Strata® DK

Digital Business Telephone Solutions

Installation and Maintenance Manual

DK14

Software Release 3.1

DK40i

Software Release 4.1

DK424

**Software Release 4.1
and ACD**

Strata DK
General End User Information

The Strata DK Digital Business Telephone System is registered in accordance with the provisions of Part 68 of the Federal Communications Commission's Rules and Regulations.

FCC Requirements

Means of Connection: The Federal Communications Commission (FCC) has established rules which permit the Strata DK system to be connected directly to the telephone network. Connection points are provided by the telephone company—connections for this type of customer-provided equipment will not be provided on coin lines. Connections to party lines are subject to state tariffs.

Incidence of Harm: If the system is malfunctioning, it may also be disrupting the telephone network. The system should be disconnected until the problem can be determined and repaired. If this is not done, the telephone company may temporarily disconnect service. If possible, they will notify you in advance, but, if advance notice is not practical, you will be notified as soon as possible. You will be informed of your right to file a complaint with the FCC.

Service or Repair: For service or repair, contact your local Toshiba telecommunications distributor. To obtain the nearest Toshiba telecommunications distributor in your area, call Toshiba America Information Systems, Inc., Telecommunication Systems Division in Irvine, CA (949) 583-3700.

Telephone Network Compatibility: The telephone company may make changes in its facilities, equipment, operations, and procedures. If such changes affect the compatibility or use of the Strata DK system, the telephone company will notify you in advance to give you an opportunity to maintain uninterrupted service.

Notification of Telephone Company: Before connecting a Strata DK system to the telephone network, the telephone company may request the following:

1. Your telephone number.

2. FCC registration number:

   ♦ Strata DK may be configured as a Key or Hybrid telephone system. The appropriate configuration for your system is dependent upon your operation of the system.

   ♦ If the operation of your system is only manual selection of outgoing lines, it may be registered as a Key telephone system.

   ♦ If your operation requires automatic selection of outgoing lines, such as dial access, Least Cost Routing, Pooled Line Buttons, etc., the system must be registered as a Hybrid telephone system. In addition to the above, certain features (tie Lines, Off-premises Stations, etc.) may also require Hybrid telephone system registration in some areas.

   ♦ If you are unsure of your type of operation and/or the appropriate FCC registration number, contact your local Toshiba telecommunications distributor for assistance.
   DK14 and DK40i
   Key system: **CJ6MLA-74479-KF-E**
   Hybrid: **CJ6MLA-74478-MF-E**
   DK424
   Hybrid: **CJ69XA-10243-MF-E**
   Key system: **CJ69XA-10242-KF-E**
   PBX: **CJCHN-22757-PF-E**

3. Ringer equivalence number: 0.3B. The ringer equivalence number (REN) is useful to determine the quantity of devices which you may connect to your telephone line and still have all of those devices ring when your number is called. In most areas, but not all, the sum of the RENs of all devices connected to one line should not exceed five (5.0B). To be certain of the number of devices you may connect to your line, as determined by the REN, you should contact your local telephone company to ascertain the maximum REN for your calling area.

4. Network connection information USOC jack required: RJ1CX, RJ2EX, RJ2GX, RJ48C, RJ48X, RJ11, RJ14C, RJ21X (see Network Requirements in this document). Items 2, 3 and 4 are also indicated on the equipment label.

Radio Frequency Interference

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the manufacturer's instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case, the user, at his/her own expense, will be required to take whatever measures may be required to correct the interference.

This system is listed with Underwriters Laboratory.

UL Requirement: If wiring from any telephone exits the building or is subject to lightning or other electrical surges, then secondary protection is required. Secondary protection is also required on DID, OPS, and tie lines. (Additional information is provided in this manual.)

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Important Notice — Music-On-Hold

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CP01, Issue 8, Part I Section 14.1
Notice: The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the Equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION! **Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.**

CP01, Issue 8, Part I Section 14.2
Notice: The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The terminal on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the Devices does not exceed 5.

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Introduction

This manual provides detailed step-by-step instructions for installing and maintaining the Strata DK14 / DK40i / DK424 digital business telephone systems. It is intended for qualified service technicians and system programmers. At the time of this printing, this book contains Release 4.1 information for the DK424. It also contains some pre-release information for software beyond Release 4.1.

Important! *Information beyond Release 4.1 is preliminary and given prior to product release. Be careful when using this information as the software will change and updates/ additions will be required upon final release.*

Use this manual in conjunction with the *Strata DK Programming Manual* which covers the programs related to the Strata DK systems discussed in this book.

Organization

In this manual, information specific to one system is clearly marked for that system whether in a chapter title or within a chapter (e.g., DK40i CO Line/Digital Telephone Interface Unit (KCDU) found in Chapter 7). Unmarked information should be considered to be general to all Strata DK systems discussed in this book.

This manual is organized into these sections/chapters for your convenience:

♦ **Chapter 1 – DK14 Installation** covers site requirements and explains how to install Strata DK14 Key Service Unit (KSU). Includes power requirements, cable lengths/network and grounding requirements.

♦ **Chapter 2 – DK40i Configuration** explains how to configure a Strata DK40i system. It also provides space to record the hardware and station devices that make up the system.

♦ **Chapter 3 – DK40i Installation** covers site requirements and cabinet installation information. Defines the installation site requirements necessary to ensure a proper operating environment for the Strata DK40i. Also included are input power requirements, cable lengths/network requirements, and grounding requirements. Explains how to install both the Base Key Service Unit (KSU) and the Expansion KSU. Instructions are also provided on how to remove and replace cabinets on installed systems.

♦ **Chapter 4 – DK424 Configuration** explains how to configure a Strata DK424 system. It also provides worksheets for determining hardware and station equipment placement and requirements.

♦ **Chapter 5 – DK424 Installation** covers site requirements and cabinet installation information. Defines the installation site requirements necessary to ensure a proper operating environment for the Strata DK424. Also included are input power requirements, cable lengths/

network requirements, and grounding requirements. Explains how to install both the Base and the Expansion Cabinets. Instructions are also provided on how to remove and replace cabinets on installed systems.

♦ **Chapter 6 – DK424 T1** provides information on T1/DS-1 interfacing for the DK424. T1/DS-1 interfacing is not available for the DK14 and DK40i.

♦ **Chapter 7 – DK Universal Slot PCBs** provides procedures for Strata DK40i/DK424 system Printed Circuit Boards (PCBs) for installation into universal slots. It includes installation instructions, optional configuration information, and wiring and programming considerations for each PCB.

Note PCBs that cannot be installed into universal slots can be found in the installation chapter for the system (e.g., Chapter 3 – DK40i Installation).

♦ **Chapter 8 – DK Universal Slot PCB Wiring** contains point-to-point wiring diagrams for connection of telephones, lines, peripheral equipment, and power supplies to the Strata DK systems.

Note Wiring diagrams for PCBs that cannot be installed into universal slots can be found in the installation chapter for the system (e.g., Chapter 3 – DK40i Installation).

♦ **Chapter 9 – Station Apparatus** provides instructions on how to connect telephones to the Strata DK systems and how to configure and upgrade them for optional features. Procedures for installing direct station selection consoles, PC and conventional attendant consoles, and door phones also appear.

♦ **Chapter 10 – Peripheral Installation** provides connection procedures for optional peripheral equipment to Strata DK systems. The instructions for each option include hardware requirements, PCB configuration, interconnection/wiring requirements, and programming considerations.

♦ **Chapter 11 – DK424 ACD Installation** includes installation instructions for Automatic Call Distribution (ACD) and Management Information System (MIS) for the Strata DK424 (applies to all common control processors except the RCTUA). Includes installation instructions for Call Center Viewer. ACD and MIS is not available to the DK14 and DK40i.

♦ **Chapter 12 – Fault Finding** for troubleshooting and fixing problems.

♦ **Chapter 13 – Computer Telephony Integration (CTI)** contains CTI, TAPI, and System Open Architecture Interface information. CTI application notes can be inserted here.

♦ **Chapter 14 – ISDN** contains an overview of the ISDN hardware with specific information on the ISDN Primary Rate Interface (PRI) and Basic Rate Interfaces (BRI). It includes instructions for installation, hardware requirements, wiring requirements, and some programming considerations.

♦ **Chapter 15 – Hospitality Management Information System (HMIS)** gives you information about HMIS, including installation, the Setup Utility, maintaining the HMIS databases and software, and troubleshooting.

♦ **Chapter 16 – Strata AirLink Systems** gives information about the external and integrated wireless systems (BSIA and RWIU), including system components, installation of hardware and software, and troubleshooting.

♦ **Glossary/Index**

Conventions

Conventions	Description
Note	Elaborates specific items or references other information. Within some tables, general notes apply to the entire table and numbered notes apply to specific items.
Important!	*Calls attention to important instructions or information.*
CAUTION!	**Advises you that hardware, software applications, or data could be damaged if the instructions are not followed closely.**
WARNING!	**Alerts you when the given task could cause personal injury or death.**
[DN]	Represents any Directory Number button, also known as an extension or intercom number.
[PDN]	Represents any Primary Directory Number button (the extension number for the telephone).
[SDN]	Represents any Secondary appearance of a PDN. A PDN which appears on another telephone is considered an SDN.
[PhDN]	Represents any Phantom Directory Number button (an additional DN).
Arial Bold	Represents telephone buttons.
Courier	Shows a computer keyboard entry or screen display.
"Type"	Indicates entry of a string of text.
"Press"	Indicates entry of a single key. For example: Type **prog** then press **Enter**.
Plus (+)	Shows a multiple PC keyboard or phone button entry. Entries without spaces between them show a simultaneous entry. Example: **Esc**+**Enter**. Entries with spaces between them show a sequential entry. Example: **#** + **5**.
Tilde (~)	Means "through." Example: 350 ~ 640 Hz frequency range.
➤	Denotes the step in a one-step procedure.
➤	Denotes a procedure.
■ 03	Used in a programming sequence to denote a variable LED button. A number on the black button represents a specific LED button.
• • •	Indicates continuation of a series of numbers entered.
See Figure 10	Grey words within the printed text denote cross-references. In the electronic version of this document (Library CD-ROM or FYI Internet download), cross-references appear in blue hypertext.

Related Documents/Media

Note   Some documents listed here may appear in different versions on the CD-ROM, FYI or in print. To find the most current version, check the version/date in the Publication Information on the back of the document's title page.

The following documents and CD-ROMS can be used to reference further information about the Strata DK systems.

♦ **Digital Telephone User Guide** provides all the procedures necessary to operate Toshiba-proprietary digital telephones, including Liquid Crystal Display (LCD) features. It also includes instructions for using the add-on module/DSS console.

♦ **Digital Telephone Quick Reference Guide** provides a quick reference for frequently-used digital telephone features.

♦ **Digital Single Line Telephone User Guide** provides all the procedures necessary to operate Toshiba-proprietary digital single line telephones.

♦ **Electronic Telephone User Guide** explains all the procedures necessary to operate Toshiba-proprietary electronic telephones, including all LCD features. Does not apply to the Strata DK14 system. It also includes instructions for using the electronic DSS console.

♦ **Electronic Telephone Quick Reference Guide** provides a quick reference for frequently-used electronic telephone features. Does not apply to the Strata DK14 system.

♦ **Standard Telephone User Guide** explains all the procedures necessary to operate rotary dial and push-button standard telephones.

♦ **Strata AirLink External Wireless Handset User Guide** shows how to use the wireless handset configured to standard ports of the Strata DK telephone system and many non-Toshiba systems.

♦ **Strata AirLink External Wireless Quick Reference Guide** contains instructions for operation of commonly used Strata AirLink External Wireless Handset features.

♦ **Strata AirLink Integrated Wireless Handset User Guide** shows how to use the wireless handset configured to digital ports of the Strata DK telephone system.

♦ **Strata AirLink Integrated Wireless Quick Reference Guide** contains instructions for operation of commonly used Strata AirLink Integrated Wireless Handset features.

♦ **System Administrator Guide** gives instructions for the System Administrator to manage the system. Contains instructions for Station Relocation, System Speed Dial, and other features only activated by the System Administrator.

♦ **PC/Data Interface User Guide** explains all the procedures necessary to operate stand-alone data interface units while in the data mode for printer sharing and modem pooling. Also provides instructions on connecting to a Personal Computer with Telephone Application Programming Interface (TAPI).

♦ **Cordless Telephone User Guid**e provides instructions on using the DKT2004-CT cordless digital telephone as a single unit or in conjunction with a digital telephone.

♦ **PC-DKT User Guide** provides installation and operation information for the Personal Computer Digital Key Telephone system.

♦ **Strata DK Feature Description Manual** describes each feature associated with the Strata DK424, DK40i and DK14. Also provides descriptions of compatible Toshiba-proprietary telephones and peripherals.

♦ **Keyprint 2000 User Guide** provides instructions for the Keyprint 2000 software printing package which allows you to print and store custom button label keystrips for Strata DK 2000-series 10-button or 20-button digital telephones, 20-button add-on modules, and 60-button digital DSS consoles.

♦ **Strata DK Programming Manual** provides all instructions necessary to program the system and system record sheets, including ACD.

♦ **Strata DK Installation & Maintenance Manual** provides installation instructions for configuring and installing the Strata DK14, DK40i and DK424. It also includes T1/DS-1 interface installation and configuration instructions, as well as fault finding flowcharts to troubleshoot the systems. An ACD Section provides instructions for installing ACD into the Strata DK424.

♦ **Strata AirLink External Wireless System Installation Guide** provides step-by-step hardware and software installation instructions. It includes examples of system configurations, information on performing a site survey, and troubleshooting techniques.

♦ **Hospitality Management Information System (HMIS) General Description** provides an overall view of the system's hardware, software, applications and features. The HMIS is a PC-based solution, designed to meet the specific operational needs of small- to medium-sized hotel/motels and includes both the PC and software.

♦ **Hospitality Management Information System (HMIS) User Guide** describes the product's many software features and gives step-by-step instructions for using them.

♦ **Strata DK Library CD-ROM** enables you to view, print, navigate and search publications for Strata DK14, DK40 and DK424 digital business telephone systems. It also includes Strata DK424 ACD Documentation, including the *Strata DK424 Call Center Solutions General Description, ACD Agent Guide, ACD Supervisors Guide.* ACD Installation and Programming instructions are included in the *Strata DK Installation and Maintenance Manual* and *Programming Manual.*

♦ **Strata DK HMIS CD-ROM** contains a copy of all HMIS documentation/bulletins and enables you to view, print, navigate and search publications.

♦ **StrataControl CD-ROM** contains the StrataControl software, that enables viewing, downloading, editing, and uploading Strata DK programmed data on a PC. This software also provides a method of creating custom lists and user guides based on information from the Strata DK system. The CD-ROM contains the *StrataControl User Guide.*

♦ **DKQuote CD-ROM** contains the DKQuote application and the *DKQuote User Guide* that shows how to use this interactive software to assist you with Strata DK Systems configuration and pricing worksheets.

♦ **DKAdmin/DKBackup CD-ROM** includes the programs that let you easily and quickly custom program and/or update the Strata DK14/DK40/DK424 with a user-friendly PC display. The CD-ROM also contains the *DKAdmin/DKBackup User Guide* that explains how to use the DKAdmin/DKBackup interactive software applications. The current version does not support DK40i.

The following documentation and media applies to the Strata DK424 system only.

♦ **Strata DK424 Call Center Solutions General Description** provides a system overview, including hardware and feature information. Highlights the technology employed in operating the ACD Strata DK424 system.

♦ **ACD Agent Guide** describes the ACD agent feature operation along with step-by-step procedures for using features.

♦ **ACD Supervisor Guide** provides instruction on how to use the ACD supervisor features.

♦ **Insight DK CD-ROM** which includes Insight DK software, the upgrade to Insight DK Plus, Demo software, Insight DK documentation and training modules.

♦ **Insight DK Installation Guide** explains how to set up the network, install the server software, install clients and explains how the data files are organized.

♦ **Insight DK Supervisor Guide** provides instructions for using the Strata DK Insight and Insight DK Plus MIS for the Supervisor of a call center. Instructions for creating and using Real Time Displays, Reports, Alarms, and Wallboards are also included.

♦ **Insight DK inView Quick Reference Guide** provides instructions for viewing and customizing the on-screen wallboard and large character views of the real time call center data.

♦ **PC Attendant Console User Guide** explains the procedures necessary to operate the PC Attendant Console.

♦ **PC Attendant Console Quick Reference Guide** provides a quick reference for frequently-used PC Attendant Console features.

♦ **Call Center Viewer User Guide** describes how to install and operate the Call Center Viewer application on a PC. It explains how to view and customize ACD group and agent status information.

♦ **Software MIS (SMIS) Supervisor Manual** provides descriptions, examples, and instructions on using the Software MIS application.

For authorized users, Internet site FYI (http://fyi.tsd.toshiba.com) contains all current Strata DK documentation and enables you to view, print, and download current publications.

DK14 Installation

1

This chapter explains how to install the Strata DK14 system. It includes information on site requirements, wiring diagrams, and step-by-step instructions on how to install the unit(s), the ground wiring, AC power cabling, reserve power (battery backup) cabling, and PCB cabling.

Inspection

1. When the system is received, examine all packages carefully and note any visible damage. If any damage is found, do not open the packages. Contact the delivery carrier immediately and make the proper claims.

2. After unpacking (and before installing), check the system against the packing list and inspect all equipment for damage. If equipment is missing or damaged, contact your supplier immediately.

3. Be sure to retain original packaging materials for re-use when storing or transporting system hardware.

Packaging and Storage

> CAUTION!   When handling (installing, removing, examining) PCBs, do not touch the back (soldered) side or edge connector. Always hold the PCB by its edges.

➤ When packaging and storing the system, remove PCBs from the system cabinet (the power supply may remain installed in the cabinet for storage and shipment). PCBs should be packaged in their original antistatic bags for protection against electrostatic discharge. Be sure to package equipment in its original shipping containers.

Site Requirements

This section defines the installation site requirements necessary to ensure a proper operating environment for the DK14. Also included are grounding requirements. (Table 1-1 for electrical/environmental characteristics.)

Input Power

The system requires an input power source of 115VAC ± 10VAC, 50/60 Hz, 10 amps. The AC outlet is recommended to be dedicated and unswitched, with a solid third-wire ground. (See "AC Power and Grounding Requirements" on Page 1-3 for details).

This is to eliminate interference from branch circuit motor noise or the like, and to prevent accidental power-off. To avoid accidental power turn-off, Toshiba recommends that you do *not* use an ON/OFF wall switch on this dedicated AC circuit.

For the DK14, a reserve power source (two customer-supplied 12-volt batteries) may be connected to the system to serve as a power failure backup.

Clearance and Location

The minimum clearance requirements for the DK14 KSU are shown in Figure 1-1. The HPFB should be mounted directly above the D14 KSU.

Consider the following conditions when selecting a location for the KSU(s):

The location *must be*:

♦ Dry and clean

♦ Well ventilated

♦ Well illuminated

♦ Easily accessible

The location *must not be*:

♦ Subject to extreme heat or cold

♦ Subject to corrosive fumes, dust, or other airborne contaminants

♦ Subject to excessive vibration

♦ Next to television, radio, office automation, or high frequency equipment
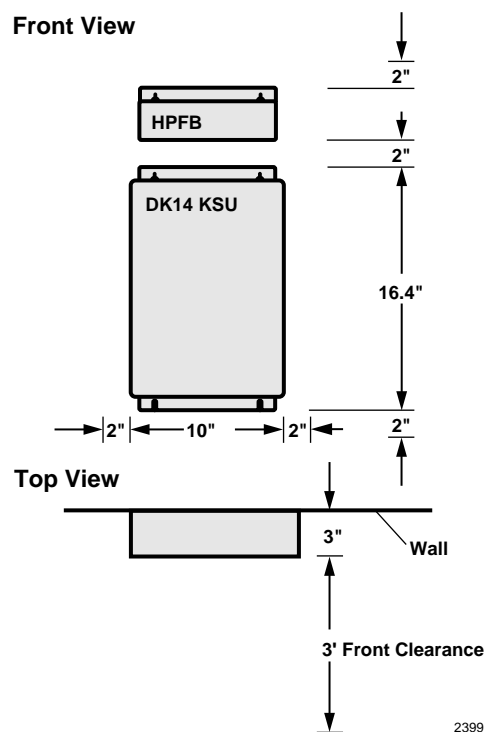
Figure 1-1   DK14 KSU Clearance Requirements

Table 1-1   Summary of Electrical/Environmental Characteristics

DK14 Primary Power	
Input AC (Power Supply Specification) AC frequency Power AC Current	85~135VAC 50/60 Hz 75 watts maximum <0.7 amps maximum
Environmental Specifications	
Operating temperature Operating humidity Storage temperature	32~104° F (0 ~40° C) 20~80% relative humidity without condensation -4~158° F (-20~70° C)
Power Supply	
DC voltage output specification	+24VDC (+26.3~+27.8VDC) +5VDC (+4.5~+5.5VDC) +5VDC converter on KSU PCB
QSTU2 (Circuits 1 and 2)	
Ring Voltage	Square wave output with high/low option jumper: Low position 130 $\pm$ 20VDC peak-to-peak (no-load) High position, 190 $\pm$ 25VDC peak-to-peak (no-load)
Ringing capability	2 ringers maximum per circuit, high or low position
QSTU2 modem interface data rate	14,400 bps maximum

AC Power and Grounding Requirements

The DK14 requires a solid earth ground for proper operation. The AC power cord contains a conductor for the "third-wire ground" provided by the commercial power outlet.

The third-wire ground should be the only ground necessary for the DK14; this ground must originate at the buildings main power distribution panel and have a solid connection to earth ground. (See Figure 1-2.)

AC Voltage Range:

♦   115VAC $\pm$ 10VAC

♦   0.7 amp. max
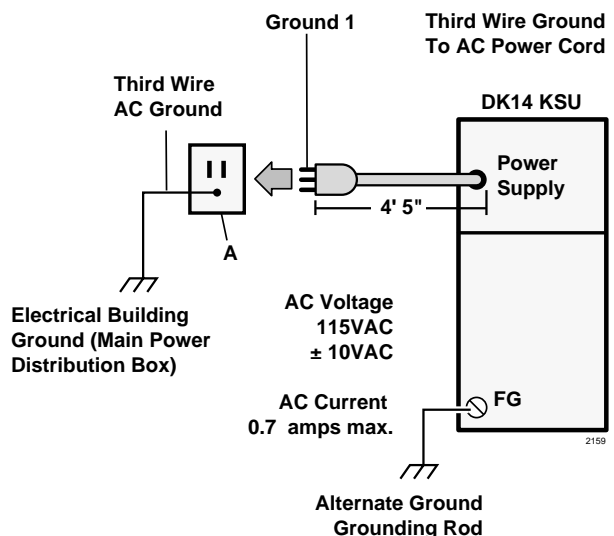
Figure 1-2   DK14 Grounding Diagram

CAUTION!   **Lack of proper ground may cause improper operation and, in extreme cases, system failure.**

AC Power and Third-wire Ground Test

Test the "third-wire ground" for continuity by either measuring the resistance between the third prong terminal (earth ground) and a metal cold water pipe (maximum: 1 ohm), or by using a commercially available earth ground indicator. If neither procedure is possible, perform the following earth ground test procedure.

> **WARNING!** Hazardous voltages that may cause death or injury are exposed during the following test. Use great care when working with AC power line voltage.

➤ **To perform the earth ground test procedure**

1. Obtain a suitable voltmeter, and set it for a possible reading of up to 250VAC.

2. Connect the meter probes between the two main AC voltage terminals (white and black wires) on the wall outlet. The reading obtained should be between 100~125VAC.

3. Move one of the meter probes to the third terminal (green wire ground). Either the same reading or a reading of zero volts should be obtained.

4. If the reading is zero volts, leave one probe on the ground terminal and move the other probe to the second voltage terminal.

CAUTION! If a reading of zero volts is obtained on both voltage terminals (white wire to green wire, black wire to green wire), the outlet is not properly grounded. Omit Steps 5 and 6, and see following CAUTION!

---

5. If a reading of zero volts on one terminal, and a reading of 105~125VAC on the other terminal is obtained, remove both probes from the outlet.

6. Set the meter to the "OHMS/Rx1" scale. Place one probe on the ground terminal, and the other probe on the terminal that produced a reading of zero volts. The reading should be less than 1 ohm.

CAUTION! If the reading is more than one ohm, then the outlet is not adequately grounded. If the above tests show the outlet AC voltage is not in range or is not properly grounded, the condition should be corrected (per Article 250 of the National Electrical Code) by a qualified electrician before the system is connected.

Alternate or Additional Ground

If the "third-wire" AC ground can not practically be improved or if extreme motor noise or other disturbance causes system malfunction, or if local area lightning storms exist, a separate direct ground may be warranted.

Connect a separate earth ground from a cold water pipe or earth grounding rod directly to the FG screw terminal on the DK14 power supply (see Figure 1-2).

This chapter provides the instructions necessary to mount the DK14 Key Service Unit (KSU). Instructions are also provided on how to remove and replace the power supply.

KSU Mounting Considerations

The KSU is designed to be mounted on a wall or other vertical surface. Toshiba recommends using the following method.

Pre-installation

1. Loosen the screws on the front cover of the KSU, and remove the cover (Figure 1-3).

2. Move the SW1 RAM Storage Battery jumper plug strap on the motherboard to the ON position (Figure 1-4).

3. If the DK14 is less than one mile from the central office (or PBX), set the CO line PAD switches, SW401 and SW451, to the PAD position to provide a 3db level loss to avoid excessive loudness.

4. Install all optional PCBs per instructions later in this chapter.
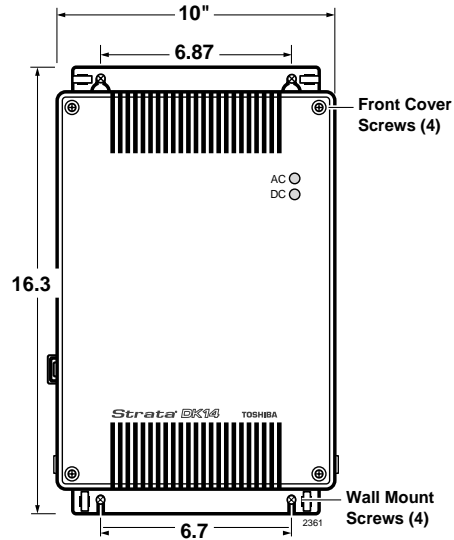
Figure 1-3   DK14 Dimensions
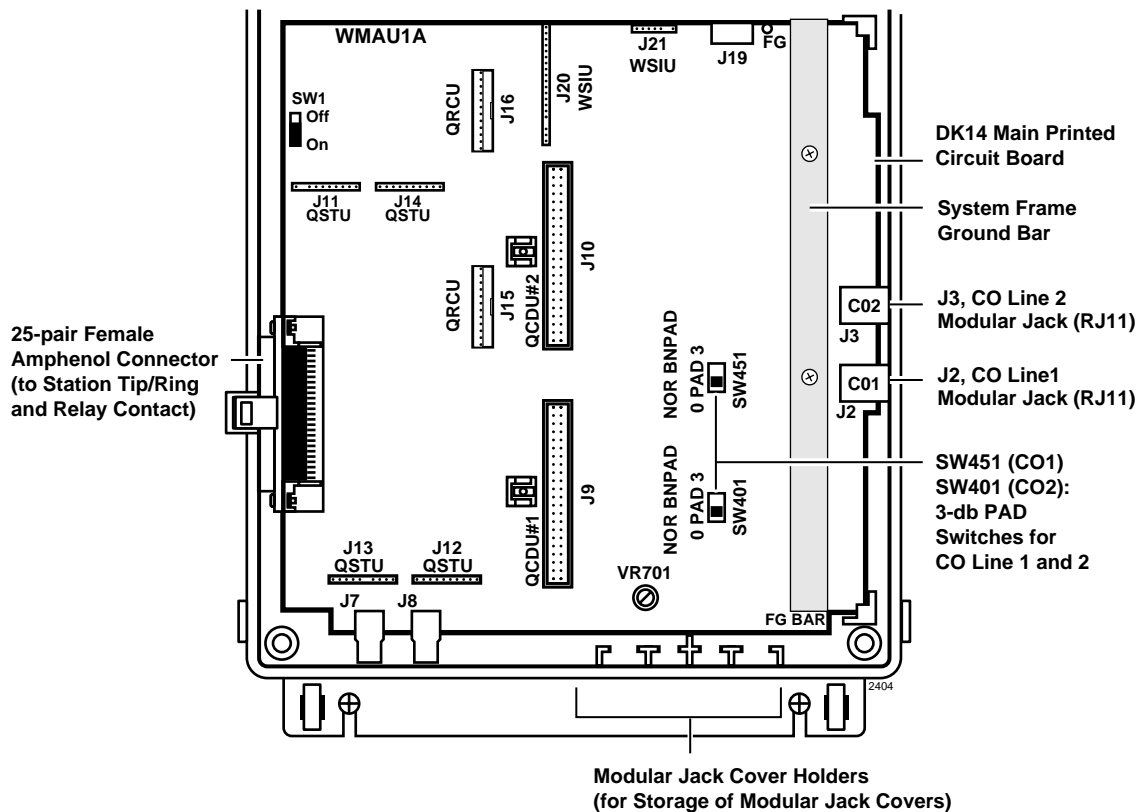
Figure 1-4   DK14 Interior View

Mounting the KSU

1. Make sure the power supply switch is turned OFF.

2. Place the KSU on the desired location on the mounting surface and mark the location of the four screw holes (there is one on each corner). See Figures 1-3 and 1-5.

3. Make sure the location of the KSU meets the minimum clearance requirements.

4. Drill holes on these marks.

5. Secure screws approximately two thirds of the way into the top two holes on the mounting surface.

6. Hang the unit from the top two screws and then secure the screws completely into the mounting surface.

7. Finish securing the unit to the mounting surface by completely screwing the bottom two screws into the wall.

8. Ground system according to previous "AC Power and Grounding Requirements" on Page 1-3 instructions.

9. Connect applicable wiring (modular CO line cords, 25-pair amphenol connector cable, etc.) to the KSU. Route the wiring as shown in Figure 1-6, and then fasten wiring to the unit with the tie wraps that come with the KSU. (See Figures 1-16~1-18 for additional wiring details.)

   Note Figure 1-6 shows cables routed to the right; they may also be routed to the left, depending on the location of the MDF.

Figure 1-5   DK14 KSU Wall Mount Method

10. If the Reserve Power Battery and Charger (HPFB) is going to be installed, refer to the following section. If not, proceed to Step 11.

11. Plug the AC power cable into an outlet and then turn ON the DC power supply switch.

12. Reinstall the front cover onto the KSU.

To HPFB FG Screw

AC Power Cord and Plug 4' 7"

Station Tip/Ring Amphenol 25-pair Jack (female)

Tie-wrap supplied to Hold Amphenol Connector

3"

Tie-wrap Holder

Reserve Battery (HPFB) Connector

BATT

DC ON/OFF Power Switch

DC

SI02
SI01

RS-232 Interface Jacks, TTY, Caller ID, SMDR

CO4
CO2
CO1
CO3

RJ11 CO Line Jacks

PFT

RJ11 Power Failure Transfer Jack

Tie-wrap Holder

2397

Left Side View   **Right Side View**

Figure 1-6   DK14 Side View and Jack Locations

Reserve Power Battery

A second HPFB can be installed directly above the unit to supply backup reserve power.

➤ **To install the Reserve Power Battery and Charger (HPFB)**

1. Place the HPFB directly above the DK14 KSU (Figure 1-7).

2. Mark the location of the two screw holes, then drill holes.

3. Screw the two screws two-thirds into the mounting surface.

4. Hang the HFPU on the screws then tighten the screws into the mounting surface.

5. Plug the first HPFB connector into BATT connector on the right side of the KSU.

6. Connect a ground wire from the HPFB "FG" screw to the DK14 QPSU8 screw labeled "HPFB6." The ground wire can be fed through the opening by the AC power cord.

Note   The DK14 should be plugged into AC power and the DC power switch should be turned ON. The HFPU will not start to operate if AC power is not available during the initial installation.

7. The 24VDC LED on the HPFB should light. If it does not light, press the battery OFF switch with a pencil point or other small-tipped object.

8. Dress and tie-wrap the HPFB cables.

9. To mount a second HPFB, repeat Steps 1~4, then plug the second HPFB connector in the first HPFB and connect an FG wire between each HPFB FG screw.

10. To test the HPFB, remove the DK14 AC plug from the AC outlet. The DK14 AC LED will go out, but the DK14 DC LED remains on. Also the system remains in normal working order and the HPFB 24V LED remains on.

11. If it is desired to turn off the HPFB (after loss of AC power), use a pencil or other sharp object to press the Battery OFF switch.

CAUTION! **Once the HPFB is turned OFF or unplugged (during AC power loss) it will not operate again until AC power is restored to the DK14 KSU.**
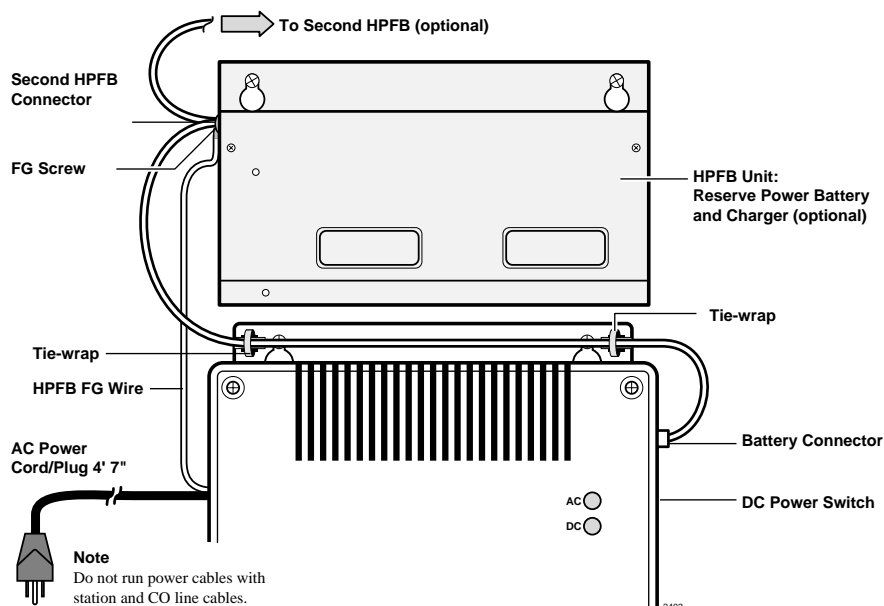
Figure 1-7   DK14 Reserve Power Installation

Power Supply Removal and Replacement

The power supply comes factory-installed in the KSU; if necessary, it can be removed and replaced.

Power Supply Removal

1. Make sure that the power supply switch is OFF and that the AC power cable is not plugged into an outlet. Confirm that green AC LED is not lit. See Figure 1-8.

2. Loosen the screws on the front cover of the KSU, and remove the cover.

3. Unplug HPFB cable from BATT connector of power supply and disconnect the HPFB ground wire.

4. Unplug the AC cable from the CN1 connector on the power supply.

5. Remove the FG screw, and disconnect the green third wire ground ring terminal.

6. Unplug the DC cable from the CN3 connector on the power supply.

7. Remove the top two, and bottom left corner screws that attach the power supply to the KSU. Remove power supply.
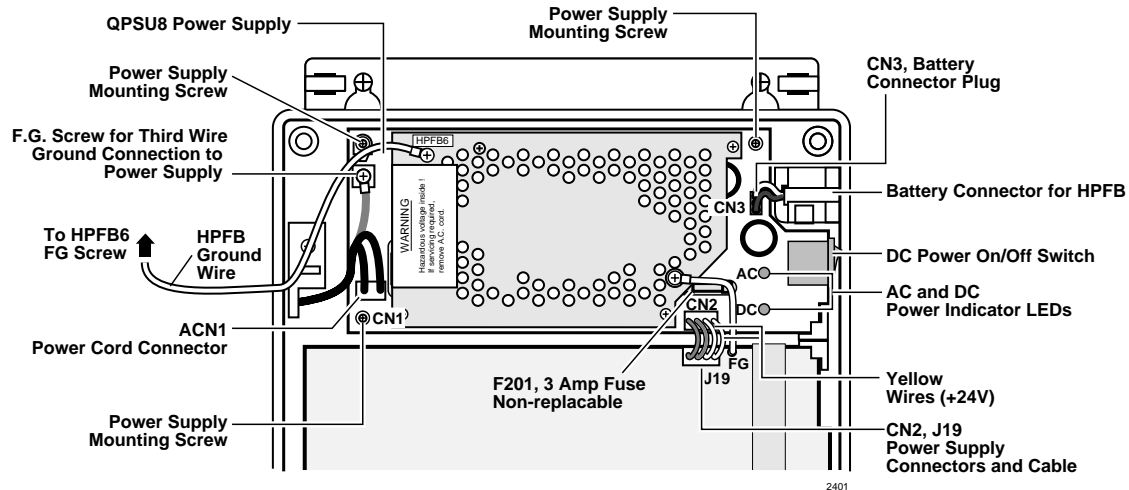
Figure 1-8   DK14 Power Supply

Power Supply Replacement

1. Set the power supply in its proper place in the KSU. See Figure 1-8.

2. Secure the power supply to the KSU with the top two, and bottom left corner screws.

3. Install the green third wire ground ring terminal with the FG screw.

4. Plug the AC cable into the CN1 connector on the power supply.

5. Plug the DC cable into the CN3 connector on the power supply.

6. Plug the AC power cable into an outlet and turn ON the power supply switch.

7. Test QPSU8 power supply according to Chapter 12-Fault Finding, "DK14 Hardware Fault Isolation procedure."

8. Plug HPFB cable into BATT connector of power supply and reconnect the HPFB ground wire.

9. Reinstall the cover on the KSU.

Printed Circuit Board (PCB) Installation

This section provides procedures for installation of Strata DK14 system optional printed circuit boards (PCBs) into the KSU. This includes installation instructions, optional configuration information, and wiring and programming considerations for each PCB.

Be sure the ground has been checked. (See "AC Power and Grounding Requirements" on Page 1-3.)

PCB Installation Considerations

The Strata DK14 KSU comes standard with four digital telephone circuits (ports) and two CO line circuits. These circuits, along with the common control unit, are built into the motherboard.

KSU Option PCBs

The DK14 KSU can support up to four optional PCBs, including:

♦ A maximum of two QCDU2s: each one provides one CO line circuit and two digital telephone circuits.

♦ A QSTU2 which provides two standard telephone circuits (ports).

♦ A QRCU2 which provides three circuits to receive DTMF tones (required for DISA and devices connected to QSTU2s), and three circuits to detect busy tone (required for the ABR feature).

♦ A WSIU which provides a port for either a Station Message Detail Recording (SMDR) device or a maintenance terminal or modem, or Caller ID interface.

♦ The KSU does not come from the factory with any option PCBs installed. Each of the option PCBs must be installed in specific locations. (See Figure 1-9.)

PCB Option Considerations

PCBs may be configured for a variety of hardware and software options. Hardware options are defined as either internal (generally related to optional PCB subassemblies) or external (related to connection of peripheral equipment such as background music, voice mail, etc.). Hardware and software options for each PCB are identified in the individual PCB installation procedures in this chapter.

PCB Hardware Options. Each PCB must be configured for the applicable hardware options prior to installation of the PCB. Configuration instructions for internal hardware options are provided in the individual PCB installation procedures in this chapter. Configuration instructions for external hardware options are provided in Chapter 10 – Peripheral Installation.

PCB Software Options. After installation of the PCBs in the KSU, configure the PCBs for software options through programming. A programming overview for each PCB is provided in the individual PCB installation procedures in this chapter. Refer to the *Strata DK Programming Manual* for detailed instructions.

PCB Installation/Power Supply Considerations

Whenever removing or installing PCBs it is recommended that the power supply be OFF.
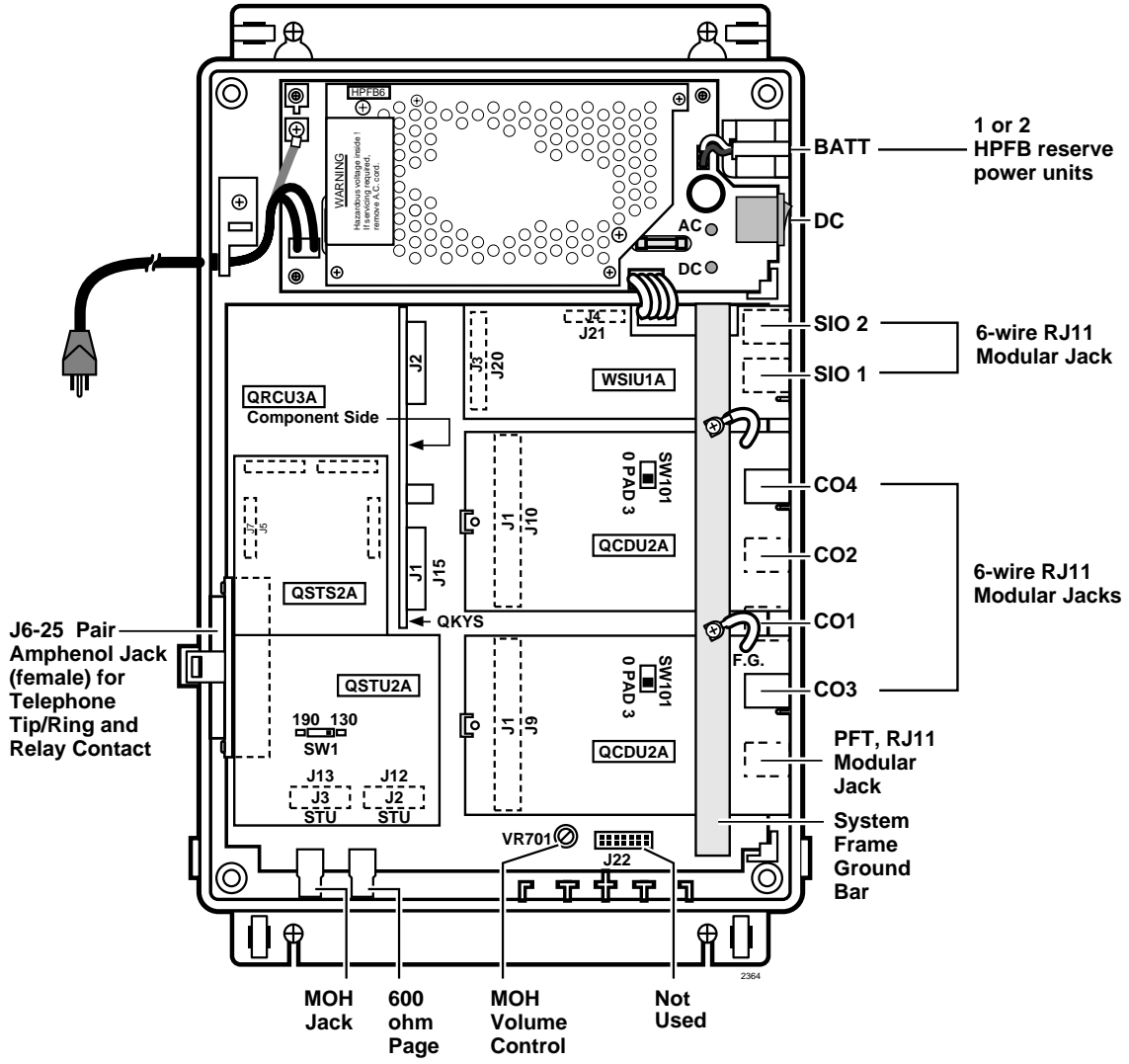
Figure 1-9   DK14 PCB Installation

Built-in CO Line, Digital, Telephone, and Other Circuits

The KSU comes standard with two CO lines and four digital telephone circuits already installed on the motherboard (WMAU). See Figure 1-4 for an illustration of the WMAU.

Built-in CO Line Circuits

The two standard loop start CO line circuits are integrated into the KSU motherboard WMAU and are identical to the QCDU2 CO line circuits.

CO lines that receive Caller ID must be cross-connected to the TC-1041 (MLX-41) Caller ID interface box (See Page 1-19 for address). See Figure 1-18 for wiring.

Built-in Digital Telephone Circuits

The four digital telephone circuits that come standard with the system are integrated into the motherboard in the KSU. These circuits are identical to the digital circuits found on the QCDU2. The motherboard does not have to be configured for the digital circuits to operate.

KSU Motherboard CO Line/Digital Station Circuit Wiring

See Figures 1-15~1-17 for details.

Power Failure Telephone Installation

1. Remove the RJ11 cover (Figure 1-11) from the PFT jack and store the jack cover.

2. Connect the power failure telephone (500/2500-type standard telephone to the PFT jack. Figure 1-17 shows the DK14 MDF to CO Line Wiring.

Music-On-Hold (MOH)/Background Music (BGM) Source Connection

Connect the MOH/BGM source to the MOH RCA jack (Figures 1-9 and 1-16) in accordance with Music Source Configuration A in Chapter 10 – Peripheral Installation.

External Page Output Connection

Connect the external page system to the 600ohm PAGE RCA output jack (Figure 1-9) to an external amplifier in accordance with the External Page Installation guidelines in Chapter 10 – Peripheral Installation.

QCDU2
CO Line Digital Telephone Interface Unit

Circuits per PCB: *one loop start CO line circuit and two digital telephone circuits*

Interfaces with: *digital telephones*
PDIU-DIs/PDIU-DI2s/RPCI-DI
ADMs connected to the telephones and PDIU-DSs
Does not support a DDSS console or DDCB

Older Version(s): *QCDU1A*

QCDU2 Configuration

The QCDU2 may have to be configured to control excessive loudness if the system is close to a CO or installed behind a PBX telephone system. It does not have to be configured for anything else. The decibel (db) PAD switch, SW101 controls the loudness by providing a 3 db signal level drop to, or from, the PBX or CO when set to the PAD position. The switch comes from the factory set at 0 (for no PAD) meaning no PAD loss.

QCDU2 Installation

A maximum of two QCDU2 PCBs can be installed in the KSU.

➤ **To install the QCDU2**

1. If the system is located within one mile of the CO or PBX telephone system, set db PAD switch SW101 to the PAD position.

2. Make sure that the power supply switch is OFF.

3. Slide QCDU2's front edge and FG wire under the System Frame Ground Bar; align and insert the QCDU2 connector J1 into the motherboard connector (J9 for CO3 first, J10 for CO4 second). (See Figure 1-10)

   Apply firm, even pressure to ensure proper mating of the connectors. Make sure the QCDU2's connector edge next to the connector J1 snaps firmly into the standoffs on the KSU motherboard. (See Figure 1-4).

4. Connect the Frame Ground (FG) lead from the QCDU2 to the screw nearest the QCDU2 located on the system Frame Ground bar. Remove the "knock-out" from the KSU cover CO3 or CO4 access slot, and store the "knock-out" in the slots provided in the KSU base. (See Figure 1-11.)
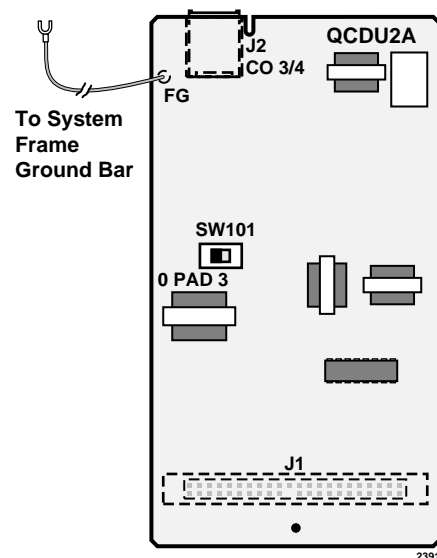
Figure 1-10 QCDU2 Printed Circuit Board
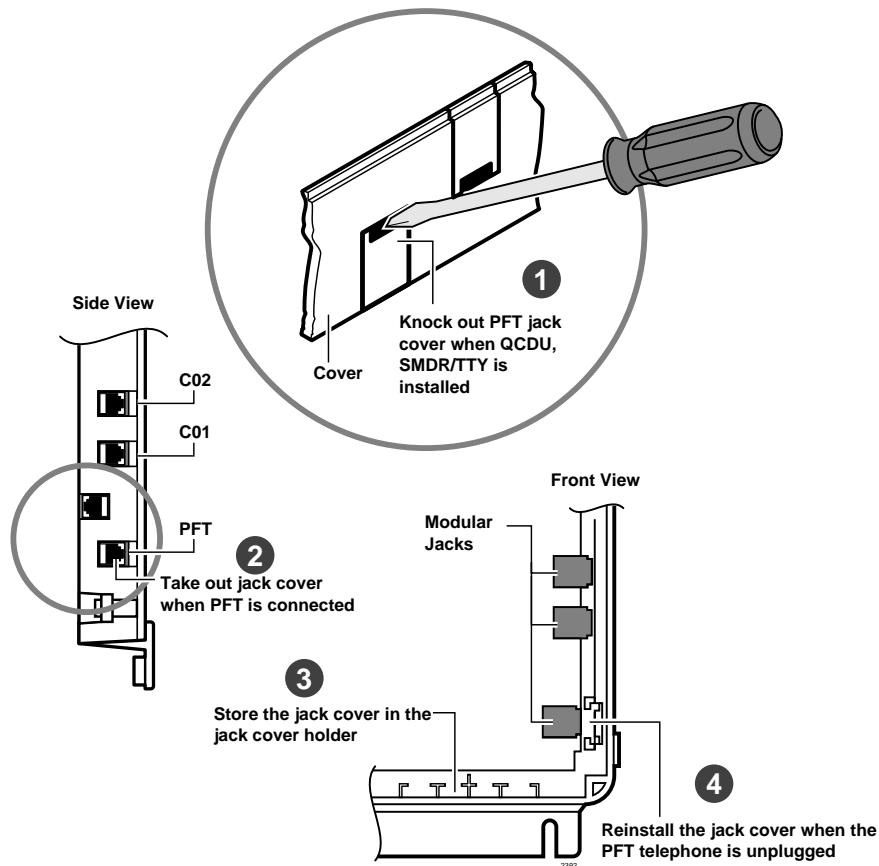
Figure 1-11   Modular Jack Cover

QCDU2 Programming

The following parameters may be specified through programming for the QCDU2.

Program 10-1: Allows/denies two-CO Line Conference and Direct Inward System Access (DISA).

Program 15: Auto Release detection; DISA, and other attributes to the CO line.

Program 16: Assigns CO line to groups 81~84, and dial 9 group.

Program 40: Assigns stations access to CO line (incoming and outgoing access).

Program *50: Assigns Caller ID CO lines to Caller ID interface CO line.

Program *51: Assigns station to Caller ID, Lost
Call memory.

QSTU2A
Standard Telephone Interface Unit

Circuits per PCB: *two standard telephone circuits*

Interfaces with: *standard telephones*
Auto Attendant devices
separate BGM source connection
voice mail machines
facsimile machines

Older Version(s): *QSTU1A*

> **Note** For the system to recognize the Dual-Tone Multi-Frequency (DTMF) tones generated by standard telephones (or any other device connected to a QSTU2 port), a QRCU3 must be installed.

The QSTS2 PCB is factory-installed on the QSTU.

QSTU2 Configuration

The QSTU2 does not require configurations for the ring generator voltage level. Most standard telephones and two-wire devices require 190; however, some devices may experience ring-trip at 190, and should be set at 130.

QSTU2 Installation

1. Make sure the power supply switch is OFF.

2. Align the QSTU2 connectors J1, J2, J3, and J4 to the motherboard connectors J11, J12, J13, and J14 respectively. Apply firm, even pressure to ensure proper mating of the connectors (see Figure 1-12).
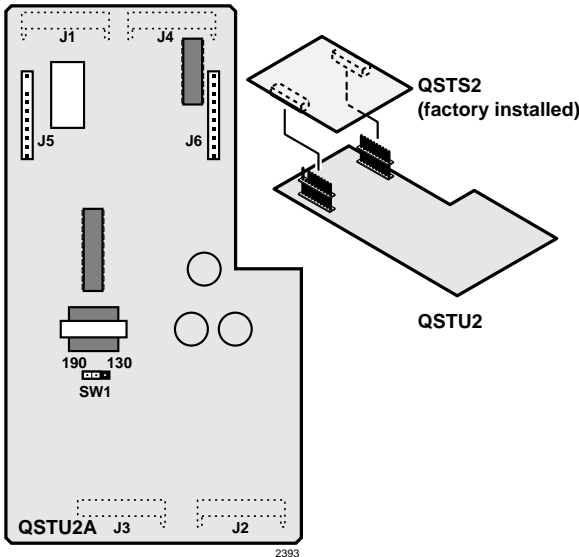
Figure 1-12 QSTU2/QSTS2 Printed Circuit Boards

QSTU2 Programming

The following parameters can be specified for the QSTU2:

Program 31: Used to configure all QSTU2 ports connected to voice mail (see Chapter 7 – DK40i/ DK424 Universal Slot PCBs for voice mail installation).

Program 10-2: Used to set standard telephone ringing option and separate BGM assignment.

Note QSTU2 ports are fixed. They are assigned even if a QSTU2 is not installed.

QSTU2 Wiring

Refer to DK14 MDF to KSU Amphenol Wiring in Figure 1-16 for QSTU2 wiring.

The QSTU2 must be connected to a OL13A (or equivalent) type lines for off-premises stations. (300 ohms loop resistance max., including the telephone or other devices DC off hook resistance.)

QRCU3
DTMF Receiver/ABR Tone Detector Unit

System: *DK14*

Circuits per PCB: *3 DTMF/ABR Tone Receivers*

Interfaces with: *two-wire devices such as standard telephones*
Auto Attendant devices, separate BGM source connection
voice mail machines
Facsimile machines.

Older Version(s):   *QRCU1/QRCU2*

The QRCU3 must be installed to recognize Dual-Tone Multi-Frequency (DTMF) tones generated by a standard telephone (or any other device connected to a standard telephone circuit (QSTU2), and it is required for Direct Inward System Access (DISA) calls. The QRCU3 circuits are also used to detect busy tone for the Automatic Busy Redial (ABR) feature and must be installed to allow ABR to operate.

QRCU3 Configuration

The QRCU3 does not have to be configured for operation.

QRCU3 Installation

1. Make sure that the power supply switch is OFF.

2. Align and insert the QRCU3 connectors J1 and J2 (see Figure 1-13 into the motherboard connectors J15 and J16 respectively (note the component side placement in Figure 1-4). Apply firm, even pressure to ensure proper mating of connectors. Push down until the connectors lock together.
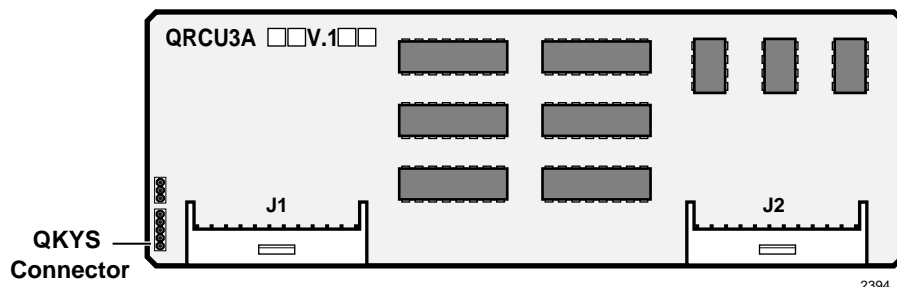
Figure 1-13   QRCU3 Printed Circuit Board

QRCU3 Programming

The following parameters can be specified:

Program 12: Set QRCU3 release time.

Program 15: Sets QRCU3 operation after CO line flash.

Built-in Auto Attendant

DK14 Built-in Auto Attendant software is enabled by installing a QKYS1 Key (chip) onto the QRCU3 PCB.

➤ **To install the QKYS1 Key**

1. Make sure that the DKSU14 power supply switch is OFF.

2. Install the QKYS1 into the QKYS1 connector on the QRCU2 PCB (see Figure 1-13).

3. The QKYS1 does not require Program 03 assignments.

Programming

Refer to "Auto Attendant (Built-in)" in the Overview section of the *Strata DK Programming Manual.*

WSIU1
Serial Interface Board

System: *DK14*

Circuits per PCB: *two serial interface ports*

Interfaces with: *SMDR connection for call accounting device*
Caller ID Interface Box, Interface for local connection of DKAdmin PC
customer-provided external modem for remote maintenance from a PC with DK Admin

Older Version(s): *none*

The WSIU1 PCB enables the DK14 system to connect to various hardware devices. *It does not have an internal modem and does not support IMDU or RMDS.*

Only one WSIU1 can be installed per DK14 system. When installed, the WSIU1 port functions are identified and enabled automatically when power is turned on. See Program 76-1 for initialized data.

CO lines that receive Caller ID must be cross-connected to the TC-1041 (MLX-41) Caller ID interface box. See Figure 1-18 for wiring.

The TC-1041 (MLX-41) is available from TEL-CONTROL, Inc., P.O. Box 4087, Huntsville, AL 35815-4087. Phone (205) 881-4000.

The communication parameters for TTY and Caller ID (WSIU1 SI01 or SI02) ports are:

♦ Data word bits = 7

♦ Parity = even

♦ Stop bits = 1

The communication parameters for SMDR (WSIU SI01 or SI02) are:

♦ Data word bits = 8

♦ Parity = None

♦ Stop bit = 1

WSIU1 Installation

1. Make sure that the power supply switch is OFF. See Figure 1-14.

2. Slide the front edge under the System Frame Ground Bar. Align and insert WSIU connector J4 into the motherboard connector J21, and J3 into J20. Apply firm, even pressure to ensure proper making of the connectors. Make sure the edge of the WSIU is next to the connector J1 and J2.

3. Remove the "knock-out" from the KSU cover SI01 or SI02 access slot, and store the "knock-out" in the slots provided in the KSU base. (See Figure 1-11.)

WSIU Programming

Program 03: No assignment is necessary. WSIU1 is automatically enabled when installed and power is turned ON. It is not assigned to a slot.

Program 76-1X-Y: Assigns each installed WSIU1 port to a function. Where X identifies the WSIU1 port number (1~2) and Y identifies the WSIU1 port function:

   ♦ Y=1, RS-232 TTY (Program 77-1, LED 14 OFF)

   ♦ Y=2, SMDR

   ♦ Y=4, SMDI

   ♦ Y=6, Caller ID Interface

   ♦ Y=0, No function - this should be used for any WSIU1 ports that are not used.

Program 76-2X-Z: Assigns each installed WSIU1 port to operate at a specified transmission rate. Where X identifies the WSIU1 Port number (1, 2). Z identifies the WSIU1/port transmission rate in bits-per-second (bps):

   ♦ Z=1; 9600

   ♦ Z=2; 4800

   ♦ Z=3; 2400

   ♦ Z=4; 1200

Note   The sum of WSIU1 port 1 and port 2 bps rate cannot exceed 9600 bps.

WSIU Wiring

Note   Refer to Chapter 10 – Peripheral Installation, SMDR and TTY for WSIU wiring/ interconnecting details. See Figure 1-18 for Caller ID interface box to WSIU wiring.

SIO#2 SIO#1

2396
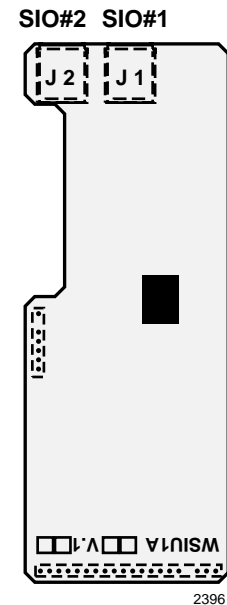
Figure 1-14 WSIU Printed Circuit Board

DK8/DK14 Compatibility

Generally, Strata DK components are upward compatible to make upgrading cost-effective. Furthermore, there is a lot of cross-compatibility between similar systems. Most of the PCBs that were introduced for the DK14 can also be used in the DK8 system (see Table 1-2). Also, a number of DK8 PCBs can be used in the DK14 (see Table 1-3).

Table 1-2   DK14 PCBs Compatible with the DK8 System

DK14 PCBs	Compatibility (Use in DK8)	Standard	Optional	Function
DKSU14A	-	X		Base Unit
QMAU2A	NO	X		Common Control/2-Loop Start CO Lines and 4-Digital Telephones Interface Unit
QPSU8A2	YES	X		Power Supply
QCDU2A	YES		X	1-Loop Start CO Line and 2-Digital Telephones Interface Unit
QRCU3A	YES		X	3-DTMF/ABR Tone Detection Receiver Unit
QSTU2A	YES		X	2-Standard Telephones Interface Unit
WSIU1A	NO		X	2-Serial I/O Interface Unit
QKYS1A	YES		X	Auto Attendant Feature Key

Table 1-3   DK8 PCBs Compatible with the DK14 System

DK8 PCBs	Compatibility (Use in DK14)	Standard	Optional	Function
DKSU8A	-	X		Base Unit
QMAU1A	NO	X		Common Control/2-Loop Start CO Lines and 4-Digital Telephones Interface Unit
QCNU1A	NO	X		Conference IC Unit
QPSU8A	YES	X		Power Supply
QCDU1A	NO		X	1-Loop Start CO Line and 2-Digital Telephones Interface Unit
QRCU2A/1A	NO		X	3-DTMF/ABR Tone Detection Receiver Unit
QSTU1A	NO		X	2-Standard Telephones Interface Unit
QSMU1A	NO		X	1-SMDR/TTY Interface Unit
QKYS1A	YES		X	Auto Attendant Feature Key

DK14 Secondary Protection

The following diagram (see Figure 1-15) shows where secondary protectors must be installed for outside wiring.
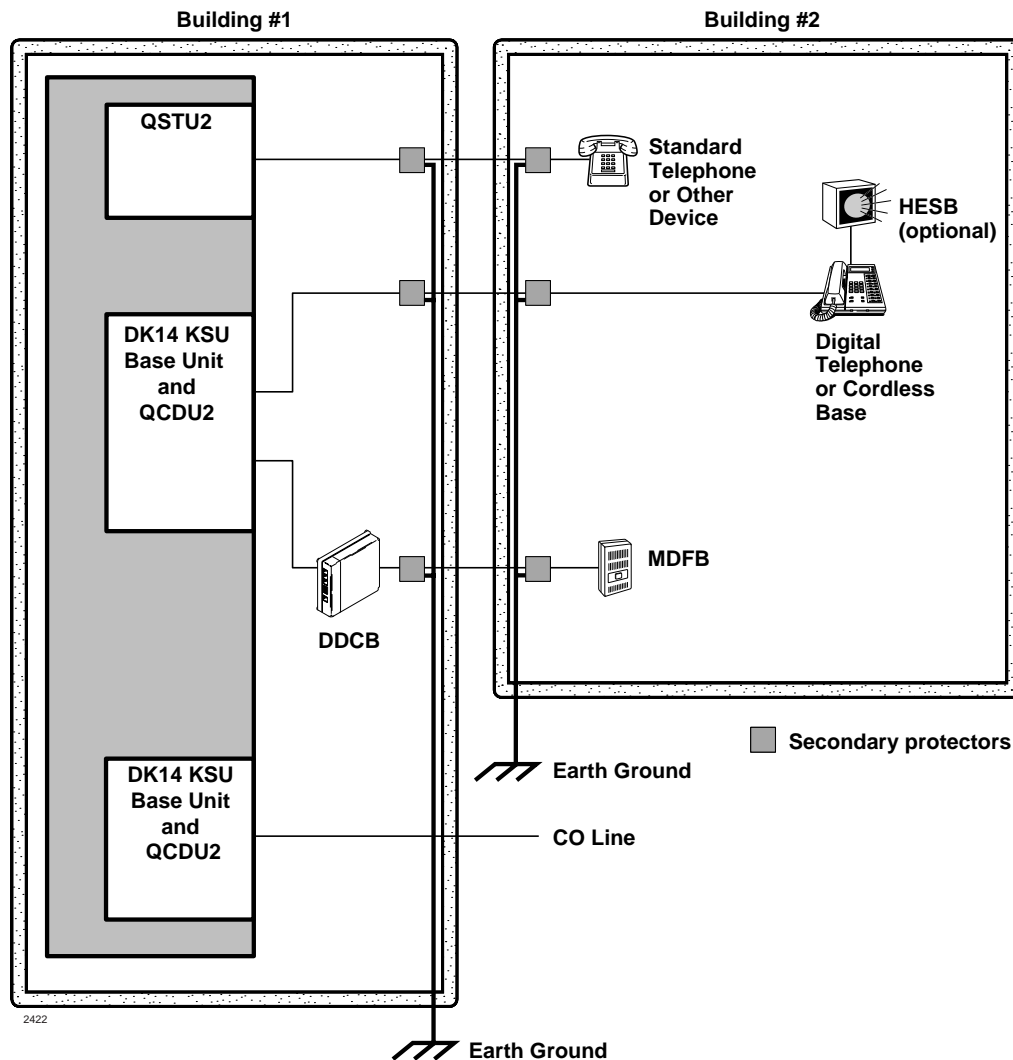
Important! *To protect against transient voltages and currents, solid state secondary protectors must be installed if there is outside wiring. These protectors, which contain fast semiconductors in addition to fuses, shall comply with the requirements for secondary protectors for communication circuits, UL497A.*

Care must be taken to ensure that they are very well grounded to a reliable earth ground. Recommended protectors are available in the fast Series 6 line from ONEAC® Corp., Libertyville, Illinois 60048, (800) 327-8801. Install and test the secondary protectors precisely to the installation instructions of thee manufacturer.

Figure 1-15   DK14 Secondary Protector Diagram

DK14 Installation

DK14 Wiring Diagrams

Wiring diagrams for the DK14 (listed below) are shown in Figures 1-16~1-18.

♦ DK14 MDF to Station Wiring (QCDU2 and QSTU2)

♦ DK14 MDF Wiring to CO Lines (KSU and QCDU)

♦ DK14 MDF Wiring to Caller ID Interface (WSIU)

To Base Unit (P5) With Female Connector

Bridging Clips

Station Cabling

Jacketed Twisted Pairs 24AWG (1 or 2 Pair, See Note 2)

To Base Unit	#	Clip	Clip	Station Cabling
W-BL	26	1	1	(-) T1 (Voice /Data)[3]
BL-W	1	2	2	(GND) R1 (Voice /Data)
W-O	27	3	3	(-) PT1 (Add. Power)
O-W	2	4	4	(GND) PR1 (Add. Power)
W-GN	28	5	5	T2
GN-W	3	6	6	R2
W-BR	29	7	7	PT2
BR-W	4	8	8	PR2
W-S	30	9	9	T3
S-W	5	10	10	R3
R-BL	31	11	11	PT3
BL-R	6	12	12	PR3
R-O	32	13	13	T4
O-R	7	14	14	R4
R-GN	33	15	15	PT4
GN-R	8	16	16	PR4
R-BR	34	17	17	T5
BR-R	9	18	18	R5
R-S	35	19	19	PT5
S-R	10	20	20	PR5
BK-BL	36	21	21	T6
BL-BK	11	22	22	R6
BK-O	37	23	23	PT6
O-BK	12	24	24	PR6
BK-GN	38	25	25	T7
GN-BK	13	26	26	R7
BK-BR	39	27	27	PT7
BR-BK	14	28	28	PR7
BK-S	40	29	29	T8
S-BK	15	30	30	R8
Y-BL	41	31	31	PT8
BL-Y	16	32	32	PR8
Y-O	42	33	33	
O-Y	17	34	34	
Y-GN	43	35	35	
GN-Y	18	36	36	
Y-BR	44	37	37	R1
BR-Y	19	38	38	T1
Y-S	45	39	39	
S-Y	20	40	40	
V-BL	46	41	41	R1
BL-V	21	42	42	T1
V-O	47	43	43	
O-V	22	44	44	
V-GN	48	45	45	
GN-V	23	46	46	
V-BR	49	47	47	
BR-V	24	48	48	
V-S	50	49	49	
S-V	25	50	50	

25-PAIR CABLE W/MALE AMP CONNECTOR

66M150 Split Block

Circuit 2 to DKT2[3] or PDIU-DS or DDCB

Circuit 3 to DKT3[3] or PDIU-DS or DDCB

Circuit 4 to DKT4[3] or PDIU-DS

Circuit 5 to DKT5[4] or PDIU-DS

Circuit 6 to DKT6[4] or PDIU-DS

Circuit 7 to DKT7[4] or PDIU-DS

Circuit 8 to DKT8[4] or PDIU-DS

QCDU2

Relay Contacts

Not Used

Standard Telephone Circuit 1

Not Used

Standard Telephone Circuit 2 or BGM

QSTU2

Not Used

R GN

BK Y

W BL

R1 T1

PT1 PR1

6 5 4 3 2 1

RJ11

2 3 4 5
PR TR PT

GND (-) GND (-)
PR T R PT

Modular Cord

Digital Telephone (DKT 1) (with or without ADM, PDIU-DI/PDIU-DI2)

2405

Notes

1. Voltage levels:
   T, PT=-26.3~27.8 VDC
   R PR=+4.5~+5.5 VDC
   +5V converter on KSU PCB

2. T/R wires are always required: PT/PR are additional power wires required for long station runs only. PT/PR can also be used with normal station runs.

3. DKT circuits (1~4) are standard on the DK14 main PCB.

4. DKT circuits (5~6) require one optional QCDU2 circuit and DKT circuits (7~8) require a second QCDU2 to be installed.

Figure 1-16   DK14 MDF to Station Wiring (QCDU2 and QSTU2)
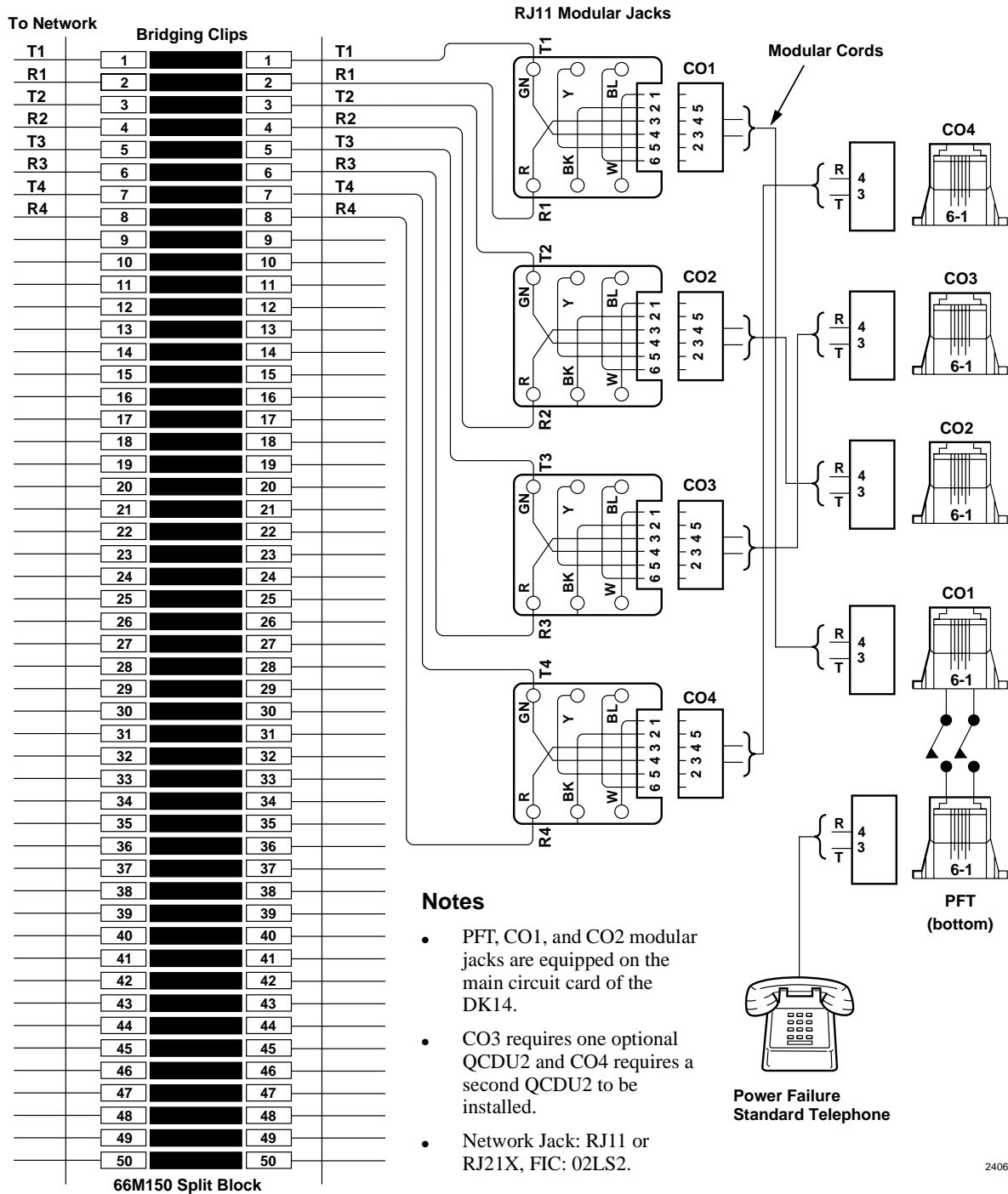
Figure 1-17 DK14 MDF Wiring to CO Lines (KSU and QCDU)

Notes

- PFT, CO1, and CO2 modular jacks are equipped on the main circuit card of the DK14.

- CO3 requires one optional QCDU2 and CO4 requires a second QCDU2 to be installed.

- Network Jack: RJ11 or RJ21X, FIC: 02LS2.
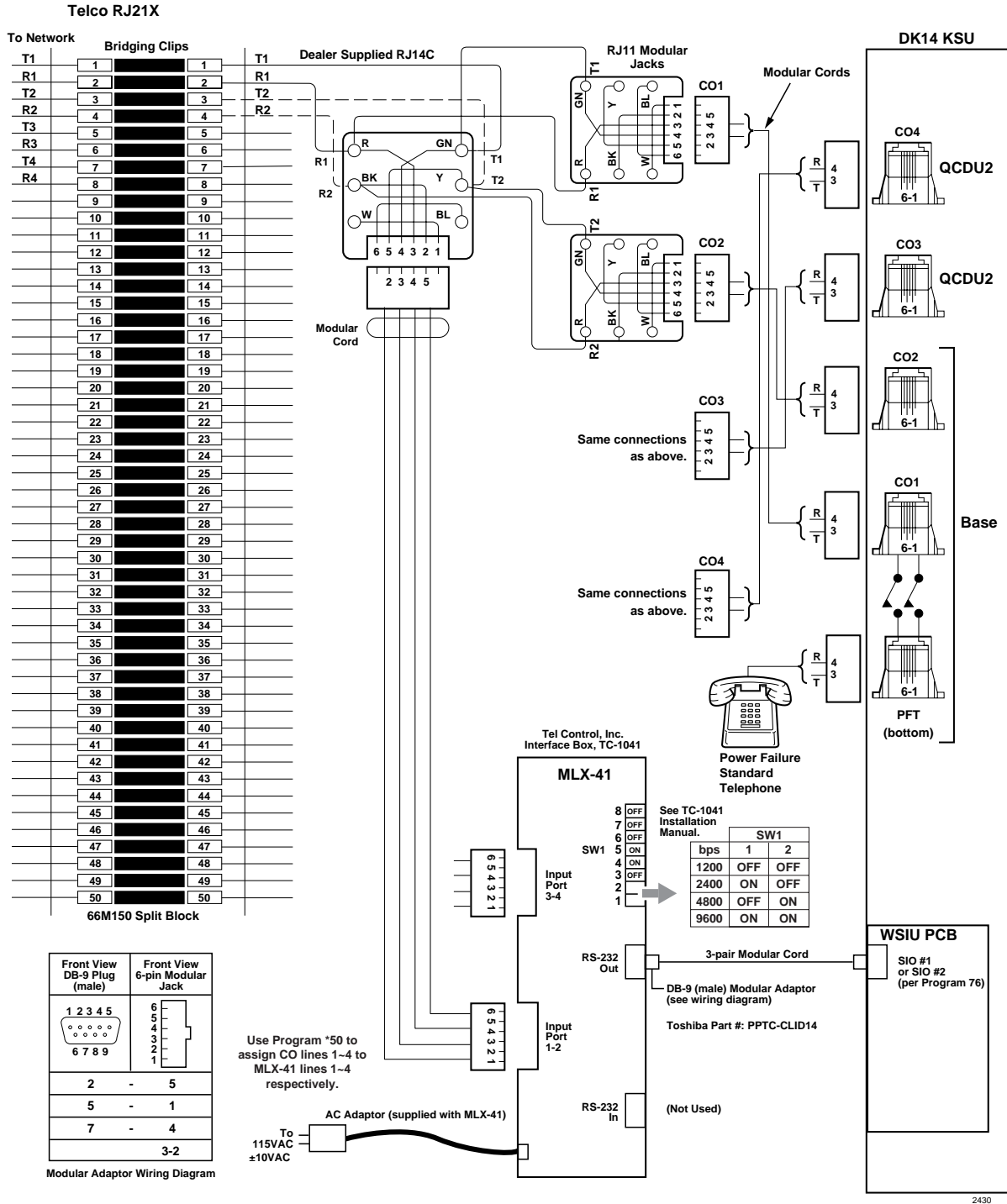
Figure 1-18 DK14 MDF Wiring to Caller ID Interface (WSIU)

DK40i Configuration 2

This chapter explains how to configure a Strata DK40i system. It also provides tables for recording the hardware and station devices that make up the system.

Base Key Service Unit (KSU)

Station and CO Lines

The DK40i Base KSU comes equipped with eight digital telephone station circuits. One of three optional PCBs can be added to provide either four loop start or DID lines, or two ISDN BRI S/T circuits (Table 2-1). An optional TCIU2 Printed Circuit Board (PCB) can be added to the Base KSU loop start line PCB to provide Caller ID interface. An optional KSTU2 PCB can be added to provide four standard telephone circuits (ports).

Note An Expansion KSU can be added to the DK40i to increase the system capacity to 28 station ports and 12 lines.

Peripherals

The DK40i Base KSU can support a number of peripherals, which are not considered as stations or lines and do not affect the maximum station and line capacities. The DK40i Base KSU comes standard with built-in interfaces for connecting the following dealer-supplied equipment: an amplifier and speaker for paging and night ringing, Music-on-Hold (MOH) source, reserve power batteries, and emergency standard telephone for system power failure occurrences when using loop start lines in the base cabinet.

A relay contact is also provided to control one of the following peripherals: MOH source, night bell, or page amplifier mute control.

An optional KSTU2 PCB provides an alternate background music source interface. The music plays through Toshiba telephone speakers, as opposed to the external page speakers.

The optional TSIU PCB provides two RS-232 interface ports to connect two of three options: a DKAdmin PC (or external modem for remote maintenance); or VM SMDI; or an SMDR port to connect a call accounting device or printer. An Expansion Unit RS-232 interface PCB is required if all three features are needed.

Table 2-1 DK40i Base KSU Components

Item	Supports	Connector Type	Standard	Optional
Digital telephone circuits (8) Base KSU main PCB (TMAU2)	Digital telephones (with or without RPCI-DI or ADM) Stand-alone Data Interface Units (PDIU-DS) Door Phone Lock/Control Unit (DDCB) Digital Direct Station Selection Console (DDSS) Cordless Digital Telephone (DKT2004-CT)	25-pair Amphenol	✔	
CO or DID line circuits (4) (TCOU or TDDU)	Loop start or DID lines	RJ11 modular		✔
BRI (S/T) circuits (2) (TBSU)[1]	2 BRI (S/T) circuits configure as BRI lines or station ports. BRI lines require a dealer supplied NT-1.	8-pair modular		✔
Power Failure Transfer Interface (TCOU only)	Standard telephone (one)[2]	RJ11 modular	✔	
Battery Backup Interface with built-in charger	Two 12-volt batteries	Proprietary connector/ cable	✔	Cable & batteries
Music-on-Hold/BGM Interface	Music-on-Hold/BGM source[2]	RCA jack	✔	
600 Ohm page Interface	Amplifier/speaker	RCA jack	✔	
Standard Telephone Interface Unit (four-circuit, KSTU2)	Standard telephones (no message waiting)[2] Other single-line devices[2] Alternate BGM source[2] Fax machine[2] Voice mail/auto attendant devices	25-pair Amphenol		✔
DTMF/ABR Receiver (K4RCU3, K5RCU, or K5RCU2)[3]	Automatic busy redial Standard telephone ports Interprets DTMF tones DISA, DID, Tie lines, or auto attendant Voice Mail	Internal		✔
Automated Attendant (KKYS)	Built-in automated attendant	Internal		✔
Control Relay	Choice of one: MOH Source Control Night Bell Control BGM Mute Control	25-pair Amphenol	✔	
Caller ID (TCIU2)	TCOU Caller ID interface	Internal T/R to TCOU		✔
RS-232 ports (TSIU)	Provides up to two ports for: Maintenance PC or External modem interface Voice Mail SMDI interface SMDR interface The TSIU does not support a built-in modem.	3-pair modular		✔

1. Each circuit can be set independently for line or station side S/T BRI.
2. Customer-supplied equipment not offered by Toshiba Telecommunication Systems Division.
3. K4RCU provides four DTMF circuits. K5RCU and K5RCU2 provide five DTMF circuits. Also, K5RCU2 provides the Mu law/A law jumper.

Base/Expansion KSU Compatibility

Expansion Units that are compatible with various Base KSUs are shown in Table 2-2.

Table 2-2   Compatible Base KSUs and Expansion Units

Base KSU	Expansion Unit		
	DK40i	DK16e	DK16
DK16	X	X	X
DK16e	X	X	
DK40	X	X	
DK40i	X	X	

X = Expansion Unit is compatible with Base KSU.

Station, Lines, and Stratagy DK Voice Mail

The optional DK40i Expansion KSU has four universal slots which can support Stratagy DK, loop and ground start lines, DID and Tie lines, ISDN BRI S/T lines and stations, Toshiba and analog stations, and option interface PCBs. PCBs that support lines and can be installed in the expansion unit are the RCOU/RCOS, KCDU, REMU, RBSU, or RDDU (see Table 2-3).

PCBs that can support stations and be installed in the expansion unit are the PDKU2, RDSU, PEKU, RSTU2, PESU, RBSU/RBSS, RWIU, and KCDU. PCBs that can interface SMDR, SMDI, and a local or remote DKAdmin Personal Computer are PIOU, PIOUS, and RSSU (see Table 2-4).

Table 2-3   DK40i Expansion KSU Components

PCB	Circuits per PCB	Interfaces	Connector
KCDU	2 CO line circuits/ 4 digital telephone circuits	Central office loop start lines	RJ14C modular (CO Line circuits)
		Digital circuits same as PDKU2, except no DDSS	25-pair Amphenol (digital telephone circuits)
PDKU2	8 digital telephone circuits	Digital telephones (with or without RPCI-DI or ADM) DDSS console PDIU-DSs DDCB Cordless Digital Telephone (DKT2004-CT)	25-pair Amphenol
PEKU	8 electronic telephone circuits	Electronic telephones HDSS console Alternate BGM source EOCU PCB for OCA External conference amplifier HDCB	25-pair Amphenol
PESU	2 standard telephone circuits/ 4 electronic telephone circuits (standard/ electronic telephone ports)	Standard: same as RSTU (no MW) Electronic: same as PEKU, except PESU does not support HDSS console	25-pair Amphenol

Table 2-3   DK40i Expansion KSU Components *(continued)*

PCB	Circuits per PCB	Interfaces	Connector
PIOU, PIOUS, RSSU	A PIOU or PIOUS can use an IMDU. See Table 2-4 for details.		25-pair Amphenol (PIOU, PEPU) Spring clip terminal (PIOUS)
RBSU	2 ISDN BRI S/T circuits (station or line)[1]	ISDN BRI S/T TE-1s and Terminal Adaptors and ISDN BRI S/T line circuits connected to an NT-1 adaptor.	RJ-45
RBSS	Two ISDN BRI S/T circuits (station only)	ISDN BRI S/T TE-1s and Terminal Adaptors.	RJ-45
RWIU	8 or 16 digital circuits for Strata AirLink	Up to four base stations (16 handsets max.)	RJ-12 (6-wire modular jack)
RCIU2	4 Caller ID circuits 8 circuits with RCIS	Loop or ground start lines with Caller ID. Requires: RCOU, RGLU2 or PCOU.	RJ14C modular
RCOU	4 CO line circuits (lines)	Central office loop start lines	RJ14C modular
RDDU	4 Direct Inward Dialing (DID) circuits	DID lines	RJ14C modular
RDSU	Without RSTS: 2 Standard telephone/ 4 Digital telephone circuits With RSTS: 4 Standard telephone/ 4 Digital telephone circuits	Digital: Same as PDKU2, except no DDSS Console Standard: Same as RSTU2 (standard telephone message waiting not available)	25-pair Amphenol
REMU	4 Tie line circuits	E&M Tie lines 2- or 4-wire transmission Type I Signaling Type II Signaling Immediate start Wink start	REMU (8-wire modular jack) USOC RJ1CX modular, 2- or 4-wire/Type I or II
R48S	8 standard telephone circuits	Optionally interfaces to the RSTU2 and RDSU to extend loop length of standard telephones from 600 ohms to 1200 ohms.	25-pair Amphenol
RGLU2	4 Line circuits	Loop or ground start lines	RJ14C modular
RSTU2	8 Standard telephone circuits	Standard telephones Voice mail ports Off-premises stations Other similar devices Alternate BGM source Auto attendant digital announcer Message waiting lamp generator	25-pair Amphenol
Stratagy DK	2 VM ports 4 VM ports 6 VM ports 8 VM ports All the above Stratagy DK systems use 8 station ports in the DK40i software.	None	None

1. Each circuit can be set independently for line or station side (S/T BRI).

Peripherals

An Expansion KSU can support PIOU, PIOUS, RSSU and PEPU PCBs (see Table 2-4 for a list of options).

PIOU or PIOUS

The PIOU/PIOUS provides one dedicated RS-232 port for Station Message Detail Recording (SMDR) connection to a call accounting device and one of the following:

♦ a TTY/RS-232 port which can connect to a customer-provided VM SMDI or external modem for remote maintenance, or to a local PC with DKAdmin

♦ connectors for an internal modem (IMDU) for remote maintenance and administration

RSSU

The RSSU provides one TTY/RS-232 port for a connection to a VM SMDI or customer-provided external modem for remote maintenance, or to a local PC with DKAdmin. The RSSU does not support SMDR or IMDU.

Any device that connects to the PIOU, PIOUS, or RSSU should not be considered a station and does not affect the system's station capacity.

DK40i Configuration

Table 2-4   DK40i Interface PCB Options

Interface Options[1]	RSSU	PIOU	PIOUS	PEPU	TSIU	DK40i Base [2]
Zone page interface (unamplified, 4 zones)		X				
Unamplified page output (single zone, 600 Ω, duplex)						X
Night transfer or Music-on-hold control relay		X	X	X		X
Door lock or external amplifier control relay		X	X	X		X
IMDU disables TTY output when piggy-backed onto PIOU or PIOUS cards		X	X			
Remote Maintenance using customer-provided external modem, StrataControl and/or DKAdmin PC (requires TTY output port)	X	X	X		X	
SMDR output (RS-232/6-wire modular connector)		X	X		X	
Alarm sensor		X	X			
Voice Mail SMDI (requires TTY output port)	X	X	X		X	

1. Amplified page output (single zone, 3 watts, 8 ohms) on the PIOU and PEPU is not available on the DK40i.

2. These functions are standard (built-in) to the DK40i Base KSU.

Feature Capacities

The DK40i line, system feature and station capacities are shown in Tables 2-5~2-7.

Table 2-5   DK40i Line Capacities and Universal Printed Circuit Board Slots

Lines and PCB Slots	DK40i
Universal slots[1]	4[1]
CO lines – loop start	12
CO lines – ground start	12
DID lines (analog)[2]	12
Tie lines (analog)[2]	12
ISDN BRI S/T type line circuits (each circuit requires an NT-1 device)[2]	6 circuits (12 B-channel/lines)
Squared System Maximum (ground/loop lines + stations)	12 lines + 12 stations
Squared System Maximum (Tie/DID lines + stations)	12 lines + 12 stations

1. There are four universal slots in the DK40i expansion unit.

2. In the D40i, DID, Tie, and BRI lines do not use up station ports as in DK40 and the DK424, R3. Each BRI line circuit uses up to two CO lines of system capacity

Table 2-6   DK40i System Feature Capacities

Features	DK40i
Amplified Conferencing[1]	2
Auto Attendant (built-in) simultaneous calls in dialing queue	5
Caller ID/ANI Abandoned Call Numbers - stored per station	10~100
Caller ID/ANI Abandoned Call Numbers - stored per system	200
CO Line Groups	8
Distributed Hunt (DH) Calls in Queue per Groups	10
DH Groups	16
DH stations per Group	28
DNIS Network Routing Numbers	100
DNIS Numbers	200
DTMF receivers	5
External Page Zones	4
Call Park Orbits - general	20
Call Park Orbits - individual	28
Personal LCD Messages per DKT[2]	10
Personal Message DKTs	16
[PhDNs] per System	28
[PDNs] per System	28
Ring Tones	3
Simultaneous Party Conferencing (4-party)	3
Simultaneous Two-CO Line conferencing (3-party)	4
Station Speed Dial	40
Stratagy DK Systems (per tenant group)	1

Table 2-6   DK40i System Feature Capacities *(continued)*

Features	DK40i
Stratagy DK Systems (per system)	2
System LCD Messages	40
System Speed Dial	40
Telephone Page Groups	5
Telephone Group Page – simultaneous stations paged	28
Telephone Pickup Groups	20
Tenants	2
Toll Restriction (AC/OC) Table	8
Toll Restriction Classes	4
Verified Account Codes	300
Voice Mail Simplified Message Desk Interface (SMDI)	Yes

1. Requires additional customer-supplied hardware.

2. Personal Messages includes: timed reminder memo and station speed dial memo.

Table 2-7   DK40i Station and Peripherals Capacities

Stations	DK40i
Add-on modules (DADM)	12
Attendant consoles	0
DKT 2004-CT Cordless Telephones (simultaneous calls)	9
DKT 2004-CT Cordless Telephones	28
Door locks	3
Door phones	9
DSS consoles	3
Handset OCA stations	28
Off-premise stations	20
PDIU-DS[1]	24
RPCI-DI used for data + TAPI (per system)	24
RPCI-DI used for TAPI only (per system)[1]	24
Speaker OCA stations[1]	28
Standard stations	20
Telephones – DKT	28[2]
Telephones – EKT	16[2]
ISDN Terminal Adapters and/or TE-1s combined	10 circuit (20 devices)[3]
Telephones – Strata Airlink Handsets	16

1. Speaker OCA, PDIU and RPCI capacity is determined by PDKU 2B channel slot availability and power supply limits.

2. To install the maximum of 28 total DKTs and EKTs, up to 16 of the stations can be EKTs and at least 8 of the stations must be DKTs.

3. In the DK40i, BRI station circuits do not use up CO line numbers as in the DK424, R4. Each BRI station circuit uses up to two station ports of system capacity. Toshiba BRI (S/T) station circuits are passive and allow up to two devices to share a circuit.

Station Considerations

For configuration purposes, any device which is connected to a dedicated telephone circuit is considered a "station." Although the words "telephone" and "station" are often used interchangeably in Strata DK40i documentation, devices other than telephones—such as Stand-alone Data Interface units (PDIU-DSs)—should also be considered stations when configuring a system since they require a dedicated telephone circuit. A station apparatus overview is shown in Table 2-8.

Table 2-8 Strata DK40i Station Apparatus Overview

Station	Type/Number of Circuits Required	PCB or Interface	Circuit(s)	Base Unit Capacity	Base & Expansion Unit Combined Capacity
Digital telephone (DKT without ADM or RPCI-DI) or Cordless Digital Telephone (DKT2004-CT)	Digital, one for each DKT	Base KSU PDKU2 KCDU RDSU	1~8 1~8 1~4 5~8	8	28
Stand-alone Data Interface Unit (PDIU-DS)	Digital, one for each PDIU-DS	Base KSU PDKU2 KCDU RDSU	1~8 1~8 1~4 5~8	7	27
Digital Direct Station Selection Console (DDSS)	Digital, one for each DDSS	Base KSU PDKU2	8 8	1	3
Digital Door Phone/Lock Control Unit (DDCB)	Digital, one for each DDCB	Base KSU PDKU2 or first KCDU	5 1 1	1	3
Electronic Telephone (EKT)	Electronic, one for each EKT	PEKU PESU	1~8 5~8	0	16
Electronic Direct Station Selection Console (HDSS)	Electronic, two for the HDSS	PEKU	7 and 8	0	2
Conference amplifier	Electronic, two for the amplifier	PEKU PESU	6 and 7 6 and 7	0	2
Single-wire-pair devices: Standard telephone Voice mail device Facsimile machine Modem Dictation equipment	Standard, one for each device (voice mail devices may require more than one circuit)	KSTU2 RSTU2 PESU RDSU RDSU/RSTS	1~4 1~8 1~2 1~2 1~4	4	20
Alternate BGM source May require interface transformer, see Chapter 10 – Peripheral Installation	Standard or electronic, one for the source	KSTU2 PEKU PESU RSTU2	2 3 8 2	1	1

Telephone Circuit (Port) Types

There are four types of telephone circuits to which stations can be connected: digital, electronic, and standard telephone circuits. Also, there are ISDN (S/T) type telephone circuits, terminal equipment (TE-1) and terminal adaptor circuits.

Digital Telephone Circuit Connections

The Strata DK40i Base KSU and the PDKU2 PCB each provide eight digital telephone circuits. Each KCDU and RDSU PCB provides four. The RWIU PCB provides circuits to support up to 16 wireless digital telephones.

Note   A maximum of four KCDU PCBs can be installed. If installed, KCDUs should be installed per configuration tables. The following devices can be connected to digital telephone circuits (see Table 2-9). Telephones connected to KCDU PCBs cannot be relocated or swapped using the station relocation feature.

Table 2-9   Digital Telephone Circuits

Digital Device	Circuits Required	Comments
Digital telephones (2000- and 1000-series, Cordless Digital Telephone-DKT2004-CT)	1	Each digital telephone circuit can support a digital telephone. Only one of the following options can be installed on a 2000-series digital telephone: RPCI-DI, DVSU (SP-OCA) or ADMs. **Note** The RPCI-DI) and the Add-on Module (ADM) do not require a dedicated circuit. They share a circuit with the telephone.
Stand-alone Data Interface Units (PDIU-DS)	1	Any digital telephone circuit, except for circuit 8 on a PDKU21, can support a PDIU-DS. **Note** There are two versions of the PDKU2: PDKU21 and PDKU2. The versions are identical, except that circuits 1~8 on the PDKU2 can each support PDIU-DSs/RPCI-DI, while only circuits 1~7 on a PDKU21 can support PDIU-DSs/RPCI-DIs.
Digital Direct Station Selection Console (DDSS)	1	DDSS consoles can connect only to circuit 8 in the Base KSU and circuit 8 on a PDKU2. The KCDU cannot support a DDSS console.
Digital Door Phone/Lock Control Box (DDCB)	1	DDCBs can only connect to Port 04 in the Base KSU, and Ports 12 and/or 20 on either the PDKU2 or KCDU.
Wireless Integrated Handsets	1	Each RWIU supports up to 32 Strata AirLInk integrated handsets.

DK40i Configuration

Electronic Telephone Circuit Connections

There are no electronic telephone circuits in the Base KSU, and none can be added to it. However, either the PEKU PCB, which has eight electronic telephone circuits, or the PESU, which has four electronic telephone circuits, can be installed in the Expansion KSU.

The following devices can be connected to electronic telephone circuits (see Table 2-10).

Table 2-10   Electronic Telephone Circuits

Electronic Device	Circuits Required	Comments
Electronic telephones (6500-, 6000-, 3000-, 2000-series)	1	Each electronic telephone circuit can support an electronic telephone.
Electronic Direct Station Selection Console (HDSS)	2	The system supports only one HDSS console. The console must be connected to both circuits 7 and 8 on the PEKU. The PESU will not support an HDSS console.
Alternate BGM source	1	The system supports an alternate BGM source which can be heard over digital and electronic telephone and external page speakers. This source can be connected to either circuit 3 on a PEKU, circuit 8 on a PESU, or circuit 4 on a KSTU2 or PSTU PCB.
Conference amplifier	2	Up to three amplifiers for two CO line conferencing can be connected to ports 9 and 10; 17 and 18; and 24 and 25 on a PEKU or PESU.

CAUTION!   **You must always calculate the Power Factor (PF)—see Worksheet 2. Exceeding the PF will cause the power supply to fail. If PF is exceeded, replace EKTs with DKTs.**

Standard Telephone Circuit Options

In addition to supporting standard telephones, each of the standard telephone circuits can support any one of a number of single-wire-pair devices, including voice mail/Auto Attendant devices and modems (see Table 2-11).

Table 2-11   Standard Telephone Circuits

	Base KSU	Expansion KSU			
Standard Telephone Circuits	**KSTU2**	**RSTU2**	**PESU**	**RSTU1 or PSTU**	**RDSU/ RSTS**
Number of Standard Telephone Circuits	4	8	2	8	2/2
Supports Message Waiting Lamps on SLTs	No	Yes	No	No	No

ISDN Station Devices

ISDN station devices must be S/T type. Each device requires a DK40i BRI circuit configured for station side, as opposed to line side. Two BRI circuits are provided by each of the ISDN PCBs: TBSU, RBSU, and RBSS. ISDN station devices include ISDN telephones, modems, terminal adaptors, video cards, etc. A maximum of 10 BRI circuits can be provided for ISDN stations.

Worksheet 1 – System PCB Assignment Guide

Customer: _____

Location: _____

This worksheet helps you configure the system. Use the following tables to record the hardware that comprises the system. To ensure that the system port/line capacity is not exceeded, consult Configuration Tables 2-13~2-16 when you fill out Tables 2-13 and 2-14 below. After configuring the system, use Worksheet 2 to ensure that the system power factors are not exceeded.

Be sure to consult "Example Configuration Tables" on Page 2-13 when filling out these tables.

Table 2-12   Hardware Configuration

Base Cabinet					Expansion Cabinet			
Slot No.	**00**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
PCB Type	None or K4RCU3, K5RCU or K5RCU2	8 DKTs	None / TCOU (4 Loop Start Lines) / TDDU (4 DID Lines) / TBSU (2 BRI Ckts.)	None / KSTU2 4 SLT	None / TCIU2 4 CLID	Universal PCB	Universal PCB	Universal PCB	Universal PCB (except Stratagy DK)

Base Cabinet Port/Line Capacity Check

Table 2-13   Strata DK40i Base Cabinet Station Port Configuration

Installed (Yes/No)	PCB Type	Port Type	Port Total
Yes	Motherboard	Digital Telephone (8 ports)	8
	KSTU2	Standard Telephone (4 ports)	
	TBSU circuit #1	ISDN station side (2 ports)	
	TBSU circuit #2	ISDN station side (2 ports)	
		Total Base Ports (16 ports max.) =	

Table 2-14   Strata DK40i Base Cabinet Line Configuration

Installed (Yes/No)	PCB Type	Number of Line Types	Line Total
	TCOU	Loop start (4 lines)	
	TDDU	Direct Inward Dial (4 lines)	
	TBSU circuit #1	ISDN line side (2 lines)	
	TBSU circuit #2	ISDN line side (2 lines)	
		Total Base Lines (4 lines max.) =	

Expansion Capacity

Table 2-15   Strata DK40i Expansion PCB Port/Line Capacity Reference Table

Expansion PCB	Port/Line Type	No. of Ports	No. of Lines
PCOU	Loop Start Lines	0	4
RCOU	Loop Start Lines	0	4
RCOU/RCOS	Loop Start Lines	0	8
RGLU	Ground or Loop Start Lines	0	4
RDDU	Direct In Dial Lines	0	4
REMU	E&M Tie Lines	0	4
PEMU	E&M Tie Lines	0	4
KCDU	Digital Ports/Loop Lines	4	2
PDKU2	Digital Telephone Ports	8	0
RSTU2	Standard Telephone Ports	8	0
RWIU	Strata AirLink Wireless Interface	8 or 16	0
Stratagy DK	Built-in Voice Mail System	8	0
RDSU	2 Standard/4-Digital Telephone Ports	8	0
RDSU/RSTS	4 Standard/4 Digital Telephones ports	8	0
PEKU	Electronic Telephone Ports	8	0
PESU	2 Standard/4 Electronic Telephone Ports	8	0
RBSU	2 ISDN BRI S/T circuits, station side or line side in any combination shown below:		
	• Both circuits line side	0	4
	• Both circuits station side	4	0
	• 1 station and 1 line circuit	2	2
RBSS	2 ISDN BRI S/T circuits	4	0

Base and Expansions Cabinet Port/Line Capacity Check

Refer to Tables 2-13~2-15 when filling in Table 2-16 to determine the DK40i Expansion Capacity.

Table 2-16   Strata DK40i Base and Expansion CO Line Configuration

Expansion Slot No.	PCB Installed	Port Type or Line Type	Ports	Lines
15				
16				
17				
18				
		Total Ports and Lines in Expansion slots (15~18)		
		Total Base Unit ports and lines (from Tables 2-12 and 2-13)		
		Total DK40i Base/Expansion ports and lines (28 ports/12 lines max.)		

Example Configuration Tables

Table 2-17   Hardware Configuration Example

Base Cabinet					Expansion Cabinet			
Slot Number	**00**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
PCB Type	K5RCU2	8 DKTs	TBSU	KSTU2 4 SLT	None	PDKU2	RBSU/ RBSS	RCOU	PIOU

Table 2-18   Strata DK40i Base Cabinet Station Port Configuration Example

Installed (Yes/No)	PCB Type	Port Type	Port Total
Yes	Motherboard	Digital Telephone (8 ports)	8
Yes	KSTU2	Standard Telephone (4 ports)	4
Yes	TBSU circuit #1	ISDN station side (2 ports)	2
–	TBSU circuit #2	ISDN station side (2 ports)	–
		Total Base Ports (16 ports max.) =	**14**

Table 2-19   Strata DK40i Base Cabinet Line Configuration Example

Installed (Yes/No)	PCB Type	Number of Line Types	Line Total
No	TCOU	Loop start (4 lines)	–
No	TDDU	Direct Inward Dial (4 lines)	–
–	TBSU circuit #1	ISDN line side (2 lines)	–
Yes	TBSU circuit #2	ISDN line side (2 lines)	2
		Total Base Lines (4 lines max.) =	**2**

Note   One TBSU circuit is configured a s a station-side BRI and one circuit is line-side BRI.

Table 2-20   Strata DK40i Base and Expansion CO Line Configuration Example

Expansion Slot No.	PCB Installed	Port Type or Line Type	Ports	Lines
15	PDKU	8 Ports	8	–
16	RBSU/ RBSS	4 Ports and 4 Lines	4	4
17	RDDU	4 Lines	–	4
18	PIOU	None	–	–
		Total Ports and Lines in Expansion slots (15~18)	12	8
		Total Base Unit ports and lines (from Tables 2-17 and 2-18)	14	2
		Total DK40i Base/Expansion ports and lines (28 ports/12 lines max.)	26	10

Note   Two RBSU circuits are line-side BRI and two RBSS circuits are station-side BRI.

DK40i Configuration

Configuration Considerations

The following considerations should be taken into account when filling out the tables in "Worksheet 1 – System PCB Assignment Guide".

Base Cabinet

1. Only one line PCB (TCOU, TDDU, or TBSU) can be installed in the Base cabinet.

2. If TBSU is installed, each circuit can be configured independently as a station side or line side S/T BRI circuit.

3. Each TBSU ISDN BRI circuit uses two station ports and no line numbers if the circuit is configured for the station side.

4. Each TBSU ISDN BRI circuit will use two line numbers and no station ports if the circuit is configured for the line side.

5. TDDU provides four DID lines and does not use station ports.

6. Install TCIU2 for Base KSU CO (TCOU) Caller ID Lines.

CAUTION!   To prevent system malfunction, do not install TCIU1 in the DK40i system.

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7. K5RCU, K5RCU2 or K4RCU3 must be installed when using built-in automated attendant, Voice Mail, ABR, Stratagy DK, standard telephone ports, Tie lines, DISA, or DID Lines.

8. TSIU can be used for an RS-232 Maintenance (TTY) port, SMDI or SMDR port. RSIU cannot be used.

Expansion Cabinet

1. Each RDDU provides four DID lines and does not use station ports. This is different from the DK424, DK40 and DK16e in which each DID circuit used a line number and station port.

2. Each REMU to PEMU provides the four Tie lines and does not use station ports. This is different from the DK424, DK40, and DK16e in which each Tie line circuit used a line number and station port.

3. Stratagy DK can be installed in the expansion unit to provide two, four, six or eight built-in Automated Attendant/Voice Mail circuits. Always install Stratagy DK in slot 15, 16, or 17; do *not* install Stratagy DK in slot 18. Program the Stratagy VM ports as if they were standard telephone ports connected to an external VM device. All models of Stratagy DK use up eight station ports.

4. Install RCIU2/RCIS in *slot 17 (only)* for Expansion KSU (RCOU/RCOS or RGLU2) Caller ID Lines.

CAUTION!   To prevent system malfunction, do no install RCIU1 in DK40i, and RCIU2 must *not* be installed in slot 18.

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5. If required, install PIOU, PIOUS, and RSSU in any slot.

6. Speaker OCA and RPCI/DIU data applications can only be installed on digital telephone ports in the DK40i Base KSU and slots 15 and 16 of the DK40i Expansion KSU (24 maximum).

7. Each Tie or DID line PCB installed provides four Tie or DID lines and does *not* use four station ports as in the DK40 (PEMU, REMU, RDDU, and RDDU).

8. RWIU can be installed in any of the expansion cabinet slots (15, 16, 17, and 18) to support up to 8 StrataLink handsets. If there are 9 to 16 handsets, the RWIU must be installed in slot 15 and slot 16 must be vacant. This system cannot support 24 or 32 handsets because of a port limitation.

DK40i ISDN

Configure DK40i, ISDN BRI PCBs (RBSU, RBSS and TBSU) with the following rules

1. TBSU installs in the base cabinet to provide 2 BRI S/T circuits, each circuit can be station side or line side in any combination.

2. If a TBSU is installed, TDDU or TCOU cannot be installed. Only one PCB (TSBU, TCOU or TDDU) can be installed in the DK40i base cabinet for a given DK40i configuration.

3. RBSU installs in any expansion unit slot to provide 2 BRI S/T circuits which can be station side or line side in any combination.

4. RBSS installs on an RBSU in any expansion unit slot to provide 2 BRI S/T circuits, which can be station side only.

5. Each RBSU, RBSS and TBSU ISDN BRI circuit uses two station ports and no line numbers if the circuit is configured for station side. This is different from the DK424 ISDN in which each BRI circuit uses two station ports and two line numbers when the circuit is configured for station side.

6. Each RBSU and TBSU ISDN BRI circuit will use two line numbers and no station ports if the circuit is configured for the line side. This is different from DK424 ISDN, in which each BRI circuit uses two station ports and two line numbers when the circuit is configured for line side.

7. Total maximum BRI S/T circuits on the station side is 10 (20 ports/B-channels max.).

8. Total maximum BRI S/T circuits on the CO line side is 6 (12 lines/B-channels max.).

DK40i Configuration

Worksheet 2 – System Power Factor Check

The DK power supply was engineered for maximum cost efficiency to provide power for the most configurations. Because of this design, some power limitations exist when using old electronic-type telephones, telephone option hardware, or newer PCBs, such as RWIU, TBSU, RBSU/RBSS.

Telephone/Device PFs

The power supply of each KSU supplies a limited amount of power. For each KSU, calculate the total Telephone/Device Power Factor (PF) and add it to Table 2-23. (See Table 2-12 for PCB quantity and type.)

The TBSU, RBSU/RBSS and RWIU PCBs require more power from +5VDC than other PCBs; therefore, it is necessary to calculate the +5VDC and -24VDC PF on DK40i.

Important! *A system PF check must be performed for **all** configurations. See Table 2-21 for the power supply +5VDC and -24VDC PFs for the DK40i system.*

Table 2-21 DK40i System Power Factor

Power Supply	Max +5VDC PF	Max -24VDC PF	AC Input Current
TPSU16A	14	39	1.8A

Note   AC current limitation by National Electric Code.

Important! *The -24VDC system PF is Expansion KSU PCBs and all telephone/options connected to the Base and Expansion KSUs. Base KSU option PCBs are already covered for -24VDC PF.*

System Power Factors PCB/Telephone Device

Use the information in Table 2-22 to complete Tables 2-25 and 2-26.

Table 2-22 DK40i PCB's Power Factors

PCB Type	+5VDC PF	-24VDC PF	PCB Type	+5VDC PF	-24VDC PF
K5RCU2	0.6	NR	RWIU	9.2	0.0
K5RCU	0.6	NR	PIOU	2.5	6.5
K4RCU3	0.6	NR	PIOUS	2.0	4.0
TSIU	0.6	NR	IMDU	0.3	0.16
TCOU	1.6	NR	RSSU	0.6	0.3
TBSU	2.5	NR	RCIU2	0.6	0.2
KSTU2	1.0	NR	RCIS	0.3	0.1
TDDU	1.8	NR	PEKU	2.5	0.7
TCIU	0.4	NR	PESU	1.6	0.5
PDKU1, 2	8.0	0.3	RMCU	0.6	0.3
KCDU	1.5	1.2	RMCS	0.6	0.3
PSTU/RSTU (-24V)	2.0	0.5	REMU2/PEMU	1.5	7.5
RSTU2/R48S (-48)	3.5	1.0	RDDU	3.0	7.0
RSTU2	3.5	0.5	RGLU2	2.5	2.5
RDSU (-24V)	1.5	0.3	RBSU (2TE)	2.5	1.0
RDSU (-48V)	1.5	0.5	RBSS (2NT)	0.6	0.3
RCOU	2.5	2.0	RBSU/R40S (2NT)	2.5	3.8
RCOU + RCOS (8 CO)	4.5	4.0	RBSU/RBSS/R40S (4 NT)	3.1	4.1
PCOU1, 2	2.0	2.0			

Worksheet Examples

Table 2-23   DK40i Telephone/Device 24 Volt Power Factor Worksheet Example (Base/Expansion KSU)

Telephone Devices	Quantity	X	24VDC PF	=	24VDC Total
2000-series Digital Telephone (any series)	16	**X**	**1.0**	**=**	**16.0**
Cordless Digital Telephone (DKT2004-CT)		**X**	**1.0**	**=**	
2000-series Electronic Telephone		**X**	**2.0**	**=**	
3000-series Electronic Telephone		**X**	**2.5**	**=**	
6000-series Electronic Telephone		**X**	**2.0**	**=**	
6005-series Electronic Telephone		**X**	**2.0**	**=**	
6500-series Electronic Telephone		**X**	**1.0**	**=**	
DDCB/HDCB (w. MDFB)		**X**	**1.2**	**=**	
DDSS/HDSS Console		**X**	**0.8**	**=**	
Add-on Module		**X**	**0.4**	**=**	
RPCI-DI	8	**X**	**0.5**	**=**	**4.0**
PDIU-DI2 and PDIU-DS		**X**	**0.8**	**=**	
Standard Telephone (-48VDC)		**X**	**1.0**	**=**	
Standard Telephone (-24VDC)		**X**	**0.5**	**=**	
Power Failure Unit (DPFT)		**X**	**3.0**	**=**	
HHEU		**X**	**0.1**	**=**	
Stratagy DK		**X**	**1.0**	**=**	
Total -24VDC PF all Telephone Devices				**=**	**20.0**

> **Note**   It is not necessary to consider the 5 volt PF for telephone devices.

Table 2-24   DK40i PCB and Power Factors Worksheet Example

In the following example, the total DK40i PFs, 10.2 PF for the +5VDC PF category and 26.5 TPSU16 maximum +5VDC PF = 14; Maximum -24VDC PF = 39.

Base PCBs	PCB Installed		+5VDC PF	-24VDC PF
	Yes	**No**		
K5RCU2	X		0.6	NR
K5RCU		X		NR
K4RCU3		X		NR
TSIU		X		NR
TCOU		X		NR
TBSU	X		2.5	NR
KSTU2	X		1.0	NR
TDDU		X		NR
TCIU		X		NR
Expansion Unit PCBs	**PCB Name**			
Slot 15	RBSU (2TE)		2.5	3.8
Slot 16	RBSS (2NT)		0.6	0.3
Slot 17	KCDU		1.5	1.2
Slot 18	KCDU		1.5	1.2
Telephone Devices from Table 2-23	N/R		N/R	20.0
Total DK40i PF =			**10.2**[1]	**26.5**[1]

1. Power factors are within limits. If power factors are exceeded, the system size must be reduced to stay within PF limits.

PCB and Power Factor Worksheets

See examples on previous pages.

Table 2-25 DK40i Telephone/Device Power Factor (Base/Expansion KSU)

Telephone Devices	Quantity Installed	X	-24VDC PF	=	-24VDC PF Total
2000-series Digital Telephone (any series)		X	1.0	=	
Cordless Digital Telephone (DKT2004-CT)		X	1.0	=	
2000-series Electronic Telephone		X	2.0	=	
3000-series Electronic Telephone		X	2.5	=	
6000-series Electronic Telephone		X	2.0	=	
6005-series Electronic Telephone		X	2.0	=	
6500-series Electronic Telephone		X	1.0	=	
DDCB/HDCB (w. MDFB)		X	1.2	=	
DDSS/HDSS Console		X	0.8	=	
Add-on Module		X	0.4	=	
RPCI-DI		X	0.5	=	
PDIU-DI2 and PDIU-DS		X	0.8	=	
Standard Telephone (-48VDC)		X	1.0	=	
Standard Telephone (-24VDC)		X	0.5	=	
Power Failure Unit (DPFT)		X	3.0	=	
HHEU		X	0.1	=	
Stratagy DK		X	1.0	=	
Total -24VDC PF of all Telephone Devices				**=**	

Table 2-26 Power Factor Worksheet

Base PCBs	PCB Installed		+5 Volt PF	-24 Volt PF
	Yes	No		
K5RCU2				
K5RCU				
K4RCU3				
TSIU				
TCOU				
TBSU				
KSTU2				
TDDU				
TCIU				
Expansion Unit PCBs	**PCB Name**			
Slot 15				
Slot 16				
Slot 17				
Slot 18				
-24VDC PF of telephones/devices from Table 2-25				
Total DK40i PF =				

Note   If power factors exceed the maximum (+5VDC= 14, -24VDC = 39), the system size must be reduced to stay within PF limits.

DK16/DK16e/DK40/DK40i Component Compatibility

The Strata DK16 Base KSU cannot be upgraded to a DK16e, DK40 or DK40i and the DK16 Expansion Cabinet is not compatible with the DK16e, DK40 or DK40i. The Strata DK40i is not a modification of the DK40, but rather a completely new system.

The DK40i uses the DK40 expansion cabinet. The DK16e can be upgraded to DK40 by changing a ROM chip, but not to a DK40i. The DK40 base cabinet cannot be upgraded to a DK40i.

The original DK16 two-loop start CO line and four-digital station interface unit (KCDU1A) is forward compatible with the DK16e or DK40i.

Most DK16 PCBs are not compatible with the DK40i, including the four-port Standard Station Interface Unit (KSTU1A), four-circuit DTMF/ABR Tone Detection Receiver Unit (K4RCU1A or K4RCU2A), and the Auto Attendant feature cartridge (KFCU1A).

Four of the Strata DK40i PCBs are backward compatible with the DK16, DK16e and DK40. They are: KSTU2A, K4RCU3A, K5RCU and K5RCU2. The DK40i Expansion Cabinet is also backward compatible with the DK16.

Table 2-27 shows the component compatibility between the Strata DK16 components with the DK16, DK16e, DK40 or DK40i systems.

Table 2-27   Strata DK16 Components

Strata DK16 Components		Compatible			
Part	**Description**	**DK16**	**DK16e**	**DK40**	**DK40i**
DKSUB16A	DK16 Base Cabinet	X			
KSTU1A	4-Standard Telephone Interface Unit	X			
K4RCU1A & K4RCU2A	4-DTMF/ABR Tone Receiver	X			
KFCU1A	Auto Attendant Feature Cartridge	X			
DKSUE16A	DK16 Expansion Cabinet	X			
KCDU1A	2-Loop CO AND 4-DKT Interface Unit	X	X	X	X
KPSU16A	Replacement Power Supply for DK16	X			

Table 2-28 shows the component compatibility between the Strata DK16e, DK40 and DK40i components with the DK16, DK16e, DK40 or DK40i systems.

DK40i Configuration

Table 2-28   Strata DK16e/DK40i Components

Strata DK16e/DK40/DK40i Components		Compatible			
Part	**Description**	**DK16**	**DK16e**	**DK40**	**DK40i**
TCOU1A	4-Loop CO Line Interface Unit		X	X	X
TDDU1A	4-DID CO Line Interface Unit		X	X	X
TCIU2A	Caller ID Interface Unit		X	X	X
TSIU1A	2-I/O Serial Interface Unit		X	X	X
KSTU2A	4-Standard Telephone Interface Unit	X	X	X	X
K4RCU3A, K5RCU1A or K5RCU2A[1]	4- or 5-DTMF/ABR Tone Receiver (only 4 DTMF receivers will operate on DK16 and DK16e)	X	X	X	X
KKYS1A	Auto Attendant Feature Key		X	X	X
DKSUE16A	DK16 Expansion Cabinet	X			
DKSUET16A	DK16e Expansion Cabinet	X	X	X	X
DKSUE40A	DK40i Expansion Cabinet	X	X	X	X
KCDU1A	2-Loop CO and 4-DKT Interface Unit	X	X	X	X
TPSU16A	Replacement Power Supply for DK40i		X	X	X
TBSU1A	2-circuit ISDN BRI S/T Unit				X
RBSU1A	2-circuit ISDN BRI S/T Unit				X
RBSS1A	2-circuit ISDN BRI S/T Unit				X

1. For 9~12 DID and/or Tie lines, use K5RCU1A or K5RCU2A, not the K4RCU3A.

DK40i Installation 3

This chapter explains how to install the Strata DK40i system. It includes information on site requirements, wiring diagrams, and step-by-step instructions on how to install the unit(s), the ground wiring, AC power cabling, reserve power (battery backup) cabling, and PCB cabling.

Inspection

1. When the system is received, examine all packages carefully and note any visible damage. If any damage is found, do not open the packages. Contact the delivery carrier immediately and make the proper claims.

2. After unpacking (and before installing), check the system against the packing list and inspect all equipment for damage. If equipment is missing or damaged, contact your supplier immediately.

3. Be sure to retain original packaging materials for re-use when storing or transporting system hardware.

Packaging and Storage

CAUTION!   **When handling (installing, removing, examining) PCBs, do not touch the back (soldered) side or edge connector. Always hold the PCB by its edges.**

➤   When packaging and storing the system, remove PCBs from the system cabinet (the power supply may remain installed in the cabinet for storage and shipment). PCBs should be packaged in their original antistatic bags for protection against electrostatic discharge. Be sure to package equipment in its original shipping containers.

Site Requirements

This section defines the installation site requirements necessary to ensure a proper operating environment for the DK40i. Also included are grounding requirements.

Input Power

The system requires an input power source of 115VAC ± 10VAC, 50/60 Hz, 15 amps. The AC outlet is recommended to be dedicated and unswitched, with a solid third-wire ground. (See "AC Power and Grounding Requirements" on Page 3-4.)

This eliminates interference from branch circuit motor noise or the like, and to prevent accidental power-off. To avoid accidental power turn-off, Toshiba recommends that you do *not* use an ON/OFF wall switch on this dedicated AC circuit.

For the Strata DK40i, a reserve power source (two customer-supplied 12-volt batteries) may be connected to the system to serve as a power failure backup.

Clearance and Location

The minimum clearance requirements for the Strata DK40i Base and Expansion KSUs are shown in Figures 3-1 and 3-2. Refer to Page 3-5 for DK40i KSU mounting instructions.
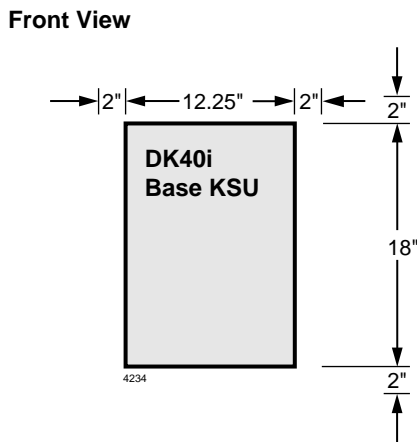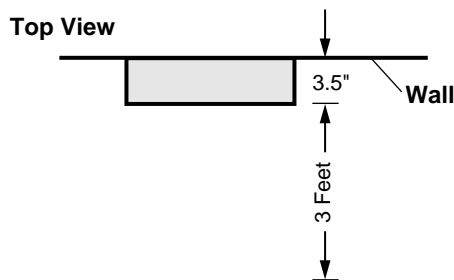
Figure 3-1   DK40i Base KSU Clearance Requirements
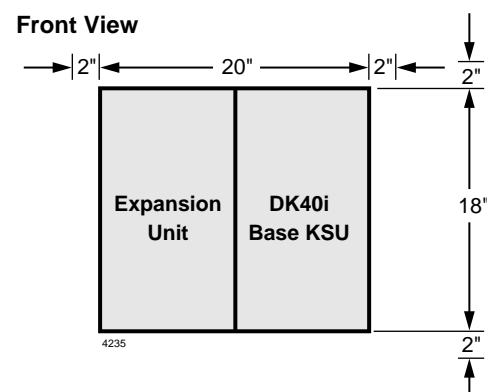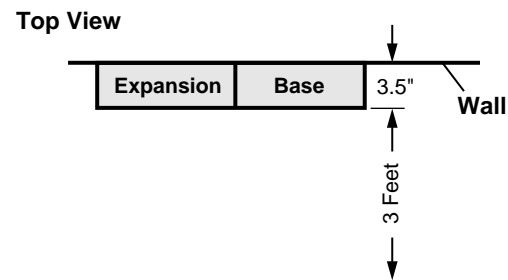
Figure 3-2   DK40i Base KSU and Expansion KSU Clearance Requirements

Consider the following conditions when selecting a location for the KSU(s):

The location *must be*:

♦ Dry and clean

♦ Well ventilated

♦ Well illuminated

♦ Easily accessible

The location *must not be*:

♦ Subject to extreme heat or cold

♦ Subject to corrosive fumes, dust, or other airborne contaminants

♦ Subject to excessive vibration

♦ Next to television, radio, office automation, or high frequency equipment

If reserve power is to be installed for the Strata DK40i, the batteries will require a well-ventilated location close (within nine feet) to the DKSUB40 (the optional Toshiba-supplied battery cable is nine feet in length).

Table 3-1 provides a summary of the electrical and environmental characteristics

Table 3-1   Summary of Electrical/Environmental Characteristics

DK40i Primary Power	
Input AC (Power Supply Specification) AC frequency Power AC input current	85~135VAC 50/60 Hz DK40i - 75 watts maximum 1.8A maximum
Environmental Specifications	
Operating temperature Operating humidity Storage temperature	32~104° F (0 ~40° C) 20~80% relative humidity without condensation -4~158° F (-20~70° C)
Power Supply	
DC voltage output specification	-24VDC (-25.94~-28.66VDC) +5VDC (+4.5~+5.5VDC) -5VDC (-4.5~-5.5VDC) - Expansion KSU only
Battery Charger Characteristics	
	Charger: current limiting Nominal float voltage: 2.275 volts/cell Charge current: 0.7 amps maximum Battery discharge cut-off voltage: 20.5 $\pm$0.5VDC
KSTU2, PSTU or PESU (Circuits 1 and 2)	
Ring Voltage	Square wave output with high/low option jumper: Low position 130 $\pm$ 20VDC peak-to-peak (no-load) High position, 190 $\pm$ 25VDC peak-to-peak (no-load)
Ringing capability	2 REN maximum per circuit, high or low position
KSTU2, PSTU, or PESU modem interface data rate	14,400 bps maximum
RSTU, RSTU2 or RDSU	
Ring Voltage	80V RMS sine wave
Ringing capability	1.5 REN per circuit, with or without Message Waiting
RSTU2 Message Waiting Voltage	-90VDC/one telephone per circuit (max.)
RSTU, RSTU2, or RDSU modem interface data rate	14,400 bps maximum
Traffic Rating Characteristics	
9 CCS per station system-wide	

AC Power and Grounding Requirements

The DK40i requires a solid earth ground for proper operation.

The AC power cord contains a conductor for the "third-wire ground" provided by the commercial power outlet. The third-wire ground should be the only ground necessary for the DK40i; this ground must originate at the buildings main power distribution panel and have a solid connection to earth ground. (See Figure 3-3.)

CAUTION!   **Lack of proper ground may cause improper operation and, in extreme cases, system failure.**
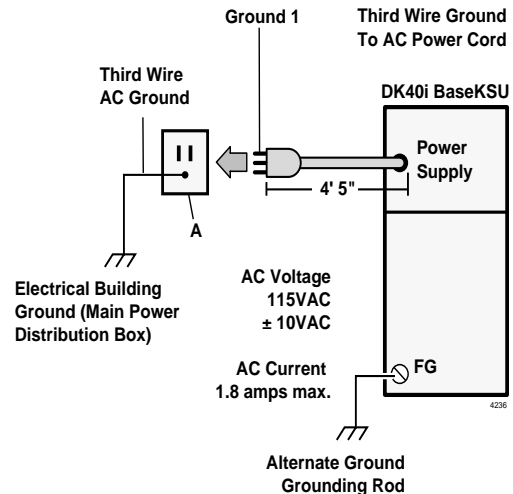
Figure 3-3   DK40i Grounding Diagram

AC Power and Third-wire Ground Test

Test the "third-wire ground" for continuity by either measuring the resistance between the third prong terminal (earth ground) and a metal cold water pipe (maximum: 1 ohm), or by using a commercially available earth ground indicator. If neither procedure is possible, perform the following earth ground test procedure.

WARNING!   **Hazardous voltages that may cause death or injury are exposed during the following test. Use great care when working with AC power line voltage.**

➤ **To perform the earth ground test procedure**

1. Obtain a suitable voltmeter, and set it for a possible reading of up to 250VAC.

2. Connect the meter probes between the two main AC voltage terminals (white and black wires) on the wall outlet. The reading obtained should be between 100~125VAC.

3. Move one of the meter probes to the third terminal (green wire ground). Either the same reading or a reading of zero volts should be obtained.

4. If the reading is zero volts, leave one probe on the ground terminal and move the other probe to the second voltage terminal.

CAUTION!   **If a reading of zero volts is obtained on both voltage terminals (white wire to green wire, black wire to green wire), the outlet is not properly grounded. Omit Steps 5 and 6, and see following CAUTION!**

---

5. If a reading of zero volts on one terminal, and a reading of 100~125VAC on the other terminal is obtained, remove both probes from the outlet.

6. Set the meter to the "OHMS/Rx1" scale. Place one probe on the ground terminal, and the other probe on the terminal that produced a reading of zero volts. The reading should be less than 1 ohm.

CAUTION! **If the reading is more than one ohm, then the outlet is not adequately grounded. If the above tests show the outlet AC voltage is not in range or is not properly grounded, the condition should be corrected (per Article 250 of the National Electrical Code) by a qualified electrician before the system is connected.**

Alternate or Additional Ground

If the "third-wire" AC ground can not practically be improved or if extreme motor noise or other disturbance causes system malfunction, or if local area lightning storms exist, a separate direct ground may be warranted.

Connect a separate earth ground from a cold water pipe or earth grounding rod directly to the FG screw terminal on the DK40i power supply (see Figure 3-3).

KSU Mounting Considerations

The Base KSU and the optional Expansion KSU are both designed to be mounted on a wall or other vertical surface. Toshiba recommends using method 1 or 2 (see Figure 3-4).

Prior to Installation

1. Loosen the screws on the front cover and the side cover of the Base KSU, remove the covers (see Figure 3-5). Figure 3-6 on Page 3-11 details the interior.

2. Place the BATT jumper plug to the ON position.

3. Install a CO line board, either the TDDU or TCOU onto the TMAU board (see Figure 3-7).

   The TCOU provides four loop start CO lines and can accommodate the Caller ID interface unit.

   The TDDU provides four DID lines.

4. Set CO line card switches.

   TCOU: Set the TCOU PAD switches (SW400-SW475) to the appropriate position (see Figure 3-21 on Page 3-32). The factory setting is NORMAL. If CO lines are connected to a PBX or are in close proximity to the central office the PAD position may be required.

   TDDU: Set the TDDU PAD switches to the appropriate position. Also, set the high/low voltage jumper plugs as required for proper dial pulse operation. See Figure 3-22 on Page 3-35.

5. If you are not installing a TCIU2, skip to Step 6. To install the TCIU2 (see Figure 3-20 on Page 3-29), align the prongs P20, P21, and P22 over P120, P121, and P122 of the TCOU and gently press down. Slip the plastic stand-off hook through the hole.

CAUTION! **To prevent system malfunction, DO NOT install TCIU1 in the DK40i system.**

DK40i Installation

6. The TCOU or TDDU cards have a green and yellow wire with a two-prong spade on the end. Slip the spade under the second screw from the right on the power supply (see Figure 3-7).

7. If applicable, install KSTU2 Standard Telephone Interface Unit. The KSTS2 comes pre-installed onto the KSTU2. Then install both boards into the DK40i Base KSU (see Figures 3-17~3-19, beginning on Page 3-26).

8. If applicable, install the K5RCU or K5RCU2 or K4RCU3 (which provides Automatic Busy Redial and DTMF tone detection) into the Base KSU (see "K4RCU, K5RCU or K5RCU2 Installation" on Page 3-23).

9. If applicable, install the KKYS (which provides built-in Auto Attendant) onto the K5RCU or K5RCU2 or K4RCU3.

10. If applicable, install the TSIU Serial Interface PCB into the KSU (Figure 3-23 on Page 3-37). If the TSIU is used for SMDR or TTY, then the PIOU/PIOUS SMDR/TTY output is not active.

Testing the System's Power Supply

If the "AC" or "DC" LEDs fail to light in Steps 1 or 3, see TPSU16 Circuit Breaker Reset Procedure–Case 1.

1. Plug the AC power cable into an outlet (see Figure 3-8). The "AC" LED on the power supply lights green.

2. Turn ON the DC power switch for the TPSU16 power supply (see Figure 3-6). The "DC" LED on the power supply lights green.

3. Using a voltmeter or other device which checks voltage, measure the voltages referenced to frame ground (FG) at the P16 connector pins (test points) located on the motherboard. The voltages should fall within the ranges below.

   ♦ Yellow-green, black, and green wires: 0V

   ♦ Two yellow wires: -27V

   ♦ Range: -25.94V~-28.66V

   If the voltages do not fall within the ranges, unplug the DC power pins from the P16 connector and measure again at the same location; if the ranges remain unacceptable. See TPSU16 Circuit Breaker Reset Procedure–Case 2.

TPSU16 Circuit Breaker Reset Procedure

Case 1

If the AC and DC LEDs on the TPSU16 power supply in the Strata DK40i Base KSU do not light, even though the AC power plug is inserted into the wall outlet and the TPSU16 DC power switch is turned on, the AC overvoltage circuit breaker may have opened.

➤ **To reset the AC overvoltage circuit breaker**

1. Remove the AC power plug from the wall outlet, turn the DC power switch OFF, and wait six minutes.

2. After six minutes, insert the AC plug back into the wall outlet and turn the DC power switch ON. The AC and DC LEDs should turn on and the system should operate.

   If the system fails to operate, either the wall outlet is not providing AC power or the system's power supply is defective.

3. If the AC power checks good, replace the power supply (see "Power Supply Removal and Replacement" on Page 3-19).

Case 2

If the TPSU16 power supply AC and DC LEDs light, but the system does not operate, the TPSU16 DC output overcurrent circuit breaker may have opened because of a DC short circuit.

➤ **To reset the DC output overcurrent circuit breaker**

1. Turn the DC power switch OFF for 15 seconds and then turn it back on. The system will go back to normal operation if the overcurrent breaker resets.

2. If the system continues to fail, press in the two -24VDC circuit breakers located on the bottom left corner of the TPSU16 power supply.

   If, then, the system does not return to normal operation, the TPSU16 power supply may be defective or an optional PCB may be shorting out the TPSU16.

3. Remove all optional PCBs and the Expansion KSU to locate the short, then repeat Steps 1 and 2 and perform the power supply test.

4. If the power supply fails the test, replace the power supply (see "Power Supply Removal and Replacement" on Page 3-19 for more information.). If the power supply passes the test, the DK40i Base KSU is probably defective.

DK40i Installation

Mounting the Base KSU

WARNING!   To prevent electrical shock, make sure the power supply switch is turned OFF.

➤ **To mount the Base KSU**

1. Place the Base KSU on the desired location on the mounting surface and mark the location of the four screw holes (there is one on each corner). See Figure 3-6.

   Make sure the location of the Base KSU meets the minimum clearance requirements specified in Figure 3-1 on Page 3-2.

   Note   The Base KSU AC power cord is 4 feet 5 inches long.

2. Drill holes on these marks.

   If mounting the KSU directly to a wall, align screws with studs behind the wall. If using a hard board between the KSU and the wall, install screws first to the hard board, and then secure the hard board to the wall, making certain that screws are aligned with studs.

3. Secure screws approximately two thirds of the way into the top two holes on the mounting surface.

4. Hang the unit from the top two screws and then secure the screws completely into the mounting surface.

5. Finish securing the unit to the mounting surface by completely screwing the bottom two screws into the wall.

6. Ground system according to "AC Power and Grounding Requirements" on Page 3-4.

7. Connect applicable wiring (e.g., modular CO line cords, 25-pair amphenol connector cable–see Figure 3-25 on Page 3-41) to the Base KSU and then fasten wiring to the unit with the tie wrap that comes with the Base KSU (see Figure 3-8 on Page 3-13). Remove amphenol connector clamp from plastic bag that comes with the Base KSU. Fasten the clamp to hold the amphenol connector.

8. Connect Reserve batteries and plug battery cable into BATT connector of the KPSU16 power supply (see "Reserve Power Option" on Page 3-17).

9. If the Expansion KSU is going to be installed, refer to "Mounting the Expansion KSU" on Page 3-9. If not, proceed to Step 1.

10. Plug the AC power cable into an outlet and then turn ON the power supply switch.

11. Reinstall the front and side covers onto the Base KSU.

Mounting the Expansion KSU

Important! *For purposes of identification, the labels appear on the boxes and Expansion KSUs (see Table 3-2).*

Table 3-2   Expansion Unit Labels

	DK40i	**DK40**	**DK16e**	**DK16**
Expansion Unit Box Labels	DKSUBI40A	DKSUB40A	DKSUBT16A	DKSUB16A
Expansion KSU Model No. (expansion case bottom)	Model DKSUE40A[1] Strata DK40	Model DKSUE40A Strata DK40	Model DKSUET16A Strata DK16e	Model DKSUE16 Strata DK16

1.   Strata DK40 may appear on a label.

> **WARNING!   To prevent electrical shock, make sure the power supply switch is turned OFF.**

➤   **To mount the Expansion KSU (see Figures 3-4, 3-6, 3-8~3-11)**

1.   Make sure the side cover is removed from the Base KSU. Turn Base KSU DC power switch OFF.

2.   Set the Expansion KSU on the Base KSU's hinge mounts, making sure that the Expansion KSU sets properly in place.

3.   Remove the safety lock from plastic bag that comes with the Expansion KSU. Install safety lock to the Base KSU as shown.

4.   Pull out on the safety lock until it can no longer be moved, securing the Expansion KSU to the Base KSU. Do not detach the lock from the Base KSU.

5.   Connect the Expansion KSU ribbon cable to the connector on the Base KSU. Close ribbon cable connector lock on Base KSU.

6.   Connect Expansion KSU green/yellow ground wire plug (FG2) to TB1 of the Base KSU. (Make sure the plug locks on FG2.)

7.   Making sure that the Expansion KSU is flush against the mounting surface, mark the location of the Expansion KSU mounting screw hole.

8.   Swing the Expansion KSU away from the mounting surface, and drill a hole at the mark made in Step 7.

9.   Install the PCBs per "Worksheet 1 – System PCB Assignment Guide" on Page 2-11 and slide the slot lock to the lock position.

10.   Swing the Expansion KSU back to the mounting surface and secure it to the surface with a screw.

11.   Connect the wiring (e.g., modular CO line cords, 25-pair amphenol connector–per Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring) to the PCBs.

12.   Fasten the wiring with Tie wraps (supplied) to the bottom of the expansion and Base KSUs.

13.   Knock out the tab on the bottom of the side cover.

14.   Plug the AC power cable into an outlet and then turn ON the power supply switch.

15.   Install the side cover to the Expansion KSU.

DK40i Installation

Figure 3-4   KSU Wall Mounting

Figure 3-5   Base KSU Exterior

-24 Volt Circuit Breakers

Connect Expansion Unit TB1 TO FG2

Important Notice

Expansion KSU Cable Receptacle

Battery Jumper

IMPORTANT: DKSUE16A is incompatible with this unit DKSUET16A or DKSUE40A is required for expansion

POWER SUPPLY ASSEMBLY
MODEL TPSU16A
INPUT: AC127V 2.2A 60 HZ
OUTPUT: -27.3V 2.8A, -27.3V 0.2A
V. 1.8-1995-05 00001
TOSHIBA CORPORATION
MADE IN

WARNING
Hazardous voltage inside!
If servicing required remove A. C. plug.

AC   DC
DC POWER
O   I

Reserve Power Battery Jack

OFF
ON

TMAU2A

Base Telephone Tip/Ring and Relay Contact

Music-on-Hold Input

600 Ω External Page Output

4238

Music-on-Hold Sensitivity Adjustment

DK40i Installation

Figure 3-6   DK40i Base KSU Interior

**Optional with TCOU
(provides Caller ID)**

TC1U2A

FG Screw

V1

TCOU1A

TOSHIBA

**Install a TCOU, TBSU
or TDDU here**

POWER SUPPLY ASSEMBLY
MODEL: TPSU16A
INPUT: AC127V 2.2A 60 HZ
OUTPUT: +7.2V 1.8A,+7.0V 12A
5.1A 166mR 0000
TOSHIBA CORPORATION
MADE IN

WARNING

Hazardous voltage inside!
If servicing required
remove A. C. plug.

AC   DC

DC POWER

BATT

PN2

3796

TDDU1A   V1

TOSHIBA

TBSU1A

FS   FS
LOS   LOS
TS   TS
BSY   BSY

Figure 3-7   CO Line Board Installation into DK40i Base KSU

DK40i Installation

AC Power Cord
Do not route power
cord with other cords.

**Modular
Connector**

**Self-Adhesive
Rubber Pad**
Supplied in
plastic bag
with Base KSU.

**Amphenol
Clamp**

Supplied in
plastic bag
with Base KSU.

**Amphenol
Connector**

RCA Plug

AC POWER DC

Tie Wrap[1]

**Tie Wrap
Holder**

**Modular
Cord (X5)**

**Amphenol
Cord (X1)**

**PIN Jack
Cord (X2)**

Base KSU

2161
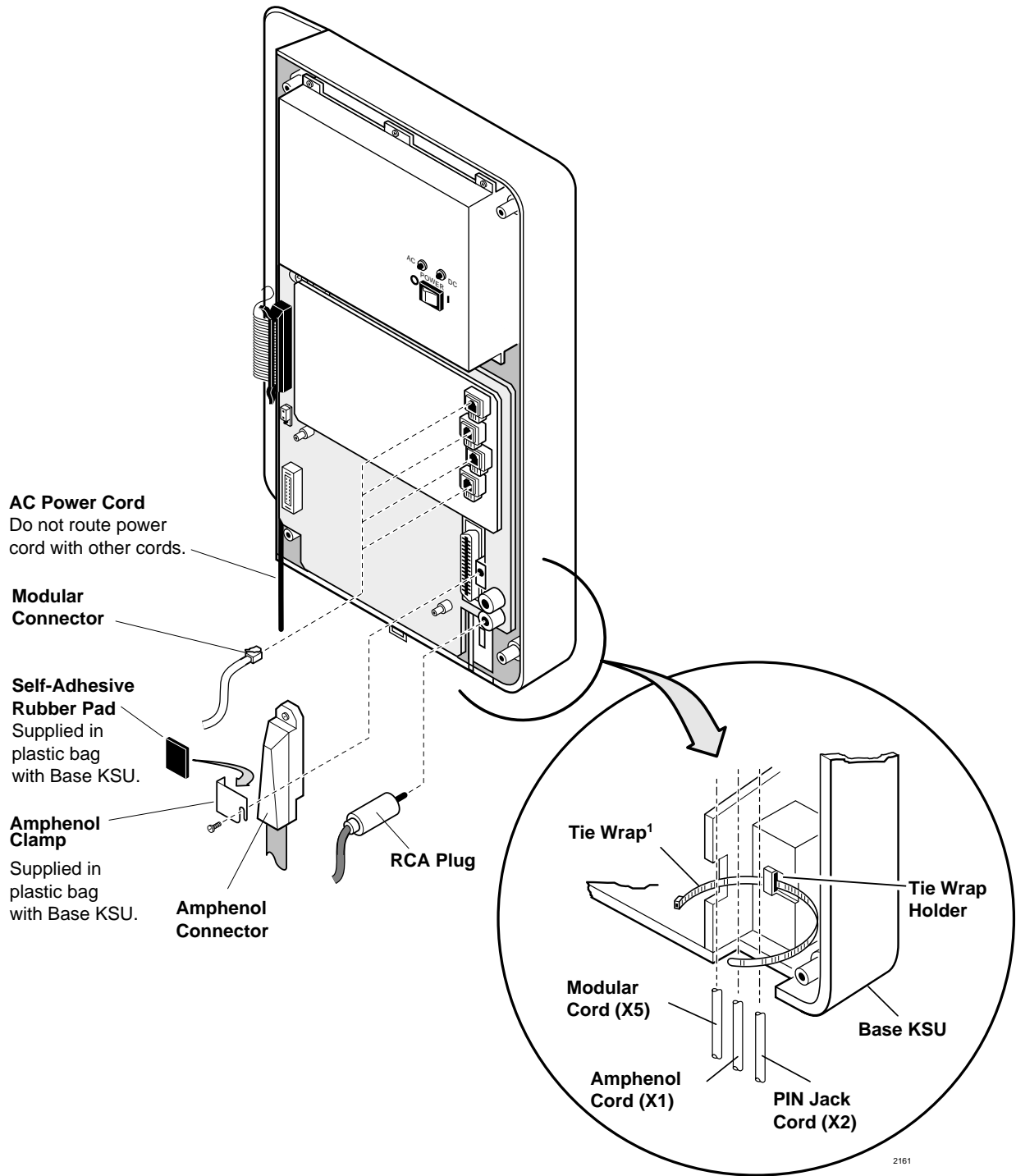
Figure 3-8   Base KSU Cables and Connectors

Base KSU

Hinge Mount

TB1 (FG2)

**Green/Yellow
FG2 Wire and Plug**
(From Expansion
KSU – Plugs into
TB1 of Base KSU)

Expansion KSU

P3

**Ribbon
Connector
Lock**

PULL
LOCK

PUSH
UNLOCK

Safety Lock
(Supplied with
Expansion KSU)

Ribbon Cable
(from Expansion KSU – Plugs into
Expansion Connector (P3) of Base KSU)
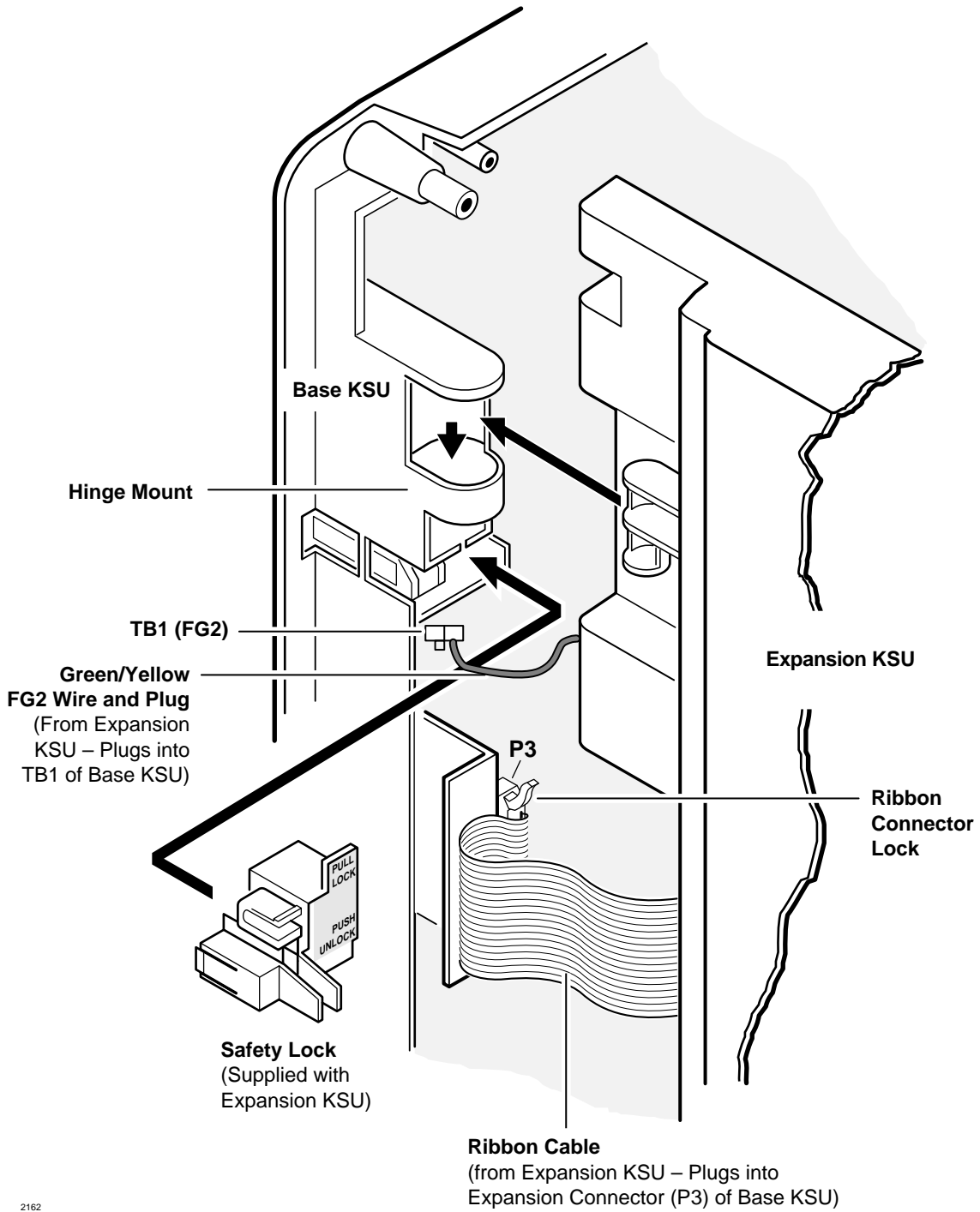
2162

Figure 3-9   Base to Expansion KSU Connection

Expansion
KSU

Expansion
Safety Lock

FG Screw

Base KSU

POWER SUPPLY ASSEMBLY
MODEL TPSU16A
INPUT: AC127V 2.2A 60 HZ
OUTPUT: -27.5V 2.8A, -27.5V 0.2A
V. 1A 1996-05 00001
TOSHIBA CORPORATION
MADE IN

AC   DC

DC POWER

BATT

WARNING
Hazardous voltage inside!
If servicing required
remove A. C. plug.

PULL
LOCK

PUSH
UNLOCK

FG2 Wire

Ribbon Cable
to Expansion KSU

Expansion
KSU Latch

Mounting Hole
and Screw

TMAU2A

4241

AC Cord (4'4")

Tie Wrap Holder

Model DKSUE40A

Label on edge of Expansion KSU

Figure 3-10   Expansion KSU Mounting and Connections

DK40i Installation

Figure 3-11   Expansion KSU Slot Lock

The DK16e Expansion Cabinet can be used on the DK40i Base Unit. The DK16e and DK40i Expansion Cabinet slot labels are different from the Program 03 slot numbers. Table 3-3 provides the slot labels and Program 03 slot numbers.

Table 3-3   DK16e and DK40i Expansion Cabinet Slot Names

DK40i Slot Label	DK40i Prg 03 Slot Number
S04	S15
S05	S16
S06	S17
S07	S18

Reserve Power Option

A reserve power source (two customer supplied 12-volt batteries) can be connected to the DK40i power supply to ensure uninterrupted system operation in the event of a power failure. A pre-assembled interface cable for installation of the Reserve Power option is available from Toshiba (PBTC-3M), see Figure 3-12.
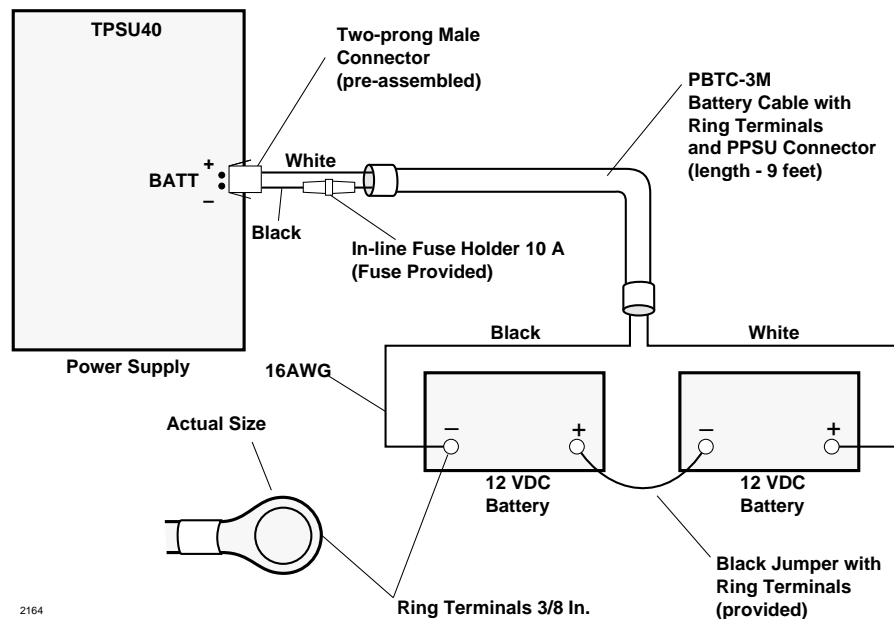
Figure 3-12 System Power Supply Wiring

Important!   *Local ordinances may dictate battery type and installation details.*

The batteries require a well-ventilated location within nine feet of the system (the interface cable is nine feet long).

WARNING!   **To reduce the risk of fire or injury to persons, read and follow these instructions:**

➤ **Use only 12-volt, gelcell batteries.**

➤ **Do not dispose of the batteries in a fire. The cells may explode. Check with local codes for possible special disposal instructions.**

➤ **Do not open or mutilate the batteries. Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.**

➤ **Exercise care in handling batteries in order not to short the battery with conduction materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.**

➤ **Charge the batteries provided with or identified for use with this product only in accordance with the instructions and limitations specified in this manual.**

➤ **Observe proper polarity orientation between the batteries and battery charger.**

Reserve Power Installation

1. Connect the PBTC-3M black jumper wire from the positive terminal of one 12VDC battery to the negative terminal of the second 12VDC battery. See Figure 3-12.

2. Ensure that a serviceable 10-ampere fuse is installed in the in-line fuse holder of the PBTC-3M battery cable.

3. Connect the white lead of the PBTC-3M battery cable to the open positive terminal of the 12VDC battery. Connect the black lead to the open negative terminal of the second 12VDC battery.

Important! *The KSU must be connected to the live operating (hot) AC power source, and the power supply ON/OFF switch set to ON prior to the final step of connecting the reserve power batteries to the power supply via the BATT +/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

4. Connect the PBTC-3M battery cable two-prong male plug to the power supply BATT +/- receptacle.

5. To test reserve power operation, disconnect the system AC power plug with the power supply power ON/OFF switch in the ON position. The system should continue to operate without any interruption.

6. Plug the AC power cable into PN2.

7. Plug the AC power cable into an outlet and turn ON the power supply switch.

8. See "Prior to Installation" to confirm that the power supply is working properly.

9. Plug reserve battery cable into BATT connector of power supply.

Power Failure Emergency Transfer Option

To enable this option, a dedicated standard telephone must be connected to the Power Failure Transfer Interface (PF1) of a DK40i Base KSU equipped with a TCOU.

Note During normal operation, this telephone cannot be used and does not count as a station (does not reduce the number of system's available stations).

If there is a power failure, the telephone automatically is connected to CO Line 1. When power is restored, the system resumes normal station and CO line assignments, and the dedicated telephone becomes inoperative again.

Important! *This is not available on a DK40i system with a TDDU installed.*

Installing Power Failure Emergency Transfer

➤ Connect a standard telephone to the PF1 connector in the Base KSU (see Figure 3-13).

Testing Power Failure Emergency Transfer

1. Turn the system power switch OFF.

2. Lift the emergency standard telephone handset, and verify that there is CO dial tone.
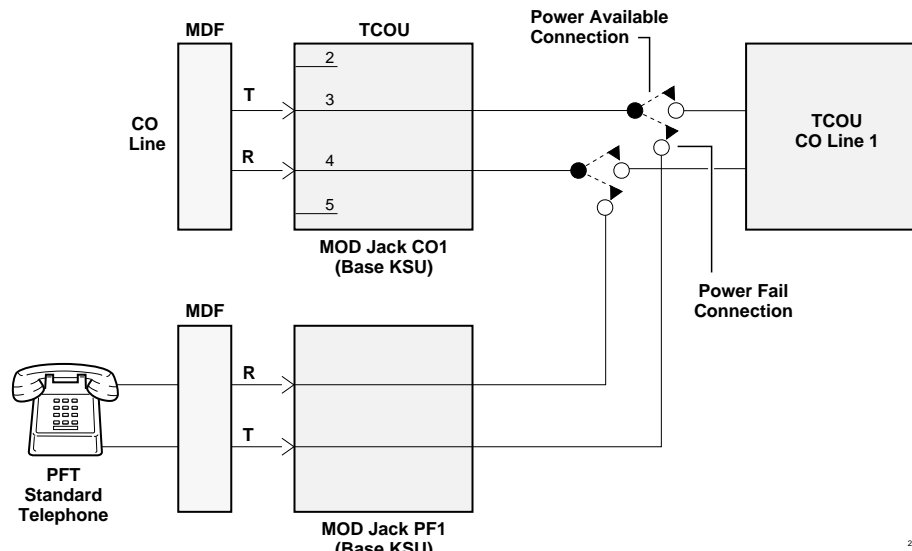
Figure 3-13 Base KSU Power Failure Transfer (PFT) Circuit Diagram

Power Supply Removal and Replacement

The power supply (TPSU16A) comes factory-installed in the Base KSU; if necessary, it can be removed and replaced.

Power Supply Removal

1. Make sure that the power supply switch is OFF and that the AC power cable is not plugged into an outlet. Confirm that the green AC LED is not lit (see Figure 3-14).
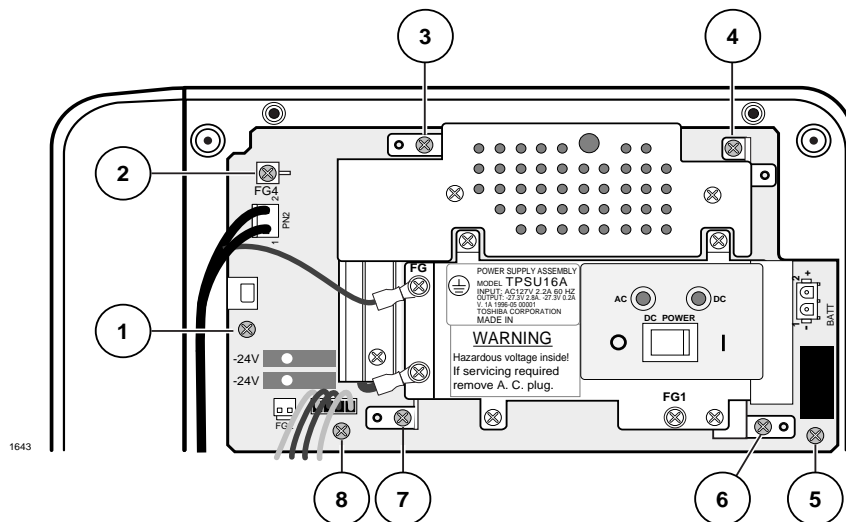
Figure 3-14 Power Supply (TPSU16A)

2. Unplug reserve battery cable from BATT connector of power supply.

3. Unplug the FG2 plug from the Expansion KSU ground wire.

4. Unplug the DC cable from the DC OUT connector (P16).

5. Remove the FG screw from left side of power supply to free FG wire/terminal and building ground wire.

6. Unplug the AC power cord from PN2.

7. Remove the seven screws that attach the power supply to the Base KSU. Remove the power supply.

Power Supply Replacement

1. Set the power supply in its proper place in the Base KSU (see Figure 3-14).

2. Secure the power supply to the Base KSU with the seven screws.

3. Connect the FG1 wire from the TCOU or TDDU to the FG1 screw on the power supply.

4. Plug the DC cable into the DC OUT connector. The green/yellow wire is on right-hand side.

5. Fasten FG green wire ring terminal and building ground wire to the left side of the power supply with the FG screw.

6. Plug the Expansion KSU green/yellow ground wire into FG2.

Printed Circuit Board (PCB) Installation

This section details Strata DK40i system PCBs installation into the Base and Expansion KSUs. Also described are optional configuration information and programming considerations for each PCB.

Base KSU PCBs

The Strata DK40i processor is built into the motherboard (TMAU2) and comes with eight digital telephone circuits (ports). The line circuits are on the TCOU or TDDU PCBs, which attach to the P10, P11 and P12 connectors on the TMAU. The PCBs that can be installed into a DK40i KSU are shown in Table 3-4.

Table 3-4   DK40i Base KSU PCBs

PCB	Provides	Installs On	Comments
TCOU	Four loop start CO line circuits	TMAU2 motherboard	Only one TCOU, TBSU or TDDU can be installed on the motherboard.
TDDU	Four DID line circuits		
TBSU	2 BRI (S/T) circuits		
TCIU2	Four caller ID circuits	TCOU	To prevent system malfunction, do not install a TCIU1 in the DK40i system.
KSTU2	Four standard telephone circuits	TMAU2 motherboard	Only one TSIU can be installed per DK40i system. When installed, the TSIU does not use a slot.
TSIU	Up to two serial interfaces (TTY and SMDR)		
K5RCU2, K5RCU or K4RCU3	Recognizes DTMF tones generated by a standard telephone and is required for DISA, Tie and DID lines and the DK40i built-in Auto Attendant. Also used to detect busy tone for the ABR feature.		
KKYS	Automated Attendant	K5RCU2, K5RCU or K4RCU3	

Toshiba recommends installing the Base KSU option PCBs, K5RCU2, K5RCU or K4RCU3 and/ or KSTU2, before mounting the Base KSU on the wall. Install the Expansion KSU per Page 3-9, then install the Expansion KSU option PCBs.

The Base KSU slots 00~14 are automatically assigned the following codes in Program 03 when the system is turned on and the Base KSU PCBs are installed.

Slot 00: Code 91 without K4RCU3; Code 92 with K4RCU3; Code 98 with K5RCU2 or K5RCU

Slot 11: Code 62 eight digital telephones with OCA/DIU, 64 for OCA/DIU/DSS.

Slot 12: Code 11 for TCOU, 16 for TDDU or 77 for TBSU (four loop, four DID lines or two BRI circuits).

Note   If installing TBSU, set each BRI circuit for station side or line side before installing more PCBs. Each BRI station circuit uses two station ports and each BRI line circuit uses two CO lines.

Slot 13: Code 31, four KSTU2 ports

Slot 14: Code 81, four TCIU2 circuits

DK40i Installation

Expansion KSU PCBs

A DK40i Expansion KSU from the factory does not come with any PCBs installed. (See Table 2-3 on Page 2-3 for a list of PCBs supported by the DK40i Expansion KSU and Chapter 7 – DK40i/ DK424 Universal Slot PCBs for detailed descriptions/installation instructions.) Toshiba recommends that PCBs which support electronic, digital or wireless telephones be installed into slots 15 and 16 because slots 17 and 18 cannot support speaker Off-hook Call Announce (OCA) or Data Interface Units (DIUs) or more than 8 wireless handsets. See "Base/Expansion KSU Compatibility" beginning on Page 2-3 for configuration information for DK40i PCBs.

PCB Hardware/Software Options

PCBs can be configured for a variety of hardware and software options. Hardware options are defined as either internal (generally related to optional PCB subassemblies) or external (related to connection of peripheral equipment, such as background music, voice mail, etc.). Hardware and software options for each PCB are identified in the individual PCB installation procedures in this chapter.

PCB Hardware Options

Each PCB must be configured for the applicable hardware options prior to installation of the PCB. Configuration instructions for internal hardware options are provided in the individual PCB installation procedures in this chapter and Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring. Configuration instructions for external hardware options are provided in Chapter 10 – Peripheral Installation.

PCB Software Options

After installation of the PCBs in the KSU, configure the PCBs for software options through programming. A programming overview for each PCB is provided in this chapter. Refer to the *Strata DK Programming Manual* for more detailed programming instructions.

PCB Installation/Power Supply Considerations

WARNING! **To avoid electrical shock, make sure that the power supply is OFF whenever removing or installing PCBs.**

Before installing any PCBs, make sure the power supply has been tested, and the ground has been checked. (See "AC Power and Grounding Requirements" on Page 3-4.)

PCB Wiring

See "MDF Wiring Diagrams" on Page 3-41 in this chapter for DK40i Base KSU wiring and Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for Expansion KSU wiring. See Chapter 16 – Strata AirLink Systems for RWIU wiring.

Digital Telephone Circuits

The eight digital telephone circuits that come standard with the system are integrated into the DK40i motherboard in the Base KSU. These circuits are identical to the digital circuits found on the PDKU. The motherboard does not have to be configured for the digital circuits to operate. For wiring, see "MDF Wiring Diagrams" on Page 3-41.

K4RCU3, K5RCU and K5RCU2
DTMF Receiver/ABR Tone Detector Unit

System:	*DK40i Base KSU*
Circuits per PCB:	*K4RCU3: four DTMF receivers and four ABR busy tone detectors*
	K5RCU, K5RCU2: five DTMF receivers and five ABR busy tone detectors.
Interfaces with:	*automatic busy redial (ABR)*
	interprets DTMF tones
	DISA, DID, Tie lines
	built-in auto attendant
Older Version(s):	*K4RCU (not compatible with DK40i)*
	K4RCU3 or K5RCU (compatible with DK16 and DK40i

The K4RCU3, K5RCU or K5RCU2 must be installed to recognize Dual-Tone Multi-Frequency (DTMF) tones generated by a standard telephone (or any other device connected to a standard telephone circuit) and to enable ABR to operate. The K5RCU2 is the same as the K5RCU, except that it has jumper settings for A law and Mu law, which makes it applicable to more countries.

Configuration

The K4RCU3, K5RCU, or K5RCU2 does not have to be configured for operation. If built-in auto attendant is required, see auto attendant KKYS installation.

K4RCU, K5RCU or K5RCU2 Installation

1. Make sure that the power supply switch is OFF.

2. Make sure SW1 is set for Mu law if installing K5RCU2. The jumper must be set for Mu law in the U.S. and Canada.

3. Making sure that the component side of the K4RCU3, K5RCU or K5RCU2 is face down (toward the power supply), plug the K4RCU3, K5RCU P602A and P602B female connectors into the P2A and P2B (K4RCU3, K5RCU or K5RCU2) connectors on the motherboard. See Figure 3-15.

K4RCU, K5RCU or K5RCU2 Programming

➤ Program 03: Enter code 92 for Slot 00 if K4RCU3 is installed or Code 98 with K5RCU or K5RCU2.

Program 12: Sets K4RCU3, K5RCU or K5RCU2 release time.

Program 15: Sets K4RCU3, K5RCU or K5RCU2 operation after CO line flash. Assigns DTMF/Dial Pulse dialing, DISA, and additional attributes to each line.

DK40i Installation
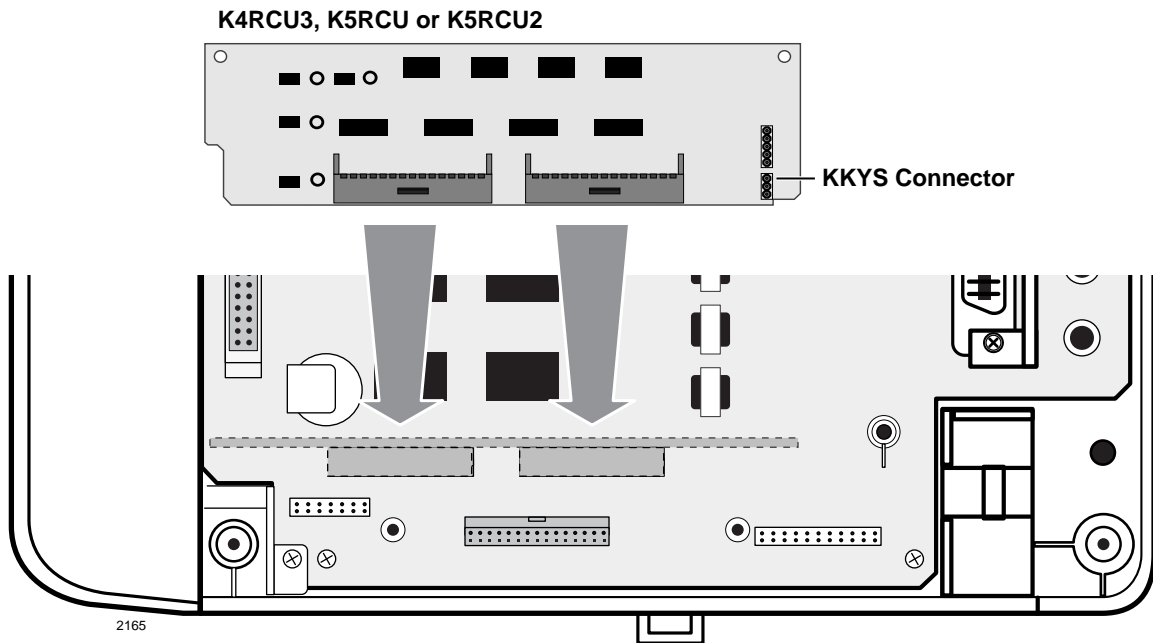
Figure 3-15   Auto Busy Redial/DTMF Receiver Board (K4RCU3, K5RCU or K5RCU2) Installation

KKYS
Auto Attendant

System: DK40i Base KSU

Circuits per PCB: one

Interfaces with: optional built-in auto attendant

Older Version(s):   none

The KKYS installs onto the K5RCU2 card in the Base KSU. (See Figure 3-16.)

KKYS Installation

➤ Install the KKYS onto the K5RCU2 to add the optional built-in auto attendant feature.
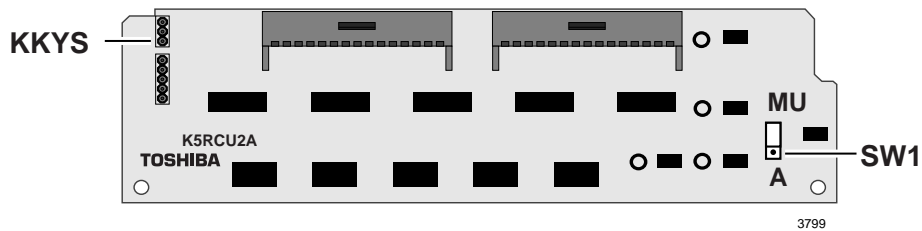
Figure 3-16   K5RCU2 Printed Circuit Board

KSTU2
Four-circuit Standard Telephone Interface Unit

System: *DK40i Base KSU*

Circuits per PCB: *four standard telephone circuits*

Interfaces with: *standard telephones (no message waiting)*
other single-line devices
alternate BGM source (circuit 4)
fax machine
voice mail devices

Older Version(s): *KSTU1 (not compatible with DK40i–KSTU2 is compatible with DK16 and DK40i)*

KSTU2 controls and indicators are illustrated in Figures 3-17 and 3-18 and described in Table 3-5 on Page 3-27.

Note   For the system to recognize the Dual-Tone Multi-Frequency (DTMF) tones generated by standard telephones (or any other device connected to a KSTU2 port), a K4RCU3 must be installed in the Base KSU.

KSTU2 Configuration

The KSTU2 hardware has to be configured only for the square wave ring generator voltage level, nothing else.

KSTU2 Installation

1. Make sure that the power supply switch is OFF.

2. Before installing the KSTU2 in the Base KSU, set the SW1 ring generator to 130V P-P or 190V P-P.

Note   Most standard telephones and two-wire devices require 190; however, some devices may experience ring-trip at 190, and should be set at 130.

3. Plug the KSTU2 cable into the P4 connector on the motherboard in the Base KSU. The red wire on the cable should match up with pin 1 on the lower side of the connector.

4. Plug the KSTU2 P508 female connector into the P8 male connector on the motherboard.

5. Secure the KSTU2 to the standoffs with the two provided screws.

KSTU2 Wiring

Refer to DK40i Base KSU KSTU2 wiring in Figure 3-25 on Page 3-41.

The KSTU2 must be connected to a OL13A (or equivalent) type lines for off-premises stations (300 ohms loop resistance max., including the telephone or other devices DC off hook resistance).

KSTU2 Programming

Program 03: Specify code 31 for KSTU2 slot.

Program 31: Configures all KSTU2 ports connected to voice mail (see Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for voice mail installation).

Program 10-2: Not required for Background Music (BGM) connection.

Program 19: BGM connection to KSTU2 Port 11.

CAUTION! **Port numbers in the Expansion KSU shift by four ports if KSTU2 or TDDU is installed (or removed after it is installed). This determines whether or not the DDCB can be connected on the KCDU in slot 15.**
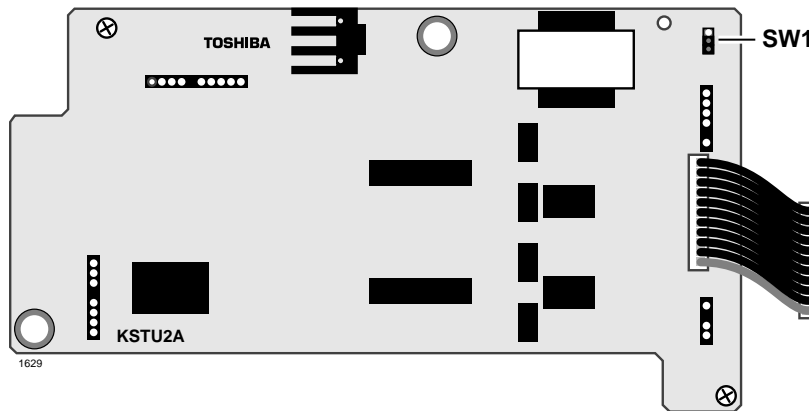
Figure 3-17 Standard Telephone Interface Board (KSTU2)
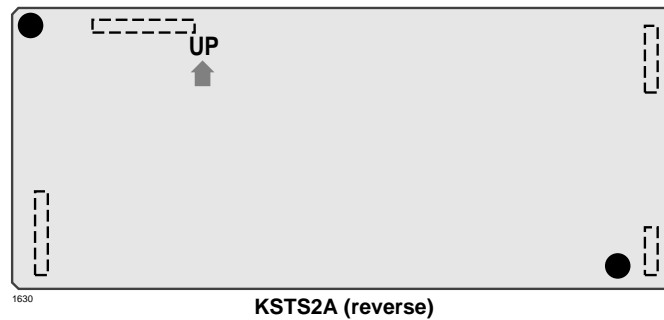
Figure 3-18 Standard Telephone Interface Subunit (KSTS2)

Table 3-5   KSTU2 Controls and Interface Connectors

Control/Indicator/Connector	Type of Component	Description
Ring voltage jumper plug SW1	3-terminal jumper	Sets ring generator voltage level for all circuits: H = 190V P-P L = 130V P-P
Connector cable P504	Cable	Connects to P4 connector on the motherboard
P10 (connects to KSTS2 P20)	7-pin connector	Interface connector for optional KSTS2. The KSTS2 arrives installed onto the KSTU2 from the factory.
P11 (connects to KSTS2 P21)	9-pin connector	
P12 (connects to KSTS2 P22)	3-pin connector	
P13 (connects to KSTS2 P23)	5-pin connector	
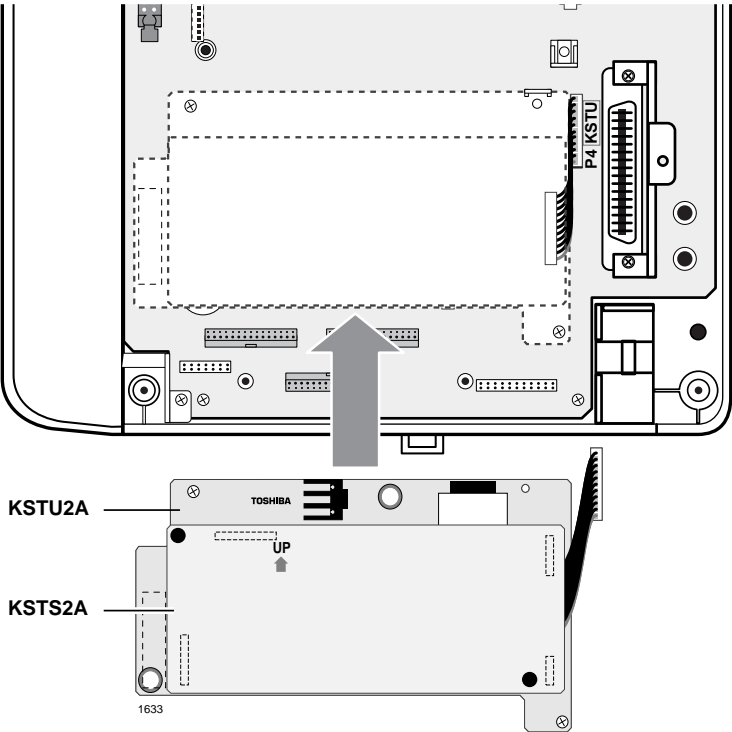
Figure 3-19   KSTU2/KSTS2 Installation

TBSU

See "RBSU/RBSS and TBSU Interface Units" on Page 14-18 in Chapter 14 – ISDN Interfaces for TSBU installation documentation.

TCIU
Caller ID

System: *DK40i Base KSU (mounts on TCOU)*

Circuits per PCB: *four caller ID circuits*

Interfaces with: *caller ID*
loop start CO lines

Older Version(s): *none*

To receive Caller ID, a TCIU2 circuit must be available to each line. (See Figure 3-20.)

CAUTION!   **To prevent system malfunction, do not install TCIU1 in the DK40i system.**

Each TCIU2 Caller ID circuit has a two-wire tip/ring interface which must be bridge-wired across its corresponding ground or loop start CO line tip/ring. This is done automatically by the PCB connectors when the TCIU2 is mounted on the TCOU. However, if installing an RCOU/RCIU2 in the Expansion KSU, the connection is made on the Main Distribution Frame (MDF). See the RCIU wiring diagram in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring.

TCIU2 Installation

1. Turn power OFF.

2. Install the TCIU2 onto the TCOU PCB by aligning the three sets of connectors marked TCOU or TCIU2, depending on the card.

3. Press down evenly and firmly on the TCIU2 card.

TCIU2 Programming

Program 03: Automatically assigns TCIU2 (Caller ID circuit) to slot 14 (code 81) when the TCIU2 is installed and power is turned on.

Note   TCIU2 Caller ID circuits are numbered automatically in numerical order starting from 01~04 when the TCIU2 is installed. Slots with code 81 will increment the Caller ID circuit numbers by four circuits on the DK40i.

Program *50: Assigns TCOU lines that will receive Caller ID to the associated TCIU2 Caller ID circuit number. TCIU2 circuits 1~4 must be assigned to TCOU circuits 1~4, respectively. RCIU circuits 5~8 should be assigned RCOU or RGLU circuits 5~8.

After assigning CO lines to Caller ID circuits, turn system power OFF for approximately five seconds and then back on or run Program 91-2 to activate Program *50 assignments.

Program *51: Sets the Caller ID (CLID)/Automatic Dialed Number Identification (ANI) memory allocation for the appropriate stations. This memory is used to save CLID/ANI telephone numbers for calls that are received but not answered (abandoned calls). CLID/ANI numbers are not saved in station memory if they are answered. Stations can be allocated with memory to save up to 100 numbers in 10-number increments.

The total memory allocated to all stations in a system is 200 numbers.

Note When a CO line rings multiple stations, a station must be the owner of the Caller ID or ANI CO line to be able to save abandoned call (Caller ID and/or ANI) telephone numbers. (See Program *52.)

Program *52: Assigns stations as owners of Caller ID CO lines. These stations will store the Caller ID telephone numbers received on abandoned (not answered) calls for the lines which they own. Typically all common CO lines are assigned to one designated telephone or attendant console and private lines are assigned to individual private line telephones.

Note A station must also be allocated with Caller ID/ANI storage memory in Program *51 to store abandoned call telephone numbers.

Program 39, Code 462: Assigns the Caller ID/ANI Lost Call Auto Dial button to LCD telephones that store Caller ID and/or ANI abandoned call telephone numbers. A user can scroll through the stored abandoned call phone numbers and auto dial the selected number using this button.

Program 60-1, Key 01: Determines which information will be sent out the system SMDR port, e.g., system Account Codes or CLID and/or ANI telephone numbers.

➤ Turn LED 01 ON if CLID and/or ANI information should be sent out the SMDR port.

➤ Turn LED 01 OFF if Account Codes information should be sent out the SMDR port.

Note The system will initialize with LED 01 OFF, e.g., Account Codes information will be sent out the SMDR port.
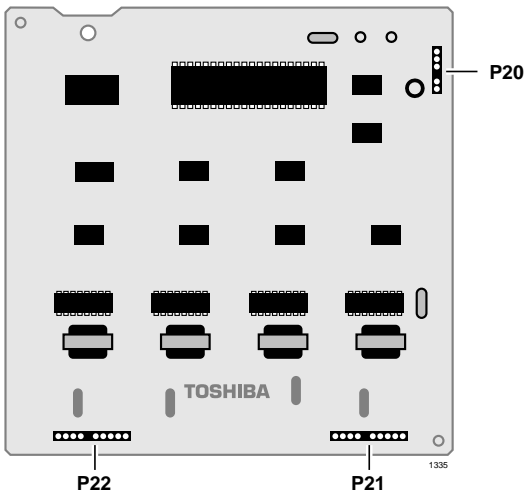
Figure 3-20   DK40i Caller ID Interface Unit (TCIU2)

Table 3-6   TCIU2 Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
P20	5-pin plug	To P120 of TCOU
P21	9-pin plug	To P121 of TCOU
P22	9-pin plug	To P122 of TCOU

TCOU
Four-circuit Loop Start CO Line Board

System: *DK40i Base KSU (mounts on KSU TMAU)*

Circuits per PCB: *four loop start CO line circuits*

Interfaces with: *loop start lines*

Older Version(s): *none*

The optional TCOU PCB installs onto the TMAU motherboard. (See Figure 3-21 and Table 3-7 for information on controls, indicators and connectors.)

Note   Only one TCOU or TDDU can be installed on the motherboard.

TCOU Hardware Options

The TCOU PCB accepts the optional Caller ID (TCIU2 not TCIU1) board. When the TCIU2 is installed on the TCOU, the tip/ring of the TCOU circuits 1~4 are automatically connected to the tip/ring of TCIU2 circuits 1~4 respectively.

TCOU Installation or Replacement

1. Make sure the power supply (TPSU16A) DC power switch is OFF.

2. Mate the TCOU male connectors P110, P111, P112 to P10, P11 and P12 respectively on the TMAU. Apply firm, even pressure to ensure proper connection. See Figure 3-7 for installation information and Figure 3-27 on Page 3-43 for wiring.

3. Secure the three plastic stand-off tabs and install screws in upper right and lower left corners.

4. Set decibel (dB) PAD switches SW101, SW201, SW301, and SW401 to the appropriate position. In most cases set to the normal position (NOR). Switches are factory set at the 0 (0 dB signal level drop) position. If CO lines are connected to a PBX or are in close proximity to the central office, set the PAD positions to 3 to provide a -3 dB signal level drop between the PBX and CO.

5. Slip the spade connected to the green/yellow wire under the second screw from the right on the TPSU power supply (see Figure 3-21). Tighten the screw until the spade is snugly secured.

TCOU Removal

If you need to remove/replace the TCOU, make sure the power supply (TPSU16A) DC power switch is turned OFF.

➤ **To remove the TCOU**

1. Loosen the screw on the TPSU power supply and free the spade.

2. Loosen and remove screws securing the TCOU to the TMAU (see Figure 3-21).

3. Pull back the three plastic stand-off tabs and pull up on the TCOU until P110, P111 and P112 are unplugged.

TCOU Programming

Program 03: Code 11 is specified automatically when TCOU is installed.

Program 10-1: Enables or disables line-to-line Conference and Direct Inward System Access (DISA).

Program 15: Assigns DTMF/Dial Pulse dialing, DISA, and additional attributes to each line. Automatic Release (AR) assignments only need to be made for loop start lines; AR is automatically enabled for ground start CO lines.

Program *15: Makes tenant assignments.

Program 16: Assigns lines to line groups.

Program 39: Assigns line access buttons to digital and electronic telephones.

Program 40: Assigns station access to lines (incoming and outgoing).

Program 41: Assigns station access to lines (outgoing only).

Programs 45~48: Defines Toll Restriction for any line.

Programs 50~56: Defines Least Cost Routing assignments.

Program 78: Assigns special ringing of lines: includes Night Ring Over Page, DISA, Remote Maintenance via the Internal Maintenance Modem (IMDU), and Integrated Auto Attendant.

Programs 81~89

♦ Assigns lines to ring selected stations and DH groups.

♦ Assigns Delayed Ringing to any line.

Programs *81, *84, *87: Assigns which [DN] will flash when the CO line rings a telephone.

Program 93: Assigns names to lines.

DK40i Installation
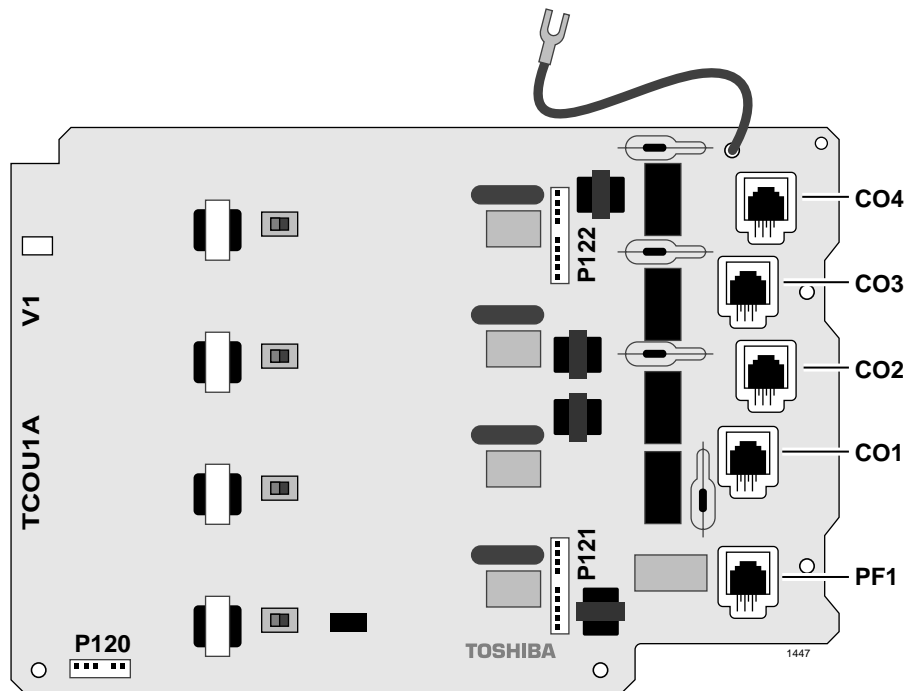
Figure 3-21   DK40i Loop Start CO Line Board (TCOU)

Table 3-7   TCOU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
CO line connectors 1~4	Modular connector	Interface connector for CO line circuits.
PF1	Modular connector	Power Failure Telephone Interface
PAD switch SW202, SW302, SW402 (circuits 1~4)	2-position slide switch	Enables -3 dB signal level drop for CO line circuit
P120	6-pin connector	To P20 of TCIU2
P121	10-pin connector	To P21 of TCIU2
P122	10-pin connector	To P22 of TCIU2

TDDU
Four-circuit DID Line Digital Telephone Interface Unit

System: *DK40i Base KSU (mounts on KSU TMAU)*

Circuits per PCB: *four DID line circuits*

Interfaces with: *DID lines*

Older Version(s): *none*

The optional TDDU PCB installs onto the TMAU motherboard. (See Figure 3-22 and Table 3-8 for information on controls, indicators and connectors and Figure 3-27 for wiring.)

Note   Only one TCOU or TDDU can be installed on the motherboard.

TDDU Installation

1. Make sure the power supply (TPSU16A) DC power switch is OFF.

2. Mate the TDDU male connectors P110, P111, P112 to the TMAU female connectors. Apply firm, even pressure to ensure proper connection. (See Figure 3-7 on Page 3-12 for installation and Figure 3-27 on Page 3-43 for wiring.)

3. Secure the three plastic stand-off tabs and install screws in the upper right and lower left corners.

4. Set decibel (dB) PAD switches SW101, SW201, SW301, and SW401 to the appropriate position. Switches are factory set at the 0 (0 dB signal level drop) position. If CO lines are connected to a PBX or are in close proximity to the central office, set to the PAD positions to 3 to provide a -3 dB signal level drop between the PBX and CO.

5. Sensitivity jumpers SW102~SW402 are used mostly for dial pulse operation to adjust for dial pulsing at different loop lengths. If close to the CO, the sensitivity should be set to low (L). As the loop length increases, set it to high (H).

6. Insert the TDDU into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors.

TDDU Programming

Program 03: Specify Code 16 for slots that will support TDDUs. Make sure DTMF operation is enabled.

Note   Program 03 can be skipped and Program 91 run instead.

Program *09: Assigns DID line extensions to route to station [PDNs].

Program 10-1: Enables or disables Two-line Conference.

Program 15: Assigns DTMF/Dial Pulse dialing, and additional attributes to each line.

Program *15: Makes tenant assignments.

Program 16: Assigns lines to line groups.

Program *17: Assigns intercept port for DID calls to wrong or vacant numbers.

Program 17: Tie and DID line options.

♦ Assigns Immediate or Wink start to DID lines and auto camp-on and no-dial tone return for DID lines.

♦ Assigns DID lines to route per DNIS and ANI options (Program 71 and 72) or DID numbers (Program *09).

Program 30: Disables RRCS for dial pulse operation.

Program 40: Assigns station access to lines (incoming and outgoing).

Program 41: Assigns station access to lines (outgoing only).

Program 42-0, 1~8: Assigns behind PBX/Centrex operation to each line.

Programs 45~48: Defines Toll Restriction for any line.

Programs 50~56: Defines Least Cost Routing assignments.

Programs 71 (1~5): Assigns DNIS or ANI option to DID lines.

Programs *71~*73: Assigns telephone to ring called [DN].

Program 93: Assigns names to lines.

The TDDU provides four DID lines and uses four station ports when installed.
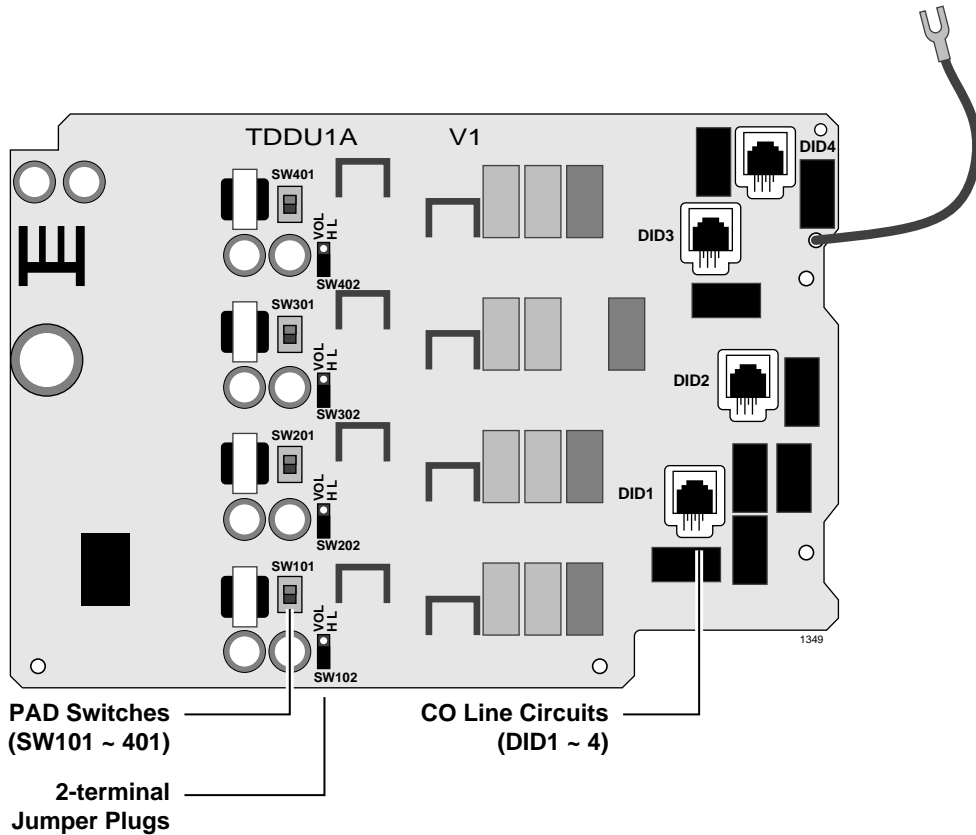
Figure 3-22   DK40i DID CO Line Board (TDDU)

Table 3-8   TDDU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
CO line busy LEDs 1~4 (DID1~DID4)	Red LED	Lights to indicate DID line circuit is operating. Trunk indicator will not light unless TDDU is connected to a DID line.
CO line connector (DID)	Modular connector	Interface connector for CO line (DID) circuits.
PAD switch SW202, SW302, SW402 (circuits 1~4)	Two-position slide	Enables 3dB signal level drop for CO line circuit (when set in PAD position).
SW102, SW202, SW302, SW402 (circuits 1~4)	2-terminal jumper plug	Adjusts for dial pulsing at different loop lengths.

CAUTION!   **Port numbers in the Expansion KSU shift by four ports if KSTU2 or TDDU is installed (or removed after it is installed). This determines whether or not the DDCB can be connected on the KCDU in slot 15.**

TSIU
Serial Interface Board

System: *DK40i Base KSU (plugs into KSU main PCB)*

Circuits per PCB: *two TTY/RS-232 interface ports*

Interfaces with: *SMDR connection for call accounting device*
                             customer-provided external modem for local/remote maintenance from a PC with
                             DK Admin

Older Version(s):   *none*

The TSIU PCB enables the DK40i system to connect to various hardware devices. It does not have an internal modem and does not support IMDU. (See Figure 3-23.)

Only one TSIU can be installed per DK40i system. When installed, the TSIU port functions are identified and enabled automatically when power is turned on and the PIOU can still be installed for zone paging. Port 01 is TTY (Program 76-1, code 1) and Port 02 is disabled (Program 76-1, code 0). If the same function is programmed for an TSIU port and a PIOU or PIOUS port, only the TSIU port functions.

The communication parameters for all TSIU TTY ports are:

- ♦ Data word bits = 7
- ♦ Parity = even
- ♦ Stop bits = 1

The communication parameters for a TSIU SMDR port is:

- ♦ Data word bits = 8
- ♦ Parity = none
- ♦ Stop bits = 1

TSIU Installation

➤ See Figure 3-23 for installation.

TSIU Programming

Program 03: No assignment is necessary. TSIU is automatically enabled when installed and power is turned ON. It is not assigned to a slot.

Program 76-1X-Y: Assigns each installed TSIU port to a function. Where X identifies the TSIU port number (1~4) and Y identifies the TSIU port function:

- ♦ Y=1, RS-232 TTY (Program 77-1, LED 14 OFF)
- ♦ Y=2, SMDR
- ♦ Y=4, SMDI
- ♦ Y=0, No function - this should be used for any TSIU ports that are not used.

Note   Function codes set in Program 76-1X-Y override PIOU and/or PIOUS function codes 41 set in Program 03.

Program 76-2X-Z: Assigns each installed TSIU port to operate at a specified transmission rate. Where X identifies the TSIU Port number (1, 2). Z identifies the TSIU/port transmission rate in bits-per-second (bps):

- ♦ Z=1; 9600
- ♦ Z=2; 4800
- ♦ Z=3; 2400
- ♦ Z=4; 1200

Note The sum of TSIU port 1 and port 2 bps rate cannot exceed 9600 bps.
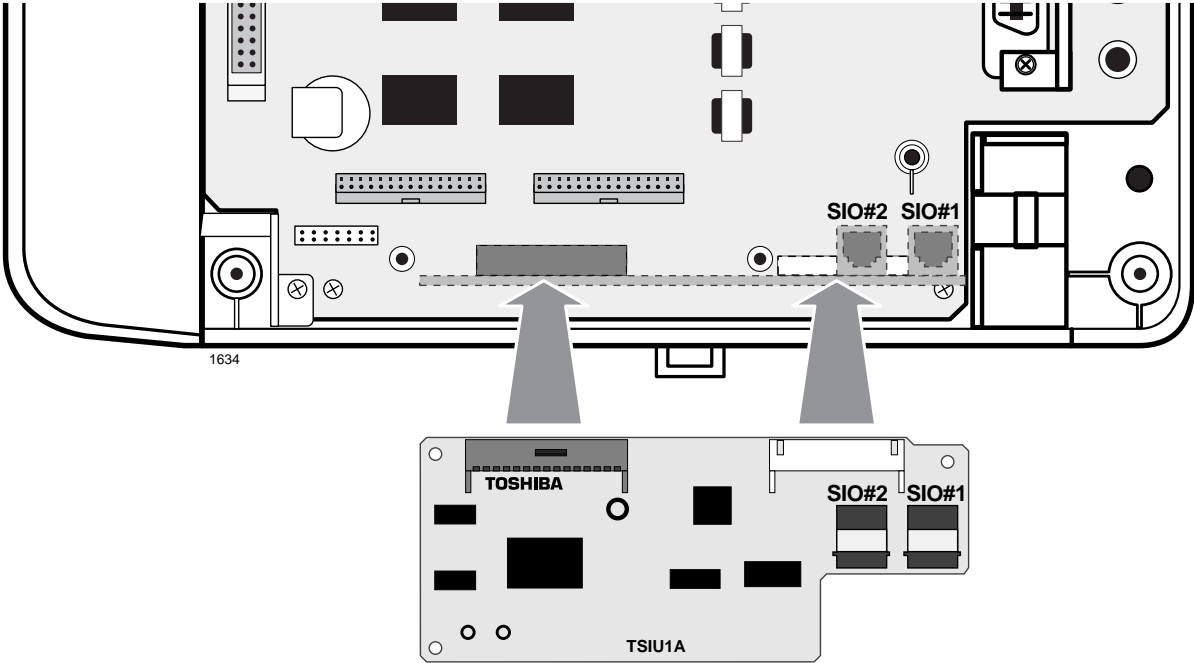
Figure 3-23   Serial Interface Board (TSIU) Installation

Universal Slot PCBs

The following PCBs can be used in the universal slots of either the Strata DK40i Expansion KSU or the Strata DK424 cabinets (see Table 3-9).

Table 3-9   Universal Slot PCB Descriptions

PCB	Title	Description	Page
KCDU	CO Line/Digital Interface Unit	Provides two loop start CO line circuits and four digital telephone circuits.	7-4
PDKU	Digital Telephone Interface Unit	Provides eight digital telephone circuits that can support the same peripherals as the digital circuits in the Base KSU.	7-6
PEKU	Electronic Telephone Interface Unit	Provides eight electronic telephone circuits that can interface with electronic telephones, an alternate BGM source, an HDSS, an external amplifier for DISA or two CO line conferencing.	7-8
PESU	Standard/Electronic Telephone Interface Unit	Provides two standard telephone or two-wire device circuits/four electronic telephone circuits in the Expansion KSU.	7-13
PIOU and PIOUS	Option Interface Unit	Provides interfaces for SMDR, IMDU and external zone paging - (PIOU only).	7-17
RCOU	CO Line Interface Unit	Adds four CO lines to the system and can only be installed in the Expansion KSU. Assigns Delayed Ringing to any CO line. You cannot piggy-back a RCOS.	7-28
RDDU	DID Line Unit	Provides four Direct Inward Dialing (DID) lines. Each line can have one office code and a block of extensions.	7-33
RDSU	Digital/Standard Telephone Interface Unit	Provides two standard telephone circuits and four digital telephone circuits.	7-36
REMU	E&M Tie Line Unit	Provides four Tie line circuits.	7-39
RGLU2	Loop/Ground Start CO Line Interface Unit	Provides four line circuits.	7-43
RSSU	PC Interface Unit	Provides two RS-232 connections.	7-51
RSTU2	Standard Telephone Interface Unit	Has eight circuits that support single-line devices, such as: rotary and push-button standard telephones, fax machines, dictation equipment, modems, a separate BGM source, off-premises stations, Toshiba voice mail (Stratagy, Stratagy DK or VP), digital announcement devices for the optional built-in auto attendant feature and customer-supplied voice mail devices.	7-53
RWIU	Strata AirLink Unit	Supports Digital Wireless Handsets: same as PDKU, except no DDSS console, Stand-alone Cordless Telephone, PDIU-DS, or DDCB.	16-36
Stratagy DK	Stratagy Voice Mail Unit	The Stratagy voice mail systems come with 2, 4, 6, or 8 voice mail ports. All of the Stratagy DK systems use 8 station ports in the DK40i and DK424 software.	10-42
RBSU/ RBSS	ISDN S/T-type Basic Rate Interface Unit and Basic Rate Interface Subassembly	RBSU provides two BRI S/T circuits. Each circuit provides two simultaneous voice and/or data connections with a single interface. The RBSS attaches to the RBSU to provide two additional BRI S/T type circuits that can be used for station-side connections only.	14-18

Loop Limits

This section provides the maximum loop lengths for connection of telephones, lines, peripheral equipment, and power supplies. The following information applies to only the Strata DK40i system (see Table 3-10). Diagrams that are applicable to all systems, including the DK40i, can be found in Chapter 8 – DK40i/DK424 Universal PCB Wiring.

Table 3-10   Digital Telephone/DIU/DDSS Console/ADM/Loop Limits

Mode	DK40i KSU or Battery Backup[1]	Maximum line length (24 AWG)				
		1 Pair feet	1 Pair meters	2 Pair[2] feet	2 Pair[2] meters	1 Pair plus external power[3]
DKT or Cordless base Ringing (Volume Max)	DK40i KSU	1000	303			
	Battery Backup	675	204			
DKT with DVSU (OCA)	DK40i KSU	1000	303			
	Battery Backup	495	150	1000	303	
DKT with HHEU or Carbon Handset	DK40i KSU	1000	303			
	Battery Backup	330	100			
DKT with PDIU-DI/ PDIU-DI2/RPCI-DI	DK40i KSU	495	150			
	Battery Backup	165	50	675	200	
PDIU-DS	DK40i KSU	1000	303	1000	303	1000 feet 303 meters
	Battery Backup	675	204	1000	303	
DKT with HHEU and RPCI-DI/PDIU-DI/PDIU-DI2	DK40i KSU	495	150	1000	303	
	Battery Backup	33	10	330	100	
DDSS2060A	DK40i KSU	1000	303			
	Battery Backup	500	151			
DDCB	DK40i KSU	1000	303			
	Battery Backup	500	151	1000	303	
DKT with DVSU and HHEU	DK40i KSU	1000	303			
	Battery Backup	165	50			
DKT with ADM	DK40i KSU	675	204			
	Battery Backup	165	50			

1. Battery backup applies to instances when the system is being powered by batteries exclusively.

2. Digital telephones and other digital devices can operate at maximum lengths with two pair wiring or an external power source.

3. Digital cable runs must *not* have the following:

    Cable splits (single or double)
    Cable bridges (of any length)
    High resistance or faulty cable splices

DK40i Installation

DK40i Secondary Protection

The following diagram (see Figure 3-24) shows where secondary protectors must be installed for outside wiring.
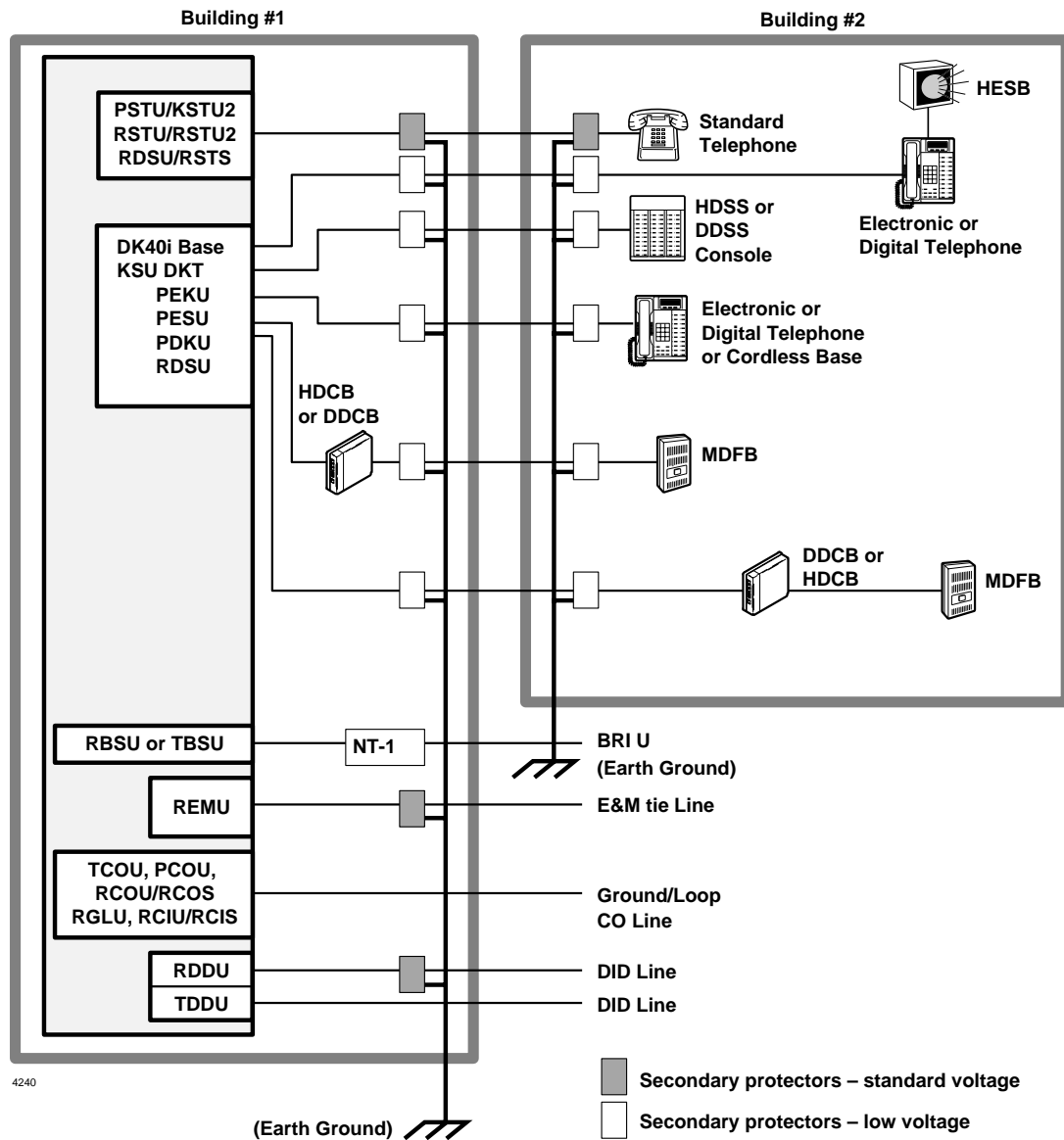
Figure 3-24 DK40i Secondary Protector Diagram

Important!   *To protect against transient voltages and currents, solid state secondary protectors must be installed if there is outside wiring, and on all DID and E&M Tie lines. These protectors, which contain fast semiconductors in addition to fuses, shall comply with the requirements for secondary protectors for communication circuits, UL 497A. Care must be taken to ensure that they are very well grounded to a reliable earth ground. Recommended protectors are available in the fast Series 6 line from ONEAC Corp., Libertyville, Illinois 60048, (800) 327-8801. Install and test the secondary protectors precisely to the installation instructions of thee manufacturer.*

MDF Wiring Diagrams

Wiring diagrams for the DK40i (listed below) are shown in Figures 3-25~3-27.

♦ MDF Wiring to KSU & Amphenol Station and Relay Connectors (KSTU2)

♦ MDF Wiring to CO Lines and Digital Telephones (KCDU)

♦ MDF Wiring to CO Lines (TCOU and TDDU)

See Chapter 8 – DK40i/DK424 Universal Wiring Diagrams for more information.
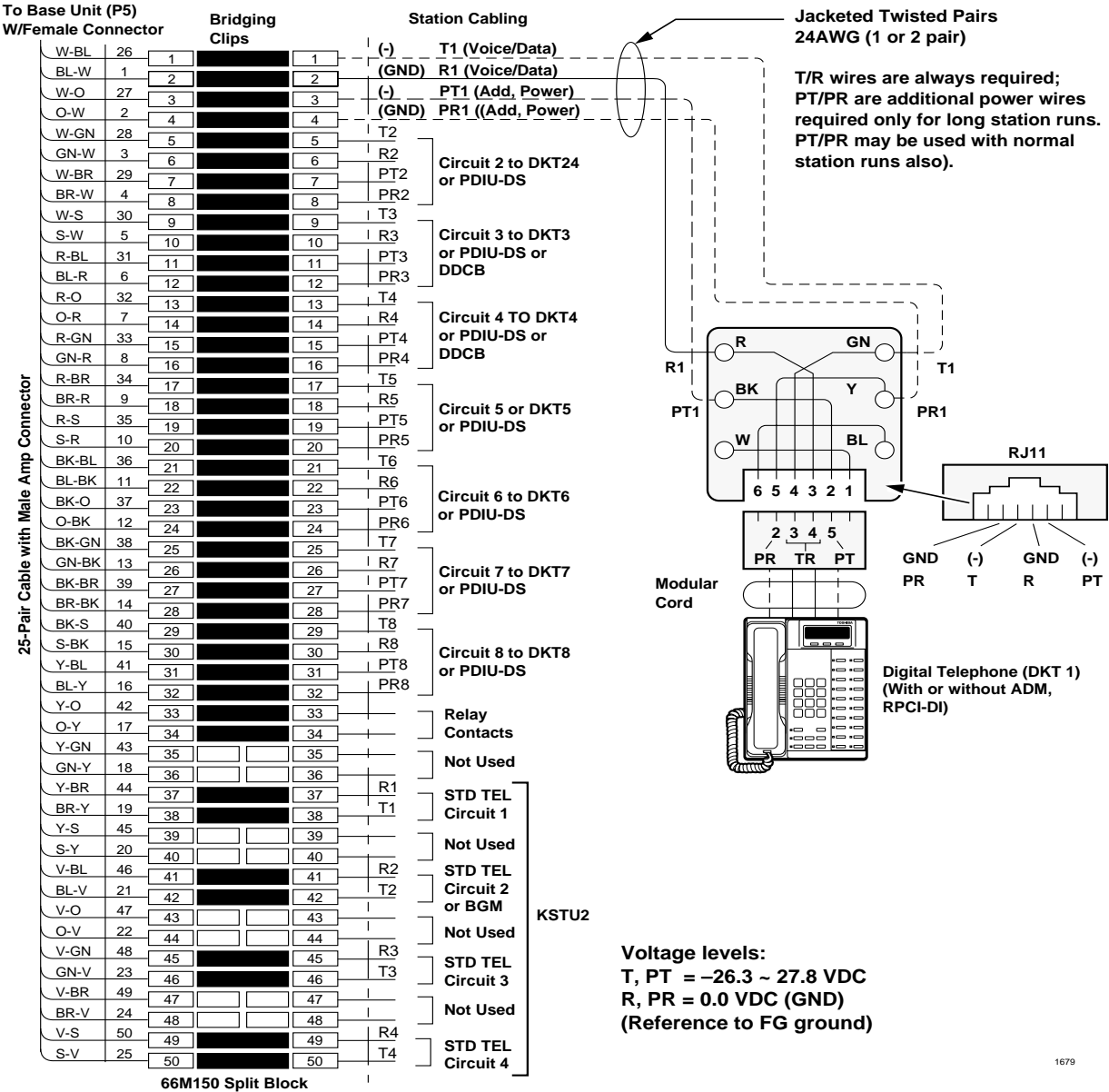
Note See Table 3-10 on Page 3-39 for loop limits.

Figure 3-25 MDF Wiring to KSU & Amphenol Station and Relay Connectors (KSTU2)

CO LINE CABLING

NETWORK JACK: RJ14C
FIC: 02LS2

KCDU
PIN-OUT

STATION CABLING
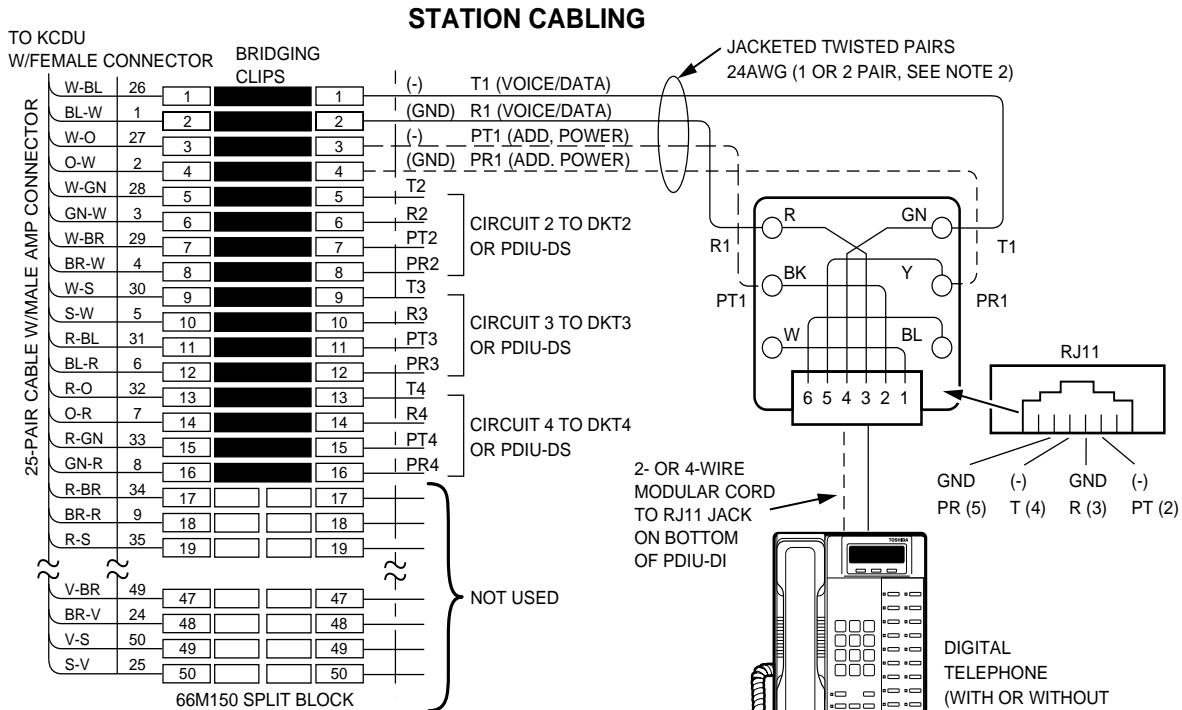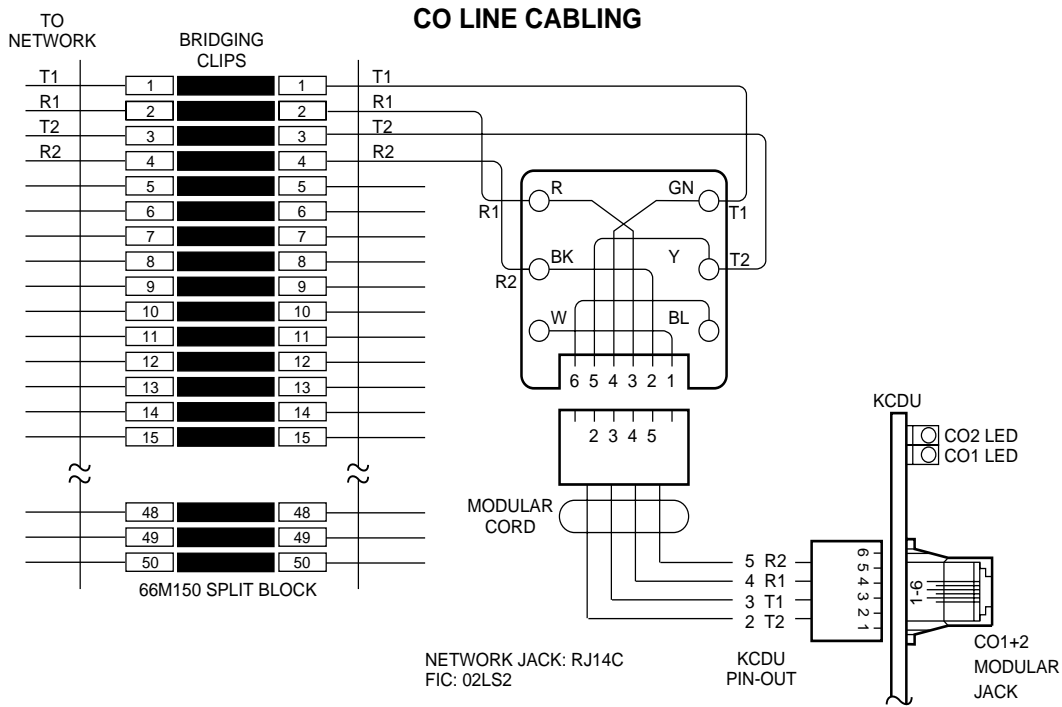
Notes

1. Voltage levels:

   T, PT = -26.3 ~ 27.8 VDC
   R, RP = 0.0 VDC (GND) (Reference to SG ground)

2. T/R wires are always required; PT/PR are additional power wires required only for long station runs or when operating on reserve power per Table 3-10. PT/PR may be used with normal station runs also.

Figure 3-26 MDF Wiring to CO Lines and Digital Telephones (KCDU)
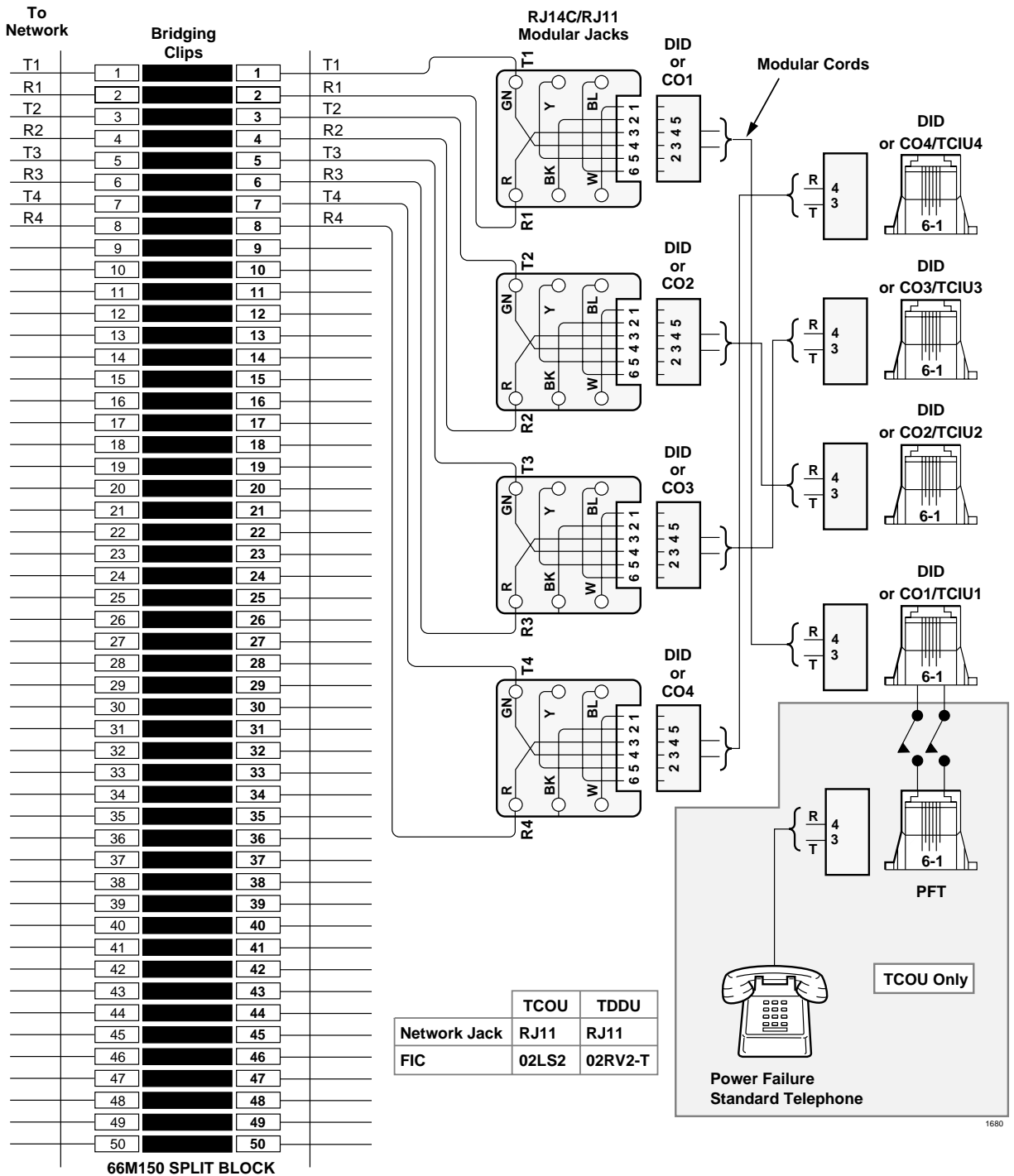
Figure 3-27   MDF Wiring to CO Lines (TCOU and TDDU)

	TCOU	TDDU
Network Jack	RJ11	RJ11
FIC	02LS2	02RV2-T

DK424 Configuration 4

This chapter explains how to configure the Strata DK424 system. The system has a modular design which enables it to support a number of station and CO line configurations. The main component of the system is the common control unit (RCTU) Printed Circuit Board (PCB).

