Meridian 1 X 11

Data Features

si-1

Meridian Data Services

Description

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Revision history

August **10, 1990**

Standard, release 1.0. Reissued for compliance with Northern Telecom standard 164.0.

December **31, 1992**

This document is reissued to include updates for X 11 release 18. Due to the extent of the changes, revision bars are ommited.

August 1, 1993

Standard. release 3.0. Reissued to include changes for X 11 release 19.

Contents

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General information

Meridian 1 data features are optional packages that are compatible with Xl 1 software. They provide integrated voice and data calls.

References

Refer to the following document for complete discussion of the data features as they apply to specific telephones.

- *Meridian I telephones description and specifications* (553-3001-108)

For complete details concerning specific Meridian data features, refer to the following documents.

- *Meridian Communications Adapter user guide*
- *Meridian 1 telephones description and specifications* (553-3001-108)
- *Meridian Programmable Data Adapter user guide*
- *QPC723 RS-232 Interface Line Card description, installation and operation* (553-2731-106)
- *QPC918 High Speed Data Card description, installation, and operation* (553-2731-108)
- *Enhanced Asynchronous Interface Line Unit description and installation* (553-2731-203)
- *XII features and services* (553-3001-305)
- *NT7D16 Data Access Card description and operation* (553-3001-191)
- *Multi-purpose Serial Data Link description* (553-3001-195)

For information regarding administration, and maintenance supported, refer to the specific documents as well as the following.

- *Meridian data features traffic engineering and configuration* (553-2731-151)
- ***Meridian aizta features operation and tests*** (553-2731-300)
- ***XII input/output guide*** (553-3001-400)

X11 release 18 and later introduce ISDN Basic Rate Interface (BRI). Refer to the following document for details concerning the features and capabilities available.

- ***ISDN Basic Rate Interface description*** (553-3901-100)
- *ZSDN Basic Rate Interface installation (553-3901-200)*
- *ZSDN Basic Rate Interface administration* (553-3901-300)
- *ZSDN Basic Rate Interface acceptance testing* (553-3901-330)
- *ZSDN Basic Rate Interface maintenance (553-3901-500)*

Introduction

Basic data call configuration

The Meridian Data Services features support a wide range of dial-up data communication activities. These applications fall into different basic categories based on equipment configuration. These categories are designated as follows:

- Local Terminal to Terminal activities involve in-house communication between intelligent terminals, display terminals and data entry devices. Word processor communication and conversational information exchange fall into this category (Figure 1).
- Terminal to Local Computer Port configurations support such applications as distributed data processing, time-shared computing and inquiry/response (Figure 2).
- Terminal to Remote Device applications involve the use of a modem pool to access analog lines for external data communications. The Meridian 1 permits external data calling on facilities also used for voice communications, such as WATS, FX and TIE lines (Figure 3).
- Remote Terminal to Local Device applications involve the use of an inbound modem pool for incoming calls to access local devices (terminals or computer ports). The Meridian 1 permits incoming data calling on facilities also used for voice communications, such as WATS, FX and TIE lines. (Figure 4).

Note: The use of Remote Peripheral Equipment (RPE) may also be used for remote terminals to local device operation. RPE extends the full The various data applications and hardware that may be connected to the Meridian 1 are shown in Figure 5.

The modem pool configuration provides internal data stations access to shared dial-up modems for outgoing trunk calls or remote terminals access to local computer ports over a voice grade network. An Add-on Data Module (ADM) connected to the modem provides the Data Directory Number (DDN) required for the receipt of incoming calls to the pooled modem.

Automated Modem Pooling

Meridian 1 offices that use Xl 1 release 5 provide the database to accommodate ADM Trunk Group and the optional Automated Modem Pooling (AMP) features. These features allow access to local or remote data stations using ADM/Modem pairs with a single-step dialing procedure and eliminate the need for separate inbound and outbound pools. AMP uses the Dataport Hunting feature to select the appropriate data set or dataport.

Figure 1
Terminal to Terminal Data Call Configuration

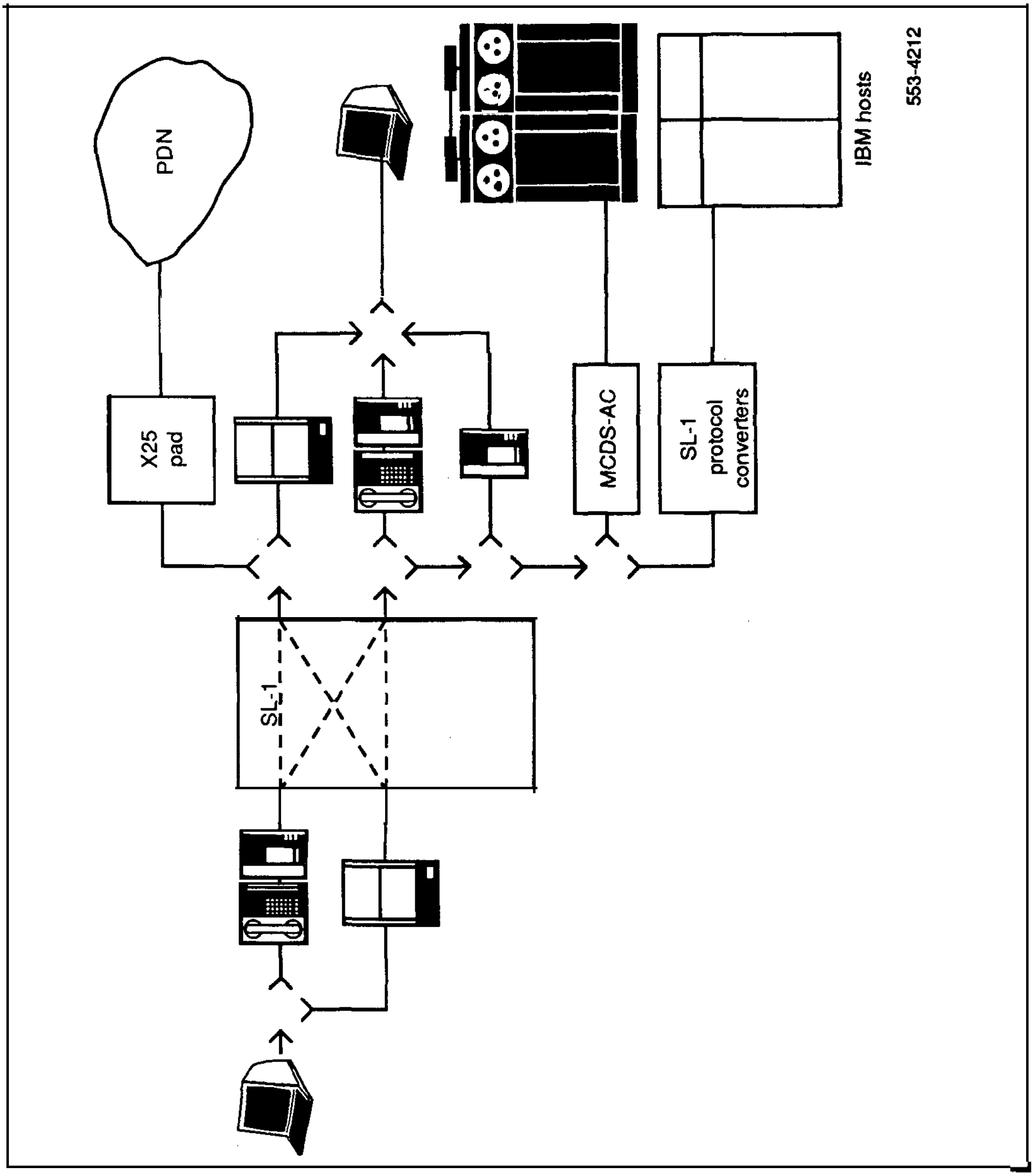


Figure 2
Terminal to Terminal Computer Port Data Call Configuration

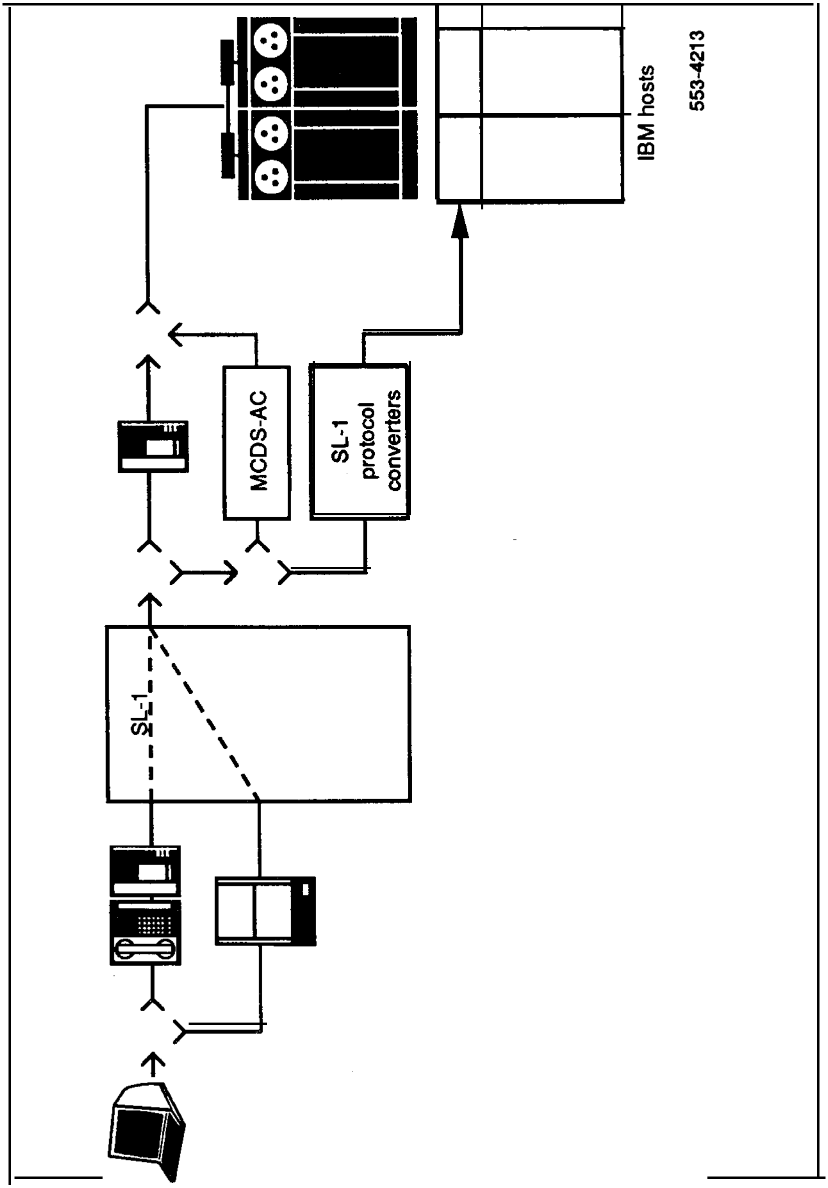


Figure 3
Terminal to Remote Device Data Call Configuration

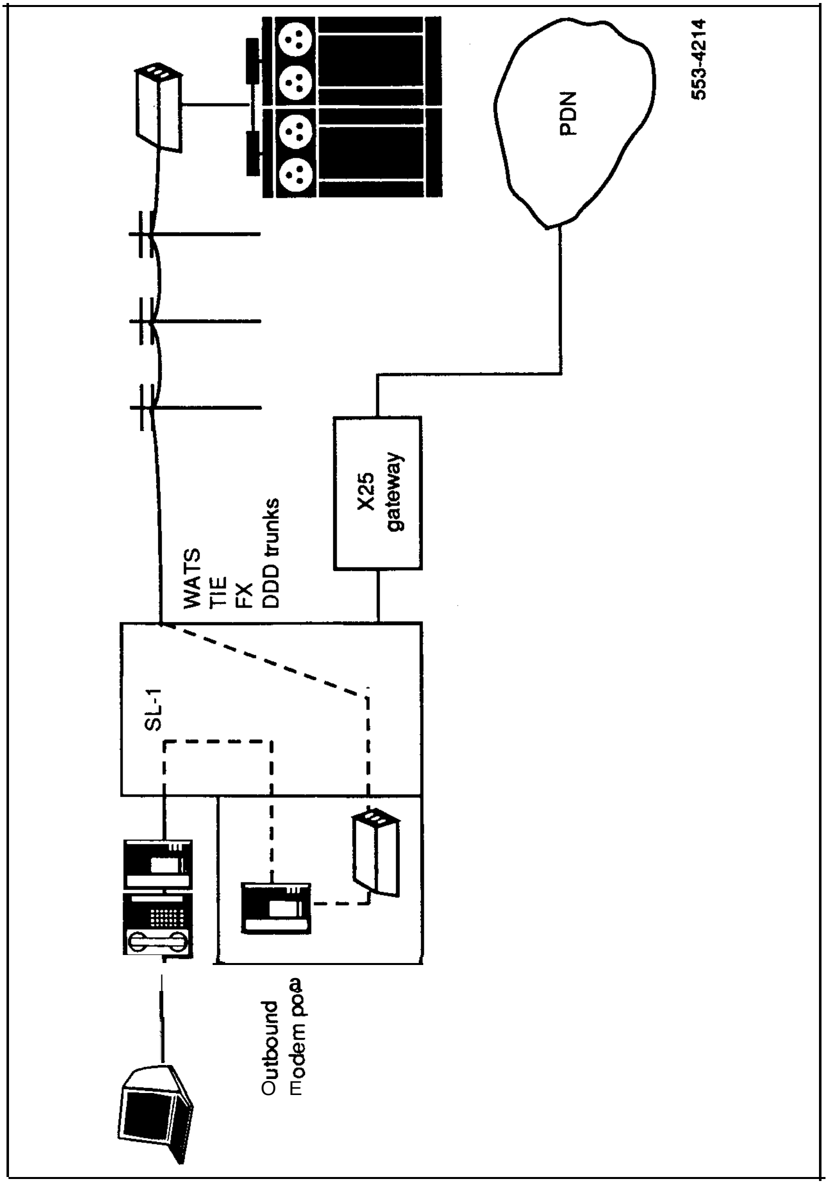


Figure 4
Remote Terminal to Local Device Data Call Configuration

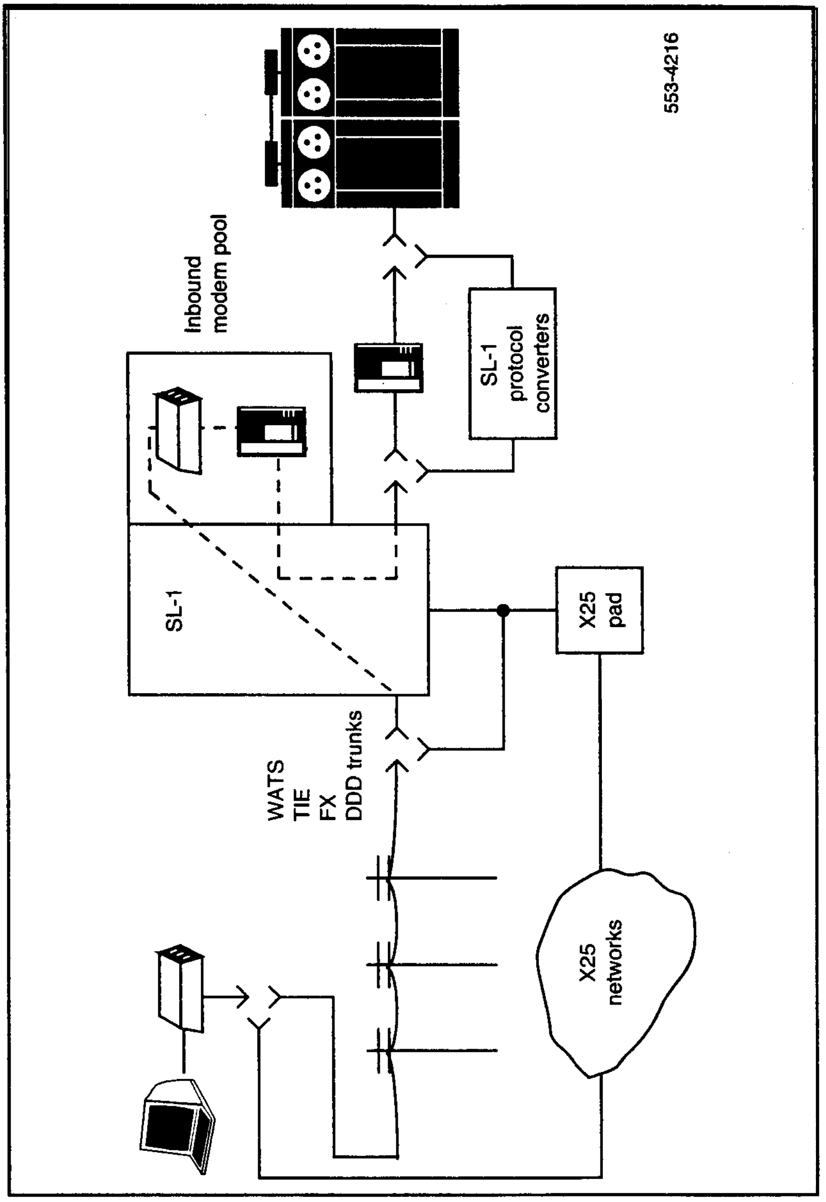
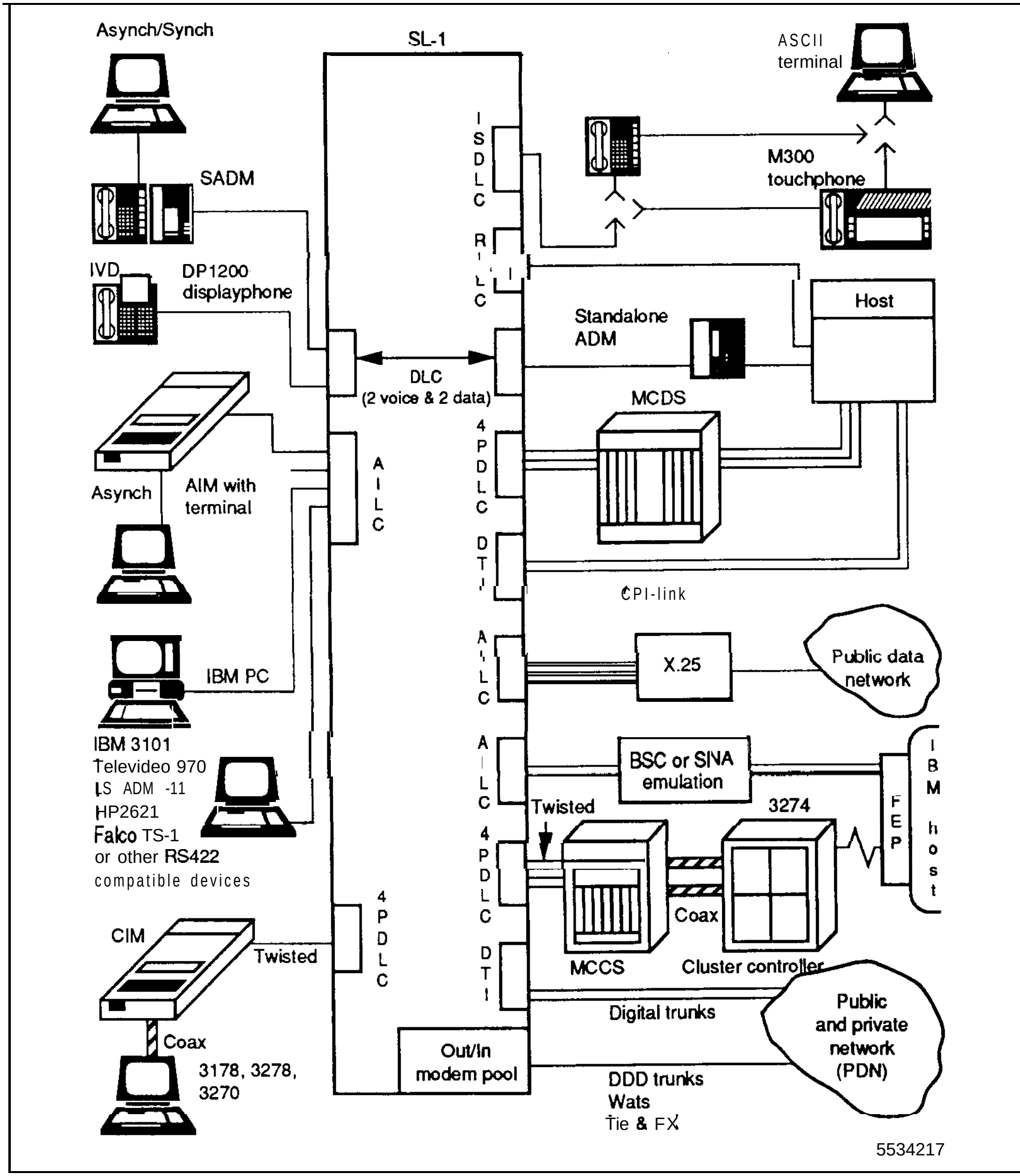


Figure 5
Overview of Meridian 1 Data Applications



Capabilities

Meridian Data Services allow for flexible configuration of data terminal equipment and permits the customer's data communications equipment to correspond to actual usage. The following is a summary of the advantages that implementation of the Meridian 1 data feature offers:

- Eliminates the need for separate voice and data switching systems and allows the use of common wiring.
- Provides efficient utilization of trunks or lines by eliminating the requirement for separate trunks or dedicated lines, as would be the case if separate data switching system or private or leased lines were used.
- Extends to data users several Meridian 1 system and station features typically limited to voice calling only.
- Provides simultaneous voice and data calling capabilities through an SL-1 telephone using the standard two-pair wire.
- Allows convenient relocation of data terminal equipment.
- Allows multiple device access from data terminal equipment.
- Provides flexible operating distances of equipment (for example, terminals, computers) from the Meridian 1.
- Eliminates most equipment associated with fixed data configurations (e.g., base-band modems, dedicated telephone sets and wiring).
- Provides efficient use of computer ports through use of the queuing and hunting features offered by Meridian 1.
- Allows the voice-grade modems required for incoming/outgoing trunk calls to be shared between users and trunks on a non-dedicated hunt group basis. These modems can thus be supplied according to actual data traffic requirements.
- Allows the colocated ADM or an AIM or ASIM to access the Serial Data Interface (SDI) port.
- Provides Synchronous Data Switching, Synchronous Keypad dialing, Asynchronous Keyboard Dialing (KBD) and Inbound Modem Pooling.

Offices that are equipped with the AMP feature do not require separate inbound and outbound modem pools. The other pooling requirements still apply.

Hardware

Configuring data feature in the Meridian 1 may require different hardware components. The hardware items available are:

Modules:

- QMT7 Asynchronous Data Module (ADM)
- QMT8 Synchronous Asynchronous Data Module (SADM)
- QMT9 Asynchronous Interface Module (AIM)
- QMT11 Asynchronous Synchronous Interface Module (ASIM)
- QMT12 V.35 ADM
- Asynchronous Interface Line Unit
- Enhanced Asynchronous Interface Line Unit
- NT9N20 Coax Interface Module (CIM)
- Meridian SL-1/74 Protocol Converter
- Meridian SL-1/71 Protocol Converter
- Meridian SL-1/50 Protocol Converter (System 36 Gateway)
- SLX25-108A X.25 Gateway (110 V, 8-port)
- SLX25-116A X.25 Gateway (110 V, 16-port)
- SLX25-208A X.25 Gateway (220 V, 8-port)
- SLX25-216A X.25 Gateway (220 V, 16-port)
- Meridian M2000 or M2317 Digital Telephones

Circuit Cards:

- QPC311(QPC341) Data Line Card (DLC)
- QPC432 4-Port Data Line Card (4PDLC)
- QPC353(QPC354) Modem Pool Line Card (MPLC)
- QPC60(QPC284) 500 Set Line Card
- QPC452 500 Set Line Card (Double Density)
- QPC397 4-port Multi-Channel Data System (MCDS) Asynchronous Card (MCDS-AC)
- QPC430 4-port Asynchronous Interface Line Card (AILC)
- QPC472 Digital Trunk Interface (DTI or CPI)
- QPC512 Personal Computer Interface (PCI) Card
- QPC578C Integrated Services Digital Line Card (ISDLC)
- QPC723 RS-232 Interface Line Card (RILC)
- NT9N02 MCCS Interface Card (CIC)

The A-law equivalent circuit pack numbers, where available, are shown in brackets ( ) following the mu-law numbers.

Miscellaneous:

- QSD27 MCDS Shelf
- QSY27 MCDS Power Supply (110 V)
- QSY32 MCDS Power Supply (220 V)
- QCA76 Large MCDS Cabinet (optional)
- QCA77 Small MCDS Cabinet (optional)
- NT9N01 Multi-Channel Coax System (MCCS)
- Spectron Digital Patch Panel (optional)

Equipment description

Add-On Data Module

The ADM is packaged in a molded chameleon gray plastic case 6.25 in (159 mm) wide. It has the same profile as the basic SL- I telephone set and is equipped with a black faceplate.

The ADM is a microprocessor-controlled module which provides advanced data transmission features over a wide range of data rates. It eliminates unnecessary analog conversions between data terminal equipment and the Meridian l switching network by using digital transmission over existing 2-pair SL- l set wire.

The ADM replaces base-band modems, acoustical couplers, and limited distance data sets for in-house data transmission activities. It extends several SL-1 station calling features to data calling use when installed on a standard SL-I telephone. The ADM also provides switched, dial-up access from multiple in-house terminal equipment to shared dedicated or voice-grade modems for external data calling.

QMT7 ADM

The QMT7 provides asynchronous, half or full-duplex operation over 2 or 4 wire transmission lines and, depending on the terminal or modem used, transmission speeds of 50, 75, 110, 134.5, 150, 300,600, 1200, 1800, 2000, 2400, 3600, 4800, 7200 and 9600 bps. It accommodates a serial character data format of 5, 6, 7 or 8 data bits and 1, 1.5 or 2 stop bits (or as defined by the data unit).

The ADM is compatible with Bell 103/212/202 compliant modems and provides EIA RS-232-C interface to data terminal equipment or modems. It converts the signals from the data equipment to full duplex digital (128 kbits/sec, BPRZ encoded) to send to the Data Line Card (DLC) in the Meridian 1.

The ADM provides for re-down-line loading of RS-232 control signals. It also provides the following Data Call Features:

- Flexible numbering plan for data stations
- Auto-answer capability
- Originate capability
- Voice path integrity in ADM power loss situations
- Alternate or simultaneous voice and data calling per data station
- Distinctive buzz for incoming data calls
- Distinctive connect tone
- Power Fail Protection.

> ***Note:*** Not all of the data modules have these features, i.e., not all have distinctive buzz, alternate or simultaneous voice and data capability. See module specifications.

The in-house error rate should be no greater than 1 error x 10^{-7} bits and the error rate over trunks should be no greater than 1 error x 10^{-5} bits (modem dependent).

Colocated ADM

When installed in the colocated mode, the ADM mounts on the right side of the telephone as the last add-on module.

- The ADM supports all data calling activities where the ability to originate and receive both data and voice calls is required.
- Any of the colocated ADM modules permit the simultaneous voice and data transmission through a single telephone.
- The telephone calling features are available for data calls when a colocated ADM is used. These features are assigned to the ADM as with a telephone.
- The telephone calling features assignable to the ADM for data calls are located on and accessed from the key/lamp strip or through keyboard dialing when applicable.
- The ADM connects to the SL-1 set via two pair of leads. One pair extends the signaling leads from the SL-1 telephone to the ADM. The other pair connects the ADM to the signaling logic in the telephone.
- A data terminal or computer is connected to the ADM via a 25-pin connector on the rear of the module. This interface conforms electrically to EIA RS-232 standard and mechanically to ISO-2110.

Stand-Alone ADM

The ADM can also be installed in a stand-alone mode to answer (cannot originate calls) calls as required for data-only in-house calling applications (for example, to support data service units, modems, printers, or computer ports) and for receiving incoming calls from trunks to a modem pool or to a dedicated facility.

In the stand-alone mode, an SL-1 telephone is not required. The ADM is in an answer-only mode the same as when interfaced to a computer port or front end processor.

Modem Pool ADM

The ADM may be configured as modem pools (see "Features and services" on page 41). The Outbound Modem Pool is accommodated by outgoing standard voice grade or conditioned lines and provides for asynchronous or synchronous transmission. The Inbound Modem Pool supports synchronous modems to single hosts. Only asynchronous modems are supported for access to multiple or remote hosts. Modem pools of different types (speed or transmission mode) must be kept separate.

> ***Note:*** Offices that are equipped with the AMP feature do not require separate inbound and outbound modem pools. The other pooling requirements still apply.

User controls, indicators and settings

The ADM has three key/lamp data call controls and three transmission and one power status lamp indicators, plus user-selectable transmission speed and parameter option switches.

The ADM contains internal option switches and jumpers selected according to customer configuration, and a switch for setting the Voice Frequency Directory Number (VFDN). The VFDN is used to set up the connection through the Meridian 1 from the analog side of the pooled modem to the outgoing trunk.

The location of all ADM controls, indicators, and option selectors is shown in. All controls and indicators are described in Table 1. Both option selectors, the speed-setting knob and option switches are described in Table 2.

Configurations

Each ADM is entered in the Meridian 1 office data in the same manner as an SL-1 telephone, using LD1 1. Instructions for assigning DDN, data hunt groups, and key/lamp features are included in XI *I input/output guide* (553-3001-400).

Operating Distances

The ADM allows different maximum separation distances from the Meridian 1 peripheral equipment and computers depending upon gauge of wire used to make the connections. Maximum end-to-end distance between ADM can be up to 8000 ft (2440 m) on 22 gauge or 7,000 ft (2134 m) on 24-gauge wire. A computer or terminal can be located as far from the ADM as is consistent with EIA RS-232 loading specifications.

Miscellaneous

The ADM provides loopback testing maintenance diagnostics that are inherent in the Meridian 1 software to the called data module.

The ADM derives 24 V ac, 50-60 Hz power from a local plug-in 110 or 220 V ac transformer.

Note: A 100 V ac transformer is available for use in Japan.

Table 1
ADM controls and indicators

Controls and indicators	Definition
DATA key	Data DN key-used for originating and answering data calls
Lamp	Data DN lamp-indicates the call state of DDN: ON-active call OFF-idle WINK-incoming call
MODEM CONTROL key	Used during call setup to a remote device
Lamp	indicates MODEM CONTROL key status: ON-modem in use OFF-no modem in use WINK-modem reserved
DATA SHIFT key	Used to shift companion SL-1 telephone from voice mode to data mode; feature-key activations made on an SL-1 telephone during data mode then relates to the DDN
Lamp	Indicates the activation of DATA SHIFT key and operating mode of SL-1 telephone: ON-SL-1 set in data mode OFF-SL-1 set in voice mode
RESET	Located on the rear of vintage B and later ADM-used to effect initialization
CONNECT lamp	Indicates if a connection is established with a called ADM: ON-connection established OFF-no connection
RECEIVE lamp	Indicates if the ADM is receiving data from the called facility: ON-ADM receiving data (flashes at data rate) OFF-ADM not receiving data
SEND lamp	indicates if the ADM is transmitting data to the called facility: ON-ADM sending data (flashes at data rate) OFF-ADM not sending data
POWER lamp	indicates if local **power** is being supplied to the ADM: ON-power up OFF-power down

Table 2
ADM User option selectors (Part 1 of 3)

Selector	Description
Speed setting knob (S2)	A 16-position switch used to select transmission speed (bits per second) of a data call (Notes 3 and 4).
Option switches (S3)	The eight switches allow selection of data code options and operating modes that match the receive and transmit characteristics of the receiving data terminal.
Asynchronous ADM Operation	
	The asynchronous ADM has an eight bit transmitter/receiver. To handle all of the combinations of codes it might receive or need to transmit, which might be less or greater than 8 bits, the ENH-INH and EVEN-ODD switches allow it to add or delete bits to make the code always equal eight bits. Most devices today use the eight bit code, so the INH and 8 CODE switches are normally operated. When INH is operated the EVEN-ODD switch setting is ignored.
ENH-INH	ENH allows the parity check; this allows the addition of a non-information bit to the data, making the number of ones in a grouping of binary bits always even or odd. INH prevents the addition of the parity bit.
EVEN-ODD	This determines the parity check type, EVEN, when the number of binary ones in a data word is always maintained as an even number or ODD, when the number of ones in the data word is odd.
HDX-FDX	Provides for the transmission aspects; HDX when half-duplex direction of transmission is under dynamic control of EIA leads CTS, RTS and CD (This switch provides local carrier monitoring oflocal request to send to ensure compatibility with 2-wire modem); FDX when full-duplex communications is required.
7-8 CODE	Transmission codes use different character lengths and different start/stop bit configurations. This switch and the Selection Switch (S4) provides for 5 through 8 character codes (Note 1).
1-2 STOP	This switch and Selection Switch (S4) provides the correct stop bits to match the required code configuration (Note 1).

Table 2
ADM User option selectors (Part 2 of 3)

Selector	Description
2W—4W	The 2W position provides for local echo while the 4W position does not provide for echo. The QMT8 labels this switch as Echo-No Echo.
ECHO-NO ECHO	This is a QMT8 switch assignment: The Echo position provides for local echo, while the No Echo position does not provide for echo from the ADM.
MANUAL-AUTO ANS	This establishes how calls to the ADM are answered; manually or automatically.
OFF-LOOPBACK	This switch is used by maintenance personnel to test ADM using the loopback setting. The switch is OFF during regular transmissions (Note 2).
Synchronous ADM Operation (QMT8 and higher)	
S3.1 and S3.2	(Not used by synchronous QMT8 or QMT12)
HDX-FDX	Provides for the transmission aspects; HDX when half-duplex direction of transmission is under dynamic control of EIA leads CTS, RTS and CD (this switch provides local carrier monitoring oflocal request to send to ensure compatibility with 2-wire modem); FDX when full-duplex communications is required.
Modem-Network	This is a synchronous QMT8/QMT12 switch assignment: Modem is used (clocks are not synchronized) for all connections except for connections to a digital network; Network is used when the transmit and receive clocks are jointly synchronized.
Ext clock-Int clock	This is a synchronous QMT8/QMT12 switch assignment: Ext clock is used when device connected to the ADM controls the transmission clock; Int clock is used when the Meridian 1 controls the transmission clock.

Table 2
ADM User option selectors (Part 3 of 3)

Selector	Description
Echo-No echo	This is a synchronous QMT8/QMT12 switch assignment: The Echo position provides for local echo while the No Echo position does not provide for echo from the ADM.
Manual-Auto Ans	This establishes how calls to the ADM are answered; manually or automatically.
Off-Loopback	This switch is used by maintenance personnel to test ADM using the loopback setting. The switch is OFF during regular transmissions (Note 2).

Note 1: Selection switch (S4) is located beneath the faceplate and should be set by maintenance personnel only. The QMT7 (S4) selection switches are used to setup for 5 or 6 bit-code, for 1.5 stop bits and to force DTR and MI/MIC modem control on or off. TheQMT8/QMT11/QMT12 (S4) selection switches are used to setup for Synchronous or Asynchronous modes, force DTR on or off, set MI/MIC modem control on or off and to encode for normal (7 or 8 bit), 5-bit, 6-bit and hotline (with 7 or 8 bit only) operation. The 1.5 bit option is provided (in the asynchronous mode only) when the speed setting switch is set at 134.5 bps.

Note 2: Use of the LOOPBACK setting is recommended only for maintenance personnel. Instructions for use of the LOOPBACK setting are given in Meridian data features operation and tests (553-2731-300).

Note 3: The control label under the flip lid has all speeds shown. Speeds above 19.2 kps are in a different color for informational purposes. At speeds above 20 kbps, the EIA cable lengths (DTE or DCE to ADM) are speed dependent and must be shorter than 50 ft (15 m); e.g., in the 5 to 8 ft (1.5 to 2.5 m) range at 56 kbps.

Note 4: The serial number and Q-code label on the bottom of the ADM contains the interface information and provides a reference to the connector type.

QMT8 SADM

The QMT8 has the same profile as the QMT7 but it supports both asynchronous and synchronous data transmission. A service switch is used to change from one mode of transmission to the other. The QMT8 can operate in the same configuration as the QMT7.

The QMT8, when operating in the asynchronous mode, can operate at 19200 bps in addition to speeds specified for the QMT7. The QMT8 also supports the inbound modem pooling and keyboard dialing features.

When operating in the synchronous mode, the QMT8 can transmit data at 1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 38400, 40800, 48000 or 56000 bps. Some of the QMT8 controls are different and are defined in Table 2.

> *Note:* For QMT8 with RS-232 interface at speeds above 20 kbps, the EIA cable lengths (DTE or DCE to ADM) are speed dependent and must be shorter than 50 ft (15 m); e.g., in the 5 to 8 ft (1.5 to 2.5 m) range at 56 kbps.

QMT12 ADM

The QMT12 (V.35) ADM has the same profile as the QMT7 and QMT8. However the QMT12 provides high-speed V.35 CCITT synchronous instead of a RS-232 interface to data terminals or modems. The QMT12 interface conforms electrically to the CCITT V.35 standard and mechanically to ISO-2110. The QMT12 provides for the same data transmission speeds as the QMT8 synchronous ADM; 1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 38400, 40800, 48000 or 56000 bps. The controls and option selectors are similar to the QMT8 and are described in Tables 1 and 2.

> *Note:* The RS-232-C (QMT8) DCE/DTE interface is normally used for low-speed data rates (up to 19.2 kbps) while the V.35 (QMT12) interface is used when high-speed (38.4 to 56.0 kbps) data rates are required. However, synchronous terminals operate with whatever clock they receive. Therefore, a user with a V.35 terminal can set the speed switch to a low speed and call an RS-232 modem. A different color is used on the speed indicator card of the QMT12 to indicate the higher speeds.

The V.35 CCITT interface should only be used in the synchronous operating mode.

The QMT12 supports four basic modes of synchronous data transmission operation

- terminal to terminal
- terminal to digital network
- terminal to modem
- terminal loopback test

While the QMT12 is equipped with a V.35 CCITT interface, wire changes within the module can be used to establish an RS-232-C interface.

Note: Unless stated otherwise, all further ADM references in this publication imply QMT7, QMT8 and QMT12.

Data Line Card

The DLC is located in a Peripheral Equipment (PE) shelf. It encodes information streams received from the ADM and routes this information through the Meridian 1 switching network to the called data facility (computer or terminal).

TheQPC311 DLC supports two SL-1 telephones and two ADM, either in independent or paired operation. The DLC data ports can support two MCDS-AC ports, two CIC ports, two ASIM or two CIM. Microprocessor control allows the DLC to separate incoming voice signals, data signals, and actual data, and route this information through the switching network.

The DLC contains an option switch used to link or isolate operation of each SL-l/ADM circuit pair as required and jumper positions for wire gauge selection.

4-Port Data Line Card

The 4PDLC is located in a Peripheral Equipment (PE) shelf. It meets the physical and electrical specifications of any DLC to data-module interface and provides access to network channels for data information. The 4PDLC is used in applications that require a large concentration of data ports.

It provides four SL-1 data only ports and is primarily designed to serve MCDS-AC, ASIM, CIM, CIC and stand-alone ADM.

The 4PDLC does not support calls that involve voice ports such as in outbound modem pool calls. The 4PDLC accepts both voice and data call signals but does not distinguish between them and therefore cannot be used in cases where both types of signals are present.

The 4PDLC has one LED indicator on the faceplate that is lit when the card is disabled.

Modem Pool Line Card

Outbound Modems

The MPLC (QPC353) contains four ports and is used exclusively in asynchronous outbound modem pool configurations to support originate modems. It provides the VFDN for call connection on the analog side of an outbound pooled modem. The synchronous outbound modem pools use the regular QPC60 line card (or the double density line card (QPC452) that contains eight instead of four ports).

The MPLC is used with originate/answer modems. There are four identical circuits on each card and they prevent ring voltages from being applied to ensure that each modem remains in the originate mode during call setup.

Inbound Modems

The regular 500-set (or double density) line card is used for asynchronous and synchronous inbound modem pool configurations.

Supplementary Power Unit

Each stand-alone and some colocated ADM must be powered from a supplementary power unit. The supplementary power unit used is a wall or floor mounted plug-in transformer that supplies 24 V ac ±10%.

In the event that the local power to a colocated ADM fails, an optional Power Fail Transfer (PFT) capability can be implemented to ensure that the SL-1 telephone continues to function. Individual and/or zone PFT can be used.

RS-232 Cord Assemblies (NE-25MQ2A)

The NE-25MQ2A (A0237451) cord assembly is a 16 ft (5 m), 25-wire cable, connectorized at both ends. It provides electrical interface and proper configuration of control signals between the ADM and Data Terminal Equipment (DTE). A shorter 6 ft (1.8 m) NE-M25QB (A0273211) cord may be used instead of the longer cord.

Modem Pool Cable (QCAD5A)

The QCAD5A connector cable (A0277406) is similar to the NE-25MQ2A cord assembly but includes a special relay and associated wiring to provide the necessary electrical interface and proper configuration of operating modes of the attached modem. This cable is only used for asynchronous outbound modem pools.

QMT9 AIM

The Asynchronous Interface Module (AIM) is packaged in a chameleon ash colored plastic housing that is 12.5 in (317.5 mm) long, 7.5 in (190 mm) wide. The module has a 4” slope with a front height of 1 3/4 in (44.5 mm) and a rear height of 2 3/4 in (70 mm). It weighs approximately 2 lb (1 kg).

The AIM may be desktop or wall mounted and is used to originate or answer data calls. It supports keyboard dialing.

Features

The AIM is a stand-alone module, equipped to transmit and receive data. It meets the DTE/DCE interface requirements of the EIA RS-232-C standard. The electrical characteristics of the interface to the associated Asynchronous Interface Line Card (AILC) meets the EIA RS-422 requirements. The AIM provides substantial electrical isolation between the RS-232 and RS-422 interfaces.

The AIM transmits data at 110, 150, 300, 600, 1200, 2400, 4800, 9600 and 19200 bps. Speeds are determined by an autobauding procedure in the AILC.

> *Note:* With the QPC430E and later vintage AILC, many of the features of "AT" -type Dialing are supported, as well as the set relocation feature. See the AIM/AILU User Guide for details. For more details, refer to *Japanese features and services* (553-2001-100) but disregard all references to Manual Answer.

A standard 500/2500 telephone may be plugged into the rear of the AIM into the "phone" jack. This telephone then operates through the AIM line cord to a standard 500-set line card in the Meridian 1.

Controls and Indicators

The module is equipped with a power on/off switch and with a power on indicator.

Configuration

The AIM provides the interface between an RS-232-C compatible asynchronous DTE through its AILC.

The connection to the AILC is made via a miniature &position jack mounted on the rear of the housing. The module is equipped with a 7 ft (3.1 m) 6-conductor cord that is terminated with miniature 6-position plugs on each end. The connection to the 110/220 V ac transformer is made with a 7 ft (3.1 m) 2-conductor cord that is attached to the rear of the unit.

The AIM can only be connected to the AILC. It cannot be connected to the DLC.

The AIM connects to the DTE through a 25-pin connector (that conforms to ISO-21 10) that is mounted on the rear of the housing.

AIM can be connected in the back-to-back mode if the send pairs of one set are connected to the receive pairs of the other set and vice versa.

Asynchronous Interface Line Card

The AILC contains all the intelligence for the AIM. It is located in a PE shelf and is used with and encodes information streams received from the AIM. It routes this information through the Meridian 1 switching network to the called data facility (computer or terminal).

> ***Note:*** The AILC may also be used to connect terminals, protocol converters, interface boards, X.25 gateways and other data transmission devices, that use an RS-422 compatible interface, to the Meridian 1 switching machine.

The AILC supports up to four AIM units. Each of the four channels has a microprocessor that emulates the ADM to the Meridian 1 system, a switching power supply and other electronic components. The transmission between the AIM and the AILC conforms to EIA RS-422 standards.

Operating Characteristics

The AILC communicates with DTE that have the following characteristics:

Data Code	ASCII (ANSI standard X3.4)
Terminal	Asynchronous, Start-Stop (ANSI standard X3.15-1976)
Number of Bits	8-bits including parity
Parity	unchanged
Data Rate	110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 bps
Stop Bits	2 bits for 110 bps, 1 bit for all other speeds

When installing or maintaining the AILC with either an AIM or Personal Computer Interface Card (PCIC), it is important to consider that AIM/PCIC to AIM/PCIC calling is not supported at 110 or 150 bps.

QMT11 ASIM

The Asynchronous Synchronous Interface Module (ASIM) looks very much like the AIM, but provides added dialing capabilities plus six data feature keys and associated lamps and data control switches.

The data control switches are in a recessed area covered with a flip-up lid. User instructions are provided on the underside of the lid. The controls allow the user to choose data mode and speed.

A 12-button dial pad plus feature keys and data status lamps are located in front of the flip-lid.

An SL1 set or an NT-500 type set may be connected to the ASIM for making voice calls. The NT-500 type set may be placed on the top surface without blocking the dial pad or the feature keys.

The ASIM may only be desktop mounted and is used to originate or answer data calls. In the asynchronous mode keyboard or keypad dialing may be used. In the synchronous mode, only keypad dialing is permitted.

Features

The ASIM is a stand-alone module, equipped to transmit and receive data. It meets the DTE/DCE interface requirements of the EIA RS-232-C standard. The electrical characteristics of the interface to the DLC or to a 4PDLC port are the same as for the ADM. It cannot be used for modem pooling.

The Asynchronous ASIM transmits data at 110, 150, 300, 600, 1200, 2400, 4800, 9600 and 19200 bps. When first turned on, ASIM selects a default of 1200, 2400, 4800, 9600, or 19200 bps as determined by the synchronous speed switch setting. If the switch is not set to any of these speeds, a default speed of 9600 bps is selected. Speeds and parity are then determined by an autobauding and autoparity feature.

The Synchronous ASIM transmits data at 1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 40800, 48000 or 56000 bps. These speeds are selected by the synchronous speed switch setting.

A standard 500/2500 or SL-1 telephone may be plugged into the rear of the ASIM into the “phone” jack. This telephone then operates through the ASIM line cord to a standard 500 or SL-1 line card in the Meridian 1.

Controls and Indicators

The module is equipped with a speed switch (synchronous), eight mode switches, a keypad dial, data status lamps and feature/feature keys.

The recessed g-position DIP switch provides for Hotline, Forced DTR, Manual/Auto Answer, Loopback, Async/Sync, HDX/FDX, Ext/Int Clk and Modem/Network (The last four functions are not applicable with Asynchronous operation). The switches are set by the user to match the data setting of the DTE. Refer to Table 2 for more details.

> ***Note*** I: When the ASIM is in the asynchronous mode, the "Terminal" setting enables the dialing menus, progress prompts, and other responses sent to the DTE. In this mode, DSR, DCD, and CTS are high at all times. When the call is disconnected, DSR, DCD, and CTS pulse to a space state for 200 msec and then return to a mark state.

> ***Note*** 2: When the ASIM is in the asynchronous mode, the "Host" setting suppresses all prompts to the DTE. The implementation of this mode in the C or earlier vintage held DSR, DCD, and CTS high when the call was not established. The QMT11D vintage keeps DSR, DCD, and CTS low until the call is connected and then raises them high.

> ***Note*** 3: When the ASIM is in the "Hotline" mode with Forced DTR on (VLL mode), the ASIM waits 1.5 seconds after a call is disconnected and ten begins to hotline continuously until the call is reestablished. It can be stopped by setting either the Hotline or Force DTR switch to the OFF position.

> ***Note*** 4: When the ASIM is set in the VLL mode, Int Clk, Modem, and Sync setting, the Transmit Clock EIA lead (pin 15 of DB-25) continuously outputs the clock signal, regardless of the state of the call.

> ***Note 5:*** Only one side of the data connections should have the Hotline or VLL turned on. Otherwise, both data modules will be trying to call each other and will never connect.

The function switches provide for Speed Call, Auto Dial, Modem Call, Ring Again and Release. These switches and the DDN switch (hookswitch) are used to originate and to answer data calls. The top "Reserved" key (the one under Ring Again) in conjunction with the "*" and "#" keys provide for the ASIM automatic relocation feature.

The definitions of the Data Status lamps are as follows:

Indicator	Description
CONNECT	The CONNNECT LED lights when a call is connected from the Meridian 1 through the ASIM to the attached device.
DTR	The DTR LED lights to indicate that DTR is received from the attached device.
RD	The RD LED lights when data is received by the ASIM.
SD	The SD LED lights when data is transmitted by the ASIM.

Configuration

The ASIM provides the interface between an RS-232-C compatible asynchronous DTE through a DLC OR 4PDLC.

The connection to the DLC or 4PDLC is made via a miniature 6-position jack mounted on the rear of the housing. The module is equipped with a 7 ft (3.1 m) 6-conductor cord that is terminated with miniature 6-position plugs on each end.

The connection to the power supply (120 V 60Hz ac input is made with a 5-conductor cord equipped with a connector that plugs into the main assembly of the ASIM.

The ASIM connects to the DTE through a 25-pin connector (that conforms to ISO-2110) that is mounted on the rear of the housing.

PC Interface Card

The Personal Computer Interface Card (QPC512) permits connection of an IBM Personal Computer or IBM Personal Computer XT directly to the Meridian 1 with standard twisted pair wiring. The card installs easily in the Personal Computer allowing the computer to be connected to the Meridian 1 through a standard TELADAPT wall jack and the QPC430 AILC. The PC may then access local and remote terminals, personal computers, other computers and databases using the Meridian 1 networking capability. The card transmits data to the AILC using the RS-422 data standard and functions with any Meridian SL.

The Personal Computer Interface Card User Guide (P0641829) provides installation and operating information.

Note: The Crosstalk XVI software is available as an option for use with the QPC512.

Protocol Converters

IBM users have traditionally been "locked-in to IBM". This meant that the 3270 family of display and controllers and coax cable distribution was necessary to access IBM hosts. Communication with non-IBM hosts from IBM Systems 34, 36, 38 and IBM 3270 terminal equipment was very difficult or impossible.

The Meridian 1 family of Protocol Converters are devices that enable ASCII terminals, printers and personal computers to communicate with IBM computers. Different makes and types of terminals can now be used in the IBM environment.

The System 36 Gateway and 3270 Protocol Converter provides a flexible, cost-effective alternative to an IBM system of dedicated terminals and controllers. In addition, the Hunting, Auto Dial and Ring Again Meridian 1 data features may be used in establishing the data calls.

The protocol converter emulates an IBM cluster controller and can access a variety of IBM applications. ASCII terminals can now be connected to the IBM link using standard telephone twisted pair cable. The ASCII terminals may be located up to 4000 cable feet from the Meridian 1 or dialed in through a modem pool. The protocol converter may also be located 4000 cable feet from the Meridian 1 and a maximum of 50 cable feet from the IBM host for direct connections or unlimited with modem pairs.

This makes moves and changes less costly and the IBM user may now benefit from the added features of Ring Again, Auto Dial, Speed Calling and other data call processing features.

The Meridian 1 protocol converter is 12 in (305 mm) long, 14 in (356 mm) wide, 4.5 in (115 mm) high and weighs 8 lb (3.6 kg). It operates in an office environment of 26°F to 91°F (10°C to 35°C) with a 20 to 80% relative humidity. It requires a 110 V ac, 60 Hz, 1 amp circuit. It can be mounted in the MCDS cabinet, in a standard EIA 19 inch rack or may be ordered as a desk-top module. It is connected to the Meridian 1 through an AILC.

The converter provides asynchronous ports for eight logical units; seven asynchronous ports and one dynamic printer port. A logical unit is assigned to each of the seven physical asynchronous connections. The eighth logical unit is a printer port that can be dynamically assigned to auxiliary ports associated with CRT connected to the seven asynchronous physical ports. The ports operate at speeds of 300, 600, 1200, 2400, 4800, or 9600 bps.

The converter provides one synchronous, full duplex/half duplex port that supports direct FEP connection (built-in modem eliminators) or remote connection via dedicated or dial up modems. This port provides clocking speeds of 1200, 2400, 4800 or 9600 bps and multi-drop configuration over private lines.

There are presently three basic versions available:

- The Meridian 1/74 Protocol Converter is an ASCII to SNA/SDLC (PU type 2) device that emulate the IBM 3274 and 3276 controllers.
- The Meridian 1/71 Protocol Converter is an ASCII to BISYNC device that emulates the IBM BSC 3274 controller.
- The Meridian 1/50 Protocol Converter (also called System 36 Gateway) is a device that emulates ASCII to SNA/SDLC for IBM System 34, 36 or 38.

A detailed Technical Reference Manual, an Operator' s Guide and a User' s Quick Reference Guide are available for each member of the family. These documents provide information for Ordering, Installation, Operation, Maintenance, Troubleshooting and Debugging as well as Diagnostics.

These manuals also provide a partial list of the ASCII terminals and printers that are supported plus cross reference sheets of keyboard emulations for those terminals.

Multi-Channel Data System

The MCDS is designed for use in computer rooms to provide rack mounted ADM-like asynchronous capabilities for interfacing multiple computer ports to the system. It consists of a shelf, power supply, a maximum of eight interface cards, backplane, patch panel (optional), and cabinet (optional).

The interface between the MCDS and the computer ports must conform to the EIA RS-232-B/C specifications.

Incoming Asynchronous calls to the MCDS may originate from QMT7, QMT9 or asynchronous QMT8 that use full/half duplex mode of operation and operate with data speeds of 110, 150, 300, 600, 1200, 2400, 4800, 9600 and 19200 bps. The MCDS interface card (AC) only supports data terminals that use 7-bit ASCII or 8-bit EBCDIC code, 1 or 2-stop bits with odd or even or no parity.

Asynchronous Card

The 4-port MCDS-AC is located in the MCDS cabinet and supports four computer ports (or any other device that requires answer only). It provides the drivers and receivers required to meet the electrical interface specifications of the RS-232-C EIA standard. The MCDS-AC provides the same functions as 4 stand-alone ADM.

The controls and indicators located on the circuit pack are described in Table 3.

Table 3
MCDS Indicators and switches

Indicator	Description
CONN	The CONN LED is located on the MCDS-AC. It lights when a call is connected from the Meridian 1 through the card to the attached device.
DTR	The DTR LED is located on the MCDS-AC. It lights to indicate that DTR is received from the attached device or forced ON at the MCDS-AC.
RD	The RD LED is located on the MCDS-AC. It lights when data is received by the card.
SD	The SD LED is located on the MCDS-AC. It lights when data is transmitted by the card to the far end.
POWER	The POWER LED is located on the front panel of the MCDS power supply. It lights when the ON-OFF switch is operated to ON
ON-OFF	The POWER switch is located on the front panel of the MCDS power supply. It is used to turn the power supply on or off. The switch should be OFF when inserting or removing the supply from the shelf.
Voltage Test Points	The VOLTAGE TEST POINTS are jacks that are located on the front panel of the power supply. They provide test points to verify the + 5, + 12, + 9 and -9 V that are supplied by an energized power supply.
PORTS	The port designations, located on the front panel of the power supply, provide legends for the MCDS-AC located in the right half of the shelf.

MCDS Power Supply

The off-line switched-mode power supply, located in the center of the MCDS shelf, provides multiple, regulated and protected dc voltage to the MCDS backplane. It supplies steady-state 140 watt multiple, regulated and protected dc voltage to the backplane from 120 V ac 60 Hz input. Each shelf requires 1.7 A from the 120 V input.

Spectron Patch Panel

This optional patch panel is wired between the interface card ports and the computer ports to provide a convenient means of rearranging interconnections and for maintenance diagnostics.

X.25 Gateway

The X.25 Gateway is a Packet Assembler/Disassembler (PAD) that provides an interface between asynchronous (start/stop) ASCII devices and packet switched equipment. The X.25 Gateway PAD supports the X.25 synchronous interface and conforms to all applicable international standards including X.25, X.3, X.28 and X.29.

The X.25 Gateway PAD is 10.5 in x 16.75 in x 5.25 in (263 mm x 419 mm x 132 mm) and may be mounted in 19 in frames or used as a stand-alone desk top unit.

The X.25 Gateway provides a cost effective communication link between the Meridian 1 and various X.25 networks. This allows various non-compatible computer systems to communicate with one another.

The PAD provides for eight or sixteen asynchronous ports (RS-422 interface) that connect to ports of an Asynchronous Interface Line Card (AILC) and two synchronous trunk lines (RS-232-C/V.24 interface) that connect to Public Data Networks (PDN) or to private data networks. The asynchronous ports operate at 300, 1200, 2400, 4800, 9600 and 19200 bps. The two synchronous trunk lines operate at 1200, 2400, 4800, 9600 and 19200 bps.

The X.25 Gateway permits building what appears to be a private data network by using PDN services and a network of remotely located Meridian 1. The computer systems connected to the Meridian 1 may communicate together through the network. This impression of a private data network can be expanded to include stand-alone computers and for access to services of Time-Shared systems and large Public Data Bases, i.e., Dow Jones, Dun and Bradstreet, the Source, and industry specific data bases.

Configurations

ASCII Workstation to PDN. With this configuration, the PAD provides the Meridian 1 connected workstations with X.25 access' to the PDN. The Meridian 1 is used as a workstation, and/or asynchronous host port concentrator, that allows workstations to contend for one of the eight or sixteen asynchronous ports on the PAD and to access one of the two X.25 synchronous links.

ASCII Workstation to Private Switched Network. In this instance, the PAD is configured to provide the Meridian 1 workstations with access to a private packet switched data network. Two or more Meridian 1 switches can be interconnected by the X.25 links. Permanent virtual circuits (PVC) or a dedicated line can be used to form a private data network.

ASCII Workstations Access to Multiple Networks. The Gateway supports two links and allows simultaneous connections to two PDN or private networks. The Gateway emulates the connection procedures (user interface) of the major North American, European and Japanese networks such as GTE/ Telenet, Tymnet, Datapac, UK PSS, Transpac, Uninet, Datex-P and DDX.

Figure 6
Typical ‘ Multi-Channel Data System

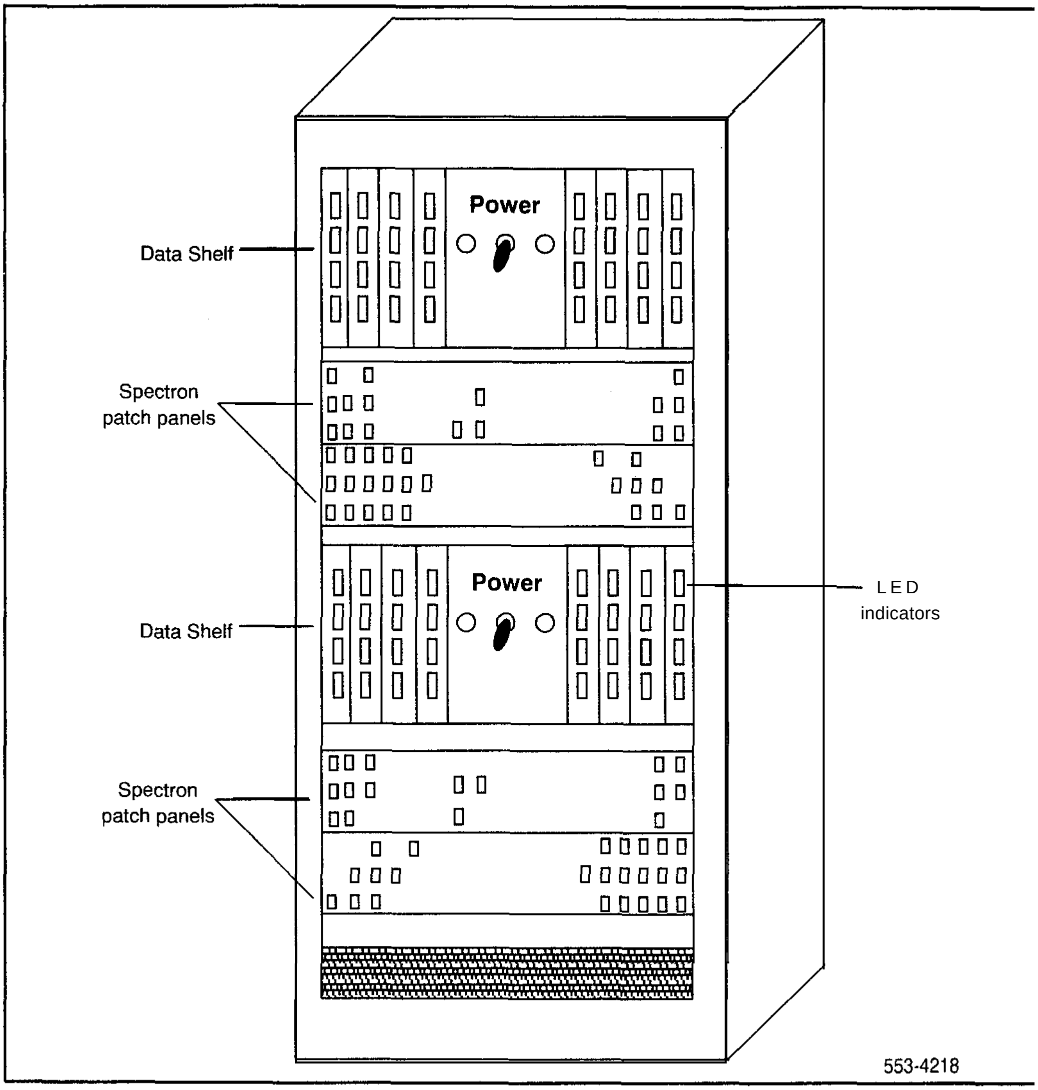
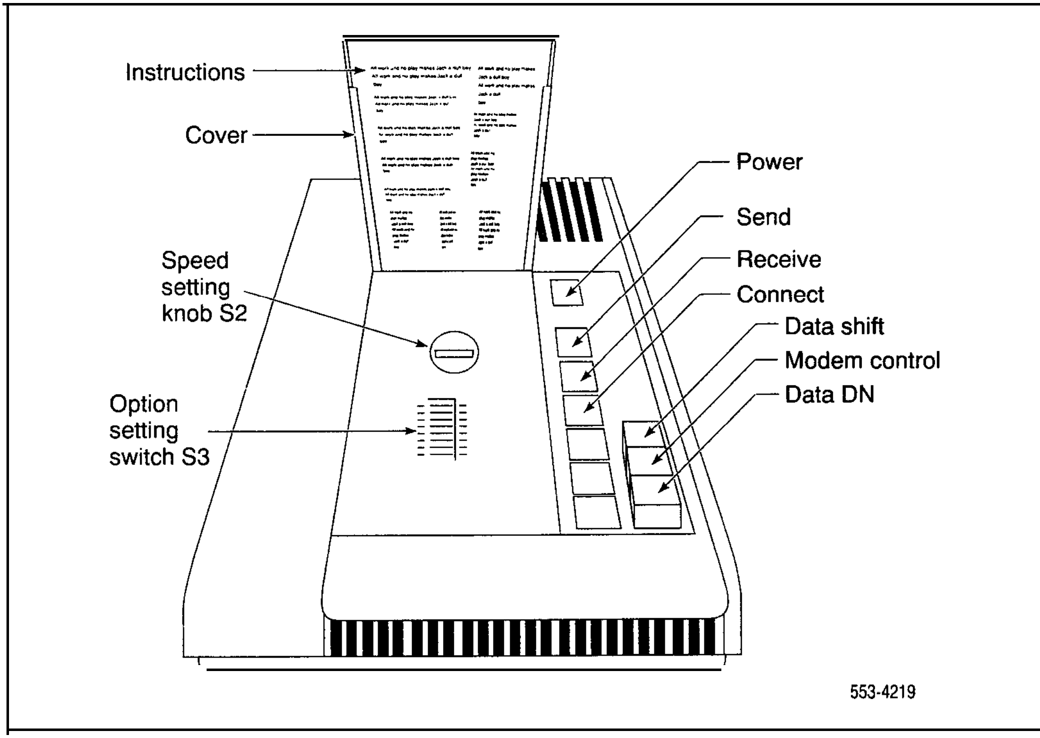


Figure 7
ADM Controls and Indicators



Features and services

Several system and telephone features are available for use with Meridian Data Services. These features, their operation and/or interaction when used in conjunction with data calls, are defined under subsequent headings.

Refer to the specific data document listed at the beginning of this document, or XI ***1 features and services*** (553-300 I-305) for more information regarding system and telephone features.

Automatic dialing

Description This feature allows a station user to dial a directory number by pressing a single key. The user may change the number associated with auto dial at any time. The directory number may include trunk access and area codes.

Interaction This feature, when assigned to a colocated ADM, is accessed from the telephone once the DATA SHIFT key is pressed on the ADM. If also assigned to the companion telephone, the feature will operate independently, i.e., programming and use apply to data (DATA SHIFT lamp steadily lit) or voice (DATA SHIFT lamp dark). The feature can also be accessed from an AIM or from a colocated ADM with keyboard dialing.

Call Forward-all calls

Description A data station with this feature may have all calls which are directed to the DDN automatically forwarded to another data station DDN within the customer group.

Interaction This feature, when assigned to the colocated ADM, is accessed from the SL-1 set once the DATA SHIFT key is pressed on the ADM. If also assigned to the companion telephone, the feature will operate independently, i.e., activation will apply to either ADM (DATA SHIFT lamp steadily lit) or telephone (DATA SHIFT lamp dark).

Call Forward-internal calls

Description This feature adds greater flexibility to the Call Forward All Calls feature, enabling a data station to opt to have only internal calls automatically forwarded to another data station within the customer group.

Feature operation and requirements adhere to the CFW All Calls feature. However, the forward DN for the Internal CFW feature functions independently of the forward DN for CFW All Calls. Consequently, non-internal calls are not affected by this new feature and will continue to be directed to the CFW DN defined for CFW All Calls.

Limitation The Internal CFW feature does not support data telephones. Therefore, on digital telephones that provide both voice and data communication, Internal CFW supports the voice line only.

Ring Again

Description This feature allows a station user to have the system monitor a busy directory number, and when it become free, to alert the calling station and to ring the called station. No digits are outpulsed until the alerted station accepts the call. The user may originate or receive other calls while Ring Again is activated.

Speed Call

Description "Speed Calling" allows a station user to place calls to a directory number by dialing a l-, 2- or 3-digit code. The DN may be for stations, CO trunks or DDD numbers.

Provision Speed call lists of 10, 100 or 1000 entries are assigned to a speed call controller who may use or change any entry in the list at any time. Any number of users may be assigned to any list.

Interaction Combined voice and data entries with the same Speed Call list are not recommended.

User Selectable Call Redirection

Description USCR allows the user to perform two tasks:

Select the four redirection DNs from the telephone. Thes DNs include the CFNA DN and the external CFNA DN (if it exists).

- Change the way the number of ringing cycles is defined for Flexible Call Forward No Answer (CFNA). One of three options can now be selected from the telephone.

Limitation This feature does not support Basic Rate Interface (BRI) telephones.

Automatic Set Relocation

Description This feature allows the users to move the data sets to another location without the intervention of an installer. This feature is available with the QMT7 (ADM) and QMT11 (ASIM).

Automatic Route Selection

Description Automatic Route Selection (ARS) provides the system with the ability to complete outgoing calls using the cheapest and most efficient routing available.

Call Detail Recording

Description Call Detail Recording (CDR) is an SL-1 optional software package which provides a record of selected calls for accounting and administration purposes. The CDR call records include the identity of the calling and called parties plus the duration of the call. *See Cull Detail Recording description and formats* (553-2631-100) for a full description of this feature.

Interaction Data calls over outgoing trunks (via modem pool) are recorded as one outgoing trunk call (PDN to external data facility) transferred to a DN of a modem. If the same key is used for voice and data, then only one call type may be made at a time. Once a data call is established, then PDN is available to make a voice call.

Hunting-Computer Ports Modem Pool (See Data Hunting)

Description Hunting allows a call directed to a busy DDN to be routed to the next idle DDN in a prearranged group. Of the four types of hunting provided by the Meridian SL-1 system, two types are recommended when used in conjunction with computer port DDN and Modem Pool DDN:

The hunting feature permits data users to access an idle device within a group of computer ports or modem pool ADM/modems by using the DDN.

Provision Hunting is assigned to stand-alone ADM associated with computer ports or modem pool ADM/modems using LD11. Data hunt groups must contain like members, i.e., there cannot be a mix of DDN belonging to computer port ADM and Modem Pool ADM within a single hunt group.

Dataport Hunting

The Dataport Hunting feature improves the hunting and ring again operations for modem pooling.

Before this feature was introduced dataports were defined as stations in the software. To establish a pool of dataports, the stations were connected in a hunt chain. The maximum number of dataports which could be accessed under a single DN were limited by the maximum number of hunt steps for that software generic. If all members in the chain were busy, the calling party could only apply ring again against one station in the chain and might not be notified when the other dataports in the pool became idle.

The Dataport Hunting feature organizes the dataports into ADM trunk type routes and hunts the dataports as trunks.

A maximum of 128 dataports can be grouped under a single access code (with an option to step to another route). If all members of a route are busy the calling party may apply ring again and be notified when ever the first route number becomes idle.

A dataport is configured by connecting either:

- a modem capable of auto answer to one unit of a 500 line card (QPC60), or
- a stand-alone ADM in the auto-answer mode to a data unit of a DLC (QPC311).

During day service only, an attendant can transfer incoming calls to dataport groups. During night service, any station can transfer calls to dataport groups.

Provision Modems and stand-alone ADM are assigned to the Dataport Hunting feature with Overlay Programs 16 and 14

Digital Trunk Interface

DTI (X11 release 5 and higher) provides for a trunk interface between an Meridian SL-1 Digital Network Loop and an external DS-1 Digital Carrier Termination

This provides the capability of an all digital path for voice and data transmission.

The DTI data channels support the same transmission mode, mode of operation, transmission speeds and data format as the SADM.

The DTI feature may be used with AMP for outgoing modem pooling but is not used for inbound modem pooling.

There are three different trunk types; Data only, Voice and Data and Voice only. If a Data Only outgoing trunk is found, a modem is not necessary. However, a modem is inserted when either of the other two trunk types are used.

Provision LD 11 is used to designate the all digital connection flag in the customer data block while overlay programs 17, 73, 16 and 14 are used to establish the DTI feature. The prefix DN is defined in Overlay Program 16.

Computer/PBX Interface

CPI provides a 24-channel **T1** carrier link between the Meridian SL-1 and a host computer. CPI uses the DTI hardware connected to a host computer to provide data channels from the **SL-1** to the host. CPI allows manufacturers to build the interface into their computers.

CPI eliminates the need for DLC, ADM, or MCDS and allows switched access to a large number of host computer ports (max 24 per CPI) via one interface.

CPI provides the capability of an all digital path for data transmission to the host with the flexibility of supporting every asynchronous and synchronous protocol. (See *1 features and services* (553-3001-305) for a full description of this feature).

The CPI data channels support the same transmission mode, mode of operation, transmission speeds and data format as the SADM.

Remote Peripheral Equipment

Description Remote Peripheral Equipment (RPE) allows the range of the multiplexed loop between the common and peripheral equipment to be extended beyond 50 ft (15 m). The peripheral equipment may then be placed closer to the stations it serves and effectively increases the serving area of the Meridian 1.

Outbound Modem Pooling (not AMP)

Description This configuration allows non dedicated, dial-up access to voice-grade modems required for outgoing data calls to remote facilities over analog trunks.

Each pooled modem consists of an odd-numbered port on a DLC connected to a stand-alone ADM. The DLC port is assigned a DDN. The ADM is in turn connected to a voice-grade modem. The modem is connected to a Line Card (Modem Pool or regular) in the Meridian 1 PE.

> ***Note:*** With the AMP feature, the regular QPC60 line card is always used to establish a pooled modem. AMP in connection with the Dataport Hunting feature is able to determine the ringing requirements. There is also no need for the VFDN reference required with Manual Modem Pooling.

The MPLC supports up to four ADM. An MPLC (QPC353) port is required for each asynchronous modem in an asynchronous modem pool. The MPLC is assigned a VFDN which corresponds to the VFDN switch setting in the ADM. This number is used to establish the outgoing call connection on the analog side (to analog trunk) of the modem.

A regular line card (QPC60) supports up to four synchronous modems in a synchronous outgoing modem pool.

To access the modem pool, a data station dials the DDN assigned to the ADM.

When a modem pool consists of more than one stand-alone ADM/modem pair, the hunting feature is used to provide users efficient modem pool access through use of one pilot modem pool DDN (see Hunting Computer Ports and Modem Pool).

The Ring Again queuing feature can also be applied by data callers who encounter a busy modem pool at the time of dialing (see Ring Again).

Provision The DDN and hunt group of the ADM/modem pair are entered in the office data using LD1 1.

Declaration of the VFDN is made in the office data using Overlay Program 10.

The number of pooled modems to be supplied is determined according to customer utilization requirements, calculated by using *data features traffic engineering and configuration* (553-2731-15 1). Modem pools must be organized according to types and transmission modes (no mixing is allowed).

Limitations Data calls placed through the modem pool over unconditioned voice-grade lines are limited to a maximum transmission rate determined by the modem capability or by the limitations of the unconditioned line.

Inbound Modem Pooling

Description This feature is only applicable to the QMT8 and higher numbered ADM.

Each pooled modem consists of a QPC60 connected to a modem. The modem is in turn connected to a stand-alone ADM. The ADM is connected to a DLC in the SL-1 PE.

An inbound modem pool is a group of modems configured in a pool to permit remote terminals to access local computer ports (or terminals) over a voice-grade network. Both asynchronous and synchronous modems are supported for access to single hosts. However, only asynchronous modems are supported for access to multiple hosts. The inbound modem pool is separate from the outbound modem pool. The dialing procedures are different for access to a single host (via Hotline) versus access to multiple hosts.

> ***Note:*** With AMP there is no need to separate inbound from outbound pool.

Provision The DDN and hunt group of the ADM/modem pair are entered in the office data using LD11. A 500-telephone line card is required to establish the incoming call connection on the analog side (to analog trunk). The number of pooled modems to be supplied is determined according to customer utilization requirements, calculated by using *Meridian data features traffic engineering and configuration* (553-2731-151). Modem pools must be organized according to modem types, i.e., modems of the same speeds and modulation shall be placed in the same pool.

Interaction Assign the analog DN of the modems into the hunt group. (The analog DN is the number assigned to the line card that is connected to the analog end of the modem.) It is possible to configure the inbound modem pool with Ring Again, however this is not recommended due to the possibility of tying up trunks and time slots.

Dedicated modems

Description This configuration allows dial-up or Hotline access to a voice-grade dedicated facility for outgoing data calls. Each dedicated modem is connected to a stand-alone ADM which is connected to an odd-numbered port on a DLC in a peripheral equipment shelf. The DLC is assigned a DDN which any data station, equipped with an SL-1 set/ADM pair, can dial up for first-come first-served modem access.

The Ring Again queuing feature can also be applied by data callers who encounter a busy modem pool at the time of dialing (see Ring Again).

Provision The DDN of the ADM/modem pair is entered in the office data using LD 11.

Limitations When an unconditioned voice-grade line facility is used, a data call placed through the modem is limited to a maximum transmission rate as determined by the modem capability or by the limitations of the unconditioned line.

Automated Modem Pooling

Description This feature is only applicable when QMT8 (vintage D11) and higher numbered SADM are used to form the ADM/Modem pair.

With AMP, available as an option in X11 release 5, the ADM/Modem pair information is organized in pool lists that contain similar modems, for speed and other options, to be accessed for use with compatible dataports.

AMP allows access to local and remote data stations using ADM/Modem pairs by a one-step dialing procedure. It is dependent upon the ADM trunk group hunting feature in its selection of modems and dataports.

AMP is able to distinguish between inbound and outbound ringing requirements. Therefore a special MPLC and separate Outbound and Inbound pools are no longer required.

With AMP, the service change to pair the ADM and modem together, eliminates the VFDN switch and the AUTO DIAL simulation requirements.

Outbound AMP

The Outbound AMP application replaces the manual three-step method of accessing modems with a one-step dialing procedure. Two different dialing procedures are available:

- Prefix dialing method
- Default method

With the Prefix dialing method, the user dials a Modem Selection Prefix of 1 to 4 digits, a trunk access code that is used to route the call and the remote computer DN.

With the Default method, it is assumed that the data user normally wishes to connect to the same modem pool for every call. In this case the Modem Selection Prefix is stored against the users TN and the user only needs to dial the trunk access code and the remote computer DN.

A user may use either method to automatically access and connect the modem. The stored Default Modem Selection Prefix can always be overridden by dialing another Modem Selection Prefix.

If the DTI package is equipped and an all digital path to the remote computer is available, an All Digital Connection Prefix can be designated in the Customer Data Block. If this special prefix is used with the Prefix or Default method a modem is not connected when the outgoing route is digital.

Inbound AMP

The Inbound AMP allows an incoming data call (via DID/Tie trunks) to terminate to a computer port or a data set. If the incoming call is voice frequency and the data port is not analog, an ADM/Modem pair is switched into the connection. If the incoming call is a digital data call, the connection to the computer port is completed without searching for a modem.

Provision When ADM are used as dataports, they are configured to look like trunk members in an ADM trunk block.

When ADM are used as data sets, they are configured as SL-1 sets in the TN block. A prompt "DTYP" is used to specify inbound only, outbound only or combined inbound/outbound.

Keyboard Dialing

Description This feature allows Data Terminal Equipment (DTE) to initiate and/or terminate data calls to in-house or remote hosts using the terminal keyboard without the use of a telephone

Keyboard dialing capability is provided on asynchronous terminals connected to:

- colocated asynchronous QMT8
- QMT9 (AIM)
- QMT11 (ASIM)

Provision This feature is supported for ASCII, asynchronous, character mode, interactive terminals equipped with EIA, RS-232-C interface. It is not provided for synchronous or block mode terminals.

Keypad Dialing

Description This feature allows the ASIM to initiate and/or terminate asynchronous or synchronous data calls to in-house or remote hosts using the ASIM keypad.

Provision Keypad dialing capability is provided on ASIM terminals with a standard 12-button dial pad that has the digits 0 through 9 plus the * and the #.

Synchronous Data Switching

Description This capability allows synchronous terminals to have switched access to local and remote computers equipped with synchronous ports.

Interaction This feature is supported by the synchronous QMT8, QMT12 ADM and ASIM.

Hotline

Description This feature is used when a data user wishes to always access a particular data station.

Hotline from QMT8 This feature is used with keyboard dialing and is similar to and uses the Automatic Dialing software. Hotline is accessed from the data terminal by:

- turning DTE on
- switching DTE from off-line to on-line
- operating the carriage return (CR) key

Hotline from QMT11 If the ASIM and the hotline key are ON, the feature is activated by:

- turning the DTE on
- releasing a call and entering a carriage return command
- momentarily depowering the ASIM when the DTE is on

Hotline uses the assigned AUTO-DIAL key

At a colocated data station, the data DN may be assigned Hotline while the voice DN may be assigned AUTO-DIAL.

Provision Use LD1 1 to assign the feature to an ASIM or a colocated or a stand-alone ADM. It is assigned as ADL in the overlay and to key/lamp pair number three. The ADM or ASIM must be configured for Hotline.

Transparent Data Networking

Description This feature provides a transparent data channel for data modules to perform end-to-end protocol exchange. This means that two data modules will wait for a circuit path to be established before exchanging protocol parameters. The data modules and protocols that are supported by TDN are:

- Meridian Communications Adapter (MCA) card in a Meridian Modular telephone (MMT) set. Uses PSDS and T-Link protocols on external calls.
- Meridian Communications Unit (MCU) - a stand-alone unit. Uses PSDS and T-Link protocols on external calls.
- Basic Rate Interface (BRI) telephones. Use T-Link, V.110, and V.120 protocols.
- High Speed Data Module (HSDM). When configured to use PSDS.

In Xl 1 release 19, there are three ways to provide a transparent data channel to accommodate data calls from modules using the above end-to-end protocols:

- ESN19 signaling on the private network
- STD signaling on the private network with the STDN option [Standard Signaling TYPE (STYP)=STDN])
- TDN only routes for access to the public network or other vendor PBXs

The TDN feature is an important development for MMT, BRI and HSDM telephones that use PSDS, T-Link and other non-proprietary protocols or rate adaption schemes, as it allows calls to be tandemed across a private network before terminating on to a public network. This enables private network users to take maximum advantage of their own network facilities before entering the public network.

> Note: A network with all PRI trunks using release 19 or greater has data tandeming capabilities without using ESN19 signaling or TDN routes.

Feature Requirements The TDN feature requires the following:

- QPC720 card in either DTI or PRI mode
- PRI trunks must use either TDN routes or ESN19

Limitations Point-to-point protocols, such as DM-DM, an NT proprietary protocol, are not supported by TDN. Refer to the feature description for a list of data modules and protocols that are supported by TDN.

Refer to *Transparent Data Networking* (553-2731-110) for detailed information on this feature.

Meridian Communications Unit

Description The Meridian Communications Unit (MCU) allows you to transmit and receive data using either PSDS over the public network or a private network. The MCU, which replaces the QMT21C, is designed for domestic and international use, with transmission speeds up to 19.2 Kbps asynch, and 64 Kpbs synch, integrated display, and self diagnostics. The MCU supports autodialing, ring again, and speed calling, as well as autobauding and automatic parity detection. You can use the MCU for

- Video conferencing
- LAN bridging
- Bulk data/PC file transfer
- Dial back-up
- Host connectivity

The MCU fully complies with RS-232C and can be configured as DCE or DTE to connect to a terminal, printer, or fax machine.

Unlike the MCA, the MCU provides a dedicated call key and call progress tones. The MCU also permits smart modem pooling.

The MCU supports the DM-DM, T-Link, V.25 bis, and PSDS interfaces as well as the RS-232C, CCITT V.35, CCITT V.24, and RS570/RS3449 (with different cables) interfaces. It complies with V.28 for European approval.

Refer to *Meridian Communications Unit and Meridian Communications Adapter* (553-2731-109) for detailed information on this feature.

Implementation

Allowable operating distances

An ADM, MCDS, AIM, or ASIM may be placed as far from its associated data terminal as is consistent with EIA RS-232 lead specifications. This separation distance is not absorbed in the following information.

Single wire gauge

The allowable operating distances between the SL-1 peripheral equipment (DLC) and a data terminal/computer port or MCDS port when one wire gauge is used are:

Cable	PIC outside	PVC inside (Type D)
22 AWG	4000 ft (1219 m)	4000 ft (1219 m[1] 3400 ft (1036 m)[2]
24 AWG	3500 ft (1067 m)	2900 ft (884 m)[1] 2000 ft (610 m)[2] 1600 ft (488 m)[3]
26 AWG	200 ft (610 m)	2000 ft (610 m)[1] 1700 ft (518 m)[2]
Note 1: QPC311 E or higher vintage with QMT7C/D, QMT8A, QMT12A, MCDS Note 2: QPC311C/D with QMT7C/D, QMT8A, QMT12A, MCDS Note 3: QMT7D operating limitation with Northern Telecom cable		

Note *1:* A colocated ADM may be installed up to 4000 ft (1200 m) from the DLC. This allows an end to end separation of 8000 ft (2400 m)

Note 2: In some instances, the above limitations may be exceeded with no adverse effect upon ADM, AIM or MCDS operation

Mixed wire gauge

In a mixed wire gauge application, the allowable equipment separation distance must be reduced in order to retain transmission quality. Average figures are:

Cable	PIC outside	PVC inside (Type D)
22/24 AWG	2500 ft (762 m)	2500 ft (762 m)[1] 2100 ft (640 m)[2]
24/26AWG	1500 ft (457 m)	1500 ft (457 m)[1] 1200 ft (366 m)[2]

Note 1: QPC311 E or higher vintage with QMT7C/D, QMT8A, QMT12A, MCDS

Note 2: QPC311C/D with QMT7C/D, QMT8A, QMT12A, MCDS

Note 3: QMT7D operating limitation with Northern Telecom cable

Note I: A colocated ADM may be installed up to 4000 ft (1200 m) from the DLC. This allows an end to end separation of 8000 ft (2400 m)

Note 2: In some instances, the above limitations may be exceeded with no adverse effect upon ADM, AIM or MCDS operation

AIM

An AIM may be placed as far from its associated AILC port as is consistent with EIA RS-422 lead specifications, which limits the distance to 4000 ft (1200 m).

Customers who use RPE can install ADM at remote locations as well as at the main location. This extends the range of all digital data communications to approximately 100 km.

Cable specifications

Twisted wire pairs must be used for digital pairs, and no bridge taps are allowed. The crosstalk figure of cable used between the MDF and ADM measured at 64 kHz with 100 ohm termination must be:

- near end crosstalk > 40 dB
- far end crosstalk > 40 dB

Strapping options are provided on the DLC and ADM for the selection of wire gauges applicable to the installation.

Modem pool configuration

The modem pool configuration provides internal data station access to shared dial-up modems for outgoing trunk calls, and remote terminal access to local computer ports over a voice-grade network. The inbound modem pool is separate from the outbound modem pool. An ADM connected to the modem provides the DDN required for the receipt of incoming calls to the pooled modem.

> ***Note:*** With AMP it is no longer necessary to maintain separate inbound and outbound modem pools.

The number of modems within a modem pool is determined according to traffic requirements for that modem pool ***(see Meridian data features traffic engineering and configuration* (553-2731-151)),** and several modem pools may be configured as required to meet the customer's application requirements.

Hardware requirements

This section describes the primary equipment items, excluding the SL-1 switch itself, required to implement the Data feature.

One ADM/AIM/ASIM/MCDS-AC is required to interface with each data device supplied by the customer.

ADM

In the colocated mode, the ADM operates in conjunction with an SL-1 telephone to provide the interface with data terminal equipment in cases where:

- both voice and data calling are required
- answer-and-originate data calling capabilities are required

In stand-alone mode (no companion SL-1 telephone), the ADM supports incoming data calls where no voice calling or data-call originating capabilities are required (for example, computer ports and modems).

AIM

The AIM and it's associated AILC port supports all types of outgoing and incoming data calls where no voice calling or data-call originating capabilities are required (for example, computer ports and modems).

ASIM

The ASIM supports all types of asynchronous and synchronous outgoing and incoming data calls. Either keyboard or keypad dialing is used to establish the asynchronous outgoing connections while only keypad dialing may be used to establish synchronous outgoing connection.

Power supply

Power for each module is supplied externally as follows:

- One external power unit is required to provide local 24 V input to each ADM or AIM. A 110 or 220 V ac to 24 V transformer must be used. Use a PO593922 or PO610756 24 V transformer for the ADM. The A0290050 24 V transformer is recommended for use with the AIM.
- One external power supply (A0297998) is required for each ASIM. A 110 V ac input service should be used. An optional 220 V power supply (A03 1829 1) is available for the international market. The ASIM power supplies are assembled with the units and it is not necessary to order them separately.

DLC

The QPC311 DLC supports SL-1 sets, ADM and ASIM in the following operating combinations:

- two independent telephone and two stand-alone ADMs
- two colocated telephone/ADM pairs
- one colocated telephone/ADM pair plus one independent SL-1 set and one stand-alone ADM
- two ASIM plus two SL-1 sets

The QPC432 4PDLC supports four ASIM or four ports of MCDS-AC.

AILC

The QPC430 AILC supports 4 AIM or equivalent units. It combines the basic functions of four ADM and provides the drivers and receivers to meet standard EIA RS-422 electrical interface specifications.

Modem Pool Line Card (asynchronous outbound only)

Each customer-supplied asynchronous outbound pooled modem requires interface, on the analog side, with one port of an MPLC. This provides the modem VFDN. One MPLC supports up to four modem pool VPDN. (The MPLC cannot be used for 500 or 2500 type set terminations.) The 500 set line card is used for inbound modem pools and for synchronous modem pools.

Note: The MPLC and the VFDN are not used with the AMP feature.

Multi-Channel Data System

The MCDS-AC port may be used instead of ADM to interface multiple ports of a computer. An MCDS-AC port is required to interface each computer port to the equipment using a DLC.

Major equipment items required to implement MCDS consist of:

- MCDS shelf
- DLC
- MCDS-AC
- MCDS power supply unit
- MCDS cabinet (optional)
- Spectron patch panel and cables (optional)

MCDS cabinet

Two different enclosures are available:

- A large cabinet (varying sizes and configurations) that can accommodate two shelves and four patch panels.
- A smaller cabinet that accommodates one shelf only.

MCDS shelf

The MCDS shelf houses a center-mounted power supply and four asynchronous cards mounted on each side of the power supply (a total of eight). It can be either a stand-alone unit on an equipment frame or mount in the MCDS cabinet.

MCDS power supply

The MCDS power supply is an off-line, switched mode supply which provides multiple, regulated and protected DC voltage to the shelf backplane. It requires 1.7 amp from 120 V, 60 Hz ac source. It supplies steady-state 140 watts multiple, regulated and protected DC voltage to the backplane. An optional MCDS power supply is available that connects to 220 V 50 Hz ac lines.

MCDS backplane

The MCDS backplane which is part of the shelf assembly, is provided with two sided circuitry. It is equipped with nine 160-pin connectors to receive the interface and power supply circuit packs. It is also equipped with two 25-pair standard telecom-type plugs to connect to the SL-1 switch and thirty-two female-type, standard 25-pin, RS-232-C connectors to provide interface to the computer ports. The backplane is also provided with an insulator sheet on the rear surface to prevent accidental shorting of the traces with metal connector hoods.

MCDS -AC

The MCDS-AC provides the drivers and receivers to meet the EIA standard RS-232-C electrical interface specifications.

Traffic measurements

Traffic measurements provided for data traffic and feature usage for data calls are the same as for voice traffic from telephones Refer to ***Traffic measurement formats and output*** (553-2001-450) for further information on available traffic measurement.

Memory and real time requirements

Implementation of the SL-1 Data feature requires additional memory for each ADM added. Requirements for unprotected and protected data store and real time are given in ***Meridian data features traffic engineering and configuration*** (553-2731-151).

Maintenance and testing

A manual remote loopback testing capability is provided for isolating ADM and ASIM faults. Information on remote loopback testing procedures is given in ***Meridian data features operation and tests*** (553-2731-300).

All resident maintenance programs, maintenance overlays, and diagnostics which apply to telephones, land line cards are also applicable to the ADM, AIM, ASIM, and AC ports, DLC AILC, and MPLC.

Administration

The Meridian1 recognizes the ADM, AIM, ASIM, or MCDS-AC port as an telephone, the DLC, 4PDLC or AILC as an SL-1 line card, and the MPLC as a 500-type line card. LD10 and LD11 are used to enter the parameters for Data hardware in the SL-1's office memory.

ADM/ASIM	LD11
MCDS-AC	LD11
DLC/4PDLC	LD11
AILC	LD11
MPLC	LD10
VFDN	LD10

The optional AMP and associated features require modifications to the following programs to enter data into memory.

AMP	LD16
Dataport Hunting and Modem TN	LD14
DTI Default Flag	LD11
DTI Default Prefix	LD15

SL-1

Meridian Data Services

Description

Release 3.0
Standard
August 1, 1993
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northern telecom

SL-1

QPC723 RS-232 interface Line Card

Description, installation and operation

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Date: December 31 , 1992

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Standard version 1 .O.

August 10, 1990

Revised for Northern Telecom standard 164.0.

December 31, 1992

Standard, release 3.0. This document is reissued to include technical content updates. Due to the extent of the changes, revision bars are not used.

Contents

Introduction

This document describes the QPC723 RS-232 Interface Line Card (RILC), and the interconnection between the RILC, the Data Termination Equipment (DTE), or Data Communication Equipment (DCE) and the Meridian 1 system. The installation and operation of the card, and associated hardware are also defined.

The RILC provides the interface through which asynchronous ASCII data equipment can connect through the network to other data equipment for data switching. Transmission between the data equipment and the RILC uses RS-232-C levels.

The RILC provides four interface ports. These ports are software configurable as SL-1 stations or ADM trunks and provide direct interface to RS-232-C asynchronous ASCII equipment. Refer to Figure 1 for an example of different RILC applications.

Purpose

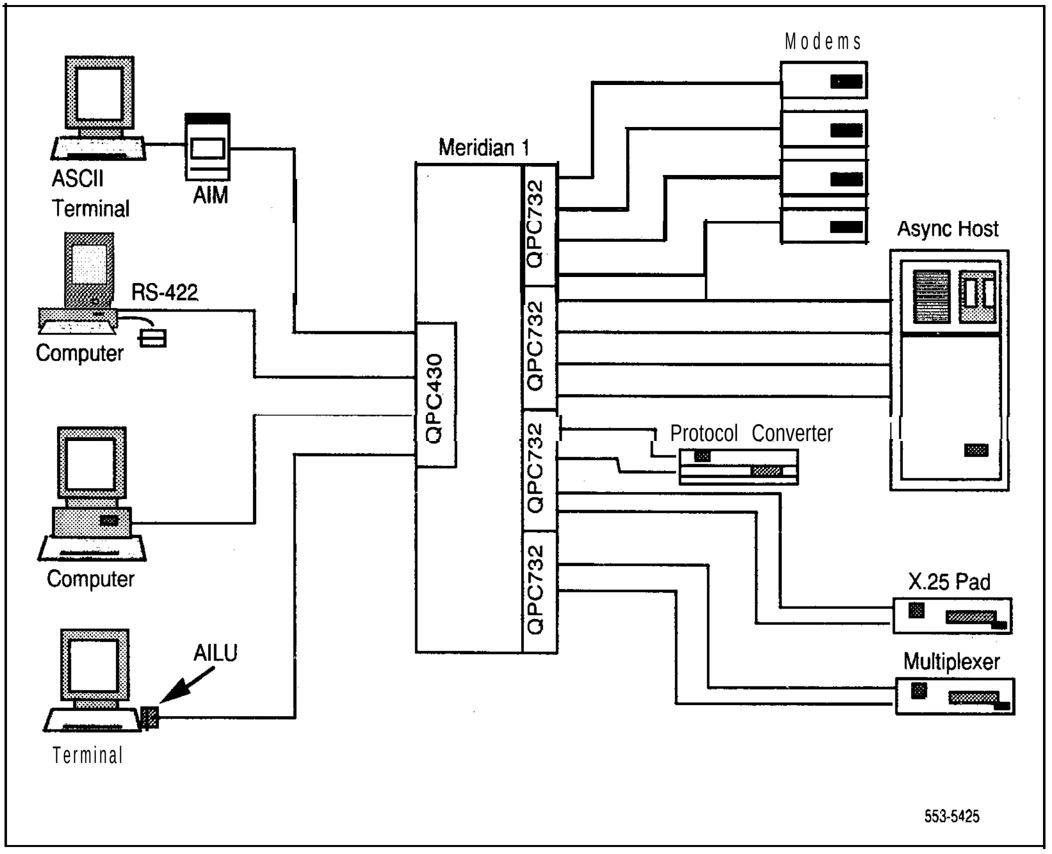
The RILC eliminates the need for data modules like the ADM, SADM, or MCDS in specific applications. The RILC replaces the Data Line Card (QPC311 or QPC432) and the data modules where the distance limitation imposed by RS-232-C is not exceeded.

The RILC is compatible with all existing Meridian 1 data products. It conforms to the data module- to- data module (DM-DM) protocol. The data products are:

- Asynchronous Interface Line Card (AILC)
- Data Line Card (DLC) and Four Port Data Line Card (4PDLC)
- Integrated Services Digital Line Card (ISDLC)

- Digital Trunk Interface (DTI)
- Compurer-to-PBX Interface (CPI)
- Remote Peripheral Equipment (RPE)

Figure 1
RILC connection diagram



Features

The QPC723 RS-232 Interface Line Card (RILC) operates with these features.

- asynchronous and full duplex operation
- keyboard dialing including autobaud and autoparity
- DTE and DCE connectivity
- terminal and host computer connectivity in DCE mode
- inbound modem pooling with any asynchronous modems
- outbound modem pooling using auto-dialer modems such as Hayes Smartmodem
- hot line operation
- forced or normal Data Terminal Ready (DTR)
- loop back test
- self diagnostics
- Auto dial
- Ring again
- Speed call

Call origination

The RILC uses keyboard dialing (KBD) and Hotline operation for call origination from data terminating equipment to local and remote hosts.

KBD refers to the capability of originating the data call to local and remote hosts or DTE by using the terminal keyboard.

Related documents

For complete information concerning Meridian data features, refer to these documents.

QMT21 High Speed Data Module (553-2731-107)

QPC918 High Speed Data Card (553-2731-108)

Traffic Engineering and Configuration (553-2731-151)

Enhanced Asynchronous Interface Line Unit description and installation (553-2731-203)

Operation and Tests (553-2731-300)

NT7D16 Data Access Card description and operation (553-3001-191)

X11 input/output guide (553-3001-400)

> ***Note:*** For the purposes of this document, Meridian 1 refers to SL-1 ST, NT, RT, and XT machines as well as Meridian 1 system options 21, 51, 61, 71, and 81. Meridian 1 option 11 does not support the RILC. With this option use the Data Access Card (NT7D16AA).

Description

The RILC is contained on one four-layer printed circuit pack (PCP). The card is 12.5 x 10 in (317.5 x 254 mm) and conforms to the Meridian 1 common features drawing for a peripheral card. It has a grey metal faceplate which contains LED indicators and DIP switch controls for each of the four ports.

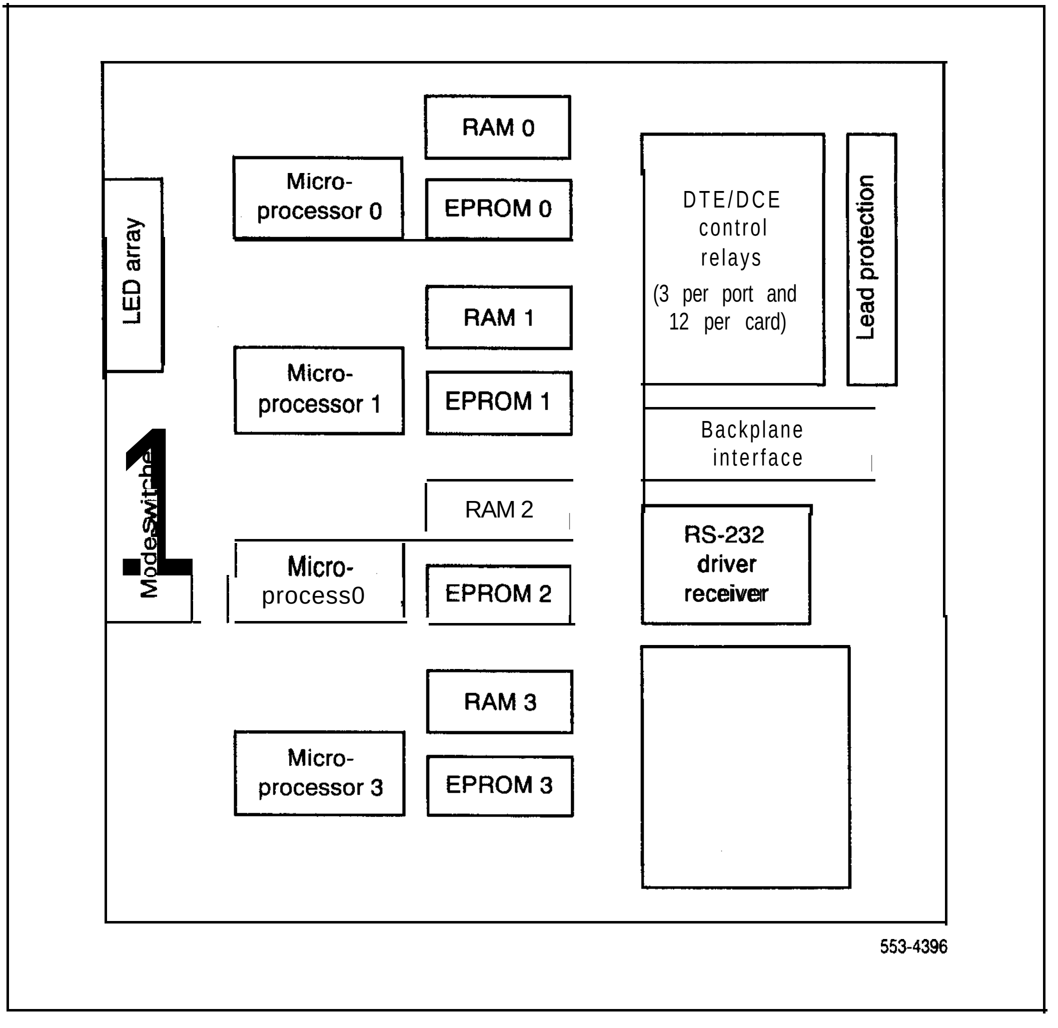
Note: The RILC cannot be used in single density peripheral shelves, nor in the Intelligent Peripheral Equipment (IPE) Modules. However, it can be used in the following PE modules and shelves; NT8D13, QSD64, QSD65 QSD80, QSP35, and QSP36.

The PCP is equipped with CMOS component parts (Figure 2).

- The microprocessor handles the asynchronous communication channel with the DTE or DCE, converts the data into the Meridian 1 data format and interfaces with the Meridian 1 signaling channel for call establishment and tear down.
- The converters change the eight-bit parallel bus from the microprocessor to the bit inter-leaved format of the Meridian 1 network. The signaling interface does the level shifting and retiming of the signals from the peripheral shelf.
- EPROM and RAM are used for memory
- The RS-232-C drivers and receivers are standard 1488 or 1489 chips (or equivalent). These EIA leads are protected against –48V, ringing and ±15V with back-to-back zener diodes.

  Three Double-Pole-Double-Throw (DPDT) relays are used to route the RS-232 leads for configuring the port into the DTE or DCE mode. There are three relays for each port or twelve relays for the four ports on the RILC.

Figure 2
RILC block diagram



Controls and indicators

The RILC faceplate provides Light Emitting Diodes (LED) indicators and DIP switches to monitor the status of the RS-232 interface signals and to control the interface mode, control lead states, and set the interface baud rate. Figure 3 shows the RILC faceplate and configuration switches and indicator LEDs.

The RILC has nine (LEDs:

- Six LEDs are for monitoring the status of the RS-232 leads. The LEDs are shared among the four ports and are controlled by a push-button (SEL) switch.
- Two LEDs indicate which port is selected for monitoring.

  A single LED indicates ON when the RILC card is disabled.

