SX-200” DIGITAL PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX)

CONTROL SHEET - VOLUME 3 (PN 9109-094-003-NA)
ENGINEERING, MAINTENANCE and TROUBLESHOOTING
CONTENTS - THIS VOLUME

CONTENTS - OTHER VOLUMES

Volume 1 GENERAL DESCRIPTION (PN 9109-094-001-NA)

Volume 2 INSTALLATION AND CUSTOMER DATA ENTRY (PN 9109-094-002-NA)

Volume 4 PERIPHERALS INFORMATION (PN 9109-094-004-NA)

SX-200” DIGITAL
DIGiTAL PRIVATE AUTOMATIC BRANCH EXCHANGE
ENGINEERING INFORMATION

NOTICE

CONTENTS PAGE

CONTENTS (CONT'D) PAGE

CONTENTS (CONT'D) PAGE

LIST OF TABLES

LIST OF TABLES (CONT'D)

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (CONT'D)

1. INTRODUCTION

General

1.01 This Section provides basic engineering information for the *SX-200*® DIGITAL PABX, with Generic 1003 software. It describes the physical aspects of the system, its configurations and technical characteristics.

Reason for Issue

1.02 This Section is issued to provide Engineering Information for the *SX-200* DIGITAL PABX.

2. FEATURES

General

2.01 The SX-200 DIGITAL PABX offers many features, which are provided by a software package. A full description of these features appears in Section MITL9109-094-105-NA, Features Description. Certain limitations which apply to System Features are listed in Table 2-l.

TABLE 2-I
FEATURE LIMITATIONS

Maximum number of simultaneous calls	248
Maximum number of speech paths or channels used by any call	2
Maximum number of simultaneous consultations	5
Maximum number of simultaneous add-on (3-way) calls	6
Maximum number of simultaneous station-controlled conference calls	6
Maximum number of parties in conference at one time	5
Maximum number of calls that can simultaneously be camped on to a station, trunk group, or hunt group	200
Maximum number of simultaneous callbacks that can be enabled	200
Maximum number of simultaneous call forwards that can be enabled	400
Maximum number of simultaneous "Dial 0" calls	200
Maximum number of hunting groups	50
Maximum number of calls that can be simultaneously connected to Music On Hold	178
Maximum number of stations in a station hunt group	50
Maximum number of stations in a call pickup group	50
Maximum number of dial call pickup groups	50
Maximum number of trunks assignable to night stations	200
Maximum number of trunks in a trunk group	50
Maximum number of trunk groups	50
Maximum number of calls that can override a given extension	1
Maximum number of attendants	11
Maximum number of calls that can be simultaneously held by one attendant	8
Maximum number of calls incoming that can be separately identified at the Attendant Console	8
Maximum number of LDN's that can be identified at the Attendant Console	9
Maximum number of abbreviated dial numbers	1000
Maximum number *SUPERSET*® Speed Dial numbers	2212
Maximum number of trunk buffers for SMDR	75
Maximum number of abbreviated dial numbers per station that may be stored	26
Maximum number of *SUPERSET 3*™ and *SUPERSET 4*™ telephones	
336-port configuration	78
480-port configuration	158
456-port configuration	118
672-port configuration	162

TABLE 2-I (CONT'D)
FEATURE LIMITATIONS

Maximum number of SUPERSET 3™DN and SUPERSET 4™DN telephones	
336-port configuration	326
480-port configuration	132
456-port configuration	228
672-port configuration	400
Maximum number of lines (456- and 480-port systems)	400
Maximum number of lines (672-port systems)	*500
Maximum number of T1 Trunks	
336-port configuration	4
480-port configuration	3
456-port configuration	2
672-port configuration	7

* This is not recommended for high traffic applications.

3. SYSTEM OVERVIEW

General

3.01 The SX-200 DIGITAL PABX employs digitally controlled solid-state, space and time division switching with stored-program control. Depending on system configuration, the SX-200 DIGITAL PABX can be either a one or two cabinet system. The system is available in four variants 456-port, 480-port, 336-port (fully digital), and 672-port (fully digital).

The maximum quantities of trunk and line cards which can be accommodated in each configuration are illustrated in Figures 3-l to 3-4.

All configurations are compatible with most existing station, key telephone, private branch exchange, central office equipment and provide:

- use of a flexible numbering plan
- simultaneous use of DTMF and rotary dial stations
- optional use of attendant consoles
- extensive selection of standard and optional features
- data port facility for traffic analysis and other requirements
- automatic diagnostics
- six to 36 power fail transfer trunks
- optional reserve power supply or UPS
- *SUPERSET 3*™ telephone
- *SUPERSET 4*® telephone
- *SUPERSET 3*™DN telephone
- *SUPERSET 4*™DN telephone
- DATASET 1100 Series.

Maintenance

3.02 Modular design and functional packaging of the equipment permits rapid location and replacement of defective components. Circuit malfunctions are detected by diagnostic routines automatically initiated by the Main Control Card (MCC). Diagnostic routines, detailed in Section MITL9109-094-353-NA, General Maintenance Information, and Section MITL9109-094-350-NA, Troubleshooting, direct service personnel to the defective circuit card or assembly, and identify the required field-replaceable unit. Diagnostic routines and maintenance procedures do not interfere with users unaffected by the malfunction.

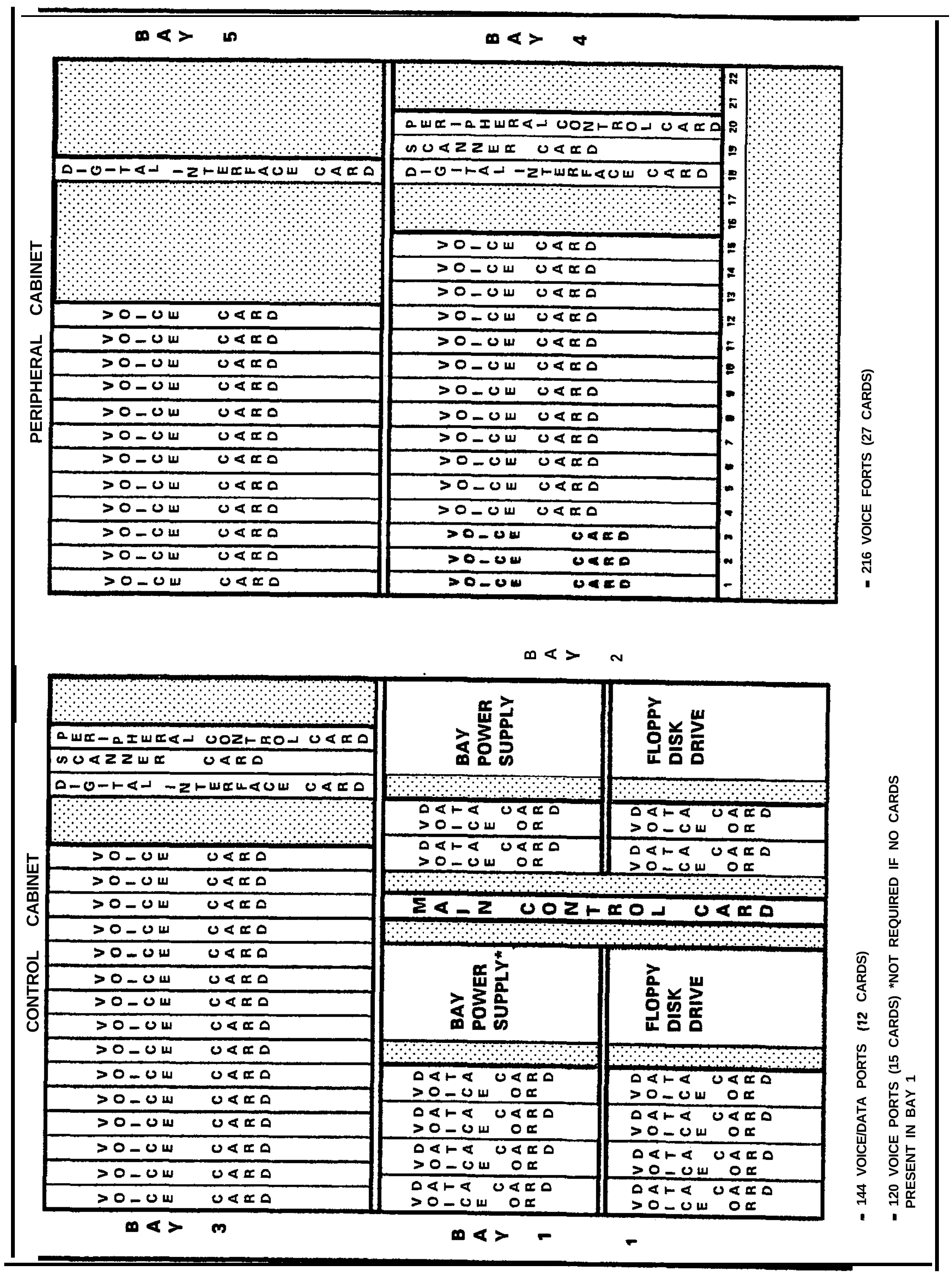

Figure 3-1 SX-200 DIGITAL PABX Bay and Slot Assignment - 480-Port Configuration

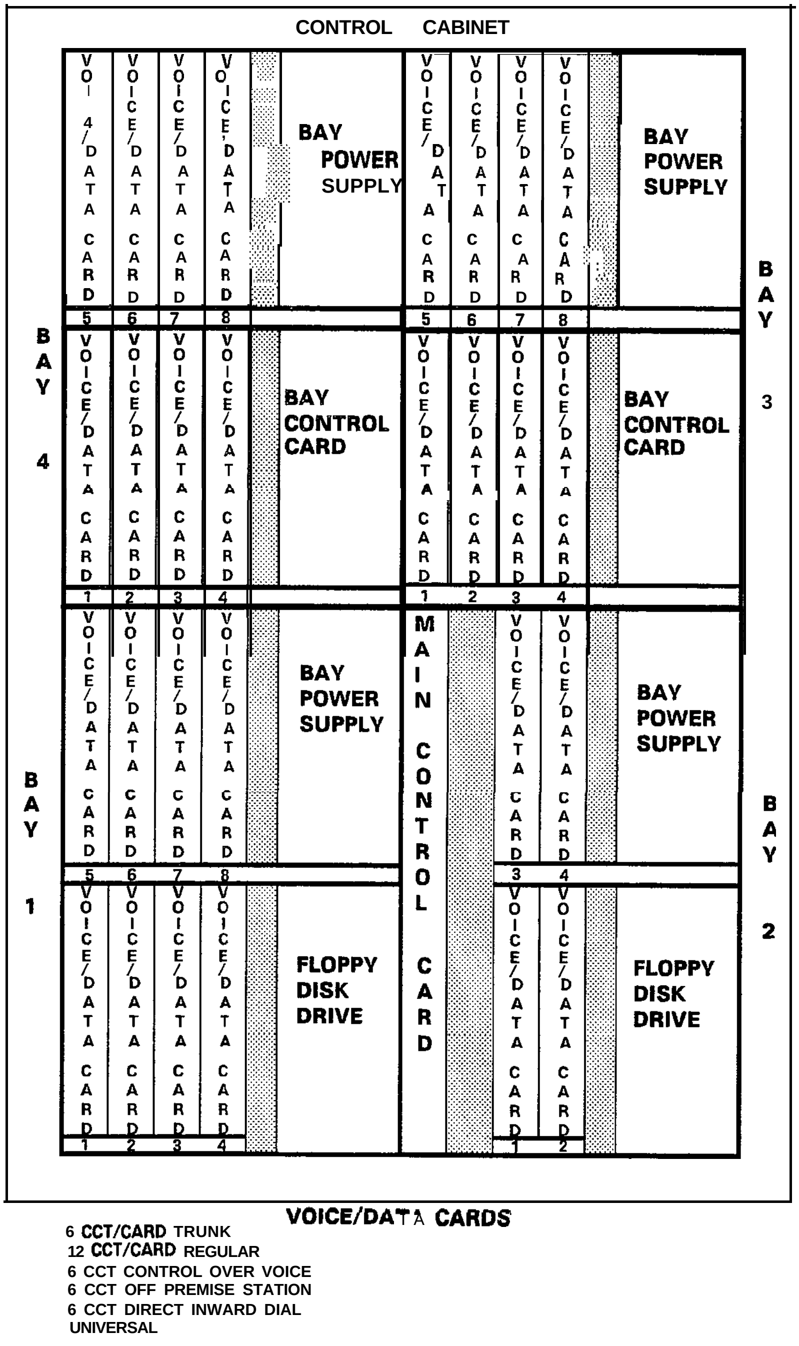

Figure 3-2 SX-200 DIGITAL PABX Bay and Slot Assignment - 336-Port Configuration

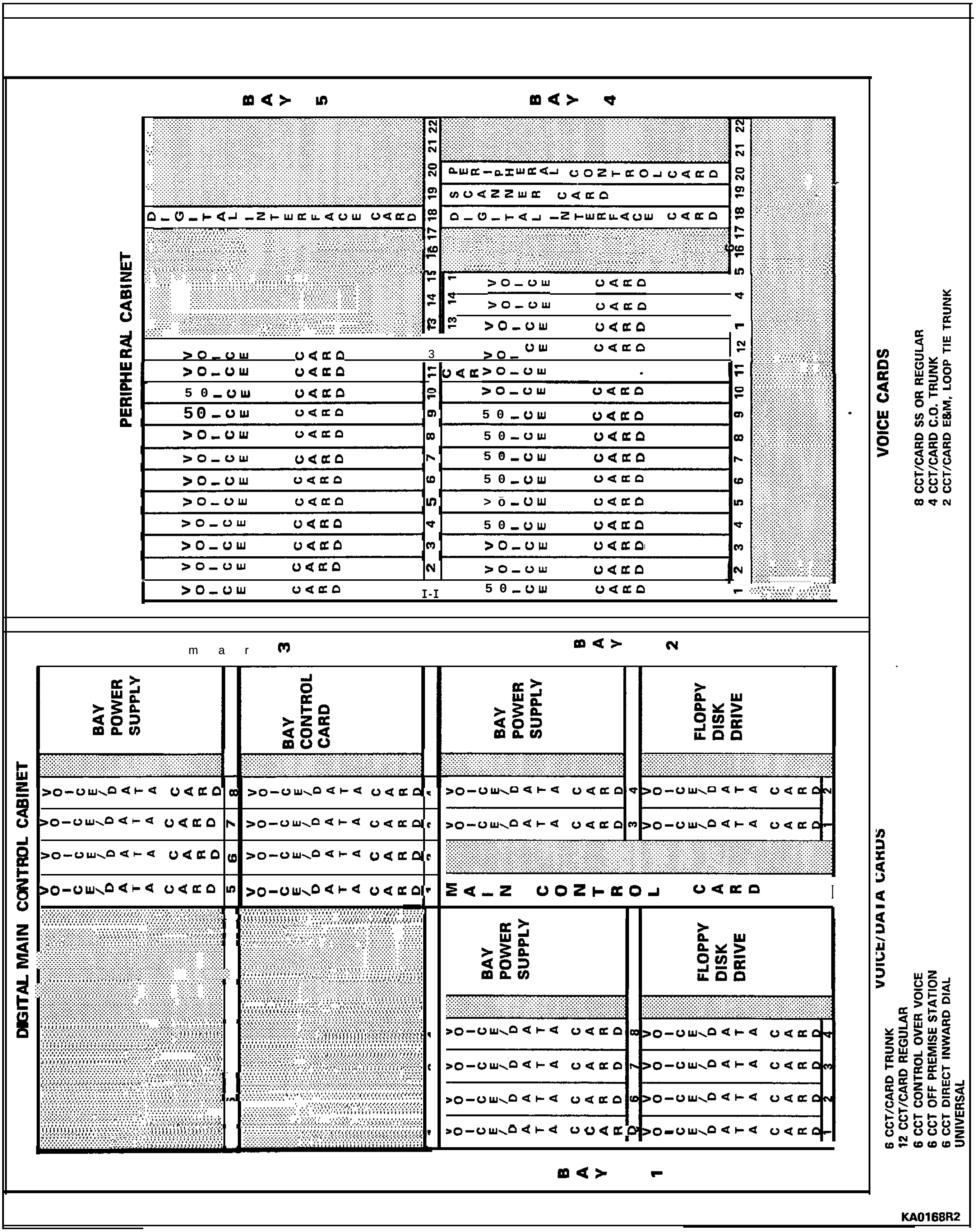

Figure 3-3 SX-200 DIGITAL PABX Bay and Slot Assignment - 456-Port Configuration

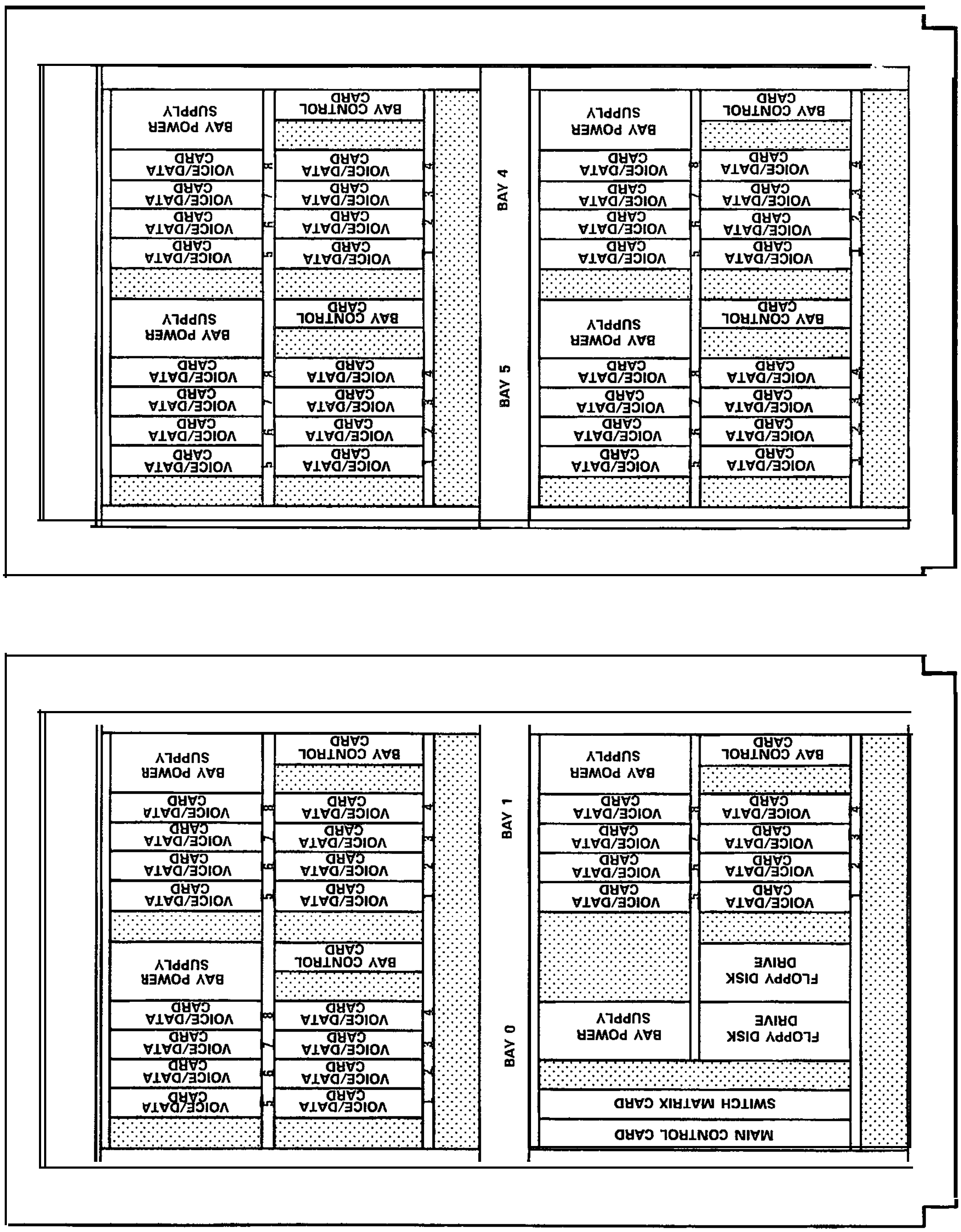

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Figure 3-4 SX-200 DIGITAL PABX Bay and Slot Assignment - 672-Port Configuration

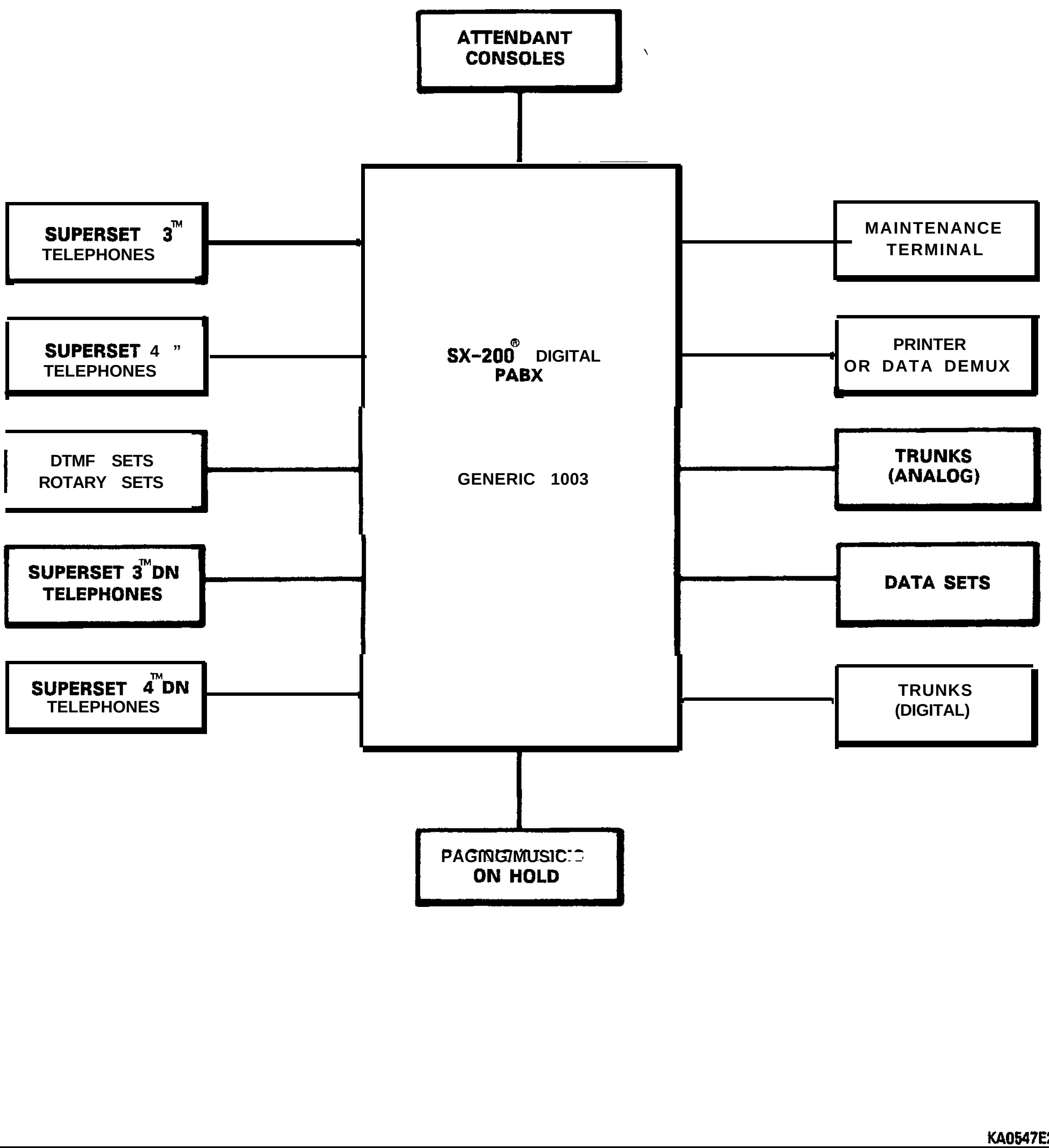

Figure 3-5 SX-200 DIGITAL PABX Peripherals

4. PHYSICAL DESCRIPTION

Cabinets

4.01 Each metal equipment cabinet (refer to Figures 4-l through Figure 4-6) has the following dimensions:

height - 965 mm (38 in.)
width - 600 mm (23.5 in.)
depth - 700 mm (27.5 in.).
weight - approximately 230 kg (500 lb) fully equipped.

4.02 The SX-200 DIGITAL PABX consists of a Control cabinet and an optional Peripheral cabinet.

Control Cabinet (480-, 336-, and 456- port Configurations)

4.03 The Control Cabinet for the 480-, 336-, and 456- port configurations contains a 144 port digital Control shelf with Bay 1 and Bay 2 in the lower position. Its Floppy Disk Drive plugs directly into the backplane, and its Main Control Card directly controls up to three 6-circuit Power Fail Transfer cards. Access to control and peripheral cards is through the front door of the cabinet. The rear door allows access to line, trunk, and PCM cable connections, and to PFT cards.

The SX-200 DIGITAL PABX 480-port configuration Control cabinet (refer to Figure 4-1 and Figure 4-2) includes a 120-port analog shelf (Bay 3) above the 144 port Control shelf; an optional 216-port Peripheral cabinet (analog Bays 4 and 5) may be connected to the Control cabinet. The 480-port Control cabinet may also be installed into a welded Control cabinet.

The SX-200 DIGITAL PABX 336-port configuration Control cabinet (Figure 4-3) includes a digital shelf (Bays 3 and 4, 96 ports each) above the 144 port Control shelf. Bays 3 and 4 are similar to Bay 1, except each also has a Bay Control Card. The Bay 4 backplane does not have to be added concurrently with the shelf and Bay 3 backplane. The 336-port configuration is a single cabinet system; it cannot have a Peripheral cabinet. Refer to Figure 4-3.

The SX-200 DIGITAL PABX 456-port configuration Control cabinet includes a digital shelf (Bay 3 only, 96 ports) above the 144 port Control shelf; an optional 216-port Peripheral Cabinet (analog Bays 4 and 5) may be connected to the Control cabinet.

Analog Peripheral Cabinet (456-and 480-port configurations only)

4.04 The SX-200 DIGITAL PABX analog peripheral cabinet contains a 120-port analog shelf (Bay 4) and an optional 96-port upper analog shelf (Bay 5) which are connected to and controlled by the Control shelf through the PCM cable and the Digital Interface Card. Refer to Figure 4-4.

672-Port Control Cabinet

4.05 The Control cabinet of the SX-200 DIGITAL 672-port configuration, shown in Figure 4-5, contains the Control shelf, Bay 0 in the lower left position, Bay 1 on the lower right and Bays 2 and 3 in the upper shelf. The Control cabinet supports up to three 6-circuit power'fail transfer cards.

672-Port Peripheral Cabinet

4.06 The SX-200 DIGITAL PABX 672-port optional Peripheral cabinet (shown in Figure 4-6) consists of 4 digital bays (4-7), 96 ports per bay. Each bay is connected to and controlled by Bay 0 in the Control shelf. The 672-Port Peripheral cabinet also supports three 6-circuit power fail transfer cards, for a system total of 36 PFT circuits.

4.07 The SX-200 DIGITAL PABX 672-port configuration may be created by converting an installed 336-port Control cabinet to a Peripheral cabinet and adding a new 672-port Control cabinet.

Maintenance Panels

4.08 Two Maintenance Panels are provided. The Control Cabinet Maintenance Panel consists of connections for a maintenance Attendant Console, a maintenance terminal, and power fail transfer switches. The remote maintenance terminal port connector is located at the lower rear of the cabinet near the cable entry. The Peripheral Cabinet Maintenance Panel is not functional, with the exception of the POWER switch, and the PFT POWER SUPPLY, COMMON CONTROL and MASTER SWITCH switches. The 672-port Peripheral cabinet does not have a Maintenance panel.

Connections

4.09 All connections from the cross-connecting terminals to the equipment cabinets are made using connectorized cables. Connections between the cross-connecting terminals and external equipment are made in accordance with accepted practice. Section MITL9109-094-200-NA, Shipping, Receiving, Installation provides details for interconnection of cables.

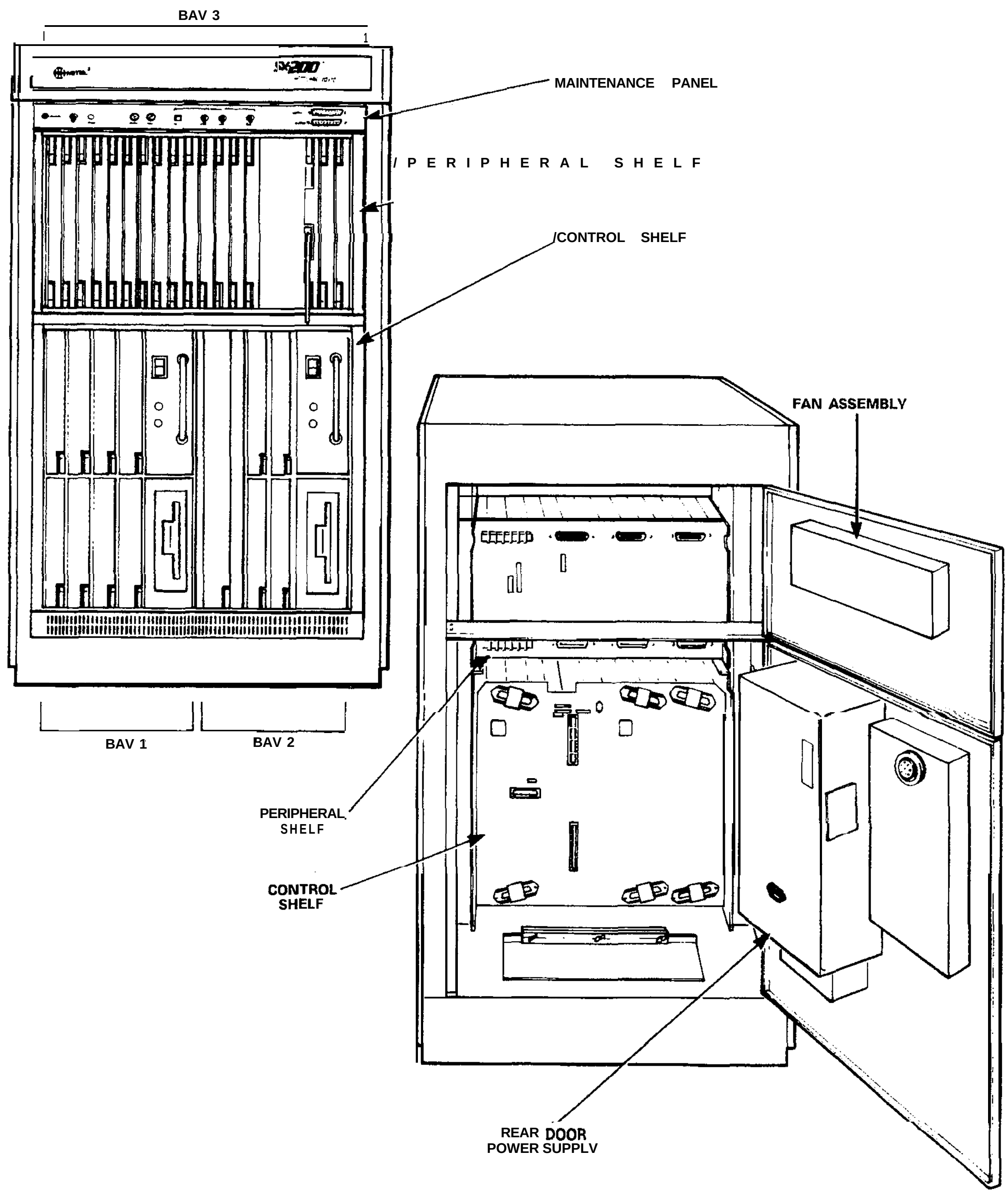

Figure 4-l Control Cabinet

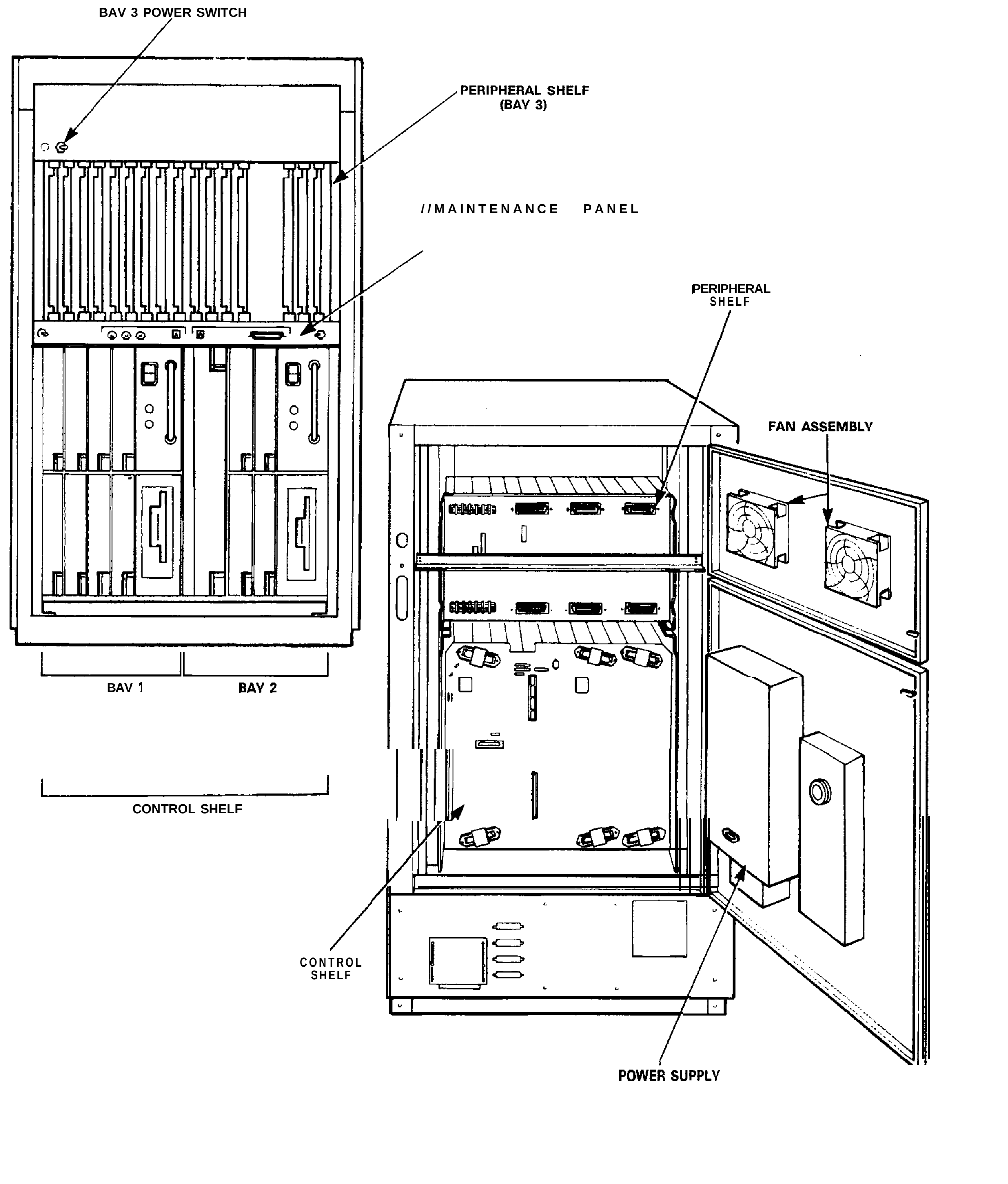

Figure 4-2 Universal Cabinet with Peripheral Bay

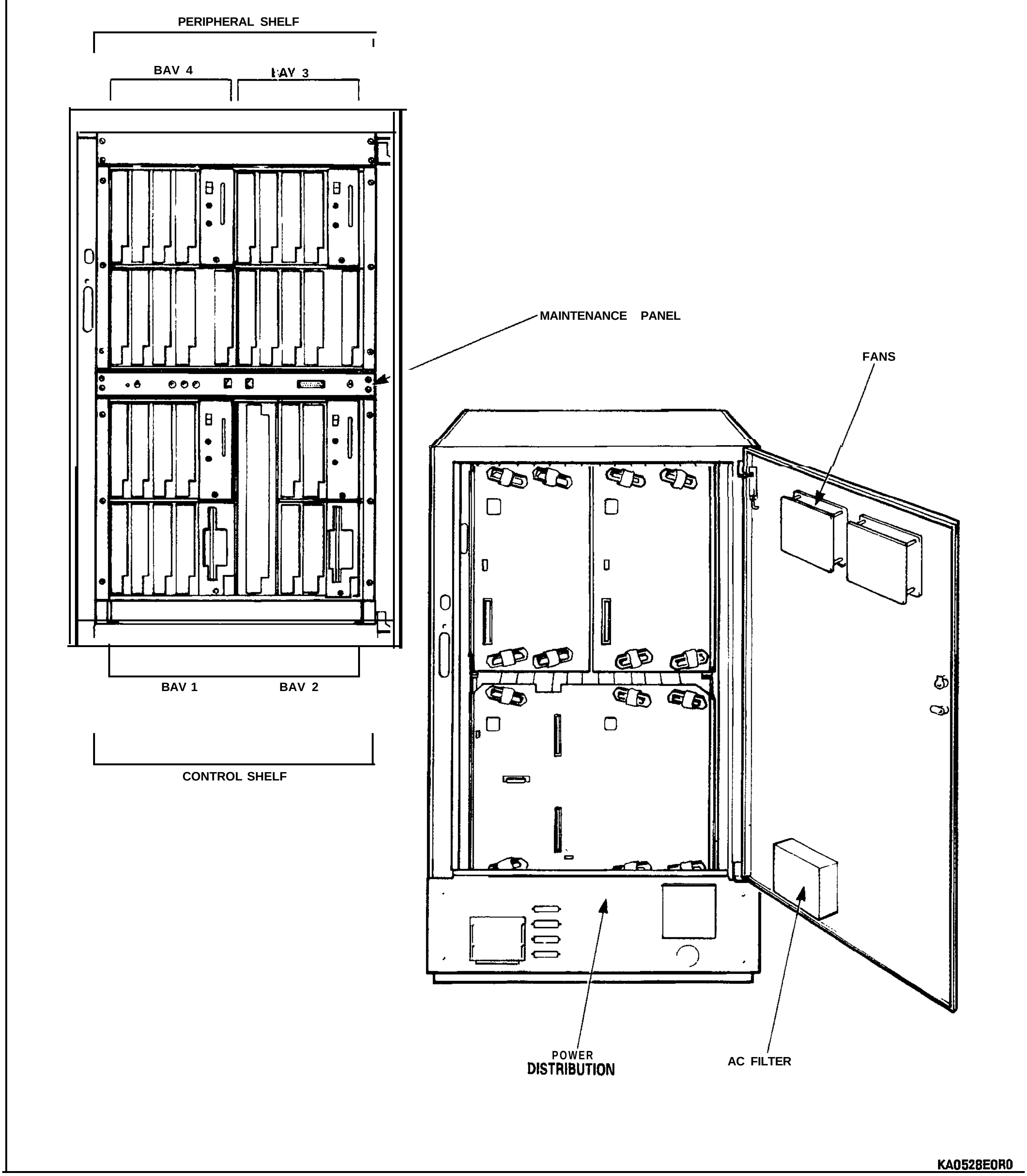

Figure 4-3 Universal Cabinet with **Digital Peripheral Bays**

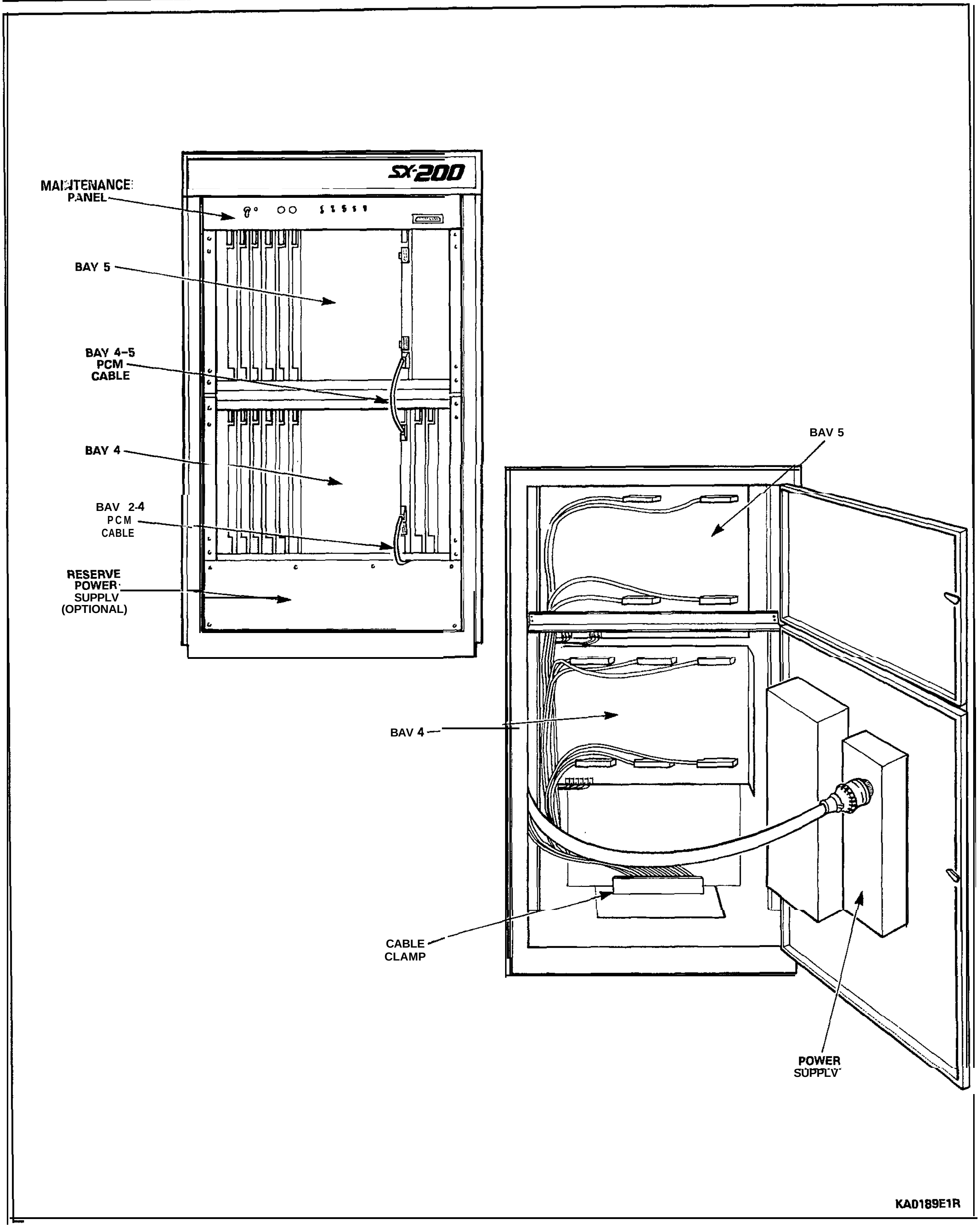

Figure 4-4 Peripheral Cabinet

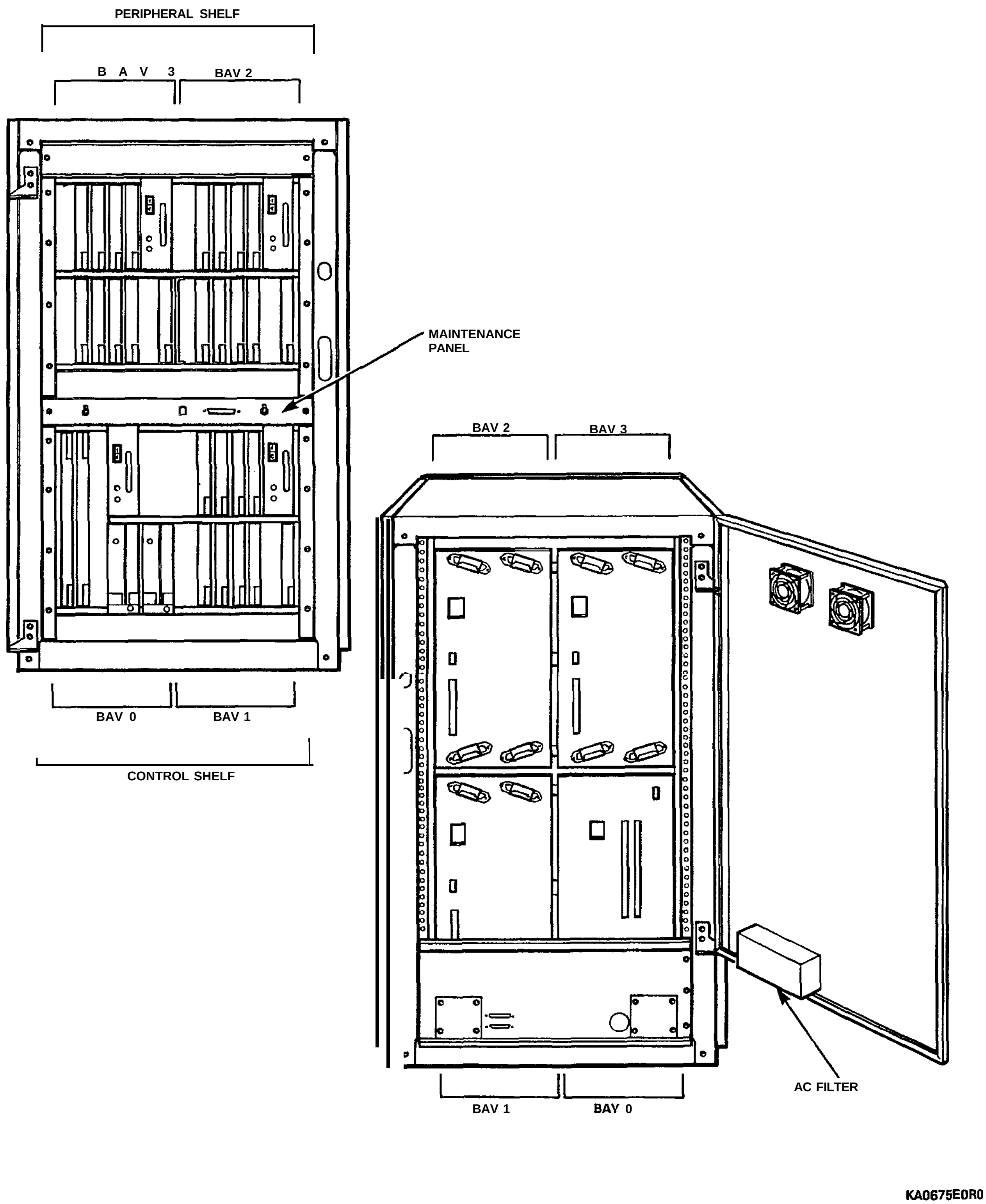

Figure 4-5 Control Cabinet 672-Port Configuration

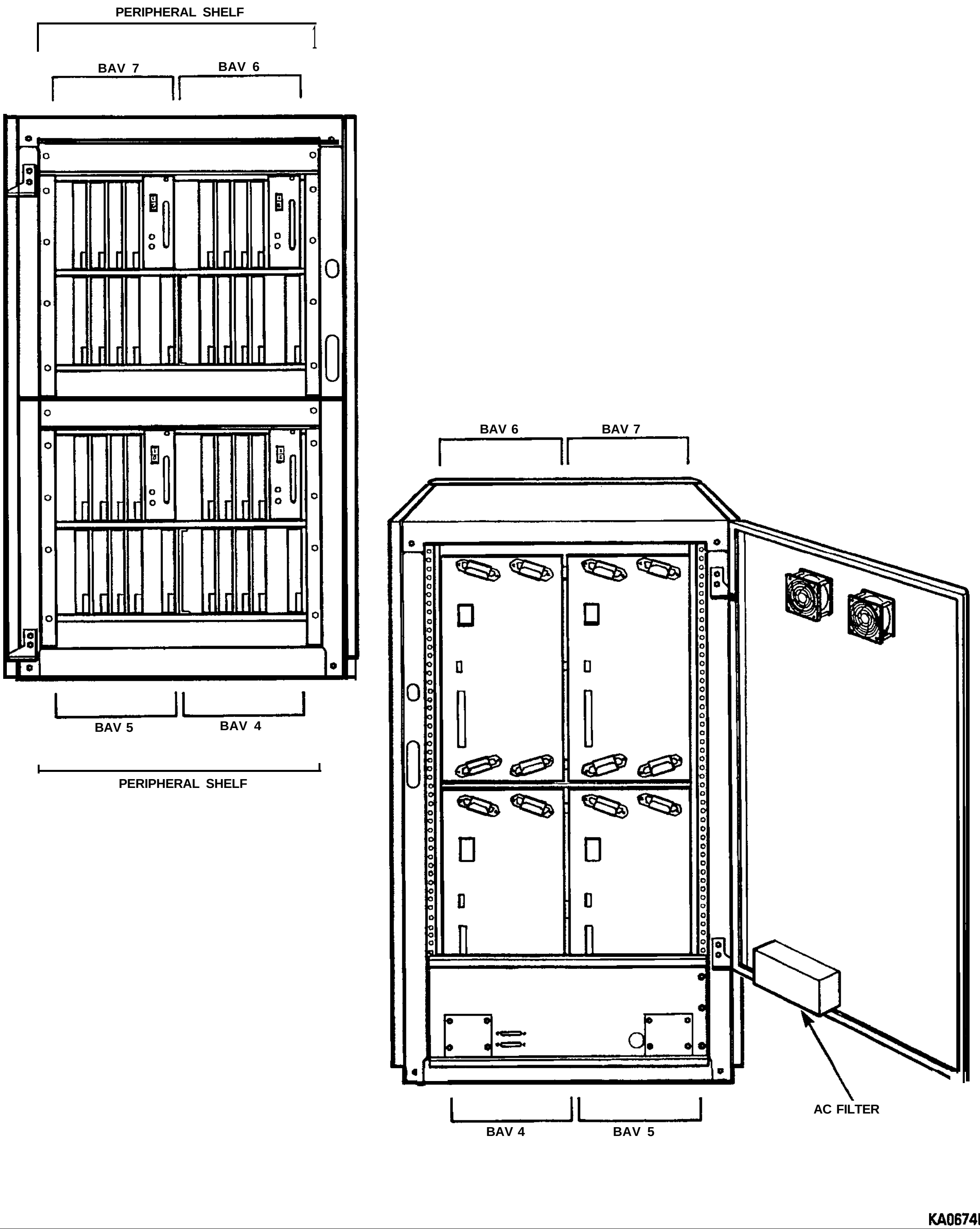

Figure 4-6 Peripheral Cabinet 672-Port Configuraton

5. CONFIGURATIONS

General

5.01 The following paragraphs describe the various configurations, equipment bays, and associated cards available with SX-200 DIGITAL PABX. Each variant, can be expanded modularly from a basic to a full configuration.

480-Port Configuration

5.02 The 480-port system is available in six different configurations. The Control cabinet for the 480-port variant is created by installing a 120-port shelf (Bay 3) above the Control shelf. An optional 216-port Peripheral cabinet (Bays 4 and 5) can be connected to the PABX. The Configurations are:

Bays 1, 2	Control shelf (digital) only (single cabinet)
Bays 1, 2, 3	Control shelf plus Peripheral shelf (single cabinet)
Bays 1, 2, 4	Control shelf and lower shelf of Peripheral cabinet
Bays 1, 2, 4, 5	Control shelf and both shelves of Peripheral cabinet
Bays 1, 2, 3, 4	Control shelf plus Peripheral shelf, and lower shelf of Peripheral cabinet
Bays 1, 2, 3, 4, 5	Control shelf plus Peripheral shelf, and both shelves of Peripheral cabinet

The maximum ports available for each variant are:

Bay	Available Channels		Max DNIC Ports	Non Block Data	Maximum DNIC Cards		Additional Non DNIC Ports Available (If dual DNIC used)	Maximum Ports
	MOH				Dual	Single		
1	124	126	144	144	6	12	72	216
2	62	63						
3	31	31	0	0	0	0	120	120
4	31	31	0	0	0	0	120	120
5	31	31	0	0	0	0	96	96
TOT:	279	282	144	144	6	12	408	552

- 200 Maximum Simultaneous calls
- 282 Maximum Non-Blocking Channels available if music on hold is NOT programmed (refer to paragraph 5.10)
- 144 Maximum DNIC Ports (Voice or Data)
- 552 Maximum ports available depending on card densities (refer to paragraph 5.11)

- **72 x 72 Data Users to Host in a 1 to 1 Non Blocking configuration**
- 96 x 48 Data Users to Host in a 2 to 1 configuration.

5.03 *SX-200* 480-Port Equipment - The SX-200 480-port configuration can be equipped as follows:

Bay	Control Card(s)	Optional Peripheral Cards
2	MCC, BPS, FDD	ONS, LS/GS, Universal, COV, DID, T1, OPS, DLC (up to 04)
1	BPS, FDD	ONS, LS/GS, Universal, COV, DID, T1, OPS, DLC (up to 08)
3	DIC, PCC, Scanner	CO Trk, Line, *SUPERSET* , E&M Trk, DID/Tie (up to 15)
4	DIC, PCC, Scanner	CO Trk, Line, SUPERSET, E&M Trk, DID/Tie (up to 15)
5	DIC	CO Trk, Line, *SUPERSET* , E&M Trk, DID/Tie (up to 12)

Note: Each bay in use must have all its Control cards present Peripheral cards are installed as required.

456-Port Configuration

5.04 The 456-port system is also available in six different configurations. The Control cabinet for the 456-Port variant is created by installing a 96-port digital shelf (Bay 3) above the Control shelf and adding a 216-port Peripheral cabinet to the Control Cabinet. The configurations are:

Bays 1, 2	Control shelf (digital) only (single cabinet)
Bays 1, 2, 3	Control shelf plus one digital Peripheral Bay
Bays 1, 2, 4	Control shelf and lower shelf of Peripheral cabinet
Bays 1, 2, 4, 5	Control shelf and both shelves of Peripheral cabinet
Bays 1, 2, 3, 4	Control shelf plus digital Peripheral bay and lower shelf of Peripheral cabinet
Bays 1, 2, 3, 4, 5	Control shelf plus digital Peripheral bay and both shelves of Peripheral cabinet

The maximum ports available for each configuration are:

Bay	Available Channels		Max DNIC Ports	Non Block Data	Maximum DNIC Cards		Additional Non DNIC Ports Available	Maximum Ports
	MOH				Dual	Single	(If dual DNIC used)	
1	124	126	144	144	6	12	72	216
2	62	63						
3	90	91	96	91	4	8	48	144
4	31	31	0	0	0	0	120	120
5	31	31	0	0	0	0	96	96
TOT:	338	342	240	235	IO	20	336	576

- 200 Maximum Simultaneous calls

- 342 Maximum Non-Blocking Channels available if music on hold is NOT programmed (refer to paragraph 5.10)
- 240 Maximum DNIC Ports (Voice or Data)
- 576 Maximum ports available depending on card densities (refer to paragraph 5.11)
- 117 x 117 Data Users to Host ports in a 1 to 1 Non Blocking configuration
- 160 x 80 Data Users to Host ports in a 2 to 1 configuration

5.05 **SX-200 456-Port Equipment** - The SX-200 456-port configuration can be equipped as follows:

Bay	Control Card(s)	Optional Peripheral Cards
2	MCC, BPS, FDD	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 04)
1	BPS, FDD	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
3	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
4	DIC, PCC, Scanner	CO Trk, Line, SUPERSET, E&M Trk, DID/Tie (up to 15)
5	DIC	CO Trk, Line, SUPERSET, E&M Trk, DID/Tie (up to 12)

Notes: Each bay in use must have all its Control cards present. Peripheral cards are installed as required.

336-Port Configuration

5.06 The 336-port configuration is completely digital and consists of one cabinet. The Control Cabinet for the 336-port system is created by installing a 192-port digital shelf (Bays 3 and 4) above the Control shelf. The configurations are as follows:

Bays 1, 2	Control shelf (digital)
Bays 1, 2, 3	Control shelf plus one digital Peripheral Bay
Bays 1, 2, 3, 4	Control shelf plus two digital Peripheral Bays

The maximum ports available for each variant are:

Bay	Available Channels		Max DNIC Ports	Non Block Data	Maximum DNIC Cards		Additional Non DNIC Ports Available (If dual DNIC used)	Maximum Ports
	MOH				Dual	Single		
1	124	126	144	144	6	12	72	216
2	62	63						
3	90	91	96	91	4	8	48	144
4	90	91	96	91	4	8	48	144
TOT:	366	371	336	326	14	28	168	504

- 200 Maximum Simultaneous calls

- 371 Maximum Non-Blocking Channels available if music on hold is NOT programmed (refer to paragraph 5.10)
- 336 Maximum DNIC Ports (Voice or Data).
- 504 Maximum ports available depending on card densities (refer to paragraph 5.11)
- 163 x 163 Data Users to Host in a 1 to 1 Non Blocking configuration.
- 224 x 112 Data Users to Host ports in a 2 to 1 configuration.

5.07 **SX-200** 336-Port Equipment - If a digital shelf is added to the Universal Cabinet, the SX-200 336-port configuration can be equipped as follows:

Bay	Control Card(s)	Optional Peripheral Cards
2	MCC, BPS, FDD	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 04)
1	BPS, FDD	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
3	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
4	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)

Note: Each bay in use must have all its Control cards present. Peripheral cards are installed as required.

672-Port Configuration

5.08 The 672-port configuration, requires the creation of a new Control cabinet, consisting of Control Bay 0 and three digital peripheral bays (96 ports per bay). A Digital Peripheral Cabinet with 384-ports can be connected to the PABX.

Bays 0, 1	Control shelf plus one digital Peripheral Bay
Bays 0, 1, 2	Control shelf plus two digital Peripheral Bays
Bays 0, 1, 2, 3	Control shelf plus three digital Peripheral Bays
Bays 0, 1, 2, 3, 4	Control shelf plus four digital Peripheral Bays
Bays 0, 1, 2, 3, 4, 5	Control shelf plus five digital Peripheral Bays
Bays 0, 1, 2, 3, 4, 5, 6	Control shelf plus six digital Peripheral Bays
Bays 0, 1, 2, 3, 4, 5, 6, 7	Control shelf plus seven digital Peripheral Bays

The maximum number of ports available for each configuration is:

Bay	Available Channels		Max DNIC Ports	Non Block Data	Maximum DNIC Cards		Additional Non DNIC Ports Available (If dual DNIC used)	Maximum Ports
	MOH				Dual	Single		
1	90	91	96	91	4	8	48	144
2	90	91	96	91	4	8	48	144
3	90	91	96	91	4	8	48	144
4	90	91	96	91	4	8	48	144
5	90	91	96	91	4	8	48	144
6	90	91	96	91	4	8	48	144
7	90	91	96	91	4	8	48	144
TOT:	630	637	672	637	28	56	336	1008

- 248 Maximum Simultaneous calls
- 637 Maximum Non-Blocking Channels available if music on hold is NOT programmed

Assuming a maximum 96 DNIC ports per bay:

- 672 Maximum DNIC Ports (Voice or Data)
- 400 Maximum DNIC Voice Ports
- 1008 Maximum ports available depending on card densities.
- 248 x 248 Data Users to Host in a 1 to 1 Non Blocking configuration (32 Digital Line Cards)
- 448 x 224 Data Users to Host in a 2 to 1 configuration. (47 Digital Line Cards)

Assuming no restrictions on Digital Line Cards:

- 1344 Maximum DNIC Ports (Voice and Data).
- 400 Maximum DNIC Voice Ports (no COV or ONS ports)
- 1344 Maximum ports available depending on card densities
- 248 x 248 Data Users to Host in a 1 to 1 Non Blocking configuration (32 Digital Line Cards)
- 496 x 248 Data Users to Host in a 2 to 1 configuration 52 Digital Line Cards)
- 576 x 192 Data Users to Host in a 3 to 1 configuration. 56 Digital Line Cards)

5.09 The 672-port configuration can be equipped as follows:

Bay	Control Cards	Optional Peripheral Cards
0	SMC, MCC, BPS, 2 FDD	none
1	BPS, BCC,	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
2	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
3	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
4	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
5	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
6	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)
7	BPS, BCC	ONS, LS/GS, Universal, COV, DID, OPS, DLC, T1 (up to 08)

5.10 The upper and lower digital bay shelves have 32 dedicated channels each, with an additional 26 shared channels between them. This adds up to a total of 90 channels. Digital Line Cards, programmed for data, should be evenly distributed between the upper and lower shelf to maximize the non-blocking channels available. For example, if four Digital Line Cards programmed for Rack Mounted DATASET 1102s were placed in the upper shelf of a digital bay, only (32 + 26) 58 channels are available. If-the cards were evenly distributed, the upper and lower bay would be able to utilize all 90 channels effectively, therefore reducing the blocking probability.

The same consideration for bays 1 and 2 must be made. There are only 62 channels going to each of upper bay 1, lower bay 1 and bay 2.

5.11 The Card Densities allowed for the following card types are:

Maximum density non-DNIC digital card:	12 ports
Maximum density DNIC digital card:	24 ports
Maximum density analog card:	8 ports

6. CIRCUIT CARDS

Printed Circuit Cards

6.01 All circuit cards (refer to Figures 6-l and 6-2) within the PABX consist of an epoxy-fibreglass board with printed wiring patterns on both sides. A transparent faceplate allows the LEDs mounted on the front of the boards to be easily seen. The digital bay cards have a single extractor located at the bottom of each card, while the analog bay cards have colour-coded card extractors located at the top and bottom of the faceplate. The extractors ensure that the card is seated correctly in the backplane connector; the coloured extractors identify the card position within an analog bay.

On the faceplate of each digital peripheral card a power symbol designates the card as a High or Low Power card. A low Power card (round symbol on faceplate) can be installed in any peripheral card slot. A High power card (square symbol on faceplate) must be installed in an upper peripheral card slot.

HIGH POWER CARDS	LOW POWER CARDS
Universal Card	ONS Line Card
COV Line Card	LS/GS Trunk Card
OPS Line Card	DLC (Digital Line Card)
DID Trunk Card	
T1 Trunk Card	

Printed Circuit Card Distribution

6.02 When assigning printed circuit cards within the card shelves, observe the following guidelines. Add additional trunks to the Control shelf and distribute existing trunks evenly across the Peripheral shelves; with this method most trunk calls will require only one speech path for completion. Place Direct-In Line (DIL) trunks in the same analog Bay (3, 4, 5) as the extension(s) to which they ring. The following lists the card types used:

Card Type	Description
MCC	Main Control Card
SMC	Switch Matrix Card
BPS	Bay Power Supply
FDD	Floppy Disk Drive
DIC	Digital Interface Card
PCC	Peripheral Control Card
Scanner	Scanner Card
ONS	On-Premise Line Card (12 circuit)
LS/GS	Loop Start/Ground Start CO Trunk Card (6 circuit)
Universal	Universal Card (accepts up to four modules)
DID	Direct Inward Dial Trunk Card (6 circuit)
OPS	Off-premises Line Card (6 circuit)
cov	Control Over Voice Line Card (6 circuit) (for *SUPERSET* telephones)

DLC	Digital Line Card (12 circuit)
CO Trk	CO Trunk Card (4 circuit)
Line	Line Card (8 circuit)
SUPERSEJ	SUPERSEJ telephone Line Card (8 circuit)
E&M Trk	E&M Trunk Card (2 circuit)
DID/Tie	Direct Inward Dial or Tie Trunk (2 circuit)
T1	Digital Trunk card (24 channels)

Digital Cards

6.03 Except for the Main Control card, and the Switch Matrix card each card in the Control shelf interfaces the system to 12 pairs of wires, which can be cross-connected at the distribution frame. A brief description of each digital card type is given below:

Switch Matrix Card (SMC) - The SMC (installed in Bay 0) is required for a 672-port configuration. It is used to expand the DX switching matrix, and signal processing resources provided by the DSP. The DX module must be removed from the MCC when the SMC is present. Refer to Note 1.

Main Control Card (MCC) - The MCC performs call processing and maintains overall control through communication with the Bay Control card or Peripheral Control card in each bay. The architecture of the Main Control card depends on system configuration. In a 672-Port system, some functions normally performed by the MCC are controlled through the Switch Matrix card (the DX module is removed from the MCC in a 672-port configuration). Refer to Note 1.

Bay Control Card (BCC) - The BCC interfaces the peripheral cards of digital bays to the MCC (one for each bay). It controls and monitors the status of lines, trunks and other circuits within the bays. This card is installed in the lower right of digital bays. Refer to Note 1.

On-Premises Line Card (ONS) - The ONS contains 12 digital line circuits to interface with analog stations located within the same building as the DIGITAL PABX. This is a low power card and can be installed in any digital peripheral slot.

LS/GS Trunk Card - The CO Trunk card provides six digital circuits to interface between the Digital PABX and an analog CO. Switches on the card can be individually set allowing these trunks to operate as Loop Start or Ground Start (see Section MITL9109-094-125-NA).

COV Line Card - The COV line card provides six SUPERSEJ line circuits which serve as digital "control-over-voice" interfaces between analog SUPERSEJ telephones and the PABX. The COV card is a high power card and must be installed in an upper slot of a digital bay.

Off Premise (OPS) Line Card - The OPS Line Card (six circuits per card) interfaces the PABX to extensions which are located in a different building.

DID Trunk Card - Provides six, one-way Direct inward Dial circuits. The DID trunk allows incoming trunk calls to dial directly to an extension within the PABX. This card is a high power card and plugs into any upper digital slot.

Digital Line Card (DLC) - Through its 12 Digital Network Interface Circuits (DNIC), the Digital Line Card interfaces digital *SUPERSET* telephones, DATASETs, and the DNIC console to the PABX. Each device connected to a Digital Line Card must also contain a DNIC circuit. Although the DLC is a low power card, consoles must not be connected to it when it is positioned in a lower peripheral card slot. When it is installed in a high power slot, a maximum of 4 consoles and 8 digital sets can be connected to the DLC card.

T1 Trunk Card - The T1 trunk card provides an interface to one 24 channel (DS-1 format) trunk. It is recommended to assign one T1 trunk card per digital bay. The T1 trunk card is designated as a high power card, and must be positioned in slot 6 of a peripheral bay (slot 4 of COMBO Bay 2).

Universal Card - The Universal card can accommodate four modules for special features required by the system. Each module is assigned a power rating; the sum of power ratings per card cannot exceed 10. Each module provides an interface between the backplane and three line pairs. The modules and their power ratings are as follows:

- Console Interface Module - Interfaces one LCD Attendant console to the PABX and has a power rating of 5.

- Receiver/Relay Module (4 DTMF Receivers and 2 Relays per module) and has a power rating of 2.

- E&M Trunk Module - Provides digital interfacing between the *SX-200* DIGITAL PABX and other PBXs, analog Toll Offices, or any other analog equipment, which require special signaling. It has a power rating of 3.

- Music on Hold/Paging Module - Provides one music input, one paging output and a control relay, typically for an external paging amplifier. It has a power rating of 1.

Analog Cards

6.04 A brief description of each analog peripheral card and analog control card is given below; each analog peripheral card interfaces the system to eight pairs:

8-Station Line Card - The 8 station line card can interface up to eight DTMF/rotary stations in analog bays. *SUPERSET* telephones can not be used with this line card.

***SUPERSET* Line Card -** The *SUPERSET* line card interfaces up to eight *SUPERSET* 3 and *SUPERSET* 4 telephones. Standard telephone sets and digital *SUPERSET* telephones cannot be used with this line card.

CO Trunk Card - The CO trunk card provides 4 interfaces for use between the Central Office and the SX-200 DIGITAL PABX (loop or ground start CO trunks).

E & M Trunk Card - The E&M trunk card provides 2 E&M interface circuits between the SX-200 DIGITAL PABX and another PBX or analog Toll Offices, or any other analog equipment which requires special signaling.

DID/Loop Tie Trunk Card - This trunk card provides 2 interfaces for Direct Inward Dialing and other dial-in lines to the SX-200 DIGITAL PABX.

Digital Interface Card (DIC) - The Digital interface card interfaces the analog shelf to the Main Control Card. It is installed in slot 18 of an analog peripheral shelf. Refer to Note 1.

Scanner Card - The Scanner card sequentially scans all ports to detect signals which require processor action in the analog peripheral bays. Refer to Note 1.

Peripheral Control Card (PCC) - The PCC card controls the analog cards on instructions from the Main Control Card. It is installed in slot 20 of an analog bay. Refer to Note 1.

Note **1:** This card must not be installed or removed with system power on. Damage to circuitry and/or loss of customer programmed data may result.

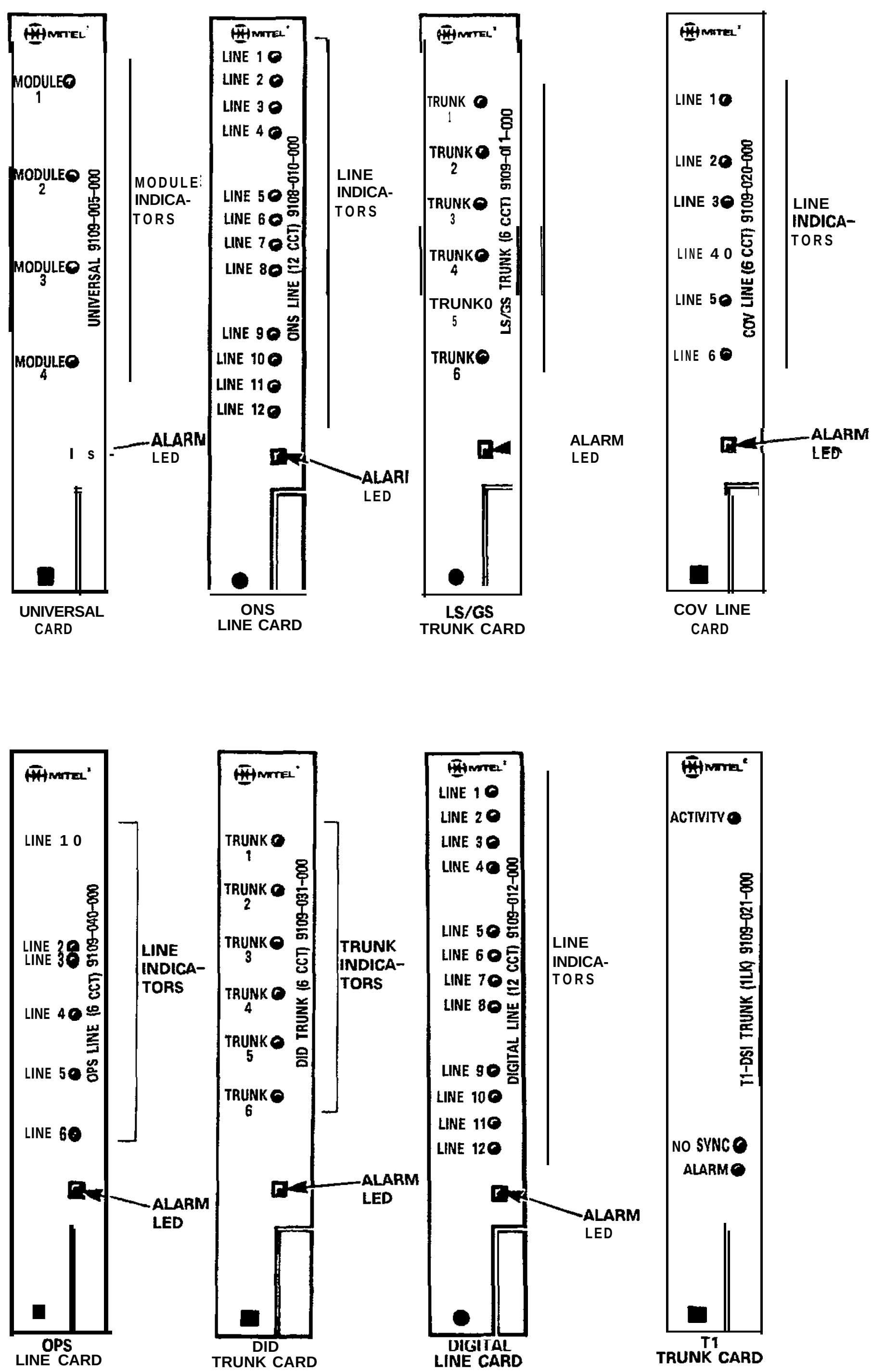

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Figure 6-l SX-200 DIGITAL Peripheral Cards (Digital Bay)

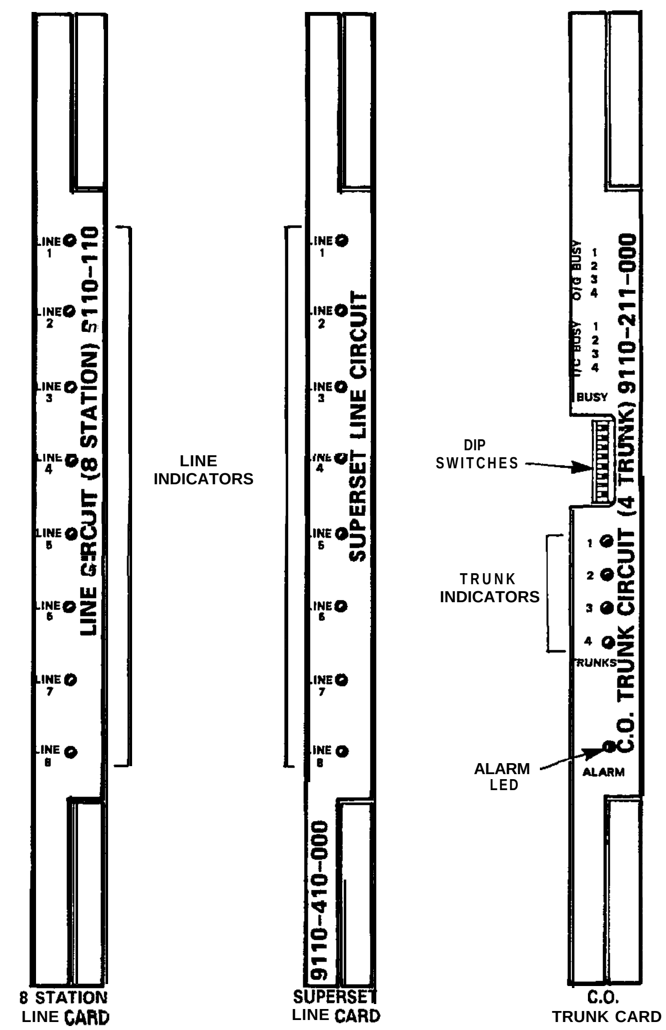

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Figure 6-2 SX-200 DIGITAL Peripheral Cards (Analog Bay)

7. PROGRAMMING AND CUSTOMER DATA ENTRY

General

7.01 The features described in Section MITL9109-094-105-NA are enabled or disabled as required during CDE. Any subsequent changes to the original data can be entered from the customer's Attendant Console or Maintenance Terminal. Full details of programming procedures are outlined in Section MITL9109-094-210-NA, Customer Data Entry.

Initial Loading

7.02 Basic programming is accomplished by loading the system software from a floppy disk. The particular version of the system software determines the "generic" level, of a system. The disk is controlled by the system main processor, located on the Main Control Card. Upon a system reset, the processor runs PROM-based diagnostics on itself and the other system processors, and then proceeds to load the system software from the disk.

Customer Data Entry

7.03 Along with the system software, the floppy disk contains a default customer database. This database can be customized to suit a particular site's requirements. Modification can be done by entering data at the Attendant Console or Maintenance Terminal, or by loading a floppy disk. Refer to Sections MITL9109-094-315-NA, Attendant Console, and/or MITL9109-094-351-NA, RS-232 Maintenance Terminal. Whether the Attendant Console or Maintenance Terminal is used, the correct password must be entered to access the customer database. Some data may be entered by a standard telephone set; e.g., call forwarding. Displays and softkeys associated with the console and terminal, enable existing data to be rapidly accessed and viewed, new data to be added, and data to be deleted.

8. TECHNICAL DESCRIPTION

General

8.01 The SX-200 DIGITAL PABX uses the PCM (Pulse Code Modulation) form of time-division multiplexing as its digital conversion format. The PABX employs both digital peripheral cards and digitally-interfaced analog peripheral cards. System architecture is illustrated in Figures 8-l to 8-4. The major component blocks are described in the paragraphs below.

Circuit Switch Links

8.02 The subsystems of the SX-200 DIGITAL PABX communicate over 2,048 kHz serial links. Each link is a continuously repeated data frame comprising 32 channels; each channel contains an 8-bit word which occupies an equal time slot within the frame. Certain channels on some links are segregated into message channels; the remainder are used for circuit switch applications.

8.03 Circuit switch links provide paths through the system for the transfer of peripheral-related data; i.e., pcm audio, or TDM data. Each digital peripheral interface card has dedicated to it one-and-one-half circuit switch links which connect the card to the peripheral switch.

Control

8.04 The main processor, which has overall control of the system, is a 16 bit MC68000 CPU. It is supported by up to 2.5 megabytes of Dynamic Random Access Memory, which is used for the storage of system software, programmed devices, abbreviated dial digit strings, ARS digit strings, and SUPERSET line appearances. The system also provides 2.48 megabytes (formatted) of disk space; this is used for the permanent storage of the system software and the customer database.

8.05 Peripheral processors control the analog cards in the 456-port and 480-port configurations. These processors are 8 bit MC6809 CPUs, and are supported by 32 kilobytes of static RAM. Each of the analog bays contain a Digital Interface card (DIC) which interfaces the analog peripheral cards to the digital end of the system. Controlling each DIC card is one 8 bit MC6809 CPU, supported by 8 kilobytes of static RAM. The Bay Control Card in digital bays has 256 kilobytes of RAM and interfaces its bay to the MCC. It is controlled by the MC68008 microprocessor.

8.06 The DLIC Attendant Console contains a MC6809 CPU, supported by 16 kilobytes of EPROM and 4 kilobytes of static RAM, which controls the display, and monitors keystrokes. The Console module on the Universal card contains one 8 bit MC68121 CPU supported by 4 kilobytes of EPROM and 2 kilobytes of RAM, which formats and controls the routing of data between the system PCM bus and the console.

8.07 The DNIC Attendant Console interfaces to a Digital Line card by tip and ring. It contains a HD6303 CPU, supported by 16 kilobytes of EPROM, and 8 kilobytes of static RAM. A printer can be attached to the console by an RS-232C port. The connector is configured so that the console is the data communication equipment.

8.08 On each analog trunk circuit card is an MC6802 CPU with up to 4 kilobytes of PROM that controls low level functions such as seizing and releasing trunk circuits.

Digital Switching

8.09 The SX-200 DIGITAL PABX uses a specially developed analog/digital combined integrated circuit to implement the analog-to-digital and digital-to-analog conversion functions. The basis of this encode/decode process is the MT8960 Integrated PCM Filter/Codec (commonly known as a CODEC), which is used throughout the system to convert analog to PCM and PCM to analog. The CODEC combines a low pass filter and an analog-to-digital PCM encoder in the transmit direction (i.e., towards the SX-200 DIGITAL PABX) and a digital-to-analog decoder and low pass filter in the receive direction (i.e., towards the peripheral).

8.10 The PABX uses another specially developed VLSI circuit as its main PCM switching matrix element - the 8 link x 32 channel MT8980 Digital Time/Space Crosspoint Switch (DX Chip). The DX chip is arranged with eight incoming links and eight outgoing links; each link comprising 32 channels. Under control of the main CPU, any channel of the incoming links can be connected to any channel of the outgoing links. Thus, one DX chip is equivalent to a 65,536 (256 x 256) crosspoint array. This chip type forms the Circuit Switch and Peripheral Switch Matrices on the Main Control card, and forms part of the interface between the digital PCM links and the analog speech paths in the analog bays.

The 672-Port variant of the SX-200 DIGITAL PABX requires the removal of the DX module from the Main Control Card and the addition of a single Switch Matrix card (SMC). The circuit switch on the SMC consists of a 24 link by 24 link square array made up of nine DX devices. Each peripheral bay requires 3 links, and several links are required for the HDLC messaging and DSP resources, thus 21 links are available to support up to 7 bays.