The focus of this chapter is a series of worksheets, providing a systematic procedure for determining the system's size. The worksheets also provide space to record the hardware and station devices that make up the system. Tables and example worksheets are included to assist you in filling out the worksheets.

Important! *Prior to Release 4, Tie and DID lines used station ports. With Release 4.0 and higher processors, these lines do not use station ports, allowing larger capacity systems when Tie and DID lines are required.*

System Configuration

Important!

System Configuration can be complex and time consuming. For best results:

♦ *Use DKQuote to provide easy, fast, automated configuration. It runs on an IBM-compatible Pentium® PC or higher, equipped with a 110MB or larger hard drive, a 3.5" 1.44 MB high density floppy disk drive, 16MB RAM, and Windows® 98/95 or Windows NT®. See the DKQuote User Guide for more information.*

♦ *If the above software is not available, use the Worksheets in this chapter.*

The DK424's main components are: the DK424 Base Cabinet (DKSUB424), DK424 Expansion Cabinets (DKSUE424), and four system processors (RCTUA4, RCTUBA3/BB4, RCTUC3/D4, and RCTUE3/F4). The processor used in the system depends on the features and number of telephones and CO lines required. Each cabinet is shipped with its required Power Supply (RPSU280); the same power supply used in DK280 cabinets.

See Chapter 5 – DK424 Installation for detailed information on installing RCTU PCBs.

Base Cabinet

The DK424 Base Cabinet provides two designated slots for the RCTU processor and six universal slots for station, line, and feature PCBs. It provides six connectors for expanding the system to a maximum of six Expansion Cabinets. It comes with a Motherboard Jumper Unit (MBJU) installed between the R11 and RCTU slot on the front side of the backplane motherboard. The MBJU is removed only when RCTUE/F is installed. MBJU is installed for all other DK Release 1~4 RCTU processor PCBs.

Expansion Cabinets

Cabinet and Universal Slot Capacity: Up to six DK424 Expansion Cabinets can be connected to a DK424 Base Cabinet. The number of DK424 Expansion Cabinets allowed depends on which processor is installed in the DK424 Base Cabinet.

The DK424 Expansion Cabinets support either six or eight universal slots, depending on which processor is installed in the DK424 Base Cabinet.

♦ All Expansion Cabinets are six slot cabinets except DK424 Expansion Cabinets. DK424 Expansion Cabinets provide eight slots, but only when connected to a DK424 Base Cabinet controlled by an RCTUE3/F3 processor with the MBJU removed.

♦ No DK424 Expansion Cabinets are allowed when connected to the DK424 Base Cabinet with an RCTUA processor installed.

♦ One DK424 Expansion Cabinet provides six universal slots when connected to the DK424 Base Cabinet with an RCTUBA/BB processor installed.

♦ Up to five DK424 Expansion Cabinets provide six universal slots each, when connected to the DK424 Base Cabinet with an RCTUC/D processor installed.

♦ Up to six DK424 Expansion Cabinets provide eight universal slots each, when connected to a DK424 Base Cabinet with an RCTUE/F processor installed.

Table 4-1 shows DK424 cabinet and slot capacities for Release 3 and 4 processors.

Table 4-1   DK424 Cabinet and Expansion Slot Capacities

Processor in DK424 Base Cabinet[1]	DK424 Expansion Cabinets Allowed	Universal Slots allowed per...		
		Base Cabinet	Expansion Cabinet	System
RCTUA	0	1~6	0	6
RCTUBA/BB	1	1~6	1~6	12
RCTUC/D	5	1~6	1~6	36
RCTUE/F	6	1~6	1~8[2]	54

1. All cabinets are DK424.

2. Only the RCTUE/F processor allows up to eight universal slots in the DK424 Expansion Cabinet.

DK424 and DK280 Compatibility

DK424 cabinets replace DK280 cabinets in the DK product line structure. DK424 Expansion Cabinets began shipping in June 1995 and DK424 Base Cabinets in February 1997. All old DK280 Release 1~3 processors and DK280 Base/Expansion Cabinets can be mixed with new DK424 Base and Expansion Cabinets with the following criteria (see Tables 4-2 and 4-3):

Table 4-2   DK280 Base with DK280 and/or DK424 Expansion Cabinets

Processor in DK280 Base Cabinet	Expansion Cabinets Allowed	Universal Slots allowed per...		
		Base Cabinet	Expansion Cabinet	System
RCTUA1, RCTUA3, RCTUA4	0	1~6	0	6
RCTUB1, RCTUB2, RCTUBA3/BB3 or RCTUBA3/BB4	1	1~6	1~6	12
RCTUC/D2, RCTUC3/D3, RCTUE3/F3 RCTUE3/F4	5	1~6	1~6	36

Table 4-3   DK424 Base with DK280 and/or DK424 Expansion Cabinets

Processor in DK424 Base Cabinet	Expansion Cabinets Allowed	Universal Slots allowed per...		
		Base Cabinet	Expansion Cabinet	System
RCTUA1, RCTUA3, RCTUA4	0	1~6	0	6
RCTUB1, RCTUB2, RCTUBA3/BB3 or RCTUBA3/BB4	1	1~6	1~6	12
RCTUC/D2, RCTUC3/D3, RCTUC3/D4	5	1~6	1~6	36
RCTUE3/F3 RCTUE3/F4	6[1]	1~6	1~6 for DK280 Exp. Cabs. 1~8 for DK424 Exp. Cabs.	36~54[2]

1. Last Expansion Cabinet must be a DK424.

2. Depends on the combination of Expansion Cabinets.

♦ DK424 and DK280 Cabinets can be mixed in any combination, with one exception. If seven cabinets are required, an RCTUE/F processor *must* be installed in a DK424 Base Cabinet and the sixth Expansion Cabinet must be a DK424. In this case DK280 Expansion Cabinets provide six universal slots and DK424 Expansion Cabinets provide eight universal slots.

♦ DK280 and DK424 Base Cabinets provide six universal slots maximum in any configuration and any RCTU processor can be installed.

♦ DK280 Expansion Cabinets provide six universal slots maximum in any configuration.

♦ DK424 Expansion Cabinets provide six universal slots maximum in any configuration with a DK280 Base Cabinet, including a DK280 Base Cabinet with an RCTUE/F processor.

♦ DK424 Expansion Cabinets provide eight universal slots in one configuration only: when connected to a DK424 Base Cabinet controlled by an RCTUE/F processor (MBJU jumper must be removed - see installation for details). DK424 cabinets provide six universal slots in all other configurations.

♦ An RCTUE/F processor can be installed in a DK280 Base Cabinet. When an RCTUE/F processor is installed in a DK280 Base, only five Expansion Cabinets (DK424 and/or DK280) can be installed. These Expansion Cabinets provide only six universal slots.

♦ All older DK280 Release 1~3 processors will function in the DK424 Base Cabinet. The features available depend on the respective release and type of the RCTU. These processors include RCTUA1, RCTUA3, RCTUB1, RCTUB2, RCTUBA3/BB3, RCTUC1/D2 and RCTUC3/D3.

  ♦ When an older processor is installed in the DK424 Base Cabinet, the DK424 and DK280 Expansion Cabinets provide six universal slots and the MBJU jumper must be installed - see RCTU installation for details.

  ♦ RCTUA in a DK424 Base allows no Expansion Cabinets.

  ♦ RCTUB or RCTUBA/BB in a DK424 Base allows one DK424 or DK280 Expansion Cabinet with six universal slots.

  ♦ RCTUC/D in a DK424 Base allows up to five DK424 and DK280 Expansion Cabinets in any combination. These Expansion Cabinets provide six universal slots.

Designated Speaker OCA, DIU Data, and T1 slots

DK424 systems require that PDKU2 PCBs that support Speaker Off-Hook-Call-Announce (OCA) and PDIU-DS and RPCI-DI PCBs for data applications must be placed in the slots designated in Tables 4-4 and 4-5.

Note PDKU2s that support Handset OCA and RPCI TAPI-only can operate in any slot.

Additionally, to enable T1/DS-1 interface, the RDTU PCB(s) must be placed in certain slots, with corresponding slots left vacant. (The operation of certain channels necessitates vacant slots.) RDTU PCBs can be placed in the slots in bold type; the vacant slots are not in bold in the following tables.

Example: for cabinet 1, if an RDTU is placed in slot 13 and you want to use RDTU channels 17~24, then slot 14 must be left vacant. If you installed a second RDTU, it would go into slot 15; slot 16 must also be vacant if you want to use RDTU channels 17~24.

Table 4-4   DK424 or DK280 Base Cabinet with MBJU Removed

Cabinet		Total Universal Slots	PDKU2 Data and Speaker OCA Slots	RDTU[1]/Vacant Slots		
No.[2]	Type					
1	DK424 (base)	6	11, 12, 13, 14, 15, 16	**13**/14[3]	**15**/16[3]	
2	DK280	6	21, 22, 23, 24, 25, 26,	**21**/22[3]	**23**/24[3]	**25**/26[3]
2	DK424	8	21, 22, 23, 24	**21**/22[3]	**23**/24[3]	**25**/27[4]/26[5]
3	DK280	6	31, 32	**31**/32[3]	**33**/35[4]/34[5]	
3	DK424	8	31, 32, 37, 38	**31**/32[3]	**33**/35[4]/34[5]	**37**/38[3]
4	DK280	6	41, 42	**41**/42[3]	**43**/45[4]/44[5]	
4	DK424	8	41, 42, 47, 48	**41**/42[3]	**43**/45[4]/44[5]	**47**/48[3]
5	DK280	6	51, 52	**51**/52[3]	**53**/55[4]/54[5]	
5	DK424	8	51, 52, 57, 58	**51**/52[3]	**53**/55[4]/54[5]	**57**/58[3]
6	DK280	6	61, 62	**61**/62[3]	**63**/65[4]/64[5]	
6	DK424	8	61, 62, 67, 68	**61**/62[3]	**63**/65[4]/64[5]	**67**/68[3]
7	DK280	6	Cannot be seventh cabinet			
7	DK424	8	No Data & Spkr OCA	**71**/77[4]/72[5]	**73**/75[4]/74[5]	

Table 4-5 pertains to a DK424 Base Cabinet with RCTU-A1, A3, A4, B2, BA3/BB3 or BA3/BB4, C1/D2, C3/D3 or C3/D4 with MBJU or a DK280 Base Cabinet with RCTU-A1, A3, A4, B2, BA3/BB3, BA3/BB4, C1/D2, C3/D3, C3/D4, E3/F3, E3/F4.

Table 4-5   DK424 or DK280 Base Cabinet with MBJU

Cabinet		Total Universal Slots	PDKU2 Data and Speaker OCA Slots	RDTU[1]/Vacant Slots		
No.[2]	Type					
1	DK424 or DK280 (base)	6	11, 12, 13, 14, 15, 16	**13**/14[3]	**15**/16[3]	
2	DK424 or DK280	6	21, 22, 23, 24, 25, 26	**21**/22[3]	**23**/24[3]	**25**/26[3]
3	DK280 or DK424	6	31, 32	**31**/32[3]	**33**/35[4]/34[5]	
4	DK280 or DK424	6	41, 42	**41**/42[3]	**43**/45[4]/44[5]	
5	DK280 or DK424	6	51, 52	**51**/52[3]	**53**/55[4]/54[5]	
6	DK280 or DK424	6	61, 62	**61**/62[3]	**63**/65[4]/64[5]	

These footnotes apply to Tables 4-5 and 4-6:

1. RCTUA does not support RDTU.
2. RCTUB and RCTUBA/BB supports cabinets 1 and 2 only.
3. Slot must be vacant for RDTU channels 17-24 (2-slot RDTU positions).
4. Slot must be vacant for RDTU channels 9-16 (3-slot RDTU positions).
5. Slot must be vacant for RDTU channels 17-24 (3-slot RDTU positions).

DK280 to DK424 Upgrades

To upgrade an existing DK280 Base Cabinet to a DK424 Base Cabinet with an RCTUE/F processor, see "DK280 to DK424 Base Cabinet Upgrade Considerations" on Page 5-52.

DK424 Configuration

Features Capacities

The features and capacities of DK424 system processors are provided in Tables 4-6~4-8.

Table 4-6   System Feature Capacities

Features	DK14	DK40i	DK424			
			RCTUA	RCTUBA/BB	RCTUC/D	RCTUE/F
Amplified Conferencing [1]	0	2	4	4	4	4
Auto Attendant (built-in) simultaneous announcements	3	5	12	12	24	24
Caller ID/ANI/CNIS Abandoned Call Numbers: stored per station	10~100	10~100	10~100	10~100	10~100	10~100
Caller ID/ANI/CNIS Abandoned Call Numbers: stored per system	200	200	200	400	1000	2000
CO Line Groups	4	8	8	8	16	16
Distributed Hunt (DH) Calls in Queue per Groups	10	10	10	10	10	10
DH Groups	16	16	16	16	16	16
DH stations per Group	8	28	32	32	32	32
DNIS Network Routing Numbers	0	100	100	200	300	300
DNIS Numbers	0	200	200	350	500	500
DTMF receivers	3	5	12	12	24	24
External Page Zones	0	4	4	4	4	8
Call Park Orbits - general	20	20	20	20	20	20
Call Park Orbits - individual	10	28	32	80	240	336
Personal LCD Messages per DKT [2]	10	10	10	10	10	10
Personal Message DKTs	8	16	16	32	96	96
[PhDNs] per System	10	28	32	80	240	336
[PDNs] per System	10	28	32	80	240	336
Ring Tones	3	3	3	3	3	3
Simultaneous Party Conferencing (4-party)	2	3	3	7	7	14
Simultaneous Two-CO Line conferencing (3-party)	2	4	4	10	10	20
Station Speed Dial	40	40	40	40	40	40
Stratagy DK Systems (per tenant group)	1	1	1	1	1	1
Stratagy DK Systems (per system)	0	2	2	2	4	4
System LCD Messages	40	40	40	40	40	40
System Speed Dial	40	40	40	100	100	800
Telephone Page Groups	5	5	5	5	9	9
Telephone Group Page – simultaneous stations paged	8	28	32	80	120	120
Telephone Pickup Groups	8	20	20	20	20	20
Tenants	2	2	2	4	4	4
Toll Restriction (AC/OC) Table	8	8	8	8	16	16
Toll Restriction Classes	4	4	4	4	8	8
Verified Account Codes	300	300	300	300	300	500
Voice Mail SMDI	Yes	Yes	Yes	Yes	Yes	Yes

1. Requires additional customer-supplied hardware.
2. Personal Messages includes: timed reminder memo and station speed dial memo.

Table 4-7   Line Capacities and Universal Printed Circuit Board Slots

Lines and PCB Slots	DK14	DK40i	DK424			
			RCTUA	RCTUBA/BB	RCTUC/D	RCTUE/F
Universal slots	0	4 [1]	6	12	36	54
CO lines – loop start	4	12 [2]	16 [2]	48 [2]	144 [2]	200 [2]
CO lines – ground start	0	12	16 [2]	40 [2]	136 [2]	200 [2]
DID lines (analog)	0	12	16 [3]	40 [3]	136 [3]	200 [3]
Tie lines (analog)	0	12	16 [3]	40 [3]	136 [3]	200 [3]
T1 (DS-1) lines each)	0	0	0	48 [4]	144 [4]	192 [4]
ISDN BRI (S/T or U) B channel lines	0	0	8 [5]	16 [5]	16 [5]	16 [5]
ISDN PRI (T) B channel lines	0	0	0	47 [6]	141 [6]	188 [6]
Squared System Maximum (lines + stations)	4 lines + 4 stations	12 lines + 12 stations	16 lines + 16 stations	48 lines + 48 stations	144 lines + 144 stations	200 lines + 200 stations

1. There are four universal slots in the DK40i expansion unit.
2. All CO line capacities assume a PIOU, PIOUS, PEPU, RSSU, or RSIU is installed for RCTUBA/BB, RCTUC/D or RCTUE/F, but no Caller ID RCIU2/RCIS PCBs.
3. Limits apply to analog DID and Tie lines, not T1 DID/Tie lines.
4. T1 lines can be loop start, ground start, Tie, or DID (maximum 24 lines per unit, any type or combination).
5. BRI lines provide CO line services, including Caller ID, DID and Direct Inward Lines (DIL).
6. PRI lines provide CO line services, including Caller ID, ANI, DID, Tie, POTS, FX and DIL.

Table 4-8   Station and Peripherals Capacities

Stations	DK14	DK40i	DK424			
			RCTUA	RCTUBA/BB	RCTUC/D	RCTUE/F
Add-on modules (DADM)	8	12	12	40	120	200
Attendant consoles	0	0	0	2	4	4
DKT 2004-CT Cordless Telephones	8	28	32	80	240	336
DKT 2004-CT simultaneous calls	8	9	9	9	9	9
Door locks	2	3	4	5	5	5
Door phones (MDFB)	6	9	9	12	12	12
DSS consoles	0	3	3	4	8	8
ISDN BRI station circuits TE-1 and TA (2B+D per circuit) [1]	0	0	8	24	48	72
Handset OCA stations	8	28	32	80	240	336
Off-premise stations	2	20	32	80	232	328
PDIU-DS [2]	7	24	31	79	160	208
RPCI-DI used for data + TAPI, per system [2]	8	24	32	80	144	200
RPCI-DI used for TAPI only: per cabinet [2]	N/A	N/A	32	40	40	40
RPCI-DI used for TAPI only: per system [2]	8	24	32	80	186	280
Speaker OCA stations [2]	8	28	32	80	160	208
Standard stations	2	20	24	72	232	328
Telephones – DKT	8	28 [3]	32 [4]	80 [4]	240 [4]	336 [4]
Telephones – EKT	0	16 [3]	32 [4]	80 [4]	240 [4]	328 [4]

1. ISDN BRI TE-1 and TA include ISDN telephones, modems, video conference interfaces, etc. Up to two stations (TE-1 and/or TA) can connect to and share one BRI S-type circuit. Only one station can connect to a BRI U-type circuit.
2. Speaker OCA, PDIU and RPCI capacity is determined by 2B channel slot availability and power supply limits.
3. To install the maximum of 28 total DKTs and EKTs in the DK40i, up to 16 of the stations can be EKTs and at least 8 of the stations must be DKTs.
4. Maximum capacity of DKT/EKT stations per DK424 cabinet is 62, less for EKT 2000, 3000 (Power Factor limitation).

DK424 Configuration

System Capacity

The number of CO lines and stations needed determine the size of the system. Tables 4-9 and 4-12 show the station and line capacities for eight-port RCOU/RCOS CO line PCBs.

There is a trade-off between stations and lines. Every group of eight stations installed decreases the CO line capacity of the system by eight, and vice versa. The exact hardware requirements depend on the features required.

Tables 4-9~4-12 assume one cabinet slot is used for an Optional Interface PCB.

Table 4-9   Strata DK424 Expansion Cabinet Configuration for Eight-Port CO Line PCBs Without Caller ID

1 Cabinet RCTUA		2 Cabinets RCTUB or RCTUBA/BB		3 Cabinets RCTUC/D		4 Cabinets RCTUC/D		5 Cabinets RCTUC/D		6 Cabinets RCTUC/D		7 Cabinets RCTUE/F	
CO Lines	Stations	CO Lines	Stations	CO Lines	Stations	CO Lines	Stations	CO Lines	Stations	CO Lines	Stations	CO Lines	Stations
16	32	48	40	72	64	96	88	120	112	144	136	200	224
		44	40	68	64	92	88	116	112	140	136	196	224
		40	48	64	72	88	96	112	120	136	144	192	232
		36	48	60	72	84	96	108	120	132	144	188	232
		32	56	56	80	80	104	104	128	128	152	184	240
		28	56	52	80	76	104	100	128	124	152	180	240
		24	64	48	88	72	112	96	136	120	160	176	248
		20	64	44	88	68	112	92	136	116	160	172	248
		16	72	40	96	64	120	88	144	112	168	168	256
		12	72	36	96	60	120	84	144	108	168	164	256
		8	80	32	104	56	128	80	152	104	176	160	264
				28	104	52	128	76	152	100	176	156	264
				24	112	48	136	72	160	96	184	152	272
				20	112	44	136	68	160	92	184	148	272
						40	144	64	168	88	192	144	280
						36	144	60	168	84	192	140	280
						32	152	56	176	80	200	136	288
						28	152	52	176	76	200	132	288
						24	160	48	184	72	208	128	296
								44	184	68	208	124	296
								40	192	64	216	120	304
								36	192	60	216	116	304
								32	200	56	224	112	312
										52	224	108	312
										48	232	104	320
										44	232	100	320
										40	240	96	328
												92	328
												88	336
												84	336

Table 4-10   CO Loop Start Analog Lines with Caller ID Maximum Capacities

1 Cabinet RCTUA		2 Cabinets RCTUBA/BB		3 Cabinets RCTUC/D		4 Cabinets RCTUC/D		5 Cabinets RCTUC/D		6 Cabinets RCTUC/D		7 Cabinets RCTUE/F	
Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations
8	24	24	40	40	56	56	72	72	88	88	104	136	152
		16	56	32	72	48	88	64	104	80	120	128	168
		8	72	24	88	40	104	56	120	72	136	120	184
				16	104	32	120	48	136	64	152	112	200
						24	136	40	152	56	168	104	216
								32	168	48	184	96	232
										40	200	88	248
												80	264

Table 4-11   CO Ground Start with Caller ID, DID and/or Tie Analog Lines Maximum Combined Capacities

1 Cabinet RCTUA		2 Cabinets RCTUBA/BB		3 Cabinets RCTUC/D		4 Cabinets RCTUC/D		5 Cabinets RCTUC/D		6 Cabinets RCTUC/D		7 Cabinets RCTUE/F	
Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations
8	16	20	24	32	40	44	48	56	64	68	72	104	112
		16	40	28	48	40	64	52	72	64	88	100	120
		8	64	24	64	36	72	48	88	60	96	96	136
				16	88	32	88	44	96	56	112	92	144
				12	96	28	96	40	112	52	120	88	160
						24	112	36	120	48	136	84	168
						20	120	32	136	44	144	80	184
						16	136	28	144	40	160	76	192
								24	160	36	168	72	208
										32	184	68	216
										28	192	64	232
												60	240
												56	256

Table 4-12   Digital, Tie, DID, Ground/Loop Start Digital T1 and ISDN PRI Lines Maximum Combined Capacities

2 Cabinets RCTUBA/BB		3 Cabinets RCTUC/D		4 Cabinets RCTUC/D		5 Cabinets RCTUC/D		6 Cabinets RCTUC/D		7 Cabinets RCTUE/F	
Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations	Lines	Stations
48	56	72	88	112	112	120	152	144	144	192[1]	240
40	64	64	96	96	120	112	160	120	168	184	248
24	72	48	104	88	128	96	168	112	176	168	264
16	80	40	112	72	136	88	176	96	192	160	272
		24	120	64	144	72	184	88	200	144	288
		16	128	48	152	64	192	72	216	136	296
				40	160	48	200	64	224	120	312
				24	168	40	208	48	240	112	320
				16	176	24	216	—	—	96	336

Notes
- T1 lines can be in increments of 8, 16 and/or 24.
- PRI channels can be in increments of 23B+1D or 47B + 1D. Each B channel represents a PRI CO line.

1. The maximum number of PRI lines for 2 cabinets is 47, 3~6 cabinets is 141 and 7 cabinets is 188.

DK424 Configuration

Tables 4-13~4-18 show system maximum capacity examples with ISDN BRI (S/T and/or U) circuits.

Table 4-13   RCTUA Maximum Capacity Examples with ISDN BRI (S/T and/or U-type) Circuits

BRI Station Circuits[1]	BRI Station B channels[1]	Other Station Circuits[3]	BRI Line Circuits[4]	BRI Line B channels[4]	Other Line Circuits[5]
8 [2]	16 [2]	16	0	0	0
6	12	16	2	4	0
5	10	16	3	6	0
4	8	16	4 [2]	8 [2]	0
4	8	16	2	4	4
3	6	16	1	2	8
2	4	24	2	4	8
1	2	28	1	2	12

Table 4-14   RCTUBA/BB Maximum Capacity Examples with ISDN BRI (S/T and/or U-type) Circuits

BRI Station Circuits [1]	BRI Station B channels [1]	Other Station Circuits [3]	BRI Line Circuits [4]	BRI Line B channels [4]	Other Line Circuits [5]
16 [2]	32 [2]	32	8 [2]	16 [2]	0
12	24	40	8	16	8
10	20	40	8	16	12
8	16	48	8	16	16
8	16	48	6	12	20
8	16	56	4	8	24
8	16	56	2	4	28
6	12	56	6	12	24
6	12	56	4	8	28
6	12	64	2	4	32
4	8	64	4	8	32
4	8	64	2	4	32
2	4	72	2	4	40

1. Each BRI circuit (S/T and/or U-type) provides two B channels plus one D channel and reduces the system capacity by two station ports and two CO lines. Each (S/T) BRI station circuit allows up to eight TE-1 and TA devices to share the BRI B channels (two simultaneous calls maximum per BRI circuit.). Each BRI-U circuit supports one TE-1 or TA device.

2. Maximum BRI capacity.

3. Other stations include Toshiba digital and electronic telephones, or attendant consoles, standard telephones and devices.

4. BRI S/T circuits are available with RBSU/RBSS PCBs and BRI-U circuits are available with RBUU/RBUS PCBs. ISDN BRI PCBs will be available with a future release of DK424 software. Each BRI line circuit (S/T or U) provides two BRI CO lines (B channels) for incoming/outgoing calls.

5. Other lines include analog and digital (T1 or PRI) loop start, ground start, DID, and Tie lines.

Table 4-15   RCTUC/D Maximum Capacity Examples with ISDN BRI (S/T and/or U-type) Circuits

BRI Station Circuits [1]	BRI Station B channels [1]	Other Station Circuits [3]	BRI Line Circuits [4]	BRI Line B channels [4]	Other Line Circuits [5]
40 [2]	80 [2]	144	82	16 [2]	48
30	60	164	8	16	68
20	40	184	8	16	88
16	32	192	8	16	96
12	24	200	8	16	104
8	16	208	8	16	112
8	16	216	4	8	120
8	16	216	2	4	124
4	8	228	2	4	132

Table 4-16   RCTUE/F Maximum Capacity Examples with ISDN BRI (S/T and/or U-type) Circuits

BRI Station Circuits [1]	BRI Station B channels [1]	Other Station Circuits [3]	BRI Line Circuits [4]	BRI Line B channels [4]	Other Line Circuits [5]
64 [2]	128 [2]	19 [2]	8 [2]	16 [2]	56
50	100	216	8	16	84
40	80	240	8	16	104
30	60	256	8	16	124
20	40	280	8	16	144
16	32	288	8	16	152
8	16	304	8	16	168
8	16	312	4	8	176
8	16	312	2	4	180
4	8	320	4	8	184
4	8	320	2	4	188
2	4	328	2	4	192

1. Each BRI circuit (S/T and/or U-type) provides two B channels plus one D channel and reduces the system capacity by two station ports and two CO lines. Each (S/T) BRI station circuit allows up to eight TE-1 and TA devices to share the BRI B channels (two simultaneous calls maximum per BRI circuit). Each BRI-U circuit supports one TE-1 or TA device.

2. Maximum BRI capacity.

3. Conventional stations include Toshiba digital and electronic telephones, or attendant consoles, standard telephones and devices.

4. BRI S/T circuits are available with RBSU/RBSS PCBs and BRI-U circuits are available with RBUU/RBUS PCBs. ISDN BRI PCBs will be available with a future release of DK424 software. Each BRI line circuit (S/T or U) provides two BRI CO lines (channels) for incoming/outgoing calls.

5. Conventional lines include analog and digital (T1 or PRI) loop start, ground start, DID, and Tie lines.

Printed Circuit Boards

The system interfaces with CO lines, stations, and peripheral devices via PCBs that plug into the Base and Expansion Cabinet slots and subassembly PCBs, that mount onto the plug-in type PCBs.

Refer to Table 4-17 for a list of station and console PCBs supported by the DK424.

Table 4-17   PCB Circuits, Interface Options and Connectors

PCB	Subassembly	Circuits	Interface Options	Connector
RPTU		(DK424 only) 1 circuit/ISDN PRI (23 B channels/1 D channel)	POTS FX Tie (senderized) Tie (cut through) OUTWATS (intra-LATA) OUTWATS (inter-LATA) InWATS	RJ48C or RJ48X ISDN TIA-568A
RBSU		2 ISDN BRI S/T point circuits (NT or TE). Each circuit is 2B+1D. (Host for the RBSS)	Network and/or station side	RJ45, ISDN TIA-568A
attaches to RBSU	**RBSS**	2 ISDN BRI, S point circuits (2B+D each)	Station side only 1 RBSS subassembly per RBSU	RJ45, ISDN TIA-568A
RBUU		(DK424 only) 2 ISDN BRI, U point circuits (2B+D each). Host for the RBUS. (Release 4.2)	Network and/or station side	RJ45, ISDN TIA-568A
attaches to RBUU	**RBUS**	2 ISDN BRI, U point circuits (2B+D each) subassembly for the RBUU. (Release 4.2)	Network and/or station side 1 RBUS subassembly per RBUU.	RJ45, ISDN TIA-568A
RDTU2		Applies to DK424 only. 1~8, 1~16, or 1~24 channels (lines), depends on system programming	Loop start lines Ground start lines Tie lines (wink or immediate) DID/DOD lines (wink or immediate)	2-pair amphenol RJ48M (All PCB amphenol connectors are female)
RMCU		2 E911 CAMA circuits with the 1 RCMS or 4 with 2 RCMSs	E911 CAMA lines	RJ11C modular
attaches to RMCU	**RCMS**	2 E911 CAMA circuits	Up to 2 RCMSs per RMCU for 4 CAMA lines max.	
REMU		4 Tie line circuits	E&M Tie lines 2- or 4-wire transmission Type I signaling Type II signaling Immediate start Wink start	REMU (8-wire modular jack) 2- or 4-wire/type I or II
KCDU		(DK40i only) 2 CO line circuits/ 4 digital telephone circuits	CO loop start lines Digital circuits same as PDKU, except no DDSS	RJ14C modular (CO Line circuits) 25-pair amphenol (digital phone circuits)
RCOU		4 CO line circuits (lines) With RCOS: 8 CO line circuits (lines)	CO loop start lines	RJ14C modular
attaches to RCOU	**RCOS**	Provides four additional Loop Start CO lines.	1 RCOS subassembly per RCOU	

Table 4-17   PCB Circuits, Interface Options and Connectors *(continued)*

PCB	Subassembly	Circuits	Interface Options	Connector
RCIU2		4 circuits With RCIS: 8 circuits	Loop or Ground Start Lines with Caller ID. Requires: RCOU, RGLU2 or PCOU	RJ14C modular
attaches to RCIU2	**RCIS**	Used with RCOU/RCOS, PCOU, and RGLU2 CO line PCBs to provide 4 Caller ID circuits.	1 RCIS subassembly per RCIU2	
RDDU		4 DID circuits	DID Lines	RJ14C modular
RGLU2		4 line circuits	Loop or ground start lines	RJ14C modular
PIOU, PIOUS, PEPU, RSSU		A PIOU or PIOUS can use an IMDU	ACD/SMIS (DK424 only, except RCTUA) SMDI for Voice Mail SMDR printer or call accounting machine PC or maintenance terminal (local or remote)	25-pair amphenol (PIOU or PEPU) Spring clip terminal (PIOUS) Two 3-pair modular (TTY/SMDR/SMDI/SMIS) (All PCB amphenol connectors are female)
attaches to PIOU and PIOUS	**IMDU**		Provides remote maintenance 300 bps or 1200 bps full-duplex modem for DKAdmin or DKBackup. 1 per PIOU/PIOUS.	None
RSTU2		8 standard telephone circuits	Standard telephones Voice mail ports Off-premises stations Other similar devices Alternate BGM source Auto Attendant digital announcer Message Waiting lamp (RSTU2 only) Fax machines ACD Announcer Strata Airlink wireless telephones	25-pair amphenol (All PCB amphenol connectors are female)
attaches to RSTU2 and RDSU	**R48S**	48VDC circuit for up to 8 standard telephone circuits	Optionally interfaces to the RSTU2 and RDSU to extend loop length of standard telephones from 600 ohms to 1200 ohms.	None
RDSU		Without RSTS: 2 standard telephone/ 4 digital telephone circuits With RSTS: 4 standard telephone/ 4 digital telephone circuits	Digital: same as PDKU, except no DDSS console Standard: same as RSTU (standard Message Waiting not available)	25-pair amphenol
attaches to RSTU2 and RDSU	**RSTS**	Provides two additional standard telephone circuits	1 maximum per RDSU	None
PESU		2 standard telephone circuits/ 4 electronic telephone circuits (standard/electronic telephone ports)	Standard: same as KSTU2 Electronic: same as PEKU, except PESU does not support HDSS console	25-pair amphenol
RATU		(DK424 only) 4 PC attendant PC console circuits	PC attendant console Conventional attendant console	25-pair amphenol

DK424 Configuration

Table 4-17   PCB Circuits, Interface Options and Connectors *(continued)*

PCB	Subassembly	Circuits	Interface Options	Connector
PDKU2		8 digital telephone circuits	Digital telephones (with or without RPCI-DI, DVSU, DADMs, or digital cordless telephone) Stand-alone digital cordless telephone DDSS console PDIU-DS DDCB	25-pair amphenol
Stratagy DK		2, 4, 6, or 8 VM ports All of the above Stratagy DK systems use 8 station ports in the DK40i and DK424 software	None	None
PEKU		8 electronic telephone circuits	Electronic telephones HDSS console Alternate BGM source EOCU PCB for OCA External conference amplifier HDCB	25-pair amphenol (All PCB amphenol connectors are Female)
attaches to PEKU or PESU	**EOCU**	Provides Speaker OCA path for 8 circuits on PEKU or 4 circuits on PESU. (Handset OCA is not available on EKTs.)	1 for PEKU or PESU that supports Speaker OCA	
RSIU (DK424 only)		Up to 4 interface ports when installed with the optional RSIS or RMDS piggy-back PCBs.	ACD/SMIS SMDI for voice mail SMDR printer or call accounting machine PC or maintenance terminal (local or remote)	One 3-pair modular (TTY/SMDR/SMDI/SMIS)
attaches to RSIU	**RSIS, RS-232 interface** **RMDS** (Modem/RS-232) (DK424 only)	Up to 3 RSISs ...or 1 RMDS and 2 RSISs per RSIU	Provides up to four interface ports (RS-232 and modem) for system interface with: RMDS (1200 or 2400 bps) Voice Mail SMDI ACD/SMIS SMDR Local or Remote Maintenance for DKAdmin or DKBackup PC.	One 3-pair modular per RSIS (RS-232), RMDS (Modem/RS-232)
RWIU		4 RJ11 jacks to support 4 Strata AirLink Integrated Base Stations	Digital Wireless Handsets: same as PDKU, except no DDSS console, Stand-alone cordless telephone, PDIU-DS, or DDCB	None

RKYS Feature Key Upgrades

The system can be upgraded for built-in AA, Automatic Call Distribution (ACD), Software Management Information System (SMIS) for ACD with feature keys that attach to the common control unit. See Table 4-18 for a list of features provided by RKYS feature keys.

Table 4-18   RKYS Features

Feature(s) Provided	RKYS1	RKYS2	RKYS3	Common Control Unit
Built-in Auto Attendant	X	X	X	Applies to all RCTUs
ACD		X	X	RCTUBA/BB, RCTUC/D or RCTUE/F
ACD with a SMIS application			X	RCTUBA/BB, RCTUC/D or RCTUE/F

Option Interface PCBs for the DK424 are listed in Table 4-19. Refer to Chapter 10 – Peripherals for further information on these options.

Table 4-19   DK424 Interface PCB Options

Interface Options	RSSU[1]	PIOU[1]	PIOUS[1]	PEPU	RSIU/RSIS[1]
Zone page interface (unamplified, 4 zones)		X			
Unamplified page output (single zone, 600 ohms, duplex)		X	X	X	
Amplified page output (single zone, 3 watts, 8 ohms)		X		X	
Night transfer or Music-on-hold control relay		X	X	X	
Door lock or external amplifier control relay		X	X	X	
Alarm Sensor		X	X		
Remote maintenance modem subassembly (IMDU or RMDS) (disables TTY output when they are piggy-backed onto the PIOU/PIOUS or RSIU/RSIS cards)[2]		X (IMDU)	X (IMDU)		X (IMDU)
Remote Maintenance using customer-provided external modem (requires TTY output port)[2]	X	X	X		X
SMDR output (RS-232/6-wire modular connector)		X[3]	X[3]		X
MIS for ACD (requires TTY output port)[2, 4]	X	X	X		X
Voice Mail SMDI (requires TTY output port)[2]	X	X	X		X
StrataControl and/or DKAdmin PC (requires TTY output port)[2]	X	X	X		X

1. PIOU, PIOUS, and RSSU each provide one TTY port which can be flexibly programmed for the features marked with X. RSIU/RSIS can provide up to four flexible TTY/SMDR ports.

2. Maintenance modem, ACD/SMIS, Insight DK, Voice Mail, SMDI and DKAdmin PC Interface each require a separate TTY output. PIOU, PIOUS, and RSSU provide one TTY output each. RSIU with RSIS PCBs provides up to four TTY outputs.

3. SMDR output will function simultaneously on the same PIOU or PIOUS with one of the following: DKAdmin, remote modem, SMIS for ACD, Insight DK, or SMDI features.

4. Insight DK, Call Center Viewer and SMIS for ACD requires that the system processor (RCTU PCB) must be equipped with an RKYS3 or higher feature key.

Telephones

The DK424 system supports Toshiba Proprietary Digital (DKT) and older series Electronic Telephones (EKTs). Standard telephones (500 or 2500 series) and devices that require a standard telephone line interface (fax, modem, VM, etc.) can also be connected to DK424.

Toshiba provides the following 2000-series Digital Telephones for Strata DK424 systems.

♦ DKT-2020SD–20-button speakerphone with LCD

♦ DKT-2010SD–10-button speakerphone with LCD

♦ DKT-2020S–20-button speakerphone

♦ DKT-2010H–10-button handsfree answerback telephone

Toshiba telephones can be equipped with optional subassemblies (listed on Page 4-33).

Attendant Position Options

The DK424 provides three options for attendant positions which answer system incoming calls. See Table 4-8 for the number of options per RCTU processor. See Table 4-20 for configuration considerations.

♦ **PC Attendant Console**–used for medium-to-heavy traffic systems where an attendant must answer and transfer incoming calls. The PC Attendant Console requires a customer-provided PC plus the RATU PCB.

Up to two consoles can be connected on systems with RCTUB or RCTUBA/BB or four with RCTUC/D (Release 2 and 3) and RCTUE/F PCBs. The RATU PCB uses four station ports in system software. RCTUC/D Release 1 and all RCTUAs do not support the attendant console.

♦ **Direct Station Select (DSS) Console**–used for medium traffic systems where an attendant must answer and transfer incoming calls. The DSS console must connect to circuit 8 on a PDKU PCB.

♦ **Digital Add-On-Module (DADM)**–used for medium traffic, smaller systems, where an Attendant must answer and transfer incoming calls. The ADM connects to any 2000-series digital telephone. The DADM shares the associated telephones circuit so it does not require a designated PCB or circuit port (see "DADM" on Page 4-33.)

Direct Station Selection (DSS) Consoles and Door Phones (MDFBs)

Up to 12 door phones can be installed in a system with DK424 RCTUB, RCTUC/D and RCTUE/F, nine with RCTUA. Each is connected to a DDCB or HDCB door phone control box. See Table 4-20 for door phone configuration considerations.

Table 4-20   DSS Console and Door Phone Configuration

Option Unit	Interface/ PCB	DK424 Capacity	Function
DDSS	PDKU2 (Circuit 8)	3-RCTUA 4-RCTUBA/BB 8-RCTUC/D 8-RCTUE/F	Digital DSS console (DDSS) can be flexibly assigned to designated electronic and digital telephone stations: Up to 8-DSS consoles may be assigned to a designated electronic or digital telephone station. It has 60-buttons which are flexibly assigned as CO line, speed dial, and DSS (no [PDN] or [PhDN]).
HDSS	PEKU (Circuits 7 and 8)	3-RCTUA 4-RCTUBA/BB 8-RCTUC/D 8-RCTUE/F	Electronic DSS console (HDSS) provides a 60-button console that functions with digital or electronic telephones. Buttons are flexibly assigned as CO line, speed dial, and DSS (no [PDN] or [PhDN]). DSS consoles can be flexibly assigned to designated electronic and digital telephone stations: Up to 8-DSS consoles may be assigned to a designated electronic or digital telephone station.
DDCB	PDKU or RDSU (Circuit 5)	4 per system: RCTUBA/BB and RCTUC/D, RCTUE/F 3 per system: RCTUA	Each Digital Door Phone/Lock control (DDCB) interfaces with up to three door phones (MDFBs) or two MDFBs and one door lock. DDCBs/HDCBs can only be connected to Ports 004, 012, 020, and 028, normally in slots 11, 12, 13, and 14, respectively. Always install DDCB/HDCB station PCBs (PDKU, RDSU, PEKU, or PESU) in slots that have lower slot numbers than RDDU, PEMU, REMU2, RATU, or RDTU PCBs.
HDCB	PEKU or PESU (Circuit 5)	4 per system: RCTUBA/BB and RCTUC/D, RCTUE/F 3 per system: RCTUA	Each Electronic Door Phone/Lock control (HDCB) provides interface for up to three door phones (MDFBs) or two MDFBs and one door lock. DDCBs/HDCBs can only be connected to Ports 004, 012, 020, and 028, normally in slots 11, 12, 13, and 14, respectively. Always install DDCB/HDCB station PCBs (PDKU, RDSU, PEKU, or PESU) in slots that have lower slot numbers than RDDU, PEMU, REMU2, RATU, or RDTU PCBs.
MDFB (Door Phone)	DDCB or HDCB	12 per system: RCTUBA/BB, RCTUC/D, RCTUE/F 9 per system: RCTUA	Door phone (MDFB) with two-way talk path to system telephones. Includes microphone for talkback amplifier with HESB. Doorbell rings designated digital and electronic telephones.

Notes

DSS (DDSS and HDSS) Console

♦   No additional hardware is required for DSS consoles.
♦   DSS consoles are assigned to associated digital and electronic telephones in programming.
♦   DSS consoles cannot be connected to RDSU or PESU electronic circuits.

Door Phone

♦   DK424 can support as many as 12 MDFBs. See Table 4-8.
♦   Each DDCB requires one circuit (Circuit 5) on a PDKU or RDSU, and each HDCB requires one circuit (Circuit 5) on either a PEKU or PESU.
♦   One door lock control can be configured on each DDCB and HDCB in place of one door phone.

AC and Reserve Power Hardware

Detailed information for AC and reserve battery power installation is described in Chapter 5–DK424 Cabinet Installation. These optional assemblies may be required, see Table 4-21.

♦ RBTC1A-2M and PBTC-3M–Battery connecting cables.

♦ RC7C1A-1.7M–Seventh cabinet battery and data cable kit.

♦ RBDB2–Battery power distribution box for up to seven cabinets.

♦ RPSB1 and RPSB2–three-outlet AC power strips, for requirements.

Table 4-21   Power Strip (RPSB) Requirements

Local Electric Code Requirement	Quantity of RPSB1 and RPSB2 Power Strips Needed[1]						
	1 Cabinet	2 Cabinets	3 Cabinets	4 Cabinets	5 Cabinets	6 Cabinets	7 Cabinets
Two AC power cords allowed from system.	0 - RPSB1 0 - RPSB2	0 - RPSB1 0 - RPSB2	1 - RPSB1 0 - RPSB2	1 - RPSB1 0 - RPSB2	2 - RPSB1 0 - RPSB2	2 - RPSB1 0 - RPSB2	2 - RPSB1 1 - RPSB2
Only one AC power cord allowed from system.	0 - RPSB1 0 - RPSB2	1 - RPSB1 0 - RPSB2	1 - RPSB1 0 - RPSB2	1 - RPSB1 1 - RPSB2	1 - RPSB1 1 - RPSB2	2 - RPSB1 1 - RPSB2	N/A

1. High current carrying capacity cord for application where local electric codes (or user) requires only one AC cord to exit four or more cabinets. Toshiba highly recommends using the RPSB2 for two-cabinet installations.

Floor Mount Installation Hardware

Floor mounting DK424 requires RFIF and RCCB hardware assemblies; wall mounting DK424 does not require special hardware (see Table 4-22), but may require a plywood backboard (see Chapter 3 – Cabinet Installation).

Table 4-22   Cabinet Power, Reserve Power, and Floor Mount Hardware Assemblies

Assembly	Description	Function
RBTC1A-2M	Reserve Power Cable - RBDB2 to Battery Terminals	Two cables are required for up to six cabinet systems and three are required for seven cabinet reserve power installations (for current carrying capacity) when connecting reserve (battery) power to three or more cabinets (wall mount). RBDB2 is also required–see "RBDB2" below. A licensed electrician must install this item to retain UL listing and/or local electrical code compliance.
PBTC-3M	Reserve Power Cable - Cabinet Power Supply to Battery Terminals	One cable is required for each Cabinet if connecting reserve power to one or two cabinets (wall or table mount). A licensed electrician must install this item to retain UL listing and/or local electrical code compliance.
RBDB2	Battery Distribution Box	Distributes reserve power when three or more cabinets require reserve power (floor or wall mount). Six RBTC2A-1.5M cables are provided with the RBDB2 distribution box to connect up to six DK424 power supplies to the battery distribution box. RC7C1A-1.7M is also required for the seventh cabinet.

Table 4-22   Cabinet Power, Reserve Power, and Floor Mount Hardware Assemblies *(continued)*

Assembly	Description	Function
RC7C1A-1.7M	Cabinet 7 Cable Kit - Data and Battery Cables	Used for seven cabinet installations only. Provides long data cable to connect the sixth Expansion Cabinet to the DK424 Base Cabinet. Provides a long battery cable to connect RBDB2 battery distribution box to the sixth Expansion Cabinet power supply.
RFIF (up to 7 cabinets)	Floor Mount Fixture Kit	Provides two metal stands for mounting three or more cabinets on floor. Three pairs of wall brackets (RWBF) are supplied with RFIF. Wall brackets are needed to secure floor mounted systems to the wall for safety purposes (not required to wall mount cabinets).
RCCB1 (up to 6 cabinets) ...or RCCB2 (7 cabinets)	Conduit Connection Box	Conduit box required for AC and battery power connection to three or more floor-mounted cabinets. (Not required for mounting two cabinets on a table or any number of cabinets on a wall.) RCCB2 is required instead of RCCB1 for seven cabinet floor mount installations. A licensed electrician must install this item to retain UL listing and/or local electrical code compliance.
RPSB1	Three-outlet AC Power Strip	One RPSB1 required when installing three or four cabinets (wall or floor mount). Two RPSB1s required when installing five, six, or seven cabinets (wall or floor mount). Two AC cords will exit the cabinets in some configurations.
RPSB2	Three-outlet AC Power Strip - heavy cord	High current carrying capacity cord for application where local electric codes (or user) requires only one AC cord to exit four or more cabinets. It is highly recommended to use the RPSB2 for two-cabinet installations to accommodate further growth. Must be ordered for seven cabinet systems.
RWBF	Wall bracket pair	Required for seven cabinet systems when the system is floor mounted. Secures the seventh cabinet to the wall for safety purposes (not required to wall mount cabinets – see RFIF).

Worksheets

The worksheets help you configure the system. Designed to make the system configuration as orderly as possible, they also provide room to record the hardware - cabinets, PCBs, stations, and options - that comprise the system.

Copy the worksheets as required, then fill them out in the order they are given.

♦   Worksheet 1 – System PCB Slot Requirements

♦   Worksheet 2 – System Cabinet Assignment Guide

♦   Worksheet 3 – System PCB Assignment Guide

♦   Worksheet 4 – Option Configuration Guide

♦   Worksheet 5 – System Power Factor (PF) Check

DK424 Configuration

Worksheet 1 – System PCB (Slot) Requirements

Customer _____

Location _____

Digital Ports Required

Digital Telephones (DKTs)

2010-H _____

2010-SD _____

2020-S _____

2020-SD _____

2004-CT _____

2001-SLT _____

WRLS-HS _____

1020-H _____

1020-SD _____

Total Digital Telephones (DKTs) _____   1 port per Digital Telephone (1 X Total) _____

Total DDSS Consoles _____   1 port per Digital DDSS Console (1 X Total) _____

Total PDIU-DS _____   1 port per Digital PDIU-DS (1 X Total) _____

Total Digital Door Phone/Lock Units (DDCB) _____   1 port per Digital DDCB (1 X Total) _____

Total Digital Ports _____

Notes

♦ Digital telephones equipped with RPCI-DI, PDIU-D12 or ADM only require one digital port. (See Table 4-8.)

♦ One door phone control box (DDCB) supports three door phones (MDFBs). (See Table 4-20.)

♦ WRLS-HS is the same part number for Digital or Analog (depends on the type installed).

Electronic Ports Required

Electronic Telephones (EKTs)

6510-S _____

6510-H _____

6520-S _____

6520-SD _____

Total Electronic Telephones (EKTs) _____   1 port per Electronic Telephone (1 X Total) _____

Total HDSS Consoles _____   2 ports per HDSS Console (2 X Total) _____

Total Electronic Door Phone/Lock Unit (HDCB) _____   1 port per HDCB (1 X Total) _____

Total BGM Source Extend Amplifiers _____   2 ports per amplifier (2 X Total) _____

Total Alternate BGM Source _____   1 port per Alternate BGM Source (1 X Total) _____

Total Electronic Ports _____

Standard Ports Required

Standard Telephones

On Premise _____

Off Premise _____

Total Standard Telephones	_____	1 port per Standard Telephone (1 X Total)	_____
Total Analog Wireless Handsets	_____	1 port per Analog Wireless Handset (1 X Total)	_____
Total Voice Mail Ports	_____	1 port per Voice Mail Port (1 X Total)	_____
Total Fax or Modem Devices	_____	1 port per fax/modem device (1 X Total)	_____
Total ACD/Auto Attendant Digital Announcement Devices	_____	1 port per device (1 X Total)	_____
Total Alternate BGM Source	_____	1 port per Alternate BGM Source (1 X Total)	_____
Total Other Devices	_____	1 port per device (1 X Total)	_____
		Total Standard Ports	_____

Notes

♦ Isolation transformer may be required for the Alternate BGM Source, see Chapter 10 – Peripheral Installation.

♦ Other devices include dictation equipment, etc.

Station PCBs/Slots Required

1. Total digital ports divided by 8 (round up) =   Total PDKU2 PCB slots required _____

   Notes

   - PDKU2 provides eight digital telephone ports (circuits). Circuit 5 (when associated with ports 004, 012, 020, and 028) can only interface with a DDCB. Circuit 8 can only interface with a DDSS console (see Page 4-17).

   - The PDKU1 can also be used. The PDKU1 can only support Data Interface Units (DIUs) on circuits 1~7, while the PDKU2 can support DIUs on all eight circuits. See Table 4-20 (example) for slot limitations.

2. Total standard ports divided by 8 (round up) =   Total RSTU2 PCB slots required _____

   Notes

   - The PSTU2 or PSTU1 can also be used. These earlier version PCBs can interface with the same devices that the RSTU can, but they have different ring generators and cannot support MW. See the RSTU/PSTU section in Chapter 7 – DK40i/DK424 Universal Slot PCBs for more details.

   - The RSTU2 provides eight standard telephone ports (circuits). Circuit 2 only can connect to a separate Background Music (BGM) source. The RSTU can be equipped with an R48S to extend the loop length of the RSTU from 600 ohms to 1200 ohms (see Table 4-17).

   - RSTU2 is required to operate message waiting lamps on a standard telephone.

3. Are four or less digital or standard ports needed?
   If so, RDSU (RSTS) can be used.   Total RDSU PCB slots required _____

   Total RSTS PCB slots required _____

   - RDSU provides two standard telephone ports (circuits) and four digital ports (circuits) in its basic configuration. The optional RSTS can be attached to the RDSU to provide two more standard telephone ports. The RSTU2 can be equipped with an R48S to extend the loop length of the RSTU2 standard telephone ports from 600 ohms to 1200 ohms (see Table 4-17).

4. Total electronic ports divided by 8 (round up) =   Total PEKU PCB slots required _____

   Note PEKU provides eight electronic telephone ports (circuits). Circuit 5 (when associated with ports 004, 012, 020, or 028) can only interface with an HDCB. The HDSS consoles requires two PEKU (see Table 4-20). Each conference amplifier requires use of circuits 2 and 3 of a PEKU.   (Refer to Step 5 before finalizing this number.)

5. Are four or less electronic ports or two or less standard ports needed?
   If so, PESU can be used.   Total PESU PCB slots required _____

   Note PESU provides two standard telephone ports (circuits) and four electronic telephone circuits (ports). Circuit 5 (when associated with Ports 004, 012, 020, and 028) can only interface with an HDCB (see Table 4-20).

6. Add totals from Steps 1~5 =   **Total Station PCB slots required** _____

CO Line PCBs/Slots Required

1. Determine analog loop start line PCB slot requirements.

   Total loop start lines (with/ without Caller ID) divided by 8 (round up) =

       Total RCOU/RCOS PCBs (slots) required   _____

   Total loop start lines (with/without Caller ID) divided by 4 (round up) =

       Total RGLU2/RCOU/PCOU PCBs (slots) required   (PCOU existing) _____

                                           Total analog loop start line PCB slots required _____

   Notes

   - RGLU2 can provide loop or ground start lines.
   - RCOU provides four loop start CO lines in its basic
     configuration. An RCOS can be attached to the RCOU to
     add four more loop start CO lines for a total of eight per slot.
   - PCOU2 provides four loop start CO lines.
   - The PCOU1 and the PCOU2 are identical in fit, form,
     and function for the U.S. market.

2. Determine analog ground start line PCB slot requirements.

   Total ground start lines (with/without Caller ID) divided by 4 (round up) =   Total analog ground start line PCB slots required _____

   Note RGLU2 provides four CO lines that can be individually configured as loop start or ground start.

3. Determine E911 CAMA line PCB slot requirements.

       Total RMCU/RCMS PCBs (1 slot) required _____ (RMCU existing)

                        Total RMCU/RCMS CAMA PCB slots required _____

   Note The RMCU supports two subassemblies (RCMS) that provide a total of up to four ports.

4. Determine Caller ID (FSK) receiver/decoder PCB slot requirements.

   Total loop and ground start lines (with Caller ID) divided by 8 (round up) =   Total RCIU2/RCIS PCB slots required _____

   Note RCIU2 provides four caller ID receiver/ decoder circuits. RCIU2 with RCIS subassembly provides eight caller ID receiver/decoder circuits. Always use RCIU2 with RCIS for up to eight circuits as opposed to using two RCIU PCBs. These circuits do not use up station port or CO line software assignments.

5. Determine analog Tie line PCB slot requirements.

Total analog Tie lines (with or without ANI/DNIS)
divided by 4 =   Total REMU/PEMU PCB slots required _____

Notes

- REMU provides four E&M Tie trunks (Type I or II signaling, Wink or Immediate Start, 2- or 4-wire transmission).

- The PEMU1 can also be used. The PEMU only provides Type 1 signaling, 2- or 4-wire transmission and Immediate Start.

- See Table 4-7 for REMU/PEMU maximum quantities. Prior to Release 4, each REMU or PEMU reduced system station port line and capacity by four ports and four lines. With Release 4, Tie lines do not use station ports.

6. Determine analog DID line PCB (slot) requirements.

    Total analog DID lines (with or without ANI/DNIS)
    divided by 4 =   Total RDDU PCB slots required _____

    Notes

    - RDDU provides four Direct Inward Dialing lines. (Prior to Release 4, each RDDU reduces system station port and line capacity by four ports and four lines.) With Release 4, DID lines do not use station ports.

    - See Table 4-7 for RDDU (DID analog lines) maximum quantities.

7. Determine RDTU T1 PCB (slot) requirements (loop/ground/Tie/DID lines).

Total loop start lines	_____	(channels)
Total ground start lines	_____	(channels)
Total Tie lines (with/without ANI/DNIS)	_____	(channels)
Total DID lines (with/without ANI/DNIS)	_____	(channels)

    Total RDTU lines required _____

    Note Contact the T1 provider (Telco or Carrier company) to determine exact T1 channel/line needs.

8. Determine RDTU PCB (slot) requirements.

Total 8-channel RDTU PCB/slots	_____	
Total 16-channel RDTU PCB/slots	_____	(include skipped slots) -2 slots
Total 24-channel RDTU PCB/slots	_____	(include skipped slots) -2 slots

    Total RDTU PCB slots required _____

Notes

- When installing 16 or 24 channel RDTU PCBs into a slot, the next slot or two slots may not be usable for other PCBs (Tables 4-4 and 4-5 and Worksheet 2.)

- RDTU provides either 8, 16, or 24 channels (lines), depending on programming. Each channel can be set for either DID, ground start CO, loop start CO, or Tie line operation. (Each RDTU Tie line or DID line reduces the system line and station port capacity by one port.)

- As many as six RDTU PCBs can be installed in systems operating with the RCTUC/D common control unit, as many as two with RCTUB operated systems. The RCTUA does not support RDTU.

- Prior to Release 4, each Tie or DID line reduced system station capacity by one port. With Release 4, Tie and DID lines do not use station ports.

9. Add totals from Steps 1~7. **Total CO Line PCB slots required** _____

DK424 Configuration

Attendant Console Slots Required

➤ Enter one slot for each attendant console required (1~4 consoles maximum).

Total RATU PCB slots required _____

PIOU/PIOUS/RSIU/RSSU Option Slots Required

➤ Enter number of option PCBs required.

Total needed for MIS for ACD (required new) _____

Total needed for remote/local maintenance with DKAdmin/DKBackup PC _____

Total needed for SMDI _____

Total needed for SMDR (existing PIOU) _____

Total needed for miscellaneous options (see Table 4-19) _____

Total PIOU/PIOUS/RSIU/RSSU PCB slots required _____

Notes

The following subassembly PCBs do not required additional cabinet slots:

● The IMDU subassembly plugs onto PIOU or PIOUS to provide a remote maintenance modem.

● The RMDS subassembly plugs onto the RSIU to provide a remote maintenance modem.

● Up to three RSIS subassemblies can plug onto RSIU to provide any option listed in this Step.

PEPU Page Option PCB Required

➤ Enter total number of PEPU PCBs needed.

Total PEPU PCB slots required _____

Note PEPU provide 600-ohm interface or 3-watt page output for external page/BGM operation.

System Slots Required

➤ List the number of slots for each of the following:

Total number of Station PCB slots required
(see Page 4-22) _____

Total number of CO Line PCB slots required
(see Page 4-25) _____

Total number of attendant console slots required
(see Page 4-26) _____

Total number of option slots required
(see Page 4-26) _____

Total number of page option slots required
(see Page 4-26) _____

Total system slots required _____

Cabinets Required

➤ Total system slots divided by 6 or 8 =   **Total Cabinets required** _____

Important!   *To determine the type of RCTU PCB required, use* Table 4-7. *The total Universal slots and features required determine the RCTU PCB needed.*

DK424 Configuration

Worksheet 2 – System Cabinet Assignment Guide

DK424 and DK280 Base and Expansion Cabinets are interchangeable. The only system considerations are:

♦   OCA/RPCI configuration requirements

♦   Channel (8, 16, and 24) RDTU (T1/DS-1 interface) slot configuration requirements

♦   Number of system slots required. (See "System Slots Required" on Page 4-27.)

See Tables 4-7 and 4-8 for OCA/RPCI and T1/DS-1 configuration requirements.

Cabinet	Type (DK424 or DK280)	Number of Slots Available
1		
2		
3		
4		
5		
6		
7		

Total Number of Slots Available

Number of Slots Required

Worksheet 3 – System PCB Assignment Guide

Fill in Worksheet 3 by recording PCBs in the following order (see Worksheet 1 for PCB type and quantities):

1. Write in the Cabinet Type.

2. Enter the RCTU PCBs as required:
   ♦ RCTUBA, RCTUC, or RCTUE in slot R11
   ♦ RCTUA, RCTUBB, RCTUD, or RCTUF in slot RCTU

3. Enter PDKU, PEKU, or RSIU in slot 11.

   ...and/or if an RSIU is installed in slot 11, install a PDKU or PEKU in slot 12.

4. Starting with the lowest empty slot (S12 or S13), record all station, attendant console, loop start, ground start PCBs from lower to higher numbered slots (left to right). Record the appropriate port numbers used by each. Do not leave empty slots except when installing RDTU PCBs (see Tables 4-4 and 4-5).

5. After all station, attendant console, and ground/loop start line PCBs are recorded, write in all DID and Tie line PCBs starting from the first numbered empty slot to the highest needed (in left to right order). Record the line numbers. Do not leave empty slots except when installing RDTU PCBs.

   The maximum number of station ports used by station, PC attendant console, Tie, and DID PCBs can not exceed the following quantities:

Processor	Maximum Ports (Station, Tie and DID)
RCTUA	32
RCTUB or RCTUBA/BB	80
RCTUC/D	240
RCTUE/F	336

   In some rare configurations, when using RDTU (T1) Tie or DID lines in systems, the maximum number of stations allowed may be reduced because the RDTU PCB takes up two or three cabinet slots. Each RDTU, REMU, or RDDU Tie/DID line uses one station port. RCIU/RCIS PCBs do not use station ports or CO line software time slot assignments.

6. Write in the PIOU, PIOUS, PEPU, RSSU, RCIU2/RCIS and RCIU2/RCIS PCBs in any convenient vacant slot, preferably in the last slots. Record any Caller ID circuit numbers.

7. Write in any Interface PCB Options.

Cabinet 1 (Type:[1])	R11	RCTU	S11	S12	S13	S14	S15	S16
PCB Type								
Port Nos.								
Line Nos.								
Option/Note								
Cabinet 2 (Type:[1])	S21	S22	S23	S24	S25	S26	S27[2]	S28[2]
PCB Type								
Port Nos.								
Line Nos.								
Option/Note								
Cabinet 3 (Type:[1])	S31	S32	S33	S34	S35	S36	S37[2]	S38[2]
PCB Type								
Port Nos.								
Line Nos.								
Option/Note								
Cabinet 4 (Type:[1])	S41	S42	S43	S44	S45	S46	S47[2]	S48[2]
PCB Type								
Port Nos.								
Line Nos.								
Option/Note								
Cabinet 5 (Type:[1])	S51	S52	S53	S54	S55	S56	S57[2]	S58[2]
PCB Type								
Port Nos.								
Line Nos.								
Option/Note								
Cabinet 6 (Type:[1])	S61	S62	S63	S64	S65	S66	S67[2]	S68[2]
PCB Type								
Port Nos.								
Line Nos.								
Option/Note								
Cabinet 7 (Type:[1])	S71	S72	S73	S74	S75	S76	S77[2]	S78[2]
PCB Type								
Port Nos.								
Line Nos.								
Option/Note								

1. Type = DK280, DK424, or NR (not required). Double-check after completing all worksheets, particularly Worksheet 5 - System Power Factor Check.

2. Cabinets 2~7: Last two slots are available on the DK424 using RCTUE/F processors, with MBJU removed.

Worksheet 4 – Option Configuration Guide

Option	Number Required	Comments
RRCS PCB RRCS-4 RRCS-8 RRCS-12		An RRCS (-4, -8 or 12 DTMF receiver circuits) must be installed on the RCTUA, RCTUB, RCTUBA/BB, RCTUC/D, or RCTUE/F if the customer has: DTMF DID, Tie, ANI, DNIS, DISA lines (remote change of call forward destination), DNIS External Call Routing, using DTMF standard telephones, or voice mail-type devices with DTMF interfaces ...or if the customer has built-in AA connected to RDSU, RSTU, RSTU2, PSTU, or PESU standard telephone ports. Both the RCTUC/D and RCTUE/F can support one RRCS on each PCB, 2 RRCSs total (maximum 24 DTMF receivers). For normal traffic, an RRCS-4 is sufficient. However, for extremely high traffic, use an RRCS-8, -12, or multiple RRCSs for large systems.
RKYS1, 2, or 3		If built-in AA ACD, or ACD/MIS is required, one RKYS option key is required see Table 4-18.
PIOU/RSIU Subassembly PCBs IMDU PCB		One IMDU PCB may be installed on the PIOU or PIOUS PCB to provide built-in remote maintenance modem capability for the Strata DK system.
RMDS PCB		One RMDS PCB may be installed on the RSIU PCB to provide built-in remote maintenance modem for the Strata DK424 system.
RSIS		Up to three RSIS PCBs may be installed on the RSIU PCB to provide one or more of the following RS-232 interface ports: MIS for ACD, SMDR, SMDI, and/or Local Maintenance (TTY) Port for DKAdmin/Backup PC.
HESC-65A		One HESC-65A modular connecting cable is required to connect the HESB to the HHEU in each digital telephone and 6500-series electronic telephone requiring the Loud Ringing Bell option.
HESB Amplifier/ Speaker		One HESB is required for each digital and electronic telephone providing the Loud Ringing Bell option. One HESB is optional to provide single-zone external page connected to either a PIOU, PIOUS, or PEPU (customer-supplied amplifiers/speakers may be used in place of the HESB). One HESB is optional to provide a talkback amplifier/page speaker connected to a PIOU, PIOUS, or PEPU (a customer-supplied talkback amplifier/page speaker may be used in place of HESB).
PPTC/PPTC9 Adapter (Modular to RS-232) PPTC (25-pin) PPTC-9 (9-pin)		PPTC adapter is used to connect an external modem DB25 female connector to a PIOU/ PIOUS/RSIU/RSIS modular jack. If a PPTC is used, a null modem adapter is also required. PPTC9 adapter is used to connect a personal computer DB9 male COM port connector to a PIOU/PIOUS/RSIU/RSIS modular jack. These adaptors are required for: SMIS for ACD, SMDI, SMDR, and system maintenance PC or terminal interface.

DK424 Configuration

Option	Number Required	Comments
DPFT Unit		The DPFT provides a means to connect eight selected CO lines to standard telephones in the event of a power failure (each DPFT requires an RSTU or PSTU PCB). There is no limit to the number of DPFTs installed, provided that the system power factor is not exceeded.
MDFB		The MDFB door phone option plugs into the DDCB or HDCB control box to provide a door phone. Three MDFBs can be connected to each DDCB or HDCB. The MDFB may also be connected to the HESB amplifier/speaker to provide page talkback.
RBDB2		Battery distribution box required when connecting reserve power batteries to three or more cabinets (wall or floor mount). Six RBTC2A-1.5M cables are provided with the RBDB2 to connect up to six DK424 power supplies to the battery distribution box. Another cable is required for the seventh cabinet. See RC7C1A-1.7M in this table.
RCCB1 or RCCB2		Conduit connection box required for AC and battery power connection to three or more floor-mounted cabinets. (Not required for mounting two cabinets on a table or any number of cabinets on a wall.) Use RCCB1 for one to six cabinet floor installations. Use RCCB2 for seven cabinets. RCCB conduit box is required for floor mount installations of three or more Cabinets.
RFIF		Floor mount fixture kit is required when floor mounting any number of cabinets. Provides two metal stands for mounting three or more cabinets on floor. Three pairs of wall brackets (RWBF) are supplied with RFIF. Wall brackets are needed to secure floor-mounted systems to the wall for safety purposes.
RPSB1/RPSB2		Three-outlet AC Power Strip–one RPSB1 required when installing three or four cabinets (wall or floor mount). Two RPSB1s required when installing five, six, or seven cabinets (wall or floor mount). Two AC cords will exit the cabinets in some configurations. RPSB2 is a high current carrying capacity cord for application where local electric codes (or user) requires only one AC cord to exit four or more cabinets. It is highly recommended to use the RPSB2 for two-cabinet installations to accommodate further growth. Must be ordered for seven cabinet systems.
RBTC1A-2M		Two reserve power cables (for current carrying capacity) are required for three to six cabinets and three are required for seven cabinets when connecting reserve power battery terminals to three or more cabinets (wall mount). RBDB2 is also required–see "RBDB2" below.
PBTC-3M		One reserve power cable is required for each cabinet if connecting reserve power for one or two cabinets (wall or table mount). Cable connects cabinet power supply to battery terminals.
RC7C1A-1.7M		Two cables used for seven cabinet installations only. Provides long data cable to connect the sixth Expansion Cabinet to the DK424 Base Cabinet. Provides a long battery cable to connect RBDB2 battery distribution box to the Base Cabinet power supply.

Option	Number Required	Comments
Stratagy or VP Voice Mail		Refer to Toshiba Stratagy or VP documentation for detailed information about the VM machines and to C2 of Worksheet 2 in this chapter for DK424 VM port requirements.
PC Attendant Consoles (with RATI and RATHC) DKAdmin/ Backup SMIS for ACD		These features require customer-supplied personal computers. See feature user guides for individual personal computer requirements.
Other Customer-supplied Items		

Telephone Subassembly Option	Number Required	Comments
EOCU		One EOCU must be installed on each PEKU and/or PESU that is connected to electronic telephones which are equipped to receive OCA. Place the PEKU or PESU where it will provide the most efficient use of the 8-circuit EOCU: The PESU only provides 4 electronic telephone ports; HDSS consoles use s ports on a PEKU; HDCBs use 1 port on a PESU or PEKU.
DVSU		One DVSU is required for each digital telephone (2000, 1000-series) that should receive telephone speaker OCA. Not required for Handset/Headset Speaker OCA.
HVSU2		6500-series Electronic Telephones equipped with one HVSU2 to receive Speaker OCA calls.
HVSU/HVSI		Electronic Telephones equipped with the older HVSU and HVSI subassemblies (one per telephone) to receive OCA calls.
HHEU		One HHEU PCB must be installed in each digital (2000, 1000 series) and electronic telephone (6500, 6005 series) that supports a headset or connects to an HESB providing a loud ringing bell.
PDIU-DI2		One PDIU-DI2 or PDIU-DI data calling interface can be installed on a 2000-series Digital Telephones.
PDIU-DI		
RPCI-D1		2000-series Digital Telephones must be equipped with an RPCI-DI to transmit and receive voice and data calls and/or interface with a TAPI PC application interface. One RPCI-DI per telephone.
DADM		One or two Add-on Modules can be attached to 2000-series Digital Telephones to provide an additional 20 or 40 buttons. Any combination of CO **Line**, **DSS**, and **SD** (Speed Dial) buttons can be added to DADMs.

DK424 Configuration

Worksheet 5 – System Power Factor Check

The Strata DK power supply was engineered for maximum cost efficiency to provide power for the most configurations. Because of this design, some power limitations exist when using old electronic-type telephones and/or telephone option hardware.

For example, only 24 3000-series telephones can be installed in a cabinet. Each telephone and PCB has a negative Power Factor (PF) and the RPSU424 or RPSU280 power supply have a positive PF (+65). The sum of the telephones' PFs and PCBs connected to a signal cabinet must not exceed –65. In the case of +5VDC, the power factor must not exceed 25.

The sum of the calculated cabinet PFs must not exceed the values provided on Page 4-38. Table 4-23 shows the PF for PCBs and the RPSU280. PF numbers for telephones and devices are shown on the following page.

Note	The maximum number of RWIUs must not exceed one for the Base Cabinet and two for the Expansion Cabinets.

**Table 4-23	PCB and Power Supply Power Factors**

PCB Type	+5VDC	-24VDC	Notes
IMDU	0.1	0.16	
PCOU1, 2	1.9	2.0	
PDKU1, 2	0.8	0.3	With 8 DKTs.
PEKU	1.6	0.7	With 8 EKTs.
PEPU	1.1	6.5	
PESU	1.5	0.5	With 4 EKTs and 4 SLTs.
PIOU	2.0	6.5	
PIOU2	1.1	6.5	
PIOUS	0.75	4.0	
Power Supply RPSU280 or RPSU424	25.0	65.0	
R40S1A	0.0	2.8	Does not use +5VDC.
RATU	1.7	0.3	
RBSS1A	0.6	0.3	
RBSS2A	0.0	0.3	Does not use +5VDC.
RBSU + RBSS	3.1	0.3	
RBSU1A	2.5	1.0	
RBSU2A	0.0	1.0	Does not use +5VDC.
RBUS1A	0.0	0.3	Does not use +5VDC.
RBUU1A	0.0	1.0	Does not use +5VDC.
RCIS1A	0.3	0.1	
RCIU1A/2A	0.7	0.2	
RCIU2		0.2	
RCMS1A	0.6	0.3	
RCOS1A/2A	1.7	2.0	
RCOU (4 CO)	2.5	2.0	
RCOU + RCOS (8 CO)	3.6	4.0	
RCOU1A/2A	1.9	2.0	
RCTUA	2.0	1.0	

Table 4-23   PCB and Power Supply Power Factors *(continued)*

PCB Type	+5VDC	-24VDC	Notes
RCTUB	4.0	1.0	
RCTUBA/BB	4.0	1.9	
RCTUC/D	4.5	1.9	
RCTUE/F	10.0	1.9	
RDDU	2.6	7.0	
RDSU (-24VDC)	1.1	0.3	With 4 DKTs and 4 SLTs.
RDSU + R48S (-48VDC)	1.1	0.5	
RDTU	1.8	1.0	
REMU2/PEMU	1.0	7.5	
RGLU1A/2A	2.1	2.5	
RMCU1A	0.7	0.3	
RMDS1A	0.35	0.16	2400 bps MODEM.
RPTU	2.6	1.0	
RRCS-12	1.5	1.0	
RRCS-4	0.4	0.3	
RRCS-8	1.0	0.5	
RSIS1A	0.35	0.15	2400 bps.
RSIU1A	1.0	0.3	9600 bps.
RSSU	0.7	0.3	
RSTU/RSTU2 (-24VDC)	1.4	0.5	With 8 SLTs.
RSTU1 + R48S (-48VDC)	1.4	1.0	With 8 SLTs.
RSTU2 + R48S (-48VDC)	4.0	2.3	With 8 MWs.
RWIU	9.2	0.0	With 8, 16, 24, or 32 handsets.

Note   Power factor calculation samples are shown in Tables 4-24 and 4-25.

Table 4-24   Strata DK424 Base Cabinet

PCB	Quantity	+5VDC	-24VDC
PDKU2A	2	1.6	0.3
RBSU1A + RBSS1A	1	3.2	0.3
RCOU1A + RCOS1A	1	3.6	4.0 (8 COs)
RCTUA3A	1	2.0	1.0
RRCS1A-4	1	0.4	0.3
RWIU	1	9.0	0.0
Total	7	19.8	5.9

Table 4-25   Strata DK424 Expansion Cabinet

PCB	Quantity	+5VDC	-24VDC
RBSU1A + RBSS1A	1	3.2	0.3
RCOU1A + RSOU1A	1	3.6	4.0 (8 COs)
RWIU	2	18.0	0.0
Total	4	24.8	4.3

DK424 Configuration

Telephone/Device Power Factors

The power supply of each cabinet supplies a limited amount of power. For each cabinet, calculate the total Telephone/Device PF and add it to the appropriate cabinet in "Cabinet Power Factor, PCB/Telephone Device" on Page 4-38.

Telephone/Device	Base Cabinet (1)			Expansion Cabinet (2)			Expansion Cabinet (3)			Expansion Cabinet (4)		
	Qty.	PF	Total	Qty.	PF	Total	Qty.	PF	Total	Qty.	PF	Total
Digital Telephone (DKT, any series)												
1~120 Telephones		x 1.0 =			x 1.0 =			x 1.0 =			x 1.0 =	
121~240 Telephones		x 0.6 =			x 0.6 =			x 0.6 =			x 0.6 =	
2000-series Electronic Telephone (EKT)		x 2.0 =			x 2.0 =			x 2.0 =			x 2.0 =	
3000-series EKT		x 2.5 =			x 2.5 =			x 2.5 =			x 2.5 =	
6000-series EKT		x 2.0 =			x 2.0 =			x 2.0 =			x 2.0 =	
6005-series EKT		x 2.0 =			x 2.0 =			x 2.0 =			x 2.0 =	
6500-series EKT												
1~120 Telephones		x 1.0 =			x 1.0 =			x 1.0 =			x 1.0 =	
121~240 Telephones		x 0.6 =			x 0.6 =			x 0.6 =			x 0.6 =	
DDCB/HDCB (with MDFB)		x 1.2 =			x 1.2 =			x 1.2 =			x 1.2 =	
DDSS/HDSS Console		x 0.8 =			x 0.8 =			x 0.8 =			x 0.8 =	
Add-on Module (DADM)		x 0.4 =			x 0.4 =			x 0.4 =			x 0.4 =	
Integrated PDIU-DI		x 0.5 =			x 0.5 =			x 0.5 =			x 0.5 =	
Integrated RPCI-DI		x 0.5 =			x 0.5 =			x 0.5 =			x 0.5 =	
Stand-alone Data Interface Unit		x 0.8 =			x 0.8 =			x 0.8 =			x 0.8 =	
Standard Telephone (-48V)		x 1.0 =			x 1.0 =			x 1.0 =			x 1.0 =	
Standard Telephone (-24V)		x 0.5 =			x 0.5 =			x 0.5 =			x 0.5 =	
Attendant Console		x 4.0 =			x 4.0 =			x 4.0 =			x 4.0 =	
Power Failure Unit (DPFT)		x 3.0 =			x 3.0 =			x 3.0 =			x 3.0 =	
HHEU		x 0.1 =			x 0.1 =			x 0.1 =			x 0.1 =	
Total Power Factor (PF)												

> **Note** PF varies by number of telephones because of station paging limit of 120 telephones. Always use "1.0" for DKT telephones when calculating PFs for individual cabinets.

Telephone/Device	Expansion Cabinet (5)			Expansion Cabinet (6)			Expansion Cabinet (7)		
	Qty.	PF	Total	Qty.	PF	Total	Qty.	PF	Total
Digital Telephone (DKT, any series)									
1~120 Telephones		x 1.0 =			x 1.0 =			x 1.0 =	
121~240 Telephones		x 0.6 =			x 0.6 =			x 0.6 =	
2000-series Electronic Telephone (EKT)		x 2.0 =			x 2.0 =			x 2.0 =	
3000-series EKT		x 2.5 =			x 2.5 =			x 2.5 =	
6000-series EKT		x 2.0 =			x 2.0 =			x 2.0 =	
6005-series EKT		x 2.0 =			x 2.0 =			x 2.0 =	
6500-series EKT									
1~120 Telephones		x 1.0 =			x 1.0 =			x 1.0 =	
121~240 Telephones		x 0.6 =			x 0.6 =			x 0.6 =	
DDCB/HDCB (w.MDFB)		x 1.2 =			x 1.2 =			x 1.2 =	
DDSS/HDSS Console		x 0.8 =			x 0.8 =			x 0.8 =	
Add-on Module		x 0.4 =			x 0.4 =			x 0.4 =	
Integrated PDIU-DI		x 0.5 =			x 0.5 =			x 0.5 =	
Integrated RPCI-DI		x 0.5 =			x 0.5 =			x 0.5 =	
Stand-alone Data Interface Unit		x 0.8 =			x 0.8 =			x 0.8 =	
Standard Telephone (-48V)		x 1.0 =			x 1.0 =			x 1.0 =	
Standard Telephone (-24V)		x 0.5 =			x 0.5 =			x 0.5 =	
Attendant Console		x 4.0 =			x 4.0 =			x 4.0 =	
Power Failure Unit (DPFT)		x 3.0 =			x 3.0 =			x 3.0 =	
HHEU		x 0.1 =			x 0.1 =			x 0.1 =	
Total Power Factor (PF)									
Note	PF varies by number of telephones because of station paging limit of 120 telephones. Always use "1.0" for DKT telephones when calculating PFs for individual cabinets.								

DK424 Configuration

Cabinet Power Factor, PCB/Telephone Device

Calculate the total PF of each cabinet (must be less than 65). See Worksheet 2, Table 4-9 for PCB quantity and type, and Table 4-23 for PF numbers.

The Total Cabinet PF must not exceed the limits shown in Max. PF Allowed, at the bottom of this chart.

		Cabinets												
		1		**2**		**3**		**4**		**5**		**6**		**7**
		PCB Type	PF	PCB Type	PF	PCB Type	PF	PCB Type	PF	PCB Type	PF	PCB Type	PF	PCB Type	PF
Slots	1														
	2														
	3														
	4														
	5														
	6														
	7														
	8														
Power Factor	Cabinet PF (subtotal)														
	Telephone/ Device PF (Page 4-36)														
	Cabinet PF (total)														
	Max. PF Allowed (all cabinets combined)		65		130		195		260		325		390		455

Note Cabinets 2~7: Last two slots are available on the DK424 (RCTUE/F).

DK424 Installation 5

This chapter explains how to install the Strata DK424 system. It includes information on site requirements and provides installation instructions for various cabinet configurations. It also explains how to install ground wiring, AC power cabling, reserve power (Battery Backup) cabling, and Printed Circuit Board (PCB) cabling.

Inspection

When the system is received, examine all packages carefully and note any visible damage. If any damage is found, do not open the packages. Contact the delivery carrier immediately and make the proper claims.

After unpacking (and before installing), check the system against the packing list and inspect all equipment for damage. If equipment is missing or damaged, contact your supplier immediately.

Be sure to retain original packaging materials for re-use when storing or transporting system hardware.

Packaging and Storage

CAUTION!	**When handling (installing, removing, examining) PCBs, do not touch the back (soldered) side or edge connector. Always hold the PCB by its edges.**

When packaging and storing the system, remove PCBs from the system cabinet (the power supply may remain installed in the cabinet for storage and shipment). PCBs should be packaged in their original antistatic bags for protection against electrostatic discharge. Be sure to package equipment in its original shipping containers.

DK424 Installation

Site Requirements

Input Power

The DK424 requires an input power source of 115VAC ± 10 VAC, 50/60 Hz, 17.5 amps. The system requires one or two AC outlets that must be dedicated to system use, fused, and grounded. See "Power Supply Installation" on Page 5-8 for complete AC power cabling, ground wiring and battery installation instructions.)

CAUTION! **To avoid accidental power turn-off, it is recommended that an ON/OFF wall switch not be used on AC circuits dedicated for the use of DK424.**

A reserve power source (two or four customer-supplied 12-volt batteries) may be connected to the DK424 to serve as a backup in case of power failure.

Clearance and Location

The Base and optional Expansion Cabinets may be either floor or wall mounted. Figure 5-1 shows the minimum clearance requirements. See "Wall Mounting the Base Cabinet" on Page 5-11 and "AC Power Distribution for Six Cabinets" on Page 5-36 for details.

Notes

- Floor mounting requires the following additional hardware:
    - RFIF – floor mounting stands and brackets.
    - RCCB – electrical conduit box, if three or more cabinets are installed.
- Wall mounting may require a plywood (3/4 inch thick) backboard.

When selecting a location for the cabinets, the location *must be:*

- ♦ Dry and clean
- ♦ Well-ventilated
- ♦ Well-illuminated
- ♦ Easily accessible

The location *must not be*:

- ♦ Subject to extreme heat or cold
- ♦ Subject to corrosive fumes, dust, or other airborne contaminants
- ♦ Subject to excessive vibration
- ♦ Next to television, radio, office automation, or high frequency equipment

Optional customer-supplied reserve batteries require a well-ventilated location close (within nine feet) to the DK424 cabinets.

Front View

Top View

24" — 23.6" — 14.5"

Base
Cabinet — 24"

Expansion
Cabinet

Wall

Expansion
Cabinet

Expansion
Cabinet

78"

Expansion
Cabinet

Expansion
Cabinet

Expansion
Cabinet

6"

Floor

Wall — 23.6"

Cabinets 9.75 "

36"
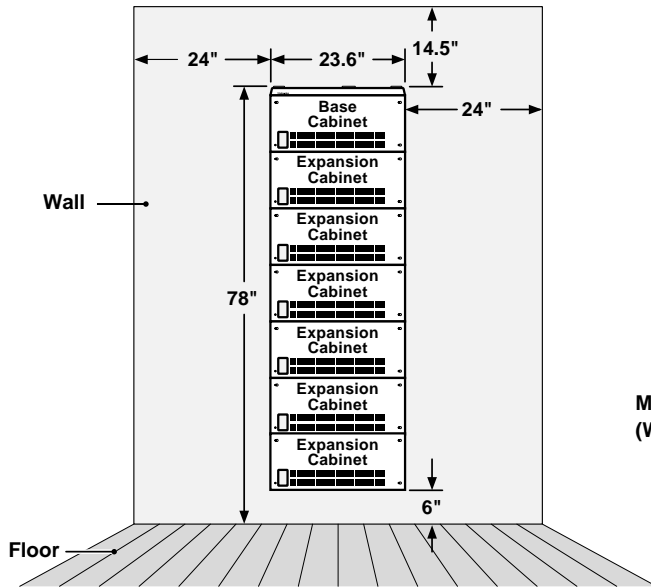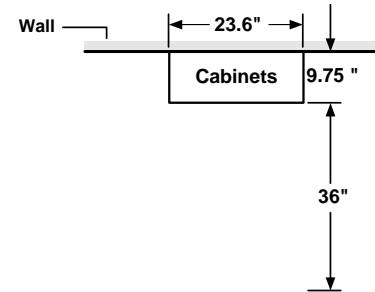
**Minimum Clearance Requirements
(Wall Mounting)**

Front View

Top View

24" — 23.6" — 13.5"

Base
Cabinet — 24"

Expansion
Cabinet

Wall

Expansion
Cabinet

Expansion
Cabinet

75"

Expansion
Cabinet

Expansion
Cabinet — 3" Floor
Mount
Stands
(RFMF)

Expansion
Cabinet

3"

Floor

Wall — 23.6"

2" Brackets
(RWBF)

Cabinets 11.75 "

36"
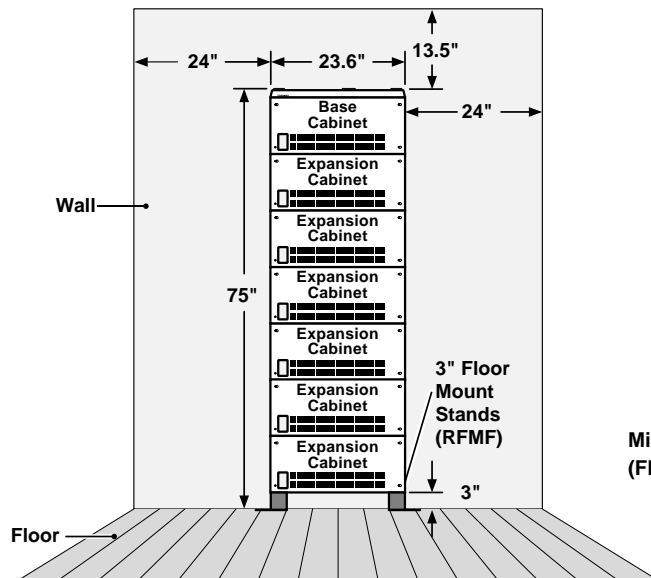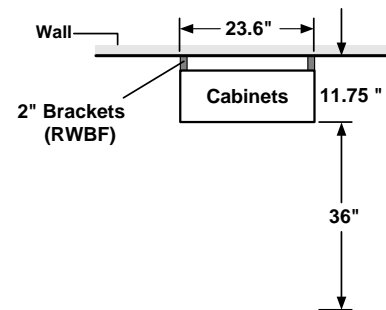
**Minimum Clearance Requirements
(Floor Mounting)**

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Figure 5-1   DK424 Minimum Clearance Requirements

Electrical/Environmental Requirements and Characteristics

See Table 5-1 for the DK424 electrical/environmental requirements and characteristics.

Table 5-1   Summary of Electrical/Environmental Characteristics

DK424 Primary Power	
Input AC AC amps for seven-cabinet system AC frequency Watts per cabinet (continuous) Watts for six cabinet system (continuous)	115VAC $\pm$ 10VAC 20 amp circuit 50/60 Hz 180 845
DK424 Maximum Peak AC Input Current	
1 cabinet – 2.5 amps 2 cabinets –5.0 amps 3 cabinets – 7.5 amps 4 cabinets – 10.0 amps	5 cabinets – 11.5 amps 6 cabinets –15.0 amps 7 cabinets – 17.5 amps
Environmental Specifications	
Operating temperature Operating humidity Storage temperature	32~104° F (0~40° C) 20~80% relative humidity without condensation -4~158° F (-20~70° C)
Power Supply	
DC voltage output specification	-24VDC (-26.3~-27.8VDC) +5VDC (+4.5~+5.5VDC) -5VDC (-4.5~-5.5VDC) - Expansion Cabinet only
Battery Charger Characteristics	
	Charger: current limiting Nominal float voltage: 2.275 volts/cell Charge current: 0.7 amps maximum Battery discharge cut-off voltage: 20.5 $\pm$0.5VDC
PESU (Circuits 1 and 2)	
Ring voltage	Square wave output with high/low option jumper: Low position 130 $\pm$20VDC peak-to-peak (no-load) High position, 190 $\pm$25VDC peak-to-peak (no-load)
Ringing capability	2 ringers maximum per circuit, high or low position
RSTU2 or RDSU	
Ring voltage	80V RMS sine wave
Ringing capability	1.5 REN per circuit, with or without Message Waiting
RSTU2 Message Waiting voltage	-90 VDC/one telephone per circuit (max.)
RSTU2 or PESU modem interface data rate	14,400 bps maximum
BTU Rating	
PDKU (5) RCOU/RCOS (1) RCTUB (1) DKTs (40)	190 BTUs (56 watt hours) per cabinet
Traffic Rating Characteristics	
9 CCS per station system-wide 36 CCS per ACD/SMIS station	
Note There are system limits for the number of simultaneous Agents depending on traffic. See the *Strata DK424 Call Center Solutions General Description* for details.	

Cable Lengths

The Base and optional Expansion Cabinets must be placed within the allowed maximum distance of each other as designated by Table 5-2.

Table 5-2   Station Loop Requirements

Device	Interface PCB Circuits	No. of Wire Pairs (use 24 AWG twisted pair)	Max Loop Resistance (including device)	Maximum Distance from Cabinet to Device
Digital telephones[1]	PDKU (1~8) or RDSU (5~8)	1-pair	40 ohms	1000 ft. (303 m)
DDSS consoles	PDKU (8)			
PDIU-DS	PDKU (1~8) or RDSU (5~8)			
DDCB	PDKU or RDSU (5)			
Attendant Console	RATU (1~4)	2-pair		
HDCB	PEKU (5) or PESU (5)[2]			
Electronic telephones	PEKU or PESU	2-pair (3-pair required for OCA)		
RPCI-DI or PDIU-D12	PDKU (1~8) or RDSU (5~8)	Shares digital telephone wire-pair[1]		
DADM	PDKU (1~8) or RDSU (5~8)			
RATI	RATU (1~4)	1 or 2-pair		
HDSS consoles	PEKU (7 & 8)	2-pair	20 ohms	500 ft. (152 m)
Standard telephones, voice mail, Auto Attendant, etc.	PSTU (1~8) or PESU (1 & 2)[1]	1-pair	300 ohms	Approx. 3000 ft. (909 m) with 150 ohm device.[3]
	RSTU (1~8) RDSU/RSTS (1~4) without R48S option		600 ohms	Approx. 9000 ft. (2727 m) with 150 ohm device.[3]
	RSTU (1~8) RDSU/RSTS (1~4) with R48S option		1,200 ohms	Approx. 21000 ft. (6363 m) with 150 ohm device.[3]

1. Two-pair wiring or optional telephone power supply is required to achieve maximum range with DADM, OCA, Headset, or Data Interface Unit.

2. PESU circuits 3 and 4 are not used.

3. See manufacturer's product specifications for exact resistance of device.

DK424 Installation

Network Requirements

The system network requirements are provided in Table 5-3.

Table 5-3   DK424 Network Requirements

PCB/Interface	Facility Interface Code	Network Jack	Ringer Equivalence	Universal Service Order Code
PESU/RSTU2/RDSU[1] (Off-premises Station)	OL13A (PESU)	RJ21X	N/A	9.0F
	OL13B (RSTU2, –24V)			
	OL13C (RSTU2, RDSU with R48S-48V)			
RCOU/RCOS (loop start line)	02LS2	RJ14C/RJ21X	0.3B	N/A
RDDU	02RV2-T	RJ14C/RJ21X	0.0B	AS.2
REMU type 1 or type 2	TL11M, 2-wire TL31M, 4-wire TL12M, type 2, 2-wire TL32M, type 2, 4-wire	RJ2EX RJ2GX RJ2FX RJ2HX	Not Available (N/A)	9.0F
RGLU2 (ground or loop start line)	02GS2 (ground) 02LS2 (loop)	RJ14C/RJ1CX	0.3B	N/A
RDTU (DS-1/T1)[2]	(See last bullet note on Note 2 below.)	RJ48C/RJ48X/ RJ48M	N/A	6.0P
RCIU2/RCIS (Caller ID)	N/A	RJ21X/RJ14C	0.3B	N/A
RPTU (PRI)[3]	04DU9-1SN	RJ48C/RJ48M	N/A	6.0P
RBSU/RBSS (S/T, BRI)[3]	02IS5	RJ48C/RJ48X	N/A	
RBUU/RBUS (U, BRI)[3]	02IS5	RJ48C/RJ48X	N/A	
RCMU/RCMS (CAMA)	02RV2-O	RJ11C/RJ21-X	N/A	

1. Only PESU circuits 1 and 2, and RDSU circuits 1~4 provide Off-premises Station (OPS) capability. PESU must use OL13A or equivalent line conditioning for OPS connection. RDSU must use OL13A or OL13B if providing –24 volt loop voltage. If equipped with the –48 volt loop option PCB (R48S), OL13A, OL13B, or OL13C may be used for OPS connection.

2. When ordering DS-1/T1 circuits, six items must be specified:
   - The number of channels per T1 circuit, fractional increments are normally 8, 12, or 16 channels, full service is 24 channels. Unused channels must be bit-stuffed.
   - Type of CO line assigned to each channel: Loop Start, Ground Start, Tie (Wink or Immediate Start), DID (Wink or Immediate).
   - Frame Format Type: Super Frame (SF) or Extended Super Frame (ESF). The T1 provider normally specifies the Frame Format to be used, either is adequate for DK424 CO digital voice lines. ESF provides a higher level of performance monitoring, but requires trained personnel and the ESF CSU normally costs more than an SF only CSU.
   - Line Code Type: Alternate Mark Inversion (AMI) or Bipolar 8 Zero Substitution (B8ZS). The T1 provider normally specified the Line Code to be used, either is adequate for DK424 T1 CO digital voice lines.
   - The customer may have to provide the Channel Service Unit (CSU) to interface the DK424 T1 circuit to the Telco T1 circuit. (CSUs are a Telco requirement.)
   - RDTU Network Channel Interface Codes: 04DU9-BN, 04DU9-DNZZ, 04DU9-1SN, 04DU9-1KN, 04DU9-1ZN.

3. For information on how to order ISDN PRI/BRI circuits, you should refer to the Toshiba ISDN Training CBT. ISDN circuits may require a customer-provided CSU for PRI and/or Terminal Adapter or Network Terminal units for BRI. In U.S. CSU/TAs must be UL-listed in the U.S. In Canada, they must be CSA certified.

Cabinet Installation Considerations

The Base (DKSUB424) and Expansion Cabinets (DKSUE424) can be wall or floor mounted. To make it easier to add cabinets (after the initial installation) when a customer needs to expand, install the Base Cabinet on top for wall-mount installations and on the bottom for floor-mount installations.

The dimensions of the Base and Expansion Cabinets are:

Height: Base Cabinet: 11 3/4 inches

Height: Expansion Cabinet: 10 inches

Width: 23 5/8 inches

Depth: 9 3/4 inches

Weight: approx. 30.5 lbs. (14 kg.)

Note   The weight approximates a cabinet completely filled with PCBs. Weight may vary slightly, depending on PCBs.

Recommended Installation Sequence

Step	Reference Information
1. Install power supplies in cabinets.	"Power Supply Installation" on Page 5-8.
2. Mount cabinets on floor or wall.	"Wall Mounting the Base Cabinet" on Page 5-11.
	"Cabinet Floor Mounting" on Page 5-21.
3. Install ground wiring.	"AC Power and Third Wire Ground Test" on Page 5-29.
4. Install AC power cabling to cabinets.	"AC Power Cabling Installation" on Page 5-30.
5. Install reserve power cabling.	"Reserve Power Installation" on Page 5-32.
6. Install PCBs and PCB cabling.	Figures 5-10, 5-12, and 5-21.

Note   Each cabinet requires four wood screws (#12X 1.25 inch size) for wall mount installation. Wood screws are not provided with the system.

DK424 Installation

Power Supply Installation

The Base and Expansion Cabinets are shipped from the factory without the power supply installed. The DK424 cabinets use the same power supply (RPSU280 and/or RPSU424) as the DK280.

Note   RPSU280 and RPSU424 are fit, form, and functionally the same. They can be interchanged and mixed in DK280 and DK424 systems.

➤ **To install power supplies in cabinets of new or installed systems**

1. Remove the power supply from its box. The box should also contain a plastic bag with two jumper plugs for the power supply DKSUB or DKSUE connector. An AC power cord and the power supply mounting screws are provided with the KSU cabinet.

2. Make sure that the front and right side covers are removed from the cabinet (see Figure 5-2**)**.

3. Slide the power supply into the right side of the cabinet so that its four mounting holes align with the four cabinet mounting holes (see Figure 5-3**)**. (Make sure that the two backplane FG wires are positioned between the FG wire holder and the power supply.)

Note   The backplane FG wires are not safety grounds: they are required for proper system CO line operation.

4. Plug the DC OUT cable plug into the DC OUT connector on the power supply. (The plug has a guide key on it to ensure that it is plugged in correctly.)

5. Secure the FG wire spade lug to the power supply with the FG screw.

6. Secure the power supply to the cabinet with the four provided screws.

7. If the cabinet is the Base Unit, plug the jumper plug that has a wire connected into the "DKSUB" jumper connector on the power supply.

8. If the cabinet is an Expansion Unit (DKSUE), plug the jumper plug that does not have a wire connected into the "DKSUE" jumper connector.

Important!   *The power supply with the "DKSUB" jumper plug (plug with wire) installed is the master and has ON/OFF control over all other power supplies, which are designated as slaves. If the master power supply is turned OFF or ON, all other power supplies will automatically turn OFF or ON. (Individual power supplies must be turned on.)*

   Power supplies that have the "DKSUE" jumper plugs (plug without wire) installed will not control other power supplies, but can be turned OFF or ON individually with their own ON/OFF switch. (The master power supply must be on and the intercabinet "Data" ribbon cable must be installed to allow a slave power supply to be turned ON.)

9. See Figure 5-3 to ensure that the power supply is properly installed.

10. Install power supplies in all cabinets, using Steps 1~9.

11. Install the Base and optional Expansion Cabinets, ground wiring, AC and reserve power cabling, and PCB cabling per the "Recommended Installation Sequence" on Page 5-7.

Note   Power Supply testing procedures are provided in the Fault Finding chapter, which should be referred to if it is suspected that the power supply does not work properly.

Plastic Bag with Four Power Supply Mounting Screws Supplied with each Cabinet

Shift cover left to remove front cover.

Intercabinet Power Supply Ground Wire (Supplied with each Expansion Cabinet)

Top Cover (Base Cabinet Only)

Loosen four screws to remove the top cover:

Note:
Do not remove the top cover if the Base Cabinet is the top cabinet.

Front Cover

Remove this screw to remove the front cover

Right Side Cover

Front   Right

1452

Loosen three screws to remove front cover

Loosen two screws to remove the side covers (right and left side covers)

Figure 5-2   DK424 Cabinet Front, Side, and Top Cover Removal and Installation

DK424 Installation

DC Voltage Pins				
Red Wire	No Wire	Blue Wire	White Wire	Green Wire
+5V	0V	−5V	+5V	0V
Green Wire	Green Wire	Yellow Wire	Yellow Wire	Yellow Wire
0V	0V	−24V	−24V	−24V

DC Voltage Specification		
+5V (+4.5 ~ +5.5)	BATT (Volts)	
-5V (−4.5 ~ −5.5), Expansion Cabinet only	+	0
-24V (−26.3 ~ −27.8)	−	−26.3 ~ −27.8*
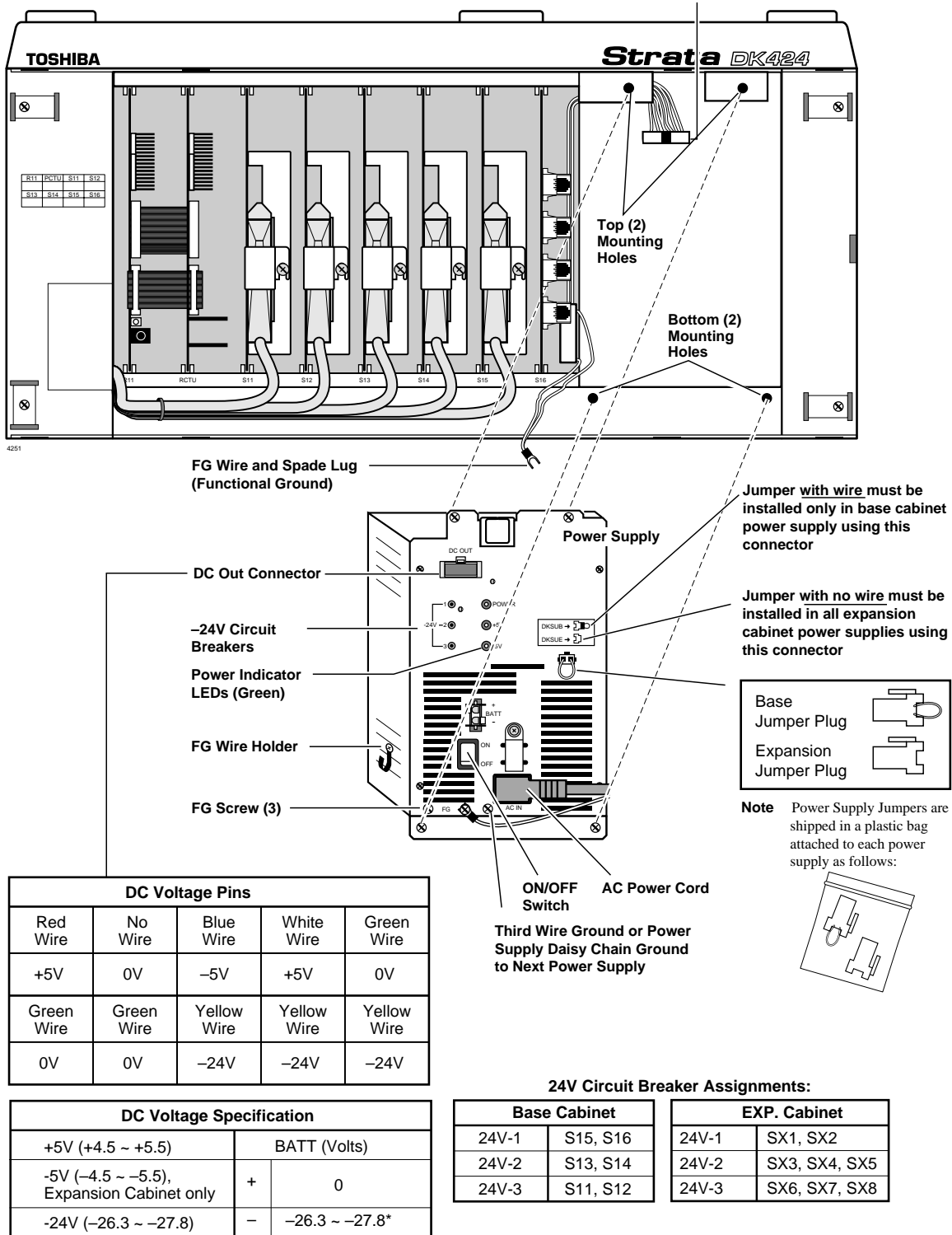
On RPSU424, the BATT output is 0 volts unless connected to good batteries

24V Circuit Breaker Assignments:

Base Cabinet		EXP. Cabinet	
24V-1	S15, S16	24V-1	SX1, SX2
24V-2	S13, S14	24V-2	SX3, SX4, SX5
24V-3	S11, S12	24V-3	SX6, SX7, SX8

Figure 5-3   DK424 Power Supply (RPSU280 or RPSU424) Installation

Power Supply (RPSU280 or RPSU424) Removal

1. Remove the front and right side covers (Figures 5-2 and 5-3) from the cabinet where the power supply will be removed. Remove the right side covers of other cabinets as necessary to disconnect wiring.

2. Turn the power supply OFF, and disconnect the AC power cord, all ground wiring and reserve power cabling that is connected to the power supply.

3. Disconnect the DC OUT cable plug from the DC OUT connector.

4. Loosen the four mounting screws securing the power supply to the cabinet and remove the power supply.

Power Supply Replacement

➤ Install the replacement power supply per "Power Supply Installation" on Page 5-8.

Wall Mounting the Base Cabinet

If the cabinet mounting holes align with wall studs, the cabinet can be installed directly on the wall (see Figure 5-4). For more than two cabinets, a wooden backboard between the cabinet and the wall is highly recommended (see Figure 5-5).

Base Cabinet (DKSUB424) Installation

1. If using a backboard: Obtain a board, such as plywood, that is at least 3/4 of an inch thick. The board should be at least 6-1/2 feet high (completely expanded systems with seven cabinets require this much height) and two feet wide (minimum).

   Secure the board to the wall with wood screws with the bottom edge of the board is six inches above the floor. (If there are wall studs, make sure the screws align with the studs.)

2. Remove the front, back, and side covers from the Base Cabinet (see Figure 5-6).

Note   The bottom left screw must be completely removed. The two screws on each side cover and the three screws on the front cover should only be loosened and the covers slid to the right for removal.

3. Hold the Base Cabinet back cover against the wall or backboard so that its two top mounting holes are approximately 6-1/2 feet (78 inches) above the floor. This allows seven cabinets to be installed (top-down) with a six-inch clearance between the floor and bottom cabinet (see Figures 5-7 and 5-8).

4. Use a level to make sure that the back cover is held level.

5. Trace the upper arch of the top mounting holes with a pencil.

6. Remove the back cover from the wall.

7. Draw a line between the top two marking hole marks.

8. Drill holes on the line in the middle of the arch tracing.

9. Screw #12 X 1.25 inch size wood screws into the two drilled holes, leaving about 1/8 of an inch clearance between the screw heads and the wall.

10. Hang the Base Cabinet back cover from the top two screws and secure the screws into the wall.

11. Drill holes at the bottom two mounting holes of the back cover, and secure #12 X 1.25 inch wood screws into the two holes.

12. If installing just a Base Cabinet: Position the Base Cabinet on the back cover cabinet hangers, slide the cabinet to the right to the proper mounting position, and secure the cabinet to the back cover with two screws on the right side of the cabinet. If installing Expansion Cabinets, skip to "Cabinet Floor Mounting" on Page 5-21.

13. Install ground wiring, AC and reserve power cabling, and PCB cabling per the "Recommended Installation Sequence" on Page 5-7.

14. Fill out the slot identification label on the cabinet (see Figure 5-11).

15. Reinstall the front cover, top cover, and side covers onto the cabinet.

Expansion Cabinet Installation (DKSUE424)

Note Toshiba recommends installing cabinets (see Figure 5-5~5-10 and 5-27) from the top down, with the Base Cabinet on top, the first Expansion Cabinet below it, the second Cabinet below that, etc.

1. Remove the front, back, and side covers from the Expansion Cabinets.

Note The bottom left screw must be completely removed. The two screws on each side cover and the three screws on the front cover should only be loosened and the covers slid to the right for removal.

2. Hold an Expansion Cabinet back cover against the wall so that its top locating parts align with the bottom locating parts of the Base Cabinet back cover. To secure the Expansion Cabinet back cover to the wall or wall board, repeat Steps 5~11 from "Base Cabinet (DKSUB424) Installation" on Page 5-11.

3. To install additional Expansion Cabinet back covers, repeat Step 2 above.

4. Starting with the top Expansion Cabinet back cover (which is fastened to the wall), position an Expansion Cabinet on the back cover cabinet hangers. Slide the cabinet to the right to the proper mounting position, and secure the cabinet to the back cover with two screws to the right side of the back cover. Repeat for all other Expansion Cabinets.

5. Loosen the bonding connection plates fastened on both sides of the first Expansion Cabinet, then fasten the plates between the Base Cabinet and the first Expansion Cabinet. Repeat to connect the first Expansion Cabinet to the second Expansion Cabinet, etc.

6. Loosen data cable door locking screws and open data cable doors; then connect the first Expansion Cabinet data cable to the "CAB 2" (top) data cable connector on the Base Cabinet. Install data cables in appropriate connectors for all other Expansion Cabinets).

7. After all data cables are installed, close data cable doors and secure with the locking screw.

Important! *Data cable door screws must be firmly tightened for proper system operation.*

8. Install ground wiring, AC and reserve power cabling, and PCB cabling per the "Recommended Installation Sequence" on Page 5-7.

9. Fill out cabinet/slot identification labels on each cabinet.

10. Reinstall covers onto cabinets.

Wall

16 in.

**Dealer Supplied
#12 X 1.25"
Wood Screws
(4 Screws per
Cabinet)**

Back Cover

1455

Up

Front
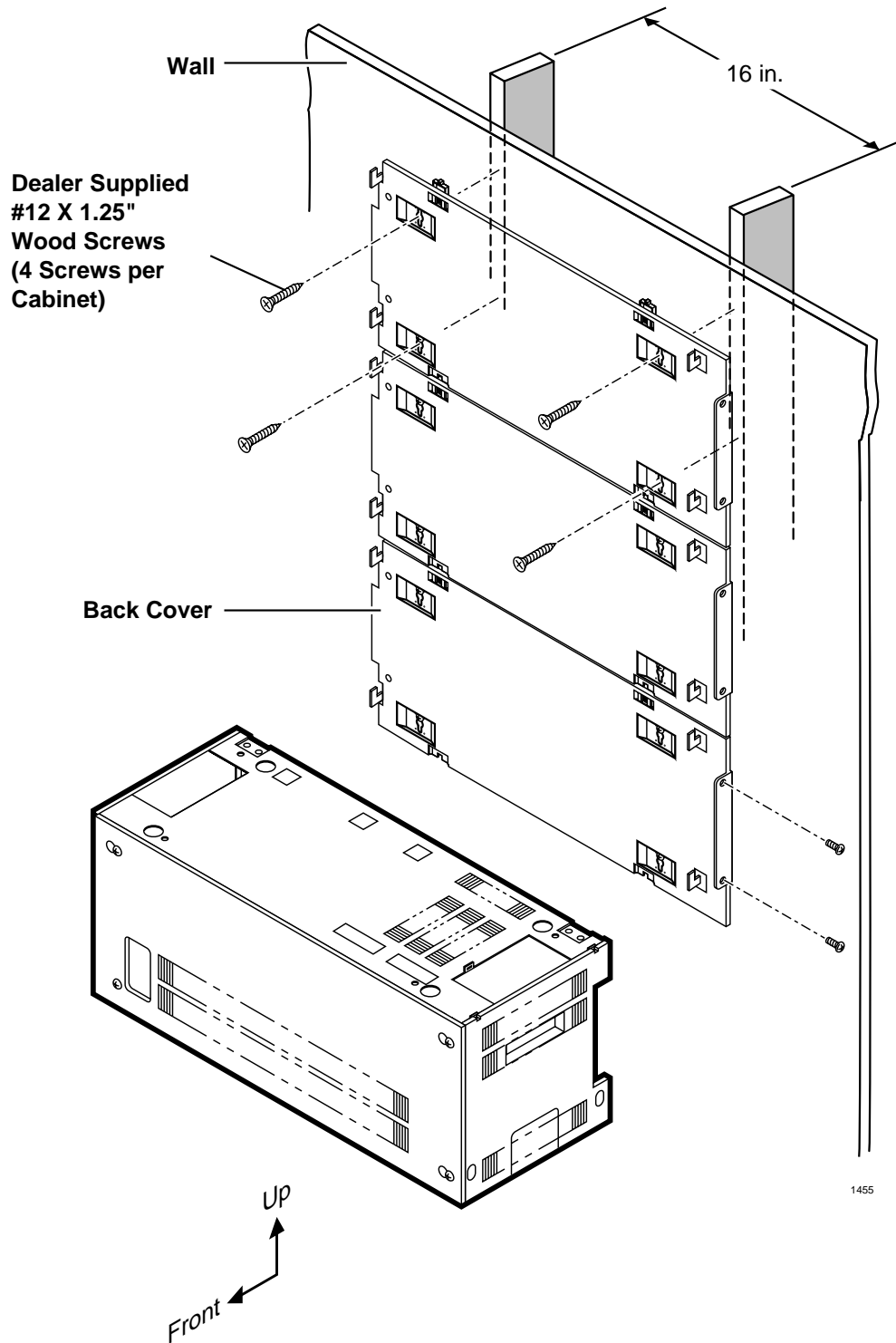
Figure 5-4   DK424 Cabinet Mounting Surface Diagram (Directly on the Wall)

Locating
Parts

Plaster Board Wall

3/4" Plywood Backboard

#12 X 1.25"
Wood Screws
(As many as necessary to
secure plywood backboard)

Dealer Supplied
#12 X 1.25"
Wood Screws
(4 Screws Per
Cabinet)

Back Cover

6.5 ft.
(for seven cabinets)

Up

Front

1456

6 inches between
bottom cabinet
and floor

Floor
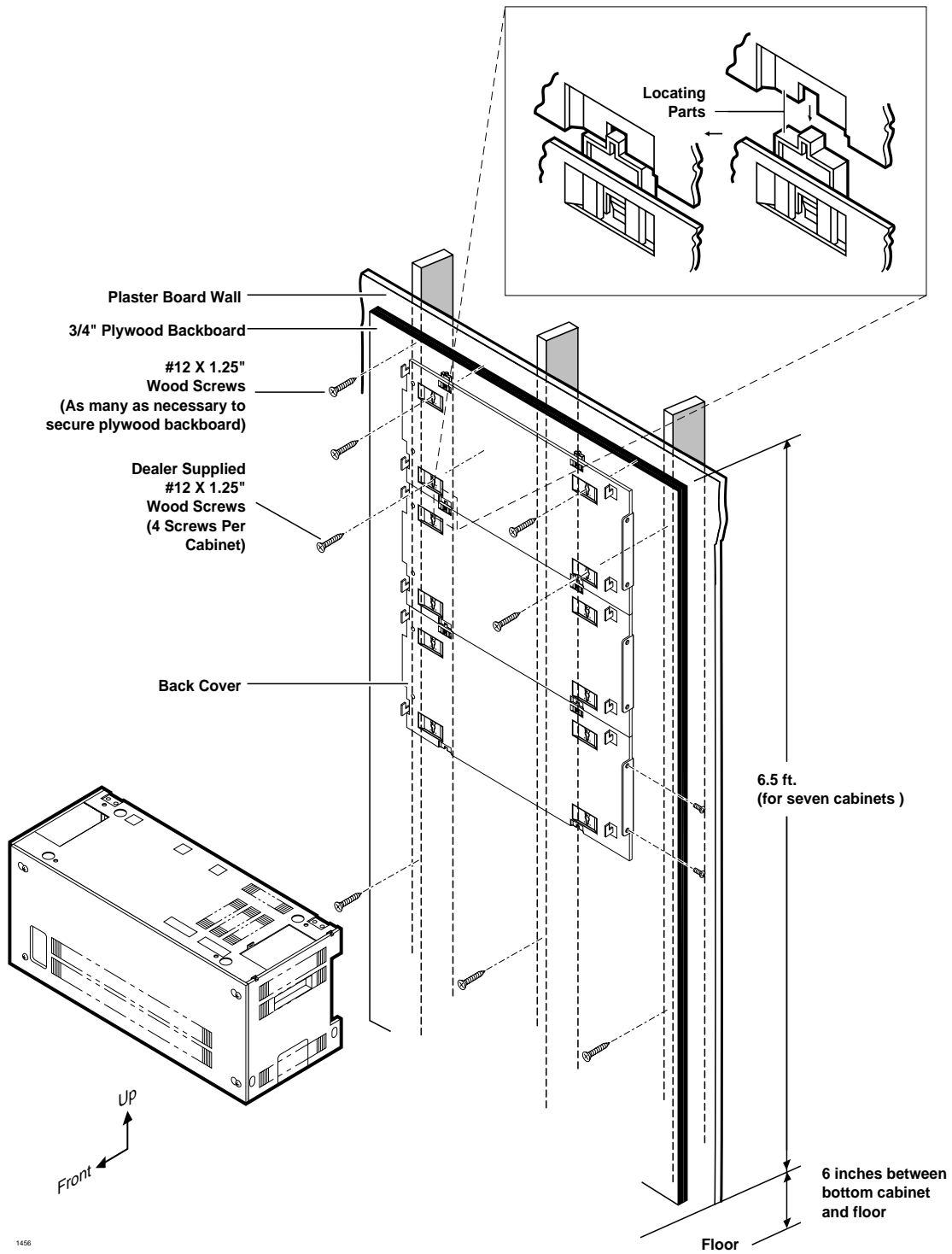
Figure 5-5   DK424 Cabinet Mounting Surface Diagram (with Plywood Backboard)

Top Cover
(Base Cabinet Only)

Loosen four screws to remove the top cover:

Note
Do not remove the top cover if the Base Cabinet is the top cabinet.

Front
Cover

Remove this screw to remove the front cover

Right
Side Cover

Front ← → Right

Loosen three screws to remove front cover

Loosen two screws to remove the side covers (right and left side covers)

Top Cover
(Base Cabinet Only)

Front → Right

Back Cover

Right
Side
Cover

Remove four screws to remove back cover

Loosen two screws to remove the side cover (right and left covers)

1457

Figure 5-6   DK424 Cabinet Cover Removal and Installation

Marking Hole

Trace Upper Arch

16 IN.

8.1 IN.
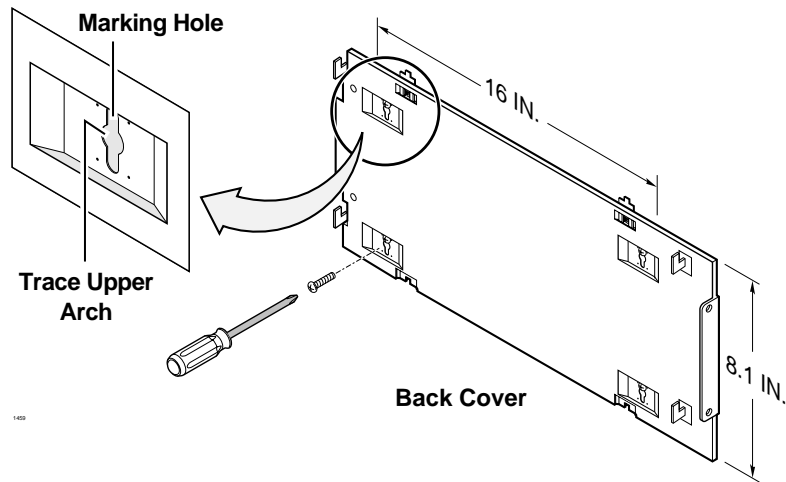
Back Cover

Figure 5-7   DK424 Back Cover Mounting Holes

Hang cabinet on back cover then slide to right.

Hanger

Back Cover

Hanger Hole

Back Cover Mounting Strip

Important! *After mounting cabinet to back cover use two screws to fasten cabinet to back cover.*

INSTALL: SLIDE RIGHT

REMOVE: SLIDE LEFT
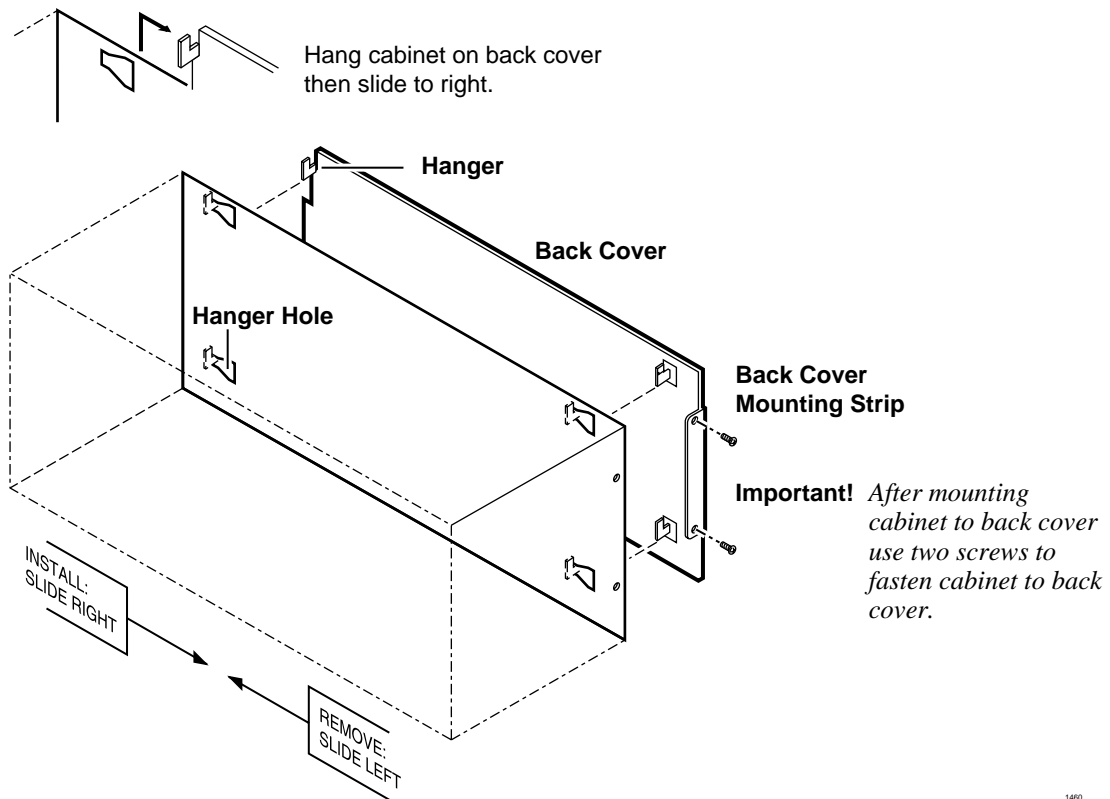
Figure 5-8   DK424 Mounting Cabinet on Back Cover
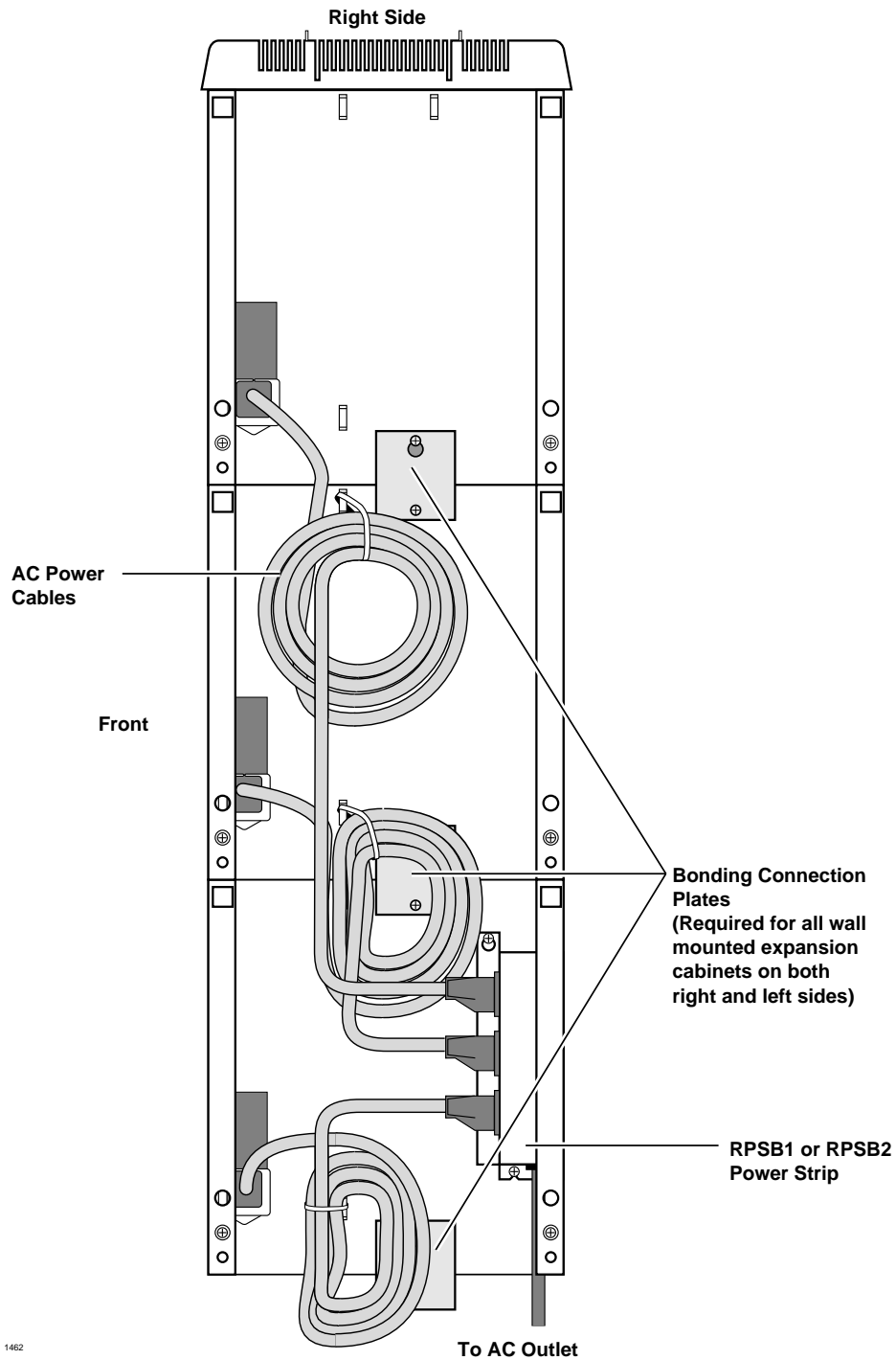
Figure 5-9   Right Side View of Cabinet Interior

Note   See "Outlet Strip (RPSB1 and RPSB2) Installation" on Page 5-34 for RPSB1 and RPSB2 cabinet locations.

Cab 2 Cable

Important ! *Data cable shield doors must be closed and secured at all times during the system operation.*

Left Side

Base Cabinet

CAB 2
CAB 3
CAB 4
CAB 5
CAB 6
CAB 7

Cable Guard Screw

Cable Guard

Data Cables

PCB Cable

Expansion Cabinet

Front

Data Cable Door (shown open)

Expansion Cabinet

1461

Bonding Connection Plate (required for all wall mount expansion cabinets)

To MDF

Figure 5-10 Left Side View of Cabinet Interior

R11	RCTU	S11	S12
S13	S14	S15	S16

**Printed Circuit
Board Cables**

CABINET NO.					
2	3	4	5	6	7
S–1		S–2		S–3		S–4
S–5		S–6		S–7		S–8
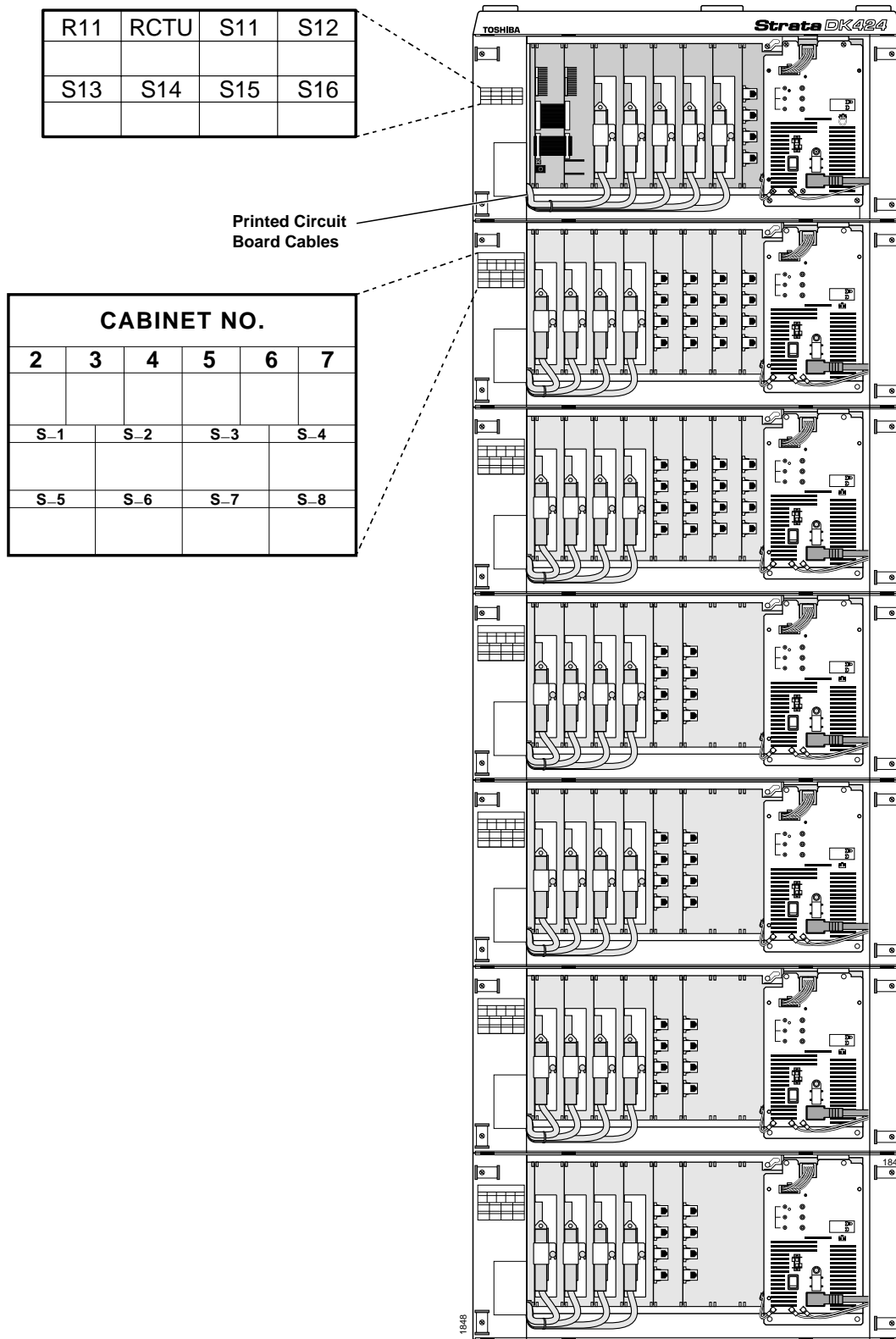
Figure 5-11   Front View of DK424 Cabinet Interior

25-Pair
Amphenol
Cables

Knock Out Plastic

Top

To MDF

A. Cables Run Out of Top of
Cabinet(s)

B. Cables Run Out of Side of
Cabinet(s)

C. Cables Run Out of Bottom
of Cabinet(s)

25-Pair
Amphenol
Cables

To MDF

To MDF

25-Pair
Amphenol Cables

1464

Figure 5-12   DK424 Cabinet Cable Routing

Cabinet Floor Mounting

One or Two Cabinets

1. Remove front, side, and top covers from cabinet(s) (Figure 5-2). Remove plastic locating parts from all cabinet back covers using a Phillips screwdriver (Figure 5-6).

2. Make sure that cabinet power supplies (RPSU280) are installed per "Power Supply Installation" on Page 5-8.

3. If installing just one cabinet, install the RFMF fixtures on each side of the bottom of the cabinet (Figure 5-13) and place the cabinet where it should be installed (go to Step 6).

4. If installing two cabinets, install a floor fixture (RFMF1) on each side of the cabinet that will be the bottom cabinet, making sure that the fixture is inside of the cabinet edge.

5. If installing two cabinets:

   ♦ Set the bottom cabinet on the floor or mount surface, then set the top cabinet on the bottom cabinet.

   ♦ Fasten the two cabinets together with the four screws provided: (two screws at front "A" and two at back "B" of cabinet. Place cabinet where it should be installed.

   ♦ Connect the Expansion Cabinet data cable to the "CAB. 2" data cable connector on the Base Cabinet (Figures 5-10 and 5-28).

6. Install ground wiring, AC and reserve power cabling, and PCB cabling per the "Recommended Installation Sequence" on Page 5-7.

7. Fill out cabinet/slot identification labels on cabinet(s) (Figure 5-11).

8. Reinstall covers on to cabinet(s).

Three or More Cabinets

This section shows you how to mount three or more cabinets to a concrete, wood or computer room floor. Use the General Steps for all of these methods first, then the specific steps that follow for each method.

1. Make sure that cabinet power supplies (RPSU280) are installed per "Power Supply Installation" on Page 5-8.

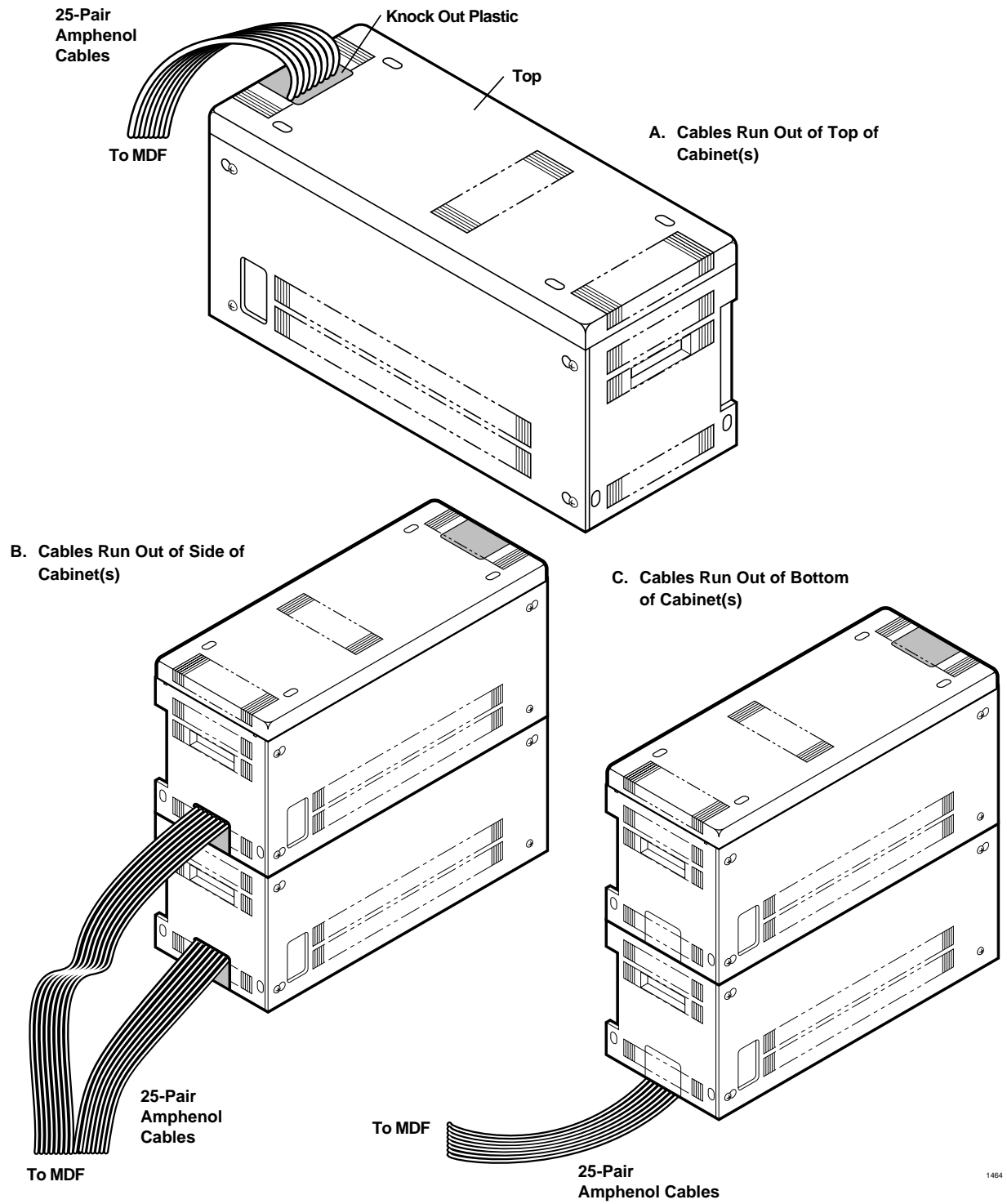2. Remove front, side, and top covers from all cabinets (Figure 5-2).

   Remove plastic locating parts from all cabinet back covers using Phillips screwdriver (Figure 5-5).

3. Install a floor fixture (RFMF1) on each side of the bottom cabinet. (Make sure that the fixture is inside of the cabinet edge. For Steps 3~10, see Figures 5-13~5-18.

4. Place cabinet two on top of the bottom cabinet and connect them together at points A and B with the screws provided.

5. Place cabinet three on top of cabinet 2 and connect them together at points A and B with the screws provided.

6. If installing more than three cabinets, install wall brackets (RWBF1) on the top of cabinet 3. Position the 3 cabinets parallel to the wall (2 inches from the wall) and secure the wall brackets to the wall with customer-provided wood screws and wall anchors as required.

DK424 Installation

7. For systems with just three cabinets, secure the floor fixtures (already attached to the bottom cabinet) to the floor with the customer-provided floor bolts.

8. Refer to the following sub-sections and anchor the system to concrete, wood, or computer room floor. After completing those steps, proceed to Step 12. For systems with four or more cabinets, skip this step and proceed to Step 9.

9. Add remaining cabinets, making sure that the cabinets are connected together at points A and B with the screws provided.

10. For systems with four or more cabinets, make sure that wall brackets (RWBF1) are installed on both sides of the top cabinet, in addition to cabinet three.

11. Check to make sure the cabinets are parallel to the wall. Secure the floor fixtures attached to the bottom cabinet to the floor with the customer-provided floor anchors.

12. Connect the data cable of each Expansion Cabinet to the applicable data cable connector on the Base Cabinet (Figures 5-10 and 5-28). (The data cable from the first Expansion Cabinet should be connected to the connector labeled "CAB. 2", the cable from the second Expansion Cabinet to the "CAB. 3" connector, etc.)

13. Install ground wiring, AC and reserve power cabling, and PCB cabling per the "Recommended Installation Sequence" on Page 5-7.

14. Fill out cabinet/slot identification labels on each cabinet and reinstall covers on the cabinets. (The top cover should be installed on the top cabinet.)
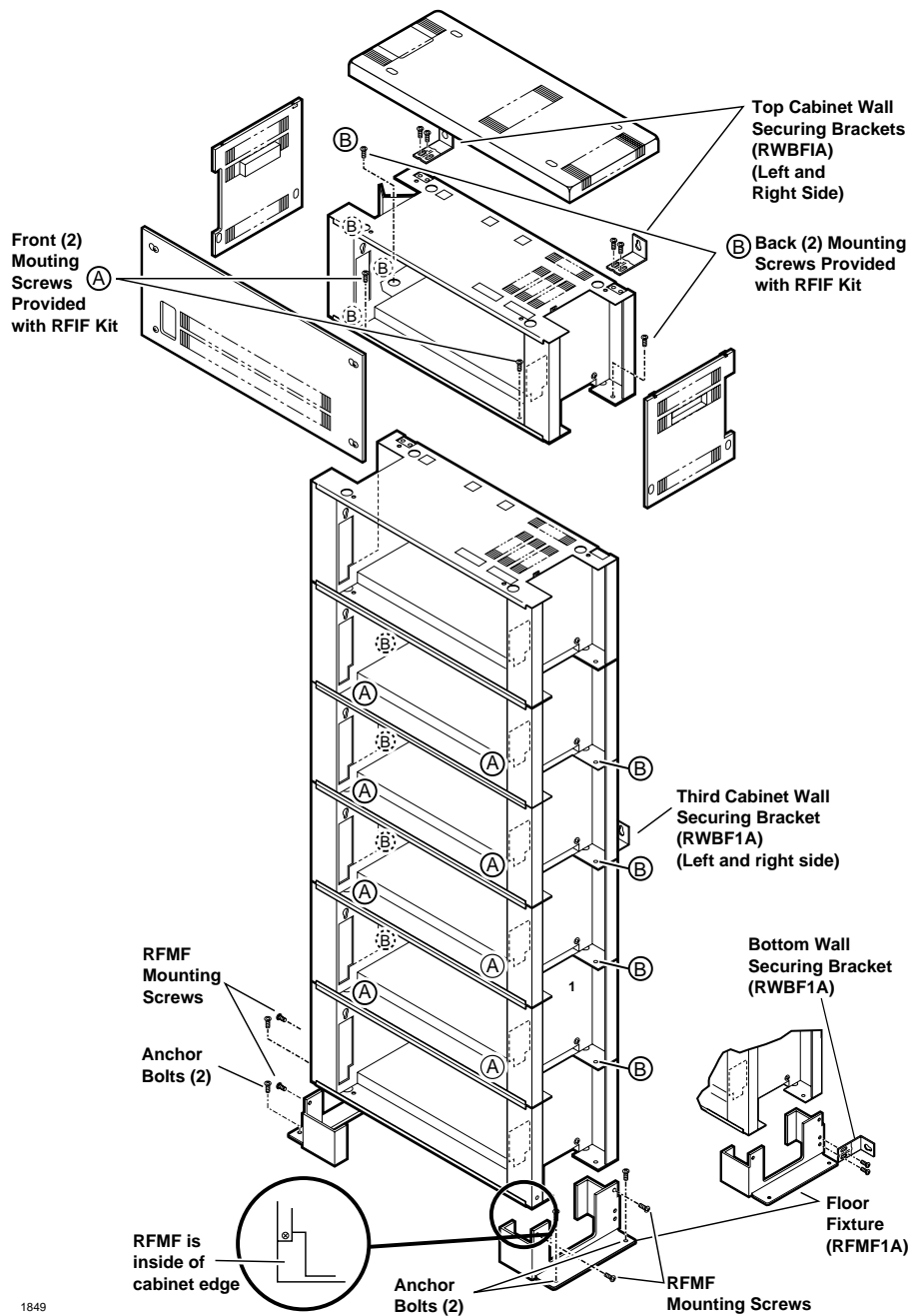
Figure 5-13 DK424 Cabinet Floor Installation

Important!

- *RFMF1A (two-each) and RWBF1A (six-each) are supplied with the floor installation kit RFIF*

- *Upper and third cabinets must be fixed to the wall with RWBFS on each side (use #12 x 1.25 wood screws and wall anchors, as required)*

- *Floor fixture (RFMF) must be fixed to floor by either anchor bolts, or wall by RWBF wall brackets (see).*
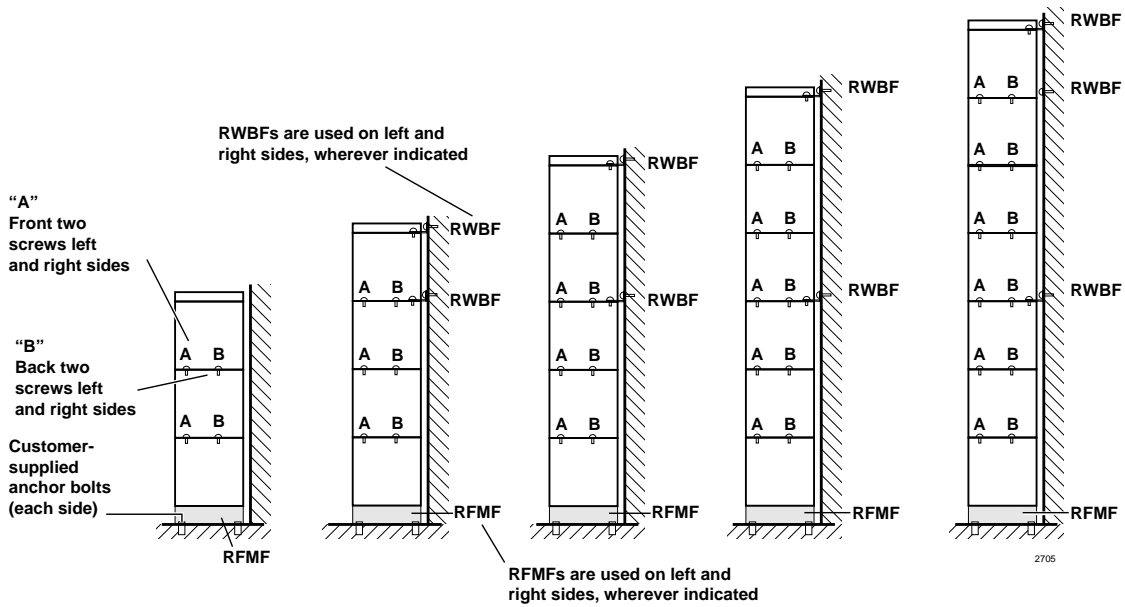
DK424 Installation

Note RWBF1A (3-pairs) and RFMF1A (1-pair) are supplied with floor installation kit RFIF.

Figure 5-14 Floor Mounting Cabinets (Bolted to the Floor)
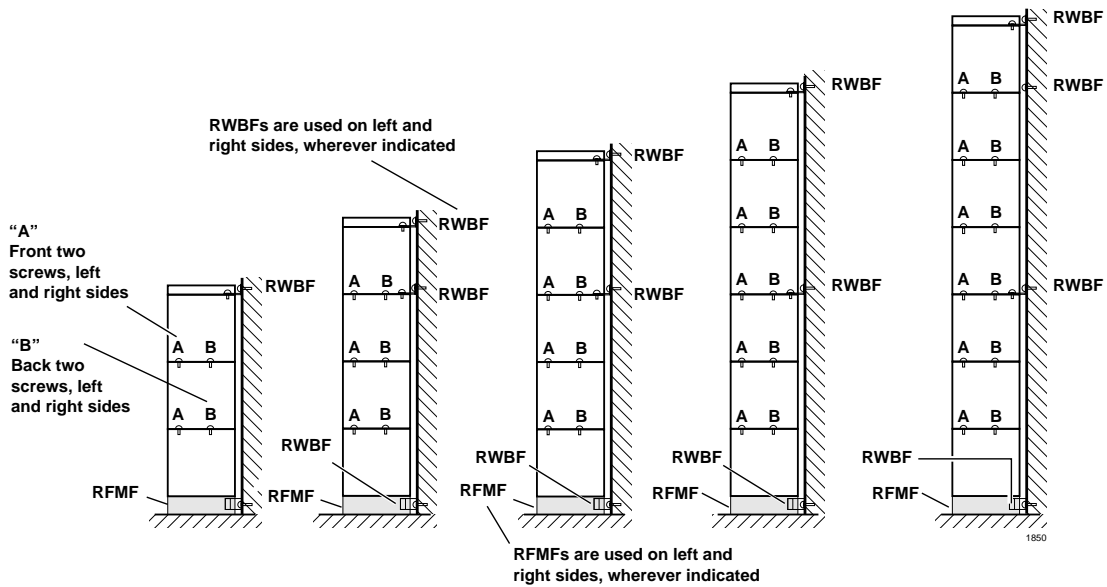
Note RWBF1A (3-pairs) and RFMF1A (1-pair) are supplied with floor installation kit RFIF.

Figure 5-15 Floor Mounting Cabinets, (Not Bolted to the Floor)

Bolt Cabinets to a Concrete Floor

1. Mount the DK424 Base Cabinet on Floor Mount Fixtures (see Figures 5-13 and 5-16).

2. Position the Base Cabinet at the selected installation location.

3. Mark the floor where holes will be drilled. Move the Base Cabinet prior to drilling.

Note   Cover the Base Cabinet with a drop cloth to protect the power equipment from dust created during drilling.

4. Use a hammer drill to make holes for 3/8-inch bolt anchors.

5. Install the bolt anchors, with plugs, in the drilled holes.

6. Using the driving tool and a hammer, drive each bolt anchor into the floor.

7. Move the Base Cabinet into position on the equipment room floor.

8. Secure the Base Cabinet to the floor using bolts, lock washers, and flat washers.
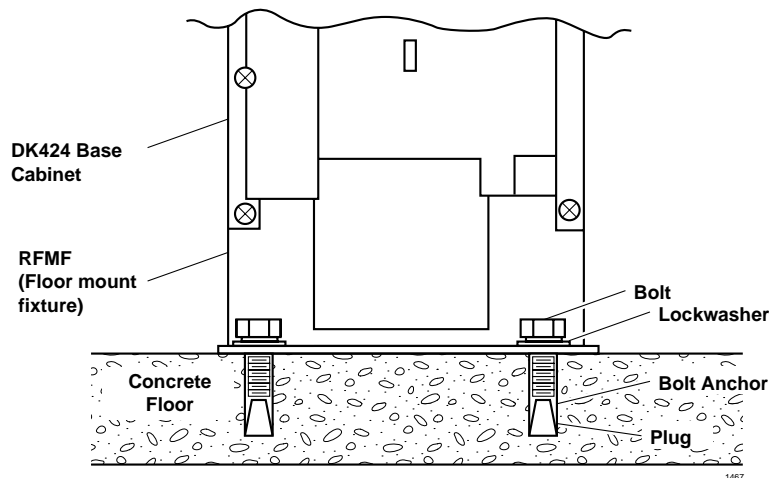
Figure 5-16   Floor Mount Installation – Concrete Floor

Bolt Cabinets to a Wooden Floor

1. Mount the DK424 Base Cabinet on Floor Mount Fixtures (RFMF). See Figures 5-13 and 5-17.

2. Position the Base Cabinet at the selected installation location.

3. Mark the floor where holes will be drilled. Move the Base Cabinet prior to drilling.

Note   Cover the Base Cabinet with a drop cloth to protect the power equipment from dust created during drilling.

4. Drill pilot holes to make insertion of 3/8 inch lag bolts easier, and to prevent splitting of wood flooring.

5. Move the Base Cabinet into position on the equipment room floor.

6. Secure the Base Cabinet to the floor using lag bolts, lock washers, and flat washers.

DK424 Installation
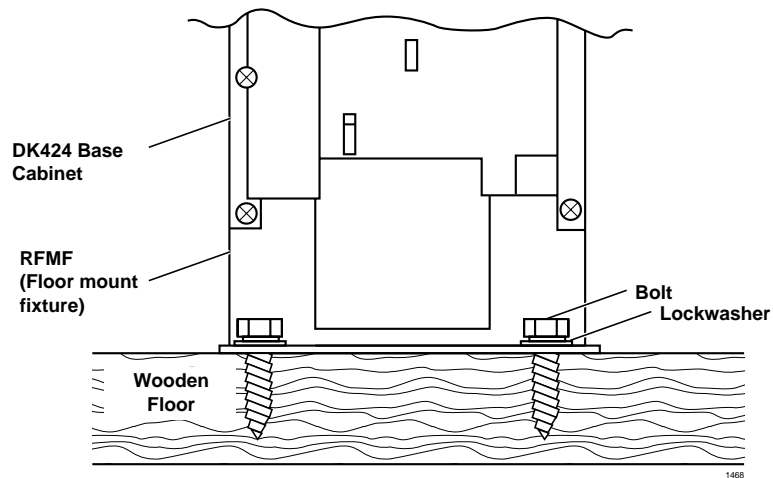
Figure 5-17   Floor Mount Installation – Wooden Floor

Bolt Cabinets to a Computer Room Floor

1. Mount the DK424 Base Cabinet on Floor Mount Fixtures (RFMF). See

2. Position the Base Cabinet at the selected installation location.

3. Mark the floor where holes will be drilled. Move the Base Cabinet prior to drilling.

Note   Cover the Base Cabinet with a drop cloth to protect the power equipment from dust created during drilling.

4. Drill holes through tile for 3/8-inch threaded rods.

5. After the tiles have been drilled, insert threaded rods through the holes in the tile and mark the concrete floor directly beneath the holes in the tiles.

6. Remove the tiles. Use a hammer drill to make holes for 3/8-inch bolt anchors.

7. Install the bolt anchors with plugs in the drilled holes.

8. Using the driving tool and a hammer, drive each bolt anchor into the floor.

9. Screw threaded rods into each bolt anchor.

10. Install a hex nut, lock washer, and flat washer on each threaded rod. Screw the nuts down far enough to allow floor tiles to be replaced over the threaded rods.

11. Replace tiles over threaded rods in their original positions on the floor.

12. Reach under the tiles, and screw the hex nuts upward until the flat washers are touching the bottom of the tile.

13. Use a hack saw to cut the threaded rods at a height of approximately 1.5 inches above the floor tile.

14. Move the Base Cabinet into position over the threaded rods.

15. Secure the Base Cabinet to the floor using flat washers, lock washer, and hex nuts on each threaded rod.
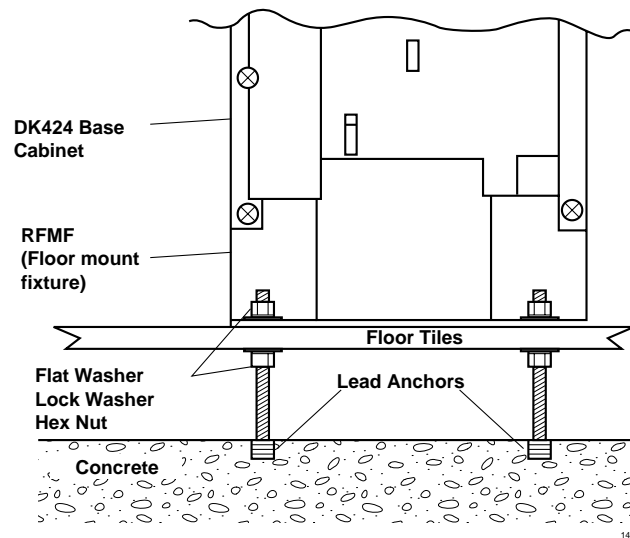
Figure 5-18 Floor Mount Installation – Computer Room Floor

Mount Cabinets to Computer Room Floor (Unbolted)

1. Make sure that cabinet power supplies (RPSU280) are installed per "Power Supply Installation" on Page 5-8.

2. Remove front, side, and top covers from all cabinets (Figure 5-2).

   Note   As shown in Figure 5-18, the two screws on each side cover and the three screws on the front cover (the bottom left screw must be completely removed) should only be loosened and the covers slid to the right for removal.

   Remove plastic locating parts from all cabinet back covers using a Phillips screwdriver (Figure 5-5).

3. Install a floor fixture (RFMF1) on each side of the bottom cabinet (Figures 5-12 and 5-14), making sure that the fixture is inside of the cabinet edge.

4. Secure a wall bracket (RWBF1) to both floor fixtures with the screws provided. Secure the wall brackets to the wall with customer-provided wood screws and wall anchors.

5. Place a cabinet on top of the bottom cabinet and connect the cabinets together at points A and B with the screws provided.

6. Install wall brackets (RWBF1) on the top of cabinet three and secure them to the wall with customer-provided wood screws and wall anchors.

7. Add remaining cabinets, making sure that the cabinets are connected together at points A and B with screws provided.

8. For systems with four or more cabinets, make sure that wall brackets (RWBF1) are installed on both sides of the top cabinet, in addition to cabinet three.

9. Connect the data cable of each Expansion Cabinet to the applicable data cable connector on the Base Cabinet (Figures 5-10 and 5-28). The data cable from the first Expansion Cabinet should be connected to the connector labeled "CAB. 2", the cable from the second Expansion Cabinet to the "CAB. 3" connector, etc.)

DK424 Installation

10. Install ground wiring, AC and reserve power cabling, and PCB cabling per the "Recommended Installation Sequence" on Page 5-7.

11. Fill out cabinet/slot identification labels on each cabinet (see Figure 5-11), then reinstall covers on the cabinets. (The top cover should be installed on the top cabinet.)

Cabinet Removal – Floor-Mounted Systems

This procedure is written on the presumption that the Base Cabinet is the bottom cabinet of systems with two or more cabinets.

1. Turn the system power OFF, and remove the front and side covers from the cabinet to be replaced and any cabinets above it. Remove the top cover from the top cabinet if it is to be replaced (Figure 5-6).

2. Unplug the AC power cord of the cabinet and any reserve power cabling connected to the power supply. Repeat this procedure for each cabinet above the cabinet to be replaced.

3. If a power strip (RPSB1 or RPSB2) (Figure 5-19), Conduit Connection Box (RCCB1 or RCCB2), or Battery Distribution Box (RBDB1 or RBDB2) is connected to the cabinet, remove it (Figures 5-23 and 5-26).

4. If the cabinet to be replaced is the Base Cabinet (DKSUB424), disconnect all data cables connected to the Base Cabinet data cable connector.

5. If the cabinet to be replaced is an Expansion Cabinet (DKSUE424), disconnect the data cable of the cabinet from the data cable connector on the Base Cabinet. Repeat this procedure for all Expansion Cabinets above the cabinet to be replaced.

6. Disconnect any intercabinet ground wiring or system ground wiring connected to the cabinet. Repeat this procedure for any cabinets above the cabinet to be replaced.

7. Remove any cabinets above the cabinet to be replaced, and then remove the cabinet to be replaced.

Cabinet Replacement

➤ To replace cabinets, refer to "Cabinet Floor Mounting" on Page 5-21.

AC Power and Grounding Requirements

The system requires a solid earth ground for proper operation and safety. The AC power cord(s) already contains a conductor for the "third wire ground" provided by the commercial power outlet. An insulated conductor must connect the frame ground terminal on the Base Cabinet (or the bottom Expansion Cabinet) to a cold water pipe or the building ground.

Notes

- The "third wire ground" ("A" in Figure 5-28) must be dedicated. The conductor connected to the frame ground must comply with the general rules for grounding contained in Article 250 of the National Electrical Code, NFPA 70, but must not depend on the cord and plug of the system.

> **WARNING!** **Failure to provide ground may be a safety hazard or lead to confusing trouble symptoms and, in extreme cases, system failure.**

AC Power and Third Wire Ground Test

Test each "third wire ground" separately for continuity by either measuring the resistance between the third prong terminal (earth ground) and a metal cold water pipe (maximum: 1 ohm) or by using a commercially available earth ground indicator. If neither procedure is possible, perform the following procedure.

➤ **To test each "third wire ground" for continuity**

> **WARNING!** **Hazardous voltages that may cause death or injury are exposed during the following test. Use great care when working with AC power line voltage.**

1. Obtain suitable voltmeter, and set it for a possible reading of up to 250VAC.

2. Connect the meter probes between the two main AC voltage terminals (white and black wires) on the wall outlet. The reading obtained should be between 100 ~ 125VAC.

3. Move one of the meter probes to the third terminal (green wire ground, point A in Figure 3-19). Either the same reading or a reading of zero volts should be obtained.

4. If the reading is zero volts, leave one probe on the ground terminal and move the other probe to the second voltage terminal.

> **CAUTION!** **If a reading of zero volts is obtained on both voltage terminals (white wire to green wire, black wire to green wire), the outlet is not properly grounded. Omit Steps 5 and 6, and proceed directly to Step 7.**

5. If a reading of zero volts on one terminal and a reading of 100 ~ 125VAC on the other terminal is obtained, remove both probes from the outlet.

6. Set the meter to the "OHMS/Rx1" scale. Place one probe on the ground terminal, and the other probe on the terminal that produced a reading of zero volts. The reading should be less than one ohm.

> **CAUTION!** **If the reading is more than one ohm, then the outlet is not adequately grounded. If the above tests show the outlet AC voltage is not in range or is not properly grounded, the condition should be corrected (per Article 250 of the National Electrical Code) by a qualified electrician before the system is connected.**

➤ **To test the frame ground conductor for continuity**

> **WARNING!** **Hazardous voltages that may cause death or injury are exposed during the following test. Use great care when working with AC power line voltage.**

1. Disconnect the AC plug(s) of the system to make sure that the separate earth ground paths are separated.

2. With a suitable volt/ohm meter, perform a reading between points "A" and "B" shown in Figures 5-28, 5-21 and 5-22. Verify that the readings do not exceed the figures listed below. If they do, the condition must be corrected by a qualified electrician before the system is connected.

DK424 Installation

A to B: 1 volt maximum then A to B: 1 ohm maximum

Intercabinet Ground

Connect intercabinet ground wires (supplied with each cabinet) between cabinets in systems with two or more cabinets (Figures 5-21 and 5-22).

AC Power Cabling Installation

The system requires an input power source of 50/60 cycles, 115VAC ± 10 VAC, and up to 17.5 amps AC to operate. AC power cabling requirements vary, depending on the method of cabinet installation and the number of cabinets. Refer "Summary of Electrical/Environmental Characteristics" on Page 5-4 for electrical power requirements.

Some floor-mounted configurations and all wall-mounted configurations require AC outlets, which must be dedicated to system use, fused, and grounded. To avoid accidental turn off, do not configure the outlet with an ON/OFF switch.

AC Power for One or Two Cabinets (Wall Mount)

Refer to the following instructions to install AC power cabling to floor or wall-mounted systems with just one or two cabinets:

1. Make sure all power supply (RPSU280) switches are in the OFF position.

2. If two cabinets are installed and local electrical code allows only one AC power cord from the system, install the RPSB2 in the bottom cabinet per Figures 5-19 and 5-20.

3. For AC power cords that will be plugged directly into a wall outlet: Undo the tie wrap that keeps the cord coiled. Plug female end of the cord into the power supply, and plug the male end into the wall outlet.

4. For AC power cords that will be plugged into power strips: Do not undo the tie wrap that keeps the cord coiled. Plug female end of the cord into the power supply, and plug the male end into the RPSB power strip. Plug the power strip power cord into a wall outlet (see Figure 5-9).

Note Power Supply testing procedures are provided in Chapter 12 – Fault Finding, which should be referred to if it is suspected that the power supply does not work properly.

AC Power for Three or More Cabinets (Wall Mount)

Local electrical codes specify that a maximum of one or two AC power cords from the system can be plugged into wall outlets. Systems with three or more cabinets must be equipped with power strips (RPSB1 or RPSB2) to adhere to this requirement. Each power strip has three outlets and an AC power cord.

Three- or four-cabinet systems require one power strip, while five- to seven-cabinet systems require two or three power strips, depending on local electrical code requirements pertaining to the number of AC power cords (one or two) allowed from the system.

➤ **To install AC power cabling to wall-mounted systems with three or more cabinets**

Refer to Figures 5-19~5-22 and follow these steps:

1. Make sure all power supply (RPSU280) switches are in the off position.

2. Secure power strips to applicable cabinets.

3. For AC power cords that will be plugged directly into a wall outlet: Undo the tie wrap that keeps the cord coiled. Plug female end of the cord into the power supply, and plug the male end into the wall outlet.

4. For AC power cords that will be plugged into power strips: Do not undo the tie wrap that keeps the cord coiled. Plug female end of the cord into the power supply, and plug the male end into the power strip. Plug the power strip power cord into a wall outlet.

Note Power Supply testing procedures are provided in Chapter 12 – Fault Finding, which should be referred to if it is suspected that the power supply does not work properly.

AC Power for Three or More Cabinets (Floor Mount)

UL specifies that floor-mounted systems with three or more cabinets require the installation of a Conduit Connection Box (RCCB1 or RCCB2) to connect AC power cabling (and reserve power) to the system. AC power cabling for floor-mounted systems with three or more cabinets requires the installation of one or two power strips (RPSB1and RPSB2), depending on the number of cabinets installed.

➤ **To connect AC power cabling to floor-mounted systems with three or more cabinets**

Refer to Figures 5-19~5-19, 5-22, 5-26 and 5-27, and follow these steps:

1. Make sure that the conduit connection box is installed on the bottom cabinet. The box can be installed by the regular system installer.

2. Have a *licensed electrician* install conduit and cabling from the AC power source to the conduit connection box and local electrical codes. The remaining steps in this procedure can be performed by the regular system installer.

3. Make sure all power supply (RPSU280) switches are in the off position.

4. Secure power strips to applicable cabinets.

5. For each power supply: Plug the female end of the provided AC power cord into the power supply, without removing the tie wrap that keeps the cord coiled. Plug the other end of the cord into a power strip.

6. Plug power strip power cords into the conduit connection box.

DK424 Installation

Reserve Power Installation

Two or four customer-supplied, 12VDC batteries (80 amp hours maximum) can be connected to the system as a power failure backup. In the event of a power failure, the system automatically switches over to battery power without any interruption to existing calls or other normal system functions.

The length of time reserve power operates depends on the system, size and number of batteries provided, and the system load. Typical reserve power duration estimates and battery specifications are estimated with the following considerations (see Table 5-4):

♦ Batteries have full charge at start of operation.

♦ Two or four batteries connected per Figure 5-25.

♦ Batteries are 12VDC, rated at 80 amp/hours each.

♦ System is operating at full load traffic with LCD phones.

♦ Batteries used for this test are gel-cell and maintenance-free. Reserve duration will vary depending upon battery type, age, and manufacturer. These figures should only be used as an estimate.

Table 5-4   Typical Reserve Power Duration Estimate

Number of Cabinets	1	2	3	4	5	6	7
Estimated operation time Two-battery configuration	16.0 hr	8.0 hr	5.0 hr	3.7 hr	3.0 hr	2.5 hr	0.5 hr
Estimated operation time Four-battery configuration	32.0 hr	16.0 hr	10.0 hr	7.5 hr	6.0 hr	5.0 hr	2.0 hr
DC Current Drain (-24 VDC)	3.5 amps	6.7 amps	9.9 amps	13.1 amps	16.3 amps	19.5 amps	22.7 amps
AC Input Current (AC Current Limitation by National Electric Code)	2.5 amps	5.0 amps	7.5 amps	10.0 amps	11.5 amps	15.0 amps	17.5 amps

WARNING!   Some batteries can generate explosive gases. Therefore...

Ensure that batteries are located in a well-ventilated area.

Do not smoke near batteries.

Avoid creating any electrical sparks near batteries.

Use commercially available battery enclosures to reduce risk to nearby people and equipment.

The procedure for installing reserve power varies, depending on the number of cabinets in the system and the mounting method employed in installing the cabinets. The following text details reserve power battery installation requirements.

WARNING!   Battery cables that exit the cabinet(s) are not UL listed because of possible incorrect installations. Have a licensed electrician install these cables.

Reserve Power for One or Two Cabinets (Wall Mount)

1. Connect the black jumper wire (supplied with the PBTC-3M cable) from the positive terminal of one 12VDC battery to the negative terminal of the second 12VDC battery (Figure 5-20).

2. Ensure that a serviceable 10-amp fuse is installed in the in-line fuse holder of the PBTC-3M cable.

3. Connect the PBTC-3M battery cable white lead to the open positive terminal of the 12VDC battery. Connect the black lead to the open negative terminal of the second 12VDC battery.

Important! *The cabinet(s) must be connected to the (live) AC power source, and the power supply ON/OFF switch set to ON prior to the final step of connecting the reserve power batteries to the power supply via the BATT+/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

4. Connect the PBTC-3M battery cable two-prong male plug to the Base Cabinet power supply BATT +/- receptacle.

5. Repeat Steps 3 and 4 to connect a PBTC-3M to the Expansion Cabinet.

6. To test reserve power operation, disconnect system AC power plugs with power supply ON/ OFF switches in the ON position. The system should continue to operate without interruption.

Note If connecting four batteries, follow the wiring diagram in Figure 5-25.

Reserve Power for Three or More Cabinets (Wall Mount)

1. Install the Battery Distribution Box (RBDB1A or RBDB2) to the bottom cabinet.

2. Connect two Cable "C" jumper wires from the positive terminal of one 12VDC battery to the negative terminal of the second 12VDC battery (Cable "C" is supplied with the RBTC1A-2M cable).

3. Ensure that a serviceable 12-amp fuse is installed in the in-line fuse holder of the RBTC1A-2M battery cable.

4. Connect the white lead of the RBTC1A-1.5M or RBTC2A-1.7M battery cable to the open positive terminal of the 12VDC battery. Connect the black lead to the open negative terminal of the second 12VDC battery.

5. Connect a second RBTC1A-1.5M or RBTC2A-1.7M in parallel to the first RBTC1A-2M cable per Steps 2, 3 and 4 instructions.

6. Plug the two RBTC1A-1.5M or RBTC2A-1.7M battery cables into the Battery Distribution Box.

Important! *The cabinets must be connected to the (live) AC power source, and the power supply ON/OFF switches set to ON prior to the final step of connecting the reserve power batteries to the power supplies via the BATT +/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

7. Connect the RBTC1A-1.5M or RBTC2A-1.7M cables from the Battery Distribution Box to the BATT +/- receptacle of individual power supplies (6-RBTC1A-1.5M cables are supplied with an RBDB distribution box). RBTC2A-1.7M is required for the seventh cabinet. It must be ordered with part number RCTC1A-1.7A.

8. To test reserve power operation, disconnect the system AC power plugs with the power supply ON/OFF switches in the ON position. The system should continue to operate without interruption.

Note If connecting four batteries, follow the wiring diagrams in Figure 5-25.

DK424 Installation

Reserve Power/AC Wiring for Three or More Cabinets (Floor Mount)

Floor-mounted systems with three or more cabinets require a Conduit Connection Box (RCCB) to connect reserve power cabling and AC power cabling to the system. Only a qualified electrician can install cabling between the reserve power source and AC power cabling to the conduit connection box. All other steps required to install reserve power, including installation of the Battery Distribution Box (RBDB), can be accomplished by the normal system installer.

➤ **To connect reserve power to floor-mounted systems with three or more cabinets**

See Figures 5-23 and 5-26~5-28 and follow these steps:

1. Make sure that the Conduit Connection Box is installed on the bottom cabinet. The box can be installed by the regular system installer.

2. Have a licensed electrician install conduit and battery cabling to the Conduit Connection Box and local electrical codes. The remaining steps in this procedure can be performed by the regular system installer.

3. Install the Battery Distribution Box on the second cabinet (the cabinet directly above the bottom cabinet).

4. Plug the two Conduit Connection Box cables (coming from the left side of the RCCB box) into the Battery Distribution Box.

Important!   *The cabinets must be connected to the (live) AC power source, and the power supply ON/OFF switches set to ON prior to the final step of connecting the reserve power batteries to the power supplies via the BATT +/- receptacle. If the batteries are connected after AC power is lost, reserve power will not function.*

5. Connect RBTC1A-1.5 and RBTC2A-1.7 cables from the (RBDB or RBDB2) Battery Distribution Box to the BATT +/- receptacle of individual power supplies (6 RBTC1A-1.5 cables come with each RBDB distribution box). RBTC2A-1.7 is a longer cable, required for the seventh cabinet. It must be special ordered with part number RCTC1A-1.7M.

6. To test reserve power operation, turn off the system AC power circuit breaker with power supply ON/OFF switches in the ON position. The system should continue to operate without interruption.
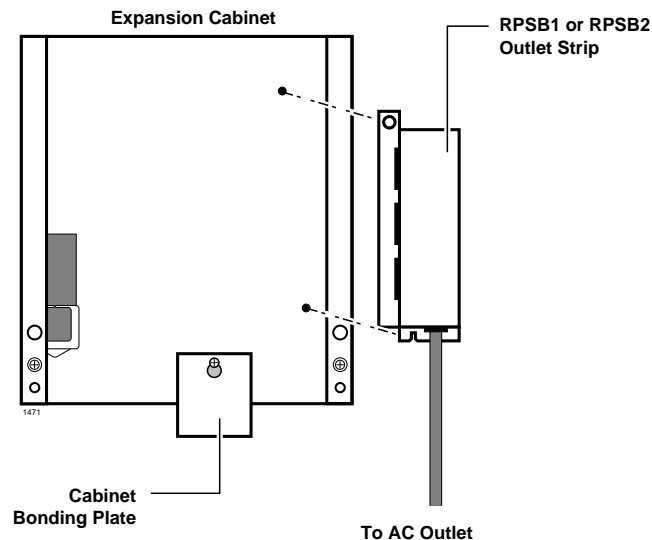
Figure 5-19 Outlet Strip (RPSB1 and RPSB2) Installation

RPSB280 Power Supply - Front View

Right Side View

Cabinet No. 1

PBTC-3M Cable to BATT Connector of Power Supply in Cabinet 1

RPSB2 (see Important note below)

Cabinet No. 2

PBTC-3M Cable to BATT Connector of Power Supply in Cabinet 2

White Wire

PBTC-3M Cable

AC Power Cord

One AC Cord (see Important note below)

Two PBTC-3M Cables

White Wires

Battery Box or Rack

12 VOLT

12 VOLT

Two Jumper to Connect Batteries in Series (Supplied With PBTC Cable)

Two AC Power Cords from RPSU280 Power Supplies (Cabinet 1 and 2)

Black Wires

To Dedicated AC Outlet (See Important Note)

115VAC ± 10VAC (11.5 Amps Max)

1474

Figure 5-20   AC and Reserve Power, One or Two Cabinets, Wall or Floor-mounted

Important!   *If local electric code allows only on AC cord from the system, install a RPSB2 in the bottom cabinet (per* Figure 5-23*). Plug power supplies into the RPSB2 and plug the RPSB2 into the dedicated wall outlet.*
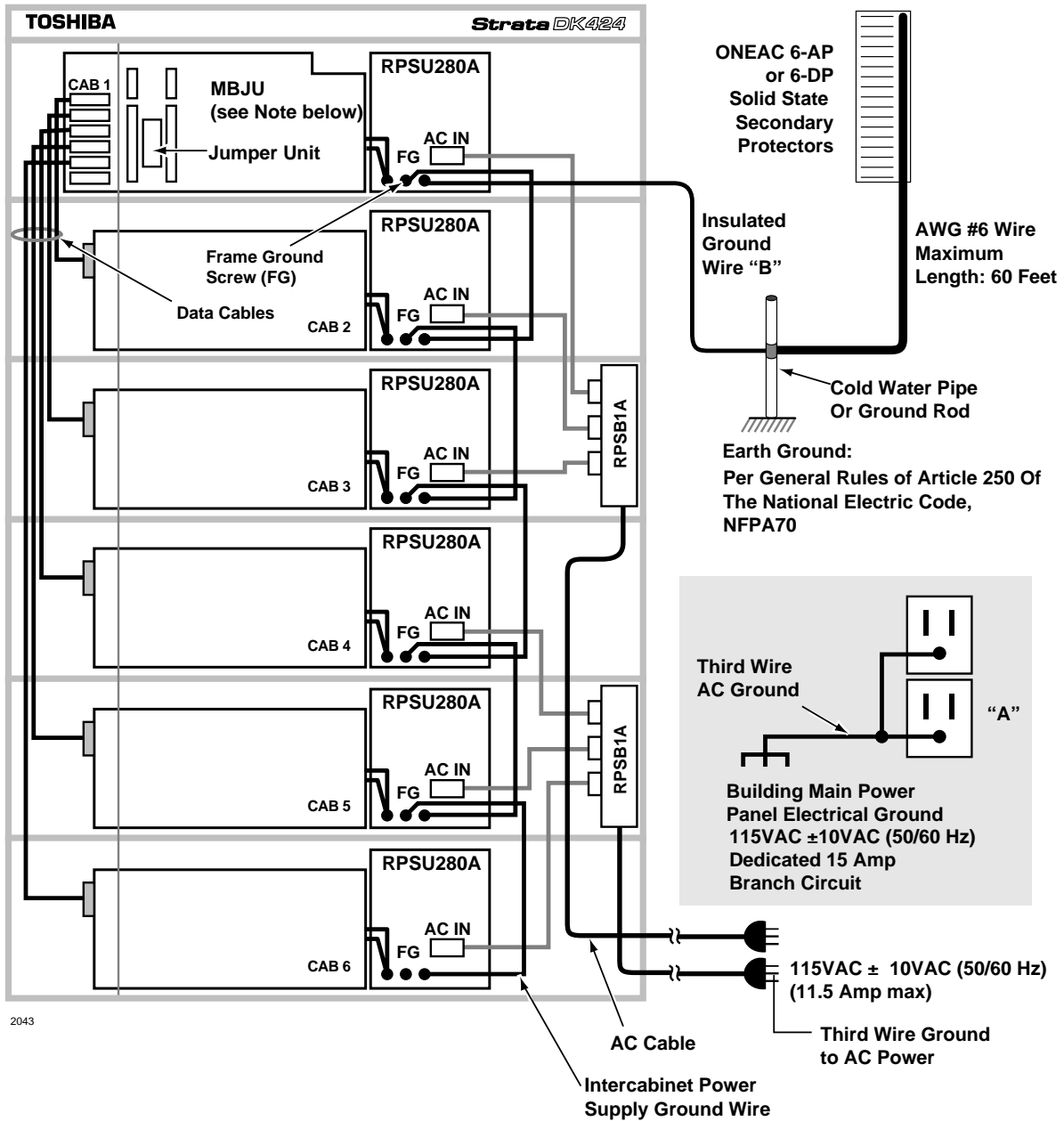
Important!   *Remove MBJU only when RCTUE/F is installed.*

Figure 5-21 AC Power Distribution for Six Cabinets
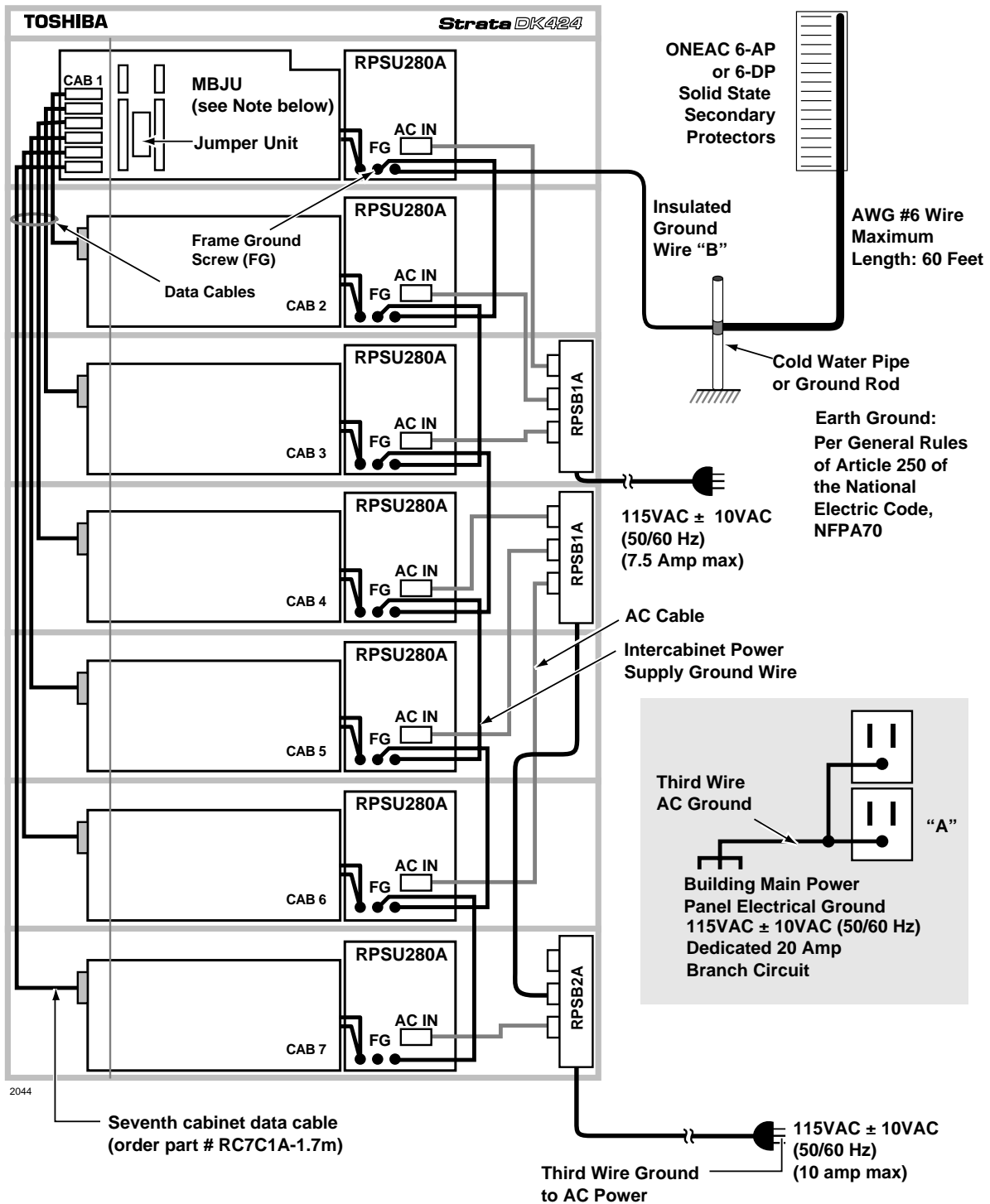
Important! *Remove MBJU only when RCTUE/F is installed.*

Figure 5-22 AC Power Distribution for Seven Cabinets

**Figure 5-23   Battery Distribution Box (RBDB) Installation
Wall/Floor Mount, Three or More Cabinets with Reserve Battery Back Up**

Right Side View

To "BATT"
Connector
RPSU 280
Top Cabinet

To "BATT"
Connector
RPSU 280
Cabinet 2

To "BATT"
Connector
RPSU 280
Cabinet 3

To "BATT"
Connector
RPSU 280
Cabinet 4

**RBTC1A-1.5M
Cable**

**AC
Power
Cord**

**RPSU280 Power Supply
Front View**

Notes

- Six RBTC1A-1.5M cables are supplied with each RBDB1A
- One "C" cable is supplied with each RBTCIA-2M

RBTC1A-1.5M cables from RBDB/PSU connectors to
individual power supply RBSU280 "BATT" connectors

To "BATT"
Connector
RPSU 280
Cabinet 5

Battery Distribution
Box RBDB1A
(Three or more cabinets,
up to six. RBDB2A is
required for seven cabinets)

BATT

PSU

To "BATT"
Connector
RPSU 280
Bottom Cabinet

RBDB

**Battery
Cabinet or Rack**

White Wires

16 AWG Wire

+
12 Volt
–

+
12 Volt
–

**Two "C"
cables to
connect
batteries
in series**

RBTCIA-2M cables to connect
batteries to RBDB distribution box
(6.5 ft cables)

Black Wires

12 Amp Fuse

1476

Note See Battery Requirements in Figure 5-25 on
Page 5-41.

DK424 Installation

Figure 5-24   Six Cabinet Reserve Power, Three to Six (Wall Mounted Cabinets)

Right Side View

To "BATT"
Connector
RPSU 280
Top Cabinet

To "BATT"
Connector
RPSU 280
Cabinet 2

To "BATT"
Connector
RPSU 280
Cabinet 3

To "BATT"
Connector
RPSU 280
Cabinet 4

To "BATT"
Connector
RPSU 280
Cabinet 5

To "BATT"
Connector
RPSU 280
Cabinet 6

To "BATT"
Connector
RPSU 280
Bottom Cabinet

DC OUT

POWER
-24V
+5V
-5V
DKSUB
DKSUE

BATT
ON
OFF
FG
AC IN

RBTC1A-1.5M
Cable

AC
Power
Cord

**RPSU280 Power Supply
Front View**

Cable supplied with RC7C1A-1.7M cable kit.

RBTC1A-1.5M cables from RBDB2/PSU connectors to
individual power supply RBSU280 "BATT" connectors
(supplied with RDBD2).

Note   See Battery Requirements in
Figure 5-25 on Page 5-41.

+ – + –
BATT

PSU

RBDB2

Battery
Cabinet or Rack

Three "C"
cables to
connect
batteries
in series

White Wires
16 AWG Wire

+
12 Volt
–

+
12 Volt
–

RBTCIA-2M cables to connect
batteries to RBDB2 distribution box
(6.5 ft cables)

Black Wires

12 AMP Fuse

2071

Figure 5-25   Seven Cabinet Reserve Power (Wall Mounted Cabinets)

2-Batteries/1~7 Cabinets (with RBDB2)[1]

12 Volt[4] Batteries 80 AMP/ HR Each

White Wire

RBTC1A-2M[2] Cable (6.5 ft)

"C" Cable

Black Wire

3 cables for 7 cabinets only

+ − + −
BATT
PSU
RBDB2

To RPSU280 "BATT" Connectors (6 max)

RBTC1A-1.5M Cables (6-max)

Cable for 7th cabinet (order number RC7C1A-1.7M)

2-Batteries/1-Cabinet (without RBDB)

12 Volt[4] Batteries 80 AMP/ HR Each

Base Cabinet
+
RPSU 280 BATT Cconnector
−

10A Fuse

PBTC-3M Cables (9 ft)

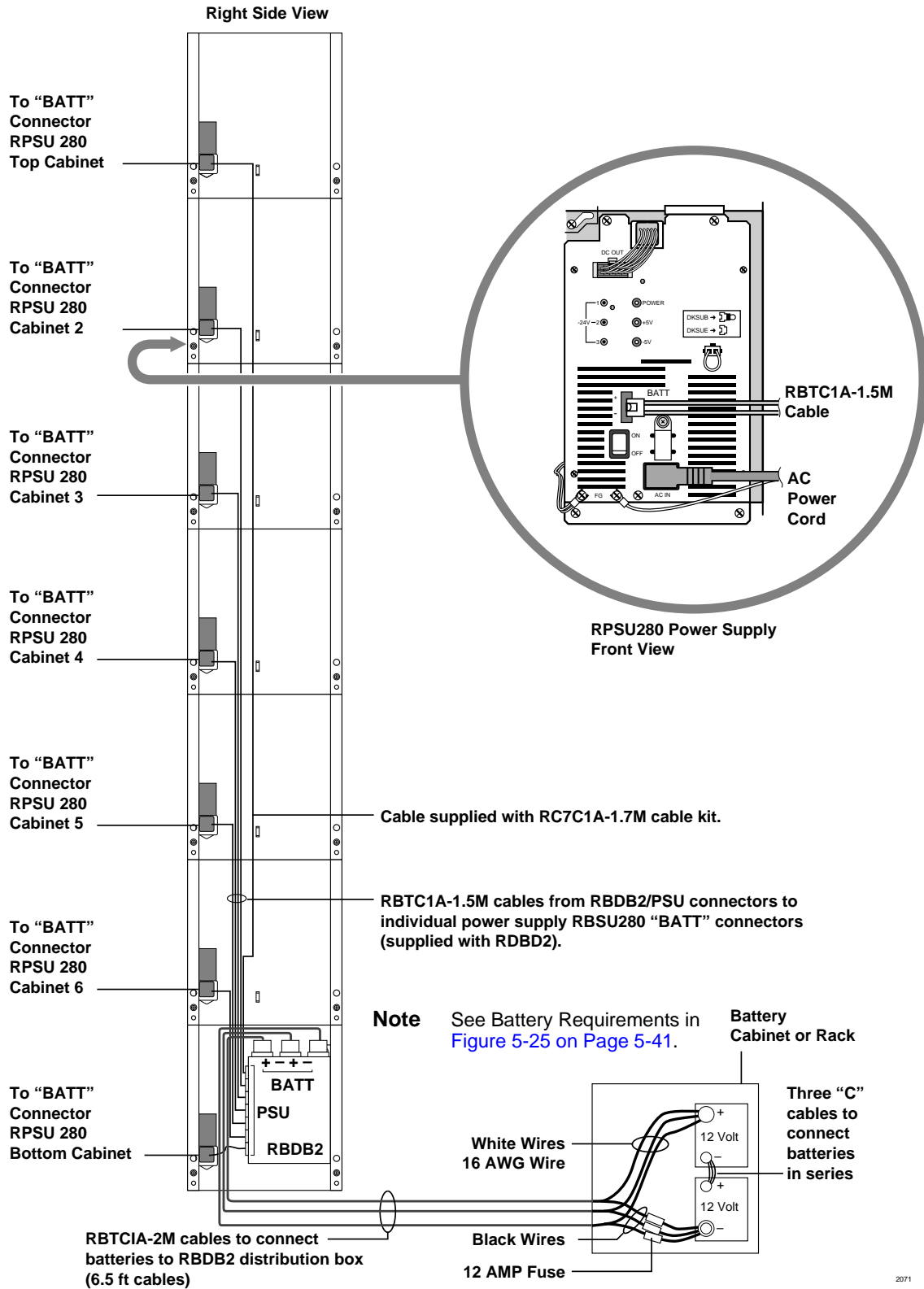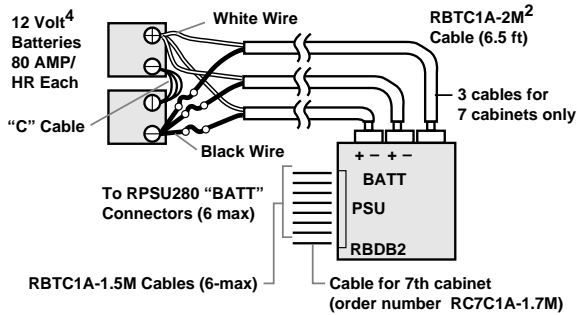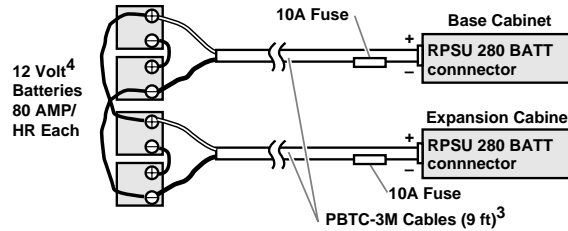**4-Batteries/2-Cabinets (without RBDB)**

10A Fuse

12 Volt[4] Batteries 80 AMP/ HR Each

Base Cabinet
+
RPSU 280 BATT connnector
−

Expansion Cabinet
+
RPSU 280 BATT connnector
−

10A Fuse

PBTC-3M Cables (9 ft)[3]

4-Batteries/1~7 Cabinets (with RBDB2)

"C" Cables

12 Volt[4] Batteries 80 AMP/ HR Each

RBTC1A-2M Cable (6.5 ft)[2]

3 cables for 7 cabinets only

12A Fuse

To RPSU280 "BATT" Connectors (6 max)

Fuses (10 AMP)

RBDB2 (cover removed)

RBTC1A-1.5M Cables (6-max)

Cable for 7th cabinet (order number RC7C1A-1.7M)

2-Batteries/2-Cabinets (without RBDB)

12 Volt[4] Batteries 80 AMP/ HR Each

Base Cabinet
+
RPSU 280 BATT connnector
−

Expansion Cabinet
+
RPSU 280 BATT connnector
−

10A Fuse

PBTC-3M Cables (9 ft)

1477

1. When floor mounting the DK424, the batteries must be installed by a licensed electrician per local electric code using conduit. (See Figures 5-25, 5-21 and 5-22 DKSUE424.)
2. RBTC1A-2M cable current ratings: discharge, 12 amps max./charge, 3.9 amps max.
3. PBTC-3M and RBTC1A-15M cable current ratings: discharge, 4.9 amps max./charge 0.6 amps max.
4. Batteries should be installed in a customer-supplied commercial battery box or enclosed rack.

Figure 5-25 Battery Wiring Diagram (Two or Four Batteries) Wall Mount Only

Notes

- PBTC-3m cables are used for one or two cabinets installations (see Figure 5-21); two RBTC1A-2M cables are used for three or more cabinet installations (DKSUE424).

Important! *Since these cables are not UL listed, a licensed electrician should install them.*

Cables connecting to batteries must be 16 AWG minimum.

Third cord is on RCCB2 only

Side View of RCCB

RCCB1 (3~6 Cabinets) or RCCB2 (7 cabinets)

To RBDB or RBDB2 (Battery Distribution Box)

RCCB1 or RCCB2 (Shown with cover on)

Loosen top two cover screws to remove cover

Loosen bottom two cover screws to remove cover

Right Side View

Bottom Cabinet

RFMFI

1473

Fuse Ratings
AC: F1~F3, 250V, 12A
BAT: F4~F6, 250V, 15A

BATT + −

AC120V L N FG

RCCB (Shown with cover off)

Battery Wires (12-AWG minimum) 24 AMPS Max

Conduit Holes to 1/2 Inch (Tradesize) Conduit

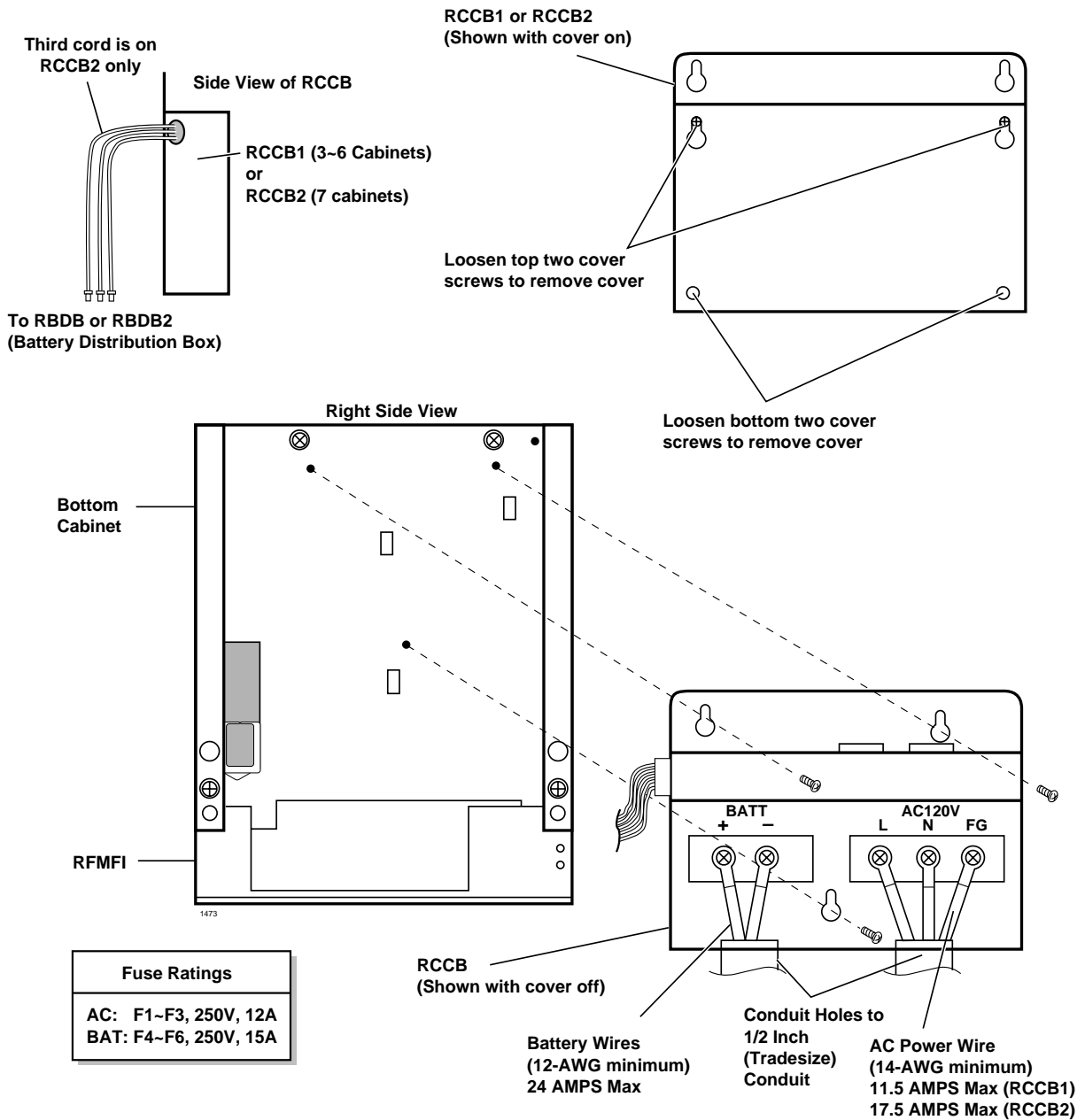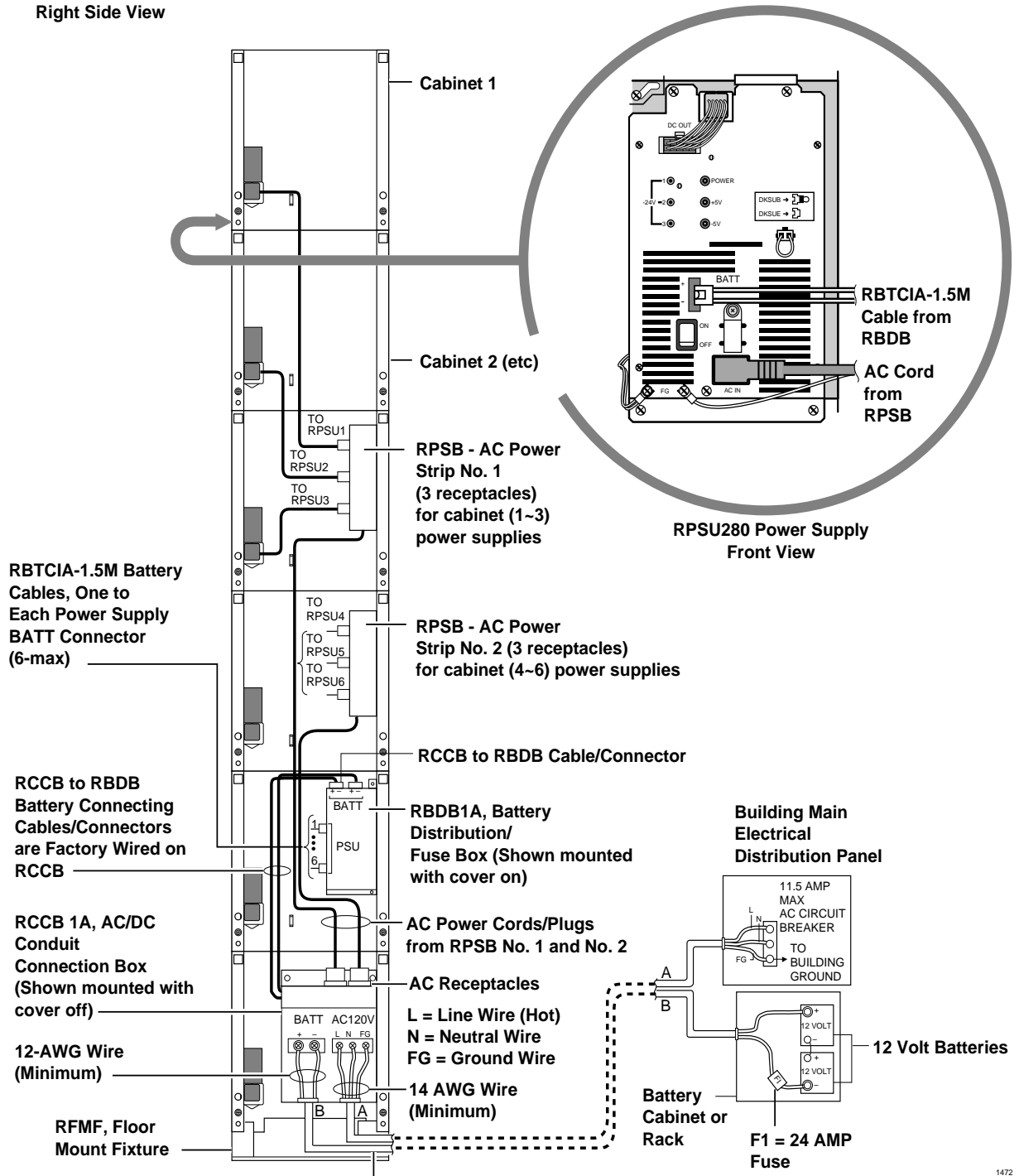**AC Power Wire (14-AWG minimum) 11.5 AMPS Max (RCCB1) 17.5 AMPS Max (RCCB2)**

Figure 5-26   Conduit Connection Box (RCCB) (Required to Floor Mount Three or More DK424 Cabinets Only)

(Maximum configuration: Cabinet 1 (top) ~ Cabinet 6 (bottom) right-hand side view)

Right Side View

Cabinet 1

Cabinet 2 (etc)

TO RPSU1
TO RPSU2
TO RPSU3

RPSB - AC Power Strip No. 1 (3 receptacles) for cabinet (1~3) power supplies

DC OUT

POWER
-24V +5V
-5V

DKSUB →
DKSUE →

BATT

ON
OFF

FG   AC IN

RBTCIA-1.5M Cable from RBDB

AC Cord from RPSB

RPSU280 Power Supply Front View

RBTCIA-1.5M Battery Cables, One to Each Power Supply BATT Connector (6-max)

TO RPSU4
TO RPSU5
TO RPSU6

RPSB - AC Power Strip No. 2 (3 receptacles) for cabinet (4~6) power supplies

RCCB to RBDB Cable/Connector

BATT

RCCB to RBDB Battery Connecting Cables/Connectors are Factory Wired on RCCB

1
PSU
6

RBDB1A, Battery Distribution/ Fuse Box (Shown mounted with cover on)

Building Main Electrical Distribution Panel

11.5 AMP MAX AC CIRCUIT BREAKER
L N
FG
TO BUILDING GROUND

A
B

RCCB 1A, AC/DC Conduit Connection Box (Shown mounted with cover off)

AC Power Cords/Plugs from RPSB No. 1 and No. 2

AC Receptacles

L = Line Wire (Hot)
N = Neutral Wire
FG = Ground Wire

+
12 VOLT
–

+
12 VOLT
–

F1

12 Volt Batteries

BATT   AC120V
+ –   L N FG

12-AWG Wire (Minimum)

14 AWG Wire (Minimum)

B   A

RFMF, Floor Mount Fixture

Battery Cabinet or Rack

F1 = 24 AMP Fuse

1472

Note   AC/DC wiring and conduit "A" and "B" must be installed by a licensed electrician per local electrical code (conduit trade size is 1/2 inch).

Figure 5-27   Reserve Power/AC Wiring for Three to Six Cabinets (Floor Mount)
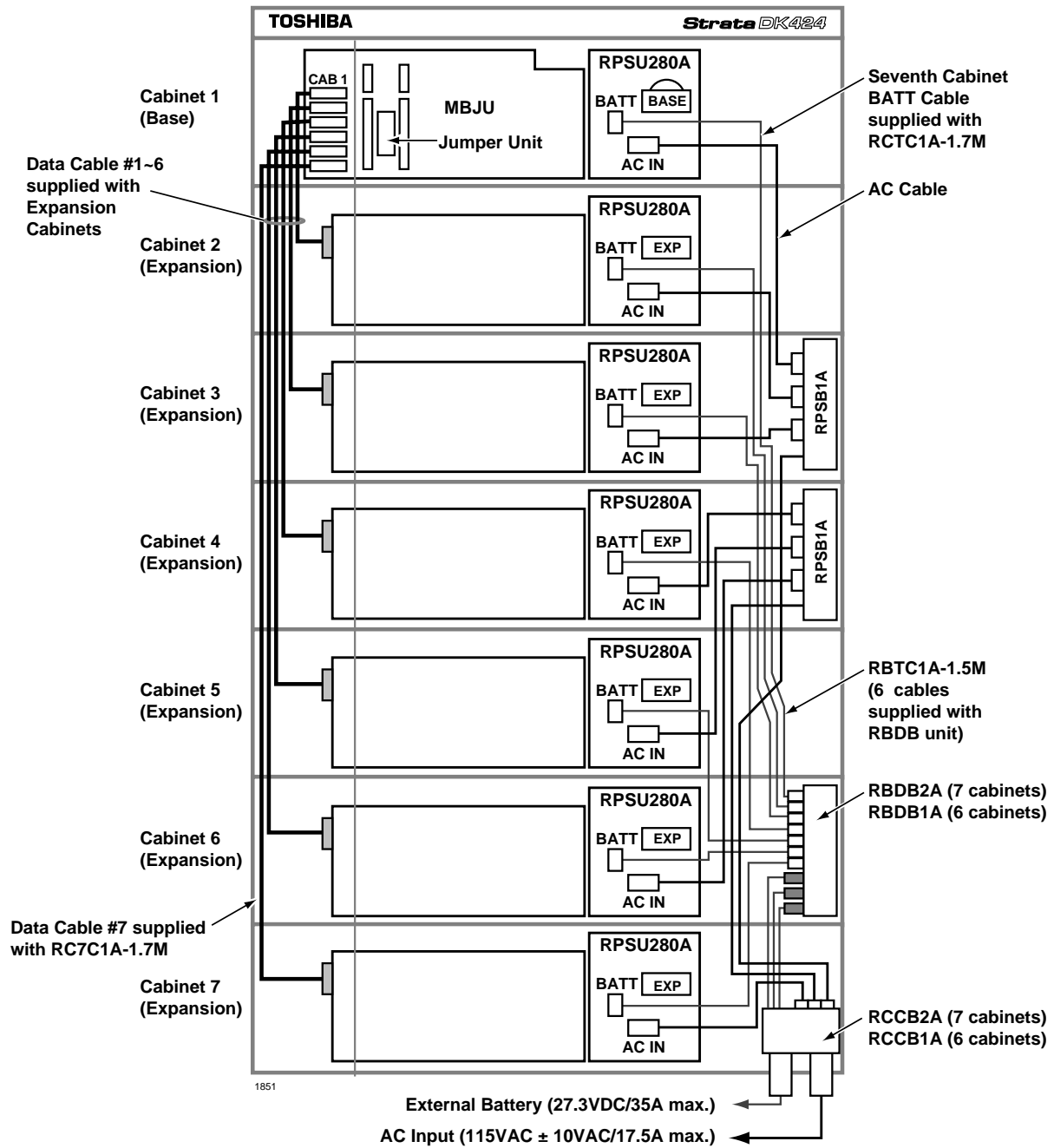
DK424 Installation

Figure 5-28   Reserve Power/AC Wiring for Three to Seven Cabinets (Floor Mount)

Printed Circuit Board (PCB) Installation

This section provides procedures for the installation of DK424 Base and Expansion Printed Circuit Boards (PCBs). It includes installation instructions, optional configuration information, wiring, and programming considerations for each PCB.

The DK424 system Base and Expansion Cabinets are shipped empty. The power supplies and PCBs are not installed at the factory. PCBs must be installed according to the configuration information obtained and developed in Chapter 4 – Configuration.

- Install PCBs only after installing the Base Cabinet and, if applicable, Expansion Cabinets per the Cabinet Installation section in this chapter.

- Be sure the power supply has been tested and the ground has been checked.

- Install universal slot PCBs per the DK424 configuration guidelines.

Note Information in this section applies to both the Release 3 and Release 4 RCTU PCBs, unless specified otherwise.

PCB Installation Considerations

The Base Cabinet has eight slots. The first two slots, labeled "R11" and "RCTU" are reserved for the common control unit and future feature upgrades. The remaining six slots (labeled "S11," "S12," "S13," "S14," "S15," and "S16") are universal and capable of hosting any of the station, line, and option interface PCBs compatible with the DK424 systems. (If needed, RSIU must be installed in slot 11.)

The Expansion Cabinets have eight universal slots, labeled "S_1," "S_2," S_3," "S_4," "S_5," "S_6," "S_7,""S_8," where the blank space of the label represents the number of the Expansion Cabinet. Like the universal slots in the Base Cabinet, these universal slots are capable of hosting any of the station, line, and option interface PCBs (except RSIU which can only be installed in slot 11).

The DK424 Expansion Cabinet slots labeled "S_7" and "S_8," can only be used when an RCTUE/ F processor is installed in the DK424 Base Cabinet. When the RCTUE/F processor is installed in the DK424 Base Cabinet, the MBJU PCB must be removed from the Base Cabinet to allow S_7 and S_8 to function in the DK424 Expansion Cabinets (see Figure 5-28 to locate MBJU).

If RCTUA, BA/BB, or C/D are installed in the DK424 Base Cabinet, only slot S_1~S_6 can be used in DK424 or DK280 Expansion Cabinets. When these processors are installed in the DK424 Base Cabinet, the MBJU PCB must be installed on the Base Cabinet (see Figure 5-28 to locate MBJU).

Cabinets are numbered from 1 to 7. The Base Cabinet is numbered 1; the first Expansion Cabinet, number 2; the second Expansion Cabinet, number 3; etc. See the DK424 Configuration and Universal Slot PCB section for details regarding PCB installation.

PCB Option Considerations

DK424 PCBs may be configured for a variety of hardware and software options. Hardware options are defined as either internal (generally related to optional PCB subassemblies) or external (related to connection of peripheral equipment such as background music, voice mail, etc.). Hardware and software options for each PCB are identified in the individual PCB installation procedures in this chapter.

DK424 Installation

Hardware Options

Some PCBs must be configured for hardware options prior to installation of the PCB in the cabinet. Configuration instructions for internal hardware options are provided in the individual PCB installation procedures in this chapter. Configuration instructions for external hardware options are provided in Chapter 10 – Peripheral Installation.

Software Options

PCBs are configured for software options through programming, following the installation instructions of the PCBs. A programming overview for each PCB is provided in the individual PCB installation procedures in this chapter. Refer to the *Strata DK Programming Manual* for detailed programming instructions.

RCTUA, RCTUBA/BB, RCTUC/D, RCTUE/F Common Control Units

System: *DK424 Base Cabinet*

Current Version: *RCTUA3, RCTUBA3/BB4, RCTUC3/D4, RCTUE3/F4*

Older Version(s): *RCTUA1, RCTUB1&2, RCTUC/D1&2, RCTUBB3, RCTUD3, RCTUF3*

The common control unit provides centralized control for the system. It incorporates a 16 or 32 bit, 68000-type microprocessor and contains a custom time switch and conference Large Scale Integration (LSI) circuitry.

The processor operating software is programmed on four read-only-memory (ROM) chips on the RCTUA3 or RCTUA4, BB3 or BB4, and D3 or D4 PCBs and on the Flash Memory PCB RMMS on the RCTUF3 or F4 PCBs. The operating software (ROM or RMMS) is factory-installed.

The RCTU PCBs also provide busy tone detection as a standard feature for Auto Busy Redial (ABR) and interfaces with optional RRCS DTMF receivers, feature keys (RKYS1, 2, or 3) for Auto Attendant (AA), Automatic Call Distribution (ACD), Management Information System (MIS) for ACD, Toshiba proprietary RS-232 and SMDI voice mail interfaces.

ACD and attendant consoles requires the RCTUBA/BB, RCTUC/D and RCTUE/F processors.

Important! *When installing RCTUE/F, you must remove the Motherboard Jumper Unit (MBJU) from the DK424 Base Cabinet (between R11 and RCTU slot on the front side of the cabinet motherboard), see* Figure 5-28 *to locate MBJU. If installing an RCTUA, BA/ BB, C/D, the MBJU must be installed on the DK424 Base Unit.*

PCB Installation Power Supply Considerations

1. The power supply must be OFF whenever removing or installing the common control unit—RCTUA, RCTUBA/BB, RCTUC/D and RCTUE/F (see Figure 5-29).

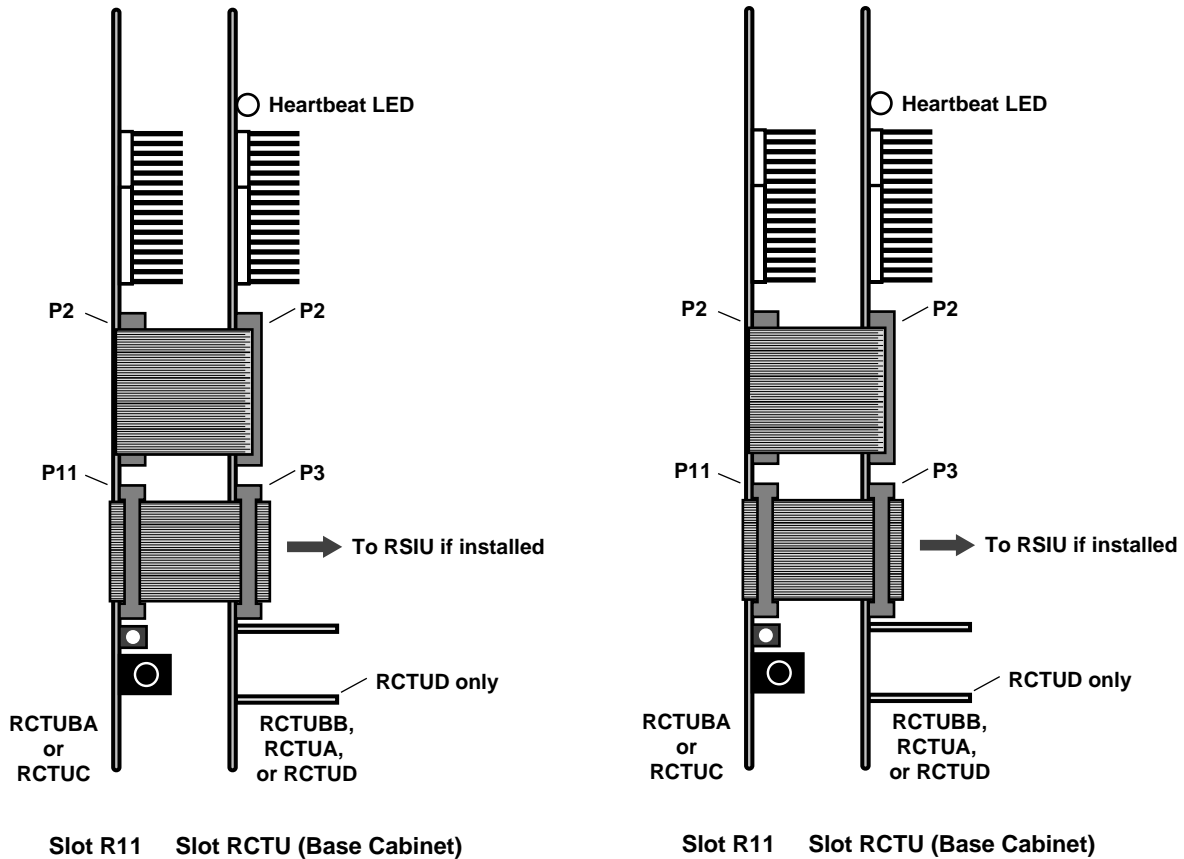2. It is recommended that the power supply be OFF, whenever possible, when removing or installing the other PCBs.

Figure 5-29 RCTU Slot Placement

Maximum Line Capacities

Configurations for a fully-expanded system can range from 40 lines/ 336 stations to a squared system of 200 outside lines/192 stations.

Table 5-5   Maximum Line Capacities by Processor Type

Common Control Unit	Number of Cabinets	Maximum	
		Lines	Stations
RCTUA	one Cabinet (Base Cabinet)	16	32
RCTUBA/BB	up to two Cabinets (Base Cabinet plus one six-slot Expansion Cabinet)	48	80
RCTUC/D	up to six Cabinets (Base Cabinet plus up to five more six-slot Expansion Cabinets)	144	240
RCTUE/F	up to seven Cabinets (Base Cabinet plus up to six more eight slot Expansion Cabinets)	200	336

DK424 Installation

Additionally, each of the common control units can support a separate set of features. Refer to Chapter 4 – Configuration for more information.

Each of the common control units (except RCTUBB) may be equipped with an RRCS (4, 8, or 12) to interpret Dual-Tone Multi-Frequency (DTMF) signals transmitted from Tie/DID lines, built-in AA and standard telephone ports. The common control units also provide an interface (along with a volume control) for a Music-on-hold (MOH)/Background Music (BGM) source.

RCTU PCBs are described later in this chapter.

Internal Hardware Options

The RCTU common control units support the following hardware options:

DTMF Receiver Unit (RRCS-4, RRCS-8, RRCS-12)

There are three RRCSs: the RRCS-4 has four DTMF receiver circuits; the RRCS-8 has eight receiver circuits; and the RRCS-12 has 12 receiver circuits.The RRCS is shown in Figure 5-31.

The RCTUA can support up to 12 DTMF receiver circuits; RCTUBA has up to 12 circuits; the RCTUC/D has up to 24 circuits (one RRCS on RCTUC and one RRCS on RCTUD), and the RCTUE/F has up to 24 circuits (one RRCS on RCTUE and one RRCS on the RCTUF).