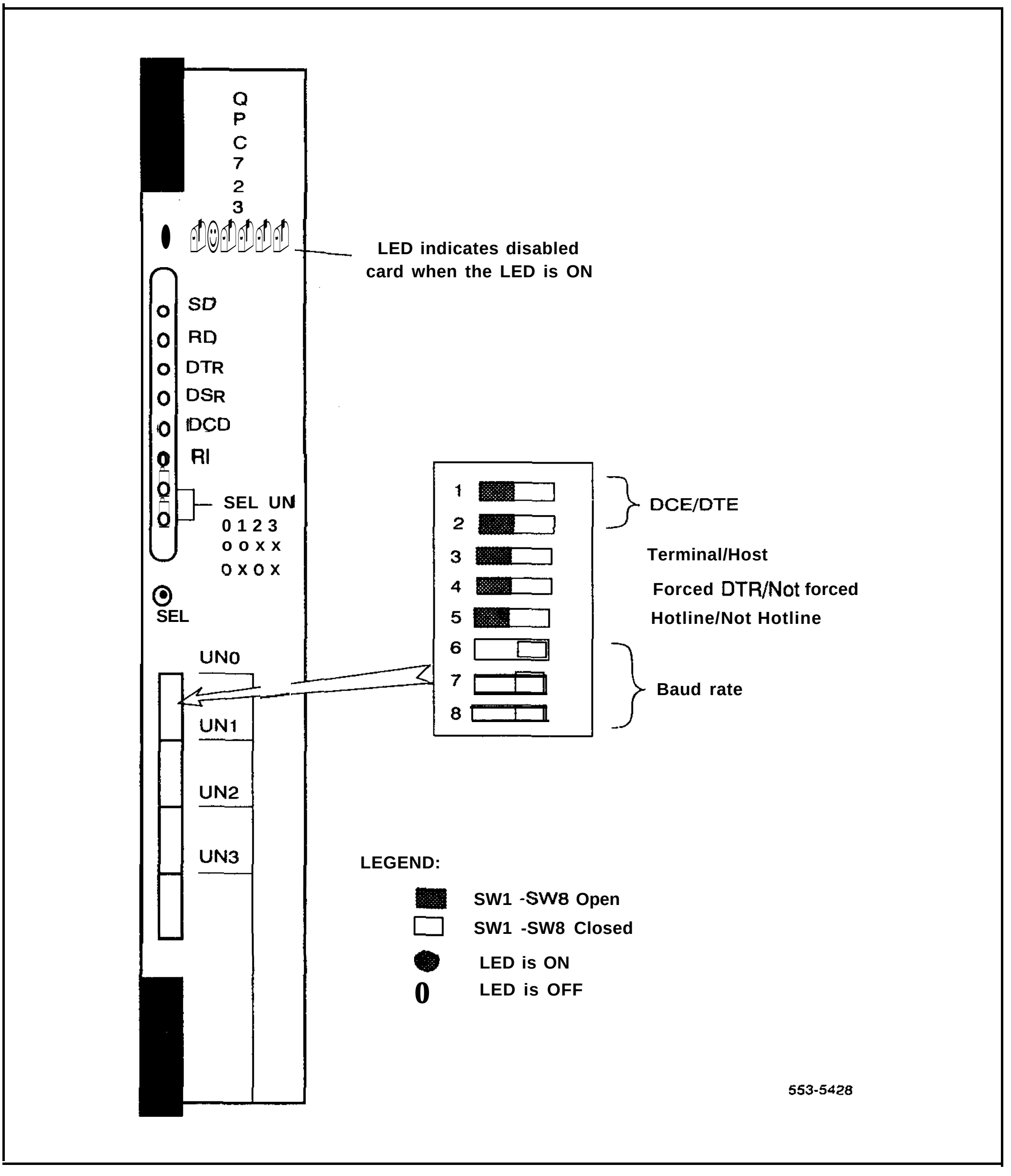
The RILC has one eight-position DIP switch for each of the four ports. The function of the faceplate switches to control each port characteristics as follows:

Switch 1:	DTE/DCE mode control
Switch 2:	DTE/DCE mode control
Switch 3:	Host/Terminal mode control
Switch 4:	Forced DTR/normal
-Switch 5:	Hot-line/KBD control
Switch 6:	Baud Rate control
Switch 7:	Baud Rate control
Switch 8:	Baud Rate control

A switch-setting change is only effective when a port is idle (not carrying on a data call).

The faceplate also displays charts that define the LED port selection and the switch settings.

Figure 3
RILC faceplate layout



Switch definitions

Switch 1 controls selection of the DTE or DCE logical **and** electrical modes of operation. Three DPDT relays direct RS-232 signal directions for DTE or DCE modes of operation as specified in the paragraph on Signals Supported.

> Note: When DTE mode is selected, the unit is operating as a DTE and is expecting to be connected to a DCE. Data from the unit appears on pin 2 of a correctly connected DB-25 connector. When DCE mode is selected, the unit is operating as a DCE and is expecting to be connected to a DTE. Data from the unit appears on pin 3 of a correctly connected DB-25 connector.

Switch 2 controls the Clear-To-Send (CTS) lead to the backplane. In the DCE mode, the CTS lead is passed through the switch and driven high (ON). In the DTE mode, switch 2 cuts off the signal to the backplane and the RILC assumes that the signal is high. **Switch 2 must always be set in the same position as switch 1.**

> ***Note:*** If switch 1 is in the DTE mode and switch 2 is left in the DCE mode, the CTS lead (usually pin 5 of the DB-25 connector) will be driven high or low. CTS status under these conditions is undefined and may cause a “bucking” driver condition in the external DCE which could cause a failure of other driver leads in the external DCE (for example, DSR, DCD, RD and RI may not operate properly).

Switch 3 controls the prompts and messages to execute keyboard dialing (KBD). When the interface is connected to a host computer, or a host-like device, the KBD prompts and messages can cause a ping-pong effect where both interfacing devices declare INVALID COMMANDS to each other. However, these prompts and commands are necessary for a terminal user to execute KBD.

When set to the “Host” position, the switch suppresses these prompts and messages. However, the host may proceed with blind dialing in some configurations.

When set to the “Terminal” position, the RILC provides KBD prompts.

Switch 4 controls the characteristics of DTR (typically pin 20 of the DB-25 connector, driven by DTE, received by DCE), and depends on the selection of switches 1 and 5 for variances in operation.

In the DCE mode, DTR is always viewed as ON even when the electrical DTR signal from the external DTE is OFF.

In the DTE mode, DTR is driven to an electrical ON condition except when a call is being connected. At disconnect, DTR is dropped (electrical OFF condition) for approximately 400 ms, then returned to the ON condition. This permits the external DCE to recognize remote disconnects.

Switch 5 provides for optional Hot line control. This allows five methods for a call to be originated to a single predefined number without manually dialing the number. The following options depend upon other switch settings.

- When in DCE mode
  - originate hotline call when DTR is toggled from OFF to ON
  - originate hotline call when DTR is not forced ON, and a Carriage Return character is received
  - originate hotline call continuously as long as DTR is ON

- When in DTE mode
  - originate hotline call when RI is ON
  - originate hotline call when DCD is ON

Switches 6, 7 **and 8** determine the baud rate of a port. The switch settings and the corresponding speeds are shown on a chart attached to the faceplate. When the switches are set to auto, the port looks for a Carriage Return <CR> to determine the baud rate. When set to a fixed baud rate, the port works at that baud rate when originating a call, but always conforms to the baud rate set by the originating data module when receiving a call.

Specifications

Data characteristics

The RILC provides the following communication characteristics.

Data Type	ASCII (ANSI standard X3.4)
Synchronization	Asynchronous, Start-stop (ANSI standard X3.15)
Number of Bits	8-bits including parity
Parity	Treated as data and transported unchanged
Data Rate	110, 150, 300, 600, 1200, 2400, 4800, 9600 and 19200 bits per second
Stop Bits	2 bits for 110 bps 1 bit for all other speeds
Handshake	Full duplex
Data Terminal Interface	RS-232/CCITT V.24

The RILC transmits and receives at a rate of +0.9 percent above the bit rates as shown above to allow operation with data equipment which transmits above the nominal bit rate without data loss.

In the KBD mode, the default parity is space and may be changed to even, odd or mark with the autoparity feature. In the data transfer mode, the parity bit is passed transparently as the eighth bit. When the calling data module specifies 7-bit with even or odd parity, the parity bit is regenerated by the RILC before data is passed to the external data equipment.

Parameter exchange

During a call set-up with another data module, the characteristics of the called are automatically configured according to that of the calling end unless an incompatible configuration is specified.

During the KBD mode, the RILC will autobaud and auto parity so that the menu and prompts are properly displayed on the user' s terminal. The parity stays unchanged until specifically changed by another autoparity operation.

When a call is made to the RILC from another data module, the RILC configures its characteristics according to the parameters sent down from the other module regardless of whether it has autobauded or not. If the far end specifies 7 bit plus parity, the parity bit will be reconstructed. The RILC rejects calls with certain parameter mismatches **such as calls specifying synchronous, half duplex or 8 bit plus parity.**

The RILC permits re-down-line-load (RDLL) from the far end, but does not provide for initiating RDLL.

Data equipment interface

A subset of the EIA signals and their CCITT V.24 equivalents are shown in Table 1. This subset is found on asynchronous data equipment, although not all leads are used.

Signals supported

The RILC only supports a subset of the listed RS-232-C signals. This is because only 8 leads per port are brought out through the backplane connector for a total of 32 leads per card slot on the double density shelf. Signal collisions with adjacent cards prevent support of RILC in single density shelves.

Signal Supported		Signal Direction	
DB-25	**Signal name**	**DCE mode**	**DTE mode**
Pin 2	TD	In	out
Pin 3	RD	out	In
Pin 5	CTS	out	In
Pin 6	DSR	out	In
Pin 7	GND		--
Pin 6	DCD	out	In
Pin 20	DTR	In	out
Pin 22	RI	out	In

Pin 1 (FG) and Pin 4 (RTS) are not supported by the RILC.

Pin 1 (FG) may be supported by the data equipment, but is generally not used by the under through elimination of the wire in the interconnecting cable.

Pin 4 (RTS) will be assumed ON all the time by the RILC in the DCE mode, since half duplex is not supported. In the DTE mode, since the user DCE is most likely to be a modem and RTS is normally ignored by full duplex modems, it is permissible to drop the RTS signal support. Strapping in the interconnecting cable to force RTS on may be used for special situations.

Table 1
M-232-C signals as applicable to asynchronous transmission

Circuit designation					
EIA	**Common**	**CCITT**	**Pin no. (DB.25)**	**Signal source**	**Signal name**
AA	FG	101	1		Frame ground
AS	GND	102	7		Signal ground
BA	TXD	103	2	DTE	Transmit data
BB	RXD	104	3	DCE	Receive data
CA	RTS	105	4	DTE	Request to send
CB	CTS	106	5	DCE	Clear to send
cc	DSR	107	6	DCE	Data set ready
CD	DTR	108.2	20	DTE	Data terminal ready
CE	RI	125	22	DCE	Ring indicator
CF	CD	109	8	DCE	Received line signal detector

Operating distance

RS-232-C is defined for speeds up to 19,200 baud at a maximum distance of 50 feet to prevent signal distortion. This specification is based on cable capacitance of 50 pF per foot and total line capacitance of 2500 pf. The capacitance of a typical 24 gauge and 26 gauge inside cable is shown below:

Wire Gauge	Capacitance/ft
24 AWG	24 pF
26 AWG	15pF

To extend the distance beyond 50 feet, shielded cable, reduced bit rate low capacitance cable, and continuous cable runs can be considered.

The RTLC is powered completely from the peripheral shelf backplane. The power requirements (shown below) are obtained from the –48V or –52V backplane supply, except for ±6V, which is provided by the peripheral buffer.

Voltage	Current	
	Nominal	Maximum
+5V	0.9A	1.3A
+6V	12mA	21 mA
-6 V	14 mA	27 mA
+9V	75 mA	100 mA
-9v	75 mA	100 mA
–48V	250 mA	320 mA
-52V	250 mA	320 mA

The card dissipates less than 15 watts of heat which must be considered when determining the system heat dissipation.

Product compatibility

The RILC is compatible with all existing Meridian 1 Data products (AILC, AIM, AILU, ADM, SADM, ADO, MCDS, ASIM, MPDA, and

CIM/VT100). It is also compatible with DTI/CPI, RPE, and any combination.

Environment

The RILC is designed to operate without degradation under the following conditions:

Specification	Operating	Storage
Ambient temperature	0” C to 60” C	-40” c to +70° c
Relative humidity (non-condensing)	5% to 95%	5% to 95%

Reliability

The RILC has a predicted mean time between failure (MTBF) of 10 years at **40” c.**

Self diagnostics

When the card is powered up, each unit of the RILC executes a self diagnostic routine. The six faceplate LEDs indicate the results of the diagnostics. At power-up, all six LEDs light momentarily and any malfunctioning LED is visually checked. If the hardware passes the self-diagnostics, the LEDs go off. If a unit fails the diagnostics, the LED blinks on and off two times per second indefinitely. Pressing the unit selection switch while the LED is blinking puts the LED ,into monitor mode, showing the RS-232 status. The LED returns to the diagnostic mode when the card is powered down and up again.

The top two LEDs (marked SD and RD) in the group indicate the diagnostic result of unit 0 of the RILC. The next two LEDs (marked DTR and DSR) indicate the result of port 1 and so on. If all four units pass the diagnostics, all the LEDs will be off at the end of the diagnostics. At this time, push the selection switch to enter monitor mode..

EIA control lead characteristics

The functional and procedural requirements of the EIA leads vary under different circumstances. To initiate KBD, a terminal or Personal Computer (PC) may require DSR, DCD, or CTS or be ON. However, a host computer may require the DCD and DSR leads to reflect the true condition of the communications channel in order to provide security to each individual user. Due to these conflicting requirements, the same option switches, namely DCE/DTE control and Host/Terminal control, also specifies the interaction of the EIA leads during the call set-up state. After a call is established, DSR, DCD, CTS and DTR are usually on.

The RILC considers a "BREAK" condition (continuous Space condition) lasting longer than 1.5 seconds as DTE or DCE not ready, and releases an established call. Breaks lasting less than 1.2 seconds are passed transparently as data to the far end. An Open line (zero voltage) is treated as OFF on the control leads, but mark on the data leads. This assures that a physical disconnect of a DTE or DCE from the Line Card always results in a call disconnect for security.

EIA leads protection

The RS-232-C leads are protected against foreign and transient voltages before exiting to the backplane. A short to a 500/2500 line, or SL-1 line, with any of the interface leads does not cause any damage to the RILC. The protection helps to protect the external DTE or DCE when they are properly connected to the RILC because the protecting circuitry reduces hazardous voltages on the line.

Installation

Power and thermal limitations only permit installing a maximum of six RILC per PE shelf. Traffic limitations may further limit the number of cards per shelf.

> Note: A maximum of four RILC may be installed in the Meridian SL-1 ST shelf due to the density of the cards in the shelf.

After the RILC is installed in the assigned slot of the Meridian 1 and the card has passed self-diagnostic tests, use the faceplate DIP switches to configure the assigned units to the operating modes and baud rates. Make necessary cross-connections to connect the RILC to the assigned DTE or DCE.

WARNING

Be very careful when connecting the RILC I/O leads at the MDF. If leads from a 500/2500 or SL-1 line card touch the leads to the computer or terminal equipment connected to the RILC, that equipment may be severely damaged.

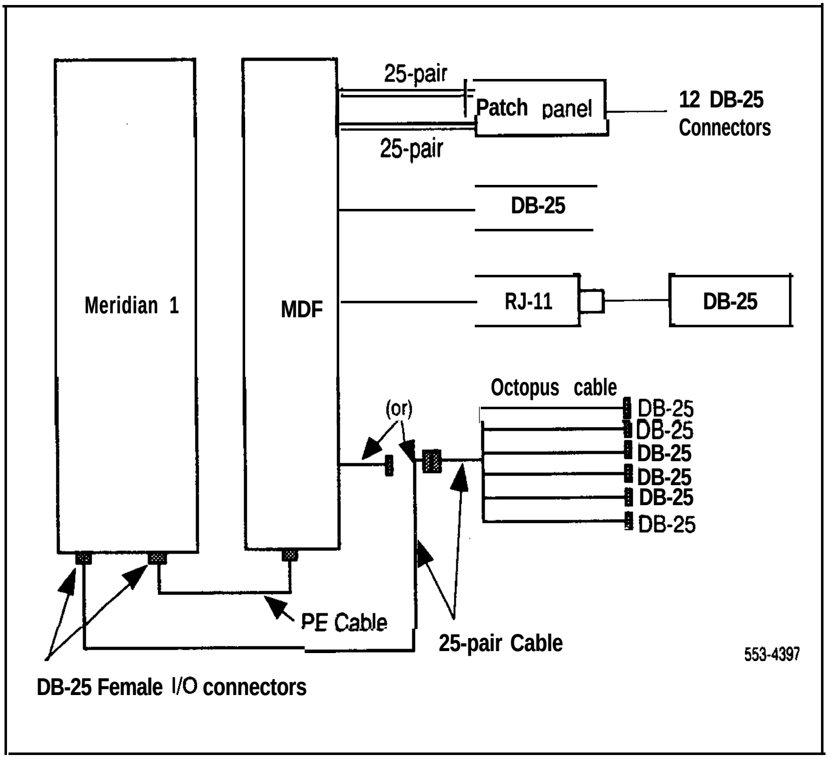
Do not apply any foreign voltage to check cable continuity while the RILC or computer equipment is connected to the MDF.

Special clips (SSM or SSP) should be installed on the MDF to identify the RILC leads or have the RILC leads routed to a MDF that is physically apart from the rest of the system.

Cabling scheme

The EIA signal leads exiting from the RILC normally terminate on the Meridian 1 MDF. Physical connectors are necessary to provide an industry compatible interface to the user for complete RS-232 connectivity. There are four methods to provide the industry standard DB-25 connector from the MDF (Figure 4).

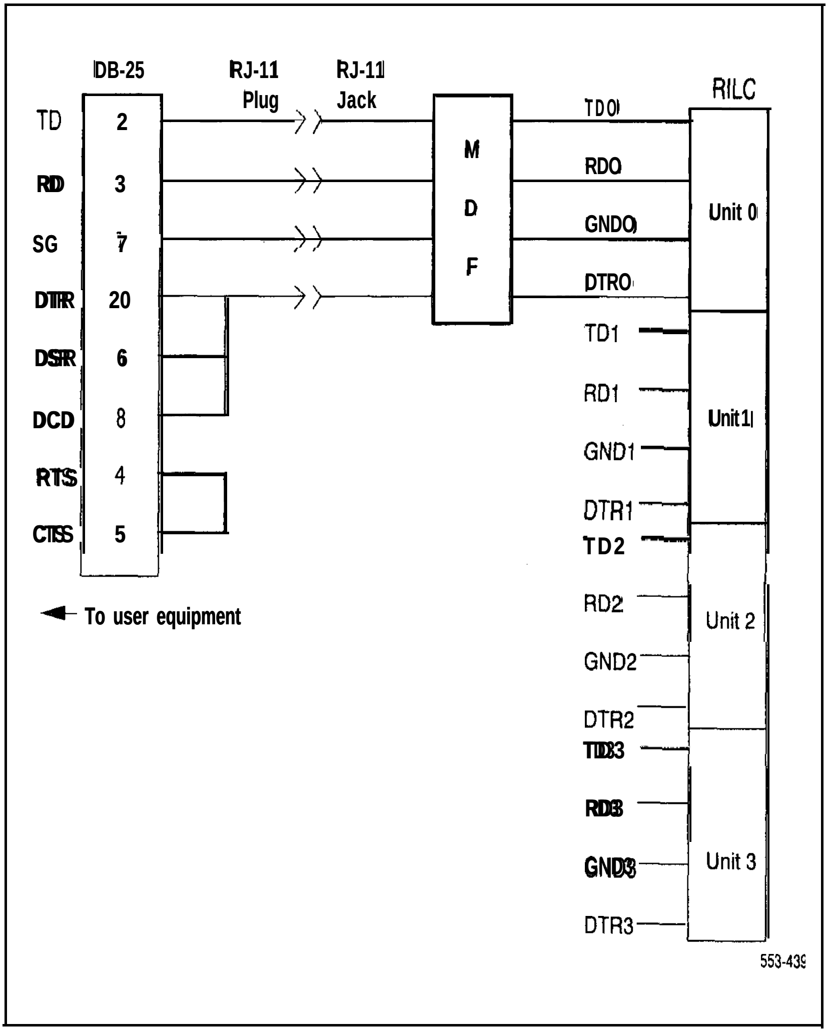
Figure 4
Four cabling options to data equipment



RS-232 cable This cable is tailored to suit individual needs and uses solid wire to allow punch-down on the MDF.

RJ-11 (or RJ-45) jack at User station Four to eight wires are used to connect the RJ-11 (or RJ-45) jack to the MDF. Another cable is necessary to convert the RJ-11 (or RJ-45) into the DB-25. Figure 5 defines the RJ- 11 to terminal connection.

Figure 5
Cabling with RJ-11 using 4 wires (for terminals)



Patch Panel A panel can be designed to branch out two 50-pin connectors into twelve DB-25 connectors. Figure 6 shows the patch panel and 25-pair cables connecting the patch panel to the MDF. The leads from the MDF are connected through 25-pair cables to the patch panel located near the user data equipment. RS-232 cables are used to connect the data equipment to the patch panel. The connectors on the panel must meet mechanical specifications of ISO-21 lo-1980 and be equipped with 4-40 female screw locks.

Figure 6
Patch panel layout

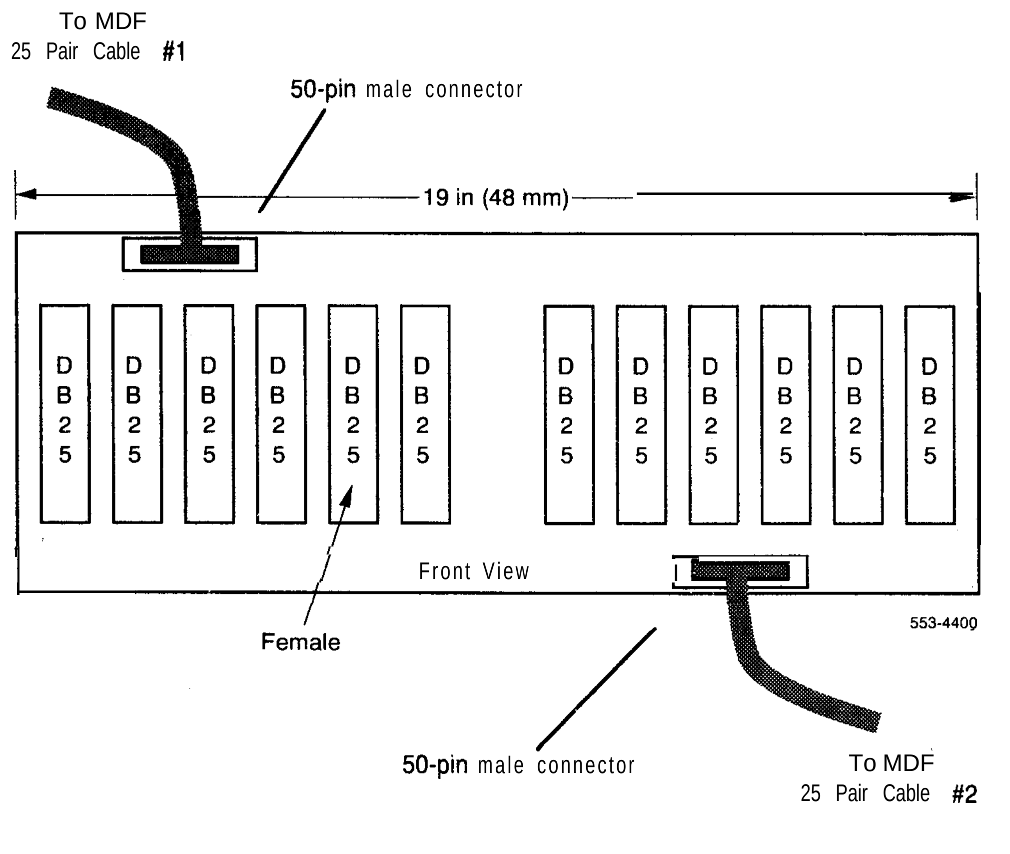
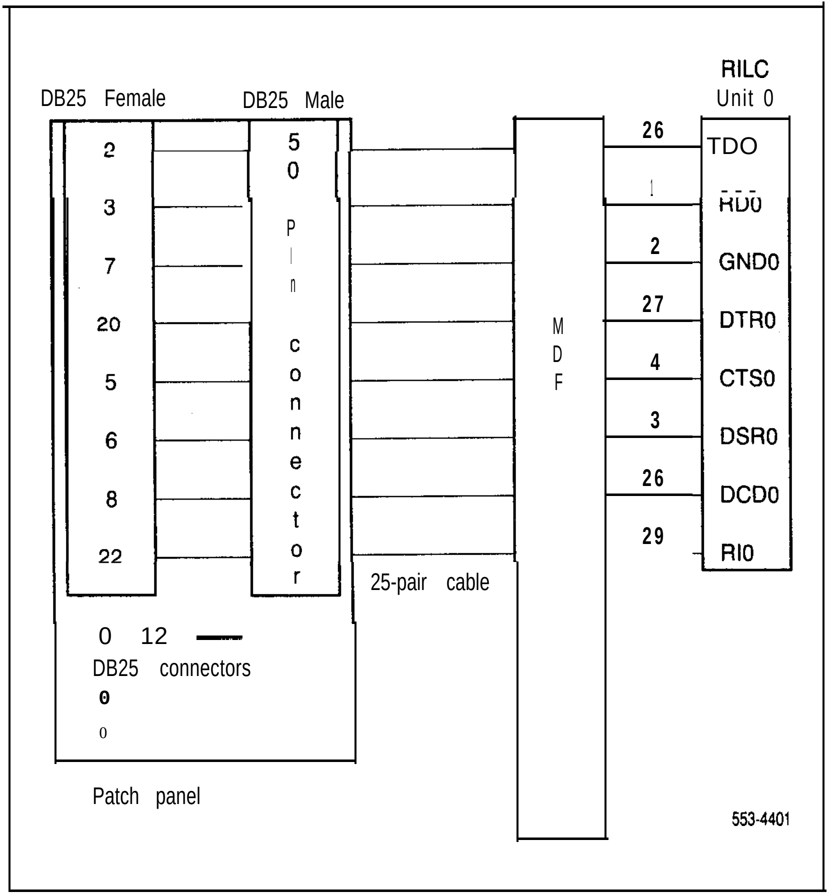


Figure 7 shows a typical signal path from the patch panel to unit 0 of an RILC. A patch panel with two male 50-pin connectors and 12 DB-25 female connectors is available from Northern Telecom.

Figure 7
Cabling with patch panel



Octopus Cable This cable (Figure 8 and Table 2) replaces the combination of the patch panel and the RS-232 cables. The 25-pair cable from the MDF (or directly from the system I/O connector) is split into six RS-232 male or female connectors for direct interconnection with the user data equipment. Two types of Octopus cables, 914 mm (3 ft) long, are available from Northern Telecom: male 50-pin to female DB-25 cable QCAD318, and male 50-pin to male DB-25 cable QCAD319.

Figure 8
Male to female octopus cable

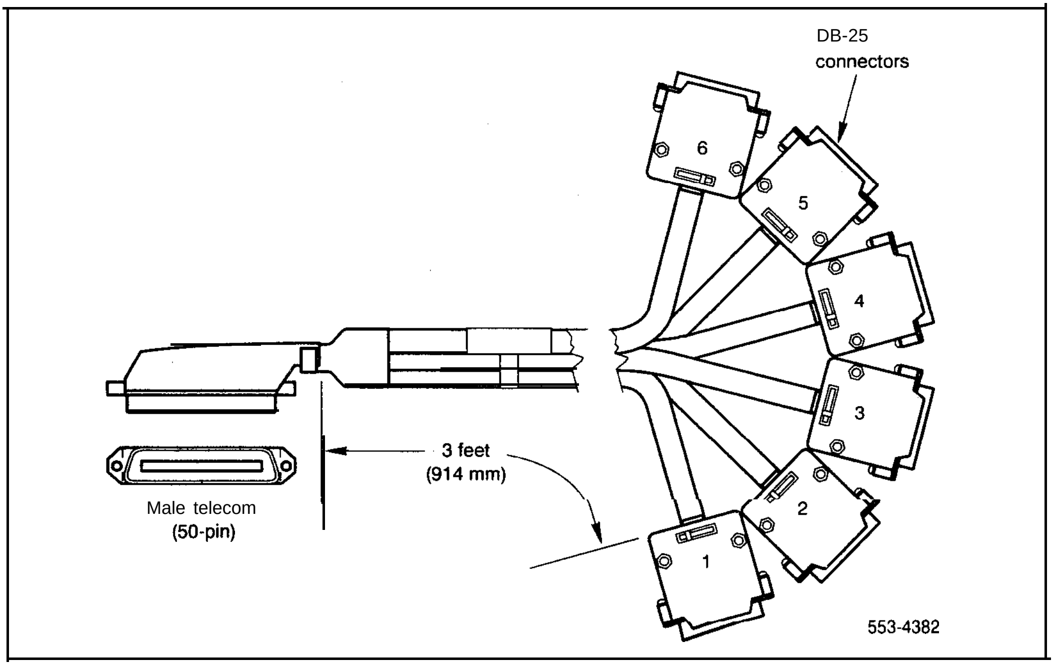


Table 2
Typical pinouts for octopus cable and patch panel

Telecom 50-pin number	DB-25 connector/pin#	Telecom 50-pin number	DB-25 connector/pin#
1	1-3	26	1-2
2	1-7	27	1-20
3	1-6	28	1-8
4	1-5	29	1-22
5	2-3	30	2-2
6	2-7	31	2-20
7	2-6	32	2-8
8	2-5	33	2-22
9	3-3	34	3-2
10	3-7	35	3-20
11	3-6	36	3-8
12	3-5	37	3-22
13	4-3	38	4-2
14	4-7	39	4-20
15	4-6	40	4-8
16	4-5	41	4-22
17	5-3	42	5-2
18	5-7	43	5-20
19	5-6	44	5-8
20	5-5	45	5-22
21	6-3	46	6-2
22	6-7	47	6-20
23	6-6	48	6-8
24	6-5	49	6-22
25	Not used	50	Not used

Note: The DB-25 connector pinouts are identified by the connector number followed by the pin number, for example, 1-3, 2-3.

Connecting to the MDF

To contain the RILC I/O leads in an MDF connector, and away from other I/O leads, follow these rules.

- When there is only one RILC to be installed, use slot 10 and all the pins will terminate on connector G (Figure 9).
- When there are two RILCs to be installed, use slots 1, 2 or 4, 5 or 7,8. Slots 3, 6 or 9 could then be used for cards that do not use I/O pins, for example, Digital Tone Receivers (DTR). With this arrangement the RILC I/O pins are totally contained in connectors AB, CD or EF (Figure 9).
- When there are three RILC to be installed, use slots 1, 2, 3 or 4, 5 6 or 7, 8, 9. The RILC I/O pins are then totally contained in connectors AB, CD or EF (Figure 9).

To further illustrate, if three RILC are placed in adjacent slots (1, 2 and 3) or (4, 5 and 6) or (7, 8 and 9) of the PE shelf and one patch panel (or two octopus cables) is used, the I/O signals are totally enclosed in two 25-pair cables. This provides maximum segregation from voice signals that may otherwise be present in the same 25-pair cable. Figure 9 shows the layout of the shelf slots and shelf connectors.

Figure 9
Layout of shelf slots and shelf connectors

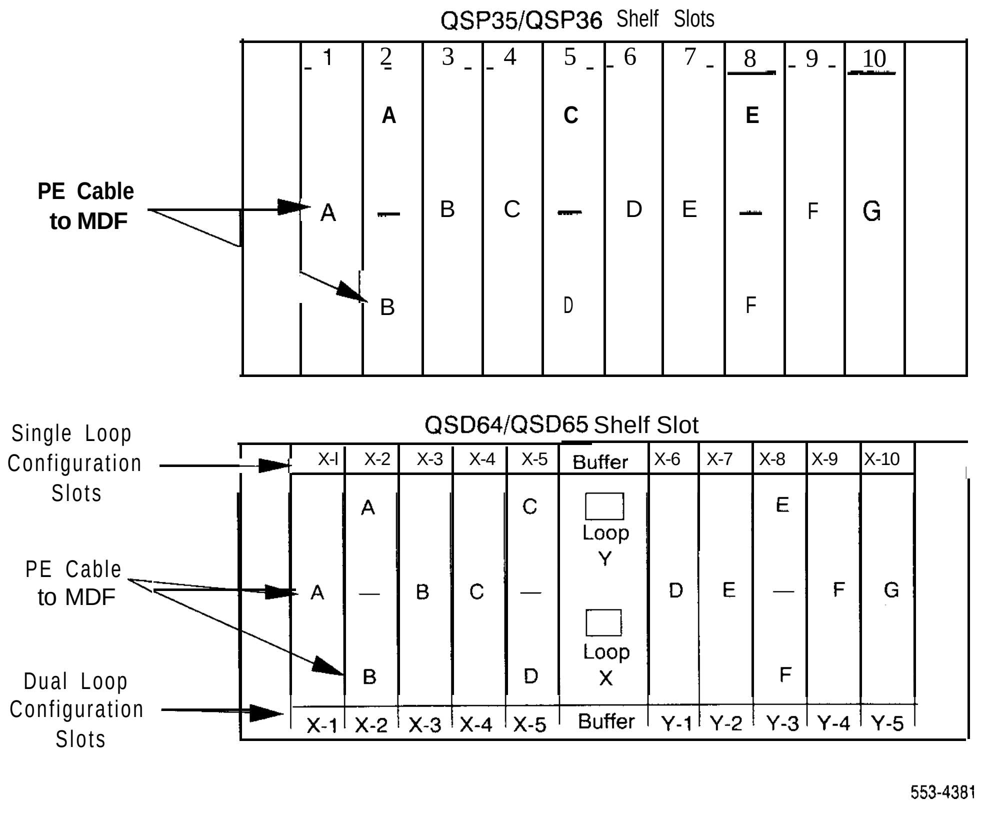


Table 3, on the following pages, shows typical backplane pin assignments for MDF connectors.

Table 3
Typical backplane pin assignments for MDF connections

Cable A							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card no.	Signal name	RS232 pin #	Pack conn #	Unit #
1T	26	W-BL	1	TD0	(2)	36A	Unit 0
1R	1	BL-W		RD0	(3)	37A	
2T	27	W-O		DTR0	(20)	38A	
2R	2	O-W		GD	(7)	39A	
3R	28	W-G		DCB0	(8)	29A	
3R	3	G-W		DSR0	(6)	30A	
4T	29	W-BR		R10	(22)	31A	
4R	4	BR-W		CTS0	(5)	32A	
5T	30	W-S		TD1	(2)	02A	1 Unit
5R	5	S-W		RD1	(3)	03A	
6T	31	R-BL		DTR1	(20)	04A	
6R	6	BL-B		GD	(7)	05A	
7T	32	R-O		DCD1	(8)	09A	
7R	7	O'R		DSR1	(6)	10A	
8T	33	R-G		RI1	(22)	11A	
8R	8	G-R		CTS1	(5)	12A	
9T	34	R-BR		TD2	(2)	36B	Unit 2
9R	9	BR-R		RD2		37B	
10T	35	R-S		DTR2		38B	
10R	10	S-R		GD		39B	
11T	36	BK-BL		DCD2	(8)	29B	
11R	11	BL-BK		DSR2	(6)	30B	
12T	37	BK-O		R12	(22)	31B	
12R	12	O-BK		CTS2	(5)	32B	

-continued —

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable A							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card slot no.	Signal name	RS232 pin #	Pack conn #	Unit #
13T	38	BK-G	*	TD3	(2)	02B	Unit 3
13R	13	G-BK	1 or X-1**	RD3	(3)	03B	
14T	39	BK-BR	for single	DTR3	(20)	04B	
14R	14	BR-BK	loop and	GD	(7)	05B	
15T	40	BK-S	X-l for	DCD3	(8)	09B	
15R	15	S-BK	dual loop	DSR3	(6)	10B	
16T	41	Y-BL		R13	22	11B	
16R	16	BL-Y		CTS3	5	12B	
17T	42	Y-O		TDO	(2)	36A	Unit 0
17R	17	O-Y		RDO	(3)	37A	
18T	43	Y-G		DTRO	(20)	38A	
18R	18	G-Y		GD	(7)	39A	
19T	44	Y-BR		DCBO	(8)	29A	
19R	19	BR-Y		DSRO	(6)	30A	
20T	45	Y-S		RIO	(22)	31A	
20R	20	S-Y		CTSO	(5)	32A	
21T	46	V-BL		TD1	(2)	02A	Unit 1
21R	21	BL-V	2 or X-2	RD1	(3)	03A	
22T	47	v-o	for single	DTR1	(20)	04A	
22R	22	o-v	loop and	GD	(7)	05A	
23T	48	V-G	X-2 for	DCD1	(8)	09A	
23R	23	G-V	dual loop	DSR1	(6)	10A	
24T	49	V-BR		RI1	(22)	11A	
24R	24	BR-V		CTS1	(5)	12A	
— continued —							

* This column shows the card position for a singe loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.
** X-l represents the first card slot of loop X connected to the bottom jack of the QPC659 PE Buffer in the PE shelf QSD65.

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable B							
Pair	**Pin**	**Terminal number**					
		Unit					
		Pair color	**Card slot no.**	**Signal name**	**RS232 pin #**	**Pack conn #**	**Unit #**
1T	26	W-BL	*	TD2	(2)	36B	Unit 2
1R	1	BL-W	2 or X-2	RD2	(3)	37B	
2T	27	W-O	for single	DTR2	(20)	38B	
2R	2	O-W	loop and	GD	(7)	39B	
3T	28	W-G	X-2 for	DCB2	(8)	29B	
3R	3	G-W	dual loop	DSR2	(6)	30B	
4T	29	W-BR		R12	(22)	31B	
4R	4	BR-W		CTS2	(5)	32B	
5T	30	W-S		TD3	(2)	02B	Unit 3
5R	5	S-W		RD3	(3)	03B	
6T	31	R-BL		DTR3	(20)	04B	
6R	6	BL-R		GD	(7)	05B	
7T	32	R-O		DCD3	(8)	09B	
7R	7	O-R		DSR3	(6)	10B	
8T	33	R-G		RI3	(22)	11B	
8R	8	G-R		CTS3	(5)	12B	
9T	34	R-BR		TD0	(2)	36A	Unit 0
9R	9	BR-R	3 or X-3	RD0	(3)	37A	
10T	35	R-S	for single	DTR0	(20)	38A	
10R	10	S-R	loop and	GD	(7)	39A	
11T	36	BK-BL	X-3 for	DCD0	(8)	29A	
11R	11	BL-BK	dual loop	DSR0	(6)	30A	
12T	37	BK-O		R10	(22)	31A	
12R	12	O-BK		CTS0	(5)	32A	

— continued —

* This column shows the card position for a singe loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable B							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card slot no.	Signal name	RS232 pin #	Pack conn #	Unit #
13T	38	BK-G	*	TD1	(2)	02A	Unit 1
13R	13	G-BK	3 or X-3	RD1	(3)	03A	
14T	39	BK-BR	for single	DTR1	(20)	04A	
14R	14	BR-BK	loop and	GD	(7)	05A	
15T	40	BK-S	X-3 for	DCD1	(8)	09A	
15R	15	S-BK	dual loop	DSR3	(6)	10A	
16T	41	Y-BL		R13	(22)	11A	
16R	16	BL-Y		CTS3	(5)	12A	
17T	42	Y-O		TD2	(2)	36B	Unit 2
17R	17	O-Y		RD2	(3)	37B	
18T	43	Y-G		DTR2	(20)	38B	
18R	18	G-Y		GD	(7)	39B	
19T	44	Y-BR		DCB2	(8)	29B	
19R	19	BR-Y		DSR2	(6)	30B	
20T	45	Y-S		R12	(22)	31B	
20R	20	S-Y		CTS2	(5)	32B	
21T	46	V-BL		TD3	(2)	02B	Unit 3
21R	21	BL-V		RD3	(3)	03B	
22T	47	V-O		DTR3	(20)	04B	
22R	22	O-V		GD	(7)	05B	
23T	48	V-G		DCD3	(8)	09B	
23R	23	G-V		DSR3	(6)	10B	
24T	49	V-BR		RI3	(22)	11B	
24R	24	BR-V		CTS3	(5)	12B	
25T	50	V-S		SPARE			
25R	25	S-V					

— continued —

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable C							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card slot no.	Signal name	RS232 pin #	Pack conn #	Unit #
1T	26	W-BL	*	TD0	(2)	36A	Unit 0
1R	1	BL-W	4 or X-4	RD0	(3)	37A	
2T	27	W-O	for single	DTR0	(20)	38A	
2R	2	O-W	loop and	GD	(7)	39A	
3T	28	W-G	X-4 for	DCB0	(8)	29A	
3R	3	G-W	dual loop	DSR0	(6)	30A	
4T	29	W-BR		R10	(22)	31A	
4R	4	BR-W		CTS0	(5)	32A	
5T	30	W-S		TD1	(2)	02A	Unit 1
5R	5	S-W		RD1	(3)	03A	
6T	31	R-BL		DTR1	(20)	04A	
6R	6	BL-R		GD	(7)	05A	
7T	32	R-O		DCD1	(8)	09A	
7R	7	O-R		DSR1	(6)	10A	
8T	33	R-G		RI1	(22)	11A	
8R	8	G-R		CTS1	(5)	12A	
9T	34	R-BR		TD2	(2)	36B	Unit 2
9R	9	BR-R		RD2	(3)	37B	
10T	35	R-S		DTR2	(20)	38B	
10R	10	S-R		GD	(7)	39B	
11T	36	BK-BL		DCD2	(8)	29B	
11R	11	BL-BK		DSR2	(6)	30B	
12T	37	BK-O		R12	(22)	31B	
12R	12	O-BK		CTS2	(5)	32B	
— continued —							

* This column shows the card position for a singe loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable C							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card slot no.	Signal name	RS232 pin #	Pack conn #	Unit #
13T	38	BK-G	4 or X-4 for single loop and X-4 for dual loop	TD3	(2)	02B	Unit 3
13R	13	G-BK		RD3	(3)	03B	
14T	39	BK-BR		DTR3	(20)	04B	
14R	14	BR-BK		GD	(7)	05B	
15T	40	BK-S		DCD3	(8)	09B	
15R	15	S-BK		DSR3	(6)	10B	
16T	41	Y-BL		R13	(22)	11B	
16R	16	BL-Y		CTS3	(5)	12B	
17T	42	Y-O	5 or X-5 for single loop and X-5 for dual loop	TD0	(2)	36A	Unit 0
17R	17	O-Y		RD0	(3)	37A	
18T	43	Y-G		DTR0	(20)	38A	
18R	18	G-Y		GD	(7)	39A	
19T	44	Y-BR		DCB0	(8)	29A	
19R	19	BR-Y		DSR0	(6)	30A	
20T	45	Y-S		R10	(22)	31A	
20R	20	S-Y		CTS0	(5)	32A	
21T	46	V-BL		TD1	(2)	02A	Unit 1
21R	21	BL-V		RD1	(3)	03A	
22T	47	V-O		DTR1	(20)	04A	
22R	22	O-V		GD	(7)	05A	
23T	48	V-G		DCD1	(8)	09A	
23R	23	G-V		DSR1	(6)	10A	
24T	49	V-BR		RI1	(22)	11A	
24R	24	BR-V		CTS1	(5)	12A	
25T	50	V-S		SPARE			
25R	25	S-V					

— continued —

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable D							
Pair	**Pin**	**Terminal number**					
		Unit					
		Pair color	**Card slot no.**	**Signal name**	**RS232 pin #**	**Pack conn #**	**Unit #**
1T	26	W-BL	*	TD2	(2)	36B	Unit 2
1R	1	BL-W	5 or X-5	RD2	(3)	37B	
2T	27	W-O	for single	DTR2	(20)	38B	
2R	2	O-W	loop and	GD	(7)	39B	
3T	28	W-G	X-5 for	DCB2	(8)	29B	
3R	3	G-W	dual loop	DSR2	(6)	30B	
4T	29	W-BR		R12	(22)	31B	
4R	4	BR-W		CTS2	(5)	32A	
5T	30	W-S		TD3	(2)	02B	Unit 3
5R	5	S-W		RD3	(3)	03B	
6T	31	R-BL		DTR3	(20)	04B	
6R	6	BL-R		GD	(7)	05B	
7T	32	R-O		DCD3	(8)	09B	
7R	7	O-R		DSR3	(6)	10B	
8T	33	R-G		RI3	(22)	11B	
8R	8	G-R		CTS3	(5)	12B	
9T	34	R-BR		TD0	(2)	36A	Unit 0
9R	9	BR-R	6 or X-6	RD0	(3)	37A	
10T	35	R-S	for single	DTR0	(20)	38A	
10R	10	S-R	loop and	GD	(7)	39A	
11T	36	BK-BL	Y-1** for	DCD0	(8)	29A	
11R	11	BL-BK	dual loop	DSR0	(6)	30A	
12T	37	BK-O		R10	(22)	31A	
12R	12	O-BK		CTS0	(5)	32A	
— continued —							

* This column shows the card position for a singe loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.
** Y-1 Is the first card slot of loop Y connected to the top jack of QPC659 PE Buffer in the QSD65 PE shelf.

Table 3 (continued)
Typical backplane pin assignments for MDF connections

<table>
<tr><th colspan="8">Cable D</th></tr>
<tr><th rowspan="3">Pair</th><th rowspan="3">Pin</th><th colspan="6">Terminal number</th></tr>
<tr><th colspan="6">Unit</th></tr>
<tr><th>Pair color</th><th>Card slot no.</th><th>Signal name</th><th>RS232 pin #</th><th>Pack conn #</th><th>Unit #</th></tr>
<tr><td>13T
13R
14T
14R</td><td>38
13
39
14</td><td>BK-G
G-BK
BK-BR
BR-BK</td><td rowspan="6">*
6 or X-6
for single
loop and

Y-1 for
dual loop</td><td>TD1
RD1
DTR1
GD</td><td>(2)
(3)
(20)
(7)</td><td>02A
03A
04A
05A</td><td rowspan="2">Unit 1</td></tr>
<tr><td>15T
15R
16T
16R</td><td>40
15
41
16</td><td>BK-S
S-BK
Y-BL
BL-Y</td><td>DCD1
DSR3
R13
CTS3</td><td>(8)
(6)
(22)
(5)</td><td>09A
10A
11A
12A</td></tr>
<tr><td>17T
17R
18T
18R</td><td>42
17
43
18</td><td>Y-O
O-Y
Y-G
G-Y</td><td>TD2
RD2
DTR2
GD</td><td>(2)
(3)
(20)
(7)</td><td>36B
37B
38B
39B</td><td rowspan="2">Unit 2</td></tr>
<tr><td>19T
19R
20T
20R</td><td>44
19
45
20</td><td>Y-BR
BR-Y
Y-S
S-Y</td><td>DCB2
DSR2
R12
CTS2</td><td>(8)
(6)
(22)
(5)</td><td>29B
30B
31B
32B</td></tr>
<tr><td>21T
21R
22T
22R</td><td>46
21
47
22</td><td>V-BL
BL-V
V-O
O-V</td><td>TD3
RD3
DTR3
GD</td><td>(2)
(3)
(20)
(7)</td><td>02B
03B
04B
05B</td><td rowspan="2">Unit 3</td></tr>
<tr><td>23T
23R
24T
24R</td><td>48
23
49
24</td><td>V-G
G-V
V-BR
BR-V</td><td>DCD3
DSR3
RI3
CTS3</td><td>(8)
(6)
(22)
(5)</td><td>09B
10B
11B
12B</td></tr>
<tr><td>25T
25R</td><td>50
25</td><td>V-S
S-V</td><td></td><td>SPARE</td><td></td><td></td><td></td></tr>
<tr><td colspan="8">— continued —</td></tr>
</table>

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable E							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card no.	Signal name	RS232 pin #	Pack conn #	Unit #
1T	26	W-BL	*	TD0	(2)	36A	Unit 0
1R	1	BL-W	7 or X-7	RD0	(3)	37A	
2T	27	W-O	for single	DTR0	(20)	38A	
2R	2	O-W	loop and	GD	(7)	39A	
3T	28	W-G	Y-2 for	DCB0	(8)	29A	
3R	3	G-W	dual loop	DSR0	(6)	30A	
4T	29	W-BR		R10	(22)	31A	
4R	4	BR-W		CTS0	(5)	32A	
5T	30	W-S		TD1	(2)	02A	Unit 1
5R	5	S-W		RD1	(3)	03A	
6T	31	R-BL		DTR1	(20)	04A	
6R	6	BL-R		GD	(7)	05A	
7T	32	R-O		DCD1	(8)	09A	
7R	7	O-R		DSR1	(6)	10A	
8T	33	R-G		RI1	(22)	11A	
8R	8	G-R		CTS1	(5)	12A	
9T	34	R-BR		TD2	(2)	36B	Unit 2
9R	9	BR-R		RD2	(3)	37B	
10T	35	R-S		DTR2	(20)	38B	
10R	10	S-R		GD	(7)	39B	
11T	36	BK-BL		DCD2	(8)	29B	
11R	11	BL-BK		DSR2	(6)	30B	
12T	37	BK-O		R12	(22)	31B	
12R	12	O-BK		CTS2	(5)	32B	
— continued —							

* This column shows the card position for a singe loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable E							
Pair	**Pin**	**Terminal number**					
		Unit					
		Pair color	**Card slot no.**	**Signal name**	**RS232 pin #**	**Pack conn #**	**Unit #**
13T	38	BK-G	*	TD3	(2)	02B	Unit 3
13R	13	G-BK	7 or X-7	RD3	(3)	03B	
14T	39	BK-BR	for single	DTR1	(20)	04B	
14R	14	BR-BK	loop and	GD	(7)	05B	
15T	40	BK-S	Y-2 for	DCD3	(8)	09B	
15R	15	S-BK	dual loop	DSR3	(6)	10B	
16T	41	Y-BL		R13	(22)	11B	
16R	16	BL-Y		CTS3	(5)	12B	
17T	42	Y-O		TD0	(2)	36A	Unit 0
17R	17	O-Y	8 or X-8	RD0	(3)	37A	
18T	43	Y-G	for single	DTR0	(20)	38A	
18R	18	G-Y	loop and	GD	(7)	39A	
19T	44	Y-BR	Y-3 for	DCB0	(8)	29A	
19R	19	BR-Y	dual loop	DSR0	(6)	30A	
20T	45	Y-S		R10	(22)	31A	
20R	20	S-Y		CTS0	(5)	32A	
21T	46	V-BL		TD1	(2)	02A	Unit 1
21R	21	BL-V		RD1	(3)	03A	
22T	47	V-O		DTR1	(20)	04A	
22R	22	O-V		GD	(7)	05A	
23T	48	V-G		DCD1	(8)	09A	
23R	23	G-V		DSR1	(6)	10A	
24T	49	V-BR		RI1	(22)	11A	
24R	24	BR-V		CTS1	(5)	12A	
25T	50	V-S		SPARE			
25R	25	S-V					
— continued —							

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable F							
Pair	**Pin**	**Terminal number**					
		Unit					
		Pair color	**Card slot no.**	**Signal name**	**RS232 pin #**	**Pack conn #**	**Unit #**
1T	26	W-BL	*	TD2	(2)	36B	Unit 2
1R	1	BL-W	8 or X-8	RD2	(3)	37B	
2T	27	W-O	for single	DTR2	(20)	38B	
2R	2	O-W	loop and	GD	(7)	39B	
3T	28	W-G	Y-3 for	DCB2	(8)	29B	
3R	3	G-W	dual loop	DSR2	(6)	30B	
4T	29	W-BR		R10	(22)	31B	
4R	4	BR-W		CTS2	(5)	32B	
5T	30	W-S		TD3	(2)	02B	Unit 3
5R	5	S-W		RD3	(3)	03B	
6T	31	R-BL		DTR3	(20)	04B	
6R	6	BL-R		GD	(7)	05B	
7T	32	R-O		DCD3	(8)	09B	
7R	7	O-R		DSR3	(6)	10B	
8T	33	R-G		RI3	(22)	11B	
8R	8	G-R		CTS3	(5)	12B	
9T	34	R-BR	*	TD0	(2)	36A	Unit 0
9R	9	BR-R	9 or X-9	RD0	(3)	37A	
10T	35	R-S	for single	DTR0	(20)	38A	
10R	10	S-R	loop and	GD	(7)	39A	
11T	36	BK-BL	Y-4 for	DCD0	(8)	29A	
11R	11	BL-BK	dual loop	DSR0	(6)	30A	
12T	37	BK-O		R10	(22)	31A	
12R	12	O-BK		CTS0	(5)	32A	
— continued —							

* This column shows the card position for a singe loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable F							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card slot no.	Signal name	RS232 pin #	Pack conn #	Unit #
13T	38	BK-G	9 or X-9 for single loop and Y-4 for dual loop	TD1	(2)	02A	Unit 1
13R	13	G-BK		RD1	(3)	03A	
14T	39	BK-BR		DTR1	(20)	04A	
14R	14	BR-BK		GD	(7)	05A	
15T	40	BK-S		DCD1	(8)	09A	
15R	15	S-BK		DSR3	(6)	10A	
16T	41	Y-BL		R13	(22)	11A	
16R	16	BL-Y		CTS3	(5)	12A	
17T	42	Y-O		TD2	(2)	36B	Unit 2
17R	17	O-Y		RD2	(3)	37B	
18T	43	Y-G		DTR2	(20)	38B	
18R	18	G-Y		GD	(7)	39B	
19T	44	Y-BR		DCB2	(8)	29B	
19R	19	BR-Y		DSR2	(6)	30B	
20T	45	Y-S		R12	(22)	31B	
20R	20	S-Y		CTS2	(5)	32B	
21T	46	V-BL		TD3	(2)	02B	Unit 3
21R	21	BL-V		RD3	(3)	03B	
22T	47	V-O		DTR3	(20)	04B	
22R	22	O-V		GD	(7)	05B	
23T	48	V-G		DCD3	(8)	09B	
23R	23	G-V		DSR3	(6)	10B	
24T	49	V-BR		RI3	(22)	11B	
24R	24	BR-V		CTS3	(5)	12B	
25T	50	V-S		SPARE			
25R	25	S-V					

— continued —

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable G							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card slot no.	Signal name	RS232 pin #	Pack conn #	Unit #
1T	26	W-BL	* 10 or X-10 for single loop and Y-5 for dual loop	TD0	(2)	36A	Unit 0
1R	1	BL-W		RD0	(3)	37A	
2T	27	W-O		DTR0	(20)	38A	
2R	2	O-W		GD	(7)	39A	
3T	28	W-G		DCB0	(8)	29A	
3R	3	G-W		DSR0	(6)	30A	
4T	29	W-BR		R10	(22)	31A	
4R	4	BR-W		CTS0	(5)	32A	
5T	30	W-S		TD1	(2)	02A	Unit 1
5R	5	S-W		RD1	(3)	03A	
6T	31	R-BL		DTR1	(20)	04A	
6R	6	BL-R		GD	(7)	05A	
7T	32	R-O		DCD1	(8)	09A	
7R	7	O-R		DSR1	(6)	10A	
8T	33	R-G		RI1	(22)	11A	
8R	8	G-R		CTS1	(5)	12A	
9T	34	R-BR		TD2	(2)	36B	Unit 2
9R	9	BR-R		RD2	(3)	37B	
10T	35	R-S		DTR2	(20)	38B	
10R	10	S-R		GD	(7)	39B	
11T	36	BK-BL		DCD2	(8)	29B	
11R	11	BL-BK		DSR2	(6)	30B	
12T	37	BK-O		R12	(22)	31B	
12R	12	O-BK		CTS2	(5)	32B	
— continued —							

* This column shows the card position for a singe loop mode in PE shelves QSP35, QSP36, QSD64, and QSD65. It also shows a dual mode in PE shelf QSD65.

Table 3 (continued)
Typical backplane pin assignments for MDF connections

Cable G							
Pair	Pin	Terminal number					
		Unit					
		Pair color	Card slot no.	Signal name	RS232 pin #	Pack conn #	Unit #
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK	10 or X-10 for single loop and Y-5 for dual loop	TD3 RD3 DTR3 GD	(2) (3) (20) (7)	02B 03B 04B 05B	Unit 3
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y		DCD3 DSR3 R13 CTS3	(8) (6) (22) (5)	09B 10B 11B 12B	
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y					
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y					
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V					
23T 23R 24T 24R	48 23 49 24	V-G G-V V-BR BR-V					
25T 25R	50 25	V-S S-V		SPARE			
Note: Cables from all PE shelves terminate as above							

Figure 10 shows the left and the right I/O Panel of the NT8D13 PE Module.

Figure 10
NT8D13 I/O Panel connectors

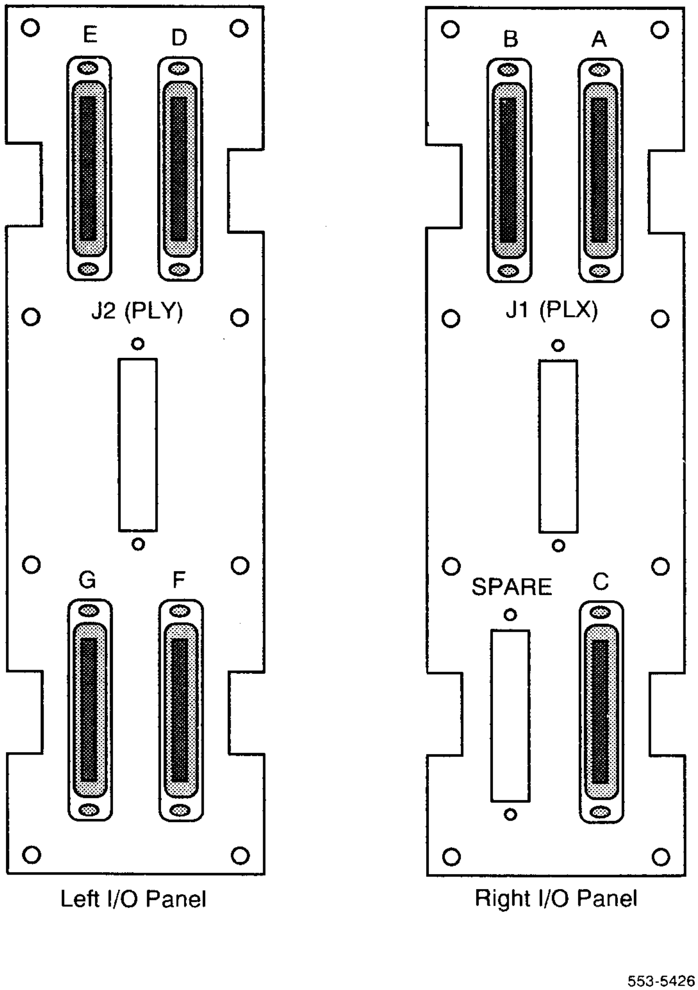


Table 4 shows typical backplane pin assignments for MDF connectors for the NT8D13 PE module configured in the single loop mode.

Table 4
RILC pair-terminations for NT8D13 PE Module I/O Panel connectors A, C, E, and G (Single Loop Mode)

Port Pairs	Connector Pin Number and Wire Color Code		I/O Panel Connectors A	I/O Panel Connectors C	I/O Panel Connectors E	I/O Panel Connectors G	RILC
1T	26	W-BL	SLOT X-1 CARD 1	SLOT X-4 CARD 4	SLOT X-7 CARD 7	SLOT X-10 CARD 10	Unit 0
1R	1	BL-W					
2T	27	W-O					
2R	2	O-W					
3T	28	W-G					
3R	3	G-W					
4T	29	W-BR					
4R	4	BR-W					
5T	30	W-S					Unit 1
5R	5	S-W					
6T	31	R-BL					
6R	6	BL-R					
7T	32	R-O					
7R	7	O-R					
8T	33	R-G					
8R	8	G-R					
9T	34	R-BR					Unit 2
9R	9	BR-R					
10T	35	R-S					
10R	10	S-R					
11T	36	BK-BL					
11R	11	BL-BK					
12T	37	BL-O					
12R	12	O-BL					
13T	38	BK-G					Unit 3
13R	13	G-BK					
14T	39	BK-BR					
14R	14	BR-BK					
15T	40	BK-S					
15R	15	S-BK					
16T	41	Y-BL					
16R	16	BL-Y					
17T	42	Y-O	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT X-8 CARD 8	SPARE	Unit 0
17R	17	O-Y					
18T	43	Y-G					
18R	18	G-Y					
19T	44	Y-BR					
19R	19	BR-Y					
20T	45	Y-S					
20R	20	S-Y					
21T	46	V-BL					Unit 1
21R	21	BL-V					
22T	47	V-O					
22R	22	O-V					
23T	48	V-BR					
23R	23	BR-V					
24T	49	V-S					
24R	24	S-V					

Table 4 (cont'd)
RILC pair-terminations for NT8D13 PE Module I/O Panel connectors B, D, and F (Single Loop Mode)

Port Pairs	Connector Pin Number and Wire Color Code		I/O Panel Connectors B	I/O Panel Connectors D	I/O Panel Connectors F	RILC
1T	26	W-BL	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT X-8 CARD 8	Unit 2
1R	1	BL-W				
2T	27	W-O				
2R	2	O-W				
3T	28	W-G				
3R	3	G-W				
4T	29	W-BR				
4R	4	BR-W				
5T	30	W-S				Unit 3
5R	5	S-W				
6T	31	R-BL				
6R	6	BL-R				
7T	32	R-O				
7R	7	O-R				
8T	33	R-G				
8R	8	G-R				
9T	34	R-BR	SLOT X-3 CARD 3	SLOT X-6 CARD 6	SLOT X-9 CARD 9	Unit 0
9R	9	BR-R				
10T	35	R-S				
10R	10	S-R				
11T	36	BK-BL				
11R	11	BL-BK				
12T	37	BL-O				
12R	12	O-BL				
13T	38	BK-G				Unit1
13R	13	G-BK				
14T	39	BK-BR				
14R	14	BR-BK				
15T	40	BK-S				
15R	15	S-BK				
16T	41	Y-BL				
16R	16	BL-Y				
17T	42	Y-O				Unit 2
17R	17	O-Y				
18T	43	Y-G				
18R	18	G-Y				
19T	44	Y-BR				
19R	19	BR-Y				
20T	45	Y-S				
20R	20	S-Y				
21T	46	V-BL				Unit 3
21R	21	BL-V				
22T	47	V-O				
22R	22	O-V				
23T	48	V-BR				
23R	23	BR-V				
24T	49	V-S				
24R	24	S-V				

Table 5 shows typical backplane pin assignments for MDF connectors for the NT8D13 PE module configured for the dual loop mode.

Table 5
RILC pair-terminations for NT8D13 PE Module I/O Panel connectors A, C, E, and G (Dual Loop Mode)

Port Pairs	Connector Pin Number and Wire Color Code		I/O Panel Connectors A	C	E	G	RILC
1T	26	W-BL	SLOT X-1 CARD 1	SLOT X-4 CARD 4	SLOT Y-2 CARD 2	SLOT Y-5 CARD 5	Unit 0
1R	1	BL-W					
2T	27	W-O					
2R	2	O-W					
3T	28	W-G					
3R	3	G-W					
4T	29	W-BR					
4R	4	BR-W					
5T	30	W-S					Unit 1
5R	5	S-W					
6T	31	R-BL					
6R	6	BL-R					
7T	32	R-O					
7R	7	O-R					
8T	33	R-G					
8R	8	G-R					
9T	34	R-BR					Unit 2
9R	9	BR-R					
10T	35	R-S					
10R	10	S-R					
11T	36	BK-BL					
11R	11	BL-BK					
12T	37	BL-O					
12R	12	O-BL					
13T	38	BK-G					Unit 3
13R	13	G-BK					
14T	39	BK-BR					
14R	14	BR-BK					
15T	40	BK-S					
15R	15	S-BK					
16T	41	Y-BL					
16R	16	BL-Y					
17T	42	Y-O	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT Y-3 CARD 3	SPARE	Unit 0
17R	17	O-Y					
18T	43	Y-G					
18R	18	G-Y					
19T	44	Y-BR					
19R	19	BR-Y					
20T	45	Y-S					
20R	20	S-Y					
21T	46	V-BL					Unit 1
21R	21	BL-V					
22T	47	V-O					
22R	22	O-V					
23T	48	V-BR					
23R	23	BR-V					
24T	49	V-S					
24R	24	S-V					

Table 5 (cont'd)
RILC pair-terminations for NT8D13 PE Module I/O Panel connectors B, D, and F (Dual Loop Mode)

Port Pairs	Connector Pin Number and Wire Color Code		I/O Panel Connectors B	I/O Panel Connectors D	I/O Panel Connectors F	RILC
1T	26	W-BL	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT Y-3 CARD 3	Unit 2
1R	1	BL-W				
2T	27	W-O				
2R	2	O-W				
3T	28	W-G				
3R	3	G-W				
4T	29	W-BR				
4R	4	BR-W				
5T	30	W-S				Unit 3
5R	5	S-W				
6T	31	R-BL				
6R	6	BL-R				
7T	32	R-O				
7R	7	O-R				
8T	33	R-G				
8R	8	G-R				
9T	34	R-BR	SLOT X-3 CARD 3	SLOT Y-1 CARD 1	SLOT Y-4 CARD 4	Unit 0
9R	9	BR-R				
10T	35	R-S				
10R	10	S-R				
11T	36	BK-BL				
11R	11	BL-BK				
12T	37	BL-O				
12R	12	O-BL				
13T	38	BK-G				Unit 1
13R	13	G-BK				
14T	39	BK-BR				
14R	14	BR-BK				
15T	40	BK-S				
15R	15	S-BK				
16T	41	Y-BL				
16R	16	BL-Y				
17T	42	Y-O				Unit 2
17R	17	O-Y				
18T	43	Y-G				
18R	18	G-Y				
19T	44	Y-BR				
19R	19	BR-Y				
20T	45	Y-S				
20R	20	S-Y				
21T	46	V-BL				Unit 3
21R	21	BL-V				
22T	47	V-O				
22R	22	O-V				
23T	48	V-BR				
23R	23	BR-V				
24T	49	V-S				
24R	24	S-V				

Operating modes

There are sixteen possible operation modes for the RILC (Table 4). The different modes enable the RILC to connect to different types of devices such as MODEMS (Modes 0, 1, 2 and 3), GATEWAYS (Modes 4, 5 6 and 7), HOSTS (modes 8, 9, 10 and 1 1), and TERMINALS (Modes 12, 13, 14 and 15). After selecting the appropriate group (for example, modem, gateway, host or terminal), the installer should study the four different modes in that group to be able to make the proper selection.

Table 6
Mode of operation selection table mode - select switches

Operation mode	Host/ terminal	Forced DTR	Hotline	Type of devices to be connected to the RILC	Group selection
Note: Switches 1 & 2 must always be set to the same operating mode.					
0 (DTE)	Host	Not Forced	Not Hotline	Modem pool inbound and outbound (like SADM in inbound)	Modes 0, 1, 2, 3 are for MODEM connectivity
1 (DTE)	Host	Not Forced	Hotline	Modem pool inbound only (hotline by RI— similar to SADM)	
2 (DTE)	Host	Forced	Not Hotline	Modem pool inbound and outbound (for Hayes 1200 modem only)	
3 (DTE)	Host	Forced	Hotline	Modem pool inbound only (hotline for Hayes 1200 modem only)	
4 (DTE)	Terminal	Not forced	Not Hotline	Gateway inbound and outbound (DTR is OFF in idle state)	Modes 4, 5, 6. 7 are for Gateway connectivity
5 (DTE)	Terminal	Not forced	Hotline	Gateway inbound only (hotline by DCD)	
6 (DTE)	Terminal	Forced	Not Hotline	Gateway inbound and outbound (DTR is on in idle state)	

— continued —

Table 4 (continued)
Mode of operation selection table mode - select switches

Operation mode	Host/ terminal	Forced DTR	Hotline	Type of devices to be connected to the RILC	Group selection
7 (DTE)	Terminal	Forced	Hotline	Gateway inbound only (hotline by DCD (DTR is on in idle state)	Gateway connectivity
8 (DCE)	Host	Not Forced	Not Hotline	Outbound to host (similar to MCDS)	
9 (DCE)	Host	Not Forced	Hotline	Host hotline by DTR (the call baud rate is determined by switches 6 to 8).	Modes 8, 9, 10, 11 are for Host connectivity (similar to MCDS)
10 (DCE)	Host	Forced	Not Hotline	Host similar to MCDS but does not require DTR to be ON.	
11 (DCE)	Host	Forced	Hotline	Continuous hotline mode when DTR is ON.	
12 (DCE)	Terminal	Not Forced	Not Hotline	Terminal similar to ASIM when set to not forced DTR and not hotline.	Modes 12, 13, 14, 15 are for terminal connectivity (like ASIM).
13 (DCE)	Terminal	Not Forced	Hotline	Terminal similar to ASIM when set to not forced DTR and hotline.	
14 (DCE)	Terminal	Forced	Not Hotline	Terminal similar to ASIM when set to forced DTR and not hotline.	
15 (DCE)	Terminal	Forced	Hotline	Continuous hotline mode when DTR ON.	

Selecting connectivity modes

Table 7 shows the connect and disconnect protocol for all modes. Use these tables in conjunction with the mode descriptions for more information. Refer to Figure 11 when selecting the modes described here.

Table 7
Connectivity modes - connect and disconnect protocol

Mode	interface	application
Mode 0	INBOUND AND OUTBOUND MODEM POOLS For inbound modem pools, most dumb modems may be used. For outbound modem pools, only smart-modems (autodialer) modems may be used.	**INBOUND MODEM POOLING** 1. Modem sends ring/no-ring cycle (2 seconds ON, 4 seconds ON) to initiate connection. 2. RILC responds by driving DTR ON within the first ring cycle. 3. Modem responds by answering the incoming call and driving DCD ON within 35 seconds. 4. If modem did not drive DCD ON within 35 seconds, the RILC drops DTR and goes idle. 5. Remote DTE sends ON to the RILC, the RILC autobauds and sends ENTER NUMBER OR H (FOR HELP). **OUTBOUND MODEM POOLING** 1. Local DM user calls to the outbound modem access number. 2. The RILC answers the outbound call and drives DTR ON. 3. Modem receives DTR and prepares to receive commands. 4. Local DM user enters the proper commands for calling the remote modem. 5. Remote modem answers and the data call is completely established. **CALL DISCONNECTION** Disconnection initiated by the RILC. 1. RILC drops DTR if the local DM user drops the call. Then, the modem must drop DCD. 2. RILC drops DTR if the remote modem sends a long break or three short breaks. Then, the modem must drop DCD. Disconnection initiated by the modem. 1. Modem drops DCD. (DCD must be ON for 100 milliseconds or more). The RILC drops DTR and disconnects the local call. 2. Modem drops DSR. (DSR must be ON for 100 milliseconds or more). Then the RILC drops DTR and disconnects the local call.

— continued —

Table 7 (continued)
Connectivity modes ▪ connect and disconnect protocol

Mode		Interface application
Mode 1	**INBOUND HOTLINE MODEM POOLS** For this application, most dumb modems can be used.	**INBOUND HOTLINE MODEM POOLING** 1. Modem sends ring/no-ring cycle (2 seconds ON, 4 seconds OFF) to initiate connection. 2. RILC responds by trying to establish a hotline call to a specific data module (auto dial). 3. When the called data module answers, then and only then, the RILC turns DTR ON. 4. The modem should answer the incoming call when DTR goes ON, and should turn DCD ON within 35 seconds; otherwise, the RILC will disconnect the call. **CALL DISCONNECTION** Disconnection is identical to Mode 0.
Mode 2	INBOUND AND OUTBOUND MODEM POOLS (forced DTR) This mode is to be used with Hayes-l 200 modem.	**INBOUND AND OUTBOUND MODEM POOLING** The operation of the RILC is identical to Mode 0 except for DTR being always forced ON, except during call disconnection (DTR drops for 0.2 seconds). **CALL DISCONNECTION** Disconnection is identical to Mode 0 except for the following: When a call is released, the RILC turns DTR OFF for 0.2 seconds and then ON. DTR stays ON until the next call release. The RILC ignores RI and DCD for about two seconds after releasing a call. This is done to avoid a problem with Hayes-l 200 modem.
Mode 3	**INBOUND HOTLINE** MODEM POOLS (forced DTR)	**INBOUND HOTLINE MODEM POOLING** The operation of the RILC is identical to Mode 1 except for DTR being always forced ON, except during call disconnection (DTR drops for 0.2 seconds). Use Hayes-i 200 Modem for this mode. **CALL DISCONNECTION** Disconnection is identical to Mode 2.

— **continued** —

Table 7 (continued)
Connectivity modes - connect and disconnect protocol

Mode		Interface application
Mode 4	**INBOUND AND OUTBOUND GATEWAY ACCESSING.**	**INBOUND GATEWAY CONNECTION PROTOCOL** 1 Gateway raises DCD to initiate connection. 2. RILC responds by driving DTR ON. 3. DSR is not required to be turned ON by the GATEWAY. However, toggling DSR or DCD from ON to OFF will cause the RILC to disconnect the call. 4. Gateway user sends <CR> to the RILC. 5. RILC autobauds on the received <CR> and sends the following prompt to the gateway, ENTER NUMBER OR H (FOR HELP). **OUTBOUND GATEWAY CONNECTION PROTOCOL** 1. Local DM user calls the RILC unit that is connected to a gateway. 2. The RILC answers the data call and drives DTR ON. 3. Gateway receives DTR and prepares to receive commands. 4. Local DM user is now transparently connected to the gateway. 5. The gateway is expected to drive DCD ON within 35 seconds from DTR ON. If the gateway fails to do so, the RILC drops DTR and the call. **CALL DISCONNECTION** Disconnection initiated by the RILC. 1. RILC drops DTR if the local DM user drops the call. Then, the gateway must drop DCD. 2. RILC drops DTR if the RILC receives a long break or three short breaks. Then, the gateway must drop DCD. Disconnection initiated by the gateway. 1. Gateway drops DCD. (DCD must be OFF for 100 milliseconds or more). Then, the RILC drops DTR and disconnects the local call. 2. Gateway drops DSR. (DSR must be OFF for 100 milliseconds or more). Then, the RILC drops DTR and disconnects the local call.

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Table 7 (continued)
Connectivity modes - connect and disconnect protocol

Mode	Interface	application
Mode 5	**INBOUND-HOTLINE GATEWAY ACCESSING.**	**INBOUND-HOTLINE GATEWAY PROTOCOL** 1. Gateway raises DCD to initiate connection. 2. RILC responds by trying to establish a hotline call to a specific data module (auto-dial). 3. When the called data module answers, then and only then, the RILC turns DTR ON. 4. The gateway is not required to turn DSR ON. However, toggling DSR or DCD from ON to OFF causes the RILC to drop the call. 5. The GATEWAY is now transparently linked to the equipment connected to the DM. **CALL DISCONNECTION** Disconnection is identical to Mode 4.
Mode 6	**INBOUND AND** OUTBOUND GATEWAY **ACCESSING** (with **DTR** forced).	**INBOUND AND OUTBOUND GATEWAY PROTOCOL** The operation of the RILC is identical to Mode 4 except for DTR being always forced ON, except when the call is being disconnected (DTR drops for 0.2 seconds). In this case, the establishment of the outbound call does not require DCD to be driven ON by the gateway within 35 seconds. **CALL DISCONNECTION** Disconnection is identical to Mode 4 except when a call is released, the RILC turns DTR OFF for 0.2 seconds and then ON. DTR stays ON until the next call release.
Mode 7	INBOUND-HOTLINE **GATEWAY ACCESSING** (with DTR forced)	**INBOUND-HOTLINE GATEWAY PROTOCOL** The operation of the RILC is identical to Mode 5 except for DTR being always forced ON, except when the call is being disconnected (DTR drops for 0.2 seconds). **CALL DISCONNECTION** Disconnection is identical to Mode 6.

— continued —

Table 7 (continued)
Connectivity modes - connect and disconnect protocol

Mode	Interface application	
Mode 8	HOST ACCESSING FOR CALL ORIGINATION AND ANSWERING.	**HOST ANSWERING AN INCOMING DATA CALL** 1. Local DM user dials the access number to initiate the connection. 2. RILC responds by driving RI ON for two seconds and OFF for four seconds, until the host answers by turning DTR ON. (If the host always drives DTR ON, then the RILC immediately answers the call without driving RI ON.) 3. When the host receives RI ON, it should respond by turning DTR ON. 4. The RILC answers when it receives DTR ON. 5. The RILC turns DSR, DCD, and CTS ON when the call is completely established. The local DM user is now transparently linked to the host. HOST ORIGINATING A DATA CALL 1. Host turns DTR ON to initiate the connection. 2. The RILC prepares to receive <CR> for autobaud. 3. Host sends <CR> followed by other commands for establishing a data call (the RILC does not echo any command, nor does it send any prompt to the host (BLIND DIALING). 4. When the data call is completely established, the RILC turns DSR, DCD, and CTS ON as long as the call is connected. **CALL DISCONNECTION** A. Disconnection initiated by the RILC. 1. RILC drops DSR, DCD, and CTS if the local DM user drops the call. The host should drop the call. 2. RILC drops DSR, DCD, and CTS if the host sends a long break or three short breaks. The host should drop the call. B. Disconnection initiated by the host. 1. Host toggles DTR from ON to OFF (DTR must be OFF for 100 milliseconds or more). Then the RILC drops DSR, DCD, and CTS and disconnects the local call.

— continued —

Table 7 (continued)
Connectivity modes - connect and disconnect protocol

Mode		Interface application
Mode 9	HOTLINE CALL ORIGINATION.	**HOTLINE ORIGINATED BY HOST (INBOUND)** 1. Host toggles DTR from OFF to ON to initiate the hotline call. 2. RILC responds by trying to establish a hotline call to a specific data module (auto-dial). 3. When the called data module answers, then and only then, the RILC turns DSR, DCD, and CTS ON (the RILC does not send any prompts to the host). If the data module being called is busy or not responding, then the RILC requires another transition of DTR from OFF to ON to initiate another hotline call. If the host keeps DTR ON, then the RILC does not try to establish another hotline call, unless the host sends a <CR> while DTR is ON. **CALL DISCONNECTION** Disconnection is identical to Mode 8.
Mode 10	HOST **ACCESSING FOR CALL ORIGINATION AND ANSWERING (forced DTR)**	The operation of the RILC is identical to Mode 8 except for DTR being considered to be always ON, even when the host is driving DTR OFF. **CALL DISCONNECTION** RILC drops DSR, DCD, and CTS if the local DM user drops the call. Then the host should drop the call. RILC drops DSR, DCD, and CTS if the host sends a long break or three short breaks. The host should then drop the call.

— continued —

Table 7 (continued)
Connectivity modes - connect and disconnect protocol

Mode	Interface application	
Mode 11	HOTLINE CALL ORIGINATION (virtual leased line)	**HOTLINE ORIGINATION BY HOST (CONTINUOUS HOTLINE MODE)** The operation of the RILC is similar to Mode 9 except the host initiates the hotline call by driving DTR ON. However, if the called DM is busy or not answering, then the RILC will continuously try to originate hotline calls once every 40 seconds (as long as DTR remains ON) until the called data module answers the call. **CALL DISCONNECTION** Disconnection is identical to Mode 8.

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Table 7 (continued)
Connectivity modes - connect and disconnect protocol

Mode	Interface application	
Mode 12	**TERMINAL ACCESSING FOR CALL ORIGINATION AND ANSWERING**	TERMINAL ANSWERING INCOMING DATA CALL 1. RILC drives DSR, DCD and CTS ON in the idle state. 2. Local DM user dials the access number to initiate the connection. 3. RILC responds by driving RI ON for two seconds and OFF for four seconds, until the terminal answers by turning DTR ON. (If the terminal always drives DTR ON, then the RILC immediately answers the call without driving RI ON.) 4. When the terminal receives RI ON, it should respond by turning DTR ON. 5. The RILC answers when DTR goes ON, and the local DM user is now transparently linked to the terminal. **TERMINAL ORIGINATING OUTGOING DATA CALL** 1. RILC drives DSR, DCD and CTS ON in the idle state. 2. Terminal turns DTR ON to initiate the connection. 3. The RILC prepares to receive <CR> for autobaud. 4. Terminal sends <CR> followed by other commands for establishing a data call (the RILC echoes all commands). CALL DISCONNECTION A. Disconnection initiated by the RILC If the local DM user drops the call, the RILC turns DSR, DCD, and CTS OFF for 0.2 seconds and then ON. B. Disconnection initiated by the terminal. 1. Terminal toggles DTR from ON to OFF (DTR must be ON for 100 milliseconds or more), then the RILC turns DSR, DCD, and CTS OFF for 0.2 seconds then ON. 2. Terminal sends a long break or three short breaks, then the RILC turns DSR, DCD, and CTS OFF for 0.2 seconds and then ON.

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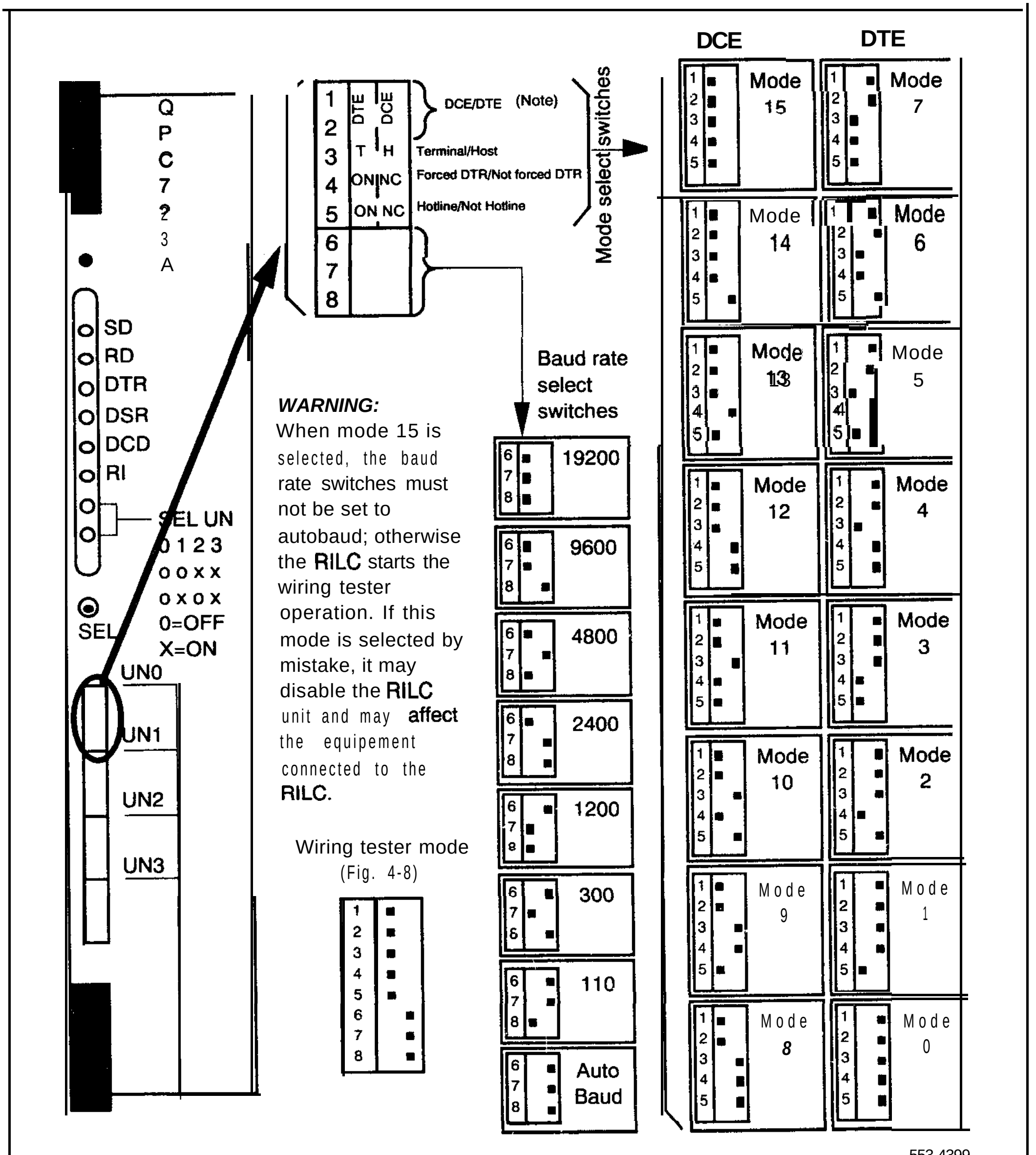
Table 7 (continued)
Connectivity modes • connect and disconnect protocol

Mode	interface application	
Mode 13	HOTLINE CALL ORIGINATION.	**HOTLINE ORIGINATED BY TERMINAL** 1. RILC drives DSR, DCD and CTS ON in the idle state. 2. Terminal toggles DTR from OFF to ON to initiate the hotline call. 3. RILC responds by trying to establish a hotline call to a specific data module (auto-dial). 4. If the data module being called is busy or not responding, then the RILC requires another transition of DTR from OFF to ON to initiate another hotline call. If the terminal keeps DTR ON, then the RILC does not try to establish another hotline call, unless the terminal sends a <CR> while DTR is ON. **CALL DISCONNECTION** Disconnection is identical to Mode 12.
Mode **14**	TERMINAL ACCESSING FOR CALL ORIGINATION AND ANSWERING (with forced DTR)	**TERMINAL ACCESSING FOR CALL ORIGINATION AND ANSWERING** The operation of the RILC is identical to Mode 12 except for DTR being considered to be always ON, even when the terminal is driving DTR OFF. **CALL DISCONNECTION** A. Disconnection initiated by RILC. If the local DM user drops the call, the RILC turns DSR, DCD, and CTS OFF for 0.2 seconds and then ON. B. Disconnection initiated by the terminal. Terminal sends a long break or three short breaks, then the RILC turns DSR, DCD, and CTS OFF for 0.2 seconds and then ON.
Mode 15	HOTLINE CALL ORIGINATION (virtual leased line)	**HOTLINE ORIGINATION BY TERMINAL (CONTINUOUS HOTLINE MODE)** The operation of the RILC is similar to Mode 13 except the terminal initiates the hotline call by driving DTR ON. However, if the called DM is busy or not answering, then the RILC will continuously try to originate hotline calls once every 40 seconds (as long as DTR remains ON) until the data module answers the call. **CALL DISCONNECTION** Disconnection is identical to Mode 12.

Figure 11
Mode and speed switches



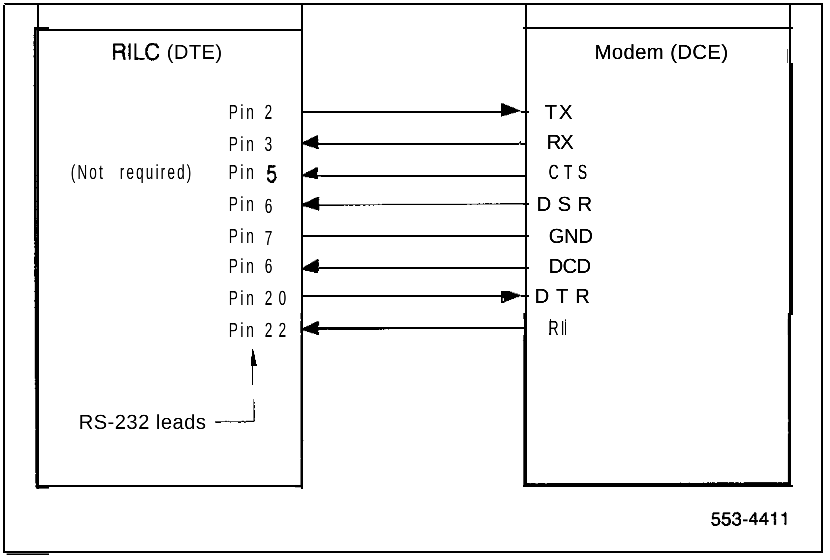
Note: Switches 1 and 2 must always be set to the same option

Modes 0, 1, 2, and 3

Selecting the proper mode for modem connectivity:

Select Modes 0, 1, 2 and 3 when the RILC is connected to different types of modems for inbound and outbound modem pooling. In these modes, the RILC operates as a DTE and monitors the DSR, DCD and RI control leads and drive the DTR lead as shown in Figure 12.

Figure 12
RILC to modem connectivity



In Modes 0 and 1, the RILC drives the DTR lead OFF when in the idle state and ON when processing an incoming or outgoing call.

In modes 2 and 3, the RILC drives the DTR lead ON except when the call is being disconnected. At disconnect, DTR is dropped for 0.2 seconds and then returns to ON.

In the case of outbound modem pooling, the RILC answers the data call and drives the DTR lead ON (Modes 0 and 1). Then the calling data module and the RILC form a transparent link between the calling DTE and the modem. The DTE user may then enter the appropriate commands to the modem for dialing a remote modem. When the call is established, the modem may cause the RILC to disconnect the call by dropping either DSR or DCD.

In the case of inbound modem pooling, the modem must drive the RI lead ON to activate the RILC. Then the RILC responds by driving the DTR lead ON and making the unit busy for outbound calls (Modes 0 and 1). The modem is expected to turn DCD to ON within 35 seconds; otherwise, the call will be dropped by the RILC. If the modem turns DCD ON before the 35 second time out, the RILC validates the incoming call and prepares to accept **<CR>** from the remote modem for autobaud. See Table 5 for more details.

Mode 0

This mode should be selected when the RILC is connected to a modem, except Hayes-1200, for inbound and outbound modem pooling (see modes 2 and 3 if you have Hayes-1200 modem). The characteristics of the modems to be used with the RILC are listed below:

Auto-Answer Capability
This feature is required when the modem is to be used for inbound modem pooling. This capability means that the modem is able to drive the RI lead ON when ringing is present at its tip and ring. In addition, the modem should auto-answer after the first ringing cycle if the DTR lead is ON (most modems support this feature).

Dynamic control of DCD
This feature must be supported by all modems to be connected to the RILC. The dynamic control of DCD means that the modem will be driving the DCD lead ON when the carrier is detected and OFF when the carrier is absent (most modems support this feature).

Auto-Dial Capability
This feature is required when the modem is to be used for outbound modem pooling. This capability means that the modem is capable of going off-hook and dialing the remote number (for example, smart modem, such as Hayes-2400, Bizcomp,. . .).

Auto Reset Capability
This capability is required when the modem is to be used for outbound modem pooling (not required for inbound pooling). The auto-reset should be executed by the modem when DTR lead goes OFF. As a result, the modem must reset all its internal parameters to the default values. This feature prevents the users of the modem pool from accidentally, or intentionally, modifying the modem’ s default parameters to inappropriate values.

How to configure modems for Mode 0

To configure Hayes modem 2400, enter these commands.

AT&D2&W

ATV1&W

ATQ&W

ATE1&W

ATS01&W

AT&C1&S1&W

AT&J&W

ATB1&W

AT&D3&W

Since the default parameters are command programmable v , they may be set differently. Be sure to check them before using the modem.

– To configure Bizcomp 1200 modem, set the configuration switches as follows:

  - switches 3 and 8 to ON
  - all other switches to OFF
    switch 7 selects telephone jack type, and must be OFF when RJ-11 is used

– To configure MULTI MODEM 224E modem, set the configuration as follows:

  - switches 3 and 8 to DOWN position
  - all other switches to UP position. Switch 7 should be UP when RJ-11 jack is used

Programming the RILC in the configuration record for Mode 0

RILC used for inbound modem pool only

In this case, the RILC unit can be configured as an SL-1 telephone (use overlay 1 1), or as an ADM trunk for inbound only (use LDs 16 and 14). When the unit is configured as an ADM trunk, the following features cannot be used.

- speed call
- auto-dial or hotline
- display of auto-dial or speed-call numbers
- outbound modem calls through a manual modem pool (SADM) connected to dumb modem). This is applicable when the inbound modem pool user tries to access a manual modem pool

RILC used for outbound modem pool only

In this case, the RILC unit can be configured as an SL-1 telephone or as an ADM trunk. CDR recording is possible only when the unit is configured as an ADM trunk.

RILC used for both inbound and outbound modem pool

In this case, the RILC unit must be configured as an SL-1 telephone only. ADM trunks for inbound and outbound are not recommended because of possible occurrence of glare. When the RILC is programmed as an SL-1 telephone, the SL-1 station hunting for the outbound modem access should be in the opposite direction to the 500/2500 hunting for the inbound modem access. See Figure 13 for more details.

When programming the RILC as an SL-1 telephone, CDR cannot be used. If CDR is required, use separate Outbound and Inbound modem pools.

Database configuration

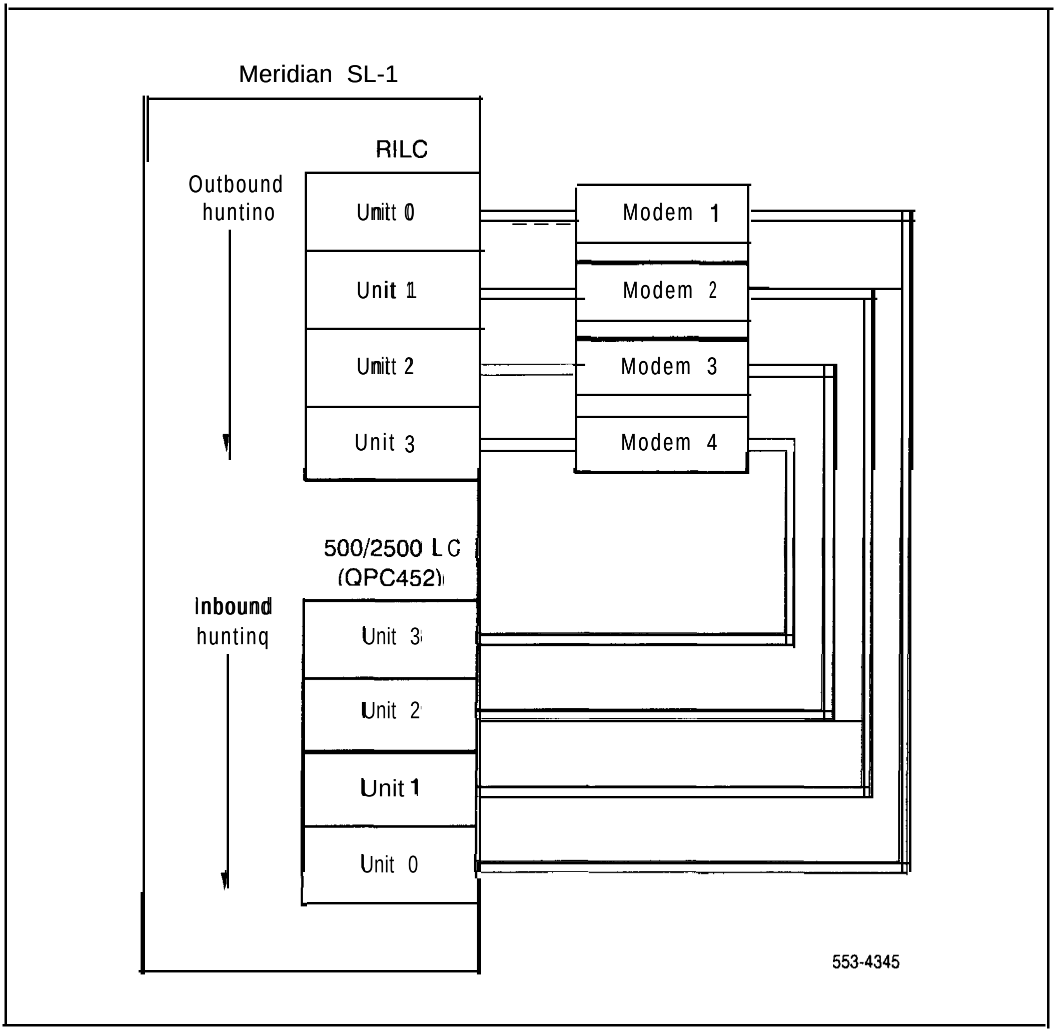
RILC should be configured using Multi-line telephone set administration program LD 11. When configuring the RILC, use the following criteria:

- Configure the data DN as an SL-1 telephone with the digit display (ADD IN CLS)
- The data DN must be a single appearance DN.
- Configure the data DN for Warning Tone Denied (WTD) and Data Terminal Allowed (DTA) in class of service.
- The Virtual Keys on the SL-1 telephone are assigned as follows:

Feature key assignments	Key number
Data ND	0
Secondary data DN	1
Call transfer key	2
Auto dial key *	3
Ring again	4
Make busy key	5
Speed call key	6
Display key	7
Release	9

* Auto dial key is used for hotline operation.

Figure 13
RILC using inbound and outbound modem pool



Mode 1

Select this mode when the RILC is connected to an auto-answer modem for inbound hotline operation. In this mode, the RILC automatically executes hotline operation when R1 is driven ON by the modem. The modem to be used in this mode must support the following features:

- AUTO-ANSWER (see Mode 0 for description)
- Dynamic control of DCD (see Mode 0 for description)

The baud rate of the hotline call is determined by switches 6.7 and 8. Program the Meridian 1 to allow inbound modem calls only.

How to configure modems for Mode 1

Most dumb modems can be configured for this mode. The modems must be able to auto-answer, and have dynamic control of DCD as described in Mode 0. Smart modems can also be used if set to the dumb mode of operation. Hayes 2400, Bizcomp 1200 and MULTI MODEM 224E can be used when set up as follows:

- for Hayes 2400, the dumb-mode-strap should be moved to the dumb-position (see Hayes manual)
- for Bizcomp 1200 modem, all switches should be ON
- for MULTI MODEM 224E, all switches should be UP except for switch 4 set DOWN

Hayes 1200 cannot be used in this mode when the default parameters are selected (see Mode 3).

Programing the RILC in Mode 1

Configure the RILC unit as an SL-1 telephone (the auto-dial feature is used for this mode). The RILC must not be configured as an ADM trunk.

Mode 2

Select this mode when the RILC is connected to Hayes-1200 modem for inbound and outbound modem pooling. This mode is created specially to resolve some problems that were encountered with this modem, namely, the auto-reset implementation. When this modem is operating in the auto-reset mode, it drives both RI and DCD ON as long as DTR is ON. This problem was resolved by driving DTR ON in the idle state, and ON for 0.2 seconds and then ON when an established call is dropped. The RILC also ignores the status of RI and DCD for approximately two seconds after a call is released to avoid false inbound call initiation.

How to configure Hayes 1200 for Mode 2

To configure this modem, set the configuration switches as follows:

- switches 3, 8 and 10 to DOWN
- all other switches to UP; switch 7 selects telephone jack type and should be up when RJ-11 is used

Programing the RILC in Mode 2

Configure the RILC unit as an SL-1 telephone.

Mode 3

Select this mode when the RILC is connected to a Hayes-1200 modem for inbound hotline operation. Use Mode 1 for inbound hotline operations if some other modem is available. However, if only Hayes-1200 modems are available, then this mode can be used. The baud rate of the inbound hotline calls is determined by switches 6, 7 and 8 (Figure 11). Program the Meridian 1 to allow inbound calls on the RILC unit only.

How to configure Hayes 1200 for Mode 3

The configuration of this modem should be as follows:

- All configuration switches should be (UP) except for switch 4. Switch 7 selects telephone jack type used and should be (UP) when RJ-11 is used.

Programming the RILC in Mode 3

Configure the RILC unit as an SL-1 telephone.

Modes 4, 5, 6, and 7

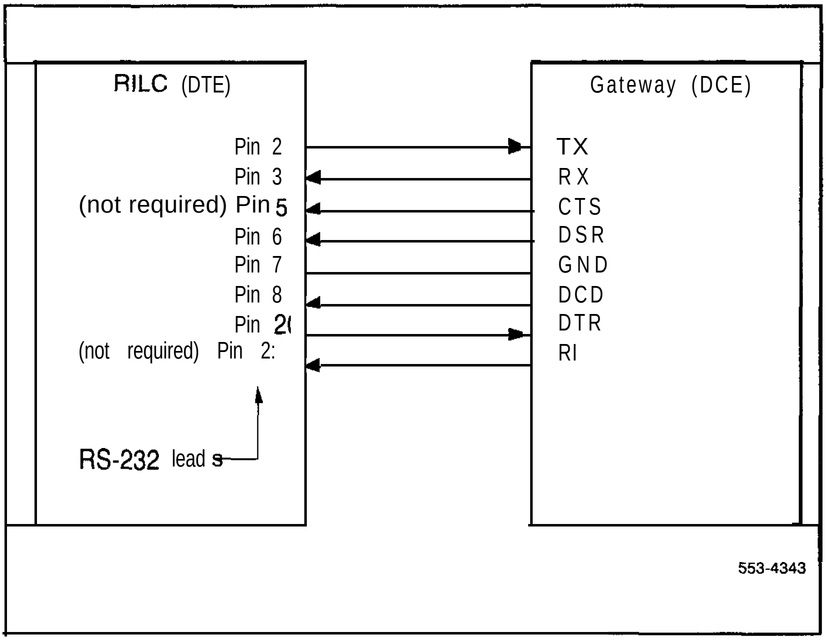
How to select the proper mode for gateway connectivity

Select Modes 4, 5, 6 and 7 when the RILC is connected to different types of **gateways** for inbound and outbound operations. Refer to Figure 14 for the connection pin assignments. The term gateway refers to any equipment that supports the following characteristics:

- the equipment must be a DCE
- the equipment does not drive RI lead (optional, the RILC ignores this lead)
- the equipment must drive DCD lead dynamically
- the equipment drives DSR lead (optional)
- the equipment can monitor the DTR lead (optional depending on the mode selected)

In these modes, the RILC operates as a DTE and monitors the DSR, and DCD control leads and drives the DTR lead (see Figure 14).

Figure 14
RILC to gateway connectivity



In Modes 4 and 5, the RILC drives the DTR lead OFF in the idle state and ON when processing an incoming or outgoing call.

In Modes 6 and 7, the RILC drives the DTR lead ON except when the call is being disconnected. At disconnect, DTR is dropped for 0.2 seconds and then returns to ON.

With outbound gateway access, the RILC answers the data call and drives the DTR lead ON (Modes 4 and 5; DTR is already ON in Modes 6 and 7). Then, the calling data module and the RILC form a transparent link between the calling DM and the gateway. The DM user may then enter the appropriate commands to the gateway to establish a data call. The RILC expects the gateway to drive DCD ON (Modes 4 and 5 only) within 35 seconds. If the gateway fails to do so, the RILC turns DTR ON and drops the call. When the call is established, the gateway may cause the RILC to disconnect the call by dropping either DSR or DCD.

In the case of inbound gateway access, the gateway must drive the DCD lead ON to activate the RILC. When the RILC receives this signal, it drives the DTR lead ON and makes the unit busy for outbound calls (Modes 4 and 5; DTR is already ON in Modes 6 and 7) and prepares to accept OFF for autobaud. The RILC expects DCD to remain ON for as long as the data call is established.

Mode 4

Select this mode when the RILC is connected to a gateway for inbound and outbound operation. The characteristics of the gateways to be used with this mode are listed below.

Auto-answer capability

This feature is required when the gateway is to be used for inbound operation. This capability means that the gateway is able to drive the DCD lead ON when the inbound data call is pending. In addition, the gateway should auto-answer when the DTR lead is ON.

Dynamic control of DCD

This feature must be supported by all gateways to be connected to the RILC. The dynamic control of DCD means that the gateway will be driving the DCD lead ON when the data call is established and OFF when the data call is disconnected.

In the inbound operation, the RILC drives the DTR lead OFF until the gateway drives the DCD lead ON. Then, the RILC drives DTR ON and makes that unit busy for any outbound calls. After that, the user of the gateway may enter the proper commands to establish a local data call to any data module.

In the outbound operation, the RILC drives the DTR lead OFF until another data module calls it for outbound accessing. The RILC answers the data call and drives the DTR lead ON. Then the calling DM is transparently connected to the gateway. The RILC requires the gateway to drive the DCD lead to ON within 35 seconds after the outbound call is connected. Call disconnection may be initiated by dropping DCD (or DSR) from ON to OFF.

Programming the RILC in Mode 4

RILC used for inbound gateway access

Configure the RILC unit as an SL-1 telephone, or as an ADM trunk for inbound only (use LD16 and LD14). When the unit is configured as an ADM trunk, the following features cannot be used.

- speed call
- auto-dial or hotline
- display of auto-dial or speed-call numbers
- outbound modem calls through a manual modem pool (SADM connected to dumb modem). This is applicable when the inbound modem pool user tries to access a manual modem pool

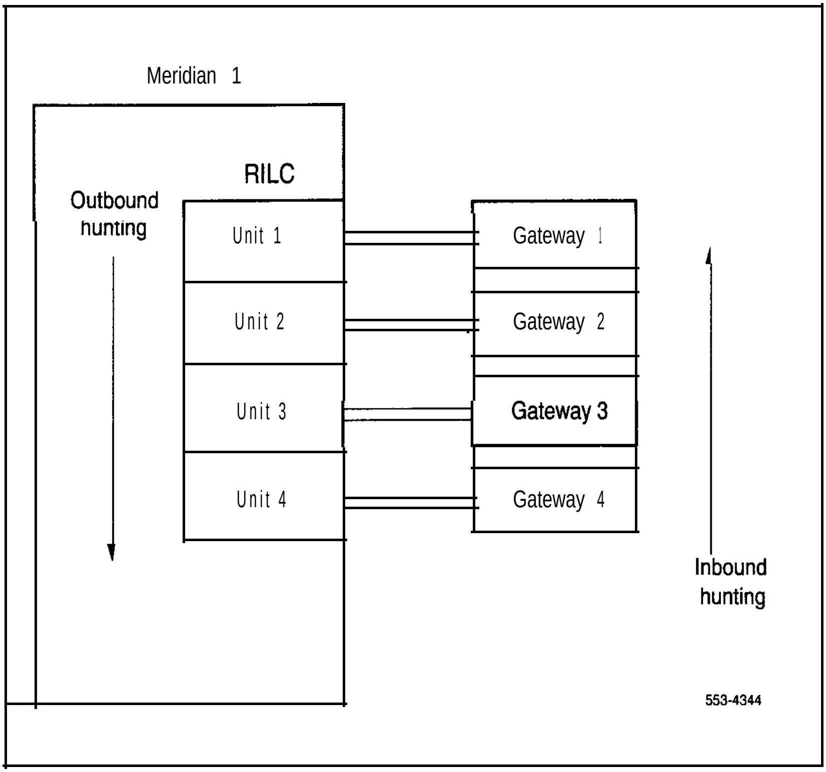
RILC used for outbound gateway access

Configure the RILC unit as an SL-1 telephone or as an ADM trunk. CDR recording is possible only when the unit is configured as an ADM trunk.