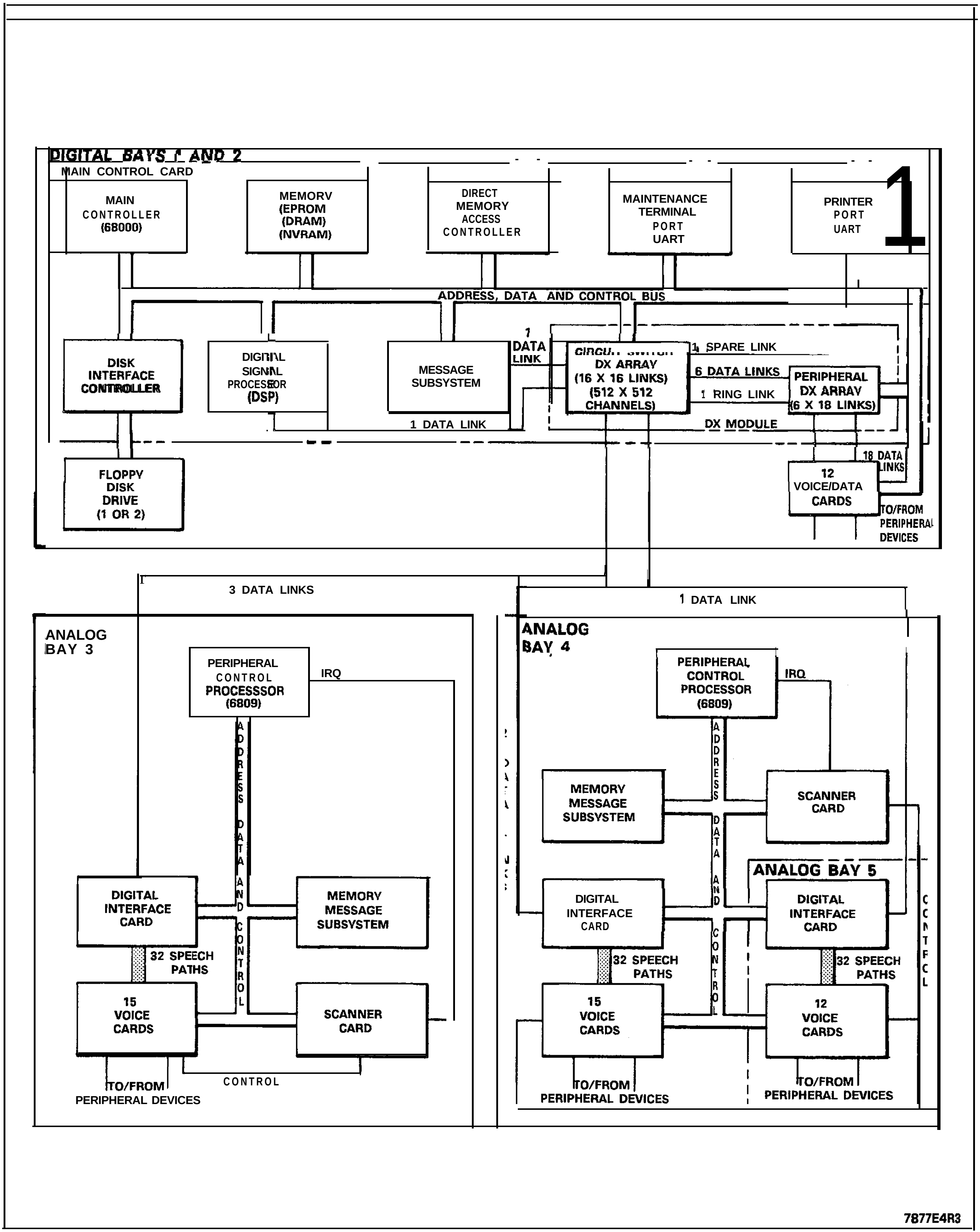


Figure 8-l SX-200 DIGITAL PABX System Architecture (480-Port Configuration)

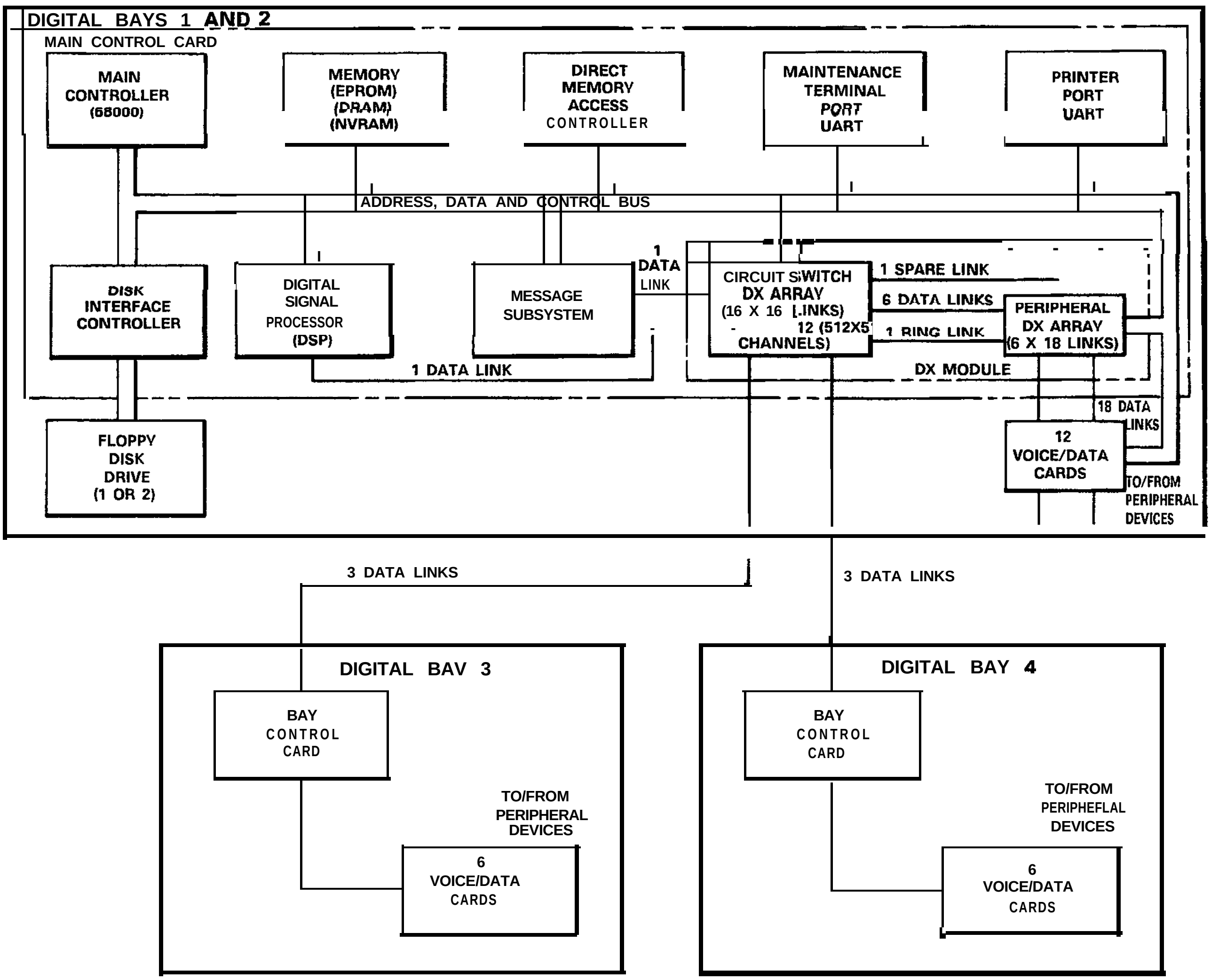


Figure 8-2 SX-200 DIGITAL PABX System Architecture (336-Port Configuration)

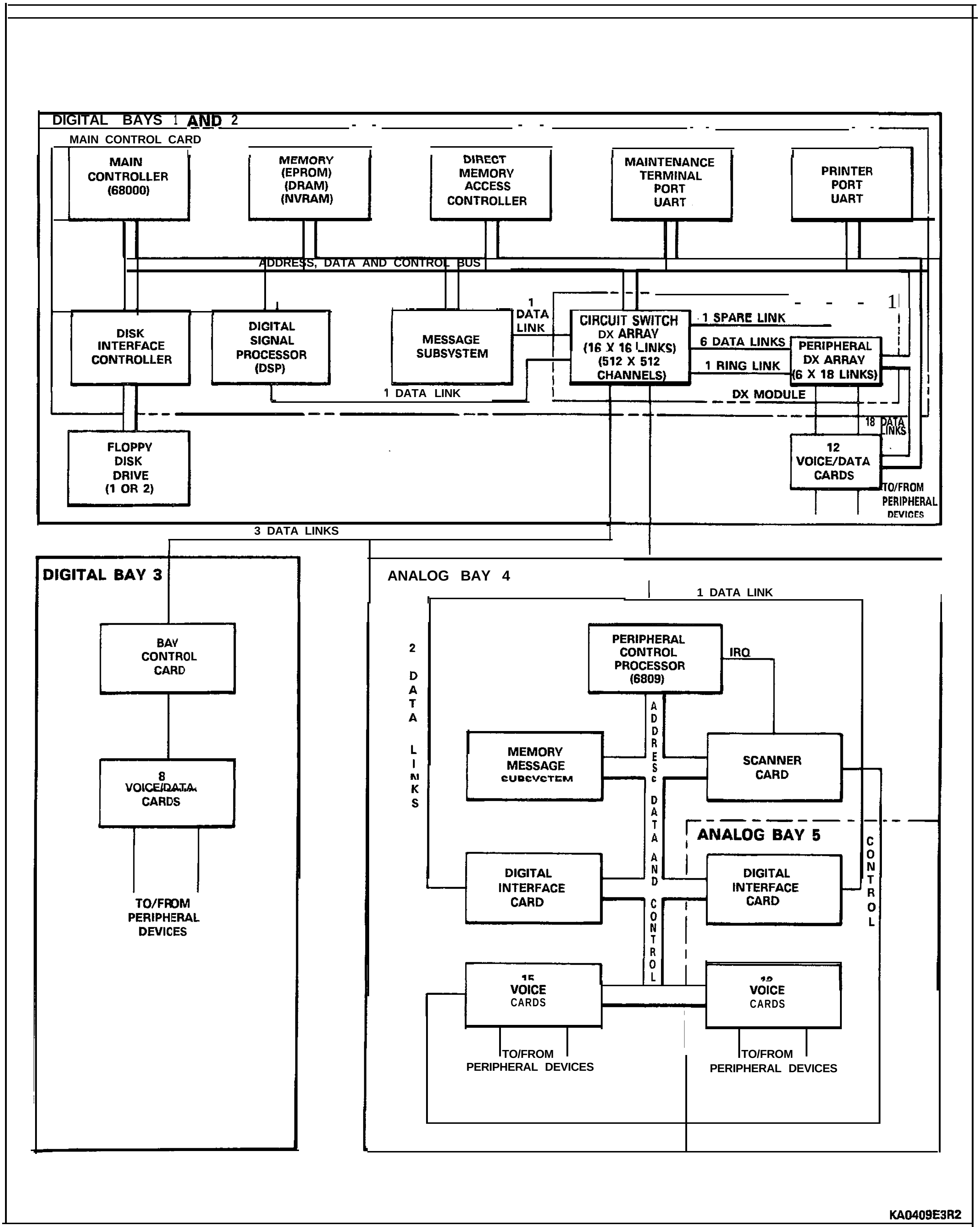


Figure 8-3 SX-200 DIGITAL PABX System Architecture (456-Port Configuration)

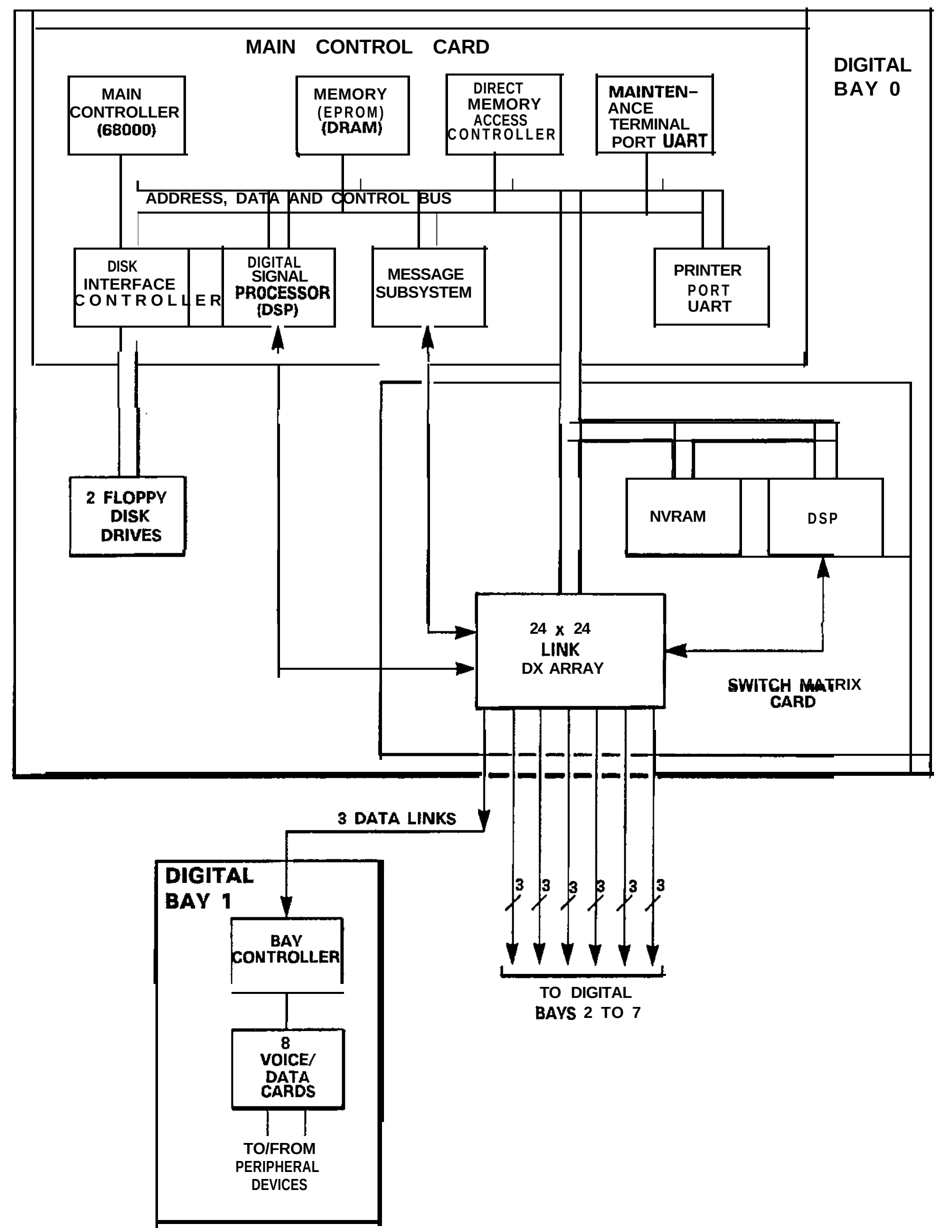


Figure 8-4 SX-200 DIGITAL PABX System Architecture (672-Port Configuration)

Analog Switching

8.11 The system uses an established LSI circuit to implement a space-division switching matrix in the analog bays. The basis of this space division is the 4-by-8 bit MT8804 Analog Switch Array, which is used throughout the analog bays to connect any one of the 32 analog speech paths to any one (or more) extension or trunk circuit(s).

Analog Bay Interface

8.12 The task of connecting the 32 digital PCM channels from the digital DX network to the 32 analog speech paths (junctors) in the analog bays is performed by the JIC (Junctor Interface Circuit). The JIC converts PCM channels into 4-wire analog signals with a CODEC, and then converts the 4-wire (separate transmit and receive) signals from the CODEC to 2-wire junctor signals.

Main Control Card

8.13 The Main Control card is the highest level in the intelligence hierarchy of the SX-200 DIGITAL PABX. It contains the following:

- 68000 CPU
- EPROM containing system power-up routines
- Dynamic RAM
- Floppy disk interface circuitry for two 5.25 inch drives
- Two communication Ports (UARTs)
- Digital Signal Processor for tone generation/detection and conferencing
- DX module containing the Circuit Switch Matrix, and the Peripheral Switch Message interface (HDLC).

Switch Matrix Card

8.14 The Switch Matrix card is required when expansion beyond the present two peripheral bay capability is desired. The DX module on the MCC must be removed when the Switch Matrix Card is used.

Circuit Switch

8.15 The circuit switch matrix provides a nonblocking switching matrix which, in conjunction with the peripheral switch, interconnects the digital peripherals (i.e., digital lines and digital trunks) and the links from the analog bays. The matrix comprises four DX chips arranged in tandem such that the matrix has 16 receive links and 16 transmit links. The function of each link is outlined in Table 8-l. As a nonblocking matrix, the circuit switch matrix is fully switchable; i.e., all incoming links have access to all outgoing links, and forms a 256 port bi-directional switching hub.

Peripheral Switch

8.16 The purpose of the peripheral switch is to concentrate the circuit switch links from up to 12 digital peripheral cards (and 18 links) on one side, down to the six links provided by the circuit switch matrix on the other side. Note that only Bays 1 and 2 are switched through the peripheral switch. The peripheral switch comprises three DX chips; one concentrates Bay 2 and two concentrate Bay 1.

Message Subsystem

8.17 The function of the message subsystem is to facilitate the transfer of control messages and program loading between the main Peripheral Control Processor and lower node processors such as Bay Control Cards, ***SUPERSET*** telephones, and consoles. This transfer of information occurs over the PCM links of the Circuit Switch Matrix (see Table 8-l). The protocol used in the message system is based on the OSI (Open Systems Interconnection) widely used HDLC (High Level Data Link Control) protocol format.

Peripheral Interface Cards

8.18 Peripheral interface cards provide an interface between the terminations of the SX-200 DIGITAL PABX (i.e., lines and trunks) and the circuit switch. The card type depends upon the type of peripheral interfaced to the system; i.e., an E&M Trunk card caters to E&M trunks only.

8.19 The number of interface circuits that each card provides varies with the type, complexity, and space requirements of the circuit. A list of peripheral interface cards and the number of circuits on each is provided in Table 8-2.

8.20 The basic operation of the digital peripheral cards in bays 1 and 2 is controlled by signals received from the peripheral switch or the Main Control card. Digital peripheral cards are controlled by the Main Control card and Bay Control card. Operation of the analog peripheral cards is controlled by the Main Control card in conjunction with the Peripheral Control card and Digital Interface card in the associated cabinet. The clocks provided by the Main Control card for the digital peripheral cards and the Digital Interface cards are as follows:

(a) Frame Pulse. This signal synchronizes the start of a PCM frame which consists of a complete sequence of 32 channels. It occurs every 125 microseconds (8 kilohertz).

(b) 244 ns Clock **(C244+).** The positive going edge of each clock pulse is used to generate channel counting.

TABLE 8-l
SX-200 PCM CIRCUIT SWITCH LINK ASSIGNMENTS

Link #	336-Port Configuration
0	DLC message system link
1	Digital Signal Processor link
2	Bay 3 voice link (lower shelf), ringing reference
3	Bay 3 voice link (upper shelf), message link (HDLC)
4	Bay 3 voice link (shared)
5	Bay 4 voice link (lower shelf), ringing reference
6	Bay 4 voice link (upper shelf), message link (HDLC)
7	Bay 4 voice link (shared)
8	Bay 1 voice link (lower shelf)
9	Bay 1 voice link (lower shelf)
10	Bay 1 voice link (upper shelf)
11	Bay 1 voice link (upper shelf)
12	Bay 2 voice link (shared)
13	Bay 2 voice link (shared)
14	dial tone, filter, codec, Bays 1 and 2 ringing reference
15	unused
Link #	**480-Port Configuration**
0	HDLC message system link
1	Digital Signal Processor link
2	Bay 3 voice link
3	Bay 3 message link (HDLC)
4	unused
5	Bay 4 voice link
6	Bays 4 & 5 message link
7	Bay 5 voice link
8	Bay 1 voice link (lower shelf)
9	Bay 1 voice link (lower shelf)
10	Bay 1 voice link (upper shelf)
11	Bay 1 voice link (upper shelf)
12	Bay 2 voice link (shared)
13	Bay 2 voice link (shared)
14	dial tone, filter, codec, Bays 1 and 2 ringing reference
15	unused

TABLE 8-I (CONT'D)
SX-200 PCM CIRCUIT SWITCH LINK ASSIGNMENTS

Link #	456-Port Configuration
0	HDLC message system link
1	Digital Signal Processor link
2	Bay 3 voice link (lower shelf), ringing reference
3	Bay 3 voice link (upper shelf), message link (HDLC)
4	Bay 3 voice link (shared)
5	Bay 4 voice link
6	Bay 4 & 5 message link
7	Bay 5 voice link
8	Bay 1 voice link (lower shelf)
9	Bay 1 voice link (lower shelf)
10	Bay 1 voice link (upper shelf)
11	Bay 1 voice link (upper shelf)
12	Bay 2 voice link (shared)
13	Bay 2 voice link (shared)
14	dial tone, filter, codec, Bays 1 and 2 ringing reference
15	unused

Link #	672-Port Configuration
0	HDLC message link
1	Digital Signal Processor link (off board)
2	Digital Signal Processor link (on board)
3	Bay 1 voice link and ringing
4	Bay 1 voice link and messaging
5	Bay 1 voice link
6	Bay 2 voice link and ringing (shared)
7	Bay 2 voice link and ringing (shared)
8	Bay 2 voice link (shared)
9	Bay 3 voice link
10	Bay 3 voice link
11	Bay 3 voice link
12	Bay 4 voice link
13	Bay 4 voice link
14	Bay 4 voice link
15	Bay 5 voice link
16	Bay 5 voice link
17	Bay 5 voice link
18	Bay 6 voice link
19	Bay 6 voice link
20	Bay 6 voice link
21	Bay 7 voice link
22	Bay 7 voice link
23	Bay 7 voice link

TABLE 8-2
PERIPHERAL INTERFACE CARDS

Card Name	Card Description	Bay Type	No. Circuits
ONS Line	On-Premise line interface	digital	12
LS/GS Trunk	Central Office trunk interface	digital	6
COV Line Card	*SUPERSET 3/SUPERSET* 4 Telephone control over-voice line interface	digital	6
OPS Line Card	Off-premise line interface	digital	6
DID Trunk Card	Direct Inward Dial trunk interface	digital	6
E&M Trunk Module	E&M Trunk interface (module on Universal Card)	digital	1
Digital Line Card	SUPERSEJ 3DN/*SUPERSET* 4DN Telephones and DATASET 1100 series data sets interface	digital	12
T1 Trunk	Digital trunk interface	digital	1
8 Station Line	On-Premise line interface	analog	8
SUPERSET Line	*SUPERSET 3/SUPERSET* 4 line interface	analog	8
CO Trunk	Central Office Trunk interface	analog	4
E&M Trunk	E&M Trunk interface	analog	2
DID/Tie Trunk	Direct Inward Dial/Tie trunk interface	analog	2

Speech Path Accessing - Digital

8.21 For each digital card, there are 1.5 PCM links allocated, connecting it to the circuit switch matrix on the Main Control card. Under control of the Main Control card (via the message subsystem), the transmit and receive channels of an originating circuit can be connected to the receive and transmit channels of any other circuit through the circuit switch matrix. See Appendix A for further details.

In the 672-Port configuration there are three links from the Switch Matrix card to each digital peripheral bay. In the 336-Port configuration there are three links from the Main Control Card to Bays 3 and 4.

Speech Path Accessing - Analog

8.22 Each speech path is directly wired to an MT8804 on each analog line and analog trunk circuit. card in the system. Under control of the Peripheral Control card, any speech path may be connected to any of the circuits on the card. This is illustrated in Figure 8-5. See Appendix A for further details.

Software Index Limitations

8.23 Software limitations exist that restrict the number of devices that can be programmed. Use Table 8-3 when the number of devices proposed for a system is close to system limits. The total must be less than 2048 for the whole system; CDE will stop the user from programming any more than this amount.

TABLE 8-3
SOFTWARE LIMITATIONS

Device	Multiplier	Number in System	Total
COV Sets	2		
Stations	1		
DNIC Voice	2		
DNIC Data Port	1		
Univ. Modules	1		
Receiver Modules	4		
Line Appearance	1		
Sets/8 (32Max)	1		
Trunks	1		
Cards Programmed	1		
Bay Control Card	1		
ACD Agent	1		
ACD Supervisor	1		
ACD Sr. Supv.	1		
ACD Agent Group	1		
ACD Path	1		
Modem Pool	1		
TOTAL	(must be less than 2048)		

Dynamic RAM Allocation

8.24 The database for Generic 1003 is 250 kilobytes for 480-, 336-, and 456-port systems, and 300 kilobytes for 672-port systems; Table 8-4 identifies the percentage of RAM used for programmed devices.

TABLE 8-4
RAM SPACE LIMITATIONS

Device	Multiplier	Number in System	Total
COV Sets	352		
Stations	274		
DNIC Voice	352		
DNIC Data Port	364		
Univ. Modules	100		
Console Module	884		
Receiver Modules	744 (4 rx)		
DTMF Generator	30		
Line Appearance	36		
Trunks	268		
Trunk Group	34		
Hunt Group	52		
Night Bell	20		
ACD Agent	54		
ACD Supervisor	40		
ACD Sr. Supv.	44		
ACD Agent Group	118		
ACD Path	90		
Modem Pool	364		
T1 Trunk Card	380		
Cards Programmed	184		
TOTAL (in bytes)			

Divide this TOTAL by 2560 (for 480-, 336-, and 456-port systems) or 3072 (for 672-port systems) and this will give the percentage of data base space used for devices. The sum of this figure plus the speed call, ARS digits, and account code percentages must be less than 100%.

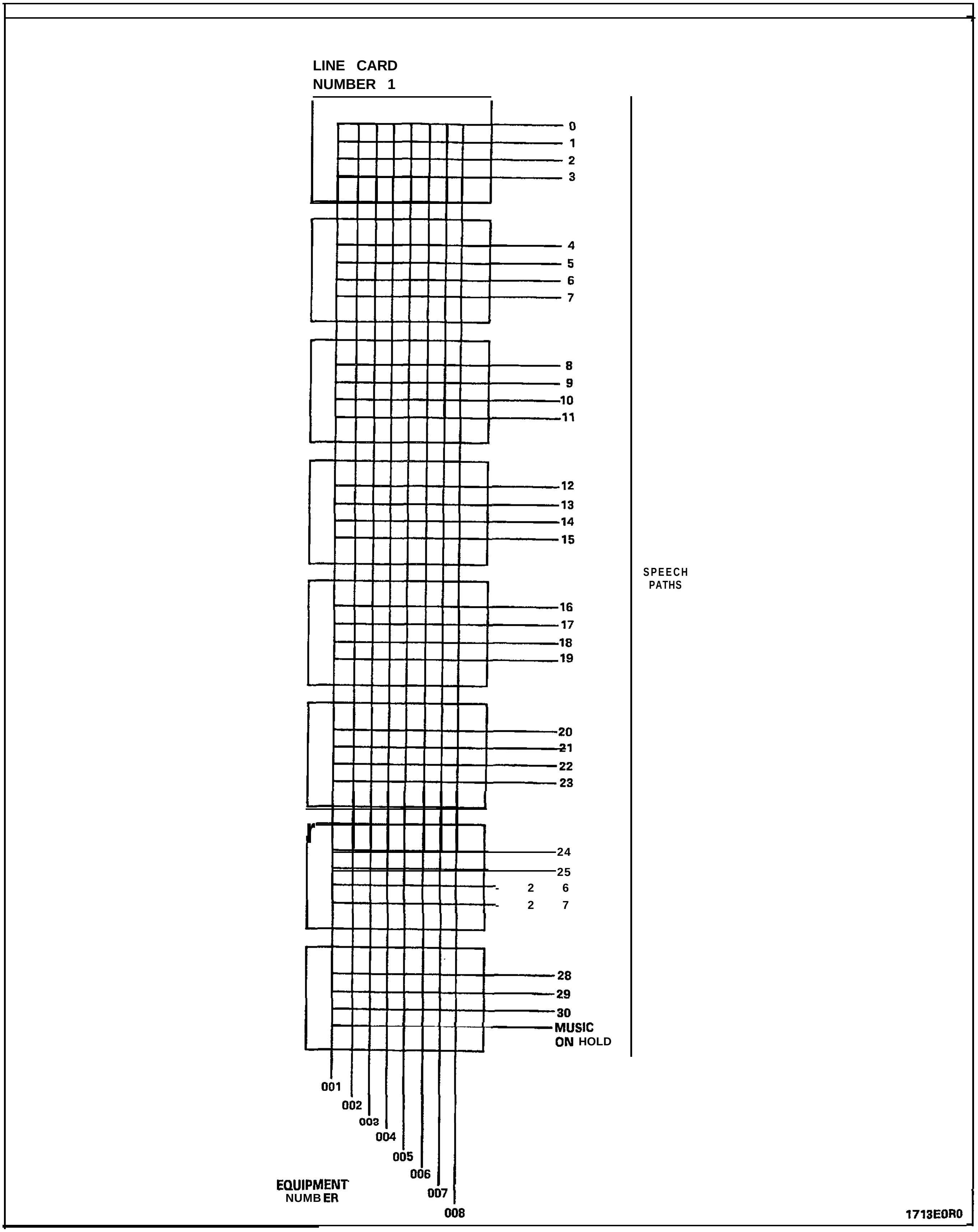


Figure 8-5 Analog Speech Paths

9. SIGNALING AND SUPERVISION

General

9.01 This Part outlines the signaling and supervision parameters of the SX-200 DIGITAL PABX.

9.02 The standard range of tones are available from the SX-200 DIGITAL PABX's Digital Signal Processor:

(a) 12 DTMF sets of tones, as listed in Table 9-2.

(b) set of tones, listed in Table 12-4 which form part of the North American Audible Tone Plan.

(c) one ringing tone of 20 Hz.

9.03 The SX-200 DIGITAL PABX is capable of accepting and repeating signals from telephone sets which have the parameters shown in Table 9-1, Dial Pulse Reception Limits and Table g-2 DTMF Tone Parameters.

9.04 Where any of the frequencies shown in Table 12-4 are present at the system input, any other single frequency (200 - 3400 Hz) should be a minimum of 40 dB below the signal frequency. DTMF pulses are registered in the presence of precise dial tone at a level of -10 dBm.

9.05 The SX-200 DIGITAL PABX gives the following output signal conditions:

- Dial Pulse Conditions:

Pulse Rate	: 9 to 11 pps
Break Interval	: 50% to 62%
Interdigit Time	: 800 ms.

- DTMF Dialing Conditions:

Frequency Deviation	: ± 1%
Tone Duration	: greater than 40 ms
Interdigit Time	: greater than 40 ms
level, low group	: greater than -10 dBm
level, high group	: greater than - 8 dBm
level, DTMF signal	: less than +2 dBm
level, third	: greater than 40 dB
Frequency	: below DTMF signal
Twist	: less than 4 dB.

TABLE 9-l
DIAL PULSE RECEPTION LIMITS

Parameter	Min	Max
ONS Line:		
Pulse Rate	8 pps	12 pps
Break Duration	58%	64%
Inter-digit Time	300 ms	15 s
8 Station Line:		
Pulse Rate	8 pps	12 pps
Break Duration	50%	80%
Interdigit Time	300 ms	15 s
OPS Line:		
Pulse Rate	8 pps	12 pps
Break Duration	42%	84%
Interdigit Time	300 ms	15 s

TABLE 9-2
DTMF TONE PARAMETERS

Low Frequency (Hz)	High Frequency (Hz)		
	1209	1336	1477
697	1	2	3
770	4	5	6
852	7	8	9
941	*	0	#

Frequency deviation : ± 1.5 %
Signal interval (2 frequency) : 40 ms (min)
Per frequency, minimum level : -17 dBm on line circuit

Twist, maximum (at -10 dBm): +4 to -8 dB
(high frequency relative to low frequency)

10. TRANSMISSION

General

10.01 The following descriptions detail some of the transmission characteristics which apply to the SX-200 DIGITAL PABX. The terms used for the different types of peripheral interfaces are explained in Table IO-I.

TABLE 10-I
INTERFACE REFERENCES

Circuit Ref	Description	Card Type (Part No.)
ONS	An industry-standard telephone set may be connected to the SX-200 DIGITAL PBX by means of the following card types:	
ONS(D) ONS(A)	• ONS Line card • 8 Station Line card	9109-010 9110-01 1
OPSS	An industry-standard telephone set located off premises may be connected to the SX-200 DIGITAL PABX via this card type: • OPS Line card	9109-020
OPSL	An industry-standard telephone set located outside the range of the ONS circuit (over 2 kilometers) may be connected to the SX-200 DIGITAL PABX via this card type: • OPS Line card	9109-020
ACO	An Analog CO (ACO) trunk can be connected to the SX-200 DIGITAL PABX by means of one of the following types of trunk interface cards:	
ACO(D) ACO(A) ACO(A) ACO(D)	• LS/GS Trunk card • CO Trunk card • DID/Tie Trunk card • DID Trunk card	9109-011 9109-211 9109-031 9109-031
AT0	An Analog Toll Office (ATO) trunk may be connected to the SX-200 DIGITAL PABX by means of one of the following trunk interface cards:	
ATO(D) ATO(A) ATO(A) ATO(D)	• LS/GS Trunk card • CO Trunk card • E&M Trunk card • E&M Trunk module	9109-011 9110-211 91 IO-013 9109-013

TABLE 10-l (CONT'D)
INTERFACE REFERENCES

Circuit Ref	Description	Card Type (Part No.)
ATT	An Analog Tie Trunk (ATT) can be connected between the SX-200 DIGITAL PABX and another PBX, over a 2- or 4-wire analog trunk by means of one of the following trunk cards:	
ATT(A)	• E&M Trunk card	91 IO-013
ATT(D)	• E&M Trunk module	9109-013
ATT(A)	• DID/Tie Trunk card	91 IO-031
ATT(D)	• DID Trunk card	9109-031
SATT	This designation refers to a "satellite" tie trunk which connects a Main PBX to a Satellite PBX. The type of trunk cards used to interface are the same as those for the ATT interface described above.	
DCO	A Digital Central Office Trunk (DCO) connects a Digital CL5 office over digital facilities.	
DTO	A Digital Toll Office Trunk (DTO) connects a DPBX to a Digita CL4 or higher office over digital facilities.	
DTT	A Digital Tie Trunk (DTT) connects a DPBX to a DPBX over digital facilities.	
T1 Trunk	Digital T1 Trunk card.	9109-021-000
CTT	A Combination Tie Trunk connects a DPBX to a remote channel bank over digital facilities. The remote channel bank usually interfaces to an analog PBX and provides the A/D & D/A conversion.	

Frequency Response

10.02 The frequency response relative to 1004 Hz at 0 dBm for different types of interconnections is shown in Table 10-2.

Overload - Digitally Switched Analog Card Types

10.03 The overload levels shown in Table 10-3 define the maximum signal levels which may be applied to an analog interface before clipping occurs. The Input Overload (IOL) defines the maximum analog input signal level which can be applied to a digital interface circuit before clipping of the encoded PCM word occurs. The Output Overload (OOL) defines the maximum analog output signal which can be produced at the output of an interface by the application of a 3 dBm0 digital signal to the input.

Overload - Locally Switched Analog Card Types

10.04 The change in attenuation when the level of a 1004 Hz signal is increased from -9 to +7 dBm shall not exceed 0.4 dB.

TABLE 10-2
FREQUENCY RESPONSE

Interconnection	Frequency (Hz)	Variation in w/r to minimum	Attenuation 1004 Hz (dB) maximum
Line to Line	60	-20.0	- -
	200	0	-5.0
Line to 2-W Analog Trunk	300	0.5	-1.0
	3000	0.5	-1.0
2-W Analog Trunk to 2-w	3200	0.5	-1.5
Analog Trunk	3400	0	-3.0
Line to 4-W Analog Trunk	60	-20.0	- -
	200	0	-4.0
2-W Analog Trunk	300	0.4	-0.65
to 4-W Analog Trunk	3000	0.4	-0.65
	3200	0.4	-1.5
	3400	0	-3.0
4-W Analog Trunk	60	-16.0	- -
to 4-W Analog Trunk	200	0	-3.0
	300	0.3	-0.3
	3000	0.3	-0.3
	3200	0.3	-1.5
	3400	0	-3.0

TABLE IO-3
OVERLOAD LEVELS - DIGITALLY SWITCHED ANALOG CARD TYPES

Interface Type	Connecting Circuit	Overload Point (dB) IOL	OOL
ONS(A)	any circuit	6.0	0
AC0(A)	ONS(D)	0	3.0
ACO(A)	any trunk	3.0	3.0

Quantization Distortion

10.05 The quantization distortion of a connection is a measure of the signal to distortion ratio as the input signal is varied. Note that this parameter does not apply to the analog card types. For 95% of connections the signal to distortion ratio will exceed the limits shown in Table 10-4.

TABLE 10-4
SIGNAL TO DISTORTION RATIO

1004 Hz Input Level (dBmo)	Signal/Distortion Ratio (dB) 95% of all connections
0 to -30	33
-40	27
- 4 5	22

Intermodulation Distortion

10.06 Intermodulation (harmonic) distortion is measured using two pairs of equal level tones (851/863 Hz and 1372/1388 Hz), at a total composite input power of -13.0 dBm0. Table 10-5 shows the second and third order products for the different types of connections. 95% of the connections in each category shall exceed the stated limits.

TABLE 10-5
INTERMODULATION REQUIREMENTS (4.8 Kb/s)

Connection Type	Second Order Product (dB)	Third Order Product (dB)
Line to Line	40	43
Line to Trunk	45	53
Trunk to Trunk	45	53

Return Loss

10.07 The ERL and SFRL return losses for different types of inter-connection or idle states are shown in Table 10-6.

TABLE 10-6
RETURN LOSS CHARACTERISTICS

Connection Type	Termina Balance		Through Balance		Transhybrid Loss		Non-Talking
	ERL (dB)	SFRL (dB)	ERL (dB)	SFRL (dB)	200 - 3400 Hz	500 - 2500 Hz	(dB)
Line to Line	18	12					
Line to 4-W Trunk	24	14					
4-W Trunk to Line	24	14					
Line to 2-W Trunk	18	12					
2-W Trunk to Line	18	12					
4-W Trunk to 2-W Trunk	28	14					
2-W Trunk to 4-W Trunk	28	14					
4-W Trunk to 4-W Trunk			27	20			
ONS(D) Line					17	19	
2-W Trunk					18	21	
Loop Start LS/GS Trunk (2-W)							6
Ground Start LS/GS Trunk (2–W)							2
Line to Line *	20	14					
Trunk to Trunk *	24	14	27	20			10
Line to Trunk *							5

* denotes analog card type

Crosstalk

10.08 The crosstalk attenuation, or coupling loss, between any two transmission paths, at any frequency between 200 and 3200 Hz is greater than 75 dB for 95% of all connections.

Echo Path Delay

10.09 The round trip echo path delay with a frequency of 1500 Hz does not exceed the stated values for the following types of interconnection:

- Line to Line: 3.0 ms
- Line to Trunk: 3.0 ms
- Trunk to Trunk: 3.0 ms.

Envelope Delay Distortion

10.10 Table IO-7 details the maximum envelope delay distortion for the digital card types. These objectives are met by 95% of all connections. For the analog card types, the envelope delay distortion is less than 200 microseconds between 400 and 3200 Hz, for all connections.

TABLE IO-7
ENVELOPE DELAY DISTORTION

Connection Type	Frequency Band (Hz)	Envelope Delay Distortion (microseconds)
Line to Line	1000 - 3000 400 - 3200	less than 280 less than 560
Line to Trunk	1000 - 3000 400 - 3200	less than 140 less than 280
Trunk to Trunk	1000 - 3000 400 - 3200	less than 140 less than 280

Longitudinal Balance

10.11 All connections (except ONS) meet the longitudinal balance requirements outlined in Table 10-8. Note that these apply to OFF-HOOK circuits only.

TABLE IO-8
LONGITUDINAL BALANCE

Frequency (Hz)	Longitudinal Balance (dB) Minimum	Average
200	58	63
500	58	63
1000	58	63
3000	53	58

System Impedances

10.12 System impedances are as follows:

- Station - 9109-010 : 600 ohms I/P impedance
  600 ohms DC loop resistance
  - 9110-I 10 : 600 ohms I/P impedance
  1200 ohms DC loop resistance.
- LS/GS Trunk Loop : 600 ohms I/P impedance, 1600 ohms loop range.
- LS/GS Trunk T/R to ground Resistance:
  - greater than 30 Kohms (ground start)
  - greater than 10 Mohms (loop start) - both in the IDLE state
- Analog type lines: 600 ohms AC input impedance, nominal
- Analog type trunks: 600/900 ohms AC input impedance, nominal

Idle Channel Noise - C Message

10.13 The idle channel C message noise will not exceed the following values for any type of interconnection:

- Average: 16 dBrnC
- 95% of all interconnections: 20 dBrnC

Idle Channel Noise - 3 kHz Flat

10.14 The idle channel noise for 3 kHz flat noise requirements do not exceed the following values for any type of interconnection:

- 95% of all interconnections: 39 dBrn0
- 50% of all interconnections: 35 dBrn0

11. LOSS AND LEVEL PLAN

General

11.01 This Part describes the loss and level plan for North American applications of the SX-200 DIGITAL PABX.

A large number of interconnections are possible with the SX-200 DIGITAL PABX, ranging from interconnections between on-premises (ONS) line circuits, to the interconnection of remotely located satellite PBXs with the SX-200 DIGITAL PABX. This part describes the principles of the loss and level plans, their application to the SX-200 DIGITAL PABX, and the arrangements for setting the transmission levels.

North American Loss and Level Plans

11.02 The purpose of a transmission loss and level plan is to provide an acceptable transmission grade of service to all subscribers in the telephone network. At present, two loss plans exist for the public switched network in North America. They are the VIA NET LOSS (VNL) plan and the SWITCHED DIGITAL NETWORK (SDN) plan.

VNL Plan

11.03 The VNL plan consists of two parts: a fixed loss portion and a variable loss portion; they are as follows:

(a) Fixed Portion. A minimum fixed amount of loss is introduced into all Toll connections. This loss is equal to 5 dB and is split equally between the two end trunks connected to the Toll network.

(b) Variable Portion. In addition to the fixed portion, a variable loss is introduced into all trunks involved in a connection. This loss, known as VNL, is proportional to the trunk length and its propagation delay. The loss ranges from a minimum of 0.5 dB to a maximum of 3.0 dB, and covers trunk lengths from 0 to about 2900 km (0 to 1800 miles). Trunks in excess of this length employ echo suppressors and are designed to zero loss.

The loss objectives for Toll connections using the VNL plan range from a minimum of 5.5 dB to a maximum of 8.0 dB between end-to-end CO offices (CL5 to CL5). This is illustrated in Figure 1 l-l.

SDN Loss Plan

11.04 The Switched Digital Network (SDN) loss plan was developed to meet the needs of the evolving digital public switched network. This plan does not assign losses to intermediate links in a connection. Under the plan, the local area public network (local CO to local CO) is operated at zero loss. This feature eliminates the need to introduce digital padding on intermediate digital trunk links and maintains data transparency throughout the network.

Control of echo and noise with this plan is achieved by inserting fixed amounts of loss at the end points where the conversion to analog takes place. A compromise value of 6 dB was selected for line-to-line connections over the Toll network. This loss is inserted in the receive (RX) direction of transmission (D-A) under software control. This is illustrated in Figure 1 l-2.

SX-200 DIGITAL PABX Loss And Level Plan

11.05 To illustrate the loss and level plan used for the SX-200 DIGITAL PABX, reference is made to the layout illustrated in Figure 1 l-3. This layout is not intended to be a typical network, but is drawn to show the different types of trunk and line interfaces which the SX-200 DIGITAL PABX will accommodate. The terms used for the different types of peripheral interfaces are explained in Table 1 l-l.

11.06 To implement the required loss objectives (Table 1 l-l) of the plan, combinations of software selectable analog and digital transmission pads are provided. All analog padding is provided by Mitel 8960 series combined Codec/Filter integrated circuits, over a 7 dB range in 1 dB increments. Padding is provided in both the Transmit (TX) and Receive (RX) directions (see Part C).

Satellite PBX

11.07 A satellite PBX (shown in Figure 1 l-3) is defined as a PBX which has no direct connection to the serving central office for incoming traffic. It has no directory number, and receives all incoming calls through the main PBX over satellite trunks. The satellite PBX is usually in the same local area as its main PBX.

Analog Transmission Pad Arrangements - Digital Interfaces

11.08 The analog transmit pad (A/D) setting defines the input level required to produce a 0 dBm0 digital signal, as well as the overload point of the interface (approximately 3 dB above the 0 dBm0 signal level). The Tx pad comprises a fixed portion and a variable portion. The fixed portion is incorporated into the analog interface to the codec/filter. The variable portion (0 to 7 dB) is incorporated into the codec/filter.

11.09 The analog receive pad (D/A) defines the output level produced by a digital milliwatt input signal. The Rx pad comprises a fixed portion which is part of the analog interface to the codec/filter, and a variable portion (0 to -7 dB) which is incorporated into the codec/filter. This pad arrangement is illustrated in Figure 11-4.

Analog Transmission Pad Arrangements - Analog Interfaces

11.10 The transmit pads for the analog type cards consist of a variable or fixed portion on the card itself, a fixed portion on the Digital Interface card, and a variable portion in the codec/filter. The variable transmit pad on the analog ONS line card may be set to either

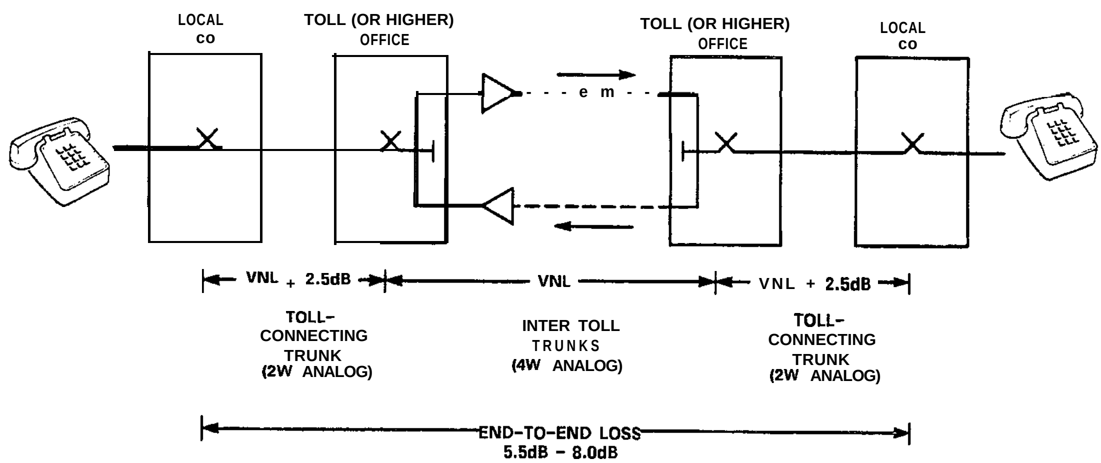


Figure 11-1 Local to Local Central Offices VNL Objectives

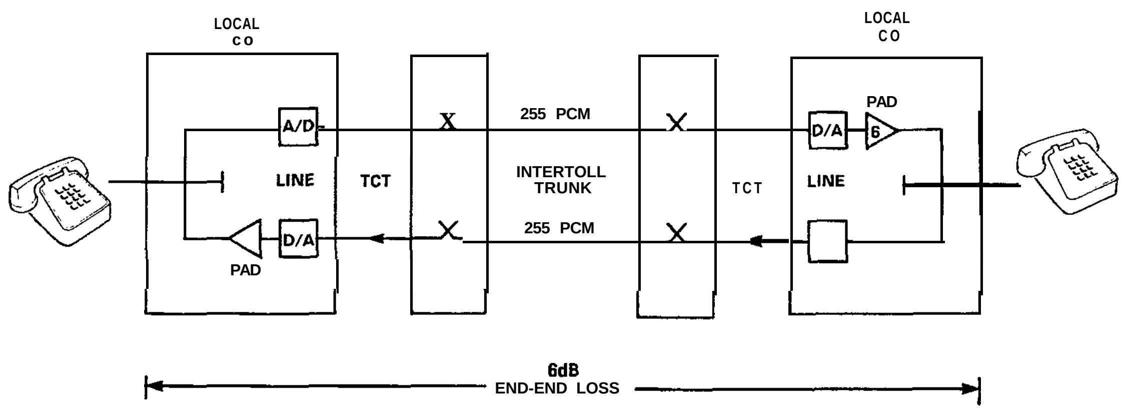


Figure 11-2 Local to Local Central Offices Fixed Loss Plan Objectives

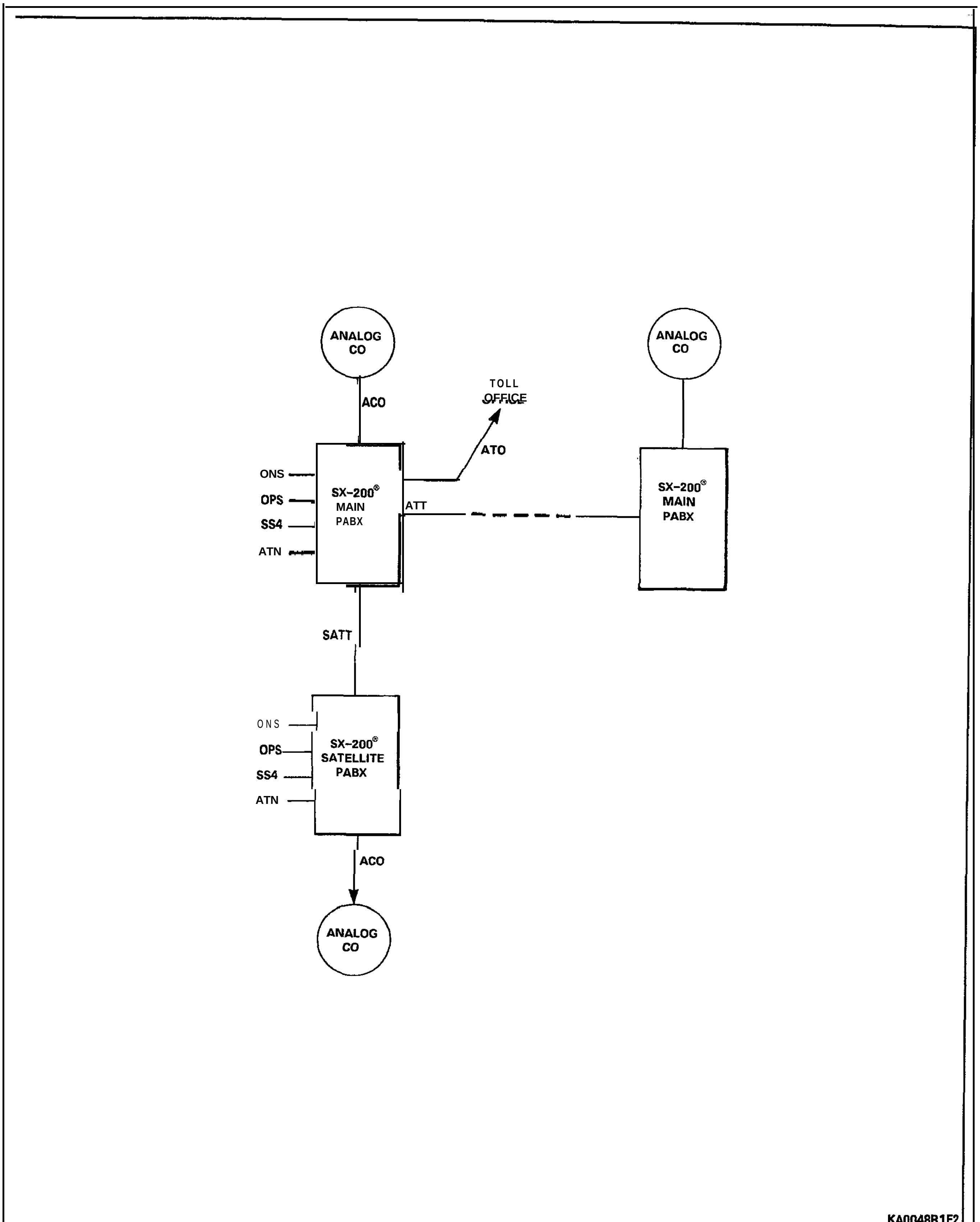


Figure 11-3 Types of Trunk and Line Interfaces

-6.0 dB or -10.7 dB. The fixed transmit pad on the analog trunk cards is set to -6.0 dB. The fixed portion on the Digital Interface card is set to 1.8 dB while the variable portion in the codec/filter can be set to anything between 0 dB and 7 dB, in 1 dB steps. The input signal level and overload level are defined by the sum of the fixed and variable pads described in the Digital Interfaces paragraphs.

11.11 The receive pads for the analog type cards consist of a fixed portion on the analog card itself, a fixed portion on the Digital Interface card, and a variable portion in the codec/filter. The fixed portions are set to 5.7 dB and -1.9 dB respectively, while the variable portion can be set from 0 to -7 dB in 1 dB steps. The output signal level and overload level are defined by the sum of the fixed and variable pads as described in the Digital Interfaces paragraphs. This pad arrangement is illustrated in Figure 11-5.

Local Switching Loss Plan

11.12 To maximize the traffic performance of the SX-200 DIGITAL PABX, connections between analog interface circuits which are in the same analog equipment bay may be made by connecting both interfaces to the same analog speech path (junctor), without passing through the digital switching network in the digital bays. This type of connection is known as a “locally switched connection”. The port-to-port losses for locally switched connections are shown in Table 11-2.

TABLE 11-1
SX-200 DIGITAL PABX LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
ONS(D)	ONS(D)	-6.0	-6.0
	ONS(A)	-5.2	-5.2
	OPSS	-6.0	-6.0
	OPSL	-3.0	-3.0
	ACO(D)	0	0
	ACO(A)	-0.2	-0.2
	ATT(A)	-3.2	-3.2
	ATT(D)	-3.0	-3.0
	ATO(A)	-6.2	-6.2
	ATO(D)	-6.0	-6.0
	DCO		
	DTO		
	DTT		
	sATT	-3.0	-3.0
	sDTT		
	sCTT		

TABLE 1 l-l (CONT'D)
SX-ZOO DIGITAL PABX LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
ONS(A)	ONS(D)	-6.0	-6.0
	ONS(A)	-5.4	-5.4
	OPSS	-5.2	-5.2
	OPSL	-3.2	-3.2
	ACO(D)	-0.2	-0.2
	ACO(A)	-0.4	-0.4
	ATT(A)	-3.4	-3.4
	ATT(D)	-3.2	-3.2
	ATO(A)	-6.4	-6.4
	ATO(D)	-6.2	-6.2
	DCO	-3	-3
	DTO	-3	-9
	DTT	-3	-9
	sATT	-3.2	-3.2
	sDTT	-3	-3
	sCTT	-3	-9
OPSS	ONS(D)	-6.0	-6.0
	ONS(A)	-5.2	-5.2
	OPSS	-6.0	-6.0
	OPSL	-3.0	-3.0
	ACO(D)	0	0
	ACO(A)	-0.2	-0.2
	ATT(A)	-3.2	-3.2
	ATT(D)	-3.0	-3.0
	ATO(D)	-6.0	-6.0
	ATO(A)	-6.2	-6.2
	DCO	-3	-3
	DTO	-3	-9
	sATT	-3.0	-3.0
	sDTT	-3	-3
OPSL	ONS(D)	-3.0	-3.0
	ONS(A)	-3.2	-3.2
	OPSL	0	0
	OPSS	-3.0	-3.0
	ACO(D)	0	0
	ACO(A)	-0.2	-0.2
	ATT(A)	-2.2	-2.2
	ATT(D)	-2.0	-2.0
	ATO(D)	-3.0	-3.0
	ATO(A)	-3.2	-3.2
	DCO	0	0
	DTO	0	-6
	DTT	0	-6
	sATT	-2.0	-2.0
	sDTT	-2	-2
	scl-r	0	-6

TABLE 1 I-I (CONT'D)
SX-200 DIGITAL PABX LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
ACO(D)	ONS(D)	0	0
	ONS(A)	-0.2	-0.2
	OPSS	0	0
	OPSL	0	0
	ACO(D)	0	0
	ACO(A)	-0.2	-0.2
	ATT(A)	-2.2	-2.2
	ATT(D)	-2.0	-2.0
	ATO(A)	-3.2	-3.2
	ATO(D)	-3.0	-3.0
	DCO	0	0
	DTO	0	-6
	DTT	0	-6
	sATT	0	0
	sDTT	0	0
	sCTT	3	-3
ACO(A)	ONS(D)	-0.2	-0.2
	ONS(A)	-0.4	-0.4
	OPSS	-0.2	-0.2
	OPSL	-0.2	-0.2
	ACO(D)	-0.2	-0.2
	ACO(A)	-0.4	-0.4
	ATT(A)	-2.4	-2.4
	ATT(D)	-2.2	-2.2
	ATO(A)	-3.4	-3.4
	ATO(D)	-3.2	-3.2
	DCO	-0.2	-0.2
	DTO	-0.2	-6.2
	DTT	-0.2	-6.2
	sATT	-0.2	-0.2
	sDTT	-0.2	-0.2
	sCTT	2.8	-3.2
ATT(A)	ONS(D)	-3.2	-3.2
	ONS(A)	-3.4	-3.4
	OPSS	-3.2	-3.2
	OPSL	-2.2	-2.2
	ACO(D)	-2.2	-2.2
	ACO(A)	-2.4	-2.4
	ATT(A)	-0.4	-0.4
	ATT(D)	-0.2	-0.2
	ATO(A)	-0.4	-0.4
	ATO(D)	-0.2	-0.2
	DCO	-2.2	-2.2
	DTO	2.8	-3.2
	DTT	2.8	-3.2
	sATT	-0.2	-0.2
	sDTT	-0.2/-2.2	-0.2/2.2
	sCTT	2.8	-3.2

TABLE 1 l-l (CONT'D)
SX-200 DIGITAL PABX LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
ATT(D)	ONS(D)	-3.0	-3.0
	ONS(A)	-3.2	-3.2
	OPSS	-3.0	-3.0
	OPSL	-2.0	-2.0
	ATT(D)	0	0
	ATT(A)	-0.2	-0.2
	DCO	-2	-2
	DTO	3	-3
	DTT	3	-3
	sATT	0	0
	ACO(D)	-2.0	-2.0
	ACO(A)	-2.2	-2.2
	ATO(D)	0	0
	ATO(A)	-0.2	-0.2
	sDTT	0/-2	0/-2
	scl-r	3	-3
ATO(A)	ONS(D)	-6.2	-6.2
	ONS(A)	-6.4	-6.4
	OPSS	-6.2	-6.2
	OPSL	-3.2	-3.2
	ACO(D)	-3.2	-3.2
	ACO(A)	-3.4	-3.4
	ATT(A)	-0.4	-0.4
	ATT(D)	-0.2	-0.2
	ATO(A)	-0.4	-0.4
	ATO(D)	-0.2	-0.2
	DCO	-3.2	-3.2
	DTO	2.8	-3.2
	DTT	2.8	-3.2
	sATT	-3.2	-3.2
	sDTT	-3.2	-3.2
	sCTT	2.8	-3.2
ATO(D)	ONS(D)	-6.0	-6.0
	ONS(A)	-6.2	-6.2
	OPSS	-6.0	-6.0
	OPSL	-3.0	-3.0
	ACO(D)	-3.0	-3.0
	ACO(A)	-3.2	-3.2
	ATT(A)	-0.2	-0.2
	ATT(D)	0	0
	ATO(A)	-0.2	-0.2
	ATO(D)	0	0
	DCO	-3	-3
	DTO	3	-3
	DTT	3	-3
	sATT	-3.0	-3.0
	sDTT	-3	-3
	sCTT	3	-3

TABLE 1 l-l (CONT'D)
SX-200 DIGITAL PABX LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
sATT	ONS(D)	-3.0	-3.0
	ONS(A)	-3.2	-3.2
	OPSS	-3.0	-3.0
	OPSL	-2.0	-2.0
	ACO(D)	0	0
	ACO(A)	-0.2	-0.2
	ATT(A)	-0.2	-0.2
	ATT(D)	0	0
	ATO(A)	-3.2	-3.2
	ATO(D)	-3.0	-3.0
	DCO	0	0
	DTO	0	-6
	DTT	0	-6
	sATT	0	0
	SD-I-I-	0	0
	scl-r	0	-6
DCO	ONS(D)		
	ONS(A)	-3	-3
	OPSS	-3	-3
	OPSL	0	0
	ACO(D)	0	0
	ACO(A)	-0.2	-0.2
	ATT(A)	-2.2	-2.2
	ATT(D)	-2	-2
	ATO(A)	-3.2	-3.2
	ATO(D)	-3	-3
	DCO	0	0
	DTO	0	-6
	DTT	0	-6
	sATT	0	0
	sDTT	0	0
	sCTT	0	-6
DTO	ONS(D)		
	ONS(A)	-9	-3
	OPSS	-9	-3
	OPSL	-6	0
	ACO(D)	-6	0
	ACO(A)	-6.2	-0.2
	ATT(A)	-3.2	2.8
	ATT(D)	-3	3
	ATO(A)	-3.2	2.8
	ATO(D)	-3	3
	DCO	-6	0
	DTO	0	0
	DTT	0	0
	sATT	-6	0

TABLE 11-1 (CONT'D)
SX-200 DIGITAL PABX LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
	sDTT	-6	0
	scl-r	0	0
DTT	ONS(D)	-9	-3
	ONS(A)	-9.2	-3.2
	OPSS	-9	-3
	OPSL	-6	0
	ACO(D)	-6	0
	ACO(A)	-6.2	-0.2
	ATT(A)	-3.2	2.8
	ATT(D)	-3	3
	ATO(A)	-3.2	2.8
	ATO(D)	-3	3
	DCO	-6	0
	DTO	0	0
	DTO	0	0
	DTT	0	0
	sATT	-6	0
	sDTT	-6	0
	sCTT	0	0
SCTT	ONS(D)	-9	-3
	ONS(A)	-9.2	-3.2
	OPSS	-9	-3
	OPSL	-6	0
	ACO(D)	-3	3
	ACO(A)	-3.2	2.8
	ATT(A)	-3.2	2.8
	ATT(D)	-3	3
	ATO(A)	-3.2	2.8
	ATO(D)	-3	3
	DCO	-6	0
	DTO	0	0
	DTO	0	0
	DTT	0	0
	sATT	-6	0
	sDTT	-6	0
	sCTT	0	0

TABLE 11-1 (CONT'D)
SX-200 DIGITAL PABX LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
sDTT	ONS(D)	-3	-3
	ONS(A)	-3.2	-3.2
	OPSS	-3	-3
	OPSL	-2	-2
	ACO(D)	0	0
	ACO(A)	-0.2	-0.2
	ATT(A)	-0.2/-2.2	-0.2/-2.2
	ATT(D)	0/-2	0/-2
	ATO(A)	-3.2	-3.2
	ATO(D)	-3	-3
	DCO	0	0
	DTO	0	-6
	DTT	0	-6
	sATT	0	0
	SDTT	0	0
	SC-IT	0	-6

TABLE 11-2
SX-200 DIGITAL PABX LOCAL SWITCHING LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
ONS(A)	ONS(A)	-5.0	-5.0
	ACO(A)	-0.3	-0.3
	ATT(A)	-2.3	-2.3
	ATO(A)	*	*
ACO(A)	ONS(A)	-0.3	-0.3
	ACO(A)	-0.3	-0.3
	ATT(A)	-2.3	-2.3
	ATO(A)	*	*
ATT(A)	ONS(A)	-2.3	-2.3
	ACO(A)	-2.3	-2.3
	ATT(A)	-0.3	-0.3
	ATO(A)	*	*

* The AT0 trunk cannot be locally switched. The AT0 trunk can be implemented with an analog CO trunk interface, but it does not have the 2 dB pad required to meet part of the loss plan for local switching.

11.13 All analog interfaces may be represented by the block diagram Figure 11-6 when they are locally switched.

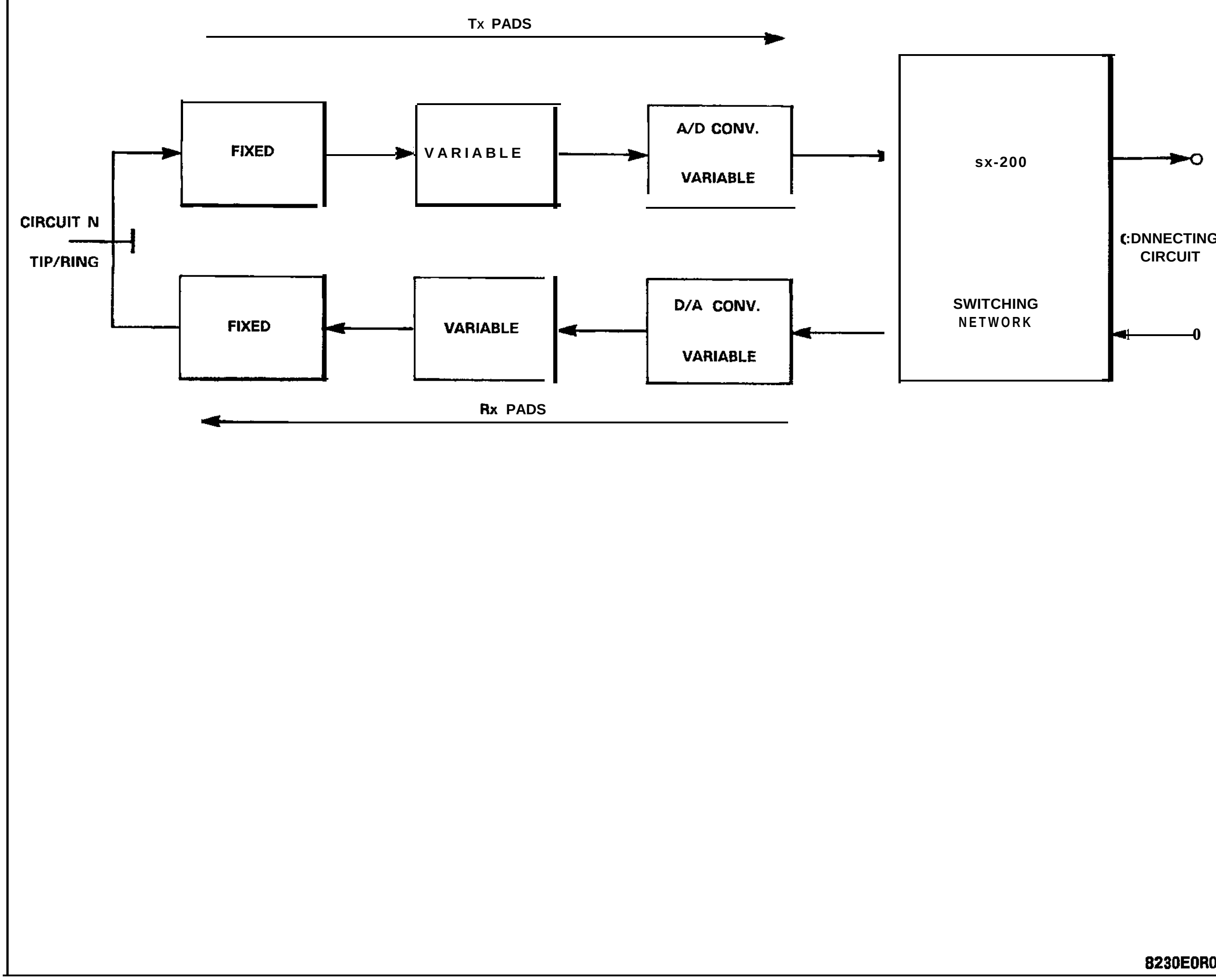


Figure 11-4 Analog Pad Arrangements – Configuration A

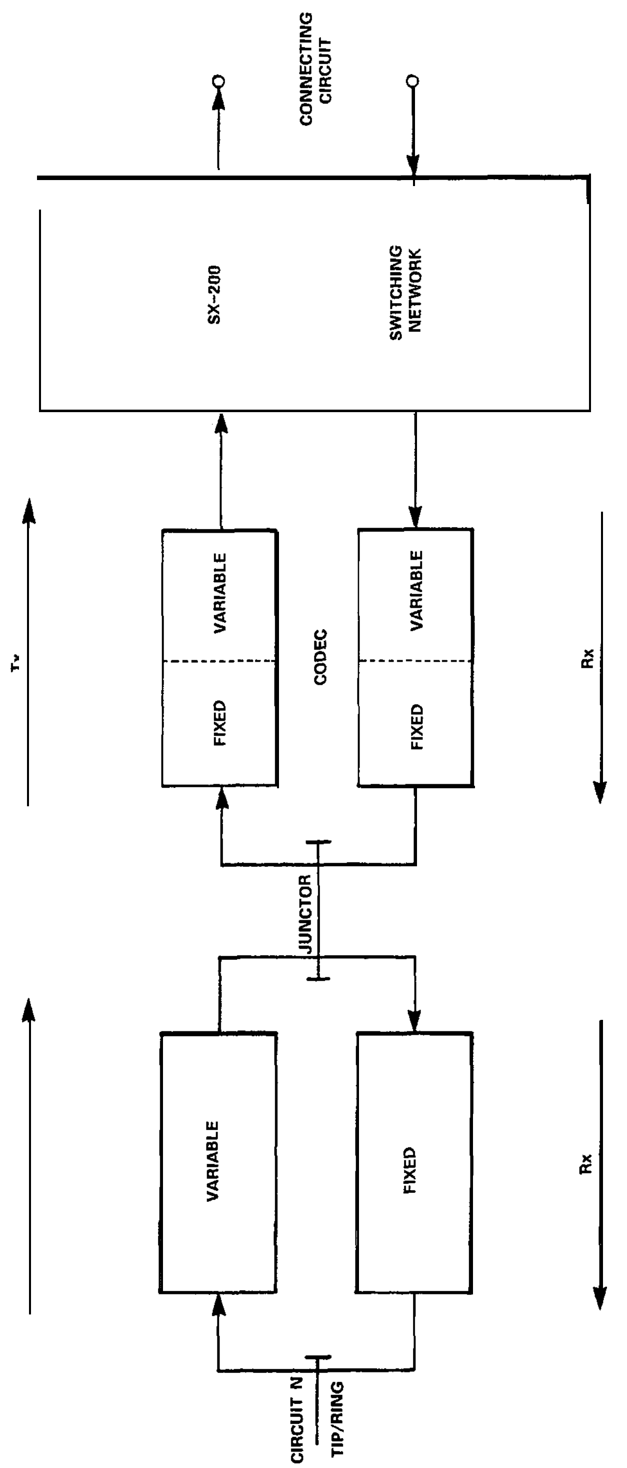


Figure 11-5 Analog Pad Arrangements - Configuration B

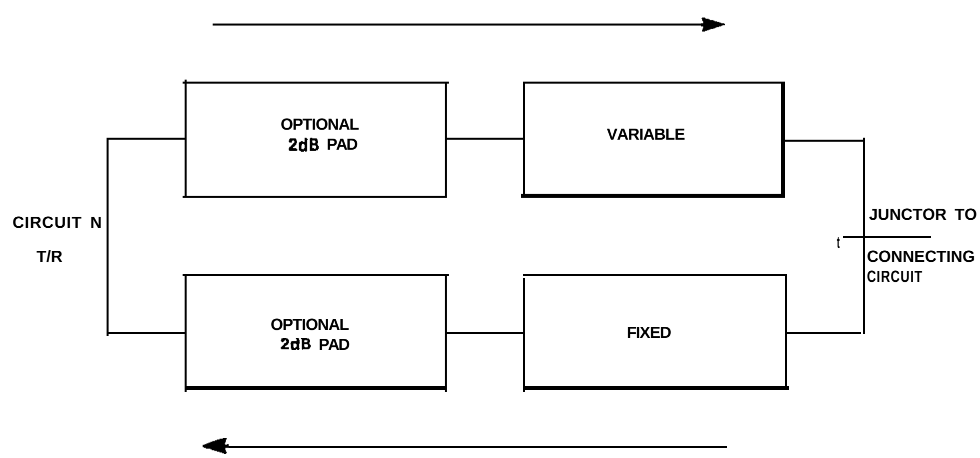


Figure 11-6 Local Switching Analog Pad Arrangements

Conferencing Loss Plan

11.14 Any SX-200 DIGITAL PABX will have at least one 18 port conference circuit (Digital Signal Processor). The conferencing circuit, on a frame-by-frame basis, compares the level of all conferees and sends the loudest signal to all other parties in the conference. The party which is the loudest receives audio from the second loudest party. The conference loss plan is outlined in Table 1 l-3.

Tone Levels

11.15 All of the tones used by the SX-200 DIGITAL PABX are provided by the Digital Signal Processor on the Main Control card. The system provides eight tone channels, each of which can generate either a dual or single frequency tone. One channel is used to generate a signal which controls the frequency and amplitude of the ringing generator output. Three channels are used for DTMF tone generation, and the remaining four are used to generate the system call progress tones.

11.16 Most call progress and DTMF tones require that the receive gain pad in the line or trunk circuit interface codec be set to a specific value for the duration of the tone. The exception is the camp-on/override tone, which does not require any adjustment of the pads. The call progress tones are described in Table 11-4. The interface settings for the call progress tones are outlined in Table 11-5. The DTMF levels and interface settings are outlined in Tables 1 l-6 and 11-7 respectively.

TABLE 11-3
CONFERENCING LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
ONS(D)	ONS(D)	-6.0	-6.0
	ONS(A)	-6.2	-6.2
	OPSS	-6.0	-6.0
	OPSL	-3.0	-3.0
	ACO(D)	-4.0	-4.0
	ACO(A)	-3.2	-3.2
	ATT(A)	-5.2	-5.2
	ATT(D)	-5.0	-5.0
	ATO(A)	-6.2	-6.2
	ATO(D)	-6.0	-6.0
	DCO	-3.0	-3.0
	DTO	-3.0	-9.0
	DTT	-3.0	-9.0
	sATT	-3.0	-3.0
	sDTT	-3.0	-3.0
	sCTT	-3.0	-9.0
ONS(A)	ONS(D)	-6.2	-6.2
	ONS(A)	-6.4	-6.4
	OPSS	-6.2	-6.2
	OPSL	-3.2	-3.2
	ACO(D)	-4.2	-4.2
	ACO(A)	-3.4	-3.4
	ATT(A)	-5.4	-5.4
	ATT(D)	-5.2	-5.2
	ATO(A)	-6.4	-6.4
	ATO(D)	-6.2	-6.2
	DCO	-3.2	-3.2
	DTO	-3.2	-9.2
	DTT	-3.2	-9.2
	SATT	-3.2	-3.2
	sDTT	-3.2	-3.2
	sCTT	-3.2	-9.2
OPSS	ONS(D)	-6.0	-6.0
	ONS(A)	-6.2	-6.2
	OPSS	-6.0	-6.0
	OPSL	-3.0	-3.0
	ACO(D)	-4.0	-4.0
	ACO(A)	-3.2	-3.2
	ATT(A)	-5.2	-5.2
	ATT(D)	-5.0	-5.0
	ATO(D)	-6.0	-6.0
	ATO(A)	-6.2	-6.2
	DCO	-3.0	-3.0
	DTO	-3.0	-9.0
	DTT	-3.0	-9.0
	sATT	-3.0	-3.0
	sDTT	-3.0	-3.0
	scI-r	-3.0	-9.0

TABLE 11-3 (CONT'D)
CONFERENCING LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
OPSL	ONS(D)	-3.0	-3.0
	ONS(A)	-3.2	-3.2
	OPSL	0	0
	OPSS	-3.0	-3.0
	ACO(D)	-1.0	-1.0
	ACO(A)	-0.2	-0.2
	ATT(A)	-2.2	-2.2
	ATT(D)	-2.0	-2.0
	ATO(D)	-3.0	-3.0
	ATO(A)	-3.2	-3.2
	DCO	0	0
	DTO	0	-6.0
	DTT	0	-6.0
	sATT	0	0
	SD-IT	0	0
	sCTT	0	-6.0
ACO(D)	ONS(D)	-4.0	-4.0
	ONS(A)	-4.2	-4.2
	OPSS	-4.0	-4.0
	OPSL	-1.0	-1.0
	ACO(D)	-2.0	-2.0
	ACO(A)	-1.2	-1.2
	ATT(A)	-3.2	-3.2
	ATT(D)	-2.2	-2.2
	ATO(A)	-4.2	-4.2
	ATO(D)	-4.0	-4.0
	DCO	-1.0	-1.0
	DTO	-1.0	-7.0
	DTT	-1.0	-7.0
	sATT	-1.0	-1.0
	sDTT	-1.0	-1.0
	scl-r	-1.0	-7.0
ACO(A)	ONS(D)	-3.2	-3.2
	ONS(A)	-3.4	-3.4
	OPSS	-3.2	-3.2
	OPSL	-0.2	-0.2
	ACO(D)	-1.2	-1.2
	ACO(A)	-0.4	-0.4
	ATT(A)	-2.4	-2.4
	ATT(D)	-2.2	-2.2
	ATO(A)	-3.4	-3.4
	ATO(D)	-3.2	-3.2
	DCO	-0.2	-0.2
	DTO	-0.2	-6.2
	DTT	-0.2	-6.2
	sATT	-0.2	-0.2
	sDTT	-0.2	-0.2
	sCTT	-0.2	-0.2

TABLE 11-3 (CONT'D)
CONFERENCING LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
ATT(A)	ONS(D)	-5.2	-5.2
	ONS(A)	-5.4	-5.4
	OPSS	-5.2	-5.2
	OPSL	-2.2	-2.2
	ACO(D)	-3.2	-3.2
	ACO(A)	-2.4	-2.4
	ATT(A)	-4.4	-4.4
	ATT(D)	-5.2	-5.2
	ATO(A)	-5.4	-5.4
	ATO(D)	-5.2	-5.2
	DCO	-2.2	-2.2
	DTO	-2.2	-8.2
	DTT	-2.2	-8.2
	sATT	-2.2	-2.2
	sDTT	-2.2	-2.2
	scl-r	-2.2	-8.2
ATT(D)	ONS(D)	-5.0	-5.0
	ONS(A)	-5.2	-5.2
	OPSS	-5.0	-5.0
	OPSL	-2.0	-2.0
	ATT(D)	-4.0	-4.0
	ATT(A)	-4.2	-4.2
	ACO(D)	-3.0	-3.0
	ACO(A)	-2.2	-2.2
	ATO(D)	-5.0	-5.0
	ATO(A)	-5.2	-5.2
	DCO	-2.0	-2.0
	DTO	-2.0	-8.0
	DTT	-2.0	-8.0
	sATT	-2.0	-2.0
	sDTT	-2.0	-2.0
	scl-r	-2.0	-8.0
ATO(A)	ONS(D)	-6.2	-6.2
	ONS(A)	-6.4	-6.4
	OPSS	-6.2	-6.2
	OPSL	-3.2	-3.2
	ACO(D)	-4.2	-4.2
	ACO(A)	-3.4	-3.4
	ATT(A)	-5.4	-5.4
	ATT(D)	-5.2	-5.2
	ATO(A)	-6.4	-6.4
	ATO(D)	-6.2	-6.2
	DCO	-3.2	-3.2
	DTO	-3.2	-9.2
	DTT	-3.2	-9.2
	sATT	-3.2	-3.2
	sDTT	-3.2	-3.2
	scl-r	-3.2	-9.2

TABLE 1 I-3 (CONT'D)
CONFERENCING LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
ATO(D)	ONS(D)	-6.0	-6.0
	ONS(A)	-6.2	-6.2
	OPSS	-6.0	-6.0
	OPSL	-3.0	-3.0
	ACO(D)	-4.2	-4.2
	ACO(A)	-3.2	-3.2
	ATT(A)	-5.2	-5.2
	ATT(D)	-5.0	-5.0
	ATO(A)	-6.2	-6.2
	ATO(D)	-6.0	-6.0
	DCO	-3.0	-3.0
	DTO	-3.0	**-9.0**
	DTT	-3.0	**-9.0**
	sATT	-3.0	-3.0
	sD-I-I-	-3.0	-3.0
	sCTT	-3.0	**-9.0**
SATT	ONS(D)	-3.0	-3.0
	ONS(A)	-3.2	-3.2
	OPSS	-3.0	-3.0
	OPSL	0	0
	ACO(D)	-1.0	-1.0
	ACO(A)	-0.2	-0.2
	All-(A)	-2.2	-2.2
	ATT(D)	-2.0	-2.0
	ATO(A)	-3.2	-3.2
	ATO(D)	-3.0	-3.0
	DCO	0	0
	DTO	0	-6.0
	DTT	0	-6.0
	sATT	0	0
	sD-I-I-	0	0
	SC-I-T	0	-6.0
SDTT	ONS(D)	-3.0	-3.0
	ONS(A)	-3.2	-3.2
	OPSS	-3.0	-3.0
	OPSL	0	0
	ACO(D)	-1.0	-1.0
	ACO(A)	-0.2	-0.2
	ATT(A)	-2.2	-2.2
	ATT(D)	-2.0	-2.0
	ATO(A)	-3.2	-3.2
	ATO(D)	-3.0	-3.0
	DCO	0	0
	DTO	0	-6.0
	DTT	0	-6.0
	sATT	0	0
	sDTT	0	0
	sCTT	-6.0	-6.0

TABLE 11-3 (CONT'D)
CONFERENCING LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
	ONS(D)	-9.0	-3.0
SCTT	ONS(A)	-9.2	-3.2
	OPSS	-9.0	-3.0
	OPSL	-6.0	0
	ACO(D)	-7.0	-1.0
	ACO(A)	-6.2	-0.2
	ATT(A)	-8.2	-2.2
	ATT(D)	-8.0	-2.0
	ATO(A)	-9.2	-3.2
	ATO(D)	-9.0	-3.0
	DCO	-6.0	0
	DTO	-6.0	-6.0
	DTT	-6.0	-6.0
	sATT	-6.0	0
	sDTT	-6.0	0
	sCTT	-6.0	-6.0
	ONS(D)	-3.0	-3.0
DCO	ONS(A)	-3.2	-3.2
	OPSS	-3.0	-3.0
	OPSL	0	0
	ACO(D)	-1.0	-1.0
	ACO(A)	-0.2	-0.2
	ATT(A)	-2.2	-2.2
	ATT(D)	-2.0	-2.0
	ATO(A)	-3.2	-3.2
	ATO(D)	-3.0	-3.0
	DCO	0	0
	DTO	0	-6.0
	DTT	0	-6.0
	sATT	0	0
	SD-I-I-	0	0
	scl-r	0	-6.0
	ONS(D)	-9.0	-3.0
DTO	ONS(A)	-9.2	-3.2
	OPSS	-9.0	-3.0
	OPSL	-6.0	0
	ACO(D)	-7.0	-1.0
	ACO(A)	-6.2	-0.2
	ATT(A)	-8.2	-2.2
	ATT(D)	-8.0	-2.0
	ATO(A)	-9.2	-3.2
	ATO(D)	-9.0	-3.0
	DCO	-6.0	0
	DTO	-6.0	-6.0
	DTT	-6.0	-6.0
	sATT	-6.0	0
	sDTT	-6.0	0
	scl-r	-6.0	-6.0

TABLE 11-3 (CONT'D)
CONFERENCING LOSS PLAN

Originating Circuit	Connecting Circuit	Loss (dB) Tx Direction	Loss (dB) Rx Direction
DTT	ONS(D)	-9.0	-3.0
	ONS(A)	-9.2	-3.2
	OPSS	-9.0	-3.0
	OPSL	-6.0	0
	ACO(D)	-7.0	-1.0
	ACO(A)	-6.2	-0.2
	ATT(A)	-8.2	-2.2
	ATT(D)	-8.0	-2.0
	ATO(A)	-9.2	-3.2
	ATO(D)	-9.0	-3.0
	DCO	-6.0	0
	DTO	-6.0	-6.0
	DTT	-6.0	-6.0
	sATT	-6;0	0
	SD-IT	-6.0	0
	sCTT	-6.0	-6.0

TABLE 11-4
SX-ZOO NORTH AMERICAN CALL PROGRESS TONES

Tone	Frequency (Hz)	Combined Level Line Interface	(dBm into 600 ohms) Trunk Interface	Cadence (seconds)
Dial tone	350/440	-13.75 f0.75	-13.75 ±0.75	continuous
Transfer dial tone	350/440	-13.75 ±0.75	-13.75 f0.75	3 x (0.1s on 0.1s off), followed by continuous
Reorder	480/620	-24.0 ±1.5	-18.0 ±1.5	0.25s on, 0.25s on
Busy	480/620	-24.0 ±1.5	-18.0 ±1.5	0.5s on 0.5s off
Ringback	440/480	-19.0 ±1.5	-13.0 f1.5	Is on 3s off

TABLE 11-4 (CONT'D)
SX-200 NORTH AMERICAN CALL PROGRESS TONES

Tone	Frequency (Hz)	Combined Level Line Interface (dBm into 600 ohms)	Trunk Interface	Cadence (seconds)
Special Ringback	440/480	-19.0 ±1.5	-13.0 ±1.5	0.4s on 0.2s off 0.4s on 3s off
Camp-on	440	-17.0 to -20.0	-14.0 to -20.0	on 0.2s
Executive override	440	-17.0 to -20.0	-14.0 to -20.0	0.8s on,(6s off, 0.2s on) repeated.
Special busy	440	-17.0 to -20.0	-14.0 to -20.0	0.5s on, 0.5s off

TABLE 1 l-5
CALL PROGRESS TONE INTERFACE LEVELS

TONE	Interface	Interface Level (dBm)
Dial Tone	ONS(D)	-13.75
	ONS(A)	-13.95
	OPSS	-13.75
	OPSL	-13.75
	ACO(D)	-13.75
	ACO(A)	-13.95
	ATT(A)	-13.95
	ATT(D)	-13.75
	ATO(A)	-13.95
	ATO(D)	-13.75
	DCO	-13.75
	DTO	-13.75
	DTT	-13.75
	sATT	-13.75
	sDTT	-13.75
	sCTT	-13.75

TABLE 11-5 (CONT'D)
CALL PROGRESS TONE INTERFACE LEVELS

TONE	Interface	Interface Level (dBm)
Reorder/Busy	ONS(D)	-24.0
	ONS(A)	-23.2
	OPSS	-24.0
	OPSL	-24.0
	ACO(D)	-18.0
	ACO(A)	-18.2
	ATT(A)	-18.2
	ATT(D)	-18.0
	ATO(A)	-18.2
	ATO(D)	-18.0
	DCO	-20.0
	DTO	-20.0
	DTT	-20.0
	sATT	-18.0
	sDTT	-20.0
	scl-r	-20.0
Ringback	ONS(D)	-19.0
	ONS(A)	-18.2
	OPSS	-19.0
	OPSL	-19.0
	ACO(D)	-13.0
	ACO(A)	-13.2
	ATT(A)	-13.2
	ATT(D)	-13.0
	ATO(A)	-13.2
	ATO(D)	-13.0
	DCO	-15.0
	DTO	-15.0
	DTT	-15.0
	sATT	-13.0
	sD-l-l-	-15.0
	scl-r	-15.0
Camp-on / Executive Override	ONS(D)	-20.0
	ONS(A)	-19.2 to -20.2
	OPSS	-20.-
	OPSL	-17.0 to -19.0
	ACO(D)	-14.0 to -20.0
	ACO(A)	-14.2 to -20.2

TABLE 11-5 (CONT'D)
CALL PROGRESS TONE INTERFACE LEVELS

TONE	Interface	Interface Level (dBm)
	ATT(A)	-17.2 to -20.2
	ATT(D)	-17.0 to -20.0
	ATO(A)	-17.2 to -20.0
	ATO(D)	-17.0 to -20.0
	DCO	-17.0
	DTO	-17.0
	DTT	-17.0
	sATT	-17.0 to -19.0
	sDTT	-17.0 to -19.0
	sCTT	-17.0

TABLE 1 I-6
DTMF LEVELS - TRUNK INTERFACE INTO 600 OHMS

Nominal level - single frequency	: -4.0 dBm
Nominal level - frequency pair	: -1.0 dBm
Nominal twist	: 0.0 dBm

TABLE 1 I-7
DTMF TONE
INTERFACE
LEVELS

Interfac	Interface Level (dBm)
ONS(D)	n/a
ONS(A)	n/a
OPSS	n/a
OPSL	n/a
ACO(D)	-1.0
ACO(A)	-1.2
ATT(A)	-1.2
ATT(D)	-1.0
ATO(A)	-1.2
ATO(D)	-1.0
DCO	-1.0
DTO	-1.0
DTT	-1.0
sATT	-1.0
sDTT	-1.0
scl-r	-1.0

12. TRAFFIC CONSIDERATIONS

General

12.01 This part details traffic limitations for all configurations available with the SX-200 DIGITAL PABX.

Information includes:

- Busy Hour Call Attempt (BHCA)
- System Traffic Capacity
- Grade of Service
- Receiver Provisioning
- Trunk Distribution.

Traffic Limitations

12.02 Traffic capacities are specified on a per line basis in terms of calls per hour, erlangs, and CCS.

456-Port Configuration

A basic system consists of 350 lines and 54 trunks. This configuration has been specified to meet the following traffic characteristics:

Busy Hour Call Attempts	System (BHCA) Mean	99.9% Peak
Per Second	**0.395**	0.580
Per Hour	1422	2087

Bothway Traffic Capacity System/Port/Line]	Calls/Hour	Erlang	ccs
Per Line	5.58	0.19	6.83
Per Port	4.84	0.16	5.91
System	1954	66.36	2389.0

Typical configured system quantities:

Lines	Trunks
350	54
325	51
300	48
275	45
250	42
225	39
200	36
175	32
150	29
125	26
100	22
75	19
50	15

480-Port Configuration

A basic system consists of 400 lines and 60 trunks. This configuration has been specified to meet the following traffic characteristics:

Busy Hour Call Attempts	System (BHCA) Mean	99.9% Peak
Per Second	0.395	0.644
Per Hour	1614	2317

Bothway Traffic Capacity			
System/Port/Line	Calls/Hour	Erlang	ccs
Per Line	5.56	0.19	6.84
Per Port	4.83	0.17	5.95
System	2224	76.03	2737.0

Typical configured system quantities:

Lines	Trunks
400	60
375	57
350	54
325	51
300	48
275	45
250	42
225	39
200	36
175	32
150	29
125	26
100	22
75	19
50	15

336 Port Configuration

A basic system consists of 250 lines and 42 trunks. Each digital port may sustain traffic levels of 36 CCS per port, up to the system maximum. This configuration has been specified to meet the following traffic characteristics:

Busy Hour Call Attempts	System (BHCA) Mean	System (BHCA) 99.9% Peak
Per Second	0.256	0.446
Per Hour	1029	1605

System/Port/Line	Bothway Traffic Capacity Calls/Hour	Erlang	CCS
Per Line	5.60	0.19	6.77
Per Port	4.80	0.16	5.79
Svstem	1401	47.00	1692.0

Typical configured system:

Lines	Trunks
250	42
225	39
200	36
175	32
150	29
125	26
100	22
75	19
50	15

672-Port Configuration

A basic system consists of 400 lines and 60 trunks. This configuration has been specified to meet the following traffic characteristics,

Busy Hour Call Attempts	System (BHCA) Mean	99.9% Peak
Per Second	0.395	0.6.44
Per Hour	1614	2317

Bothway Traffic Capacity System/Port/Line	Calls/Hour	Erlang	CCS
Per Line	5.56	0.19	6.84
Per Port	4.83	0.17	5.95
System	2224	76.03	2737.0

Typical configured system quantities:

Lines	Trunks
400	60
375	57
350	54
325	51
300	48
275	45
250	42
225	39
200	36
175	32
150	29
125	26
100	22
75	19
50	15

Grade of Service

12.03 The SX-200 DIGITAL PABX Grade of Service (GOS) (in terms of blocking) is outlined in Table 12-1.

TABLE 12-1
SX-200 DIGITAL PABX GRADE OF SERVICE (GOS)

Link/Resource Blocking	Blocking Probability
Link Blocking:	
Peripheral to Network	<0.1%
Network to Network	0.0%
Resource Blocking	
Software	<0.01%
DTMF Receivers, Trunks	provisioning dependent

Receiver Provisioning

12.04 The number of receivers required to be installed in the PABX is dependent on various factors, such as the number of lines and trunks installed, the amount of traffic flow estimated for the system and the desired grade of service. In order to arrive at the quantity of receivers required the following assumptions were made:

- Average receiver holding time for intercom call is 6 seconds
- Average receiver holding time for a trunk call is 17.4 seconds
- Holding time for receivers is exponential
- Call originations are Poisson
- Call holding times are exponential
- Receivers are provisioned in multiples of 4.

12.05 For a given load (heavy, medium and light traffic), the minimum number of required receivers was determined for the following grades of service (ABSBH):

- ABSBH = 99.0 - 99.0 % of all receiver requests serviced within 3 seconds.
- ABSBH = 99.99 - 99.99 % of all receiver requests serviced within 3 seconds.

12.06 The following calculations are used to generate Tables 12-2 through 12-4:

Receiver Holding Time (h) = 6 x (% intercom traffic) + 17.4 x (% trunk traffic) Seconds

Receiver Traffic (A) =

$$\frac{\text{(Originating Calls per hour) x (Receiver holding time (sec))}}{3600} \text{ Erlangs}$$

Multiple of holding time (t) = 3 (s) ----------h (s)

Probability of of delay greater than t (P(>t)) = 1 - ABSBH/100

Using Erlang C formula delay curves, knowing t, A, P(>t), the minimum number of receivers can be obtained.