RKYS Feature Key Upgrades

The system can be upgraded for built-in AA, ACD, and MIS for ACD with the following feature keys that attach to the common control unit.

Table 5-6   RKYS Features

Feature Key	Common Control Unit	Feature(s) Provided
RKYS1	Applies to all RCTUs	• Built-in Auto Attendant
RKYS2	RCTUBA/BB, RCTUC/D, or RCTUE/F	• Built-in Auto Attendant • ACD
RKYS3	RCTUBA/BB, RCTUC/D, or RCTUE/F	• Built-in Auto Attendant • ACD with an MIS application

➤ **To install the RKYS (1, 2, or 3)**

   ➤ Insert the RKYS into the socket on the appropriate RCTU PCB (see Figure 5-30).

   Note   Only one RKYS socket is available on the card.

It is not necessary to run any special programs (i.e., Program 03) when RKYS is installed. RKYS can be installed before or after system initialization, and, before or after the customer database is entered. The feature(s) provided by the RKYS are immediately enabled when the RKYS is installed. However, configuration programs for AA and ACD must be run for the feature to operate.
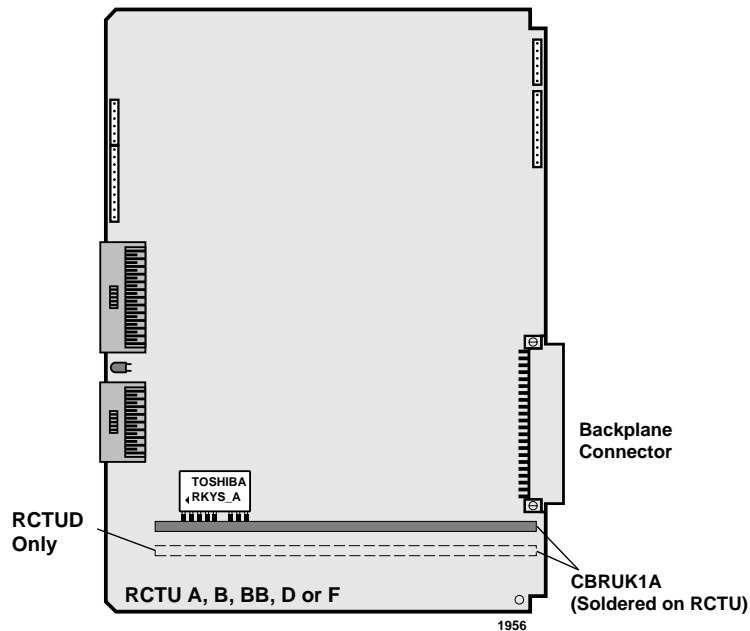
Figure 5-30 RKYS Feature Key Installation

Music-on-hold/Background Music Volume Control (External Options)

Each of the common control units (except RCTUBB, RCTUD and RCTUF) has a trim potentiometer (VR1) to adjust the volume of the MOH/BGM source connected to the Music-on-hold (MOH)/Background Music (BGM) RCA jack interface, which is also on the common control unit. The volume control potentiometer and the MOH/BGM interface are on the RCTUA, RCTUBA3, RCTUA4, RCTUC, RCTUE3 and RCTUE4 PCBs.

The VR1 potentiometer does not control the volume of alternate BGM sources connected to either the RSTU2, RDSU, PSTU, PEKU, PESU, or other BGM source interfaces.

➤ **To install the MOH/BGM source to common control unit**

> ➤ Adjust the VR1 potentiometer to the desired volume level while listening to MOH or BGM (see Chapter 6 – Peripheral Installation).

RRCS

The DTMF receiver subassembly (RRCS) translates DTMF signals to data signals and attaches to common control units with 4, 8, or 12 receiver circuits.

RRCS (4, 8, or 12) Installation onto RCTUA

> ➤ Mate RRCS connectors J1, J2, J3, and J4 (Figure 5-31) with RCTUA connectors P2, P3, P4, P5. Apply firm, even pressure to the RRCS to ensure proper mating of the connectors.

RRCS Installation onto RCTUBA, RCTUC/D, and RCTUE/F

RCTUBA provides up to 12 DTMF receiver circuits because an RRCS PCB can be installed on RCTUBA only and not on RCTUBB.

DK424 Installation

➤ **To install an RRCS onto RCTUA, RCTUBA/BB, RCTUC/D, or RCTUE/F**

➤ Mate RRCS connectors J1, J2, J3, and J4 (See Figure 5-31) with the applicable RCTU PCB. Apply firm, even pressure to the RRCS to ensure proper mating of the connectors.

RCTUA connectors are P2, P3, P4, P5. (See Figure 5-32.)

RCTUBA connectors are P3, P4, P5, P6. (See Figure 5-33.)

RCTUC connectors are P3, P4, P5, and P6; RCTUD connectors P5, P6, P7, P8. (See Figures 5-35, 5-36.)

RCTUE connectors are P6, P7, and P9; RCTUF3 are P8, P9, and P10. (See Figures 5-37, 5-38.)

Note The RRCS connectors on these PCBs are positioned to allow installation of the RRCS only in the proper position.

The combined RCTUC/D and RCTUE/F common control unit can support up to 24 DTMF receiver circuits. Both the RCTUC or RCTUE and the RCTUD or F PCBs can be equipped with the RRCS (4, 8, or 12).

RRCSs can be installed on both the RCTUC or RCTUE and the RCTUD or RCTUF at the same time. If only one RRCS is installed, the RRCS must be on the RCTUC. Always install the RRCS on the RCTUC before RCTUD and the RCTUE before RCTUF.

Note The RRCS connectors on these PCBs are positioned to allow installation of the RRCS only in the proper position.
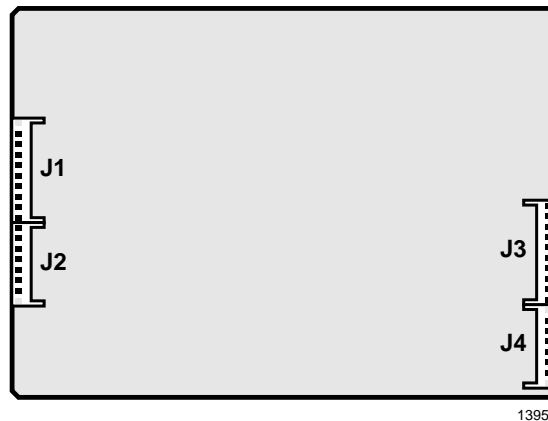

Figure 5-31 RRCS Printed Circuit Board

RSIU Installation

See "DK424 RCIU1 or RCIU2 Installation" on Page 7-23.

RCTU Installation

> **CAUTION!**
>
> 1. **Do not remove the plastic insulation shield from the back of the RCTU PCB. If the shield comes off, do not allow the back of the PCB to contact metal.**
>
> 2. **The RCTU PCBs are shipped from the factory with the battery jumper in the "OFF" position. Ensure it is moved to the "ON" position before installing the RCTU to protect customer configuration information stored in the RCTU RAM.**
>
> 3. **The power supply must be off when installing the RCTU PCB or damage to the board could result.**

1. Set the P5, P8 or P9 battery jumper on the RCTUA, BA3, C3, D3, or RCTUF3 to the "ON" position (see Figures 5-31~5-38).

2. Ensure the RCTU has been configured for the appropriate hardware options (i.e., RRCS or RKYS). See "Internal Hardware Options" on Page 5-48.

3. Insert the RCTUA, RCTUBB, RCTUD, or RCTUF (1, 2 or 3) into the "RCTU" slot in the Base Cabinet. If RCTUA and RSIU is installed, you must also install a ribbon cable between them ("RSIU, RSIS, RMDS RS-232/Modem Interface Unit" on Page 7-45).

   Ensure the component side of the RCTU PCB is facing right when installing it in the Base Cabinet.

4. Insert the RCTUBA, RCTUC, or RCTUE PCB into slot R11.

5. After installing the RCTU PCBs, gently pull it outward. If the connectors are properly mated, a slight resistance will be felt.

6. Connect the supplied ribbon cables between RCTUA, RCTUBA and BB and RSIU, if installed; or RCTUC/D, RCTUE/F, and RSIU, if installed.

Note Do not adjust the C14 or C15 trimmer capacitor. The capacitor is factory-calibrated.

> **CAUTION!** **When transporting the RCTU PCBs, keep the P8 or P9 battery jumper in the "ON" position in order to save the configuration data stored in RCTU RAM. (The battery will protect RAM for approximately six years.) Otherwise, to conserve the lithium battery, move the jumper to the "OFF" position.**

When packaging the RCTU PCB, use only a nonconducting material enclosure, such as plain cardboard. Conductive material can cause the internal battery to discharge and erase memory in the RCTU PCB.

RCTU Programming

After initially installing a new and unused common control unit, all on-board RAM memory needs to be erased and initialized by running Program 91-9 twice after all other PCBs are installed. If RAM contains configuration or feature data from previous programming that should be retained, do not run Program 91-9. See the *Strata DK Programming Manual.*

DK424 Installation

If installing a RCTU PCB perform a processor RAM test using Program 00, part 2. On new RCTU installations, the RAM test should be run after RCTU initialization and before entering the customer database.

The following parameters can be specified, through programming, for the RCTU PCB.

Program 00, part 2: RCTU RAM test.

Program 03:

➤ For RCTUA, RCTUBA3, RCTUC/D, RCTUE/F—assign the appropriate slot code for each PCB: slot code 00 for RCTUA, RCTUBA, RCTUC or RCTUE; slot code 01 for RCTUD and RCTUF.

➤ Assign the appropriate code for each PCB:

♦ Code 91 – no RRCS

♦ Code 92 – four RRCS circuits

♦ Code 93 – eight RRCS circuits

♦ Code 94 – 12 RRCS circuits

Notes

• System Power must be cycled or Program 91-2 must be run after Program 03.

• If there are no options on the RCTU, Program 03 can be skipped and Program 91-1 or 91-9 can be run instead.

➤ Program *03: For RCTUE/F only. Run program to identify DK424 and DK280 cabinets.

➤ Program 12: Select the seize time of the RRCS circuits.

➤ Program 90, 91, 92: RCTU initialization programs.

DK280 to DK424 Base Cabinet Upgrade Considerations

1. Remove MBJU from the DK424 Base Cabinet motherboard.

2. After installing and initializing the RCTUE/F, run Program *03 to identify the DK280 and DK424 cabinets.

♦ DK280 Expansion Cabinet slots S_1 to S_6 operate; S_7 and S_8 do not.

♦ DK424 Expansion Cabinets slots S_1 to S_8 operate.

Important! *If installing station and/or CO line PCBs in slots S_7 and S_8, the ports and/or lines will shift by 4, 8, 16, or 24, depending on the PCBs installed in S_7 and/or S_8. Toshiba recommends moving the existing 25-pair and modular cables backward, in order, to the newly installed PCBs to keep the port and CO line numbers matched with the cable pairs.*

Table 5-7   RCTUA Controls, Indicators, and Interface Connectors

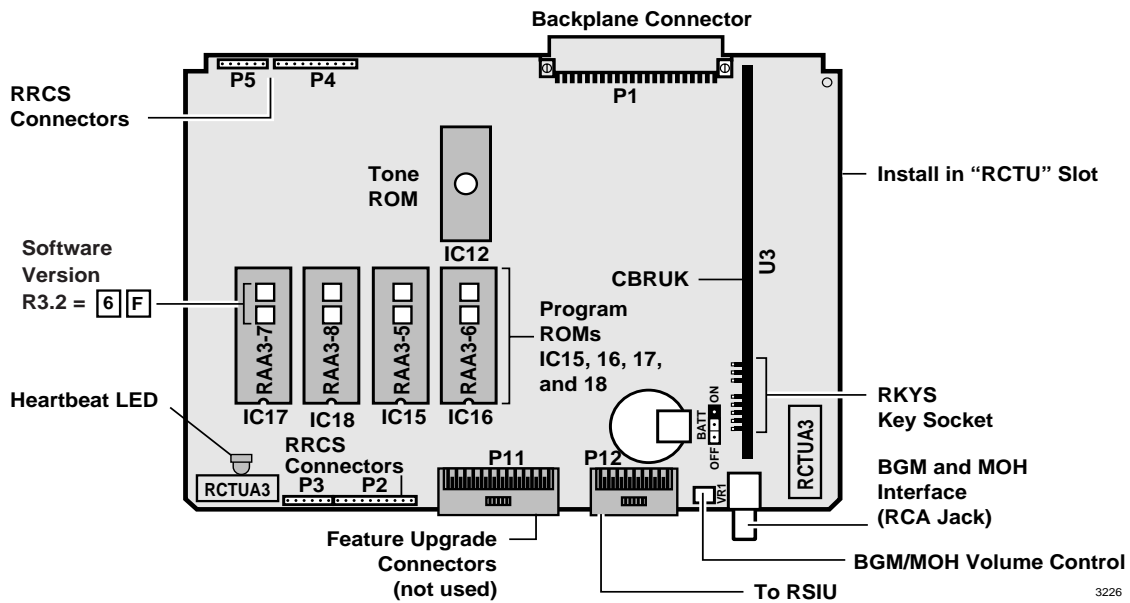| Control/Indicator/Connector	Type of Component	Description
DTMF Receiver Connector P2	10-pin male connector	Interface connector for optional DTMF receiver subassembly (RRCS). Used in conjunction with P3, P4 and P5.
DTMF Receiver Connector P3	6-pin male connector	Used in conjunction with P2, P4 and P5.
DTMF Receiver Connector P4	10-pin male connector	Used in conjunction with P2, P3 and P5.
DTMF Receiver Connector P5	6-pin male connector	Used in conjunction with P2, P3 and P4.
BATT Battery Jumper P8	3-terminal jumper	Interface connector for on-board lithium battery that protects configuration data stored in system RAM.
MOH/BGM Source Connector	RCA jack	Interface connector for MOH/BGM source.
Future Feature Upgrade Connector P11 & P12	Connector for ribbon cable	Connector for connection with future feature upgrade PCB.
MOH/BGM Source Volume Control VR1	Trim potentiometer	Adjusts volume for MOH/BGM source connected to RCTUA.
Heart Beat indicator CD11	Red LED	Flashes to indicate operation (1/4 second ON – 1/4 second OFF).

Figure 5-32 RCTUA PCB

DK424 Installation

Table 5-8   RCTUBA Controls, Indicators, and Interface Connectors

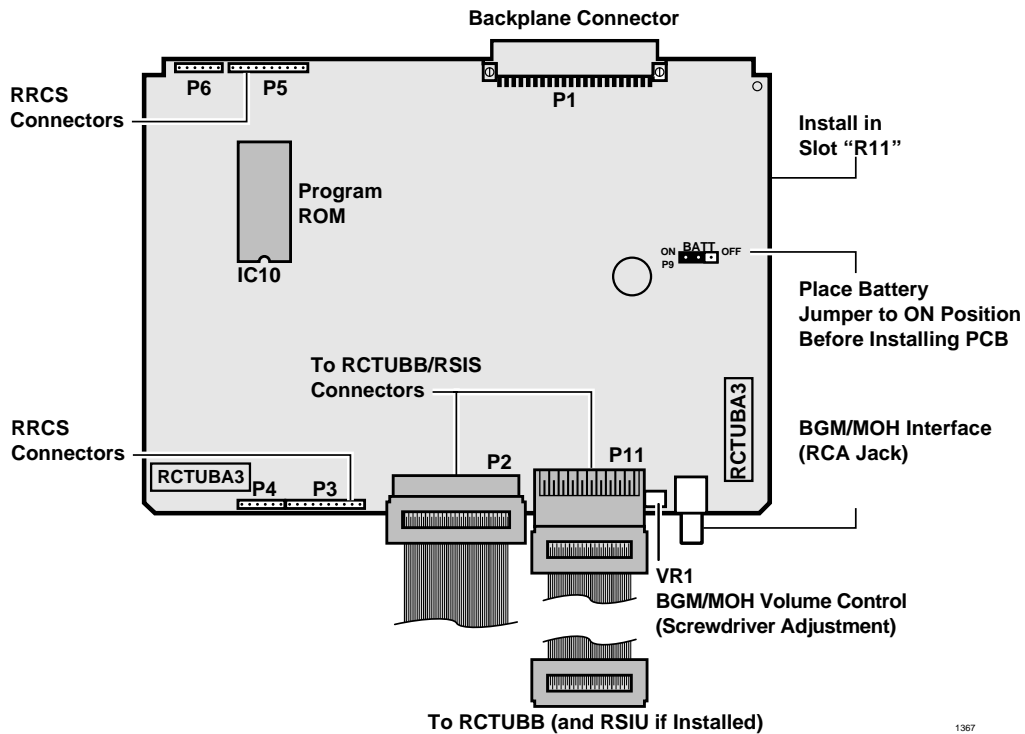| Control/Indicator/Connector	Type of Component	Description
RCTUBA ribbon cable Connector P2	Connector and ribbon cable	Ribbon cable connector for connection to RCTUBB. Used in conjunction with P2.
DTMF Receiver Connector P3	10-pin male connector	Interface connector for optional DTMF receiver subassembly (RRCS). Used in conjunction with P4, P5, and P6.
DTMF Receiver Connector P4	6-pin male connector	Used in conjunction with P3, P5, and P6.
DTMF Receiver Connector P5	10-pin male connector	Used in conjunction with P3, P4, and P6.
DTMF Receiver Connector P6	6-pin male connector	Used in conjunction with P3, P4, and P5.
BATT Battery Jumper P9	3-terminal jumper	Interface connector for on-board lithium battery that protects configuration data stored in system RAM.
MOH/BGM Source Connector	RCA jack	Interface connector for MOH/BGM source.
RCTUBA ribbon cable Connector P11	Connector and ribbon cable	Ribbon cable connector for RCTUBA and RSIU. Used in conjunction with P2.
MOH/BGM Source Volume Control VR1	Trim potentiometer	Adjusts volume for MOH/BGM source connected to RCTUBA.

Figure 5-33 RCTUBA PCB

Table 5-9   RCTUBB Controls, Indicators, and Interface Connectors

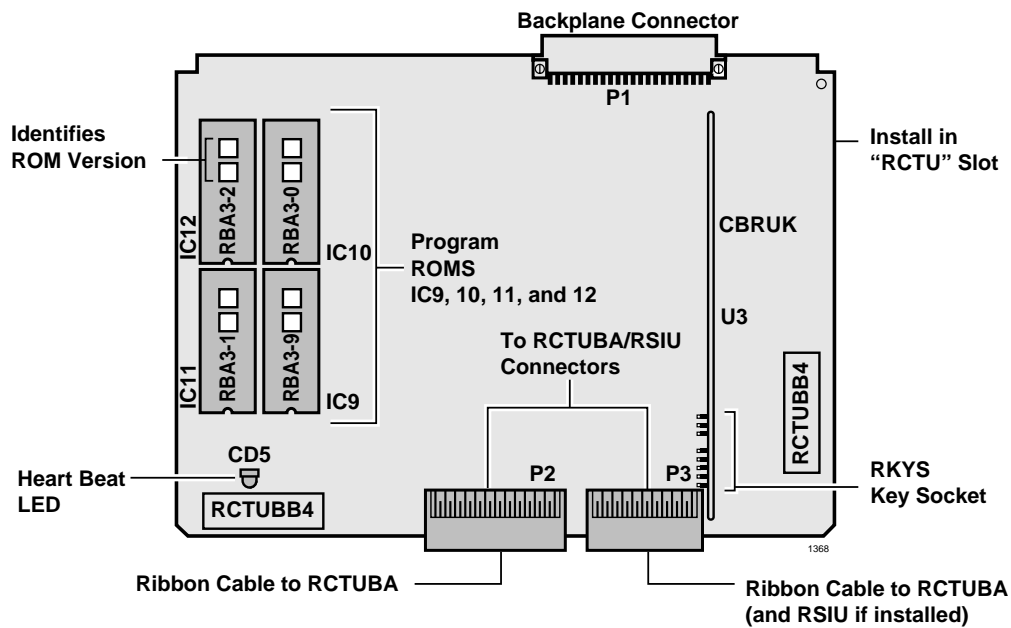| Control/Indicator/Connector	Type of Component	Description
Connector P2	Connector for ribbon cables	Connector for RCTUBA ribbon cables. Used with P2.
Connector P3	Connector for ribbon cables	Connector for RCTUBA and RSIU ribbon cable. Used with P11.
Heart Beat indicator CD11	Red LED	Flashes to indicate operation (1/4 second ON — 1/4 second OFF).

Figure 5-34   RCTUBB PCB

Table 5-10   RCTUC3 Controls, Indicators, and Interface Connectors

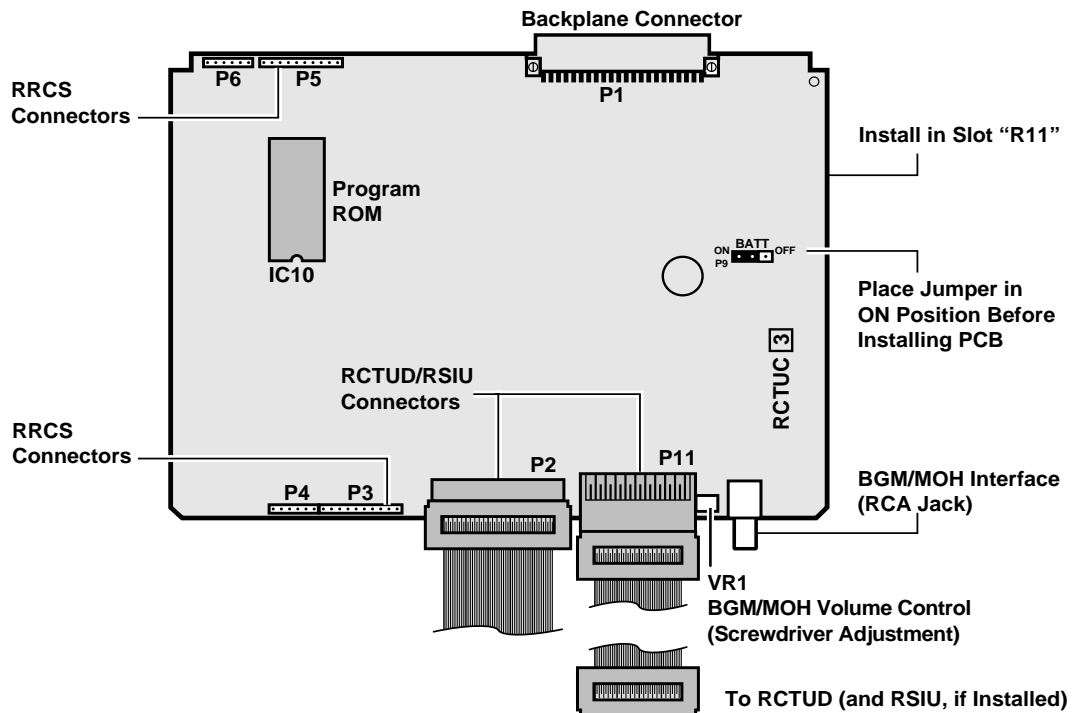| Control/Indicator/Connector	Type of Component	Description
RCTUC Ribbon Cable Connector P2	Connector and ribbon cable	Ribbon cable connector for connection to RCTUD. Used in conjunction with P2.
DTMF Receiver Connector P3	10-pin male connector	Interface connector for optional DTMF receiver subassembly (RRCS). Used in conjunction with P4, P5, and P6.
DTMF Receiver Connector P4	6-pin male connector	Used in conjunction with P3, P5, and P6.
DTMF Receiver Connector P5	10-pin male connector	Used in conjunction with P3, P4, and P6.
DTMF Receiver Connector P6	6-pin male connector	Used in conjunction with P3, P4, and P5.
BATT Battery Jumper P9	3-terminal jumper	Interface connector for on-board lithium battery that protects configuration data stored in system RAM.
MOH/BGM Source Connector	RCA jack	Interface connector for MOH/BGM source.
RCTUC ribbon cable Connector P11	Connector and ribbon cable	Ribbon cable connector for RCTUD and RSIU. Used in conjunction with P2.
MOH/BGM Source Volume Control VR1	Trim potentiometer	Adjusts volume for MOH/BGM source connected to RCTUC.

Figure 5-35   RCTUC PCB

Table 5-11   RCTUD3 Controls, Indicators, and Interface Connectors (for Release 3)

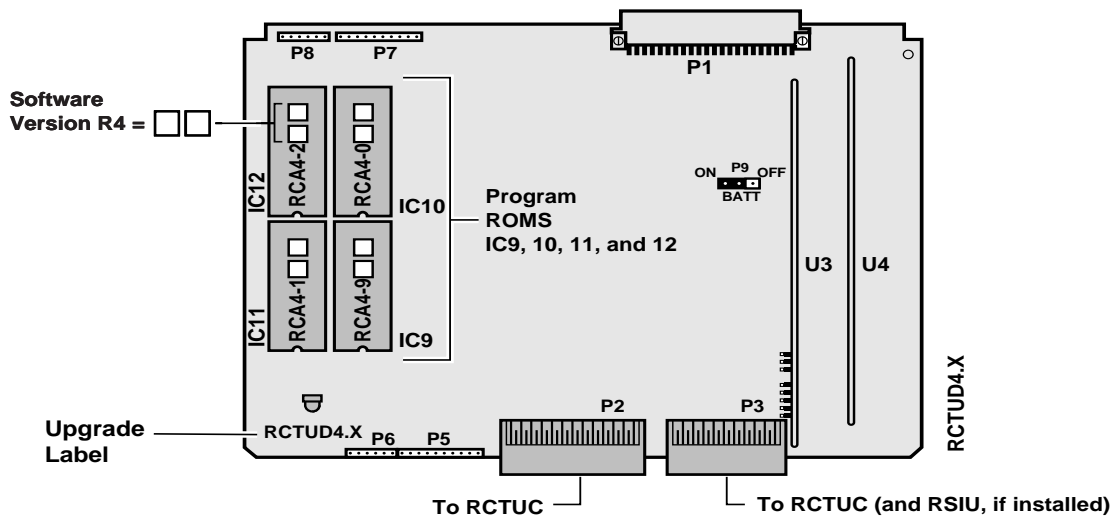| Control/Indicator/Connector	Type of Component	Description
RCTUD Connector P2	Connector for RCTUC ribbon cables	Used with P2.
RCTUD Connector P3	Connector for RCTUC ribbon cables	Used with P11.
BATT Battery Jumper P9	3-terminal jumper	Interface connector for on-board lithium battery that protects configuration data stored in system RAM.
DTMF Receiver Connector P5	6-pin male connector	Interface connector for optional DTMF receiver subassembly (RRCS). Used in conjunction with P6, P7, and P8.
DTMF Receiver Connector P6	10-pin male connector	Used in conjunction with P5, P7, and P8.
DTMF Receiver Connector P7	10-pin male connector	Used in conjunction with P5, P6, and P8.
DTMF Receiver Connector P8	6-pin male connector	Used in conjunction with P5, P6, and P7.
Heart Beat Indicator CD5	Red LED	Flashes to indicate operation (1/4 second ON, 1/4 second OFF).

Figure 5-36   RCTUD PCB

Table 5-12   RCTUE3 Controls, Indicators, and Interface Connectors

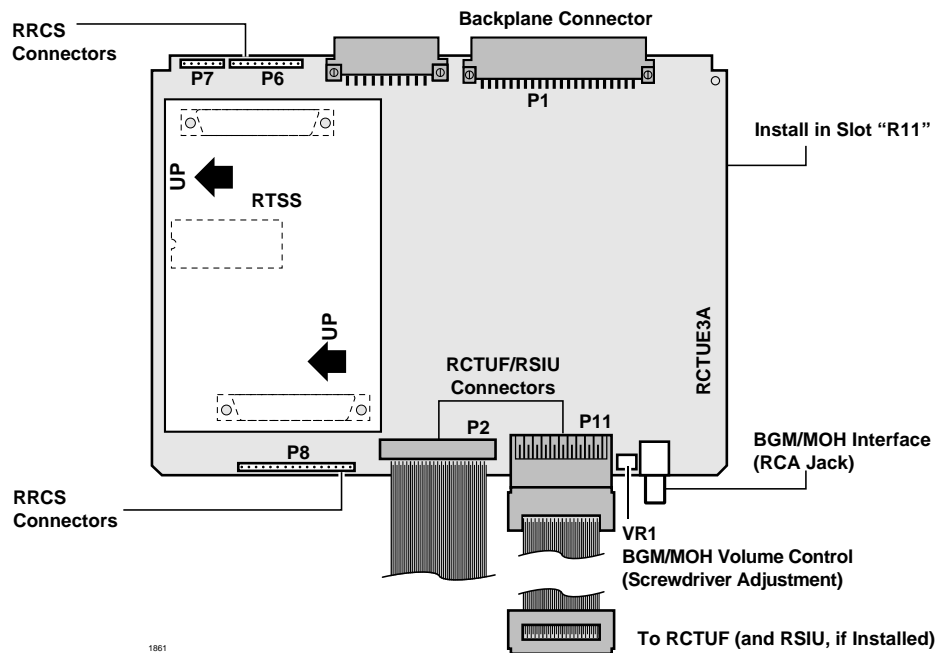| Control/Indicator/Connector	Type of Component	Description
RCTUF Connector P2	Connector and ribbon cable	Ribbon cable connector to RCTUF and RSIU. Used in conjunction with P2.
RRCS Connector P8	10-pin male connector	Interface connector for optional DTMF receiver subassembly (RRCS). Used in conjunction with P6 and P7.
RRCS Connector P7	3-pin male connector	Interface connector for optional DTMF receiver subassembly (RRCS). Used in conjunction with P6 and P9.
RRCS Connector P6	6-pin male connector	Interface connector for optional DTMF receiver subassembly (RRCS). Used in conjunction with P7 and P9.
MOH/BGM Source Connector	RCA jack	Interface connector for MOH/BGM source.
RCTUF Connector P11	Connector and ribbon cable	Ribbon cable connector to RCTUF and RSIU. Used in conjunction with P11.
MOH/BGM Source Volume Control VR1	Trim potentiometer	Adjusts volume for MOH/BGM source connected to RCTUF.

Figure 5-37   RCTUE PCB with RTSS Subassembly

CAUTION!   When removing the RTSS from RCTUE3, take off the RTSS slowly, rocking back and forth in the direction of the arrows in the diagram.

Table 5-13   RCTUF4 Controls, Indicators, and Interface Connectors

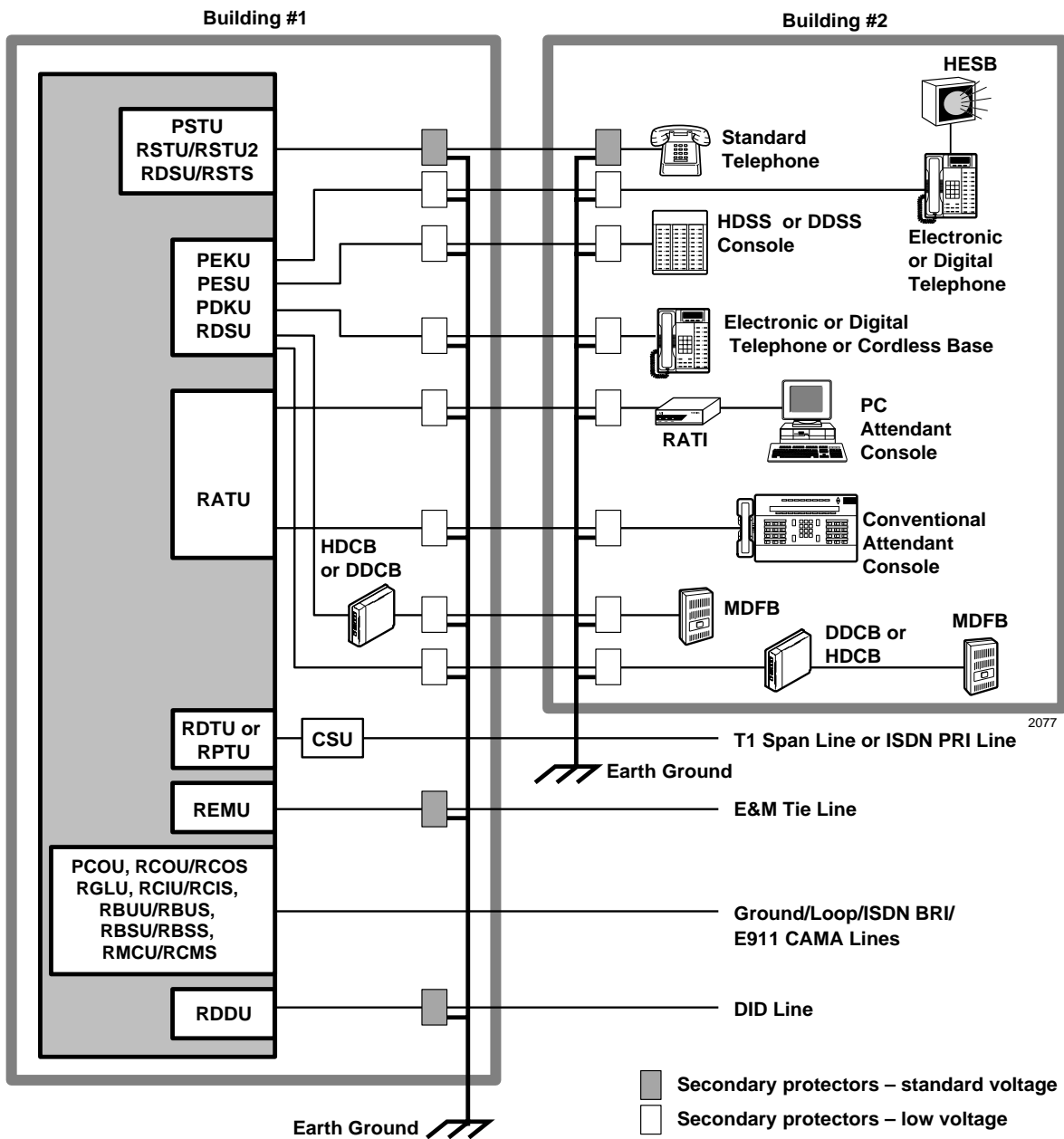| Control/Indicator/Connector	Type of Component	Description
RCTUE Connector P2	Connector and ribbon cable	Ribbon cable connector to RCTUE and RSIU. Used in conjunction with P2.
RCTUE Connector P3	Connector and ribbon cable	Ribbon cable connector to RCTUE and RSIU. Used in conjunction with P3.
DTMF Receiver Connector P8	10-pin male connector	Interface connector for optional DTMF receiver subassembly (RRCS). Used in conjunction with P6, P7, and P9.
DTMF Receiver Connector P9	6-pin male connector	Used in conjunction with P5, P7, and P9.
DTMF Receiver Connector P10	10-pin male connector	Used in conjunction with P5, P6, and P9.
Heart Beat Indicator CD5	Red LED	Flashes to indicate operation (1/4 second ON, 1/4 second OFF).
BATT Battery Jumper P5	3-terminal jumper	Interface connector for on-board lithium battery that protects configuration data stored in system RAM.
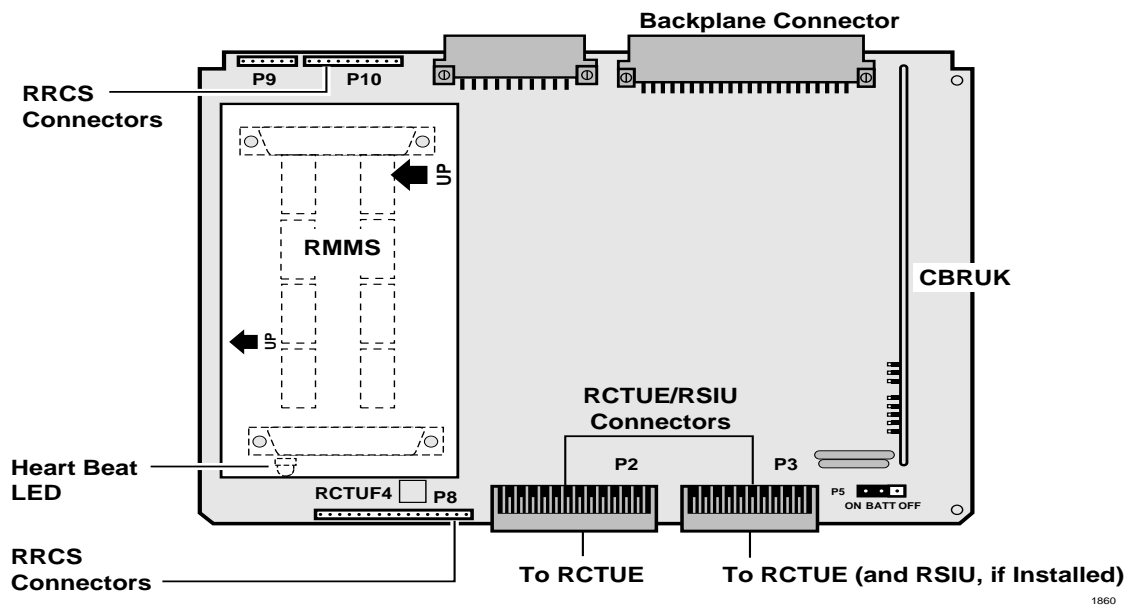
Figure 5-38   RCTUF PCB with RMMS Subassembly

CAUTION!   When removing the RMMS from RCTUF, take off the RMMS slowly, rocking back and forth in the direction of the arrows in the diagram.

DK424 Installation

Figure 5-39 DK424 Secondary Protector Diagram

Important! *To protect against transient voltages and currents, solid state secondary protectors must be installed if there is outside wiring, and on all DID and E&M Tie lines. These protectors, which contain fast semiconductors in addition to fuses, shall comply with the requirements for secondary protectors for communication circuits, UL 497A. Care must be taken to ensure that they are very well grounded to a reliable earth ground. Recommended protectors are available in the fast Series 6 line from ONEAC Corp., Libertyville, Illinois 60048, (800) 327-8801. Install and test the secondary protectors precisely to the installation instructions of thee manufacturer.*

DK424 T1 6

This chapter covers information on using T1/DS-1 interfacing. It is available for the DK424. T1/DS-1 interfacing is not available for the DK14 and DK40i.

Channelization

The Strata DK424 RDTU PCB provides T1/DS-1 interface for up to 24 channels. Each channel can be individually set for loop start, ground start, Tie, or DID line operation (voice only, not data lines). Each RDTU can be set in system programming to activate (1~8), (1~16), or (1~24) channels (lines). Fractional increments of 4, 12, and 20 are also possible but the RDTU will still assign 8, 16, or 24 channels respectively in system software.

Example: If only 12 channels of fractional T1 are used, assign RDTU as a 16 channel RDTU. The system will assign 16 CO lines to the RDTU even though only 12 CO lines will be used. To busy out unused RDTU channels (see "System Programming for T1" on Page 6-3, Step 4). Use Program 03 to set the quantity of RDTU channels.

Slot Assignments

Up to eight RDTU PCBs can be installed in a DK424 to provide up to 192 lines. RDTU PCBs can be installed in the same cabinets that have analog type CO line PCBs installed. RDTU PCBs must be placed in designated slots in each of the DK424 cabinets. (See Tables 4-4 and 4-5 in Chapter 4 – DK424 Configuration for RDTU slot installation rules)

If an RDTU is installed in a cabinet (in some cases one or two slots to the right of the RDTU may not be used in that cabinet) the number of unusable slots in a cabinet (none, 1 or 2) depends on which slot the RDTU occupies and how many lines (8, 16, or 24) the RDTU is programmed to provide. Use Program 03 to set the RDTU slot assignments and Channel quantities (Code 71 = 8 ch., Code 72 = 16 ch., and Code 73 = 24 ch.).

RDTU
T1 Interface Unit

System: *DK424*

Circuits per PCB: *8, 16, or 24 channels*

Interfaces with: *ground start CO lines*
                      loop start CO lines
                      DID or Tie lines

Older Version(s): *none*

RDTU is configured for Tie or DID lines and an RRCS must be installed for DTMF operation. LEDs on the RDTU show a continuous status of RDTU operation.

Note   Each Tie or DID line decreases the system's station port and CO line capacity by one.

A Strata DK424 system operating with an RCTUE/F can support up to eight RDTU PCBs. RCTUC/D common control unit supports up to six RDTU PCBs. The RCTUB and RCTUBA/BB support up to two RDTU PCBs. The RDTU cannot be installed in a system operating with the RCTUA.

RDTU controls and interface connectors are shown in Figure 6-1 and described in Table 6-1.

The RDTU requires installation of a customer-provided Channel Service Unit (CSU). Refer to "Installation Guidelines" on Page 6-10 for CSU installation.

Testing procedures (local loop back and remote loop back) are in "Loop Back Testing" on Page 6-16.

SW1 Equalizer Switch and Loop Back Jumpers (Internal Option)

The distance between the DK424 cabinets and the CSU (or other customer premise T1 circuit) determines the setting of the SW1 Equalizer Switch. The SW1 switch consists of a bank of smaller switches, S1~S7.

➤ Set the SW1 switch as follows:

Mode	Feet from DK424	S1	S2	S3	S4	S5	S6	S7	S8
Short	0~150	ON	OFF	OFF	OFF	OFF	OFF	OFF	N/A
Medium	151~450	OFF	ON	OFF	ON	OFF	ON	OFF	N/A
Long	450~655	OFF	OFF	ON	OFF	ON	OFF	ON	N/A

Note   The maximum distance between the RDTU and the CSU or other T1 circuits can not be more than 655 feet (see "RDTU to PBX T1 (Separated More Than 655 ft.)" on Page 6-11).

RDTU Installation

Installing an RDTU (T1) into a Strata DK424 requires a number of system programs to be run. Toshiba recommends running these programs in the order listed before actually installing the RDTU into the system. This allows the RDTU to function immediately, including self-check loop back testing and normal operation, when it is inserted into the system.

➤ **To install an RDTU PCB**

1. Set jumper wire plugs P1 (LB), P2, P3, and P4 to the OFF position. See "Loop Back Testing" on Page 6-16 for loop back testing procedures.

   See "SW1 Equalizer Switch and Loop Back Jumpers (Internal Option)" on Page 6-2 for the appropriate SW1 equalizer switch setting.

2. Insert the RDTU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors. (See "Slot Assignments" on Page 6-1 and Chapter 4 – DK424 Configuration, Worksheet 2 for RDTU slot assignment recommendations.)

3. After installing the RDTU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

System Programming for T1

1. Run Program 03: Assign the number of RDTU channels used and the cabinet slot number into which the RDTU will be installed (see "Channelization" and "Slot Assignments" on Page 6-1). If 1~8 channel are required, assign code 71, if 1~16 channels are required, assign code 72, or if 1~24 channels are required, assign code 73 to the RDTU slot. Also, assign RRCS code to RCTU if RDTU Tie/DID channels are DTMF.

   Important! *Special consideration must be taken when installing Tie or DID T1 channels (see Worksheets in 6.*

2. Run Program *41-2: Assign each channel for loop start, ground start Tie (Immediate or Wink), or DID (Immediate or Wink). See Program *41-2 record sheet (unused channels can remain as initialized—loop start).

3. Turn system power supply OFF (five seconds) and ON to activate Program 03 and *41-2 program data.

   Note These are the only programs relating to RDTU operation that require system power to be cycled OFF and ON.

4. Run Programs 16, 40, 39: If an RDTU is connected to a fractional T1 circuit and all the RDTU channels (8, 16, or 24) are not used, busy-out the unused CO lines from all line groups (Program 16), all telephone buttons (Program 39), and restrict all stations from accessing the unused lines (Program 40).

   Example, if the Network fractional T1 provides 12 channels, set the RDTU connected to this T1 for 16 channels in Program 03 (with code 72). If this RDTU is the first CO line PCB in the system, the RDTU CO lines will be numbered 001~016. Use Programs 16, 39 and 40 to deny use of all unused lines (i.e., lines 13, 14, 15, and 16). In this case the first 12 lines are usable; lines 13, 14, 15, and 16 cannot be used. The CO lines on the next CO line PCB (any type) following the RDTU PCB will start numbering at line 017.

5. Run Programs 15 and 30: If RDTU Tie and/or DID are dial pulse: Run Program 15-1, LED ON for each DP Tie/DID line and run Program 30, LED 11 ON for each Tie/DID station port.

DK424 T1

6. Run Program 17.

♦ LED 01: For RDTU Tie lines, set LED01 to allow (ON) or deny (OFF) Page and Voice Announce on incoming calls to DK424 stations from the far end T1 Tie line stations. This option (LED01) does not apply to RDTU DID lines—Page and Voice Announce is always denied to incoming DID calls because of FCC "answer supervision" rules.

♦ LED 02 (Wink/Immediate): This assignment is for RDDU, REMU, and PEMU lines only; it does not apply to RDTU Tie or DID lines. Use Program *41-2 to assign RDTU lines for wink or immediate start.

♦ LED 03: Toshiba recommends turning this LED ON (initialized state) for all RDTU DID lines to enable incoming DID calls to camp-on busy stations. This is also necessary to allow more than one DID line to ring into a station simultaneously. LED03 does not apply to RDTU Tie lines.

♦ LED 04: For RDTU Tie lines, LED04 is normally OFF to enable dial tone to be received from the far end Tie line when calling DK424 stations. For DID lines LED04 is normally ON so RDTU DID lines do not send dial tone to the CO Run *41-1: Use this program to assign the RDTU (T1) Line Coding method (B8ZS or AMI) and signal Framing format (SF or ESF). Contact the account representative of the company that is providing the T1 span line (Local Central Office or Long Distance Provider) to determine which line Coding and Frame format will be used.

♦ Line Coding: The DK424 RDTU supports T1/DS-1 transmission of Voice and Analog Data (using modems) using Alternate Mark Inversion (AMI) with Zero Code Suppression (ZCS) or Bipolar Eight Zero Substitution (B8ZS) line coding. B8ZS provides clear channel capability, which allows frame information bits to carry any combination of ones and zeros—a feature needed for T1/DS-1 transmission of digital DATA (DK424 does not support transmission of digital DATA over RDTU T1/DS-1 at this time).

♦ As of this writing, most Telcos provide AMI line coding which is adequate for DK424 RDTU voice transmission; however, B8ZS may be required by some long distance providers, college campus private networks, or customer premise end to end T1 connections. AMI and B8ZS are adequate for DK424 Voice T1/DS-1 transmission.

♦ Framing: As of this writing, D3/D4 Superframe (SF), or Type I and Extended Superframe (ESF), or Type II T1/DS-1 is offered by most all local Telcos and Long Distance Providers. Normally the local Telco will provide SF, which is adequate for DK424 voice (and modem type data) transmission. Long distance providers may offer either SF or ESF.

ESF provides a more enhanced method of error checking that SF; however, the Channel Service Unit (CSU) must be compatible with ESF and may cost more than a SF only CSU. ESF circuits have the additional power of Cyclic Redundancy Checking (CRC), which allows end-to-end monitoring of T1 circuit performance. ESF, T1 performance monitoring normally requires that a person be specially trained for this function. SF and ESF Frame format is adequate for DK424 Voice (and modem type data) T1/DS-1 transmission.

7. Run Programs *41-3 and -4: These programs allow the RDTU Transmit and Receive (Volume) level to be adjusted by changing the RDTU built-in digital PAD value between +6 decibels (dB) and –15 dB. Transmit and Receive levels are individually adjustable on each RDTU (all channels will have the same level). Toshiba recommends using the initialized levels (Receive –3 dB/Transmit –6 dB) upon initial installation. Adjust the RDTU digital PAD as required while testing each RDTU T1 channel.

8. Run Program *42 Series—T1 Span Timing Reference Assignments

Timing references for T1 RDTU PCBs are made with the Program *42 series. The RDTU (T1) timing (or synchronization) program options determine how the DK424 system digital voice

transmission path (time-switch) is synchronized with the far end digital system transmission path. For proper T1 operation, the equipment at each end of a T1 span line must be synchronized.

The DK424 time-switch is synchronized (as slave) to the T1 span equipment on the other end of the T1 line by the RDTU PCB designated as the Primary Reference in Program *42-1. When a RDTU is connected to a Telco or Long Distance Provider T1 span line, the RDTU in the lowest slot number should be assigned as the Primary Reference RDTU (*42-1, DATA = 1 FOR THIS RDTU).

If a malfunction occurs and Primary Synchronization is lost, the DK424 automatically switches modes and synchronizes to the T1 span connected to the RDTU PCB designated as the Secondary Reference (provided that there are two RDTU PCBs installed in the DK424) (see Figure 6-1).
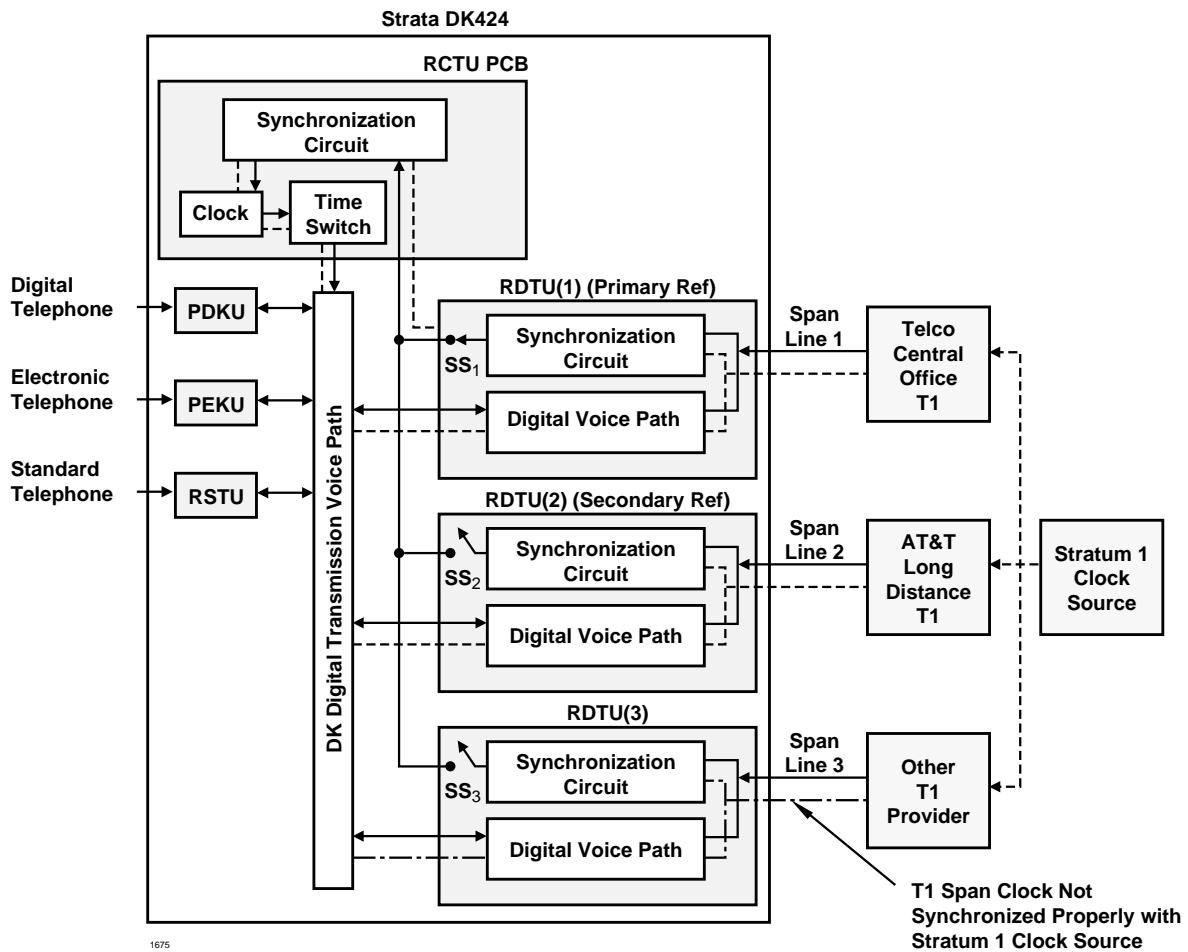
Notes

- Primary Reference Synchronization:
  In this diagram RDTU(1) is the primary reference, its synchronization circuit sends the clock reference from the TELCO T1 span to the DK424, to the RCTU synchronization circuit, via RDTU1 Software Switch (SS). The RCTU(1) clock synchronizes the DK424 digital transmission voice path (via RCTU time switch) to the TELCO/STRATUM1 clock source.

- Secondary Reference Switch-Over:
  If the primary reference T1 RDTU(1) fails, the DK424 will automatically open the RDTU(1) primary synchronization circuit (SS1) and close the RDTU(2) secondary synchronization circuit (SS2). At this time, the DK424 digital voice path will be synchronized to the AT&T/STRATUM1 clock source.

- Slip example:
  In the above diagram the "Other T1 Provider" is not synchronized to the STRATUM1 clock source properly – Slip problems will occur on RDTU(3) T1 channels.

Figure 6-1   RDTU Primary/Secondary Reference Block Diagram

If there are two RDTU PCBs installed, it is recommended not to install the Primary and Secondary Reference RDTU PCBs in the same DK424 cabinet if possible (although both Primary and Secondary Reference RDTU PCBs can be installed in the same cabinet). The Secondary Reference RDTU should also be connected to a Telco or Long Distance Provider T1 span (*42-2, Data = 2 for this RDTU).

If the equipment on the other end of the DK424 T1 lines should synchronize to the DK424 clock source, then blanks should be entered in Program *42. In this case, the DK424 clock runs free and is considered the Master Synchronization provider. The DK424 can be assigned as the Master (free run) clock provider if the far end equipment connected to the RDTU T1 span is a Customer Premise type equipment and it is not synchronized to some other T1 provider (i.e., PBX, Channel Bank, Key/Hybrid or other DK424). In this case (when the Telco network is not connected), either the DK424 RDTU span or the far end equipment can be the Master (synchronization clock provider).

♦ Program *42-1, Primary Timing Reference Assignment: Assign the Primary Timing Reference with this program.

♦ Program *42-2, Secondary Timing (Backup) Reference Assignment: Assign the Secondary (Backup) Timing Reference with this program.

♦ To assign RDTUs for the Master Clock Provider, leave Programs *42-1 and *42-2 blank. Press button/LED01 to enter blanks.

Important! *The Digital Network is connected to clocks with various degrees of precision called stratum levels from Stratum 1 (highest level of accuracy) to Stratum 4 (lowest level) as follows:*

• *Stratum 1—Public Telephone Network clock located in Hillsboro, Missouri.*

• *Stratum 2—Normally associated with #4 ESS Toll switches.*

• *Stratum 3—Normally associated with #5 ESS Central offices.*

• *Stratum 4—Normally associated with Digital PBXs.*

• *If a DK424 RDTU is programmed as the Primary Synchronization Clock reference, the clock provider connected to this RDTU should be a reliable clock provider, such as a Telco or common carrier (Example—AT&T). All other T1 span lines connected to RDTUs in the DK424 must be synchronized to the same clock source as the AT&T span line. If a T1 span line is not synchronized with the primary clock provider (AT&T, for this example), then DK424 lines assigned to this T1 span line (RDTU) may experience "slip" problems.*

9. The programs in Steps 1~8 are described for specific RDTU application programming. Also refer to "System Programming for T1" on Page 6-3. Run the programs as they apply to RDTU CO line applications.

DK424 T1

RDTU Programming

The following programs select the number of channels supported by the RDTU and assign line operation for the individual channels.

Notes

- RDTU Tie lines can route per Program 04 [DN] assignment or Program 71 and 72 DNIS assignments (see Program 17, LED 05).

- RDTU DID lines can route per Program *09 assignments or Program 71 and 72 DNIS assignments (see Program 17, LED 05).

Program 03: Specify Code 71 for an 8-channel RDTU, Code 72 for a 16-channel RDTU, or Code 73 for a 24-channel RDTU. (The 8-channel RDTU is the default.) Also, the Dual-Tone Multi-Frequency receiver (RRCS) must be installed and assigned if RDTU Tie and/or DID lines are DTMF.

Note   If the T1 is 8 channels, skip Program 03 and run Programs 91, 91-1 or 91-9 instead.

Program 04: Tie line digit translation (if T1 channel is Tie). Also see Programs 17 and 71~72.

Program *09: Use to translate DID digits to ring designated stations. Also see Programs 17 and 71~72.

Program 10-1: Use to enable or disable Two-Line Conference and Direct Inward System Access (DISA).

Program 15: Use to assign DTMF/Dial Pulse dialing, DISA, and additional attributes to each line. Automatic Release (AR) assignments only need to be made for loop start lines; AR is not needed for ground start lines. Also use to enable DID lines with DNIS and ANI options.

Program *15: Use to make tenant assignments.

Program 16: Use to assign lines to line groups.

Program 17: Use to assign Tie/DID Auto Camp-on, and second dial tone.

Program *17: Use to assign intercept port for DID line calls to wrong or vacant numbers.

Program 30: If RDTU Tie and/or DID lines are Dial Pulse (DP—Program 15-1), then Program 30, LED 11 should be ON for the Tie/DID station port numbers; if they are DTMF, LED 11 should be OFF.

Program 39: Use to assign line access buttons to digital and electronic telephones.

Program 40: Use to assign station access to lines (incoming and outgoing).

Program 41: Use to assign station access to lines (outgoing only).

Program *41 Series: Run to assign RDTU channel line operation, and coding and framing modes.

Program 42-0, 1~8: Use to assign behind PBX/Centrex operation to each line.

Program *42 Series: Use to assign timing reference for RDTUs.

Programs 45~48: Use to define Toll Restriction for any line.

Programs *50, *51, *52: Use to define Caller ID/ANI assignments.

Programs 50~56: Use to define Least Cost Routing assignments.

Program 59: Use to assign T1 lines to attendant console buttons.

Program 71~74: These programs are used in place of Program *09 to assign DID/Tie/DNIS line ringing destinations.

Program 71 (1~5): Tie/DID DNIS assignment (optional used in place of *09. Also see Program 04).

Program *71~*73: Tie/DID telephone/[DN] ring assignments.

Program 78: Use to assign special ringing of lines: includes Night Ring Over Page, DISA, Remote Maintenance via the Internal Maintenance Modem (IMDU), and Built-in Auto Attendant.

Programs 81~89: Use to assign loop and ground start RDTU CO lines to ring selected stations on incoming calls.

Programs *81, *84, *87: Assigns [DN] LEDs to flash when CO line rings a telephone.

Table 6-1   RDTU Controls, Indicators, and Connectors

| Control/Indicator/Connector	Type of Component	Description
SW1 Equalizer Setting Switch	8 2-position slide switches	Sets line length between RDTU and CSUs or other T1 (max 655 ft.).
P3 (not used)	3-terminal jumper plug	This jumper plug is reserved for future use.
P4 Remote Loop Remote Mode jumper plug	3-terminal jumper plug	Sets RDTU for Remote Loop Back mode test procedure.
P1 and P2 Loop Back jumper plug	3-terminal jumper plug	Sets RDTU for self check or Network/CSU loop back check.
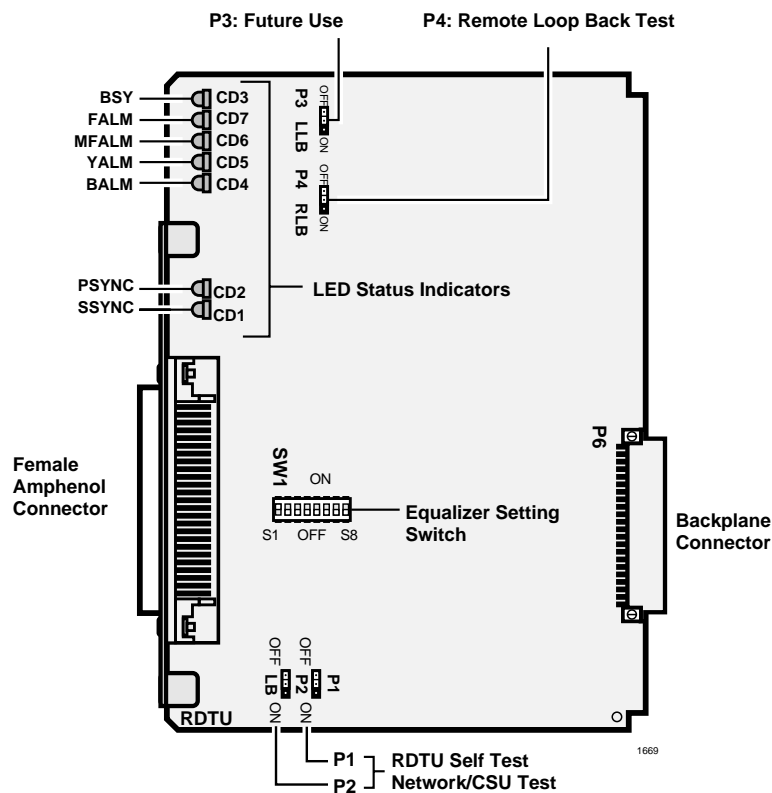
Figure 6-2   RDTU Printed Circuit Board

Installation Guidelines

1. Read "Channelization" on Page 6-1 before proceeding to Step 2.

2. Run RDTU T1 related system programs as described in "Applications" on Page 6-11.

3. Set P1 and P2, loop back jumper to the ON position for RDTU self test (see "RDTU Self Test" on Page 6-16). Refer to "Hardware and Cabling" on Page 6-13 for the appropriate SW1 Equalizer Switch setting and set SW1 to the setting that matches the RDTU cable length.

4. Install the RDTU PCB per instructions Page 6-3.

Note   Ensure the RDTU's component side is facing right when installing it in the cabinet.

5. Run the RDTU self check per "Network/CSU T1 Span Test" on Page 6-17. After self check passes, put P1 and P2 to the OFF position for normal operation and insert the RDTU PCB back into the appropriate slot.

6. Install CSUs and wire them to the RDTU and Network Interface Unit (NIU) or Customer Premises T1 circuit as required. See "System Programming for T1" on Page 6-3.

Note   Before connecting the CSU to the Telco line, notify the T1 provider. You should also notify the T1 provider before disconnecting the CSU.
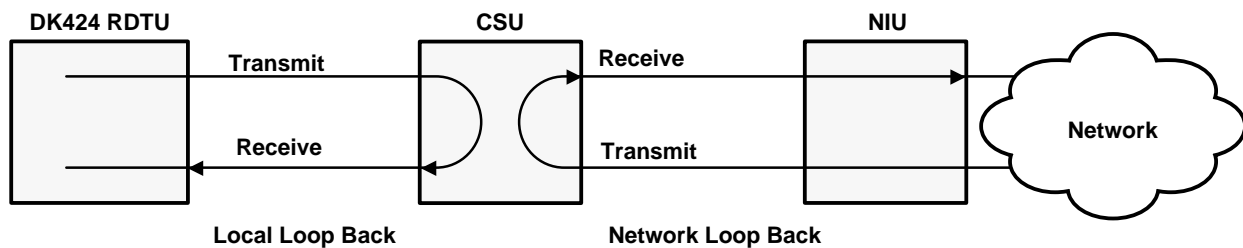

Figure 6-3   CSU Local and Network Loop Back Tests

7. Perform CSU to RDTU and CSU to Network loop back testing per CSU documentation and "Loop Back Testing" on Page 6-16.

Notes

- Local loop back and network loop back test cannot be performed simultaneously.

- CSU local/network loop back is a function of the CSU, not all CSUs provide this function – see CSU I&M documentation for CSU loop back test procedures.

8. After loop back testing is complete and synchronized with the far end T1 circuit, perform test calls on all RDTU lines. (Use the troubleshooting procedures in "T1 Fault Isolation" on Page 6-20 to help correct problems.)

9. Check T1 performance periodically for transmission errors using the "T1ERR" test. This requires a local or remote maintenance terminal connected to the PIOU or PIOUS PCB (local) and IMDU or Hayes-compatible modem (remote).

Applications

Each RDTU T1 PCB requires the following connecting equipment and cables to provide service (see the following sections and Figure 6-4).

RDTU to Network

If the RDTU must interface to a public telephone network or common carrier T1 circuit, the RDTU must be connected to a CSU. Use the NDTU cable (30 ft. cable supplied with RDTU) to connect the RDTU to the CSU. The function of the CSU is to provide the required interface between the RDTU PCB and the Public Telephone or Carrier Network. The interface created by the CSU normally provides protection and capabilities for loop back testing both the Network equipment and the RDTU PCB.

Connecting the CSU to the Network Interface Unit (NIU) is specified by the CSU manufacturer—see CSU installation documentation. Toshiba does not supply the cables and connectors required to connect the CSU to the NIU (see "RDTU Cable Installation").

RDTU to PBX T1 (Separated More Than 655 ft.)

If the RDTU must interface to a customer's premises T1 circuit (PBX, key/hybrid, or another DK424) to provide Tie line service, the RDTU must be connected to a CSU (with Toshiba NDTU cable) if the other customer premise T1 equipment is more than 655 ft. from the RDTU. The T1 span on the other end must also connect to a CSU.
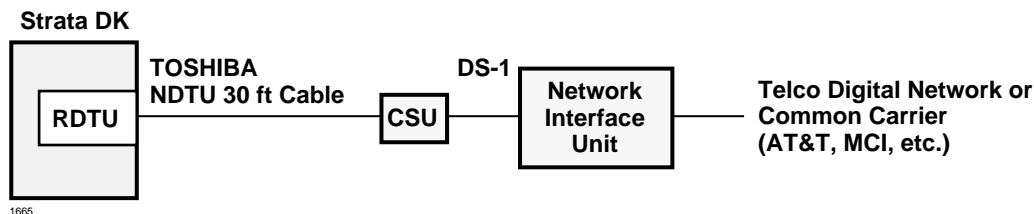
Figure 6-4   RDTU Connection to Digital Network or OCC

The RDTU equalization switch (SW1) must be set for "SHORT" cable length because RDTU will be connected to the CSU with the 30 ft. NDTU cable (see Table 6-2).

Connecting CSU to CSU and CSU to the far-end PBX T1 is specified by the CSU manufacturer—see the CSU installation documentation. Toshiba does not supply cables or connectors to connect CSU to CSU (Cable A) or CSU to the far end PBX (Cable B).

RDTU to PBX T1 (Separated Less Than 655 ft.)

If the RDTU is within 655 ft. of the far-end PBX T1 circuit, a CSU is not required. However, connecting a RDTU T1 span to another PBX or Key/Hybrid T1, in a Tie line configuration at a distance less than 655 ft. (without a CSU) will require a customer provided special cable. The transmit and receive pair of this span cable must be separated by at least five cable pairs and the wires must be 24 AWG, twisted pair, otherwise 22 AWG, ABAM type cable must be used. See "RDTU Cable Installation" on Page 6-14.

CSUs are not required if the RDTU is less than 655 ft. from the channel bank (see Figure 6-5).

Two CSUs (customer provided) are required if the RDTU is more than 655 ft. from the customer premise channel bank (see Figure 6-6).

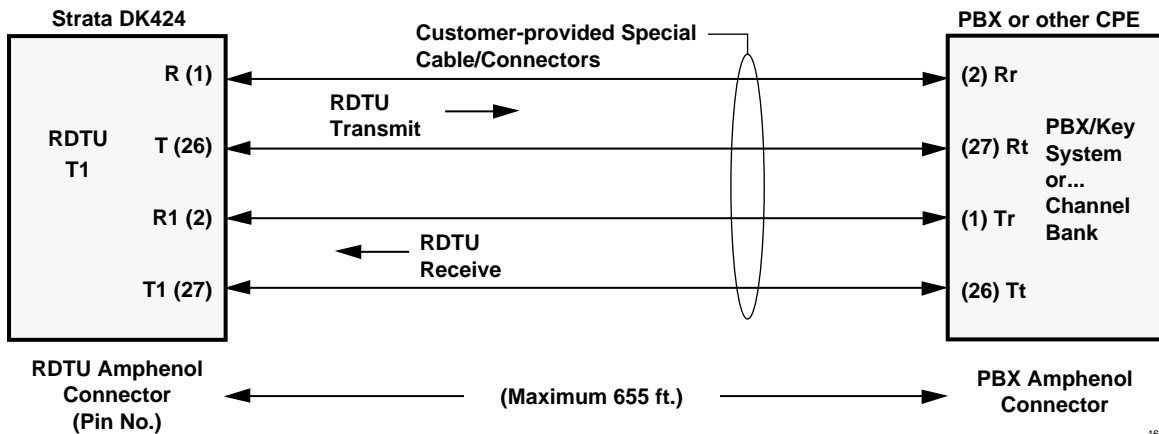In Figures 6-5 and 6-6, special cable and connectors are customer-provided.

Figure 6-5   Required Cables/Connectors for RDTU Connection at Distances of Less than 655 (200 Meters)
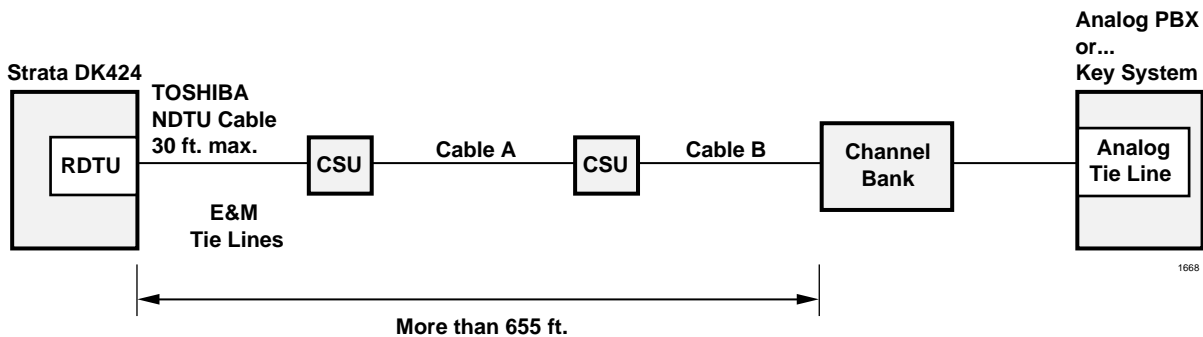

Figure 6-6   RDTU Connection via CSU and Channel Bank

Hardware and Cabling

RDTU Cable Length Switch

The distance between the DK424, RDTU and CSU or RDTU to other Customer Premise Equipment (CPE) T1 may vary (0~655 ft.) as shown. (See Figures 6-4, 6-5, and 6-6.) The RDTU interface transmitter must be equalized and its impedance must be matched to the cable length connecting the RDTU to the CSU or other CPE, T1.

RDTU transmit equalization/ impedance matching is accomplished by setting RDTU SW1 for the proper cable length (see Figure 6-5 for SW1 location and "SW1 Equalizer Switch and Loop Back Jumpers (Internal Option)" on Page 6-2 for SW1 setting instruction).

RDTU Loop Back Jumper Plugs

The RDTU PCB provides jumper plugs for loop back testing. Loop back tests are described in "Loop Back Testing" on Page 6-16.

RDTU Front Panel Indicators

The RDTU PCB provides seven LED indicators to show the status of RDTU: Busy or Idle condition, Alarm status, and Synchronization status. See Table 6-2 for the function of each status LED. Figure 6-2 shows the LED locations. Busy LED (BSY)—Turns on when one or more RDTU channels (lines) are in use. Also, when the RDTU does not receive the far end 1.544 mbs carrier signal, the RDTU will cause the BSY to be on steady.

Alarms are used to indicate potentially serious telephone network problems. Example: when monitoring a T1 network, if a Blue or Yellow alarm is indicated, it can be concluded that there is a cable fault or some other serious transmission impairment.

♦ Frame Alarm (FALM)—This LED turns ON steady if the RDTU has not achieved synchronization or when the span cable is not connected.

♦ Multi-Frame Alarm (MFALM)—LEDs turn ON steady if the RDTU receives the 1.554 mbs T1 carrier from the far end, but has not achieved Frame synchronization or when the span cable is not connected. Also, if the RDTU is set for SF and the far end is sending ESF (or vice versa), the MFALM LED will be ON steady.

♦ Red Alarm (FALM and MFALM)—When FALM and MFALM are both ON steady, a Red alarm condition exists. This indicates that the RDTU does not detect a proper carrier signal (1.544 mbs T1) on its receive pair and the RDTU is not synchronized. When the Red alarm condition exists, the RDTU should turn the BSY LED ON steady and attempt to send a Yellow alarm signal (RDTU YALM LED flashes) to the far end T1 circuit.

♦ Yellow Alarm (YALM)—When the far end network or CPE T1 does not detect the RDTU transmitted 1.544 mbs T1 carrier signal on its receive pair the far end T1 sends a Yellow alarm signal pattern to the RDTU—the RDTU should turn on the YALM LED (the YALM repeats the signal it receives from the far end—flashing or steady). If the RDTU does not receive the far end carrier signal, the RDTU sends the Yellow alarm signal to the far end and causes the BSY and YALM LEDs to flash.

♦ Blue Alarm (BALM)—The Blue alarm, also known as the Alarm Indication Signal (AIS), is detected by the RDTU. This signal is sent by the Far End Network equipment to RDTU when it loses the carrier from a Network T1 circuit (other than RDTU). This signal assures that the RDTU maintains synchronization when there is a problem between two Network Nodes. The RDTU BALM also lights if the far end sends a Blue alarm signal during loop back. The RDTU sends a Blue alarm signal when loop-back test is being performed.

DK424 T1

Synchronization LEDs

♦ Primary Synchronization (PSYNC) LED (see Figure 6-1 on Page 6-6) – If one RDTU PCB is assigned as the Primary Timing T1 PCB in Program *42, the PSYNC LED of this RDTU PCB flashes when it is synchronized with the far end T1 span line clock provider. If the Primary RDTU is not synchronized with the clock provider, the PSYNC LED will be ON steady. The SSYNC LED of the Primary sync RDTU PCB should always be OFF. The Primary sync RDTU PCB synchronizes the RTCU (time-switch) to the clock signal it receives from the T1 span circuit to which it is connected. The RTCU then synchronizes the DK424 PCM talk path (time-switch) to the far end PCM talk path.

♦ Secondary Synchronization (SSYNC) LED – If an RDTU PCB is assigned as the Secondary time T1 PCB in Program *42, its SSYNC LED will be ON steady (standby mode) when the DK424 is synchronized to the Primary T1 clock provider. In the event of a loss of Primary synchronization (when 4 out of 12 consecutive frame timing bits are in error) the DK424 switches from synchronizing to the Primary RDTU span line clock to the span line clock connected RDTU designated as the Secondary Timing Reference. When the DK424 is synchronized to the Secondary Reference RDTU, the PSYNC LED on the Primary Reference RDTU turns on steady and the SSYNC LED on the Secondary Reference RDTU will flash.

♦ Run Free (PSYNC/SSYNC) – If the RDTU PCB is the clock provider to the Far-end T1 span circuit both the PSYNC and SSYNC LEDs are always OFF.

RDTU Cable Installation

The RDTU PCB is shipped with a Toshiba NDTU cable for connecting the RDTU PCB to a CSU. The NDTU is a 30 ft. cable and is specially made to conform with EIA specifications (see Figure 6-7).

All other cables required to connect the T1 span line to the RDTU PCB are customer-supplied and must conform with EIA specification, see the Notes of Figure 6-7. Almost all CSU manufacturers supply cables that comply with T1 span specifications for connecting the CSU to customer premise equipment (like DK424, RDTU) to the Network Interface equipment.

RDTU To Network or Long Distance T1 Provider

RDTU To Customer Premise Equipment (CPE) T1
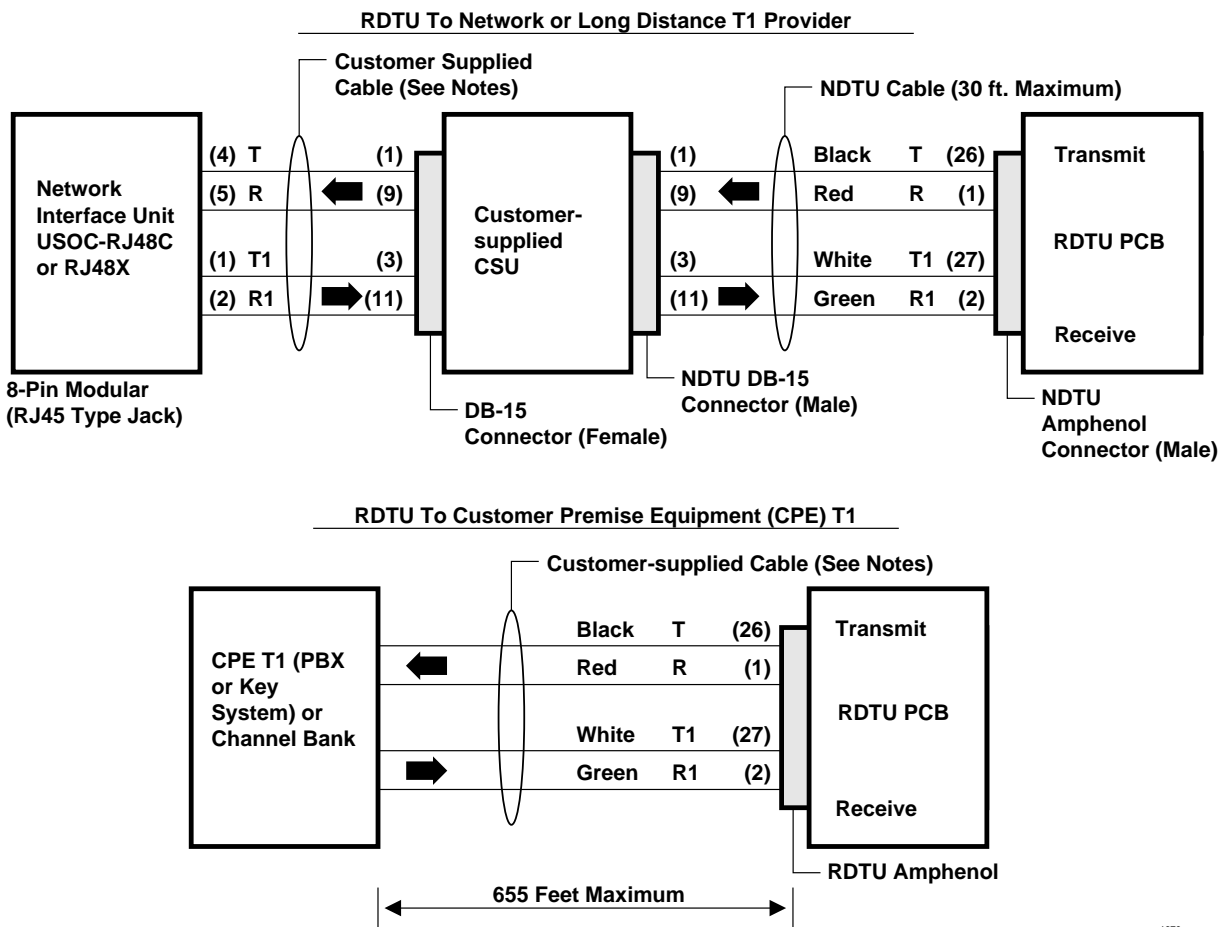
Notes

- Pins 2 and 4 of the DB-15 connector in most CSUs are frame ground. No connection is required.

- NDTU cable is supplied with RDTU PCB (30 ft. maximum).

- Set RDTU SW1 switch for proper loop length per DK14.

- Customer-supplied span cables must be 22 AWG, ABAM cable or, if using standard 24 AWG twisted pair, the transmit pair must be separated from the receive pair by at least 5-cable pairs. Most CSU manufacturers supply cables to connect the CSU to the Network Interface Unit or other CPE equipment.

Figure 6-7   RDTU Cable Connections

Loop Back Testing

The RDTU provides three loop back test configurations. These loop back tests should be performed as required in conjunction with CSU loop back tests (see CSU loop back test documentation).

RDTU Self Test

This test should be performed upon initial installation of a RDTU PCB. Program the RDTU per "System Programming for T1" on Page 6-3; then perform the RDTU loop back test, per the instructions in Figure 6-8, before connecting the far end (CSU, Network, or CPE) T1 span line.
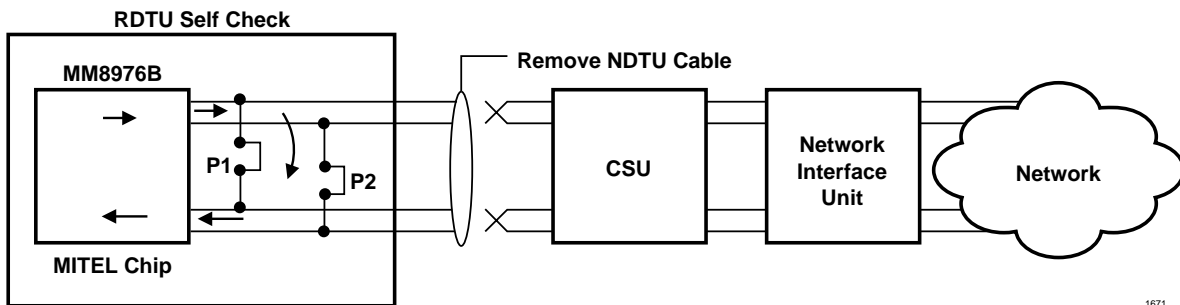
Notes

- P1 and P2 to ON position (see Figure 6-2).
- Remove NDTU cable from RDTU amphenol connector.
  - After about 12 seconds, all RDTU LEDs (except PRI/SEC SYNC) turn OFF.
  - Appropriate primary or secondary sync. LED flashes if RDTU is Primary or Secondary reference.
  - If RDTU is not a primary or secondary reference, then the Primary and Secondary sync LEDs should turn OFF.

Figure 6-8   RDTU Self Test

Network/CSU T1 Span Test

This test will verify that the far end (CSU, Network, or CPE) T1 equipment and span cabling is functioning properly. This test checks all T1 span cabling including the RDTU Amphenol cable and connector. Guidelines for this test are provided in Figure 6-9.

Network/CSU Check

Loop Back

P1 On   P2 On

P26, TT
P1, TR
P27, RT
P2, RR

NDTU Cable

CSU

Network Interface Unit

Network

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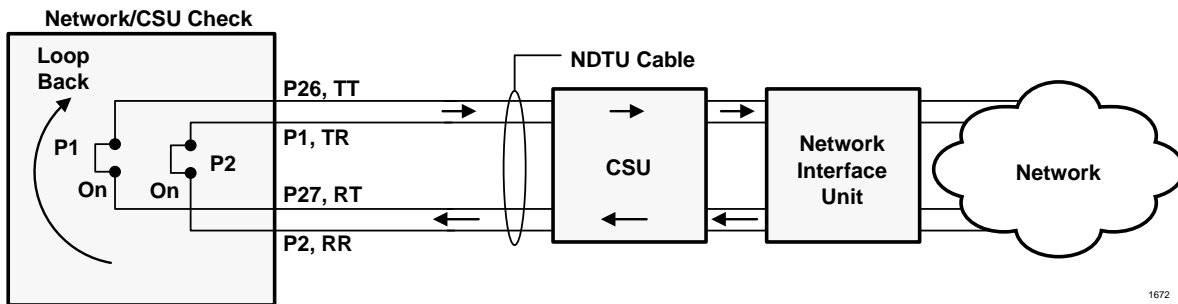
Notes

- P1 and P2 to ON position (see Figure 6-2).

- Unplug RDTU from DK424 back plane.

- CSU or Network T1 equipment should receive its own transmitted signal.

- Indications and results depend on CSU and/or Network equipment.

Figure 6-9   Network/CSU T1 Span Test

Network/CSU/RDTU Span Test

This test checks all equipment that is checked with the test in the above paragraph, but this test also checks that the RDTU Mitel LSI chip is functioning. Guidelines for this test are described in Figures 6-8~6-10.

Note   Loop back tests with CSU and Network equipment can also be performed when connecting the RDTU PCB directly to a customer premise (PBX, Key Hybrid, Channel bank) T1 circuit.

The RDTU Self Test is an active test of the RDTU circuit.

The Network/CSU Test checks all cables, the Network and CSU equipment (RDTU is not active).

The Remote Loop Back (RLB) Test is an Active test of RDTU (LSI MM8976B), CSU, Network equipment and all cables.

Refer to Figure 6-3 and the CSU manufacturer's Installation and Maintenance manual for information on CSU Local/Network Loopback Tests.

DK424 T1

0	Busy →	ON Steady

LEDS ON RDTU PCB

Top LED →

		T1	T2	T3	T4	T5
0	FALM →	ON	OFF	OFF	OFF	ON
0	FMALM →	OFF	ON	OFF	OFF	OFF
0	YALM →	OFF	OFF	ON	OFF	OFF
0	BALM →	OFF	OFF	OFF	ON	OFF

Continue to Cycle when P4 is in ON Position

T1   T2   T3   T4   T5   T6   T = About 1/2 Second

0	Primary SYNC	ON or OFF, Steady
0	Secondary SYNC	ON or OFF, Steady

Bottom LED →
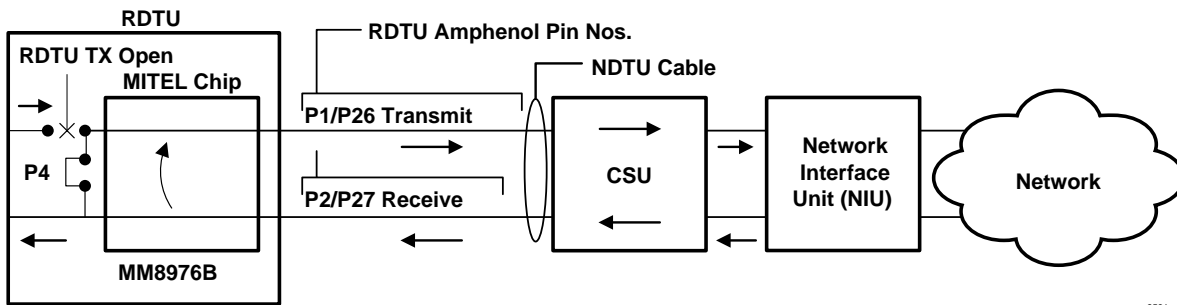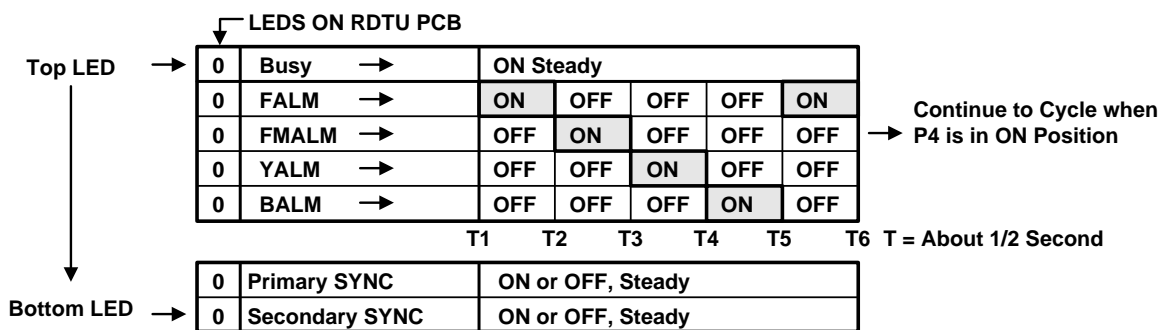
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Performance Monitoring

The performance of the RDTU can be monitored using the Data Dump Mode. This requires an RSIU, RSIS, PIOU or PIOUS PCB, an ASCII terminal (or PC) and, if monitoring RDTU performance from a remote location, an IMDU or RMDS modem or Hayes compatible modem is required.

The RDTU monitoring feature provides a printout (or CRT display) of RDTU detected T1 errors as shown in Figure 6-10. There are no time parameters given with this error report so the time between error count increments must be monitored manually. Basically the error count of any error category should not increase within 24-hour periods (see Table 6-2 on Page 6-21).

```
                         T1 ERROR DISPLAY
T1ERR
DTU NO = 1
   SYNCHRO BIT ERROR        = XXXX TIMES (1 TIME = 1024 ERRORS)
   BIPOLAR VIOLATION ERROR  = XXXX TIMES (1 TIME = 256 X 256 ERRORS)
   SLIP ERROR               = XXXX TIMES (1 TIME = 256 ERRORS)
   CRC ERROR                = XXXX TIMES (1 TIME = 256 ERRORS)
DTU NO = 2
   SYNCHRO BIT ERROR        = XXXX TIMES (XXXX = 0~9999)
   BIPOLAR VIOLATION ERROR  = XXXX TIMES
   SLIP ERROR               = XXXX TIMES
   CRC ERROR                = XXXX TIMES
DTU NO = 3                  = XXXX TIMES
   SYNCHRO BIT ERROR        = XXXX TIMES
   BIPOLAR VIOLATION ERROR  = XXXX TIMES
   SLIP ERROR               = XXXX TIMES
   CRC ERROR                = XXXX TIMES
DTU NO = 4
   SYNCHRO BIT ERROR        = XXXX TIMES
   BIPOLAR VIOLATION ERROR  = XXXX TIMES
   SLIP ERROR               = XXXX TIMES
   CRC ERROR                = XXXX TIMES
DTU NO = 5
   SYNCHRO BIT ERROR        = XXXX TIMES
   BIPOLAR VIOLATION ERROR  = XXXX TIMES
   SLIP ERROR               = XXXX TIMES
   CRC ERROR                = XXXX TIMES
DTU NO = 6
   SYNCHRO BIT ERROR        = XXXX TIMES
   BIPOLAR VIOLATION ERROR  = XXXX TIMES
   SLIP ERROR               = XXXX TIMES
   CRC ERROR                = XXXX TIMES
```

Figure 6-10 RDTU Performance Monitor Printout

The error categories are as follows:

♦ Synchro Bit Error: This counter increments each time the RDTU detects 1024 synchronization bit errors.

♦ Bipolar Violation Error: This counter increments each time the RDTU detects 6.55 x 104 bipolar violations.

♦ Slip error: This counter increments each time the RDTU detect 256 slips.

♦ CRC Errors: Cyclical Redundancy Check counter increments each time the RDTU detects 256 CRC-6 errors. This is only available when the RDTU is in the Extended Super Frame mode.

DK424 T1

➤ **To receive the "T1 ERROR DISPLAY" from a terminal (local or remote)**

1. Establish communication with the terminal or PC using a communication software (e.g., Procomm®).

2. Enter the security code, and press **Enter** (or **Return**).

3. At the **>MODE** prompt, type **DUMP** (must be all caps), press **Enter** (or **Return)**. The **>D** prompt displays on your screen.

4. At the **>D** prompt, type **T1ERR** and press **Enter** (or **Return**). The display (see Figure 6-10) shows all RDTU PCBs (DTUNO=1~DTUNO=8) even if the associated RDTU (1~8) is not installed. The ERROR counter can only be reset by turning the DK424 OFF and ON.

   Use Table 6-2 for recording customer's problems.

➤ **To exit the dump mode**

➤ At the **>D** prompt, type **QUIT**, press **Enter** (or **Return**); the **>MODE** prompt displays.

T1 Fault Isolation

T1 fault troubleshooting can be complex and may require expensive test equipment to perform the necessary fault isolation. Because of the high cost, many dealers have not purchased T1 test equipment. As a result, on a cutover when an RDTU does not synchronize or CO lines simply do not function, the site technician can only check wiring and cabling. Without proper test equipment, there is very little that can be tested.

This section provides some procedures that can be done without T1 test equipment to help find the cause of a failure, or at least determine if system hardware is functioning properly.

The DK424 also provides T1 "in-service" monitoring which allows maintenance personnel to detect line errors without introducing any disturbances on the line. This method of testing permits maintenance personnel to monitor T1 performance without the expense of test equipment or without taking the T1 circuit out of service. The T1 error check is particularly useful for monitoring the T1 circuit for intermittent problems that may become more serious as time progresses (see "RDTU Performance Monitor Printout" on Page 6-19).

If experiencing problems with an RDTU span circuit, refer to Flowcharts 6-1~6-3 to isolate the fault. The flowcharts in this section use the same logic symbols as those used in DK. Document error information in Table 6-2, "RDTU T1 Error Record" on Page 6-21.

Table 6-2   RDTU T1 Error Record

Customer: _____

Date	Time	Latest Strata DK424 Power Off/On Reset	Syncro Bit Error	Bipolar Violation Error	Slip Error	CRC Error

Notes

- Latest DK424 Power On/Off Reset: Use this column to record whether the DK424 Power was reset On or Off, and the date and time that it was reset.

- Use the Synchro Bit Error, Bipolar Violation Error, Slip Error, and CRC Error columns to record the error number, and the date and time that they occur.

Flowchart Symbols

Five symbols are used in the flowcharts, which are identified in Figure 6-11.

Marking points of a flowchart sequence.

Important notes affecting the fault clearing procedure.

Question to be answered YES or NO.

Progression TO or FROM another flowchart location. Letters and numbers denote the exact entrance or exit points.

Statement of a required action.

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Figure 6-11 Flowchart Symbols

DK424 T1

Flowchart 6-1   Fault Classification

Flowchart 6-2   No Synchronization

Start

Check RDTU/CSU/NIU cabling per "RDTU Cable Installation."

Run DK system programs per "RDTU (T1) System Programming".

Correct as necessary.

Possible causes: No carrier from far end; defective CSU, NIU, or RDTU; cable problems.

Is fault cleared ?
No → Perform RDTU self test per "RDTU Loop Back Testing."
Yes → **End**

Before disconnecting CSU from Telco line, notify the T1 provider. You should also notify the provider before connecting the CSU.

Did RDTU pass the self test ?
No → Replace RDTU and retest. ③
Yes → ①

Is the problem corrected ?
Yes → **End**
No → Go to ④

Perform the CSU local loop back test. In this test the RDTU loop back jumpers remain off and the CSU is placed in the local loop back mode. (The RDTU transmit signal is looped back to its receiver circuit.) See the CSU manufacturer's I&M documentation.

Perform the CSU network loop back test per Figure 6-2.

Perform RDTU Network loop back tests per Figures 6-10 and 6-11.

② **Did the CSU local loop back test pass ?**
Yes → ②
No → Recheck cables, then replace CSU. → Go to ④

Did CSU network test pass but still no synchronization ?
Yes → ③
No → Recheck cables, then replace CSU.

Is the problem corrected ?
Yes → **End**
No → Go to ③

Contact the T1 provider (carrier) and request them to perform a point-to-point, on-site, test from the NIU (demarcation point) to the far end T1 equipment.

Was problem corrected by network personnel ?
No → Contact your technical support group. ④
Yes → **End**

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DK424 T1

Flowchart 6-3   Synchronization Slip Problems

Start

Is there more than one RDTU installed ?

No → ①

Yes → ②

Slip problems cause periodic clicking on the talk path. Clicks can occur many times (severe case) during a call or only a few times during a 24-hour period.

Slips occur when synchronization timing is lost for an instant and then recovers.

Monitor slips using "T1ERR" function in DK280 remote maintenance DUMP mode.

One example of a slip fault when using more than one RDTU T1 span is provided in Figure 6-6.

②
- If RDTU spans are connected to a Telco or...
  long distance provider, program the first RDTU as the primary reference and the second as a secondary reference using Program *42 (see Figure 6-7).
- If a third RDTU is connected to a PBX, the PBX should be set up as a slave to the RDTU.
- If all RDTUs are connected to a PBX, then either the RDTUs can be set as primary and secondary references (slaves) and the PBX as the master (Program *42 data is blank; or, all RDTUs should be set as the master and the PBX T1s should be slaves.

Program as required.

①
- If RDTU is connected to a reliable clock source (Telco, AT&T etc.) then it should be programmed as a slave (primary reference) to the provider. (Program *42 – data = 1).
- If RDTU is connected to a PBX or channel bank, make sure that RDTU is programmed as the master clock provider (Program *42 – data = blank); or, if the PBX is set up as a master, the RDTU should be programmed as a primary reference.

Program as required.

Is slip problem cleared ?

No (left branch) / Yes (right branch)

Is slip problem cleared ?

Yes → **End**

No → ③

Use Program *42 and assign a different RDTU as Primary reference. If problem continues try another RDTU as Primary reference.

Is slip problem cleared ?

Yes → Change the RDTU that was causing slip problems when it was set-up as Primary reference.

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No → Go to ③

③
- Check all cable connections and correct as necessary.
- Change CSU.
- Change Primary reference RDTU.
- If problem continues after RDTU is changed, change RCTU.
- If problem continues after CSU, RDTU, and RCTU are changed, contact the T1 provider and request a point-to-point slip test from NIU to far end T1.

Is slip problem cleared ?

No → Contact your technical support group.

Yes → **End**

DK40i/DK424 Universal Slot PCBs

This chapter contains information on Printed Circuit Boards (PCBs) which can be used in the universal slots of either the Strata DK40i Expansion KSU or the Strata DK424 cabinets. Although the system architecture of these systems is very different, the PCBs described in this chapter are common to both systems.

Important! *When installing these circuit boards in the DK40i Expansion KSU, you must install them in the universal slots designated in Chapter 2 – DK40i Configuration.*

PCBs which are not installed in the universal slots of the system can be found in the installation chapter for the system. For example, the TCOU PCB for the DK40i system appears in Chapter 3 – DK40i Installation. Paragraph headings identify information which is specific to a particular system and minor exceptions are mentioned in text.

Note Prior to PCB installation, the power supply must be tested and the ground checked.

PCB Compatibility

The following is a list of PCBs that appear in this chapter:

PCB	Compatible with DK40i	Compatible with DK424	Function
EOCU	X	X	Speaker Off-hook Call Announce Unit (See PEKU for installation/programming instructions.)
IMDU	X	X	Remote Maintenance Modem Unit (See PIOU2, PIOUS2 for installation/programming instructions.)
KCDU	X		CO Line/Digital Telephone Interface Unit
PCOU1,2	X	X	(See RCOU for installation/programming instructions.)
PDKU2	X	X	Digital Telephone Interface Unit
PEKU	X	X	Electronic Telephone Interface Unit
PEMU	X	X	See REMU.
PEPU	X	X	External Page Interface Unit
PESU	X	X	Standard/Electronic Telephone Interface Unit

PCB	Compatible with DK40i	Compatible with DK424	Function
PIOU2, PIOUS2	X	X	Option Interface Units
PSTU	X	X	(See RSTU2 for installation/programming instructions.)
RATU		X	Attendant Console Interface Unit
RCIS	X	X	Adds four additional Caller ID lines to RCIU2.
RCIU1		X	(See RCIU2 for installation/programming instructions.)
RCIU2	X	X	Caller ID Interface
RCMS			Adds two ports per card (maximum of two) to E911 CAMA Trunk Direct Interface card (RMCU)
RCOS	X	X	Adds four loop start lines. (See RCOU for installation/programming instructions.)
RCOU	X	X	Four-Circuit Loop Start CO Line Interface Unit
RDDU	X	X	Direct Inward Dialing Line Interface Unit
RDSU	X	X	Digital/Standard Telephone Interface Unit
RDTU		X	T1 Interface Unit (See Chapter 6.)
REMU	X	X	E&M Tie Line Unit
RGLU2	X	X	Loop/Ground Start CO Line Interface Unit
RMCU		X	CAMA E911 Trunk Direct Interface card
RMDS		X	Optional built-in modem. (See RSIU for installation/programming instructions.)
RSIS		X	Optional RS-232 ports. (See RSIU for installation/programming instructions.)
RSIU		X	RS-232/Modem Interface Unit
RSSU	X	X	PC Interface Unit
RSTS	X	X	Optional Standard Telephone Interface Subunit (See RDSU for installation/programming instructions.)
RSTU2	X	X	Standard Telephone Interface Unit
RWIU	X	X	Strata AirLink Wireless Interface Unit (see Chapter 16 – Strata AirLink Systems)

PCB Chapter Layout

Each PCB outline begins with the PCB's designation and title (the outline appears in the chapter in alphabetical order by designation). A brief synopsis of the PCB appears next and includes a notation of the system(s) that the PCB can be used in, the circuits supplied by the PCB, what equipment the PCB interfaces with, and a list of the PCB's older version(s) with a brief description of their differences.

Installation and programming instructions follow the synopsis with a table showing the PCB's controls, indicators and connectors and an illustration of the board.

DK40i/DK424 Universal Slot PCBs

PCB Title

DK16e/DK424 Universal Slot PCBs   *RDDU Direct Inward Dialing LIne Interface Unit*

RDDU
Direct Inward Dialing Line Interface Unit

System: *DK16e Expansion KSU, DK424*
Circuits per PCB: *four DID lines*
Interfaces with: *DID lines*
Older Versions: *None*

The RDDU provides four Direct Inward dialing (DID) lines, each of which can have a single office code along with a block of extensions. If an RDDU is installed, an RRCS must be installed for DTMF operation, but not for dial pulse operation.

Each extension can be assigned to ring a station [DN] that appears on one or multiple staitons, Distributed Hunt or ACD Group (DK424 only), or an external tlephone number selected in system programming. This enables calls over the same line to be routed to difernent staions or group of stations. An extension can alos be assinged to ring the maintenance modem. Each RDDU can be set for either wink start or immediate. All RDDU lines support DNIS and ANI features.

RDDU controls, indicator,s and interface connectors are shown in Figure 7-10 and described in Table 7-8.

RDDU Hardware Option

Ther e are no hardware options supported by the RDDU.

sample.pg

System:

Gives the type of system that is compatible with the given PCB. Be sure to read this information before attempting to use a PCB with your system application.

Circuits per PCB:

Type and number of circuits available on the PCB.

Interfaces with:

Type of line/hardware the PCB can accept.

Older Version(s):

Describes older version or versions of the PCB.

KCDU
CO Line/Digital Telephone Interface Unit

System: *DK40i Expansion KSU*

Circuits per PCB: *two CO loop start/four digital telephone circuits*

Interfaces with: *central office loop start lines*
digital telephones (with or w/o RPCI-DI or ADM)
PDIU-DS
DDCB
cordless digital telephone (DKT2004-CT)

Older Version(s):   *none*

One or two KCDU PCBs may be installed in the Expansion KSU. For controls, connectors, and indicators, see Figure 7-1 and Table 7-1.

KCDU Configuration

The KCDU may have to be configured to control excessive loudness if the system is close to a CO or installed behind a PBX telephone system. It does not have to be configured for anything else. The decibel (dB) PAD switches, SW501 (CO1) and SW601 (CO2), control the loudness by providing a 3 dB signal level drop to, or from, the PBX or CO when set to the PAD position. The switch comes from the factory set at NOR (for normal) meaning no PAD loss.

KCDU Installation

1. If the system is located within one mile of the CO or PBX telephone system, set dB PAD switches SW501 and SW601 to the PAD position.

2. Insert the KCDU into the appropriate slot in the Expansion KSU, per tables in Chapter 2 – DK40i Configuration. Apply firm, even pressure to ensure proper mating of the connectors.

3. After installing the KCDU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance will be felt.

Note   If KCDU CO lines receive Caller ID, RCIU2 must be installed.

KCDU Programming

See "RCOU Programming" on Page 7-29 and "PDKU2 Programming" on Page 7-6 for KCDU programming information. When running Program 03 for the KCDU slot(s), specify code 65 if the KCDU does not support OCA or PDIU-DI telephones or code 66 if the KCDU supports OCA or PDIU-DI telephones. Do not specify code 11, 61, 62, or 64.

Table 7-1   KCDU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
CO line circuit 1 indicator SW501	Red LED	Lights to indicate CO line circuit is in operation.
CO line circuit 2 indicator SW601	Red LED	
J7 connectors	Modular connector	Interface connector for CO line circuits,1 and 2.
PAD switch SW501	Two-position slide	Enables 3 dB signal level drop for CO line circuit 1 (when set in PAD position).
PAD switch SW601	Two-position slide	Enables 3 dB signal level drop for CO line circuit 2 (when set in PAD position).

25-Pair Amphenol Connector (Female)

J7

CO2

CO1

**SW601
(CO2)**

**SW501
(CO1)**

PAD NOR

PAD NOR

1857

Backplane Connector
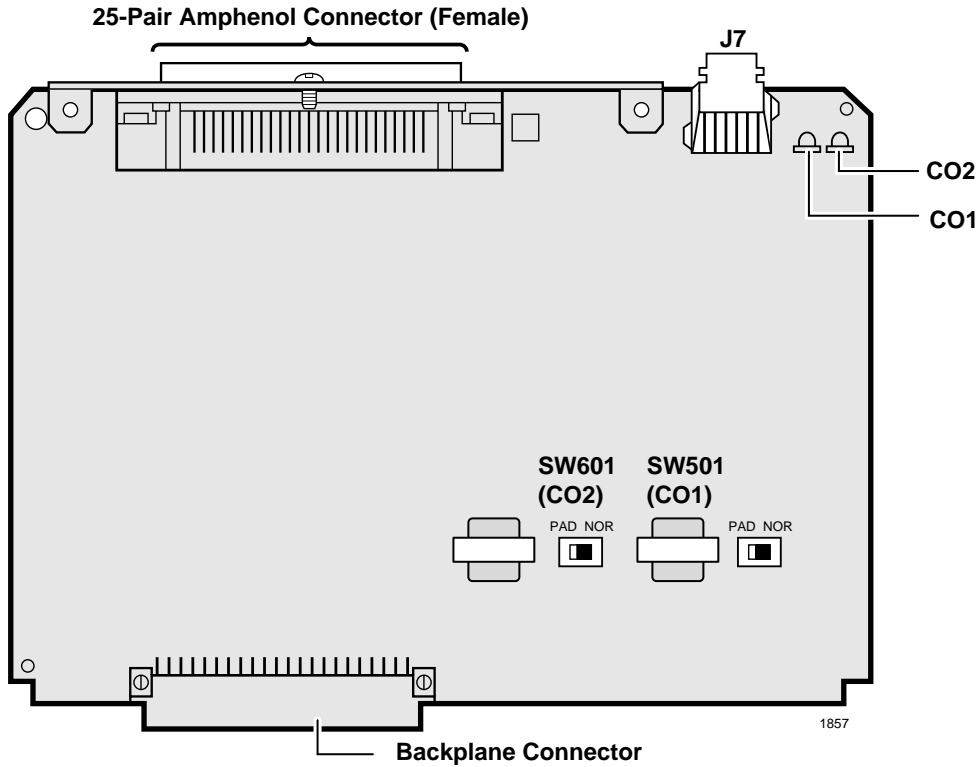
Figure 7-1   KCDU PCB

PDKU2
Digital Telephone Interface Unit

System:	*DK40i Expansion KSU, DK424*
Circuits per PCB:	*eight digital telephone circuits*
Interfaces with:	*digital telephones (with or w/o RPCI-DI or ADM)*
	DDSS console (circuit 8 only)
	PDIU-DS (must have dedicated circuit)
	DDCB (circuit 5 only–ports 004, 012, 020, and 028)
	cordless digital telephone (DKT2004-CT)
	DKT2001 single line digital telephones (see Note below)
Older Version(s):	*PDKU1 (identical to PDKU2 except it does not support continuous DTMF tones w/DKT2000-series telephones, DIUs can only be connected to circuits 1~7)*

PDKU2 Hardware Options

PDKU2 does not have to be configured for any option. Refer to Chapter 9 – Station Apparatus for instructions on how to connect digital telephones, DDCBs, and DDSS consoles to the PDKU2, as well as how to upgrade digital telephones with these options: an Integrated Data Interface Unit (PDIU-DI, RPCI-DI), a Speaker Off-hook Call Announce upgrade (DVSU), and a Headset/Loud Ringing Bell Interface (HHEU). Refer to Chapter 10 – Peripheral Installation to connect the Stand-alone Data Interface Unit (PDIU-DS) to the PDKU.

Note   DKT2001 telephones do not support HHEUs, DADMs, DDSSs, RPCI-DIs, or DVSUs.

There are no controls or indicators on the PDKU (Figure 7-2).

PDKU2 Installation

1. Insert the PDKU2 (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors. (For DK40i, PDKU2 must be installed per tables in Chapter 2 – DK40i Configuration.)

2. After installing the PDKU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

PDKU2 Programming

Program 03

♦ Specify Code 61 to indicate a station line PDKU2.

♦ Specify Code 62 to indicate a PDKU2 supporting Speaker Off-hook Call Announce (OCA) and/or DIUs and RPCI-DI Data mode.

♦ Specify Code 64 to indicate a PDKU2 supporting a DDSS console, Speaker OCA, DIUs, and RPCI-DI Data mode.

♦ For RPCI-DI TAPI mode only and Handset OCA, code 61 can be used and the PDKU2 can be in any universal cabinet slot.

Note   If there are no PDKU2 options, Program 03 can be skipped, and Program 91-1 or 91-9 can be run instead.

Programs 20, 21, and 22: Configures DIUs and RPCIs.

Programs 28 and 29: Digital Direct Station Selection Consoles (DDSS) assignments.

Program *29: Enables ADMs on 2000-series digital telephones.

Program 27: Adjusts initial off-hook volume level for digital telephone handsets.

Programs 30, 31: Enables OCA.

Programs 77-1, 77-2, 79, *79: Digital Door Phone/Lock Control Unit (DDCB) and door phone ringing assignments.

Program 92-5: Initializes initial ringing, speaker, and muted ring volume levels of digital telephones.

Backplane Connector

1371

50-Pin Female Amphenol Connector
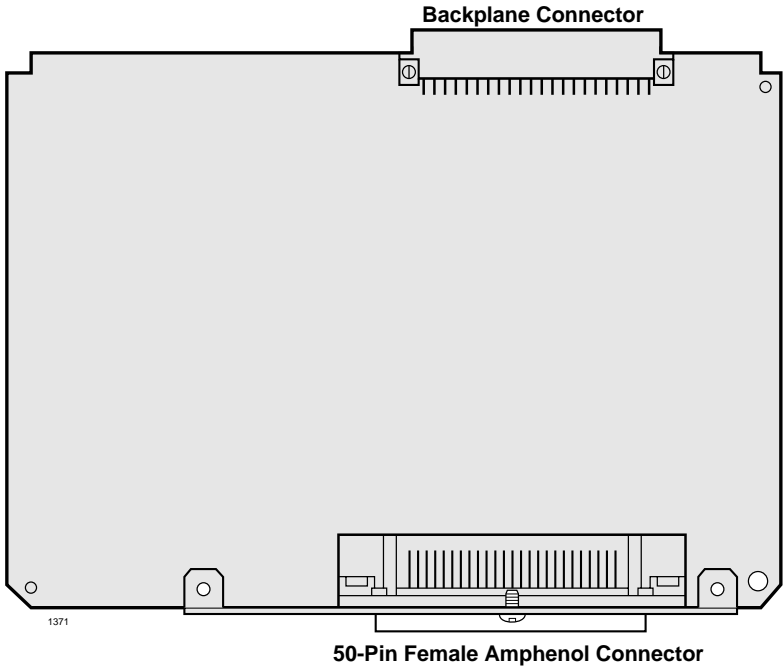
Figure 7-2   PDKU2 PCB

PEKU
Electronic Telephone Interface Unit

System: *DK40i Expansion KSU, DK424*

Circuits per PCB: *eight electronic telephone circuits*

Interfaces with: *electronic telephones*
HDSS console (circuits 7 and 8 only–each console requires two circuits)
alternate BGM source (circuit 3 only)
EOCU PCB for OCA
external conference amplifier (circuits 2 and 3 only–ports 09 and 10, 17 and 18, 25 and 26, 33 and 34–each amplifier requires two circuits)
HDCB (circuit 5 only–ports 004, 012, 020, and 028)

Older Version(s): *none*

PEKU controls and interface connectors are shown in Figure 7-4 and described in Table 7-2.

Speaker Off-hook Call Announce Unit (EOCU) Installation onto the PEKU (Internal Option)

Note   PEKU connectors P10, P20, P40, P50, and P60 are positioned to allow installation of the EOCU only in the proper position (Figure 7-3).

1. Mate EOCU connectors J10, J20, J40, J50, and J60 with PEKU connectors P10, P20, P40, P50, and P60.

2. Apply firm, even pressure to EOCU to ensure proper mating of connectors.

3. Use a three-pair cable for making connections between the PEKU and the speaker OCA electronic telephone.

4. Refer to "Electronic Telephone Upgrades" on Page 9-16 for procedures to upgrade electronic telephones for Speaker OCA.

Note   Electronic telephones do not support handset OCA.
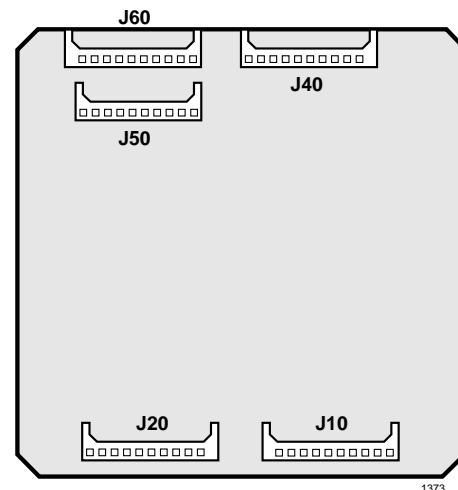
Figure 7-3   Off-Hook Call Announce Unit (EOCU) Installation

External Options

Note   Refer to Chapter 9 – Station Apparatus and Chapter 10 – Peripheral Installation for installation of electronic telephones (including the following upgrades: HVSU2 or HVSU, HVSI for Off-hook Call Announce and HHEU for headset and/or loud ringing bell interface) and external options, respectively.

PEKU Configuration to Support an HDSS Console Option

1. Set the SW1 switch to DSS.

2. See "HDSS Console" on Page 9-21 for console installation instructions. Each HDSS console requires dedicated use of circuits 7 and 8 of a particular PEKU PCB.

PEKU Configuration to Support Door Phone/Lock Control Unit (HDCB)

1. Cut the W9 Door Phone jumper wire on the PEKU PCB.

2. Refer to "Door Phone (MDFB)" on Page 9-22 for HDCB, associated Door Phones (MDFBs) and door lock control installation procedures. Only circuit 5 of a PEKU associated with ports 004, 012, 020, and 028 can support HDCBs.

PEKU Configuration to Support Separate BGM Source Connection

1. Cut the W5 (BGM) jumper wire on the PEKU PCB.

2. Refer to Chapter 10 – Peripheral Installation for installation procedures for BGM connection. Only circuit 3 can support a BGM source.

3. In Program 10-2, set LED 09 on to enable the PEKU (Port 002) BGM source to be sent to digital and electronic telephone speakers and/or PIOU2, PIOUS2, PEPU PCBs.

4. Use Program 19 to identify the slot in which the PEKU supporting the BGM source will be installed.

PEKU Installation

1. Make sure the PEKU has been configured for the appropriate hardware options. See previous pages for more information.

2. Insert the PEKU (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors. (For DK40i, the PEKU can be installed only in place of the RSTU2, PDKU, or RDSU. See Chapter 2 – DK40i Configuration.)

3. After installing the PEKU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance will be felt.

PEKU Programming

Program 03: Door phones, the BGM source connection, and external amplifiers do not require a special code.

➤ Specify Code 21 to indicate a non-optioned station line PEKU.

➤ Specify Code 22 to indicate a PEKU configured for Speaker OCA.

➤ Specify Code 23 to indicate a PEKU configured for an HDSS console.

➤ Specify Code 24 to indicate a PEKU configured for Speaker OCA and an HDSS console.

Note If there are no PEKU options, Program 03 can be skipped, and Program 91 can be run instead.

Programs 10-2 and 19: BGM connection.

Programs 10-3: Assigns external amplifiers to ports.

Programs 28 and 29: HDSS console assignments.

Programs 77-1, 77-2, 79: HDCB and door phone ringing assignments.

Table 7-2   PEKU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
Off-hook call announce P10	10-pin connector	Interface connector for optional Off-hook Call Announce subassembly connector (used with P20, P40, P50, and P60).
Off-hook call announce P20		Used with P10, P40, P50, and P60.
Off-hook call announce P40		Used with P10, P20, P50, and P60.
Off-hook call announce P50		Used with P10, P20, P40, and P60.
Off-hook call announce P60		Interface connector for optional Off-hook Call Announce subassembly connector (used with P10, P20, P40, and P50).
DSS/EKT HDSS Console/ Electronic Telephone SW1 Switch	2-position slide switch	Configures PEKU for operation with an HDSS console or electronic telephones.
Door phone W9 jumper wire	White jumper wire	When cut, configures PEKU for installation of an optional HDCB.
BGM source connection W5 jumper wire		When cut, configures PEKU for BGM source connection.
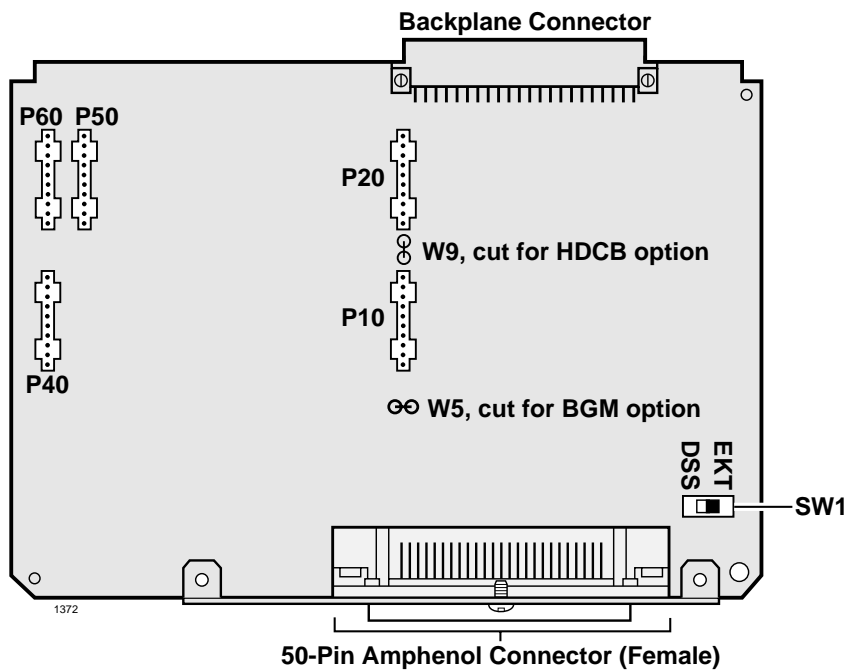
Figure 7-4   PEKU PCB

PEPU2
External Page Interface Unit

System: *DK40i Expansion KSU, DK424*

Circuits per PCB: *(see interfaces)*

Interfaces with: *built-in paging amplifier or page speaker*
door lock control
external amplifier control
external paging 600 ohm (duplex) interface (one zone)
MOH control
night relay control

Older Version(s): *none*

The PEPU is similar to the PIOU2 and PIOUS2, but supports fewer peripherals than both PCBs. PEPU controls, indicators, and interface connectors are illustrated in Figure 7-5 and described in Table 7-3.

PEPU does not support the following PIOU2 and PIOUS2 options:

♦ Alarm sensor

♦ Four-zone page

♦ SMDR port

♦ Remote maintenance modem or ASCII terminal connector

♦ IMDU connection

Note Refer to Chapter 10 – Peripheral Installation and Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for installation of external options.

PEPU2 Installation

1. Make sure P15 is in the Mu Law position for U.S. and Canada.

2. Ensure the PEPU2 has been configured for the appropriate hardware options. (Refer to Chapter 10 – Peripheral Installation.)

3. Insert the PEPU2 (component side facing right) into the last slot (S16) of the Base KSU/ cabinet if the system has only a Base KSU/cabinet and no Expansion KSUs/cabinets. If there are Expansion KSU/cabinets, install the PEPU2 in the highest slot number of the highest numbered KSU/cabinet. Apply firm, even pressure to ensure proper mating of connectors.

4. After installing the PEPU2, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

PEPU2 Programming

Program 03: Specify Code 41 for the slot that will support a PEPU.

Program 10-2: Activates External Page with All Call Page (with access code **#39** only, not with **All Call Page** button).

Program 77-1: Assigns relay control options.

Program 78: Sets Night Ringing over External Page.

Table 7-3   PEPU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
M/B make/break jumper plug P10	3-terminal jumper plug	External page/door lock control relay make or break jumper plug.
M/B make/break jumper plug P11		Night/hold relay make or break jumper plug.
SPI/SPO internal/external amplifier switch SW4	2-position slide switch	Selects built-in 3-watt amplifier (SPI) or 600-ohm output (SPO) for external page/BGM operation.
Volume control VR1	Trim potentiometer	Adjusts volume of built-in 3-watt amplifier.
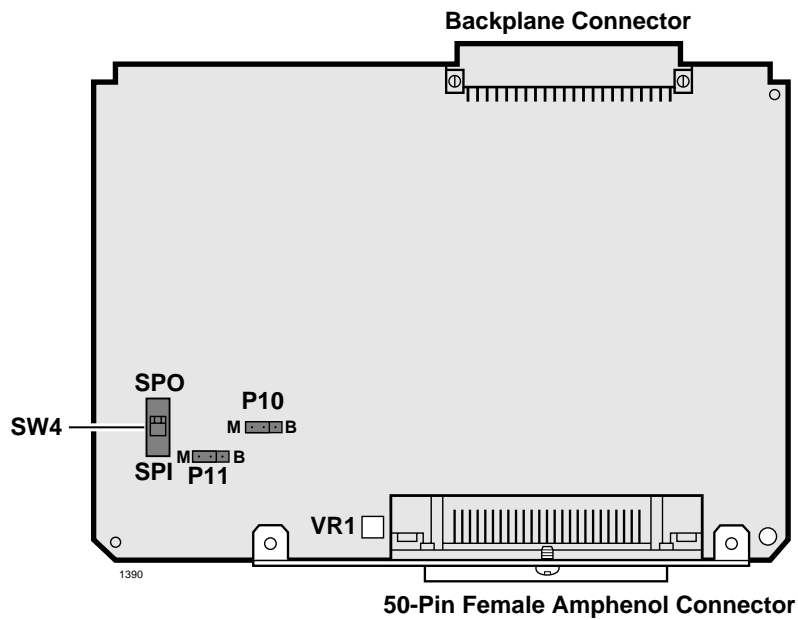
Figure 7-5   PEPU PCB

PESU
Standard/Electronic Telephone Interface Unit

System: *DK40i Expansion KSU, DK424*

Circuits per PCB: *two standard telephone or two-wire device circuits (circuits 1,2)/ four electronic telephone circuits (circuits 5~8)*

Interfaces with: ***standard telephone circuits***
standard telephones
voice mail ports
off-premises stations
alternate BGM source
auto attendant digital announcer

electronic telephone circuits
electronic telephones
alternate BGM source (circuit 8 only)
EOCU PCB for OCA
HDCB (circuit 5 only–ports 004, 012, 020, and 028)
external conference amplifier

Older Version(s): *none*

The PESU provides a ring generator that can be set for either 130V P-P or 190V P-P for the two standard interface circuits. PESU circuits 3 and 4 are nonfunctional, but they are each assigned a port in system programming.

Note   For the system to recognize the DTMF tones generated by a standard telephone (or any other device connected to a standard telephone port), a DTMF receiver unit (RRCS4, 8, or 12) must be installed on the DK40i K4RCU3 or the DK424 common control unit.

PESU controls and interface connectors are shown in Figure 7-6 and described in Table 7-4.

DK40i General Information

The PESU must be installed in the DK40i Expansion KSU in place of RDSU, RSTU or PDKU. See Chapter 2 – DK40i Configuration.

CAUTION!   **To prevent system malfunction, DO NOT install the PESU in slot 18 of the DK40i system.**

Installing the Speaker Off-hook Call Announce Unit (EOCU) (Internal Option)

1. Mate the EOCU connectors J10, J20, J40, J50, and J60 (Figure 7-6) with the PESU connectors P10, P20, P40, P50, and P60.

Note   PESU connectors P10, P20, P40, P50, and P60 are positioned to allow installation of the EOCU only in the proper position.

2. Apply firm, even pressure to the EOCU to ensure proper mating of connectors.

3. Use three-pair cable for connecting the PESU and the Speaker OCA electronic telephone. Refer to Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for wiring/ interconnecting details.

4. See "PDIU-DI Installation into 1000-series Digital Telephone" on Page 9-9 for procedures to add required speaker OCA upgrade to electronic telephones.

External Options

Note Refer to Chapter 9 – Station Apparatus to connect electronic telephones (including the following upgrades: HVSU2 or HVSU/HVSI for Off-hook Call Announce and HHEU for headset and/or Loud Ringing Bell interface), standard telephones, and HDCBs to the PESU. See Chapter 10 – Peripheral Installation to connect peripherals.

PESU Configuration to Support Door Phone/Lock Control Unit (HDCB)

1. Cut the W9 door phone jumper wire on the PESU PCB.

2. See "Door Phone/Lock Programming" on Page 9-24 for installation procedures for the HDCB and associated door phones (MDFBs) and door lock control.

3. Each HDCB requires dedicated use of circuit 5 of a particular PESU PCB.

PESU Configuration to Support Background Music (BGM) Source

1. Cut the W7 (BGM) jumper wire on the PESU.

2. Refer to Chapter 10 – Peripheral Installation for BGM installation procedures.

PESU Configuration for Square Wave Ring Generator

➤ Ensure the P90 jumper plug is set to the "H" (190V P-P) position for initial installation. The "L" (130V P-P) position is used if devices connected to the PSTU1 or PSTU2 experience ring trip.

PESU Installation

1. Make sure that the PESU subunit (ESTS) is securely attached to the PESU (Figure 7-6).

> **WARNING!** **The protective shield on the back of the PESU is designed to protect the installer from potentially hazardous ring voltage. Do not remove this shield.**

2. Ensure the PESU has been configured for the appropriate hardware options. "PESU Controls, Indicators, and Connectors" on Page 7-15.

3. Insert the PESU into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors.

> **CAUTION!** **To prevent system malfunction, DO NOT install the PESU in slot 18 of the DK40i system.**

4. After installing the PESU, gently pull it outward. If the connectors are properly mated, a slight resistance will be felt.

PESU Programming

Enter Code 25 in Program 03 for a non-optioned PESU or Code 26 for a PESU supporting Off-hook Call Announce. To program the PESU standard telephone ports, see "PESU Programming" on Page 7-15. To program the PESU electronic telephone ports, see "PESU Programming" on Page 7-15. If there are no PESU options, skip Program 03 and run Program 91 instead.

Table 7-4   PESU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
Off-hook call announce P10	10-pin connector	Interface connector for optional Off-hook Call Announce subassembly connector (used with P20, P40, P50, and P60).
Off-hook call announce P20		Used with P10, P40, P50, and P60.
Off-hook call announce P40		Used with P10, P20, P50, and P60.
Off-hook call announce P50		Used with P10, P20, P40, and P60.
Off-hook call announce P60		Used with P10, P20, P40, and P50.
Ring voltage jumper plug P90	3-terminal jumper	Sets ring generator voltage level for circuits 1 and 2. H=190V P-P (factory setting) L=130V P-P
Door phone W9 jumper wire	White jumper wire	When cut, configures PESU, circuit 5 for installation of an optional HDCB.
BGM W7 jumper pack		When cut, configures PESU, port 07, circuit 8, for BGM source connection (slot 01 only with PCTU2 and PCTU1).

Cut W7 Only if BGM Is Connected to Port 07, Circuit 8

PESU

W7

P60

P40

P50

Optional EOCU, Equip. for OCA Feature

Cut W9 for Door Phone Option (HDCB on Circuit 5)

W9

P10

P20

ESTS

50-Pin Amphenol Connector (Female)

P80

P70

Backplane Connector

Up

L   H

P90

PESU

1378

Ring Voltage Option (Ports 1 & 2):
L = Low Level (130V P-P)
H = High Level (190V P-P)

ESTS: Standard Telephone Interface, Always Equipped From Factory

Note Connect two ringers maximum per port (H or L).

Figure 7-6   PESU PCB

PIOU2, PIOUS2
Option Interface Units

System: *DK40i Expansion KSU, DK424*

Circuits per PCB: *(see interfaces)*

Interfaces with: *night transfer/music hold control relay*
door lock/external amplifier control relay
remote maintenance (IMDU)
TTY port–terminal, modem, SMDI, ACD/MIS (DK424 only)
SMDR output
alarm sensor
zone page interface–four zones (PIOU2 only)
built-in paging amplifier (PIOU2 only)
unamplified page output

Older Version(s): *none*

The PIOU2 and PIOUS2 both provide a circuit interface with the system peripheral options. A maximum of three PIOU2 or PIOUS2 PCBs can be installed in the system. (see "PIOU2, PIOUS2 Installation" on Page 7-18).

DK40i General Information: On the DK40i, the Base KSU provides the 600 ohm page output; the 600 ohm page output on the PIOU2, PIOUS2 is not used on the DK40i.

PIOU2 controls, indicators, and interface connectors are shown in Figure 7-8 and described in Table 7-6. PIOUS2 information is provided in Figure 7-9 and Table 7-7.

IMDU Compatibility with PIOU and PIOUS

The compatibility of the IMDU1 and IMDU2A PCBs are shown in Table 7-5.

Table 7-5   IMDU and PIOU/PIOUS Compatibility

PIOU/PIOUS	IMDU1	IMDU2A
PIOU1A/PIOUS1A	Available	Available
PIOU2A/PIOUS2A	N/A	Available

IMDU2 Installation onto a PIOU2 or PIOUS2 (Internal Option)

1. Make sure IMDU2 P3 is set for PCM Mu Law operation in the U.S and Canada.

2. Make sure IMDU2 P1, modem transmit gain is set on L in the U.S and Canada.

3. Make sure IMDU2 P2, modem receive gain is set on L in the U.S and Canada.

4. On the PIOU2 or PIOUS2, set the SW3 switch to the "MODEM" position for IMDU2 operation.

5. Set the P13 jumper plug on the PIOU2 or PIOUS2 to the "BELL."

3651
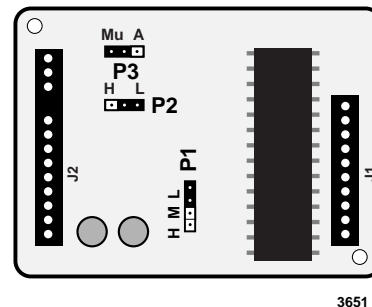
Figure 7-7   Remote Maintenance Modem (IMDU2) Installation

6. Mate IMDU2 connector J1 with PIOU2 or PIOUS2 connector P1 and IMDU2 J2 with P2 and P3 (see Figure 7-7).

Note PIOU2 or PIOUS2 connectors P1, P2, and P3 are positioned to allow installation of the IMDU2 only in the proper position.

7. Refer to the *Strata DK Programming Manual* and turn LED 14 on in Program 77-1 to enable IMDU2 operation.

Note The IMDU2 default station intercom or [DN] is #19.

8. Apply firm, even pressure to the IMDU2 to ensure proper mating of connectors.

9. Set the SW2 baud rate switch on the front panel to 300 or 1200, as appropriate, after the PCB has been installed in the KSU/cabinet (in for 300 bps, out for 1200 bps).

Note Refer to Chapter 10 – Peripheral Installation for external option installation procedures.

PIOU2, PIOUS2 Installation

1. Make sure that P15 is in the Mu Law position for USA and Canada.

2. Ensure that the PIOU2 or PIOUS2 has been configured for the appropriate hardware options. (Refer to Chapter 10 – Peripheral Installation for more details.)

3. Insert the PIOU2 or PIOUS2 (component side facing right) into the last slot ("S16") of the Base KSU/cabinet if the system only has a Base KSU/cabinet and no Expansion KSUs/cabinets. If there are Expansion KSUs/cabinets, install the PIOU2 or PIOUS2 in the highest slot number in any KSU/cabinet. Apply firm, even pressure to ensure proper mating of connectors.

Note In DK40i, PIOU2 or PIOUS2 can be installed in any available Expansion KSU.

4. After installing the PIOU2 or PIOUS2, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

PIOU2, PIOUS2 Programming

Program 03: Specify Code 41, 42, or 43 for the slot that will support a PIOU2 or PIOUS2. (See "Multiple Serial Port Installation" on Page 11-2)

Note Program 76 assignments for RSIU, RSIS, RMDS will override Program 03 assignments (41, 42, and 43) for SMDI, SMDR, TTY, and maintenance modem.

Program 10-2: Activates External Page with All Call Page (with access code #39 only, not with **All Call Page** button).

Program 60: Assigns SMDR options.

Program 77-1: Assigns relay control and IMDU2 options.

Program 78: Sets Night Ringing over External Page
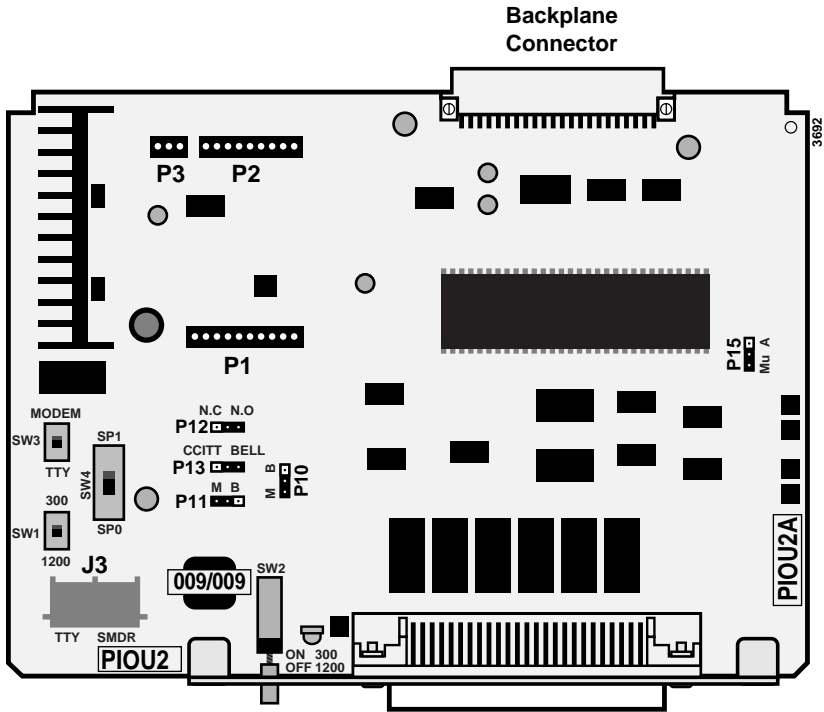
Figure 7-8   PIOU2 PCB

Figure 7-9   PIOUS2 PCB

Table 7-6   PIOU2 Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
SMDR/TTY interface connector J3	Dual modular connector	Interface connector for SMDR printer/call accounting device and maintenance terminal/modem.
IMDU2 connector P1	10-pin connector	Interface connector for remote maintenance modem piggy-back module.
IMDU2 connector P2	9-pin connector	
IMDU2 connector P3	3-pin connector	
M/B make/break jumper plug P10	Plastic jumper	External Page/Door Lock Control Relay Make or Break jumper plug.
M/B make/break jumper plug P11		Night/Hold Relay Make or Break jumper.
Alarm sensor N.O./N.C. jumper plug P12		Alarm sensor normally open or closed jumper.
CCITT/BELL plug P13		IMDU2 or external modem operating specification jumper plug.
SMDR baud rate switch SW1	2-position slide switch	Selects baud rate (300 or 1200 bps) for SMDR printer or call accounting device.
TTY baud rate switch SW2	2-position locking push-button switch	Selects baud rate (300 or 1200 bps) for Remote Maintenance Modem piggy-back module (IMDU2) or external TTY jack.
Modem/TTY switch SW3	2-position slide switch	Enables PIOU2 for operation with IMDU2 modem or TTY jack.
SPO/SP1 internal/external amplifier switch SW4		Selects built-in 3-watt amplifier (SPI) or 600-ohm output (SPO) for external page/BGM operation.
Volume control VR1	Trim potentiometer	Adjusts volume of built-in 3-watt amplifier.
PCM A Law/Mu Law option P15	3-terminal jumper plug	Default set for Mu Law standard (applies to the U.S., Canada and Japan). A Law is used in Mexico, the United Kingdom, and other parts of Europe and Asia.
*Most modems in USA require BELL specification. **Top modular is TTY and Bottom modular is SMDR.		

Table 7-7   PIOUS2 Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
SMDR/TTY interface connector J3	Dual modular connector (top modular is TTY, bottom is SMDR)	Interface connector for SMDR printer/call accounting device and maintenance terminal/modem.**
IMDU2 connector P1	10-pin connector	Interface connector for remote maintenance modem piggy-back module.
IMDU2 connector P2	9-pin connector	
IMDU2 connector P3	3-pin connector	
M/B make/break jumper plug P10	3-terminal jumper plug	External Page/Door Lock Control Relay Make or Break jumper plug.
M/B make/break jumper plug P11		Night/Hold relay make or break jumper plug.
Alarm sensor N.O./N.C. jumper plug P12		Alarm sensor normally open or normally closed jumper plug.
CCITT/BELL jumper plug P13		IMDU2 or external modem operating specification jumper plug.
SMDR baud rate switch SW1	2-position slide switch	Selects baud rate (300 or 1200 bps) for SMDR printer or call accounting device.
TTY baud rate switch SW2	2-position locking push-button switch	Selects baud rate (300 or 1200 bps) for Remote Maintenance Modem piggy-back module (IMDU) or external TTY jack.
Modem/TTY switch SW3	2-position slide switch	Enables PIOUS2 for operation with IMDU2 modem or TTY jack.
PCM A Law/Mu Law option P15	3-terminal jumper plug	Default set for Mu Law standard (applies to the U.S., Canada and Japan). A Law is used in Mexico, the United Kingdom, and other parts of Europe and Asia.
Most modems in USA require BELL specification.		
Top modular is TTY and Bottom modular is SMDR.		

RATU
Attendant Console Interface Unit

System: *DK424*

Circuits per PCB: *four attendant console circuits*

Interfaces with: *up to four conventional and/or PC attendant consoles*

Older Version(s): *none*

RATU controls and indicators are illustrated in Figure 7-10 and described in Table 7-8.

RATU Installation

1. Insert the RATU (component side facing right) into the slot following the last station PCB. Apply firm, even pressure to ensure proper mating of connectors (consoles will assume the next four station port numbers). (See Worksheets in Chapter 4 – DK424 Configuration for RATU slot assignment recommendations.

2. After installing the RATU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

Table 7-8   RATU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
Console 1 indicator CD3	Red LED	Lights when a PC or conventional console is not operating. The LED will turn off when the console is operational. The LED temporarily flashes when the console is first installed and the DK424 RCTU processor and attendant console or RATI initialize.
Console 2 indicator CD4		
Console 3 indicator CD5		
Console 4 indicator CD6		
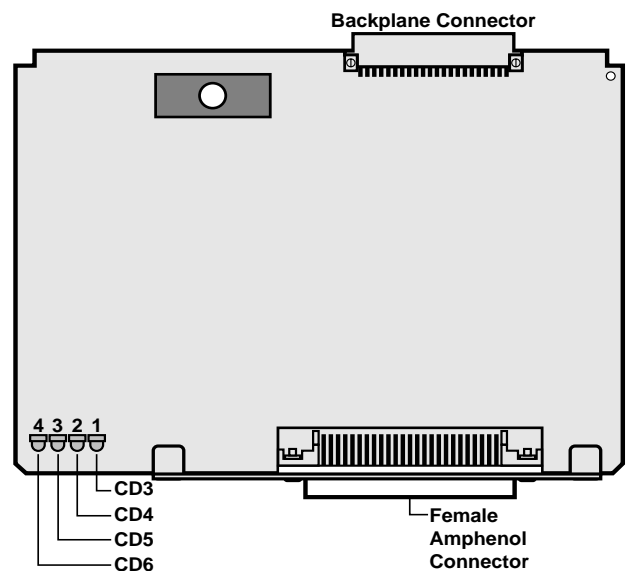
Figure 7-10   RATU PCB

RCIU1, RCIU2, RCIS
Caller ID Interface

System: *RCIU1–DK424*
RCIU2 –DK40i Expansion KSU, DK424
RCIS–DK424

Circuits per PCB: *four Caller ID circuits*

Interfaces with: *loop or ground start lines w/Caller ID (requires RCOU or RGLU2)*

Older Version(s): *none*

The RCIU1, RCIU2 PCB provides the Caller ID feature, also known as Calling Number Delivery (CND). There are two types of RCIU PCBs, RCIU1 and RCIU2. RCIU1 can be used in DK424 systems. RCIU2 can be used in DK424 and DK40i systems.

CAUTION!   **To prevent system malfunction, DO NOT install RCIU1 in the DK40i system.**

Caller ID can be provided on analog loop start lines (PCOU, KCDU, RCOU PCBs) and analog ground start lines (RGLU2 PCB) only. It is not available on any other type of analog lines (RDDU/DID and/or REMU, PEMU Tie) or any type of digital lines (RDTU- T1, including ground start, loop start, DID and Tie lines).

An RCIU1/RCIS or RCIU2/RCIS circuit must be available in addition to each RCOU, RGLU, etc., line that is to receive Caller ID. When ordered from the factory, the RCIU1, RCIU2 PCB comes equipped with four caller ID circuits.

RCIS PCB

An RCIS piggy-back PCB can be installed onto the RCIU to provide an additional four caller ID circuits. Hence, an installed RCIU/RCIS can provide a maximum of eight caller ID circuits per cabinet slot.

To provide up to eight circuits, always install RCIS onto RCIU1 (DK424 only) or RCIU2 (DK40i and DK424) instead of installing two RCIU PCBs (Program 03 code 81 always assigns each RCIU slot with eight software caller ID circuits).

Each RCIU/RCIS Caller ID circuit has a two-wire tip/ring interface which must be bridge-wired across its corresponding ground or loop start CO line tip/ring on the MDF (see Figure 8-27 on Page 8-28). Each RCIU/RCIS modular jack provides interface for two Caller ID circuits.

DK40i RCIU2 Installation

➤ Install RCIU2 in *slot 17 only* (see Figure 7-12 and Chapter 2 – DK40i Configuration.)

DK424 RCIU1 or RCIU2 Installation

➤ Install the RCIU1/RCIU2 PCBs in any universal cabinet slot of the DK424 (except slot 11 or slot 12 if the RSIU is installed in slot 11).

Note   It is not necessary to install the RCIU1, RCIU2, RCIU1/RCIS, or RCIU2/RCIS PCBs in the same cabinet as their associated CO lines or in slots adjacent to the lines.

DK424 RCIU1/RCIS or RCIU2/RCIS Installation

1. Install the RCIS onto the RCIU1 or RCIU2 as required (see Figures 7-11 and 7-13).

2. Install the RCIU1/RCIS or RCIU2/RCIS into the appropriate cabinet slot. The circuit modular jack numbering and the tip/ring cross connect wiring of RCIU1/RCIS or RCIU2/RCIS to RCOU, PCOU, or RGLU is shown in Figure 8-25 on Page 8-26.

Note   It is not necessary to install the RCIU1, RCIU2, RCIU1/RCIS, or RCIU2/RCIS PCBs in the same cabinet as their associated CO lines or in slots adjacent to the lines.

RCIU1, RCIU2, RCIS Programming

Program 03: Program each RCIU1, RCIU2, RCIU1/RCIS or RCIU2/RCIS (four or eight Caller ID circuit) slot with code 81.

Note   RCIU1/RCIS or RCIU2/RCIS caller ID circuits are numbered automatically in numerical order starting with the RCIU1/RCIS or RCIU2/RCIS installed in the lowest slot number. Slots with code 81 increment the Caller ID circuit numbers by eight circuits even if RCIS is not installed on the RCIU1 or RCIU2.

Program *50: Assigns CO lines that will receive Caller ID to an associated RCIU1/RCIS or RCIU2/RCIS Caller ID circuit number. This assignment is flexible, i.e., any RCOU, PCOU, RGLU Caller ID CO line can be assigned to any RCIU1, RCIU2 or RCIS caller ID circuit number.

Note   After assigning CO lines to caller ID circuits, turn system power OFF for approximately five seconds and then back ON or run Program 91-2 to activate Program *50 assignments.

Program *51: Sets the Caller ID (CLID)/Automatic Dialed Number Identification (ANI) memory allocation for the appropriate stations. This memory is used to save CLID/ANI telephone numbers for calls that are received but not answered (abandoned calls). CLID/ANI numbers are not saved in station memory if they are answered. Stations can be allocated with memory to save up to 100 numbers in 10-number increments.

The total memory allocated to all stations in a system is:

♦ RCTUE/F = 2000 numbers

♦ RCTUC/D = 1000 numbers

♦ RCTUBA/BB = 400 numbers

♦ RCTUA and DK40i = 200 numbers

Note   When a CO line rings multiple stations, a station must be the owner of the Caller ID or ANI CO line to be able to save abandoned call (Caller ID and/or ANI) telephone numbers. (See Program *52.)

Program *52: Assigns stations as owners of Caller ID CO lines. These stations will store the Caller ID telephone numbers received on abandoned (not answered) calls for the lines which they own. Typically all common CO lines are assigned to one designated telephone or attendant console and private lines are assigned to individual private line telephones.
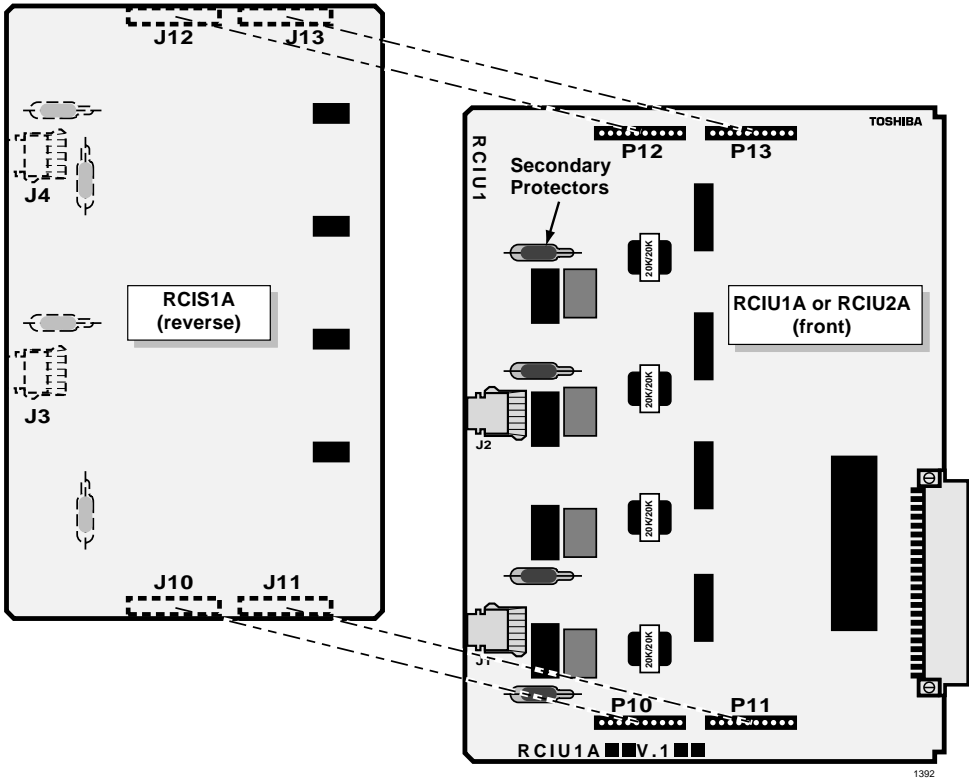
Figure 7-11   DK424 RCIU1/RCIS or DK40i RCIU2/RCIS PCB Installation
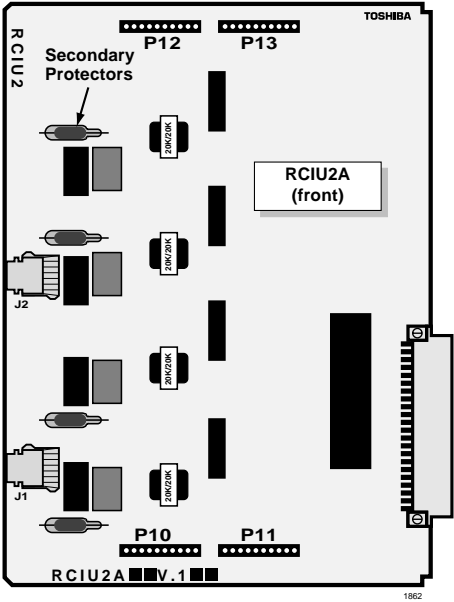
Figure 7-12   DK40i RCIU2 PCB Installation
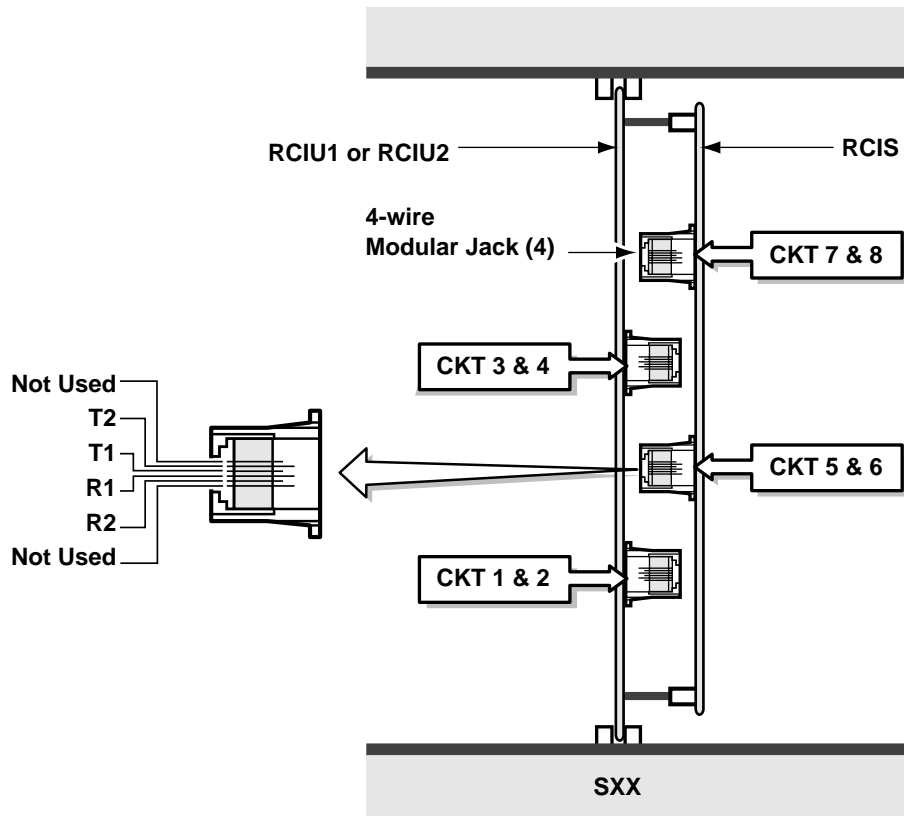
Figure 7-13 DK424 RCIU1/RCIS or RCIU2/RCIS PCB Modular Jack Positions

Note   A station must also be allocated with Caller ID/ANI storage memory in Program *51 to store abandoned call telephone numbers.

Program 39, Code 462: Assigns the Caller ID/ANI **Lost Call Auto Dial** button to LCD telephones that store Caller ID and/or ANI abandoned call telephone numbers. A user can scroll through the stored abandoned call telephone numbers and auto dial the selected number using this button.

Program 59, Code 462: Assigns the CLID/ANI **Lost Call Auto Dial** button to the attendant consoles that store Caller ID and/or ANI abandoned call telephone numbers. A console user can scroll through the stored abandoned call telephone numbers and auto dial the selected number using this button.

Program 10-3, Key 08: Determines if CLID and/or ANI telephone numbers will be sent out the system SMDI port:

➤ Turn LED 08 ON if the CLID and/or ANI numbers received should be sent out the system SMDI port.

➤ Turn LED 08 OFF if the CLID and/or ANI numbers received should not be sent out the system SMDI port.

Note   The system will initialize with LED 01 OFF, i.e., no CLID/ANI information will be sent out the SMDI port.

Program 60-1, Key 01: Determines which information will be sent out the system SMDR port, i.e., system Account Codes or CLID and/or ANI telephone numbers:

➤ Turn LED 01 ON if CLID and/or ANI information should be sent out the system SMDR port.

➤ Turn LED 01 OFF if Account Codes information should be sent out the system SMDR port.

Note The system will initialize with LED 01 OFF, i.e., Account Codes information will be sent out the SMDR port.

Program 77-4, LED 01/LED 02 (DK424 Release 3.2 and above): Enables CLID, ANI, and/or Dialed Number Identification Service (DNIS) information to be sent from the RSIU Open Architecture (OA) port on ACD calls only:

➤ Turn LED 01 ON if the OA port should send CLID and/or ANI information.

➤ Turn LED 01 OFF if the OA port should not send Caller ID/ANI.

➤ Turn LED 02 ON if the off port should send DNIS information.

➤ Turn LED 02 OFF if the OA port should not send DNIS information.

Notes

• Program 77-4 allows LED 01 and LED 02 to be turned ON simultaneously to allow CLID, ANI, and DNIS information to be sent from the OA port on ACD calls.

• The system will initialize with LED 01 and LED 02 OFF, i.e., no CLID, ANI, or DNIS information will be sent from the OA port on ACD calls.

RCOU, RCOS
Four-Circuit Loop Start CO Line Interface Unit

System: *RCOU–DK40Expansion KSU, DK424*
                                      RCOS–DK40i, DK424

Circuits per PCB: *four loop start CO line circuits*

Interfaces with: *loop start lines*

Older Version(s):   *PCOU2 (does not have ABR circuitry, uses RCTU, K4RCU ABR circuits)*
                                    PCOU1(has ABR circuitry, identical and interchangeable w/PCOU2)

The RCOU also provides ring detection, dial outpulsing, and hold circuitry. Each RCOU line can be programmed for DTMF or dial pulse signaling and gas tube secondary protection.

RCOU PCBs are shown in Figure 7-14 and described in Table 7-9.

RCOS Installation (Internal Option)

An RCOS PCB can be installed on the RCOU of the DK40i and DK424 for four more loop start lines (for a total of eight lines–the RCOS circuits provide the same options as the RCOU). Each RCOS circuit has gas tube secondary protection.

Excessive loudness which is caused by close proximity to a CO or PBX telephone can be fixed through the RCOS and RCOU decibel (dB) PAD switches. RCOS dB switches SW501, SW601, SW701, and SW801 and RCOU dB switches SW101, SW201, SW301, and SW401 provide a -3 dB signal level drop between the PBX and CO when set to position 3. Switches are factory-set at the 0 (0 dB signal level drop) position.

See Figure 7-12 and Table 7-10 for RCOS controls, indicators, and interface connectors.

➤ **To install an RCOS PCB**

1. If the Strata DK system is within one mile of the PBX or CO, set the RCOS dB PAD switches SW501, SW601, SW701, and SW801 to the 3 (-3 dB signal level drop) position. Set the RCOU dB PAD switches to position 3 also.

   Note   RCOU male connectors P11, P12, P13, and P14 are positioned to allow installation of the RCOS only in the proper position.

2. Mate the RCOS female connectors J11, J12, J13, and J14 (Figure 7-16) to the RCOU male connectors P11, P12, P13, and P14 (Figure 7-14).

3. Apply firm, even pressure to the RCOS to ensure proper mating of connectors.

RCOU Installation

Note   The decibel (dB) PAD switches SW101, SW201, SW301, and SW401 control excessive loudness resulting from close proximity to a Central Office or PBX telephone office by providing a -3 dB signal level drop to, or from, the PBX or CO when set to the 3 position. Switches are factory-set to the 0 (0 dB signal level drop) position.

➤ **To install an RCOU PCB**

1. If the Strata DK system is within one mile of the PBX or Central Office, set the RCOU dB PAD switches SW101, SW201, SW301, and SW401 to the 3 (-3 dB signal level drop) position.

2. Insert the RCOU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors. PCOU2 can be installed in place of RCOU, see Chapter 2 – DK40i Configuration.

3. After installing the RCOU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

RCOU Programming

Program 03: Specify Code 11 for each slot that will support an a four-circuit RCOU (without an RCOS). Specify Code 17 for each slot that will support an RCOU equipped with an RCOS.

Note   Program 03 can be skipped, and Program 91 can be run instead. Program 91 recognizes the RCOS.

Program 10-1: Enables or disables line-to-line Conference and Direct Inward System Access (DISA).

Program 15: Assigns DTMF/Dial Pulse dialing, DISA, and additional attributes to each line. Automatic Release (AR) assignments only need to be made for loop start lines; AR is automatically enabled for ground start CO lines.

Program *15: Makes tenant assignments.

Program 16: Assigns lines to line groups.

Program 39: Assigns line access buttons to digital and electronic telephones.

Program 40: Assigns station access to lines (incoming and outgoing).

Program 41: Assigns station access to lines (outgoing only).

Program 42-0, 1~8: Assigns behind PBX/Centrex operation to each line.

Programs 45 ~ 48: Defines Toll Restriction for any line.

Programs 50 ~ 56: Defines Least Cost Routing assignments.

Program *50: Assigns Caller ID circuits (RCIU1, RCIU2, RCIS) to CO lines.

Program *52: Caller ID line owner station assignment.

Program 78: Assigns special ringing of lines: includes Night Ring Over Page, DISA, Remote Maintenance via the Internal Maintenance Modem (IMDU), and Integrated Auto Attendant.

Programs 81 ~ 89:

♦   Assigns lines to ring selected stations and DH groups.

♦   Assigns Delayed Ringing to any line.

Programs *81, *84, *87: Assigns which [DN] will flash when the CO line rings a telephone.

Program 93: Assigns names to lines.

Table 7-9   RCOU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
CO line circuit 1~4 indicators	Red LED	Lights to indicate that line circuit is in operation. (CO line indicator will not light unless RCOU is connected to a CO line).
J1 connector	Modular connector	Interface connector for CO line circuits 1 and 2.
J2 connector	Modular connector	Interface connector for CO line circuits 3 and 4.
PAD switch SW101 (circuits 1)	2-position slide switch	Enables -3dB signal level drop for CO line circuit.
PAD switch SW201 (circuit 2)		
PAD switch SW301 (circuit 3)		
PAD switch SW401 (circuit 4)		
RCOS connector P11, P12, P13, P14	10-pin male connector	Interface connector for RCOS 4-circuit loop start CO line unit.
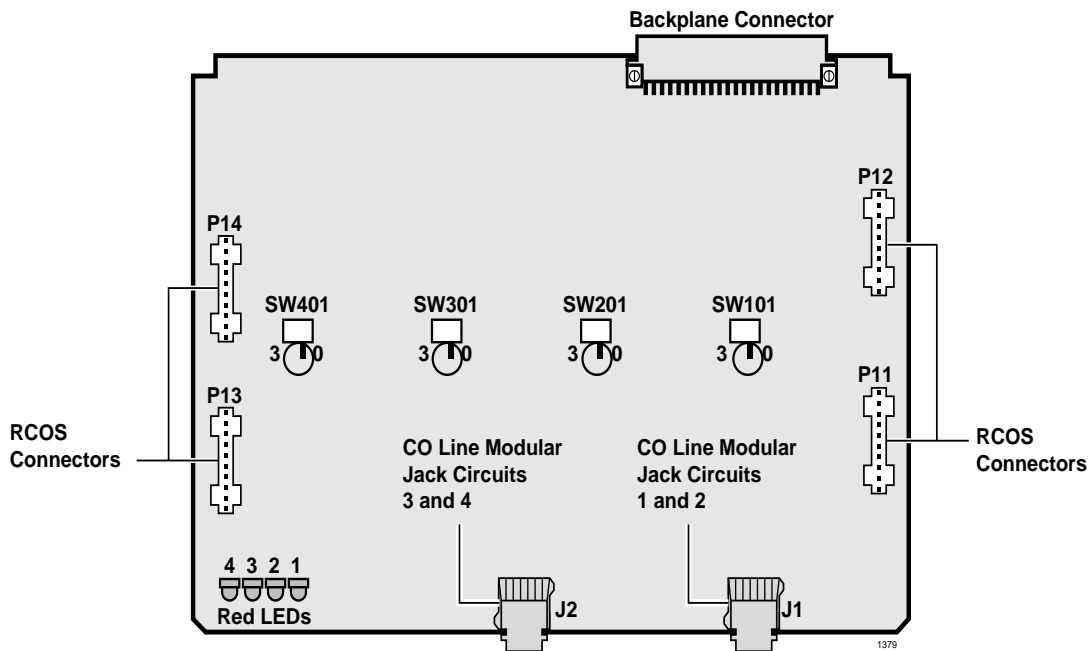
Figure 7-15 RCOU PCB

Table 7-10   RCOS Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
CO line circuit 5~8	Red LED	Lights to indicate that line circuit is in operation. (CO line indicator will not light unless RCOU is connected to a CO line).
J3 connector	Modular connector	Interface connector for CO line circuits 5 and 6.
J4 connector	Modular connector	Interface connector for CO line circuits 7 and 8.
PAD switch SW501 (circuit 1)	2-position slide switch	Enables -3dB signal level drop for CO line circuit.
PAD switch SW601 (circuit 2)		
PAD switch SW701 (circuit 3)		
PAD switch SW801 (circuit 4)		
RCOU connector J11, J12, J13, J14	Female connector	Interface connector for RCOU 4-circuit loop start CO line unit.
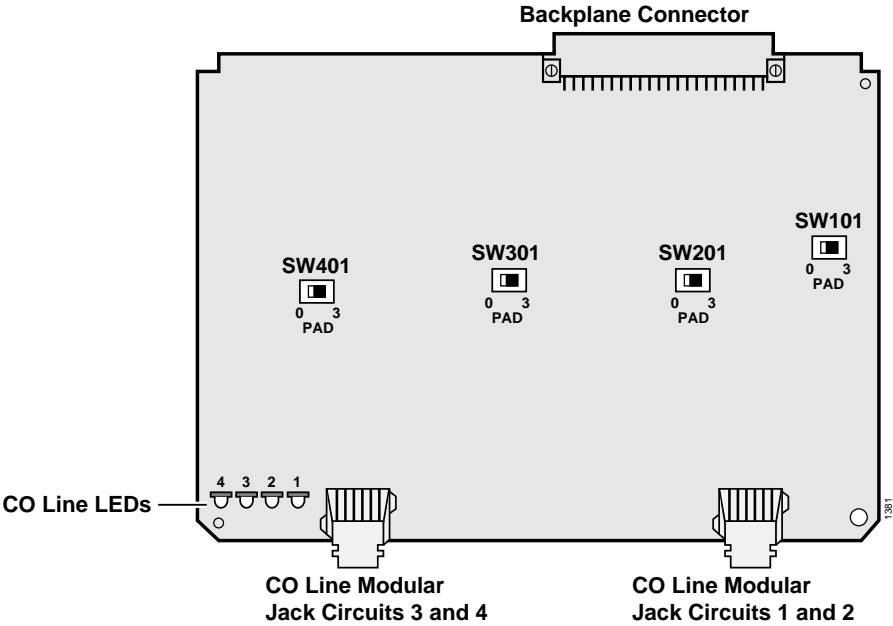
Figure 7-16   DK40i and DK424–RCOS Controls, Indicators, and Connector

Table 7-11   PCOU2 Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
CO line circuit 1 CD112	Red LED	Lights to indicate that line circuit is in operation. CO line indicator will not light unless PCOU is connected to a CO.
CO line circuit 2 CD212		
CO line circuit 3 CD312		
CO line circuit 4 CD412		
J1 connector	Modular connector	Interface connector for CO line circuits 1 and 2.
J2 connector		Interface connector for CO line circuits 3 and 4.
PAD switch SW101 (circuit 1)	2-position slide switch	Enables -3dB signal level drop for CO line circuit.
PAD switch SW201 (circuit 2)		
PAD switch SW301 (circuit 3)		
PAD switch SW401 (circuit 4)		

Figure 7-17   DK424 – PCOU2 PCB

RDDU
Direct Inward Dialing Line Interface Unit

System: *DK40i Expansion KSU, DK424*

Circuits per PCB: *four DID lines*

Interfaces with: *DID (one or two-way) lines*

Older Version(s): *none*

The RDDU provides four Direct Inward Dialing (DID) lines, each of which can have a single office code along with a block of extensions

Note For the system to recognize the DTMF tones generated by incoming DID lines a DTMF Receiver Unit (RRCS -4, -8, or -12) must be installed on the DK40i Base KSU K4RCU3 or on any DK424 RCTU.

RRCS is not required for RDDU dial pulse operation (see Program 30, LED 11).

Each extension can be assigned to ring a station [DN] that appears on one or multiple stations, Distributed Hunt or ACD Group (DK424 only), or an external telephone number selected in system programming. This enables calls over the same line to be routed to different stations or groups of stations. An extension can also be assigned to ring the maintenance modem. Each RDDU can be set for either wink start or immediate. All RDDU lines support DNIS and ANI features.

RDDU controls, indicators, and interface connectors are shown in Figure 7-18 and described in Table 7-12.

RDDU Installation

Note   Switches are factory-set to the 0 (0 dB signal level drop) position.

1. If the KSU is located within one mile of the PBX or CO, set dB PAD switches SW101 through SW401 to the 3 (-3 dB signal level drop) position to c*ontrol excessive loudness resulting from close proximity to the PBX or CO.*

2. Sensitivity jumpers P101~P401 are used mostly for dial pulse operation, to adjust for dial pulsing at different loop lengths. If close to the central office, the sensitivity should be set for low (L); as the loop length increases, it should be set to medium (M), then high (H).

3. Insert the RDDU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors. (For DK40i, RDDU must be installed per tables in Chapter 2 – DK40i Configuration.)

Important! *Each RDDU PCB uses four station ports in software. See Worksheets in Chapter 2 – DK40i Configuration for recommended RDDU slot assignments.*

4. After installing the RDDU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

RDDU Programming

Program 03: Specify Code 16 for slots that support RDDUs and make sure RRCS is enabled for DTMF operation. Program 03 can be skipped, and Program 91 can be run instead.

Program *09: Assigns DID line extensions to route to station [PDNs] and IMDU or RMDS Remote Maintenance (see Program 17 below).

Program 10-1: Enables or disables two-line conference.

Program 15: Assigns DTMF/dial pulse dialing, and additional attributes to each line.

Program *15: Makes tenant assignments.

Program 16: Assigns lines to line groups.

Program *17: Assigns intercept port for DID calls to wrong or vacant numbers.

Program 17: Assigns immediate or wink start to DID lines. Also used to assign Auto camp-on and no-dial tone return for DID lines. Program 17 also Assigns DID lines to route per DNIS and ANI options (Program 71 and 72) or DID numbers (Program *09).

Program 30: Disables RRCS for dial pulse operation.

Program 39: Assigns line access buttons to digital and electronic telephones.

Program 40: Assigns station access to lines (incoming and outgoing).

Program 41: Assigns station access to lines (outgoing only).

Program 42-0, 1~8: Assigns behind PBX/Centrex operation to each line.

Programs 45~48: Defines toll restriction for any line.

Programs 50~56: Defines least cost routing assignments.

Programs 71 (1~5): Assigns DNIS or ANI option to DID lines.

Programs *71~*73: Assigns telephone to ring called [DN].

Program 93: Assigns names to lines.

Table 7-12   RDDU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
PAD switch SW101 (circuit 1)	3-position slide switch	Enables -3 dB signal level drop for line circuit.
PAD switch SW201 (circuit 2)		
PAD switch SW301 (circuit 3)		
PAD switch SW401 (circuit 4)		
J1 connector	Modular connection	Interface connector for DID line circuits 1 & 2
J2 connector	Modular connection	Interface connector for DID line circuits 3 & 4
DID line circuit 1 CD122	Red LED (top)	Lights to indicate line circuit is in operation. (Trunk indicator will not light unless RDDU is connected to a DID line.)
DID line circuit 2 CD222	Red LED	
DID line circuit 3 CD322	Red LED	
DID line circuit 4 CD422	Red LED (bottom)	
Jumper plug P101	3-terminal jumper plug	Adjusts for dial pulsing at different loop lengths.
Jumper plug P201		
Jumper plug P301		
Jumper plug P401		
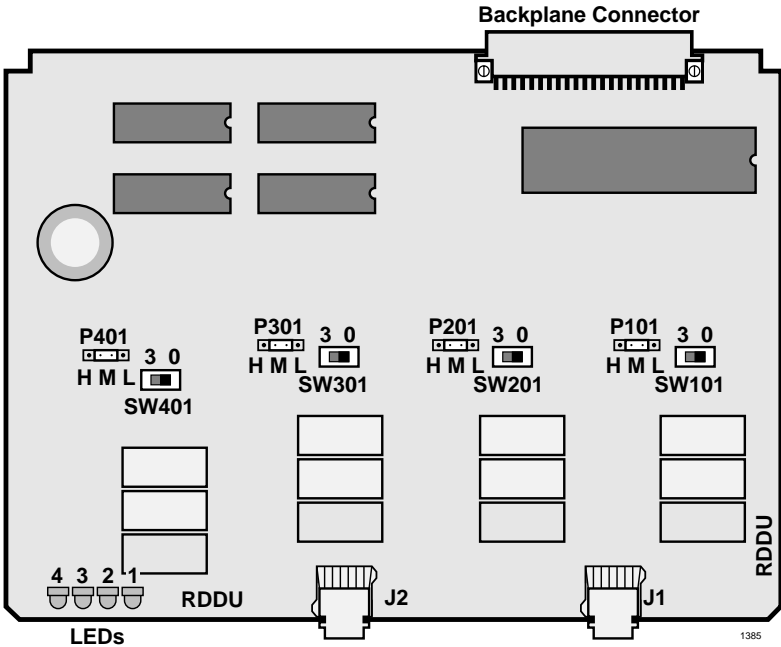
Figure 7-18   RDDU Controls, Indicators, and Interface Connectors

RDSU
Digital/Standard Telephone Interface Unit

System:	*DK40i Expansion KSU only, DK424*
Circuits per PCB:	***(with RSTS)*** *four standard telephone (circuits 1~4)/four digital telephone (circuits 5~8)*
	(without RSTS) *two standard telephone circuits (1 and 2)/four digital telephone circuits*
Interfaces with:	***digital circuits***
	digital telephones (with or w/o RPCI-DI or ADM)
	PDIU-DS
	DDCB (circuit 5 only–ports 004, 012, 020, 028)
	cordless digital telephone (DKT2004-CT)
	standard circuits
	standard telephones
	voice mail ports
	off-premises stations
	other similar devices
	alternate BGM source (circuit 2 only)
	auto attendant digital announcer
	message waiting lamp
Older Version(s):	*none*

An optional Standard Telephone Interface Subunit (RSTS) can be attached to the RDSU to provide two more standard telephone ports (circuits 3 and 4).

RDSU and RSTS controls and interface connectors are shown in Figure 7-19. RDSU interface connectors are described in Table 7-13.

Note   For the system to recognize the DTMF tones generated by incoming DID lines a DTMF Receiver Unit (RRCS -4, -8, or -12) must be installed on the DK40i Base KSU K4RCU3 or on any DK424 RCTU.

CAUTION!   **To prevent system malfunction, DO NOT install the RDSU in slot 18 of the DK40i system.**

Installing R48S Ring Generator (Internal Option)

An optional R48S unit can be connected to the RDSU or RSTU to change the standard telephone loop voltage from -24VDC to -48VDC, extending the standard telephone circuit loop length (including the resistance of the phone) from 600 ohms to 1200 ohms. The features provided by the R48S apply to the RSTS circuits as well as the basic RDSU standard telephone circuits.

➤ **To install the R48S on the RDSU**

➤ Mate the R48S connectors R6 and R7 with the RDSU connectors R6 and R7. RDSU connectors P6 and P7 are positioned to allow installation of the R48S only in the proper position (Figure 7-26).

Installing RSTS (Internal Option)

➤ Mate the RSTS connectors P2~P5 with the RDSU connectors P2~P5. RDSU connectors P2~P5 are positioned to allow installation of the RSTS only in the proper position (Figure 7-19).

RDSU Installation

1. Ensure the SSTU subunit and optional subassemblies are securely attached to the RDSU (Figure 7-19).

   WARNING! **The protective shield on the back of the RDSU is designed to protect the installer from potentially hazardous ring voltage. Do not remove this shield.**

2. Insert the RDSU into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors. (See Figure 8-22 on Page 8-23.)

   CAUTION! **To prevent system malfunction, DO NOT install the RDSU in slot 18 of the DK40i system. See Chapter 2 – DK40i Configuration.**

3. After installing the RDSU gently pull the RDSU outward. If the connectors are properly mated, a light resistance is felt.

RDSU Programming

➤ Enter Code 27 in Program 03 for a non-optioned RDSU, or enter Code 28 for an RDSU that support off-hook call announce and data interface units. To program the RDSU standard telephone ports (including the RSTS), see "RDSU Programming" on Page 7-37. To program the RDSU digital telephone ports, see "PDKU2 Programming" on Page 7-6.

➤ If there are no RDSU options, skip Program 03 can be skipped, and run Program 91 instead.

Table 7-13   RDSU, RSTS Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
RSTS connector P2/P3	10-pin connector	Connector for RSTS subassembly that provides two standard telephone circuits.
RSTS connector P4/P5		
R48S connector to P6	8-pin connector	Interface connector for R48S.
R48S connector to P7	6-pin connector	
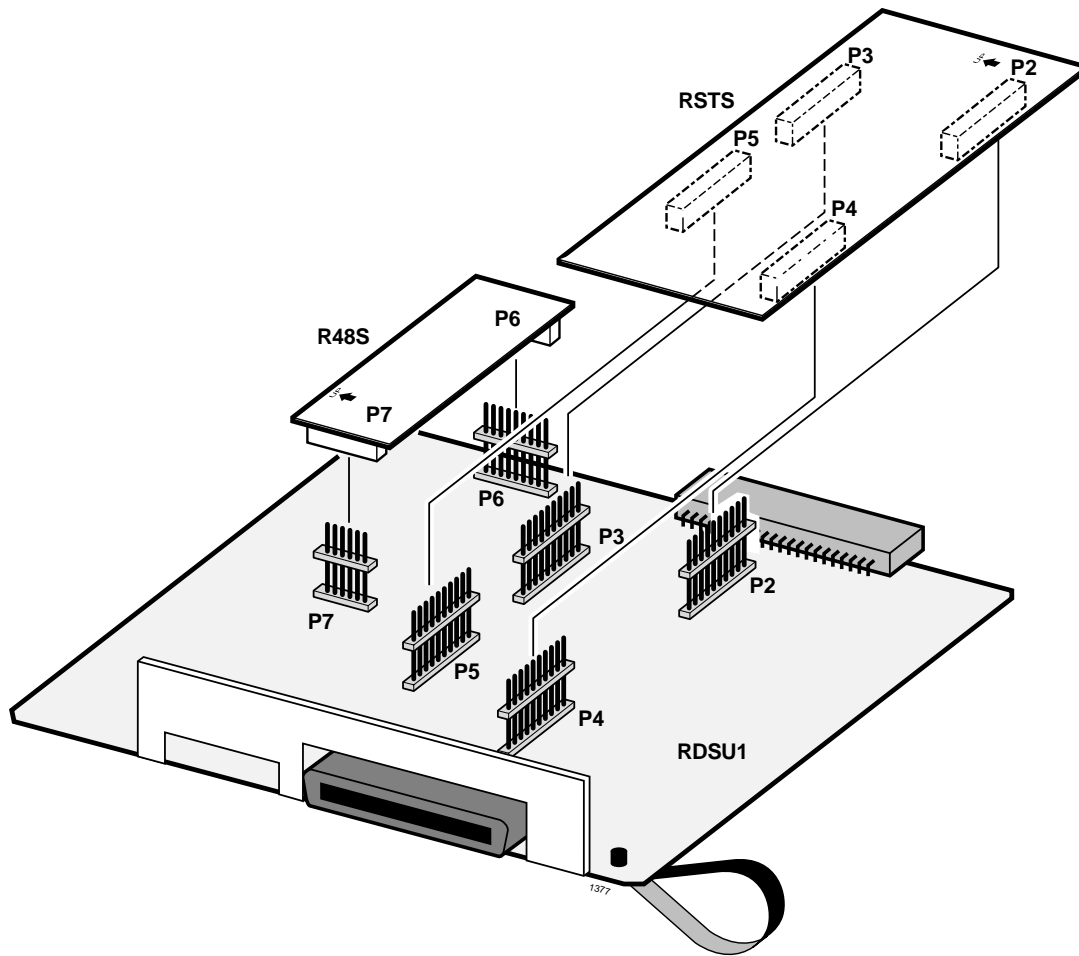
Figure 7-19   RDSU, RSTS PCBs

RDTU
T1 Interface Unit

See Chapter 6 – DK424 T1 for RDTU PCB installation and programming information.

REMU
Tie Line Unit

System: *DK40i Expansion KSU, DK424*

Circuits per PCB: *four Tie line circuits*

Interfaces with: *E&M Tie lines*
2- or 4-wire transmission
Type I and II Signaling
Immediate and Wink Start

Older Version(s): *PEMU (Type I signaling & immediate start only,*
does not provide PAD switches)

With DK424, Tie lines can route per Program 04 [DN] assignments or Program 71 and 72 DNIS/ ANI assignments (see Program 17).

The REMU has four decibel (dB) PAD switches which can be set to reduce excessive loudness resulting from close proximity to a central office or PBX by providing a -3 dB signal level drop to the PBX or central office. (PAD is for Transmit and Receive for 2W operation, and Transmit only is for 4W operation.)

Note For the system to recognize the DTMF tones generated by incoming DID lines a DTMF Receiver Unit (RRCS -4, -8, or -12) must be installed on the DK40i Base KSU K4RCU3 or on any DK424 RCTU.

RRCS is not required for REMU dial pulse operation (see Program 30, LED 11).

REMU controls, indicators, and interface connectors are shown in Figure 7-20 and described in Table 7-14.

PEMU controls, indicators, and interface connectors are shown in Figure 7-21 and described in Table 7-15.

REMU Installation

1. Set the 2W/4W jumper plugs SW103~SW403 to the appropriate positions.

2. Set the P102/104, P202/204, P302/304, and P402/404 jumper plugs for Type 1 or Type 2 signaling.

3. If the system is located within one mile of the PBX or central office, set the REMU dB PAD switches SW101, SW201, SW301, and SW401 to the 3 (-3 dB signal level drop) position.

4. Insert the REMU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors. (For DK40i, the REMU, PEMU can be installed only in place of the RDDU per tables in Chapter 2 – DK40i Configuration.)

Important! *Each REMU decreases the maximum system CO line and station ports by four each. See Worksheets in Chapter 2 – DK40i Configuration for recommended REMU slot assignments.*

5. After installing the REMU, gently pull it outward. If the connectors are properly mated, a slight resistance is felt.

PEMU Installation

1. Determine if the E&M Tie lines will be configured for 2- or 4-wire transmission.

2. Set the 2W/4W jumper plugs P103, P203, P303, and P403 to the appropriate positions.

3. Set the FG jumper plug P3 to the "2-3" position.

4. Set all GND/BAT jumper plugs to the "BAT" position for connection to the telephone network.

Note The "GND" position is used to connect PEMU circuits back-to-back on premises only, 1000 feet maximum (E&M lead wires must be crossed).

5. Insert the PEMU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors.(For DK40i, the REMU, PEMU can be installed only in place of the RDDU per tables in Chapter 2 – DK40i Configuration.)

Important! *Each PEMU decreases the maximum system CO line and station ports by four each. See Worksheets in Chapter 2 – DK40i Configuration and Chapter 4 – DK424 Configuration for recommended PEMU slot assignments.*

6. After installing, gently pull the PEMU outward. If the connectors are properly mated, a slight resistance is felt.

PEMU, REMU Programming

Program 03: Specify Code 13 for slots that support PEMUs and make sure RRCS is enabled for DTMF operation.

Program 04: Specifies [PDNs]. These are also the numbers that must be received by incoming Tie lines to route calls to the proper telephones (see Program 17, LED 05).

Program 10-1: Enables/disables two-line conference.

Program 15: Assigns tandem connections and dial pulse option to Tie lines.

Program 17: Assigns immediate or wink start to REMU Tie lines.

Important! *Also used to turn on Tie line dial tone return.*

Note When a PEMU or REMU is installed in a system, it automatically assumes the next four consecutive CO line and station port numbers.

Program 30: Disables RRCS for dial pulse operation.

Program 71 (1~5) and Program 72: Tie/DID DNIS assignments.

Program *71~*73: DH/Tie/DID to [DN] ringing assignments.

Program 93: Assigns a name to a Tie line

Table 7-14   REMU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
Tie trunk circuits 1~4 (CD102, 202, 302, and 402)	Red LED	Lights to indicate that Tie line is in operation.
E&M Tie trunk connector circuits 1~4 (J101, 201, 301, and 401)	Modular connector	Interface connector for E&M Tie line circuit.
PAD switch SW101 (circuit 1)	2-position slice switch	Enables -3 dB signal level drop for line circuit.
PAD switch SW201 (circuit 2)		
PAD switch SW301 (circuit 3)		
PAD switch SW401 (circuit 4)		
TYP1/TYP2 jumper plugs P102/ 104	3-terminal jumper	Enables line circuit to be set for Type 1 or Type 2 signaling.
TYP1/TYP2 jumper plugs P202/ 204		
TYP1/TYP2 jumper plugs P302/ 304		
TYP1/TYP2 jumper plugs P402/ 404		
2W/4W switch 102 (circuit 1)	2-position slice switch	Selects 2- or 4-wire configuration for E&M Tie line circuit.
2W/4W switch 202 (circuit 2)		
2W/4W switch 302 (circuit 3)		
2W/4W switch 402 (circuit 4)		
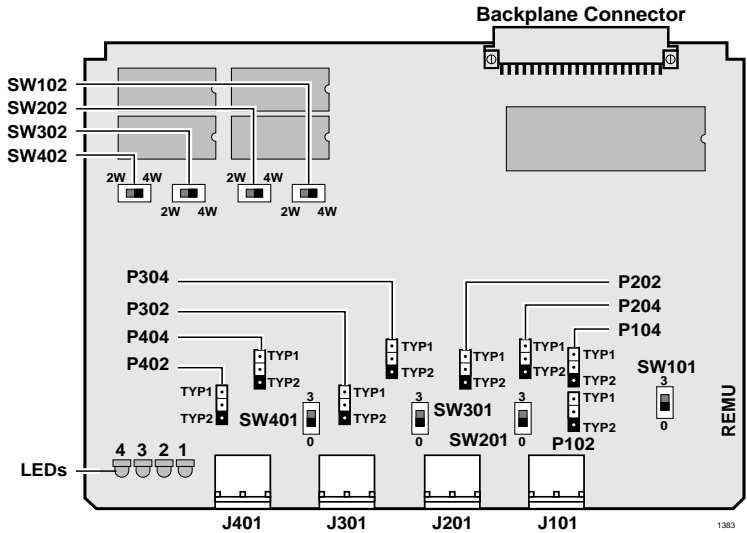
Figure 7-20   REMU PCB

Table 7-15   PEMU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
Tie trunk circuit 1~4 (CD102, 202, 302, and 402)	Red LED	Lights to indicate that Tie line is in operation.
E&M Tie line connector J101, 201, 301,and 401 (circuit 1~4)	Modular connector	Interface connector for E&M Tie line circuit.
FG jumper P3	3-terminal jumper	Enables or disables -48VDC ground to FG.
GND/BAT jumper P101	3-terminal jumper (Tie line 1)	Enables -3 dB signal level drop for line circuit.
GND/BAT jumper P102		
GND/BAT jumper P201	3-terminal jumper (Tie line 2)	
GND/BAT jumper P202		
GND/BAT jumper P301	3-terminal jumper (Tie line 3)	M-lead origination for Tie line (must be in BAT position per FCC requirements.
GND/BAT jumper P302		
GND/BAT jumper P401	3-terminal jumper (Tie line 4)	
GND/BAT jumper P402		
2W/4W switch P103, 203, 303, and 402 (circuit 1~4)	3-terminal jumper	Selects 2- or 4-wire configuration for E&M Tie line circuit.
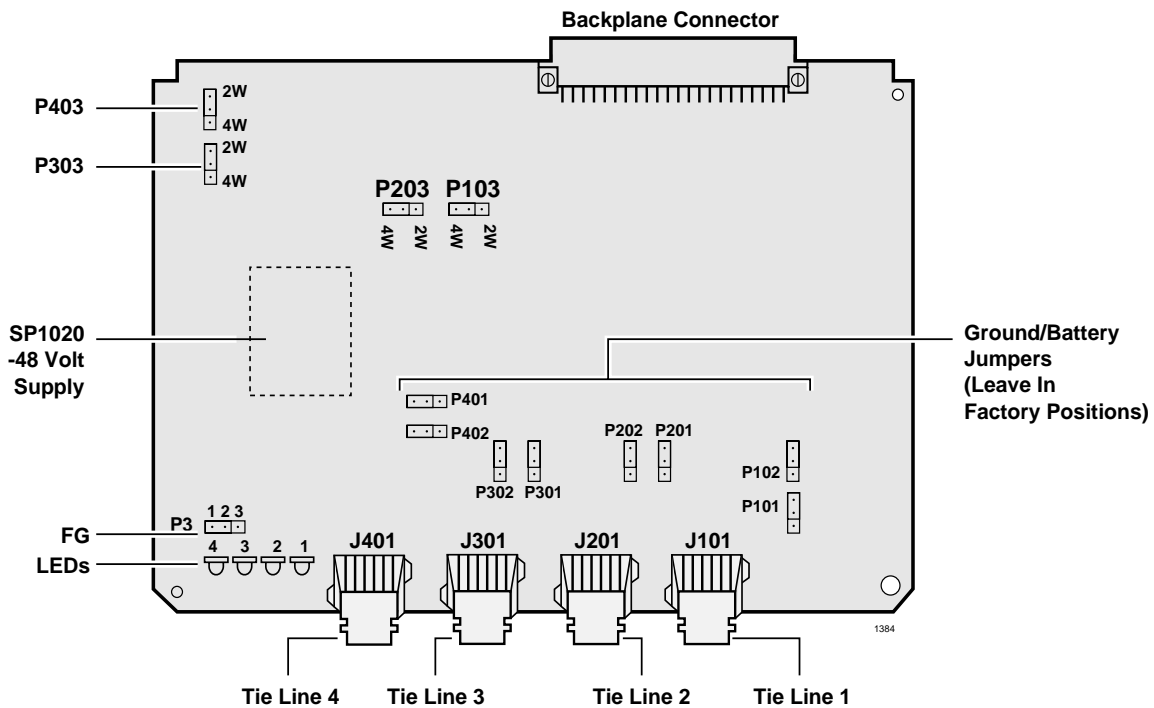
Figure 7-21 PEMU PCB

RGLU2
Loop/Ground Start CO Line Interface Unit

System: *DK40i Expansion KSU, DK424*

Circuits per PCB: *four line circuits*

Interfaces with: *loop or ground start lines*

Older Version(s):   *RGLU1 (does not have hookflash to CO)*

The RGLU2 also provides ring detection, dial outpulsing, and hold. Each RGLU2 line can be programmed for DTMF or dial pulse signaling and gas tube secondary protection.

RGLU2 controls, indicators, and interface connectors are shown in Figure 7-22 and described in Table 7-16.

RGLU2 Installation

Note   The decibel (dB) PAD switches SW101, SW201, SW301, and SW401 control excessive loudness resulting from close proximity to a central office or PBX telephone office by providing a -3 dB signal level drop to, or from, the PBX or central office when set to the 3 position. Switches are factory set to the 0 (0 dB signal level drop) position.

➤ **To install an RGLU2 PCB**

1. If the DK KSU is within one mile of the PBX or central office, set the dB PAD switches SW101, SW201, SW301, and SW401 to the 3 (-3 dB signal level drop) position.

2. Set each line for ground start (GND) or loop start (LOOP) by setting the following jumper plugs: SW103 for line 1, SW203 for line 2, SW303 for line 3, and SW403 for line 4.

3. Insert the RGLU2 (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper mating of connectors. RGLU2 can be installed in place of RCOU, per tables in Chapter 2 – DK40i Configuration.

4. After installing the RGLU2, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

RGLU2 Programming

Programming for the RCOU and RGLU2 is essentially the same. See "RCOU Programming" on Page 7-29, for an overview of RGLU2 programming.

Table 7-16   RGLU2 Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
Line circuit 1	Red LED	Lights to indicate that line circuit is in operation. CO line indicator will not light unless RGLU2 is connected to a line.
Line circuit 2		
Line circuit 3		
Line circuit 4		
J1 connector	Modular connector	RJ14 modular Interface connector for trunk circuits 1 and 2.
J2 connector	Modular connector	RJ14 modular Interface connector for trunk circuits 3 and 4.
PAD switch SW101 (circuit 1)	2-position slice switch	Enables -3dB signal level drop for trunk circuits.
PAD switch SW201 (circuit 2)		
PAD switch SW301 (circuit 3)		
PAD switch SW401 (circuit 4)		
LOOP/GND jumper SW103 (configures line 1)	3-terminal jumper	Used to configure line for loop or ground start.
LOOP/GND jumper SW203 (configures line 2)		
LOOP/GND jumper SW303 (configures line 3)		
LOOP/GND jumper SW403 (configures line 4)		
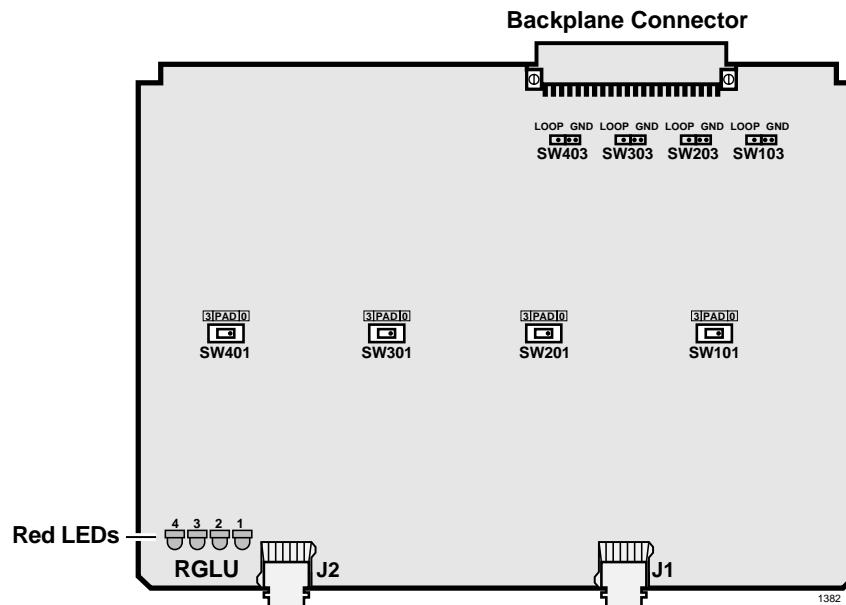
Figure 7-22   RGLU2 PCB

RSIU, RSIS, RMDS
RS-232/Modem Interface Unit

System: *DK424*

Circuits per PCB: *four interface ports*

Interfaces with: *SMDI or Toshiba Proprietary RS-232 voice mail*
        ACD SMIS computer
        SMDR printer or SMDR call accounting machine
        DKAdmin/DKBackup PC or maintenance terminal (locally or remotely)
        Open-architecture application computer system–receives ANI, DNIS or CLID digits from
          the DK424 on ACD calls

Older Version(s): *none*

The RSIU is a standard plug-in type PCB that must be installed into the first universal slot of the DK424 base cabinet. The RSIU PCB provides one standard RS-232 port (modular jack) when ordered from the factory; this port can be configured in system programming to support any one of the hardware options listed above.

The RSIU can be equipped with up to three more optional RS-232 ports (total of four RS-232 ports) or with two optional RS-232 ports and one modem port (total of three RS-232 ports and one modem port). The optional RS-232 ports are provided by installing RSIS piggy-back PCBs onto the RSIU PCB. The optional built-in modem is provided by installing an RMDS piggy-back PCB onto the RSIU (see Figure 7-38 in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring).

The RSIS PCB can support any one of the hardware devices listed above via its RS-232 modular jack. The RMDS PCB can function two ways: the RMDS can operate like an RSIS allowing it to support any one of the hardware devices listed above locally from its RS-232 modular jack; or, the RMDS can operate as a 1200 bps (bits-per-second) or 2400 bps system remote maintenance modem.

The RMDS PCB function (modem or RS-232 port) is set in a system program option. The RMDS can be set for one function only; it cannot support both functions simultaneously. When configured as a modem, the RMDS PCB supports only the DK424 remote maintenance, ASCII terminal, or DKBackup, and DKAdmin functions, and does not simultaneously support SMDI, SMIS, SMDR, etc. (See)

The total bits-per-second (bps) data rate of the four RSIU, RSIS, RMDS (RS-232/modem) ports combined cannot exceed 9600 bps. The RSIU, RSIS RS-232 ports can be individually set in system programming to operate at 1200 bps, 4 ports max.; 2400 bps, 3 ports max.; 4800 bps, 2 ports max.; or 9600 bps, 1 port max.; or, any other combination that does not exceed 9600 bps. The RMDS modem function can be set to operate at 1200 bps or 2400 bps; however, if the RMDS port is used as a RS-232 port instead of a modem, it can also be set for 4800 bps or 9600 bps.

The TTY and modem function cannot operate on separate RSIU, RSIS, RMDS ports simultaneously. If both functions are programmed at the same time on separate ports, the function of the lowest numbered RSIU, RSIS, RMDS port (TTY or modem) will be active.The communication parameters for all RSIU, RSIS, RMDS port function types except the SMDR are:

♦ Data word bits = 7

♦ Parity = even

♦ Stop bits = 1

The communication parameters for an RSIU, RSIS SMDR port is:

♦ Data word bits = 8

♦ Parity = none

♦ Stop bits = 1

Only one RSIU can be installed per DK424 system. When the RSIU PCB is installed, the RSSU, PIOU2, PIOUS2, IMDU modem, and PEPU PCBs can still be installed with all of their respective paging, modem, and RS-232 port functions available; however, five RS-232/modem ports can be installed in one DK424 system.

When installed together in the same DK424 system, the RSIU, PIOU2, PIOUS2, RSSU port functions are identified and enabled (turned ON/OFF) in system programming. If the same function is programmed for an RSIU port and a PIOU2, PIOUS2, RSSU port, only the RSIU port will function.

RSIS, RMDS Piggy-Back Installation

1. Install all RSIS and RMDS PCBs on the RSIU PCB before installing the RSIU into the DK424. Each RSIS or RMDS piggy-back PCB is installed on the RSIU PCB as shown in Figure 4-38.

   Up to three RSIS PCBs can be installed on the RSIU PCB; only one RMDS PCB can be installed on the RSIU. The function and bit-per-second (bps) data rate of each RSIS and RMDS circuit port is set in Program 76 as described in the Programming Part that follows.

2. After installing all RSIS, RMDS PCBs, install the RSIU into the DK424 per the following instructions.

RSIU Installation

1. The RSIU must be installed only in slot 11 of the base cabinet (see Figure 7-23 to install the RSIU PCB).

2. A PDKU or PEKU PCB must be installed in slot 12 of the base cabinet to support the programming telephone.

3. The first 8-station ports (000-007) appear on the PDKU or PEKU as installed in slot 12. The programming telephone will then be on the 6th circuit (port 005; or, 013 until Program 03 Code 49 is set for slot 11) of the PDKU in slot 12.

   The function and bit-per-second (bps) data rate of the RSIU or RMDS, RS-232 circuit port is set in Program 76 as described in the *Strata DK Programming Manual.*

All information provided in the "RSIU Installation" on Page 7-46 applies to installing an RSIU in an existing system. Hence, most PCBs must be moved to the next highest slot.

Each position on the RSIU card can
accept either an RSIS or RMDS (Note 1)
card. Only one RMDS card can be used
per RSIU. (See Note 1)

Bottom View (solder side)

RMDS Top View

RSIS Top View

CAUTION:

**Do not connect
telephone circuit
Tip/Ring to J4
(See Note 2)**

1814
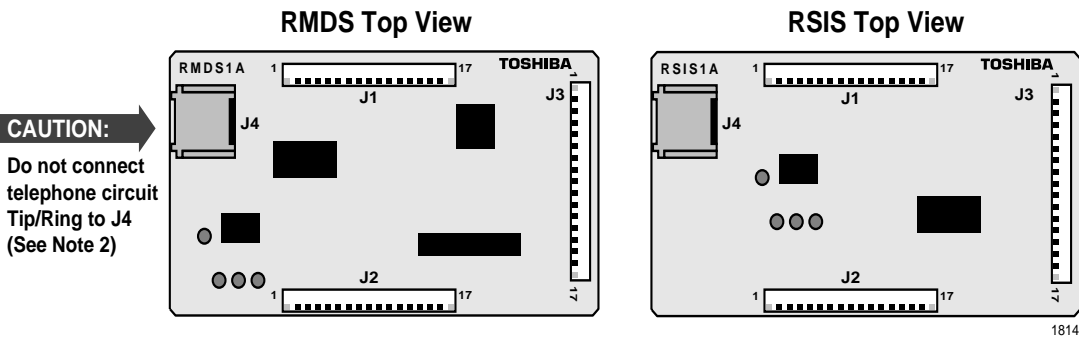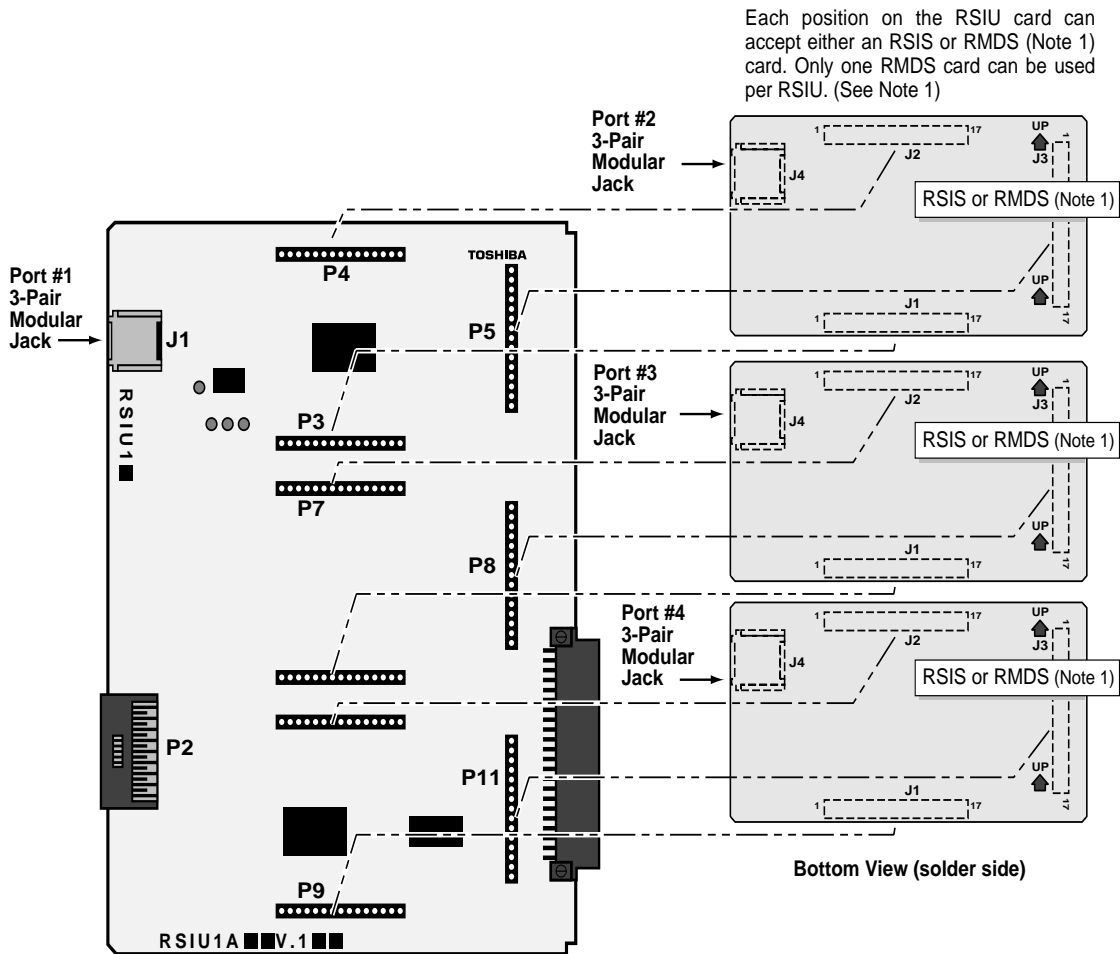
Notes

1. Maximum of one RMDS per RSIU, maximum of three RSIS per RSIU.

2. On RMDS, is not used for modem, operation. It is used when RMDS is configured for TTY, SMDI, or
    MIS operation like RSIS.

Figure 7-23   RSIU, RSIS, RMDS PCB Installation
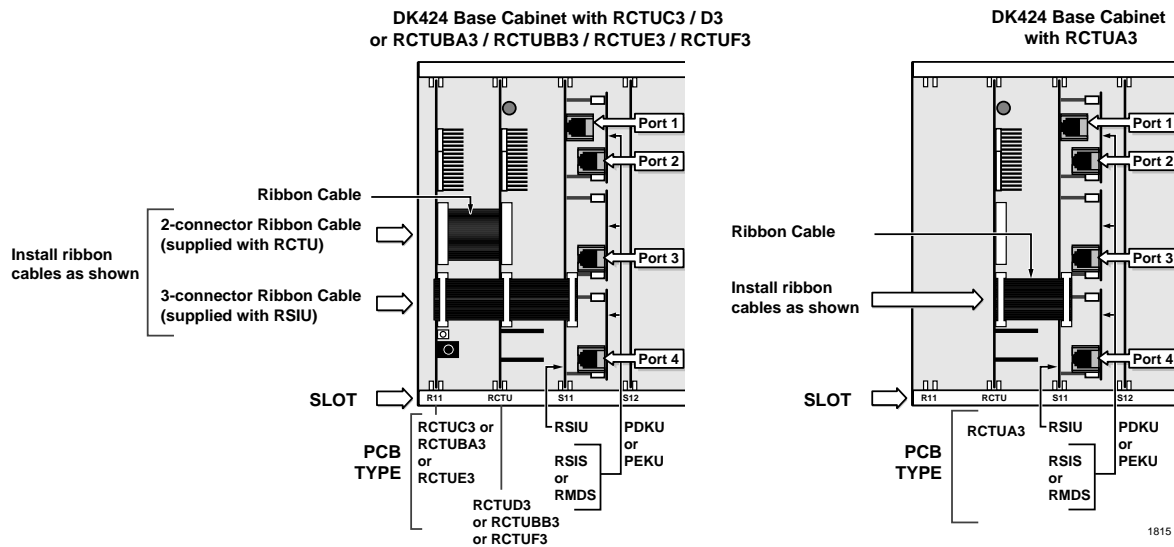
Figure 7-24 RSIU Installed into an Existing System without DID and/or Tie Lines

➤ **To move the PCB to the next highest slot**

1. Identify (mark) the attendant console and all station PCB wiring connectors so they can be removed and then reinstalled on the same PCB later (console station PCBs include: PDKU, RDSU, PEKU, PESU, RSTU, PSTU and RATU PCBs).

2. Turn system power OFF.

3. Disconnect the connectors from the attendant console and all station PCBs listed in Step 1.

4. Remove all station PCBs listed in Step 1.

5. Install each PCB that was removed in Step 4 into the next highest empty station PCB slot number. Skip over all other types of PCBs that were not removed. Example: If a PDKU was originally in slot 11 and a PSTU was in slot 12, the PDKU is moved to slot 12 and the PSTU is moved to slot 13. The programming telephone will then be on the 6th circuit (port 005; or, 013 until Program 03 Code 49 is set for slot 11) of the PDKU in slot 12.

6. Connect all PCB connectors that were removed back into the same PCBs they were removed from in Step 3.

7. Turn the system power ON and note that the programming telephone is on port 13 and all other ports are shifted up by eight ports. Program slot 11 with Code 49 and all other slots with the appropriate codes using Program 91-1 and/or 03.

   Next, cycle system power OFF (five seconds) and ON, or, run Program 91-2 to transfer Program 03 data from temporary to working memory. At this time the programming telephone changes from port 13 to port 005 and all other ports shift down by eight ports.

➤ **To install an RSIU PCB into an existing system with DID and/or Tie lines**

Note The steps in "RSIU Installation" on Page 7-46 apply to installing an RSIU into an existing system. Hence, most PCBs must be moved to the next highest slot using the following steps.

1. Identify (mark) all PCB wiring connectors so they can be removed and then reinstalled onto the same station PCB later.

2. Turn system power OFF.

3. Disconnect the connectors from all PCBs except PIOU2, PIOUS2, RSSU, PEPU, RCIU, and RCIS.

4. Remove all PCBs except PIOU2, PIOUS2, RSSU, PEPU, RCIU, and RCIS.

5. Each PCB that was removed must be installed into the next highest empty PCB slot number. Skip over all other types of PCBs that were not removed.

Note This step may have to be modified for the RDTU PCB, depending on the configuration to meet the requirements of RDTU slot assignments per tables in Chapter 6 – DK424 T1.

6. Connect all PCB connectors that were removed back into the same PCBs from which they were removed.

7. Turn the system power on and note that the programming telephone is on port 13 and all other ports are shifted up by eight ports. Program slot 11 with Code 49 and all other slots with the appropriate codes using Program 91-1 and/or 03.

Next, cycle system power OFF (5 seconds) and on or, run Program 91-2 to transfer Program 03 data from temporary to working memory. At this time the programming telephone changes from port 13 to port 005 and all other ports shift down by eight ports.

RSIU, RSIS, RMDS Programming

Program 03: Programs slot 11 with code 49 to identify that the RSIU PCB is installed in slot 11.

Program 76-1X-Y: Assigns each installed RSIU port to a function. Where X identifies the RSIU port no. 1~4 (see Figure 7-23 for RSIU port number configuration) and Y identifies the RSIU port function:

♦ Y=1, RS-232 TTY (Program 77-1, LED 14 OFF)

♦ Y=1, RMDS modem (Program 77-1, LED14 ON)

♦ Y=2, SMDR

♦ Y=3, MIS or SMIS

♦ Y=4, SMDI

♦ Y=5, Open Architecture

♦ Y=0, No function - this should be used for any of the four RSIU, RSIS, RMDS ports that are not used.

Notes

• Function codes set in Program 76-1X-Y will override RSSU, PIOU2, and/or PIOUS2 function codes (41, 42, 43) set in Program 03.

- The TTY and modem function cannot operate on separate RSIU, RSIS, RMDS ports simultaneously. If both functions are programmed at the same time on separate ports, the function of the lowest numbered RSIU, RSIS, RMDS port (TTY or modem) will be active.

- When uploading Program 76-1 with DKAdmin or DKBackup, the data will not change until the system power is cycled.

Program 76-2X-Z: Assigns each installed RSIU port to operate at a specified transmission rate. Where X identifies the RSIU port no. 1~4 (see Figure 7-23 for RSIU port number configuration) and Z identifies the RSIU, RSIS, RMDS port transmission rate in bits-per-second (bps).

Notes

- The sum of the used RSIU, RSIS, RMDS ports transmission rates cannot exceed 9600 bps. Ports assigned as "non-function" (code 0) in Program 76-2X-Y will not be included in the transmission rate sum. The RMDS will only function at 1200 or 2400 bps.

- When uploading Program 76-2 with DKAdmin or DKBackup make sure that Program 76-2 bps rate for the TTY/ modem port is set the same in: DKAdmin communications setup, DKAdmin customer database, and any DK424 RCTU. If the bps rate is not the same in all three areas, uploading will fail on Program 76

Program 77-1, LED 14: Enables the RMDS modem function. If the RMDS should function as a modem, turn ON LED 14. If the RMDS should function as a RS-232 port, turn OFF LED 14.

Program 77-1, LED 15: Sets the RMDS communications standard type to CCITT/V.22bis (2400 bps) or Bell 212A (1200 bps). The standard set in this program must match the standard of the modem communicating with the DK424 RMDS.

If the RMDS modem standard should be CCITT/V.22bis, turn LED 15 ON. If the RMDS standard should be Bell 212A, turn LED 15 OFF. Most Hayes compatible modems will function with either standard. Check with the modem manufacturer's documentation to verify which protocol should be used. When the system is initialized the Bell 212A standard is set (LED 15 OFF).

Program 77-4, LED 01/LED 02: Enables CLID, ANI, and/or DNIS information for ACD calls to be sent from the RSIU OA port.

➤ Turn LED 01 ON if the OA port should send CLID and/or ANI information for ACD calls.

➤ Turn LED 02 ON if the OA port should send DNIS information for ACD calls.

Program 77-4 allows LED 01 and LED 02 to be turned ON simultaneously, allowing CLID, ANI, and DNIS information to be sent from the OA port for ACD calls.

The system will initialize with LED 01 and 02 OFF–no CLID, ANI, or DNIS information will be sent from the OA port for ACD calls.

RSSU
PC Interface Unit

System: *DK40i Expansion KSU, DK424*

Circuits per PCB: *one RS-232 connection*

Interfaces with: *TTY jack*

Older Version(s): *none*

The RSSU contains one RS-232 serial port for connecting an SMDI, SMIS processor, DKAdmin/DKBackup PC or external modem.

One optional RSSU maintenance interface PCB can be used for connecting a maintenance PC or external modem (local or remote) to the DK40i.

A maximum of three RSSU cards can be supported per DK424.

The RSSU controls, indicators, and interface connectors are shown in Figure 7-25 and described in Table 7-17.

RSSU Installation

1. Insert the RSSU (component side facing right) into the last slot ("S16") of the Base KSU/cabinet if the system only has a Base KSU/cabinet and no Expansion KSUs/cabinets. If there are Expansion KSUs/cabinets, install the RSSU in the highest slot number in any KSU/cabinet. Apply firm, even pressure to ensure proper mating of connectors.

   Note   In DK40i, RSSU can be installed in any available Expansion KSU.

2. After installing the RSSU, gently pull the PCB outward. If the connectors are properly mated, a slight resistance is felt.

RSSU Programming

Program 03–Specify Code 41, 42 and 43 for slots that support RSSUs.

Table 7-17   RSSU Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
TTY interface connector J3	Dual modular connector	Interface connector for maintenance terminal/external modem.
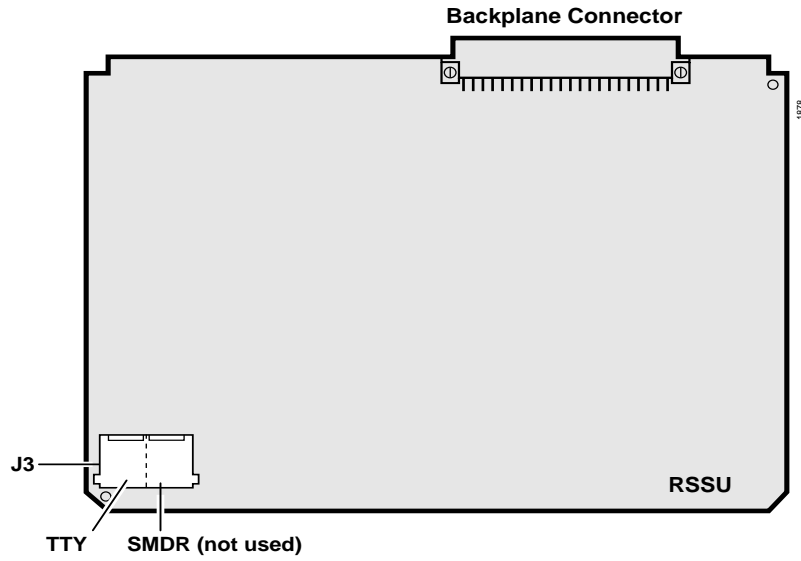
Figure 7-25 RSSU PCB

RSTU2
Standard Telephone Interface Unit

System:	*DK40i Expansion KSU, DK424*
Circuits per PCB:	*eight standard telephone circuits*
Interfaces with:	*standard telephones*
	voice mail ports
	off-premises stations
	other similar devices
	alternate BGM source (circuit 2 only)
	auto attendant digital announcer
	message waiting lamp (RSTU2 only)
Older Version(s):	*RSTU1–80-VRMS sine wave ring generator, optional R48S unit increases the loop voltage from -24VDC to -48VDC, extending the loop length (including the resistance of the phones) from 600 ohms to 1200 ohms.*
	PSTU2–190V P-P or 130V P-P W1 jumper
	PSTU1 v.3–square wave ring generator fixed at 190V P-P
	PSTU1 v.4–square wave ring generator set at 190V P-P or 130V P-P with the W1 jumper

Only one telephone (or device) can be connected to a RSTU2 port. If more than one telephone or device is connected to a port, ringing or message waiting may not function. RSTU2 only provides a 90-volt square wave message waiting generator to drive standard telephone 90V message waiting lamps.

Notes

- For the system to recognize the DTMF tones generated by a standard telephone (or any other device connected to a standard telephone port), a DTMF Receiver Unit (RRCS-4, -8, or -12) must be installed on any DK424 RCTU or the DK40i K4RCU3.

- Most standard telephones and two-wire devices require the 190V P-P level; however, some devices may experience ring-trip with 190V P-P and should be set for 130V P-P.

See Figure 7-27 for an illustration of the PSTU1, PSTU2. Figure 7-28 shows the RSTU2. See Table 7-18, for details of the PSTU and RSTU2 controls and indicators.

R48S -48 Volt Supply Installation (Internal Option)

➤ Mate the R48S connectors P6 and P7 (Figure 7-26 and Figure 7-28) with the R48S connectors P6 and P7 on the RSTU or RSTU2.

Note RSTU connectors P6 and P7 are positioned so that the R48S only fits in the proper position.
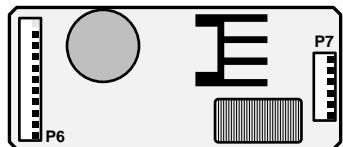
Figure 7-26 R48S Interface Connectors

External Options

W1 Ring Generator Switch Configuration (PSTU1 and PSTU2)

➤ On the PSTU1 or PSTU2, ensure the W1 switch is set to the "H" (190V P-P) position for initial installation. The "L" (130V P-P) position is used if devices connected to the PSTU1 or PSTU2 experience ring trip.

Standard Telephone Message Waiting Lamp Control

No steps required here.

RSTU2 Installation

1. Make sure the factory-installed SSTS or SSTU subunit is securely attached to the RSTU2 (Figure 7-27 and Figure 7-28).

> **WARNING!** The shield on the back of the RSTU2 is designed to protect the installer from potentially hazardous ring voltage. Do NOT remove this shield.

2. Insert the RSTU2 (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper mating of connectors. RSTU2 must be installed per tables in Chapter 2 – DK40i Configuration.

3. After installing the RSTU2, gently pull the RSTU2 outward. If the connectors are properly mated, a light resistance is felt.

Table 7-18   RSTU2 Controls, Indicators, and Connectors

Control/Indicator/Connector	Type of Component	Description
Ring voltage W1 jumper (PSTU1 (V.4) and PSTU2 only)	3-terminal jumper	Sets ring generator voltage level for all circuits. H=190V P-P, L=130V P-P.
R48S connector P6 (RSTU or RSTU2 only)	9-pin connector	Interface connector to P6 of R48S.
R48S connector P7 (RSTU or RSTU2 only)	6-pin connector	Interface connector to P7 of R48S.
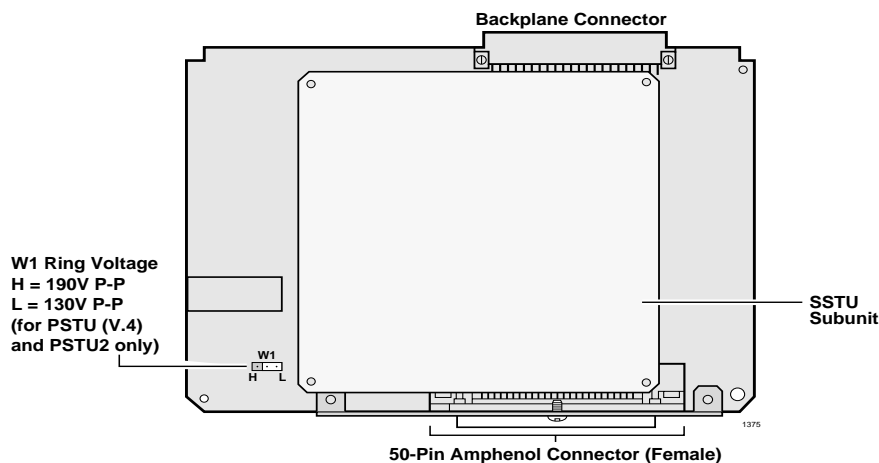
Figure 7-27   PSTU and Subunit (SSTU)
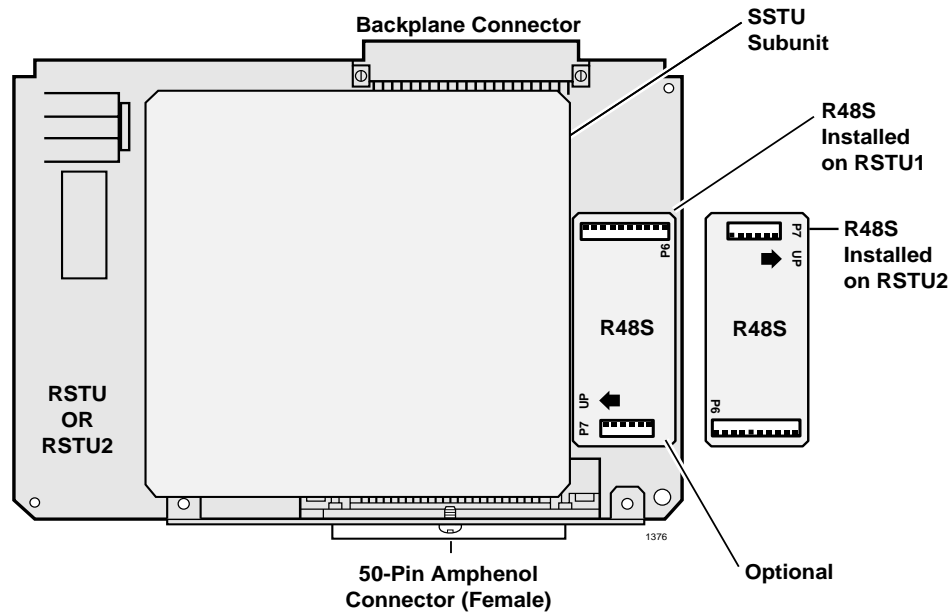
Figure 7-28   RSTU2 Controls and Interface Connectors

RSTU2 Programming

Program 03: Specify code 31 for all slots that have RSTUs and PSTUs installed.