RILC used for both inbound and outbound access

Configure the RILC unit as an SL-1 telephone. ADM trunks for inbound and outbound are not recommended because of possible occurrence of glare. When the RILC is programmed as an SL-1 telephone, the SL-1 station hunting for the outbound gateway access should be in the opposite direction to the hunting for inbound gateway access (see Figure 15 for more details). When programming the RILC as an SL-1 telephone, CDR cannot be used. If CDR is required, separate Outbound and Inbound modem pools should be used.

Figure 15
Gateway access for station hunting



Mode 5

Use this mode when the RILC is connected to an auto-answer gateway for inbound hotline operation. In this mode, the RILC automatically executes hotline operation when DCD is driven ON by the gateway. If the data module being called by the hotline operation is busy or not answering, the RILC continuously places repeated hotline calls as long, as the DCD lead is ON, until the called unit answers. The gateway used in this mode must support the following features.

- auto-answer (see Mode 4 for description)
- dynamic control of DCD (also see Mode 4 for description)

The baud rate of the hotline call is determined by switches 6, 7 and 8 (Figure 11). Program the Meridian 1 to allow inbound modem calls only.

Programming the RILC in Mode 5

Configure the RILC unit as an SL-1 telephone (the auto-dial feature is used for this mode). The RILC must not be configured as an ADM trunk.

Mode 6

Select this mode when the RILC is connected to a gateway requiring DTR to be ON always except during call disconnection. In this mode, the RILC can be used for both inbound and outbound operations. The operation of this mode is similar to Mode 4 except for the following.

- the DTR lead is ON in the idle state
- the DTR lead will be dropped OFF for 0.2 seconds when an established call is disconnected

Programming the RILC in Mode 6

Configure the RILC unit as an SL-1 telephone.

Mode 7

Select this mode when the RILC is connected to a gateway for inbound hotline operation. The operation of this mode is similar to Mode 5 except for the following.

- the DTR lead is ON in the idle state
- the DTR lead will be dropped OFF for 0.2 seconds when an established call is disconnected

The baud rate of the inbound hotline calls is determined by switches 6, 7 and 8 (Figure 11). Program the Meridian 1 to allow inbound calls only on the RILC unit.

Programming the RILC in Mode 7

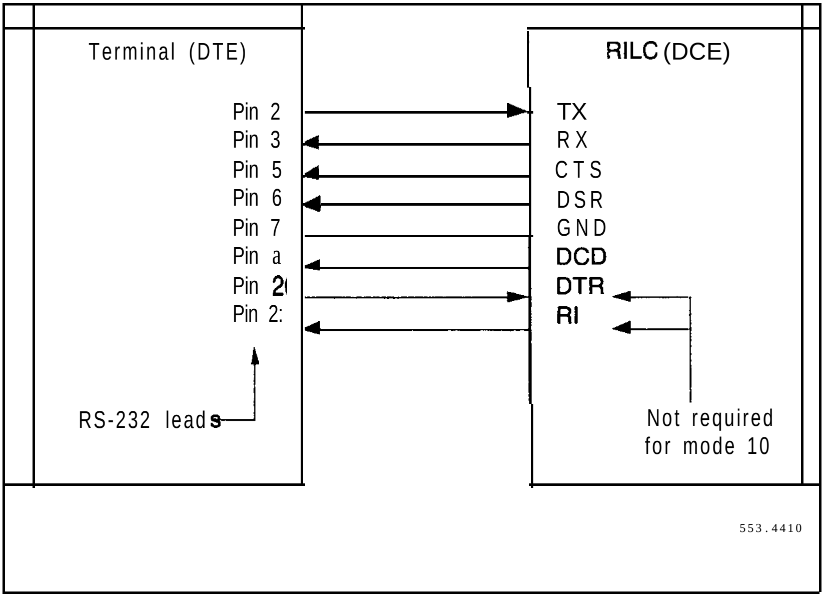
Configure the RILC unit as an SL-1 telephone..

Modes 8, 9, 10, and 11

How to select the proper mode for host connectivity

Select Modes 8, 9, 10 and 11 when the RILC is connected to different types of hosts (DTE). In these modes, the RILC operates as a DCE and drives DSR, DCD, and RI control leads (see Figure 16). The RILC does not send any menu or prompt to the host, and does echo any command sent from the host. The CTS, DSR, and DCD will be driven ON until the call is released. An incoming call to the RILC causes the RI lead to go ON for two seconds and then OFF for 4 seconds until the call is answered by the host. When the Host turns DTR ON, the RILC answers the call. If DTR was already ON, then the RILC does not drive RI ON.

Figure 16
RILC host connectivity



Mode 8

Use this mode when the RILC is connected to a host for host accessing. In this mode, the RILC operates in a similar like the MCDS. The hosts to be used with this mode should have the following characteristics:

Auto-answer capability
The host should be capable of monitoring the RI lead for detection of incoming calls. When RI is turned ON by the RILC, the host should respond by driving DTR ON, which forces the RILC to answer the incoming call. If the host drives the DTR lead ON all the time, then incoming calls will always be immediately answered and the RI lead will not be turned ON by the RILC.

Dynamic control of DTR
This feature is required only if it is required that the host be capable of releasing an established call. The host should be able to drop an established data call by driving DTR ON for more than 100 ms.

In this mode, the RILC does not send any menus or prompts to the host. However, the host can still originate an outgoing call by blind-dialing (sending commands to the RILC without receiving echoes).

Programming the RILC in Mode 8

Configure the RILC unit as an SL-1 telephone.

Mode 9

Use this mode when the RILC is connected to a host, and requires a hotline call origination. In this mode, the host hotline calls to a specific data unit by driving the DTR lead ON. The transition of DTR from OFF to ON causes the RILC to hotline to the auto-dial DN. The hosts to be used with this mode should have the following characteristics:

Dynamic control of DTR for call origination
The host should be capable of driving the DTR lead from ON to ON for initiating the hotline call. If the host always drives the DTR lead ON (not capable of dynamic control), then Mode 11 should be used.

Dynamic control of DTR for releasing established calls
This feature is required only if it is required that the host be capable of releasing an established call. The host should be able to drop an established data call by driving DTR OFF for more than 100 ms.

Programing the RILC in Mode 9.

Configure the RILC unit as an SL-1 telephone (the auto-dial feature is used for this mode). The RILC must not be configured as an ADM trunk.

Mode 10

Choose this mode when the RILC is connected to a host for inbound host accessing. The host in this mode is not required to be capable of monitoring RI, or driving DTR. This mode is similar to Mode 8 except for the following.

- The status of DTR lead is assumed to be always ON, even when the actual condition of that lead is OFF (forced DTR). Therefore, the RILC always answers an incoming call regardless of the status of DTR.

  The host cannot release an established data call by driving DTR OFF. As a result, the host cannot initiate call release except with long break or three short breaks.

In this mode, the RILC does not send any menus or prompts to the host. However, the host can still originate an outgoing call by blind-dialing (sending commands to the RILC without receiving echoes).

Programing the RILC in Mode 10

Configure the RILC unit as for Mode 4.

Mode 11

This mode provides a virtual leased line and the meaning of the Forced DTR switch is redefined.

Use this mode when the RILC is connected to a host and requires continuous hotline operation. In this mode, the RILC repeatedly tries to hotline to the auto-dial DN as long as DTR is ON. This operation is like having a leased line feature, where the connection between two extensions is always established. When the RILC tries to hotline to a busy data module, ring again automatically activates and the connection is established as soon as the called unit is free. After establishing the data call, if the called unit releases the call, for any reason, the RILC hotline calls again to reestablish the call. If the data unit being called does not answer the hotline call, the RILC places another hotline call every 40 seconds until the called unit answers. Use this mode only when requiring a permanent connection between a host and another data unit . The RILC does not send any menus or prompts to the host. The baud rate of the hotline call is determined by switches 6, 7, and 8 (Figure 11).

Programing the RILC in Mode 11

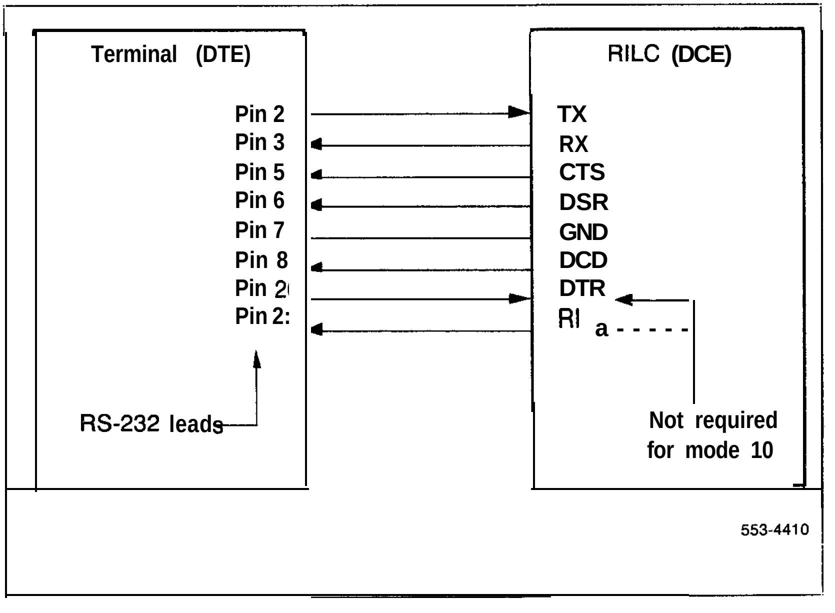
Configure the RILC unit as an SL-1 telephone..

Modes 12, 13, 14, and 15

How to select the proper mode for terminal connectivity

Select Modes 12, 13, 14 and 15 when the RILC is connected to different types of terminals. In these modes, the RILC operates as a DCE and drives DSR, DCD, and RI control leads (see Figure 17 below). It also monitors DTR lead in Modes 12, 13 and 15 (DTR is ignored in Mode 14). All the menus and prompts are sent to the terminals and all the commands from the terminals are echoed. The CTS, DSR and DCD is driven OFF during the idle state (data call is not established). After the call is established, these leads are driven ON until the call is released. The RI lead is controlled only in Modes 12, 13 and 15 and is driven OFF in the idle and connect states. An incoming call to the RILC causes the RI lead to go ON for two seconds and then OFF for four seconds until the call is answered by the terminal. When the terminal turns DTR ON, the RILC answers the call.

Figure 17
Terminal connectivity



Mode 12

Select this mode when the RILC is connected to a terminal (DTE) for inbound and outbound data calls. This mode is like the ASIM when set to not forced DTR and not hotline. In this mode, call origination and auto-answer is not executed by the RILC, unless the DTR lead is driven ON by the terminal. Any terminal that drives the DTR lead ON can be used with this mode (such as VT100, VT102). The RILC drives CTS, DSR, and DCD ON, except when a call is dropped or when Control-Z is typed in the idle state. In this case, the RILC drives those leads OFF for 0.2 seconds and then ON. When the DTR lead is driven OFF by the terminal, the RILC does not execute autobaud, nor will it respond to any command.

Programing the RILC in Mode 12

Configure the RILC unit as an SL-1 telephone since auto-dial, speed-call and display commands are likely to be used.

Mode 13

Use this mode when the RILC is connected to a terminal (DTE) and requires hotline call origination. This mode is like the ASIM when set to not forced DTR and hotline. In this mode the terminal hotline calls a specific data unit by driving the DTR lead ON. The transition of DTR from ON to OFF causes the RILC to hotline the auto-dial DN. Any terminal that drives DTR lead ON can be used with this mode (such as VT100, VT102). The RILC drives CTS, DSR, and DCD ON, except when a call is dropped. In this case, the RILC drives those leads OFF for 0.2 seconds and then ON. The baud rate of the hotline call is determined by switches 6, 7 and 8 (Figure 11).

Programing the RILC in Mode 13

Configure the RILC unit as an SL-1 telephone.

Mode 14

Select this mode when the RILC is connected to a terminal (DTE) for inbound and outbound data calls. This mode is like the ASIM when set to forced DTR and not hotline. The terminal used with this mode is not required to drive the DTR lead. This mode of operation is similar to Mode 12 except for the following.

- The status of DTR lead is assumed to be always ON, even when the actual condition of that lead is OFF (forced DTR). The RILC always answers an incoming call regardless of the status of DTR.
- The terminal cannot release an established data call by driving DTR OFF. As a result, the terminal cannot initiate call release except with long break or three short breaks.

Programing the RILC in Mode 14

Configure the RILC unit as an SL-1 telephone.

Mode 15

This mode provides a virtual leased line and the meaning of the Forced DTR switch is redefined.

Select this mode when the RILC is connected to a terminal (DTE) and continuous hotline call origination is required. In this mode, the RILC repeatedly hotline calls the auto-dial DN as long as DTR is ON. This operation is similar to having a leased line feature, where the connection between two extensions is always established. When the RILC hotline calls a busy data module, ring again is automatically activated and the connection is established as soon as the called unit is free. After establishing the data call, if the called unit releases the call for any reason, the RILC automatically hotline calls again to reestablish the call. If the called data unit does not answer the hotline call, the RILC places another hotline call every 40 seconds until the called unit answers. This mode is recommended only when requiring a permanent connection between a terminal and another data unit. The baud rate of the hotline call is determined by switches 6, 7 and 8 (Figure 11). The status of CTS, DSR and DCD is controlled in a similar manner as described in Mode 15.

Programing the RILC in Mode 15

Configure the RILC unit as an SL-1 telephone.

Baud rates

The three baud select switches (6, 7 and 8) provide two functions for calls originated from an RILC.

- The first function provides a way to select a baud rate of a hotline call. The RILC starts the hotline operation without receiving a **<CR>** for autobaud. If the switches are set to auto baud, the RILC defaults to 9600 bps except in Mode 15. Normally the RILC should be selected to operate at autobaud.

- The second function is to set the RILC to operate at a fixed baud rate. The RILC does not return the menu or hotline unless an **<CR>** is received at the selected baud rate. The fixed baud rate operation is useful in cases where the RS-232 lines exceed the 50 feet (15 m) limit by a large margin and the RILC fails to autobaud.

When the RILC receives a call, it adapts to the caller’ s baud rate, regardless of the switch settings.

Testing procedure

There are eight wires for each unit of the RILC. The correct installation of these wires is essential to proper operation of the unit, so the RILC has a special mode of operation that allows the installer to verify and troubleshoot any wiring error from the MDF to the RS-232 connector. Procedure 1 explains the steps for an easy and error-free wiring installation. Procedure 2 explains the installation test procedure for cabling with RJ-11 using 4 wires for terminal connectivity.

Procedure 1
Installation test procedure

Step	Procedure
1	Program the RILC units as SL-1 telephones or **as** ADM trunks **CAUTION** Do not insert the RILC in the PE shelf yet.
2	Install the wiring from the MDF to the data equipment (Modem, Host, Gateway or Terminal). See Figure 18. **CAUTION** Do not connect the wiring to the RS232 connector from the data equipment until the test is completed .
3	Insert the QPC723 in the assigned location on the PE shelf.
4	Connect an RS232 Breakout box to the RS232 (DTE) connector (Figure 18). **Be sure the data equipment is not connected to anything yet.**
5	Set the configuration switches of the RILC under test to the wiring-tester mode (Figure 18).
6	Operate the faceplate select unit switches to select the RILC unit to be tested. When the proper "sel un" LED is displayed, the other LEDs should blink in sequence (Figure 19). If not, replace the RILC.
7	Observe the LED blink sequence at the RS232 Breakout box. The sequence should be as follows: RS-232 pin #2 (SD) LED blinks once, then RS-232 pin #3 (DR) LED blinks 2 times, then RS-232 pin #5 (CTS) LED blinks 3 times, then RS-232 pin #6 (DSR) LED blinks 4 times, then RS-232 pin #8 (DCD) LED blinks 5 times, then RS-232 pin #20 (DTR) LED blinks 6 times, then RS-232 pin #22 (RT) LED blinks 7 times, then The above process is repeated as long as the unit is in the wiring-tester mode.
8	If the sequence is not as stated above, then the wiring at the MDF is not correct, the blinking rate of each of the leads may be helpful in finding the source of the problem. Note: Pin #7 does not blink because it must be grounded.
9	If the blinking sequence is correct, go to next step.

-continued —

Procedure 1 (continued)
Installation test procedure

Step	Procedure
10	Follow steps 1 through 9 and verify the other units of the RILC.
11	After a unit passes the wiring test, reset the configuration switches to the appropriate operation mode for that unit. If some units of the RILC are not used, they can be set to any mode except the wire tester mode. **Do not leave any RILC unit configured for the wire tester mode after the testing is completed.**
12	When the appropriate mode of operation for each unit has been properly set, enable the RILC card in LD 32.
13	Once the tests have been completed and the card is enabled, connect the data equipment to the RILC unit.
14	Data calls may now be established and data connectivity can be verified.

Figure 18
Breakout box - blinking sequence during wire testing

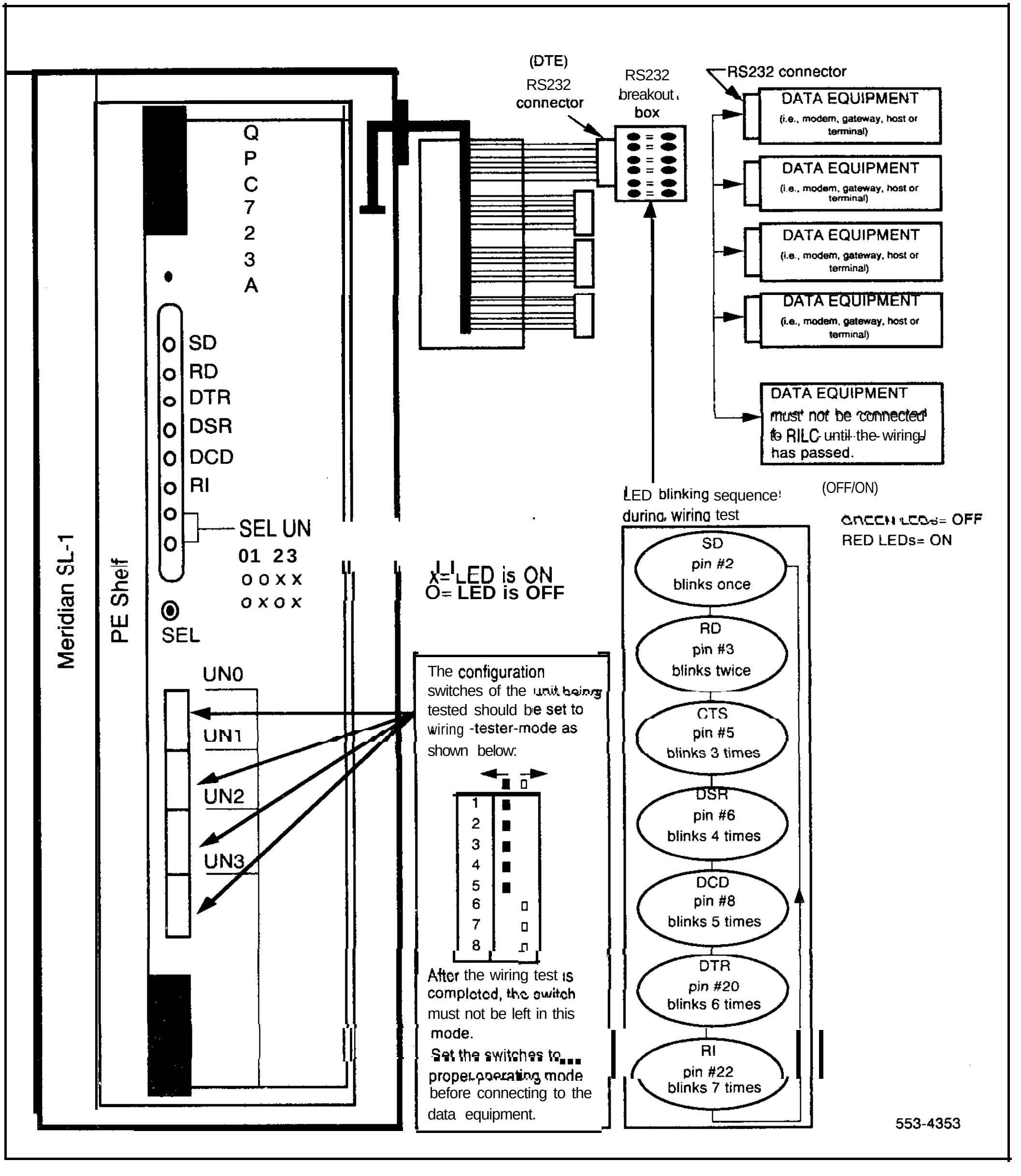
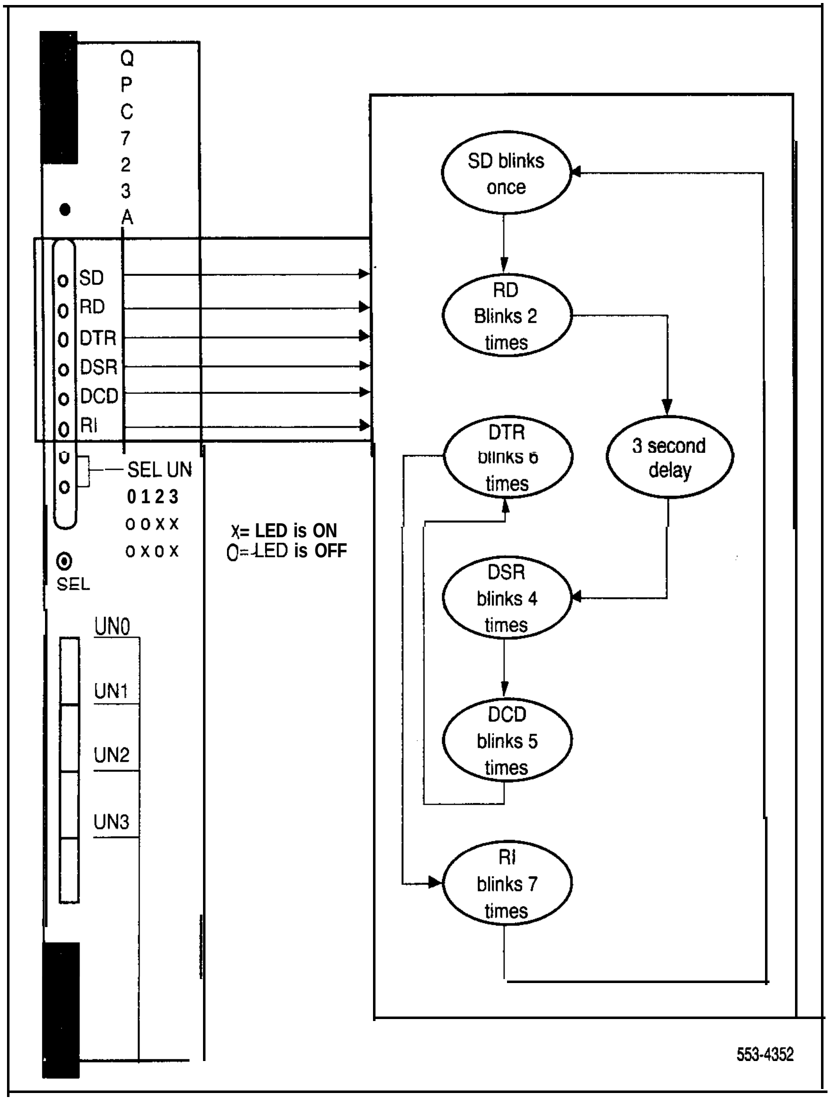


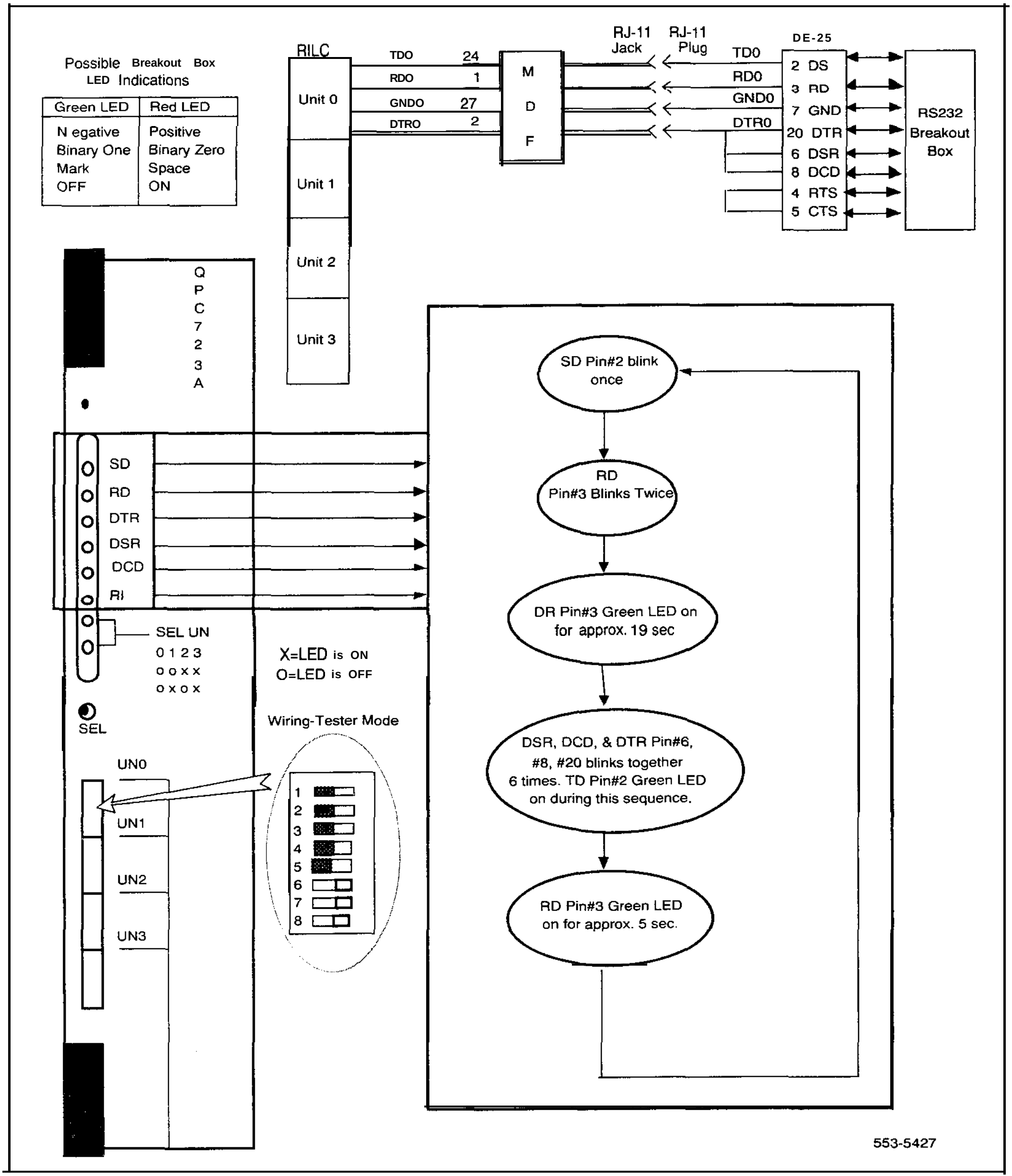
Figure 19
RILC faceplate - blinking sequence during wire testing



Procedure 2
Installation test procedure for RJ-11 4-wire cabling

Step	Procedure
1	Program the RILC units as SL-1 telephones **CAUTION** Do not insert the RILC in the PE shelf yet.
2	Install the wiring from the MDF to the terminal. See Figure 20. **CAUTION** Do not connect to terminal until the test is completed .
3	Insert the QPC723 in the assigned location on the PE shelf if not already done.
4	Connect an RS232 Breakout box to the RS232 (DTE) connector (Figure 20). Be **sure the data equipment is not connected to anything yet.**
5	Set the configuration switches of the RILC under test to the wiring-tester mode (Figure 20).
8	Operate the faceplate select unit switches to select the RILC unit to be tested. When the proper "sel un" LED is displayed, the other LEDs should blink in sequence (Figure 20). If not, replace the RILC.
7	Observe the LED blink sequence at the RS232 Breakout box. The sequence should be as follows: RS-232 pin #2 (SD) LED blinks once, then RS-232 pin #3 (DR) LED blinks 2 times, then RS-232 pin #3 (DR) green LED is ON for approximately 10 seconds, then RS-232 pins #6, 8, and 20 (CTS) LED blink together 6 times and TD pin # 2, green LED, is ON during this sequence, then RS-232 pin #3 (DR) green LED is ON for approximately 5 seconds The above process is repeated as long as the unit is in the wiring-tester mode.
8	If the sequence is not as stated above: Insure that the cable is correctly installed at the I/O Panel at the top of the cabinet. Verify the wiring between the MDF and the RILC Check the wiring to the RJ-11 jack Check DB-25 connector wiring

Figure 20
Breakout box - blinking sequence during 4-wire RJ-11 testing



Operation

The Meridian 1 views the RILC as four Meridian 1 station sets, when configured as stations in the Meridian 1 data base. It responds to all system diagnostic messages in the same manner as a station set. Unlike the SL-1 telephone, the RILC does not have flexible keys and requires features to be assigned to specific keys.

The RILC can be configured as ADM trunks and all features available to such trunks are applicable to the card, including linear or round-robin hunting, trunk group restrictions, and CDR.

Call disconnect

After the data call has been set up, it can be disconnected by different methods depending on the mode of operation.

- **Call disconnection in modes 8, 9, 11, 12, 13 and 15**
  - **Long Break** lasting 1.2 seconds or more
  - **Three Short Breaks,** each lasting 100 ms or more and occurring within two seconds
  - **Dropping the DTR lead** for 100 ms or more. Do this by turning the terminal power off. In some terminals, the ON LINE/OFF LINE switch may drop DTR (see the user guide for the terminal)
  - **Called-Party Disconnects** first
- **Call disconnection in modes 10, and 14**
  In these modes, an established call can be disconnected by items the long break, three short breaks, or when the called party disconnects first, as described above.
- **Call disconnection in Modes 0, 1, 2, 3, 4, 5, 6 or 7**
  In these modes, an established call can be disconnected by the long break, three short breaks, or when the called party disconnects first, as described above. The call drops if either DSR or DCD leads toggle from ON to OFF.

Keyboard dialing (KBD)

The KBD feature provides the following capabilities. A call can be initiated with either keyboard dialing (KBD) or hotline.

- Autobaud and Autoparity from 110 to 19200 bps. Parity includes Mark, Space, Odd, and Even (for seven bit ASCII data only).
- call origination to local hosts
- call origination to remote hosts
- Ring Again
- Auto dial calling for calls to local hosts
- Speed Call
- Digit Display

Database requirements

The following data base considerations.

- the primary and secondary DN must be single appearance DNs
- for access to remote hosts, the class of service of the data DN for the RILC must allow external calls
- the primary and secondary DN must be configured as an SL-1 telephone and, if desired, with digit display (DDS) feature on it
- the data DN and voice DN should be configured for Warning Tone Denied (WTD)
- the secondary DN and Call Transfer keys must be programmed if the RILC is to place calls to an outbound modem pool (not smart modem pool)
- the virtual keys of the SL-1 telephone are assigned as follows. Key 8 is reserved for future use and is left unassigned

Feature key assignments	Key number
Data ND	0
Secondary data DN	1
Call transfer key	2
Auto dial key	3
Ring again	4
Make busy key	5
Speed call key	6
Display key	7
Release	9

Note: When the host option is selected (switch 3 in host position), DDS messages from the Meridian 1 to the external device are suppressed at the RILC. DDS may be programmed off in the database to reduce the possibility of Meridian 1 output buffer overflow conditions. In the host mode, it is more desirable to configure the RILC as ADM trunks

Keyboard menu

KBD with the RILC is easy to use because the user friendly prompts guide you through the operating steps. ENTER NUMBER OR H (FOR HELP) appears on the screen first after entering <CR> . If H is entered, the main menu as shown below is used to determine the call or function type.

A - AUTO DIAL	S - SPEED CALL
C - CALL	M - MODIFY
D - DISPLAY	

SELECT:

If M is entered from the main menu, the following submenu appears.

A - AUTO NUMBER	R - REMOTE LOOPBACK
S - SPEED NUMBER	Q - QUIT MODIFY

SELECT:

Some typical messages and prompts are shown in Table 8.

Table 8
Typical messages and prompts

No.	Message	Circumstance
1	ENTER NUMBER OR H (FOR HELP)	Immediately after autobaud/<CR> at the terminal
2	CALLING nnnn	Dialing the DN
3	CALL CONNECTED. SESSION STARTS (bell)	Remote data module Answers
4	BUSY, RING AGAIN? (Y/N)	Called DN is busy but ring again may be placed
5	ENTER REMOTE NUMBER:	Dialing remote host outbound modem pool
6	MODEM RESERVED ENTER REMOTE NUMBER:	Accessed modem reserved Dialing remote DTE
7	RING AGAIN PLACED	Ring again placed on Meridian 1
8	RELEASED	When call is released
9	DATA STATION NOW AVAILABLE. PLACE CALL? (Y/N) (bell)	Ring again available
10	ENTER ACCESS CODE:	Request for entry of Speed Call access number
11	SERVICE UNAVAILABLE RELEASED	Meridian 1 is not responding to requested service or modem time out, or ring no answer
12	NO SYSTEM RESPONSE REENTER:	RILC unit to Meridian 1 signalling is failing; check system status of unit
13	INCOMING CALL CONNECTED (bell)	Automatic answering
14	INCOMPATIBLE INCOMING CALL. RELEASED	Auto answer not possible, module originating call was set to synchronous operation, a baud rate which the RILC cannot match or data bit/parity configuration not supported by the RILC
15	REMOTE LOOPBACK (Y/N)	Prompt for Loopback to be set on subsequent call
16	INVALID COMMAND/ENTRY REENTER:	
17	UNDER TEST	Auto answer with calling party requesting loopback
18	BAUD RATE = nnnn. REMOTE LOOPBACK = Y or N. AUTO DIAL NO. = nnnnnnnnnn	Displayed when user types D <CR> at the ENTER NUMBER OR H (FOR HELP) OR SELECT D<CR> from the main menu prompts.

Procedure 3 provides the steps used when operating a terminal with KBD. Keyboard dialing is only applicable to ASCII, asynchronous start stop character mode devices not configured for hotline operation. Units configured for Host operations (switch 3) do not receive prompts and indications. However, blind dialing is supported for these devices. Synchronous or block mode devices are not supported.

Procedure 3
Keyboard dialing with the RILC

Step	Action	Terminal echo	Prompt or indicator	Comment
	Start condition.			Data station idle. Terminal and RILC power on.
1	Enter (CR or <CR> (.) <CR>		ENTER NUMBER OR H (FOR HELP)	Go to step 6 or 10 if the number is to be entered instead of H. If you are familiar with the menu, you may use the command (C, <CR> , A, S, etc.) instead of H. Go to step **3, 4** or 5 if a "MENU" command is entered instead of H.
If autobaud has been selected by faceplate switches 6, 7 and 8 <CR> causes the RILC to sutobaud. (.) <CR> causes the RILC to automatically select the correct parity for the KBD nessages.				
2	Enter H <CR>	A – AUTO DIAL C – CALL D – DISPLAY SELECT:	S – SPEED CALL M -MODIFY	
3	Auto Dial Active?			If yes, go to step 21. If not, continue.
4	Speed Call Active?			If yes, go to Step 22. If not, continue.
5	Enter C <CR>	C	ENTER NUMBER:	

— continued —

Procedure 3 (continued)
Keyboard dialing with the RILC

Step	Action	Terminal echo	Prompt or indicator	Comment
CALL TO OTHER DEVICES USING DIGITAL CONNECTION				**Go** to Step **10 for call** to **remote** device in the same digital network.
6	Enter number NNNN <CR>.	NNNN	CALLING NNNN	The number of digits **dialled** may vary with the local dialing plan. All numeric and alphanumeric input, # and * are accepted. During call setup all legal user input appears on terminal screen. RILC sends digits to Meridian 1 which places call to host. Meridian 1 sends digits NNNN back to the RILC and terminal.
7	Called device answers (if busy, see steps 16 or 21).		CALL CONNECTED. SESSION STARTS	Data Modules perform handshake and data channel becomes transparent.
8	Follow login procedures.			Data session begins.
9	Proceed with data session.			KBD is complete. The answering device must provide all further messages or input echo. Go to step 34 for disconnect procedures.
CALLS VIA MODEM POOL				
10	Enter Modem Number NNNN <CR>.	All digits typed	Canning NNNN	
11	Modem answers.		MODEM RESERVED ENTER REMOTE NUMBER:	Modem is reserved.

— continued —

Procedure 3 (continued)
Keyboard dialing with the RILC

Step	Action	Terminal echo	Prompt or indicator	Comment
12	Enter remote number digits <CR>.	All digits typed.	CALLING NNNNNNN;	The Meridian 1 places a call to the remote number.
13	Remote modem answers.		CALL CONNECTED. SESSION STARTS.	The call is connected. (If busy, go to step 20.)
14	Follow login procedures.			Data session begins.
15	Proceed with data session.			KBD is complete. The answering device must provide all further messages or input echo. Go to step 34 for disconnect procedures.
CALLED DEVICE IS BUSY-RING **AGAIN ACTIVE?**				
16	Called Device Busy.	Number digits	CALLED NNNN BUSY, RING AGAIN? (Y/N)	
17	Enter Y <CR>	Y	RING AGAIN PLACED	The RILC uses the Meridian 1 Ring Again feature to retry the call.
18	Called device available for incoming call.		DATA STATION NOW AVAILABLE. RING AGAIN? (Y/N)	A bell character (CONTROL G) is sent to the local device in terminal operations.
19	Enter Y<CR>			Meridian 1 automatically places call (go to steps 7 or 13).
CALLED DEVICE BUSY-NO RING AGAIN				
20	Called device is busy or not answering.		SERVICE UNAVAILABLE	

-continued —

Procedure 3 (continued)
Keyboard dialing with the RILC

Step	Action	Terminal echo	Prompt or indicator	Comment
AUTO DIAL ACTIVE? (Note)				**LOCAL DEVICE ONLY**
21	Enter A <CR> at "Enter a number or H (for Help)"		CALLING NNNN	RILC sends DDN and Auto Dial indication. Meridian 1 places the call to the predesignated number. Return to step 7.
SPEED CALLING ACTIVE? (Note)				All speed call numbers must be programmed in data base against the user DDN.
22	Enter S <CR> at "Enter a number or H (for Help)"	S	ENTER ACCESS CODE:	
23	Enter N <CR>	N	CALLING N>NNNNNNN	RILC sends DDN and Speed Call Index. Return to steps 7 or 13.
DISPLAY ACTIVE? (Note)				Used to display terminal parameters of the user DDN.
24	Enter D <CR> at "Enter a number or H (for Help)"		BAUD RATE = NNNN REMOTE LOOPBACK = N AUTO DIAL NO = NNNN A - AUTO DIAL S - SPEED CALL C - CALL M - MODIFY D - DISPLAY SELECT:	

— continued —

Note: To select these functions, the terminal must be at the prompt: "Enter Number or H (for Help)".

When you enter H, the main menu allows you to select one of the following: A-Auto dial, D-Display, S-Speed call, M-Modify.

Procedure 3 (continued)
Keyboard dialing with the RILC

Step	Action	Terminal echo	Prompt or indicator	Comment
	The Baud rate must be manually reset at the DTE/DCE (See User Guide): — power down DTE/DCE (or enter break or drop DTR) — change baud rate at DTE/DCE — power up DTE/DCE — enter <CR> to auto baud It may be verified after resetting by autobauding again with <CR> and again using the D command. The other parameters are modified as shown in the following steps.			
MODIFY ACTIVE? (see Note on preceding page)				Used to modify RILC unit features.
25	Enter M <CR> at "Enter a number or H (for Help)"	M	A-AUTO NUMBER S - SPEED NUMBER SELECT: R - REMOTE LOOPBACK Q - QUIT MODIFY	If you enter: A - go to step 26 S - go to step 28 R - go to step 31 Q - go to step 33
MODIFY AUTO DIAL				
26	Enter A <CR>	A	AUTO DIAL NO =	
27	Enter new number <CR>	New number	A-AUTO NUMBER S -SPEED NUMBER SELECT: R - REMOTE LOOPBACK Q - QUIT MODIFY	Auto dial number is changed. Select another feature or go to step 33.
MODIFY SPEED CALL				
28	Enter S<CR>	S	ENTER ACCESS CODE:	
29	Enter X <CR>	X	SPEED NUMBER:	
30	Enter new number <CR>	New number	A - AUTO NUMBER S - SPEED NUMBER SELECT: R - REMOTE LOOPBACK Q - QUIT MODIFY	New number is set. Select another feature or go on to step 33.

— continued —

Procedure **3 (continued)**
Keyboard dialing with the RILC

Step	Action	Terminal echo	Prompt or indicator	Comment
MODIFY REMOTE LOOPBACK				
31	Enter R <CR>	R	REMOTE LOOPBACK Y OR N <CR>	Used to verify transmitted data from test station to terminal with remote loopback 4. Read results at the test station.
32	Enter Y or N <CR>	Y or N	A - AUTO NUMBER S-SPEED NUMBER SELECT: R - REMOTE LOOPBACK Q - QUIT MODIFY	Remote Loopback is Y or N. Select another feature or go to step 33.
QUIT MODIFY (Note)				
33	Enter Q <CR>	Q	A-AUTO NUMBER C - CALL D - DISPLAY SELECT: S - SPEED CALL M - MODIFY	Try any other feature or place a Data Call
CALL DISCONNECT PROCEDURES				
34	Call disconnect is not a part of KBD, however, it returns the user to KBD procedures. Refer to paragraphs on call disconnects for more information.			
35	Call disconnected.		RELEASED	The user has been returned to KBD, ready for entry at step 1.

Note: Q <CR> must be entered before implementing feature changes.

SL-1

QPC723 RS-232 interface line card

Description, illustration and operation

Release 3.0
Standard
December 31, 1992
Printed in USA

northern telecom

SL-1

QMT21 High Speed Data Module

Description, installation, operation

Publication number: 553-2731-l 07
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Revision history

December 20, 1990

This document is reissued to include updates and changes for X1 1 release 16. Updates are indicated by change bars in the margins.

December 31, 1992

This document is reissued to include technical updates. Due to the extent of changes, revision bars are omitted.

Contents

Introduction

The QMT21 High Speed Data Module (HSDM) is a stand alone desktop data module that provides an RS-232C/V.35 interface between compatible asynchronous or synchronous data terminal equipment (DTE) and the switching network. The HSDM provides connectivity to the DTE for intra-switch communications, as well as for wide area communications over Digital Trunk Interface (DTI) or Primary Rate Interface (PRI) links to other Northern Telecom switches. The HSDM does not interface directly to Data Communication Equipment (DCE) such as modems. The QMT8 (ADM) or QMT12 (SADM) are used for that purpose.

The HSDM functions are based on the QMT11 Asynchronous Synchronous Interface Module (ASIM). The HSDM provides a V.35 interface and allows synchronous data transmission up to 64000 bits per second. The HSDM V.35 interface conforms electrically to the CCITT V.35 standard and mechanically to ISO-21 10. When HSDM is used as a V.35 interface unit, an adapter cable is required to convert the ISO 2110 (DB-25) into an ISO 2593 (34-pin rectangular connector).

The HSDM has the exact same profile as the ASIM but is packaged in a Meridian grey color plastic housing. It weighs approximately 3 lb.

An external power supply is provided for each HSDM. The power supplies are assembled with the units and it is not recommended to order them separately.

When the HSDM is used as an RS-232 interface unit it can replace an ASIM. The HSDM meets the DTE/DCE interface requirements of the EIA RS-232C standard. The electrical characteristics of the interface to the Data Line Card (DLC) or to a 4-Port Data Line Card (4PDLC) are the same as for the ASIM.

Features

A Light Emitting Diode (LED), next to the legend "V.35" on the front face plate, is lit continuously if the HSDM is configured internally for V.35 interface.

The HSDM can originate outgoing data calls by either keyboard dialing or keypad dialing. Keyboard (KBD) or keypad dialing may be used in the asynchronous mode. Only keypad dialing is permitted in the synchronous mode.

A standard 500/2500, SL-1 or digital telephone may be plugged into the phone jack of the HSDM. This telephone then operates through the HSDM line cord to a standard 500/2500 SL-1 line card or Integrated Service Data Line Card (ISDLC) line card in the switch.

The following features are supported by the HSDM.

RS-232C/V.35 interface

Up to 64 Kbps in Synchronous mode

Hot Line

Auto/Speed Call

Ring Again

Remote Loop Back

Echo (automatically with KBD)

Originate/Answer Data Calls

Outbound Modem Pool Call

Forced DTR

Virtual Leased Line

Self Diagnostics

Automatic Set Relocation

Public Switched Data Service (PSDS)

Echo Canceller Disabler Tone

Related documents

For complete descriptions of te Meridian data features, refer to these documents.

QPC723 RS-232 interface line card (553-2731-106)

QPC918 High Speed Data Card (553-2731-108)

Meridian data features traffic engineering and configuration (553-2731-151)

COAX Elimination Installation (553-2731-201)

Enhanced Asynchronous Interface Line Unit description and installation (553-2731-203)

Meridian data features operation and tests (553-2731-300)

NT7D16 Data Access Card description and operation (553-3001-191)

X11 input/output guide 553-3001-400

Note: For the purposes of this document, Meridian 1 refers to Meridian SL-1 ST, NT, RT, and XT machines as well as Meridian 1 system options 21, 51, 61, and 71.

Description

The HSDM is packaged in a Meridian Grey color plastic housing that is 12.5 in. (317.5 mm) long and 7.5 in. (190 mm) wide. The module has a 4” slope with a front height of 1.75 in .(44.5 mm) and a rear height of 2.75 in. (70 mm).

Controls and indicators

The HSDM is equipped with a synchronous speed switch, two eight-mode switches, a keypad dial, data status lamps and eight feature keys.

The data control switches are in a recessed area covered with a flip-up lid. User instructions are provided on the underside of the lid. These controls allow the user to choose a data mode and a data speed.

The 12-button dial pad plus feature keys and data status lamps are located in front of the flip-lid.

Keypad dialing

Keypad dialing allows the user to initiate asynchronous or synchronous data calls on the module to in-house or remote hosts (Figure 1).

Keypad dialing capability is provided by a standard 12-button dial pad that has the digits 0 through 9 plus the * and the #.

Keypad dialing operation

Procedure 1 details the keypad dialing operations of the HSDM.

Keyboard dialing

Keyboard dialing allows the user to initiate data calls to in-house or remote hosts using the terminal keyboard of a DTE without the use of the keypad.

Keyboard dialing capability is only provided for asynchronous terminals connected to the HSDM.

Keyboard dialing is supported for ASCII, asynchronous, character mode, interactive terminals equipped with EIA RS-232C interface. It is not provided for synchronous or block mode terminals.

Keyboard dialing operation

Procedure 2 details the keyboard dialing operations of the HSDM.

Mode switches

The HSDM has two recessed 8-position DIP mode switches (Figures 2 and 3) which are:

SW1		SW2	
s 1:	Hotline	s 1:	SL-1 or DMS/SL-100
s 2:	Forced DTR	s 2:	Terminal/Host
s 3:	HDX/FDX	s 3:	PSDS
s 4:	Async/Sync	s 4:	Echo Canceller Disabler
s 5:	Ext/Int Clock	s 5:	Reserved
S 6:	Modem/Network	S 6:	Reserved
s 7:	Manual/Auto Answer	s 7:	Reserved
s 8:	Loopback	S 8:	Reserved

An Echo mode is not provided as an option (but characters will be echoed during keyboard dialing). To disable echo cancellers in the public digital network, the SW-4 dip switch must be set to ON.

Virtual Leased Line

The Virtual Leased Line (VLL) mode is controlled by operating the switch to the Hotline and Forced DTR position. In the Virtual Leased Line mode, the HSDM waits for 1.5 seconds after the call is disconnected and begins to hotline continuously until the call is re-established. If a call is not connected within 40 seconds, the call is aborted and the sequence starts over again. It can be stopped by setting either the Hotline or FDTR switch to the Off position.

SW1 definitions

Hotline allows the user to always access a particular data station. An auto-dial is initiated whenever the "Data Terminal Ready (DTR)" lead goes from off to on.

Forced DTR allows the HSDM to originate or answer a call in the absence of a true hardware DTR.

HDX/FDX is provided for the half or full duplex data transmission.

Async/Sync is provided for the asynchronous or synchronous data transmission.

Ext/Int Clock External clock is used when the device connected to the HSDM controls the transmit clock signal. Internal clock is used when the system controls the transmit clock signal. The receive clock is always controlled by the HSDM.

Modem/Network Modem is used for all connections except for connections to a digital network; Network is used when the transmit and receive clocks are jointly synchronous such as from a digital service unit (DSU).

Manual/Auto Answer is provided for the user to answer an incoming call manually or automatically; manual answer an incoming call is performed by either entering a Carriage Return (in asynchronous mode only) or pressing the DDN key.

Loopback will permit the local calling HSDM to force the far-end data module into a Remote Loopback test mode. This switch is provided for diagnostic purposes and used by maintenance personnel.

SW2 definitions

SL-1 or DMS/SL-100 Half duplex synchronous is provided to the user from the HSDM when the DMS/SL-100 switch is set. At 56 or 64 Kbps, only full duplex is available. In the "SL-1" setting, the HSDM interprets the protocol from the network as used by all other data modules. When expecting a call from DMS/SL-100 in the synchronous half duplex mode, the switch should be turned to DMS/SL-100 position.

Terminal/Host In the asynchronous mode, the "host" setting suppresses all the prompts to the DTE. Blind dialing is still allowed.

Public Switched Data Service (PSDS) To activate the X11 release 16 feature Switched 56 Kpbs service, or Switched 64 Kbps, set this switch to ON before pressing the DDN key. In this mode, the HSDM accepts or originates only calls at synchronous speed of 56Kbps, or 64 Kbps.

Echo Canceller Disabler This feature can be engaged only if the HSDM is in Public Switched Data Service (PSDS) mode (SW2-3 is ON). To implement this feature the dip switch must be set to ON before the DDN key is pressed.

Positions 5 to 8 are reserved for future use and should be set to the OFF position.

Synchronous speeds switch

This switch sets the synchronous speeds and assists in determining the asynchronous autobaud rate. See specifications for more details on speeds available.

Functional switch

The following function switches are used to originate, answer and release data calls.

- Speed Call
- Auto Dial
- Modem Call
- Ring Again
- Data Directory Number (DDN)
- Set Relocation
- Release

Functional switch definitions

Speed Call allows the station user to place calls to a directory number by dialing a 1-, 2- or 3-digit code. The DN may be for stations, CO trunks or DID numbers (Direct Inward Dialing). Speed call lists of 10, 100 or 1000 entries are assigned to a speed call controller who may use or change any entry in the list at any time. Any number of users may be assigned to any list. Combined voice and data entries with the same Speed Call list are not recommended.

Auto **Dial** allows the user to program the module with a frequently used number, so that it can be automatically dialed.

Modem Call allows non dedicated, dial-up access through a data line card to voice-grade modems required for outgoing data calls to remote facilities over analog trunks.

Ring Again allows queuing of calls made to busy Directory Number (DN) within the customer group, alerts the user when the busy DN becomes free, and provides automatic callback to the DN.

Data Directory Number allows user to answer an incoming call manually or to initiate a data call using the keypad dialing.

Release allows the user to initiate disconnect procedures.

Automatic Set Relocation

The Set Relocation key in conjunction with the * and # keys provide for the HSDM automatic relocation feature. This feature allows HSDM user to move sets to another location without the intervention of a craftsperson. Directory numbers and features assigned to the set are maintained.

Data Status Lamps

The definitions of the Data Status Lamps are as follows:

Indicator	Description
CONNECT	The CONNECT LED lights when a call is connected from the switch through the HSDM to the attached device.
DTR	The DTR LED lights to indicate that DTR is on from the attached device or is forced on by the forced DTR setting.
RD	The RD LED lights when data is received by the external DTE.
SD	The SD LED lights when data is transmitted by the external DTE.
V.35	The V.35 LED lights when the HSDM is internally configured for the V.35 interface.

Figure 1
Keypad **layout**

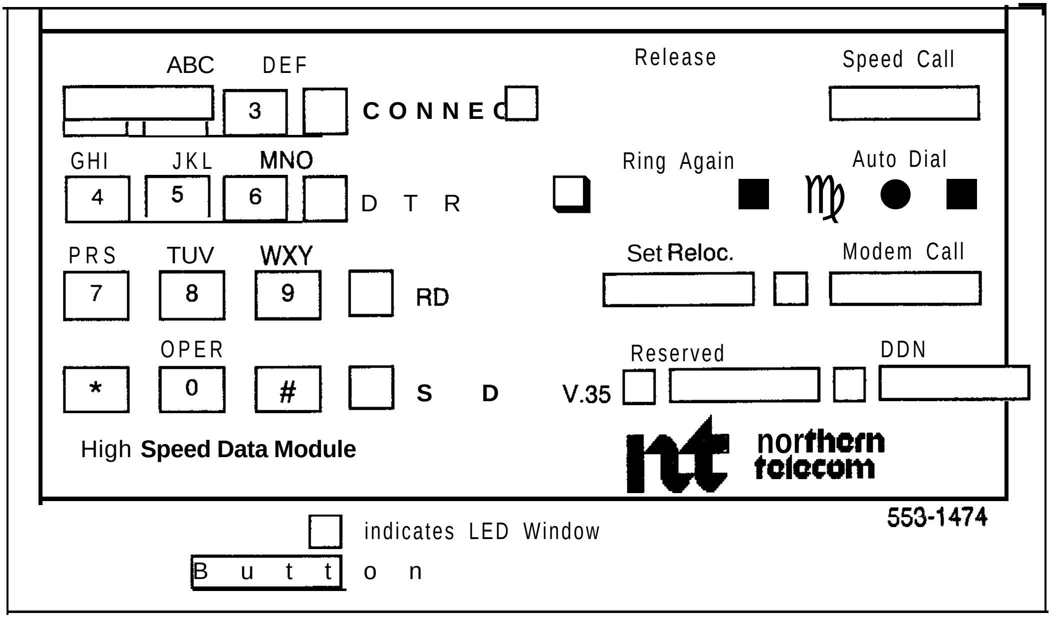


Figure 2
Switch plate layout

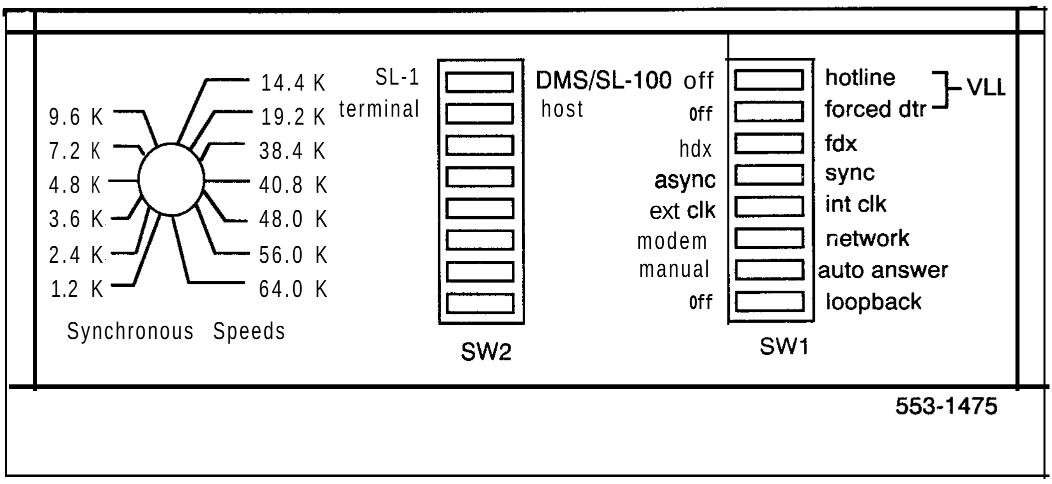
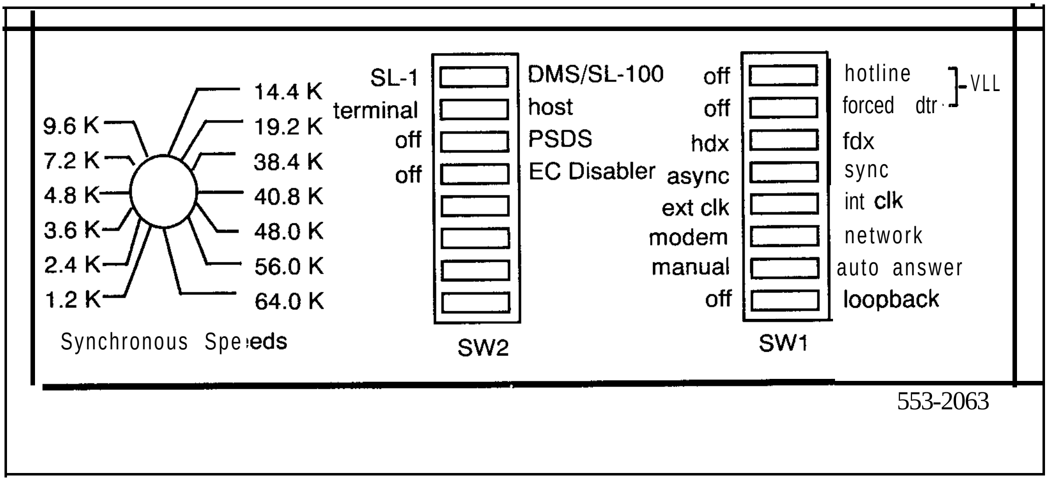


Figure 3
QMT21 C switch plate layout



Keypad dialing from an HSDM data station

Keypad dialing is applicable to asynchronous or synchronous data terminal equipment equipped with EIA RS-232-C or V.35 interface.

The HSDM and Keypad dialing provides the following capabilities:

- Call origination to local and remote hosts
- Manual or Auto Answer
- Ring Again capability
- Auto Dial data calling to local hosts
- Speed calling
- Automatic set relocation
- Asynchronous Data baud rate of 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 bps
- Synchronous Data baud rate of 1200, 2400, 3600, 4800, 7200, 9600, 19200, 38400, 40800, 56000 and 64000 bps
- 2 stop-bits for 110 baud and 1 bit for all other baud rates

Miscellaneous information:

Ensure data terminal is on-line and that both terminal and HSDM are turned on.

The call is dialed from the standard dial pad on the HSDM. The * and # are accepted as is and treated as touch pad items.

For set relocation, the off-hook and on-hook are simulated as follows

- Off-hook Press set relocation key and then * key.
- On-hook Press set relocation key and then # key.

Use the RELEASE key if it is necessary to abandon a call during call setup.

Procedure 1
Keypad dialing

Step	Action	Prompt/Indicator	Comment
	Start Condition		Data station idle. Terminal and HSDM power on.
1	Data Auto Dial Active?		If yes, go to Step 18. If not, go to Step 3 (Note 8).
2	Speed Call Active?		If yes, go to Step 20. If not, go to Step 3 (Note 8).
3	Operate DDN key.	DDN lamp on.	
Call to local host or smart modem pool calling			
4	Enter number.		All numeric input, # and * are accepted. HSDM sends digits to the switch which places call to host.
5	Called host answer (if busy see Steps 13 or 16).	CALL CONNECTED SESSION STARTS CONNECT lamp on	Data modules perform handshake and data channel becomes transparent (Note 2).
6	Follow log in procedures.		Data session begins.
7	Proceed with data session.		Host echoes all typed input. Go to Step 23 for disconnect procedures.
Call to remote host			**Multiple hosts**
a	Enter Modem Number xxxx.	DDN and MODEM CALL lamps winks.	Wait until modem is reserved.
9	Enter remote number digits.		
10	Press MODEM CALL key.	MODEM CALL lamp on; DDN lamp winks.	The switch places a call to the remote number.
11	Remote host answers.	CALL CONNECTED SESSION STARTS DDN, CONNECT and MODEM CALL lamps on.	The call is connected. (If busy, go to Steps 14 or 17.)
12	Follow log in procedures.		Data session begins.

Procedure 1
Keypad dialing (continued)

Step	Action	Prompt/Indicator	Comment
13	Proceed with data session.		Host echoes all typed input. Go to Step 23 for disconnect procedures.
Host Busy — Ring Again active ?			**(See Notes 1 and 2)**
14	Called Host Busy.	RING AGAIN PLACED RELEASED RING AGAIN lamp on; DDN lamp off.	The HSDM uses Ring Again to retry the call (Note 7).
15	Called port becomes free.	A STATION NOW AVAILABLE ENTER (CR) RING AGAIN lamp winks	HSDM sends BELL characters from terminal.
16	Operate DDN and RING AGAIN keys in sequence.	CALL CONNECTED SESSION STARTS DDN and CONNECT lamp on; RING AGAIN lamp off.	Go to Steps 6 or 11.
Host Busy — No Ring Again			
17	Call Host Busy.	DDN lamp flashes.	Release DDN key.
Data Autodial active?			**Local Host only (Note 1)**
18	Operate DDN key.		DDN lamp on.
19	Operate AUTO DIAL key.		The switch places the call to the predesignated number. Return to Step 5.
Speed Calling active?			All speed call numbers must be programmed in database against the user DDN.
20	Operate DDN key. DDN lamp on.		
21	Operate SPEED CALL key.	SPEED CALL lamp on.	
22	Enter 1-, 2- or 3-digit code for the number to be stored.	SPEED CALL lamp off.	The switch places the call to the predesignated number. Return to Step 5.

Procedure 1
Keypad dialing (continued)

Step	Action	Prompt/Indicator	Comment
Call disconnect procedures			
23	Enter a disconnect command to terminate session, and to initiate call disconnect by the host terminal. OR Operate the HSDM RELEASE key. **OR** Operate break key for 1.6 s (asynch only). For terminals with overlapping timed breaks, operate the break key several times. OR At the terminal, turn LINE/LOCAL to LOCAL, or turn POWER switch to POWER OFF OR Power down HSDM for about 1.6 s.		This causes host to drop DTR and release the connection (Note 9). This method does not work on terminals with nonoverlapping timed breaks.
24	Call Disconnect.	CALL RELEASED. DDN lamp off	The prompt only appears if HSDM is on (Note 10).

Procedure 1
Keypad dialing (continued)

Step	Action	Prompt/Indicator	Comment
Program or modify Autodial			
25	Press AUTO DIAL key. (Do not press DDN key.)	AUTO DIAL lamp flashes.	
26	Enter new number.		
27	Press AUTO DIAL key.	AUTO DIAL lamp off.	Auto dial number is changed.
Program or modify Speed Call			
28	Press SPEED CALL key. (Do not operate DDN key.)	SPEED CALL lamp flashes.	If lamp does not flash, this station is not a Speed Call Controller and cannot store numbers.
29	Dial 1- to 3-digit access code.		
30	Dial Speed Call number.		Include * and # where necessary.
31	Press SPEED CALL key.	SPEED CALL lamp off.	Speed Call List is now updated with entry.
32	Repeat Steps 28-31 to program more numbers.	Use a different access code for each different number.	

Procedure 1
Keypad dialing (continued)

Step	Action	Prompt/Indicator	Comment
Automatic Set Relocation			
33	Press DDN key.	DDN lamp on.	
34	Dial the Special Prefix code plus the set relocation access code 81.		
35	Dial Security code (if required).		
38	Dial 4-digit identification code.		After a few seconds, the DDN lamp goes dark.
37	Unplug HSDM and plug it in at a location equipped with a TN of the same type.		
38	Press Set Reloc. key and * keys.		This provides an off-hook indication.
39	Dial 4-digit identification code.		This must be the same 4-digit code as in Step 36. A 2-second tone is heard, after a slight pause, to indicate that the set has been successfully relocated.
40	Press Set Reloc key and # keys.		This provides an on-hook indication.

Note 1: The Auto Dial and Speed Call numbers can be modified from the DTE keypad or with a service change to the database (Steps 25 through 32).

Note 2: No call progress tones are provided during call setup.

Note 3: If the user wants to abandon the call during the setup stage, operate the RELEASE key.

Note 4: During call setup, there is a maximum of characters. If this limit is exceeded, the HSDM only uses the number it requires.

Note 5: If a remote terminal is calling via the incoming modem pool to multiple hosts the ADM serving the modems must be setup in the nonautodial (nonhotline) mode and the caller must input the DN of the called host (Step 12). If the remote terminal is calling a single host, the ADM serving the modem must be setup in the auto dial (hot-line) mode with the DN programmed to the DN of the called host (skip Step 12).

Note 6: Auto or Manual Answer: The terminal and the HSDM must be powered up with the terminal ON-LINE. An incoming call is answered automatically or manually by selecting either AUTO or MANUAL mode. When AUTO is selected, an incoming call is answered automatically after a single Bell Character sounds.

Note 7: When Ring Again has been placed, no further action should be taken unless the user wants to cancel Ring Again.

Note 8: If Speed Call or Auto Dial features are denied to the DN, attempts to use them performs no function.

Note 9: For disconnection by a local host, the device (ADM, MCDS) connected to the host must be configured to monitor the data terminal ready (DTR) signal from the host. For disconnection by a remote host, the modem connected to the host must be configured to monitor the DTR signal from the host.

Note 10: When the HSDM is connected to a VT100 terminal, a break on the terminal drops DTR and sends a long break. HSDM does not display released message. The prompt can be displayed by forcing DTR on HSDM. When the HSDM is connected to a VT102 terminal, a break on the terminal drops DTR. HSDM does not display released message unless the call is released from the keypad. When HSDM is associated with a printer, configure the printer for mark and space parity.

Note ZZ: The call is dropped immediately if SADM calls HSDM, MCDS or AIM and the baud rate plus parity do not match. The SADM releases the call (after one to two minutes for low baud rates, e.g. 300 bps).

Note 12: When a call is connected between two modules, power failure or removal of power from one data modules does not release the connection until the power is restored to the data module.

Note 13: When a modem is reserved (during a call to a remote host) and the remote number is misdialed, operate the release key twice; once to release the remote modem (DDN lamp flashes) and then the DDN and release keys to release the reserved modem and the call. This condition applies particularly to synchronous half-duplex operation mode.

Keyboard dialing from the HSDM data station

Keyboard dialing is only applicable to ASCII, asynchronous start stop character mode, interactive terminals equipped with EIA RS-232-C interface. It is not available for synchronous or block mode terminals.

The HSDM and KBD provides the following capabilities:

- Call origination to local and remote hosts
- Ring Again capability
- Auto Dial data calling to local hosts
- Speed call calling
- Auto Answer (Note 6)
- Manual answering of information calls (Note 10)
- Asynchronous mode Autobauding. (On initial power up, a default speed, as selected by the SYNC speed switch setting, of 1200, 2400, 4800, 9600 or 19200 bps is used. If the switch is not set to any of the five speed settings, HSDM defaults to 9600 bps. After once autobauded, HSDM remembers the current speed and if not again autobauded, continues to use the speed.)
- Asynchronous Mode Autoparity. The HSDM detects the speed on the carriage return (CR) character. If the parity of the terminal matches the default (8 bit, no parity), HSDM echoes a legible prompt on the screen. If parity does not match, an illegible prompt appears on the screen. When this happens, the user should enter a period (.) and a (CR) to force the HSDM to detect the parity and to echo a legible prompt on the screen.
- HSDM returns to the default mode when:
  - Terminal powered off and on.
  - After Control Z, break, release, DTR off and call disconnections.
- Asynchronous Data baud rate of 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 bps
- Synchronous Data baud rate of 1200, 2400, 3600, 4800, 7200, 9600, 19200, 38400, 48000, 56000 and 64000 bps
- 2 stop-bits for 110 baud and 1 bit for all other baud rates

- Menu information: HSDM with Keyboard dialing is easy to use because the user friendly prompts guide you through the operating steps. Two MENUS provide a choice of call or function operation.

The help MENU as shown below appears on the screen when the first Carriage Return is entered:

ENTER NUMBER OR H (FOR HELP):

The main MENU as shown below appears on the screen when "H" is selected from the help MENU:

A – AUTO DIAL	D – DISPLAY
(CR) – AUTO DIAL	S – SPEED CALL
C – CALL	M – MODIFY

The modify MENU as shown below appears on the screen when "M" is selected from the main MENU:

A – AUTO DIAL NUMBER	D – DISPLAY
S – SPEED NUMBER	Q – QUIT MODIFY

SELECT:

Each MENU item for call setup and display or modify functions are shown separately in this chart.

Miscellaneous information

Ensure data terminal is on-line and that both terminal and HSDM are powered on.

User inputs may be in either lower or upper case and must be terminated by carriage return (CR), enter or equivalent command.

The call may be dialed by using the numeric combinations of the keyboard. The * and # are accepted as is and treated as touch pad items. Illegal characters (i.e., spaces) result in an error message Invalid Number.

All inputs are echoed on the terminal screen.

The input may be edited with backspace (BS), delete line (DEL) keys or their equivalents.

All prompts during call set-up are in upper case and are preceded by a line feed. Those that need input are followed by a colon and space while others are followed by semicolon or (CR) and line feed.

Use CONTROL Z if it is necessary to abandon an asynchronous call during call setup.

If the call cannot be completed and the station is not busy, SERVICE UNAVAILABLE CALL RELEASED is the only prompt provided.

If the prompt REENTER is received at any time, return to the Menu.

When the Digit Display feature is assigned to the DN, the digits NNNN are displayed as the system sends them.

Procedure 2
Keyboard dialing

Step	Action	Terminal Echo	Prompt/indicator	Comment
	Start Condition			Data station idle. Terminal and HSDM power on.
1	Enter (CR)		ENTER NUMBER OR H (FOR HELP) :	Go to Step 6 or 10 if the number is to be entered instead of H. If you are familiar with the menu, you may use a command (C, (CR), A, S, etc.) instead of H. Go to Steps 3, 4, or 5 if MENU command is entered instead of H.

This first (CR) also causes the HSDM to autobaud to the SYNC speed switch setting or to the default of 9600 bps or to the previous rate.

Step	Action	Terminal Echo	Prompt/indicator	Comment
2	Enter H (CR)		A - AUTO DIAL D - DISPLAY (CR) -AUTO DIAL S - SPEED CALL C CALL M - MODIFY SELECT:	
3	Data Auto Dial Active?			If Yes, go to Step 22. If not continue (Note 8).
4	Speed Call Active?			If yes, go to Step 23. If not continue (Note 8).
5	Enter C (CR)	C	ENTER NUMBER:	

Call to local host or smart modem pooling **Go to Step 10 for call to remote host.**

Step	Action	Terminal Echo	Prompt/indicator	Comment
6	Enter number XXXX XXXX (CR).		CALLING NNNN DDN lamp on.	All numeric input, # and * are accepted. During call setup all legal user input appears on terminal screen (Note 4). HSDM sends digits to the switch which places call to host. The switch sends digits NNNN back to the HSDM.

Procedure 2
Keyboard dialing (continued)

Step	Action	Terminal Echo	Prompt/Indicator	Comment
7	Called host answer (if busy, see Step 16 or 21).		CALL CONNECTED SESSION STARTS CONNECT lamp on; RING AGAIN lamp off.	Data modules perform handshake and data channel becomes transparent (Note 2).
8	Follow login procedures.			Data session begins.
9	Proceed with data session.			Host echoes all typed input. Go to Step 35 for disconnect procedures.
Call to remote host using manual modem pooling				**Multiple Hosts**
10	Enter Modem Number xxxx (CR).	All digits typed	Calling NNNN DDN lamp on.	
11	ADM connected to modem answers.		MODEM RESERVED ENTER REMOTE NUMBER:	Modem is reserved (Note 5).
12	Enter remote number digits (CR).	All digits typed	CALLING NNNNNNN;	The switch places a call to the remote number.
13	Remote modem answers.		CALL CONNECTED SESSION STARTS CONNECT lamp on; RING AGAIN lamp off.	The call is connected. (If busy, go to Step 16 or 21.)
14	Follow login procedures			Data session begins.
15	Proceed with data session.			Host echos all typed input. Go to Step 35 for disconnect procedures.
Host Busy — Ring Again Active?				**(See Notes 1 and 2)**
16	Called Host Busy.	Number Digits	CALLING NNNN BUSY RING AGAIN (Y/N)? RING AGAIN lamp on.	

Procedure 2
Keyboard dialing (continued)

Step	Action	Terminal Echo	Prompt/Indicator	Comment
17	Enter Y (CR)	Y	RING AGAIN PLACED RELEASED RING AGAIN lamp off; DDN lamp off.	The HSDM uses Ring Again to retry the call (Note 7).
16	Enter (CR)			Necessary to autobaud HSDM.
19	Called port becomes free.		DATA STATION NOW AVAILABLE RING AGAIN (Y/N) RING AGAIN lamp winks.	If the DTE accepts bell characters, bell in DTE rings.
20	Enter Y (CR)		DDN lamp on.	The switch places call (go to Step 7 or 13).
Host Busy — No Ring Again				
21	Called Host Busy.		SERVICE UNAVAILABLE CALL RELEASED	
Data Autodial Active?				**Local Host only (Note 1)**
22	Enter A (CR) or (CR)		CALLING NNNN DDN lamp on.	HSDM sends DDN and Auto Dial indication. The switch places the call to the predesignated number. Return to Step 7.
Speed Calling Active?				All speed call numbers must be programmed in database against the user DDN.
23	Enter S (CR)	S	ENTER ACCESS CODE:	
24	Enter X (CR)	X	CALLING N>NNNNNNN DDN lamp on.	HSDM sends DDN and Speed Call Index. Return to Step 7 or 13.

Procedure 2
Keyboard dialing (continued)

Step	Action	Terminal Echo	Prompt/Indicator	Comment
Display Active?				To display terminal parameters of the user DDN.
25	Enter D (CR)	D	BAUD RATE (11 o-9600) = NNN REMOTE LOOPBACK (Y/N/(CR) = N AUTO DIAL NO = NNN A AUTO DIAL D — DISPLAY (CR) -AUTO DIAL S — SPEED CALL C CALL M — MODIFY SELECT:	The Baud rate must be manually reset at the DTE (See User Guide). Power down HSDM and DTE (or enter break or drop DTR). Change baud rate at DTE. Power up HSDM and DTE. Enter (CR) to auto baud.

It may be verified after resetting by autobauding again with (CR) and again using the D command. The other parameters are modified as shown in the following steps.

Step	Action	Terminal Echo	Prompt/Indicator	Comment
Modify Active?				Used to modify HSDM settings to match terminal parameters.
26	Enter M (CR)	M	A — AUTO DIAL NUMBER R — REMOTE LOOPBACK S-SPEED NUMBER Q-QUIT MODIFY SELECT:	
				If you enter: A go to Step 27 S go to Step 29 R go to Step 32 Q to to Step 34

Procedure 2
Keyboard dialing (continued)

Step	Action	Terminal Echo	Prompt/indicator	Comment
Modify Auto Dial				
27	Enter A (CR)	A	AUTO DIAL NO =	
28	Enter new number (CR)	New Number	A-AUTO DIAL NUMBER R - REMOTE LOOPBACK S-SPEED NUMBER CI - QUIT MODIFY SELECT:	Auto dial number is changed.
Modify Speed Call				**List Controller Only**
29	Enter S (CR)	S	ENTER ACCESS CODE:	
30	Enter X (CR)	X	SPEED NUMBER:	
31	Enter new number (CR)	New Number	A -AUTO DIAL NUMBER R - REMOTE LOOPBACK S-SPEED NUMBER Q - QUIT MODIFY SELECT:	New number is set.
Modify Remote Loopback				
32	Enter R (CR)	R	REMOTE LOOPBACK Y or N (CR):	
33	Enter Y or N (CR)	Y or N	A - AUTO DIAL NUMBER R - REMOTE LOOPBACK S-SPEED NUMBER Q - QUIT MODIFY SELECT:	Remote Loopback is Y or N.
Quit Modify				
34	Enter Q (CR)	Q	A - AUTO DIAL NUMBER R - REMOTE LOOPBACK S-SPEED NUMBER Q - QUIT MODIFY SELECT:	Try any other feature, or place a Data Call

Procedure 2
Keyboard dialing (continued)

Step	Action	Terminal Echo	Prompt/Indicator	Comment
Call Disconnect Procedure				
35	Enter a disconnect command to terminate session, and to initiate call disconnect by the host terminal. OR Operate the HSDM RELEASE key. OR At the terminal, turn LINE/LOCAL to LOCAL, or POWER switch to POWER OFF OR Power down HSDM for about 1.6 s. OR In asynch operation, press the break key for 1.6 s. (For terminals with overlapping timed breaks, it is press the break key several times.)			This causes host to drop DTR and release the connection (Note 9).
36	Call Disconnect.		CALL RELEASED	The prompt only appears if HSDM is on (Note 11).

Note 1: The Auto Dial and Speed Call numbers can be modified from the keyboard or with a service change to the database. Ring Again can be activated and originated from the terminal keyboard.

Note 2: No call progress tones are provided during call setup.

Note 3: If the user wants to abandon the call during the setup stage, use Control Z (simultaneously operate control and Z keys).

Note 4: During call setup, there is a maximum of characters in a line. If this limit is exceeded, the HSDM considers the line as invalid input and prompts the user to retype the last line.

Note 5: If a remote terminal is calling via the incoming modem pool to multiple hosts the ADM serving the modems must be setup in the nonautodial (nonhotline) mode and the caller must input the DN of the called host (Step 12). If the remote terminal is calling a single host, the ADM serving the modem must be setup in the auto dial (hot-line) mode with the DN programmed to the DN of the called host (skip Step 12).

Note 6: Auto Answer: The terminal and the HSDM must be powered up with the terminal ON-LINE. The HSDM Auto Answer switch must be set to ON. An incoming call is answered automatically if the HSDM is not in the process of establishing a call nor in the Modify Display feature mode. If the terminal is autobauded before the incoming asynchronous call is received (or has a default or previous speed set), mismatching of the baud rate between the incoming call and the local terminal causes the call to be released. If the calling party issues re-down-line-load, HSDM treats it as a new incoming call and gives the appropriate prompts, e.g., INCOMING CALL CONNECTED/UNDER TEST/INCOMPATIBLE INCOMING CALL RELEASED/etc.

(a) Terminal Not Autobauded:

Action	**Prompt**	**Comment**
Incoming Call	NNNN INCOMING CALL CONNECTED **OR** NNNN UNDER TEST	NNNN is calling DDN Call is setup even though baud rate does not match. With no match, illegible information is received.

(b) Terminal Autobauded:

Action	Prompt	Comment
Call comes in with matching baud rate	NNNN INCOMING CALL CONNECTED **OR** **NNN** UNDER TEST	NNNN is calling DDN Data Call established.
Call comes in mismatching baud rate	NNNN INCOMPATIBLE INCOMING CALL RELEASED	NNNN is calling DDN Data call not setup. Cannot transmit data.

Note 7: When Ring Again has been placed, no further action should be taken unless the user wants to cancel Ring Again.

Note 8: If Speed Call or Auto Dial features are denied to the DN, attempts to use them will result (after a pause) in the prompt SERVICE UNAVAILABLE, REENTER.

Note 9: For disconnection by a local host, the device (ADM, MCDS) connected to the host must be configured to monitor the data terminal ready (DTR) signal from the host. For disconnection by a remote host, the modem connected to the host must be configured to monitor the DTR signal from the host.

Note *10:* Manual Answer: The terminal and the HSDM must be powered up with the terminal ON-LINE. The HSDM Manual Answer switch must be set to ON. An incoming call is answered manually from the terminal keyboard by hitting carriage return.

(a) Terminal Autobauded:

Action	**Prompt**	**Comment**
Call comes in.	DDN lamp winks	
	INCOMING CALL ANSWER Y/N?	
Enter Y	NNNN INCOMING CALL CONNECTED	NNNN is calling DDN Matching baud rate
	OR	**OR**
	NNNN INCOMPATIBLE CALL RELEASED	NNNN is calling DDN Mismatching baud rate
	OR	**OR**
	NNNN UNDER TEST	NNNN is calling DDN

Note ZZ: When the HSDM is connected to a VT100 terminal, a break on the terminal drops DTR and sends a long break. HSDM does not display the released message. The prompt can be displayed by forcing DTR on HSDM. When the HSDM is connected to a VT102 terminal, a break on the terminal drops DTR. HSDM does not display released message unless the call is released from the keypad.

HSDM troubleshooting procedures

If the HSDM does not operate properly, perform the following checks:

- Ensure that Data Station is ready for data transmission with the proper speed and other parameter set on the terminal
  - Ensure that the HSDM power supply is plugged in. Operate the force DTR key on the HSDM and verify that the DTR lamp lights. Replace the HSDM if the lamp does not light.
  - The power supply is not a recommended field replaceable item and the whole HSDM, including the power supply, should be returned to NT for repair.
- Is data terminal power on and ON-LINE/OFF-LINE (LINE/LOCAL) switch (if equipped) set to ON-LINE (LINE)?

The call is connected but station is not sending or receiving data.

- Is MONITOR SEND lamp on DTE (if equipped) or the SD lamp on the HSDM flashing while sending data?
- If they do not flash:
  - Ensure RS-232 interface cable is properly connected to HSDM and DTE.
  - Ensure ON-LINE/OFF-LINE (LINE/LOCAL) switch is set to ON-LINE (LINE).

The call is connected but illegible characters appear on the screen.

- When calling another data service, ensure that the operating controls of both data devices connected to the switchdevice match.
- Ensure that the terminal is set so that it does not check parity or that it is set to 8 bits (no parity). If it is set for 7 bits, even or odd parity, enter a period (.) and (CR) to force HSDM to calculate parity and to provide legible prompts.

If problems occur during call setup, disconnect and attempt to place the call again. Place the call from a regular phone to ensure that the receiving station is working before calling for service.

If pseudo random pattern 5 11 data is sent in the idle mode, the keypad is made inoperative. Use the break or release keys to clear the condition.

Specifications

RS-232 interface

When HSDM is used as a RS-232 interface unit, the HSDM replaces an ASIM completely. The HSDM meets the DTE/DCE interface requirements of the EIA RS-232C standard. The electrical characteristics of the interface to the DLC or to a 4PDLC are the same as for the ASIM.

V.35 interface

The HSDM V.35 interface conforms electrically to the CCITT V.35 standard and mechanically to ISO-2110. When HSDM is used as a V.35 interface unit, an adapter cable is needed to convert the ISO 2110 (DB-25) into an ISO 2593 (34-pin rectangular connector).

The HSDM interface to the network through a DLC or 4PDCL.

Telephone interface

A standard 500/2500 telephone, SL-1 or a digital set may be connected to the phone jack on the rear of the HSDM telephone (Figure 4). This telephone then operates through the HSDM line cord to a standard 500/2500, SL-1, or ISDLC line card in the system.

The connection to the DLC or 4PDLC is made via a miniature 6-position jack mounted on the rear of the housing labeled “line”. Two wires are used for digital transmission and four wires may be used to connect to a telephone. The module is equipped with a 7 ft (3.1 m) 6-conductor cord that is terminated with miniature 6-position plugs on each end.

The connection to the power supply is made with a 5 conductors cord equipped with a connector that plugs into the main assembly of the HSDM. The power supply is an integral part of the HSDM and can not be separated.

Synchronous mode

In Synchronous mode, the HSDM transmits data at 1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 40800, 48000, 56000 or 64000 bits per seconds. These speeds are selected by the synchronous speed switch setting (see Figures 2 and 3).

Asynchronous mode

In Asynchronous mode, the HSDM transmits data at 110, 150, 300, 600, 1200, 2400, 4800, 9600, or 19200 bits per second. The HSDM selects a default of 1200, 2400, 4800, 9600, or 19200 bps as determined by the synchronous switch setting. If the switch is not set to any of these speeds, a default speed of 9600 bps is selected at the start up of the HSDM. After start up, speeds and parity are then determined by an autobauding and autoparity routine in the firmware.

Power supply

An external power supply is provided for each HSDM. The power supplies are assembled with the units and it is not recommended to order them separately.

An optional 220 V/50 Hz powered HSDM is available (A0318291) for the international market.

An optional 100 V/50 Hz powered HSDM (A0336890) is available for the Japan market.

EIA RS-232 leads

Table 1 shows the EIA leads supported by the HSDM.

CCITT V.35 leads

Table 2 shows the V.35 (CCITT) leads supported by the HSDM. An adapter cable is needed to convert the IS0 2110 (DB-25) into an IS0 2593 (34-pin cable).

The HSDM may be placed as far from its associated data terminal or computer port as is consistent with EIA RS-232 or V.35 lead specifications.

Power requirements

The HSDM is powered from an external power supply. The power requirements are as follows:

Voltage	Tolerance	Current	
		Nominal	Maximum
+5 V dc	±5%	1.0 amp	0.8 amp
+12 V dc	±10%	0.2 amp	85 mA
-12Vdc	±1 0%	0.2 amp	35 mA

A total of 1.0 ampere is required from the 110 V ac power receptacle.

Environmental

The HSDM is designed to operate without degradation under the following conditions:

Specification	Operating	Storage
Ambient Temperature	0 to 40 degrees C	–40 to 70 degrees C
Relative Humidity (non condensing)	5 to 85%	0 to 95%

Reliability

The HSDM has a predicted mean time between failure (MTBF) of 10 years at 40 degrees Celsius.

Table 1
EIA signals supported by HSDM

Circuit EIA	number CCITT	HSDM DB-25 Pin No.	Signal source DTE	HSDM	Abbrev.	Description
AA	101	1				Protective Ground *
BA	103	2	X		SD	Transmitted Data
BB	104	3		X	RD	Received Data
CA	105	4	X		RTS	Request to Send
CB	106	5		X	CTS	Clear to Send
CC	107	6		X	DSR	Data Set Ready
AB	102	7		X		Signal Ground
CF	109	8		X	CD	Carrier Detect
		9/10				no connection
SBA	118	11	X			Sec. Trans Data
SBB	119	12		X		Sec. Rec. Data
		13/14				no connection
DB	113	15		X	SCT	Received Data
		16				no connection
DD	128	17		X	SCR	Received Clock
		18/19				no connection
CD	108.2	20	X		DTR	Data Terminal Ready
		21				no connection
CE	125	22		X	RI	Ring Indicator
CH/CI	126	23	X			Data Rate Select
DA		24	X			External Transmit Clock
BO		25	X			Busy Out **

* Pin 1 is connected to the MCDS shelf frame.

** Pin 25 is connected to an RS-232 receiver on the HSDM, but is ignored by the HSDM controller

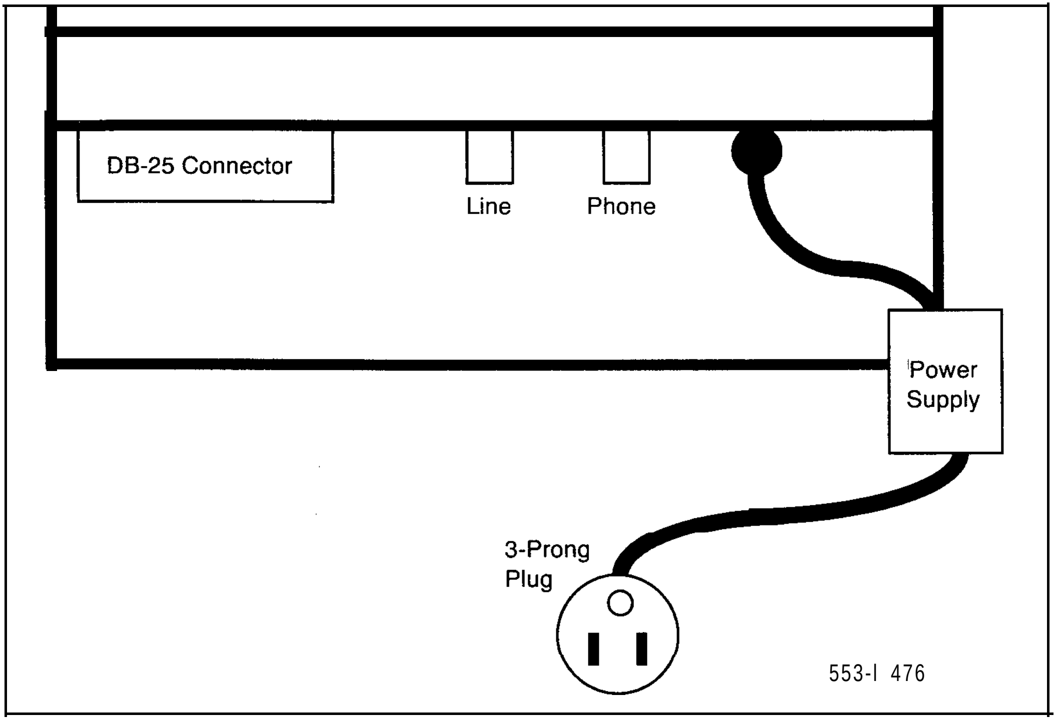
Table 2
V.35 CCITT **signals supported by HSDM**

v.35 CCITT	HSDM DB-25 Pin No.	Abbrev.	Adapter cable DB-25 Pin No.	v.35 Pin No.	Signal Source DTE	Signal Source HSDM	Description
101	1	DG	1	A			Protective Ground *
103A	2	SDA	2	P	X		Transmit Data A
104A	3	RDA	3	R		X	Receive Data A
105	4	RTS	4	C	X		Request to Send
106	5	CTS	5	D		X	Clear to Send
107	6	DSR	6	E		X	Data Set Ready
102	7	s	7	B			Signal Ground
109	8	CD	8	F		X	Carrier Detect
----	9/10	----	911 0	CC/L			no connection
----	11	----	11	K	X		**
1158	12	SCRB	12	X		X	Serial Clock Receive B
103B	13	SDB	13	S	X		Transmit Data B
114B	14	SCTB	14	AA		X	Serial Clock Transmit B
114A	15	SCTA	15	Y		X	Serial Clock Transmit A
104B	16	RDB	16	T		X	Receive Data B
115A	17	SCRA	17	V		X	Serial Clock Receive A
----	18/19	----	18119	M/HH			no connection
108.2	20	DTR	20	H	X		Data Terminal Ready
----	21	----	21	EE			no connection
125	22	RI	22	J		X	Ring Indicator
113B	23	SCTEB	23	W	X	X	Tran Sign Elemt Time B
113A	24	SCTEA	24	U	X	X	Tran Sign Elemt Time A
----	25	----	25	MM	X		**

* Pin 1 is connected to the MCDS shelf Frame.

** These leads are ignored by the HSDM controller.

Figure 4
High Speed Data Module Rear View



Installation

Hardware configuration

Procedure 3 provides the materials and the install/remove procedures of the HSDM. It details the connection between the HSDM and the DLC.

For V.35 interface configuration, a 10-pin DIP jumper plug inside the HSDM is required to be removed from the RS-232C socket and installed in the V.35 socket. These sockets are located on the QPC824, the main circuit board inside the HSDM. Figure 5 shows the locations of these two sockets.

The HSDM is shipped from the factory configured for the RS-232 interface. V.35 is to be configured only in the field at installation time.

Adapter cable

An adapter cable is also needed to convert from the ISO-2110 connector into an ISO-2593 (34-pin connector). Figures 6 and 7 show the details and the connection of the adapter cable. An extension cable could be added to the length of the adapter cable as shown in Figure 7.

- For DTE equipped with female ISO-2593, Adapter cable number A0300752 is required.

  For DTE equipped with male ISO-2593, Adapter cable number A0300753 is required.

Wire guage setting

A jumper inside the HSDM is provided to select 22/24 guage inside wire or 26 guage outside wire (see Figure 5 for the locations of the straps).

Designation	Setting
E10, E11	El 1 (inside 22/24 AWG) El0 (outside 24/26 AWG)

Cabling

The physical capacities and provisioning requirements of Data feature hardware must be met upon installation. Table 3 lists cabling and environmental requirement and limitations. All hardware is installed using basic installation tools.

Table 3
Cabling capabilities

Allowable cabling	Type D PVC inside wiring cable		
	PIC for outside use only		
Maximum separation distances			
HSDM to DTE	Distance consistent with EIA RS-232 cable loading specifications.		
	Note that in some cases the above limitations may be exceeded with no adverse effect on HSDM operation.		
Distance (by cable type)			
HSDM to DLC	PIC outside	PVC inside	Gauge
	4000 ft (1220 m)	4000 ft (1219 m)	22 AWG
	3500 ft (1070 m)	2900 ft (884 m)	24 AWG
	2000 ft (610 m)		26 AWG
	2500 ft (760 m)	2500 ft (760 m)	22/24 mixed
	1500 ft (460 m)	1200 ft (370 m)	24/26 mixed

DTE interface

The HSDM provides a 25-pin connector (that conforms to ISO-2110) that mounted in the rear on the housing.

Note I: If an RS-232C cable is used to connect the HSDM to an ADM3 terminal, pin 22 should be disconnected. If a full RS-232C cable without pin 22 disconnected is used, the ADM3 goes into the test mode.

Note 2: When the HSDM is connected to a VT100 terminal, a break on the terminal drops DTR and sends a long break. The HSDM does not display released message. The prompt can be displayed by forcing DTR on the HSDM.

Note 3: When the HSDM is connected to a VT102 terminal, a break on the terminal drops DTR. The HSDM does not display released message. The prompt is displayed if the call is released from the keypad.

Note 4: If pseudo-random pattern 511 data is sent in the idle mode, keypad dialing is made inoperative. Use the break or release keys to clear the condition.

Configuration

Hardware provisioning capacities follow:

QTY	Item	Comments
1	HSDM	Each HSDM is connected to a data port of a DLC or a 4PDLC.
2	HSDM terminating on each DLC	TN must be L-S-C-l and/or L-S-C-3 for QPC311 or Could be L-S-C-O, 1, 2, or 3 for QPC432.

Field-replaceable items

Field-replaceable items are listed in Table 4.

The related hardware is installed in different basic configurations with equipment allocated as follows:

1	QMT21 HSDM
1	DLC or 4PDLC port
1 (Note)	NE 25MQA2A (A0237451) RS-232 cable (HSDM – DTE)
1	**NPS50318-L1**, 6 conductor Teladapt cord (HSDM – DLC)

> ***Note:*** If the HSDM is specifically configured for V.35 interface, an adapter cable is needed (see Figure 6 and 7).

Plug to plug adapter cable **ICC12TP** (OS) PP-3, 5 ft (1.5 m), A0300752

Plug to socket adapter cable **ICC12TP** (05) PS-3, 5 **ft** (1.5 m), A0300753

Table 4
Field replaceable/orderable items

Items	CPC number
High Speed Data Module (HSDM) (110 V ac, 60 Hz) - QMT21A	A0342672
HSDM (220 V ac, 50 Hz) - QMT21A1	A0347343
HSDM (100 V ac, 50 Hz) - QMT21A2	A0347344
RS-232 Cord Assembly, 16 ft (4.8 m) HSDM to DTE (NE-25MQ2A)	A0237451
NE D4B4-87, 7 ft (2 m) — Telephone to HSDM	A0248297
NPS50318 — HSDM to wall jack, 7 ft (2 m)	A0301 005
Adapter cable to HSDM (Plug to plug) ICC12TP (05) PP-3, 5 ft (1.5 m)	A0300752
Adapter cable to HSDM (Plug to socket) ICC12TP (05) PS-3, 5 ft (1.5 m)	A0300753

Service change

The SL-1 recognizes the HSDM port as an SL-1 telephone set; the DLC and 4PDLC as a SL-1 line card. LD11 is used to enter the DATA hardware information into the office memory.

Installing and removing the HSDM

Installation and removal procedure are provided in detail in Procedure 3 and Procedure 4. The HSDM can be disconnected from the network by disabling the port in the database with LD32.

Installation and removal procedures

The following materials are required for this procedure:

QMT21 equipped with an external power supply.

DLC or one 4PDCL port

NE D4B4 cord to connect telephone to HSDM (optional)

NPS50318-L1 Line cord HSDM to wall jack (supplied with HSDM)

NE 25MQ2A cord HSDM to DTE (Note 2).

Note 1: Locate the HSDM close to the terminal.

Note 2: To connect the HSDM to an ADM3 terminal, use an RS232 cable without pin 22. If a full RS232 cable with pin 22 is used the ADM3 goes into the test mode.

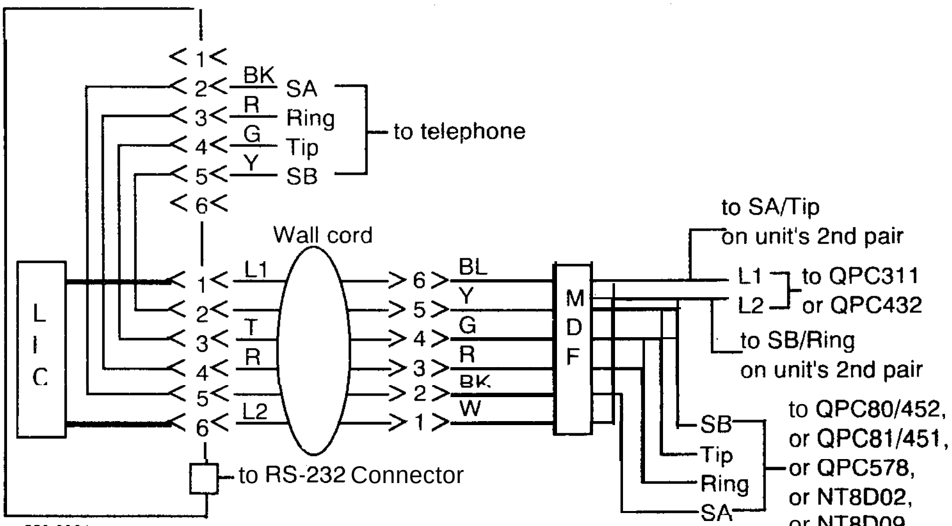
Note 3: QMT21 to QMT8 connections exhibit excessive errors at 19.2 kbps in the asynchronous mode. It is recommended that only QMT21 to QMT21 or QMT8 to QMT8 configurations be used when operating at 19.2 kbps.

Note 4: QMT21 to QMT7 connections exhibit excessive errors at 9.6 kbps in the asynchronous mode. It is recommended that QMT8 be used instead of QMT7 for this configuration.

Note 5: The QPC432 is wired out as an eight unit card. However, only the first four units are available.

Procedure 3
Installing the HSDM

Step	Procedure	Reference
1	Ensure that the HSDM is not powered up.	
2	Connect one end of the supplied 7 ft (2.1 m) 6-conductor cord to the miniature line 'jack' closest to the RS-232 connector on the rear of the HSDM. (The supplied cord is terminated at each end with a miniature six-position plug.)	
3	Connect the other end through house wiring or cabling to the DLC data port (see sketch and ensure that the wire continuity is maintained).	



553-2064

Note: For SA and SB connections, the QPC311 supports data connections on ports **1 and 3.** The QPC432 supports data connections on ports 0, 1, 2, and3.

Step	Procedure	Reference
4	Use an RS-232 NE-25MQ2A cable or a V.35 adaptor cable to connect the female connector on rear of HSDM to a supplied DTE.	
5	If a telephone set is to be associated with the HSDM, use a 4-conductor NE D4B4 cord to connect it to the miniature phone jack on the rear of the HSDM.	Figure 4

Procedure 3
Installing the HSDM (continued)

Step	Procedure	Reference
6	Verify that the external power supply is attached to the HSDM (via the 5-conductor power cord that exits from the rear of the HSDM).	Figure 4
7	Install DLC in PE shelf.	
8	Make the MDF cross-connections and ensure that the pin numbers are correctly connected. Connect the talking pair in the usual manner. ***Note:*** There should be no bridge taps, etc. on the line.	
9	Designate the cross-connections.	
10	Use LD11 to update system memory for the HSDM or the DLC. **Note:** Ensure the following restrictions are observed. WTD Warning Tone Denied Key0 DN Key 1 Secondary DN (Required only for modem pool dialing.) Key 2 * Call Transfer (optional) Key 3 ** Auto Dial Calling (optional) Key 4 Ring Again (optional) Key 6 Speed Call (optional) Key 7 *** Display (DSP) (optional) Key 9 RLS * Key 2 is required to provide access to a manual outbound modem pooling. ** Key 3 is required to operate autodial or hot line feature. *** DSP requires the class of service updated to DDS or ADD.	553-3001-400
11	Plug the power supply into a commercial 110 V **ac** outlet	
12	Test the HSDM	Procedure 1

Procedure 4
Removing the HSDM

Step	Procedure	Reference
1	Use overlay 32 to disable the port connected to the HSDM.	
2	Unplug and disconnect the power supply.	
3	Remove the connections from the HSDM to the: switch equipment telephone DTE	Procedure 3 Step 3
4	Remove the HSDM	
5	Pack and ship the equipment.	