Trunk Distribution

12.07 Since the digital bays are non-blocking, while the analog bays are blocking, as many trunks as possible should be distributed in the digital bays. Analog type trunks should be evenly distributed throughout the analog bays. For example, a fully configured system in a heavy traffic environment might have four to five trunk cards in each of the analog bays.

TABLE 12-2
HEAVY TRAFFIC

o. o .ines	CCS/ Line	Total CCS	In CCS	out CCS	Intra CC5	In Calls	out Calls	Intra Calls	Orig Calls	In Trks	out Trks	2Way Trks	Receivers Required for ABSBH = 99.0%	Receivers Required for ABSBH = 99.99%
80	5.94	358	150	140	87	85	103	77	180	11	9	18	8	8
80	5.77	482	190	178	93	108	132	108	238	12	11	19	8	12
100	5.87	587	230	218	120	131	180	138	298	14	13	228	8	12
120	5.80	872	289	254	149	153	189	187	358	16	14	25	12	12
140	5.55	777	308	292	177	174	218	196	414	17	15	26	12	18
180	5.51	662	348	329	207	198	244	229	473	19	17	30	12	18
180	5.48	986	364	385	237	217	272	281	533	20	16	33	12	16
200	5.46	1092	422	402	287	236	299	292	591	21	20	38	12	18
220	5.44	1197	480	439	298	258	327	324	851	23	21	38	12	18
240	5.43	1303	497	478	330	279	355	358	711	24	22	41	18	20
280	5.41	1407	534	511	382	299	302	366	770	25	23	43	18	20
280	5.40	1512	570	547	394	319	409	420	629	27	25	48	18	20
300	5.39	1817	807	563	428	338	438	452	888	26	26	46	18	20
320	5.38	1722	643	819	459	357	483	463	948	29	27	51	18	20
340	5.36	1629	660	855	493	378	491	518	1007	31	26	53	18	24
380	5.37	1933	718	891	528	395	516	547	1085	32	30	65	20	24

TABLE 12-3
MEDIUM TRAFFIC

No. of Lines	CCS/ Line	Total CCS	In CCS	Out CCS	Intra CCS	In Calls	out Calls	Intra Calls	Orig Calls	In Trks	out Trks	2Way Trks	Receivers Required for ABSBH = 99.0%	Receivers Required for ABSBH = 99.99%
80	3.23	194	81	78	37	48	58	42	98	7	6	11	4	8
80	3.14	251	103	97	51	59	72	56	130	8	8	13	8	8
100	3.09	309	125	118	88	71	67	74	181	9	a	14	8	8
120	3.05	388	147	138	61	83	103	91	194	10	9	18	8	12
140	3.02	423	168	169	98	95	116	106	128	11	10	18	a	12
180	3.00	460	188	179	113	107	133	125	258	12	11	19	8	12
180	2.99	536	210	199	129	116	148	142	290	13	12	21	8	12
200	2.96	598	230	220	148	130	183	180	323	14	13	22	8	12
220	2.97	853	251	240	183	141	176	177	355	15	13	24	8	12
240	2.98	710	271	259	180	152	193	194	387	16	14	25	12	18
280	2.95	787	291	279	197	183	206	212	220	16	15	27	12	18
280	2.94	823	311	298	214	174	223	229	452	17	18	28	12	18
300	2.94	882	331	318	233	185	238	248	484	18	18	30	12	18
320	2.93	938	350	337	250	195	252	283	612	19	17	31	12	18
340	2.93	998	371	357	289	205	287	281	546	19	18	32	12	18
380	2.93	1055	391	377	267	215	283	298	581	20	19	34	12	18
360	2.92	1110	4	395	305	225	297	315	812	21	19	35	12	18
400	2.92	1168	429	416	324	235	312	332	844	22	20	38	12	18

TABLE 12-4
LIGHT TRAFFIC

No. of Lines	CCS/ Line	Total CCS	In ccs	out ccs	Intra CCS	In Calls	out Calls	Intra Calls	Orig Calls	In Trks	out Trks	2Way Trks	Receivers Required for ABSBH = 99.0%	Receivers Required for ABSBH = 99.99%
60	1.41	a5	36	33	16	20	24	16	42	5	4	7	4	8
80	1.41	113	46	44	23	26	32	26	58	6	5	a	4	8
100	1.41	141	57	54	30	33	40	34	74	6	5	9	4	a
120	1.41	169	68	64	37	36	47	42	69	7	6	10	4	a
140	1.41	197	78	74	45	44	55	50	105	7	6	11	a	8
160	1.41	226	69	84	53	50	62	59	121	a	7	12	a	a
180	1.41	254	99	94	61	56	70	67	137	a	7	12	a	a
200	1.41	262	109	104	69	61	77	75	152	9	a	13	a	a
220	1.41	310	119	114	77	67	65	64	169	9	a	14	6	8
240	1.41	336	129	123	66	72	92	93	185	10	9	15	a	12
260	1.41	367	139	133	94	76	99	101	200	10	9	16	6	12
260	1.41	395	149	143	103	83	107	110	217	10	10	16	a	12
300	1.41	423	159	153	112	89	114	118	232	11	10	17	a	12
320	1.41	451	169	162	120	94	121	127	246	11	10	19	a	12
340	1.41	479	178	172	129	99	129	135	264	12	11	19	a	12
360	1.41	506	88	181	136	104	136	144	260	12	11	19	a	12
380	1.41	536	196	191	147	109	143	152	295	13	11	20	a	12
400	1.41	564	207	200	156	114	150	160	310	13	12	21	6	12

13. SYSTEM CHARACTERISTICS

General

13.01 This section describes the environmental, electrical, and operational characteristics of the SX-200 DIGITAL PABX.

Environmental Conditions

13.02 The systems are designed to operate within the environmental conditions outlined in Table 13-1.

TABLE 13-1
SYSTEM ENVIRONMENTAL OPERATING CONDITIONS

Specification	Range
Temperature	10°C to 40°C (50°F to 104°F) for system 0°C to 30°C (32°F to 86°F) for console.
Relative humidity	20% to 80% noncondensing.
Acoustic noise	The system radiates less than 50 dB SPL, "A" weighted, measured 1524 mm (60 in.) from the center of the cabinet.
Maximum Altitude	4000 metres

Heat Dissipation

13.03 A fully configured SX-200 DIGITAL PABX will dissipate heat in the following manner (figures are approximate):

Digital Bays (each)	: 500 BTU/hr
Analog Bay 3	: 1000 BTU/hr
Analog Bay 4	: 1000 BTU/hr
Analog Bay 5	: 750 BTU/hr

Shipping and Storage

13.04 The equipment is designed to withstand shipping by truck, rail, air, or sea without damage, when packaged in conventional shipping containers of the manufacturer. The range of environmental conditions that the equipment is capable of withstanding in storage is shown in Table 13-2.

TABLE 13-2
STORAGE CONDITIONS

Specification	Range
Temperature range	-50°C to 71°C (-58°F to 159.8°F) for the system
	10°C to 40°C (50°F to 104°F) for the floppy disk
	-20°C to 60°C (-4°F to 140°F) for the console.
Relative humidity	Up to 100 % RH at 18°C (64.4°F)
	10 to 70% RH for the console.
Vibration	0.5 g (4.903 m/s^2) (sinusoidal) 5 to 1000 Hz
	1.5 g (14.7 m/s^2) (sinusoidal) 100 to 500 Hz
Shock	Up to 75 cm (30 in.) drop depending upon package
Low pressure	87 mm Hg 15,152 m (50,000 ft)
Temperature shock	-40°C to 21°C (-40°F to 70°F) in 5 minutes
	66°C to 21°C (150°F to 70°F) in 5 minutes

Loop Lengths

13.05 Loop lengths for various cards are given in Table 13-3:

Digital Line Card Loop Lengths

13.06 The maximum loop length for DNIC based peripherals and sets connected to a Digital Line Card is 1000 meters (with 22, 24, or 26 wire gauge).

Loop Specifications for Connections to a Digital Line Card

Application: This interface is not intended or approved for off premises applications.

Bridge Taps: Qne bridge tap of any length and located at any point on the main loop will not significantly degrade the error performance. A second bridge tap, depending on its length and location may significantly degrade the error performance. The main loop and the bridge tap must NOT have any devices connected to them other than the SX-200 Digital line circuit and one Digital set or console; the third tip and ring pair must not be terminated.

TABLE 13-3
LOOP LENGTHS

Card Type	Wire Gauge (AWG)	Loop Length
COV Card	26 24 22	1006 m 3300 ft 1524 m 5000 ft 2010 m 6600 ft
SUPERSET Line Card	22 24 26	840 m 2750 ft 610 m 2000 ft 470 m 1550 ft
DLC Console Interface	26	305 m 1000 ft
DNIC line card (Dig. set) (DNIC Console)	24 26 24 26	1006 m 3300 ft 1006 m 3300 ft 1006 m 3300 ft 1006 m 3300 ft
ONS Card		600 ohms
OPS Card		1600 ohms
DID Trunk Card		2200 ohms
LS/GS		1600 ohms

TABLE 13-3 (CONT'D)
LOOP LENGTHS

Card Type	Wire Gauge (AWG)	Loop Length
T1 Trunk These are cable, not loop lengths. DIP switches on T1 Trunk card must be set for the correct equalization depending on cable length.		0 - 45.8 m (0 - 150 ft) 45.8 - 137.3 m (150 - 450 ft) 137.3 - 200.5 m (450 - 655 ft)

14. POWER SUPPLIES

General

14.01 This Part gives details of the electrical characteristics of the power supplies. A summary of the electrical power characteristics is detailed in Table 14-1.

TABLE 14-1
ELECTRICAL POWER CHARACTERISTICS

Characteristic	Details
Door-Mounted AC Power Supply	
input voltage	120 Vac -20% to +10%
Frequency	44 Hz to 64 Hz
Holdover Time	Momentary interruptions in commercial power: - up to 250 ms duration
Input Current	7 Amps maximum at 120 Vac
Talk Battery Noise	Does not exceed 28 dBrnC
Shelf-Mounted AC Power Supply	
Input Voltage	102 Vac to 135 Vac
Frequency	47 Hz to 63 Hz
Holdover Time	Minimum of: 40 ms at 120 Vac, 20 ms at 102 Vac, delivering full rated load
Input Current	Maximum of: 2.0 Amps at 120 Vac 1.1 Amps at 240 Vac

14.02 The power supply for an analog peripheral bay is mounted directly on the cabinet back door and weighs 31.8 kg (70 lb). It generates the system operating voltages of 8 Vdc, -5 Vdc, -10 Vdc, -48 Vdc and 90 Vac ringing voltage from a 115 Vac power input (optionally 230 Vac). A Control cabinet that includes an analog Bay 3 or an analog Peripheral cabinet each requires a rear door power supply. Rear door power supply test points are shown in Table 14-2.

TABLE 14-2
REAR DOOR POWER SUPPLY TEST POINT VOLTAGES

Voltage	Range
+ 8 Vdc	+7.6 to +8.4
0 Vdc	- -
- 5 Vdc	-5.3 to -4.7
-10 Vdc	-10.5 to -9.5
-48 Vdc	-52.0 to -45.0
GND or 0 Vdc	- -
90 Vac	85.0 to 95.0

Bay Power Supplies

14.03 The power supplies for the digital bays are card-mounted and are located in the upper right position of each Digital bay. The Bay power supply (BPS) connects to the backplane through a card-edge connector at the rear of the card; also at the rear is an IEC receptacle which connects to a line cord from the system AC distribution. The dimensions of the power supply are as follows:

Width	5.1 cm	(2.0 in.)
Height	15.7 cm	(6.2 in.)
Depth	36.8 cm	(14.5 in.)

Electrical Characteristics

14.04 All power is derived from either a commercial AC source or an Uninterruptable Power Supply (UPS). The BPS is preset at the factory to one of two input voltage ranges. The BPS specifications are:

	Commercial power	Inverter power	Current
Low range	102 Vrms to 135 Vrms.	102 Vrms to 135 Vrms.	2.0 A rms max.
High range	204 Vrms to 270 Vrms.	204 Vrms to 270 Vrms.	1.1 A rms max.
Frequency	47 Hz to 63 Hz.	47 Hz to 63 Hz.	
Waveform	Sinusoidal, 5% THD max.	Quasi-square wave, 0.71 duty cycle.	

14.05 The Bay Power Supply output voltages, current, and power rating for which the unit will operate within its design specifications are shown in Table 14-3. Table 14-4 shows voltage specifications.

TABLE 14-3
BAY POWER SUPPLY RATINGS

OUTPUT	MAXIMUM CURRENT	POWER
12 V DC	2.5 A	30 w
+5 V DC	15.0 A	75 w
+5 v (PC)	TRANSIENT	
-5 V DC	1.0 A	5 w
-12 V DC	2.0 A	24 W
-28 V DC	1.6 A	45 w
-48 V DC	1.5 A	72 W
90 V-RING	0.1 A rms	10 w
TOTAL POWER (see Note)		140 w

Note: The maximum power supply output is 140 watts; therefore the outputs are partially exclusive. Maximum current values in the table are for each individual rail; however, the total power cannot exceed 140 watts.

TABLE 14-4
BAY POWER SUPPLY TEST POINT VOLTAGES

Voltage	Range
+ 5 Vdc	+4.925 to +5.075
+12 Vdc	+10.8 to +13.2
-12 Vdc	-13.2 to -10.8
- 5 Vdc	-5.5 to -4.5
-28 Vdc	-30.8 to -23.8
-48 Vdc	-53.76 to -40.8
90 Vac	63.0 to 99.0

Controls and Indicators

14.06 The ON/OFF switch is mounted on the front of the BPS and is used to turn the power on or off to the unit. Two LEDs are also on the front; the upper LED indicates that the BPS is operating, and the lower LED is ON when the ringing amplifier is producing power (flashing in cadence with it). Refer to Figure 14-1.

Input And Output Protection

14.07 The input to the converter is protected by a fuse, and by low voltage protection which shuts off the converter if the input voltage falls below the specified minimum. The converter will not be re-enabled until the input voltage returns to the specified minimum. The input also includes protection which limits the peak inrush current to 20 A.

14.08 Each output is protected against short circuits, overloads, and overvoltage. The overload/short circuit protection is self-resetting.

Power Fail Sense

14.09 The converter has a single alarm signal, PFS (power fail sense), which is driven low when the incoming AC falls below its minimum specified value. At this point there will be approximately 10 ms before the outputs fall out of regulation.

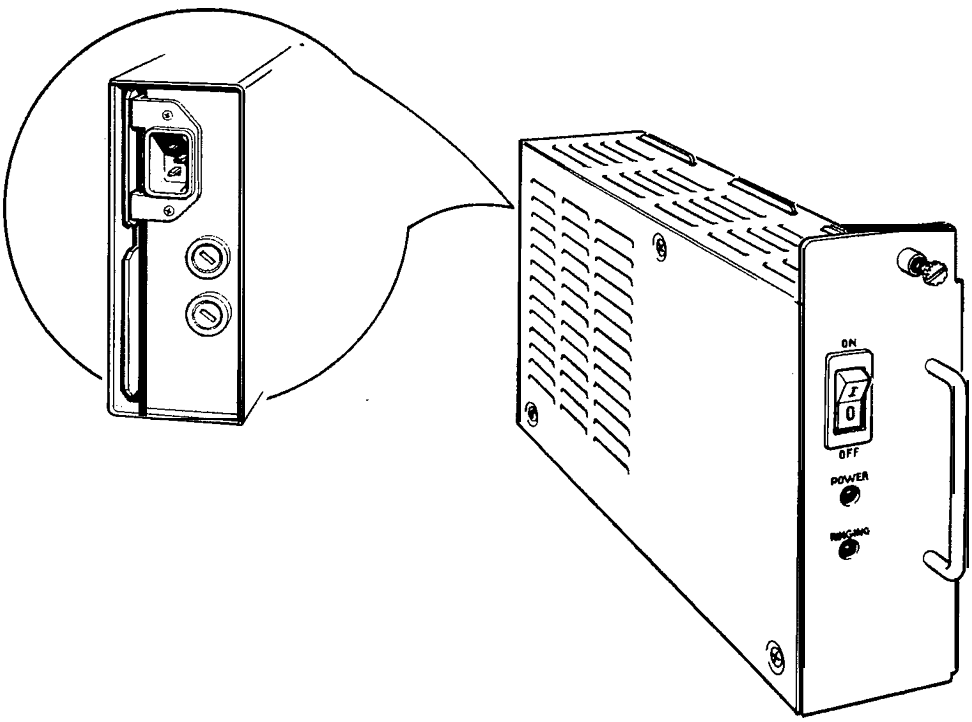


Figure 14-1 Bay Power Supply

15. RESERVE POWER SUPPLY

General

15.01 The reserve power supply for the Control cabinet is a stand-alone, Uninterruptable Power Supply (UPS) or Standby Power Supply (SPS) comprising a battery pack, a charger, and an inverter. The UPS or SPS backup time is dependent upon the unit selected and the capacity of the batteries provided. The unit must be able to provide 115 Vac at 15A.

15.02 The Peripheral cabinet can have its own standard reserve power supply (in the base of the cabinet), or can be supported by an additional UPS. The UPS is an assembly not manufactured by MITEL Corporation.

15.03 Mitel Corporation has evaluated several Uninterruptable Power Supplies (UPS) and Standby Power Supplies (SPS) that have proved compatible with the SX-200 DIGITAL PABX. Marketing and Sales literature, which is available from authorized representatives, identifies the approved products.

15.04 Please note that compliance to electrical installation and building codes is the responsibility of the purchaser of the equipment. Consult local municipal and electrical utility authorities before proceeding with the installation of equipment.

15.05 The UPS should be a true Uninterruptable Power Supply (except for the one SPS recommended by MITEL) which always supplies the output load from its inverter and which includes a reverse transfer switch to automatically bypass the UPS if it fails.

Rating	1.5 kVA minimum
Input Voltage	120 Vrms +10%,−15%, 60 Hz ±5%
Output Voltage	120 Vrms +10%,−15%, 60 Hz ±5%
Output Waveform	Sinewave or Quasi square wave (not square wave)
Output Receptacle	NEMA 15 A 3-pin grounded
Holdup/Recharge Times	Per customer requirements.

15.06 An Uninterruptable Power Supply (UPS) can have an external connection (from an internal relay) which provides a closed contact to remotely indicate status or condition. Conditions which may be indicated include:

- an ALARM condition is present within the UPS

- the UPS is operating from its batteries (probably because commercial AC power has been interrupted).

The relay contact may be connected to a remote alarm or to a “Contact Monitor” line circuit to promptly indicate the condition.

Refer to the Manufacturer's Installation Manual, which describes conditions that are indicated. Refer to Section MITL9109-094-105-NA for a description of "Contact Monitor" line circuit operation.

16. POWER FAIL TRANSFER

Power Fail Transfer Operation

16.01 In the event of a major alarm condition, the power fail transfer relays located on the Power Fail Transfer (PFT) card, will connect Central Office (CO) trunks to selected station lines. Calls in progress when PFT occurs will be dropped; however calls made while in PFT mode will not be dropped when the system returns to normal operation, but will terminate normally at the end of the call. No PABX features are available while PFT is in effect. Any of the following conditions will cause power fail transfer:

Commercial power failure (if no reserve power supply is used).
Common control failure.
Manual transfer from control cabinet.

The maximum number of Power Fail Transfer circuits for the various system sizes is shown below:

System Size	In Control Cabinet	In Peripheral Cabinet	Total Circuits
480 port	12 Maximum	12 Maximum	24 max
456 port	18 Maximum	12 Maximum	30 max
336 port	18 Maximum	-----	18 max
672 port	18 Maximum	18 Maximum	36 max

APPENDIX A

Al. APPENDIX A - CALL PROCESSING INFORMATION

Al .01 - Digital Bay to Digital Bay (within bays 1 and 2)

1. The Main Control Card (MCC) scans for on-hook/off-hook change of state.
2. An extension goes off-hook in Bay 1.
3. The MCC detects the off-hook during its line card scan.
4. MCC checks for the COS of the extension to determine if the call is allowed.
5. The MCC checks for an idle receiver.
6. The MCC connects the DTMF receiver to the line circuit through the DX matrix on a PCM channel.
7. The MCC connects the same channel to the Digital Signal Processor (DSP) to provide dial tone.
8. The MCC monitors the circuit for rotary pulses.
9. The DTMF receiver detects any DTMF tones and sends a message to the MCC indicating the value of the dialed digits.
10. On receipt of the first digit, the MCC removes the DSP from the assigned channel.
11. The MCC monitors the digits dialed and checks the idle/busy condition of the destination.
12. If the destination is idle, the MCC connects the DSP to the originator and ringback is supplied.
13. The MCC sends the originator a cadence message to provide interruption of the ringback tone.
14. The MCC sends ringing to the Bay Power Supply from the DSP via a DX link.
15. The Bay Power Supply amplifies and routes the ringing to the destination.
16. The MCC sends a message to the destination to turn ringing on.

17. When the destination answers, the MCC detects the off-hook change of state.

18. Ringing is removed from the destination.

19. Ringback is removed from the originator.

20. A channel is connected between the originator and the destination.

21. The MCC scans for on-hook/off-hook changes of state.

22. When an on-hook is detected, the MCC removes the channel, and the call is terminated.

AI .02 - Analog Bay (Rotary) to Analog Bay

1. The Scanner card scans the line circuits for on-hook/off-hook changes of state.

2. An extension goes off-hook in Bay 3.

3. The Scanner detects an off-hook during the line card scan.

4. The Scanner sends an IRQ to the Peripheral Control Card (PCC).

5. The PCC determines the originator, generates a message and passes it to the Digital Interface Card (DIC).

6. The DIC formats and sends a message to the MCC.

7. The MCC checks the originator's COS to determine if the call is allowed.

8. The MCC checks for an idle DTMF receiver.

9. The MCC sends a message to the PCC to connect a junctor to the originator.

10. The MCC assigns a channel of the link to the junctor, and connects the DTMF receiver to the channel through the DX matrix.

11. The MCC connects the same channel to the DSP to provide dial tone.

12. The PCC monitors the circuit for rotary pulses.

13. The DTMF receiver detects any DTMF tones and sends a message to the MCC indicating the value of the tones.

14. On receipt of the first digit, the MCC removes the DSP from the assigned channel.

15. The MCC monitors the digits dialed and checks the idle/busy condition of the destination.

16. If the destination is idle, the MCC connects the DSP to the originator and ringback tone is supplied.

17. The MCC sends a cadence message to the PCC of the originator to provide interruption of the ringback tone.

18. The MCC sends a message to the PCC to ring the destination.

19. When the destination answers, the Scanner detects the off-hook.

20. The Scanner sends an IRQ to the PCC.

21. The PCC stops ringing and sends a message to the MCC indicating that the destination is off-hook.

22. Ringback is removed from the originator.

23. Since both parties are in Bay 3, the MCC sends a message to the PCC to provide a connection between the originator and the destination using a speech path. (There are no PCM channels used in this connection).

24. The Scanner scans for on-hook/off-hook changes of state.

25. When an on-hook is detected, the PCC sends a message to the MCC indicating that the extension(s) have gone on-hook; the call is terminated.

SX-200” DIGITAL
PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX)
TROUBLESHOOTING

CONTENTS PAGE

CONTENTS (CONT'D) PAGE

LIST OF ILLUSTRATIONS

LIST OF CHARTS

LIST OF CHARTS (CONT'D)

LIST OF TABLES

FOR EMERGENCY

TROUBLESHOOTING

GO TO

CHART 2-2

ON PAGE 6

I M P O R T A N T   N O T I C E

A. CORRECT SYSTEM GROUNDING IS CRITICAL. GROUNDING INSTRUCTIONS CONTAINED IN SECTION MITL9109-094-200-NA, SHIPPING, RECEIVING AND INSTALLATION MUST BE ADHERED TO WITHOUT EXCEPTION. NOTE THAT THE SYSTEM MAY FUNCTION ERRATICALLY, OR NOT AT ALL WITHOUT PROPER GROUNDING.

B. THE FOLLOWING POINTS SHOULD BE CAREFULLY NOTED AND THE INSTRUCTIONS THEREIN STRICTLY OBSERVED :

- Handle circuit cards by the edges only, and ensure that a ground strap is used. Card damage may otherwise result.
- Before replacing a card, remove the original card, check for bent or damaged connectors, inspect the backplane, and reseat the original card.
- If a problem has been cured through the replacement of a card, temporarily reinsert the original card to verify that the fault is located therein.
- Always provide the maximum amount of relevant data on the card repair tag accompanying a faulty card (see Appendix F) - never return a card without a repair tag.
- Ensure that a system fault record is always up-to-date, and kept on site.

1. GENERAL

Introduction

1.01 This Section is intended to provide maintenance personnel with a comprehensive guide to the detection, analysis and correction of malfunctions of the SX-200® DIGITAL PABX with Generic 1003 software. The scope of this Section covers the main switching machine, the central office interface, stations and special sets, and AC power (including grounding). The Section comprises troubleshooting procedures, which are used to isolate and correct malfunctions, together with additional supporting information.

1.02 Before troubleshooting is attempted, the maintenance user should become very familiar with the SX-200 maintenance system. A complete description of the maintenance system is provided in Section MITL9109-094-353-NA. Further details concerning the maintenance of the SX-200 DIGITAL PABX with Generic 1003 software may be found in the MITEL Sections listed in Table l-l.

Reason for Issue

1.03 This Section forms part of the MITEL Standard Practices issued to provide technical information for the SX-200 DIGITAL PABX, with Generic 1003 features and software.

TABLE l-l
SX-200 DIGITAL PABX MITEL PRACTICES

MITLS 109-094-l 00-NA	General Description
MITLS 109-094-105-NA	Features Description
MITLS 109-094- 180-NA	Engineering Information
MITLS 109-094-200-NA	Shipping, Receiving and Installation
MITL9109-094-210-NA	Customer Data Entry
MITLS 109-094-351 -NA	RS-232 Maintenance Terminal
MITL9109-094-353-NA	General Maintenance Information

2. PRIMARY TROUBLESHOOTING PROCEDURES

General

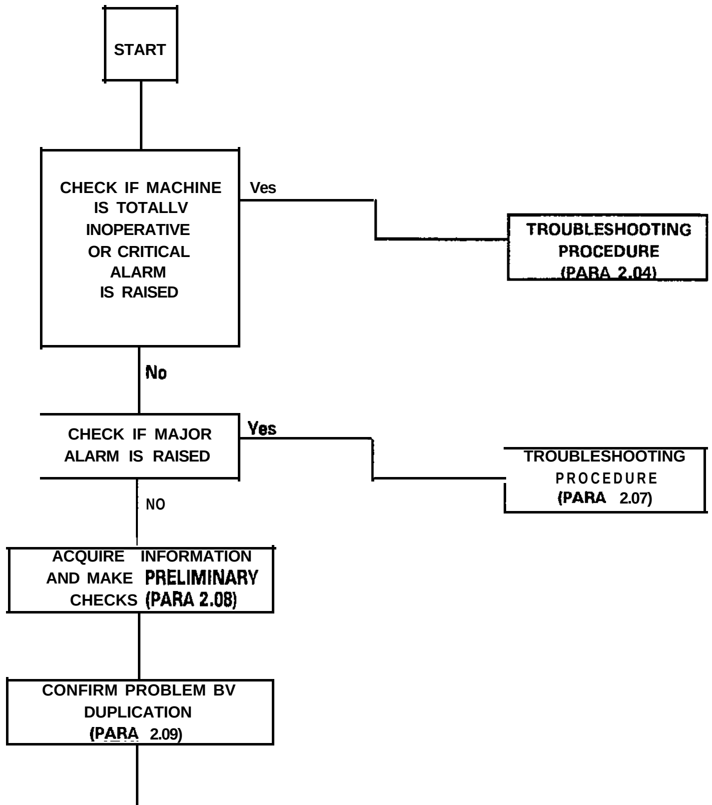
2.01 Troubleshooting a malfunction in any complex electronic system is accomplished in a series of logical steps. This Section assumes the following basic steps in the troubleshooting of a malfunction:

- GATHERING of information
- CLARIFICATION of the problem
- CONFIRMATION of the problem
- ISOLATION of the problem
- CORRECTION
- DOCUMENTATION.

2.02 Chart 2-1 provides the basic primary troubleshooting flowchart for the SX-200 DIGITAL PABX system. This chart acts as a starting point for the troubleshooting process, and directs the troubleshooter to the appropriate detailed troubleshooting procedure.

2.03 The troubleshooter, when investigating a problem, should continually verify each step in the isolation process so as to ensure that the system, and the symptoms of the malfunction are clearly understood. This will ensure that the malfunction is accurately categorized so that appropriate diagnostics, where applicable, may be invoked.

CHART 2-I FLOWCHART - PRIMARY TROUBLESHOOTING PROCEDURES



CATEGORIZE PROBLEM INTO ONE OF THE FOLLOWING PROCEDURE GROUPS:

Title	Para.	Page
Lines	3.01	21
Trunks	3.06	35
Universal Card	3.10	49
DTMF Receiver	3.11	52
Console Module	3.12	55
MOH/Pager Module	3.13	55
Analog Junctors	3.14	59
Attendant Console	3.15	61
SUPERSET® Telephones	3.16, 3.17	64, 67
DIGITAL SUPERSET Telephones	3.18	70
DATASET 1100 Series	3.19	73
Standalone DATASET 2103	3.28	89
DATASET 2102 Rack Mounted Card	3.31	94
DATASHELF 9100	3.34	98
DATACABINET 9000	3.37	101
Main Control Card	4.01	105
Bay Control Card	4.06	106
Analog Bay Control Cards	4.11	111
Floppy Disk Subsystem	4.16	115
Power Subsystem	4.18	118
UPS	4.20	122
Maintenance/CDE Terminal	4.21	123
Printer	4.22	124
Cabinet Cooling System	4.23	125
Power Fail Transfer System	4.24	127

PROCEDURE 1 - MACHINE TOTALLY INOPERATIVE

General

2.04 When any switching machine is totally inoperative the prime requirement is the restoration of service to the system, or the part that has been affected. Chart 2-2 shows how to achieve this in the shortest possible time. Once service has been restored, the other procedures (see Chart 2-l) may be used to determine the cause of the failure.

2.05 Note that if power fail transfer has occurred, or it is necessary to invoke power fail transfer, toggle the POWER FAIL TRANSFER switches on the maintenance panel(s) to prevent lines and trunks from transferring back to the switch before it has been returned to operational status.

CHART 2-2
EMERGENCY TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	Check if the green ACTIVE LED on the Main Control Card front panel is flashing.	Yes: • Go to step 9. No : • Go to step 2.	
2	Press the SYSTEM RESET pushbutton on the front panel of the Main Control card.	• If the Main Control card 7-segment displays are blank, go to step 3; otherwise go to step 11.	
3	Check if the POWER ON LED on the Bay 2 power supply is on (ensure the switch is in the ON position).	Yes: • Go to step 4. No : • Go to step 8.	
4	Turn the Bay 2 power supply off, reseat the Main Control card, and turn the power on again. Anything on 7-segment displays?	Yes: • Go to step 11. No : • Go to step 5.	
5	Turn the Bay 2 power supply off, unplug the Main Control Card, and verify that the flea clips are properly connected (particularly clips W4 and W8). For Rev A and later, flea clips are not required.	• Reseat the Main Control Card; turn the power back on. • If the problem persists, go to step 6.	see Fig 2-l
6	Check power rails and continuity on the Bay 2 backplane.	• Verify that the required voltage signals actually are present at the Main Control card edge connectors. • Once verified go to step 7.	see Fig 2-2
7	Power down Bay 2, remove Main Control card, and check if EPROM IC is securely installed.	Yes: • Possible EPROM problem (check revision label) - replace Main Control card. No: • Install EPROM properly and go back to step 2.	see Fig 2-3
6	Remove T1 Clock Module, if present; replace flea clips if MCC is pre-Rev A. Power up PABX. Does problem persist?	Yes: • Power down and replace T1 Clock Module; go to step 9. No: • T1 Clock Module is faulty.	
9	Ensure power supply is firmly seated into backplane. Is AC cord firmly connected to the rear of the Bay 2 power supply?	No : • If loose, plug in securely; go back to step 2. Yes: • Check all other AC connections through the AC distribution frame, to the AC source. • If no cabling problems are found, refer to the Bay Power Supply troubleshooting procedures in Paragraph 4.19.	
10	Attempt a call - is Call Processing running?	Yes: • Stop. Continue to monitor system. No : • Press the SYSTEM RESET pushbutton on the Main Control card front panel, and go to step 11.	
11	Power down Bay 2, unplug Main Control card and verify that flea clip W6 is properly attached.	Yes: • Plug Main Control card back in, power the bay up, and go to step 12. No : • Connect it properly, and go back to step 2.	see Fig 2-l

CHART 2-2 (Cont'd)
EMERGENCY TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
12	Check for the following error codes on the Main Control card 7-segment displays:		
13	0	• Power down Bay 2, remove Main Control card, check flea clip W3 - re-install or replace as required; go back to step 2. • If problem persists, replace Main Control card.	see Fig 2-1
14	E 0	• Power down Bay 2, remove Main Control card, inspect installation of DRAM and DX modules. • If improperly installed, install correctly, and go back to step 2. • If properly installed, problem likely with either DRAM or DX modules - replace Main Control card.	see Fig 2-3
15	E1 E3 E4 or E5	• Power down Bay 2, replace Main Control card.	
16	E 2	• Power down Bay 2, remove Main Control card, inspect installation of EPROM IC. • If improperly installed, install correctly, and go back to step 2. • If properly installed, problem likely with EPROM IC - replace Main Control card.	see Fig 2-3
17	E6 E7 E8 or E9	• Power down Bay 2, remove Main Control card, inspect installation of DRAM module. • If improperly installed, install correctly, and go back to step 2. • If properly installed, problem likely with DRAM module - replace Main Control card.	see Fig 2-3
18	E b.	• Go to step 21.	
19	Sequence: 2 8 9 b Eb	• Power down the Main Control card, and check the installation of the Decryption module. • If it is installed incorrectly, install it correctly. • If installed correctly, likely problem with Decryption module; replace Main Control card.	see Note 1
20	- ANY OTHER ERROR CODE -	• Go back to step 2. • If this persists, go to step 27.	see Note 2

CHART 2-2 (Cont'd)
EMERGENCY TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
21	Ensure that the disk drive is connected to both the power source and the data bus at the backplane.	Yes: • Go to step 22. No : • Make corrections as required, then go back to step 2.	see Fig 2-2
22	Check that the diskette is installed properly, and that the lock latch is closed.	• If problem persists, go to step 23.	
23	Remove the diskette, and check for physical damage.	• Replace diskette if damaged. • If not damaged, attempt to reset system again. • If problem persists, go to step 24.	
24	Replace the diskette.	• If problem persists, go to step 25.	
25	Ensure that the bottom switch in S3 is in the ON position (up, with respect to the board).	Yes: • Go to step 26. No : • Put switch into ON position, go to step 2.	see Fig 2-l
26	Replace the disk drive.	• If problem persists, go to step 27.	
27	Replace the Main Control card.	• If problem persists, contact MITEL Field Service.	

Notes: 1. In this case, the normal test progression will take place, software will be loaded from disk, but will not be started; rather, the system resets. This cycle will continue until the problem is corrected.

2. A normal running system may show other error codes on the 7-segment displays during normal operation; however, during a system reset, only those error codes shown in steps 12 through 18 are possible. Other error codes may be:
   a) Disk error codes - see paragraph 4.16.
   b) Faulty card error codes - where the top 7-segment display indicates the Bay number and the bottom 7-segment display indicates the slot number.

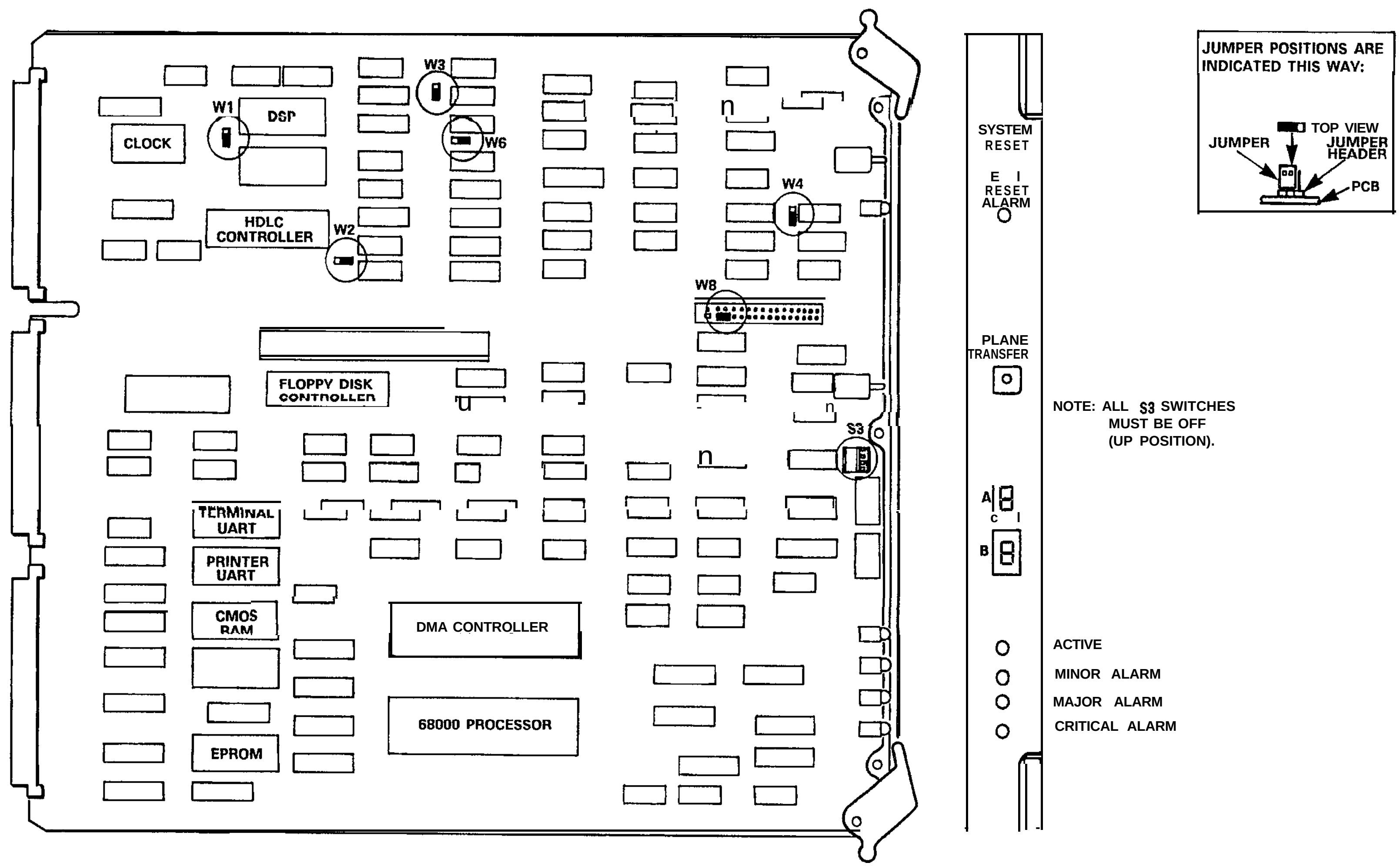


Figure 2–1 Main Control Card Flea Clip and Device Locations

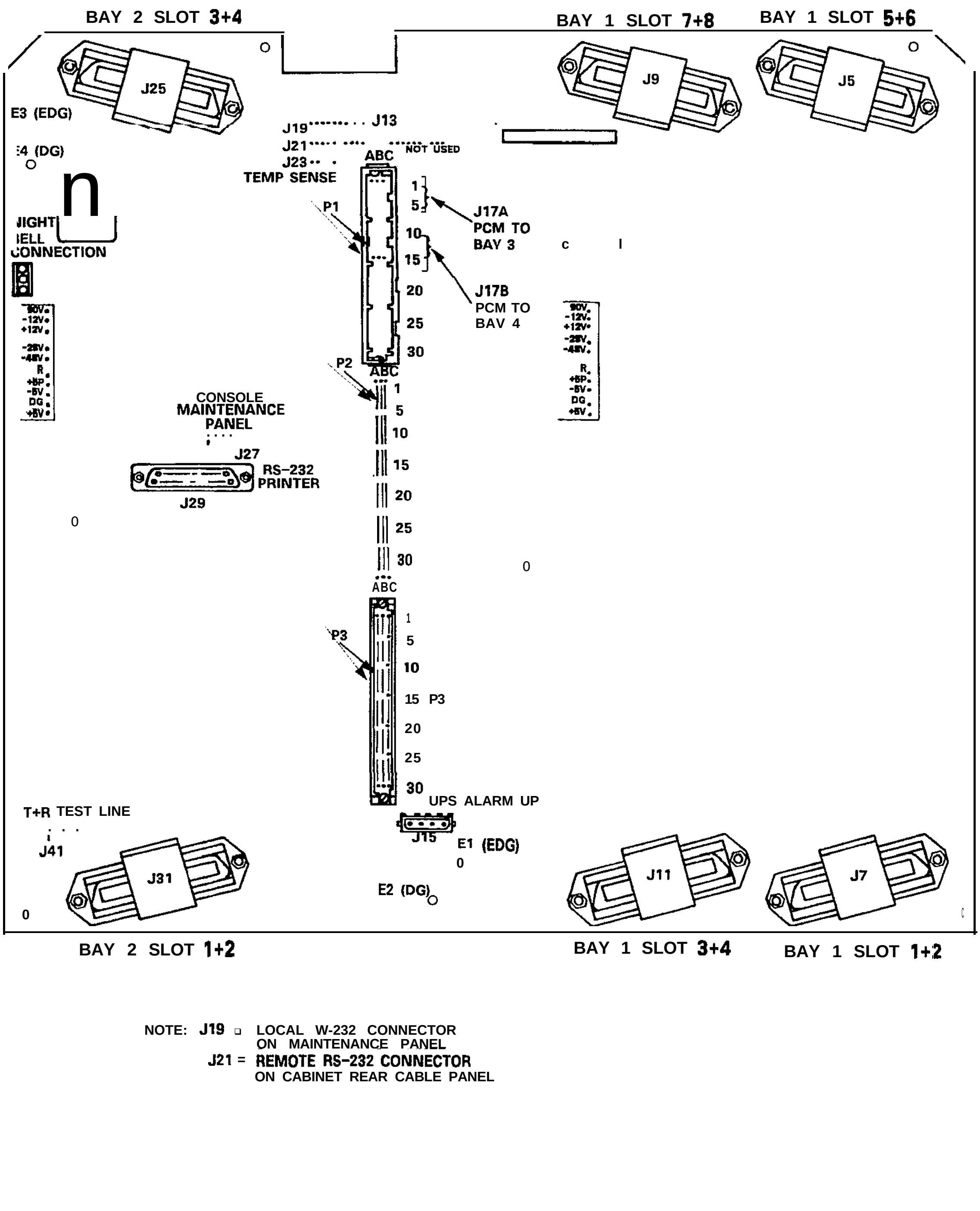


Figure 2-2 SX-200 DIGITAL PABX Backplane

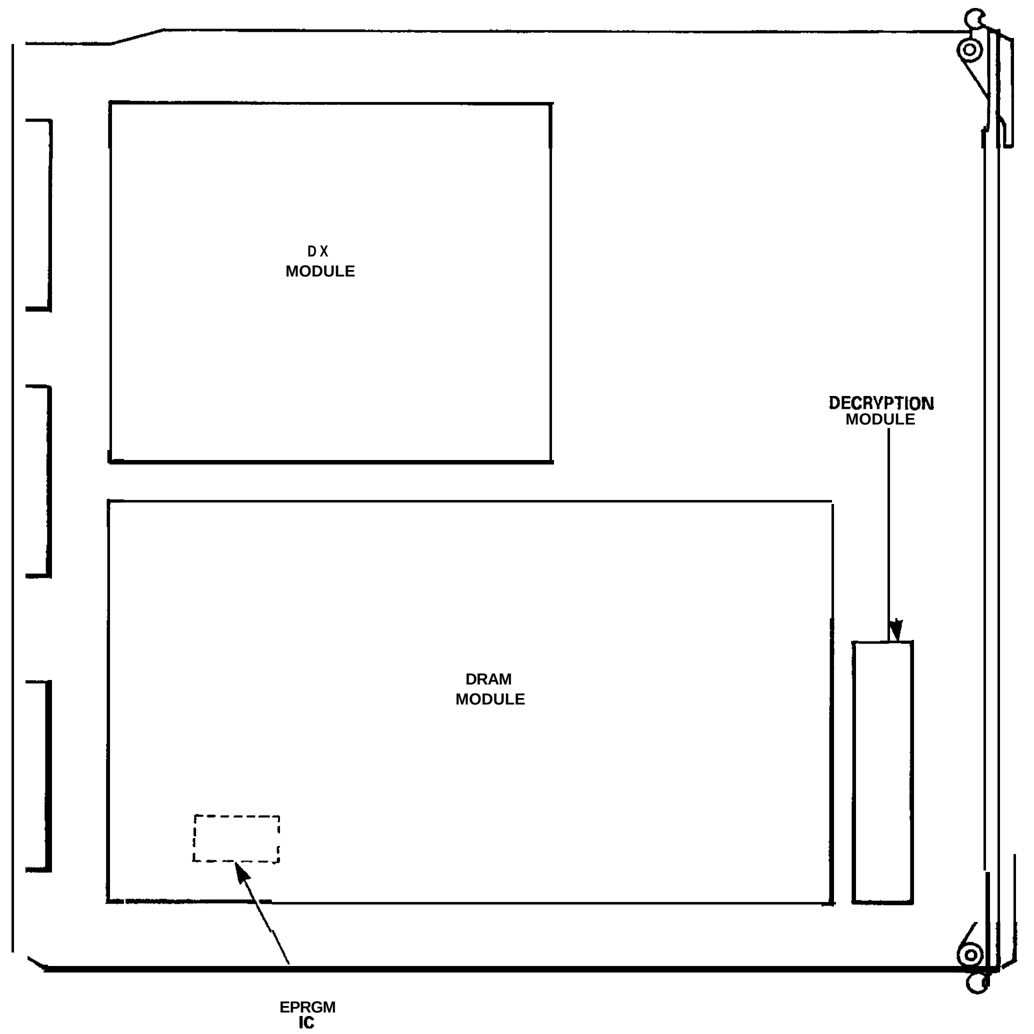


Figure 2-3 Main Control Card Module Locations

PROCEDURE 2 - CRITICAL ALARM

General

2.06 The raising of a critical alarm indicates a fault of actual or potentially catastrophic magnitude has occurred. Such an alarm is usually accompanied by activation of the automatic power fail transfer operation in a bay, bays, or throughout the entire system. Chart 2-3 shows the steps to be taken in analyzing a fault resulting in the raising of a critical system alarm. Refer to Section MITL9109-094-353-NA, General Maintenance Information for details on alarms.

CHART 2-3
CRITICAL ALARM TROUBLESHOOTING PROCEDURES - SYSTEM

step	Action	Description / Follow-up	Remarks
1	Check if system has gone into power fail transfer mode - examine maintenance log.	Yes: • Go to step 2. No : • Force the system into power fail transfer mode via the maintenance panel switches, and leave it in this condition until the system is repaired.	see Note 1
2	Check if the Main Control card appears to be functioning correctly - check visual displays on Main Control card front panel.	Yes: • Go to step 3. No : • Refer to Emergency Troubleshooting Procedures (Chart 2-2).	see Note 3
3	If there are analog cards in the system, check if they seem to be functioning correctly - check visual displays on control card front panels.	Yes: • Go to step 4. No : • Refer to Peripheral Control Card troubleshooting procedures.	see Note 3
4	Check maintenance log history for indications of trouble before the critical alarm; any such indications?	yes: • Refer to the appropriate troubleshooting No : • Go to step 5.	see Note 2
5	Identify the fault(s) which caused the critical alarm condition.	• Use the SHOW ALARMS command. • If maintenance cannot be accessed, refer to the Emergency Troubleshooting Procedures (Chart 2-2). • Go to step 6.	see Note 2
6	Refer to the appropriate troubleshooting procedures as indicated by the alarm report.	• If this leads nowhere, go to step 7.	
7	Check maintenance log for possible cause(s).	• If this uncovers a clue, refer to the appropriate troubleshooting procedures; otherwise go to step 8.	see Note 2
8	Check if the bays have power.	Yes: • Go to step 9. No : • Refer to the power supply troubleshooting procedures.	
9	Exercise call processing to test stability.	• Make station-to-station calls, station-to-trunk calls, etc. • If critical alarm persists to this point, go to step 10.	see Note 4
10	Refer to the Power Fail Transfer card troubleshooting procedures.	• If the PFT cards appear functional, go to step 11.	
11	Refer to the Main Control card troubleshooting procedures.		

Notes:
1. Refer to Section MITL9109-094-353-NA, General Maintenance Information for details on the power fail transfer switches.
2. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for information on procedures.
3. Refer to Section MITL9109-094-353-NA, General Maintenance Information for details on control card status indicators.
4. Avoid using stations or trunks under Power Fail Transfer (PFT) control.

PROCEDURE 3 - MAJOR ALARM

General

2.07 A major alarm is raised when a serious degradation of service occurs. The major alarm is activated when a preprogrammed percentage of ports fail, or when any common control card fails. Refer to Section MITL9109-094-353-NA, General Maintenance Information for further details on alarms. Chart 2-4 outlines the troubleshooting procedures for both system-related major alarms and bay-related major alarms.

CHART 2-4
MAJOR ALARM TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	identify the fault(s) which caused the major alarm condition.	• Use the SHOW ALARMS command. • If maintenance cannot be accessed, refer to the Main Control card troubleshooting procedures. • Go to step 2.	see Note 1
2	Refer to the appropriate troubleshooting procedures as indicated by the alarm report.	• If this leads nowhere, go to step 3.	
3	Check maintenance log for possible cause(s).	• If this uncovers a clue, refer to the appropriate troubleshooting procedures. • If this is a system major alarm, or a digital bay major alarm, go to step 4. • Otherwise go to step 6.	
4	Check if the affected bay(s) have power.	Yes: • Go to step 5. No : • Refer to the bay power supply troubleshooting procedures.	
5	Check if the Main Control card appears to be functioning correctly.	Yes: • Go to step 6. No : • Refer to the Main Control card troubleshooting procedures.	see Note 2
6	Check if the affected bay(s) have power.	Yes: • Go to step 7. No : • Refer to the rear-door power supply troubleshooting procedures. .	
7	If there are analog cards in the system, check if they appear to be functioning correctly.	Yes: • Go to step 8. No : • Refer to Peripheral Control Card troubleshooting procedures.	see Note 2
8	Check connections at the backplane (see Fig. 2-2).	• Secure connections / replace cable as required. • Go to step 9.	see Note 3
9	Check maintenance log history for indications of trouble before the major alarm; any such indications?	Yes: • Refer to the appropriate troubleshooting procedures. No : • Go to step 10.	
10	Check if any other observable cause exists for the alarm.	Yes: • Refer to the appropriate troubleshooting procedures. No : • Alarm may have been caused by a transient condition; record details and monitor the system's progress.	

Notes: 1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.

2. Refer to Section MITL9109-094-353-NA, General Maintenance Information for details of control card status indicators.

3. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for location and connections of the interconnect card.

Information Gathering and Problem Clarification

2.08 Chart 2-5 provides a list of the information which may be necessary in order to adequately categorize a fault. All relevant information should be gathered and entered into a site fault record. If the fault has resulted in total or partial shutdown of the system, much of this data will be unobtainable or irrelevant. In such cases, reference should be made to PROCEDURE 1 of this document.

CHART 2-5
INFORMATION GATHERING AND CLARIFICATION

step	Action	Description / Follow-up	Remarks
1	Talk to attendants and station users.	Obtain the following information: *frequency of occurrence • intermittent or continuous nature • area of the system in which the fault occurs *time period during which the fault occurs *number and types of users affected • ability of the attendant/user to make the fault reappear *occurrence in relation to customer's Busy Hour	
2	Check Maintenance / Alarm indications.	• Check maintenance log for fault/alarm reports. • Note whether the system is in Day Service, Nightl, or Night2 Service. • Check system LED and 7-segment display indicators for error codes.	see Note 1
3	Collect data concerning environmental conditions.	• Check if the system is located close to a heat source or a source of power radiation. • Note the temperature and humidity conditions and compare with specified operating parameters. • Check the susceptibility of the area with respect to static electricity generation. • The following can seriously affect the performance of the PABX: • power fluctuations • lightning storms • excessively high humidity • excessively high temperature • dust *radio-frequency interference	see Note 2
4	Verify system programming.	• Check the existing programming to ensure that the correct options and features have been enabled. • Verify the Class Of Service (COS) assignments, trunk descriptors, and feature access codes.	see Note 3
5	Make special checks for new installations, additions or modifications.	• Check that the procedures specified in Section MITL9109-094-200-NA have been properly implemented. • Verify that any changes have been made in accordance with the appropriate practices, and to the prescribed standards. • Check for possible conflicts if features have been added or deleted, or if other programming changes have been made.	

CHART 2-5 (Cont'd)
INFORMATION GATHERING AND CLARIFICATION

step	Action	Description / Follow-up	Remarks
6	Make random miscellaneous checks.	• Ensure all circuit cards are properly seated. • Verify that the system fans are running. Check the cross-connect field for loose or damaged wiring, improperly seated connectors, or other signs of trouble.	
7	Check for minor alarm indications - these assist in isolating and categorizing faults	• Record relevant data and note the affected area of the system.	

Notes: 1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details on procedures.

2. Refer to Section MITL9109-094-180-NA, Engineering Information for the specified operating parameters.

3. Refer to Sections MITL9109-094-105-NA, Features Description and MITL91 09-094-2 IO-NA, Customer Data Entry.

Problem Confirmation

2.09 Many faults, particularly intermittent faults, "disappear" before the troubleshooter is able to make a positive trace. Wherever possible, attempts should be made to force the problem to recur, such that the effects may be observed and hence the cause determined. The information gathered up to this point may be used to set up conditions relating as closely as possible to those under which the fault originally manifested itself.

Useful Aids

2.10 The aids listed in Table 2-l are useful in verifying fault conditions.

TABLE 2-I
TROUBLESHOOTING AIDS

Troubleshooting Aid	Description and Use
Maintenance Log	• Provides a record of maintenance activities and causes of alarms. The primary source of troubleshooting information. • A summary of all log messages is presented in Appendix A of this Section.
Maintenance Terminal	• Primary access to the maintenance log. • Allows testing of individual functional units, using directed diagnostics. • Provides ability to query ALARM status, along with a variety of status reports.
7-Segment Displays	• Allows system power-up testing and operation to be monitored.
Status LEDs (on peripheral cards)	• Used to determine if circuit is in use, idle, or not functioning.
System Test Line	• Allows access, through hardware connection, to specific equipment for test purposes. • Usually used in lieu of a functional maintenance terminal.
Maintenance Panels	• Provides ability to manually initiate power fail transfer.

3. PERIPHERAL EQUIPMENT TROUBLESHOOTING PROCEDURES

Line Cards

3.01 The procedures detailed in the following paragraphs cover the isolation and correction of station line cards and *SUPERSET* line cards. Since these usually involve a degree of remoteness between the individual sets and the SX-200 DIGITAL PABX, it is recommended that an additional person should assist the troubleshooter.

ONS/Station Line Cards

3.02 The 12 circuit ONS Line card (9109-010) is installed in the digital bays, while the 8 circuit 8-Station Line card (9110-110) is installed in analog peripheral shelves, if present. Chart 3-l lists the steps involved in the testing of these cards. Further information concerning the characteristics, parameters and operation of the ONS card is contained in Section MITL9109-094-125-NA.

CHART 3-1
ONS / 8-STATION LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Verify the problem.	• Go to step 2.	
2	Disconnect the affected circuit(s) from the cross-connect field.	• Go to step 3.	
3	Use a butt-set to check if the problem persists.	Yes: • Go to step 4. No : • Problem lies outside the PBX. Check for problems with cabling and the telephone set.	
4	Log into the Maintenance Terminal.	• Must enter username and password.	ee Note 1
5	Use SHOW STATUS command on the affected bay.	• Go to step 6.	
6	If required, examine the maintenance log to obtain further information. (use LOGS READ command).	• Go to step 7.	
7	Check if there appears to be problems with more than one circuit.	Yes: • Go to step 31. No : • Go to step 8.	
8	Check if the affected circuit is of type 9109-010.	Yes: • Go to step 12. No : • Go to step 9.	
9	Test all of the junctors (channels) in the affected bay.	• Use the TEST DEVICE TYPE command to test each of 31 junctors. • Go to step 10.	
10	Do any of the junctors fail?	Yes: • Go to step 11. No : • Go to step 13.	

CHART 3-1 (Cont'd)
ONS / 8-STATION LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
11	Unseat the suspect card, and run the test(s) on the failed junctor(s) again. Do they now pass?	Yes: • Replace faulty card. Problem fixed. No : • Refer to Analog Junctors troubleshooting procedures.	
12	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Reseat the card and rerun the test. • If failure persists, replace the card and rerun the test. • If failure still persists, reinstall the original card, go back to step 5 and investigate further. Pass: • If programming problem is indicated, go to step 13.	See Note 2
13	Check the programming for the station; including COS, COR, and pickup groups; any programming errors?	Yes: • Correct programming errors as required. No : • Go to step 14.	See Note 3
14	Check that the associated line circuit LED lights when the set is taken off-hook.	No : • Replace the line card; if the problem persists, reinstall the original card, and go to step 32. Yes: • Go to step 15.	
15	Go off-hook, and verify that dial tone is returned.	Yes: • Go to step 21. No : • Go to step 16.	
16	Check if problem is intermittent.	Yes: • Go to step 17. No : • Go to step 19.	
17	Ensure receivers are not busied out by maintenance or due to malfunctions; (use SHOW STATUS command). Busied out?	Yes: • Return receivers to service, or refer to DTMF receiver troubleshooting procedures as required. No : • Go to step 18.	
18	Ensure sufficient receivers are provided to carry the peak traffic load. Enough receivers?	No : • Add receivers as required; if problem persists, go to step 19. Yes: • Go to step 19.	See Note 4
19	Check if Side Tone is present.	Yes: • Go to step 20. No : • Replace the line card and retest; if problem persists, go to step 32.	
20	Check if calls can be completed without dial tone.	Yes: • Problem is with control card(s). Go to step 32. No : • Replace the line card; if the problem persists, go to step 32.	
21	Dial one digit, and verify that Dial Tone is broken.	Yes: • Go to step 24. No : • Go to step 22.	
22	Check if call can be completed over Dial Tone.	Yes: • Problem is with control card(s). Go to step 32. No : • Go to step 23.	

CHART 3-I (Cont'd)
ONS / 8-STATION LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
23	Problem lies in one of the following areas: • Main Control card • Receiver module	• Check maintenance log for indications of problems in these areas. • Refer to the applicable troubleshooting procedures.	
24	Complete the dialing process and check that ringback tone is returned.	Yes: • Go to step 26. Problem in either the control card(s) or the line card. No : • Go to step 25.	
25	Replace the line card.	• If problem persists, likely problem with control card(s). Go to step 32.	
26	Set up a call to the suspect line and verify that ringing is received.	Yes: • Go to step 29. No : • Go to step 27.	
27	Verify that ringing generator output is within spec 90 Vac, 20 Hz).	• If not within spec, refer to bay power supply troubleshooting procedures; otherwise, go to step 28.	See Note 5
28	Replace line card.	• If problem persists, reinstall the original line card, and go to step 32.	
29	Answer call and verify that level and audio quality is acceptable.	Yes: • Go to step 30. No : • Replace line card and retest. • If problem persists, reinstall the original line card, and go to step 32.	
30	Flash switchhook and check if the call is dropped.	Yes: • If timing is too short, increase flash time via CDE. NOTE- Be aware of limitations of flashing while connected to a trunk. No : • Line circuit is functioning correctly - continue to monitor.	
3	Use SHOW ALARMS ALL ALL command to obtain an overall view of the problem(s).	• If there is a system CRITICAL ALARM condition, go see Note 1 of the Critical Alarm troubleshooting procedures in paragraph 2.06. • If there is a system MAJOR ALARM condition, go to the Major Alarm troubleshooting procedures in paragraph 2.07. • If there is a system MINOR ALARM condition, address each problem independently as if it were isolated - go back to step 8.	
	STEPS 32 AND ONWARD SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL - CHECK IF THIS CORRECTS THE PROBLEM. DO NOT PROCEED TO STEP 32 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		

CHART 3-I (Cont'd)
ONS / 8-STATION LINE CARD TROUBLESHOOTING PROCEDURE8

step	Action	Description / Follow-up	Remarks
32	Check if card is of type 9109-010.	Yes: • Go to step 39. No : • Go to step 33.	
33	Power down the affected bay via the power.switch on the maintenance panel/top panel.	• Go to step 34.	
34	Replace the Digital Interface card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 35. No : • Problem fixed.	
35	Replace the Peripheral Control card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 36. No : • Problem fixed.	
36	Replace the Scanner card; power up the bay. Does the fault persist?	Yes: • Possible problem with Main Control card; go to step 39. No : • Problem fixed.	
37	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 38 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 38. No: • Problem fixed.	
38	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 39 if PABX is not 672-port). Does problem persist?	Yes • Reinstall SMC; go to step 39. No: • Problem fixed.	
39	Power down the system, replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes to Chart 3-I:

1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.
2. This is indicated by an error message returned to the terminal.
3. Refer to Sections MITL9 109-094-2 1 0-NA, Customer Data Entry and MITL9 109-094- 105-NA, Features Description for details of procedures.
4. Refer to Section MITL9109-094-180-NA, Engineering Information for details on receiver provisioning.
5. 90 V Ringing is labelled both on the backplane and the rear-door power supply.

OPS Line Card

3.03 OPS Lines are provided where the distance of the station from the PABX is greater than allowable for a regular ONS line, or where the station is required to be in a location removed from the PABX (up to 2 km away). Chart 3-2 contains information on the troubleshooting of this card type. Note that these procedures apply to card type 9109-040 only. Refer to the ONS line card procedures, for off-premise extensions connected to card type 91 IO-1 10. Further information concerning the characteristics, parameters and operation of the OPS line card is contained in Section MITL9109-094-125-NA.

CHART 3-2
OPS LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Verify the problem.	• Go to step 2.	
2	Disconnect the affected circuit(s) from the cross-connect field.	• Go to step 3.	
3	Use a butt-set to check if the problem persists,	Yes: • Go to step 4. No: • Problem lies outside the PBX. Check for problems with cabling and the telephone set.	
4	Log into the Maintenance Terminal.	• Must enter username and password.	See Note 1
5	Use SHOW STATUS command on the affected bay.	• Go to step 6.	
6	If required, examine the maintenance log to obtain further information. (use LOGS READ command).	• Go to step 7.	
7	Check if there appears to be problems with more than one circuit.	Yes: • Go to step 27. No: • Go to step 6.	
8	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Reseat the card and rerun the test. • If failure persists, replace the card and rerun the test. • If failure still persists, reinstall the original card, go back to step 5 and investigate further. • If programming problem is indicated, go to step 9. • Otherwise, go to step IO.	See Note 2

CHART 3-2 (Cont'd)
OPS LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
9	Check the programming for the station; including COS, COR, and pickup groups; any programming errors?	Yes: • Correct programming errors as required. No: • Go to step 10.	see Note 3
10	Check that the associated line circuit LED lights when the set is taken off-hook.	No : • Replace the line card; if the problem persists, reinstall the original card, and go to step 28. Yes: • Go to step 11.	
11	Go off-hook, and verify that dial tone is returned.	Yes: • Go to step 17. No: • Go to step 12.	
12	Check if problem is intermittent.	Yes: • Go to step 13. No : • Go to step 15.	
13	Ensure receivers are not busied out by maintenance or due to malfunctions; (use SHOW STATUS command). Busied out?	Yes: • Return receivers to service, or refer to DTMF receiver troubleshooting procedures as required. No: • Go to step 14.	
14	Ensure sufficient receivers are provided to carry the peak traffic load. Enough receivers?	No : • Add receivers as required; if problem persists, go to step 15. Yes: • Go to step 15.	see Note 4
15	Check if Side Tone is present.	Yes: • Go to step 16. No : • Replace the line card and retest; if problem persists, go to step 28.	
16	Check if calls can be completed without dial tone.	Yes: • Problem is with Main Control card. Go to step 28. No : • Replace the line card; if the problem persists, go to step 28.	
17	Dial one digit, and verify that Dial Tone is broken.	Yes: • Go to step 20. No: • Go to step 18.	
18	Check if call can be completed over Dial Tone.	Yes: • Problem is with Main Control card. Go to step 28. No : • Go to step 19.	
19	Problem lies in one of the following areas: • Main Control card • Receiver module	• Check maintenance log for indications of problems in these areas. • Refer to the applicable troubleshooting procedures.	
20	Complete the dialing process and check that ringback tone is returned.	Yes: • Go to step 22. No : • Problem in either the Main Control card or the line card. • Go to step 21.	
21	Replace the line card.	• If problem persists, likely problem with Main Control card. Go to step 28.	

CHART 3-2 (Cont'd)
OPS LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
22	Set up a call to the suspect line and verify that ringing is received.	Yes: • Go to step 25. No: • Go to step 23.	
23	Verify that ringing generator output is within spec (90 Vac, 20 Hz).	• If not within spec, refer to bay power supply troubleshooting procedures; otherwise, go to step 24.	
24	Replace line card.	• If problem persists, reinstall the original line card, and go to step 28.	
25	Answer call and verify that level and audio quality is acceptable.	Yes: • Go to step 26. No: • Replace line card and retest. • If problem persists, reinstall the original line card, and go to step 28.	
26	Flash switchhook and check if the call is dropped.	Yes: • If timing is too short, increase flash time via CDE. NOTE- Be aware of limitations of flashing while connected to a trunk. No: • Line circuit is functioning correctly.	
27	Use SHOW ALARMS ALL ALL command to obtain an overall view of the problem(s).	• If there is a system CRITICAL ALARM condition, go see Note 1 of the Critical Alarm troubleshooting procedures in paragraph 2.06. • If there is a system MAJOR ALARM condition, go to the Major Alarm troubleshooting procedures in paragraph 2.07. • If there is a system MINOR ALARM condition, address each problem independently as if it were isolated.	
	STEP 28 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL - CHECK IF THIS CORRECTS THE PROBLEM. DO NOT DO STEP 28 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
28	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 29 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 29. No: • Problem fixed.	
29	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 30 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 30. No: • Problem fixed.	
30	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No: • Problem fixed.	

Notes:
1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.
2. This is indicated by an error message returned to the terminal.
3. Refer to Sections MITL9109-094-210-NA, Customer Data Entry and MITL9109-094-105-NA, Features Description for details of procedures.
4. Refer to Section MITL9109-094-180-NA, Engineering Information for details on receiver provisioning.

COV/SUPERSET Line Cards

3.04 COV and SUPERSEJ Line cards connect the advanced feature SUPERSEJ 3™ and SUPERSEJ 4® telephones to the SX-200 DIGITAL PABX. The COV Line card (9109-020) is installed in the digital bays and provides capacity for up to six SUPERSEJ telephones. The SUPERSEJ Line card (9110-410) is installed in analog peripheral shelves, if present, and connects up to eight SUPERSEJ telephones to the system. Chart 3-3 lists the steps involved in the troubleshooting of these card types. Further information concerning the characteristics, parameters and operation of the cards is contained in Sections MITL 9 109-094-200-NA and MITL91 09-094-I 25-NA.

CHART 3-3
COV / SUPERSET LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Verify the problem.	• Go to step 2.	
2	Disconnect the affected circuit(s) from the cross-connect field.	• Go to step 3.	
3	Use a SUPERSET telephone at the MDF to check if the problem persists.	Yes: • Go to step 4. No : • Problem lies outside the PBX. Check for problems with cabling and the telephone set. • Refer to the applicable SUPERSET troubleshooting procedures.	
4	Log into the Maintenance Terminal.	• Must enter username and password.	See Note 1
5	Use SHOW STATUS command on the affected bay.	• Go to step 6.	
6	If required, examine the maintenance log to obtain further information. (use LOGS READ command).	• Go to step 7.	
7	Check if there appears to be problems with more than one circuit.	Yes: • Go to step 29. No : • Go to step 8.	
8	Check if the affected circuit is of type 9109-020.	Yes: • Go to step 12. No : • Go to step 9.	
9	Test all of the junctors (channels) in the affected bay.	• Use the TEST DEVICE TYPE command to test each of 31 junctors. • Go to step 10.	
10	Do any of the junctors fail?	Yes: • Go to step 11. No: • Gotostep13.	

CHART 3-3 (Cont'd)
COV / *SUPERSET* LINE CARD TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
11	Unseat the suspect card, and run the test(s) on the failed junctor(s) again. Do they now pass?	Yes: • Replace faulty card. Problem fixed. No : • Refer to Analog Junctors troubleshooting procedures.	
12	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Reseat the card and rerun the test. • If failure persists, replace the card and rerun the test. • If failure still persists, reinstall the original card, go back to step 5 and investigate further. • If programming problem is indicated, go to step 13. Pass: • Go to step 13.	see Note 2
13	Check the programming for the set; including COS, COR, and pickup groups; any programming errors?	Yes: • Correct programming errors as required. No : • Go to step 14.	see Note 3
14	Check that the associated line circuit LED lights when the set is taken off-hook.	No : • Replace the line card; if the problem persists, reinstall the original card, and go to step 30. Yes: • Go to step 15.	
15	Go off-hook, and verify that dial tone is returned.	Yes: • Go to step 21. No : • Go to step 16.	
16	Check if problem is intermittent.	Yes: • Go to step 17. No : • Go to step 19.	
17	Ensure receivers are not busied out by maintenance or due to malfunctions; (use SHOW STATUS command). Busied out?	Yes: • Return receivers to service, or refer to DTMF receiver troubleshooting procedures as required. No : • Go to step 18.	
18	Ensure sufficient receivers are provided to carry the peak traffic load. Enough receivers?	No : • Add receivers as required; if problem persists, go to step 19. Yes: • Go to step 19.	see Note 4
19	Check if Side Tone is present.	Yes: • Go to step 20. No : • Replace the line card and retest; if problem persists, go to step 30.	
20	Check if calls can be completed without dial tone.	Yes: • Problem is with control card(s). Go to step 30. No : • Replace the line card; if the problem persists, go to step 30.	
21	Dial one digit, and verify that Dial Tone is broken.	Yes: • Go to step 24. No : • Go to step 22.	
22	Check if call can be completed over Dial Tone.	Yes: • Problem is with control card(s). Go to step 30. No : • Go to step 23.	

CHART 3-3 (Cont'd)
COV / SUPERSET LINE CARD TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
23	Problem lies in one of the following areas: *Main Control card • Receiver module	• Check maintenance log for indications of problems in these areas. • Refer to the applicable troubleshooting procedures.	
24	Complete the dialing process and check that ringback tone is returned.	Yes: • Go to step 27. • Problem in either control card(s) or the line card. No : • Go to step 25.	
25	Replace the line card.	• If problem persists, likely problem with control card(s). Go to step 30.	
26	Set up a call to the suspect line and verify that ringing is received.	Yes: • Go to step 29. No : • Go to step 27.	
27	Replace line card.	• If problem persists, reinstall the original line card, and go to step 30.	
26	Answer call and verify that level and audio quality is acceptable.	Yes: • Line circuit is functioning correctly - continue to monitor. No : • Replace line card and retest. • If problem persists, reinstall the original line card, suspect the set.	
29	Use SHOW ALARMS ALL ALL command to obtain an overall view of the problem(s).	• If there is a system CRITICAL ALARM condition, go see Note 1 of the Critical Alarm troubleshooting procedures in paragraph 2.06. • If there is a system MAJOR ALARM condition, go to the Major Alarm troubleshooting procedures in paragraph 2.07. • If there is a system MINOR ALARM condition, address each problem independently as if it were isolated - go back to step 6.	
	STEP 30 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 30 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
30	Check if card is of type 9109-020.	Yes: • Go to step 35. No : • Go to step 31.	
31	Power down the affected bay via the power switch on the maintenance panel/top panel.	• Go to step 32.	
32	Replace the Digital Interface card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 33. No : • Problem fixed.	

CHART 3-3 (Cont'd)
COV / *SUPERSET* LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
33	Replace the Peripheral Control card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 34. No : • Problem fixed.	
34	Replace the Scanner card; power up the bay. Does the fault persist?	Yes: • Possible problem with Main Control card; go to step 37. No : • Problem fixed.	
35	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 36 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 36. No: • Problem fixed.	
36	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 37 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 37. No: • Problem fixed.	
37	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes:
1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.
2. This is indicated by an error message returned to the terminal.
3. Refer to Sections MITL9109-094-210-NA, Customer Data Entry and MITL9109-094-105-NA, Features Description for details of procedures.
4. Refer to Section MITL9109-094-180-NA, Engineering Information for details on receiver provisioning.

Digital Line Card

3.05 The Digital Line Card (DLC) provides the link between Digital SUPERSET telephones, DATASETS, consoles, workstations and the common control of the SX-200 DIGITAL PABX. This card, installed in a low powered slot of a digital bay, will accommodate twelve devices. Chart 3-4 lists the steps involved when troubleshooting a Digital Line Card. Further information concerning the characteristics, parameters and operation of the DLC is contained in the Installation Section (MITL9109-094-200-NA) and the Circuit Card Descriptions (MITL9109-094-125-NA).

CHART 3-4
DIGITAL LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Verify the problem.	• Go to step 2.	
2	Log into the Maintenance Terminal.	• Must enter username and password.	See Note 1
3	Use SHOW STATUS command on the affected bay.	• Go to step 4.	
4	If required, examine the maintenance log to obtain further information. (use LOGS READ command).	• Go to step 5.	
5	Check if there appears to be problems with more than one circuit.	Yes: • Go to step 25. No : • Go to step 6.	
6	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Reseat the card and rerun the test. • If failure persists, replace the card and rerun the test. • If failure still persists, reinstall the original card, go back to step 3 and investigate further. • If programming problem is indicated, go to step 7. • Otherwise, go to step 8.	see Note 2
7	Check the programming for the station; including COS, COR, and pickup groups; any programming errors?	Yes: • Correct programming errors as required. No : • Go to step 8.	see Note 3
8	Check that the associated line circuit LED lights when the set is taken off-hook.	No : • Replace the line card; if the problem persists, reinstall the original card, and go to step 25. Yes: • Go to step 9.	
9	Go off-hook, and verify that dial tone is returned.	Yes: • Go to step 15. No : • Go to step 10.	
10	Check if problem is intermittent.	Yes: • Go to step 11. No : • Go to step 13.	

CHART 3-4 (Cont'd)
DIGITAL LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
11	Ensure receivers are not busied out by maintenance or due to malfunctions; (use SHOW STATUS command). Busied out?	Yes: • Return receivers to service, or refer to DTMF receiver troubleshooting procedures as required. No: • GotosteplZ.	
12	Ensure sufficient receivers are provided to carry the peak traffic load. Enough receivers?	No : • Add receivers as required; if problem persists, go to step 13. Yes: • Go to step 13.	see Note 4
13	Check if Side Tone is present.	Yes: • Go to step 14. No : • Replace the line card and retest; if problem persists, go to step 25.	
14	Check if calls can be completed without dial tone.	Yes: • Problem is with Main Control card. Go to step 26. No : • Replace the line card; if the problem persists, go to step 25.	
15	Dial one digit, and verify that Dial Tone is broken.	Yes: • Go to step 18. No : • Go to step 16.	
16	Check if call can be completed over Dial Tone.	Yes: • Problem is with Main Control card. Go to step 25. No: • Gotostep17.	
17	Problem lies in one of the following areas: • Main Control card • Receiver module	• Check maintenance log for indications of problems in these areas. • Refer to the applicable troubleshooting procedures.	
18	Complete the dialing process and check that ringback tone is returned.	Yes: • Go to step 20. No : • Problem in either the Main Control card or the line card. • Go to step 19.	
19	Replace the line card.	• If problem persists, likely problem with Main Control card. Go to step 25.	
20	Set up a call to the suspect line and verify that ringing is received.	Yes: • Go to step 22. No : • Go to step 21.	
21	Replace line card.	• If problem persists, reinstall the original line card, and go to step 25.	
22	Answer call and verify that level and audio quality is acceptable.	Yes: • Go to step 23. • Replace line card and retest. No : • If problem persists, reinstall the original line card, and go to step 25.	

CHART 3-4 (Cont'd)
DIGITAL LINE CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
23	Flash switchhook and check if the call is dropped.	Yes: • If timing is too short, increase flash time via CDE. NOTE- Be aware of limitations of flashing while connected to a trunk. No : • Line circuit is functioning correctly.	
24	Use SHOW ALARMS ALL ALL command to obtain an overall view of the problem(s).	• If there is a system CRITICAL ALARM condition, go see Note 1 of the Critical Alarm troubleshooting procedures in paragraph 2.06. • If there is a system MAJOR ALARM condition, go to the Major Alarm troubleshooting procedures in paragraph 2.07. • If there is a system MINOR ALARM condition, address each problem independently as if it were isolated.	
	STEP 25 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL - CHECK IF THIS CORRECTS THE PROBLEM. DO NOT DO STEP 25 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
25	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 26 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 26. No: • Problem fixed.	
26	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 27 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 27. No: • Problem fixed.	
27	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes: 1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.

2. This is indicated by an error message returned to the terminal.

3. Refer to Sections MITL9109-094-210-NA, Customer Data Entry and MITL9109-094-105-NA, Features Description for details of procedures.

4. Refer to Section MITL9109-094-180-NA, Engineering Information for details on receiver provisioning.

Trunk Cards

3.06 The procedures detailed in the following paragraphs cover the isolation and correction of the various trunk cards. Since the many different types of trunks share much common circuitry, the troubleshooting procedures have been generalized. Supplementary procedures are provided for specific trunk types (and specialized procedures), where required. Chart 3-5 outlines the general troubleshooting procedures for trunk cards. The trunk types covered are:

- LS/GS Trunk (9109-011)
- CO Trunk (9110-011, 111, 211, 311)
- DID Trunk (9109-031)
- DID/Tie Trunk (9110-031)
- E&M Trunk (9109-013)
- E&M Trunk (9110-013)
- T1 Trunk (9109-021).

CHART 3-5
GENERAL TRUNK CARD TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	Verify the problem.	• Go to step 2.	
2	Disconnect the affected circuit(s) from the cross-connect field.	• Go to step 3.	
3	Use a butt-set to check if the problem persists.	Yes: • Go to step 4. No : • Problem lies outside the PBX. Check for problems with cabling, Central Office, CDE programming for stations, etc.	
4	Log into the Maintenance Terminal.	• Must enter username and password.	See Note 1
5	Use SHOW STATUS command on the affected bay.	• Go to step 6.	
6	If required, examine the maintenance log to obtain further information. (use LOGS READ command).	• Go to step 7.	
7	Check if there appears to be problems with more than one circuit.	Yes: • Go to step 8. No : • Go to step 9.	
8	Check if problem is with all circuits on one card only.	Yes: • Reseat the card and check again. If problem persists, replace card. No: • Go to step 40.	
9	Check if the affected circuit is in either Bay 1 or Bay 2.	Yes: • Go to step 13. No: • GotosteplO.	
10	Test all of the junctors (channels) in the affected bay.	• Use the TEST DEVICE TYPE command to test each of 31 junctors. • Go to step 11.	

CHART 3-5 (Cont'd)
GENERAL TRUNK CARD TROUBLESHOOTING PROCEDURES

step	Action	Description / Follow-up	Remarks
11	Do any of the junctors fail?	Yes: • Go to step 12. No: • Go to step 15.	
12	Unseat the suspect card, and run the test(s) on the failed junctor(s) again. Do they now pass?	Yes: • Replace faulty card. Problem fixed. No : • Refer to Analog Junctors troubleshooting procedures.	
13	Check if circuit is an E & M trunk module (type 9109-013).	Yes: • Go to step 23. No : • Go to step 14.	
14	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Reseat the card and rerun the test. Pass: • If failure persists, replace the card and rerun the test. • If failure still persists, reinstall the original card, go back to step 5 and investigate further. • If programming problem is indicated, go to see Note 2. • Go to step 15.	
15	Check the programming for the trunk circuit– including COS, COR, trunk descriptors, ARS data, and trunk groups; programming errors?	Yes: • Correct programming errors as required. No : • Go to step 16.	see Note 2
16	If the circuit is in an analog bay, ensure switch settings are as specified in Section MITL9109-094-200-NA.	• Correct switch settings as required. • If no problems, go to step 17.	
17	Check if fault is intermittent.	Yes: • Go to step 18. No : • Go to step 19.	
18	Ensure that trunks are not affected by the CO Busy Hour congestion (usually occurs in late morning/early afternoon).	• If problem persists, go to step 19.	see Note 3
19	Ensure that there are no Ground offsets between the trunk circuits and the SX-200 DIGITAL PABX system.	• If there are, investigate; if not, go to step 20.	see Note 4
20	Check if problem appears to be dropped calls or phantom incoming calls.	No : • Go to step 32. Yes: • Go to step 21.	
21	Verify that the trunk programming does not recognize tip/ring reversals unless there is a special application.	• Go to step 22.	
22	Verify that the disconnect timing allows for the possibility of periodic loop disconnects during call processing through a CO.	• If problem persists, go to step 32.	see Note 5
23	Perform a directed test on the suspect circuit(s).	• Use the TEST command. • Go to step 24.	see Note 1

CHART 3-5 (Cont'd)
GENERAL TRUNK CARD TROUBLESHOOTING PROCEDURES

step	Action	Description / Follow-up	Remarks
24	Check for test failure.	Fail: • Reseat the card and the module, then rerun the test. • If failure persists, go to step 25. Pass: • Go to step 26.	
25	Check maintenance log for indications of problems with the Universal card, other modules on the Universal card, or the Main Control card. Any such indications?	Yes: • Refer to the applicable troubleshooting procedures. No : • Go to step 26.	see Note 1
26	Use SHOW CONFIG on the card slot to identify any other modules on the Universal card. Other modules?	Yes: • Go to step 27. No : • Go back to step 15.	see Note 1
27	Perform directed tests on the other modules. Do these fail es well?	Yes: • Replace faulty module(s) - if problem persists, go to step 29. No : • Go to step 28.	see Note 6
28	Replace suspect E & M module and test.	Pass: • Problem fixed. Fail: • Possible problem with control card(s). • Go to step 41.	
29	Is one of the modules installed a Music On Hold (MOH)/Pager module?	Yes: • Go to step 30. No : • Go to step 31.	
30	Remove the MOH/Pager module from the Universal card and retest.	Pass: • Fault was with MOH/Pager module. Problem fixed. Fail: • Go to step 31.	see Note 7
31	Replace Universal card and retest.	Pass: • Problem fixed. Fail: • Possible problem with Main Control card. • Go to step 41.	
32	If the circuit is an E & M trunk, go to the Supplementary E & M Trunk Troubleshooting Procedures (Chart 3-5).	• Otherwise go to step 33.	
33	If the circuit is a DID or Loop/Tie trunk go to the Supplementary DID/Loop/Tie Trunk Troubleshooting Procedures (Chart 3-6).	• Otherwise, go to step 34.	
34	Check if Central Office trunk is loop start or ground start - see Appendix E for details.	• Ensure that CDE programming for the PBX trunk circuit agrees with results. If not, change programming and jumpers for type 9109-011 cards, or change switch settings for type 91 IO-01 1,-1 11, -211, and -311 cards. • If problem persists, go to step 35.	see Note 2 see Note 8
35	Check if busy tone is returned after dialing a trunk access code.	Yes: • Go to step 36. No : • Go to step 37.	

CHART 3-5 (Cont'd)
GENERAL TRUNK CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
36	Check for two loop start trunks connected together.	Yes: • At least 1 of the trunks must have a forced release time-out period. This is switch controlled on analog trunks (see MITL9109-094-200-NA for details), and CDE controlled for digital trunks (see CDE Form 13, Trunk Circuit Descriptors - Disconnect Timer). No • Go to step 37.	see Note 8
37	Check Tip / Ring voltages, loop currents - refer to Table 3-1.	• If any of these are incorrect, replace the card; otherwise go to step 38.	
38	Check the loop current of the circuit - refer to Appendix D.	• If this is out of tolerance, replace the card; otherwise go to step 39.	
39	Check backplane(s) for problems.	• If problem persists, possible control card problem - go to step 41.	
40	Use SHOW ALARMS ALL ALL command to obtain an overall view of the problem(s).	• If there is a system CRITICAL ALARM condition, go to the Critical Alarm troubleshooting procedures in paragraph 2.06. • If there is a system MAJOR ALARM condition, go to the Major Alarm troubleshooting procedures in paragraph 2.07. • If there is a system MINOR ALARM condition, address each problem independently as if it were isolated - go back to step 5.	see Note 1
	STEP 41 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 41 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
41	Check if circuit is located in a digital bay.	Yes: • to step 46. No • Go to step 42.	
42	Power down the affected bay via the power switch on the maintenance panel/top panel.	• Go to step 43.	
43	Replace the Digital Interface card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 44. No : • Problem fixed.	
44	Replace the Peripheral Control card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 45. No : • Problem fixed.	

CHART 3-5 (Cont'd)
GENERAL TRUNK CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
45	Replace the Scanner card; power up the bay. Does the fault persist?	Yes: • Possible problem with Main Control card; go to step 48. No : • Problem fired.	
46	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 47 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 47. No: • Problem fixed.	
47	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 48 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 48. No: • Problem fixed.	
48	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes:
1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.
2. Refer to Sections MITL9109-094-105-NA, Features Description and MITL9109-094-210-NA, Customer Data Entry.
3. Refer to Section MITL9109-094-180-NA, Engineering Information for details on provisioning.
4. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on system grounding.
5. If periodic opens in loop current are experienced during call progression through a central office, and disconnect timing has been set for a short interval, loop disconnects may cause the trunk to drop. In such cases, the timing should be increased one step at a time, until the calls are no longer dropped.
6. This step is necessary to ensure that other faulty modules are not preventing the E&M trunk module from functioning properly.
7. This step is necessary because there are no MOH/Pager module diagnostics (since the MOH is always "on-line", it cannot be taken "off-line" for testing).
8. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on trunk card switch settings.