Note   If there are no RSTU, RSTU2 or PSTU options, Program 03 can be skipped, and Program 91-1 or 91-9 can be run instead.

Program 10-2: Sets standard telephone ringing option.

Program 19: Used for BGM connection.

Program 21: Assigns standard telephone ports to modem pools.

Programs 10-3, 23, 24, 25, 26: Integrated Auto Attendant Digital Announcer assignments.

Program 31: Configures all RSTU, RSTU2 and PSTU ports connected to voice mail or external Auto attendant devices.

Program *34, LED 01: Standard telephone Camp-on/Busy Override tone option.

Program 35, LED 03: Standard telephone message waiting lamp control option.

RMCU/RCMS
E911 CAMA Trunk Direct Interface

System: *DK424*

Circuits per PCB: *four circuits*

Interfaces with: *enhanced 911 locator services*

Older Version(s):   *none*

The E911 CAMA Trunk Direct Interface card (RMCU) enables cost-effective connection to the Enhanced 911 locator services without third-party equipment. Figure 7-31 shows the RMCU. The RMCU supports two subassemblies (RCMS) that provide a total of up to four ports as shown in Figure 73.

The RMCU has no CAMA circuits. It requires one RCMS subassembly to provide one or two CAMA trunks and two RCMS PCBs to provide up to four CAMA trunks.

When RMCU code 19 is entered for a slot in Program 03, that slot assumes the next four consecutive CO line numbers in the system. Only one RMCU PCB can be installed in a DK424 system. If more than one slot is programmed with code 19 in Program 03, the lowest slot having code 19 will be the CAMA trunk active slot.

The controls, indicators, and connectors for the RCMS are listed in Table 90.

Location of the RCMS LEDs are shown in Figure 76.

Functions of the RCMS LEDs are given in Table 91.

A wiring diagram is shown in "RCMS Subassembly (stand-alone)" on Page 7-57.

RCMS Subassemblies Installation

1. Attach one or two subassemblies (RCMS) to the connectors on the RMCU as shown in Figure 7-29. If only one RCMS is to be installed, install it in the bottom position.

2. Apply firm even pressure to ensure that the connectors are properly seated in the RMCU connector blocks. If they are seated properly, a light resistance is felt when you pull the units away from the RMCU.
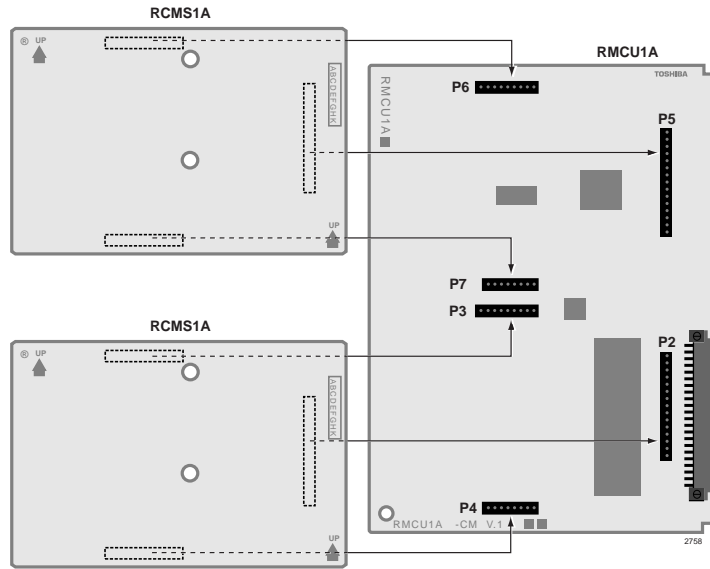
Figure 7-29   Placement of RCMS Subassemblies on the RMCU Interface Card
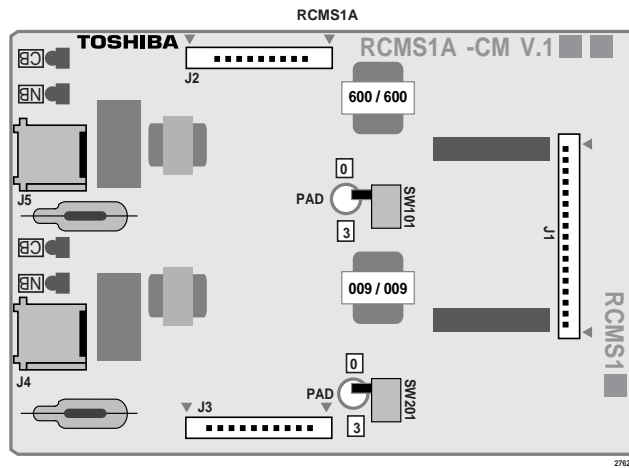
Figure 7-30   RCMS Subassembly (stand-alone)

Table 7-19   RCMS Subassembly Controls, Indicators, and Connectors

Controls, Indicators, & Connectors	Type of Component	Description
SW101	Switch	3-dB PAD switch for circuit 1 or 3.
SW201	Switch	3-dB PAD switch for circuit 2 or 4.
J1		Jacks to connect to RMCU.
J2	Connector Blocks	Jacks to connect to RMCU.
J3		Jacks to connect to RMCU.
RJ11	6-pin modular connector	Network interface jack to CAMA trunk.

RMCU Installation

1. Insert the RMCU (component side facing right) into the appropriate slot, and apply firm, even pressure to ensure proper seating of the connectors.

2. Gently pull the unit outward. If the connectors are properly seated, a light resistance is felt.

3. Wire the RCMS jacks, J4 and J5, to the network CAMA trunks per Figure 8-26 on Page 8-27.

4. Test the CAMA trunk and set the 3-dB PAD switches, SW101 and SW 201, for the appropriate volume level.
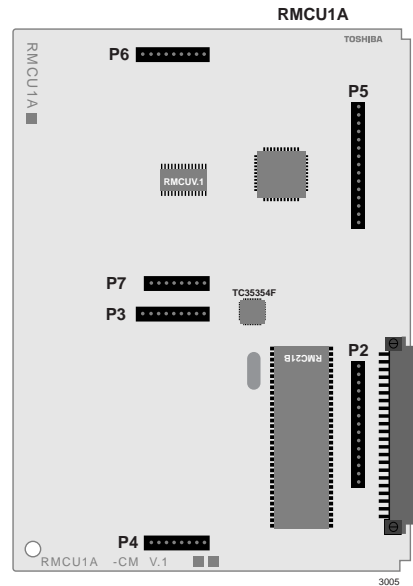
Figure 7-31 RMCU Interface Card
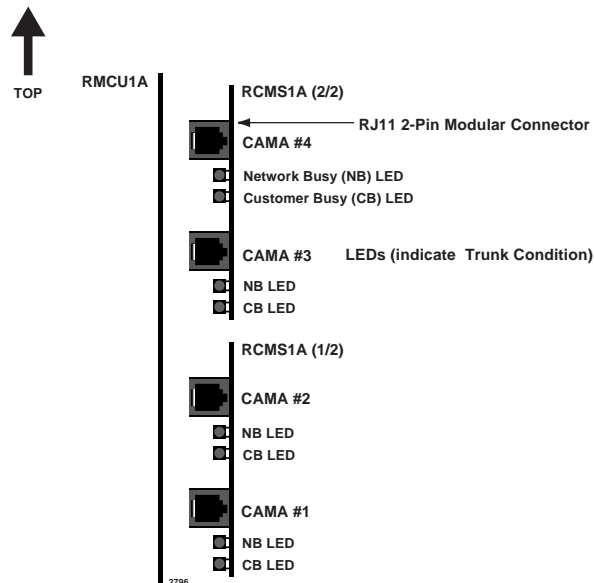
Figure 7-32 Location of the RCMS LEDs

Table 7-20   LED Indications (Normal Operation) *(continued)*

	Status	NB LED	CB LED
1	No network connection. RMCU is in stand-by mode.	ON	OFF
2	Network connected. RMCU is in stand-by mode.	OFF[*]	OFF
3	Network is in stand-by mode and the RMCU is off hook. Network is connected and the RMCU MF sending dial tone.	OFF	ON
4	Network is seizing and the RMCU is off-hook.	Flashing	ON
5	Network is connecting, before ANI is sent, and the RMCU is sending. Network is connecting and the RMCU is communicating.	ON	ON
6	Network is disconnecting first and then the RMCU disconnects.	ON then OFF	ON then OFF
7	RMCU is disconnecting first and then the network disconnects.	ON then OFF	ON then OFF

1. If the NB LED stays ON, even if the modular connector of the network is connected, check the following:
   - Tip and Ring could be reversed.
   - Network could be busy.

RMCU/RCMS Programming

Program 03: Specify code 19 for the RMCU slot.

Program *11, *12, *13: Refer to the E911, CAMA trunk tab in the *Strata DK Programming Manual* and set Programs *11, *12, and *13 as required.

Note   Program *10 is required only when using third-party adjunct CAMA interface and not used with RMCU CAMA interface.

DK40i/DK424
Universal Slot PCB Wiring

8

This chapter contains point-to-point wiring diagrams for connection of telephones, lines, peripheral equipment, and power supplies for the universal slot PCBs of both the Strata DK40i Expansion KSU and DK424 systems.

Wiring diagrams are divided into groups according to the PCB which provides the interface for, or controls the operation of, the associated equipment, as listed below:

♦   Station Wiring:

   ♦   Digital Stations

   ♦   Electronic Stations

   ♦   Attendant Consoles

   ♦   Analog Stations

♦   Power Failure Cut-through (DPFT) Pin-outs

♦   CO Line Wiring

♦   DID and Tie Line Wiring

♦   Option Interface PCBs

Note   Before using the Connect Record Sheets (following each Wiring Diagram), make copies for future use.

Diagrams which apply to only one system (e.g., DK40i) are in the installation chapter which relates to the system. Wiring diagrams appear at the end of these two chapters:

♦   Chapter 1 – DK14 Installation

♦   Chapter 2 – DK40i Installation

The RDTU cable connection information (DK424 only) is in Chapter 6 – DK424 T1.

Station Wiring Diagrams

Digital Station Wiring

To PDKU W/Female Connector

Bridging Clips

Station Cabling

Jacketed Twisted Pairs 24 AWG (1 or 2 pair. See Note 1.)

W-BL	26	1		1	(-) T1 (Voice/Data)
BL-W	1	2		2	(GND) R1 (Voice/Data)
W-O	27	3		3	(-) PT1 (Add. Power)
O-W	2	4		4	(GND) PR1 (Add. Power)
W-GN	28	5		5	T2
GN-W	3	6		6	R2
W-BR	29	7		7	PT2
BR-W	4	8		8	PR2

Circuit 2 to DKT 2 or PDIU-DS

Circuit 3 to DKT 3 or PDIU-DS

Circuit 4 to DKT 4 or PDIU-DS

Circuit 5 to DKT 5 or PDIU-DS or DDCB

Circuit 6 to DKT 6 or PDIU-DS

Circuit 7 to DKT 7 or PDIU-DS

T8 (Voice/Data) / R8 (Voice/Data) / PT (Add. Power) / PR (Add. Power)

25-Pair Cable W/Male Amp Connector

66M150 Split Block

Not Used

RJ11

GND (-) GND (-)
PR T R PT

Modular Cord

Digital Telephone (With or Without PDIU-DI)

(See Note 1)

DDSS Console (Circuit 8 Only)
or...
Digital Telephone (DKT 8)
or...
PDIU-DS (with PDKU2)

Notes

1. T/R wires are always required; PT/PR are additional power wires required only for long station runs per Table 3-10 on Page 3-39. PT/PR may be used with normal station runs also.

2. Voltage levels:
   T, PT = -26.3~27.8 VDC
   R, PR = 0.0 VDC (GND). Reference to SG ground.

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Figure 8-1   MDF Wiring for Digital Telephones (DKTs) and DDSS Console to PDKU
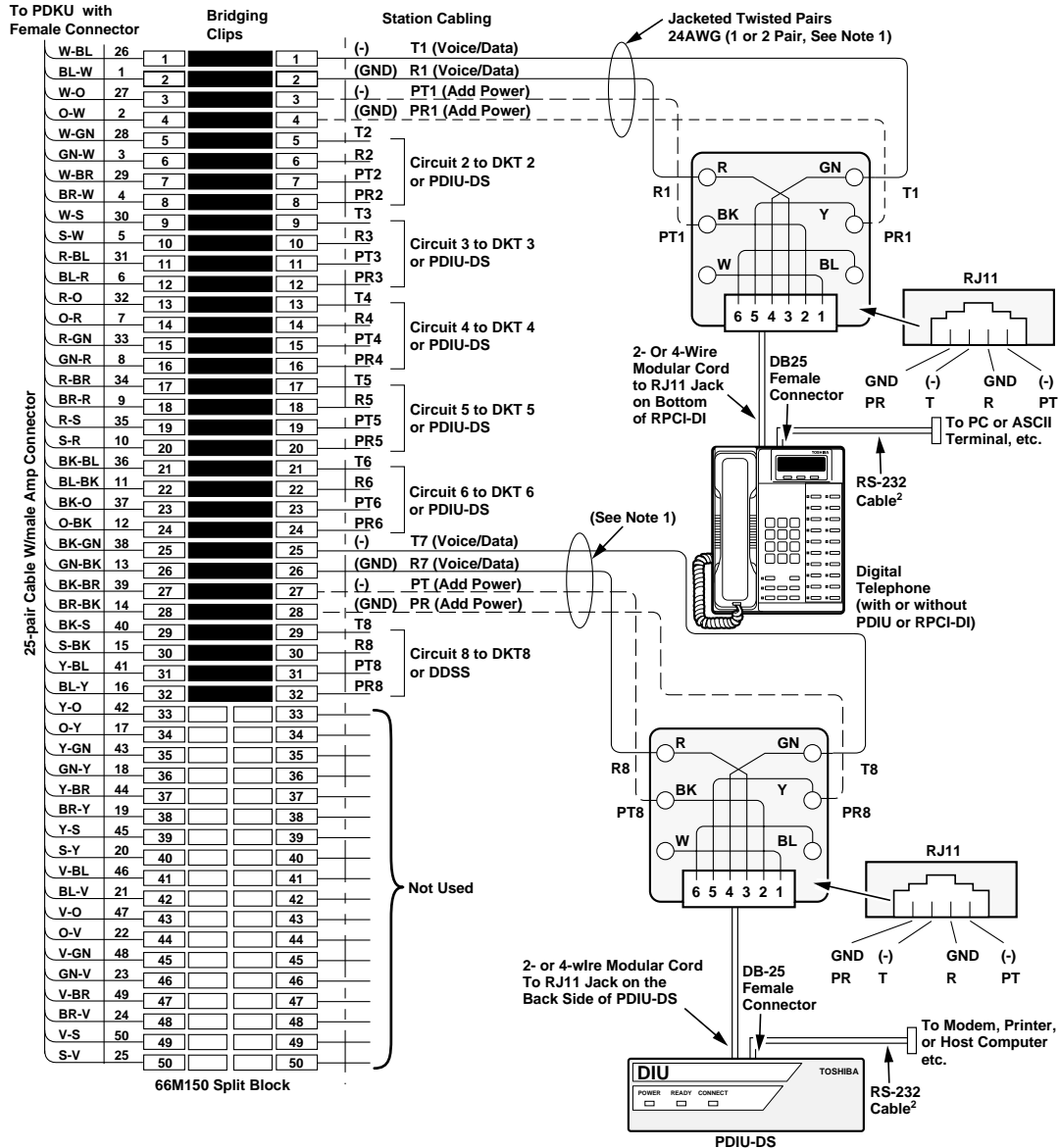
DK40i/DK424 Universal
Slot PCB Wiring

Notes

1. T/R wires are always required; PT/PR are additional power wires
   required only for long station runs per Table 3-10 on Page 3-39. PT/PR may be used with normal station runs also.

2. RS-232 cable length is max 50 ft. with 24 AWG wire. See Chapter 10 – Peripheral Installation.

General Notes

- Voltage levels:
  T, PT = -26.3~27.8 VDC
  R, PR = 0.0 VDC (GND). Reference to SG ground.
- DIUs can be connected to Circuits 1~7 only if connected to PDKU1; or Circuits 1~8 on PDKU2.
- DK40i: Slots 15 and 16 only support data applications.
- KCDU provides circuits 1~4 only. See Tables 4-4 and 4-5 in Chapter 4 – DK424 Configuration for allowed data slots.

Figure 8-2   MDF Wiring for Digital Telephones with RPCI-DI and PDIU-DS to PDKU

To PDKU With Female Connector

Bridging Clips

W-BL	26	1
BL-W	1	2
W-O	27	3
O-W	2	4
W-GN	28	5
GN-W	3	6
W-BR	29	7
BR-W	4	8
W-S	30	9
S-W	5	10
R-BL	31	11
BL-R	6	12
R-O	32	13
O-R	7	14
R-GN	33	15
GN-R	8	16
R-BR	34	17
BR-R	9	18
R-S	35	19
S-R	10	20
BK-BL	36	21
BL-BK	11	22
BK-O	37	23
O-BK	12	24
BK-GN	38	25
GN-BK	13	26
BK-BR	39	27
BR-BK	14	28
BK-S	40	29
S-BK	15	30
Y-BL	41	31
BL-Y	16	32
Y-O	42	33
O-Y	17	34
Y-GN	43	35
GN-Y	18	36
Y-BR	44	37
BR-Y	19	38
Y-S	45	39
S-Y	20	40
V-BL	46	41
BL-V	21	42
V-O	47	43
O-V	22	44
V-GN	48	45
GN-V	23	46
V-BR	49	47
BR-V	24	48
V-S	50	49
S-V	25	50

Circuit 1, Circuit 2, Circuit 3, Circuit 4, Circuit 6, Circuit 7, Circuit 8

- T5 (Voice/Data)
(GND) R5 (Voice/Data)
PT
PR

25 Pair Cable W/Male Amp Connector

66M150 Split Block

1596

Not Used

Screw Terminals

R GN
BK Y
W BL
6 5 4 3 2 1

1 2 L1 L2
Not Used

Door Phone A MDFB (Rear View)

3 4

Modular Cord

DDCB
Door Phone MDFB
A B C   HKSU

2-pair Modular Cords

R GN
BK Y
W BL
6 5 4 3 2 1

MDFB Door Phone B or Door Lock Control

2 3 4 5

Modular Cord

See Note 1

See Note 2

MDFB Door Phone C

MDFB (Door Phone) Station #s			
Port #	A	B	C
004	#151	#152	#153
012	#154	#155	#156
020	#157	#158	#159
028	#161	#162	#163

Notes

1. DDCB "B" output options:
   - SW1: Always in DOOR position.
   - SW2: DOOR position; "B" connects to door phone LOCK position; "B" connects to door lock.
2. Door phones may be connected to circuit 5 on ports 04, 012, 0202, and 028 only.
3. See Table 3-10 on Page 3-39 for loop lengths.

Figure 8-3   MDF Wiring-DDCB/Door Phone/Lock to PDKU

PDKU Connector

Bridging Clips

Station Cabling

Jacketed Twisted Pairs 24AWG (1 Pair)

W-BL	26	1		1	(-) T1 (Voice/Data)
BL-W	1	2		2	(GND) R1 (Voice/Data)
W-O	27	3		3	PT1 (Not Used)
O-W	2	4		4	RT2
W-GN	28	5		5	T2
GN-W	3	6		6	R2
W-BR	29	7		7	PT2 CKT 2
BR-W	4	8		8	PR2
W-S	30	9		9	T3
S-W	5	10		10	R3
R-BL	31	11		11	PT3 CKT 3
BL-R	6	12		12	PR3
R-O	32	13		13	T4
O-R	7	14		14	R4
R-GN	33	15		15	PT4 CKT 4
GN-R	8	16		16	PR4
R-BR	34	17		17	T5
BR-R	9	18		18	R5
R-S	35	19		19	PT5 CKT 5
S-R	10	20		20	PR5
BK-BL	36	21		21	T6
BL-BK	11	22		22	R6
BK-O	37	23		23	PT6 CKT 6
O-BK	12	24		24	PR6
BK-GN	38	25		25	T7
GN-BK	13	26		26	R7
BK-BR	39	27		27	PT7 CKT 7
BR-BK	14	28		28	PR7
BK-S	40	29		29	T8
S-BK	15	30		30	R8
Y-BL	41	31		31	PT8 CKT 8
BL-Y	16	32		32	PR8

25-PAIR CABLE W/MALE AMP CONNECTOR

DC Output

AC/DC External Power Source

AC Input

To 120VAC Commercial Power Outlet

R1 / T1 — R, GN, BK, Y, W, BL — 6 5 4 3 2 1

2 3 4 5 TR

2-Pair Modular Cord Required

RJ11

(+) (-) GND (-) / T R

Digital (1000 or 2000 Series) Telephone (With Or Without RPCI-DI) or... DDSS, DDCB, PDIU-DS

AC/DC External Power Source Specifications:

AC IN: 120VAC ± 10%
DC OUT: 24VDC ± 10%
160 MA (Min.) DC Current
200 MV P-P (Max) AC Ripple On DC Output

AC/DC power supplies that meet the above requirements are available from most telephone equipment supply houses.

External Power Straps:

If the external power is installed, cut the external power straps located inside the digital telephone DDSS, DDCB, or PDIU-DS.

See Loop Limits at the front of this section for external power requirements.

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Figure 8-4   External Power for PDKU Digital Telephone Connection

MDF Block Number   [   ]   KSU Slot Number   [   ]

Color Code	Designation	CKT Number	Port Number	Intercom Number	Device/Standard Telephone/Electronic Telephone Location
W-Bl	T	1			
Bl-W	R				
W-O	PRW-T				
O-W	PRW-R				
W-G	T	2			
G-W	R				
W-Br	PRW-T				
Br-W	PRW-R				
W-S	T	3			
S-W	R				
R-Bl	PRW-T				
Bl-R	PRW-R				
R-O	T	4			
O-R	R				
R-G	PRW-T				
G-R	PRW-R				
R-Br	T	5[1]			
Br-R	R				
R-S	PRW-T				
S-R	PRW-R				
Bk-Bl	T	6			
Bl-Bk	R				
Bk-O	PRW-T				
O-Bk	PRW-R				
Bk-G	T	7			
G-Bk	R				
Bk-Br	PRW-T				
Br-Bk	PRW-R				
Bk-S	T	8			
S-Bk	R				
Y-Bl	PRW-T				
Bl-Y	PRW-R				

1. DDCBs connect only to Circuit 5, Ports 004, 012, 020, and 028.

> **Note**   Indicate if PDIU-DS, digital telephone (with or without RPCI-DI), DSS console (number 1~8), or DDCB is connected.

Figure 8-5   PDKU Station MDF Cross Connect Record

DK40i/DK424 Universal Slot PCB Wiring

To RDSU W/Female Connector

Bridging Clips

Station Cabling Jacketed Twisted Pairs (24 AWG)

25-Pair Cable With Male Amp Connector

W-BL	26	1	1	Tip 1
BL-W	1	2	2	Ring 1
W-O	27	3	3	
O-W	2	4	4	Not Used
W-GN	28	5	5	Tip 2
GN-W	3	6	6	(See Note) Ring 2
W-BR	29	7	7	
BR-W	4	8	8	
W-S	30	9	9	T3
S-W	5	10	10	R3
R-BL	31	11	11	Not Used
BL-R	6	12	12	
R-O	32	13	13	T4
O-R	7	14	14	R4
R-GN	33	15	15	Not Used
GN-R	8	16	16	
R-BR	34	17	17	T5
BR-R	9	18	18	R5
R-S	35	19	19	PT5
S-R	10	20	20	PR5
BK-BL	36	21	21	T6
BL-BK	11	22	22	R6
BK-O	37	23	23	PT6
O-BK	12	24	24	PR6
BK-GN	38	25	25	T7
GN-BK	13	26	26	R7
BK-BR	39	27	27	PT7
BR-BK	14	28	28	PR7
BK-S	40	29	29	(-) T8 (Voice/Data)
S-BK	15	30	30	(GND) R8 (Voice/Data)
Y-BL	41	31	31	(-) PT (Add Power)
BL-Y	16	32	32	(GND) PR (Add Power)
Y-O	42	33	33	
O-Y	17	34	34	
Y-GN	43	35	35	
GN-Y	18	36	36	
Y-BR	44	37	37	
BR-Y	19	38	38	
Y-S	45	39	39	
S-Y	20	40	40	Not Used
V-BL	46	41	41	
BL-V	21	42	42	
V-O	47	43	43	
O-V	22	44	44	
V-GN	48	45	45	
GN-V	23	46	46	
V-BR	49	47	47	
BR-V	24	48	48	
V-S	50	49	49	DG
S-V	25	50	50	-24V

66M150 SPLIT BLOCK

Standard Telephone Circuits 3 and 4 available with optional RSTS PCB. Wire the same as Circuits 1 and 2.

Circuit 5 to DKT 5 or PDIU-DS or DDCB

Circuit 6 to DKT 6 or PDIU-DS

Circuit 7 to DKT 7 or PDIU-DS

RJ11

R   GN
BK   Y
W   BL
6 5 4 3 2 1
Tip ⬭ Ring

Standard Telephone 1
Voice Mail Port Or Similar Device

RJ11

R   GN
BK   Y
W   BL
6 5 4 3 2 1
TIP ⬭ RING

Standard Telephone 2
Voice Mail Port Or Similar Device

RJ11

R   GN
BK   Y
W   BL
6 5 4 3 2 1

R8   T8
PT8   PR8

2 3 4 5
PR TR PT

GND (-) GND (-)
PR   T   R   PT

Modular Cord

Digital Telephone

DPFT Power Failure Transfer Box (J1)

DG (J1, 50)   -24VDC (J1, 25)

1603

CAUTION! To prevent system malfunction, DO NOT install the RDSU in Slot 18 of the DK40i system.

Figure 8-6   RDSU Wiring

	MDF Block Number		KSU Slot Number	

Color Code	Designation	CKT Number	Port Number	Directory Number	Device/Standard Telephone/ Electronic Telephone Location
W-Bl	T				
Bl-W	R	1		(Standard)	
W-O	Not Used				
O-W	Not Used				
W-G	T				
G-W	R	2		(Standard)	Indicate if separate BGM source connected to Circuit 2.
W-Br	Not Used				
Br-W	Not Used				
W-S	T				
S-W	R	3		(Standard) (RSTS)	
R-Bl	Not Used				
Bl-R	Not Used				
R-O	T				
O-R	R	4		(Standard) (RSTS)	
R-G	Not Used				
G-R	Not Used				
R-Br	T				
Br-R	R	5		(Digital)	DDCBs connect only to Circuit 5, Ports 004, 012, 020, and 028
R-S	PWRT				
S-R	PWRR				
Bk-Bl	T				
Bl-Bk	R	6		(Digital)	
Bk-O	PWRT				
O-Bk	PWRR				
Bk-G	T				
G-Bk	R	7		(Digital)	
Bk-Br	PWRT				
Br-Bk	PWRR				
Bk-S	T				
S-Bk	R	8		(Digital)	
Y-Bl	PWRT				
Bl-Y	PWRR				

Note Indicate if standard telephone, voice mail port, etc.

Figure 8-7   RDSU Station MDF Cross Connect Record

Electronic Station Wiring Diagrams

Figure 8-8   MDF Wiring/Electronic Telephone to PEKU

Notes

- To receive OCA, the 6500-series electronic telephone must have an HVSU2 or the combined HVSI and HVSU installed.

- Program 31, button/LED 03 must be ON for electronic telephone to receive OCA.

- An HHEU must be installed inside 6500-series electronic telephones for headset or HESB, Loud Ringing Bell option.

- All cable 24 AWG, max 40 ohm loop resistance from PEKU to electronic telephone (1000 ft).

To PEKU w/Female Connector

W-BL	26
BL-W	1
W-O	27
O-W	2
W-GN	28
GN-W	3
W-BR	29
BR-W	4
W-S	30
S-W	5
R-BL	31
BL-R	6
R-O	32
O-R	7
R-GN	33
GN-R	8
R-BR	34
BR-R	9
R-S	35
S-R	10
BK-BL	36
BL-BK	11
BK-O	37
O-BK	12
BK-GN	38
GN-BK	13
BK-BR	39
BR-BK	14
BK-S	40
S-BK	15
Y-BL	41
BL-Y	16
Y-O	42
O-Y	17
Y-GN	43
GN-Y	18
Y-BR	44
BR-Y	19
Y-S	45
S-Y	20
V-BL	46
BL-V	21
V-O	47
O-V	22
V-GN	48
GN-V	23
V-BR	49
BR-V	24
V-S	50
S-V	25

25 Pair Cable w/Male amp Connector

Bridging Clips

Voice T1
Voice R1
Data T1
Data R1
Circuit 2
Circuit 3
Circuit 4
Circuit 5
Circuit 6
Voice Pait - Not Used
Circuit 7
Data Tip 7
Data Ring 7
Voice Pait - Not Used
Circuit 8
Data Tip 8
Data Ring 8
OCA T1
OCA R1
Circuit 2
Circuit 3
Circuit 4
Circuit 5
Circuit 6
Circuit 7
Circuit 8
Not Used

66M150 Split Block

Jacketed Station Cable Twisted Pair 24 AWG

R   GN
BK   Y
W   BL

X   To OCA T1
Y   To OCA R1

6 5 4 3 2 1

1 2 3 4 5 6

Modular Cord   **Station**

Electronic Telephone Associated with HDSS

Only if Electronic Telephone Receives Off-Hook Calls

Circuits 7 & 8 T/R pair order must be wired as shown.

R8   R   GN   T8
T7   BK   Y   R7
W   BL

6 5 4 3 2 1

2 3 4 5

Modular Cord

DSS Console

Notes

- Place PEKU SW1 to HDSS.
- All cable 24 AWG max loop resistance: 20 ohms from PEKU to HDSS (500 ft).
- See Program 29 to assign HDSS feature buttons.
- See Program 28 for telephone to HDSS assignments.

DSS
EKT
SW1

1579

Figure 8-9   MDF Wiring/HDSS Console and Associated EKT to PEKU

To PEKU or PESU
w/Female Connector

Bridging
Clips

W-BL	26	1	1	
BL-W	1	2	2	Circuit 1
W-O	27	3	3	
O-W	2	4	4	
W-GN	28	5	5	
GN-W	3	6	6	Circuit 2
W-BR	29	7	7	
BR-W	4	8	8	
W-S	30	9	9	
S-W	5	10	10	Circuit 3
R-BL	31	11	11	
BL-R	6	12	12	
R-O	32	13	13	
O-R	7	14	14	Circuit 4
R-GN	33	15	15	
GN-R	8	16	16	
R-BR	34	17	17	Voice T5
BR-R	9	18	18	Voice R5
R-S	35	19	19	Data T5
S-R	10	20	20	Data R5
BK-BL	36	21	21	
BL-BK	11	22	22	
BK-O	37	23	23	Circuit 6
O-BK	12	24	24	
BK-GN	38	25	25	
GN-BK	13	26	26	
BK-BR	39	27	27	Circuit 7
BR-BK	14	28	28	
BK-S	40	29	29	
S-BK	15	30	30	Circuit 8
Y-BL	41	31	31	
BL-Y	16	32	32	
Y-O	42	33	33	OCA T1
O-Y	17	34	34	OCA R1
Y-GN	43	35	35	Circuit 2
GN-Y	18	36	36	
Y-BR	44	37	37	Circuit 3
BR-Y	19	38	38	
Y-S	45	39	39	Circuit 4
S-Y	20	40	40	
V-BL	46	41	41	Circuit 5
BL-V	21	42	42	
V-O	47	43	43	Circuit 6
O-V	22	44	44	
V-GN	48	45	45	Circuit 7
GN-V	23	46	46	
V-BR	49	47	47	Circuit 8
BR-V	24	48	48	
V-S	50	49	49	Not Used
S-V	25	50	50	

25 Pair Cable w/Male amp Connector

66M150 Split Block

1580

Screw
Terminals

R   GN
BK   Y
W   BL
6 5 4 3 2 1

1 2 L1 L2
Not
Used

**Door Phone A
MDFB (Rear View)**

3 4

Modular
Cord

HDCB

Door Phone
MDFB
A B C   HKSU

2-Pair
Modular
Cords

See Note 1

VR   VT
R   GN
BK   Y
DT   DR
W   BL
6 5 4 3 2 1

MDFB
Door
Phone B
or Door
Lock
Control

MDFB
Door
Phone C

2 3 4 5

Modular
Cord

See Note 1
See Note 2

MDFB (Door Phone) Station Nos.			
Port #	A	B	C
004	151	152	153
012	154	155	156
020	157	158	159
028	161	162	163

Notes

1. On PEKU or PESU, cut W9. See Programs 39, 77-1, 77-2, and 79.

2. HDCB "B" output options:

   SW1: Always in DOOR position.

   SW2: DOOR position; "B" connects to door phone LOCK position;
   "B" connects to door lock.

3. Door phones may be connected to Circuit 5 on Ports 004, 012, 020,
   and 028 only.

Figure 8-10 MDF Wiring-Door Phone/Lock to PEKU/PESU

To PEKU w/Female Connector   **Bridging Clips**   **Station Cabling (24 AWG, Twisted Pairs)**

PEKU	Pin	Clip	Clip	Signal	
W-BL	26	1	1	Voice T1 (VT)	to Electronic Telephone 1 (Port 000)
BL-W	1	2	2	Voice R1 (VR)	
W-O	27	3	3	Data T1 (DT)	
O-W	2	4	4	Data R1 (DR)	
W-GN	28	5	5	VT2	Circuit 2 to Electronic Telephone (Port 001)
GN-W	3	6	6	VR2	
W-BR	29	7	7	DT2	
BR-W	4	8	8	DR2	
W-S	30	9	9	VT3	Background Music Source Output (600 OHMS; 1V RMS MAX)
S-W	5	10	10	VR3	
R-BL	31	11	11	DT3	
BL-R	6	12	12	DR3 Not Used	
R-O	32	13	13	VT	Circuit 4 to Electronic Telephone (Port 003)
O-R	7	14	14	VR	
R-GN	33	15	15	DT	
GN-R	8	16	16	DR	
R-BR	34	17	17	VT	Circuit 5 to Electronic Telephone or HDCB
BR-R	9	18	18	VR	
R-S	35	19	19	DT	
S-R	10	20	20	DR	
BK-BL	36	21	21	VT	Circuit 6 to Electronic Telephone
BL-BK	11	22	22	VR	
BK-O	37	23	23	DT	
O-BK	12	24	24	DR	
BK-GN	38	25	25	VT	Circuit 7 to Electronic Telephone or DSS
GN-BK	13	26	26	VR	
BK-BR	39	27	27	DT	
BR-BK	14	28	28	DR	
BK-S	40	29	29	VT	Circuit 8 to Electronic Telephone or DSS
S-BK	15	30	30	VR	
Y-BL	41	31	31	DT	
BL-Y	16	32	32	DR	
Y-O	42	33	33	OCA T1 (OT)	
O-Y	17	34	34	OCA R1 (or) to Electronic Telephones that receive OCA	
Y-GN	43	35	35	OT	Circuit 2
GN-Y	18	36	36	OR	
Y-BR	44	37	37	OT	Circuit 3
BR-Y	19	38	38	OR	
Y-S	45	39	39	OT	Circuit 4
S-Y	20	40	40	OR	
V-BL	46	41	41	OT	Circuit 5 — to Electronic Telephones that receive OCA
BL-V	21	42	42	OR	
V-O	47	43	43	OT	Circuit 6
O-V	22	44	44	OR	
V-GN	48	45	45	OT	Circuit 7
GN-V	23	46	46	OR	
V-BR	49	47	47	OT	Circuit 8
BR-V	24	48	48	OR	
V-S	50	49	49	Not Used	
S-V	25	50	50		

25-Pair Cable w/Male amp Connector

66M150 Split Block

Notes

- A separate BGM source is available.
- Program 10-2, button/LED 09 ON, for BGM connection.
- Program 19 for slot assignment.
- Cut W5 jumper on PEKU.
- Provide BGM to external page with PIOU/PIOUS/PEPU.
- Volume is adjusted at BGM source only (not at PEKU).

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Figure 8-11   MDF Wiring PEKU Background Music Connection

To PEKU W/Female Connector

Bridging Clips

25-Pair Cable With Male Amp Connector

Color	Pin	Clip	Clip	Signal	Description
W-BL	26	1	1	VT1	
BL-W	1	2	2	VR1	Circuit 1 to EKT
W-O	27	3	3	DT1	
O-W	2	4	4	DR1	
W-GN	28	5	5	VT2	
GN-W	3	6	6	VR2	PEKU, Circuit 2 Voice Pair
W-BR	29	7	7	DT2	Not Used
BR-W	4	8	8	DR2	
W-S	30	9	9	VT3	
S-W	5	10	10	VR3	PEKU, Circuit 3 Voice Pair
R-BL	31	11	11	DT3	Not Used
BL-R	6	12	12	DR3	
R-O	32	13	13	VT4	
O-R	7	14	14	VR4	
R-GN	33	15	15	DT4	Circuit 4 to EKT
GN-R	8	16	16	DR4	
R-BR	34	17	17	VT5	
BR-R	9	18	18	VR5	Circuit 5 to EKT or HDCB
R-S	35	19	19	DT5	
S-R	10	20	20	DR5	
BK-BL	36	21	21	VT6	
BL-BK	11	22	22	VR6	Circuit 6 to EKT
BK-O	37	23	23	DT6	
O-BK	12	24	24	DR6	
BK-GN	38	25	25	VT7	
GN-BK	13	26	26	VR7	Circuit 7 to EKT or DSS
BK-BR	39	27	27	DT7	
BR-BK	14	28	28	DR7	
BK-S	40	29	29	VT8	
S-BK	15	30	30	VR8	Circuit 8 to EKT or DSS
Y-BL	41	31	31	DT8	
BL-Y	16	32	32	DR8	
Y-O	42	33	33		OCA T1 (OT)
O-Y	17	34	34		OCA R1 (OR)
Y-GN	43	35	35	OT2	
GN-Y	18	36	36	OR2	Circuit 2
Y-BR	44	37	37	OT3	
BR-Y	19	38	38	OR3	Circuit 3
Y-S	45	39	39	OT4	
S-Y	20	40	40	OR4	Circuit 4
V-BL	46	41	41	OT5	
BL-V	21	42	42	OR5	Circuit 5
V-O	47	43	43	OT6	
O-V	22	44	44	OR6	Circuit 6
V-GN	48	45	45	OT7	
GN-V	23	46	46	OR7	Circuit 7
V-BR	49	47	47	OT8	
BR-V	24	48	48	OR8	Circuit 8
V-S	50	49	49		Not USED
S-V	25	50	50		

66M150 Split Block

Customer-supplied Two-way amplifier or Line repeaters (see Note 1)

Port A (CO Side)

Port B (Subscriber side)

(See Note 2)

To 115 VAC ± 10 VAC

Notes

1. Refer to Manufacturer's installation documentation for amplifier or line repeater pin numbering.

2. Connect to PEKU circuits only, do not connect to PESU, PSTU, RSTU, RDSU or PDKU circuits.

General Note

- Amplifier or repeater must have automatic gain control and be registered FCC Part 68.

System Programs

- **Program 10-3, circuit assignments:**

Program 10-3 Button/LED	PEKU Slot Position	PEKU Port Number	PEKU Circuit
LED 01, ON	2nd	A = 009 B = 010	CKT2 CKT3
LED 02, ON	3rd	A = 017 B = 018	CKT2 CKT3
LED 03, ON	4th	A = 025 B = 026	CKT2 CKT3
LED 04, ON	5th	A = 033 B = 034	CKT2 CKT3

Program 10-1, button LED 19 and 20 ON.

Program 15-5, enable appropriate CO lines for tandem connection.

Program 78-2, enable appropriate CO lines if amplified DISA is required.

Program 10-2, key LED 18 and 19 ON.

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Figure 8-12 MDF Wiring/PEKU Amplified Two-CO Line Conference

	MDF Block Number			KSU Slot Number	

Color Code	Designation	CKT Number	Port Number	Intercom Number	Device/Standard Telephone/Electronic Telephone Location
W-Bl	VT	1			
Bl-W	VR				
W-O	DT				
O-W	DR				
W-G	VT	2			See Note 1.
G-W	VR				
W-Br	DT				
Br-W	DR				
W-S	VT	3			See Notes 1 and 2.
S-W	VR				
R-Bl	DT				
Bl-R	DR				
R-O	VT	4			
O-R	VR				
R-G	DT				
G-R	DR				
R-Br	VT	5			See Note 3.
Br-R	VR				
R-S	DT				
S-R	DR				
Bk-Bl	VT	6			
Bl-Bk	VR				
Bk-O	DT				
O-Bk	DR				
Bk-G	VT	7			See Note 4.
G-Bk	VR				
Bk-Br	DT				
Br-Bk	DR				
Bk-S	VT	8			See Note 4.
S-Bk	VR				
Y-Bl	DT				
Bl-Y	DR				

Notes

1. Indicate if two-way amplifier or line repeater

2. Indicate if BGM or electronic telephone is connected (see Program 10-2 and 19); BGM connects to VT and VR, Circuit 3 only (DT and DR not used).

3. Indicate if electronic telephone or HDCB (allowed HDCB port numbers: 004, 012, 020, 028).

4. Indicate if electronic telephone or HDSS Console number (1~8).

Figure 8-13 PEKU Station MDF Cross Connect Record
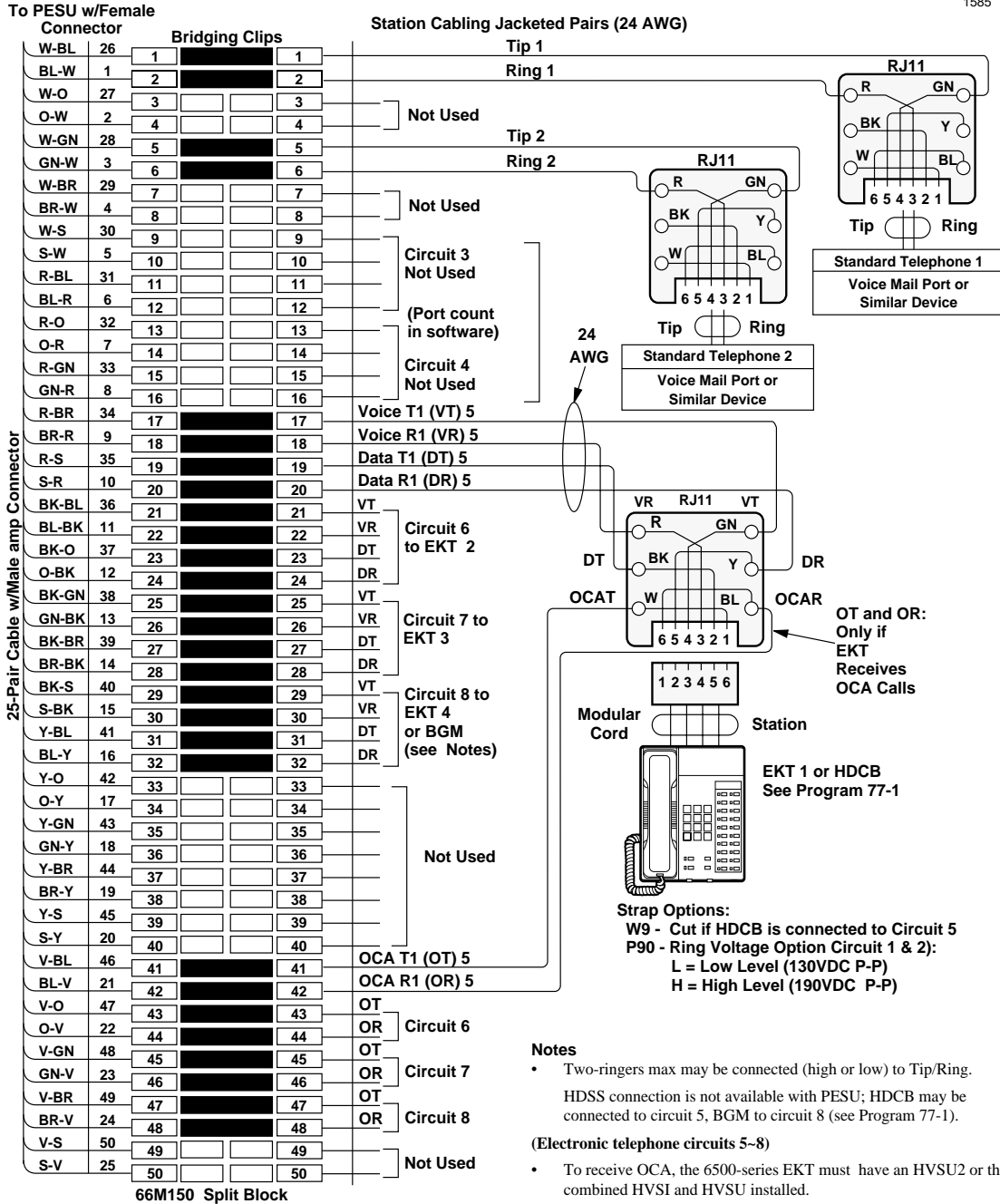
Figure 8-14 PEKU Station MDF Cross Connect Record PESU Wiring Diagram

Notes (Standard telephone circuits 1 & 2)
- All cable 24 AWG; max loop resistance - 300 ohms from PESU to standard telephone/VM port.
- Standard telephones may be on- or off-premises. Off-premises connection is made via OL13A FIC, and RJ21X jack.
- Two ringers max per port.

Notes
- Two-ringers max may be connected (high or low) to Tip/Ring.

  HDSS connection is not available with PESU; HDCB may be connected to circuit 5, BGM to circuit 8 (see Program 77-1).

(Electronic telephone circuits 5~8)
- To receive OCA, the 6500-series EKT must have an HVSU2 or the combined HVSI and HVSU installed.
- Program 31, button/LED 03 must be ON for the EKT to receive OCA.
- An HHEU must be installed inside 6500-series EKTs for headset or HESB; Loud Ringing Bell option.
- All cable 24 AWG, max 40 ohm loop resistance from PESU to electronic telephone (1000 ft).

CAUTION!   To prevent system malfunction, DO NOT install the PESU in Slot 18 of the DK40i system.

MDF Block Number [   ]   KSU Slot Number [   ]

Color Code	Designation	CKT Number	Port Number	Intercom Number	Device/Standard Telephone/Electronic Telephone Location
W-Bl	T				
Bl-W	R	1			
W-O	Not Used				
O-W	Not Used				
W-G	T				
G-W	R	2			
W-Br	Not Used				
Br-W	Not Used				
W-S	Not Used			NA	NA
S-W	Not Used	3			
R-Bl	Not Used				
Bl-R	Not Used				
R-O	Not Used			NA	NA
O-R	Not Used	4			
R-G	Not Used				
G-R	Not Used				
R-Br	VT				See Note 1.
Br-R	VR	5			
R-S	DT				
S-R	DR				
Bk-Bl	VT				
Bl-Bk	VR	6			
Bk-O	DT				
O-Bk	DR				
Bk-G	VT				See Note 2.
G-Bk	VR	7			
Bk-Br	DT				
Br-Bk	DR				
Bk-S	VT				See Notes 2 and 3.
S-Bk	VR	8			
Y-Bl	DT				
Bl-Y	DR				

1. Indicate if HDCB or electronic telephone.

2. HDSS console number 1~8 is not allowed.

3. Indicate if BGM or electronic telephone is connected; BGM connects to VT and VR, circuit 8 only (DT and DR not used).

Notes

- Indicate if standard telephone, voice mail port, electronic telephone, HDCB (allowed HDCB port numbers: 004, 012, 020, 028) or separate BGM source.

- OCA wiring not shown, see MDF-to-electronic telephone wiring.

Figure 8-15 PESU Station MDF Cross Connect Record

Attendant Console Wiring Diagrams

To RATU PCB W/Female Connector

PC Attendant Console Cabling[3]

Jacketed Twisted Pairs 24 AWG (2 Pair, See Note 1)

Bridging Clips

25-pair Cable W/Male Amp Connector				
W-BL	26	1	1	(-) T1 (Voice/Data)
BL-W	1	2	2	(GND) R1 (Voice/Data)
W-O	27	3	3	(-)
O-W	2	4	4	(GND)
W-GN	28	5	5	T2
GN-W	3	6	6	R2
W-BR	29	7	7	PT2
BR-W	4	8	8	PR2
W-S	30	9	9	T3
S-W	5	10	10	R3
R-BL	31	11	11	PT3
BL-R	6	12	12	PR3
R-O	32	13	13	T4
O-R	7	14	14	R4
R-GN	33	15	15	PT4
GN-R	8	16	16	PR4
R-BR	34	17	17	
BR-R	9	18	18	
R-S	35	19	19	
S-R	10	20	20	
BK-BL	36	21	21	
BL-BK	11	22	22	
BK-O	37	23	23	
O-BK	12	24	24	
BK-GN	38	25	25	
GN-BK	13	26	26	
BK-BR	39	27	27	
BR-BK	14	28	28	
BK-S	40	29	29	
S-BK	15	30	30	
Y-BL	41	31	31	
BL-Y	16	32	32	
Y-O	42	33	33	
O-Y	17	34	34	
Y-GN	43	35	35	
GN-Y	18	36	36	
Y-BR	44	37	37	
BR-Y	19	38	38	
Y-S	45	39	39	
S-Y	20	40	40	
V-BL	46	41	41	
BL-V	21	42	42	
V-O	47	43	43	
O-V	22	44	44	
V-GN	48	45	45	
GN-V	23	46	46	
V-BR	49	47	47	
BR-V	24	48	48	
V-S	50	49	49	
S-V	25	50	50	

66M150 Split Block

PC Attendant Console #2
PC Attendant Console #3
PC Attendant Console #4

R1 T1 PT1 PR1

R GN BK Y W BL

6 5 4 3 2 1

2 3 4 5 PR TR PT

RJ11

GND (-) GND (-)
PR   T   R   PT

Customer-supplied PC Attendant Console

1-pair Modular Cord

to PC COM Port

Customer-supplied 9-pin computer cable 9 ft. max. (female DB9 connectors on each end)

2-pair modular cord (RJ11 plugs on each end)

8-pair modular cord (RJ45 plugs on each end)

Handset
RATHC
Headset
150~200 W
2-pair Modular

(–22 dBv Output)[4]
(–25 ~ –30 dBv Audio Input – Future Use)

Audio Plugs

To AC Outlet[2]

RATI (Rear Connections)

REC OUT AUX IN

RJ11 RJ45

DB9 (Female)

Notes

1. RATI is wired with 1-pair wiring - maximum distance from KSU (RATU PCB) is 1,000 feet (303 m).
2. PC Attendant Console and CRT require local AC power.
3. Attendant console cable runs **must not** have the following:
   - Cable splits (single or double)
   - Cable bridges (of any length)
   - High resistance or faulty cable splices
4. To tape recorder "REC" input.
5. Audio input is for future use.

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Figure 8-16 PC Attendant Console MDF Wiring Diagram
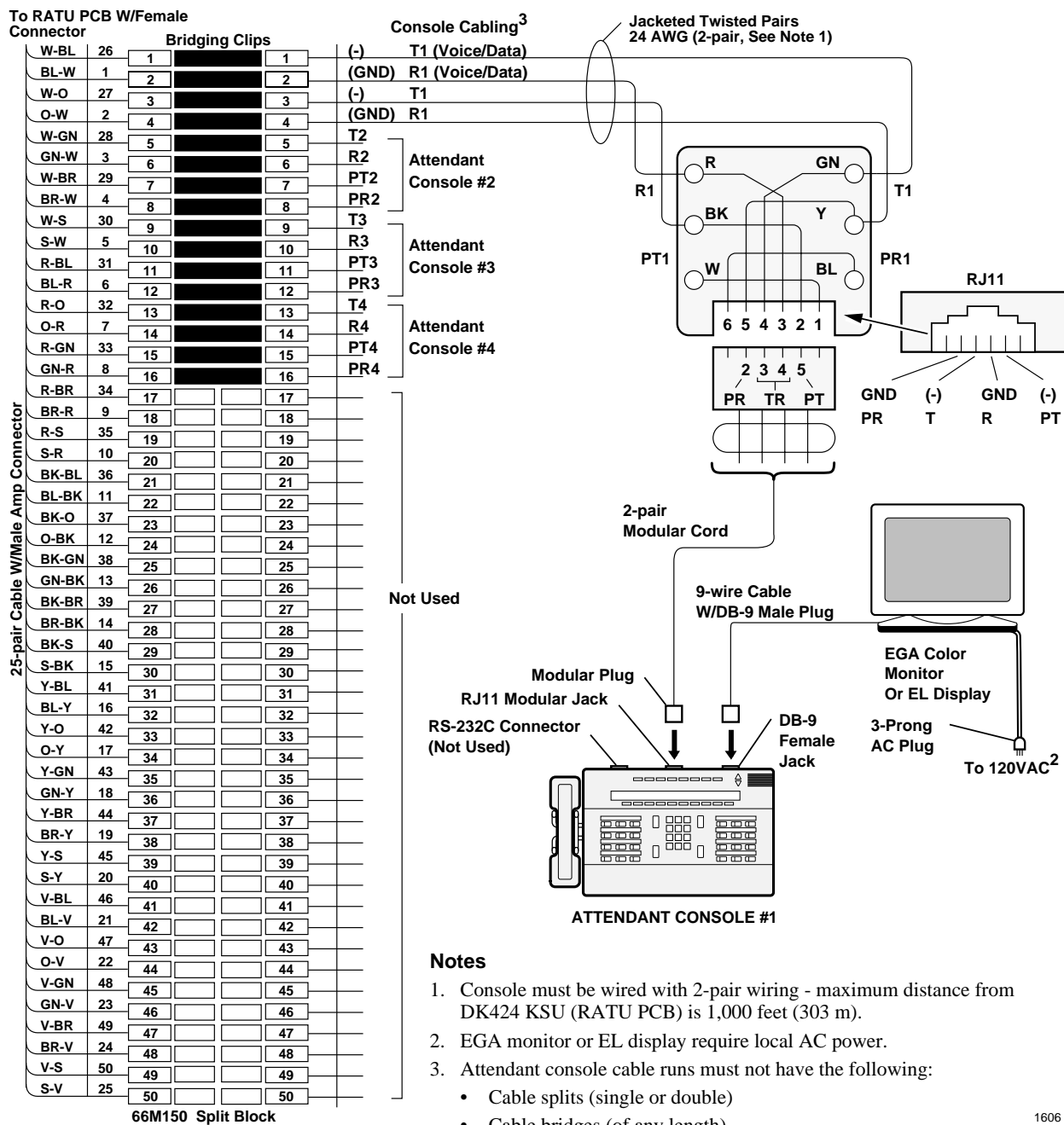
Figure 8-17 Attendant Console MDF Wiring Diagram

Notes

1. Console must be wired with 2-pair wiring - maximum distance from DK424 KSU (RATU PCB) is 1,000 feet (303 m).

2. EGA monitor or EL display require local AC power.

3. Attendant console cable runs must not have the following:
   - Cable splits (single or double)
   - Cable bridges (of any length)
   - High resistance or faulty cable splices

Analog Devices Wiring

Figure 8-18   MDF Wiring/Standard Telephone, Voice Mail, DPFT to RSTU/RSTU2/RDSU/RSTS/PSTU/PSTU2
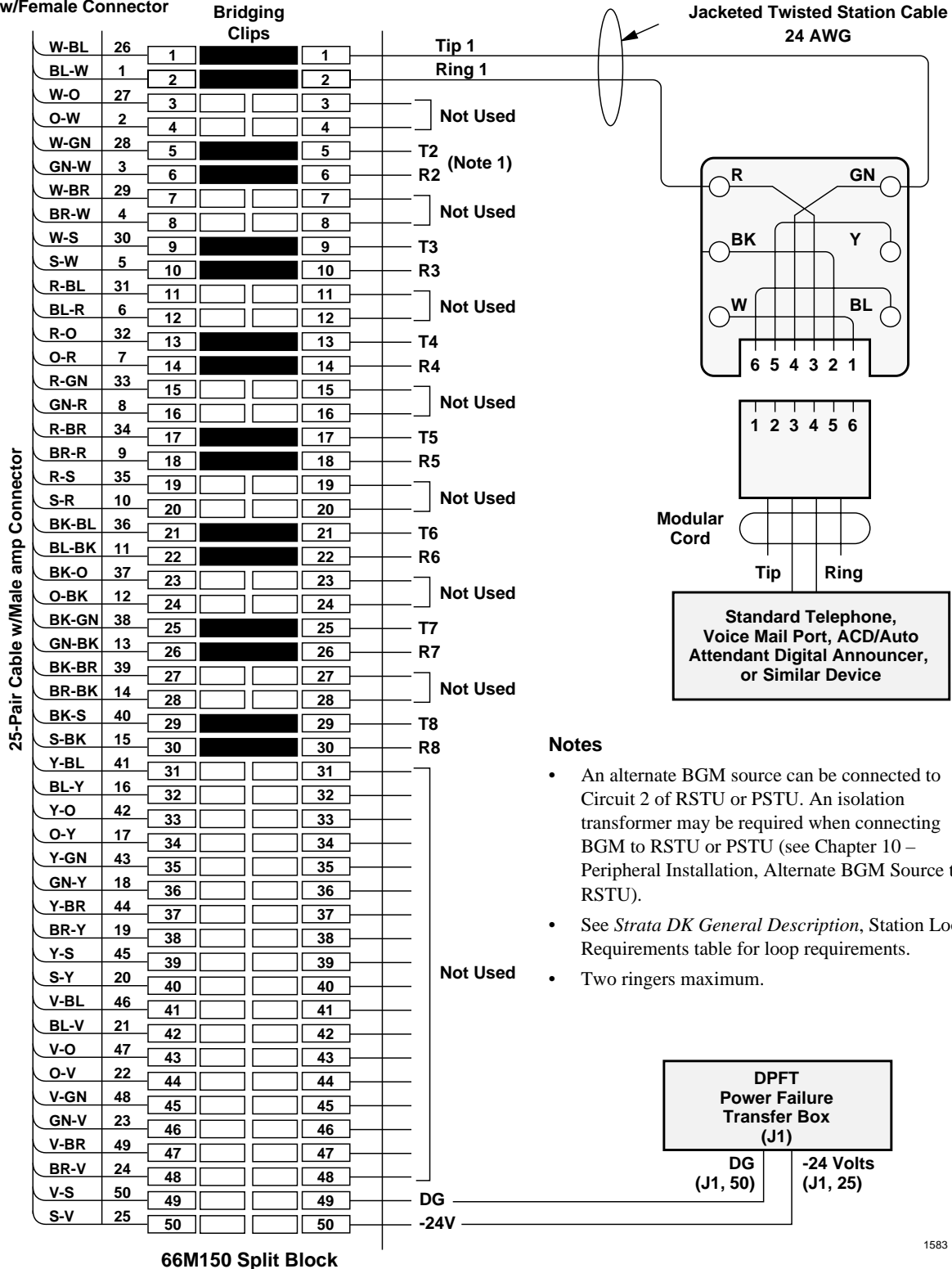
Notes

- An alternate BGM source can be connected to Circuit 2 of RSTU or PSTU. An isolation transformer may be required when connecting BGM to RSTU or PSTU (see Chapter 10 – Peripheral Installation, Alternate BGM Source to RSTU).

- See *Strata DK General Description*, Station Loop Requirements table for loop requirements.

- Two ringers maximum.

MDF Block Number		KSU Slot Number	

Color Code	Designation	CKT Number	Port Number	Intercom Number	Device/Standard Telephone/Electronic Telephone Location
W-Bl	T	1			
Bl-W	R				
W-O	Not Used				
O-W	Not Used				
W-G	T	2			Indicate if separate BGM source.
G-W	R				
W-Br	Not Used				
Br-W	Not Used				
W-S	T	3			
S-W	R				
R-Bl	Not Used				
Bl-R	Not Used				
R-O	T	4			
O-R	R				
R-G	Not Used				
G-R	Not Used				
R-Br	T	5			
Br-R	R				
R-S	Not Used				
S-R	Not Used				
Bk-Bl	T	6			
Bl-Bk	R				
Bk-O	Not Used				
O-Bk	Not Used				
Bk-G	T	7			
G-Bk	R				
Bk-Br	Not Used				
Br-Bk	Not Used				
Bk-S	T	8			
S-Bk	R				
Y-Bl	Not Used				
Bl-Y	Not Used				

Note   Indicate if standard telephone, voice mail port, etc.

Figure 8-19   RSTU/RSTU2/RDSU/RSTS/PSTU/PSTU2 Station MDF Cross Connect Record

Power Failure Cut Through (DPFT) Wiring Pin-outs

Pair	Pin	Color Code	Lead Designation	Function		PSTU/RSTU PCB Position
1t	26	W-Bl	T	TIP-TEL	#1	
R	1	Bl-W	R	RING-TEL	#1	
2T	27	W-O	T	TIP-RSTU/RSTU/RDSU	#1	
R	2	O-W	R	RING-PSTU/RSTU/RDSU	#1	
3T	28	W-G	T	TIP-TEL	#2	
R	3	G-W	R	RING-TEL	#2	
4T	29	W-Br	T	TIP-RSTU/RSTU/RDSU	#2	
R	4	Br-W	R	RING-PSTU/RSTU/RDSU	#2	
5T	30	W-S	T	TIP-TEL	#3	
R	5	S-W	R	RING-TEL	#3	
6T	31	R-Bl	T	TIP-RSTU/RSTU/RDSU	#3	
R	6	Bl-R	R	RING-PSTU/RSTU/RDSU	#3	
7T	32	R-O	T	TIP-TEL	#4	
R	7	O-R	R	RING-TEL	#4	
8T	33	R-G	T	TIP-RSTU/RSTU/RDSU	#4	
R	8	G-R	R	RING-PSTU/RSTU/RDSU	#4	
9T	34	R-Br	T	TIP-TEL	#5	
R	9	Br-R	R	RING-TEL	#5	
10T	35	R-S	T	TIP-RSTU/RSTU/RDSU	#5	
R	10	S-R	R	RING-PSTU/RSTU/RDSU	#5	
11T	36	Bk-Bl	T	TIP-TEL	#6	
R	11	Bl-Bk	R	RING-TEL	#6	
12T	37	Bk-O	T	TIP-RSTU/RSTU/RDSU	#6	
R	12	O-Bk	R	RING-PSTU/RSTU/RDSU	#6	
13T	38	Bk-G	T	TIP-TEL	#7	
R	13	G-Bk	R	RING-TEL	#7	
14T	39	Bk-Br	T	TIP-RSTU/RSTU/RDSU	#7	
R	14	Br-Bk	R	RING-PSTU/RSTU/RDSU	#7	
15T	40	Bk-S	T	TIP-TEL	#8	
R	15	S-Bk	R	RING-TEL	#8	
16T	41	Y-Bl	T	TIP-RSTU/RSTU/RDSU	#8	
R	16	Bl-Y	R	RING-PSTU/RSTU/RDSU	#8	
17T	42	Y-O	Spare			
R	17	O-Y	Spare			
18T	43	Y-G	Spare			
R	18	G-Y	Spare			
19T	44	Y-Br	Spare			
R	19	Br-Y	Spare			
20T	45	Y-S	Spare			
R	20	S-Y	Spare			
21T	46	V-Bl	Spare			
R	21	Bl-V	Spare			
22T	47	V-O	Spare			
R	22	O-V	Spare			
23T	48	V-G	Spare			
R	23	G-V	Spare			
24T	49	V-Br	Spare			
R	24	Br-V	Spare			
25T	50	V-S	Spare			
R	25	S-V	Spare			

Figure 8-20 DPFT Connector J2/Terminal Sequence & Designations/Station Line Connection

Pair	Pin	Color Code	Lead Designation	Function		PSTU/RSTU PCB Position
1t	26	W-Bl	T	TIP-CO	#1	
R	1	Bl-W	R	RING-CO	#1	
2T	27	W-O	T	TIP-PCOU/RCOU	#1	
R	2	O-W	R	RING-PCOU/RCOU	#1	
3T	28	W-G	T	TIP-CO	#2	
R	3	G-W	R	RING-CO	#2	
4T	29	W-Br	T	TIP-PCOU/RCOU	#2	
R	4	Br-W	R	RING-PCOU/RCOU	#2	
5T	30	W-S	T	TIP-CO	#3	
R	5	S-W	R	RING-CO	#3	
6T	31	R-Bl	T	TIP-PCOU/RCOU	#3	
R	6	Bl-R	R	RING-PCOU/RCOU	#3	
7T	32	R-O	T	TIP-CO	#4	
R	7	O-R	R	RING-CO	#4	
8T	33	R-G	T	TIP-PCOU/RCOU	#4	
R	8	G-R	R	RING-PCOU/RCOU	#4	
9T	34	R-Br	T	TIP-CO	#5	
R	9	Br-R	R	RING-CO	#5	
10T	35	R-S	T	TIP-PCOU/RCOU	#5	
R	10	S-R	R	RING-PCOU/RCOU	#5	
11T	36	Bk-Bl	T	TIP-CO	#6	
R	11	Bl-Bk	R	RING-CO	#6	
12T	37	Bk-O	T	TIP-PCOU/RCOU	#6	
R	12	O-Bk	R	RING-PCOU/RCOU	#6	
13T	38	Bk-G	T	TIP-CO	#7	
R	13	G-Bk	R	RING-CO	#7	
14T	39	Bk-Br	T	TIP-PCOU/RCOU	#7	
R	14	Br-Bk	R	RING-PCOU/RCOU	#7	
15T	40	Bk-S	T	TIP-CO	#8	
R	15	S-Bk	R	RING-CO	#8	
16T	41	Y-Bl	T	TIP-PCOU/RCOU	#8	
R	16	Bl-Y	R	RING-PCOU/RCOU	#8	
17T	42	Y-O	Spare			
R	17	O-Y	Spare			
18T	43	Y-G	Spare			
R	18	G-Y	Spare			
19T	44	Y-Br	Spare			
R	19	Br-Y	Spare			
20T	45	Y-S	Spare			
R	20	S-Y	Spare			
21T	46	V-Bl	Spare			
R	21	Bl-V	Spare			
22T	47	V-O	Spare			
R	22	O-V	Spare			
23T	48	V-G	Spare			
R	23	G-V	Spare			
24T	49	V-Br	Spare			
R	24	Br-V	Spare			
25T	50	V-S	PFT DG	PFT GROUND (INPUT)		RDSU/RSTU/PSTU/PIN50
R	25	S-V	PFT -24V	PFT -24V (INPUT)		RDSU/RSTU/PSTU/PIN25

Figure 8-21 DPFT Connector J1/Terminal Sequence & Designations/CO Line Connection & DPFT Control

CO Line Wiring Diagrams
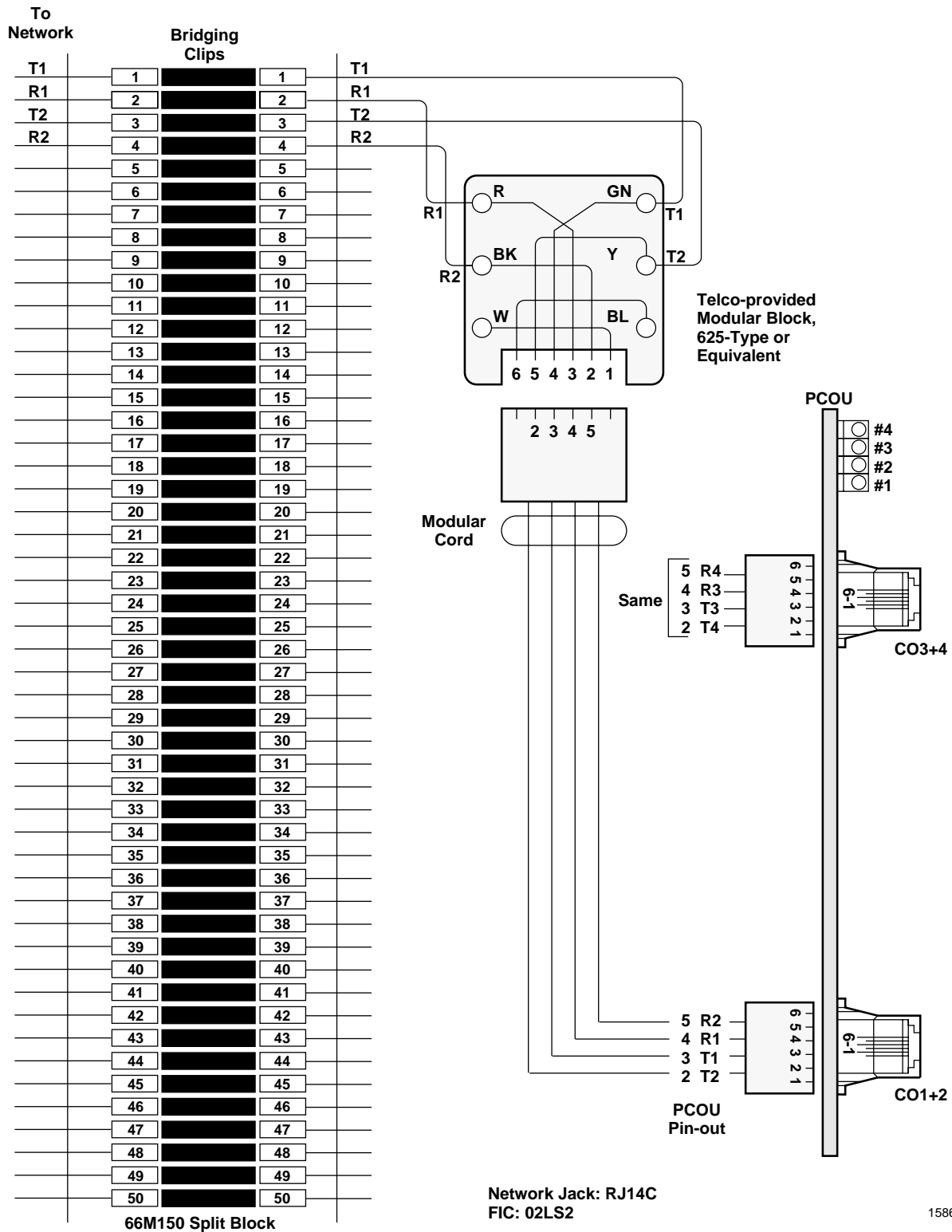
Figure 8-22 MDF Wiring/CO Lines to PCOU

MDF Block Number	CO Line Number	PCB Type and Cabinet Slot Number	MDF Block Number	CO Line Number	PCB Type and Cabinet Slot Number	MDF Block Number	CO Line Number	PCB Type and Cabinet Slot Number

Figure 8-23   CO Line (RCOU/RCOS, RGLU2, RDDU, PEMU, REMU, RDDU, RDTU) MDF Cross Connect Record

DK40i/DK424 Universal
Slot PCB Wiring
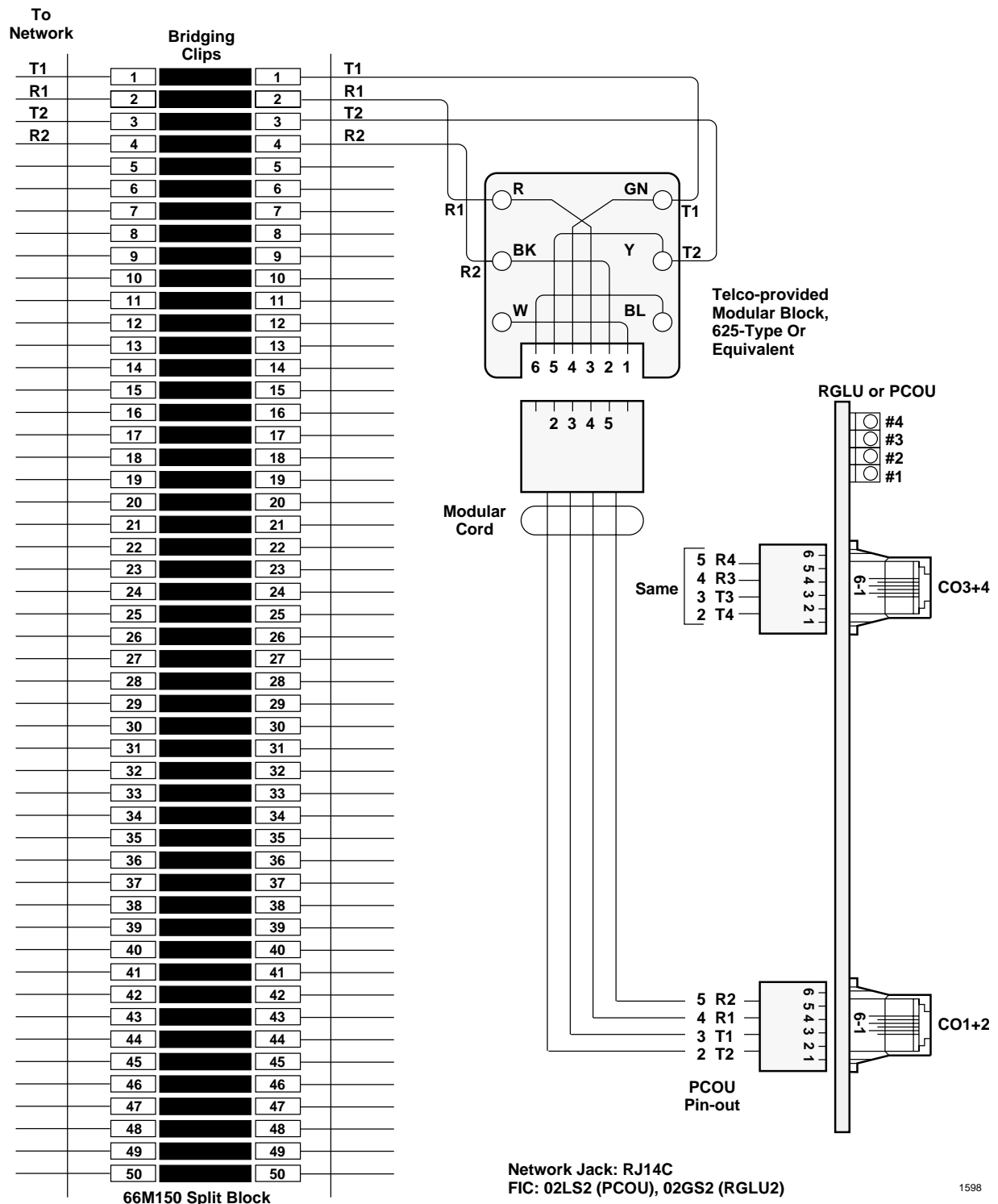
Figure 8-24 MDF Wiring/CO Lines to RGLU2 or PCOU
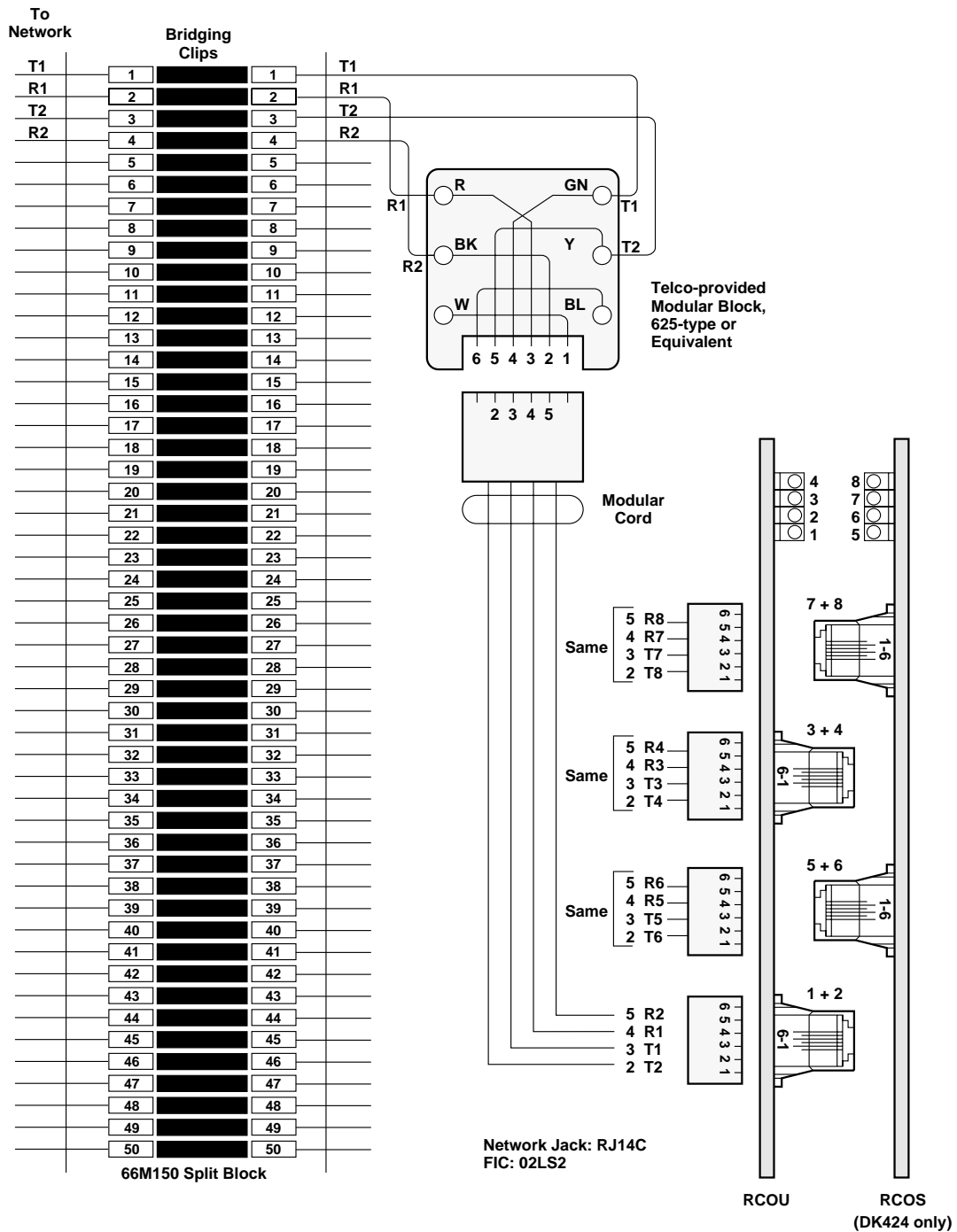
Figure 8-25 MDF Wiring/CO to RCOU/RCOS

RJ-11 2-pin
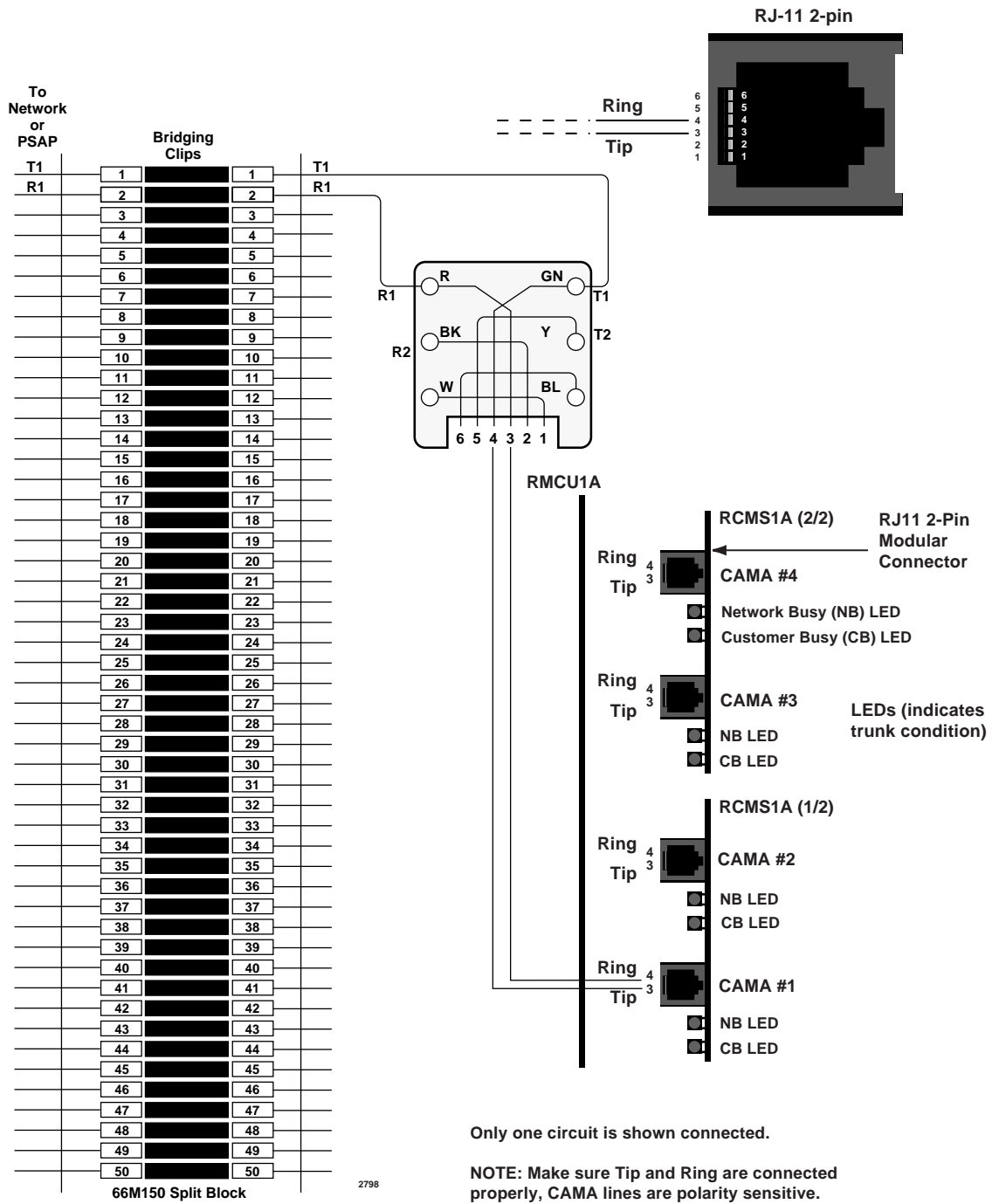
Figure 8-26 RMCU/RMCS Wiring Diagram
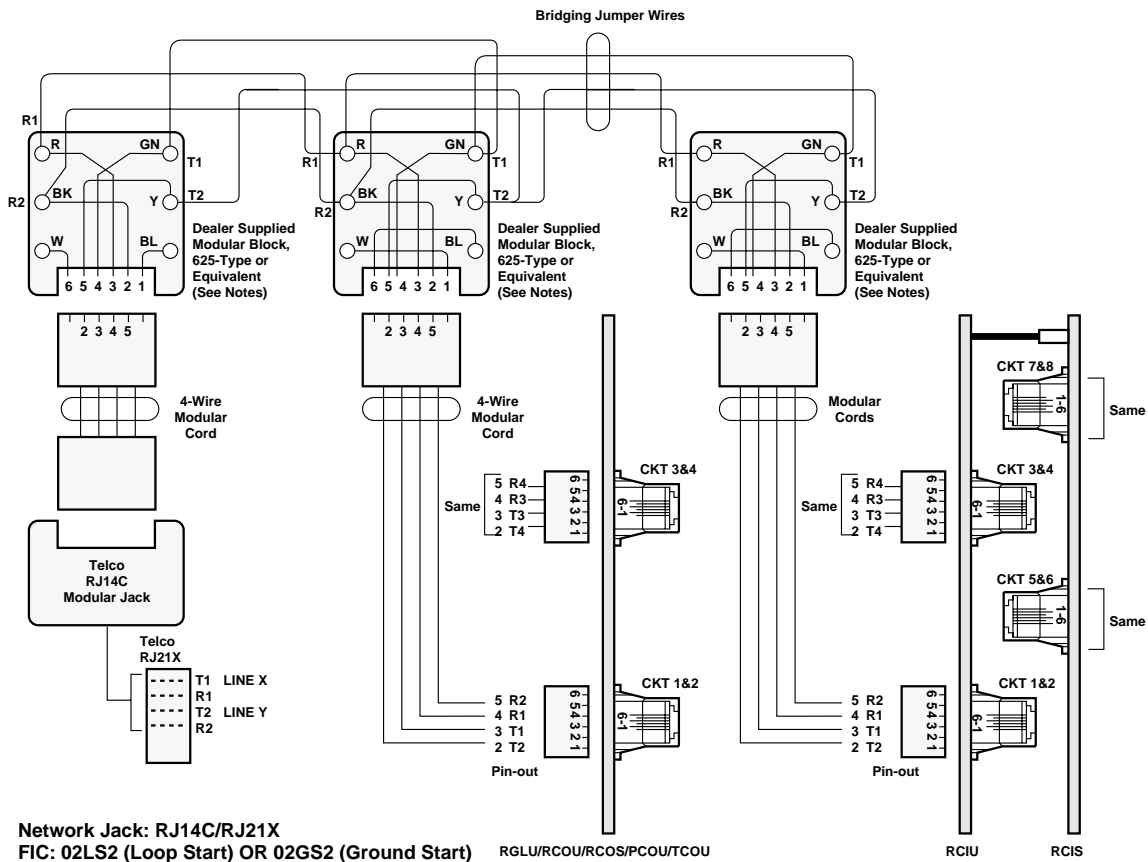
Only one circuit is shown connected.

NOTE: Make sure Tip and Ring are connected properly, CAMA lines are polarity sensitive.
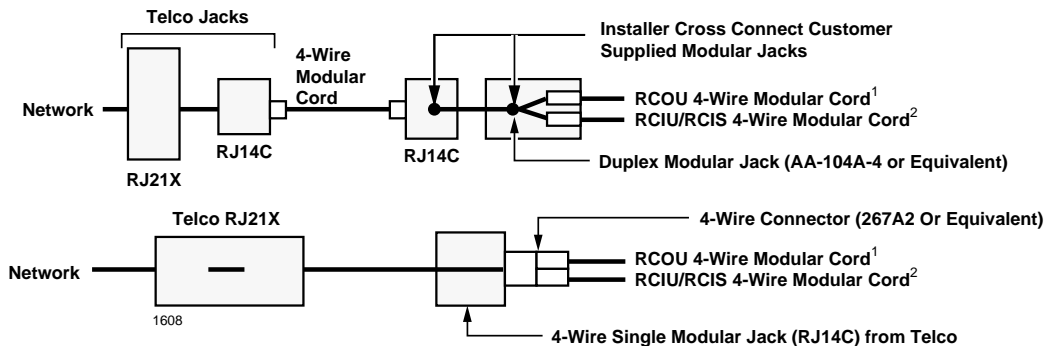
1. 4-wire modular jacks such as graybar part number AA-104A-4 could be used in place of the two modular jacks; or, a T-connector such as graybar part number 267A2 Adaptor could be used as shown below:
2. Assign RCIU1/RCIU2/RCIS circuits to the appropriate CO line using Program *50.

> **CAUTION!** **RCIU1 cannot be used in DK40i. Install RCIU2 in slot 17 only of the DK40i Expansion Unit; it must never be installed in slot 18.**

Figure 8-27   RCIU1/RCIS or RCIU2/RCIS MDF Wiring Diagram
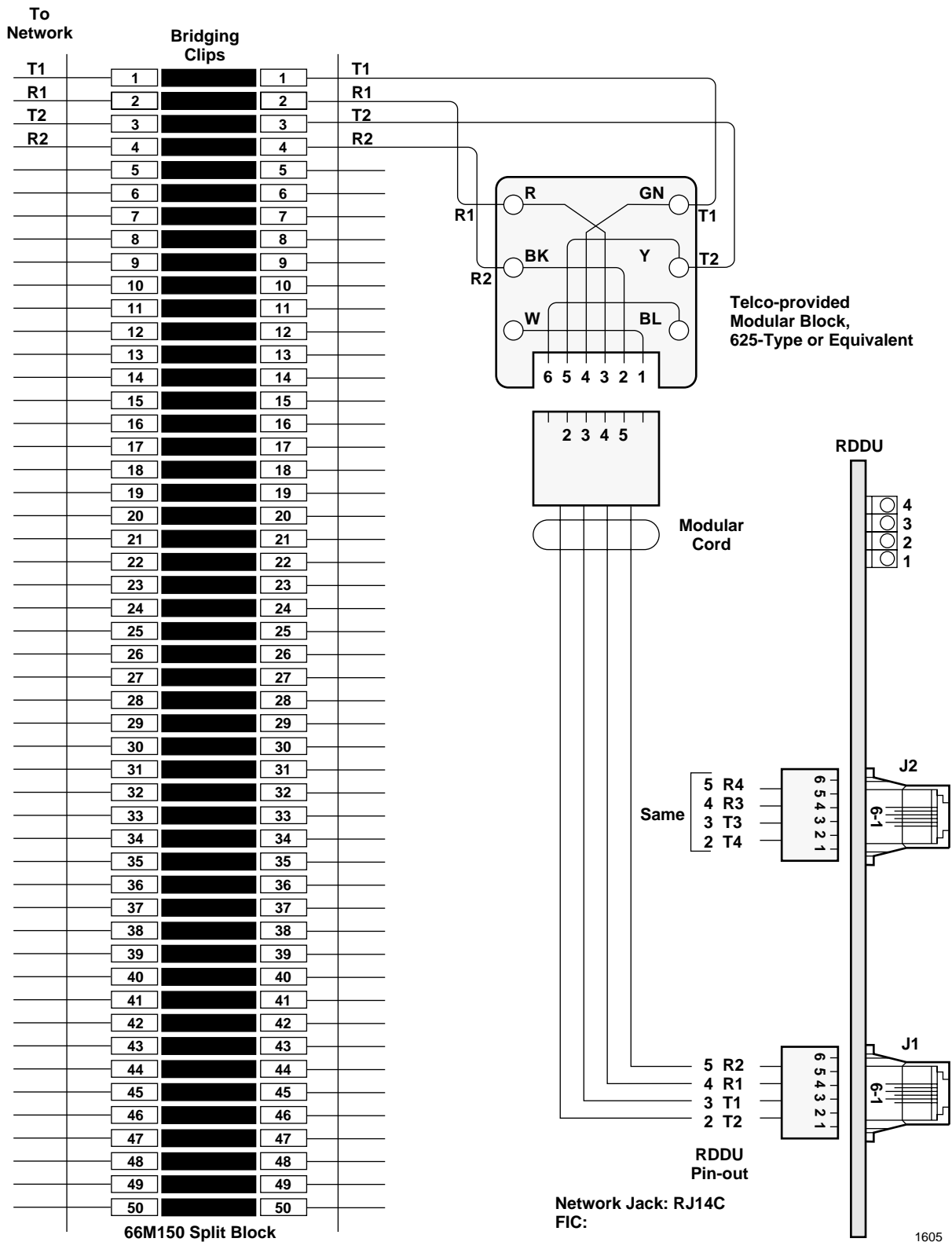
DID and Tie Line Wiring

Figure 8-28   MDF Wiring/DID CO Lines to RDDU
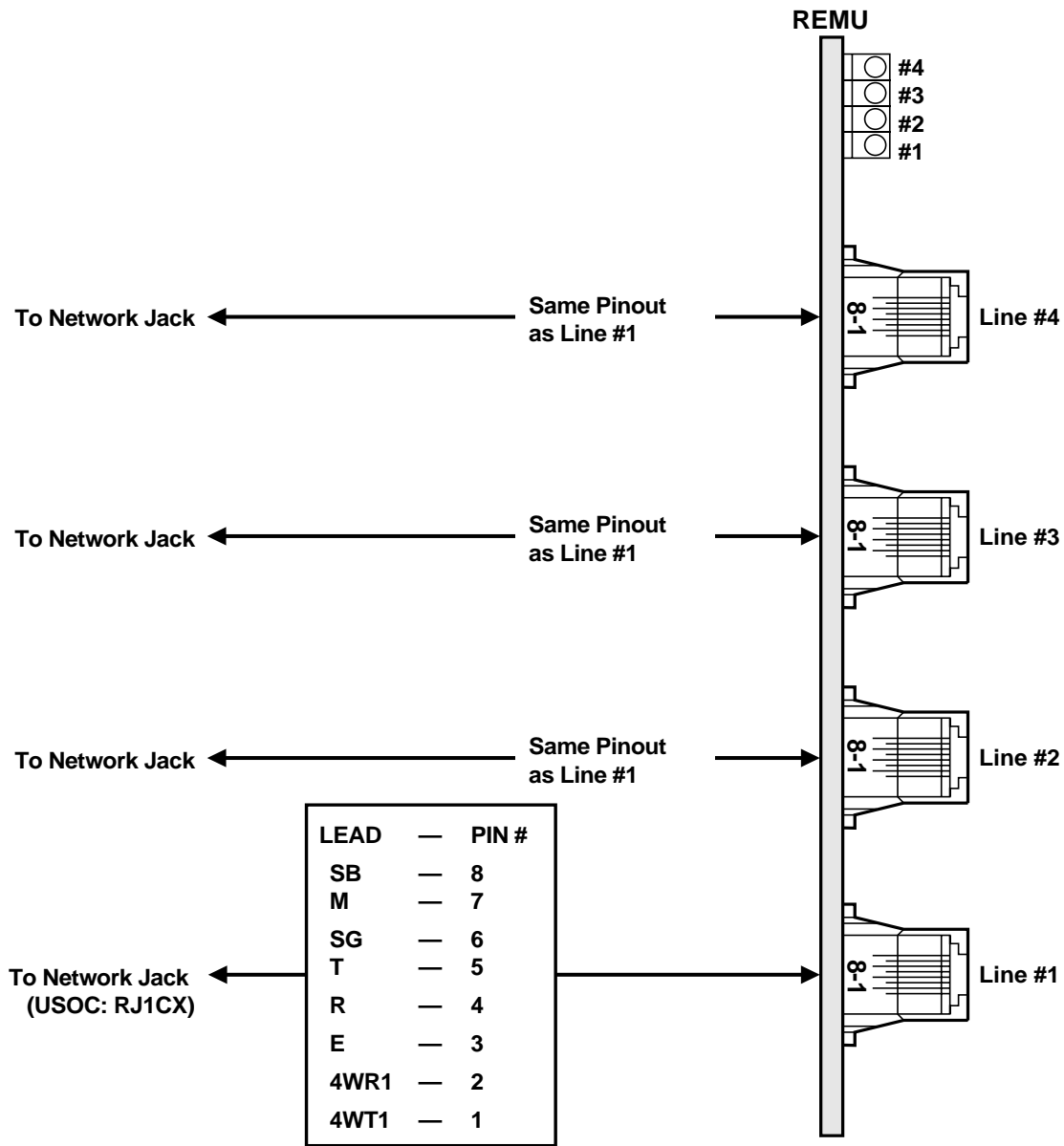
Figure 8-29   MDF Wiring REMU 2/4 Wire Type I/II
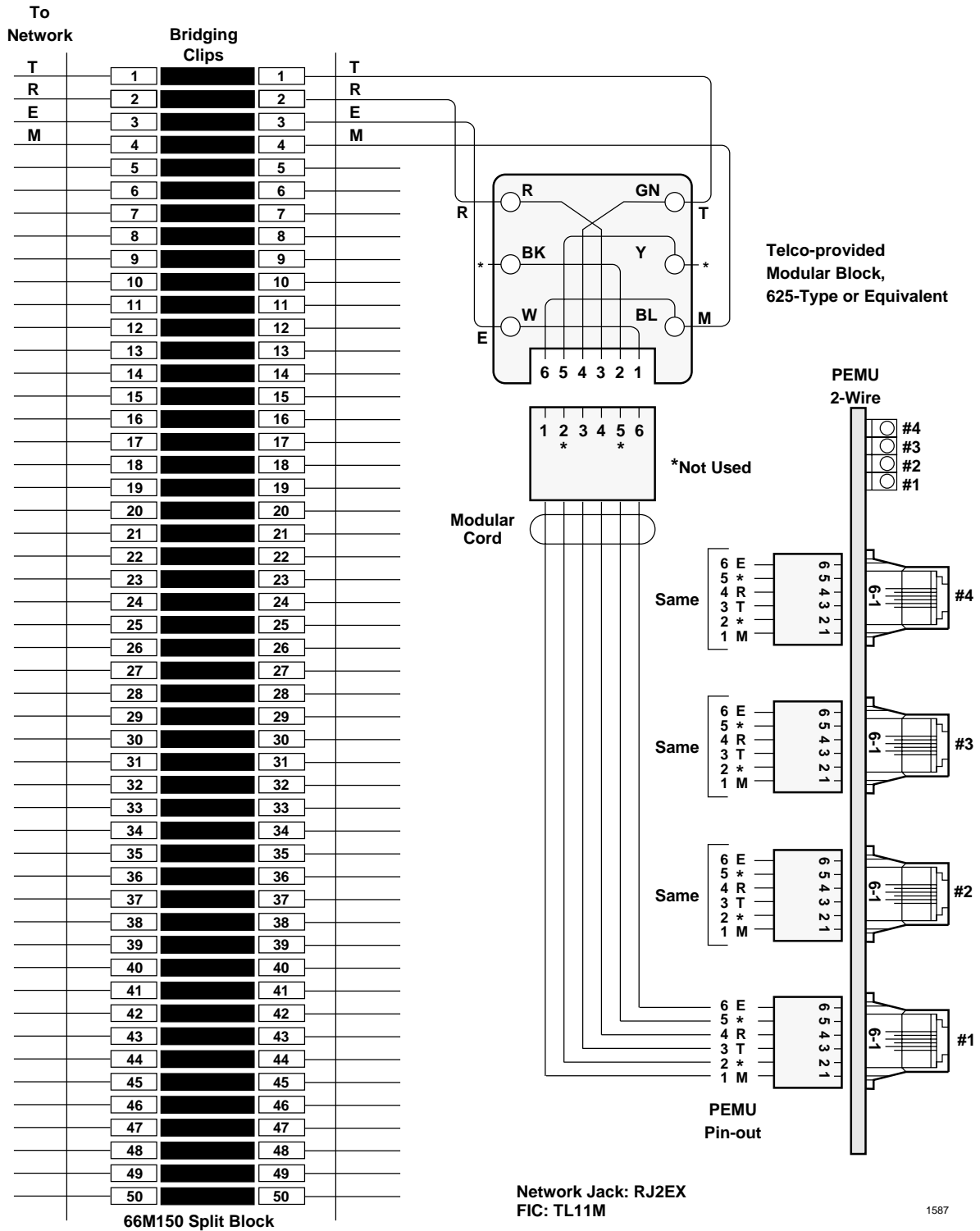
Figure 8-30   MDF Wiring/2-Wire Tie Line to PEMU
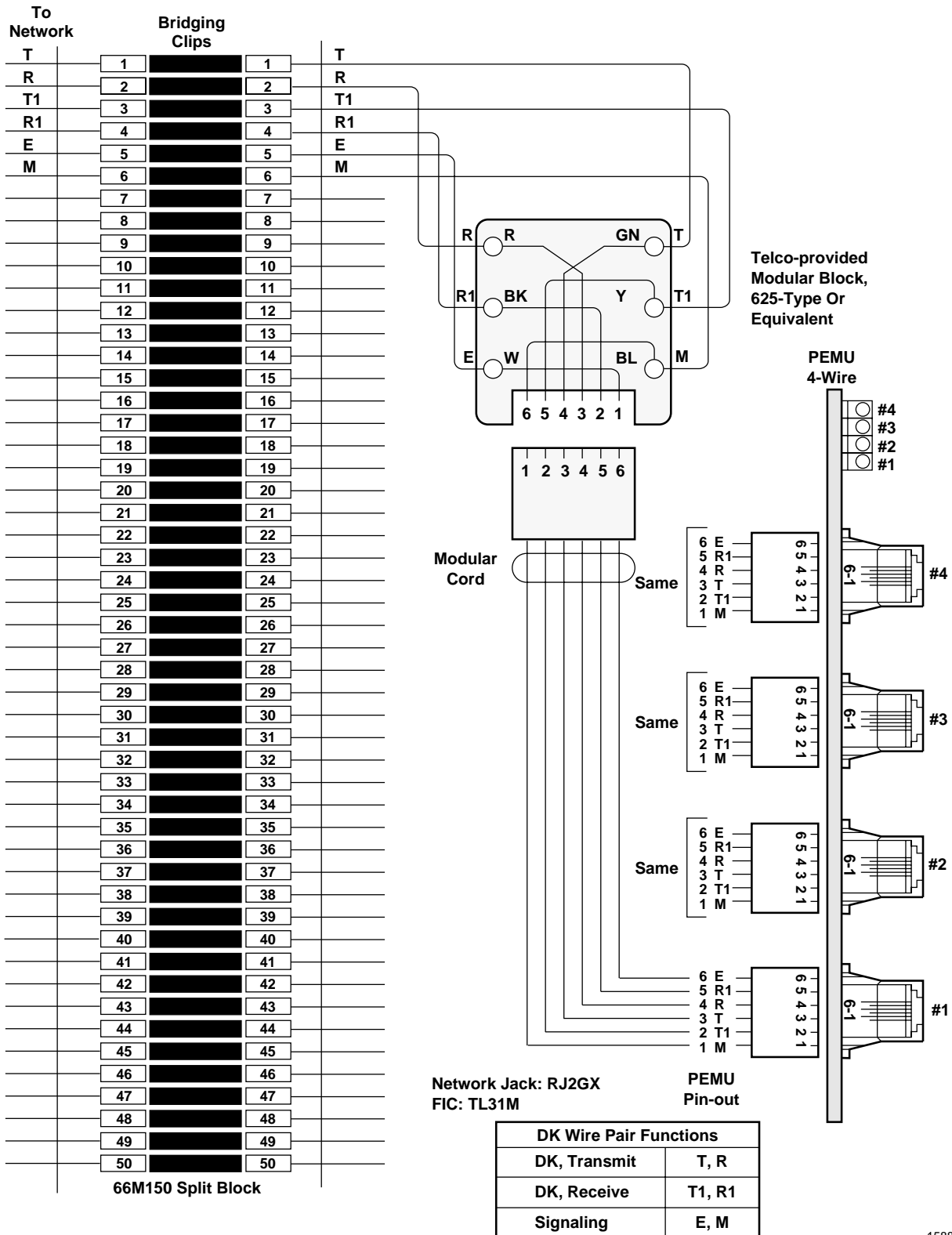
Figure 8-31 MDF Wiring/4-Wire Tie Line to PEMU

DK Wire Pair Functions	
DK, Transmit	T, R
DK, Receive	T1, R1
Signaling	E, M

Network Jack: RJ2GX
FIC: TL31M

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Option Interface PCB Wiring Diagrams
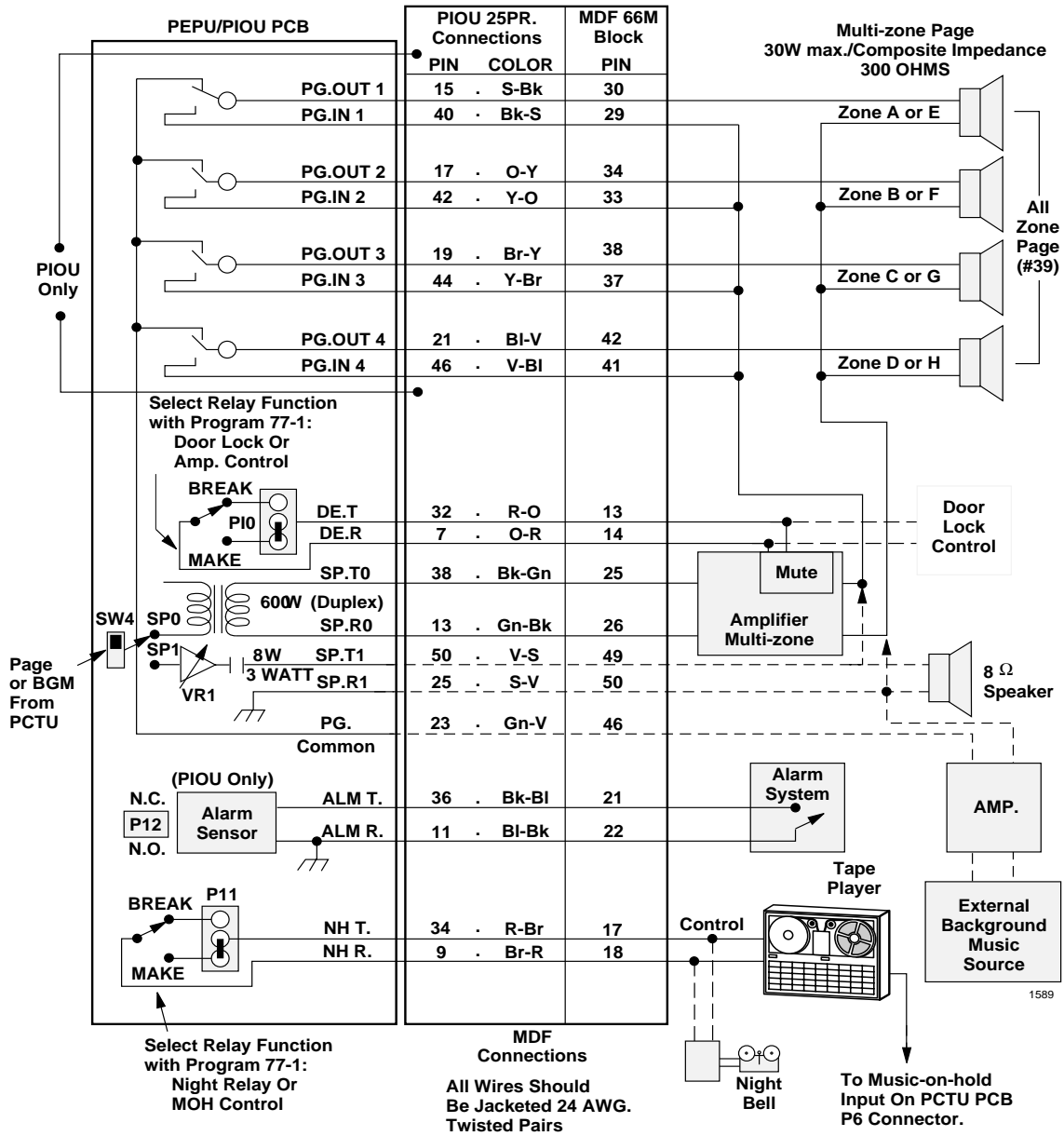
DK40i/DK424 Universal
Slot PCB Wiring

Zones	Access Codes DK40i and DK424 (RCTUA, RCTUBA/BB, RCTUC/D)	Access Codes DK424 (RCTUE/F equipment with a PIOU)
A	#35	#351
B	#36	#352
C	#37	#353
D	#38	#354
E		#355
F		#356
G		#357
H		#358

Note Four-digit access codes are for RCTUE/F only. Zones E~H require a second PIOU PCB.

Figure 8-32 MDF Wiring/PIOU or PEPU Peripherals (25-pair)
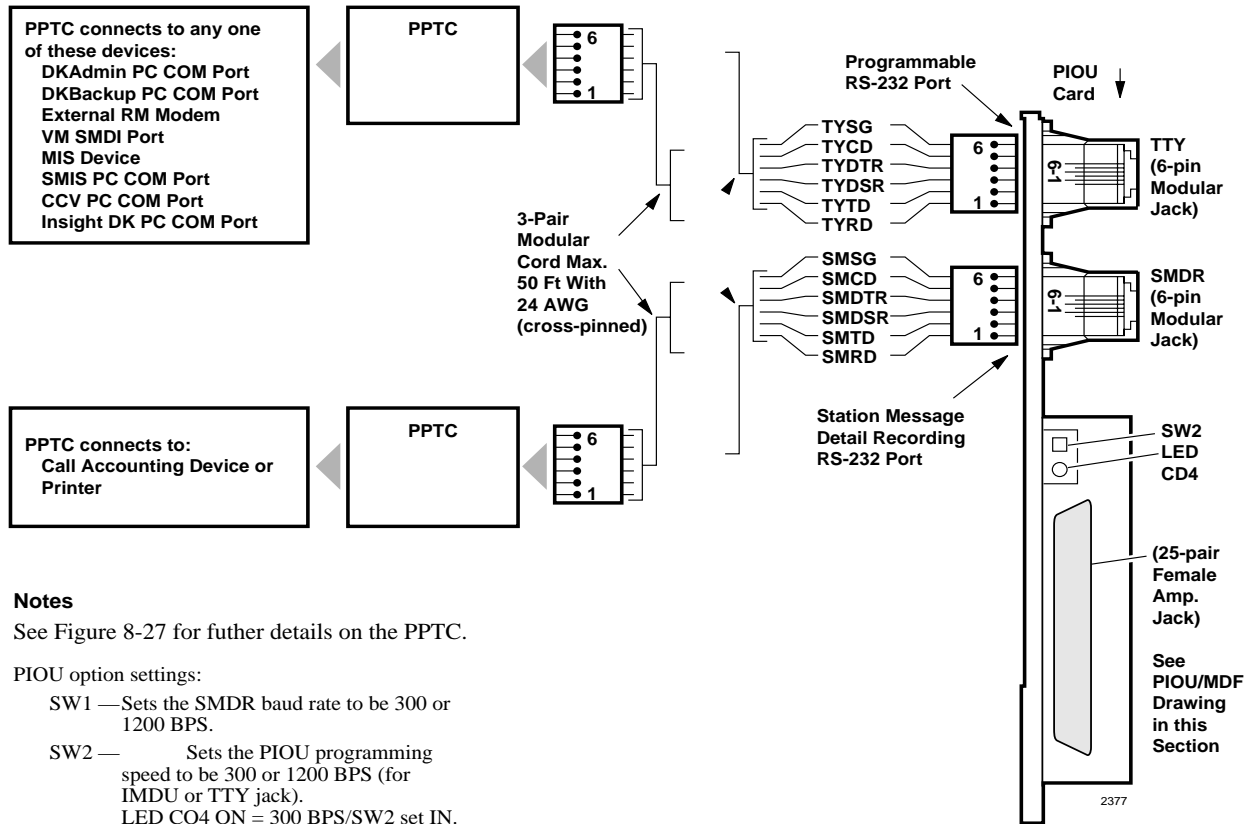
Figure 8-33 PIOU/TTY and SMDR Wiring (with PPTC Adapter)
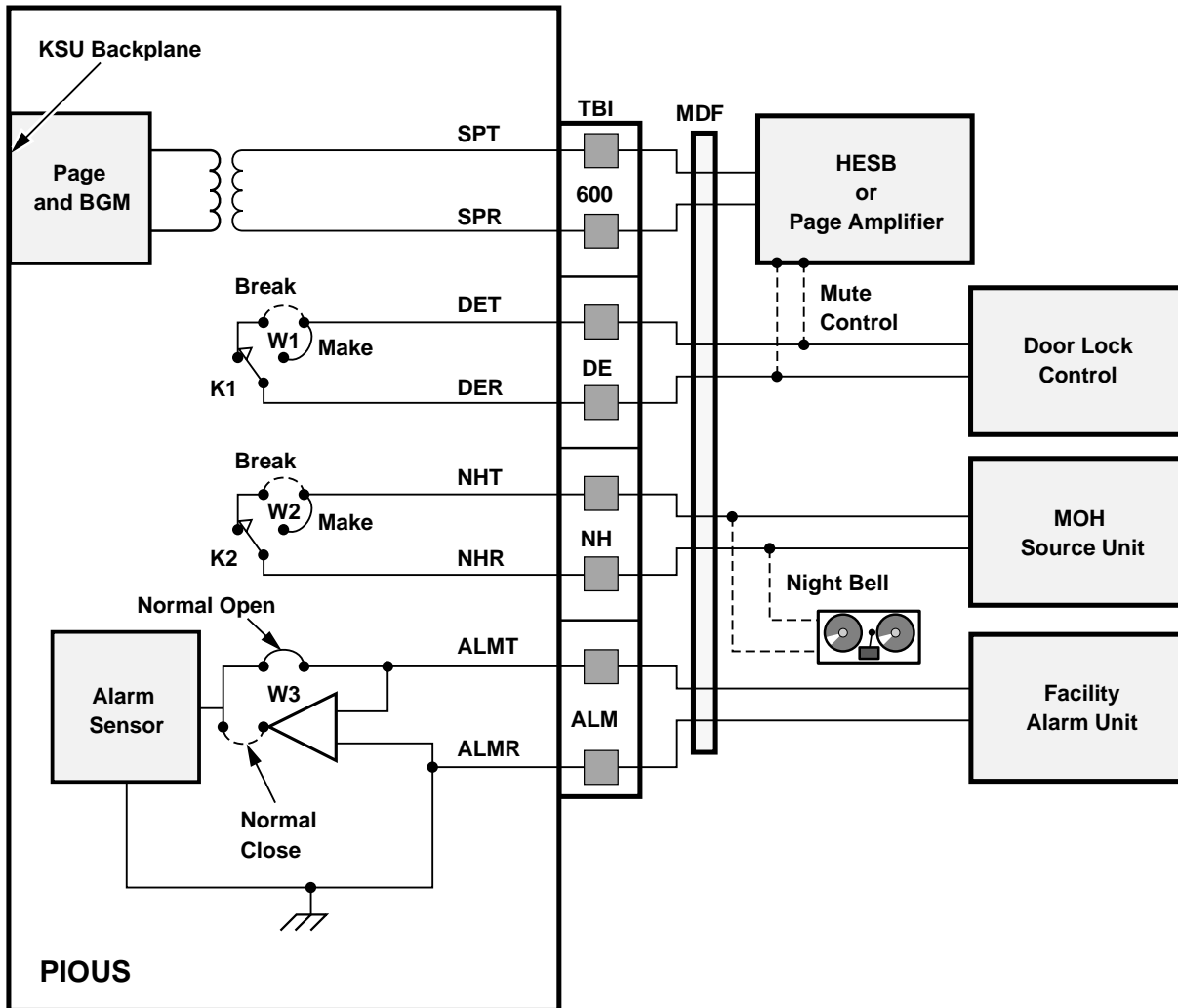
Notes

See Figure 8-27 for futher details on the PPTC.

PIOU option settings:

SW1 —Sets the SMDR baud rate to be 300 or 1200 BPS.

SW2 —   Sets the PIOU programming speed to be 300 or 1200 BPS (for IMDU or TTY jack). LED CO4 ON = 300 BPS/SW2 set IN. LED CO4 OFF = 1200 BPS/SW2 set OUT.

SW3 —Sets the PIOU to operate with the IMDU or an external device connected to the TTY modular jack.
> MODEM — For IMDU operation.
> TTY — For ASCII terminal or external modem.

W4 — Sets the IMDU and TTY jack for bell or CCITT specification.

Relay Options:

- **K1 (DE): Door Lock or Amp Mute Control; Program 77-1, LED 07**
- **K2 (NH): Night Relay or Music-on-hold Control; Program 77-1, LED 05**
- **K1 & K2: 24 VDC, 1 Amp Maximum**

Notes

- All wiring connections must be 24 AWG twisted pairs.
- Dotted lines show optional connections; only one optional connection is allowed.

1591

Figure 8-34   PIOUS Page/Relay/Alarm Connections
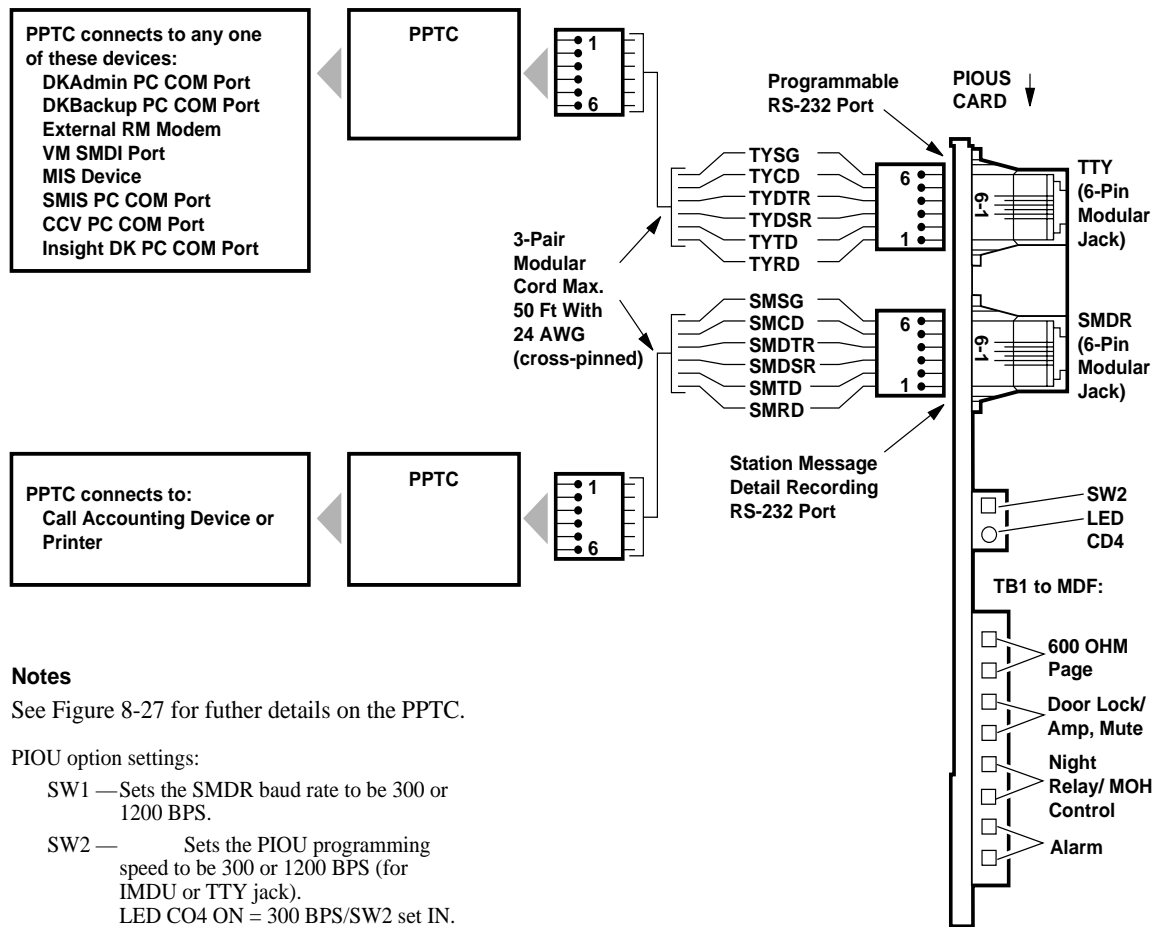
Notes

See Figure 8-27 for futher details on the PPTC.

PIOU option settings:

SW1 —Sets the SMDR baud rate to be 300 or 1200 BPS.

SW2 — Sets the PIOU programming speed to be 300 or 1200 BPS (for IMDU or TTY jack).
LED CO4 ON = 300 BPS/SW2 set IN.
LED CO4 OFF = 1200 BPS/SW2 set OUT.

SW3 —Sets the PIOU to operate with the IMDU or an external device connected to the TTY modular jack.
MODEM — For IMDU operation.
TTY —For ASCII terminal or external modem.

W4 — Sets the IMDU and TTY jack for bell or CCITT specification.

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Figure 8-35 PIOUS SMDR/TTY Options and Wiring (with PPTC Adapter)

DK40i/DK424 Universal
Slot PCB Wiring

RSIU/RSIS/RMDS Modular Jack

6-wire Modular Cord - telephone type
(modular jack locking tabs on the same
side of each cord).

Toshiba PPTC PC COM Port

RSIU (plug-in motherboard)

Port 1 — MIS[2] — ACD/MIS PC

RSIS (piggy-back)[1]
serial interface subassemly — Port 2 — SMDI[2] — Stratagy Voice Mail System

RSIS (piggy-back)[1]
serial interface subassemly — Port 3 — SMDR[2] — Station Message Detail Report

RMDS or **RSIS** (piggy-back)[1]
(2400 bps modem or serial interface)[3] — Port 4 — TTY[2] — DKAdmin/DKBackup PC

CAUTION! Do not plug CO line or
RSTU tip/ring into RMDS
or RSIU modular jack

Notes

1. The RSIU can be configured with up to three RSIS, or two RSIS and one RMDS (in any position). Use Program 76 to set RSIU/RSIS/RMDS port types.

2. All RSIU/RSIS/RMDS ports are system programmable to allow up to four of any of the functions: SMDR, MIS, CCV, SMDI, TTY, and remote modem.

3. When the RMDS is used as a modem, the modular jack is not used. If the RMDS is used as an RS-232 interface port, the modular jack is used.

DKAdmin or
DKBackup
PC

Remote
Modem — CO Line — Telephone
Network — CO Line

RS-232 Cable

RSIU

RMDS

CO Line
Circuit

Flash
or ROM
and
RAM

Time
Switch

Strata DK

4274

CO line connects to RMDS port
(#19) via: DID, Auto Attendant,
DISA, Ring transfer, or ringing
assignments.

Figure 8-36   DK424 RSIU/RSIS/RMDS Wiring Diagrams
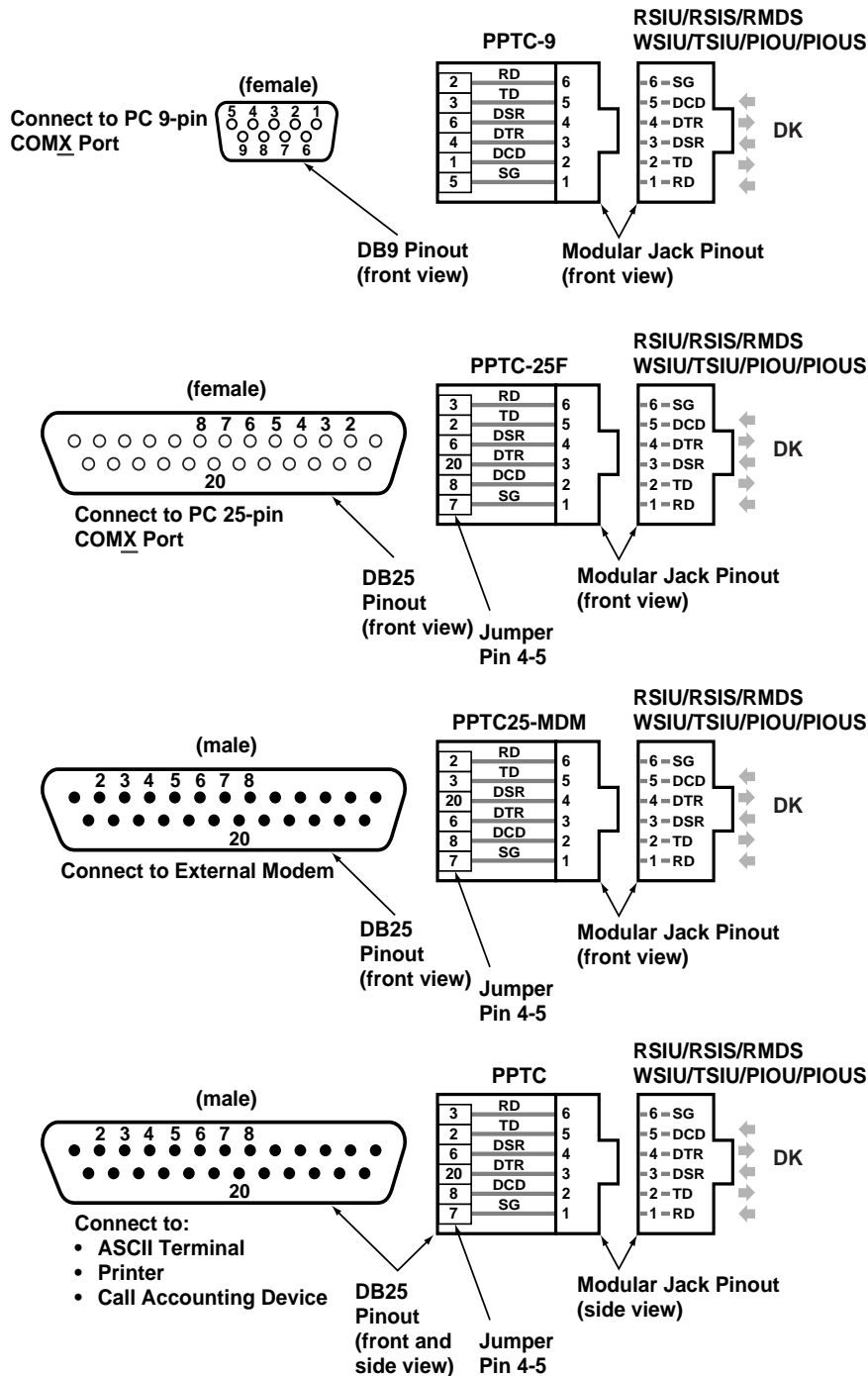
1. The above modular adapters can be used to connect PCs, terminals, and SMDR devices to WSIU, TSIU, RSIU, RSIS, RMDS, PIOU, and PIOUS RS-232 ports.

2. PPTC will not connect directly into a 25-pin PC COM port because they are male gender.

3. All PPTC, PPTC9, PPTC25F connections require a 6-wire, telephone type modular cord (with modular jack locking tabs on the same side of each cord.)

4. See Chapter 1 – DK14 Installation for connection the MLX-41 Caller ID interface box to the WSIU, RS232 port using PPTC-CLID14.

Figure 8-37   DK RS-232 Modular Adapter Pin Configuration

Station Apparatus 9

This chapter provides instructions on how to connect telephones to the Strata DK systems and how to configure and upgrade them for optional features. Procedures for installing direct station selection consoles and door phones also appear in this chapter.

Types of Telephones

The Strata DK systems can support digital, electronic and standard telephones.

Digital Telephones

Installation instructions for digital telephones in this chapter and elsewhere in this manual apply only to the Toshiba 2000- and 1000-series digital telephones. The 2000-series digital telephones consist of four models:

DKT2010-H

The DKT2010-H is a 10-Button Digital Telephone with Handsfree Answerback.

1867

DKT2020-S

The DKT2020-S is a 20-button Digital Speakerphone.

1877

DKT2010-SD

The DKT2010-SD is a 10-Button Digital Speakerphone with Liquid Crystal Display.

3645

DKT2020-SD

The DKT2020-SD is a 20-Button Digital Speakerphone with Liquid Crystal Display.

1869

There are two 1000-series digital telephone models, the DKT1020-H and DKT1020-SD.

Electronic Telephones

The electronic telephone instructions in this manual apply to the Toshiba 6500-series electronic telephones. They consist of four models: the EKT6510-H, EKT6510-S, EKT6520-H, and EKT6520-SD.

Note   Other electronic telephones that are compatible with the Strata DK systems are the 2000-, 3000-, and 6000-series telephones.

Important!   *When you install 2000-, 3000-, or 6000-series electronic telephones, you must calculate the system power factor using the tables provided in Chapters 2 or 4 to ensure that the system power supply is not overloaded.*

Standard Telephones

500- and 2500-type standard telephones apply whenever standard telephones are mentioned in this manual.

Strata AirLink Wireless Handset

Strata AirLink™ wireless systems add wireless telephone service to Strata DK16 and DK16e, DK40, DK40i, DK280, and DK424 and many non-Toshiba telephone systems. There is one handset model (shown at right) that stores up to eight system and handset IDs that are configured by your System Administrator.

The handset has a two-line Liquid Crystal Display (LCD) that shows alphanumeric information, including the idle message, date, call duration, icons and specific call activity.

For installation instructions of the systems and operation of the handset, see Chapter 16 – Strata AirLink Systems and the *Strata AirLink Handset User Guide.*

Telephone Installation

This section describes the wiring required to connect telephones to the system. Before installing any telephone wiring, read the following warning and caution notes:

> **WARNING!**
> ➤ **Never install the telephone wiring during a lightning storm.**
> ➤ **Never install the telephone jacks in wet locations, unless the jack is specifically designed for wet locations.**
> ➤ **Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.**
> ➤ **Use caution when installing or modifying telephone lines.**
> ➤ **If telephone, DSS console, door phone control box, or door phone wiring exits the building, external secondary protection is required. See Chapter 8 – DK40i/DK424 Universal PCB Wiring.**

CAUTION! **When installing the station cable, do not run the cables parallel if they are within three feet of an AC power line. AC power lines should be crossed at right (90○) angles only. In particular, avoid running station wire pairs near devices that generate electrical noise, such as neon or fluorescent light fixtures.**

Important! *For DK14, see Figure 1-15 on Page 1-22, for DK40i, see Figure 3-24, and for DK424, see Chapter 5 – DK424 Installation for station apparatus secondary protection information.*

The DKT2000 V.4 series telephones have DIP switches that enable use for the international market. The DIP switches are located underneath the flexible button key strip on the DKT2000 V.4 series telephones (see Figure 9-1). On the DKT2001, the DIP switch is located on the base.
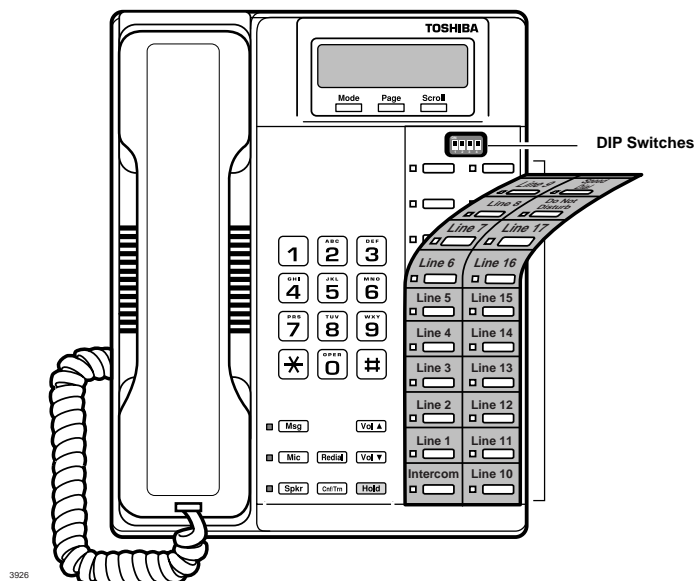
Figure 9-1   DKT 2000-series V.4 DIP Switches

Table 9-1 shows the correct country settings for the DKT2010-S, DKT2020-S, DKT2010-SD, DKT2020-SD, DKT2001 V.4 telephones.

Note The default DIP switch settings are preset for the USA and Canada. Therefore, you do not need to adjust any of these from the default factory settings for North America.

Table 9-1   DKT International DIP Switch Settings

Country	Dip Switch				DIP Switch Position
	1	**2**	**3**	**4**	
USA Canada (Default Setting)	ON	ON	ON	ON	ON ▪▪▪▪ 1 2 3 4
Mexico	ON	ON	ON	OFF	ON ▪▪▪▪ 1 2 3 4
Taiwan	OFF	ON	ON	ON	ON ▪▪▪▪ 1 2 3 4
Hong Kong Thailand*	ON	OFF	ON	ON	ON ▪▪▪▪ 1 2 3 4
Singapore Malaysia Indonesia Sri Lanka India China	OFF	OFF	ON	OFF	ON ▪▪▪▪ 1 2 3 4

3925

* The DKT2000 V.4 is not compatible for Hong Kong and Thailand. Use the V.4A or later versions in these two countries.

System Connection

Digital Telephones

The following provides information on how to connect digital telephones to the DK system.

Note Before proceeding, see warning and caution notes in "Telephone Installation".

Digital telephones connect to the digital telephone ports via the MDF with standard twisted-pair jacketed telephone cable. If using 24 AWG cable, single-pair wiring is sufficient in most cases for digital telephones to operate effectively at up to 1000 feet from the system.

Digital telephones that are equipped with Integrated Data Interface Units or ADMs should have two-pair (or external power) to function effectively at this distance. This also applies to digital telephones supported by systems that must operate with battery reserve power – Chapter 5 – DK424 Installation, Table 5-2 on Page 5-5.

To accommodate the digital telephone line cord, the cable should be terminated in a modular station connector block (RJ-11) at the station location. The standard single-pair, modular digital telephone cord that is sent with the telephone is 7 ft. (the maximum allowed is 25 ft.).

Note Digital telephone cable runs must not have cable splits (single or double), cable bridges (of any length), or high resistance or faulty cable splices.

Electronic Telephones

The following provides information on how to connect electronic telephones to the Strata DK system.

Note Before proceeding, see warning and caution notes in "Telephone Installation" on Page 9-3.

Electronic telephones are connected to electronic telephone circuits in the DK40i Expansion Unit on the Electronic Telephone Interface Unit (PEKU) and the Standard/Electronic Telephone Interface Unit (PESU) via the MDF with standard twisted-pair jacketed telephone cable. Two-pair wiring, as a minimum, is required for telephone connection. However, three-pair wiring is recommended for some upgrades, such as OCA.

To accommodate the electronic telephone line cord, the cable should be terminated in a modular station connector block (RJ-11) at the station location. The standard two-pair modular electronic telephone cord length is 7 feet (the maximum allowed length is 25 feet). See Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for more details.

If using 24 AWG cable, the overall length of the station cable run from the DK40i Base KSU to the telephone must not exceed 1,000 feet (305 meters).

Standard Telephones

The following provides information on how to connect standard telephones to the DK system.

Note Before proceeding, see warning and caution notes in "Telephone Installation" on Page 9-3.

Standard telephones connect to standard telephone circuits of the Standard Telephone Interface PCBs: RSTU, RSTU2, RDSU/RSTS, PSTU, PESU, KSTU2 (DK40i only), and QSTU2 (DK14 only). Standard telephones connect to RSTU, RDSU/RSTS, PSTU or PESU via the MDF with standard twisted-pair jacketed telephone cable. (See single-pair wiring Chapter 8 – DK40i/DK424 Universal PCB Wiring for more details.)

The standard telephone cable's overall loop resistance, connected on- or off-premises, is 300 ohms maximum, (for PSTU, PESU, KSTU2, or QSTU2), 600 ohms for RSTU and RDSU/RSTS with -24VDC (*no* R48S), and 1200 ohms for RSTU and RDSU/RSTS with -48VDC (R48S installed on RSTU, RSTU2, or RDSU PCB), including the telephone resistance. This also applies to all devices connected to standard telephone circuits.

A standard telephone connected off-premises via the telephone network should interface with OL13A, OL13B, or OL13C lines (or equivalent) and connect to an RJ21X, FIC jack or equivalent, (see Chapter 8 – Universal Wiring Diagrams and Table 5-3, "DK424 Network Requirements" on Page 5-6).

Telephone Wall Mounting

This section explains how to mount digital and electronic telephones to a wall or other vertical surface. See the manufacturer's documentation for instructions on mounting standard phones.

Notes

- Digital telephones equipped with PDIU-DIs, RPCI-DIs or PDIU-DI2s cannot be wall mounted.
- Electronic and older digital telephones equipped with an HHEU1 can be wall mounted. 2000-series digital telephones with headsets can only be wall mounted with an HHEU2.

➤ **To mount digital and electronic telephones**

Refer to Figures 9-2~9-3 and the following steps.

1. Loosen the captive screws, and remove the telephone base.

2. Using a suitable cutter, remove the handset hanger from the base.

3. Insert the handset hanger in the slot on the front of the phone. The hanger fits in the notch on the handset cradle.

4. Rotate the telephone base 180 degrees and secure it to the telephone with its four captive screws.

5. Connect the phone to the wall modular connector with a cord approximately four inches long (available at most telephone supply companies).

6. Route the cord into the hollow portion of the base.

7. Mount the phone on the wall mounting modular connector plate.
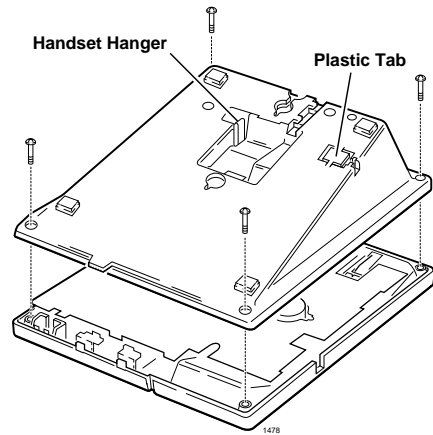
Figure 9-2   Removing the Telephone Base

Figure 9-3   Wall Mounting Base Rotation

Figure 9-4   Handset Hanger

Telephone Upgrades

Digital and electronic telephones can be upgraded for a number of features; there are no upgrades for standard telephones. Each of these upgrades shares a circuit with the telephone that it is connected to and is not considered a station. See Table 9-2 for more information.

Table 9-2   Telephone Subassembly Upgrades

Subassembly	Host Telephone	Function	Capacity
DVSU[1]	2000- and 1000-series Digital Telephones	Provides interface for digital telephone to receive Speaker Off-hook Call Announce (OCA). Not required for Handset/Headset OCA.	1 per telephone
HHEU	2000- and 1000-series Digital Telephones. 6500- and 6005-series Electronic Telephones.	Provides interface for headset and loud ringing bell to telephone. Can be installed with DVSU, RPCI-DI, or DADM.	
RPCI-DI[1]	2000-series Digital Telephones	Provides TAPI PC application and data calling interfaces.	
DADM[1]	2000-series Digital Telephones	Provides telephone with 20 (or 40 with two DADMs) additional feature buttons for DSS, System or Station speed dial, or CO line appearances.	1 or 2 per telephone

1. Only one of the following subassemblies allowed per telephone: DVSU, RPCI-DI or DADM.

Digital Telephone Upgrades

This section describes how to upgrade and configure 2000- and 1000-series digital telephones for features and options.

TAPI and Simultaneous Voice and Data Upgrades (RPCI-DI, PDIU-DI2 and PDIU-DI)

Both the 2000- and 1000-series digital telephones can be upgraded with an integrated data interface unit to transmit and receive simultaneous voice and data calls. There are three versions of the integrated unit:

♦ RPCI-DI and PDIU-DI2 for the 2000-series telephones

♦ PDIU-DI for the 1000-series telephones.

Asynchronous devices, such as PCs and terminals, can be connected to the standard RS-232 connector of the RPCI-DI or PDIU-DI2. Station users are able to transmit and receive RS-232 data over the single-wire pair of the RPCI-DI or PDIU-DI2 equipped telephone.

TAPI/Data Communications Modes

The RPCI-DI can operate in two modes: the TAPI or the data communications mode. The mode is changed by sending the appropriate control signal to the RPCI-DI from the PC to which the RPCI-DI is connected.

TAPI Mode

In the TAPI mode, the PC connected to the RPCI-DI can place telephone calls. The PC can also receive Caller ID, ANI, and DNIS information received by the RPCI-DI telephone. When in the TAPI mode, the RPCI-DI is designed to be compatible with Microsoft TAPI application programs.

Station Apparatus (side tab)

For more information, see Chapter 13 – Computer Telephony Integration. If an RPCI-DI only needs to support TAPI (and not data–see Notes below) it can be connected to any digital telephone circuit.

Data Communications Mode

In the data communications mode, data calls can be from a telephone with the **Data Call** button and disconnected with the **Data Release** button. Digital telephones can have a **Modem** button for reserving a modem or monitoring modem availability and status. These feature buttons are assigned to telephones with Program 39. Data and voice calls can be dialed from a terminal or PC using standard "AT" commands.

Notes

- 1000-series digital telephones with an RPCI-DI or PDIU-DI2 cannot be wall-mounted or equipped with an Add-On-Module (ADM) or DVSU for Speaker OCA. A 2000-series digital telephone with a PDIU-DI2 or RPCI-DI can support an HHEU at the same time, but cannot support a DVSU or ADM and can be wall-mounted.

- Only PDKU1 circuits 1~7 can support RPCI-DI or PDIU-DI2s; all PDKU2 and Base Unit digital circuits can support PDIU-DI2 and RPCI-DIs.

- RPCI-DIs and PDIU-DI2s that support data communications mode, must be connected to digital telephone circuits that support 2B channels. The digital circuits that support RPCI-DI data communication are:

    DK14 – all digital telephone circuits.

    DK40i – all digital telephone circuits except those installed in slot 17 and 18 of the expansion unit.

    DK424 – see Tables 4-4 and 4-5 of the Chapter 4 – DK424 Configuration.

RPCI-DI/PDIU-DI2 Installation

See Figures 9-2, 9-5 and 9-6 and follow these steps:

1. Loosen the four screws on the digital telephone base and remove the base.

2. Insert the two integrated unit wire plugs into the connectors on the PCB in the telephone (observing the red wire for correct positioning).

3. Attach the integrated unit to the bottom of the phone. Install the PDIU-DI for 1000-series; install PDIU-DI2 or RPCI-DI for 2000-series phones. Secure with the four captive screws.

Note RPCI-DI V2s require some modification when installed in DKT versions 1~3; RPCI-DI V2s in DKT version 4 or higher do not require any modification.

4. Remove the directory tray from the original telephone base and install it on the integrated unit phone base. Squeeze the tray on its sides so it bows slightly to remove and re-install.

5. See Chapter 5 – DK424 Installation, Table 5-2 on Page 5-5 for loop limits. Install a two-pair house cable (or external power) and a two-pair modular cord (supplied with PDIU-DI), if required for distance.

RPCI, PDIU-DI1/PDIU-DI2 Programming

Program 39: Assigns the **Data Call**, **Data Release**, and **Modem** buttons.

Programs 20 and 22: RPCI and data interface unit assignments.
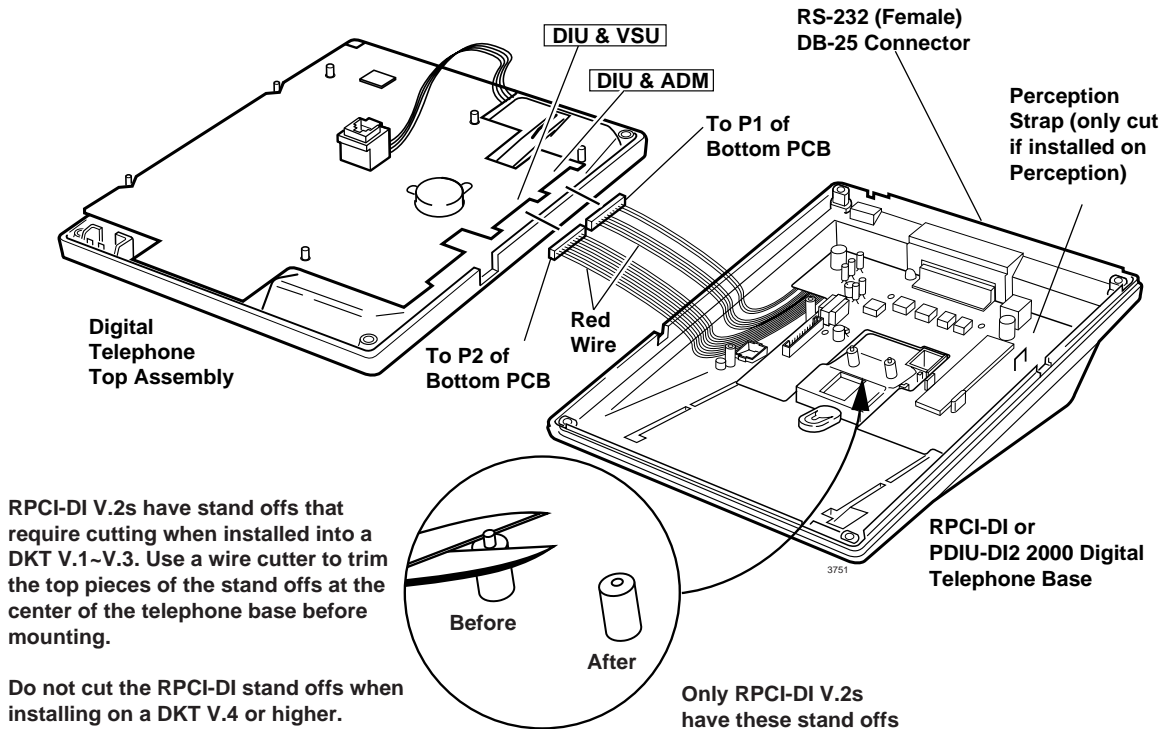
Figure 9-5   RPCI-DI or PDIU-DI2 Installation into 2000-series Digital Telephone
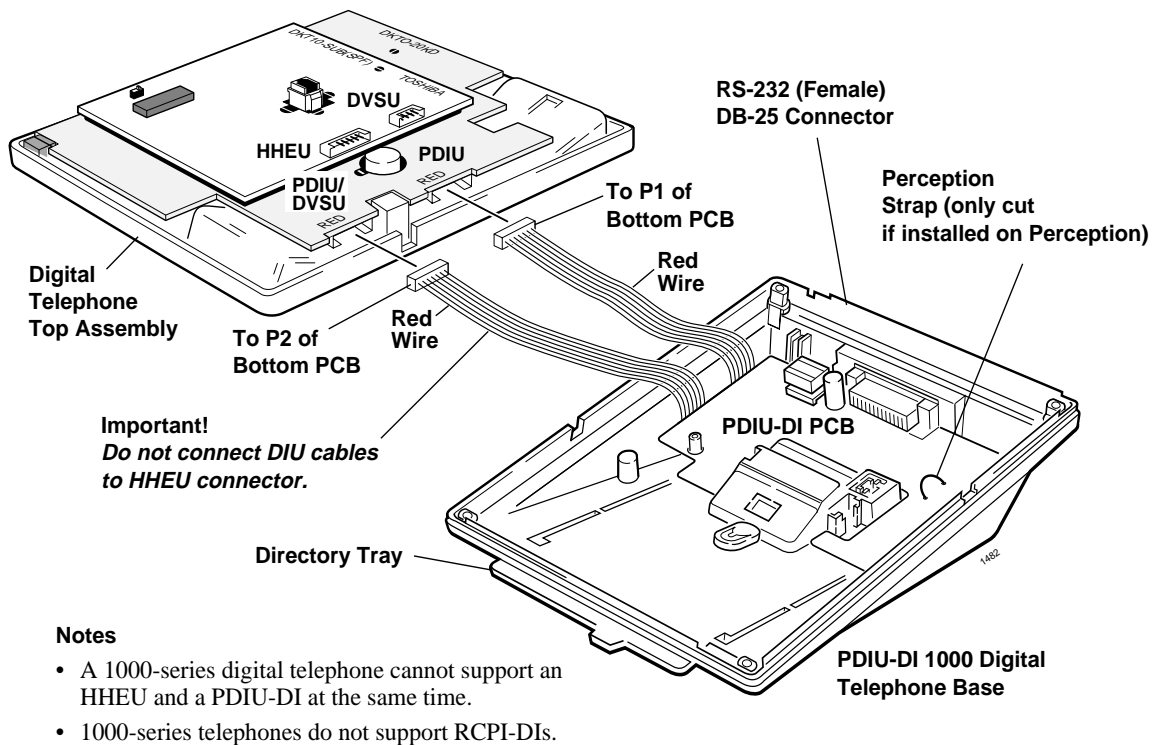
Figure 9-6   PDIU-DI Installation into 1000-series Digital Telephone

Telephone Speaker Off-hook Call Announce Upgrade (DVSU)

To receive Speaker Off-hook Call Announce (OCA) calls over the digital telephone speaker, a digital telephone must be upgraded with a DVSU; the telephone making the call does not require a DVSU. In a DK system with release 3 and above software, a DVSU is not required to receive OCA in the telephone handset or headset. An additional wire pair is not required for digital telephones that receive Speaker OCA calls. The DVSU is compatible with both 2000-series and 1000-series digital telephones.

Notes

● Digital telephones cannot be equipped with a DVSU and integrated data interface unit (PDIU-DI, RPCI-DI or PDIU-DI2) or DADMs at the same time.

● Program 03, Code 62 or 64 must be set for the PDKU and Code 28 for the RDSU for telephones that are to receive Speaker OCA and Program 31 LED 03 must be turned ON for telephone ports.

● DVSU is not necessary to receive handset OCA.

DVSU Upgrade Installation

See Figures 9-2 and 9-7~9-10 and follow these steps:

1. Loosen the four captive screws on the telephone base and remove the base.

2. Loosen the four captive screws on the metal plate to the standoffs inside the base. Remove and discard the plate.

3. Position the DVSU PCB on the standoffs), and secure with the four provided screws.

4. If installing the DVSU into a 2000-series digital telephone and then connect the DVSU wire plugs to the DVSU connectors on the PCB inside the telephone.

...or if installing the DVSU into a 1000-series digital telephone and connect the DVSU wire plugs to the DVSU connectors on the PCBs inside the telephone.

5. Reinstall the telephone base and secure it with its four captive screws.
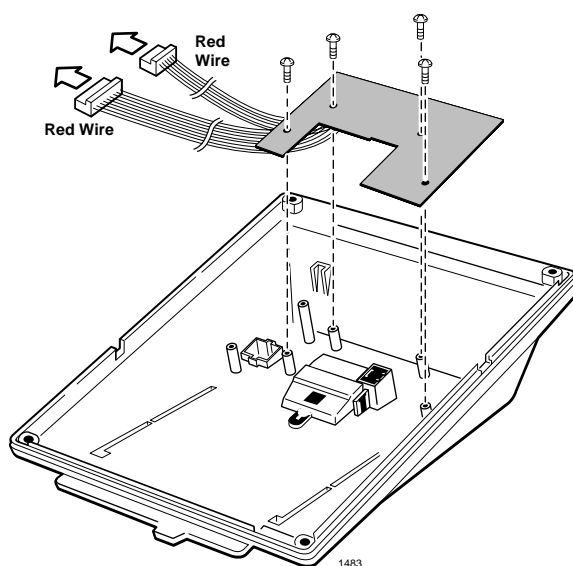
Figure 9-7   DVSU Installation for Digital Telephones
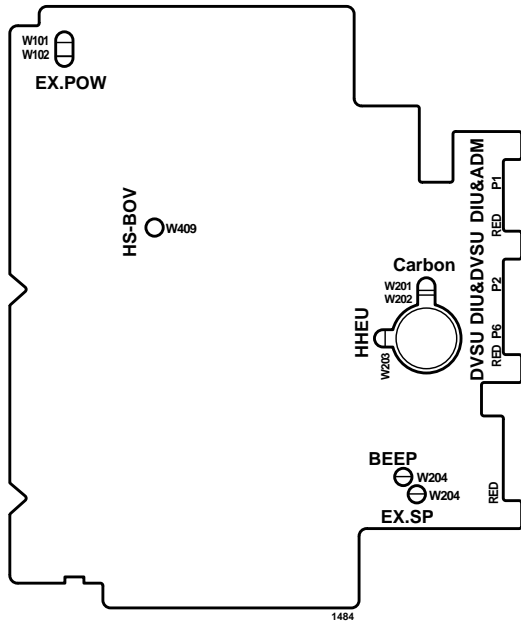
Figure 9-8   DKT2010-H Strap and Connector Locations
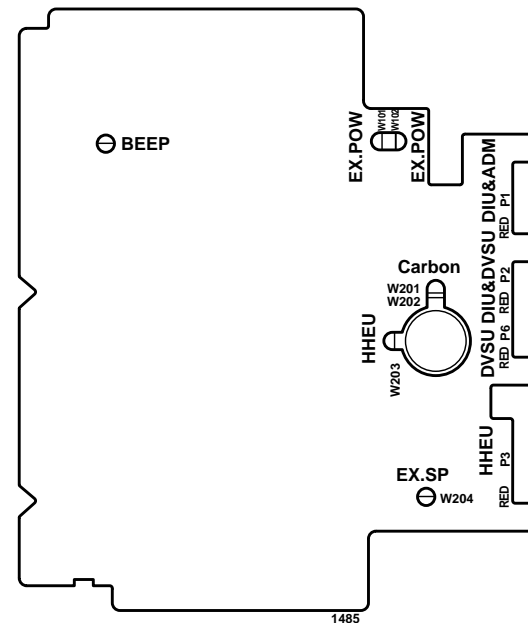
Figure 9-9   DKT2010-SD, DKT2020-S, and DKT2020-SD Strap and Connector Locations

Station Apparatus
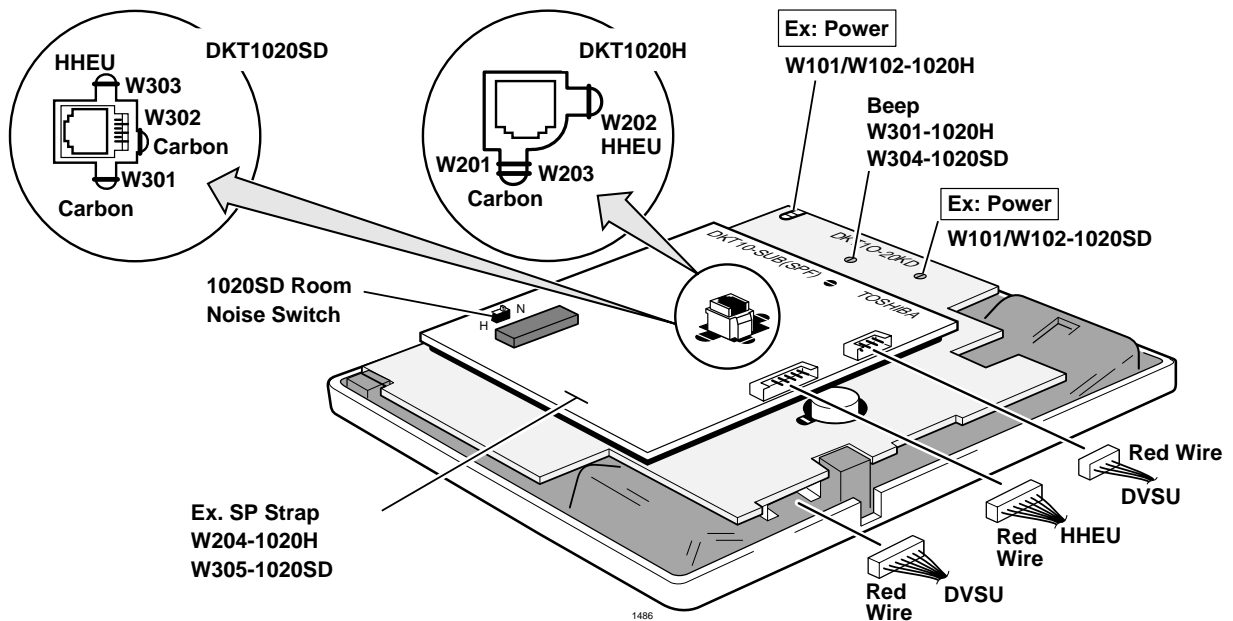
Figure 9-10   1000-series Digital Telephone Strap and Connector Locations

Loud Ringing Bell/Headset Upgrade (HHEU)

The Loud Ringing Bell/Headset upgrade (HHEU) enables an external speaker (HESB) for the Loud Ringing Bell feature and/or a headset to be connected to both series of digital telephones.

Notes

- There are two types of HHEUs: the HHEU1 (which has four versions, V.1~V.4) and the HHEU2.

- Both 2000- and 1000-series digital telephones require either an HHEU2 or a V.3 or V.4 HHEU1 for HESB operation; earlier HHEU1 versions are only sufficient for headset operation only.

- Only digital telephones equipped with an HHEU2 can be wall mounted. The HHEU2 is identical to the V.4 HHEU1, except that the HHEU2 has longer wires to accommodate wall mounting.

- A Toshiba HESC-65A cable is required to connect the HHEU in a digital telephone to the HESB.

- 1000-series digital telephones cannot be equipped with the HHEU (any type or version) and the integrated data interface unit (PDIU-DI) at the same time, but 2000-series digital telephones can support an HHEU and a RPCI-DI or PDIU-DI2 at the same time.

HHEU Upgrade Installation

See Figures 9-2 and 9-8~9-12 and follow these steps:

1. Loosen the four captive screws on the telephone base, and remove the base.

2. Use a screwdriver or other suitable tool to remove the plastic tab on the back of the base. (The HHEU modular connector for the headset is accessed through this opening.)

3. If installing a V.3 HHEU1, set the SW601 switch on the HHEU to headset for the headset or loud bell application.

    V.4 HHEU1 and HHEU2 do not have this switch, because they are automatically set for the headset/loud bell application.
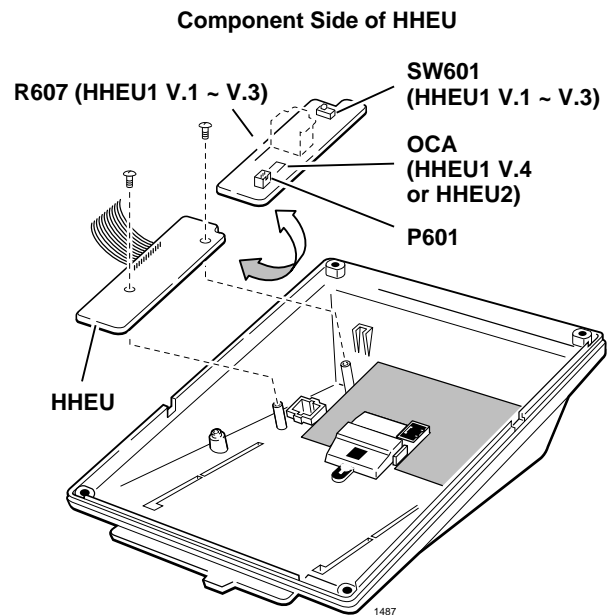
Figure 9-11   HHEU Installation for Digital Telephones

4. Connect the HESC-65A cable to P601 of the HHEU (both HHEU1A versions and the HHEU2 have P601) if the Loud Ringing Bell option is required.

   Refer to Chapter 10– Peripheral Installation for HESB installation procedures.

5. For the V.3 HHEU1: If only the headset is connected to the HHEU, cut both sides of the R607 resistor, then remove the resistor to eliminate electrical contact.

Note Do not cut the R607 resistor if connecting an HESB to the HHEU for the Loud Ringing Bell–even if a headset is also installed on the HHEU.

...or

For the V.4 HHEU1 and the HHEU2: if only the headset is connected to the HHEU, cut the speaker OCA strap.

Figure 9-12 HESC-65A Cabling

Note Do not cut the speaker OCA strap if connecting an HESB to the HHEU for the Loud Ringing Bell–even if a headset is also installed on the HHEU.

6. Position the HHEU PCB on the standoffs inside the base, and secure with the two provided screws.

Note See Figures 9-8~9-10 for Steps 7~8.

7. For 2000-series digital telephones. Connect the wire plug of the HHEU PCB to the HHEU connector on the PCB in the phone.

   ...or for 1000-series digital telephones. Connect the wire plug of the HHEU to the HHEU connector on the PCB of the phone.

8. For 2000-series digital telephones: If an HESB will be connected to the HHEU (for Loud Ringing Bell), locate the EX.SP strap on the PCB in the telephone and *cut* the strap.

   ...or for 1000-series digital telephones: If an HESB will be connected to the HHEU, locate and *cut* the EX.SP strap on the upper PCB in the phone.

9. For 2000-series digital telephones: If a headset will be connected to the HHEU, locate and *cut* the HHEU strap on the PCB in the phone.

   ...or for 1000-series digital telephones: a headset will be connected to the HHEU, locate and *cut* the HHEU strap on the upper PCB in the phone

Note If the HHEU PCB is removed from the phone, the HHEU strap must be replaced for proper telephone operation.

10. Reinstall the telephone base; secure with the four captive screws.

Station Apparatus

➤ **To adjust the volume of the HESB Loud Ringing Bell**

1. Call the telephone connected to the HESB.

2. Adjust the volume control on the back of the HESB and the ring volume control on the telephone.

Carbon Headset/Handset Straps

If a carbon-type handset or headset is connected to the handset jack on the side of the telephone, two jumper straps inside the telephone must be cut.

➤ **To cut the straps**

Note You do not need to cut these straps if the headset is connected to the HHEU.

See Figures 9-2 and 9-8~9-10 and follow these steps:

1. Loosen the four captive screws on the telephone base, and remove the base.

2. For 2000-series digital telephones, and cut the W201 and W202 carbon straps.

   ...or

   For 1000-series digital telephones, cut the carbon straps (W301 and W302 on the DKT1020-SD; W201 and W203 on the DKT1020-H).

3. Reinstall the telephone base, and secure it with its four captive screws.

Beep Strap

A "beep" sounds whenever a dial pad or feature button is pressed on a digital telephone.

➤ **To eliminate the beep sound**

See Figures 9-2 and 9-8~9-10 and follow these steps:

1. Loosen the four captive screws from the telephone base and remove the base.

2. Cut the beep strap.

3. Reinstall the telephone base, and secure it with its four captive screws.

Microphone/Speaker Sensitivity Adjustment (Speakerphones Only)

High ambient noise levels may cause the speaker on some digital telephone speakerphone models to cut off frequently.

➤ **To make the 1000-series digital telephone models less sensitive to loud surrounding noise**

1. Loosen the four captive screws on the 1000-series digital telephone speakerphone base (Figure 9-2), and remove the base.

2. For the 1000-series speakerphone model (DKT1020-SD), see Figure 9-10, and locate the room noise switch. Push the switch carefully to the H (high) position (for low sensitivity) when there is high background noise in the area surrounding the telephone.

3. Reinstall the telephone base.

➤ **To make the 2000-series digital telephone models less sensitive to loud surrounding noise**

> ➤ Hold down **Mic** button, then press the **Vol ▲** button. The less-sensitive level will be set after the third flash of the Mic LED.

➤ **To reset the sensitivity back to the normal level**

> ➤ Hold down the **Mic** button, then press the **Vol ▼** button. The normal level will be set after the third flash of the Mic LED.

> **Note** On 2000-series digital telephone speakerphone models that are set for low sensitivity, the Mic LED flashes at the in-use rate when the speakerphone is used. When set to normal sensitivity, the Mic LED is on steady when using the speakerphone.

Busy Override and Camp-on Ring Tone Over Handset/Headset Option

Using a 2000-series digital telephone, the busy override and camp-on ring tones can be sent over the telephone handset or headset, in addition to the speaker. Using a 1000-series digital telephone, the tones sound only over the speaker.

➤ **To send busy override/camp-on ring tones over the handset of the DKT2010-H model**

> 1. Loosen the four captive screws on the telephone base (Figure 9-2), and remove the base.
> 2. Install a strap in the HS-BOV W409 location (see Figure 9-8).
> 3. Reinstall the telephone base.

➤ **To send busy override/camp-on ring tones over the handset/headset of the DKT2010-SD/ 2020-S/2020-SD**

> ➤ Hold down the **Redial** button and press the **Vol ▲** button.

➤ **To block the tone over the handset/headset of the DKT2010-SD/2020-S/2020-SD**

> ➤ Hold down the **Redial** button and press the **Vol ▼** button.

> **Note** For this to function properly with headsets, make sure the speaker OCA strap or R607 is cut on the HHEU PCB and the HHEU strap is cut on the telephone. (See "Loud Ringing Bell/Headset Upgrade (HHEU)" on Page 9-12)

External Power Straps

Digital telephones equipped with options such as integrated data interface units and ADMs require two-pair wiring or external power to operate efficiently at the maximum-allowed distance from the KSU. Two-pair wiring or external power is also necessary for maximum cable run lengths for digital telephones that are connected to systems that must operate with reserve power. (Table 5-2 on Page 5-5.)

Each digital telephone has two external power straps which must be cut for external power when the cabling of the telephone is connected to an external AC/DC power supply.

➤ **To cut the straps**

See Figures 9-2 and 9-8~9-10 and follow these steps:

1. Loosen the four captive screws on the telephone base and remove the base.
2. Depending on the telephone, locate the W101 and W102 external power straps and cut them.

3.   Reinstall the telephone base, and secure it with its four captive screws.

Note   Refer to Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for external AC/DC power supply ordering information and installation instructions.

DKT2000 ADM Installation

See "Digital Add-on Module Installation" on Page 9-29.

Electronic Telephone Upgrades

This section describes how to upgrade and configure electronic telephones for features and options.

Off-hook Call Announce Upgrade (HVSU2 or HVSU/HVSI)

Electronic telephones must be equipped with either the HVSU2 subassembly or the combined HVSU and HVSI subassemblies to receive Speaker Off-hook Call Announce (OCA) calls. These telephones also require three-pair wiring to receive speaker OCA, instead of the standard two-pair. Telephones making speaker OCA calls do not require an upgrade or extra wire pair.

Notes

- See Notes in "PDIU-DI Installation into 1000-series Digital Telephone" on Page 9-9.
- Handset OCA is not available on electronic telephones.

HVSU2 Upgrade Installation

See Figures 9-2 and 9-13 and follow these steps:

1.   Loosen the four captive screws on the telephone base and remove the base.

2.   Position the HVSU2 on the standoffs inside the base, and secure with the two provided screws.

3.   Connect the HVSU2 wire plug to the P2 connector on the PCB in the telephone.
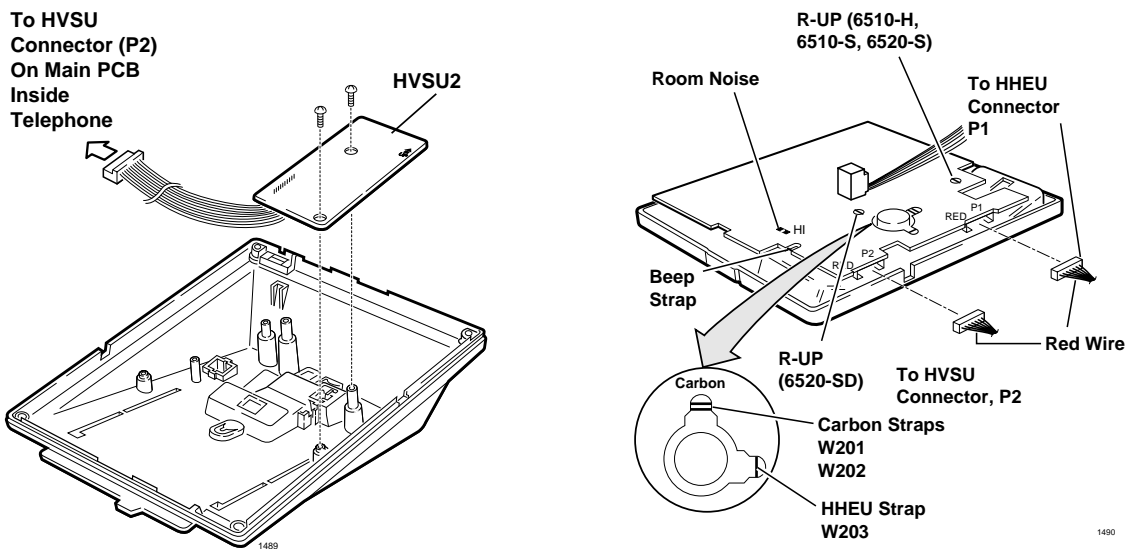
Figure 9-13   HVSU Installation for Electronic Telephones

HVSU/HVSI Upgrade Installation

See Figures 9-2 and 9-13~9-14 and follow these steps:

1. Loosen the four captive screws on the telephone base and remove the base.

2. Align the P5 connector on the HVSI subassembly with the receptacle on the HVSU subassembly.

   Apply firm, even pressure to the PCBs to ensure that the connectors mate properly (they should click).

Note Exercise care when assembling the HVSU to the HVSI to prevent damage to the connector pins; also, verify that the HVSU is aligned with the silk-screened image on the HVSI.

3. Position the HVSU/HVSI subassembly on the standoffs inside the base, and secure with the two screws provided.

4. Connect the HVSU/HVSI subassembly wire plug to the P2 connector on the electronic telephone PCB.
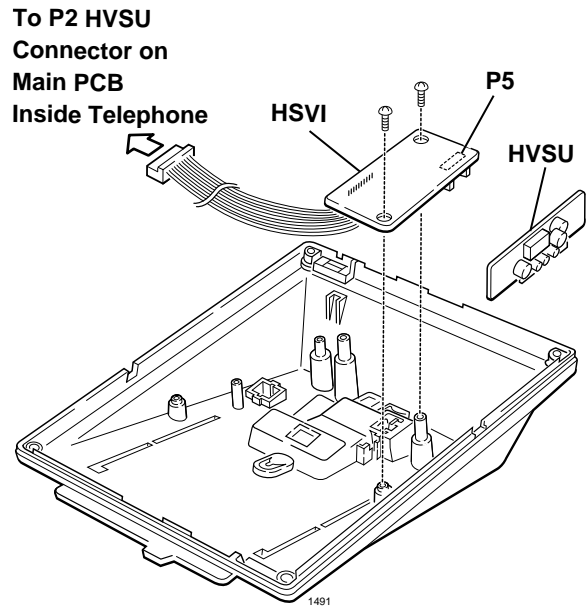
Figure 9-14   HVSI/HVSU Installation for Electronic Telephones

5. Reinstall the electronic telephone base, and secure it with its four captive screws.

Loud Ringing Bell/Headset Upgrade (HHEU)

The Loud Ringing Bell/Headset upgrade (HHEU) enables an external speaker (HESB) and/or a headset to be connected to the electronic telephone. The HESB serves as a loud ringing bell when connected to a telephone.

Notes

- There are two types of HHEU: the HHEU1 (which has four versions, V.1~V.4) and the HHEU2.

- Only electronic telephones equipped with an HHEU2 can be wall mounted. The HHEU2 is identical to the V.4 HHEU1, except that the HHEU2 has longer wires to accommodate wall mounting.

- A Toshiba HESC-65 or HESC-65A cable is required to connect the HHEU in an electronic telephone to the HESB. Refer to Chapter 10– Peripheral Installation for HESB installation procedures.

- All HHEU versions and types, except for V.1 HHEU1, are compatible with the Speaker Off-hook Call Announce upgrades (HVSU2 and HVSU/HVSI).

HHEU Upgrade Installation

See Figures 9-2, 9-12, 9-13 and 9-15 and follow these steps:

1. Loosen the four captive screws on the telephone base and remove the base.

2. Using a screwdriver or other suitable tool, remove the plastic tab on the back of the base. The HHEU modular connector for the headset will be accessed through this opening.

3. If using a V.3 or earlier HHEU1, set the SW601 switch to the HEADSET position for HESB and/or headset connection. This switch is not on either the V.4 HHEU1 or the HHEU2, because the operation is automatic with these subassemblies.

4. Connect either the HESC-65 or HESC-65A cable to P601 of the HHEU if the Loud Ringing Bell option is required. Refer to Chapter 10– Peripheral Installation for HESB installation procedures.

Figure 9-15   HHEU Installation for Electronic Telephones

5. For the V.3 or earlier HHEU1: if only the headset is connected to the HHEU, cut both sides of the R607 resistor on the HHEU and remove the resistor to eliminate electrical contact.

Note   Do not cut the R607 resistor if connecting an HESB to the HHEU for the Loud Ringing Bell–even if a headset is also installed on the HHEU.

...or

For the V.4 HHEU1 or the HHEU2: if only the headset is connected to the HHEU, cut the speaker OCA strap.

Note   Do not cut the speaker OCA strap if connecting an HESB to the HHEU for the loud ringing bell–even if a headset is also installed on the HHEU.

6. Position the HHEU subassembly on the standoffs inside the base, and secure with the two screws provided.

7. Connect the HHEU subassembly wire plug to the P1 connector on the electronic telephone PCB.

8. Cut the HHEU strap on the telephone PCB.

Note   The HHEU strap must be replaced if the HHEU PCB is removed from the telephone.

9. Reinstall the telephone base, and secure it with its four captive screws.

Adjust (HESB) Loud Ringing Bell Volume

1. Call the telephone connected to the HESB.

2. Adjust the volume control on both the back of the HESB and the ring volume control on the telephone.

Carbon Headset/Handset Straps

If a carbon-type handset or headset is connected to the handset jack on the side of the 6500-series electronic telephone, two straps inside the telephone must be cut.

➤ **To cut the straps**

Note It is not necessary to cut these straps if the headset is connected to the HHEU.

See Figures 9-2 and 9-13 and follow these steps:

1. Loosen the four captive screws on the telephone base and remove the base.

2. Locate the carbon straps, W201 and W202 and cut them.

3. Reinstall the telephone base, and secure it with its four captive screws.

Beep Strap

A "beep" sounds whenever a dial pad button or feature button is pressed on an electronic telephone.

➤ **To eliminate the beep**

See Figures 9-2 and 9-13 and follow these steps:

1. Remove the four captive screws on the telephone base to the telephone and remove the base.

2. Locate and cut the beep strap on the telephone PCB.

3. Reinstall the electronic telephone base and secure in place using the four captive screws.

Microphone/Speaker Threshold (Speakerphones only)

High ambient noise levels may cause the speaker on the electronic telephone speakerphone models (the EKT6510-S, EKT6520-S, and EKT6520-SD) to cut off frequently.

➤ **To make these telephones less sensitive to noise and to prevent the cut-off**

See Figures 9-2 and 9-13 and follow these steps:

1. Remove the four captive screws on the base to the telephone, and remove the base.

2. Locate the room noise switch on the PCB inside the telephone, and push it carefully to the HI (high) position.

3. Reinstall the telephone base and secure in place using the four captive screws.

Handset Receiver Volume-up Strap (Version 2 6500-series Telephones Only)

For Version 2 (V.2) 6500-series electronic telephones only, the handset receiver volume can be increased six decibels (dB) by cutting a strap inside the telephone.

➤ **To cut the strap**

See Figures 9-2 and 9-13 and follow these steps:

1. Remove the four captive screws on the telephone base to the telephone, and remove the base.

2. Locate the R-UP strap on the PCB inside the telephone and cut it.

3. Reinstall the telephone base, and secure in place using the four captive screws.

Direct Station Selection (DSS) Console/System Connection

The Strata DK40i can support up to three DSS consoles and the DK424 systems configured with RCTUA can support up to three DSS consoles, RCTUB up to four DSS consoles, RCTUC/D and RCTUE/F up to eight consoles.

There are two types of consoles: the Digital DSS (DDSS) and the Electronic (HDSS) console. The DDSS console can be connected to designated digital telephone circuits, and the HDSS console can only be connected to designated PEKU circuits. This section provides instructions on how to install both types of consoles.

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DDSS Console Connections

The DDSS console, which can operate with a digital telephone (preferably an LCD model), can connect only to circuit 8 of a PDKU digital telephone circuit. Standard twisted single-pair or two-pair jacketed telephone cable (maximum 1000 feet, 303 meters) is used for the connection.

To accommodate the DDSS console connection, the instrument end of the cable should be terminated in a modular station connector block (RJ-11). Refer to Chapter 8 – DK40i/DK424 Universal PCB Wiring for wiring/interconnecting details.

Notes

• DDSS console cable runs must not have cable splits (single or double), cable bridges (of any length) or high resistance or faulty cable splices.

• See Chapter 3 – DK40i Installation for secondary protection information and loop limits.

• See Chapter 5 – DK424 for secondary protection information and loop limits.

CAUTION! **When installing the DDSS cable, do not run the cables parallel if they are within three feet of an AC power line. AC power lines should be crossed at right (90◦) angles only. In particular, avoid running station wire pairs near devices that generate electrical noise, such as neon or fluorescent light fixtures.**

DDSS Console Configuration

An RDSU will not support a DDSS.

DDSS Programming

Program 03: Code 64 identifies the slots that support DDSS consoles.

Program 28: Assigns DDSS console(s) to telephones.

Program 29: Assigns button functions for DDSS consoles.

HDSS Console

HDSS Console Connections

The HDSS console must be connected to the data pairs of circuits 7 and 8 on a PEKU with standard two-pair twisted, jacketed telephone cable. To accommodate the connection, the instrument end of the HDSS console cable should be terminated in a modular station connector block (RJ-11). Refer to Chapter 8 – DK40i/DK424 Universal PCB Wiring for wiring/ interconnecting details.

If using 24 AWG cable, the overall length of the cable run from the Expansion Unit (KSU) to the HDSS console must not exceed 500 feet (152 meters). The HDSS console can operate with either an electronic or digital telephone (preferably an LCD model).

CAUTION! **When installing the HDSS console cable, do not run the cables parallel if they are within 3 feet of an AC power line. AC power lines should be crossed at right (90◦) angles only. Avoid running HDSS console wire pairs near devices that generate electrical noise, such as neon or fluorescent light fixtures.**

HDSS Console Configuration

The following considerations should be made when installing an HDSS console:

♦ A PEKU PCB is required.

♦ Two PEKU ports are required for the HDSS console (always circuits 7 and 8).

♦ The PESU does not support the HDSS console.

HDSS Programming

Program 03: Codes 23 and 24 identify the slot that supports a PEKU that interfaces with the HDSS console.

Program 28: Assigns HDSS console to a telephone.

Program 29: Assigns individual button functions for the HDSS console.

Door Phone (MDFB)

This section provides installation instructions for the Door Phone (MDFB). Door Phones can be installed can also with Door Phone/Lock Control Units (see following section).

♦ **DK14** can have up to 6 door phones

♦ **DK40i** can have up to nine door phones

♦ **DK424** can have up to 12 door phones

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Lock Control Unit and Door Phone

This section provides installation instructions for the Digital (DDCB) or Electronic (HDCB) Door Phone/Lock Control Units. Each DDCB or HDCB can support as many as three MDFBs or two MDFBs and one door lock.

DDCBs or HDCBs can only connect to slot 11/port 004, slot 12/port 012, slot 13/port 020 and slot 14/port 028. DDCBs can only connect to circuit 5 (a PDKU or RDSU PCB and HDCBs can connect only to circuit 5 of a PEKU or PESU PCB).

DDCBs and HDCBs cannot connect to the RSTU2, PSTU, or KCDU.

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DDCB/HDCB and MDFB Cabling

For DDCB, HDCB, and MDFB wiring/interconnecting details and door lock control installation procedures, refer to Chapter 8 – DK40i/DK424 Universal PCB Wiring. If using 24 AWG cable, the length of the cable run from the Strata DK to the MDFB (via the DDCB or HDCB) must not exceed 1,000 feet (305 meters).

• DDCB or HDCB cable runs must not have cable splits (single or double), cable bridges (of any length) or high resistance or faulty cable splices.

• See Chapters 1, 3 or 5 for Strata DK14, DK40i or DK424 secondary protection information and loop limits.

DDCB/HDCB Wall Mounting

The DDCB and HDCB is designed to be mounted on a wall or other vertical surface.

➤ **To mount the units**

1. Locate the two mounting holes on the right-hand side on the DDCB or HDCB (see Figure 9-16).

2. Remove the side cover from the DDCB or HDCB to expose the two left-hand mounting holes.

3. Position the DDCB or HDCB adjacent to the Base KSU with regard to wiring needs.

4. Secure the DDCB or HDCB to the mounting surface with four one-inch panhead wood screws.

External Power Straps (DDCB Only)

KSU Jack

MDFB Jack A~C

Mounting Screws (4)
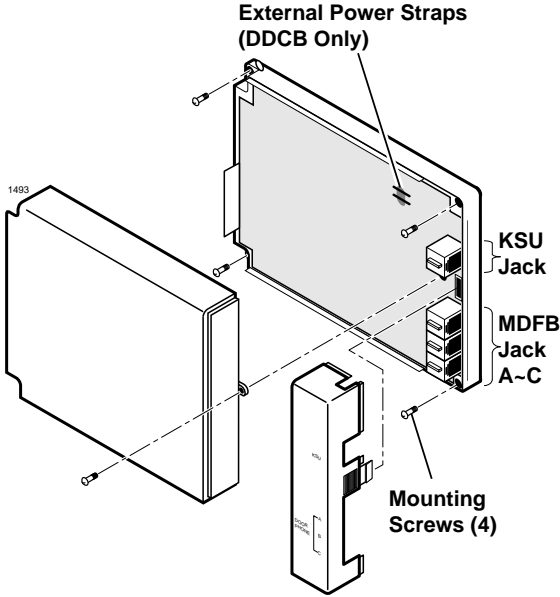
Note See Table 3-9 regarding external power requirements.

Figure 9-16 Door Phone (DDCB or HDCB) Installation

MDFB Wall Mounting

1. Remove the screw from the bottom of the cover. Detach the cover from the base and metal frame (see Figure 9-17).

2. Position the metal frame and base to the mounting surface and secure with two one-inch panhead wood screws.

3. Attach cover to the metal frame and base and secure with the screw which was removed in Step 1.

MDFB Volume Control Adjustments

1. Remove the screw from the bottom of the MDFB cover.

2. Detach the cover from the base and metal frame.

3. The volume level is changed by a screw adjustment on the back of the MDFB. Turn the screw with a flat-headed screwdriver while ringing the MDFB or while on a call with it. The volume level will change as the screw is turned.

Base

Metal Frame

3.25 inches

Two Wall Mounting Holes

Door Phone

Figure 9-17 Door Phone (MDFB) Installation

Station Apparatus

Door Phone/Lock Programming

Program 39: Assigns door phone and door lock buttons to digital telephones.

Program 77-1: Assigns DDCBs or HDCB to ports, door phone ringing over external page during the NIGHT mode, and door lock activation time.

Program 77-2: Busy out unused MDFB positions, identifies which DDCBs support the door lock option, and sets the door phone to ring one or five times.

Note Each DDCB/HDCB door lock assignment will reduce the system door phone capacity by one (see Chapter 10 – Peripheral Installation for HDCB, DDCB, and PIOU/PIOUS door lock installation information).

Program 79: Assigns door phone-to-station ringing assignments.

Program *79: Assigns which [DN] flashes on telephones assigned in Program 79.

Cordless Digital Telephone (DKT2004-CT)

The Toshiba DKT2004-CT cordless digital telephone brings mobility and productivity to office telephones. Greater call access cuts down on leaving messages and "telephone tag." Its compact design enables the user to take it to many locations within the office complex.

Digital 900 MHz spread spectrum technology provides nine simultaneous channels and represents state-of-the-art design and engineering. Spread spectrum technology provides clarity in unsurpassed range, several times greater than conventional analog cordless telephones.

Spread spectrum technology also provides secure communications between cordless digital telephones and their corresponding base stations within a given environment. Fully charged, the cordless digital telephone provides over three hours of talk time, and 42 hours standby. An extended operation battery is also available to provide over five hours of talk time.

The cordless digital telephone either attaches to a Toshiba DKT2000-series corded digital telephone or is used as a stand-alone. It provides many sophisticated Strata features:

♦ LCD provides information such as User Name, DNIS and Caller ID

♦ Four programmable buttons for feature, multiple line or feature access

♦ Headset jack (headset optional)

♦ Handset volume adjustment

♦ Conference/Transfer (**Cnf/Trn**) button

♦ Message Waiting LED

♦ **Hold** button

♦ 20 Speed Dial number memory (in addition to 40 station speed dials)

The DKT2004-CT cordless digital telephone operates from the same digital station port on the Digital Telephone Interface Unit (PDKU) as the DKT2000-series digital telephone which may or may not be attached.

Precautions

Before you read anything else, please observe the following:

> **WARNING!** Toshiba *does not* represent this unit to be waterproof. To reduce the risk of fire, electrical shock, or damage to the unit, *do not* expose this unit to rain or moisture.

Rechargeable Nickel-Cadmium Battery Warning

♦ This equipment contains a Rechargeable Nickel-Cadmium Battery.

♦ Cadmium is a chemical known to the State of California to cause cancer.

♦ The Rechargeable Nickel-Cadmium Battery contained in this equipment may explode if disposed of in a fire.

♦ Do not short circuit the battery.

♦ Do not charge the Rechargeable Nickel-Cadmium Battery used in this equipment in any charger other than the one designed to charge this battery as specified in this Guide. Using another charger may damage the battery, or cause the battery to explode.

Rechargeable Nickel-Cadmium Batteries Must Be Recycled or Disposed of Properly

♦ Residents of Minnesota should contact 1-800-225-PRBA for information concerning reclamation and disposal of Rechargeable Nickel-Cadmium batteries.

♦ Residents outside of Minnesota should contact their local authorities for information concerning reclamation and disposal of Rechargeable Nickel-Cadmium batteries.:

> **WARNING!** To reduce risk of fire, use only Model EXP9580 or EXP9586 batteries.

> **CAUTION!** To power your Toshiba DKT2004-CB Cordless base unit, use only UL Listed AC Adapter Model AD-9500 Class 2 Power Supply.
> Ratings are:
> Input:120VAC 14W
> Output:0VDC 500mA

Important! *Charge your battery for 10 hours before using your new Cordless Digital Telephone.*

Cordless Telephone Installation

Important! *Your telephone system must be programmed for Auto Preference for your TALK button to work. If there is a shared digital telephone, you receive internal system dial tone automatically after picking up the handset of your deskset. For example, in a DK system, Program 32 must have a setting other than "00." It is best to set Auto Line Preference to access Intercom dial tone.*

➤ **To install the cordless telephone**

1. Select a location for your cordless digital telephone. Avoid excessive heat or humidity.

2. Place the cordless digital telephone's base unit on a desk or tabletop near a standard 120V AC outlet and within reach of the digital telephone line connection to your Strata DK system.

Station Apparatus

3. Keep the base unit and handset away from sources of electrical noise (motors, fluorescent lighting, etc.).

Important! *Place the cordless telephone to the right of the DKT. If placed on the left of the DKT, the cordless antenna will pick up a tone due to its close proximity to the DKT speaker and electronic parts.*

Telephone Cord Connection

There are two telephone line jacks on the back of the base unit of your cordless digital telephone: "Line In" and "Line Out." You can connect the cordless digital telephone to both the telephone line and a Strata DK digital telephone.

➤ **To connect cords for use as a stand-alone telephone**

   ➤ Connect the modular jack labeled "Line In" to the telephone wall jack.

   ...or

➤ **To connect cords for use with a desk telephone**

   1. Unplug the telephone line cord from your desk telephone.

   2. Connect this cord to "Line In" of your cordless telephone.

   3. Using the two foot modular cord that came with your cordless telephone, connect the jack labeled "Line Out" to the desk telephone.

Connect and Apply Power to Base Unit

The AC adapter furnished with this telephone may be equipped with a polarized line plug (a plug having one blade wider than the other). This plug fits into the power outlet only one way. If you are unable to insert the plug fully into the outlet, try reversing the plug. If the plug still does not fit, contact your facilities coordinator about replacing the obsolete plug. Do not alter the shape of the blades on the polarized plug.

➤ **To connect the cordless telephone using the AC adapter**

   1. Plug the AC adapter cord into the AC adapter input jack on the base unit (see Figure 9-18).

CAUTION!   **Use only the AC adapter supplied with your cordless digital telephone.**

AC Adapter   **Modular Cords**   **Line Out to DKT**   **Line In to Digital Telephone Circuit (DK14 KSU or DK40 Base KSU, KCDU, PDKU2, RDSU)**

See Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring
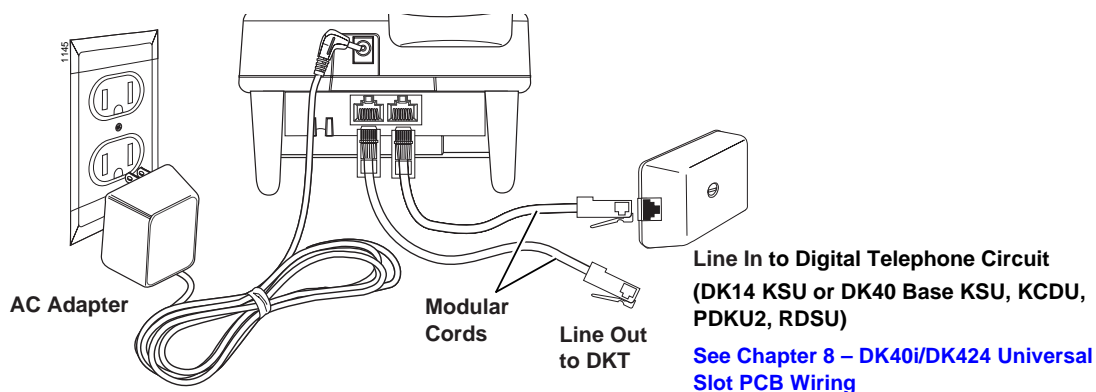
Figure 9-18 Cordless Telephone Connectors

2. Plug the AC adapter into a standard 120VAC wall outlet.

3. Route the power cord where it is not a trip hazard, and where it will not become chafed and create a fire or electrical hazard.

4. Wrap the power cord around the notch on the bottom of the base unit (see Figure 9-19).

5. Check to see that the power LED is on, indicating the telephone has power.

6. Before using your cordless digital telephone, be sure to raise the antenna to the vertical position.
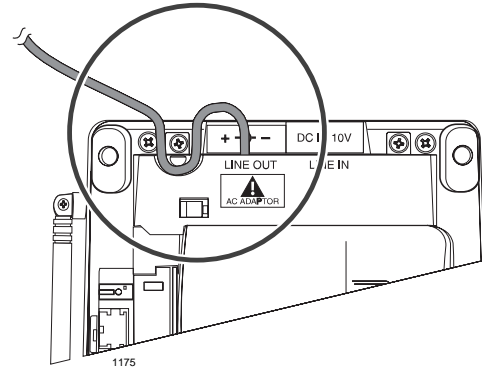
Figure 9-19   Line Out Cord

Attach/Remove Belt Clip to Handset (optional)

➤ **To attach the belt clip to the handset**

1. Snap the tabs of the belt clip into the notches on the sides of the handset.

2. Use the belt clip to attach the handset to your belt or pocket for convenient portability.

➤ **To remove the belt clip**

1. Pry one tab at a time from the notch on the side of the handset.

2. Carefully lift the belt clip off.

The belt clip is designed to fit snugly onto the handset.

Handset Battery Pack Installation

1. Place a charged battery pack onto the handset so that it slides easily along the ridges.

   If your battery is not charged, see "Removing and Charging Your Battery Pack".

2. Slide the battery pack up onto the handset until it clicks into place.

You are now ready to configure your cordless digital telephone.

Removing and Charging Your Battery Pack

Before using your new cordless digital telephone, the battery must be charged continuously for 6 to 8 hours.

➤ **To remove the handset's battery pack**

1. Press in on the battery pack release latch.

2. Slide the battery pack off the handset.

   Note   You may have to pull hard to slide the battery pack off, when the handset is new.

➤ **To charge the handset's battery pack**

1. Place the handset on the base unit.

2. Make sure the CHARGE LED lights. If it does not light, check to see that the AC adapter is plugged in and that the handset is making good contact with the base unit.

Station Apparatus

Charging Extra Battery Packs

The base unit of your cordless digital telephone is equipped with a battery charger for charging an extra battery pack. This compartment has a latch that keeps the battery pack in place during charging.

➤ **To charge extra battery packs**

1. Position the battery pack so the inner side is facing toward the top of the base unit.

2. Slide the battery pack into the charging compartment until it clicks into place.

3. Make sure the BATTERY CHARGE LED lights. If it does not light, make sure the AC adapter is plugged in and that the battery pack is seated into the charger.

Note   Charge the standard 400 mAh battery pack without interruption for 6-8 hours. Charge the optional 730 mAh extended battery pack without interruption for 8-10 hours.

Tips on Extending Battery Pack Life

All rechargeable nickel cadmium batteries can develop a "memory" (reduced charge capacity) caused by repeated charge and discharge cycles. Batteries that have developed this effect do not operate to their fullest capacity.

➤ **To avoid memory effect**

➤ Operate the unit until the battery pack is completely discharged before recharging. For example, use the handset off the base all day. Only replace the handset on the base at night after a full day of use. Do not "top off" the charge after using the battery for a short time.

➤ **To erase memory effect**

➤ Operate the unit until the battery pack is completely discharged, then recharge it fully. Repeat this process at least three times.

LCD Low Battery Indicator

When the battery pack in the handset is low and needs to be charged you see this message on the display and the handset beeps. Table 9-3 shows symptoms.

Table 9-3   Low Battery Symptoms

On a Call...	In Standby Mode...
Only the **TALK** key operates.	None of the keys operate.
Handset beeps once every three seconds	Handset beeps once.
Complete your call as quickly as possible	Cannot make call.
Replace battery pack.	Replace battery pack before making a call.

➤ **To restore your battery capacity**

➤ Return the handset to the base unit for charging or replace the handset battery pack with another charged one.

Digital Add-on Module Installation

Install one or two DADM 2020s to a 2000-series digital telephone (only).

♦ **DK14** supports up to 8 DADMs

♦ **DK40i** supports up to 12 DADMs

The number of DADMs supported by the DK424 depends on the common control PCB:

♦ **RCTUA** supports 12 DADMs

♦ **RCTUB** supports 40 DADMs

♦ **RCTUC/D** supports 120 DADMs

♦ **RCTUE/F** supports 200 DADMs

The DADM provides DSS buttons, speed dial buttons and CO line buttons.

Notes

♦ See Chapters 1, 3 or 5 – DK14, DK40i or DK424 Installation for loop length and secondary protection requirements.

♦ DADMs cannot be installed on telephones that have RPCI-DI on OCA/DVSU installed.

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➤ **To install DADMs**

See Figure 9-20 and follow these steps:

1. Loosen the four captive screws on the 2000-series digital telephone base and remove the base.

2. Remove the base handset hanger.

3. Loosen two captive screws on DADM and remove bases.

4. Put the DADM supplied cable through the telephone and DADM bases.

5. Connect DADM cable connectors to P1 of DADM and P1 of DKT2000 telephone.

6. Install base of DADM and telephone– tuck DADM cable into DADM and telephone base, as necessary, for proper length.

7. Secure DADM to telephone base with DADM connecting plate (using four screws).

8. If required to achieve maximum distance, install 2-pair house cable (or external power) and 2-pair modular cord, supplied with DADM. (See Chapter 8 – DK40i/DK424 Universal PCB Wiring.)

9. If a second DADM should be installed, connect P1 of the second DADM to P2 of the first DADM with the DADM connecting cable.

(Smaller Connector)

P 1

P 2 (No Connection)

4-Screws

4-Screws

Second DADM

DADM Base

DADM Connection Plate (provided with DADM)

DADM Cable (Supplied with DADM)

Remove Handset Hanger

Black Wire to Pin 1

First DADM

P 1

Telephone Base

P 2

Black Wire to Pin 1

2000-Series Digital Telephone

(Larger Connector)

DIU & ADM

P1 of Bottom PCB

DADM2020   **DADM2020**   **2000-Series DKT**

View of Bottom

1495
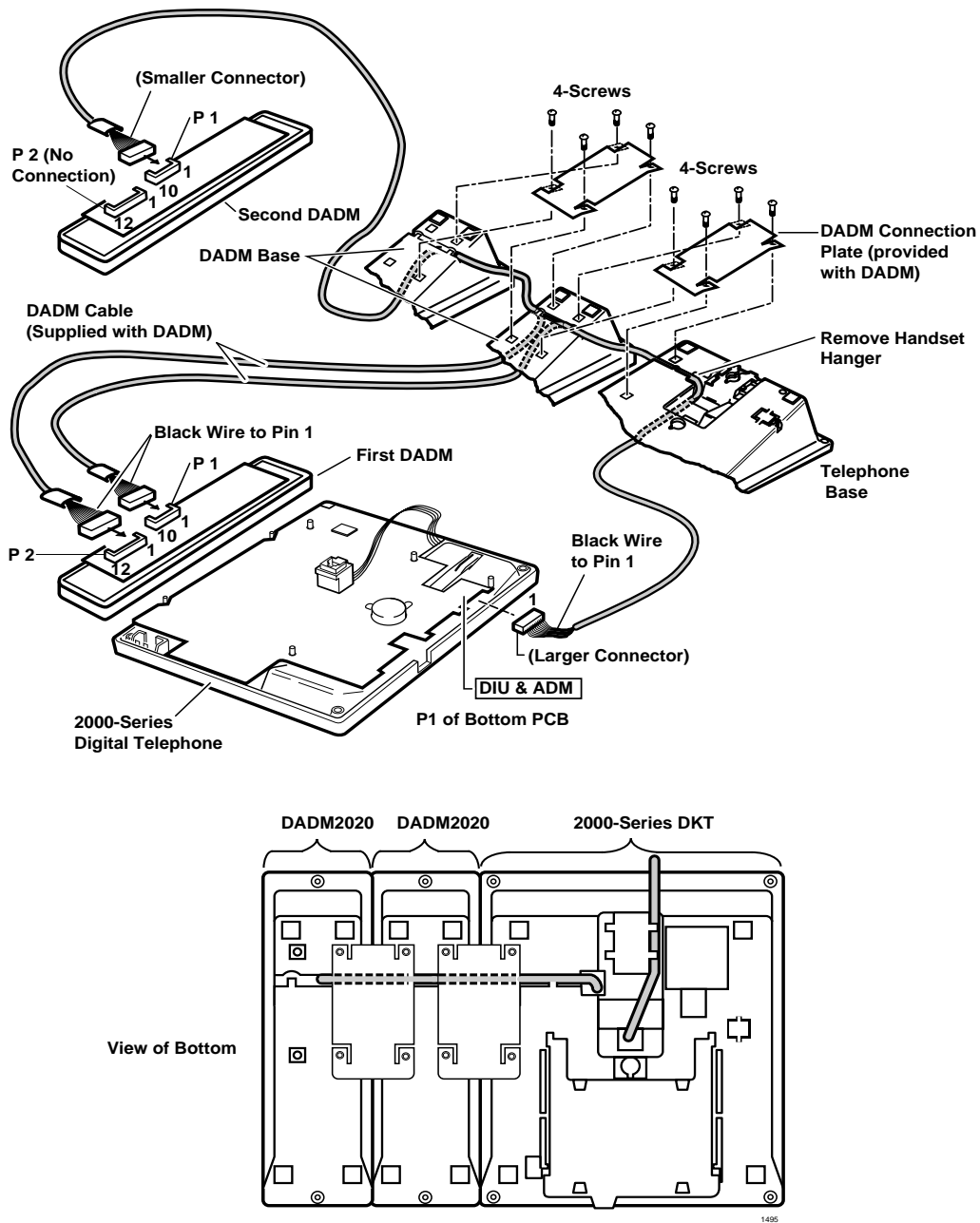
Figure 9-20   Digital Add-On-Module

ADM Programming

ADMs are programmed in Program ∗29.

Important!   *To activate the ADM, Program ∗29 must be entered for each telephone port equipped with an DADM.*

See the Strata DK programming record sheets in the *Strata DK Programming Manual* for button defaults.

PC Attendant Console

A Strata DK system configured with RCTUB2 or RCTUBA/BB can support two Attendant Consoles, and systems with RCTUC1/D2 or RCTUC3/D3 can support four Attendant Consoles. The RCTUA1, RCTUA3, RCTUB1, or RCTUC/D1 do not support Attendant Consoles.

PC and conventional Attendant Consoles require RCTUB2 or RCTUC/D2 R 2 processors or RCTUBA/BB, RCTUC3/D3, RCTUE3/F3 R3 processors.

The PC attendant console (DK-PCATT) requires a customer-supplied, IBM-compatible PC. A VGA or SVGA monitor and a COM port dedicated to the PC attendant console is required. Toshiba recommends the following for the PC attendant console: Pentium processor/100 MHz, 16 MB RAM, 1.44 MB floppy drive, 200 MB hard drive, and a mouse. A tower that sits on the floor is provides better monitor visibility (as opposed to a desktop model). Microsoft® Windows® 95 software must be resident on the PC. Windows 3.1 will work, but Windows 95 is recommended.

Important! *After the PC attendant console is installed in Windows 95, you can find your old program groups by clicking the Start button (formally Program Manager) and then selecting Programs. Your groups appear as folders. To manage files in Windows 95, click the Start button, select Programs, and then click Windows Explorer (formally File Manager). Your directories appear as folders.*

Hardware Installation

The RATU PCB can support up to four Attendant Consoles in any combination. (See "RATU Installation" on Page 7-22.)

Notes

- The maximum distance from the Strata DK to either attendant console is 1000 ft. (303 m).

- Attendant console cable runs must not have the following:

    - Cable splits (single or double)

    - Cable bridges (of any length)

    - High resistance or faulty cable splices

- See Chapter 8 – Universal Slot PCB Wiring Diagrams for attendant console wiring.

- See Chapter 3 – DK40i Installation or Chapter 5 – DK424 Installation for loop length and secondary protection requirements.

CAUTION! **When installing the PC or conventional attendant console cable, do not run the cables parallel to AC power if they are within three feet of an AC line. AC power lines should be crossed at right (90◦) angles only. In particular, avoid running station wire pairs near devices that generate electrical noise, such as neon or fluorescent light fixtures.**

➤ **To install the PC attendant console**

See Figure 9-21 on Page 9-32 and follow these steps:

1. Connect the RATI to the PC COM port a with a standard RS-232 cable.

2. Use one-pair wiring to connect the MDF to an RJ11 jack at the attendant console location. If you need to use a long cable, use two-pair for more power.

3. Plug in the handset cradle to the RJ45-jack.

4. Plug in the headset (if needed) to the handset base.

5. After programming the Strata DK424 system, install the PC attendant console software and complete the Telephony Setup per the instructions on "PC Attendant Console Software Installation" on Page 9-34.
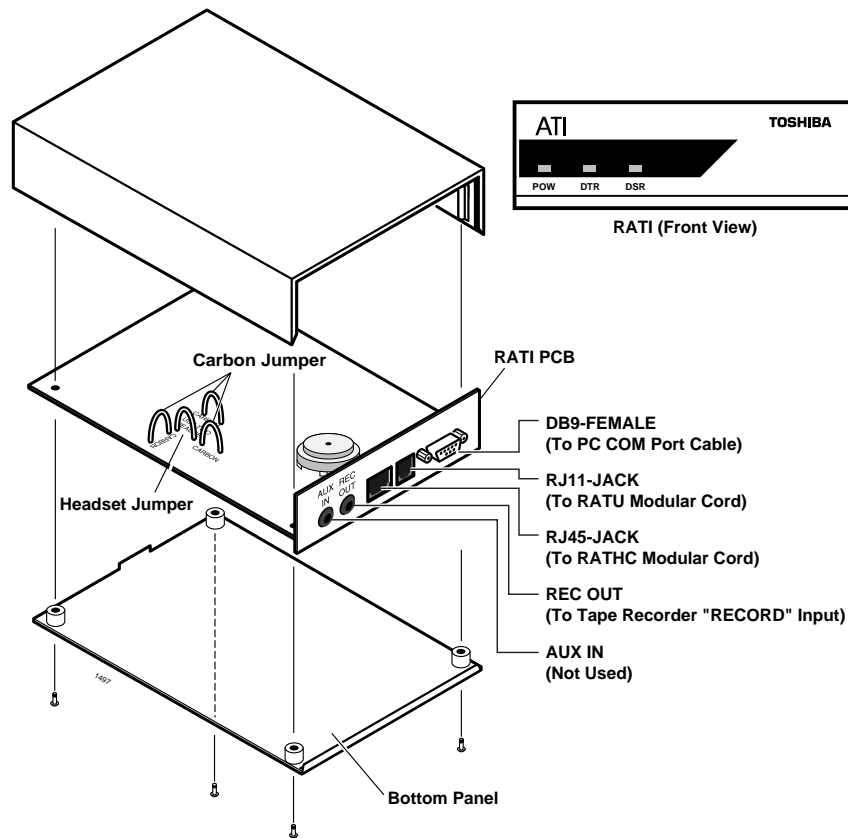
Figure 9-21 RATI Assembly/Disassembly

Notes

• Do not cut HEADSET jumper unless you are connecting two headsets.

• Cut CARBON jumpers if a carbon handset is connected to the RATHC handset cradle.

• "REC OUT" can be used to monitor or record the attendant console talkpath. Both the attendant and connected party will be monitored or recorded. The record level output from the attendant handset or headset is approximately 3 dB below the connected party record level. Use a 1/8" mini audio jack.

• "AUX IN" can be used to send audio to the attendant and connected party. The audio level to the attendant is approximately 10 dB below the audio level sent to the connected party. Audio sent to the outside party is limited to–15 dBv (CO Tip/Ring). Use a 1/8" mini audio jack.

• See Figures 8-16 and 8-17 in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for RATI cable wiring information.

PC Attendant Console Programming

Program 03: Code 51 assigns the RATU PCB attendant console cabinet slot number.

Important! *The RATU PCB takes up four station ports in software; each attendant console will be assigned one of the ports in consecutive order. Toshiba recommends installing the RATU PCB in the next highest slot number following the last station PCB installed– do not skip slots. The first port number will be the next consecutive port number following the last station port installed.*

Program 15: If the attendant console is used to set-up trunk-to-trunk (two CO-line or tandem) connections with loop start lines, set Program 15-5 appropriately; if the CO sends the AR-Hold signal, set 15-0 and 15-3 to Detect. If the CO does not send the AR signal, set 15-0 and 15-3 to Ignore. Loop start trunk-to-trunk calls remain on attendant hold loops only if AR-Ignore is set.

Program 58

♦ 58-1: Sets the attendant console overflow time for each console.

♦ 58-2: Sets the console display for EL or CRT (EGA) and enables or disables console call waiting tone for each console. (Not used for the PC attendant console).

♦ 58-4: Sets the console Answer key priority for each console.

♦ 58-5: Sets the console overflow destination for each console.

Program 59: Assigns attendant console Flexible Buttons (Keys) for each console.

Attendant Console Load Share Programming

Program 81~89: Assigns CO lines (loop, ground, and DID) to share the incoming call load between consoles. (Tie lines load share on Dial "0" calls only, without the use of Programs 81~89.) All incoming CO lines (including DID lines) to be distributed between two or more Attendant Consoles should be assigned to ring each console in Programs 81~89.

Note Delay ring assignments do not apply to DID lines.

Program *09: Assigns the user company's main listed [DN] (last four digits) to the attendant console if DID lines should ring the console. If the DID lines are assigned to ring multiple attendant console ports in Programs 81~89, DID calls will be distributed between the consoles. Only one console (any one) should be assigned with the main listed [DN] in Program *09.

Programs 71 and 72: Can be used to provide an alternative assignment of DID calls using Program *09. Program 71 assigns the dialed number to ring at different locations during each Night Mode (Day, Day2, Night). DNIS tags can be added for personalized identification of calls. Program 72 provides external forwarding of calls listed in Program 71.

Program *17: Assigns each CO line to an attendant console as the DID line intercept position as required. (Intercept calls do not load share.)

Attendant Console Load Share Programming Example

The user's company DID line [DN] is 583-3700; this number and other loop start lines should ring in a load sharing manner to each of the Company's two Attendant Consoles in the Day, Day 2, and Night modes.

Attendant consoles one and two are connected to RATU ports 024 and 025 respectively and should load share 583-3700 calls and other CO line calls. Program the DK424 as shown below:

♦ In Programs 81, 84, and 87, assign all CO and DID lines to ring ports 024 and 025.

♦ In Program *81, *84 and *87, assign all CO lines to flash the [PDN] of port 024.

♦ In Program *09 or 71, assign digits 3700 to port 024, and assign any other selected DID extension number(s) to port 025–note that when the DID extension number assigned to either console is dialed, calls will load share between consoles.

PC Attendant Console Software Installation

Step 1: Install the Software

The PC attendant console requires the installation of software on an IBM-compatible PC which has been connected to the RATI. See "To install the PC attendant console" on Page 9-32.

➤ **To install the software**

1. Turn on the PC and open the Windows Program.

2. Insert Diskette #1 in drive A (or B).

3. Run A:\setup (or B:\setup) from Windows. The installation process will proceed and request you to remove Diskette #1 and insert Diskette #2 as the program is decompressed and installed.

A new program group will be added to your Windows Program Manager for the PC Attendant. This will include three icons for running the PC Attendant, PCATT BACKUP, and TELEPHONY SETUP (see screen below).

Step 2: Add the Driver

Before the PC attendant console can be used, the driver for the interface to the RATI must be installed and Telephony Setup must be established. The following steps may be skipped if this driver was previously installed.

1. Click the Telephony Setup Icon or respond to the "Go to Telephony Setup box" at the end of the installation process.
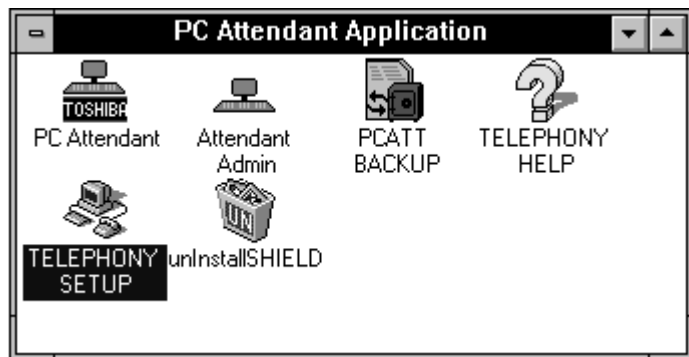
2. From the Telephony dialog box, click the Driver Setup... button.
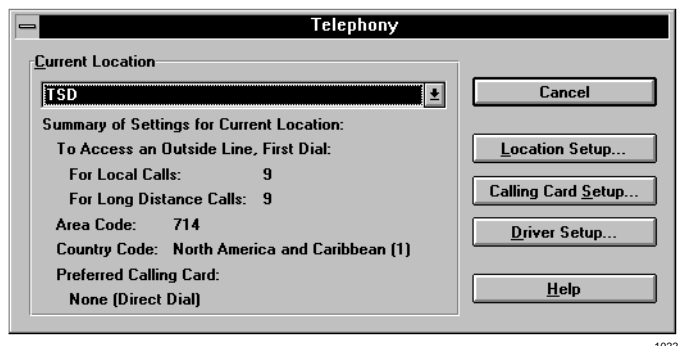
3. In the Telephony Drivers dialog box, if "ATT Telephone Telephony SP" is shown in the driver list, go to Telephony Setup below. Otherwise, click the Add button to display the Add Dialog screen.
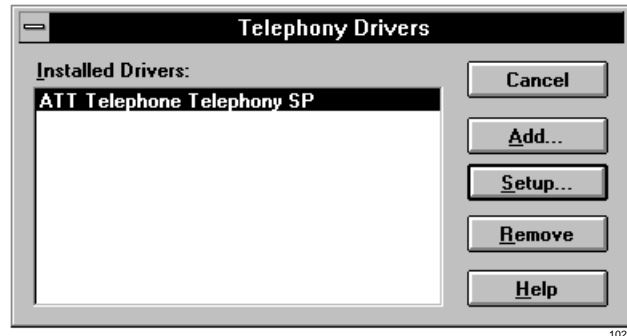
4. From the Add Drivers dialog box, if "ATT Telephone Telephony SP" is in the list, then select it (it should be highlighted) and press Add.
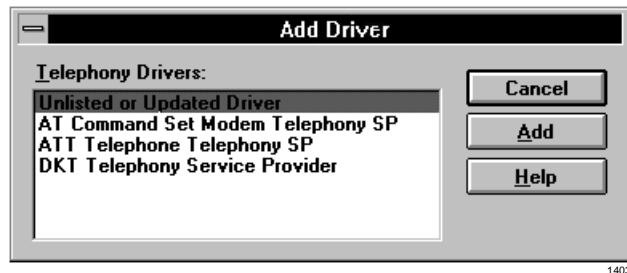
5. If "ATT Telephone Telephony SP" is not listed, press Add and type **c:\windows\system\att.tsp** in the edit box. Click OK to return, select it in the list and press Add.

Step 3: Set Up the Telephony Driver

1. From the Telephony Drivers dialog box, click the Setup button.

2. From the DK PC Attendant Configuration dialog box, set the COM port used for the RATI interface (COM1, COM2, COM3, COM4).

3. Choose the processor type for the connected DK424 system (RCTUB or RCTUC/D).

4. Select the DK software version of the system (R2, R3 or higher).

5. Enter emergency numbers as programmed in Program 44-91~93 of the DK424.

6. Click the Default Configuration button. This will set all the parameters to match the default values of the DK424.
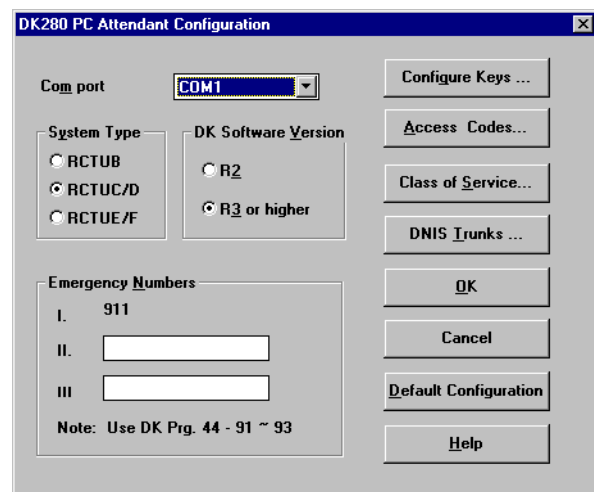
Important! *It is extremely important to match the parameters set in the DK424 with those in the Telephony Setup or the PC attendant console will not know how to operate properly. Before Step 7, go through each of the following telephony setup programs. ALL changes in these following screens must match the corresponding values in the programming of the DK424.*

7. The Default Configuration button will close the DK424 PC Attendant Configuration screen. To make changes, select Setup again, then continue.

Default Key Assignments

From the DK PC Attendant Configuration screen, the Configure Keys button takes you to the DK PC Attendant Key Configuration screen. The default key assignments are defined for R2 and R3. These key assignments must match Program 59 of the DK. The Default Config button on this screen sets the default keys only, whereas the Default Config button on the previous screen sets the system database defaults.

➤ **To assign PC Attendant keys**

1. From the PC Attendant Configuration dialog box, select the key that you want to change.

   The Key Type drop-down box shows a list of key names that can be selected for that button. The three-digit program codes are shown in front of the button for convenient programming. If the programming telephone is next to the PC attendant console, you can look at the codes on the PC Attendant screen while you program.

2. Click OK after making your selections.
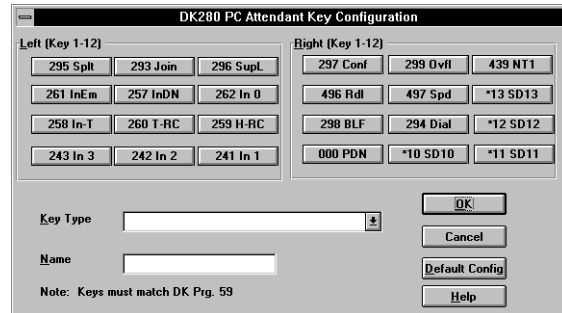
Access Codes

Access Codes are used by the DK424 for dialing features. The access codes (dialing plan) must match to allow the PC Attendant to dial the correct code to activate certain features. This is normally left at default, but if Program 05 is modified, corresponding changes are needed here. If no changes were made to Program 05, skip these steps.

➤ **To change access codes to match Program 05**

1. From the DK424 PC Attendant Configuration screen, click the Access Code button.

2. In the Access Code dialog box, click OK after making your selections.
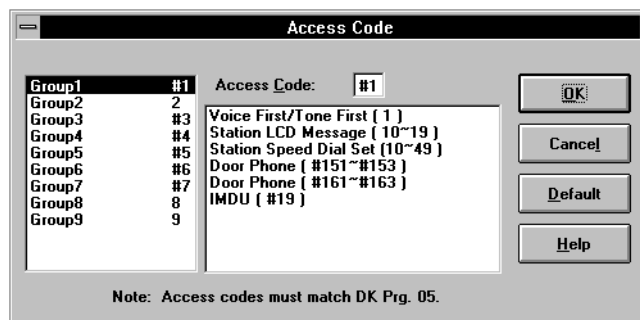
Class of Service

The Class of Service settings should reflect the call states and features which are anticipated to be used the most often.

1. From the DK424 PC Attendant Configuration screen, click the Class of Service button.

   These contain two items from Program 10 for setting the operation for Tone First or Voice First when calling a [DN] on the system and for setting the system to support two or three Night Transfer modes. The Class of Service for the port assigned to the PC attendant console must match Program 30 of the DK424.

2. In the Class of Service dialog box, click OK.
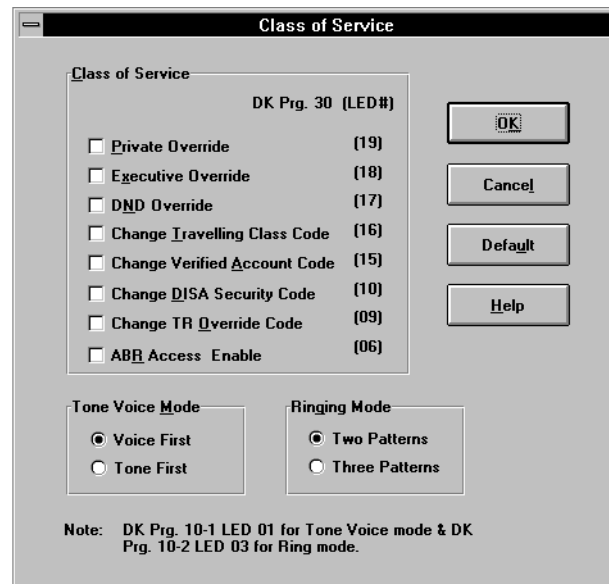
DNIS Trunks

To allow the DNIS feature to work properly, the PC attendant console needs to know whether trunk ports are being used for DNIS number translation or for CO line circuits. This assignment must follow Program 17 LED 05 in the DK424. (LED ON requires the line to be marked as DNIS.)