Figure 5
V.35 and RS-232 socket location on the QPC824

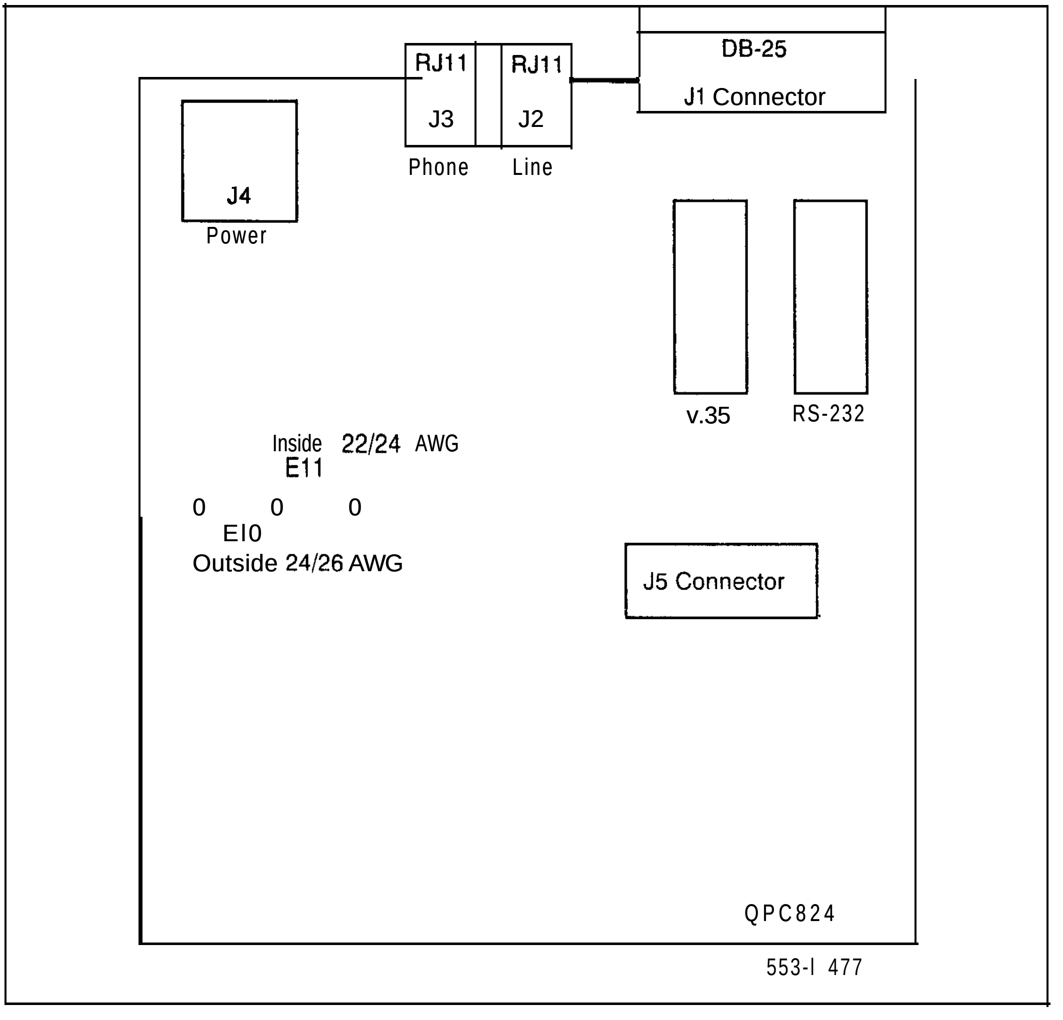


Figure 6
QMT21 with adapter cable for V.35

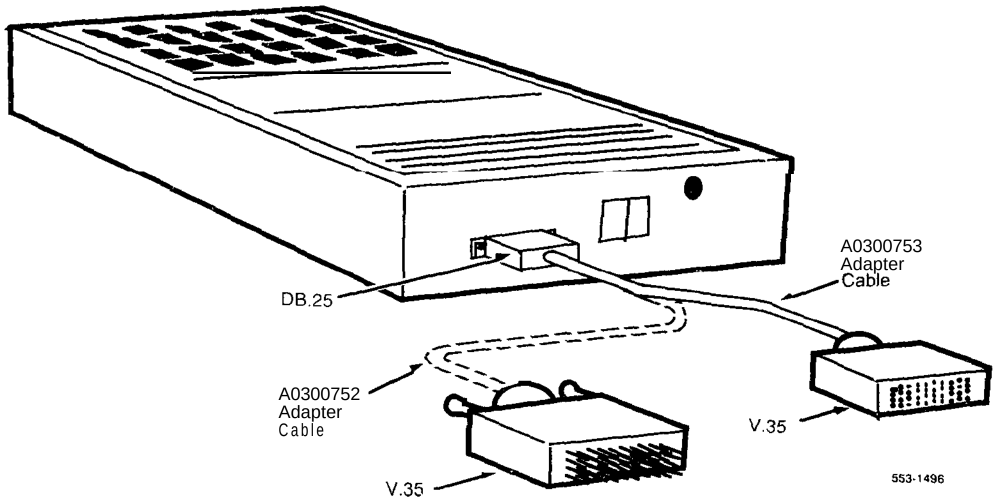
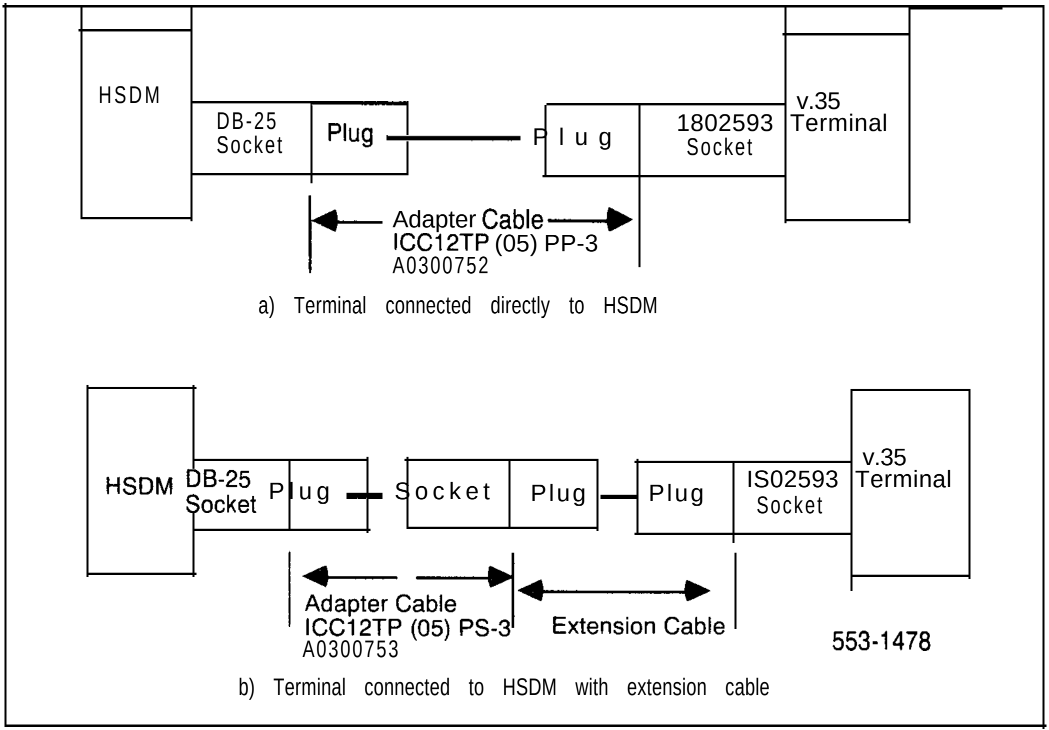


Figure 7
QMT21 with adapter cable connection for V.35



SL-1

QMT21 High Speed Data Module

Description, installation, and operation

Release 4.0
Standard
December 31, 1992
Printed in USA

northern telecom

SL-1

QPC918 High Speed Data Card

Description, installation, and operation

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Date: December 31, 1992

Revision history

August 10, 1990

Standard. release 1.0. Reissued for compliance with Northern Telecom standard 164.0.

December 31, 1992

Standard, release 2.0. This document is reissued to include technical content updates. Due to the extent of the changes, revision bars are not used.

Contents

General information

The QPC918 High Speed Data Card (HSDC) provides an RS-232C/V.35 interface between a compatible asynchronous or synchronous Data Terminal Equipment (DTE) and the Meridian SL-1 switching network. The HSDC provides connectivity to the DTEs for intra-switch communications, as well as for wide area communications over DTI or Primary Rate Interface (PRI) links to other Northern Telecom equipment.

The HSDC capabilities are similar to the High Speed Data Module (HSDM QMT21). Refer to *QMT21 High Speed Data Module* (553-2731-107) for further information. Each High Speed Data Card (HSDC) supports two data ports that operate independently of each other in synchronous and asynchronous mode of operation. Each port provides call originating and answering capabilities. In the answering mode, the HSDC adapts to the originating Meridian SL- 1 data module characteristics (speed and mode of transmission, for example). The High Speed Data Card (HSDC) is mounted in slots 1 through 8 of a standard Multi-Channel Data System (MCDS) shelf.

The HSDC, like the HSDM, interfaces with the data port of the 4 port Data Line Card (QPC432).

The HSDC can also connect to a QPC311 Data Line Card (DLC). However, the QPC311 is being replaced by the QPC432 4PDLC.

The 4PDLC can be installed in slots 1 through 10 in the following PE Modules or shelves: NT8D13 (PE Module), QSD64, QSD65, QSD80, QSP35, and QSP36.

Purpose

The High Speed Data Card (HSDC) provides an interface to high speed synchronous devices, such as front end processors, group IV facsimile equipment, or video conferencing ports. It also provides an interface to the Multi-Channel Data system (MCDS) and Meridian 1. In the synchronous mode, it supports data speeds up to 64000 bits per second.

The HSDC works with DTE only. The HSDC does not interface directly to modems (DCEs).

When the HSDC is used as an RS-232 interface unit, the HSDC can replace an ASIM (QMT1 1) or Asynchronous Interface Card (AIC QPC397). The HSDC meets the DTE/DCE interface requirements of the EIA RS-232C standard. The electrical characteristics of the interface to the Data Line Card (DLC QPC311) or to the 4-Port Data Line Card (4PDLC QPC432) are the same as for the ASIM and AIC.

> ***Note:*** The HSDC V.35 interface conforms to the CCITT V.35 electrical standard, and to the ISO-2110 mechanical standard. When HSDC is used as a V.35 interface unit, an adapter cable is needed to convert the ISO 2110 (DB-25) into an IS0 2593 (34-pin rectangular connector).

Features

The following features are supported by the HSDC:

RS-232C/V.35 interface

- Up to 64 Kbps in synchronous mode
- Hot Line
- Auto/Speed Dial
- Ring Again

Remote Loop Back

- Echo (automatically with Keyboard Dialing)
- Originate/Answer Data Calls
- Outbound Modem Pool Call
- Forced DTR

Virtual Leased Line

Keyboard dialing in asynchronous mode.

Self Diagnostics

Related documents

Refer to the following documents for complete information about the Meridian data features.

(553-2731- ***100)***

Meridian Data Services RS-232 Interface Line Card (553-273 1- 106)

QMT21 High Speed Data Module description, installation, and operation (553-2731-107)

Meridian Data Services traffic engineering and configuration (553-2731-151)

Meridian Data features operation and tests (553-2731-300)

High Speed Data Module User Guide (P0696749)

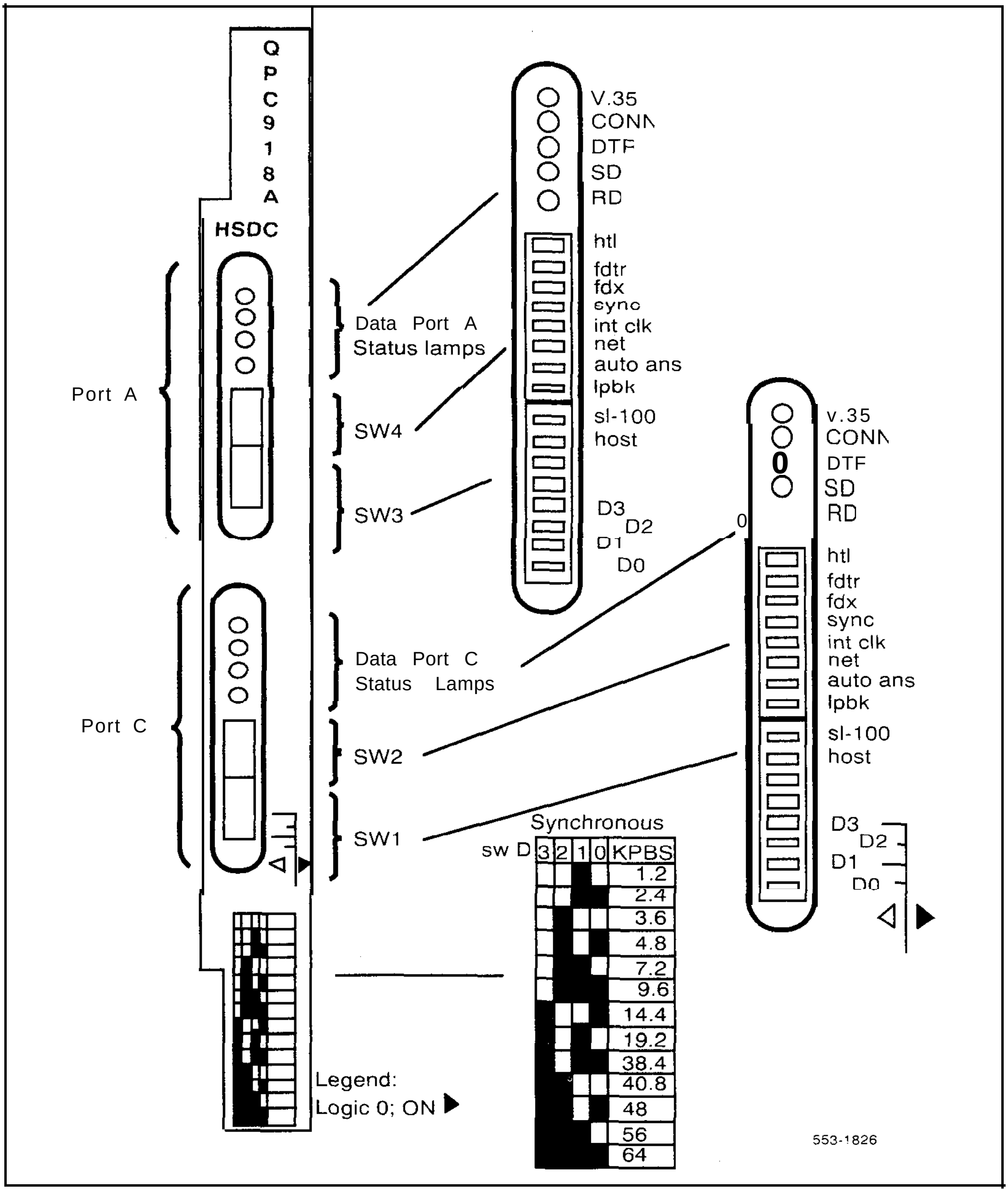
Functional description

Controls and indicators

This card supports full duplex (FDX) mode only in asynchronous transmission. In synchronous transmission, both full duplex (FDX) and half duplex (HDX) operational modes are supported.

In asynchronous or synchronous transmission mode, each port operates independently of the other. Each port adapts to the mode of operation of the originating (calling) Meridian 1 data module, with the exception of Asynchronous/Synchronous mode. Synchronous/Asynchronous modes are set up by SW2 for Port C, and SW4 for Port. A The following modes are controlled by the switches mounted on the QPC918 faceplate. The layout of the faceplate is shown in Figure I.

Figure 1
High Speed Data Card (HSDC) faceplate



Mode switches

The HSDC has four recessed g-position DIP mode switches. The functions controlled by these switches follow:

SW2 (Port C), SW4 (Port A		SW1 (Port C), SW3 (Port A)	
S 1:	OFF/Hotline (htl)	S 1:	SL-1/DMS\SL-100
S 2:	OFF/Forced DTR (fdtr)	S 2:	Terminal/Host
S 3:	HDX/FDX	S 3:	Reserved 1
S 4:	Asynch/Sync	S 4:	Reserved 2
S 5:	Ext/Int Clock	S 5:	D3-Speed Selection
S 6:	Modem/Network	S 6:	D2-Speed Selection
S 7:	Manual/Auto Answer	S 7:	D1-Speed Selection
S 8:	OFF/Loopback (lpbk)	S 8:	D0-Speed Selection

Only the options on the right side are labeled on the faceplate (eg. htl, fdtr, FDX, and so on)

An Echo mode is not provided as an option, but characters will be echoed during keyboard dialing.

Virtual Leased Line

The Virtual Leased Line (VLL) mode is controlled by setting SW2 or SW4 to the **htl** and **fdtr** position. In the Virtual Leased Line mode, the HSDC waits 1.5 seconds after the call is disconnected, and then begins to hotline continuously. The HSDC waits 40 seconds for the call to connect before aborting the call, and starting over. Stop the VLL by setting either the **htl** or **fdtr** switch to OFF position.

SW2, SW4 definitions

S 1 OFF/Hotline (htl) is provided for the user who wishes to always access a particular data station. An autodial is initiated whenever the DTR lead goes from OFF to ON.

S 2 – OFF/Forced DTR (fdtr) forces the DTR lead to be high. This mode allows the HSDM to originate or answer a data call in the absence of a true hardware DTR.

S 3 – HDX/FDX is provided for half or full duplex data transmission.

S 4 Asynch/Synch switch is provided for asynchronous or synchronous data transmission.

S 5 Ext/Int Clock. External clock is used when the device connected to the HSDC controls the transmit clock. Internal clock is used when the HSDC controls the transmit clock. The receive clock is always controlled by the HSDC.

S 6 – Modem/Network switch. In the synchronous mode, Modem setup is used for all connections except for connection to a digital network, such as through a Digital Service Unit (DSU) when the HSDC port clock (Txc and Rxc) are synchronized to the DSU's clock (Txc and Rxc).

S 7 – Manual/Auto Answer is provided for the user to answer an incoming call manually or automatically. Manual answer of an incoming call is by entering carriage return (CR). In the asynchronous mode, the card provides both manual and auto answer capability. In the synchronous mode, only auto answer is provided. A **manual setting will result in the call not being answered.**

S 8 – OFF/Loopback permits the local calling HSDC to force the far-end data module into a Remote Loopback test mode. The switch is provided for the diagnostic use by maintenance personnel. Refer to *Troubleshooting* in this manual for diagnostic and maintenance procedures.

SW 1, SW3 definitions

S 1 – SL-1 or DMS\SL-100 Because of the protocol difference between the HSDC and the DMS/SL100 Data Unit (DU), when the DU calls the HSDC in the synchronous mode, the HSDC always goes into a full-duplex mode. If half-duplex mode is desired, the HSDC should have the **SL-1/DMS\SL-100** switch set to DMS \ SL-100. Setting the switch to **DMS\SL-**100 still allows the HSDC to answer the call automatically, but in the half-duplex mode.

S 2 – Terminal/Host. In the asynchronous mode, when the switch is set to **terminal** prompts are provided for keyboard dialing. When the switch is set to host, prompts are not sent to the DTE.

S3 and S4 Reserved for future use and should be set to the OFF position.
S5 to S8 – Reserved for synchronous speed selection.

Data Port Status lamps

The definitions of the Data Port Status lamps following table.

Table **1**
Data Port status lamps

Indicator	Description
V.35	The V.35 LED lights when the HSDC is internally configured for the V.35 interface.
CONN	The CONNECT lamp is lit when a data call is connected between the HSDC port and data module at the far end.
DTR	The DTR LED is lit to indicate that DTR is ON from the attached device or is forced ON by the "forced DTR" setting.
RD	The RD LED is lit when data is received by the DTE.
SD	The SD LED is lit when data is transmitted by the DTE.

Keyboard dialing

Keyboard dialing (KBD) allows the user to initiate and /or terminate data calls to in-house or remote hosts using the terminal keyboard of a DTE.

Keyboard dialing capability is supported for ASCII, asynchronous, character mode, interactive terminals equipped with EIA, RS-232C, or CCITTV.3.5 interface. It is not provided for synchronous, or block mode terminals.

The HSDC and KBD provide the following features and capabilities:

- Call origination to local and remote hosts
- Ring Again capability
- Auto Dial data calling
- Speed Call data calling
- Auto Answer
- Manual Answer
- Asynchronous Data transmission rate of 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 bps
- Asynchronous Mode Autobaud and Autoparity features. On initial power up, a default speed, selected by the SYNC speed switch setting, of 1200, 2400, 4800, 9600, or 19200 bps, is used. If the switch is not set to any of the five speed settings, the HSDC defaults to 9600 bps.
- The HSDC detects the speed on receipt of carriage return (CR) character. If the parity of the terminal matches the HSDC default setting (8 bits, no parity), HSDC echoes a legible prompt on the screen. If parity does not match, an illegible prompt appears on the screen. **When this happens, enter a period (.) and carriage return (CR) to force the HSDC to detect the parity and to echo a legible prompt on the screen.**
- After having autobauded once, the HSDC remembers the current speed, and continues to use the same speed if not again autobauded.

- The HSDC returns to the default mode when:
  - The terminal powered OFF and ON,
  - After a Control Z, Break, DTR OFF, or call disconnections from the far end.

For complete descriptions of all keyboard dialing procedures, ***see*** the ***High Speed Data Module User Guide*** (P0696749).

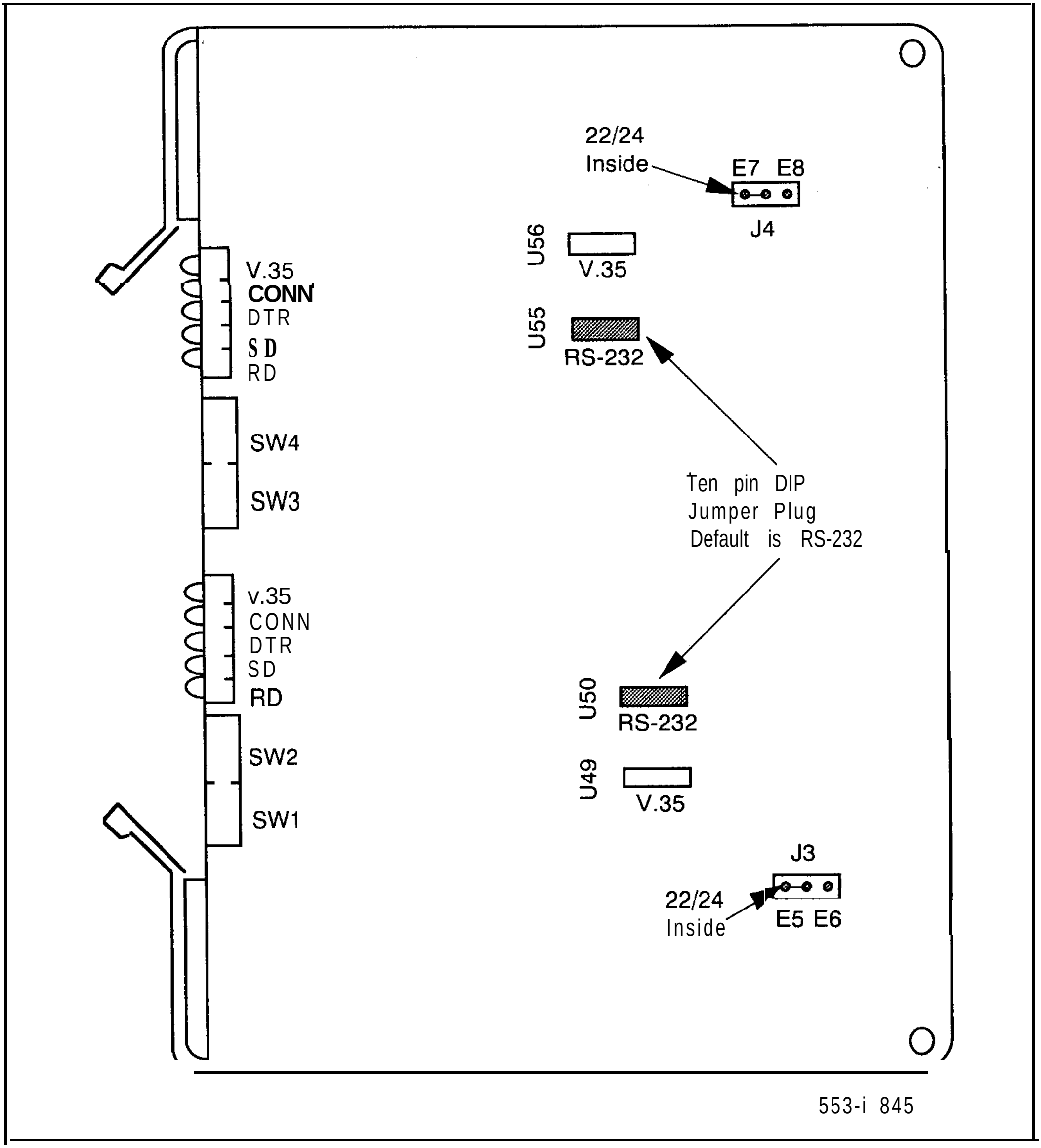
Interface specifications

Meridian 1 interface

The Multi-channel Data System (MCDS) shelf containing HSDC cards interfaces with Meridian 1 by the QPC311 Data Line Card (DLC) or QPC432 Four-Port Data Line Card (4PDLC). A connecting loop wire gauge selection is provided on the HSDC. The selection plugs, J3 for Port C, J4 for Port A, select either 22/24 gauge inside wire or 24/26 gauge outside wire. J3 and J4 are not accessible from the faceplate (see Figure 2). Wire gauge selection requires removing the HSDC card from the MCDS shelf.

Note: The QPC432 replaces the QPC311 card, which is available for repair only and cannot be ordered as new equipment.

Figure 2
High Speed Data Card jumper locations



RS-232 interface

For RS-232 interface configuration, a 10 pin DIP jumper plug on the QPC918 board should be placed in the RS-232 position.

When the HSDC is used as a RS-232 interface unit, the HSDC can replace an ASIM and AIC completely. The HSDC meets the DCE/DTE interface requirements of the EIA RS-232C standard.

A 10-pin DIP jumper plug must be inserted in the correct socket of the QPC918, as shown in the Table 2, to support RS-232-C or V.35 interfaces.

Table 2
QPC918 interface selection

Port	Interface Type	Install 10-pin DIP at Location
Port A	RS-232-C	u55
	v.35	U56
Port c	RS-232-C	U50
	v.35	u49

Table 3 shows the EIA leads supported by the HSDC/MCDS Port A or Port C.

Table 3
EIA signals supported by HSDC

PIN NO.	DESCRIPTION	CKT	FROM	TO
Ground Leads				
1 (Note 1)	Protective Ground	AA		
7	Signal Ground (SG)	AB		
Control Leads				
4	Request to Send (RTS)	CA	DTE	HSDC
5	Clear to Send (CTS)	CB	HSDC	DTE
6	Data Set Ready (DSR)	CC	HSDC	DTE
8	Carrier Detect (CD)	CF	HSDC	DTE
15	Serial Clock Receive (SCR)	DD	HSDC	DTE
17	Serial Clock Transmit (SCT)	DB	HSDC	DTE
20	Data Terminal Ready (DTR)	CD	DTE	HSDC
22	Ring Indicator (RI)	CE	HSDC	DTE
23	Data Rate Selector	CH/CI		
24	Ext Transmit Clock (SCTE)	DA	DTE	HSDC
25 (Note 2)	Busy out	BO	DTE	HSDC
Data Leads				
2	Transmit Data (TD)	BA	DTE	HSDC
3	Receive Data (RD)	BB	HSDC	DTE

Note I: Pin 1 is connected to the MCDS shelf frame.

Note 2: Pin 25 is connected to an RS-232 receiver on the HSDC, but is ignored by the HSDC.

V.35 interface

For V.35 interface configuration, remove a 10 pin DIP jumper plug on the HSDC from the RS-232 socket and install it in the V.35 socket.

The HSDC V.3.5 interface conforms electrically to the CCITT V.35 standard and mechanically to ISO-21 10. When HSDC is used as a V.35 interface unit, an adapter cable is needed to convert the IS0 2110 (DB-25) connector on the MCDS backplane into an IS0 2593 (34-pin rectangular connector).

The HSDC is shipped from the factory configured for the RS-232 interface. V.35 is configured only when required by the application.

Table 4 shows the V.35 (CCITT) leads supported by the HSDC/MCDS Port A or Port C.

Table 4
V.35 CCITT signals supported by the HSDC

Pin. No.	Description	EIA Signals	Abbrev.	CCITT	DB-25 Pin No.	V.35 Pin No.
1	Protective Ground (Note 2)	AA	DG	101	1	A
2	Transmitted Data A	BA	SDA	103A	2	P
3	Receive Data A	BB	RDA	104A	3	R
4	Request to Send	CA	RTS	105	4	C
5	Clear to Send	CB	CTS	106	5	D
6	Data Set Ready	CC	DSR	107	6	E
7	Signal Ground	AB	SG	102	7	B
8	Carrier Detect	CF	CD	109	8	F
9	No connection				9	CC
10	No connection				10	L
11	—— (Note 3)				11	K
12	Receive Signal Element Timing B	SBA	SCRB	1158	12	X
13	Transmitted Data B	SBB	SDB	1038	13	S
14	Transmitted Signal B Element Timing	——	SCTB	1148	14	AA
15	Transmitter Signal A Element Timing		SCTA	114A	15	Y
16	Receive Data B		RDB	104B	16	T
17	Receiver Signal Element Timing A	——	SCRA	115A	17	V
18	No connection				18	M
19	No connection				19	HH
20	Data Terminal Ready	CD	DTR	108.2	20	H

— continued —

Table 4
v.35 CCITT signals supported by the HSDC (continued)

Pin. No.	Description	EIA Signals	Abbrev.	CCITT	DB-25 Pin No.	v.35 Pin No.
21	No connection				21	EE
22	Ring Indicator	CE	RI	125	22	J
23	Transmitter Signal Element Timing A	CH/CI	SCTEA	113B	23	W
24	Transmitter Signal Element Timing B	DA	SCTEB	113A	24	U
25	Busy Out (Note 3)	—			25	MM

Note 1: Leads not specified are not used.

Note 2: Pin 1 is connected to the MCDS shelf frame.

Note 3: When the HSDC is configured for the V.35 interface, pins 11 and 25 are still connected to an RS-232C receiver.

Data transmission rates

The data rates supported by the HSDC are listed in Table 5. These speeds can be set by four switches labeled DO, D1, D2, and D3 on the faceplate.

In the asynchronous mode, there is one stop bit for all speeds except for 110 bps. There are two stop bits at 110 bps. The HSDC operates only in full duplex mode with 8 bits, including parity. The HSDC supports the asynchronous speeds of 110, 150, 300, 600, 1200, 2400, 4800, 9600, or 19200 bps. The HSDC will always autobaud to the DTE baud rate.

In the mode, when the HSDC is first powered up, the default speed of either 1200, 2400, 4800, 9600, or 19200 is selected. This speed is determined by the DO, D1, D2, and D3 switch settings on the HSDC faceplate. After autobauding, the HSDC remembers the terminal speed (current speed). If not autobauded, the previous speed is remembered. If the switch settings are not set to one of the five speeds, 9600 bps is used as a default.

In the ***Synchronous*** mode, the speeds available are listed in Table C. The synchronous speeds are determined by the DO, D1, D2, and D3 switch settings. The speed can be changed only in the idle state.

Table 5
Data transmission rates and switch settings

synchronous Mode (bps)	Synchronous Mode (bps)	Faceplate Switch Settings (SW1 or SW3) D3	D2	D1	D0
		OFF	OFF	OFF	OFF
		OFF	OFF	OFF	ON
1200	1200	OFF	OFF	ON	OFF
	3600	OFF	ON	OFF	OFF
4800	4800	OFF	ON	OFF	ON
	7200	OFF	ON	ON	OFF
9600	9600	OFF	ON	ON	ON
		ON	OFF	OFF	ON
19200	19200	ON	OFF	ON	OFF
	38400	ON	OFF	ON	ON
	40800	ON	ON	OFF	OFF
	48000	ON	ON	OFF	ON
	56000	ON	ON	ON	OFF
	64000	ON	ON	ON	ON

ote : In the asynchronous mode, incoming data call operating at speeds other an 110, 150, 300, 600, 1200, 2400, 4800, 9600, or 19200 bps will be disconnected ıd an appropriate message sent to the user screen. Each port will adapt to the ıta rate of the calling Meridian SL-1 data module.

Data code and parity

The card supports asynchronous data terminals using 7 bit ASCII code, 1 or 2 stop bits, and odd, even, space, or mark parity.

In asynchronous mode, the HSDC uses the autobaud and autoparity feature to automatically detect the speed and parity of the DTE. The procedure for autobaud and autoparity is as follows:

- The HSDC detects the speed of the Carriage Return (CR) ASCII character. If the parity of the terminal matches the default (8 bit, space parity), HSDC echoes legible prompts on the screen. Otherwise illegible prompts appear on the screen. To re-autoparity, the user should enter period (.) and a Carriage Return (CR). After the HSDC detects the parity, legible prompts will be echoed on the screen. This is the standard procedure used on all other SL-1 data products.

  The HSDC goes back to default mode under the following conditions:

  - DTE power goes from ON to OFF, then returns to ON,
  - After Control Z, Break, DTR OFF, or call is disconnected from the far end.

Re-downline loading

The HSDC is capable of accepting re-downline loading of the configuration parameters in the asynchronous mode.

Power requirements

The HSDC is powered from a MCDS power supply. The power requirements per card are is shown below.

Voltage	Tolerance	Current	
		Nominal	Maximum
+5 Vdc	±5%	1.4 amp	2.1 A
+12 Vdc	±10%	24 mA	0.2 A
-9Vdc	±10%	30 mA	0.2 A
+9 Vdc	±10%	30 mA	0.2 A

A total of 1.7 ampere is required from the MCDS 110 V AC power receptacle when the MCDS shelf is fully loaded with eight HSDCs.

Environmental

The HSDC is designed to operate without degradation under the following conditions.

Specification	Operating	Storage
Ambient temperature	0 to 50 degrees C	• 40 to 70 degrees C
Relative humidity (non condensing)	10 to 95%	0 to 95%

Reliability

The HSDC has a predicted mean time between failure (MTBF) of 29.3 years at 40 degrees Celsius.

Installation

Multi-Channel Data System (MCDS)

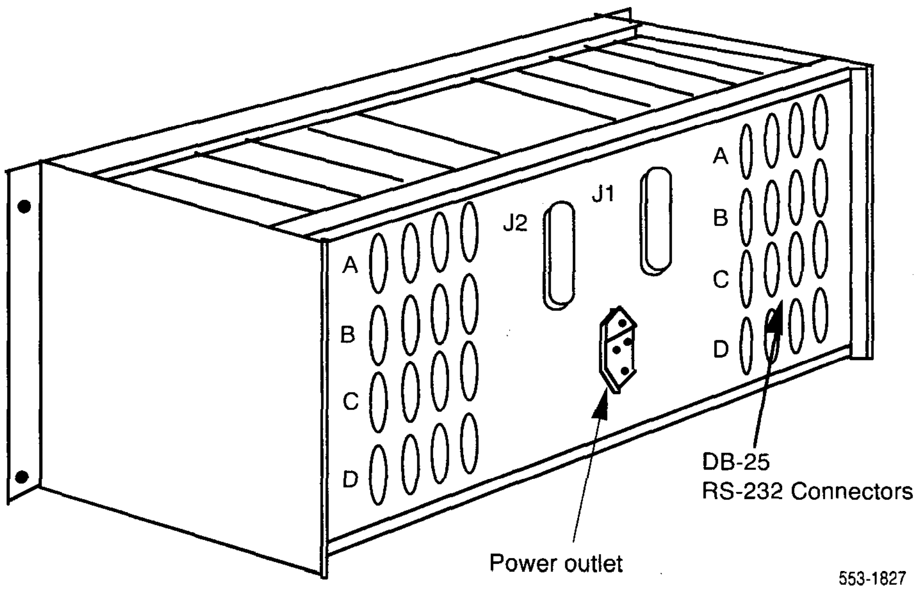
The MCDS is designated for use in computer rooms for interfacing multiple computer ports to the Meridian SL-1. The HSDC is mounted in the standard MCDS shelf (QSD27). Each shelf can accommodate up to eight HSDCs, eight Asynchronous Interface Cards (AIC QPC397), or any combination of the two, totaling eight. For each AIC, the MCDS shelf identifies four ports (units) A, B, C, and D. The HSDC supports two data ports per card. As a result, it utilizes only ports (units) A and C of the MCDS shelf.

The major equipment required to implement MCDS is listed here:

– MCDS Shelf	QSD27
– MCDS Power Supply 110V	QSY27
– MCDS Power Supply 220V	QSY32
– 2 Port High Speed Data Card	QPC918
– 4 Port Line Card	QPC432
– 4 Port Asynch. Interface Card	QPC397
– MCDS Desk Cabinet (optional)	QCA77
– MCDS Rack Cabinet (optional)	QCA76

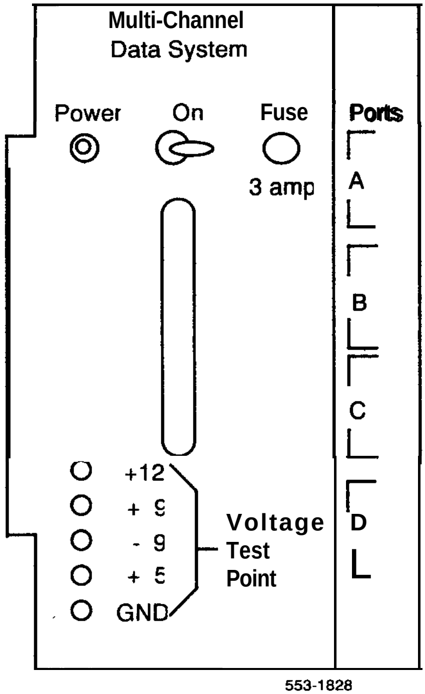
The MCDS shelf (Figure 3) houses a center-mounted power supply and four HSDC or AIC cards mounted on each side of the power supply (a total of eight). It can be either a stand alone unit on an equipment frame or mounted in the MCDS cabinet. It is equipped with front flange mounting brackets and is 19 inches wide, 14 inches high, and 14.25 inches deep.

Figure 3
MCDS QSD27 shelf



The MCDS power supply (Figure 4) is an off-line, switched mode supply which provides multiple, regulated and protected DC voltage to the shelf backplane. It requires 1.7 amp from 1 10V, 60 Hz AC source. An optional MCDS power supply (QSY32) is available that connects to 220 V Hz AC lines.

Figure 4
MCDS power supply



The MCDS backplane (Figures 5 and 6) which is a part of the shelf assembly, is provided with two sided circuitry. It is equipped with nine 160-pin connectors to receive the interface cards and shelf power supply. It is also equipped with two 25-pair standard Amphenol type plugs (J1, J2) to connect to the Meridian SL-1, and 32 female, standard RS-232-C (DB-25) connectors to provide interface to the computer ports (DTEs). The backplane is also provided with an insulator sheet on the rear surface to prevent accidental shorting of the traces with metal connector hoods.

Figure 5
MCDS backplane (front view)

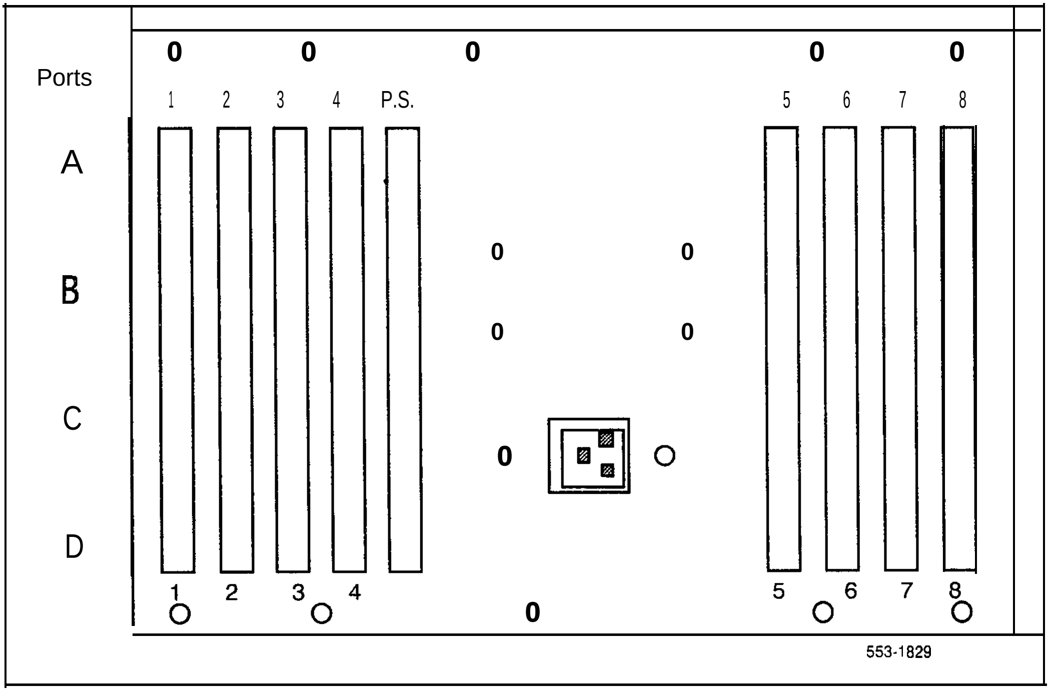
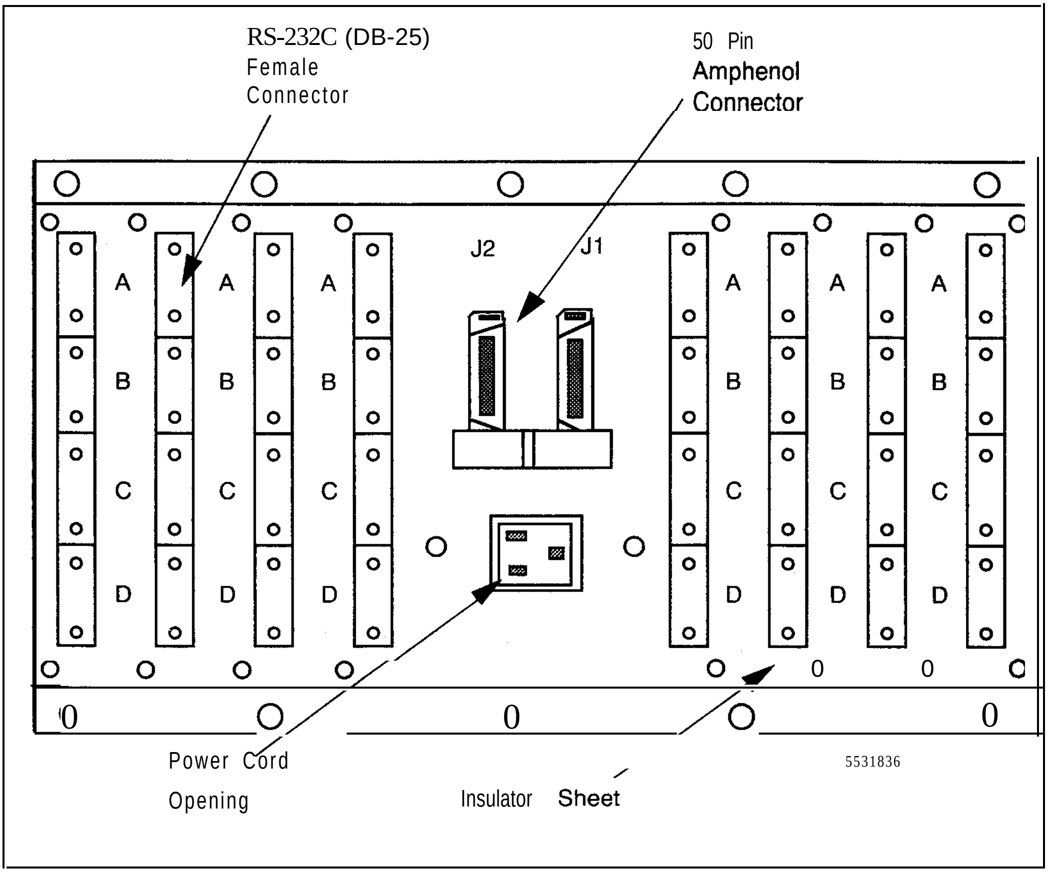


Figure 6
HSDC backplane (rear view)



The Spectron patch panel is inserted between the MCDS and the DTE computer ports to provide a convenient means of rearranging interconnections and for maintenance diagnostics. Each panel contains 16 plug-in modules. To monitor a 2 -shelf MCDS cabinet, 2 panels are required.

The AIC card supports four asynchronous DTEs that use 7-bit ASCII code and 1 or 2 stop bits. It supports full (FDX) and half (HDX) modes of operation and provides auto-answer capability only.

The QPC432 4PDLC supports two HSDC cards, or one AIC card.

Detailed information about the Multi-Channel Data System (MCDS) installation and removal may be found in the Northern Telecom Publication *Meridian Data Services installation and testing (553-2731-200).*

MCDS shelf to DTE connection

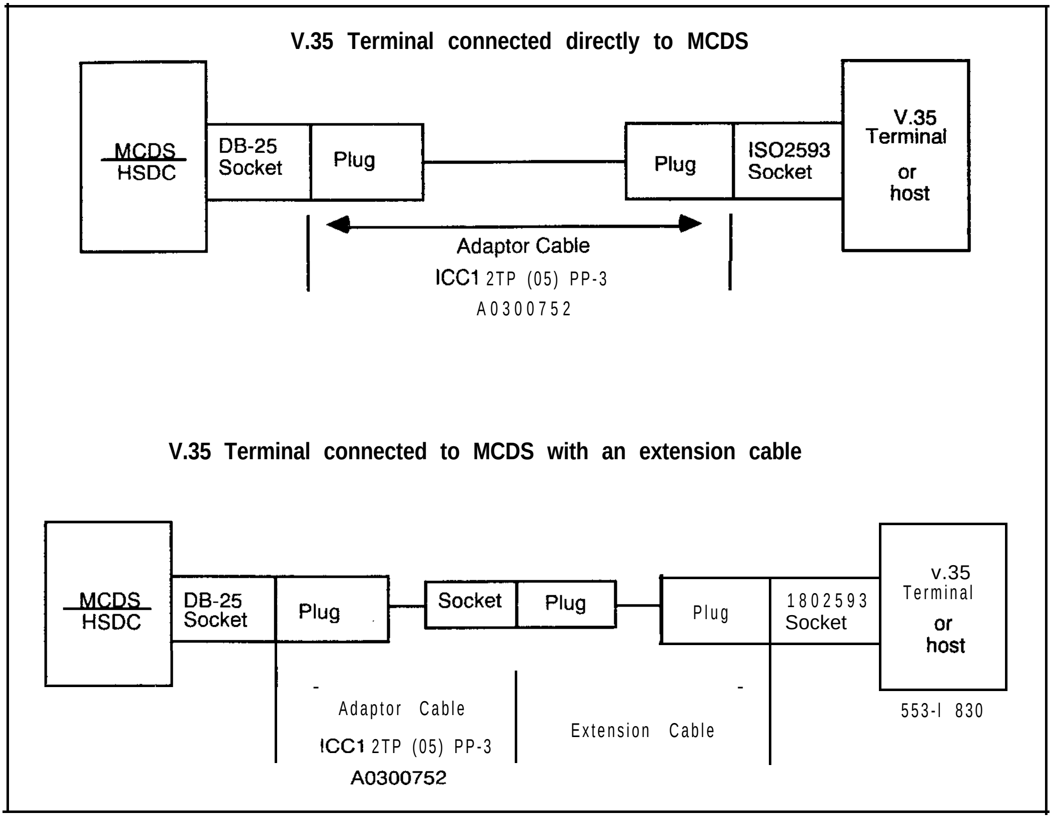
When the Spectron patch panel is not used, connect the MCDS shelf to the computer ports with an RS-232-C cable equipped with male-type 25-pin connectors.

When the Spectron patch panel is used, use a Spectron patch cable to connect the MCDS shelf to the assigned monitor jacks of the patch panel, which is labeled Modem. Then connect the associated equipment jacks (labeled Equip.) to the computer ports with an RS-232-C cable equipped with male-type 25-pin connectors.

When HSDC is used as the V.35 interface unit, an adaptor cable is needed to convert the ISO-21 10 (DB-25) connector on the MCDS backplane into an ISO-2593 (34-pin rectangular) connector. Figure 7 shows the details and connection of the adaptor cable.

For DTE equipped with female ISO-2593, adaptor cable number A0300752 is required. For DTE equipped with male ISO-2593, adaptor cable A0300753 is required.

Figure 7
MCDS to V.35 DTE connection



MCDS shelf to Meridian 1 connection

The selection plugs J3 and J4 on the HSDC are provided to select a 22/24 gauge inside wire or 24/26 gauge outside wire.

Designation	Setting
E5, E7	inside 22/24 AWG
E6, E8	outside 24/26 AWG

The physical capacities and provisioning requirements of Meridian SL-1 Data feature hardware must be met upon installation. Table 6 lists cabling and environmental requirement and limitations. All hardware is installed using basic installation tools.

MCDS shelf cabling sequence is shown in Figure 8.

Note: Each HSDC utilizes only Unit A (Port A) and Unit C (Port C) of the MCDS shelf.

Table 6
MCDS to SL-1 cabling

Allowable Cabling		Type D PVC inside wiring cable PIC for outside use only.	
Maximum separation distances (by cable type)			
MCDS to 4PDLC			
	PIC Outside	**PVC Inside**	**Gauge**
	4000 ft (1220 m)	4000 ft (1219 m)	22 AWG
	3500 ft (1070 m)	2900 ft (884 m)	24 AWG
	2000 ft (610 m)		26 AWG
	2500 ft (760 m)	2500 ft (760 m)	22/24 mixed
	1500 ft (460 m)	1200 ft (370 m)	24/26 mixed

Table 7 lists the MCDS shelf pair terminations and Table 8 lists the NT8D13 PE Module I/O Pane1 connectors and the signal assignments to the connector pins and the 4PDLC and DLC units and their I/O port signals.

Note: Only ports A and C on the MCDS can be used by the QPC918 HSDC.

Only units D1 and D3 of the QPC311 DLC and units 0 to 3 of the QPC432 4PDLC can be used.

The I/O Pane1 connectors for the NT8D13 PE Module can also be used for QSD64, QSD65, QSD80, QSP35, and QSP36 PE shelves.

Table 7
MCDS shelf pair terminating sequence

Cable J1 Pair	Pin	Pair Color	Card 1-4		Cable J2 Pair	Pin	Pair Color	Card 5-6	
1T R	26 1	W-BL BL-W	Card 1	Unit A	1T R	26 1	W-BL BL-W	Card 5	Unit A
2T R	27 2	W-O O-W	Card 1	Unit B	2T R	27 2	W-O O-W	Card 5	Unit B
3T R	28 3	W-G G-W	[illegible]	Unit C	3T R	28 3	W-G G-W	Card 5	Unit C
4T R	29 4	W-BR BR-W	Card 1	Unit D	4T R	29 4	W-BR BR-W	Card 5	Unit D
5T R	30 5	W-S S-W	Card 2	Unit A	5T R	30 5	W-S S-W	Card 6	Unit A
6T R	31 6	R-BL BL-R	Card 2	Unit B	6T R	31 6	R-BL BL-R	Card 6	Unit B
7T R	32 7	R-O O-R	Card 2	Unit C	7T R	32 7	R-O O-R	Card 6	Unit C
8T R	33 8	R-G G-R	Card 2	Unit D	8T R	33 8	R-G G-R	Card 6	Unit D
9T R	34 9	R-BR BR-R	Card 3	Unit A	9T R	34 9	R-BR BR-R	Card 7	Unit A
10T R	35 10	R-S S-R	Card 3	Unit B	10T R	35 10	R-S S-R	Card 7	Unit B
11T R	36 11	BK-BL BL-BK	Card 3	Unit C	11T R	36 11	BK-BL BL-BK	Card 7	Unit C
12T R	37 12	BK-O O-BK	Card 3	Unit D	12T R	37 12	BK-O O-BK	Card 7	Unit D
13T R	36 13	BK-G G-BK	Card 4	Unit A	13T R	38 13	BK-G G-BK	Card 8	Unit A
14T R	39 14	BK-BR BR-BK	Card 4	Unit B	14T R	39 14	BK-BR BR-BK	Card 8	Unit B
15T R	40 15	BK-S S-BK	Card 4	Unit C	15T R	40 15	BK-S S-BK	Card 8	Unit C
16T R	41 16	Y-BL BL-Y	Card 4	Unit D	16T R	41 16	Y-BL BL-Y	Card 8	Unit D
17T R	42 17	Y-O O-Y	Spare		17T R	42 17	Y-O O-Y	Spare	
18T R	43 18	Y-G G-Y			18T R	43 18	Y-G G-Y		
19T R	44 19	Y-BR BR-Y			19T R	44 19	Y-BR BR-Y		
20T R	45 20	Y-S S-Y			20T R	45 20	Y-S S-Y		
21T R	46 21	V-BL BL-V			21T R	46 21	V-BL BL-V		
22T R	47 22	V-O O-V			22T R	47 22	V-O O-V		
23T R	48 23	V-G G-V			23T R	48 23	V-G G-V		
24T R	49 24	V-BR BR-V			24T R	49 24	V-BR BR-V		
25T R	50 25	V-S S-V	Spare		25T R	50 25	V-S S-V	Spare	

553-1831

Table 8
QPC432 (4PDLC) and QPC311 DLC pair-terminations for NT8D13 PE Module I/O Panel connectors A, C, E, and G (Single Loop Mode)

Port Pairs	Connector Pin Number	Wire Color Code	I/O Panel Connectors A	C	E	G	4PDLC Sig	4PDLC Unit	DLC Sig	DLC Unit
1T	26	W-BL	SLOT X-1 CARD 1	SLOT X-4 CARD 4	SLOT X-7 CARD 7	SLOT X-10 CARD 10	T	D0	T	V0
1R	1	BL-W					R		R	
2T	27	W-O					SA		SA	
2R	2	O-W					SB		SB	
3T	28	W-G					T	D1	T	D1
3R	3	G-W					R		R	
4T	29	W-BR					SA		SA	
4R	4	BR-W					SB		SB	
5T	30	W-S					T	D2	T	V2
5R	5	S-W					R		R	
6T	31	R-BL					SA		SA	
6R	6	BL-R					SB		SB	
7T	32	R-O					T	D3	T	D3
7R	7	O-R					R		R	
8T	33	R-G					SA		SA	
8R	8	G-R					SB		SB	
9T	34	R-BR								
9R	9	BR-R								
10T	35	R-S								
10R	10	S-R								
11T	36	BK-BL								
11R	11	BL-BK								
12T	37	BL-O								
12R	12	O-BL								
13T	36	BK-G								
13R	13	G-BK								
14T	39	BK-BR								
14R	14	BR-BK								
15T	40	BK-S								
15R	15	S-BK								
16T	41	Y-BL								
16R	16	BL-Y								
17T	42	Y-O	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT X-8 CARD 8	SPARE	T	D0	T	V0
17R	17	O-Y					R		R	
18T	43	Y-G					SA		SA	
18R	16	G-Y					SB		SB	
19T	44	Y-BR					T	D1	T	D1
19R	19	BR-Y					R		R	
20T	45	Y-S					SA		SA	
20R	20	S-Y					SB		SB	
21T	46	V-BL					T	D2	T	V2
21R	21	BL-V					R		R	
22T	47	V-O					SA		SA	
22R	22	O-V					SB		SB	
23T	48	V-BR					T	D3	T	D3
23R	23	BR-V					R		R	
24T	49	V-S					SA		SA	
24R	24	S-V					SB		SB	

Table 8 (cont' d)
QPC432 (4PDLC) and QPC311 DLC pair-terminations for NT8D13 PE Module I/O Panel connectors B, D, and F (Single Loop Mode)

Port Pairs	Connector Pin Number	Wire Color Code	I/O Panel Connectors B	I/O Panel Connectors D	I/O Panel Connectors F	4PDLC Sig	4PDLC Unit	DLC Sig	DLC Unit
IT 1R 2T 2R	26 1 27 2	W-BL BL-w w-o o-w	S L 0 T X-2 C A R D 2	S L O T X-5 C A R D 5	S L O T -8 C A R D 8				
3T 3R 4T 4R	28 3 29 4	W-G G-W W-BR BR-W							
5T 5R 6T 6R	30 5 31 6	W-S S-W R-BL BL-R							
7T 7R 8T 8R	32 7 33 6	R-O O-R R-G G-R							
S T 9R 10T 10R	34 9 35 10	R-BR BR-R R-S S-R				T R SA SB	DO	T R SA SB	VO
11T 11R 12T 12R	36 11 37 12	BK-BL BL-BK BL-0 0-BL				T R SA SB	D1	T R SA SB	D1
13T 13R 14T 14R	38 13 39 14	BK-G G-SK BK-BR BR-BK	S L 0 T X-3 C A R D 3	S L 0 T X-6 C A R D 6	S L 0 T x-s C A R D 9	T R SA SB	D2	T R SA SB	V2
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y				T R SA SB	D3	T R SA SB	D3
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y							
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y							
21T 21R 22T 22R	46 21 47 22	V-BL BL-V v-o o-v							
23T 23R 24T 24R	48 23 49 24	V-BR BR-V v-s s-v							

Table 6 (cont' d)
QPC432 (4PDLC) and QPC311 DLC pair-terminations for NT8D13 PE Module I/O Panel connectors A, C, E, and G (Dual Loop Mode)

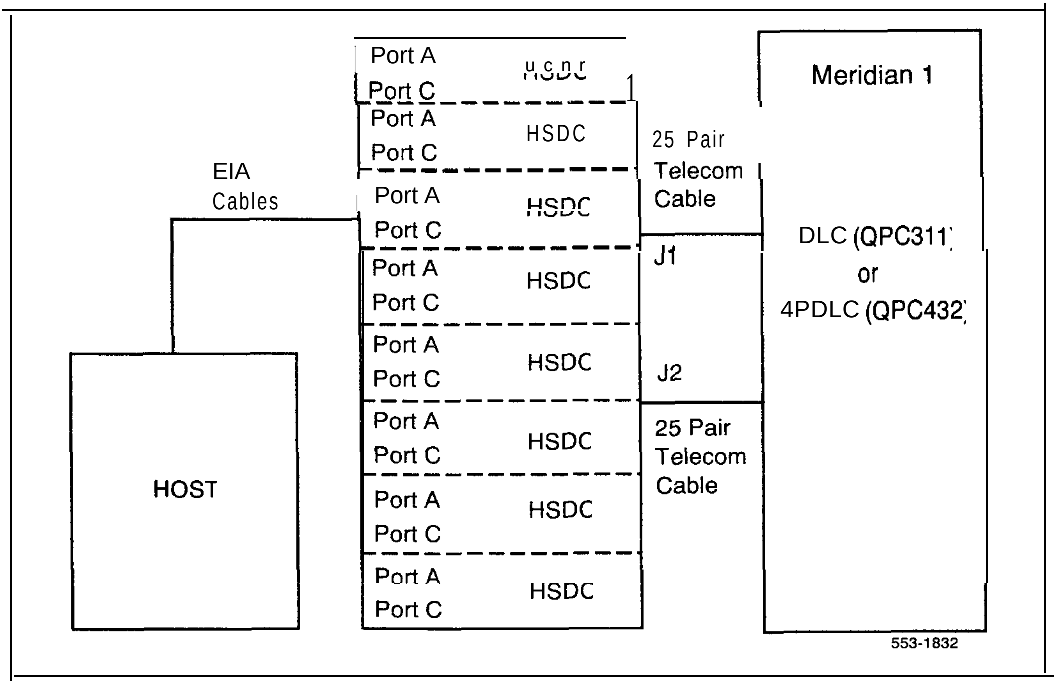
Port Pairs	Connector Pin Number	Wire Color Code	I/O Panel Connectors A	C	E	G	4PDLC Sig	4PDLC Unit	DLC Sig	DLC Unit
1T	26	W-BL	SLOT X-l CARD 1	SLOT z-4 CARD 4	SLOT f-2 CARD 2	SLOT '-5 CARD 5	T	D0	T	V0
1R	1	BL-W					R		R	
2T	27	W-O					SA		SA	
2R	2	O-W					SB		SB	
3T	28	W-G					T	D1	T	D1
3R	3	G-W					R		R	
4T	29	W-BR					SA		SA	
4R	4	BR-W					SB		SB	
5T	30	W-S					T	D2	T	V2
5R	5	S-W					R		R	
6T	31	R-BL					SA		SA	
6R	6	BL-R					SB		SB	
7T	32	R-O					T	D3	T	D3
7R	7	O-R					R		R	
8T	33	R-G					SA		SA	
6R	8	G-R					SB		SB	
9T	34	R-BR								
9R	9	BR-R								
10T	35	R-S								
10R	10	S-R								
11T	36	BK-BL								
11R	11	BL-BK								
12T	37	BL-O								
12R	12	O-BL								
13T	38	BK-G								
13R	13	G-BK								
14T	39	BK-BR								
14R	14	BR-BK								
15T	40	BK-S								
15R	15	S-BK								
16T	41	Y-BL								
16R	16	BL-Y								
17T	42	Y-O	SLOT X-2 CARD 2	SLOT X-E CARD 5	SLOT Y-3 CARD 3	SPARE	T	D0	T	V0
17R	17	O-Y					R		R	
18T	43	Y-G					SA		SA	
18R	18	G-Y					SB		SB	
19T	44	Y-BR					T	D1	T	D1
19R	19	BR-Y					R		R	
20T	45	Y-S					SA		SA	
20R	20	S-Y					SB		SB	
21T	46	V-BL					T	D2	T	V2
21R	21	BL-V					R		R	
22T	47	V-O					SA		SA	
22R	22	O-V					SB		SB	
23T	48	V-BR					T	D3	T	D3
23R	23	BR-V					R		R	
24T	49	V-S					SA		SA	
24R	24	S-V					SB		SB	

Table 8 (cont' d)
QPC432 (4PDLC) and QPC311 DLC pair-terminations for NT8D13 PE Module I/O Panel connectors B, D, and F (Dual Loop Mode)

Port Pairs	Connector Pin Number	Wire Color Code	I/O Panel Connector B	I/O Panel Connector D	I/O Panel Connector F	4PDLC Sig	4PDLC Unit	DLC Sig	DLC Unit
1T 1R 2T 2R	26 1 27 2	W-BL BL-W W-O O-W	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT Y-3 CARD 3				
3T 3R 4T 4R	28 3 29 4	W-G G-W W-BR BR-W							
5T 5R 6T 6R	30 5 31 6	W-S S-W R-BL BL-R							
7T 7R 8T 8R	32 7 33 8	R-O O-R R-G G-R							
9T 9R 10T 10R	34 9 35 10	R-BR BR-R R-S S-R	SLOT X-3 CARD 3	SLOT Y-1 CARD 1	SLOT Y-4 CARD 4	T R SA SB	D0	T R SA SB	V0
11T 11R 12T 12R	36 11 37 12	BK-BL BL-BK BL-O O-BL				T R SA SB	D1	T R SA SB	D1
13T 13R 14T 14R	38 13 39 14	BK-G G-BK BK-BR BR-BK				T R SA SB	D2	T R SA SB	V2
15T 15R 16T 16R	40 15 41 16	BK-S S-BK Y-BL BL-Y				T R SA SB	D3	T R SA SB	D3
17T 17R 18T 18R	42 17 43 18	Y-O O-Y Y-G G-Y							
19T 19R 20T 20R	44 19 45 20	Y-BR BR-Y Y-S S-Y							
21T 21R 22T 22R	46 21 47 22	V-BL BL-V V-O O-V							
23T 23R 24T 24R	48 23 49 24	V-BR BR-V V-S S-V							

Connection of the MCDS shelf to the SL-1 and Host computer is shown in Figure 8.

Figure 8
MCDS shelf to host



Service change

The Meridian 1 recognizes the HSDC port as an SL-1 telephone, the DLC, 4PDLC as SL-1 line cards. LD 77 is used to enter the HSDC port call processing into the system.

Ensure that the following items are defined:

- Key 0 DN (data)
- Key 1 Secondary DN
- Key 2 Cail Transfer (optional)
- Key 3 Auto Dial Calling (optional)
- Key 4 Ring Again (optional)

- Key 6 Speed Call (optional)
- Key 7 Display (DSP) (optional)
- Key 9 RLS (release)
- PUD Deny call pickup
- DTA Data service allowed

Note 1: Key 2 is required to provide access to a manual outbound modem pooling.

Note 2: Key 3 is required to operate autodial, or hotline feature.

Note 3: DSP requires the Class of service updated to DDS, or ADD.

In order to use the 64 Kb/s data capability, the following Meridian 1 configurations are required:

- Meridian 1 software must be X11 release 12 or later.
- QPC720 PRI must be configured for B8ZS line coding.
- TI facility must support B8ZS line coding.
- For connection to SL-100, the software should be X11 release 13 or later, QPC720 PRI vintage B or higher should be configured for B8ZS.

Troubleshooting

If the HSDC does not operate properly, perform the following checks:

Procedure 1
HSDC troubleshooting procedures (general check)

1 Ensure that the MCDS power supply is powered on.

2 Operate the **fdtr** key on the HSDC faceplate and verify that the DTR lamp lights. Replace the HSDC if the lamp does not light.

3 The V.35 lamp should be ON if the 10-pin jumper plug is inserted into the V.35 socket on the QPC918 card. If the jumper is installed and the V.35 LED is off, replace the card.

4 Ensure that the data terminal power is ON, and ON-LINE/OFF-LINE (LINE/LOCAL) switch (if equipped) set to ON-LINE (LINE).

5 Ensure that Data Terminal or Host Port is ready for data transmission with the proper speed and other parameters set appropriately.

If the call is connected but station is not sending or receiving data.

6 Is MONITOR SEND lamp on DTE (if equipped) or the SD lamp on the HSDC flashing while sending data ?

If they do not flash:

7 Ensure that the interface cable is properly connected to MCDS and DTE.

8 Ensure ON-LINE/OFF-LINE (LINE/LOCAL) switch is set to ON-LINE (LINE).

9 If problems occur during call setup, disconnect and attempt to place the call again. Place the call from a regular phone to ensure that the far end data equipment, and the HSDM or HSDC is properly set up and working before calling for service.

If the problem continues, place a test call using an Asynchronous Terminal (DTE) connected to the HSDC port in loopback mode. The data sent by your terminal will be loopbacked. Perform the following steps:

Procedure 2

HSDC troubleshooting

1 Set the local HSDC to Asynchronous, Loopback, Full duplex, and Terminal mode. Make sure the remote HSDC or HSDM is set to the Asynchronous Mode, and Loopback OFF.

2 Be sure your terminal is set so that it does not check parity, or that it is set to 8 bits (no Parity). If it is set to 7 bits, even, or odd parity, enter a period (.) and Carriage Return (CR) to force the HSDC to calculate parity and provide legible prompts.

3 Press <cr> on the Async. Terminal connected to the HSDC that is in loopback mode.

4 Dial the call using the terminal keyboard. The lamps for CONN and DTR should be ON for a successful call.

5 Check that the characters you type are echoed on the screen at the local terminal. If the characters are returned properly, check the remote DTE that is connected to the HSDC/HSDM.

6 If the characters are not returned properly, place a call to another remote HSDC/HSDM. If the problem persists:
-- Use LD 32 to check that the QPC311 or QPC432 is enabled.
-- Enable the card and proceed with troubleshooting.
-- Replace the HSDC card.

SL-1

QPC918 High Speed Data Card

Description, installation, and operation

Release 2.0
Standard
December 31, 1992
Printed in USA

northern telecom

SL-1

Meridian Communications Unit and Meridian Communications Adapter

Description, installation, administration, operation

Publication number: 553-2731-109
Product release: X11 release 19
Document release: 1.0
Document status: Standard
Date: August 1, 1993

Revision history

August 1, 1993

This is a new document describing the Meridian Communications Unit and the Meridian Communications Adapter. Revision bars are omitted.

Contents

List of figures

List of tables

Introduction

The Meridian Communications Adapter (MCA) and Meridian Communications Unit (MCU) provide an RS-232C/V.35 interface between compatible asynchronous or synchronous data terminal equipment (DTE) and the Meridian 1 switching network. Both interface with the digital line card (QPC578/NT8D02). MCA/MCU connect to the DTE for intra-switch communications and for wide area communications over Digital Trunk Interface (DTI) or Primary Rate Interface (PRI) links to other Northern Telecom switches.

The MCA fits inside a Meridian Modular Telephone (MMT) to provide access to data functions. The MCU, available beginning with X11 release 18, is a stand-alone version of the MCA that replicates the functionality of the MCA and provides additional features.

> *Note:* The MCA should be configured with a display to facilitate programming.

Most of the information you need to operate the MCA and MCU is available in the following chapter, “Description” on page 9. Read this chapter carefully for information on using the keypad and keyboard. Subsequent chapters contain more technical information on specifications, installation, and troubleshooting.

Communications software

Most commercial MS-DOS and Macintosh communications packages are compatible with the MCA/MCU and personal computers for internal and external communications. Ask your Northern Telecom representative for information.

Public Switched Data Service

The Public Switched Data Service (PSDS) lets you receive data at 56 Kbps over Digital Trunk Interface (DTI) trunks beginning with X11 release 16 and at 64 Kbps over an ISDN Primary Rate Interface (PRI) channel beginning with X11 release 18.

Beginning with Xl 1 release 18, set PSDS in LD11. For more information, refer to the Public Switched Data Service section in *Xl 1 features and services* (553-3001-305).

Meridian Communications Adapter

The MCA replaces the MPDA with Xl 1 release 18 and later and offers enhanced functionality over the MPDA. The MCA may be configured as an MPDA for use with Xl 1 releases 14 through 18. Change MCA data functions using LD11.

Functional Description

The MCA mounts within the telephone and allows asynchronous ASCII terminals, personal computers, and printers to connect to the telephone using an RS-232-C or V.35 interface on a DB-25 connector. Beginning with X11 release 14, the MCA also allows synchronous applications (DTEs such as video conferencing equipment and Group IV fax units) to be connected to the telephone.

1.5 MB PRI (QPC720) and 2.0 MB PRI (NT8D782AA) support MCA, although 2.0 MB does not support the on-board protocol converter. MCA supports the DM-DM proprietary protocol for the Meridian 1, the TLink protocol for DMS, and the PSDS protocol for synchronous 64 or 56 Kbps clear data path applications on external trunks only.

X11 releases 14 through 17 allow access to data functions through the keypad only. However, Xl 1 release 18 and later allow access to data functions via both the keypad and service change in LD11.

Software support

Meridian 1 fully supports MCA. Table 1 shows the domestic and international support for trunk interworking, configuration, and protocols.

Table 1
Software support

	Phase 7C (16.90 G)	Phase 8B	x11 release 17 (and earlier)	x11 release 18 (and later)
Trunk interworking				
Stand-alone	yes	yes	yes	yes
Private Q.931 network	yes	yes		
ISDN trunks	no	yes	yes	yes
DPNSS/DASS	no	yes		
Configuration				
Overlay 11	configure as MPDA	Configure as MCA	Configure as MPDA	Configure as MPDA or MCA
Digital set keypad	yes	yes	yes	yes
Protocols				
DM-DM	yes	yes	yes	yes
TLINK	no	yes	no	yes
PSDS	yes	yes	yes*	yes*
Protocol step through	no	yes	no	yes

* PSDS is available beginning with Xl 1 release 16

Meridian Communications Unit

The MCU allows customers to transmit and receive data using either PSDS over the public network or a private network. The MCU, which replaces the QMT21C, is designed for domestic and international use, with transmission speed up to 19.2 Kbps async and 64 Kbps synch, integrated display, and self diagnostics.MCU supports autodialing, ring again, and speed calling as well as autobauding and automatic parity detection. Customers use MCU for

- Video conferencing
- LAN bridging
- Bulk data/PC file transfer
- Dial back-up
- Host connectivity

The MCU fully complies with RS-232C and can be configured as DCE or DTE to connect to a terminal, printer, fax machine, or similar peripheral equipment

Unlike MCA, MCU provides a dedicated call key and call progress tones. MCU permits smart (but not dumb) modem pooling.

The MCU supports the DM-DM, T-Link, V.25 bis, and PSDS interfaces as well as the RS-232C, CCITT V.35, CCITT V.24, and RS570/RS3449 (with different cables) interfaces. It complies with V.28, for European approval.

Processing, power, and protocols

MCU includes a mother board that performs all the processing requirements for the data adaptor and the interface to the Meridian 1. A daughter board provides a power supply connector (+5, +12, and -12 volts), DB-25 connectors to the data equipment, and drivers/receivers for the MCU.

The MCU supports existing MCA features except for Meridian TeleCenter and Voice PCM support. It provides multiple protocols (DM-DM, T-Link, V.2.5 bis, PSDS), dedicated data and feature keys, and call progress tones (provided via speaker) generated by 8-bit Digital to Analog converters. The unit includes a display.

Features

The MCA and MCU support these asynchronous features:

- Asynchronous transmission at up to 19.2 Kbps (autobaud)
- Enhanced Hayes commands, including upper- and lower-case dialing, voice call origination through AT dialing, hang-up data call, and on-line disconnect of voice call
- Script file capability that replays a dial-up and logon sequence to access a host or service
- Voice Call Origination (VCO)
- DCE mode
- Autodial
- Ring Again
- Speed Call
- Autobaud and Autoparity Detect
- Modem Pool Calling
- Host/Terminal Mode
- Forced Data Terminal Ready (DTR)
- Dynamic Carrier Detect (DCD)
- Inactivity Time-out

- Remote Loopback
- RTS/CTS hardware flow control capability for calling another MCA

Additionally, MCU provides a dedicated call key and call progress tones. MCU supports modem pooling.

Synchronous mode features supported by the MCA/MCU include:

- Half Duplex/Pull Duplex
- Internal and external clocking
- Modem and network capability
- Synchronous transmission up to 64 Kbps
- Public Switched Data Services (PSDS) compatibility. MCA extends PSDS (56K or 64K) and 64K restricted and 64K clear capabilities to Modular telephones.
- V.25 bis dialing protocol support at all synchronous speeds up to 64 Kbps., plus High-Level Data Link Control (HDLC) and Bisynch (character oriented) framing of the V.25 commands.
- Programmable echo canceller disabling for 56 and 64 Kbps network calls

Synchronous asynchronous mode features supported by MCA/MCU include:

- T-Link and DM-DM support

  T-Link and DM-DM are Northern Telecom proprietary protocols. The SL-100 and DMS data devices use T-Link. Meridian 1 data devices such as ASIM, AIM, ADM, SADM, Asynchronous Data Option (ADO), and MPDA use DM-DM. MCA can use both DM-DM and T-Link.
- Hotline
- Virtual Leased Line
- V.35 interface capability selectable with jumper plugs

- Data tandem calls across tie trunks provided all switches involved are Northern Telecom machines.
- PSDS tandem data calls across tie trunks are supported beginning with Xl 1 release 18 when each tandem node uses an ISDN Primary Rate Interface (PRI) or Basic Rate Interface (BRI) connection. See "Transparent Data Networking" in (553-2731-100) for more information.

  Note: PSDS tandem requires use of TDN feature. Internal PSDS calls are not supported.

Related Documents

For information on data adapters, including MCA, refer to the last chapter of ***Meridian 1 telephones.*** For information on related and complementary products, please refer to the following documents:

- ***Meridian Communications Adaptor user guide*** (P0738420)
- ***QPC723 KS-232 Interface Line Card description, installation and operation*** (553-2731-106)
- ***QPC918 High Speed Data Card description, installation, and operation*** (553-2731-108)
- ***Meridian data features traffic engineering and configuration*** (553-2731-151)
- ***Enhanced Asynchronous Interface Line Unit description and installation*** (553-2731-203)
- ***Meridian data features operation and tests*** (553-2731-300)
- ***NT7D16 Data Access Card description and operation*** (553-3001-191)
- ***Xl 1 input/output guide (553-3001-400)***

Description

This chapter focuses on using the keypad and keyboard of the MCA and MCU, with attention to the two different dialing procedures and options (AT and NT) available with the keyboard.

For more extensive keypad and keyboard procedures, refer to the *Meridian Communications Adaptor user guide* (P0738420).

Looking at the keypad

A standard 12-button pad with digits 0 through 9. *, and # lets the user initiate asynchronous or synchronous data calls to in-house or remote hosts.

The MCA and MCU have an LED that is lit continuously if the set is configured internally for V.35 interface.

Using the keypad

You can invoke commands using your telephone keypad. The procedure:

1 Press the Program (P-key) button.

2 Press the desired digits or symbol from the list below.

3 Execute the command by pressing the P-key again.

Table 2
Program key commands (Part 1 of 3)

Digits	Definition	Notes
#	Manual data call	MCA only
*	Release data call	MCA only
05	Language selection	
20	Asynchronous mode	
21	Synchronous mode	Display required
22	Baud rate	
23	Space parity	
24	Odd parity	
25	Even parity	
26	Mark parity	
27	Host mode	Prompts are not sent to terminal
28	Terminal mode	Prompts are sent to terminal
29	Hotline off	Turns hotline off (see P30)
30	Hotline on	Auto dials when the MCA/MCU detects a position DTR transition or a carriage return (carriage return not applicable in synchronous mode)
31	Virtual leased line off	Turns leased line off (see P32)

Table 2
Program key commands (Part 2 of 3)

Digits	Definition	Notes
32	Virtual leased line on	For applications that require constantly active data call, emulates a dedicated line between terminal and other device
33	Forced DTR off	Turns forced DTR off (see P34)
34	Forced DTR on	Forces data call connection even if RS-232 DTR lead is not active. Useful for sending data to a printer or for PC-PC connections where neither PC is configured as host
35	Dynamic carrier detect off	Turns DCD off (see P36)
36	Dynamic carrier detect on	DCD is constantly high (except for 100 ms after a call is dropped). Included for communication software that requires DCD transition from low to high to activate Answer mode.
37	Remote loopback off	Turns remote loopback off (see P38)
38	Remote loopback on	Remote loopback activated for next call
39	Cancel data ring again	MCA only
40	Full duplex	
41	Half duplex	Applies to synchronous mode only
42	Modem mode	MCA/MCU emulates a modem
43	Network mode	Clocks from a digital network can pass through
44	Internal clock	
45	External clock	
46	PSDS mode off	Turns PSDS mode off (see P47)
47	PSDS mode on	Use Public Switched Data Services
48	Enable echo canceller	
49	Disable echo canceller	

Table 2
Program key commands (Part 3 of 3)

Digits	Definition	Notes
50	SL-1 mode	For default mode; see P51
51	SL-l/DMS-100 mode	When the DMS data unit calls MCA/MCU in synchronous mode, MCA/MCU enters full duplex. To keep MCA at half duplex, program for SL-l/DMS-100 mode.
54	V.25 bis mode off	
55	V.25 bis mode on	For automatic calls with group IV fax
56	Bisynch on	
57	HDLC on	For automatic calls with group IV fax
58	Assert RTS off	
59	Assert RTS on	
60	Auto dial programming	MCA only
61	Auto dial call	MCA only
62	Data parameter display	Applies only to units with monitors
63	EIA leads status display	Applies only to units with monitors
64	Monitor data call	Applies only to units with monitors
65	Reset to default parameters	
66	Emulation selection	
67	Lock/unlock data parameters	
68	VDN key assignment	MCA only

MCA keypad dialing

Keypad dialing is available in synchronous and asynchronous mode.

Making manual data calls

To make a manual data call, press the P-key, followed by an octothorpe **(#)**.

- If you do not have a display, enter the number, followed by the P-key
- If you have a display, you see a prompt:

  MDIAL
  ENTER DIGITS, P to EXIT

  Enter the number, followed by the P-key. The screen confirms the connection:

  DATA CALL CONNECTED

Autodialing

To autodial, press the P-key, followed by 61.

To program the autodialer, press the P-key, followed by 60.

- If you do not have a display, enter the desired number followed by the P-key.
- If you have a display, you see a prompt:

  ADIAL
  ENTER DIGITS, THEN P

  Enter the number, followed by the P-key.

Making Ring Again calls

If the manually or automatically dialed number is busy, Ring Again is automatically placed.

If you have a display, you see the message:

RING AGAIN PLACED

To verify the connection, press P-key and dial 64. The display reads:

DATA CALL CONNECTED

To cancel a Ring Again, press the P-key and dial 39.

- If you do not have a display, press the P-key again.

  If you have a display, you see a message:

  DATA RING AGAIN CANCELLED
  ENTER P to EXIT

  Press the P-key to exit.

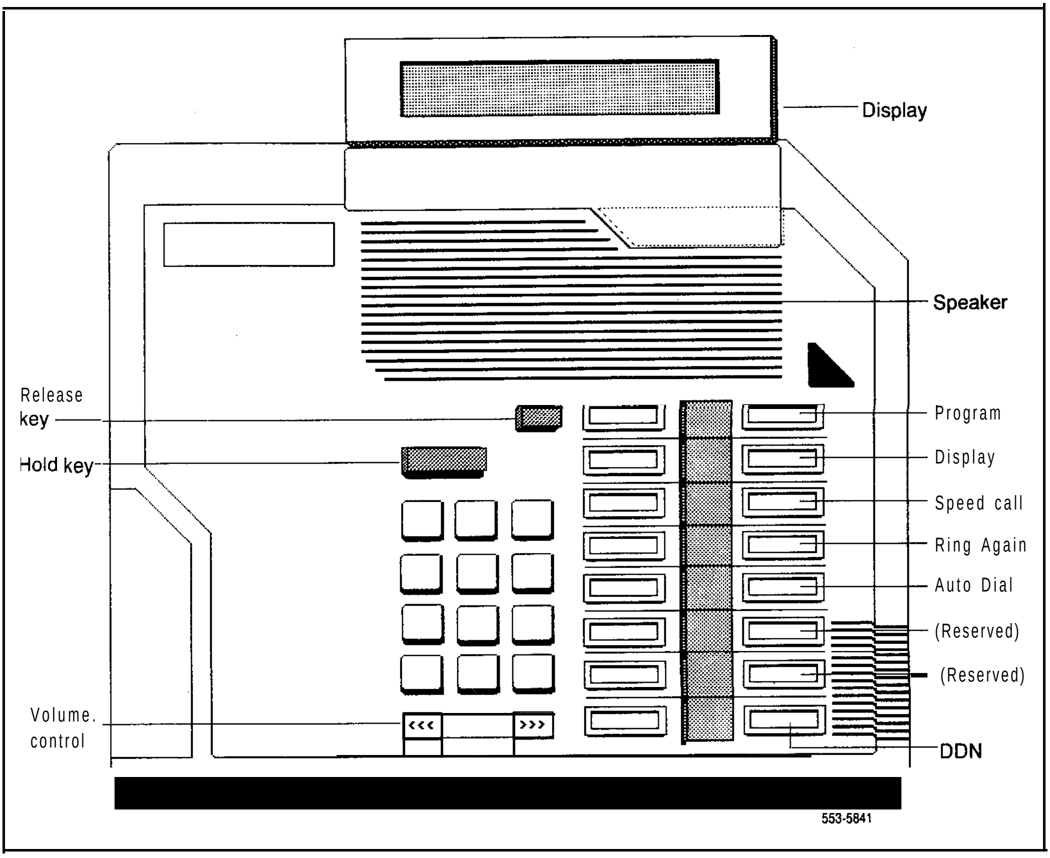
MCU keypad dialing features

The MCU has the following feature keys:

- Speed Call: lets the station user call a DN using a code of up to three digits. Any number of users can be assigned to any list, although it is unwise to combine voice and data entries on the same list.
- Auto Dial: lets user program the module with a frequently used number that is automatically dialed.
- Ring Again: permits queuing of calls to busy DNs within a customer group, alerts the caller when the busy DN is free, and provides automatic callback to the DN.
- Data Directory Number (DDN): allows user to answer an incoming call manually or to initiate a data call using keypad dialing.
- Display: to display autodial and speed call numbers
- Program, described in "Looking at the keypad" on page 9.
- Release: lets user disconnect a call.

Figure 1 shows the MCU.

Figure 1
Meridian Communications Unit



Using keypad features

The following procedure steps show how to use the different features. You will probably only use one or two features at a time; refer to the section that describes the feature you need.

The first column shows the step number. The second column describes the action (for example, answering a question or pressing a button), and Prompt/Indicator shows the system response to the action. (Responses that are bold and capitalized indicate actual system output.) The final column provides notes that can help you feel more comfortable with the system.

Procedure 1
MCU keypad dialing (Part 1 of 5)

Step	Action	Prompt/Indicator	Comment
	Start Condition		Data station idle. MCU power on.
1	Use data Autodial?		If yes, go to Step 13. If not, go to Step 3 (DN must be equipped with this feature).
2	Use Speed Call?		If yes, go to Step 15. If not, go to Step 3 (DN must be equipped with this feature).
3	Press DDN key.	DDN LCD lit; display is blank; dial tone	Go to step 4 to call a local host or smart modem Go to step 8 to call a remote host
Call to local host or smart modem pool calling			
4	Enter number.	Dial tone changes to ringback tone; digits appear on display; MCU receives a ringback tone.	All numeric input, # and * are accepted. MCU sends digits to the switch which places call to host.
5	Called host answers (if busy see Steps 18 or 21).	**CALL CONNECTED SESSION STARTS.** LCD on; ringback tone off; call progress tones provided	Data modules perform handshake and data channel becomes transparent.
6	Follow log in procedures.		Data session begins.

Procedure 1
MCU keypad dialing (Part 2 of 5)

Step	Action	Prompt/Indicator	Comment
7	Proceed with data session.		Host echoes all typed input. Go to Step 23 for disconnect procedures.
Call to remote host			**Multiple hosts**
8	Enter Modem Number xxxx.	DDN LCD blinks; dial tone changes to ringback tone	Wait until modem is reserved.
9	Enter remote number.		Meridian SL-1 calls.
10	Remote host answers.	**CALL CONNECTED SESSION STARTS.** DDN LCD on; ringback tone oft	The call is connected. (If busy, go to Steps 18 or 21 .)
11	Follow log in procedures.		Data session begins.
12	Proceed with data session.		Host echoes all typed input. Go to Step 22 for disconnect procedures.
Data Autodial active?			**Local Host only** (Modify Autodial and Speed Call numbers from DTE keypad or with a service change to the SL-1 database)
13	Press DDN key.	DDN LCD on; dial tone	
14	Press Autodial key.	Display shows previously programmed Autodial number.	The switch places the call to predesignated number. Return to Step 5. If busy, go to Step 18 or 22.
Speed Calling active?			All speed call numbers must be programmed in database associated with user DDN.
15	Press DDN key.	DDN LCD on; dial tone	
16	Press Speed Call key.	Speed Call LCD on; dial tone off	

Procedure 1
MCU keypad dialing (Part 3 of 5)

Step	Action	Prompt/Indicator	Comment
17	Enter 1-, 2- or 3-digit code to access the number to be dialed.	Speed Call LCD off; ringback tone.	Switch calls stored number. Return to Step 5. If busy, go to step 18 or 22.
Host Busy — Ring Again active?			
18	Called; Host Busy.	Busy tone; message: **DESTINATION BUSY ACTIVATE RING AGAIN.**	
19	Press Ring Again once to activate Ring Again function; press twice to cancel	If activated: Ring Again LCD on; DDN LCD off If cancelled: Ring Again LCD on, then off.	Can cancel at any time before call completion by pressing Ring Again a second time.
20	Called port becomes free.	**RING AGAIN READY SELECT LINE, RING AGAIN?** Ring again LCD blinks	MCU sends two second tone to alert users.
21	Press DDN and Ring again keys in sequence.	**CALL CONNECTED SESSION STARTS.** DDN LCD on; Ring Again LCD off; ringback tone off	Go to Step 6.
Host Busy — No Ring Again			
22	Called; Host Busy.	DDN LCD flashes.	Release DDN key.

Procedure 1
MCU keypad dialing (Part 4 of 5)

Step	Action	Prompt/Indicator	Comment
Call disconnect procedures			
23	Enter a disconnect command to terminate session, and to initiate call disconnect by the host terminal. (For local host disconnection, the device (ADM, MCDS, DAC, MCU) connected to the host must be configured to monitor the host DTR. For disconnection by a remote host, the host modem must be configured to monitor host DTR		This causes host to drop DTR and release the connection.
	OR		
	Press the Release key.		
	OR		
	Press break key for 1.6 seconds (asynch only). For terminals with overlapping timed breaks, press the break key several times.		This method does not work on terminals with nonoverlapping timed breaks.
	OR		
	Use three short breaks at least 100 ms long within one second.		
24	Call Disconnect.	**CALL RELEASED.** DDN LCD off	The prompt only appears if MCU is on (For VT100, display prompt by forcing DTR; for VT1 02, release call from keypad to display message. Configure any associated printer for mark and space parity.)

Procedure 1
MCU keypad dialing (Part 5 of 5)

Step	Action	Prompt/indicator	Comment
Program or modify Autodial			
25	Press Autodial key. (Do not press DDN key.)	Autodial LCD blinks. **PROGRAMMING AUTODIAL ENTER NUMBER**	
26	Enter new number.	Display shows digits. **PRESS AUTODIAL TO SAVE**	
27	Press Autodial key.	Autodial LCD off: display returns to idle state.	Autodial number changes
Program or modify Speed Call			
28	Press Speed Call key. (Do not press DDN key.)	Speed Call LCD blinks. **PROGRAMMING SPEED CALL ENTER ACCESS CODE AND NUMBER**	
29	Dial 1- to 3-digit access code.		
30	Dial Speed Call number.	Code and number appear on display. **PRESS SPEED CALL TO SAVE**	Include * and # where necessary.
31	Press Speed Call key.	Speed Call LCD off; display returns to idle.	Speed Call list contains new entry.
32	Repeat Steps 28-31 to program more numbers.		Use a different access code for each number

Using the keyboard

MCA and MCU let users enter command via the keyboard. For most calls, the keypad commands are adequate. More sophisticated communications applications, for example, those that interface with other software, require keyboard input.

There are two protocols available for keyboard dialing: NT and AT. NT is the Northern Telecom standard; AT is the Hayes Smartmodem standard. Calls outside the network require the AT protocol. NT commands are more succinct, making NT to use easier for internal calls.

A user can initiate data calls to in-house or remote hosts using the terminal keyboard of a DTE. Keyboard dialing capability is available only for ASCII, asynchronous, character mode, interactive terminals equipped with an RS-232 interface and connected to the MCA/MCU.

Special keyboard capabilities

The keyboard has many of the same calling features as the keypad. In addition, the keyboard provides:

- Autobaud. After autobauding, MCA/MCU remembers the current speed.
- Autoparity. MCA/MCU detects the carriage return character speed. If the terminal parity matches the 8-bit no parity default, a legible prompt appears. If a legible prompt does not appear, the user needs to enter a period, followed by a carriage return to force the MCA/MCU to detect the parity.
- Asynchronous data baud rates of 110, 1.50, 300,600, 1200, 2400, 4800. 9600, and 19200 bps
- Two stop bits for 110 baud and one bit for other baud rates
- A menu driven interface (with NT protocols only)

Making and answering calls with NT protocols

NT protocols simplify the process of making and answering calls while providing features that can speed or automate calling.

Making calls

The first prompt

ENTER NUMBER OR H (FOR HELP)

appears on the screen after the user enters a carriage return. To make a telephone call:

Type the number desired

Otherwise,

Press H to access the Help menus.

Normally, the call is answered and the user initiates log in procedures required by the host terminal. For information on call variations (busy signals, digital trunk calls, smart modem pool calls) see "Handling call variations" on page 32.

Using the Help menus

Pressing H produces a Command menu with six selections:

A - AUTODIAL: Select to automatically dial the stored number

C - CALL: Select, then enter telephone number (the result is the same as if the number had been entered in response to the original prompt)

D - DISPLAY: Displays terminal parameters

S - SPEED CALL: After entering access code, the system speed dials the predesignated number.

M - MODIFY: Accesses the Modify menu (below)

F - SCRIPT FILE DIRECTORY: Lists the script files that currently reside in the user's directory (applies only to MCA)

Using the Modify Menu

Select M from the Command menu to access the Modify menu.

A - AUTO NUMBER: User is prompted with the message **AUTO DIAL** NO.: to enter the new number to be stored for automatic dialing

S - SPEED NUMBER: The user is prompted to **ENTER ACCESS CODE,** then to enter a new **SPEED NUMBER**

R - REMOTE LOOPBACK: User must respond to the question: **REMOTE LOOPBACK (Y/N)**

M - MANUAL ANSWER: User must respond to the question: **MANUAL ANSWER** (Y/N) where a no response indicates automatic answer

Q - QUIT MODIFY: Exits the Modify menu

F - SCRIPT FILE (for MCA only): Accesses Script menu (below)

Using the Script Menu (MCA only)

Select F from the Modify menu to access the Script menu.

C - LEARN SCRIPT: Accesses Learn Script menu (below)

D - DELETE SCRIPT: Accesses Delete Script menu (below)

E - ESCAPE CODE

Q - QUIT: Exits the Script menu

Using the Learn Script/Delete Script menus (MCA only)

The Learn Script and Delete Script menus have similar prompts:

A - LEARN/DELETE AUTO DIAL SCRIPT:?

S - LEARN/DELETE SPEED CALL SCRIPT:?

D - SCRIPT FILE DIRECTORY: Lists script files in user’ s directory

Q - QUIT: Exits menu.

Answering calls

Unless Manual Answer has been selected ("Using the Modify Menu" on page 23), calls are answered automatically.

If calls are to be answered manually, the calling number appears on the screen followed by the message:

INCOMING CALL. ANSWER? (Y/N<Y>)

The user types a <CR> or a Y, followed by a <CR> to answer the call.

Usually the user sees an **INCOMING CALL CONNECTED** message. For other possible responses, see "Rules and information governing NT protocols" on page 24

Rules and information governing NT protocols

The following rules apply to NT dialing:

1 The data terminal must be on-line. Both the terminal and the MCA/MCU must be powered on.

2 Make sure special features have been programmed. (If a user accesses Speed Call or Autodial and no number has been programmed, a **NOT IN SERVICE** message appears and the call is released.

3 User inputs may be in lower or upper case and must be terminated by a carriage return (or equivalent).

4 Dial a call using keyboard numbers, *, and #. No other characters are accepted. Invalid input results in an **INVALID COMMAND/ENTRY** message followed by the command to **REENTER**

5 A call to an invalid number produces a **NOT IN SERVICE** message and releases the call.

6 Edit input with the backspace or delete keys or their equivalents.

7 All prompts in setup are in upper case. Those requiring user input are followed by a colon and a space (:) while others are followed by a semicolon and carriage return or line feed.

8 Abandon an asynchronous call during setup using <Ctrl-Z>.

9 If you receive a call from someone who has requested a data loopback, **you** receive an **UNDER TEST** message instead of **DATA CALL CONNECTED**

10 If the call cannot be completed even though the station is not busy, a **SERVICE UNVAILABLE CALL RELEASED** prompt appears.

11 If the user changes the terminal speed and does not reautobaud, the system prompt may be garbage.

12 If an incoming call has a mismatched baud rate or unsupported data pattern, the user receives an **INCOMPATIBLE INCOMING CALL** message

13 Return to the menu any time you receive the **REENTER** prompt.

14 If the DN has a digit display feature, the digits appear as the system sends them.

Calling with AT protocols

AT protocols are appropriate for calls made outside the network or for calls that interface with another software application. The AT standard is universally accepted, but requires more keystrokes than NT.

To make an AT call

Press **<Ctrl-Z>**

AT calls are prefixed with the letters AT. After typing the AT command:

Press **<CR>**

The following Table 3 shows the calling commands available with AT. Command lines are limited to a maximum of 40 characters, not including the AT and spaces.

The letter “n” represents a digit or symbol (O-9,**#,** *) dialed. If you omit the digit, the system assumes that the parameter is zero. Commands have different possible digits and symbols; see the notes for each command.

Table 3
AT Commands (Part 1 of 3)

Command	Meaning	Notes
ATA	Answer incoming data call	If MCA/MCU is set for manual answer in S registers
ATDnnnn	Dial	
A/	Repeat last command	Carriage return not required
AT0	On-line	Hit three escape characters rapidly to go off-line
ATDPnnnn	Voice call	Maximum 32 digits. Available only with MCA
ATF3	Handsfree/mute	Toggle between mute and normal. Available only with MCA.
ATM	Voice call on hold	Available only with MCA.
ATF5	Select (voice call off hold)	Available only with MCA.
ATH0	Hang up data call	Must first be off-line (hit three escape characters). Return to command mode by pressing the program key and *. Return to on-line mode by entering AT0
ATHP	Hang up voice call	Available only with MCA.
ATIn	Product ID code	If n=0, sends Smartmodem ID (default 960; can also be 122 or 240); if n=1 , sends result code ' 206;' if n=4, sends result codes 'a037800C004420' and 'b100000000.' (These are the same values returned by the Smartmodem V-series 9600.)

Table 3
AT Commands (Part 2 of 3)

Command	Meaning	Notes
ATQn	Result code	If n=O, results codes are sent; if n=l , no result codes are sent. The result codes: 0: ok; command was successful 1: connect; far end answered 2: ring; local end is ringing 3: no carrier; call was released 4: error; command line contains error 5: connect 1200 7: busy; busy signal detected 10: connect 2400 11: connect 4800 12: connect 9600 14: connect 19200
ATVn	Verbal result	If n=0, number codes are sent; if n=1, no numeric codes are sent. See ATQn for result codes
ATXn	Result code selection	If n=1 , supports result codes O-4; if n=l or 2 supports all result codes except 7; if n=3 or 4 supports all result codes. See ATQn for result codes.
ATSn?	Reads the value of S register n	See “Reading and Writing to S registers” on page 29
ATSn=xxx	Writes xxx to S register n	See “Reading and Writing to S registers” on page 29
ATZ	Soft reset to default parameters	Returns registers SO through S49 and AT configurations to default settings
ATCn	Carrier detect	If n=l , carrier detect is enabled; if n=O, it is disabled
ATEn	Echo	If n=1, command echo back to terminal; if n=0, there is no echo
ATTSP!	Transparent mode	Displays raw signaling messages between PBX and MCA; not available with MCU.

Table 3
AT Commands (Part 3 of 3)

Command	Meaning	Notes
AT&Cn	Carrier detect control	If n=1, carrier detect is asserted; if n=0, it is not asserted
AT&Dn	DTR response	When DTR status changes and n=0, ignore; if n=1, go off-line; if n=2, release the call; if n=3, release the call and return Hayes parameters to default
AT&Rn	Clear-to-send	If n=1, CTS is always present; if n=0 it is not always present
AT&Sn	Data set ready	If n=1, DSR is always present: if n=1, it is not always present
AT&F	Factory configuration	If n=1, returns AT configuration to defaults; n=O leaves unchanged
AT&Yn	Recall user profile	Recalls registers SO through S49 and AT configuration to default settings on power up if n=1

Dialing modifiers

The following rules apply to calling telephone numbers:

- Use digits O-9 and A, B, C, and D for placing calls

  To instruct the PBX to begin dialing the digits enter, press a #.
- To outpulse a tone, press *.
- Delay processing by pressing a comma (time delay is set in S8 register)
- Return to command state after dialing by using a semicolon.

Reading and Writing to S registers

The S registers configure the MCA/MCU. To read an S register, type

ATSn?

where n is the register number.

To write to an S register, type

ATSn=x

where x is the new value for the S register:

Table 4 shows the S register values.

Table 4
S register values (Part 1 of 2)

Register	Definition	Notes
S0	Number of rings incoming, range 0-255	Disable auto answer by setting n=O. Set to other value to indicate number of rings before call answer
S1	Ring count	This is a read-only register that stores current number of rings for incoming data calls
S2	Escape character, range O-255	ASCII value of escape character. If set to a value of 128 or greater, escape character is disabled
S3	Carriage return character, range 0-127	ASCII value of carriage return used for command line termination and prompt termination; default is 13
s 4	Line feed character, range O-l 27	ASCII value of line feed character; default is 10
s 5	Backspace character, range O-32, 127	Holds two values for backspace, one for the backspace key, one for the character echoed to move the cursor back
S6	Wait time before blind typing	Not applicable
s7	Wait time for carrier/dial tone; range I-255	Holds Carrier detect timeout value; when time in seconds elapses; call is released. Default is 30 seconds.
S8	Pause time for comma; range =0 - 255	A comma delays call dialing by the number of seconds defined in this register; default is two seconds. Does not apply to voice commands.
S9	Carrier detect response time	Not applicable
S10	Lost carrier hang up delay	Not applicable

Table 4
S register values (Part 2 of 2)

Register	Definition	Notes
S11	DTMF tone duration	Not applicable
s12	Escape code guard time in milliseconds: range =O-255	Guard time helps recognize escape sequence, used because different numbers of escape characters have different means. Default is 50 milliseconds (one second)
S51	Delay until modem pool activation; range =0-255	Each S51 increment represents a .25 seconds delay before outbound modem pool activation; default is 16 (four seconds). Not altered by software reset
S52,53,54	Product code response	Contain the product identification code returned in response to ATI command.
S66	AT/KBD autobaud interpretation, 0 or 1	A value of 0 means only Hayes autobaud is possible; a value of 1 permits Hayes and keyboard autobaud dialing

Handling call variations

There are several situations applying to both NT and AT calling procedures that require special handling: busy phone calls, digital trunk calls, manual smart modem pool calls, and access errors.

Handling busy calls

When a number is busy, the user receives a BUSY RING AGAIN? (Y/N) or a BUSY, PREVIOUS RING AGAIN ACTIVE, REPLACE? (Y/N) prompt. (The latter prompt indicates that another Ring Again is active.) If the user responds with a Y, the system continues to try to call the number, sending a message when the station is available. (If the user is busy with another call, no message is sent.) If the user responds with an N, the call is released.

The ring again feature is available for local calls and for queuing on trunk calls.

Making digital trunk calls

Digital trunks provide additional, optional features: authorization code, expensive route warning, and off hook queuing.

- If an authorization code is required, the user is prompted to enter it after initiating the call.
- If the system has Least Cost Routing, the user can choose whether to take the expensive route or to queue for the next available trunk.
- If the system has Off Hook Queuing, the user may simply be asked to wait for a free trunk.

Manual smart modem pool calls

To make a manual smart modem pool call, the user:

1. Calls the local modem, receiving a **CALL CONNECTED. SESSION STARTS** message.
2. Dials ATDT followed by the number, for example: ATDT5551212.

The remote modem responds with a **CONNECT** message, and the remote host requests the login sequence.

Dealing with access errors

A user calling a local modem can experience one of three access. errors: no answer, modem busy, or illegal number.

- If there is no answer, the user should disconnect.
- If the modem is busy, refer to "Handling busy calls" on page 32
- If the number called is invalid, the message **NOT IN SERVICE** appears and the system releases the call.

A user calling a remote modem can encounter several difficulties after entering the remote number.

- If the user misdials or does not complete dialing within the timeout period (usually 30 seconds) the call is released.
- If the remote modem does not respond properly within the resource block timeout (typically 120 seconds) the call is released.
- If the trunk is busy, out of service, or restricted, the user receives a **NOT IN SERVICE** message and the call is released.

Data adapter device

The Meridian Data adapter device, A64, is a 44 pin, 5 volt CMOS device that interfaces with the A44 and the 80C31 microprocessor, providing serial/ parallel and parallel/serial conversions as well as reset and clock monitoring circuitry. Timer/counter circuitry regulates synchronous data operation.

Microprocessors

The Signetics 80C31 microprocessor operates at 20 MHz to take advantage of additional real time. It controls MCA/MCU data functions, interfacing with the A64, a set of EIA drivers and receivers, USART, and memory and handling call requests and other protocols. In the second data channel, the 80C31 initializes the A44.

In the primary channel, a Mitsubishi M50747 microprocessor initializes the A44 and interfaces to the display. The MS0747 also performs key scanning and updates the LCD.

RS-232 and V.35 drivers

The MCA/MCU uses CMOS 14506A transceivers for RS232 drivers and receivers. The V.35 interface uses CMOS 34C86 and 34C87 drivers and receivers.

Power

A universal isolated power supply provides +5 volts, t12 volts, and -12 volts to the MCU through a connector on the daughter board.The MCU does not require internal power conversion.

Language ROM

A separate ROM supports six languages. The second data channel does not interface to the display and therefore cannot support the language ROM.

8530 Communications controller

The 8530 communications controller performs the same functions as the 2661 USART and provides High-level Data Link Control (HDLC) control to implement Meridian Packet Handler (MPH).

Digital to Analog converters (MCU only)

8-bit Digital to Analog converters generate call progress tones for both MCU channels. The 80C31 microprocessors convert the call progress tones and channel them through the communications controller to the Digital to Analog converters.

Memory

Two 64 K ROMs and one 8 K static RAM reside on each MCA and MCU board.

MCA memory configuration

The main ROM holds the MCA base code (48.5 K) and the English prompts and the Norwegian language prompts (12.5 K). The language ROM holds the Parisian and Quebec French, Spanish, Italian, and Norwegian screen prompts (51 K). The script feature consumes 1.7 K per language.

4 K of the available 8 K static RAM is currently used.

MCU memory configuration

Since the MCU does not support VCO and script features, the English language resides on the language ROM, where there is more space, instead of on the main ROM. As a result, the main ROM has the base code, including the MPH feature (48 K), and the Norwegian language prompts (2 K). Approximately 14 K is available for future development.

The language ROM holds the Parisian and Quebec French, Spanish, German, English, and Norwegian screen prompts (50 K).

5.2 K of the 8 K static RAM is currently used.

MCA/MCU Performance

The MCA/MCU by itself corrupts less than one in 10E9 bits. The corruption rate between the MCA/MCU and another data module connected through the Meridian 1 is less than one in 10E7 bits.

Real time analysis

The worst case requires a total of 95 microseconds of the 125 microseconds available at 20Mhz.

DTE/DCE configurations

The MCA/MCU can connect to a terminal, printer, computer port, fax, video equipment, and other peripherals. MPH requires the DTE interface.

Software

For MPH, MCU requires X11 release 19 software or later. Most non-MPH applications can use Xl 1 release 14 software or later. To use the PSDS feature, the system must be running X11 release 16 or later.

Operating parameters

The data parameters are stored locally although the configuration is set in the Meridian 1 system If the parameters are set before installation, the configuration information will be lost.

With X11 release 18 and later, set system parameters using LD11 or the keypad. (See ***the X11 input/output guide*** (553-3001-400) for prompt and response details.) Beginning with X11 release 18 and later software, set parameters using LD11 or the keypad.