TABLE 3-1
TRUNK VOLTAGE AND LOOP CURRENT MEASUREMENTS

CIRCUIT	IDLE	SEIZED
E and M	Tip to gnd = OV Ring to gnd = OV Tip to Ring = OV E lead = -48V M lead = OV E to M lead = 48V I loop = 0mA	Tip to gnd = OV Ring to gnd = OV Tip to Ring = OV E lead = OV M lead = -48V E to M lead = -48V I loop = 0mA
Loop Start	Tip to gnd = OV Ring to gnd = -48V Tip to Ring = -48V I loop = 0mA	Tip to gnd = -14v to -22v Ring to gnd = -34V to -26V Tip to Ring = -4V to -20V I loop = 10mA to 100mA
Ground Start	Tip to gnd = -48V Ring to gnd = -48V Tip to Ring = OV I loop = 0mA	Tip to gnd = -14v to -22v Ring to gnd = -34V to -26V Tip to Ring = -4V to -20V I loop = 10mA to 100mA
DID	Tip to gnd = -2V Ring to gnd = -48V Tip to Ring = -46V I loop = 0mA	Tip to gnd = -33v to -44v Ring to gnd = -17V to -6V Tip to Ring = 16V to 38V I loop = 12mA to 30mA
Loop/Tie	Tip to gnd = -2V Ring to gnd = -48V Tip to Ring = -46V I loop = 0mA	Tip to gnd = -17V to -6V Ring to gnd = -33V to -44V Tip to Ring = -16V to -38V I loop = 12mA to 30mA

Supplementary E&M Trunk Troubleshooting Procedures

3.07 E&M Trunks are provided for the SX-200 DIGITAL PABX in two forms. The E&M Trunk module (9109-013) is installed on the Universal card in the digital bays. The module provides a single E&M circuit, which nay be programmed as either 2-wire or 4-wire, as well as being conditioned via switches as Bell Standard E&M Types I or V. The E&M Trunk card (9110-013) is installed in the analog peripheral shelves (Bays 3, 4 and 5). This circuit card can also be set as either 2-wire or 4-wire via switches, but can be conditioned only as Bell Standard E&M Type 1. The Supplementary Troubleshooting Procedures for this type of trunk are provided in Chart 3-6. Further information concerning the characteristics, parameters and operation of the module is contained in Section MITL9109-094-125-NA.

CHART 3-6
SUPPLEMENTARY E&M TRUNK TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Perform General Trunk Troubleshooting Procedures in Chart 3-5.	• Go to step 2.	
2	Disconnect the affected circuit(s) from the cross-connect field.	• Go to step 3.	
3	IDLE STATE TEST- connect voltmeter between -48 Vdc and the M lead. Reading should be -48 Vdc.	• If not -48 Vdc, replace card; otherwise go to step 4.	see Fig 3-l
4	INCOMING TEST - seize the trunk incoming - connect butt-set to E lead and ground. Circuit LED should light when butt-set goes off-hook.	• If not, replace card/module; if fault persists, possible control problem - go to step 11. • Otherwise go to step 5.	see Fig 3-l
5	Check if incoming wink is programmed.	Yes: • Go to step 6. No - • Go to step 7.	
6	Connect voltmeter to M lead and ground. Flash of -48 Vdc should be seen when butt-set goes off-hook.	• If not, replace card/module; if fault persists, possible control problem - go to step 11. • Otherwise go to step 7.	see Fig 3-l
7	Connect voltmeter to M lead and ground. Complete a call to an extension - when call is completed, steady -48 Vdc should be seen.	• If not, replace card/module; if fault persists, possible control problem - go to step 11. • Otherwise go to step 8.	
8	OUTGOING TEST - repeat step 3.	• Go to step 9.	
9	Connect voltmeter to ground and the M lead.	• Go to step 10.	

CHART 3-6 (Cont'd)
SUPPLEMENTARY E&M TRUNK TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
10	Connect butt-set to the E lead and ground, and dial the access code for a trunk group. The reading should be a steady -48 Vdc.	• If not, replace card/module; if fault persists, possible control card problem - go to step 11. • Otherwise, circuit is functioning properly.	see Fig 3-I
	STEP 11 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 11 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
11	Check if circuit is located in a digital Bay.	Yes: • Go to step 16. No : • Go to step 12.	
12	Power down the affected bay via the power switch on the maintenance panel/top panel.	• Go to step 13.	
13	Replace the Digital Interface card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 14. No : • Problem fixed.	
14	Replace the Peripheral Control card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 15. No : • Problem fixed.	
15	Replace the Scanner card; power up the bay. Does the fault persist?	Yes: • Possible problem with Main Control card; go to step 18. No : • Problem fixed.	
16	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 17 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 17. No: • Problem fixed.	
17	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 18 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 18. No: • Problem fixed.	
18	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Supplementary DID Trunk Troubleshooting Procedures

3.08 The DID Trunk (9109-031) card is installed in the digital bays of the SX-200 DIGITAL PABX system. The card provides six trunk circuits. The DID/Tie Trunk (9110-031) is installed in analog peripheral shelves, if present, and provides two trunk circuits. The Supplementary Troubleshooting Procedures for these types of trunks are provided in Chart 3-7. Further information concerning the characteristics, parameters and operation of the DID Trunk card is contained in Section MITL9109-094-125-NA.

CHART 3-7
SUPPLEMENTARY DID/LOOP/TIE TRUNK TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	Perform General Trunk Troubleshooting Procedures in Chart 3-5.	• Go to step 2.	
2	Disconnect the affected circuit(s) from the cross-connect field.	• Go to step 3.	
3	Connect the butt-set across the Tip and Ring of the trunk circuit - the circuit LED should light when the butt-set goes off-hook.	• If not, replace the card; if problem persists, possible control problem - go to step 9. • Otherwise, go to step 4.	see Fig 3-2
4	Check if circuit is a DID trunk.	Yes: • Go to step 5. No : • Go to step 6.	
5	Use butt-set to simulate incoming digits - connection should be made to and extension/attendant, etc. The circuit LED should wink following digits pulsed.	• If not, ensure extension/attendant console is functional - replace suspect module/card; if fault persists, possible control problem - go to step 9. . Otherwise, go to step 7.	
6	TIE TRUNK - dialing, or going off-hook from the butt-set should connect to an extension, attendant console, night bell, hunt group, etc., depending upon the trunk's programming.	• If not, ensure connecting device is functional - replace suspect card; if fault persists, possible control problem - go to step 9. • Otherwise, go to step 7.	
7	Connect voltmeter across the Tip and Ring of the trunk circuit.	• To check wink start, or answer back supervision, go to step 8.	see Fig 3-2
8	Connect meter across Tip and Ring and check results during a simulated incoming call from the butt-set.	• When seized, meter should read -18 to -20 Vdc. • For a wink start, the meter should read a 180 ms positive flash, and back to -18 to -20 Vdc. • For answer back supervision, deflection to +18 to +20 Vdc should be read. • If these readings are not read, retry. If this persists, replace the suspect card/module; if fault still persists, possible control problem - go to step 9.	see Fig 3-2

CHART 3-7 (Cont'd)
SUPPLEMENTARY DID/LOOP/TIE TRUNK TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
	STEP 9 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 9 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
9	Check if circuit is located in a digital bay.	Yes: • Go to step 14. No: • Go to step 10.	
10	Power down the affected bay via the power switch on the maintenance panel/top panel.	• Go to step 11.	
11	Replace the Digital Interface card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 12. No: • Problem fixed.	
12	Replace the Peripheral Control card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 13. No: • Problem fixed.	
13	Replace the Scanner card; power up the bay. Does the fault persist?	Yes: • Possible problem with Main Control card; go to step 16. No: Problem fixed.	
14	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 15 if there is no BCC). Does problem persist?	Yes • Reinstall original BCC; go to step 15. No: • Problem fixed.	
15	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 16 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 16. No: • Problem fixed.	
16	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No: • Problem fixed.	

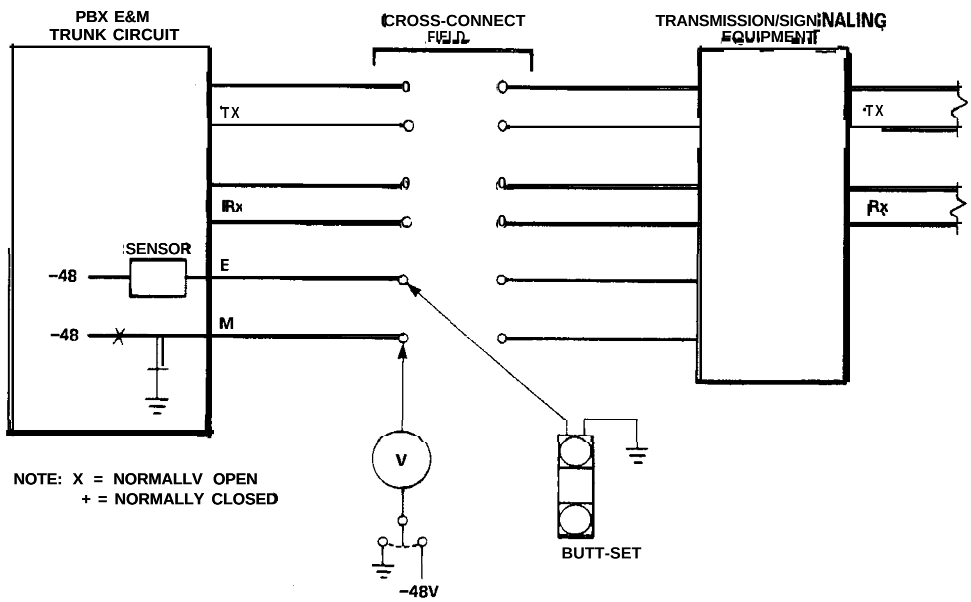


Figure 3-l E&M Trunk Testing

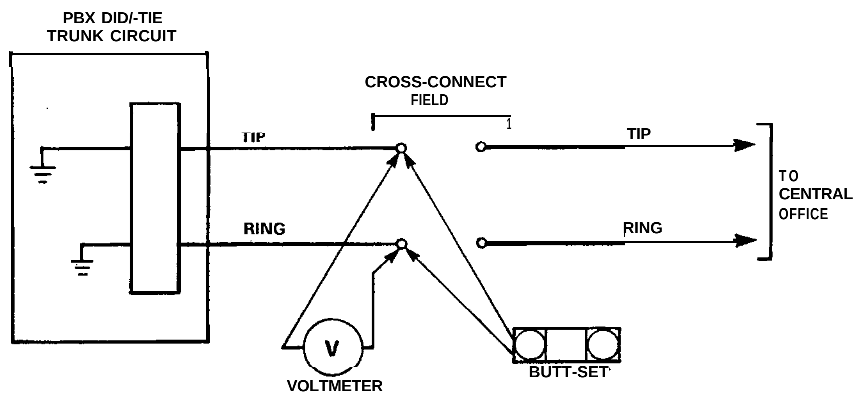


Figure 3-2 DID/Loop/Tie Trunk Testing

T1 Trunk Card, T1 Adapter Card, and T1 Adapter Cable Assembly

3.09 The T1 Trunk Card allows an SX-200 DIGITAL PABX to communicate with a T1 trunk at 1,544 Mbps. The T1 Adapter Card interfaces the T1 Trunk Card to a T1 Adapter Cable Assembly, which is connected to the Channel Service Unit where the Carrier's T1 trunk is terminated within the building. Chart 3-8 outlines the troubleshooting procedures for the T1 Trunk Card.

CHART 3-8
T1 TRUNK CARD TROUBLESHOOTING PROCEDURES

step	Action	Description / Follow-up	Remarks
1.	Identify the suspect Tl trunk card.		
2.	Verify that the line equalization switch setting (S1) is correct for the length of the cable.		Note 1
3.	Perform the analog loop-back diagnostics from the Maintenance terminal.	If the tests pass, go to Step 4; if the tests fail, go to Step 5.	Note 2
4.	Perform the digital loop-back diagnostics from the Maintenance terminal. Only one channel may be selected at a time.	If the tests pass, go to Step 5; if the tests fail, go to step 8.	Note 2
5.	Use the Maintenance Terminal to send a constant value to the far end; have the far end send a constant value to your end. Seizing and releasing the far end by selectively setting A and B bits on one channel from the Maintenance Terminal, while the remaining channels operate without interruption. A yellow alarm may be sent or received from the Maintenance terminal; however, this action disables all 24 channels of the T1 trunk.	Any particular data pattern may be sent on one channel for testing, while the remaining channels are unaffected and continue to operate; one channel's incoming data pattern may be observed while the remaining channels continue to operate. Maintenance personnel may have to be at each end of the T1 trunk, able to communicate with each other, for some of this testing.	Note 2
6.	Remove the T1 cable at the PABX end, plug in a commercial T1 tester in place of the PABX to check T1 trunk operation. Ensure proper line equalization setting on the tester.	If the test passes, go to step 8; if it fails, go to Step 8.	
7.	Remove the T1 cable at the CSU end; plug in a Commercial T1 trunk tester to test the CSU directly. Ensure proper line equalization settings (short) on both units.	If the CSU passes, the T1 cable is bad; check for erroneous connector wiring or noise on the line, reroute cable as required. If it fails, it is a bad CSU or CSU-Carrier connection; call supplier.	
8.	Replace the T1 trunk card, and repeat Step 2.	If the tests still fail, go to step 9.	
9.	Replace the backplane T1 Adapter, if necessary.	If it malfunctions, go to Step 10; if it does not malfunction, exit.	
10.	Replace the associated Bay Power Supply or Bay Control Card (Main Control Card in a COMBO backplane) and repeat Step 2.	Repeated failure at Step 10 indicates backplane is damaged or has a wiring error; contact Mitel Field Service.	

Notes: 1. Refer to Section MITL9109-094-200-NA, Shipping, Receiving, and Installation.

2. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal.

Other Peripheral Cards

Universal Card

3.10 The Universal card provides a general interface for SX-200 Digital modules. The modules are: the E&M Trunk module, the DTMF Receiver module, the Console Interface module, and the Music On Hold (MOH) module. The Universal card plugs into any high power (upper) slot of any digital bay of the PABX. Chart 3-9 shows the steps involved in the troubleshooting of this card type.

Further information on the Universal card may be found in Sections MITL9109-094-200-NA, Shipping, Receiving and Installation and MITL9109-094-125-NA, Circuit Card Descriptions.

CHART 3-9
UNIVERSAL CARD TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	identify the affected Universal card.	• Go to step 2.	
2	Check maintenance log for indications of problems with modules, or the Attendant console. Any such indications?	Yes: • Refer to the troubleshooting procedures for the appropriate device. No : • Go to step 3.	
3	Check which module types are installed on the card; use the SHOW CONFIG command.	• Go to step 4.	
4	Check cabling to the Universal card, and all of the modules installed on it. Any cabling problems?	Yes: • Correct faulty cabling. If problem persists, go to step 5. No : • Go to step 6.	see Nott 2
5	Check programming for the Universal card and all of the modules installed on it. Any programming errors?	Yes: • Correct faulty programming. If problem persists, go to step 6. No : • Go to step 6.	see Note 3
6	If there are DTMF Receiver modules on the card, test them. Otherwise, go to step 7.	Pass: • Go to step 7. Fail: • Replace faulty module and retest. If problem persists, go to step 7.	see Note 1
7	If there are E & M Trunk modules on the card, test them. Otherwise, go to step 8.	Pass: • Go to step 8. Fail: • Replace faulty module and retest. If problem persists, go to step 8.	see Note 1
8	If there are Console modules on the card, test them. Otherwise, go to step 9.	Pass: • Go to step 9. Fail: • Replace faulty module and retest. If problem persists, go to step 9.	see Note 1
9	If there is a Music On Hold (MOH) module on the card, remove it. Does problem persist?	Yes: • Go to step 10. No : • Problem fixed. Replace faulty module.	
10	Replace the faulty Universal card, and check if problem persists.	Yes: • Possible problem with Main Control card. Go to step 11. No : • Problem fixed.	
	STEP 11 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 11 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
11	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 12 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 12. No: • Problem fixed.	
12	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 13 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 12. No: • Problem fixed.	
13	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes: 1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.

2. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and installation for details of cabling.

3. Refer to Sections MITL9 109-094- 105-NA, Features Description, and MITL9 109-094-210-NA, Customer Data Entry for details.

DTMF Receiver Module (9109-016)

3.11 The DTMF Receiver module is installed on the Universal card in the digital bays of the SX-200 DIGITAL PABX system. The module provides four DTMF Receiver circuits. Also provided are two relay circuits. The troubleshooting procedures for DTMF Receivers are provided in Chart 3-10. Further information concerning the characteristics, parameters and operation of the module is contained in Section MITL9109-094-125-NA.

CHART 3-10
DTMF RECEIVER MODULE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Check the status of the suspect circuit.	• Use the SHOW STATUS command, and check for abnormal conditions.	see Note 1
2	Check if problem is with DTMF circuit or a relay circuit.	DTMF: • Go to step 3. Relay: • Go to step 17. • If unknown, go to step 3.	
3	Perform a directed test on the suspect circuit(s).	• First busy out the receiver, then use the TEST command. If possible, avoid busying a circuit involved in a call. • Go to step 4.	see Note 1
4	Check for test failure.	Fail: • Reseat the card and the module, then rerun the test. • If failure persists, go to step 5. Pass: • Go to step 14.	
5	Check backplane continuity from Universal card to Main Control card. Problems?	Yes: • Correct as required; if problem persists, go to step 6.	
6	Check maintenance log for indications of problems with the Universal card, other modules on the Universal card, or the Main Control card. Any such indications?	Yes: • Refer to the applicable troubleshooting procedures. No : • Go to step 7.	see Note 1
7	Use SHOW CONFIG command on the card slot to identify any other modules on the Universal card. Other modules?	Yes: • Go to step 6. No : • Gotostepll.	
6	Perform directed tests on any other receiver modules, E & M trunk modules, and the console (if there is a console module installed). Do these fail as well?	Yes: • Go to step 9. No : • Go to step 11.	
9	Is one of the other modules a Music On Hold (MOH) module?	Yes: • Go to step 10. No : • Gotostepll.	see Note 2
10	Remove the MOH module, and check if problem persists. Does problem persist?	Yes: • Go to step 11. No : • Problem fixed. Replace faulty MOH module.	

CHART 3-10 (Cont'd)
DTMF RECEIVER MODULE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
11	Replace suspect DTMF Receiver module and test.	Pass: • Problem fixed. Fail: • Go to step 12.	
12	Test the signal processor; use the TEST DEVICE TYPE DSP command.	Pass: • Go to step 13. Fail: • Problem with Signal Processor; go to step 22.	
13	Replace Universal card and retest.	Pass: • Problem fixed. Fail: • Possible problem with Main Control card. • Go to step 22.	
14	Busy out all of the DTMF Receivers in the system, except the suspect receiver.	• IMPORTANT : THIS STEP MUST BE DONE DURING A PERIOD OF LOW OR NO TRAFFIC, AS IT WILL ADVERSLY AFFECT SYSTEM PERFORMANCE. • Go to step 45.	see Note 1
15	Initiate a station-to-station call. Can the call be completed?	Yes: • Record details; return all circuits to service. Use SHOW STATUS and TEST CONTINUOUS commands, and periodically refer to the maintenance log to observe the progress of the circuit. No : • Go to step 16.	
16	Replace the suspect module.	• If problem persists, indicates possible problem with Main Control card. Go to step 22.	
17	Ensure relay is properly programmed in CDE Forms 18 and 19.	• Correct programming as required. • If problem persists, go to step 18.	see Note 3
18	Disconnect relay from the external equipment at the MDF.	• Go to step 19.	
19	Ensure external equipment is functional - short out at the MDF.	• If external equipment is activated (i.e., night bell rings) go to step 20. If not, problem with external equipment.	see Fig 3-3
20	Connect ohmmeter across relay leads at the MDF.	• An open circuit should be read. If not, verify connection at the backplane, and reseat the module. • If this persists, replace the module. • Otherwise, go to step 21.	see Fig 3-3

CHART 3-10 (Cont'd)
DTMF RECEIVER MODULE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
21	From any station, dial the access code for the external equipment (i.e., the Night Bell access code).	• If the meter reads a short circuit, the relay is functioning properly; if not, replace the suspect module. • If problem persists, possible Main Control problem - go to step 22.	
	STEP 22 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 22 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
22	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 23 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 23. No: • Problem fixed.	
23	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 24 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 24. No: • Problem fixed.	
24	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes:
1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.
2. This step is required, as it is not possible to run diagnostics on the MOH module due to its permanent "on-line" nature.
3. Refer to Sections MITL9109-094- 105-NA and MITL9109-094-210-NA for information on programming.

Console interface Module

3.12 The Console Interface module is installed on the Universal card in the digital bays of the SX-200 DIGITAL PABX system. The module provides an interface to the system for the Attendant Console. For Console Module troubleshooting procedures refer to the part on the Attendant Console.

Further information on the Console Interface module may be found in Section MITL9109-094-200-NA, Shipping, Receiving and Installation.

Music On Hold (MOH) / Pager Module

3.13 The Music On Hold (MOH) / Pager module is installed on the Universal card in the digital bays of the SX-200 DIGITAL PABX system. The module provides a music source input, a paging output, and a pair of relay contacts to control an external paging amplifier. The troubleshooting procedures for this module type are provided in Chart 3-11. Further information on the MOH/ Pager module may be found in Section MITL9109-094-200-NA, Shipping, Receiving and Installation.

CHART 3-l 1
MUSIC ON HOLD / PAGER MODULE TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	Check the status of the suspect circuit.	• Use the SHOW STATUS command, and check for abnormal conditions.	see Note 1
2	Check maintenance log for indications of problems with other modules, or the Universal card. Any such indications?	Yes: • Refer to the appropriate troubleshooting procedures. No : • Go to step 3.	
3	Check if problem is with Music On Hold or Pager.	• If MOH, go to step 4. • If Pager, go to step 8. • If unknown, treat as problem with both.	
4	Disconnect the music source from the MOH module at the MDF.	• Go to step 5.	
5	Connect butt-set to music source pair at the MDF and go off-hook. Is music heard?	Yes: • Go to step 6. No : • Problem with music source or cabling.	see Fig 3-3
6	Reconnect music source to MOH at the MDF.	• Go to step 7.	
7	Access MOH from any station (put on hold) - is music heard?	Yes: • MOH portion is functioning correctly. No : • Go to step 12.	
6	Disconnect the PA system from the Pager at the MDF.	• Go to step 9.	

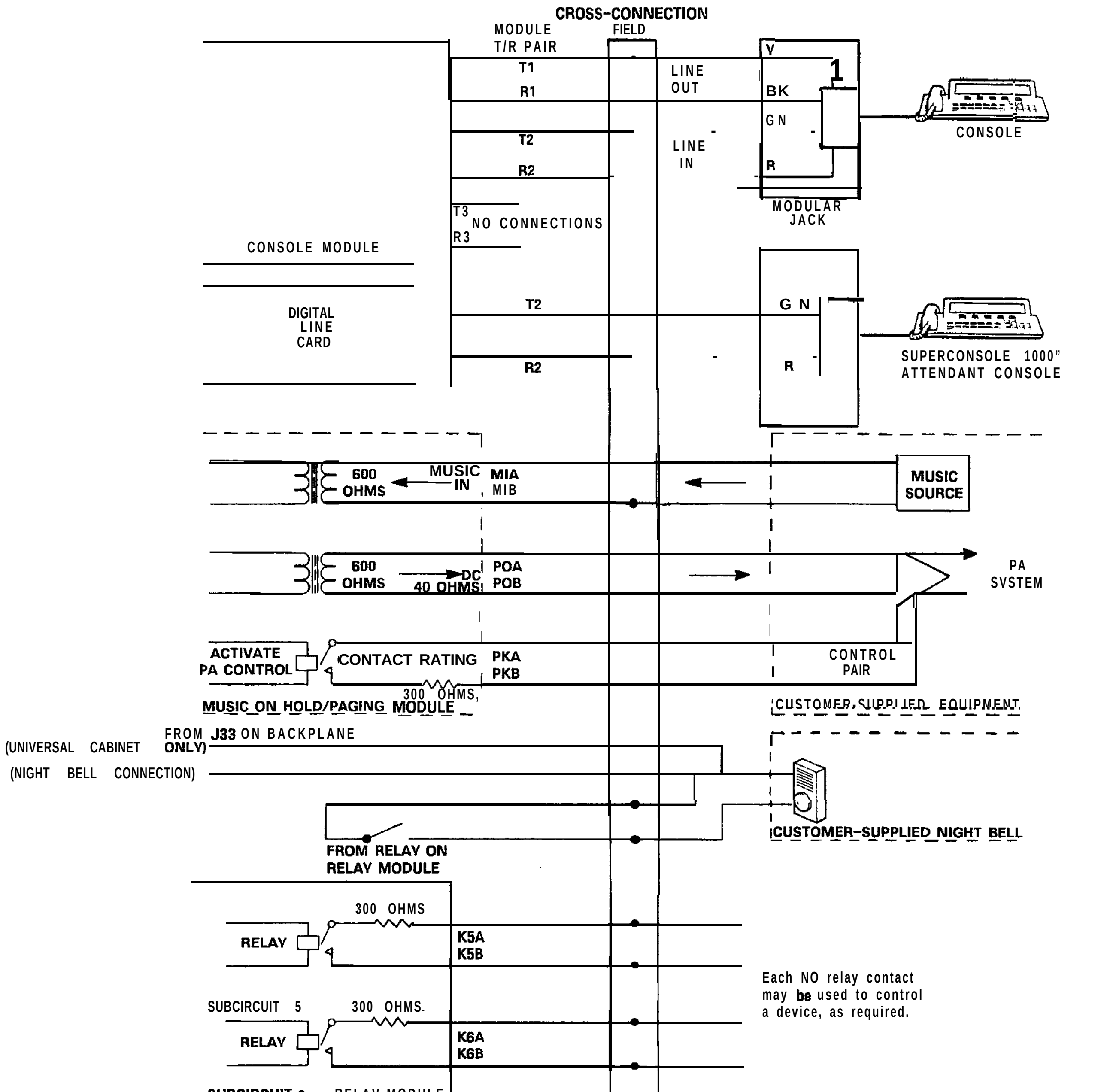
CHART 3-11 (Cont'd)
MUSIC ON HOLD / PAGER MODULE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
9	Connect butt-set to the PA system pair at the MDF, go off-hook and speak. Is PA system accessed?	Yes: • Go to step 10. No : • Problem with PA system or cabling.	see Fig 3-3
10	Connect butt-set to the pager pair at the MDF.	• Go to step 11.	
11	Access the pager from any station with the appropriate pager access in its COS, and speak. Is this heard on the butt-set?	Yes: • Pager portion is functioning correctly. No: • GotostepIZ.	
12	Check CDE programming of the module. Check Forms 01, 16, 19 and station/trunk COS. Any programming problems?	Yes: • Correct programming errors; if problem persists, go to step 13. No : • Go to step 13.	see Note 3
13	Use SHOW CONFIG command on the card slot to identify any other modules on the Universal card. Other modules?	Yes: • Go to step 14. No : • Go to step 15.	
14	Perform directed tests on any consoles, E&M trunk modules, and DTMF receiver modules on the affected Universal card. Do these fail as well?	Yes: • Go to step 16. No: • Gotostep15.	
15	Replace the Music On Hold (MOH) / Pager module. Does problem persist?	Yes: • Go to step 16. No : • Problem fixed.	
16	Replace Universal card and retest.	Pass: • Problem fixed. Fail: • If MOH module has not already been replaced, do so; if problem persists, indicates possible problem with Main Control card. • Go to step 17.	
	STEP 17 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 17 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
17	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 18 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 16. No: • Problem fixed.	
18	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 19 if PABX is not 672-port). Does problem persist?	yes: • Reinstall SMC; go to step 19. No: • Problem fixed.	
19	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes: 1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.

2. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on cabling.

3. Refer to Sections MITL9 109-094-I 05-NA, Features Description and MITL9109-094-210-NA, Customer Data Entry for details.



NOTE 1. All wiring must be done in accordance with the National Electrical Coda (USA) or Canadian Electrical Code and/or local electrical inspection authorities.

NOTE 2. Refer to Part 6 of this Section for Cross-connect Field pin numbers for each module; their assignment depends upon the position of the Universal Card and Module.

NOTE 3. This relay contact may be connected only to a secondary circuit that has no direct connection to a primary circuit, and receives its power from a transformer, converter, or equivalent isolation device situated within the equipment.

NOTE 4. For 336, 456 and 460 port configurations, the relay for the night bell must be in digital bay 1 or 2.

NOTE 6. For 672 port configuration, the relay for the night bell may be in any peripheral bay.

NOTE 6. The Superconsole 1000" attendant console which connects to the default position must use circuit 2 to match default wiring from the maintenance panel. Other Superconsole 1000™ attendant consoles may connect to any port on a Digital Line Card.

KA0282R2E3

Figure 3-3 Music, Paging and Relay Connections

Analog Junctors / Channels

3.14 If analog bays are present in an SX-200 system, the analog cards are connected to 32 junctors, or voice paths via analog crosspoint chips. These are located on the cards themselves, and are in turn connected to the 32 channels of the bay's digital link via the Digital Interface Card. Refer to Section MITL9109-094-180-NA, Engineering Information for further details on this interface. Chart 3-12 outlines the troubleshooting procedures for the analog junctors.

CHART 3-12
ANALOG JUNCTOR / CHANNEL TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Verify the problem.	• Go to step 2.	
2	Identify the link number.	• Check the maintenance log message, and refer to Table 3-2.	
3	Check the status of the junctors in the affected bay.	• Use SHOW STATUS command to obtain further information. • Go to step 4.	
4	Run a directed test on the suspect junctor/ channel.	Pass: • Repeat several times to verify. • Continue observation using SHOW STATUS command and maintenance log. Fail: • Go to step 5.	
	IMPORTANT : THE FOLLOWING STEPS INVOLVE THE UNPLUGGING OF SOME OR ALL OF THE CARDS IN THE AFFECTED BAY. THIS WILL ADVERSELY AFFECT SYSTEM PERFORMANCE. THIS SHOULD BE DONE ONLY DURING PERIODS OF LOW OR NO TRAFFIC.		
5	Unseat the card in Slot 1 of the affected bay, and rerun the test.	Pass: • Problem fixed. • Return the junctor to service, and replace the faulty card. Fail: • Reseat the card, and go to step 6.	
6	Repeat step 5 for all of the installed peripheral (lines and trunks) cards installed in the affected bay.	• If fault persists, go to step 7.	
7	Unseat all of the peripheral cards in the affected bay.	• Go to step 8.	
6	Rerun the test on the suspect junctor/ channel; does it now pass?	Yes: • Go to step 9. No: • Gotostep13.	
9	Reseat the card in slot 1, and rerun the test.	Pass: • Go to step 10. Fail: • Replace card and continue.	
10	Reseat the next card into its slot, and rerun the test.	Pass: • Go to step 11. Fail: • Replace card and continue.	
11	Repeat step 10 for all of the peripheral cards in the affected bay.	• Replace the cards which cause the test to fail.	

CHART 3-12 (Cont'd)
ANALOG JUNCTOR / CHANNEL TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
12	Check cabling from the digital bay backplane to the appropriate Digital Interface card.	• Correct faulty cabling/damaged cables. • Refer to Section MITL9109-094-200-NA for details on cabling. • If fault persists, go to step 13.	
13	Replace the following cards in order and rerun the test: *Digital Interface Card • Peripheral Control Card *Scanner Card.	• Note: The affected shelf must be powered down to replace these cards. • If fault still persists, possible problem with Main Control card - refer to Main Control card troubleshooting procedures.	

TABLE 3-2
ANALOG BAY LINK ASSIGNMENTS

LINK #	Connects to
2	Bay 3
5	Bay 4
7	Bay 5

Special Sets

Attendant Console

3.15 The Attendant console is a microprocessor-controlled liquid crystal display terminal which integrates access to the SX-200 DIGITAL PABX system data and telephony functions in a single device. It is adaptable to many different applications, including Maintenance and Customer Data Entry. Chart 3-13 shows the steps involved in the troubleshooting of the Attendant console.

Further information on the Attendant console may be found in Section MITL9 109-094-315-NA, Console Description.

CHART 3-13
ATTENDANT CONSOLE TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	temarks
1	Check if system is up and running; use SHOW ALARMS command, check Main Control card status indicators. Is system running?	'es: • Go to step 2. do : • Refer to Primary Troubleshooting Procedures.	ee Note 2
2	Initiate console self tests by disconnecting, then reconnecting the console.	• Go to step 3.	
3	Check if console is inoperative and one of the following is true: *HOLD 1 LED flashing • HOLD 2 LED flashing • HOLD 3 LED flashing *All LEDs on always	'es: • Replace console. Jo : • Go to step 4.	
4	Check if the following message is on console display: CONSOLE HARDWARE PROBLEM 123456789 ERROR CODE 1 PLEASE NOTE DETAILS ON REPAIR TAG	'es: • Replace console. Problem fixed. lo : • Go to step 5.	ee Note 7
5	Check if one of the following messages are on console display: WAITING FOR SYNCHRONIZATION 123456789 PLEASE WAIT WAITING FOR COMMUNICATION 123456789 PLEASE WAIT	Jo: • Go to step 10. 'es: • Go to step 6. • Go to step 8.	ee Note !
6	Check cabling from console to PABX. Errors in cabling?	'es: • Correct wiring problems. Jo : • Go to step 7.	
7	Use voltmeter. to check for presence of voltage between leads T1 and T2, T1 and R2, T2 and RI, RI and R2 at the MDF. Any voltage (should be difference of 48 volts)?	'es: • Go to step 8. Jo : • Go to step 13.	see Fig 3-3

CHART 3-13 (Cont'd)
ATTENDANT CONSOLE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
8	Check programming for the console and associated module - (CDE Forms 01, 07 and the console's COS). Programming errors?	Yes: • Correct as required. No : • Go to step 9.	see Note 5
9	Replace the console. Does the problem persist?	Yes: • Reinstall original console, and go to step IO. No : • Problem fixed.	
10	Check maintenance log for indications of problems with Console module or Universal card. Any such indications? If the console is a Superconsole 1000™ attendant console, refer to Digital Line Card Troubleshooting Procedures (Chart 3-4).	Yes: • Refer to the applicable troubleshooting procedures. No : • Go to step 11.	
11	Check programming for the console and associated module - (CDE Forms 01, 07 and the console's COS). Programming errors?	Yes: • Correct as required. No : • Go to step 12.	see Note 5
12	Replace console. Does problem persist?	No : • Problem fixed. Yes: • Go to step 13.	
13	Check the status of the suspect module.	• Use the SHOW STATUS command, and check for abnormal conditions. • Go to step 14.	see Note 2
14	Perform a directed test on the corresponding console.	• Use the TEST DEVICE TYPE CONSOLE command. • Go to step 15.	see Note 2 see Note 3
15	Check for test failure.	Fail: • Reseat the card and the module, then rerun the test. • If failure persists, go to step 16. Pass: • Problem fixed.	
16	Use SHOW CONFIG command on the card slot to identify any other modules on the Universal card. Other modules?	Yes: • Go to step 17. No: • Gotostep18.	
17	Perform directed tests on any other consoles, E & M trunk modules, and DTMF receiver modules on the affected Universal card. Do these fail as well?	Yes: • If all fail, go to step 21; if one fails, replace the faulty module. No : • Go to step 18.	
18	Replace the console interface module and retest. Does problem persist?	Yes: • Go to step 19. No : • Problem fixed.	

CHART 3-13 (Cont'd)
ATTENDANT CONSOLE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
19	Is one of the other modules on the Universal a Music On Hold (MOH) module?	Yes: • Go to step 20. No: • Go to step 21.	see Note 6
20	Remove the MOH module, and check if problem persists. Does problem persist?	Yes: • Go to step 21. No: • Problem fixed. Replace faulty MOH module.	
21	Replace Universal card and retest.	Pass: • Problem fixed. Fail: • Possible problem with Main Control card. Go to step 22.	
	STEP 22 SHOULD BE DONE ONLY DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL - CHECK IF THIS CORRECTS THE PROBLEM. DO NOT DO STEP 22 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
22	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 23 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 23. No: • Problem fixed.	
23	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 24 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 24. No: • Problem fixed.	
22	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No: • Problem fixed.	

Notes:

1. These messages are displayed when communication cannot be made between the system and the console. If communication is established, the message is erased.
2. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.
3. This indirectly tests the operation of the Console module.
4. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on cabling.
5. Refer to Sections MITL9 109-094-I 05-NA, Features Description and MITL9109-094-210-NA, Customer Data Entry for details.
6. This step checks if a faulty MOH/Pager module is preventing the console module from functioning properly.
7. "Error Code 1" indicates that the console failed its power-up self tests.

SUPERSET 4 Telephone

3.16 The SUPERSET 4 telephone is a microprocessor-controlled telephone set which interconnects with the SX-200 DIGITAL PABX system. It provides visual PABX feature prompting by means of a Liquid Crystai Display (LCD) panel, and permits up to 15 line appear-ances. The SUPERSET 4 telephone derives its power from the system, and all voice and signal communication between the set and the system is achieved via the normal Tip and Ring leads. No special cabling is required for the SUPERSET 4 telephone, nor is any AC supply required. The SUPERSET 4 telephone is connected to the system via one of two card types. The COV line card connects the SUPERSET 4 telephone to the system through the digital bays, while the SUPERSET Line card connects the set through analog bays, if present. Chart 3-14 shows the steps involved in the troubleshooting of the SUPERSET 4 telephone. The line cards described above have their own related troubleshooting procedures.

CHART 3-14
SUPERSET 4 TELEPHONE TROUBLESHOOTING PROCEDURES

step	Action	Description / Follow-up	Remarks
1	Identify the extension number of the suspect SUPERSET telephone.	• Go to step 2.	
2	Obtain a SUPERSET error summary from the maintenance / CDE terminal.	• Use the SHOW ERRORS command and check for abnormal conditions. • If errors are indicated, go to step 6; otherwise, go to step 3.	see Note 1
3	Check maintenance log for indications of problems with the COV card / SUPERSET card. Any indication?	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 4.	
4	Check if problem exists with other sets from other line cards.	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 5.	
5	Check if problem exists with other sets from the same line card.	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 6.	
6	Check if errors occurred on more than one card.	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 7.	
7	Check if errors occurred in more than one circuit.	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 8.	
8	Perform SUPERSET 4 Loopback Test from the suspect SUPERSET telephone.	Pass: • Go to step 10. Fail: • Go to step 9.	see Note 2

CHART 3-14 (Cont'd)
SUPERSET 4 TELEPHONE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
9	Replace the suspect SUPERSET telephone, and rerun the Loopback test from the new set.	Pass: • Problem fixed. Fail: • Go to step 10.	
10	Check that the voltage across the Tip and Ring leads at the SUPERSET 4 (with the set connected, and on-hook) is between 40 Vdc and 48 Vdc.	Yes: • Go to step 11. No : • Replace the set, and remeasure. If still out of range, go to step 11.	
11	Check cabling.	• If no cabling problems, go to step 12.	
12	Check if the resistance of the loop exceeds 200 ohms.	No: • Gotostep13. Yes: • Check for loose connection and remeasure. If still out of range, refer to the troubleshooting procedures for the COV or SUPERSET Line card.	
13	Check if display reads "No Communication" or "Consecutive Errors".	Yes: • If set has not been replaced yet, replace it. Otherwise, refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 14.	
14	Take the receiver off-hook and check if dial tone is returned.	Yes: • Go to step 17. No : • Go to step 15.	
15	Check if side tone is present.	Yes: • Go to step 16. No : • Refer to troubleshooting procedures for the COV or SUPERSET Line card.	
16	Check if calls may be completed without dial tone.	Yes: • Problem with Main Control card - go to step 18. No : • Refer to troubleshooting procedures for the COV or SUPERSET Line card.	
17	If problem persists, check the Class Of Service options of the set.	• If there are programming errors, correct them; otherwise refer problem to Mitel field service.	see Note 3
	STEP 18 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 18 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
18	Check if line card is of type 9109-020.	Yes: • Go to step 23. No : • Go to step 19.	
19	Power down the affected bay via the power switch on the maintenance panel/top panel.	• Go to step 20.	
20	Replace the Digital Interface card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 21. No : • Problem fixed.	

CHART 3-14 (Cont'd)
SUPERSET 4 TELEPHONE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
21	Replace the Peripheral Control card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 22. No : • Problem fixed.	
22	Replace the Scanner card; power up the bay. Does the fault persist?	Yes: • Possible problem with Main Control card; go to step 25. No : • Problem fixed.	
23	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 24 if there is no BCC). Does problem persist?	Yes • Reinstall original BCC; go to step 24. No: • Problem fixed.	
24	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 25 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 25. No: • Problem fixed.	
25	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes: 1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.

2. *SUPERSET* 4 Loopback Test is System Feature # 26. Refer to CDE Form 02 - Feature Access Codes for the actual access code. If there is no dial tone, the test fails.

3. Refer to Section MITL9109-094-105-NA, Features Description for details of features and options.

SUPERSET 3 Telephone

3.17 The SUPERSET 3 telephone is a microprocessor-controlled telephone set which interconnects with the SX-200 DIGITAL PABX system. The set permits up to 12 line appearances. The SUPERSET 3 telephone derives its power from the system, and all voice and signal communication between the set and the system is achieved via the normal Tip and Ring leads. No special cabling is required for the SUPERSET 3 telephone, nor is any AC supply required. The SUPERSET 3 telephone is connected to the system via one of two card types. The COV line card connects the SUPERSET 3 telephone to the system through the digital bays, while the SUPERSET Line card connects the set through analog bays, if present. Chart 3-15 shows the steps involved in the troubleshooting of the SUPERSEJ 3 telephone. The line cards described above have their own related troubleshooting procedures.

CHART 3-15
SUPERSET 3 TELEPHONE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Identify the extension number of the suspect SUPERSET telephone.	• Go to step 2.	
2	Obtain a SUPERSET error summary from the maintenance / CDE terminal.	• Use the SHOW ERRORS command and check for abnormal conditions. • If errors are indicated, go to step 6; otherwise, go to step 3.	see Note 1
3	Check maintenance log for indications of problems with the COV card / SUPERSET card. Any indication?	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 4.	
4	Check if problem exists with other sets from other line cards.	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 5.	
6	Check if problem exists with other sets from the same line card.	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 6.	
6	Check if errors occurred on more than one card.	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 7.	
7	Check if errors occurred in more than one circuit.	Yes: • Refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 8.	
8	Check that the voltage across the Tip and Ring leads at the SUPERSET 3 telephone (with the set connected, and on-hook) is between 40 Vdc and 48 Vdc.	Yes: • Go to step 9. No : • Replace the set, and remeasure. If still out of range, go to step 9.	

CHART 3-15 (Cont'd)
SUPERSET 3 TELEPHONE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
9	Check cabling.	• If no cabling problems, go to step 10.	
10	Check if the resistance of the loop exceeds 200 ohms.	No: • Gotostepll. Yes: • Check for loose connection and remeasure. If still out of range, refer to the troubleshooting procedures for the COV or SUPERSET Line card.	
11	Check if all three line appearance LEDs are permanently on.	Yes: • If set has not been replaced yet, replace it. Otherwise, refer to the troubleshooting procedures for the COV or SUPERSET Line card. No : • Go to step 12.	
12	Take the receiver off-hook and check if dial tone is returned.	Yes: • Go to step 15. No : • Go to step 13.	
13	Check if side tone is present.	Yes: • Go to step 14. No : • Refer to troubleshooting procedures for the COV or SUPERSET Line card.	
14	Check if calls may be completed without dial tone.	Yes: • Problem with Main Control card - go to step 16. No : • Refer to troubleshooting procedures for the COV or SUPERSET Line card.	
15	If problem persists, check the Class Of Service options of the set.	• If there are programming errors, correct them; otherwise refer problem to Mitel field service.	see Note 2
	STEP 16 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL. IF ANALOG BAYS ARE PRESENT, THESE MAY BE RESET USING THE "MASTER RESET" PUSHBUTTON ON THE SCANNER CARD. CHECK IF THE RESET SOLVES THE PROBLEM. DO NOT PROCEED TO STEP 16 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
16	Check if card is of type 9109-020.	Yes: • Go to step 21. No: • Gotostep17.	
17	Power down the affected bay via the power switch on the maintenance panel/top panel.	• Go to step 18.	
18	Replace the Digital Interface card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 19. No : • Problem fixed.	
19	Replace the Peripheral Control card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 20. No : • Problem fixed.	
20	Replace the Scanner card; power up the bay. Does the fault persist?	Yes: • Possible problem with Main Control card; go to step 21. No : • Problem fixed.	

CHART 3-15 (Cont'd)
SUPERSET 3 TELEPHONE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
21	Switch off the Bay Power Supply and replace the Bay Control Card (go to step 22 if there is no BCC). Does problem persist?	Yes: • Reinstall original BCC; go to step 22. No: • Problem fixed.	
22	If PABX is 672-port, power down Bay 0 and replace Switch Matrix Card (go to step 23 if PABX is not 672-port). Does problem persist?	Yes: • Reinstall SMC; go to step 23. No: • Problem fixed.	
23	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No : • Problem fixed.	

Notes: 1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.

2. Refer to Section MITL9109-094-105-NA, Features Description for details of features and options.

Digital *SUPERSET* Telephone

3.18 The Digital SUPERSEJ telephone is an advanced, microprocessor-controlled electronic telephone set containing digital electronic circuitry and liquid crystal displays (LCD). The Digital SUPERSEJ telephone can be used only with MITEL DIGITAL PABXs containing proprietary Digital Line Cards. Chart 3-16 lists the steps involved when troubleshooting a Digital SUPERSEJ telephone. Further information concerning the characteristics, parameters and operation of the SUPERSEJ 4™DN telephone is contained in Section MITL9109-094-109-NA and the SUPERSEJ 3™DN telephone is contained in Section MITL9 109-094- 108-NA.

CHART 3-16
DIGITAL *SUPERSET* TELEPHONE TROUBLESHOOTING PROCEDURES

›tep	Action	Description / Follow-up	Remarks
	IF A PROBLEM OCCURS DURING INITIAL INSTALLATION, THE PROGRAMMING SHOULD BE REVIEWED BEFORE PROCEEDING (SEE STEP 22 FOR A LIST OF APPLICABLE CDE FORMS). CORRECT PROGRAMMING ERRORS AS REQUIRED. IF PROBLEM PERSISTS, FOLLOW TROUBLESHOOTING PROCEDURES.		
1	Identify the extension number of the suspect Digital set.	• Go to step 2.	
2	Obtain a Digital set error summary from the maintenance terminal using the SHOW ERRORS command. Are any errors indicated?	Yes: • Go to step 4. No: • No: Go to step 3.	see Note 1
3	Check maintenance log for indications of problems with the Digital line card.	Yes: • Refer to the troubleshooting procedures for the Digital Line card. No: • Go to step 4.	
4	Check if any of the following conditions apply? • Problems with other sets on other Digital Line cards. • Problems with other sets from the same Digital Line card. • Errors occurring on more than one Line card. • Errors occurring on more than one circuit on a Digital Line card.	Yes: • Refer to the troubleshooting procedures for the Digital Line card. No: • Go to step 5.	

CHART 3-16 (Cont'd)
DIGITAL *SUPERSET* TELEPHONE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
5	Check that the voltage across the Tip and Ring leads at the Digital set (with the set connected, and on-hook) is between 24 Vdc arid 46 Vdc.	Yes: • Go to step 6. No: • Replace the set, and remeasure. If still out of range, go to step 6.	
6	Check if the resistance of the loop exceeds 200 ohms.	Yes: • Go to step 7. No: • Check for loose connection and remeasure. If still out of range, refer to the troubleshooting procedures for the Digital Line card.	
7	Check cabling.	• If no cabling problems, go to step 8.	
8	Is the set a *SUPERSET* 4DN telephone?	Yes: • Go to step 9. No: • Go to step 10.	
9	Check if display reads "No Communication" or "Consecutive Errors".	Yes: • If set has not been replaced yet, replace it. Otherwise, refer to the troubleshooting procedures for the Digital Line card. No: • Go to step 10.	
10	Take the receiver off-hook and check if dial tone is returned.	Yes: • Go to step 13. No: • Go to step 11.	
11	Check if side tone is present.	Yes: • Go to step 12. No: • Refer to troubleshooting procedures for the Digital Line card.	
12	Check if calls can be completed without dial tone.	Yes: • Go to step 13. No: • Refer to troubleshooting procedures for the Digital Line card.	
13	Replace set.	• If problem still persists, ensure Digital line card is configured properly. • Go to step 14.	
14	Check that the connections at the MDF, and the associated wiring are not faulty.	• Repair connections as required; if problem persists, replace Digital set.	
15	Use SHOW STATUS command on the affected Digital Line Card.	• If affected circuit(s) are not idle, take corrective action to return to the idle state. • Go to step 16.	see Note 3

CHART 3-16 (Cont'd)
DIGITAL *SUPERSET* TELEPHONE TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
16	If required, examine the maintenance log to obtain further information. (Use LOGS READ command.)	• Go to step 17.	
17	Check if there appear to be problems with more than one Digital line card circuit.	Yes: • Go to step 18. No: • Go to step 19.	
18	Check if suspect circuits are all located on one line card.	Yes: • Replace the line card; if problem persists, reinstall the original card and go to step 20. No: • Treat all faults as isolated incidents; go to step 19.	
19	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Go to step 20. Pass: • Go to step 22.	See Note 4
20	Check if test indicates a fault with the following: Digital Line Card	Yes: • Go to step 21. No: • Go to step 22.	
21	Reseat the card and rerun the test.	• If test now passes, monitor the circuit. • If failure persists, replace the line card with a known working card. • If failure still persists, reinstall the original card and go to Bay Control Card Troubleshooting Procedures. • If a programming problem is indicated, go to step 22.	
22	Check programming in the following CDE Forms where applicable: Form 01 System Configuration Form 02 Feature Access Codes Form 03 COS Define Form 05 Tenant Interconnection Table Form 09 Station/*SUPERSET* telephones Form 17 Hunt Groups Form 30 Device Interconnection Table Form 35 Global Find Access Code	• Correct programming errors as required. • If problem still persists, refer to Bay Control Card Troubleshooting Procedures	See Note 2

Notes:
1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.
2. See Customer Data Entry, Section MITL9109-094-210-NA, for details of procedures.
3. Use the Returning Busy Equipment to Service (RET-TO-SVC) command. See Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.
4. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for procedures of Directed Testing.

DATASET 1100 Series

DATASET 1101 Cartridge

3.19 The DATASET 1101 Cartridge is mounted within a *SUPERSET* 3DN or a *SUPERSET* 4DN telephone set. This cartridge is not field replaceable; it is an integral part of a Digital *SUPERSET* telephone. Connected via an internal cable to the telephone set circuit board, the cartridge interfaces to the PABX Digital Line card through the same twisted pair that the telephone set voice circuit uses.

3.20 Located at the rear of the DATASET 1101 Cartridge are LEDs, and connectors for RS-232 and power (see Figure 3-4). The primary interface to the user is through two programmable line appearance keys and an associated LCD on the telephone set.

3.21 Troubleshooting procedures for the DATASET 1101 Cartridge are described in Chart 3-17. Further' information on the DATASET 1101 Cartridge may be found in Section MITL9141-753-503-NA, DATASET 1100 series.

CHART 3-17
DATASET 1101 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
	IF A PROBLEM OCCURS DURING INITIAL INSTALLATION, THE PROGRAMMING SHOULD BE REVIEWED BEFORE PROCEEDING (SEE STEP 35 FOR A LIST OF APPLICABLE CDE FORMS). CORRECT PROGRAMMING ERRORS AS REQUIRED. IF PROBLEM PERSISTS, FOLLOW TROUBLESHOOTING PROCEDURES.		
1	Can you make a voice call?	Yes: • Suspect problem with DATASET cartridge. Go to step 15. No • Go to step 2.	
2	Identify the extension number of the suspect Digital set.	• Go to step 3.	
3	Obtain a Digital set error summary from the maintenance terminal using the SHOW ERRORS command. Are any errors indicated?	Yes: • Go to step 5. No: • No: Go to step 4.	See Note 1
4	Check maintenance log for indications of problems with the Digital line card.	Yes: • Refer to the troubleshooting procedures for the Digital Line card. No: • Go to step 5.	
5	Check if any of the following conditions apply? • Problems with other sets on other Digital Line cards. • Problems with other sets from the same Digital Line card. • Errors occurring on more than one Line card. • Errors occurring on more than one circuit on a Digital Line card.	Yes: • Refer to the troubleshooting procedures for the Digital Line card. No: • Go to step 6.	

CHART 3-17 (Cont'd)
DATASET 1101 TROUBLESHOOTING PROCEDURES

step	Action	Description / Follow-up	Remarks
6	Check that the voltage across the Tip and Ring leads at the Digital set (with the set connected, and on-hook) is between 40 Vdc and 46 Vdc.	Yes: • Go to step 7. No: • Replace the set, and remeasure. If still out of range, go to step 7.	
7	Check if the resistance of the loop exceeds 200 ohms.	Yes: • Go to step 6. No: • Check for loose connection and remeasure. If still out of range, refer to the troubleshooting procedures for the Digital Line card.	
6	Check cabling.	• If no cabling problems, go to step 9.	
9	Is the set a SUPERSET 4DN telephone?	Yes: • Go to step 10. No: • Go to step 11.	
10	Check if display reads "No Communication" or "Consecutive Errors".	Yes: • If set has not been replaced yet, replace it. Otherwise, refer to the troubleshooting procedures for the Digital Line card. No: • Go to step 11.	
11	Take the receiver off-hook and check if dial tone is returned.	Yes: • Go to step 14. No: • Go to step 12.	
12	Check if side tone is present.	Yes: • Go to step 13. No: • Refer to troubleshooting procedures for the Digital Line card.	
13	Check if calls can be completed without dial tone.	Yes: • Go to step 14. No: • Refer to troubleshooting procedures for the Digital Line card.	
14	Replace set.	• If problem still persists, go to step 32.	
15	Verify the problem.	• Ensure Digital line card and DATASET cartridge are configured properly. • Ensure cartridge is plugged into AC power. • Ensure that the DATASET is connected to a DTE device. If a DCE device is attached, the DATASET must be equipped with a Mitel Modem Adaptor. • Go to step 16.	see Fig. 3-5 see Note 3
16	Reset the DATASET by momentarily disconnecting the AC power source. This initiates a self test. Verify the RxD and TxD LED's on the DATASET Module flash five times. Refer to Figure 3-4 for DATASET connectors and indicators.	Yes: • DATASET passed self test. Go to step 19. No: • Go to step 17.	see Fig. 3-4
17	Verify that the AC power source and the AC adapter are within spec. (AC adapter output should be 9 Vac, 500 mA.)	• Replace the AC adapter if it is out of spec. • If this is not the problem, replace the Digital set. • If problem persists, go to step 18.	

CHART 3-17 (Cont'd)
DATASET 1101 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
18	Check that the connections at the MDF, and the associated wiring are not faulty.	• Repair connections as required; if problem persists, replace Digital set.	
19	Check if the TxD LED is on. Pin 20 drives this LED with a voltage of 3 Vdc or greater.	Yes: • Go to step 23. No: • Go to step 20.	
20	Is Auto-Answer Enabled in the Data Circuit Descriptor Options?	Yes: • This is the normal state of the TxD LED when Auto Answer is enabled. Go to step 23. No: • Go to step 21.	see Note 2
21	Verify that the terminal is turned on.	Yes: • Go to step 22. No: • Turn on terminal. If problem persists, go to step 22.	
22	Inspect ribbon cable and RS-232 connectors at both ends.	• Repair or replace as required. If problem persists go to step 23.	
23	Is DTR (on pin 20) provided? Verify this with the use of a break-out box or measure the voltage on pin 20 for a reading of 3 Vdc or greater.	Yes: • Replace Digital set. No: • Go to step 24.	
24	Is the installed terminal designed to provide DTR? Refer to the terminal manufacturers specification manual.	Yes: • Fault is with the installed terminal. Digital set is functioning properly. No: • Go to step 25.	
25	Ensure RS-232 DTR and RTS Force High Options are enabled in the Data Circuit Descriptor for this device.	Yes: • Replace Digital set. No: • Enable RS-232 DTR and RTS Force High Options. If fault persists, go to step 26.	
26	Press ATTN key. Check if the ATTN KEYs LCD flashes when ATTN key is pressed. This key must be programmed during CDE.	Yes: • Communication within the DATASET is functioning properly. Go to step 27. No: • Replace Digital set.	see Note 6
27	Log into the Maintenance Terminal.	• Must enter username and password. • Go to step 28.	see Note 1
28	Use SHOW STATUS command on the affected Digital Line Card.	• If affected circuit(s) are not idle, take corrective action to return to the idle state. • Go to step 29.	see Note 4

CHART 3-17 (Cont'd)
DATASET 1101 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
29	If required, examine the maintenance log to obtain further information. (Use LOGS READ command.)	• Go to step 30.	
30	Check if there appear to be problems with more than one Digital line card circuit.	Yes: • Go to step 31. No: • Go to step 32.	
31	Check if suspect circuits are all located on one line card.	Yes: • Replace the line card; if problem persists, reinstall the original card and go to step 32. No: • Treat all faults as isolated incidents; go to step 32.	
32	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Go to step 33. Pass: • Go to step 35.	see Note 5
33	Check if test indicates a fault with one of the following: Digital Line Circuit (DLC) DATASET Cartridge (DC)	DLC: • Go to step 34. DC: • Replace set. None: • Go to step 35.	
34	Reseat the card and rerun the test.	• If test now passes, monitor the circuit. • If failure persists, replace the line card with a known working card. • If failure still persists, reinstall the original card and go to Bay Control Card Troubleshooting Procedures. • If a programming problem is indicated, go to step 35.	
35	Check programming in the following CDE Forms where applicable: Form 01 System Configuration Form 02 Feature Access Codes Form 03 COS Define Form 05 Tenant Interconnection Table Form 09 Station/*SUPERSET* telephones Form 11 Data Circuit Descriptor Form 12 Data Assignment Form 17 Hunt Groups Form 29 DTE Profile Form 30 Device Interconnection Table Form 35 Global Find Access Code	• Correct programming errors as required. • If problem still persists, refer to Bay Control Card Troubleshooting Procedures	see Note 2

Notes:
1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.
2. See Customer Data Entry, Section MITL9109-094-210-NA, for details of procedures.
3. Refer to Section MITL9141-753-503-NA, Series Data Sets, for additional information.
4. Use the Returning Busy Equipment to Service (RET-TO-SVC) command. See Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.
5. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for procedures of Directed Testing.
6. These keys are programmed during Customer Data Entry; refer to Section MITL9109-094-2 1 0-NA.

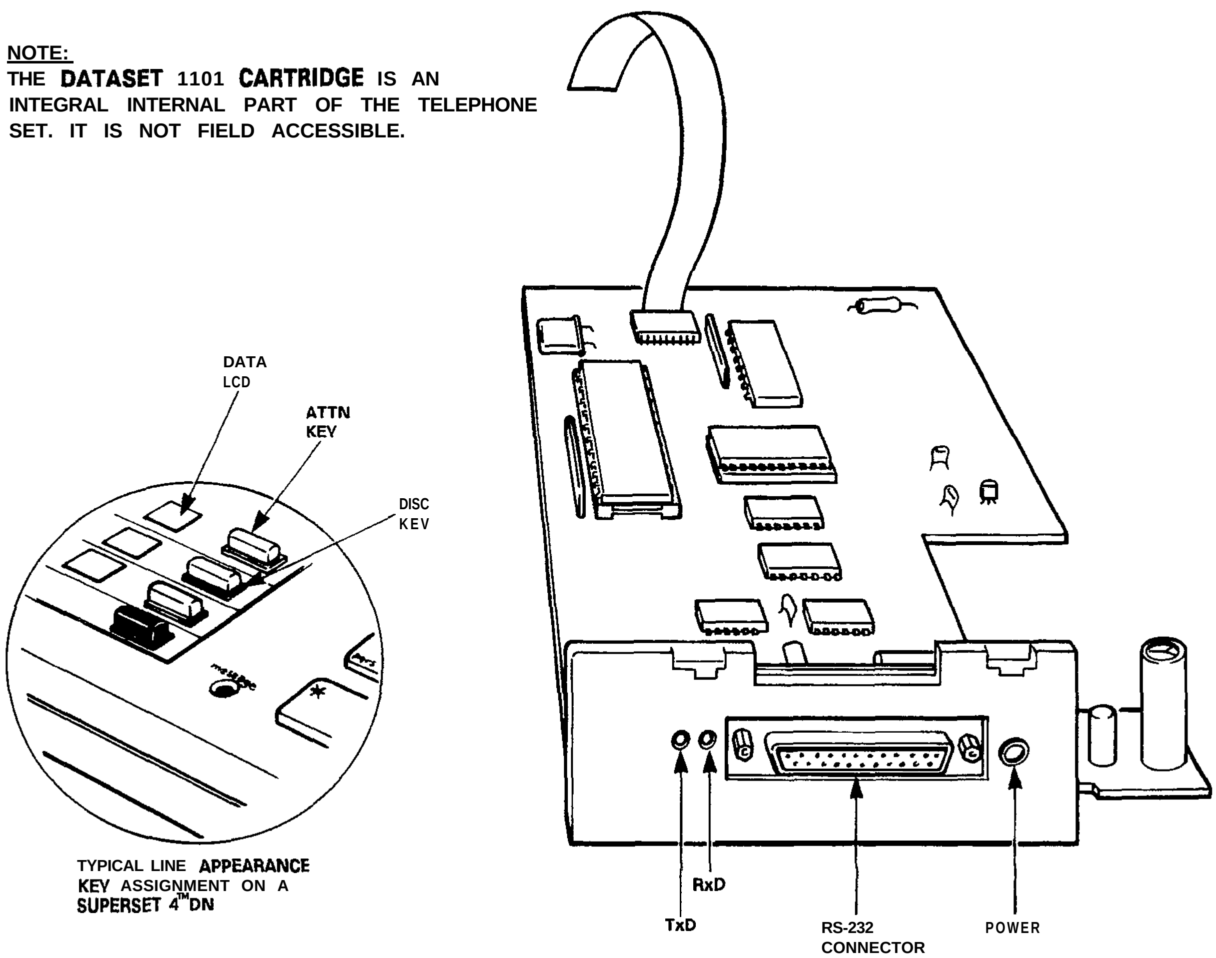


Figure 3-4 DATASET 1101 Cartridge

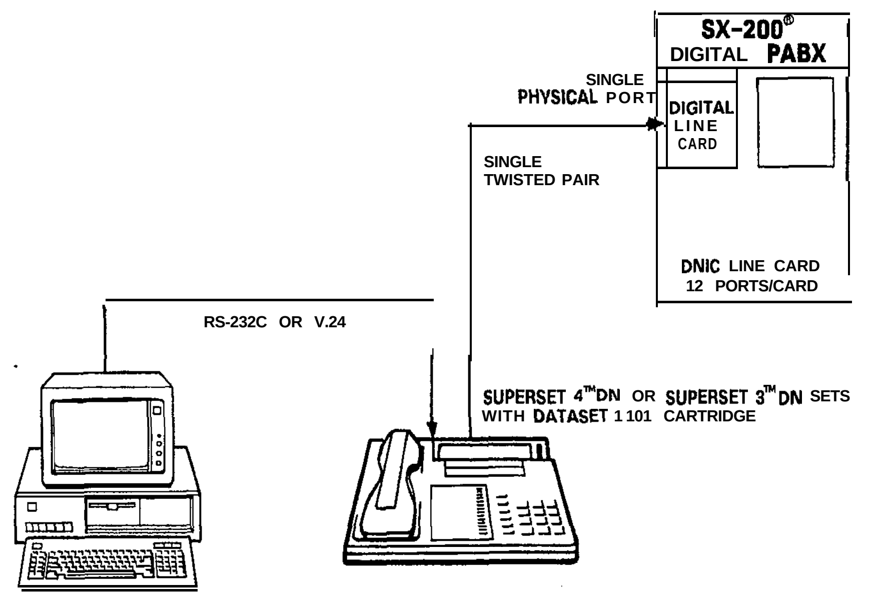


Figure 3-5 Typical DATASET 1101 Cartridge Application

Standalone DATASET 1103

3.22 The Standalone DATASET 1103 can have two configurations. It may be connected to the PABX using a four-wire connection; one pair connects the DATASET to the Digital Line Card, and the other pair connects the telephone tip-ring to an ONS or COV line card. An alternate method connects the telephone set independently (Figure 3-6 provides an example of both applications).

3.23 The Standalone DATASET 1103 is functionally the same as the DATASET 1101 Cartridge. The controls, indicators, and connectors are shown in Figure 3-7. It usually interfaces a terminal, a personal computer, a printer, a file disk, or another peripheral device to the PABX, for connection to a host computer or to another peripheral device.

3.24 Chart 3-18 shows the steps involved in the troubleshooting of the Standalone DATASET 1103.

CHART 3-18
DATASET 1103 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
	IF A PROBLEM OCCURS DURING INITIAL INSTALLATION, THE PROGRAMMING SHOULD BE REVIEWED BEFORE PROCEEDING (SEE STEP 23 FOR A LIST OF APPLICABLE CDE FORMS). CORRECT PROGRAMMING ERRORS AS REQUIRED. IF PROBLEM PERSISTS, FOLLOW TROUBLESHOOTING PROCEDURES		
1	Verify the problem.	• Ensure Digital line card, ONS line card, and DATASET are configured properly (see Section MITL9141-753-503-NA, DATASET 1100 Series). • Ensure DATASET is plugged into AC power. • Ensure that the DATASET is connected to a DTE device. If a DCE device is attached, the DATASET must be equipped with a Mitel Modem Adaptor. • Go to step 2.	see Fig. 3-6
2	Reset the DATASET by momentarily disconnecting the AC power source. This initiates a self test. Check if the three LED's on the front of the DATASET flash five times.	Yes: • DATASET passed self test. Go to step 4. No: • Go to step 3. • Refer to Figure 3-7 for DATASET connectors and indicators.	
3	Verify that the AC power source and the AC adapter are within spec. (AC adapter output should be 9 Vac, 500 mA.)	• Replace the AC adapter if it is out of spec. • If this is not the problem, replace the DATASET.	
4	POWER LED will remain flashing until the DATASET has established synchronization with the Digital line card. Check if POWER LED remains steady after synchronization.	Yes: • Go to step 6. No: • Go to step 5.	

CHART 3-18 (Cont'd)
DATASET 1103 TROUBLESHOOTING PROCEDURES

step	Action	Description / Follow-up	Remarks
5	Check that the connections at the MDF, and the associated wiring are not faulty.	• Repair connections as required; if problem persists, replace DATASET. Go to step 6.	
6	Check if the DEVICE LED is on. Pin 20 drives this LED with a voltage of 3 Vdc or greater.	Yes: • Go to step 10. No: • Go to step 7.	
7	Is Auto-Answer Enabled in the Data Circuit Descriptor Options?	Yes: • This is the normal state of the DEVICE LED when Auto Answer is enabled. Go to step 10. No: • Go to step 8.	see Note 1
8	Verify that the terminal is turned on.	Yes: • Go to step 9. No: • Turn-on terminal. If problem persists, replace DATASET.	
9	Inspect ribbon cable and RS-232 connectors at both ends.	• Repair or replace as required. If problem persists, go to step 10.	
10	Is DTR (on pin 20) provided? Verify this with the use of a break-out box or measure the voltage on pin 20 for a reading of 3 Vdc or greater.	Yes • Replace the DATASET. No • Go to step 11.	
11	Is the installed terminal designed to provide DTR? Refer to the terminal manufacturers specification manual	Yes: • Fault is with the installed terminal. DATASET is functioning properly. No: • Go to step 12.	
12	Ensure RS-232 Force High Option is enabled in the Data Circuit Descriptor for this device.	Yes: • Replace DATASET No: • Enable RS-232 Force High Option. If fault persists, go to step 13.	see Note 1
13	Press ATTN key. Check if the ATTN KEYs LED flashes when ATTN key is pressed.	Yes: • Communication within the DATASET is functioning properly. Go to step 14. No: • Replace DATASET.	
14	Press DISCONNECT key. Check if the DEVICE LED flashes when DISCONNECT key is pressed.	Yes • Communication within the DATASET is functioning properly. Go to step 15. No: • Replace DATASET.	
15	Log into the Maintenance Terminal.	• Must enter username and password. • Go to step 16.	see Note 2
16	Use SHOW STATUS command on the affected Digital Line Card.	• If affected circuit(s) are not idle, take corrective action to return to the idle state. • Go to step 17.	see Note 3
17	If required, examine the maintenance log to obtain further information. (Use LOGS READ command.)	• Go to step 18.	

CHART 3-18 (Cont'd)
DATASET 1103 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
18	Check if there appears to be problems with more han one Digital line card circuit.	Yes: • Go to step 19. No: • Go to step 20.	
19	Check if suspect circuits are all located on one line card.	Yes: • Replace the line card; if problem persists, reinstall original card and return to step 17. No: • Treat all faults as isolated incidents; go to step 20.	
20	Run a directed TEST on the affected circuit; check est results returned to the terminal.	Fail: • Go to step 21. Pass: • Go to step 23.	ee Note 4
21	Check if test indicates a fault with one of the ollowing: Digital Line Circuit (DLC) DATASET Card (DS)	DLC: • Go to step 22. DS: • Replace DATASET. None: • Go to step 23.	
22	Reseat the card and rerun the test.	• If test now passes, monitor the circuit. • If failure persists, replace the line card with a known working card. • If failure still persists, reinstall the original card and go to Bay Control Card Troubleshooting Procedures. • If a programming problem is indicated, go to step 19.	ee Note 1
23'	Check programming in' the following CDE forms where applicable: Form 01 System Configuration Form 02 Feature Access Codes Form 03 COS Define Form 05 Tenant Interconnection Table Form 11 Data Circuit Descriptor Form 12 Data Assignment Form 17 Hunt Groups Form 29 Data Terminal Equipment Profile Form 30 Device Interconnection Table Form 35 Global Find Access Code	• Correct programming errors as required. • If problem still persists, refer to Bay Control Card Troubleshooting Procedures.	ee Note 1

Notes:
1. Refer to Section MITL9109-094-210-NA, Customer Data Entry, for details of procedures.
2. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for Login procedures.
3. Use the Returning Busy Equipment to Service (RET-TO-SVC) command. See Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.
4. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.

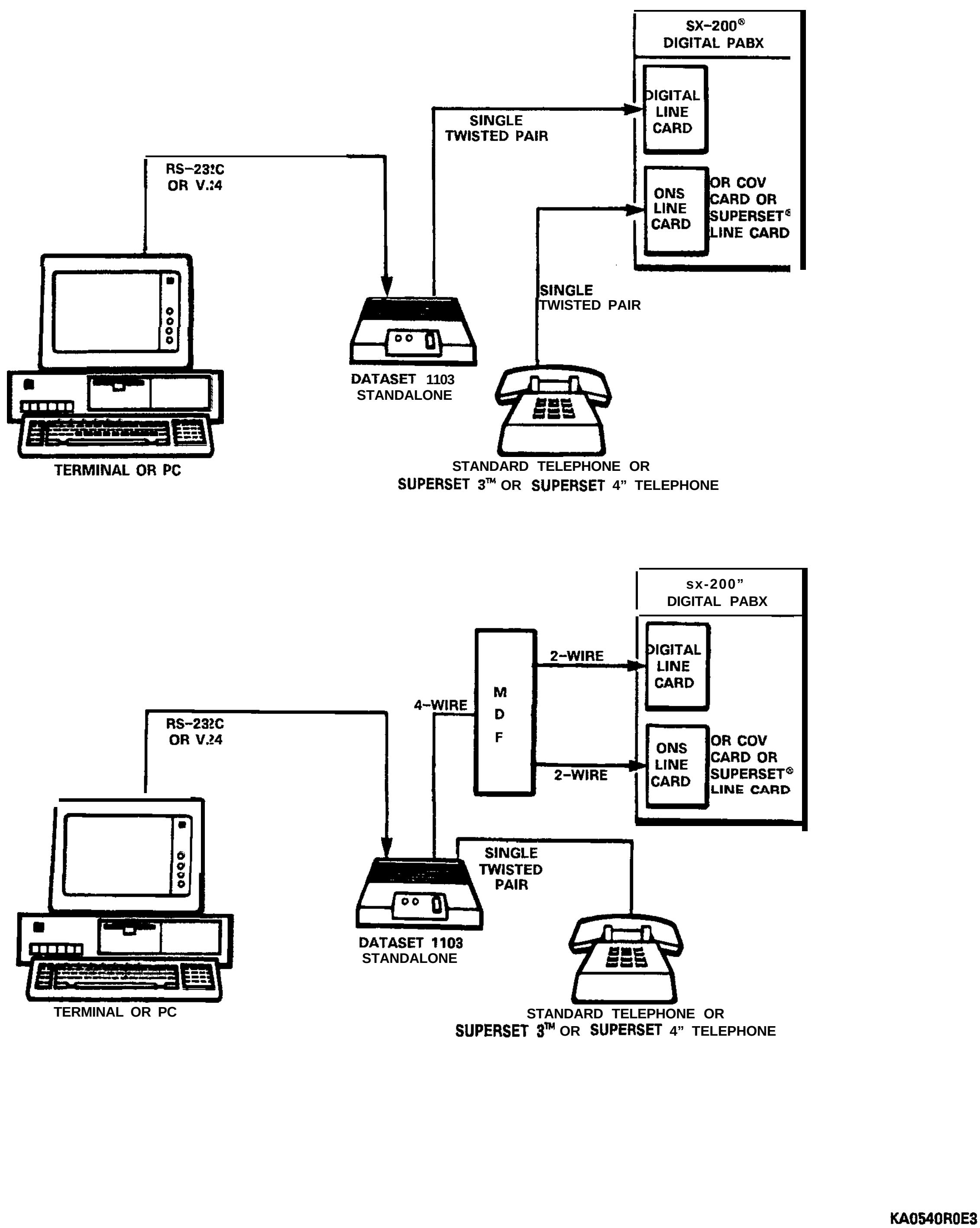


Figure 3-6 Typical DATASET 1103 Standalone Applications

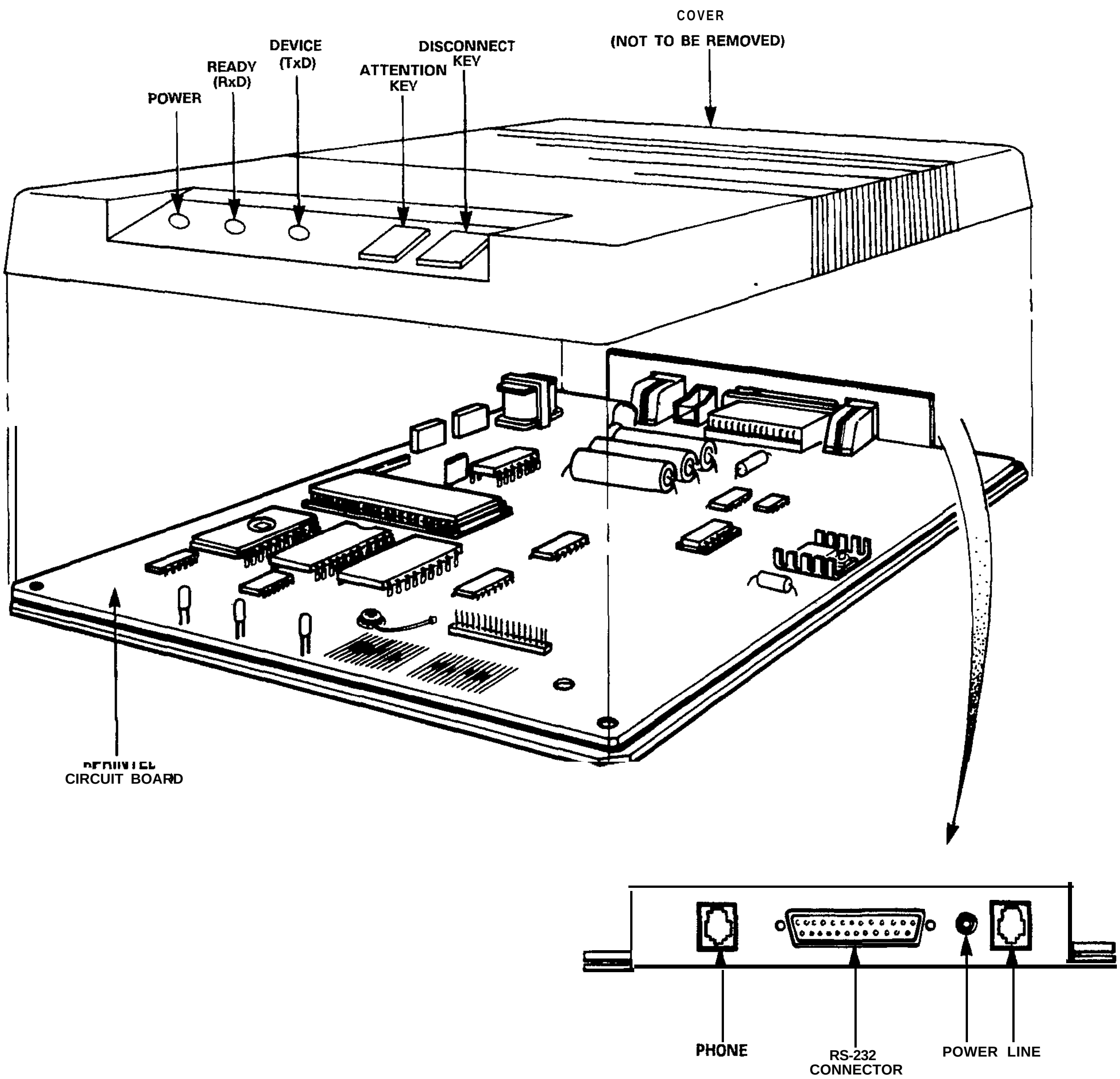


Figure 3-7 DATASET 1103 Standalone

DATASET 1102 Dual Rack Mounted Card

3.25 Each DATASET 1102 Dual Rack Mounted card contains two DATASETs mounted on a common pcb. The card, which is installed within a data cabinet, interfaces to a PABX Digital Line card circuit through a single pair.

3.26 Each card has two RS-232 connectors which connect directly to the device with which the DATASET is to communicate. Each DATASET also has an edge connector which plugs into the backplane of the Datashelf.

3.27 The troubleshooting procedures for the DATASET 1102 Dual Rack Mounted card are shown in Chart 3-19.

CHART 3-19
DATASET 1102 TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
	IF A PROBLEM OCCURS DURING INITIAL INSTALLATION, THE PROGRAMMING SHOULD BE REVIEWED BEFORE PROCEEDING (SEE STEP 22 FOR A LIST OF APPLICABLE CDE FORMS). CORRECT PROGRAMMING ERRORS AS REQUIRED. IF PROBLEM PERSISTS, FOLLOW TROUBLESHOOTING PROCEDURES.		
1	Is Datashelf power indicator on?	Yes: • Go to step 2. No: • Verify switch is on. Refer to DATASHELF 9100 Troubleshooting Procedures, Chart 3-21.	see Fig. 3-8
2	The four LEDs on the front panel of the Datashelf indicate fuse status. The two fuses on the left relate to shelf slots 1 to 8 and the two right fuses relate to slots 9 to 16. Verify LEDs are on.	Yes: • Go to step 3. No: • Replace Datashelf fuses as required. If problem persists, refer to DATASHELF 9100 Troubleshooting Procedures, Chart 3-21.	
3	Locate affected card. The POWER 1 LED indicates the fuse status for both circuits on the card. Is the LED lit?	Yes: • Card fuses are not affected, go to step 4. No: • Fuses are faulty, replace card.	see Fig. 3-9
4	Reseat the card to initiate a reset. All LEDs, except POWER 1 (which should be on solid), will flash five times to indicate a self test is in progress. Verify that the LEDs flash.	Yes: • Go to step 5. No: • Replace DATASET card.	
5	The POWER 2 LED will begin flashing until the DATASET card and the Digital line card have established synchronization Check if POWER 2 LED remains steady after synchronization.	Yes: • Go to step 7. No: • Go to step 6.	
6	Check the wiring between the DATASET card and the PABX.	• Repair connections as required, if fault persists, replace DATASET. Go to step 7.	
7	Check if the DEVICE LED is steady.	Yes: • Normal condition, go to step 11. No: • Go to step 8.	

CHART 3-19 (Cont'd)
DATASET 1102 TROUBLESHOOTING PROCEDURES

step	Action	Description / Follow-up	Remarks
8	Check the programming of this circuit. Is Auto-Answer enabled in the Data Circuit Descriptor Options?	Yes: • This is the normal state for the DEVICE LED when Auto-Answer is enabled. Go to step 11. No: • Go to step 9.	see Note 1
9	Verify that the terminal is turned on.	Yes: • Go to step 10. No: • Turn on terminal. If problem persists, replace DATASET card. Go to step 10 if problem is not solved.	
10	Inspect ribbon cable and RS-232 connectors from terminal to DATASET card.	• Repair or replace as required. If problem persists, go to step 11.	
11	Is DTR (on pin 20) provided? Verify this with the use of a break-out box or measure the voltage on pin 20 for a reading of 3 Vdc or greater.	Yes: • Replace DATASET card. No: • Go to step 12.	
12	Is the installed terminal designed to provide DTR? Refer to the terminal manufacturers specification manual.	Yes • Fault is with the installed terminal. DATASET card is functioning properly. No: • Go to step 13.	
13	Ensure RS-232 Force High Option is enabled in the Data Circuit Descriptor for this device.	Yes: • Replace DATASET card. No: • Enable RS-232 Force High Option. If fault persists, go to step 14.	see Note 1
14	Log into the Maintenance Terminal.	• Go to step 15.	see Note 2.
15	Use SHOW STATUS command on the affected DATASET Card.	• If affected circuit(s) are not idle, return the circuit(s) to the idle state. • Go to step 16.	see Note 3
16	If required, examine the maintenance logs to obtain further information. (Use LOGS READ command.)	• Go to step 17.	
17	Check if there appears to be problems with more than one of the cards in the Datashelf.	Yes: • Go to step 18. No: • Go to step 19.	
18	Check if suspect circuits are located on one DATASET rack mounted card.	Yes: • Replace the card with a known working card; if problem persists, reinstall the original card and go to step 19. No: • Treat all faults as isolated incidents; go to step 19.	
19	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Go to step 20. Pass: • Go to step 22.	see Note 4
20	Check if test indicates a fault with one of the following: Digital Line Circuit (DLC) ONS Line Card (ONS) DATASET (DS)	DLC: • Go to step 21. ONS: • Go to step 21. DS: • Replace DATASET card None: • Go to step 22.	

CHART 3-19 (Cont'd)
DATASET 1102 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
21	Reseat the card and rerun the test.	• If test now passes, monitor the circuit. • If failure persists, replace the line card with a known working card. • If failure still persists, reinstall the original card and go to Bay Control Card Troubleshooting Procedures. • If a programming problem is indicated, go to step 22.	
22	Check programming in the following CDE Forms where applicable: Form 01 System Configuration Form 02 Feature Access Codes Form 03 COS Define Form 05 Tenant Interconnection Table Form 11 Data Circuit Descriptor Form 12 Data Assignment Form 17 Hunt Groups Form 29 Data Terminal Equipment Profile Form 30 Device Interconnection Table Form 35 Global Find Acess Code	• Correct programming errors as required. • If problem still persists, refer to Bay Control Card Troubleshooting Procedures.	see Note 1

Notes: 1. Refer to Section MITL9109-094-210-NA, Customer Data Entry, for details of procedures.

2. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for Login procedures.

3. Use the Returning Busy Equipment to Service (RET-TO-SVC) command. See Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.

4. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.

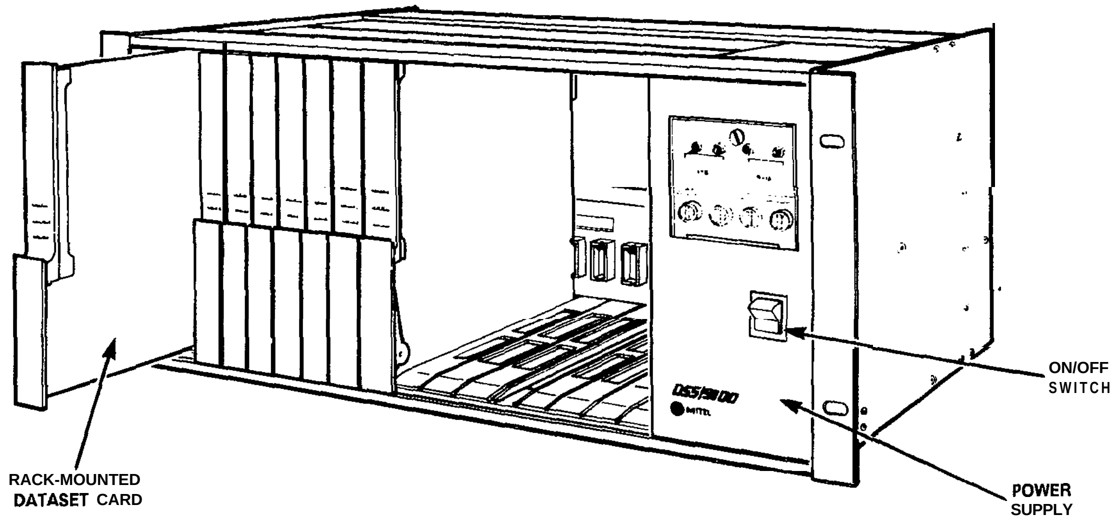


Figure 3-8 DATASHELF 9100, Front View

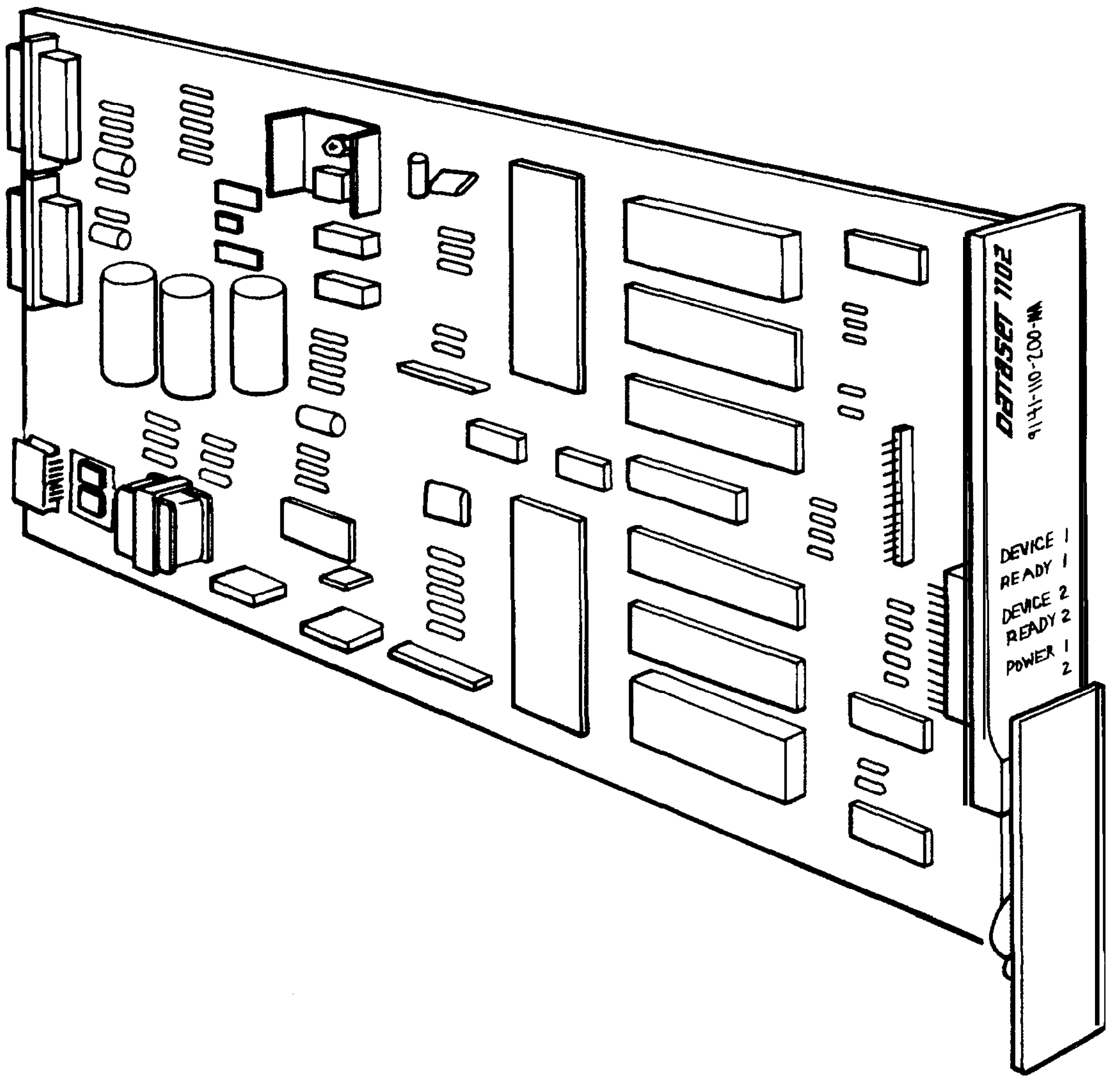


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Figure 3-9 DATASET 1102 Dual Rack Mounted Card

Standalone DATASET 2103

3.28 The Standalone DATASET 2103 can have two configurations. It may be connected to the PABX using a four-wire connection; one pair connects the DATASET to the Digital Line Card, and the other pair connects the telephone tip-ring to an ONS or COV line card. An alternate method connects the telephone set independently (Figure 3-10 provides an example of both applications).