➤ **To set DNIS trunk identification**

1. From the DK PC Attendant Configuration screen, click the DNIS button.

2. From the Class/ANI DNIS Trunk Assignment dialog box, click OK when done.
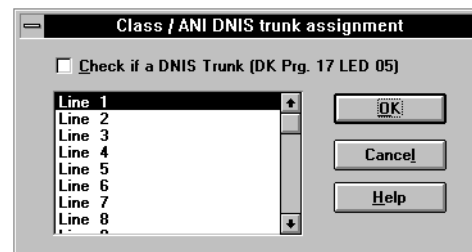
➤ **To exit Telephony Drivers and Telephony Setup**

1. From the DK PC Attendant Configuration screen, click Close to exit the Telephony Drivers box.

2. Click Close again to exit the Telephony Setup box.

PC Attendant Setup

After Telephony Setup has been completed, then a series of items needs to be configured within the main program. System Settings in the main program can be easily changed since they do not require a corresponding change in the DK424 in order to function. Most of these items are found under the Main Menu heading of Setup.

➤ **To access System Settings**

1. From the Main Menu, select Setup.

2. Click OK or enter a password.

Initially, you can click OK, without entering a password. Store a password if you need to ensure that these settings cannot be changed without authorization. Once a password is entered, you must enter that password to proceed.
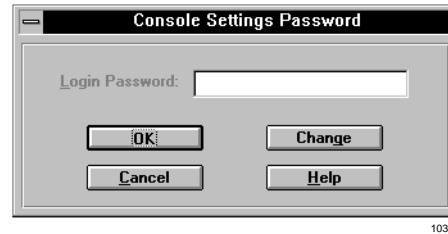
System Settings

Once the password screen is entered, the System Settings menu is presented. The two menu items, System Code Settings and Change Station User Name, allow the Attendant to change System Administration settings in the DK424. Within System Settings, the Attendant can customize the labels for only three menu items: Door Phone, Door Unlock, and Paging.

The following sections cover the main settings needed to make the console work.
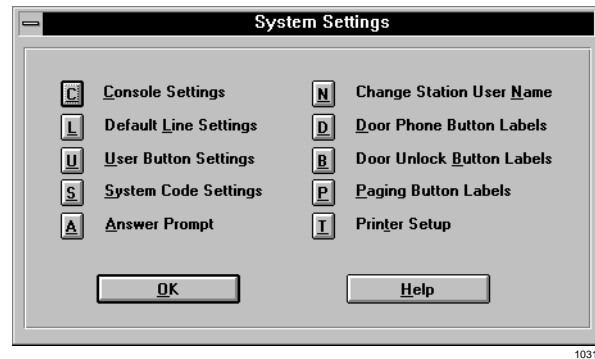
Console Settings

The first selection is Console Settings. This screen defines the PC attendant console main operating features, including:

♦ Auto Hold and Auto Dialing

♦ Account code length expected by the DK424

♦ Pilot number for Voice Mail

♦ Prefix digits needed to access a mailbox for message taking

♦ Voice Mail ID codes for message answering

♦ Call Forwarding to Voice Mail

More details about these settings can be found in the *Strata DK PC Attendant Console User Guide.*
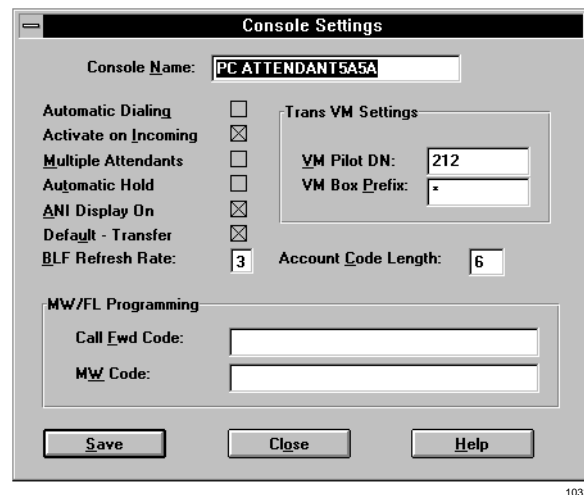
Line Settings

Each line and line group within the system can be renamed to allow for easy identification. For example, a private line for John Smith can be marked "John's Pvt Line". These identifiers are unique to the PC attendant console.

In the Lines dialog box, you can change the names that appear in the Active Call window. The Active Call window names are different from the names that appear in the PC attendant console selection windows.

The Attendant can also define a default line or line group to make dialing more efficient. The default line or line group can be used with the Directory to identify a Tie line group for easy transfer of calls. (See "Setting up the Directory" later in this section).

➤ **To change CO line and names**

1. From the menu bar, select Setup, Settings... and OK to access the System Settings dialog box. Then select Default Line Settings.

2. From the Lines dialog box, highlight the Line or Line Group to be changed.

3. Select the corresponding edit box and enter a new name.

4. Repeat for all lines or line groups that change names.
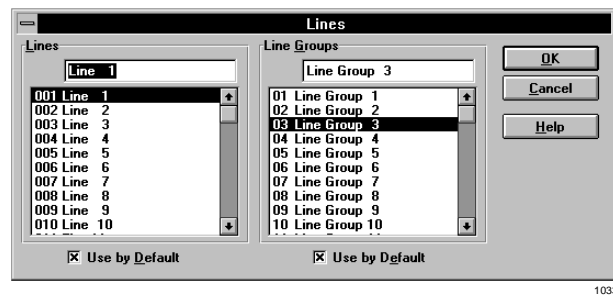
User Buttons

The user buttons of the PC attendant console can be customized with features used most often by the Attendant. User buttons can be set to immediately invoke a feature or to open a dialog box associated with the feature. Each button can be programmed with Speed Dial or Feature buttons. (See the *Strata DK PC Attendant Console User Guide* for instructions on clearing buttons.)

➤ **To change user buttons**

1. From the System Settings dialog box, select User Buttons.

2. From the User Buttons dialog, select the button to be changed.

3. Select either Autodial or Feature to change the button.

4. Enter a feature code for the list by selecting from the pull down list or selecting the Digits box and entering a number.

5. Select Label to change, if necessary.

6. Select the next button to change and repeat the process.

7. Select the OK button when all changes have been made.
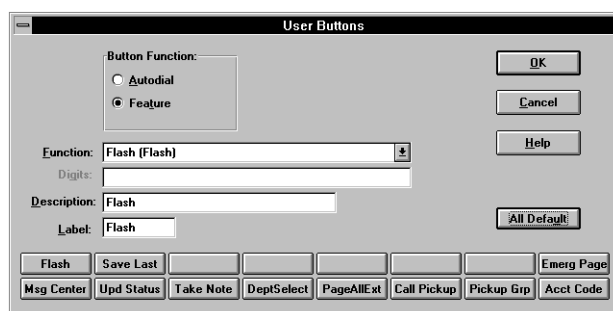
Answer Prompts

Answer Prompts can be entered so that when new calls are presented and answered by the Attendant, the prompts will appear in the information window. Any currently recorded prompts are listed in the Answer Prompts box (shown below) and two selections on the left allow linking the prompts to a DNIS tag or CO line.

Note   DNIS applies to R3 and up only.

The DK424 identifies calls to the Attendant position by using the default CO line indication. It can also attach a tag that was recorded in Program 71 for each DNIS number translated by the system.

When lines are marked as DNIS in the Telephony Setup (see "PC Attendant Console Software Installation" on Page 9-34), the PC attendant console uses the DNIS tag to select the prompt instead of the line number. The button marked DNIS Text... is used to record the DNIS Tags which should match those listed in Program 71-5.

Toshiba recommends entering DNIS tags when they are programmed into the DK system. This enables the Attendant or System Administrator to create prompts as needed. Even if some DNIS lines are not scheduled to ring at the console, the calls to be forwarded to the Attendant and answers prompts may be used later.

The Answer Prompts can have approximately 110 characters. The edit window, shown below, is the same size as the window on the main screen in order to view the message as it will display.

➤ **To write an Answer Prompt**

1. From the System Settings dialog box, select Answer Prompt.
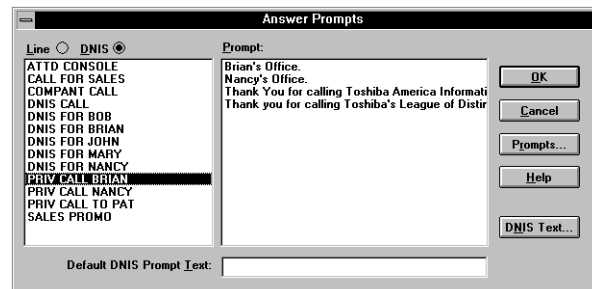
2. From the Answer Prompt dialog, select the Prompts...button.

3. Select the New button.

4. Type in a new prompt message in the Prompt box.

5. Select the New button again to enter another prompt or OK to save those entered.
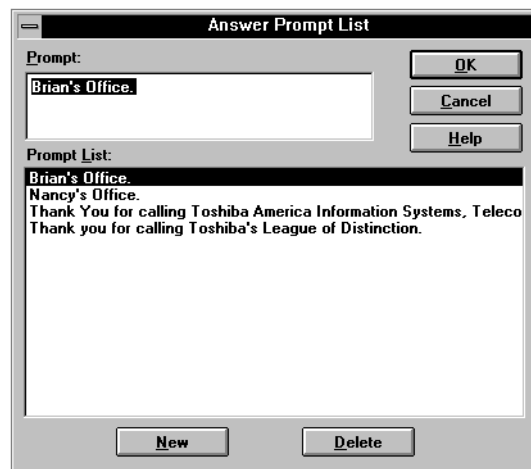
➤ **To write a DNIS Answer Prompt**

1. From the System Settings dialog box, select Answer Prompt.

2. Select the DNIS Text... button.

3. From the DNIS Text dialog box, select the Add button.

4. Type in the Name Tag as entered in Strata DK System system programming.

5. Select the Add button to enter another prompt or the OK button to save those entered.
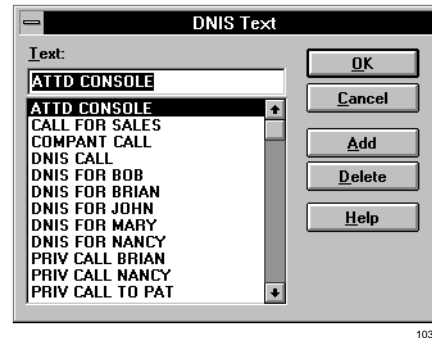
➤ **To link a CO line or DNIS tag with an Answer Prompt**

1. Click on a line or DNIS tag.

2. Highlight the Prompt.

3. Press OK.

➤ **To remove an Answer Prompt from a CO or DNIS line tags**

➤ Click to remove the highlight.

See the *Strata DK PC Attendant Console User Guide* for instructions on other Answer Prompt options.

Setting up the Directory

The directory is a central part of the PC attendant console. Information in the directory is used for the following:

♦ Auto Dial

♦ Auto Transfer

♦ Transfers to Voice Mail

♦ Recording an individual's status

♦ Recording messages for people without phones or for transferring to Voice Mail

♦ Recording individual's work departments so that when a caller asks for someone in "Sales," a list of department members will appear
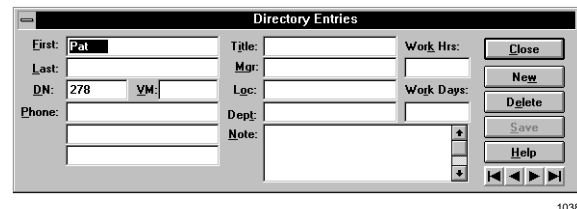
This is also a place to store information about different individuals and how they may be reached, for example, pagers, home office, car phones, fax, etc. It can also be used to indicate location, work schedule and supervisors of people if needed.

Multiple entries of the same information is allowed.

For example, two people may share the same [DN]. A call to John Smith will ring station 204 and if Sandy Johnson has the same [DN], her telephone will also ring. The same person may be entered twice. For example, John Brady may be entered with [DN] 204 and with a [PhDN] 504.

When there are multiple entries, Auto Dial (includes Auto Transfer) is disabled. In the first example, where two people shared the same [DN], the system would pause if the [DN] is entered. At this point, the Attendant can enter a name and as long as there are no name conflicts, the console will now Auto Transfer. When the system pauses, other calls can still be handled by Auto Dial if there are no conflicts.

It is important to enter names in the same format, otherwise, the directory search function will not work and the individual will have to be selected manually. In other words, avoid entering first names for some people and first and last names for others. For example, if I created an entry for Pat L and another for Pat Long, the first entry would never be selected because the console will look for a match to Pat Long. If an "o" is entered after the "L", the console will select Pat Long. Avoid using abbreviations in the initial entry.

Use the "Dept" field for grouping people who need to be reached by function. Directory entries with this field left blank will not show in the "Dept Select" feature. Assigning a consistent list allows for all people within a group to show on the list together, offering the Attendant a method to choose the person that can best serve the caller.

See the *Strata DK PC Attendant Console User Guide* for instructions on adding entries into the Directory.

Establishing the Speed Dial List

The Speed Dialing list must be established before the list will show in the Dialing window. This can be done in one of two ways.

Method 1

With the first method, you transfer a Speed Dial list that was previously entered into the DK system to the PC attendant console. Once you have completed the following procedure, the PC attendant console will store the numbers to match those stored in the system.Then, when the Attendant uses this Speed Dial list, the PC attendant console dials the code for speed dial and the DK system uses the number it has in memory.

➤ **To transfer the DK Speed Dial list to the PC attendant console**

1. If the Speed Dial list has been entered into the DK system, then select each speed dial entry.

2. Press the Modify button.

3. (optional) Enter a name for the number.

   Note This name is stored in the PC attendant console only and is not downloaded into the DK system Speed Dial Memo.
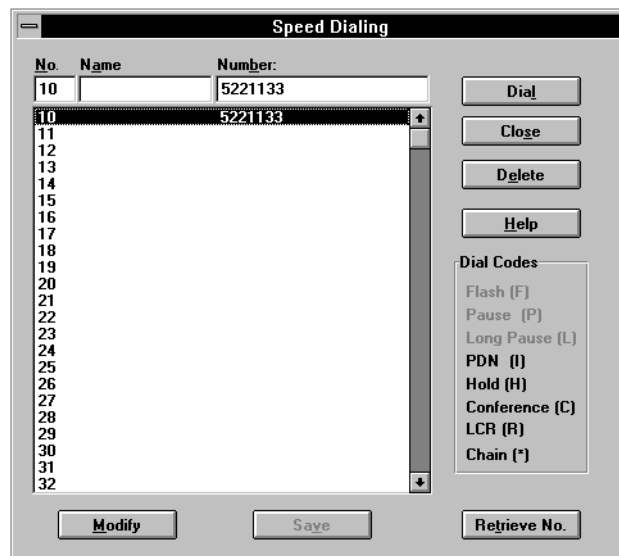
Method 2

With Method 2, you enter a list of Speed Dial names and numbers from the console. The entered list will automatically re-sort and display

alphabetically by name. A second sort is performed by dialed number which also searches for names that are the same.

Do not enter extra spaces after either the first or last names and do not put the full name in only one box. The system searches the names by putting together the First and Last name by adding a space between the first and last.

The system also adds a comma and space after the last and before the first. The Attendant can type names using either first or last name which will be automatically dialed if there is a matching name, but the name must match exactly, including any spaces and commas.

[DNs] are treated as a separate match, thus calls proceed with either a [DN] or name match.

➤ **To enter Speed Dial numbers**

1. Enter each number and name from the console.

2. Click the Save button.

Using LCD Messaging

LCD Messaging uses the system messages and the personal messages (if enabled).

➤ **To display the messages currently programmed in the DK system**

1. Select each message number and press the Retrieve Msg button.

2. Press the Modify or Save button.

3. Press Close.

See the *Strata DK PC Attendant Console User Guide* for more instructions on the messaging features.

Backup/Restore Configuration

After all the data parameters are entered, the system should be backed up to a floppy diskette for restoring the operation later if needed. This backup diskette can be used to set up additional PC Attendant Consoles to operate with the same directory and settings as the first. This saves time when creating additional consoles and ensures that the buttons and operation of one console matches the next.

➤ **To backup or restore PC attendant console setup data**

1. Double-click on the PCATT BACKUP icon.
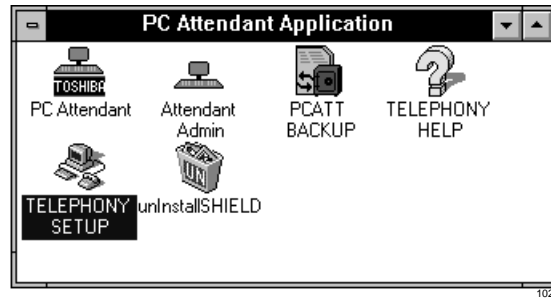
2. From the PC Attendant Backup and Restore dialog box, select Backup or Restore.

3. Enter the appropriate directories.

4. Select the Start Backup or Close buttons.
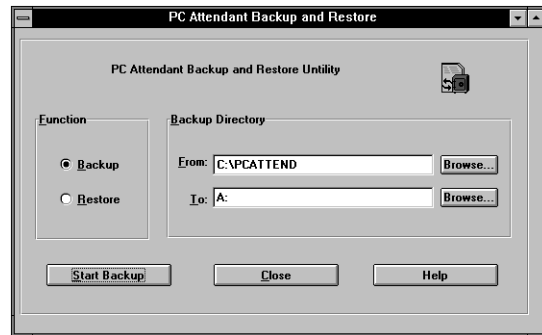
Windows Control Panel

Several items within Windows have an effect on the operation of the PC Attendant console. These controls are within the Main Program Group under the topic of Control Panel.

Choose Color Dialog Box

Windows allows the screen to use a variety of colors. PC Attendant console uses the color settings to determine the highlight, title bar and text color of many parts of the program. Choose a color scheme that provides the type of contrast best suited to the user.

	Action	Description
1.	Switch to Program Manager (**Alt+Tab**).	The screen will show each window currently open, including the Program Manager.
2.	From the Main Program Group, choose Control Panel.	
3.	From the Control Panel, choose Colors.	
4.	Select a color setting from the list.	A dialog box showing the current color settings and example colors is shown. Using the mouse or Arrow keys, the color settings can be viewed and changed.
5.	Press the OK button when done.	

Choose Desktop Dialog Box

The Desktop defines whether or not the Alt+Tab key combination can be used to switch between open applications on the desktop. The Desktop screen controls: cursor blink rate, whether a screen saver is used, and the timer to invoke the screen saver. Toshiba recommends using a screen saver since this protects the video monitor. When calls come into the PC Attendant when the screen saver is displayed, ringing is heard, but the screen saver remains on until the user takes an action. "Activate on Incoming" does not affect the screen saver.

	Action	Description
	1. Switch to Program Manager (**Alt+Tab**).	The screen will show each window currently open, including the Program Manager.
	2. From the Main Program Group, choose Control Panel.	
	3. From the Control Panel, choose Desktop.	
	4. Look at Applications and make certain that "**Fast Alt+Tab**" operation is enabled. And choose a screen saver pattern and delay time for the pattern to employed.	A number of settings are possible within the desktop control. Only the "**Fast Alt+Tab**" operation and screen saver patterns are used with the PC Attendant.
	5. Press the OK button.	

Choose Keyboard Dialog Box

Two controls can be used on the keyboard, the first is the delay needed to hold a key down before the character will repeat and the second is the speed of repetition once the key repeats.

	Action	Description
	1. Switch to Program Manager (**Alt+Tab**).	The screen will show each window currently open, including the Program Manager.
	2. From the Main Program Group, choose Control Panel.	
	3. From the Control Panel, choose Keyboard.	

Station Apparatus

Action	Description
4. Choose the Delay before Repeat and Repeat Rate speed desired.	The slide controls offer two speed settings. This affects the rate of change the **Vol Up/Vol Dn** keys respond to when a key is held down to adjust the volume. The slower the repetition, the easier it is to distinguish level change. This rate also affects scroll rate for the Arrow keys used in the directory and other lists. Toshiba recommends starting at mid-points of each setting before making adjustments.
5. Press the OK button when done.	

Choose Mouse Dialog Box

Under the title Mouse, two settings affect the speed of the mouse and the speed of the double click needed to make a selection. If you are currently using a mouse, these settings should be appropriate and need not be changed. If the mouse is new to you, Toshiba recommends each setting to be a slower speed for easier operation. Once you gain experience with the mouse, you can use faster settings.

Action	Description
1. Switch to Program Manager (**Alt+Tab**).	The screen will show each window currently open, including the Program Manager.
2. From the Main Program Group, choose Control Panel.	
3. From the Control Panel, choose Mouse.	
4. Choose the Tracking and Double Click speed desired.	Two speed settings are possible using a slide control. Slower operation is for beginning users while faster tracking and double click speeds are for experienced users. The control buttons can also be changed to allow for left-handed users of the mouse.
5. Press the OK button when done.	

Conventional Attendant Console

A Strata DK system configured with RCTUB2 or RCTUBA/BB can support two Attendant Consoles, and systems with RCTUC1/D2 or RCTUC3/D3 can support four Attendant Consoles. The RCTUA1, RCTUA3, RCTUB1, or RCTUC/D1 do not support Attendant Consoles.

PC and conventional Attendant Consoles require RCTUB2 or RCTUC/D2 R 2 processors or RCTUBA/BB, RCTUC3/D3, RCTUE3/F3 R3 processors.

The conventional attendant console can be configured with a Toshiba-supplied base (ATT BASE-1) and an Electroluminescent (EL) or EGA Color CRT.

Installation

Refer to "Hardware Installation" on Page 9-31 and the following steps.

➤ **To install the conventional attendant console**

1. Plug in the EL or CRT display to the base with a nine-pin cable, which is supplied with the display.
2. Plug in the EL or CRT display to a commercial three-prong AC 117V outlet.
3. Use two-pair wiring to connect the MDF to an RJ11 jack at the attendant console location.
4. Plug in the handset to the base RJ45-jack (see Figure 9-21).
5. Plug in the headset (if needed) to the base.

Conventional Attendant Console Programming

Follow the same programming instructions provided for the PC attendant console. See "PC Attendant Console Programming" on Page 9-33. Software Installation and Windows instructions do not apply to the conventional console.

Station Apparatus

DKT2001 Digital Single Line Telephone

The following provides information on how to connect the DKT2001 Digital Single Line Telephones (SLTs) to the DK system.

Before proceeding, see warning and caution notes in "Telephone Installation".

The digital SLTs connect to the digital telephone ports via the MDF with standard twisted-pair jacketed telephone cable. If using 24 AWG cable, single-pair wiring is sufficient in most cases for DKT2001 model standard telephones to operate effectively at up to 1000 feet from the system.

3532

To accommodate the digital telephone line cord, the cable should be terminated in a modular station connector block (RJ-11) at the station location. The standard single-pair, modular DKT2001 model standard telephone cord that is sent with the telephone is 7 ft. (the maximum allowed is 25 ft.).

Digital telephone cable runs must not have cable splits (single or double), cable bridges (of any length), or high resistance or faulty cable splices.

➤ **To wall mount DKT2001 digital SLTs**

1. Loosen the screws, and remove the telephone base.

2. Using a suitable cutter, remove the handset hanger from the base.

3. Insert the handset hanger in the slot on the front of the phone. The hanger fits in the notch on the handset cradle.

4. Rotate the telephone base 180 degrees and secure it to the telephone with its four screws.

5. Connect the phone to the wall modular connector with a cord approximately four inches long (available at most telephone supply companies).

6. Route the cord into the hollow portion of the base.

7. Mount the phone on the wall mounting modular connector plate.

Handset Hanger

3633
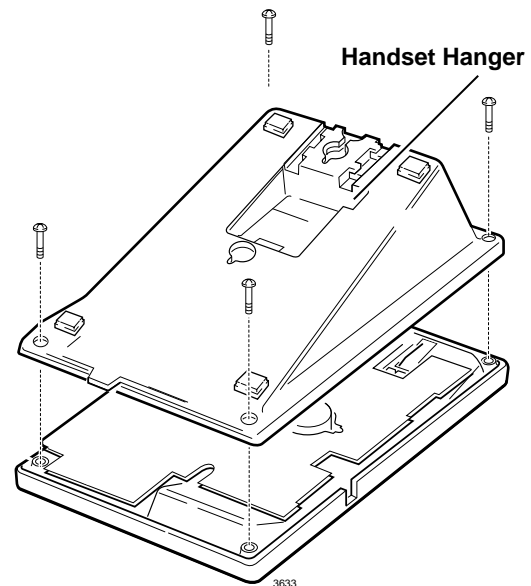
Figure 9-22 Removing the Telephone Base

Installation

1. Set the DIP switches to match Figure 9-23. The DIP switches are preset from the factory for the USA and Canada. Refer to Table 9-1 on Page 9-4 for other country settings.

2. If required to achieve maximum distance (greater than 1000 ft.), install a two-pair house cable (or external power).
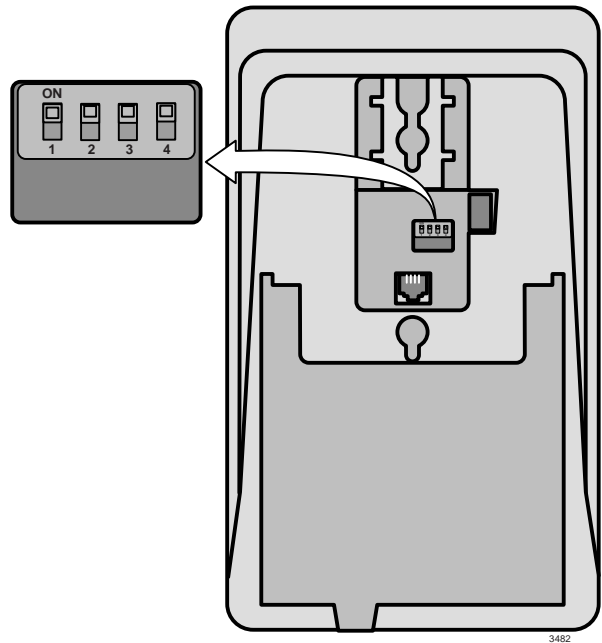
Programming

Program 03: Specify Code 61 to indicate a station line PDKU2.

Program 27: Adjusts initial off-hook volume level for digital telephone handsets.

Program 38: Specify Code 21.

Program 39: Specify button 01 as a [PDN].

Important! *Do not program CO lines or secondary line appearances onto button 01 or in any other position. Since the system assigns CO lines 01~17 by default, be sure to remove any CO line appearances by programming them as Station Speed Dial buttons (code ∗).*

Note If the **Speed Dial Select** button is removed, the ∗ key becomes the **Speed Dial Select** button. While on an outside call, the user must press ∗ then # to activate the ∗ and # DTMF tones for the duration of the call.

Program 92-5: Initializes initial ringing, speaker, and muted ring volume levels of digital telephones.

Also, refer to the Numerical Programming Listing in the *Strata DK Programming Manual* for other station-related programs.

Figure 9-23   DKT2001 DIP Switch Settings

Peripheral Installation

10

This chapter provides connection procedures for optional peripheral equipment to Strata DK Systems. Information in this chapter applies to all systems, unless stated otherwise in text.

Instructions include hardware requirements, PCB configuration, interconnection/wiring requirements, and programming considerations. Peripheral equipment is connected to system PCBs. See Chapter 7 – DK40i/DK424 Universal Slot PCBs installation and configuration information and the appropriate installation section.

Power Failure Options

In the event of a power failure, Strata DK uses these options:

Reserve Power

For information on the Reserve Power Option, see:

♦ Chapter 1 – DK14 Installation

♦ Chapter 3 – DK40i Installation

♦ Chapter 5 – DK424 Installation

DK14/DK40i Single-line Power Failure Emergency Transfer

DK14 and DK40i have a built-in single-line Power Failure Emergency Transfer (requires loop start lines). See Chapter 1 – DK14 Installation and Chapter 3 – DK40i Installation for detailed information.

DK40i/DK424 Power Failure Transfer Unit

An optional Power Failure Transfer Unit (DPFT) can be installed that automatically connects up to eight selected CO lines directly to designated standard telephones in the event of a power failure. The DPFT enables normal operation of the selected CO lines and standard telephones when the system is in service. When power is restored, each telephone is independently reconnected to system standard telephone circuit ports after it is finished with its direct CO line call. The DPFT is normally installed on the MDF.

Figure 10-1 provides a circuit diagram of the DPFT.
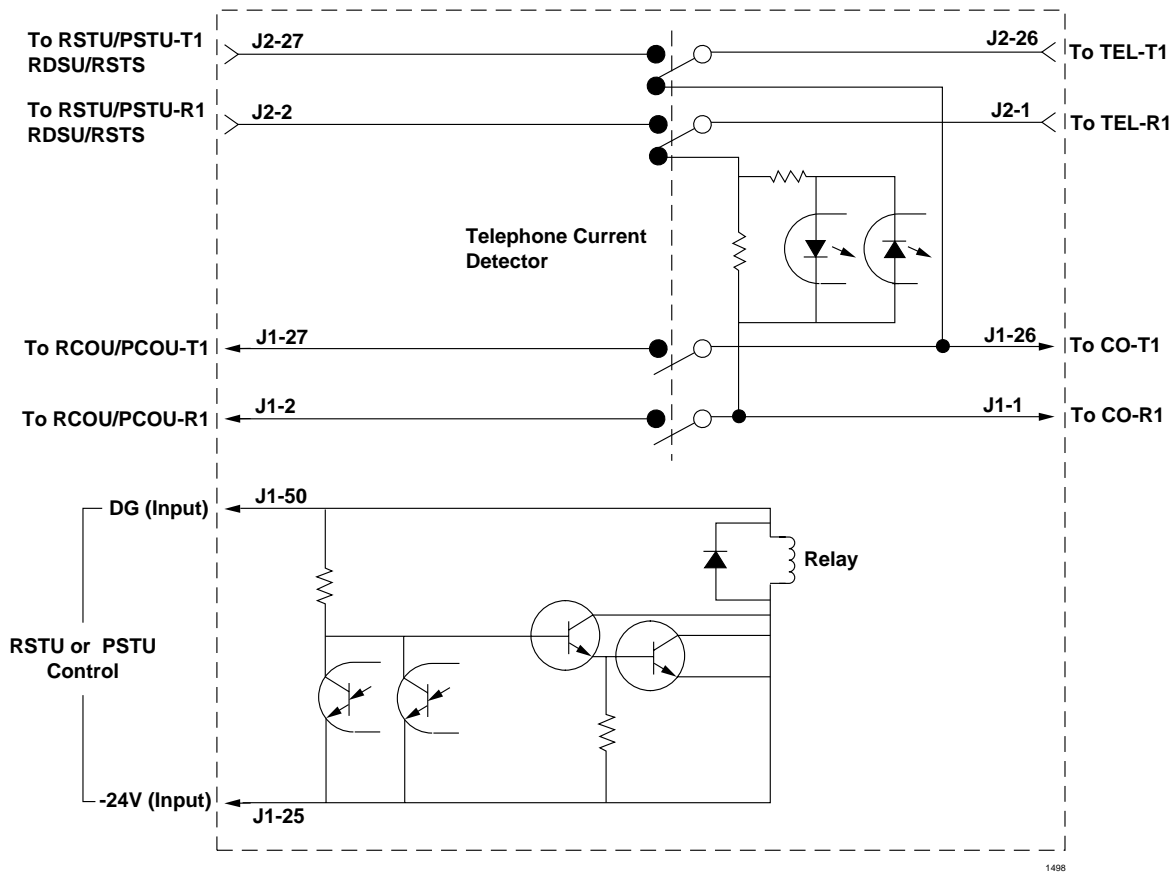
Figure 10-1   DPFT Circuit Diagram

Power Failure Emergency Transfer (DPFT) Installation

1. Mount the DPFT on or near the MDF.

   Note   See Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring, DPFT/MDF interconnecting tables.

2. Using 25-pair cables with amphenol-type connectors (female for DPFT connector J1, male for DPFT connector J2), connect the DPFT to two 66-type quick-connect blocks.

3. Connect the CO lines selected for emergency use to the DPFT J1-block "CO-TIP" and "CO-RING" terminals.

4. Connect the RCOU, RCOS (or PCOU) circuits related to the emergency CO lines to the DPFT J1-block "RCOU-TIP" and "RCOU-RING" terminals.

5. Connect the standard telephone stations selected for emergency use to the DPFT J2-block "TEL-TIP" and "TEL-RING" terminals.

6. Connect the RSTU, RDSU/RSTS or PSTU standard telephone circuits related to the emergency standard telephones to DPFT J2-block "PSTU/ RSTU-TIP" and "PSTU/RSTU-RING" terminals.

7. Connect the DPFT to the RDSU/RSTU/PSTU DG and -24V terminals (See Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for RSTU/PSTU and RCOU/PCOU wiring/interconnecting details). The -24V (Pin 25) and DG (Pin 50) ground terminals are available on the KSTU2, RSTU2, RDSU, or PSTU only, not on the PESU.

➤ **To test the operation of the DPFT**

1. Turn the system power switch OFF.

2. Verify that CO dial tone is available at each standard telephone connected to the DPFT.

3. Call back to each telephone using an outside line.

Music-on-Hold (MOH)/ Background Music (BGM) Options

Strata DK systems provide an MOH option for CO, E&M tie and DID lines, as well as telephones connected to the system. A variety of BGM options are also provided. (See Figure 10-2.)

MOH Option

The DK14 KSU, DK40i KSU or DK424 RCTU supports an external, customer-provided music source – such as a tuner, compact disc player, digital music source, cassette downloader digital source or tape player – for MOH. The DK14 KSU, DK40i Base KSU, PIOU, PIOUS, and PEPU each has a relay contact on it that can be configured to automatically turn the source on when a CO line or station is placed on hold. MOH source and MOH relay contact specifications are as follows:

BGM or MOH Source Specifications

♦ Input Impedance: 600 ohms or 8 ohms

♦ Input Voltage (recommended levels)
    Minimum: 0.14 VRMS (-15 dBm)
    Maximum: 0.77 VRMS (0 dBm)

Relay Contact Specifications

♦ Voltage: 24VDC maximum

♦ Current: 1 amp maximum

Important! *In accordance with U.S. Copyright Law, a license may be required from the American Society of Composers, Authors, and Publishers (ASCAP), or other similar organization, if copyrighted music is transmitted through the Music-on-Hold feature of this telecommunications system. Toshiba America Information Systems, Inc., hereby disclaims any liability arising out of the failure to obtain such a license.*

Peripheral Installation

➤ **To install the MOH option**

1. Connect the external music source to the DK14 or DK40i KSU, or DK424 RCTU, RCA jack (see Figure 10-1).

2. Rotate the DK14 KSU, DK40i KSU or RCTU volume control (VR1) to adjust MOH volume: clockwise increases volume; counterclockwise decreases volume. Listen to the CO line on-hold when setting MOH to the proper volume.

3. If MOH relay control is required, access Program 77-1. Set LED 05 to ON to configure the MOH/Night Transfer Control relay for the MOH function. This feature requires the installation of a DK14 KSU, DK40i KSU, or PIOU, PIOUS, or PEPU PCB.

4. If using the MOH control feature with a PIOU or PEPU, set PIOU or PEPU jumper plug P11 to the MAKE or BREAK position as required:

   ♦ MAKE (M) – Shorts the normally open contacts (pins 9 and 34) when MOH is activated.

   ♦ BREAK (B) – Opens the normally closed contacts (pins 9 and 34) when MOH is activated.

   ...or

   If using the MOH control feature with a PIOUS, solder PIOUS jumper W2 to the MAKE or BREAK position as required:

   ♦ MAKE (M) – Shorts the normally open contacts (NHT and NHR) when any CO line is in the hold condition.

   ♦ BREAK (B) – Opens the normally closed contacts (NHT and NHR) when any CO line is in the hold condition.

5. MOH (CO line or intercom hold) is applied from the RCTU through the KSU's backplane to DID lines, tie lines, CO lines, electronic, digital, and standard telephones on hold.

6. MOH is also applied through the DK14 KSU, DK40i KSU, RCTU, Page/BGM control to provide BGM to electronic/digital telephone speakers and external page.
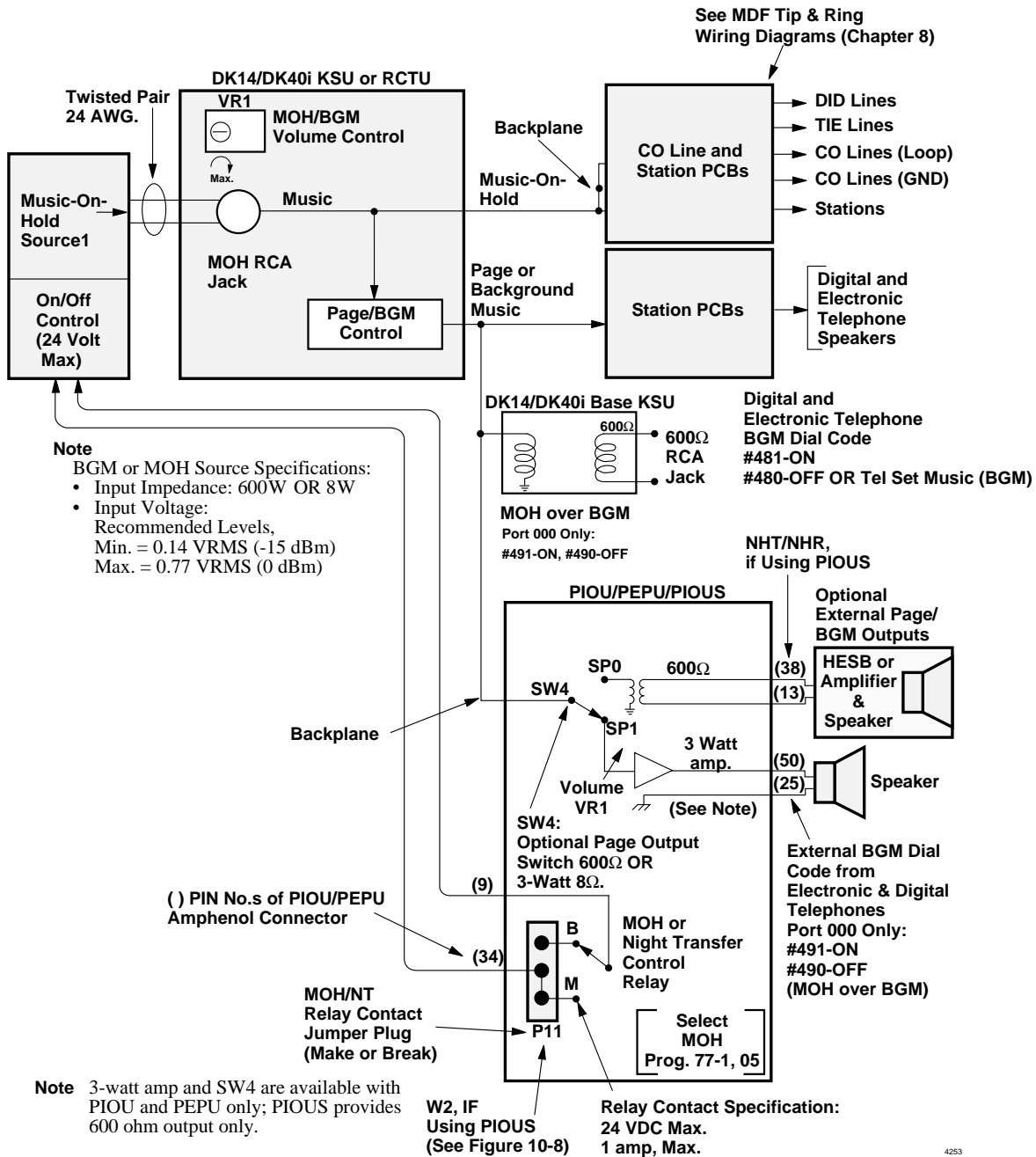
Figure 10-2   Music-on-Hold and Background Music (same source) Functional Diagram

BGM Options

The BGM options allow music to play over optional external speakers (external page system) and/ or digital and electronic telephone speakers. BGM can be configured in three ways:

Configuration A – One Music Source

This configuration enables BGM and MOH to share the same music source (see Figure 10-3). With this configuration, the MOH/BGM music source is connected to the RCA jack on the DK14 KSU, DK40i KSU or RCTU PCB. The music source is sent to CO lines/stations on hold, to electronic/digital telephone speakers, and to the external page system via the PIOU, PIOUS, or PEPU optional PCBs. Station Port 000 must dial **#491** to send MOH over BGM and **#490** to disable the option.
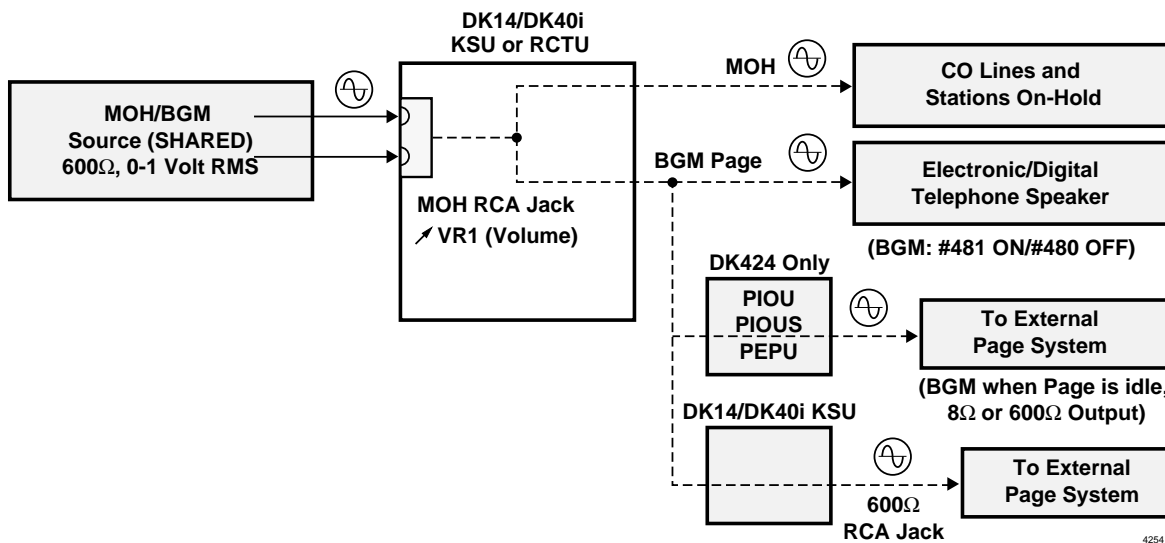
Figure 10-3   MOH/BGM Music Source Configuration A

Note   Telephone users can turn on BGM at their station by pressing the **Tel Set Music** (**BGM**) button; or by pressing [PDN] + **#481** (**#480** turns BGM OFF).

Configuration B – Alternate Background Music Source

This configuration enables the MOH source to be connected to the MOH RCA jack of the DK14 KSU, DK40i KSU or RCTU, (as in Configuration A) and a separate BGM source to be connected to a PEKU (circuit 3), PESU (circuit 8)

...or

KSTU2, QSTU2, RSTU, RSTU2, RDSU, or PSTU (circuit 2) PCB (see Figures 10-4 and 10-5). With this configuration, the MOH source is sent only to CO lines/stations on hold, while the BGM source is sent directly to electronic/digital telephone speakers and to the external page system via the PIOU, PIOUS, PEPU or DK14 and DK40i BGM 600 ohm RCA jack.
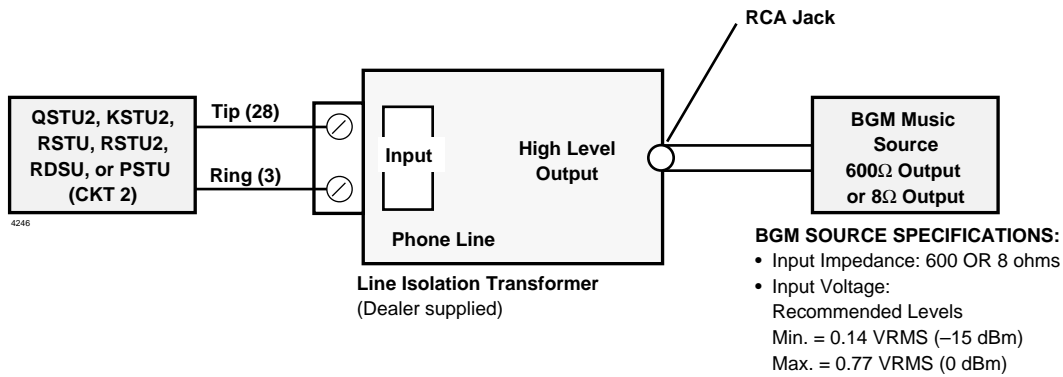
Figure 10-4   DK14/DK40i/DK424 Alternate BGM Source to Standard Telephone Port Connection
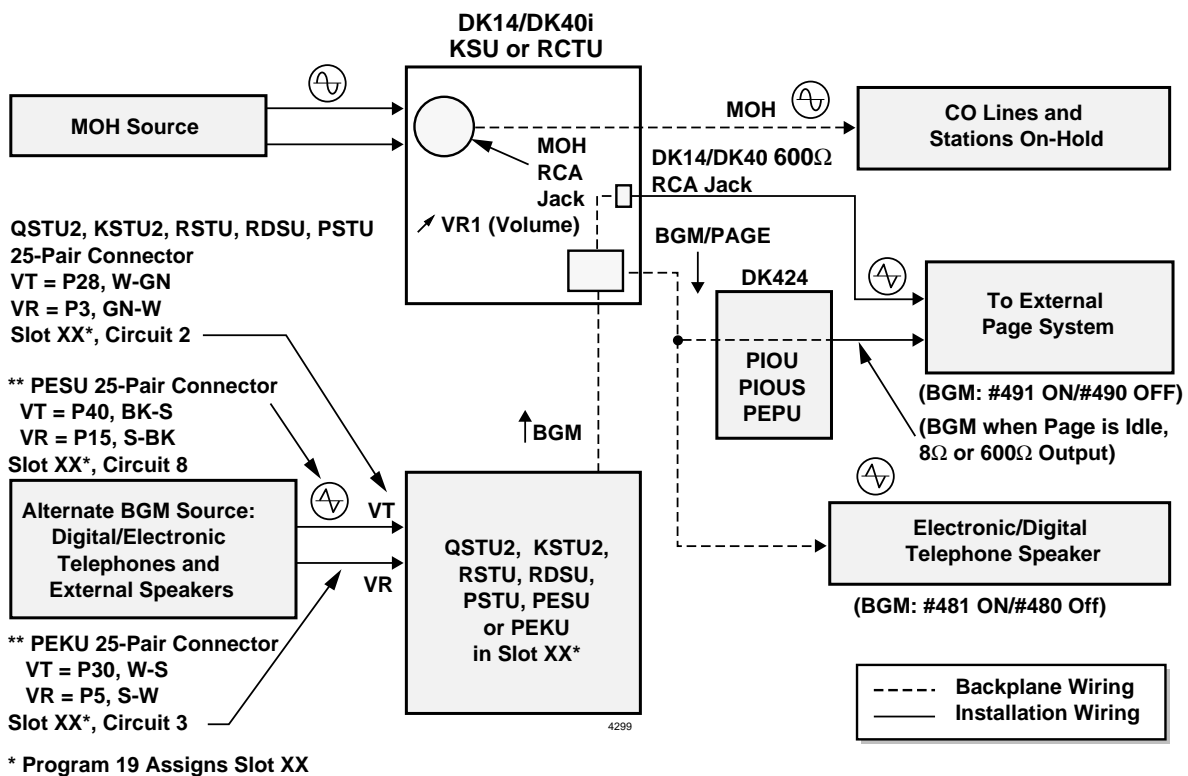
Figure 10-5   DK40i/DK424 Alternate BGM Source Configuration B

Configuration C – Three Music Sources

This configuration enables the MOH source to be connected to the RCA jack of the DK40i KSU or DK424 RCTU (as in Configuration A). The digital or electronic telephone BGM source is connected to a PEKU, PESU, KSTU2, RSTU, RSTU2, RDSU or PSTU PCB (as in Configuration B), and a separate BGM source is sent to the external page speakers via the PIOU PCB (see Figure 10-6). This option is not available on DK14.

When a separate BGM source is connected to the PIOU, two customer-supplied amplifiers are required to drive the external speakers.One amplifier drives the speakers for BGM when page is idle and the other amplifier drives the speakers during page. The PIOU switches BGM or page to the external speakers via zone relays. (The PIOUS and PEPU do not provide zone relays; therefore Configuration C is not possible with these PCBs.)
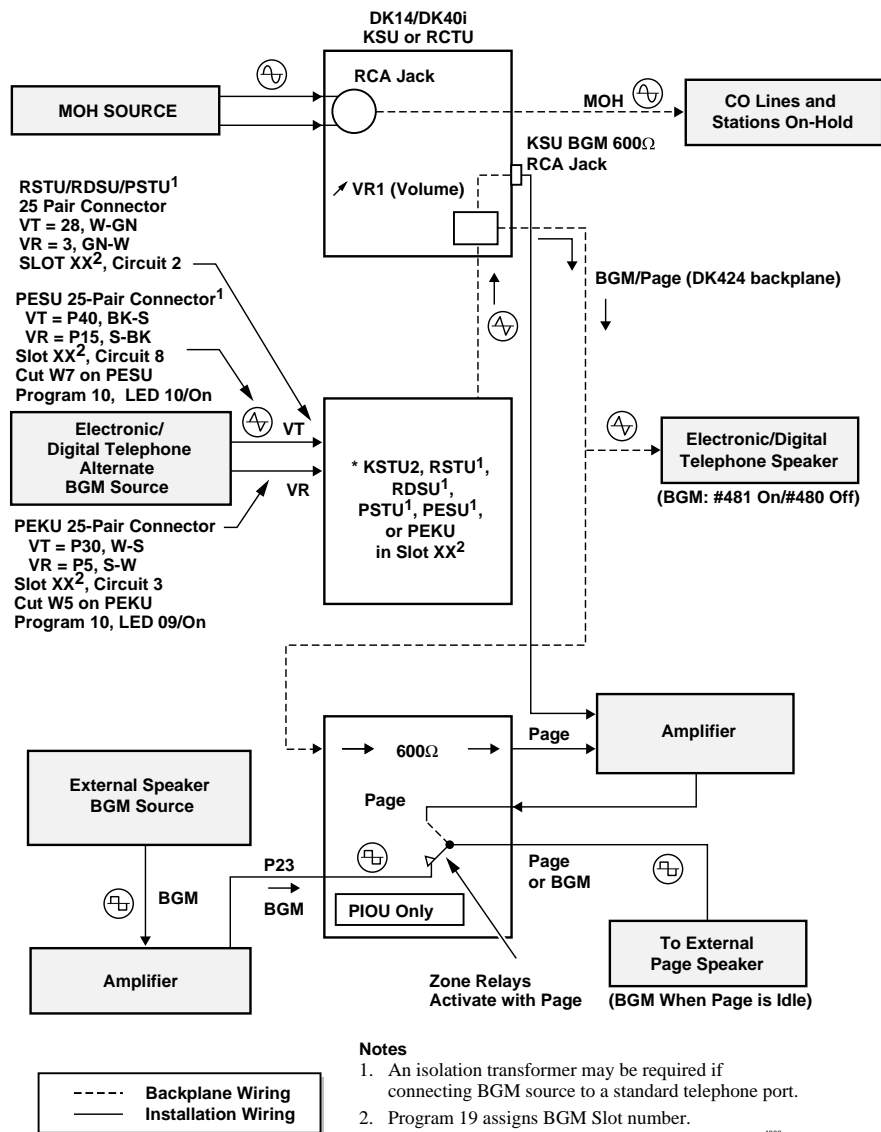
Figure 10-6   DK40i/DK424 Alternate Music Source Configuration C

➤ **To install the MOH/BGM as BGM**

1. Ensure that the MOH option is installed in accordance with "To install the MOH option" on Page 10-4 (see Figure 10-2).

2. The output of the RCTU page/BGM control is applied through the backplane to the output select switch (SW4) on the PIOU or PEPU. Set the SW4 switch to either SPO or SPI, as required:

   ♦ SPO – Directs external page and non-amplified BGM to the HESB or external amplifier (pins 13 and 38).

   ♦ SPI – Directs external page and BGM through the on-board 3-watt amplifier to the external speaker output (pins 25 and 50).

   Note The PIOUS provides non-amplified BGM/page output only (SPT and SPR). See Figure 10-8.

3. When using an HESB or external amplifier for paging/BGM, adjust volume using the HESB or amplifier volume control.

4. When using the internal amplifier for paging/BGM, adjust the volume using the volume control (VR1) on the PIOU/PEPU PCB.

Alternate BGM Source Installation

A BGM source can be connected to a station PCB (QSTU2, KSTU2, RSTU2/PSTU, RDSU, PEKU, or PESU) to send music to all electronic/digital telephone speakers and to the external page system via a PIOU, PIOUS, or PEPU. The BGM source is separate from the MOH source connected to the RCTU PCB. An isolation transformer is needed to connect a music source to one of the above standard telephone circuits (see Figure 10-4).

➤ **To connect the BGM source to the QSTU2, KSTU2, RSTU2/PSTU, RDSU, PEKU or PESU**

See Figures 10-4~10-6 and follow these steps:

1. Access Program 10-2. If the BGM source is connected to circuit 3 on a PEKU, set LED 09 to ON. If the source is connected to circuit 8 on a PESU, set LED 10 to ON. If connecting BGM to QSTU2, KSTU2, RSTU2, RDSU or PSTU, LED 09 and 10 should be OFF.

2. Using Program 19, identify (assign) the BGM slot.

3. If connecting the BGM source to a PEKU or PESU: Connect the PEKU tip and ring of circuit 03 to the 600 ohms or 8 ohms output of the BGM source or connect the BGM output to circuit 8 of a PESU.

   ...or

   If connecting the BGM source to a QSTU2, KSTU2, RSTU2/PSTU or RDSU: Connect circuit 2 of the RSTU2/PSTU or RDSU to a customer-supplied isolation transformer and BGM source.

   Note The isolation transformer protects the BGM source from potentially damaging QSTU2, KSTU2, RSTU2/PSTU or RDSU voltage. Some music sources which are designed for telephone system applications may have this protection built-in and do not require the transformer. (Consult the documentation provided with the music source.)

4. If the BGM source is connected to either a W5 on the PEKU or W7 on the PESU PCB, cut the strap. There is no strap to cut on the QSTU2/KSTU2, RSTU2/PSTU or RDSU.

5. Using the BGM source's volume control, adjust the BGM volume to the desired level while listening to BGM via a telephone speaker and/or the external page speakers. When BGM is sent to external speakers via a PIOU or PIOUS or PEPU PCB, use the external amplifier volume control to balance the BGM and page volume levels.

External BGM Installation

The external BGM options are closely associated with the external paging options. See "External Page Options" on Page 10-26 for external paging amplifier installation.

Relay Control Options and Door Lock Control

Two relays are provided on the PIOU, PIOUS, and PEPU PCBs to control the operation of peripheral equipment:

♦ External Page/Door Lock Relay

♦ Night Transfer/Music-on-Hold Relay

Note Only the PIOU/PIOUS/PEPU with the lowest Program 03 code (41, 42, or 43) will provide the relay control function.

Each relay can be configured to provide one of two possible control functions and as normally open (MAKE) or closed (BREAK). Electrical specifications for the relay contacts are as follows:

Voltage: 24VDC maximum

Current: 1 amp maximum

CAUTION! **To prevent relay damage, do not connect relays directly to 120VAC power source.**

Note See the *Strata DK Programming Manual*, as necessary, when instructed to program the PIOU, PIOUS, or PEPU in the following paragraphs.

External Page/Door Lock Relay Options (PIOU, PIOUS, or PEPU)

The PIOU, PIOUS, or PEPU PCB may be programmed for either the external page function or the door lock control function. (See Figures 10-7 and 10-8.)

When configured in Program 77-1 for the external page function, the relay controls an external music source connected to the PIOU, PIOUS or PEPU to provide BGM over external speakers. When a paging announcement is made over the external speakers, the external page relay mutes the BGM.

When configured in Program 77-1 for the door lock control function, the relay controls an external door lock. When a door lock button at a digital or electronic telephone is pressed, the door lock control relay unlocks the door for three or six seconds, as specified in Program 77-1 (LED 20).

Configure PIOU, PIOUS or PEPU for External Page Mute Option

1. Set Program 77-1 LED 07 to OFF to configure the PIOU, PIOUS, or PEPU PCB for the external page function.

2. If using a PIOU or PEPU, set the jumper plug P10 on the PIOU or PEPU jumper plug to the MAKE or BREAK position as required:

    ♦   MAKE – Shorts the normally open contacts (pins 7 and 32) when external page is activated.

    ♦   BREAK – Opens the normally closed contacts (pins 7 and 32) when external page is activated.

    ...or

    If using a PIOUS, solder the jumper W1 on the PIOUS to the MAKE or BREAK position as required:

    ♦   MAKE – Shorts the normally open contacts (DET and DER) when external page is activated.

    ♦   BREAK – Opens the normally closed contacts (DET and DER) when external page is activated.

3. See Figures 10-7 and 10-8 for wiring/interconnecting details. Connect the PIOU, PIOUS, or PEPU to the MDF as required for the external paging function.

Note   Dotted lines and solid lines differentiate optional connections where applicable; do not connect both options simultaneously.
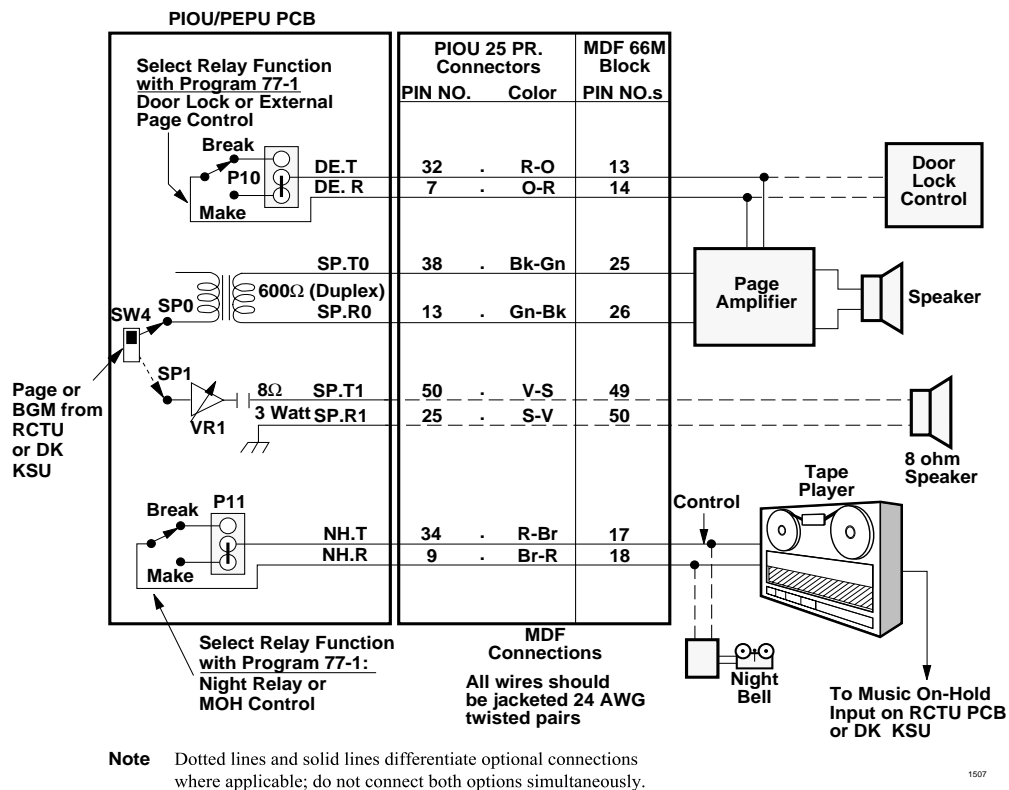
Figure 10-7   PIOU/PEPU Relay Control Functional Wiring Diagram

Figure 10-8   PIOUS Relay Control Functional Wiring Diagram
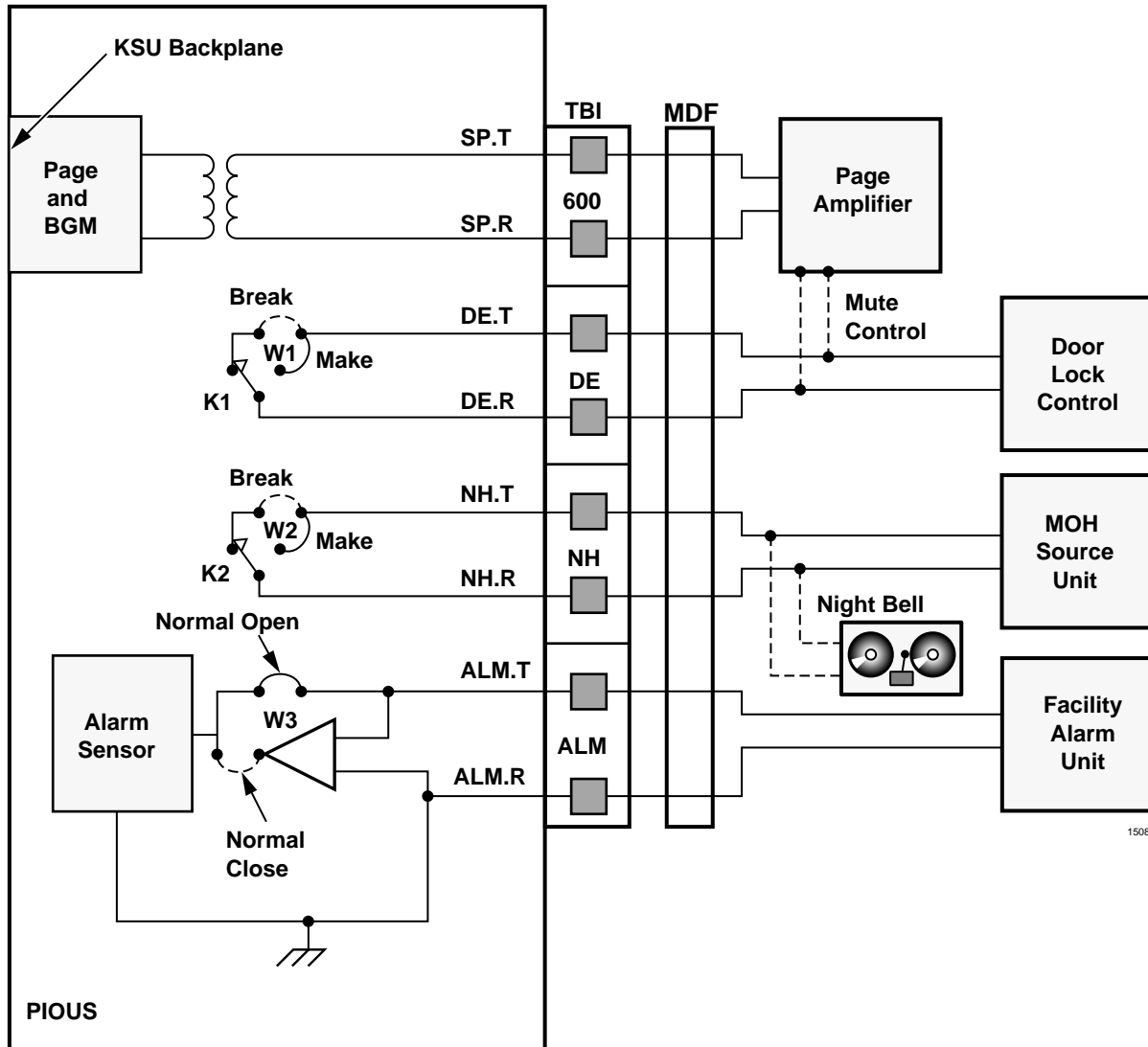
Notes
- All wiring connections must be 24 AWG twisted pairs.
- Dotted lines and solid lines differentiate optional connections where applicable; do not connect both options simultaneously.

Relay Options:
- K1 (DE): Door Lock or amp Mute Control; Program 77-1, LED 07
- K2 (NH): Night Relay or Music-on-Hold Control; Program 77-1, LED 05
- K1 & K2: 24VDC, 1 amp Maximum

Lock Control Function

Note Only one door lock control is available using an optional PCB (PIOU, PIOUS, or PEPU) and only the optional PCB with the lowest Program 03 Code (41, 42, or 43) will provide the door lock function.

1. Set Program 77-1 LED 07 to ON to configure the PIOU, PIOUS, or PEPU PCB for the door lock control function (see Figure 10-9).

2. Set Program 77-1 LED 20 to OFF for a three-second door lock activation time, or set LED 20 to ON for a six-second door lock activation time.

3. If using a PIOU or PEPU, set the P10 jumper plug on the PIOU or PEPU to the MAKE or BREAK position, as required:

    ♦ MAKE – Shorts the normally open contacts (pins 7 and 32) when a station's door lock button is pressed.

    ♦ BREAK – Opens the normally closed contacts (pins 7 and 32) when a station's door lock button is pressed.

    ...or

    If using a PIOUS, solder the W1 jumper plug on the PIOUS to the MAKE or BREAK position, as required:

    ♦ MAKE – Shorts the normally open contacts (DET and DER) when a station's door lock button is pressed.

    ♦ BREAK – Opens the normally closed contacts (DET and DER) when a station's **Door Lock** button is pressed.

4. See Figure 10-9 for wiring/interconnecting details. Connect the PIOU, PIOUS, or PEPU to the MDF as required for the door lock control function.
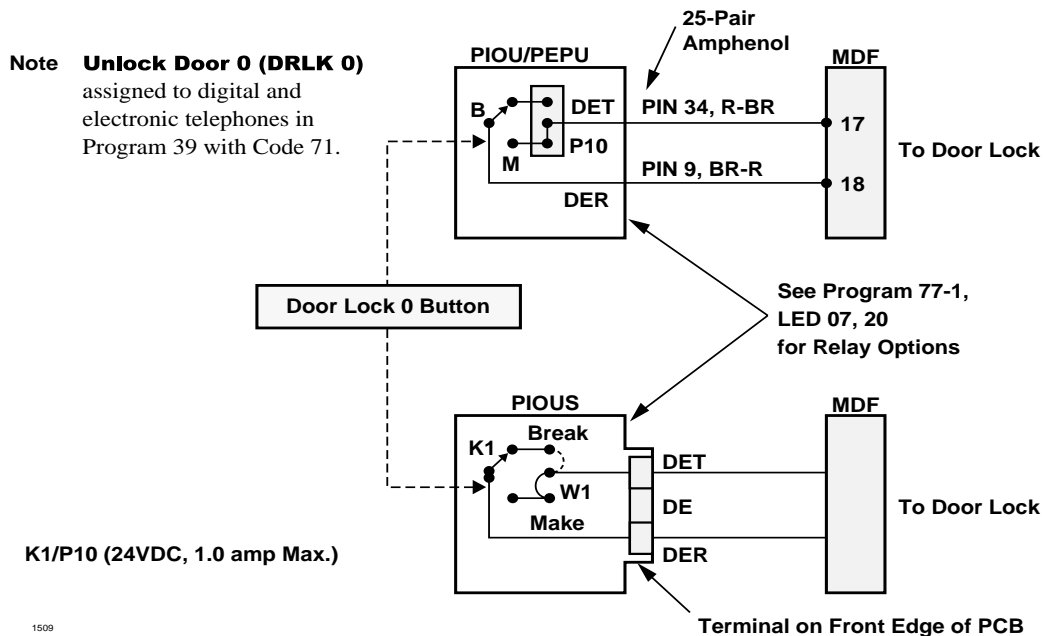
Figure 10-9   Door Lock Control Option (PIOU/PIOUS/PEPU)

Door Lock Control with DDCB and HDCB

In addition to the option interface PCB (PIOU, PIOUS, PEPU), each DDCB and HDCB can provide one door lock control.

♦ **DK14** provides two door lock controls on DDCB only.

♦ **DK40i** provides three door lock controls. The DK424 support DDCBs and HDCBs.

♦ **DK424 RCTUA** provides four door lock controls.
   RCTUB, RCTUBA/BB, RCTUC/D, or RCTUE/F provide five DDCB/HDCB door lock controls.

DK40i and DK424 DDCBs connect only to digital circuits (always circuit 5 on a PDKU or RDSU) associated with ports 004, 012, 020, and 028. DK14 DDCBs connect to ports 002 or 003 only.

HDCBs connect only to electronic circuits (always circuit 5 on a PEKU or PESU) associated with ports 004, 012, 020, and 028 (see Table 10-1).

Table 10-1 DDCB and HDCB/DRLK Assignments Guide

DK14/DK40i KSU or RDSU/PDKU/PEKU/PESU	DDCB/ HDCB No.	Port No.	Program 39 Button Assignments
DK40i/DK424 Door Lock 1	1	004	Unlock Door 1 (DRLK 1), Code 72
DK14 Door Lock 1	1	002	Unlock Door 1 (DRLK 1), Code 72
DK14 Door Lock 2	2	003	Unlock Door 2 (DRLK 2), Code 73
DK40i/DK424 Door Lock 2	2	012	Unlock Door 2 (DRLK 2), Code 73
DK40i/DK424 Door Lock 3	3	020	Unlock Door 3 (DRLK 3), Code 74
DK424 Door Lock 4	4	028	Unlock Door 4 (DRLK 4), Code 75

Important! *Each DDCB/HDCB door lock control reduces the maximum door phone capacity by one.*

Configure Each DDCB/HDCB for the Door Lock Control Function

1. **DK40i and DK424:** connect PDKU circuit 5 (T/R and PT/PR) to the DDCB HKSU modular jack (see Figures 10-9 and 10-10).

   DK14: connect applicable digital telephone circuit (logical port 02 or 03) to the DDCB KSU modular jack. See Figure 10-7 and Figure 8-1.

2. Connect the door lock wire pair to the DDCB modular B-jack (pins 3 and 4).

3. Set SW1 to the DOOR position.

4. Set SW2 to the LOCK position.

5. SW3 inside the DDCB can be set to open or close the door lock relay whenever a door lock button is pressed: if SW3 is in the "1-2" position, the relay closes when the button is pressed; if in the "2-3" position, the door lock relay opens when the button is pressed.

Note SW3 comes from the factory in the "1-2" position.

6. In Program 77-1, set the door lock activation for three or six seconds and enable the PDKU or RDSU ports for DDCB connection.

7. In Program 77-2, enable the DDCB B-jack for door lock operation.

8. In Program 39, assign door lock buttons to stations per the customer's record sheet.

9. Check each telephone door lock button from each station: the DDCB modular B-jack (pins 3 and 4) will momentarily open or close (three or six seconds) when the button is pressed.

HDCB Installation (DK40i and DK424 only)

1. Cut jumper W9 of the particular PEKU or PESU that will connect to the HDCB. (See Figure 10-10 and Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring.)

2. Connect circuit 5 VT/VR and DT/DR pairs to the HDCB HKSU modular jack.

3. Connect the door lock wire pair to the HDCB modular B-jack (pins 3 and 4).

4. Set SW1 to the DOOR position.

5. Set SW2 to the LOCK position.

6. W3 inside the HDCB can be set to open or close the door lock relay whenever a door lock button is pressed: if W3 is in the "solid-line" position, the relay will provide a closure when the button is pressed; if in the "dotted-line" position, the door lock relay will open when the door lock button is pressed.

7. In Program 77-1, set the door lock activation for three or six seconds, and enable the PEKU and PESU ports for HDCB connection.

8. In Program 77-2, enable the HDCB B-jack for door lock operation.

9. In Program 39, assign door lock buttons to the desired stations per the customer's record sheet.

10. Check each door lock button from each station: The HDCB modular B-jack (pins 3 and 4) will momentarily close (three or six seconds) when the appropriate door lock button is pressed.

Note The HDCB W2 strap is not used with Strata DK424 systems. The strap provides an alarm function with other Strata systems.

Peripheral Installation

Figure 10-10   Multiple Door Lock Control Options (DDCB/HDCB)

HDCB WIRING CHART		
PEKU or PESU	**to**	**HDCB KSU Jack**
VT (34) / VR (9)	to	PIN 3 / 4
DT (35) / DR (10)	to	PIN 5 / 6

DDCB Wiring Chart		
PDKU or RDSU	**to**	**DDCB KSU Jack**
DT (34) / DR (9)	to	PIN 3 / 4
PT (35) / PR (10)	to	PIN 5 / 6
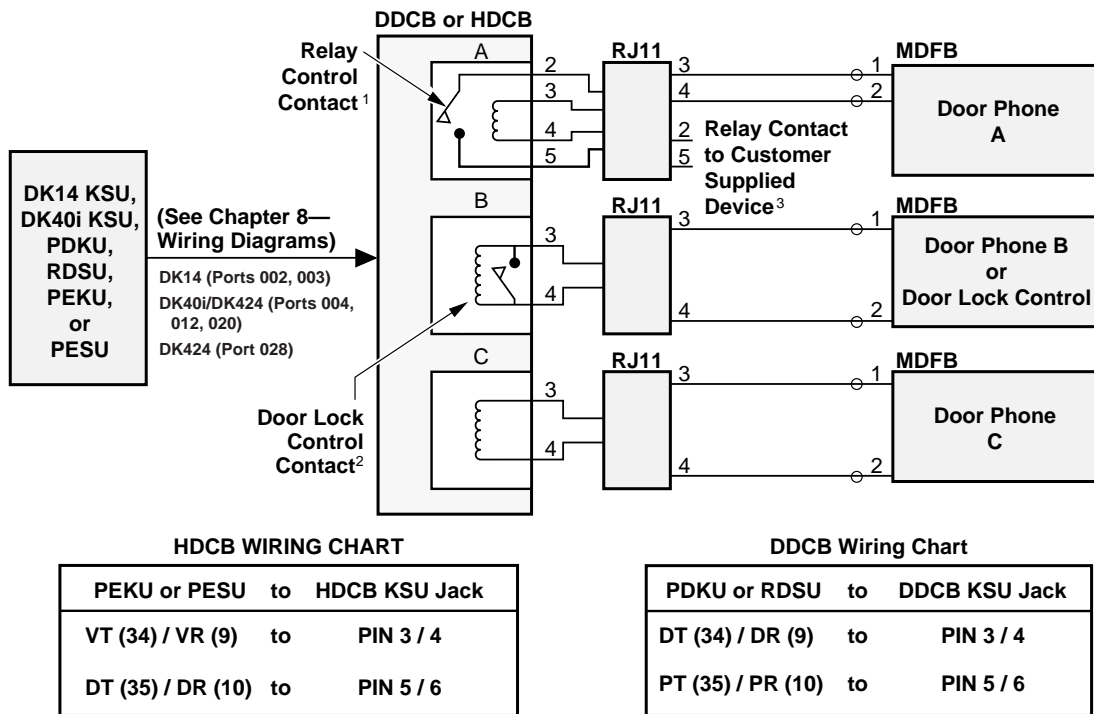
See Chapter 8—Wiring for PEKU, PESU, PDKU or RDSU pin-out information.
See DK14 and DK40i Installation chapters for appropriate pin-out information.

Notes

1. Relay control contact will close when the door phone is in the ringing, talk, or monitor state.
2. See External Page/Door Lock Relay Options on Page 10-14 and DDCB and HDCB/DRLK Assignments Guide on Page 10-19.
3. Relay contact specifications are -24VDC at 1.0 amp. max. Do not connect relay contacts to 120 AC commercial power.

Night Transfer/Night Relay Options with PIOU, PIOUS, or PEPU

Night Transfer/Night Relay option may be programmed for either the Night Relay or the MOH relay function. (See Figures 10-7 and 10-8.)

Note   Only the PIOU/PIOUS, or PEPU with the lowest Program 03 code (41, 42 or 43) will provide the Night Transfer (NT) or MOH relay control function.

When configured for the NT function with Program 77-1, the relay activates if the system is in the Night mode. The relay can be programmed to activate continuously when the **Night Transfer** button (only) is set for the Night mode (for indirect answering machine control), or to pulsate at one-second ON/three-seconds OFF (for a night bell) when incoming CO lines ring (Night Transfer 1~4 = tenant 1~4 CO lines) per Program *15 and 77-3.

When configured for the MOH function with Program 77-1, the relay activates any time a CO line is on hold. In this configuration, the relay is normally used to control the MOH source.

Configure PIOU, PIOUS or PEPU for Night Transfer

1. In Program 77-1, set LED 05 to OFF to configure the Night/Hold Relay for the Night Transfer function (see Figures 10-7 and 10-8).

2. In Program 77-1, set LED 06 to provide continuous or pulsating relay activation:

   ♦ OFF – Programs the relay for continuous activation when the **Night Transfer** button (only) is set in the Night mode.

   ♦ ON – Programs the relay for pulsating activation when the **Night Transfer 1~4** button for tenant 1~4 is set to the Night mode and a CO line rings.

   Note CO lines must be enabled in Program 78 for the Night Transfer pulsating relay function.

3. Set in Programs 87, 88, and 89 the CO lines that will activate the relay (when the system is in the Night mode).

4. Assign, in Program 39, the **Night Transfer** buttons to telephones that should be able to set the Strata DK system into the Night mode.

5. Assign in Programs 29-1~29-4 a **Night Transfer** button on all direct station selection consoles that are to transfer the Strata DK system into the Night mode.

6. If tenant operation is required, set in Program *15 the CO lines for tenant 1 through tenant 4 operation. DK40i and the DK424 RCTUA and RCTUB provides two tenant assignments, RCTUC/D provides four.

7. If using a PIOU or PEPU, set the P11 jumper plug on the PIOU or PEPU to the MAKE or BREAK position, as required:

   ♦ MAKE – Shorts the normally open contacts (pins 9 and 34) when the night relay is activated.

   ♦ BREAK – Opens the normally closed contacts (pins 9 and 34) when the night relay is activated.

   ...or

   If using a PIOUS, solder the jumper W2 on the PIOUS to the MAKE or BREAK position, as required:

   ♦ MAKE – Shorts the normally open contacts (NHT and NHR) when the night relay is activated.

   ♦ BREAK – Opens the normally closed contacts (NHT and NHR) when night relay is activated.

8. See Figures 10-7 and 10-8 for wiring/interconnecting details. Connect the PIOU, PIOUS, or PEPU to the MDF as required for the night relay function.

Note Door phones programmed to ring over external page in the Night mode do not activate the Night Transfer feature, per Program 77-1.

Configure PIOU, PIOUS, or PEPU for MOH Relay Control

1. In Program 77-1, set LED 05 to ON to configure the Night/MOH relay for the MOH relay function (see Figures 10-8 and 10-9).

2. If using a PIOU or PEPU, set the P11 jumper plug on the PIOU or PEPU to the MAKE or BREAK position, as required:

    ♦ MAKE – Shorts the normally open contacts (pins 9 and 34) when any CO line is on hold.

    ♦ BREAK – Opens the normally closed contacts (pins 9 and 34) when any CO line is on hold.

    ...or

    If using a PIOUS, solder the W2 jumper on the PIOUS to the MAKE or BREAK position, as required:

    ♦ MAKE – Shorts the normally open contacts (NHT and NHR) when any CO line is on hold.

    ♦ BREAK – Opens the normally closed contacts (NHT and NHR) when any CO line is on hold.

3. Connect the PIOU, PIOUS, or PEPU to the MDF as required for the MOH Relay function.

DK14 KSU and DK40i KSU Relay

The DK40i KSU Relay can be programmed for one of three options:

♦ BGM mute

♦ Night transfer

♦ MOH source control

These options are set in Program 77-1 (LED 05 and 06). Only one option is allowed per installation. However, in the DK40i, these options can be supplemented with PIOU/PIOUS relay options. Electrical specifications for the DK40i base relay contacts are:

Voltage:

24VDC maximum

Current:

♦ 1 amp maximum

♦ Normally open – closed when activated

External Speaker Unit (HESB) Options

Strata DK systems provide three options utilizing an HESB:

♦ Loud Ringing Bell

♦ Amplified Speaker

♦ Talkback Amplified Speaker

System hardware requirements vary depending on the HESB option selected. See the following installation procedures for the hardware requirements for each option.

Loud Ringing Bell Option

The loud ringing bell option enables the voice first or ringing signal tone to be amplified without the use of other manufacturers' equipment. The voice first and signal tone can be amplified on all electronic and digital telephones equipped with HHEU PCBs and HESB. (See Chapter 9 – Station Apparatus.)

The HESB automatically turns OFF once the ringing call or voice first has been manually answered from the electronic or digital telephone. This turn-off feature prevents audio feedback problems.

Installing the HESB Loud Ringing Bell in Digital Telephones

1. Connect a jumper between terminals 2 and 10 on the HESB TB1 terminal block (Figure 10-11).

2. Connect a jumper between terminals 4 and 5 on the HESB TB2 terminal block.

3. Install an HHEU PCB and HESC-65A cable in the telephone per Chapter 9 – Station Apparatus before proceeding with Step 4.

Note   HESB connections made in Steps 4~6 can be accomplished using the HESB VOICE modular jack instead of the TB1 terminal block.

4. Connect terminal 1 of the HESB TB1 terminal block to the red (+) wire of the HESC-65A using a modular block.

5. Connect terminal 2 of the HESB TB1 terminal block to the green (-) wire of the HESC-65A using a modular block.

6. Connect terminal 8 of the HESB TB1 terminal block to the yellow (L2) wire of the HESC-65A cable using a modular block.

7. Connect the HACU-120 power supply's +12V lead to terminal 1 of the HESB TB2 terminal block, and connect the power supply's 0V lead to terminal 2.

8. Plug the provided power cord into the power supply and to a 115VAC ± 10VAC, 60Hz power source.

Important!   *If AC voltage is not within range, have a qualified electrician correct the problem.*

Peripheral Installation
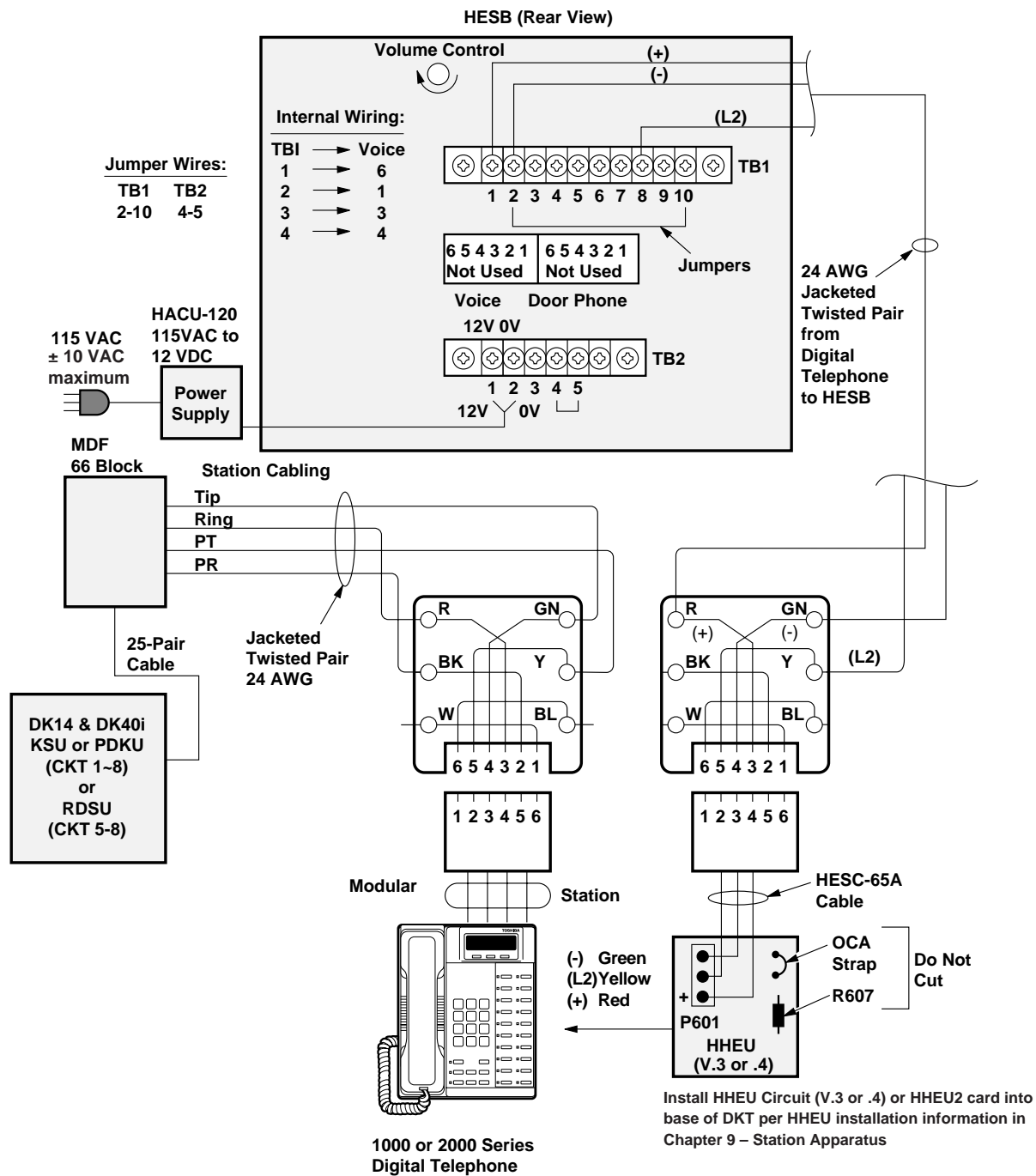
Figure 10-11   HESB/Digital Telephone with Loud Ringing Bell Wiring

Important!   *See Chapter 9 – Station Apparatus for instructions to cut EXSP and HHEU jumpers on the electronic telephone main PCB.*

Installing the HESB Loud Ringing Bell in Electronic Telephones (DK40i and DK424 Only)

1. On the HESB TB1 terminal block: connect a jumper between terminals 6 and 7, and connect another jumper between terminals 5 and 8 (see Figure 10-12).

2. On the HESB TB2 terminal block, connect a jumper between terminals 4 and 5.

3. Install an HHEU PCB and HESC-65A (or HESC-65A) cable in the telephone per Chapter 9 – Station Apparatus before proceeding with Step 4.

Note   HESB connections made in Steps 4~7 can be made with the HESB VOICE modular jack instead of the TB1 terminal block.

4. Connect terminal 1 of the HESB TB1 terminal block to the red (+) wire of the HESC-65 cable using a modular block.

5. Connect terminal 2 of the HESB TB1 terminal block to the green (-) wire of the HESC-65 cable using a modular block.

6. Connect terminal 3 of the HESB TB1 terminal block to pin 3 of the electronic telephone's modular block (VOICE TIP).

7. Connect terminal 4 of the HESB TB1 terminal block to pin 4 of the electronic telephone's modular block (VOICE RING).

8. Connect the HACU-120 power supply's +12V lead to terminal 1 of the HESB TB2 terminal block, and connect the power supply's 0V lead to terminal 2.

9. Plug power cord into the power supply and to a 115VAC ± 10VAC, 60Hz power source.

Important!

- *Make sure the AC power is within the specified limits shown in Step 9. If AC voltage is not within range, have a qualified electrician correct the problem.*

- *Cut the EX-SP and HHEU straps on telephones and do not cut the OCA strap or R607 on the HHEU (see Chapter 9 for details).*

Testing the Loud Ringing Bell Option

1. Test the AC input voltage. See Step 9, above.

2. Make a CO or station call to the station configured for the loud ringing bell. Ringing will be heard over the HESB.

3. Use a small, slotted screwdriver to turn the volume control on the back of the HESB to the desired level and adjust the ring volume control on the telephone.

4. If ringing is heard at the station, but not over the HESB, check the following while the station is ringing:

   ♦ Using a suitable voltmeter, measure voltage across terminals 1 (+) and 2 (-) of the HESB TB1 terminal block. Voltage indication should be 4.5~5VDC.

Note   Ringing stops once the call is manually answered. There should be NO voltage potential across terminals 1 and 2.

   ♦ If voltage is not as specified during ringing, check that the telephone wiring connections to the HESB have been made properly (wires to terminals 1 and 2 of the HESB TB1 terminal block may have been reversed).
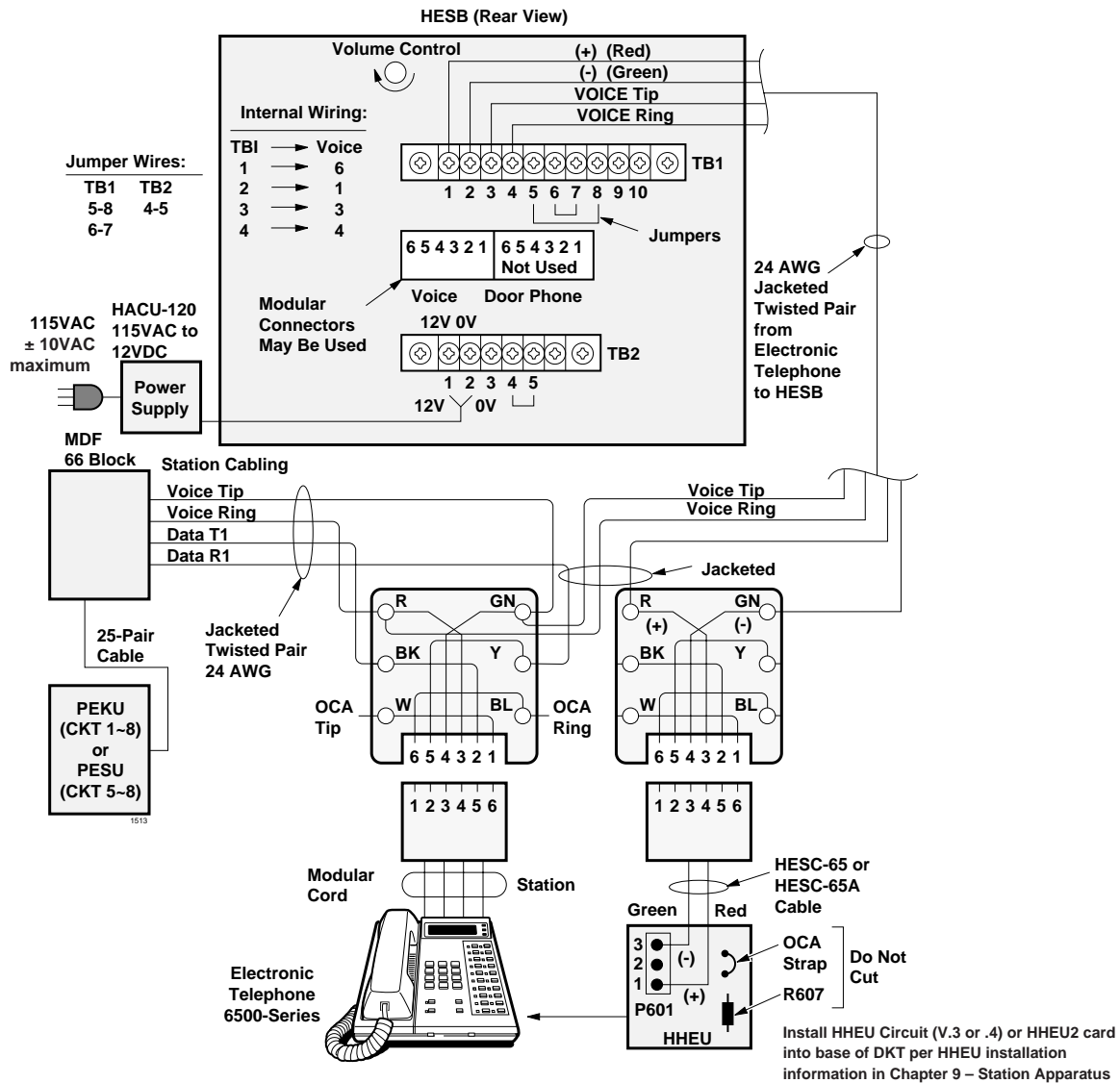
Important! *See Chapter 9 – Station Apparatus for instructions to cut EXSP and HHEU jumpers on the electronic telephone main PCB.*

Figure 10-12   HESB/Electronic Telephone with Loud Ringing Bell Wiring

Amplified Speaker Option

The amplified speaker option enables the HESB to be configured as a paging speaker. The HESB is connected to the PIOU, PIOUS, or PEPU 600-ohm page output to provide an amplified external speaker.

➤ **To install the HESB amplified speaker option**

1. Connect a jumper between terminals 1 and 2 of the HESB TB1 terminal block (see Figure 10-13).

2. Connect a jumper between terminals 6 and 7 of the HESB TB1 terminal block.

3. Connect a jumper between terminals 5 and 8 of the HESB TB1 terminal block.

4. Connect a jumper between terminals 3 and 4 of the HESB TB2 terminal block.

5. Connect a jumper between terminals 5 and 6 of the HESB TB2 terminal block.

6. If using a PIOU or PEPU, connect the PIOU or PEPU 600-ohm page output (pins 13 and 38) to terminals 3 and 4 of the HESB TB1 terminal block.

   ...or

   Connect the PIOUS, DK14 or DK40i KSU 600-ohm page output (SPT and SPR) to terminals 3 and 4 of the HESB TB1 terminal block.

7. Connect the power supply's +12V lead to terminal 1 of the HESB TB2 terminal block, and connect the 0V lead to terminal 2.

8. Plug the provided power cord into the power supply and to a 115VAC ± 10VAC, 60Hz power source.

9. Set the PIOU or PEPU SW4 switch to the SPO position.

   Important! *If AC voltage is not within range, have a qualified electrician correct the problem.*

➤ **To test the amplified speaker option**

1. Make an external page. The page should be heard over the HESB.

2. Adjust the HESB volume control to the desired level.
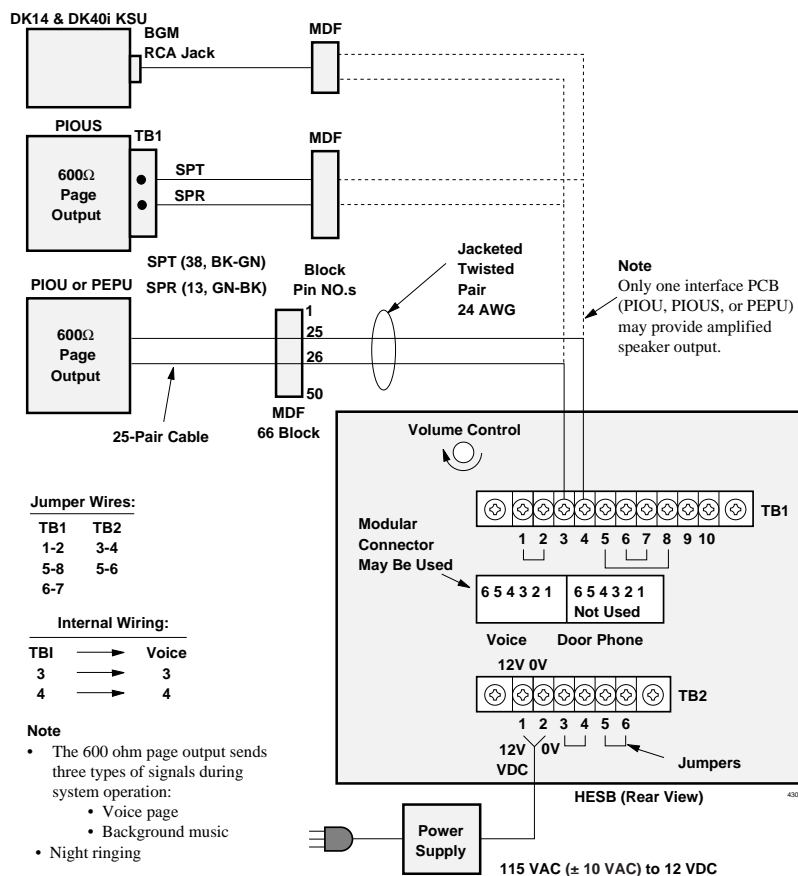
Figure 10-13   HESB/Amplified Speaker Wiring

Talkback Amplified Speaker Option

The talkback amplified speaker option enables a talkback speaker to be provided in areas where a telephone is not needed. In this configuration, the HESB is connected to the PIOU, PIOUS, or PEPU 600 ohm (duplex) output and is used as the amplifier and speaker.

A door phone unit (MDFB) is connected to the HESB, and serves as a microphone to provide talkback operation. (The MDFB push-button is inoperative, and the unit serves only as a microphone for talkback and not as the normal door phone.)

Note   The PIOU, PIOUS, and PEPU 600 ohm is a two-way (duplex) page output compatible with most commercially available talkback amplifiers – door phone not required for talkback.

➤ **To install the HESB talkback amplified speaker**

1. Connect a jumper between terminals 1 and 2 of the HESB TB1 terminal block (see Figure 10-14).

2. Connect a jumper between terminals 3 and 4 of the HESB TB2 terminal block.

3. Connect a jumper between terminals 5 and 6 of the HESB TB2 terminal block.

Note   HESB connections made in Steps 4~7 may be accomplished using the HESB VOICE and door phone modular jack instead of the TB1 terminal block.

4. Connect terminal 7 of the HESB TB1 terminal block to Pin L1 of the MDFB.

5. Connect terminal 8 of the HESB TB1 terminal block to Pin L2 of the MDFB

6. Connect terminal 9 of the HESB TB1 terminal block to Pin 1 of the MDFB.

7. Connect terminal 10 of the HESB TB1 terminal block to Pin 2 of the MDFB.

8. If using a PIOU or PEPU, connect the PIOU or PEPU 600-ohm page output (pins 13 and 38) to terminals 3 and 4 of the HESB TB1 terminal block.

   ...or

   If using a PIOUS, connect the PIOUS 600-ohm page output (SPT and SPR) to terminals 3 and 4 of the HESB TB1 terminal block.

9. Set the PIOU or PEPU SW4 switch to the SPO position.

10. Connect the HACU-120's +12V lead to terminal 1 of the HESB TB2 terminal block, and connect the 0V lead to terminal 2.

11. Plug the provided power cord into the power supply and to a 117VAC 60Hz power source.

Important!   *If AC voltage is not within range, have a qualified electrician correct the problem.*

➤ **To test the talkback amplified speaker**

1. Make an external page. Page will be heard over the HESB.

2. Verify that someone speaking into the door phone can be heard at the paging station. (With this application, pressing the door phone button is not required to talk back through the door phone.)

MDFB (Rear View)

Door Phone
Talkback
Microphone

DK14 & DK40i KSU

BGM

RCA Jack

MDF

1 2 L1 L2

PIOUS

TB1

MDF

600Ω
Page
Output

SPT

SPR   Duplex

Jacketed
Twisted
Pair
24 AWG

PIOU or
PEPU

MDF Block
Pin Numbers

Jacketed
Twisted Pair
24 AWG

600Ω
Page
Output

SPT (38, BK-GN)

SPR (13, GN-BK)

1
25
26

<Duplex>

MDF
66 Block

25 Pair Cable

Volume Control

L1 L2 1   2

Jumper Wires:

TB1	TB2
1-2	3-4
	5-6

1 2 3 4 5 6 7 8 9 10   TB1

Modular
Connector
May Be Used

6 5 4 3 2 1   6 5 4 3 2 1

Voice   Door Phone

Internal Wiring:

TBI	→	Voice
4	→	4
3	→	3

TBI	→	Door Phone
7	→	4
8	→	3
9	→	2
10	→	5

12V 0V

1 2 3 4 5 6   TB2

12V 0V

Jumpers

HESB (Rear View)   4304

Notes

- The 600 ohm duplex page output is compatible with most commercially available talkback amplifiers. – MDFB not required.
- Only one interface PCB (PIOU, PIOUS, or PEPU) may provide talkback amplified speaker.

HACU-120

Power
Converter

115VAC ± 10VAC to 12VDC

Figure 10-14   HESB/Talkback Amplified Speaker Wiring

HESB Wall Mounting

Some applications may require that the HESB is mounted on a wall or other vertical surface.

➤ **To wall mount the HESB**

1. Find a suitable location on the mounting surface for the HESB (see Figure 10-15).

2. Screw a 1.25-inch panhead wood screw into the mounting surface.

3. Hang the HESB from the screw.

One Wall Mounting Hole
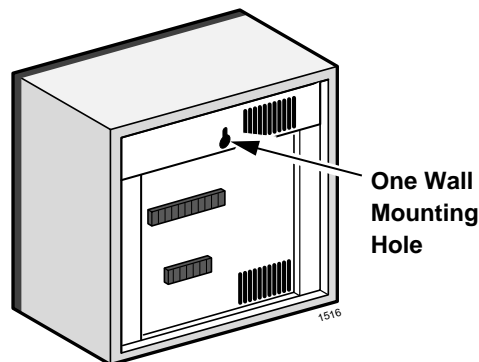
Figure 10-15   HESB Wall Mounting

External Page Options

Strata DK systems equipped with a PIOU, PIOUS, or PEPU PCB offer a variety of external paging options, each of which includes a BGM option. The PIOU, PIOUS, or PEPU PCB with the lowest Program 03 code (41, 42, or 43) is required to support these options:

♦ Paging with BGM (same amplifier) – available with PIOU, PIOUS, or PEPU

♦ Zone Paging with BGM (separate amplifiers) – available with PIOU

♦ Zone Paging with BGM (multiple amplifiers) – available with PIOU

External Page Option Installation

All paging connections are made via the PIOU or PEPU Amphenol connectors or the PIOUS TB1 terminal to the Main Distribution Frame (MDF).

Paging (Single-zone) with BGM (Same Amplifier)

Paging and BGM are amplified by a common customer-supplied paging amplifier. When the external page access code is dialed, the external page control relay is activated, which applies a short (or opens the contacts) to the amplifier mute control to mute the music.

➤ **To install External Page (single zone) with BGM (same amplifier)**

1. Connect input 1 from the paging amplifier to pins 13 (SPR) and 38 (SPT) of the PIOU or PEPU; or connect to SPT and SPR of the PIOUS (see Figure 10-17).

2. Connect the paging amplifier mute terminal to pins 7 and 32 of the PIOU or PEPU; or connect to DET and DER of the PIOUS.

3. Connect the music source to input 2 of the paging amplifier.

4. Connect the speaker to the paging amplifier output.

5. Verify that the PIOU or PEPU P10 jumper plug is in the MAKE position or that the PIOUS W1 jumper wire is in the MAKE position.
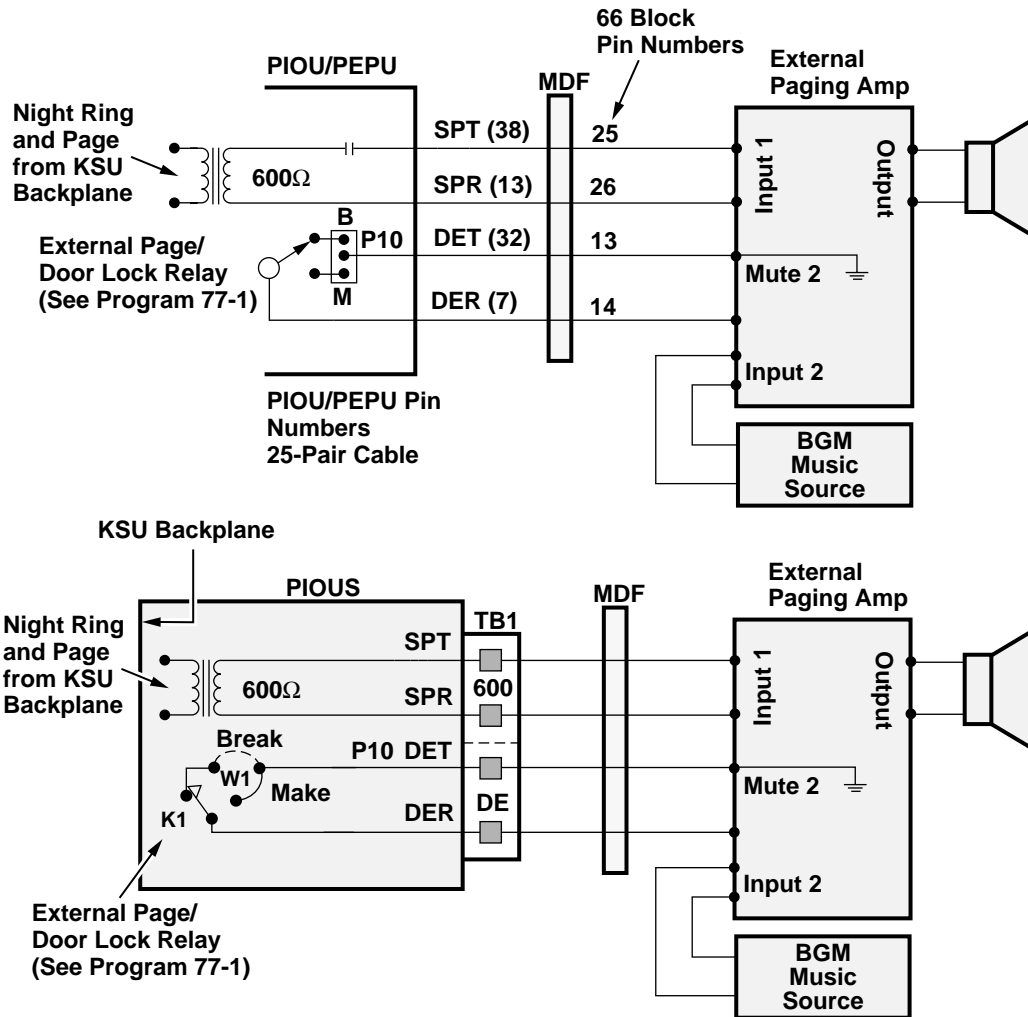
Note The PIOU/PIOUS/PEPU PCB with the lowest Program 03 code (41, 42, or 43) will provide External Page options.

Figure 10-16   DK424 Page and BGM Using the Same Amplifier (PIOU/PIOUS/PEPU)

Zone Paging with BGM (Separate Amplifiers)

Provides multiple-zone paging capability. The output of the paging amplifier is routed back to the PIOU, where it is switched to one of four sets of speakers by PIOU Relays K1 through K4. The relay selected is determined by the access code dialed by the station user. Default access codes are:

PIOU Relay Access Codes	DKT LCD Display
K1/zone 1 = **#35** or **#351** K1/zone 5 = **#355**	External Paging A or E
K2/zone 2 = **#36** or **#352** K2/zone 6 = **#356**	External Paging B or F
K3/zone 3 = **#37** or **#353** K3/zone 7 = **#357**	External Paging C or G
K4/zone 4 = **#38** or **#354** K4/zone 8 = **#358**	External Paging D or H
See Program 90 in the *Strata DK Programming Manual*.	EXT + ALL CALL PAGE or RCTUE/F

Note   Multi-zone page output rating is 30W/maximum at 300 ohms. Zones 5~8 (LCD display E~F) for a second PIOU installed when using an RCTUE3/F3 processor only (see Figure 10-6).

An all zone page code (**#39**) is also available as an option (see Program 10-2). When the All Page code is dialed, all four or eight relays are activated to permit simultaneous paging to all speaker zones and all digital and electronic telephone speakers.

➤ **To install the page and background music features on the same amplifier**

1. Connect the input from the paging amplifier to pins 13 (SPR) and 38 (SPT) of the PIOU (see Figure 10-17).

2. Connect the BGM music source to the music amplifier input.

3. Connect the paging amplifier output to the "M" contact's PIOU relays K1~K4 and the "C" terminal of zone 1 through zone 4 or zone 5 through zone 8 speakers.

4. Connect the BGM music amplifier output to terminal 23 (PG COMMON) of the PIOU, and to "C" of zone 1 through zone 4 or zone 5 through zone 8 speakers.
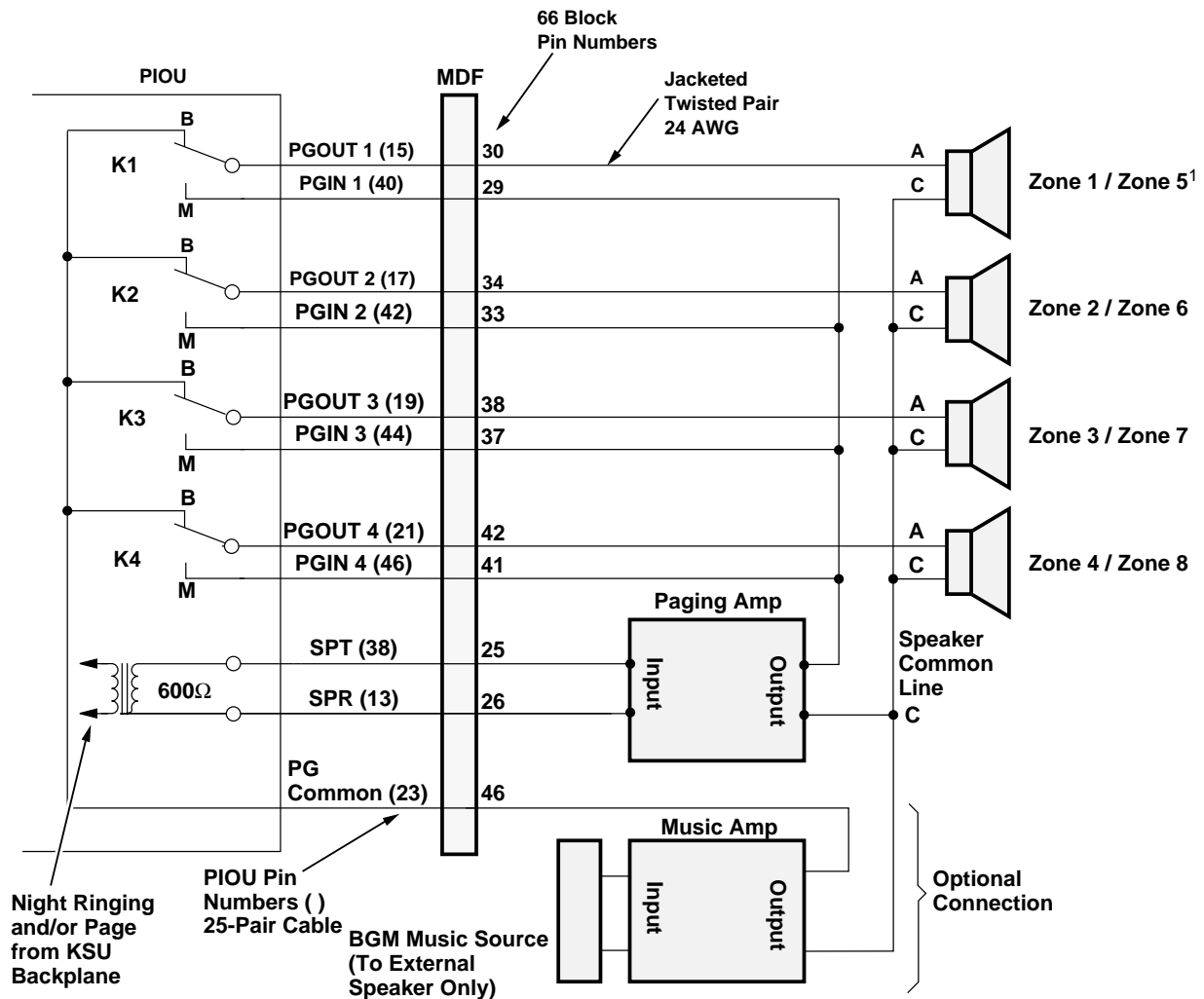
1. Zones 5~8 are available only to DK424 systems equipped with a RCTUE/F common control unit and more than one PIOU. Set zones 1~4 (first PIOU) with Program 03 Code 41, and zones 5~8 (second PIOU) with Program 03 Code 42 or 43 (if 42 is not used).

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Notes

- See Programs 78-1, *15 and 77-3 for Night Ringing CO line and Tenant (1-4) assignment options.

- Dial [PDN] or [PhDN] + **#59** to pick-up night ringing CO lines.

- The PIOU with the lowest Program 03 code (41, 42, or 43) will provide the External Page and Night Ring options.

Figure 10-17   PIOU Zone, Page/BGM/Night Ring (Separate Amplifiers)

Zones	Access Codes DK40i and DK424 (RCTUA, RCTUBA/BB, RCTUC/D)	Access Codes DK424 (RCTUE/F equipment with a PIOU)	
All Call Page and External	#39	#39	
All Call Page	#30	#30	
1	#35	#351	
2	#36	#352	
3	#37	#353	
4	#38	#354	
5	Not Available	#355	
6	Not Available	#356	RCTUE/F More than 1 PIOU
7	Not Available	#357	
8	Not Available	#358	

Zone Paging with BGM (Multiple Amplifiers) DK40i and DK424 Only

Provides multiple-zone paging capability (same as "External Page Option Installation" on Page 10-26) but separate amplifiers are used for each zone.

➤ **To install zone and night ringing with multiple amplifiers**

1. Connect the inputs from the paging amplifiers to pins 13 (SPR) and 38 (SPT) of the PIOU (see Figure 10-18).

2. Connect the music source to the music amplifier input.

3. Connect the paging amplifier outputs to "M" of the PIOU Relays K1~K4 and to "C" of zone 1 through zone 4 speakers.

4. Connect the music amplifier output to terminal 23 (PG COMMON) of the PIOU, and to the "C" terminal of zone 1 through zone 4 speakers.

5. Connect zone 1 through zone 4 speakers "A" terminal to the "B" contact of the PIOU relays K1~K4, respectively.

Figure 10-18   PIOU Zone Paging and Night Ringing with Multiple Amplifiers

Zones 5~8 are available only to DK424 systems equipped with a RCTUE/F common control unit and more than one PIOU. Set zones 1~4 (first PIOU) with Program 03 Code 41, and zones 5~8 (second PIOU) with Program 03 Code 42 or 43 (if 42 is not used).

Notes

- See Programs 78-1, *15 and 77-3 for Night Ringing CO line and Tenant (1-4) assignment options.

- Dial [PDN] or [PhDN] + **#59** to pick-up night ringing CO lines.

- The PIOU with the lowest Program 03 code (41, 42, or 43) will provide the External Page and Night Ring options.

Zones	Access Codes DK40i and DK424 (RCTUA, RCTUBA/ BB, RCTUC/D)	Access Codes DK424 (RCTUE/F equipment with a PIOU)	
All Call Page and External	#39	#39	
All Call Page	#30	#30	
1	#35	#351	
2	#36	#352	
3	#37	#353	
4	#38	#354	
5	Not Available	#355	More than 1 PIOU
6	Not Available	#356	
7	Not Available	#357	
8	Not Available	#358	

Night Ringing over Selected Page Zones

In systems shared by 1~4 tenants, each tenant's CO lines can be assigned to night ring separate PIOU external page zones. This feature can also be used in one-tenant systems.

With shared systems, for example, Tenant 1's night ringing CO lines could be programmed to ring PIOU external page zones 1 and 2, while Tenant 2's lines could be programmed to ring zones 3 and 4. In non-shared systems, night ringing CO lines can be assigned to ring all of the zones or just selected zones.

Note   For DK424 only: any RCTU provides four tenants.

Programming CO Lines to Ring Selected PIOU Page Zones

Program 78-1: Assigns CO lines, Tenant 1 through Tenant 4, that will night ring over PIOU external page zones.

Program *15: Assigns CO lines to Tenant 1 through Tenant 4. Lines are initialized as Tenant 1.

Note   For DK424 only: RCTUA and RCTUB provides two tenants, RCTUC/D and RCTU E/F provide four.

Program 77-3: Assigns Tenant 1 through Tenant 4 CO lines to night ring specific PIOU external page zones.

Program 39: Assigns appropriate **Night Transfer** and **Tenant Pick-up** (for Tenant or Non-Tenant systems) buttons to electronic and digital telephones.

Note   Any station can pick up CO lines that night ring over external page zones by pressing the [PDN] and dialing **#59**.

PIOU Zone Paging Installation

See "External Page Option Installation" on Page 10-26, paragraph 4 and Figure 10-17 for installation instructions.

Two-CO Line External Amplified Conference

Customer-supplied two-way amplifiers can be installed to amplify two-CO line tandem (DISA, External Call Forward) and/or conference calls. Amplified Conference is not available for the DK14.

DK40i Information

Up to two amplifiers per Strata DK40i System can automatically connect to any two CO line conference.

DK424 Information

As many as four amplifiers (4-RCTUB, C/D, and /F; 3-RCTUA) can be installed to support up to four of these calls simultaneously. If three amplifiers are installed, three simultaneous calls can be supported. If all amplifiers are in use, then subsequent two-CO line tandem calls and/or conference calls will be unamplified. Each amplifier is connected to two designated PEKU station ports and will automatically be switched into a two-CO line connection established between any CO lines in the system.

Amplified Talk Path

Figure 10-19 provides a functional diagram of a two-CO line amplified conference connection. (A tellabs 7206 amplifier is used here.) The talk path for the connection is as follows: outside party 1 – public telephone network – CO PCB, CKTX – RCTU – PEKU, port A – into AMP, Line in, – AMP, Line out – PEKU, port B – RCTU – CO PCB, CKTY – public telephone network – outside party 2. This path is two-way so when outside party 2 talks, the talk level is amplified in the reverse direction.

Note Only the outside party 1 talk path is amplified to/from a system telephone when it is connected into a two-CO line conference.

Amplifier Requirements

♦ Customer-supplied amplifier (two maximum for DK40i and four maximum for DK424).

♦ Must be FCC-registered, Part 68, and must provide automatic gain control.

♦ Each amplifier requires two PEKU station ports.

♦ See the amplifier manufacturer's installation documentation for amplifier grounding instructions.

➤ **To connect a two-way amplifier to the Strata DK system**

1. At the MDF, connect the voice pair (VT, VR, port A) of circuit 2 on the designated PEKU PCB to one input of the customer-supplied two-way amplifier. In the example in Figure 10-19, this is CKTA (CO Side A) of the amplifier. (See the Amplified Two-CO Line Conference wiring diagram in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring.)

2. At the MDF, connect the voice pair (VT, VR, port B) of circuit 3 on the designated PEKU PCB to the other input of the amplifier. In Figure 10-19, this is CKTB (subscriber side B) of the amplifier.

3. Plug the amplifier's power cord into the 117VAC (standard) wall outlet.

4. Set the gain and other amplifier parameter options per the amplifier manufacturer's installation documentation.

Amplifier Programming

♦ Program 10-1: LEDs 19 and 20 must be ON.

♦ Program 10-2: LED 18 must be ON.

♦ Program 10-3: Enables the appropriate PEKU PCB ports for amplifier connection. Only enable the ports that will be connected with the amplifier(s).

♦ Program 15-5: Enables appropriate CO lines for Two-CO line tandem connection.

Note LED 19 in Program 10-1 should be ON if it is certain that an amplifier will always be available for two-CO line conference connections (four maximum, simultaneously). If this LED is ON and a two-CO line connection is established without an external amplifier, the Strata DK424 station may be unbalanced and may receive a hum noise. LED 19 provides additional station amplification when external amplifiers are switched into two-CO line connections.

♦ Program 78-2: Enables appropriate CO lines if amplified DISA is required.

Programming Notes

• **Program 10-3, circuit assignments:**

Program 10-3 PEKU Port Conf. Enable Button/LED	PEKU Slot Position	PEKU Port Number	PEKU Circuit
LED 01, ON	12	A = 009 B = 010	CKT2 CKT3
LED 02, ON	13	A = 017 B = 018	CKT2 CKT3
LED 03, ON	14	A = 025 B = 026	CKT2 CKT3
LED 04, ON	15	A = 033 B = 034	CKT2 CKT3

• **Program 10-1, LEDs 19 and 20 ON.**
• **Program 15-5, enable appropriate CO lines for tandem connection.**
• **Program 78-2, enable appropriate CO lines if amplified DISA is required.**
• **Program 10-2, LEDs 18 and 19 ON.**

Notes (Amplifier)

• All amplifier equipment is customer or dealer-supplied.

• Available in single and multiple configurations.

• For information regarding the tellabs 7206 two-way amplifier:

   http://www.tellabs.com

   1(800) 445-6501

• Install in accordance with tellabs technical manual *Through Signalling Configuration*.

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Figure 10-19   External Amplified Two-CO Line Call Functional Wiring Diagram

SMDR Printer/Call Accounting Device Options

An SMDR printer or call accounting device may be connected to the system to provide a hard-copy record of station activity. The Strata DK system can record incoming, outgoing, and transferred calls, as well as Account Code entries and names and telephone numbers of answered DNIS, ANI, Caller ID, E911 and ISDN calls. Call record data is printed out at the completion of each eligible call. SMDR format is ASCII-formatted, 8-bits, no parity, 1-stop bit.

To support the SMDR printer/call accounting device option, a Strata DK system must be equipped with a PIOU, PIOUS,...or

♦ For DK424 only, a RSIU/RSIS, PIOU, and PIOUS

♦ For DK40i only, TSIU

♦ For DK14 only, WSIU

Connection of the printer or call accounting device to the PIOU, PIOUS, RSIU/RSIS (DK424), TSIU (DK40i), or WSIU (DK14) PCB is accomplished with a 3-pair modular cord (seven feet maximum) and a PPTC connector adapter (Figure 10-21, "PIOU/PIOUS SMDR Cable Connections").

Note PIOU, PIOUS will be 300 or 1200 bps (see Chapter 7 – DK40i/DK424 Universal Slot PCBs); RSIU/RSIS (DK424), TSIU (DK40i) and WSIU (DK14) can be 1200~9600 bps (see Program 76).

The PIOU, PIOUS, RSIU/RSIS (DK424), or TSIU (DK40i) contain a call record buffer which stores call record data (up to 50 calls) when the printed or call accounting device is turned OFF, or when no device is connected to the SMDR port. No further call records are stored after the buffer is filled. When the printer or call accounting device is made operational, "ERROR BUFFER OVERFLOW" prints out to indicate the buffer was full, and that some call information may have been lost.

Note If PIOU, PIOUS, RSIU/RSIS (DK424) or TSIU (DK40i) are assigned as SMDR simultaneously in programming, RSIU/RSIS or TSIU will operate as SMDR – not PIOU, PIOUS. A display of the customer database (Figure 10-22 on Page 10-41) can also be printed using the SMDR RS-232 port by running Program 97.

To program SMDR, use Program 60. The SMDR port is active only on the PIOU or PIOUS with the lowest Program 03 code (41, 42, or 43), or the RSIU or RSIS Port programmed with code x2 in Program 76-1.

SMDR sends out special names for the following types of calls:

♦ MSS – Prints on DISA and External Call Forward calls to stations. MSS prints only on DISA calls that are answered after the threshold time (set in Program 60-2). If the call is answered before the threshold time, the call will register as a normal incoming call and the MSS/transfer portion of the call will not print out.

Note The call threshold time – the length of time that a call must be in progress before it is registered by SMDR – can be set for either 1.0 or 10 seconds in Program 60-2.

♦ MODM – Prints on calls to the RMDS or IMDU remote maintenance modem (Station #19).

♦ DISA – Prints on DISA and External Call Forward calls in which CO lines are accessed for trunk-to-trunk outside calling.

Peripheral Installation

Figure 10-20, "SMDR Output" shows a sample SMDR printout and describes the contents of each column. The following examples show call record samples and describe the sequence of events that generated the call records.

If a subaddress for an call is received or sent on an ISDN call, it is included in the SMDR. Subaddresses may/may not be received/sent on all ISDN calls.

A	* = Non-ISDN call established, then network disconnects. A = ISDN call established, then DK disconnects. + = ISDN call established, then network disconnects. S = Start of E911 call. E = End of E911 call.[4]	Field Number 1
B	CO Line Number (001~144).	Field Number (2~4)[3]
C	C = Caller ID Call; D = ANI or DNIS Call.	Field Number 5
D	[PDN] of the Station (1~4 digits)[2] making/answering a call.	Field Number (7~10)[3]
E	Primary, Secondary, or Phantom Directory Number which made/answered the call (1~4 digits). Blank if call is made from a CO line button.	Field Number (12-15)[3]
F	Time of Day (HH:MM:SS).[1]	Field Number (17-21)[3]
G	Call Duration (HH:MM:SS).[1]	Field Number (23-30)[3]
H	CO Line Incoming Ring Duration Before Answer (MM:SS).	Field Number (32-36)[3]
I	Station to which the CO line was transferred (1~4 digits).	Field Number (38-41)[3]
J	Telephone Number • Incoming (1~20 digits)[5] ANI (10 digits), DNIS (2~5 digits), Caller ID Number or ID Code • Outgoing Number (1~20 digits) • E911 Station ID (Prg *12)	Field Number (43-63)[3] ANI/DNIS Format: * 7145833730 * 3846 Field Number (43~52)
K	DNIS NAME[5] (0~16 characters); Caller ID Name[5] (0~16 characters), or Account Code[6] (4~15 digits); LCD User Name on E911 Calls	Field Number (65~80)[3]
L	Outgoing Subaddress on ISDN call.	Field Number (82~101)
M	Incoming Subaddress on ISDN call.	Field Number (103~122)

1. Call Duration (incoming, outgoing, or transfer) must be 1 or 10 secs. (set by Program 60-2) to generate a call record printout.
2. "MSS": designates a DISA or CF–External CO call to an unanswered station or answered after 1 or 10 secs. (threshold) per Program 60-2. The call registers as a normal incoming call if answered before the threshold time. DISA calls always register 5~6 seconds ring before answer duration time.
3. Field column information is provided for SMDR output formatting purposes.
4. A "*" in the first column indicates a disconnected call by the CO Calling Party Control (CPC) or Automatic Release signal. Loop start CO lines must have Programs 15-0 and 15-3 enabled before the CPC is dropped.
5. Answered calls ANI, DNIS, and Caller ID data transmits using the SMDR port. Abandoned calls data is not transmitted, but can be stored in station memory. See Program *51 and *52.
6. See Program 60-1.
7. Strata DK sends a Carriage Return (CR) and Line Feed (LF) ASCII symbol after each line of data.

General Notes

The call record data is ASCII-formatted, 8 bits; no parity, 1-stop bit.

Special dial printout: Tone = "T", Long pause = "L", Flash = "F", Pause = "P"

"DISA": designates a DISA or CF–External call through the system via CO-to-CO connection.

"MODM": designates a call to the IMDU, Remote Maintenance Modem.

Figure 10-20   SMDR Output

SMDR Printout Examples

Note   SMDR printout "time of day" and month/day/year (MM/DD/YY) is the same as the system clock time/date set by the station connected to Port 000. SMDR MM/DD/YY prints out each time 50 call records are generated and at midnight each day.

Direct Inward System Access (DISA) CO Lines

Note   DISA station calls print out as MSS or DISA.

Example 1 – Ring, No Answer DISA Call

Call Sequence A

- ♦   Outside caller rings CO line 003. (CO line 003 is programmed as a DISA line.)

- ♦   Line 003 returns internal dial tone to caller after one or two ring cycles (5~6 seconds).

- ♦   Caller does nothing. DH 200 rings but is not answered.

- ♦   After 32 seconds, call is disconnected.

- ♦   Printout A prints after disconnect at 4:59.

Printout A (Release 1 and 2): 003 MSS 04:59 00:00;32 00;06

Printout A (Release 3 and above): 003 MSS   04:59 00:00;25 00;05

Example 2 – DISA Internal Station Call

Call Sequence B

- ♦   Outside caller rings CO line 003. (CO line 003 is programmed as a DISA line.)

- ♦   Line 003 returns intercom dial tone to caller after two ring cycles (5~6 seconds).

- ♦   Caller dials 203.

- ♦   After 48 seconds from start of call, station 203 answers.

- ♦   Printout B prints after station 203 answers the call at 4:32.

Note   MSS will not print if the call is answered before the threshold time set in Program 60-2.

Printout B (Release 1 and 2): 003 MSS 04:32 00:00;48 00;05 203

Printout B (Release 3 and above): 003 MSS 04:32 00:00;48 00;05 203

Example 3 – DISA Outgoing CO Line Call

Note   DISA CO line calls print out as DISA.

Call Sequence C

- ♦   Outside caller rings CO line 001. (Line 001 is programmed as DISA.)

- ♦   Line 001 returns intercom dial tone after two ring cycles (5~6 seconds).

- ♦   Caller dials #7003 to access CO line 003 (outgoing).

- ♦   Caller dials the DISA security code and receives CO dial tone.

- ♦   Caller dials the telephone number and converses when the call is answered.

Peripheral Installation

♦ Caller hangs up.

♦ The call releases, and Printout C prints after the call disconnects at 12:22.

Notes

• *If the CO provides the Calling Party Control or Auto Release (AR) signal (see Program 15-0 and 15-3), the call disconnects when either party hangs up. A "*" will follow the CO line number in Release 1 and 2 and precede the CO line number in Release 3 on the printout if the call is disconnected by the CPC or AR signal.*

• *If the CPC or AR signal is not sent, the CO lines will remain seized until the DISA disconnect timer releases the call (see Program 12).*

Printout C

Auto Release signal: (Release 1 and 2)

003 MSS 12:20 00:00;02 00:06 (outgoing)

003* DISA 12:22 00:02;01 (outgoing)

001 DISA 12:22 00:02;01 (incoming)

Auto Release signal (Release 3 and above)

003 MSS   12:20 00:00;03 00:05 DISA (outgoing)

*003 DISA   12:22 00:02;01 (outgoing)

001 DISA   12:22 00:02;01 (incoming)

Disconnect Timer (Release 1 and 2)

001 DISA 12:24 00:04;57 (incoming)

003 DISA 12:24 00:04;57 (outgoing)

Disconnect Timer (Release 3 and above)

001 DISA   12:24 00:04;57 (incoming)

003 DISA   12:24 00:04;57 (outgoing)

Note The "MSS" entry prints out only if the call was connected after the SMDR threshold, 1.0 or 10 seconds. The threshold is set in Program 60-2.

SMDR Programming

Program 03

♦ The SMDR output is provided by the PIOU or PIOUS with the lowest code assigned (41, 42, or 43).

♦ If using RSIU or RSIS PCB (DK424) in slot 11 for SMDR, set Program 03 code 49 for slot 11.

Notes

● *WSIU (DK14) and TSIU (DK40i) do not require a Program 03 slot assignment.*

● *RSIU/RSIS (DK424) Program 76-1 code x2 overrides PIOU/PIOUS SMDR assignments and code 49 for RSIU/RSIS.*

Program 60

♦ Item 1: Selects Caller ID, ANI and DNIS or Account Code to be sent out the SMDR Port.

♦ Item 2: Selects the minimum duration (1.0 or 10 seconds) of calls that will be registered by SMDR. Any call that lasts less than the set time will not be recorded.

♦ Item 3: Selects the records of outgoing calls or outgoing and incoming calls to be printed.

♦ Item 4: Selects the digit length of Account Codes (4 to 15 digits).

♦ Item 5: Allows only long distance call records to be printed.

♦ Item 6: DISA security code.

♦ Item 7: Credit card calling digit length.

Program 76

♦ If WSIU (DK14), TSIU (DK40i), or RSIU/RSIS (DK424) is used to interface to the SMDR device use Program 76 to make the appropriate WSIU, TSIU, RSIU/RSIS SMDR programming assignments.

SMDR Printer/Call Accounting Device Installation

1. Connect the interface cable and the PPTC or PPTC9 adapter from the WSIU (DK14), TSIU (DK40i), PIOU, PIOUS, RSIU/RSIS (DK424), or SMDR port to the SMDR printer or call accounting device DB25 or DB9 connector. (See Figure 10-21 and PIOU, PIOUS, RSIU, or RSIS TTY and SMDR Wiring in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for more details.)

2. Set the PIOU or PIOUS SW1 switch to the appropriate bps rate WSIU (DK14), TSIU (DK40i) – 1200~9600 bps), (PIOU/PIOUS – 300 or 1200 bps, RSIU/RSIS (DK424) as determined by the baud rate of the printer or call accounting device (Program 76 set WSIU/TSIU, RSIU/RSIS bps rate).

3. Set the printer or call accounting device to no parity/8-bits/one stop bit.

4. Use Program 60 to set the system for the required SMDR printer/call accounting device options (See the following section and the *DK Strata Programming Manual*).

Note   Only the PIOU/PIOUS with the lowest code in Program 03 (41, 42, or 43) or RSIU/RSIS with Program 76-1 code X2 will provide the SMDR output.

Peripheral Installation

Basic Connection

DK14, DK40i or DK424

3-pair Modular Cord (7 ft. max)

Modular Jack

DB25 or DB9 Plug

WSIU or TSIU or RSIU or RSIS or PIOU or PIOUS

SMDR Modular Jack

50 ft. max 24 AWG Wire Twisted Pair Modularized

Printer or Call Accounting Device

Toshiba PPTC1A-5M (25 pin), PPTC-25F, or PPTC9 (9-pin) RS232, Modular Adapter

Data Format:
• ASCII
• 8-bits
• No parity
• 1-stop bit
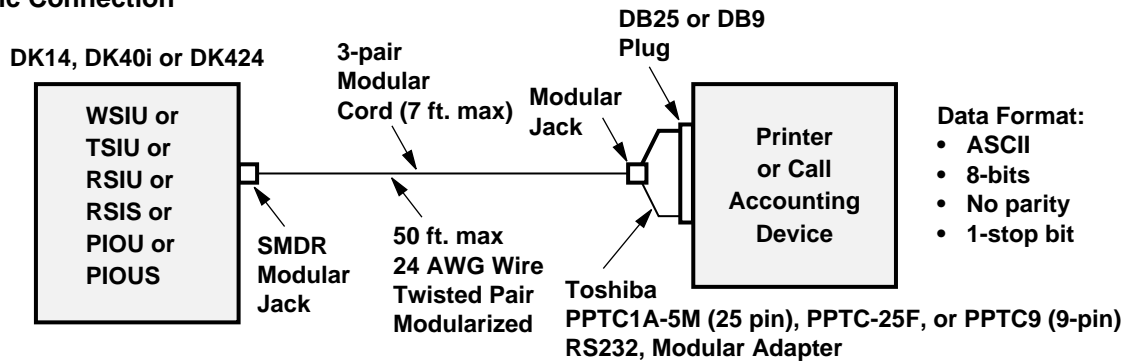
Basic Wiring

PIOU, SMDR Jack Modular Pin No.	PPTC1A-5M Adapter		RS-232 Lead Name
	Modular Pin No.	DB25 Pin No.	
1 to →	6 to →	3	RD
2 to →	5 to →	2	TD
3 to →	4 to →	6	DSR
4 to →	3 to →	20	DTR
5 to →	2 to →	8	CD
6 to →	1 to →	7	SG
		4 Jumper to 5	RTS to CTS

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Figure 10-21   PIOU/PIOUS SMDR Cable Connections

System Database Printout Using SMDR Port

If a printer is connected to the SMDR port, customer program information stored in the DK14, DK40i or DK424 RCTU RAM may be printed out for reference (see Figure 10-22).

Program 97

♦ Enables system program data to be printed via the SMDR port. See Program 97 record sheet.

Notes

● *An SMDR printer must be connected to the SMDR port to use the printout option selected by Program 97.*

● *Call record data is lost when program data is printed out with Program 97.*

```
      Program Number
      Port Number            ## System Programming ##
                                                                1: SELECT (LED ON)
        40        3 3 3 2      2 5 24        1 7 16        9   8       1 ← CO Line Numbers
   81 000    1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1
             1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 ← Lines 41 ~ 80
             1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 ← Lines 81 ~ 120
                                              1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1
                                         144       1 3 7136        1 2 9128       1 2 1 ← CO Line Numbers
        40        3 3 3 2      2 5 24        1 7 16        9   8       1
   81 001-249 0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0
             0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0
             0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0
                                              0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0  0 0 0 0 0 0 0 0
                                         144       1 3 7136        1 2 9128       1 2 1


   ## END OF PRINT          ##

                                                                                        1523
```

Figure 10-22   PIOU/PIOUS/RSIU/RSIS SMDR Port Data Dump Example

Voice Mail Options

Strata DK systems can support a Toshiba Stratagy, Stratagy DK, VP or customer-supplied voice mail system.

Voice mail systems connect to standard telephone circuits (QSTU2, KSTU2, RSTU2, RDSU/RSTS, PSTU or PESU). The number of circuits required by each device depends on the customer's voice mail requirements, such as the number of voice mail users. To support voice mail, DK14 KSU must have QCRU3 installed, DK40i KSU must have K4RCU3 or K5RCU installed and a DK424 RCTU must have an RRCS installed.

Voice mail integration is provided by Strata in-band tones and/or on DK424 (only) the Simplified Message Desk Interface (SMDI) output of the PIOU, PIOUS, RSSU, RSIU, or RSIS SMDI port.

The PIOU/PIOUS/RSSU must be set with Program 03, code 43 or for RSIU/RSIS Program 03, code 49 and Program 76-1 with code x4 to provide SMDI output. See the SMDI section for more details about SMDI installation and operation.

Toshiba Stratagy, Stratagy DK, or VP Voice Messaging Systems

Strata DK systems are designed to support the full range of features offered by the Toshiba Stratagy and/or VP systems. It provides various call routing, message handling, and information management features, including:

♦   Auto Attendant

♦   Call Forward to Voice Mailbox

♦   Message Waiting Indication

♦   Voice Mail Control from Digital and Electronic Telephones

♦   System Monitoring

♦   Feature Integration

A block diagram of voice mail-to-QSTU2, KSTU2, -RSTU2, -RDSU/RSTS, or -PESU connection is shown in Figure 10-23, "Voice Mail Block Diagram".

Note   The RRCS must be installed on the RCTU and K4RCU3 must be installed on the DK14 KSU or DK40i Base KSU to allow VM DTMF dialing.

For installation procedures, see:

♦   Chapter 1 – DK14 Installation for QSTU2

♦   Chapter 3 – DK40i Installation for KSTU2

♦   Chapter 7 – DK40i/DK424 Universal Slot PCBs for RSTU2, RDSU/RSTS, and PESU
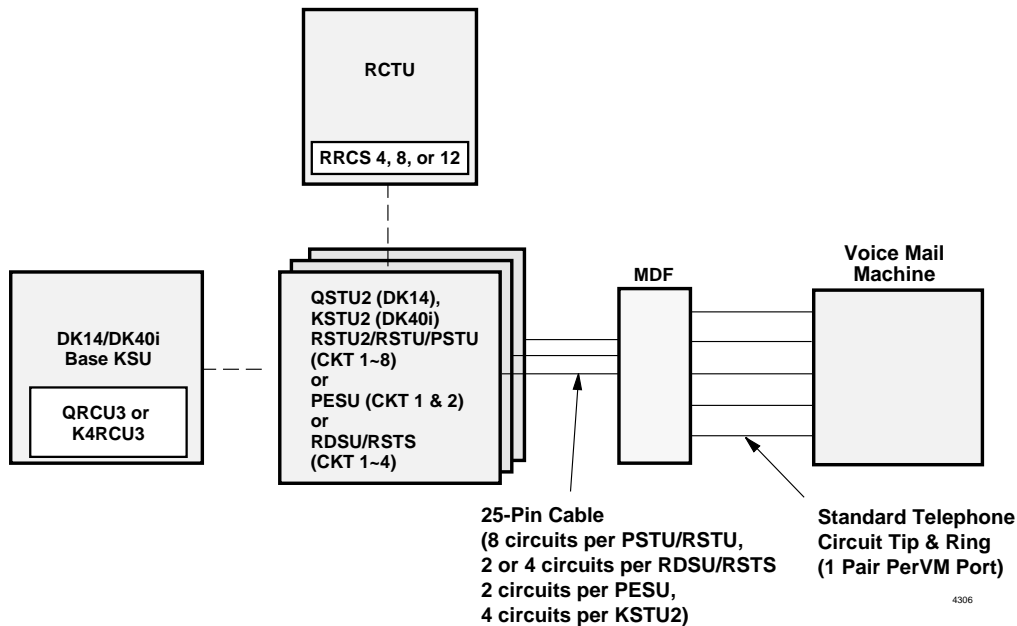
Figure 10-23   Voice Mail Block Diagram

Toshiba Stratagy, Stratagy DK, or Toshiba VP Programming

Some features of Strata DK system programming were designed for Toshiba Stratagy, Stratagy DK or VP systems, and do not necessarily apply to customer-supplied voice mail messaging systems. These programming features are:

Answer (A) Tone

The Strata DK stations send an answer tone to Stratagy or VP when the station answers a VP or Stratagy call.

Disconnect (D) Tone

The Strata DK stations send a disconnect tone to Stratagy or VP when the station hangs up while connected to Stratagy or VP. [(D Tone is also sent to release the Stratagy or VP/Auto Attendant port when an outside loop start CO line caller hangs-up and the CO provides a Calling Party Control (CPC) or Auto Release (AR) disconnect signal per Program 15-0 and 15-3. Ground start CO lines will send "D" tone to VM ports anytime an outside caller hangs up.]

Notes

- *D Tone will not operate in all areas, because some COs fail to provide the CPC or AR signal on loop start lines.*

- *Both A and D Tones provide more efficient Stratagy or VP port use. Always enable these options. Both options are enabled by accessing Program 31, and setting LED 15 ON.*

- *The CPC or AR signal of some COs is not reliable and may occur during a CO line voice connection, causing the call to disconnect. If this occurs, disable CPC /AR Hold and CPC/AR Voice Mail calls on all CO loop start lines with Programs 15-0 and 15-3.*

Peripheral Installation

Recall (B) Tone

Stations send a recall (B) tone to Stratagy or VP whenever Stratagy or VP answers a transfer (camp-on) recall from stations that did not answer a Stratagy or VP blind transfer. (The B tone notifies Stratagy or VP that the call is a recall and not a new call, allowing Stratagy or VP to respond with the appropriate greeting.) For this feature to operate, QSTU2, KSTU2, RSTU2, RDSU/RSTS, PSTU or PESU voice mail ports must have LEDs 19 and 20 turned ON in Program 31.

See "General Voice Mail (Standard Telephone Port) Programming" below for more information.

Customer-supplied Voice Mail Messaging Systems

Strata DK systems are designed to support a wide range of customer-supplied voice mail messaging systems. Depending on the voice mail system used, some of the features available with Toshiba Stratagy or VP (See "Toshiba Stratagy, Stratagy DK, or VP Voice Messaging Systems" on Page 10-42) may be available with the customer-supplied system.

General Voice Mail (Standard Telephone Port) Programming

Voice mail (VM) QSTU2, KSTU2, RSTU2, RDSU/RSTS, PSTU or PESU port programming is accomplished using Programs 31 and 10-2. (See *Strata DK Programming Manual* for more details.) VM programming features are as follows:

VM Groups

This feature groups VM QSTU2, KSTU2, RSTU2, RDSU/RSTS, PSTU or PESU ports together so that message waiting set/cancel signals appear to originate from the lowest port in the VM group. All VM ports connected to a particular VM machine should be set in the same VM group (Program 31, LEDs 05~08). The same ports set in the Program 31 VM group should also be set in the designated VM Distributed Hunt Group in Program *40.

Message Waiting (MW) Set/Cancel

If the VM machine has the ability to dial a code and the appropriate station numbers to set or cancel the message waiting LEDs on digital and electronic telephones, you can use Program 10-2, LED 04 to instruct the VM machine to set or cancel a MW LED. See the *Strata DK Programming Manual* for more information.

Note   Only dial codes **#63** and **#64** are set in the VM device configuration; the VM device dials the station number automatically to set/cancel the MW LED.

No Conference VM

Prevents undesired three-party connections during VM call transfers. All VM ports should be set for No Conference (Program 31, LED 09).

Privacy Override Deny

Prevents stations from overriding (breaking in) in-progress VM calls (Program 31, LED 18).

End-to-End Signaling

Enables VM port DTMF operation. All VM ports should be set for end-to-end signaling (Program 31, LED 17).

Note   The RRCS -4, -8, or -12 must be installed on the DK40i or DK424 RCTU to enable End-to-End Signaling.

Receive Auto Call Forward ID Codes

Provides auto digits from call forwarded stations to direct callers to station mailboxes. All VM ports should be set to receive auto ID code (Program 31, LED 16).

Voice Mail Program Checklist

Prior to Programming

Set Toshiba VP Maintenance Menu system parameters to "D" = Strata DK (any model). See Toshiba Stratagy, Stratagy DK, or VP documentation for other parameter settings.

Programming Strata DK for Voice Mail

♦ Program 92: Initialization clears voice mail auto dial codes.

♦ Program 03: Verifies that a RRCS is installed on the RCTU, K4RCU3 or K5RC4 is installed on the DK40i KSU, or the QRCU3 is installed in the DK14 to enable the VM device to send DTMF tones. Also sets PIOU, PIOUS (code 43) or RSIU/RSIS (code 49) to enable the SMDI port (see Program 76 if installing RSIU or RSIS SMDI port).

♦ Program 04: Assigns station Intercom or Directory numbers [DN] to VM ports (initialized numbers recommended).

♦ Program 05: First digit of special codes **#63** and **#64** (initialized numbers recommended).

♦ Program *09: Sets DID extensions to ring VM Auto Attendant Ports if Program 71 is not used.

♦ Program 10-1: If the system is first set for voice, program the VM device to dial the suffix "1" after station numbers.

♦ Program 10-2: If LED 04 ON for set/cancel operation and LED 06 ON for the VM to detect 80 millisecond tones. Also set DTMF Tone return or No DTMF return options (LED 11 and 20).

♦ Program 10-3: Sets SMDI options.

♦ Program 13: If the VM device is the message center, set the lowest standard telephone port in the Program 31 VM group as the message center.

♦ Program 31: Turn LEDs 04, and 15~20 ON, and LED 05, 06, 07 or 08 ON for the QSTU2, KSTU2, RSTU2, RDSU/RSTS, or PESU ports that are connected to the Toshiba VP and Stratagy VM ports. Turn LED 09 ON for VM Auto Attendant "Supervised Transfer" operation; turn LED 09 OFF for VM Auto Attendant "blind transfer" operation and/or VM two CO-line tandem connection with release 3.2. Do not set these options for telephone station ports.

Note   A, D, and B Tones should be enabled only for VM devices that respond to these tones.

♦ Program *32: Sets lowest standard telephone port if the Program 31 VM group as message center for stations using VM.

♦ Program 33: Sets the QSTU2, KSTU2, RSTU2, RDSU/RSTS, and PESU ports that are connected to the VM ports to a hunting sequence, starting with the lowest port hunting to the next highest port, etc. The last hunt should be to an attendant station. Only use Program 33 if you ar not using Program *40 to set up a VMDA group.

♦ Program *34: Turns OFF LED 01 to disable camp-on BOV tone to a VM port.

♦ Program 35: LEDs 01 and 02 must be ON for stations to receive the message waiting indication (flashing LED) from a VM device. This program also turns ON LED 03 for standard telephone ports that must support standard telephone message waiting lamps. It is

Peripheral Installation

advisable to turn Busy Station Transfer (LED 20) ON for all VM/Auto Attendant ports, and to turn Busy Station Ringing (LED 19) ON for all stations that must never be detected as busy when called by the VM/Auto Attendant port. Also turn LED 03 OFF to disable standard telephone MW signal to VM ports.

♦ Program 36: Sets Fixed Call Forward to VM [DN] per customer requirements.

♦ Program 37: Sets the transfer recall timer for the VM ports to 11~999 seconds minimum to allow Call Forward-No Answer to work on VM transferred calls. Station users can individually set CF-NA ring time from 8~60 seconds.

♦ Program 39: Sets the VM-related buttons on the digital and electronic telephones that will be used to communicate with the VM device.

♦ Program *40: Sets VM standard ports into a Distributed Hunt Group (same ports set as Program 31 VM group).

♦ Program 71 (1-3): Sets tie/DID/DNIS extensions to ring VM Auto Attendant Ports if Program *09 is not used.

♦ Program 71-4: Sets the DNIS VM ID code (for Inband Integration only, not SMDI).

♦ Program 76: Sets RSIU RSIS or TSIU SMDI port.

♦ Programs 81~89: Verifies that the ringing assignments to the VM devices are set per customer requirements.

♦ Programs 16, 40, 41, 45~48 and 50~56: Verifies that outgoing CO line access is allowed on VM ports to allow the VM beeper notification feature to operate.

Voice Mail System Installation

1. Ensure that the QSTU2, KSTU2, RSTU2, RDSU/RSTS, PSTU or PESU PCB is installed in the system per Chapter 7 – DK40i/DK424 Universal Slot PCBs.

2. Connect the VM system to the selected KSTU2, RDSU/RSTS, RSTU2, PSTU or PESU standard telephone port. (See Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring Chapter 3 – DK40i Installation or Chapter 1 – DK14 Installation.)

3. Program the Strata DK system for the required VM features. (See "Toshiba Stratagy, Stratagy DK, or VP Voice Messaging Systems" on Page 10-42, paragraph 3 and "General Voice Mail (Standard Telephone Port) Programming" on Page 10-44.)

4. For DK424, ensure that an RRCS -4, -8 or -12 is installed on the RCTU, and verify that the RCTU code in Program 03 is for RRCS operation.

   ...or

   For DK40i, K4RU3 is installed on the KSU.

   For DK14, QRCU is installed.

5. Perform additional VM system programming as applicable (See customer-supplied installation/programming manuals).

Note Some VM devices may ring trip when called; in this case, set the square-wave ring voltage jumper to L (low position) on the PSTU2, KSTU2, PESU or PSTU2 PCB connected to the VM device. This is not necessary on RSTU2 and RDSU/RSTS PCBs because they have a sine-wave ring generator.

PC/Data Communications Interface Units

The Strata DK supports two types of Data Interface Units (DIUs) that enable digital telephone users to simultaneously transmit and receive data on the same digital station port and wire pair while communicating on a voice call.

One unit, called the integrated DIU (RCPI-DI, PDIU-DI/PDIU-DI2), becomes part of the digital telephone, replacing the telephone's base; the other unit, is a small self-contained unit called the stand-alone DIU (PDIU-DS). Each RPCI or PDIU is powered by the digital port to which it is connected (see Figure 8-3 on Page 8-4 for wiring requirements).

The RPCI-DI can operate in two modes: Telephony Application Program Interface Mode (TAPI) or Data Communication mode. The RCPI operating mode is controlled by the PC connected to the RPCI-DI. This section only covers the RCPI-DI data communications mode. See the *PC/DIU User Guide* for information on changing the RPCI-DI mode.

Notes

- *"Digital Ports" include the PDKU and RDSU digital station ports.*

- *2000-series digital telephones require RPCI-DI or PDIU-DI2 and 1000-series telephones require PDIU-DI and are not compatible with RPCI-DI or PDIU-DI2.*

Both RPCIs and DIUs can be connected to standard Electronic Industries Association (EIA) RS-232 asynchronous serial data devices. EIA devices are divided into two categories: data communication equipment (DCE) and data terminal equipment (DTE). Common DCE devices are modems and some printers; common DTE devices are personal computers, ASCII terminals, and some printers.

The RPCI-DI and PDIU-DI operate like a DCE and connect directly to DTE devices using standard RS-232 cables. Depending on how its internal jumper plugs are configured, the PDIU-DS can either operate like a DTE and connect to DCE devices; or operate like a DCE device and connect to DTE devices. In most applications, DTE and DCE devices exchange data between each other via the standard RS-232 cable connection.

When in the data communications modes, RPCIs and DIUs can function with DCE and DTE devices at data speeds of up to 19.2 kbps. However, keyboard dialing using AT commands (from a PC or terminal connected to a RPCI or DIU) is limited to 9600 bps. RPCI or DIU data transmission speed is set by the first AT command that the RPCI or DIU receives once it is in the command state; if manual dialing or receiving calls in the auto answer (default) mode, the transmission speed is transparent and can be up to 19.2 kps.

Important! *To use the RPCI-DI, PDIU-DI or PDIU-DS with AT commands, communications software or a PC program that performs terminal emulation must be used. AT commands cannot be issued from the computer's operating system prompt.*

Peripheral Installation

RPCI-DI Dual Mode

RPCI-DI can operate in the data communication or Telephone Application Program Interface (TAPI) mode.

♦ When in the Data Command mode, send the HEX (fØ), enter ALT (Hold) + 240 to the RPCI to switch it to the Data Communications mode. (Unplugging the telephone cord and then reconnecting it also resets the RPCI to the Data Communications mode.)

♦ When in the TAPI mode, send (ATCØ) to the RPCI to switch it to the Data Command mode. In the TAPI mode, a constant stream of data is sent from the RPCI to the PC COM port.

♦ RPCI-DI mode switching should be performed automatically by the application programs running on the PC connected to the RPCI-DI.

(See Chapter 13 – Computer Telephony Integration for instructions on configuring your PC for TAPI software.)

Common DIU Connections

The block diagram in Figure 10-24 illustrates common RPCI and DIU data communications connections. In this example, RPCI-DIs or PDIU-DIs are connected to PCs (PC1 and PC2), and PDIU-DSs are connected to a serial printer and modems. PC users can transfer files internally, print files on the same printer, and access the modem pool to send/receive data to/from an external personal computer or dial up data service.

To access these devices, a data call connection must be established between the RPCIs and DIUs. This is accomplished by dialing the destination DIU from a digital telephone dial pad or from a PC keyboard using standard AT dial commands. RPCI-DIs and PDIU-DIs share the same intercom or [PDN]/ports with the digital telephone to which they are connected, while PDIU-DSs have their own. The intercom and data call LEDs on the digital telephone initiates a voice or data call, respectively. When dialing from a keyboard with AT commands, **ATD** is typed for voice calls, and **ATDD** for data calls.

Installation instructions for these devices are provided, starting from "RPCI-DI, PDIU-DI, PDIU-DS SW1 DIP Switch Information" on Page 10-60 through "PDIU-DS Disassembly and Assembly" on Page 10-65. Call paths and scenarios for five types of data test calls are provided in "RPCI-DI/PDIU-DI/PDIU-DS Data Communication Installation Tests" on Page 10-66, paragraph 2 through paragraph 6. Step-by-step data calling procedures are provided in the *PC/Data Interface User Guide*.
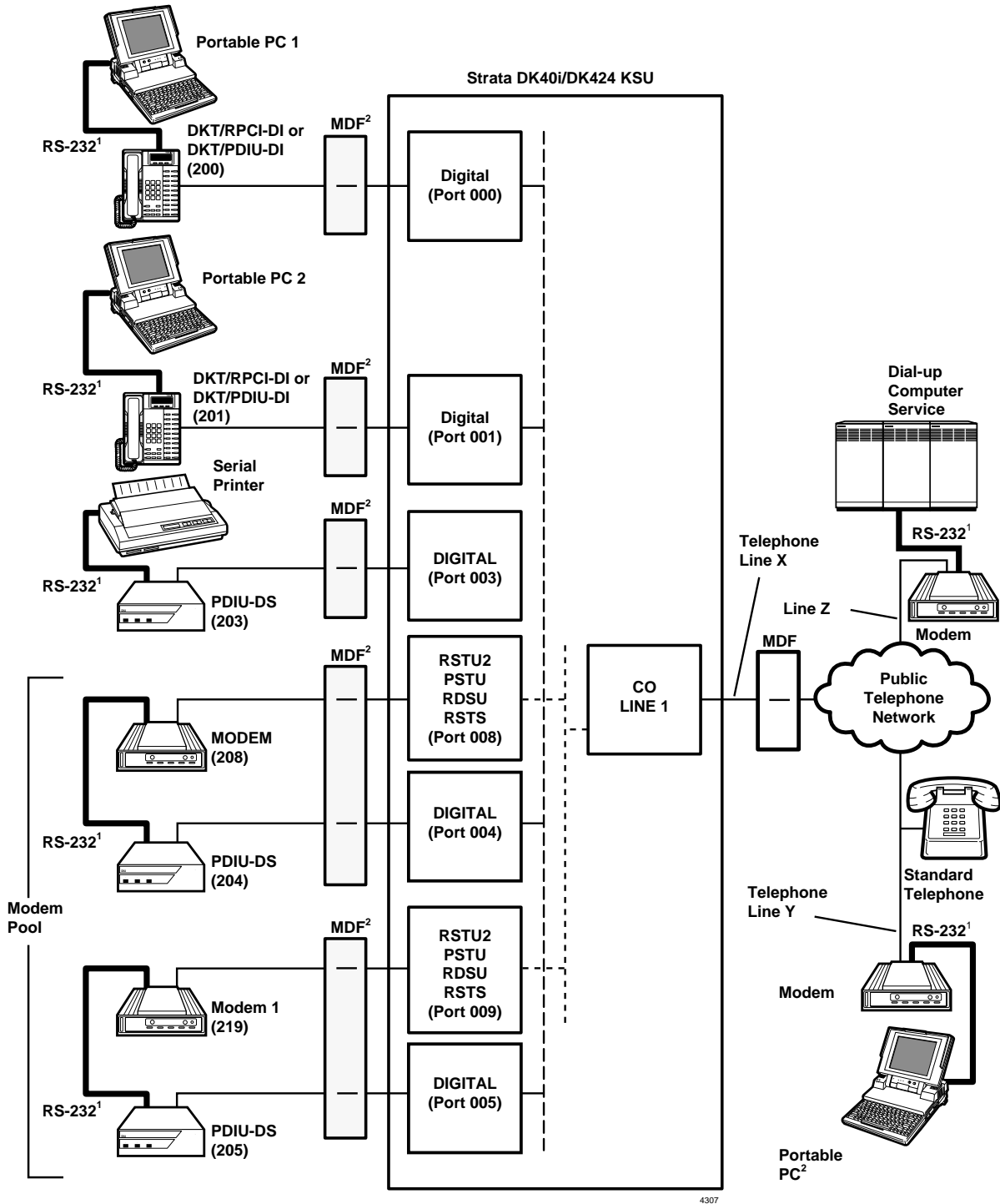
1. RS-232 cable and connector information is provided in Figures 10-26 to 10-33.

2. See Chapter 3 – DK40i Installation and Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for PC, data interface and modem MDF station wiring.

Figure 10-24   DK Data Communications Installation Example Block Diagram

EIA Interface Leads (Signals)

Both DIUs operate with 10 standard EIA RS-232 interface leads (signals) on which signaling data is transmitted and received. RPCIs and DIUs connect to serial data devices with standard RS-232 cables, available from telephone supply stores (see Figures 10-24~10-29 and 10-31). The RPCI-DI/PDIU-DI/PDIU-DS requires 10 signals for some applications, but can function with eight using modular cords and connectors with RJ45/DB25 adapters for other applications. If uncertain which signals are necessary for an application, all 10 should be connected.

See Figure 10-33, "RPCI-DI, PDIU-DI, PDIU-DS SW1 DIP Switch Information" for more information.

Important!

♦ *The RPCI-DI and PDIU-DI is always a DCE device; the PDIU-DS may be a DTE or DCE, depending on how its internal jumpers (1~9) are configured.*

♦ *In the descriptions below, when a signal is ON, its potential is about seven volts positive relative to signal ground (pin 7); when a signal is OFF, it is about 7 volts negative relative to the signal ground (pin 7).*

Frame Ground (FG, Pin 1)

The FG signal (EIA circuit AA) is a protective or safety ground which is bonded to the PDIU-DI/PDIU-DS PCB. If required by local codes, the FG should be connected to external ground.

Signal Ground (SG, Pin 7)

The SG signal (EIA circuit AB) establishes the common ground reference for all other PDIU and data device signals and must be wired for all applications.

Transmit Data (TD, Pin 2)

DTE devices transmit and DCE devices receive data on the TD lead (EIA circuit BA). Before the DTE device can transmit the TD signal, the RTS, CTS, DSR, and DTR signals (all discussed below) must be ON. The TD signal is OFF in the idle state.

Receive Data (RD, Pin 3)

The DCE device transmits data to the DTE device on the RD lead (EIA circuit BB); the DTE receives data on the RD.

Request to Send (RTS, Pin 4)

Some DTE devices send an RTS signal (EIA circuit CA) to the DCE device when they are ready to transmit data on the TD lead. If the DTE device does not generate the RTS signal, the DIU DIP switch SW1-4 should be set ON to inform the RPCI or DIU. Sometimes, the DTE/DCE device may use RTS/CTS for Ready/Busy type flow control, in these cases DIP switch SW1-4 should be OFF.

Clear to Send (CTS, Pin 5)

The DCE device sends the CTS signal (EIA circuit CB) which indicates that it is prepared to transmit data to the line side. The DCE device sends this signal only when it receives the RTS signal from the DTE device. Sometimes, the DTE/DCE device may use RTS/CTS for Ready/Busy type flow control; in these cases, DIP switch SW1-4 should be OFF.

Data Set Ready (DSR, Pin 6)

When connected to the communication channel and prepared to exchange control characters to initiate data transmission, the DCE device sends the DSR signal (EIA circuit CC) to the DTE device. If the PDIU DIP switch SW1-2 is set ON, DSR will be ON continuously; if the switch is set OFF, DSR follows DTR (if DSR is ON, DTR is ON, etc.) SW1-2 should be OFF in most cases.

Data Carrier Detect (DCD, Pin 8)

The DCE device sends the DCD signal (DCD, Pin 8) when receiving the carrier signal on the line side. Before transmitting or receiving data, most DTE devices require that the DCD be ON. If the carrier signal is removed by the remote end or lost due to a fault condition on the line, the DCE notifies the DTE device by an OFF condition with the DCD signal. The PDIU DIP switch SW1-2 is set ON to set the DCD ON continuously. If set OFF, the DCD signal will only be ON when connection between two DIUs is established and OFF when a connection is not established. SW1-2 is set OFF when the DTE/DCE uses the DTR/DSR signals for Ready/Busy flow control.

Data Terminal Ready (DTR, Pin 20)

The DTE device sends the DTR signal (EIA circuit CD) to the DCE device, prompting the DCE device to open the communication line. The line is closed and the call disconnected when the DTE device quits sending the DTR signal. DTR may be sent any time to indicate that the DTE is ready to transmit or receive data. DIP switch SW1-2 should be set OFF in most cases.

Ring Indicator (RI, Pin 22)

The RI signal (EIA circuit CE) is sent by the DCE device to the DTE device. Whenever the DCE device receives a ringing signal on the line side, it turns the RI signal ON. If RPCI or DIU DIP switch SW1-3 is set ON, the RI signal will be continuously ON if ringing; if the switch is set OFF, the RI signal will be one second ON/three seconds OFF when the RPCI or DIU detects ringing signal.

Peripheral Installation

**Personal Computer or
Toshiba Portable (DTE)
Pin Designations**

COM Port Pin #	1	2	3	4	5	6	7	8	9
Name	DCD	RD	TD	DTR	SG	DSR	RTS	CTS	RI

Rear view of asynchronous (serial)
communication interface connector (DB9)
of PC or Toshiba Portable.

**RPCI-DI or PDIU-DI
(Functions like a DCE)
Pin Designations**

PDIU-DI Pin #	1	2	3	4	5	6	7	8	20	22
Name	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

Rear view of RPCI-DI or PDIU-DI DB25,
RS-232 female connector

DB9 Female Connector

DB25 Female Connector

DB9 Male Connector

DB25 Male Connector

DB9 Pin #	Name	DB25 Pin #
1	DCD	8
2	RD	3
3	TD	2
4	DTR	20
5	SG	7
6	DSR	6
7	RTS	4
8	CTS	5
9	RI	22

**PC modem style (serial) DB25
to DB9, RS-232 cable. Pin to
pin connections are
configured as a straight cable,
not as a null modem cable
(50 ft max, 24AWG; customer-
supplied).**

Notes
- Some RS-232 EIA leads may be called by other names by some manufacturers.
- The computer receives data on Pin 2 (RD) and sends data on Pin 3 (TD).

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Figure 10-25   RPCI-DI to 25-Pin to 9-Pin COM Port

**Personal Computer
or ASCII Terminal
(Functions like a DTE)**

DB25 Pin Designations

PDIU-DI Pin #	1	2	3	4	5	6	7	8	20	22
Name	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

**RPCI-DI or PDIU-DI
(Functions like a DCE)**

DB25 Pin Designations

PDIU-DI Pin #	1	2	3	4	5	6	7	8	20	22
Name	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

**Rear view of personal computer
or ASCII terminal DB25,
RS-232 connector**

DB25 Male Connector

DB25 Female Connector

**Rear view of RPCI-DI or
PDIU-DI DB25, RS-232
female connector**

DB25 Female Connector

DB25 Male Connector

DB25 Pin #	Name	DB25 Pin #
8	DCD	8
3	RD	3
2	TD	2
20	DTR	20
7	SG	7
6	DSR	6
4	RTS	4
5	CTS	5
22	RI	22
1	FG	1

RS-232 Cable

**PC modem style (serial) DB25
to DB25 (M/F) RS-232 cable
(50 ft max, 24 AWG, customer
-supplied).**

Note The PC/ASCII terminal receives data on Pin 3 (RD) and transmits data on Pin 2 (TD).

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Figure 10-26   RPCI-DI/PDIU/PDIU-DS to 25-Pin to 25-Pin COM Port

Peripheral Installation

**Toshiba Serial Printer
(Functions like a DTE)**

**PDIU-DS
(Configured in the "Connect to DTE" Mode:
P1 ~ P9 = A-B SO PDIU Functions like a DCE)**

DB25 Pin Designations

Printer Pin #	1	2	3	4	5	6	7	8	20	22
Name	FG	TD	RD	RTS	N/C	DSR	SG	DCD	DTR	RI

DB25 Pin Designations

PDIU-DS Pin #	1	2	3	4	5	6	7	8	20	22
Name	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

Rear view of printer or ASCII terminal DB25, RS-232 connector.
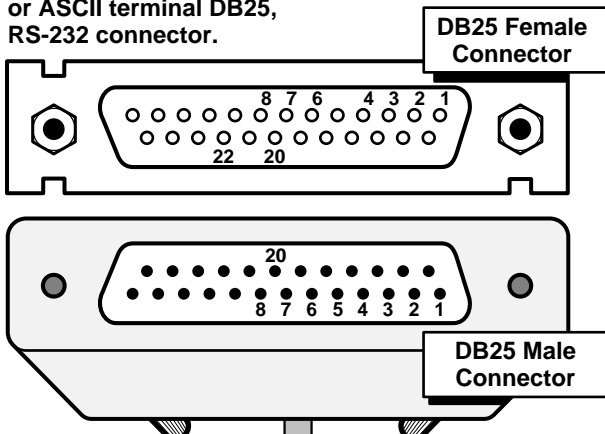
Rear view of PDIU-DI DB25, RS-232 female connector

Notes

- The printer receives data on Pin 3 (RD) and transmits data on Pin 2 (TD).

- The PDIU-DS should be in the connect-to-DTE mode (P1 ~ P9 are strapped A-B), so that it transmits data on Pin 3 (RD) and receives data on Pin 2 (TD).
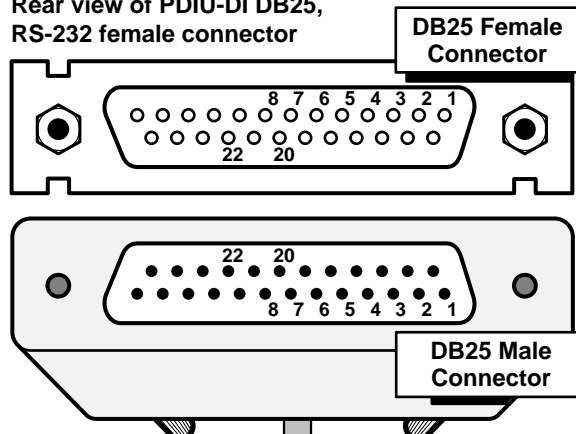
DB25 Pin #	Name	DB25 Pin #
8	DCD	8
3	RD	3
2	TD	2
20	DTR	20
7	SG	7
6	DSR	6
4	RTS	4
N/C	CTS	5
N/C	RI	22
1	FG	1

RS-232 Cable

(50 ft max, 24 AWG; customer supplied).

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Figure 10-27   PDIU-DS to Toshiba Printer, RS-232 Connector/Cable Connections

**Hayes-Compatible Smart Modem
(Functions like a DCE)**

**PDIU-DS
(Configured in the "Connect to
Modem" Mode, P1 ~ P9 = B-C,
So it functions like a DTE)**

Modem Pin #	1	2	3	4	5	6	7	8	20	22
Name	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

PDIU-DS Pin#	1	2	3	4	5	6	7	8	20	22
Name	FG	TD	RD	RTS	CTS	DSR	SG	DCD	DTR	RI

Rear view of modem DB25 connector

Rear view of PDIU-DS DB25, connector

DB25 Female Connector

8 7 6 5 4 3 2 1
22 20

DB25 Male Connector

22 20
8 7 6 5 4 3 2 1

DB25 Female Connector

8 7 6 5 4 3 2 1
22 20

DB25 Male Connector

22 20
8 7 6 5 4 3 2 1

**The following commands
should be sent to the modem:**

ATS0=1: Auto Answer

ATE0: Disable character echo in command state

ATQ0: Modem returns result codes

AT&C1: Track presence of data carrier

AT&D2: Hang up and assume command state with DTR on to off transition

DB25 Pin #	Name	DB25 Pin #
8	DCD	8
3	RD	3
2	TD	2
20	(Open) DTR	20
7	SG	7
6	(Open) DSR	6
4	RTS	4
5	CTS	5
22	RI	22
1	FG	1

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RS-232 Cable

(50 ft. max., 24 AWG, customer-supplied)

For PDIU-DS port:

Program 20: LEDs 01, 04, 17 ON. All other LEDs OFF. LED 02 should be set ON after the AT commands

Peripheral Installation

Notes

- Modem receives data on pin 2 (TD) and transmits data on pin 3 (RD).

- The PDIU-DS must be in the Connect to Modem mode (P1~P9 strapped B-C) so that it transmits data on pin 2 (TD) and receives data on pin 3 (RD).

- For the above cable modifications, modem AT commands, and Program 20 settings are required for proper call release when modems disconnect. With this configuration, the PDIU-DS "READY" light will not light until modems at both ends establish communication (DCD is detected)

- See "PDIU-DS to Modem Installation", paragraph 3 for more details.

Figure 10-28   PDIU-DS to Hayes-Type Smart Modem, RS-232 Connector/Cable Connections

Connection Example 1

Digital Telephone

Personal Computer (PC) or Toshiba Portable

**PDIU-DI Base
or
RPCI-DI Base**

Type 1 Modular Adapter[1]

**Type B Modular Cord (Crossed)[1]
(50 ft max, 24AWG)**

Type 2 Modular Adapter[1]

IMPORTANT! Will not function with applications that require the RI signal

Connection Example 2

Digital Telephone

Personal Computer (PC)

**PDIU-DI Base
or
RPCI-DI Base**

Type 3 Modular Adapter[1]

**Type A Modular Cord (Straight)[1]
(50 ft max, 24AWG)**

Type 2 Modular Adapter[1]

IMPORTANT! Will not function with applications that require the RI signal

Connection Example 3

Stand-Alone DIU

**Toshiba P321SL or Similar
Standard Type Serial Printer**

PDIU-DS

Type 2 Modular Adapter[1]

**Type A Modular Cord[1]
(50 ft max, 24AWG)**

Type 2 Modular Adapter
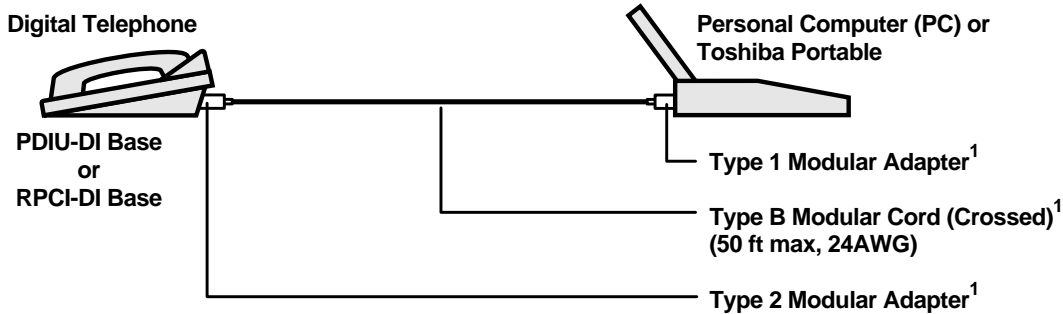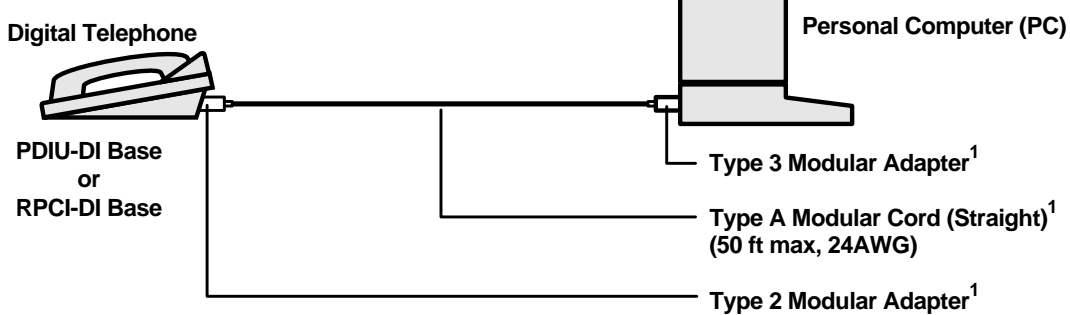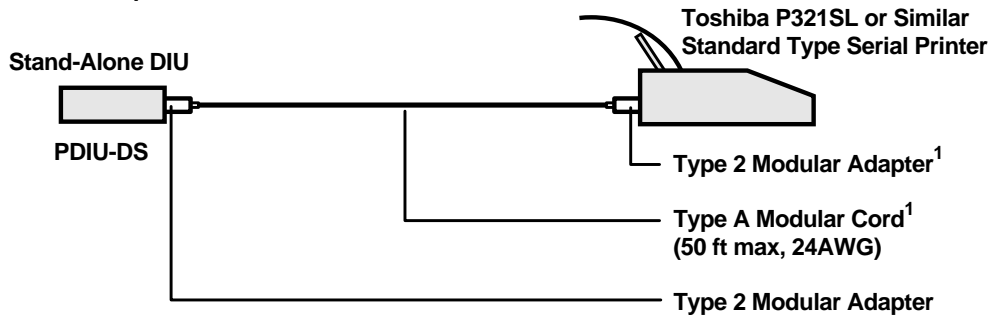
4333

1. See Figure 10-31 for detailed pin-out information of modular cords and adapters.

Notes

- Never use modular cords and adapters when connecting a RPCI-DI/PDIU-DI/PDIU-DS to a modem.
- Connection examples 1 and 2 work when using the RPCI-DI or PDIU-DI to make calls with personal computer applications (auto-dialers, printer sharing, outgoing modem calls, etc). If the PC RPCI-DI or PDIU-DI must receive calls, the RI lead is normally required; therefore, a standard RS-232 cable must be used (see).
- In Connection Example 3, PDIU-DS must be in the connect to DTE mode (P1 ~ P9, strapped A-B).
- All modular cords and adapters are customer-supplied.

Figure 10-30   RPCI-DI/PDIU-DI/PDIU-DS Modular Cable/RJ-45 Adapter Connections

Type 1
RJ45 TO DB9 (Female) Adapter

8	7	6	5	4	2	1	N/C	RJ45
DSR	RTS	RD	DCD	TD	GND	CTS	RI	Lead Name
6	7	2	1	3	5	8	9	DB9

TYPE 2
RJ45 TO DB25 (Male) Adapter

8	7	6	5	4	3	2	1	N/C	RJ45
CTS	SG	DTR	TD	DCD	RD	RTS	DSR	RI	Lead Name
5	7	20	2	8	3	4	6	22	DB25

TYPE 3
RJ45 TO DB25 (Female) Adapter

8	7	6	5	4	3	2	1	N/C	RJ45
CTS	SG	DTR	TD	DCD	RD	RTS	DSR	RI	Lead Name
5	7	20	2	8	3	4	6	22	DB25

TYPE A
RJ45 Flat Modular Cord (Straight)

RJ45 Straight Through

TYPE B
RJ45 Flat Modular Cord (Crossed)

RJ45 Cross Pinning

Modular Cords (50 ft max, 24AWG; customer-supplied)

1532

Figure 10-31   RPCI-DI/PDIU-DI/PDIU-DS Modular Cords and RJ-45/RS-232 Adapter Pin Connections

Peripheral Installation

Notes

- *Mode select (P1~P9) "A-B" if PDIU-DS is connected to a terminal-type device (DTE).*

- *Mode select (P1~P9) "B-C" if PDIU-DS is connected to a modem-type device (DCE).*

- *Do not cut the Perception strap when installing a PDIU-DS in Strata DK Systems.*

- *See Figure 10-33 for SW1~4 DIP switch options and Figure 10-34, "DK PDIU-DS Disassembly/Assembly Diagram" to disassemble/assemble PDIU-DS.*

- *Some RS-232 leads go by different names depending on the equipment manufacturer.*

Figure 10-32   PDIU-DS Jumper Plug Options/RS-232 Connector Information

DIP Switch Options

The RPCI-DI, PDIU-DI and the PDIU-DS each have a four-control DIP switch which can be configured for signaling options. The switch is located on the bottom of the PDIU-DI, and on the back panel of the PDIU-DS (see Figure 10-33).

SW1-1

Normally, this switch is set ON to disconnect devices from RPCIs or DIUs automatically. The connection is maintained if data is exchanged between the device and the RPCI or DIU within eight to nine minute intervals. If SW1-1 is OFF on the called and calling DIU, data calls will remain connected until released manually.

SW1-2

This switch is placed in the ON position when the RPCI-DI or PDIU-DI (or PDIU-DS configured like a DCE) must hold DCD and DSR ON continuously. If SW1-2 is OFF, DSR follows DTR and DCD will be ON only when the DIU is connected on a data call to another DIU. SW1-2 should be OFF on a RPCI DIU when it is connected to a personal computer that uses a communications software program to establish data calls with AT commands; and whenever PDIU-DS is connected to a modem.

SW1-3

The RPCI-DI or PDIU-DI (or PDIU-DS configured as a DCE) sends the Ring Indicate (RI) signal to the computer to tell the computer (DTE) that the RPCI or PDIU is receiving an incoming call. SW1-3 should be ON for the DIU to send RI steady, and OFF to send at one second ON/three seconds OFF intervals.

SW1-4

This switch is placed in the ON position if the computer does not output the RTS signal or when connected to a modem that tracks the DCD signal (modem set with AT&C1). Sometimes, the DTE device may use RTS/CTS for Ready/Busy flow control, in these cases SW1-4 should be OFF.

In this case the DCD signal of the calling DTE is used as the RTS lead of the called DTE and the DCD signal of the called DTE is used as the RTS signal of the other DTE. In this case a signal which stops the DTE from transmitting data (usually the CTS lead) should be cross-connected to the RPCI's or DIU's DCD signal. Consult the DTE device or application software documentation to determine which type of flow control is required. If the DIU-DS is connected to a modem that tracks carrier detect (AT&C1) SW1-4 should be ON.

Peripheral Installation
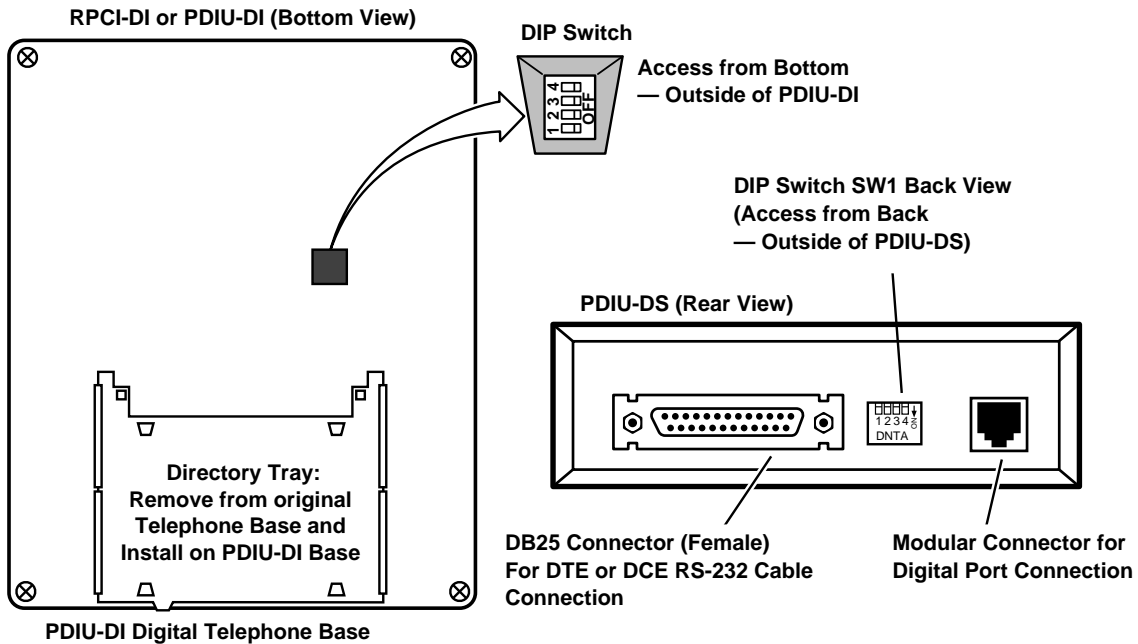
PDIU-DI and -DS SW1 DIP Switch (1 ~ 4) Functions

General Notes

- See Subsection "EIA Interface Leads (Signals)" and "DIP Switch Options" for more details regarding SW1 option settings.
- When a PDIU-DS is connected to a modem that tracks the DCD signal (AT&C1) SW1(4) must be ON.
- If using Toshiba Personal Computers and Toshiba Printers using X-ON/X-OFF flow control, set SW1(4) ON on PDIU-DIs and -DSs.
- SW1(2) should be off when PDIU-DS is connected to a modem.

Switch	Function	Initial Position
SW1 (1)	Forced hang up when DIU does not detect space signal on TD or RD for about 8 to 9 minutes On: enable (auto-disconnect)[1] Off: disable	OFF
SW1 (2)	DCD, DSR control On: continuous on Off: DSR depends on DTR (DCD is on during communication state)	OFF
SW1 (3)	RI control On: RI is on continuously during ringing state Off: RI is 1 sec ON/3 sec OFF during ringing state	OFF
SW1 (4)	RTS control ON: DTE doesn't have RTS signal Off: DTE has RTS signal (ready/busy flow control: RTS/CTS:DCD)	OFF

1534

1. RPCI or DIU port must have LED 02 ON in Program 20 to enable auto disconnect.

Figure 10-33   RPCI-DI, PDIU-DI, PDIU-DS SW1 DIP Switch Information

RPCI-DI and PDIU-DI to PC Installation

The RPCI-DI and PDIU-DI always functions as a DCE device; it transmits data on the Receive Data lead (RD) and receives data on the Transmit Data lead (TD). Most personal computers function as a DTE device; PCs transmit data on the TD lead and receive data on the RD lead.

Note The RPCI-DI or PDIU-DI can connect to a DCE computer or any other DCE-type device using a specially configured RS-232 cable or adapter; but this application is rarely required.

➤ **To install the RPCI-DI or PDIU-DI to a DTE device, PC, or ASCII terminal**

1. Install the digital telephone that is to be equipped with RPCI-DI or PDIU-DI per the instructions in Chapter 9 – Station Apparatus and the drawing in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring.

2. Install the RPCI-DI or PDIU-DI under the digital telephone per the instructions in Chapter 9 – Station Apparatus.

Note The RPCI-DI or PDIU-DI always operates as a DCE device; therefore, unlike the PDIU-DS, it has no internal jumpers.

3. Connect the appropriate RS-232 cable between the RPCI-DI or PDIU-DI's DB-25 female connector and the PC's appropriate asynchronous serial communications port connector (COM port).

Important! *Check the PC manufacturer's serial communication port interface documentation for correct RS-232 pin requirements; requirements vary with each manufacturer. The number of EIA RS-232 signals required (8, 9, or 10 wires) depends on the application. When EIA signal requirements are not known, connect the 10 EIA signals listed in "EIA Interface Leads (Signals)" on Page 10-50. Figures 10-33 and 10-31 provide diagrams for connecting RS-232 cables between PDIU-DIs and PCs/ Toshiba portables.*

4. Set the RPCI-DI or PDIU-DI DIP switch (SW1-1~4) for the desired application. See Figure 10-33, "RPCI-DI, PDIU-DI, PDIU-DS SW1 DIP Switch Information".

RPCI-DI and PDIU-DI Programming

Configure the RPCI-DI or PDIU-DI for DTE-type connection in Program 20 and the data button assignments of the digital telephone connected to the PDIU-DI in Program 39.

♦ Program 20

   ♦ The port number entered for the RPCI-DI or PDIU-DI in Program 20 is the port number of the digital telephone to which the RPCI-DI or PDIU-DI is connected.

   ♦ LED 01: Should always be ON for RPCI-DI and PDIU-DI ports.

   ♦ LED 02: Should be ON for RPCI-DI or PDIU-DI ports, unless the PC user will never uses RPCI or DIU AT commands (other than ATDD, ATDT, and ATD) and never requires the RPCI-DI or PDIU-DI to send result codes to display on the PC display screen. Frequently, it is difficult to determine the full extent of these requirements; so Toshiba recommends turning LED 02 ON. See the *PC/Data Interface User Guide* for DIU AT commands and result codes.

   ♦ LEDs 03 and 04: Should be OFF for RPCI-DI or PDIU-DI ports.

♦ LED 05: Should be ON if the system is installed behind a PBX or Centrex that uses access codes to make external calls or to insert a pause following RPCI DIU access of an outside line.

♦ LED 10: Enables Caller ID and ANI information to be sent from RCPI-DI to the connected PC.

♦ LED 11: Enables DNIS information to be sent from the RCPI-DI to the connected PC.

♦ LEDs 17~20: Used to establish data security groups. RPCI and PDIU stations are only allowed to make calls to RPCI and PDIUs in the same assigned data group.

♦ Program 39: The following data call buttons can be assigned digital telephones equipped with PDIU-DIs: **Data Call**, and **Modem**. Assign **SD** buttons to data devices as required. Do not assign **DSS** buttons to data devices; **DSS** buttons are used for voice calls only.

PDIU-DS to Printer Installation

Strata DK enables serial printers (laser, dot matrix, or other types) to be connected to stand-alone data interface units (PDIU-DSs). Digital telephones equipped with RPCI or PDIU-DIs can share access to these printers. Serial printers operate as DCE or DTE devices, depending on the vendor; the PDIU-DS can be connected to either type, since it can be configured as a DTE or DCE device. (The PDIU-DS comes from the factory configured as a DCE device.)

➤ **To connect the PDIU-DS to a serial printer**

Notes

● *Only serial printers (not parallel) that conform to EIA RS-232 signaling requirements can be connected to PDIU-DSs.*

● *In rare applications, it may be desired to connect printers to PDIU-DIs. See the printer's installation instructions.*

1. Consult the serial printer's documentation and determine if the printer operates as a DCE or DTE device. Also, see Figures 10-32 and 10-34.

    If the printer is a DCE device: Disassemble the PDIU-DS and configure it to operate like a DTE device by placing the jumper plugs (P1~P9) in the "B-C" (MODEM) position. Reassemble the PDIU-DS, and mark "B-C" on the bottom label for future reference.

    If the printer is a DTE device: You may not need to disassemble the PDIU-DS, since it comes factory-direct configured as a DCE device. However, if uncertain, disassemble the PDIU-DS and verify that jumper plugs (P1~P9) are in the "A-B" (DTE) position. Reassemble the PDIU-DS and mark "A-B" on the bottom label for future reference.

2. Connect the PDIU-DS to the appropriate digital telephone circuit per wiring diagrams in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring and Chapter 9 – Station Apparatus.

3. Connect the appropriate RS-232 cable between the printer and the PDIU-DS (see Figures 10-27 and 10-30 for an example printer cable connection).

4. If Steps 2 and 3 are done properly, the Power and Ready LEDs on the PDIU-DS light when the printer is turned on and ready.

5. Set the PDIU-DS DIP switch (SW1-1~4) for the application. See Figure 10-33 for DIP switch locations.

Note   If using Toshiba computers and printers with X-ON/X-OFF flow control, set SW1-(4) "ON" on the DIU connected to the computer and DIU connected to the printer.

Important! *Check the printer's serial documentation for correct RS-232 pin requirements. The requirements vary with each manufacturer.*

PDIU-DS Programming

♦ Program 20: Configures the PDIU-DS to connect to a serial printer (see *Strata DK Programming Manual* for instructions and record sheets).

  ♦ LED 01: Should always be ON for PDIU-DS ports.

  ♦ LED 02: Should be OFF for PDIU-DS ports connected to printers.

  ♦ LED 03: Should be OFF for PDIU-DS ports that connect to DTE- or DCE-type printers.

  ♦ LED 04: Should always be ON for PDIU-DS ports.

  ♦ LED 05: Should be OFF for PDIU-DS ports connected to printers.

  ♦ LEDs 17~20: Data security groups can be used to enable or disable digital telephones equipped with PDIU-DIs access to PDIU-DS ports connected to a printer. DIU stations can only make data calls to DIUs in the same data security group.

♦ Program 22: Configures PDIU-DSs to hunt if more than one PDIU-DS connected to the same printer/server.

PDIU-DS to Modem Installation

Strata DK enables asynchronous-type (not synchronous) modems to be connected to PDIU-DSs. This enables RPCI-DI or PDIU-DI equipped digital telephones that are connected to personal computers, terminals, and other devices to share access to a modem or modem pool.

Important! *Modems must be "smart modems" that respond to AT commands and return result codes. Modems are customer-supplied.*

A modem(s) can be accessed internally for outgoing data calls or externally for incoming data calls. Modems operate as DCE devices; so PDIU-DSs that are connected to them must be configured to operate like a DTE device.

In the example shown in , the line side of the two modems are connected to RDSU/RSTS, RSTU2, PSTU, or PESU ports to establish a modem pool; however, the line side of modems can be connected directly to a dedicated CO line.

If modems are connected directly to telephone network CO lines, automatic transfer of CO line voice calls to system modems (data call) do not function as described in the *PC/Data Interface User Guide*.

For efficient operation and the best use of CO lines and modems, Toshiba recommends configuring modems to RSTU2, PSTU or RDSU/RSTS standard station ports in a modem pool. The RS-232 side of the modem connects to the PDIU-DS with standard RS-232 cables; the PDIU-DS line side (RJ-11 connector) always connects to its own individual digital port.

Peripheral Installation

➤ **To configure the PDIU-DS as a DTE device**

1. Disassemble the PDIU-DS and place jumper plugs P1~P9 in the "B-C" position (MODEM).

2. Reassemble the PDIU-DS and mark "B-C" on the bottom identification label for future reference. (See Figures 10-32 and 10-33.)

➤ **To install modems to PDIU-DSs**

1. Connect the PDIU-DS to the appropriate digital port circuit per the wiring diagrams in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring.

2. Connect the appropriate RS-232 cable between the modem and the PDIU-DS. Figure 10-29, "PDIU-DS to Hayes-Type Smart Modem, RS-232 Connector/Cable Connections" shows an example PDIU-DS to "smart modem" RS-232 connection.

Important! *All 10 PDIU-DS EIA leads (signals) should be connected to the modem. Consult the modem's documentation for correct RS-232 pin requirements; the requirements may vary with each manufacturer.*

3. Connect the line side of the modem to a RDSU/RSTS, RSTUS2, or PESU standard telephone circuit or a dedicated CO line (consult the modem's documentation to install it to a CO line). Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring provides station port wiring information.

4. Set the PDIU-DS DIP switch (SW1-1~4) for the desired application. (See Figures 10-32 and 10-33.)

Note If the modem tracks carrier detect (DCD, AT&C1), SW1(4) should be ON, and SW1(2) should be OFF when PDIU-DS is connected to a modem.

5. Configure the PDIU-DS to connect to an asynchronous modem using Programs 20, 21, 22, 31 and 33.

PDIU-DS Programming

Note See the *Strata DK Programming Manual* for instructions and record sheets.

♦ Program 20

   ♦ LED 01: Should always be ON for PDIU-DS ports

   ♦ LED 02: Should be ON for PDIU-DS ports connected to modems, enabling the use of AT commands and result codes when incoming calls are made from outside the system to modems connected to PDIU-DSs.

   ♦ LED 03: Should be set ON for PDIU-DS ports connected to modems.

   ♦ LED 04: Should always be ON for PDIU-DS ports.

   ♦ LED 05: Should be OFF if the system is installed behind a PBX/Centrex that uses access codes to place outgoing trunk calls.

   ♦ LED 06: Should be OFF for DIUs connected to modems. The modem cable must be modified per Figure 10-29 or Figure 10-38, or the PDIU-DS internal jumper plugs must be set per the instructions in the *DKAdmin/DKBackup User Guide*.

   ♦ LEDs 17~20: Data security groups can be used to allow or deny digital telephones equipped with PDIU-DIs access to the PDIU-DS ports connected to a modem. DIU stations can only make data calls to DIUs in the same data security group.

♦ Program 21: For each PDIU-DS/modem pair, assign the digital, RSTU2, RDSU/RSTS, and PESU ports that will be connected to the PDIU-DS and modem, respectively.

♦ Program 22/33: If more than one modem/PDIU-DS pair is configured as a system modem pool, the PDIU-DSs should be set to hunt each other in Program 22. The modem RSTU, PSTU, RDSU/RSTS, or PESU ports should be set to hunt each other in Program 33.

♦ Program 31: LED 18 should be turned ON for all RSTU2, RDSU/RSTS, or PESU station ports that are connected to modems. This provides data security by preventing executive or privacy override of modem calls.

Modem Setup Recommendations

1. Always make sure the escape sequence of the telephone PDIU-DI is default (+++).

2. Send AT command ATS2=43 to PDIU-DI.

3. Use a modified modem cable for the connection (see Figures 10-29 and 10-38) or reset the PDIU-DS internal jumper plugs per the instructions in the *DK Admin User Guide*.

4. Send the following AT commands to the modem pool modem: ATS0=1, ATE0, ATQ0, AT&C1, and AT&D2.

PDIU-DS Disassembly and Assembly

To set the jumper plugs (P1~P9) on the PCB inside the PDIU-DS for DCE or DTE operation, the PDIU-DS must be disassembled.

➤ **To disassemble the PDIU-DS**

1. Remove the four non-captive screws on the bottom of the unit (Figure 10-34); these screws are needed in Step 3 of the assembling procedure.

2. Remove the bottom panel.

3. Remove the PCB inside the PDIU-DS by lifting the back panel from its side grooves.

4. Turn the PCB over and set the jumper plugs (P1~P9):

   ♦ If the PDIU-DS is connected to a DTE, set the plugs to the "A-B" position.

   ♦ If the PDIU-DS is connected to a DCE device, set the plugs to the "B-C" position.

   Note Do not cut PDIU-DS PERCEPTION jumper wire for Strata DK installations.

➤ **To assemble the PDIU-DS**

1. Position the back panel to the PCB (Figure 10-34).

2. Slide the back panel down into its side grooves.

3. Attach the bottom panel, and secure with the four non-captive screws.

Peripheral Installation
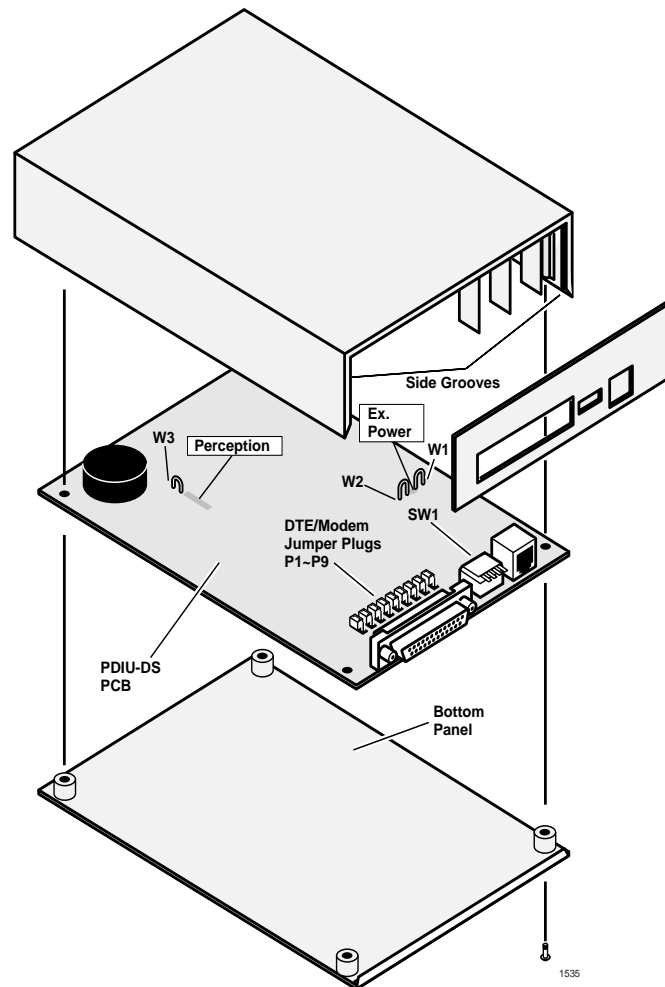
Notes

- Do not cut the Perception jumper wire for Strata DK installation.
- Jumper wire is for Perception applications only.

Figure 10-34   DK PDIU-DS Disassembly/Assembly Diagram

RPCI-DI/PDIU-DI/PDIU-DS Data Communication Installation Tests

The following material provides tests for five RCPI/DIU data call applications:

- ♦ PC-to-PC
- ♦ PC-to-Printer
- ♦ Internal PC-to-External PC
- ♦ External PC-to-Internal PC
- ♦ PC Auto Dial Voice Call

These test routines only check the data communications mode of the RPCI-DI; they do not check the RPCI-DI API mode. The telephone and port numbers used in these figures are provided as an example. When performing the test, use the appropriate port and telephone numbers for the system.

Each of these tests can be conducted with manual dialing from a digital telephone's dial pad or AT dialing from a personal computer's keyboard; however, only the preferred method of dialing for application is presented.

PC-to-PC Test with AT Commands

Note   See Figure 10-35, "DK PC to PC Test Call Using AT Commands" for additional information.

1. Set RPCI or DIU programming.

   ♦ Program 20: Ports 000 and 01. LEDs 01, 02, 05, and 17 ON; all other LEDs OFF.

   ♦ Program 39: Ports 000 and 01. **Data Call** (456) and **Data Release** (454) buttons should be provided.

   ♦ Default settings for PDIU-DI S-Registers.

2. Make sure PC 1 and PC 2 are on-line with communications software and that the parameters of each PC and its communication software are set to the same values (data transmission rate, parity, data bits, stop bits, flow control, etc.).

Note   If using an RPCI-DI, you may need to switch the RPCI from the TAPI mode to the Data Communications Mode before proceeding with Step 3. To place the RPCI into the data communications mode from the PC keyboard: Set **Num Lock** to ON and type **240** while holding the **Alt** key down (this is HEX F0). If in the data communication mode, ATC0 will switch the RPCI-DI back to the TAPI mode.

3. From PC 1's keyboard, type **ATDD201** and press **Enter** (AT commands must be capital letters).

   ♦ The data call LEDs light on DKT 200 and 201.

   ♦ PC 1 displays: **CONNECT XXXX**.

   ♦ PC 2 displays: **RING**.

   PDIU-DIs or RPCI-DIs are now in the communication mode.

Note   Typing from the PC 1 keyboard appears on the PC 2 monitor and vice versa.

➤ **To terminate the call**

   ➤ Press the DKT's **Data Release** button.

   ...or

1. Type **XXX** from either PC keyboard. The PC screen displays, **OK**.

   XXX = PDIU-DI escape sequence (see "PDIU-DS to Modem Installation" on Page 10-63).

2. Type **ATH** from the PC keyboard used in Step 3.

   PC 1 and PC 2 screens display, **NO CARRIER**. The data call LEDs on each DKT are OFF.

Peripheral Installation
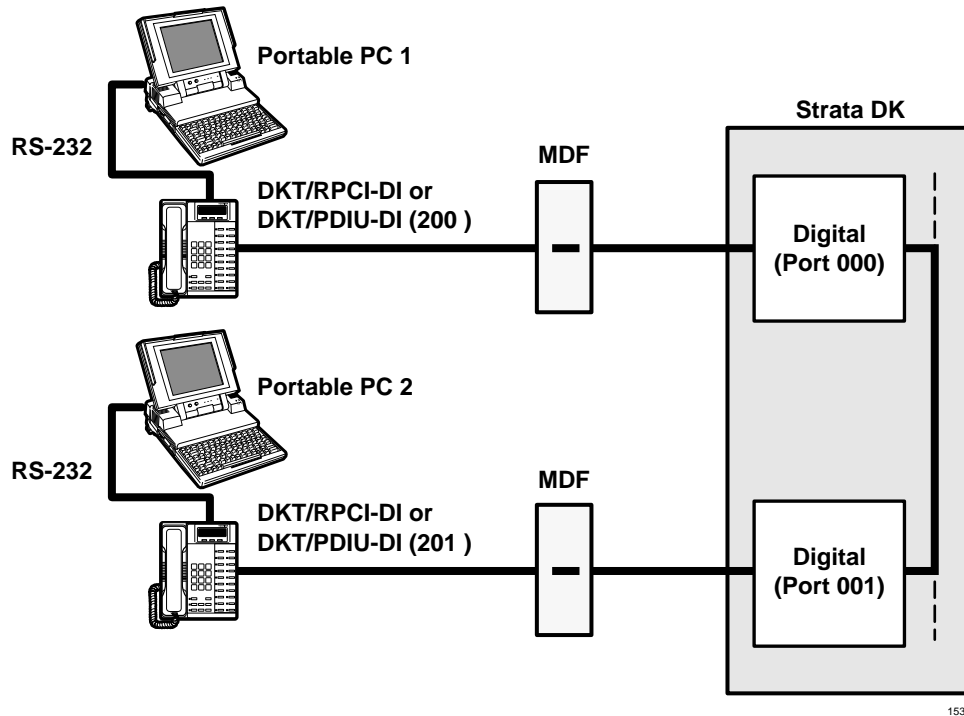
Figure 10-35   DK PC to PC Test Call Using AT Commands

PC-to-Printer Test using Manual Dialing

Note   See Figure 10-36 for additional information.

1. Set the RPCI or DIU programming.

    ♦   Program 20: Port 001. LEDs 01, 02, 05, and 17 ON; all other LEDs OFF.

    ♦   Program 20: Port 003. LEDs 01, 04, and 17 ON; all other LEDs OFF.

    ♦   Program 39: Port 001. **Data Call** (456) and **Data Release** (454) buttons should be provided.

    ♦   Default settings for PDIU-DI, S-Registers.

2. Make sure the PC is configured to print data from its serial port (the PC COM port connected to DKT/PDIU-DI or DKT/RPCI-DI port 001). This is normally accomplished using the DOS MODE commands.

Note   If using an RPCI-DI, it may be necessary to switch the RPCI from the TAPI mode to the Data Communications Mode before proceeding with Step 3. To place the RPCI into the data communications mode from the PC keyboard: Set **Num Lock** to ON and type **240** while holding the **Alt** key down (this is HEX f0). If in the data communication mode, ATC0 will switch the RPCI-DI back to the TAPI mode.

3. Using the manufacturer's documentation, make sure the communication parameters (data speed, parity, data bits, stop bits, etc.) of the PC COM port match the printer's serial interface parameters.

➤ **To connect the PC to the printer**

    ➤ Press **Data Call** + **203** on the DKT.

CONNECT on the PDIU-DS lights. The connection between the PC and the printer is completed, as shown in Figure 10-36. (PDIU-DS 203 is in the communication mode).

Note If busy tone is sent to the DKT, the connection is not complete; press **Data Release** and Step 3 again.

Operate the PC to print data as required.
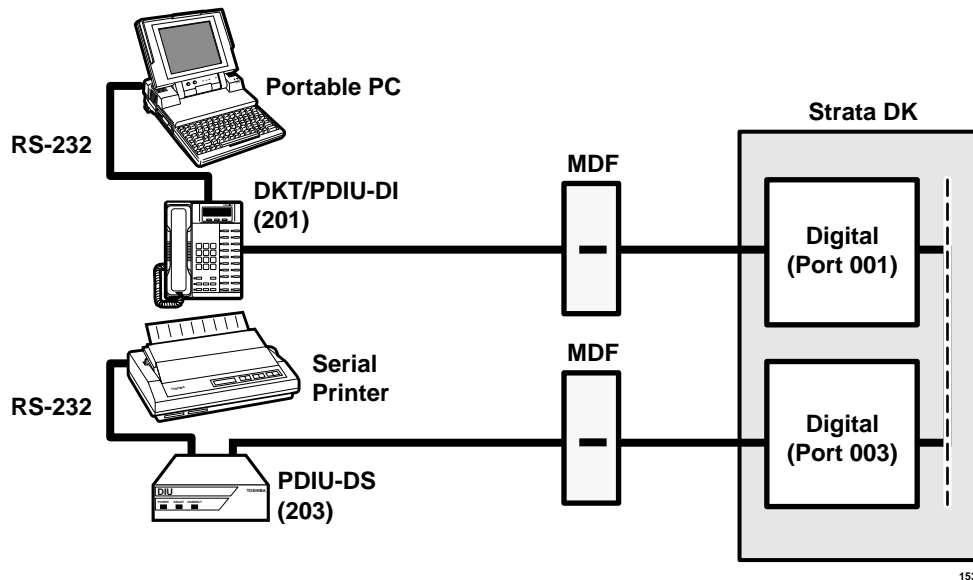
Figure 10-36 DK PC to Printer Test Call Using Manual Dialing

➤ **To terminate the call**

    ➤ Press the DKT's **Data Release** button.

Internal PC-to-External PC Test using AT Commands

Note See Figure 10-37 for additional information.

1. Set the RPCI or DIU programming.

   ♦ Program 20: Port 000. LEDs 01, 02, 05, and 17 ON; all other LEDs OFF.

   ♦ Program 20: Port 004. LEDs 01, 02, 03, 04, 06, and 17 ON; all other LEDs OFF.

   ♦ Program 21: Digital port 004 assigned with KSTU port 008.

   ♦ Program 39: Port 000. **Data Call** (456), **Data Release** (454), and **Modem** (455) buttons should be provided.

   ♦ Default settings for PDIU-DI and PDIU-DS S-Registers.

2. Make sure PC 1 and PC 2 are on-line with a communications software package and that the communication parameters of each PC and communication software package are set to the same values (data transmission rate, parity, data bits, stop bits, flow control, etc.).

Peripheral Installation

Note With an RPCI-DI, you may need to switch the RPCI from the TAPI mode to the data communication mode before proceeding with Step 3.

3. To place the RPCI into the data communication mode from the PC keyboard: Set **Num Lock** ON, and hold the **Alt** key down while typing **240** (this is HEX F0).

   If the RPCI is in data communication mode, **ATC0** switches back to TAPI mode.

4. From PC 1's keyboard, type **ATDD204** and press **Enter** (AT commands must be capital letters).

   ♦ The data call LED on DKT 204 is ON.

   ♦ The CONNECT LED on PDIU-DS 204 is ON.

   ♦ The screen on PC 1 displays, **CONNECT XXXX**, where **XXXX** is the data transmission speed set by the communications software.

5. The PC 1 and PDIU-DS 204 are connected (PDIU-DS 204 is in the communication mode). PC 1 is now linked directly to the RS-232 side of the internal modem and can issue AT commands to the internal modem, which is now in the command mode.

Note If Digital/PDIU-DS port 004 is the only DIU port connected to the modem (Program 20, LED 03 ON), the Modem LEDs on all DKTs is ON.

6. From PC 1's keyboard, type **ATDT#70016744700** and press **Enter**.

   ♦ The internal modem (208) goes off-hook, dials #7001 to seize the CO line, and then dials the external modem's telephone number (674-4700).

   ♦ The external modem rings and auto answers; the modems handshake and establish communications.

   ♦ If the modems send result codes, the screen on PC 1 displays, **CONNECT XXXX**, where **XXXX** is the data transmission speed set by the communication software.

7. The PC 1 and PC 2 are connected, as shown by the thick lines above, to exchange data (file transfers, type messages, etc.).

➤ **To terminate the call**

1. Press the telephone **Data Release** button.

2. Type **+++** from PC2 keyboard. The PC screen displays, **OK**.

3. Type **ATH** from the PC keyboard used in Step 2.

   ♦ PC 1 and PC 2 screens both display, **NO CARRIER**.

   ♦ The data call LED on DKT 200 will turn OFF.
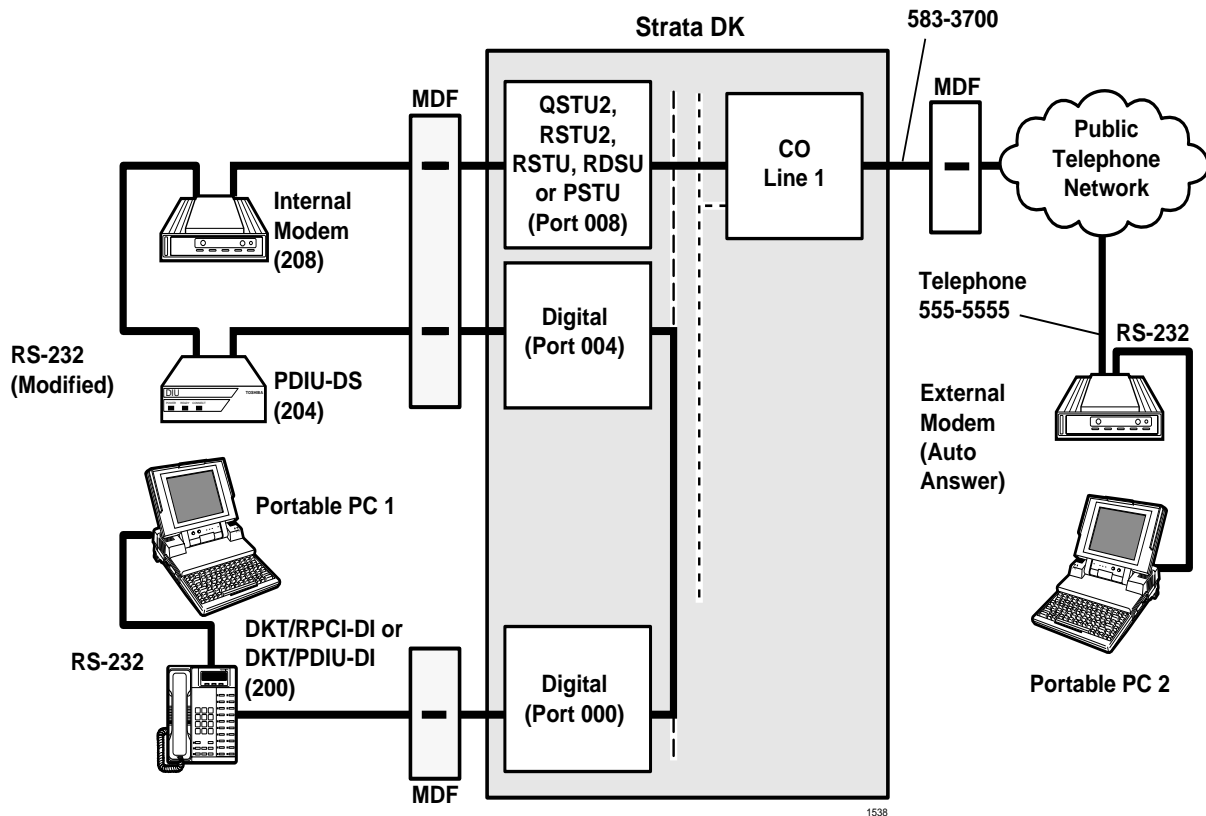
Figure 10-37   Internal PC to External PC Test Call Using AT Commands

External PC-to-Internal PC Test

See Figure 10-38 for additional information.

1. Set the RPCI or DIU programming.

    ♦ Program 20: Port 000. LEDs 01, 02, 05, and 17 ON; all other LEDs OFF.

    ♦ Program 20: Port 004. LEDs 01, 02, 04, and 17 ON; all other LEDs OFF.

    ♦ Program 39: Port 000. **Data Call** (456) and **Data Release** (454) buttons should be provided.

    ♦ Internal modem: set the following AT commands: Auto answer (ATS0=1), disable character echo in the command state (ATE0), modem returns result codes (ATQ0), presence of data carrier (AT&C1), hang up and assume command state with DTR on-to-off transition (AT&D2).

    ♦ Settings for PDIU-DS: rear panel switches 1, 2 and 4 ON; internal jumpers P1-P9 set to B-C position.

2. Make sure PC 1 and PC 2 are on-line with a communications software package and that the communication parameters of each PC and communication software package are set to the same values (data transmission rate, parity, data bits, stop bits, flow control, etc.)

Peripheral Installation

Note If using an RPCI-DI, it may be necessary to switch the RPCI from the TAPI mode to the Data Communications Mode before proceeding with Step 3. To place the RPCI into the data communications mode from the PC keyboard: Set **Num Lock** to ON and type **240** while holding the **Alt** key down (this is HEX F0). If in the data communication mode, ATC0 will switch the RPCI-DI back to the TAPI mode.

3. From PC 2's keyboard, type **ATDT5833700** and press **Enter**.

   ♦ The external modem originates the call to internal modem.

   ♦ The internal modem rings and auto answers; the modems handshake and establish communications. The ready light on the PDIU-DS turns ON.

   ♦ If the modems send result codes, the PC's screens display, **CONNECT XXXX**, where **XXXX** is the data transmission speed set by the communications software.

4. The PC 2 is connected to PDIU-DS (204), as shown by the thick lines above (PDIU-DS 204 is in the command mode). PC 2 can now issue AT commands to PDIU-DS 204.

5. From PC 2's keyboard, type **ATDD200** and press **Enter** (AT commands must be capital letters); this prompts PDIU-DS (204) to dial and connect to PDIU-DI (200).

   ♦ The CONNECT LED on the PDIU-DS (204) is ON; the Data Call LED on DKT 200 is also ON.

   ♦ The screens on PC 1 and PC 2 display, **CONNECT XXXX**, where **XXXX** is the data transmission speed set by the communication software.

6. The PC 1 and PC 2 are connected, as shown by the thick lines, to exchange data (file transfers, typed messages, etc.).

➤ **To terminate the call**

   ➤ Press the DKT's **Data Release** button.

   ...or

1. Type **+++** from either PC keyboard. The PC screen displays, **OK**.

2. Type **ATH** from the PC keyboard used in Step 5 above.

   ♦ PC 1 and PC 2 screens both display, **NO CARRIER**.

   ♦ The DATA and MODEM LEDs on DKT 200 will turn OFF.
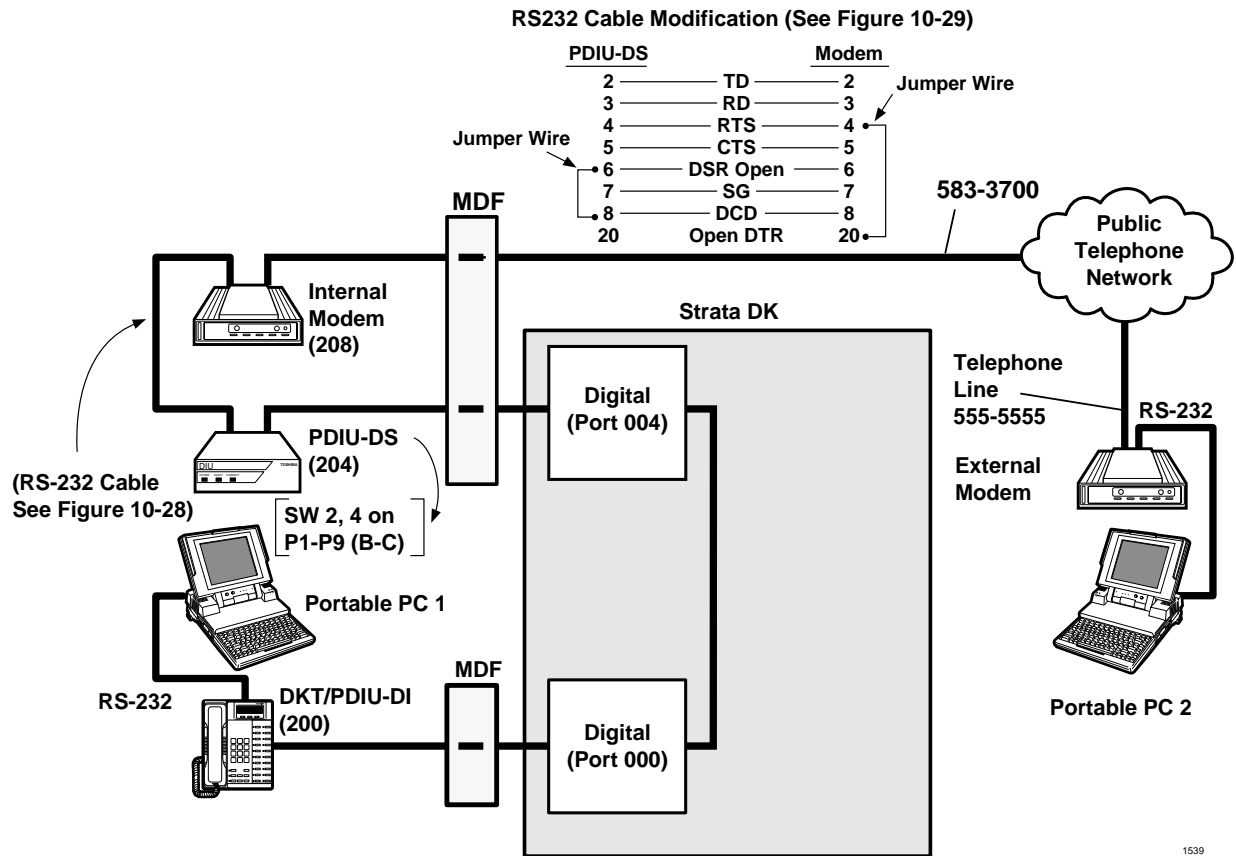
Notes

- When a PDIU-DS is connected with modified RS-232 cable, the READY LED will not light until the External and Internal modem establish carrier detect.