Terminal communication

The MCA communicates with Data Terminal Equipment (DTE) using the operating parameters shown in the table below.

Table 5
YCA operating parameters

Synchronization	Asynchronous	Synchronous
Number of Bits	8 bits	6,7,8
Parity	none (unchecked)	not applicable
Data rate	110, 150, 300, 1200, 2400, 4800, 9600,19200 bits per second (auto-baud)	1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 38400, 40800, 48000, 56000, and 64000 bits per second
Stop bits	2 stop bits for 110 bits per second; 1 bit for all other speeds	not applicable
Transmission	Full duplex	Full or half duplex

> ***Note:*** The MCA requires an additional power supply board. See “Specifications” on page 39. for power requirements information.

Figure 2 shows the back of an MMT with an MCA mounted; Figure 3 shows a block diagram of the MMT and MCA.

Figure 2
Back of Meridian Modular Telephone showing MCA

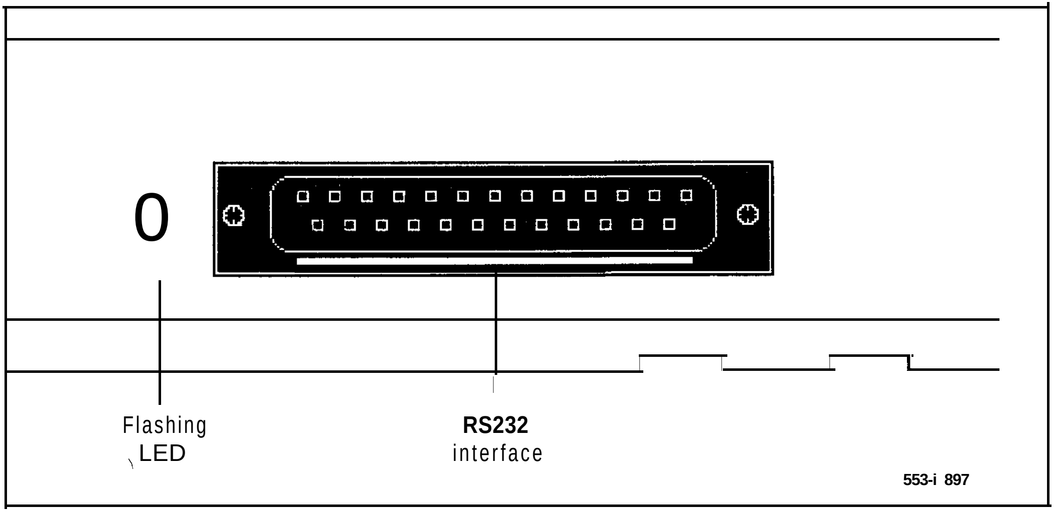
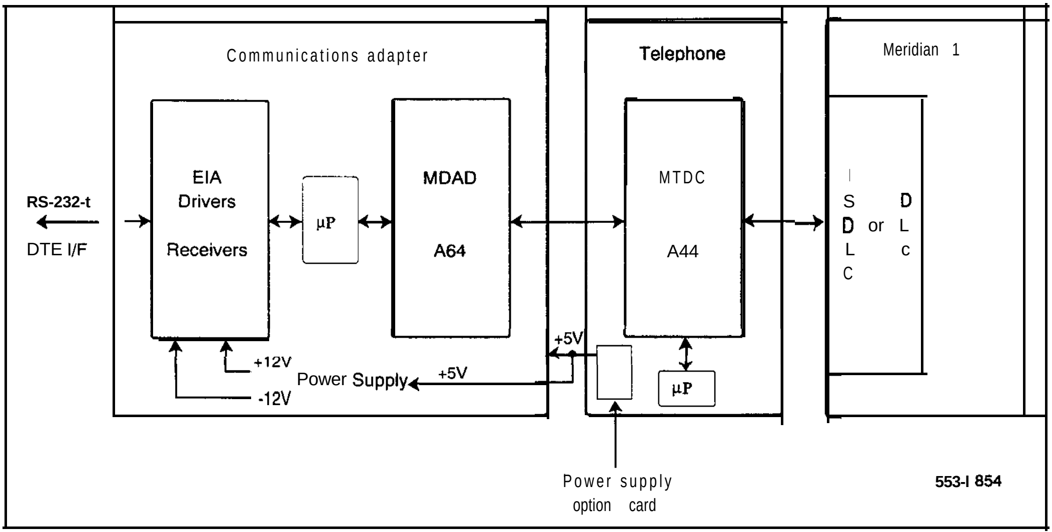


Figure 3
Block diagram of MCA and Meridian Modular Telephone



Specifications

This chapter outlines the specifications for the MCU and the MCA.

MCA/MCU parameters

The MCA/MCU can communicate with an ISDLC/XDLC over a distance of 3500 feet using 24-gauge D-type inside cable, with an RS-232 DTE over a maximum distance of 50 feet (with speed up to 20,000 bps), and with a V.35 DTE over 4000 feet at 64 Kbps.

It operates at temperatures between zero and 40 degrees

RS-232 interface

Optional jumper plugs on the MCA/MCU board help establish the RS-232 interface. The MCA/MCU meets the EIA RS-232C standards for DTE/DCE interfaces. The electrical characteristics of the interface to the ISDLC/XDLC are the same as for the ASIM.

V.35 interface

The MCA/MCU has a DB25 connector that provides a V.35 interface to V.35 data terminals, conforming electrically to the CCITT V.35 standard and mechanically to ISO-21 10. A DB25-V.35 cable connects a V.35 DTE to the MCA/MCU.

In MPH mode, the MCU must be configured as a DTE. For non-MPH applications, the MCU acts like a DCE, but can be upgraded to emulate a DTE.

Pins 1 and 2 need to be jumpered for A Law.

V.25 bis automatic calling

Synchronous data terminal equipment can originate or answer data calls automatically using this feature. V.25 bis can operate in one of two modes:

1 Direct call and/or answer controlled by DTE. Automatically originates or answers a call by raising the DTE DTR control lead.

2 Addressed call and/or answer authorized by DTE. DTE can instruct the DCE on procedures for originating and answering calls. The MCA/MCU uses nine interchange circuits on the RS-232 or V.35 interface as shown below in Table 6.

Table 6
Interchange circuits

Transmit data	TXD	103	Pin 2
Receive data	RXD	104	Pin 3
Clear to send	CTS	105	Pin 5
Data set ready	DSR	107	Pin 6
Data terminal ready	DTR	108	Pin.20
Ext Tx signal timing		113	Pin 24
Trans signal timing		114	Pin 15
Rec signal timing		115	Pin 17
Ring indicator	RI	125	Pin 22

Video and group four FAX require the synchronous transmission format that MCA/MCU provides for V.25 calling. The video or FAX equipment must ensure that each frame is processed before a new frame is sent.

For synchronous byte-oriented operation, the three-character V.25 commands are encoded in sync format. The frame message field, of variable length, contains the control or command encoded in IA5 characters, each of which includes a 7-bit code and an odd parity bit.

The message exchange between the MCA/MCU and DTE is asynchronous and balanced. MCA/MCU responds to DTE with an indication or a DSR assertion. MCA/MCU issues an invalid indicator and/or does not assert DSR lead if it detects an erroneous frame start or other problem.

MCA/MCU in V.25 bis mode supports these commands:

- CRN: call request with number provided. DTE sends to MCA/MCU to initiate call.
- CIC: connect incoming call. DTE instructs MCA/MCU to answer a call.
- INC: incoming call indication. MCA/MCU sends to DTE to signify incoming call detection.
- INV: invalid indication. MCA/MCU has received a DTE command that it does not support, or a valid command followed by invalid parameters.
- CFI: call failure indication. MCA/MCU responds to DTE by indicating that the call was unsuccessful because of a busy tone, an unstored number, a busy DCE, or failure to detect an answer tone.

DTE tells MCA/MCU to respond to a CRN or CIC command. If the receiving unit is busy or out of order, DTE receives no indication and drops DTR to release the call after thirty seconds.

MCA/MCU also supports HDLC and Bisynch for video and group four FAX machines.

Telephone interface

The MCU connection to the ISDLC or XDLC uses a six-position jack mounted on the rear of the housing at the position labeled “line.” The MCA is connected to the Meridian Modular Telephone.

A five conductor cord connects the main assembly of the MCU to the power supply. The power supply is integrated into the MCU and cannot be separated. The MCA is powered from the telephone.

Synchronous mode

In Synchronous mode, the MCA/MCU transmits data at 1200, 2400, 3600, 4800, 7200, 9600, 14400, 19200, 38400, 40800, 48000, 56000 (the default) or 64000 bits per seconds.

Asynchronous mode

In Asynchronous mode, the MCA/MCU transmits data at 110, 150, 300, 600, 1200, 2400, 4800, 9600 (default), or 19200 bits per second After start up, speeds and parity are then determined by an autobauding and autoparity routine in the firmware.

Power supply

The power supply is integrated into the MCU.

An optional 220 V/50 Hz powered MCU is available (A0318291) for the international market.

An optional 100 V/50 Hz powered MCU (A0336890) is available for the Japanese market.

EIA RS-232 leads

Table 7 shows the EIA leads supported by the MCA/MCU.

Table 7
EIA signals supported by MCA/MCU (Part 1 of 2)

Circuit number		MCA/ MCU DB-25	Signal source		Abbrev.	Description
EIA	CCITT	Pin No.	DTE	MCA/ MCU		
AA	101	1				Protective Ground *
BA	103	2	X		SD	Transmitted Data
BB	104	3		X	RD	Received Data
CA	105	4	X		RTS	Request to Send
CB	106	5		X	CTS	Clear to Send
CC	107	6		X	DSR	Data Set Ready
AB	102	7		X		Signal Ground
CF	109	8		X	CD	Carrier Detect
		9/10				no connection
SBA	118	11	X			Sec. Trans Data
SBB	119	12		X		Sec. Rec. Data
		13114				no connection
DB	113	15		X	SCT	Received Data
		16				no connection

Table 7
EIA signals supported by MCA/MCU (Part 2 of 2)

Circuit number		MCA/ MCU DB-25	Signal source		Abbrev.	Description
EIA	CCITT	Pin No.	DTE	MCA/ MCU		
DD	128	17		X	SCR	Received Clock
		18/19				no connection
CD	108.2	20	X		DTR	Data Terminal Ready
		21				no connection
CE	125	22		X	RI	Ring Indicator
CH/CI	126	23	X			Data Rate Select
DA		24	X			External Transmit Clock
BO		25	X			Busy Out **

* Pin 1 connects to the MCDS shelf frame.

** Pin 25 is connected to an RS-232 receiver on the MCA/MCU, but is ignored by the MCA/ MCU controller

CCITT V.35 leads

– Table 8 shows the V.35 (CCITT) leads supported by the MCA/MCU. An adapter cable is needed to convert the IS0 2110 (DB-25) into an IS0 2593 (34-pin cable)

For DTE equipped with female ISO-2593, Adapter cable number A0300752 is required.

For DTE equipped with male ISO-2593, Adapter cable number A0300753 is required.

Table 8
V.35 CCITT signals supported by MCA/MCU (Part 1 of 2)

v.35 CCITT	MCA/MCU DB-25 Pin No.	Abbrev	Adapter cable DB-25 Pin No.	Adapter cable v.35 Pin No	Signal Source DTE	Signal Source MCA/MCU	Description
101	1	DG	1	A			Protective Ground *
103A	2	SDA	2	P	X		Transmit Data A
104A	3	RDA	3	R		X	Receive Data A
105	4	RTS	4	C	X		Request to Send
106	5	CTS	5	D		X	Clear to Send
107	6	DSR	6	E		X	Data Set Ready
102	7	S	7	B			Signal Ground
109	8	CD	8	F		X	Carrier Detect
----	9/10	----	9/10	CC/L			no connection
----	11	----	11	K	X		**
115B	12	SCRB	12	X		X	Serial Clock Receive B
1038	13	SDB	13	S	X		Transmit Data B

Table 8
V.35 CCITT signals supported by MCA/MCU (Part 2 of 2)

v.35 CCITT	MCA/MCU DB-25 Pin No.	Abbrev	Adapter cable		Signal Source		Description
			DB-25 Pin No.	v.35 Pin No	DTE	MCA/MCU	
14B	14	SCTB	14	AA		X	Serial Clock Transmit B
14A	15	SCTA	15	Y		X	Serial Clock Transmit A
04B	16	RDB	16	T		X	Receive Data B
15A	17	SCRA	17	v		X	Serial Clock Receive A
--	18/19	----	18119	M/HH			no connection
08.2	20	DTR	20	H	X		Data Terminal Ready
--	21	----	21	EE			no connection
25	22	RI	22	J		X	Ring Indicator
13B	23	SCTEB	23	W	X	X	Tran Sign Elemt Time B
13A	24	SCTEA	24	U	X	X	Tran Sign Elemt Time A
--	25	----	25	MM	X		**

Pin 1 is connected to the MCDS shelf Frame.

' These leads are ignored by the MCA/MCU controller.

The MCA/MCU may be placed as far from its associated data terminal or computer port as is consistent with EIA RS-232 or V.35 lead specifications.

Power requirements

The MCA/MCU is powered from an external power supply. The power requirements are as follows:

Voltage	Tolerance	Current	
		Nominal	Maximum
+5 V dc	±5%	0.8 amp	1 .O amp
+12 V dc	±10%	85 mA	0.2 amp
-12Udc	±10%	35 mA	0.2 amp

A total of 1.0 ampere is required from the 110 V ac power receptacle.

Environmental

The MCA/MCU cannot show any evidence of corrosion, discoloration, brittleness, electrical performance degradation, or safety-endangering malfunctions due to environmental stresses. It should operate properly and safely in an operating temperature range of 0 to 50 C, with humidity between 5 and 85%, low air pressure of 600 mbar, vibration of 5-200 Hz, and RFI susceptibility of five V/M. The unit should survive a drop of 75 cm without damage.

Reliability

The mean time between failure is ten years at a 25 C operating temperature, with a mean time of 15 minutes to diagnose and repair. Field replaceable parts include the line cord (equipped with Teledapt connectors), key caps, labels, external power supply, and display.

MCA/MCU protocols and functional support

MCA/MCU supports the T-Link and DM-DM protocols and facilitates PSDS as described below:

- T-Link, NT’ s proprietary protocol for transferring either asynchronous or synchronous data over a 64 Kbps digital circuit used by SL-100/DMS 100 data devices.
- DM-DM, an NT proprietary protocol used by Meridian 1 data services.
- PSDS, Public Switched Data Services, help establish a connection between a Meridian 1 and a Central Office or another vendor’ s PSDS compatible switch.

Installation and maintenance

This chapter describes the installation, maintenance, and removal techniques for the MCA/MCU. The final section of the chapter gives troubleshooting advice.

Configuring the V.35

The MCA/MCU is shipped from the factory configured for the RS232 interface. Configure V.35 in the field at installation time.

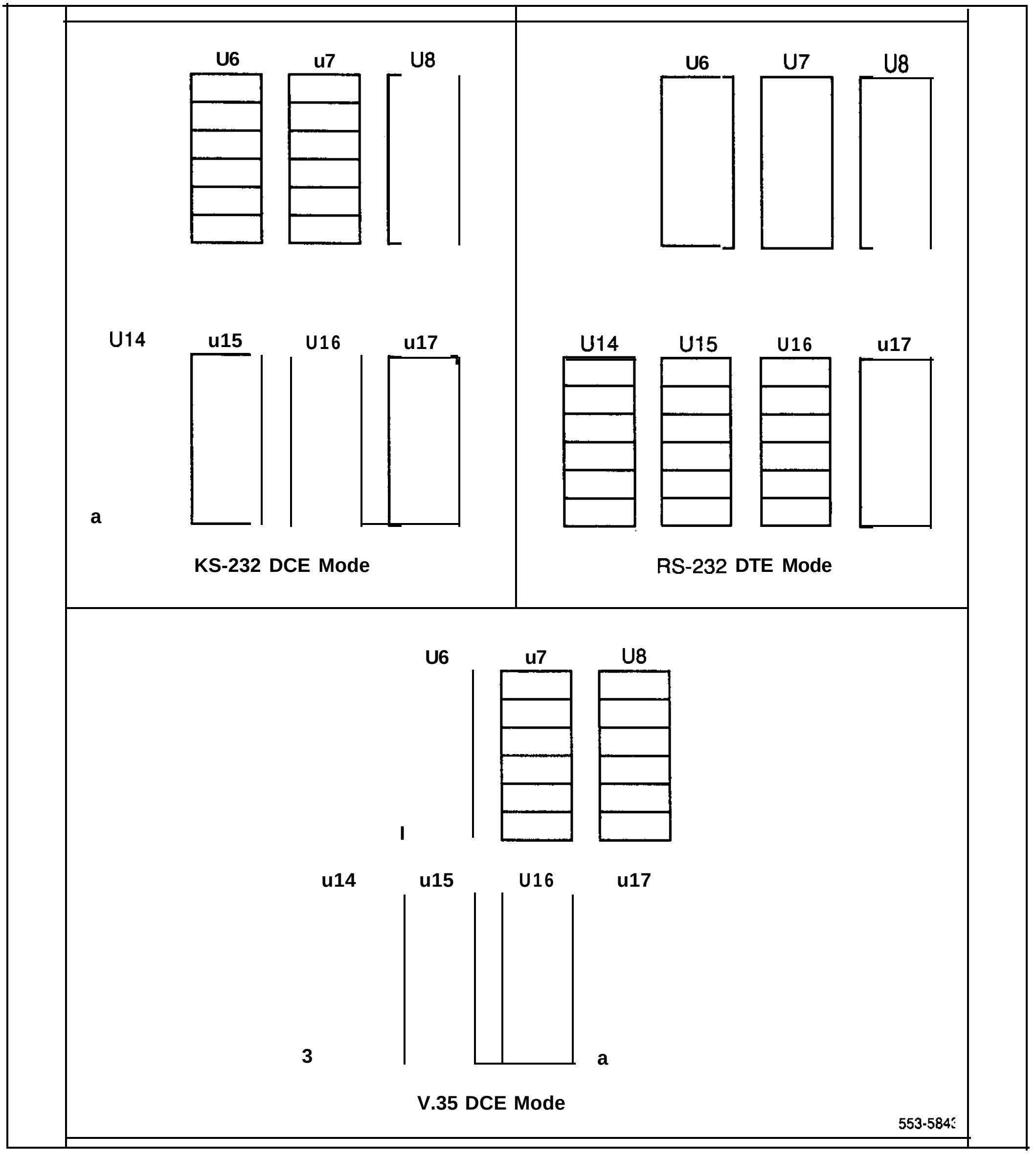
V.35 and MCA

The V.35 interface can be selected with two DIP jumpers. The V.35 signals appear on the DB-25 connector; an adapter cable is required. The MCA can be placed as far from its associated data terminal or computer port as is consistent with EIA RS232 or V.35. Jumper plugs on the MCA card may be moved from RS232 to V.35.

V.35 and MCU

For V.35 interface configuration, remove a IO-pin DIP jumper plug from the MCU RS-232C sockets and install it in the V.35 socket. These sockets are located on the daughter board inside the MCU as shown in Figure 3.

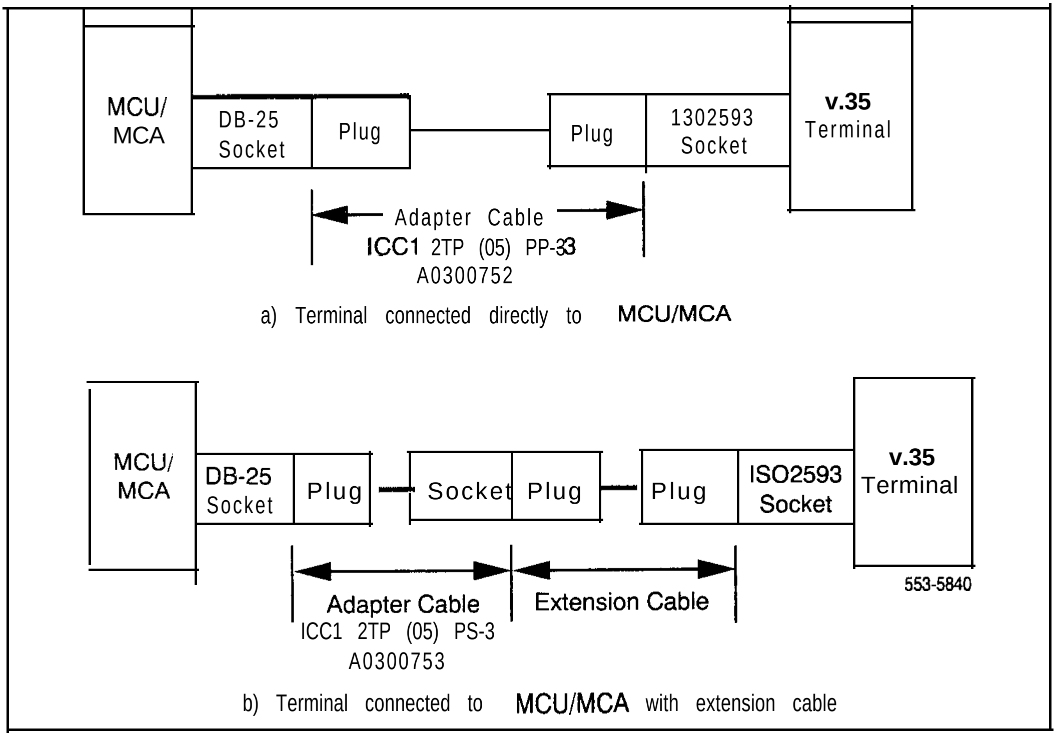
Figure 3
V.35 and socket locations



Adapter cable

An adapter cable converts the ISO-2110 connector into an ISO-2593 (34-pin connector) as show in Figure 4.

Figure 4
MCU/MCA with adapter cable connection for V.35



For a DTE equipped with female ISO-2593, Adapter cable number A0300752 is required.

- For a DTE equipped with male ISO-2593, Adapter cable number A0300753 is required.

Cabling

The physical capacities and provisioning requirements of data feature hardware must be met upon installation. Table 9 lists cabling and environmental requirement and limitations. No special installation tools are needed.

Table 9
Cabling capabilities

Allowable cabling	Type D PVC inside wiring cable PIC for outside use only		
Maximum separation distances			
MCU/MCA to DTE	Distance consistent with EIA RS-232 cable loading specifications. Note that in some cases the above limitations may be exceeded with no adverse effect on MCU operation.		
Distance (by cable type)			
MCU/MCA to DLC	PIC outside	PVC inside	Gauge
	4000 ft. (1220 m)	4000 ft. (1219 m)	22 AWG
	3500 ft. (1070 m)	2900 ft. (884 m)	24 AWG
	2000 ft. (610 m)		26 AWG
	2500 ft. (760 m)	2500 ft. (760 m)	22/24 mixed
	1500 ft. (460 m)	1200 ft. (370 m)	24/26 mixed

DTE interface

The MCA/MCU provides a 25-pin connector (that conforms to ISO-2110) that mounted in the rear on the housing.

If an RS-232C cable connects the MCU to an ADM3 terminal, disconnect pin 22. (The ADM3 enters test mode if pin 22 remains connected.)

When the MCU is connected to a VT100 terminal, a break on the terminal drops DTR. The MCU does not display the released message. Display the prompt by forcing DTR on the MCU.

When the MCU is connected to a VT102 terminal, a break on the terminal drops DTR. The MCU does not display the released message.

Pseudo-random pattern 511 data sent in the idle mode disconnects keypad dialing. Stop sending data before making the call.

Configuration

Hardware provisioning capacities follow:

Item	Comments
MCA/MCU	Each MCA/MCU is connected to a data port of an ISDLC/XDLC
MCA/MCU terminating on ISDLC/ XDLC	No voice TN with MCU. Refer to LD11.

Field-replaceable items

The table below lists items that can be replaced in the field.

The related hardware is installed in different basic configurations with equipment allocated as follows:

one	MCU (NTND36AA) or MCA (NT2K65XH)
one	QPC578 or 8D02 port
one	NE 25MQA2A (A0237451) RS-232 cable (MCU – DTE)

Note: If the MCU is specifically configured for V.35 interface, an adapter cable is needed (see Figure 5).

one	RS-232 cord assembly, 16 ft (4.8 m) MCU to DTE (NE-25MQ2A); A0237451
one	NE D44-87, 7 ft (2 m) telephone to MCU, A0248297
one	NPS50318 wall jack, 7 ft (2 m) A0301005
one	Plug to plug adapter cable ICC12TP (05) PP-3, 5 ft. (1.5 m), A0300752
one	Plug to socket adapter cable ICC12TP (05) PS-3, 5 ft. (1.5 m), A0300753

The Meridian 1 recognizes the MCA/MCU port as a Meridian Modular Telephone. Enter data hardware information into memory using LD11.

Installing and removing the MCU

Installation and removal procedure are provided in detail in Procedures 2 and 3. Disconnect the MCU from the network by disabling the database port with LD32.

installation and removal procedures

The procedure requires these materials:

- NTND36AA (MCU)
  XDLC port
- Power supply
- NPS 503 1 8-L1 line cord to wall jack

The factory sets the MCU in RS232 mode, non-MPH, and Asynchronous. The power supply plug should be connected to the MCU before being connected to the wall outlet.

Procedure 2
Installing the MCU (Part 1 of 2)

Step	Procedure	Reference
1	Ensure that the MCU is not powered up.	
2	Install XDLC in PE shelf	
3	Make the cross-connections and ensure that the pin numbers are correctly connected. ***Note:*** There should be no bridge taps, etc. on the line.	
4	Designate the cross-connections.	
5	Use LD11 to update system memory for the MCU or the DLC. Note: Ensure the following restrictions are observed DTA Data Terminal WTD Warning Tone Denied	*X11 input/ output guide* (553-3001-400)

Procedure 2
Installing the MCU (Part 2 of 2)

Step	Procedure	Reference
	Key0 DN	
	Key 3 * Autodial (optional)	
	Key 4 Ring again (optional)	
	Key 5 Speed Call (optional)	
	Key 6 ** Display (DSP) (optional)	
	* Key 3 is required for autodial or hot line feature.	
	** DSP requires that class of service be updated to ADD.	
6	Plug the power supply connector to the MCU.	
7	Plug the power supply into a commercial 110 V ac outlet	
8	Test the MCU	

Procedure 3
Removing the MCU

Step	Procedure	Reference
1	Use overlay 32 to disable the port connected to the MCU.	
2	Unplug and disconnect the power supply.	
3	Remove the connections from the MCU to the: switch equipment DTE	Procedure 2 Step 3
4	Remove the MCU.	
5	Pack and ship the equipment.	

Installing and removing the MCA

Use the procedures listed here for adding the MCA and power supply board to the M2006, M2008, M2016S, M2616, and M2216ACD telephones only and connecting the MCA to your terminal.

CAUTION

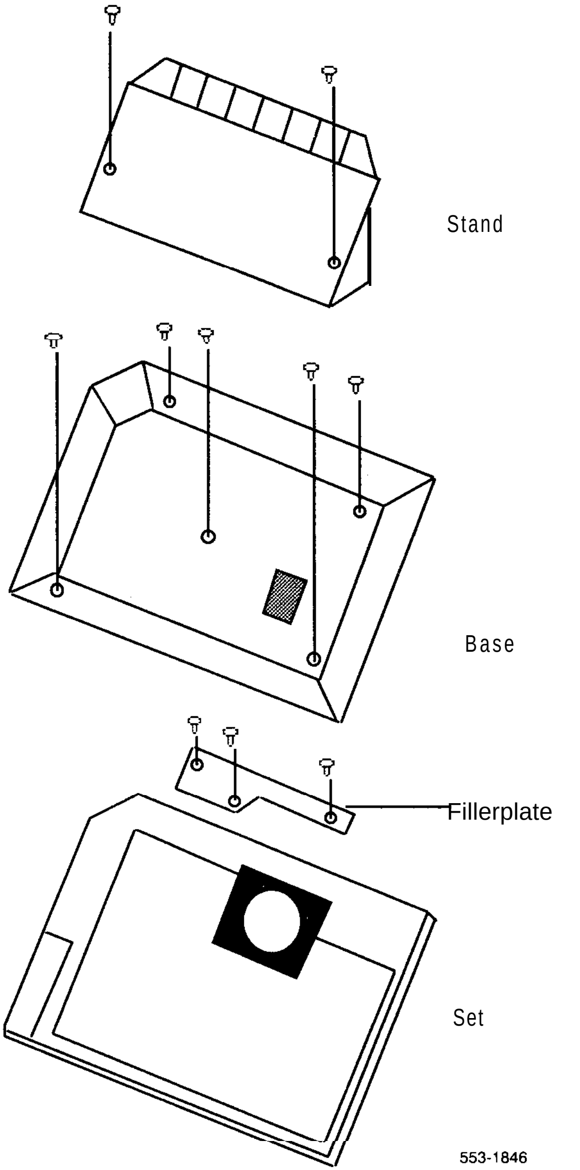
Use only the line cord provided with your Meridian Modular Telephone when installing and removing options. The acceptable line cord is AO346862.

Figure 5 shows an exploded view for reference when dismantling the telephone to get at its internal components. Some telephone types are slightly smaller than the M2616 and do not have the center screw in the base, but otherwise are the same. The center screw may not be required.

Beginning with X11 release 18, data programming can be implemented in the MCA through a service change (LD11) as well as the keypad. Xl 1 releases 14 through 17 support data commands on the keypad only.

When using the MCA for synchronous data connections, configure the telephone with a display option to view the data parameters.

Figure 5
Exploded view of the M2616/M2016S/M2216ACD telephone



Procedure 4
installing and removing the Meridian Communications Adapter

> **CAUTION**
> Before handling internal telephone components, you must discharge static electricity from your hands and tools by touching any grounded metal surface or conductor.

1. Remove the handset and place the telephone upside down on top of a level, solid work surface (a desktop, for example) covered with soft material or paper to prevent damage to movable keys and the telephone face.
2. Disconnect all cords from the telephone.
3. Remove the two screws from the stand assembly and unsnap the stand assembly by pressing inward at the back of the stand where it meets the base and pulling upward.
4. If the telephone is not equipped with the Meridian Communications Adapter (MCA), go to step 6. If you wish to replace an existing MCA, carefully disconnect the end of the 8-pin TELADAPT jack plugged into the telephone by pressing firmly on the latch-tab and slowly lifting up.
5. Turn the telephone stand assembly over and put it in the normal use position. Remove the two self-tapping screws that fasten the MCA to the telephone stand assembly and remove the MCA by pulling outward and up. Go to step 7 to replace the MCA.
6. Remove the breakout section in the rear of the telephone stand assembly, and clean away the small tabs.
7. For MCA, set option plugs to the required configuration, RS-232 or V.35. The factory default is RS-232.
8. Tilt the MCA circuit board up and insert the DB-25 connector socket into the breakout section, then slide the board connector end-first under the tabs in the stand assembly and position it over the locating pins. Position and lower it completely onto the telephone stand assembly. Insert the two self-tapping Phillips head screws supplied with the MCA into the mounting holes and tighten them with a #1 Phillips screwdriver.

9 Plug one end of an 8-conductor line cord supplied with a TELADAPT adapter in the jack J1 of the MCA (latch tab facing down) and plug the other end of the line cord into the jack of the modular telephone. Make certain the latch tab of each cable end is firmly snapped into place.

10 Carefully route the excess cable so that it will not become pinched between the stand and base.

11 Reassemble the base and stand assembly sections, ensuring that the stand is firmly seated on the base.

12 Tighten the screws, reconnect all cords, and place the telephone in the normal operating position. Place the label supplied with the MCA on the bottom cover of the telephone for tracking purposes.

Procedure 5
Connecting the data terminal

1 Connect the DB-25 connector-C interface connector from the data terminal to the matching header connector in the back of the modular telephone.

2 Insert the two captive screws in the connector body into the threaded holes in the header connector and secure tightly to prevent accidental disconnection during data terminal operation.

Power Supply Board

Use Procedure 6 to add a Power Supply Board to the telephone for connection to a transformer or closet power supply. A power supply is required for the MCA.

> **CAUTION**
> Connect the optional Power Supply to your Meridian Modular Telephone only. Equipment damage may result from incorrect connections. Both the closet power supply and the transformer are for use with the Meridian Modular Telephone only.

Procedure 6
Installing and removing the Power Supply Board

> **CAUTION**
> Before handling internal components of telephones, you must discharge static electricity from your hands and tools by touching any grounded metal surface or conductor.

1. Remove the handset and place the telephone upside down on top of a level, solid work surface (such as a desktop) covered with soft material or paper to prevent damage to movable keys and the telephone face.
2. Disconnect all cords from the telephone.
3. Remove the two screws from the stand assembly and unsnap the stand assembly by pressing inward at the back of the stand where it meets the base and pulling upward.
4. If the telephone is equipped with a Meridian Communications Adapter (MCA), unplug the data cable from telephone's base jack.
5. Remove the screws securing the base of the telephone to the top cover. Remove the base and set it aside.
6. If the telephone is equipped with a display, disconnect the display ribbon cable from the display board and move it out of the way.
7. If the telephone is not equipped with the Power Supply Board, remove the jumpers from P1 connector pins on the Main Board. Go to step 9.

   If the telephone is equipped with a Power Supply Board, go to step 8.
8. The Power Supply Board is located on the left side of the telephone. Remove two small screws from the Power Supply Board (near the top) and set them aside. Grasp the board firmly on each side. Work the board loose from the connector by slowly applying upward pressure to alternate sides until released.

   If you are not replacing the Power Supply Board, place the jumpers (A0288529) connecting the bottom two sets of pins on the P1 connector.

9 Place the Power Supply Board so that the alignment pin on the telephone fits into Slot A or Slot B (depending on telephone set) on the board (see Figure 6). Align the mounting holes in the board (near the top) over the mounting holes in the telephone and carefully press down so that the H1 connector on the board slides onto the P1 pins.

10 Take the self-tapping Phillips head screws supplied with the Power Supply Board and install them into the mounting holes. Tighten firmly with a #1 Phillips screwdriver.

11 If the telephone has a Display, reconnect the Display ribbon cable.

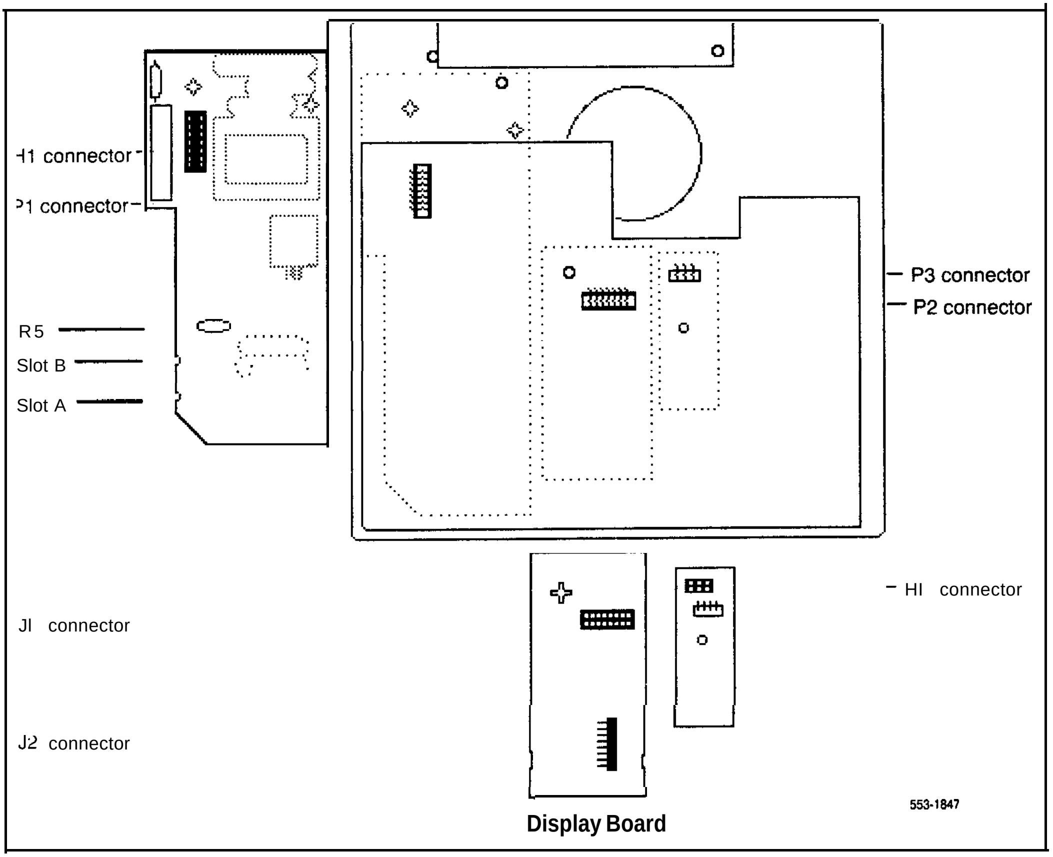
Note: Do not allow R5 on the Power Supply Board to become bent during this procedure.

12 Replace the base. If the telephone is equipped with an MCA, reconnect the data cable to the base telephone jack and replace the stand (ensuring that the MCA cable does not get pinched between the base and stand). Make sure the stand is firmly seated to the base.

13 Tighten all screws, reconnect the line cord, and place the telephone in the normal operating position. Place the label supplied with the Power Supply option on the bottom cover of the telephone for tracking purposes.

14 Connect the telephone to a local transformer or closet power supply as shown. Refer to *Meridian 1 telephones description and specifications* (553-3001-108) for requirements

Figure 6
M2006/2008 telephone and option boards



Maintenance

Two basic sets of diagnostics address asynchronous and synchronous connections.

Troubleshooting asynchronous problems

If the MCA/MCU does not operate properly, perform these checks:

1 Ensure that the power supply (MCU) is plugged in.

2 Operate the FORCE DTR key on the MCU and verify that the DTR LCD is on. Replace the MCU if the LCD does not go on. (The power supply should not be replaced in the field; the whole MCU should be returned for repair.)

3 Verify that data terminal power is on and ON-LINE/OFF-LINE (LINE/LOCAL) switch, if applicable, is set to ON-LINE (LINE).

If the call is connected but the station cannot send or receive data:

Press P63 to determine RS232 leads monitor mode.

If the LCD does not flash:

1 Ensure that RS232 interface is properly connected to MCA/MCU and DTE

2 Ensure that ON-LINE/OFF-LINE (LINE/LOCAL) switch is set to ON-LINE (LINE).

When the call connects but illegible characters appear:

1 If you are calling another SL-1 data service, ensure that the operating controls of both data devices connected to the SL-1 device match.

2 Ensure that the terminal is set so that it does not check parity, or that it is set to 8 bits (no parity). If it is set to 7 bits, even, or odd parity, enter a period followed by a carriage return to force the MCA/MCU to calculate parity and to provide legible prompts.

If problems occur during call setup, disconnect and attempt to place the call again. If problems persist, call from a regular phone to ensure that the receiving station is not at fault.

If pseudo-random pattern 5 11 data is sent in idle mode, the keyboard becomes inoperative. Stop sending data in idle mode.

Troubleshooting synchronous problems

If the MCA/MCU could not send data (using bit error rate testers) and no asynchronous terminal is available, replace the MCA/MCU.

If the async terminal is available, test MCA/MCU in async mode as described in "Troubleshooting asynchronous problems" on page 64. If the unit still fails, replace it.

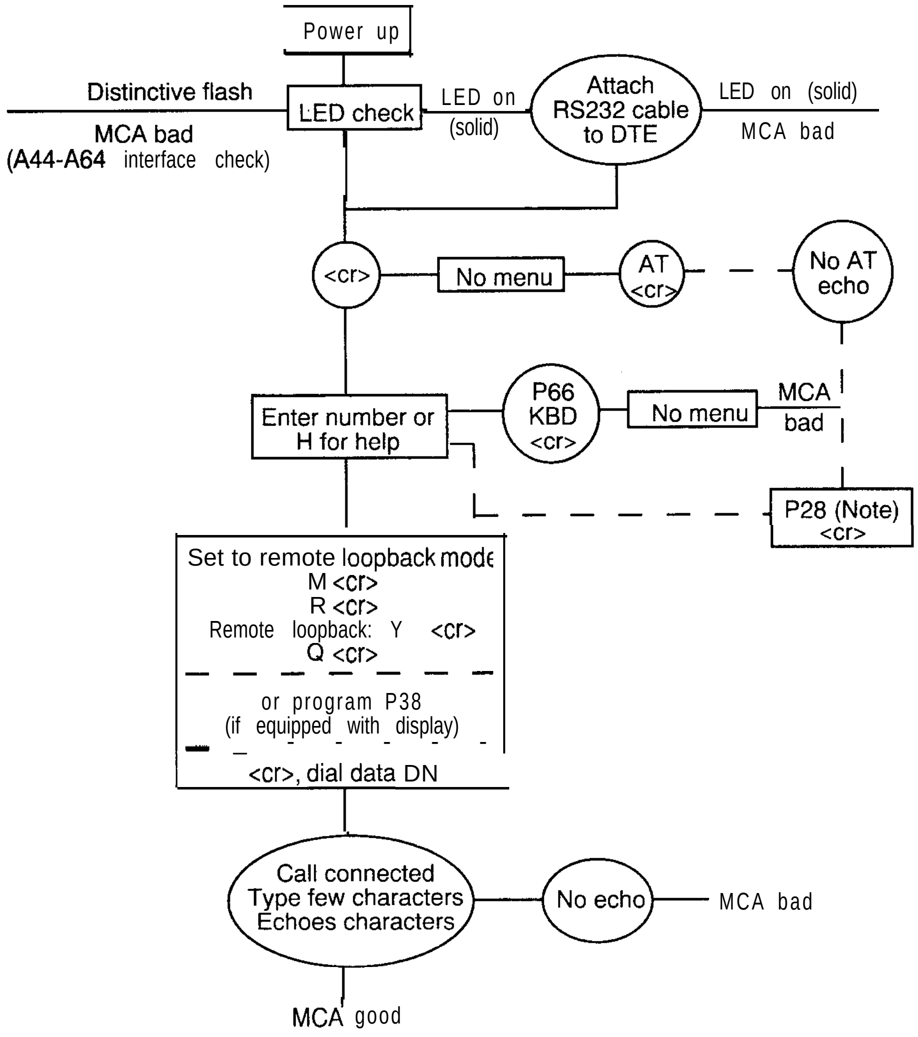
Troubleshooting MCA

A few special troubleshooting tips apply only to MCA units:

1. Check LED in back of telephone to see if it is flashing. (If it is steady, reconfigure the MCA in the system or replace it. If LED does not light, the telephone needs external power.)
2. Ensure that the data cable from the terminal or PC is connected to the MCA.
3. If a display is attached to the MCA, check data parameters using *Meridian Communications Adaptor. user guide* (P0738420).
4. Ensure that transformer is plugged in or closet power is connected.
5. Check that MCA cable connects to the telephone and has not been pinched.
6. Ensure that power board has been installed properly, with option plugs set for either RS232 or V.35.

See the flow chart in Figure 7 for a description of the MCA troubleshooting process.

Figure 7
MCA troubleshooting



Note: If equipped with display, check with P62 whether it is Terminal mode or Host mode.

553-5839

Troubleshooting MCU

Other troubleshooting techniques apply to MCU, as the unit includes power-on self-diagnostics, maintenance diagnostics from the keypad dialing menu, and far-end loop back with on-board bit error rate tester.

The LED on the MCU's cover shows the results of power-up diagnostics.

- LED off: no power or bad LED
- LED on: self test failure
- LED flashing at 4hz: normal function
- LED flash, 2 counts on, 1 count off: loss of communication; the MCU passes the diagnostic test

Completely check the hardware with tests that include:

- ROM checksum test
- RAM test
- DTE control lead test
- Sanity timer test
- DTE data loopback test
- DATA local loopback test
- Signaling loopback test

These tests check each of the seven major MCU components (A64, A44, 803C1, and M50747 on channel 1; A64, A44, and 803C1 on channel 2) individually.

Press the Release key and apply power simultaneously to check the keypad, LCD indicators, and display.

Far-end loop back check

For a far-end loopback check, establish a data connection between MCU and any data module, then use the on-board bit error rate tester to check the path integrity.

SL-1

Meridian Communications Unit and Meridian Communications Adapter

Description, installation, administration, operation

Release 1.0
Standard
August 1.1993

SL-I

Transparent Data Networking

Publication number: 553-2731-l 10
Product release: Xl 1 release 19
Document release: 1 .O
Document status: Standard
Date: August 1, 1993

Revision history

August 1, 1993

This new document introduces the Transparent Data Networking feature for XI 1 release 19 and later.

Contents

List of tables

Transparent Data Networking

Overview

Transparent Data Networking (TDN) allows end-to-end protocol exchange between two data modules that use end-to-end protocols such as T-Link and PSDS. TDN accesses Tie and DID trunks, so that all types of calls can be tandemed across Meridian 1 switches. The data modules will wait for the circuit path to be established before exchanging protocol parameters. The data modules and protocols that TDN supports are:

Table 1
Modules and protocols that TDN supports

Module	Protocols
Meridian Communications Adapter (MCA) card in a Meridian Modular Telephone (MMT)	PSDS and T-Link on external calls
Meridian Communications Unit (MCU), a stand-alone version of the MCA	PSDS and T-Link on external calls
Basic Rate interface (BRI) telephone	T-Link, V.110, V.120
High Speed Data Module (HSDM)	PSDS

TDN also enhances the Electronic Switched Network (ESN5) signalling feature to provide more efficient and economical access between private and public networks. The enhanced ESN is ESN19.

A call is a TDN call if it meets one or more of these criteria:

- An external call that originates or terminates on a MCA/MCU or BRI data module
- A PSDS call
- Uses an end-to-end protocol

Operating parameters

Originating and all intermediate nodes must be equipped with the NSIG package to use ESN signalling.

MCA, MCU, and BRI (with Data Adapter) modules will generate the ESN19 signalling when using a route configured to support ESN 19 or standard signalling.

Any data module that can make a PSDS call will generate the ESNl9 or standard signalling when using a route configured to support ESN19.

Data modules that use DM-DM continue to use ESN5 signalling for data networking.

ESN supports private-public and public private interworking of a PSDS call. It does not support private-public-private network hopping.

ESN19 signalling does not interwork with ESN5 or earlier signalling. ESN19 reverts to ESN5 at ESN5 or earlier nodes.

TDN is not supported on DT12 or PR12 trunks.

TDN is supported on the QPC720 only.

Standard transparent data networking (STDN) signalling is not carried over PRI. ESN19 must be used to carry TDN information, or the DSEL value must be set to TDN.

Feature implementation

Procedure 1
Use LD16 to configure TDN calls or routes

Prompt	Response	Description
REQ	NEW CHG	Add or change a route
TYPE	RDB	Route data block
CUST	xx	Customer number (O-99)
ROUT	xxx	Route number (O-511)
TKTP	TIE/DID	Trunk type
DTRK	YES	Digital trunk route
DSEL	VOD DTA VCE TDN	Voice or data Data only Voice only Transparent data networking data only
SIGO	STD ESN2 ESN3 ESN5 ETN EN19	Standard signalling ESN transparent data networking data Note: SIGO is not prompted if DSEL=TDN or if TKTP=DID)
STYP		Type of standard signalling. This prompt appears when SIGO-STD on a DTI route.
	SDAT	Standard signalling for voice and data (DM-DM and non-tandem PSDS)
	STDN	Standard signalling for voice, data, and TDN calls; only valid for DTI trunks

Procedure 2
Use LD21 to print the TDN configuration record

Prompt	Response	Description
REQ	PRT	Print configuration
TYPE	RDB	Route data block
CUST	xx	Customer number (O-99)
ROUT	xxx	Route number (O-511)

Note: DSEL is printed for PRI routes when DSEL=TDN. DSEL is not printed for PRI if it is set to any other value.

Feature operation

To establish and utilize a transparent data channel, the TDN feature introduces a new data type, TDN, a new signalling arrangement, E(S)N19, and a new standard signalling type, STDN. All are configured in LD16.

TDN provides a transparent data channel for private network calls and for calls that terminate or originate in a public network. The terminating side can be the next logical node or at the end of several nodes tandemed by T1 links.

Any data call that remains within the private network is identified as a TDN call type. It travels along Tie routes configured for ESN19 signalling.

A non-DM-DM data call that hops onto or off of the public network uses a TDN route. A TDN route is a DID trunk that is configured to use standard transparent data networking (STDN) signalling.

The user can dial a network access code or a route access code. If you dial a network access code, ESN19 inserts the TDN call signalling to convey the type of call to the network signalling. The route access code specifies a route configured for DSEL set to DTA, VOD, or TDN.

An originating call that is not classified as TDN will be blocked from taking a TDN route. A call can go from a TDN route to a VOD or DTA route; but if the VOD/DTA route uses ESN19 signalling, the TDN call will lack valid protocol information.

Table 2 shows the results of incoming and outgoing TDN calls on Tie and DID trunks, according to the DSEL values.

Table 2
Results of TDN calls according to trunk types and DSEL values

DSEL	TDN incoming and outgoing Tie trunk	Incoming and outgoing DID trunk
VCE	N/A	Blocked
DTA	TDN call	Blocked
VOD	TDN call	TDN call
TDN	TDN call	TDN call

Circumstances that can cause TDN to fail are:

Incompatible date module setup. For a PSDS call, the users are responsible for ensuring that the data parameters on the originating and terminating data modules correspond.

Route incorrectly configured for- ESN19 signalling. If a PSDS call selects a Tie trunk with a VOD route not configured to support TDN signalling, the switch will try to convert the protocol if both trunks in the tandem node are DTI trunks. The data may be corrupted. If at least one of the trunks in the tandem node is a PRI trunk, the call will tandem successfully through the switch. However, ESN19 DTI TDN CALL message will not be created.

Incompatible ESN. For example: If a Meridian 1 network has X11 release 18 switches or above and is all PRI, TDN calls will successfully tandem through the switches. If the network is not all PRI, or includes Meridian 1 switches with X11 release 18 or below, the call going from the X11 release 19 switch using TDN signalling or a TDN route to the ESN 2/3/5 is blocked. A call going from ESN 1/3/5 to X11 release 19 will be completed if there is at least one trunk whose DSEL is either DTA or VOD.

TDN call type with no ESN19 or TDN routes in the Route List Block (RLB). This call is blocked. No speech path is created and overflow results.

Tandem TDN or DTA call type using an ACOD of VCE route over PRI or ISL. This call is blocked.

Tandem VCE call type using an ACOD of DTA, or TDN route over PRI or ISL. This call is blocked.

TDN call type with ACOD of ESN5 route. The call is placed on the ESN5 route. If the call is over a Tie trunk and the call terminates on the next switch, the call will be successful if the parameters on both the originating and terminating data modules correspond. If the call tandems through a subsequent switch, it may be completed; but the data may be corrupted. If the call is a PSDS call, disconnect procedures may not be initiated until the data transfer from one unit to the other is completed.

Receive overflow tone or call does not connect when making a TDN call using standard signalling. Verify that the STYP value in LD16 is set to STDN on all DTI trunks used for the call.

SL-1

Transparent Data Networking

Description and formats

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SL-1

Meridian data features

Traffic engineering and configuration

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Release 2.0 omitted.

Release 3.0 omitted.

December 31, 1992

Standard, release 4.0. This document was reissued to include technical content updates. Because of the extent of the changes, revision bars are not used.

Contents

Introduction

This document provides configuration guidelines for implementing Meridian data features in Meridian 1 systems. Use the traffic and service tables in this document to determine your system requirements.

Service facilities allocated when engineering Meridian data features include: data (DLC or AILC) and station line circuit packs, trunk circuit packs, Add-On Data Modules (ADM) or Asynchronous Interface Modules (AIM) or Multi Channel Data Systems-Asynchronous Cards (MCDS-AC) ports, computer ports modem pool equipment. The AILC is only used with the AIM. Recommendations for the distribution of these facilities in various application types are also given in this publication.

References to ADM imply all data modules or MCDS-AC ports unless stated otherwise.

Other equipment calculations, such as those for provisioning tone and digit switches, DIGITONE receivers, conference circuit packs, and overall shelf and cabinet requirements can be determined using *System engineering* (553-3001-151).

Description

The Meridian data features integrate dial-up data switching capabilities with voice calling capabilities from telephone sets, and extends to data users several Meridian 1 system and station calling features.

When implementing the Meridian data features, be aware of the two types of traffic utilizing your system: voice traffic and data traffic.

- Voice traffic characteristics typically reflect homogeneous patterns since this type of traffic is generated for a single application: conversations between people. When actual holding times for voice calls are not known, certain average holding times per call (for example, 2 to 5 min) can be assumed when engineering your Meridian 1 system, due to the homogeneous nature of this type of traffic.
- Data traffic, however, can be produced by many kinds of data processing applications. This results in heterogeneous traffic patterns where holding times for data calls widely differ, dependent upon the specific data application. For example, data-call holding times can range from several minutes in a simple inquiry-response application to several hours in a remote job-entry application. Because of this wide range of call patterns, use of an average holding time for data calls (often considered to be about 20 to 30 min) can result in under- or over-engineering in actual applications.

While the anticipated calling rate must also be considered when engineering for voice and data traffic, the call holding time distribution is the more important consideration in engineering the Meridian data features. In general, as the call holding time increases, the calling rate decreases.

Related documents

For complete descriptions of the Meridian data features, refer to these documents.

QPC723 RS-232 interface line card (553-2731-106)

QMT21 High Speed Data Module (553-2731-107)

QPC918 High Speed Data Card (553-2731-108)

Enhanced Asynchronous Interface Line Unit description and installation (553-2731-203)

Meridian data features operation and tests (553-2731-300)

*NT7D16 **Data Access Card description and operation*** (553-3001-191)

XII input/output guide 553-3001-400

> ***Note:*** For the purposes of this document, Meridian 1 refers to Meridian SL-1 ST, NT, RT, and XT machines as well as Meridian 1 system options 21, 51, 61, 71, and 81.

System grade of service

Basic definitions of traffic distribution and grades of service appear in *System engineering* (553-3001-151). When configuring your Meridian 1 system to include the Meridian data features, the grade of service (GOS) desired for both data traffic and voice traffic must be considered.

Two factors affecting the system grade are:

Time slot blockage which is the probability of blocking due to the unavailability of time slots in the Meridian 1.

Service facility unavailability which is the probability of blocking due to the unavailability of a called service facility.

Time slot blockage

Since time slot blockage is a function of the amount of traffic connected on the network loop (both voice and data traffic) at the time the call is made, the probability of time slot blockage is the same for both voice calls and data calls.

The Meridian 1 system cannot be engineered to give a different GOS for voice traffic and another GOS for data traffic with respect to time slot blockage, unless voice traffic and data traffic are segregated on separate network loops.

The GOS desired for data traffic and the GOS desired for voice traffic in the Meridian 1 should be engineered to meet the more stringent GOS requirement of the two. Since the grade of service to which data users are traditionally accustomed often falls well below the P.01 and P.02 level of blockage typically engineered for voice traffic, the voice traffic GOS is likely to be the more stringent.

The selected GOS determines the maximum average CCS to be handled per network loop in your system. Both voice and data CCS contributions are included in this figure. See Table 1 for the allowable CCS per network loop accorded to different grades of service.

Service facility unavailability

Blockage due to the unavailability of a called service facility is a traffic factor reflected by the number of service facilities provisioned in your system. While this factor is not used in determining traffic handling capacity, the network termination constraints applicable to the Meridian 1 must be considered when calculating service facility requirements, and when balancing anticipated traffic loads for both voice and data traffic among the network loops.

Use the service facility utilization tables when determining the recommended number of service facilities for different grades of service.

Use the Configuration Guidelines to determine your system requirements and limits when provisioning for the Meridian data features.

Data call characteristics

The types of data calls possible with respect to the Meridian data features fall into these categories.

- calls to a data communications terminal
- calls to a computer port
- calls to an outgoing trunk (via outbound modem pool)
- calls from an incoming trunk (to an inbound modem pool)
- calls to a Multi-Channel Data System channel

Calls to a data communications terminal

This type of data call is similar to an intra-office voice call since it is a call to a specific line termination within your Meridian 1 system. Two time slots are used to establish these calls, and the grade of service is the same as that of the overall system. Calls through the MCDS are the same as through an ADM.

Calls to a computer port

This type of data call is similar to an outgoing voice call to a hunt group since it can be connected to any one of several common line terminations. This call may use an ADM or one port of a MCDS.

> Note: If only one computer port is provided, then this call-type is like a call to a data communications terminal.

Two time slots are used for calls to a computer port, and the grade of service with respect to time slot blocking is the same as the overall system grade of service. Blockage may still occur, assuming an adequate grade of service, if the number of computer ports is insufficient.

In the event of time slot blockage when a data call is placed to the computer port, no second call processing attempt is made by the system to locate time slots for another port on a different network loop.

Calls to an outgoing trunk

A data call can be made through your Meridian 1 system to a remote computer over an outgoing analog trunk. Outgoing trunks are accessed for data calls from within your system via a modem pool arrangement; this data-calling capability is unique to the Meridian data features and involves five separate terminations:

- the originating station (ADM/AIM-data side)
- the originating station (voice side)
- the modem pool (inbound side with ADM)
- the modem pool (outbound side with modem)
- the outgoing trunk (to remote computer)

Call setup for a data call made via an outgoing trunk momentarily (just during transfer stage) requires three separate Meridian 1 paths (6 time slots) to establish the connection. The sequence is:

Connection I: a to c user initiated

Connection 2: b to e user initiated

Connection 3: d to e

> ***Note:*** Connections one and two can be performed in reverse order, but the above sequence is recommended.

Only two of these call-setup connections are user initiated: Connections 1, and 2. When Connection 2 is established, user-control intervention then allows this connection to be Call Transferred by the system, to become Connection 3.

> ***Note:*** With AMP the three-step process of accessing the modems is replaced with a one-step procedure. The insertion of the ADM/Modem by the Meridian 1 switch is totally transparent to the user.

After call-setup is completed, two paths (four times slots) are in use during this data call to a remote computer: Connection 1 and Connection 3. Thus, once established, this type of call constitutes one intra-office data call, plus one outgoing-originating voice (outgoing trunk) call in terms of traffic generated.

Figure 1 illustrates the call setup sequence for data calls made to a remote computer via modem pool. For a detailed operating description of this type of call-setup, refer to ***Meridian data features operation and tests*** **(553-2731-300).**

Calls from incoming trunk

A data call can be made through your Meridian 1 system to a computer port or terminal over an incoming analog trunk only. The computer port or terminal is accessed from within your system via a modem pool arrangement; this data-calling capability is unique to the Meridian data features. This capability involves four separate terminations:

- the incoming trunk (from remote user)
- the modem pool (inbound side with modem)
- the modem pool (outbound side with ADM)
- the terminating station (ADM-data side)

Call setup for a data call made from an incoming trunk requires two separate Meridian 1 paths (four time slots) to establish the connection. The sequence is:

Connection 1: a to b user initiated

Connection 2: c to d Meridian 1 initiated for Hotline; user initiated with keyboard dialing

One or both of these call-setup connections are user initiated. When Connection 2 is established, user-control intervention then allows data to be transmitted.

Note: With AMP, the incoming call can terminate on a customer dataport or a data set. The data set has a special class of service while the dataport is a member of an ADM trunk route. If the incoming call is analog (not digital) and the dataport is not analog, then an ADM/Modem pair is switched into the connection for data transmission. The dataports are organized into trunk routes. When the proper number is dialed for a dataport or a data set, the system selects the proper modem from the pool and inserts it into the connection.

After call-setup is completed, two paths (four time slots) are in use during this data call from a remote user. Once established, this type of call constitutes one intra-office data call plus one incoming-originating voice (incoming trunk) call in terms of traffic generated.

Figure 2 illustrates the call setup sequence for data calls made from a remote user to a computer port or terminal via the modem pool on your Meridian 1 system.

Calls to MCDS

This type of data call is similar to an intra-office voice call since it is to a specific line termination within your system. Two time slots are used to establish these calls, and the grade of service is the same as that of the overall system.

Figure 1
Call setup to outgoing trunk (via modem pool without AMP)

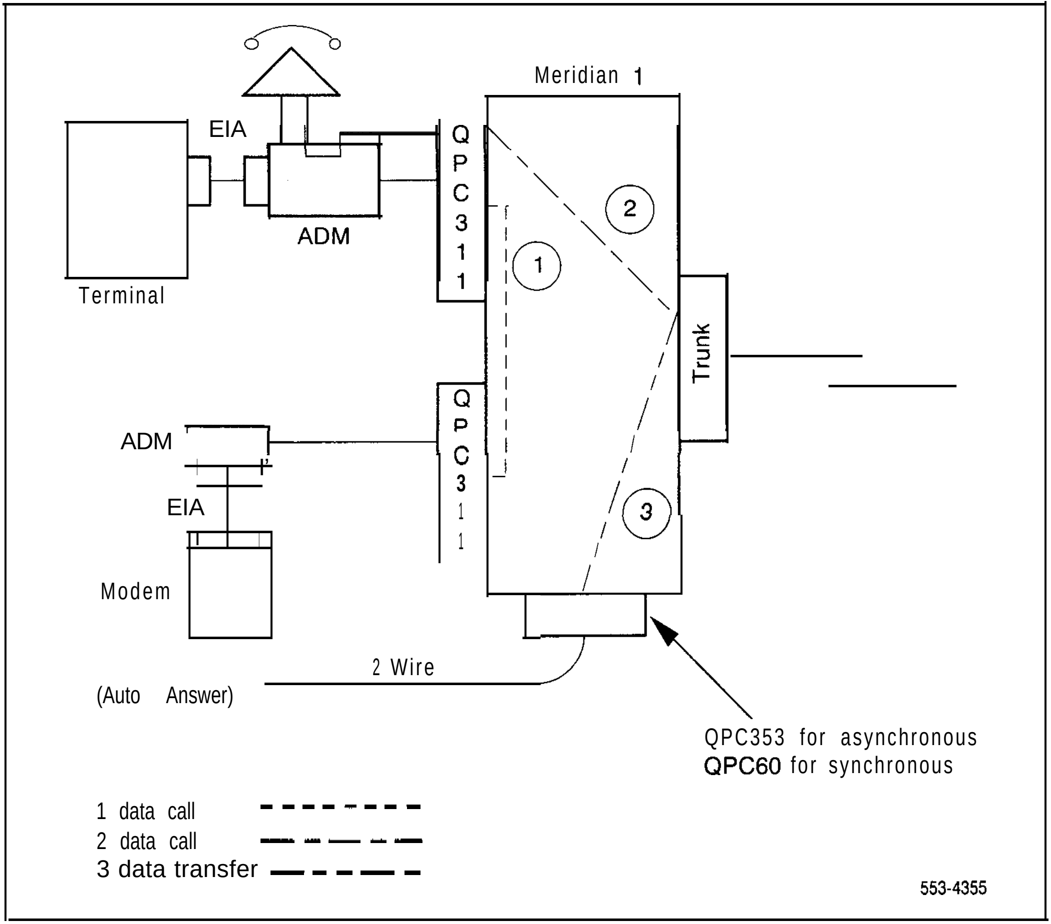


Figure 2
Call setup from incoming trunk (via modem pool)

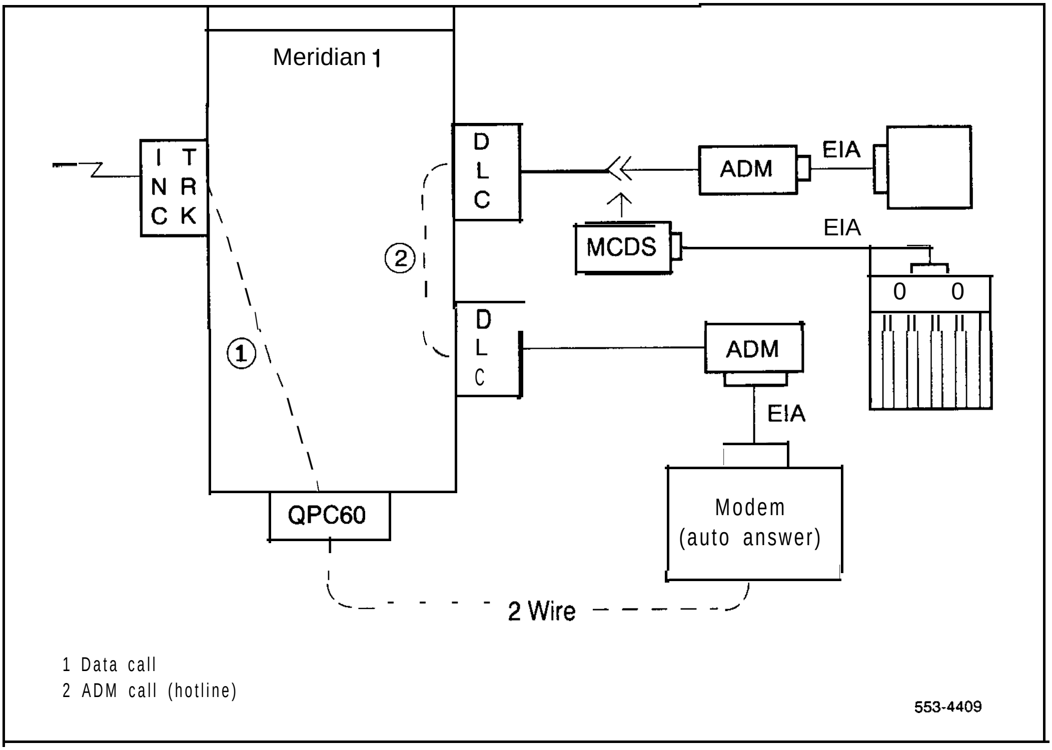
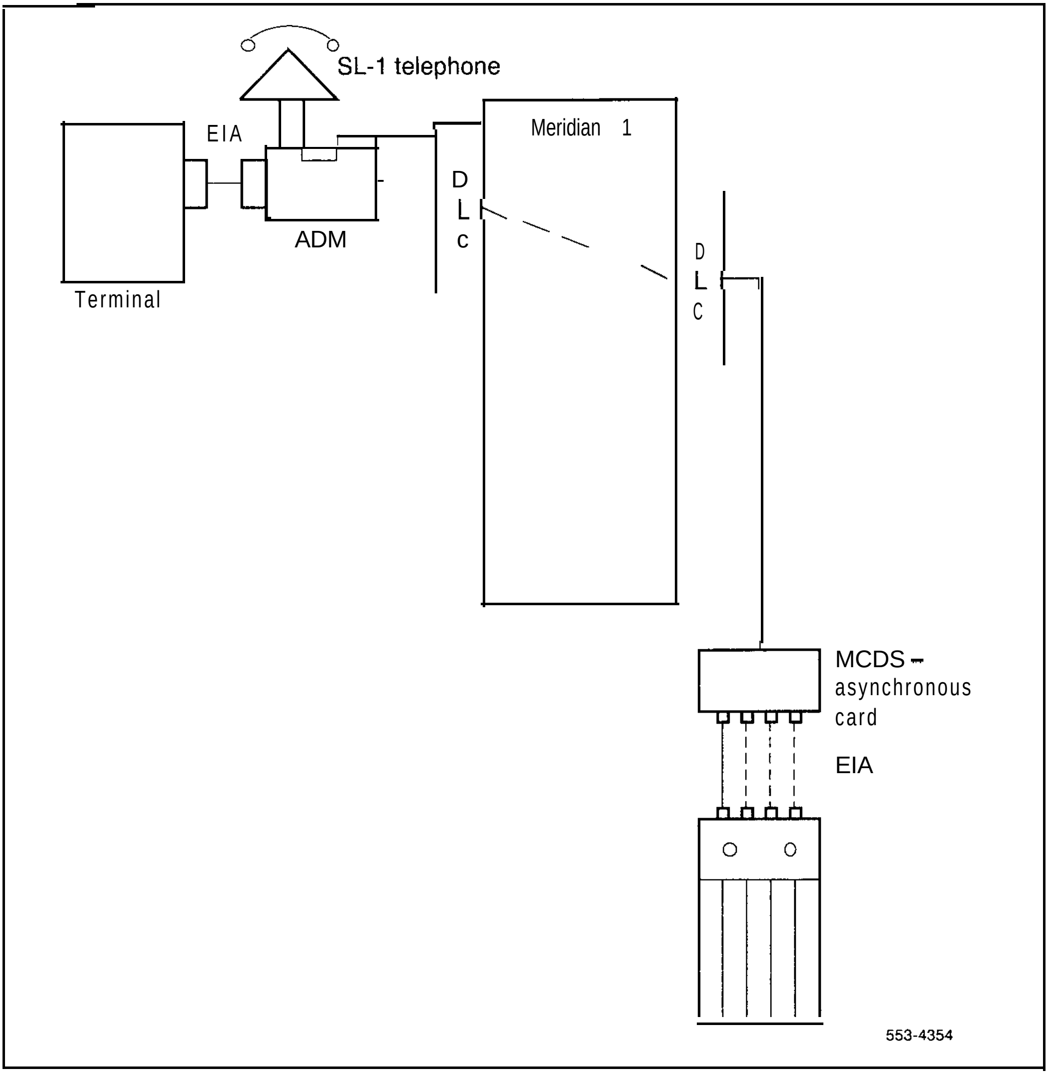


Figure 3
Call setup to MCDS port



Data calling traffic impact

Implementing the Meridian data features provides data users with access to several system features and station calling features. These include Automatic Route Selection, Hunting, Remote Peripheral Equipment, and Call Detail Recording on the system level. Auto Dial, Call Forward, Ring Again, and Speed Call are assignable to each co-located or stand-alone ADM or AIM. Keyboard Dialing may be assigned to all co-located and stand-alone ADM (except QMT7) and to AIM. Either the Hotline or the Auto-Dialing feature may be assigned to those data stations (except QMT9) that use keyboard dialing. Using a stand-alone ADM with a modem allows modem-pool services, an additional feature which is provided by Meridian data features implementation (QMT9 are not used for modem pools). Only two of these features associates with Meridian Data, Ring Again queuing and modem pooling, have a particular impact on data traffic engineering.

Outbound modem pool calls

Blockage for a modem-pool call is higher than that of the overall system grade of service due to the need to establish three separate Meridian 1 call paths during the setup of a data call to remote computer via modem pool.

If it were assumed that these three path setups were independent of one another, the blockage would be approximately three times greater than that of the overall system grade of service. Since, however, all three paths must be completed in order to establish an active outbound call through the modem pool, these paths are interdependent. Therefore, assuming call-path dependence and a system grade of service of P.01, the modem-pool call would experience blockage of 4.5 percent on the average.

Additionally, since the established data call through the modem pool consists of one intra-office data call and one outgoing-originating voice call, modem pool calls generate twice the network CCS of a regular voice call or intra-office data call.

Inbound modem pool calls

Blockage and system grade of service is the same here as for the outbound modem pool except that only two separate paths are setup for the data call from the incoming trunk via the modem pool.

Ring Again queuing

Ring Again feature operation is the same for data calls as it is for voice calls: it allows queuing of calls made to busy Directory Numbers (DN) within the customer group, alerts the user when the busy DN becomes free, and provides automatic callback to the DN.

In relation to calls placed from a Data Directory Number (DDN), Ring Again can be used when calls to a busy data terminal, computer port, trunk route, (eg, WATS), or a modem pool DDN are encountered. (Note that for both voice and data calls, Ring Again does not apply to busy facilities encountered outside of the customer group.)

The queuing capability provided by Ring Again typically increases the utilization of all called service facilities within the SL-1 system. Therefore, the probability of delay (rather than blockage) and a measure of average queuing time become significant criteria in specifying overall system grade of service.

Since Ring Again queuing increases service-facility utilization, thereby increasing the traffic carried by these facilities, the CCS load per network loop will also increase unless the number of terminations per loop is decreased. Example: If 10 computer ports assigned to a network loop are operating at 44 percent utilization without Ring Again queuing, the traffic generated is 159 CCS (36 X .44 X 10). Assuming a utilization increase to 86 with Ring Again queuing, the traffic generated would then be 310 CCS (36 X .86 X 10), which is 151 CCS more than the original traffic calculation made without compensation for queuing. If this additional 151 CCS generated via queuing were to cause the total network loop CCS to exceed the limit for the desired grade of service, then reassignment of line terminations to other network loops would be made to the extent necessary.

Keyboard Dialing

Keyboard Dialing provides the capability to originate and terminate data calls to local computers by using the terminal keyboard. It is used by all co-located and stand-alone ADM (except QMT7) and by the AIM to activate the data feature. The Hotline or Auto-Dialing feature may be used with keyboard dialing to originate data calls. The Data Directory Number (DDN) Ring Again can be used when calls to a busy data terminal, computer port, trunk route, or modem pool DDN are encountered.

> ***Note:*** For both voice and data calls, Ring Again does not apply to busy facilities encountered outside of the customer group.)

Configuration guidelines

Assignment procedures

When assigning actual data terminations to specific network loops, each end of a potential call path should be placed on separate loops. This can be done by placing computer ports on separate loops from outgoing trunks, and placing terminals and inbound modem pool terminations on different loops. Inbound and outbound modem pool terminations can be on the same loop since no time slot path exists between them. These guidelines are independent of size of Meridian 1. On multiple network group systems (VL, VLE, XL), efforts should still be made to minimize junctor traffic between groups. This can be done by placing all data traffic in the same network group.

> ***Note:*** The routing of data calls should be carefully engineered because certain modules (ie, AIM) do **not** give warning tones and any alternate routing signals (NARS/BARS) are not available to warn the user that the module is connected through on an expensive route.

Assignment of Peripheral Equipment and Common Equipment for the overall system in which the Meridian data features is implemented should be done according to the procedures given in ***System engineering (553-*** 3001-151).

When assigning equipment indigenous to data, carefully consider the impact this feature places on overall system capacity and equipment planning.

Operating parameters

The Meridian data features can be implemented in any Meridian 1 system. The capacity of each Meridian 1 is subject to five independent constraints for which compensation must be made for the inclusion of data:

- memory capacity
- real time capacity
- network traffic capacity
- network terminating capacity
- configuration limits

Any of the above factors can limit system size. Actual system capacities and limits for each Meridian 1 are given in ***System engineering*** (553-3001-151).

Memory requirements

The Meridian data features has no effect on the system software program storage requirements. When assigning each ADM or MCDS-AC or AIM and its data calling features, however, the protected and unprotected data storage requirements are the equivalent of those for a telephone and its assignable features. See ***System engineering*** (553-3001-151).

Real time requirements

The maximum real time available in each Meridian 1 is 2100 seconds. Depending upon the calling applications, data traffic characteristics can produce a wide range of real-time requirements. That is, data call from an inquiry-based system could have short holding times and high call attempts, thus utilizing more real time than an interactive computer application where holding time is long and call attempts are low.

Real time usage by the Meridian data features is dependent upon the types of data calling applications accommodated as well as the number of all data call attempts made. To assess whether sufficient real time will be available for a particular data application:

- Estimate the number of Average Busy Season Busy Hour (ABSBH) data call attempts (including blocked, busy, and unanswered calls) for each type of data call (ie, calls to terminals, computer ports, and outgoing trunks).
- Multiply the number of each type of data call by the real time for each type.

  Note: A data call attempt produces the real-time equivalent of a voice call attempt. See *System engineering* (553-3001-151).

  - call to a Data Terminal = 1 intra-office call
  - call to a Computer Port = 1 intra-office call
  - call to Remote Computer = 2 intra-office calls + 1 trunk call (Outgoing Modem Pool Call)
  - call from Incoming Trunk to a modem pool = 1 trunk + 1 intra-office call. (Incoming Modem Pool Call.)

- Take the total data real time calculated in item 2 and add this sum to the total real time required for voice call processing (as calculated from *System engineering* (553-3001-151).
- The total real time required for successful calls (both voice and data) should be less than 2100 s.

  Note I: No features are included in the above measurements.

  Note 2: Measurements for an ADM and a SL-1 telephone are equivalent; calls to a trunk(Outgoing Modem Pool Call) are made from the PDN of the ADM's companion SL-1 telephone and the above measurements apply.

  Note 3: Three individual calls constitute a complete Outgoing Modem Pool Call set up. The above measurements reflect real time required for each call. Therefore the sum of 2 intra-office calls + 1 trunk call = 1 complete Modem Pool Call real time measurement.

Note 4: Two individual calls constitute a complete Incoming Modem Pool Call set up. The above measurements reflect real time required for each.

Network traffic requirement

Each network loop is capable of the maximum traffic capacities given in Table 1. With the inclusion of the Meridian data features, the data line usage must be included in the calculations required to determine the total network traffic requirements.

Data calls to terminals or computer ports should be considered intra-office calls. Modem pool calls, once established, constitute one intra-office call plus one outgoing-originating trunk call. Total data usage is the product of the average number of calls multiplied by the average holding time.

Performing the following calculations yields the total data usage figure:

TOTAL DATA USAGE = (A + B) X 2
where A = number of data calls to terminals/computer ports x estimated holding time.and B = number of modem pool calls x 2 x estimated holding time.

Note: The results of the above calculations should be converted to ccs:

- If Total Data Usage is expressed in minutes, multiply by 60 and divide by 100.
- If the Total Data Usage is expressed in hours, multiply by 36.

Two of the basic traffic definitions stated in *System engineering (553-3001-151)* are expanded to include data traffic contributions. These are:

- Line CCS = Incoming Terminating CCS (voice)

  + Outgoing Originating CCS (voice

  + Terminating Intra-office CCS (voice)

  + Originating Intra-office CCS (voice)

  + Originating ADM CCS (data)

  + Terminating ADM CCS (data)

  + Outgoing Modem Pool Call CCS (data)

- Intra-office Ratio (R) = Terminating Intra-office CCS (voice)

  + Originating Intra-office CCS (voice)

  + Originating ADM CCS (data)

  + Terminating ADM CCS (data)

  Line CCS

In these modified traffic definitions, total line CCS consists of all voice line calls plus all ADM CCS and actual trunk CCS associated with a modem pool call. Therefore:

- Total Loop CCS = Total Line CCS x (2 – R)

Utilizing the traffic definitions stated above when Meridian 1 Data is implemented, network CCS and the required network equipment for the system can be determined by using *System engineering* (553-3001-151).

Termination requirement

Each Peripheral Equipment (PE) shelf accommodates 10 line and/or trunk circuit packs, and each network loop interfaces with a maximum of four PE shelves. (The number of DIGITONE receivers supplied is not included in this figure.)

The DLC used with the Meridian data features supports two data lines and two voice lines. A maximum of four DLC can be installed in each PE shelf. This allows a maximum of 32 data lines per network loop (four PE shelves).

Each voice-line circuit pack (QPC60, QPC61 and QPC353) supports four voice lines and a total of 160 lines (4 lines x 10 cards x 4 PE shelves) can be installed per network loop. When four DLC are installed per network loop, the voice-line terminating capacity becomes 128 (4 lines x 6 cards) + (2 lines x 4 cards) x (4 PE shelves) per network loop. Of this total voice-line terminating capacity of 128, one line unit of a MPLC is required to provide a Voice Frequency Directory Number (VFDN) for each modem associated with a modem pool ADM. **(The MPLC and the VFDN are not used if the AMP feature is active.)** Since the MPLC supports only pooled modems, the total loop terminating capacity for voice lines used for voice traffic becomes: 128 – 4n (where n = number of MPLC). The trunk terminating capacity per network loop is 80 (2 trunks per trunk card x 10 cards x 4 PE shelves). There can be an arbitrary mixture of lines and trunks per loop, but the number of data lines can never exceed eight (4 DLC) per shelf.

Configuration parameters

The configuration of a Meridian 1 system in which the Meridian data features is implemented is flexible within the constraints specified in Table 2 of *System* engineering (553-3001-151). A system may not be able to accommodate all of the maximum values given in that table due to system limitations on the real time, total memory, or network traffic capacity.

Modem pool and computer port allocation

Through use of the ADM, voice-grade modems and computer ports can be allocated on a contention basis; that is, dedicated connections from terminals to voice-grade modems and/or computer ports can be eliminated as the customer' s data application(s) permit.

In general terms contention for computer ports is provided by:

- connecting a stand-alone ADM to each computer port; and
- assigning the Data Directory Number of each ADM connected to a port of this computer to a single hunt group

Note *1:* The required ADM and DLC installation requirements are given in *Meridian data features installation and configuration* (553-2731-200). More than one modem pool can be configured per customer group.

Note 2: When the AMP feature is used, there is no need for separate modem pools. In conjunction with the Dataport Hunting feature, the DDN of each dataport is assigned as a trunk and is hunted as a trunk group.

Contention for voice-grade modems is accomplished by configuring a modem pool.

Outbound Modem Pool

In general terms, a modem pool is configured by:

- connecting each voice-grade modem to a stand-alone ADM on the inbound (digital) side;
- connecting the outbound (analog) side of each of these modems to a unit on a MPLC; and
- assigning the DDN of each ADM connected to these modems to a single hung group

Inbound Modem Pool

In general terms, a modem pool is configured by:

- connecting each voice-grade modem to a stand-alone ADM on the outbound (digital) side
- connecting the inbound (analog) side of each of these modems to a unit on a 500-set line card; and
- assigning the DDN of each line card connected to these modems to a single hunt group

Modem pool calculations

The number of pooled modems and computer ports must be determined according to a grade of service (GOS) selected by the customer. (This grade of service applies to the availability of these service facilities, not to the overall system GOS.)

If no Ring Again queuing is desired, the service facility GOS is a specified blockage level. When no queuing is provided, the length of the call does not affect the blockage level.

If the Ring Again queuing is desired, then the service facility GOS is specified as an average queuing time (ie, delay time). When queuing is provided, the length of the call does affect the GOS. As the average call length increases, the amount of traffic which can be carried decreases for the same GOS.

The following procedure can be used in determining the required number of computer ports or modems in each modem pool respectively:

- Estimate the number of successful calls to the service facility per hour (ie, ABSBH).
- Multiply the average holding time (in CCS) per data call by the total calls calculated in step 1. The product equals the total traffic offered to the service facility.
- Using the total traffic offered and the desired GOS, the required number of modems or computer ports is determined by referring to Tables 2 through 24.

Note: When more than one modem pool is to be provided and each pool supports different services (eg, differing transmission speeds), this procedure should be used to size each modem pool.

Traffic and service facility tables

Definitions

Four sets of traffic tables are included in this publication. Each table is defined by two characteristics. One is whether or not queuing (ie, Ring Again) is to be used and the other is the effective size of the calling population which generates the traffic. The following presents the table numbers which correspond to these respective characteristics.

Traffic table cross-reference

	Size of call population	
	Infinite	Finite
No Queuing	Table 2	Tables 4 through 13
With Queuing	Table 3	Tables 14 through 23

Queuing

Queuing is invoked on the Meridian 1 by using the Ring Again feature. The queuing time is the time from which Ring Again is initiated until a service facility or station becomes available. Since more traffic can be carried when queuing is used, fewer service facilities are required for the same level of traffic.

Calling population

Size of the calling population is important since it affects the rate at which traffic is generated. The calling population consists of the telephones and/or terminals to be considered.

Infinite population

The term "infinite" is used to imply a large number. A population is considered infinite when the overall calling rate is not affected when one member of the population goes into service; that is, each individual telephone or terminal has little impact on the overall system. Almost all voice systems are assumed to have "infinite" populations.

Finite population

A "finite" population is defined as one where the calling rate is affected when a member goes into service. Since each member of the population is such a large percentage of the total, the calling rate is decreased when a member goes into service since there is respect to the "finite" tables, the number in source is the number of telephones or terminals being considered. The tables go up to 50 for the number in source. For numbers above 50, the results from finite population assumptions begin to converge to the results from the infinite population assumption.

Population size tables

As a general rule, the "infinite" tables should be used for population sizes over 50 and "finite" tables for 50 and below. It might be noted that more traffic is carried when the population is "finite". Therefore, fewer service facilities are required from the same level of traffic.

Traffic table format

All traffic Tables 2 through 23 follow the same basic format. The table title identifies which of the two characteristics (ie, queuing/no queuing and infinite/finite) apply to that table. Finite source Tables 4 through 23 are explicitly labeled as such. The finite source tables also have the number in the source printed in the table heading. The infinite source Tables 2 and 3 are not explicitly labeled.

These traffic tables present the maximum CCS load that can be offered to a specified number of service facilities (either trunk, ports, modems in a modem pool, etc.) and still meet a specified grade of service. Of the seven columns per table, the left-most column gives the number of service facilities. The remaining six columns present CCS values for six different grades of service. For no queuing, the grade of service is blocking probability and the column heading is "0.XXX", where XXX is the blockage value. For queuing, the GOS is a ratio of the average queuing time (or delay) divided by the average holding time per call. The column heading is "X.XX", where D/HT is delay divided by holding time and X.XX is the ratio. To determine, for example, the maximum CCS that could be offered when each call averages 10 min with a delay of 5 min, refer to the column labeled "0.50". It should be noted that the queuing delays are averaged over all calls and not just for the calls which were delayed.

Values for traffic offered are presented in the traffic tables. With queuing, traffic carried equals traffic offered. With no queuing, traffic carried equals traffic offered multiplied by (1 – GOS). For example, at P.02, if 100 CCS of traffic is offered, then 100 x (1 .02) = 100 x .98 = 98 and 98 CCS of traffic is carried.

As stated earlier, queuing permits circuits to carry more traffic than when no queuing is allowed. Also, as the average call holding time increases (ie, D/HT decreases), the amount of traffic decreases. Tables 2 through 23 were produced using the generally accepted formulas in the telephone industry. The following shows the formulas used.

Traffic Table Formulas

	Size of Population	
	Infinite	Finite
No Queuing	ERLANG B (blocked calls cleared) Table 2	ENGSET (blocked calls cleared) Tables 4 through 13
With Queuing	ERLANG C (blocked calls delayed)	ENGSET (blocked calls delayed)

Examples of use

Tables 2 through 23 can be used in several ways.

- To determine how much traffic can be offered to a specified number of service facilities at a specified GOS, go down the left-hand column to the number of service facilities and read the value out of the appropriate GOS column.
- For grades of service not listed, interpolate between adjacent columns.
- To determine the number of service facilities required to handle a specified amount of traffic, first convert the traffic figure into offered CCS, and then go down the appropriate GOS column until the first value that equals or exceeds that traffic value is located. Then read the required number of service facilities from the left-most column on the same line.

Five sample cases, as follows, illustrate various applications in which the traffic tables can be used.

Case 1

Assume

25 time sharing terminals

20 min average holding time per call

5 calls per day per terminal evenly spread over an 8 hr day

Problem

Determine required number of computer ports if:

(a) no queuing and a P.05 GOS

(b) queuing and an average delay of 10 min

(c) queuing and an average delay of 5 min

Solution

total hours of usage =
(25 terminals) (1/3 hr per call) (5 calls) = 41.67 hr

Hourly CCS = (41.67 hr) (36 CCS per hr)/(8 hr)
= 187.5 CCS or 188 CCS

With only 20 terminals, the Finite Source tables should be used.

(a) Using Table 8, 188 CCS at P.05 requires 9 ports

(b) D/HT = 10 min / 20 min = 0.5

Using Table 18 188 CCS with D/HT = 0.5 requires 6 ports

(c) D/HT = 5 min / 20 min = 0.25

Using Table 18, 188 CCS with D/HT = 0.25 requires 7 ports

CASE 2

Assume

An inquiry application with a large number of terminals currently uses dial-up modem to gain access to the computer. Sixty-four ports are now allocated to this function and the blockage is thought to be about 5.

Problem

What is the percentage of traffic increase realized if Ring Again is used to queue for the ports? Assume a D/HT ratio of 1.

Solution

Since there are a large number of terminals, the Infinite Source tables should be used.

From Table 2, 64 ports at P.05 can carry: (2109.6 CCS) (.95) = 2004 CCS.

From Table 3, 64 ports at a D/HT ratio of 1 can carry 2272.6 CCS.

Therefore, the percentage increase is

2272.6 – 2004 / 2004 x 100 = 13.4%

> ***Note:*** The data feature can be justified by showing increased utilization of computer resources via Ring Again.

CASE 3

Assume

A company uses 10 computer terminals to access a computer at the plant as well as a computer at a distant location. About 10 percent of the time the distant computer is used.

Each terminal is used approximately 45 min per hour. Each terminal is connected about 30 min per session.

Problem

Determine the number of ADM required for this application if a 15 min delay is acceptable.

Solution

Total Hourly usage = (10 terminals) (3/4 hours) = 7.5 hours

Remote usage = (10.) (7.5) = 0.75 hours

Local usage = (90.) (7.5) = 6.75 hours

Remote CCS = (0.75) (36) = 27 CCS

Local CCS = (6.75) (36) = 243 CCS

Each terminal requires an ADM. The remote traffic would use a modem pool. The local traffic would use hunting for computer ports, each port with an ADM.

15 min average queuing delay gives D/HT = 0.5

Using Table 15, 2 ADM are required for remote (modem pool) and 7 ADM are required for local.

Therefore a total of 9 ADM are required.

CASE 4

Assume

A customer has 32 terminals accessing 16 computer ports. Each terminal generates about 12 CCS during the busy hour.

Problem

What is the expected blockage when queuing is not used?

Solution

Total offered CCS = (32 terminals) (12 CCS) = 384 CCS

Since there are only tables for 30 and 35 terminals in the source, we must interpolate.

A summary of the CCS values for 16 ports from Tables 10 and 11 are:

NUMBER IN SOURCE	P.01	P.02
35	**360.0**	**391.9**
30	**369.2**	**400.4**

Interpolation between 30 and 35 gives (ie, two-fifths of the difference between the two values):

32	**365.5**	**397.0**

Since 384 CCS lies between 365.5 CCS and 397.0 CCS, the blockage probability will lie between **P.01** and **P.02.** Interpolating again between **P.01** and **P.02** gives:

384 – 365.5 / 397 – 365.5 = X – .01 / .02 – .01

.587 = X – .01 / .01

Therefore: X = .01 + (.587) (.01) = .0159

X is the expected blockage

Note: The actual blockage value is .0154.

CASE 5

Assume

Same information as Case 4 (ie, 16 computer ports and 12 CCS per terminal).

Problem

How many terminals can be supported if:

blockage is allowed to increase to P.05?

Ring Again is used and the average delay is twice the call holding time?

Solution

Divide the total CCS by 12 CCS and compare the result with the entries in our tables at the given grade of service and number in source for 16 ports.

(a) Use the following

Table	Number in source	CCS at P.05	Number of terminals
8	25	467	38.9
9	30	455	38.0
10	35	448	37.3
11	40	443	36.9
12	45	439	36.6
13	50	436	36.4

The number in source matches the number of terminals at about 37 terminals. Therefore, approximately 37 terminals can be supported at a P.05 grade of service.

(b) Using the queuing finite tables for 2.00 and for 16 computer ports, 576 CCS can be offered (and carried).

Therefore, the number of terminals which can be supported is 576 / 12 = 48.

By looking at Tables 22 and 23, we see that the 576 CCS value occurs for 1 .00, 2.00 and 4.00 (for 16 ports). The CCS value for 0.75 is almost 576 CCS. This means that the maximum average delay experienced by 45 or 50 terminals is just over 75. of the average holding time. Once a group of circuits or ports is at full capacity, this capacity cannot be increased (576 CCS = 16 ports x 36 CCS).

Table 1
CCS capacities per loop

Blockage (GOS)	Number of loops 2	3	4	5	6	7	9	12
0.0025	488	503	511	518	523	526	531	536
0.0050	520	535	544	550	554	557	562	566
0.0075	540	555	564	570	574	577	582	586
0.0100	555	570	579	585	589	592	596	600
0.0125	567	582	591	597	601	604	608	612
0.0150	578	592	601	607	611	614	618	622
0.0175	587	601	610	615	619	622	626	630
0.0200	594	609	618	623	627	630	634	638
0.0225	602	616	625	630	634	637	641	645
0.0250	608	623	631	637	640	643	647	651
0.0275	614	629	637	643	646	649	653	657
0.0300	620	634	643	648	652	655	659	662
0.0325	625	639	648	653	657	660	664	667
0.0350	630	644	653	658	662	665	668	672
0.0375	634	649	657	663	666	669	673	676
0.0400	639	653	662	667	671	673	677	681
0.0425	643	657	666	671	675	677	681	685
0.0450	647	661	670	675	679	681	685	688
0.0475	651	665	673	679	682	685	689	692
0.0500	654	669	677	682	686	689	692	696
0.0525	658	672	681	686	689	692	696	699
0.0550	661	676	684	689	693	695	699	702
0.0575	664	679	687	692	696	699	702	706
0.0600	667	682	690	696	699	702	705	709
0.0625	671	685	693	699	702	705	708	712

-continue&

Table 1 (continued)

CCS capacities per loop

Blockage (GOS)	Number of loops 2	3	4	5	6	7	9	12
0.0650	674	688	696	701	705	708	711	714
0.0675	676	691	699	704	708	711	714	717
0.0700	679	694	702	707	711	713	717	720
0.0725	682	697	705	710	713	716	719	723
0.0750	685	699	707	712	716	719	722	725
0.0775	687	702	710	715	719	721	725	728
0.0800	690	704	712	717	721	724	727	730
0.0825	692	707	715	720	723	726	729	733
0.0850	695	709	717	722	726	728	732	735
0.0875	697	711	720	725	728	731	734	737
0.0900	699	714	722	727	730	733	736	739
0.0925	701	716	724	729	733	735	739	742
0.0950	704	718	726	731	735	737	741	744
0.0975	706	720	728	733	737	739	743	746
0.1000	708	723	731	736	739	742	745	748

This table lists average values; these values may vary according to specific user requirements.