3.29 The Standalone DATASET 2103 controls, indicators, and connectors are shown in Figure 3-l 1. It usually interfaces a terminal, a personal computer, a printer, a file disk, a modem, or another peripheral device to the PABX, for connection to a host computer or to another peripheral device.

3.30 Chart 3-20 shows the steps involved in the troubleshooting of the Standalone DATASET 2103.

CHART 3-20
DATASET 2103 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
	IF A PROBLEM OCCURS DURING INITIAL INSTALLATION, THE PROGRAMMING SHOULD BE REVIEWED BEFORE PROCEEDING (SEE STEP 23 FOR A LIST OF APPLICABLE CDE FORMS). CORRECT PROGRAMMING ERRORS AS REQUIRED. IF PROBLEM PERSISTS, FOLLOW TROUBLESHOOTING PROCEDURES		
1	Verify the problem.	• Ensure Digital line card, ONS or COV line card, and DATASET are configured properly. Check DIP switches on DATASET. Refer to Section MITL9141-753-506-NA, DATASET 2100 Series. • Ensure DATASET is plugged into AC power. • Ensure that the DATASET is connected to a DTE device. If a DCE device is attached, the DATASET must be equipped with a Mitel Modem Adaptor. • Go to step 2.	see Fig. 3-10
2	Reset the DATASET by momentarily disconnecting the AC power source. This initiates a self test. Check if the four LEDs on the front of the DATASET flash five times.	Yes: • DATASET passed self test. Go to step 4. No: • Go to step 3. • Refer to Figure 3-11 for DATASET connectors and indicators.	
3	Verify that the AC power source and the AC adapter are within spec. (AC adapter output should be 9 Vac, 500 mA.)	• Replace the AC adapter if it is out of spec. • If this is not the problem, replace the DATASET.	
4	POWER LED will remain flashing until the DATASET has established synchronization with the Digital line card. Check if POWER LED remains steady after synchronization.	Yes: • Go to step 6. No: • Go to step 5.	

CHART 3-20 (Cont'd)
DATASET 2103 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
5	Check that the connections at the MDF, and the associated wiring are not faulty.	• Repair connections as required; if problem persists, replace DATASET. Go to step 6.	
6	Check if the DEVICE LED is on. Pin 20 drives this LED with a voltage of 3 Vdc or greater (unless DTR forced high).	Yes: • Go to step 10. No: • Go to step 7.	
7	Is Auto-Answer Enabled in the Data Circuit Descriptor Options?	Yes: • This is the normal state of the DEVICE LED when Auto Answer is enabled. Go to step 10. No: • Go to step 8.	See Note 1
8	Verify that the terminal is turned on,	Yes: • Go to step 9. No: • Turn on terminal. If problem persists, replace DATASET.	
9	Inspect ribbon cable and RS-232 connectors at both ends.	• Repair or replace as required. If problem persists, go to step 10.	
10	Is DTR (on pin 20) provided and required (DTR forced high CDE option)? Verify this with the use of a break-out box or measure the voltage on pin 20 for a reading of 3 Vdc or greater.	Yes • Replace the DATASET. No • Go to step 11.	
11	Is the installed terminal designed to provide DTR? Refer to the terminal manufacturers specification manual	Yes: • Fault is with the installed terminal. DATASET is functioning properly. No: • Go to step 12.	
12	Ensure RS-232 Force High Option is enabled in the Data Circuit Descriptor for this device.	Yes: • Replace DATASET No: • Enable RS-232 Force High Option. If fault persists, go to step 13.	See Note 1
13	Press ATTN key. Check if the ATTN KEYs LCD flashes when ATTN key is pressed.	Yes: • Communication within the DATASET is functioning properly. Go to step 14. No: • Replace DATASET.	
14	Press ATTN key. Check if the DEVICE LED remains lit.	Yes • Communication within the DATASET is functioning properly. Go to step 15. No: • Replace DATASET.	
15	Log into the Maintenance Terminal.	• Must enter username and password. • Go to step 16.	See Note 2
16	Use SHOW STATUS command on the affected Digital Line Card.	• If affected circuit(s) are not idle, take corrective action to return to the idle state. • Go to step 17.	See Note 3
17	If required, examine the maintenance log to obtain further information. (Use LOGS READ command.)	• Go to step 18.	

CHART 3-20 (Cont'd)
DATASET 2103 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
18	Check if there appears to be problems with more than one Digital line card circuit.	Yes: • Go to step 19. No: • Go to step 20.	
19	Check if suspect circuits are all located on one line card.	Yes: • Replace the line card; if problem persists, reinstall original card and return to step 17. No: • Treat all faults as isolated incidents; go to step 20.	
20	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Go to step 21. Pass: • Go to step 23.	see Note 4
21	Check if test indicates a fault with one of the following: Digital Line Circuit (DLC) ONS Line Card (ONS) DATASET printed circuit board (DS)	DLC: • Go to step 22. ONS: • Go to step 22. DS: • Replace DATASET. None: • Go to step 23.	
22	Reseat the card and rerun the test.	• If test now passes, monitor the circuit. • If failure persists, replace the line card with a known working card. • If failure still persists, reinstall the original card and go to Bay Control Card Troubleshooting Procedures. • If a programming problem is indicated, go to step 19.	see Note 1
23	Check programming in the following CDE forms where applicable: Form 01 System Configuration Form 02 Feature Access Codes Form 03 COS Define Form 05 Tenant Interconnection Table Form 11 Data Circuit Descriptor Form 12 Data Assignment Form 17 Hunt Groups Form 29 Data Terminal Equipment Profile Form 30 Device Interconnection Table Form 35 Global Find Access Code	• Correct programming errors as required. • If problem still persists, refer to Bay Control Card Troubleshooting Procedures.	see Note 1

Notes:
1. Refer to Section MITL9109-094-210-NA, Customer Data Entry, for details of procedures.
2. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for Login procedures.
3. Use the Returning Busy Equipment to Service (RET-TO-SVC) command. See Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.
4. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.

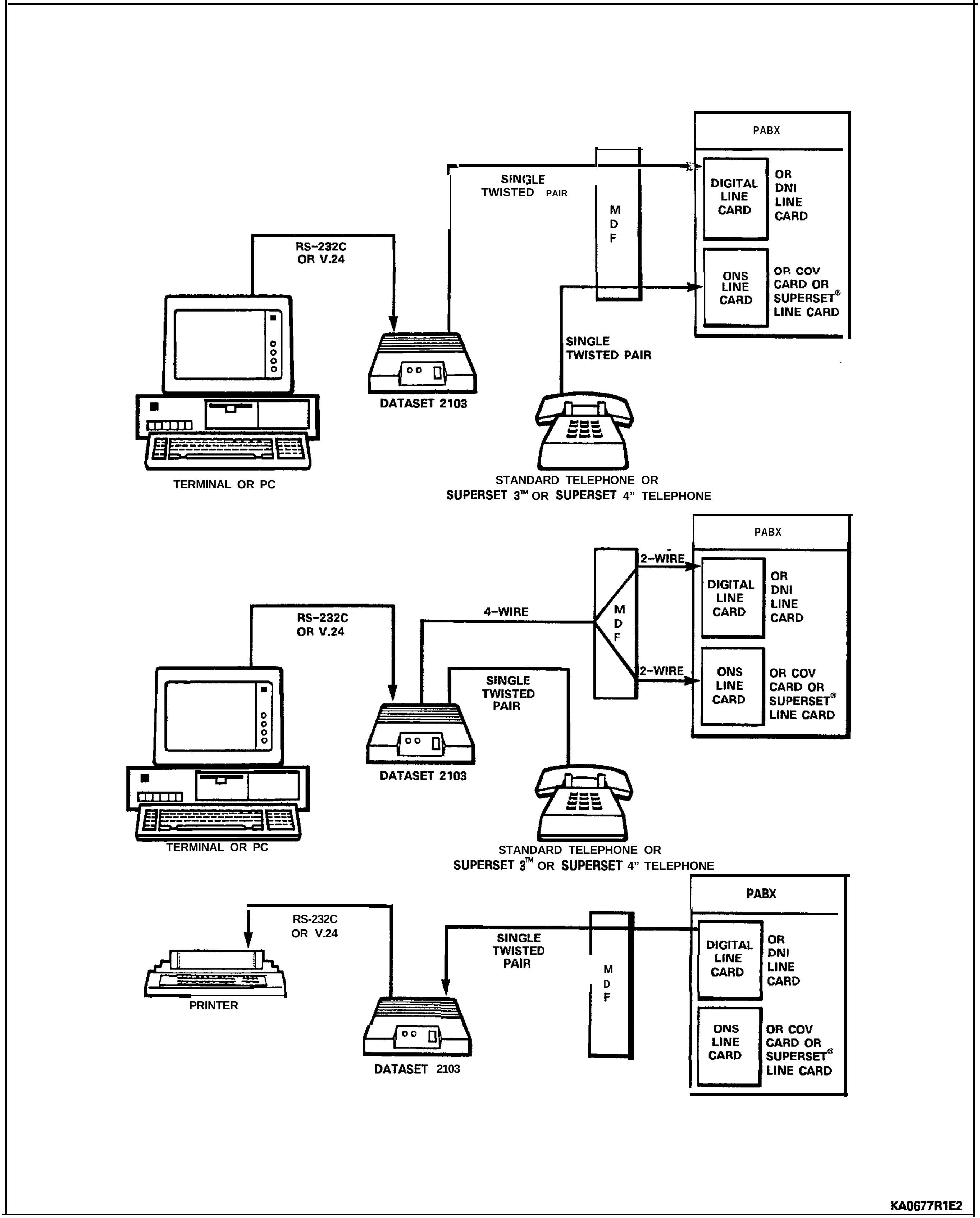

Figure 3-10 Typical DATASET 2103 Standalone Applications

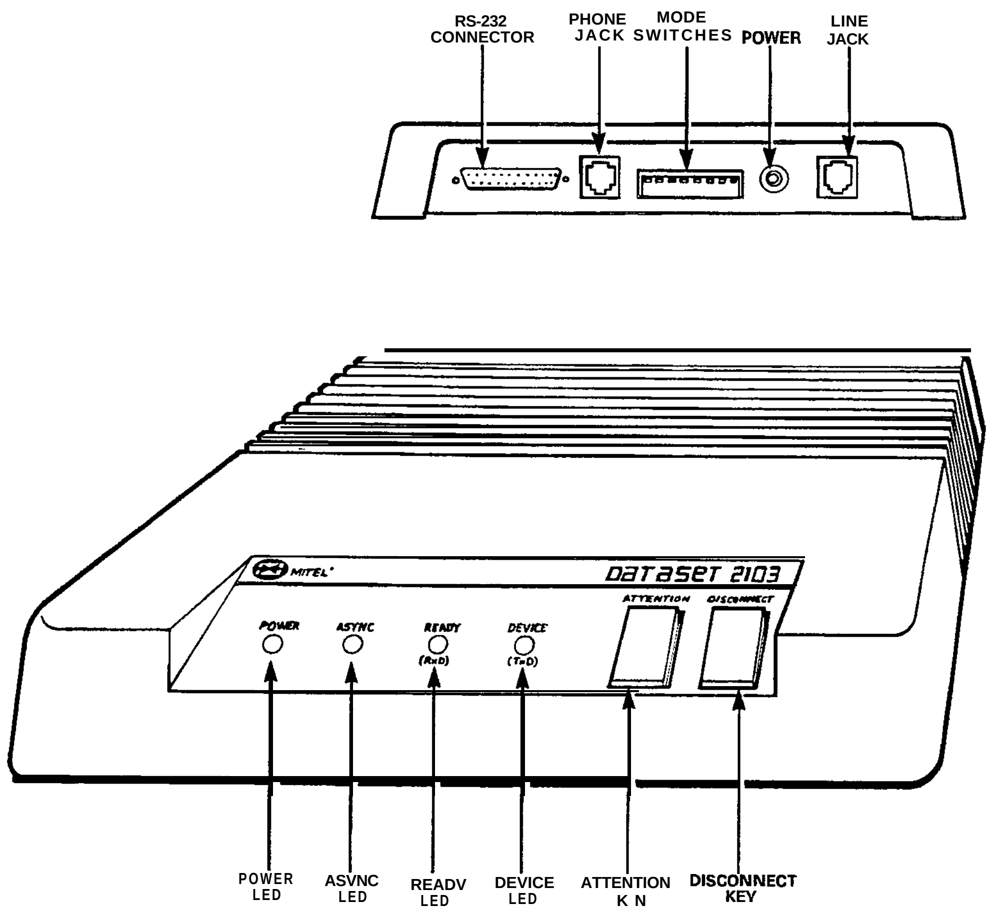

Figure 3-l 1 Standalone DATASET 2103

DATASET 2102 Rack Mounted Card

3.31 Each DATASET 2102 Rack Mounted card contains one DATASET. The card, which is installed within a data cabinet, interfaces to a PABX Digital Line card circuit through a single pair.

3.32 Each card has one RS-232 connector which connects directly to the device with which the DATASET is to communicate. Each DATASET also has an edge connector which plugs into the backplane of the Datashelf. Figure 3-12 shows a DATASET 2102 Rack Mounted Card.

3.33 The troubleshooting procedures for the DATASET 2102 Rack Mounted card are shown in Chart 3-21.

CHART 3-21
DATASET 2102 TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
	IF A PROBLEM OCCURS DURING INITIAL INSTALLATION, THE PROGRAMMING SHOULD BE REVIEWED BEFORE PROCEEDING (SEE STEP 22 FOR A LIST OF APPLICABLE CDE FORMS). CORRECT PROGRAMMING ERRORS AS REQUIRED. IF PROBLEM PERSISTS, FOLLOW TROUBLESHOOTING PROCEDURES.		
1	Is Datashelf power indicator on?	Yes: • Go to step 2. No: • Verify switch is on. Refer to DATASHELF 9100 Troubleshooting Procedures, Chart 3-22.	see Fig. 3-8
2	The four LEDs on the front panel of the Datashelf indicate fuse status. The two fuses on the left relate to shelf slots 1 to 8 and the two right fuses relate to slots 9 to 16. Verify LEDs are on.	Yes: • Go to step 3. No: • Replace Datashelf fuses as required. If problem persists, refer to DATASHELF 9100 Troubleshooting Procedures, Chart 3-22.	
3	Locate affected card. The POWER 1 LED indicates the fuse status for the card. Is the LED lit?	Yes: • Card fuses are not affected, go to step 4. No: • Fuses are faulty, replace card.	see Fig. 3-12
4	Reseat the card to initiate a reset. All LEDs, except POWER 1 (which should be on solid), will flash five times to indicate a self test is in progress. Verify that the LEDs flash. Verify DIP switch settings.	Yes: • Go to step 5. No: • Replace DATASET card.	
5	The POWER 2 LED will begin flashing until the DATASET card and the Digital !ine card have established synchronization Check if POWER 2 LED remains steady after synchronization.	Yes: • Go to step 7. No: • Go to step 6.	
6	Check the wiring between the DATASET card and the PABX.	• Repair connections as required, if fault persists, replace DATASET. Go to step 7.	
7	Check if the DEVICE LED is steady.	Yes: • Normal condition, go to step 11. No: • Go to step 8.	

CHART 3-21 (Cont'd)
DATASET 2102 TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
8	Check the programming of this circuit. Is Auto-Answer enabled in the Data Circuit Descriptor Options?	Yes: • This is the normal state for the DEVICE LED when Auto-Answer is enabled. Go to step 11. No: • Go to step 9.	see Note 1
9	Verify that the terminal is turned on.	Yes: • Go to step 10. No: • Turn on terminal. If problem persists, replace DATASET card. Go to step 10 if problem is not solved.	
10	Inspect ribbon cable and RS-232 connectors from terminal to DATASET card.	• Repair or replace as required. If problem persists, go to step 11.	
11	Is DTR (on pin 20) provided? Verify this with the use of a break-out box or measure the voltage on pin 20 for a reading of 3 Vdc or greater.	Yes: • Replace DATASET card. No: • Go to step 12.	
12	Is the installed terminal designed to provide DTR? Refer to the terminal manufacturers specification manual.	Yes . Fault is with the installed terminal. DATASET card is functioning properly. No: • Go to step 13.	
13	Ensure RS-232 Force High Option is enabled in the Data Circuit Descriptor for this device.	Yes: • Replace DATASET card. No: • Enable RS-232 Force High Option. If fault persists, go to step 14.	see Note 1
14	Log into the Maintenance Terminal.	• Go to step 15.	see Note 2.
15	Use SHOW STATUS command on the affected DATASET Card.	• If affected circuit(s) are not idle, return the circuit(s) to the idle state. • Go to step 16.	see Note 3
16	If required, examine the maintenance logs to obtain further information. (Use LOGS READ command.)	• Go to step 17.	
17	Check if there appears to be problems with more than one of the cards in the Datashelf.	Yes: • Go to step 18. No: • Go to step 19.	
18	Check if suspect circuits are located on one DATASET rack mounted card.	Yes: • Replace the card with a known working card; if problem persists, reinstall the original card and go to step 19. No: • Treat all faults as isolated incidents; go to step 19.	
19	Run a directed TEST on the affected circuit; check test results returned to the terminal.	Fail: • Go to step 20. Pass: • Go to step 22.	see Note 4
20	Check if test indicates a fault with one of the following: Digital Line Circuit (DLC) ONS Line Card (ONS) DATASET (DS)	DLC: • Go to step 21. ONS: • Go to step 21. DS: • Replace DATASET card None: • Go to step 22.	

CHART 3-21 (Cont'd)
DATASET 2102 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
21	Reseat the card and rerun the test.	• If test now passes, monitor the circuit. • If failure persists, replace the line card with a known working card. • If failure still persists, reinstall the original card and go to Bay Control Card Troubleshooting Procedures. • If a programming problem is indicated, go to step 22.	
22	Check programming in the following CDE Forms where applicable: Form 01 System Configuration Form 02 Feature Access Codes Form 03 COS Define Form 05 Tenant Interconnection Table Form 11 Data Circuit Descriptor Form 12 Data Assignment Form 17 Hunt Groups Form 29 Data Terminal Equipment Profile Form 30 Device Interconnection Table Form 35 Global Find Acess Code	• Correct programming errors as required. • If problem still persists, refer to Bay Control Card Troubleshooting Procedures.	see Note 1

Notes: 1. Refer to Section MITL9109-094-210-NA, Customer Data Entry, for details of procedures.

2. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for Login procedures.

3. Use the Returning Busy Equipment to Service (RET-TO-SVC) command. See Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.

4. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal, for details of procedure.

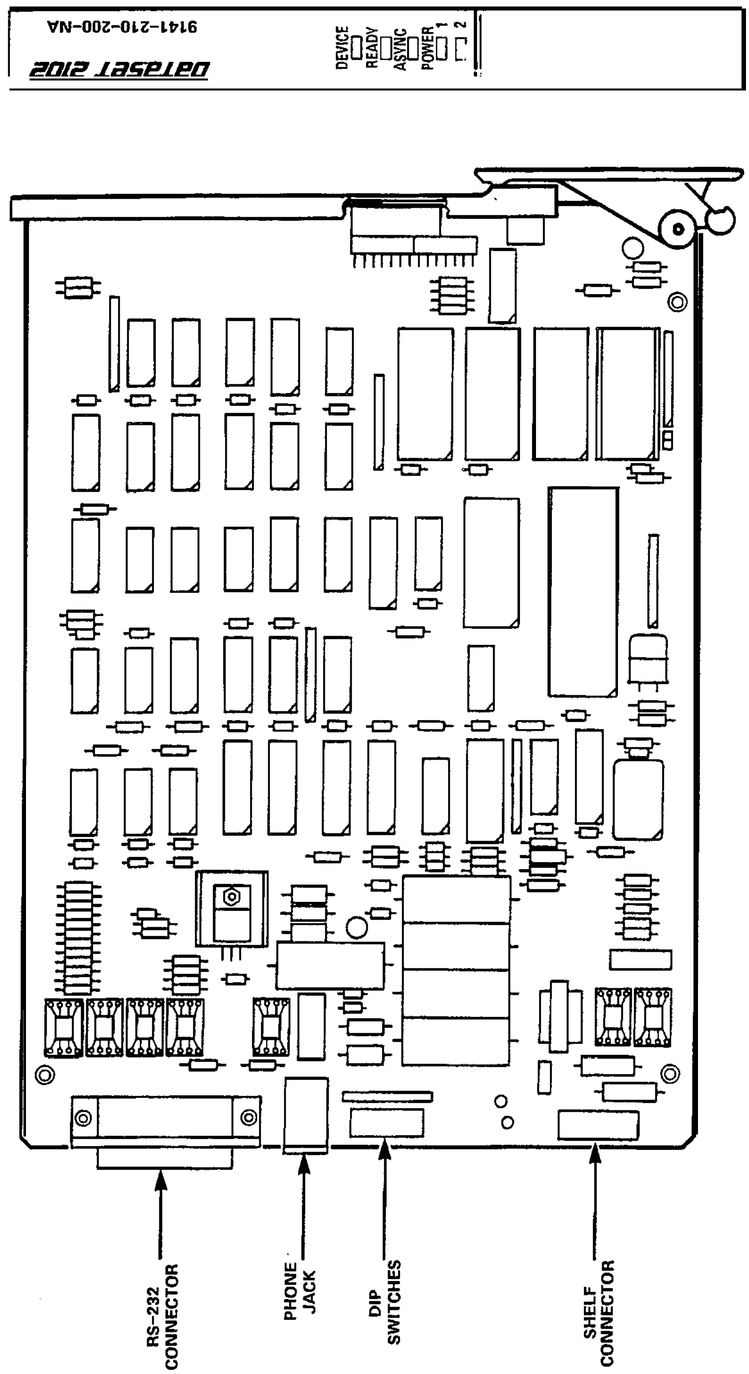

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Figure 3-12 DATASHELF 2102 Rack Mounted Card

DATASHELF 9100

3.34 The DATASHELF 9100 consists of a shelf power supply and slots to accommodate up to 16 DATASET 1102 Dual Rack Mounted cards or DATASET 2102 Rack Mounted Cards. The shelf, its power supply, and the backplane are one integral unit (see Figure 3-8).

3.35 All connections are made at the back of the datashelf (see Figure 3-13). The power cord from the ac distribution panel plugs into the rear of the shelf power supply. The power supply provides 9 Vac to each card connector. A 25-pair connecter on the backplane connects the tip-ring pairs from the DATASETs to the PABX.

3.36 Chart 3-22 shows the steps involved when troubleshooting the DATASHELF 9 100.

CHART 3-22
DATASHELF 9100 TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	Is Datashelf power indicator on? (see Figure 3-8.)	Yes: • Go to step 2. No: • Verify switch is on, go to step 3.	
2	The four LEDs on the front panel of the Datashelf indicate fuse status. The two fuses on the left relate to shelf slots 1 to 8 and the two right fuses relate to slots 9 to 16. Verify LEDs are on.	Yes: • Go to step 3. No: • Replace Datashelf fuses as required. If problem persists, go to step 3.	
3	Check the primary input fuse located at the rear of the Datashelf beside the power cord connector (see Figure 3-13).	• Replace blown fuse as required. If problem persists, go to step 4.	
4	Verify that the Datashelf is securely plugged into the Distribution Panel.	• Reconnect or replace cord as required. • If problem persists, go to step 5.	
5	Plug the power cord into an unused socket on the Distribution Unit.	• If problem disappears, problem was a faulty socket and Distribution Unit should be replaced. • If problem persists, go to step 6.	
6	Using a voltmeter, measure the Power Distribution Unit output - verify that 120 Vac is present.	Yes: • Go to step 7. No: • If voltage is present when the shelf is disconnected; and not present (or out of spec) when connected, go to step 7. • If no voltage is present, refer to DATACABINET 9000 Troubleshooitng Procedures, Chart 3-22.	
7	Unseat all of the cards on the shelf and check if power stabilizes.	Yes: • Go to step 8. No • Go to step 9.	
8	Reseat all of the cards one-by-one while monitoring the voltage level.	• Replace any cards that affect power. • If power gradually destabilizes while inserting cards, go to step 9.	
9	Replace Datashelf.	• If problem persists, contact MITEL Field Service.	

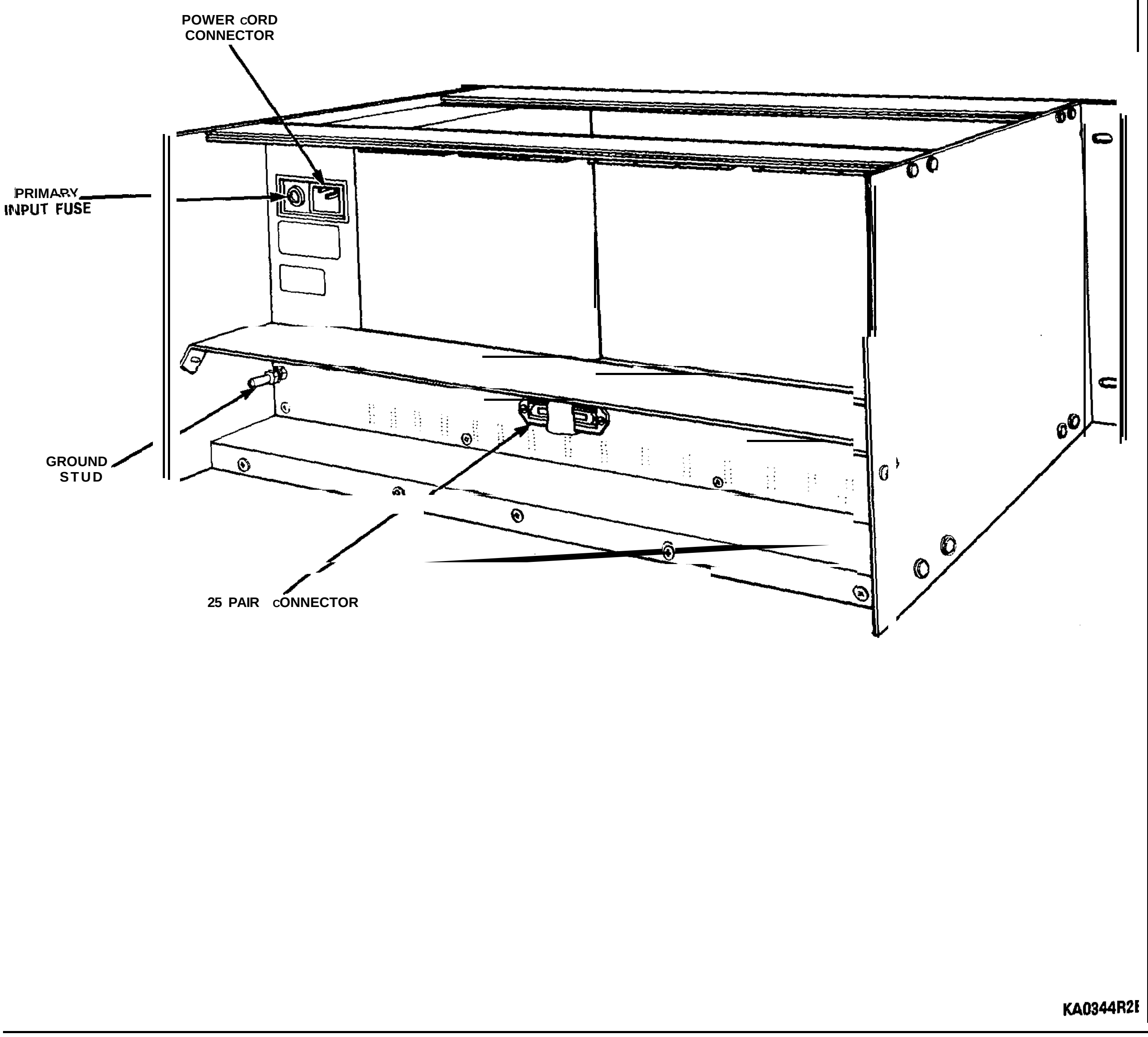


Figure 3-13 Backplane and Connectors of the DATASHELF 9100

DATACABINET 9000

3.37 The DATACABINET 9000 is a free standing metal cabinet mounted on four casters. It is equipped with a fan unit, a power distribution unit panel, and a vertical power strip for distributing power to equipment within the cabinet.

3.38 The DATACABINET 9000 configured with three DATASHELF 9100 assemblies and one Modem Interconnect Panel, is shown in Figure 3-14. A DATACABINET 9000 rear view is shown in Figure 3-15. Refer to Chart 3-23 for DATACABINET 9000 Troubleshooting Procedures.

CHART 3-23
DATACABINET 9000 TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Check the power indicators of both the data shelves and the cards installed in them.	• If all power indicators are off, go to step 2. • If power indicators of a Datashelf are off, go to step 2. • If problem appears to be isolated to DATASET card, refer to Chart 3-18, DATASET 1102 Troubleshooting Procedure or Chart 3-20, DATASET 2102 Troubleshooting Procedures. • If problem with just the fan unit, go to step 7.	
2	Verify all Datashelf power switches are in the ON position.	Yes: • Go to step 3. No : • Turn them on.	
3	Verify that the Power Distribution Unit Panel is firmly connected to the commercial AC power source. Inspect power cord.	• Reconnect or replace cord as required. • If problem persists, go to step 4.	
4	Verify that the Datashelf power cords are plugged securely into the sockets of the Distribution Panel.	• Reconnect or replace cords as required. • If problem persists, go to step 5.	
5	Using a voltmeter, verify that 120 Vac is present at the Distribution Panel output.	Yes: • Cabinet power system is functioning properly. Troubleshoot the Datashelf individually; refer to DATASHELF 9100 Troubleshooting Procedures, Chart 3-21. No: • Go to step 6.	
6	Measure the commercial AC power source to verify that 120 Vac is present.	Yes: • Replace the Power Distribution Unit; if problem persists, contact MITEL Field Service. No: • Obtain 120 Vac power source.	
7	Check if fan unit is on.	Yes: • Fan unit is functioning properly. No: • Go to step 8.	
8	Verify that the fan unit power cord is plugged securely into the Distribution Panel.	• Reconnect cord / replace cord as required. • If problem persists, go to step 9.	
9	Plug the power cord into a spare socket on the Distribution Unit.	• If problem disappears, problem was a faulty socket, replace the Power Distribution Unit. • If problem persists, go to step 10.	
10	Using a voltmeter, measure the Power Distribution Unit output - verify that 120 Vac is present.	Yes: • Go to step 11. No: • If voltage is present when the fan unit is connected; and not present (or out of spec) when disconnected, go to step 11. • If no voltage is present, replace the Distribution Unit; if problem persists, contact MITEL Field Service.	
11	Replace the fan unit.		

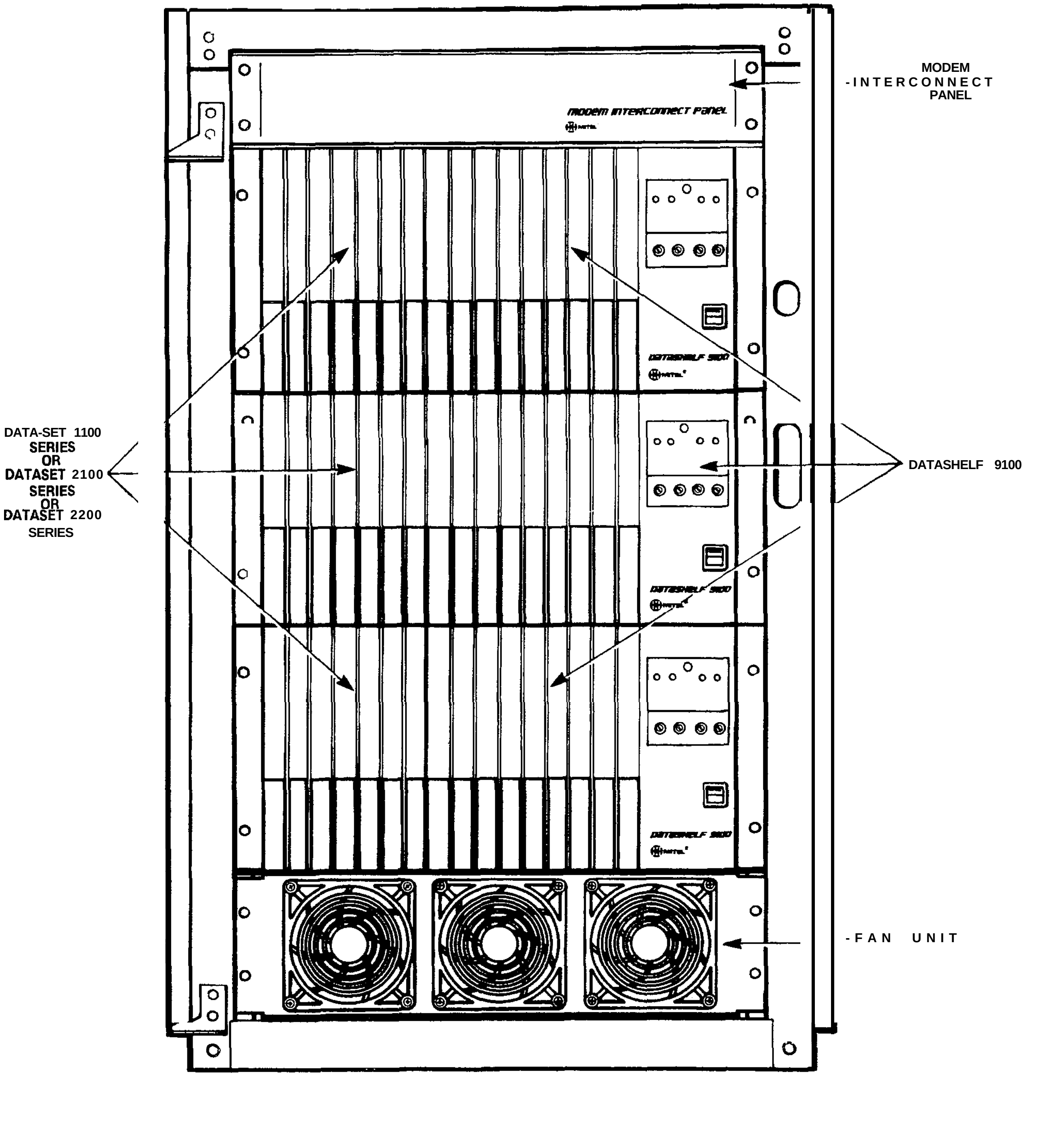


Figure 3-14 DATACABINET 9000 Front View

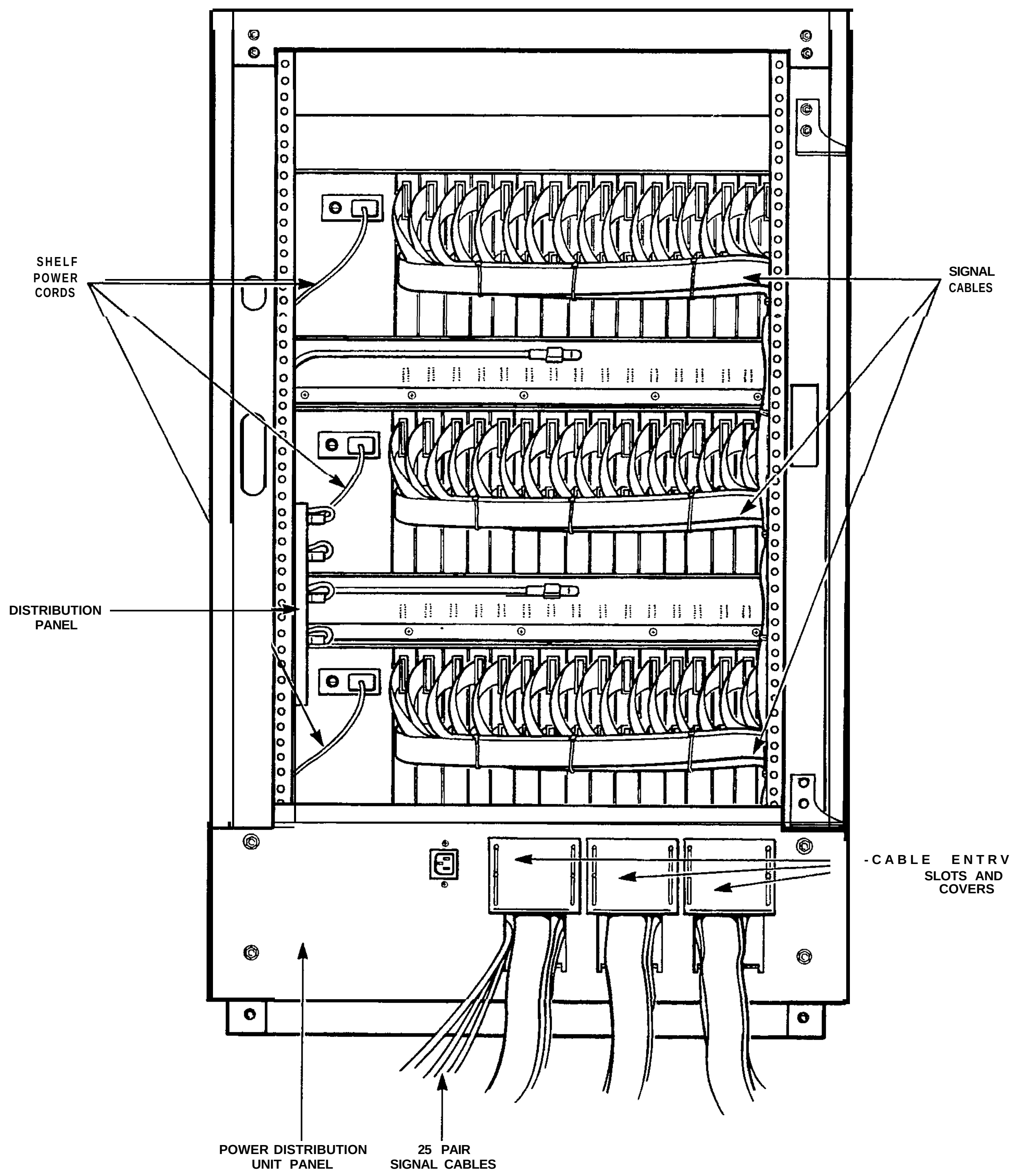


Figure 3-15 DATACABINET 9000 Rear View

4. SUBSYSTEM TROUBLESHOOTING PROCEDURES

Main Control Card

4.01 The following paragraphs outline the troubleshooting procedures for the Main Control Card.

Configuration

4.02 The Main Control card consists of the following:

Name

- Main Control card (without modules)
- DX Module
- DRAM module
- Decryption module
- EPROM
- T1 Clock Module

Main Control Card Power-Up Tests

4.03 The Main Control card power-up tests are run automatically upon operation of the SYSTEM RESET pushbutton located on the Main Control card front panel. The test results are indicated in code form on the Main Control card's 7-segment displays, also located on the Main Control card front panel.

Note: The Main Control card 7-segment displays are also used for the troubleshooting of the Floppy Disk Subsystem - refer to the Floppy Disk Subsystem troubleshooting procedures.

First-Step Checks

4.04 Prior to replacing cards as directed by the Main Control card troubleshooting procedures, carry out the following checks:

(a) Reseat the suspect card.

(b) Check for bent pins at the backplane or module connector, where applicable.

If the above does not clear the fault, proceed to replace the card.

Power-Up Sequence

4.05 The Main Control card power-up sequence is outlined in detail in Section MITL9109-094-353-NA, General Maintenance Information. See Emergency Troubleshooting Procedures (Chart 2-2) for Main Control card procedures.

Digital Bay Control Subsystem

4.06 The following paragraphs detail the troubleshooting procedures for the Digital Bay Control subsystem.

Configuration

4.07 The Digital Bay Control subsystem consists of one card - the Bay Control card (Part No. 9109-017-000-NA).

Bay Control Power-Up Tests

4.08 The Bay Control card power-up tests are run automatically upon power-up of the associated bay, or a reset of the Main Control card. Failure of any of the power-up tests will result in the flashing of the Bay Control card ALARM LED soon after initialization.

First-Step Checks

4.09 Prior to replacing cards as directed by the Digital Bay Control subsystem troubleshooting procedures, carry out the following checks:

(a) At the Maintenance terminal, SHOW ERRORS and check the DX channel links; also check the HDLC and the Disk Drives. Refer to RS-232 Maintenance Terminal, Section MITL9109-094-351-NA, and to Troubleshooting, Section MITL9109-094-350-NA.

(b) Reseat the suspect card.

(c) Check for bent pins at the backplane or module connector, where applicable.

If the above does not clear the fault, proceed to replace the card.

Power-Up Sequence

4.10 The Bay Control card power-up sequence is outlined in detail in Section MITL9109-094-353-NA, General Maintenance Information. Chart 4-l summarizes the troubleshooting procedures for the Bay Control card.

CHART 4-l
BAY CONTROL CARD TROUBLESHOOTING PROCEDURES

tep	Action	Description / Follow-up
1	Check if the Bay Control card status LEDs indicate problems (see Table 4-1), or if the Main Control 7-segment displays indicate a Bay Control problem - displays show one of the following: 3 / 0 or 4 / 0	• Go to step 2.
2	Verify the power is available in the affected bay (there should be one or more LEDs lit on the Bay Control card, or any other card in the affected bay). Power available?	Yes: • Go to step 3. No: • This indicates a bay power supply problem. Refer tc Bay Power Supply Troubleshooting Procedures.
3	Check if all three Bay Control card status LEDs are on.	Yes: • Go to step 4. No: • Go to step 11.
4	Reset the Bay by switching the Bay Power Supply OFF, and then ON again.	• Go to step 5.
5	Check if all three Bay Control card status LEDs light up and remain on.	Yes: • This indicates that there is no communication between the Bay Control and the Main Control. • Go to step 6. No: • Go back to step 1.
6	Check the PCM cable connecting the bay backplane to the control backplane - ensure it is firmly connected at both ends.	• Connect the cable properly as required. • If the cable is connected properly, replace the cable; if the problem persists, go to step 7.
;TEP 7 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT MAY HAVE AN ADVERSE EFFECT ON SYSTEM ‘ERFORMANCE. DO NOT PROCEED TO STEP 7 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
7	Power down the affected bay and remove the Bay Control card.	• Go to step 8.
8	Ensure all switches (SWI-1, SW1-2, SW2-1, SW2-2) are in the CLOSED position (see Figure 4-l).	• Close all switches as required; go back to step 4. • If this is not the problem, go on to step 9.
9	A problem with the DX chips on the Bay Control card could cause these symptoms - replace the Bay Control card.	• If the problem persists, reinstall the original Bay Control card and go to step IO.

CHART 4-1 (Cont'd)
BAY CONTROL CARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up
10	A problem with the DX module on the Main Control card, or with Main Control card itself could cause these symptoms. Replace Main Control card.	• If problem persists, contact MITEL Field Service.
11	Check if Bay Control card ALARM LED is flashing.	Yes • Go to step 12. No: • Go to step 15.
STEP 12 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT MAY HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. DO NOT PROCEED TO STEP 12 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP		
12	Power down the affected bay via the switch on the bay power supply.	• Go to step 13.
13	A problem with the Bay Control card on-board EPROM could cause these symptoms - remove card and ensure EPROM is installed correctly. (See Figure 4-I).	• Install EPROM correctly as required. • If EPROM is installed correctly, go to step 14.
14	Replace Bay Control card.	• If problem persists, contact MITEL Field Service.
STEP 15 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT MAY HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. DO NOT PROCEED TO STEP 15 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP		
15	Check if there is an intermittent problem of loss of voice in Bays 3 and 4.	Yes: • Go to step 16. No: • Go to step 18.
16	Power down the affected bay and remove the Bay Control card.	• Go to step 17.
17	Ensure all switches (SW1-1, SWI-2, SW2-1, SW2-2) are in the CLOSED position (see Figure 4-I).	• Close all switches as required and go back to step 4. • If this is not the problem, go to step 18.
18	Contact MITEL Field Service.	

TABLE 4-I
BAY CONTROL CARD STATUS LEDs

TX LED	RX LED	ALARM LED	Meaning
on	on	on	Bay Control card is either waiting for, or has lost communication with the Main Control card. If this state persists for more than a few seconds, there is no communication.
flashing	flashing	on	Bay Control card is being downloaded by the Main Control card.
flashing	flashing	Off	Bay Control card is up and running and communicating to the Main Control card.
Off	Off	Off	This is the normal operating . condition of the Bay Control card.
		flashing	There is a failure on the Bay Control card.

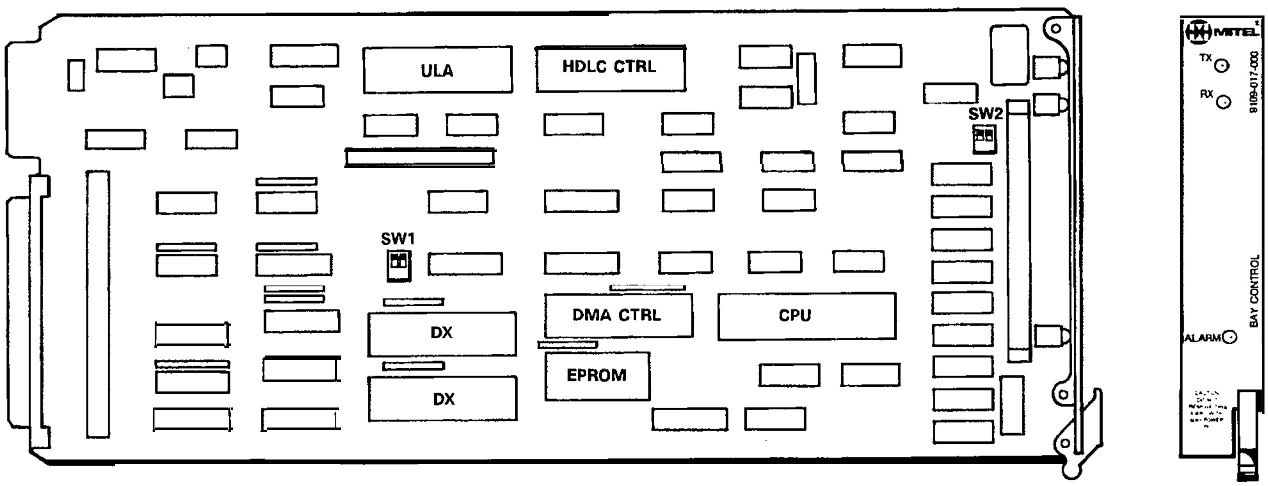


Figure 4-l Bay Control Card Device Locations

Analog Bay Peripheral Control Subsystem

4.11 The following paragraphs detail the troubleshooting procedures for the Analog Bay Peripheral Control Subsystem.

Configuration

4.12 The Analog Bay Peripheral Control Subsystem consists of the following cards:

	Name	Part No.
•	Peripheral Control Card (PCC)	9108-203-000-NA
•	PCC EPROM	
•	Digital Interface Card (DIC)	9108-002-000-NA
•	DIC EPROM	
•	Scanner Card	9110-104-000-NA, 9110-004-000-NA

Peripheral Control Subsystem Power-Up Tests

4.13 The Peripheral Control Subsystem power-up tests are run automatically upon operation of the SYSTEM RESET pushbutton located on the Scanner card front panel. The test results are indicated in code form on the Scanner card's 7-segment displays, also located on the Scanner card front panel.

First-Step Checks

4.14 Prior to replacing cards as directed by the Peripheral Control Subsystem troubleshooting procedures, carry out the following checks:

(a) Reseat the suspect card.

(b) Check for bent pins at the backplane or module connector, where applicable.

If the above does not clear the fault, proceed to replace the card.

Power-Up Sequence

4.15 The Peripheral Control subsystem power-up sequence is outlined in detail in Section MITL9109-094-353-NA, General Maintenance Information. Chart 4-2 summarizes the troubleshooting procedures for the Peripheral Control subsystem.

CHART 4-2
ANALOG PERIPHERAL BAY TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	If Scanner 7-segment displays do not read "b3" or "b4", press MASTER RESET pushbutton on the Scanner card front panel.	• Go to step 2.	
2	Check if power-up tests have begun.	Yes: • Go to step 7. No : • Go to step 3.	see Nott 1
3	Ensure bay power is turned on.	• TOP SHELF POWER switch on the maintenance panel should be in the ON position. • Go to step 4.	
4	Verify that power is available in the bay.	Yes: • Go to step 5. No : • This indicates a power supply problem. Refer to the Rear Door Power Supply troubleshooting procedures.	
5	Check if Scanner card 7-segment displays are blank.	Yes: • Go to step 6. No : • Go to step 7.	
6	Replace Scanner card.	• Go to step 7.	
7	Check if the Scanner card 7-segment displays show the following error code : E 2	Yes: • Go to step 6. No : • Go to step 15.	
6	Power down the affected bay via the switch on the maintenance panel.	• Go to step 9.	
9	Remove PCC card and verify that the EPROM IC is installed properly.	• If problem persists, go to step 10.	
	STEP 10 SHOULD BE DONE DURING PERIODS OF LOW OR NO TRAFFIC, AS IT WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. BEFORE PROCEEDING, ATTEMPT A SYSTEM RESET, USING THE "SYSTEM RESET" PUSHBUTTON ON THE MAIN CONTROL CARD FRONT PANEL - CHECK IF THIS CORRECTS THE PROBLEM. DO NOT PROCEED TO STEP 10 UNLESS SPECIFICALLY DIRECTED TO IT FROM A PREVIOUS STEP.		
10	Power down the affected bay via the power switch on the maintenance panel.	• Go to step 11.	
11	Replace the Digital Interface card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 12. No : • Problem fixed.	

CHART 4-2 (Cont'd)
ANALOG PERIPHERAL BAY TROUBLESHOOTING PROCEDURES

Ste	Action	Description / Follow-up	Remarks
12	Replace the Peripheral Control card; power up the bay. Does fault persist?	Yes: • Power down shelf; go to step 13. No: • Problem fixed.	
13	Replace the Scanner card; power up the bay. Does the fault persist?	Yes: • Possible problem with Main Control card; go to step 14. No: • Problem fixed.	
14	Power down the system; replace the Main Control card. Does the fault persist?	Yes: • Refer problem to Mitel field service. No: • Problem fixed.	
15	Check if the Scanner card 7-segment displays show the following error code: E 1	Yes: • Go to step 16. No: • Go to step 17.	
16	Replace the PCC card.	• If problem persists, contact Mitel Field Service.	
17	Check if the Scanner card 7-segment displays show one of the following status codes: b b 3 4	Yes: • The bay is functioning correctly. No: • Go to step 18.	See Note 2
18	Check if the Scanner card 7-segment displays show one of the following status codes: 0 A A A	Yes: • Go to step 19. No: • Go to step 22.	
19	Press the MASTER RESET push-button on the front panel of the Scanner card.	• If problem persists, go to step 20.	
20	Verify PCM cabling from front of DIC card to Bay 2 backplane (Bay 3 and Bay 4 DIC cards), or from Bay 4 DIC card to Bay 5 DIC card.	• Correct faulty cabling as required. • If problem persists, go to step 21.	See Note 3 See Note 4
21	Power down the affected shelf and replace the DIC card.	• If problem persists, may indicate a problem with the Main Control card. Refer to Main Control card troubleshooting procedures.	
22	If anything else is on the Scanner card 7-segment displays, press the MASTER RESET push-button on the Scanner card front panel.	• If the problem persists, power down the affected bay, and replace the affected cards in the following order: - Scanner - DIC - PCC • If the problem persists, contact Mitel Field Service.	See Note 3

Notes to Chart 4-2:

1. The correct 7-segment display reset sequence is: 00, bb, OA, b3 (or b4). Refer to Section MITL9109-094-353-NA, General Maintenance Information for details on the Scanner card LED codes.
2. At this point, if there is no call processing in the affected bay, contact Mitel Field Service.
3. In the peripheral cabinet, the affected DIC card will have the "Rx" LED on (i.e., not off, not flashing) and the "Tx" LED off.
4. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on DIC card cabling.
5. Verify proper shelf and system grounding.

Floppy Disk Subsystem

4.16 The following paragraphs detail the troubleshooting procedures for the Floppy Disk Subsystem. Chart 4-3 outlines the troubleshooting procedures for the Floppy Disk Subsystem. Note that some troubleshooting of the Floppy Disk Subsystem is done implicitly through the troubleshooting of the Main Control card.

Configuration

4.17 The Floppy Disk Subsystem consists of the following components:

Name		Part. No.
• Floppy Disk Drive		9109-024-000-NA,
	or	9109-124-000-NA
• Main Control Card		9109-036-000-NA
• Interconnecting cables		
• Bay 1 Cable Adapter		9108-037-000-NA
• Bay 2 Cable Adapter		9108-038-000-NA

Action in Case of Power Loss

4.18 In order to prevent corruption of the data on the floppy diskettes, care should be taken to disable system access to the disk drive unit prior to taking it off-line for troubleshooting purposes. Always release the lock-latch before removing power from the unit. Similarly, always ensure power is applied to the disk drive before inserting the diskette.

CHART 4-3
FLOPPY DISK SUBSYSTEM TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	Ensure bay power is turned on.	• Bay power supply switch should be in the ON position. • ‘Go to step 2.	
2	Verify that power is available in the bay. (Measure at backplane.)	Yes: • Go to step 3. No : • This indicates a power supply problem. Refer to the Bay Power Supply troubleshooting procedures.	see Fig 2-2
3	Verify power cable and signal ribbon cable are properly connected to the backplane.	• Go to step 4.	see Note 1
4	Check if Main Control card 7-segment displays show the following error code: E. 1	Yes: • Indicates original system diskette has been replaced, and logs are pending; go to step 5. No : • Go to step 6.	see Note 4 see Note 2
5	Either (a) Re-insert original diskette, or (b) Restart system	• NOTE : ONLY RESTART THE SYSTEM DURING LOW OR NO TRAFFIC CONDITIONS, AS THIS HAS AN ADVERSE EFFECT ON SYSTEM PERFORMANCE.	
6	Check if Main Control card 7-segment displays show the following error code: E. 2	Yes: • Indicates original system diskette has been replaced; go to step 7. No : • Go to step 6.	
7	Either (a) Re-insert original diskette, or (b) Restart system	• NOTE : ONLY RESTART THE SYSTEM DURING LOW OR NO TRAFFIC CONDITIONS, AS THIS HAS AN ADVERSE EFFECT ON SYSTEM PERFORMANCE.	
6	Check if Main Control card 7-segment displays show the following error code: E. 3	Yes: • Indicates that the disk drive is empty, and that disk updates are pending; go to step 9. No: • GotostepIO.	see Note 2
9	Either (a) Re-insert original diskette, or (b) Insert new diskette and restart the system.	• NOTE : ONLY RESTART THE SYSTEM DURING LOW OR NO TRAFFIC CONDITIONS, AS THIS HAS AN ADVERSE EFFECT ON SYSTEM PERFORMANCE.	see Note 3
10	Check if Main Control card 7-segment displays show the following error code: E. 4	Yes: • Indicates that the disk drive is empty; go to step 11. No : • Go to step 12.	
11	Either (a) Re-insert original diskette, or (b) Insert new diskette and restart the system	• NOTE : ONLY RESTART THE SYSTEM DURING LOW OR NO TRAFFIC CONDITIONS, AS THIS HAS AN ADVERSE EFFECT ON SYSTEM PERFORMANCE.	

CHART 4-3 (Cont'd)
FLOPPY DISK SUBSYSTEM TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
12	Check if Main Control card 7-segment displays show the following error code: E. 5	Yes: • Indicates that there is an obstruction over the diskette "write notch" (i.e., a write-protect sticker); remove it. No: • Gotostep13.	
13	Check if Main Control card 7-segment displays show the following error code: E. 6	Yes: • Indicates that diskettes A and B are not matched. (i.e., not of the same load); go to step 14. No: • Go to step 15.	
14	Insert two diskettes of the same load and restart the system	• NOTE : ONLY RESTART THE SYSTEM DURING LOW OR NO TRAFFIC CONDITIONS, AS THIS HAS AN ADVERSE EFFECT ON SYSTEM PERFORMANCE.	
15	Check if Main Control Card 7-segment displays show the following error code: E. 7	Yes: • Indicates that the system could not read the system type off the disk. Go to step 16. No: • Go to step 17.	
16	Restart the system.	• NOTE : ONLY RESTART THE SYSTEM DURING LOW OR NO TRAFFIC CONDITIONS, AS THIS HAS AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. If restart was unsuccessful, go to step 19.	
17	Check if Main Control card 7-segment displays show the following error code: E. 8	Yes: • Indicates that there is no decryption module or the connection to the debug card is faulty. Go to step 18. No: • Go to step 19.	
18	Either (a) Install a decryption module and reset the system (b) Check the debug card connections.	• NOTE : ONLY RESTART THE SYSTEM DURING LOW OR NO TRAFFIC CONDITIONS, AS THIS HAS AN ADVERSE EFFECT ON SYSTEM PERFORMANCE. If restart was unsuccessful, go to step 19.	
19	Refer to the troubleshooting procedures for the Main Control card.		

Notes:
1. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details of the Floppy Disk Drive installation.
2. Disk update information (e.g., log reports) is stored in system RAM until a period of low traffic before being transferred to the floppy disk.
3. If system is restarted at this point, the pending logs will be lost.
4. Software error codes are: E.l, E.2, E.3, E.4, E.5, E.6, E.7, and E.8.

Power Subsystem

4.19 The SX-200 DIGITAL PABX power subsystem consists of one to eight bay power supplies, and one or two rear-door power supplies, depending upon the configuration of the system. The optional uninterruptable power supply (UPS) is optional, and is user-supplied. Charts 4-4 and 4-5 outline the troubleshooting procedures for the power subsystem.

CHART 4-4
REAR-DOOR POWER SUPPLY TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Check if the 'AC POWER ON' LED, located on the rear panel of the power supply is on.	Yes: • Go to step 5. No ⇒ • Go to step 2.	see Note 1
2	Verify that the system is plugged securely into the commercial AC source	• Replace / repair cord as required. • Go to step 3.	
3	Check the AC power LINE fuse located on the rear panel of the power supply.	• If it has blown, replace it; otherwise, go to step 4.	see Note 1
4	Verify the commercial AC source with an AC meter, or by connecting another device to it.	• If commercial AC source is out of spec, ensure that a UPS is connected. • Verify that the UPS is functioning correctly. • Go to step 5.	
5	Check if the CONVERTER INPUT circuit breaker is tripped (OFF).	Yes: • Switch it to the ON position; if it trips to the OFF position again, replace the power supply. No ⇒ • Go to step 6.	see Note 1
6	Check the connection from the rear-door power supply (harness) to the shelf backplane.	• Repair / replace any faulty wiring. • Go to step 7.	see Note 2
7	Check that the TOP SHELF POWER switch on the maintenance panel/top panel is in the ON position.	• Go to step 8.	
8	Verify that the maintenance panel cable is connected correctly to the Interconnect card inside the cabinet.	• Repair / replace broken switch(es). • Repair / replace faulty wiring. • Go to step 9.	see Note 2
9	Check backplane for bent pins, foreign material, damage, etc.	• If backplane is damaged, replace it; otherwise, go to step 10.	
10	Check the backplane voltages (from terminal block on upper left corner of backplane).	• If they are out of spec, go to step 11. • If they are in spec, power supply is functioning correctly.	see Note 3
11	Replace the rear-door power supply.		

Notes:
1. Refer to Section MITL9109-094-353-NA, General Maintenance Information for location of LEDs, fuses, inputs, and outputs of the rear-door power supply.
2. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation, for details on these connections.
3. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation, for the measuring points. See Tables 4-2 and and 4-3 for the expected voltages. Remove all peripheral wiring before making measurements.

CHART 4-5
BAY POWER SUPPLY TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Check if the power switch on the front panel bay power supply is in the "ON" position, and the associated LED is on.	Yes: • Go to step 8. No: • The power supply is not turned on. Put the power switch into the "ON" position. • Go to step 2.	
2	Verify that the system is plugged securely into the commercial AC power source.	• Replace / repair cord as required. • Go to step 3.	
3	Check if the cabinet has a rear-door power supply.	Yes: • Verify that it is functioning properly - refer to the Rear-door power supply troubleshooting procedures. • If it is functioning properly, go to step 5. No: • Go to step 4.	See Note 1
4	Check the connection between the AC line filter (on the rear door) and the AC distribution panel, located beneath the equipment shelves.	• Secure connections / replace cable as required. • Go to step 6.	See Note 2
5	Check the connection between the rear-door power supply and the AC distribution panel, located beneath the equipment shelves.	• Secure connections / replace cable as required. • Go to step 6.	See Note 2 See Note 3
6	Verify the wiring inside the AC distribution panel.	• Replace / repair wiring as required. • Go to step 7.	
7	Check connection from AC distribution panel to the bay power supply.	• Secure connection / replace cable as required. • Go to step 8.	See Note 2
8	Check backplane voltages.	• If they are out of spec, go to step 9. • If they are within spec, power supply is functioning correctly.	See Note 4
9	Replace the bay power supply.		

Notes:

1. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for information on power supply configurations.
2. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on power supply cabling.
3. In some cabinets the AC distribution panel is located on the floor of the cabinet, behind the equipment shelves. See Section MITL9109-094-200-NA for further details.
4. Refer to Bay 1/2 backplane, and Figure 2-2 for the measuring points; see Tables 4-2 and 4-3 for the expected voltages.

TABLE 4-2
BAY POWER SUPPLY TEST POINT VOLTAGES

Voltage	Minimum	Maximwm
+ 5 Vdc	**+ 4.925**	+ 5.075
+ 12 Vdc	+ 10.8	+ 13.2
- 12 Vdc	- 13.2	- 10.8
- 5 Vdc	- 5.5	- 4.5
- 28 Vdc	- 30.8	- 23.8
-48 Vdc	- 53.76	- 40.8
90 Vac	63.0	99.0

TABLE 4-8
REAR DOOR POWER SUPPLY TEST POINT VOLTAGES

TB	Pin	Voltage	Minimum	Maximum
1	4	+ 8 Vdc	+ 7.6	+ 8.4
	3	0 Vdc		
	2	- 5 Vdc	- 5.3	- 4.7
	1	- 10 Vdc	- 10.5	- 9.5
2	5	- 48 Vdc	- 52.0	- 45.0
	4	GND or 0 Vdc		
	2	90 Vac	85.0	95.0

Uninterruptabie Power Supply (UPS)

4.20 Any UPS may be used with the SX-200 DIGITAL PABX, provided that it meets the requirements specified in Section MITL9109-094-200-NA, Shipping, Receiving and Installation. Since these are available from a number of suppliers, only rudimentary troubleshooting procedures for the UPS are provided in this document. Reference should be made to the appropriate manual provided by the manufacturer of the UPS for any self-diagnostic capabilities. Chart 4-6 outlines the troubleshooting procedures for the UPS.

CHART 4-6
UPS TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	Verify the connection between the UPS and the commercial AC power source.	• Secure connection / replace cable as required. • Go to step 2.	
2	Verify the connection between the UPS and the PABX.	• Secure connection / replace cable as required. • Go to step 3.	
3	Check if UPS is functioning correctly.	Yes: • stop. No: • Go to step 4.	
4	Consult manufacturer's instructions and make adjustments.	• IMPORTANT: IF IT IS NECESSARY TO REPLACE THE UPS, THIS MUST BE DONE ONLY DURING PERIODS OF LOW OR, PREFERABLY NO TRAFFIC, AS THIS WILL HAVE AN ADVERSE EFFECT ON SYSTEM PERFORMANCE.	

Maintenance / CDE Terminal

4.21 Any terminal which is compatible with RS-232C type interface protocol may be used with the SX-200 DIGITAL PABX. Since these are available from a number of suppliers, only rudimentary troubleshooting procedures are provided in this document. Reference should be made to the appropriate manual provideti by the manufacturer of the terminal for any self-diagnostic capabilities. Chart 4-7 outlines the troubleshooting procedures for the video display terminal.

CHART 4-7
MAINTENANCE / CDE TERMINAL TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	See Note 1.		
2	Verify the connection from the commercial AC power source and the terminal.	• Secure connection / replace cable as required. • Go to step 3.	see Note 2
3	Verify the connection from the terminal's RS-232 socket to the RS-232 socket on the maintenance panel (RS-232 pins 2, 3, 4, 5 and 7 are used).	• Secure connection / replace cable as required. • Go to step 4.	see Note 2
4	Check if the terminal passes its own self-diagnostics.	Yes: • Go to step 5. No : • Replace the terminal.	
5	Verify that the communication parameters of the terminal match those of the maintenance port.	• Go to step 6.	see Note 3
6	Verify the wiring from the maintenance panel to the Bay 2 backplane.	• Secure connection / repair wiring as required. • Go to step 7.	see Note 4
7	Replace the terminal.	• If problem persists, go to step 8.	
8	Refer to Main Control card troubleshooting procedures.	• May be necessary to replace Main Control card.	

Notes:
1. If the terminal is out of commission, system maintenance can still be performed via either the testline interface or the attendant console. Refer to Sections MITL9109-094-353-NA, General Maintenance Information and MITL9109-094-315-NA Attendant Console Guide for further details.
2. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of the connections.
3. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of setting communication parameters.
4. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details 'on wiring of the maintenance panel.

Printer

4.22 Any printer which is compatible with RS-232C type interface protocol may be used with the SX-200 DIGITAL PABX. Since these are available from a number of suppliers, only rudimentary troubleshooting procedures are provided in this document. Reference should be made to the appropriate manual provided by the manufacturer of the printer for any self-diagnostic capabilities. Chart 4-8 outlines the troubleshooting procedures for the printer.

CHART 4-8
PRINTER TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Test the printer; use the TEST DEVICE TYPE PRINTER command.	Pass: • Go to step 2. Fail: • Replace printer; if problem persists, go to step 2.	see Note 1 see Note 2
2	Verify the connection from the commercial AC power source and the printer.	• Secure connection / replace cable as required. • Go to step 3.	see Note 4
3	Verify the connection from the printer's RS-232 socket to the RS-232 socket on the Bay 2 backplane (RS-232 pins 2, 3, 4, 5 and 7 are used).	• Secure connection / replace cable as required. • Go to step 4.	see Note 4
4	Check if the printer passes its own self-diagnostics.	Yes: • Go to step 5. No : • Replace the printer.	
5	Verify that the communication parameters of the printer match those of the printer port.	• Go to step 6.	see Note 5
6	Replace the terminal.	• If problem persists, go to step 7.	
7	Refer to Main Control card troubleshooting procedures.	• May be necessary to replace Main Control card.	

Notes:
1. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of procedures.
2. To pass the test, the printer should print an entire page of test data.
3. If the terminal is out of commission, system maintenance can still be performed via the testline interface. Refer to Section MITL9109-094-353-NA, General Maintenance Information for further details.
4. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of the connections.
5. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for details of setting communication parameters.

Cabinet Cooling System

4.23 The maximum safe internal ambient operating temperature inside the SX-200 DIGITAL PABX control cabinet is 40 degrees Celsius. A temperature sensor is installed within the cabinet and is set to trip at 60 degrees Celsius. This means that when the user is informed of this (via a log message), the system is definitely OVERHEATING, and immediate action is required. Chart 4-9 outlines the troubleshooting procedures for the cabinet cooling system. The temperature sensor is no longer installed in Control cabinets.

CHART 4-9
CABINET COOLING SUBSYSTEM TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
1	Verify that both of the fans are operating.	Yes: • Go to step 2. No: • Go to step 10.	
2	Verify that temperature within the cabinet is in fact at or near 60 degrees Celsius.	• Open the cabinet front door and hold the thermometer deep within the cabinet.	
3	Is the temperature at, or near 60 degrees?	Yes: • Go to step 5. No: • Go to step 4.	
4	The sensor is faulty. Replace the sensor.		
5	Check the ambient room temperature; is temperature over 40 degrees Celsius?	Yes: • This exceeds the maximum operating temperature. Lower temperature, or move the system to a cooler location. No: • Go to step 6.	
6	Check if there is anything obstructing the air inlet vents on the front of the cabinet.	Yes: • Remove the obstruction. No: • Go to step 7.	
7	Check if there is a localized source of heat, such as a malfunctioning power supply, board or rectifier.	Yes: • Attend to the fault - refer to the appropriate troubleshooting procedures. No: • Go to step 8.	
8	Check the air filter; does it require cleaning / replacement.	Yes: • Clean / replace the filter as required. • Go to step 9. No: • Go to step 12.	see Note 1
9	Wait briefly - verify that the filter change brings temperature down - measure with thermometer and check for maintenance log message.	Yes: • Problem fixed. No: • Go to step 12.	
10	Check AC connection from AC distribution panel to the fan unit.	• Secure connection / replace cord as required. • Go to step 11.	see Note 2
11	Check if AC power is available throughout the system.	Yes: • Go to step 12. No: • Refer to power subsystem troubleshooting procedures.	
12	Replace the fan unit.		

Notes: 1. Refer to Section MITL9109-094-353-NA, General Maintenance Information for details on filter maintenance.

2. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on cabling.

Power Fail Transfer System

General

4.24 Power fail transfer relays are provided in order to allow essential service to be maintained in the event of failure of a critical item of equipment, or a serious degradation of service. Power to the transfer relays is maintained during normal operation, but during power fail transfer conditions, power is cut off from the relays. This releases them, connecting selected ONS or OPS lines directly to selected CO trunks.

4.25 Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on the location of the PFT cards. Chart 4-10 outlines the troubleshooting procedures for the power fail transfer system.

Note: In order to prevent misunderstanding, it is emphasized that the relays are NORMALLY OPERATED, and are RELEASED to effect the transfer operation.

CHART 4-10
POWER FAIL TRANSFER BOARD TROUBLESHOOTING PROCEDURES

itep	Action	Description / Follow-up	Remarks
1	Check if the system is operational.	Yes: • Go to step 2. No : • Go to Chart 2-2.	
2	Check if the entire system is in power fail transfer mode - refer to the maintenance log.	Yes: • Go to step 3. No : • Go to step 7.	
3	Verify that -48 Vdc is available in all bays.	Yes: • Go to step 4. No : • Go to the applicable power supply troubleshooting procedure.	
4	Verify that the maintenance panel switches are not set to power fail transfer.	• If they are, return them to the normal operating position. • Go to step 5.	see Note 1
5	Verify the -48 Vdc feed to the power fail transfer card - through the maintenance panel switches, to the interconnect card, to the power fail transfer card.	• Secure wiring / replace wiring as required. If problem persists, go to step 6.	see Note 2
6	Verify the connections at the interconnect field.	• Repair connections as required; if problem persists, go to step 17.	see Note 3
7	Check if entire peripheral cabinet is in the power fail transfer condition.	Yes: • Go to step 8. No: • Gotostep12.	
8	Verify that -48 Vdc is available in all bays used in the cabinet.	Yes: • Go to step 9. No : • Go to the applicable power supply troubleshooting procedure.	
9	Verify that the maintenance panel switches are not set to power fail transfer.	• If they are, return them to the normal operating position. • Go to step 10.	see Note 1
10	Verify the -48 Vdc feed to the power fail transfer card - through the maintenance panel switches, to the interconnect card, to the power fail transfer card.	• Secure wiring / replace wiring as required. If problem persists, go to step 11.	see Note 2
11	Verify the connections at the interconnect field.	• Repair connections as required; if problem persists, see Note 3 and go to step 17.	
12	Check if a single bay is in the power fail transfer condition.	Yes: • Go to step 13. No: • Gotostep15.	

CHART 4-10 (Cont'd)
POWER FAIL TRANSFER BOARD TROUBLESHOOTING PROCEDURES

Step	Action	Description / Follow-up	Remarks
13	Verify that -48 Vdc is available in the affected bay.	Yes: • Go to step 14. No : • Go to the applicable power supply troubleshooting procedure.	
14	Verify the connections at the interconnect field.	• Repair connections as required; if problem persists, see Note 3 and go to step 17.	
15	Check if one or more separate stations are in the power fail transfer condition.	Yes: • Go to step 16. No : • No problem with power fail transfer system.	
16	Verify the connections at the interconnect field.	• Repair connections as required; if problem persists, go to step 17.	see Note 3
17	Replace the affected power fail transfer card.	• If problem persists, contact Mitel Field Service.	

Notes:
1. Refer to Section MITL9109-094-353-NA, General Maintenance Information for details on the switch settings.
2. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on PFT card wiring.
3. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details on PFT connections to the interconnect field.

APPENDIX A

MAINTENANCE LOG MESSAGES

General

Al.01 This Appendix contains the complete set of information messages which are recorded in the maintenance log when a significant event occurs. Each message is self-explanatory, identifying the event and providing details about it. Information on options available to maintenance personel is included under the “Action Required” heading.

Al.02 There are three types of log report; they are as follows:

1. Fault Report - a report generated when the maintenance system or Call Processing detects a fault, or an abnormal condition.
2. Reset Report - a report generated when a bay or the system is reset.
3. Alarm Report - a report generated when a change in any of the alarm levels occurs.

Al.03 This Appendix is divided into three sections which correspond to the three types of log messages. The ‘Fault Reports’ section is arranged using the Alarm Code, an index number specific to the type of fault indicated. The Reset and Alarm Report sections are arranged in a logical manner.

Al.04 Information on access to the maintenance log, and the use of other maintenance tools may be found in Section MITL9109-094-351-NA, RS-232 Maintenance Terminal. Information on overall maintenance philosophy and specific diagnostic tests may be found in Section MITL9109-094-353-NA, General Maintenance Information.

TABLE AI-I
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
00	Link 07 Channel 19 failed junctor test Alarm Code = 00	Do a directed test on the specified link to verify the problem. Note that link 02 corresponds to Bay 03, link 05 corresponds to Bay 04, and link 07 corresponds to Bay 05. If the problem persists, refer to the Analog Junctor Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS command.
01	Link 07 Channel 19 failed junctor dgl codec Alarm Code = 01	Do a directed test on the specified link to verify the problem. Note that link 02 corresponds to Bay 03, link 05 corresponds to Bay 04, and link 07 corresponds to Bay 05. If the problem persists, refer to the Digital Interface Card Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS command.
02	Link 07 channel 19 failed junctor ang codec Alarm Code = 02	Do a directed test on the specified link to verify the problem. Note that link 02 corresponds to Bay 03, link 05 corresponds to Bay 04, and link 07 corresponds to Bay 05. If the problem persists, refer to the Digital Interface Card Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS command.
03	DLIC module failed at 02 03 01 00 console test Alarm Code = 03	Do a directed test on the specified circuit to verify the problem. If the problem persists, refer to the Console/DLIC module Part of this Section. Replace as required. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands
04	DLIC module failed at 02 03 01 00 console dgl codec Alarm Code = 04	Do a directed test on the specified circuit to verify the problem. If the problem persists, refer to the Console/DLIC module Part of this Section. Replace as required. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.
05	DLIC module failed at 02 03 01 00 console ang codec Alarm Code = 05	Do a directed test on the specified circuit to verify the problem. If the problem persists, refer to the Console/DLIC module Part of this Section. Replace as required. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.
06	ONS card failed at 02 01 01 00 ext 2101 inject codec test Alarm Code = 06	Do a directed test on the specified circuit to verify the problem. If the problem persists, refer to the Fault Isolation Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
36 (Cont'd)	COV card failed at 01 05 01 00 ext 1501 inject codec test Alarm Code = 06 LS/GS trnk card failed at 02 02 01 00 inject codec test Alarm Code = 06 E&M module failed at 02 02 01 00 inject codec test Alarm Code = 06 DTMF RX module failed at 02 02 01 00 inject codec test Alarm Code = 06	
07	ONS card failed at 02 01 01 00 ext 2101 Dgl L/B codec test Alarm Code = 07 COV card failed at 01 05 01 00 ext 1501 Dgl L/B codec test Alarm Code = 07 LS/GS trnk card failed at 02 02 01 00 Dgl L/B codec test Alarm Code = 07 E&M module failed at 02 02 01 00 Dgl L/B codec test Alarm Code = 07 DTMF RX module failed at 02 02 01 00 Dgl L/B codec test Alarm Code = 07	Do a directed test on the specified circuit to verify the problem. If the problem persists, refer to the Fault Isolation Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.
08	ONS card failed at 02 01 01 00 ext 2101 Ang L/B codec test Alarm Code = 08 COV card failed at 01 05 01 00 ext 1501 Ang VB codec test Alarm Code = 08 LS/GS trnk card failed at 02 02 01 00 Ang L/B codec test Alarm Code = 08 E&M module failed at 02 02 01 00 Ang L/B codec test Alarm Code = 08 DTMF RX module failed at 02 02 01 00 Ang L/B codec test Alarm Code = 08	Do a directed test on the specified circuit to verify the problem. If the problem persists, the fault is isolated to the specified circuit. Refer to the appropriate Part of this Section. Replace as required. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.
09	ONS card failed at 02 01 01 00 ext 2101 Message lamp test Alarm Code = 09	The specified station has been unplugged, or lamp bulb needs to be replaced.
10	ONS card failed at 02 01 01 00 ext 2101 Hook test Alarm Code = 10	Do a directed test on the specified circuit to verify the problem. If the problem persists, refer to the ONS Line card Part of this Section. Replace as required. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.
11	ONS card failed at 02 01 01 00 ext 2101 Adc reference test Alarm Code = 11 LS/GS trnk card failed at 02 02 01 00 Adc reference test Alarm Code = 11	Do a directed test on the specified circuit to verify problem. If the problem persists, refer to the Fault Isolation Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
12	Card read test Alarm code = 12	
13	LS/GS trnk card failed at 02 02 01 00 Hybrid loopback test Alarm Code = 13	Do a directed test on the specified circuit to verify the problem. If the problem persists, the fault is isolated to the specified circuit. Refer to the appropriate Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.
14	DIG line card failed at 01 08 01 01 ext 1801 DNIC output L/B test Alarm Code = 14	DNIC chip failed at circuit 01. Problem with DIGITAL line card.
15	DIG line card failed at 01 08 01 01 ext 1801 DNIC input L/B test Alarm code = 15	DNIC chip failed at circuit 07. Problem with DIGITAL line card.
16	DIG line card failed at 01 08 01 01 ext 1801 dn set c/s tes Alarm Code = 16	Replace the specified station.
17	DIG line card failed at 01 08 01 01 ext 1801 dn set bphone test Alarm Code = 17	Replace the specified station.
19	DIG line card failed at 01 08 01 02 ext 1802 dataset L/B test Alarm Code = 19	Replace the specified station
20	DTMF RX module failed at 02 02 01 00 DTMF receiver test Alarm Code = 14	Do a directed test on the specified circuit to verify the problem. If the problem persists, the fault is isolated to the specified DTMF Receiver. Refer to the DTMF Receiver Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS and SHOW STATUS commands.
21	PRINTER failed at 00 00 02 00 Printer test Alarm Code = 15	Do a directed test on the printer to verify this. Check if printer is off-line or disconnected. Refer to printer troubleshooting procedures.
22	DSP failed at 00 00 06 00 DSP memory test Alarm Code = 16	Do a directed test on the DSP to verify the problem. If it persists, refer to the Main Control card Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS command.
23	DSP failed at 00 00 06 00 DSP tone detect test Alarm Code = 17	Do a directed test on the DSP to verify the problem. If it persists, refer to the Main Control card Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS command.
24	DSP failed at 00 00 06 00 DSP tone gen test Alarm Code = 18	Do a directed test on the DSP to verify the problem. If it persists, refer to the Main Control card Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS command.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
25	DSP failed at 00 00 06 00 DSP conference test Alarm Code = 19	Do a directed test on the DSP to verify the problem. If it persists, refer to the Main Control card Part of this Section. Otherwise, investigate further, using the MONITOR DIAGNOSTICS command.
27	Link 07 Channel 19 Failed unisolated PCM loopback test Alarm Code = 27	Check inter-bay cables
29	Link 07 Channel 19 Failed isol to bay PCM loopback test Alarm Code = 29	Failure on bay controller card. Replace card.
29	Link 07 Channel 19 Failed isol to mcc PCM loopback test Alarm Code = 29	Failure on DX module. Replace Bay Controller Card.
31	Link 07 Channel 19 Failed isol to bay PCM loopback test Alarm Code = 31	Failure on bay controller card. Replace card.
32	Link 07 Channel 19 Failed unisolated PCM loopback test Alarm Code = 32	Check inter-bay cables.
32	Link 07 Channel 19 Failed isol to bay PCM loopback test Alarm Code = 32	Failure on bay controller card. Replace card.
33	Link 07 Channel 19 Failed isol to mcc PCM loopback test Alarm Code = 33	Failure on DX module. Replace Bay Controller Card.
34	Link 07 Channel 19 Failed unisolated PCM loopback test Alarm Code = 34	Check inter-bay cables.
34	Link 07 Channel 19 Failed isol to mcc PCM loopback test Alarm Code = 34	Failure on DX module. Replace Bay Controller Card.
39	ONS card failed at 02 01 00 Get free junctor Alarm Code = 39	An unsuccessful attempt was made to get a free junctor for use by analog 8804 test.
40 to 43	Analog 8804 test Alarm Code = 40 to 43	Information only. Analog 8804 diagnostics.
44	DIG line card failed at 01 08 01 01 ext 1801 dn set earpiece test Alarm Code = 44	Digital *SUPERSET* problems.
45	DIG line card failed at 02 02 01 00 ext 2301 dn set speaker test Alarm Code = 45	Digital *SUPERSET* problems.
46	DIG line card failed at 02 02 01 00 ext 2301 dn set microphe test Alarm Code = 46	Digital *SUPERSET* problems.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
47	T1 trunk card failed at 01 06 01 00 Trk 019 tl channel L/B test Alarm Code = 47	
48	DIG line card failed at 05 01 01 Modem answer test Alarm Code = 48	The modem at this location is not able to answer a call.
49	DIG line card failed at 05 01 01 Modem originate test Alarm Code = 49	The modem at this location is not able to originate a call.
100	DSP failed at 00 00 06 00 DSP went insane Alarm Code = 100	Do a directed test on the DSP to verify the problem. If the problem persists, refer to Main Control card troubleshooting procedures.
101	ONS card failed at 02 01 01 00 ext 2101 OFF hook too long Alarm Code = 101 Stn line card failed at 03 01 01 00 ext 3101 OFF hook too long Alarm Code = 101 COV card failed at 01 05 01 00 ext 1501 OFF hook too long Alarm Code = 101 Superset card failed at 03 01 01 00 ext 3101 OFF hook too long Alarm Code = 101	Information only.
102	ONS card failed at 02 01 01 00 ext 2101 Card removed Alarm Code = 102 Stn line card failed at 03 01 01 00 ext 3101 Card removed Alarm Code = 102 COV card failed at 01 05 01 00 ext 1501 Card removed Alarm Code = 102 Superset card failed at 03 01 01 00 ext 3101 Card removed Alarm Code = 102 LS/GS trnk card failed at 02 02 01 00 Trk001 Card removed Alarm Code = 102 CO trunk card failed at 02 02 01 00 Trk002 Card removed Alarm Code = 102 E&M trunk card failed at 02 02 01 00 Trk003 Card removed Alarm Code = 102 DID trunk card failed at 02 02 01 00 Trk004 Card removed Alarm Code = 102 UNIVERSAL card failed at 02 03 01 00 Card removed Alarm Code = 102 T1 trunk card failed at 02 06 00 00 Card removed Alarm Code = 102	Verify card has been removed. If alarm is raised due to this, either replace/re-install the card, or deprogram it via CDE. Refer to Section MITL9109-094-210-NA, Customer Data Entry for details.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
103	ONS card passed at 02 01 01 00 ext 2101 Card installed Alarm Code = 103 Stn line card passed at 03 01 01 00 ext 3101 Card installed Alarm Code = 103 COV card passed at 01 05 01 00 ext 1501 Card installed Alarm Code = 103 Superset card passed at 03 01 01 00 ext 3101 Card installed Alarm Code = 103 LS/GS trnk card passed at 02 02 01 00 TrkOOl Card installed Alarm Code = 103 CO trunk card passed at 02 02 01 00 Trk002 Card installed Alarm Code = 103 E&M trunk card passed at 02 02 01 00 Trk003 Card installed Alarm Code = 103 DID trunk card passed at 02 02 01 00 Trk004 Card installed Alarm Code = 103 UNIVERSAL card passed at 02 03 01 00 Card installed Alarm Code = 103 T1 trunk card passed at 02 06 00 00 Card installed Alarm Code = 103	Information only.
104	ONS card failed at 02 01 01 00 ext 2101 Wrong card in slot Alarm Code = 104 Stn line card failed at 03 01 01 00 ext 3101 Wrong card in slot Alarm Code = 104 COV card failed at 01 05 01 00 ext 1501 Wrong card in slot Alarm Code = 104 Superset card failed at 03 01 01 00 ext 3101 Wrong card in slot Alarm Code = 104 LS/GS trnk card failed at 02 02 01 00 TrkOOl Wrong card in slot Alarm Code = 104 CO trunk card failed at 02 02 01 00 Trk002 Wrong card in slot Alarm Code = 104 E&M trunk card failed at 02 02 01 00 Trk003 Wrong card in slot Alarm Code = 104 DID trunk card failed at 02 02 01 00 Trk004 Wrong card in slot Alarm Code = 104 UNIVERSAL card failed at 02 03 01 00 Wrong card in slot Alarm Code = 104	The specified card type is not programmed for the specified card slot. Use the SHOW CONFIG command to observe the correct configuration. Either insert the correct card type, or reprogram the card slot (see Section MITL91 09-094-210-NA, Customer Data Entry).