- See "PDIU-DS to Modem Installation", paragraph three and Figure 10-29 for more details.

Figure 10-38   External PC to Internal PC Test Call Using Direct CO Line Connection

PC Auto Dial Voice Call Test

There are many off-the-shelf, Windows compatible, desktop organizer software packages that provide an auto dialer function. One of these is the terminal resident Starfish Sidekick®. It is used in this section for test explanation purposes only. If you choose another auto dialer software package, the detailed response may be different than that shown here.

➤ **To test a PC auto dial voice call**

Note   See Figure 10-39 for additional information.

1. Set the RPCI or DIU programming.

    ♦ Program 20: Port 001. LEDs 01, 02, 05, and 17 ON; all other LEDs OFF.

♦   Program 39: Port 001. **Data Call** (556) and **Data Release** (554) buttons are optional. If the PDIU-DI is only used for the PC auto dial application, the **Data Call** and **Data Release** buttons are unnecessary.

2.   Make sure that the auto dial application software is installed on the PC root directory and that the communication parameters of the PC and application software are set to the same values.

Note   If using an RPCI-DI, it may be necessary to switch the RPCI from the TAPI mode to the Data Communications Mode before proceeding with Step 3. To place the RPCI into the data communications mode from the PC keyboard: Set **Num Lock** to ON and type **240** while holding the **Alt** key down (this is HEX F0). If in the data communication mode ATC0 will switch the RPCI-DI back to the API mode.

3.   Make sure that a dialing directory consisting of names and telephone numbers you wish to auto dial is installed within the application software (include the appropriate Strata CO line access code prefixing each telephone number).

➤ **To auto dial using Sidekick from the PC keyboard**

1.   Press the **Alt** and **Ctrl** keys simultaneously. The PC screen displays the Sidekick menu window.

2.   Press F5 twice (Sidekick prompts "**search for INITIALS**:" to display on the PC's screen).

3.   Type the initials or name of the person or organization you wish to auto dial.

4.   Press **Enter**. Sidekick finds and highlights the desired name/number.

5.   Press **Enter** again.

♦   DKT/PDIU-DI 201 seizes the CO line and auto dials the selected telephone number.

♦   The LEDs of the DKT's Data Call and CO line 001 buttons are ON (if assigned in Program 39).

♦   Dial tone, DTMF tones, and ringback or busy tones are audible from the DKT's speaker.

6.   Take the DKT's handset off-hook at any time after the phone number is dialed. Press the Spacebar to release the **Data Call** button, or remain on-hook and use the DKT's speakerphone.

Note   Speakerphone model only: pressing the Spacebar when using the speakerphone feature disconnects the call.

➤ **To terminate the call anytime**

1.   If off-hook, press the Spacebar and place the DKT handset on-hook.

2.   If talking via the speakerphone, press the Spacebar.
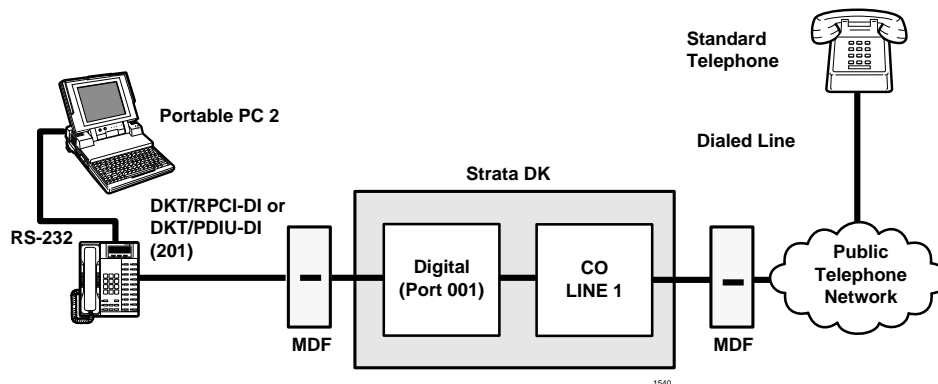
Figure 10-39   DK PC Auto Dial Voice Call Test

DK Alarm Sensor

The PIOU or PIOUS PCB provides a circuit that can be set to detect a relay open or closed condition from a facility alarm system. When the sensor is activated, all electronic and digital telephones sound an alarm signal. The electronic/digital telephone alarm signal can be reset by any electronic or digital telephone with an **Alarm Reset** button (see Program 39).

Alarm Sensor Options

Note   See Figure 10-40 for additional information.

Jumper plug P12 on the PIOU is used to set the alarm sensor to detect an open or closed condition from the facility alarm system.

➤ **To detect an open or closed condition by the jumper plug P12**

1. To detect a closed condition, set P12 to the N.O. position.

2. To detect an open condition, set P12 to the N.C. position.

Jumper W3 on the PIOUS is used to set the alarm sensor to detect an open or closed condition from the facility alarm system

➤ **To detect an open or closed condition by soldering the W3 jumper wire**

1. To detect a closed condition, solder W3 to the normal open position.

2. To detect an open condition, solder W3 to the normal closed position.

Peripheral Installation

Alarm Sensor Wiring

See Figure 10-40, and connect the facility alarm system relay contacts to the PIOU/PIOUS PCB.
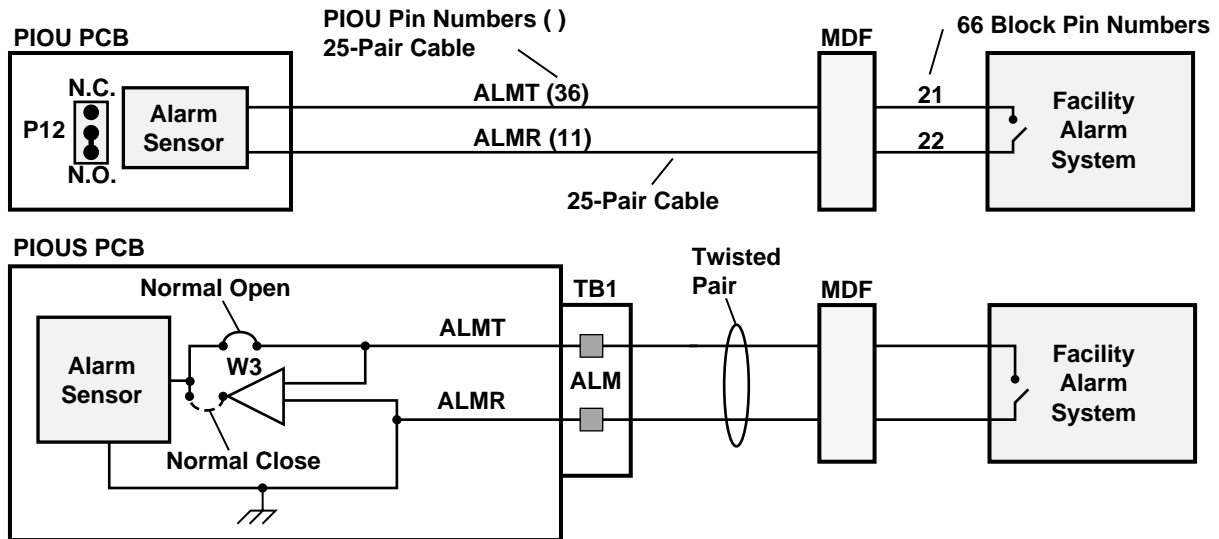
Figure 10-40   DK Alarm Sensor Block Diagram (PIOU/PIOUS)

Auto Attendant

Auto Attendant operates like an automatic station attendant or switchboard operator that quickly and efficiently distributes calls to stations selected by callers. Incoming calls are greeted by an external announcement device that offers callers a menu of station locations associated with a number, such as 3 for Sales, 4 for Customer Service, etc. Callers pick the destination just by dialing the single number associated with it. The call is then transferred to the station. Callers can also dial the intercom number directly.

This feature is available from three separate sources.

♦   Strata DK built-in Auto Attendant

♦   Voice Mail device Auto Attendant

♦   External Auto Attendant

Note   Auto Attendant is licensed by Dytel, Inc. under United States Patent No. 4,975,941.

Strata DK Built-In Auto Attendant (AA)

A built-in Auto Attendant feature is programmed into the Strata DK system software. To enable the built-in AA to function, RRCS (-4, -8 or -12) DTMF tone receiver PCB (see Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for RRCS and RKYS installation instructions).

The customer must provide digital announcement device(s), on which the greeting and menu that the callers hear are recorded. The digital announcement devices must connect to Strata DK standard telephone circuits. There is a series of programs (explained later) in the *Strata DK Programming Manual* Record Sheets, which are for the built-in AA feature exclusively, not the other two AA feature applications. Callers must use a DTMF (tone) telephone to select AA dialing options.

The built-in AA feature offers flexibility in answering calls. Calls follow the basic sequences described below and illustrated in Figure 10-41, "Built-in Auto Attendant Basic Call Sequences".

Sequence A

The call is answered directly after being transferred from the Auto Attendant. The caller calls in on CO lines assigned for built-in Auto Attendant, receives a greeting along with a menu of dialing options, and then dials an option of the intercom number. The call is then transferred to a station, which answers the call.

Sequence B

The call is not answered after being transferred from the Auto Attendant and is routed to an optional secondary announcement, where it will receive a new announcement and the same or additional dialing options. Some customers may not configure their AA system with a secondary announcement; if so, their unanswered calls would follow sequence C or D.

Sequence C

The call is not answered after being transferred from the Auto Attendant and is routed to an alternate station(s) assigned in system programming, ringing assignments.

Sequence D

The call is not answered after being transferred from the Auto Attendant and is routed back to the primary announcement. This is probably the least desirable of the four sequences, since the caller hears a repeat of the announcement he just received seconds earlier.

Note   In all of the above sequences, the call can first ring telephones selected in system programming for 12 or 24 seconds, and then be routed to the Auto Attendant if not answered by any of the ringing stations. This is called Auto Attendant delayed ring.
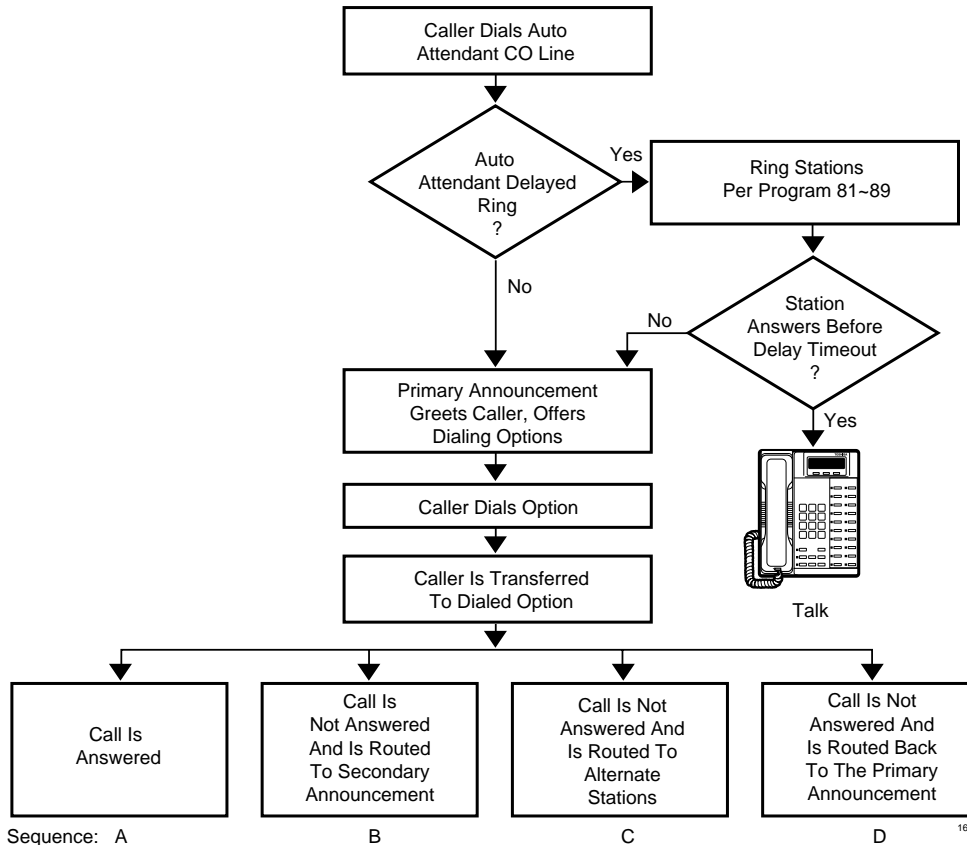
Figure 10-41   Built-in Auto Attendant Basic Call Sequences

Built-in Auto Attendant Programming

See Figures 10-41 and 10-42 for a comprehensive overview of built-in Auto Attendant (AA).

♦ Program 78 (61, 62, and 63): CO lines are assigned for built-in AA with this program. There is no limit to the number of lines that can be assigned for AA, and each line can be set for any or all of the ringing modes (DAY, DAY2, and NIGHT). See Programs 81~89 record sheet notes in the *Strata DK Programming Manual*.

♦ Programs 81~89: Assign stations to ring if AA callers do not dial or AA calls are not answered. Also, if not answered by a station set to ring during Immediate Ringing (or delay 2 ring), incoming calls can be set to ring built-in AA announcement ports on a Delayed Ringing basis.

♦ Program 03: An RRCS (-4, -8 or -12) must be installed on the DK40i or DK424 RCTU for the system to interpret DTMF tones generated by the CO. Use this program to tell the system that the common control unit is equipped with an RRCS.

Important! *RKYS must also be installed on RCTU, RKYS does not need a Program 03 (or any other) program assignment.*

♦ Program 25-1: If there are no RRCS circuits or announcement devices available for an incoming CO line built-in AA call, the call will transfer to alternative station(s) (Programs 81~89) after a time duration assigned with this program.

♦ Program 23: As many as four digital announcement devices for primary announcements, each requiring one standard telephone station port (Figure 10-42), can be assigned. Callers receive primary announcements (60 secs. maximum announcement time) – which consist of the greeting along with the delivery of menu prompts – when they first call (they may also be rerouted back to the announcement after reaching a busy or ring no answer station).

♦ Program 24: Transferred calls that are unanswered at stations can be routed to a secondary announcement device (60 secs. maximum announcement time), which typically first informs the caller that the option they dialed was unavailable and then presents them with either the same options offered by the primary announcement device or some additional ones (Figure 10-42).

♦ Program 09: Tells the system where to transfer built-in AA calls after the caller has dialed in response to the delivered menu options.

♦ Program 60-6: Enter a DISA security code to prevent users from making unauthorized external calls via the AA DISA access (Dial *) feature.

♦ Program 26: There will be times when transferred AA calls are not answered after camping-on to a busy station. This program tells the system when to end the camp-on and to route the call to another destination (it could be a secondary announcement device or alternative stations per program 10-3, LED 18). If a station has Call Forward set, the call forwards to the proper destination instead of routing per AA Program 10-3, LED 18.

♦ Program 10-3:

    ♦ LED 18: Some customers may choose to configure their AA without a secondary announcement device. In these arrangements, transferred calls that are unanswered can be routed for normal ringing to some alternative stations set in Programs 81, 84, and 87, or back to the primary announcement device. LED 18 should be ON if the calls should be routed to stations assigned in Programs 81, 84, and 87. It should be OFF for the primary or secondary announcement device option. If LED 18 is selected, see LEDs 16 and 17 for disconnect timing options.

    ♦ LED 15: If LED15 is ON (and Music-on-Hold (MOH) is installed) the DK sends MOH to callers when the AA routes a call to ring or camp-on a station. If LED 15 is OFF the DK send ring-back-tone to the caller.

    ♦ LEDs 16 and 17: Set LEDs 16 and 17 to tell the system when to disconnect, as a safeguard, built-in AA calls that have not been answered by stations. This feature assures that the loop start CO line that the call was made on is free for other calls if the caller hangs up before the call is answered. The initialized disconnect setting is 40 seconds. The other timing options available are 150 secs. and 350 secs. Set LEDs 16 and 17 for the desired time as follows:

40 seconds: LED 16 = OFF. LED 17 = OFF.

150 seconds: LED 16 = OFF. LED 17 = ON.

350 seconds: LED 16 = ON. LED 17 = OFF.

Ground start lines disconnect automatically with this timer.

♦ Program 15: Selects Automatic Release (AR) on Voice Mail, AA or voice calls. This will provide automatic release (if the calling party disconnects) without waiting for the safeguard timer in Program 10-3.

Built-in Auto Attendant Installation

The built-in Auto Attendant feature only requires the installation of a feature key and customer-supplied announcement devices to deliver announcements to callers. The feature does not require the installation of any other devices.

➤ **To install the customer-supplied digital announcement devices**

Note In Figure 10-42 and elsewhere in this manual, announcement devices are referred to as A1 and A2. A1 designates a primary announcement device, and A2 a secondary announcement device. The prime marks following the designation distinguishes the multiple announcers from each other.

1. Ensure that the PCB that will connect with the device is installed per:

   Chapter 1 – DK14 Installation for the QRCU3

   ...or Chapter 7 – DK40i/DK424 Universal Slot PCBs for the KSTU2, RSTU2, PESU, or RDSU/RSTS

2. Connect the devices to the selected circuit per wiring diagrams:

   ♦ Chapter 1 – DK14 Installation for the QRCU3

   ♦ Chapter 3 – DK40i Installation for the KSTU2, RSTU2, PESU, or RDSU/RSTS

   ♦ Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring.

3. Ensure that the feature key is correctly installed per:

   ♦ Chapter 1 – DK14 Installation for the QKYS

   ♦ Chapter 7 – DK40i/DK424 Universal Slot PCBs, see RRCS and RKYS on the RCTU

   ♦ Chapter 3 – DK40i Installation for KKYS installation on K4RCU3

4. Program the system per the instructions in "Built-in Auto Attendant Basic Call Sequences" on Page 10-78.

5. Record the message and dialing prompts on the announcement device per the device manufacturer's instructions.
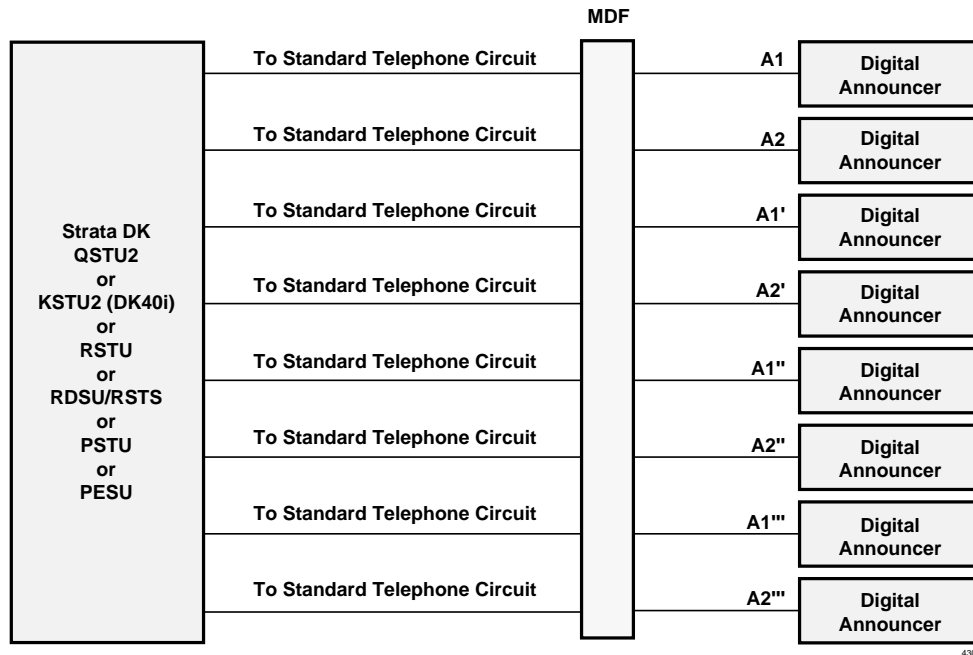
**See Programs 23 and 24 for Digital Announcement Assignements
(A1 = Primary Auto Attendant (AA) Announcements, A2 = Secondard AA Announcements)**

Figure 10-42   Announcement Device Block Diagram

DK424 Built-in Auto Attendant ACD Applications

The DK built-in Auto Attendant can function with Automatic Call Distribution (ACD) groups in two ways (see Flowchart 10-1 and text below):

♦ The DK built-in Auto Attendant can function to answer calls and send them to selected ACD groups when the caller dials the digit assigned to an ACD group.

♦ A call that is waiting in an ACD queue can overflow to the built-in Auto Attendant to enable the caller to choose another destination.

Note   Both options can be used simultaneously or independently. See Chapter 11 – ACD Installation for ACD/Auto Attendant programming options.
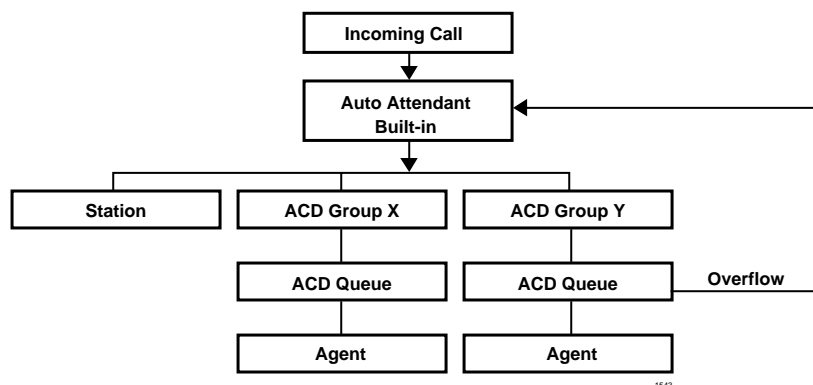
Flowchart 10-1   Auto Attendant/ACD Application Flowchart

Digital Announcer Auto Disconnect

The DK built-in AA automatically disconnects digital announcers immediately after the caller(s) dials a digit and are routed to a selected destination. Thus, the announcement device does not have to play to the end before it is released. This feature requires a digital announcer that can recognize a 100 milliseconds open circuit on the (RSTU2, RDSU/RSTS) loop and hang-up when it detects the open on the loop.

Built-in Auto Attendant Block Diagram

A detailed block diagram which includes call flow patterns and associated programs is provided in Flowchart 10-2.
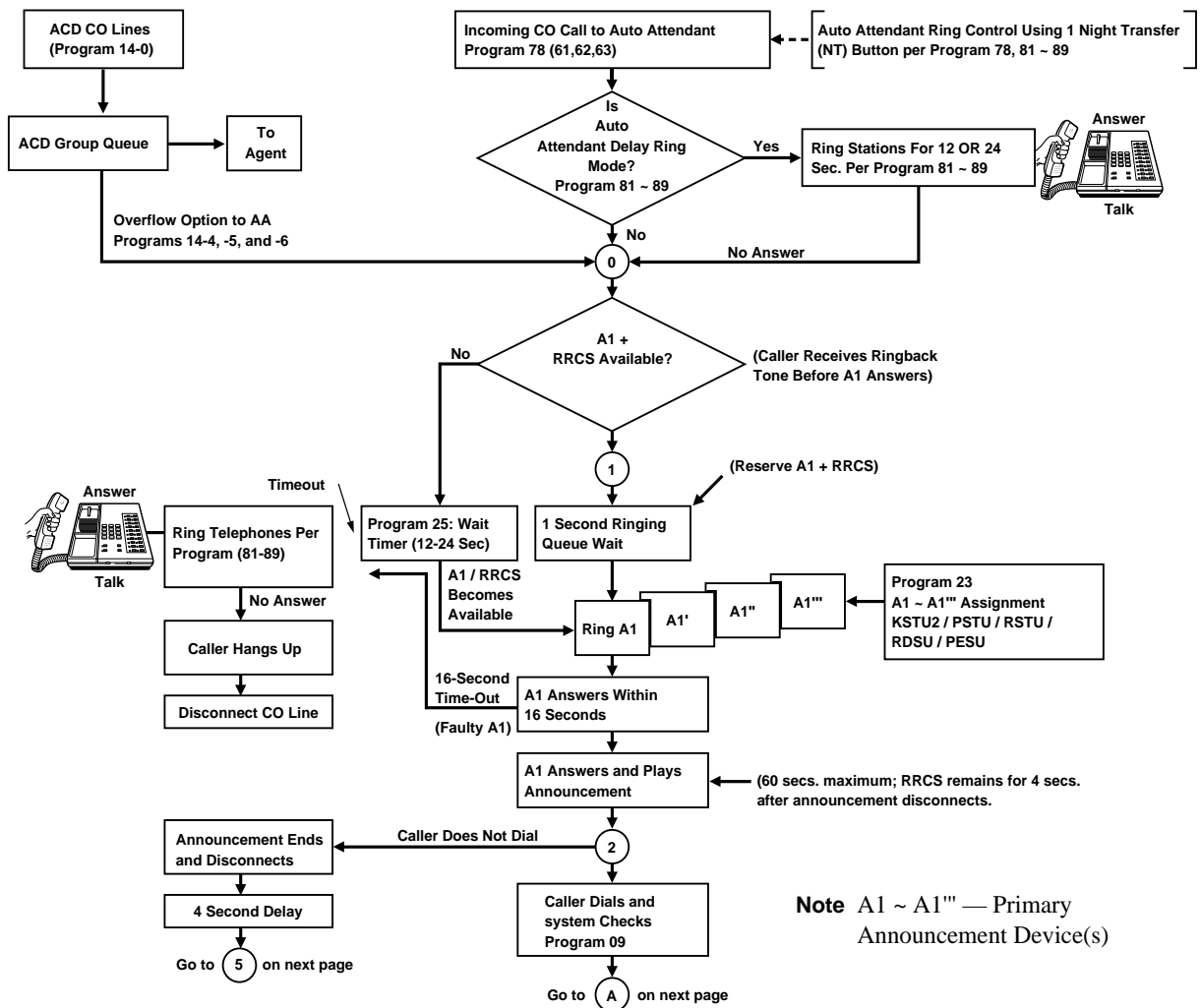
Flowchart 10-2   Built-in Auto Attendant Flowchart
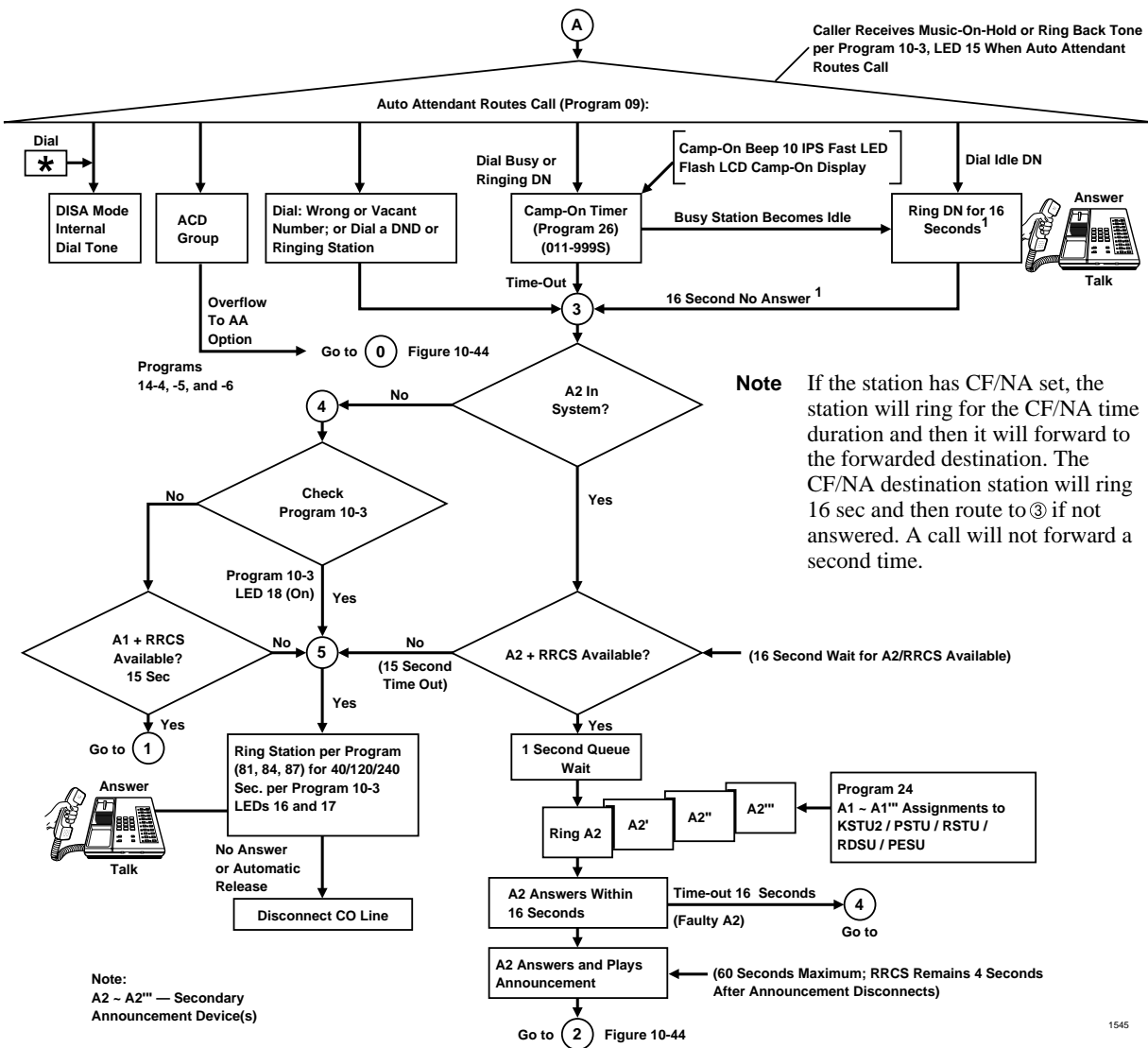
Flowchart 10-2   Built-in Auto Attendant Flowchart (continued)

Non-built-in Auto Attendant

Alternatives to using the Strata DK built-in AA feature, are voice mail systems, such as Toshiba Stratagy or VP, with an AA feature and non-voice mail AA as a stand-alone device.

Non-built-in Auto Attendant Programming

The Auto Attendant programs described in "Built-in Auto Attendant Basic Call Sequences" on Page 10-78 do not apply to the Non-integrated AA feature sources, but Strata DK Programs 03, 04, 10-1, 13, 16, 31, 33, 36, 37, 39, and 81~89 should be considered for proper operation.

Non-built-in Auto Attendant Installation

Non-integrated AA sources, such as voice mail devices and stand-alone units, connect to standard telephone circuits (ports). See Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for more information.

Multiple PIOU, PIOUS, RSSU Installation

Up to three PIOU, PIOUS, or RSSU PCBs can be installed in a system to simultaneously provide: maintenance terminal (or modem) interface, Management Information System (MIS) for ACD interface, and RS-232 voice mail interface (Toshiba proprietary or SMDI).

Each of these interfaces are provided by the modular jacks on a separate PIOU, PIOUS, RSSU (Figure 10-37). Interface assignments are made in Program 03 (Code 41, 42, and 43). PIOU and PIOUS Paging, SMDR, relay control, alarm sensor, and door lock functions will be active only on the PIOU or PIOUS PCB which is assigned the lowest Program 03 code (41, 42, or 43). RSSU only provides the TTY interface for SMDI, local maintenance, or ACD MIS but not for SMDR, built-in maintenance modem or system OA.

If TSIU or RSIU/RSIS is installed, functions enabled in Program 76 will operate as programmed and the same functions programmed in Program 03 (Code 41, 42, and 43) will not operate. For more details regarding RSIU/RSIS/RMDS and TSIU installation, see RSIU installation in Chapter 7 – DK40i/DK424 Universal Slot PCBs and Figure 8-35 in Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring.

Figure 10-43   Multiple PIOU/PIOUS (Remote Maintenance, MIS for ACD, RS-232 Voice Mail Integration)
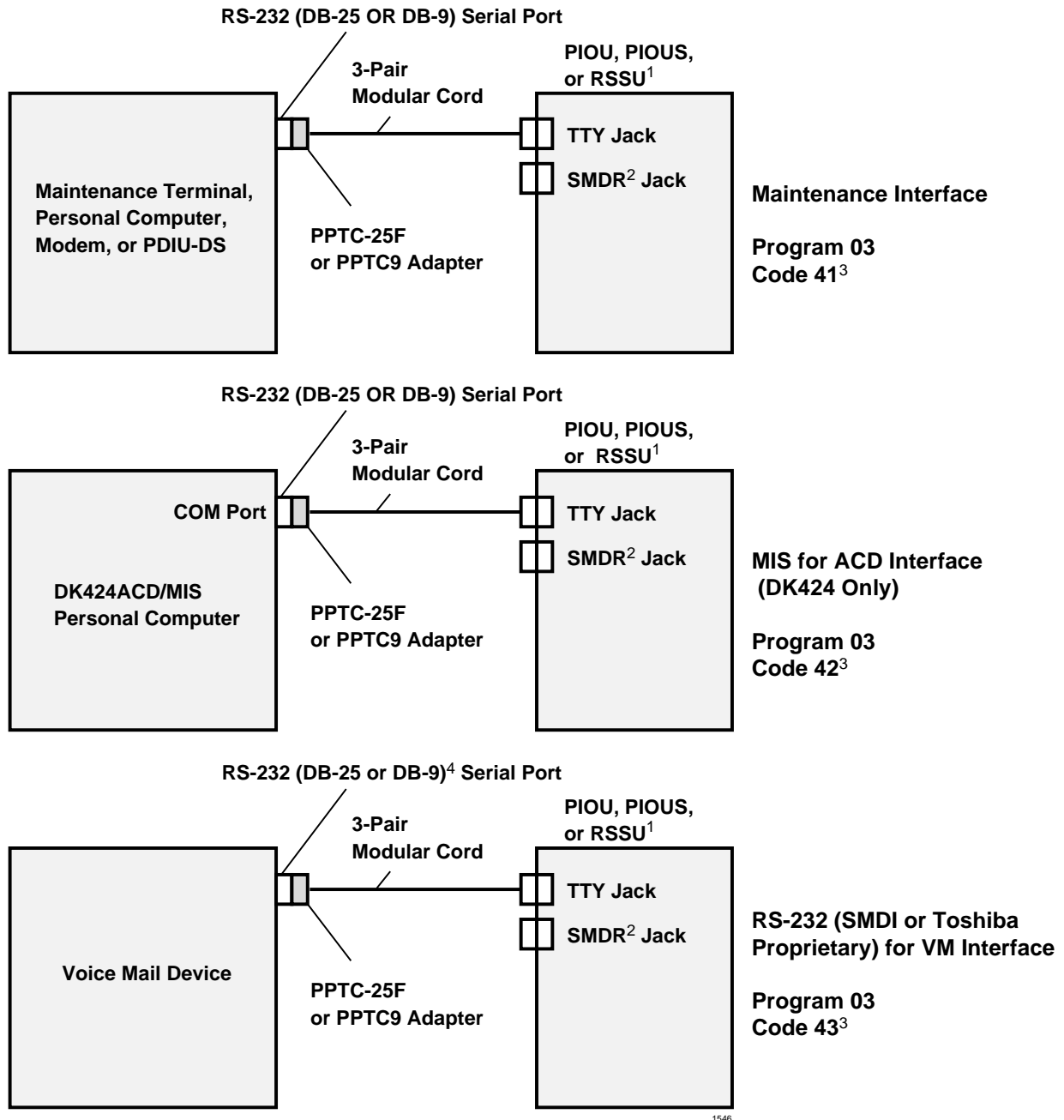
1. Install PIOU, PIOUS, or RSSU PCBs in the last (highest numbered) slot in any cabinet(s).

2. SMDR, Page Outputs, Relay controls, Alarm Sensor, and other miscellaneous options on PIOU or PIOUS will be active on the installed PIOU/PIOUS that is programmed with the lowest Program 03 code (41, 42, or 43). RSSU does not provide these features.

3. If set, TSIU, RSIU/RSIS Program 76 will override Program 03 code 41, 42, and 43.

4. VP100 and Stratagy use straight cables, VP200/300 require "null modem" connection. PPTC (25-pin) requires a "male-to-female" gender changer.

Enhanced 911 Service (E911)

The Toshiba Strata DK forwards 911 and 9+911 calls to designated ports to interface with external third party adjunct translation equipment designed to handle them. The Strata DK provides up to two QSTU2, KSTU2 or RSTU2 ports (standard telephone ports) to receive these calls and send them to the third party E911 adjunct equipment along with the specific directory number of the emergency calling station.

The Strata DK sends the telephone DN to the telephone company's 911 tandem switch that forwards the call to the proper Public Safety Answering Position (PSAP) where it is matched up with a central Automatic Location Information (ALl) database to provide enhanced information to the PSAP dispatcher.

Interface between the third party adjunct equipment and the E911 tandem CO must be via special Centralized Automatic Message Accounting (CAMA) trunks. (Ordering of these specialized trunks is done through a special ordering desk with your local phone company.)

Important!

- *DID numbers: In many cases, a DID service is the only way to provide a unique number (CESID) for each station that is recognizable by the telephone company.*

- *In order for this feature to be effective, 911 and 9+911 calls must be dialed from a DKT [DN] or single-line telephone. 911 calls originating from a [PhDN] CO Line or Pooled Line button bypass the adjunct equipment and go directly to the CO exactly as dialed.*

E911 System Installation

1. Ensure that the QSTU2, KSTU2, RSTU2, RDSU/RSTS or PESU PCB is installed in the system per Chapter 7 – DK40i/DK424 Universal Slot PCBs or each DK14 and DK40i installation section.

2. Connect the E911 system to the selected QSTU2, KSTU2, RSTU2, RDSU/RSTS, or PESU standard telephone port. (See Chapter 1 – DK14 Installation, Chapter 3 – DK40i Installation, Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for wiring/interconnecting details.)

3. Program the Strata DK system for the required E911 features. (See "E911 Programming".)

4. Install E911 external system per the manuals supplied by the vendor selected and used for the interface.

E911 Programming

Program *10: Selections 11 and 12 assign the RSTU port to be used for E911 Service. Selections 91 and 92 assign an inter-digit timer for valid dialing and a delay timer before the station number is sent to external E911 equipment.

➤ Remove the [DN] assignment for ports assigned to E911 so that someone calling a station number will not accidentally call 911.

DK424 ACD Installation
11

This chapter includes information on the Automatic Call Distribution (ACD) and Management Information System (MIS) for:

♦   Strata DK424 systems (applies to all common control units except the RCTUA)

♦   ACD and MIS are not available to the Strata DK14 and DK40i

Included in this chapter are installation instructions, ACD programming procedures and record sheets.

Note   Only qualified service technicians and system programmers should install ACD/MIS.

ACD automatically routes incoming calls so they are equally distributed to a group of ACD Agents. Figure 11-1 shows an example of how a typical ACD call is handled.

The Strata DK System provides many ACD functions and custom keys on for Toshiba DKT2000-series telephones. For instance, the ACD Supervisor can monitor calls and assist Agents through use of an LCD telephone, programmed especially for the Supervisor which shows ACD Agent and Group information. Telephone instructions are provided in the *Strata DK ACD Supervisor Guide* and *Agent User Guide.*
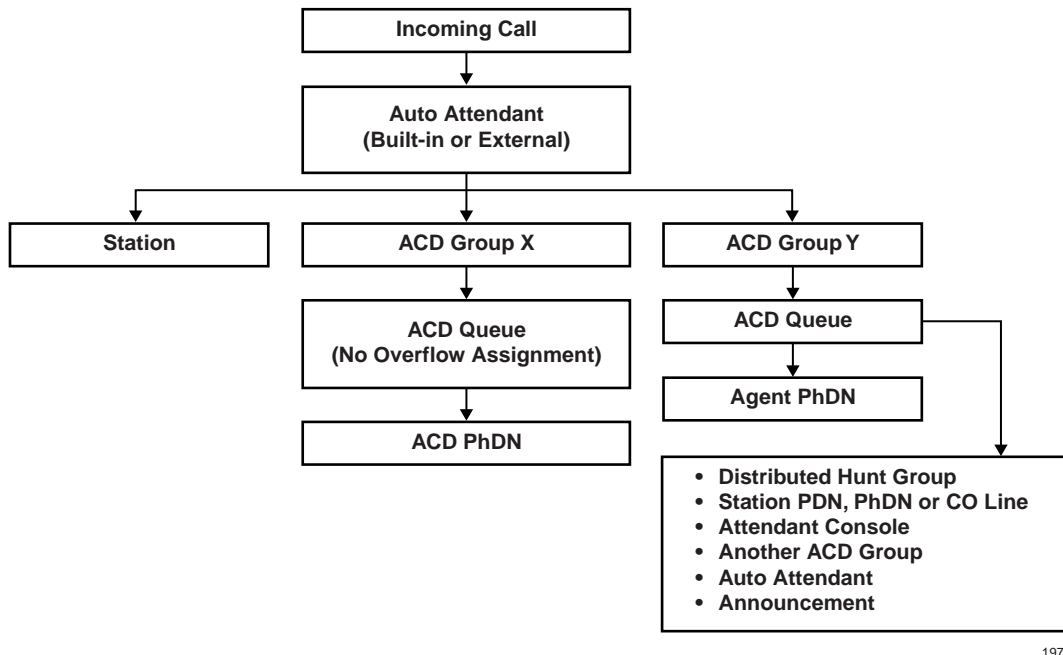
Figure 11-1   ACD Call Handling Example

Installation

ACD for the Strata DK systems is provided through a feature key upgrade called RKYS. The RKYS is a subassembly that attaches to the common control unit to provide the system with optional features. See "RKYS Feature Key Upgrades" on Page 5-48 for installation instructions.

Multiple Serial Port Installation

Remote Maintenance, MIS for ACD, and SMDI

With DK R3 or higher (RCTUBA3/BB3, RCTUC3/D3, RCTUE3/F3), the RSIU/RSIS/RMDS PCBs can be installed alone or in addition to PIOU/PIOUS/RSSU to provide:

♦ Maintenance Terminal (or modem) interface

♦ Management Information System (MIS) for ACD interface

♦ SMDI

♦ SMDR

Related Programs

Program 03 (Codes 41, 42, and 43): Assigns PIOU and PIOU interface options. SMDR, page outputs, SMDR, relay controls, alarm sensor, and door lock functions on PIOU or PIOUS will be active on the installed PIOU/PIOUS that is programmed with the lowest Program 03 code (41, 42, or 43).

♦ Code 41: Enables Remote Maintenance

♦ Code 42: Enables MIS/SMIS PIOU, PIOUS, or RSSU Slot. The TTY port must have Code 42 set for its slot in Program 03 to support ACD/MIS.

♦ Code 43: Enables RS-232 Voice Mail Interface/SMDI

♦ If the RSIU is to be used for ACD/MIS, the RSIU must be installed in the Strata DK Base Cabinet, slot 11 and programmed with Code 49 in Program 03.

♦ The RSSU only supports TTY, SMIS, or SMDI. The RSSU does not provide SMDR, page, alarm sensor or relay control.

Program 76-1x3: Assigns the RSIU or RSIS port to provide MIS for ACD.

Notes

● Program 76 assignments override Code 42 if programmed for PIOU, PIOUS, or RSSU in Program 03.

For more information on installation of the PIOU/PIOUS/RSSU and the RSIU/RSIS/RMD, see Chapter 7 – DK40i/DK424 Universal Slot PCBs and Chapter 10 – Peripheral Installation.

Wiring

Announcements/music patterns are played and sent to callers at programmed time intervals while calls are waiting in an ACD queue. Announcement and music devices are connected to Strata DK station ports and are assigned to ACD Groups in Program 14-3.

The ACD/MIS interface is provided by the TTY modular jack on a separate serial port (RSSU, PIOU, PIOUS, RSIU, or RSIS), see Figure 11-2.
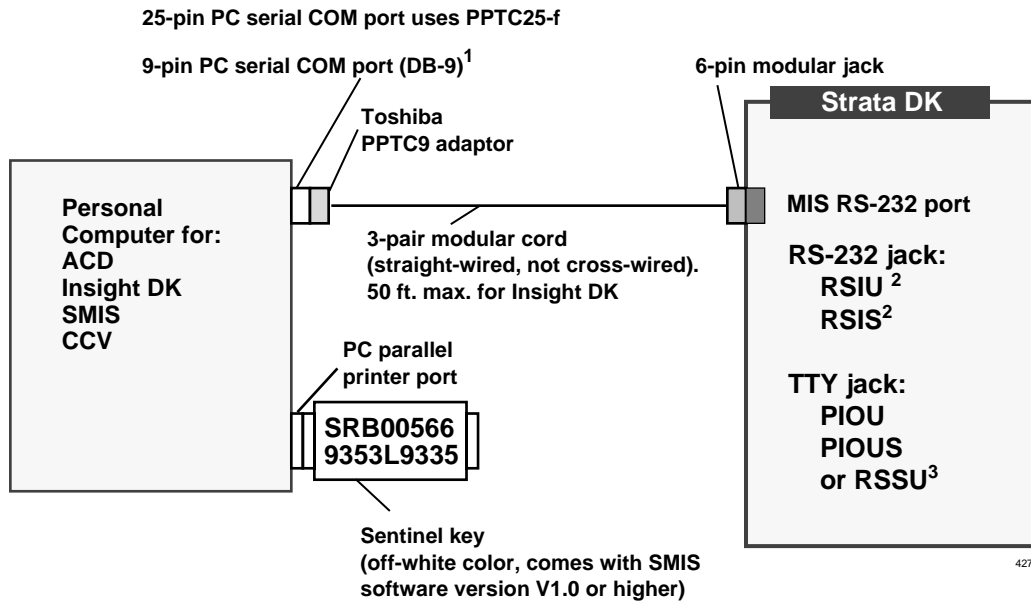
25-pin PC serial COM port uses PPTC25-f

9-pin PC serial COM port (DB-9)[1]

6-pin modular jack

Toshiba PPTC9 adaptor

Strata DK

Personal Computer for:
ACD
Insight DK
SMIS
CCV

3-pair modular cord (straight-wired, not cross-wired). 50 ft. max. for Insight DK

MIS RS-232 port

RS-232 jack:
RSIU [2]
RSIS[2]

PC parallel printer port

SRB00566 9353L9335

TTY jack:
PIOU
PIOUS
or RSSU[3]

Sentinel key (off-white color, comes with SMIS software version V1.0 or higher)

4277

1. Install PIOU, PIOUS, or RSSU PCBs in the last (highest numbered) slots in any cabinet(s).

2. Install RSIU in Slot 11 of Base Cabinet only.

3. If the PC COM port is a DB-25, a Toshiba PPTC25-F adapter is required in place of the Toshiba DB-9 adapter.

Figure 11-2   ACD Application Wiring Diagram

DK424 ACD Installation

Digital announcement devices can be connected to DK standard telephone ports only; music sources such as digital Music-on-Hold (MOH) devices, radio tuners, CD players, etc., can be connected to standard telephone ports, electronic (not digital) telephone ports, or to the RCTU MOH jack. The wiring diagrams for connecting announcement/music devices are:

♦ **Digital announcers and/or music sources to standard telephone PCB ports:** RSTU, RSTU2, PSTU, PSTU2, RDSU/RSTS, PESU – see Chapter 7 – Wiring Diagrams. Digital announcement devices and music sources can be assigned to any standard telephone port; they are not restricted to designated Background Music (BGM) source ports (see Program 14-3 for assignments). Announcement devices are designed to connect directly to standard telephone ports. Do not use an isolation transformer to connect digital announcers.

Important! *Most music sources (600 or 8 OHM) are not designed to be connected to telephone line circuits like the Strata DK standard telephone circuits. When connecting these devices to standard telephone circuits, an isolation transformer may be required between the music source and the standard telephone circuit.* Figure 10-4 *shows how to connect an isolation transformer*.

♦ **Music sources to electronic telephone PCB ports**: PEKU, PESU – see Chapter 8 – Wiring. Music sources can be assigned to any PEKU or PESU port; they are not restricted to designated BGM ports (see Program 14-3 for assignments).

♦ **Music source to DK MOH input**: The MOH source connected to the RCTU MOH jack can be sent to ACD Groups selectively via Program 14-3.

➤ **To connect a music source to the RCTU MOH jack**

   ➤ See Chapter 10 – Peripheral Installation, "Music-on-Hold (MOH)/ Background Music (BGM) Options" on Page 10-3.

ACD Installation Guidelines

The following steps show how to install the Strata DK ACD feature.

Step 1: Initialize the System

If installing a new RCTUBA/BB, RCTUC/D2, RCTUC3/D3, RCTUE3/F3 (ACD is not provided with RCTUA3) processor PCB or if changing ROMs on the RCTU, the RCTU must be fully initialized by running Programs 91-9 and 03 per the programming procedures in the *Strata DK Programming Manual.*

If the system has been previously initialized and installed, it is not necessary to re-initialize the RCTU when installing the ACD feature unless the RCTU ROMs or flash memory are changed to install ACD. If changing ROMs, DK Admin or DK Backup software is recommended for downloading/uploading previously programmed customer data.

Step 2: Install the RKYS Feature Key

➤ **To install the RKYS2 (ACD/Auto Attendant) or RKYS3 onto the RCTU PCB**

  ➤ Read the section titled "RKYS Feature Key Upgrades" on Page 5-48 and refer to Figure 5-30 for installation instructions.

  Important! *It is not necessary to run any special programs (i.e., Program 03) when RKYS is installed. RKYS can be installed before or after system initialization, and, before or after the customer database is entered. The feature(s) provided by the RKYS are enabled immediately when RKYS is installed. However, configuration programs for Auto Attendant and ACD must be entered for the feature to operate.*

Step 3: Install Related PCBs

1. Install PIOU, PIOUS, or RSSU PCBs in the highest numbered slots in any cabinets.

2. Install the RSIU PCB in slot 11 of the Base Cabinet only.

Step 4: Connect COM Port Wires

➤ Connect Strata DK to the SMIS PC per Figure 11-2.

SMDR, Page Outputs, Relay Controls, Alarm Sensor, and other miscellaneous options on the PIOU or PIOUS PCBs will be active on the installed PIOU/PIOUS that is programmed with the lowest Program 03 code (41, 42, or 43). The RSSU PCB only supports TTY, SMIS, or SMDI.

Step 5: Install ACD/SMIS Interface

If installing a SMIS personal computer, a RSSU, PIOU, PIOUS, RSIU or RSIS must be installed (see Figure 11-2 for MIS RS-232 port installation).

Step 6: Set the MIS Channel

If there are more than 1,000 Agent calls in a heavy-traffic hour, the MIS channel must be set higher than 1200 bps. The next higher speed, 2400 bps, can handle up to 1,300 calls per hour. Strata DK allows 1200, 2400, 4800 or 9600 bps for the MIS channel.

Agent calls are defined as ACD incoming, PBX incoming/outgoing, and external/internal calls to and from the Agent's [PhDN].

SMIS registers ACD and PBX calls:

♦ An ACD call is a call that is sent (directly or transferred) to the ACD group.

♦ A PBX call is a call that is sent to the Agent's **ACD Call** button [PhDN] or a call originated from an Agent's **ACD Call** button [PhDN].

Based on a total system speed of 10,800 bps (9600 + 1200) for auxiliary serial channels and a requirement of one channel each for SMDI, TTY, SMDR, and MIS, the installation should use the lowest MIS channel speed for the expected amount of traffic.

CAUTION!   **If the channel speed is not set high enough, the MIS buffer may overflow, causing loss of data to MIS.**

DK424 ACD Installation

Step 7: Connect Announcement Devices

Connect the digital announcement devices that are used for each ACD Group (queue) to the appropriate station ports. Digital announcers can be connected to any RSTU, RSTU2, RDSU/RSTS, PSTU, or PESU standard telephone ports.

See Chapter 8 – Wiring Diagrams for MDF wiring to appropriate standard telephone ports.

♦ Use Program 14-3, Code 1, 2, and 3 to assign digital announcers to standard telephone ports. Use Program 14-3, Code 5 and Program 14-5XX to configure the queue announcement pattern for each ACD Group.

Step 8: Connect Music Sources

Connect the music source for each ACD Group (queue) to the appropriate station port or to the RCTU MOH jack. Music sources can be connected to RSTU, RSTU2, RDSU/RSTS, PSTU, PEKU, or PESU station ports or to the RCTU MOH jack. See Figures 10-3, 10-4, 10-5 and "Alternate BGM Source Installation" on Page 10-9.

See Chapter 8 – Wiring Diagrams for wiring information.

Important! *If connecting a music source to RSTU, RSTU2, RDSU/RSTS, PSTU, PEKU, or PESU standard telephone ports, an isolation transformer may be required as shown in Figure 10-4 to protect the music source from excessive current/voltage.*

Each ACD Group can have a separate music source or Groups can share music sources in any combination.

Music source port assignments are made in Program 14-3, Code 4. Music source timers are set in Program 11-5 (1, 2, and 3).

Step 9: Install ACD to Strata DK Built-in Auto Attendant (AA) Integration

If ACD calls route to an ACD Group via the Strata DK built-in AA, install and program the AA per "Built-in Auto Attendant Basic Call Sequences" on Page 10-78 of Chapter 10 – Peripheral Installation.

Auto Attendant "single digits" are assigned to ACD Groups in Program 09.

Step 10: Assign ACD to Toshiba Stratagy or VP AA Integration

If a Toshiba Stratagy or VP AA must answer calls and transfer CO lines to ACD Groups, assign the CO lines to ring the Strata DK standard telephone ports connected to the Stratagy or VP AA in Programs 81~89.

Also program the appropriate Strata DK station ports to interface with the Stratagy or VP ports in Program 31.

Program the Stratagy or VP AA to hookflash and dial **#406XX** to transfer calls to ACD Groups (where XX = the ACD Group Number: 01~16).

ACD Line Operation/Programming Considerations

ACD Programming

All types of DK lines can be routed to ACD Groups (ground/loop start, DID/Tie/DNIS/ANI). Lines can be assigned in programming to route directly to ACD Groups when they ring or dial into the Strata DK system. All line types can be programmed to transfer into an ACD Group from any telephone, attendant console, or built-in or external AA.

Use the ACD programming guidelines and flowcharts provided in Chapter 6 of the *Strata DK Programming Manual* to configure the remaining ACD items per the customer's requirements.

The following paragraphs describe differences in the operation and programming of ground/loop start lines versus DID/Tie/DNIS/ANI lines used with an ACD system.

Direct Incoming Assignments to ACD Groups

Ground/Loop Start Incoming Line Calls

Program 14-0: Used to make the line assignments to send calls directly to specific ACD Groups. If a ground or loop start line is assigned to an ACD Group in Program 14-0, it routes per that ACD Group's call routing assignments.

ACD calls ring on Agent **ACD Call** [PhDN] buttons. Do not assign CO **Line** or **Pooled Line Grp** buttons to Agent telephones. ACD CO **Line** or **Pooled Line Grp** buttons can be assigned to overflow destination telephones.

Note Program 14-0 has priority over all other ringing assignments except Program 78 (61, 62, and 63). If a line is assigned to ring an ACD Group in Program 14-0 at the same time the line is assigned to ring the DK built-in AA in Program 78, the line routes to the AA.

DID/Tie/DNIS/ANI Incoming Line Calls

Program *09 or Program 71-1, 2, or 3: assigns DID/Tie/DNIS/ANI incoming digits to ACD Groups and DID digits to ring designated station ports. ANI only lines must route to the same ACD Group (see Program 71-1, 2, or 3 address 349 or 499).

Program 04 or Program 71-1: assigns Tie line digits to ring at designated station ports (see Program 17, LED 05).

If the incoming digits (XXXX) dialed from a Tie or DID line match the digits assigned to an ACD Group, the call routes per that ACD Group's call routing assignments.

ACD calls ring on Agent **ACD Call** [PhDN] buttons. Do not assign DID/Tie/DNIS/ANI **Line** buttons to Agent telephones. However, ACD DID/Tie/DNIS/ANI **Line** buttons can be assigned to overflow destination telephones.

Transfer From Built-in Auto Attendant (AA) to ACD Group

Ground/Loop Start Line Calls

Calls can be assigned to ring into the DK built-in AA in Program 78. Each ACD Group can be assigned a unique one or two-digit AA dialing prompt in Program 09. Incoming calls on these lines are answered by the AA. The caller then enters the one or two-digit number and is connected to a specific ACD Group.

DK424 ACD Installation

DID/Tie/DNIS/ANI ACD Line Calls

Calls cannot be assigned to ring the DK built-in AA, so they cannot be transferred from the DK AA to an ACD Group.

Transfer From External AA to an ACD Group

The external AA (Stratagy or VP) can be programmed to transfer calls to specific ACD Groups by assigning one-digit dialing prompts to each Group.

To transfer a call into an ACD Group from an external AA, the user must hookflash and dial **#406XX** (**XX** = ACD Group number 01~16).

Ground/Loop Start Line Calls

Calls can be assigned to ring external AA ports in Program 81~89. The external AA can be programmed to transfer calls to particular ACD Groups by assigning one-digit dialing prompts to each Group.

DID/Tie/DNIS/ANI Line Calls

Calls can be assigned to ring directly into an external AA by assigning incoming digits to the AA ports in Programs *09 or 71 for DID/DNIS/ANI lines and Programs 04 or 71 for Tie lines (see Program 17, LED 05). Internal station to station [DN] calls cannot be transferred to ACD Groups.

Overflow From an ACD Group Queue

ACD Calls

ACD calls can be routed to overflow to a [PDN], [SDN], [PhDN], to normal CO line ringing assignments, to another ACD Group, or to a Distributed Hunt [DH] Group (see *Strata DK Programming Manual,* Flowcharts 6-3~6-10).

If the overflow [PhDN] or [PDN] is idle when overflow time occurs, an ACD call rings the overflow destination [DN]. If it is busy, the ACD call does not overflow but remains in the ACD queue until the overflow destination, an Agent telephone in the ACD Group, or a DH Group member telephone becomes idle. The first device (Agent telephone or overflow destination) to become idle receives the call. In this case, DID/Tie/DNIS/ANI lines operate the same as ground, and loop start lines.

Ground/Loop Start Lines

Lines can overflow from an ACD queue to the DK CO line Normal Ringing assignments set in Programs 81, 84, 87 and *81, *84, and *87; to the DK built-in AA or to an attendant console. When the overflow time or point occurs, calls immediately exit the ACD Group queue and ring all stations assigned to ring in Programs 81, 84, or 87 and *81, *84, and *87 (no delay ringing assignment operates during overflow). Idle stations and [DNs] ring normally while busy stations and [DNs] have a muted ring.

Auto Attendant

If the overflow destination is the DK built-in AA, calls overflow immediately when overflow time occurs and are routed per the AA program assignments. If the AA is busy, the call still exits the ACD queue and queues onto the AA announcement port.

Attendant Console

If the overflow destination is the attendant console, calls immediately exit the queue and alert the console whether the console is idle or busy. This applies to overflow queue time out (Programs 11-1 and 14-4) and overflow point (see Programs 14-3, 14-5, and Flowcharts 6-8~6-10).

DID/Tie/DNIS/ANI Lines

Lines cannot overflow to the DK CO line Normal Ringing assignments set in Programs 81, 84, 87 and *81, *84, and *87, or to the DK built-in AA.

If the overflow destination is assigned as either the DK CO line normal ringing or built-in AA, DID/Tie/DNIS/ANI lines route to the substitute destination [DN] assigned in Program *14-2. This applies to overflow queue time out and overflow point destinations assigned in Programs 14-4/11-1, and 14-5, respectively.

If the overflow destination [DN] is busy when overflow time occurs, the ACD call does not overflow but remains in the ACD queue until the overflow destination [DN] or an Agent telephone in the ACD Group becomes idle. The first device (Agent telephone or overflow destination) to become idle receives the call.

ACD Group Status

After Shift Mode

When an ACD Group is placed in the After Shift mode, calls are not sent to the ACD Group's queue or Agents, but are routed to the After Shift destination set in Program 14-6. The After Shift operation for each possible case is described below (also see *Strata DK Programming Manual,* Flowchart 6-5):

♦ If the After Shift destination is idle, all line types ring the idle destination. DID/Tie/DNIS/ANI and ground/loop start lines operate the same.

♦ If the After Shift destination of an ACD Group is another ACD Group, and all Agents in the destination Group are busy on calls or in the After Call Work Time mode, the call is placed at the end of the destination ACD Group's queue. If there are no Agents logged in for the After Shift Group, the call is sent to that Group's After Shift destination. DID/Tie/DNIS/ANI and ground/loop start lines operate the same.

♦ If the After Shift destination is a [DN], the [DN] rings. If the station is busy, DID/Tie/DNIS/ANI lines camp on to the [DN] while ground/loop start lines busy override ring the port.

♦ If the After Shift destination is the DK Normal Ringing assignment, ground/loop start lines ring stations assigned to the ACD lines in Programs 81~89 (including delayed ringing assignments). DID/Tie/DNIS/ANI lines do not ring stations in the Normal Ring assignments but ring or camp on to the [DN] assigned in Program *14-2.

♦ If the After Shift destination is the DK AA, ground/loop start lines are answered by the AA and routed after the caller dials a digit prompted by the AA. DID/Tie/DNIS/ANI lines do not route to the AA, but ring or camp on to the [DN] assigned in Program *14-2.

♦ If the After Shift destination is the attendant console, calls ring or queue onto the console whether it is busy or idle. This applies to DID/Tie/DNIS/ANI and ground/loop start lines.

All Agents Unavailable Mode

If all the Agents in an ACD Group become unavailable simultaneously, calls that would normally ring into the ACD Group or enter the Group's queue are routed to either the Group's After Shift destination, set in Program 14-6 or to the Group's Overflow Point destination, set in Program 14-5 (see *Strata DK Programming Manual*, Flowchart 6-6).

The option of where to send calls when all Agents are unavailable is set system-wide for all ACD Groups in Program 10-4, LED 04. All line types (ground/loop start and DID/Tie/DNIS/ANI) follow this operation. If the "All Agents Unavailable Operation" is set to route calls to the After Shift destination set in Program 14-6, (Program 10-4, LED 04 "Off"), calls to a Group whose Agents are all unavailable are treated as if the ACD Group were in the After Shift mode.

If the "All Agents Unavailable Operation" is set to route calls to the Overflow Point destination set in Program 14-5 (Program 10-4, LED 04 "On"), calls to a Group whose Agents are all unavailable are treated as if they overflowed from the Group's queue even if the overflow destination is busy. If the "All Agents Unavailable" overflow destination is another ACD Group, calls route to an idle Agent, or are placed at the end of the overflow ACD Group's queue.

Agent Ring No Answer Call Treatment

If an ACD call rings an Agent telephone for the time specified in Program 11-2 and the call is not answered, the call is routed to ring another idle Agent in the same ACD Group for that same time duration (see *Strata DK Programming Manual*, Flowchart 6-7).

This continues until all idle Agents in that Group have been rung. If the call is not answered by an Agent, the call then routes to the destination assigned in Program 14-5. Two consecutive Ring No Answer (RNA) calls to the same Agent automatically places that Agent's telephone in the Unavailable mode. The RNA operation for possible cases is described below:

♦ If the RNA destination is an idle [DN], it rings when RNA occurs. If the RNA [DN] is busy when RNA occurs, DID/Tie/DNIS/ANI calls camp on to the [DN] and ground/loop start lines route to the Normal Ringing assignments in Programs 81~89 and *81, *84, and *87 (including delay ring assignments).

♦ If the RNA destination is an ACD Group, the call rings an idle Agent in that Group when RNA occurs. If all Agents in the RNA destination ACD Group are busy when RNA occurs, DID/Tie/DNIS/ANI lines route to the destination assigned in Program *14-2 and ground/loop start lines route to the Normal Ringing assignments in Programs 81~89 and *81, *84, and *87 (including delay ringing assignments).

♦ If the RNA destination is the DK Normal Ringing assignment, DID/Tie/DNIS/ANI lines route to the [DN] assigned in Program *14-2 and ground/loop start lines route to the Normal Ringing assignments in Programs 81~89 and *81, *84, and *87 (including delay ring assignments). If the RNA destination is busy when RNA occurs, DID/Tie/DNIS/ANI lines camp on to the [DN] assigned in Program *14-2 and ground/loop start lines mute ring the busy [DN].

♦ If the RNA destination is the DK built-in AA, DID/Tie/DNIS/ANI lines route to the [DN] assigned in Program *14-2 and ground/loop start lines route per the AA program assignments. If the AA is busy when RNA occurs, DID/Tie/DNIS/ANI lines camp on to the [DN] assigned in Program *14-2 and ground/loop start lines queue onto the AA announcement port.

♦ If the RNA destination is the DK attendant console, RNA calls ring or queue on the console whether it is busy or idle. This applies to ground, loop, Tie, DID, DNIS, and ANI lines.

ACD SMDR Printout Examples

Auto Attendant, DNIS, ANI, DID, and Tie line ACD calls can be identified on SMDR printouts. Several SMDR printout examples noting ACD information are provided. (See Figures 11-3 through 11-10). However, Toshiba recommends using SMIS to track ACD call data rather than SMDR. SMIS is designed to track ACD/PBX agent calls.

Loop and ground start line ACD calls can only be identified by line and station numbers. The ACD tag is not applied. For detailed ACD call record reporting, Toshiba recommends using SMIS.

The Work Unit (or Stroke) count data, which is entered from the Agent telephone while on an ACD call, is printed in the account code field of the SMDR output data (last 15 columns).

Note   If multiple Work Unit entries are entered on the same ACD call, SMDR only sends data for the last entry. MIS or SMIS receives all entries made.

Figure 11-3   DID Call to ACD Queue Example

Figure 11-4   Ground/Loop Start Incoming Call Example

Figure 11-5   DID ACD Call to Available Agent Example

```
                              ┌──────────── Identifies DISA or Built-in AA call
                   ┌────────────────────── Time call was transferred
                   │      ┌──────────────── Call connected to DISA or AA Time Duration
                   │      │      ┌───────── Ring before DISA or AA Answer
                   │      │      │           Time Duration
007 MSS        10:36 00:00;26 00;03   203
007 203   500  10:37 00:01;12            └─ Caller dials 203, DISA or AA transfers to 203
                   │      │                 Call connected to 203 Time Duration
                   │      └──────────────── Time 203 hung-up and call disconnected
                   │
          └────────────────────────────── [DN] that answered call
      └──────────────────────────────────── [DN] connected to Line 007
  └────────────────────────────────────── Line Number
```

Note: DISA callers cannot dial into an ACD Group.

Auto Attendant Transfers Call to ACD Group

```
007 MSS   500  10:38 00:00;26 ACD
```

Figure 11-6   Incoming Built-in AA or DISA Call (non-ACD call) Example   2080

```
                              ┌──────────── 203 Transfer Time
                        ┌──────────────── 203 Talk Time Duration
                        │       ┌──────── 203 Ring before Answer Time Duration
                        │       │   ┌──── Indicates Call Transfer to ACD Group
A→ 003 203   203  13:10 00:00;10 00;03  ACD
B→ 003 ACD        13:10 00:00;06 ┐      204
C→ 003 204   500  13:10 00:00;26        └─ [PDN] of telephone that
                        │                   answers the ACD transferred call
                        │               └── 204 Ring before Answer Time or
                        │                   Queue Time
                        └──────────────── 204 Talk Time
                 └─────────────────────── 204 Discconnect Time
```

A→ **[DN]** 203 Transfer Line 003 to ACD Group 01 (Dialing **Cnf/Trn** + **#40601**)
B→ **[DN]** 204 Answers Line 003 (Agent logged in and ready on 204)
C→ **[DN]** 204 Hangs up

Figure 11-7   Transfer CO Line to ACD Group Example   2081

```
003 204  500  14:13 00:01;05 00;10
                        │      │     │   └─ Ring Duration Time before Agent answers
                        │      │     │          6 – 09  2 Rings
                        │      │     │         10 –13  3 Rings
                        │      │     │         14 –17  4 Rings etc.
                        │      │     └────── Talk Time Duration
                        │      └─────────── Call Disconnect Time
                 └────────────────────── Agent ACD Call [PhDN]
            └──────────────────────────── [PDN] of Agent Telephone
       └──────────────────────────────── ACD CO Line Number
```

2082

Figure 11-8   Direct Ground/Loop Start Line Call to ACD Agent (no Queue Time)

Direct ACD call with ANI/Caller ID Number, answered by ACD Queue Announcer 4414. Call stays in queue until Agent **ACD Call** button, [PhDN] 500 on Station 4403 becomes available. Agent answers call on **ACD Call** button [PhDN] 500, line 1 prints, services call and hangs up, line 2 prints.

Indicates DNIS/ANI Line — ACD GRP Announcer Port — Agent [PDN]

```
018D    ACD   4414   01:32   00:00;13   00;14   4403      *7145833700**
018     4403  500    01:32   00:00;17
```

Line Number — Station 4403 [PDN] — **ACD Call** Button [PhDN] on station 4403 — ANI/Caller ID Number Prints On SMDR After Agent Answers

---

Direct ACD call with ANI, does not enter queue and is answered by Agent Station 4403 on **ACD Call** button [PhDN] 500. The information below prints on SMDR when the Agent hangs up.

Indicates DNIS/ANI Line

```
018D   4403   500   02:05   00:00;06   00;19      *7145833700**
```

Line Number — Station 4403 [PDN] — **ACD Call Agent** Button [PhDN] — ANI/Caller ID Number Prints On SMDR After Agent Hangs Up

---

Direct ACD Call with ANI/DNIS, does not enter ACD queue and is answered by Agent station 4403 on **ACD Call** button [PhDN] 500. The information below prints on SMDR when the Agent hangs up.

Indicates DNIS/ANI Line

```
019D   4403   500   02:47   00:00;04   00;18      *7145833777*2222*   DR JONES
```

Line Number — Agent [PDN] — **ACD Call Agent** Button [PhDN] — ANI No. — DNIS No. — DNIS Name

---

Direct ANI/Caller ID Number call goes to queue and caller hangs up while in queue; the information below prints on SMDR.

Indicates DNIS/ANI LINE

```
018D    ACD   4414   02:34   00:00;03   00;17      *7145833333**
```

Line Number — ACD Queue Announcer [PDN] — ANI/Caller ID Number Prints When Caller Hangs Up

---

Lost or Abandoned Calls ANI/Caller ID Number Storage

♦ Direct ACD call does not go to queue but rings Agent: Abandoned call is stored on Agent telephone.

♦ Direct ACD call does not go to queue but rings Agent. Agent does not answer and call goes to Ring No Answer (RNA) destination telephone: Abandoned call ANI/Caller ID Number is stored on RNA destination telephone.

♦ Direct ACD call rings to ACD Group. Caller hangs up before ACD announcer answers: Abandoned Call ANI/Caller ID Number is stored on telephone owner of ACD line which received the call (Program *52 assignment).

♦ Direct ACD call is answered by ACD queue announcer: Abandoned call ANI/Caller ID Number information is printed on SMDR as shown directly above.

0874

Figure 11-9   ACD ANI/DNIS Printout Example

```
                Delay Ring to Built-in Auto Attendant — Dial ACD Group "1" Digit
                                              Time caller dials "1"
                                              Auto Attendant Announce Time Duration
                                              Ring Duration Time before AA answer
                                              Indicate AA sent call to ACD Group
   003 MSS        14:47 00:00;10 00;16  ACD   Work Unit Entry appears in Acct Code Field
   003 ACD        14:47 00:00;03          204 Agent or Overflow Destination Telephone
   003 204   500  14:48 00:00;42              Primary Directory Number [PDN]
                                              Agent ring before Answer Time Duration
                                              Agent Talk Time Duration
                                              Call Disconnect Time
                                              CO Line Number
                                                                              1998
```

Figure 11-10   Delay Ring to Built-in AA Example

Insight DK (DK424 only)

The Insight DK™ and Insight DK Plus are full-featured ACD MIS tools for call center supervisors, providing user-defined supervisor displays, user-defined historical reports, electronic wall board connections, and inView LAN-based status display messaging. Insight DK and DK Plus are Windows-based MIS software programs that work with PCs running Microsoft® Windows® 95 (Vers. 4.00.950A, B, or C), Windows 98 or Windows NT® with Service Pack 3.

For more information, refer to the *Strata DK424 Call Center Solutions General Description* or other Insight DK documents listed in "Related Documents/Media" on Page xviii of the Introduction.

Call Center Viewer (CCV)

Call Center Viewer™ is a software application designed for ACD supervisors which enables them to view the calling states and activities of ACD Groups and Agents. With the Call Center Viewer, supervisors can customize the ACD displays, set Call Waiting alarms, and send messages to Wall Boards. The software works on a PC running Windows 95.

This section discusses various combinations of connections between the Strata DK System and the Call Center Viewer PC(s). The Call Center Viewer application can be configured to work directly with the Strata DK, or with a SMIS PC, and/or with one Master PC plus additional PCs also running Call Center Viewer application programs.

Application Overview

Call Center Viewer organizes and displays events reported by the Strata DK MIS port. This application enables you to see the following:

♦ Number of Calls in Queue

♦ Number of Agents Available

♦ Number of Agents Busy

♦ Number of Agents Logged-In

♦ Number of Agents Unavailable

♦ Individual Agent States and State Times

♦ Longest Call Waiting

♦ Strata DK Date/Time

♦ Wall Board Messages

Strata DK Requirements

The RKYS3 must be installed on the Strata DK RCTU processor card in order for the Call Center Viewer to work.

Host PC Requirements

The host PC does not have to be dedicated to the application, since the Call Center Viewer application was designed for multi-tasking.

When the Call Center Viewer application connects to the Strata DK system, it functions as a machine-to-machine interface, constantly updating call center data. The Call Center Viewer application should be installed on a PC with the following minimum requirements:

♦ Windows 95

♦ IBM®-compatible 100MHz Pentium® class processor

♦ 16MB of RAM

♦ Hard drive with 10MB of available space

♦ One available serial communication ports; two if Wall Boards are used

♦ SVGA color display

♦ Windows Graphics Acceleration card

♦ Keyboard and Mouse

♦ Parallel Printer Port

Increasing the PC's processor speed and adding RAM will improve the host PC's performance, therefore boosting the performance of the Call Center Viewer application.

To ensure data integrity, Toshiba strongly recommends that both the host PC and CCV application remain in continuous operation once the CCV application session begins.

When the CCV application starts, the objects are displayed in Tree View, including ACD Groups, Agents, and Reader Boards.

Note   The term "Wall Board" refers specifically to the physical Wall Board. The Call Center Viewer software uses the term "Reader Board" in place of "Wall Board."

DK424 ACD Installation

Following is an example of a typical Call Center Viewer display.

Main Menu —

Tree View —

Status Bar —

List View
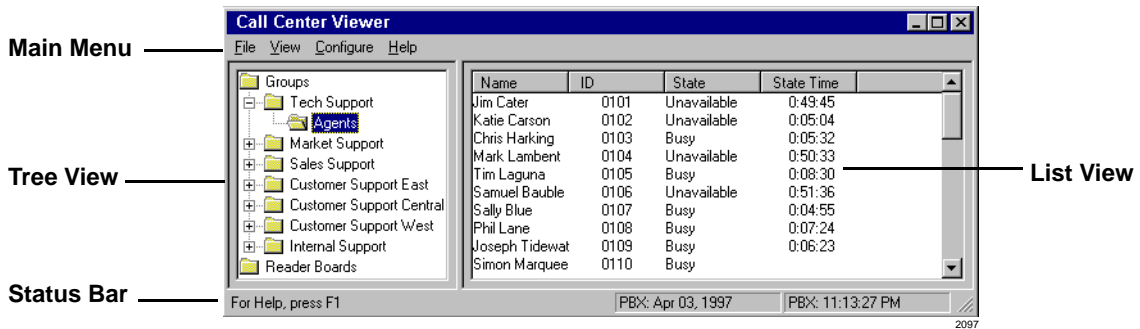
Reference Information

Refer to the *Call Center Viewer User Guide* for software installation and operation instructions.

CCV Configuration

Considerations

The Call Center Viewer application can connect solely to the Strata DK280 or DK424 port, or in parallel with other CCV applications, or with a Software MIS (SMIS) computer. The number of CCV PCs and the hardware configuration determines the type of connectors needed.

Depending on the configuration of the RS-232 port of the Strata DK System, a null modem adapter may be needed.

Connectors

This section describes the various connectors used with the CCV. Specific instructions for different types of configurations appear later in this section.

Call Center Viewer "Y" Connector (CCVY)

The CCVY connector enables two-way transmission between the Strata DK and a host PC, or SMIS equipment, and one-way transmission to other PCs. Use the CCVY to install multiple CCV PCs. (See Figure 11-11).

The CCVY enables only SMIS to send ACK and NAK to the telephone system, and not from the Call Center Viewer host PC(s). The PC(s) only receive data on the RXD lead from the Strata DK system.

An example of CCV connections is shown in Figure 11-18.
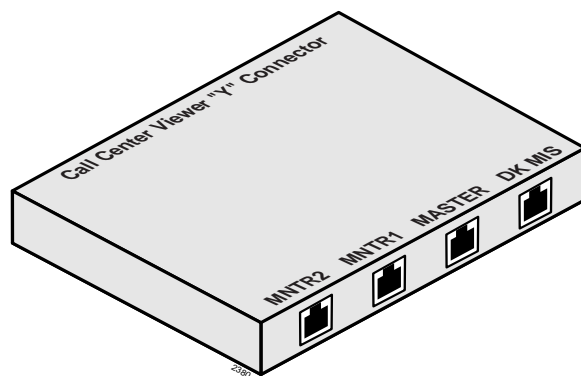
Figure 11-11   Call Center Viewer "Y" Connector (CCVY)

PPTC Connector

A PPTC-9 or PPTC-25F is used to connect a six conductor standard telephone cord plug to connect the PC's COM port (see Figure 11-12).
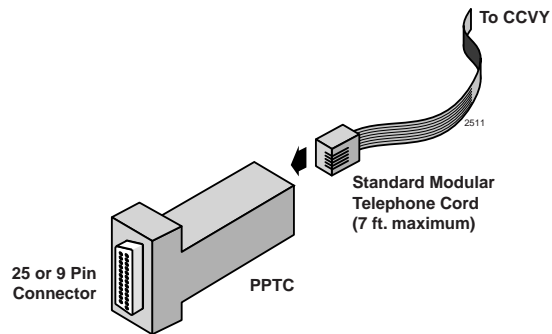
Figure 11-12   PPTC-9 or PPTC-25F Connector

There are three models of the PPTC appropriate for this application. See Figure 11-13 for pinout details for connecting the Call Center Viewer with equipment, such as Line Drivers and Data Broadcast Units.
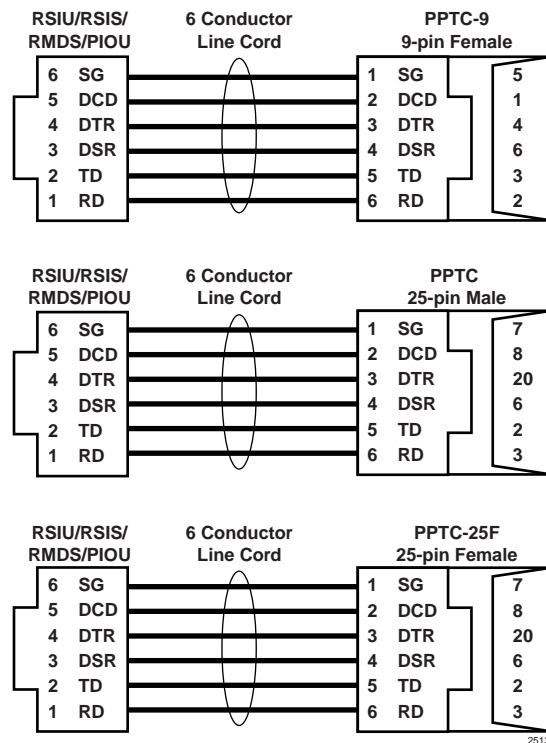
Figure 11-13   PPTC Pinout Diagram

Line Driver

An RS-232 short-haul modem or Line Driver is needed to boost transmission for PCs located more than 50 feet from the Strata DK System. A suitable Line Driver is made by Black Box® Corporation at (724) 746-5500, Model ME764A-MSP (male) or ME764A-FSP (female). See Figure 11-14.
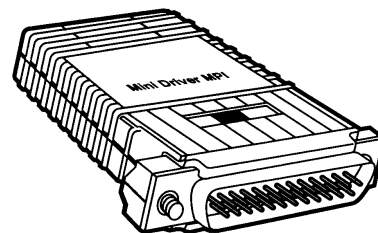
Figure 11-14   RS-232 Short-haul Line Driver

Line Drivers must be used in pairs. Figure 11-15 shows the connections between the two line drivers.
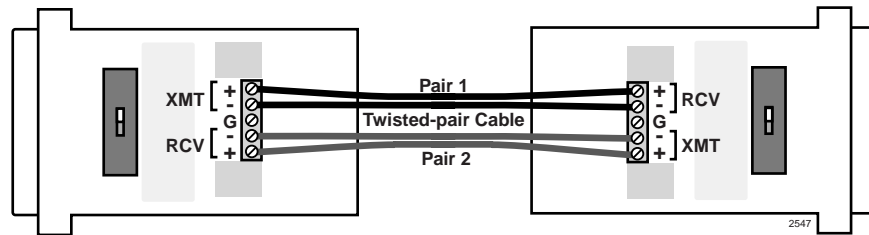
Figure 11-15   Twisted Pair Connections

Instructions for connecting PCs more than 50 feet from the Strata DK are covered later in this section.

Data Broadcast Unit

The Data Broadcast Unit (Figure 11-16) enables you to connect more than three PCs to with the Call Center Viewer application. A data broadcast unit regenerates the RS-232 signal to accommodate multiple PCs.

A suitable data broadcast unit to drive eight PCs can be obtained from Black Box Corporation at (724) 746-5500, model number TL158A.
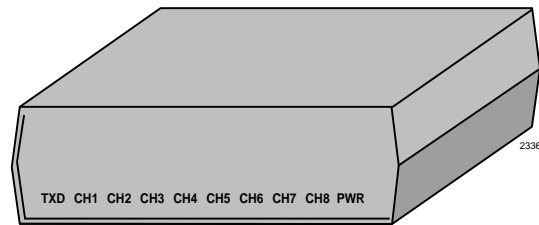
Figure 11-16   RJ-25 Data Broadcast Unit

This unit is powered by AC. If the Strata DK424 system is equipped with reserve power, then a small PC-type uninterrupted power supply can be used for full system operation in the event of a power failure.

Instructions for connecting multiple PCs to the CCV appear later in this section.

CCV Configuration Instructions

Connecting the DK to a Stand-alone CCV PC

➤ Connect the Strata DK280 or DK424 MIS port (RSIU/RSIS, RSSU, PIOU, or PIOUS PCB) to the COM port of the host computer with an RS-232 cable. See Figure 11-17.
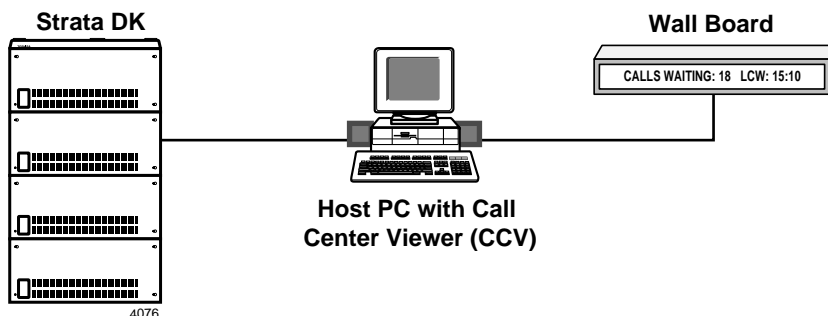
Figure 11-17   Connecting Strata DK Directly to a CCV PC with Optional Wall Board

Connecting the DK to a Stand-alone CCV PC, More than 50 Feet Away

1. Connect the Strata DK280 or DK424 MIS port (RSIU/RSIS, RSSU, PIOU, or PIOUS PCB) to the ME764-MSP Line Driver with an RS-232 cable (see Figure 11-18). Set the switch on the Line Driver to DTE.

2. Connect the other end of the Line Driver to the COM port of the host PC. Set the switch on this Line Driver to DCE
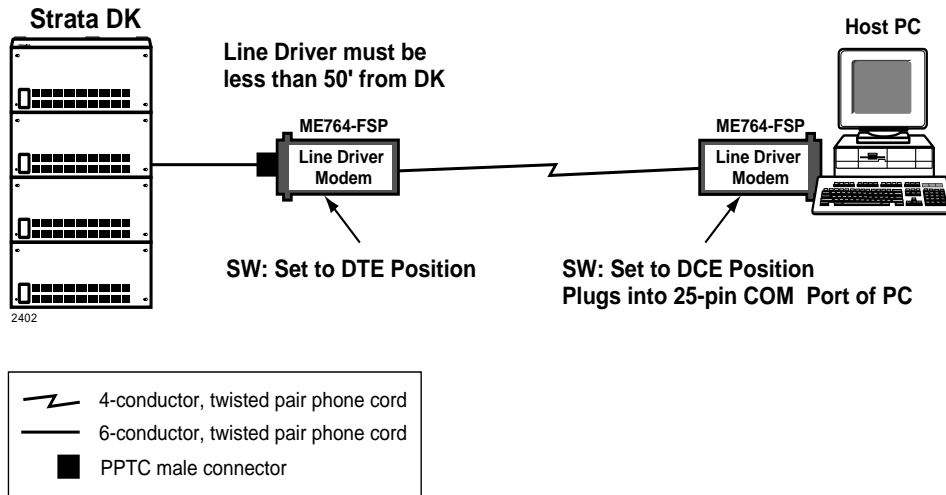
Figure 11-18   Connecting Strata DK to a CCV PC More Than 50 Feet Away

Connecting CCV and SMIS

Call Center Viewer monitors the data flowing between the Toshiba SMIS and the Strata DK. This enables the CCV application PC to display information and work in conjunction with a SMIS computer that is connected to the same Strata DK280 or DK424 MIS port.

The CCV application and the SMIS application must reside on separate computers because SMIS requires a dedicated PC. The CCV provides the real-time status displays and connection of electronic Wall Boards. SMIS is used to provide historical ACD reports. The CCV can run concurrently with other Windows applications on other ACD Supervisors' PCs.

➤ **To connect the CCV to SMIS PC, less than 50 feet from the DK**

1. Install the CCVY connector into the Strata DK MIS port (RSIU, RSIS, RMDS, or PIOU PCBs). See Figure 11-19.

   Depending on the configuration of the RS-232 port of the Strata DK System, a null modem adapter may be needed

2. Use a six-conductor modular telephone cord to connect the DK MIS port to the "DK MIS" port on the CCVY.

3. Plug a six-conductor modular cord into the "MASTER" port of the CCVY. Use a PPTC-9 or PPTC-25F at the other end of the cord to connect to the SMIS or Main Call Center Viewer PC.

4. To connect up to two more PCs, use a six-conductor modular telephone cord between the CCVY "MNTR1" or "MNTR2" port(s) with a PPTC-9 or PPTC-25F to attach the PCs.
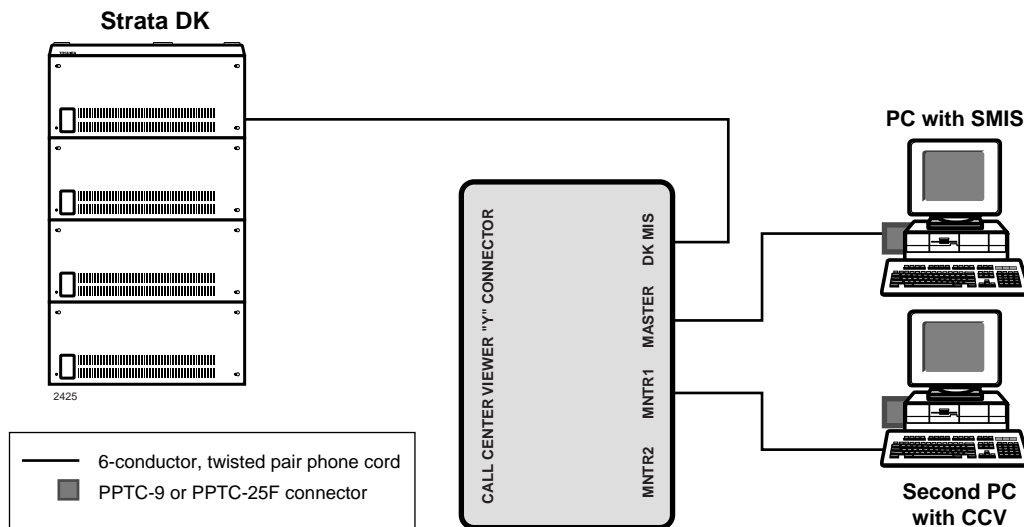
Figure 11-19   Connecting Strata DK to SMIS and CCV PCs

Connecting Up to Three CCV PCs

If you are connecting multiple PCs with the CCV application, use:

One Call Center Viewer "Y" Connector (CCVY)

One six-conductor telephone cord per PC, plus one cord for the DK to CCVY connection

One PPTC-9 or PPTC-25F pin connector per PC

➤ **To connect up to three CCV PCs to the Strata DK**

1. Install the CCVY connector into the Strata DK MIS port (RSIU, RSIS, RMDS, or PIOU PCBs). See Figure 11-20.

2. Use a six-conductor twisted pair telephone cord to connect the DK MIS port to the "DK MIS" jack on the CCVY.

3. Plug a six-conductor modular cord into the "MASTER" port of the CCVY. Use a PPTC-9 or PPTC-25F at the other end of the cord to connect to the Main Call Center Viewer PC.

4. Connect the additional PCs the CCVY "MNTR1" or "MNTR2" port with a six-conductor line cord. Use a PPTC-9 or PPTC-25F on the PC end of the cord.
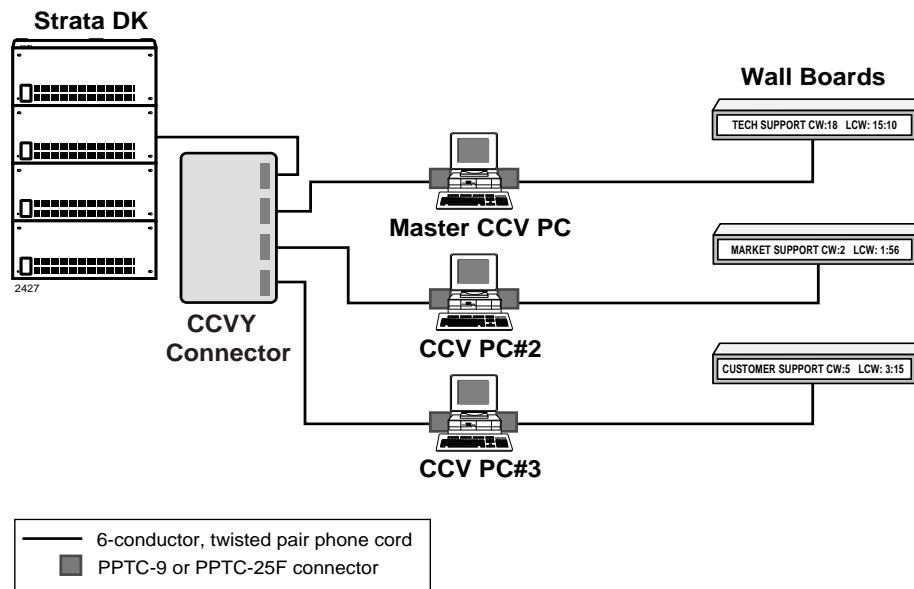
Figure 11-20   Connecting Strata DK to Two or Three CCV PCs

Connecting the CCV to More than Three CCV PC

Use a Data Distribution Box when you are connecting more than three PCs using the CCV software. You will also need the connectors listed on the previous page.

➤ **To connect Strata DK to multiple CCV PCs**

1. Install the CCVY connector into the Strata DK MIS port (RSIU, RSIS, RMDS, or PIOU PCBs). See Figure 11-21.

2. Use a six-conductor twisted pair telephone cord to connect the DK MIS port to the "DK MIS" port on the CCVY.

3. Plug a six-conductor modular plug into the "MASTER" port of the CCVY. Use a PPTC-9 or PPTC-25F at the other end of the cord to connect to the SMIS or Main Call Center Viewer PC.

4. Make sure that the Data Distribution Box is strapped for DTE operation for every output port (8). By using multiple data broadcast units, as many PCs as desired can be used, provided each one has the Call Center Viewer application and key installed.

5. Plug in a six-conductor line cord to either the CCVY "MNTR1" or "MNTR2" port. connect the other end to the Data Distribution box

   ...or

   if the PCs are located more than 50 feet from the DK, use Line Driver Modem(s) to boost the signal (see Figure 11-22). Use a a PPTC-9 or PPTC-25F to attach the recommended ME764-MSP Line Driver modem. Connect the other end of the Line Driver modem directly into the Data Distribution box.

6. Connect the additional PCs to the Data Distribution box with RS-232 cables *or* line cords with PPTCs.
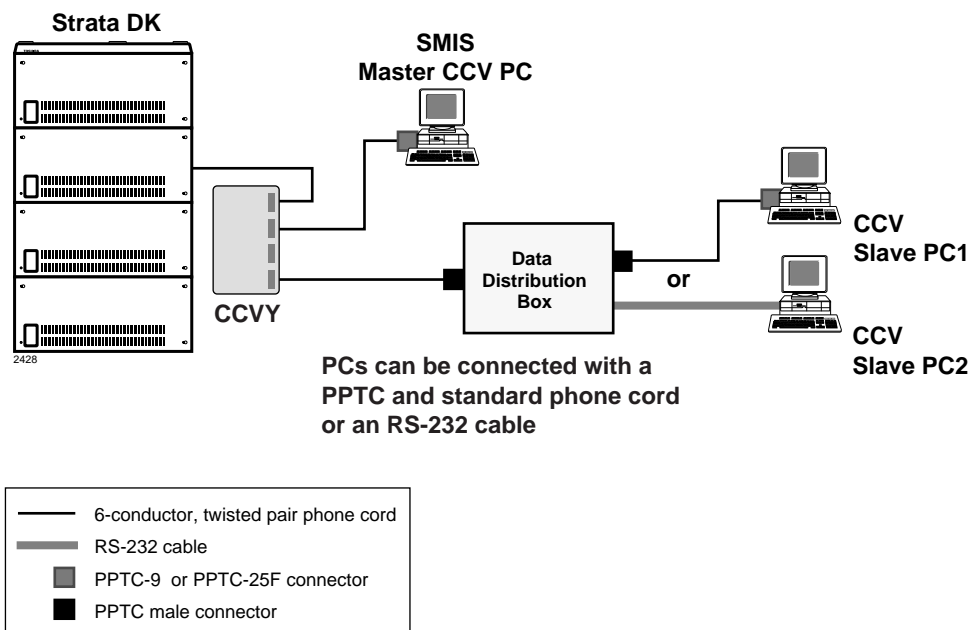
Figure 11-21   Connecting Up to Three CCV PCs (Less than 50' From the DK)
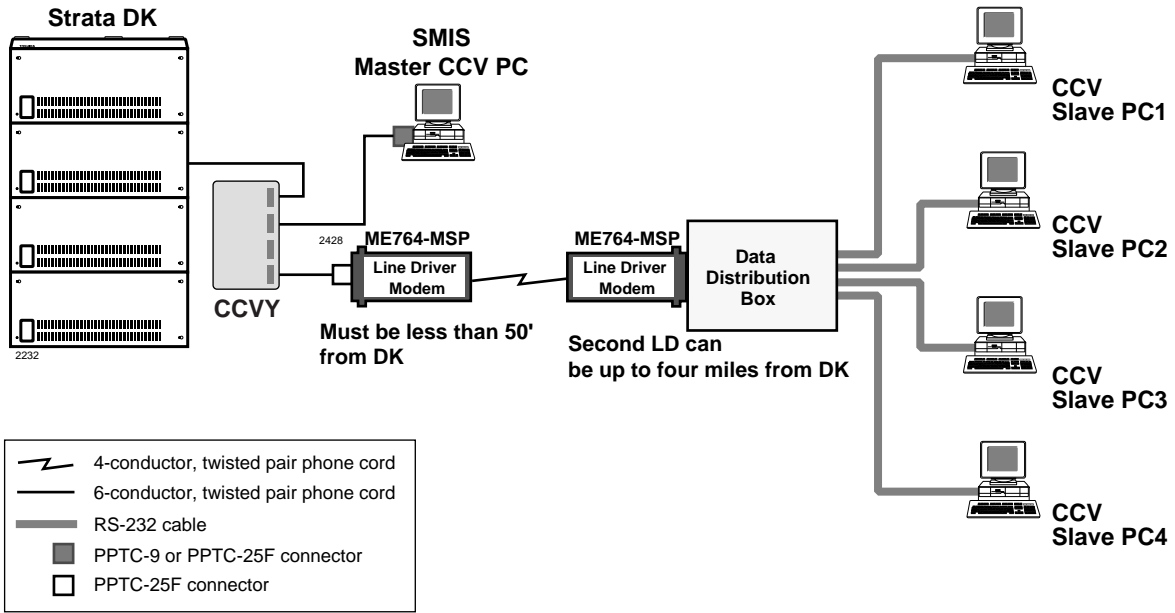
Figure 11-22   Connecting Multiple CCV PCs (More than 50' from Strata DK)

Spectrum Electronic Wall Boards

Electronic Wall Boards can be connected to each supervisor's PC to display call center status data over head from the Call Center Viewer application. This provides visibility of important call center event information to both supervisors and agents. The supervisor can also send custom, user defined, text information to the electronic Wall Board. This can be used for general information, motivational messages, etc.

One copy of the Call Center Viewer application supports a Wall Board network which can cover all active ACD groups. The Call Center Viewer application works with Spectrum 200, 300 and 700 series electronic Wall Boards listed below. In the following table, "R" stands for a red display and "C" stands for a three-color display: green, amber, and red.

Table 11-1   Wall Board Model and Part Numbers

Model	Toshiba Part Number	Message Area Size
215R Master	TOS1512RM1	27" wide x 2.1" high
215R Slave	TOS1512RS1	
215R Stand-alone	TOS1512RA1	
215C Master	TOS1512CM1	
215C Slave	TOS1512CS1	
215C Stand-alone	TOS1512CA1	
320C Master	TOS1023CM1	54" wide x 3.1" high
320C Slave	TOS1023CS1	
320C Stand-alone	TOS1023CA1	
330C Master	TOS1033CM1	81" wide x 3.1" high
330C Slave	TOS1033CS1	
330C Stand-alone	TOS1033CA1	
714C Master	TOS3417CM1	45.6" wide x 4" high
714C Slave	TOS3417CS1	
714C Stand-alone	TOS3417CA1	

Spectrum Electronic Wall Boards are available directly from Spectrum Corporation (800-944-6200 or at Website: http://www.specorp.com). Spectrum provides technical support for their products. Toshiba does not plan to sell, stock, or provide technical support for Spectrum Wall Boards.

Multiple Wall Boards

Each Call Center Viewer PC can drive multiple electronic Wall Boards that function independently from other supervisor's Wall Boards. Wall Boards connect to each other using a twisted pair Spectrum network. Up to 255 slave Wall Boards can be attached to one master Wall Board. The total cable distance can be up to 10,000 feet.

Each supervisor can send custom messages to that supervisor's Wall Board. The Wall Boards are addressable so that multiple supervisors can use a group of Wall Boards connected to one PC to send messages and ACD data differently to each Wall Board.

Fault Finding

12

This chapter describes the procedures to diagnose faults in the Strata DK14 and DK40i Key Service Unit (KSU) and the DK424 system. Faults are classified and then cleared by replacing the malfunctioning unit and by performing operational tests in the sequences by prescribed by the fault clearing flowcharts in "Fault Isolation Flowcharts" on Page 12-10.

Fault Classification

A Fault Classification Flowchart is provided to ensure that fault clearing is pursued in a logical sequence (Flowchart 12-1 on Page 10).

The flowcharts assume that the fault was discovered and reported by a digital or electronic telephone user. All faults, therefore, are classified according to the way they would appear at the digital or electronic telephone.

Fault Clearing Procedures

Before attempting to clear any fault, ensure that it is in the system and not caused by associated external equipment, such as wiring, MOH source, etc.

Important! *Many system features are assigned, enabled or disabled using software entries as described in the Strata DK Programming Manual. It is very important to verify that the system programming is correct and functional before troubleshooting the hardware.*

Initialize the system (Programs 91-9 and 03) before testing new systems or when changing the DK14 or DK40i KSU, or DK424 RCTU PCB.

Faults in the Strata DK40i and DK424 are cleared by replacing PCBs, telephones (digital or electronic) or the power supply, as instructed in the flowcharts.

Five symbols are used in the flowcharts, which are identified in Figure 12-1.

The flowcharts are sequentially arranged to permit rapid fault localization within the system. All fault clearing must begin with the Fault Classification Flowchart, which is arranged in the correct fault locating sequence.

Marking points of a flowchart sequence.

Important notes affecting the fault clearing procedure.

Question to be answered YES or NO.

Progression TO or FROM another flowchart location. Letters and numbers denote the exact entrance or exit points.

Statement of a required action.
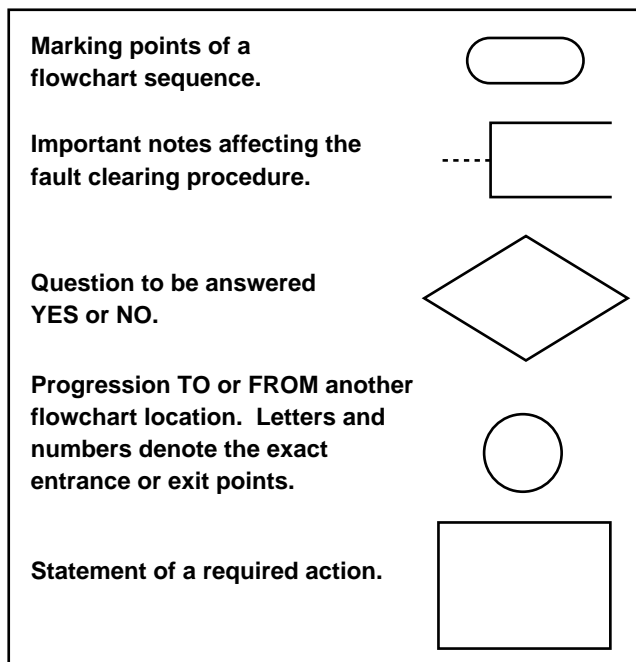
1887

Figure 12-1 Flowchart Symbols

CAUTION! **When handling PCBs, do not:**

Drop a PCB.

Stack one PCB on top of another.

Handle a PCB without discharging any static electricity from your person by touching the grounded cabinet.

Touch the PCB contacts with your fingers.

Important! *If the fault is not cleared by substituting a PCB, reinstall the original PCB in the KSU/cabinet before trying another PCB.*

Parts Return

1. Pack the part in a suitable container (original box is highly recommended). Use anti-static containers for all PCBs and feature cartridges. Use plastic bags for digital or electronic telephones, KSU/cabinet, etc.

CAUTION! **To avoid damage, never write on the part itself.**

2. Describe the nature of the defect on an information tag. Attach the tag to the front of the unit with string (not wire) so the tag can remain attached during the testing and repair.

Note Return tags are available from Toshiba America Information Systems, Inc., TSD Division.

KSU/RCTU Fault Isolation

The DK14 and DK40i KSU circuits, and DK424 RCTU circuits may contain a "soft" fault due to an extremely high level of static electricity and/or improper or no System Initialization.

If the KSU or RCTU is found defective during the fault finding procedures, attempt to clear a "soft" fault before returning the DK14 or DK40i KSU, or the DK424 RCTU PCB for repair.

➤ **To clear a "soft" fault**

1. Initialize the system, then re-program the system as necessary to test for the fault.

2. If the fault returns again, tag the defective KSU or RCTU and return it for repair.

Fault Isolation Procedure

1. Test the power supply (see "Testing the System's Power Supply" on Page 3-6). Test AC power and ground per system installation section.

2. Verify that the BATT jumper plug on the DK14 or DK40i Base KSU motherboard, or the DK424 common control RCTU PCB, is in the ON position.

3. If there are feature keys, verify that they are correctly installed:

   ♦ DK14: verify that the QKYS is correctly installed per Chapter 1 – DK14 Installation.

   ♦ DK40i verify the KKYS option installation on the K4RCU3 per Chapter 3 – DK40i Installation.

   ♦ DK424 verify correct installation of the RRCS or RKYS options on the RCTU per Chapter 7 – DK40i/DK424 Universal Slot PCBs.

4. For the DK14 and DK40i, skip to Step 6.

   For the DK424, make sure the system power is OFF. Then install an RCTU in the "RCTU" slot of the base cabinet. If RCTUD is installed, install RCTUC in the "R11" slot of the base cabinet. If RCTUBB is installed in the "RCTU" slot, install RCTUBA in the R11 slot of the base cabinet.

5. For DK424: If installing RCTUBA and RCTUBB, RCTUC and RCTUD, or RCTUE and RCTUF connect them together with the two ribbon cables supplied per Chapter 5 – DK424 Installation.

6. Verify that all PCBs are installed in proper slots per Chapter 1 – DK14 Installation, Chapter 2 – DK40i Configuration, or Chapter 4 – DK424 Configuration.

7. Turn system power ON; backup the customer database using DK Admin or DK Backup. For the DK424, verify that the heartbeat LED flashes on RCTUA3, RCTUBB, RCTUB, RCTUD, RCTUE (RCTUA, RCTUBA, RCTUC and RCTUF do not have heartbeat LEDs).

8. Run System Initialization Program 91-9 (two times) per Program 91-9.

9. Run Program 03, for all option PCBs installed per Program 03.

10. Run the processor RAM tests with Program 00 (Part 2).

11. Enter the customer database (manually or with DKAdmin or DKBackup) and retest for faults.

12. After performing the above steps, tag the defective PCB(s), Power Supply, or KSU, and return for repair.

Fault Finding

DK424 RPSU280 Power Supply Test

This test applies to the base and expansion cabinet RPSU280 and RPSU424 power supplies. Cabinet PCBs may or may not be installed when beginning this test. Some steps in the test require an AC/DC voltmeter that can measure up to 50VDC and 150VAC.

Notes

- RPSU280 and RPSU424 power supplies are fit, form, and functionally the same. They can be interchanged and mixed in DK280 and DK424 systems.

- To test DK14 or DK40i power supplies, see their respective installation in Chapter 1 – DK14 Installation or Chapter 3 – DK40i Installation.

➤ **To test the Power Supply**

1. Verify that the correct RPSU280 and RPSU424 jumper plug is installed in the jumper plug socket. The plug with the wire must be installed on the base cabinet power supply and the plug without the wire must be installed on all expansion cabinet power supply. One of each plug is supplied in a plastic bag attached to each power supply.

2. Verify the power supply ON/OFF switch is in the ON position.

Note The base cabinet ON/OFF switch must be ON to allow expansion cabinet power supplies to operate.

Verify that the data ribbon cable is plugged into the base from all expansion cabinets.

Check AC power and ground per AC Power and Grounding Requirements in Chapter 5 – DK424 Installation.

3. Ensure the AC power cord is plugged into the RPSU280 or RPSU424 AC IN connector and the commercial AC outlet (or power strip (RPSB) if used). The green power LED indicator will be on when AC power is connected to the power supply and the ON/OFF switch is ON. Take appropriate action to restore AC power if necessary.

Note The green power LED indicates that AC voltage is present at the AC IN connector only when the power supply ON/OFF switch ON. This is helpful for battery backup systems—the POWER indicator will be OFF and the +5V and –5V indicators will be ON when the DK280 or DK424 is operating on reserve power (batteries).

4. Verify that the +5V and –5V green LED indicators are ON. If one or both indicators are OFF, remove cabinet PCBs one at a time and check if +5V or –5V indicators turn on (it may be necessary to turn power OFF and ON to restore ±5V). Replace defective PCBs causing a ±5V fault.

Important! *If a CRCU PCB is installed on an RCTU PCB, ±5*V *will turn OFF. Do not install CRCU on RCTU. Only RRCS DTMF PCBs can be installed on RCTU.*

5. Lightly press the three –24 circuit breakers to ensure they have not accidentally opened during shipment. If a circuit breaker continues to "trip," remove cabinet PCBs, one at a time, and try to reset the circuit breaker. Replace defective PCBs if causing –24V fault. If breakers continue to trip, go to Step 7.

6. Using a DC voltmeter, measure the power supply DC output voltages at the "DC OUT" connector on the power supply. Place the positive (black) meter lead on the FG screw. Insert the negative (red) meter lead tip into the DC out connector until it makes contact.

Make sure that +5V, –5V, and –24V are within the range specified in Figure 12-2. Do this test with PCBs inserted; if a voltage(s) is not within specification, remove PCBs, one at a time and recheck the voltage. (Power may have to be turned OFF and ON to restore a voltage.)

Replace any PCB which causes a voltage fault. If voltage tests out of specification with all PCBs removed from the cabinet, go to Step 7.

7. Unplug the cabinet DC power connector from the power supply "DC OUT" jack. Attempt to reset -24V breakers per Step 5. If breaker cannot be reset replace power supply; if breakers reset go to Step 8.

8. Check the power supply DC voltages measuring at the power supply "DC OUT" jack with the black meter lead on the BATT "+" terminal. If the DC voltages are within specification when the cabinet DC power connector is disconnected but not within specification when the cabinet is connected, the cabinet is probably defective.

   If the DC voltages are not within specification when the cabinet DC power connector is unplugged, the power supply probably is defective. Replace the defective cabinet or power supply per Chapter 5 – DK424 Installation.

Important! *+5VDC (white wire) cannot be checked with the DC out cable disconnected.*

9. Using the DC voltmeter, check the RPSU280 battery charger as follows: Remove the battery cable from the power supply "BATT" connector. Place the positive (black) meter lead on the "+" BATT pin and the negative (red) meter lead on the "–" BATT pin. The allowed range is (–26.3VDC ~ –27.8VDC). The "BATT" connector output of the RPSU424 is 0VDC unless connected to good batteries. If BATT output is not within specification, replace the RPSU280.

Fault Finding

DC Out Cable/connector

Power Indicator LEDs (Green)

Base Jumper Plug

AC Power Cord

ON/OFF Switch

Third Wire Ground or Power Supply Daisy Chain Ground to Next Power Supply

FG Wire and Spade Lug

–24VDC Circuit Breakers

DC VOLTAGE PINS

Red Wire	No Wire	Blue Wire	White Wire	Green Wire
+5VDC	0VDC	–5VDC	+5VDC	0VDC
Green Wire	Green Wire	Yellow Wire	Yellow Wire	Yellow Wire
0VDC	0VDC	–24VDC	–24VDC	–24VDC

DC VOLTAGE SPECIFICATION

–5VDC (+4.5 ~ +5.5)	BATT (VDC)	
–5VDC (–4.5 ~ –5.5), Expansion Cabinet only	+	0
–24VDC (–26.3 ~ –27.8)	–	–26.3 ~ –27.8*

*RPSU424 "BATT" is 0 volt unless connected to good batteries.

24VDC Circuit Breaker Assignments:

BASE CABINET	
24V-1	S15, S16
24V-2	S13, S14
24V-3	S11, S12

EXP. CABINET	
24-1	SX1, SX2
24-2	SX3, SX4, SX5
24-3	SX6, SX7, SX8

Base Jumper Plug

Expansion Jumper Plug

Figure 12-2 RPSU280 Power Supply Voltage Test Points / Circuit Breakers / Jumper Plugs

Station Cable Continuity Check

Voltmeter Test

Use a voltmeter to check cable continuity between the DK40i KSU/DK424 cabinet, digital or electronic telephone, DSS console, and the attendant console (DK424). Make tests at the modular block. Refer to Tables 12-1 and 12-2.

➤ **To perform the voltmeter test**

1. Refer to Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring for appropriate MDF wiring diagrams in Chapters 1 and 3.

2. Disconnect the digital or electronic telephone, DSS console, PDIU-DS, HDCB, or DDCB.

3. Using a DC voltmeter, measure between the wires of the two pairs to verify the readings shown in Table 12-1 for digital telephone ports. Refer to Table 12-2 for electronic telephone ports. The reading will be a plus or minus depending on meter lead placement.

4. An improper reading indicates an open, crossed or shorted wire. See "Power Supply Replacement" on Page 1-9, Page 3-20, or Page 5-11.

5. For the MDF-to-telephone (digital or electronic) cable, use an ohmmeter to make a more precise check.

Table 12-1   Station Cable Continuity Check for Digital Telephone Cables using Voltmeter

From			To			Voltage
Pair	Wire	Color	Pair	Wire	Color	
1	T	Green[1]	2	T	Black	0
1	R	Red	2	T	Black	24[2]
1	T	Green	2	R	Yellow	24[2]
1	R	Red	2	R	Yellow	0
1	T	Green	1	R	Red	24[2]
2	T	Black	2	R	Yellow	24[2]

1. The green-red, black-yellow and white-blue measurements should be within 10% of each other.
2. Nominal voltage—within limits of $\pm26.3 \sim \pm27.8$VDC while under AC power, polarity depending on voltmeter lead placements.

Fault Finding

Table 12-2   Station Cable Continuity Check for Electronic Telephone Cables using Voltmeter

From			To			Voltage
Pair	**Wire**	**Color**	**Pair**	**Wire**	**Color**	
1	T	Green[1]	2	T	Black	24^2
1	R	Red	2	T	Black	24^2
1	T	Green	2	R	Yellow	24^2
1	R	Red	2	R	Yellow	24^2
1	T	Green	1	R	Red	0
2	T	Black	2	R	Yellow	0
3	T	White	3	R	Blue	0
3	T	White	1	R	Red	0
3	R	Blue	1	R	Red	0
3	T	White	1	T	Green	0
3	R	Blue	1	T	Green	0
3	T	White	2	T	Black	0
3	R	Blue	2	T	Black	0
3	T	White	2	R	Yellow	0
3	R	Blue	2	R	Yellow	0

1. The green-red, black-yellow and white-blue measurements should be within 10% of each other.
2. Nominal voltage—within limits of ±26.3 ~ ±27.8VDC while under AC power, polarity depending on voltmeter lead placements.

Ohmmeter Test

Check the continuity of the cable run between the KSU/cabinet and digital or electronic telephone with an ohmmeter.

➤ **To perform the ohmmeter test**

1. Disconnect the DSS console, electronic or digital telephone.

2. At the MDF, remove the bridging clips.

3. At the MDF, place shorting jumper wires between the T and R of pair #1 (green-red), the T and R of pair #2 (black-yellow) and the T and R of OCA pair #3 (blue-white), for PEKU/PESU only. (For MDF pin numbers, see Chapter 8 – DK40i/DK424 Universal Slot PCB Wiring.)

4. At the modular block, measure the resistance between all wire combinations. The proper readings are shown in Table 12-3 for digital telephones, DDSSs, DDCBs and Table 12-4 for electronic telephones and HDSSs.

5. An improper reading indicates an open, crossed or shorted wire. see "Power Supply Removal and Replacement" on Page 1-8 (DK14), or Page 3-19 (DK40i), or Page 5-11 (DK424).

Cable Installation Test

If cable voltmeter and ohmmeter tests are within limits, digital telephones, DDCBs, or DDSS consoles may not operate.

➤ **To perform the cable installation test**

1. Cable runs for the above digital devices must be free of cable splits (single or double). Test for and eliminate all cable splits.

2. Cable bridge taps – Digital telephones will not operate if cable runs contain any type (short or long) of cable bridge. Test for and eliminate all cable bridges.

3. When installing the station cable, do not run parallel to and within 3 ft. of an AC power line. AC power lines should cross at right (90°) angles only. In particular, avoid running station wire pairs near devices that generate electrical noise, such as neon or fluorescent light fixtures.

4. **For DK40i**: Chapter 3 – DK40i Installation, Table 3-10 on Page 3-39. Verify that your telephone is wired correctly (2-pair or External power) for the options it supports (ADM, RPCI-DI, PDIU-DI, HHEU, DVSU, etc.).

Table 12-3   **Station Cable Continuity Check for Digital Telephone Cables using Ohmmeter**

From			To			Voltage
Pair	Wire	Color	Pair	Wire	Color	
1	T	Green[1]	2	T	Black	open
1	R	Red	2	T	Black	open
1	T	Green	2	R	Yellow	open
1	R	Red	2	R	Yellow	open
1	T	Green	1	R	Red	40 ohms[2]
2	T	Black	2	R	Yellow	40 ohms[2]

Table 12-4   **Station Cable Continuity Check for Electronic Telephone Cables using Ohmmeter**

From			To			Voltage
Pair	Wire	Color	Pair	Wire	Color	
1	T	Green[1]	2	T	Black	open
1	R	Red	2	T	Black	open
1	T	Green	2	R	Yellow	open
1	R	Red	2	R	Yellow	open
1	T	Green	1	R	Red	40 ohms[2]
2	T	Black	2	R	Yellow	40 ohms[2]
3	T	White	3	R	Blue	40 ohms[2]
3	T	White	1	R	Red	open
3	R	Blue	1	R	Red	open
3	T	White	1	T	Green	open
3	R	Blue	1	T	Green	open
3	T	White	2	T	Black	open
3	R	Blue	2	T	Black	open
3	T	White	2	R	Yellow	open

1. The green-red, black-yellow and white-blue measurements should be within 10% of each other.
2. This is the maximum allowable reading for all digital and electronic telephone cable runs except if connecting an HDSS console to circuits 7 and 8 of a PEKU, then the maximum cable restriction is 20 ohms, not 40 ohms.

Fault Finding

Fault Isolation Flowcharts

The following troubleshooting flowcharts are available to aid in fault isolation. Toshiba recommends reading the previous text in this chapter before proceeding to Flowchart 12-1 on Page 10 to begin fault isolation.

Flowchart 12-1   Fault Classification

Flowchart 12-2   Catastrophic Faults

```
                                    ┌──────────┐
                                    │  START   │
                                    └──────────┘
                                          │
                                          ▼
        ┌───────────┐    No      ╱────────────────╲
        │  Go to    │◄───────────  Is the system
        │ Flowchart │            ╲ completely      ╱
        │   12-1    │             ╲non-operational?╱
        └───────────┘              ╲──────────────╱
                                          │ Yes
                                          ▼
                                      ( 2-1 )
                                          │
                                          ▼
                        ┌─────────────────────────────┐
                        │ Test the Power Supply as     │
                        │ described in the installation│
                        │ sections of DK14 and DK40i   │
                        │ and in this chapter for      │
                        │ DK424. Also perform Hardware │
                        │ Fault Isolation per this     │
                        │ chapter.                     │
                        └─────────────────────────────┘
                                          │
                                          ▼
                                      ( 2-2 )
                                          │
                                          ▼
                               ╱────────────────╲        Yes              ┌──────────────┐
                               ╲ Was the fault   ╱──────────( 2-3 )──────►│ Tag the      │
                               ╲isolated by      ╱                        │ defective    │
                               ╲completing the   ╱                        │ unit(s) and  │
                               ╲system hardware  ╱                        │ return for   │
                               ╲   check?       ╱                         │ repair.      │
                                ╲──────────────╱                          └──────────────┘
                                          │ No                                   │
                                          ▼                                      ▼
                                      ( 2-5 )                                ┌────────┐
                                          │                                  │  END   │
                                          ▼                                  └────────┘
                        ┌─────────────────────────────┐
                        │ Re-initialize the system     │
                        │ (Programs 91-9 and 03) and   │
                        │ re-check fault using default │
                        │ program data (do not enter   │
                        │ customer database).          │
                        └─────────────────────────────┘
```

(2-4)

Reprogram customer database, one program at a time, and check to see if fault re-occurs.

(2-7)

Does the fault re-occur after entering customer database?

(2-6)

Was the fault cleared after re-initializing the system?   Yes → (2-4)

No → (2-8)

Yes → (2-8)

No → **END**

Call your technical support group.

Flowchart 12-3   Station Dial Tone Faults

Replaceable Station PCBs:

DK14: QCDU, QSTU2

DK40i Base KSU: KSTU2 and all PCBs in the DK40i Expansion Unit

DK424: PEKU, PESU, PSTU, RSTU, RDSU/RSTS, PDKU

Flowchart 12-4   CO Line Dial Tone Faults

Replaceable CO Line PCBs:

DK14	QCDU
DK40i Base KSU:	KCOU TCOU TDDU
DK40i only:	KCDU
DK40i Expansion KSU/ DK424:	RCOU RCIU2 REMU RDDU PCOU
DK424 only	REMU RCOS RGLU

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Flowchart 12-5   DSS Console Faults

START

Note DSS is not available on DK14.

DSS console type?

DDSS → 5-0

HDSS

On PEKU connected to HDSS, set SW1 to the DSS position.

Go to 5-0

Is the correct PCB slot code entered in Program 03?

No → 5-1

Yes

5-3

Enter correct PCB slot code using Program 03; then turn power OFF (for 5 seconds) and then ON.

5-2

Is the fault cleared?

No → Go to 5-3

Yes

END

Refer to Chapter 8 and verify wiring:

• For DDSS, circuit 8 of the base unit or PDKU (KCDU does not support DDSS).
• For HDSS, circuit 7 and 8 of PEKU (PESU does not support HDSS).

Correct as necessary.

5-4

Is the fault cleared?

Yes → **END**

No

Test DSS cable with cable continuity checks in this chapter.

Correct as necessary.

5-5

Is the fault cleared?

Yes → **END**

No

Call your technical support group.

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Flowchart 12-6   Voice Mail/(External) Auto Attendant Faults

```
                    ┌──────────┐                                    ┌──────────┐
                    │  START   │                                    │   6-1    │
                    └────┬─────┘                                    └────┬─────┘
                         │                                               │
              ┌──────────▼──────────┐              ┌────────────────────▼─────────────────────┐
              │ This chart assumes  │              │ Check that the QRCU3 (DK14),              │
              │ the VM/AA device    │              │ K5RCU (DK40i) or RRCS (DK424) is          │
              │ has no faults.      │              │ installed correctly and programmed        │
              └──────────┬──────────┘              │ with Code 92 in Prog. 03 (DK40i) or       │
                         │                         │ Code 92, 93, and 94 in Prog. 03           │
                         │                         │ (DK424).                                   │
                    ╱────▼────╲      Yes           └────────────────────┬─────────────────────┘
                   ╱ Is VM/AA  ╲────────►                               │
                  ╱ integration ╲                                  ╱────▼────╲      Yes     ┌────────┐
                  ╲ completely  ╱                                 ╱  Is the   ╲────────────►│  END   │
                   ╲non-operational?                              ╲  fault    ╱             └────────┘
                    ╲────┬────╱                                    ╲ cleared? ╱
                         │ No                                       ╲────┬────╱
                    ┌────▼────┐                                          │ No
                    │   6-2   │                          ┌───────────────▼────────────────┐
                    └────┬────┘                          │ Check that VM/AA ports are      │
                         │                               │ connected to standard telephone │
       ┌─────────────────▼────────────────┐             │ station ports correctly.         │
       │ Read "Voice Mail Options" in      │             │ (Refer to QSTU2 (DK14), KSTU2    │
       │ Chapter 10 and the programming    │             │ (DK40i only). DK40i/DK424 RSTU2, │
       │ instructions for:                 │             │ PSTU, PESU, and for the DK424    │
       │ DK14/DK40i: 03 (Code 92, slot 00  │             │ only, RDSU/RSTS wiring           │
       │ for K4RCU3) DK424: 03 (Code 92~94 │             │ diagrams in Chapter 8.)          │
       │ for RCTU PCB) DK14/DK40i/DK424:   │             ├─────────────────────────────────┤
       │ 15-0 and 15-3 (Auto release), and │             │ Correct if necessary.            │
       │ 31 (LEDs: 04, 05, 09, 15~20).     │             └───────────────┬─────────────────┘
       │ This explains system hardware and │                             │
       │ programming options related to VM │                        ┌────▼────┐
       │ and external auto attendant.      │                        │   6-4   │
       ├───────────────────────────────────┤                        └────┬────┘
       │ Correct Hardware/System           │                             │
       │ Programming as necessary.         │                        ╱────▼────╲      Yes     ┌────────┐
       └─────────────────┬─────────────────┘                       ╱  Is the   ╲────────────►│  END   │
                         │                                         ╲  fault    ╱             └────────┘
                    ┌────▼────┐                                     ╲ cleared? ╱
                    │   6-3   │                                      ╲────┬────╱
                    └────┬────┘                                          │ No
                         │                                ┌──────────────▼───────────────┐
                    ╱────▼────╲      Yes     ┌────────┐   │ Using a standard DTMF         │
                   ╱  Is the   ╲────────────►│  END   │   │ telephone, check all standard │
                   ╲  fault    ╱             └────────┘   │ telephone circuits (QSTU2,    │
                    ╲ cleared? ╱                          │ KSTU2,RSTU2, PSTU2, PESU).    │
                     ╲────┬────╱                          ├───────────────────────────────┤
                         │ No                             │ Replace defective PCB if      │
       ┌─────────────────▼────────────────┐              │ necessary.                    │
       │ Check that the VM I.D. codes (656 │              └──────────────┬────────────────┘
       │ and 657) are stored correctly in  │                             │
       │ users' digital or electronic      │─────────────►          ┌────▼────┐
       │ telephones. Use operating         │                        │   6-5   │
       │ procedures in the manual for      │                        └────┬────┘
       │ instructions.                     │                             │
       └───────────────────────────────────┘                       ╱────▼────╲      Yes     ┌────────┐
                                                                   ╱  Is the   ╲────────────►│  END   │
       ┌───────────────────────────────────┐                      ╲  fault    ╱             └────────┘
       │ Other VM/AA related programs:     │                       ╲ cleared? ╱
       │ • 10-2, LED 11 – No DTMF tones    │                        ╲────┬────╱
       │ • 13 – Message center             │                             │ No
       │ • 33 – Station hunting            │                        ┌────▼────┐
       │ • 35 – Busy station transfer/     │                        │   6-6   │
       │        ringing                    │                        └────┬────┘
       │ • 36 – Fixed call forward         │                             │
       │ • 37 – Ring transfer recall time  │              ┌──────────────▼────────────────┐
       └───────────────────────────────────┘              │ Call your technical            │
                                                          │ support group.                 │
                                                          └────────────────────────────────┘
```

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Fault Finding

Flowchart 12-7   Station Message Detail Recording (SMDR) Faults

START

Read the SMDR installation instructions in this chapter before proceeding with this chart.

This chart assumes the SMDR device has no faults.

No SMDR data or garbled data is detected at the QSMU, WSIU/TSIU/PIOU/PIOUS/RSIU/RSIS SMDR port. — Yes → 7-4

No

7-1

SMDR data records are sent correctly but not when the customer requires. — No → No other faults are classified. Call your technical support group for assistance.

Yes

7-2

Set SMDR options in Program 60: Threshold time, long distance calls only, etc.

7-3

Is the fault cleared? — No → Call your technical support group.

Yes

END

- DK40i/DK424: The SMDR port is the bottom modular jack (TTY is on top) of WSIU (DK14) or TSIU (DK40i only) /PIOU/PIOUS.
- DK424: SMDR can be any jack on RSIU or RSIS. See Program 76.
- The modular cord connecting to the SMDR port must be 6-wires.

7-4

Verify that the PIOU/PIOUS, WSIU (DK14), or TSIU (DK40i only) baud rate SW1 switch is in the correct position (300 bps or 1200 bps) to match the SMDR device baud rate. (Refer to TSIU/PIOU/PIOUS installation in Chapter 7.)

If using RSIU/RSIS with DK424, verify Program 76-1 for port assignment. Verify baud rate in Program 76-2

Change as required.

7-5

Is the fault cleared? — Yes → END

No

Verify that the SMDR device communication parameters are set for: 8-data bits, no-parity, 1-stop bit, 300 or 1200 bps. RSIU/RSIS 1200, 2400, 4800 and 9600

Change as required.

7-6

Is the fault cleared? — Yes → END

No

7-7

Check that the SMDR device is wired correctly to the WSIU/RSIU/RSIS/TSIU/PIOU/PIOUS SMDR port. (Refer to PIOU or PIOUS wiring instructions in Chapter 8.)

Fix as required.

7-8

Is the fault cleared? — Yes → END

No

Change the PIOU/RSIU/RSIS/TSIU PIOUS PCB.

7-9

Is the fault cleared? — Yes → END

No

Call your technical support group.

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Flowchart 12-8   Remote Maintenance Faults

START

If a digital or electronic telephone is in the Programming mode, it is not possible to enter the Remote Maintenance mode.

This chart assumes that the remote terminal and modem have no fault and that Remote Maintenance does not operate.

Check that the baud rate switch (SW2, push-button switch on PIOU/PIOUS) is set to match the remote terminal baud rate (300 bps LED ON, 1200 bps LED OFF) .

DK40i: check that the WSIU, TSIU, IMDU, PIOU, or PIOUS is installed correctly.

DK424: check that the RSIU, RMDS, IMDU, RSSU, PIOU or PIOUS is installed correctly.

If using RSIU/RSIS/RMDS, check that Program 76 settings match DKAdmin/DKBackup PC and modem or remote terminal/modem.

Check that communication parameters of remote terminal are set to match the PIOU or PIOUS TTY port or IMDY (7-data bits, even parity, 1-stop bit).

8-1

Is Remote Maintenance connection via external modem on TTY port or IMDU modem?

External modem connected to the WSIU, TSIU, PIOU, PIOUS TTY port

8-2

IMDU modem installed on PIOU or PIOUS

8-4

Check that the communication parameters of the remote terminal are set to match the IMDU (7-data bits, even parity, 1-stop bit).

Check that the PIOU/PIOUS SW3 switch is in the MODEM position.

- Enable the IMDU by turning LED 14 ON in Program 77-1.
- If required, assign CO lines for DISA or to ring IMDU in system Program 78, Code 51~53.
- When calling IMDU or RMDS via DISA or ring transfer, dial #19.
  If calling RMDS or IMDU via DID lines, call the sttion number assigned to Port 085 (RCTUB) or Port 245 (RCTUC/D) in Program *09 or 71, 72 and 73.

Correct above if necessary or replace IMDU or PIOU(S).

Check that the WSIU/TSIU/PIOU/PIOUS SW3 switch is in the TTY position. For DK424, check Program 76-1 and verify the port is programmed as a 1 for TTY.

Correct as necessary.

8-3

Is the fault cleared?   YES   END

NO

Check that the modem or terminal connected to the TTY port is wired correctly per the WSIU/TSIU/PIOU/PIOUS, RSIU/RSIS, RSSU MDF wiring in Chapter 8.

Correct above if necessary or replace WSIU, TSIU, PIOU, PIOUS, or RSIU/RSIS.

- The TTY port is the top modular jack (SMDR is bottom) of the PIOU/PIOUS.
- The modular cord connecting the TTY port to the terminal or external modem must be 6-wires.
- TTY can be any jack on RSIU/RSIS—see Program 76.

8-5

Is the fault cleared?

Call your technical support group.

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Computer Telephony Integration   13

This chapter gives you information about Computer Telephony Integration (CTI). Currently, it includes procedures for using a Personal Computer Interface Unit (RPCI-DI) for Telephony Application Programming Interface (TAPI) running under both Microsoft® Windows® 95, Windows 3.1 and Windows 3.11 for Workgroups.

About Strata DK and TAPI

The Telephony Specification was jointly developed and copyrighted by Intel® and Microsoft. It consists of both TAPI, used by applications, and the Telephony Service Provider Interface (TSPI), implemented by other service providers.

Toshiba provides the TAPI connection through a Strata DKT2000-series telephone with a modified Data Interface Unit. The Personal Computer Interface Unit (RPCI-DI) for TAPI integrates into the bottom base of a 2000-series telephone.

There are two separate modes of operation for the Toshiba TSPI depending on the type of Strata DK telephone system that the DKT/RPCI-DI is connected to. Toshiba's TSPI is configured using the Telephony icon installed as part of TAPI in the Microsoft Windows Control Panel.

Windows Telephony is a component of Windows Open Services Architecture. This architecture provides telephony services when connected to many different telephone switches. Therefore, an application needs to know only the definition of the API (Application Program Interface) and not its implementation.

The Strata DK TAPI Service Provider (DK TSPI) comes with each RPCI-DI. This device, along with this software module, allows a Windows-based PC to interconnect with the phone system for receiving and making calls. Any TAPI-compliant PC software becomes compatible with Strata DK systems.

The disk set also contains a "middleware" software known as StrataLink. This application enables other Windows-based software to also work with Strata DK systems.

Requirements

To use TAPI with the DKT Service Provider, you must have an IBM-compatible PC with 8 MB RAM, running:

♦   Windows 95, Windows 3.1 or Windows for Workgroups 3.11.

♦   Microsoft TAPI installed. (Most TAPI applications automatically install TAPI as part of the normal installation process.)

StrataLink and TAPI Service Provider for Windows 95

Step 1: Remove Previously Installed DKT TAPI Service Provider Applications

1. Click on the Start Button, Settings, then Control Panel.
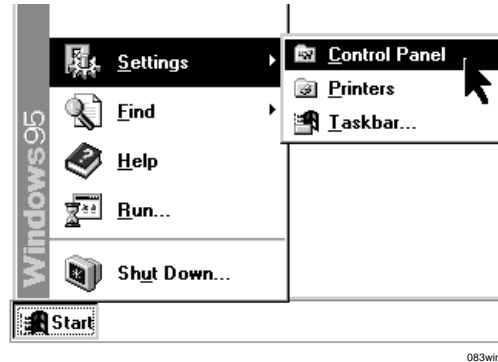
2. Double click on the Telephony Control Panel icon.
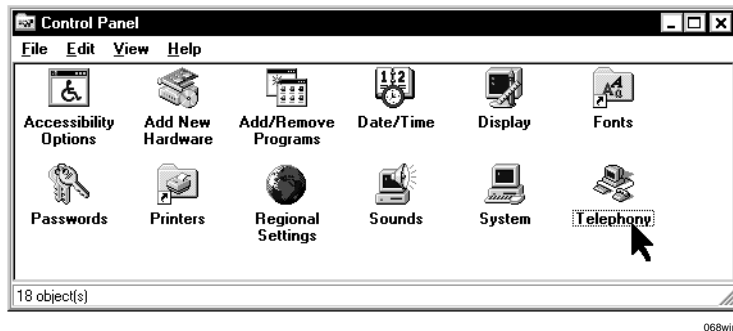
3. Highlight the Toshiba DKT TSPI. Click Remove.
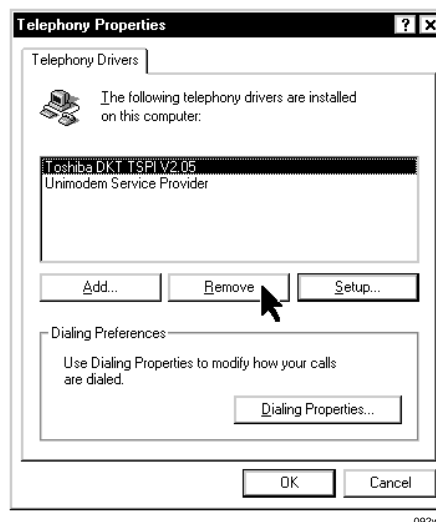
4. A confirmation box asks if you want to remove the driver. Click Yes.

Step 2: Install TSPI and/or StrataLink Packages

1. From the Windows' Start button, select Run.

2. Enter **A:\Setup.exe**, then follow the Installation Wizard instructions.

3. When the Package Selection menu appears, select the appropriate option to install either software package or both software packages (recommended).
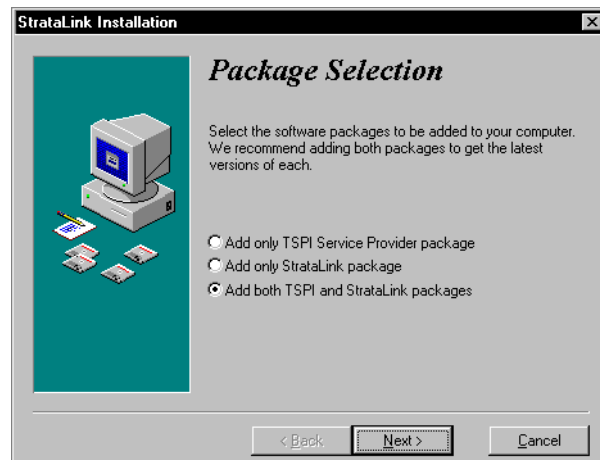
4. When the Automatic Startup menu appears, make sure that "Add StrataLink to the Startup Group" is checked.

5. Follow the remaining Installation Wizard instructions to complete the installation.
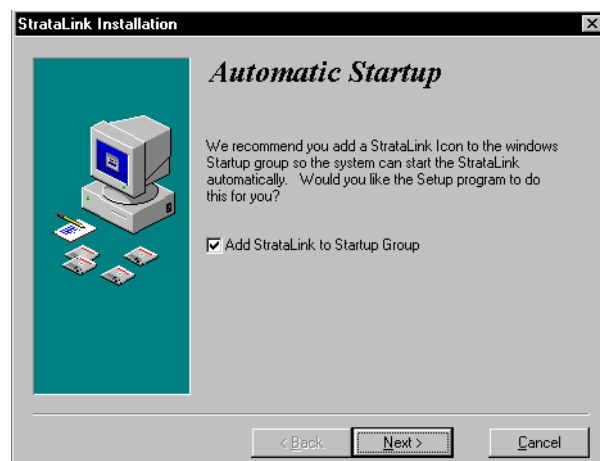
Step 2: Initialize StrataLink and the TAPI Service Provider

➤ **To initialize StrataLink and TAPI Service Provider**

1. Press the Windows Start button, select Programs, StrataLink, and StrataLink.

2. Click "Enable TAPI".

The light above this box will be red at first, then yellow as the TAPI Service Provider is initialized, and finally green when initialization is complete.

3. Press Driver Setup to configure the TAPI Service Provider.

4. Select the Com Port that will be used to make the connection to the desktop telephone.

5. You may type a name in the Phone Name box. This name appears in the application on the PC.

6. Select phone type: 10- or 20-key.

7. Select the switch type from the drop-down menu.

8. Select the shared line appearance to enable incoming calls to act like a key system. Leave it unselected for a standard TAPI (PBX interface).
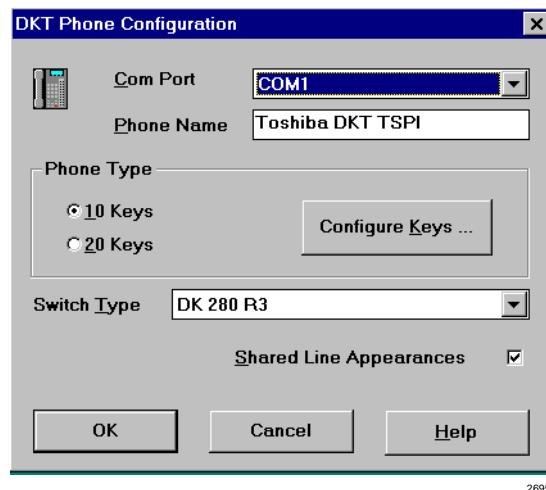
9. Click on Configure Keys to define the functions assigned to each of the telephone buttons.

10. Select a button.

11. Choose a function from the list.

12. Name the button to match the name on the telephone. Repeat for each button to be used (see table).

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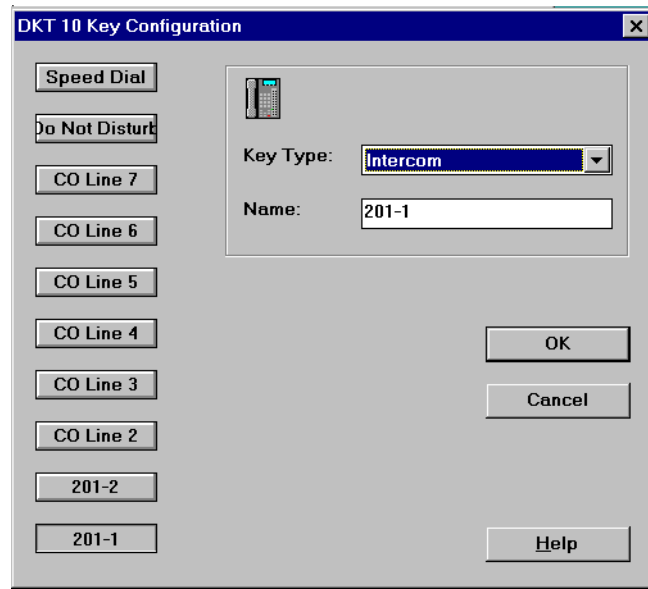
Note Strata Link uses the label to create the customizing Trigger Rules. Unique button names allows rules that apply individually to that button. Buttons with the same name will have the same rule applied. For example, the two PDN buttons will follow any rule If {Call Ringing} on PDN then {Pop Goldmine}". All other buttons will not respond to this rule.

13. Click OK.

Toshiba recommends the following assignments:

Table 13-1 DK Button Definitions:

DK Button	Use
PDN/Intercom	Primary Line
SDN	Secondary Appearance
PhDN	Primary Line
CO Line	CO Line
Speed	Speed Dial
All Others	Feature Key

Using StrataLink for CTI Connections

This section provides important general information on StrataLink and how it operates. For specific instructions on using StrataLink with a given software application, see the Application Notes for that software.

Many Windows-based Computer Telephony software products either do not have a TAPI compliant version of their product, or need the additional capabilities of a "middleware" software to use their software with the Strata DK.

StrataLink is a "middleware" application that provides the multiple line and translation functions for non-TAPI software applications. StrataLink provides the flexibility to interface multiple applications and to be able to define the actions desired for each button on the connected phone.

StrataLink works with Toshiba's TAPI Service Provider (TSPI) v2.26 or higher. Both the TAPI Service Provider and the StrataLink application are included on the TAPI installation disks. Either TSPI, StrataLink, or both can be installed. The installation program selects the appropriate TAPI Service Provider for the PC's operating system.

StrataLink Operation

StrataLink communicates with software applications using Microsoft Windows Open System Architecture capabilities for Dynamic Data Exchange (DDE). The specific messages are defined as Actions in StrataLink. StrataLink contains a number of Actions for popular applications. The user can select from this list or define new Actions for an application.

StrataLink also accepts DDE Execute commands. These commands enable dialing calls, answering calls, holding calls, blind transfer of calls, and hanging up. Many of these commands can be directed to specific telephone buttons or the TSPI can choose the button.

When using this interface for dialing, StrataLink also provides for button preferences to be used for intercom, local, or long distance calls. It can include prefix digits prior to dialing the number and automatically insert a "1," if required for long distance calling.

Incoming calls are based upon events from the TAPI Service Provider. These events (Call Ringing, Call Connected, Call Hold, Call Cleared) are used in the Triggering Rules that define what Actions are needed and when. Filters can be used to qualify when an action should be taken.

Figure 13-1 shows how StrataLink is used with Windows applications to provide telephone services with your desktop PC.
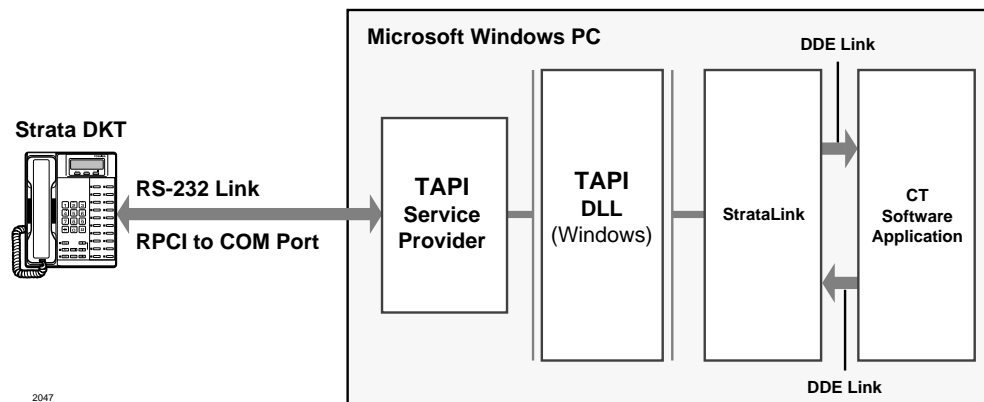
Figure 13-1 Computer Telephony Connection Using Toshiba's StrataLink

StrataLink has three basic functions. It:

♦ Accepts events from the telephone, applies filtering rules and conditions, and causes actions to take place in the application

♦ Provides for outbound calling and call control from the application

♦ Provides tools for testing the interface and debugging or monitoring the call events

Incoming Call Events

Using Windows TAPI, StrataLink accepts the Strata DK commands and provides a selection of Actions based upon call events (Triggers). Each Trigger can have one or more conditions applied to control how, when, or if the Action should be performed. Each Action has a set of parameters that can customize the application for the user. A list of Trigger events can be created for the desired Action.

Provides Outbound Calling and Call Control

The Computer Telephony Software creates events for controlling the telephone. The events are controlled using DDE exchanges originating from the application and received by StrataLink. In some programs, the application software must be configured for this operation.

Tests, Debugs, and Monitors

StrataLink provides several important testing and debugging functions. These tools enable the installer to verify whether the link is functional. The installer can also use the TAPI link to view the details of the information being passed. These tools reduce the guesswork in the troubleshooting and operation verification.

Starting StrataLink

The Main Screen for StrataLink is shown in Figure 13-2. This screen provides access to the main menu, driver setup, the ability to enable/disable the TAPI link, and a testing interface with the telephone. Most Setup items are located under Setup item from the Main Menu.
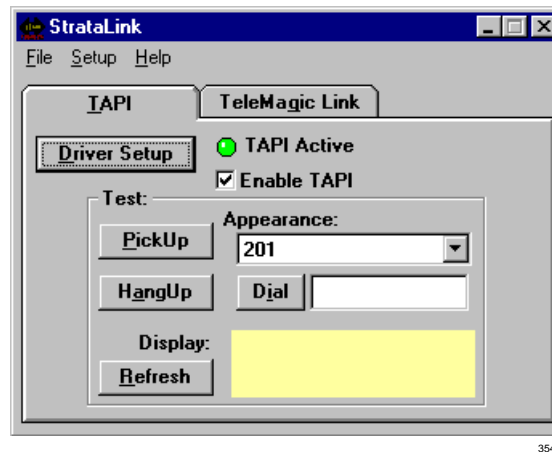
Figure 13-2   StrataLink Main Screen

➤ **To install and set up StrataLink**

1. Load the software by inserting Disk 1 in the floppy disk drive, and from Windows, selecting **Run...**, typing **A:\Setup.exe** and pressing **Enter**.

2. Follow the instructions for installation.

3. Start StrataLink, enable TAPI and wait for the green light that indicates a communication link with the TAPI Service Provider was successful.

4. Press Driver Setup to configure the driver if not previously done as part of the installation.

5. The Driver Setup selects the COM port, system type, and key definitions for the connected phone. Be sure to assign meaningful labels for the keys on the phone as these are used for creating the Triggering Rules.

6. Test the link with the phone using the Test section. Select the button to place a call, enter a number to dial and press Dial.

7. Once the link has been established with the phone, go to Setup to establish the Preferences, add or edit any new Actions.

Note Actions can be tested using the Add/Edit Action and Show Test Params button.

8. Create Trigger Rules using the events expected from the phone and the desired Action.

9. Make several test calls to verify all the pieces are working and the installation is complete.

Preferences

Most application programs when attempting to dial using a DDE command are not able to specify the line appearance for the call. A line appearance must be specified and can be different for the different types of calls:

♦ **Intercom Calls** – dialing numbers with less than five digits.

♦ **Local Calls** – calls that match the local area code specified or calls with only seven digits.

♦ **Long Distance Calls** – any call with 10 or more digits (also indicate if a "1" needs to be added when missing).

When an Intercom or [PDN] button is used to initiate calls, a prefix code is required to select an outside line. Local and Long Distance calls have provisions for prefix digits to be dialed prior to the number received from the software application.

Applications using DDE messages generally will dial the area code of the telephone number even if it is a local call. By assigning a Local Area Code, StrataLink detects these calls, strips off the Area Code of the telephone number, and dials using the "Local" appearance.

For example, if your Local Area Code is "714" and the application attempts to dial "714-515-1234," the program converts the number to "515-1234" before dialing.

It may be convenient to record a person's extension number as part of the telephone number. When dialed the 10 digit number is sent along with the extension number. As long as the number is stored using any letter, such as "x," all digits following are not dialed, e.g. "714-515-1234 x205" is dialed as "515-1234".

Some databases may not include a "1" as part of the dialed number. StrataLink can optionally insert this missing digit by using the option "Add 1+ if Missing". For example, if the application attempts to dial a long distance call like "612-555-1234" (and your Local Area Code is "714"), this option converts the number to "1-612-555-1234" before dialing.

Incoming calls with Caller ID need to have the telephone number in a specific format for the lookup function to work. Caller ID and ANI numbers are received from the telephone network as 10 digits. Many databases store the numbers in a more readable format using punctuation formats by inserting hyphens, parenthesis, and spaces.

StrataLink provides a method for defining the format to present this number to the software application. Any character other than "x" is included as part of the number, where "x" will be replaced with the number received as part of Caller ID.

For example, if the international number plan is needed for the number, then a code for &H of "1+(xxx) xxx-xxxx" is entered. When a number "6125551234" is received, it will be presented as "1+(612) 555-1234".

The Preferences dialog box is shown in Figure 13-3.
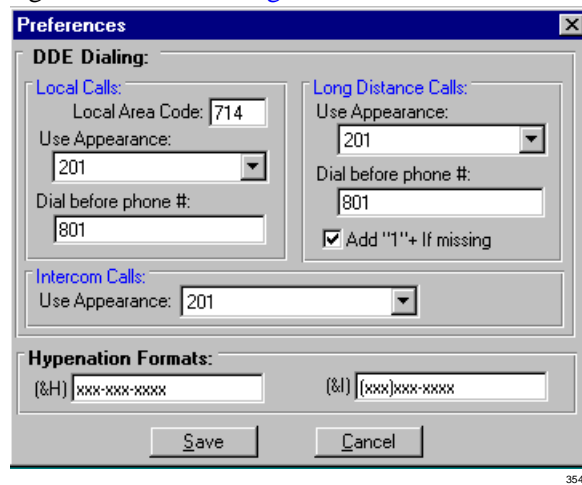
Figure 13-3   Preferences Dialog Box

DDE Commands

StrataLink accepts a number of DDE commands for controlling calls. StrataLink, wherever necessary, offers more than one format for each command. The commands supported include Dial, Answer, Hangup, Transfer, and Hold/Unhold.

Table 13-4   DDE Commands

Dial	Dial a telephone number on the specified line appearance. If the line appearance is not specified, the lowest button appearance (Intercom, Local, or Long Distance) is used. [Dial, "Phone Number", <appearance>] ...or [DialNumber ("Button Name", "Outside Phone Number")]
Answer	Answer a Ringing Call on the specified line appearance. If the line appearance is not specified, the lowest appearance is used. [Answer, <appearance>] ...or [AnswerCall ( )]
Hangup	Hangup on a active call. [Hangup] ...or [DropCall ( )]
Hold	To hold the active call. [Hold]

Table 13-4   DDE Commands *(continued)*

Unhold	Retrieving a call from Hold. If the "appearance" isn't specified, the lowest button number with a holding line is answered. [UnHold, <appearance>]
Transfer	Blind transfer a call to the designated number [Xfr, "Ext Number"] …or Transfer, "Ext Number"]
Quit	Terminates the OA Client program. [Quit]
<appearance>	This is a numerical value for the buttons on the attached phone. Buttons begin on the lower left and count upward beginning with zero.

Telephone System Events

Trigger Rules and Conditions

The Trigger Rules are established by the installer or user so that specific Actions can be performed when an event occurs. The Triggering event can be any number of things (e.g., Call Ringing, Call Connected, Call Holding, or Call Cleared). See Figure 13-5.
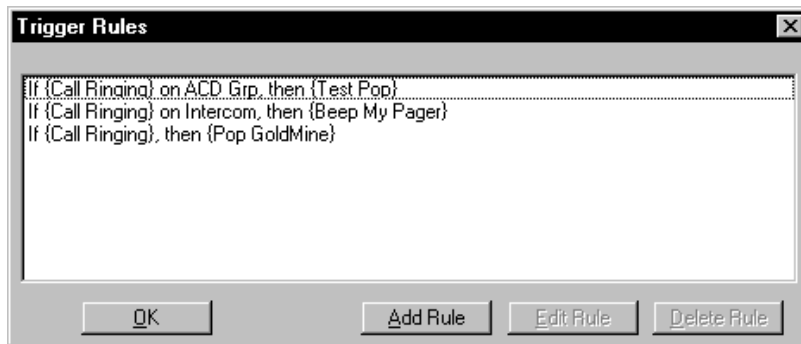
2657

Figure 13-5   Trigger Rules

The existing Trigger Rules can be displayed, edited, deleted or new rules can be added. Multiple rules can be created and active at the same time.

Each rule uses the names assigned in the TAPI Service Provider to determine their application to a given event. Buttons with the same name use the same rule written for that name. For example, creating a Triggering Rule for "Call Ringing" on a [PDN] with multiple appearances can be written to apply only to the PDN name, such as "3351."

Specific [PDNs] can be labeled for "Call Ringing," while other appearances may require a screen pop whenever a call is connected. These other appearances could have the rule "Call Connected" using <any> button. This prevents screen pops for calls which are directly ringing a particular telephone button, while providing screen pops when a call is answered on another button on the phone.

Add/Change a Trigger Rule

When adding or changing a rule, Filters and Conditions fields display on the Add/Change Trigger Rule screen (see Figure 13-6):

3535

Figure 13-6   Add/Change Trigger Rule

Filters

When the triggering event occurs, it may need to pass specific filters or conditions before the Action is performed. The Filters (see Figure 13-6) are:

♦   **Caller ID** – required/not required. If there is no Caller ID associated with a call, you may not want to have an Action performed. The most common example is "Screen Pop" where you may select "any Number" to not perform the action until a Caller ID number has been received. To trigger an event anytime a call rings, regardless of whether Caller ID is present, you need select "none Required."

♦   **Trigger Delay** – a short delay, expressed in tenths of a second, that will occur prior to the action. The delay is needed to allow the Caller ID or other information to be received prior to performing the action.

♦   **Appearance** – the Trigger can be used on any line or a specific line. If the same Trigger applies to some lines but not to others, the rule must be entered for each line to which the rule applies. Buttons having the same name need only one rule, e.g., two buttons labeled 205 would have the same action whenever either ring when a Trigger Rule for Call Ringing is created for appearance 205.

Conditions

Conditions (i.e., Phone State, shown in Figure 13-6) include performing the action "if not talking" or "if trunk number is available." You may not want to have an Action performed while you are talking on a call. Again, a common example is to screen pop only "If Not Talking". This prevents an Action from occurring until you are finished with the call or placed it on hold.

Actions and Parameters

Actions are set up by the installer to perform a specific function (e.g., Screen Pop Goldmine, Pop Telemagic, or Beep My Pager). These Actions can then be used as part of a Trigger Rule and performed when a specific event occurs. The existing Actions can be displayed (Figure 13-7), edited, deleted or new Actions added.

3533

Figure 13-7   Add/Change Actions

Important!   Deleting or adding Actions without instructions from Toshiba or knowledge of your program's DDE commands is not recommended. Toshiba supports editing actions that are based on Application Notes.

Add/Edit Action

When adding or editing an Action, the following fields are displayed (see Figure 13-8 and the following text):
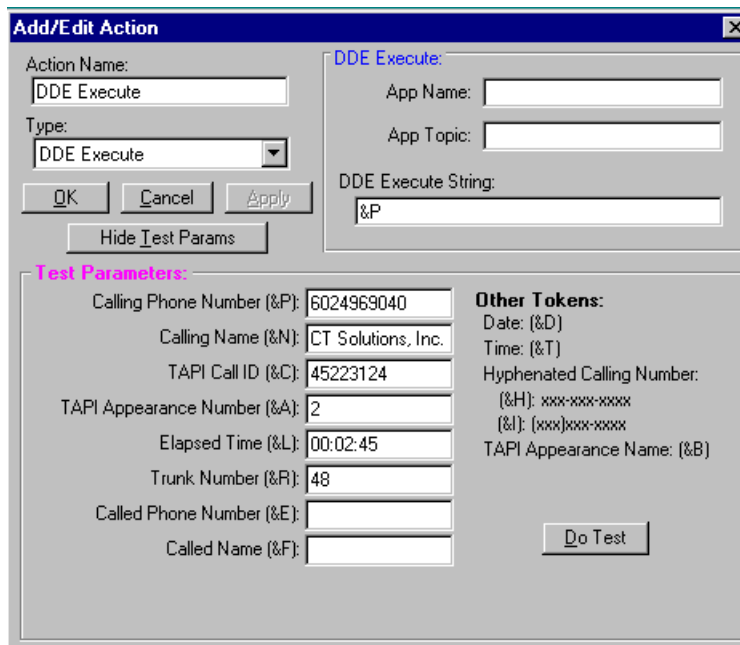
3543

Figure 13-8   Add/Edit Actions

Important!   *Changes to these items without specific instructions in the program's Application Notes is not supported by Toshiba.*

Action Name – Every event Action has a "Name" that you should set to describe the result the action, such as "Beep My Pager." This name is used in the Trigger Rules.

Type – Select the Action to be performed from the pull-down menu. Each Action has one or more parameters that must be provided by the user/installer. These parameters often contain "tokens" that enable the inclusion of real-time information (e.g., Caller Phone Number, Date, Time, etc.). The choices are as follows:

♦ **DDE Execute** – Sends a specific DDE command to the program you specify. This Action is very flexible and can be used to communicate with many different types of programs for a variety of purposes (e.g., Screen Pop). DDE Execute String parameters include:

  ♦ **App Name** – Used to set the DDE name of the application to receive the DDE event.

  ♦ **App Topic** – Used to set the DDE "Topic" for the application to receive the DDE event.

  ♦ **DDE Execute String** – This is the command executed by the application receiving this DDE event. Typically this command includes token(s) so that real-time information is included in the command string.

♦ **Show/Hide Test Params Button** – When you set up an Action, it is always a good idea to make sure the Action works correctly. The Show Test Params button exposes a set of parameters (e.g., Calling Phone Number and Calling Name) that can be changed for verifying the action defined.

➤ To execute the command, press the Do Test button.

The results of the action are displayed on the lower part of the window. Clicking on the open part of the window clears the test results and the process repeated.

Some parameters contain token(s) that enable the inclusion of real-time information (like the Caller Phone Number, Date, Time, etc.). The Tokens are described in Table 13-9.

Table 13-9   Tokens

Token	Function
&P	Caller Phone Number: Unformatted
&H	Caller Phone Number: Formatted 714-555-12341
&I	Caller Phone Number: Formatted (714)555-12341
&N	Caller Name
&L	Elapsed Time of Call (Seconds)
&C	TAPI Call ID
&R	Trunk (CO Line) Number
&E	Called Phone Number (DNIS)
&F	Called Name (DNIS Tag)
&A	Phone Button Number
&B	Phone Button Name
&D	Date: MM:DD:YY
&T	Time of Day: HH:MM

Note   The format is defined using the Preferences dialog box.

TeleMagic Link

The TeleMagic program (from Telemagic, Inc.) communicates with StrataLink via a special link called TeleMagic. The TeleMagic Link appears automatically each time StrataLink is accessed and provides a means to set up and monitor communication between the two programs.

Important!   *For this link to operate, the TeleMagic program must be loaded and operational.*

If you select Auto Activate Link (see Figure 13-10), StrataLink automatically attempts to establish the TeleMagic link periodically (every 30 seconds or so) until the connection is made. Once the link is established, the Link Active light changes from Red to Green, dialing and Screen-Pop can function. For Screen-Pop to work, the appropriate Trigger Rules must be set up.
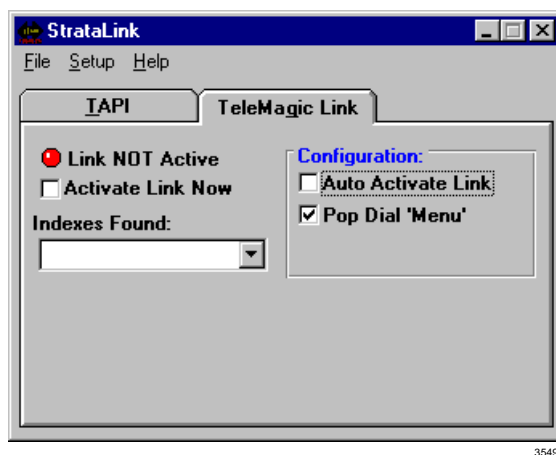
Figure 13-10   Telemagic Link

Pop TeleMagic

This instruction sends a "Pop" or "LookUp" command to TeleMagic with the configuration you specify. This is used to Screen-Pop the TeleMagic contact manager when a call rings in. Pop TeleMagic parameters are:

♦   **Index Level** – Tells TeleMagic the level on which to perform the search (e.g., 1, 2, 3, etc.). Leaving this parameter blank causes the search to occur on the level in present use.

♦   **Index Name** – Selects the TeleMagic index to be used for the search. For Screen Pop this is typically "TelePhone #", but since the Indexes within TeleMagic are programmable, this could be set to any appropriate index. The TeleMagic Link must be operational before you can make this selection.

♦   **Search String** – This should be set to whatever string should be searched for using the above two parameters. For Screen Pop, this is typically the Calling Phone number which would be the token &P.

Testing TSPI Link

The TAPI dialog box provides a method for verifying the TAPI Driver is setup and operational. To check the driver, select an appearance (e.g., Intercom) and click on each of the Pickup, Dial, and Hangup keys individually. To complete the test, you should repeat this procedure for each line appearance.

To access the setup screen for the Toshiba TAPI Service Provider, click on the Driver Setup button. The Configure Keys section of the screen should be programmed properly as they will be

interrogated and used as the Appearances by StrataLink. Whenever you make configuration changes to the TAPI Service Provider, it is recommended that you exit and restart StrataLink.

The Display section on the screen is the display found on the phone. This information is not normally shown and can be activated by pressing Alt+O (See Figure 13-11).

Figure 13-11   StrataLink Main Screen

Show Events

♦ Show Events opens a Debug Events screen which shows real-time events as they occur (see Figure 13-12). The Display option enables you to choose which event you will monitor.
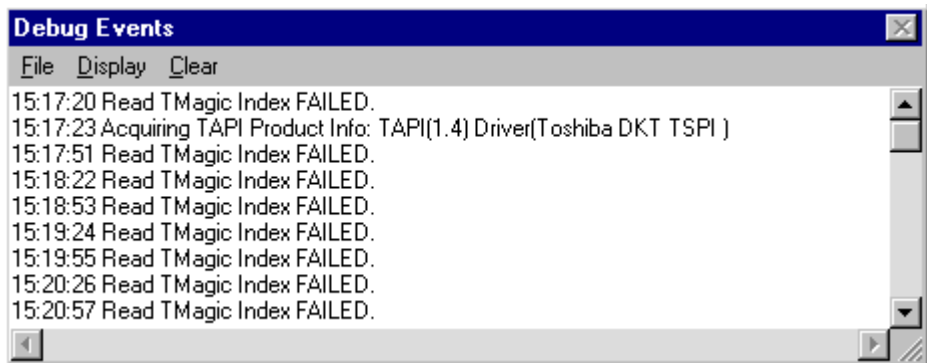
Figure 13-12 Debug Events Screen Telephone System Events

♦ Show Calls displays the Active Call Queue window (see Figure 13-13), which can be kept open while other activities and functions are performed.
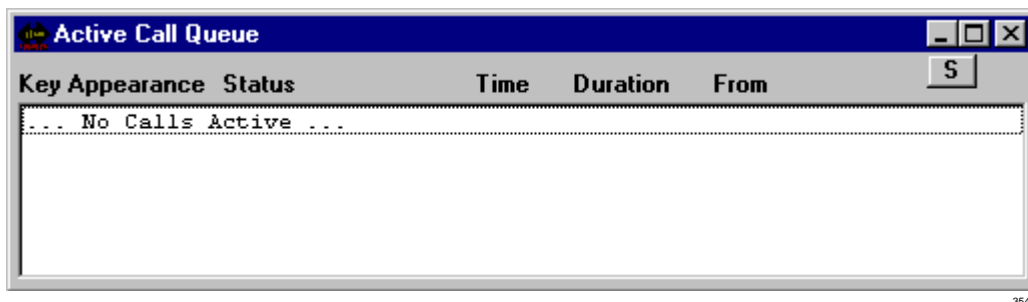
Figure 13-13 Active Call Screen

CTI Application Bulletin Contents

The list below gives you the current application bulletins available for understanding, installation and operation of third-party software applications with your Toshiba telephone system.

As you get future updates and new bulletins, simply replace older ones with the updates and/or add the additional bulletins. Updates and additions that may affect the list below will also include an update to this Contents page.

♦   AB50-0013   September 15, 1997   Update for Using Goldmine 95 with StrataLink
                                      (Replaces AB50-0008, April 1, 1997)

♦   AB50-0012   September 15,1997   TSPI Description V2.26

♦   AB50-0011   September 15, 1997   Using ACT! 3.0 with StrataLink

♦   AB50-0010   September 15, 1997   Using ACT! 2.0 with StrataLink

♦   AB50-0009   April 1, 1997   Using TeleMagic Enterprise V2.2 with StrataLink

♦   AB50-0008   April 1, 1997   Using Goldmine 95 with StrataLink
                                      (use AB50-0013)

♦   AB50-0007   April 1, 1997   Using DayTimer Organizer V2.0 with StrataLink

♦   AB50-0006   April 1, 1997   Using Commence V2.0 with StrataLink

♦   AB50-0005   April 1, 1997   Golden Gate Pager Client/Server user StrataLink

♦   AB50-0004   April 1, 1997   This bulletin is obsolete. Refer to the new section
                                      "Using StrataLink for CTI Connections" on Page 13-6.

♦   AB50-0003   April 1, 1997   TSPI Description V2.15

♦   AB50-0002   January 10, 1997   Installing ACT! Trial Size Demo Software

♦   AB50-0001   January 10, 1997   Using ACT! Phone Link with Strata DK

♦   *Understanding Computer Telephony in a Business Phone System*, April 1, 1997

Note   All of the above application bulletins have been sent to you in previous mailings. Place them after this page. If you do not have these bulletins, they can be found on the *Strata DK Library CD-ROM*.

ISDN Interfaces

14

This chapter covers information on the ISDN Primary Rate Interface (PRI) and Basic Rate Interfaces (BRI).

PRI and BRI Overview

♦ PRI is available on DK424 Release 4.0 systems with RCTUBA3/BB4, C3/D4, and E3/F4 processors; but unavailable for any other Strata DK systems or processors.

For PRI services, the Strata DK424 uses an RPTU PCB to connect to a Public Switched Telephone Network (PSTN) PRI line using a UL listed Channel Service Unit (CSU) in most locations in the U.S. Each RPTU provides 23B + D channels. The B-channels support CO speech and data connections on the PSTN side only. The RPTU PCB is shown in Figure 14-2 on Page 14-6.

♦ BRI S/T is available for DK40i and all DK424 Release 4.1 processors including RCTUA4, but not for any other DK systems.

For BRI S/T services, the DK424 uses an RBSU PCB; the DK40i uses TBSU and RBSU. Both the RBSU and TBSU provide two BRI S/T circuits to connect to the PSTN BRI line using an external UL listed NT1; or, on the station-side, connect to:

   ♦ S-type ISDN telephones and Terminal Equipment (TE-1-S)

   ♦ S-type Terminal Adapters (TA-S) with non-ISDN devices

Each TE-1-S and TA1-S device can support voice and/or RS-232 switched-circuit data as shown in Figure 14-1. The station-side BRI S/T circuits are point-to-multipoint.

A subassembly (RBSS) can be attached to the RBSU for two additional BRIs for S-type station-side connections only. The RBSU PCB and the RBSS subassembly are shown in Figures 14-14 and 14-15 on Page 14-21. The combination of RBSU and RBSS uses only one slot to provide up to four BRI S/T circuits.

Note In DK424, each installed RBSU or RBSS circuit provides a 2B + D connection and uses a system capacity of two station ports and two CO lines regardless of the circuit application, even if the circuit is not actually connected. In the DK40i, each TBSU, RBSU, or RBSS circuit uses two CO lines (no station ports) when configured for the CO side and two station ports (no CO lines) when configured for the station side.

♦ BRI U will be available on all Release 4.2 processors for the DK424, including RCTUA4, as well as the DK40i.

For BRI U services, the Strata DK424 uses an RBUU PCB. The RBUU provides two BRI U circuits that connect directly to PSTN BRI lines; or, on the station side, connect to:

♦ U-type ISDN telephones and Terminal Equipment (TE-1-U)

♦ U-type Terminal Adapters (TA-U) with non-ISDN devices

Each TE-1-U and TA-U device can support voice and/or RS-232 switched-circuit data depending on the device (see Figure 14-1). The station-side BRI U circuits are point-to-point.

A subassembly (RBUS) can be attached to the RBUU for two additional BRIs for PSTN and/ or U-type station connections. The RBUU PCB and the RBUS subassemblies are shown in Figure 14-28 on Page 14-33 and Figure 14-29 on Page 14-34. The combination of RBUU and RBUS uses only one slot to provide up to four U-type BRI circuits.

Note Each installed RBUU or RBUS circuit provides a 2B + D connection and uses a system capacity of two station ports and two CO lines regardless of the circuit application, even if the circuit is not actually connected.
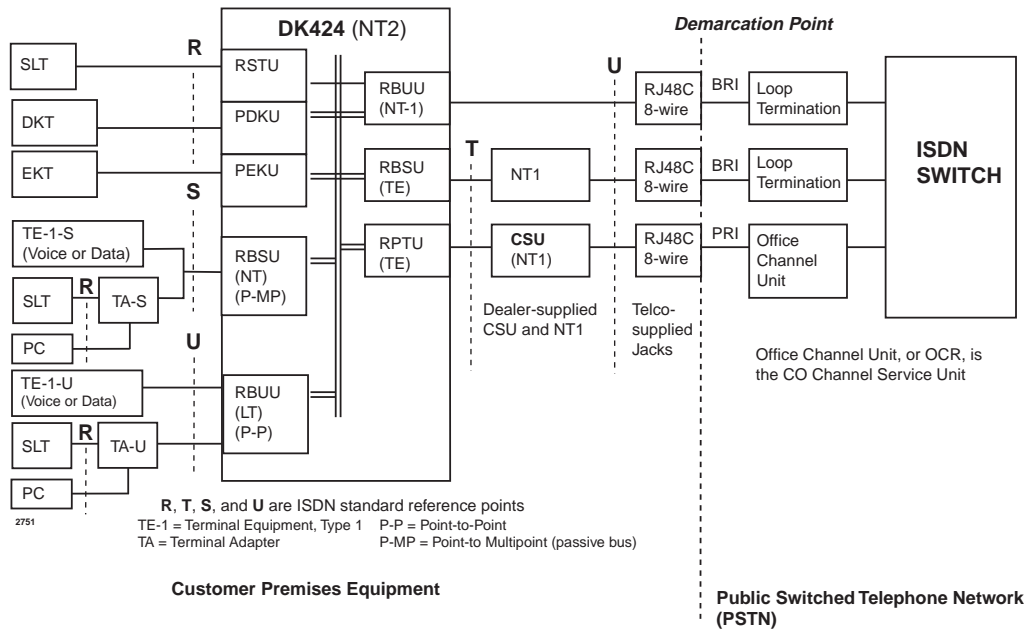
Figure 14-1   DK424 ISDN Reference Model

RPTU Interface Unit

System: *DK424 Release 4.0*

Circuits per PCB: *24 channels*

Interfaces with: *ISDN PRI*

Older Version(s): *none*

The DK424 Release 4.0 system supports the RPTU according to the common control units resident in the system.

Note   The RPTU cannot be installed in a system operating with the RCTUA4.

The RPTU requires installation of a customer-provided CSU in most locations of the U.S. Refer to "CSU Requirements" on Page 14-3 for CSU installation.

Testing procedures (local and remote loop back) are in "Loop-back Testing" on Page 14-10.

The RPTU's LEDs indicate a continuous status of its operation. They are shown in Figure 14-3. Table 14-5 on Page 14-7 lists the functions for each LED.

Switches, jumpers, and interface connectors are described in Figure 14-2.

RPTU Overview

The RPTU is a DS-1 divided into 24 TDM channels using standard T1 electrical signal format. The RPTU's D-channel is typically the 24th channel and can control the signaling of 23 of its own B-channels and 24 B-channels of another designated RPTU. Each RPTU can also use its own D-channel for control.

The RPTU's in-service bit rate is 1.544 mbps (± 4.6 ppm), but during a maintenance session, the rate may vary ± 32 ppm. The RPTU provides Binary 8-Zero Substitution (B8ZS) and ESF with Framing Pattern Sequence (FPS) and Cyclical Redundancy Check (CRC) error checking in the framing bits.

Note   The Embedded Operations Channel (EOC) which carries alarm notifications, statistics, and error indications is *not* available with DK Release 4.0 software.

Extracting the Stratum-1 clock from the ISDN PRI, BRI, or T1 provider is the most common method used to synchronize the RPTU PCB and the DK time switch to the public telephone network. One RPTU, RBSU, RBUU, or RDTU T1 must extract the clock from the ISDN or T1 provider. The selected unit is designated as the "Primary" timing source in system Program *41-1. For more information, refer to "Timing and Synchronization" on Page 14-11.

A dealer-supplied CSU must be installed between the ISDN PRI network line and the RPTU PCB as shown in Figure 14-1. Some telephone companies supply the CSU and call it the Network Interface Unit (NIU).

CSU Requirements

In the U.S., the CSU must be UL listed and comply with Part 68 of the FCC rules. It must also comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. In Canada, the CSU must be CSA certified.

ISDN Interfaces

The CSU is transparent to data, clock, and framing. It acts as a repeater, not a controller, for timing. The CSU also acts as a signal regenerator and must be able to perform loop-back tests and maintenance to both the network and DK RPTU. The CSU is the same type as used for T1 circuits although it performs the function as NT1 for PRI ISDN in the ISDN reference model as shown in Figure 14-1.

Slot Assignments

Up to eight RPTU PCBs can be installed in a DK424 system providing up to 188 PRI lines (B-channels). If RPTU (PRI) and RDTU (T1) PCBs are installed in the same DK424, the maximum combined PCBs cannot exceed the numbers provided in Table 14-1. The PCBs must be placed in designated slots in each of the DK424 cabinets per Tables 14-2 and 14-3. The next highest slot adjacent to the RPTU slot must be vacant.

Program 03, code 79 designates which cabinet slots contain RPTU PCBs. The maximum number of cards and lines is listed in Table 14-3.

Table 14-1   Maximum Number of RPTU PCBs, Lines, and Stations

Processor	Max. PCBs	Max. Lines
RCTUA (1~4)	0	Not Applicable
RCTUBA3/BB4	2	47 B-Channels
RCTUC3/D4	6	141 B-Channels
RCTUE3/F4	8	188 B-Channels

Table 14-2   DK280 or DK424 Base Cabinets with BA3/BB4, or C3/D4 with MBJU; or DK280 Base with RCTUE3/F4

DK280 or DK424 Cabinet No.	RPTU[1]/Vacant Slots[2]		
1 (base)	13[1]/14[2]	15[1]/16[2]	
2	21[1]/22[2]	23[1]/24[2]	25[1]/26[2]
3	31[1]/32[2]		
4	41[1]/42[2]		
5	51[1]/52[2]		
6	61[1]/62[2]		

1. Allowed RPTU slots.

2. Slots must be vacant.

Table 14-3   DK424 Base Cabinet with RCTUE3/F4 with MBJU Removed

Cabinet		RPTU[1]/Vacant Slots[2]		
No.	Type			
1	DK424 (base)	$13^1/14^2$	$15^1/16^2$	
2	DK280	$21^1/22^2$	$23^1/24^2$	$25^1/26^2$
	DK424	$21^1/22^2$	$23^1/24^2$	
3	DK280	$31^1/32^2$		
	DK424	$31^1/32^2$	$37^1/38^2$	
4	DK280	$41^1/42^2$		
	DK424	$41^1/42^2$	$47^1/48^2$	
5	DK280	$51^1/52^2$		
	DK424	$51^1/52^2$	$57^1/58^2$	
6	DK280	$61^1/62^2$		
	DK424	$61^1/62^2$	$67^1/68^2$	
7	DK280	Does not have a seventh cabinet.		
	DK424	None		

1. Allowed RPTU slots.
2. Slots must be vacant.

RPTU Installation

Before installing a RPTU PCB into a DK424, a number of system programs should be run. This enables the RPTU to function immediately upon insertion. It is recommended that you run these programs in the order listed in the *DK Programming Manual* (refer to the ISDN section) before beginning installation.

➤ **To install an RPTU PCB**

1. Set the jumper wire plugs JP1 and JP2 (LB) to the OFF position.

2. Turn the DK424 system power OFF.

3. Insert the RPTU (component side facing right) into the appropriate slot (see "Slot Assignments" on "Slot Assignments" on Page 14-4) and apply firm, even pressure to ensure proper seating of connectors.

4. After installing the RPTU, gently pull the PCB outward. If the connectors are properly seated, a slight resistance is felt.

Note   For cabling information and requirements, refer to "Cabling" on Page 14-8.
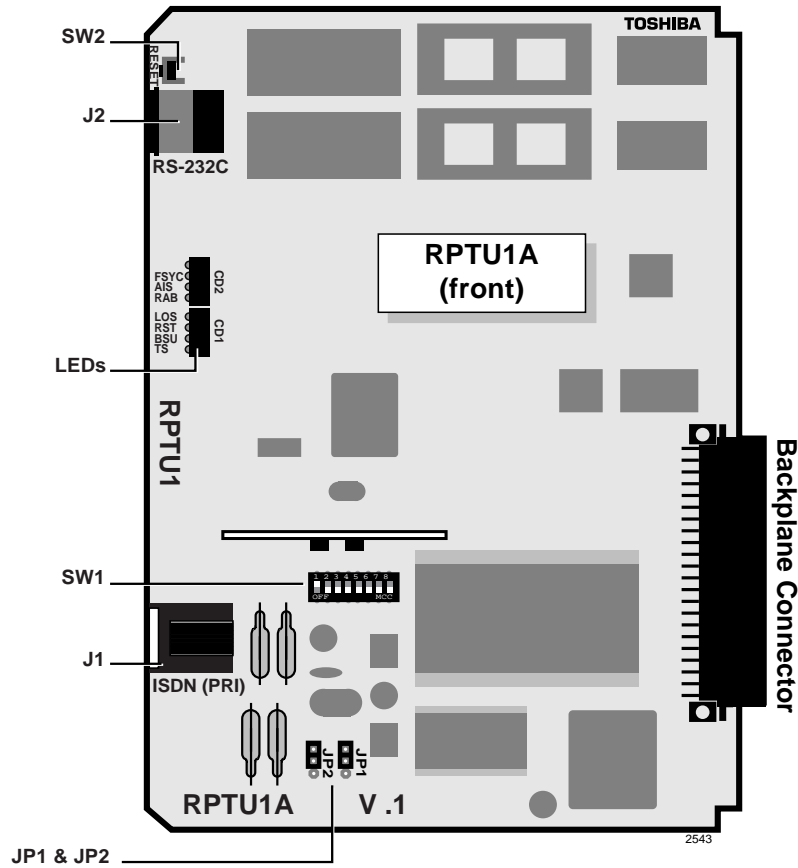
Figure 14-2   RPTU PCB

Table 14-4   RPTU Switches, Jumpers, and Connectors

Switches/Jumpers/Connector	Description
SW1 (Line length adjustment switch)	Matches the RPTU impedance to the impedance of the line (length between the CSU and the RPTU). Refer to Table 14-6 on Page 14-8.
SW2 (Reset switch)[1]	Resets or initializes the RPTU firmware. Press this switch to correct an out-of-service condition, or just prior to connecting to the Network PRI.
JP1 & JP2 (Loop-back jumpers)	Makes loop-back tests of the cabling between the ISDN Network switch, CSU, and RPTU.
J1 8-pin Modular Connector (RJ-45)	Connects the RPTU to the CSU/network PRI ISDN line.
J2 6-pin Modular Connector (RJ-11)	Connects the RPTU to a terminal or PC to monitor D-channel data.

1. If this switch on the Primary Clock source RPTU is pressed (Program *42-1), the clock source will automatically revert to the Secondary Clock source PCB (Program *42-2).

2747
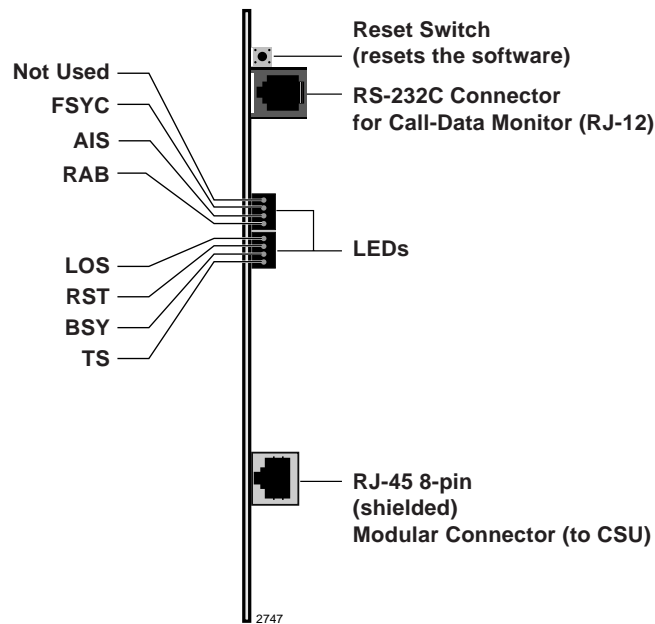
Figure 14-3 RPTU LEDs and Connectors

Table 14-5 LED Functions

LED	Functions
FSYC	Frame Synchronization ON: Frame alignment is lost. OFF: Frame alignment is working properly.
AIS	Alarm Indication Signal ON: Receiving an alarm from the CO. OFF: Circuit is working properly.
RAB	Remote Alarm ON: Receiving a remote alarm from the CO. OFF: Circuit is working properly.
LOS	Loss of Signal ON: IC signal cannot be detected. OFF: Circuit is working properly.
RST	Reset ON: CPU is resetting the software. OFF: Circuit is working properly.
BSY	Busy ON: One or more B-channels are busy. OFF: All B-channels are idle.
TS	Timing Signal ON: Circuit is secondary timing source. OFF: Circuit is not used for system timing. Flashing:Circuit is primary timing source.

Cabling

To meet Part 15 of FCC Rules, ISDN PRI equipment must be connected using CAT5, Shielded Twisted-Pair (STP) cabling between the CSU and the RPTU. CAT5 STP protects against cross talk, Radio Frequency Interference (RFI), and/or Electro Magnetic Interference (EMI). STP protects ISDN signal data while being transmitted through the cable and keeps the cable itself from emitting EMI and RFI.

Important! *To avoid ground loops, connect only the RPTU end of the shielded cable to ground. The DK grounds the CAT5 cable shield between the DK and CSU at the RPTU RJ-45 jack. You do not have to connect the CSU ground drain. The CSU ground should not be connected to the cable shield.*

Shield continuity must be maintained from the RPTU to the CSU, particularly if using extension connecting cables. Keep the cable as short as possible between the CSU and the PRI Demarcation jack, because there is no shield between the CSU and the Demarcation jack.

Toshiba provides a cable kit (Part No. RPRI-CBL-KIT), that contains all that you need to connect the network ISDN jack to the network side of most CSUs and the equipment side of the CSU to the RPTU PCB. Depending on the manufacturer, the CSU may use DB15 or modular jacks. If the CSU is equipped with the modular jacks, the DB15/modular adapters are not used. If this is the case, make sure the CSU modular jacks are not shielded jacks. Refer to Figure 14-3 for more information.

A detailed pinout diagram for the RJ-45 jacks (USOC RJ-48C or RJ-48X) and the modular cords/adaptors is shown in Figure 14-2 on Page 14-6.

Cable Length

The distance between the RPTU and CSU or RPTU and other Customer Premise Equipment (CPE) may vary (0~655 ft.). The RPTU must be equalized and its impedance must match the impedance of the connecting cable. Set SW1 on the RPTU for the proper cable length as shown in Table 14-6. Refer to Figure 14-2 for switch locations.

Table 14-6   SW1 Settings

SW1	Short (0 - 150 ft.)	Medium (150 - 450 ft.)	Long (450 - 655 ft.)
1	ON	OFF	OFF
2	OFF	ON	OFF
3	OFF	OFF	ON
4	OFF	ON	OFF
5	OFF	OFF	ON
6	OFF	ON	OFF
7	OFF	OFF	ON
8	Not Used	Not Used	Not Used

Cable Installation

The RPTU PCB is shipped with a Toshiba RPRI cable kit for connection of the RPTU to a CSU. Install the kit as shown in .
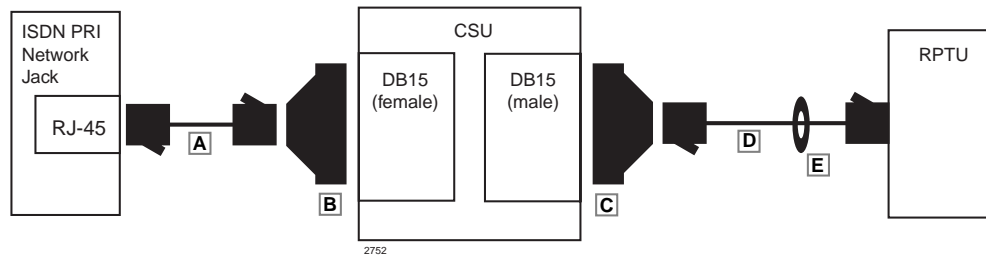
Item	Description
A[1]	Fifteen feet of CAT5 unshielded cable
B	One DB15 modular adapter (CSU to network jack)
C	One DB15 modular adapter (CSU to RPTU)
D[1]	Thirty feet of CAT5 shielded cable
E	One Ferrite core

1. Cable A and D are straight-pinned data cables, not cross-pinned telephony cables.
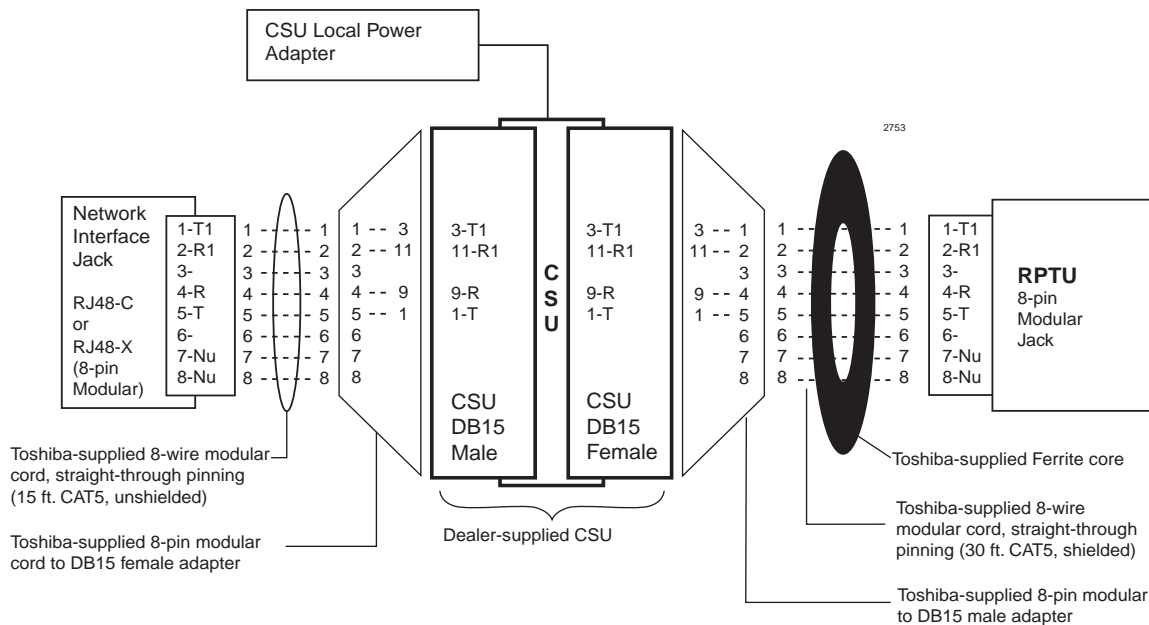
Network Jack/RPTU Modular Jack	
Pin	Function
1	Tip – Receives from the network (NT – TE)
2	Ring – Receives from the network (NT – TE)
3	Not Used
4	Ring – Transmits to the network (TE – NT)
5	Tip – Transmits to the network (TE – NT)
6	Not Used
7	Not Used
8	Not Used

Notes

- The modular pins are numbered left to right when looking into the jack cavity with the locking clip down.

- Shield continuity must be maintained between the RPTU and the CSU, particularly on extension cords. Since there is no shield continuity across the CSU and network jack, the cable should be kept as short as possible.

Figure 14-4   Detailed Pinouts for ISDN PRI Cabling

Ferrite Core

Install the Ferrite core provided with the RPRI cable kit as shown in Figure 14-5. This core is needed to comply with FCC requirements.

**RPTU
Side View**

ISDN PRI Jack

CAT5 Shielded Cable

Tie Wrap

2754

Ferrite Core
ZCAT3035-1330

Note: The Ferrite core must be as close as possible to the RPTU.

One Turn
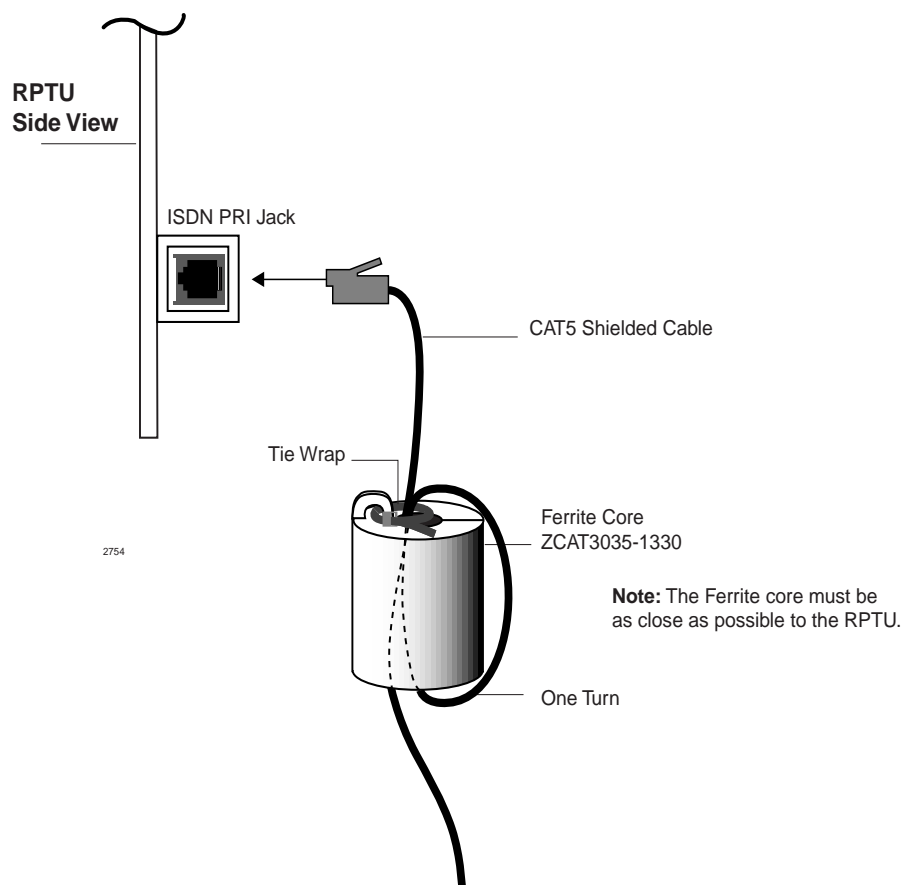
Figure 14-5   Ferrite Core Installation

RPTU Testing and Troubleshooting

Loop-back Testing

The RPTU has loop-back test jumpers that enable physical connections (cables/jacks/plugs) between the RPTU, CSU, and the network PRI line to be tested (see Figure 14-6). The tests check that the CSU receives and transmits the PRI signal properly in both directions. The test signals, generated by the Network PRI provider, pass through the CSU and loop around the RPTU. The RPTU sends the received test signal back through the CSU to the Network and the Network detector checks for a valid signal.

➤ **To perform the loop-back test**

1. Remove the PRI modular cord from the RPTU RJ-45 jack and remove the RPTU from its card slot.

2. Place the JP1 and JP2 jumpers to the LB-ON position. Install the RPTU with the DK power OFF and the PRI modular disconnected from the RPTU RJ-45 jack.

3. Turn the DK power ON and connect the PRI modular cord to RPTU RJ-45.

4. After the PRI line and RPTU are synchronized, have the CO generate the loop-back test sign (all "1s" or "0s").

CAUTION!   **Do not have the CO do a QRS loop-back test, because the test signal may cause the DK to drop all calls and/or stop operating.**

---

5. If the loop-back test fails, perform tests to isolate the problem with an ISDN test set, such as the Sunbird, ISDN, or Trend DUET. In this case, the network PRI line is disconnected and the test set is connected to the CSU network input jack. For testing details, refer to the ISDN test set operating procedures.
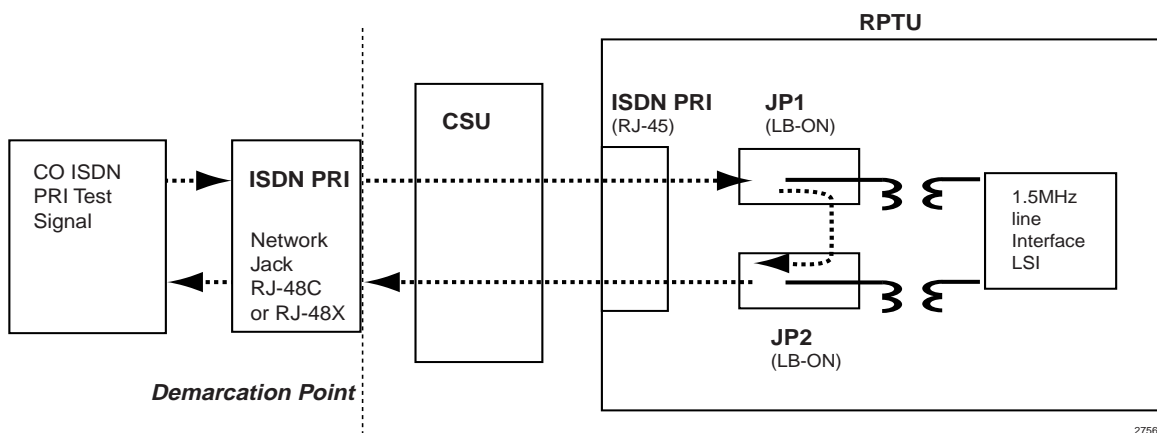
Figure 14-6   Loop-back Test

Timing and Synchronization

The Digital Network is connected by timing clocks that synchronize the network and have various degrees of precision (stratum levels). There are four stratum levels – 1 is the highest and 4 is the lowest. They are associated with the following sources:

♦   **Stratum – 1**: Public Telephone Network clock

♦   **Stratum – 2**: #4 ESS Toll Switches

♦   **Stratum – 3**: #5 ESS Central Offices

♦   **Stratum – 4**: Digital PBXs

In the DK424, one PRI, BRI, or T1 PCB can be programmed to extract the Stratum clock signal. It uses the signal as the DK system Primary clock reference. The clock provider should be a reliable source, such as a Telco or common carrier (AT&T). All other PRI, BRI, or T1 lines connected to the DK424 will be synchronized to the same clock provider. If the PRI, BRI, or T1 are not synchronized to the same clock provider, the DK424 could experience "slip" problems.

Timing reference assignments for PRI, BRI, and T1 are made with the Program *42 series. The timing or synchronization program determines how the DK424 digital voice or data transmission path is synchronized with the far-end digital path. For proper PRI, BRI, and T1 operation, the equipment at each end of the line must be synchronized.

The RCTU time switch is synchronized as the slave to the PRI, BRI, or T1 line (Line 1 in Figure 14-7). The DK424 PRI, BRI, or T1 in any slot number can be assigned as the Primary reference (Program *42-1, DATA=1 for this PRI, BRI, or T1).

If a malfunction occurs and Primary reference synchronization is lost, the DK424 automatically switches modes and synchronizes to the Secondary reference, provided that there is another PRI, BRI, or T1 installed in the DK424. The Secondary reference PCB is assigned in Program *42-2.
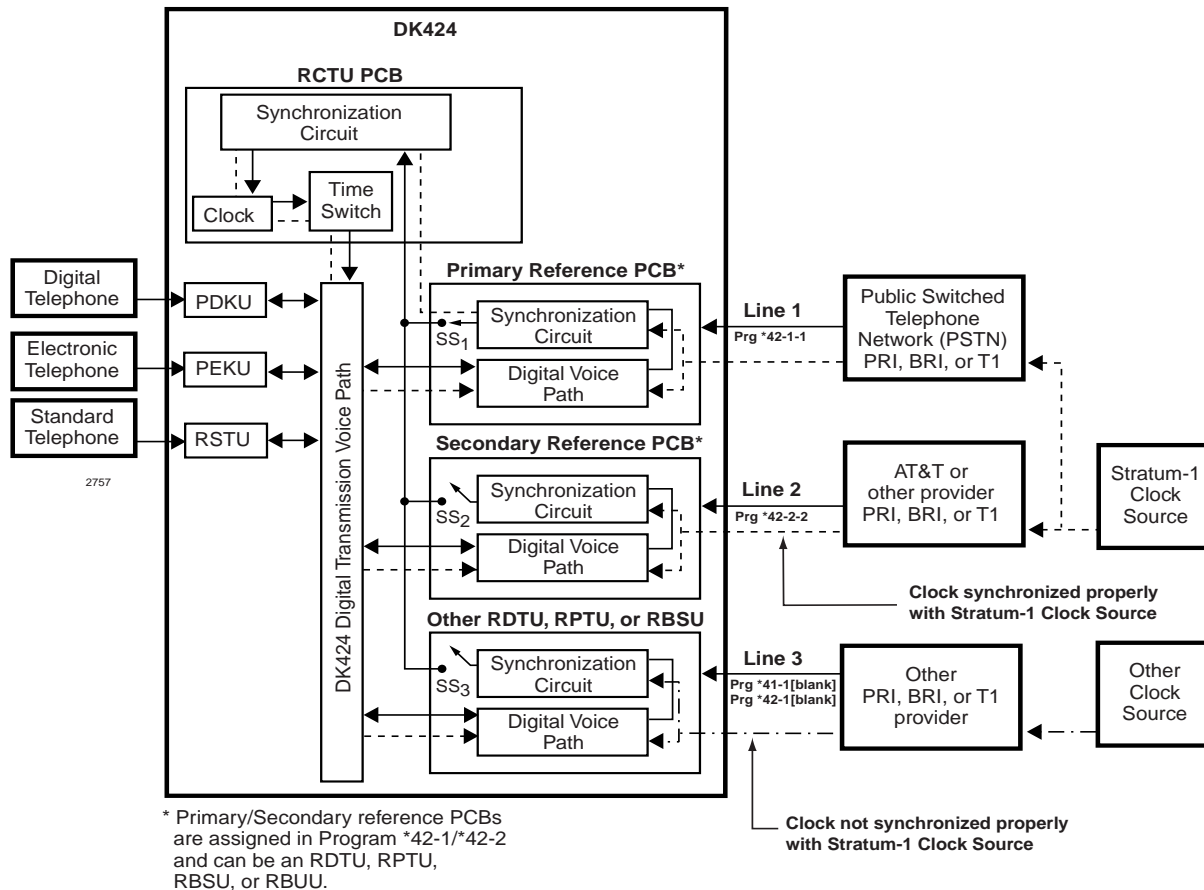
Figure 14-7   Primary and Secondary References

Figure 14-7 shows the Primary reference PCB. The clock signal from Line 1 passes through the PCB Software Switch (SS$_1$) and the synchronization circuit of the RCTU PCB. The RCTU clock passes the clock source through the time switch and synchronizes the DK424 digital transmission voice or data path.

The Secondary reference is activated if the Primary reference fails. The DK424 automatically *switches over* to the Secondary reference PCB by opening its synchronization circuit (SS_1) and closing the synchronization circuit (SS_2). When this occurs, the digital voice or data path of the DK424 is synchronized to the Line 2 clock source.

If the path is not synchronized to the Stratum – 1 clock source, calls connected through that path experience "slipping" or "jitter" in the digital voice or data path (channels). Figure 14-7 shows an unsynchronized signal from Line 3. The unsynchronized signal produces a clicking or popping sound that is heard by the people connected through this path or causes data errors on data transmissions.

RPTU Call Monitoring (PRI)

The RPTU provides an RS-232 monitor function that enables you to monitor the ISDN PRI D-channel call progress layer two and three messages (setup, connect, and release). This data can be monitored live, saved to a file, and/or printed using a PC with communication software.

The hardware connections and communication parameters for the RPTU monitor port are shown in Figure 14-8. Once this connection is setup and established, call monitoring data continues to be sent (on the fly) as PRI calls are originated or received.

Two sample printouts from the RPTU monitor are provided. Figure 14-9 shows typical ISDN PRI start-up and synchronization sequences that occur at connection and power on. Figure 14-10 shows typical ISDN PRI outgoing call setup and release sequences.

The communication parameters for all call-monitor jacks are 9600 bps, 7, 1, even.
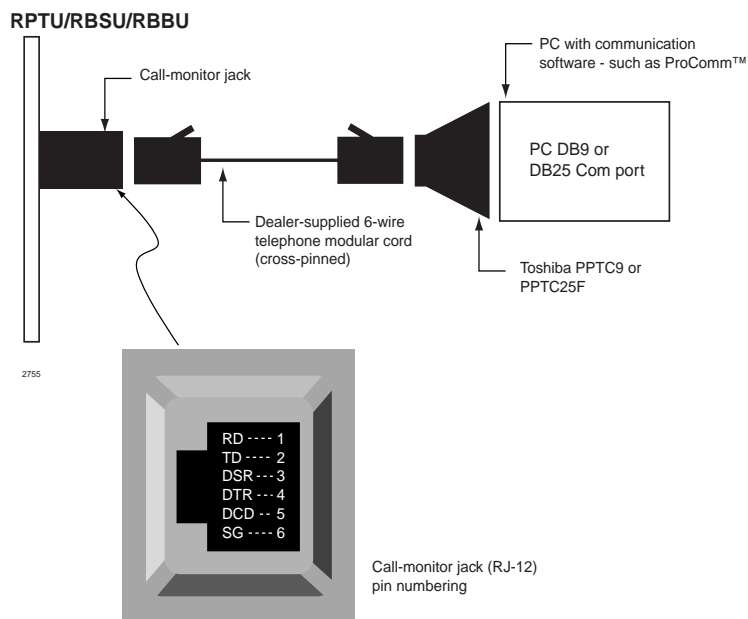
Note The RPTU, RBSU, and RBUU ISDN interface PCBs each have a call-monitor jack. The pin numbering and communication parameters are the same for each call-monitor jack. The call-monitor jack on each PCB provides data only for the circuits of the PCB on which it appears.

Figure 14-8   Call-monitor Jack for the RPTU, RBSU, and RBUU

```
              /*------------------------*/
                Copyright(C) 1997
                TOSHIBA Corporation
                All rights reserved
                RPTU Ver.1G
                [Reset]
              /*------------------------*/
              <U1>00;00 016 Act.        (F1)

              /*------------------------*/
                Copyright(C) 1997
                TOSHIBA Corporation
                All rights reserved
                RPTU Ver.1G
                [Reset]
              /*------------------------*/
              <U1>00;00 016 Act.        (F1)
              <U1>00;09 634 LOS         (F3)
              <U1>00;12 109 Act.        (F1)

              /*------------------------*/
                Copyright(C) 1997
                TOSHIBA Corporation
                All rights reserved
                RPTU Ver.1G
                [Reset]
              /*------------------------*/
              <U1>00;00 017 Act.        (F1)
              <U1>00;06 619 Tx :[SAPI]00 C [TEI]000 [FRAME]SABME P
              <U1>00;06 630  Rx:[SAPI]00 R [TEI]000 [FRAME]UA    F
              <U1>00;07 236  Rx:[SAPI]00 C [TEI]000 [FRAME]SABME P
              <U1>00;07 245 Tx :[SAPI]00 R [TEI]000 [FRAME]UA    F
              <U1>00;11 754 LOS         (F3)
              <U1>00;14 228 Act.        (F1)
              <U1>00;14 415 Tx :[SAPI]00 C [TEI]000 [FRAME]SABME P
              <U1>00;14 427  Rx:[SAPI]00 R [TEI]000 [FRAME]UA    F
              <U1>00;14 753 Tx :[SAPI]00 C [TEI]000 [FRAME]SABME P
              <U1>00;14 765  Rx:[SAPI]00 R [TEI]000 [FRAME]UA    F
              <U1>00;24 275 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]000 [N(R)]000
                           PD = Q.931(08)
                           CR = 02 0002
                           MT = SETUP(05)
                           04 03 80 90 A2 18 03 A9 83 97 70 08 C1 35 38 33   ..........p..583
                           33 30 30 31                                       3001
              <U1>00;24 292  Rx:[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]001
              <U1>00;28 315 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]001 [N(R)]000
                           PD = Q.931(08)
                           CR = 02 0002
                           MT = SETUP(05)
                           04 03 80 90 A2 18 03 A9 83 97 70 08 C1 35 38 33   ..........p..583
                           33 30 30 31                                       3001
              <U1>00;28 333  Rx:[SAPI]00 R [TEI]000 [FRAME]RR      [N(R)]002
              <U1>00;43 812  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]000 [N(R)]002
                           PD = Q.931(08)
                           CR = 02 8002
                           MT = CONN(07)


                                                            2759
```

Figure 14-9   Start-up and Synchronization Sequences

```
<U1>01;14'446  Rx:[SAPI]00 C [TEI]000 [FRAME]RR    P [N(R)]004
 <U1>01;14'449 Tx :[SAPI]00 C [TEI]000 [FRAME]RR    P [N(R)]002
 <U1>01;14'456 Tx :[SAPI]00 R [TEI]000 [FRAME]RR    F [N(R)]002
 <U1>01;14'460  Rx:[SAPI]00 R [TEI]000 [FRAME]RR    F [N(R)]004
 <U1>01;19'450 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]004 [N(R)]002
         PD = Q.931(08)
         CR = 02 0003
         MT = SETUP(05)
         04 03 80 90 A2 18 03 A9 83 97 70 08 C1 35 38 33  ..........p..583
         33 30 30 31                   3001
<U1>01;19'466  Rx:[SAPI]00 R [TEI]000 [FRAME]RR       [N(R)]005
<U1>01;19'878  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]002 [N(R)]005
         PD = Q.931(08)
         CR = 02 8003
         MT = CALL PROC(02)
         18 03 A9 83 97                  .....
<U1>01;19'888 Tx :[SAPI]00 R [TEI]000 [FRAME]RR       [N(R)]003
<U1>01;19'924  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]003 [N(R)]005
         PD = Q.931(08)
         CR = 02 8003
         MT = ALERT(01)
         18 03 A9 83 97                  .....
<U1>01;19'932 Tx :[SAPI]00 R [TEI]000 [FRAME]RR       [N(R)]004
<U1>01;25'464  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]004 [N(R)]005
         PD = Q.931(08)
         CR = 02 8003
         MT = CONN(07)
         18 03 A9 83 97                  .....
<U1>01;25'476 Tx :[SAPI]00 R [TEI]000 [FRAME]RR    [N(R)]005
<U1>01;25'785  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]005 [N(R)]005
         PD = Q.931(08)
         CR = 02 0003
         MT = CONN ACK(0F)
<U1>01;25'799  Rx:[SAPI]00 R [TEI]000 [FRAME]RR       [N(R)]006
<U1>01;46'127  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]005 [N(R)]006
         PD = Q.931(08)
         CR = 02 8003
         MT = DISC(45)
         08 02 80 90                  ....
<U1>01;46'138 Tx :[SAPI]00 R [TEI]000 [FRAME]RR       [N(R)]006
<U1>01;46'449 Tx :[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]006 [N(R)]006
         PD = Q.931(08)
         CR = 02 0003
         MT = REL(4D)
         08 02 80 90                  ....
<U1>01;46'464  Rx:[SAPI]00 R [TEI]000 [FRAME]RR       [N(R)]007
<U1>01;46'784  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]006 [N(R)]007
         PD = Q.931(08)
         CR = 02 8003
         MT = REL COMP(5A)
         08 02 80 90                  ....
<U1>01;46'795 Tx :[SAPI]00 R [TEI]000 [FRAME]RR    [N(R)]007
<U1>02;16'659 Tx :[SAPI]00 C [TEI]000 [FRAME]RR    P [N(R)]007
<U1>02;16'670  Rx:[SAPI]00 R [TEI]000 [FRAME]RR    F [N(R)]007
<U1>02;22'661  Rx:[SAPI]00 C [TEI]000 [FRAME]INFO    [N(S)]007 [N(R)]007
         PD = Q.931(08)
         CR = 02 0004
```

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Figure 14-10   Outgoing Call Connect and Release

ISDN Interfaces

Performance Monitoring

The performance of the RPTU can be monitored using the Data Dump Mode. This requires:

♦ RSIU, RSIS, PIOU or PIOUS PCB TTY port.

♦ ASCII terminal or PC with communications software (such as ProComm).

♦ IMDU or RMDS modem or Hayes compatible modem for remote monitoring.

The RPTU monitoring feature provides a download of PRI errors detected as shown in Figure 14-11. This data can be stored to a file and/or printed when using a PC with communications software.

There are no time parameters for the error report, so the time between error-count increments must be monitored manually. The counter is reset after 15 registrations and begins again from zero. Basically the error count of any error category should not increase within 24-hour periods.

➤ **To dump the data (PRI ERROR DISPLAY) from a terminal or PC (local or remote)**

1. Establish communications between the DK TTY port and the terminal or PC using a communications software.

2. Enter the security code, and press **Enter** (or **Return**).

3. At the **>MODE** prompt, type **DUMP** (must be all caps), and press **Enter** (or **Return)**. The **>D** prompt displays on your screen.

4. At the **>D** prompt, type **PRIERR** and press **Enter** (or **Return**). The display (see Figure 14-11) shows all RPTU PCBs (PRI NO=1~PRI NO=8), even if the associated RPTU (1~8) is not installed. The ERROR counter can only be reset by turning the DK424 OFF and ON.

➤ **To exit the dump mode**

➤ At the **>D** prompt, type **QUIT**, press **Enter** (or **Return**); the **>MODE** prompt displays.

```
PRI ERROR DISPLAY
PRIERR
PRI NO = 1
   SYNCHRO BIT ERROR         = XX TIMES (1 TIME = 1024 ERRORS)
   BIPOLAR VIOLATION ERROR  =  XX TIMES (1 TIME = 256 X 256 ERRORS)
   SLIP ERROR               = XX TIMES (1 TIME = 256 ERRORS)
   CRC ERROR                = XX TIMES (1 TIME = 256 ERRORS)
PRI NO = 2
   SYNCHRO BIT ERROR        = XX TIMES (XX = 00~15)
   BIPOLAR VIOLATION ERROR  = XX TIMES
   SLIP ERROR               = XX TIMES
   CRC ERROR                = XX TIMES
PRI NO = 3                  = XX TIMES
   SYNCHRO BIT ERROR        = XX TIMES
   BIPOLAR VIOLATION ERROR  = XX TIMES
   SLIP ERROR               = XX TIMES
   CRC ERROR                = XX TIMES
PRI NO = 4
   SYNCHRO BIT ERROR        = XX TIMES
   BIPOLAR VIOLATION ERROR  = XX TIMES
   SLIP ERROR               = XX TIMES
   CRC ERROR                = XX TIMES
PRI NO = 5
   SYNCHRO BIT ERROR        = XX TIMES
   BIPOLAR VIOLATION ERROR  = XX TIMES
   SLIP ERROR               = XX TIMES
   CRC ERROR                = XX TIMES
PRI NO = 6
   SYNCHRO BIT ERROR        = XX TIMES
   BIPOLAR VIOLATION ERROR  = XX TIMES
   SLIP ERROR               = XX TIMES
   CRC ERROR                = XX TIMES
PRI NO = 7
   SYNCHRO BIT ERROR        = XX TIMES
   BIPOLAR VIOLATION ERROR  = XX TIMES
   SLIP ERROR               = XX TIMES
   CRC ERROR                = XX TIMES
PRI NO = 8
   SYNCHRO BIT ERROR        = XX TIMES
   BIPOLAR VIOLATION ERROR  = XX TIMES
   SLIP ERROR               = XX TIMES
   CRC ERROR                = XX TIMES
```

Error Message	Action
Synchro Bit Error	Increments each time the RPTU detects 1024 synchronization bit errors.
Bipolar Violation Error	Increments each time the RPTU detects 6.55 x 104 bipolar violations.
Slip Error	Increments each time the RPTU detects 256 slips.
CRC Error	Increments each time the RPTU detects 256 CRC-6 errors. The RPTU must be in the ESF mode.

Figure 14-11   RPTU Performance Monitor Printout

SMDR Output for ISDN

See Figure 10-20 on Page 10-36 for a sample SMDR printout and descriptions of each column.

RBSU/RBSS and TBSU Interface Units

System: *DK424 and DK40i, Release 4.1 and above*

Circuits per PCB: *2 circuits (2B + D each circuit)*

Interfaces with: *ISDN BRI S/T when connected to the Public Network or a BRI S-type, TE-1, or TA devices when connecting to ISDN station equipment*

Older Version(s):   *none*

The Strata DK424 and DK40i Release 4.1 system supports the RBSU/RBSS interface unit according to the common control units resident in the system shown in Table 14-7. The DK40i only supports the TBSU.

RBSU/RBSS switches, jumpers, and connectors are shown in Figures 14-14 and 14-15 on Page 14-21 and described in Table 14-8.

TBSU switches, jumpers, and connectors are shown in Figure 14-8 on Page 14-13 and described in Table 14-10 on Page 14-25.

LEDs on the TBSU and RBSU/RBSS show a continuous status of BRI operation. Refer to Table 14-9 on Page 14-23 for a list of each LED's status.

Overview

The TBSU, RBSU and RBSS PCBs provide the Basic Rate Interface (BRI) circuits for DK40i and DK424, Release 4.1. The TBSU can only be installed in the DK40i Base KSU. The RBSU is the main plug-in PCB that plugs into the DK424 cabinet slots and the DK40i Expansion KSU slots.

The RBSS is an optional PCB that plugs onto the RBSU. Each PCB provides two ISDN BRI circuits. Each BRI circuit provides 2 B-channels + 1D channel for voice/data/video applications.

An REBU PCB is a piggy-back PCB that plugs onto the RBSU and provides basic functions for RBSU/RBSS circuits so it must always be installed on the RBSU. The REBU is not required on the TBSU.

The TBSU and RBSU circuits are four-wire S/T type circuits and connect to the Public Switched Telephone Network (PSTN) BRI lines using an Network Terminator unit (NT1); or, on the station side, they can connect to ISDN Terminal Equipment (TE) or Terminal Adapters (TA) as shown in Figure 14-12.

TE devices include any ISDN device (telephone, fax, computer) that connects directly to S/T ISDN BRI circuits. TA devices match the protocol of non-ISDN devices (telephone, fax, computer) to the protocol of S/T ISDN BRI circuits.

The TBSU and RBSU circuits can be configured two ways:

♦ As BRI – TE circuits which connect to Telephone Network BRI lines using a NT1.

♦   As BRI – NT circuits which connect to ISDN TEs or TAs. These devices must be S-type station devices.

Important!   *The DK424 and DK40i BRI circuits allocate line numbers and station ports differently. In DK424, each BRI circuit consumes two line numbers and two station port when configured as line-side or station side. In DK40i, each BRI line circuit consumes two line numbers and no station ports; each BRI station circuit consumes two station ports and no line numbers.*

The RBSU connection options (BRI line or ISDN TE-1/TA devices) are selected in DK40i and DK424 customer database programming and option switches located on the TBSU and RBSU.

The TBSU and RBSU circuits that connect to the ISDN network side requires a dealer-supplied NTI interface box to convert the two-wire, U-interface BRI line from the telephone network to the four-wire, T-interface of the RBSU circuit. The NT1 must be UL listed (U.S.) or CSA certified (Canada). The network BRI line connection is a point-to-point connection, which means that the network BRI line can only be connected to one RBSU or TBSU circuit via the NT1 (T-reference point).