Table 2
Service facility utilization-with no queuing (ERLANG B) (IN CCS)

	Grade of service (GOS)-traffic offered					
Number	**0.005**	**0.010**	0.020	0.030	0.050	**0.100**
1	0.2	0.4	0.7	1.1	1.9	4.0
2	3.8	5.5	8.0	10.1	13.7	21.4
3	12.6	16.4	21.7	25.7	32.4	45.7
4	25.2	31.3	39.3	45.3	54.9	73.6
5	40.8	49.0	59.7	67.5	79.9	103.7
6	58.4	68.7	81.9	91.5	106.6	135.3
7	77.7	90.0	105.7	117.0	134.6	168.0
8	98.3	112.6	130.6	143.5	163.5	201.5
9	120.0	136.2	156.4	170.9	193.3	235.7
10	142.6	160.6	183.0	199.1	223.8	270.4
11	166.0	185.8	210.3	227.8	254.8	305.5
12	190.0	211.5	238.1	257.1	286.2	341.1
13	214.7	237.9	266.5	286.8	318.1	376.9
14	239.9	264.7	295.2	316.9	350.3	413.0
15	265.5	291.9	324.3	347.4	382.8	449.4
16	291.6	319.5	353.8	378.2	415.6	486.0
17	318.0	347.5	383.6	409.3	448.6	522.8
18	344.8	375.7	413.7	440.6	481.9	559.7
19	371.9	404.3	444.0	472.1	515.3	596.8
20	399.3	433.1	474.5	503.9	549.0	634.1
21	427.0	462.2	505.3	535.9	582.8	671.4
22	454.9	491.4	536.3	568.0	616.8	708.9
23	483.0	520.9	567.4	600.3	650.9	746.5
24	511.3	550.6	598.7	632.8	685.1	784.2
25	539.9	580.5	630.2	665-4	719.5	822.0

Table 2 (continued)
Service facility utilization-with no queuing (ERLANG B) (IN CCS)

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
26	568.6	610.5	661.8	698.1	753.9	859.9
27	597.5	640.7	693.5	731.0	788.5	897.8
28	626.6	671.1	725.4	764.0	823.2	935.8
29	655.8	701.5	757.4	797.0	858.0	973.9
30	685.2	732.1	789.5	830.2	892.9	1012.1
31	714.7	762.9	821.8	863.5	927.8	1050.3
32	744.4	793.7	854.1	896.9	962.8	1088.5
33	774.2	824.7	886.5	930.4	997.9	1126.8
34	804.1	855.8	919.0	963.9	1033.1	1165.2
35	834.1	887.0	951.7	997.6	1068.4	1203.6
36	864.2	918.3	984.4	1031.3	1103.7	1242.1
37	894.5	949.6	1017.1	1065.1	1139.0	1280.6
38	924.8	981.1	1050.0	1098.9	1174.4	1319.1
39	955.2	1012.6	1082.9	1132.8	1209.9	1357.7
40	985.7	1044.3	1115.9	1166.8	1245.5	1396.4
41	1016.3	1076.0	1149.0	1200.9	1281.0	1435.0
42	1047.0	1107.8	1182.1	1235.0	1316.7	1473.7
43	1077.8	1139.6	1215.3	1269.1	1352.3	1512.4
44	1108.7	1171.6	1248.5	1303.3	1388.1	1551.2
45	1139.6	1203.5	1281.8	1337.6	1423.8	1589.9
46	1170.6	1235.6	1315.2	1371.9	1459.6	1628.7
47	1201.7	1267.7	1348.6	1406.2	1495.5	1667.6
48	1232.8	1299.9	1382.1	1440.6	1531.3	1706.4
49	1264.1	1332.2	1415.6	1475.1	1567.2	1745.3
50	1295.3	1364.5	1449.2	1509.6	1603.2	1784.2

—continued—

Table 2 (continued)
Service facility utilization-with no queuing (ERLANG B) (IN CCS)

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
51	1326.7	1396.8	1482.8	1544.1	1639.2	1823.2
52	1358.1	1429.2	1516.5	1578.7	1675.2	1862.1
53	1389.6	1461.7	1550.2	1613.3	1711.2	1901.1
54	1421.1	1494.2	1583.9	1647.9	1747.3	1940.1
55	1452.6	1526.7	1617.7	1682.6	1783.4	1979.1
56	1484.2	1559.3	1651.5	1717.3	1819.6	2018.1
57	1515.9	1592.0	1685.4	1752.1	1855.7	2057.2
58	1547.6	1624.7	1719.3	1786.9	1891.9	2096.3
59	1579.4	1657.4	1753.2	1821.7	1928.1	2135.3
60	1611.2	1690.2	1787.2	1856.5	1964.4	2174.4
61	1643.1	1723.0	1821.2	1891.4	2000.6	2213.6
62	1675.0	1755.9	1855.2	1926.3	2036.9	2252.7
63	1707.0	1788.7	1889.3	1961.2	2073.2	2291.9
64	1739.0	1821.7	1923.4	1996.2	2109.6	2331.0
65	1771.0	1854.7	1957.5	2031.2	2145.9	2370.2
66	1803.1	1887.7	1991.7	2066.2	2182.3	2409.4
67	1835.2	1920.7	2025.9	2101.2	2218.7	2448.6
68	1867.4	1953.8	2060.1	2136.3	2255.1	2487.8
69	1899.6	1986.9	2094.4	2171.4	2291.6	2527.0
70	1931.8	2020.0	2128.7	2206.5	2328.0	2566.3
71	1964.1	2053.2	2163.0	2241.6	2364.5	2605.5
72	1996.4	2086.4	2197.3	2276.8	2401.0	2644.8
73	2028.7	2119.7	2231.6	2312.0	2437.5	2684.1
74	2061.1	2152.9	2266.0	2347.2	2474.0	2723.4
75	2093.5	2186.2	2300.4	2382.4	2510.6	2762.7

—continued—

Table 2 (continued)
Service facility utilization-with no queuing (ERLANG B) (IN CCS)

	Grade of service (GOS)-traffic offered					
Number	0.005	**0.010**	0.020	0.030	0.050	**0.100**
76	2126.0	2219.5	2334.8	2417.6	2547.1	2802.0
77	2158.4	2242.9	2369.3	2452.9	2483.7	2841.3
78	2190.9	2286.2	2403.8	2488.2	2620.3	2880.6
79	2223.5	2319.6	2438.3	2523.5	2656.9	2920.0
80	2256.0	2353.1	2472.8	2558.8	2693.5	2959.3
81	2288.6	2386.5	2507.3	2594.1	2730.2	2998.7
82	2321.3	2420.0	2541.9	2629.9	2766.8	3038.0
83	2353.9	2453.5	2576.4	2664.9	2803.5	3077.4
84	2386.6	2487.0	2611.0	2700.2	2840.2	3116.8
85	2419.3	2520.6	2645.7	2735.7	2876.8	3156.2
86	2452.0	2554.1	2680.3	2771.1	2913.6	3195.6
87	2484.8	2587.7	2714.9	2806.5	2950.3	3235.0
88	2517.6	2621.3	2749.6	2842.0	2987.0	3274.4
89	2550.4	2655.0	2784.3	2877.5	3023.7	3313.8
90	2583.2	2688.6	2819.0	2912.9	3060.5	3353.3
91	2616.1	2722.3	2853.7	2984.4	3097.3	3392.7
92	2648.9	2756.0	2888.5	2984.0	3134.0	3432.2
93	2681.8	2789.7	2923.2	3019.5	3170.8	3471.6
94	2714.8	2823.5	2958.0	3055.0	3207.6	3511.1
95	2747.7	2857.2	2992.8	3090.6	3244.4	3550.5
96	2780.7	2891.0	3027.6	3126.2	3281.3	3590.0
97	2813.7	2924.8	3062.4	3161.8	3318.1	3629.5
98	2846.7	2958.6	3097.3	3197.4	3354.9	3669.0
99	2879.7	2992.5	3132.1	3233.0	3391.8	3708.5
100	2912.8	3026.3	3167.0	3268.6	3428.7	3748.0

—continued—

Table 2 (continued)
Service facility utilization-with no queuing (ERLANG B) (IN CCS)

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
101	2945.9	3060.2	3201.9	3304.2	3465.5	3787.5
102	2978.9	3094.1	3236.8	3339.9	3502.4	3827.0
103	3012.1	3128.0	3271.7	3375.5	3539.3	3866.5
104	3045.2	3161.9	3306.6	3411.2	3576.2	3906.0
105	3078.3	3195.8	3341.5	3446.9	3613.1	3945.5
106	3111.5	3229.8	3376.5	3482.6	3650.0	3985.0
107	3144.7	3263.8	3411.5	3518.3	3687.0	4024.6
108	3177.9	3297.7	3446.4	3554.0	3723.9	4064.1
109	3211.2	3331.7	3481.4	3589.7	3760.8	4103.7
110	3244.4	3365.8	3516.4	3625.5	3797.8	4143.2
111	3277.7	3399.8	3551.4	3661.2	3834.8	4182.8
112	3310.9	3433.8	3586.5	3697.0	3871.7	4222.3
113	3344.2	3467.9	3621.5	3732.8	3908.7	4261.9
114	3377.6	3502.0	3656.6	3768.5	3945.7	4301.5
115	3410.9	3536.1	3691.6	3804.3	3982.7	4341.0
116	3444.2	3570.2	3726.7	3840.1	4019.7	4380.6
117	3477.6	3604.3	3761.8	3875.9	4056.7	4420.2
118	3511.0	3638.4	3796.9	3911.8	4093.7	4459.8
119	3544.4	3672.6	3832.0	3947.6	‘4130.7	4499.4
120	3577.8	3706.7	3867.1	3983.4	4167.7	4539.0
121	3611.2	3740.9	4902.2	4019.3	4204.8	4578.6
122	3644.6	3775.1	3937.4	4055.1	4241.8	4618.2
123	3678.1	3809.3	3972.5	4091.0	4278.9	4657.8
124	3711.6	3843.5	4007.7	4126.9	4315.9	4697.4
125	3745.0	3877.7	4042.8	4162.7	4353.0	4737.0

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Table 2 (continued)
Service facility utilization-with no queuing (ERLANG B) (IN CCS)

	Grade of service (GOS)-traffic offered					
Number	0.005	**0.010**	0.020	0.030	0.050	**0.100**
126	3778.5	3911.9	4078.0	4198.6	4390.1	4776.6
127	3812.0	3946.2	4113.2	4234.5	4427.1	4816.2
128	3845.6	3980.4	4148.4	4270.4	4464.2	4855.9
129	3879.1	4014.7	4183.6	4306.4	4501.3	4895.5
130	3912.7	4049.0	4218.8	4342.3	4538.4	4935.1
131	3946.2	4083.2	4254.0	4378.2	4575.5	4974.7
132	3979.8	4117.5	4289.3	4414.2	4612.6	5014.4
133	4013.4	4151.9	4324.5	4450.1	4649.7	5054.0
134	4047.0	4186.2	4359.8	4486.1	4686.8	5093.7
135	4080.6	4220.5	4395.0	4522.0	4724.0	5133.3
136	4114.2	4254.9	4430.3	4558.0	4761.1	5173.0
137	4147.9	4289.2	4465.6	4594.0	4798.2	5212.6
138	4181.5	4323.6	4500.9	4629.9	4835.4	5252.3
139	4215.2	4358.0	4536.1	4665.9	4872.5	5291.9
140	4248.9	4392.3	4571.4	4701.9	4909.7	5331.6
141	4282.6	4426.7	4606.8	4737.9	4946.8	5371.3
142	4316.3	4461.1	4642.1	4773.9	4984.0	5411.0
143	4350.0	4495.6	4677.4	4810.0	5021.1	5450.6
144	4383.7	4530.0	4712.7	4846.0	5058.3	5490.3
145	4417.4	4564.4	4748.1	4882.0	5095.5	5530.0
146	4451.2	4598.9	4783.4	4918.1	5132.7	5569.7
147	4484.9	4633.3	4818.8	4954.1	5169.8	5609.3
148	4518.7	4667.8	4854.2	4990.1	5207.0	5649.0
149	4552.5	4702.3	4889.5	5026.2	5244.2	5688.7
150	4586.3	4736.7	4924.9	5062.3	5281.4	5728.4

—continued—

Table 2 (continued)
Service facility utilization-with no queuing (ERLANG B) (IN CCS)

	Grade of service (GOS)-traffic offered					
Number	0.005	**0.010**	0.020	0.030	0.050	**0.100**
151	4620.1	4771.2	4960.3	5098.3	5318.6	5768.1
152	4653.9	4805.7	4995.7	5134.4	5355.8	5807.8
153	4687.7	4840.2	5031.1	5170.5	5393.1	5847.5
154	4721.5	4874.8	5066.5	5206.6	5430.3	5887.2
155	4755.4	4909.3	5101.9	5242.7	5467.5	5926.9
156	4789.2	4943.8	5137.3	5278.8	5504.7	5966.6
157	4823.1	4978.4	5172.8	5314.9	5541.9	6006.3
158	4857.0	5012.9	5208.2	5351.0	5579.2	6046.0
159	4890.8	5047.5	5243.6	5387.1	5616.4	6085.7
160	4924.7	5082.0	5279.1	5423.2	5653.7	6125.4
161	4958.6	5116.6	5314.6	5459.3	5690.9	
162	4992.5	5151.2	5350.0	5495.5	5728.2	
163	5026.5	5185.8	5385.5	5531.6	5765.4	
164	5060.4	5220.4	5421.0	5567.7	5802.7	
165	5094.3	5255.0	5456.4	5603.9	5839.9	
166	5128.3	5289.6	5491.9	5640.0	5877.2	
167	5162.2	5324.2	5527.4	5676.2	5914.5	
168	5196.2	5358.9	5562.9	5712.4	5951.7	
169	5230.2	5393.5	5598.4	5748.5	5989.0	
170	5264.1	5428.1	5633.9	5784.7	6026.3	
171	5298.1	5462.8	5669.4	5820.9	6063.6	
172	5332.1	5497.5	5705.0	5857.1	6100.9	
173	5366.1	5532.1	5740.5	5893.2	6138.2	
174	5400.2	5566.8	5776.0	5929.4	6175.5	
175	5434.2	5601.5	5811.6	5965.6	6212.8	

Table 3
Service facility utilization-with queuing (ERLANG C) (in CCS) (delay over all calls)

	Delay holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.2	12.0	15.4	18.0	24.0	23.8
2	32.2	41.6	47.1	50.9	58.8	64.4
3	61.9	74.1	80.9	85.3	94.2	100.2
4	93.3	107.6	115.3	120.2	129.8	136.1
5	125.8	141.8	150.2	155.4	165.5	172.0
6	158.9	176.3	185.2	190.8	201.3	207.9
7	192.5	211.1	220.5	226.3	237.1	243.9
8	226.4	246.0	255.8	261.8	272.9	279.8
9	260.5	281.1	291.3	297.5	308.8	315.8
10	294.8	316.3	326.8	333.1	344.7	351.7
11	329.3	351.6	362.4	368.9	380.6	387.7
12	363.9	386.9	398.0	404.6	416.5	423.7
13	398.6	422.3	433.6	440.4	452.4	459.7
14	433.5	457.8	469.3	476.1	488.4	495.6
15	468.3	493.2	505.0	511.9	524.3	531.6
16	503.3	528.8	540.7	547.8	560.2	567.6
17	528.3	564.3	576.5	583.6	596.2	603.6
18	573.4	599.9	612.2	619.4	632.1	639.6
19	608.6	635.5	648.0	655.3	668.1	675.6
20	643.8	671.2	683.8	691.2	704.0	711.5
21	679.0	706.8	719.6	727.0	740.0	747.5
22	714.3	742.5	755.4	762.9	776.0	783.5
23	749.6	778.2	791.2	798.8	811.9	819.5
24	784.9	813.9	827.1	834.7	847.9	855.5
25	820.3	849.6	862.9	870.6	883.9	891.5

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Table 3 (continued)
Service facility utilization-with queuing (ERLANG C) (in CCS) (delay over all calls)

	Delay holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
26	855.6	885.4	898.8	906.5	919.8	927.5
27	891.0	921.1	934.6	942.4	955.8	963.5
28	926.5	956.9	970.5	978.3	991.8	999.5
29	961.9	992.6	1006.4	1014.2	1027.7	1035.5
30	997.4	1028.4	1042.2	1050.2	1063.7	1071.5
31	1032.9	1064.2	1078.1	1086.1	1099.7	1107.5
32	1068.4	1100.0	1114.0	1122.0	1135.7	1143.4
33	1103.9	1135.8	1149.9	1157.9	1171.7	1179.4
34	1139.5	1171.6	1185.8	1193.9	1207.6	1215.4
35	1175.0	1207.4	1221.7	1229.8	1243.6	1251.4
36	1210.6	1243.2	1257.6	1265.7	1279.6	1287.4
37	1246.2	1297.1	1293.5	1301.7	1316.5	1323.4
38	1281.8	1314.9	1329.4	1337.6	1351.6	1359.4
39	1317.4	1350.7	1365.3	1373.6	1387.5	1395.4
40	1353.0	1386.6	1401.2	1409.5	1423.5	1431.4
41	1388.6	1422.4	1437.1	1445.5	1459.4	1467.4
42	1424.2	1458.3	1473.0	1481.4	1495.5	1503.4
43	1459.9	1494.1	1509.0	1517.4	1531.5	1539.4
44	1495.5	1530.0	1544.9	1553.3	1567.5	1575.4
45	1531.2	1565.8	1580.8	1589.3	1603.4	1611.4
46	1566.8	1601.7	1616.8	1625.2	1639.4	1647.4
47	1602.5	1637.6	1652.7	1661.2	1675.4	1683.4
48	1638.2	1673.5	1688.6	1697.1	1711.4	1719.4
49	1673.9	1709.3	1724.5	1733.1	1747.4	1755.4
50	1709.6	1745.2	1760.5	1769.0	1783.4	1791.4

-continue&

Table 3 (continued)
Service facility utilization—with queuing (ERLANG C) (in CCS) (delay over all calls)

	Delay holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
51	1745.3	1781.1	1796.4	1805.0	1819.4	1827.4
52	1781.0	1817.0	1832.4	1841.0	1855.4	1863.4
53	1816.7	1852.9	1868.3	1876.9	1891.3	1899.4
54	1852.5	1888.8	1904.2	1912.9	1927.3	1935.4
55	1888.2	1924.6	1940.2	1948.9	1963.3	1971.3
56	1923.9	1960.5	1976.1	1984.8	1999.3	2007.3
57	1959.7	1996.4	2012.1	2020.8	2035.3	2043.3
58	1995.4	2032.3	2048.0	2056.8	2071.3	2079.3
59	2031.2	2068.2	2084.0	2092.7	2107.3	2115.3
60	2066.9	2104.1	2119.9	2128.7	2143.3	2151.3
61	2102.7	2140.1	2155.9	2164.7	2179.3	2187.3
62	2138.4	2175.9	2191.8	2200.6	2215.3	2223.3
63	2174.2	2211.9	2227.8	2236.6	2251.3	2259.3
64	2209.9	2247.8	2263.7	2272.6	2287.2	2295.3
65	2245.8	2283.7	2299.7	2308.5	2323.2	2331.3
66	2218.5	2319.6	2335.6	2344.5	2359.2	2367.3
67	2317.3	2355.5	2371.6	2380.5	2395.2	2403.3
68	2353.1	2391.4	2407.5	2416.5	2431.2	2439.3
69	2388.9	2427.3	2443.5	2452.4	2467.2	2475.3
70	2424.7	2463.3	2479.4	2488.4	2503.2	2511.3
71	2460.5	2499.2	2515.4	2524.4	2539.2	2547.3
72	2496.3	2535.1	2551.4	2560.4	2575.2	2583.3
73	2531.1	2571.0	2587.3	2596.3	2611.2	2619.3
74	2567.9	2607.0	2623.3	2632.3	2647.2	2655.3
75	2603.7	2642.9	2659.2	2668.3	2683.2	2691.3

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Table 3 (continued)
Service facility utilization-with queuing (ERLANG C) (in CCS) (delay over all calls)

	Delay holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
76	2639.5	2678.8	2695.2	2704.3	2719.2	2727.3
77	2675.3	2714.7	2731.2	2740.2	2755.1	2763.3
78	2711.1	2750.7	2767.1	2776.2	2791.1	2799.3
79	2746.9	2786.6	2803.1	2812.2	2827.1	2835.3
80	2782.7	2822.5	2839.1	2848.2	2863.1	2871.3
81	2818.6	2858.5	2875.0	2384.1	2899.1	2907.3
82	2854.4	2894.4	2911.0	2920.1	2935.1	2943.3
83	2890.2	2930.4	2947.0	2956.1	2971.1	2979.3
84	2926.1	2966.3	2982.9	2992.1	3007.1	3015.3
85	2961.9	3002.2	3018.9	3028.1	3043.1	3051.3
86	2997.7	3038.2	3054.9	3064.0	3079.1	3087.3
87	3033.6	3074.1	3090.8	3100.0	3115.1	3123.3
88	3069.4	3110.0	3126.8	3136.0	3151.1	3159.3
89	3105.2	3146.0	3162.8	3172.0	3187.1	3195.3
90	3141.1	3181.9	3198.7	3208.0	3223.1	3231.3
91	3176.9	3217.9	3234.7	3243.9	3259.1	3267.3
92	3212.8	3253.8	3270.7	3279.9	3295.1	3303.3
93	3248.7	3289.8	3306.6	3315.9	3331.1	3339.3
94	3284.5	3325.7	3342.6	3351.9	3367.0	3375.3
95	3320.3	3361.6	3378.6	3387.9	3403.0	3411.3
96	3356.2	3397.6	3414.6	3423.9	3439.0	3447.3
97	3392.1	3433.6	3450.5	3459.8	3475.0	3483.3
98	3427.9	3469.5	3486.5	3495.8	3511.0	3919.3
99	3463.8	3505.4	3522.5	3531.8	3547.0	3555.3
100	3499.6	3541.4	3558.5	3567.8	3583.0	3591.3

-continue+

Table 3 (continued)
Service facility utilization-with queuing (ERLANG C) (in CCS) (delay over all calls)

	Delay holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
101	3535.5	3577.3	3594.4	3603.8	3619.0	3627.3
102	3571.4	3613.3	3630.4	3639.8	3655.0	3663.3
103	3607.3	3649.2	3666.4	3675.7	3691.0	3699.3
104	3643.1	3685.2	3702.3	3711.7	3727.0	3735.3
105	3679.0	3721.1	3738.3	3747.7	3763.0	3771.3
106	3714.8	3757.1	3774.3	3783.7	3799.0	3807.3
107	3750.7	3793.1	3810.3	3819.7	3835.0	3843.3
108	3786.6	3829.0	3846.3	3855.7	3871.0	3879.3
109	3822.5	3865.0	3882.2	3891.7	3907.0	3915.3
110	3858.3	3900.9	3918.2	3927.6	3943.0	3951.3
111	3894.2	3936.9	3954.2	3963.6	3979.0	3987.3
112	3930.1	3972.8	3990.2	3999.6	4015.0	4023.3
113	3966.0	4008.8	4026.1	4035.6	4051.0	4059.2
114	4001.9	4044.7	4062.1	4071.6	4087.0	4095.2
115	4037.8	4080.7	4098.1	4107.6	4123.0	4131.2
116	4073.6	4116.6	4134.1	4143.6	4158.9	4167.2
117	4109.5	4152.1	4170.1	4179.5	4194.9	4203.2
118	4145.4	4188.6	4206.0	4215.5	4230.9	4239.2
119	4181.3	4224.5	4242.0	4251.5	4266.9	4275.2
120	4217.2	4260.5	4278.0	4287.5	4302.9	4311.2
121	4253.1	4296.4	4314.0	4323.5	4338.9	4347.2
122	4289.0	4332.4	4349.9	4359.5	4374.9	4383.2
123	4324.9	4368.4	4385.9	4395.5	4410.9	4419.2
124	4360.7	4404.3	4421.9	4431.5	4446.9	4455.2
125	4396.6	4440.3	4457.9	4467.4	4482.0	4491.2

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Table 3 (continued)
Service facility utilization—with queuing (ERLANG C) (in CCS) (delay over all calls)

	Delay holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
126	4432.5	4476.3	4493.9	4503.4	4518.9	4527.2
127	4468.4	4512.2	4529.9	4539.4	4554.9	4563.2
128	4504.3	4548.2	4565.8	4575.4	4590.9	4599.2
129	4540.2	4584.1	4601.8	4611.4	4626.9	4635.2
130	4576.1	4620.1	4637.8	4647.4	4662.9	4671.2
131	4612.0	4656.1	4673.8	4783.4	4698.9	4707.2
132	4647.9	4692.0	4709.8	4719.4	4734.9	4743.2
133	4683.8	4728.0	4745.7	4755.4	4770.9	4779.2
134	4719.8	4764.0	4781.7	4791.3	4806.9	4815.2
135	4755.6	4799.9	4817.7	4827.3	4842.9	4851.2
136	4791.6	4835.9	4853.7	4863.3	4878.0	4887.2
137	4827.4	4871.9	4889.7	4899.3	4914.9	4923.2
138	4863.3	4907.8	4925.7	4935.3	4950.9	4959.2
139	4899.2	4943.8	4961.6	4971.3	4986.9	4995.2
140	4935.2	4979.8	4997.6	5007.3	5022.9	5031.2
141	4971.1	5015.7	5033.6	5043.3	5058.9	5067.2
142	5007.0	5051.7	5069.6	5079.3	5094.9	5103.2
143	5042.9	5087.7	5105.6	5115.3	5130.9	5139.2
144	5078.8	5123.6	5141.5	5151.2	5166.9	5175.2
145	5114.7	5159.6	5177.5	5187.2	5202.9	5211.2
146	5150.6	5195.6	5213.5	5223.2	5238.9	5247.2
147	5186.5	5231.5	5249.5	5259.2	5274.9	5283.2
148	5222.5	5267.5	5285.5	5295.2	5310.9	5319.2
149	5258.4	5303.5	5321.5	5331.2	5346.8	5355.2
150	5294.3	5339.4	5357.5	5367.2	5382.8	5391.2

Table 4
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 5

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
1	0.2	0.5	0.9	1.4	2.3	4.9
2	5.4	7.7	11.1	13.8	18.3	27.6
3	20.2	25.7	33.0	38.4	46.6	62.1
4	47.9	57.1	68.2	75.9	87.2	107.3

Table 5
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 10

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
1	0.2	0.4	0.8	1.2	2.1	4.4
2	4.4	6.4	9.3	11.7	15.7	24.1
3	15.3	19.8	25.9	30.5	37.8	52.2
4	32.1	39.3	48.5	55.2	65.5	85.1
5	54.1	63.7	75.8	84.4	97.4	121.5
6	80.9	92.9	107.4	117.6	132.9	160.8
7	112.9	126.9	143.5	155.0	172.1	203.1
8	151.3	167.0	185.2	197.6	215.9	249.2
9	200.4	217.1	236.2	248.9	267.7	302.1

Table 6
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 15

	Grade of service (GOS)-traffic offered					
Number	0.005	**0.010**	0.020	0.030	0.050	0.100
1	0.2	0.4	0.8	1.2	2.0	4.3
2	4.2	6.1	8.8	11.1	15.0	23.1
3	14.3	18.5	24.3	28.7	35.8	49.8
4	29.4	36.1	44.9	51.3	61.4	80.7
5	48.5	57.6	69.1	77.5	so.3	114.4
6	70.9	82.3	96.4	106.4	121.7	150.1
7	96.5	109.9	126.3	137.8	155.2	187.5
8	124.7	140.0	158.4	171.3	190.6	226.4
9	155.8	172.6	192.8	206.8	227.8	266.6
10	189.7	207.9	229.6	244.5	266.9	308.3
11	226.7	246.2	268.9	284.6	308.0	351.6
12	267.9	288.1	311.6	327.6	351.8	397.1
13	314.4	335.0	358.7	375.0	399.3	445.7
14	371.1	391.4	414.6	430.4	454.3	500.6

Table 7
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 20

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
1	0.2	0.4	0.8	1.2	2.0	4.2
2	4.1	5.9	8.6	10.8	14.6	22.7
3	13.8	17.9	23.6	27.9	34.8	48.7
4	28.2	34.7	43.3	49.6	59.6	78.7
5	46.2	55.1	66.4	74.6	87.3	111.4
6	67.1	78.2	92.1	102.0	117.3	145.8
7	90.6	103.7	119.9	131.4	149.0	181.7
8	116.2	131.2	149.6	162.5	182.2	218.6
9	143.8	160.5	180.9	195.1	216.6	256.6
10	173.2	191.6	213.6	229.0	252.3	295.5
11	204.4	224.2	247.8	264.2	289.0	335.2
12	237.4	258.5	283.4	300.7	326.8	375.7
13	272.3	294.4	320.5	338.5	365.8	417.1
14	309.2	332.2	359.1	377.8	406.0	459.4
15	348.4	371.9	399.6	418.7	447.6	502.8
16	390.3	414.2	442.2	461.6	491.0	547.6
17	435.7	459.7	487.7	507.1	536.7	594.3
18	486.2	509.9	537.5	556.5	585.9	644.0
19	546.9	569.5	595.7	614.0	642.4	699.8

Table 6
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 25

Number	Grade of service (GOS)-traffic offered					
	0.005	0.010	0.020	0.030	0.050	0.100
1	0.2	0.4	0.8	1.2	2.0	4.1
2	4.0	5.8	8.5	10.7	14.4	22.4
3	13.5	17.6	23.2	27.4	34.3	48.1
4	27.5	34.0	42.4	48.7	58.5	77.6
5	45.0	53.7	64.9	73.0	85.7	109.7
6	65.1	76.1	89.8	99.6	114.8	143.4
7	87.5	100.5	116.6	128.1	145.6	178.5
8	111.9	126.8	145.1	158.0	177.8	214.6
9	137.9	154.6	174.9	189.2	211.0	251.6
10	165.4	183.7	206.0	221.5	245.2	289.3
11	194.3	214.2	238.1	254.9	280.3	327.6
12	224.6	245.9	271.4	289.2	316.1	366.5
13	256.2	278.7	305.6	324.4	352.8	406.1
14	289.1	312.7	340.9	360.4	390.2	446.1
15	323.1	347.8	377.1	397.4	428.3	486.7
16	358.6	384.1	414.3	435.3	467.2	527.9
17	395.5	421.7	452.6	474.1	506.0	569.7
18	433.9	460.6	492.1	514.1	547.6	612.2
19	474.0	501.0	533.0	555.2	589.3	655.5
20	516.2	543.3	575.4	597.8	632.3	699.8

Table 9
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 30

	Grade of service (GOS)-traffic offered					
Number	0.005	**0.010**	0.020	0.030	0.050	**0.100**
1	0.2	0.4	0.8	1.2	2.0	4.1
2	4.0	5.8	8.5	10.6	14.3	22.2
3	13.3	17.4	22.9	27.1	34.0	47.6
4	27.1	33.5	**41.9**	**48.1**	**57.9**	**76.9**
5	44.2	52.8	63.9	72.0	84.6	108.6
6	63.9	74.7	88.3	98.2	113.3	142.0
7	85.7	98.5	114.6	126.0	**143.6**	**176.6**
8	**109.2**	124.0	142.3	155.3	175.1	212.1
9	134.3	151.0	171.3	185.7	207.6	248.5
10	160.8	179.1	201.4	217.1	241.0	285.6
11	188.5	208.4	232.5	249.4	275.1	323.2
12	217.4	238.7	264.5	282.6	310.0	361.3
13	247.4	270.0	297.4	316.5	345.5	399.9
14	278.2	302.2	331.0	351.1	381.6	439.0
15	310.2	335.2	365.3	386.3	418.2	478.4
16	343.0	369.2	400.4	422.2	455.4	518.2
17	376.9	404.0	436.3	458.8	493.2	558.5
18	411.7	439.6	472.8	496.1	531.5	599.1
19	447.5	476.2	510.2	533.9	570.3	640.2
20	484.4	513.6	548.3	572.6	609.8	681.6
21	522.4	552.1	587.3	611.9	649.9	723.6
22	561.5	591.6	627.2	652.2	690.7	766.1
23	602.2	632.4	668.2	693.3	732.3	809.2
24	644.4	674.5	710.3	735.5	774.0	853.1
25	688.3	718.3	754.0	779.2	818.6	897.9

Table 10
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 35

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
1	0.2	0.4	0.8	1.1	1.9	4.1
2	4.0	5.7	8.4	10.5	14.2	22.1
3	13.2	17.2	22.7	26.9	33.7	47.4
4	26.8	33.2	41.5	47.7	57.4	76.4
5	43.7	52.2	63.3	71.3	83.9	107.9
6	63.0	73.8	87.3	97.1	112.3	140.9
7	84.4	97.2	113.2	124.6	142.2	175.2
8	107.5	122.2	140.4	153.4	173.2	210.5
9	132.0	148.5	168.0	183.3	205.3	246.4
10	157.8	176.1	198.4	214.1	238.2	283.1
11	184.7	204.6	228.8	245.8	271.7	320.3
12	212.7	234.1	260.0	278.2	306.0	357.9
13	241.6	264.4	292.0	311.3	340.8	396.0
14	271.4	295.6	324.7	345.1	376.1	434.4
15	302.1	327.4	358.0	379.3	411.9	473.2
16	333.5	360.0	391.9	414.2	448.1	512.3
17	365.8	393.3	426.4	449.5	484.8	551.7
18	398.7	427.3	461.5	485.4	521.9	591.5
19	432.5	461.9	497.1	521.8	559.5	631.5
20	467.0	497.3	533.4	558.7	597.4	671.8
21	502.3	533.2	570.2	596.1	635.8	712.5
22	538.4	569.9	607.6	634.0	674.6	753.4
23	575.2	607.3	645.5	672.4	713.9	794.7
24	712.9	645.5	684.2	711.5	753.6	836.3
25	651.7	684.4	723.5	751.1	793.9	878.3

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Table 10 (continued)
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 35

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
26	691.4	724.3	763.6	791.4	834.8	920.8
27	732.1	765.2	804.6	832.5	876.2	963.7
28	774.2	807.1	846.5	874.5	918.5	1007.2
29	817.7	850.4	889.6	917.5	961.7	1051.5
30	863.0	895.3	934.1	961.8	1005.9	1096.6

Table 11
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 40

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
1	0.2	0.4	0.8	1.1	1.9	4.1
2	3.9	5.7	8.3	10.5	14.2	22.0
3	13.2	17.1	22.6	26.8	33.6	47.2
4	26.6	32.9	41.2	47.3	57.1	76.1
5	43.3	51.8	62.8	70.8	83.3	107.3
6	62.4	73.1	86.6	96.4	111.5	140.2
7	83.5	96.2	112.1	123.5	141.1	174.2
8	106.2	120.8	139.1	152.0	171.9	209.2
9	130.3	146.8	167.1	181.6	203.6	245.0
10	155.6	173.8	196.2	212.0	236.1	281.3
11	182.0	201.9	226.1	243.2	269.3	318.2
12	209.3	230.8	256.8	275.2	303.1	355.5
13	237.6	260.5	288.2	307.7	337.5	393.2
14	266.7	290.9	320.3	340.9	372.2	431.2

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Table 11 (continued)
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 40

	Grade of service (GOS)-traffic offered					
Number	**0.005**	**0.010**	0.020	0.030	0.050	**0.100**
15	296.5	322.0	352.9	374.5	407.5	469.6
16	327.0	353.7	386.0	408.7	443.1	508.3
17	358.2	386.1	419.7	443.3	479.2	547.2
18	390.1	419.1	453.9	478.3	515.6	586.4
19	422.6	452.5	488.5	513.8	552.3	625.8
20	455.7	486.6	523.7	549.6	589.4	665.5
21	489.5	521.1	559.2	585.9	626.9	705.4
22	523.8	556.3	595.3	622.6	664.6	745.5
23	558.8	592.0	631.7	659.7	702.7	785.9
24	594.4	628.2	668.7	697.1	741.1	826.5
25	630.6	665.0	706.1	735.1	779.8	867.4
26	667.6	702.3	744.0	773.4	819.0	908.5
27	705.1	740.3	782.4	812.2	858.5	949.9
28	743.5	778.9	821.3	851.5	898.4	991.6
29	782.5	818.2	860.9	891.2	938,7	1033.6
30	822.6	858.2	901.1	931.6	979.6	1076.0
31	863.4	899.1	941.9	972.6	1020.9	1118.7
32	905.3	940.9	983.7	1014.3	1062.9	1162.0
33	948.4	983.7	1026.3	1056.9	1105.6	1205.8
34	993.0	1027.9	1070.0	1100.4	1149.1	1250.3
35	1039.3	1073.5	1115.1	1145.3	1193.8	1295.8

Table 12
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 45

	Grade of service (GOS)-traffic offered					
Number	0.005	0.010	0.020	0.030	0.050	0.100
1	0.2	0.4	0.8	1.1	1.9	4.1
2	3.9	5.7	8.3	10.4	14.1	22.0
3	13.1	17.0	22.5	26.6	33.4	47.0
4	26.5	32.7	41.0	47.1	56.8	75.8
5	43.0	41.5	62.4	70.4	82.9	106.9
6	61.9	72.6	86.0	95.8	110.9	139.6
7	82.8	95.4	111.4	122.8	140.4	173.5
8	105.2	119.9	138.0	151.0	170.9	208.3
9	129.0	145.5	165.8	180.2	202.4	243.8
10	154.0	172.2	194.6	210.4	234.6	280.0
11	179.9	199.9	224.1	241.3	267.5	316.6
12	206.9	228.4	254.5	272.9	301.0	353.7
13	234.6	257.6	285.5	305.1	335.0	391.1
14	263.1	287.5	317.0	337.8	369.4	428.9
15	292.4	318.1	349.2	371.0	404.3	467.0
16	322.3	349.2	381.8	404.6	439.5	505.3
17	352.7	380.9	414.9	438.7	475.1	543.9
18	383.9	413.2	448.4	473.2	511.0	582.7
19	415.5	445.9	482.4	508.0	547.2	621.8
20	447.6	479.0	516.8	543.2	583.8	661.0
21	480.5	512.7	551.5	578.8	620.6	700.5
22	513.8	546.9	586.7	614.7	657.6	740.1
23	547.5	581.5	622.2	560.9	695.0	780.0
24	581.8	616.5	658.1	687.4	732.6	820.0
25	616.6	652.0	694.4	724.3	770.5	860.2

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Table 12 (continued)
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 45

	Grade of service (GOS)-traffic offered					
Number	0.005	**0.010**	0.020	0.030	0.050	**0.100**
26	652.0	687.8	731.1	761.6	808.7	900.6
27	687.8	724.2	768.1	799.1	847.1	941.2
28	724.1	761.1	805.6	837.0	885.9	982.0
29	761.1	798.5	843.4	875.2	924.9	1023.0
30	798.5	836.3	881.6	913.9	964.2	1064.2
31	836.6	874.6	920.3	952.8	1003.8	1105.6
32	875.3	913.4	959.5	992.2	1043.8	1147.4
33	914.8	953.0	999.1	1032.1	1084.2	1189.3
34	954.8	993.0	1039.4	1072.5	1125.0	1231.6
35	995.7	1033.9	1080.1	1113.3	1166.2	1274.2
36	1037.5	1075.4	1121.6	1154.8	1207.9	1317.2
37	1080.2	1118.0	1163.8	1197.0	1250.2	1360.6
38	1124.4	1161.5	1207.0	1240.0	1293.3	1404.7
39	1169.6	1206.3	1251.2	1284.0	1337.1	1449.4
40	1216.6	1252.6	1296.7	1329.1	1382.1	1494.9

Table 13
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 50

	Grade of service (GOS)-traffic offered					
Number	0.005	**0.010**	0.020	0.030	0.050	**0.100**
1	0.2	0.4	0.7	1.1	1.9	4.1
2	3.9	5.6	8.3	10.4	14.1	21.9
3	13.0	17.0	22.4	26.6	33.3	46.9
4	26.3	32.6	40.8	46.9	56.6	75.6
5	42.7	51.2	62.1	70.1	82.6	106.6
6	61.5	72.1	85.6	95.3	110.5	139.1
7	82.2	94.9	110.7	122.1	139.7	172.9
8	104.5	119.0	137.2	150.2	170.1	207.6
9	128.0	144.5	164.8	179.2	201.4	243.0
10	152.7	170.9	193.3	209.2	233.4	278.9
11	178.4	198.3	222.6	239.8	266.1	315.4
12	205.0	226.5	252.7	271.1	299.3	352.3
13	232.3	255.3	283.3	303.0	333.1	389.5
14	260.5	284.9	314.5	335.4	367.3	427.1
15	289.3	315.0	346.3	368.3	401.8	464.9
16	318.6	345.7	378.5	401.6	436.7	503.0
17	348.6	376.9	411.2	435.2	472.0	541.4
18	379.1	408.7	444.2	469.3	507.5	580.0
19	410.2	440.8	477.7	503.7	543.4	618.7
20	441.7	473.4	511.6	538.4	579.5	657.7
21	473.8	506.5	545.8	573.5	615.9	696.8
22	506.3	539.9	580.4	608.8	652.5	736.2
23	539.3	573.7	615.2	644.5	689.3	775.7
24	572.7	608.0	650.4	680.4	726.5	815.3
25	606.4	642.5	686.0	716.6	763.8	855.1

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Table 13 (continued)
Service facility utilization-finite source with no queuing (ENGSET) (in CCS)
Number in source = 50

	Grade of service (GOS)-traffic offered					
Number	0.005	**0.010**	0.020	0.030	0.050	**0.100**
26	640.8	677.5	721.9	753.1	801.3	895.0
27	675.4	712.9	758.0	789.8	839.1	935.1
28	710.6	748.6	794.5	826.9	877.1	975.4
29	746.2	784.8	831.3	864.2	915.3	1015.8
30	782.1	821.2	868.4	901.8	953.8	1056.4
31	818.6	858.1	905.8	939.6	992.4	1097.1
32	855.6	895.5	943.6	977.8	1031.4	1138.0
33	892.9	933.1	981.7	1016.3	1070.6	1179.1
34	930.8	971.3	1020.2	1055.1	1110.0	1220.3
35	969.3	1009.9	1059.0	1094.2	1149.7	1261.8
36	1008.3	1049.0	1098.3	1133.7	1189.8	1303.5
37	1047.7	1088.5	1138.0	1173.6	1230.1	1345.4
38	1088.0	1128.7	1178.2	1213.9	1270.8	1387.0
39	1128.9	1169.5	1218.9	1254.6	1311.9	1430.0
40	1170.5	1210.8	1260.2	1295.9	1353.4	1472.9

Table 14
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 5

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	9.5	16.5	21.8	25.9	34.0	36.0
2	48.6	62.4	68.7	71.2	72.0	72.0
3	97.9	107.4	108.0	108.0	108.0	108.8
4	143.8	144.0	144.0	144.0	144.0	144.0

Table 15
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 10

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	8.2	14.0	18.8	21.6	29.9	35.2
2	39.4	51.9	59.3	64.1	71.2	71.9
3	78.8	94.5	102.0	105.6	108.0	108.0
4	121.6	137.2	142.4	143.8	144.0	144.0
5	165.4	177.9	179.9	179.9	180.0	180.0
6	208.6	215.8	216.0	216.0	216.0	216.0
7	250.0	252.0	252.0	252.0	252.0	252.0
8	287.9	288.0	288.0	288.0	288.0	288.0
9	324.0	324.0	324.0	324.0	324.0	324.0

Table 16
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 15

	Delay/holding time (D/HP)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.8	13.3	17.8	20.4	28.1	34.0
2	36.8	48.4	55.5	60.3	69.3	72.0
3	72.9	88.3	96.7	101.6	107.7	108.0
4	112.3	129.6	137.6	141.4	144.0	144.0
5	153.2	170.7	177.2	179.4	180.0	180.0
6	194.9	210.9	215.2	216.0	216.0	216.0
7	236.6	249.8	251.9	252.0	252.0	252.0
8	277.9	287.4	288.0	288.0	288.0	288.0
9	318.3	324.0	324.0	324.0	324.0	324.0
10	357.7	359.8	360.0	360.0	360.0	360.0
11	395.6	396.0	396.0	396.0	396.0	396.0

Table 17
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 20

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.7	12.9	16.8	19.8	27.2	38.1
2	35.6	46.7	53.5	58.3	67.7	71.8
3	70.1	85.0	93.4	98.7	106.8	108.0
4	107.6	125.0	133.9	138.7	143.9	144.0
5	146.8	165.5	173.7	177.6	180.0	180.0
6	186.9	205.7	212.7	215.2	216.0	216.0
7	227.5	245.3	250.6	251.8	252.0	252.0
8	268.1	284.1	287.6	288.0	288.0	288.0
9	308.7	322.1	323.9	324.0	324.0	324.0
10	348.9	359.3	360.0	360.0	360.0	360.0
11	388.5	395.8	396.0	396.0	396.0	396.0
12	427.6	432.0	432.0	432.0	432.0	432.0
13	465.9	468.0	468.0	468.0	468.0	468.0
14	503.3	504.0	504.0	504.0	504.0	504.0
15	539.9	540.0	540.0	540.0	540.0	540.0

Table 18
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 25

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.6	12.8	16.5	19.5	26.6	32.5
2	34.9	45.7	52.3	57.0	66.5	71.5
3	68.4	83.0	91.3	96.7	105.8	108.0
4	104.8	122.1	131.1	136.5	143.4	144.0
5	142.8	161.8	170.9	175.6	179.9	180.0
6'	181.8	201.6	210.1	213.8	216.0	216.0
7	221.5	241.2	248.5	251.1	252.0	252.0
8	261.4	280.4	286.2	287.7	288.0	288.0
9	301.4	319.0	323.3	324.0	324.0	324.0
10	341.4	357.0	359.8	360.0	360.0	360.0
11	381.1	394.4	396.0	396.0	396.0	396.0
12	420.6	431.3	432.0	432.0	432.0	432.0
13	459.7	467.8	468.0	468.0	468.0	468.0
14	498.3	504.0	504.0	504.0	504.0	504.0
15	536.5	540.0	540.0	540.0	540.0	540.0
16	574.1	576.0	576.0	576.0	576.0	576.0
17	611.2	612.0	612.0	612.0	612.0	612.0
18	647.8	648.0	648.0	648.0	648.0	648.0

Table 19
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 30

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.5	12.6	16.3	19.2	26.2	32.0
2	34.4	45.0	51.5	56.0	65.6	71.1
3	67.3	81.6	89.8	95.2	104.9	107.9
4	102.9	120.0	129.1	134.7	142.9	144.0
5	140.1	159.1	168.6	173.8	179.7	180.0
6	178.4	198.5	207.8	212.3	216.0	216.0
7	217.2	237.9	246.4	250.0	252.0	252.0
8	256.5	277.1	284.5	287.1	288.0	288.0
9	296.0	315.9	322.0	323.7	324.0	324.0
10	335.6	354.3	359.0	359.9	360.0	360.0
11	375.1	392.2	395.6	396.0	396.0	396.0
12	414.5	429.6	431.9	432.0	432.0	432.0
13	453.7	466.7	468.0	468.0	468.0	468.0
14	492.6	503.4	504.0	504.0	504.0	504.0
15	531.3	539.8	540.0	540.0	540.0	540.0
16	569.6	575.9	576.0	576.0	576.0	576.0
17	607.6	612.0	612.0	612.0	612.0	612.0
18	645.2	648.0	648.0	648.0	648.0	648.0
19	682.4	684.0	684.0	684.0	684.0	684.0
20	719.2	720.0	720.0	720.0	720.0	720.0
21	755.7	756.0	756.0	756.0	756.0	756.0
22	791.9	792.0	792.0	792.0	792.0	792.0

Table 20
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 35

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.5	12.5	16.2	19.0	25.9	31.7
2	34.1	44.5	50.9	55.4	64.9	70.7
3	66.5	80.6	88.7	94.1	104.1	107.8
4	101.6	118.4	127.6	133.3	142.3	144.0
5	138.2	157.1	166.7	172.3	179.4	180.0
6	175.8	196.1	205.8	210.9	215.9	216.0
7	214.1	235.3	244.5	248.9	252.0	252.0
8	252.9	274.3	282.8	286.3	288.0	288.0
9	291.9	313.1	320.6	323.2	324.0	324.0
10	331.0	351.6	358.0	359.7	360.0	360.0
11	370.3	389.8	394.9	395.9	396.0	396.0
12	409.5	427.5	431.5	432.0	432.0	432.0
13	448.6	465.1	467.8	468.0	468.0	468.0
14	487.5	502.2	503.9	504.0	504.0	504.0
15	526.3	538.9	540.0	540.0	540.0	540.0
16	564.9	575.5	576.0	576.0	576.0	576.0
17	603.2	611.8	612.0	612.0	612.0	612.0
18	641.3	647.9	648.0	648.0	648.0	648.0
19	679.1	684.0	684.0	684.0	684.0	684.0
20	716.6	720.0	720.0	720.0	720.0	720.0
21	753.8	756.0	756.0	756.0	756.0	756.0
22	790.7	792.0	792.0	792.0	792.0	792.0
23	827.3	828.0	828.0	828.0	828.0	828.0
24	863.7	864.0	864.0	864.0	864.0	864.0
25	899.9	900.0	900.0	900.0	900.0	900.0

Table 21
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 40

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.4	12.5	16.1	18.9	25.7	31.4
2	33.8	44.1	50.5	54.9	64.3	70.4
3	65.9	79.8	87.8	93.2	103.3	107.7
4	100.6	117.2	126.3	132.1	141.7	144.0
5	136.7	155.5	165.2	171.0	179.1	180.0
6	173.9	194.2	204.2	209.6	215.7	216.0
7	211.7	233.1	242.9	247.7	251.9	252.0
8	250.0	272.0	281.2	285.4	288.0	288.0
9	288.6	310.7	319.2	322.5	324.0	324.0
10	327.4	349.3	356.8	359.2	360.0	360.0
11	366.4	387.5	394.0	395.7	396.0	396.0
12	405.3	425.5	430.8	431.9	432.0	432.0
13	444.2	463.4	467.4	468.0	468.0	468.0
14	483.1	500.6	503.7	504.0	504.0	504.0
15	521.9	537.7	539.9	540.0	540.0	540.0
16	560.5	574.5	576.0	576.0	576.0	576.0
17	599.0	611.1	612.0	612.0	612.0	612.0
18	637.2	647.5	648.0	648.0	648.0	648.0
19	675.3	683.8	684.0	684.0	684.0	684.0
20	713.1	719.9	720.0	720.0	720.0	720.0
21	750.7	756.0	756.0	756.0	756.0	765.0
22	788.1	792.0	792.0	792.0	792.0	792.0
23	825.3	828.0	828.0	828.0	828.0	828.0
24	362.2	864.0	864.0	864.0	864.0	864.0
25	898.9	900.0	900.0	900.0	900.0	900.0

continued—

Table 21 (continued)
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 40

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
26	935.4	936.0	936.0	936.0	936.0	936.0
27	971.7	972.0	972.0	972.0	972.0	972.0
28	1007.9	1008.0	1008.0	1008.0	1008.0	1008.0

Table 22
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 45

	Delay/holding time (D/HT)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.4	12.4	16.0	18.8	25.5	31.2
2	33.7	43.8	50.1	54.5	63.8	70.1
3	65.5	79.2	87.1	92.4	102.7	107.6
4	99.8	116.3	125.3	131.1	141.1	144.0
5	135.6	154.2	164.0	169.9	178.6	180.0
6	172.3	192.6	202.7	208.5	215.5	216.0
7	209.8	231.3	241.4	246.7	251.9	252.0
8	247.7	270.0	279.8	284.4	288.0	288.0
9	286.0	308.6	317.8	321.8	324.0	324.0
10	324.5	347.1	355.6	358.7	360.0	360.0
11	363.1	385.5	393.0	395.3	396.0	396.0
12	401.9	423.6	430.0	431.7	432.0	432.0
13	440.6	461.4	466.8	467.9	468.0	468.0
14	479.3	499.0	503.3	504.0	504.0	504.0
15	518.0	536.3	539.6	540.0	540.0	540.0

—continued—

Table 22 (continued)
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 45

	Delay/holding time (D/Hi)-traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
16	556.6	573.4	575.8	576.0	576.0	576.0
17	595.1	610.2	611.9	612.0	612.0	612.0
18	633.4	646.9	648.0	648.0	648.0	648.0
19	671.6	683.3	684.0	684.0	684.0	684.0
20	709.6	719.6	720.0	720.0	720.0	720.0
21	747.4	755.8	756.0	756.0	756.0	756.0
22	785.1	791.9	792.0	792.0	792.0	792.0
23	822.6	828.0	828.0	828.0	828.0	828.0
24	859.8	864.0	864.0	864.0	864.0	864.0
25	896.9	900.0	900.0	900.0	900.0	900.0
26	933.8	936.0	936.0	936.0	936.0	936.0
27	970.5	972.0	972.0	972.0	972.0	972.0
28	1007.1	1008.0	1008.0	1008.0	1008.0	1008.0
29	1043.5	1044.0	1044.0	1044.0	1044.0	1044.0
30	1079.7	1080.0	1080.0	1080.0	1080.0	1080.0

Table 23
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 50

	Delay/holding time (D/HT)—traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
1	7.4	12.4	16.0	18.7	25.3	31.0
2	33.5	43.6	49.8	54.1	63.4	69.8
3	65.1	78.7	86.6	91.8	102.2	107.4
4	99.1	115.5	124.5	130.3	140.6	143.9
5	134.6	153.1	163.0	168.9	178.2	180.0
6	171.1	191.3	201.5	207.5	215.2	216.0
7	208.2	229.7	240.1	245.7	251.7	252.0
8	245.8	268.3	278.4	283.5	287.9	288.0
9	283.8	306.8	316.6	321.0	324.0	324.0
10	322.1	345.3	354.4	358.1	360.0	360.0
11	360.4	383.6	391.9	394.9	396.0	396.0
12	399.0	421.7	429.1	431.4	432.0	432.0
13	437.5	459.6	466.1	467.7	468.0	468.0
14	476.1	497.3	502.8	503.9	504.0	504.0
15	514.6	534.8	539.3	540.0	540.0	540.0
16	553.1	572.1	575.6	576.0	576.0	576.0
17	591.6	609.1	611.8	612.0	612.0	612.0
18	629.9	645.9	647.9	648.0	648.0	648.0
19	668.1	682.6	684.0	684.0	684.0	684.0
20	706.2	719.1	720.0	720.0	720.0	720.0
21	744.2	755.4	756.0	756.0	756.0	756.0
22	782.0	791.7	792.0	792.0	792.0	792.0
23	819.7	827.8	828.0	828.0	828.0	828.0
24	857.2	863.9	864.0	864.0	864.0	864.0
25	894.5	900.0	900.0	900.0	900.0	900.0

—continued—

Table 23 (continued)
Service facility utilization-finite source with queuing (ENGSET) (in CCS)
Number in source = 50

	Delay/holding time (D/HT)—traffic offered					
Number	0.25	0.50	0.75	1.00	2.00	4.00
26	931.7	936.0	936.0	936.0	936.0	936.0
27	968.7	972.0	972.0	972.0	972.0	972.0
28	1005.6	1008.0	1008.0	1008.0	1008.0	1008.0
29	1042.3	1044.0	1044.0	1044.0	1044.0	1044.0
30	1078.8	1080.0	1080.0	1080.0	1080.0	1080.0
31	1115.2	1116.0	1116.0	1116.0	1116.0	1116.0
32	1151.6	1152.0	1152.0	1152.0	1152.0	1152.0
33	1187.8	1188.0	1188.0	1188.0	1188.0	1188.0
34	1223.9	1224.0	1224.0	1224.0	1224.0	1224.0

SL-1

Meridian data features

Traffic engineering and configuration

Release 4.0
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SL-1

NT7D16 Data Access Card

Description and operation

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December 31, 1992

Standard, release 3.0 reissued for technical updates. Changes are noted with revision bars in the margins.

Contents

About this document

This document outlines the characteristics and operation of the NT7D16 Data Access Card (DAC).

References

The following documents are for reference only, and are not required to use the DAC.

- (553-2731-106)
- *QMT21 High Speed Data Module description, installation. and operation* (553-2731-107)
- ***Meridian Data Services Traffic engineering and configuration*** (553-2731-151)
- ***High Speed Data Module User Guide***

See the ***Xl l input/output guide*** (553-3001-400) for a description of all administration programs, maintenance programs, and system messages.

Description

The NT7D16 Data Access Card (DAC) is a data interface card that integrates the functionality of the QPC723A RS-232 4-Port Interface Line Card (RILC) and the QPC430 Asynchronous Interface Line Card (AILC). This combination allows the NT7D16 DAC to work with the RS-232-C interface, the RS-422 interface, or both.

To support the NT7D16 Data Access Card, the system must be equipped with software release 16 or higher, and an Intelligent Peripheral Equipment (IPE) Module.

The DAC supports up to six ports, each capable of operating in RS-232-C or RS-422 mode. Each port supports its own parameters that, once configured and stored in the system database memory, are downloaded to the card.

Features

Light Emitting Diodes (LEDs) indicate the status of the card, the call connection, and the mode (RS-232-C or RS-422) the DAC is operating in. A pushbutton toggle switch allows you to scan all six ports and monitor the activity on each port.

The DAC supports the following features:

- Asynchronous and full duplex operation
- Keyboard dialing
  Hayes dialing
- Data terminal equipment (DTE)/data communication equipment (DCE) mode selection

- Modem and gateway connectivity in DTE mode
- Terminal and host connectivity in DCE mode
- Forced or normal DTR
- Hotline
- Remote and local loopback testing
- Virtual leased line mode
- Inactivity timeout
- Wire test mode
- Self diagnostics
- Inbound modem pooling with any asynchronous modems
- Outbound modem pooling using "dumb" modems
- Outbound modem pooling using auto dialing modems

Controls and indicators

The LEDs on the DAC faceplate indicate the status mode for each port. Figure 1 shows the NT7D16 DAC faceplate.

Card status

The LED at the top of the faceplate is unlabeled. This LED is:

- off: if one or more ports are enabled
- on: if all ports are disabled

Electronic Industries Association signal monitors

The six LEDs located below the card status LED are labeled SD, RD, DTR, DSR, DCD, and RI. They show the dynamic state of the associated Electronic Industries Association (EIA) control leads for a specific port (as shown by the display). When in RS-422 mode, only SD and RD are utilized. When in RS-232-C mode, the LED goes on to indicate that the signal is asserted on, or off to indicate that the signal is asserted off. When the LED is off, there is no active voltage on the signal lead.

CONNECT

This lamp lights to indicate that a data call is established for the port displayed. A data call is connected when the data module-to-data module protocol messages are successfully exchanged between the two ends.

Port mode

This lamp lights to indicate that the port indicated is in RS-422 mode. If the lamp is dark, the specified port is in RS-232-C mode.

Port number

The number displayed specifies the port driving the EIA signal LEDs mentioned above. The pushbutton switch below the display allows you to rotate among the six ports to monitor the activity of any port. This display is also used to monitor several error conditions.

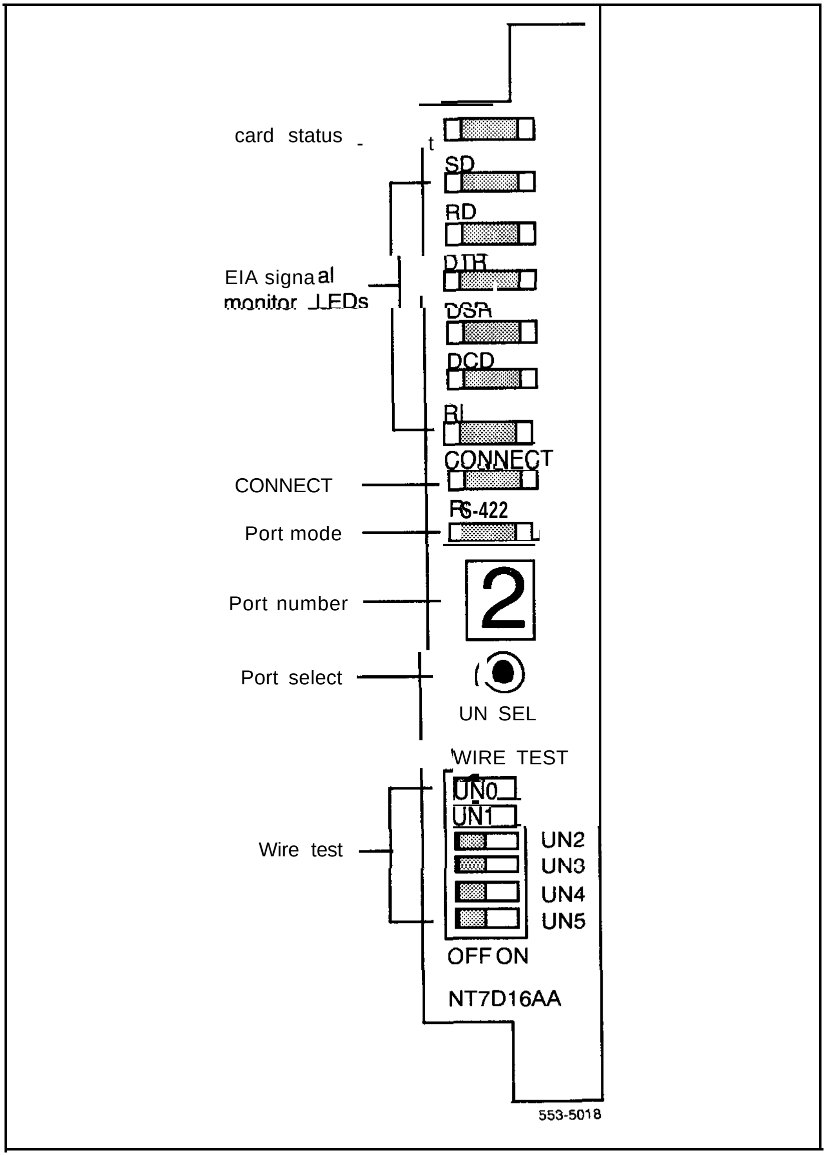
Port select button

This pushbutton switch below the display is used to select which port is monitored.

Wire test

These switches are used to select the wire test mode for each of the six ports.

Figure 1
NT7D16 Data Access Card faceplate



Operation

Dialing operations

The DAC supports both keyboard and Hayes dialing sequences. The following discussion concerns features common to both dialing modes.

Port firmware in idle state

The port firmware is considered idle when it is expecting one of the allowed autobaud characters. The idle state is identified by either of the following conditions:

- The last prompt received was RELEASED (keyboard dialing).
- The last prompt received was OK, NO CARRIER, or ERROR (Hayes dialing).

Call Set-up abort

The user may abandon the call during the dialogue phase using one of the following methods:

Terminal off-line This method is useful for RS-232-C interface only. The equipment drops Data Terminal Ready (DTR) to indicate an idle connection. For example, if the equipment is turned off, the DAC interprets that signal as an idle connection.

Long break The user sends a break (transmit line held in the OFF or SPACE state) for more than 1.2 seconds. The break is not transmitted to the far end. At the end of the long break, the DAC port initiates call disconnect. The AILU converts the dropping of DTR into a long break for the RS-422 interface. The long break feature can be disabled through the Modify menu on the DAC port.

Three short breaks When the user equipment transmits three breaks to the far end, the DAC abandons the call. Note that the breaks must be spaced at least 10 msec apart, and all three must occur within 3 seconds.

Make Port Busy on loss of DTR

This feature is implemented by means of the Make Set Busy (MSB) station feature. When this is activated, any attempt to reach the specified Data DN will result in a busy signal.

This application, which operates only in the RS-232-C mode, requires a non-standard RS-232-C interface. Only two of the possible sixteen RS-232-C modes can be used: Mode 8 (DCE, Host, Normal DTR, Manual dial), and Mode 12 (DCE, Terminal, Normal DTR, Manual dial). This feature is configured in the software, and is downloaded to the DAC.

A DTR timeout period is started whenever the DTR signal lead makes the transition to OFF. If DTR is returned to ON within the set time period (5 seconds), the DAC port operates as if this feature was not activated. If the DTR remains OFF beyond the 5 seconds, the system receives an MSB feature key message. The DAC sends another MSB message when the DTR returns to ON, and the port is able to receive inbound calls.

> *Note:* If this feature is active, and the port is connected to a DTE that holds DTR OFF when idle, the port will be permanently busied out to inbound calls following the DTR timeout period.

Inactivity timeout

Once a successful data call is completed, the user's activity is monitored. If no activity occurs within the amount of time configured in the downloaded parameters, the DAC releases the call. Three minutes before the inactivity timeout takes place, the DAC sends a warning message to the near-end equipment if terminal mode is selected.

Wire test mode

The DAC allows for the EIA signaling leads to be tested to facilitate installation and troubleshooting. This feature can be invoked through the service change downloaded parameters, or by setting the appropriate front panel switch. Wire test mode only operates when the port is idle. The leads are cycled ON and OFF in 0.5 second periods (ON for 0.5 seconds, OFF for 0.5 seconds) for the number of cycles shown in Table 1. The lead status can be monitored by the front panel LEDs. The test will be run indefinitely until the front panel switch is turned off, and the software wire test parameters are disabled.

> ***Note:*** For the most accurate results, be sure no equipment is connected to the EIA leads.

Table **1**
Wire test signal leads cycle counts

Label	EIA Signal Lead description	Pin	Cycle count RS-232-C	Cycle count RS-422
TxD	Transmit	2	1	1
RxD	Receive	3	2	2
CTS	Clear To Send	5	3	
DSR	Data Set Ready	6	4	—
DCD	Carrier Detect	8	5	—
DTR	Data Terminal Ready	20	6	—
RI	Ring Indicator	22	7	—

Note: The CTS signal is not included in the faceplate LED. Therefore, a 1.5-second delay will occur between the RxD lamp going on, and the DSR lamp going on.

Independent storage of dialing parameters

Two dialing parameters, DCD control, and Answer mode, can be modified by both keyboard and Hayes dialing commands.

The Hayes dialing mode also allows the user to modify the Input echo control, and Prompt/Result codes transmit control. With keyboard dialing, the Input echo control and Prompt/Response codes control are determined by the downloaded parameters. They cannot be altered through dialing commands.

The DAC maintains separate buffers for keyboard and Hayes dialing modes. Changes made to a given parameter in one mode do not affect that parameter in the other mode. When a dialing mode is selected, the DAC copies the corresponding dialing parameters into the active buffer. This buffer controls the call processing.

If the DAC receives an incoming, call while idle, the most recent dialing mode is used to answer the call.

User input

User input may include either upper or lower case ASCII characters.

All entries are accumulated in an input record. This record is completed with a Terminator character. For keyboard dialing, this character is always <CR>; for Hayes dialing, it can be user defined (but default to <CR>). The entries are not processed until the Terminator character is received.

The input record is limited to 43 characters, including the Terminator, but excluding any ignored space characters.

The record can be edited by using the backspace and escape characters.

Operating modes

There are sixteen possible RS-232-C operating modes with three basic common modes of operation which correspond to three types of equipment connected to the DAC. The three modes are: modem, terminal, and host. Host mode is a subset of the terminal mode, which only suppresses the prompts at the terminal.

The fourth mode, gateway, is a subset of the modem mode and is not normally used. This mode is useful if the attached modems do not have Ring Indicator lead. The application used is inbound modem pooling.

The different modes enable the DAC to connect to different types of devices such as modems (modes 0, 1, 2, and 3), gateways (modes 4, 5. 6, and 7), hosts (modes 8. 9. 10, and 11), and terminals (modes 12. 13. 14, and 15). After selecting the appropriate group (that is, modem, gateway, host, or terminal), the installer should study the four different modes in that group to make the proper selection. See Table 2.

Table 2
DAC mode of operation selection

Service changeable downloadable parameters (LD1 1)					
Operation mode	**Modem/ Gateway/ Host/KBD**	**Forced DTR***	**Hotline**	**Type of device to be connected**	**Group selection**
DEM	PRM	DTR	HOT		
3 (DTE)	OFF "Host On" (Ring Indicator — RI)	OFF Not Forced	OFF Not Hotline	Modem Pool inbound and outbound (similar to Synchronous / Asynchronous Data Module (SADM) in inbound) MSB by RI	Modes 0, 1, 2, and 3 are for RS232 modem connectivity
1 (DTE)	OFF "Host On" (RI)	OFF Not Forced	ON Hotline	Modem Pool inbound only (Hotline by RI-similar to SADM)	
2 (DTE)	OFF "Host On" (RI)	ON Forced	OFF Not Hotline	Modem Pool inbound and outbound (for Hayes 1200 modem) MSB by RI	
3 (DTE)	OFF "Host On" (RI)	ON Forced	ON Hotline.	Modem Pool inbound only (Hotline for Hayes 1200 modem only)	
4 (DTE)	ON "Keyboard Dialing (KBD) On" (No RI)	OFF Not Forced	OFF Not Hotline	Gateway inbound and outbound (DTR is OFF in idle state) MSB by Carrier Detect (DCD)	Modes 4, 5, 6, and 7 are for RS232 Gateway connectivity
5 (DTE)	ON "KBD On" (No RI)	OFF Not Forced	ON Hotline	Gateway inbound only (Hotline by DCD: ON for Hotline OFF for Virtual Leased Line (VLL)	
6 (DTE)	ON "KBD On" (No RI)	ON Forced	OFF Not Hotline	Gateway inbound and outbound (DTR is on in idle state) MSB by DCD	

— continued —

Table 2
DAC mode of operation selection (continued)

Service changeable downloadable parameters (LD1 1)					
Operation mode	**Modem/ Gateway/ Host/KBD**	**Forced DTR***	**Hotline**	**Type of device to be connected**	**Group selection**
DEM	PRM	DTR	HOT		
7 (DTE)	ON "KBD On" (No RI)	ON Forced	ON Hotline	Gateway inbound only (Hotline by DCD: ON for Hotline OFF for VLL) (DTR is ON in idle state)	
3 (DCE)	OFF "Host On" (prompts off)	OFF Not Forced	OFF Not Hotline	Outbound to Host (similar to Multi Channel Data System (MCDS)) Prompt PBDO = OFF/ON	Modes 8 and 9 are for RS422 Host connectivity
3 (DCE)	OFF "Host On" (prompts off)	OFF Not Forced	On Hotline	Host Hotline by DTR	
10 (DCE)	OFF "Host On" (prompts off)	ON Forced	OFF Not Hotline	Host similar to MCDS but does not require DTR to be ON	Modes 8, 9, 10, and 11 are for RS232 Host connectivity
11 (DCE)	OFF "Host On" (prompts off)	ON Forced	On Hotline	Continuous Hotline mode when DTR is ON (VLL)	
12 (DCE)	ON "KBD On" (prompts on)	OFF Not Forced	OFF Not Hotline	Terminal similar to Asynchronous/Synchronous Interface Module (ASIM) when set to Not Forced DTR and Not Hotline Prompt PBDO = OFF/ON	Modes 12 and 12 are for RS422 Terminal connectivity

— continued —

Table 2
DAC mode of operation selection (continued)

Service changeable downloadable parameters **(LD11)**

Operation mode DEM	**Modem/ Gateway/ Host/KBD** PRM	**Forced DTR*** DTR	**Hotline** HOT	**Type of device to be connected**	**Group selection**
13 (DCE)	ON "KBD On" (prompts on)	OFF Not Forced	On Hotline	Terminal similar to ASIM when set to Not Forced DTR and Hotline	
14 (DCE)	ON "KBD On" (prompts on)	ON Forced	OFF Not Hotline	Terminal similar to ASIM when set to forced DTR and Not Hotline	Modes 12, 13, 14, and 15 are for RS232 Terminal connectivity (similar to ASIM)
15 (DCE)	ON "KBD On" (prompts on)	ON Forced	On Hotline	Continuous Hotline when DTR is ON	

• Not prompted for Type = R422. Defaults for Type = R422: DEM = DCE and DTR = OFF.

Selecting the proper mode for Modem connectivity

Select modes 0, 1, 2, and 3 when the DAC is connected to different types of modems for inbound and outbound modem pooling. In these modes, the DAC operates as a DTE, monitors the DSR, DCD, and RI control leads, and drives the DTR lead. No menus are given and no characters are echoed when DCD is OFF. All prompts and messages are enabled for inbound calls and disabled for outbound calls.

In modes 0 and 1, the DAC drives the DTR lead OFF when in the idle state, and ON when processing an incoming or outgoing call.

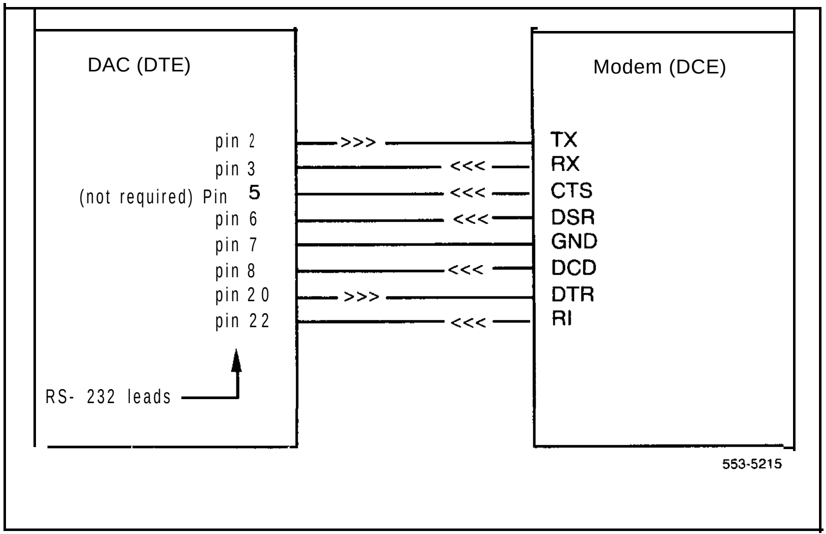
In modes 2 and 3, the DAC drives the DTR lead ON except when the call is being disconnected. At disconnect, DTR is dropped for 0.2 seconds and then returns to ON.

In the case of outbound modem pooling, the DAC answers the data call and drives the DTR lead ON (modes 0 and 1). Then the calling data module and the DAC form a transparent link between the calling DTE and the modem. The DTE user may then enter the appropriate commands to the modem for dialing a remote modem. When the call is established, the modem may cause the DAC to disconnect the call by dropping either DSR or DCD.

In the case of inbound modem pooling, the modem must drive the RI lead ON to activate the DAC. Then the DAC responds by driving the DTR lead ON and making the unit busy for outbound calls (modes 0 and 1). The modem is expected to turn DCD to ON within 35 seconds; otherwise, the call will be dropped by the DAC. If the modem turns DCD ON before the 35-second timeout, the DAC validates the incoming call and prepares to accept <CR> from the remote modem for autobaud.

See Figure 2 for more details,

Figure 2
DAC to modem connectivity



Mode 0

This mode should be selected when the DAC is connected to a modem, except Hayes-l 200, for inbound and outbound modem pooling (see modes 2 and 3 for Hayes-1200 modem). The modem used should have the following features:

Auto-answer capability This feature is required when the modem is used for inbound modem pooling. It allows the modem to drive the RI lead ON when ringing is present at its tip and ring. In addition, the modem should auto-answer after the first ringing cycle if the DTR lead is ON (most modems support this feature).

Dynamic control of DCD This feature must be supported by all modems to be connected to the DAC. It allows the modem to drive the DCD lead ON when the carrier is detected and OFF when the carrier is absent (most modems support this feature).

Auto-dial capability This feature is required when the modem is used for outbound modem pooling. It allows the modem to go off-hook and dial the remote number (such as Smartmodem Hayes-2400 or Bizcomp).

Auto-reset capability This feature is required when the modem is used for outbound modem pooling. The modem should execute auto-reset when the DTR lead goes OFF. As a result, the modem must reset all its internal parameters to the default values. This feature prevents the users of the modem pool from modifying the modem' s default parameters to inappropriate values.

Configuring modems for mode 0

To configure Hayes modem 2400, enter the following commands:

```
AT&D2&W
ATVl&W
ATQ&W
ATEl&W
ATSO= 1&W
AT&Cl&Sl&W
AT&J&W
ATB1&W
AT&D3&W
```

Since the default parameters are programmable using commands, there is no guarantee that users will not change them.

To configure Bizcomp 1200 modem, set the following parameters in LD 11:

DEM	DTE
PRM	OFF
DTR	OFF
HOT	OFF

To configure MULTI MODEM 224E modem, set the configuration switches as follows:

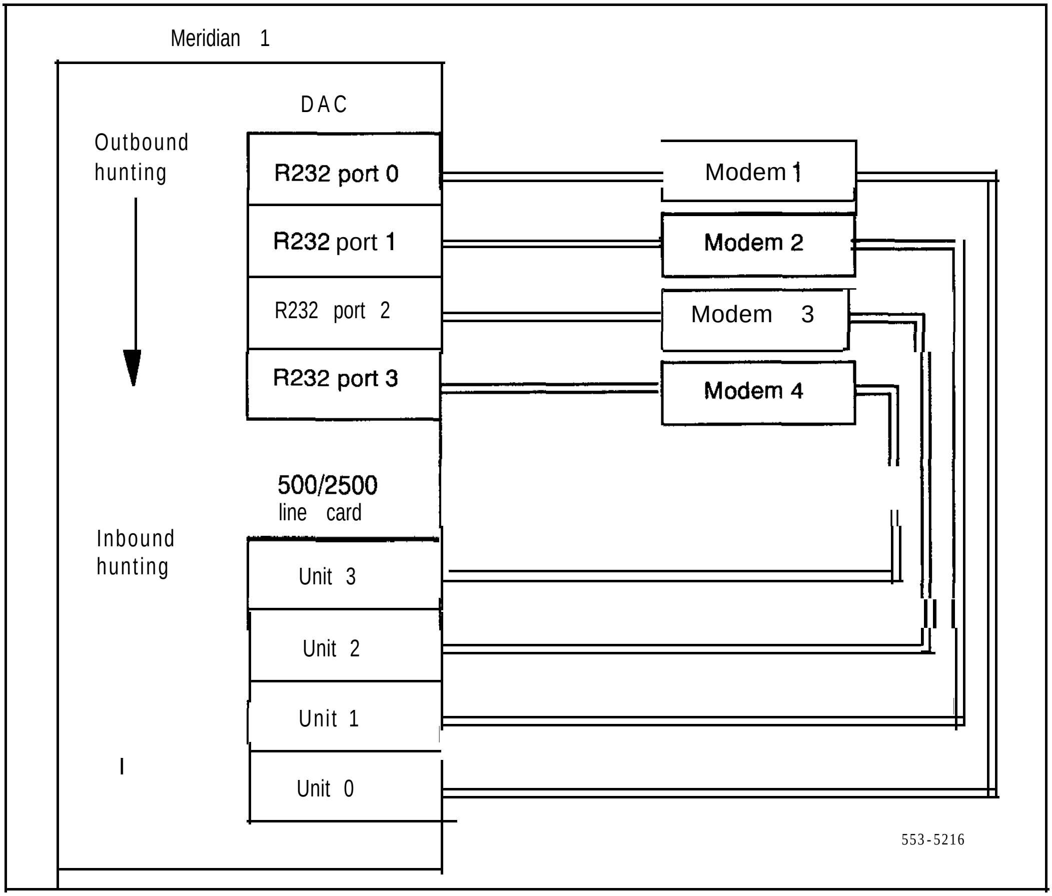
- switches 3 and 8 to DOWN position
- all other switches to UP position. Switch 7 should be UP when using RJ-11 jack.

Programing DAC for mode 0 in service change LD11

When used for inbound or outbound Modem Pool only, the DAC can be configured as R232 in LD11. When used for both inbound and outbound Modem Pool, the DAC must be configured as R232; station hunting for the outbound modem access should be in the opposite direction to the 500/2500 station hunting for the inbound modem access. See Figure 3 for more details.

Note: If Call Detail Recording (CDR) is required, use separate outbound and inbound Modem Pools.

Figure 3
DAC to Modem Pool connectivity



Mode 1

This mode should be selected when the DAC is connected to an **auto-**answer modem for inbound Hotline operation. In this mode, the DAC automatically executes Hotline operation when RI is driven ON by the modem. The modem used should have the following features:

Auto-answer capability This feature is required when the modem is used for inbound modem pooling. It allows the modem to drive the RI lead ON when ringing is present at its tip and ring. In addition, the modem should auto-answer after the first ringing cycle if the DTR lead is ON (most modems support this feature).

Dynamic control of DCD This feature must be supported by all modems to be connected to the DAC. It allows the modem to drive the DCD lead ON when the carrier is detected and OFF when the carrier is absent (most modems support this feature).

Hotline call baud rates are determined by switches 6 and 8. Program the Meridian 1 to allow inbound modem calls only.

Configuring modems for mode 1

Most dumb modems can be configured for this mode. The modem must be able to auto-answer and have dynamic control of DCD as described in mode 0. Smart modems can also be used if set to the dumb mode of operation. Hayes 2400, Bizcomp 1200, and MULTI MODEM 224E can be used when set up as follows. Hayes 1200 cannot be used in this mode when the default parameters are selected (see mode 3).

- For Hayes 2400, the dumb-mode-strap should be moved to the **dumb-**position (see Hayes manual).
- For Bizcomp 1200 modem, set the following parameters in **LD11**:

DEM	DTE
PRM	OFF
DTR	OFF
HOT	ON

Programing DAC for mode 1 in service change LD11

The DAC must be configured as R232 (the Autodial feature key is used for this mode). The DAC must not be configured as an Asynchronous Data Module (ADM) trunk.

Mode 2

This mode should be selected when the DAC is connected to a Hayes-1200 modem for inbound and outbound modem pooling. This mode is created specially to resolve some problems that were encountered with this modem, namely, the auto-reset implementation. When this modem is operating in the auto-reset mode, it drives both RI and DCD ON as long ‘ as DTR is OFF. This problem was resolved by driving DTR ON in the idle state, and OFF for 0.2 seconds, and then ON when an established call is dropped. The DAC also ignores the status of RI and DCD for approximately 2 seconds after a call is released to avoid false inbound call initiation.

Configuring Hayes 1200 for mode 2

To configure this modem, set the following parameters in LD11:

DEM	DTE
PRM	OFF
DTR	ON
HOT	OFF

To configure this modem, set the configuration switches as follows:

- switches 3, 8, and 10 to DOWN position
- all other switches to UP position. Switch 7 should be UP when using RJ-11 jack.

Programing DAC for mode 2 in service change LD11

When used for inbound or outbound Modem Pool only, the DAC can be configured as R232 in LD11. When used for both inbound and outbound Modem Pool, the DAC must be configured as R232. When the DAC is programmed as station hunting, outbound modem access should be in the opposite direction to the 500/2500 station hunting for the inbound modem access.

> ***Note:*** If Call Detail Recording (CDR) is required, use separate outbound and inbound Modem Pools.

Mode 3

This mode should be selected when the DAC is connected to a Hayes-1200 modem for inbound Hotline operation. It is recommended that mode 1 be used for inbound Hotline operations if some other modem is available. However, if only Hayes-1200 modems are available, then this mode could be used as a last resort.

Configuring Hayes 1200 for mode 3

For Hayes 1200 modem, set the following parameters in LD11:

DEM	DTE
PRM	OFF
DTR	ON
HOT	ON

To configure this modem, set the configuration switches as follows:

- all switches to UP position, except for switch 4. Switch 7 should be UP when using RJ-11 jack.

Programing DAC for mode 3 in service change LD11

The DAC must be configured as R232 (the Autodial feature is used for this mode). The DAC must not be configured as an ADM trunk.

Selecting the proper mode for Gateway connectivity

Select modes 4, 5, 6, and 7 when the DAC is connected to different types of gateways for inbound and outbound operations. The term gateway refers to any equipment that has the following characteristics:

- The equipment must be a DCE.
- The equipment does not drive RI lead (optional, the DAC ignores this lead).
- The equipment must drive DCD lead dynamically.
- The equipment drives DSR lead (optional).
- The equipment can monitor the DTR lead (optional, depending on the mode selected).

In modes 4, 5, 6, and 7, the DAC:

- operates as a DTE
- monitors the DSR
- monitors DCD control leads
- drives the DTR lead

The RI lead is ignored. No menus or prompts are given when DCD is OFF. All prompts and messages are enabled for inbound calls and disabled for outbound calls. See Figure 4 for more details.

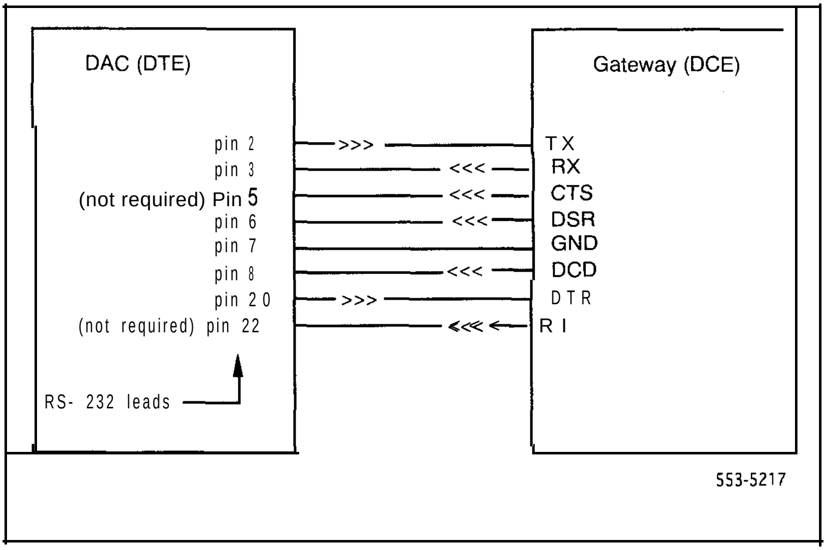
In modes 4 and 5, the DAC drives the DTR lead OFF in the idle state, and ON when processing an incoming or outgoing call.

In modes 6 and 7, the DAC drives the DTR lead ON except when the call is being disconnected. At disconnect, DTR is dropped for 0.2 seconds and then returns to ON.

With outbound gateway access, the DAC answers the data call and drives the DTR lead ON (modes 4 and 5; in modes 6 and 7, DTR is already ON). Then the calling data module and the DAC form a transparent link between the calling Data Module (DM) and the gateway. The DM user may then enter the appropriate commands to the gateway to establish a data call. The DAC expects the gateway to drive DCD ON (modes 4 and 5 only) within 35 seconds. If the gateway fails to do so, the DAC turns DTR OFF and drops the call. When the call is established, the gateway may cause the DAC to disconnect the call by dropping either DSR or DCD.

For inbound gateway access, the gateway must drive the DCD lead ON to activate the DAC. When the DAC receives this signal, it drives the DTR lead ON, makes the unit busy for outbound calls (modes 4 and 5; in modes 6 and 7, DTR is already ON), and prepares to accept <CR> for autobaud. The DAC expects DCD to remain ON for as long as the data call is established.

Figure 4
DAC to Gateway connectivity



Mode 4

This mode should be selected when the DAC is connected to a gateway for inbound and outbound operation. The characteristics of the gateways to be used with this mode are:

Auto-answer capability This feature is required when the gateway is used for inbound operation. It allows the gateway to drive the DCD lead ON when the inbound data call is pending. In addition, the gateway should auto-answer when the DTR lead is ON.

Dynamic control of DCD This feature must be supported by all gateways to be connected to the DAC. It allows the gateway to drive the DCD lead ON when the data call is established, and OFF when the data call is disconnected.

In the inbound operation, the DAC drives the DTR lead OFF until the gateway drives the DCD lead ON. Then, the DAC drives DTR ON and makes that unit busy for any outbound calls. After that, the user of the gateway may enter the proper commands to establish a local data call to any DM.

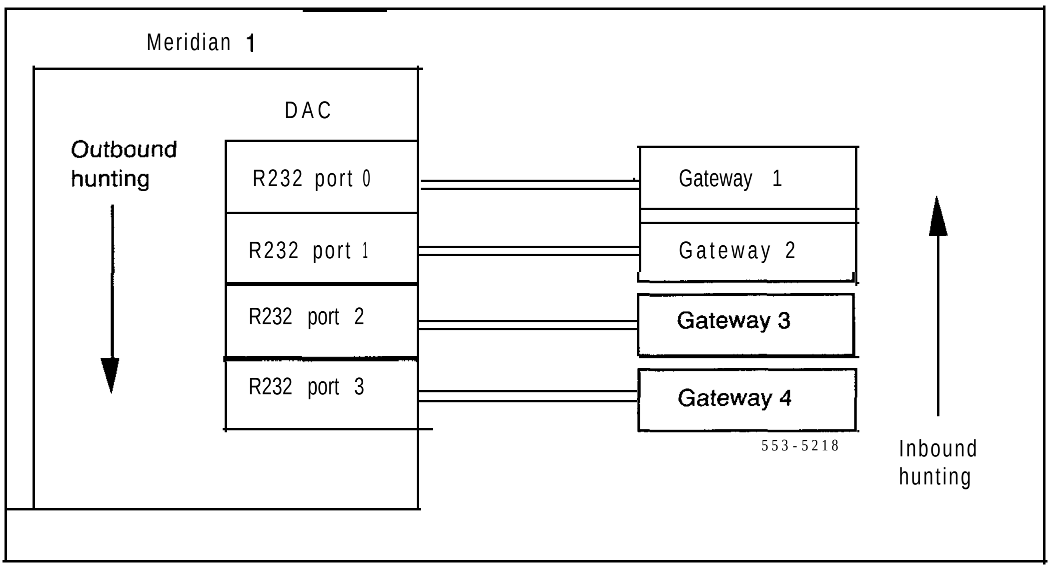
In the outbound operation, the DAC drives the DTR lead OFF until another DM calls it for outbound accessing. The DAC answers the data call and drives the DTR lead ON. The calling DM is then transparently connected to the gateway. The DAC requires the gateway to drive the DCD lead to ON within 35 seconds after the outbound call is connected. Call disconnection may be initiated by dropping DCD (or DSR) from ON to OFF.

Programing DAC for mode 4 in service change LD11

When used for inbound or outbound gateway access, the DAC can be configured as R232 in LD11. When used for both inbound and outbound gateway access, the DAC must be configured as R232. When the DAC is programmed as station hunting, outbound gateway access should be in the opposite direction to the hunting for inbound gateway access. See Figure 5 for more details.

> *Note:* If CDR is required, use separate outbound and inbound gateway access.

Figure 5
DAC to Gateway-Inbound/Outbound connectivity



Mode 5

This mode should be selected when the DAC is connected to an auto-answer gateway for inbound Hotline operation. In this mode, the DAC automatically executes Hotline operation when DCD is driven ON by the gateway. If the DM being called by the Hotline operation is busy or not answering, the DAC will place repeated Hotline calls as long as the DCD lead is ON until the called unit answers. The gateway used in this mode should have the following features:

Auto-answer capability This feature is required when the gateway is used for inbound operation. It allows the gateway to drive the DCD lead ON when the inbound data call is pending. In addition, the gateway should auto-answer when the DTR lead is ON.

Dynamic control of DCD This feature must be supported by all gateways to be connected to the DAC. It allows the gateway to drive the DCD lead ON when the data call is established, and OFF when the data call is disconnected.

The baud rate of the Hotline call is determined by the AUTB and BAUD parameters in LD11. The Meridian 1 should be programmed to allow inbound modem calls only.

Programing DAC for mode 5 in service change LD11

The DAC must be configured as R232 (the Autodial feature is used for this mode). The DAC must not be configured as an ADM trunk.

Mode 6

This mode should be selected when the DAC is connected to a gateway that requires DTR to be ON always except during call disconnection. In this mode, the DAC can be used for both inbound and outbound operations. The operation of this mode is similar to mode 4 except for the following:

- The DTR lead is ON in the idle state.
- The DTR lead will be dropped OFF for 0.2 seconds when an established call is disconnected.

Programing DAC for mode 6 in service change LD11

When used for inbound or outbound gateway access, the DAC can be configured as R232 in LD11. When used for both inbound and outbound gateway access, the DAC must be configured as R232. When the DAC is programmed as station hunting, outbound gateway access should be in the opposite direction to the hunting for inbound gateway access. See Figure 5 for more details.

Note: If CDR is required, use separate outbound and inbound gateway access.

Mode 7

This mode should be selected when the DAC is connected to a gateway for inbound Hotline operation. The operation of this mode is similar to mode 5 except for the following:

- The DTR lead is ON in the idle state.
- The DTR lead will be dropped OFF for 0.2 second when an established call is disconnected.

The baud rate of inbound Hotline calls is determined by programmable database. The Meridian 1 should be programmed to allow inbound calls only on the DAC unit.

Programing DAC for mode 7 in service change LD11

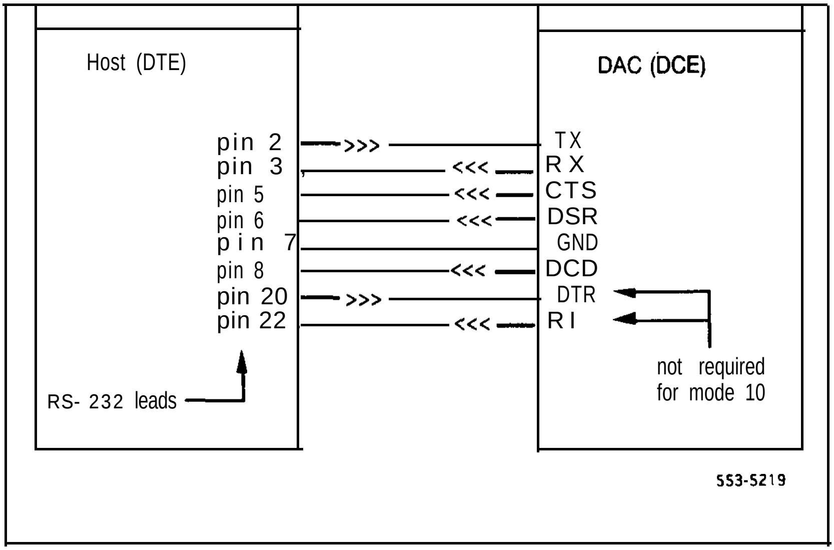
The DAC must be configured as R232 (the Autodial feature is used for this mode). The DAC must not be configured as an ADM trunk.

Selecting the proper mode for Host connectivity

Select modes 8, 9, 10, and 11 when the DAC is connected to different types of hosts (DTE). In these modes, the DAC operates as a DCE and drives DSR, DCD, and RI control leads (see Figure 6). CTS, DSR, and DCD are driven OFF in the idle state.

The DAC will not send any menu or prompt to the host, nor will it echo any command sent from the host. The CTS, DSR, and DCD will be driven ON until the call is released. An incoming call to the DAC causes the RI lead to go ON for 2 seconds and then OFF for 4 seconds until the call is answered by the host. When the host turns DTR ON, the DAC answers the call. If DM-to-DM protocol exchange is successful, the DAC drives CTS, DSR, and DCD ON. If DTR was already ON, the DAC does not drive RI ON.

Figure 6
DAC to Host connectivity



Mode 8

This mode should be selected when the DAC is connected to a host for host accessing. In this mode, the DAC operates in a similar manner to the MCDS. The hosts used with this mode should have the following characteristics:

Auto-answer capability The host should be capable of monitoring the RI lead for detection of incoming calls. When RI is turned ON by the DAC, the host responds by driving DTR ON, which forces the DAC to answer the incoming call. If the host drives the DTR lead ON all the time, incoming calls will always be immediately answered and the RI lead will not be turned ON by the DAC. If DM-to-DM protocol exchange is successful, the DAC drives CTS, DSR, and DCD ON.

Dynamic control of DTR This feature is required only if the host must be capable of releasing an established call. The host should be able to drop an established data call by driving DTR OFF for more than 100 ms.

Note: If the PBDO parameter in LD11 is ON, then Make Set Busy will be activated when DTR is driven OFF for more than five seconds.

In this mode, the DAC will not send any menus or prompts to the host. However, the host can still originate an outgoing call by blind-dialing (sending commands to the DAC without receiving echoes).

Programing DAC for mode 8 in service change LD11

When used for inbound or outbound host access, the DAC can be configured as R232 or R422 in LD1 1. When used for both inbound **and** outbound host access, the DAC must be configured as R232 or R422. When the DAC is programmed as station hunting, outbound host access should be in the opposite direction to the hunting for inbound host access.

> ***Note:*** If CDR is required, use separate outbound and inbound host access.

Mode 9

This mode should be selected when the DAC is connected to a host and Hotline call origination is required. In this mode, the host will be able to Hotline to a specific data unit by simply driving the DTR lead ON. The transition of DTR from OFF to ON causes the DAC to Hotline to the Autodial DN. The hosts used with this mode should have the following characteristics:

Dynamic control of DTR for call origination The host should be capable of driving the DTR lead from OFF to ON to initiate the Hotline call. If the host always drives the DTR lead ON (not capable of dynamic control), mode 11 should be used.

Dynamic control of DTR for releasing established calls This feature is required only if it is required that the host be capable of releasing an established call. The host should be able to drop an established data call by driving DTR OFF for more than 100 ms.

Programing DAC for mode 9 in service change LD11

The DAC must be configured as R232 or R422 (the Autodial feature is used for this mode). The DAC must not be configured as an ADM trunk.

Mode 10

This mode should be selected when the DAC is connected to a host for inbound host accessing. The host in this mode is not required to monitor RI or drive DTR. This mode is similar to mode 8, except for the following:

- The status of DTR lead is assumed to be always ON, even when the actual condition of that lead is OFF (forced-DTR). The DAC always answers an incoming call regardless of the status of DTR.
- The host cannot release an established data call by driving DTR OFF. As a result, the host cannot initiate call release except with a long break or three short breaks.

In this mode, the DAC does not send any menus or prompts to the host. However, the host can still originate an outgoing call by blind-dialing (sending commands to the DAC without receiving echoes).

Programing DAC for mode 10 in service change LD11

When used for inbound or outbound host access, the DAC can be configured as R232 in LD11. When used for both inbound and outbound host access, the DAC must be configured as R232. When the DAC is programmed as station hunting, outbound host access should be in the opposite direction to the hunting for inbound host access.

> ***Note:*** If CDR is required, use separate outbound and inbound gateway access.

Mode 11

This mode provides a "virtual leased line" and the meaning of the Forced DTR switch is re-defined. The operation is similar to having a leased line feature, where the connection between two extensions is always established. The DAC does not send any menus or prompts to the host. The baud rate of the Hotline call is determined by switches 6, 7, and 8.

This mode should be selected when the DAC is connected to a host and continuous Hotline operation is required. In this mode, the DAC repeatedly tries to Hotline to the Autodial DN as long as DTR is ON. When the DAC tries to Hotline to a busy Data Module, it activates Ring Again and the connection is established as soon as the called unit is free. After establishing the data call, if the called unit releases the call for any reason, the DAC will automatically try to Hotline again to reestablish the call.

If the data unit being called does not answer the Hotline call, the DAC tries to place another Hotline call once every 40 seconds until the called unit answers. This mode is recommended only when a permanent connection between a host and another data unit is required.

Programing DAC for mode 11 in service change LD11

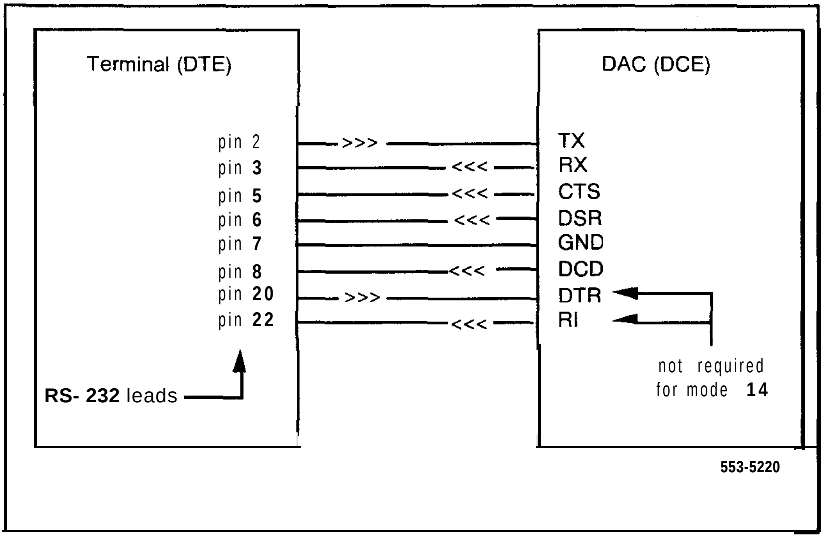
The DAC must be configured as R232 (the Autodial feature is used for this mode). The DAC must not be configured as an ADM trunk.

Selecting the proper mode for Terminal connectivity

Select modes 12, 13, 14,and 15 when the DAC is connected to different types of terminals. In these modes, the DAC operates as a DCE, drives DSR, DCD, and RI control leads, and monitors DTR lead in modes 12, 13, and 15 (see Figure 7). DTR is ignored in mode 14. All the menus and prompts are sent to the terminals and all the commands from the terminals are echoed. CTS, DSR, and DCD are driven OFF during the idle state (data call is not established).

When the call is released, DSR and DCD are turned OFF for 200 ms. The RI lead is controlled only in modes 12, 13, and 15, and is driven OFF in the idle and connect states. An incoming call to the DAC causes the RI lead to go ON for 2 seconds and then OFF for 4 seconds until the call is answered by the terminal. When the terminal turns DTR ON, the DAC answers the call.

Figure 7
DAC to Terminal connectivity



Mode 12

This mode should be selected when the DAC is connected to a terminal (DTE) for inbound and outbound data calls. This mode is similar to the operation of the ASIM when set to not-forced-DTR and not-Hotline. In this mode, call origination and auto-answer will not be executed by the DAC, unless the DTR lead is driven ON by the terminal. Any terminal that drives the DTR lead ON can be used with this mode (such as VT100 or VT102).

The DAC drives CTS, DSR, and DCD ON, except when a call is dropped or when control – Z is entered during the idle state. In this case, the DAC drives those leads OFF for 0.2 seconds and then ON. When the DTR lead is driven OFF by the terminal, the DAC does not execute autobaud, nor will it respond to any command.

Note:

If the PBDO parameter in LD11 is ON, then Make Set Busy will be activated when DTR is driven OFF for more than five seconds.

Programing DAC for mode 12 in service change LD11

The DAC must be configured as R232 or R422 since Autodial, Speed Call, and Display commands are likely to be used.

Mode 13

This mode should be selected when the DAC is connected to a terminal (DTE) and Hotline call origination is required. This mode is similar to the operation of the ASIM when set to not-forced-DTR and Hotline. In this mode, the terminal is able to Hotline to a specific data unit by driving the DTR lead ON. The transition of DTR from OFF to ON causes the DAC to Hotline to the Autodial DN. Any terminal that drives DTR lead ON can be used with this mode (such as VT100 or VT102).

The DAC drives CTS, DSR, and DCD ON, except when a call is dropped. In this case, the DAC drives those leads OFF for 0.2 second and then ON. The baud rate of the Hotline call is determined by the AUTB and BAUD parameters in LD1 1.

Programing DAC for mode 13 in service change LD11

The DAC must be configured as R232 or R422 since Autodial, Speed Call, and Display commands are likely to be used.

Mode 14

This mode should be selected when the DAC is connected to a terminal (DTE) for inbound and outbound data calls. This mode is similar to the operation of the ASIM when set to forced-DTR and not-Hotline. The terminal used with this mode is not required to drive the DTR lead. This mode of operation is similar to mode 12, except for the following:

- The status of DTR lead is assumed to be always ON, even when the actual condition of that lead is OFF (forced-DTR). The DAC always answers an incoming call regardless of the DTR status.
- The terminal cannot release an established data call by driving DTR OFF. As a result, the terminal cannot initiate call release except with a long break or three short breaks.

Programing DAC for mode 14 in service change LD11

The DAC must be configured as R232 since Autodial, Speed Call, and Display commands are likely to be used.

Mode 15

This mode provides a "virtual leased line" and the meaning of the "Forced DTR" switch is re-defined.

This mode should be selected when the DAC is connected to a terminal (DTE) and continuous Hotline call origination is required. In this mode, the DAC repeatedly tries to Hotline to the Autodial DN as long as DTR is ON. This operation is similar to having a leased line feature, where the connection between two extensions is always established. When the DAC tries to Hotline to a busy Data Module, it activates Ring Again and the connection is established as soon as the called unit is free. After establishing the data call, if the called unit releases the call for any reason, the DAC automatically tries to Hotline again to reestablish the call.

If the data unit being called does not answer the Hotline call, the DAC tries to place another Hotline call once every 40 seconds until the called unit answers, This mode is recommended only when a permanent connection between a terminal and another data unit is required. The baud rate of the Hotline call is determined by the AUTB and BAUD parameters in LD11. The status of CTS, DSR, and DCD is controlled in a similar manner as described in mode 13.

Programing DAC for mode 15 in service change LD1 1

The DAC must be configured as R232 since Autodial, Speed Call, and Display commands are likely to be used.

Mode selection baud rates

The AUTB and BAUD parameters in LD11 provide two functions for calls originated from a DAC:

- Provide a way to select a baud rate of a Hotline call. The DAC starts the Hotline operation without receiving a <CR> for autobaud.
- Set the DAC to operate at a fixed baud rate. The DAC does not return the menu or Hotline unless a <CR> is received at the selected baud rate. Normally the DAC should be selected to operate at autobaud.

Note: If AUTB is set to ON, the BAUD parameter is not prompted. If AUTB is set to OFF, you may select a fixed baud rate in response to the prompt BAUD.

When the DAC receives a call, it adapts to the caller's baud rate.

See Table 3 for connect and disconnect protocol.

Table 3
Connect and disconnect protocol

Mode of operation	Interface application	Comments
Wode 0	Inbound and Outbound modem pools For inbound modem pools, most dumb modems may be used. For outbound modem pools, only smart modems (auto-dialer) may be used.	**Inbound modem pooling:** 1 Modem sends ring/no ring cycle (2 seconds On, 4 seconds OFF) to initiate connection. 2 DAC responds by driving DTR ON within the first ring cycle. 3 Modem responds by answering the incoming call and driving DCD ON within 35 seconds. 4 If modem does not drive DCD ON within 35 seconds, the DAC drops DTR and goes idle. 5 Remote DTE sends <CR> to the DAC. The DAC autobauds and sends initial prompt. **Outbound modem pooling:** 1 Local DM user calls to the outbound modem access number. 2 DAC answers the outbound call and drives DTR ON. 3 Modem receives DTR and prepares to receive commands. 4 Local DM user enters the proper commands for calling the remote modem. 5 Remote modem answers; data call established.

— continued —

Table 3
Connect and disconnect protocol (continued)

Mode of operation	Interface application	Comments
		Call disconnection (DAC): 1 DAC drops DTR if the local DM user drops the call. The modem must drop DCD. 2 DAC drops DTR if the remote modem sends a long break or three short breaks. The modem must drop DCD. **Call disconnection (modem):** 1 Modem drops DCD (DCD OFF for 100 ms or more). The DAC drops DTR and disconnects the local call. 2 Modem drops DSR (DSR OFF for 100 ms or more). The DAC drops DTR and disconnects the local call.
Wode 1	Inbound Hotline modem pools Most dumb modems can be used for this application.	**Inbound Hotline modem pooling:** 1 Modem sends ring/no ring cycle (2 seconds On, 4 seconds OFF) to initiate connection. 2 DAC responds by trying to establish a Hotline call to a specific Data Module (Autodial) 3 When Data Module answers, then and only then, the DAC turns DTR ON. 4 Modem should answer the incoming call when DTR goes ON and should turn DCD ON within 35 seconds; otherwise the DAC disconnects the call. **Call disconnection:** Disconnection is the same as mode 0.

— continued —

Table 3
Connect **and disconnect protocol (continued)**

Mode of operation	Interface application	Comments
Mode 2	Inbound and Outbound modem pools (with forced DTR) Use this mode with Hayes 1200 modem.	**Inbound and Outbound modem pooling:** The DAC operation is identical to mode 0 except that DTR is always forced ON (except during disconnect). **Call disconnection:** Disconnection is identical to mode 0 except: -when a call is released, the DAC turns DTR OFF for 0.2 second and then ON. DTR stays ON until the next call release. -The DAC ignores RI and DCD for about 2 seconds after releasing a call. This avoids problems with the Hayes 1200 modem.
Mode 3	Inbound Hotline modem pools (with forced DTR) Use this mode with Hayes 1200 modem.	**Inbound Hotline modem pooling:** The DAC operation is identical to mode 1 except that DTR is always forced ON (except during disconnect). **Call disconnection:** Disconnection is identical to mode 2.
Mode 4	Inbound and Outbound Gateway access	**Inbound Gateway connection protocol:** 1 Gateway raises DCD to initiate connection. 2 DAC responds by driving DTR ON. 3 Gateway does not have to turn DSR ON. However, toggling DSR or DCD from ON to OFF causes the DAC to disconnect the call. 4 Gateway user sends <CR> to the DAC. 5 DAC autobauds and sends the initial prompt to the Gateway.

— continued —

Table 3
Connect and disconnect protocol (continued)

Mode of operation	Interface application	Comments
		Outbound Gateway connection protocol: 1 Local DM user calls the DAC that is connected to a Gateway. 2 DAC answers the data call and drives DTR ON. 3 Gateway receives DTR and prepares to receive commands. 4 Local DM user is now transparently connected to the Gateway. 5 Gateway is expected to drive DCD ON within 35 seconds. If the Gateway fails to do so, the DAC drops DTR and the call. **Call disconnection (DAC):** 1 DAC drops DTR if the local DM user drops the call. The Gateway must drop DCD. 2 DAC drops DTR if the DAC receives a long break or three short breaks. The Gateway must drop DCD. **Call disconnection (Gateway):** 1 Gateway drops DCD (DCD OFF for 100 ms or more). The DAC drops DTR and disconnects the local call. 2 Gateway drops DSR (DSR OFF for 100 ms or more). The DAC drops DTR and disconnects the local call.

— continued —

Table 3
Connect and disconnect protocol (continued)

Mode of operation	Interface application	Comments
Mode 5	Inbound Hotline Gateway access	**Inbound Hotline Gateway protocol:** 1 Gateway raises DCD to initiate connection. 2 DAC responds by trying to establish a Hotline call to a specific Data Module (Autodial). 3 When Data Module answers, then and only then, the DAC turns DTR ON. 4 Gateway does not have to turn DSR ON. However, toggling DSR or DCD from ON to OFF causes the DAC to drop the call. 5 Gateway is now transparently linked to the equipment connected to the DM. **Call disconnection:** Disconnection is identical to mode 4.
Mode 6	Inbound and Outbound Gateway access (with forced DTR)	**Inbound and Outbound Gateway protocol:** The DAC operation is identical to mode 4 except that DTR is always forced ON (except during disconnect). The establishment of the outbound call does not require DCD to be driven ON by the Gateway. **Call disconnection:** Disconnection is identical to mode 4 except that when a call is released, the DAC turns DTR OFF for 0.2 second and then ON. DTR stays ON until the next call release.
Mode 7	Inbound Hotline Gateway access (with forced DTR)	**Inbound Hotline Gateway protocol:** The DAC operation is identical to mode 5 except that DTR is always forced ON (except during disconnect). **Call disconnection:** Disconnection is identical to mode 6.

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Table 3
Connect and disconnect protocol (continued)

Mode of operation	Interface application	Comments
Mode 8	Host **access for call** origination and answering	**Host answering an incoming data call:** 1 Local DM user dials the access number to initiate the connection. 2 DAC responds by driving RI ON for 2 seconds and OFF for 4 seconds until the Host answers by turning DTR ON. (If the Host always drives DTR ON, the DAC immediately answers the call without driving RI ON.) 3 When Host receives RI ON, it should respond by turning DTR ON. 4 DAC answers when it receives DTR ON. 5 DAC turns DSR, DCD, and CTS ON when the call is completely established. The local DM user is now transparently linked to the Host. **Host originating a data call:** 1 Host turns DTR ON to initiate the connection. 2 DAC prepares to receive <CR> for autobaud. 3 Host sends <CR> followed by other commands for establishing a data call (the DAC does not echo a command, nor does it send any prompt to the Host (blind dialing). 4 When the data call is completely established, the DAC turns DSR, DCD, and CTS ON as long as the call is connected.

— continued —

Table 3
Connect and disconnect protocol (continued)

Mode of operation	interface application	Comments
		Call disconnection (DAC): 1 DAC drops DSR, DCD, and CTS if the local DM user releases the call. The Host should then drop the call. 2 DAC drops DSR, DCD, and CTS if the Host sends a long break or three short breaks. The Host should then drop the call. **Call disconnection (Host):** The Host toggles DTR from ON to OFF (DTR must be OFF for 100 ms or more). The DAC drops DSR, DCD, and CTS and disconnects the local call.
Mode 9	Hotline call origination	**Hotline originated by Host (Inbound):** 1 Host toggles DTR from OFF to ON to initiate the Hotline call. 2 DAC responds by trying to establish a Hotline call to a specific Data Module (Autodial). 3 When Data Module answers, then and only then, the DAC turns DSR, DCD, and CTS ON (the DAC does not send any prompts to the Host). If the Data Module is busy or not responding, the DAC requires another transition of DTR from OFF to ON to initiate another Hotline call. If the Host keeps DTR ON, the DAC does not try to establish another Hotline call, unless the Host sends a <CR> while DTR is ON. **Call disconnection:** Disconnection is identical to mode 8.

— continued —

Table 3
Connect and disconnect protocol (continued)

Mode of operation	Interface application	Comments
Mode 10	Host access for call origination and answering (with forced DTR)	**Host access for call origination and answering:** The DAC operation is identical to mode 8 except DTR is always considered ON, even when the Host is driving DTR OFF. **Call disconnection:** 1 DAC drops DSR, DCD, and CTS if the local DM user releases the call. The Host should then drop the call. 2 DAC drops DSR, DCD, and CTS if the Host sends a long break or three short breaks. The Host should then drop the call.
Mode 11	Hotline call origination (Virtual Leased Line)	**Hotline origination by Host (continuous Hotline mode):** The DAC operation is similar to mode 9 except the Host initiates the Hotline call by driving DTR ON. However, if the DM is busy or not answering, the DAC will continuously try to originate Hotline calls once every 40 seconds (as long as DTR stays ON) until the called DM answers the call. **Call disconnection:** Disconnection is identical to mode 8.

— continued —

Table 3
Connect and disconnect protocol (continued)

Mode of operation	Interface application	Comments
Mode 12	Terminal access for call origination and answering	**Terminal answering an incoming data call:** 1 DAC drives DSR, DCD, and CTS ON in the idle state. 2 Local DM user dials the access number to initiate the connection. 3 DAC responds by driving RI ON for 2 seconds and OFF for 4 seconds, until the terminal answers by turning DTR ON (if the terminal always drive DTR ON, the DAC immediately answers the call without driving RI ON). 4 When terminal receives RI ON, it should respond by turning DTR ON. 5 DAC answers when DTR goes ON and the local DM user is now transparently linked to the terminal. **Terminal originating an outgoing data call:** 1 DAC drives DSR, DCD, and CTS ON in the idle state. 2 Terminal turns DTR ON to initiate the connection. 3 DAC prepares to receive <CR> for autobaud. 4 Terminal sends <CR> followed by other commands for establishing a data call (the DAC echoes all commands).