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
105	COV card failed at 01 05 01 00 ext 1501 Supersst unplugged Alarm Code = 105 Superset card failed at 03 01 01 00 ext 3101 Superset unplugged Alarm Code = 105	The specified extension has been unplugged. If this is not the case, check wiring.
106	Database failed at 00 00 04 00 Serious ram shortage Alarm Code = 106	This is a warning. Stop CDE programming activity. Wait for a low traffic period, and reset the system. If this persists, search for an Alarm Code 108 message. Watch for further occurrences.
107	Database failed at 00 00 03 00 Serious dsk shortage Alarm Code = 107	This is a warning. Stop CDE activity. Wait for a low traffic period, perform a COPY DATABASE, and reset the system using the new database. If this persists, search for an Alarm Code 25 message. Watch for further occurrences.
108	RAM failed at 00 00 04 00 No Ram space left Alarm Code = 108	No further CDE programming will be possible. There is no RAM space available. Wait for a period of low traffic, and reset the system. If further programming is required, other devices, account code numbers, ARS strings, or speed call numbers will have to be deprogrammed.
109	DISK failed at 00 00 03 00 No Disk space left Alarm Code = 109	No further CDE programming will be possible. There is no disk space available. Wait for a period of low traffic, perform a COPY DATABASE, and reset the system using the new database. If further programming is required, other devices, account numbers, ARS strings, or speed call numbers will have to be deprogrammed.
110	ONS card failed at 02 01 01 00 ext 2101 Msg reg overflow Alarm Code = 110 Stn line card failed at 03 01 01 00 ext 3101 Msg reg overflow Alarm Code = 110 COV card failed at 01 05 01 00 ext 1501 Msg reg overflow Alarm Code = 110 Superset card failed at 03 01 01 00 ext 3101 Msg reg overflow Alarm Code = 110	The message registration counter for the specified extension has overflowed. The overflow threshold is 50,000. Ensure that the counters are periodically reset at the Attendant Console.
111	LS/GS trnk card failed at 02 02 01 00 Trk001 Can't seize trunk Alarm Code = 111 CO trunk card failed at 02 02 01 00 Trk002 Can't seize trunk Alarm Code = 111 E&M trunk card failed at 02 02 01 00 Trk003 Can't seize trunk Alarm Code = 111 DID trunk card failed at 02 02 01 00 Trk004 Can't seize trunk Alarm Code = 111	Verify the wiring from the trunk circuit to the public network. Correct as required. Refer to Section MITL9109-094-200-NA, Shipping, Receiving, and Installation. If this is not the problem, suspect failure or bad wiring at the Central Office.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
112	LS/GS trnk card failed at 02 02 01 00 Trk001 Can't release trunk Alarm Code = 112 CO trunk card failed at 02 02 01 00 Trk002 Can't release trunk Alarm Code = 112 E&M trunk card failed at 02 02 01 00 Trk003 Can't release trunk Alarm Code = 112 DID trunk card failed at 02 02 01 00 Trk004 Can't release trunk Alarm Code = 112	No release signal was received from the Central Office. Verify wiring. Refer to Section MITL9109-094-200-NA, Shipping, Receiving, and Installation for details.
113	UNIVERSAL card failed at 02 03 01 00 Exceeds power rating Alarm Code = 113	The total power rating of the modules installed on the specified Universal card exceeds the maximum permitted total power rating. Refer to Section MITL9109-094-200-NA, Shipping, Receiving and Installation for details.
114	PRINTER failed at 00 00 02 00 SMDR printer down Alarm Code = 114	The printer used for SMDR printing is off-line or not working. Check printer. Refer to printer troubleshooting procedures.
115	Disk failed at 00 00 03 00 Disk removed/Bad ID Alarm Code = 115	Contact MITEL Field Service.
116	Disk passed at 00 00 03 00 Disk inserted Alarm Code = 116	Information only.
117	RAM failed at 00 00 05 00 CMOS checksum failed Alarm Code = 117	This is not a serious problem if it occurs once. However, if it is persistent, refer problem to field service.
118	COV card failed at 01 05 01 00 ext 1501 Card in low pwr slot Alarm Code = 118 UNIVERSAL card failed at 02 03 01 00 Card in low pwr slot Alarm Code = 118 DID card failed at 01 05 01 00 Card in low pwr slot Alarm Code = 118 OPS card failed at 02 03 01 00 ext 1502 Card in low pwr slot Alarm Code = 118	The specified card is a high power card installed in a low power slot. Use SHOW CONFIG command to obtain information on the card slot. Re-install/reprogram the card for a high power slot.
119	Temp sense failed at 00 00 07 00 System over-heated Alarm Code = 119	System is overheating. Inspect fan cooling system. If inoperative, refer to the Fan/Cooling System Part of this Section.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
120	Temp sense passed at 00 00 07 00 Temp back to normal Alarm Code = 120	Information only.
121	PFT sense failed at 00 00 08 00 Bay has cut through Alarm Code = 121 BAY failed at 03 00 00 00 Bay has cut through Alarm Code = 121	The digital bays have gone into Power Fail Transfer mode. Use SHOW ALARMS command and examine logs further to find the actual cause of the cut through. The specified analog bay has gone into Power Fail Transfer mode. Check for messages indicating that other bays have cut through. Use SHOW ALARMS command and examine logs further to find the actual cause of the cut through.
122	PFT sense passed at 00 00 08 00 Bay has cut back Alarm Code = 122 BAY passed at 03 00 00 00 Bay has cut back Alarm Code = 122	The specified bay has been cut back to normal operation. Verify that appropriate action was taken to rectify the event which caused the cut through.
123	ONS card failed at 02 01 01 00 ext 2101 Recording dev failed Alarm Code = 123 Stn line card failed at 03 01 01 00 ext 3101 Recording dev failed Alarm Code = 123	The recording device attached to the specified port has malfunctioned. Check wiring. Refer to the instructions provided by the maufacturer of the recording device.
124	PRINTER failed at 00 00 02 00 Wakeup printer down Alarm Code = 124	The printer used for Hotel/Motel wakeup printing is off-line or not working. Check printer. Refer to Printer troubleshooting procedures.
125	ONS card failed at 02 01 01 00 ext 2101 Wakeup not answered Alarm Code = 125 Stn line card failed at 03 01 01 00 ext 3101 Wakeup not answered Alarm Code = 125 COV card failed at 01 05 01 00 ext 1501 Wakeup not answered Alarm Code = 125 Superset card failed at 03 01 01 00 ext 3101 Wakeup not answered Alarm Code = 125	Information only.
126	ONS card failed at 02 01 01 00 ext 1201 Plid Restored Alarm Code = 126	Record this and watch for further occurrences. If system performance is degraded substantially, contact MITEL Field Service.
127	DISK failed at 00 00 03 00 Disk corrupt Alarm Code = 127	Disk has been corrupted. Check to see if disk is properly installed. Attempt to access the disk by logging into CDE or Maintenance. Reset the system at the earliest low traffic period. New diskette will likely be required.
128	DTMF RX module failed at 02 02 01 00 Receiver locked out Alarm Code = 128	Reseat the affected Universal card.
129	** anything ** failed at 00 00 00 00 Bad Group Link Alarm Code = 129	Record this and watch for further occurrences. Perform a Verify Database operation and check for further occurrences of this Alarm Code. If system performance is degraded substantially, contact MITEL Field Service.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
130	** anything ** failed at 00 00 00 00 Plid to Swid failed Alarm Code = 130	Record this and watch for further occurrences. Perform a Verify Database operation and check for further occurrences of this Alarm Code. If system performance is degraded substantially, contact MITEL Field Service.
131	RAM failed at 00 00 04 00 Disk VS Ram Failed Alarm Code = 131	Record this and watch for further occurrences. Perform a Verify Database operation and check for further occurrences of this Alarm Code. If system performance is degraded substantially, contact MITEL Field Service.
132	** anything ** failed at 00 00 00 00 Key dB corrupt.	A CDE audit has failed. If this persists, attempt a COPY DATABASE as soon as possible. Perform a Verify Database operation and check for further occurrences of this Alarm Code. If this still persists; contact MITEL Field Service.
133	** anything ** failed at 00 00 00 00 Trunk Number Corrupt.	A CDE audit has failed. If this persists, attempt a COPY DATABASE as soon as possible. Perform a Verify Database operation and check for further occurrences of this Alarm Code. If this still persists; contact MITEL Field Service.
134	** anything ** failed at 00 00 00 00 Access Code Tbl Bad.	A CDE audit has failed. If this persists, attempt a COPY DATABASE as soon as possible. Perform a Verify Database operation and check for further occurrences of this Alarm Code. If this still persists; contact MITEL Field Service.
135	UPS sense failed at 00 00 09 00 UPS not available Alarm Code = 135	The Uninterruptable Power Supply is not operating. Check the relevant wiring (see Section MITL91 09-094-200-NA, Shipping, Receiving, and Installation). Refer to the UPS Part of this Section.
136	UPS sense passed at 00 00 09 00 UPS available Alarm Code = 136	Information only.
137	UPS sense failed at 00 00 09 00 AC voltage failure Alarm Code = 137	The line AC voltage has failed. Ensure UPS is functioning.
138	UPS sense failed at 00 00 09 00 Battery/charger Alarm Code = 138	Either the battery is failing, or the battery charger is not functioning. Examine battery, charger, and wiring. Also refer to the instructions provided by the manufacturer of the UPS.
139	UPS sense failed at 00 00 09 00 AC/battery/charger Alarm Code = 139	There is no line AC voltage. Also, the battery is failing, or the charger is/was not functioning properly. Examine battery, charger and wiring. Also, refer to the instructions provided by the manufacturer of the UPS.
141	Nil device failed at 00 00 00 00 PMS is down Alarm Code = 141	When the PBX receives no reply from the PMS after one full minute of enquiry, it will generate this log.
142	Nil device failed at 00 00 00 00 PMS is up Alarm Code = 142	This log is generated after the PBX receives an acknowledgement from the recovered PMS.

TABLE AI-I (CONT'D)
GENERIC 1003 FAULT REPORTS

Alarm Code	Message	Action Required
143	Nil device failed at 00 00 00 00 PMS buffer is full Alarm Code = 143	While the PMS is down, the PBX can accept up to 50 transactions before generating this log.
144	Nil device failed at 00 00 00 00 No STX from PMS Alarm Code = 144	PMS has sent the PBX an invalid START-OF-TEXT message.
145	Nil device failed at 00 00 00 00 No ETX from PMS Alarm Code = 145	PMS has sent the PBX an invalid END-OF-TEXT message.
146	Nil device failed at 00 00 00 00 Bad PMS function Alarm Code = 146	PMS has sent the PBX an invalid function message.
147	Nil device failed at 00 00 00 00 Bad PMS status Alarm Code = 147	PMS has sent the PBX an invalid status message.
146	Nil device failed at 00 00 00 00 Bad PMS room number Alarm Code = 146	PMS has sent the PBX an invalid room number message.
149	Nil device failed at 00 00 00 00 Cannot send PMS msg Alarm Code = 149	If the PMS refuses to accept a transaction from the PBX after five tries, the PBX will generate this log.
150	LS/GS trk card failed at 01 05 01 00 trk 001 Trunk no dial tone Alarm Code = 150	This trunk was seized and after 10 seconds dial tone was not detected. The trunk has been busied out.
151	Link 07 Channel 19 Busied out Alarm Code = 151	Device busied out by maintenance personnel.
151	ONS card failed at 01 01 01 00 ext 1101 Busied out Alarm Code = 151	Device busied out by maintenance personnel.
152	ONS card passed at 01 01 01 00 ext 1101 Returned to service Alarm Code = 152	Device returned to service by maintenance personnel.
152	Link 07 Channel 19 Returned to service Alarm Code = 152	Device returned to service by maintenance personnel.
153	Threshold change Alarm Code = 153	
155	T1 trunk card passed at 01 06 01 00 Trk 019	Device returned to service.

TABLE Al-2
ALARM LOG REPORTS

Alarm Code	Action Required
Tot alarm went from No Alarm to MAJOR Due to threshold change of <see ' Alarm Reasons' in Table A1-3>	Use SHOW ALARMS command for more detailed information. Also see the applicable entry in Table Al-3.
Tot alarm went from MINOR to MAJOR Due to threshold change of <see ' Alarm Reasons' in Table A1-3>	Use SHOW ALARMS command for more detailed information. Also see the applicable entry in Table A1-3.
Tot alarm went from MAJOR to CRITICAL Due to threshold change of <see ' Alarm Reasons' in Table A1-3>	Use SHOW ALARMS command for more detailed information. Also see the applicable entry in Table Al-3.
Tot alarm went from MAJOR to MINOR Due to threshold change of <see ' Alarm Reasons' in Table A1-3>	This is an improvement in service. Information only.
Tot alarm went from MINOR to No Alarm Due to threshold change of <see ' Alarm Reasons' in Table A1-3>	This is an improvement in service. Information only.

TABLE AI-3
ALARM RESET REASONS

Alarm Level Change Reason	Action Required
Alarm level change due to control	If system is not processing calls, reset the system immediately. Otherwise refer to the Main Control card Part of this Section.
Alarm level change due to bay 03 PCM channels	Check the status of the specified bay via the SHOW ALARMS and SHOW STATUS commands. Refer to the 'Analog Peripheral Subsystem' Part of this Section.
Alarm level change due to bay 03 control	Check the status of the specified bay via the SHOW ALARMS and SHOW STATUS commands. Refer to the 'Analog Peripheral Subsystem' Part of this Section.
Alarm level change due to bay 02 lines	Check the status of the lines in the specified bay via the SHOW ALARMS and SHOW STATUS commands. If the problem seems to be isolated to a single card, refer to the appropriate line card Part of this Section.
Alarm level change due to bay 02 trunks	Check the status of the trunks in the specified bay via the SHOW ALARMS and SHOW STATUS commands. If the problem seems to be isolated to a single card, refer to the appropriate trunk card Part of this Section.
Alarm level change due to bay 02 rcvrs	Check the status of the DTMF receivers in the specified bay via the SHOW ALARMS and SHOW STATUS commands. If the problem seems to be isolated to a single card, refer to the DTMF receiver module Part of this Section.

TABLE AI-4
RESET LOG REPORTS

Reset Log Message	Action Required
Main Control was reset due to power up	Information only. Main Control card is reset at power-up.
Main Control was reset due to pushbutton	The SYSTEM RESET pushbutton on the Main Control card was pushed. Investigate.
Main Control was reset due to watch dog timer Main Control was reset due to local bay cause Main Control was reset due to msg link failure Main Control was reset due to software error Process 00 <<ANYTHING>> at address 012345 Main Control was reset due to software error RAM parity error at address = 012345 Main Control was reset due to software error Process 00 has overflowed its stack Main Control was reset due to software error Exception = <<ANYTHING>>at address 012345	* In all cases, check if Main Control card is functioning; if not, go to Emergency Troubleshooting procedures (Chart 2-2).
Main Control was reset due to Copy Database Upgrade disks left in drives.	A copy was done and the update disks were left in causing a reset.

APPENDIX B

CALL PROCESSING INFORMATION

B1.01 - Digital Bay to Digital Bay Call

1. The Main Control Card (MCC) scans for on-hook/off-hook change of state.
2. An extension goes off-hook in Bay 1.
3. The MCC detects the off-hook during its line card scan.
4. MCC checks for the COS of the extension to determine if the call is allowed.
5. The MCC checks for an idle receiver.
6. The MCC connects the DTMF receiver to the line circuit through the DX matrix on a PCM channel.
7. The MCC connects the same channel to the Digital Signal Processor (DSP) to provide dial tone.
8. The MCC monitors the circuit for rotary pulses.
9. The DTMF receiver detects any DTMF tones and sends a message to the MCC indicating the value of the dialed digits.
10. On receipt of the first digit, the MCC removes the DSP from the assigned channel.
11. The MCC monitors the digits dialed and checks the idle/busy condition of the destination.
12. If the destination is idle, the MCC connects the DSP to the originator and ringback is supplied.
13. The MCC sends the originator a cadence message to provide interruption of the ringback tone.
14. The MCC sends ringing to the Bay Power Supply from the DSP via a DX link.
15. The Bay Power Supply amplifies and routes the ringing to the destination.
16. The MCC sends a message to the destination to turn ringing on.
17. When the destination answers, the MCC detects the off-hook change of state.

18. Ringing is removed from the destination.

19. Ringback is removed from the originator.

20. A channel is connected between the originator and the destination.

21. The MCC scans for on-hook/off-hook changes of state.

22. When an on-hook is detected, the MCC removes the channel, and the call is terminated.

B1.02 - Analog Bay (Rotary) to Analog Bay Call

1. The Scanner card scans the line circuits for on-hook/off-hook changes of state.

2. An extension goes off-hook in Bay 3.

3. The Scanner detects an off-hook during the line card scan.

4. The Scanner sends an IRQ to the Peripheral Control Card (PCC).

5. The PCC determines the originator, generates a message and passes it to the Digital Interface Card (DIC).

6. The DIC formats and sends a message to the MCC.

7. The MCC checks the originator's COS to determine if the call is allowed.

8. The MCC checks for an idle DTMF receiver.

9. The MCC sends a message to the PCC to connect a junctor to the originator.

10. The MCC assigns a channel of the link to the junctor, and conects the DTMF receiver to the channel through the DX matrix.

11. The MCC connects the same channel to the DSP to provide dial tone.

12. The PCC monitors the circuit for rotary pulses.

13. The DTMF receiver detects any DTMF tones and sends a message to the MCC indicating the value of the tones.

14. On receipt of the first digit, the MCC removes the DSP from the assigned channel.

15. The MCC monitors the digits dialed and checks the idle/busy condition of the destination.

16. If the destination is idle, the MCC connects the DSP to the originator and ringback tone is supplied.
17. The MCC sends a cadence message to the PCC of the originator to provide interruption of the ringback tone.
18. The MCC sends a message to the PCC to ring the destination.
19. When the destination answers, the Scanner detects the off-hook.
20. The Scanner sends an IRQ to the PCC.
21. The PCC stops ringing and sends a message to the MCC indicating that the destination is off-hook.
22. Ringback is removed from the originator.
23. Since both parties are in Bay 3, the MCC sends a message to the PCC to provide a connection between the originator and the destination using a speech path. (There are no PCM channels used in this connection).
24. The Scanner scans for on-hook/off-hook changes of state.
25. When an on-hook is detected, the PCC sends a message to the MCC indicating that the extension(s) have gone on-hook; the call is terminated.

APPENDIX C

TROUBLESHOOTING KIT

C1.01 The following is a recommended list of items required in the Field Service Engineering Troubleshooting Kit:

- One of each circuit card as a spare, including modules
- Butt set
- Digital multimeter
- Moving coil multimeter
- Static strap
- Ground mat
- Assorted screwdrivers, wrenches
- Long nose pliers
- Spare fuses
- Wire strippers
- Fan filter.
- Breakout Box (for Data)

APPENDIX D

LOOP CURRENT MEASUREMENT

D1.01 There are two methods available to measure loop current:

- In-Line method.
- Voltage conversion measurement.

If it is not possible to break the loop (i.e., open the Tip or Ring lead) the second method may be used; however, it is not as accurate.

D1.02 In-Line Method. The procedure for the in-line method of measuring loop current is shown in Figure DI-1 and is described as follows:

1. Open either the Tip or Ring lead of the trunk facility by removing one of the bridge clips on the MDF.
2. Insert an ammeter where the clip was.
3. Take current readings at the instant the trunk is seized, and after the call has been completed. Do this in both incoming and outgoing directions.
4. Release the trunk and repeat the measurements several times on the same Central Office at peak and low traffic hours.
5. Repeat the above using different Central Office trunks.

D1.03 Voltage Conversion Method. This method of loop current measurement should be used only in such instances when it is not desirable to open the Tip or Ring leads. The procedure is as follows:

1. With the trunk seized, use a voltmeter to measure the voltage between the Tip and Ring of the trunk.
2. This voltage is then used to calculate the loop current (see below).
3. Release the trunk and repeat the measurement several times using the same Central Office trunk at peak and low traffic hours.
4. Repeat the above measurements using different Central Office trunks.
5. Typical equivalent resistance seen between Tip and Ring, when the trunk is seized, is approximately 250 ohms.

6. The following is ,a simple calculation used to obtain the loop current value:

$$\text{Loop Current} = \frac{\text{measured Tip to Rinn voltage}}{250}$$

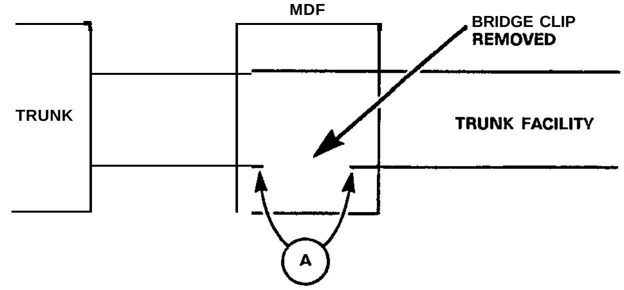


Figure DI-1 In-Line Current Measurement

APPENDIX E

LOOP START VS GROUND START CHECK

El.01 The loop start vs ground start check should be performed as follows (also refer to Figure El-l):

1. Locate the PBX trunk circuit Tip and Ring on the connecting block at the MDF.

2. Remove the bridge clips on the Tip and Ring (i.e., disconnect the PBX trunk circuit from the Central Office Tip and Ring).

3. Connect the butt set across the Central Office Tip and Ring.

4. Go. off-hook with the butt set. If Central Office dial tone is returned, then the Central Office trunk is loop start.

5. If no dial tone is returned, then momentarily ground the Ring lead with a butt set off-hook across Tip and Ring. If Central Office dial tone is returned, then the Central Office is ground start.

6. If still no dial tone is returned, repeat the previous step and ground the Tip lead instead. If Central Office dial tone is returned, the Central Office trunk is ground start (however, the Tip and Ring are reversed).

7. If still no dial tone is returned in either of these cases, there is a problem (perhaps Tip and Ring opened or shorted, or a large ground differential between PABX ground and Central Office ground.) Check PABX ground. If PABX ground is good, then report problem to telephone company.

Note: In most cases with ground start trunks, dial tone may be returned by grounding either Tip or Ring. If this should occur, repeat the 5th and 6th steps using the butt set in its “on-hook” or “monitor” state. Hold the ground lead on for a few seconds; CO should return dial tone as long as the ground lead is connected.

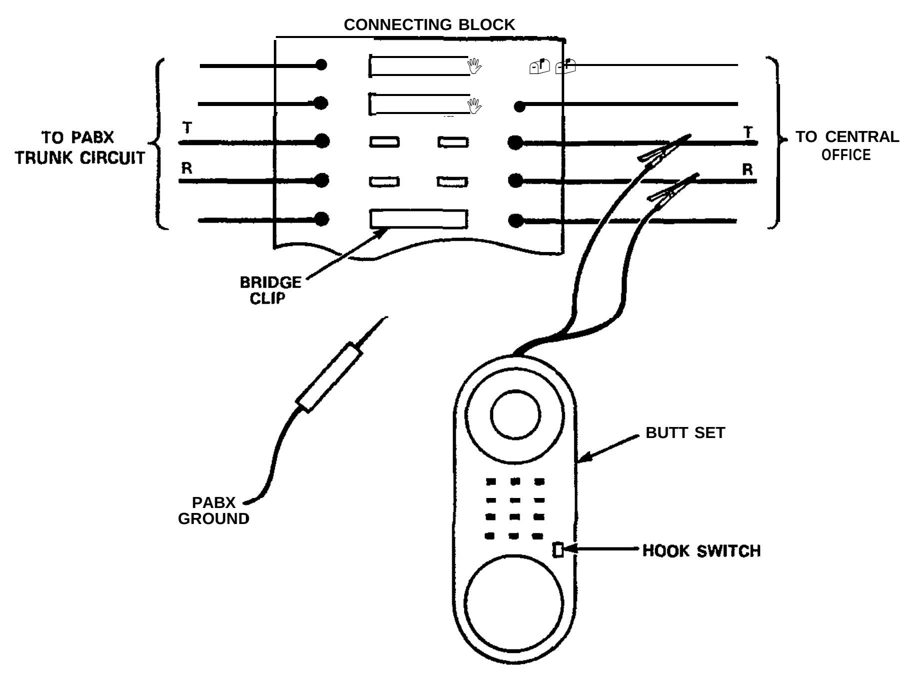


Figure El-l Loop Start Versus Ground Start Check

APPENDIX F

MITEL REPAIR TAG

General

F1.01 Any card or any other device found faulty must be returned with a Mitel Repair Tag (see Figure F1-1). The following information must be included on the repair tag:

1. The date on which the device was returned.
2. The location of the point of origin (the installation site).
3. The company name.
4. The product name (i.e., SX-200 DIGITAL).
5. The system serial number (located on the front of the cabinet).
6. The software generic (i.e., GENERIC 1003).
7. The software Revision (i.e., 480P/D64.1 9-SEP-1986).
8. The assembly part number of the item being returned (i.e., DTMF Receiver Module - 9109-016-000-NA).
9. The assembly serial number of the item being returned - this is a white sticker located on the card itself.
10. Any pertinent alarm/error displays; this may include circuit card alarm LEDs, 7-segment displays, console or maintenance terminal error messages, or maintenance log messages.
11. A brief description of the symptoms of the problem.
12. Indicate whether the fault occurred during installation, or while the system was in service.
13. Include any further information that may be useful on the rear of the repair tag.

KA0013R0

Figure F1-1 The Mitel Repair Tag

SX-200” DIGITAL
PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX)
RS-232 MAINTENANCE TERMINAL

NOTICE

CONTENTS PAGE

CONTENTS (CONT'D) PAGE

CONTENTS (CONT'D) PAGE

LIST OF ILLUSTRATIONS

LIST OF TABLES

1. GENERAL

Introduction

1.01 This Section is intended to assist maintenance personnel in obtaining the maximum benefit from the extensive built-in maintenance features of the SX-200® DIGITAL PABX with Generic 1003 software. It provides information on the setting up and use of the RS-232 Maintenance Terminal, which is the prime maintenance tool on the SX-200 DIGITAL system. The maintenance terminal is also used for Customer Data Entry (CDE) and Traffic Measurement. All of those functions are also accessible from the Attendant Console. Since the scope of this Section is primarily maintenance-related, refer to Sections MITL9109-094-210-NA, Customer Data Entry and MITL9109-094-450-NA, Traffic Measurement for information on these topics.

Reason for Issue

1.02 This Section forms pat-t of the MITEL Standard Practices issued to provide technical information for the SX-200 DIGITAL PABX, with Generic 1003 features and software.

How to Use this Section

1.03 This Section has been arranged in such a way as to serve two distinct functions: first, as a self-teaching guide for those using the SX-200 DIGITAL PABX maintenance terminal for the first time; secondly, as a reference manual for those requiring review material. For the first group, it is recommended that the section be read through carefully, preferably with a maintenance terminal available so that the various commands may be tried out as the material is studied. For the second group, it is recommended that the index be used as a reference to the features and commands available.

2. SETTING UP

Terminal Type

2.01 The SX-200 DIGITAL PABX maintenance subsystem is designed to interface with virtually any 80-column terminal having an RS-232 type interface. The terminal may be either a video display terminal or a hard copy teleprinter. For ease of operation, a video display terminal capable of using the ANSI X3.64-1977 special character set for special graphics (i.e., VT-100 compatible) is preferred. The system prompts the user to specify the terminal type at the start of the login sequence (see paragraph 2.04). To ensure compatibility with the maintenance subsystem, the terminal should be set up for the following data characteristics:

- 8 data bits
- 1 start bit
- 1 stop bit
- no parity.

The maintenance subsystem will automatically set itself to the terminal's baud rate; however, the terminal baud rate must be one of:

- 300
- 600
- 1200
- 2400
- 4800
- 9600.

Connection to the System (Terminal)

2.02 The maintenance terminal is connected to the SX-200 DIGITAL PABX by means of a standard 25-pin RS-232 cable. One end of the cable is plugged into the main RS-232 communication port of the terminal; the other end is plugged into the RS-232 Maintenance Connector port on the system Maintenance Panel (see Figure 2-l). The Maintenance Port Selection Switch at the right of the panel should be set to "TERMINAL (DTE)". Alternatively, a modem may be plugged into the "REMOTE" connector, located on the rear maintenance panel, for communication with a remote maintenance terminal. The port selection switch should be set to "MODEM (DCE)". Note that a terminal MAY NOT be connected directly to the "REMOTE" connector. Note also that the "REMOTE" and "LOCAL" connectors may not be used concurrently.

Connection to the System (Printer)

2.03 If required, a printer (or any other ASCII output device) may be connected to the system by means of a standard 25-pin RS-232 cable. One end of the cable is connected to the RS-232 port of the printer; the other end is connected to socket J29 on the backplane of the Control Cabinet (see Figure 2-3). The printer should initially be set up for the following data characteristics:

- 8 data bits
- 1 start bit
- 1 stop bit
- no parity
- 1200 baud.

Note that the baud rate of the printer port may be changed via a command from the maintenance terminal.

Login Procedures

2.04 With the terminal powered-up, or reset, the system is ready for the user to log in. Pressing the RETURN key twice within 1 second causes the system to automatically determine the terminal's baud rate, and to query the user for the terminal type as follows:

1 - VT-I 00 COMPATIBLE
2 - TTY TYPE

SELECT A TERMINAL TYPE :

If the terminal is capable of using special graphic characters, enter 1; if not, enter 2. The system will then query the user for the type of action or application intended; i.e., Maintenance or Customer Data Entry (CDE):

1 - MAINTENANCE
2 - CDE
6 - QUIT
SELECT AN APPLICATION (OR QUIT TO START OVER) :

If the maintenance system (or CDE) is being accessed by another terminal, or an attendant console, the following message will be returned after pressing the RETURN key twice:

MAINTENANCE or CDE in use by Console Ext 1234.
Please Try Again Later

This will happen because only one user may access maintenance or CDE at any one time. Assuming that there are no users currently logged in, the system will return the username prompt after an application number (1 or 2) is chosen:

ENTER USERNAME :

2.05 Users of the SX-200 DIGITAL PABX system have five levels of system access priority available when logging-in to the maintenance terminal. Each level has its own username, and corresponding command privileges (see Appendix A). The usernames are, in descending order of priority:

- INSTALLER

- MAINT1
- MAINT2
- SUPERVISOR
- ATTENDANT.

Respond to the **username** prompt by entering one of these usernames. The system will then query the user for a password:

ENTER PASSWORD :

The *SX-200* DIGITAL system database contains one default password for all of the usernames. Passwords may be changed as required (see paragraph 4.06). The default password for all users is “1000”. Note that, for security reasons, the system does not echo the password back to the terminal. If the password is accepted, the system will prepare to set up the maintenance screen, displaying the following message for a brief moment:

Please Wait...

Logout Procedures

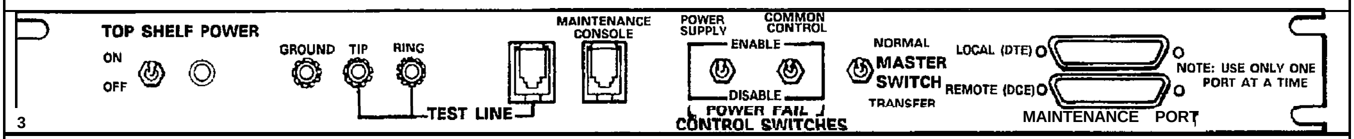
2.06 To ensure the security of the system, the **logout** procedure should be used whenever the maintenance terminal is to be left unattended. To log out, the user enters the QUIT **softkey** (see paragraph 3.02) to get out of the maintenance application. At this point, the following prompt is returned:

```
            1 - MAINTENANCE
            2 - CDE
            6 - QUIT
SELECT AN APPLICATION ( OR QUIT TO START OVER ) :
```

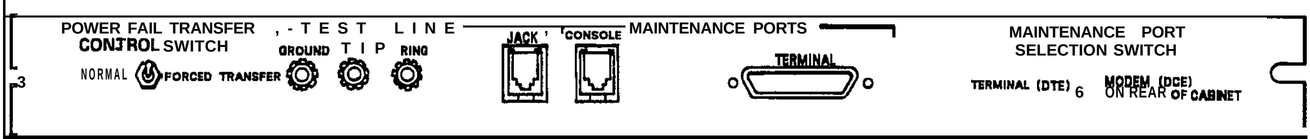
Enter “6” to log out.

or

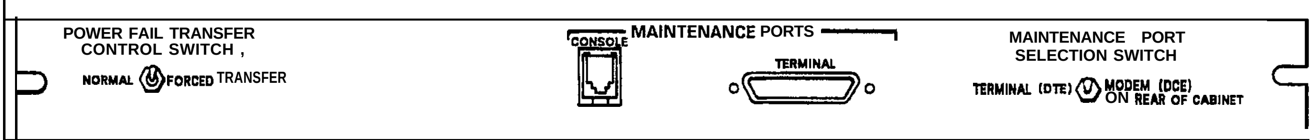
System will log out when the **10** second **logout** time out is reached.



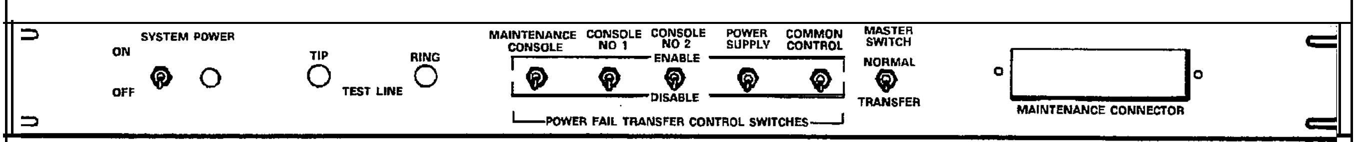
SX-200® DIGITAL PABX Maintenance Panel
(located at top of SX-200® Welded Cabinet)



SX-200” DIGITAL PABX Maintenance Panel
(located above Control Shelf in a Universal Cabinet)



SX-200” DIGITAL PABX 672 Port Maintenance Panel



SX-200® Analog Peripheral Cabinet Maintenance Panel

Note: 672 Port Peripheral Cabinet does not have a Maintenance Panel

KA0680R0E0

Figure 2-I SX-200 DIGITAL Maintenance Panels

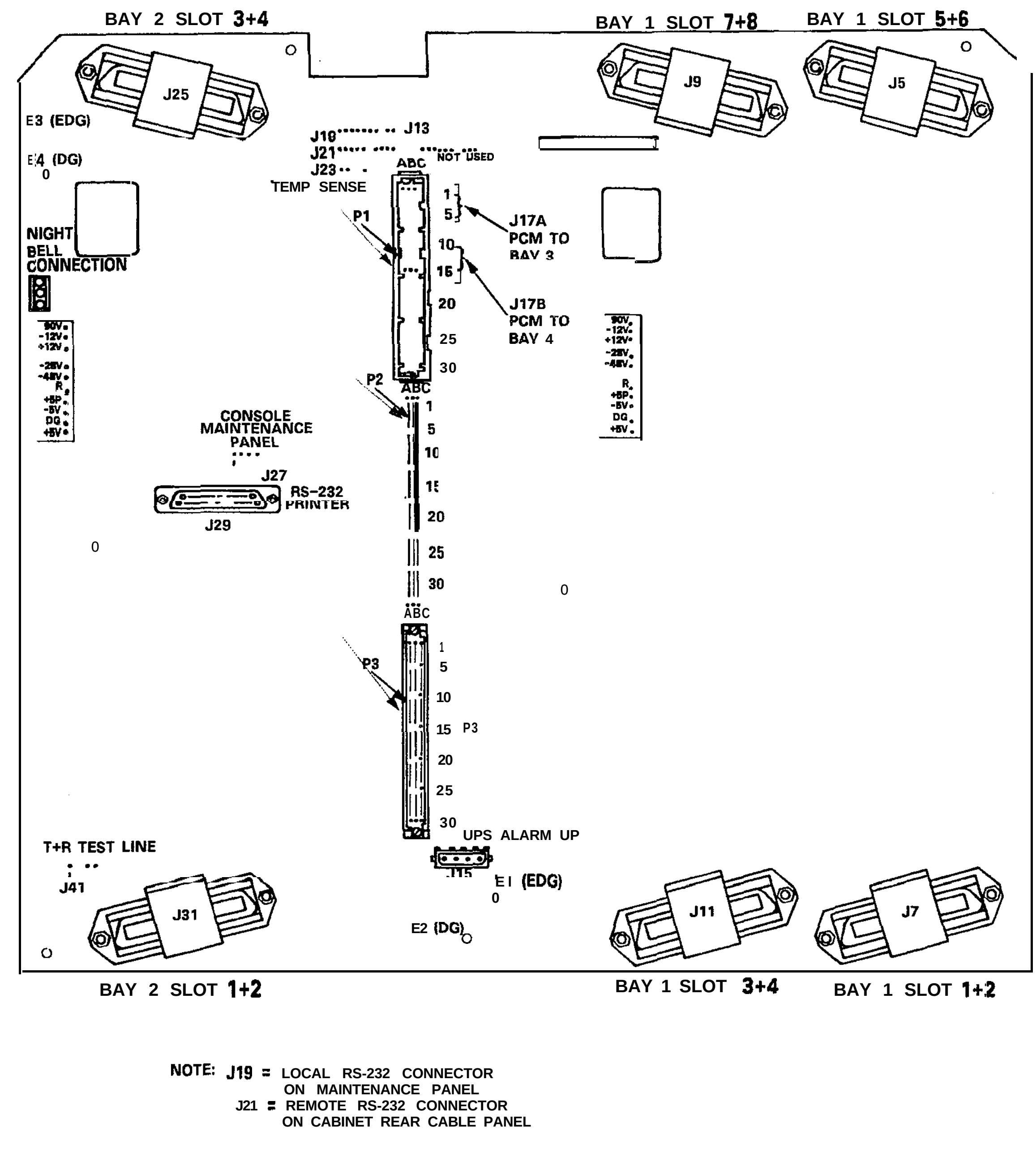


Figure 2-2 SX-200 DIGITAL Combo Backplane

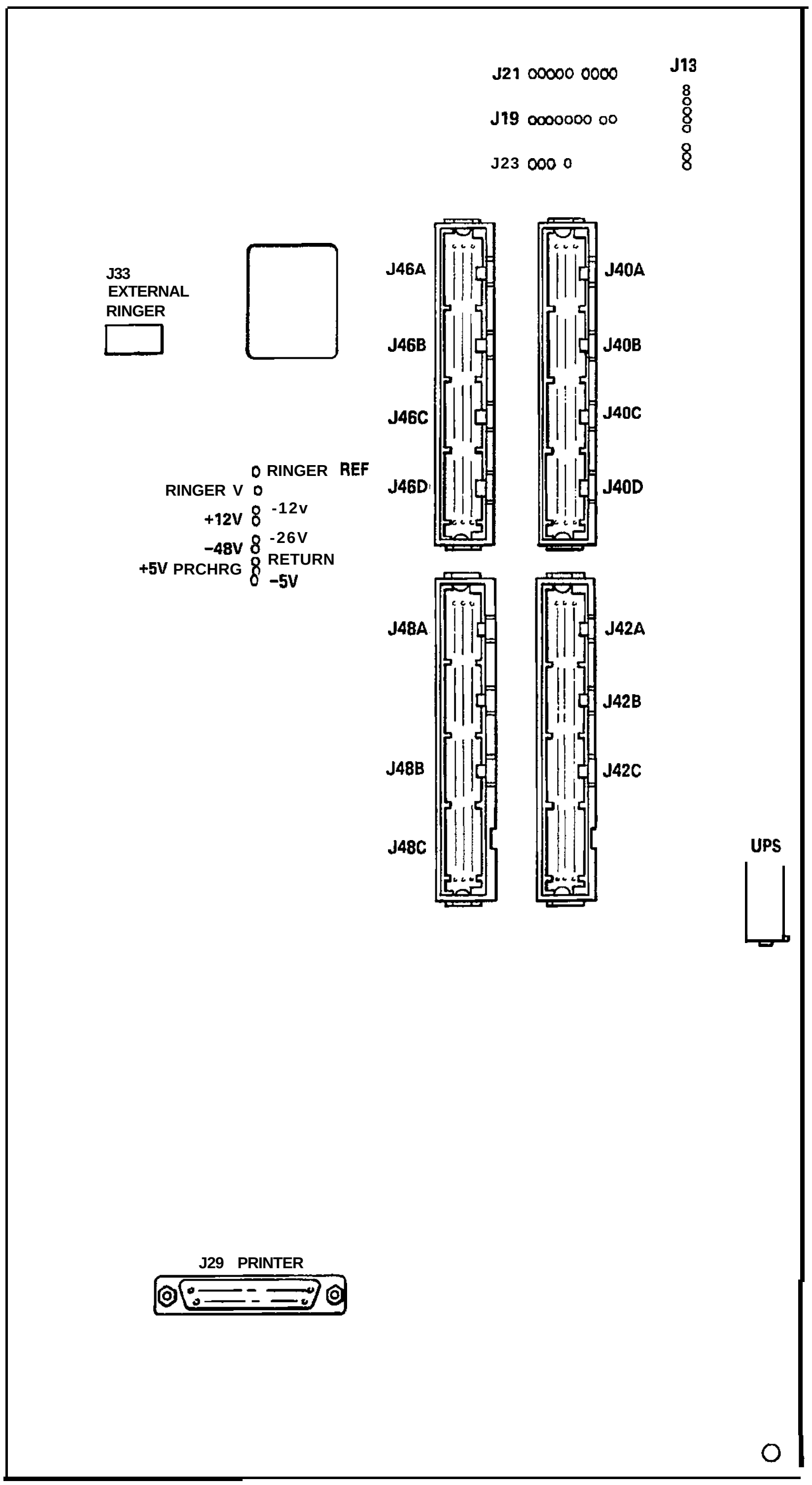


Figure 2-3 SX-200 DIGITAL Control Backplane (672-Port)

3. MAINTENANCE COMMAND INPUT

Maintenance Terminal Display

3.01 The maintenance display screen is shown in Figure 3-l. There are five distinct and separate areas to the screen:

1. Status Line: This occupies a single line above the bordered area, and displays the time and date, and the system alarm status.

2. Header Line: This occupies the top line within the bordered area. It identifies the running software version, and its creation date. It also describes which MAINTENANCE menu is currently being displayed; one of Main Menu, System, Diagnostics, Traffic Measurement, Logs, or Reports.

3. Applications Area: This occupies the next 12 lines in the bordered area. Output information resulting from command input is displayed in this area.

4. Command Line: This occupies the line directly below the Applications Area. Commands are echoed onto this line as they are input by the user. Responses to command input (other than data; e.g., error messages) are also returned here.

5. Softkey Area: The Softkey Area changes dynamically with the MAINTENANCE mode (System, Diagnostics, Traffic Measurement, Logs, or Reports) and identifies the functions of the maintenance terminal's 10 softkeys. The Softkey Area occupies the bottom two lines of the bordered area: the first line identifies the functions of softkeys 1 through 5; the second line identifies the functions of softkeys 6 through 10.

Softkey Presentation

3.02 Command entry on the SX-200 DIGITAL PABX is designed to make commands easy to use, even for those using the maintenance terminal for the first time. All commands are entered using softkeys. "Softkeys" are programmable keys, the functions of which may be changed to suit any particular application. The maintenance terminal has 10 such keys; they are the number keys (1 through 0) on the terminal keyboard. The "1" key corresponds to softkey 1 in the Softkey Area; all other softkeys are similar.

Figure 3-l Top Level Maintenance Terminal Screen Layout

4:27 1 O-FEB-87 alarm status = NO ALARM

SX-200 DIGITAL Generic 1003 480P/D64.1 6-FEB-1987 Main menu

1 -SYSTEM	2 -	3-DIAGNOSTICS	4-	5-TRAFFIC_MEAS
6-QUIT	7-LOGS	8-	S-REPORTS	0-

Entering of Commands

3.03 Commands are entered by pressing the desired softkeys in sequence, terminating each command sequence with softkey 0, the ENTER softkey. Note that pressing the conventional keyboard RETURN key has the same effect as the ENTER softkey. As softkeys are pressed, they are displayed on the Command Line. After the ENTER softkey is pressed, the command is processed by the maintenance system, and the appropriate response is returned.

Incorrect Command Entry

3.04 The SX-200 DIGITAL PABX user interface provides a comprehensive set of error messages to inform the user of incorrect command entry. While the softkey-oriented command input interface minimizes the chance of incorrect command entry, the error messages provide concise descriptions of the input error. A summary of the error messages with descriptions may be found in Appendix B.

Non-VT-l 00 Compatible Terminal Use

3.05 When using a terminal not compatible with VT-100, softkeys are presented as described above, but without the graphic bordering. Similarly, commands are entered in exactly the same manner. Instead of a Title line, the current menu is identified by the command input prompt:

- SYS> - System level menu
- DIAG> - Diagnostics level menu
- TRAFF> - Traffic Measurement menu
- LOGS> - Logs level menu
- REP> - Reports level menu.

Device Number Parameters

3.06 Some commands require the inclusion of card/circuit location numbers (referred to as physical location identification numbers - bay number, slot number, circuit number, sub-circuit number) or extension numbers as part of the input. The user is prompted for these, one at a time on the Command Line of the screen:

enter Bay then press RETURN:
enter Slot then press RETURN:
enter Circuit then press RETURN:
enter Sub-circuit then press RETURN:

OR

enter Ext. Number then press RETURN:

When these prompts occur, the softkeys are disabled, and the required numbers must be entered in the conventional manner; using the keyboard number keys and pressing the RETURN key after each entry. Note that if a 2-digit number is entered, the RETURN key is not required after each digit. When all of the required device numbers have been entered, the appropriate softkeys will again be presented.

Note: When entering circuit location numbers, the sub-circuit qualifier is often not required, and may be answered by simply pressing the RETURN key. The only devices that require sub-circuit numbers are Universal card modules such as DTMF Receiver Modules, Music-On-Hold/Pager Modules and Digital Line Card circuits.

Wild Card Characters

3.07 Wild card characters may be used to perform some command-initiated functions on a range of devices. This is done simply by not specifying circuit location numbers when prompted (pressing only the RETURN key). For example, entering Bay 1, but not specifying the slot, circuit or sub-circuit would translate to “all circuits on all cards in Bay 1”. Note that this does not apply to all commands; refer to the individual command descriptions.

Canceling a Command

3.08 The user may cancel any command at any point before entering the ENTER softkey; this is done by pressing the CANCEL softkey. The effect of this is that any softkeys that were entered and echoed back onto the Command Line are now canceled, leaving the Command Line empty and ready for new command input.

Command Line Correction

3.09 The user may correct a current command input line before entering the ENTER softkey, without having to cancel and enter the command over again. This is done by pressing the DELETE key. Each time the DELETE key is pressed, the most recently entered softkey or device number is deleted.

4. SYSTEM LEVEL FUNCTIONS

Introduction

4.01 The System Level of operation contains commands that are not necessarily maintenance applications, but affect maintenance in some way (e.g., the setting of time, date, and passwords). To access the system level commands, press the SYSTEM softkey. All of the following operations are done while in the System Level. Table 4-l provides a quick reference for all operations available in system level functions.

Time Setting and Verification

4.02 The system time-of-day may be set and verified from the maintenance terminal although the hour format used is specified during CDE. Note that the user may set the time in either 12-hour or 24-hour format by using the PM softkey as required. To set the system time from the maintenance terminal, press the following softkeys:

SET
TIME

At this point the softkeys are disabled, and the user is prompted to press the desired time:

enter Time HH:MM

After entering a valid time, the user may implement the new time-of-day by pressing the ENTER softkey, or cancel the new time by pressing the CANCEL softkey.

The user may verify the time-of-day by pressing the following softkeys:

SHOW
TIME
ENTER

Date Setting and Verification

4.03 The system date may be set and verified from the maintenance terminal. To set the system date from the maintenance terminal, press the following softkeys:

SET
DATE

At this point the softkeys are disabled, and the user is prompted to press the desired date:

enter Date DD/MM/YY

After entering a valid date, the user may implement the new date by pressing the ENTER softkey, or cancel the new date by pressing the CANCEL softkey.

The user may verify the date by pressing the following softkeys:

SHOW
DATE
ENTER

Terminal/Printer Port Status Report

4.04 The maintenance user may view the current data characteristics of the SX-200 DIGITAL PABX maintenance terminal and printer ports. Information in the reports includes communication speed (baud rate), the parity sense (odd, even, or none) and the number of stop bits. To view the status of the maintenance terminal port, press the following softkeys:

SHOW
DEVICE
MAINT-PORT
ENTER

To view the status of the printer port, enter the following softkeys:

SHOW
DEVICE
PRINTER-PORT
ENTER

An example of a status report is shown in Figure 4-l.

Software Version Report

4.05 The software version report provides the maintenance user with information on the currently running software load. The information includes software load iteration number and date of creation. To obtain a software version report, press the following softkeys:

SHOW
IDENTITY
ENTER

An example of a software version report is shown in Figure 4-2.

TABLE 4-l
SYSTEM LEVEL FUNCTIONS

LEVEL	COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER	QUALIFIER
1-SYSTEM	1-SET	1-DATE [dd/mm/yy]				
		Z-TIME [hh:mm]				
		3-PASSWORD	1-ATTENDANT [XXXXX]			
			Z-SUPERVISOR [XXXXX]			
			3-MAINT2 [XXXXX]			
			4-MAINT1 [XXXXX]			
			7-INSTALLER [XXXXX]			
		4-SPEED	I-MAINT-PORT [speed]			
			B-PRINTER-PORT [speed]			
		8-RESET_TIME	1-AFTER_N_FLTS			
			Z-DAY/TIME	1-MONDAY	1-TIME [hh:mm]	
				2-TUESDAY	1-TIME [hh:mm]	
				3-WEDNESDAY	1-TIME [hh:mm]	
				4-THURSDAY	1-TIME [hh:mm]	
				6-FRIDAY	1-TIME [hh:mm]	
				7-SATURDAY	I-TIME [hh:mm]	
				8-SUNDAY	I-TIME [hh:mm]	
				9-DAILY	I-TIME [hh:mm]	
			3-IMMEDIATELY			
		9-ALARM_THRESH	I-LINES	1-SYSTEM	B-CONFIRM	
			Z-TRUNKS	Z-BAY NOTE: USER MUST ENTER BAY NUMBER		
			3-RECEIVERS			
			Q-PCM-CHANNELS			
	-SHOW	1-DATE				
		2-TIME				
		4-DEVICE	I-MAINT-PORT			
			4-DATASTN_PLID	1-BAY/SLOT/CCT		
				3-EXT-NUM		
			8-PRINTER_PORT			
		B-RESET-TIME				
		B-IDENTITY				
	I-COPY	1-DATABASE				
	I-MONITOR	1-SMDR				
		2-DATA_SMDR				
		3-DIAGNOSTICS	1-STEP			
			2-SLOW_SCAN			
			3-FREE_RUN			
		7-LOGS	1-MAINT-PORT			
			2-SYS_PRINTERS			
	i-SUSPEND_PRTR	7-PRINTER_PLID	1-BAY/SLOT/CCT/			
			3-EXT-NUM			
		8-PRINTER_PORT				
	i-QUIT					

TABLE 4-1 (CONT'D)
SYSTEM LEVEL FUNCTIONS

LEVEL	COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER	QUALIFIER
	7-RESUME-PRTR	7-PRINTER-PLID	1-BAY/SLOT/CCT			
			3-EXT-NUM			
		S-PRINTER-PORT				
	B-FE-START	Z-RESET-SYSTEM				
	9-STOP	7-LOGS				

Figure 4-l Terminal/Printer Port Status Report

4:27 1 O-FEB-87 alarm status = NO ALARM

SX-200 DIGITAL Generic 1003 480P/D64.1 6-FEB-1987 System

```
SHOW DEVICE PORT     :  MAINTENANCE
          SPEED      : 9600 BPS
          PARITY     : NONE
          STOP BITS  : 1
```

I-SET	2-SHOW	3-COPY	4-MONITOR	5-SUSPEND-PRTR
6-QUIT	7-RESUME-PRTR	8-RE-START	9-STOP	0-

Figure 4-2 Example of SHOW IDENTITY Display

4:27 1 O-FEB-87 alarm status = NO ALARM

SX-200 DIGITAL Generic 1003	48?P/D64.1	6-FEB-1987	System
CARD NAME	BAY #	PROM ID	DEBUG CAPABILITY
MAIN CONTROL CARD	0	**OE	YES

SHOW IDENTITY

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

Password Change

4.06 It is recommended, for system security, that passwords be changed regularly once the SX-200 DIGITAL PABX has been put into service. Password changes may be made by the affected username, or any other username with a higher priority (see paragraph 2.05). A password may be any string of alphanumeric characters of up to 20 characters in length (any more characters are ignored).

Important: Entering new passwords with alphabetic characters will make login from the Attendant Console impossible, as only numeric characters may be entered from the console.

To change the password, press the following softkeys:

SET
PASSWORD
(select the required Username)
ENTER

The system then prompts the user for the old password (See Note):

Enter Old Password then press RETURN/ENTER:

The user enters the old password, and the system prompts the user for the new password:

Enter New Password then press RETURN/ENTER:

The system then prompts the user to verify the new password:

Enter New Password to verify then press RETURN/ENTER:

After the user verifies the new password, the system implements the password change; the old password is no longer valid. An incorrect entry of the old or new passwords will cause the password changing process to be aborted. Note that neither the old nor the new passwords are echoed back to the maintenance terminal display.

Note: If the Username selected is the one used when Logging-in, the system will prompt for the old password. When the username selected is a lower level than the login user the system will not require verification of access priority and will prompt for the new password only.

Baud Rate Setting (Terminal)

4.07 The baud rate of the SX-200 DIGITAL maintenance terminal port may be changed from its value at login time. Any one of six different baud rates may be chosen: 300, 600, 1200, 2400, 4800 or 9600 baud. To change the terminal baud rate, press the following softkeys:

SET
SPEED
MAINT-PORT
(select the softkey for the desired baud rate)
ENTER

Note: This operation changes the baud rate of the SX-200 DIGITAL PABX port only. The maintenance terminal baud rate must be changed separately. Refer to the manufacturer's instructions for the particular terminal being used.

At this point, the softkeys are disabled, and the system prompts the user to change the terminal speed:

change terminal speed and press RETURN when ready

Baud Rate Setting (Printer)

4.08 The baud rate of the SX-200 DIGITAL system printer port may be changed from its default value of 1200 baud. Any one of six different baud rates may be chosen: 300, 600, 1200, 2400, 4800 or 9600 baud. To change the printer port baud rate, press the following softkeys:

SET
SPEED
PRINTER-PORT
(select the softkey for desired baud rate)

After a value is entered, the user may implement it by pressing the ENTER softkey, or cancel it by pressing the CANCEL softkey. Note that this operation changes the baud rate of the SX-200 DIGITAL system port only; the baud rate of the printer itself must be changed separately. Refer to the manufacturer's instructions for the particular printer being used.

Setting Print Device

4.09 Log entries are produced at the device named in the CDE Form, DIRECTED I/O. See Section MITL9109-094-2 10 Customer Data Entry for details.

Database Copying

4.10 The user may make a copy of the system database on another floppy disk for use as a backup source. Note that only the database is copied; the diskette being written to must already have the system software stored on it. To copy the database, press the following softkeys:

COPY
DATABASE
ENTER

At this point, the system starts verifying the database, then loading the database from the disks into the system RAM memory. When this is done, the system prompts the user to remove the disks, and to insert the new disks:

Insert new disks, close doors and press CONTINUE

At this point the user may press the CONTINUE softkey to write to the new disks, or the CANCEL softkey to abort the process. If the user presses the CONTINUE softkey the saved database will be written to the new disks; the save will take several minutes, depending upon the size of the database. When the process is completed, the following message is returned to the terminal:

Copy successful. If upgrading then RESET - else press CANCEL to continue.

The backup disks and the original disks will now have identical databases. See Appendix C for additional information.

THE MONITOR COMMAND

Monitor Diagnostics

4.11 The MONITOR DIAGNOSTICS command is a "window" into the maintenance system's diagnostic controller, the Maintenance Manager. With this, the user may monitor the progress of the SX-200 DIGITAL PABX diagnostics as they are being run. See Part 6 of this Section for further information on diagnostics.

4.12 To monitor the progress of the currently running diagnostic, press the following softkeys:

MONITOR
DIAGNOSTICS

At this point the user may press the ENTER softkey to begin the monitor process, or the CANCEL softkey to cancel the command. If the user presses the ENTER softkey, diagnostic data will be written on the Application Area of the screen.

4.13 The user may alter the manner in which the monitor display is updated, through the use of the "STEP", "SLOW-SCAN" and "FREE-RUN" softkeys.

The "STEP" softkey enables the user to advance through the diagnostic process step-by-step. This manual control permits user viewing of each diagnostic state.

The "SLOW-SCAN" softkey results in the display of each diagnostic test as it is run until a command is given to stop. The Maintenance Manager decreases the speed at which the monitoring of the diagnostics occurs, and the Maintenance Terminal display is updated as each test is run.

The "FREE-RUN" softkey causes the monitor to run the diagnostic tests at full speed. The Maintenance Terminal display is only updated intermittently. This permits the user the ability to progress quickly through the diagnostic tests, until the area of specific interest is encountered.

An example of the monitor output is shown in Figure 4-3 (for definition of terms, see Table 4-2).

Figure 4-3 Example of MONITOR DIAGNOSTICS Display

4:27 1 O-FEB-87 alarm status = NO ALARM

SX-200 DIGITAL Generic 1003 480P/D64.1 6-FEB-1987 System

	BKGRND	SYSTEM	PWR UP	FLT ISO	PWR RET	FLT RET	USR DIR
SYST :	4	0	0	0	0	0	0
BAY :	4	0	0	0	0	0	0
CARD :	2	0	0	0	0	0	0
DEV :	1	0	0	0	0	0	0

DEV PLID : 2 3 3 2 EXT/TRNK : - CUR MODE : backgrnd
CARDTYPE : rcvr mod BCKGR EN : on MQDESTAT : dg avail
CARDSTAT : instld PWRUP EN : off DIAG NAM : digl cod I/b
DEV TYPE : rcvr NUM CCTS : 4 DIAGSTAT : state 2
DEV STAT : avail DIAGRSLT : pass
TX LK-CH : 12-23 RX LK-CH : 12-23

DIAGNOSTICS

1 -STEP	-2-SLOW-SCAN	3-FREE-RUN	4 -	5-CANCEL
6 -	7-	8-	9 -	0-

(For definition of terms, see Table 4-2)

4.14 The following is a summary of the terms used in the "Monitor Diagnostics" display:

TABLE 4-2
TERMS USED IN MONITOR DIAGNOSTICS DISPLAY

Term	Meaning
SYST	The total systemwide number of devices waiting to be tested on the following queues: BKGRND - Background diagnostic queue SYSTEM - system request diagnostic queue PWR UP - Power-up diagnostic queue FLT ISO - second chance test queue PWR RET - Power-up diagnostic retry queue (CP had device) FLT RET - second chance test retry queue (CP had device) USR DIR - User (directed diagnostic) queue
BAY	The number of devices in this Bay (see "DEV PLID") waiting to be tested, on the same queues as above.
CARD	The number of devices on this card (see "DEV PLID") waiting to be tested, on the same queues as above.
DEV	Tests pending for the circuit being monitored.
DEV PLID	The physical location identification of the circuit being monitored; a 4 to 8-digit number representing Bay, slot, circuit and sub-circuit numbers.
CARDTYPE	The type of card being monitored; one of the following: nil - nil card ons - ONS line card ls/gs trk - CO trunk card universal - Universal card dlc - Digital line card *superset* - COV line card did trunk - DID trunk card em trunk - E&M trunk card ops - OPS line card main cntl - Main Control card bay cntl - Bay Control card digtl i/f - Digital Interface card perip ctl - PPC card ram mod - DRAM module T1 trunk - Digital Trunk card dx mod - DX module rcvr mod - DTMF Receiver module moh mod - Music on hold module cons mod - DLIC (digital line interface circuit) module modem mod - ls-modem-mod-type emtrk mod - E&M trunk module

TABLE 4-2 (CONT'D)
TERMS USED IN MONITOR DIAGNOSTICS DISPLAY

Term	Meaning
CARDSTAT	The status of the card being monitored; one of the following: instld - the correct card type is installed unplug - the card is either unplugged, or not installed wrong - an incorrect card type is installed
DEV TYPE	The type of device being monitored; one of the following: dsp - 7720 Digital signal processor ons - ONS line circuit ops - OPS line circuit rcvr - DTMF receiver module moh - Music on hold module ls/gs - CO trunk circuit cons - DLIC (digital line interface circuit) module jnctr - junctor set - COV/digital set or data set dnic - Digital line circuit did - DID trunk circuit e & m - E&M trunk circuit pcm - Bay DX circuit T1 - T1 circuit poolm - pooled modem dncon - DNIC based console
DEV STAT	The status of the device being monitored; one of the following: avail - available to CP and maintenance progr - programmed in CDE but not installed unpro - not programmed in CDE suspt - suspect, failed one diagnostic test flty0 - faulty flty1 - faulty with one pass flty2 - faulty with two passes flty3 - faulty with three passes flty4 - faulty with four passes flty5 - faulty with five passes flty6 - faulty with six passes bsout - forced busy, busied-out
EXT/TRNK	Extension number/trunk number of the device being monitored
BCKGR EN	Background diagnostics enable flag; either "on" or "off"
PWRUP EN	Power-up diagnostics enable flag; either "on" or "off"
NUM CCTS	Number of circuits programmed for the specified card type

TABLE 4-2 (CONT'D)
TERMS USED IN MONITOR DIAGNOSTICS DISPLAY

Term	Meaning
CUR MODE	The current test mode; one of the following: system - system request diagnostics backgrnd - background diagnostics power up - power-up diagnostics pwr rtry - power-up diagnostics retry fault isol - diagnostic second-chance flt retry - diagnostic second-chance retry user - directed diagnostics
MODESTAT	The status of the specified test mode; one of the following: idle - idle device reqst dev - requesting device to test dev locatd - located device to test dev n/a - device being used by call processing res alloc - test resources allocated res n/a - test resources could not be allocated dg avail - determined which test to run reqst test - message to Bay to request test enter test - message to Bay to start test dg disable - diagnostics disabled dg active - testing wait msg - waiting for test result diag done - current diagnostic done dg pending - other tests pending on circuit dgs compl - all tests done dg incompl - test incomplete dg aborted - circuit taken by CP before test completed audit req - requests out of sync; checking
DIAG NAME	The current diagnostic test being run; one of the following: force hi/low - junctor test digl cod l/b - codec digital loopback test anlg cod l/b - codec analog loopback test status check - console test inject codec - codec transmission test message lamp - message lamp/ringer present test switch hook - switch hook test a/d convert - A/D converter reference test read card id - card read test hybrid l/b - hybrid loopback test dtmf tones - dtmf receiver test printer port - printer port test dnic o/p l/b - dnic output loopback test dnic i/p l/b - dnic input loopback test dnic chksum - dnic set eprom checksum test dnic bphone - dnic set bphone test dnic transdu - dnic set transducer test dataset l/b - dataset data loopback test earpiece tst - dnic set transducer earpiece test

TABLE 4-2 (CONT'D)
TERMS USED IN MONITOR DIAGNOSTICS DISPLAY

Term	Meaning
DIAG NAME (CONT'D)	speaker test - dnic set transducer speaker test microph test - dnic set transducer microphone test mouthpce tst - dnic set transducer mouthpiece test DSP memory - NEC7720 memory test DSP tone det - NEC7720 tone detect test DSP tone gen - NEC7720 tone generation test DSP conferen - NEC7720 conference test PCM loopback - full pcm loopback test link shared? - is link shared test rd bc dx+l - read next bay dx rd mc dx+l - read next mcc dx rd bc dx - read bay dx tx fr bc dx - send from bay dx tx fr bcdx+l - send from next bay dx tx fr mcdx+1 - send from next mcc dx tx fr mcdx+l - send from next mcc dx to bay only voice set? - is there a voice set data set? - is there a data set other half? - does otherhalf has a set dig bay test - digital bay test get jnc test - get junctor test 8804 test - analog 8804 test no failures - analog no failures test alt dev - analog alt dev test alt dev l/b - analog alt dev loopback test T1 chn l/b - T1 channel loopback test pldmdm ansr - pooled modem answer mode test pldmdm orig - pooled modem origination mode test retest prim - retest primary retest secon - retest secondary junc isol? - has junctor been isolated alt device? - enough alternate devices suspect junc - make junctor supect 50% junctors - enough junctors
DIAGSTAT	The current diagnostic state; one of the following: pass state - current test has passed isolated - fault detected, isolated unisolated - fault detected, unisolated state 1 through state 25 Note: States 1 through 25 are dependent upon the device under test; refer to Section MITL9109-094-353-NA, General Maintenance Information for further details

TABLE 4-2 (CONT'D)
TERMS USED IN MONITOR DIAGNOSTICS DISPLAY

Term	Meaning
DIAGRSLT	Result of the most recent diagnostic test; one of the following: pass - test passed without errors fail - error(s) occurred inconcl - inconclusive; call processing aborted the test or the Bay failed to return a message dev n/a - device not available - being used by CP
TX LK-CH	Transmit link and channel
RX LK-CH	Receive link and channel

Monitor Logs

4.15 The user may monitor the progress of the SX-200 DIGITAL PABX maintenance logs as they occur. When the monitor logs process is running, the maintenance logs will be output to the print device as well as being recorded on the system floppy disk. The output device may be either the maintenance terminal, or the system printers. If monitoring logs on the system printer port, the user may log out from the maintenance terminal without first stopping the monitor process. However, if the user is monitoring logs on the maintenance terminal, the monitor process must first be stopped before logging out. To monitor logs, press the following softkeys:

MONITOR
LOGS
MAINT-PORT
ENTER

For further information on maintenance logs, see Part 6 of this Section, and Section MITL9109-094-353-NA, General Maintenance Information.

Monitor SMDR

4.16 The user may monitor the progress of the SX-200 DIGITAL system SMDR reports as they occur. Unlike the MONITOR LOGS command, monitoring of SMDR may only be done at the maintenance terminal. It is not necessary to select a print device in this case, as monitoring will be output to the maintenance terminal automatically. This does not affect the spontaneous printing of SMDR data to the system printer port. To monitor SMDR reports at the maintenance terminal, press the following softkeys:

MONITOR
SMDR
ENTER

Refer to Section MITL9109-094-221-NA, Station Message Detail Recording for further information on SMDR.

Monitor DATA-SMDR

4.17 The user may monitor the progress of the SX-200 DIGITAL system DATA-SMDR reports as they occur. Unlike the MONITOR LOGS command, monitoring of DATA-SMDR may only be done at the maintenance terminal. It is not necessary to select a print device in this case, as monitoring will be output to the maintenance terminal automatically. This does not affect tha spontaneous printing of DATA-SMDR data to the system printer port. To monitor DATA-SMDR reports at the maintenance terminal, press the following softkeys:

MONITOR
DATA-SMDR
ENTER

Refer to Section MITL9109-094-221-NA, Station Message Detail Recording for further information on DATA-SMDR.

Initiating System Reset

4.18 The Re-start command allows the maintenance user to reset the system. The purpose of this is to optimize the integrity of the system software. This should be done only during a period of low or no call processing traffic, as the system will be totally inoperative for a period of approximately 1 minute. To initiate a system reset, enter the following softkeys:

RE_START
RESET-SYSTEM
ENTER

4.19 The maintenance user may also program the system to reset in the event of a fault occurrence, at a predetermined time of day. This may be set for a particular day or daily. To program a system reset, press the following keys:

SET
RESET-TIME
DAY/TIME
(press one of the seven “day” softkeys or DAILY)
TIME
(enter the hour and minutes in 24 hour format - hours must be 01 - 24)
ENTER

Note: The system will reset only if a fault occurs.

4.20 The maintenance user may also program the system to reset after one or after 101 system software faults. To program the system to reset after a single software fault, press the following keys:

SET
RESET-TIME
IMMEDIATELY
ENTER

To program the system to reset after 101 such anomalies, press the following keys:

SET
RESET-TIME
AFTER_N_FLTS
ENTER

System Reset Report

4.21 The maintenance user may obtain a report indicating when, and under what conditions a system reset will occur. To obtain such a report, press the following keys:

SHOW
RESET-TIME
ENTER

Setting of Alarm Thresholds

4.22 Alarm thresholds may be programmed by the maintenance user to facilitate the requirements of a particular system. Table 4-3 shows the default values of the alarm thresholds. Refer to Section MITL9109-094-353-NA, General Maintenance Information for further details on the alarms and alarm thresholds. To change the alarm thresholds for lines throughout the entire system, press the following softkeys:

SET
ALARM-THRESH
LINES
ENTER
SYSTEM
(enter the desired MINOR Alarm threshold percentage, or press RETURN to leave unchanged)
(enter the desired MAJOR Alarm threshold percentage, or press RETURN to leave unchanged)
(enter the desired CRITICAL Alarm threshold, or press RETURN to leave unchanged)
ENTER
CONFIRM

4.23 The procedure for changing alarm thresholds for trunks, DTMF receivers and PCM channels (junctors) is the same as that shown for lines. The only difference is that the TRUNKS, RECEIVERS or PCM-CHANNELS softkeys are used in place of the LINES softkey.

4.24 Alarm thresholds may be changed on a bay basis as well. The procedure is the same as that shown above, the only difference being that the BAY softkey is used in place of the SYSTEM softkey. DTMF receiver thresholds may be changed only in digital bays.

4.25 In all cases, the Alarm Threshold table will be shown in the Applications area of the screen. An example of the Alarm Threshold table is shown in Figure 4-4.

TABLE 4-3
DEFAULT ALARM THRESHOLDS

ALARM CATEGORY (Peripheral Devices)	ALARM THRESHOLDS		
	Minor	Major	Critical
Lines	0%	20%	0
Trunks	0%	10%	0
DTMF Receivers	0%	25%	0
PCM Channels (Junctors)	10%	25%	1

Figure 4-4 Example of ALARM THRESHOLD Display

1 O-FEB-87 alarm status = MAJOR

SX-200 DIGITAL Generic 1003 480P/D64.1 6-FEB-1987 Reports

BAY# OR SYSTEM	NUMBER OF DEVICES	TOTAL DEVICES UNAVAIL	PERCENT UNAVAILABLE	ALARM LEVEL	ALARM THRESHOLDS		
					MINOR	MAJOR	CRITICAL
Bay# 1	13	1	7%	Minor	0%	20%	0
Bay# 2	2	1	50%	Major	0%	20%	0
Bay# 3	1	0	0%		0%	20%	0
Bay# 4	0	0	0%		0%	20%	0
Bay# 5	0	0	0%		0%	20%	0
System	16	2	12%	Minor	0%	20%	0

SET ALARM-THRESH LINES SYSTEM MINOR =

1-	2-	3-	4-	5-
6-	7-	8-	9-	0-

5. REPORTS LEVEL FUNCTIONS

Introduction

5.01 The Reports Level of operation is a conglomeration of static commands that are designed to display maintenance information. Types of reports available are: configuration, alarm status, circuit status, PCM path status and the displaying and clearing of device errors. To access the reports level commands, press the REPORTS softkey. All of the following operations are possible while in the Reports Level.

Equipment Configuration Report

5.02 The Configuration report provides the maintenance user with information on the hardware which is currently installed in the system. The user may request a configuration report on a specific card slot, a specific extension number, or the entire system. The information provided includes:

- the physical location(s), in terms of bay number, slot number, and circuit (module) number
- the installed type of card/module
- the card/module type programmed for that location.

Entire System

5.03 To obtain a configuration report on the entire system, press the following softkeys:

SHOW
CONFIG
ALL
ENTER
(MORE or CANCEL)

Specific Card Slot

5.04 To obtain a configuration report on a specific card slot, press the following softkeys:

SHOW
CONFIG
BAY/SLOT/CCT
(enter the required bay, slot and circuit numbers, pressing the RETURN key after each one)
ENTER

Specific Extension

5.05 To obtain a configuration report on a specific extension number, press the following softkeys:

SHOW
CONFIG
EXT-NUM
(enter the required extension number, then press the RETURN key)
ENTER

5.06 In all cases, the system will output the configuration data in the Applications Area of the screen. In cases where the data requires more space than is available on the screen, the user is prompted to request more data via the MORE softkey, or to cancel the output via the CANCEL softkey. An example of a configuration report is shown in Figure 5-1.

TABLE 5-1
REPORTS LEVEL FUNCTIONS

LEVEL	COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER	QUALIFIER
1-REPORTS	1-SHOW	1-CONFIG	1-BAY/SLOT/CCT			
			I-EXT-NUM [number]			
			L-ALL			
		!-ALARMS	1- DEVICE TYPE	1-LINES		
				2-TRUNKS		
				3-RECEIVERS		
				4-PCM-CHANNELS		
			I-ALL	O-MORE		
		S-STATUS	-BAY/SLOT/CCT			
			2-SWID	1-SW-STATION	See Note	
				2-SW-RECEIVER	See Note	
				3-SW CONSOLE	See Note	
				4-SW_LINE	See Note	
				6-SW_DTMF_GEN	See Note	
				7-SW-SET	See Note	
				D-SW-DATA-STN	See Note	
				O-MORE-KEYS	I-SW-CO-TRUNK	See Note
					2-SW-DID-TRUNK	See Note
					3-SW_TIE_TRUNK	See Note
					4-SW_DISA_TRUNK	See Note
					S-SW-CAP	See Note
					7-SW_TRUNK_GRP	See Note
					8-SW_HUNT_GRP	See Note
					O-MORE-KEYS	
			3-EXT-NUM [number]			
			4-ALL	1-CP_DWA		
				2-CP_DWA_MEM		
				3-LINK STATUS		
				6-MT_DWA		
				7-MT_DWA_MEM		
				8-UP_1_PAGE		
				9-DOWN_1_PAGE		
		S-CHANNEL-MAP	1-LOGICAL	1-CHANNEL NUM		
			2-PHYSICAL	1-BAY_NUM		
				2-LINK-NUMBER		
		r-ERRORS	1-DEVICE-TYPE	1-SS3 SS4		
				2-DISK		
				3-DIGITAL_SETS		
				4-HDLC		
				6-DATASETS		
				7-CONSOLE		
				9-T1_TRUNK		

TABLE 5-I (CONT'D)
REPORTS LEVEL FUNCTIONS

LEVEL	COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER	QUALIFIER
	3-CLEAR	7-ERRORS	1-BAY/SLOT/CCT			
			2-DEVICE-TYPE	1-SS3_SS4		
				2-DISK		
				3-DIGITAL SETS		
				4-HDLC		
				6-DATASETS		
				'I-CONSOLE		
				D-II-TRUNK		
			3-EXT-NUM			
			4-ALL	8-CONFIRM		
	6-QUIT					

Note: The following softkeys are presented when a SWID selection is made; 1-CP_DWA. 2-CP_DWA_MEM, 6-MT_DWA, 7-MT_DWA_MEM, 8-UP_1_PAGE, g-DOWN-1 -PAGE

Figure 5-I Example of CONFIGURATION Report Display

4:27 1 O-FEB-87 alarm status = NO ALARM

BAY SLT CCT	PROGRAMMED	INSTALLED
1 1 0	ONS card	ONS card
1 2 0	LS/GS trnk card	
1 3 0	ONS card	
1 4 0	ONS card	ONS card
1 5 0	UNIVERSAL card	UNIVERSAL card
1 5 1	DLIC module	DLIC module
1 5 2		
1 5 3		
1 5 4		

SHOW CONFIG ALL

1-	2 -	3 -	4 -	5-CANCEL
6 -	7 -	8 -	9 -	O-MORE

Alarm Status Report

5.07 The Alarms Manager is a software program which monitors the performance of the SX-200 DIGITAL PABX, compares it to a set of default thresholds and, if the system performance is below the specified level, causes an alarm to be raised. There are four alarm categories:

- Lines
- Trunks
- DTMF Receivers
- PCM Channels (junctors).

There are four alarm levels defined:

- NO ALARM
- MINOR
- MAJOR
- CRITICAL

There are three types of alarms:

- Bay Alarms - these are the alarm levels of the categories specific to each separate bay in the system.
- System Alarms - these are the alarm levels of the categories on a systemwide basis.
- Overall Alarm - this is the overall system alarm level, taking into account all of the bay alarms and system alarms in all categories. Note that this is displayed at all times above the upper right corner of the enclosed area of the maintenance display.

For more information on alarms, see Section MITL9109-094-353-NA, General Maintenance Information.

Alarm Report - All Devices

5.08 The user may obtain an alarm report on the entire system (i.e., all device types, in all bays of the system) by pressing the following softkeys:

SHOW
ALARMS
ALL
ENTER
(MORE or CANCEL)

Alarm Report - Specific Device Type

5.09 The user may obtain an alarm report on a specific device type (category) by pressing the following softkeys:

SHOW
ALARMS
DEVICE TYPE
(LINES or TRUNKS or RECEIVERS or PCM-CHANNELS)
ENTER

5.10 In all cases, the system will output the alarm status data in the Applications Area of the screen. In cases where the data requires more space than is available on the screen, the user is prompted to request more data via the MORE softkey, or to cancel the output via the CANCEL softkey. An example of an alarm report is shown in Figure 5-2.

Figure 5-2 Example of LINE ALARM Status Display

4:27 1 O-FEB-87 alarm status = MAJOR

SX-200 DIGITAL Generic 1003 480P/D64.1			6-FEB-1987		Reports		
BAY# OR SYSTEM	NUMBER OF DEVICES	TOTAL DEVICES UNAVAIL	PERCENT UNAVAILABLE	ALARM LEVEL	ALARM THRESHOLDS		
					MINOR	MAJOR	CRITICAL
Bay# 1	13	1	7%	Minor	0%	20%	0
Bay# 2	2	1	50%	Major	0%	20%	0
Bay# 3	1	0	0%		0%	20%	0
Bay# 4	0	0	0%		0%	20%	0
Bay# 5	0	0	0%		0%	20%	0
System	16	2	12%	Minor	0%	20%	0

LINE ALARMS DISPLAY

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

(For definition of terms, see Table 5-2).

5.11 The following is a summary of the terms used in the alarm status report:

TABLE 5-2
TERMS USED IN THE ALARM STATUS REPORT

Term	Meaning
BAY# OR SYSTEM	The range of the specified alarm category; one of: Bay 0, Bay 1, Bay 2, Bay 3, Bay 4, Bay 5, Bay 6, Bay 7, or System; i.e., a specific bay, or the entire svstem.
NUMBER OF DEVICES	Total number of devices programmed in the specified category in the specified range; e.g., a total of 13 lines in Bav 1.
TOTAL DEVICES UNAVAIL	Total number of devices unavailable to Call Processing in the corresponding TOTAL.
PERCENT UNAVAILABLE	The percentage of devices unavailable to Call Processing in the corresponding TOTAL.
ALARM LEVEL	The current alarm level in the specified ranae.
MINOR	The Minor Alarm threshold - a percentage of the total number of devices in the specified range.
MAJOR	The Major Alarm threshold - a percentage of the total number of devices in the specified range.
CRITICAL	The Critical Alarm threshold - the actual minimum number of devices in the specified range allowed before the system will reset.

Equipment Status Report

5.12 The equipment status report provides the maintenance user with information concerning the current Call Processing and Maintenance states of any device or range of devices. The information provided includes:

- the physical location(s), in terms of bay number, slot number, circuit number, and sub-circuit number
- the extension number (where applicable)
- the programmed type of circuit
- the maintenance status of the circuit
- the software status of the circuit
- the hardware status of the circuit
- background diagnostics status
- power-up diagnostics status
- PCM link and channel number used (where applicable).

Status - Entire Bay

5.13 To obtain an equipment status report on an entire bay, press the following softkeys:

SHOW
STATUS
BAY/SLOT/CCT
(enter the required bay number, press the RETURN key, and enter only the RETURN key for the slot, circuit and sub-circuit prompts)
ENTER

Status - Specific Card Slot

5.14 To obtain an equipment status report on a specific card slot, press the following softkeys:

SHOW
STATUS
BAY/SLOT/CCT
(enter the required bay, and slot numbers, pressing the RETURN key after each one; enter only the RETURN key for the circuit and sub-circuit prompts)
ENTER

Status - Specific Circuit

5.15 To obtain an equipment status report on a specific circuit, press the following softkeys:

SHOW
STATUS
BAY/SLOT/CCT
(enter the required bay, slot and circuit numbers, pressing the RETURN key after each one; enter only the RETURN key for the sub-circuit prompt)
ENTER

Status - Specific Extension

5.16 To obtain an equipment status report on a specific **extension** number, press the following softkeys:

SHOW
STATUS
EXT-NUM
(enter the required extension number, then press the RETURN key)
ENTER

Status - SWID

5.17 To obtain an equipment status report on a software identifier, press the following softkeys;

SHOW
STATUS
SWID
(press one of the softkeys shown in Table 5-3)
ENTER

This operation enables user to show status by selection of a device type.

TABLE 5-3
SWID NPES

Softkeys	
SW-STATION	SW-CO-TRUNK
SW-RECEIVER	SW-DID-TRUNK
SW-CONSOLE	SW-TIE-TRUNK
SW-LINE	SW_DISA_TRUNK
SW_DTMF_GEN	SW-CAP
SW-SET	SW-TRUNK-GRP
SW-DATA-STN	SW-HUNT-GRP

5.18 In all cases, the system will output the equipment status data in the Applications Area of the screen. In cases where the data requires more space than is available on the screen, the user is prompted to request more data via the MORE softkey, or to cancel the output via the CANCEL softkey.

An example-of an Equipment Status Report is shown in Figure 5-3. The Maintenance Device Work Area (DWA) is described in Section MITL9109-094-353-NA, General Maintenance Information.

Figure 5-3 Example of EQUIPMENT STATUS Report

4:27 1 O-FEB-87 alarm status = NO ALARM

BB	SS	CC	SC	SOFTWARE-ID	EX/TK	TYPE	BG	PWR	MTSTAT	SWSTAT	HWSTAT
1	1	5	0	station 0	1105	ons	on	off	avail	idle	idle
1	1	6	0	station 1	1106	ons	on	off	avail	idle	idle
1	1	1	0	co-trk 0	1	ls/gs	of	off	progr	bsout	down
1	3	2	0	co-trk 1	2	ls/gs	on	off	avail	idle	maint
1	3	3	0	co-trk 2	3	ls/gs	on	off	avail	dialg	idle
1	3	4	0	co-trk 3	4	ls/gs	on	off	avail	idle	idle
1	3	5	0	co-trk 4	5	ls/gs	on	off	avail	idle	idle
1	3	6	0	co-trk 5	6	ls/gs	on	off	avail	idle	idle
1	5	1	1	console 0	1511	cons	on	off	avail	idle	idle

DEVICE STATUS

1-CP_DWA	2-CP_DWA_MEM	3-	4-	5-CANCEL
6-MT_DWA	7-MT_DWA_MEM	8-UP_1_PAGE	9-DOWN_1_PAGE	0-

(For definition of terms, see Table 5-4).

5.19 The following is a summary of the terms used in the Equipment Status Report:

TABLE 5-4
TERMS USED IN THE EQUIPMENT STATUS REPORT

Term	Meaning
BB	The bay in which the device is located
SS	The card slot in which the device is located
CC	The circuit number of the device
SC	The sub-circuit number of the device (where applicable)
SOFTWARE-ID	Type of device installed and its index
EX/TK	The extension or trunk number of the device (where applicable); a number up to five digits in length.
TYPE	The circuit type; one of the following: ons - ONS line circuit (digital bay) cov - COV line circuit (digital bay) rcvr - DTMF Receiver module moh - Music on Hold module ls/gs - CO trunk circuit (digital bay) cons - DLIC (digital line interface circuit) module jnctr - junctor did - DID trunk e&m - E&M trunk pcm - pcm channel stn - ONS line circuit (analog bay) sset - COV line circuit (analog bay) cotrk - CO trunk circuit (analog bay)
BG	Background diagnostics enabled; either "on" or "off"
PWR	Boot diagnostics enabled; either "on" or "off"
MTSTAT	The current maintenance status; one of the following: avail - available to CP and maintenance progr - programmed in CDE but not installed unprog - installed but not programmed in CDE suspt - suspect - failed diagnostic test once bsout - busied-out by maintenance - failed diagnostic test at least twice, or busied-out by maintenance user flty0 faulty with no passes flty1 faulty with one pass flty2 faulty with two passes flty3 faulty with three passes flty4 faulty with four passes flty5 faulty with five passes flty6 faulty with six passes

TABLE 5-4 (CONT'D)
TERMS USED IN THE EQUIPMENT STATUS REPORT

Term	Meaning
SWSTAT	The current call processing (CP) software status; for lines and trunks, one of the following: altms - alternate music acdwt - ACD wait bsout - busied-out bst - receiving busy tone campd - camped on dialg - dialing dnd - do not disturb error - receiving reorder tone hfi - handsfree idle hfree - handsfree ringing hfs - handsfree suspended hold - consultation hold idle - idle lockd - locked-out pagng - paging parkd - parked (held by attendant) rngbk - ringback rngng - ringing rs232 - data station is establishing RS232 protocol stowd - stowed (hard or call hold) suspd - suspended talkg - talking tkd - trunk dial wdtrx - data station waiting for dtrx response wfjct - waiting for junctor wflin - waiting for line wfoff - waiting for off-hook The current call processing (CP) software status, for receivers and junctors; one of the following: free - ready for use by CP busy - currently in use by CP down - currently unavailable to CP
HWSTAT	The current hardware status; one of the following: idle - available to CP busy - busy down - card not present - unavailable to CP dwnld - downloading prompts to a *SUPERSET 4*™DN telephone maint - maintenance busy - busied-out by maintenance diagnostics

Monitor T1 Trunk Activity

5.20 The user may monitor the activity on the ST bus to and from the T1 Trunk module. This monitoring may only be done at the Maintenance terminal; it is not necessary to select a print device, as the monitoring will be output to the maintenance terminal automatically. Four buses, DSTi, DSTo, CSTi, and CSTo may be monitored.

Through this feature, the user may also modify the data on selected trunks. The user is able to:

- Send a yellow alarm to the receiving end
- Put the T1 Trunk card into analog loopback mode
- Manually select the synchronization source for the T1 link
- Send data values down the selected trunk
- Change the transmit and receive gains
- Change the A B signaling bits
- Put selected trunks into digital loopback.