RBSS circuits connect directly to S-type TE-1 or TA ISDN devices only. They do not support BRI-TE telephone network BRI line connections.

The TBSU, RBSU, and/or RBSS circuits that connect to the DK station side, (BRI-NT, S-reference point) allows direct connection of multiple ISDN (TE-1 or TA) devices. The S point of the TBSU and RBSU/RBSS supports the Toshiba DK passive bus, also known as point-to-multipoint connection. The terminal-side (S-point) of the TBSU or RBSU/RBSS BRI circuit can have parallel connections of up to two TE-1s or TAs maximum.

When multiple TE-1 and TA devices are installed on a single TBSU or RBSU/RBSS BRI circuit, the devices must share, or contend for, that circuit's two B-channels. That is to say, a maximum of two simultaneous voice and/or data calls are allowed between both devices connected to the same BRI circuit. The contention rule for the two BRI B-channels is first come, first serve.
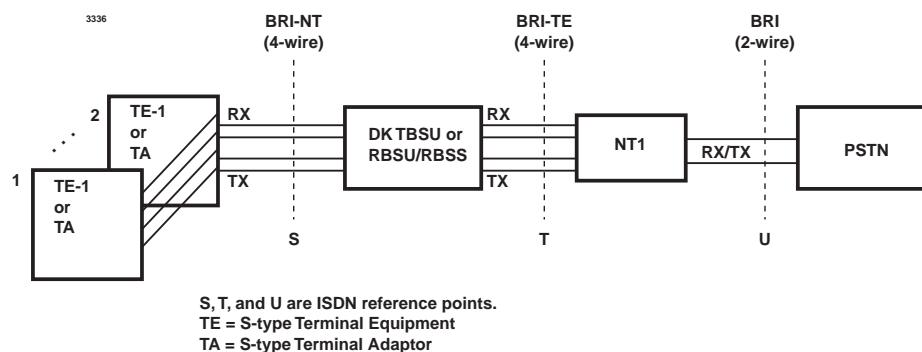
Figure 14-12   TBSU and RBSU/RBSS Interfaces between the S/T Reference Points

Capacity and Cabinet Slot Information

The TBSU can only be installed in the DK40i Base KSU. The RBSU/RBSS can be installed in any DK40i Expansion Unit slot and any DK424 slot except the programming telephone PDKU or PEKU slot. On DK424, each RBSU and/or RBSS contains two circuits and each circuit reduces the system capacity by two station ports *and* two CO lines (one port/line per B-channel). Therefore, if the RBSU PCB is installed, the station port and CO line count will increment by four ports and four lines at the RBSU cabinet slot.

If the RBSU/RBSS is installed in a DK424 slot, the station port and CO line count will increment by eight station ports and eight lines at the RBSU/RBSS cabinet slot. RBSU and RBSS PCBs can

be installed in any combination so long as the number of RBSU PCBs is the same or greater than the number of RBSS PCBs. See Table 14-7 for the maximum RBSU/RBSS circuits allowed.

On DK40i, TBSU and each RBSU and/or RBSS contains two circuits. Each circuit reduces the system capacity by two station ports or two CO lines. If the BRI circuit is configured as NT, the circuit assumes two station ports. If the BRI circuit is configured as TE, the circuit assumes two CO lines.

Table 14-7   RBSU/RBSS, BRI-TE, and BRI-NT Maximums by Type of Processor

Processor	TBSU[1]	Maximum allowed:				
		RBSU/RBSS/ PCBs combined	BRI-TE Circuits	BRI-TE Channels	BRI-NT Circuits	BRI-NT Channels
DK40i	1	8^2	6	12	10^2	20^2
RCTUA4	N/A	4	4	8	8	16
RCTUBA3/BB4	N/A	12	8	16	16	32
RCTUC3/D4	N/A	24	8	16	40	80
RCTUE3/F4	N/A	36	8	16	64	128

1. TBSU and RBSU circuits can be NT or TE, but RBSS circuits can only be NT. TBSU can only be installed in the DK40i Base KSU.

2. Maximums may not be achievable because of power factor limitations.

PS-1 Backup Power Option

The RBSU provides an optional backup power supply, R40S, that will supply backup power to TE devices in the event of an AC power loss. This power backup option only applies to RBSU or RBSS circuits that are configured in the NT mode. See Figure 14-16 to install the R40S.

Note   The R40S is not available for the TBSU.

Also the DK system must have battery backup to allow the R40S power backup function to operate. The R40S power supply is an ISDN, PS-1 type power unit which means it supplies power to TE devices on the RBSU/RBSS transmit and receive wire pairs as shown in Figure 14-13. This power arrangement is also known as phantom power.

Each of the four circuits on RBSU/RBSS can be connected to share the R40S using option switches on the PCBs (see Table 14-8). Before using the R40S as a backup power source, make sure the TE devices do not require more power than the R40S can supply and the TE is compatible with the ISDN PS-1 power arrangement. Figure 14-6 shows the power limits of the R40S.
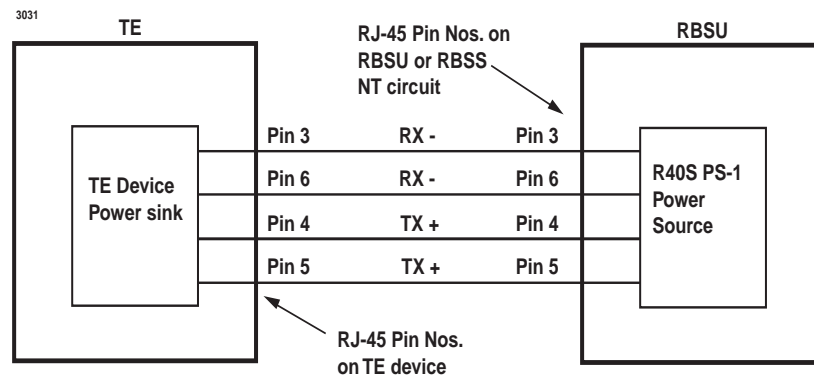
R40S Power Limits:
Voltage: 33.3VDC to 38.85VDC maximum
Current: 100mA maximum (25mA maximum per each RBSU/RBSS circuit)

Figure 14-13   Power Limits of the Backup Power Supply

TBSU and RBSU/RBSS Installation

Step 1: Run Related Programs

➤ Run all ISDN programs related to TBSU and RBSU/RBSS BRI circuits prior to installation of the PCBs. This enables the circuits to operate immediately upon insertion. ISDN BRI programs are explained in the *Strata DK424 Programming Manual* under the ISDN tab.

Important! *For the DK40i, make sure to run Program *60 to identify all station (NT) and CO (TE) BRI circuits for each RBSU/RBSS and TBSU installed. **Program *60 causes station port and CO line shifting on PCBs installed in slots that follow the BRI PCBs.***

Step 2: Set Option Switches/Jumpers

➤ Set all option switches and jumpers on the TBSU, RBSU, and RBSS PCBs before plugging the RBSS onto the RBSU or inserting the RBSU into the system. RBSU/RBSS switch/jumper information and locations are shown in Figures 14-14, 14-15 and Table 14-8. TBSU switch/jumper information is shown in Figure 14-18 and Table 14-10.
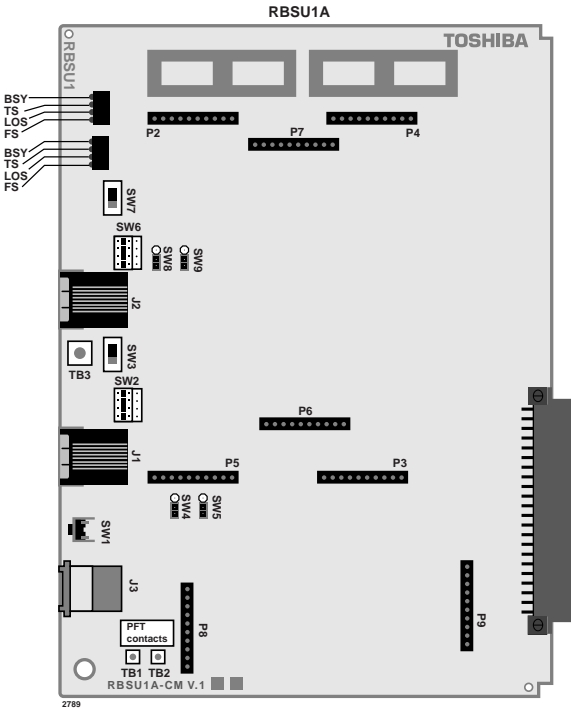
Figure 14-14   RBSU PCB
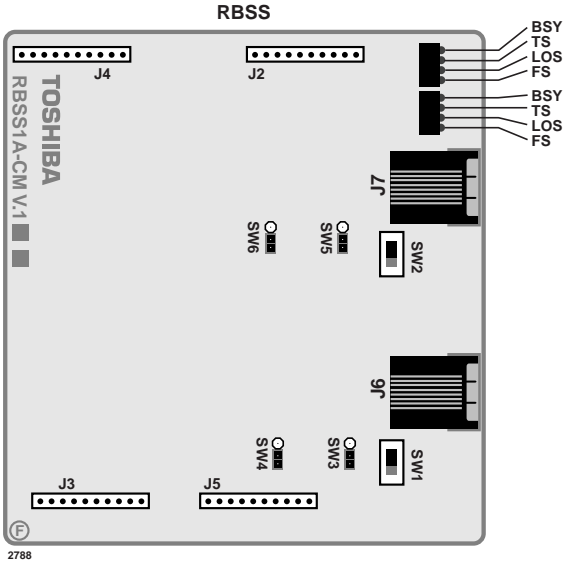
Figure 14-15   RBSS PCB

Table 14-8   RBSU/RBSS Option Switches, Jumpers, and Connectors

PCB	Circuit	Option Switch	Type	Circuit Type		Description
				TE	NT	
RBSU	All	SW 1	Push-button	N/A	N/A	Resets firmware on all circuits of RBSU/RBSS. Drops calls off the RBSU/RBSS.
	1	SW 2	Jumper	X	X	Causes the circuit to operate as TE or NT[1].
	1	SW 3	Slide	ON	OFF	Switches a 100-ohm resistor in/out of the circuit.
	1	SW 4, 5	Jumper	N/A	ON	Switches PS-1 in/out of the circuit.
	2	SW 6	Jumper	X	X	Causes the circuit to operate as TE or NT[1].
	2	SW 7	Slide	ON	OFF	Switches a 100-ohm resistor in/out of the circuit.
	2	SW 8, 9	Jumper	N/A	ON	Switches PS-1 in/out of the circuit.
RBSS	3 (NT only)	SW 1	Slide	ON	OFF	Switches a 100-ohm resistor in/out of the circuit.
	3 (NT only)	SW 3, 4	Jumper	N/A	ON	Switches PS-1 in/out of the circuit.
	4 (NT only)	SW 2	Slide	ON	OFF	Switches a 100-ohm resistor in/out of the circuit.
	4 (NT only)	SW 5, 6	Jumper	N/A	ON	Switches PS-1 in/out of the circuit.

1. Also requires Program *60 to set TE or NT.

Step 3: Install the REBS

> **Note**   The REBS provides a basic part of the RBSU/RBSS circuit functionality; therefore, it must always be installed on the RBSU (see Figure 14-16).

1. Align the two connectors carefully while observing the "UP" arrows on the REBS.

2. Plug the REBS onto the RBSU.

Step 4: Install the RBSS

> **Note**   If one or two additional BRI-NT circuits are required, install the RBSS (see Figure 14-16).

1. Align the four connectors carefully while observing the "UP" arrows on the REBS.

2. Plug the RBSS onto the RBSU.

Step 5: Install the R40S

> **Note**   If ISDN PS-1 backup power for TE devices is required, install the R40S (optional PCB) (see Figure 14-16).

1. Align the two connectors carefully while observing the "UP" arrows on the R40S.

2. Plug the R40S onto the RBSU.
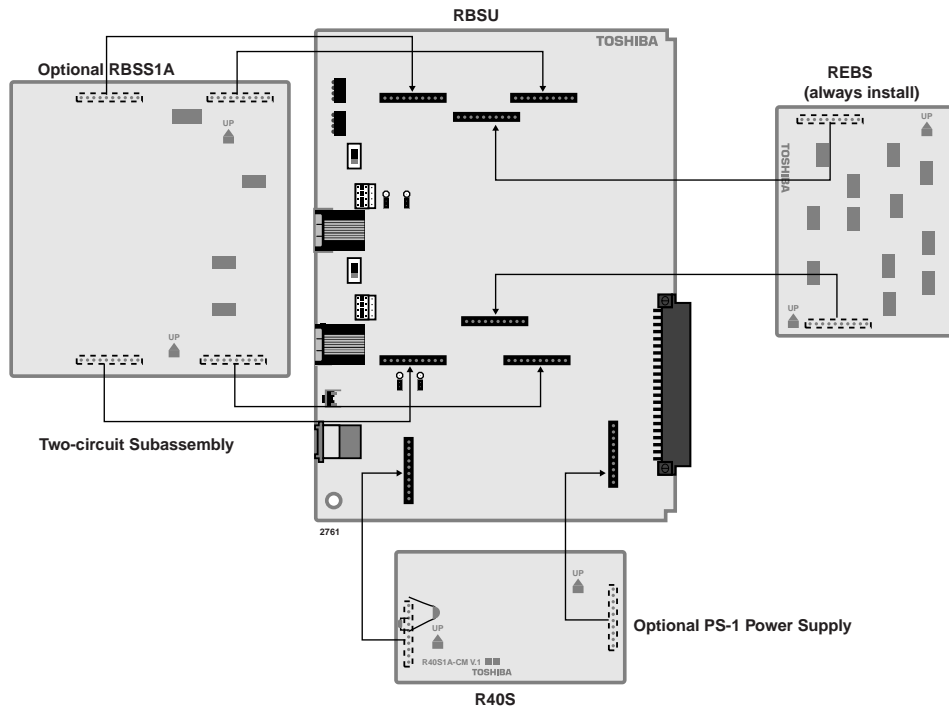
Figure 14-16 Location of RBSU Plug-on PCBs

Step 6: Install RBSU/RBSS PCBs into Cabinet

After setting the switches and jumpers and installing the plug-on PCBs as described in the preceding paragraphs, the RBSU/RBSS PCBs can be installed in the appropriate cabinet slots. Refer to RBSU/RBSS Capacity and Cabinet Slot Information on Figure 14-18. After the RBSU/RBSS is installed in the DK424 cabinet or DK40i Expansion Unit, the status LEDs and connecting jacks are positioned as shown in Figure 14-19.

Table 14-9 RBSU/RBSS LED Indications

LED	Indication
BSY	**Circuit Busy** ON – Any B-channel is in use. OFF – B-channels are idle.
TS	**Timing Source** Blinking ON/OFF – The RBSU is extracting the clock from the BRI line and is the Primary synchronization circuit for ISDN and T1. ON – The RBSU is the secondary (backup) synchronization circuit for the ISDN and T1. OFF – The RBSU is not used for ISDN or T1 synchronization.
LOS	**Loss of Signal** ON – Clock timing cannot be detected from the line. OFF – Normal condition.
FS	**Frame Alignment Alarm** ON – Frame alignment cannot be established. OFF – Frame alignment is established.

Step 7: Install the TBSU

Carefully align the TBSU connector pins with P11 and P12 on the DK40i motherboard and install the TBSU into the DK40i Base Unit. Use the two supplied screws to secure the TBSU to the motherboard. Figure 14-17 shows the TBSU mounting on the DK40i and Figure 14-18 shows the TBSU switch layout. Table 14-10 shows the TBSU option switches.
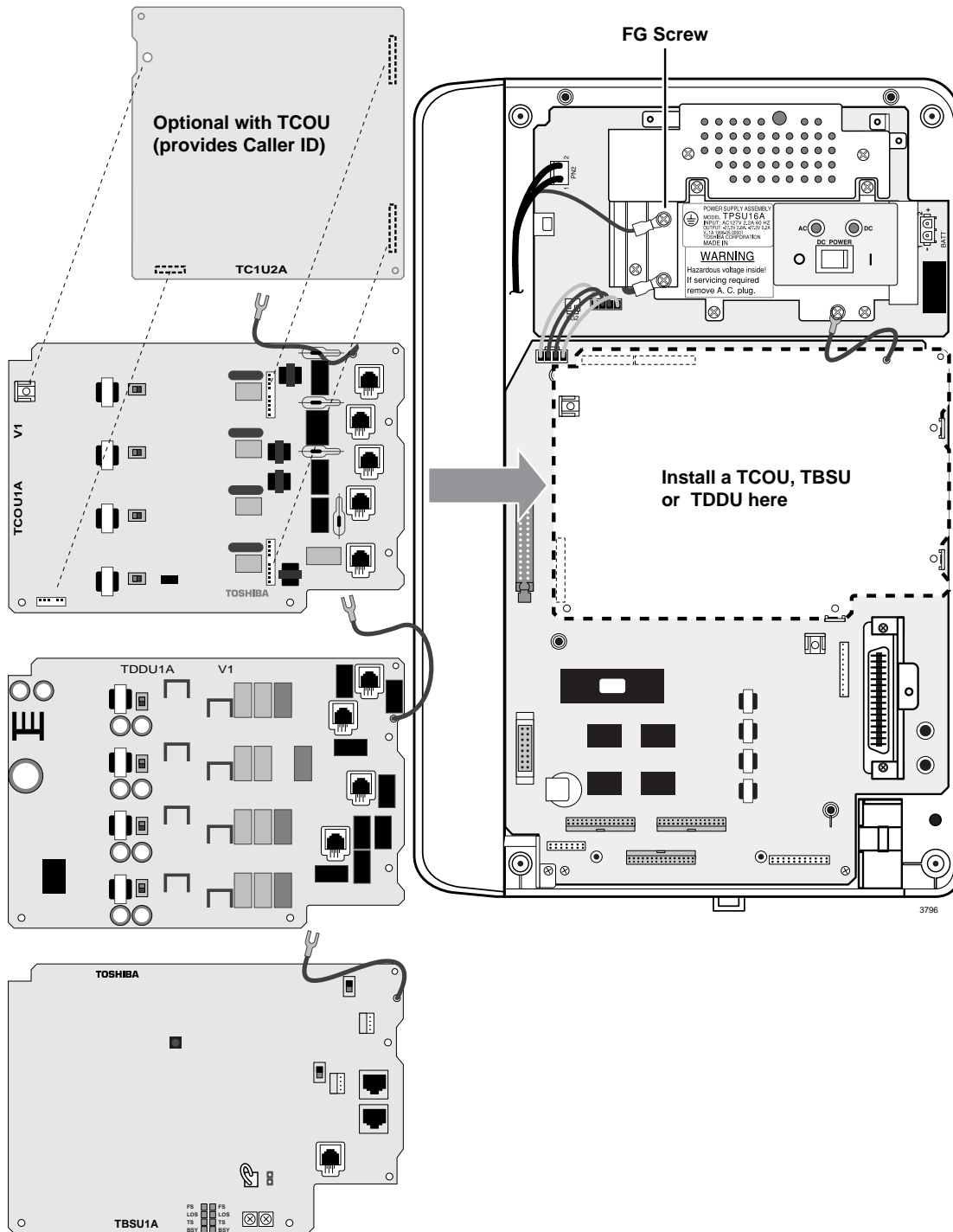
Figure 14-17   Installation of TBSU into DK40i
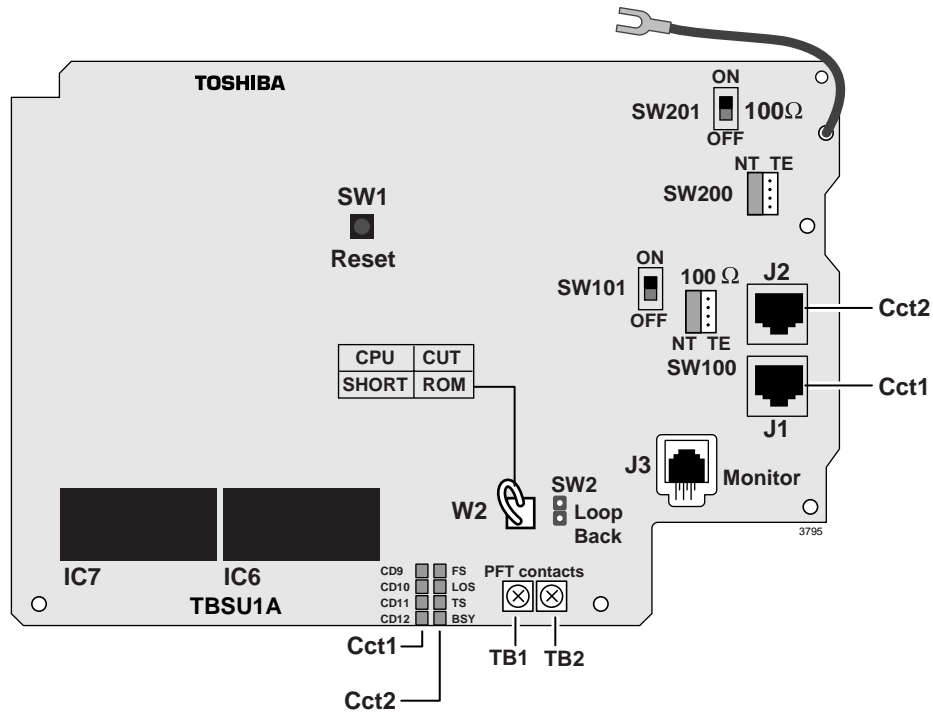
Figure 14-18   TBSU Switch Layout

> **Note**   It is normal for sockets IC7 and IC8 to be empty.

Table 14-10   TBSU Option Switches, Jumpers, and Connectors

TBSU Circuit	Option Switch	Type	Circuit Type		Description
			TE	NT	
All	SW 1	Push-button	N/A	N/A	Resets firmware on all TBSU circuits. Drops calls off the TBSU.
1	SW 100	Jumper	X	X	Causes the circuit[1] to operate as TE or NT.
1	SW 101	Slide	ON	ON	Switches a 100-ohm resistor in/out of the circuit.[1]
2	SW 200	Jumper	X	X	Causes the circuit[2] to operate as TE or NT[1].
2	SW 201	Slide	ON	ON	Switches a 100-ohm resistor in/out of the circuit.[2]

1. Also requires Program *60 to set TE or NT.
2. SW2 is for factory use only

Switch	Type	Circuit		Description
		Short	Cut (remove)	
W2	Jumper	TBSU1A uses the internal CPU ROM (IC20)	TBSU1A uses the external ROM (IC6 and 7)	Future Use
SW2	Jumper	For factory loop back test.	Normal operation	Used for factory inspection only. Do not cut this jumper.

Modular Jack Pin Configurations

BRI Circuit Jack (TE or NT Mode)

The TBSU and RBSU/RBSS BRI circuit jack is a shielded RJ-45 (8-pin modular) with Transmit (Tx) and Receive (Rx) pin numbers as shown in Figure 14-19. The Tx and Rx pin numbers change when the BRI circuit is configured with TBSU and RBSU/RBSS option switches for TE or NT (Tables 14-8 and 14-10). If the R40S is installed on the RBSU, the PS-1 voltage is carried on the Tx/Rx wires with polarity. (See Table 14-11).

The position of the TBSU BRI and RBSU/RBSS circuit jacks are shown in Figure 14-18 and 14-19 respectively.

Table 14-11 RJ-45 Pins in the 8-pin Modular Jack

Pin No.	TE Side	NT Side	PS1/R40S Polarity
1	N/C	N/C	N/C
2	N/C	N/C	N/C
3	Tx	Rx	-
4	Rx	Tx	+
5	Rx	Tx	+
6	Tx	Rx	-
7	N/C	N/C	N/C
8	N/C	N/C	N/C

87654321

3048

Front View of RJ-45 Jack Cavity
Note: The RJ-45 pins are numbered as shown above.

Monitor Jack

The TBSU and RBSU/RBSS monitor jack is an RJ-12 (6-pin modular). This jack provides an RS-232 output that enables you to monitor the TBSU and RBSU/RBSS BRI circuit D-channel, layer-2 and layer-3 data. The monitor jack pin configuration and communication parameters are the same as RPTU and RBUU which are shown in Figure 14-8 on Page 14-13. Figures 14-29 and 14-30 on Pages 14-34 and 14-35, respectively, show examples of the TBSU or RBSU monitor jack output. Figures 14-10 and 14-19 show the location of the TBSU and RBSU monitor jacks respectively.
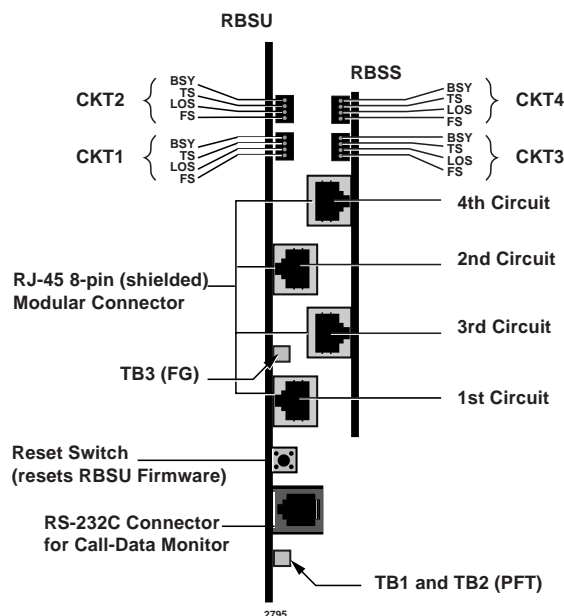
Figure 14-19 Location of LEDs and Connectors

TBSU and RBSU/RBSS Premise Wiring Guidelines

Power Failure Terminal Screws

TB1 and TB2 are the connecting points that interface a pair of dry contacts that can be used for power failure switching purposes (see Figure 14-19 for the locations). When the DK system (TBSU and RBSU) has power (from AC source or batteries) there is a short circuit across TB1 and TB2. In the event of no power to the DK424, there is an open circuit across TB1 and TB2. The specifications for TB1 and TB2 contacts are:

♦   Maximum switchable voltage: 30VDC

♦   Maximum switchable current: 80mA

♦   Short circuit resistance: Approximately 15 ohms

Grounding Terminal Screws

TB3 is a screw terminal that can be used to connect a ground wire to the RBSU PCB (see Figure 14-19 for the location). This ground enables the RBSU/RBSS to meet Electro Magnetic Compatibility (EMC) requirements. As of Release 4.1, RBSU complies with EMC requirements without grounding TB3 on the RBSU, so it is not necessary to connect a ground wire to TB3.

BRI Wire Type Recommendations

CAT3 or CAT5 wire is recommended for ISDN BRI customer-premises wiring. While the ISDN BRI signal works for some distance over almost any wire that is suitable for analog voice service, better wire enables longer runs. CAT5 provides better 100-ohm impedance matching (at little extra cost) between the TBSU or RBSU/RBSS circuit and the station Terminal Equipment (TE-1).

Normally the CAT3 or CAT5 wiring does not have to be shielded when used for ISDN BRI premises wiring. However, the RJ-45 jacks on the TBSU and RBSU/RBSS BRI circuits are shielded and provide a ground shield in the event that shielded modular plugs and cable are used.

Note   If using shielded cable and plugs, cable runs should only be grounded at the DK TBSU and RBSU/RBSS, RJ-45 jacks. To prevent ground loops, do not ground both ends of shielded cable runs.

TBSU and RBSU/RBSS BRI Cable Jacks and Connectors

In the U.S., the standard connector for ISDN equipment is the eight-pin RJ jack. Patch cables have eight-pole plugs at both ends. The same pinout applies to both ends of an ISDN cable, which is the practice of the data world. This means that a flat untwisted cable with an RJ modular plug at both ends will have the locking tab of the plug on one end, "up;" and, on the other end, "down," as shown in Figure 14-20.

Note   This is the opposite of telephony "silver satin" cables which have locking tabs on both ends facing the same direction. Telephony cables cause the pins at either end to crossover while data cables provide a straight through pin-to-pin connection between modular jacks.

A cord of up to 10 meters connects the ISDN BRI RJ-45 wall jack to the desktop TE-1 or TA RJ-45 jack. Bellcore recommends that all TE-1 and TA devices be attached with the same standard cord to ensure compatibility.
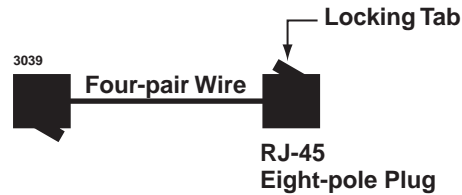
Figure 14-20   Modular ISDN Data Cable

The standard pinouts for ISDN jacks is the TIA-568A or TIA-568B jack as listed in Table 14-12. The variants A and B to the TIA specification are electrically the same, only the wire colors are different. However, you should only use one type TIA jack in a customer installation because mixing the two may cause certain wire pairs to be swapped which would result in line faults.

Table 14-12 TIA-568A (RJ-45) Jack – ISDN Standard Interface Modular Connector Pinout (RBSU-TE mode)

Pin	Color	Name	Function
1	Green	T2	Power 3 (not used on DK TBSU or RBSU/RBSS)
2	Green/White	R2	Power 3 (not used on DK TBSU or RBSU/RBSS)
3	Orange/White	R3	Transmit to Network (NT-1, S/T jack)
4	Blue/White	R1	Receive from Network (NT-1, S/T jack)
5	Blue	T1	Receive from Network (NT-1, S/T jack)
6	Orange	T3	Transmit to Network (NT-1, S/T jack)
7	Brown	T4	- Power 2 (not used on DK TBSU or RBSU/RBSS)
8	Brown/White	R4	+ Power 2 (not used on DK TBSU or RBSU/RBSS)

Notes

- Pins are numbered left to right when looking into the jack cavity with the locking tab down.

- TIA-568B swaps pair two with pair three, changing only the color of the wires on the pins. Electrical performance is the same.

TBSU and RBSU/RBSS EMC Ferrite Core Requirement

To ensure that the TBSU and RBSU/RBSS circuits meet the EMC requirements, it is necessary to run all wire connecting TBSU and RBSU/RBSS circuits (TE mode and NT mode) through a Ferrite core. Use Toshiba part number, FER-CORE-ISDN, which is shipped with the TBSU and RBSU. Figures 14-21 and 14-22 show how to dress the wiring through the Ferrite core.
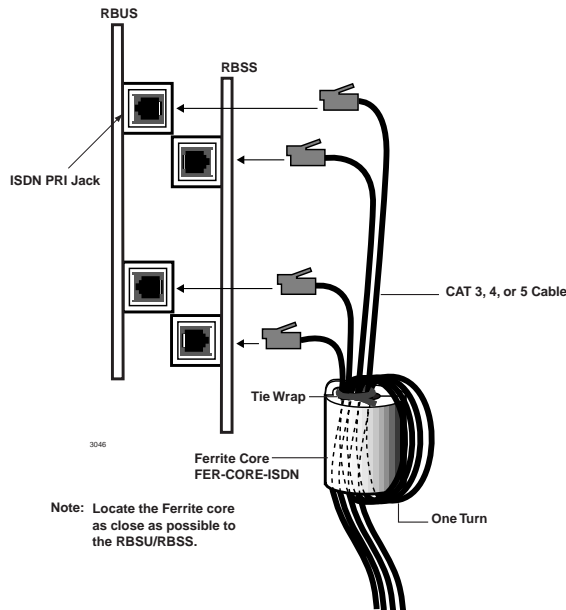
Figure 14-21 RBSU/RBSS Ferrite Core Installation
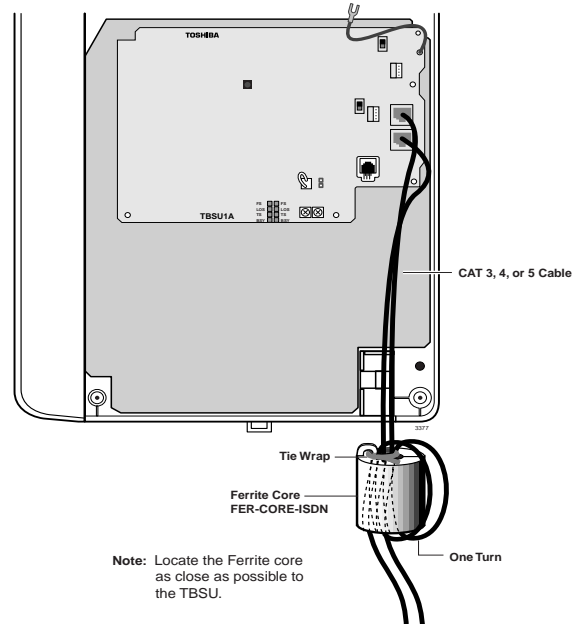
Figure 14-22 TBSU Ferrite Core Installation

Connecting TBSU and RBSU to Network Side (TE-Mode)

The TBSU and RBSU only, not the RBSS, circuits can be connected to the network side of a BRI line. The TBSU and RBSU circuits must be configured in the TE-mode (refer to option switches in Table 14-8 on Page 14-22 and Table 14-10 on Page 14-25 and Program *60).

In the U.S., the BRI line from the ISDN service provider is a two-wire U-type BRI line. This line connects to the TBSU or RBSU TE circuit via a customer-provided NT1 as shown in Figure 14-23. The NT1 is necessary to convert the network BRI, two-wire, U interface to the TBSU or RBSU BRI, four-wire, T interface. The NT1 must be UL listed (U.S.) or CSA certified (Canada).

The NT1 is powered by local AC power via an AC adapter supplied with the NT1. The connection between the NT1 and the TBSU or RBSU TE circuit is a point-to-point connection, so the NT1 can connect to only one TBSU or RBSU BRI TE circuit.

A 100-ohm Terminating Resistor (TR) is required on each end of the point-to-point connection. The TR must be switched into the TBSU or RBSU TE circuit (refer to option switches in Table 14-10 on Page 14-25 and Table 14-8 on Page 14-22) and into the NT1 device.

Most NT1 devices have TR option switches; if the NT1 does not have TRs, two 100-ohm TRs must be wired into the NT1 modular jack - one 100-ohm resistor across each pair (Tx and Rx). Refer to the NT1 manufacturers documentation for the maximum loop length between the NT1 and the network jack. The maximum loop length between the NT1 and the TBSU or RBSU circuit is 1650 feet.
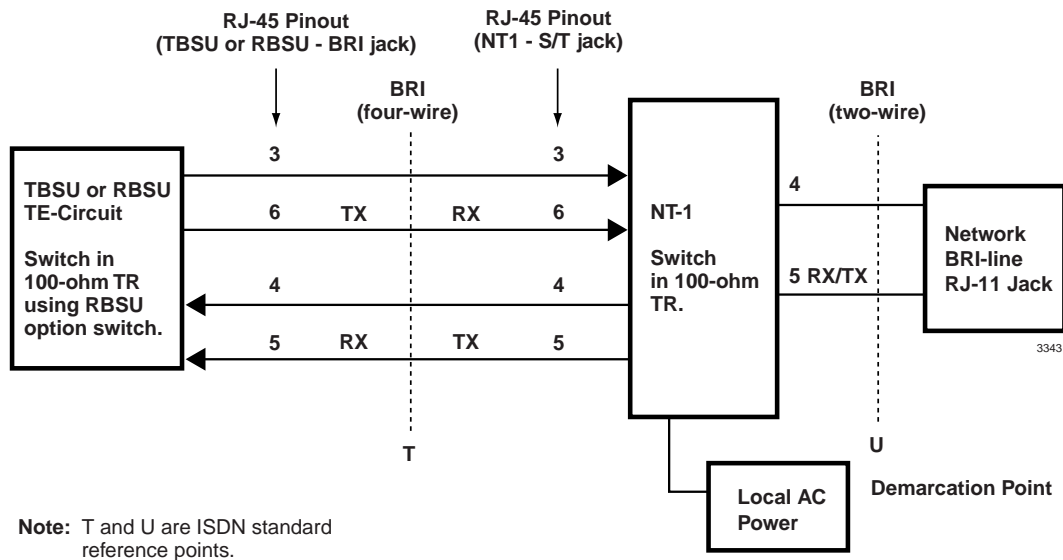
Figure 14-23   TBSU or RBSU to NT1 Point-to-point Connection

Connecting TBSU and RBSU/RBSS Station Devices (NT-Mode)

S-type TAs and TE-1s can be connected to the station side of TBSU, RBSU, and RBSS circuits. TA and TE devices must be powered by local AC power using AC adapter supplied with the TA or TE device. The TBSU and RBSU/RBSS circuits must be configured in the NT mode when connected to TA and TE devices (refer to option switches in Table 14-8 on Page 14-22 and Table 14-10 on Page 14-25 and Program *60).

The TA enables you to connect non-ISDN voice and data devices to ISDN BRI circuits. The TA matches the protocol of existing interfaces (R-reference point) to the ISDN S/T protocol (see Figure 14-1 on Page 14-2). TA devices include asynchronous circuit-switched adapters that convert RS-232 async data (like data from a PC COM port) to B-channel 64 kbps sync.

TAs also enable you to connect standard telephones and non-ISDN fax machines to receive and make calls over ISDN circuits. TEs include any user device (telephone, fax, PC video conference board) that is designed to plug directly into the ISDN (S/T) interface without the use of a TA.

There are two types of ISDN TA and TE-1 devices: the U-type and the S/T type. Most manufacturers of ISDN station devices make both types. In DK424 R4.1 and DK40i, the TBSU and RBSU/RBSS station side, BRI-NT circuits only function with S/T type TA and TE-1 devices. You cannot connect U-type TE-1 or TA devices to the TBSU or RBSU/RBSS BRI-NT circuits.

Also, connecting an NT1 to the TBSU or RBSU/RBSS BRI-NT circuit to convert from S/T to U interface is not supported to enable the use of U-type TE-1 or TA device on the station side of the TBSU or RBSU/RBSS. U-type TE-1 and TA device interface is provided in the DK by the TBUU and RBUU/RBUS BRI circuit only. TBUU and RBUU/RBUS will be provided in the DK424 and DK40i Release 4.2.

The TBSU and RBSU/RBSS BRI-NT circuit supports the National ISDN 2 (NI2) S-Interface "passive bus." It is called a passive bus, because it contains no logical functions. The TBSU and RBSU/RBSS BRI-NT interface supports a point-to-multipoint connection on two twisted pairs. Up to two TE-1 and/or TA devices can be connected to one TBSU or RBSU/RBSS, BRI-NT circuit. Using standardized wiring and modular connectors, as explained in previous paragraphs,

maintains control of polarity. The pinout from the TBSU and RBSU/RBSS circuit to a S-type TE-1 or TA device is shown in Figure 14-24 and Table 14-11.
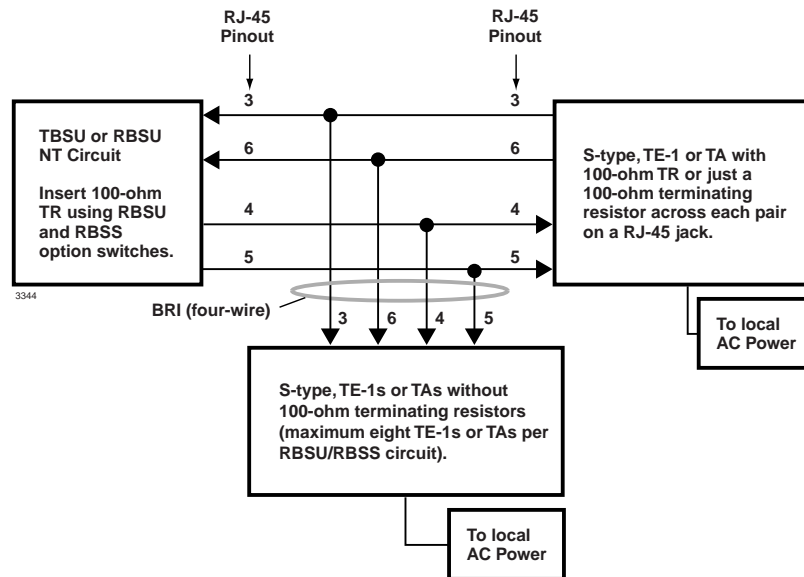
Figure 14-24   TBSU and RBSU/RBSS NT Circuit Pinout on Passive Bus

As a parallel bus, the TBSU and RBSU/RBSS BRI-NT passive bus will accept TE-1 and TA devices scattered on the bus; however, the locations of the TE and TA devices on the S bus is limited by timing considerations. Specifically, the round trip propagation delay of a signal from the TBSU or RBSU/RBSS circuit to one device must be within four microseconds of the delay from the other device on the bus. That is to say, layer-1 frames from the TBSU and RBSU/RBSS must be received within a two microsecond window. This says nothing about how large the delay can be. In fact, it can be much larger, as long as the differences remain small.

To control electrical characteristics, a 100-ohm terminating resistor (TR) is required at both ends of the passive bus. One resistor should be across the Tx pair and one across the Rx pair at either end of the passive bus. Branch-type passive bus configurations, shown in Figures 14-25~14-28, may only require a TR on the TBSU or RBSU/RBSS NT circuit side and not on the TE or TA device side of the bus.

The TBSU, RBSU, and RBSS circuits provide an option switch that allows the 100-ohm TR to be switched into the circuit on the DK side of the bus (see Table 14-8 on Page 14-22 and Table 14-10 on Page 14-25). Most TE-1 and TA devices also provide option switches to connect 100-ohm terminating resistors as shown in Figure 14-23.

If the TE or TA devices do not provide TRs, they may be permanently wired in place on a RJ-45 jack at the far end of the bus. Only one terminating resistor on each pair should be on the far (TE) end of the passive bus - do not switch in TRs on more than one TE-1 or TA device on the passive bus.

Important!   *The correct placement of TRs on the Passive Bus is critical to ISDN BRI circuit operation (see the following TBSU and RBSU/RBSS Passive Bus configurations section).*

TBSU and RBSU/RBSS Passive Bus Configurations

The placement of S-type TE and TA devices on the BRI S-passive bus is critical for good TBSU and RBSU/RBSS BRI circuit performance. Figures 14-25~14-28 show four passive bus architectures that are known to work. In all installations, follow the guidelines of any of these passive-bus models using the wire, cables, and jacks described in the previous paragraphs.
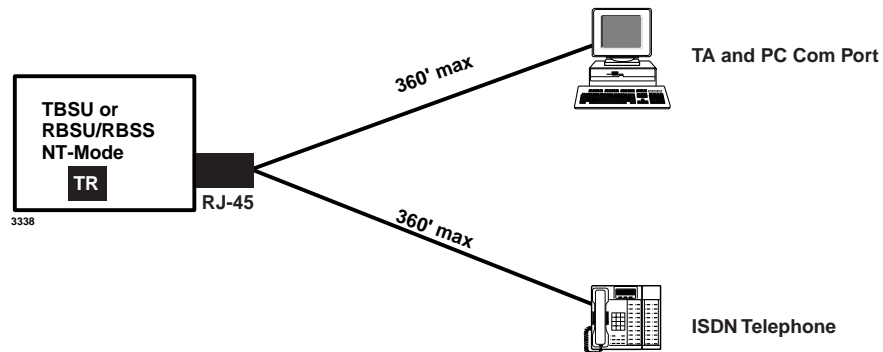
Figure 14-25   Simplified Short-branched Passive Bus
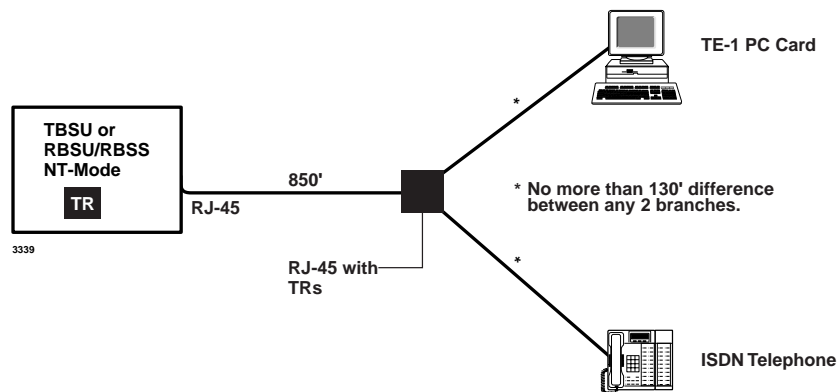
Figure 14-26   Branched Passive Bus
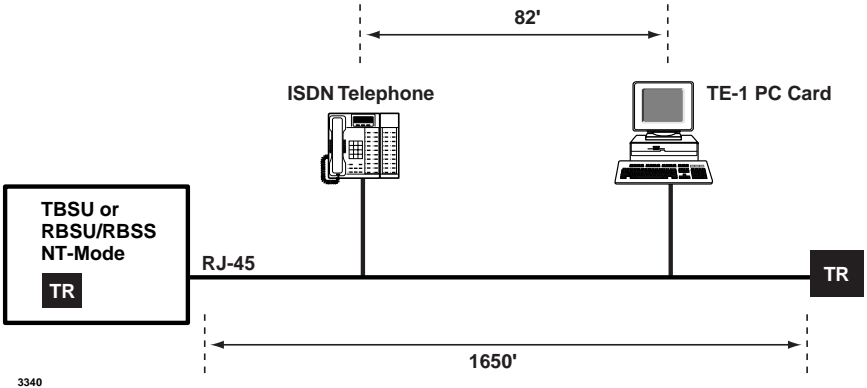
Figure 14-27   Extended Passive Bus
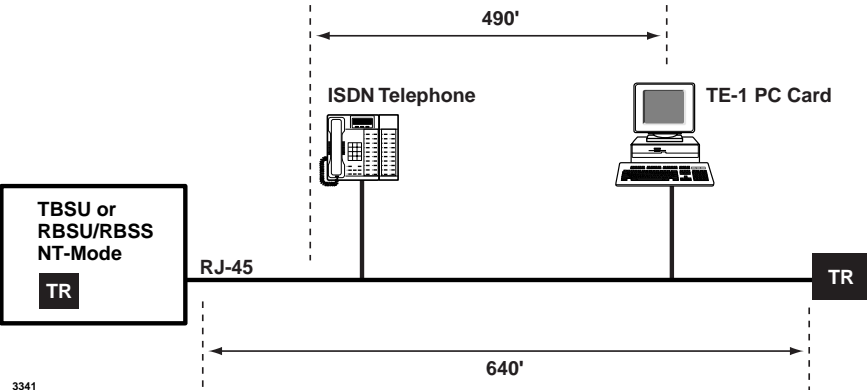
Figure 14-28   Short Passive Bus

TBSU and RBSU/RBSS BRI Call Monitor

The call-monitor jack located on the TBSU and RBSU enables you to use a PC or ASCII terminal to monitor the BRI, D-channel call setup, layer-2 and layer-3 data (refer to Figure 14-8 on Page 14-13 for information about connecting the monitor jack). Figures 14-29 and 14-30 provide examples of BRI call setup message information that is available from the TBSU and RBSU call-monitor jack.

```
<U3>06;57'958 Tx :[SAPI]00 C [TEI]102 [FRAME]RR    P [N(R)]021
<U3>06;57'970  Rx:[SAPI]00 R [TEI]102 [FRAME]RR    F [N(R)]019
<U3>07;07'166  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]021 [N(R)]019
              PD = Q.931(08)
              CR = 01 0F
              MT = SETUP(05)
              04 03 80 90 A2 6C 05 C1 33 30 37 32 96 7B 01 81  .....l..3072.{..
<U3>07;07'217 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]022
<U3>07;07'735 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]019 [N(R)]022
              PD = Q.931(08)
              CR = 01 8F
              MT = SETUP ACK(0D)
              18 01 89 1E 02 80 88 34 01 00 32 01 C2 95 2A 24  .......4..2...*$
              80 9E 14 44 49 41 4C 20 53 54 41 54 49 4F 4E 20  ...DIAL STATION
              4E 4F 2E 20 4F 52 20 9E 0B 41 43 43 45 53 53 20  NO. OR ..ACCESS
              43 4F 44 45                                      CODE
<U3>07;07'750  Rx:[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]020
<U3>07;07'866  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]022 [N(R)]020
              PD = Q.931(08)
              CR = 01 0F
              MT = INFO(7B)
              2C 01 31                                         ,.1
<U3>07;07'909 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]023
<U3>07;08'171  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]023 [N(R)]020
              PD = Q.931(08)
              CR = 01 0F
              MT = INFO(7B)
              2C 01 30                                         ,.0
<U3>07;08'192 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]024
<U3>07;08'415  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]024 [N(R)]020
              PD = Q.931(08)
              CR = 01 0F
              MT = INFO(7B)
              2C 01 30                                         ,.0
<U3>07;08'450 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]025
<U3>07;08'658  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]025 [N(R)]020
              PD = Q.931(08)
              CR = 01 0F
              MT = INFO(7B)
              2C 01 35                                         ,.5
<U3>07;08'682 Tx :[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]026
<U3>07;08'941 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]020 [N(R)]026
              PD = Q.931(08)
              CR = 01 8F
              MT = CALL PROC(02)
              18 01 89 32 01 82                                ...2..
<U3>07;08'958  Rx:[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]021
<U3>07;09'086 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]021 [N(R)]026
              PD = Q.931(08)
              CR = 01 8F
              MT = ALERT(01)
              18 01 89 1E 02 80 88 34 01 40 95 2A 0B 80 9E 08  .......4.@.*....
              43 41 4C 4C 49 4E 47 20                          CALLING
<U3>07;09'106  Rx:[SAPI]00 R [TEI]102 [FRAME]RR      [N(R)]022
<U2>07;09'314 Tx :[SAPI]00 C [TEI]112 [FRAME]RR    P [N(R)]000
<U4>07;09'318  Rx:[SAPI]00 C [TEI]112 [FRAME]RR    P [N(R)]000
<U4>07;09'344 Tx :[SAPI]00 R [TEI]112 [FRAME]RR    F [N(R)]000
```

Figure 14-29   Outgoing Call Setup Output of BRI Call Monitor

```
<U2>07;40'993 Tx :[SAPI]00 R [TEI]113 [FRAME]RR     F [N(R)]000
<U4>07;40'997  Rx:[SAPI]00 R [TEI]113 [FRAME]RR     F [N(R)]000
<U4>07;41'000 Tx :[SAPI]00 R [TEI]113 [FRAME]RR     F [N(R)]000
<U2>07;41'005  Rx:[SAPI]00 R [TEI]113 [FRAME]RR     F [N(R)]000
<U3>07;41'168 Tx :[SAPI]00 C [TEI]102 [FRAME]RR     P [N(R)]027
<U3>07;41'180  Rx:[SAPI]00 R [TEI]102 [FRAME]RR     F [N(R)]025
<U3>07;53'481 Tx :[SAPI]00 C [TEI]127 [FRAME]U-INFO
             PD = Q.931(08)
             CR = 01 04
             MT = SETUP(05)
             04 03 80 90 A2 18 01 89 1E 02 80 83 6C 06 00 83   .............l...
             31 30 30 35 70 05 80 33 30 37 32 34 01 40         1005p..30724.@
<U3>07;53'514  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]027 [N(R)]025
             PD = Q.931(08)
             CR = 01 84
             MT = ALERT(01)
             18 01 89                                          ...
<U3>07;53'548 Tx :[SAPI]00 R [TEI]102 [FRAME]RR        [N(R)]028
<U3>07;55'488  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]028 [N(R)]025
             PD = Q.931(08)
             CR = 01 84
             MT = CONN(07)
<U3>07;55'518 Tx :[SAPI]00 R [TEI]102 [FRAME]RR        [N(R)]029
<U3>07;55'781 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]025 [N(R)]029
             PD = Q.931(08)
             CR = 01 04
             MT = CONN ACK(0F)
             18 01 89 34 01 4F 95 2A 03 80 9E 00               ...4.O.*....
<U3>07;55'792  Rx:[SAPI]00 R [TEI]102 [FRAME]RR        [N(R)]026
<U3>07;57'585  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]029 [N(R)]026
             PD = Q.931(08)
             CR = 01 84
             MT = DISC(45)
             08 02 80 90                                       ....
<U3>07;57'619 Tx :[SAPI]00 R [TEI]102 [FRAME]RR        [N(R)]030
<U3>07;57'942 Tx :[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]026 [N(R)]030
             PD = Q.931(08)
             CR = 01 04
             MT = REL(4D)
             08 02 80 90                                       ....
<U3>07;57'959  Rx:[SAPI]00 R [TEI]102 [FRAME]RR        [N(R)]027
<U3>07;57'979  Rx:[SAPI]00 C [TEI]102 [FRAME]INFO    [N(S)]030 [N(R)]027
             PD = Q.931(08)
             CR = 01 84
             MT = REL COMP(5A)
<U3>07;58'029 Tx :[SAPI]00 R [TEI]102 [FRAME]RR        [N(R)]031
<U1>07;59'447 Await. Sig.(F4)
<U4>08;05'903 Tx :[SAPI]00 C [TEI]112 [FRAME]RR     P [N(R)]000
<U2>08;05'907  Rx:[SAPI]00 C [TEI]112 [FRAME]RR     P [N(R)]000
<U2>08;05'928 Tx :[SAPI]00 R [TEI]112 [FRAME]RR     F [N(R)]000
<U4>08;05'932  Rx:[SAPI]00 R [TEI]112 [FRAME]RR     F [N(R)]000
<U2>08;05'969 Tx :[SAPI]00 C [TEI]112 [FRAME]RR     P [N(R)]000
<U4>08;05'973  Rx:[SAPI]00 C [TEI]112 [FRAME]RR     P [N(R)]000
<U4>08;05'989 Tx :[SAPI]00 R [TEI]112 [FRAME]RR     F [N(R)]000
```

Figure 14-30   Incoming Call Setup Output of BRI Call Monitor

ISDN Interfaces

RBUU/RBUS Interface Unit

System: *DK424, Release 4.2 and above*

Circuits per PCB: *2 circuits (2B + D each circuit)*

Interfaces with: *ISDN BRI U when connected to the Public Network or a BRI U-type TE-1 or TA devices when connecting to ISDN station equipment*

Older Version(s): *none*

The DK424 Release 4.2 system supports the RBUU/RBUS interface unit (Figures 14-31 and 14-32) according to the common control units resident in the system.

LEDs on the RBUU/RBUS show a continuous status of operation. Refer to Table 14-13 for a list of each LED's status.

Figure 14-33 shows the location of the LEDs and connectors.

RBUU Installation

Before installing a RBUU PCB into a DK424, a number of system programs must be run. We recommends running these programs in the order listed before installation. This allows the RBUU to function immediately upon insertion beginning with a self-check loop-back test and then normal operation. Before you can begin installation of the RBUU, you may have to install the subassemblies.

➤ **To install the subassemblies (RBUS)**

➤ Place the RBUS card (component side facing down) onto the RBUU connectors. Apply firm, even pressure to ensure proper seating of the connectors. The RBUS card should have been installed at the factory.

➤ **To install an RBUU PCB**

1. Insert the RBUU (component side facing right) into the appropriate slot and apply firm, even pressure to ensure proper seating of connectors.

2. After installing the RBUU, gently pull the PCB outward. If the connectors are properly seated, a slight resistance is felt.

RBUU1A

RJ-45 Modular for Circuit 1

RJ-45 Modular for Circuit 2

LED Indicator for Circuit 1

BSY
TS
LOS
FS

BSY
TS
LOS
FS

LED Indicator for Circuit 2

RS-232C Monitor Output

DIN Connector

P2 · P7 · P4 · P6 · P5 · P3 · P8 · P9 · J1 · J2 · J3

TOSHIBA

ORBUU1

RBUU1A

2799

Figure 14-31   RBUU PCB

RBUS1A

J7 — RJ-45 Modular for Circuit 3

J6 — RJ-45 Modular for Circuit 4

LED Indicator for Circuit 3

BSY
TS
LOS
FS

BSY
TS
LOS
FS

LED Indicator for Circuit 4

TOSHIBA

RBUS1A

2800
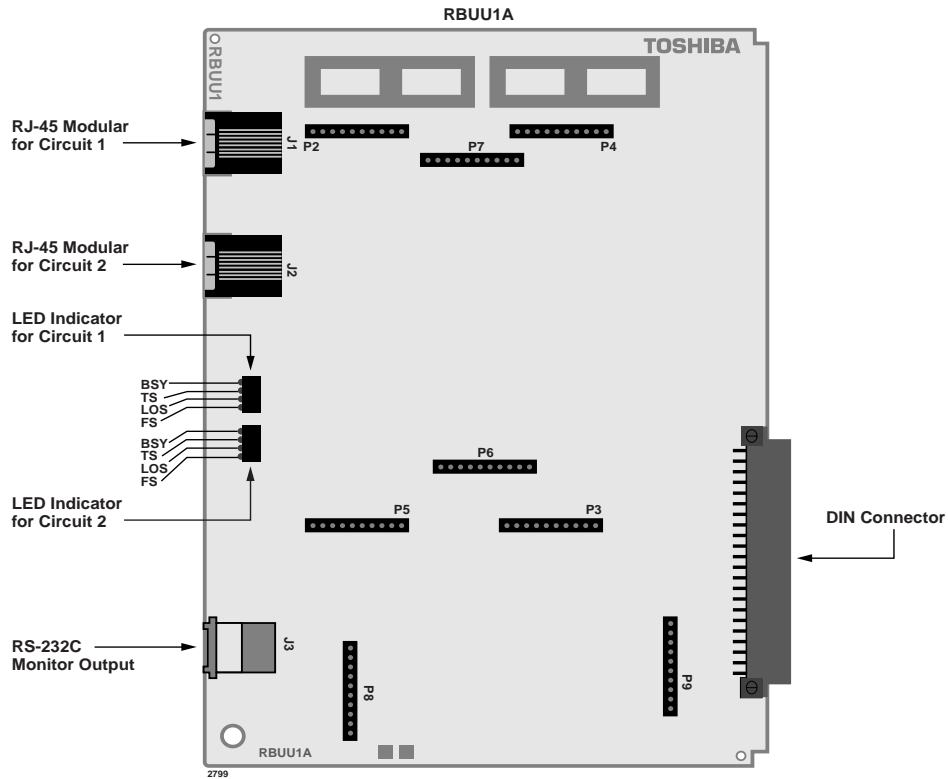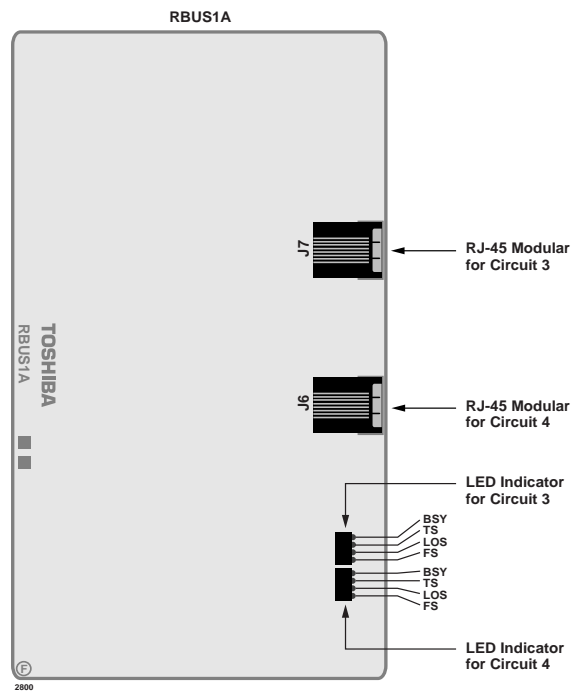
Figure 14-32   RBUS Subassembly
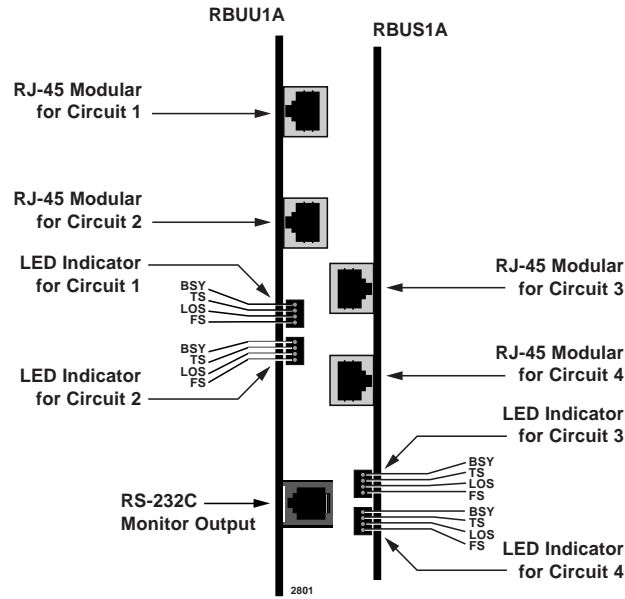
Figure 14-33   Location of LEDs and Connectors (RBUU/RBUS)

Table 14-13   RBUU/RBUS LED Indications

LED	Indication
BSY	Busy
TS	Time Synchronization
LOS	Loss of Signal
FS	Frame Synchronization

Hospitality Management Information System (HMIS) 15

This chapter gives you information about the Hospitality Management Information System (HMIS), including:

♦ HMIS Server/Workstation PC requirements

♦ Installation steps

♦ Setup Utility

♦ Maintenaince and troubleshooting

HMIS comes in a complete software package or a turnkey system that has all of the components pre-installed in the PC. The software package includes:

♦ HMIS application and documentation CD-ROM

♦ Printed user guide

♦ Symantec™ pcANYWHERE™

♦ HMIS activation key

For additional information, see the *Hospitality Management Information System (HMIS) General Description* and *HMIS User Guide*.

Minimum PC Requirements

HMIS Server

To ensure proper operation of HMIS, the following minimum PC requirements must be met. The turnkey package PC is also listed and can be used as a reference for the recommended PC requirements.

Table 15-1   Minimum Specifications

Hardware	Minimum	Recommended
PC	Intel® Celeron® Pentium® 200 MHz (or higher) with Universal Serial Bus (USB) port[1]	Toshiba Equium™ 7000D with Intel Pentium 200 MHz (or higher) and USB port[1]
RAM	32MB	32MB
Hard Drive	2GB	3GB
Disk Drive	3.5" 1.44MB Floppy	3.5" 1.44MB Floppy
CD-ROM	8 Speed	24 Speed
Network Interface Card (NIC)	10BASE-T EtherLink®[2]	10/100BASE-T EtherLink[2]
Monitor	14-inch SVGA .28n	15-inch SVGA .28n
Video Card	SVGA with 1MB VRAM	SVGA with 1MB VRAM
Keyboard	Standard 101/102	Standard 101/102
Mouse	PS/2	PS/2
Parallel Ports	1 (for activation key and customer-supplied printer)	1 (for activation key and customer-supplied printer)
Serial Ports	2	2
Modem	33.6 kbps or higher	33.6 kbps or higher
Uninterrupted Power Supply (UPS)[3]	ONEAC® (highly recommended)	ONEAC® (highly recommended)
Backup	Tape or Zip® drive (highly recommended)	Tape or Zip® drive (highly recommended)
Connectors	N/A	2 PPTC-9(F)
Software	**Minimum**	**Recommended**
Windows	95B/98[4]	Same
Remote	Symantec pcANYWHERE	Same

1. Port used to plug-and-play peripherals using one interrupt and address.
2. Required if the server and workstations are networked.
3. UPS is part of the turnkey package. It is highly recommended to protect the server from power failure that can corrupt data.
4. Required for USB support.

HMIS Workstation

Table 15-2   Minimum Specifications

Hardware	Minimum	Recommended
PC	Intel Celeron Pentium 150MHz (or higher) with USB port	Toshiba Equium 7000D with Intel Pentium 233MHz (or higher) and USB port
RAM	32MB	32MB
Hard Drive	1GB	3GB
Disk Drive	3.5" 1.44MB Floppy	3.5" 1.44MB Floppy
CD-ROM	8 Speed	8 Speed
NIC	10BASE-T EtherLink[1]	10BASE-T EtherLink[1]
Monitor	14-inch SVGA .28n	15-inch SVGA .28n
Video Card	SVGA with 1MB VRAM	SVGA with 1MB VRAM
Keyboard	Standard 101/102	Standard 101/102
Mouse	PS/2	PS/2
Serial Ports	2	2
Parallel Ports	1 (for customer-supplied printer)	1 (for customer-supplied printer)
Software	**Minimum**	**Recommended**
Windows	95B/98[2]	95B/98[2]

1. Required if the server and workstations are networked.
2. Required for USB support.

Installation

Step 1: Check Strata DK System Requirements

The Strata DK must have SMDR and TTY ports to transmit and receive data to the HMIS. HMIS connects to Strata DK using the TTY and SMDR ports on a PIOU, PIOUS, RSIU, or RSSU at 1200, 2400, or 4800 baud (see "Connect HMIS PC to Strata DK" on Page 15-4). RSIU with RSSU is the recommended configuration.

If SMDR is also used for general purposes, in addition to hotel guest billing records, it requires a customer-supplied Y-connector (see to a general purpose printer or call accounting device.
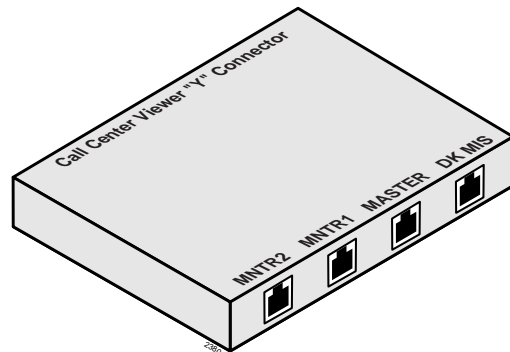
Figure 15-1   Customer-supplied Y-Connector

Important!

♦ *The Automatic Wake-up Call function has some specific Strata DK system requirements that are:*

  ♦ *One dedicated digital station port and one digital telephone to provide Automatic Wake-up Call.*

  ♦ *An external customer-supplied music source or digital announcer is required for optional music or greeting for guests who receive Auto Wake-up calls. The telephone system must have an available standard station port on an RSTU2 or RDSU card.*

♦ *An RSIU with two RSIS cards are required for Stratagy Voice Mail (SMDI interface). See Stratagy Hospitality Application Software Technical Bulletin (TB40-0022) for details.*

Step 2: Make Sure You Have Everything

♦ HMIS-SWK CD-ROM with the HMIS software and documentation

♦ Printed *HMIS User Guide*; *Strata DK Installation and Maintenance Manual*, Chapter 15; and other applicable documentation (bulletins, etc.)

♦ Symantec pcANYWHERE

♦ Adobe® Acrobat® Reader

♦ HMIS activation keys

♦ PPTC-9 and PPTC-25F connectors

♦ UPS (optional)

♦ Five-port network hub (optional)

Note   Printer not included.

Step 3: Inspect HMIS Server/Workstation PCs

CAUTION!	**Always wear an anti-static wrist strap when inspecting HMIS system components.**

Important!   *Before powering on, remove the computer cover and verify that all cards (i.e., internal modem, SVGA, and network cards) are seated and secured properly. Make any adjustments necessary and replace the cover.*

Step 4: Connect HMIS PC to Strata DK

HMIS interfaces directly to the DK424/DK280 Release 3.1 or higher and the DK40i, by connecting the PC to the TTY and SMDR ports. HMIS comes standard as a server/workstation configuration. If additional terminals are needed, HMIS workstations can be networked using a LAN.

PPTC Connectors

A PPTC, PPTC-9, PPTC-25F or PPTC25-MDM and two six-conductor telephone cords connect the HMIS-SVR COM Port 1 and 2 with Strata DK TTY and SMDR ports (see Figure 15-2).

See Figure 15-5 on Page 15-6 for pinout details for connecting the HMIS SVR to other equipment, such as line drivers.
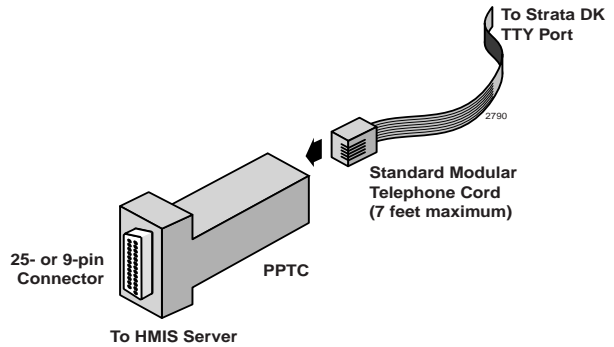
Figure 15-2   PPTC-9 or PPTC-25F Connector

Line Driver

An RS-232 short-haul modem or Line Driver (see Figure 15-3) is needed to boost PC transmission located more than 50 feet from the Strata DK System. A suitable Line Driver is made by Black Box® Corporation at (412) 746-5500, Model ME764A-MSP (male) or ME764A-FSP (female).

Line Drivers must be used in pairs. Figure 15-4 shows the connections between the two line drivers.

See "HMIS Server PC (More than 50 Feet Away)" on Page 15-7 for instructions on connecting PCs more than 50 feet from the Strata DK.
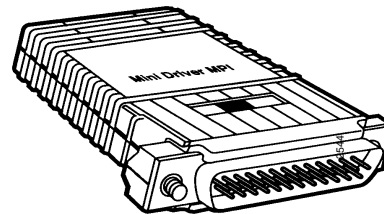
Figure 15-3   RS-232 Short-haul Line Driver
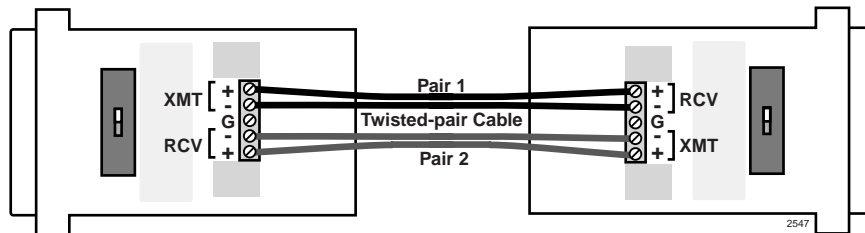
Figure 15-4   Twisted-pair Connections
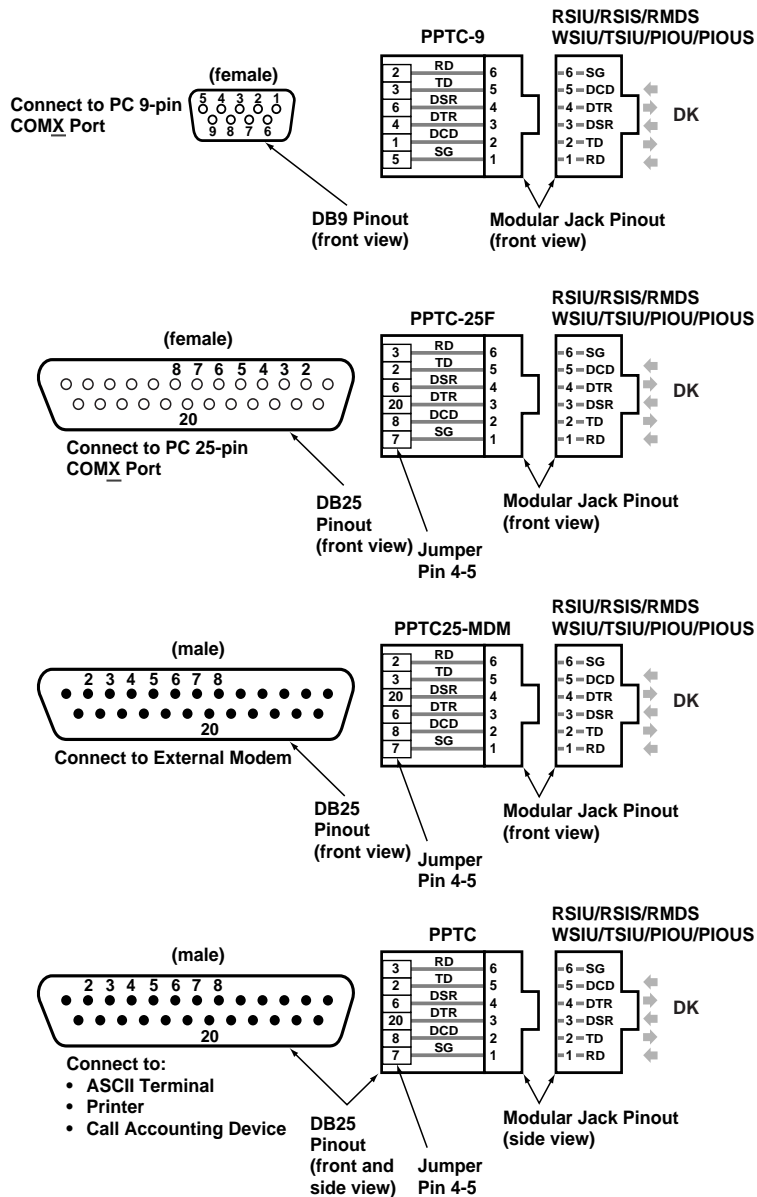
Figure 15-5   PPTC Pinout Diagram

HMIS Server PC (Single Front Desk Terminal)

For smaller installations, an HMIS server acting as a single front desk terminal can be installed (see Figure 15-6).

Strata *DK424*

SMDR link to DK424 using a PIOU, PIOUS, RSIU, or RSSU at 1200, 2400, 4800 baud to COM Port 2 on HMIS-Server PC.

UPS

UPS keeps the HMIS working even when commercial power is down.

Resident 33.6 modem connected to a station on the DK424 or a telephone company line.

HMIS Server

2420

TTY link to DK424 using a PIOU, PIOUS, RSIU, or RSSU at 1200, 2400, 4800 baud to COM Port 1 on HMIS-Server PC.

Figure 15-6   HMIS Server PC

HMIS Server PC (More than 50 Feet Away)

1. Connect the Strata DK TTY or SMDR port (RSIU/RSIS, RSSU, PIOU, or PIOUS PCB) to the ME764-MSP Line Driver with an RS-232 cable (see Figure 15-7). Set the switch on the Line Driver to DTE.

2. Connect the other end of the Line Driver to the COM port of the HMIS PC. Set the switch on this Line Driver to DCE.

HMIS Server PC

Strata DK

Line driver must be less than 50' from DK

ME764-FSP
Line Driver Modem

ME764-FSP
Line Driver Modem

2791

SW: Set to DTE position

SW: Set to DCE position - plugs into 25-pin COM port of PC

4-conductor, twisted-pair phone cord
6-conductor, twisted-pair phone cord
■ PPTC male connector
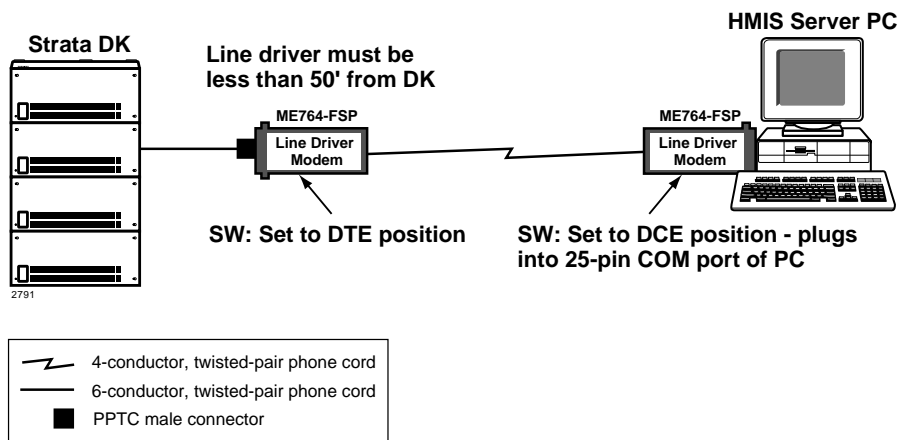
Figure 15-7   Connecting Strata DK to a HMIS Server PC more than 50 Feet Away

HMIS Server PC with HMIS Workstation PCs

For larger installations, the HMIS server PC can be networked with HMIS workstation PCs via a LAN to function as multiple front desk terminals (see Figure 15-8). The configuration includes a five-port 10Base-T network hub (HM-HUB5P) which can support up to four workstations. Up to nine workstations can be connected using either larger or multiple hubs.
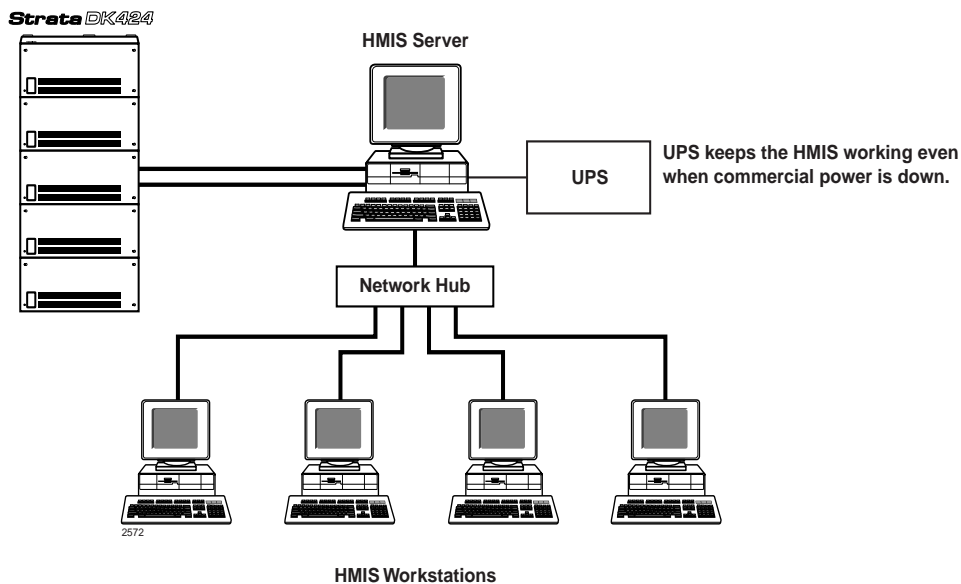
Figure 15-8   Server PC with Workstations

Step 5: Install the Network Hub (Optional)

➤ See the hub manufacturer's instruction booklet (included in the package) for the procedure on installing the hub.

Step 6: Install Activation Keys

There are two types of required activation keys, one for a server (HMIS-S) and one for a workstation (HMIS-W).

➤ Install the correct HMIS activation key on the LPT1 parallel printer port of the HMIS server (see Figure 15-9).
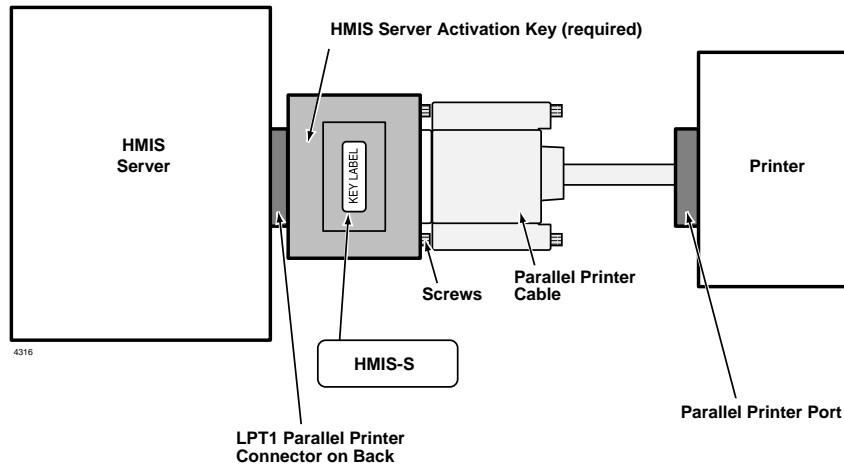
Figure 15-9   HMIS Server PC Activation Key

...or if there are HMIS workstations, install the correct activation key on each (see Figure 15-10).
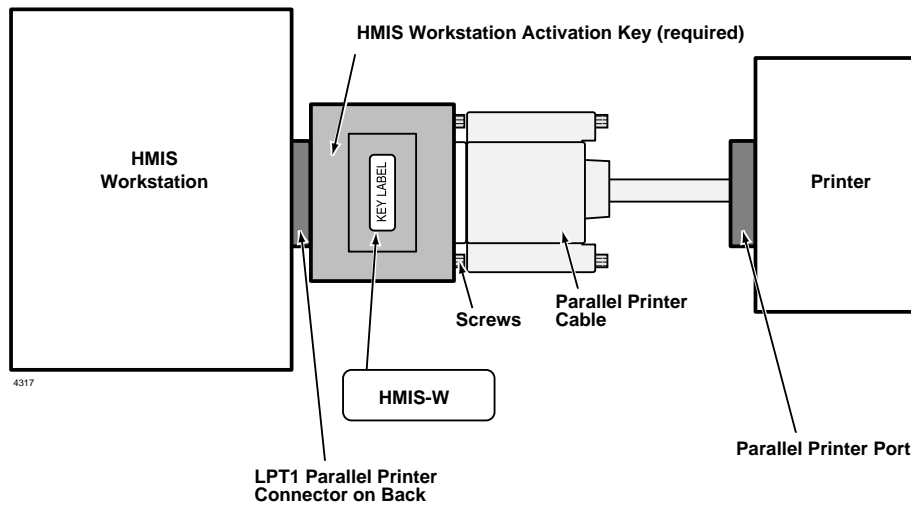
Figure 15-10   HMIS Workstation PC Activation Key

Step 7: Power Up the System

➤ Power up the HMIS PC server/workstations.

Step 8: Verify Communication Port Settings

1.	From Windows 98/ 95, click Start, then Settings.	The Settings drop-down menu displays.
2.	Click Control Panel, then double-click the System icon.	The System Properties screen displays.
3.	Click the Device Manager tab, then double-click the Ports icon.	The ports display on the screen.
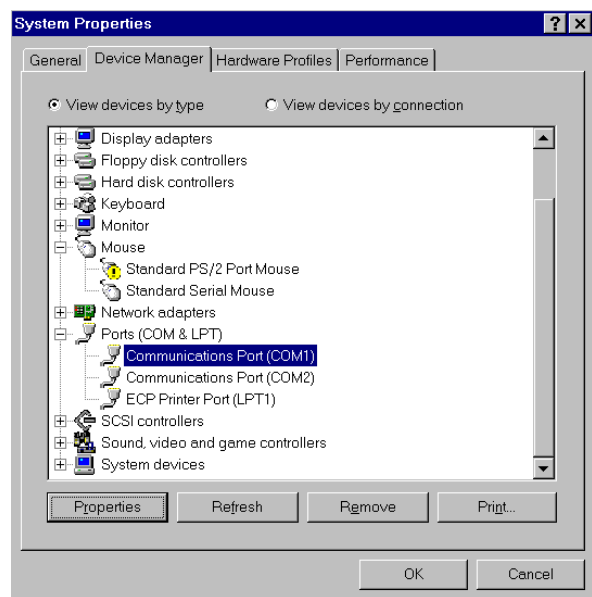
4.	Highlight COM1 and click Properties.	The Communications Port (COM1) Properties screen displays.

5.	Click Resources tab.	This displays:
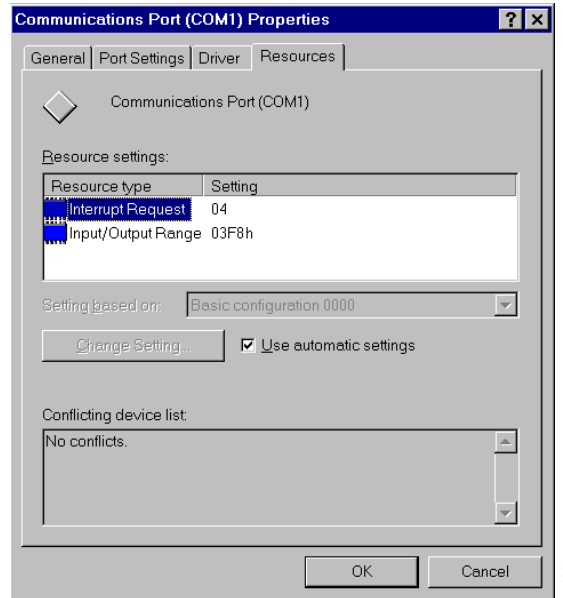
6.	Check the Interrupt and Address settings.	The communication port settings for the HMIS server/workstation PCs are:

- ♦ Interrupt = 4
- ♦ Address = 3F8h

7.	Click OK.	
8.	Highlight COM2 and click Properties.	The Communications Port (COM2) Properties screen displays.
9.	Click Resources tab.	The COM2 resource settings display.
10.	Check the Interrupt and Address Settings.	The server/workstation communication port settings are:

- ♦ Interrupt = 3
- ♦ Address = 2F8h

11.	Click OK twice, then close the Control Panel window.	**Important!** *The COM3 modem must have a unique IRQ and address setting. These resources cannot be shared.*

Step 9: Verify Modem Settings

Important!   *The HMIS workstation PC is not equipped with a modem.*

1. From Windows 98/ 95, click Start, then Settings.

2. Click Control Panel, then double-click the Modems icon.

The screen should designate the COM3 port as Modem 33.6K (as shown).
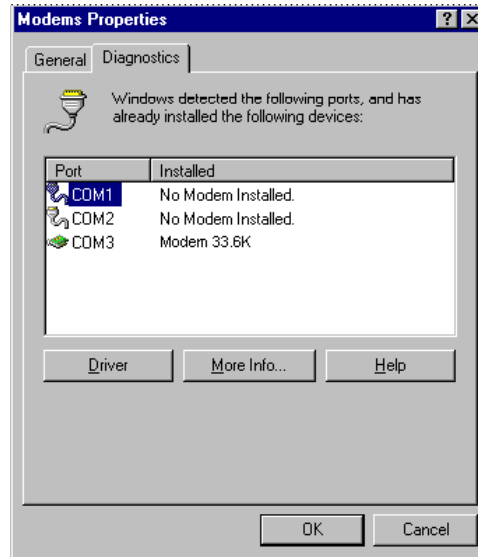
3. Click the Diagnostics tab.

4. Highlight COM3 and click More Info...
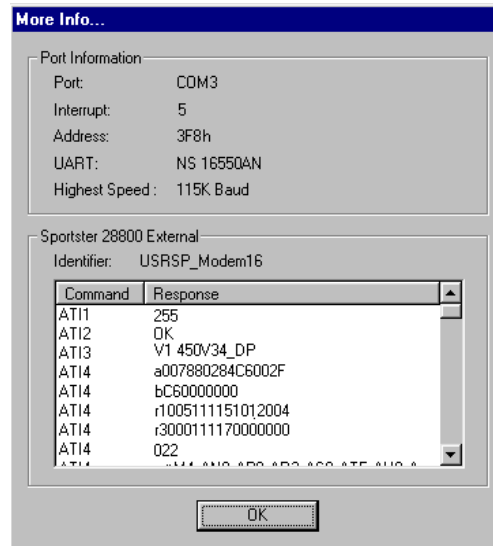
5. Check the Interrupt and Address settings.

The modem settings should be:

♦ Interrupt = 5

♦ Address = 3E8h

6. Click OK twice, then close the Control Panel window.

Important! *The COM3 modem must have a unique IRQ and address setting. These resources cannot be shared.*

Step 10: Verify pcANYWHERE Modem Settings

Note   These settings are available only on the HMIS server PC.

1. From Windows 98/ 95, click Start, then highlight Programs.

The Programs drop-down menu displays.

2. Highlight pcANYWHERE32 and from the drop-down menu, click pcANYWHERE.
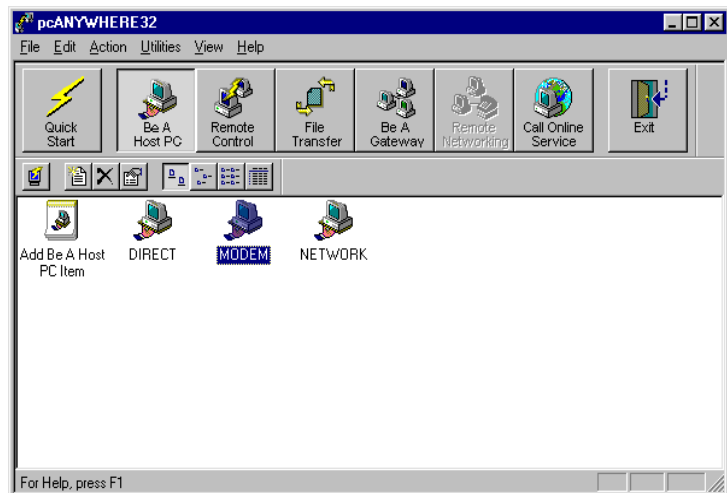
3. Highlight the Modem icon and press **Alt**+**Enter**.
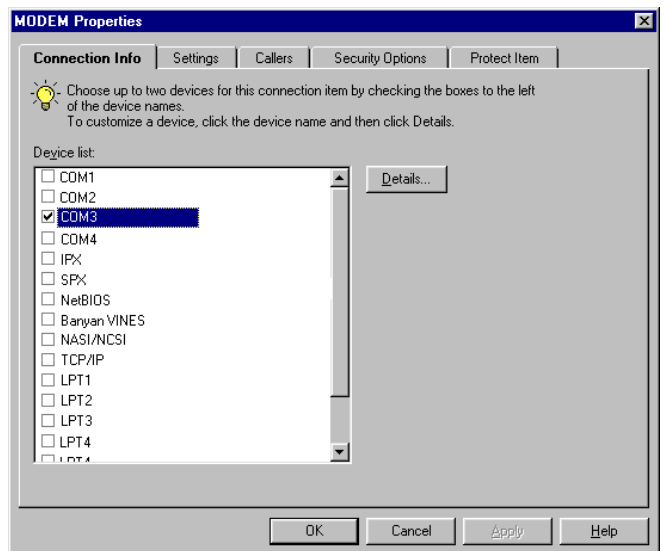
4. Highlight COM3 and click Details.

This displays:
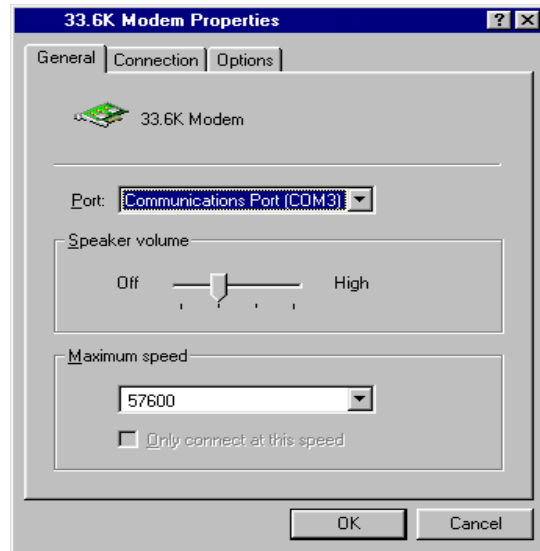
5. Check that Port field reads COM3. If not, use the pull-down menu to correct.

6. Click OK twice, then close pcANYWHWERE window.

Step 11: Install the Software

Note If you purchased the turnkey system, all of the software comes pre-installed from the factory. This procedure is provided to assist you in reinstalling or upgrading the turnkey software, when necessary, or installing the software package.

Important!

♦ *Run ScanDisk to verify that no errors exist on the HMIS hard drive.*

♦ *Backup the HMIS databases using the Windows backup function.*

♦ *Close all applications on the PC before attempting HMIS software installation.*

➤ **To install, reinstall, or upgrade the software**

1. Click Start, then Run.

2. Insert the CD-ROM Disk into the <drive>.

   <drive> = CD-ROM drive letter on the PC.

3. Type:
   <drive>:\hmis\ setup.exe
   Click OK.

   A pop-up window reads "Copying initialization files...". When complete, this displays:

4. Click OK.

   This displays:
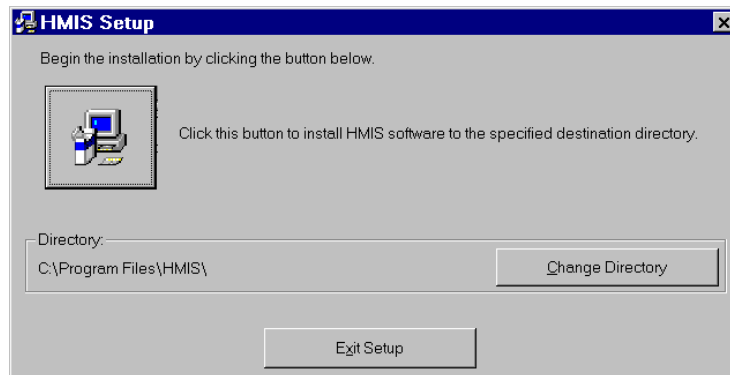
5. Click the installation button.

   The HMIS setup begins.

Then, this displays for a few seconds:

Finally, this displays:

6. Click OK.

7. Restart HMIS server/ workstation PC.

Step 12: Set up the HMIS Databases/Settings

The Setup Utility is accessed from the Main screen by clicking on the Setup button at the bottom of the screen. At the right of every setup screen is a menu of the setup selections that comprise the utility (see Figure 15-11).

The following options appear in the Setup Menu screen:

♦ Rooms – Enables you to set up a database of room listings using the Master Room Setup screen.

♦ Settings – Establishes phone rates (local, long distance, international), taxes, voice mail, auto wake-up settings, etc.

♦ Employee – Enables you to enter a three-digit employee ID code for maids, janitors, clerks, medical, service/delivery, restaurant, management and other staff categories. The codes can be used for various productivity and tracking reports.

♦ AutoGen – Creates contiguous room records automatically using an incremental approach. Given a starting room number, extension number and port number, a specified number of default records are appended to the room-record database. For configurations with widely varying room numbers, segments of room numbers can be created by repeating the procedure.

♦ Company – Provides company information for use on guest bills and reports.

♦ Statement – Enables you to set up a customized billing statement.

For a complete description of screen fields and instructions on using the screens, see "Set up the Server Network" on Page 15-31.

HMIS Main Screen

Setup Menu

Figure 15-11   Setup Menu

Substep A: Access HMIS Server PC

1. Click Start, Programs, then HMISWS icon.

HMIS Login

Enter User Name:

Enter Password:

2. From the HMIS Login screen, press **Enter** twice.

This displays until you enter the employee IDs and names in the database. (See "Create Employee Database" on Page 15-20.)
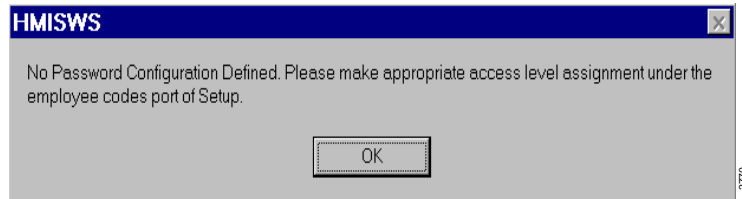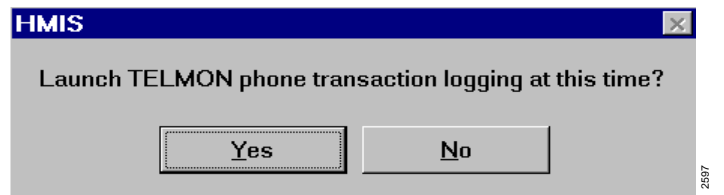
```
HMISWS                                                        [X]

No Password Configuration Defined. Please make appropriate access level assignment under the
employee codes port of Setup.

                            [    OK    ]
```

3. Click OK.

This displays:

```
HMIS                                                         [X]

Launch TELMON phone transaction logging at this time?

        [    Yes    ]              [    No    ]
```

4. Click Yes.

Important! *TelMon must always be running on the server to capture call data from the Strata DK SMDR port.*

A Strata Hospitality icon is placed on the Windows taskbar. This displays until you enter the port communication settings for the SMDR line.
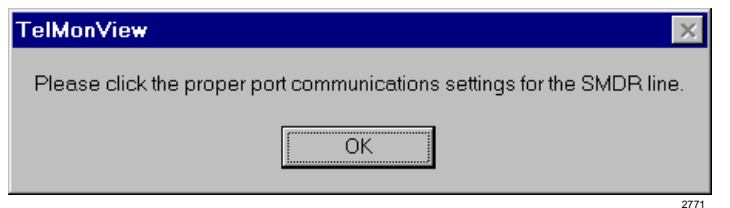
```
TelMonView                                                   [X]

Please click the proper port communications settings for the SMDR line.

                            [    OK    ]
```

See "Check HMIS SMDR and TTY Port Settings" on Page 15-21 for instructions.
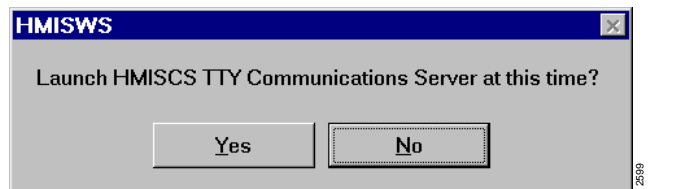
5. Click OK.

This displays:

```
HMISWS                                                       [X]

Launch HMISCS TTY Communications Server at this time?

        [    Yes    ]              [    No    ]
```

Important! *The TTY Communications server communicates directly with the Strata DK system and must always be running.*

6. Click Yes.

A Strata Hospitality icon is placed on the Windows taskbar. The icon is used to check/change the TTY settings (see "Check HMIS SMDR and TTY Port Settings" on Page 15-21).

7. Click OK.	This only displays the first time you access HMIS.
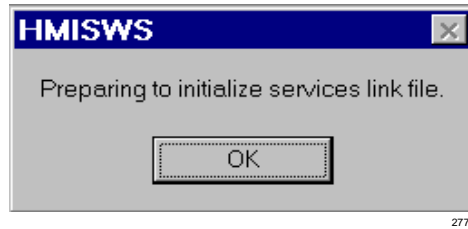
8. Click OK.	The HMIS initializes the services link file. This only displays the first time you access HMIS.
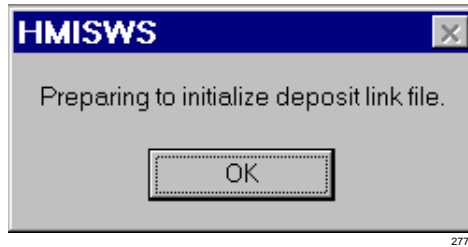
9. Click OK.	The HMIS initializes the deposit link file. This only displays the first time you access HMIS.

10. Click OK.	The HMIS initializes the messages link file. When the message link file is initialized, this displays.
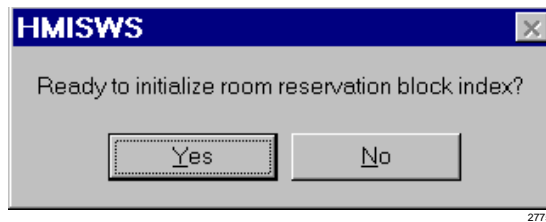
This only displays the first time you access HMIS.

Substep B: Initialize the Room Reservation Block Index

➤ Click Yes.	HMIS initializes a room reservation block index for eight years. Once initialized you can change the reservation block to 4, 12, 16, or 20 years. (See "Modify the Reservation Block Index" on Page 15-54 for instructions on changing the block index.) This displays:
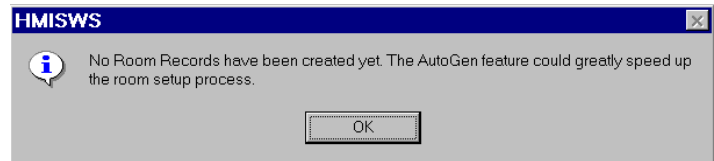
Substep C: Create Room Records Database

1. Click OK.	The AutoGen Setup screen displays (see Figure 15-16 on Page 15-43).
2. Enter the rooms (description, type, location, etc.) into the AutoGen Setup screen	You can use the AutoGen Setup screen to enter blocks of similar rooms at one time. It may be possible to complete your installation by running this procedure a few times.
...or click Rooms and enter the rooms into the Master Room Setup screen.	You can select the Master Room Setup screen and enter individual rooms into the database (see Table 15-7 "Master Room Setup Screen Fields" on Page 15-45 for instructions).

Substep D: Create Employee Database

➤ Enter the company employees into the database, using the Employee Codes screen. (See "Add a Staff Member to the Database" on Page 15-48 for instructions.)

Substep E: Enter the Company Information

➤ Enter the company information into the database, using the Company screen. (See "Add Company Information to the Database" on Page 15-50 for instructions.)

Substep F: Establish HMIS Settings

➤ Enter the settings (rates, taxes, voice mail, etc.) for the hotel/motel system, using the Settings screen. (See "Enter, Change, Delete Settings" on Page 15-53 for instructions.)

Substep G: Set up Statement Format

➤ Set up statement format to be used as a billing statement when a guest checks out. (See "Invoice Statement Format" on Page 15-55 for instructions.)

Step 13: Check HMIS SMDR and TTY Port Settings

Note   These programs are available only on the HMIS server PC.

There are two auxiliary programs that must be running on the server at all times—Transaction Monitor Program (TelMon) and HMIS Communication Settings Program (HMISCS).

Transaction Monitor Program (TelMon)

This program captures call data from the Strata DK SMDR port. The TelMon program consists of two screens, SMDR Viewing and SMDR Processor.

SMDR Viewing/Processor Screens

These screens (see Figure 15-12) contain HMIS SMDR port settings and an exporting feature which enables you to export data to an ASCII file for checking trunk utilization. See Table 15-3 on Page 15-22 for screen field descriptions.

Important!   *This program must always be running on the server to capture call data from the Strata DK SMDR port.*
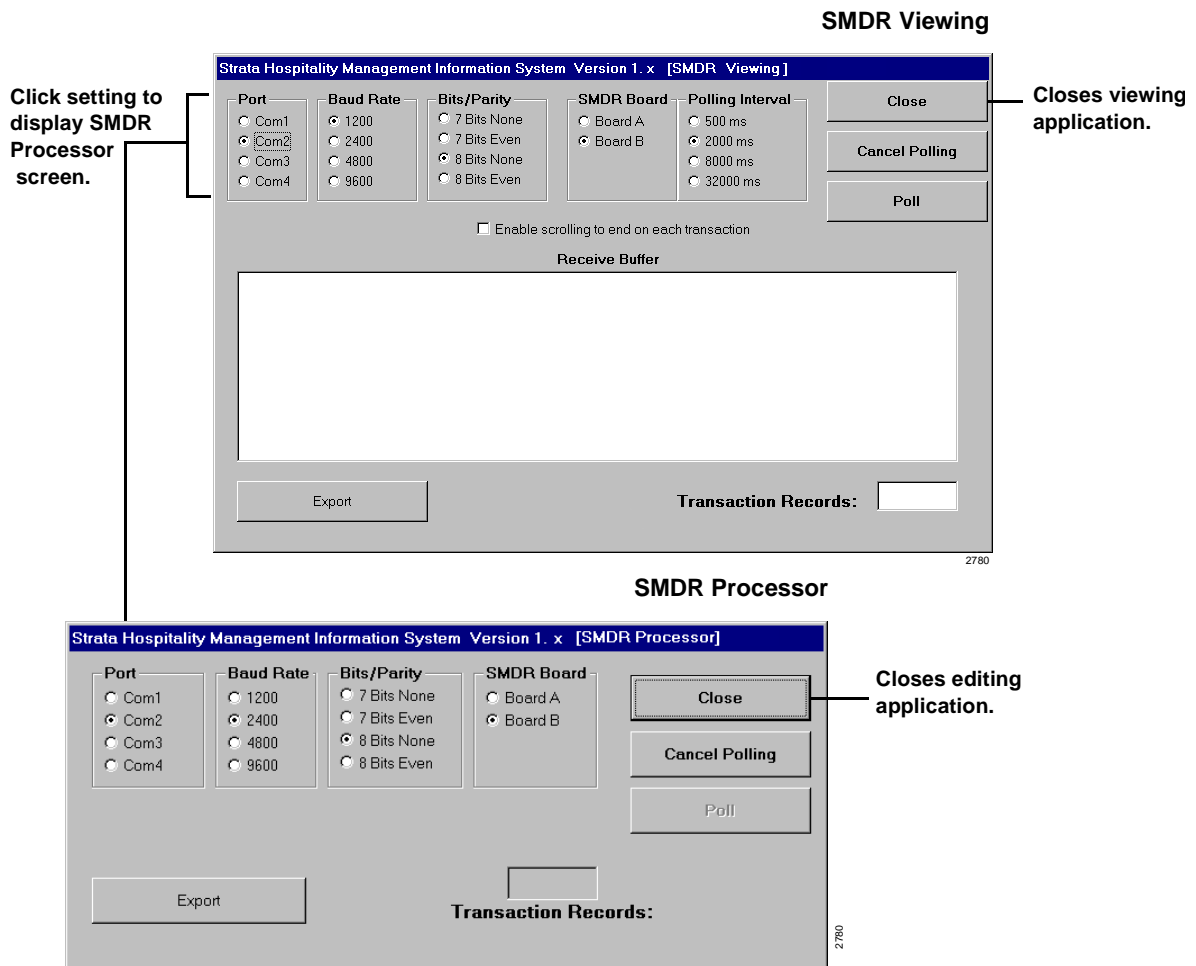
Figure 15-12   SMDR Viewing/Processor Screens

Note   For instructions on using these screens to export data, see "Check Trunk Utilization" on Page 15-68.

Table 15-3   SMDR Viewing/Processor Screen Fields

Field	Description
Port	Select COM2 as the SMDR port to receive data from the Strata DK. The default configuration is COM2 which is marked COM on the back of the PC.
Baud Rate	The baud rate speed must match the Strata DK TTY port setting. The default for DK424 is 1200.
Bits/Parity	The bits/parity should match the Strata DK. The default for the DK424 is 8 bits, None.
SMDR Board	Board A = RCTUA Board B = RCTUBA/BB, RCTUC/D, or RCTUE/F
Polling Interval	The polling interval should be 2000 ms; this is the factory setting and does not need to be changed.
Enable scrolling to end on each transaction	By checking this selection, the latest or last call record received is listed at the end of the receive buffer window. If unchecked, it enables the up and down arrow at the side of the receive buffer window to be used to scroll back through approximately 2,000 call records that are displayed in the received buffer window.
Transaction Records	(Display only) The transaction records window is a counter that increments as call records are received. This window starts at "0" only when the system is first installed. The window shows "2000" after 2,000 call records have been received into the buffer. From that point on, it displays 2,000+; however, many calls would have been received since the software has been stopped and restarted.

HMIS Communication Settings Program (HMISCS)

This program communicates with the Strata DK TTY port. The HMISCS software consists of three TTY screens, Comm Server Viewer, Comm Server, and Communication Settings and Emulation.

Comm Server Viewer/Comm Server

These screens (see Figure 15-13) verify the following functions are working properly: check-in/check-out and the Enable DND, Disable DND, and Change Phone Service buttons on the Control/Status tab. See Table 15-4 on Page 15-23 for screen field descriptions.

Important!   *This program must always be running on the HMIS server to communicate with the Strata DK TTY port.*

**Double-click here to display the
Comm Server screen.**

Comm Server Viewer

**Closes viewing
application.**

**Functions
Window**

3301

Comm Server

Display

**Status
Line**

3308
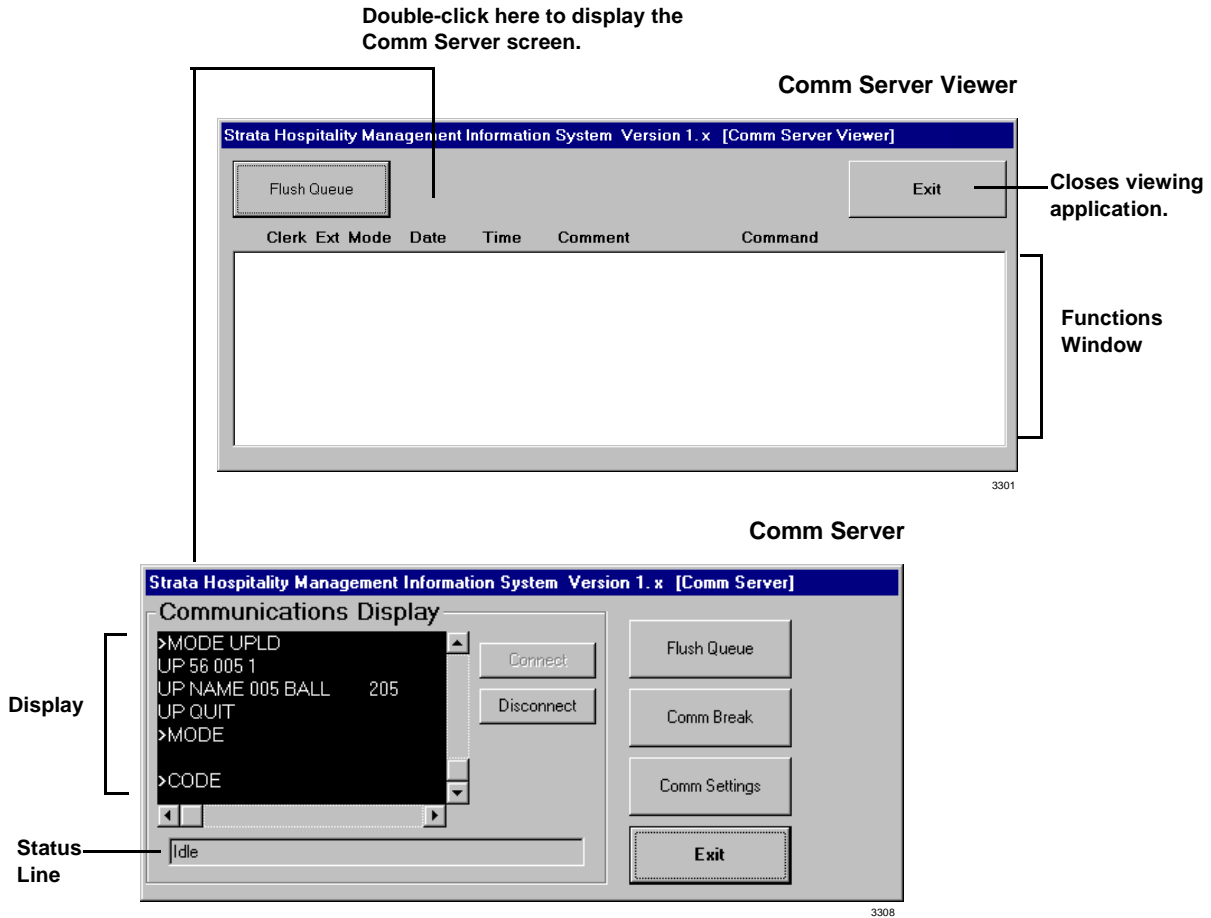
Figure 15-13   Comm Server Viewer/Comm Server Screens

Note   For instructions on using this screen to verify communications, see "Check HMIS Communications with Strata DK" on Page 15-74.

Table 15-4   Comm Server Viewer/Comm Server Screen Fields

Field	Description
Status Line	Displays the active function. If no function is active, displays "Idle."
☑ **(Check Mark)**	HMIS checks the box once it has completed the function.
Clerk	ID of person logged on to the system.
Ext	Room extension.
Mode	These are the modes: 1: Enable telephone service. 2: Disable telephone service. 3: Enable DND. 4: Disable DND. 5: Remote maintenance (required to perform Mode 1 or 2 changes)
Date	Date in DD/MM/YY format when the procedure was performed.
Time	Time in HH/MM/SS format when the procedure was performed.
Comment	Brief description of function performed.
Command	Guest name/room number.

Communication Settings and Emulation Screen

This screen (see Figure 15-14) designates the Strata DK telephone system interface/settings. The screen can also be used to communicate and program the Strata DK and to output (record) the communications to a file. (See Table 15-5 for screen field descriptions.)

Important!   *This procedure stops communication to the Strata DK.*
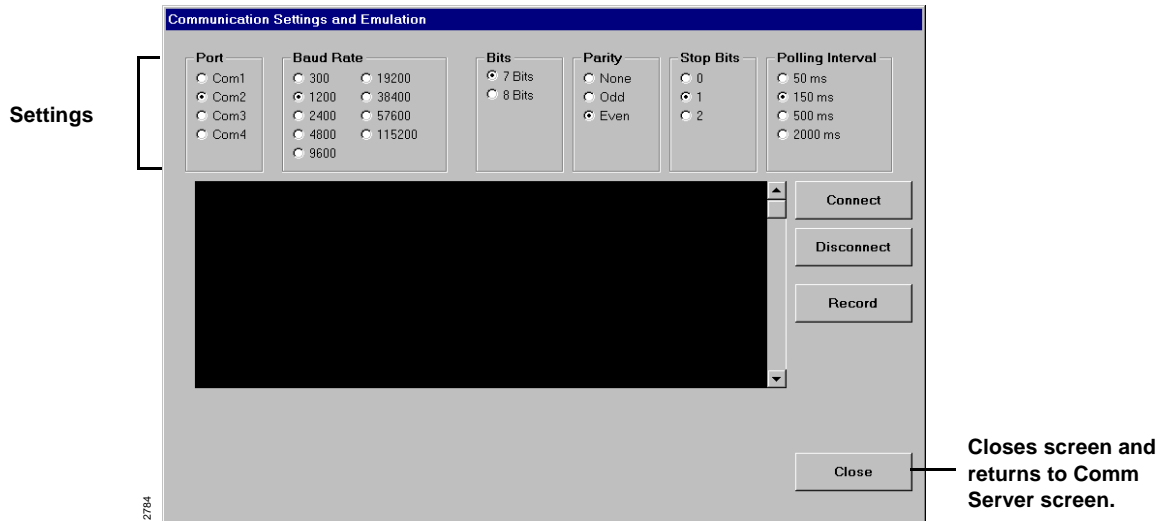
Figure 15-14   Communication Settings and Emulation Screen

Note   For instructions on using this screen to perform manual tests/remote maintenance or output data to a file, see "Perform Manual Tests/Remote Maintenance" on Page 15-71.

Table 15-5   Communication Settings and Emulation Screen Fields

Field	Description
Port	Select COM1 which is marked COM on the back of the PC.
Baud Rate	The baud rate speed must match the Strata DK TTY port setting. The default for DK424 is 1200.
Bits	The Bits must match the Strata DK TTY port setting. The default for DK424 is 7 Bits.
Parity	The Parity must match the Strata DK TTY port setting. The default for DK424 is Even.
Polling Interval	The polling interval must be 150 ms.

Substep A: Access the TelMon/HMISCS Screens

Each time the HMIS program is started, a minimized button for each of the programs (i.e., TelMon, HMISCS) appears on the desktop taskbar (shown below). By placing your cursor on a button, context-sensitive help identifies the program as the SMDR Viewer (TelMon) or the Comm Server (TTY) Viewer.
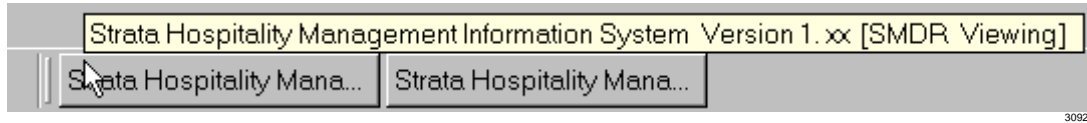
➤ **To access the program screens**

➤ Click on the desktop taskbar icon. The program screen (Comm Server Viewer, SMDR Viewing) displays.

Upon exiting the screens, the minimized buttons are removed from the taskbar, and the servers continue to run in the background. To access the screens again, you must use the Setup Utility screen (see "Restart HMIS SMDR and/or TTY Servers" on Page 15-65).

Substep B: Check SMDR Settings

1. From the SMDR Viewing screen, check the SMDR settings on the screen (see Figure 15-12 on Page 15-21).	SMDR settings for the DK424 should be: ♦ Port = COM2 ♦ Baud Rate = 1200 ♦ Bits/Parity = 8 Bits None ♦ SMDR Board = Board B ♦ Polling Interval = 2000 ms.
2. If no changes are necessary, click Close. When the TelMon View pop-up box displays, click Yes ...or if you have a change, click the desired setting.	
3. Click Yes to make the change	The SMDR Processor screen displays (see Figure 15-12 on Page 15-21).
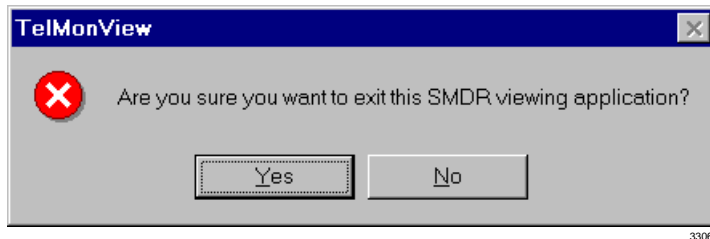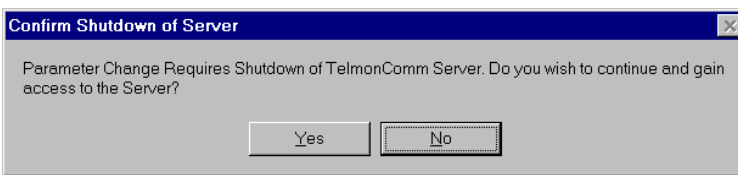
...or click No to cancel the process. When the TelMon View pop-up box displays, click OK.

4. Select the new setting, then click Close.

The SMDR Viewing screen displays.

5. Click Close.
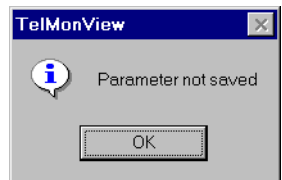
6. Click Yes.
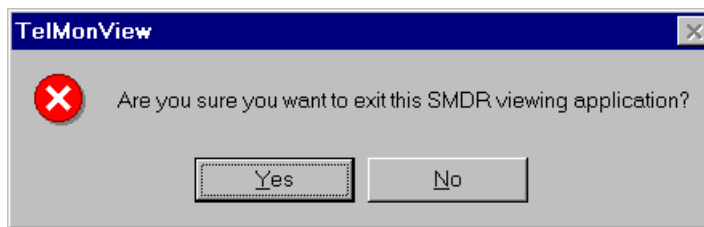
Substep C: Check HMIS TTY Settings

1. From the Comm Server Viewer screen, double-click the area to the right of Flush Queue (see Figure 15-13 on Page 15-23).
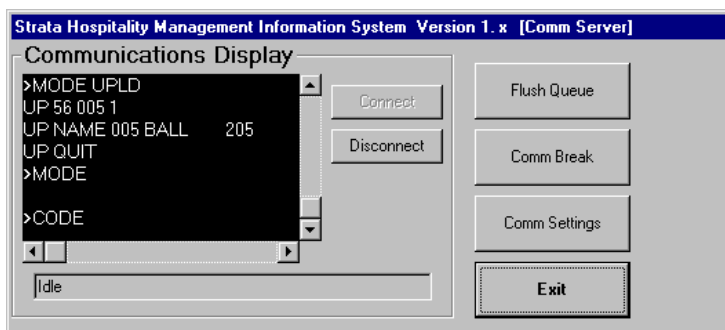
2. From the Comm Server screen, click Disconnect.

Call capturing is discontinued.

3. Click Comm Settings.
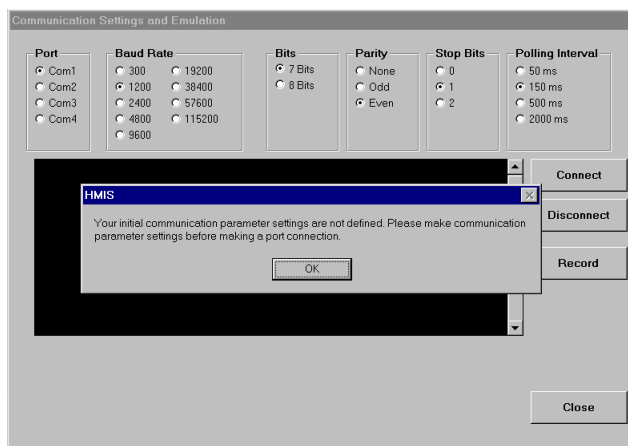
4.	Click OK.	The pop-up box disappears.
5.	Check the TTY settings on the screen and change, if necessary.	TTY settings for the DK424 should be:

- ♦ Port = COM1
- ♦ TTY = 1200
- ♦ Bits = 7 Bits
- ♦ Parity = Even
- ♦ Stop Bits = 1
- ♦ Polling Interval = 150 ms.

6.	Click Close.	The Comm Server screen displays.
7.	Click Exit.	The Comm Server Viewer screen displays.
8.	Click Exit.	
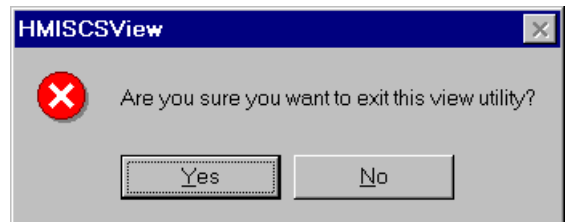
9.	Click Yes.

Step 14: Program the Strata DK

The HMIS controls outgoing calls by assigning the station to one of three LCR classes of service. Outgoing calls are tracked and recorded using the DK's SMDR data.

Table 15-15 lists the Strata DK programs which must be configured for the HMIS integration with the Strata DK systems to operate properly. See Strata DK HMIS LCR Programming on the next page for additional LCR programming instructions.

Table 15-15 Strata DK Program List

Program	Settings
Program 03	Assign PIOU, PIOUS or RSIU PCBs to cabinet slots.
Program 16	Assign CO Line Groups or Dial 9.
Program 45-1	Define a dial plan for Toll Restriction.
Program 50-1	Set LED 01 and 04 ON to enable LCR.
Program 50-2	Set LCR home area code.
Program 50-3	Add the 411 and 911 as special codes.
Program 50-4	Add the long distance route plan: 08 for RCTUA, RCTUBA/BB and 16 for RCTUC/D, RCTUE/F.
Program 50-5	Enter 02 as the local call plan.
Program 50-6	Enter the LCR time-out value. 06 is recommended.

Table 15-15 Strata DK Program List *(continued)*

Program	Settings
Program 51	Enter LCR area codes. Plan 01 includes home area code, 800, 888. Plan 08 includes long distance area codes. Plan 16 is used for RCTUC/D, E/F processors.
Program 52	Assign LCR office code exceptions for specified area code as needed.
Program 53	Enter LCR schedule assignments for LCR plan no. 01, 02, and 08/16. Stations in groups 1, 2, and 3 are controlled by HMIS.
Program 54	LCR Route Definition Tables. Table defaults are acceptable.
Program 55-0	Delete PIC Code digits as needed.
Program 55-1/55-2	Assign PIC Code digits as needed.
Program 56	LCR Station Group Assignments for LCR plans 01, 02, and 08/16. Group 1: No restrictions Group 2: Local, 800, 888, 911only Group 3: Resident room in house dialing and 911 only
Program 60-2	Set SMDR threshold time to 0 for 1 second.
Program 60-3	Set SMDR output for 0 (outgoing calls only).
Program 76-1	Assign SMDR and TTY ports.

Strata DK HMIS LCR Programming

The following LCR programs use the guidelines shown in Table 15-15. See Chapter 5 – Least Cost Routing in the *Strata DK Programming Manual* for more detailed information.

Program 50-1 LCR Parameters

➤ Set LED 01 and LED 04 to ON.

LED	On		Off	
01	X	Enable System LCR		No LCR
02		Not Used		Not Used
03		555 LDI Route per Program 50-4		Per Area Code Table
04	X	Dial Tone After LCR Access		Silent
05		Warning Tone Last Choice Route Number		No Warning Tone
10	X	Silent[1]		Dial Tone after Completion of Dialing

1. Strata DK Release 4.15 software only.

Program 50-2 LCR Home Area Code

➤ Enter the local area code. Example shown below.

| `*` | `#` | `*` | `#` | `1` | `*` | `2` | `*` | `3` | - | Spkr | `5` | `0` | Hold | - | Spkr | `2` | `7` | `1` | `4` | Hold | - | Spkr | `#` | `#` | Hold | - | Spkr | `#` | `#` | Hold |

        DATA = Home (local) area Code

Programs 50-3 (1~5) LCR Special Codes

➤ Add special codes 411 and 911.

SELECT =	Special Code (4 Digits)	Examples
31	411	
32	911	
33		
34		
35		

Program 50-4 LCR Long Distance Information (LDI) Plan Number

➤ Enter 08 for RCTUA, RCTUBA/BB and 16 for RCTUC/D and RCTUE/F.

$\boxed{*}\boxed{\#}\boxed{*}\boxed{\#}\boxed{1}\boxed{*}\boxed{2}\boxed{*}\boxed{3}$ - $\boxed{\text{Spkr} \ 5 \ 0 \ \text{Hold}}$ - $\boxed{\text{Spkr} \ 4 \ 08 \ \text{Hold}}$ - $\boxed{\text{Spkr} \ \# \ \# \ \text{Hold}}$ - $\boxed{\text{Spkr} \ \# \ \# \ \text{Hold}}$

DATA = LDI Route Plan

Program 50-5 LCR Local Call Plan Number

➤ Enter 02 as the local call plan.

$\boxed{*}\boxed{\#}\boxed{*}\boxed{\#}\boxed{1}\boxed{*}\boxed{2}\boxed{*}\boxed{3}$ - $\boxed{\text{Spkr} \ 5 \ 0 \ \text{Hold}}$ - $\boxed{\text{Spkr} \ 5 \ 02 \ \text{Hold}}$ - $\boxed{\text{Spkr} \ \# \ \# \ \text{Hold}}$ - $\boxed{\text{Spkr} \ \# \ \# \ \text{Hold}}$

DATA = Local Call Plan

Program 50-6 LCR Dial 0 (Zero) Time-out

➤ Enter the time-out value. Value 06 is recommended.

$\boxed{*}\boxed{\#}\boxed{*}\boxed{\#}\boxed{1}\boxed{*}\boxed{2}\boxed{*}\boxed{3}$ - $\boxed{\text{Spkr} \ 5 \ 0 \ \text{Hold}}$ - $\boxed{\text{Spkr} \ 6 \ 06 \ \text{Hold}}$ - $\boxed{\text{Spkr} \ \# \ \# \ \text{Hold}}$ - $\boxed{\text{Spkr} \ \# \ \# \ \text{Hold}}$

DATA = Time-out Value

Program 51 LCR Area Codes

➤ Enter the LCR area codes.

Plan 01 includes home area code, 800, 888. Plan 08 includes long distance area codes. Plan 16 is used for RCTUC/D and RCTUE/F processors. The following table uses "714" as the example home area code.

LCR Plan:	01		LCR Plan:	02		LCR Plan:	08		LCR Plan:		

Data = Area Code			Data = Area Code			Data = Area Code			Data = Area Code		
714						000	713				
800						715	799				
888						801	887				
						889	999				

Program 52 LCR Office Code Exceptions for Specified Area Code

➤ Assign LCR office code exceptions as needed.

Program 53 LCR Schedule Assignments for LCR Plans

➤ Enter LCR schedule assignments for LCR plan 01, 02 and 08/16.

Stations in groups 1, 2, and 3 are controlled by HMIS. The following table shows you how to set up Program 53 for the HMIS.

LCR Plan 01~16	Sched. 1~3	Program 56 LCR Station Group (see legend above)	Program 54 Route Definition # (see legend above)				LCR Plan 01~16	Sched. 1~3	Program 56 LCR Station Group (see legend above)	Program 54 Route Definition # (see legend above)			
			1st Pick	2nd Pick	3rd Pick	4th Pick				1st Pick	2nd Pick	3rd Pick	4th Pick
01	1	1	1				← Guest Room with restricted calling						
		2	1				← Guest Room local/800/888/911						
		3		Home Area Code			← Guest Room complete restriction/911 only						
		4	1				← Hotel Administration (unrestricted)						
02	1	1	1										
		2	1	Local Call Route/ 911									
		3	1										
		4	1										
08	1	1	1										
		2		Long Distance									
		3											
		4	1										

Program 54 LCR Route Definition Tables

➤ Enter LCR Route Definition Tables. Table defaults are acceptable (shown below).

LCR Plan 01~16	Route Definition # (see legend above)	Program 16 CO Line Group (see legend above)	Program 55 Modified Digits (see legend above)	LCR Plan 01~16	Route Definition # (see legend above)	Program 16 CO Line Group (see legend above)	Program 55 Modified Digits (see legend above)
01	1	01	01	← Local			
02	1	01	01	← 911			
08	1	01	01	← Long Distance			

Program 55-0 Delete Number of Digits from the Front of Dialed Number

➤ Delete PIC Code digits as needed.

Program 55-1 and 2 Add Digits Before and/or After the Dialed Number

➤ Add PIC Code digits as needed.

Program 56 LCR Station Group Assignments

➤ Enter LCR Station Group Assignments for LCR Plans 01, 02, and 08/16. Guidelines are shown below.

	LCR Group	**Enables**
Guest Rooms	01	All calls to be dialed by rooms.
	02	Local calls, 800/888, 911 only.
	03	911 only.
Administration	04	As needed (most likely will be the same as Group 01).

Step 15: Set up the Server Network

The following section has step-by-step instructions to set up the server in a Windows peer-to-peer network. For additional information on any of these procedures, see Microsoft Windows Help/ Network.

➤ **To set up the server**

1. Double-click My Computer, Control Panel, and Network.

   The Configuration Tab should be selected.

2. Verify that Client for Microsoft Networks, TCP/IP, and NetBEUI are installed.

   If these components are not installed, proceed to Step 3, otherwise go to Step 12.

3. Click Add.

4270

4. Highlight Service and Microsoft.

5. Click OK.

4269

6. Click Add.

7. Highlight Protocol and click Add.

8. Highlight Microsoft and TCP/IP, then click OK.

4318

9. Click Add.

10. Click Protocol and click Add.

11. Highlight Microsoft and NetBEUI, then click OK.

4319

12. Click File and Print Sharing.

4269

13. Ensure the boxes shown at right are checked.

14. Click OK.

➤ To set up workgroup

1. Open Identification.

2. Enter this computer name: HMISSRV01.

   Note Make sure you enter a zero in the name.

3. Enter this work group: HMIS

4. Enter this description: HMIS SERVER

5. Open Access Control.

   The share level access control should be selected.

6. Click OK.

7. Remove floppy disk from drive A.

8. Click OK to restart the computer.

9. If log in dialog box appears, enter HMISSRV01 for the user name and leave password blank.

10. Click OK to log in.

➤ To activate sharing

1. Double-click My Computer.

2. Right-click C: and select Sharing from the pop-up menu box.
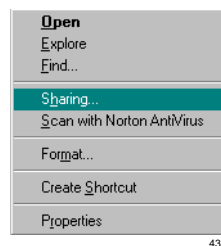
3. Select Share As and Full under Access Type.

4313
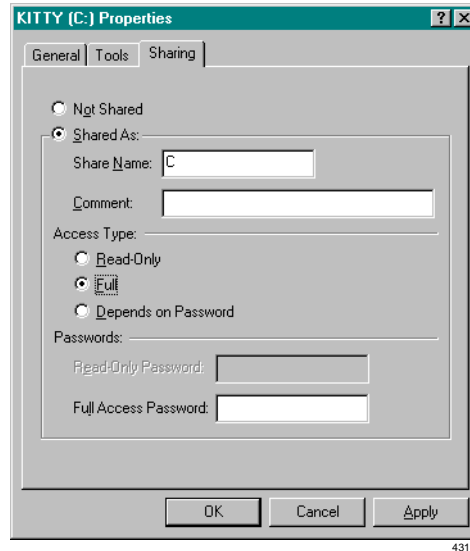
4. Click OK.

5. In My Computer dialog box, right-click D: (CD-ROM drive).

4312
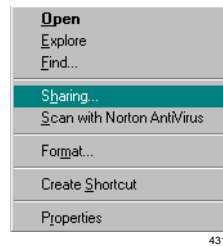
6. Select Share As and Full under Access Type.

4313
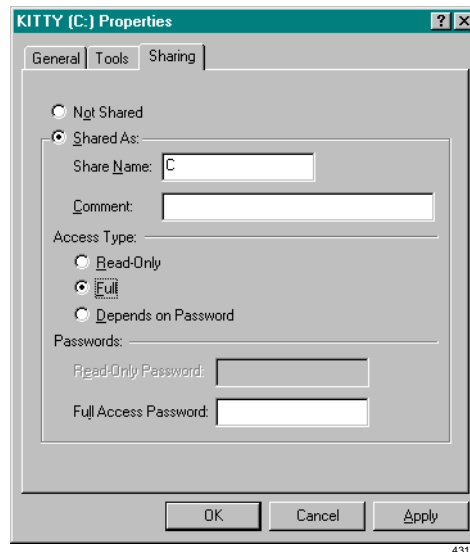
7. Close the My Computer dialog box Workstation network setup.

Step 16: Set up the Workstation

The following section has instructions to set up Windows peer-to-peer networking. For additional information on any of these procedures, see Microsoft Windows Help/Network.

1.	Double-click My Computer, Control Panel, and Network.	The Configuration Tab should be selected.
2.	Verify if Client for Microsoft Networks, TCP/IP, and NetBEUI are installed.	If these components are not installed proceed to Step 3, otherwise go to Step 12.
3.	Click Add.	

4. Highlight Service and Microsoft.
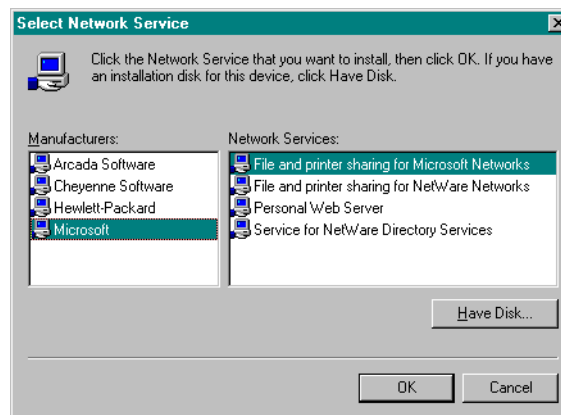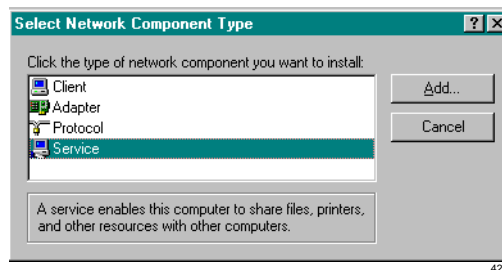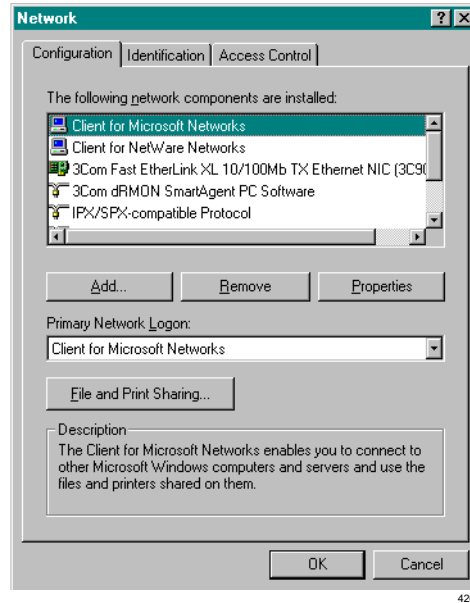
5. Click OK.

6. Click Add.

7. Highlight Protocol and click Add.

8. Highlight Microsoft and TCP/IP, then click OK.

9. Click Add.

10. Click Protocol and click Add.

11. Highlight Microsoft and NetBEUI, then click OK.

12. Click File and Print Sharing.

13. Ensure the boxes shown at right are checked.

14. Click OK.

➤ **To set up a workgroup**

1. Open Identification.

2. Enter this computer name: HMISWRK01.

Notes

- Make sure you enter a zero.

- If you have two or more workstations, name each workstation HMISWRK02, HMISWRK03, etc.

3. Enter this workgroup: HMIS

4. Enter this description: HMIS WORKSTATION

5. Open Access Control. | The share level access control should be selected.

6. Click OK.

7. Click OK to restart the computer.

8. Remove the floppy disk from drive A.

9. If the log in dialog box appears, enter HMISWRK01 for the user name and leave the password blank.

10. Click OK to log in.

➤ **To activate sharing**

1. Double-click My Computer.

2. Right-click C:.

3. Select Sharing from the pop-up menu box.

4. Select Share As.

5. Choose Full, then click OK.

6. Close the My Computer dialog box.

Step 17: Installing the Workstation Software

Note   If you purchased the turnkey system, all of the software comes pre-installed from the factory. This procedure is provided to assist you in reinstalling or upgrading the turnkey software, when necessary, or installing the software package.

Important!

♦ *Run ScanDisk to verify that no errors exist on the HMIS hard drive.*

♦ *Backup the HMIS databases using the Windows backup function.*

♦ *Close all applications on the PC before attempting HMIS software installation.*

➤ **To install, reinstall, or upgrade the software**

1. Click Start, then Run.33
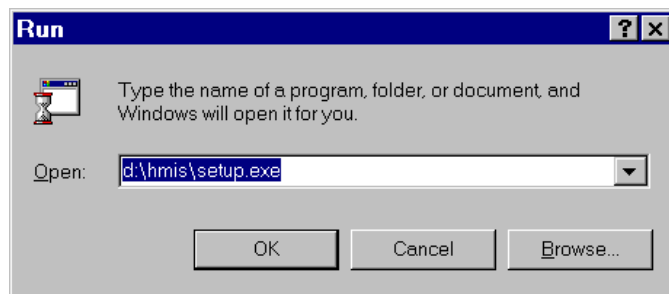
2. Insert the CD-ROM Disk into the <drive>.

<drive> = CD ROM drive letter on the PC.

3. Type: **<drive>:\hmis\ setup.exe** Click OK.

A pop-up box reads "Copying initialization files...". When complete, HMIS Setup Welcome screen displays:

4. Click OK.

The main HMIS Setup screen displays:
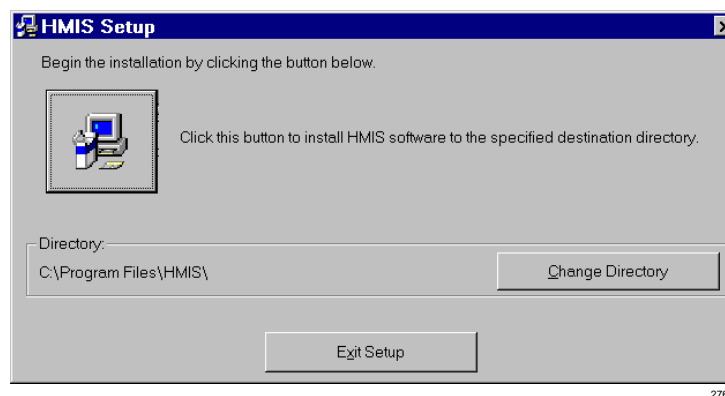
5. Click the installation button.

The HMIS setup begins.When it finishes, this displays for a few seconds:

This displays:

HMIS Setup

HMIS Setup was completed successfully.

OK

2769
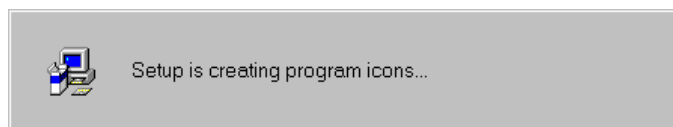
6. Click OK.

7. Open Windows Explorer.

8. Double-click Program Files.

9. Click or highlight the HMIS directory.

10. Delete the HMIS directory.

11. Restart the HMIS workstation.

Important! *The HMIS directory must be deleted from the workstation PC. The HMIS program is accessed and run from the HMIS server.*

Step 18: Map the HMIS Workstation to the Server

After the HMIS software is installed on the workstation and the HMIS directory is deleted, you have to access the HMIS software application using the network.

1. Double-click Network Neighborhood and the HMISSVR01 icon.

Note If the HMIS server does not display, verify the network configuration.

2. Right-click C:.

3. Select Map Network Drive.

4. Select Reconnect at Logon.

5. Click OK.

6. Double-click on the mapped network drive, C:, then Program Files and HMIS.

7. Right-click on HMISWS.EXE.

A pop-up window displays.

8. Select Send To/
   Desktop (Create
   Shortcut).

9. Close all network
   windows.

10. Restart the HMIS
    Workstation
    Computer.

Setup Utility

The Setup Utility is accessed from the Main screen by clicking on the Setup button at the bottom of the screen. At the right of all setup screens is a menu of the screen selections that comprise the utility (see Figure 15-11 on Page 15-17) that includes:

♦ AutoGen Setup – adds a group (range) of identical rooms automatically

♦ Master Room Setup – adds only a few rooms

♦ Employee Codes – adds codes for each employee

♦ Company Information – adds and changes the company information on the invoice

♦ HMIS Settings – adds and changes the settings in HMIS

♦ Invoice Statement Format – sets up or changes the invoice format

AutoGen Setup

This screen (see Figure 15-16) enables you to quickly format a room-record database based on a set of default parameters. Information that must be unique, such as room number and associated port/extension numbers, HMIS automatically generates by incrementing each value by one. See Table 15-6 for the field descriptions.
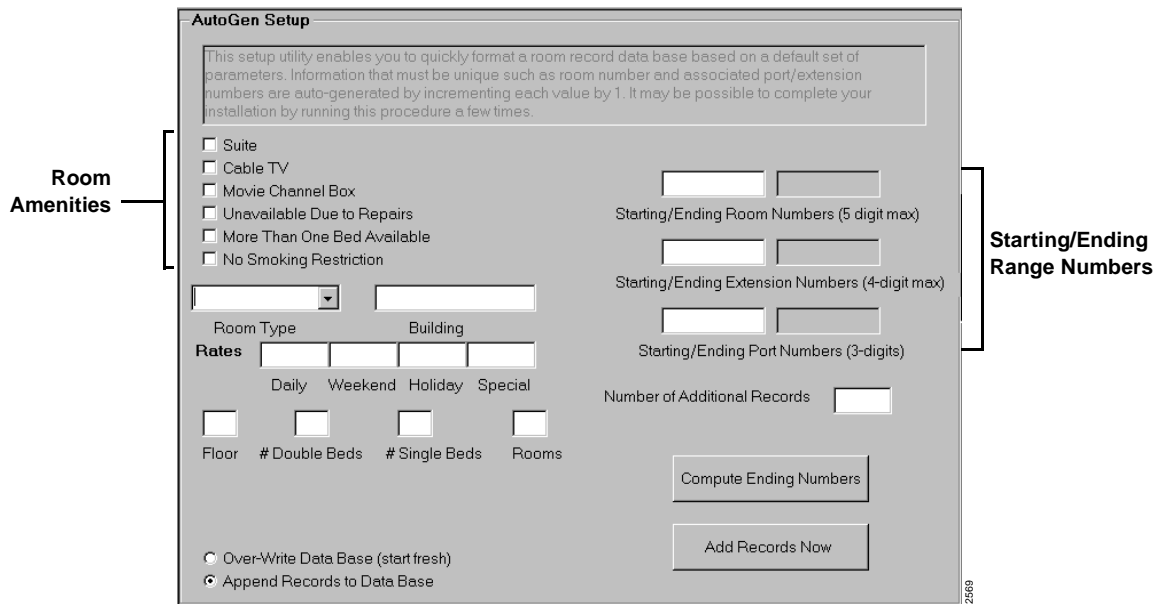
Figure 15-16   AutoGen Setup Screen

Table 15-6   AutoGen Setup Screen Fields

Field	Description
Room Amenities (check boxes)	Selections can be toggled ON/OFF by clicking the option's button. The selections describe the amenities or status of the room: Suite, Cable TV, Movie Channel Box, No Smoking Restriction, Unavailable Due to Repairs, and More Than One Bed Available. These options are displayed in the Restrict/Accommodate pop-up dialog box on the Main screen.
Room Type	User definable, or use the drop-down menu for preset options. Any new types are automatically saved by HMIS to the drop-down menu for future use with this screen and the Master Room Setup screen.
Building	Building identification (e.g., main, tower).
Rates	The rate to be charged for the room on a Daily, Weekend, Holiday (Seasonal) or Special rate basis. Decimals/cents are not required. HMIS treats the entered number as a dollar amount. For example, if you enter 73, HMIS saves the rate at $73.00. Rates are user definable and automatically apply when guests check in.
Floor, #Beds, #Rooms	Fields are displayed in the Available Room Selection Window when reserving a room or checking in a guest. Queen/King beds can be entered as # Double Beds.
Starting/Ending Room Numbers (5 digit max)	Enter the Starting Room Number. The Ending Room Number is computed automatically by HMIS.
Starting/Ending Extension Numbers (4-digit max)	Enter the Starting Extension Number. The Ending Extension Number is computed automatically by HMIS.
Starting/Ending Port Numbers (3-digits)	Enter the Starting Port Number. The Ending Port Number is computed automatically by HMIS.
Number of Additional Records	Number of room records you want HMIS to add. The numbers appear in the Ending Room/Extension/Port Numbers fields after clicking Computer Ending Numbers.

Add/Overwrite Room Record Database

1. From the Main screen, click Setup.

2. Click Autogen.   The AutoGen Setup screen displays (see Figure 15-16).

3. Enter the room information in the screen fields (e.g., room type, amenities, rates, etc.).   See "AutoGen Setup Screen Fields" on Page 15-43 for field descriptions.

4. Enter the starting numbers (i.e., Room, Extension and Port) in each field, the number of additional records required, and click Compute Ending Numbers.   HMIS adds the ending room, extension and port numbers to the screen.

5. Click Over-Write Data Base to overwrite the current database of rooms and start fresh

   ...or Append Records to Data Base to add the rooms to the current database.

   Important!   *For new installations, you must use the Over-Write Data Base option for the first entry; then change the screen to Append Records to Data Base for subsequent entries.*

6. Click Add Records Now.

7. Click Yes if the HMISCS and TELMON servers are shut down
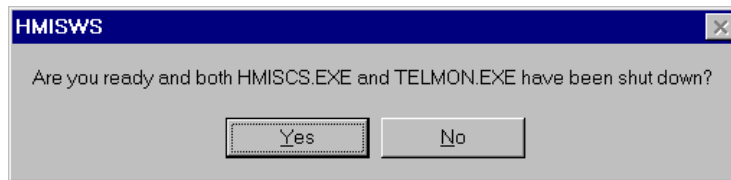
   ...or click No and shut down the HMISCS and TELMON servers.   The rooms are added to the database. The room, extension and port number fields are cleared. The remainder of the fields (e.g., room type, building, rates) remain on the screen for use with the next record.

8. Repeat this procedure until all rooms have been added.

9. Click Save, then Main screen.   The Main screen displays.

10. Click Exit to close the HMIS program, then restart the program.

| **Important!** | *Always exit the HMIS program after adding or deleting room records from the database.* |

Master Room Setup Screen

This screen (see Figure 15-17) enables you to enter, modify, or delete a room record. Records consist of room number, extension, type, location, rates, amenities and comments. (See Table 15-7 for screen field descriptions.)
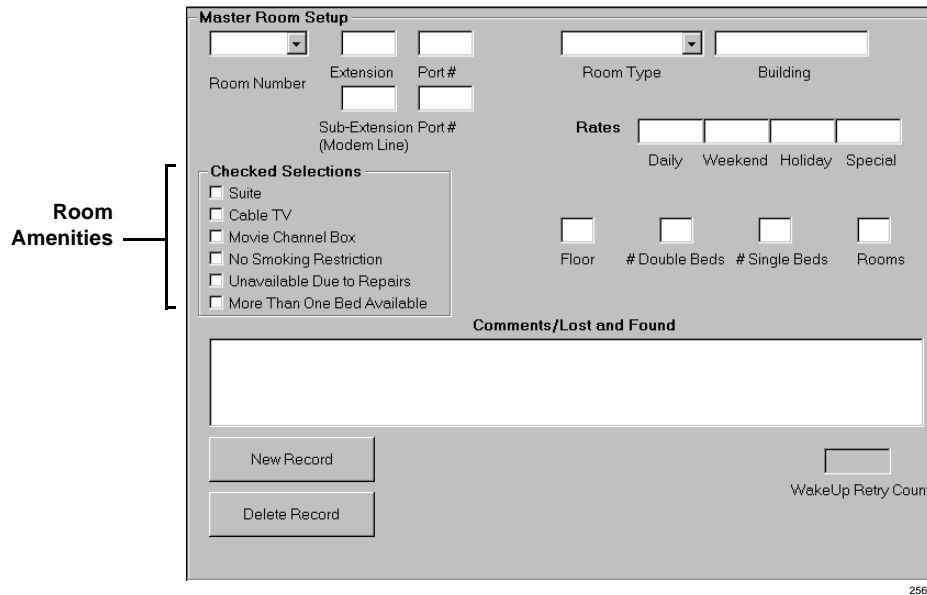
Figure 15-17   Master Room Setup Screen

Table 15-7   Master Room Setup Screen Fields

Field	Description
Room Number	The room number (alphanumeric up to five-digits).
Extension	The telephone system extension number (up to four-digits). Phone numbers do not have to match room numbers. Example: Room 201, Ext. 2201, Port 000 can be used.
Port #	The Strata DK station port number.
Room Type	User definable, or use the drop-down menu for preset options. Any new types are automatically saved by HMIS to the drop-down menu for future use with this screen and the Master Room Setup screen.
Building	Building identification (e.g., main, tower).
Sub-Extension/Port # (modem line)	Extension and port number used for faxes.
Rates	The rate charged for the room on a Daily, Weekend, Holiday (seasonal) or Special rate basis. Decimals/cents are not required. HMIS treats the entered number as a dollar amount. For example, if you enter 73, HMIS saves the rate at $73.00. Rates are user-definable and automatically apply when guests check in.

Table 15-7   Master Room Setup Screen Fields *(continued)*

Field	Description
Room Amenities (check boxes)	Selections can be toggled ON/OFF by clicking the option's button. The selections describe the amenities or status of the room: Suite, Cable TV, Movie Channel Box, No Smoking Restriction, Unavailable Due to Repairs, and More Than One Bed Available. These options are displayed in the Restrict/Accommodate pop-up dialog box on the Main screen.
Floor, # Double Beds, # Single Beds, Rooms	Fields are displayed in the Available Room Selection Window when reserving a room or checking in a guest. Queen/King beds should be counted as double beds and entered in the # Double Beds field.
Comments/Lost and Found	Comments and lost and found information. Entries stay until manually changed by highlighting and pressing **Delete**.
WakeUp Retry Count	The number of times a wake-up call is redialed if the phone is not answered.

Add a Room Record to the Database

1.	From the Main screen, click Setup.	
2.	Click Rooms.	The Master Room Setup screen displays (see Figure 15-17).
3.	Enter the information in the screen fields.	See Table 15-7 "Master Room Setup Screen Fields" on Page 15-45 for field descriptions.
4.	Click Save to save your entries.	
5.	(Optional) To add another room record, click New Record	The room, extension and port number fields are cleared. The remainder of the fields (e.g., room type, building, rates) remain on the screen for use with the next record.
6.	When finished, click Main screen.	The Main screen displays.
7.	Click Exit to close the HMIS program, then restart the program.	**Important!** *Always exit the HMIS program after adding or deleting room records from the database.*

Delete a Room Record from the Database

1.	From the Main screen, click Setup.	
2.	Click Rooms.	The Master Room Setup screen displays (see Figure 15-17).
3.	Enter the room number.	You can use the field pull-down menu to select the room.
4.	Click Delete Record.	You are asked to confirm the deletion.
5.	Press **y** or click Yes to delete the room record from the database.	
6.	Click Main screen.	The Main screen displays.

7. Click Exit to close the HMIS program, then restart the program.	**Important!** *Always exit the HMIS program after adding or deleting room records from the database.*

Modify a Room Record in the Database

1. From the Main screen, click Setup.	
2. Click Rooms.	The Master Room Setup screen displays (see Figure 15-17).
3. Enter the room number.	You can use the field pull-down menu to select the room.
4. Highlight the field and typeover the current entry.	
5. When you are finished, click Save.	

Employee Codes

The Employee Codes screen (see Figure 15-18) enables you to enter a three-digit employee ID code for all employees (see Table 15-8 for screen field descriptions). Standard staff categories listed on the screen are maid, janitor, clerk, medical, service/delivery, restaurant, management and other. The codes can be used for various productivity and tracking reports and employees requiring access to the HMIS system can be given a password and access level.

Figure 15-18   Employee Codes Screen

Table 15-8   Employee Codes Screen Fields

Field	Description
Employee ID (3-digit)	A unique three-digit ID (alphanumeric). **Important!** *Employee IDs assigned to maids must be numeric for the purpose of entering the code on the telephone's dial pad.* **HMIS Maid Service Activity Feature** This feature requires the maid to enter a code into the room telephone upon entering and leaving the room for the purpose of cleaning. The code consists of a direct trunk access code + three-digit Employee ID code + 4-digit Maid Service Start or Complete Code (assigned in the Settings screen). The HMIS checks for maid activity by monitoring the SMDR port for CO line activity; therefore, each Employee ID code assigned to a maid must correlate to a vacant CO port on the Strata DK RCTU processor. Since Strata DK systems equipped with RCTUA processors only enable up to 048 as a valid entry, we recommend you start assigning maid codes with the highest number possible (i.e., 048) and continue by assigning consecutive lower numbers (e.g., 047, 046, etc.). A sample code is: **#7**+**048**+***7*7**, where: **#7** = Direct Trunk Access Code **048** = Employee ID Code (vacant CO port) ***7*7** = Maid Service Start Code
Password	A unique password (alphanumeric). Provides access to HMIS. Optional field if employee does not need access to HMIS.
Access Level	Levels 0~10 provide access to all HMIS functions except Setup Utility. The utility is limited to accessing the Master Room Setup screen. Levels 11~ 20 provide access to all HMIS functions, including all functions/screens of the Setup Utility. Optional field if employee does not need access to HMIS.
First/MI/Last	Employee's name.
Staff Categories	Select one of the categories. Categories are: maid, janitor, clerk, medical, service/delivery, restaurant, management, other.
Provide Access to HMIS	Must be checked to give an employee access to HMIS. Even if you enter a password and access level for an employee and do not check this field, the employee cannot access HMIS. Should not be checked if the employee does not require access to HMIS.
TTY Communications Enabled	(Optional) Select this field if the employee (e.g., a manager) is going to need to log on to the HMIS server.

Add a Staff Member to the Database

1. From the Main screen, click Setup.

2. Click Employee.   The Employee Codes screen displays (see Figure 15-18).

3. Click New.

4. Enter the information in the screen fields.	See "Employee Codes Screen Fields" on Page 15-48 for field descriptions.
	Note If the employee does not need access to HMIS, do not select Provide Access to HMIS or fill in the Password or Access Level fields.
5. Click Save.	Your entries are saved.
6. Add another employee by clicking New ...or select another setup option ...or click Main screen.	

Delete a Staff Member from the Database

1. From the Main screen, click Setup.	
2. Click Employee.	The Employee Codes screen displays (see Figure 15-18).
3. Enter the Employee ID.	
4. Click Delete.	The record is deleted from the database.

Company Information

The information entered in the Company screen (see Figure 15-19) prints on the top of all billing statements when guests check-out unless designated on the "Invoice Statement Format Screen" on Page 15-55.

Figure 15-19   Company Information Screen

Add Company Information to the Database

1. From the Main screen, click Setup.

2. Click Company.

3. Enter the company name, address, and phone and FAX numbers.

4. Click Save.

5. Select another setup option

   ...or click Main screen.

The Company screen displays (see Figure 15-19).

HMIS Settings

The Settings screen (see Figure 15-20) contains the settings for the many items that are required to do business. Some of these items are: phone call rates (e.g., long distance, local, etc.); the reservation block size; voice mail/DND port designations; local, state, and additional taxes; and auto-wakeup settings. (See Table 15-9 for screen field descriptions.

Settings

Long Distance Call Rates

Initiation .50   Min. .30   After 42   Sec

International Call Rates

Initiation 10.0   Min. 5.00   After 42   Sec

Local Call Rates

Initiation .50   Min. 0.00   After 42   Sec

Toll Free Call Rates

Initiation .50   Min. 0.00   After 42   Sec

Common Carrier Pick

Code   1 0 1 X X X X

Centranet ('8' or '9' precede every call) ☐
LCR Enabled ('P' as leading character) ☑
Trunks Not Requiring '1' access ☐
Print Credit Card Number on Statement ☑
Display Zero-Cost Calls ☐
Voice Mail Sys. Enabled ☑   Stratagy ☑

VM/DND Forward Port #   900

Stratagy VM Clearing Extension   235

Software Version   3.0

System CPU   RCTUC + RCTUD

Leading Year of Reservation Block (can not change manually).   1998   Modify Block Size

Formatted Reservation Block Size in Multiples of 4 Years   20   Convert

Local Sales Tax in Percent: 2.00

State Sales Tax in Percent: 8.00

Additional Taxes   User Defined Tax Rules

Phone System Security Code   0000

Billing Resolution (Seconds)   30

CFBNA Timer (Seconds)   18

Reverse Billing Area Code(s):   713 712 711 710

Auto-Wakeup Digital Init Port   015

Auto-Wakeup Announcer Extension #   222

Auto-Wakeup Retry Limit   3

AW Polling Period (sec) 6   CommTimeout (Sec) 30

Transmit Delay [5] (ms) 3   Rx Delay [4] (ms) 2

Maid Serv Start Code (4) *7*7   Complete Code (4) *0*0

Include All Rooms in Consolidated Night Audit Report ☐

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Figure 15-20   Settings Screen

Table 15-9   Settings Screen Fields

Field	Description
Long Distance Call Rates	Initiation – Initial cost for making the call. Min. – Cost per minute. After __ Sec. – The grace period before billing of a call, setup time or the ring before answer time.
International Call Rates	Initiation – Defines initial cost for making the call. Min. – Defines cost per minute. After __ Sec. – Defines the grace period before billing of a call, setup time or the ring before answer time.
Local Call Rates	Initiation – Defines initial cost for making the call. Min. – Defines cost per minute. After __ Sec. – Defines the grace period before billing of a call, setup time or the ring before answer time. **Note** If there are no charges for making local calls, the HMIS automatically defaults all telephones to LCR Class 2 service upon guest check in.
Toll-Free Call Rates	Initiation – Defines initial cost for making the call. Min. – Defines cost per minute. After __ Sec. – Defines the grace period before billing of a call, setup time or the ring before answer time.
Comm Carrier Pick Code	Select one of the following options from the pull-down menu: "None" if none used 10XXX if using old NANP for intraLATA or long distance 101XXXX if using new NANP Pick Codes Default: None
Centranet ('8' or '9' precede every call)	Select if an "8" or "9" prefix is required to make a call on an outside line (Telco service, Centranet, Centrex).
LCR Enabled ('P' as leading character)	Select if Least Cost Routing is used. This must always be checked on a Strata DK system.
Trunks Not Requiring '1' access	Select if area codes with long distance billing numbers do not require a "1" first (e.g., AT&T T1 service).
Print Credit Card Number on Statement	Select if you want the guest's credit card number automatically printed on billing statement.
Display Zero-Cost Calls	Select if you want the no-charge calls to be shown on the Phone Calls Tab screen and printed on the guest's bill at check-out.
Voice Mail Sys. Enabled	Select if voice mail is installed on the system. If checked, changes DND buttons on Main screen to Call Forward–Busy/No Answer(CFBNA).
Stratagy	Select if Stratagy is installed on the system. If checked, changes DND buttons on Main screen to CFBNA.
VM/DND Forward Port #	The Strata DK port number for the voice mail pilot number; or, if no voice mail is used, the port number for the front desk telephone to which calls are forwarded.
Stratagy VM Clearing Extension	The extension number at the Stratagy VM Port used for clearing guest messages upon check-out.
Software Version	(For information only) The Strata DK software version number 3.1 or higher.
System CPU	(For information only) Select a processor type from the drop-down menu. Options are RCTUA, RCTUBA/BB, RCTUC/D, and RCTUE/F.
Local Sales Tax in Percent	The local tax charged.
States Sales Tax in Percent	The state tax charged.

Table 15-9   Settings Screen Fields *(continued)*

Field	Description
Additional Taxes	Additional taxes that may be required. Click User Defined Tax Rules to display a pop-up box to add/change or delete the listed taxes. If additional taxes are entered, the standard invoice statement can no longer be used. You must format the default statement (see "Default Statement" on Page 15-58). The pop-up box fields are: Enable – Selects the tax for inclusion on the guest bills. Tax Description – Description of tax (max. 16-characters). Prints in all caps on the bill. Room/Phone/Service – Select the item to be taxed (i.e., room, phone, service). Additive $ – Enter dollar amount of applicable tax ...or Percent % – Enter the percent of applicable tax. Repeat Daily – Select if tax is to be a per day tax rather than a one-time tax charge.
Phone System Security Code	Defines the Strata DK Security Code which must match the telephone system. Enter 0000.
Billing Resolution (Seconds)	The time in second increments used for billing. For example, six-second increments would bill every six seconds after the first 30 seconds are billed.
CFBNA Timer (Seconds)	The Call Forward-Busy/No Answer time, if Voice Mail is used, before a call is sent to Voice Mail.
Reverse Billing Area Code(s)	Up to four area code(s) that do not require "1" in front of the area code and are not billed to the caller's room. Usually associated with Pager or Cellular companies that set up long distance calls to a pager or cellular phone.
Auto-Wakeup Digital Init Port	The digital port of the Strata DK that is used to initiate auto wake-up calls.
Auto-Wakeup Announcer Extension #	The extension number of the Strata DK optional digital announcer, if used. Valid entries must be three or four-digit long numeric characters.
Auto-Wakeup Retry Limit	The retry limit if the room telephone is busy or no answer on auto wake-up.
AW Polling Period (sec)	The time in seconds used to poll auto wake-up. Default is set at 6 and should not be adjusted.
COMM Timeout (Sec)	Communication timer (seconds) for link with Strata DK. Default is set to 30 and should not be changed.
Transmit Delay [5] (ms)	Communication timer in milliseconds (ms). Default is set at 5 ms. and should not be changed.
Rx Delay [4] (ms)	Communication timer in milliseconds (ms). Default is set at 4 ms. and should not be changed.
Maid Serv Start Code (4)	The code the maid dials when starting to clean a room. This code works with the maid Employee ID assigned in the Employee screen, and should be a unique code (e.g., *7*7).
Maid Serv Complete Code (4)	The code the maid dials when finished cleaning a room. This code works with the maid Employee ID assigned in the Employee screen, and should be a unique code (e.g., *0*0). Note See "Employee ID (3-digit)" on Page 15-48 for a more detailed explanation of this field.
Include All Rooms in Consolidated Night Audit Report	All rooms are included on the Consolidated Night Audit Report.

Enter, Change, Delete Settings

Important! *After changing or deleting any settings, the HMIS PC must be restarted before the changes or deletions take effect.*

1.	From the Main screen, click Setup.	
2.	Click Settings.	The Settings screen displays (see Figure 15-20).
3.	Enter/delete the information in the screen fields.	See "Settings Screen Fields" on Page 15-51.
4.	Click Save.	Your entries are saved.
5.	Select another setup option ...or click Main screen.	

Add Applicable Additional Taxes

1.	From the Main screen, click Setup.	
2.	Click Settings.	The Settings screen displays (see Figure 15-20).
3.	Click User Defined Tax Rules in the Additional Taxes field.	
4.	Select (check) the Enable field.	Tax is included on guest bills.
5.	Enter a brief description of the tax.	Maximum 16-characters. Prints on bill in all caps.
6.	Select (check) one of the following: Room, Phone, Service.	Tax is calculated based on charges against room, phone or service items.
7.	Enter either a set dollar amount in the Addition $ field ...or a percent in the Percent % field.	

8. If the tax is to be added daily to the room charges, select (check) Repeat Daily.

9. Repeat Substeps 4~8 for any other taxes.

10. Click OK.

Modify the Reservation Block Index

1. From the Main screen, click Setup.

2. Click Settings.   The Settings screen displays (see Figure 15-20).

3. Click Modify Block Index button (upper-right corner of Settings screen).

4. After reading the caution in the dialog box, click Yes to change the index and reformat/convert the database

   ...or No to abort the procedure.

5. Click OK.

6. Using the drop-down menu, select the reservation block size (i.e., 4, 12, 16, or 20 years).   The menu appears in the upper-right corner of the Settings screen:
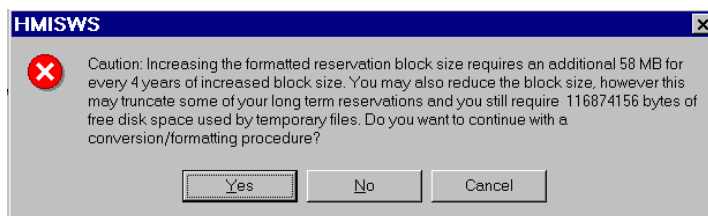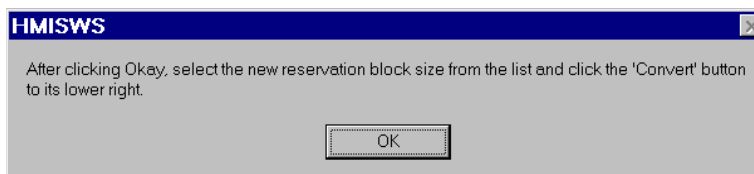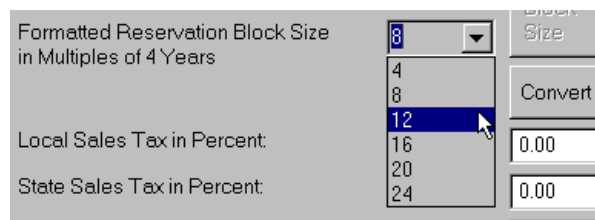
HMIS defaults to an eight-year reservation database.

7. Click Convert.   The HMIS converts the database.

Invoice Statement Format

Using the Invoice Statement Format screen (see Figure 15-21), you can set up the billing statement given the guest upon check out in one of three different formats — standard, default and customized. (See Table 15-10 on Page 15-56 for screen field descriptions.)

Exclude item from Statement

Figure 15-21   Invoice Statement Format Screen

Table 15-10 Statement Screen Fields

Field	Description
Hotel Name...Room Rate	The first 16 fields on the left-hand side of the screen are standard items that can appear on the billing statement. Enter the row and column number for each item or check Off to eliminate the item from printing on the statement.
Maximum Number of Columns	The maximum number of columns is 96.
Lines Per Page	The maximum number of lines is 66.
Number of Copies	The number of statement copies that print each time.
Font Size	The size of the statement's print. Select 8, 9, 10, 11, or 12 from the pull-down menu.
Left Column for Body	Determines the left margin for the statement.
Starting Row for Body on Page	Determines the top margin for the statement.
Ending Row for Body on Page	Determines the bottom margin for the statement.
Phone Charges Sub-Total Column	Column location for phone charges sub-total.
Billed Services Sub-Total Column	Column location for billed services sub-total.
Pre-Tax Charges Column	Column location for pre-tax charges total.
Credits And Payments Column	Column location for credits/payments total.
Local and State Taxes Column	Column location for local and state taxes total.
Total Charges	Column location for billing statement total.
Net Statement Balance Column	Column location for net statement balance.
Separate Pages for Phone Calls and Services	If selected, the phone calls and services are printed on separate pages.
Add Test Pattern on Current Session	If this field is selected, the billing statement is printed with a vertical and horizontal test pattern. Click the field to turn off the selection. If you do not manually turn off this option, it remains on until you have logged off the HMIS program.

Standard Statement

When HMIS is installed, the Invoice Statement Format screen fields (see Figure 15-21 on Page 15-55) default to "0."

Without making any changes to the screen, the HMIS produces a billing statement (see Figure 15-22) that covers all the basic hotel/motel charges and information: hotel name, address, date, guest name, billed services, room rates, credits and payments, etc.

This form is perfect for businesses that do not have preprinted stationery or forms.

```
                                TSD SUITES
                             9740 IRVINE BLVD.
                             IRVINE, CA 92713
                   PHONE: (714) 555-3700 FAX: (714) 555-6798
                     TUESDAY, JANUARY 21, 1998 3:40:44 PM

CUSTOMER ROOM NO. 107 EXTENSION NO: 107
HOWARD FELDMAN
REF: XYZ COMPANY, INC. 714-587-3701
30 MAIN STREET
ANYWHERE, CA 92714 USA
714-888-8979

CONFIRMATION NO: 778AGW124251
CREDIT CARD NO:   0123456789 10/98

BASE RATE DESCRIPTION          PER NIGHT         # NIGHTS
      DAILY                     120.00              2
TOTAL BASE ROOMCHARGE:                                          240.00
DATE(S):                                             10/21/97 - 10/23/97
PHONE BILLING:                                                  (NONE)


BILLED SERVICES:

MOVIES                   10/21/97 15:35 RENTAL                    5.00
ROOM SERVICE             10/21/97 15:35 BREAKFAST               20.00
ROOM SERVICES            10/21/97 15:35 DINNER                  30.00
                         TOTAL SERVICES:                        55.00


PRE-TAX CHARGES:                                               295.00

LOCAL AND STATE TAXES:                                          14.75


TOTAL CHARGES:                                                 309.75

CREDITS AND PAYMENTS:                                          309.75

**** PRIOR PAYMENT CREDIT ACTIVITY ****
10/21/97 15:40 CR HF  PAYMENT               120.00
10/23/97 11:15 CR HF  PAYMENT               189.75

NET STATEMENT BALANCE:                                          $0.00
```

Figure 15-22   Standard Statement

Default Statement

The Default Statement (see Figure 15-23) also includes all the standard items (e.g., guest name, room number, etc.), works from a set of preprogrammed defaults (shown below), and works with a common billing format. Figure 15-23 shows the Invoice Statement Format screen with the defaults loaded.

Figure 15-23   Invoice Statement Format Screen with Standard Defaults

➤ **To change the invoice statement format to the defaults**

1. From the Invoice Statement Format screen, click Load Defaults.	HMIS automatically enters the preset defaults that produces the default statement (see Figure 15-23 on Page 15-59).
	This pop-up box displays:
2. Click Yes.	
3. Click Save.	

```
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123451
                              TSD SUITES                                                        2
                              9740 IRVINE BLVD.                                                  3
                              IRVINE, CA 92620                                                   4
                              714-555-9787                                                       5
                              FAX: 714-555-7878                                                  6
                                                                                                7
         JOHN  DOE                                        ROOM 100                               8
         8789 MAIN STREET                                 01/23/98                               9
         IRVINE, CA 92620 USA                             01/23/98                               0
                                                          CONF #: 837PAG151604                   1
                                                          90.00                                  2
                                                          XYZ COMPANY 714-555-8888               3
                                                                                                4
                                                                                                5
                         FORD/3DFG888                                                            6
                                                                                                7
                                                                                                8
                                                                                                9
                                                                                                0
                                                                                                1
                                                                                                2
                                                                                                3
                                                                                                4
         ---------------------------------------------------------------------------------------
         BASE RATE DESCRIPTION   PER NIGHT   # NIGHTS                                             6
         DAILY                   90.00         1                                                 7
                                                                                                8
         TOTAL BASE ROOM CHARGE:                              90.00                               9
                                                                                                0
         PHONE BILLING:                                                                          1
                                                             (NONE)                              2
                                                                                                3
         BILLED SERVICES:                                                                        4
          ROOM SERVICE      01/23/98 15:16 BREAKFAST        20.00                                5
          ROOM SERVICE      01/23/98 15:17 LUNCH            30.00                                6
          MOVIE             01/23/98 15:17                   5.00                                7
          TOTAL SERVICES:                                    55.00                               8
                                                                                                9
         PRE-TAX CHARGES:                                                                        0
         LOCAL AND STATE TAXES:                              13.05                                1
         TOTAL CHARGES:                                     158.05                                2
                                                                                                3
         CREDITS AND PAYMENTS:                                        158.05                      4
                                                                                                5
                                                                                                6
         ---------------------------------------------------------------------------------------
                                                                                                8
                                                                                                9
                                                                                                0
             9999999999999        09/99                                                          1
             JOHN DOE                                                                            2
                                                                                                3
                                                                                                4
                                                                                                5
                                                                                                6
                                                                                                7
                                                                                                8
                                                                                                9
                                                                                                0
                                                                                                1
                                                                                                2
                                                                                                3
                                                                                                4
                                                                                                5
                                                                                                6
```

— Test
Pattern

3016

Figure 15-24   Default Statement with Test Pattern

Customized Statement

The Default Statement can be used as a starting point for customizing the billing statement to suit any preprinted forms or stationery.

Simply click Add Test Pattern on Current Session at the bottom of the Invoice Statement Format screen (see Figure 15-23) and print a sample bill (see Figure 15-23). The test pattern appears both vertically and horizontally on the printout and gives you the locations for the rows and columns.

➤ **To customize a statement**

1. From the Invoice Statement Format screen, click Load Defaults.	HMIS automatically enters the preset defaults that produces the default statement (see Figure 15-23). This pop-up box displays: **Save Default Parameters** ✕ Save these parameters? [Yes] [No] 2994
2. Click Yes.	
3. Enter the numbers required for the first seven fields on the right hand side of the screen. (See "Statement Screen Fields" on Page 15-56 for field descriptions.)	The fields are: Maximum Number of Columns, Lines Per Page, Number of Copies, Font Size, Left Column for Body, Starting Row for Body on Page, and Ending Row for Body on Page. These seven fields determine the overall requirements for the statement.
4. Click Add Test Pattern on Current Session.	The test pattern consists of numbers designating the locations of the rows and columns on the page.
5. Click Save.	
6. Return to the Main screen and print a sample billing statement.	
7. Click Setup, then Statement.	The Invoice Statement Format screen displays.
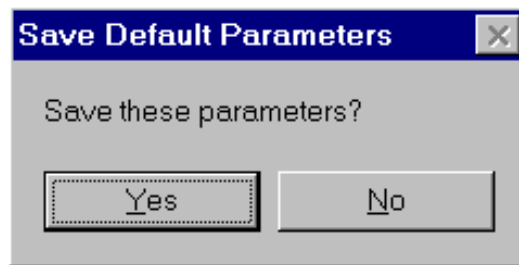
8. With the sample statement as a reference, enter a row and column for the items on the left-hand side of the screen

    ...or click Off to stop the item from printing on the statement.

Items consist of Hotel Name, Hotel Address, Arrival Date, Room Rate, etc.

Note If you did not check the Print Credit Card Number on Statement field on the Settings screen, the Credit Card Number field on this screen is not active.

Be sure to turn off any items (e.g., hotel name/address, etc.) that are on the preprinted stationery/form.

9. Enter the column locations for the remaining fields on the screen.

HMIS automatically produces subtotals and totals of charges that appear on each statement (e.g., phone charges, pre-tax charges, credits and payments total, etc.).

The entries in these fields place the credits/charges in the desired locations.

10. (Optional) If a separate page is required for phone calls and services, click Separate Pages for Phone Calls and Services.

11. Click Save.

12. Return to the Main screen and print a test billing statement.

13. With the sample statement as a reference, adjust any entries.

14. Repeat Substeps 12~13 until the statement matches the required pre-printed stationery/form.

15. When finished, click Add Test Pattern on Current Session.

Template Captions

To further customize the billing statement, up to 14 captions can be entered into a Define Template Captions screen (see Figure 15-25) and added to the printout. The captions can be used to print any special note required on the statement. For example, an 800 number can be printed at the bottom of each page. Captions print in all caps on the statement and appear on each page.

Figure 15-25   Define Template Captions Screen

➤ **To add special captions (notes) to the billing statement**

1.	From the Invoice Statement Format screen, click Caption Setup.	The Define Template Captions screen (see Figure 15-25) displays.
2.	Enter the caption in the field (up to 30 characters).	
3.	Enter Row and Column location desired.	Maximum row number appears in the Lines Per Page field on the Invoice Statement Format screen and maximum column number appears in the Maximum Number of Columns field on same screen.
4.	Repeat Steps 2 and 3 for each caption.	
5.	Click OK.	The Invoice Statement Format screen displays.
6.	Click Save.	

Maintenance

The maintenance procedures provided in this section are:

♦ Reinstall software

♦ Shut down HMIS SMDR and/or TTY servers

♦ Restart HMIS SMDR and/or TTY servers

Note All HMIS software comes pre-installed from the factory in the turnkey system. This procedure is included to assist you in reinstalling or upgrading software, when necessary.

Before You Begin

1. Run ScanDisk to verify there are no errors on the HMIS hard drive.	
2. If you are performing an upgrade, backup of the HMIS databases.	Backups can be performed using the Windows backup function.
3. Close all applications before attempting HMIS software installation.	

Reinstall/Upgrade Software

1. Click Start, then Run.	 **Run** ? ☒ Type the name of a program, folder, or document, and Windows will open it for you. Open: `d:\hmis\setup.exe` ▾ OK Cancel Browse... 2765
2. Insert the CD-ROM Disk into the \<drive\>.	\<drive\> = CD ROM drive letter on the PC.
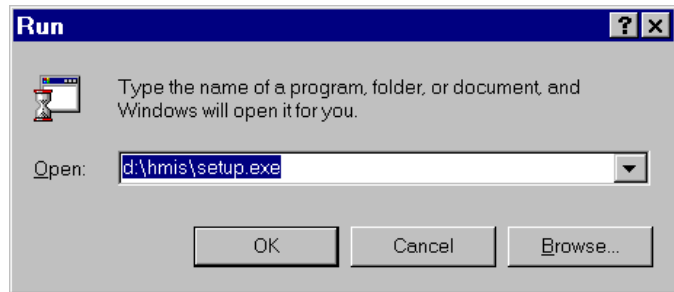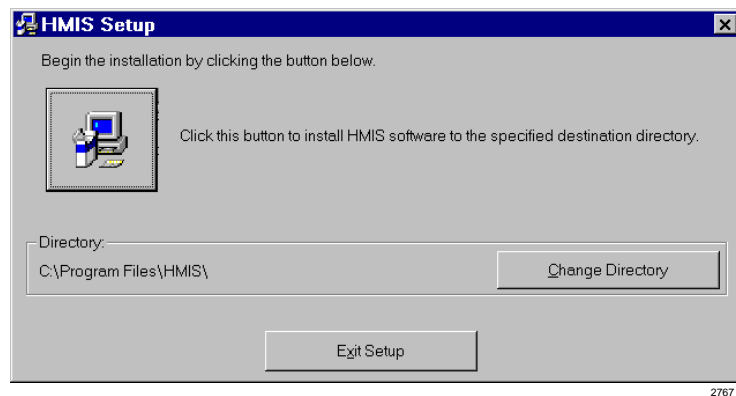
| 3. | Type:
**<drive>:\hmis\se
tup.exe**
Click OK. | A pop-up box reads "Copying initialization files...". When complete, HMIS Setup Welcome screen displays: |

| 4. | Click OK. | The main HMIS Setup screen displays: |

| 5. | Click the installation button. | The HMIS setup begins.

When it finishes, a status screen displays for a few seconds: |
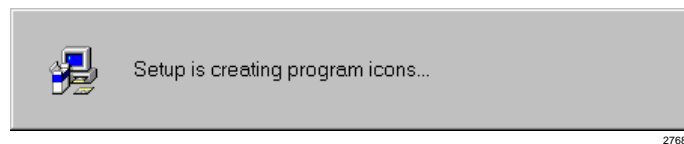
Finally, a message displays on the screen stating that the installation is complete:
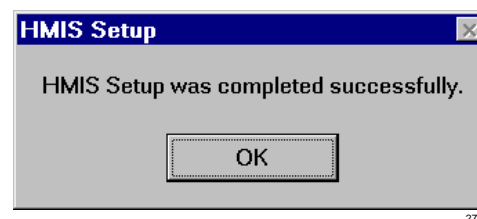
| 6. | Click OK. |
| 7. | Restart HMIS server/
workstation PC. |

Shut Down HMIS SMDR and/or TTY Servers

1. Press **Ctrl**+**Alt**+**Del**.	The Close Program dialog box displays.
2. Highlight the program name (i.e., TelMonComm, HMISComm).	
3. Click End Task.	

4. Click OK.	

Restart HMIS SMDR and/or TTY Servers

1. From the Setup screen, double-click the area below the Setup menu.	The Launch Auxiliary Server Applications box displays:
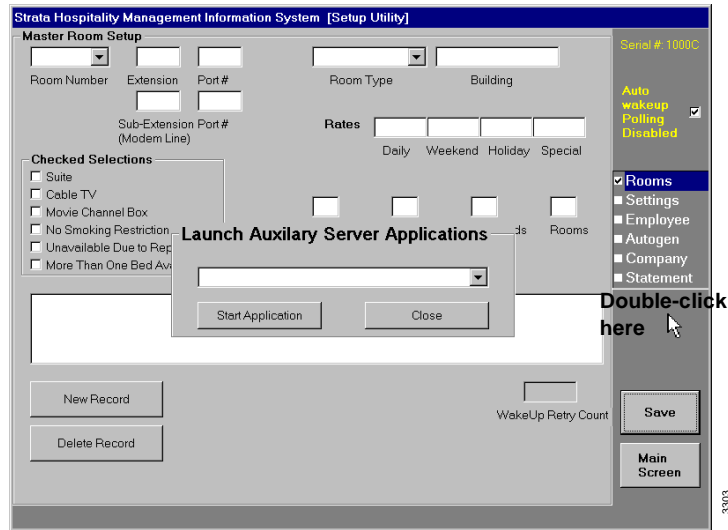
2. Using the pull-down menu, highlight either the Communications Server or SMDR Processor (Telmon) selection.	
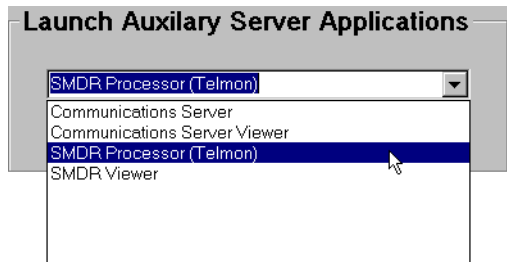
3. Click Start Application.	The selected program is restarted.

Troubleshooting

The troubleshooting procedures provided in this section are:

♦ Verify data communications

♦ Check trunk utilization

♦ Perform manual tests/remote maintenance

♦ Output data to file

♦ Check HMIS communications with the Strata DK

♦ Verify communication port settings

♦ Verify modem settings

♦ Verify modem data communication

♦ View HMIS error file (i.e., HmisErr.Log)

Important! *Technical Support can request that your PC be replaced with one that meets the recommended PC specifications on Page* 15-2 *and that all auxilliary software (games, etc.) be removed for isolation of possible software conflicts.*

Verify Data Communications

Step 1: Verify the Server COM/TTY Port Communications)

1. From the Setup Utility screen, double-click below the Setup menu.

2. From the pull-down menu, select Communications Server Viewer.
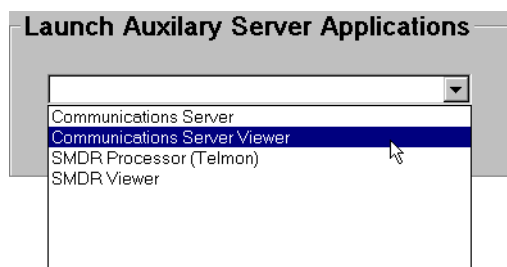
3. Click Start Application.
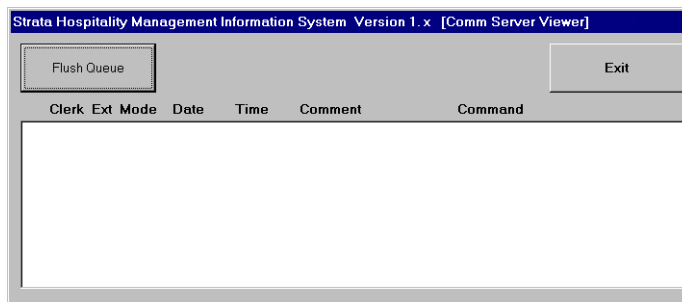
4.	Double-click the area to the right of Flush Queue.	The Comm Server screen displays:
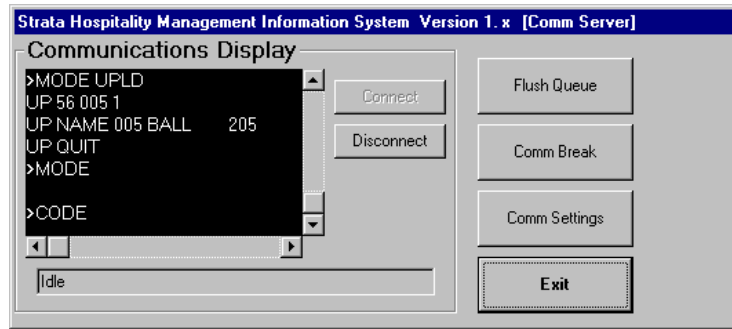
5.	Click Disconnect.	Call capturing is discontinued.
6.	Click Comm Settings.	The Communication Settings and Emulation screen displays (shown below).
7.	Click Connect and press **Enter**.	A **>CODE** prompt appears on the screen (shown below). You have successfully connected the HMIS/Strata DK TTY ports. If the system does not respond, check the TTY port settings at the top of the screen.
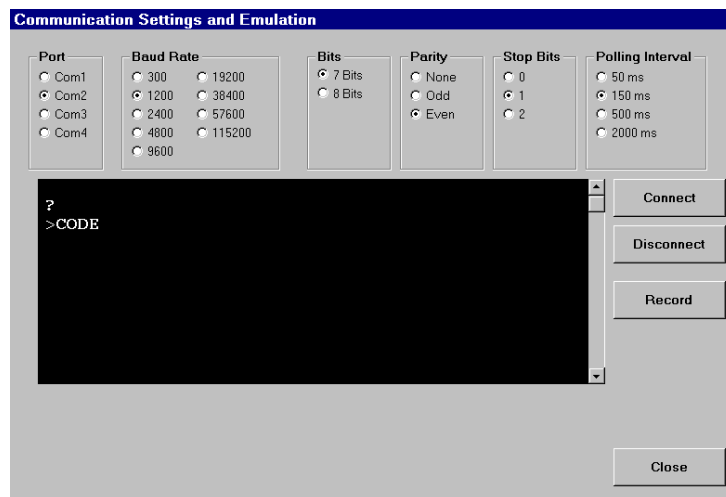
8.	Click Disconnect, then Close.	The Comm Server screen displays.
9.	Click Exit.	The Comm Server Viewer displays.
10.	Click Exit.	
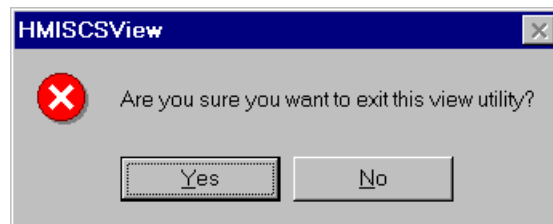
11.	Click Yes.	The Launch Auxiliary Server Applications screen displays.

Step 2: Verify SMDR Communications

1. From the pull-down menu, select SMDR Viewer.

2. Click Start Application.

The SMDR Viewing screen displays (see below).

3. From a DKT phone, dial **9** and a seven-digit telephone number, then hangup.

The SMDR window shows port, extension number, time stamp, duration and the number dialed (shown below). You have successfully connected the HMIS/Strata DK SMDR ports. If the system does not respond, check the SMDR port settings at the top of the screen.

4. Click Close.

5. Click Yes.

The Launch Auxiliary Server Application screen displays.

6. Click Close.
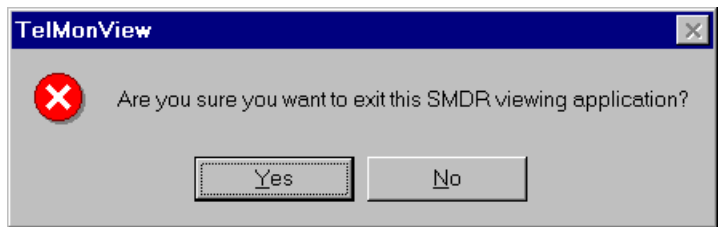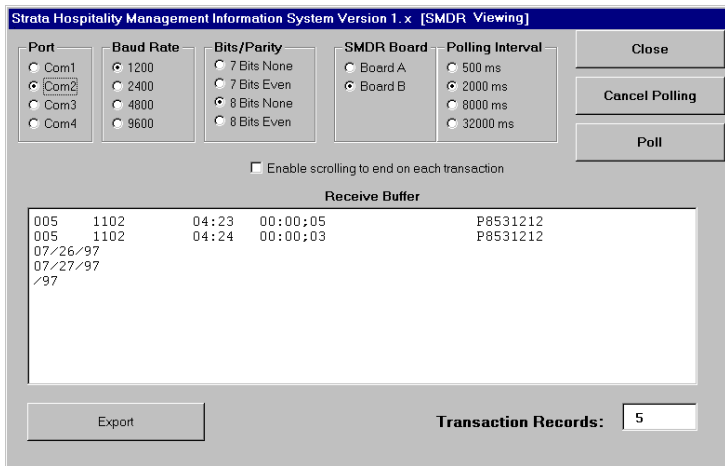
Check Trunk Utilization

Important! *This procedure stops all call capturing. Polling should only be stopped when absolutely necessary.*

Polling saves call records to a file and automatically starts when the software is loaded. To check trunk utilization, you must temporarily stop the polling and send either the outgoing or incoming

call data collected in the buffer to an ASCII file with a "," delimiter. Exported data can then be imported to a database program and checked.

➤ **To export data**

1. From the Setup Utility screen, double-click below the Setup menu.

2. From the pull-down menu, select SMDR Viewer.
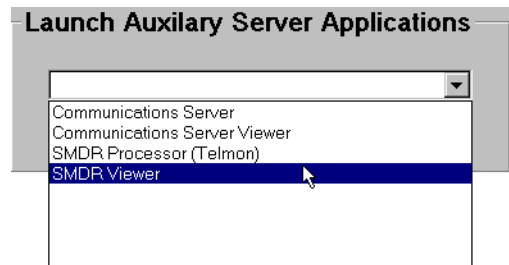
3. Click Start Application.
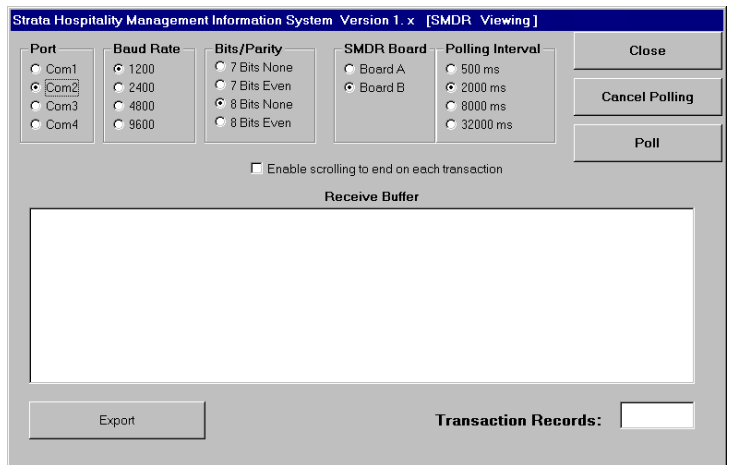
4. Click Cancel Polling.
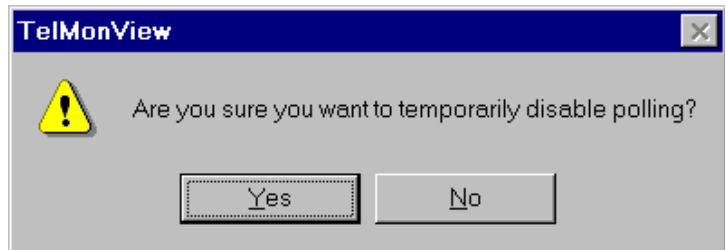
5. Click Yes to temporarily disable polling

   ...or No to continue the polling function.

6. Click Export.

> **TelMonView** ✕
>
> Export outgoing calls? Answering 'No' means only incoming calls to be exported.
>
> [Yes]   [No]
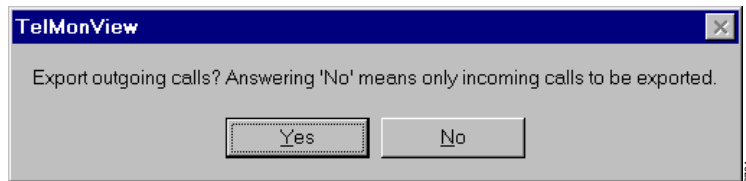
7. Click Yes if you want outgoing/incoming calls exported.

A pop-up box displays (shown below) requesting the directory/ file name. The default is **C:\Program Files\HMIS\Outcdm.txt**. If you want to change it, type over the default.

> **Export Dialog** ✕
>
> Enter Output file path for export: [OK] [Cancel]
>
> C:\Program Files\HMIS\Outcdm.Txt
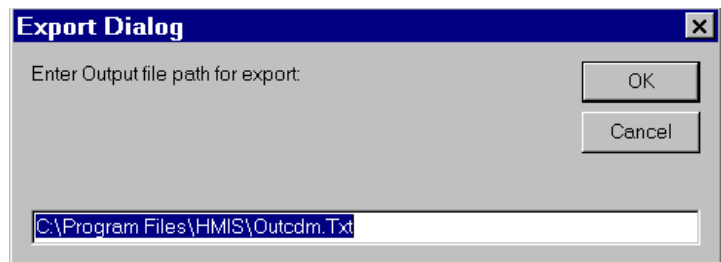
...or No if you want only incoming calls exported.

A pop-up box displays (shown below) requesting the directory/ file name. The default is **C:\Program Files\HMIS\Incdm.txt**. If you want to change it, type over the default.

> **Export Dialog** ✕
>
> Enter Output file path for export: [OK] [Cancel]
>
> C:\Program Files\HMISWS\Incdm.Txt
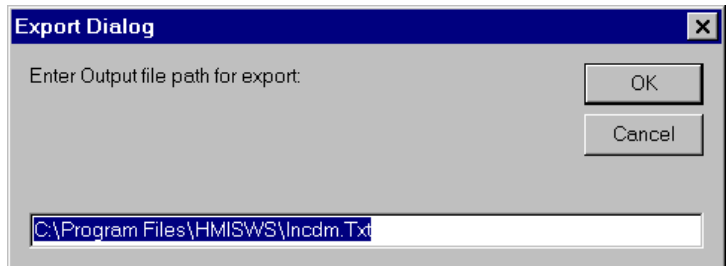
8. Click Poll.

Call capturing is sent to the buffer.

9. Click Close.

> **TelMonView** ✕
>
> ❌ Are you sure you want to exit this SMDR viewing application?
>
> [Yes]   [No]
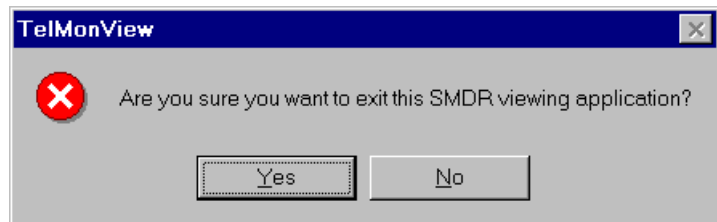
10. Click Yes.

The Launch Auxiliary Server Application screen displays.

11. Click Close.

Perform Manual Tests/Remote Maintenance
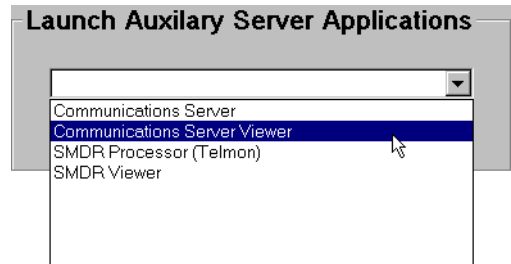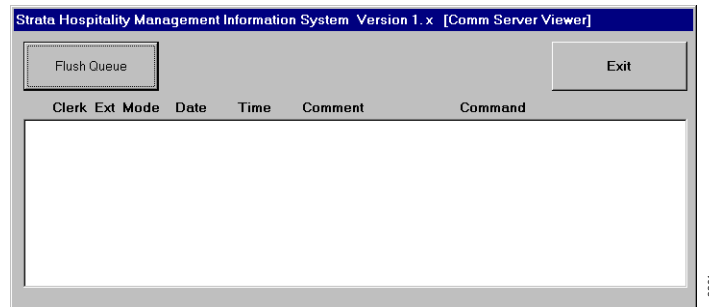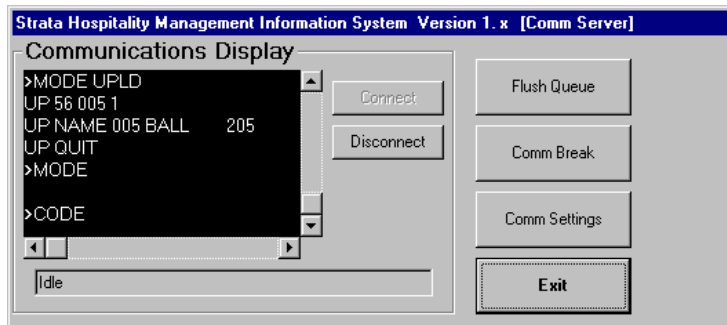
1.	From the Setup Utility screen, double-click below the Setup menu.	
2.	From the pull-down menu, select Communications Server Viewer.	
3.	Click Start Application.	
4.	Double-click the area to the right of Flush Queue.	
5.	Click Disconnect.	Call capturing discontinues.
6.	Click Comm Settings.	The Communication Settings and Emulation screen displays (shown below).

7. Click Connect and press **Enter**.

A **>CODE** prompt appears on the screen (shown below). You have successfully connected the HMIS/Strata DK TTY ports.
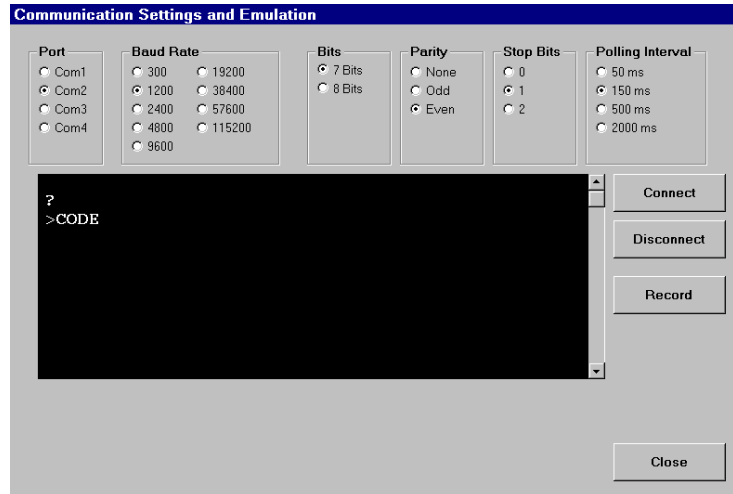
Note If the system does not respond, check the TTY port settings at the top of the screen.

8. Using the center display area, you can now do any tests/ maintenance.

While performing tests/maintenance, you can record all transmissions to a file. When finished, you can view or print the file. (See "Output Data to File" on Page 15-72 for instructions.)
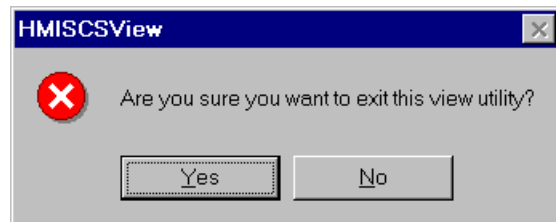
9. When finished, click Disconnect.

10. Click Close.

The Comm Server screen displays.

11. Click Exit.

The Comm Server Viewer displays.

12. Click Exit.

13. Click Yes.

The Launch Auxiliary Server Applications screen displays.

14. Click Close.

Output Data to File

This procedure records all transmissions to a file while you are performing tests/maintenance. Exported data can then be imported to a database program and checked.

Important! *This procedure must be done after hours, because it stops all call capturing and interfers with hotel activities.*

1. From the Communication Settings and Emulation screen, click Record.	
2. When you are finished performing tests/maintenance procedures, click Stop Recording.	A pop-up box displays (shown below). The directory/file name defaults to Record.txt on your hard drive.

Save Recorded Buffer in C:\Program Files\HMIS

Save as:

OK

Cancel

Record.Txt

2782
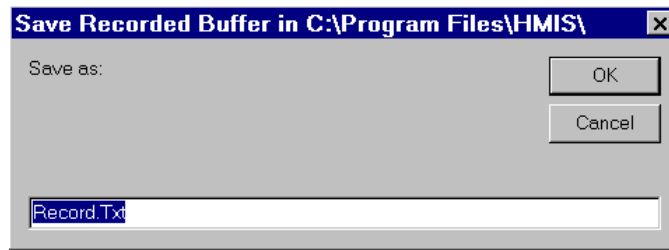
3. (Optional) If you want to change the directory/file name, type over the default.	
4. Click OK.	The data is saved to the file.

Check HMIS Communications with Strata DK

This feature enables you to verify the following communications:

♦ Check-in/check-out procedure for phones

♦ Manually changing a room's phone service (enable/disable) or DND mode (enable/disable)

➤ **To verify HMIS communications with Strata DK**

1. From the Setup Utility screen, double-click below the Setup menu.

2. From the pull-down menu, select Communications Server Viewer.
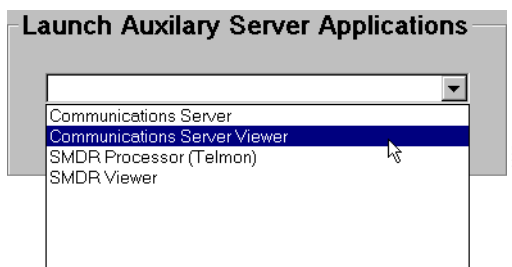
3. Click Start Application.
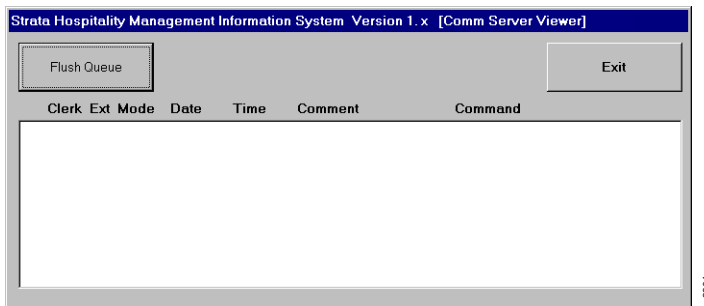
4. Arrange the two screens (Main and Communications Display) so that you can view both of them.

5. From the Main screen, perform one of the following functions:

   ♦ Check a guest in or out on the Main screen

   ♦ Enable/disable phone service on the Control/Status Tab screen

   ♦ Enable/disable DND or CFAC/CFBNA on the Control/Status Tab screen

The Communications Display Window shows the commands that are being sent to the Strata DK by the HMIS (shown below). As HMIS completes the individual procedure, a check mark is placed next to it.
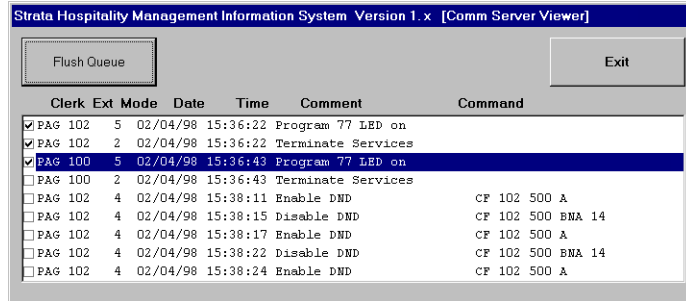
By repeating this step for each of the options, you can verify that HMIS is communicating effectively with the Strata DK.

6. To repeat a procedure already performed, uncheck the box by clicking on it.

HMIS performs the same procedure again.

7. To mark all functions as completed, click Flush Queue.

All items in the queue are checked as completed. If any procedures are being performed, HMIS discontinues processing.
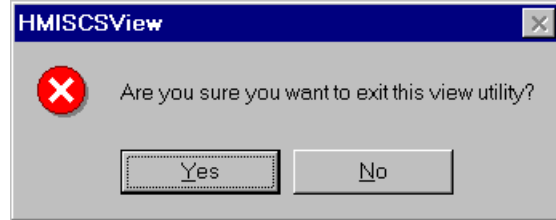
8. When finished, click Exit.

9. Click Yes.

The Launch Auxiliary Server Applications screen displays.

10. Click Close.

Note The HMIS workstation PC is not equipped with a modem or pcANYWHERE software.

Verify Communication Port Settings

1.	From Windows 98/95, click Start, then Settings.	The Settings drop-down menu displays.
2.	Click Control Panel, then double-click the System icon.	The System Properties screen displays.
3.	Click the Device Manager tab, then double-click the Ports icon.	The ports display on the screen.
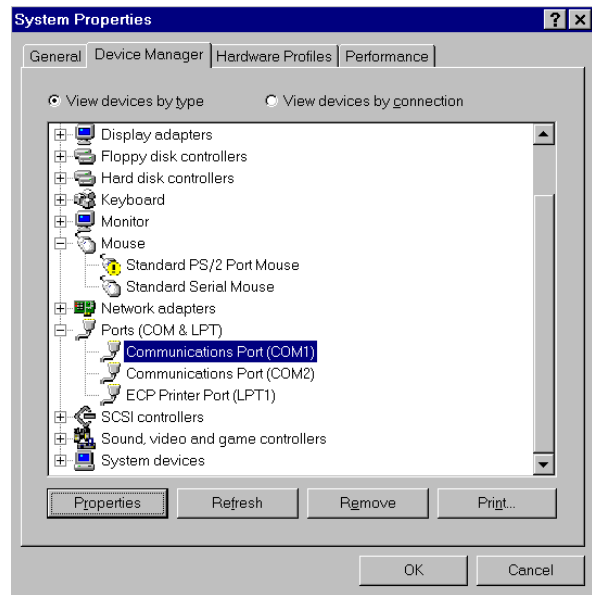
4.	Highlight the COM1 port and click Properties.	The Communications Port (COM1) Properties screen displays.

5.	Click Resources tab.	The screen displays the resource settings for COM1.
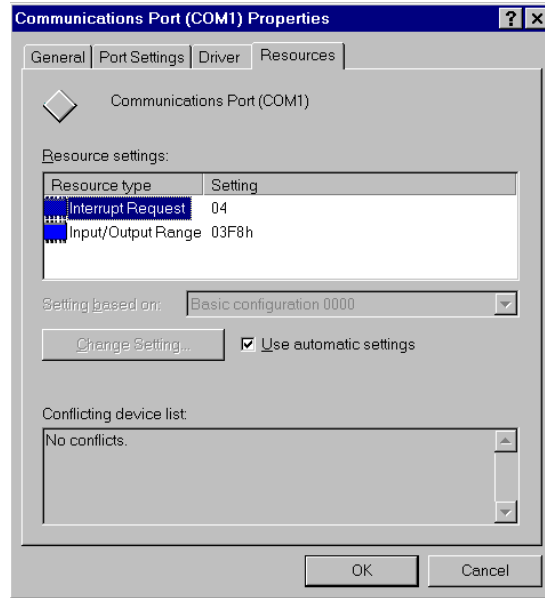
6.	Check the Interrupt and Address settings.	The communication port settings for the HMIS server/workstation PCs are:

- ♦ Interrupt = IRQ4
- ♦ Address = 3F8h

7.	Click OK.	
8.	Highlight the COM2 port and click Properties.	The Communications Port (COM2) Properties screen displays.
9.	Click Resources tab.	The screen displays the resource settings for COM2.
10.	Check the Interrupt and Address Settings.	The communication port settings for the HMIS server/workstation PCs are:

- ♦ Interrupt = IRQ3
- ♦ Address = 2F8h

11.	Click OK twice, then close the Control Panel window.	**Important!** *The COM3 modem must have a unique IRQ and address setting. These resources cannot be shared.*

Verify Modem Settings

Note The HMIS workstation PC is not equipped with a modem.

1. From Windows 98/ 95, click Start, then Settings.

2. Click Control Panel, then double-click the Modems icon.

The screen should designate the COM3 port as Modem 33.6K (as shown).
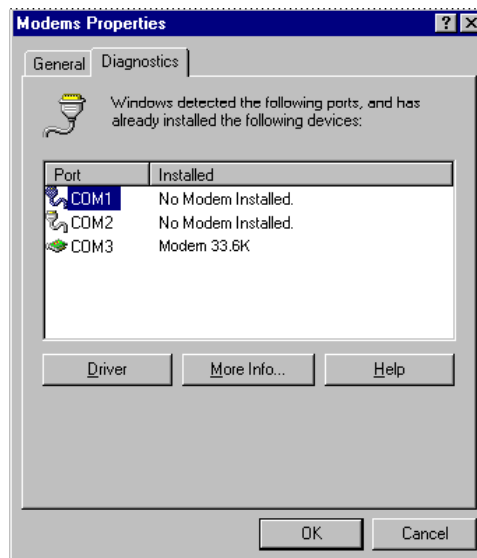
3. Click the Diagnostics tab.

4. Highlight the COM3 port and click More Info...
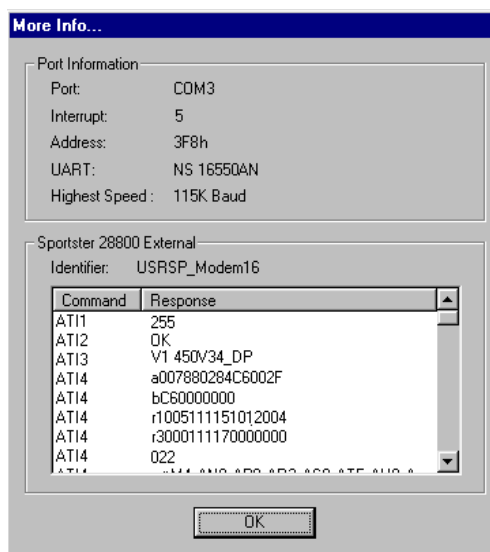
5.	Check the Interrupt and Address settings.	The modem settings should be:	
		♦ Interrupt = IRQ5	
		♦ Address = 3E8h	
6.	Click OK twice, then close the Control Panel window.	**Important!**	*The COM3 modem must have a unique IRQ and address setting. These resources cannot be shared.*

Verify pcANYWHERE Modem Settings

Note These settings are available only on the HMIS server PC.

1.	From Windows 95, click Start, then highlight Programs.	The Programs drop-down menu displays.
2.	Highlight pcANYWHERE32 and from the drop-down menu, click pcANYWHERE.	
3.	Highlight the Modem icon and press **Alt**+**Enter**.	
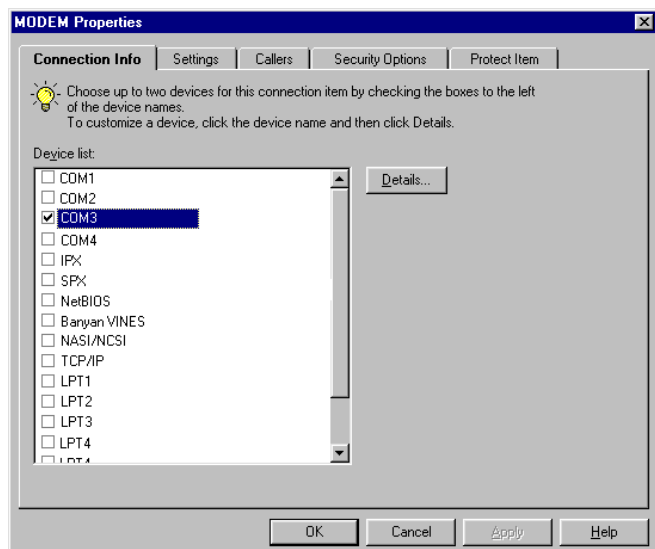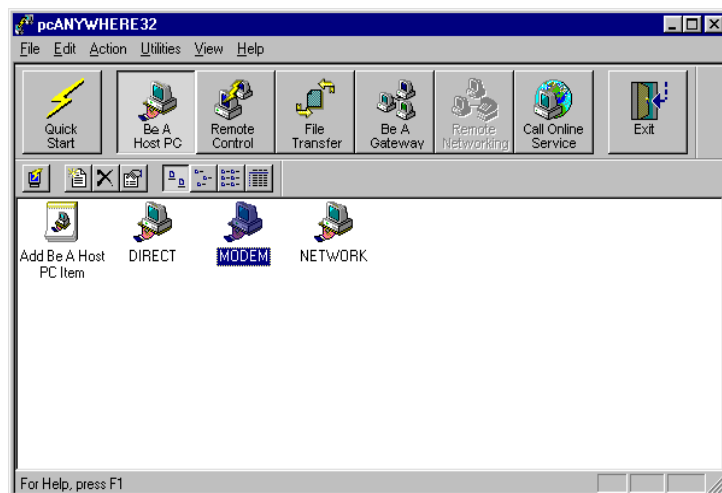
4. Highlight COM3 and click Details.

The modem properties for COM3 display on the screen.
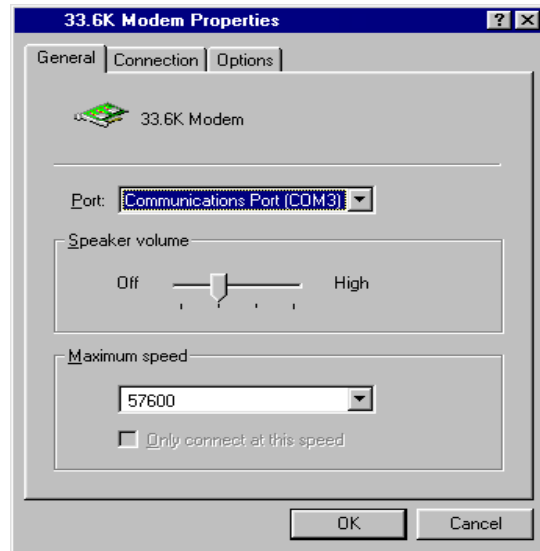
5. Check that Port field reads COM3. If not, use the pull-down menu to correct.

6. Click OK twice, then close pcANYWHWERE window.

Verify Modem Data Communication

Step 1: Set HMIS Server PC as Host PC

1. From Windows 95, click Start, then highlight Programs.	The Programs drop-down menu displays.
2. Highlight pcANYWHERE32 and from the drop-down menu, click pcANYWHERE.	
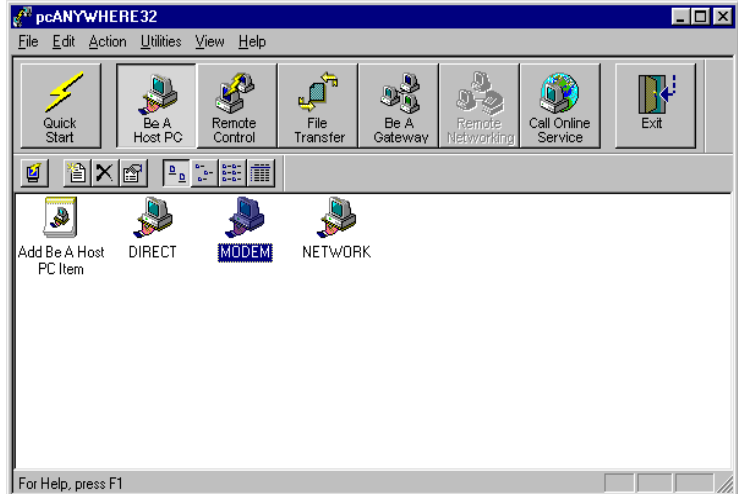
3. Click Be A Host PC.	
4. Double-click the Modem icon.	The HMIS is now waiting for connection.

Step 2: From the Host PC System, remotely connect to HMIS Server PC

1. From Windows 95, click Start, then highlight Programs.	The Programs drop-down menu displays.
2. Highlight pcANYWHERE32 and from the drop-down menu, click pcANYWHERE.	
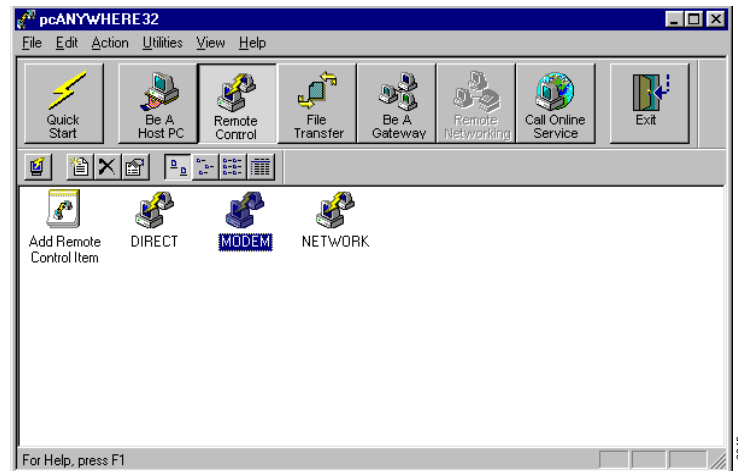
3. Click Remote Control, then double-click the Modem icon.

The program prompts you to enter the modem telephone number.
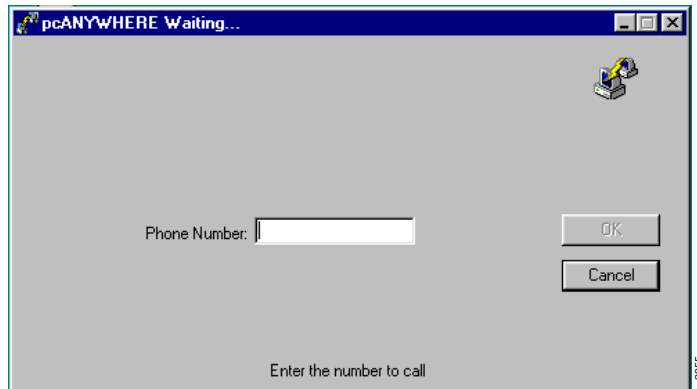
4. Enter the dialing number assigned at RSTU for the HMIS PC system.