— continued —

Table 3
Connect and disconnect protocol (continued)

Mode of operation	Interface application	Comments
		Call disconnection (DAC): If the local DM user releases the call, the DAC turns DSR, DCD, and CTS OFF for 0.2 second and then ON. **Call disconnection (terminal):** 1 Terminal toggles DTR from ON to OFF (DTR must be OFF for 100 ms or more). The DAC turns DSR, DCD, and CTS OFF for 0.2 second and then ON. 2 Terminal sends a long break or three short breaks. The DAC turns DSR, DCD, and CTS OFF for 0.2 second and then ON.
Mode 13	Hotline call origination	**Hotline originated by terminal:** 1 DAC drives DSR, DCD, and CTS ON in the idle state. 2 Terminal toggles DTR from OFF to ON to initiate Hotline call. 3 DAC responds by trying to establish a Hotline call to a specific DM (Autodial). 4 If Data Module is busy or not responding, the DAC requires another transition of DTR from OFF to ON to initiate another Hotline call. If the terminal keeps DTR ON, the DAC does not try to establish another Hotline call unless the terminal sends a <CR> while DTR is ON. **Call disconnection:** Disconnection is identical to mode 12.

— continued —

Table 3
Connect and disconnect protocol (continued)

Mode of operation	Interface application	Comments
Mode 14	Terminal access for call origination and answering (with forced DTR)	**Terminal access for call origination and answering:** The DAC operation is identical to mode 12 except that DTR is considered to be always ON, even when the terminal is driving DTR OFF. **Call disconnection (DAC):** If the local DM user drops the call, the DAC turns DSR, DCD, and CTS OFF for 0.2 second and then ON. **Call disconnection (terminal):** the terminal sends a long break or three short breaks. The DAC turns DSR, DCD, and CTS OFF for 0.2 second, and then ON.
Mode 15	Hotline call origination (Virtual Leased Line)	**Hotline call origination by terminal:** The DAC operation is similar to mode 13 except the terminal initiates the Hotline call by driving DTR ON. However, if the called DM is busy or not answering, the DAC will continuously try to originate Hotline calls once every 40 seconds (as long as DTR remains ON) until the Data Module answers the call. **Call disconnection:** Disconnection is identical to mode 12.

Keyboard dialing

Keyboard dialing is an interactive dialogue mode between the connected equipment and the DAC. This dialogue allows equipment to give dialing commands to the DAC in order to make a data call to another far-end data port. Keyboard dialing supports a modify mode that allows the user to modify certain dialing parameters.

The following keyboard dialing features are supported with the DAC:

- Autobaud from 110 to 19200 bps
- Autoparity to ensure that the keyboard dialing menu is readable on the data terminal during the interactive dialogue mode
- Originating calls to local and remote hosts
- Ring Again
- Speed Call
- Two answer modes for incoming calls: manual and auto
- Digit display
- Dialing by mnemonic

Initiating conditions

In order for the DAC to respond to user commands/entries, the following conditions must be met:

- The DAC must be active (power ON), and have successfully received the downloaded parameters from the system.
- The user equipment must be active, and, if in RS-232-C mode, must assert these control lines
  - DCE mode: DTR (unless Forced DTR has been software selected)
  - DTE mode: RI has cycled the appropriate number of times

Echo

During call setup (dialogue phase), all user input is echoed back to the user equipment. Once the call is established, the DAC is transparent to data communications. To get echoed characters after a call is established, the far end must provide the echo.

> ***Note:*** When RS-232-C modes 12-15 (Host modes) are selected, there is no echo during dialogue phase.

Prompts

Call processing prompts are in upper case letters only. Other prompts consist of both upper and lower case characters, and the dialogue session depicts the actual upper/lower case letters used.

All prompts are preceded by the Carriage Return and Line Feed ASCII characters (<CR>, <LF>).

Prompts requesting user input are terminated with the ASCII colon (:).

Prompts requiring a Yes or No answer are terminated by a question mark (?), followed by a list of allowable responses. The default response, if allowed, is bracketed.

Call abort

In addition to the methods mentioned above, which are common to both Hayes and keyboard modes, keyboard dialing supports the following method to abort a call during the dialogue phase.

- Sending the Control Z character (simultaneously pressing the control and Z keys) sends a message to the DAC to immediately abandon the data call setup.

Autobaud

All user dialogue must begin with Autobaud detection. This allows the DAC to determine the user equipment baud rate. During this phase, only <CR> will be recognized by the DAC. All other entries are ignored, and no entries are echoed. Once a valid <CR> is detected, the DAC responds with the New Menu prompt at the baud rate detected. If a fixed rate has been determined by the downloaded parameters, the DAC will look for that rate. If the rates agree, the dialogue phase begins. If not, the following prompt is sent to the user:

Baud Rate xxxx expected

After receiving a number of invalid responses, the DAC reverts to autobaud detection, since the terminal data speed may have changed.

Keyboard Autobaud is allowed after the call is placed in off-line mode.

> Note: If the Hayes autobaud characters ***A or*** a are sent, the DAC will enter Hayes dialing mode. Autobaud character detection is selected in the software.

Auto parity

The user can override the downloaded parity rate by entering the ASCII period (.) as a command. This period must be the only command sent, followed by <CR>. The period must be sent only when the Primary menu is displayed, and can be sent only once during a call setup session.

Dialing operation

For the purposes of this document, when illustrating the prompt/response sequences, the **bold** type is what the user enters on the keyboard. All other type represents the DAC output. Likewise, "xxxxxxx," "yyyyyyy," or "zzzzzzz" represents numbers entered by the user, or dialed by the DAC, and in no way indicates the absolute character limit. A maximum of 43 characters is allowed.

When the user enters the **autobaud** character, <CR>, and the dialing mode is Manual (not Hotline), the DAC sends the following menu:

<CR><LF><CR><LF><LF>ENTER NUMBER OR H (FOR HELP):<SP>

If the user enters <CR>, the DAC presents this prompt again. When a number is entered, the DAC attempts to place the call. Entering H at this point will list the Primary Commands menu:

Primary Commands Menu:

A - Auto Dial C - Call
D - Display M - Modify
S - Speed Call
CTRL Z (Abort Keyboard Dialing)
Select: <SP>

Whenever a Primary command is expected, the user may enter the Parity command (period). If Auto Parity has already been done, the Invalid Command menu is presented:

Invalid Command/Entry
Re-Enter: <SP>

The user's port may be set to idle by entering CTRL Z. Any call in progress will be dropped, and any Ring Again placed will be released. Once the Primary Command menu has appeared, the user must enter C to place a call. The DAC will not accept a number in place of a Primary command.

Primary commands

Once the Primary menu has appeared, only primary commands are accepted.

Call (C)

The Call command must be used to place a call once the Primary menu has appeared. The DAC will not accept a number only.

C<CR>

ENTER NUMBER:<SP>

xxxxxxx<CR>

CALLING xxxxxxx
RINGING
ANSWERED
CALL CONNECTED. SESSION STARTS

Autodial (A)

The Autodial command allows the user to dial a predefined number stored within the local system. The DAC will automatically attempt to place a data call to the Autodial number:

A <CR>

CALLING xxxxxxx

RINGING

ANSWERED

CALL CONNECTED. SESSION STARTS

The currently stored Autodial number may be viewed by entering the primary command D (Display), followed by the selection A (Autodial). See the Display discussion later in this document.

> ***Note:*** If the Autodial feature key is not defined in the software you will be notified by the following: Feature key Autodial not defined.

Speed Call (S)

The Speed Call command allows the user to make a call to a number associated with a l-, 2-, or 3-digit access code. The user supplies the access code, and the DAC places the call according to the code supplied.

S<CR>

ENTER ACCESS CODE: <SP>

xxx<CR>
CALLING YYYYYY
RINGING
ANSWERED
CALL CONNECTED. SESSION STARTS

If the DAC does not know the access code length, you will be notified by: ENTER ACCESS CODE (all digits) <SP>. Leading zeroes must be entered if the access code is less than the maximum number of digits allowed for the Speed Call list for the associated data DN (DDN).

> ***Note:*** If the Speed Call feature key is not defined in the software, you will be notified by the following: Feature key Speed Call not defined.

Both the Autodial and Speed Call commands can be changed with the Modify command (M). Additionally, the Speed Call number can be changed in the service change. When this command is entered, the Modify menu appears.

Modify Menu:

A-Auto Number	D - DCD Control
L - Long Break	M - Manual Answer
Cl - Quit Modify Menu	R - Remote Loopback
S - Speed Call	
CTRL Z (Abort Keyboard Dialing)	
Select:<SP>	

Any of these choices leads to another series of prompts and responses.

By entering A on the keyboard, you enter the Autodial Modify menu. Respond to the following prompts to change the Autodial number.

A <CR>

Current Autodial number : zzzzzzz

Enter Autodial number: <SP>

xxxxxxx <CR>

New Autodial number: xxxxxxx

By entering S on the keyboard, you enter the Speed Call Modify menu. The Speed Call number can also be changed in the software. Respond to the following prompts to change the Speed Call number.

S<CR>

Enter access code <SP>

Current Speed Call number: zzzzzzz

Enter Speed Call number: <SP>

zzzzzzz<CR>

New Speed Call number: xxxxxxx

By entering R on the keyboard, you enter the Remote Loopback Modify menu. Respond to the following prompts to enable or disable the Remote Loopback feature.

R <CR>

Remote Loopback Disabled (or enabled, indicating current status)
Remote Loopback ? (Y/N): <SP>

Y **<CR>** or N **<CR>**

Remote Loopback: Enabled (or Disabled)

By entering M on the keyboard, you enter the Manual Answer Modify menu. Manual Answer indicates that the DAC prompts the user to answer an incoming data call. Auto answer picks up the call after the specified number of rings. Respond to the following prompts to enable or disable the Manual Answer feature.

M <CR>

Current Answer Mode: Manual
Auto - xx Rings

Manual Answer ? (Y/N): <SP>

Y <CR>	N <CR>
	Number of rings (l-255 <1>): <SP>
YY	
New Answer Mode: Manual	New Answer Mode: Auto - yy Rings

By entering D on the keyboard, you enter the DCD Modify menu. Respond to the following prompts to enable DCD as Forced or Dynamic.

D <CR>

DCD Control: Dynamic
Forced On

Dynamic DCD? (Y/N): <SP>

Y <CR>	N <CR>
DCD Control : Dynamic	DCD Control : Forced On

By entering L on the keyboard, you enter the Long Break Detect Modify menu. Respond to the following prompts to enable or disable the detection of the Long Break as an abandon signal.

L <CR>

Long Break : Detected
Ignored

Detect Long Break? (Y/N): <SP>

Y <CR>	N <CR>
Long Break : Detected	Long Break : Ignored

To exit the Modify menu, enter Q. This entry returns you to the Primary commands menu. To view the port' s parameters, enter D when in the Primary Commands menu. This display shows the Display Options menu.

Display Options Menu:

A - Auto Dial number   D - Date and Time
K - Feature Keys   P - Data Port Parameters
Q - Quit Display   S - Speed Call number(s)
CTRL Z (Abort Keyboard Dialing)
Select: <SP>

Ring Again

When a call is placed to a busy DN, the DAC prompts you to activate Ring Again. The Ring Again feature alerts you as soon as the dialed DN becomes free. Once the Ring Again has been activated, you will return to the Primary Commands menu. The following is the prompt and response sequence enabling the Ring Again feature.

> ***Note:*** If you hang up the call, or give an abandon command, Ring Again is canceled.

BUSY, RING AGAIN ? (Y/N): **<SP>**

Y <CR> **or** **N <CR>**

RING AGAIN PLACED

Primary Commands Menu:

A - Auto Dial C - Call
D - Display M - Modify
S - Speed Call
CTRL Z (Abort Keyboard Dialing)
Select: **<SP>**

If a Ring Again request has already been placed, the DAC offers the option of overriding the previous request.

RING AGAIN ACTIVE, REPLACE ? (Y/N) : **<SP>**

Y <CR>

RING AGAIN PLACED

Primary Commands Menu:

A - Auto Dial C - Call
D - Display M - Modify
S - Speed Call
CTRL Z (Abort Keyboard Dialing)
Select: **<SP>**

When the called DN becomes available, the system notifies the DAC, which then prompts the user to place the call. If you do not respond to the Ring Again prompt within a software determined time period, Ring Again is canceled, and the Primary Commands Menu appears.

DATA STATION NOW AVAILABLE, PLACE CALL? (Y/N/<Y>): <SP>

Y <CR>

CALLING XXXX
RINGING
ANSWERED
CALL CONNECTED. SESSION STARTS

> *Note* 1: If the Ring Again notice occurs during a parameter change, the prompt only appears after the change has been completed.

> *Note* 2: If the notice occurs during an active call, the Ring Again notice is ignored. When the active call is completed, you will be notified that the Ring Again call was canceled.

You can also cancel the Ring Again request at this time.

DATA STATION NOW AVAILABLE, PLACE CALL? (Y/N/M): <SP>

N <CR>

RING AGAIN CANCELLED

Primary Commands Menu:

A - Auto Dial S - Speed Call
C - Call M - Modify
D - Display
CTRL Z (Abort Keyboard Dialing)
Select: <SP>

Not in service

When the DAC attempts a call to a DN that is' not supported, it sends you a message. The call is released, and you must reenter the Autobaud character <CR> to initiate keyboard dialing again.

C<CR>

ENTER NUMBER:<SP>

xxxxxxx<CR>

CALLING xxxxxxx

NOT IN SERVICE

RELEASED

No response from the system

Likewise, when the DAC receives no system response from your port after a 30-second timeout period, the DAC sends you a message. The call is abandoned. This means the port is either disabled or unequipped.

C<CR>

ENTER NUMBER:<SP>

xxxxxxx<CR>

NO SYSTEM RESPONSE

RELEASED

Hayes dialing

Like keyboard dialing, Hayes dialing is an interactive dialing mode with the terminating equipment connected to the NT7D16 Data Access Card (DAC). In addition to the common parameters and functions, the Hayes dialing mode offers the following features:

- Data call dialing
- Two modes for answering incoming calls: auto and manual
- Repeat previous command
- Character echo control
- On-hook/off-hook control
- Detect off-line escape sequence
- Return to on-line
- Initiate Remote Digital Loopback
- Terminate Remote Digital Loopback
- Modify S Registers SO through S12
- Display S Registers SO through S12
- Support all S Registers except: S6, S7, S9, and S11

The Hayes dialing mode supports the following AT Dialing commands

Initiating conditions

The DAC responds to commands only when the following initial requirements are met:

- the DAC is active
- the DAC has successfully received the downloaded parameters
- the user equipment is active, and, if operating in RS-232-C mode
  - the DCE mode is DTR (unless Forced DTR has been software selected)
  - the DTE mode, and RI has cycled the appropriate number of times and DCD is asserted on by the modem

Note: In Gateway mode, DCD must be asserted on. In modem mode, only RI must be on. The DAC asserts DTR to the modem, and awaits DCD from the modem.

Input requirements

All input must be in the same case (upper or lower).

The Hayes repeat command, A/, is used to immediately execute the last command entered. The terminator character need not be entered. A complete discussion of the Repeat command can be found later in this document.

Where a Dial Number is expected, you may enter the characters O-9, #, and comma (,). The characters @, P, R, T, and W are accepted, but ignored.

The maximum number of characters is 43. This limit includes the AT prefix, and the record Terminator character, but does not include the ASCII space character.

Echo

Throughout the dialogue phase, the DAC echoes all user input. In RS-232-C modes 0, 1, 2, and 3, no inbound call messages are presented to the modem. Prompts are presented only if the modem user originates the call. In modes 8, 9, 10, and 11, no prompts or characters echo under any circumstances. The echo function can be turned off with a Hayes dialing command.

All prompts and responses issued by the system are displayed to the user unless the display command has been disabled. Like the Repeat command, this is explained later in this document.

> ***Note:*** If the RS-232-C DAC Host modes (1, 2, 3, 8, 9, 10, 11, or 12) are used, all attempts to enable the echo or display is ignored. Likewise, the Hayes Reset command is also ignored.

Result codes and messages

Each input record generates a result code which is sent to the user. Only one code is sent regardless of the number of commands in the record. The reply is in one of two formats:

- Numeric replies contain a one- or two-number code
- Verbose replies contain one or more words

Table 4 shows the codes for each reply in both formats, and explanations for the codes.

> ***Note*** I: Verbose commands are the default and appear in upper case characters only. Numeric commands are sent by issuing the Numeric Results code command (explained later in this document).

> ***Note*** 2: All verbose codes and messages are preceded and terminated by the user defined Terminator and New Line characters. The default, or reset, characters are the ASCII Carriage Return, and ASCII Line Feed. The Numeric codes are preceded and terminated by the Terminator character only.

> ***Note*** 3: The Suppress result command (explained later in this document) will disable the sending of these codes. If in RS-232-C DAC Host modes, this command is ignored.

Table 4
Hayes dialing result codes and messages

Verbose code	Numeric code	Description
OK	0	Command(s) executed, no error
CONNECT	1	Data call established, session starts
RING	2	Inbound call presented
NO CARRIER	3	Data call abandoned
ERROR	4	Error in command line
NO DIALTONE	6	System does not allow call to proceed
BUSY	7	Far end is busy
NO ANSWER	8	Far end does not answer
CONNECT 1200	5	Session starts at 1200 baud
CONNECT 2400	10	Session starts at 2400 baud
CONNECT 4800	11	Session starts at 4800 baud
CONNECT 9600	12	Session starts at 9600 baud
CONNECT 19200	14	Session starts at 19200 baud

Baud rate detection

Every command line begins with Baud rate detection. This phase allows the DAC to determine the user equipment baud rate. During this phase, the DAC accepts only the ASCII “A, “or “a” characters. Once a valid autobaud character is detected, the DAC echoes the parity bit character at the baud rate detected.

> ***Note:*** If Hayes dialing is desired, you must enter the character “A” or “a” BEFORE the <CR>. If Carriage Return (<CR>) is entered before this Hayes dialing command, you will be placed in keyboard dialing mode.

Parity detection

Once the baud rate has been determined, the DAC accepts only the ASCII characters "T," "t," or "/." If the Repeat character "/" is entered, the previous command is executed. If "T," or "t" is entered, the DAC uses its parity and the parity of the preceding A (a) to determine the user's parity. This parity is used on the following messages and prompts associated with the command lines.

> ***Note:*** The parity determined here overrides the parity downloaded from the system. Also, the T (t) must be entered in the same case as the A (a). If you entered uppercase A for the Baud Rate, you must enter upper case T for the parity.

Dialing operation

Like keyboard dialing, the Hayes dialing commands allow the user to initiate a data call, as well as change certain dialing parameters. The commands may be entered in either upper or lower case, but must be the same case throughout the command line. Also the case must match the autobaud case.

> ***Note:*** Hayes dialing does not allow for the Ring Again feature. If a call is made to a busy number, that call is abandoned.

Table 5 provides a list af the AT dialing commands.

Table 5
AT **dialing commands**

Command	Description
ATA	Answer (answer incoming data call)
ATDnnnn ATDTnnnn	Dial (n = O-9, numbers to be dialed)
A/	Repeat last command (no <CR> needed)
AT0	On-line (enter three Escape characters rapidly to go off-line)
ATDPnnnn	Voice call (n = O-9, numbers to be dialed)
ATFO	Handsfree/mute (toggle Handsfree between mute and normal)
ATF1	Hold (put voice call on hold)
ATF2	Select (take voice call off hold)
ATH0	Hang up data call
ATHP	Hang up voice call
ATQn	Result code (n = 0, 1; if n = 0, result codes are sent)
ATVn	Verbal result (n = 0, 1; if n = 0, numeric codes are sent)
ATXn	Result code selection (n = 0, 1; if n = 1, extended results)
ATSn?	Read S register (n = number of S register to read)
ATSn=x	Write S register (n = S register number; x = new value)
ATZ	Soft reset (reset to default parameters)
ATCn	Carrier detect (n = 0, 1; if n = 1, carrier detect is enabled)
ATEn	Echo (n = 0, 1; if n = 1, commands will echo back to terminal:
ATTSP!	Transparent mode

Note 1: To use AT dialing, enter CTRL-z at carriage return (<CR>) when the port is idle.

Note 2: Follow each command (except A/) by a carriage return (<CR>) to execute it.

For the purposes of this document, when illustrating the prompt/response sequences, the **bold** type is what the user enters on the keyboard. All other type represents the DAC output. Likewise, "xxxxxxx," "yyyyyyy," or "zzzzzzz" represents numbers entered by the user, or dialed by the DAC, and in no way indicates the absolute character limit. The number of characters is dependent on the feature activated (Auto Dial, Speed Call, for example). Also, for simplicity purposes, all Result messages are shown in Verbose code. See Table 4 for a complete list of the Verbose and Numeric codes. See *1 features and services* (553-3001-305) for a complete description of the features operating.

S registers

These commands allow the user to access various dialing parameters. The user can determine the present parameter setting, and alter the parameter. These parameters are grouped into a set referred to as the S registers.

All S registers may be changed with the exception of S1, the Ring count. If an attempt is made to change this parameter, the command is accepted but no action is taken. The Ring count is the number of 6-second intervals that have expired since an inbound call has been received. The current count may be displayed through the Display S register command but cannot be altered After a call is dropped, the Ring counter is set back to 0.

If, when using the display or alter commands, no register or value number is input, the number 0 is used. For example, ATS? is equivalent to ATS0.

Allowable S registers Table 6 shows the supported S registers allowed by the DAC. This table shows the register number, the range accepted (decimal values shown), and a description of the register. Whenever a register value is changed, the DAC checks for validity. If the value entered is not within the allowed range, all processing ceases and no command processing following the invalid entry is accepted. The DAC sends an ERROR result *message.*

Table 6
Allowable S registers

3 register	Range	Range units	Supported	Description
so	0 - 255	Rings	Yes	Number of rings to answer a system call (0 = manual answer)
S1	0-255	Rings	Yes	Ring count for the current inbound system call
S2	0- 127	ASCII	Yes	Off-line escape sequence character
s 3	0- 127	ASCII	Yes	input/output line terminating character
s 4	0- 127	ASCII	Yes	New line character for the output line
s 5	0 - 32, 127	ASCII	Yes	Backspace character for input/output lines
S6	2 - 255	Seconds	No	Wait time before blind dialing
s 7	1 - 255	Seconds	Yes	Timeout timer for far end answering
S8	0-30	Seconds	Yes	Duration for the dial pause character
S9	1 - 255	0.1 second	No	Carrier detect response time
S10	1 - 255	0.1 second	No	Delay time between loss of carrier and call release
S11	50 - 255	Milliseconds	No	Touch tone spacing
s12	20 - 255	20 milliseconds	Yes	Guard time for the escape sequence

You can view any of the S registers by issuing the following display command. Any S register can be specified through the ATS command, and the system will display the current setting for that parameter. More than one S register can be viewed by listing the desired registers on the same command line.

<u>One register</u>	<u>Two registers</u>
ATS8?	**ATS8? S9?**
20	**002**
OK	**006**
	OK

To change any S register range, except S1, use the following change command. The new parameters remain in effect until another change command is given or the Hayes Reset modem command (Z) is issued. If the DAC is powered up, the parameters are reset to the defaults.

ATS 8 = 15

OK

Reset Hayes parameters

All of the Hayes dialing parameters and S registers remain even after the data call is complete. Similarly, if the dialing mode, keyboard to Hayes or vice versa, are changed, the parameters remain as specified. The following command allows you to reset the parameters and **S** registers to the defaults. Entering 0 resets to the Hayes default, while entering 1 resets to the downloaded operating parameters.

> **CAUTION**
> **All previous instructions will be ignored.**
> This command should only be used to reset all parameters. It should be the last command entered, because all previous commands are ignored.

ATZ **0**
1

OK

Table 7 lists all the parameter and S register default values. These are the values established when the reset command is given.

Table 7
Hayes parameters and S register reset values

Parameter	Value	Description
C	1 *	DCD control Dynamic (1) Forced ON (0)
E	1 *	Input character echo Enabled (1) Disabled (0)
Q	0	Send Result codes Enabled (1) Disabled (0)
v	1	Result codes sent in Verbose format
X	1	Features selection 0 - 8, 10 - 13
P	—	Dial method (pulse)
s 0	0 * 1	Manual Answer (if 0) Auto answer on 1 ring
S1	0	Ring count 0
s 2	43	Escape sequence character Plus sign (+)
s 3	13	Terminator character Carriage Return (<CR>)
s 4	10	New line character Line Feed (<LF>)
s 5	8	Back space character BS (<BS>)
S6	2	Blind dial delay 2 seconds
s 7	30	Timeout for outbound call answer 30 seconds
S8	2	Dial pause delay 2 seconds
S9	6	Carrier detect response time 0.6 seconds
S10	14	Call disconnect timer for carrier loss 1.4 seconds
S11	95	Touchtone space 95 milliseconds
S12	50	Escape sequence guard timer 1 .00 seconds

* Parameters that are reset to the downloaded operating parameters when 1 is entered at the reset command.

Outbound calls

The DAC supports two types of outbound data calls:

- point-to-point data calls
- calls sent through a modem without call origination capabilities

Hayes dialing does not provide for any alterations during call processing, Ring Again, or Controlled Call Back Queueing (CCBQ) for example. Consequently, if such variances occur during the call processing, the DAC releases the call and notifies you with a NO CARRIER or BUSY result code. Table 8 lists the command characters allowed for an outbound call.

Table 8
Allowed outbound call command characters

Character	Description
o-9	Dial number normal digits Delay dialing the next digit by the value set in S8 register

Inbound calls

The DAC supports auto answer and manual answer capabilities. The following commands give examples of both auto and manual answer dialogues.

This dialogue session describes the sequence when the SO register is set to three. In this case, the DAC automatically answers the incoming call on the third ring, and the session begins with the CONNECT message.

RING

RING

RING

CONNECT

Issuing the On Hook command while the call is still ringing disconnects the incoming call. The DAC disconnects the call and notifies you with a NO CARRIER message.

RING

RING

ATH 0

NO CARRIER

When the SO register is set to 0, the DAC is set to manual answer, and an inbound call must be answered with the Answer command. You can also abandon the call with the On Hook message, as in the Autodial sequence.

RING

RING

ATH 0

NO CARRIER

Off Line mode

Off Line mode acts as a sort of Hold mode. Once the call is answered and the session begins, the Off Line command enables you to enter Hayes command modes. The Off Line sequence is transmitted to the far-end, but at the end of the sequence, the command mode is initiated. At this point, any Hayes command except Dial Number can be executed. Once the desired command is completed, you can return to the call through the On Line command.

The Guard Time (S12 register) defines the amount of time for no local input for the Off Line escape sequence to take place. If the S12 register is set to 0, enter the escape character defined in the S2 register. For a complete list of the parameters allowed for each S Register, see Table 7 describing the S Registers.

In the following example, <GT> is the Guard Time and <EC> the Escape Character defined in the S2 register. The example shows the Off Line escape sequence, the command to display an S register (Ring Count, in this case), and the command to go back on line and attend to the answered call.

<GT><EC><EC><EC><GT

OK

ATS 1?

005

OK

AT0 0

CONNECT

Specifications

QPC430 and QPC723 interfaces

The NT7D16 Data Access Card provides the same features as the QPC430 four-port Asynchronous Interface Line Card (AILC) and the QPC723 RS-232 Interface Line Card (RILC). The operational mode for each port is determined in LD11.

Download parameters

These parameters are configured in the system through service change operations. They are then downloaded to the DAC. For a complete description of the service change procedures, see the *X11 input/output guide* (553-3001-400).

System parameters

System parameters downloaded by the switch include the type of system, the inactivity timer, and the data DN. These parameters are described below:

- System type: Meridian 1
- Inactivity timeout
  - No timeout
  - 15 minutes
  - 30 minutes
  - 60 minutes
- DDN: 1 to 7 digits (O-9)

Operating parameters

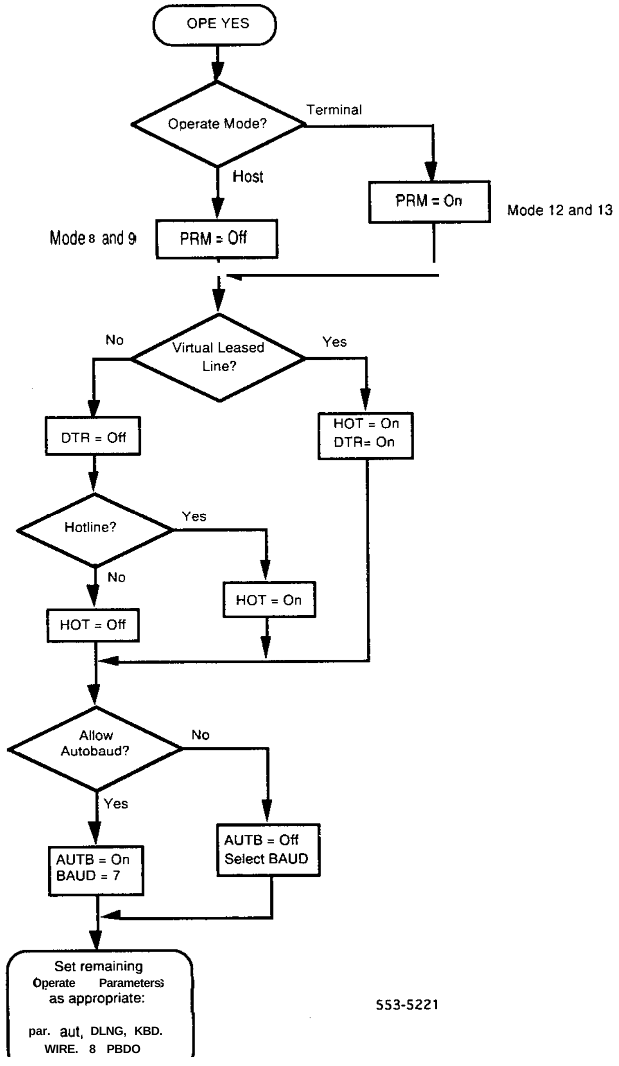
There are thirteen parameters configured in the system that are downloaded to the DAC. They are:

- Dialogue parity
  - Space (OFF)
  - Mark (ON)
  - Even
  - Odd
- DTR control
  - Dynamic (affected by call progress)
  - Forced ON
- DCD control
  - Dynamic (affected by call progress)
  - Forced ON
- Dialing mode
  - Manual (user initiates the call with dialogue commands)
  - Hotline (call the Autodial number upon connection)
- Wire test
  - Disabled (can be invoked only with front panel switch)
  - Enabled (start only if the DAC firmware is idle)
- Language
  - English
  - Quebec French
- Keyboard dialing
  - Enabled (allow both keyboard or Hayes dialing modes)
  - Disabled (Hayes dialing only)

- Make port busy
  - Disabled — On with DTR (normal)
  - Enabled — Off with DTR (modes 8 or 12, and no DTR for 5 seconds)
- Auto Baud
  - Variable (use auto baud rate)
  - Fixed (use baud rate selection only)
- Baud rate
  - 110
  - 1.50
  - 300
  - 600
  - 1200
  - 2400
  - 4800
  - 9600
  - 19200
- Operating mode
  - DCE
  - DTE
- Equipment type
  - Terminal (send prompts/replies)
  - Host (suppress prompts/replies)
- Long Break Detect

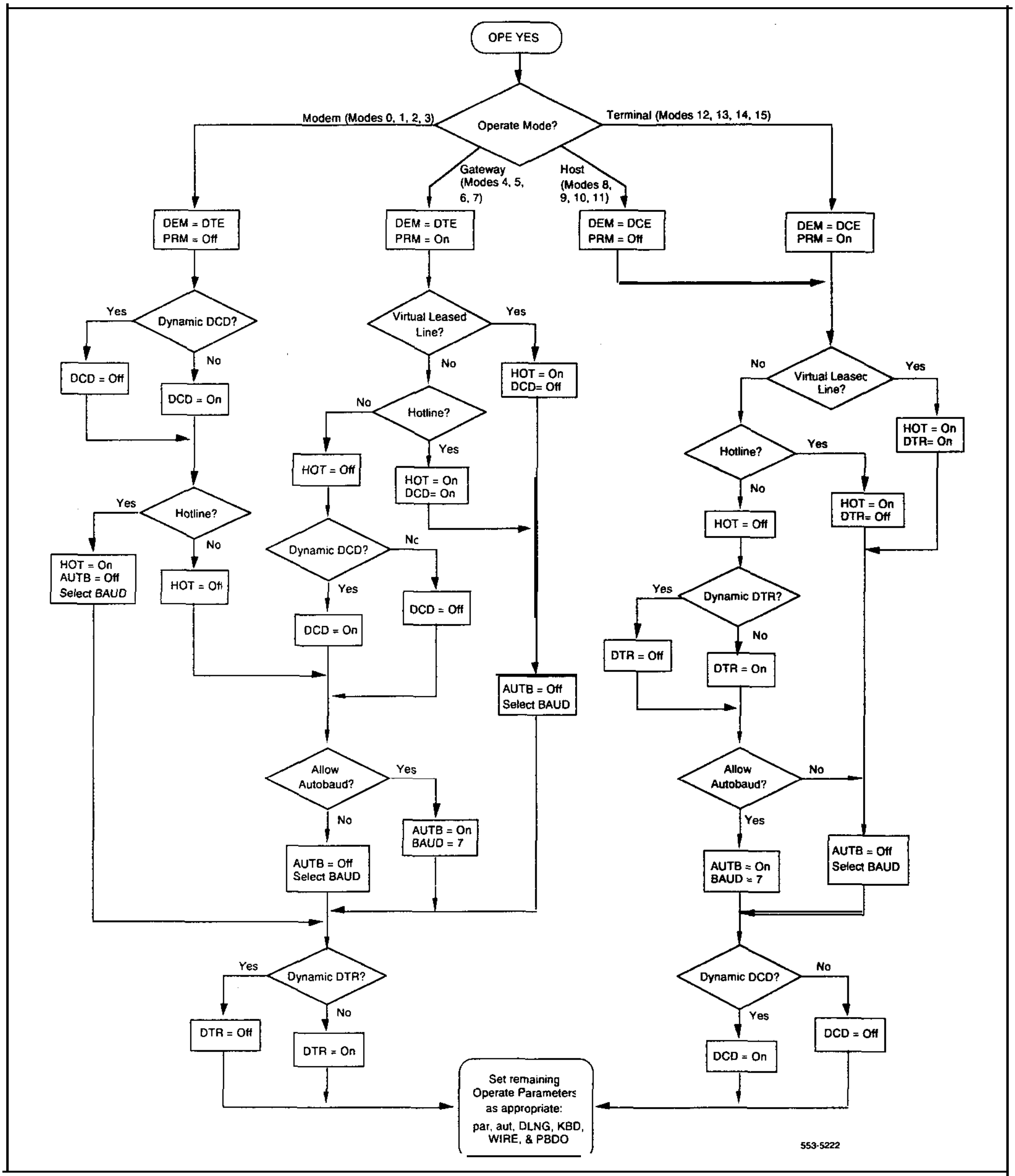
In Figures 8 and 9, the rectangles represent the settings of service change parameters in LD1 1 that affect the desired function. The diamonds represent the logical DAC operating mode decisions.

Figure 8
Operating mode selection-FE422



Notes: DTR and PBDO are not prompted.
WIRE: ON causes TX data to cycle once and Rx data to cycle twice.

Figure 9
Operating mode selection-RS-232-C



Upload parameters

The system can, at any time, request information from a DAC port. The uploaded parameters contain information about the individual card (card type, order code, release information), as well as the status of the configured operating parameters. Because the dialogue operations of data calls can affect the operating parameters, this is useful to monitor and confirm port settings. An additional parameter is listed in the uploaded information: port interface mode (RS-232-C/RS-422). The interface is set by the use of jumpers on the DAC, and cannot be altered by the service change.

System database requirements

To ensure proper operation of the DAC keyboard and Hayes dialing, the system requires the following:

- The Data DN must have only one appearance.
- For access to remote hosts, the TNs class of service must allow external calls. The Data TN must have the following in its class of service:
  - Call Pickup Denied (PUD)
  - Call Forward No Answer Denied (FND)
  - Call Forward Busy Denied (FBD)
  - Data (DTA)

  Note: Warning Tone Denied (WTD) defaults if DTA is entered.
- If the DAC is used to call out through modem pooling, where the modem pool consists of dumb modems connected to QMT8 SADM or QMT12 V.35 SADM, the DAC port should be configured with a secondary DN, which has a single appearance.
- The Virtual keys must be assigned as shown in Table 9.

Table 9
Virtual key assignments

Feature key	Key number SL-1	Key number SL-100	Use
Data DN	0	0	Required
Secondary DN	1	1	Required for manual modem pooling
Call Transfer	2	—	Required for manual modem pooling
Auto Dial	3	2	Required for Hotline and VLL
Ring Again	4	6	Optional
Speed Call	5	3	Optional
Display	6	—	Required
Make Set Busy	7	7	Optional

Power supply

Be sure that all power requirements are met before installing the DAC. Operation may be affected by improper power and environmental conditions.

EIA signals supported

The DAC supports a subset of the standard signals. Only 8 leads can be brought through the backplane connector for each port, totaling 48 leads for each card slot. Table 10 lists the EIA signals supported on this card.

Table 10
EIA signals supported (W-232-C)

EIA	DB-25 Pin	Signal abbreviation	Description	DCE mode	DTE mode
BA	2	TD	Transmitted Data	In	out
BB	3	RD	Received Data	Out	In
CB	5	CTS	Clear To Send	Out	In
CC	6	DSR	Data Set Ready	Out	In
AB	7	GND	Signal Ground		—
CF	8	DCD	Carrier Detect	Out	In
CD	20	DTR	Data Terminal Ready	In	out
CE	22	RI	Ring Indicator	out	In

Note: **RS-422** leads supported are: T x (transmit) and Rx (receive).

Environmental

The DAC functions fully when operating within the following specified conditions:

Specification	Operating	Storage
Ambient temperature	0 to 60 degrees C	**40** to 70 degrees C
Humidity	5% to 95%	**5% to 95%**

Reliability

The DAC has a predicted mean time between failure (MTBF) of 8 years at 45 degrees Celsius. The mean time to repair (MTTR) is 1 hour.

Installation

Installing the Data Access Card in system option 11

The DAC is fully supported in any card slot in either the main or expansion cabinet of system option 11 without any hardware modification. Insert the DAC into any available card slot and secure it in place using the locklatches.

To cable out the DAC on system option 11, run a standard 25-pair cable to the cross connect, or use one of the following breakout cables in conjunction with an Amphenol 50-pin female-to-female gender converter:

- QCAD318A — 50-pin Amphenol to 6 female DB25 connectors
- QCAD319A — 50-pin Amphenol to 6 male DB25 connectors

For information on the programming of the DAC, see "Configuring the Data Access Card".

> ***Note:*** For system option 11, the format to be used in response to the "TN" prompt must be one of the following:

	cc 00 00 uu	CC - Card Slot
or	cc uu	UU - Unit Number

Installing the Data Access Card in system options 21, 51, 61, 71, and 81

In most Meridian 1 system options 21, 51, 61, 71, and 81, the DAC is fully supported in IPE modules. These special slots on the DAC have 24-pair cables pre-wired to the Main Distribution Frame (MDF) in card slots O-15. Any IPE slot will support the first four ports on the DAC if connections are made at the MDF. Most IPE modules can be upgraded to wire 24-pair cables to the MDF for all card slots.

> *Note:* For directions concerning the pinouts for the MDF, refer to *System installation procedures* (553-3001-210).

Before you begin, power down:

- the IPE module only, if it is a DC-powered system
- the entire column, if it is an AC-powered system

It is recommended that you begin the installation from the right hand side (when facing the backplane), starting with slot 0 and moving towards slots on the left side. If you wish to add more than six DACs, and require slots 8 through 15, remove the input/output (I/O) panel. Be aware that a full shelf installation can take up to 3 hours. You need the following equipment to upgrade the cabling:

- A0359946 Amphenol cables
  - These connectors include all the connector and screw apparatus.
  - You need one cable for each DAC.
- cable ties
- wire cutters
- A3/16 nutdriver

System compatibility

To support the 24-pair requirement of the DAC, some cabling may need to be upgraded (Table 11). See "Upgrading systems" for more information.

Ports 0, 1, 2, and 3 of the DAC work in any standard 16-pair IPE slot (connect directly to the MDF).

An upgraded backplane has three shrouds for each card slot. A backplane that cannot be upgraded has only two shrouds for each card slot.

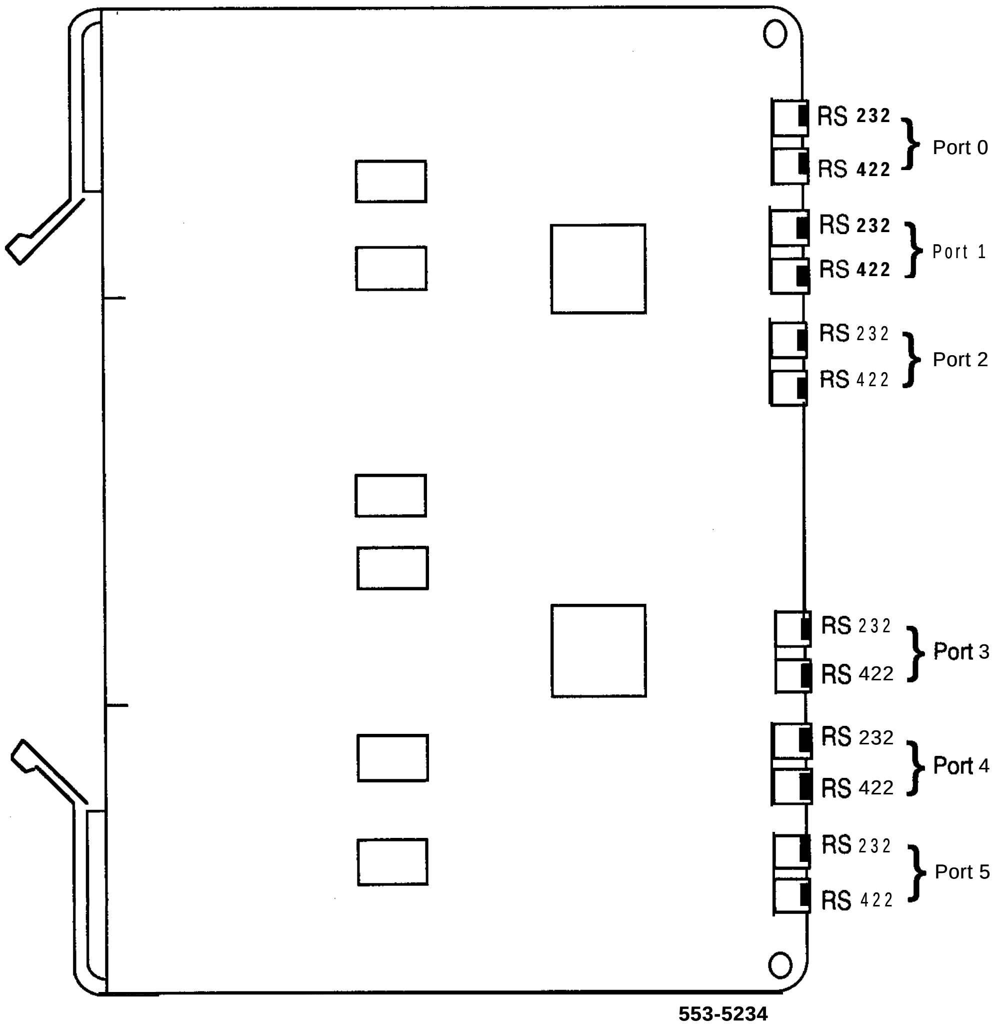
Table 11
System option compatibility with the DAC

System option	Backplane code	Backplane release	Upgrade	Maximum no. of ports/DAC supported
21/21A	NT8D1102	6 and below	No	4
21/21A	NT8D1102	7 and above	Yes	6
51/61/71	NT8D3701	3 and below	No	4
51/61/71	NT8D3701	4 and above	Yes	6

Port configuration

Figure 10 shows the port configurations for both the RS-232-C and RS-422 ports. The software configuration requirements for the DAC are shown at the end of this chapter. Responses to the prompts listed are required. Depending on the configuration, ensure that the option plug is set for RS-232 or RS-422.

Figure 10
NT7D16 Data Access Card port connectors



Note: Insert only one option plug per port.

Cabling

Several cabling schemes are possible for both AILC and RILC modes. Typical capacitance for 24- and 26-gauge cables is shown in the Tables 12 and 13. RS-232 and RS-422 transmission distance is limited by the electrical capacitance of the cable. Low-capacitance cable carries a digital signal further than a high-capacitance cable.

Table 12
W-232-C maximum line capacitance 2,500 µF

Gauge	Capacitance per foot (µF)	Max distance
24	24	104
26	15	166

Table 13
RS-422 maximum line capacitance 60,000 µF

Gauge	Capacitance per foot (µF)	Max distance
24	24	2500
26	15	4000

Figure 11 shows the cabling choices available. It includes cabling with the RS-232-C cable, associated patch panel, the RJ-11, and the octopus cable. Each scheme can be tailored to suit individual needs, and specific alternatives are shown in later figures.

Figure 11
Cabling to the data equipment

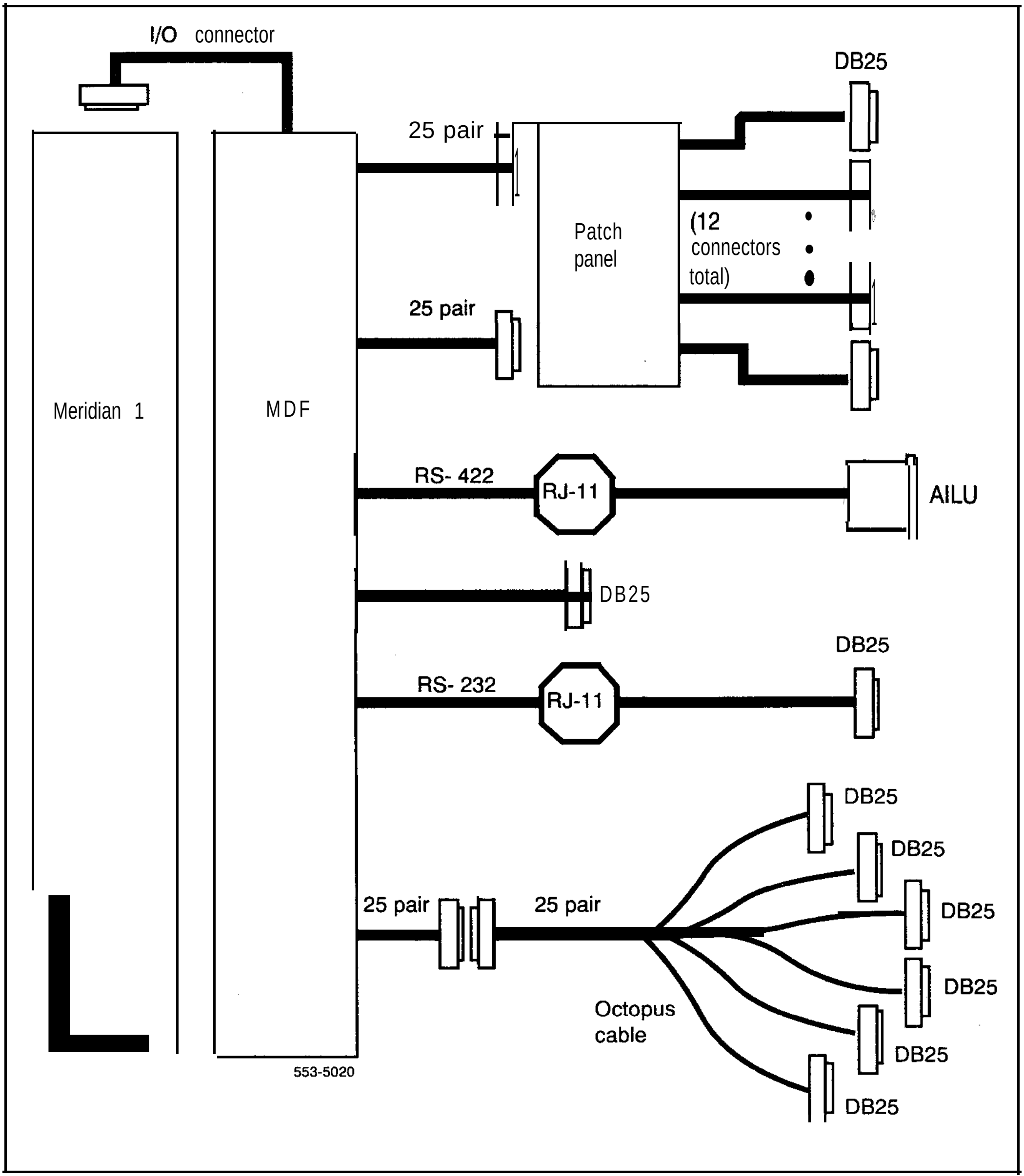


Figure 12 shows a connection through an RJ-11 or RJ-45 jack located at the data station. It is recommended that four wires be used similarly to the AIM drop when using the RJ-11 jack. Another cable is required to convert the RJ-11 or RJ-45 into DB25.

Note: It is necessary to turn over Receive Data and Send Data between the DAC and the AILU. This is done on the TN at the MDF.

Figure 12
RJ-11 or RJ-45 jacks

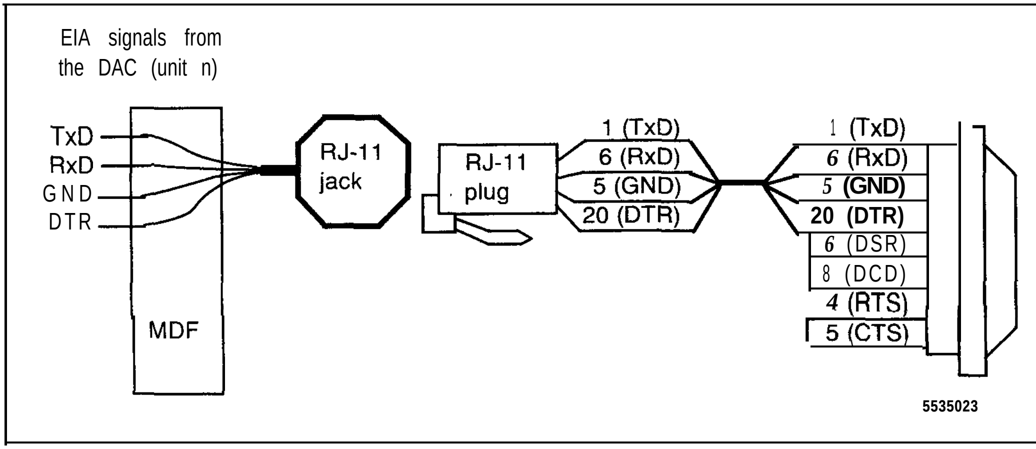


Figure 13 illustrates the patch panel. RS-232-C cables are used to connect the data equipment to the patch panel. This particular panel shows two SO-pin connectors into twelve DB25. The signals from the MDF travel on 25-pair cables, terminating at the patch panel.

Note: Use patch panels that follow the pinout of the DAC.

Figure 13
Patch panel layout

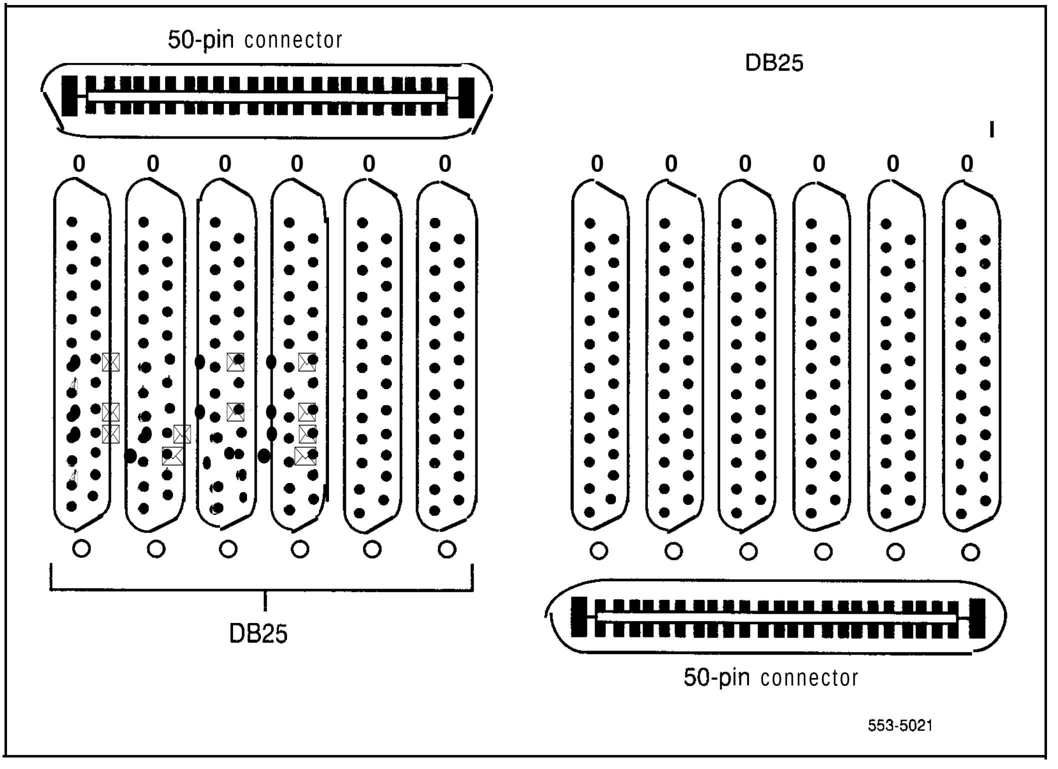
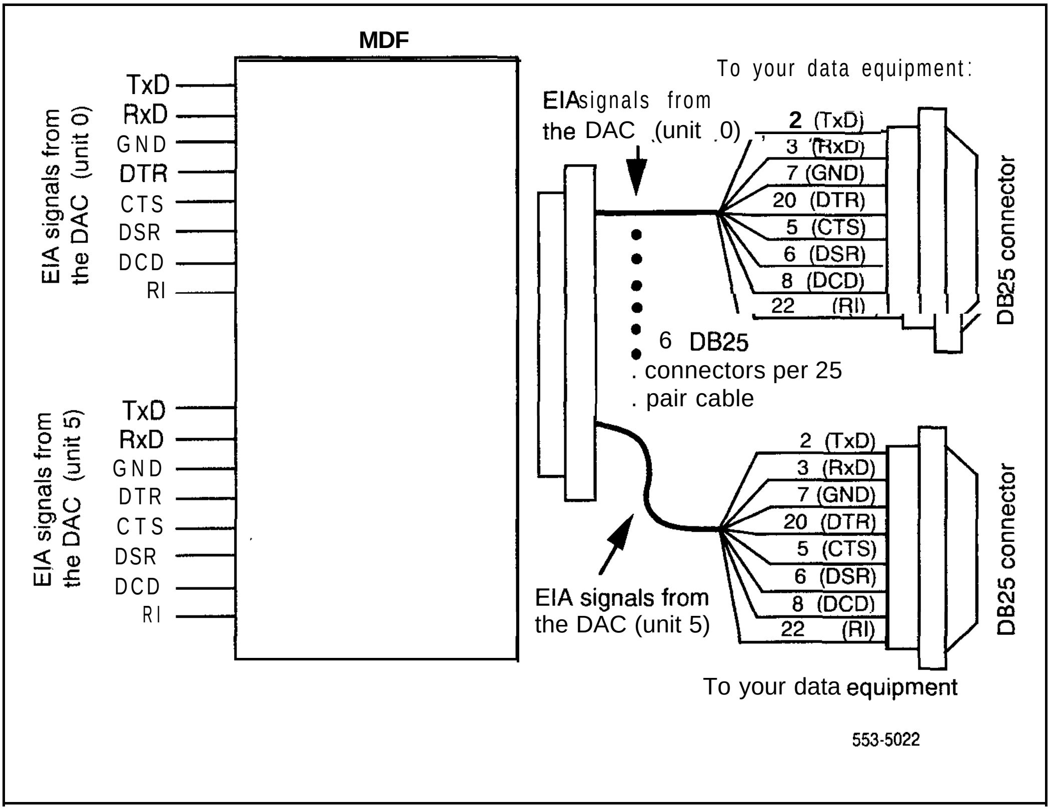


Figure 14 describes an octopus cabling scheme. This cable replaces the combined patch panel and RS-232-C cabling scheme. The 25-pair cable is split into six RS-232-C male or female connectors. This allows direct connections to the data equipment from the Meridian 1 I/O panel. The octopus cable allows for the maximum segregation of the voice signals that might otherwise be present within the same 25-pair cable.

Note: Use an octopus cable that follows the pinout of the DAC, such as QCAD318A (female) and QCAD319A (male), in conjunction with a 50-pin female-to-female gender converter.

Figure 14
Octopus cabling



Backplane pinout and signaling

Two 40-pin, and two 20-pin edge connectors connect the card to the backplane. The detailed pinout configurations are listed in Tables 14 and 15.

Table 14
W-232-C and RS-422 pinouts for first three DAC ports

I/O cable			Unit no.	RS-232-C		RS-422 Signal	Patch pair or octopus
Pair	Pin	Pair color		Signal	Pin no.		
1T	26	W-BL	UNIT 0	TDO	2	RDAO	
1R	1	BL-W		RDO	3	RDBO	
2T	27	W-O		DTRO	20	SDAO	
2R	2	O-W		GNDO	7	SDBO	Connector
3T	28	W-G		DCDO	8		1
3R	3	G-W		DSRO	6		
4T	29	W-BR		RI0	22		
4R	4	BR-W		CTSO	5		
5T	20	W-S	UNIT 1	TD1	2	RDA1	
5R	5	S-W		RD1	3	RDB1	
6T	31	R-BL		DTR1	20	SDA1	
6R	6	BL-R		GND1	7	SDB1	Connector
7T	32	R-O		DCD1	8		2
7R	7	O-R		DSR1	6		
8T	33	R-G		RI1	22		
8R	8	G-R		CTS1	5		

— continued —

Table 14
W-232-C and RS-422 pinouts for first three DAC ports (continued)

I/O cable			Unit no.	W-232-C		RS-422 Signal	Patch pair or octopus
Pair	Pin	Pair color		Signal	Pin no.		
9T	34	R-BR	UNIT 2	TD2	2	RDA2	
9R	9	BR-R		RD2	3	RDB2	
10T	35	R-S		DTR2	20	SDA2	
10R	10	S-R		GND2	7	SDB2	Connector
11T	36	BK-BL		DCD2	8		3
11R	11	BL-BK		DSR2	6		
12T	37	BK-0		RI2	22		
12R	12	0-BK		CTS2	5		

Note 1: The RS-232 pinout follows the standard set by the QPC723 RILC.

Note 2: The RS-422 pinout follows the standard set by the QPC430 AILC (first pair: Receive Data; second pair: Send Data). Receive and Send are designated with reference to the DTE; therefore, they must be turned over in the cross-connect since most DTE have first pair as Send Data and second pair as Receive Data.

Table 15
RS-232-C and RS-422 pinouts for last three DAC ports

I/O cable			Unit no.	RS-232-C		RS-422 Signal	Patch pair or octopus
Pair	Pin	Pair color		Signal	Pin no.		
13T	38	BK-G	UNIT 3	TD3	2	RDA3	
13R	13	G-BK		RD3	3	RDB3	
14T	39	BK-BR		DTR3	20	SDA3	
14R	14	BR-BK		GND3	7	SDB3	Connector
15T	40	BK-S		DCD3	8		1
15R	15	S-BK		DSR3	6		
16T	41	Y-BL		RI3	22		
16R	16	BL-Y		CTS3	5		
17T	42	Y-O	UNIT 4	TD4	2	RDA4	
17R	17	O-Y	(Note)	RD4	3	RDB4	
18T	43	Y-G		DTR4	20	SDA4	
18R	18	G-Y		GND4	7	SDB4	Connector
19T	44	Y-BR		DCD4	8		2
19R	19	BR-Y		DSR4	6		
20T	45	Y-S		RI4	22		
20R	20	S-Y		CTS4	5		

-continued —

Table 15
RS-232-C and RS-422 pinouts for last three DAC ports (continued)

I/O cable			Unit no.	RS-232-C		RS-422 Signal	Patch pair or octopus
Pair	Pin	Pair color		Signal	Pin no.		
21T	46	V-BL	UNIT 5	TD5	2	RDA5	
21R	21	BL-V	(Note)	RD5	3	RDB5	
22T	47	V-O		DTR5	20	SDA5	
22R	22	O-V		GND5	7	SDB5	Connector
23T	48	V-G		DCD5	8		3
23R	23	G-V		DSR5	6		
24T	49	V-BR		RI5	22		
24R	24	BR-V		CTS5	5		

Note : Units 4 and 5 are available when the DAC is installed in a fully wired 24-pair slot.

Configuring the Data Access Card

LD11 must be configured to accept the DAC. The commands listed here must be answered. LD20 prints out card information when requested. For a complete list of the service change prompts and responses, see *Xl 1 input/output guide* (553-3001-400).

DAC administration (LD11)

Responding R232 or R422 to the TYPE prompt in LD11 begins the prompt sequence for the DAC configuration. Responses to the following prompts are required. The defaults are bracketed, and may be issued by Carriage Return (<CR>).

Prompt	Response	Comments
REQ	NEW, CHG, MOV, COPY	Add, change, move or copy the unit
TYPE	R232, R422	R232 = the RS-232-C unit R422 = the RS-422 unit
TN	LLSCCU	DAC data TN. The loop (LL) must be a superloop.
RNPG	<CR>	Ringing number pickup group (default to zero)
CLS		The class of service allowed for the DAC. These are the required responses.
	DTA	DTA = data allowed
	ADD	ADD = digit display allowed (optional)
TOV	(0), 1, 2, 3	Timeout value 0 = no timeout 1 = 15 minutes 2 = 30 minutes 3 = 60 minutes
OPE	YES, (NO)	Operation parameter change

— continued —

Prompt	Response	Comments
PAR	(SPAC), ODD, EVEN, MARK	SPAC = space parity ODD = odd parity EVEN = even parity MARK = mark parity
DTR	ON, (OFF)	DTR settings ON = forced DTR OFF = dynamic DTR This prompt appears only if TYPE = R232
HOT	ON, (OFF)	Hotline If HOT = ON, then AUTB = OFF
AUT	OFF, (ON)	Automatic answer
AUTB	OFF, (ON)	Autobaud Prompt appears only if HOT = OFF
BAUD	0, 1, 2, 3, 4, 5, 6, (7), 8	Baud rate 0 = 110 1 = 150 2 = 300 3 = 600 4 = 1200 5 = 2400 6 = 4800 7 = 9600 8 = 19200 This prompt appears only if AUTB = OFF.
DCD	OFF, (ON)	DCD settings OFF = forced DCD ON = dynamic DCD This prompt appears only if TYPE = R232.
PRM	OFF, (ON)	Prompt mode OFF = no prompt (Host) mode ON = prompt (Terminal) mode

— continued —

Prompt	Response	Comments
DEM	**DTE, (DCE)**	Data Equipment mode This prompt appears only if TYPE = R232.
DLNG	FRN, (ENG)	Data port language FRN = Quebec French ENG = English
KBD	**OFF, (ON)**	Keyboard dialing OFF = disabled (Hayes dialing commands will still work) ON = enabled
WIRE	ON, (OFF)	Wire test mode ON = enabled OFF = disabled
PBDO	**ON, (OFF)**	Port busy upon DTR off ON = enabled (port busy off with DTR) OFF = disabled (port busy on with DTR) This prompt appears only if TYPE = R232 **PBDO** = OFF for any RS-232-C mode besides 8, or 12 If PBDO = ON, key 7 = MSB
KEY		Key settings
	0 SCR xxxx	Primary data DN
	1 SCR xxxx	Secondary Data DN
	2 **TRN**	Call Transfer
	3 AD L yy xxxx	Autodial
	4 **RGA**	Ring Again
	5 SCC O-253	Speed Call Controller, list number
	6 **DSP**	Display
	7 **MSB**	Make Set Busy
		Primary and secondary data DNs must be single appearance DNs. Feature key assignment must be as shown here.

Printing the card parameters (LD20)

By responding R232, R422, or DAC to the TYPE prompt in LD20, you can print out the configured parameters for each port, or the entire DAC. This is useful to determine if any parameters have been altered during keyboard or Hayes dialing modify procedures.

Prompt	Response	Comments
REQ	PRT, LTN, LUU	Print data, TN, or unit information for the unit specified
TYPE	R232, R422, DAC	Print information for the RS-232-C, RS-422 ports, or the whole DAC
TN	LLSCCU	Print information for this TN. Uploaded parameters can only be printed when a specific **TN** is listed.

The operation parameter printout for an RS-232 or RS-422 port is similar to the following, depending on the configuration.

	DBASE R-232 or R-422	**UPLOAD** R-232 or R-422
PAR	SPAC	SPAC
DTR	ON	ON
HOT	OFF	OFF
AUT	ON	0
AUTB	ON	ON
BAUD	9600	4800
DCD	OFF	OFF
PRM	KBD ON	KBD ON
DEM	DCE	DCE
DLNG	FRN	FRN
KBD	ON	ON
WIRE	OFF	OFF
PBDO	OFF	OFF

Vote: The Upload parameters are printed only when a single TN is specified.

Connecting Apple Macintosh to the DAC

The Apple Macintosh can be connected with twisted pair wire to a port of a NT7D16 Data Access Card (DAC) to allow access to the Meridian 1 switching capability. The Macintosh can then access local or remote terminals, personal computers, hosts, and peripherals.

Figure 15 shows the 9-pin subminiature D (DB9) connection to the Macintosh. Figure 16 shows the mini-8 DIN connection to the Macintosh.

Figure 15
Macintosh to DAC connection—9-pin subminiature D

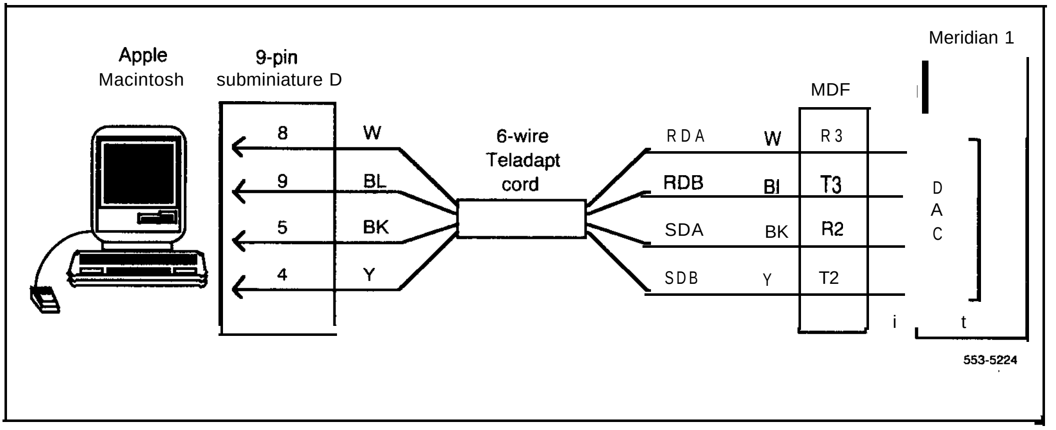
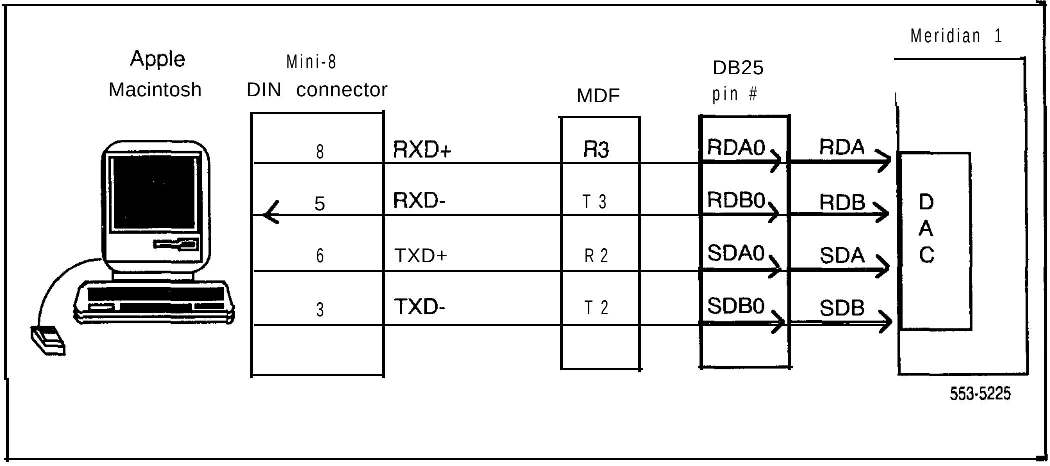


Figure 16
Macintosh to DAC connection-mini-8 DIN



Upgrading systems

The following explains when and how to upgrade your Meridian 1 system to support the DAC. Ports 0, 1, 2, and 3 of the DAC will work in any standard lo-pair IPE slot (connect directly to the MDF).

System options 21 and 21A upgrade

With release 7 of the NT8D1102 Backplane, the first card slot is fully cabled for the 24 pair to the I/O panel. The DAC can be installed directly into slot 0 with no cabling changes. If another slot is required, the upgrade must be made. Follow this procedure to upgrade the cabling for card slots one through nine.

Note *1:* Three new NT8D81AA cable/filter assemblies are required.

Note 2: Cables are designated by the letter of the I/O panel cutout where the SO-pin cable connector is attached. The 20-pin connectors are labeled 1, 2, and 3.

Note 3: The locations for the cable connectors are designated by the slot number (L0-L9), and the shroud row (1, 2, and 3).

1 Remove cable C from the backplane and connect ends C-l, C-2, and C-3 to L2-1, L2-2, and L2-3.

2 Add cable D to the I/O panel by connecting ends D-l, D-2, and D-3 to L3-1, L3-2, and L3-3.

3 Move cable end E-3 to L4-3.

4 Remove cable F from the backplane and connect ends F-l, F-2, and F-3 to L5-1, L5-2, and L5-3.

5 Add cable G to the I/O panel by connecting ends G-l, G-2, and G3 to L6-1, L6-2, and L6-3.

6 Move cable end H-3 to L7-3.

7 Remove cable K from the backplane and connect ends K-l, K-2, and K-3 to L9-1, L9-2, and L9-3.

8 Add cable L to the I/O panel by connecting ends L-l, L-2, and L3 to L9-1, L9-2, and L9-3.

Be sure to re-label the MDF to show that the module has been upgraded to allow for one cable per peripheral equipment (PE slot). The resulting backplane and cable arrangement should look like this:

Backplane slot-connector	I/O panel cable position
L0	A
L1	B
L2	C
L3	D (new cable)
L4	E
L5	F
L6	G (new cable)
L7	H
L8	K
L9	L (new cable)

You can also upgrade the first four PE slots only. This requires only one NT8D81AA cable assembly. Perform the following procedure:

1 Leave cable A as is in slot L0.

2 Move cable end B-3 to L1-3.

3 Remove cable C from the backplane and connect ends C-1, C-2, and C-3 to L2-1, L2-2, and L2-3.

4 Add cable D to the I/O panel by connecting ends D-1, D-2, and D-3 to L3-1, L3-2, and L3-3.

Cables E, F, H, and K remain the same. Cable positions G and L are open for further expansion. Be sure to re-label the MDF to show that the module has been upgraded to provide one cable for each PE slot.

System options 51, 61, 71, and 81 upgrade

With release 4 of the NT8D3701 Backplane, the four slots are fully cabled for the 24 pair to the I/O panel. The DAC can be installed directly into slots 0, 4, 8, and 12 with no cabling changes. If other slots are required, the upgrade must be made. Follow this procedure to upgrade your cabling. You can upgrade the cabling segment-by-segment, or the entire module at one time.

Note *1:* Four NT8D81AA cable/filter assemblies are required to upgrade the entire module, one assembly per segment.

Note 2: Cables are designated by the letter of the I/O panel cutout where the 50-pin cable connector is attached. The 20-pin connectors are labeled 1, 2, and 3.

Note 3: The locations for the cable connectors are designated by the slot number (L0-L9), and the shroud row (1, 2, and 3).

Segment 0

1 Leave cable A as is in slot LO.

2 Move cable end B-3 to Ll-3.

3 Remove cable C from the backplane and connect ends C-l, C-2, and C-3 to L2-1, L2-2, and L2-3.

4 Add cable D to the I/O panel by connecting ends D-l, D-2, and D-3 to L3-1, L3-2, and L3-3.

Segment 1

1 Leave cable E as is in slot L4.

2 Move cable end F-3 to L5-3.

3 Remove cable G from the backplane and connect ends G-l, G-2, and G-3 to L6-1, L6-2, and L6-3.

4 Add cable H to the I/O panel by connecting ends H-l, H-2, and H-3 to L7-1, L7-2, and L7-3.

Segment 2

1 Leave cable K as is in slot L8.

2 Move cable end L-3 to L9-3.

3 Remove cable M from the backplane and connect ends M-l, M-2, and M-3 to L10-1, L10-2, and L10-3.

4 Add cable N to the I/O panel by connecting ends N-l, N-2, and N-3 to Lll-1, Lll-2, and Lll-3.

Segment 3

1 Leave cable R as is in slot L12.

2 Move cable end S-3 to L13-3.

3 Remove cable T from the backplane and connect ends T-l, T-2, and T-3 to L14-1, L14-2, and L14-3.

4 Add cable U to the I/O panel by connecting ends U-l, U-2, and U-3 to L15-1, L15-2, and L15-3.

Be sure to re-label the MDF to show that the module has been upgraded to provide one cable for each PE slot. The resulting backplane and cable arrangement should look like this:

Backplane slot-connector	I/O panel cable position
L0	A
L1	B
L2	C
L3	D (new cable)
L4	E
L5	F
L6	G
L7	H (new cable)
L8	K
L9	L
L10	M
L11	N (new cable)
L12	R
L13	S
L14	T
L15	U (new cable)

SL-1

NT7D16 Data Access Card

Description and operation

Ordering number PO735252

Release 3.0
Stanaard
December 31, 1992
Printed in USA

northern telecom

INTEGRATED SYSTEMS NETWORK

MERIDIAN SL-1* DATA FEATURE

APPLE MACINTOSH# INTERFACE

INSTALLATION

CONTENTS PAGE

* Meridian and SL-1 are trademarks of Northern Telecom Limited

Macintosh is a trademark of Apple Computer Inc

1. GENERAL

1.01 This appendix describes, with the aid of illustrations. the connection of the Apple MacIntosh computer to the SL-1 Switch.

1.02 The Apple MacIntosh can be connected with twisted pair wire to a port of an Asynchronous Interface Line Card (AILC) to allow it access to the SL-1 switching capability.

1.03 The MacIntosh may then access local or remote terminals, personal computers, other computers and databases by using the SL-1 networking features.

1.04 When the proper software program (i.e.. MACTERM) is loaded into the MacIntosh, it uses the RS-422 data standard to transmit data to the AILC.

1.05 After a data call is established through the SL-1, the 'SHIFT' and 'ENTER' keys are used to disconnect the call.

EQUIPMENT INTERFACE

1.06 The QPC430 AILC is used to connect the MacIntosh to the SL-1 Switch (Fig. 2-l and 2-2).

1.07 The MacIntosh may be located up to 4000 ft (1220 m) from the AILC.

RELATED DOCUMENTS

1.06 Detailed information about the AILC and AILC installation procedures may be found in the following Northern Telecom Practices (NTP):

553-2731-180	Engineering Description and Data Characteristics
553-2731-200	Installation and Testing

2. INSTALLATION

2.01 Pins 4. 5. 8 and 9 of the MacIntosh modem jack are connected via twisted wire pairs to the AILC. The signals provided at the pins are:

Pin 5	SDA
Pin 4	SDB
Pin9	RDA
Pin8	RDB

WITHOUT TELEPHONE

2.02 Use a 6-wire teledapt cord that is equipped with a 9-pin subminiture D jack on one end. The other end of the cord should be equipped to connect through a plug/jack or connecting block arrangement to the AILC (Fig. 2-l).

2.03 Connect the 9-pin subminiture D jack to the ' Modem Plug' of the MacIntosh.

2.04 Connect the other end of the cord through the SL-1 MDF to the AILC.

WITH TELEPHONE

2.05 Use a 4-wire teledapt cord that is equipped with a 9-pin subminiture D jack on one end. The other end of the cord should be equipped to connect to a 'RJ-11' telephone connection block (Fig 2-2).

2.06 Use a 6-wire teledapt cord to connect from the RI-11 telephone connection block to the SL-1.

2.07 Connect the 9-pin subminiture D jack to the ' Modem Plug' of the MacIntosh.

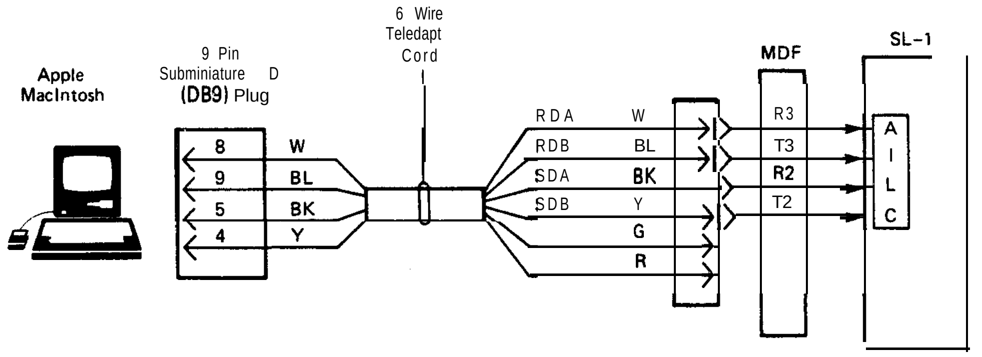
2.08 Connect the other end of the cord to the RJ-11 block.

2.09 Connect the 6-Wire teledapt cord to the other side of the RJ-11 block.

2.10 Connect the other end of the 6-wire cord to the SL-1 MDF to the AILC and the Voice Line Card (VLC).

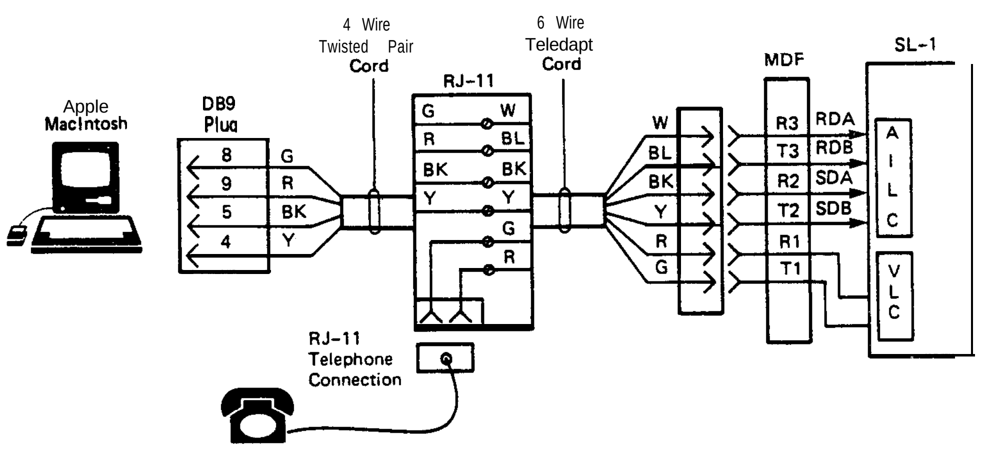
> **Note:** Ensure that the pin wire connections and continuity are maintained.

2.11 Attach a 500 or 2500 telephone set to the RI-11 block.



(Ill. 374)

Fig. 2-1
MacIntosh to SL-1 Connection Without Telephone)



(Ill. 373)

Fig. 2-2
MacIntosh to SL-1 Connections (With Telephone)

INTEGRATED SERVICES NETWORK

MERIDIAN SL-1 LANSTAR*

HEWLETT PACKARD
INTERFACE TO MERIDIAN SL-1
INSTALLATION AND FAULT CLEARING

CONTENTS **PAGE**

Figure

Table

* MERIDIAN, SL-1 and LANSTAR are trademarks of Northern Telecom

1. GENERAL

1.01 This appendix describes the configuration that allows the Hewlett Packard 3000ATP to be directly connected to the Meridian SL-1.

RELATED DOCUMENTS

1.02 Detailed information about the Asynchronous Interface Line Card (AILC) and related installation procedures are found in the following Northern Telecom Practices (NTP):

- 553-2731-180 - Engineering Description and Data Characteristics
- 553-2731-200 - Configuration and Installation
- 553-2731-300 - Operation and Testing.

2. HP3000 ATP

2.01 The "HP3000 ATP to Meridian SL-1 interface" on the HP3000 provides twelve (12) ports of RS422 interface which are compatible with the AILC. The ports have the capability to convert long **breaks** from the AILC into modem control signals. When calls are dropped, sessions are closed properly. It also allows long breaks to be generated from the HP3000 to initiate a call disconnect.

Installation

2.02 A typical connection requites 3 QPC430D (or higher vintage) AILC to provide twelve ports.

2.03 The QPC430D can be configured for 'Hosts' or Terminals (Fig. 2-l). Configure each AILC port to the Host mode (switches on the AILC faceplate operated to the left).

2.04 Terminate a 50-wire telecom connector (a breakout box is recommended) from the MDF onto 12 RJ-11 jacks like an AIM drop (Fig. 2-2).

2.05 Use twelve 6-wire modular line cords to connect the jacks to the ATP/HP3000 interface where similar RJ-11 jacks are provided.

> ***Note:*** It is recommended that the line cord length should be limited **to 25 ft (7620** mm) maximum.

2.06 Fig. 2-3 shows a complete path of signals from the Meridian SL-1 to the HP3000 for one of the twelve paths.

2.07 The physical connection of the modular line cord to the HP3000 interface is normally performed by a Hewlett Packard representative.

2.08 The breakout box can be obtained from Nevada Western (part number 024-4098-12-4D). Table 2-A provides the wiring list for the 50-pin Amphenol/12RJ-11 breakout box.

2.09 A 7-foot "teladapt" line cord (A0301005) to plug into the RJ-11 jack can be ordered through Northern Telecom.

Fault Clearing

2.10 Two LED per port are provided on the AILC faceplate to assist in fault clearing.

- The LED are extinguished when the line is in the "mark" condition and lit when in the "space" condition.
- When the AILC is connected to an external device, both SD and RD LED will be extinguished and will blink with data traffic.

- When a break is sent from the AILC, the RD LED will light and when a break is sent from the HP3000 the SD LED will light.
- If the SDA and SDB leads from the HP3000 are open or reversed, the SD LED are constantly lit, indicating a fault.
- If the AILC is plugged into the shelf but not connected to a physical device, all four SD LED on the faceplate will be lit.

2.11 In case of trouble, perform the following test procedure.

(1) Unplug the line cord from the RJ- 1 1 [illegible] at the breakout box.

(2) Connect an AIM (QMT9) or AILU to the jack of the breakout box.

(3) Connect a terminal to the AIM/AILU.

(4) Make a call from another data module to the AIM/AILU under test.

(5) The two terminals should be able to communicate with each other. If so. the trouble is probably in the HP3000 side. Follow the normal procedure for obtaining HP service.

(6) Ensure that the line cord between the breakout box and the ATP port is not faulty.

(7) If the trouble is determined to be on the Meridian Sl-1 side, follow the normal fault clearing procedure for AIM/AILU and AILC. If necessary, switch the AILC *mode to* "Terminal" to aid in fault clearing, since the terminal mode allows the menu from the AILC to be displayed. Remember to switch it back to "Host" afterwards.

Table 2-A
BREAKOUT BOX WIRING

JACK NUMBER	RJ-11 JACK	SIGNAL NAME	50-PIN AMPHENOL
1	6	RDB	1
	1	RDA	26
	5	SDB	2
	2	SDA	27
‘ 2	6	RDB	3
	1	RDA	28
	5	SDB	4
	2	SDA	29
3	6	RDB	5
	1	RDA	30
	5	SDB	6
	2	SDA	31
4	6	RDB	7
	1	RDA	32
	5	SDB	8
	2	SDA	33
5	6	RDB	9
	1	RDA	34
	5	SDB	10
	2	SDA	35

Table Continued

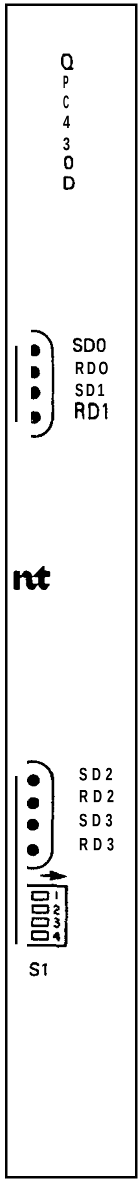
Table 2-A Continued
BREAKOUT BOX WIRING

JACK NUMBER	RJ-11 JACK	SIGNAL NAME	SO-PIN AMPHENOL
6	6	RDB	11
	1	RDA	36
	5	SDB	12
	2	SDA	37
7	6	RDB	13
	1	RDA	38
	5	SDB	14
	2	SDA	39
8	6	RDB	15
	1	RDA	40
	5	SDB	16
	2	SDA	41
9	6	RDB	17
	1	RDA	42
	S	SDB	18
	2	SDA	43
10	6	RDB	19
	1	RDA	44
	5	SDB	20
	2	SDA	45

Table Continued - w - -

Table 2-A Continued
BREAKOUT BOX WIRING

JACK NUMBER	RJ-11 JACK	SIGNAL NAME	SO-PIN AMPHENOL
11	6	RDB	21
	1	RDA	46
	5	SDB	22
	2	SDA	47
12	6	RDB	23
	1	RDA	48
	5	SDB	24
	2	SDA	49
		NOT USED	25
		NOT USED	50



(III. 1002)

Fig. 2-1
QPC430D Faceplate

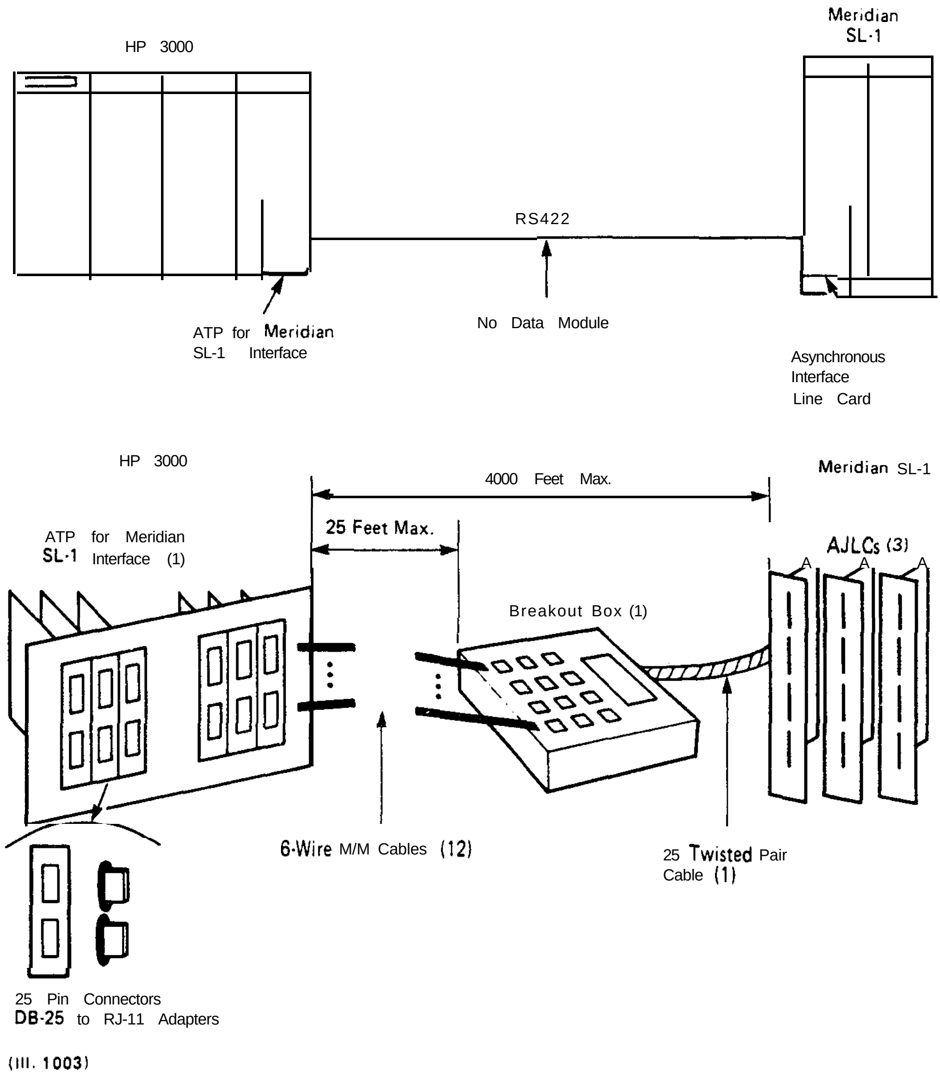
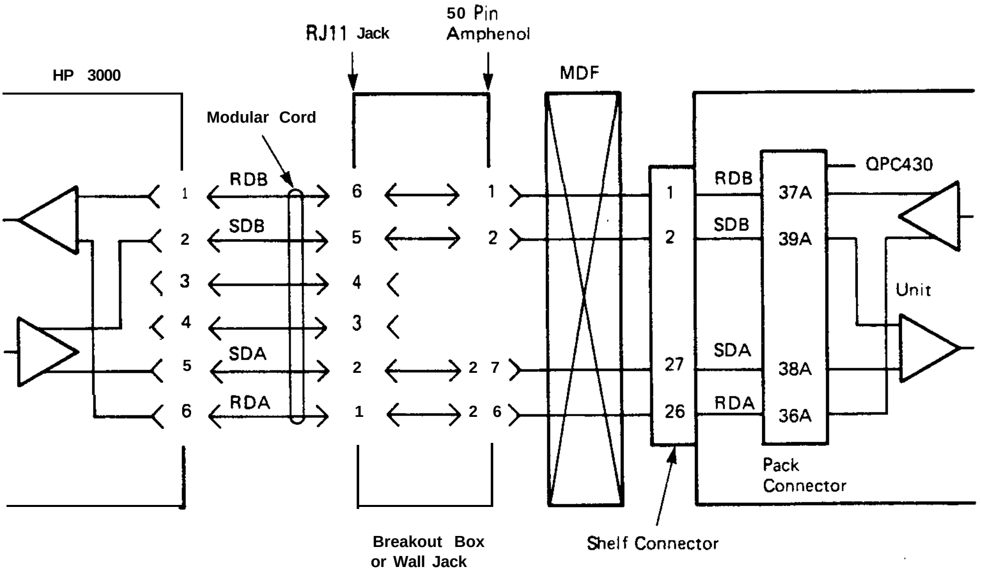


Fig. 2-2
HP3000 Meridian SL-1 Host Connection



This drawing shows a complete path of signals
from the SL-1 to HP 3000 for one of the 12 ports

(III. 1004)

Fig. 2-3
Signal Path - HP3000 to Meridian SL-1

SL-1

Enhanced Asynchronous Interface Line Unit description and installation

Description and installation

Publication number: 553-2731-203
Document release: 2.0
Document status: Standard
Date: December 31. 1992

Revision history

August 10, 1990

Standard, release 1 .O. Reissued for compliance with Northern Telecom standard 164.0.

December 31, 1992

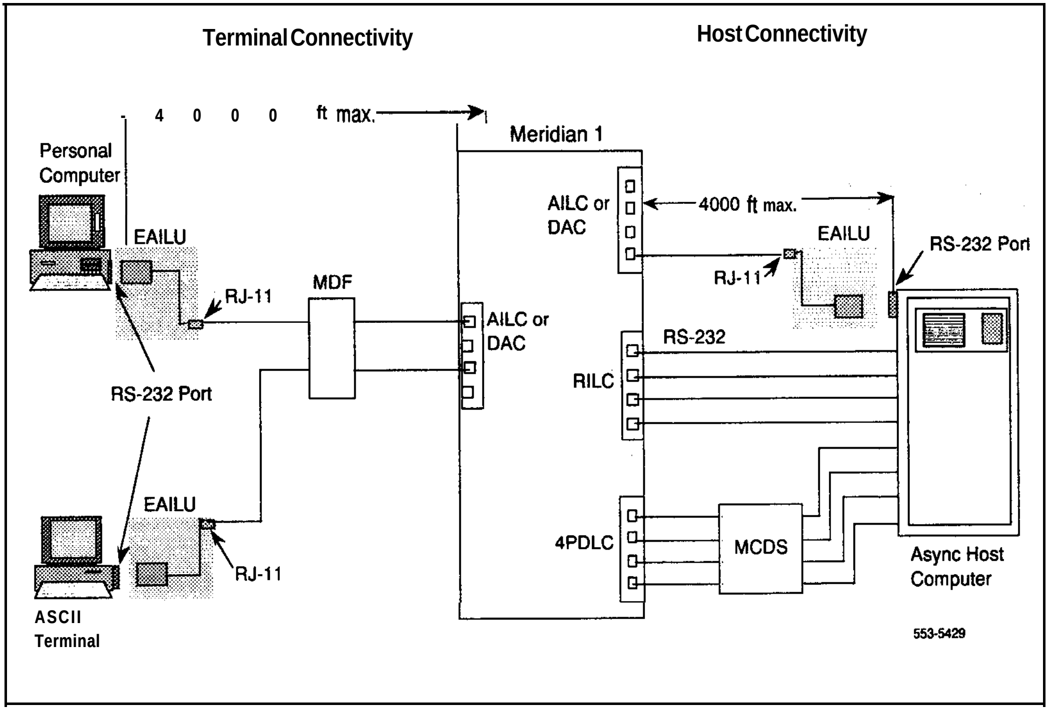
Standard, release 2.0. This document is reissued to include technical content updates. Due to the extent of the changes, revision bars are not used.

Contents

Description

The Enhanced Asynchronous Interface Line Unit (EAILU) is a compact EIA RS-232 to RS-422 cable line driver that provides terminal and host connectivity to Meridian 1. With terminal connectivity, the EAILU allows RS-232-C compatible data terminal equipment (DTE) such as ASCII data terminals, teleprinters, personal computers, etc., to connect directly through an RJ-11 wall outlet to Meridian 1 to place and receiver data calls. These data calls can use Meridian 1 features such as speed dial, auto dial, and ring again. All features are accessed from the terminal keyboard by using menus and prompts. With host connectivity, the EAILU can also be used to connect directly to host computers at distances of up to 4000 feet from Meridian 1 using asynchronous link.

Figure 1
EAILU application diagram



This figure illustrates how the following equipment is connected for data transmission between Meridian 1 and terminals and host computers.

EAILU (A0344336 - male version and A0344337 - female version) for terminal and host computer connectivity up to 4000 feet from Meridian 1.

DAC (Data Access Card) used for direct RS-232 Asynchronous Host Connectivity and RS-422 for Intelligent Peripheral Equipment Module (IPE) connectivity in Meridian 1 options 21 through 71 and option 11 main and expansion cabinets.

RILC (RS-232 Interface Line Card) for direct Asynchronous Host Connectivity. To *QPC723 RS-232 interface line card* (553-2731-106).

MCDS (Multi-channel Data System) for High-Density Host Connectivity.

Related documents

For complete information concerning Meridian data features, refer to these documents.

QPC723 RS-232 interface line card (553-2731-106)

QMT21 High Speed Data Module (553-2731-107)

QPC918 High Speed Data Card (553-2731-108)

Traffic Engineering and Configuration (553-2731-151)

Operation and Tests (553-2731-300)

NT7D16 ***Data Access Card description and operation*** (553-3001-191)

X11 input/output guide (553-3001-400)

X11 ***features and services description*** (553-3001-305)

> ***Note:*** For the purposes of this document, Meridian 1 refers to SL-1 ST, NT, RT, and XT machines as well as Meridian 1 system options 21, 51, 61, 71, and 81.

Compatible DTE devices

DTE devices that have the following characteristics can be interfaced through an EAILU to:

- the DAC (NT7D16AA), which is housed in the IPE module (NTED37) or CE/PE module (NT8D11) and supports connection of up to six EAILUs.
- the DAC card, which can be housed in the main or expansion cabinet of a Meridian 1 option 11 system.
- the Asychronous Interface Line Card (AILC - QPC430), which can be housed in the PE modules/shelves and connect up to four EAILUs. These PE modules/shelves are: NT8D13 (PE Module), QSD64, QSD65, QSD80, QSP35, and QSP36.

For Computer PBX Interface (CPI) application, use QPC430 vintage C or higher. When used for asynchronous host computer applications, use the Enhanced version EAILU, which must interface to AILCs (QPC430 vintage E or higher).

Mode	Full duplex (when connected to DAC or AILC)
Data type	ASCII
Signal format	Asynchronous Start/Stop
Bits	8, including a parity bit
Data rates	110, 150, 300, 600, 1200, 2400, 4800, 9600, and 19200 bps
Stop bits	2 stop bits for 110 bps 1 stop bit for all other speeds
Clock	Internal, +1% frequency tolerance
Signal level	5 V to 15 V dc (nominal)

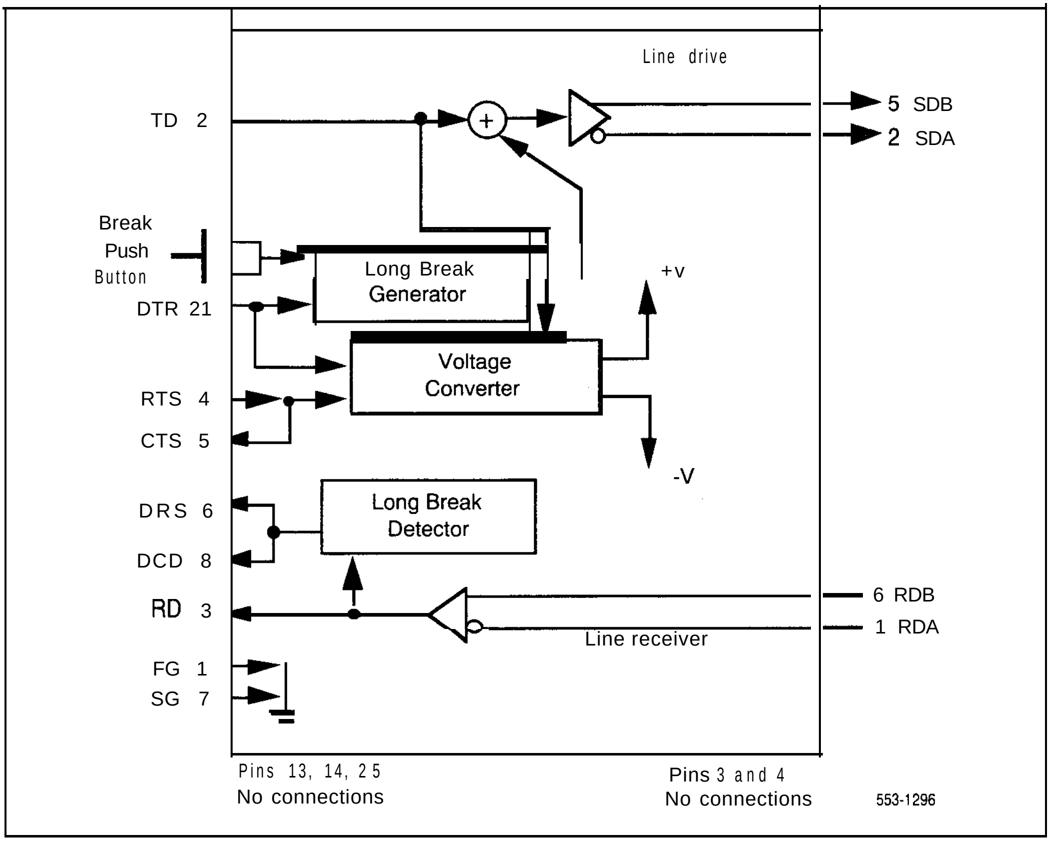
Physical description

The EAILU is a compact high-impact plastic unit which is 2 1/4 in. (57 mm) long, 1 3/4 in. (44 mm) wide and 1/2 in. (13 mm) high.

The unit is equipped with a connector to attach to the RS-232-C connector of the DTE device and with a 7 ft (2133 mm) 4-conductor line cord that is terminated with a standard Teladapt male plug to connect to an RJ-11 (or equivalent) type jack. A push button located at the back of the unit is for long break generation purposes.

The EAILU allows control of near end call disconnect by the long break sent from the DTE device. Far end disconnect is indicated by a long break sent to the near end DTE. See Figure 2 for a block diagram of the EAILU.

Figure 2
EAILU block diagram



The EAILU has a long break detection feature which will toggle the DSR, DCD leads in the RS-232-C interface when the far end initiates a call disconnect.

The EAILU can generate a long break signal to the AILC or the DAC by either manually pushing the push-button at the back of the unit, or dropping the DTR lead from the DTE device.

The enhancements allow

- a terminal that cannot generate a break to control the call disconnect by pushing the push button
- a host computer device that does not have the long break generation capability to control the call disconnect by dropping the DTR lead
- a host computer device that does not have the long break detection capability to detect the far end call disconnect via the dropping of DSR or DCD leads

CAUTION

After the call drops, DSR and DCD drop momentarily and return to the on condition. The host may interpret that another call is established. Do not ime out or you may have unpredictable results.

The EAILU supports asynchronous data transmissions over loop lengths of up to 4000 feet (1200 m). Speeds are determined by the autobauding procedures of the AILC or DAC.

The EAILU connects directly to the DTE RS-232 connector (DB-25). See Table 1 for EAILU pin assignment. The EAILU uses two-pair wires to connect to the AILC or DAC. There is no need to use an RS-232-C cable for the interconnection.

Table 1
EAILU **DB-25 connector pin assignments**

Pin number and description		EIA designation	CCITT	Description
1	PG	AA	101	Protective Ground
2	TXD	BA	103	Transmit Data from DTE
3	RXD	BB	104	Receive Data from DTE
4	RTS	CA	105	Request to Send from DTE
5	CTS	CB	106	Clear to Send to DTE
6	DSR	CC	107	Data Set Ready to DTE
7	SG	AB	102	Signal Ground
8	CD	CF	109	Carrier Detect to DTE
20	DTR	CD	108.2	Data Terminal Ready from DTE

Power requirements

There is no need for an external power source. The EAILU is powered from the RS-232-C connector of the connected DTE. When the DTE is turned on, 9 V dc (nominal) is applied to Pin 20 (DTR) and Pin 4 (RTS) of the RS-232-C connector.

Maintenance

The EAILU is a passive device that requires no preventive maintenance. There are no diagnostic programs, switches, configuration options or straps associated with it.

If no response is received from the AILC or DAC, the user should ensure that the DTE is powered up, properly connected to the EAILU and ready for data transmission with the proper speed and other parameters correctly set up.

If a unit is suspected to be faulty, replace it with a known working unit. Further failure indicates that the problem may be caused by MDF cross-connection or the AILC or DAC line card.

Field repair of a defective unit is not recommended. The defective unit should be disposed as per local instructions or returned for replacement if still under warranty.

Specifications

Environmental

The EAILU operates within the following environmental limits.

Operating temperatures	0 degrees C to +50 degrees C
Storage temperatures	-10 degrees C to +70 degrees C
Humidity	5% to 95% RH non-condensing

Electrical

The EAILU conforms to the following electrical specifications.

RS-422 Line interface Baud rates:	up to 19200 baud
Line length	4000 ft (1200 m) using 26 gauge cable
RS-232C Port interface Voltage level at receiver output pints RD, DSR, DCD	4V ±1V nominal

CAUTION

Vintage A or B of the QPC430 AILC will operate at up to 2500 ft (762 m).