5.21 To monitor the T1 Trunk activity from the maintenance terminal, press the following softkeys when in MAINTENANCE mode:

9-REPORTS

2-SHOW

3-STATUS

Enter plid of a programmed T1 Trunk

The following softkey set will appear if the current workline is a programmed T1 Trunk circuit. Softkey 3-LINK-STATUS only appears if the current device is a T1 circuit.

1-CP_DWA	2-CP_DWA_MEM	3-LINK-STATUS	4-	5-CANCEL
6-MT_DWA	7-MT_DWA_MEM	8-UP_1_PAGE	g-DOWN-1 -PAGE	0-

06-MAR-67 NO ALARM

SX-200 DIGITAL GENERIC 1003

DSTi	82	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	SYNC	0
	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	SLIP	0
DSTo	FF	82	00	00	00	00	00	00	00	00	00	00	00	00	00	00	BPV	0
	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	XS1	0
																	XCTL	1
CSTi	A3	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	RxYLW	0
	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	8KHZ	1
CSTo	87	B7	B7	87	B7	B7	B7	B7	B7	B7	B7	87	B7	B7	07	B7	B8ZS	1
	B7	B7	B7	B7	B7	B7	B7	B7	B7	B7	B7	B7	B7	B7	B7	FC	TxYLW	No
																	CCS	No

TRK	T x	TxA	TxB	TxPD	R x	RxA	R x 8	RxPD	LPBK	DAC	SRCE	MODE		
01	82	1	1	100	92	1	1	10	NO	7FF	2400	AUTO	MCW	01011000
													MST	10000000

1 TRUNK-NUM	2 YELLOW	3 CCS	4 LOOPBACK-A	5 CANCEL
6 UPDATE	7 MANUAL	8	9	0 MORE-KEYS

Figure 5-4 Monitor T1 Trunk Activity Screen Display

5.22 The following lists the commands that may be entered from the maintenance terminal to monitor or test the T1 link.

Press softkey 1 TRUNK-NUM (the maintenance terminal returns the following prompt):

Enter TRUNK NUMBER

Enter the trunk number of the trunk to be monitored and press ENTER:

The data used on the selected trunk will be highlighted in the information from the four buses, DSTi, DSTo, CSTi, and CSTo.

The following softkeys are displayed:

1 TRUNK-NUM 2 YELLOW 3 CCS 4 LOOPBACK-A 5 CANCEL
6 UPDATE 7 MANUAL 8 9 0 MORE-KEYS

Press softkey 0 MORE-KEYS to see additional softkeys:

1 SEND 2 TXPAD 3 TXA/B_00 4 TXA/B_01 5 CANCEL
6 LOOPBACK-D 7 RXPAD 8 TXA/B_10 9 TXA/B_1 1 0 MORE-KEYS

To send data down the selected trunk

Press SEND:

The following prompt is returned:

Enter Data:

Enter data to be sent in the range O-255 , then press ENTER:

The following **softkeys** are displayed:

1 SEND	2 TXPAD	3 TXA/B_00	4 TXA/B_01	5 CANCEL
6 LOOPBACK-D	7 RXPAD	8 TXA/B_10	9 TXA/B_11	0 MORE-KEYS

To manually change the clock source

Press **softkey** 7 MANUAL:

Softkey '/-MANUAL appears if the synchronization made is AUTO or FREE

Softkey 7-AUTO appears if the synchronization made is MANL

Press **softkey** 7-AUTO to return the synchronization MODE to the original MODE prior to the MANL setting

No Bay or Slot needs to be entered

If MANUAL is selected, the display prompts: Enter Bay: Slot:

Enter Bay number and Slot number, then press **softkey** 0 ENTER (or 5 CANCEL):

TABLE 5-5
SOFTKEY DEFINITIONS

Softkey	Definition
TRUNK-NUM	Prompts for target trunk. Defaults to 01. Valid is 01-24.
CANCEL	Goes back to SHOW STATUS form. The default settings for all control signals will be set.
YELLOW	Toggles bit that forces the T1 module to send a yellow alarm to the far end or removes the yellow alarm condition (bipolar).
MANUAL	This softkey will allow the user to change the sync source. The user will be prompted for Bay/Slot.
AUTO	This softkey will restore the original synchronization mode.
SEND	Prompts user for data to be transmitted. Data is sent continuously down the channel currently selected. Valid input is O-255.
TxPad	Increments transmit attenuation control bits.
RxPad	Increments receive attenuation control bits.
TxA/B_00	Transmits A = 0 , B = 0
TxA/B_01	Transmits A = 0 , B = 1
TxA/B_10	Transmits A = 1 , B = 0
TxA/B_11	Transmits A = 1 , B = 1
LOOPBACK-A	Analog loopback. Toggles the loopback relay for the card. Loops the signals back through the hardware in the card (will override any channels in digital loopback).
LOOPBACK-D	Digital loopback. Toggles the loopback bit for the selected channel. The DS1 channel is looped internally to replace the corresponding receive channel (will be overridden if card is in analog loopback).
UPDATE	This softkey updates the values on the screen.

5.23 The following information is displayed for information only; it cannot be altered from the terminal.

TABLE 5-6
DEFINITION OF MAINTENANCE TERMINAL DISPLAY

Display	Meaning
DSTi	Data ST bus Input (32 channels/24 active).
DSTo	Data ST bus Output (32 channels/24 active).
CSTi	Control ST bus Input (32 channels/25 active).
CSTo	Control ST bus Output (32 channels/25 active).
SYNC	This bit goes to 1 when synchronization to the RECEIVED DS1 link is lost.
SLIP	This bit changes state once a slip condition occurs between the RECEIVED DS1 data and the ST-BUS data.
BPV	This bit changes state after 256 bipolar violations, other than the B8ZS code, within a sample period of 200 ms.
XS1	This EXTERNAL SCAN POINT bit contains the data sampled at the XS1 pin once per frame.
RxYLW	This bit goes to 0 when the yellow alarm condition is detected for 500 ms on the RECEIVED DS1 link.
XCTL	XCTL bit. Indicates there is one trunk in the active state.
B8ZS	B8ZS bit value in control register.
8KHZ	8KHz Sel bit value in control register. If 1 then the 8khz pin is low for received channels 1 to 15 and high for channel 16 to the S-bit.
TxYlw	This indicates if a yellow alarm is being sent down the link.
DAC	The current value being written to the DAC. The DAC is on the T1 Clock Interface Module. Its purpose is to provide the ability to adjust the system clock. This is accomplished by writing a 12 bit word to the DAC .
SRCE	This field gives the current SYNC source (Bay/slot).

TABLE 5-5 (CONT'D)
DEFINITION OF MAINTENANCE TERMINAL DISPLAY

Display	Meaning
MODE	This is the current mode of operation. There are three modes: AUTO (AUTO), FREERUN (FREE), or MANUAL (MANU). AUTO - the T1 process is adjusting the system clock to lock on to the incoming 1.544 mhz signal. The link the process looks at for an external source is based on the order of the links in the network sync form. FREERUN - the system clock is not being adjusted to lock on to the incoming 1.544 mhz signal. The reason for this is there is nothing programmed in the network sync form or the links all exceed the error threshold. MANUAL - the T1 process is forced via maintenance to look at a particular link as an external source. The system clock is adjusted based on this and locks to this source. The T1 process will automatically switch external sources after 24 hours or if the error threshold has been exceeded.
Tx	This is the current data sample for the transmit side of the channel being monitored.
Rx	This is the current data sample for the receive side of the channel being monitored.
TxA, TxB	These are the transmit A and B bits used for controlling channels on the DS1 link.
TxPD	The per channel transmit attenuation control bits.
RxA, RxB	These are the receive A and B bits used for monitoring channels on the DS1 link.
RxPD	The per channel receive attenuation control bits.
LPBK	This indicates if any loopbacks have been activated. no - there are none alg -analog loopback has been activated for the card dig -digital loopback has been activated for this channel (is not seen if the card is in analog loopback).

Error Reports

Show Errors

5.24 The Error Reports provide the maintenance user with an up-to-date record of all the transmission checksum errors which have occurred since the system was initialized, or since they were last cleared (see Clearing Error Counter, paragraph 5.20).

To obtain an error report, press the following softkeys:

SHOW
ERRORS
DEVICE-TYPE

At this point softkeys are presented for device selection:

SS3_SS4
DISK
DIGITAL-SETS
HDLC
CONSOLE
DATAS ETS
T1_TRUNK

ENTER

The system will output the error data in the Applications Area of the screen. In cases where the data requires more space than is available on the screen, the user is prompted to request more data via the MORE softkey, or to cancel the output via the CANCEL softkey. Examples of error reports are provided in Figures 5-5 through 5-11.

Figure 5-5 Example of *SUPERSET* Error Report

4:27 1 O-FEB-87 alarm status = NO ALARM

PLID	EXT.#	ERRORS
3 2 2 0	3202	4

SHOW ERRORS SS3_SS4

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

Figure 5-6 Example of DISK Error Statistics Report

DISK	DATA ERRS	COMMAND ERRS	POSITION ERRS
Disk Drive A	2	0	1
Disk Drive B	0	1	3

SHOW ERRORS DISK

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

Explanation of error types:
DATA ERRS (CRC) - number of recoverable retries to access the disk
COMMAND ERRS - number of recoverable retries to access the disk
POSITION ERRS - number of recoverable retries to access the disk

Figure 5-7 Example of DIGITAL Set Error Report

4:27 1 O-FEB-87 alarm status = NO ALARM

PLID	EXT.#	DEVICE	NO-SYNC	LINK-RESET	RETRANSMIT
1851	1861	SS4dn	4	2	75

SHOW ERRORS DIGITAL-SETS

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

Explanation of error types:

NO-SYNC - The link is torn down and re-established and synchronization is lost.
LINK-RESET - The link is torn down and re-established without a loss of synchronization.
RETRANSMIT - The set has not acknowledged an information packet so the system retransmits. This field is updated in increments of 25.

Figure 5-8 Example of HDLC Link Error Statistics Report

HDLC LINK	TX-ERR	RX-ERR	OVRFLW	CRCERR	ABORTS	ODDPKT	RETRAN
Bay 3 to MC	0	0	0	0	0	0	0
MC to Bay 3	0	0	0	0	0	0	0
Bay 4 to MC	0	0	0	0	0	0	0
MC to Bay 4	0	0	0	0	0	0	0
Bay 5 to MC	0	0	0	0	0	0	0
MC to Bay 5	0	0	0	0	0	0	0

SHOW ERRORS HDLC

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

Explanation of error types:
TX-ERR - miscellaneous tx errors
RX-ERR - miscellaneous rx errors
OVRFLW - receiver overflow errors
CRCERR - bad checksum errors
ODDPKT - double byte errors; first byte in received packet has a duplicate
RETRAN - link layer retransmits

Figure 5-9 Example of CONSOLE Error Report

4:27 1 O-FEB-87 alarm status = NO ALARM

PLID	EXT.#	DEVICE	NO-SYNC	RESETS	RETRANSMIT	CHECKSUM
231 1	2311	CONSOLE	0	4	0	

SHOW ERRORS CONSOLE

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

Explanation of error types:

NO-SYNC - The link is torn down and re-established and synchronization is lost.

RESETS - The link is torn down and re-established without a loss of synchronization.

RETRANSMIT - The set has not acknowledged an information packet so the system retransmits. This field is updated in increments of 25.

CHECKSUM - Console Rom hardware errors.

Figure 5-10 Example of DATASET Error Statistics Report

PLID	EXT.	FAILRS	ABORTS	CRCERR	RESETS	PARITY	OVRFLW	NOSYNC
3310	3301	0	0	5	3	0	4	0
3320	3302	1	0	2	1	0	0	0

SHOW ERRORS DATASET

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

Explanation of error types:

FAILRS - applies to situations which involve link layer errors such as failing to achieve link reset after N number of tries

ABORTS - applies to situations such as received idle HDLC link when flags were expected

CRCERR - number of received frames with CRC errors or frame aborts; this value is set to zero when DNIC synchronization is lost

RESETS - number of times the link initiated link reset; this value is set to zero when DNIC synchronization is lost

PARITY - number of bytes received from the attached device with parity errors; this value is set to zero when DNIC synchronization is lost

OVRFLW - number of buffer overflows in the following cases:
DATASET 2100 series : (Sync mode) number of overflows of PLL buffer
DATASET 2100 series : (Async_mode) overflows on receive information from the locally attached device
DATASET 1100 series : (Async_mode) overflows on receive information from the locally attached device
These values are set to zero when DNIC synchronization is lost

NOSYNC - This occurs when there has been loss of synchronization between the dataset and the system; most common cause is set disconnected

Figure 5-11 Example of T1 Trunk Error Statistics Report

PLID	HOUR	SLIPS	FRAME	BIPOLAR	STATUS	STATE
1500	0	0	0	0	clear	active
1500	1	0	0	0		
1500	2	0	0	0		
1500	3	0	0	0		
1500	4	0	0	0		
1500	5	0	0	0		
1500	6	0	0	0		
1500	7	0	0	0		
1500	8	0	0	0		
1500	9	0	0	0		
1500	10	0	0	0		
1500	11	0	0	0		

SHOW ERRORS T1_TRUNK

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	0-

Explanation of error types:

HOUR - data is accumulated hourly
SLIPS - number of data slips due to internal and external timing clocks
FRAME - number of framing errors
BIPOLAR - number of bipolar violations
STATUS - appears only for the current hour, and shows current link status. Valid values are:

- clear - when there is no alarm condition on the link
- active - not currently used
- yellow - receiving a yellow alarm
- red - link is in a red alarm condition
- shrt term - this link is the current sync source and is using the short term formula to adjust the system clock
- long term - this link is the current sync source and is using the long term formula to adjust the system clock

STATE - appears for the current hour only, and shows the current link state. Valid values are:

- no sync - the status of the link is red because it is not in sync
- no power - the status of the link is red because it has a power fault
- active - there is no alarm on the link
- inactive - there is an alarm condition on the link

Clearing Error Counter

For Specific Devices

5.25 To clear the Error Counter for a specific device, press the following softkeys:

CLEAR
ERRORS
DEVICE-TYPE

At this point softkeys are presented for device selection:

SS3_SS4
DISK
DIGITAL-SETS
HDLC
CONSOLE
DATAS ETS
T1_TRUNK

Note: T1 Trunk errors are tracked on a 24 hour basis. Every hour that the T1 Trunk operates it generates a new report. The error count is a series of 24 one-hour reports, that is updated every hour; the oldest entry is deleted.
When a T1 Trunk is selected to be cleared, a standard error message is returned to indicate that T1 Trunks cannot be cleared.

ENTER

For Specific Circuits

5.26 To clear the Error Counter for a specific *SUPERSET* circuit, press the following softkeys:

CLEAR
ERRORS
BAY/SLOT/CCT
(enter the required bay, slot, circuit and sub-circuit numbers, pressing the RETURN key after each one)
ENTER

For Specific Extensions

5.27 To clear the counter for a specific extension, press the following softkeys:

CLEAR
ERRORS
EXT-NUM
(enter the required extension number, then press the RETURN

key)
ENTER

For All Devices

5.28 To clear all error counters, press the following softkeys:

CLEAR
ERRORS
ALL
ENTER
CONFIRM
ENTER

5.29 The user may verify the error counter clearing via the "SHOW ERRORS" command, which operates in the Reports Level, as described in paragraph 5.24.

Channel Map Report

5.39 The Channel Map Report provides the maintenance user with the current status of the system's PCM links. The user may choose between either PHYSICAL or LOGICAL channels. Physical links will show what bay the link is connected to if it is used for voice connection. To obtain a channel map report, press the following soft- keys:

SHOW
CHANNEL-MAP
PHYSICAL
LINK-NUMBER or BAY NUMBER
(enter the desired LINK or BAY number, followed by the RETURN key)
ENTER

or

SHOW
CHANNEL-MAP
LOGICAL
CHANNEL-NUM
(enter the desired CHANNEL number, followed by the RETURN key or simply press the RETURN key to view all busy channels).
ENTER

The system will output the Channel Map Report in the Applications area of the screen. In cases where the data requires more space than is available on the screen, the user is prompted to request more data via the MORE softkey, or to cancel output via the CANCEL softkey. An example of a Channel Map Report is shown in Figure 5-12. Table 5-7 gives a summary of the terms used in the Channel Map Report.

Figure 5-12 Example of PHYSICAL CHANNEL MAP Report

4:27 1 O-FEB-87 alarm status = NO ALARM

Channel #	Rx Status	Tx Status	Channel #	Rx Status	Tx Status
0	free	frae	1	free	free
2	free	free	3	free	free
4	free	free	5	free	free
6	free	free	7	free	free
8	free	free	9	free	free
10	free	free	11	free	free
12	free	free	13	free	free
14	free	free	15	free	free

Link number 2 is connected to bay 3

SHOW CHANNEL-MAP PHYSICAL LINK-NUMBER 02

1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	O-MORE

(For definition of terms, see Table 5-7).

TABLE 5-7
TERMS USED IN THE CHANNEL MAP REPORT

Term	Meaning
channel	- Channel number
Rx	- Receive cnannel
Tx	- Transmit channel
free	- ready for use by CP
cp_busy	- currently in use by CP
down	- currently unavailable to CP
mt_busy	- being tested by maintenance
b_syout	- busied out by maintenance
music	- music on hold
ringbk	- ringback
tone a	- channel connected to tone a
tone b	- channel connected to tone b
tone c	- channel connected to tone c
misc	- channel connected to misc tone
faulty	- failed test, unavailable to CP
os_msg	- channel used by operating system

6. MAINTENANCE LOG FUNCTIONS

Introduction

6.01 The purpose of the Maintenance Log is to record all maintenance-related information, including anything which affects the functioning or the capacity of the system. Typical maintenance log entries would be circuits failing diagnostics, cards being unplugged, and alarm level changes. The user may read, delete and print log entries, as well as set a variety of printing options. For the READ, PRINT and DELETE commands, the following qualifiers apply:

1) ALL - causes all log entries to be read, printed or deleted.

2) NEWEST - causes the most recent user-defined number of log entries to be read, printed, or deleted.

3) OLDEST - causes the oldest user-defined number of log entries to'be read, printed, or deleted.

For further information on the Maintenance Log, refer to Section MITL9109-094-353-NA, General Maintenance Information. To access the logs level commands, press the LOGS softkey. All of the following operations are possible while in the Logs Level. Table 6-l offers a quick reference for log operations.

Reading Log Entries

All Log Entries

6.02 To read all of the maintenance log entries, press the following softkeys:

READ
ALL
ENTER

Newest Log Entries

6.03 To read the newest user-defined number of maintenance log entries, press the following softkeys:

READ
NEWEST
(enter the number of log entries to be read)
ENTER

Oldest Log Entries

6.04 To read the oldest user-defined number of maintenance log entries, press the following softkeys:

READ
OLDEST
(enter the number of log entries to be read)
ENTER

6.05 In all cases, the system will output the requested number of log entries into the Applications Area of the screen. In cases where the log data requires more space than is available on the screen, the user is prompted to request more log data via the MORE softkey, or to cancel the output via the CANCEL softkey. An example of reading logs is shown in Figure 6-l.

TABLE 6-l
LOGS LEVEL FUNCTIONS

LEVEL	COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER	QUALIFIER
'I-LOGS	1-SET	4-AUTOPRINT	1-ON			
			2-OFF			
	2-READ	1-NEWEST [number]				
		2-OLDEST [number]				
		4-ALL				
		9-TRACE_INFO				
	3-PRINT	1-NEWEST [number]				
		2-OLDEST [number]				
		4-ALL				
		9-TRACE_INFO				
	4-DELETE	1-NEWEST [number]				
		Z-OLDEST [number]				
		4-ALL	S-CONFIRM			
		O-TRACE-INFO				
	6-QUIT					
	9-STOP					

Note: T RACE-INFO is a diagnostic tool in the event of a System Reset with Generic 1003; it provides information to help correct the fault. Contact Mitel Field Service.

Figure 6-l Example of LOGS READ Display

4:27 1 O-FEB-87 alarm status = MINOR

SX-200 DIGITAL Generic 1003 480P/D64.1 6-FEB-1987			Logs	
1987-JAN-21 15:33:01 1987-JAN-21 11:11:19 1987-JAN-2 1 09:23:25 1987-JAN-21 09:23:25	ONS card failed at 02 01 01 00 ext = 2101 OFF hook too long Error number = 101 COV card failed at 03 03 01 00 ext = 3301 SS4 unplugged Error number = 105 Tot alarm went from No Alarm to MINOR Alarm level change due to Bay 03 trunks trunk card failed at 03 09 01 00 trk = 01 Can't seize trunk Error number = 111			
READ LOGS ALL				
1-	2-	3-	4-	5-CANCEL
6-	7-	8-	9-	O-MORE

Deleting Log Entries

All Log Entries

6.06 To delete all of the maintenance log entries, press the following softkeys:

DELETE
ALL
ENTER
CONFIRM
ENTER

Newest Log Entries

6.07 To delete the newest user-defined number of maintenance log entries, press the following softkeys:

DELETE
NEWEST
(enter the number of log entries to be deleted)
ENTER

Oldest Log Entries

6.08 To delete the oldest user-defined number of maintenance log entries, press the following softkeys:

DELETE
OLDEST
(enter the number of log entries to be deleted)
ENTER

In all cases, the system will echo the command into the Applications Area of the screen. The user may verify that the particular log entries have been deleted, using the READ command.

Printing Logs on System Printer

All Log Entries

6.09 To print all of the maintenance log entries onto the printer, which is defined during Customer Data Entry, press the following softkeys:

PRINT
ALL
ENTER

Newest Log Entries

6.10 To print the newest user-defined number of maintenance log entries, press the following softkeys:

PRINT
NEWEST
(enter the number of log entries to be printed)
ENTER

Oldest Log Entries

6.11 To print the oldest user-defined number of maintenance log entries, press the following softkeys:

PRINT
OLDEST
(enter the number of log entries to be printed)
ENTER

In all cases, the system will echo the command into the Applications Area of the screen.

Setting Print Device

6.12 Log entries are produced at the device named in the CDE Form, DIRECTED I/O. See Section MITL9 109-094-210-NA Customer Data Entry for details.

Setting Automatic Printing

6.13 Maintenance log entries may be printed without the need of a maintenance user to explicitly request printing using the "PRINT" command. This is accomplished by automatic printing. Requesting automatic printing eliminates the danger of losing maintenance log information due to overflow. When the maintenance log contains 75% new (unprinted) log entries, the new entries are automatically printed. The maintenance log contains a maximum of 96 log entries. To initiate the automatic printing of logs, press the following softkeys:

SET
AUTOPRINT
ON
ENTER

The system will echo the command into the Applications Area of the screen.

7. DIAGNOSTIC FUNCTIONS

7.01 The Diagnostics Level of operation is a conglomeration of active testing-related commands that are designed to assist the maintenance user in ensuring that the SX-200 DIGITAL PABX is operating at peak performance. The available commands allow the user to enable, schedule and initiate diagnostic testing, and to take equipment out of service, and return it to service. All operations available in diagnostics are shown in Table 7-1.

Introduction

7.02 Four types of diagnostics are available to the maintenance user; they are:

1. PROM-Based Diagnostics - are run only on system initialization and are not user-controlled. These are the only tests that verify the Main Control and Peripheral Control cards.

2. Power-up Diagnostics - if enabled, run once, starting at system initialization.

3. Background Diagnostics - if enabled, start running after power-up diagnostics have completed, and run continuously.

4. Directed Diagnostics - tests initiated by the maintenance user from the maintenance terminal, console, or butt set.

7.03 Power-up, background and directed diagnostics are capable of testing the following devices:

- ONS line circuits
- CO trunk circuits
- DTMF receiver circuits (in digital bays only)
- Analog junctor circuits (in analog bays only)
- Console interface (in digital bays only).
- PCM channels
- T1 trunk circuits

Note: The DEVICE TYPE softkey must be used to test, enable/disable diagnostics for the analog junctors and PCM channels. Refer to Section MITL9109-094-353-NA for further information.

The user may check the status of the Power-up and Background diagnostics via the SHOW STATUS command for a specified group of devices (see paragraph 5.12).

The Maintenance Manager

7.04 The Maintenance Manager is a software program which manages the running of diagnostics on the SX-200 DIGITAL PABX. Its duties include the scheduling of tests, the invoking of tests, the logging of errors, and the removal of faulty devices from service. The Maintenance Manager tests devices one at a time from one of six prioritized queues. The priority scheme of the queues is as follows, in ascending order:

- Background diagnostic queue
- Power-up diagnostic queue
- Power-up diagnostic retry queue
- Diagnostic second-chance queue
- Diagnostic second-chance retry queue
- User (directed diagnostic) queue.

For further information on diagnostics, refer to Section MITL9109-094-353-NA, General Maintenance Information. To access the diagnostic level commands, press the DIAGNOSTICS softkey. All of the operations described in the following paragraphs are possible while in the Diagnostics Level.

Enabling Power-up Diagnostics

For an Entire Bay

7.05 The user may enable power-up diagnostics for an entire bay by pressing the following softkeys:

MORE-KEYS
ENABLE-DIAG
POWER-UP
BAY/SLOT/CCT
(enter the required bay number then press the RETURN key four times)
ENTER

For an Entire Peripheral Card

7.06 The user may enable power-up diagnostics for an entire peripheral card by pressing the following softkeys:

MORE-KEYS
ENABLE-DIAG
POWER-UP
BAY/SLOT/CCT
(enter the required bay; press the RETURN key; enter the required card slot number; press the RETURN key three times)
ENTER

For a Specific Circuit

7.07 The user may enable power-up diagnostics for a specific circuit by pressing the following softkeys:

MORE-KEYS
ENABLE-DIAG

POWER-UP
BAY/SLOT/CCT
(enter the required bay, slot, circuit and sub-circuit numbers, pressing the RETURN key after each one)
ENTER

TABLE 7-I
DIAGNOSTICS LEVEL FUNCTIONS

LNEL	COMMAND	SUB-COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER
3-DIAGNOS-TICS	1-TEST	1-BAY/SLOT/CCT				
		2-DEVICE_TYPE	1-ONS			
			2-LS/GS-TRUNK			
			3-RECEIVERS			
			4-JUNCTOR [number]			
			7-CONSOLE			
			B-DSP			
			9-EM			
			O-MORE-KEYS	1-COV		
				2-LINK/CHANNEL		
				3-DID		
				4-OPS		
				6-DNIC		
				7-PRINTER_PLID		
				8-PRINTER_PORT		
				9-T1_TRUNK		
				0-MORE_KEYS		
		3-EXT-NUM [number]				
	2-CLR_FEATURE	1-FORWARD	1-BAY/SLOT/CCT			
		2-DO_N_DISTURB	3-EXT_NUM			
		3-CALL_BACK				
		4-ALL				
	6-QUIT					
	9-STOP-TEST	6-PRINTERS				
	0-MORE-KEYS	2-ENABLE--DIAG	1-BACKGROUND	1-BAY/SLOT/CCT		
				2-DEVICE_TYPE		
					1-ONS	
					2-LS/GS-TRUNK	
					3-RECEIVERS	
					4-JUNCTOR [number]	
					7-CONSOLE	
					8-DSP	
					9-EM	
					0-MORE_KEYS	1-COV
						2-LINK/CHANNEL
						3-DID
						4-OPS
						6-DNIC
						9-T1_TRUNK
						0-MORE_KEYS
				3-EXT-NUM [number]		

TABLE 7-I (CONT'D)
DIAGNOSTICS LEVEL FUNCTIONS

LEVEL	COMMAND	SUB-COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER
3-DIAGNOSTICS	I-MORE-KEYS	2-ENABLE-DIAG	1-POWER-UP	-BAY/SLOT/CCT		
				2-DEVICE_TYPE	1-ONS	
					2-LS/GS-TRUNK	
					3-RECEIVERS	
					4-JUNCTOR [number]	
					7-CONSOLE	
					8-DSP	
					9-EM	
					0-MORE_KEYS	1-COV
						2-LINK/CHANNEL
						3-DID
						4-OPS
						6-DNIC
						9-T1_TRUNK
						0-MORE_KEYS
				-EXT-NUM [number]		
		I-BUSY-OUT	-BAY/SLOT/CCT			
			-DEVICE-TYPE	-LINK/CHANNEL		
			-EXT-NUM [number]			
			-JUNCTOR			
		i-QUIT				
		-DISABLE-DIAG	-BACKGROUND	-BAY/SLOT/CCT		
				-DEVICE_TYPE	1-ONS	
					1-LS/GS-TRUNK	
					3-RECEIVERS	
					4-JUNCTOR [number]	
					7-CONSOLE	
					8-DSP	
					9-EM	
					0-MORE_KEYS	
						1-COV
						2-LINK/CHANNEL
						3-DID
						4-OPS
						6-DNIC
						9-T1_TRUNK
						0-MORE_KEYS
				-EXT-NUM [number]		

TABLE 7-l (CONT'D)
DIAGNOSTICS LEVEL FUNCTIONS

LEVEL	COMMAND	SUB-COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER
I-DIAGNDS TICS	I-MORE-KEYS	-DISABLE-DIAG	-POWER-UP	-BAY/SLOT/CCT		
				-DEVICE-TYPE	1-ONS	
					2-LS/GS-TRUNK	
					3-RECEIVERS	
					4-JUNCTOR [number]	
					7-CONSOLE	
					8-DSP	
					B-EM	
					O-MORE-KEYS	1-COV
						Z-LINK/CHANNEL
						3-DID
						4-OPS
						6-DNIC
						9-T1_TRUNK
						O-MORE-KEYS
				-EXT-NUM ıumber]		
		-RET-TO-SVC	1-BAY/SLOT/CCT			
			Z-DEVICE-TYPE	Z-LINK/CHANNEL		
			3-EXT-NUM [number]			
			4-JUNCTOR			
		-DISC-TRUNK	1-BAY/SLOT/CCT			

For a Specific Extension

7.08 The user may enable power-up diagnostics for a specific extension number by pressing the following softkeys:

MORE_KEYS
ENABLE-DIAG
POWER-UP
EXT-NUM
(enter the required extension number, then press the RETURN key)
ENTER

For a Specific Device Type

7.09 The user may enable power-up diagnostics for a specific device type by pressing the following softkeys:

MORE-KEYS
ENABLE-DIAG
POWER-UP
DEVICE TYPE
(press one of the softkeys shown in Table 7-2)
ENTER

TABLE 7-2
DEVICE TYPES

Softkey	Meaning
ONS	ONS line card.
LS/GS TRUNK	LS/GS trunk card.
RECEIVERS	DTMF receiver module.
JUNCTOR	Junctors
CONSOLE	Attendant console.
DSP	Digital signal processor.
EM	E&M trunk module.
COV	COV line card.
DID	DID trunk card.
OPS	OPS line card.
DNIC	Digital line card
LINK/CHANNEL	PCM Channels
T1-TRUNK	T1 trunk card

7.10 In all cases, the system will echo the command into the Applications Area of the screen. The user may verify that the particular power-up diagnostics have been enabled via the SHOW STATUS command (see paragraph 5.12).

Disabling Power-up Diagnostics

For an Entire Bay

7.11 The user may disable power-up diagnostics for an entire bay by pressing the following softkeys:

MORE-KEYS
DISABLE-DIAG
POWER-UP
BAY/SLOT/CCT
(enter the required bay number, then press the RETURN key four times)
ENTER

For an Entire Peripheral Card

7.12 The user may disable power-up diagnostics for an entire peripheral card by pressing the following keys:

MORE-KEYS
DISABLE-DIAG
POWER-UP
BAY/SLOT/CCT
(enter the required bay; press the RETURN key; enter the required card slot number; press the RETURN key three times)
ENTER

For a Specific Circuit

7.13 The user may disable power-up diagnostics for a specific circuit by pressing the following softkeys:

MORE-KEYS
DISABLE-DIAG
POWER-UP
BAY/SLOT/CCT
(enter the required bay, slot, circuit and sub-circuit numbers, pressing the RETURN key after each one)
ENTER

For a Specific Extension

7.14 The user may disable power-up diagnostics for a specific extension number by pressing the following softkeys:

MORE-KEYS
DISABLE-DIAG
POWER-UP
EXT-NUM
(enter the required extension number, then press the RETURN

key)
ENTER

For a Specific Device Type

7.15 The user may disable power-up diagnostics for a specific device type by pressing the following softkeys:

MORE-KEYS
DISABLE-DIAG
POWER-UP
DEVICE TYPE
(press one of the softkeys shown in Table 7-2)
ENTER

7.16 In all cases, the system will echo the command into the Applications Area of the screen. The user may verify that the particular power-up diagnostics have been disabled via the SHOW STATUS command (see paragraph 5.12).

Enabling Background Diagnostics

For an Entire Bay

7.17 The user may enable background diagnostics for an entire bay by pressing the following softkeys:

MORE-KEYS
ENABLE-DIAG
BACKGROUND
BAY/SLOT/CCT
enter the required bay number; then press the RETURN key four times)
ENTER

For an Entire Peripheral Card

7.18 The user may enable background diagnostics for an entire peripheral card by pressing the following keys:

MORE-KEYS
ENABLE-DIAG
BACKGROUND
BAY/SLOT/CCT
(enter the required bay; press the RETURN key; enter the required card slot number; press the RETURN key three times)
ENTER

For a Specific Circuit

7.19 The user may enable background diagnostics for a specific circuit by pressing the following softkeys:

MORE-KEYS
ENABLE-DIAG
BACKGROUND
BAY/SLOT/CCT
(enter the required bay, slot, circuit and sub-circuit numbers, pressing the RETURN key after each one)
ENTER

For a Specific Extension

7.20 The user may enable background diagnostics for a specific extension number by pressing the following softkeys:

MORE-KEYS
ENABLE-DIAG
BACKGROUND
EXT-NUM
(enter the required extension number, then press the RETURN key)
ENTER

For a Specific Device Type

7.21 The user may enable background diagnostics for a specific device type by pressing the following softkeys:

MORE-KEYS
ENABLE-DIAG
BACKGROUND
DEVICE TYPE
(press one of the softkeys shown in Table 7-2)
ENTER

7.22 In all cases, the system will echo the command into the Applications Area of the screen. The user may verify that the particular background diagnostics have been enabled via the SHOW STATUS command (see paragraph 5.12).

Disabling Background Diagnostics

For an Entire Bay

7.23 The user may disable background diagnostics for an entire bay by pressing the following softkeys:

MORE-KEYS
DISABLE-DIAG
BACKGROUND

BAY/SLOT/CCT
(enter the required bay number, then press the RETURN key four times)
ENTER

For an Entire Peripheral Card

7.24 The user may disable background diagnostics for an entire peripheral card by pressing the following keys:

MORE-KEYS
DISABLE-DIAG
BACKGROUND
BAY/SLOT/CCT
(enter the required bay; press the RETURN key; enter the required card slot number; press the RETURN key three times)
ENTER

For a Specific Circuit

7.25 The user may disable background diagnostics for a specific circuit by pressing the following softkeys:

MORE-KEYS
DISABLE-DIAG
BACKGROUND
BAY/SLOT/CCT
(enter the required bay, slot, circuit and sub-circuit numbers, pressing the RETURN key after each one)
ENTER

For a Specific Extension

7.26 The user may disable background diagnostics for a specific extension number by pressing the following softkeys:

MORE-KEYS
DISABLE-DIAG
BACKGROUND
EXT-NUM
(enter the required extension number, then press the RETURN key)
ENTER

For a Specific Device Type

7.27 The user may disable background diagnostics for a specific device type by pressing the following softkeys:

MORE-KEYS
DISABLE-DIAG
BACKGROUND
DEVICE TYPE

(press one of the softkeys shown in Table 7-2)
ENTER

7.28 In all cases, the system will echo the command into the Applications Area of the screen. The user may verify that the particular background diagnostics have been disabled via the SHOW STATUS command (see paragraph 5.12).

Directed Testing

7.29 Directed diagnostics consist of exactly the same tests as the power-up and background diagnostics, but are initiated by the user from the maintenance terminal, and have priority over power-up and background diagnostics. Directed tests also differ from power-up and background tests in that they return immediate responses to the user via the maintenance terminal.

On a Specific Circuit

7.30 To run a directed test on a specific circuit, press the following softkeys:

TEST
BAY/SLOT/CCT
(enter the required bay, slot, circuit and sub-circuit numbers, pressing the RETURN key after each one)
ENTER

On a Specific Extension

7.31 To run a directed test on a specific extension number, press the following softkeys:

TEST
EXT-NUM
(enter the required extension number, then press the RETURN key)
ENTER

On a Specific Device Type

7.32 To run a directed test on a specific device type, press the following softkeys:

TEST
DEVICE TYPE (see note)
(press one of the softkeys shown in Table 7-2)
ENTER

Note: Testing can be performed on system printer. Selection of DEVICE TYPE will be followed by the softkeys in Table 7-l and two printer related softkeys; PRINTER PLID and PRINTER PORT.

In all cases, the system will output the test results in the Applications Area of the screen. An example of a directed test is shown in Figure 7-l.

Figure 7-l Example of Directed TEST Display

4:27 1 O-FEB-87 alarm status = MINOR

SX-200 DIGITAL Generic 1003 480P/D64.1 6-FEB-1987 Diagnostics

TEST 02 01 03 **

TOTAL TESTS RUN = 1 TOTAL TESTS FAILED = 0 PLID TESTED = 2 1 3 0

1 -TEST	2-CLR_FEATURE	3-	4-	5-
6-QUIT	7-	8-	9-STOP_TEST	O-MORE-KEYS

Range Testing

7.33 It is possible for the maintenance user to test a range of devices using wild card characters. To test an entire bay, press the following softkeys:

TEST
BAY/SLOT/CCT
(enter the required bay number)
(answer the slot, circuit and sub-circuit prompts by pressing the RETURN key)
ENTER

To test an entire card, specify the bay and the slot, but answer the circuit and sub-circuit prompts by pressing only the RETURN key.

Busying Out Equipment

7.34 Peripheral circuits may be placed in a state such that they are accessible only through maintenance. While in this state, the device will appear busy when requested by Call Processing. The following circuit types can be busied-out in this manner:

- ONS lines
- CO trunks
- DTMF receivers
- analog junctors
- *SUPERSET* Lines
- LS/GS Trunks
- E&M Trunks
- DID Trunks
- 8 Station Lines
- PCM Channels

Specific Circuits

7.35 To busy out a specific circuit, press the following softkeys:

MORE-KEYS
BUSY-OUT
BAY/SLOT/CCT
(enter the required bay, slot, circuit and sub-circuit numbers, pressing the RETURN key after each one)
ENTER

Specific Extensions

7.36 To busy out a specific extension number, press the following softkeys:

MORE-KEYS
BUSY-OUT
EXT-NUM
(enter the required extension number, then press the RETURN key)
ENTER

Specific Link/Channels

7.37 To busy out a specific link/channel, press the following softkeys:

MORE-KEYS
BUSY-OUT
DEVICE-TYPE
LINK/CHANNEL
(enter the required link number and channel number
pressing the RETURN key after each one)
ENTER

Note: On System Reset as replacement of a card, any circuit that had been busied out, will remain busied out. The exception is DTMF receiver modules, which reboots or powers up to the idle state.

Specific Junctors

7.38 To busy out a specific junctor, found in the 456 and 480 port systems, press the following softkeys:

MORE-KEYS
BUSY-OUT
DEVICE-TYPE
JUNCTOR
(enter the required junctor number, then press the RETURN key)
BAY-NUM
(enter the required bay number, then press the RETURN key)
ENTER

7.39 In either case, the system will echo the command into the Applications Area of the screen. The user may verify that the particular circuit or extension number has been busied-out via the SHOW STATUS command (see paragraph 5.12).

In the event that a circuit is in use by call processing when the maintenance user tries to busy it out, the circuit will not be busied-out until the extension goes on-hook. This, however, does not apply to junctors or PCM channels. The user must wait for these to become idle before they are busied-out.

Returning Busy Equipment to Service

Specific Circuits

7.40 To return a specific circuit to service, press the following soft-keys:

MORE-KEYS
RET-TO-SVC
BAY/SLOT/CCT
(enter the required bay, slot, circuit and sub-circuit numbers, pressing the RETURN key after each one)
ENTER

Specific Extensions

7.41 To return a specific extension number to service, press the following softkeys:

MORE-KEYS
RET-TO-SVC
EXT-NUM
(enter the required extension number, then press the RETURN key)
ENTER

Specific Link/Channels

7.42 To return a specific link/channel to service, press the following softkeys:

MORE-KEYS
RET-TO-SVC
DEVICE-TYPE
LINK/CHANNEL
(enter the required link number and channel number pressing the RETURN key after each one)
ENTER

Specific Junctors

7.43 To return a specific junctor to service, press the following softkeys:

MORE-KEYS
RET-TO-SVC
DEVICE-TYPE
JUNCTOR
(enter the required junctor number, then press the RETURN key)
BAY-NUM
(enter the required bay number, then press the RETURN key)
ENTER

Forced Trunk Disconnect

7.44 To force release a locked-up trunk, press the following softkeys:

MORE-KEYS
DISC-TRUNK
BAY/SLOT/CCT
(enter the required bay, slot, and circuit numbers, pressing the RETURN key after each one)
ENTER

Remote Clearing of Extension Feature

7.45 The Maintenance Terminal can be used to clear CALL FORWARDING, DO NOT DISTURB, and CALL BACK features that are active on an extension (previously this could only be done from an Attendant console). This allows all features on a card in a PABX to be de-programmed from a remote maintenance terminal without requiring a local Attendant console. Only *SUPERSET* telephones and industry standard sets may be cleared from the maintenance terminal.

7.46 The extension to be cleared may be identified by either extension number of Bay/Slot/Circuit; standard error messages are returned if invalid values are entered. If the identification or extension number entered is not that of an extension, the following message is displayed: Device type must be a SUPERSET telephone or station.

7.47 Enter this application from the maintenance diagnostic menu, as follows:

PRESS SOFTKEY 2 CLR-FEATURE

The screen displays 4 softkey prompts:

1 -FORWARD
2-DO-N-DISTURB
3-CALL-BACK
4-ALL

Select the feature (or ALL features) to be cleared, by pressing the softkey.

The screen displays 2 softkey prompts:

1 -BAY/SLOT/CCT
3-EXT-NUM

Enter bay, slot, circuit, and sub-circuit numbers (sub-circuit is not used, but is part of standard prompt format) or enter the extension number, when prompted.

When all information has been entered, the screen displays the O-ENTER softkey prompt and all the entered parameters.

Press O-ENTER to clear the specified telephone set.

Note that the softkey 5-CANCEL is also available with these prompts.

8. OTHER MAINTENANCE TERMINAL APPLICATIONS

Customer Data Entry (CDE)

8.01 The RS-232 Maintenance Terminal is also the main device used for the programming of customer data. At the start of the login procedure, the user is queried to start either a Maintenance session or a CDE session (see paragraph 2.04). Only a VT-100 compatible terminal may be used for CDE. For further information on CDE, see Section MITL9109-094-210-NA, Customer Data Entry.

Traffic Measurement

8.02 Traffic Measurement is a separate level in Maintenance. All of the information in Part 3 (Command Input) of this Section applies to Traffic Measurement as well. See Section MITL9109-094-450-NA, Traffic Measurement for command descriptions and other information on Traffic Measurement. Table 8-1 contains all the operations available in Traffic Measurement Functions.

TABLE 8-I
TRAFFIC MEASUREMENT FUNCTIONS

LEVEL	COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER	QUALIFIER
5-TRAFFIC_ MEAS	1-SET	1-UNITS	1-CCS			
			2-ERLANGS			
		2-PERIOD [number]				
		3-DURATION [number]				
		4-AUTOPRINT	1-ON			
			2-OFF			
		7-START_TIME [hh:mm]	1-PM			
		8-CONDENSED	1-ON			
			2-OFF			
	2-SHOW	3-STATUS				
	3-PRINT					
	4-READ					
	6-QUIT					
	9-STOP	1-TRAFFRPT				
		3-PRINT				

APPENDIX A

USERNAME COMMAND PRIVILEGES

AI.01 The following Table lists all the command privileges of all of the valid username levels:

TABLE AI-I
USERNAME COMMAND PRIVILEGES

COMMAND	Installer	Maintl	Maint2	Supervisor	Attendant
SET TIME	X	X	X	X	X
SET DATE	X	X	X	X	X
SET PASSWORD	X	X	X	X	X
SET SPEED	X	X			
SHOW DATE	X	X	X	X	X
SHOW TIME	X	X	X	X	X
SHOW DEVICE	X	X	X	X	X
SHOW IDENTITY	X	X	X	X	X
COPY DATABASE	X	X	X		
MONITOR SMDR	X	x	X	X	
MONITOR DIAG	X	X	X	X	
MONITOR LOGS	X	X	X	X	
STOP MONITOR	X	X	X	X	
TEST	X	X			
SHOW ERRORS	X	X			
CLEAR ERRORS	X	X			
ENABLE/DISABLE BG DIAGS	X	X			
ENABLE/DISABLE PWR UP DIAGS	X	X			
BUSY-OUT RETURN TO SVC	X	X			
TRAFFIC SET	X	X	X	X	
RESTART	X				
SET RESET-TIME	X				
SET ALARM THRESH	X				

TABLE AI-I (CONT'D)
USERNAME COMMAND PRIVILEGES

COMMAND	Installer	Maintl	Maint2	Supervisor	Attendant
TRAFFIC SHOW	X	X	X	X	
TRAFFIC PRINT	X	X	X	X	X
TRAFFIC READ	X	X	X	X	X
TRAFFIC STOP	X	X	X	X	X
LOGS SET AUTO	X	X			
LOGS READ	X	X			
LOGS PRINT	X	X			
STOP PRINT LOGS	X	X			
LOGS DELETE	X	X			
SHOW ALARMS	X	X			
SHOW CONFIG	X	X	X		
SHOW STATUS	X	X	X		
SHOW CHANNEL-MAP/	X	X	X		

APPENDIX B

MAINTENANCE TERMINAL ERROR MESSAGES

81.01 The following Table lists all of the status and error messages which may appear at the maintenance terminal during a maintenance session:

TABLE B1-1
MAINTENANCE TERMINAL ERROR MESSAGES

Message	Meaning
A specific value cannot follow the default value "XX".	If the user has entered a default value for the BAY/SLOT/CIRCUIT prompt, a specific value cannot follow.
An invalid or incorrect password was entered.	Displayed in SET PASSWORD when the old password does not match that stored in the system, or when the new passwords contain invalid characters (i.e., has characters other than ['A'..'Z','a'..'z',0..9]).
Busy out sequence initiated--check device status for success/failure.	Use SHOW STATUS command to verify busy-out status.
Card not installed.	No card is installed at the specified location. Use SHOW CONFIG command to check the state of the card.
Change terminal speed and press RETURN when ready.	An instruction message rather than an error message; appears when changing the speed of the maintenance port while on the maintenance terminal.
Circuit "XX" does not exist on this card or card not programmed.	Use SHOW CONFIG command to verify installed cards.
Clearing of T1 Trunk errors is not permitted.	The user attempted to clear T1 errors; this is not permitted
Copy successful. If upgrading then RESET - else press CANCEL to continue.	COPY DATABASE has been successfully completed. If copying database to a different version of software, the user is required to reset the system.
Critical Disk Shortage.	Database file on disk has less than 1K of disk space left. Do a copy DB to recover free space.
Database Corrupt in: templates.	The verification of the database has failed. The template section may be corrupted.
Database Corrupt in: static section.	The verification of the database has failed. The static section may be corrupted.
Database Corrupt in: b-tree.	The verification of the database has failed. The b-tree section (ARS or Account codes) may be corrupted.
If more than one section is corrupted the following possibilities may be displayed. - Database Corrupt in: templates and static section. - Database Corrupt in: templates and b-tree. - Database Corrupt in: static section and b-tree. - Database Corrupt in: templates, static section, and b-tree.	
Device not programmed.	An attempt was made to RET-TO-SVC or BUSY-OUT a device by specifying a plid which is not programmed.

TABLE BI-1 (CONT'D)
MAINTENANCE TERMINAL ERROR MESSAGES

Message	Meaning
Disk busy--Please try again later.	The user has tried to READ, PRINT, or DELETE logs and the disk is busy.
Disks are not responding.	System may be too busy to handle the COPY DATABASE sequence - try when the system is less busy. May be communication problem with diskette - check the connections to the disk drive. Verify that there is a diskette in the drive. Repeated failure indicates a problem - refer to Section MITL9109-094-350-NA, Troubleshooting.
Disks corrupt. insert backups and RESET.	The disks in the system are corrupt. The original disks should be reinserted.
Disk I/O failure - database may be corrupted.	Disk access has failed, perhaps corrupting the database. One of the following is likely: - disk drive door is open - there is no diskette installed - the diskette has a write protect sticker - a disk read or write failed.
Disk is write-protected - data was not written to disk.	Disks inserted are write protected. Remove copy protect tab, or insert new diskettes as required.
Disks mismatched. Reinsert disks properly and Press CANCEL.	After the 'Insert new disks, close doors and press CONTINUE' prompt the disks are checked to make sure that they are a compatible pair. If for some reason they are not compatible, this message is displayed. Verify new diskettes have been inserted. Verify disk drive doors are closed. Verify new diskettes are in appropriate disk drives.
Disks mismatched. Insert original disks and press CANCEL.	After the 'Disks mismatched. Reinsert disks properly and press CANCEL' prompt the disks are not compatible, the original disks must be reinserted and the copy operation is aborted. This error message may also appear after a successful copy, if the original disks are inserted incorrectly.
Error initializing new disks. Insert original disks and press CANCEL.	Verify new diskettes have system software. New diskettes may be corrupted. Insert original diskettes as required.
Error reading load tag. Press CANCEL to continue.	The load tag was not successfully read. The original disks should be reinserted and the copy is aborted.
Error updating disk database. Insert original disks and press CANCEL.	At the start of the COPY DATABASE sequence, the database is updated before it is read. This may indicate failure of this stage. If not, new diskette may be corrupted, or may not have system software, or database is corrupted.
Error writing load tags. Press CANCEL to continue.	The load tags were not successfully copied. The copy operation is aborted. The original disks should be reinserted.
Illegal operation. Copying to different stream. Insert originals.	Disks of a different stream have been inserted following "Insert new disks, close doors and press CONTINUE". Insert original disks and press CANCEL; copy operation is then aborted.
Invalid data station specified.	The user has tried to SHOW DEVICE DATASTN-PLID and specifies a plid which is not a data station.

TABLE BI-1 (CONT'D)
MAINTENANCE TERMINAL ERROR MESSAGES

Message	Meaning
Invalid day for the month specified. Date not set.	Valid month entries are dependent upon the Roman calendar. For example, an attempt may have been made to set the date to the 30th of February.
invalid parameter "XX". TIME (or DATE) not set.	Time may be set to 00:00-23:59, date may be set to 01-31 for days, 01-12 for months, 00-99 for years. Valid month entries are dependent upon the Roman calendar.
Logical channel specified is not in use.	The user has tried to SHOW CHANNEL-MAP LOGICAL CHANNEL-NUM ### which is idle. This function shows only those channels which are in use.
MONITOR LOGS already in use!	A second attempt was made to monitor logs. Monitor logs was already in progress.
Must specify at least a bay number in Bay/Slot/Cct.	When entering bay number for junctor diagnostics, a specific value must be used.
Must specify at least a link number.	The user has tried to BUSY-OUT or RET-TO-SVC A pcm channel and uses a wildcard for the link parameter.
No errors found within specified range.	The user attempted to SHOW ERRORS and the devices specified (SS3_SS4, DISK, DIGITAL-SETS, HDLC, DATASETS, CONSOLE, T1_TRUNK) have no errors. Note: This function always gives the T1 Trunk error form, even though there are no errors.
No programmed devices within specified range.	There are no programmed devices within the specified range. Use SHOW CONFIG command to check range.
No disks in drives, please insert original and press CANCEL.	If there are no disks in the drives or the door was left open.
No wild cards allowed for this function.	The user has specified wildcards in a plid parameter when trying to BUSY-OUT or RET-TO-SVC.
Not original disks. Please insert originals and press CANCEL.	The original disks should be reinserted. This message will be printed as long as the original disks are not reinserted.
Please wait, accessing disk...	This is a status message only. The system needs time to access the disk.
Original disks reinserted or backups left in.	This is a status message only printed after a successful copy sequence. The original disks were reinserted or disks of the same load version as the originals were inserted at the appropriate time.
PRINTER-PLID is invalid as a printer device.	The user has tried to SUSPEND-PRTR or RESUME-PRTR. The specified plid is not a printer plid.
Read failure, resetting system.	During COPY operation, the disks are read to determine their identity. This may indicate failure of this stage.
Reading database, please wait...	This is a status message only. Database is being read from disk to system RAM as part of the COPY DATABASE command.
Reading disks, please wait...	This is a status message only. The disks are being read to determine their identity and compatibility. i.e., 64.8.
Serious Disk Shortage.	Database file on disk has only 4K of disk space left. Do a copy DB to recover free space.

TABLE B1-1 (CONT'D)
MAINTENANCE TERMINAL ERROR MESSAGES

Message	Meaning
Stop of print pending or no print currently in progress.	There was no PRINT process running when STOP PRINT was entered.
System bury, please try again later	Copy database is inhibited for several minutes following a system reset; the maximum time is eiaht minutes.
The access code "XXX" does not exist.	The specified extension number does not exist. Use SHOW STATUS command to check the status code.
The Bay/Slot/Circuit - XX/XX/XX used is inappropriate.	The user attempted to clear errors through Bay/Slot/Circuit of an inappropriate device.
The extension number "XXXX" is not a SUPERSET, CONSOLE, or DATASET.	The user has specified an extension number when he tries to CLEAR ERRORS. Errors are only compiled for these types of devices.
The hour value "XX" is out of range. Start time not set.	Used in traffic measurement for invalid values in the SET START TIME command.
The link "X" cannot be tested.	The user has tried to test or enable diagnostics on a pcm link which is not used as a telephony link. Links 0, 1, 14 and 15 are not available for testina.
The minute value "XX" is out of range. Start time not set.	Used in traffic measurement for invalid values in the SET START TIME command.
The value "X" is invalid for BAY-NUM.	The user has tried to enable or disable diagnostics on junctors and the bay specified is not an analog bay.
The value "XX" is invalid for JUNCTOR.	The user has tried to enable or disable diagnostics on junctors and has specified a junctor outside the valid range (O-31).
The value "XX" is outside the valid range for SUBCIRCUIT.	The specified sub-circuit number is invalid for this particular device type. Use SHOW STATUS command to verify card type and number of programmed circuits.
There are no logs currently on the disk.	There are no logs on the diskette to READ or PRINT.
This function is not available for this device.	The user has tried to BUSY-OUT or RET-TO-SVC the console.
This function is not available on the console.	The user has tried to perform a command which is not available when logged into maintenance from the console.
TIMEOUT PERIOD EXPIRED. Press Return to login.	After being prompted for the username, the user has 10 seconds to begin entering characters.
Traffic measurement already in progress. STOP first.	In traffic measurement, the following parameters can not be changed while traffic measurement is collecting data: PERIOD, DURATION, and START TIME.
Trunk value "XX" outside valid range (l-24).	The user requested to monitor the LINK-STATUS of a trunk which was outside the valid range of 24 circuits for the T1_Trunk card.
Unable to print. Maintenance port already in progress.	There can be only one PRINT or READ occurring at one time. If required, enter STOP PRINT command to initiate a second PRINT.
Unable to read the disk.	Occurs in conjunction with the READ PRINT and ALARMS commands. Verify there is a diskette alarm present. Ensure disk drive door is closed.

TABLE B1-1 (CONT'D)
MAINTENANCE TERMINAL ERROR MESSAGES

Message	Meaning
Unable to update disk.	When doing operation with the logs, i.e., READ, PRINT or even the ALARMS command from the console, the diskette is first updated. This message indicates failure of this stage. Check for presence of a diskette in the drive. Ensure the disk drive door is closed.
Universal Card. Module "X" in Bay/Slot/Module is out of range (1-4).	The user has chosen a universal card but the module number is out of range (i.e., not between 1 and 4).
Universal Card. Sub-circuit "X" does not exist on module.	The user has chosen a Universal card; the module number is valid and exists but the sub-circuit number specified does not.
Upgrade disks in drives, resetting system.	This is a status message only printed after a successful copy sequence. Upgrade disks were left in the disk drives.
Value must be less than 256.	Whenever there is a prompt for "Number of Entries", up to three digits may be entered but only values up to 255 are acceptable.
Verifying database, please wait...	This is a status message only. The database in Ram and on disk is compared. If any differences are found the database is said to be corrupt and the copy operation is aborted.
Warning. Sub-circuit field ignored for this card.	Sub-circuit parameter was entered, but was not required. Information only.
Writing database, please wait...	This is a status message only. Database is being written from system RAM to disk as part of the COPY DATABASE command.

APPENDIX C

INSTALLATION OF NEW SOFTWARE

Cl.01 This Appendix outlines the procedures involved in the installation of new or upgraded software. Additional information may be found in Section MITL9109-094-200-NA, Shipping, Receiving and Installation. The SX-200 DIGITAL PABX software is stored on two 5 1/4 inch floppy diskettes; the database is also stored here. When upgraded software is procured, it is desirable to simply copy the customized database from the old software diskettes onto the new software diskettes, rather than re-entering the database manually. The procedures for this are outlined below.

Procedure

Cl.02 It is important to note that these procedures involve a complete reset of the system (needed to initialize the new software). Therefore, this procedure should be done only at night, or during a period of low traffic to ensure minimum effect upon system users. To install new software, follow the following procedures in Table Cl-l.

TABLE Cl-l
NEW SOFTWARE INSTALLATION

Step	Procedure
1	Select the MAINTENANCE application at the maintenance terminal, and log in. See Paragraph 2.04 of this Section.
2	Press the SYSTEM softkey to access the System Level in the Maintenance Application.
3	To copy the database, enter the following softkeys: COPY DATABASE ENTER
4	Wait for the database to be read into DRAM; this is complete when the following message is presented at the maintenance terminal: Insert new disks, close doors and press CONTINUE.
5	Remove the original floppy diskettes from the disk drives.
6	Insert the new software diskettes into the disk drive, and move the latch into the closed position. Ensure diskettes are inserted into correct disk drives.
7	Press the CONTINUE softkey to write the database on to the new floppy diskettes.
8	Wait for the write to complete; this is indicated by the following message: Copy successful. If upgrading then RESET - else press CANCEL to continue.

TABLE CI-I (CONT'D)
NEW SOFTWARE INSTALLATION

Step	Procedure
9	At this point, if it is not desirable to reset the system. Remove the new software diskettes from the disk drives, insert the original diskettes, press the CANCEL softkey, and wait for an appropriate time. Otherwise, proceed to Step 10.
10	Press the SYSTEM RESET pushbutton on the Main Control card (see Section MITL9109-094-200-NA, Shipping, Receiving and Installation). If the upgrades disks are left in and SYSTEM RESET is not pressed, the system will reset itself.
11	Wait for the reset to complete; this is indicated by the green ACTIVE LED indicator on the Main Control card flashing on and off. The system is now running the new software. Note: It will be possible to log into the maintenance terminal approximately 2 minutes after pressing the SYSTEM RESET pushbutton.

SX-200” DIGITAL
PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX)
GENERAL MAINTENANCE INFORMATION

NOTICE

CONTENTS PAGE

CONTENTS (CONT'D) PAGE

LIST OF ILLUSTRATIONS

LIST OF TABLES

LIST OF TABLES (CONT'D)

1. GENERAL

Introduction

1.01 This Section describes the maintenance philosophy, features, and facilities of the SX-200® DIGITAL Private Automatic Branch Exchange (PABX). Included are the use of diagnostic tests, maintenance aids, local and remote terminals, and other tools available to assist maintenance users in ensuring a continued high standard of efficiency and performance. Further details concerning SX-200 DIGITAL PABX maintenance may be found in the Sections listed in Table I-1.

TABLE I-I
SX-200 PRACTICES

MITL9109-094-100-NA	General Description
MITL9109-094-105-NA	Features and Services
MITL9109-094-180-NA	Engineering Information
MITL9109-094-350-NA	Troubleshooting
MITL9109-094-351-NA	RS-232 Maintenance Terminal

Reason for Issue

1.02 This Section forms part of the MITEL Standard Practices issued to provide technical information for the SX-200 DIGITAL PABX, with Generic 1003 features and software.

The *SUPERSET 4*® Telephone

1.03 For information on the *SUPERSET* 4 telephone, see Section MITL9109-094-107-NA, *SUPERSET* 4 Telephone Information.

The *SUPERSET 3*™ Telephone

1.04 For information on the *SUPERSET* 3 telephone, see Section MITL9109-094-106-NA, *SUPERSET* 3 Telephone Information.

The *SUPERSET 4*™DN Telephone

1.05 For information on the *SUPERSET* 4DN telephone, see Section MITL9109-094-109-NA, *SUPERSET* 4DN Telephone Information.

The *SUPERSET 3*™DN Telephone

1.06 For information on the *SUPERSET* 3DN telephone, see Section MITL9109-094-108-NA, *SUPERSET* 3DN Telephone Information.

2. SYSTEM OVERVIEW

General

2.01 The SX-200 DIGITAL PABX system is a fully electronic solid-state microprocessor-controlled switching system employing digital switching techniques and incorporating special peripheral devices and architecture to provide a modern integrated office communications system. A block diagram of the system is shown in Figures 2-1 through 2-4.

Maintenance

2.02 The modular design and functional packaging of the system permits rapid location and replacement of defective equipment. Circuit malfunctions are detected by diagnostic tests automatically initiated by the Central Processing Unit (CPU). These tests are detailed in Part 6 of this Section. The use of troubleshooting procedures is outlined in Section MITL9109-094-350-NA. Troubleshooting helps to locate the defective circuit card or assembly, in order to indicate to the service personnel the required field-replaceable unit. Diagnostic tests and procedures generally do not interfere with users unaffected by the malfunction.

Physical Description

2.03 The SX-200 DIGITAL PABX equipment cabinets are of metal construction, and are shown in Figures 2-5 to 2-10. All connections from the cross-connecting terminals to the system equipment cabinets are made using standard connector cables. Connections between cross-connecting terminals, the Attendant Console and external equipment are made in accordance with accepted practice. A more detailed physical description may be found in Section MITL9109-094-IOO-NA, General Description.

2.04 As an option, the SX-200 DIGITAL PABX may be fitted with a standby Uninterruptable Power Supply (UPS). The reserve power should maintain system operation for approximately 2 hours in the event of a primary power failure. Each cabinet in a multi-cabinet system must be fitted with one dedicated UPS. Refer to the manufacturer's instructions for information on installation and maintenance.

Control Equipment Cabinet

2.05 The door on the front of the SX-200 DIGITAL control equipment cabinet provides access to the system maintenance panel, two digital equipment bays on the bottom shelf, two more digital bays or an analog bay in the top shelf, and the Main Control (MC) card. The rear doors provide access to the backplanes and equipment interface connectors. Connection to an optional peripheral equipment cabinet is made through the cable ducts located at the bottom of either of the cabinet side panels. The 672-port Control Cabinet contains Bay 0 (with the Control Cards) and up to three peripheral Bays.

Peripheral Equipment Cabinet

2.06 **480-Port and 456-Port Configurations:** The door on the front of the SX-200 DIGITAL peripheral equipment cabinet provides access to the peripheral maintenance panel, and two analog equipment bays. The rear doors provide access to the backplanes, equipment interface connectors and the power supply. Connection to the control equipment cabinet is made through the cable ducts located at the bottom of either of the cabinet side panels.

2.07 **672-Port Configuration:** The 672-port peripheral cabinet contains up to four digital peripheral bays (two shelves); it has no maintenance panel.

Digital Equipment Bays

2.08 Digital equipment bays house the voice/data digital peripheral cards. In a 480-, 456-, or 336- port configuration, Bay 2 contains a Bay Power Supply (BPS), a Floppy Disk Drive, (FDD), and up to four peripheral cards; Bay 1 contains a BPS, an FDD (which receives its power from Bay 2), and up to eight peripheral cards. Between the bays is a Main Control Card (MCC) which is powered from Bay 2. Digital Bays 3 and 4 each contain a Bay Control Card (BCC), a BPS, and up to eight peripheral cards. In a 672-port configuration, Bay 0 contains a BPS, two FDD's, a MCC, and a Switch Matrix Card. Bays 1 through 7 are the same as Bays 3 and 4 above, containing a BPS, a BCC, and up to eight peripheral cards.

Analog Equipment Bays

2.09 Analog equipment bays house the analog peripheral circuit cards, a Digital Interface Card (DIC), a Peripheral Control Card (PCC), and an interrupt Scanner card (Bay 5 requires only a DIC card). Analog equipment bays are optional, and reside in either the control equipment cabinet (Bay 3) or the peripheral equipment cabinet (Bays 4 and 5). Analog bays may contain up to 15 analog cards each in Bays 3 and 4, Bay 5 may contain 12 analog cards.

Main Control Card

2.10 The Main Control Card (MCC) is the “brain” of the SX-200 DIGITAL PABX. It is responsible for call processing, tone generation and detection, voice conferencing, circuit and message switching, sending diskette information to the Peripheral Control cards, and the generation of ringing signal.

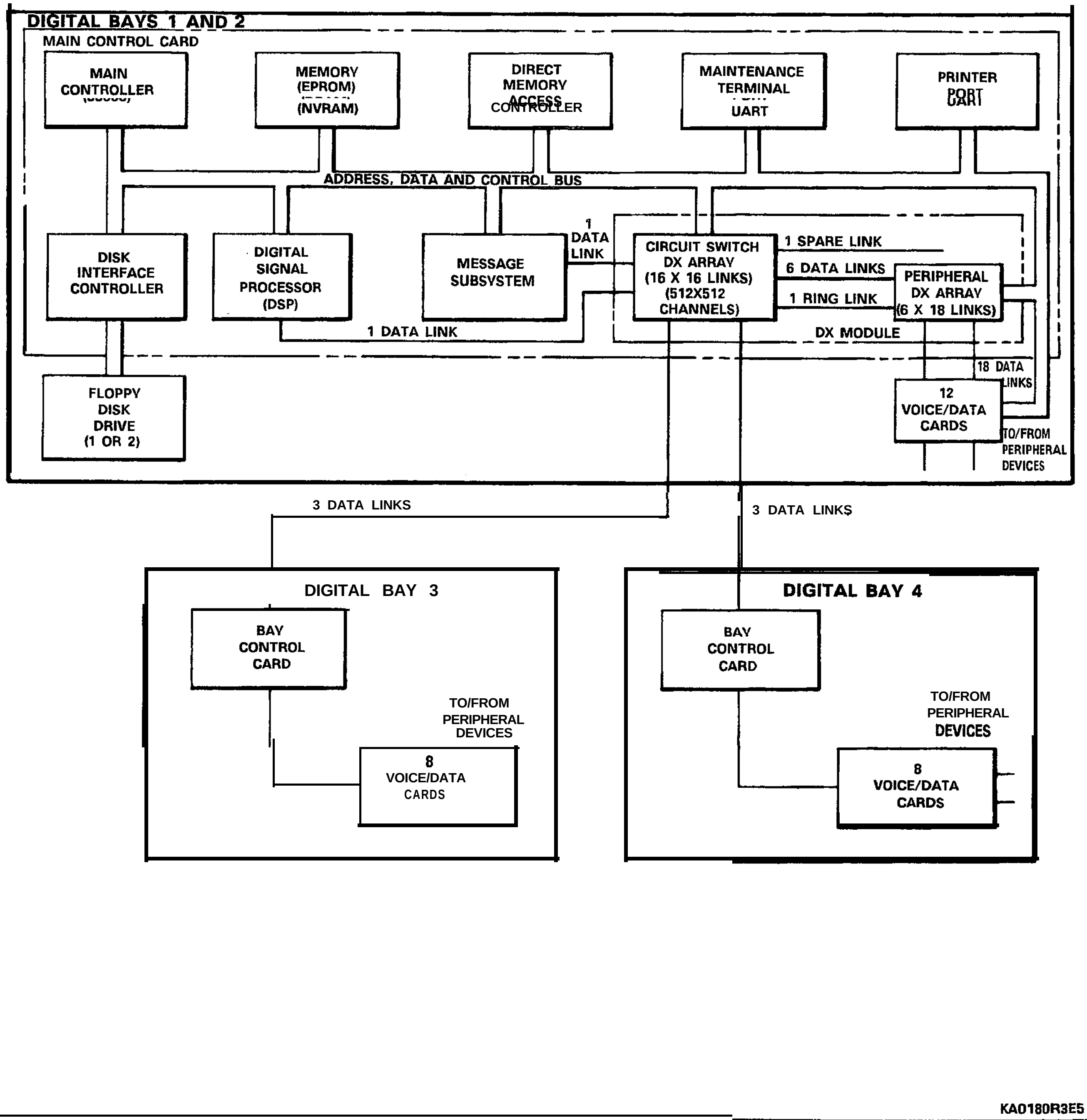


Figure 2-l System Block Diagram (336-Port Configuration)

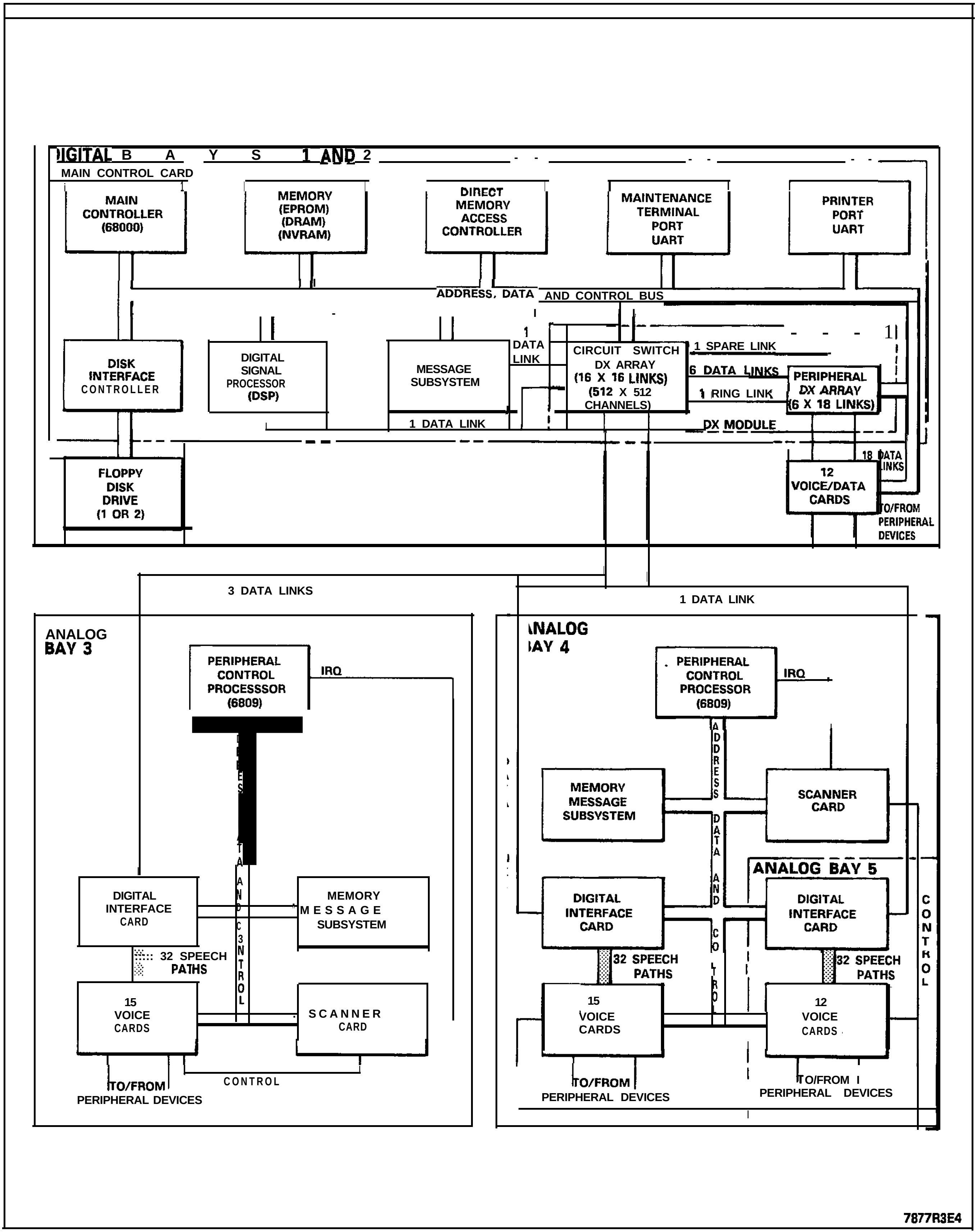


Figure 2-2 System Block Diagram (480-Port Configuration)

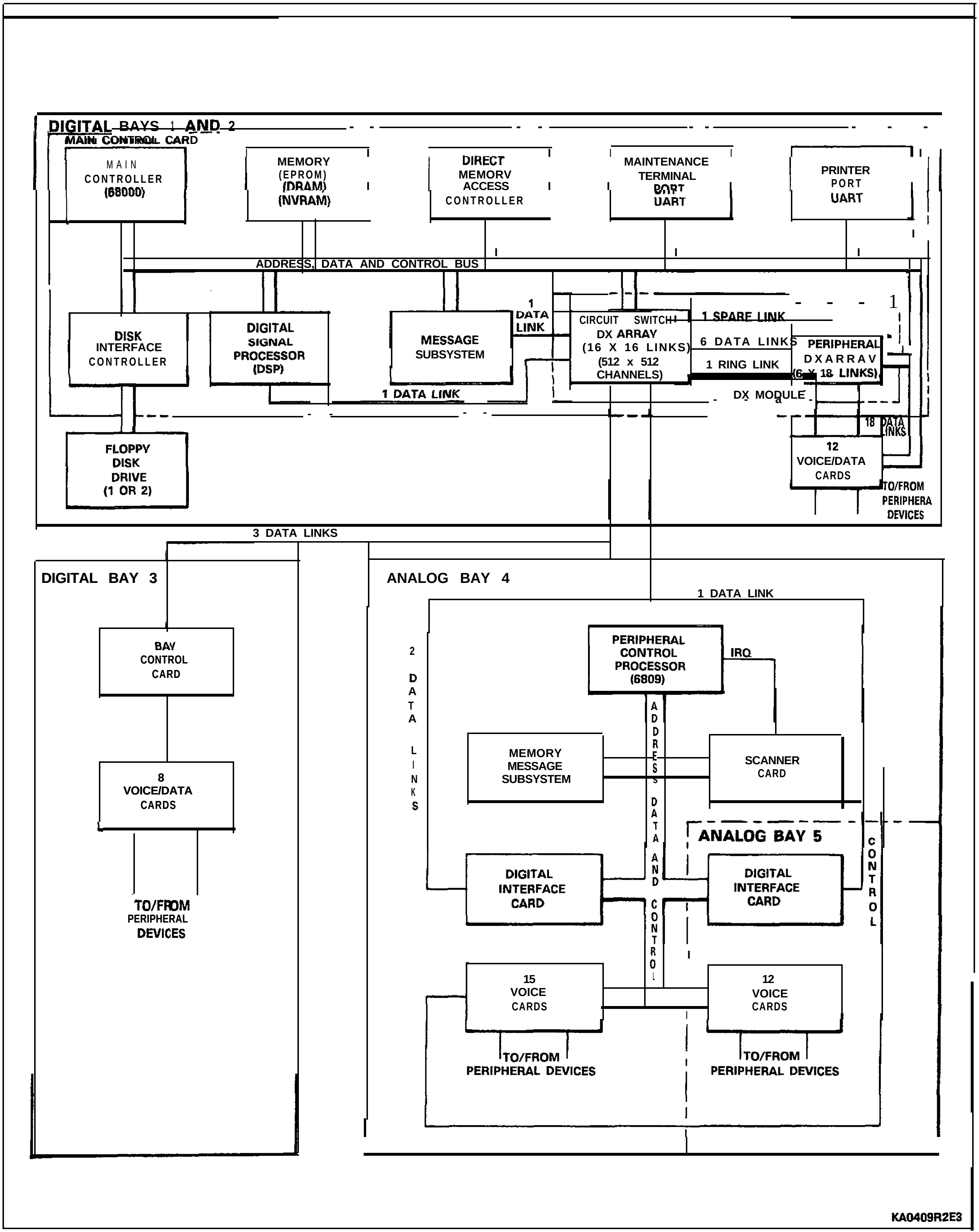


Figure 2-3 SX-ZOO DIGITAL PABX 456-Port Configuration Block Diagram

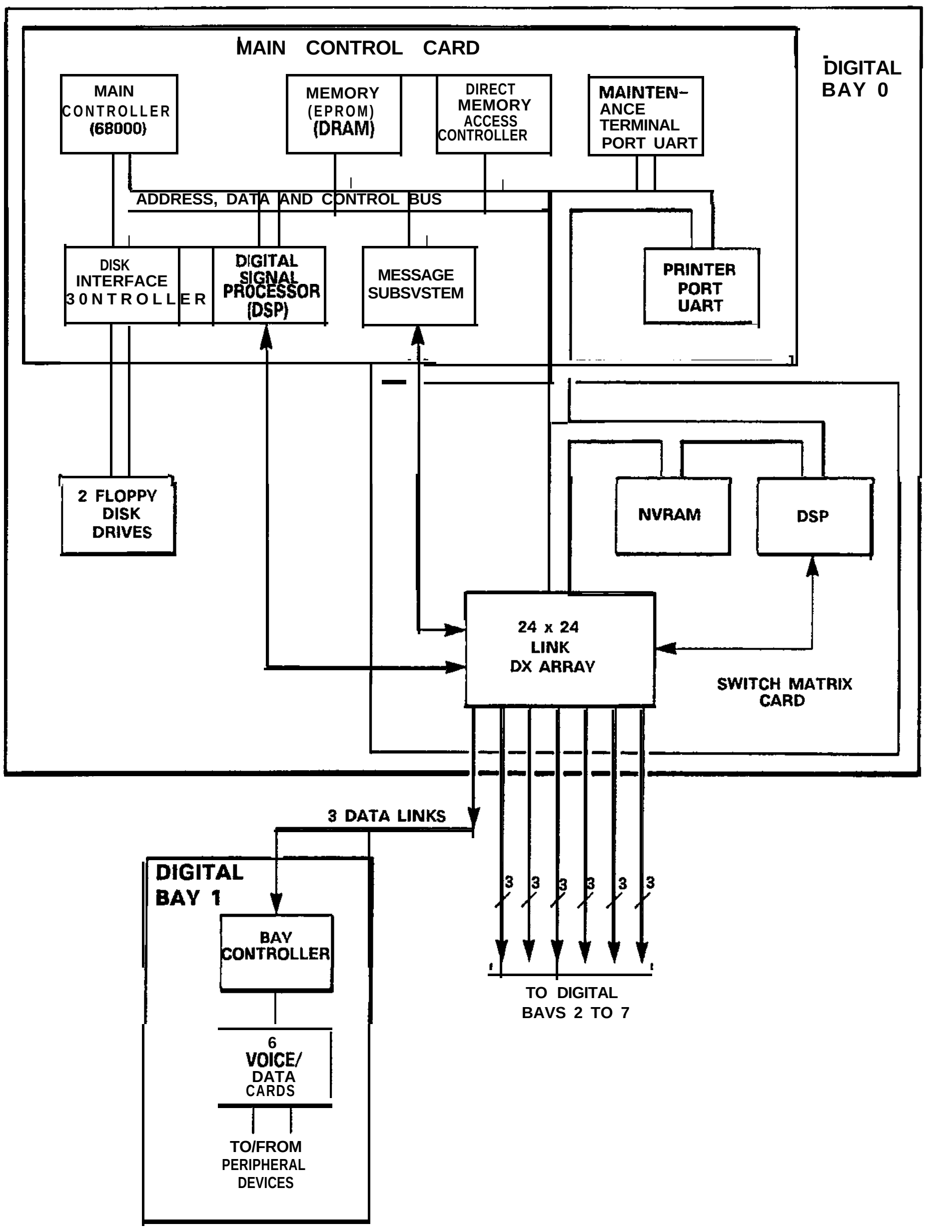


Figure 2-4 System Block Diagram (672-Port Configuration)

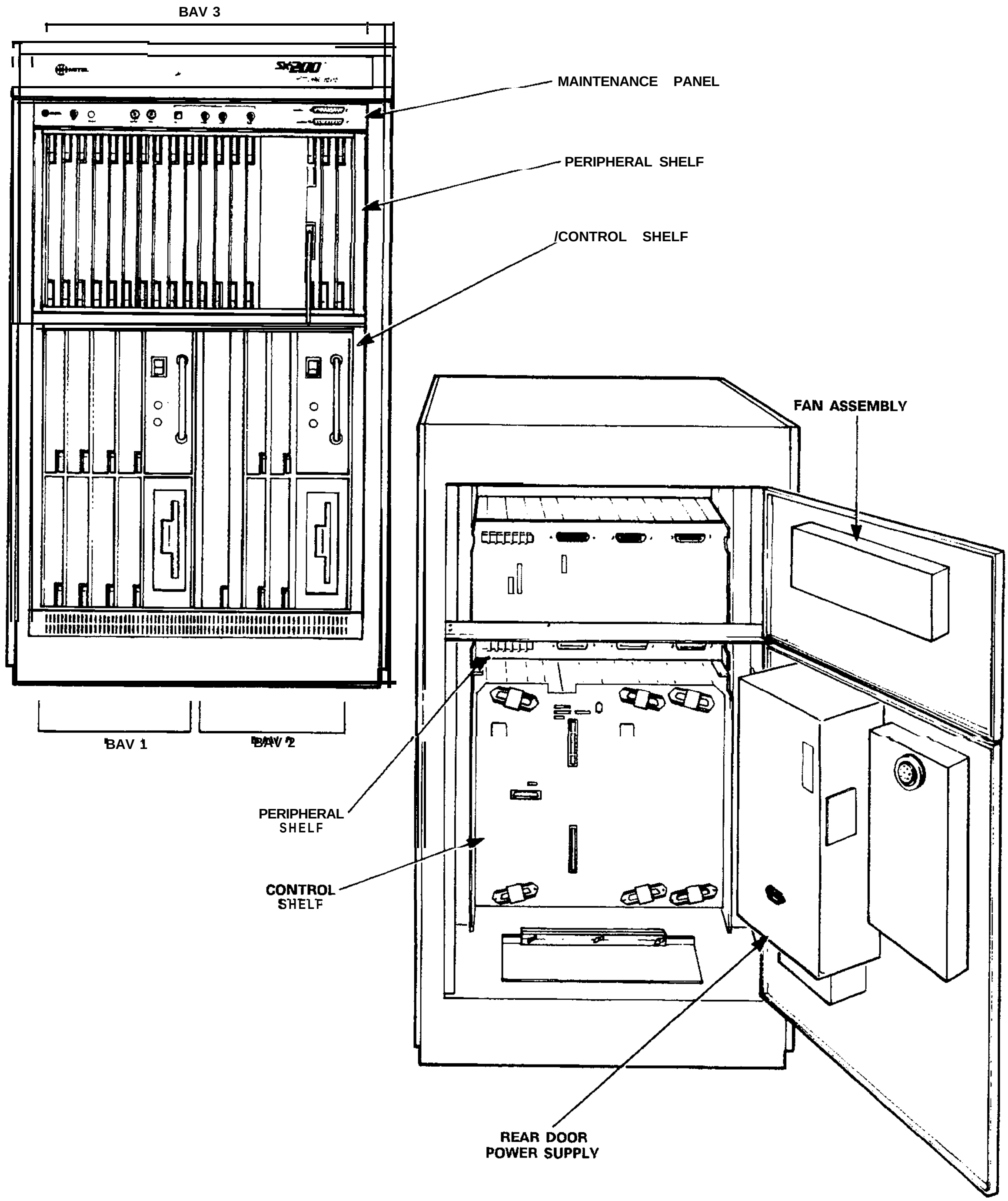


Figure 2-5 SX-200 DIGITAL PABX Welded Control Cabinet

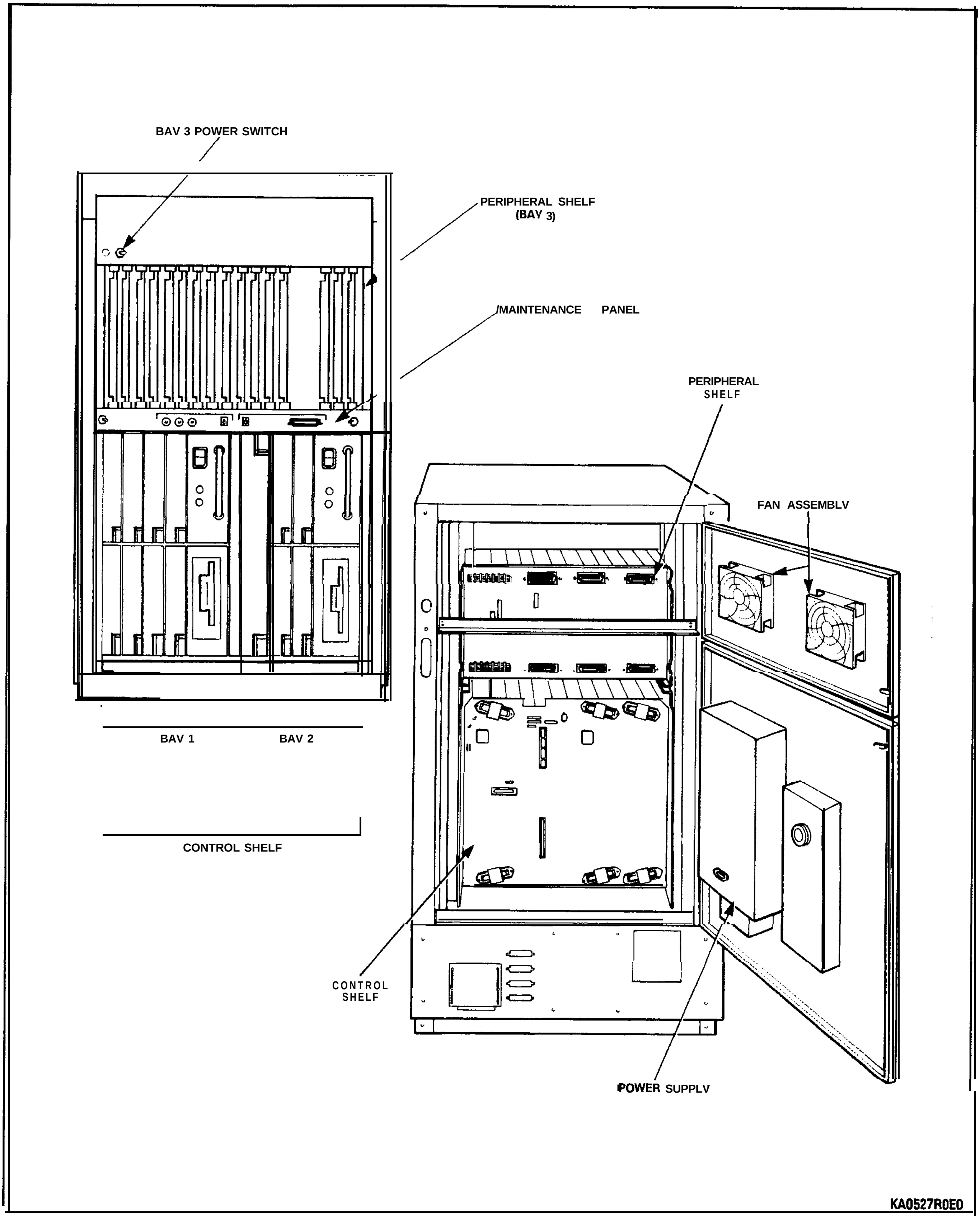


Figure 2-6 SX-200 Universal Control Cabinet

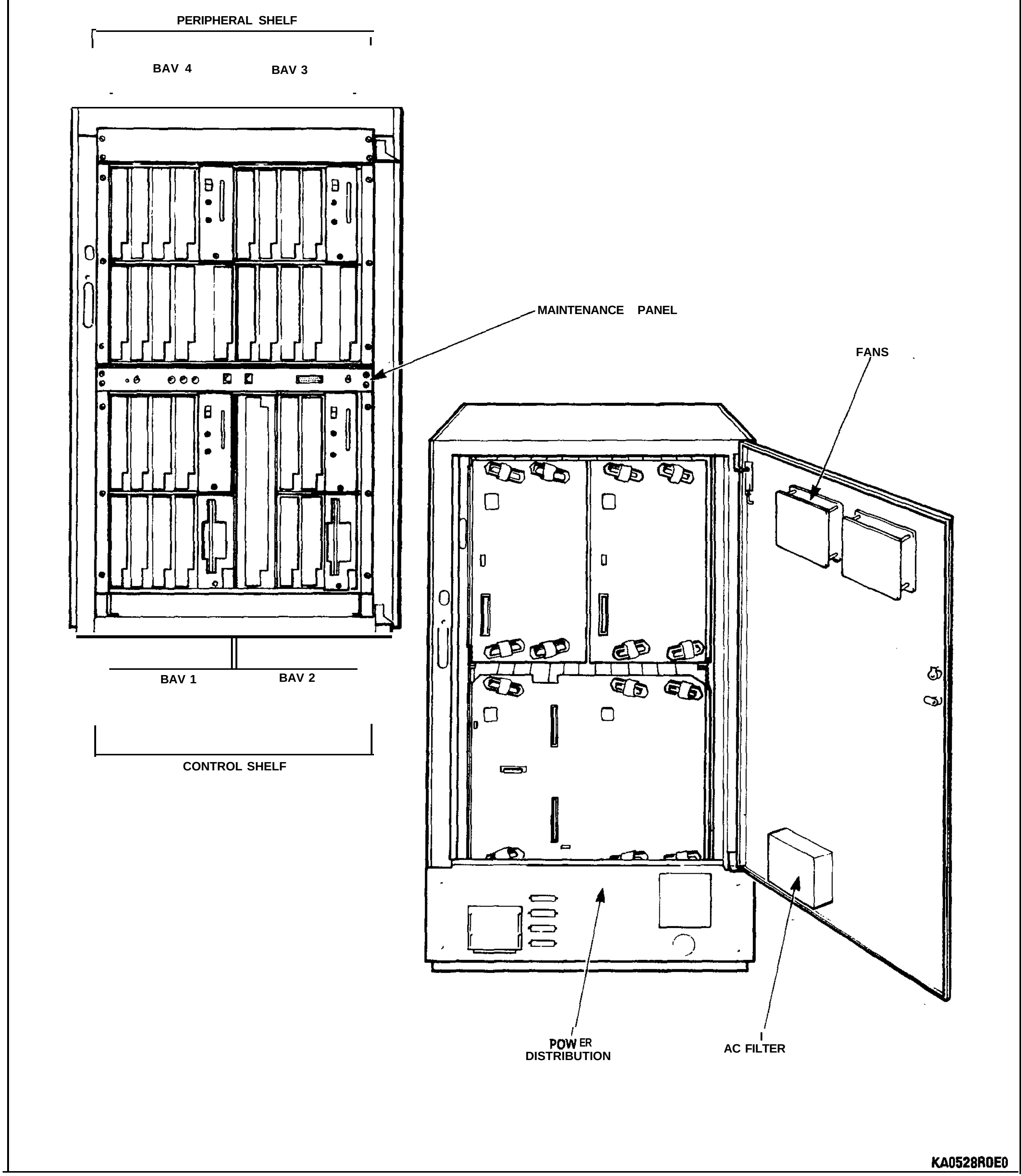


Figure 2-7 ***SX-200*** DIGITAL PABX Universal Control Cabinet with Digital Peripheral Shelf