The Remote PC is now able to operate the HMIS program on the HMIS server PC.

Step 3: Access HMIS from Remote PC

1. From Windows 95 on the HMIS server PC screen, click Start, then highlight Programs.

2. Click HMISWS icon.
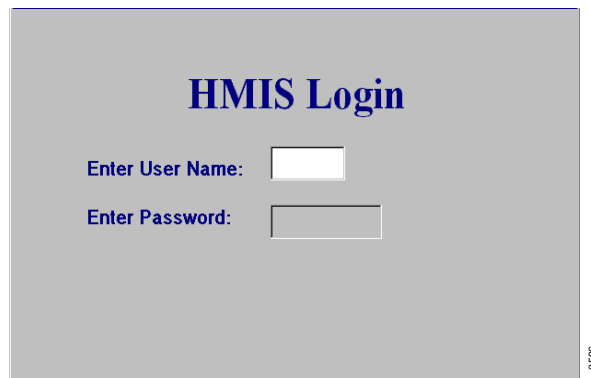
3. Type your user name and press **Enter**.

4. Type your password and press **Enter**.
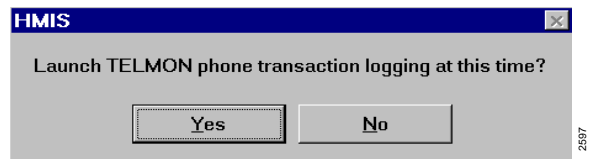
5. Click Yes.	**Important!** *TelMon must always be running to capture telephone call data.*

A SMDR Processor (TelMon) minimized button is placed on the desktop taskbar.

The HMISCS TTY Communications Server launch pop-up window displays:

HMISWS

Launch HMISCS TTY Communications Server at this time?

Yes   No

2599
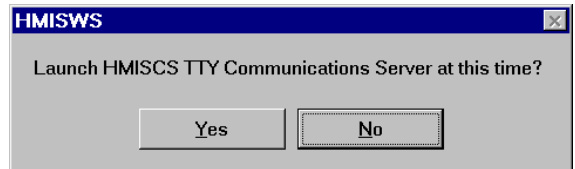
6. Click Yes.   **Important!** *The TTY Communications server communicates directly with the Strata DK system and must always be running to capture call data.*

A Comm Server (TTY) minimized button is placed on the desktop taskbar.

The Main screen displays.

7. To exit HMIS, from the Main screen, click Exit.

Are you sure you want to Exit?

Yes   No

2654
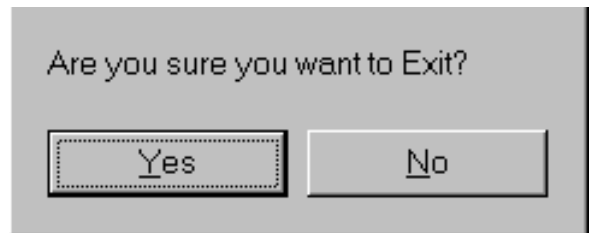
8. Click Yes.

View HmisErr.Log

The HmisErr.log file located on the HMIS directory captures any error that may occur in each of the modules. This includes reporting the loss of communications with the TTY port on the Strata DK. If an error does occur in the software, it may be necessary to forward this file to Toshiba Technical Support for decoding.

Note This file is available only on the HMIS server PC. Using a text editor, access the file in the HMIS directory.

```
HMISWS    Type mismatch in procedure: Swap        06-30-199812:37:57
HMISWS    Type mismatch in procedure: Swap        06-30-199812:37:57
COMMSERV.Device Unavailable. in procedure: TerminatePhoneServices
                                                06-30-199813:24:37
HMISWS    Type mismatch in procedure: Swap        06-30-199813:25:38
COMMSERV.Device Unavailable. in procedure: SetProgram56
                                                06-30-199813:25:40
COMMSERV.Device Unavailable. in procedure: EnableDndStatusUp
                                                06-30-199813:26:45
COMMSERV.Device Unavailable. in procedure: TerminatePhoneServices
                                                06-30-199813:27:47
COMMSERV.Device Unavailable. in procedure: SetProgram56
                                                06-30-199813:28:49
COMMSERV.Device Unavailable. in procedure: EnableDndStatusUp
                                                06-30-199813:29:52
COMMSERV.Device Unavailable. in procedure: TerminatePhoneServices
                                                06-30-199813:31:06
COMMSERV.Device Unavailable. in procedure: SetProgram56
                                                06-30-199813:32:08
```

3445

Figure 15-26   Sample HmisErr.Log

View History Log

The History log file logs all communications with the Strata DK.

➤ **To view the history log**

1. From the Communication Display, click on the lower right-hand area of the screen.

3308

2. Clear the History On box by clicking in it.

4320
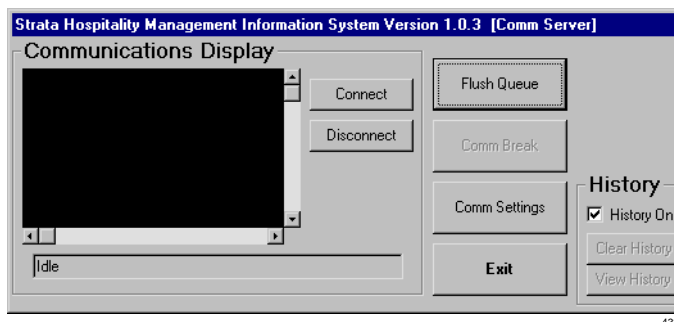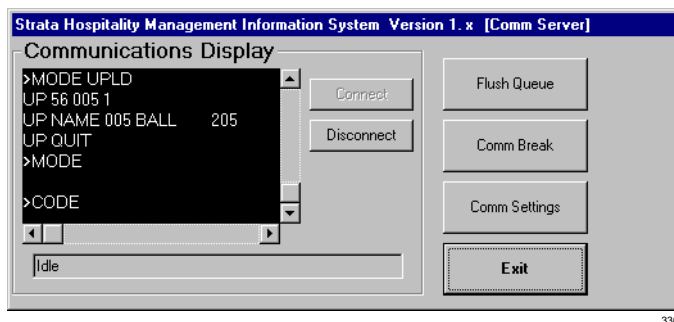
3. Click the View
    History button.
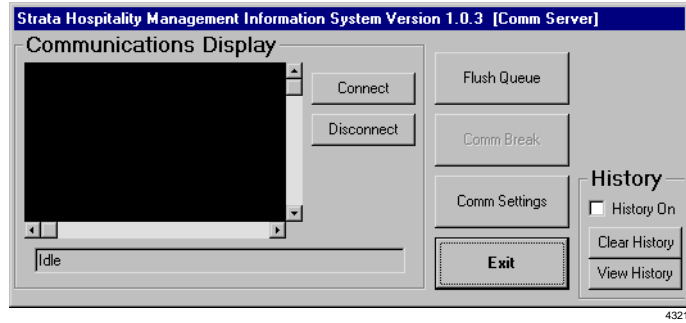
This displays:
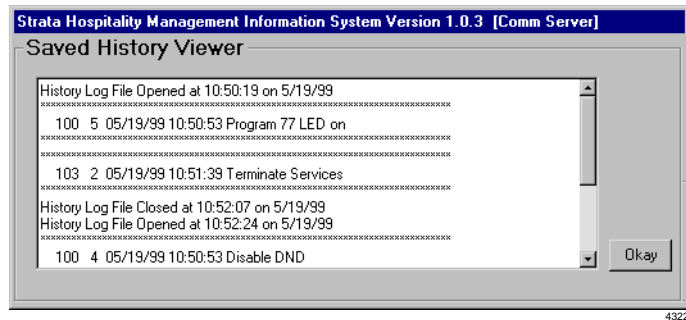
4. Click Okay.
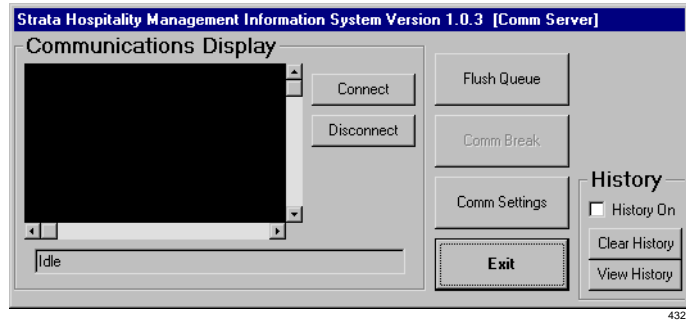
Important! *Be sure to check the History On box before exiting this window.*

Strata AirLink Systems 16

This chapter describes Strata AirLink™ wireless systems. There are two available configurations:

♦ **Strata AirLink External Wireless System –** The basis for this system is the Base Station Interface Adapter (BSIA) system that interfaces to Strata DK systems and many non-Toshiba systems using the standard telephone ports.

♦ **Strata AirLink Integrated Wireless System –** The basis for the integrated version is the RWIU system that interfaces to Strata DK16, DK16e, DK40, DK40i, DK280, and DK424, using a proprietary RWIU Printed Circuit Board (PCB).

Strata AirLink operates in single building and campus environments in the 1920~1930 MHz band. This bandwidth is designated by the Federal Communication Commission (FCC) for unlicensed operation, and an FCC license is not required to install and operate the system.

System Components

The BSIA system supports up to two Base Stations and one BSIA or controller. The RWIU system supports up to four Base Stations and interfaces directly to the Strata DK system without using a controller. Both systems support up to 32 handsets.

Each Base Station (see Figure 16-1) provides 4 or 8 simultaneous speech paths and up to 320,000 square feet of calling coverage for either system. Since handsets are not in continuous conversation, a system can support more than 8 handsets, up to a maximum of 32. Multiple systems can be active simultaneously.

The Base Station has radio transmitters and receivers that relay calls between the BSIA or RWIU, handsets, other telephones and trunks. It has four external antennas that enable the best choice for receiving and transmitting the strongest signal.

Figure 16-1   Base Station

The Base Stations can be mounted on walls or ceilings up to 2,000 feet from the system, using twisted-pair continuous cable. They receive power directly or locally. If powered locally, they can be installed up to 3,300 feet from the system. LEDs provide diagnostic information for System Administrators or technical personnel (see Table 16-22 on Page 16-66).
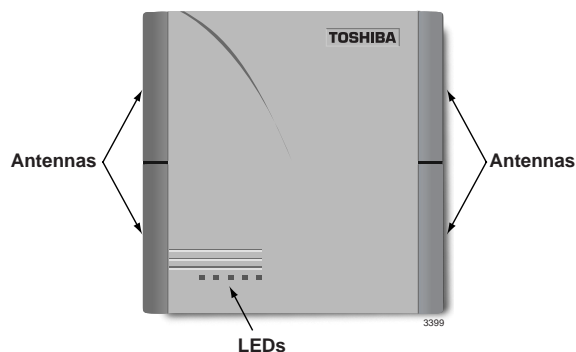
In typical office environments, each Base Station has a broadcast range (see Figure 16-2) of up to 300 feet. They can also be placed one meter apart in the same coverage area to increase traffic capacity without interference.

The Base Station software is easily upgraded from the BSIA or RWIU, simplifying system administration and eliminating the need to remove the Base Stations for system upgrades.

The handset is small, lightweight, and easy to use. Its Liquid Crystal Display (LCD) shows alphanumeric information and icons that report status. It has many features depending upon the interfacing telephone system. The handsets used with the RWIU system have many of the same Strata DK Digital Telephone (DKT) features.

Broadcast Range - 300 Feet

Base Station

2967

Figure 16-2   Broadcast Range

Unique Electronic Serial Numbers (ESNs) are programmed into the handsets at the factory and are automatically configured the first time a call is made.

Pre-installation

This section provides common step-by-step pre-installation procedures and several sample configurations for both Strata AirLink Wireless systems. The configurations range from a single system with one or two Base Stations to multiple-overlapping systems. The anticipated coverage of 320,000 square feet per Base Station and a maximum number of 32 users for each system was used to layout the samples.

It is highly recommended that a site survey and BER test be conducted to assist in the careful planning of Base Station placement, ensuring the highest possible quality of coverage. The survey should include:

♦   Location of Base Stations

♦   Maximum broadcast range required from any Base Station

♦   High traffic areas and general coverage areas, such as conference rooms, cafeterias, and manufacturing floors

♦   Obstructions between Base Stations and handsets

♦   Office locations and number of handsets within each location

♦   Construction materials used in walls, including the insulation, and floors between multistory buildings

♦   Window coatings and coverings

♦   Large metal objects, such as equipment, doors, and fluorescent lamp shades

♦   Distance of Base Stations from the BSIA or RWIU

There are special installation requirements to meet Underwriters Laboratories (UL) 1459 regulations in the United States that are explained in the "Underwriters Laboratories (UL)" on Page 16-91.

Step 1: Check the System Hardware and Software Requirements

Table 16-1 lists the minimum hardware and software that your PC must have to use the Strata AirLink Manager software.

Table 16-1   Hardware and Software Requirements

	Minimum	**Recommended**
Hardware	386DX 33 MHz	486DX2 66 MHz
Hard Drive	1.5MB	3MB
Random Access Memory (RAM)	4MB	8MB
Video	VGA	SVGA
Mouse	Any supported by Windows	Same
Floppy Drive	1.44 MB 3.5 inch	Same
Software	Microsoft Windows 3.11/3.1	Windows 98/95

Important!   *Windows 3.11/3.1 is a 16-bit application and the Manager software is 32-bit. To run the Manager software, a special 32-bit support expansion is required.*

Step 2: Review System Component Placement

A review of component placement before installation will help to reduce or eliminate attenuation. Attenuation is loss of RF signal strength due to distance, antenna positioning, and/or obstructions. The loss is measured in decibels (dBs).

Increases or reductions of three dBs result in doubling or halving signal strength. Try to limit the total loss to 100 dBs (see Figure 16-3).
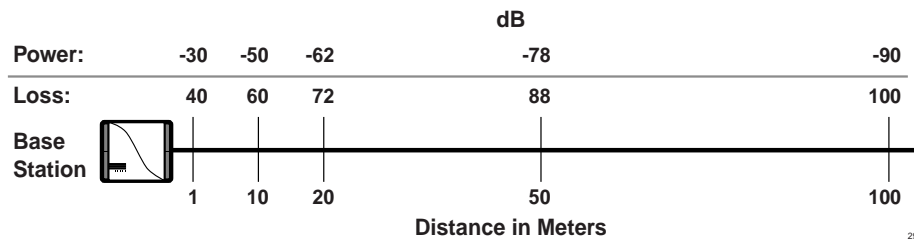
Figure 16-3   Loss of Signal Strength by Distance (Direct Line of Sight)

Table 16-2 shows attenuation obstruction caused by common materials in a building.

Table 16-2   Signal Attenuation Obstruction

Object	Approximate dB Loss
Concrete	20
Concrete with metal siding	30
Brick	15
Plaster	10
Walls with windows	10
Walls with metal coating	20

Table 16-2   Signal Attenuation Obstruction *(continued)*

Object	Approximate dB Loss
Venetian blinds Open Closed	10 20
Soft partitioning	3 to 4

❸ **To reduce or eliminate attenuation and fading**

1. Begin the signal path without obstructions even though signals can travel through obstacles (see Figure 16-4).

2. If obstructions cannot be avoided, do not place the Base Stations:

    ♦ On or near metallic objects or on walls that have metallic content such as metal girders or foil-backed insulation.

    ♦ Near large obstructions; for example, doors that could temporarily obstruct antennas when the doors open.

3. Place components in locations that ensure clear line of sight signaling between the Base Station and handset.
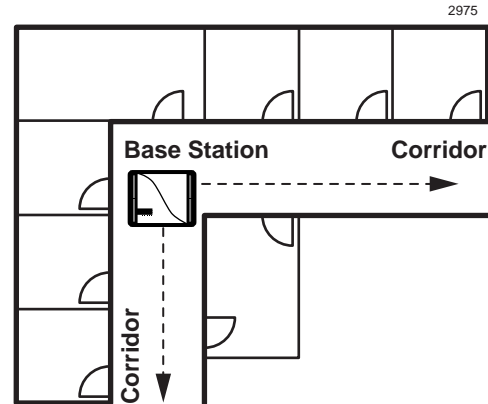
Figure 16-4   Maximum Line of Sight

Note   In general, for optimum coverage and reduced signal fading, it is recommended that the coverage by the Base Station overlap by approximately 25 percent. Base Stations are designed to automatically use frequencies that are not already in use, so interference between the Base Stations is not a problem.

4. Plan coverage for each floor separately in multi-story environments. A single Base Station can support multiple floors. The guidelines for ensuring proper broadcast ranges and maximum traffic must be followed.

5. Consider the high traffic areas and install the number of Base Stations required to meet the estimated traffic demand. When multiple Base Stations are needed in the same location, you can mount Base Stations as close as one meter apart.

    Each Base Station can support eight or more simultaneous conversations. Figure 16-5 shows 2 Base Stations supporting 32 handsets in a manufacturing area.

6. Use corridors because they can act as natural pathways for RF signals. When trying to cover two types of areas, place a Base Station near a corridor to optimize coverage in both areas.

Note   Handoff does not operate between Base Stations connected to different wireless systems.
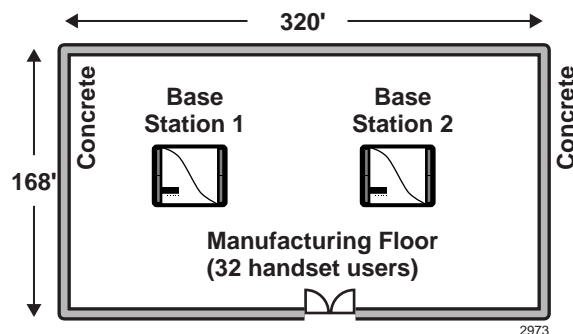
Figure 16-5   Increasing Traffic Capabilities

Step 3: Review Possible System Configurations

It is highly recommended that you follow the installation guidelines and examples in this step. The maximum number of Base Stations that the BSIA system supports is two, and the RWIU system, four.

Some configurations are:

♦ Single BSIA system with two Base Stations (see Figure 16-6) or single RWIU system with four Base Stations (see Figure 16-7). The Base Stations are placed in locations that optimize the requirements of the system. For example, the Base Stations could be placed in the same general area or on separate floors, but with overlapping coverage
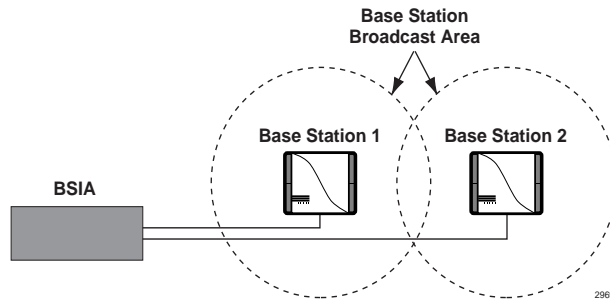
Figure 16-6   BSIA System with Two Base Stations
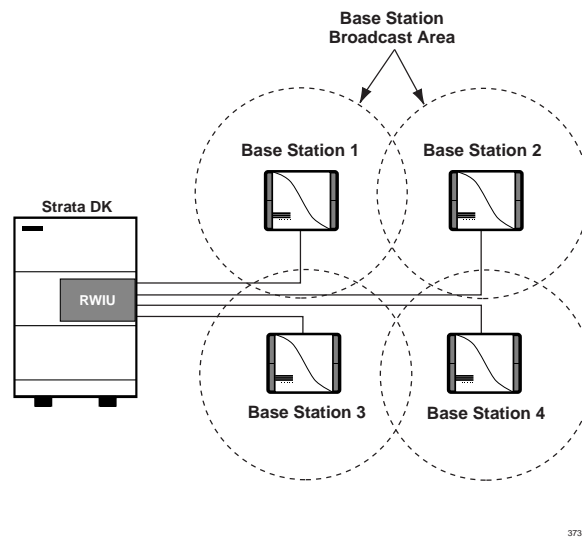
Figure 16-7   RWIU System with Four Base Stations

Strata AirLink Systems

♦ Multiple BSIA systems as a single system (see Figure 16-8)
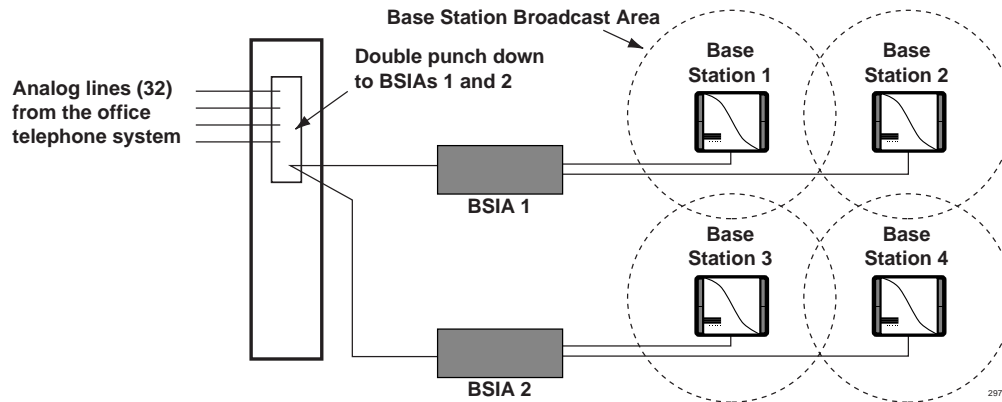
Figure 16-8   Multiple BSIAs in One System

This configuration creates a system with greater coverage area. The handsets must be programmed with both system IDs. Users can place and receive calls, although handoff does not automatically operate between Base Stations connected to different BSIAs. Manually invoke handoff by using **FLSH** to hold the call while moving between Base Station 4 and 2, for example.

System Identification numbers (SIDs) for both BSIAs must be programmed in the handset for this operation.

♦ Multiple overlapping systems (see Figure 16-9).

Multiple overlapping configurations create a system with greater user capacity. This configuration works for the BSIA or RWIU systems.

Use Table 16-3 to determine how many Base Stations are needed to accommodate the numbers of users at different traffic levels.
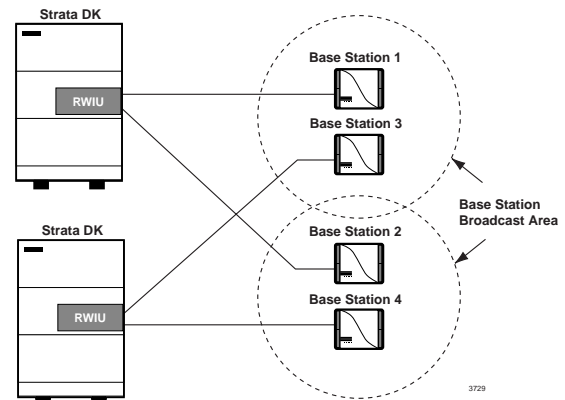
Note   It is assumed that users have access to all Base Stations in a high-traffic environment where only one call is blocked out of 100 attempts.

Figure 16-9   Multiple Overlapping Systems

Table 16-3   Base Station Traffic Requirements

Erlangs[1] Per User	Number of Users	Total Erlangs	Equivalent CCS[2]	Required Channels	Base Stations Required
.1	10	1	36	5	1
	20	2	72	6	1
	30	3	108	8	1
	32	3.2	115.20	8	1
.15	10	1.5	54	6	1
	20	3	108	8	1
	32[3]	4.8	172	11	2
.2	10	2	72	6	1
	16	3.2	115.20	8	1
	32[3]	6.4	230.4	13	2

1. Typical usage assumes .1, .15, and .2 Erlangs (6 minutes, 9 minutes, and 12 minutes, respectively, where 1 Erlang equals 60 minutes of usage) per line during the busiest hour of the day.

2. CCS stands for centi-call seconds, or 100 seconds of telephone conversation.

3. Assumes Base Stations are co-located.

♦ Factory with adjoining offices (see Figure 16-10).

Both Base Stations are placed in the factory area to accommodate the greater number of users in that area.

Place Base Station 2 closer to the offices, maximizing line of sight signal through the doorway.

This is especially important if the wall between the offices and factory is concrete.

The Base Stations are also mounted on the ceilings and away from any potential obstructions to the antennas.

Figure 16-10   System with a Factory and Adjoining Offices

If a second area was available to the left of the factory, moving Base Station 1 to that location would broaden the coverage to users in that area also.

♦ Manufacturing plant (see Figure 16-11).

The entrance from the manufacturing area into the cafeteria is a high-traffic area.

Placing a Base Station in the entry area of the cafeteria blocks the line of sight to the other areas in the cafeteria.

Locate Base Station 2 centrally in the cafeteria and Base Station 1 in the manufacturing area. Align Base Station 2 with the entrance of the cafeteria to provide coverage into that area.
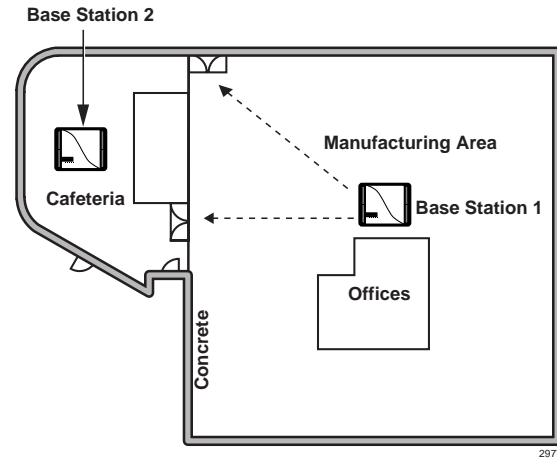
Figure 16-11   System in a Manufacturing Area

♦ Cubicles, walled offices, and conference rooms (see Figure 16-12).

Although the number of Base Stations in this environment would depend on the number of handsets, the Base Stations are aligned with corridors to maximize the line of sight.

Instead of placing both Base Stations close to each other, place Base Station 1 near the conference rooms and entrance area to accommodate greater potential traffic in these areas.
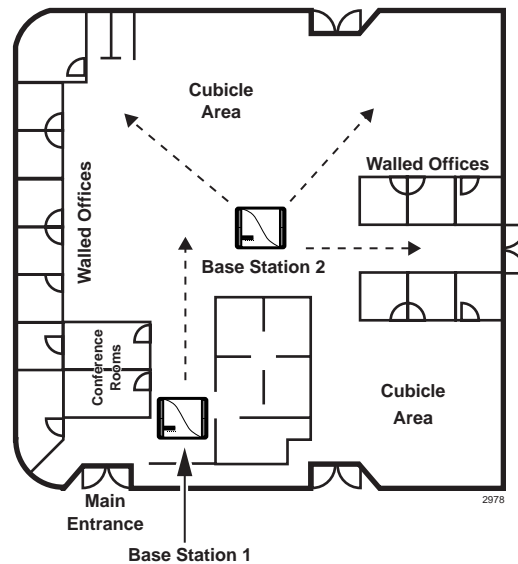
Figure 16-12   Office Area with Cubicles and Walls

Step 4: Unpack the Shipment

1. Inspect all packages carefully and note any visible damage when the system first arrives. If any damage is found, do not open the packages. Contact the delivery carrier immediately and make the proper claims.

2. Unpack all of the packages.

3. Be sure to retain the original packaging materials for re-use when storing or transporting the system components.

Step 5: Check the Equipment List

1. Before installation, check the system components against the packing list and inspect all equipment for damage. If equipment is missing or damaged, contact the supplier immediately.

2. Ensure that the following Toshiba-supplied equipment was delivered:

   ♦ BSIA or RWIU PCBs

   ♦ PC cable with DB9 or DB25 adapter (BSIA)

   ♦ RWIU Manager interface cable (6-pin connector)

   ♦ Power supplies

   ♦ Optional power supply for locally powered Base Stations

   ♦ Base Stations, handsets, and Charger Bases

   ♦ Strata AirLink Manager and RWIU Manager software (two floppy disks)

Step 6: Purchase Additional Equipment

➤ Ensure that the following equipment has been purchased:

   ♦ PC (for the Strata AirLink Manager software)

   ♦ BSIA grounding wire (for gauge requirements, see Table 16-37 on Page 16-88)

   ♦ BSIA external alarm (see Page 16-16 for specifications)

   ♦ Cable for the Base Stations (see Page 16-16 for specifications)

   ♦ ONEAC five-pin analog protector for outside Base Station installation

Step 7: Select Suitable Locations

1. Pick locations for your system components that are dry and clean, well ventilated and illuminated, and easily accessible.

   The indoor/outdoor locations must not be subject to:

   ♦ Extreme heat or cold

   ♦ Corrosive fumes, dust, or other airborne contaminants

   ♦ Excessive vibration

2. Do not place the components next to televisions, radios, or high-frequency equipment.

Step 8: Set Up Temporary Installation

Important!   *It is recommended that you use the Toshiba Stand-alone Base Station Test Stand instead of setting up a temporary installation. If the test stand is used, skip this step and go to Step 9.*

Setting up a temporary installation helps to determine proper Base Station placement without permanently cabling any components. A BER test can be easily conducted to determine the proper Base Station placement for maximum signaling. The BER test is a password-protected function of an initialized handset.

Strata AirLink Systems

One BSIA or RWIU, one Base Station, and one handset is all that is required to conduct the BER test. To initialize the BSIA system, see Steps 7~9 on Page 16-19. To initialize the RWIU system, see Step 11 on Page 16-45.

Step 9: Use the Stand-alone Base Station Test Stand

The Stand-alone Base Station Test Stand verifies the Base Station positioning prior to system activation or during the site survey. It generates an audible tone for the handset to lock onto, verifies BER status, and can be moved to validate the best locations for each Base Station.

Substep A: Before You Begin

1. Ensure that the following materials are available:

   ♦ Strata AirLink Stand-alone Base Station Test Stand

   ♦ Base Station power supply with cord

   ♦ One or more handsets with batteries fully charged

   ♦ Floor plan of the facility to survey

Substep B: Set Up the Base Station

1. Determine the best location for a Base Station. See "Review System Component Placement" on Page 16-3 for more information.

2. Temporarily place the Stand-alone Base Station Test Stand as close as possible to the selected Base Station location with the proper orientation (vertical or horizontal).

   Note When testing with a Base Station, be sure to rotate all four antennas to a 90° angle.

3. Plug the Base Station power supply into the +5VDC connector of the test stand (located on the bottom) and into a 110VAC outlet.

4. Watch the LEDs on the front of the test stand until all red LEDs are out and only the green LED is lit.

Substep C: Set Up the Handsets

1. Make sure that your handsets are fully charged.

2. Press **PWR** to turn on a handset.

3. Enter **10** and press **FCN** to access System Configuration.

4. Press **FCN** again.

```
┌─────────────────────┐
│ S │ I │ D │ # │ 0 │  │  │  │
├─────────────────────┤
│   │   │   │   │   │  │  │  │
├─────────────────────┤
│         │ 1 │ 2 │ : │ 1 │ 5 │
│ ▭▭▭▭ │         │ ‖‖‖ ∕│
└─────────────────────┘
```
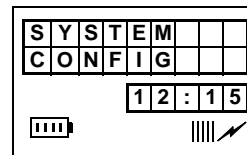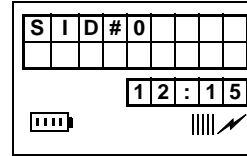
5. Enter **7171**.

6. Press ▼ (right of **ABC**).

```
┌─────────────────────┐
│ H │ I │ D │ # │ 0 │  │  │  │
├─────────────────────┤
│   │   │   │   │   │  │  │  │
├─────────────────────┤
│         │ 1 │ 2 │ : │ 1 │ 5 │
│ ▭▭▭▭ │         │ ‖‖‖ ∕│
└─────────────────────┘
```
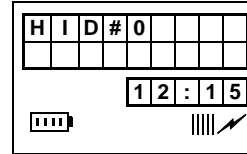
7. Enter **1**.

8. Press **END**.   The handset returns to idle.

9. Repeat Substeps 1~8 for each
   handset, substituting a
   different HID number (for
   example, 2, 3, 4, 5, etc.) in
   Substep 7.

Substep D: Audio Coverage Test

Important!   *Strata DK must recognize DTMF signaling, if you have a BSIA. Strata DK requires*
a DTMF receiver PCB to support the RSTU ports.

1. Press **PWR** to turn on the handset.

2. Press **CALL**.

3. Listen for continuous tone while walking around the facility observing coverage area
   boundaries.

4. Mark the floor plan where the continuous tone "warbles" (indicating the beginning of a
   handoff overlap area) and where the continuous tone "breaks" or stops (indicating the end of
   the coverage area).

5. Press **END**. The handset returns to idle.

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Substep E: Perform the Handset Bit Error Rate (BER) Test

1. Simulate real use rather than trying to get the best readings by:

   ⋆ Perform tests in all possible areas that users may carry their handsets.

   ⋆ Remain in an area long enough to get an accurate reading. BER readings can take a few seconds to register. It is recommended that you stand still for an accurate reading.

   ⋆ Test specific Base Stations. Handsets do not perform handoff during BER tests so that you can test each Base Station

2. In idle mode, press **##****.

3. Press **ABC**, then **CALL**.

```
B E R
M E A S U R E
              1 2 : 1 5
▭
```
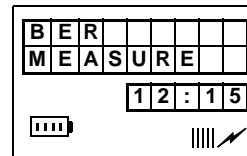
4. Make a 360 degree circle to check the signal from different directions.

```
H S           M A X
B S 0 2   G O O D
              1 2 : 1 5
▭
```
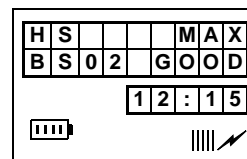
See Table 16-4 for BER test readings. In the example above, **02** indicates the Base Station ID, **MAX** is the handset receive signal, and **GOOD** is the Base Station receive signal.

5. Keep the handset slightly raised.

Important! *Mark the floor plan where the LCD permanently changes from **MAX** to **GOOD** (indicating the beginning of the handoff overlap area) and where the LCD permanently changes from **GOOD** to **POOR** (indicating the end of the coverage area).*

6. Walk while performing the test, but pause occasionally for the best readings.

7. Press **END**.

Table 16-4   Explanation of Possible BER Test Results

BER Result	Description
Max or Good	Values required for clear conversation.
Poor	Call setup is not advisable, although calls in progress could survive.
Bad	Area is not sufficiently covered to support call traffic. Relocate other Base Stations or put up another Base Station.
Mismatched values (e.g., good/bad)	Faulty equipment or interference close to the handset or Base Station.

Step 10: Mount the Base Stations

1. Determine a location (see "Set Up Temporary Installation" on Page 16-9) that provides the best coverage before mounting the Base Station permanently.

2. Use locations that reduce attenuation and create a clear line of sight.

3. Always mount the Base Stations in a centralized location in open, symmetrical areas.

Note   Base Station placement guidelines are provided in "Review Possible System Configurations" on Page 16-5.

❸   **To ceiling mount the Base Station**

1. Rotate Base Station antennas to expose the mounting tabs (see Figure 16-13).

2. Mark the mounting tab position on the ceiling by holding the Base Station in place to use as a guide for drilling.

3. Drill the four holes in the ceiling.

Mounting Tabs

3382

Rotated Antenna
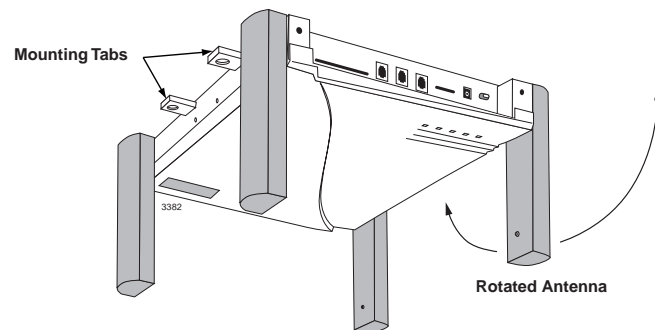
Figure 16-13   Mounting Tabs Location on the Base Station

Important!   *Do not mount Base Stations on movable surfaces such as acoustic drop ceilings. Mounting a Base Station above a non-metallic dropped ceiling is acceptable.*

4. Insert anchors into the drilled holes.

5. Insert #8 screws in the anchors, leaving a gap between the ceiling and screw head.

6. Mount the Base Station on the screws and tighten the screws.

7. Rotate the antennas so that they are perpendicular to the Base Station (facing down).

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❸ **To wall mount the Base Station**

1. Choose a location that is in a corridor or non-symmetrical area and faces the greatest coverage area.

2. Mount the Base Station midway between the floor and permanent ceiling, but above any obstructions such as cubicle walls.

3. Rotate the Base Station antennas to expose the mounting tabs (see Figure 16-14).

4. Mark the mounting tab position on the ceiling by holding the Base Station in place to use as a guide for drilling.

5. Drill the four holes in the wall.

6. Insert anchors into the drilled holes.

7. Insert #8 screws in the anchors, leaving a gap between the wall and screw head.

8. Mount the Base Station on the screws and tighten the screws.

9. Rotate the Base Station antennas so that they are perpendicular to the wall
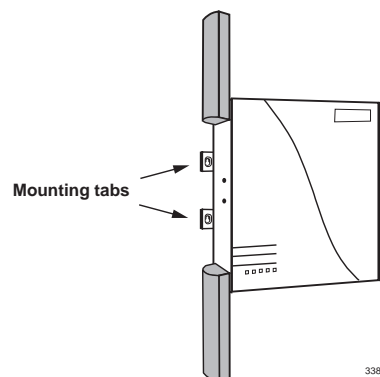
Figure 16-14   Location of Mounting Tabs

For specific installation procedures for the BSIA system, see "BSIA System Installation" and for the RWIU system, see "RWIU System Installation" on Page 16-36.

BSIA System Installation

This section describes specific installation steps for the BSIA system. It interfaces to Strata DK16, DK16e, DK40, DK40i, DK280, and DK424 and many non-Toshiba telephone systems using standard telephone ports.

Step 1: Install the Analog Line Module (ALM)

Note   Skip this step and go to Step 7 if ALM PCB was not purchased.

The BSIA motherboard comes configured to support a maximum of 8 handset users (upgradeable to 16, 24, or 32). Additional groups of eight users can be installed using the ALM PCB.

CAUTION!   **When installing, removing, or examining PCBs, do not touch the soldered (back) side or "gold" plate at the edge of the PCB.**

---

1. Remove the screws securing the cover of the BSIA (see Figure 16-15) and lift the cover off the BSIA.

2. Align the ALM with DIN connector J5 (see Figure 16-16).

3. Gently press the PCB into the DIN connector.

4. Connect the standoffs.

5. Replace the BSIA cover and re-install the screws.

2985
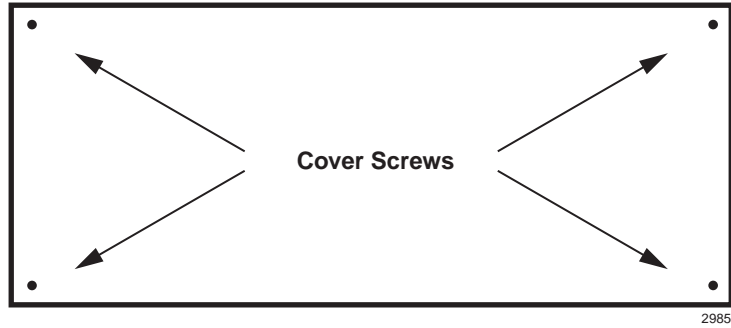
Figure 16-15   Location of Screws on the BSIA Cover

Important!   *Do not power on the BSIA at this point.*
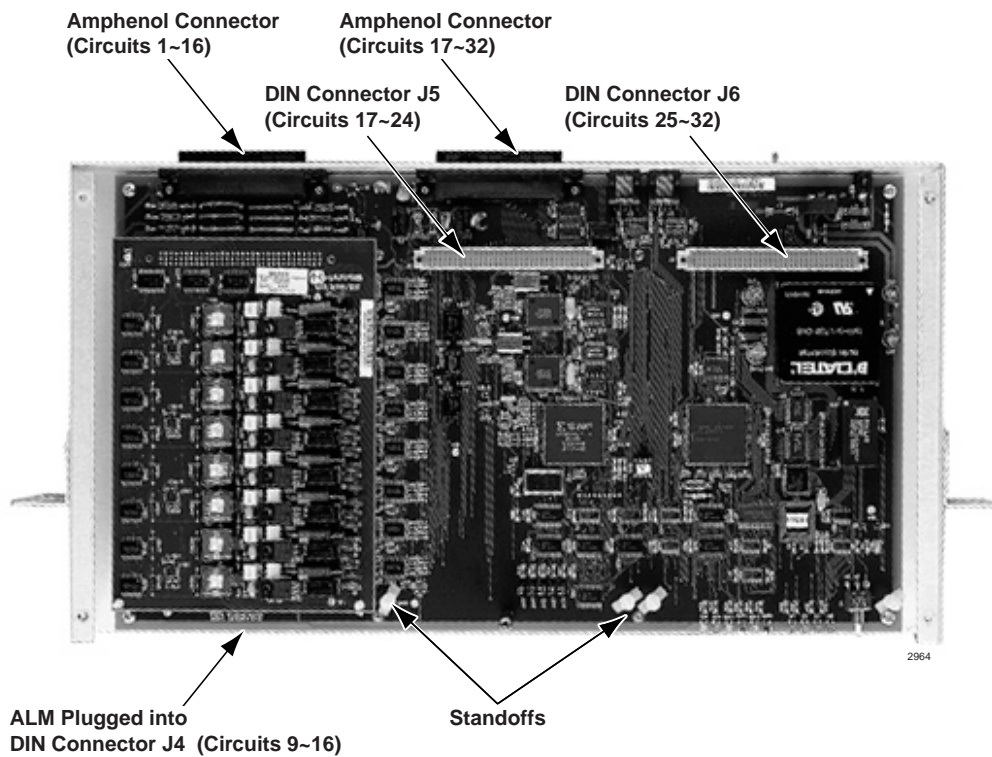
Figure 16-16   ALM Connections on the BSIA

Step 2: Run the Cable

1. Run the cable from the Base Stations to the BSIA, using the following maximum cabling distances:

   ♦ 2,000 feet for line power

   ♦ 3,300 feet for local power

2. Use Category 5 cable. Using a mix of Categories 2, 3, 4, and 5 is acceptable, but can affect the total possible cable length. See Figure 16-19 on Page 16-17 for the wiring diagram.

3. Connect the *transmit* cable (pair 21 or 25) to the receive side (see Figure 16-17).

4. Connect the *receive* cable (pair 20 or 24) to the transmit jack (see Figure 16-17).
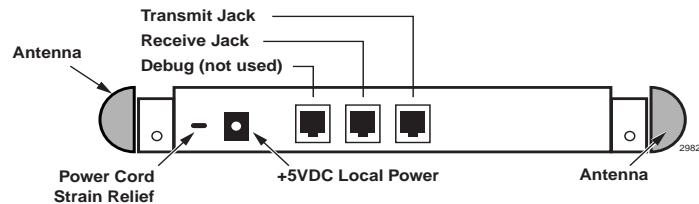
Figure 16-17   Location of Transmit and Receive Jacks

Step 3: Activate the External Critical Alarm (Optional)

Note   The BSIA system is not equipped with an external critical alarm. If one was not purchased, skip this Step.

1. Connect pair 22 on connector block P1 to one input on the external alarm device (see Figure 16-18).

2. Connect tip (normally closed) or ring (normally open) of pair 23 on P1 to the other input of the alarm device.
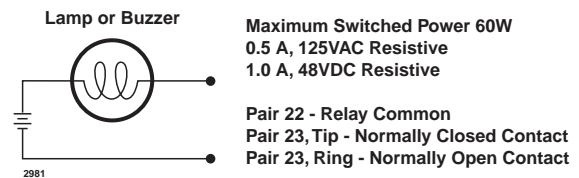
Figure 16-18   Wiring for External Critical Alarm

Step 4: Determine the Base Station Power Supply

A Base Station can receive input (line) power from the BSIA or an optional local power supply. Using a local power supply increases the distance Base Stations can be located from the BSIA.

Toshiba provides an optional universal 110/230VAC, 50/60 Hz power supply with a barrel-jack connection to the Base Station (see Figure 16-20 on Page 16-18).

Customers with 220VAC outlets can:

♦ Purchase another power cord to fit the universal connector (three-pronged IEC 320 power inlet) on the power supply.

♦ Replace the 110VAC plug on the cable with an appropriate 220VAC plug.

♦ Connect a North American 220VAC adapter to the 110VAC plug.
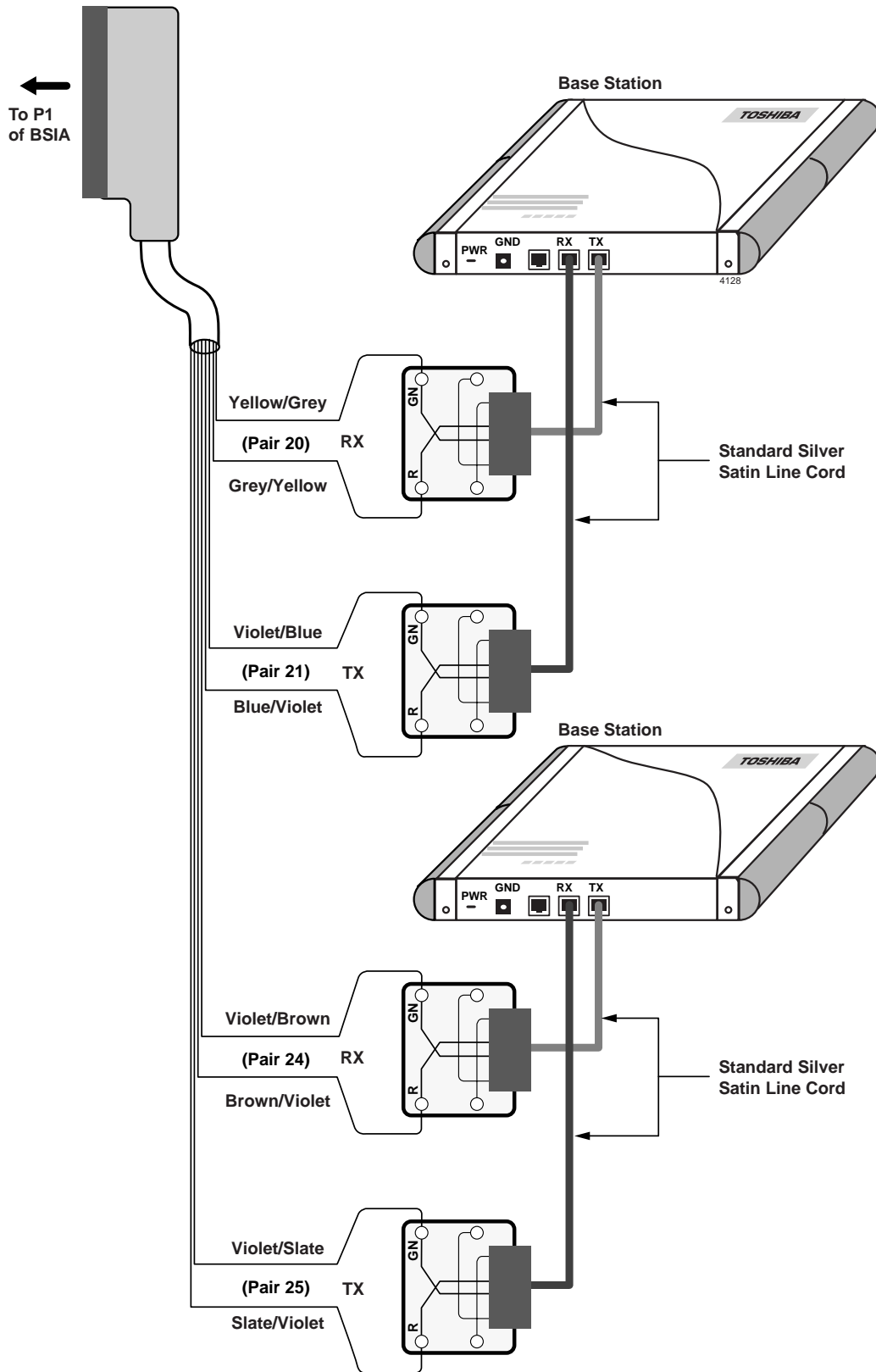
Figure 16-19   Base Station to BSIA Wiring Diagram

Step 5: Connect the Power Supply

➤ For AC power, use the power supply that comes with the BSIA system. It has a universal input (110/220VAC), operates at 50~60 Hz, and provides -48VDC.

Note The power supply includes a cable with a barrel-jack connection (see Figure 16-20) to the BSIA and 110VAC cable.

Barrel Jack

**Power Supply
115/230VAC Input
(50/60 Hz)**

2983
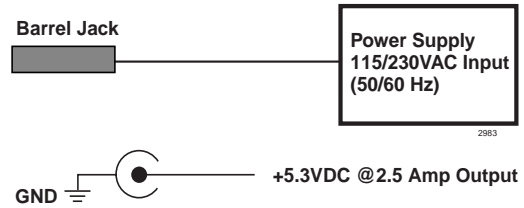
CAUTION! **Connect to power, but do not power on until the entire system is cabled.**

GND ⏚

+5.3VDC @2.5 Amp Output

Figure 16-20   Barrel-jack Connection

❸ **To connect to power when -48VDC is required**

1. For DC power, a power cord with the following is required:

   ♦ 18 AWG wire

   ♦ 2.1mm ID x 5.5mm barrel jack (Switchcraft, Inc. S765 or equivalent) with minus (–) potential center lead and positive (+) shield lead

2. Connect the barrel jack to the BSIA at J1 (see Figure 16-20).

Note Battery source requirements are -44 to -56VDC @2 amps. An inline, slow-blow fuse rated 3 amps @250VAC must be installed as close as possible to the battery source on the minus potential side.

3. To prevent accidental removal of the power cord connected to J1 on the BSIA, tie wrap the power cord to the power strain relief above the ground screw on the BSIA (see Figure 16-22).

Step 6: Connect the PC

1. Insert one end of the RS-232-C cable with a DB9 or DB25 adapter into the serial port in the back of the PC (see Figure 16-21).

RJ-45 Connector (J2 Admin Port)

RS-232-C Cable

BSIA

3730

**DB9 or DB25 Connector
(Male DB9 or DB25 Adapter)**
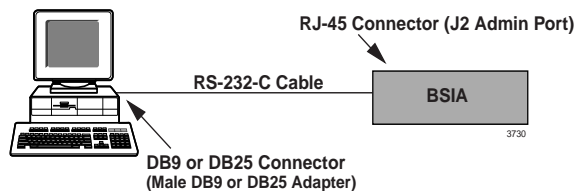
Figure 16-21   PC to BSIA Connection

2. Insert the RJ-45 connector into the back of the BSIA (J2) (see Figure 16-22)

Power Cord Strain Relief

**P2
(Circuits 17~32)**

**P1
(Circuits 1~16)**

J1

J3   J2

3000

**-48VDC
Input**

GND

**Not
Used**

**RJ-45
(Admin Port)**

**25-pair Female Connectors
(Analog Lines and Base Stations)**
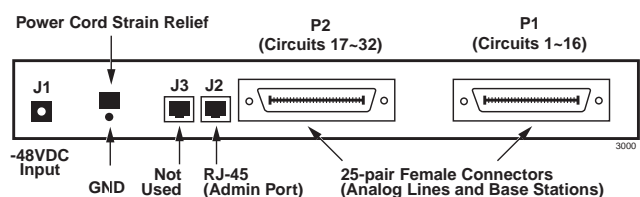
Figure 16-22   BSIA RJ-45 Jack (back side)

Step 7: Install the Strata AirLink Manager Software

1. Check the PC hardware/ software against the required minimums.	Refer to "Check the System Hardware and Software Requirements" on Page 16-3.
2. Close any open applications in Windows.	
3. Insert the Strata AirLink Manager software floppy disk into the A:\ drive.	
4. In Windows 98/95, click Start and Run	
...or in Windows 3.11/3.1, open Program Manager and click File and Run.	A dialog box displays requesting the location of the setup disk.
5. Click File and Run.	A dialog box displays requesting the location of the setup disk.
6. Type **A:\Setup** and click OK.	The Windows setup screen appears and warns you to close other Windows applications.
7. Click Yes	A dialog box displays, recommending a destination path of C:\Wireless.
...or No if you need to close applications.	
8. Click OK	C:\Wireless is accepted as the destination directory.
...or change the destination drive and directory.	
9. Click OK.	A dialog box displays asking for verification of the software location (its program directory or the Windows system directory). It is recommended that the program directory is used.
10. Select the program directory.	
11. Click OK.	The files are copied to the hard disk. A program group is created.

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Step 8: Copy the Upgrade Software

1. Place the Strata AirLink floppy disk #2 into drive A:\.

2. In Windows 98/95, double-click the My Computer icon

   ...or in Windows 3.11/3.1, open Program Manager.

3. Navigate to the A:\ drive.
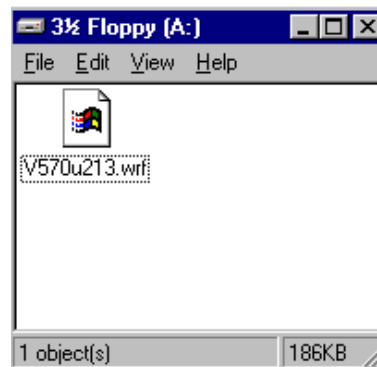
3332

4. From the A:\ drive, highlight the file to be copied.

5. From the Edit pull-down menu, double-click Copy.
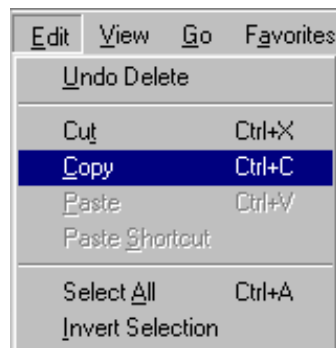
3505

All of the highlighted files are copied to the clipboard.

6. Navigate to the C:\Wireless\Software subdirectory.

7. From the Edit pull-down menu, double-click Paste.

   All of the files on the clipboard are pasted to the subdirectory.

8. Close all the windows and return to the Strata Airlink Manager application.

Step 9: Configure the System

	1. Make sure the PC is connected to a BSIA.	
	2. Turn on the PC.	Windows automatically starts.
	3. Double-click the Strata AirLink Manager Desktop icon.	This displays only once when the system is initialized.

3327

	4. Type the name, organization (company name) and the password.	**Important!** *If the password is forgotten, the software must be reloaded. The password can be changed after initialization of the system.*
	5. Click Continue.	The Password Verification dialog box appears.
	6. Enter the same password and click OK.	The Setup dialog box displays again.
	7. Click Continue.	The software starts and requests your password.
		Important! *If a warning message that the manager cannot open port 1 or 2 is received, check the software port configuration against the hardware configuration.*
	8. Enter the password and click OK.	

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Substep A: Activate UTAM

	1. From the Desktop Toolbar, click the Status icon.	

3484
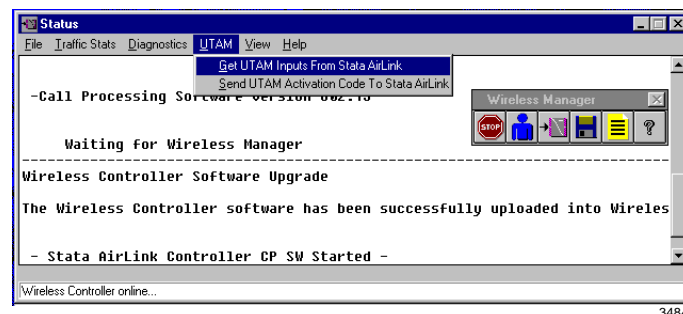
2. Click Get UTAM Inputs from Strata Airlink.

3. Make a note of the BSIA serial number and input codes before calling the Strata AirLink Activation Desk because the staff will request these numbers.

UTAM Activation Code Generation Inputs

Controller S/N : 0k0en2

Input Code 1 : 5011 1416 2320

Input Code 2 : 6116 3510 0524

OK

3485

4. Call the Strata AirLink Activation Desk, (949) 598-4980 for the activation code.

Note The hours of operation are: Monday through Friday, 8:00 a.m. to 5:00 p.m., Pacific Standard Time.

After the BSIA serial number and input codes are given to the activation desk, the technician will give you the UTAM system activation code.

5. Close the Get UTAM Inputs From Strata AirLink window.

The Status window displays.

6. From the Status window, highlight UTAM.

Status

File Traffic Stats Diagnostics UTAM View Help

```
                Get UTAM Inputs From Stata AirLink
        Waiting for Wir   Send UTAM Activation Code To Stata AirLink
-----------------------
Wireless Controller Software Upgrade

The Wireless Controller software has been successfully uploaded into wireles

 - Stata AirLink Controller CP SW Started -
 09:33:11 07/07/98

Software type: Wireless Controller Boot software
Version Number: B19.00
```

Wireless Manager

STOP
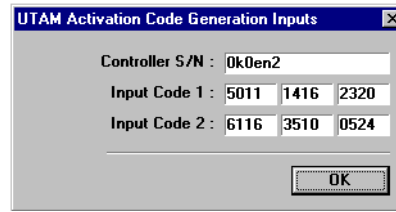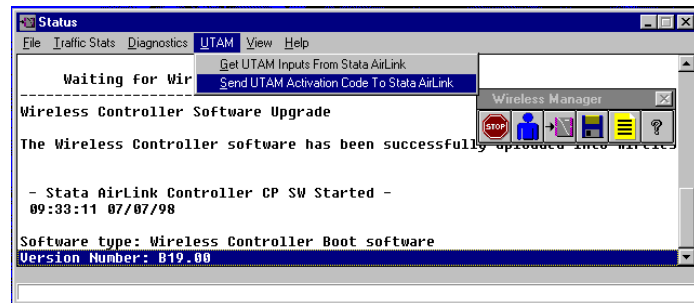
3486

7. Select Send UTAM Activation Code to Strata AirLink.

8. From the UTAM Activation Code dialog box, enter the UTAM Activation Code.

UTAM Activation Code

New Activation Code 50027 7460 7011

OK   Cancel

3487

9. Click OK.
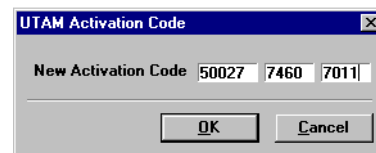
The message "Wireless system has been activated" displays at the bottom of the Status window.

Important! *Install the UTAM code in one hour or a new one must be obtained.*

Normal LED indications display on the BSIA (PWR and Master LEDs ON) and Base Stations (PWR LED ON). Several messages display (below) on the PC screen as Strata AirLink Manager tests the installation.
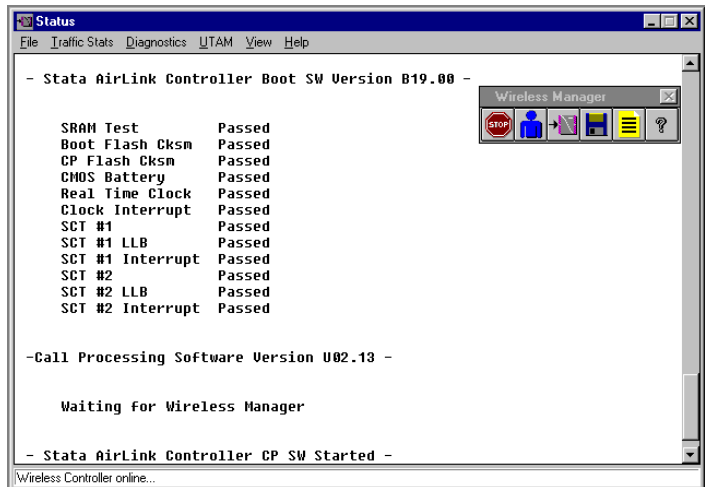
3491

Important! *If the message "Waiting for Wireless Manager" does not appear in the Status window before the progress bar times out, or LED S2 remains lit after a reboot, the BSIA has not been upgraded. Repeat Substeps 1~9.*

Substep B: Set the System Time and Date

1. Click the Configuration icon.
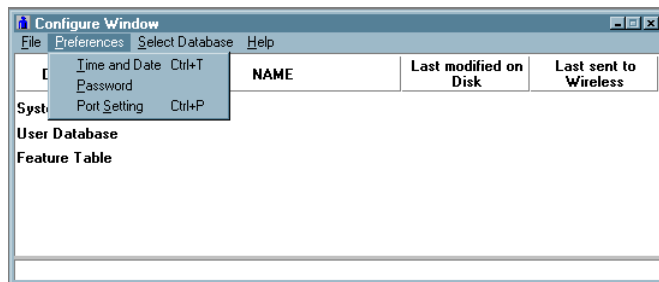
3282

2. Highlight Preferences.

3. Click Time and Date.

3274

Strata AirLink Systems
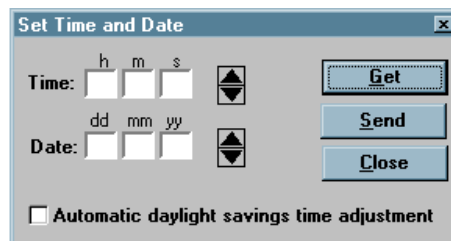
4. Enter the time and date.

5. Click "Automatic daylight savings time adjustment," if needed.

6. Send the new data to the configuration file.

7. Click Close.

Substep C: Enter the System Settings

1. Complete the System Settings form.

See Table 16-5 on Page 16-28.

2. Open the Strata AirLink Manager program.

3. Click the Configuration icon.

4. Highlight Select Database.
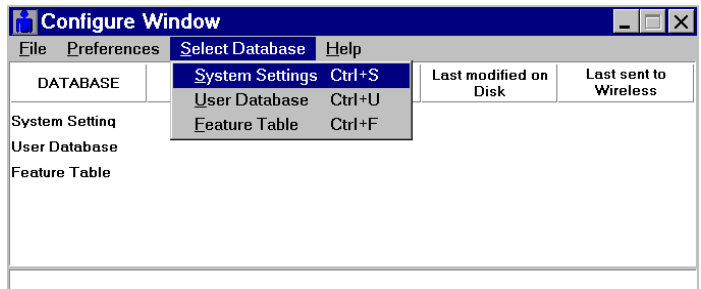
5. Click System Settings ...or double-click "System Settings" in the active window.
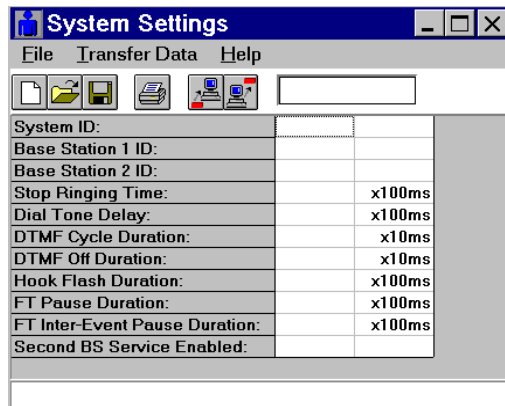
6. Click the Get icon.

The current data from the BSIA displays.

7. Verify previous settings.

8. Enter the System and Base Station IDs, and timing intervals.

The recommended timing intervals are:

♦ Stop ringing time – 4500 ms

♦ Dial tone delay – 200 ms

♦ DTMF cycle duration – 200 ms

♦ DTMF off duration – 100 ms

♦ Hookflash duration – 500 ms

♦ FT pause duration – 1000 ms

♦ FT inter-event pause – 100 ms

9. Click the Send icon.

The new data is sent to the BSIA.

10. Save the file (file extension is .sdb).

Substep D: Configure the Handsets

1. Complete the User Settings form.

See Table 16-6 on Page 16-29.

2. Ensure that each handset ID corresponds to the correct connector pair.

3. Open the Strata AirLink Manager program.

4. Click the Configuration icon.

5. From the Configure Window, click Select Database and User Database.
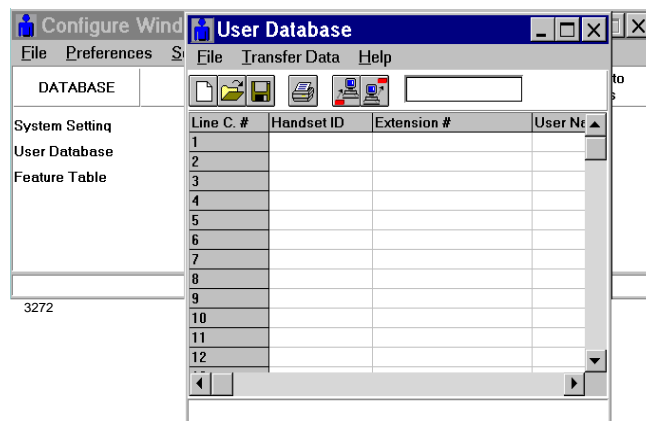
	6. Click the Get icon.	The current data from the BSIA displays.
	7. Verify the previous BSIA settings.	
	8. Enter the handset ID.	
	9. Save the file (file extension is .udb).	
	10. Click the Send icon.	The new data is sent to the BSIA.

Substep E: Program the Button Sequences

	1. Complete the Programming Button Sequences form.	Consider the order in which commands and text displays should occur during the execution of a telephone feature. See Table 16-7 on Page 16-30.
	2. Enter events 1~20 using the command codes or text displays.	
	3. Open the Strata AirLink Manager program.	
	4. Click the Configuration icon.	
	5. From the Configure Window, click Select Database and Feature Table.	

6. Click Select Event and Commands.

3264

7. Click a command (**Hookflash**, **1~0**, *****, **#**, etc.).

The command appears in the designated column (labeled Event 1~20). The Select Event pull-down menu displays.

8. Highlight Display.

3265
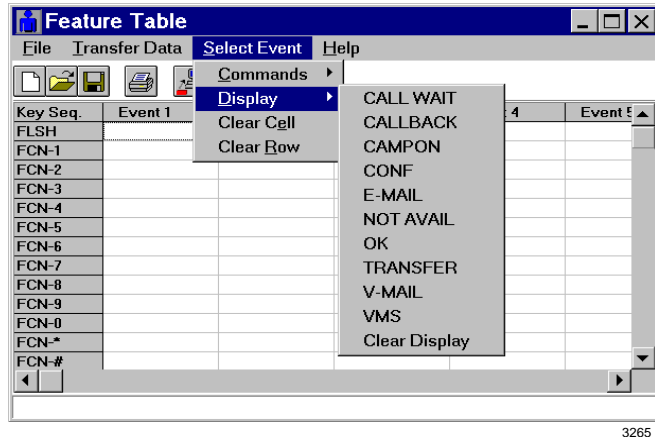
9. Click an LCD message (**CALL WAIT**, **CALLBACK**, **CAMPON**, etc.).

The message appears in the designated column (labeled Event 1~20). A completed Feature Table looks like this:

3258

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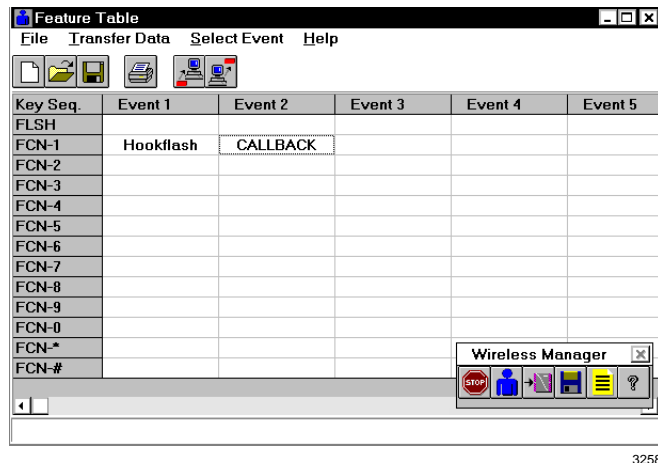
10. Repeat Substeps 1~5 as necessary.

11. Save the file (file extension is .fdb).

12. Click the Send icon. The new data is sent to the BSIA.

Programming Sheets

Table 16-5   System Settings

Parameter	Description	Units/ Range	Suggested Setting	Your Setting
System ID	ID for the system (written on the RWIU label).	1~5		
Base Station 1 ID	ID of the first Base Station.	0~31		
Base Station 2 ID	ID of the second Base Station.	0~31		
Stop Ringing Time	Length of time the RWIU waits after last detection of ring voltage on a line before it stops the ring.	100 ms[1]	45	
Dial Tone Delay[2]	Time delay between pressing **CALL** and outpulsing DTMF tones.	100 ms[1]	2	
DTMF Cycle Duration	Duration of the full DTMF cycle (length of tone plus length of silence between tones) for dialing and other telephone system operations.	10 ms[3]	20	
DTMF Off Duration	Duration of silence between DTMF tones.	10 ms[3]	10	
Hookflash Duration	Duration of the hookflash in signaling the office telephone system.	100 ms[1]	5	
FT Pause Duration	Duration of pause events in the Feature Table.	100 ms[1]	10	
FT Inter-event Pause	Duration of pause between events in the Feature Table.	100 ms[1]	1	
Second Base Station Service Enabled	Enables service for a second Base Station. TRUE if a second Base Station is installed. FALSE if only one Base Station is installed or out of order.	NA		

1. For example, a setting of 2 means 2 x 100 ms or 200 ms.

2. The Dial Tone Delay eliminates the possibility of a user dialing before the office telephone system is ready.

3. For example, a setting of 2 means 2 x 10 ms or 20 ms.

Table 16-6   User Settings

Line	Amphenol Connector/ Pair	Handset ID (1 - 1535)	Extension # (1 - 10 digits)	User Name/Comment (1 - 12 characters)
1	P1, Pair 1			
2	P1, Pair 2			
3	P1, Pair 3			
4	P1, Pair 4			
5	P1, Pair 5			
6	P1, Pair 6			
7	P1, Pair 7			
8	P1, Pair 8			
9	P1, Pair 9			
10	P1, Pair 10			
11	P1, Pair 11			
12	P1, Pair 12			
13	P1, Pair 13			
14	P1, Pair 14			
15	P1, Pair 15			
16	P1, Pair 16			
17	P2, Pair 1			
18	P2, Pair 2			
19	P2, Pair 3			
20	P2, Pair 4			
21	P2, Pair 5			
22	P2, Pair 6			
23	P2, Pair 7			
24	P2, Pair 8			
25	P2, Pair 9			
26	P2, Pair 10			
27	P2, Pair 11			
28	P2, Pair 12			
29	P2, Pair 13			
30	P2, Pair 14			
31	P2, Pair 15			
32	P2, Pair 16			

Strata AirLink Systems

Button Sequence	Events 1 - 20 (Use the Commands or Text Displays Listed Below)																			
FLSH																				
FCN 1																				
FCN 2																				
FCN 3																				
FCN 4																				
FCN 5																				
FCN 6																				
FCN 7																				
FCN 8																				
FCN 9																				
FCN 0																				
FCN *																				
FCN #																				

Commands				Text Displays	
Digit 1	Digit 7	Pause	Echo (digits entered)	CALL WAIT	OK
Digits 2	Digit 8	User Extension	Key Pad	CALL BACK	TRANSFER
Digit 3	Digit 9	Hookflash		CAMP ON	V-MAIL
Digit 4	Digit 10	Oh-hook		CONF	VMS
Digit 5	Digit *	Off-hook		E-MAIL	Clear Display
Digit 6	Digit #	Terminate Call[1]		NOT AVAIL	

1. The Terminate Call command can only be used as the last event in a sequence.

Substep F: Store the IDs in the Handset

1.	Press **PWR**.	The handset turns on.
2.	Press **FCN**.	

```
M E N U
O P E R A T I O N

                1 2 : 1 5
[....]              IIIII/
```

3.	Press ▼ until **SYSTEM CONFIG.** displays

```
S Y S T E M
C O N F I G .

                1 2 : 1 5
[....]              IIIII/
```

	...or **10** + **FCN**.
4.	Press **FCN**.

```
S I D # 0


                1 2 : 1 5
[....]              IIIII/
```

5.	Enter the proper System ID (SID).	**Note** The SID must match the data entered in the system settings.
6.	Press **CLR** to make corrections.	
7.	Press ▼.	

```
H I D # 0


                1 2 : 1 5
[....]              IIIII/
```

8.	Enter the handset ID (four digits) for the system ID entered in Substep 5.

```
H I D # 1


                1 2 : 1 5
[....]              IIIII/
```

9.	Press ▼ for other systems.	
10.	Repeat Substeps 1~11 to enter all the system and handset IDs required.	A maximum of eight system IDs and associated handset IDs can be stored in handset memory.
11.	Press **END**.	The ESN displays momentarily.
12.	Press **CALL**.	The handset ESN is stored in the BSIA.

Strata AirLink Systems
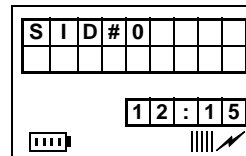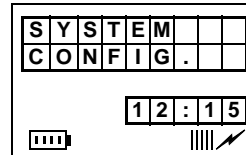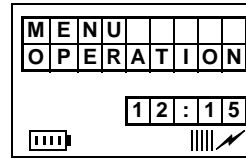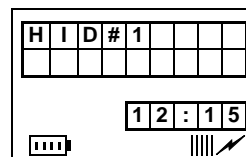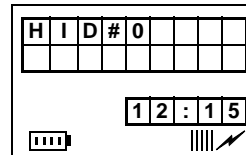
BSIA Additional Information

The following tables have additional information unique to the BSIA system and cover:

♦ BSIA (controller) specifications – Table 16-8

♦ Adapter and BSIA pinouts – Tables 16-9 and 16-10

♦ ALM removal

♦ Initial configuration change

♦ Password change

♦ Base Station additions

♦ Communication port change

BSIA (Controller) Specifications

Table 16-8   BSIA Specifications

Name	Description
Dimensions	16.84 x 9.29 x 1.75 inches
Weight	4.6 lbs. without ALM
Mount	Wall or industry-standard rack mount
Input Power	-48VDC or 110/220VAC with optional power supply
Temperatures	Operating: 10°~40°C Storage: -20°~53°C Operating Humidity: 20 to 80% non-condensing Storage Humidity: 5 to 95% non-condensing
Altitude	Operating: 4,920 ft. **Note** Systems operating above 4,920 ft. in low humidity areas could require additional cooling. Storage: 940 to 9,400 ft.

Adapter and BSIA Pinouts

Tables 16-9 and 16-10 list the adapter and BSIA pinouts.

Table 16-9   DB9 and DB25 Adapter Pinouts

8-Pin Jack	DB9-F	DB25-F	8-Pin Jack	DB9-F	DB25-F
1/BLU	Not Used	Not Used	5/GRN	3	2
2/ORG	7	4	6/YEL	5	7
3/BLK	8	5	7/BRN	Not Used	Not Used
4/RED	2	3	8/WHT	Not Used	Not Used

Table 16-10   BSIA Pinouts

Pair	P1	P2
1	Tip, ring — station 1	Tip, ring — station 17
2	Tip, ring — station 2	Tip, ring — station 18
3	Tip, ring — station 3	Tip, ring — station 19
4	Tip, ring — station 4	Tip, ring — station 20
5	Tip, ring — station 5	Tip, ring — station 21
6	Tip, ring — station 6	Tip, ring — station 22
7	Tip, ring — station 7	Tip, ring — station 23
8	Tip, ring — station 8	Tip, ring — station 24
9	Tip, ring — station 9	Tip, ring — station 25
10	Tip, ring — station 10	Tip, ring — station 26
11	Tip, ring — station 11	Tip, ring — station 27
12	Tip, ring — station 12	Tip, ring — station 28
13	Tip, ring — station 13	Tip, ring — station 29
14	Tip, ring — station 14	Tip, ring — station 30
15	Tip, ring — station 15	Tip, ring — station 31
16	Tip, ring — station 16	Tip, ring — station 32
20	Receive from Base Station 1	
21	Transmit to Base Station 1	
22	Tip, ring — external alarm connection	
23	Tip, ring — external alarm connection	
24	Receive from Base Station 2	
25	Transmit to Base Station 2	

ALM Removal

1. Power off the BSIA.

2. Remove the screws securing the cover of the BSIA case.

3. Lift the cover off of the BSIA.

4. Unplug connectors J4, J5, or J6.

CAUTION!   **Do not apply diagonal pressure to the DIN connectors (see Figure 16-16 on Page 16-15).**

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5. Disconnect the ALM from the standoffs on the BSIA PCB.

6. Gently lift the ALM out of the BSIA.

7. Replace the BSIA cover and re-install the screws.

Initial Configuration Change

It is highly recommended that you get the current configuration and save it to a file on the PC as the working copy. Then, open and edit the working copy – not the original file. Using this method ensures that the original configuration file is not corrupted while adding or editing existing data. Once the new information is saved, the BSIA uses the new data immediately.

Important! *Sending configuration information to the BSIA overwrites existing information. Make sure that the sent data contains all of the required configuration information, not just the few additions or changes that were made.*

Password Change

1. From the Desktop Toolbar, click the Configuration icon.

2. Open the Configure Window.

3. Select Preferences from the menu bar and Password.

4. Enter the old and new password and click OK.
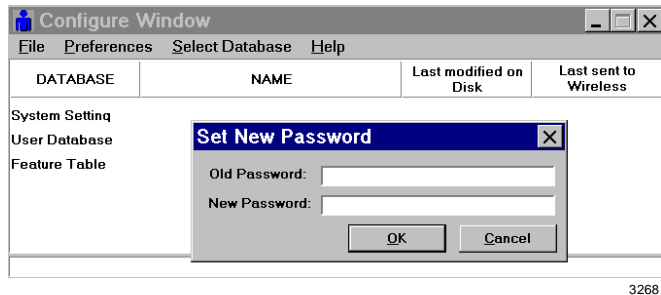
Base Station Addition

1. From the Desktop Toolbar, click the Configuration icon.

2. Open the Configure Window.

3. Click Select Database and System Settings.

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4. Click the Get icon.
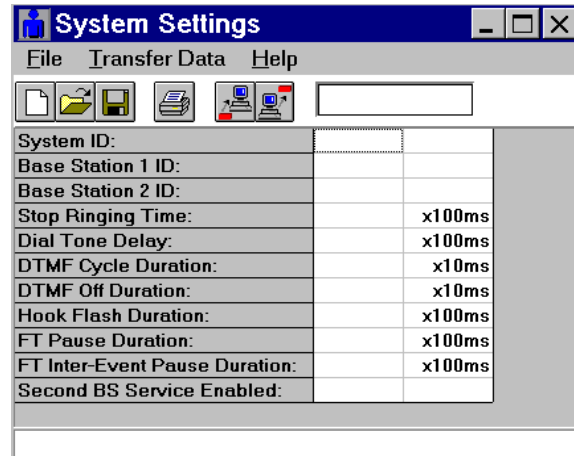
The current data from the BSIA displays.

5. Enter TRUE in Second Base Station Service Enabled.

Important! *Do not perform this step without getting the current system settings first, or all data is overwritten.*

6. Save the file and close the Configure Window.

The Desktop Toolbar displays.

7. Double-click the Upgrade icon.

The Base Station is upgraded.

Communications Port Change

1. From the Desktop Toolbar, click the Configuration icon.

2. Click Preferences and Port Setting.
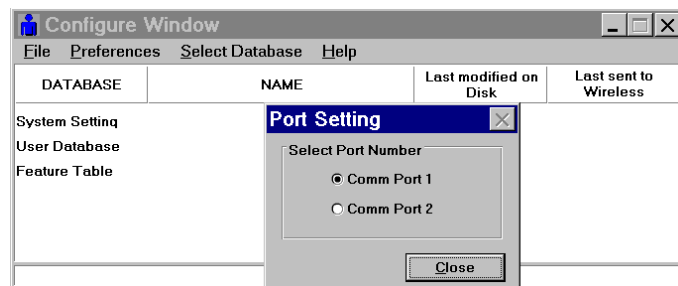
3281

3. Click the new port and Close.

Important! *Click close immediately (before 10 seconds have elapsed) or the change does not take effect.*

Strata AirLink Systems

RWIU System Installation

This section describes the specific installation steps for the RWIU PCB.

Step 1: Check the DIP Switches and Jumpers on the PCB

CAUTION!	The RWIU and WWIS come from the factory already assembled. Remove the WWIS carefully to check the DIP switches on the RWIU, keeping the pins on it straight. After checking the DIP switches, but before aligning the two PCBs, be sure that the connectors are not bent. This causes irreparable damage to both PCBs.

The RWIU has three DIP switches. The location of each is shown in Figure 16-23. The factory default positions are given in the following steps.
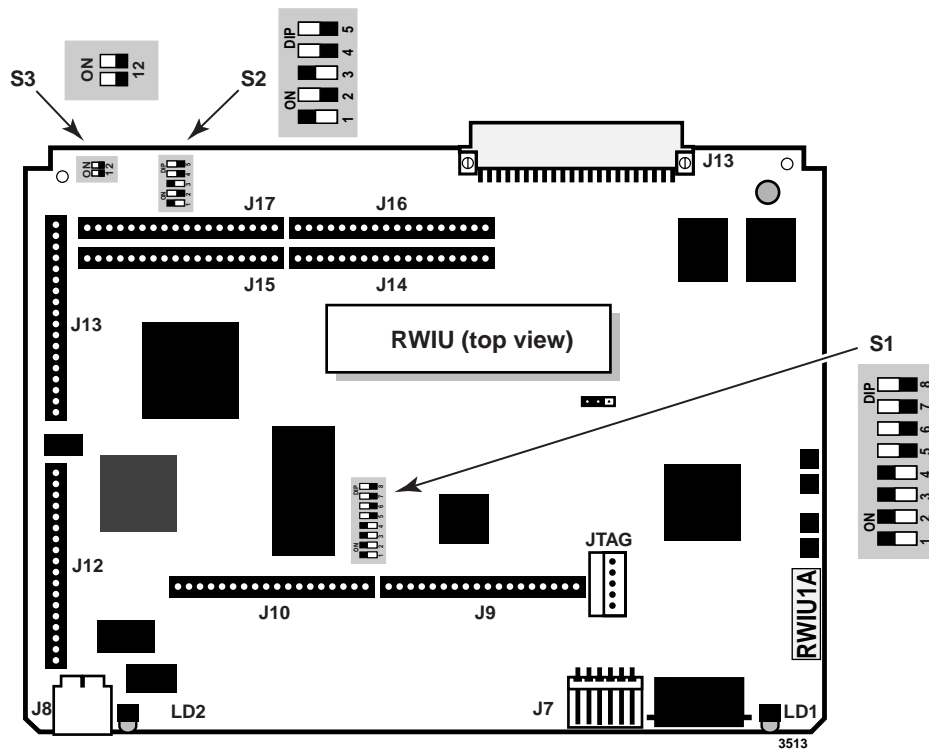
Figure 16-23   Location of RWIU DIP Switches S1~S3

1. Check DIP Switch S1. Table 16-11 gives the factory settings - defaults are in bold.

Table 16-11   S1 Factory Default Positions

Position	1	2	3	4	5	6	7	8
	S1 DIP Switch Number							
On	Base Station 1 Inactive	Base Station 2 Inactive	Base Station 3 Inactive	Base Station 3 Inactive	**Spare**	**Spare**	**Spare**	**Disable Download**
Off	**Base Station 1 Active**	**Base Station 2 Active**	**Base Station 3 Active**	**Base Station 4 Active**	Spare	Spare	Spare	Force Download

Important!

- *Switch 8 is used to recover the RWIU in the event of a software load failure. Turn Switch 8 to its off position to force a download of the stored factory default software.*

- *If any Base Station is not used, put its corresponding S1 switch in the on (inactive) position. If the switch is in the off position, the WWIS subassembly LED 1 and 2 remain lit and the RWIU tries to initialize that Base Station every 40 seconds.*

2. Check DIP Switch S2. Table 16-12 gives factory settings - defaults are in bold:

Table 16-12   S2 Factory Default Positions (RF Signals)

Position	1	2	3	4	5
	S2 DIP Switch Number				
On	Slave[1]	**DECT[2] Disabled**	PCS[3] Disabled	**Four Ports**	**Spare**
Off	**Master**	DECT Enabled	**PCS Enabled**	Two Ports	Spare

1. RWIU must be in the master setting to operate.

2. DECT = Digital European Cordless Telecommunications

3. PCS = Personal Communication Service

3. Check DIP Switch S3 settings to ensure that the correct number of handsets are enabled (see Table 16-13).

Table 16-13   S3 Factory Default Positions (Number of Handsets)

1	2	Number of Handsets
S3 DIP Switch Number		
On	On	8
Off	**On**	**16**
On	Off	24
Off	Off	32

4. Verify that the Watch Dog Timer (WDT) is jumpered correctly as shown in Figure 16-24.

Step 2: Mount the WWIS onto the RWIU

CAUTION! **Before aligning the two PCBs, be sure that the connectors are not bent. This causes irreparable damage to both PCBs.**

1. Carefully align the connectors of the WWIS (P9~P10 and P12~P17) to the terminals on the RWIU (J9~J10 and J12~J17) (shown in Figure 16-24).
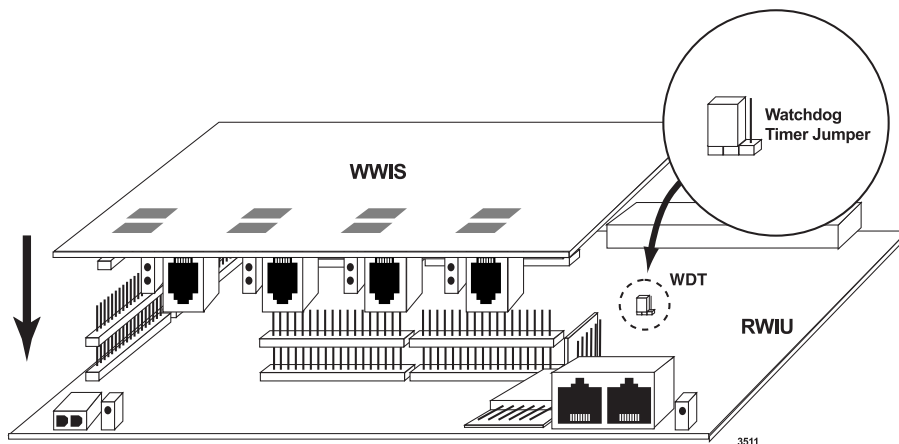
Figure 16-24   Alignment of the WWIS onto the RWIU

2. Gently press the WWIS onto the RWIU. Ensure that the connections are solid by gently pulling the WWIS away from the RWIU. If the connectors are properly seated, a slight resistance is felt.

Step 3: Determine the Proper Strata DK Slot Configuration

➤ Use Table 16-14 to determine the physical slot configuration for the RWIU in Strata DK424 or DK280. The bold numbers indicate the first physical RWIU position for nine or more handsets. You can only have one RWIU per Base Cabinet and two per Expansion Cabinets.

Note   For 8 handsets, install the RWIU in any slot except 11 and 12.

Table 16-14   Strata DK424 and DK280 Base and Expansion Cabinet Slot Assignments

Cabinet		Physical Slots	Vacant Slots		
Number	Type				
1	DK424 Base	13~16	**13**/14[1]	**15**/16[1]	
2	DK424	21~28	**21**/22[1]	**23**/24[1]	**25**/26[1]/27[2]/28
2	DK280	21~26	**21**/22[1]	**23**/24[1]	**25**/26[1]
3	DK424	31~38	**31**/32[1]	**33**/34[1]/35[2]/36[3]	**37**/38[1]
3	DK280	31~36	**31**/32[1]	**33**/34[1]/35[2]/36	
4	DK424	41~48	**41**/42[1]	**43**/44[1]/45[2]/46	**47**/48[1]
4	DK280	41~46	**41**/42[1]	**43**/44[1]/45[2]/46	
5	DK424	51~58	**51**/52[1]	**53**/54[1]/55[2]/56	**57**/58[1]
5	DK280	51~56	**51**/52[1]	**53**/54[1]/55[2]/56	
6	DK424	61~68	**61**/62[1]	**63**/64[1]/65[2]/66	**67**/68[1]
6	DK280	61~66	**61**/62[1]	**63**/64[1]/65[2]/66	
7	DK424	71~78	**71**/72[1]	**73**/74[1]/75[2]/76	**77**/78[1]
7	DK280	Cannot be seventh cabinet			

1. Slot must be vacant for RWIU handsets 9~16 (2 slot RWIU positions).

2. Slot must be vacant for RWIU handsets 17~24 (3 slot RWIU positions).

3. Slot must be vacant for RWIU handsets 25~32 (4 slot RWIU positions).

Important!   *For Strata DK40i, if there are 8 handsets, the RWIU can be installed in any of the expansion cabinet slots (15, 16, and 18). If there are 16 handsets, the RWIU must be installed in slot 15 and Slot 16 must be vacant. This system cannot support 24 or 32 handsets because of a port limitation.*

Step 4: Install the RWIU/WWIS into the Strata DK

1. Insert the RWIU (WWIS and components facing right) into the appropriate slot of the Strata DK and apply firm, even pressure to ensure proper mating of connectors.

CAUTION!   **Strata DK power must be off before inserting the RWIU.**

2. After installing the RWIU, gently pull the PCB outward. If the connectors are properly seated, a slight resistance is felt.

Step 5: Run the Cable

1. Do not exceed these cabling distances between the Base Stations and WWIS for Category 5, 24 AWG:

   ♦   2,000 feet for line power

   ♦   3,300 feet for local power

2. Use Category 5 cable. Using a mix of Categories 2, 3, 4, and 5 is acceptable but can effect the total possible cable length.

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3. Connect one end of each cable into the RJ-45 jacks on the RWIU/WWIS (Point B in Figure 16-26) and the other end (reversed) into the EMI box (Point A in Figure 16-26). The RJ-45 transmit and receive pins are shown in Figure 16-25.

4. Connect each end of the other set of cables into the RJ-45 jacks of the EMI box (Point C - To Base Stations in Figure 16-26) and run the opposite end out to the Base Stations.
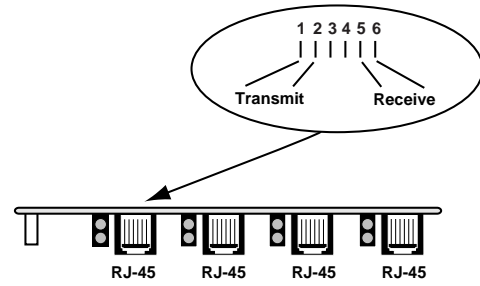
Figure 16-25   RJ-45 Pin Configuration
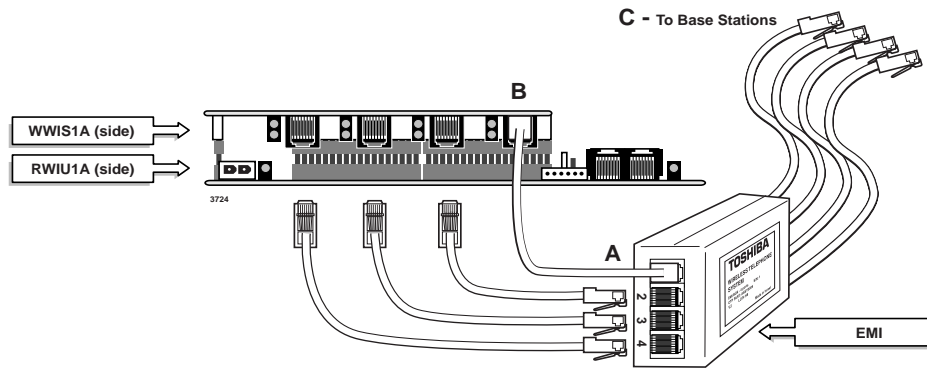
Figure 16-26   EMI Connections to the RWIU/WWIS

CAUTION!

♦ **Do not use bridge taps between the RWIU and Base Stations because of potential transmission problems.**

♦ **Do not use current-limiting (fuse style) primary protectors on the transmit and receive pairs between the RWIU and Base Stations.**

♦ **Do not connect the RWIU to power at this point.**

Step 6: Determine Base Station Power Supply

A Base Station can receive input (line) power from the RWIU or an optional local power supply. Using a local power supply increases the distance Base Stations can be located from the RWIU.

Customers with 220VAC outlets can:

♦ Purchase another power cord to fit the universal connector (three-pronged IEC 320 power inlet) on the power supply

♦ Replace the 110VAC plug on the cable with an appropriate 220VAC plug

♦ Connect a North American 220VAC adapter to the 110VAC plug

Step 7: Connect the Power Supply

The maximum available PBX power for each RWIU PCB is one amp (+5VDC).

1. Use the external power supply (see Figure 16-27) to increase the amps for each Base Station.

   The power supply has a -40VDC power connector for direct connection to the RWIU.

2. Connect to 110VAC power, but do not power on.

Step 8: Use the Proper Power Factor (PF)

➤ Check the +5VDC PF using Table 16-15 as a reference. Calculation examples are shown in Tables 16-16 and 16-17.

Note The maximum voltages for the RPSU280A Power Supply are 25.0 (+5VDC) and 65.0 (-24VDC).
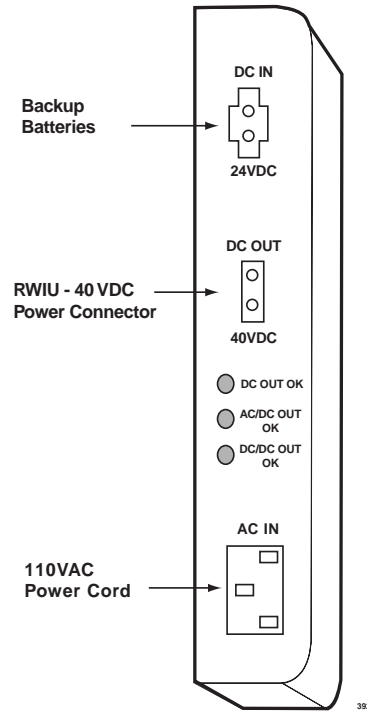
Figure 16-27   RWIU Power Supply

Table 16-15   Strata DK40i and DK424 PCB and Power Supply PFs

PCB Type	+5VDC PF	-24VDC PF	Notes
IMDU	0.1	0.16	
PCOU1, 2	1.9	2.0	
PDKU1, 2	0.8	0.3	With 8 DKTs.
PEKU	1.6	0.7	With 8 EKTs.
PEPU	1.1	6.5	
PESU	1.5	0.5	With 4 EKTs and 2 SLTs.
PIOU	2.0	6.5	
PIOU2	1.1	6.5	
PIOUS	0.75	4.0	
RSTU/RSTU2 (-24VDC)	1.4	0.5	With 8 SLTs.
R40S	0.0	2.8	Does not use +5VDC.
RATU	1.7	0.3	
RBSS	0.6	0.3	
RBSS2	0.0	0.3	Does not use +5VDC.
RBSU + RBSS	3.2	0.3	
RBSU	2.5	1.0	

Table 16-15   Strata DK40i and DK424 PCB and Power Supply PFs *(continued)*

PCB Type	+5VDC PF	-24VDC PF	Notes
RBSU2	0.0	1.0	Does not use +5VDC.
RBUS	0.0	0.3	Does not use +5VDC.
RBUU	0.0	1.0	Does not use +5VDC.
RCIS	0.3	0.1	
RCIU, RCIU2	0.7	0.2	
RCMS	0.6	0.3	
RCOS, RCOS2	1.7	2.0	
RCOU (4 CO)	2.5	2.0	
RCOU + RCOS (8 CO)	3.6	4.0	
RCOU, RCOU2	1.9	2.0	
RCTUA	2.0	1.0	
RCTUB	4.0	1.0	
RCTUBA/BB	4.0	1.9	
RCTUC/D	4.5	1.9	
RCTUE/F	10.0	1.9	
RDDU	2.6	7.0	
RDSU/RDSS (-24VDC)	1.1	0.3	With 4 DKTs and 4 SLTs.
RDSU + R48S (-48VDC)	1.1	0.5	
RDTU	1.8	1.0	
REMU2/PEMU	1.0	7.5	
RGLU, RGLU2	2.1	2.5	
RMCU	0.7	0.3	
RMDS	0.35	0.16	2400 bps MODEM.
RPTU	2.6	1.0	
RRCS-12	1.5	1.0	
RRCS-4	0.4	0.3	
RRCS-8	1.0	0.5	
RSIS	0.35	0.15	
RSIU	1.0	0.3	
RSSU	0.7	0.3	
RSTU + R48S (-48VDC)	1.4	1.0	With 8 SLTs.
RSTU2	4.0	2.3	With 8 MWs.
RWIU	9.2	0.0	With 8, 16, 24, or 32 handsets.

Table 16-16   Example of Strata DK424 Base Cabinet Configuration with RCTUA4A

PCB	Quantity	+5VDC PF	-24VDC PF
RCTUA4A	1	2.0	1.0
RRCS-4	1	0.4	0.3
PDKU2	2	1.6	0.3
RCOU + RCOS	1	3.6	4.0 (8 COs)
RBSU + RBSS	1	3.2	0.3
RWIU	1	9.0	0.0
Total	**7**	**19.8**	**5.9**

Table 16-17   Example of Strata DK40i Expansion Cabinet Configuration

PCB	Quantity	+5VDC PF	-24VDC PF
RCOU + RSOU	1	3.6	4.0 (8 COs)
RBSU + RBSS	1	3.2	0.3
RWIU	2	18.0	0.0
Total	**4**	**24.8**	**4.3**

Step 9: Program the Strata DK

> **Important!**   *Do not use a DKT that has an intercom button for Speed Dial programming.*

1. Determine how many handsets, PDKU ports, and available slots are required before programming the Strata DK. Up to 32 handsets per RWIU are allowed.

2. Use the following programs:

    ♦ Program 03 for Code 61 (slot assignments).

    ♦ Program 32 for Auto Preference.

    ♦ Program 39 for flexible button assignments.

    ♦ Programs 81~89 for line ringing on the handsets.

    ♦ Program 91-9 for automatic PCB recognition.

    ♦ Programs *71~73 for DID ringing on specific handsets.

    Refer to *Strata DK Programming Manual* for specific information and Table 16-18 for available Strata DK station features.

Table 16-18   Available Station Features

Feature Name	
Account Code	Continuous DTMF Tones
Automatic Call Distribution (ACD)	DISA Security Code Revision
Automatic Busy Redial (ABR)	Do Not Disturb (DND)
Automatic Call Back (ACB)	DND Override (receive)
Automatic Hold	Exclusive Hold
Automatic Line Selection	Door Phone

Table 16-18 **Available Station Features** *(continued)*

Feature Name	
Busy Override/Busy Station Transfer/Busy Station Ringing	Headset Interface
Call Forward:	Headset Receiver Volume Control
• All Calls	Hearing Aid Compatible
• Busy	Liquid Crystal Display (LCD)
• No Answer	Message Waiting Indication
• Busy/No Answer	Multiple Message Waiting
• Fixed	Microphone Control (fixed) - Mute Only
• External	Microphone Sensitivity Control
Call Park Orbits:	Loud Ringing Bell (headset)
• Park/Page	Night Lock
Call Pickup:	Night Transfer
• Night Bell	Off-hook Call Announce (OCA) - Handset Mode
• Tenant Ringing Lines (four groups)	Page Access
• Station Groups (20 groups, all call types)	Phantom Message Waiting Indication
• Any Ringing LIne	Pooled Line
• Directed Station (all call types)	Private CO Lines
• Held CO Lines (selectively)	Push-button Dialing
• Parked Call	Release and Release/Answer
• External Page	Remote Retrieval of Held/Parked Calls
Centrex/PBX Compatible	Ringing Line Preference
CO/Centrex	Saved Number Redial
Conferencing	Timed Reminders
Dial Pulse DTMF Mode Change	Toll Restriction Override Code Revision
Direct Station Selection (DSS)	User Programmable Feature Buttons
DSS Console Features	

Step 10: Connect the PC

➤ Run the RS-232-C cable to the back of the PC (COM port 1) and insert the 6-pin connector into the RWIU jack (see).
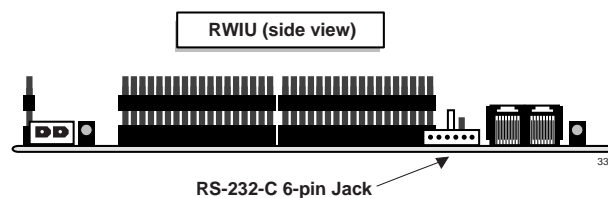
Figure 16-28   RWIU 6-pin Jack

Step 11: Initialize the RWIU

1. Open the RWIU Manager software.

2. Turn on the Strata DK. The RWIU checks Base Station status and connections.

3. Check the LEDs on the Base Stations. If all the LEDs are OFF, the initialization is complete.

4. Check the handsets for dial tone. If there is dial tone, the initialization is complete.

Step 12: Install the RWIU Manager

1. Check the PC hardware/ software against the required minimums.	Refer to "Check the System Hardware and Software Requirements" on Page 16-3.
2. Close any open applications in Windows.	
3. Insert the RWIU Manager floppy disk into the A:\ drive.	
4. In Windows 98/95, click Start and Run	
...or in Windows 3.11/3.1, open Program Manager and click File and Run.	A dialog box displays requesting the location of the setup disk.
5. Type **A:\Setup** and click OK.	The Windows setup screen warns Windows applications should be closed.
6. Click Yes	A dialog box displays recommending a destination path of C:\Wireless.
...or No if applications need to be closed.	
7. Click OK	C:\Wireless is accepted as the destination directory.
...or change the destination drive/directory.	
8. Click OK.	A dialog box displays requesting verification of the software location (its program directory or the Windows system directory). Using the program directory is recommended.
9. Select the program directory.	
10. Click OK.	The files are copied to the hard disk. A program group is created.

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Step 13: Start the RWIU Manager

1. Make sure that the PC is connected to the RWIU.

2. From the RWIU program group, double-click on the Manager icon.

After a few seconds, the Desktop Toolbar displays.
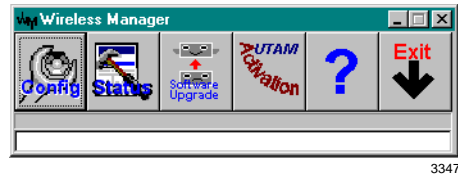
3347

Step 14: Set General Settings

1. From the Desktop Toolbar, click the Config icon.
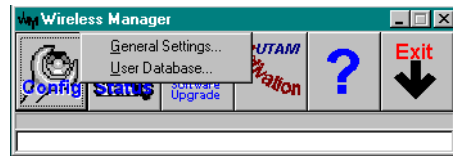
3348

2. Click General Settings and assign COM port 1.
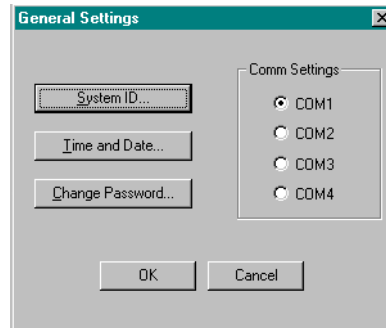
3349

3. Click OK.

4. Click System ID.
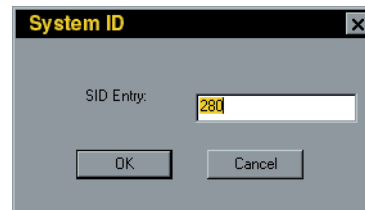
3351

5. Enter the System ID.

6. Click OK.

General Settings window displays.

7. Click Time and Date.
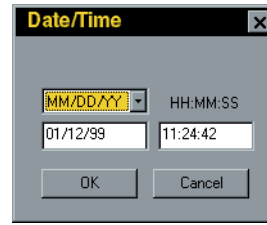
3354

8. Enter the Date and time.

9. Click OK.

Step 15: Enter the Handset IDs

1. From the Desktop Toolbar, click the Config icon.

2. Click User Database.

3. Download the settings from the RWIU.

Default IDs display.

Handset IDs do not have to be in numerical order and can be changed at any time.

3746

4. Click OK.
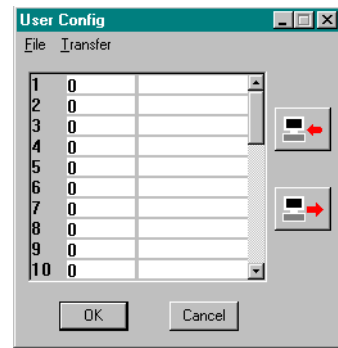
The Desktop Toolbar displays.

5. Upload the settings to the RWIU.

The new IDs are saved.

Step 16: Enable UTAM

1. From the Desktop Toolbar, click the UTAM Activation icon.

3356

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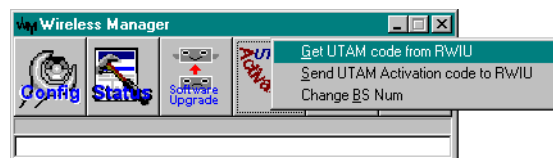
2. Click Get UTAM Code from RWIU.	
3. Enter the password LABUTAM.	
4. Click OK twice.	The Desktop Toolbar displays.
5. Click Get UTAM code from RWIU.	The new 20-digit UTAM activation code displays. Call the UTAM Activation desk at (949) 598-4980 between the hours of 8:00 a.m. and 5:00 p.m. (Pacific Standard Time), Monday through Friday with this number.
6. Click OK.	The Desktop Toolbar displays.
7. Click Send UTAM Activation Code to RWIU.	3357
8. Input the 10-digit code given to you by the Activation Desk	3358
9. Press Enter.	"Permission granted successfully" displays. If an error message displays, repeat Steps 1~7.
	Note If UTAM is required, the Base Stations have one power LED ON (green), two (center) transmission LEDs ON (red), and four additional LEDs that are red.
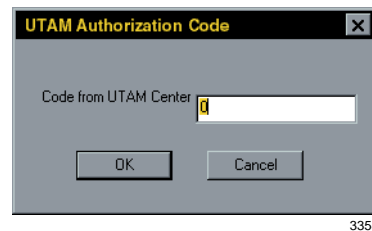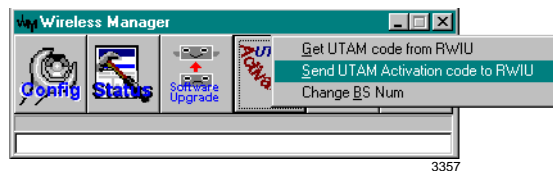
Step 17: Store the IDs in the Handset
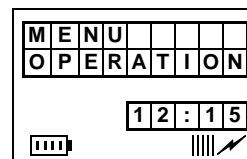
1. Press **PWR**.	The handset turns on.
2. Press **FCN**.	

3. Press ▼ until **SYSTEM CONFIG.** displays

```
S Y S T E M
C O N F I G .

            1 2 : 1 5
[====]        |||||/
```

   ...or **10** + **FCN**.

4. Press **FCN**.

```
S I D # 0

            1 2 : 1 5
[====]        |||||/
```
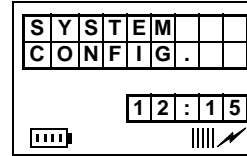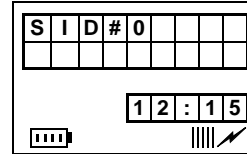
5. Enter the proper System ID (SID).

6. Press **CLR** to make corrections.

7. Press ▼.

Note The SID must match the data entered in the system settings.

```
H I D # 0

            1 2 : 1 5
[====]        |||||/
```

8. Enter the handset ID (four digits) for the system ID entered in Substep 5.

```
H I D # 1

            1 2 : 1 5
[====]        |||||/
```
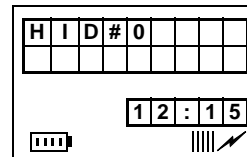
9. Press ▼ for other systems.

10. Repeat Substeps 5~7 to enter all the system and handset IDs required.
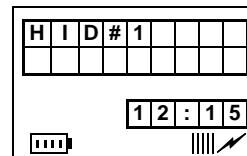
A maximum of eight system IDs and associated handset IDs can be stored in handset memory.

11. Press **END**.

The ESN displays momentarily.

12. Press **CALL**.

The handset ESN is stored in the BSIA.

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RWIU Additional Information

The following paragraphs describe:

♦ RWIU/WWIS interface unit

♦ Changing the initial configuration

♦ Changing the communications port

♦ Checking the RWIU and Base Station software versions

♦ Viewing log messages

♦ Resetting the Base Stations and RWIU

♦ Upgrading the RWIU and Base Stations

♦ Changing the Base Station number

RWIU/WWIS Interface Unit

The Strata AirLink Wireless System interfaces to Strata DK16, DK16e, DK40, DK40i, DK280, and DK424 systems with an RWIU Interface Unit. The RWIU PCB (shown in Figure 16-29) functions as a protocol converter between the Base Stations on one side and the Strata DK system on the other. The RWIU is the "master" PCB, generating timing and synchronization signals and the WWIS PCB is the "slave."

The PCBs have LEDs that indicate a continuous status of operation for both. They are shown in Figure 16-30 on Page 16-52. The switches and jumper are described in Tables 16-11~16-13 on Page 16-37.

The PCB has an Intel® 80C186EC, 25 MHz (provided by a 50 MHz oscillator), 16-bit Complementary Metal Oxide Semiconductor (CMOS) embedded Central Processing Unit (CPU) with the following:

♦ External 16-bit data bus and 20-bit address bus

♦ Four Direct Memory Access (DMA) channels

♦ Three programmable timer counters

♦ Eight programmable external interrupt controller inputs

♦ Two integrated communication channels Universal Asynchronous Receiver/Transmitter (UARTS)

♦ Integrated Watch Dog Timer (WDT)

♦ Two flash memories (expandable by two)

♦ Two CMOS Static Random Access Memories (SRAMs) (expandable by two)

♦ In-circuit test points

The RWIU has the following interfaces:

♦ Backplane (P1)

♦ Synchronous RS485 bus (J5)

♦ Serial line (J7)

♦ External power supply (J8)

♦ JTAG Mach programming (J11)

The WWIS has four Base Station interface connectors (J1~J4).
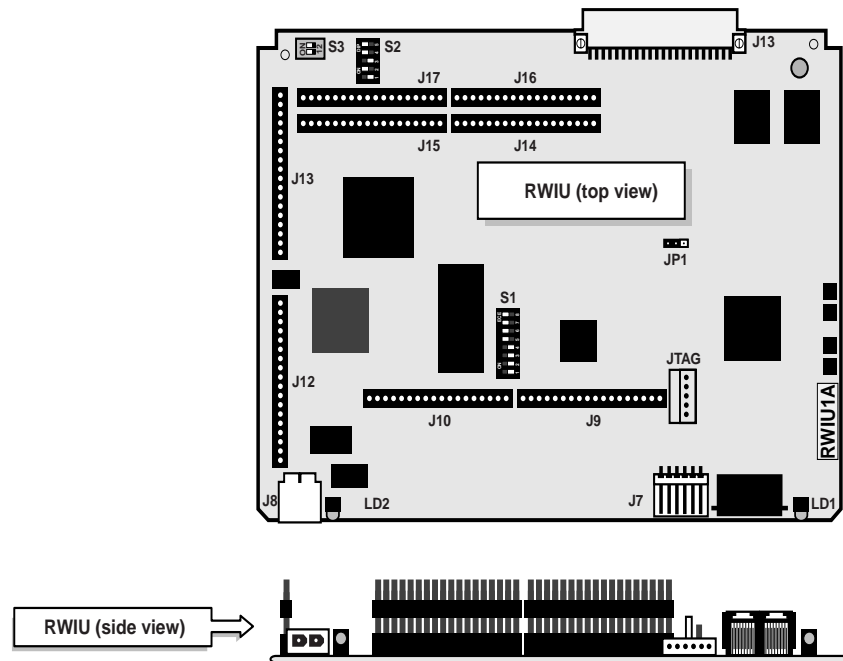
Figure 16-29   Top and Side View of the RWIU

The CPU addresses come from three octal latches that are also address buffers while the data bus addresses are buffered by a pair of bi-directional octal transceivers connected to the various peripheral devices.

There are eight external interrupt signals:

♦ INT0 – connects to the data highway receive (RX) and transmit (TX) interrupt output or to the RX interrupt output of internal serial channel one (optional).

♦ INT1 – connects to the TX interrupt output of internal serial channel one.

♦ INT2 – connects to interrupt output of the DMA channel N0 (DMA0).

♦ INT3 – connects to interrupt output of the DMA channel N1 (DMA1).

♦ INT4 – connects to N0~3 interrupt output.

♦ INT5 – connects to the RX interrupt output of internal serial channel one or to the data highway RX and transmit TX interrupt output (optional).

♦ INT6 – connects to the general device interrupt output.

♦ INT7 – connects to the interrupt output of the optional external UART device.

The CPU has two flash (boot) memories, 128KB each, operating at 55 ns and mounted on 32-pin sockets. The memory is expandable to two optional flash memories (512KB each, 55 ns). The total size of program memory is 256KB or 1024KB using two memories.

The Random Access Memory (RAM) consists of two CMOS SRAM chips, 128KB (55 ns), used as main data memories. It is expandable to 512KB (55 ns) using two additional chips. The total size of the data memory of the CPU is 512KB.

The WWIS PCB (see Figure 16-30) has the following components:

♦ Four E1 transceivers with crystals, line transformers, protectors, and electronic circuit breakers

♦ Two LEDS for each transceiver

♦ Eight elastic buffers, two for each E1 interface

♦ Surface Mount Technology (SMT) resistors and capacitors
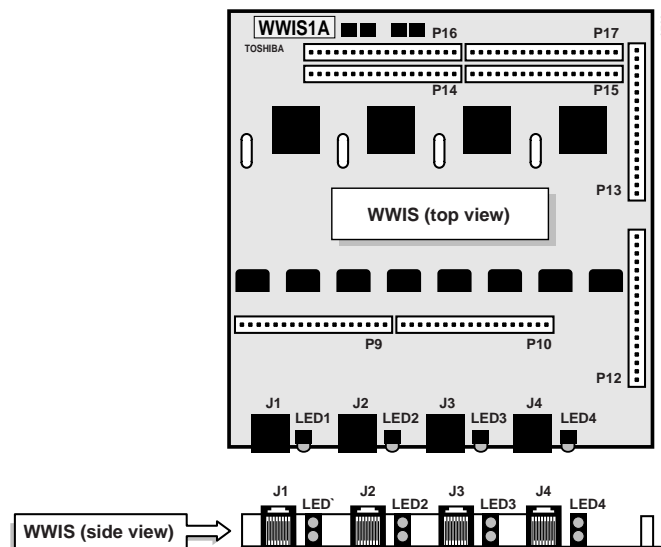
Figure 16-30   Top and Side View of WWIS

The thickness of the RWIU is 1.6 mm and the maximum distance between the WWIS PCB (including the height of the mounted components) is 30 mm.

Signaling

A high density Mach decoder generates all the chip select signals and control signals for Erasable Programmable Read Only Memory (EPROM), flash and RAM memories, peripherals, and Input/Output (I/O) devices. The Mach device includes a serial interface on connector J7 for on-board programming.

The digital I/O block has two digital input buffers and four output D flip-flops for the digital output signals. All input buffers and output flip-flops connect to the CPU lower data bus using a bi-directional transceiver. All control signals are generated to the I/O devices by the Mach decoder.

A power ON external reset generator is provided by an internal WDT chip. There is also a power-fail circuit that alerts the CPU when the voltage falls below 4.75V. This feature is necessary because the CPU stores data in the backup memory of the RTC during a power failure.

An RTC chip mounts on the RWIU PCB only. It has an internal Lithium battery and an internal backup 2KB of SRAM memory, powered by the same Lithium battery.

The RWIU interfaces to the Strata DK system using a 32 time slot, 2.048 MHz Pulse Code Modulator (PCM) channel. The PCM channel has the following signals:

♦ PHOUT – 32 time slots (receiving data)

♦ PHIN – 32 time slots (transmitting data)

♦ PHFS – 8 KHz frame synchronization output

♦ PHCLK - 2.048 MHz clock input

♦ 4MCLK - 4.096 MHz clock input

The interface with the voice channel has the following signals:

♦ PCM matrix memory time switch device

♦ Digital I/O buffers (output enable)

The PHOUT connects to the matrix PCM input signal using a digital input buffer. The PHIN connects to the output signal using a digital output buffer. It is enabled only during the transmission phase of the data by the matrix. A time-slot assignment logic enables the output buffer of the PHIN signal during the right time segment.

There are five hardwired address pins coming from the backplane connector (P1) of the RWIU and one additional two-position DIP switch (S3). These are connected to seven input pins to control the time-slot assignment logic for the various configurations. The CPU reads the status of these hardwired addresses and the state of the two-position DIP switch (S3). An additional five-position DIP switch (S2) selects various RWIU configurations and synchronizes the clock with the 8 KHz frame synchronization pulse.

The receive data signal from the main PCM voice channel connects to input N0 (IN0) of the matrix. The transmit data signal from the main PCM voice channel comes from output N0 (OUT0). The signal connects to a buffer that generates the external buffered transmit data signal available on the backplane connector P1. Table 16-19 describes the four internal synchronous 2.048 PCM busses generated by the matrix.

Table 16-19   Generated Internal Synchronous PCM Signal

PCM Bus Number	E1 Interface	Signal
1	N1	RD01 internal synchronous PCM channel N1 receive data.
		XDI1 internal synchronous PCM channel N1 transmit data signal, derived from input N1 (IN1) of the matrix while the output signal is derived from output N1 (OUT1) of the same matrix.
2	N2	RD02 internal synchronous PCM channel N2 receive data.
		XDI2 internal synchronous PCM channel N2 transmit data signal, derived from input N2 (IN2) of the matrix while the output signal is derived from output N2 (OUT2) of the same matrix.
3	N3	RD03 internal synchronous PCM channel N3 receive data.
		XDI3 internal synchronous PCM channel N3 transmit data signal, derived from input N3 (IN3) of the matrix while the output signal is derived from output N3 (OUT3) of the same matrix.
4	N4	RD04 internal synchronous PCM channel N4 receive data.
		XDI4 internal synchronous PCM channel N4 transmit data signal, derived from input N4 (IN4) of the matrix while the output signal is derived from output N4 (OUT4) of the same matrix.

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Timing and Synchronization

To comply with FCC part 15D clock and frame synchronization requirements, the clock and frame frequency accuracy must be ± 10 parts per million (ppm). To meet this requirement without adding cost, the system uses the Strata DK system as the primary clock source. The analog, digital, and Stratum 3 trunks were considered as possible configurations.

To continue using only one single interface between the RWIU and the Base Stations, the clock signal is sent through the E1 interface using a 320 ms synchronization pulse. The Base Stations lock onto the RWIU clock signal and the Portable Unit Board (PUB) extracts the clock from the Base Stations. The RWIU provides a signal to all other PCBs for a simple insertion into the E1 time slot 17.

Backplane Interface Connector

The RWIU has a 44-pin Deutsche Institut fur Normung (DIN) connector (P1) that connects to the backplane of the Strata DK system. The connector has two rows with 22 pins in each row.

PBX Data Highway Interface

The PBX data highway control channel uses an integrated UART controller running at 312.5 kbs. The control channel uses the following signals that originate from the backplane connector P1:

♦ DHOUT - receive signal (input) and connects to RX

♦ DHIN - transmit signal (output) and connect to TX

The UART debug serial channel connects to the integrated serial channel N0, and the asynchronous multi-drop communication channel connects to serial channel N1. The UART internal serial channels connect to the debug serial channel and the asynchronous multi-drop communication channel. The debug serial channel connects to N0, and the asynchronous multi-drop communication channel connects to the external UART device.

An RS-485 asynchronous multi-drop communication link between the RWIU and the WWIS occurs because the UART connects to the CPU external bus. The UART is not physically mounted on the RWIU, but uses the 28-inch PLCC socket on the RWIU.

The UART receives its operating frequency from the output of the internal timer N0 of the CPU. N0 is programmed to divide the internal 25 MHz operating frequency of the CPU by a factor of 5 to obtain the UART 5 MHz operating frequency. It is possible to use N0 for other software applications by substituting an optional external 5 MHz crystal.

Base Station Interface Connectors (E1s)

Four identical long-haul E1 (2048 kbs) PCM interfaces connect the RWIU PCB to each Base Station (N0~N3) using a standard pulse (see Table 16-20). Each interface has:

♦ Primary access transceiver devices

♦ Two elastic buffers for each E1 channel

♦ RX and TX line transformers with protectors

♦ 320 ms synchronization signal insertion logic (channel N17)

♦ Loop back controls

♦ RWIU generated Base Station reset (relays K1~K4)

♦ RFI protectors (common mode chokes - optional)

♦ Electronic circuit breakers for each E1 channel

Table 16-20   Connector J1~J4 Descriptions

Pin No.	Base Station	Name	Description
J4			
1	1	TX_TIP_BS1	E1 interface (transmission output from TX line transformer)
2		TX_TIP_BS1	
3			Not used
4			Not used
5		RX_TIP_BS1	E1 interface (transmission output from RX line transformer)
6		RX_TIP_BS1	
J3			
1	2	TX_TIP_BS2	E1 interface (transmission output from TX line transformer)
2		TX_TIP_BS2	
3			Not used
4			Not used
5		RX_TIP_BS2	E1 interface (transmission output from RX line transformer)
6		RX_TIP_BS2	
J2			
1	3	TX_TIP_BS3	E1 interface (transmission output from TX line transformer)
2		TX_TIP_BS3	
3			Not used
4			Not used
5		RX_TIP_BS3	E1 interface (transmission output from RX line transformer)
6		RX_TIP_BS3	
J1			
1	4	TX_TIP_BS4	E1 interface (transmission output from TX line transformer)
2		TX_TIP_BS4	
3			Not used
4			Not used
5		RX_TIP_BS4	E1 interface (transmission output from RX line transformer)
6		RX_TIP_BS4	

The four primary access transceivers (U7, U13, U25, and U35) use the E1 (31 B + D) interface to each Base Station. Not all of the 32 time slots of the E1 (32 B + D) frame are used. The format is called 8 B + D and organized as follows:

♦   Time slot N0 – synchronization time slot

♦   Time slots N1~N8 – voice channels time slots

♦   Time slots N9~N15 – idle (free) time slots

♦   Time slot N16 – signaling CCS time slot

♦   Time slot N17 – multiframe 320 ms synchronization pulse time slot

♦   Time slots N18~N31 – idle (free) time slots

The E1 devices receive each processed (but not formatted) 31 B + D frame from the CPU and transmits it (after formatting) to its Base Station through its TX line transformer. The same is true from the receiving side. The CPU performs the protocol conversion. Both TX and RX transfers are actuated in DMA mode by the CPU.

The E1 device connects to the matrix using four internal 2048 kbs synchronous PCM buses with the following signals:

♦ RD01 internal PCM channel n1 received data (U7)

♦ XDI1 internal PCM channel n1 transmit data (U7)

♦ RD02 internal PCM channel n2 received data (U13)

♦ XDI2 internal PCM channel n2 transmit data (U13)

♦ RD03 internal PCM channel n3 received data (U25)

♦ XDI3 internal PCM channel n3 transmit data (U25)

♦ RD04 internal PCM channel n4 received data (U35)

♦ XDI4 internal PCM channel n4 transmit data (U35)

The four internal 2048 kbs synchronous PCM busses transfer the data between each E1 device and the matrix. The matrix places the data on the backplane PCM channels.

Protectors

The RX and TX transformers connect to the E1 line through protector devices. Current-limiting resistors are used on both sides of the transformers. Tranazorb U45~U47, U53, U57~U58, and U62~U63 and Gas Tubes G1~G8 devices provide fast protection from lightning by sending sudden surges to the frame around the RWIU PCB.

Additional protection is provided by the secondary line transformers by dual MMBT7000 diodes. All the line transformers RX and TX are breakdown-rated at 1500 Vrms. Loop back controls and Base Station resets are provided for each Base Station by a relay. Each relay is controlled by the CPU using an output port signal. Transistors drive each relay.

Power (-40VDC) transfers from each Base Station to the associated remote Base Station are performed using a standard phantom interface on the central taps of the secondary of each TX and RX transformer of the E1 interface. An electronic circuit breaker with associated power Field Effect Transistor (FET) is used for each Base Station E1 interface.

Important!   *In the case of a short circuit on the -40VDC side of one the phantom interfaces, the electronic breaker turns off its associated power FET. After about five seconds, it tries to verify that the short is gone by turning on the power FET for a shorter period (about 200 ms). If the short is gone, the circuit breaker turns on its power FET permanently. If the short is still present, it continues to retry the circuit.*

The same device protects the PCB against a rush current at Base Station power up. Each electronic circuit breaker block is turned on/off by the CPU using the output port that drives the LED of a photocoupler. A short circuit indication flag is provided to the CPU for each electronic circuit breaker. The following are additional protection devices for each E1 interface:

♦ Four slow-blow fuses

♦ One polyswitch

Ring Back Tones Generator

The RWIU PCB incorporates a 32KB EPROM that generates:

♦ 440 Hz ring back tone, modulated at 480 Hz

♦ 2400 Hz busy override tone

♦ 4 tone channels for the U.S.

Each tone generates 800 bytes every 125 ms. The bytes are sent on a specific time slot of the matrix and to the related time slot of the PHIN output.

Serial Line Interface

There is a six-pin serial line interface (J7) that debugs and sets up the system. It is a RS-232 port and connects the PC to the RWIU (see Table 16-21).

Table 16-21   Connector J7 Descriptions

Pin No.	Name	Description
1	TXD	RS-232 TX data (from the RWIU)
2	RTS_0	RS-232 RTS data (from the RWIU)
3	RXD	RS-232 RX data (to the RWIU)
4	CTS_1	RS-232 CTS data (from the RWIU)
5		Not used
6	GND	RS-232 Ground (from the RWIU)

Software Architecture

The RWIU software is a real-time embedded software, written in C language designed for the Intel 80186EC processor. Its modules include real-time tasks, service packages, and hardware drivers. Its functions are:

♦ Communication (KSU DHWY and Base Station)

♦ Local debugging

♦ Monitor communication

♦ Call control logic procedures (call origination, delivery and release)

♦ Mobility control (handoff)

♦ Handset text and icon displays

♦ System and Base Station power up controls

♦ RWIU cross connects

♦ Base Station software download

♦ Start-up diagnostics (BIT)

♦ Online diagnostics

♦ Loop tests

♦ System audit and parameter refresh

♦ RWIU and Base Station configuration

♦ Alarm reports and LEDs

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♦ System parameters

♦ UTAM activation

The software is built in layers, each implementing a different function. Each layer gets input from the layer below and provides services to the layer above. The hardware drivers layer uses interrupts and API calls interface with the layers above.

The operating system is totally independent of the hardware configuration and uses API calls to interface with the other layers. All other layers use API calls and inter-task communication messages to interface each other.

The operating system main services are:

♦ Task definition and initiation, termination, and context switching

♦ Inter-task communication (message, semaphores)

♦ Message handling (mailbox)

♦ Timers

♦ Memory management (buffer pools)

All access to the operating system is performed using an Operating System Shell (OSS). The shell provides a general API to the operating system services. The software supports the following interrupt-driven protocols:

♦ KSU DHWY communication protocol (addressed ASYNC)

♦ Base Station communication protocol (E1 D channel)

♦ Local debug/monitor communication protocol (RS-232)

The main data structures are:

♦ Port information

♦ Card status

♦ External E1 links state and status

♦ External/internal E1 cross connect configuration

♦ Base Station configuration

♦ System ID

♦ UTAM parameter

The communication protocol layer, using the corresponding hardware drivers, handles external interfaces. Messages from the KSU and the Base Station are converted by the communication protocol layer to inter-task messages and are sent to the corresponding layer or task. The hardware drivers consist of:

♦ CPU (Intel 80186EC)

♦ E1 Transceiver (DALLAS DS2153)

♦ Matrix (MITEL MT8985)

♦ WDT (CPU)

♦ UART (16550 compatible and internal to the CPU)

♦ External UART (16550 compatible)

♦ PIC (8259 compatible and internal to the CPU)

♦ DMA (four channels and internal to the CPU)

♦ RTC

The communication with hardware drivers is performed using package interface procedures. The Init task controls the sequence of card initialization and synchronizes it according to the KSU and Base Station needs.

System management consists of several packages—each a set of functions providing a group of services. The main features are:

♦ Alarm management (send alarm, set alarm severity)

♦ Database services (add Base Station, change status)

♦ Configuration Interfaces (reset Base Station)

♦ Test Control (set loop back, start test, utilities and general services, such as set date and time, set LED)

♦ UTAM procedures

Changing Initial Configuration

It is highly recommended that you get the current configuration and save it to a file on the PC as the working copy. Then, open and edit the working copy – not the original file. Using this method ensures that the original configuration file is not corrupted while adding or editing existing data. Once the new information is saved, the RWIU uses the new data immediately.

Important! *Sending configuration information to the RWIU overwrites existing information. Make sure that the sent data contains all of the required configuration information, not just the few additions or changes that were made.*

Changing Communications Ports

1. From the Desktop Toolbar, click the Config icon.
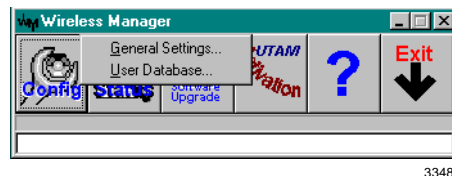
2. Click General Settings.
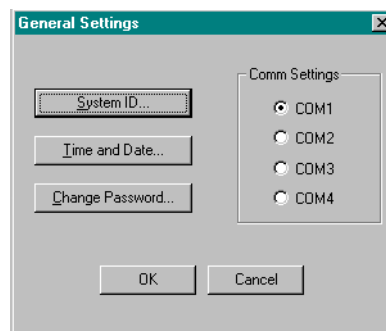
3. Click the new port and OK.   The Desktop Toolbar displays.

Checking RWIU and Base Station Software Versions

1. From the Desktop Toolbar, click the Status icon.
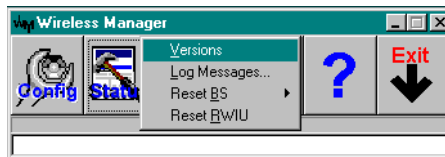
3360

2. Click Versions.
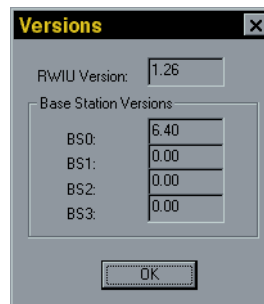
3742

Viewing Log Messages

1. From the Desktop Toolbar, click Status.
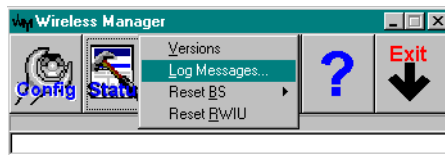
4145

2. Click Log Messages.
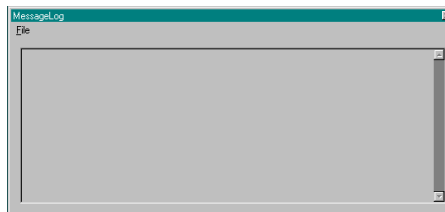
4146

Resetting Base Stations and RWIU

1. From the Desktop Toolbar, click Status.

2. Click Reset BS

   4147

   ...or Reset RWIU.

   4148
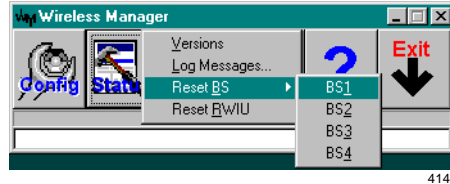
   The selected Base Station or RWIU is reset automatically.

Upgrading RWIU and Base Stations

1. From the Desktop Toolbar, click the Software Upgrade icon.

   3743

2. Click RWIU Software   The software downloads.

   3744

   ...or Base Station Software.

   3736
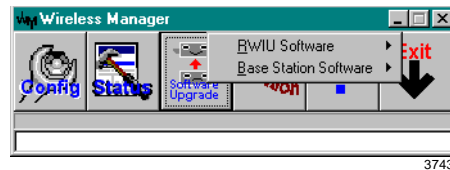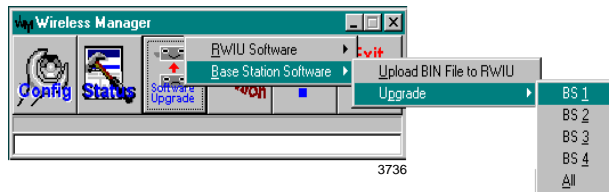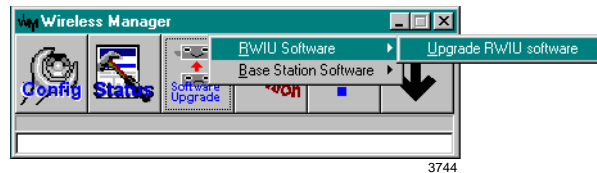
3. Click BS0~BS3

   ...or Download BIN File to   The software downloads.
   RWIU.

Changing Base Station Numbers

1. From the Desktop Toolbar, click the UTAM Activation icon.

3737
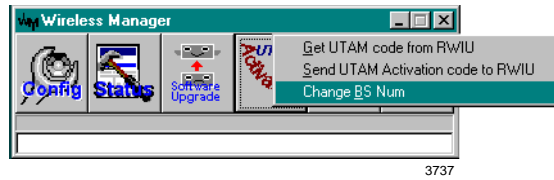
2. Click Change BS Num.

You are prompted for a password.

3739

3. Enter the password and click OK.

4. Enter the new Base Station number.

Charging Batteries

1. Insert the handset with the battery (power off) into the Charger Base front pocket.
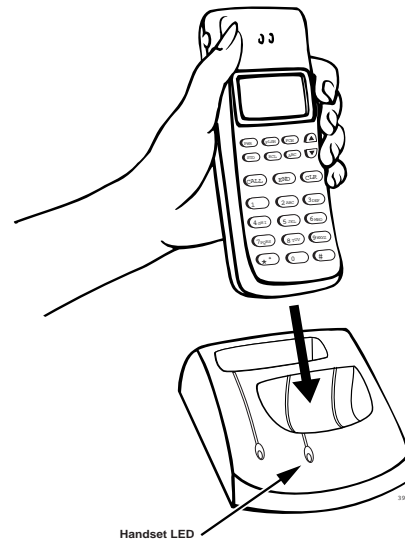
Handset LED

The front pocket LED changes to amber and then changes to red to indicate that rapid charging is in progress.

2. Insert the spare battery into the Charger Base rear pocket.

Battery LED
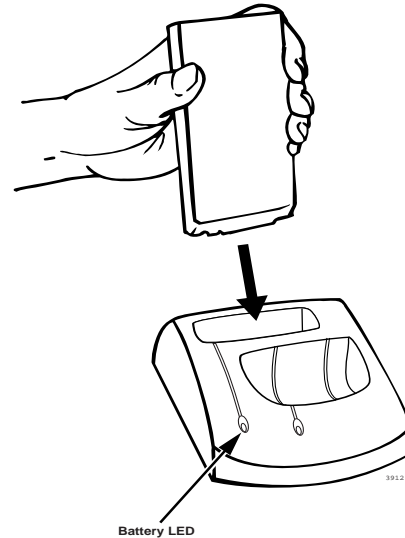
The rear pocket LED changes to amber while the handset finishes charging or alternates between green and amber, indicating in-progress discharge.

3. When LEDs change to green, charging is complete.

The charger switches to a trickle charge. When the handset is fully charged, the front pocket LED changes to green and the rear pocket LED changes to red, indicating an in-progress charge.

4. Remove the handset or spare battery.

Important!

♦   Do not use an incomplete, charged battery, even if the battery icon shows full strength. The handset will have reduced talk/standby time.

♦   If a fully charged battery is placed in the charger, it will detect the charged condition and cancel rapid charging. The LED changes to amber, red, and then green.

Discharging Batteries

1. Insert the battery into the charger base rear pocket.

If the LED alternates between green and amber, leave the battery in the charger to complete discharging.

After the discharge cycle completes, the LED changes to red to indicate rapid charging is in progress.

2. Remove the battery, when the LED changes to green.

Strata AirLink Systems

Troubleshooting

This section describes troubleshooting tips for the Strata AirLink Wireless BSIA and RWIU systems. Problems are classified and cleared by replacing the malfunctioning unit and by performing operational tests in the sequences described in this chapter.

Important! *Many wireless system features are assigned, enabled or disabled using software entries as described in "Install the Strata AirLink Manager Software" on Page 16-19 (BSIA) and "RWIU System Installation" on Page 16-36 (RWIU). It is very important to verify that the programming is correct and functional before troubleshooting the hardware.*

Before beginning diagnostic and troubleshooting tests, check the following:

♦ System power, polarity, and continuity

♦ BSIA or RWIU LEDs, boot sequence, and alarm relays

♦ Base Station LEDs

♦ Handset and batteries

♦ Strata AirLink and RWIU Manager reports

System Power, Polarity, and Continuity

It is important to check all power sources, polarity, and continuity before any other troubleshooting begins. Quickly check the LEDs. Check the polarity of the system by ensuring that all transmit and receive pairs are consistently wired throughout the system. Sometimes switching pairs at the Base Station solves a problem quickly.

Components

If only one system component has a problem, try replacing it with a known good one. For example, switch Base Stations, RWIUs, BSIAs, ALMs, or handsets to see if problems persist.

Communications

To check for communication errors (for example, serial port failure), perform a software version query of the Base Station from the software. If the system does not respond to the query, check the cables.

RF Link Termination

The handset can lose its signal from the Base Station because of reduced power, interference, or stepping out of range. Verify that the battery is fully charged and the handset is in range of a Base Station.

Noisy Circuits

If users complain about noisy circuits or problems with dial tone, try switching the user to another circuit on the office telephone system. If a circuit is not operating at all, use a installer test set to check continuity throughout a system.

DC Resistance

The distances between the system and its Base Stations (see Table 16-28), whether using line power or a local power supply, can be exceeded during an installation. The distances are reflected in the resistance of the line. For specific BSIA information, see "To measure the DC resistance" on Page 16-73, and for the RWIU, see "Measuring DC Resistance" on Page 16-85.

System Reset

As a last resort, sometimes resetting the system clears up system problems. Before resetting the system, collect as much information as possible in the current log file. Get traffic statistics reports, call status reports, line and Base Station status reports, and alarm reports, if available. Use the Save As command to save the log file.

Activation Code

If the UTAM activation code has not been uploaded, the Base Stations will not operate (refer to "Set Up Temporary Installation" on Page 16-9 for more information). Contact Strata AirLink Activation Desk at (949) 598-4980 for the code between the hours of 8:00 a.m. and 5:00 p.m. (Pacific Standard Time), Monday through Friday. Voice mail is available for messages after hours.

Base Station

The Base Station has five LEDs (see Figure 16-31). Four LEDs on the left indicate error conditions during power on, reset, and during the diagnostic tests that run during normal operation. The green LED on the right is the power indicator.

Power On/Reset

Table 16-22 explains how to interpret Base Station LED readings that occur during power on or reset. The LEDs must be read in combination to understand their meaning. The footnotes to the table contain troubleshooting suggestions.
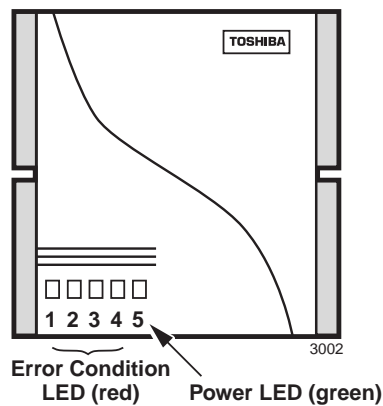
Figure 16-31   Base Station LED Location

Table 16-22   Base Station LEDs during Power On/Reset

Failed Test	Red LEDs (In Combination)			
	1	**2**	**3**	**4**
Memory test 1[1]	Off	Off	Off	Blinking
Memory test 2[1]	Off	Off	Blinking	Off
Memory test 3[1]	Off	Off	Blinking	Blinking
Base Station Interface/processor test[1]	Off	Blinking	Off	Off
Base Station Interface external communication test[2]	Off	Blinking	Off	Blinking
ASIC test[3]	Off	Blinking	Blinking	Off
Frequency test[4]	Off	Blinking	Blinking	Blinking
Vocoder Initialization test[1]	Blinking	Off	Vocoder # (0–3)	
			0: Off	Off
			1: Off	On
			2: On	Off
			3: On	On
Signaling channel test[5]	Blinking	Blinking	Off	Off
Memory flash test[4]	Blinking	Blinking	Off	Blinking

1. Indicates a Base Station failure in most cases. Check cable connections or replace transmit/receive cables or local power supply.

2. Check whether the Base Station transmit/receive cables enable another Base Station to initialize.

3. Verify power supply.

4. Test the Base Station on the another BSIA or RWIU Base Station port and with good transmit/receive cables.

5. Reset the BSIA.

Normal Operation

Table 16-23 explains how to interpret Base Station LED readings that occur during self- diagnostic tests that run during normal operation. The LEDs must be read in combination to understand their meaning. The footnotes to the table contain troubleshooting suggestions.

Table 16-23   Base Station LEDs during Normal Operation

Test Failed	Red LEDs (In Combination)			
	1	**2**	**3**	**4**
ASIC test[1]	Off	Off	Off	On
Phase lock loop lock test[2]	On	Off	On	Off
Vocoder test[2]	Off	On	Vocoder # (0–3)	
			0: Off	Off
			1: Off	On
			2: On	Off
			3: On	On
Synthesizer unlock test[3]	On	Off	Off	On
Waiting for configuration test[4]	Off	On	On	Off
Phase lock loop initialization test[2]	Off	On	Off	Off

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Table 16-23   Base Station LEDs during Normal Operation *(continued)*

Test Failed	Red LEDs (In Combination)			
	1	**2**	**3**	**4**
Base Station Interface clock test[2]	On	On	Off	Off
Receive loss[2]	Off	Off	On	On
Loss of control channel[5]	On	Off	Off	Off

1. Test the Base Station on another BSIA or RWIU Base Station port and with different transmit and receive cables.
2. Reset the Base Station on the other BSIA or RWIU. Reset a Base Station by plugging/unplugging its transmit or receive cable. Reset all Base Stations by resetting the BSIA.
3. Test Base Station transmit/receive cables by replacing the Base Station with a functional one.
4. Ensure that the system has been activated or check the BSIA or RWIU configuration. Also try resetting the BSIA.
5. Check for RF interference.

Replacing a Defective Base Station

1. Disconnect the transmit and receive cables and power supply, if applicable.
2. Lift the Base Station off the mounting screws.
3. Mount the new Base Station and connect the cables and power supply, if applicable.
4. If the Base Station does not come online within a minute, perform a software upgrade using the latest version of software. See "Upgrading Base Stations" on Page 16-77.

Handset

Table 16-24 lists handset symptoms and possible solutions.

Table 16-24   Handset Troubleshooting

Symptoms	Possible Solution
Called party can hear but cannot be heard. Conversation broken up. Handoff clicks occur during conversation.	The handset signal strength is inadequate. Try moving closer to a Base Station. If the problem is reported by many users, try moving the Base Station to a location that provides better coverage. For best results the signal strength icon should show three to five bars. The (BER) test should report Good or Max results. See BER testing on Page 16-13 for instructions on how to perform this test.
Display does not contain date, time and signal strength.	The handset is not locked onto a Base Station. Try powering off and on or moving to another location closer to a Base Station. **Note** It may take up to a minute for the full display to appear. If the problem persists, check system and handset ID configuration. These symptoms could also occur if the BSIA, RWIU, or Base Station is being reset.

Table 16-24   Handset Troubleshooting *(continued)*

Symptoms	Possible Solution
Off-hook icon (☎) flashes when **CALL** is pressed; Handset operated correctly and now cannot make calls.	The handset ESN is improperly configured. Fix this problem by: 1. Reprogramming the handset with proper system and handset IDs. 2. Changing the handset ID configured for the handset to any valid ID not already in use. 3. Changing the handset ID in the User Database to match the ID programmed in the handset. 4. Making a call on the handset to store its ESN in the BSIA or RWIU. 5. Installing the ALM. 6. Performing a maintenance check (system maintenance busy) and loop start line status is activated.
Invalid ESN reported for handset (alarm).	The same handset ID and system ID were programmed into two telephones and databases, and the handset ESNs were associated with the wrong analog line when the first telephone call was made. Fix this problem by: 1. Locating both handsets and correcting the databases. 2. Checking the handset ID configuration in both handsets to make sure they are correct. 3. Changing the ID in the handset and making another call (corrects the ESN configuration for that handset). 4. Correcting the configuration for the handset that reported the invalid ESN. Follow these steps: • Open the User Database and change the handset ID configured for the handset to any valid ID not already in use. • Change the handset ID in the User Database to match the ID programmed in the handset. • Make a call on the handset to store its ESN.
No dial tone.	Make sure the handset is locked and check the volume level. If the problem remains, the handset is not locked onto a Base Station. Try powering off and on or moving to another location closer to a Base Station. Check the analog line with a installer's test set to ensure the telephone system is operating properly. If it is, check the wiring between the BSIA or RWIU and the telephone system. Check the BSIA, RWIU, or Base Station for a reset condition because this will interrupt the dial tone.
Weak or delayed dial tone.	Check the handset volume level. Make sure to align the handset with the ear rather than mouth and don't watch the display. Consider using the predial method to make calls by dialing the number and pressing **CALL** (rather than pressing **CALL** and waiting for dial tone).
NO SERVICE! message.	The handset is not locked and it is out of range or all eight channels of the Base Station are being used for other calls. Try powering off and on or moving to another location closer to a system Base Station. Check the BSIA, RWIU, or Base Station for a reset condition because this will cause the NO SERVICE! message. Reset the handset to the factory defaults.

Table 16-24   Handset Troubleshooting *(continued)*

Symptoms	Possible Solution
SYSTEM BUSY message.	The handset is locked onto a Base Station and **CALL** was pressed, but the Base Station did not respond. One or more Base Station channels could be in a maintenance busy state or the handset may not be locked well enough to complete the request for service.
Unexpected digits in display.	It is easy to inadvertently press keys on the handset when the handset is not in use. Use the lock feature. To clear digits from the display, use **CLR**.

Password Protection

Table 16-25 lists functions in the handset that are accessed by password. Some of the functions are for use by Toshiba technical support only.

Table 16-25   Handset Password-protected Functions

Function	Meaning
Bulker DU	Access to functions.
Unique Base Station	Locks the handset onto a Base Station with a particular ID. Zero (0) means normal operation.
Software version	Displays handset's software version.
Beep on Roam	Causes an idle handset to beep when the Base Station it is locked onto changes.
Handoff by Recall	Enables **RCL** to initiate handoff to another Base Station in the system while a call is in progress.
Reset to factory defaults	Restores the handset to factory default settings. All changes made via the handset menu are removed.

❸ **To access password-protected functions**

1. In idle mode, press **1 2 3 4**.

2. Press **ABC**, then **FCN**.
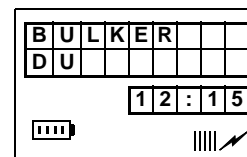
3. Enter the password.

4. Press ▼ to choose **UNIQUE BASE STATION**

   ...or **SOFTWARE VERSION**

   ...or **BEEP ON ROAM**

   ...or **HANDOFF BY RCL**

   ...or **FLASH MODE**

   ...or **RESET TO FACT DFLT**.

➌ **To lock a handset to a Base Station**

1. Press ▼.

```
U N I Q U E
B S
              1 2 : 1 5
```
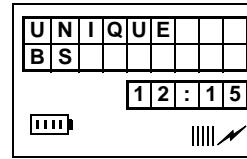
2. Enter a Base Station ID (1 or 2)

   ...or 0 to restore a handset to normal operation.

Note RWIU 1, 2, or 3 cannot lock uniquely to Base Station 0 (zero).

➌ **To view the software version**

1. Press ▼.

```
S O F T W A R E
V E R S I O N
              1 2 : 1 5
```
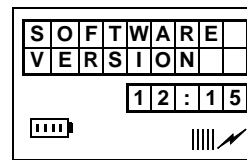
2. Press **FCN**.

The software version displays.

➌ **To use vthe Beep On Roam feature**

1. Press ▼.
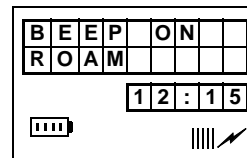
```
B E E P   O N
R O A M
              1 2 : 1 5
```

2. Press **FCN**

```
B E E P   O N
R O A M   O N
              1 2 : 1 5
```

   ...or **FCN** again.

```
B E E P   O N
R O A M   O F F
              1 2 : 1 5
```
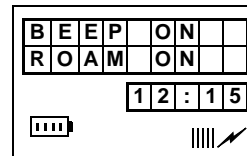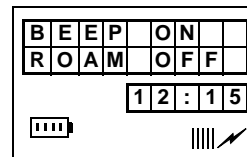
3. Press **END**

   ...or ▼ to go the next password protected function.

❸ **To use the Handoff by Recall feature**

1. Press ▼.
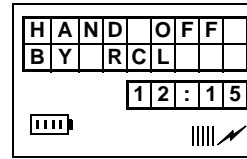
```
HAND OFF
BY  RCL
          12:15
[====]
            |||||↗
```

2. Press **FCN**.

```
HAND OFF
RCL  ON
          12:15
[====]
            |||||↗
```

   ...or **FCN** again.

```
HAND OFF
RCL  OFF
          12:15
[====]
            |||||↗
```
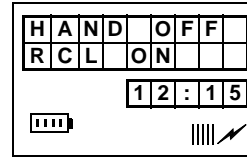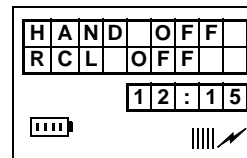
3. Press **END**

   ...or ▼ to go the next
   password-protected function.

❸ **To reset to factory defaults**

1. Press ▼.

```
RESET  TO
FACTDFLT
          12:15
[====]
            |||||↗
```

2. Press **FCN**.

```
RESET
DONE
          12:15
[====]
            |||||↗
```

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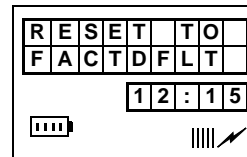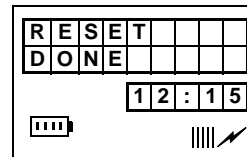
Battery

Table 16-26 lists symptoms of battery problems and possible solutions.

Table 16-26   Battery Troubleshooting

Symptom	Possible Solution
Battery has reduced talk/standby time.	Try discharging and recharging the battery using the instructions on Page 16-73. The handset has been left unpowered for a long period of time and has drained.
	Make sure users are not removing batteries from the charger base before the green LED appears. The handset battery strength icon shows full power after a short period of charging.
	Complete the full charging cycle before using the batteries. Users should also use the handset during the day and recharge it at the end of the day, rather than performing intermittent charging during the day.
Charger has green flashing LED.	Try recharging the battery. If the problem continues, replace the battery.

Charger Base

The Charger Base charges the handset and a spare battery. Do not have to remove the battery from the handset to charge it. The LEDs indicate the status of the charging process as shown in Table 16-27.

Table 16-27   Charger Base LED Indications

LED	State	Meaning
Red	Steady	Battery is rapid charging.
	Flashing	Internal battery fault. Charge the battery again. If the problem persists, replace the battery.
Green	Steady	Battery is charged and ready.
	Flashing	Battery is charged, but it could have reduced standby/talk time. Try repeated rapid charging to rejuvenate the battery. Replace the battery, if this fails to remedy the situation.
Amber	Steady	The charger is evaluating the handset or battery state, or waiting for one battery to complete charging.
	Flashing	Short circuit or over-discharged battery is detected. Make sure contacts are clean and allow the battery to remain in the charger until rapid charging starts and completes.
Amber/green	Alternate flashing	Battery is discharging.

BSIA System

Reports

Strata AirLink Manager generates reports with troubleshooting information. Some of the reports are:

♦ Alarm conditions

♦ Traffic statistics

♦ Line, channel, and call status

Analog Line Continuity

To check the analog line continuity throughout the system, use an installer test set at individual MDF/IDF locations. Check for any bridge taps on the Base Station transmit/receive cables and remove. Check all punch downs and cable connections.

DC Resistance

The distances between the system and its Base Stations (see Table 16-28), whether using line power or a local power supply, can be exceeded during an installation. The distances are reflected in the resistance of the line.

❸ **To measure the DC resistance**

1. Use a digital multimeter that has resistance measuring capability in ohms and a basic accuracy of better than one percent.

2. Use an RJ-11 female-to-female line adapter.

3. Ensure that all permanent wiring is done and all primary protectors are installed, if required. For information on primary protection requirements for UL1459 compliance in the United States, see "Primary and Secondary Protectors" on Page 16-91.

4. Disconnect the BSIA from power.

5. Disconnect the 25-pair cables from P1 and P2 on the BSIA.

6. Disconnect the transmit and receive cables from the Base Station and connect them into each end of the RJ-11 line adapter.

7. Set the multimeter to the ohms scale.

8. To check the distance to Base Station 1, connect the multimeter probes between pins 20 and 46 of the 25-pair cable that connects to P1 on the BSIA. If no reading or a high resistance is reported, measure between pins 20 and 21. A reading should register at only one of the pairs and must be less than the values listed in Table 16-28.

Table 16-28   Cable DC Resistance

Input Power	Wire Gauge	Maximum DC Resistance Allowed for 2,000 feet
Line	22, 24, or mixed	98 ohms
Local	22	66 ohms
	24	104 ohms

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9. Based on which pins returned a valid reading in Step 8, check readings between the following pairs:

   ♦ Valid reading pins 20/46 – measure pins 21/45

   ♦ Valid reading pins 20/21 – measure pins 45/46

   The readings between the measured sets of pins should be similar.

10. To check the distance to Base Station 2, connect the multimeter probes between pins 24 and 50. If no reading or a high resistance is reported, measure between pins 24 and 25.

   Note A reading should register at only one of the pairs and must be less than the values listed in Table 16-28.

11. Based on which pins returned a valid reading in Step 10, check readings between the following pairs:

   ♦ Valid reading pins 24/50 – measure pins 25/49

   ♦ Valid reading pins 24/25 – measure pins 49/50

   The readings between the measured sets of pins should be similar.

12. If the multimeter reports no reading or high resistance, check the readings between any of the other pins specified in Steps 8~11.

   If readings after performing Step 9 are correct, the transmit and receive pairs are probably reversed or shorted somewhere in the installation. If not, there are open connections somewhere in the installation; check and correct all punch-down connections and repeat Steps 8~11.

Status Window

To diagnose problems, there are several reports available that are:

♦ Base Station channels status

♦ Loop start lines status

♦ Call status

♦ Critical alarms

A software query can be performed also, or as a last resort, the BSIA can be rebooted from the Status Window.

Alarms

Table 16-29 lists possible alarms by its displayed number.

Table 16-29   Alarm Descriptions by Number

Alarm # (decimal)	Alarm # (hex)	Description
48	30	NO_MSG_BUFFER_AVAILABLE The BSIA attempts a system reboot after this alarm occurs. If the system cannot reset, press the reset button to the right of the LEDs. If the problem persists, contact Toshiba.

Table 16-29   Alarm Descriptions by Number *(continued)*

Alarm # (decimal)	Alarm # (hex)	Description
49	31	SMX_OS_ERROR The BSIA attempts a system reboot after this alarm occurs. If the system cannot reset itself, press the reset button to the right of the LEDs. If the problem persists, contact Toshiba.
50	32	UTAM_CHECK_FAIL_SYSTEM_CLOCK
51	33	UTAM_ACTIVATION_NEEDED (UTAM_CHECK_FAIL_NORMAL) Contact Toshiba for an UTAM activation code.
138	8A	INVALID_HSID_FROM_BS A handset with invalid handset ID, but valid system ID, tried to make a call. Compare the handset ID against the user database in the Strata AirLink Manager and ensure that they match.
153	99	INVALID_INCOMING_BCC A bad connection exists between the BSIA and Base Station. Check the cable.
161	A1	INVALID_ESN A handset with invalid Electronic Serial Number (ESN) tried to make a call. Check the system settings database in the Strata AirLink Manager software against the handset ESN. Ensure that they are the same.
186	BA	UTAM_ACTIVATION_NOT_NEEDED The UTAM activation code is not required.
194	C2	NO_BS_SANITY_RESPONSE_RECEIVED Check the cable connections between the BSIA and Base Station.
203	CB	FAILURE_IN_BS_SW_UPGRADE The software upgrade process failed. Check the cable connections between the PC and BSIA and try again.
204	CC	TIMEOUT_IN_BS_SW_UPGRADE The software upgrade process failed. Check the cable between the PC and BSIA and try again.
207	CF	INVALID_MSG_BEFORE_UTAM_ACTIV The system must be UTAM activated. See "Set Up Temporary Installation" on Page 16-9.
208	D0	UTAM_ACTIVITION_CODE_IS_OLD
256	D9	INCOMPATIBLE_BS_SW_VERSION The software version of one of the Base Stations is not compatible with the BSIA software. Upgrade the system software.
N/A	N/A	UTAM_ACTIVATION_FAILED A failure occurred during the UTAM activation process. A new UTAM activation code is needed. Contact Toshiba Activation Desk at (949) 598-4980.

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Critical Alarm Relay

When a critical alarm is detected, a relay on the BSIA is triggered and LED S3 flashes. The relay activates an external alarm, if one is installed (see installation instructions and specifications in Step 3 on Page 16-16).

To reset the alarm relay and determine the cause of the critical alarm, check the critical alarm report in the Strata AirLink Manager. Checking the critical alarm report also stops the flashing LED.

LEDs

There are LEDs on the BSIA (controller) that give continuous system status and assist in diagnosing symptoms. When the BSIA system is powered on, all BSIA LEDs except for PWR, RLOS1, and RLOS2 go through these changes:

♦ LEDs are lit for one second to show that they all work.

♦ LEDs turn OFF for a brief moment.

♦ LEDs light again.

♦ Each LED is turned OFF as the LED passes the test.

♦ If an LED remains lit after the boot tests complete, one or more hardware integrity tests have failed. Call processing software usually starts even if some of the tests fail, although some failures prevent call processing software from starting.

♦ The MASTER LED remains lit during boot up because it does not respond to a boot test.

♦ The PWR LED is always lit when the BSIA has power. The RLOS LEDs flicker during boot tests and are lit when there is a problem with Base Station connections.

Table 16-30 explains the meaning of the LED states during boot up and normal operation.

Table 16-30   BSIA LEDs during Boot Up and Normal Operation

Bottom Label	Top Label	Color	Meaning When Lit	
			Boot Up	**Normal Operation**
☀	POWER	Green	The power is on.	
9	MASTER	Yellow	This LED should always be lit.	
8	BUSY1	Green	The test that checks the integrity of the connection to Base Station 1 failed.	One or more channels on Base Station 1 are busy. If flashing, a software upgrade is in process.
7	RLOS1	Red	Loss of synchronization occurs on Base Station 1 because of poor connection, bad cable, Base Station or BSIA failure.	
6	BUSY2	Green	The test that checks the integrity of the connection to Base Station 2 failed.	One or more channels on Base Station 2 are busy.
5	RLOS2	Red	Loss of synchronization occurs on Base Station 2 because of poor connection, bad cable, Base Station failure, BSIA failure; or the Second Base Station Service Enabled parameter is set to TRUE in the System Settings database when the system has one Base Station only.	

Table 16-30   BSIA LEDs during Boot Up and Normal Operation *(continued)*

Bottom Label	Top Label	Color	Meaning When Lit	
			Boot Up	**Normal Operation**
4	S3	Yellow	The test that checks the integrity of the real time clock failed.	If flashing, a critical alarm has occurred.
3	S2	Yellow	The test that checks the integrity of call processing software stored in non-volatile memory failed. Try reloading the software (see "Activate the External Critical Alarm (Optional)" on Page 16-16).	
2	S1	Yellow	The test that checks the integrity of boot software stored in non-volatile memory failed because there is a hardware failure.	
1	S0	Yellow	The test that checks volatile memory failed because there is a hardware failure.	

Upgrading Base Stations

> **CAUTION!**   **This procedure should only be performed if technical support requires it. Attempting the procedure without technical support, could destroy the system.**

1. From the Desktop Toolbar, click Status.

3496
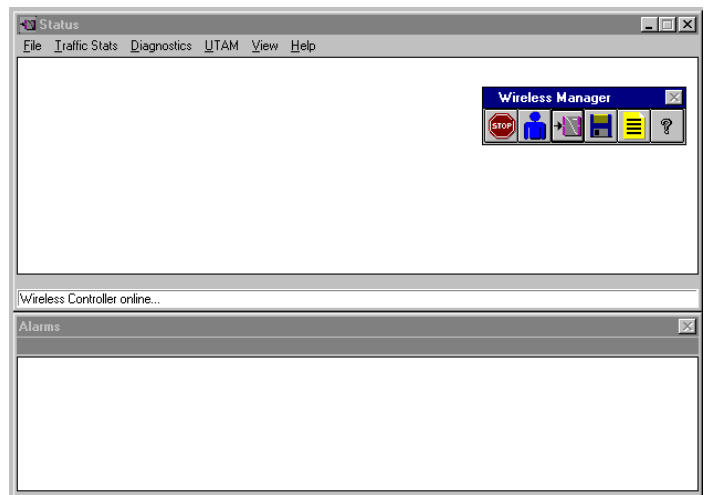
Monitor the upgrade by viewing the status messages as the BSIA powers up.

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2. From the Desktop Toolbar, click Upgrade.

Select software to be uploaded:

File name:
v570u213.wrf

v570u213.wrf

Folders:
c:\wireless\software

c:\
wireless
software

List files of type:
Packet Files (*.wrf)

Drives:
c:

OK
Cancel
Help
Network...
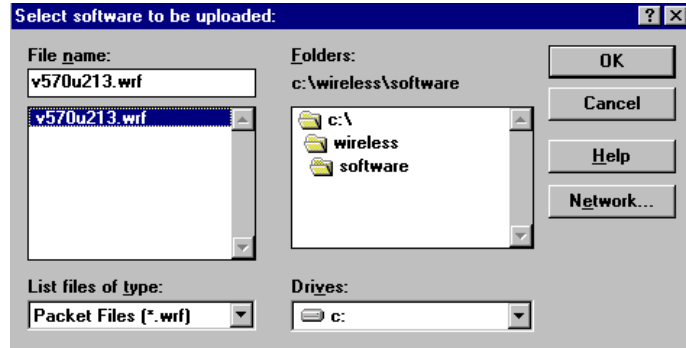
3279

3. From the Select software to be uploaded: dialog box, highlight the file and click OK.

Software Upgrade

Are you sure you want to upload C:\WIRELESS\SOFTWARE\V570U213.WRF into Wireless Controller?

Note: if Wireless Controller does not reboot after you press OK, then you need to reboot it manually by pressing the white reset button.

OK   Cancel
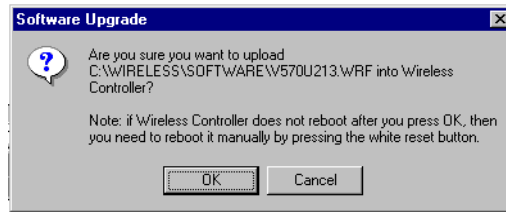
3497

4. From the Software Upgrade screen, click OK.

The BSIA boots automatically.

Software Upgrade

Rebooting Wireless Controller ...

Cancel
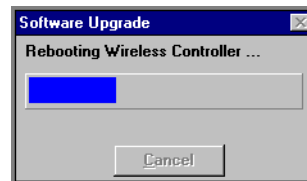
3492

Note If the BSIA does not boot automatically within a few seconds, which occurs sometimes during the initial upgrade, press the reset button on the BSIA.

A series of screens display:

♦ Upgrade of the BSIA software:
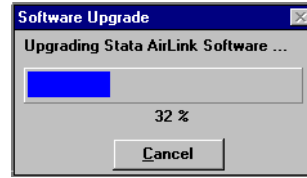
3493

♦ Upgrade of the Base Station software:
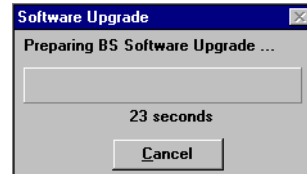
3494

♦ Normal failure of the Base Station upgrade:
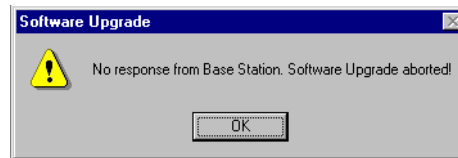
3495

Important! *At this point in the upgrade process, input the UTAM system activation code.*

5. From the Software Upgrade screen, click OK.
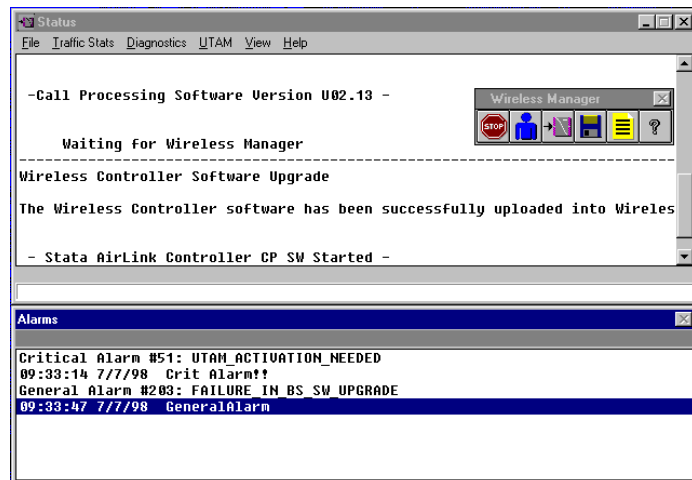
3483

6. From the Status menu bar, highlight UTAM and pull down its menu.

3484
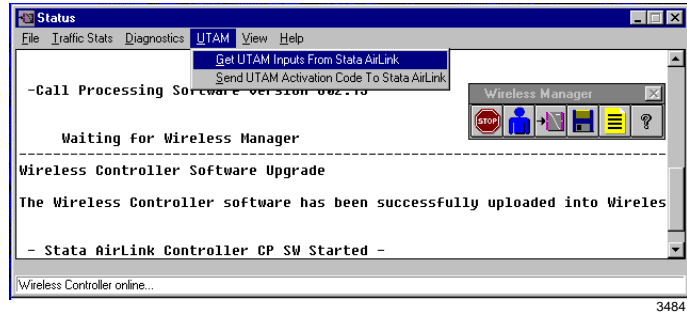
7. From the UTAM pull-down menu, select Get UTAM Inputs From Strata AirLink.

3485
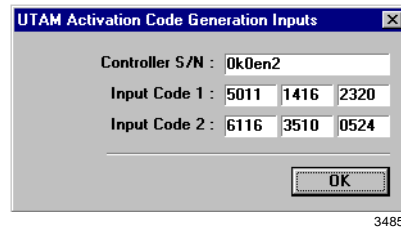
Important! *Make a note of the BSIA serial number and input codes before calling the Strata AirLink Activation Desk because the staff will ask for these numbers.*

8. Call the Strata AirLink Activation Desk, (949) 598-4980 for the activation code.

Note The hours of operation are: Monday through Friday, 8:00 a.m. to 5:00 p.m., Pacific Standard Time.

After the BSIA serial number and input codes are given to the activation desk, the technician will give you the UTAM system activation code.

9. Close the Get UTAM Inputs From Strata AirLink window.

The Status window displays.

10. From the Status window, highlight UTAM and pull down its menu.

3486
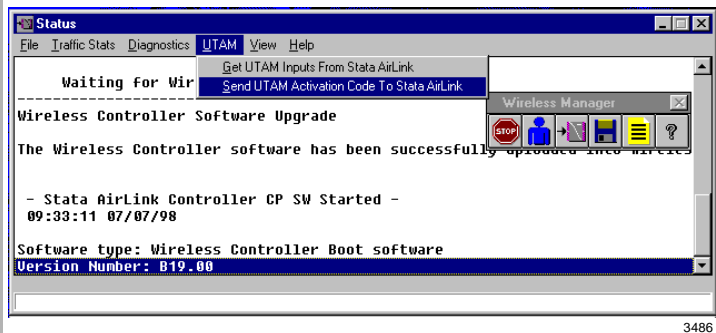
11. From the UTAM pull-down menu, select Send UTAM Activation Code to Strata AirLink.

3488
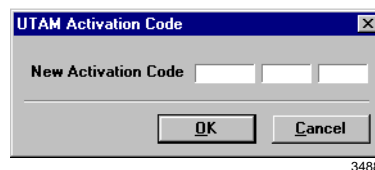
12. In the UTAM Activation Code dialog box, enter the UTAM Activation Code and click OK.
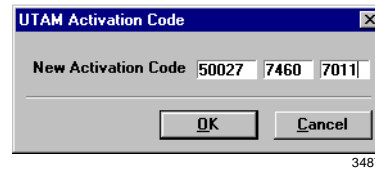

```
UTAM Activation Code                    ⊠

New Activation Code  50027   7460   7011

              OK        Cancel
```
3487

The message "Wireless system has been activated" is displayed at the bottom of the Status window.

Important! *The UTAM code must be installed in one hour or a new one is required.*

Normal LED indications display on the BSIA (PWR and Master LED ON) and Base Stations (PWR LED ON).

Several messages display (shown at the right) on the PC screen as Strata AirLink Manager tests the installation.
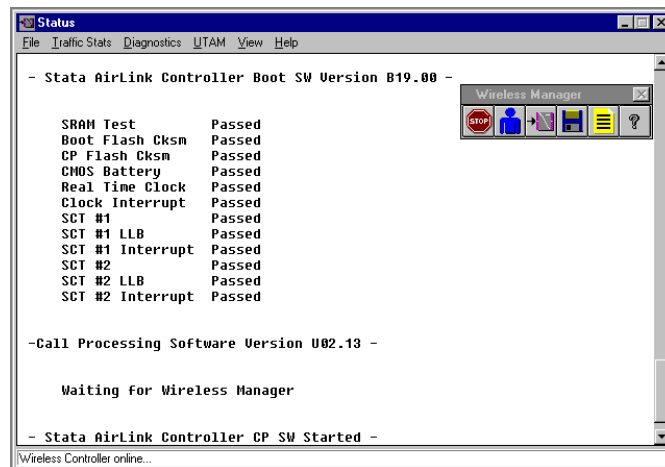

```
Status                                           _ ⊡ ⊠
File  Traffic Stats  Diagnostics  UTAM  View  Help

- Stata AirLink Controller Boot SW Version B19.00 -
                                        Wireless Manager    ⊠

    SRAM Test          Passed           STOP
    Boot Flash Cksm    Passed
    CP Flash Cksm      Passed
    CMOS Battery       Passed
    Real Time Clock    Passed
    Clock Interrupt    Passed
    SCT #1             Passed
    SCT #1 LLB         Passed
    SCT #1 Interrupt   Passed
    SCT #2             Passed
    SCT #2 LLB         Passed
    SCT #2 Interrupt   Passed


-Call Processing Software Version U02.13 -

    Waiting for Wireless Manager

- Stata AirLink Controller CP SW Started -
Wireless Controller online...
```
3491

Important! *If the message "Waiting for Wireless Manager" does not appear in the Status window before the progress bar times out, or LED S2 remains lit after a reboot, the BSIA has not been upgraded. Repeat Substeps 1~12.*

Replacing Defective Handsets

1. Go to the Configure Window.

2. Pull down the Select Database menu and click User Database.
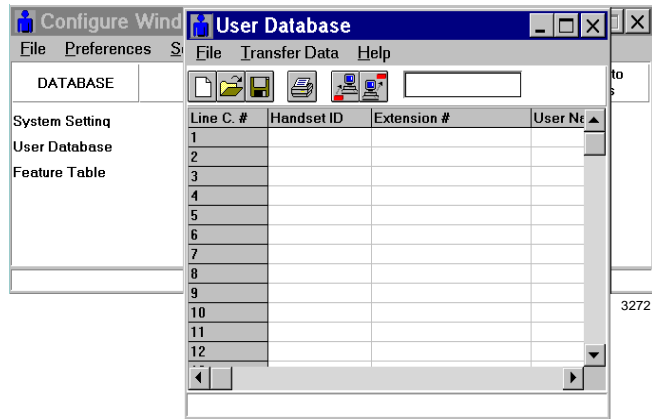
3. From the User Database toolbar, click Get.

   Current information displays.

4. Highlight the handset ID to be replaced and delete the ID.

5. From the User Database toolbar, click Send.

   Strata AirLink Manager prompts for confirmation.

6. Click OK.

   The new data is uploaded.

7. Input the original handset ID.

   Important! *Enter the new SID and HID in the handset by accessing System Configuration (* **10** *+* **FCN** *).*

8. From the User Database toolbar, click Send.

   Strata AirLink Manager prompts for confirmation.

9. Click OK.

   The data is uploaded.

10. Go off-hook and press **CALL**.

    New ESN is locked into the BSIA.

Log Files

The Strata AirLink Manager creates log files that open in any text editor for viewing. If the log file has blank lines when opened, Strata AirLink Manager is running in the background. Close the software and re-open the log file.

Communication errors (PDQ Comm) occur in the log file when the BSIA is powered on. This has no effect on performance.

If the log file has information about the boot software instead of the Base Station software after an upgrade or when querying the software, try querying the BSIA software version before querying the Base Station software.

Error Messages

There are several error messages that can occur during the initial configuration process and data uploads. Most are self-explanatory. A brief description of each is in Tables 16-31 and 16-32.

Table 16-31   System/Base Station ID Troubleshooting
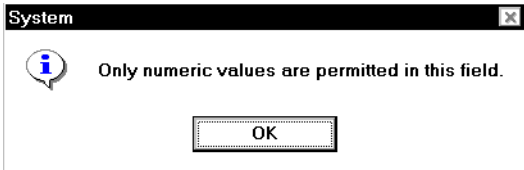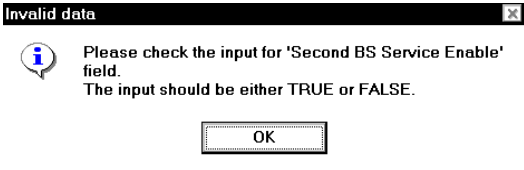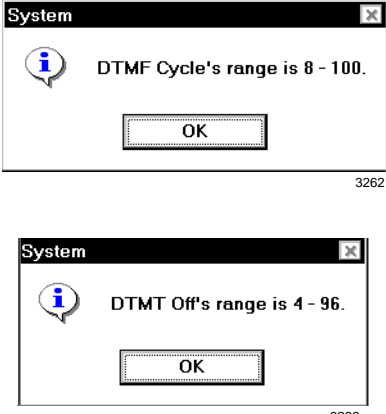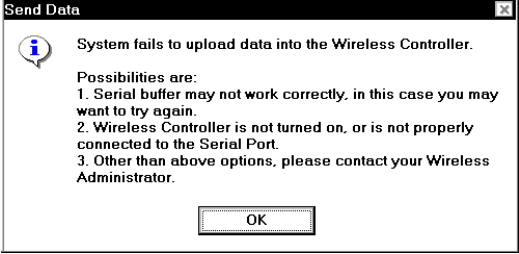
Error Message	Possible Solution
When alpha characters are input instead of numeric characters, this displays: **System** ⓘ Only numeric values are permitted in this field. OK 3269	Click OK and input numeric values.
When adding a Base Station and a word was entered that Strata AirLink Manager does not recognize in the Second Base Station Service Enable field, the following displays: **Invalid data** ⓘ Please check the input for 'Second BS Service Enable' field. The input should be either TRUE or FALSE. OK 3278	Click OK and input TRUE or FALSE.
If incorrect DTMF cycle duration ranges have been input, these display: **System** ⓘ DTMF Cycle's range is 8 – 100. OK 3262 **System** ⓘ DTMT Off's range is 4 – 96. OK 3263	Click OK and enter the proper number.

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Table 16-32   BSIA Troubleshooting

Error Message	Possible Solution
When uploading data, if this error message displays: *[Send Data dialog box: "System fails to upload data into the Wireless Controller. Possibilities are: 1. Serial buffer may not work correctly, in this case you may want to try again. 2. Wireless Controller is not turned on, or is not properly connected to the Serial Port. 3. Other than above options, please contact your Wireless Administrator." OK]* 3283	Check the serial port and try again. If it still fails, contact the System Administrator.
If these error messages display during UTAM activation or a software upgrade: • BSIA off-line • System did not boot • Critical alarm #48	Reset the BSIA immediately to clear all errors and try again.
If this error message: "Corrupt Msg from BSIA. Msg length = 31. Pls try again" or "ALM #200. Invalid msg during Base Station sw upgrade" displays	Try the upgrade again.
If the Strata AirLink Manager loses its communication link with the BSIA	Restart the software to re-establish the connection.

RWIU System

LEDs

There are two LEDs for each Base Station jack on the WWIS, and two on the RWIU for the external power jack and system. The Base Station LEDs are for the transmit and receive sides of the Base Stations.

If the LEDs are OFF, they are linked and working. If they are ON, there could be a problem with the cabling or battery. The power LED should be on and the system LED should be blinking. This means that the system is properly linked and working.

If any Base Station is not used, its jumper on DIP switch S1 should be off. If S1 is on, the two LEDs will remain lit and the RWIU will try to initialize that Base Station every 40 seconds.

Replacing a Defective Handset

1. From the Desktop toolbar, click the Config icon.

[Wireless Manager window with Config, Status, UTAM Activation, Software Upgrade, ?, Exit. Menu showing General Settings..., User Database...]
3348
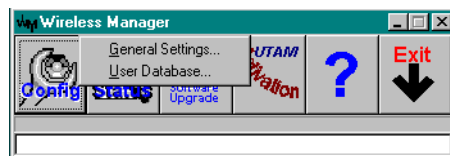
2. Click General Settings.

3. Get current handset IDs.

4149
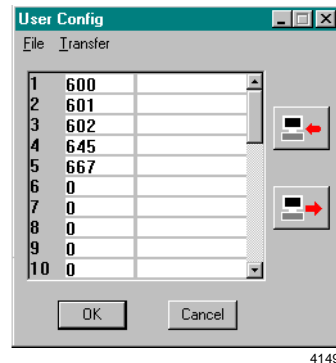
4. Highlight the defective handset ID and press Del.

5. Input the new handset ID.

6. Click OK.

7. Go off-hook and press **CALL**.

New ESN is locked to the RWIU.

Measuring DC Resistance

1. Use a digital multimeter that has resistance measuring capability in ohms and a basic accuracy of better than one percent.

2. Use an RJ-11 female-to-female line adapter.

3. Ensure that all permanent wiring is done and all primary protectors are installed, if required. For information on primary protection requirements for UL1459 compliance in the United States, see "Primary and Secondary Protectors" on Page 16-91.

4. Disconnect the RWIU from power.

5. Disconnect the cables from Base Station 1, 2, 3, and 4.

6. Disconnect the transmit and receive cables from the Base Station and connect them into each end of the RJ-11 line adapter, creating a loop.

7. Set the multimeter to the ohms scale.

8. To check the distance to Base Station 1, connect the multimeter probes between pins 1 and 5 or 1 and 6, depending on the cable polarity.

9. Connect the probes between 2 and 5 or 2 and 6.

Note A reading should register at only one of the pairs and must be less than the values listed in Table 16-33.

Strata AirLink Systems

Table 16-33   Cable DC Resistance

Input Power	Wire Gauge	Maximum DC Resistance Allowed for 2,000 feet
Line	22, 24, or mixed 22/24	98 ohms
Local	22	66 ohms
	24	104 ohms

10. Repeat Steps 1~9 to check all the Base Stations.

11. If the multimeter reports no reading or high resistance, check the readings again.

    If the readings are correct after performing Step 9, the transmit and receive pairs are probably reversed or shorted somewhere in the installation. If not, there are open connections somewhere in the installation; check and correct all punch-down connections and repeat Steps 1~9.

Base Station Specifications

The following tables list the Base Station and power supply specifications for both wireless systems.

Table 16-34   Base Station

Item	Description
Dimension	13.25 x 13.25 x 2.5 inches
Weight	4 lbs., 11.5 oz.
Temperatures	Operating: 0°~40°C Storage: -10°~70°C
Channels	8 duplex, 1 control
Antennas	4
Antenna Gain	4 dBi maximum, 3 dBi typical
Mount	Ceiling or wall
Wiring Distances from BSIA/RWIU	Line Power: 1,186 ft. (24 AWG) 2,985 ft. (22 AWG) Local Power: 3,280 ft. (22 and 24 AWG)
Modulation	π/4 differential (QPSK)
Gross Bit Rate	384 kbs (QPSK)
Access Method	FDMA/TDMA/TDD

Table 16-34   Base Station *(continued)*

Item	Description
Power Requirements	Peak Transmission: 80 milliwatts Average Transmission: 40 milliwatts From PBX: 6.5~13 watts For remote power: 13 watts at 2,300 feet Input: -48VDC line power; +5.2VDC local power Consumption: 11.5 watts (-48VDC) from the PBX
Miscellaneous	Line powered, local power option, voice scrambling.

Table 16-35   Base Station Power Supply (Local Power Option Only)

Name	Description
Dimensions	5 x 3 x 2.25 inches
Weight	15.5 oz. without cable
Mount	Desktop
Power	Input: 115/230VAC 0.6/0.3 amps (50/60 Hz) Output: 5.2V at 2.5 amps (20 watts maximum)
Temperatures	Operating: 10°~40°C Storage: 0°~50°C

Handset Specifications

Table 16-36   Handset

Name	Description
Dimension	6.125 x 2.25 x 1.125 inches
Weight	6.4 oz. with battery
Transmission	Peak: 80 milliwatts Average: 5 milliwatts
Antenna	1 internal
Antenna Gain	3 dBi maximum, 2 dBi typical
Modulation	$\pi/4$ (QPSK)
Temperatures	Operating: 0°~40°C Storage: 0°~50°C (without battery) -10°~70°C (with battery)
Ringer	Types: 8 Volumes: 3, plus mute
LCD	2 lines and 9 characters

Grounding Requirements

Table 16-37 provides the recommended gauges for the distances between the system and the master ground bus of the office telephone system. The proper gauge wire ensures that DC resistance does not exceed 0.25 ohms.

Table 16-37   Ground Wire Requirements

StrataAirLink:Distance Between BSIA/RWIU & Ground	Recommended Gauge
0~18 feet	16 AWG
0~30 feet	14 AWG
0~46 feet	12 AWG
0~73 feet	10 AWG
0~113 feet	8 AWG

FCC

The Strata AirLink wireless telephone system operates under the FCC Part 15 rules for Unlicensed Personal Communications Service (UPCS) equipment in the 1920~1930 MHz band.

Note   Part 15 ID numbers for the Base Station (BS) and handset are BS-CJ6DT-WRLS-BS-01 and HS-CJ6DT-WRLS-HS-01, respectively. The system complies with UL1459 for safety, and the compliance ID is C86-0345.

Part 68

The Strata AirLink Wireless telephone system complies with Part 68 of FCC rules. Product labels contain, along with other information, the FCC registration number. This information must be provided to the telephone company if they request it.

Note   The FCC Part 68 registration number is 5RYISR-23723-WC-T, and the Ringer Equivalence Number (REN) is 0.6B.

An FCC-compliant telephone cord with modular plug is provided with the system hardware. This equipment is designed for telephone networks or premises wiring using a compatible modular jack that is Part 68 compliant.

If the wireless equipment causes harm to the telephone network, the telephone company will give advance notification. If advance notice is not practical, the telephone company will give notification as soon as possible. Along with the notification, the telephone company will advise of the right to file a complaint with the FCC, if necessary.

To report trouble with the wireless equipment, please contact Toshiba America Information Systems, Inc., Telecommunications Systems Divisions in Irvine, CA, (949) 583-3700 for repair and/or warranty information. If the trouble is causing harm to the public telephone network, the telephone company can request that the wireless equipment be removed from the network until the problem is resolved.

Important!   *Repairs must be made by an authorized representative or the warranty is void.*

Do not install the wireless equipment on public coin service provided by the telephone company. Connection to party line service is subject to state tariffs. Contact the state public utilities commission for information.

It is recommended that an AC surge arrestor be installed in the AC outlet to which the wireless system is connected. This prevents damage to the equipment caused by local lightning strikes and other electrical surges.

The wireless system provides access to interstate providers of operator services through the use of equal access codes. Modifications by aggregators to alter these capabilities is a violation of the telephone operator consumer services improvement act of 1990 and Part 68 of the FCC Rules.

Part 15

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with this chapter of the *Strata DK Installation and Maintenance Manual*, it can cause harmful interference to radio communications.

Important!

- Changes or modifications not expressly approved by Toshiba America Information Systems, Inc. can void the authority to operate the equipment.

- The 25-pair cable that connects the BSIA to an MDF must be shielded to meet FCC emissions limits under Part 15 Class A.

UTAM, Inc.

The Strata AirLink system operates in the 1920~1930MHz band, and microwave services are also offered in this band. The FCC has designated UTAM, Inc. to coordinate the transition of microwave services to other frequency bands and the installation of new UPCS equipment, which includes the wireless system, until all microwave users are cleared from the band.

Each device requesting FCC certification must have an affidavit from UTAM stating that the device meets the requirements of Rules 15.307(d), (e), and (h), regarding UTAM location verification and disablement. The basic mandatory requirements are:

♦ The handset must not transmit when it is not within the coverage area of any system Base Station.

♦ A Base Station must not begin operation until it is UTAM confirmed and attached to a permanent structure such as a building so that it cannot be easily relocated.

♦ If the system is removed from its original installed location and re-installed at another location, the system must not begin operation until the new location is UTAM confirmed.

The Frequency Coordination Service Request (sample on Page 16-90) must be completed and sent to UTAM before activation of the system. Contact the Strata AirLink Desk at (949) 598-4980 for more information between the hours of 8:00 a.m. and 5:00 p.m. (Pacific Standard Time), Monday through Friday. Voice mail is available for messages after hours.

UTAM FREQUENCY COORDINATION SERVICE REQUEST

Part 1 - Installation Status	
Type of Request (circle one): New-Permanent/New-Temporary/Reiteration/Removal/Relocation	
Installation Date:	
If Temporary, Proposed Activation Date:	Removal Date:

Part 2 - Dealer Information	
Dealer Name:	Telephone:
Dealer Contact:	Fax:

Part 3 - Site Information	
Customer Name:	County of Installation:
Street:	Customer Contact:
City:	Customer Contact Telephone:
State:	Zip:	Customer Contact Fax:

Part 4 - Equipment Information	No. of BSIA Controllers:
No. of Base Stations (antennas) Inside:	Outside:	No. of Handsets:
Max. Height (inch/feet) and/or Floor of Base Stations Inside:	Outside:

DO NOT WRITE BELOW THIS POINT

Part 5 - System Information		
UTAM ID: BSIA CJ6CCLMU00022	Base Station: CJ6DT-WRLS-BS-01	Handset: CJ6DT-WRLS-HS-01
Band: Isochronous	Power/Device (mW) - Fixed: 40mW	Mobile: 5mW
Building Loss: Unknown	Max. Horizontal Distance: 2,000 ft. (default)	
Latitude:	Longitude:	
Zone 1 or Zone 2:	FIPS No.:	
PFC ID (if not a new site)	UTAM Site ID:	

Part 6 - Approvals	
Jeff Parkin	Telephone: (949) 598-4980
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Title: Primary Frequency Coordinator	Date:
UTAM Member Contact (if different from above): Paul Keith	

Underwriters Laboratories (UL)

To ensure that installations are fully protected from fire hazards, UL1459 specifies primary and secondary protectors for circuits that interconnect to the telephone network or cables that exit/enter buildings.

Primary and Secondary Protectors

Protectors replace bridge clips when installed across two horizontal 66-block terminals. When using 66-50 connector blocks, it is recommended that protector ITW Linx SCP-9 be used as the secondary protector and out-of-building primary protector. It provides overvoltage protection of 600VAC or DC, overcurrent protection of 350 mA, and installs in series with the telephone loop.

Line circuits do not require protectors unless the circuit is cross-connected to out-of-building circuits. In this case, it is recommended that ONEAC 6-AP200 protectors are used. This is a single, block-mounted protector that provides both primary and secondary protection for out-of-building, single-line circuits.

System Line Circuit Requirements

Line circuits do not require protectors unless the circuit is cross-connected to out-of-building circuits. Out-of-building circuits require primary/secondary protectors, and it is recommended that the ONEAC 6-AP200 be used. This is a single, block-mounted protector that provides both primary and secondary protection for out-of-building, single-line circuits that are terminated to a system.
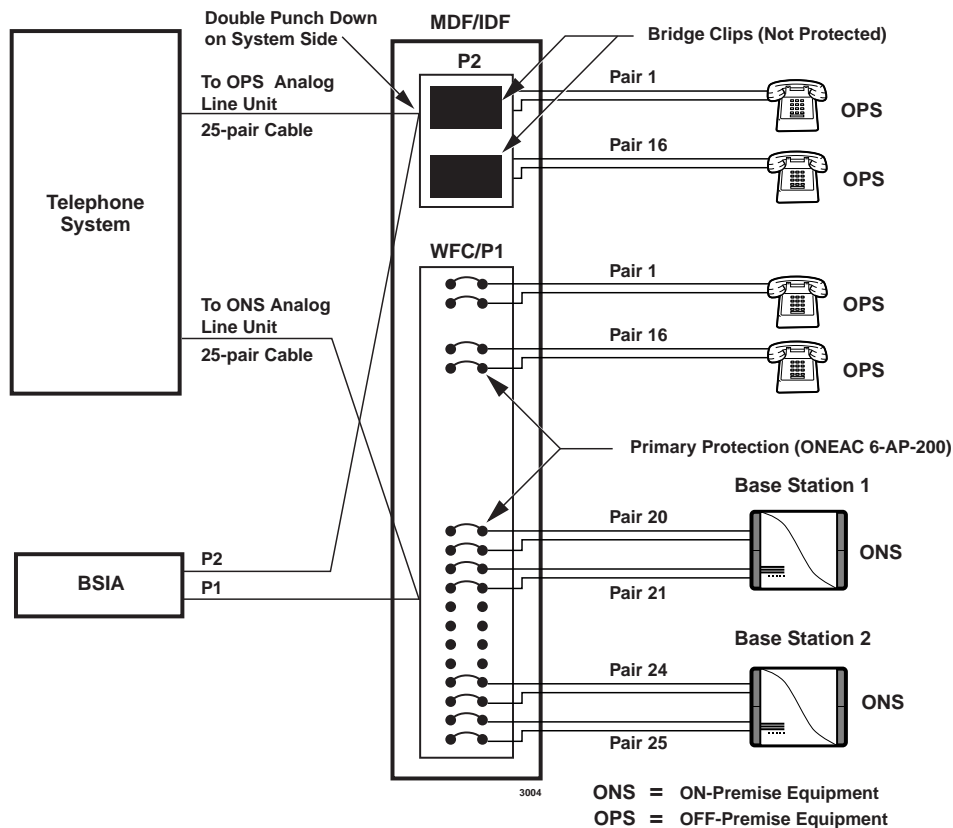
Figure 16-32   Primary and Secondary Protectors

Glossary

Term	Definition
AA	Auto Attendant (built-in or external). This feature acts as an automatic operator that directs incoming callers to stations by offering a menu of dialing prompts.
ACD	Automatic Call Distribution. Allows incoming calls to be distributed to a group of ACD agents. The ACD supervisor's LCD telephone displays ACD Agent and Group information which allows the supervisor to monitor calls and assist agents.
ACD/MIS	Automatic Call Distribution (ACD) with Management Information System (MIS).
ADM	Add-on Module—*See DADM.*
Amphenol Connector	A 25-pair connector typically used on a multi-button telephone set for interfacing cables to many electronic key and PBX systems.
ANI	Automatic Number Identification—Telephone number of the calling party is sent to the Strata DK system over incoming DID or tie lines. This feature is provided by some long distance telephone service companies.
B-channel	Used in ISDN. Data or voice information is transmitted on the B-channels of an ISDN line at 64kpbs. The B-channel refers to the frequency range of transmissions on a copper pair; it is a logical, rather than a physical channel. Also see BRI and PRI.
B8ZS	Bipolar 8 Zero Substitution.
BGM	Background Music—Allows customer-supplied music to be sent to telephone speakers and external speakers.
bps	Bits Per Second—Unit of measure that refers to the transmission speed (baud rate) of electronic signals. It is used when describing data interface unit and modem operation.
BRI	Basic Rate Interface—ISDN line with 2B + 1D channel. BRI lines can have a U-interface with RJ-11 jacks and single twisted pair wiring, or RJ-45 four pair S/T interface wiring.
CAMA	Centralized Automatic Message Accounting. A special trunk provided by the phone company or the E911 Public Safety Answering Point Agency.
CESID	Caller's Emergency Service Identification—Telephone number for specific station or station location which is sent to the CAMA trunk.

Glossary

Term	Definition
CCVY	Call Center Viewer "Y" Connector—Enables two-way transmissions between the Strata DK and a host PC, or SMIS equipment, and one-way transmissions to other PCs. There are four ports on the Call Center Viewer Connector for one Strata DK, another master port, and two additional ports.
CLASS	Custom Local Area Signaling Services—Defines a number of features offered by local telephone companies.
CLID or CND	Calling Line Identification or Calling Number Delivery—Telephone number or name of the calling party sent to the Strata DK system over incoming ground or loop start CO lines. This feature is one of the "CLASS" features offered by some local telephone companies.
CO	Central Office—The facility which houses switching equipment that provides telephone service (CO lines, E & M tie lines, DID lines, Centrex lines, etc.) for the immediate geographical area.
CO Line	A term used to define the Strata DK system hardware circuits that connect to the Central Office network line pair. Each CO line, DID and tie line circuit is assigned a CO line number in system software.
CODECs	Coder/Decoder—Semiconductors that allow the system to process analog-to-digital and digital-to-analog conversions.
DADM	Digital Add-on-Module—Optional device that connects to 2000-series digital telephones to provide the telephones with 20 flexible feature buttons that can be assigned individually for Direct Station Selection, System and Personal Speed Dial, and CO line access.
D-channel	Used in ISDN. This channel transmits call control information (out-of-band signaling) for B-channels. The D-channel is a logical, not a physical channel.
DDCB	Digital Door Phone/Lock Control Unit—A peripheral hardware unit compatible with designated digital telephone circuits that supports optional door phones (MDFBs) and provides door lock control.
DDSS	Digital Direct Station Selection Console—A device that helps facilitate the processing of a heavy load of incoming calls. The DDSS connects only to designated digital telephone circuits, and is associated with a digital telephone.
DIL	Direct In Line—Refers to two-way, standard CO trunk lines that are assigned to a particular extension or hunt group.
DID Line	Direct Inward Dialing line.
DISA	Direct Inward System Access—A feature that allows an outside party to access the Strata DK system internal stations or outgoing CO lines without having to go through an operator or automated attendant. An optional security code may be set to prevent unauthorized access to outgoing CO lines for through system calling.
DK	Digital Key.

Term	Definition
DKAdmin	Toshiba's customer database programming and upload/download software package for Strata DK systems.
DKBackup	Toshiba's customer database upload/download software package for Strata DK systems.
DKT	Digital Telephone.
DKT2000 series	Toshiba proprietary digital telephones consisting of four models: two 10-button models with handsfree answerback and/or LCD display and two 20 button telephones with speakerphone or a speakerphone with LCD display.
DKSU14A	Strata DK14 Key Service Unit (KSU) with power supply. Equipped with two loop start CO line circuits and four digital telephone circuits built-in. Includes external page interface, MOH/BGM interface, power failure transfer and miscellaneous relay control.
DKSUB280 or DKSUB424	Base Cabinet—Unit that houses the Common Control Unit (RCTU), as well as six universal slots for station, line, and option PCBs. The Base Cabinet also contains a power supply that provides power for all of the stations and peripherals connected to the base cabinet PCBs.
DKSUE280 or DKSUE424	Expansion Cabinet—Optional unit that has six universal slots for station, line, and option PCBs. The expansion cabinet has a power supply that furnishes power for all of the stations and peripherals connected to the expansion cabinet PCBs. As many as five expansion cabinets can be added to the system.
DKSUB40i	Strata DK40i Base Key Service Unit (KSU) with power supply and battery charger. Equipped with eight digital telephone circuits built-in, and no CO line circuits. Includes external page interface, MOH/BGM interface, power failure transfer and miscellaneous relay control.
[DN]	Directory Number.
DNIS	Dialed Number Identification Service—Telephone number of called party is sent to the Strata DK over incoming DID or tie lines. This feature is provided by some long distance telephone companies.
DPFT	Power Failure/Emergency Transfer Unit—An optional backup unit that provides emergency service during power failures by automatically connecting up to eight standard telephones to designated CO lines.
DSS	Direct Station Selection—Feature which allows a telephone user (as well as a DSS console and ADM user) to call another station with the touch of a flexible feature button.
DTMF	Dual-tone Multi-frequency—Push-button tone dialing.
DVSU	A subassembly that equips a digital telephone with the capability to receive Speaker Off-hook Call Announce (OCA) calls. DVSU is not required to receive Handset OCA (HS-OCA).

Glossary

Term	Definition
E911	Enhanced 911 operation that provides more complete locator information to the responding agency.
EKT	Electronic Telephone.
ESF	Extended Super Frame.
EOCU	Off-hook Call Announce Subassembly—An optional upgrade to the Electronic Telephone Interface Unit (PEKU) or Electronic Telephone/Standard Telephone Interface Unit (PESU) that enables properly configured telephones (see HVSU2) to receive Off-hook Call Announce (OCA) calls.
FCC	Federal Communications Commission—The federal agency which regulates the telecommunication industry. All Toshiba hardware is FCC listed or approved.
HDCB	Electronic Door Phone/Lock Control Unit—A peripheral hardware unit compatible with designated electronic telephone circuits that supports optional door phones (MDFBs) and provides door lock control.
HDSS	Electronic Direct Station Selection Console—A device that helps facilitate the processing of a heavy load of incoming calls. The HDSS console connects only to designated electronic telephone circuits, and is associated with electronic telephones.
HESB	External Speaker Box—A speaker/amplifier that can be configured with the system to provide a variety of functions, such as a paging speaker and/or Background Music (BGM) speaker.
HESC-65A	A cable used to connect an HHEU-equipped digital telephone or an HHEU-equipped electronic telephone to the external speaker box (HESB) for the Loud Ringing Bell feature.
HHEU	Headset/Loud Ringing Bell Interface—Subassembly that fits inside a digital telephone or a 6500-series electronic telephone to allow a headset or an external speaker box (HESB) to be connected to the telephone.
HPFB	Optional Reserve Power Battery Charger (DK14)—One or two can be connected to the power supply to maintain normal operation during a power failure.
HVSU2	Subassembly that fits into a 6500-series electronic telephone enabling it to receive Off-hook Call Announce (OCA) calls. The telephone must be connected to an Electronic Telephone Interface Unit (PEKU) or a Standard Telephone/Electronic Telephone Interface Unit (PESU) equipped with an Off-hook Call Announce Subassembly (EOCU) to receive OCA, and must have three-pair wiring.
IMDU	Remote Maintenance Modem Subassembly—A subassembly installed on an Option Interface Unit (PIOU or PIOUS) that allows the system to be connected with a remote administration/maintenance terminal or DK Admin/DK Backup personal computer.
ISDN	Integrated Services Digital Network.

Term	Definition
K4RCU, K5RCU	Dual-Tone Multi-Frequency (DTMF) Receiver/ABR Tone Detector Unit—An optional PCB installed on the TMAU motherboard. The K4RCU3A, K5RCU1A or K5RCU2A must be installed to recognize Dual-Tone Multi-Frequency (DTMF) tones generated by a standard telephone (or any other device connected to a standard telephone circuit) and it is required for Direct Inward System Access (DISA) and DID. The K4RCU and K5RCU circuits are also used to detect busy tone for the Automatic Busy Redial (ABR) feature and must be installed to allow ABR to operate. K4RCU has four DTMF receivers and four ABR busy tone detectors; K5RCU1A and 2A have five DTMF receivers and four ABR detectors.
KCDU	CO Line/Digital Telephone Interface Unit (DK40)—The KCDU has two loop start CO line circuits and four digital telephone circuits. The KCDU digital telephone circuits can support all but one of the devices supported by either the PDKU or Base Unit integrated digital telephone circuits: digital telephones, PDIU-DIs/PDIU-D12s, PDIU-DSs, ADMs, DDCBs and RPCIs.
KKYS	Modular add-on key or integrated circuit that installs onto the K4RCU3 to add the auto attendant feature to the DK40.
KSTU2	The optional PCB provides four standard telephone circuits and it can only be installed in the base unit. The KSTU2 supports the two-wire devices such as standard telephones, Auto Attendant devices, voice mail machines, and facsimile machines. The KSTU2 can also support an alternate Background Music (BGM) source on circuit four.
LATA	Local Access and Transport Area.
LCD	Liquid Crystal Display—The optional display on digital and electronic telephones that displays calling information.
LCR	Least Cost Routing.
LDI	Long Distance Information.
LED	Light Emitting Diode—Status indicators located on printed circuit boards (PCBs), digital telephones, and electronic telephones.
LSI	Large Scale Integration—Related to circuit design technology. Strata DK system printed circuit boards (PCBs) use LSI circuit design.
MDF	Main Distribution Frame—The wiring frame usually located in a phone closet.
MDFB	Door Phone Box—A peripheral two-way speaker box option.
MOH	Music-on-Hold—Customer-supplied music or announcements can be sent to parties on-hold on CO lines or the intercom.
NDTU	Toshiba 30-foot cable that connects the RDTU to the KSU.
NT-1	Used in ISDN. Network Termination device that powers a U-interface ISDN line and enables multiple S/T ISDN devices to connect to it. The NT-1 must be UL-listed (U.S.) or CSA-certified (Canada).

Glossary

Term	Definition
OCA	Off-hook Call Announce. There are two types: Handset OCA and Speaker OCA.
OPS	Off-premises Station.
PBTC	A Toshiba-supplied cable used to connect customer-supplied batteries to a cabinet power supply in a one- or two-cabinet system for emergency reserve power for the entire system.
PBX	Private Branch Exchange—Industry-standard term which refers to a telephone switch, usually on-premises, which serves an individual company, and is connected to a public telephone exchange through the Central Office (CO).
PCB	Printed Circuit Board.
PCM	Pulse Code Modulation—A widely-used form of digital telephone switching.
PCOU	CO Line Interface Unit—An optional PCB (an older version of RCOU) that provides the system with four loop start CO lines. Supports Caller ID when used with RCIU/RCIS circuits.
PDIU-DI2	Integrated Data Interface Unit—Replaces the normal digital telephone base so that the telephone can be used for the transmission and reception of data between a terminal/personal computer connected to the telephone and devices connected to other PDIU-DIs or to modems, printers, and computers which are in turn connected to PDIU-DSs. The PDIU-DI is also used to provide personal computer auto dialing of voice calls without a modem; and, access to outside dial-up data services and/or bulletin boards via modem pooling. **Note** *Replaced by RPCI-DI.*
PDIU-DS	Stand-alone Data Interface Unit—Used for modem pooling, printer sharing, and accessing host/mainframe computer.
PDKU2	Digital Telephone Interface Unit—An optional PCB that provides the system with eight digital telephone circuits. In addition to digital telephones, the PDKU can support data interface units (stand-alone and integrated), a digital DSS console (DDSS), RPCI, ADM, and a digital door phone/lock control unit (DDCB).
[PDN]	Primary Directory Number.
PEKU	Electronic Telephone Interface Unit—An optional PCB that provides the system with eight electronic telephone circuits, which can support electronic telephones, a Background Music source, a door phone/lock control unit (HDCB), an electronic DSS console (HDSS), and amplifiers for two CO-line conference calls. The PEKU is also used with older Strata systems.
PEMU	E & M Tie Line Unit—An optional PCB (an older version of REMU) that provides the system with support for four E & M Type I tie lines. The PEMU is also used with older Strata systems.
PEPU	External Page Interface Unit—An optional PCB that provides support and/or circuit interface mainly for optional hardware peripherals and upgrades associated with external paging functions.

Term	Definition
PESU	Standard/Electronic Telephone Interface Unit—An optional PCB that provides the system with a combination of two standard and four electronic telephone circuits. The standard telephone circuits can support standard telephones and optional hardware peripherals, such as voice mail devices and fax machines. Except for the electronic DSS console, the PESU electronic telephone circuits can support the same stations and peripherals that the PEKU does. The PESU is also used with older Strata systems.
[PhDN]	Phantom Directory Number.
PIOU	Option Interface Unit—An optional PCB that provides support and/or circuit interface for optional hardware peripherals and upgrades.
PIOUS	The same as the PIOU, with some exceptions; most notably, the PIOUS has one external paging interface zone, while the PIOU has four.
PORT	A term used to identify a station circuit or CO line circuit location.
PBTC1A-3M	Battery cable that connects reserve power batteries to cabinet RPSU280 power supplies (102 cabinet installations).
PPTC	A Toshiba-supplied adapter—An adapter that is used to connect: an SMDR device, ASCII maintenance terminal, or remote maintenance external modem.
PPTC	A Toshiba-supplied adapter—An adapter that is used to connect: the modular SMDR, SMDI, MIS for ACD, Open Architecture (OA), maintenance ports of the PIOU, PIOUS, RSSU, RSIU, or RSIS to the DB-9 (PPTC-9) connector of a call accounting machine, DK Admin, DK Backup personal computer (PC), SMIS personal computer or Open Architecture personal computer.
PPTC-9	Designed to connect directly to the DB9 connector of PC COM ports, while PPTC connects directly to an ASCII terminal female DB25, not a PC COM port male DB25.
PPTC-25F	Used to connect a Call Center Viewer PC or SMIS PC to the RS-232 Strata DK424 MIS port on the PIOU, PIOUS, RSIU, or RSSU.
PRI	Primary Rate Interface.
PSTU2	Standard Telephone Interface Unit—An optional PCB (an older version of RSTU2) with a built-in ring generator that provides interface for eight standard telephones or optional hardware peripherals (voice mail devices, Background Music source, fax machines, etc.). The PSTU2 has a square wave ring generator that can be set for 190V peak-to-peak or 130V peak-to-peak. The PSTU2 is also used with older Strata systems.
PSTN	Public Switched Telephone Network.
QCDU2	CO Line Digital Telephone Interface Unit (DK14)—Provides one CO line (loop start) circuit and two digital telephone circuits on each PCB. The QCDU2 interfaces with digital telephones, PDIU-DIs/PDIU-DI2s/RPCI-DI, ADMs connected to the telephones and PDIU-DSs, but does not support a DDSS or DDCB console.

Glossary

Term	Definition
QKYS	Auto Attendant Feature Key (DK14)—Provides built-in Auto Attendant software without Program 03 assignments and installs directly onto the QRCU3 PCB.
QSTU2	Standard Telephone Interface Unit (DK14)—Provides two standard telephone circuits (ports) and interfaces with standard telephones, Auto Attendant devices, separate BGM source connections, voice mail machines, and facsimile machines.
QRCU2	DTMF Receiver/ABR Tone Detector Unit (DK14)—Provides three circuits to receive DTMF tones (required for DISA and devices connected to QSTU2s), and three circuits to detect busy tone (required for the ABR feature).
RAM	Random Access Memory—Refers to the type of system memory that holds individual system configuration and feature programming. RAM is read/write memory, and can be easily revised in programming.
RATU	Attendant Console Interface Unit—Optional PCB that can support up to four attendant consoles and/or PC attendant consoles.
RBDB	Battery Distribution Box—Interface used to connect reserve power batteries to systems with three or more cabinets (also provides six RBTC1A-1.5M cables to connect RBDB to cabinet RPSU280 power supplies).
RBSU	ISDN Basic Rate Interface (BRI) Unit—Provides two circuits, each of which provide two simultaneous voice and/or data connections with a single interface. BRI uses the 2B+D transmission format which is defined as two 64-kbps bearer channels and one 16-kbps data (control channel). Available for DK424 with Release 4.1.
RBSS	ISDN Basic Rate Interface (BRI) Subassembly—Attaches to the RBSU to provide two additional BRI "U" circuits that can be used to connect to Network BRI lines and/or station-side connections only. Available for DK424 with Release 4.1.
RBTC1A-2M	Battery cable that connects reserve power batteries to RBDB battery distribution box (3 or more cabinet installations).
RBUU	ISDN Basic Rate Interface (BRI) Unit—Provides two BRI "U" circuits. Each circuit provides two simultaneous voice and/or data connections with a single interface. BRI uses the 2B+D transmission format which is defined as two 64-kbps bearer channels and one 16-kbps data (control) channel. Available for DK424 with Release 4.2.
RBUS	ISDN Basic Rate Interface (BRI) Subassembly—Attaches to the RBUU to provide two additional BRI "U" circuits that can be used to connect to Network BRI lines and/or station-side connections only. An RBUU with the RBUS subassembly provides four BRI "U" circuits in one card slot. Available for DK424 with Release 4.2.
RCMS	Enhanced 911 (E911) CAMA Trunk Direct Subassembly—Enables the DK424 (Release 4.0 and above) to connect to one or two CAMA trunks. Two RCMS PCBs enable connection to four CAMA trunks.

Term	Definition
RMCU	Enhanced 911 (E911) CAMA Trunk Direct Interface—Enables connection from the DK424 (Release 4.0 and above) to E911 locator services without third-party equipment. The RMCU supports two subassemblies (RCMS) that provide a total of up to four ports.
RCCB	Conduit Connection Box—Device required for floor-mounted systems with three or more cabinets to connect AC power and reserve power battery cabling to the system. Cabling from the AC power source and from the reserve power battery source can only be installed by a licensed electrician.
RCIU2/RCIS	Four-circuit plug-in PCB/four-circuit piggy-back PCB, each of which receives and decodes FSK Caller ID (CLID or CND) information from the Central Office ground or loops Caller ID lines. Each RCIU/RCIS circuit works in conjunction with a DK424 RGLU/RCOU/RCOS line PCB circuit.
RCOS	Loop Start CO Line Interface Subassembly—Optional subassembly that attaches to the RCOU PCB to provide four additional CO analog line circuits to the PCB. Supports Caller ID when used with RCIU/RCIS circuits.
RCOU	CO Line Interface Unit—An optional PCB that provides the system with four loop start CO lines. An optional RCOS subassembly can be attached to the RCOU for four more loop start analog CO lines. Supports Caller ID when used with RCIU/RCIS circuits.
RCTU	Common Control Unit—The system's controller PCB that contains the system's main microprocessor and microprocessor bus, ROM, RAM, time switch logic, busy tone detectors, system tones and MOH/BGM Interface. RCTUs include: RCTUA, RCTUB, RCTUBA/BB, RCTUC/D, and RCTUE/F. Each RCTU supports different station and line capacities. The RCTU PCBs also provide interface for the optional RRCS PCB and RKYS key.
RDDU	Direct Inward Dialing Interface Unit—Optional PCB that provides four analog Direct Inward Dialing line circuits. Supports ANI and DNIS.
RDSU	Digital/Standard Telephone Interface Unit—Optional PCB that provides two standard telephone and four digital telephone circuits in its basic configuration. An RSTS can be attached to the RDSU for two additional standard telephone circuits.
RDTU	T1/DS-1 Interface Unit—Optional PCB that provides up to 24-digital channels that can individually be assigned for loop start CO line, ground start CO line, E & M tie line, or DID line operation. Supports ANI and DNIS.
REMU	E & M Tie Line Unit—An optional PCB that provides the system with support for four E & M Type I or Type II, Immediate or Wink Start tie lines. Supports ANI and DNIS.
RFIF	Floor Mount Installation Kit—Kit that is used to floor mount systems.
RGLU	Analog Ground/Loop Start CO Line Interface Unit—Provides four CO line circuits that can be individually configured for loop start or ground start CO line operation. Supports Caller ID when used with RCIU/RCIS circuits.

Glossary

Term	Definition
RKYS	Feature Key Upgrade—Subassembly that attaches to the common control unit to provide the system with optional features. There are four versions of the RKYS: the RKYS1, the RKYS2, the RKYS3 and the RKYS4, each of which provides a distinct set of features.
RMDS	Remote Maintenance Modem Subassembly—A subassembly installed on the RSIU Optional Interface Unit that allows the system to be connected with a remote administration/maintenance terminal or DK Admin/DK Backup personal computer.
RPCI-DI	Computer Data Interface Unit—Replaces the normal telephone base and provides all the functions of PDIU-D12. In addition, it can be switched to a second mode automatically and used with a Telephone Application Program Interface (TAPI) software application.
RPTU	ISDN Primary Rate Interface (PRI) Unit—Provides 1 data (control) channel and 23 bearer channels.All B-channels appear and program as CO lines in the DK424 system and can be individually configured for local service, FX, WATS, DID, tie, etc., service operation. Supported by the RCTUBA3/BB4, RCTUC3/D4 and RCTUE3/F4.
ROM	Read Only Memory—Refers to the type of system memory that holds static software that comprises the mechanics of the features' functions. ROM is only revised by Toshiba software engineers.
RPSB (1 and 2)	Power Strip—Interface between cabinet power supplies and the commercial AC power source. The RPSB provides outlets for three power supplies. One RSPS is required for systems with three or four cabinets, two or three RSPSs for five- or six-cabinet systems.
RPSU280	Cabinet Power Supply—Furnishes power to all of the stations and peripherals connected to the cabinet PCBs. Each Base and optional expansion cabinet has a separate power supply.
RRCS	Dual-tone Multi-frequency Receiver—An optional upgrade to the system common control unit (RCTU) that provides Dual-tone Multi-Frequency (DTMF) receivers for system Direct Inward System Access (DISA) CO lines, E&M tie lines, DID, DNIS and ANI lines, Auto attendant announcement devices, remote change of call forward-external destination, DNIS external call routing, and stations and other peripherals that connect to standard telephone circuits. The RRCS comes in three models: the RRCS-4 (provides four DTMF receivers), the RRCS-8 (eight DTMF receivers), and the RRCS-12 (12 DTMF receivers).
RSIS	Optional RS-232 Serial Interface Unit—A subassembly installed on the RSIU optional interface unit that allows the system to be connected to any of the following features: voice mail SMDI, MIS for ACD, SMDR, local DK Admin/DK Backup personal computer, external maintenance modem, Open Architecture personal computer.

Term	Definition
RSIU	Optional RS-232 Serial Interface Unit—An optional PCB that provides interface to any of the following features: voice mail SMDI, MIS for ACD, SMDR, local or remote DK Admin/DK Backup Personal computer, built-in (RMDS) or external system maintenance modem, Open Architecture personal computer. By itself, the RSIU PCB provides one interface port. With up to three RSIU/RMDS subassemblies, it can provide up to four interface ports.
RSTU	Standard Telephone Interface Unit—An optional PCB (an older version of RSTU2) with a built-in ring generator that provides interface for eight-standard telephones or optional hardware peripherals (voice mail devices, Background music source, fax machines, etc.). The RSTU has a built-in 80V RMS sine wave ring generator. The RSTU also has connectors for the R48S, which extends station loop length and is described in this section.
RSTU2	Standard Telephone Interface Unit—An optional PCB functionally identical to the RSTU. RSTU2 also contains a 90-volt DC message waiting/generator/switching circuit to operate standard telephone message waiting lamps.
RWBF1	Wall bracket Fixture—Bracket that is part of an installation kit (RFIF) that is used to floor mount systems.
RFMF	Floor Mount Fixture—Fixture that is part of an installation kit (RFIF) that is used to floor mount systems.
R48S	Optional 48V Power Supply—Subassembly that can be connected to the RSTU or RDSU to extend the loop length of standard telephone circuits (including the resistance of the phone) from 600 ohms to 1200 ohms.
[SDN]	Secondary Directory Number.
SF	Super Frame.
SLT	Single-line Telephone.
SMDI	Simplified Message Desk Interface: RS-232 link from PIOU, PIOUS, RSSU, RSIS, or RSIU modular jack connected to a voice mail machine to provide Strata DK voice mail integration.
SMIS	Software MIS for ACD.
SSTU	Factory-installed sub-unit board that is "piggy-backed" onto the PSTU or PSTU2.
S/T Interface	Reference interface points ("S" or "T") of an ISDN network. S/T interfaces are RJ-45, 8-wire connection interfaces for ISDN equipment. An NT-1 is needed to network U-type BRI lines to S/T type interfaces.
TAPI	Telephone Application Programming Interface.
TA	Terminal Adapter or ISDN modem that converts PC and other types of protocol into a signal that works with ISDN. Generally, TAs support RJ-11 voice ports and RS-232C or V.35 or V.449 data interfaces.
T1/DS-1	*See RDTU.*

Glossary

Term	Definition
TCIU1	Caller ID—An optional PCB that provides the Caller ID option in the Strata DK424.
TCIU2	Caller ID—An optional PCB that provides the Caller ID option in the Strata DK40.
TCOU	Four-Circuit Loop Start CO Line Board— An optional PCB providing four loop start CO line circuits in the Strata DK40.
TDDU	Four-Circuit DID Line Digital Telephone Interface Unit— An optional PCB providing four DID line circuits in the Strata DK40.
TE	Terminal Equipment. This refers to devices using ISDN service (telephones, faxes, computers, etc.). TE1 supports ISDN formats with S/T or U-type intefaces.
TSPI	Telephony Service Provider Interface.
TSIU	RS-232 Ports—An optional PCB that provides up to two RS-232 interface ports (modular jacks) enabling the DK40 to connect to various hardware devices.
TTY	Flexible RS-232 port which can be used for maintenance SMDI and MIS (ACD).
U Interface	A single twisted pair of copper wire on an RJ-11 jack. The wiring is identical to POTS, with different signaling. Only one U-interface device can be attached per line.
universal slot	Slots in a telephone KSU/cabinet that are used for a variety of optional PCBs.
WSIU	Serial Interface Board (DK14)—Provides two serial ports for either a Station Message Detail Recording (SMDR) device or a maintenance terminal or modem, or Caller ID interface.

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