Timing requirements

The following lists the minimum DTR turn off, break, and drop times for the EAILU.

Minimum DTR pin turned off time to generate a 1.5 second Break signal (see Figure 3)	150 ms
Minimum Break Time in the Line to activate the Break Detector	1.6 seconds
DSR, DCD drop time after detecting a Long Break (see Figure 4)	400 ms (typical) 100 ms (minimum)

Figure 3
Long Break generation via DTR drop

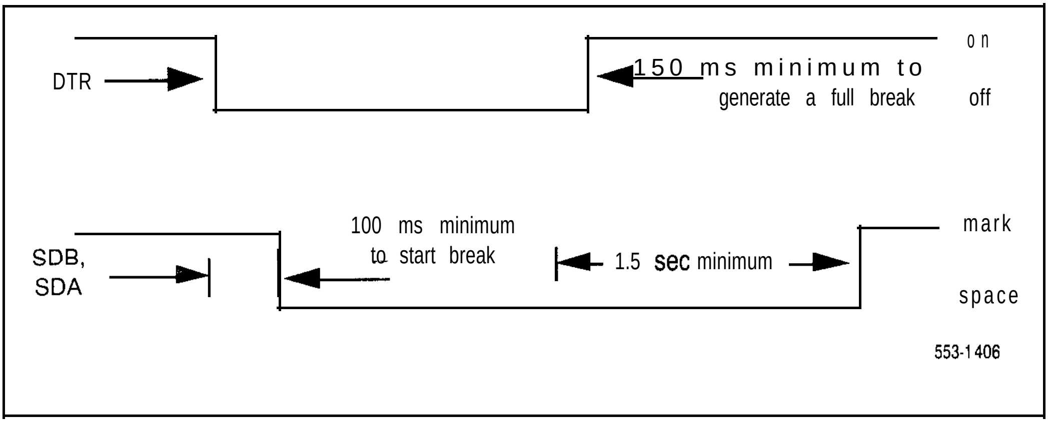
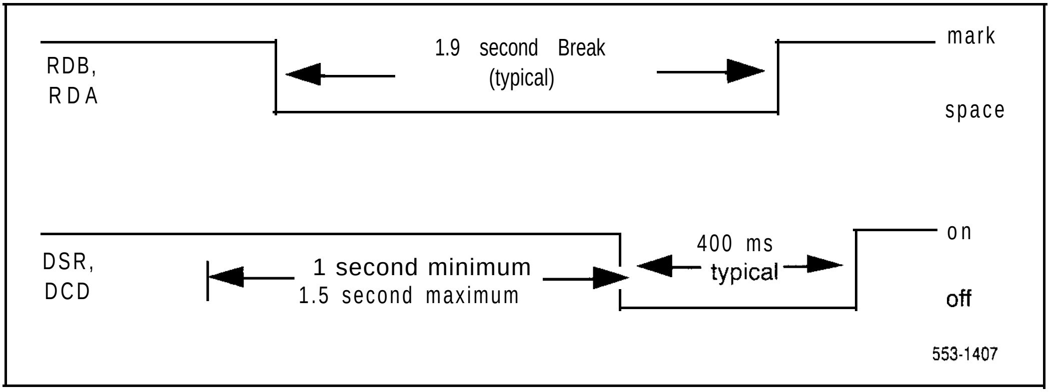


Figure 4
DSR, DCD control via Break Detect



Ordering information

The EAILU can be ordered with either a male or a female DB-25 connector. Specify the following information when ordering.

- EAILU with male connector
  - CPC number: A0344336
  - Engineering code: NPS 50705-L1
  - Model Number: M232-422A
- EAILU with female connector
  - CPC number A0344337
  - Engineering code: NPS 50705-L2
  - Model Number: F232-422A

Table 2
Terminals that pass the qualification test

Manufacturer	Model
Digital Equipment	VT1 00 VT1 02 VT220
Data General	D-200 D-400
Hewlett Packard	HP 2392A HP 2621A HP 2622A HP 2693A
Falco	Fame II TS-28 TS-1
Wang	2110
Wyse	WY-85
Qume	108
Zentec	Zephyr
Prime	PST-l 00
IBMPC	Async Comm Adaptor
AST Research Inc.	AST Multifunction Card

Installation and testing

Installation and testing procedures list the steps required to install and maintain the EAILU.

Pre-installation information

Perform the following tasks prior to installing the EAILU:

- Install all DACs and I/O cables.

  Note: Refer to *NT7D16AA DAC description and operation* (553-3001-191) for detailed information on available IPE card slot positions for DACs installation and I/O Panel cable terminations to the Main Distribution Frame (MDF).

- Install all AILCs and I/O cables.

  Note: An AILC can be installed in slots 1 through 10 of a PE module/shelf but cannot be installed in an IPE module. Refer to Table 3 for AILC and I/O cable wire and pin assignment information.

- Install all RJ-11 jacks, distribution blocks, facility wiring, and cross-connect wiring as illustrated in Figure 5. Ensure that the line length does not exceed 4,000 feet using 26 gauge wire.

  Note: The DTE that the EAILU is connected to must not share the same power outlet strip with EMI noisy equipment such as fluorescent lamp. Otherwise, data corruption may occur.

- Install the DTE device.

- Configure Meridian 1 using LD 11 program to identify all DAC and AILC ports supporting EAILUs.

Note: If adding or changing AILC ports that support EAILUs, refer to Meridian data features description (553-2731-100). If adding or changing DAC ports, refer to ***NT7D16 Data Access Card description and operation*** (553-3001-191). Make sure all DAC ports supporting EAILUs are set to RS-422 using LD 11 program by setting TYPE= RS-422. The minimum voltage levels, when the EAILU is connected to the AILC line card, are listed here.

- 700 mV between SDB and SDA at the EAILU
- 500 mV between SDB and SDA at the MDF
- 700 mV between RDB and RDA at the EAILU

Table 3

Pair-terminations at the NT8D13 PE Module I/O Panel connectors A, C, E, and G for the AILC Card QPC430 (Single Loop Mode)

Port Pairs	AILC Port Pins	Connector Pin Number	Wire Color Code	I/O Panel Connectors A	C	E	G	AILC Card
1T	RDA0	26	W-BL	SLOT X-1 CARD 1	SLOT X-4 CARD 4	SLOT X-7 CARD 7	SLOT X-10 CARD 10	Unit 0
1R	RDB0	1	BL-W					
2T	SDA0	27	W-O					
2R	SDB0	2	O-W					
3T		28	W-G					
3R		3	G-W					
4T		29	W-BR					
4R		4	BR-W					
5T	RDA1	30	W-S					Unit 1
5R	RDB1	5	S-W					
6T	SDA1	31	R-BL					
6R	SDB1	6	BL-R					
7T		32	R-O					
7R		7	O-R					
8T		33	R-G					
8R		8	G-R					
9T	RDA2	34	R-BR					Unit 2
9R	RDB2	9	BR-R					
10T	SDA2	35	R-S					
10R	SDB2	10	S-R					
11T		36	BK-BL					
11R		11	BL-BK					
12T		37	BL-O					
12R		12	O-BL					
13T	RDA3	38	BK-G					Unit 3
13R	RDB3	13	G-BK					
14T	SDA3	39	BK-BR					
14R	SDB3	14	BR-BK					
15T		40	BK-S					
15R		15	S-BK					
16T		41	Y-BL					
16R		16	BL-Y					
17T	RDA0	42	Y-O	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT X-8 CARD 8	SPARE	Unit 0
17R	RDB0	17	O-Y					
18T	SDA0	43	Y-G					
18R	SDB0	18	G-Y					
19T		44	Y-BR					
19R		19	BR-Y					
20T		45	Y-S					
20R		20	S-Y					
21T	RDA1	46	V-BL					Unit 1
21R	RDB1	21	BL-V					
22T	SDA1	47	V-O					
22R	SDB1	22	O-V					
23T		48	V-BR					
23R		23	BR-V					
24T		49	V-S					
24R		24	S-V					

Table 3 continued
Pair-terminations at the NT8D13 PE Module I/O Panel connectors B. D. and F for the AILC Card QPC430 (Single Loop Mode)

Port Pairs	AILC Port Pins	Connector Pin Number	and Wire Color Code	I/O Panel Connectors B	D	F	AILC Card
1T	RDA2	26	W-BL	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT X-8 CARD 8	Unit 2
1R	RDB2	1	BL-W				
2T	SDA2	27	W-O				
2R	SDB2	2	O-W				
3T		28	W-G				
3R		3	G-W				
4T		29	W-BR				
4R		4	BR-W				
5T	RDA3	30	W-S				Unit :
5R	RDB3	5	S-W				
6T	SDA3	31	R-BL				
6R	SDB3	6	BL-R				
7T		32	R-O				
7R		7	O-R				
8T		33	R-G				
8R		8	G-R				
9T	RDAO	34	R-BR	SLOT X-3 CARD 3	SLOT X-6 CARD 6	SLOT X-9 CARD 9	Unit a
9R	RDBO	9	BR-R				
10T	SDAO	35	R-S				
10R	SDBO	10	S-R				
11T		36	BK-BL				
11R		11	BL-BK				
12T		37	BL-O				
12R		12	O-BL				
13T	RDA1	38	BK-G				Unit 1
13R	RDB1	13	G-BK				
14T	SDA1	39	BK-BR				
14R	SDB1	14	BR-BK				
15T		40	BK-S				
15R		15	S-BK				
16T		41	Y-BL				
16R		16	BL-Y				
17T	RDA2	42	Y-O				Unit 2
17R	RDB2	17	O-Y				
18T	SDA2	43	Y-G				
18R	SDB2	18	G-Y				
19T		44	Y-BR				
19R		19	BR-Y				
20T		45	Y-S				
20R		20	S-Y				
21T	RDA3	46	V-BL				Unit 3
21R	RDB3	21	BL-V				
22T	SDA3	47	V-O				
22R	SDB3	22	O-V				
23T		48	V-BR				
23R		23	BR-V				
24T		49	V-S				
24R		24	S-V				

Table 3 continued
Pair-terminations at the NT8D13 PE Module I/O Panel connectors A, C, E, and G for the AILC Card QPC430 (Dual Loop Mode)

Port Pairs	AILC Port Pins	Connector Pin Number	Wire Color Code	I/O Panel Connectors A	C	E	G	AILC Card
1T	RDA0	26	W-BL	SLOT X-1 CARD 1	SLOT X-4 CARD 4	SLOT Y-2 CARD 2	SLOT Y-5 CARD 5	Unit 0
1R	RDB0	1	BL-W					
2T	SDA0	27	W-O					
2R	SDB0	2	O-W					
3T		28	W-G					
3R		3	G-W					
4T		29	W-BR					
4R		4	BR-W					
5T	RDA1	30	W-S					Unit 1
5R	RDB1	5	S-W					
6T	SDA1	31	R-BL					
6R	SDB1	6	BL-R					
7T		32	R-O					
7R		7	O-R					
8T		33	R-G					
8R		8	G-R					
9T	RDA2	34	R-BR					Unit 2
9R	RDB2	9	BR-R					
10T	SDA2	35	R-S					
10R	SDB2	10	S-R					
11T		36	BK-BL					
11R		11	BL-BK					
12T		37	BL-O					
12R		12	O-BL					
13T	RDA3	38	BK-G					Unit 3
13R	RDB3	13	G-BK					
14T	SDA3	39	BK-BR					
14R	SDB3	14	BR-BK					
15T		40	BK-S					
15R		15	S-BK					
16T		41	Y-BL					
16R		16	BL-Y					
17T	RDA0	42	Y-O	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT Y-3 CARD 3	SPARE	Unit 0
17R	RDB0	17	O-Y					
18T	SDA0	43	Y-G					
18R	SDB0	18	G-Y					
19T		44	Y-BR					
19R		19	BR-Y					
20T		45	Y-S					
20R		20	S-Y					
21T	RDA1	46	V-BL					Unit 1
21R	RDB1	21	BL-V					
22T	SDA1	47	V-O					
22R	SDB1	22	O-V					
23T		48	V-BR					
23R		23	BR-V					
24T		49	V-S					
24R		24	S-V					

Table 3 continued
Pair-terminations at the NT8D13 PE Module I/O Panel connectors B, D, and F for the AILC Card QPC430 (Dual Loop Mode)

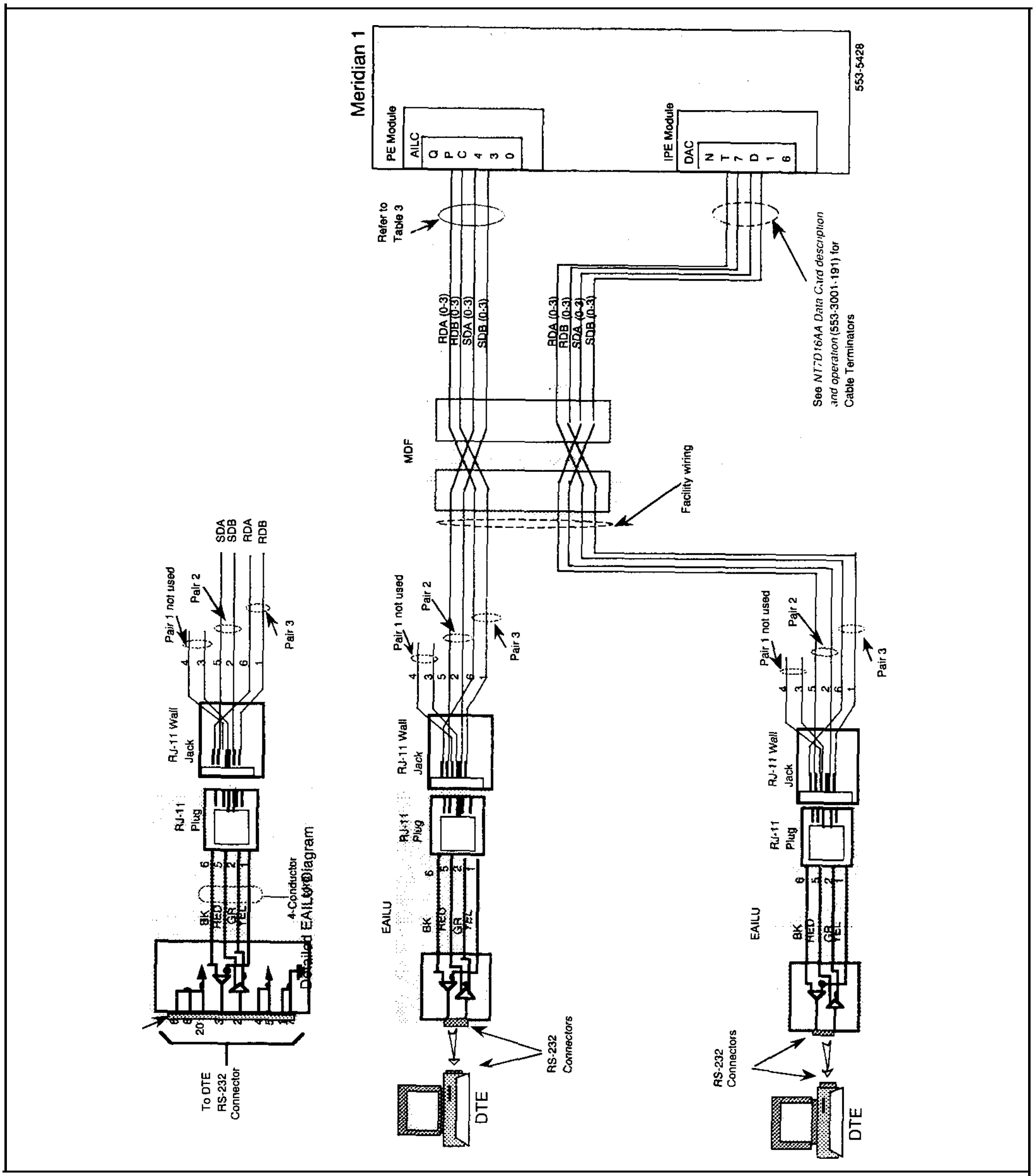
Port Pairs	AILC Port Pins	Connector Pin Number	Wire Color Code	I/O Panel Connectors B	D	F	AILC Card
1T	RDA2	26	W-BL	SLOT X-2 CARD 2	SLOT X-5 CARD 5	SLOT Y-3 CARD 3	Unit 2
1R	RDB2	1	BL-W				
2T	SDA2	27	W-O				
2R	SDB2	2	O-W				
3T		28	W-G				
3R		3	G-W				
4T		29	W-BR				
4R		4	BR-W				
5T	RDA3	30	W-S				Unit 3
5R	RDB3	5	S-W				
6T	SDA3	31	R-BL				
6R	SDB3	6	BL-R				
7T		32	R-O				
7R		7	O-R				
8T		33	R-G				
8R		8	G-R				
9T	RDAO	34	R-BR	SLOT X-3 CARD 3	SLOT Y-1 CARD 1	SLOT Y-4 CARD 4	Unit 0
9R	RDBO	9	BR-R				
10T	SDAO	35	R-S				
10R	SDBO	10	S-R				
11T		36	BK-BL				
11R		11	BL-BK				
12T		37	BL-O				
12R		12	O-BL				
13T	RDA1	38	BK-G				Unit 1
13R	RDB1	13	G-BK				
14T	SDA1	39	BK-BR				
14R	SDB1	14	BR-BK				
15T		40	BK-S				
15R		15	S-BK				
16T		41	Y-BL				
16R		16	BL-Y				
17T	RDA2	42	Y-O				Unit 2
17R	RDB2	17	O-Y				
18T	SDA2	43	Y-G				
18R	SDB2	18	G-Y				
19T		44	Y-BR				
19R		19	BR-Y				
20T		45	Y-S				
20R		20	S-Y				
21T	RDA3	46	V-BL				Unit 3
21R	RDB3	21	BL-V				
22T	SDA3	47	V-O				
22R	SDB3	22	O-V				
23T		48	V-BR				
23R		23	BR-V				
24T		49	V-S				
24R		24	S-V				

EAILU installation

To install the EAILU into an asynchronous data link between Meridian 1 and a terminal or a host computer, follow the steps below:

1. Unpack and inspect the EAILU. Tag and return any defective units per local instructions.
2. Connect the DB-25 connector on the EAILU to the appropriate DB-25 RS-232 connector at the rear of the DTE device. See Figure 5.
3. Secure the EAILU connector to the device connector with the attached screws.
4. Insert the RJ-11 plug of the EAILU into the RJ-11 wall mounted telephone jack. Ensure that the clip on the RJ-11 plug snaps securely into place.
5. Use EAILU data station keyboard dialing procedures to verify the installation. Refer to ***Operation and Tests*** (553-2731-300) for the AIM keyboard dialing procedures.

Figure 5
EAILU connections



SL-1

Enhanced Asynchronous Interface Line Unit

Description and installation

Release 2.0
Standard
December 31, 1992
Printed in USA

northern telecom

SL-1

Meridian data features

Operation and tests

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December 31, 1992

This document is issued to include technical updates. Due to the extent of changes. revision bars are omitted.

Contents

Introduction

This document describes the method of operating the Meridian data station and the methods by which its on-line transmission performance can be tested.

A colocated data station consists of a QSU-type SL-1 telephone and an Add-On Data Module (ADM) connected to data terminal equipment.

Note: References in this publication to ADM imply QMT7, QMT8 and QMT12 ADM.

The Meridian colocated data station permits data calling and regular telephone calling to be conducted to and from a single SL-1 telephone. The data station also allows several optional calling features associated with the SL-1 telephone to be used in conjunction with data calling.

A stand-alone ADM when connected to a data terminal (for example, without a companion SL-1 telephone) provides services associated with Meridian data calling that do not require user intervention.

Appropriate configuration of each stand-alone ADM is critical to the proper function of Meridian data stations.

The AIM provides the interface between an RS-232-C compatible asynchronous DTE through its (AILC).

The AIM may be desktop or wall mounted and is used to originate and to answer data calls. It supports keyboard dialing.

The ASIM provides the interface between an RS-232-C compatible asynchronous or synchronous DTE and the Meridian 1 system.

The ASIM is desktop mounted and is used to originate and to answer data calls. It supports the following.

- keyboard and keypad dialing for asynchronous calling
- keypad dialing only for synchronous calling
- automatic set relocation

A Multi-Channel System is used to access a multiple port computer and takes the place of several ADM. The 4-port MCDS Asynchronous Card (MCDS-AC) performs the same functions as four separate ADM.

The Meridian data station operations described in this publication should be performed after installation to ensure that each ADM is functional and is properly configured to provide the data service the customer requires.

Operation procedures and tests

Prerequisites

Ensure that commercial power is supplied at the appropriate outlets. Be sure the power modules required for any SL-1 telephone add-on module (for example, QMT) equipped at an Meridian data station are installed according to instructions.

Designate or install a test station to have access to external data test equipment before testing the Meridian data station or stand-alone ADM.

Testing procedure

The operating procedures specify the manner the Meridian data station and stand-alone ADM/AIM/ASIM normally functions.

If there is are any differences when testing, follow these steps.

1 Checking the following connections to verify that the data-related equipment is properly connected.
   - ADM/AIM/ASIM power
   - Power Fail Transfer (PFT)
   - ADM-to-SL-1 telephone
   - ADM/AIM/ASIM-to-DTE
   - ADM/ASIM-to-DCE
   - DCE to PE
   - MCDS to PE connections to the connecting block
   - Cross-connections at the MDF for bridge taps and eliminate

2 Verify that the appropriate assignments have been made in the database (LD10 or LD11) to allow operation.
   - Check DLC port/AILC assignments
   - Check ADM/AIM/ASIM feature assignments
   - Verify SL-1 and ADM/AIM/ASIM key assignments
   - Check MPLC or 500-set line card assignments

3 Verify that the ADM/ASIM is properly configured for connection to the equipment.
   - Compare transmission control settings on S2, S3 and S4 of the ADM to the parameters of the connected data equipment.
   - Compare transmission control settings of the ASIM to the parameters of the connected data equipment.

Note: Do not attempt to change the baud rate while a call is connected. The connection may lock up.

4 Verify that the ADM/AIM/ASIM/MCDS is not installed out of range from the DTE or the PE.

Check cable-distance between ADM/AIM/ASIM/MCDS-AC and DTE.

Compare wire-gauge selection jumper settings of ADM/MCDS-AC to the gauge(s) of wire connecting ADM/MCDS-AC to PE.

Check cable-distance between ADM/AIM/ASIM/MCDS-AC and PE.

Note the jumper settings (in mixed wire-gauge installations, the jumpers should be set to match the wire gauge constituting the greatest length).

5 Verify the integrity of the terminal equipment connected to the ADM/AIM/MCDS-AC.

Disconnect ADM from SL-1 telephone and check SL-1 telephone function.

Check DTE.

Check DCE.

6 Verify that the DLC is properly configured.

Check option-switch settings for the TN in question.

Check jumper pin positions.

Check shelf installation (maximum 4 DLC/AILC per shelf).

Operating procedures

Procedures 1 through 11 provide detailed action and response sequences for various types of calls from the ADM.

Procedure 12 provides detailed action and response sequences for various type of actions from the AIM.

Procedure 13 and 14 provide detailed action and response sequences for various type of actions from the ASIM.

The procedures are, however, examples and only recommended. The user is not restricted to exactly following the sequences in many of the procedures, especially those involving simultaneous voice and data calls.

Procedure 1
Originating an intraoffice data station call with a colocated ADM

Step	Action	Verification	Comment
	Stat-l Condition	POWER lamp on	Data station idle Handset on-hook
1	Press DDN key	DDN lamp on DATA SHIFT lamp on Dial tone on speaker.	Data station shifts to data mode Further SL-1 telephone key depressions corresponds to DDN.
2	Dial first digit of Called DDN	Dial tone removed	
3	Dial remaining digits of called DDN	RINGBACK tone on speaker	
4	Called DDN answers	CONNECT lamp on DATA SHIFT lamp off RINGBACK tone off CONNECT Beep on speaker	RINGBACK removed before connect beep is heard
5	Press DATA SHIFT Key	DATA SHIFT lamp on	
6	Press RLS key	DDN, DATA SHIFT and CONNECT lamps off	Call disconnected Data station shifts to voice mode

Note: Once the called DDN answers and the DATA Shift lamp is extinguished, the data station can be used in the voice mode.

Procedure 2
Originating Outgoing Data Station Call (Modem Pool Call)

Step	Action	Verification	Comment
	Start Condition	POWER lamp on	Data station idle Handset on-hook.
1	Press DDN key	DDN lamp on DATA SHIFT lamp on Dial tone on speaker	Data station shifts to data mode Further SL-1 telephone key depressions corresponds to DDN
	Manual Modem Pool (Go to Step 11 for AMP)		
2	Dial first digit of Modem Pool DDN.	DIAL tone removed.	
3	Dial remaining digits of Modem Pool DDN.	RINGBACK Tone on speaker.	
4	Modem Pool DDN answers.	RINGBACK Tone off. DATA SHIFT lamp off. MODEM CTRL lamp winks. CONNECT Beep on speaker.	RINGBACK removed before 2-sec connect tone is heard. Winking MODEM CONTROL lamp indicates that a modem is reserved. If the modem is reserved and an incoming call appears on voice DN, lift handset and answer the call. Put the voice call on hold and release data call if necessary. Modem pool call can be made using secondary DN.
5	Press PDN key.	PDN lamp on; DIAL tone on speaker.	
6	Dial first digit of called remote computer.	DIAL tone off.	
7	Dial other digits of called remote computer.	RINGBACK tone on speaker.	

— continued —

Procedure 2
Originating Outgoing Data Station Call (Modem Pool Call) continued

Step	Action	Verification	Comment
3	Modem of remote computer answers.	RINGBACK tone off. CARRIER tone on speaker.	
9	Press MODEM CTRL key.	MODEM CTRL and CONNECT lamps on; PDN lamp off; CARRIER tone off.	Carrier tone removed after brief interval. Call established. PDN automatically released from connection. PDN lamp goes dark. Station shifts to voice mode.
Automated Modem Pool (see note)			
10	Dial first digit	DIAL tone removed	All dialing is done from the Data DN at the Data Station.With Prefix Dialing this is the first digit of the 1 to 4 digit Modem Selection Prefix. With Default Dialing this is the first digit of the Trunk Access Code.
11	Dial remaining digits		With Prefix Dialing this includes the remainder of the Modem Selection Prefix, the Trunk Access Code and the remote DN.With Default Dialing this is the remainder of the Trunk Access Code and the remote DN.
12	Modem of Remote computer answers.	Connect Lamp on. Modem CTRL lamp on; PDN lamp off; Carrier tone off. Call established.	PDN automatically released from connection. Station shifts to voice mode. Data station shifts to data mode

Note: If it is necessary to initiate data features during the call, press the DATA SHIFT key to transfer to the data DN, initiate the feature, then press the Data Shift key to shift back to the voice DN.

— continued —

Procedure 2
Originating Outgoing Data Station Call (Modem Pool Call) continued

Step	Action	Verification	Comment
Disconnect Data Call			
13	Press DATA SHIFT key.	DATA SHIFT lamp on.	Data station shifts to data mode.
14	Press RLS key.	DDN, DATA SHIFT, CONNECT and MODEM CTRL lamps off.	Call disconnected. Station idle.

Note: A data user may use either the Prefix Dialing or Default method to automatically access and connect the modem. The Prefix Dialing method allows the data user to choose the modem pool to be used to select the modem. The user dials a 1 to 4 digit Modem Selection Prefix, a Trunk Access code and the remote computer port DN. If all resources are available, a data path is established between the data user and the host and the connect lamp is lit. If either the modem pool or the trunk route is busy, ring again is applied. If the data call is incomplete due to the remote port being unavailable or the call being misdialed, no call progress tones are received to indicate the problem source. The.Default method assumes that some data users normally wish to connect to the same modem pool for each call. In this case a Default trunk route associated with a modem selection prefix is stored against the user's TN. The user only needs to dial the trunk access code and the remote computer DN. The Meridian 1 system does the rest and treats the call as if the user had dialed the modem selection prefix. The stored default modem selection prefix can always be overridden by dialing another modem selection prefix.

When a completely digital path is available from the data station to the remote computer port, an all Digital Connection Prefix can be designated if the DTI package is equipped. If the DTI prefix is used, a modem is not connected when the outgoing route is digital. Overflow tone is returned if the user attempts to use a voice frequency trunk to set up the call

Procedure 3
Establishing simultaneous voice and data calls as viewed from an originating station

Step	Action	Verification	Comment
	Start condition, Data Station A	POWER lamp on.	Data station idle. Handset on-hook. Station A = originating station Station B = called station
1	Lift handset at Data Station A.	PDN lamp on; DIAL tone on handset.	
2	Dial first digit of Data Station B PDN/VDN.	DIAL tone off.	Dial tone removed.
3	Dial remaining digits of Data Station B PDN/VDN.	RINGBACK on handset.	
4	Data Station B answers.	RINGBACK tone off;	RINGBACK removed. 2-way conversation.
5	Press DDN key at Data Station A.	DDN and DATA SHIFT lamps on; PDN lamp flashes; DIAL tone on handset.	PDN call automatically placed on hold. Data Station shifts to data mode.
6	Dial first digit of Data station B DDN.	DIAL tone off	When equipped, AMP procedures may be used instead of steps 6 and 7 (See Procedure 2, steps 11-14).
7	Dial remaining digits of Data station B DDN.	RINGBACK tone on handset.	
8	Data Station B DDN answers.	DATA SHIFT lamp off; CONNECT lamp on; RINGBACK off; CONNECT BEEP on handset.	PDN call is still on hold.
9	Press DATA SHIFT key at Data Station A.	DATA SHIFT lamp on.	Data Station A shifts to data mode.

— continued —

Procedure 3
Establishing simultaneous voice and data calls as viewed from an originating station (continued)

Step	Action	Verification	Comment
10	Press RLS key.	DDN, DATA SHIFT and CONNECT lamps off.	Data call disconnected. Voice call still on hold.
11	Press PDN key.	PDN lamp on.	Voice connection reestablished.
12	Ask Data Station B to place a call to your DDN at Data Station A.		Data Station B DDN makes a data call to Data Station A DDN (this places voice call from Data Station B PDN on hold).
13	As Data Station B completes dialing DDN of Data Station A.	DDN lamp winks; DATA BUZZ on handset.	
14	Press DDN key (ADM set to MANUAL Answer).	DDN lamp on; CONNECT lamp on; PDN lamp flashes; DATA BUZZ off.	Data buzz removed after 2 s or when called ADM answers. (No DDN key depression is required if ADM is set to Auto Answer.) PDN call was automatically placed on hold (2-way hold now exists between data stations in this case). See Step 12.
15	Press PDN key on Data Station B.	PDN lamp on.	Simultaneous voice and data calls established between Data Stations A and B.
16	Press RLS key.	PDN lamp off.	PDN call disconnected; PDN lamp goes dark.
17	Press DATA SHIFT key.	DATA SHIFT lamp on.	Data Station A shifts to data mode.
18	Press RLS key.	DDN, DATA SHIFT and CONNECT lamps off.	DDN call disconnected. All ADM lamps go dark except POWER. Data station idle.

Procedure 4
Answering voice calls during data call setup

Step	Action	Verification	Comment
	Start Condition.	DDN, DATA SHIFT and POWER lamps on.	DDN call setup in progress.
1	incoming call presented to PDN and VDN.	PDN and VDN lamps flash;	
2	Press RLS key.	DDN and DATA SHIFT lamps off.	Data call setup abandoned.
3	Lift Handset.	PDN lamp on.	2-way conversation on PDN.
4	Place PDN on Hold.	PDN lamp flashes;	PDN on Hold.
5	Press VDN key associated with flashing lamp.	VDN lamp on.	2-way conversation on VDN. PDN call on hold.
6	Press HOLD key.	VDN lamp flashes.	VDN call placed on hold.
7	Press DDN key.	DDN and DATA SHIFT lamps on; DIAL tone on handset.	Data Station shifts to data mode.
8	Dial first digit of required DDN.	DIAL tone off.	
9	Dial remaining digits of DDN.	RINGBACK tone on handset.	
10	Called DDN answers.	CONNECT lamp on; RINGBACK off; CONNECT BEEP on handset.	Data call established.
11	Press PDN key.	PDN lamp on.	Voice call reestablished.
12	Press RLS key.	PDN lamp off.	PDN call disconnected PDN lamp goes dark.
13	Press VDN key next to flashing lamp.	VDN lamp on.	VDN call reactivated. Simultaneous voice and data call.

— continued —

Procedure 4
Answering voice calls during data call setup (continued)

Step	Action	Verification	Comment
14	Press RLS key.	VDN lamp off.	VDN call disconnected.
15	Press Data SHIFT key.	DATA SHIFT lamp on.	Data station shifts to data mode.
16	Press RLS key.	DDN, DATA SHIFT and CONNECT lamp off.	DDN call disconnected. Data Station idle.
17	Replace handset.		

Procedure 5
Automatic dialing

Step	Action	Verification	Comment
Programming Auto Dial			
	Start Condition.	POWER lamp on.	Data station idle Handset on-hook.
1	Press DATA SHIFT key.	DATA SHIFT lamp on.	Data station shifts to data mode. Further SL-1 telephone key depressions corresponds to DDN.
2	Press AUTO DIAL key once.	AUTO DIAL lamp flashes.	
3	Dial the data number to be programmed (up to 23 digits).		See 553-3001-305 for digit maximums per generic.
4	Press AUTO DIAL key again.	AUTO DIAL lamp off.	Number stored.
5	Press RLS or Data Shift key.	DATA SHIFT lamp off.	Data station shifts back to voice mode.
Using Auto Dial			
6	Press DDN key.	DDN and DATA SHIFT lamps on; DIAL tone on speaker.	Data station shifts to data mode.

— continued —

Procedure 5
Automatic dialing (continued)

Step	Action	Verification	Comment
7	Press AUTO DIAL key.	DIAL tone off; RINGBACK tone on speaker.	After digits are outpulsed, ringback or busy tone is heard.
8	Called DDN answers.	DATA SHIFT lamp off; CONNECT lamp on; RINGBACK tone off; CONNECT BEEP on speaker.	Data Call established. Set switched to Voice Mode.
9	Press DATA SHIFT key.	DATA SHIFT lamp on;	Data station shifts to Data mode.
10	Press RLS key.	DDN, DATA SHIFT and CONNECT lamps off.	Data station shifts to voice mode. Data Station idle.

Procedure 6
Call Forward

Step	Action	Verification	Comment
	Start Condition.	POWER lamp on.	Data station idle Handset on-hook.
1	Press DATA SHIFT key on Data Station A.	Data Shift lamp on.	DATA station shifts to data mode.
2	Press CALL FWD key once.	~~CALL FWD lamp flashes.~~	
3	Dial DDN of Data Station B where calls will be forwarded.		
4	Press CALL FWD key again.	CALL FWD lamp on.	Feature activated.
5	Press RLS or DATA SHIFT key.	DATA SHIFT lamp off.	Data Station shifts back to voice mode.
All ca[illegible]s made to Data Stat on A DDN will be presented to Data Station B.			

— continued —

Procedure 6
Call Forward (continued)

Step	Action	Verification	Comment
Release Call Forward			
6	Press DATA SHIFT key.	DATA SHIFT lamp on.	Data Station shifts to data mode.
7	Press CALL FWD key.	CALL FWD lamp off.	Feature canceled.
a	Press RLS or DATA SHIFT key.	DATA SHIFT lamp off.	

Procedure 7
Ring Again

Step	Action	Verification	Comment
	Start Condition. Establish an active DDN call between Data Stations B and C.	POWER lamp on.	Data station idle Handset on-hook.
1	Press DDN key at Data Station A and dial Data Station B.	DDN and DATA SHIFT lamps on; BUSY tone on speaker.	
2	Press RING AGAIN key once.	DDN and DATA SHIFT lamps off; RGA lamp on.	Data call attempt disconnected. Data Station A shifts back to voice mode.
3	Disconnect DDN call between Data Stations B and C.	RING AGAIN lamp flashes; 2-SEC BUZZ on speaker.	Data Station A is alerted that Data Station B is free.
4	Press DDN key.	DDN and DATA SHIFT lamps on.	
— continued —			

Procedure 7
Ring Again (continued)

Step	Action	Verification	Comment
5	Press RING AGAIN key.	RINGBACK tone on speaker;	Data Station B DDN is automatically dialed.
6	Data Station B answers.	DATA SHIFT lamp off; CONNECT lamp on; RINGBACK tone off; CONNECT BEEP on speaker.	2-way data call established. Data Station in voice mode.
7	Press DATA SHIFT key.	DATA SHIFT lamp on;	Data Station in data mode.
8	Press RLS key.	DDN, DATA SHIFT and CONNECT lamps off.	Data station shifts back to voice mode. Data Station idle.

Procedure 8
Speed Call

Step	Action	Verification	Comment
	Start Condition.	POWER lamp on.	Data station idle. Handset on-hook.
1	Press DATA SHIFT key.	DATA SHIFT lamp on.	DATA station shifts to data mode.
2	Press SPEED CALL key once.	SPEED CALL lamp flashes.	If SPEED CALL lamp does not flash, this Data station is not a Speed Call controller.
3	Enter 1-, 2- or 3-digit code for the number to be stored.		See 553-3001-305 for available list sizes per number sizes stored.
4	Dial the number to be programmed.		See 553-3001-305 for max digits per list size (up to 32).
5	Press SPEED CALL key again.	SPEED CALL lamp off; DATA SHIFT lamp on.	Number stored.
6	Press RLS or DATA SHIFT key.	DATA SHIFT lamp off.	Data Station shifts back to voice mode.

— continued —

Procedure 8
Speed Call (continued)

Step	Action	Verification	Comment
7	Press DDN key.	DDN and DATA SHIFT lamps on; DIAL tone on speaker.	
8	Press SPEED CALL key.	SPEED CALL lamp on; DIAL tone off.	
9	Dial 1-, 2- or 3-digit code.	SPEED CALL lamp off; RINGBACK tone on speaker.	Number automatically dialed.
10	Called Station answers.	DATA SHIFT lamp off; CONNECT lamp on; RINGBACK tone off; CONNECT BEEP on speaker.	2-way call established.
11	Press DATA SHIFT key.	DATA SHIFT lamp on;	Data Station in data mode.
12	Press RLS key.	DDN, DATA SHIFT and CONNECT lamps off.	Data station shifts back to voice mode. Data Station idle.

Hotline calls

Hotline is used with keyboard dialing from QMT8 asynchronous ADM for calling local hosts. It is also used in the synchronous mode in response to DTR in inbound modem pool or calling local hosts.

Asynchronous mode

There are three slight variations of the Hotline feature.

- If the S4.1 and 2 are on and S4.3 is off, then a DTR transition from off to on invokes Hotline to dial the number.
- If the S4.1 and 2 are on and S4.3 is off and the DTR is already true, then carriage return invokes Hotline (see step procedure below).
- If the S4.1, 2 and 3 are all on then carriage return invokes Hotline (see step procedure below).

Synchronous mode

If the S4.1 and .2 are on and S4.3 is off, then a DTR transition from off to on invokes hotline to dial the number.

Miscellaneous information

- Ensure data terminal is on-line and that both terminal and ADM are turned on.
- Ensure switch settings for speed and mode on terminal and ADM match.
- Ensure that the ADM is setup for Hotline operation with S4.1 and S4.2 switches set to on.
- Ensure that the predesignated number is programmed in the Meridian ldata base against the Hotline (Auto Dial) key (number three).

Procedure 9
Hotline **call**

Step	Action	Verification	Comment
	Start Condition.	POWER lamp on.	Data station active. Handset on hook.
1	Enter (CR)	DDN and DATA SHIFT lamps on.	HOTLINE OPERATION appears on screen.
2	Called number answers.	CONNECT lamp on; DATA SHIFT lamp off.	CALL CONNECTED appears on screen.
3	Follow login procedures.		Host echoes all typed input.
4	Proceed with data session.		

Procedure 10
Change of speed and/or mode setting on SW2 during active call

Step	Action	Verification	Comment
	Start Condition. Active data call with local computer.	DDN, CONNECT and POWER lamps on.	Data station active. Handset on hook. (If the call is with a remote computer, MODEM CONTROL lamp will also be steadily lit, see Note.)
1	Change speed settings on the terminal and ADM.		
2	Change mode setting on SW2		All parameters except Auto-Answer can be set. New mode is in effect.
3	Press DDN key.		New speed is in effect

Note: This asynchronous feature applies only for in-house calls. Any attempt to use this feature with a modem pooling call will result in the data call being dropped.

Keyboard dialing

Keyboard dialing is provided by the colocated QMT8 and is only applicable to ASCII, asynchronous start-stop character mode, interactive terminals equipped with EIA RS-232-C interface.

It is not available for synchronous or block mode terminals.

KBD provides the following capabilities;

- Call origination to local and remote hosts
- Ring Again capability
- Hotline calling to local hosts.

Miscellaneous information:

- Ensure data terminal is on-line and that both terminal and ADM are turned on.
- Ensure switch settings for speed and mode on terminal and ADM match.
- User inputs may be in either lower or upper case and must be terminated by carriage return (CR), enter or equivalent command.
- All inputs are echoed on the terminal screen.
- There is no provision to edit the input.
- Use "Control + Z" if it is necessary to abandon the call during the call set-up stage.
- All prompts during call set-up are in upper case, are preceded by a line feed and followed by (CR) and line feed.

Procedure 11
Keyboard Dialing from Colocated ADM (QMT8) Data Station

Step	Action	Verification	Comment
	Start Condition.	POWER lamp on.	Data station idle. Terminal and ADM power on.
1	Enter (CR)	DDN and DATA SHIFT lamps on; DIAL tone on speaker.	The ADM senses the change and prepares to receive the DDN (Note 3). ENTER NUMBER appears on screen.
2	HOTLINE active?	Connect lamp on: DATA SHIFT lamp off.	HOTLINE OPERATION appears on screen first and when called number answers, CALL CONNECTED appears on screen. Go to Step 6. If not, continue (Note 1).
Call to local host or AMP calling			
3	Enter first digit.	DIAL tone off.	Continue or go to Step 9.
4	Enter subsequent digits.		All numeric input, #. and *. are accepted. During call setup all legal user input appears on terminal screen (Note 4).
5	Enter (CR)	RINGBACK tone on speaker.	ADM sends digits to Meridian 1 which places call to host (Note 2).

— continued —

Procedure 11
Keyboard Dialing from Colocated ADM (QMT8) (continued)

Step	Action	Verification	Comment
6	**Called host** answers.	DATA SHIFT lamp off; CONNECT lamp on; RINGBACK tone off; Short BEEP tone on.	CALL CONNECTED appears on screen (if host < host or trunk with AMP > is busy, see Step 18).
7	Follow login procedures.		Host echoes all typed input.
8	Proceed with data session.		Host echoes all typed input. Go to Step 21 for disconnect procedures.
Call to remote host (Multiple hosts)			
9	Enter subsequent digits.		All numeric input, # and *, are accepted. During call setup all legal user input appears on terminal screen.
10	Enter (CR)	RINGBACK tone on speaker.	If called modem is free tone is heard. (If it is busy, see Step 18.)
11	ADM connected to modem answers.	RINGBACK tone off. MODEM CTRL lamp winks; PDN lamp on; CONNECT BEEP tone on.	ENTER (CR) WHEN DN IDLE appears on screen (Note 5).
12	Enter (CR)	DIAL tone on speaker.	ENTER REMOTE NUMBER appears on screen and PDN lights.
13	Enter remote number digits and (CR).	DIAL tone off; RINGBACK tone on.	Call is placed to the remote number. If it is free, ringback tone is received. PDN is on. See Step 18.
14	Remote host answers.	RINGBACK tone off. CARRIER tone on speaker.	Tone heard from remote modem. ENTER (CR) AT CARRIER TONE.
15	Enter (CR)	DATA SHIFT lamp off; MODEM CTRL lamp on; CONNECT lamp on; CARRIER tone off; PDN lamp off.	CALL CONNECTED appears on screen. PDN is off.

— continued —

Procedure 11
Keyboard Dialing from Colocated ADM (QMT8) (continued)

Step	Action	Verification	Comment
16	Follow login procedures.		Host echoes all typed input.
17	Proceed with data session.		Host echoes all typed input.
Ring Again active (Notes 1 and 2)			
18	Called Host Busy.	Busy Tone on speaker; DDN lamp on; RA lamp on.	RING AGAIN PLACED — CALL RELEASED appears on screen when called modem is busy. Ring Again is placed automatically in 5 seconds. If the called number is no-answer or an illegal number, CALL RELEASED appears on the screen and the DDN lamp goes dark. When the AMP feature is equipped and the remote data port is unavailable or the call was misdialed, no progress tones are received.
19	Called port is now free.	RA lamp flashes; BUSY tone off; RING AGAIN buzz on speaker.	
20	Enter (CR)	DATA SHIFT lamp on; Brief DIAL tone on speaker; RINGBACK on speaker.	After Ringback on speaker, CALL CONNECTED appears on screen. Return to Steps 7 or 16.

— continued —

Procedure 11
Keyboard Dialing from Colocated ADM (QMT8) (continued)

Call Disconnect procedures			
21	Enter a disconnect command to terminate session and to initiate call disconnect by the host (for example: Logo, Control + D, etc.). This causes the called terminal to disconnect the call by dropping DTR. or Operate terminal LINE or POWER switch to OFF. or Operate DS and RLS keys in sequence.		
22	Call Disconnected.	DDN and DATA SHIFT lamps off.	CALL RELEASED appears on screen. All ADM lamps except POWER go dark.

Note 1: Speed Call, Hotline, Auto Dial, Call Forward and Ring Again can only be programmed with the DATA SHIFT key (DS) and the relevant feature keys of the SL-1 telephone.

Note 2: If the called port is busy the Meridian 1 system returns busy tone. When Ring Again is activated by the SL-1 telephone, the "Y" answer to the screen prompt causes the ADM to retry the call.

Note 3: If the user wants to abandon the call during the call setup stage, type " CONTROL +Z"

Note 4: During call setup, there is a maximum number of characters in a line. The ADM ignores all characters input beyond this limit.

Note 5: If a data call is being setup and a voice call is received, answer the voice call and then put it on hold Release the data call with the CONTROL + Z if necessary.

Note 6: If a remote terminal is calling into an inbound modem pool and is calling multiple hosts, the ADM serving the modems must be setup in the non-hotline mode and the caller must input the DN of the called host (Steps 12 and 13). If the remote is calling a single host, the ADM serving the modem must be setup in the hotline mode with the DN programmed to the DN of the called host (skip Step 13).

Keyboard Dialing from AIM Station

Keyboard dialing is only applicable to ASCII, asynchronous start stop character mode, interactive terminals equipped with EIA RS-232-C interface.

- It is not available for synchronous or block mode terminals.
- The AIM and KBD provides the following capabilities:
  - Call origination to local and remote hosts
  - Ring Again capability
  - Auto Dial data calling to local hosts
  - Data baud rate of 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 (110 and 150 bps are not supported for AIM/PCIC to AIM/PCIC calling)
  - 2 stop-bits for 110 baud and 1 bit for all other baud rates
  - 8 data bits and no parity
  - Auto Answer (Note 6)

Menu information

- AIM is easy to use because the user friendly prompts guide you through the operating steps. Two "MENUS" provide a choice of call or function operation.

  The main MENU as shown below is used to determine the call or function type:

A – AUTO DIAL	R – REMOTE CALL
(CR) – AUTO DIAL	S – SPEED CALL
C – CALL	M – MODIFY
D – DISPLAY	
SELECT:	

The modify MENU shown below appears on the screen when "M" is selected from the main MENU:

A – AUTO DIAL NUMBER   R – REMOTE LOOPBACK

S – SPEED NUMBER   Q – QUIT MODIFY

SELECT:

Each MENU item for call setup and display or modify functions are shown separately in this procedure.

Miscellaneous information

- Ensure data terminal is on-line and that both terminal and AIM are turned on.
- User inputs may be in either lower or upper case and must be terminated by carriage return (CR), enter or equivalent command.
- The call may be dialed by using the same alphanumeric combinations that exist on a standard dial pad i.e., ABC = 2, etc. The & and # are accepted as is and treated as touch pad items. Illegal characters (i.e., spaces) result in an error message "Invalid Number"
- All inputs are echoed on the terminal screen.
- The input may be edited with "backspace" (BS), "delete line" (DEL) keys or their equivalents.
- All prompts during call set-up are in upper case and are preceded by a line feed. Those that need input are followed a colon and space while others are followed by (CR) and line feed.
- Use "CONTROL + Z" if it is necessary to abandon the call during call setup.
- If the call cannot be completed and the station is not busy, "SERVICE UNAVAILABLE CALL RELEASED" is the only prompt provided.
- If the prompt REENTER is received at any time, return to the Menu.
- When the Digit Display feature is assigned to the DN, the digits NNNN are displayed as the Meridian 1 system sends them.

Procedure 12
Keyboard Dialing from AIM Data Station

Step	Action	Terminal Echo	Prompt	Comment
	Start Condition.			Data station idle. Terminal and AIM power on.
1	Enter (CR)		A — AUTO DIAL (CR) -AUTO DIAL C — CALL D DISPLAY SELECT:	R REMOTE CALL S — SPEED CALL M MODIFY
This first (CR) also causes the AIM to autobaud to the rate set at the DTE.				
2	Data Auto Dial Active?			Go to Step 21. If not continue (Note 8).
3	Speed Call Active?			Go to Step 22. If not continue or go to Step 9 (Note 8).
Call to local host or AMP calling				
4	Enter C (CR)	C	ENTER NUMBER:	
5	Enter number XXXX (CR).	xxxx	CALLING NNNN	All alphabetic and numeric input, # and * are accepted. During call setup all legal user input appears on terminal screen (Note 4). AILC sends digits to Meridian 1 which places call to host. Meridian 1 sends digits NNNN back to the AILC.
6	Called host answers (if busy see Steps 16 or 20).		CALL CONNECTED SESSION STARTS	Data modules perform handshake and data channel becomes transparent (Note 2).
7	Follow login procedures.			Data session begins.
8	Proceed with data session.			Host echoes all typed input. Go to Step 34 for disconnect procedures.
— continued —				

Procedure 12
Keyboard Dialing from ADM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Call to remote host (multiple hosts)				
9	Enter R (CR)	R	ENTER NUMBER FOR MODEM:	
10	Enter Modem Number XXXX (CR).	All digits typed	Calling NNNN	
11	ADM connected to modem answers.		MODEM RESERVED ENTER REMOTE NUMBER:	Modem is reserved (Note 5).
12	Enter remote number digits (CR).	All digits typed	CALLING NNNNNNN;	The Meridian 1 places a call to the remote number.
13	Remote modem answers.		CALL CONNECTED SESSION STARTS	The call is connected. (If busy go to Steps 16 or 20.)
14	Follow login procedures.			Data session begins.
15	Proceed with data session.			Host echoes all typed input. Go to Step 34 for disconnect procedures.
Host busy — Ring Again active? (Notes 1 and 2)				
16	Called Host Busy.	Number Digits	CALLING NNNN BUSY. "RING AGAIN? (Y/N)	
17	Enter Y (CR)	Y	RING AGAIN PLACED	The AIM uses the Meridian 1 Ring Again feature to retry the call (Note 7).

— continued —

Procedure 12
Keyboard Dialing from ADM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
18	Called port becomes free.		DATA STATION xxxx NOW AVAILABLE. RING AGAIN Y/N/(CR)	If the DTE accepts bell characters, bell in DTE rings.
19	Enter (CR)		CALLING NNNN	Meridian 1 places call (go to Steps 6 or 13).
Host busy — no Ring Again				
20	Called Host Busy.		SERVICE UNAVAILABLE CALL RELEASED	
Data Auto Dial active? Local Host only (Note 1)				
21	Enter A (CR) or (CR)		CALLING NNNN;	AIM sends DDN and Auto Dial indication. Meridian 1 places the call to the predesignated number. Return to Step 6.
Speed Calling active?		All speed call numbers must be programmed in database against the user DDN.		
22	Enter S (CR)	S	ENTER ACCESS CODE:	
23	Enter X (CR)	X	CALLING N>NNNNNNN	AIM sends DDN and Speed Call Index. Return to Steps 6 or 13.
— continued —				

Procedure 12
Keyboard Dialing from ADM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Display active?		Used to display terminal parameters of the user **DDN.**		
24	Enter D (CR)	D	**BAUD RATE** (110-9600) =1200 REMOTE LOOPBACK (Y/N/(CR) =N **AUTO DIAL NO =NNNN** **A —** AUTO DIAL (CR) -AUTO DIAL C CALL D — DISPLAY **SELECT:**	R — **REMOTE CALL** **S SPEED CALL** **M** — MODIFY
The baud rate must be manually reset at the DTE. (See User Guide); • Power down AIM and DTE (or enter break or drop DTR) • Change baud rate at DTE • **Power** up **AIM** and DTE • Enter (CR) to auto baud It may be verified after resetting by autobauding again with (CR) and again using the D command. The other parameters are modified as shown in the following steps.				
Modify active?		Used to modify AIM settings to match terminal parameters.		
25	Enter M (CR)	M	A -AUTO DIAL NUMBER S — SPEED NUMBER **SELECT:**	R — REMOTE LOOPBACK Q — QUIT MODIFY MODIFY AUTO DIAL
— continued —				

Procedure 12
Keyboard Dialing from ADM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Modify Auto Dial				
26	Enter A (CR)	A	AUTO DIAL NO =	
27	Enter new number (CR)	New Number	A — AUTO DIAL NUMBER S — SPEED NUMBER SELECT:	R — REMOTE LOOPBACK Q — QUIT MODIFY Auto dial number is changed.
Modify Speed Call		**List Controller only**		
28	Enter S (CR)	S	ENTER ACCESS CODE:	
29	Enter X (CR)	X	SPEED NUMBER:	
30	Enter New Number (CR)	New number	A — AUTO DIAL NUMBER SPEED NUMBER SELECT:	R — REMOTE LOOPBACK Q — QUIT MODIFY New number is set.
Modify Remote Loopback				
31	Enter R (CR)	R	REMOTE LOOPBACK Y or N (CR):	
32	Enter Y or N (CR)	Y or N	A — AUTO DIAL NUMBER S — SPEED NUMBER SELECT:	R — REMOTE LOOPBACK Q — QUIT MODIFY Remote Loopback is Y or N.
Quit Modify				
33	Enter Q (CR)	Q	A — AUTO DIAL (CR) -AUTO DIAL C — CALL D — DISPLAY SELECT:	R — REMOTE CALL S — SPEED CALL M — MODIFY Try any other feature or place a Data Call
— continued —				

Procedure 12
Keyboard Dialing from ADM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Call Disconnect Procedures				
34	Enter a disconnect command to terminate session and to initiate call disconnect by the host terminal (e.g., LOGO, Control + D, etc.). This causes host to drop DTR and release the connection (Note 9). Operate break key for 1.6 s. (For terminals with overlapping timed breaks, it is necessary to operate the break key several times. This method does not work on terminals with non-overlapping timed breaks.) At the terminal, turn LINE/LOCAL to LOCAL or POWER switch to POWER OFF Turn AIM Off for about 1.6 s.			
35	Call Disconnected.		CALL RELEASED	The prompt only appears if AIM is on.

Note 1: The Auto Dial and Speed Call numbers can be modified from the keyboard or with a service change to the Meridian 1 database. Ring Again can be activated and originated from the terminal keyboard.

Note 2: No call progress tones are provided during call setup.

Note 3: If the user wants to abandon the call during the call setup stage, use “ controlZ" (simultaneously operate control and Z keys).

Note 4: During call setup, there is a maximum of characters in a line. If this limit is exceeded, the AIM considers the line as invalid input and prompts the user to retype the last line.

Note 5: If a remote terminal is calling via the incoming modem pool to multiple hosts the ADM serving the modems must be setup in the non-autodial (non-hotline) mode and the caller must input the DN of the called host (Step 12). If the remote terminal is calling a single host, the ADM serving the modem must be setup in the auto dial (hotline) mode with the DN programmed to the DN of the called host (skip Step 12).

Note 6: Auto Answer:

The terminal and the AIM must be powered up with the terminal ON-LINE.

An incoming call is answered automatically if the AIM is not in the process of establishing a call nor in the Modify Display feature mode.

If the terminal is autobauded, mismatching of the baud rate between the incoming call and the local terminal causes the call to be released:

— continued —

Procedure 12
Keyboard Dialing from ADM Data Station (continued)

	Action	Prompt	Comment
Terminal not Autobauded	Call comes in	INCOMING CALL CONNECTED 4 bell characters sound	Call established even though baud does not match.
Terminal Autobauded	Call comes in with matching baud rate	INCOMING CALL CONNECTED	Call established.
	Call comes in.with baud rate not matching.	INCOMPATIBLE INCOMING CALL CALL RELEASED	Call not established.

Note 7: When Ring Again has been placed, no further action should be taken unless the user wants to cancel Ring Again.

Note 8: If Speed Call or Auto Dial features are denied to the DN, attempts to use them will result (after a pause) in the prompt " SERVICE UNAVAILABLE, REENTER"

Note 9: For disconnection by a local host, the device (ADM, MCDS) connected to the host must be configured to monitor the data terminal ready (DTR) signal from the host. For disconnection by a remote host, the modem connected to the host must be configured to monitor the DTR signal from the host.

Note *10:* For QPC430E and later vintages, there are changes in keyboard dialing prompts. These prompts are similar to ASIM (QMT11) and M2000 data option. See AIM/AILU User Guide for information.

Keyboard dialing from the ASIM data station

Keyboard dialing is only applicable to ASCII, asynchronous start stop character mode, interactive terminals equipped with EIA RS-232-C interface. It is not available for synchronous or block mode terminals.

The ASIM and KBD provides the following capabilities:

- Call origination to local and remote hosts
- Ring Again capability
- Auto Dial data calling to local hosts
- Speed call calling
- Auto Answer (Note 6)
- Manual answering of incoming calls (Note 10)
- Asynchronous mode Autobauding (On initial power up, a default speed, as selected by the SYNC speed switch setting, of 1200, 2400, 4800, 9600 or 19200 bps is used. If the switch is not set to any of the five speed settings, ASIM defaults to 9600 bps. After once autobauded, ASIM remembers the current speed and if not again autobauded, continues to use that speed.)
- Asynchronous Mode Autoparity. The ASIM detects the speed on the carriage return (CR) character. If the parity of the terminal matches the default (8 bit, no parity), ASIM echoes a legible prompt on the screen. If parity does not match, an illegible prompt appears on the screen. When this happens, the user should enter a period and a (CR) to force the ASIM to detect the parity and to echo a legible prompt on the screen.

  ASIM returns to the default mode when:

  - Terminal powered off and on,
  - After Control Z, break, release, DTR off and call disconnections.
- Asynchronous Data baud rate of 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 bps
- Synchronous Data baud rate of 1200, 2400, 3600, 4800, 7200, 9600, 19200, 38400, 40800, 48000 and 56000 bps
- 2 stop-bits for 110 baud and 1 bit for all other baud rates

Menu information

ASIM with Keyboard dialing is easy to use because the user friendly prompts guide you through the operating steps. Two "MENUS" provide a choice of call or function operation.

The main MENU as shown below is used to determine the call or function type:

A — AUTO DIAL	D — DISPLAY
(CR) — AUTO DIAL	S — SPEED CALL
C — CALL	M — MODIFY
SELECT:	

The modify MENU shown below appears on the screen when "M" is selected from the main MENU:

A — AUTO DIAL NUMBER	R — REMOTE LOOPBACK
S — SPEED NUMBER	Q QUIT MODIFY
SELECT:	

Each MENU item for call setup and display or modify functions are shown separately in this procedure.

Miscellaneous information

- Ensure data terminal is on-line and that both terminal and ASIM are powered on.
- User inputs may be in either lower or upper case and must be terminated by carriage return (CR), enter or equivalent command.
- The call may be dialed by using the numeric combinations of the keyboard. The & and # are accepted as is and treated as touch pad items. Illegal characters (i.e., spaces) result in an error message "Invalid Number"
- All inputs are echoed on the terminal screen.
- The input may be edited with "backspace" (BS), "delete line" (DEL) keys or their equivalents.
- All prompts during call set-up are in upper case and are preceded by a line feed. Those that need input are followed by a colon and space while others are followed by semicolon or (CR) and line feed.

- Use "CONTROL + Z" if it is necessary to abandon an asynchronous call during call setup.
- If the call cannot be completed and the station is not busy, "SERVICE UNAVAILABLE CALL RELEASED" is the only prompt provided.
- If the prompt REENTER is received at any time, return to the Menu.
- When the Digit Display feature is assigned to the DN, the digits NNNN are displayed as the Meridian 1 system sends them.

Procedure 13
Keyboard Dialing from the ASIM Data Station

Step	Action	Terminal Echo	Prompt	Comment
	Start Condition			Data station idle. Terminal and ASIM power on.
1	Enter (CR)		ENTER NUMBER OR H (FOR HELP)	Go to step 6 or 10 if the number is to be entered instead of H. If you are familiar with the menu, you may use the command (C,(CR),A,S,etc.) instead of H. Go to step 3, 4 or 5 if "MENU" command is entered instead of H.
This first (CR) also causes the ASIM to autobaud to the SYNC speed switch setting or to the default of 9600 bps or to the previous rate.				
2	Enter H (CR)	A AUTO DIAL (CR) — AUTO DIAL C — CALL SELECT:	D DISPLAY S — SPEED CALL M MODIFY	
3	Data Auto Dial Active?			If Yes, go to Step 22. If not continue (Note 8).
4	Speed Call Active?			If yes, go to Step 23. If not continue (Note 8).
5	Enter C (CR)	C	ENTER NUMBER:	

— continued —

Procedure 13
Keyboard Dialing from the ASIM Data Station

Step	Action	Terminal Echo	Prompt	Comment
Call to local host or AMP calling (Go to Step 10 for call to remote host.)				
6	Enter number XXXX (CR).	xxxx	CALLING NNNN DDN lamp on.	All numeric input, # and & are accepted. During call setup all legal user input appears on terminal screen (Note 4). ASIM sends digits to Meridian 1 which places call to host. Meridian 1 sends digits NNNN back to the ASIM.
7	Called host answers (if busy, see Steps 16 or 21).		CALL CONNECTED SESSION STARTS CONNECT lamp on; RING AGAIN lamp off.	Data modules perform handshake and data channel becomes transparent (Note 2).
8	Follow login procedures.			Data session begins.
9	Proceed with data session.			Host echoes all typed input. Go to Step 35 for disconnect procedures.
Call to remote host		**Multiple hosts**		
10	Enter Modem Number xxxx (CR).	All digits typed	Calling NNNN DDN lamp on.	
11	ADM connected to modem answers.		MODEM RESERVED ENTER REMOTE NUMBER:	Modem is reserved (Note 5).
— continued —				

Procedure 13
Keyboard Dialing from the ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
12	Enter remote number digits (CR).	All digits typed	CALLING NNNNNNN;	The Meridian 1 places a call to the remote number.
13	Remote modem answers.		CALL CONNECTED SESSION STARTS CONNECT lamp on; RING AGAIN lamp Off.	The call is connected. (If busy, go to Steps 16 or 21.)
14	Follow login procedures.			Data session begins.
15	Proceed with data session.			Host echoes all typed input. Go to Step 35 for disconnect procedures.
Host busy — Ring Again active? (Notes 1 and 2)				
16	Called Host Busy.	Number Digits	CALLING NNNN BUSY RING AGAIN (Y/N)? RING AGAIN lamp on.	
17	Enter Y (CR)	Y	RING AGAIN PLACED RELEASED RING AGAIN lamp off; DDN lamp off.	The ASIM uses the Meridian 1 Ring Again feature to retry the call (Note 7).
18	Enter (CR)			Necessary to autobaud ASIM.
19	Called port becomes free.		DATA STATION NOW AVAILABLE RING AGAIN (Y/N); RING AGAIN lamp winks.	If the DTE accepts bell characters, bell in DTE rings.
-continued —				

Procedure 13
Keyboard Dialing from the ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
20	Enter Y(CR)		DDN lamp on.	Call placed (go to Step 7 or 13).
Host Busy — No Ring Again				
21	Called Host busy.		SERVICE UNAVAILABLE CALL RELEASED	
Data Auto Dial active?	**Local host only (Note 1)**			
22	Enter A (CR) or (CR)		CALLING NNNN DDN lamp on.	ASIM sends DDN and Auto Dial indication. Meridian 1 places the call to the predesignated number. Return to Step 7.
Speed Calling active?	All speed call numbers must be programmed in database against the user DDN.			
23	Enter S (CR)	S	ENTER ACCESS CODE:	
24	Enter X (CR)	X	CALLING N > NNNNNNN DDN lamp on.	ASIM sends DDN and Speed Call Index. Return to Steps 7 or 13.
Display Active?	Used to display terminal parameters of the user DDN.			
25	Enter D (CR)	D	BAUD RATE (110-9600) = NNNN REMOTE LOOPBACK (Y/N/(CR) = N AUTO DIAL NO = NNNN A — AUTO DIAL D — DISPLAY (CR) -AUTO DIAL S — SPEED CALL C — CALL M MODIFY SELECT:	

— continued —

Procedure 13
Keyboard Dialing from the ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
The Baud rate must be manually reset at the DTE Do not attempt to reset while a call is connected (See User Guide); · Power down ASIM and DTE (or enter break or drop DTR) · Change baud rate at DTE · Power up ASIM and DTE · Enter (CR) to auto baud. It may be verified after resetting by autobauding again with (CR) and again using the D command. The other parameters are modified as shown in the following steps.				
Modify active? Used to modify ASIM settings to match terminal parameters.				
26	Enter M (CR)	M	A — AUTO DIAL NUMBER S — SPEED NUMBER SELECT:	R — REMOTE LOOPBACK Q — QUIT MODIFY If you enter; A, go to step 27 S, go to step 29 R, go to step 32 Q, go to step 34
Modify Auto Dial				
27	Enter A (CR)	A	AUTO DIAL NO =	
28	Enter new number (CR)	New number	A — AUTO DIAL NUMBER S- SPEED NUMBER SELECT:	R — REMOTE LOOPBACK Q — QUIT MODIFY Auto dial number is changed.

— continued —

Procedure 13
Keyboard Dialing from the ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Modify Speed Call			**List Controller only**	
29	Enter S (CR)	S	ENTERACCESS CODE:	
30	Enter X (CR)	X	SPEED NUMBER:	
31	Enter new number (CR)	New number	A — AUTO DIAL NUMBER S — SPEED NUMBER SELECT:	R — REMOTE LOOPBACK Q — QUIT MODIFY New number is set.
Modify Remote Loopback				
32	Enter R (CR)	R	REMOTE LOOPBACK Y or N (CR):	
33	Enter Y or N (CR)	Y or N	A — AUTO DIAL NUMBER S SPEED NUMBER SELECT:	R — REMOTE LOOPBACK Q — QUIT MODIFY Remote Loopback is Y or N.

Procedure 13
Keyboard Dialing from the ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Quit Modify				
34	Enter Q (CR)	Q	A — AUTO DIAL (CR) -AUTO DIAL C — CALL D DISPLAY SELECT:	R — REMOTE CALL S — SPEED CALL M — MODIFY Try any other feature or place a Data *Call*
35	Enter a disconnect command to terminate session and to initiate call disconnect by the host terminal (e.g., LOGO, Control + D, etc.). This causes host to drop DTR and release the connection (Note 9). or Operate ASIM RELEASE key or At the terminal, turn LINE/LOCAL to LOCAL or POWER switch to POWER OFF or Power down ASIM for about 1.6 s. or In asynchronous operation, operate break key for 1.6 s. (For terminals with overlapping timed breaks, it is necessary to operate the break key several times. This method does not work on terminals with non-overlapping timed breaks.)			

— continued —

Procedure 13
Keyboard Dialing from the ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Call Disconnect procedures				
36	Call Disconnected.		CALL RELEASED	The prompt only appears if ASIM is on (Note 11).

Note 1: The Auto Dial and Speed Call numbers can be modified from the keyboard or with a service change to the Meridian 1 database.

Ring Again can be activated and originated from the terminal keyboard.

Note 2: No call progress tones are provided during call setup.

Note 3: If the user wants to abandon the call during the call setup stage, use " controlZ" (simultaneously operate control and Z keys).

Note 4: During call setup, there is a maximum of characters in a line.

If this limit is exceeded, the ASIM considers the line as invalid input and prompts the user to retype the last line.

Note 5: If a remote terminal is calling via the incoming modem pool to multiple hosts the ADM serving the modems must be setup in the non-autodial (non-hotline) mode and the caller must input the DN of the called host (Step 12).

If the remote terminal is calling a single host, the ADM serving the modem must be setup in the auto dial (hotline) mode with the DN programmed to the DN of the called host (skip Step 12).

Note 6: Auto Answer: The terminal and the ASIM must be powered up with the terminal ON-LINE. The ASIM Auto Answer switch must be set to ON. An incoming call is answered automatically if the ASIM is not in the process of establishing a call nor in the Modify Display feature mode. If the terminal is autobauded before the incoming asynchronous call is received (or has a default or previous speed set), mismatching of the baud rate between the incoming call and the local terminal causes the call to be released.

If the calling party issues re-down-line-load, ASIM treats it as a new incoming call and gives the appropriate prompts, e.g.,INCOMING CALL CONNECTED/UNDER TEST/INCOMPATIBLE INCOMING CALL RELEASED/etc.

— continued —

Procedure 13
Keyboard Dialing from the ASIM Data Station (continued)

	Action	Prompt	Comment
Terminal not Autobauded	Incoming Call-	NNNN INCOMING CALL CONNECTED OR NNNN UNDER TEST	NNNN is calling DDN Call is setup even though baud rate does not match. With no match, illegible information is received.
Terminal Autobauded	Call comes in.with matching baud rate	NNNN INCOMING CALL CONNECTED OR NNNN UNDER TEST	NNNN is calling DDN Data call established.
	Call comes in mismatching baud rate	NNNN INCOMPATIBLE INCOMING CALL RELEASED	NNNN is calling DDN Data call not setup. Cannot transmit data.

Note 7: When Ring Again has been placed, no further action should be taken unless the user wants to cancel Ring Again.

Note 8: If Speed Call or Auto Dial features are denied to the DN, attempts to use them will result (after a pause) in the prompt " SERVICE UNAVAILABLE, REENTER"

Note 9: For disconnection by a local host, the device (ADM, MCDS) connected to the host must be configured to monitor the data terminal ready (DTR) signal from the host. For disconnection by a remote host, the modem connected to the host must be configured to monitor the DTR signal from the host.

Note *10:* Manual Answer:
The terminal and the ASIM must be powered up with the terminal ON-LINE. The ASIM Manual Answer switch must be set to ON. An incoming call is answered manually from the terminal keyboard by hitting carriage return.

— continued —

Procedure 13
Keyboard Dialing from the ASIM Data Station (continued)

	Action	Prompt	Comment
Terminal Autobauded	**Call** comes in	DDN lamp winks INCOMING CALL ANSWER Y/N?	
	Enter Y	NNNN INCOMING CALL CONNECTED or NNNN INCOMPATIBLE CALL RELEASED or NNNN UNDER TEST	NNNN is calling DDN Matching baud rate. NNNN is calling DDN Mismatching baud rate. NNNN is calling DDN.

Note *11:* When the ASIM is connected to a VT100 terminal, a break on the terminal drops DTR and sends a long break. ASIM does not display the released message. The prompt can be displayed by forcing DTR on ASIM.

When the ASIM is connected to a VT102 terminal, a break on the terminal drops DTR. ASIM does not display released message unless the call is released from the keypad.

Keypad dialing from ASIM data station

Keypad dialing is applicable to ASCII, asynchronous/synchronous start stop character mode, interactive terminals equipped with EIA RS-232-C interface.

The ASIM and Keypad dialing provides the following capabilities:

- Call origination to local and remote hosts
- Manual or Auto Answer
- Ring Again capability
- Auto Dial data calling to local hosts
- Speed calling
- Automatic set relocation
- Asynchronous Data baud rate of 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 bps
- Synchronous Data baud rate of 1200, 2400, 3600, 4800, 7200, 9600, 19200, 38400, 40800, 48000 and 56000 bps (ASIM only)
- 2 stop-bits for 110 baud and 1 bit for all other baud rates

Miscellaneous information

- Ensure data terminal is on-line and that both terminal and ASIM are turned on.
- The call is dialed from the standard dial pad on the ASIM. The * and # are accepted as is and treated as touch pad items.
- For set relocation, the off-hook and on-hook are simulated as follows;

  Off-hook - Press reserved key below ring again and then * key.

  On-hook - Press reserved key below ring again and then # key.
- Use “RELEASE” key if it is necessary to abandon a call during call setup.

Procedure 14
Keypad Dialing from ASIM Data Station

Step	Action	Prompt - Indicator	Comment
	Start Condition		Data Station idle. Terminal and ASIM power on.
1	Data- Auto- Dial' Active?		If yes, go to Step 18. If not, go to Step 3 (Note 8).
2	Speed Call Active?		If yes, go to Step 20. If not, go to Step 3 (Note 8).
3	Operate DDN' key.	DDN lamp on.	
Call to local host or AMP calling			
4	Enter number.		All numeric input, # and * are accepted. ASIM sends digits to Meridian 1 which places call to host.
5	Called host answers (if busy see Steps 13 or 16).	CALL CONNECTED SESSION STARTS CONNECT lamp on.	Data modules perform handshake and data channel becomes transparent (Note 2).
6	Follow login procedures.		Data session begins.
7	Proceed with data session.		Host echoes all typed input. Go to Step 23 for disconnect procedures.

— continued —

Procedure 14
Keypad Dialing from ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Call to remote host				
8	Enter Modem Number XXXX.	DDN and MODEM CALL lamps wink.		Wait until modem is reserved.
9	Enter remote number digits.			
10	Press MODEM CALL key.	MODEM CALL lamp on; DDN lamp winks.		The Meridian 1 places a call to the remote number.
11	Remote host answers.	CALL CONNECTED SESSION STARTS DDN,CONNECT and MODEM CALL lamps on.		The call is connected. (If busy, go to Steps 14 or 17.))
12	Follow login procedures.			Data session begins.
13	Proceed with data session.			Host echoes all typed input. Go to Step 23 for disconnect procedures.

— continued —

Procedure 14
Keypad Dialing from ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Host Busy — Ring Again Active?				
14	**Called** Host Busy.	RING AGAIN PLACED RELEASED RING AGAIN lamp on; DDN lamp off.		The ASIM uses the Meridian 1 Ring Again feature to retry the call (Note 7).
15	Called port becomes free.	DATA STATION NOW AVAILABLE ENTER (CR) RING AGAIN lamp winks.		ASIM sends BELL characters from terminal.
16	Operate DDN and RING AGAIN keys in sequence.	CALL CONNECTED SESSION STARTS DDN and CONNECT lamps on; RING AGAIN lamp off.		Go to Steps 6 or 11.
Host Busy — No Ring Again				
17	Called Host Busy.	DDN lamp flashes.		Release DDN key
Data Auto Dial Active? Local Host only (Note 1)				
18	Operate DDN key.	DDN lamp on.		
19	Operate AUTO DIAL key.			Meridian 1 places the call to the predesignated number. Return to Step 5.

Procedure 14
Keypad Dialing from ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Speed Calling Active?		All speed call numbers must be programmed in database against the user DDN.		
20	Operate DDN key.	DDN lamp on.		
21	Operate SPEED CALL key.	SPEED CALL lamp on.		
22	Enter 1-, 2- or 3-digit code for the number to be stored.	SPEED CALL lamp off.		Meridian 1 places the call to the predesignated number. Return to Step 5.

— continued —

Procedure 14
Keypad Dialing from ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Call Disconnect procedures				
23	Enter a disconnect command to terminate session and to initiate call disconnect by the host terminal (e.g., LOGO, Control + D, etc.). This causes host to drop DTR and release the connection (Note 9). or Operate the ASIM RELEASE key. or Operate break key for 1.6 s (asynchronous operation only). (For terminals with overlapping timed breaks, it is necessary to operate the break key several times. This method does not work on terminals with non-overlapping timed breaks.) or At the terminal, turn LINE/LOCAL to LOCAL or POWER switch to POWER OFF or Power down ASIM for about 1.6 s			
24	Call Disconnected.	CALL RELEASED. DDN lamp off.		The prompt only appears if ASIM is on (Note 10).
Program or modify Auto Dial				
25	Press AUTO DIAL key. (Do not operate DDN key.)	AUTO DIAL lamp flashes.		
26	Enter new number.			
27	Press AUTO DIAL key.	AUTO DIAL lamp off.		Auto dial number is changed.

— continued —

Procedure 14
Keypad Dialing from ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
Program or modify Speed Call List Controller Only				
28	Press SPEED CALL key. (Do not operate DDN key.)	SPEED CALL lamp flashes.		If lamp does not flash, this station is not a Speed Call Controller and cannot store numbers.
29	Dial 1- to 3-digit access code			
30	Dial Speed Call number.			Include * and # where necessary.
31	Press SPEED CALL key.	SPEED CALL lamp off.		Speed Call List is now updated with entry.
32	Repeat steps 28-31 to program more numbers.			Use a different access code for each different number.
Automatic set relocation				
33	Press DDN key.	DDN lamp on.		
34	Dial the Special Prefix code plus the set relocation access code "81"			
35	Dial Security code (if required).			
36	Dial 4-digit identification code.			After a few seconds, the DDN lamp goes dark.
— continued —				

Procedure 14
Keypad Dialing from ASIM Data Station (continued)

Step	Action	Terminal Echo	Prompt	Comment
37	Unplug ASIM, plug in at a location equipped with a TN of the same type.			
38	Press Reserved key (one below Ring Again key) and * keys.			This provides an off-hook indication.
39	Dial 4-digit identification code.			This must be the same 4-digit code as in step 36. A 2-second tone is heard, after a slight pause, to indicate that the set was successfully relocated.
40	Press Reserved key (one below Ring Again key) and # keys.			This provides an on-hook indication.

Note *1:* The Auto Dial and Speed Call numbers can be modified from the DTE keypad or with a service change to the Meridian 1 database (Steps 25 through 32).

Note 2: No call progress tones are provided during call setup.

Note 3: If the user wants to abandon the call during the call setup stage, operate the RELEASE key.

Note 4: During call setup, there is a maximum of characters. If this limit is exceeded, the ASIM only uses the number it requires.

Note 5: If a remote terminal is calling via the incoming modem pool to multiple hosts the ADM serving the modems must be setup in the non-autodial (non-hotline) mode and the caller must input the DN of the called host (Step 12).

If the remote terminal is calling a single host, the ADM serving the modem must be setup in the auto dial (hotline) mode with the DN programmed to the DN of the called host (skip Step 12).

— continued —

Procedure 14
Keypad Dialing from ASIM Data Station (continued)

Note 6: Auto or Manual Answer:

The terminal and the ASIM must be powered up with the terminal ON-LINE

An incoming call is answered automatically or manually by selecting either AUTO or MANUAL mode. When AUTO is selected, an incoming call is answered automatically after a single Bell Character sounds.

Note 7: When Ring Again has been placed, no further action should be taken unless the user wants to cancel Ring Again.

Note 8: If Speed Call or Auto Dial features are denied to the DN, attempts to use them performs no function.

Note 9: For disconnection by a local host, the device (ADM, MCDS) connected to the host must be configured to monitor the data terminal ready (DTR) signal from the host. For disconnection by a remote host. the modem connected to the host must be configured to monitor the DTR signal from the host.

Note 10: When the ASIM is connected to a VT100 terminal, a break on the terminal drops DTR and sends a long break. ASIM does not display released message. The prompt can be displayed by forcing DTR on ASIM. When the ASIM is connected to a VT102 terminal, a break on the terminal drops DTR. ASIM does not display released message unless the call is released from the keypad. When ASIM is associated with a printer. configure the printer for mark and space parity.

Note 11: The call is dropped immediately if SADM calls ASIM, MCDS or AIM and the baud rate plus parity do not match. The SADM releases the call (after one to two minutes for low baud rates, e.g. 300 bps).

Note 12: When a call is connected between two modules, power failure or removal of power from one data module does not release the connection until the power is restored to the data module.

Note 73: When a modem is reserved (during a call to a remote host) and the remote number is misdialed, operate the release key twice; once to release the remote modem (DDN lamp flashes) and then the DDN and release keys to release the reserved modem and the call. This condition applies particularly to synchronous half-duplex operation mode.

Performance testing operations

Many variable scan degrade the data-transmission performance of a colocated ADM, stand-alone ADM or MCDS that might otherwise function satisfactorily from a call-processing or features standpoint.

Where excessive errors are introduced, three general elements are attributable:

- human error in operation/application
- faults in the equipment hardware and software
- faults in the connecting transmission facility.

Fault isolation (Procedure 15), therefore, becomes a matter of identifying the involved elements by taking systematic corrective action.

The error-rate specification for Meridian Data feature transmission are:

- In-House — 1 error in 10 M bits
- Outgoing — 1 error in 100 K bits (modem dependent)

In-house transmission performance testing

In-house data calls are conducted from data stations to data stations and from data stations to stand-alone ADM or MCDS connected to DTE. Loopback testing can be performed from any data station to an in-house facility to verify the integrity of the ADM under test (Procedure 15).

Loopback testing from a known good data station can also isolate faults to called ADM (or MCDS). or to transmission lines according to the desired test sequence or transmission type in which it is used.

Interoffice data transmission performance testing

Inbound and Outbound data calling through the Meridian 1 switching network is made possible by the provision of modem pooling. The modem pool allows data calls to be switched over voice-grade analog trunks to remote or local data facilities. This capability, while allowing efficient use of modems and trunks, adds several variables to the error-source location process.

In addition to the probable sources of transmission error to which in-house data calls are subjected, modem pool calls are subject to error introduced by local modem faults, remote modem faults, and transmission gradients inherent in many DDD applications.

Error isolation techniques for modem pool calls are dependent on the type of modems supplied in the modem pool. The local loopback facility is able to test in-house ADM or MCDS connected to the modem pool.

Outbound Modem Pool fault testing

Successful modem pool services begin with very careful configuration of each ADM equipped with a modem. If the modems in a modem pool are of various manufacture, each MUST BE compatible to whatever is located at the dialed remote location. When installing the modem pool, ADM configuration requirements include:

- setting jumper plugs on QPC314/399 pack;
- setting the modem’ s VFDN on S1 on the QPC314/399 pack;
- setting S3.7 option switch to AUTO ANSWER.

It is recommended that the modem pool be located in close proximity to the PE (i.e., in the equipment room). This ensures that each ADM is less sensitive to wire-gauge gradients.

Inbound Modem Pool fault testing

The same care specified for outbound pooled modems applies for the inbound pool.

ADM configuration requirements include:

- setting jumper plugs on QPC314/399 pack
- setting the modem's DDN on S1 on the QPC314/399 pack
- setting all S3 option parameter switches to match modem parameters
- setting S3.7 option switch to AUTO ANSWER

It is recommended that the modem pool be located in close proximity to the PE (i.e., in the equipment room). This ensures that each ADM is less sensitive to wire-gauge gradients.

AIM/AILC fault testing

The most important item to verify is that there are no pair reversals between the AIM and the AILC. Failure to maintain correct polarity within a pair prevents correct operation, e.g., if logical "one" and "zero" are reversed, the AILC is unable to autobaud.

Procedure 15
Loopback Testing of In-House Data Colocated and Stand-Alone ADM

1 Connect a Bit Error Rate Tester (BERT) or data terminal to ADM used to control the test.

2 Set test station ADM switch S3.7 to AUTO ANSWER. The ADM must be equipped with a data terminal.

3 At the data station to be tested, set ADM switch S3 as follows.
S3.1 – INH (Not used with Synch ADM)
S3.2 EVEN
S3.3 – FDX (Not used with Synch ADM)
S3.4 – according to DTE
S3.5 – according to DTE
S3.6 – 4 w
S3.7 – AUTO
S3.8 – LOOPBACK

4 Depending on the type of station, perform the following:

For colocated ADM, continue to Step 5.

For stand-alone ADM, go to Step 9.

5 Establish a DDN call from station under test to the test station.

6 Transmit a test message from the station under test.

7 Read results at the station under test. Observe performance of ADM.

8 Proceed to Step 12.

9 Establish a DDN call from the test station to the station under test.

10 Transmit a test message from the test station to the station under test.

11 Read results at the test station. Observe performance of ADM at station under test.

12 Message should return intact. SEND and RECEIVE lamps should light.

13 If errors are contained in the message, repeat a loopback test after each of the appropriate fault-location procedures given below are followed.

a Conflicting S3 switch setting (e.g., ENB and 8-CODE): Check S3 switch settings per Step 3; check data terminal parameters. Reset S3 as required.

b Faulty EIA cable. Check and replace if required.

c Jumpers E12/E13/E14 on QPC315/499 are pinned for inappropriate wire gauge setting or are pinned to a wire gauge setting that conflicts with DLC settings.

- Repin jumpers to match wire gauge setting of DLC.
- Observe any change in data received.

Note I: If this action clears the errors, STOP. Retain the corrective jumper settings.

Note 2: If errors persist, conduct a wire gauge test before proceeding to Step 13d.

d SL-1 telephone attached to ADM under test is faulty.

- The DLC must be switched to stand-alone.
- Remove ADM from SL-1 telephone and restore the yellow and black mounting cord leads on the SL-1 telephone to their standard positions.
- Test SL-1 telephone per 553-3001-305; replace if faulty. Reconnect SL-1 telephone if functioning normally.

e ADM (or MCDS) under test is out-of-range.

- Check maximum allowable cable-feet for wire gauge used. Correct if maximum is exceeded.

f Bridge taps are present.

- Remove any bridge taps.

g Improper connections made from ADM (or MCDS) to PE

- Check all physical connections and terminations.
- Conduct continuity tests as required.

h DLC port assigned to the DLC under test is faulty.

- Load LD32 (Network and PE Replacement Diagnostic) and test. Replace pack if test fails.
- If the ADM (or MCDS) assigned to the other data port on the pack is functioning normally, reassign the ADM (or MCDS) under test to that TN.

i ADM (or MCDS) under test is faulty.

- If loopback tests were unsatisfactory after conducting the procedures in Steps (a) through (i). Follow procedures shown in Procedure 16 before replacing the ADM (or MCDS) under test.

Procedure 16
ADM troubleshooting procedures

Symptom	Procedure
Dark power indicator (LED).	Ensure that power transformer has an ac source. Ensure that transformer output is properly connected to ADM.
Dial tone is not returned when Data DN key is operated. Data Shift key LED lights.	Ensure that all leads are properly terminated in host SL-1 telephone. Check switch S4-2; On QPC314 (QMT7), if terminal gives DTR, S4-2 should be up; otherwise, switch should be down. On QPC399 (QMT8), if terminal gives DTR, S4-2 should be off. Check that the terminal is set on-line.
ADM functions per NTP, no response on action device (Terminal).	Ensure that action device is connected to ADM using RS-232 cable. Loop back switch is off. Switch settings match between ADM and terminal.
Ring no answer (called DN flashes).	Check all cross-connect jumpers and station cabling for bridge taps or grounds. If ADM is accessing a computer port, determine if port returns DTR; On QPC314 (QMT7), set SW4 position 2 up. On QPC399 (QMT8), set S4-2 should be off. Make sure called ADM is in AUTO ANSWER.
All LED on host SL-1 telephone flash.	QPC311 is not properly set, correct options per NTP. Reset ADM
In modem pooling configuration, ADM call transfers to wrong VFDN.	Ensure that correct modem is being dialed. Ensure that VFDN SW (matrix SW) reflects modem's DN (500 lines).
In modem-pooling configuration, ADM connect and transfer but there is no input from called host.	Position loopback option SW3 position 8 to OFF. Ensure correct baud rate. Ensure ADM and terminal's switch settings match, Ensure host sees correct character for auto baud "CR" or "space bar", etc.

— continued —

Procedure 16
ADM troubleshooting procedures (continued)

Symptom	Procedure
Terminal receives double characters with loopback option in the OFF position.	ADM SW3 position 6 must be in 4W select position. Check terminal switch settings, should be in FDX.
When calling a colocated or stand-alone ADM, changes must be made to baud rate or any other switch position on S3.	Down-line load ADM by operating the DDN key on ADM from calling ADM.
Ringback tone stops, no connect lamp or tone.	Operate RESET switch at the called unit.
Ringback tone ends, continuous connect tone or a howl is received.	Operate RESET switch at calling unit. Call another DDN after RESET, if symptom persists, remove and replace DLC.
Garbled characters received on terminal.	Option E-l 2-13-l 4 on ADM must match option E-37-38-39 or E-52-53-54 of the DLC. See option settings ADM and DLC.

Procedure 17
AIM troubleshooting procedures

Symptom	Procedure
No response from AILC:	
AIM power indicator (LED) is dark.	Check AIM power switch. Ensure power transformer has an ac source. Ensure AIM transformer is plugged in. Ensure that transformer leads are properly connected to the AIM.
AIM power indicator (LED) is lit.	Ensure terminal is powered up. Ensure terminal is properly connected to AIM. Ensure terminal is ON LINE. Ensure terminal is ready for data transmission with the proper speed and other parameters correctly set up.
No response from AILC:	
AIM power lamp is steadily lit.	Ensure AIM is properly connected to **AILC.** Verify that the wire pairs are not reversed. Verify that there are no open leads.
Still no response from AILC.	Use another AILC. Use another terminal. Use another AIM.
Responses are received from AILC:	
Characters are garbage.	Check bit rate of terminal. Check number of stop bits on terminal. Verify that the wire pairs are not reversed. Try a new terminal. Try a new AILC.
Some characters are missing or garbage.	Check parity setting on the terminal.
A call cannot be placed to a remote unit.	Ensure that the database is properly programmed. Ensure that the remote unit is capable of communicating with the originating terminal. Try originating a call to another terminal. Try a new **AILC.**

Procedure 18
MCDS troubleshooting procedures

Symptom	Procedure
Cannot establish the call (CONN LED dark)	Is DTR LED lit to indicate DTR is received from the attached device? • NO: (see DTR LED dark). • YES: Is wiring between MCDS and Line Card correct? • NO: (correct any defective wiring). • YES: Is DN properly configured? . NO: (correct DN configuration). • YES Is Line Card enabled? • NO: (enable Line Card). • YES: (try a new Line Card). Are speed and transmission parameters supported by MCDS.(If the speed and transmission parameters used are not supported by MCDS, call cannot be established.) • NO: (correct defective condition). • YES: Attempt call using another port (use patch panel if available) on this or another card.
Call established, but device connected to MCDS-AC not receiving data or getting junk data.	Is RD LED lit to indicate card is transmitting data to attached device? • NO: (reestablish call using another port (use patch patch panel) on this or another card). • YES: Inspect wiring from MCDS to DTE. Check the speed and transmission parameters.
Call established, but remote device not receiving data or is receiving junk data.	Is SD LED lit to indicate card is receiving data from the attached device? • NO: (inspect wiring from MCDS to DTE). • YES: Do speed and transmission parameters match? • NO: (correct defective condition). • YES: Reestablish call using another port (use patch panel) on this or another card.

— continued —

Procedure 18
MCDS troubleshooting procedures (continued)

Symptom	Procedure
DTR LED dark (No DTR)	Is connecting device turned on? • NO: (correct any defective condition). • YES: Inspect wiring from MCDS to terminal or computer port. (Is it connected to the selected port?) Is the connecting device providing DTR? • NO: (change to the FORCED DTR configuration on the MCDS-AC). • YES: Use another port (use patch panel) on this or another card.
More than one card on a shelf not operating properly.	Ensure power supply is operating correctly. Inspect back panel for shorts or crosses. Inspect wiring from MCDS to DTE.
Power Supply checks	Power Supply Checks. Power Supply is connected to available 110 V ac supply. Power LED lights when switch is on. Fuse is not blown. Fuse is the correct value (3 amp). Use voltage test points to verify +.2, +9, -9, +5 V and GRD.

ASIM troubleshooting procedures

If the ASIM does not operate properly, perform the following checks:

1 Ensure the Data Station is ready for data transmission with the proper speed and other parameters set on the terminal.

2 Ensure that the ASIM power supply is plugged in. Operate the force dtr key on ASIM and verify that the ddn lamp lights. Replace power supply if the lamp does not light.

Note: The power supply is a field replaceable item and should not be returned to NT for repair.

- Is data terminal power on and ON-LINE/OFF-LINE (LINE/LOCAL) switch (if equipped) set to ON-LINE (LINE)?

If the call is connected but station is not sending or receiving data.

1 Is MONITOR SEND lamp on DTE (if equipped) or the SD lamp on the ASIM flashing while sending data?

If they do not flash:

1 Ensure RS-232 cable is properly connected to ASIM and DTE.

2 Ensure ON-LINE/OFF-LINE (LINE/LOCAL) switch is set to ON-LINE (LINE).

The call is connected but illegible characters appear on the screen.

1 When calling another Meridian data device, ensure that the operating controls of both data devices connected to the Meridian device match.

2 Ensure that the terminal is set so that it does not check parity or that it is set to 8 bits (no parity). If it is set for 7 bits, even or odd parity, enter a period (.) and (CR) to force ASIM to calculate parity and to provide legible prompts.

If problems occur during call setup, disconnect and attempt to place the call again. Place the call from a regular phone to ensure that the receiving station is working before calling for service.

If pseudo random pattern 511 data is sent (Tektronix 834) in the idle mode, the keypad is made inoperative. Use the break or release keys to clear the condition.

Glossary

ADM Call Controls

There are three call control key/lamp pairs located on the bottom right-hand portion of the ADM. Four additional lamps – CONNECT, RECEIVE, SEND, and POWER are also provided as status indicators (see Figure 1).

ADM Transmission Controls

These controls are located on the top center of the ADM (Figure 1) and consist of the following.

a rotary dial (S2) for selection of data transmission speeds
selection of transmission parameters

Asynchronous interface Line Card

The AILC is the printed circuit pack QPC430 which is installed in the Peripheral Equipment (PE) to support AIM only. The AILC interfaces a DTE via an AIM to the Meridian 1 system for data switching.

There are no controls or switches on the card. There is a LED to indicate when the card is disabled.

AIM Call Controls

The AIM is equipped with a power on/off switch and a power on indicator lamp (Figure 2).

ASIM Call Controls

The ASIM is equipped with a dial pad, key/lamp pad, synchronous data speed selection switch and data control switches. The speed selection and data mode switches are recessed under a flip-up lid. User instructions are provided on the underside of this lid (Figure 2).

ASIM Automatic Set Relocation

This feature allows ASIM users to move sets to another location without the intervention of a craftsperson.

Directory numbers and features assigned to the set are maintained. Up to 32 sets can be in the process of relocating at any one time.

The following codes are associated with the feature.

Special prefix code
Set relocation access code 81
Security code (optional)
Identification code

A four-digit security code can be assigned by the customer. When the option is selected, the security code must be entered before a set can be moved. The Identification code is user-selectable, and can be any four-digit number (excluding & and #).

Colocated ADM

This refers to an ADM connected to an SL-1 telephone. (See also “Data Station” and “Stand-Alone ADM”.)

Computer Pool

This is a group of computer ports, each port connected to a "Stand-Alone ADM or to a port on a MCDS interface card."

Each port is assigned a DDN (see "Directory Numbers"), and all computer-port DDN assigned to the same hunt group constitute a computer pool. A computer pool allows data callers to access available ports on a contention basis. The QPC311 DLC is a printed circuit pack which is installed in the PE to support Meridian data services.

One DLC consists of four ports which operate independently (2 voice and 2 data) or as two voice/data pairs. Two ports support SL-1 telephones (voice) and two ports support ADM/ASIM (data).

Option switches on the pack select colocated ADM or stand-alone ADM operation.

The QPC432 4-port DLC is a printed circuit pack which is installed in the PE to support Meridian data services.

Each 4PDLC consists of four data only ports which operate independently.

All ADM/ASIM must terminate on a DLC or 4PDLC data port.

Data Mode

This term is used to indicate the operating status of an Meridian data station. When the DATA SHIFT lamp on the ADM is lit, all key depressions on the colocated SL-1 telephone will correspond to the DDN.

Data Station

This is a colocated SL-1 telephone and ADM connected to Data Terminal Equipment (DTE). A data station allows, in addition to regular telephone calls, incoming/outgoing data calling and application of Meridian 1 calling features to data calls.

Directory Numbers

The DN term refers to a telephone extension number within the Meridian 1 system. In this document, reference is made to the followinf four DN types.

DDN – Data Directory Number, assigned to the ADM.

PDN – Prime Directory Number, assigned to the SL-1 telephone as its main extension.

VDN – Voice Directory Number, assigned to an SL-1 telephone as a secondary extension.

VFDN – Voice Frequency Directory Number, physically set via Switch S1 on an ADM connected to a voice-grade modem. The system, during a Outgoing Modem Pool call, automatically accesses the modem's VFDN, via a Modem Pool Line Card (MPLC) port.

During an Inbound Modem Pool Call the system accesses the modem's DDN via a 500-set line card port.

Modem pool

This refers to one or more voice-grade modems supplied for Meridian data calling over outbound/inbound voice-grade trunks.

With Manual Modem Pooling, each asynchronous outbound pooled modem is connected to a stand-alone ADM on the digital side and a QPC353 MPLC on the analog side.

Each synchronous outbound pooled modem is connected to a stand-alone ADM on the digital side and a QPC60 line card on the analog side.

Each modem in an inbound modem pool is connected to a QPC60 line card on the analog side and to,an ADM on the digital side.

Each ADM connected to a modem is assigned a DDN, and all DDN assigned to a hunt group constitute a Modem Pool. A Modem Pool allows data callers to reserve and use available modems on a contention basis, The Modem Pool is typically located in the equipment room.

> ***Note:*** In inbound modem pooling, the ADM triggers its hotline dialing off the EIA RI signal given by the modem when it sees ring voltage on the incoming line. However, some synchronous modems that are in the 4-wire FDX leased line mode keep RI high. The ADM is unable to distinguish between the two, so with this in mind, assign hotline.

With Automated Modem Pooling, each pooled modem is connected to a stand alone ADM on the digital side and to a QPC60 line card on the analog side.

With the AMP feature the outbound and inbound calls can use the same modem pool.

Each pooled modem is configured to look like trunk members in a trunk block.

AMP creates service changes to pair the ADM and modems together. AMP uses the Data Hunting feature to organize the ADM hunting.

Stand-alone ADM

This refers to any ADM that is not equipped with a companion SL-1 telephone. A stand-alone ADM provides incoming data calling services where SL-1 telephone telephone features are not a requirement. A stand-alone ADM can interface with either of the following.

DTE — computer ports, printers, word processors, teletypewriters and other peripherals
DCE — Modems

The MCDS provides ADM-like capabilities for interfacing computer ports to the Meridian 1 system. It is designed to operate in a computer room environment with computer ports, printers, teletypewriters and other answer only peripherals.

Test station

This refers to an Meridian data station allocated for maintenance testing. One test station is typically located in the equipment room.

Voice mode

This term is used to indicate the operating status of an Meridian data station. When the DATA SHIFT lamp on the ADM is dark, all key depressions on the SL-1 telephone will correspond to the PDN or VDN(s).

Figure 1
ADM and User Option Selection Controls

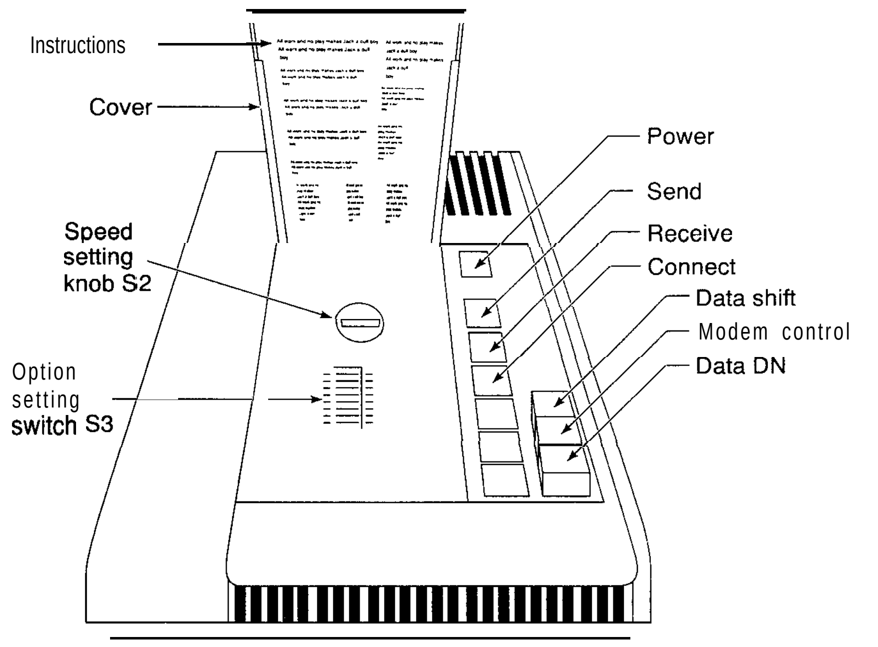
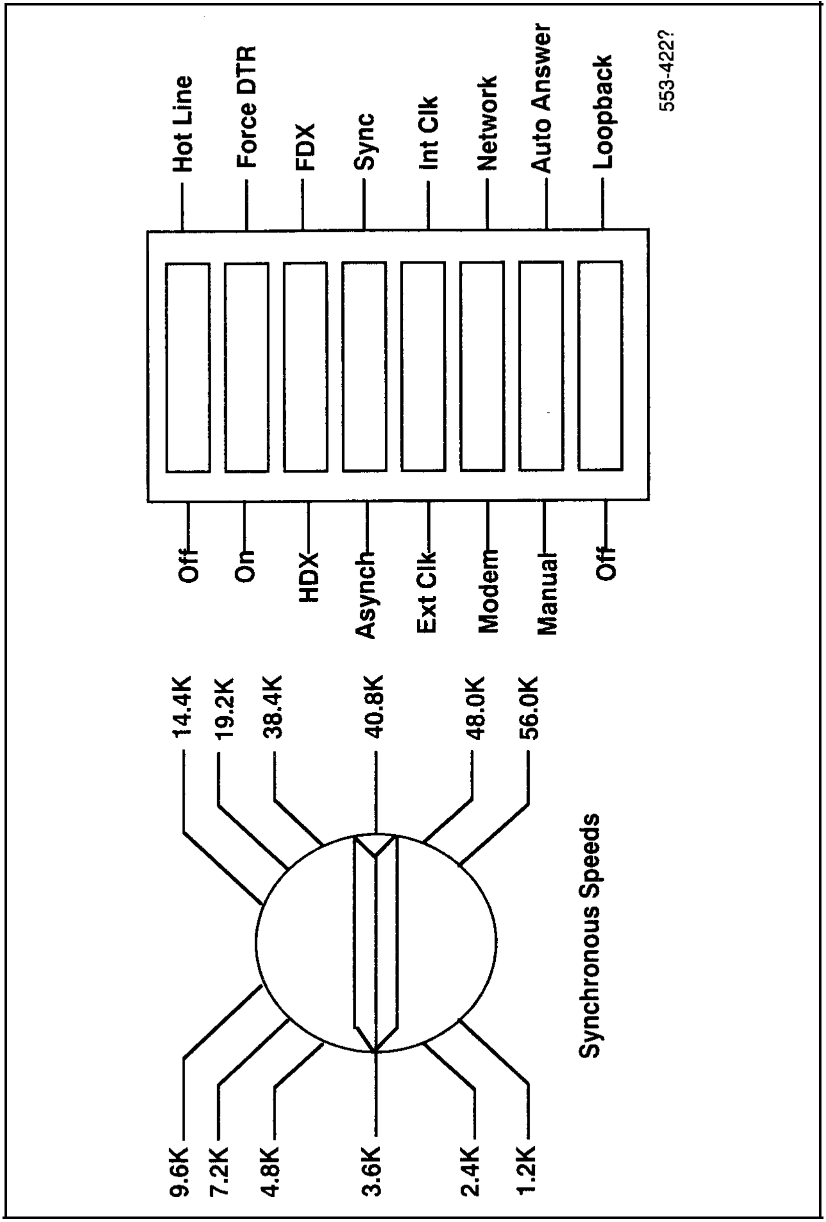


Figure 2
ASIM Recessed User Option Selection Controls



SL-1

Meridian data features

Operation and tests

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