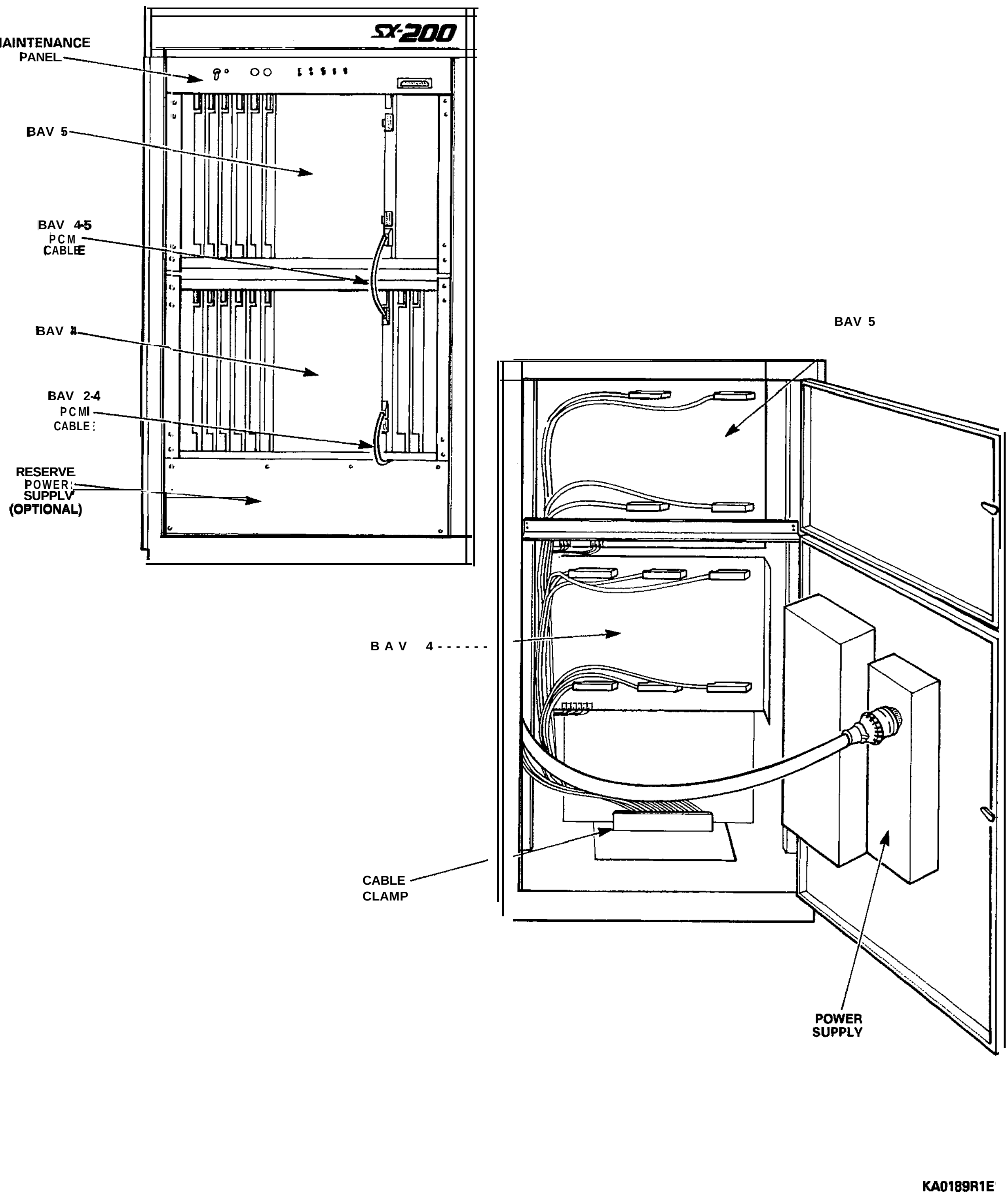


Figure 2-8 SX-200 DIGITAL PABX Peripheral Cabinet

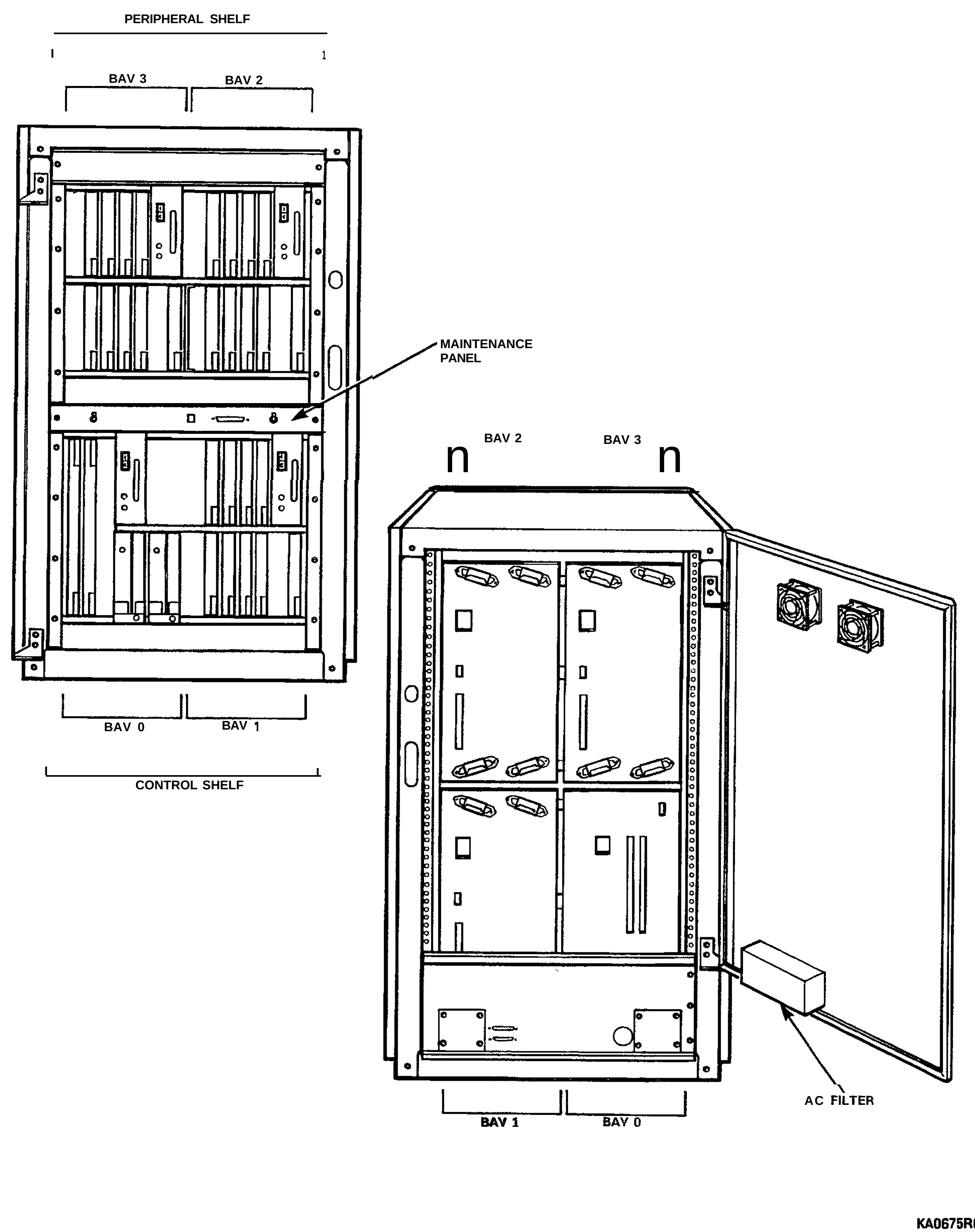


Figure 2-9 SX-200 DIGITAL 672-Port Control Cabinet

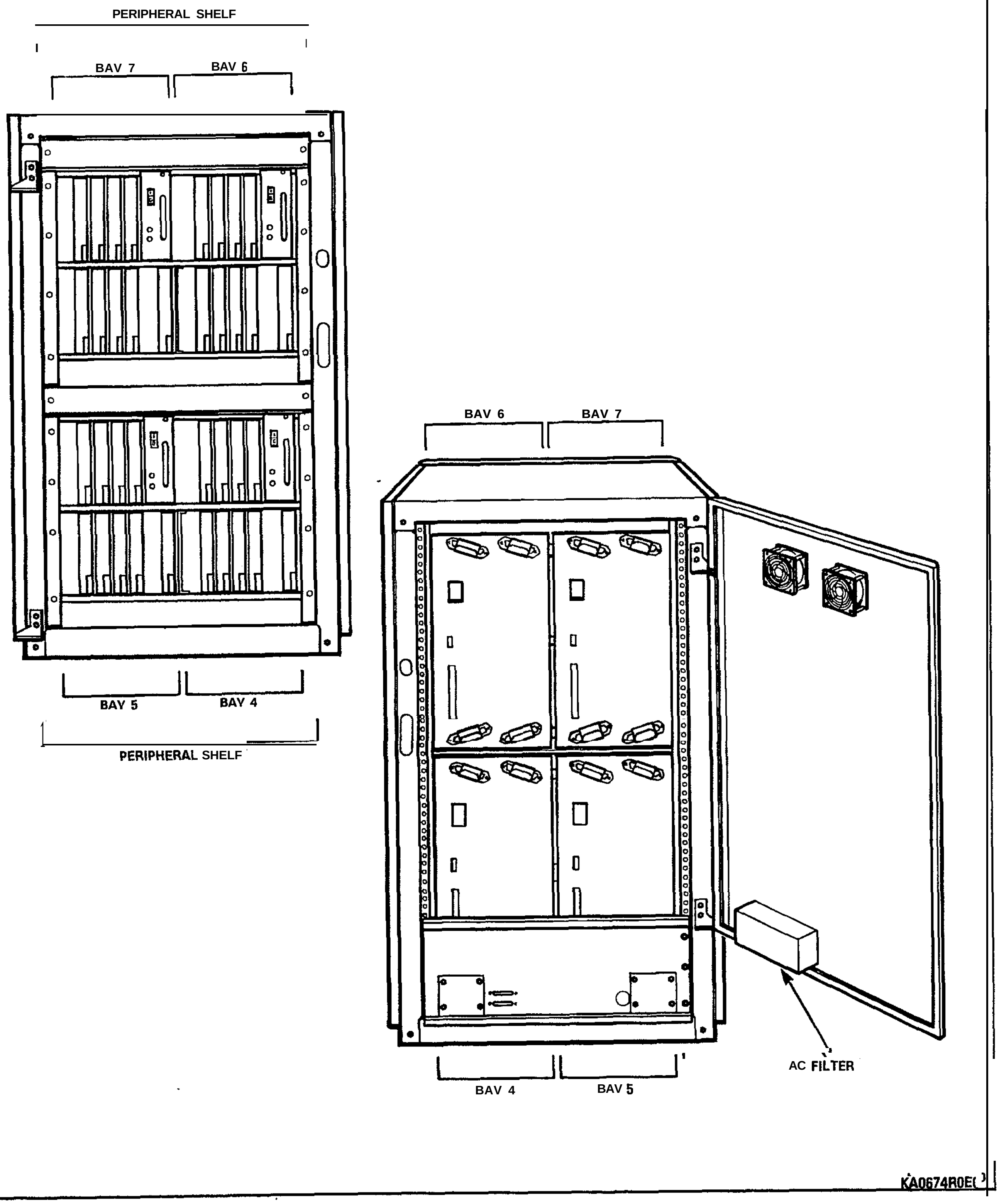


Figure 2-10 SX-200 DIGITAL 672-Port Peripheral Cabinet

Switch Matrix Card

2.11 The 672-port configuration contains a Switch Matrix Card (SMC) which interfaces the MCC to the BCC's in each peripheral bay. When a SMC is present, there is no DX module on the MCC.

Technical/Electrical Characteristics

2.12 See Section MITL9109-094-180-NA, Engineering Information.

Attendant Console

2.13 The SX-200 DIGITAL Attendant Console (Figure 2-5) is enclosed in an attractive, streamlined housing. Located on the left side of the console are a pair of handset/headset cable connections allowing simultaneous operation and supervision. The console keyboard contains two rows of seven fixed function keys, two rows of five softkeys, and a full numeric keypad. The console LCD display, mounted above the keyboard, displays the active state of calls in progress, among other things. See Section MITL9109-094-315-NA, Attendant Console Description for further details.

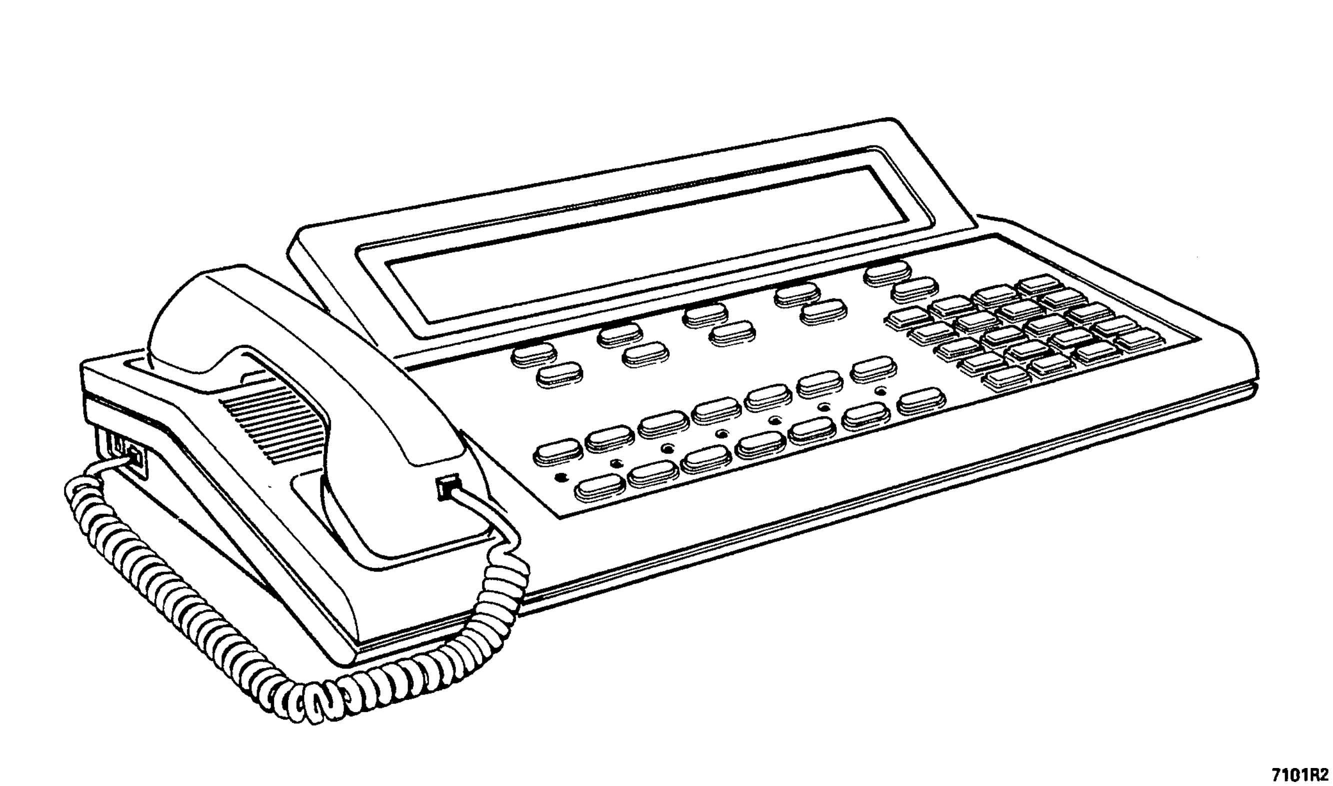


Figure 2-l 1 Attendant Console

3. MAINTENANCE AIDS

The Maintenance Terminal

3.01 The RS-232 ASCII Maintenance Terminal (see Figures 3-l and 3-2) is the primary maintenance tool for the SX-200 DIGITAL PABX. A wide range of commands are available at the maintenance terminal to help the user to locate and replace faulty equipment. For further information, refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal.

3.02 The SX-200 DIGITAL Attendant Console (see Figure 2-5) may be used as an alternate maintenance workstation. All of the commands available at the maintenance terminal are available at the attendant console as well.

Control Cabinet Maintenance Panels

3.03 Located at the front of the control equipment cabinet is the control maintenance panel (see Figure 3-3). This provides maintenance personnel with access to the system through the maintenance ports and test line connectors. Also housed on the control maintenance panel are the Power Fail Transfer control switches, and the power on/off switch and LED power indicator for Bay 3 (480-Port Configuration only).

3.04 Maintenance Port. These connectors are provided to allow the maintenance person to connect an RS-232 ASCII terminal to the system for maintenance or programming purposes. The terminal may be connected either directly to the system (using the LOCAL port), or indirectly, via a modem (using the REMOTE port). Note that only one of the Maintenance Ports may be used at any point in time. Note that the Remote Maintenance port is located on the Universal cabinet's rear panel. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal for further information.

3.05 Power Fail Transfer Control Switches. These switches allow the maintenance person to determine the type of failure that will cause a power fail transfer to occur (refer to Section MITL9109-094-105-NA, Features Description for information on power fail transfer). These switches apply only to 480-port configurations with a welded Control Cabinet. There are three options: transfer on power supply failure, transfer on common control failure, or transfer on either power supply or common control failure. These options are selected by switching the POWER SUPPLY and COMMON CONTROL switches to the ENABLE and DISABLE positions as required. The MASTER SWITCH allows the maintenance person to manually force a power fail transfer, by switching to the TRANSFER position. For normal system operation, this switch should always be in the NORMAL position.

3.06 Maintenance Console. This connector allows the maintenance person to connect an Attendant Console directly to the maintenance panel for maintenance or programming purposes, instead of using an RS-232 ASCII terminal. Refer to Section MITL9109-094-

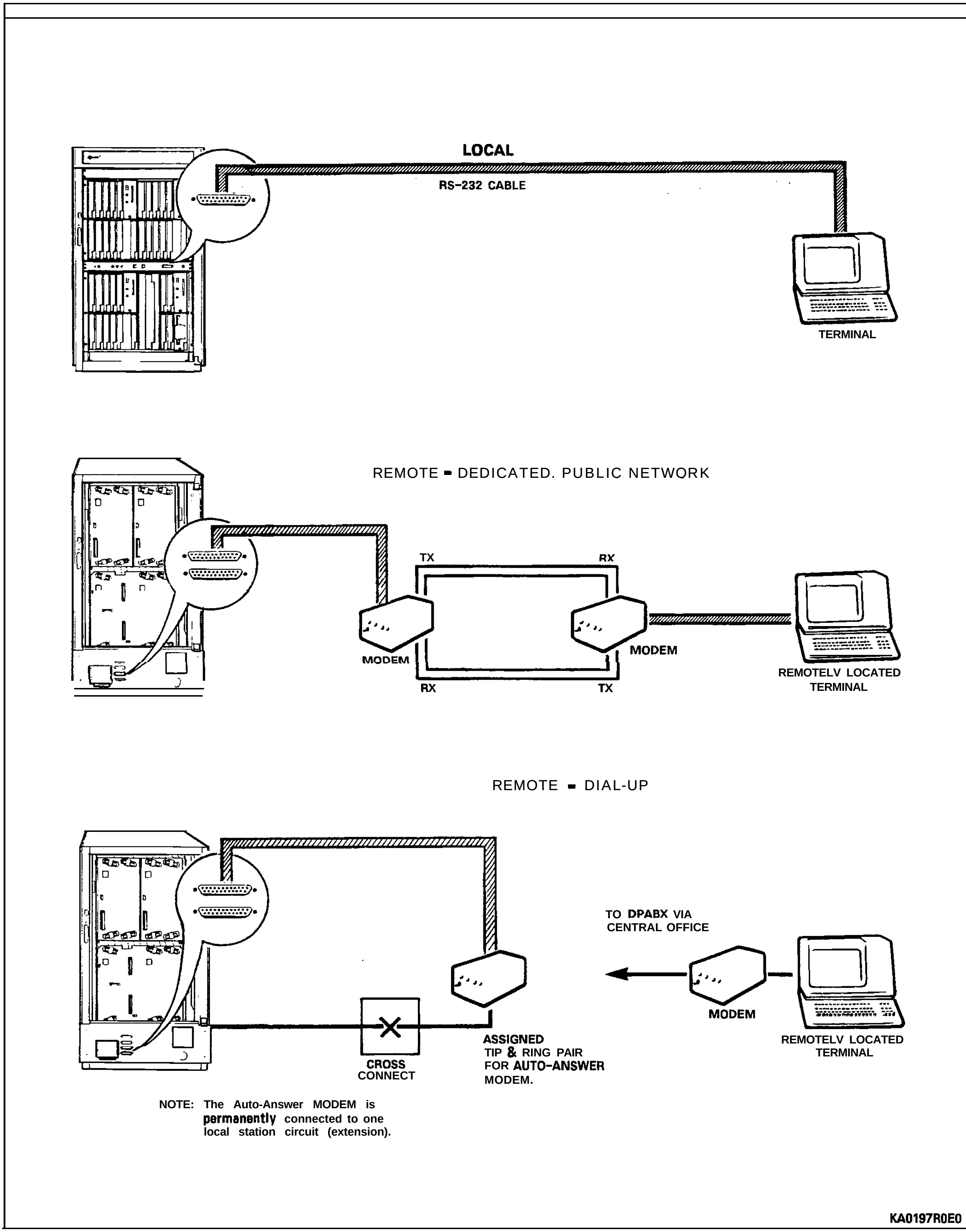


Figure 3-l Maintenance Terminal Connection (SX-200 DIGITAL Universal Control Cabinet)

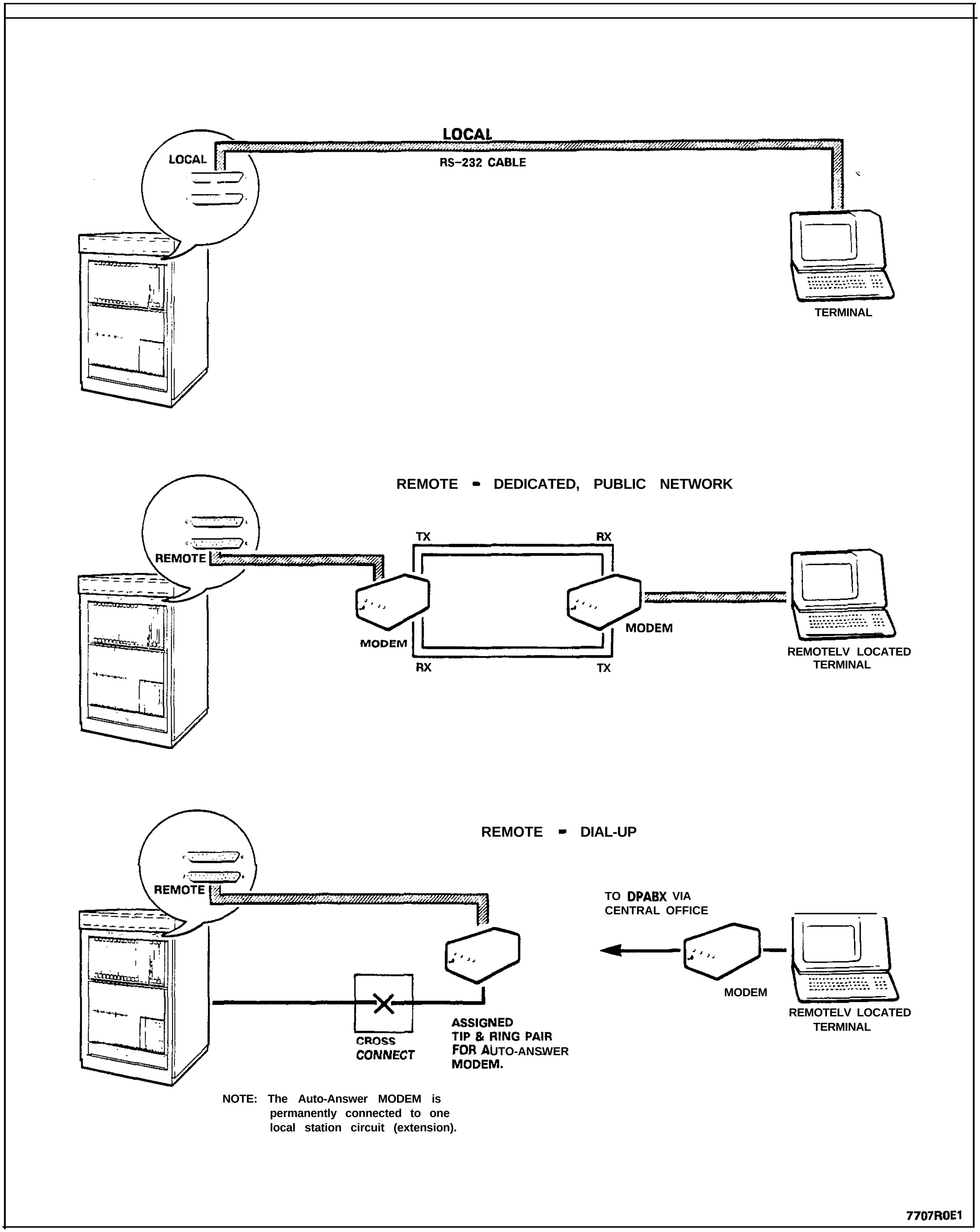
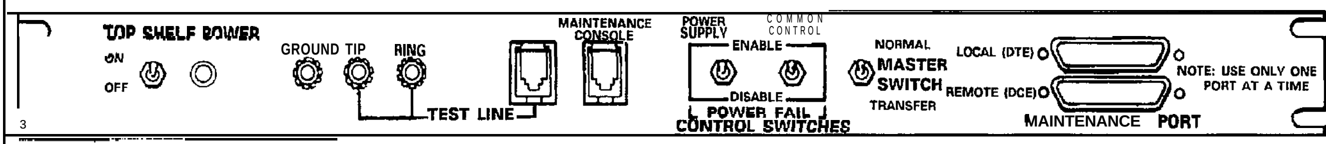
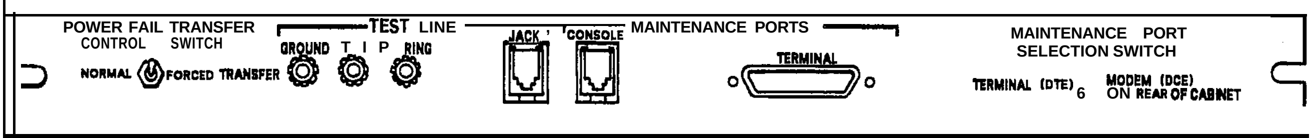


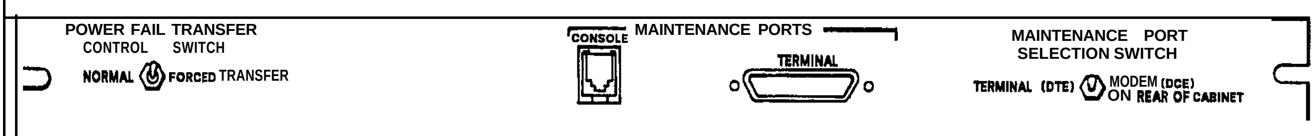
Figure 3-2 Maintenance Terminal Connection (SX-200 DIGITAL Welded Control Cabinet)



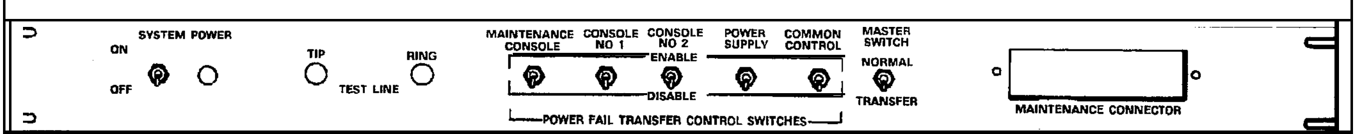
SX-200® DIGITAL PABX Maintenance Panel
(located at top of SX-200® Welded Cabinet)



SX-200' DIGITAL PABX Maintenance Panel
(located above Control Shelf in a Universal Cabinet)



SX-200® DIGITAL PABX 672 Port Maintenance Panel



SX-200® Analog Peripheral Cabinet Maintenance Panel

Note: 672 Port Peripheral Cabinet does not have a Maintenance Panel

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Figure 3-3 SX-200 DIGITAL PABX Maintenance Panels

315-NA, Attendant Console Description for information on console operation. To allow operation of the console, there must be a Console Module installed on a Universal Card located in bay 2, slot 3, circuit 1 in a 480 port, 336 port, or 456 port system; in a 672 port system, the console jack is connected to bay 1, slot 5, circuits 1 and 2.

Caution: With Generic 1003, there are two console types; the LCD Console (which is also with Generics 1001 and 1002) interfaces to a Console Module on a Universal Card, while the Superconsole 1000™ attendant console interfaces to a Digital Line Card. When connecting a console to a maintenance panel, make sure that the console matches the type of card that is installed in the default position.

3.0% Test Line Connectors. These connectors allow the maintenance person to access individual lines, trunks and receivers for testing purposes. The test line also has the, capability of removing circuits from service, and accessing speech paths and the system printer. To facilitate operation of the test line, there must be an ONS line card installed in bay 2, slot 1. Refer to Part 7 of this Section for further information on the test line. There are no Test Line Connectors on a 672 Port Maintenance Panel.

Peripheral Cabinet Maintenance Panel

3.08 Located at the top of the welded peripheral equipment cabinet is the peripheral maintenance panel (see Figure 3-3). This provides maintenance personnel with access to the power fail transfer switches for the peripheral equipment cabinet. These switches allow the maintenance person to determine the type of failure that will cause a power fail transfer in the peripheral equipment cabinet. There are three options: transfer on power supply failure, transfer on common control failure, or transfer on either power supply or common control failure. These options are selected by switching the POWER SUPPLY and COMMON CONTROL switches to the ENABLE and DISABLE positions as required. The MASTER SWITCH allows the maintenance person to manually force a power fail transfer, by switching to the TRANSFER position. For normal system operation, this switch should always be in the NORMAL position.

Important: Note that the switches labelled MAINTENANCE CONSOLE, CONSOLE NO. 1 and CONSOLE NO. 2 must always be in the DISABLE position. The 672 port peripheral cabinet does not have a maintenance panel.

System Maintenance Log

3.09 The system maintenance log is a floppy-disk-based record of maintenance-related information. Any event which has the potential of affecting the functioning or the capacity of the system is entered into this log. There are three types of log reports possible:

1. Fault report - A report is generated whenever Call Processing or the maintenance system detects an error or an abnormal condition.

2. Reset report - A report is generated whenever a bay or the Main Controller is reset.

3. Alarm level change report - A report is generated whenever a change in the overall system alarm level occurs.

4. ALARMS

General

4.01 Alarms are the means through which the SX-200 DIGITAL PABX is able to determine its own functional state. The Alarm Manager software program monitors the performance of all peripheral devices in the system, and compiles up-to-date statistics on anomalies. The level of alarm is determined by the actual or potential effect on service that the anomalies cause.

Alarm Levels

4.02 There are four distinct levels of alarm defined for the SX-200 maintenance system. These levels are intended to give the maintenance person up-to-date information on the severity of existing anomalies. The four alarm levels are:

1. NO ALARM - This indicates that the system is functioning properly.
2. MINOR - This indicates that there are problems affecting the system in small proportion.
3. MAJOR - This indicates that there are problems causing a serious degradation of service.
4. CRITICAL - This indicates that there has been a very serious loss of call processing capability; an automatic power-fail transfer (PFT) is invoked and the system is reset.

Alarm Categories

4.03 There are four basic alarm categories, all relating to peripheral equipment. All problems affecting system performance will fall into one or more of these categories. Failure of other system components will indirectly cause failure of peripheral equipment. The categories are:

- Lines
- Trunks
- DTMF Receivers
- PCM Channels (junctors).

Alarm Types

4.04 Since the SX-200 DIGITAL PABX is modular in design, the Alarm Manager keeps alarm statistics in a modular fashion. For this reason, the alarms are divided into three types:

1. Bay Alarms - These are the alarm levels of the categories specific to each separate bay in the system.

2. System Alarms - These are the alarm levels of the categories on a systemwide basis.

3. Overall Alarm - This is the overall system alarm level, taking into account all of the bay alarms and system alarms in all categories. This is the alarm that is displayed on the upper right corner of the console

Alarm Thresholds

4.05 For each alarm category, the thresholds represent the alarm level trip points; the precise divisions between the alarm levels. The thresholds are simple percentages, indicating availability; the number of working devices is compared to the number of programmed devices. The critical alarm threshold, however, is not a percentage, but rather a precise numerical value. When the number of available devices falls below this number, a Critical Alarm is raised. The thresholds are programmable (refer to Section MITL9109-094-351-NA); the default values are specified in Table 4-l.

Alarm Totals

4.06 The Alarm Manager keeps a record of the total numbers of the various devices that should be available to Call Processing, as well as the actual number that are available. Alarm totals are maintained for each of the alarm categories in each bay, as well as for the entire system. These totals are compared to the alarm thresholds, to determine the level of alarm that is raised.

TABLE 4-1
ALARM THRESHOLDS

ALARM CATEGORY (Peripheral Devices)	ALARM THRESHOLDS		
	MINOR	MAJOR	CRITICAL
Lines	0%	20%	0
Trunks	0%	10%	0
DTMF Receivers	0%	25%	0
PCM Channels (Junctors)	10%	25%	1

5. THE MAINTENANCE MANAGER

General

5.01 The Maintenance Manager is the central maintenance software program in the SX-200 DIGITAL PABX system software. Its responsibility includes the receiving of requests to run diagnostic tests, managing the test schedules (queues) and initiating testing.

Diagnostic Test Queues

5.02 Diagnostic tests are grouped into three different categories: Power-up, Background and Directed. To reflect this, the test schedules (queues) are prioritized along the same categories. Table 5-l describes the queues in ascending order of priority. When the Maintenance Manager schedules a device for a particular type of diagnostic test, it places the device in the appropriate diagnostic test queue. When the maintenance person disables a diagnostic test type via the maintenance interface, the corresponding test requests are removed from the associated test queue. The priority scheme is designed to ensure that testing requested by the maintenance person via the maintenance terminal is handled immediately.

TABLE 5-l
DIAGNOSTIC TEST QUEUES

Diagnostic Test Queue	Priority	Description
Background Queue	6	This queue has the lowest priority; any device with background diagnostics enabled will normally be tested once during each pass through the system. Note: Background Diagnostics can be manually disabled.
Power-up Queue	5	If a device has power-up diagnostics enabled, and is both programmed and installed, it will be put on this queue. Note: Power-up Diagnostics must be manually enabled.
Power-up Retry Queue	4	If a device could not be tested when on the Power-up Queue, it will be placed on this higher priority queue to be tested as soon as possible.
Fault Isolation Queue	3	If a previously healthy device fails a test, it will be flagged “SUSPECT” and tested again from this queue. The device must pass its test seven times before it is returned to service. If it fails here, it is removed from service.

TABLE 5-1 (CONT'D)
DIAGNOSTIC TEST QUEUES

Diagnostic Test Queue	Priority	Description
Fault Isolation Retry Queue	2	If a device could not be tested when on the Fault Isolation queue, it will be placed on this higher priority queue to be tested as soon as possible.
Directed Test (User) Queue	1	This is the highest priority test queue. Devices in this queue will be tested immediately; results will be reported to initiating user port.

Testing

5.03 The Maintenance Manager controls the entire test sequence on any device under test. The general test sequence for any peripheral device is as follows:

1. The Maintenance Manager locates a device with diagnostic test requests pending on the highest priority test queue.

2. The device is requested from Call Processing for testing. If the device is idle, the request will be granted.

3. Any resources required to perform tests on the device are allocated.

4. The series of tests for the particular device is invoked.

5. When testing has been completed, the status of the device is updated.

6. If the device status has changed, this will be logged into the Maintenance log, and the alarm levels will be updated.

7. Resources required for testing are released.

8. The device is then returned to Call Processing, providing all tests passed. If any of the tests failed, the device will be retested; failure in this case will result in the device being removed from service.

5.04 When the Maintenance Manager has control of a device for testing purposes, it must follow a set of "guidelines" designed to make diagnostic testing both transparent to system users, and efficient. These include:

(a) If Call Processing requires a device while it is being tested, the Maintenance Manager immediately aborts the test and releases the device.

(b) When a device fails a diagnostic test, it will be tested a second time to verify the fault. If it fails again, it will be removed from service.

(c) When a device fails diagnostic tests, and is subsequently removed from service, it shall remain out of service until it passes seven successive diagnostic tests.

(d) If a device scheduled forpower-up or fault-isolation diagnostic testing cannot be tested, it will be rescheduled for testing on a higher priority test queue, and retried on 5 minute intervals.

(e) Each device may have background and/or power-up diagnostics selectively disabled by the maintenance person via the maintenance interface.

Fault Recovery

5.05 Once a device fails diagnostic testing, it is removed from active service; it can no longer be used by Call Processing. There are three different circumstances through which the device can be returned to active service. They are:

1. The most common method should be through the troubleshooting procedures outlined in Section MITL9109-094-350-NA, Troubleshooting. This entails repairing or replacing the affected card. When re-installed, the device is automatically tested, and if it passes, is returned to service.

2. The maintenance person has the option of returning a faulty device to service, should that be desirable. This is done via the maintenance interface (terminal, console, or testline) - see Section MITL9109-094-351-NA, RS-232 Maintenance Terminal.

3. When a device fails diagnostic testing and is subsequently removed from service, the Maintenance Manager continues testing it. If a device passes seven consecutive tests after being removed from service, it will be returned to service.

The Maintenance Database

5.06 All cards that are programmed via Customer Data Entry (CDE) have associated with them an up-to-date status record located in system DRAM memory. These are known as the Maintenance Device Work Areas (DWA), and aid the system in determining the state of every device in the system at any point in time. Table 5-2 describes all of the information stored in the device work areas.

TABLE 5-2
THE MAINTENANCE DEVICE WORK AREA

DWA Entry	Description
Physical Location	**The physical location (bay, slot, circuit, subcircuit) of the device.**
Card Type	**The type of card programmed in the specified location; i.e., ONS Line Card, DTMF Receiver Module, etc.**
Card Status	**The status of the card; one of:** **instld - the correct card type is installed** **unplug - the card is programmed, but is either unplugged, or not installed** **wrong - an incorrect card type is installed.**
Test Request Pending Counter	**The number of outstanding requests for diagnostics tests for the card, on each of the six test queues.**
Test Request Pending Flag	**For each circuit on the card, and for each test queue, this indicates outstanding test requests.**
Circuit Status	**The status of the circuit, one of:** **avail - available to CP and maintenance** **progr - programmed in CDE but not installed** **unprog - installed but not programmed in CDE** **suspt - suspect - failed diagnostic test once** **flty0 - faulty** **flty1 - faulty with one pass** **flty2 - faulty with two passes** **flty3 - faulty with three passes** **flty4 - faulty with four passes** **flty5 - faulty with five passes** **flty6 - faulty with six passes** **bsout - forced busy, busied-out**
Power-up Enable	**Indicates for each circuit on the card, if power-up diagnostics are enabled.**
Background Enable	**Indicates for each circuit on the card, if background diagnostics are enabled.**

6. DIAGNOSTIC TESTS

General

6.01 For each physical device in the SX-200 DIGITAL PABX there is a special set of diagnostic tests specifically designed to test the device as thoroughly as possible. If faults are detected, broader ranges of tests may be run in an attempt to isolate the fault to the board level, and to ensure that isolated faults are not merely side effects of other problems. The diagnostics are divided into four different functional groups. This is necessary to facilitate the different characteristics of the various devices in the system. For example, a line circuit may be tested at any time; whereas the system RAM or the CPU may not, as the system software requires them at all times. Note that cards in the analog bays may be tested only indirectly, by testing the voice paths that they are connected to. Table 6-l describes the four types of diagnostic tests. Table 6-2 shows which devices are tested by each of the four types of diagnostics.

TABLE 6-l
DIAGNOSTIC TYPES

Diagnostic Type	Description
PROM-Based	These are the only tests that thoroughly verify the Main Control and Peripheral Control cards. They can be initiated only by resetting the system.
Power-up	If enabled (by default they are not) run once, starting at system initialization. These tests can be enabled from the maintenance terminal or the console.
Background	If enabled, start running after power-up diagnostics have completed, and run continuously. These tests can be enabled from the maintenance terminal or the console. The default condition for this type of diagnostic test is “ON”.
Directed	These are tests initiated by the maintenance user from the maintenance terminal, console, or test line.

Note: Power-up, Background, and Directed diagnostics are actually the same set of tests; the difference lies only in the manner in which they are invoked.

TABLE 6-2
DIAGNOSTIC COVERAGE

Device Type	Power-up	Background	Directed	PROM
ONS Line (digital)	yes	yes	yes	
COV Line (digital)	yes	yes	yes	
OPS Line (digital)	yes	yes	yes	
LS/GS Trunk (digital)	yes	yes	yes	
DID Trunk (digital)	yes	yes	yes	
E&M Trunk Module (digital)	yes	yes	yes	
Digital Line Card (DNIC)	yes	yes	yes	
DTMF Receiver Module	yes	yes	yes	
Console Module	yes	yes	yes	
Music/Pager Module	see Note			
Svstem Printer			ves	
Analog Voice Paths (Junctors)	yes	yes	yes	
Main Control Card				yes
Digital Signal Processor (DSP)	yes	yes	yes	
Bay Control Card				yes
Analog Bay Control Cards				yes
8-Station Line (analog)	yes	yes	ves	
SUPERSET® Line (analog)	yes	yes	yes	
CO Trunk (analog)	yes	yes	yes	
DID Trunk (analog)	yes	yes	yes	
E&M Trunk (analog)	yes	yes	yes	
Tie Trunk (analog)	yes	yes	yes	
T1 Trunk	yes	yes	yes	
PCM Channels (DX)	yes	yes	yes	
DATASETs	yes			
Digital SUPERSEJ Telephones	yes			

Note: Music/Pager module cannot be tested, as the device is always busy.

Main Control Card Tests

6.02 Due to the nature of the Main Control Card, it is not possible to thoroughly test it in the on-line environment. Therefore, most testing is performed only on initialization (i.e., power-up and reset). These tests reside in the Main Control card's onboard EPROM, and test virtually all of the card's main functional blocks. If any of the tests should fail, a unique error code will be displayed on the dual 7-segment display status indicators located on the front panel of the card. These codes are shown in Table 8-1.

6.03 The following tests are performed on the Main Control Card:

- Processor Viability Test
- PROM Checksum Test
- Dynamic RAM Chip Select Independence Test
- Dynamic RAM Data Bit Independence Test
- Memory Address Line Independence Test
- Memory Address Space Independence Test
- DMA Controller Test.

Bay Control Card Tests

6.04 Like the Main Control card, it is not possible to thoroughly test the Bay Control card in the on-line environment. Therefore, most testing is performed only on initialization (power up and reset). The tests reside in the Bay Control card's on-board EPROM, and test most of the card's functional blocks. If any of the tests should fail, the alarm LED on the card's front panel will flash.

6.05 The following tests are performed on the Bay Control card:

- Processor Viability Test
- PROM Checksum Test
- Dynamic RAM Chip Select Independence Test
- Dynamic RAM Data Bit Independence Test
- Memory Address Line Independence Test
- Memory Address Space Independence Test.

Peripheral Control Complex Tests

6.06 The Peripheral Control Complex consists of one Peripheral Control (PCC) Card, one Digital Interface (DIC) Card, and one Scanner card. Like the Main Control card, it is not possible to thoroughly test the Peripheral Control card, in the on-line environment. Therefore, testing is performed only on initialization (i.e., power-up and reset). These tests reside in the onboard EPROM on both the DIC card and the PCC, and test most of the functionality of the DIC and PCC cards, along with indirect testing of the Scanner card. If any of the tests should fail, a unique error code will be displayed on the dual 7-segment display status indicators located on the front panel of the Scanner card. These codes are shown in Tables 8-4 and 8-5.

Peripheral Device Tests

6.07 There is a unique sequence of tests specifically designed for each type of peripheral device in the system. These test sequences include some device-specific tests along with some common tests. The test sequences are described in Tables 6-3 through 6-15.

The actual tests are described in the following paragraphs. Refer to Section MITL9109-094-125-NA, Circuit Card Description for information on peripheral circuit hardware.

6.08 AC CODEC loopback test This test verifies the CODEC encode, decode and filter functions as well as the PCM paths from the DX Matrix. Since this test will always follow the dc CODEC test, failure of the test will isolate the fault.

6.09 AC hybrid loopback test This test is similar to the ac CODEC loopback test, but carries the test further, to the hybrid. Again, if this test fails, the fault is isolated to the device under test.

6.10 ACDC loopback test This is the digital CODEC loopback test, used to determine if the PCM path and the digital signal processor are functioning from the Main Control DX module to the bay. After the dc CODEC test is performed, this test is called without involving the CODEC so the only difference between the two tests is the connections in the DX chip. Failure of this test will not isolate the fault to the CODEC under test.

6.11 Alternate device available This test is for isolation of the fault responsible for the failure of the analog 8804 loopback test. This routine tries to get alternate devices from every card in the bay. An incomplete test will result if less than half the devices are available.

6.12 Alternate device loopback This routine runs the analog 8804 loopback test on the alternate devices.

6.13 Analog 8804 loopback test This test sends a tone down the first junctor, through an 8804, and tries to receive the tone on the second junctor.

6.14 Analog no failures Any juctors involved in analog 8804 loopback test failures now undergo alternate device tests.

6.15 Check ADC ref voltage This test verifies the operation of the Analog-to-Digital converter by checking the level on the PCM Encoder/Decoder (CODEC) reference source. All digital lines and trunks, with the exception the Digital Line Card, undergo this test.

6.16 Check for a data set This function checks for a DNIC data set connected to the device under test. This software test, providing information about the device, is an aid when deciding what hardware tests are to be done.

6.17 Check for a voice set This function checks for a DNIC voice set connected to the device under test. This software test, providing information about the device, is an aid when deciding what hardware tests are to be done.

6.18 Check if other half has a set This function checks for a DNIC voice/data set connected to the other half of the circuit of the device under test. This software test, providing information about the device, is an aid when deciding what hardware tests are to be done.

6.19 Conference test A three party conference is attempted. The test is a pass if the attempt is successful, otherwise a failure of the device is indicated.

6.20 Console status This test verifies the operation of the console. It consists of a status message being sent from the console to the Maintenance Manager. If the test fails, the fault cannot be isolated to the console.

6.21 Dataset loopback This routine performs a dataset data loop-back by forming a loopback path from the dataset UART transmitter back to the UART receiver. Once the path is formed, a block of data is sent to the dataset and the set should send the block back. The test passes if the data received is the same as the data sent. This loopback test is done over the D Channel.

6.22 DC CODEC test This test verifies the operation of the PCM paths from the DX Matrix to the CODEC on the peripheral card and back again. It also verifies the integrity of a tone transmitted from the Main Control card's digital signal processor (DSP) along these paths. If the test fails, it is not possible for the system to isolate the fault completely.

6.23 Digital bay type test Used to decide which set of diagnostics to run, if this routine returns a pass, digital bay diagnostics are run. Analog bay diagnostics are run if a fail is returned.

6.24 DNIC set bphone This test sends bphone_test_request messages to a DNIC voice set. The set verifies the BPHONE chip interface by ensuring one can read and write to/from some of the internal chip registers, and replies back with a pass/fail message. Failure of the test will isolate the fault to the set itself.

6.25 DNIC set eprom checksum This test sends eprom_checksum_request messages to a DNIC voice/data set. The set performs a checksum test and replies back with a pass or fail message. Failure of the test will isolate the fault to the set itself.

6.26 DNIC set transducer earpiece This test sends a transducer-register-contents message to a Digital *SUPERSET* telephone. The set replies back with the contents of the transducer control register. The contents are compared to what is expected to be for the earpiece field, in the call processing work area and a pass or fail is determined. Failure of the test will isolate the fault to the set.

6.27 DNIC set transducer microphone This test sends a transducer-register-contents message to a Digital *SUPERSET* telephone. The set replies back with the contents of the transducer control register. The contents are compared to what is expected to be for the microphone field, in the call processing work area and a pass or fail is determined. Failure of the test will isolate the fault to the set itself.

6.28 **DNIC set transducer mouthpiece** This test sends a transducer-register-contents message to a Digital SUPERSET telephone. The set replies back with the contents of the transducer control register. The contents are compared to what is expected to be for the mouthpiece field, in the call processing work area and a pass or fail is determined. Failure of the test will isolate the fault to the set.

6.29 **DNIC set transducer speaker** This test sends a transducer-register-contents message to a Digital SUPERSET telephone. The set replies back with the contents of the transducer control register. The contents are compared to what is expected to be for the speaker field, in the call processing work area and a pass or fail is determined. Failure of the test will isolate the fault to the set.

6.30 **Get free junctor test** This function attempts to get a junctor for use by the analog 8804 test.

6.31 **Junctor AC CODEC loopback** This test, performed on analog bays, if present, is similar to the Junctor dc CODEC loopback test, but verifies the DIC CODEC encode, decode and filter functions as well. Since this test will always succeed the Junctor dc CODEC loop-back test, failure of the test will isolate the fault to the DIC CODEC.

6.32 **Junctor DC CODEC loopback** This test, performed on analog bays, if present, is similar to the dc CODEC test: it verifies the operation of the PCM paths from the Main Controller Card to the Peripheral Control Card, to the CODEC on the DIC Card, and back again, using a tone transmitted from the tone generator. If the test fails, it is not possible for the system to isolate the fault.

6.33 **Modem pooling test** The first part of this test verifies that the Digital Line Card, the ONS Card, and the DATASET 2100 are each functional; it also determines the mode of the modem. The second part of the test is to make a call through the ONS card to the modem (ANSWER ONLY mode) to detect answer tone and to terminate the call successfully, or to make a similar call through the DLC to the modem (ORIGINATE ONLY mode) to detect answer tone and to terminate the call successfully. If the modem is BOTHWAY, these two parts of the second test are performed to verify bothway operation.

6.34 **Perform junctor test** If analog bays are present, this test verifies the operation of the analog junctors. This is done by ensuring that the junctor can independently be forced to high state, low state and ground state. If the test fails, the fault is isolated to the junctor under test.

6.35 **Receiver test** The digital signal processor sends a tone to the receivers and verifies that the receiver correctly detects the digit. Tones 0, 5, 9 and 13 are used for this test.

6.36 **Switch hook test** This tests the ability of a line card to detect an off-hook for the device under test.

6.37 **Test DNIC input** This test is used to loop the data internally at DNIC input. Failure of the test will isolate the fault to the card but will not isolate it to the particular DNIC chip on the card.

6.38 **Test DNIC output** This test is used to loop the data internally at DNIC output. Failure of this test will isolate the fault to the particular DNIC chip under test on the card.

6.39 **Tone detection test** This test generates a test tone of 440 Hz, and loops it back to the digital signal processor. The energy level of the tone must fall in a particular range to pass this test. Failure of the test indicates a faulty device.

6.40 **Tone generation test** This test collects two consecutive samples from the digital signal processor for a test tone of 440 Hz. The validity of the two samples is checked to determine a pass or fail. Failure of the test indicates a faulty device.

6.41 **Verify card type** Used to ensure that the bus is working, this procedure tests that the card installed is the card programmed.

6.42 **Test T1 channel** This test is used to loop back one T1 trunk channel and check if everything is OK. Failure of the test will isolate the fault to this particular channel.

6.43 **Pooled modem answer mode test** See Modem Pooling Test.

6.44 **Pooled modem originate mode test** See Modem Pooling Test.

TABLE 6-3
ONS/OPS LINE DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	Digital bay type test	State 12
State 2	check adc ref voltage	device fail unisolated
State 3	switch hook test	device fail unisolated
State 4	No test performed	
State 5	ac CODEC loopback test	State 6
State 6	dc CODEC test	device fail unisolated
State 7	acdc loopback test	device fail unisolated
State 8	No test performed	
State 9	No test performed	
State 10	No test performed	
State 11	No test performed	
State 12	get free junctor test	State 17
State 13	junctor dc CODEC loopback	test incomplete

TABLE 6-3 (CONT'D)
ONS/OPS LINE DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 14	junctor ac CODEC loopback	test incomplete
State 15	perform junctor test	test incomplete
State 16	analog 8804 loopback test	device fail isolated
State 17	analog no failures	State 18
State 18	alternate device available	device fail isolated
State 19	alternate device loopback	test incomplete

TABLE 6-4
OPS LINE DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	check adc ref voltage	device fail unisolated
State 2	dc CODEC test	device fail unisolated
State 3	acdc loopback test	device fail unisolated
State 4	ac CODEC loopback test	device fail unisolated
State 5	switch hook test	device fail isolated

TABLE 6-5
CO TRUNK DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	Digital bay type test	State 7
State 2	check adc ref voltage	device fail unisolated
State 3	dc CODEC test	device fail unisolated
State 4	acdc loopback test	device fail isolated
State 5	ac CODEC loopback test	device fail isolated
State 6	ac hybrid loopback test	device fail isolated
State 7	get free junctor test	State 12
State 8	junctor dc CODEC loopback	test incomplete
State 9	junctor ac CODEC loopback	test incomplete
State IO	perform junctor test	test incomplete
State 11	analog 8804 loopback test	device fail isolated
State 12	analog no failures	State 13

TABLE 6-5 (CONT'D)
CO TRUNK DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 13	alternate device available	device fail isolated
State 14	alternate device loopback	test incomplete

TABLE 6-6
DTMF RECEIVER DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	dc CODEC test	device fail unisolated
State 2	acdc loopback test	device fail unisolated
State 3	ac CODEC loopback test	device fail isolated
State 4	Receiver test	device fail isolated

TABLE 6-7
CONSOLE DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	Console status	device fail unisolated

TABLE 6-8
ANALOG VOICE PATH (JUNCTOR) DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	junctor dc CODEC loopback	chan fail unisolated
State 2	junctor ac CODEC loopback	chan fail isolated
State 3	perform junctor test	chan fail isolated

TABLE 6-9
SUPERSETLINE DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	Digital bay type test	State 5
State 2	dc CODEC test	device fail unisoiated
State 3	acdc Loopback test	device fail unisolated
State 4	ac CODEC loopback test	device fail isolated
State 5	get free junctor test	State 10
State 6	junctor dc CODEC loopback	test incomplete
State 7	junctor ac CODEC loopback	test incomplete
State 8	perform junctor test	test incomplete
State 9	analog 8804 loopback test	device fail isolated
State 10	analog no failures	State 11
State 11	alternate device available	device fail isolated
State 12	alternate device loopback	test incomplete

TABLE 6-10
DIGITAL E&M TRUNK DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State I	dc CODEC test	device fail unisolated
State 2	acdc loopback test	device fail unisolated
State 3	ac CODEC loopback test	device fail isolated

TABLE 6-11
ANALOG E&M TRUNK DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	Digital bay type test	State 2
State 2	get free junctor test	State 7
State 3	junctor dc CODEC loopback	test incomplete
State 4	junctor ac CODEC loopback	test incomplete

TABLE 6-11 (CONT'D)
ANALOG E&M TRUNK DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 5	perform junctor test	test incomplete
State 6	analog 8804 loopback test	device fail isolated
State 7	analog no failures	State 8
State 8	alternate device available	device fail isolated
State 9	alternate device loopback	test incomplete

TABLE 6-12
DIGITAL DID TRUNK DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	check adc ref voltage	device fail unisolated
State 2	dc CODEC test	device fail unisolated
State 3	acdc loopback test	device fail isolated
State 4	ac CODEC loopback test	device fail isolated

TABLE 6-13
ANALOG DID TRUNK DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	Digital bay type test	State 2
State 2	get free junctor test	State 7
State 3	junctor dc CODEC loopback	test incomplete
State 4	junctor ac CODEC loopback	test incomplete
State 5	perform junctor test	test incomplete
State 6	analog 8804 loopback test	device fail isolated
State 7	analog no failures	State 8
State 8	alternate device available	device fail isolated
State 9	alternate device loopback	test incomplete

TABLE 6-14
DIGITAL LINE DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	check if other half has a set	State 11
State 2	check for a voice set	State 6
State 3	DNIC set eprom checksum	device fail isolated
State 4	DNIC set bphone	device fail isolated
State 5	DNIC set transducer earpiece	device fail isolated
State 6	check for a data set	device passed
State 7	DNIC set eprom checksum	device fail isolated
State 8	check if other half has a set	State 9
State 9	test DNIC output	device fail isolated
State 10	dataset loopback	device fail isolated
State 11	test DNIC input	device fail unisolated
State 12	DNIC set transducer speaker	device fail isolated
State 13	DNIC set transducer microphone	device fail isolated
State 14	DNIC set transducer mouthpiece	device fail isolated

Note: States 1, 2, 6 and 8 are Software tests. These tests, used to find which device (data/voice) is connected, are helpful when planning which tests to execute.

TABLE 6-15
DIGITAL SIGNAL PROCESSOR DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	Conference test	device fail isolated
State 2	tone detection test	device fail isolated
State 3	tone generation test	device fail isolated

TABLE 6-16
DIGITAL TRUNK (T1) DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	T1 channel loopback test	device fail isolated

TABLE 6-17
MODEM POOL DIAGNOSTICS

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	is there a data set	state 6
State 2	DNIC set eprom checksum test	device fail isolated
State 3	DATASET data loopback test	device fail isolated
State 4	pldmdm ansr mode test	device fail unisolated
State 5	pldmdm orig mode test	device fail unisolated
State 6	DNIC input loopback test	device fail unisolated
State 7	DNIC output loopback test	device fail isolated

TABLE 6-18
Superconsole 1000 ATTENDANT CONSOLE DIAGNOSTIC SEQUENCE

Diagnostic State	Test Name	Circuit State if Test Fails
State 1	DNIC set eprom checksum test	device fail unisolated
State 2	DNIC set bphone test	device fail unisolated

7. TEST LINE

General

7.01 The test line interface is designed to provide the maintenance person with a portable, inexpensive and readily available tool for diagnosing system failures and pe t-forming maintenance functions. A powerful subset of the maintenance functionality available via the maintenance terminal is available at the test line interface. In addition, the maintenance person can place calls without having a permanently wired extension on the premises.

Connection to Test Line

7.02 Two connection points for the test line are provided on the control maintenance panel on the control cabinet (see Figures 3-3 and 3-4); either an RJ-11 jack type connector or a pair of “banana plugs” may be used. These connectors are hardwired directly from the control maintenance panel to the port located in Bay 2, Slot 1, Circuit 1 of the control cabinet. The system will accept either rotary dial or DTMF dialing through this interface.

Programming

7.03 Before the test line package may be used, an access code must first be programmed through Customer Data Entry (CDE). Information on programming may be found in Section MITL9109-094-210-NA, Customer Data Entry. The user must first call up Form 02 (Feature Access Codes). Once in this form, the user must assign an access code to Feature Number 18 (Maintenance Function - Test Line); this must not conflict with existing access codes or with the system numbering plan.

Test Line Access

7.04 To access test line, connect a set to one of the test line connectors on the maintenance panel. Lift the handset, wait for dial tone and enter the following:

- The test line access code; as specified in CDE
- One of the valid test line command codes (see Table 7-l)
- If required, enter the circuit location number or junctor number.

Note that when CDE or maintenance is accessed via the maintenance terminal or Attendant Console, the test line cannot be accessed. In these cases, the user will receive busy tone upon dialing the test line access code. Also note that after accessing the test line, if no action is taken for 90 seconds, the test line session will be automatically terminated.

TABLE 7-1
TEST LINE COMMAND CODES

COMMAND CODES Numeric	Alphabetic	Description
22	BC	Busyout Channel (Remove Channel)
23	CD	Copy Database
25	BJ	Busyout Junctor
26	BO	Busy-Out device
35	DL	Dump Logs
38	DT	Direct Trunk select
72	RC	Return Channel
73	SD	Stop Dump Logs
75	RJ	Return Junctor to service
77	RS	Return device to Service
78	ST	Stop Test Printers
82	TC	Test Channel
83	TD	Test Device
85	TJ	Test Junctor
872	TPB	Test Printer Bay-Slot-Circuit
873	TPE	Test Printer Extension-Number
877	TPP	Test Printer Port

Test Line Indicator LEDs

7.05 The test line software uses the dual -/-segment display status indicators on the Main Control card as status indicators. When the user enters the test line access code on the test line set, the LEDs go blank, indicating that the system is waiting for command input. After the user enters a command sequence, the LEDs will display the results of the action performed. See Table 7-2.

Test Line Tones

7.06 The test line software uses some of the existing system-generated tones as audible status indicators. Approximately 10 seconds after the user enters the test line access code on the test line set, a short ring burst, followed by dial tone is heard, indicating that the system is waiting for command input. After the user enters a command sequence, the returned tone will indicate the result of the action performed. See Table 7-3 for a complete list of the tones.

Command Input

7.07 Commands are entered on the test line by dialing command codes using the DTMF keypad or rotary dial of the set being used. These command odes are listed in Table 7-l.

TABLE 7-2
TEST LINE STATUS INDICATOR CODES

Status Code	Meaning
PA	The attempted operation was successful (pass).
FA*	The attempted operation was unsuccessful (fail).*
(blank)	System is waiting for command input.
II	Test was inconclusive.
EE	Fatal disk error; refer to Section MITL9109-094-350-NA, Troubleshooting.
E5	Invalid command or device location entered; only those commands in Table 7-1 are acceptable.
cc	Diskette information has been loaded into RAM; insert new diskette (see paragraph 7.14).
bb	Device was busy. Try again later.
7E	An invalid physical location number was entered. Enter bay number (e.g., 02), slot number (e.g., 04), and circuit number (e.g., 06).
FF	Unknown error. Attempt operatjon again - ensure correct use of command codes (see Table 7-l).
1E	Error in acquiring the software ID of the testline. Attempt operation again - ensure correct use of command codes (see Table 7-l). Use maintenance terminal or console if necessary.
2 E	Possible software error. Attempt operation again - ensure correct use of command codes (see Table 7-l). Use maintenance terminal or console if necessary.

*Failure of any of the test line command sequences will necessitate the use of the more sophisticated maintenance tools available from the maintenance terminal or console. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal.

TABLE 7-3
TEST LINE STATUS TONES

Tone Type	Meaning
Dial tone	System is waiting for command input.
Camp-on tone (single beep)	The attempted operation was successful (Pass).
Reorder tone*	The attempted operation* was unsuccessful (fail).
Trunk camp-on tone (double beep)	Test was inconclusive.
Ringback tone (continuous)	Diskette information has been loaded into RAM; insert new diskette (see paragraph 7.14).
Ringback tone (double beep)	Initial maintenance access.
Busy Tone	Device was busy. Try again later.
Silence	Test line software is being read from disk.

*Failure of any of the test line command sequences will necessitate the use of the more sophisticated maintenance tools available from the maintenance terminal or console. Refer to Section MITL9109-094-351-NA, RS-232 Maintenance Terminal.

Commands Available

7.08 Although the complete set of maintenance commands are not provided, the available test line commands permit the maintenance person to perform most maintenance functions. For a complete list of the available commands, see Table 7-1. The commands are described below.

Specifying Equipment

7.09 Many of the test line command sequences require the maintenance person to specify a circuit or junctor as part of the command input. Circuits are specified using their physical location numbers (bay, slot, circuit, subcircuit). For example, a receiver circuit at location Bay 2, Slot 3, Circuit 3, Subcircuit 4 would be specified as “02 03 03 04”. A line circuit at location Bay 2, Slot 1, Circuit 6 would be specified as “02 01 06 00”. Note that circuits with no subcircuit number (i.e., lines and trunks) must be specified with “00” as the subcircuit.

7.10 Junctors are specified using their assigned junctor numbers and the required bay number. The junctor number is a 2-digit number from 00 to 31; the bay number is a 2-digit number from 01 to 05. For example, Junctor 5 in Bay 3 would be specified as “05 03”.

7.11 Channels are specified using the required Link and Channel number. The link number is a 2-digit number. Note that Link 0,1, 14 or 15 cannot be tested. The Channel number is a 2-digit number from 00 to 31. Channel 30 on Link 9 is specified as “09 30”.

Normal Extension Calls

7.12 The test line has access to normal extension facilities, and is subject to Class Of Service (COS) and Class Of Restriction (COR) restrictions. It is not necessary to enter the test line access code or a special command code to make normal extension calls.

Busyout Channel Command (BC)

7.13 This command allows the maintenance person to busy out any channel on the system. To do this, enter the test line access code, followed by the Busyout Channel code (22), followed by the Link/Channel number. “PA” on the status indicator and a single beep tone indicates the successful operation. "FA" and reorder tone indicates failure. See Table 7-2.

Copy Database Command (CD)

7.14 This command allows the maintenance person to copy the database from the system floppy diskette onto another system floppy diskette. To copy the database, do the following:

1. Enter the test line access code.
2. Enter the Copy Database code (23) - silence will be heard.
3. Wait until ringback tone is heard, and the status indicators read “CC”.
4. Remove the original diskette - ringback continues.
5. Enter “1” to begin copying to the new diskette - silence will be heard.
6. If the disks are not properly inserted or do not match the status indicator will display “E.6”. Dial tone will be heard. The disks must be reinserted properly and enter “1” to continue the copy operation - silence will be heard.
7. Wait for “CC” to appear on the status indicators and a single beep tone - indicates copy successful.
8. Enter any digit to continue normal operation - both diskettes now have the same database.
9. Wait for “PA” to appear on the status indicators and a single beep tone - indicates copy operation has completed.
10. If the upgrade disks were left in the system will reset itself.

Busyout Junctor Command (BJ)

7.15 This command allows the maintenance person to remove from service any analog junctor in the system. To do this, enter the test line access code, followed by the Busy-Out Junctor code (25), followed by the junctor number, and the bay number. “bb” on the status indicators and a single beep tone will indicate that the junctor was busied-out. “FA” and reorder tone indicate failure - see Table 7-2.

Busy-Out Command (BO)

7.16 This command allows the maintenance person to busy out any peripheral device in the system except consoles and the test line circuit. To do this, enter the test line access code, followed by the Busy-Out device code (26), followed by the physical location number of the device. If the device was in use (busy) at the time of access, the status indicators will read “PA” and the trunk will be busied as soon as it reaches the idle state. If the operation succeeds, the status indicators will read “PA” and a single beep tone will be heard. "FA" and reorder tone indicate failure - see Table 7-2.

Dump Logs Command (DL)

7.17 This command allows the maintenance person to print the system maintenance log on to the system printer. To print (dump) the logs, enter the test line access code, followed by the Dump Logs code (35). “PA” on the status indicators and a single beep tone indicate that the system has started sending the logs to the printer. “FA” and reorder tone indicate failure - see Table 7-2.

Direct Trunk Select Command (DT)

7.18 This command allows the maintenance person to directly select any trunk in the system from the test line. To select a trunk, enter the test line access code, followed by the direct trunk select code (38), followed by the physical location number of the required trunk. If the trunk is not busy and in working order, the status indicators will revert to whatever was present before the testline was accessed and dial tone will be heard. The trunk is then ready for use.

If the trunk is in use (busy) at the time of access, it is not selected; if the trunk is not functional, the status indicators will read "FA".

Return Channel Command (RC)

7.19 This command allows the maintenance person to return to service any channel on the system. To do this, enter the test line access code, followed by the Return Channel code (72), followed by the Link/Channel number. “PA” on the status indicator and a single beep tone indicates the successful operation of the channel being returned to service. “FA” and reorder tone indicates failure. See Table 7-2.

Stop Dump Logs Command (SD)

7.20 This command allows the maintenance person to stop print the system maintenance log on to the system printer. To stop print (dump) the logs, enter the test line access code, followed by the Stop

Dump Logs code (73). "PA" on the status indicator and a single beep tone indicates that the system has stopped sending the logs to the printer. "FA" and reorder tone indicates failure. See Table 7-2.

Return Junctor To Service Command (RJ)

7.21 This command allows the maintenance person to return to service any analog junctor that was previously removed from service via maintenance. To do this, enter the test line access code, followed by the Return Junctor to service code (75), followed by the junctor number and the bay number. "PA" on the status indicators and a single beep tone indicate that the junctor was returned to service. "FA" and reorder tone indicate failure - see Table 7-2.

Return Device To Service Command (RS)

7.22 This command allows the maintenance person to return to service any peripheral device that was previously removed from service via maintenance. To do this, enter the test line access code, followed by the Return Device to Service code (77), followed by the physical location number of the device. "PA" on the status indicators and a single beep tone will indicate that the device was returned to service. "FA" and reorder tone indicate failure - see Table 7-2.

Stop Test Printers Command (ST)

7.23 This command allows the maintenance person to stop test the printers on the system. To do this, enter the test line access code, followed by the Stop Test Printers code (78). "PA" on the status indicator and a single beep tone indicates that the system has stopped testing the printers. "FA" and reorder tone indicates failure. See Table 7-2.

Test Channel Command (TC)

7.24 This command allows the maintenance person to test any channel on the system. To do this, enter the test line access code, followed by the Test Channel code (82), followed by the Link/Channel number. "PA" on the status indicator and a single beep tone indicates that the test passed. "FA" and reorder tone indicates that the test failed. See Table 7-2.

Test Device Command (TD)

7.25 This command allows the maintenance person to test any peripheral circuit in the digital bays. To test a device, enter the test line access code, followed by the Test Device code (83), followed by the physical location number of the device. "PA" on the status indicators and a single beep tone indicate that the test passed. "FA" and reorder tone indicate that the test failed.

Test Junctor Command (TJ)

7.26 This command allows the maintenance person to test any of the analog junctors in any bay in the system. To test a junctor, enter the test line access code, followed by the Test Junctor code (85), followed by the junctor number and the bay number. If the junctor was in use (busy) at the time of access, the status indicators will read “bb”; attempt the test later. “PA” on the status indicators and a single beep tone indicate that the test passed. “FA” and reorder tone indicate that the test failed.

Test Printer Bay-Slot-Circuit Command (TPB)

7.27 This command allows the maintenance person to test any printer on the system, other than the system printer using the physical location number of the printer port. To do this, enter the test line access code, followed by the Test Printer Bay-Slot-Circuit code (872), followed by the physical location number of the printer port. The printer should then print two full pages of all the printable characters. “PA” on the status indicators and a single beep tone indicates that the system has started sending test data to the printer. "FA" and reorder tone indicates that the test failed. See Table 7-2.

Test Printer Extension-Number Command (TPE)

7.28 This command allows the maintenance person to test any printer on the system, other than the system printer using the extension number of the printer port. To do this, enter the test line access code, followed by the Test Printer Extension-number code (873), followed by the extension number of the printer port. The printer should then print two full pages of all the printable characters. “PA” on the status indicators and a single beep tone indicates that the system has started sending test data to the printer. “FA” and reorder tone indicate that the test failed. See Table 7-2.

Test Printer Port Command (TPP)

7.29 This command allows the maintenance person to test the system printer. To do this, enter the test line access code, followed by the Test Printer Port code (877). The printer should then print two full pages of all the printable characters. “PA” on the status indicators and a single beep tone indicate that the system has started sending test data to the printer. “FA” and reorder tone indicates that the test failed. See Table 7-2.

8. MAINTENANCE CONTROLS AND INDICATORS

General

8.01 The following paragraphs describe the maintenance controls and indicators found on the components of the SX-200 DIGITAL Private Automatic Branch Exchange. Most of the indicators are software-controlled, and provide maintenance personnel with information on the current status of the SX-200 DIGITAL PABX.

Maintenance Panels

8.02 Most of the SX-200 DIGITAL PABX maintenance functionality is accessed through the maintenance panels. The maintenance panels are described in detail in Part 3 of this Section; further functionality is described in Section MITL9109-094-351-NA, RS-232 Maintenance Terminal.

Main Control Card

8.03 On the Main Control Card, there are status LEDs, two 7-segment LED status indicators, and two pushbuttons. All of these controls and indicators are labelled clearly on the Main Control Card's front panel (see Figure 8-l). The functions of the controls and indicators are described in the following paragraphs.

8.04 System Reset Button. As the name suggests, this is the manual system reset button. When pressed, the system will cease all activity, run all initialization tests, and reload the software from the floppy diskette. Note that this should never be done while the SX-200 DIGITAL PABX is handling traffic, as all calls will immediately be dropped, and the system will switch to Power Fail Transfer mode.

8.05 Plane Transfer Button. This is similar in function to the system reset button. When pressed, the system will cease all activity and run a checksum test on the software; if this fails, the software will be reloaded from the floppy diskette. Otherwise, the system will reinitialize. Note that this should never be done while the SX-200 DIGITAL PABX is handling traffic, as all calls will immediately be dropped, and the system will switch to Power Fail Transfer mode.

8.06 Seven-Segment Display Status Indicators. The Main Control card status indicators consist of two 7-segment display LEDs, arranged vertically, as shown in Figure 8-l. The top display LED is the most significant while the lower display LED is the least significant. The function of the Main Control card status indicators depends upon the software currently being executed. At system initialization, they indicate the status of the Main Control card tests; this is summarized in Table 8-l. When the maintenance person is accessing the test line facility, the status indicators are totally dedicated to this function; refer to Part 7 of this Section for further details on the test line. Problems with the system floppy disk drive will be indicated by error codes on the displays (see Table 8-2). Finally, the status indicators will show the

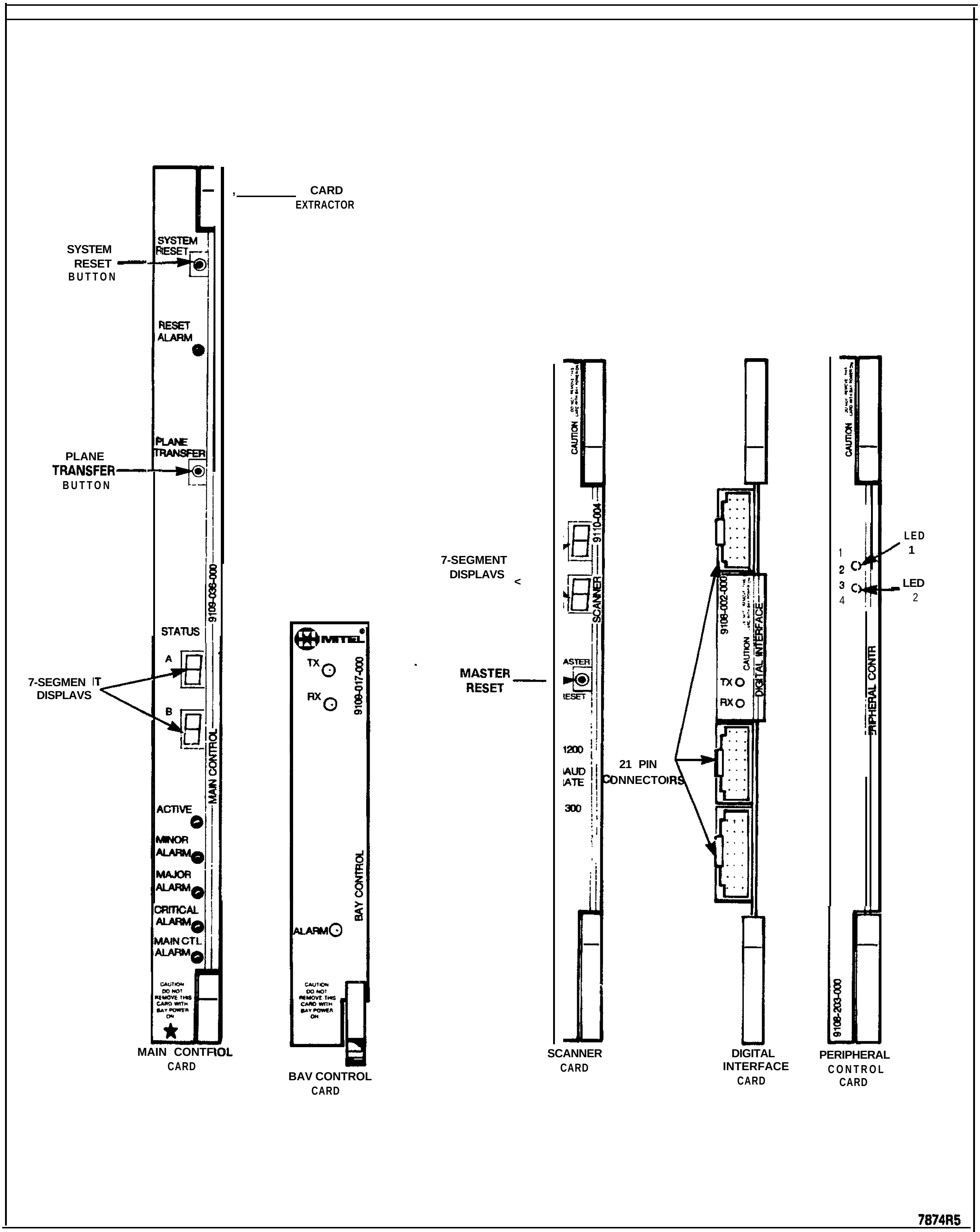

Figure 8-l Control Card Front Panels

physical location of the most recent card to have a problem entered into the Maintenance Log. The card's bay number (top) and slot number (bottom) will be displayed. During normal operation when no applications are using the status indicators, a pair of horizontal dashes will be displayed.

TABLE 8-I
MAIN CONTROL CARD TEST STATUS CODES

Test Name	Test Code	Error Code
Bus Error Vector/Stack Test	0	E0
Processor Viability Test	1	E1
PROM Checksum Test	2	E2
RAM Load Checksum Test	3	E3
Limited RAM Test	4	E4
DMA Controller Test/PFS OK*	5	E5
RAM Chip Select Test	6	E6
RAM Data Bit Indep. Test	7	E7
Memory Address Test	8	E8
Memory Space Test	9	E9
** Booting System Software	b OR b.	Eb or Eb.

* Power Supply Power Fail Sense can cause this test to fail.

** Note that, upon test failure, test error codes will be flashed for 1 second, after which testing will begin again from test # 1.

8.07 Reset Alarm LED. This indicator will light when the system has been reset.

8.08 Active LED. This green LED serves as an indication of the health of the system. A steady 1 second pulse cycle indicates that the system is up and running. Should the LED remain constantly on or off, this indicates that the system is not running; in this case Section MITL9109-094-350-NA, Troubleshooting should be consulted.

8.09 Alarm Status LEDs. The bottom three LEDs on the main control card are the alarm status LEDs; only one of these LEDs may be on at any one time. They indicate the overall system alarm level; one of: MINOR ALARM, MAJOR ALARM, CRITICAL ALARM or no alarm. If none of the alarm status LEDs are on, the system should be in perfect working order. Refer to Part 4 of this Section for further information on alarms.

Bay Control Card

8.10 The Bay Control card has three status LEDs, labelled TX, RX and ALARM. The TX and RX LEDs indicate communication (transmit and receive) with the Main Control card. The ALARM LED has two functions. A flashing ALARM LED indicates a failure on the Bay Control card. A permanently lit ALARM LED indicates that the Bay Control card is waiting for, or has lost communication with the Main Control card. See Table 8-3 for a summary of the Bay Control card status LED states.

Peripheral Control Card

8.11 The Peripheral Control card (PCC) has two status LEDs, labelled "1" and "2", located on the card's front panel (see Figure 8-l). These LEDs are used along with the Scanner card's 7-segment display status indicators during the Peripheral Control card initialization sequence. Table 8-4 summarizes the functions of the PCC LEDs.

Digital Interface Card

8.12 The Digital Interface Card (DIC) has two status LEDs, labelled "TX" and "RX", located on the card's front panel (see Figure 8-l). These LEDs have two different functions. During DIC initialization, they are used along with the Scanner card's 7-segment display status indicators to display initialization status. Table 8-5 summarizes the LED information for this case. During peripheral bay loading, they are used to indicate message traffic between the main control and the peripheral control. In this case, the TX LED indicates message information is being transmitted from the peripheral control to the main control. Similarly, the RX LED indicates message information being transmitted from the main control to the peripheral control.

TABLE 8-2
DISKETTE ERROR CODES

Error Code	Meaning
E.1	New diskette has been inserted. Updates pending on original.
E.2	New diskette has been inserted.
E.3	Disk drive is empty, updates pending on original diskette.
E.4	Disk drive is empty.
E.5	Diskette write protected.
E.6	Diskettes not matched.
E.7	System type read failure.
E.8	No decryption module or debug card.

TABLE 8-3
BAY CONTROL CARD STATUS LEDS

TX LED	RX LED	Alarm LED	Meaning
on	on	on	Bay Control card is either waiting for, or has lost communication with the Main Control card. If this state persists for more that a few seconds, there is no communication.
flashing	flashing	on	Bay Control card is being downloaded by the Main Control card.
flashing	flashing	Off	Bay Control card is up and running and communicating to the Main Control card.
Off	Off	Off	This is the normal operating condition of the Bay Control card when the PABX is idle and diagnostics are off.
		flashing	There is a failure on the Bay Control card.

TABLE 8-4
PERIPHERAL CONTROL CARD TEST STATUS INDICATORS

Test Name	Test Pass		Test Fail	
	PCC LEDs	Scanner LEDs	PCC LEDs	Scanner LEDs
PCC PROM Checksum Test	LED 1 on	00	LED 1 on	E2
*PCC RAM Checksum Test	LED 1 on	00	LED 1 on	-
PCC RAM Test	LED 1 on	00	LED 1 on	El
** DIC card tests pass	both off	bb		
** Ready for bay downloading	both off	OA AA	-	-
Bay in Cutover	both off	co		
** Download done	both off	b3 b4		

* The "PCC RAM Test" is run only if this test fails; hence there is no "test fail" error code.

** OA indicates that Bay 3 is ready for downloading; AA indicates that Bays 4 and 5 are ready. Similarly, b3 indicates Bay 3 has finished loading; b4 indicates Bays 4 and 5 have finished.

TABLE 8-5
DIGITAL INTERFACE CARD TEST STATUS INDICATORS

Test Name	Test Pass DIC LEDs	Test Pass Scanner LEDs	Test Fail DIC LEDs	Test Fail Scanner LEDs
DIC to PCC Link Test	both off	03	RX on	**
DIC RAM Test	both off	05	RX on	**
DIC PROM Checksum Test	both off	07	RX on	**
DX Connect Memory Test	both off	0b	RX on	**
DIC HDLC Test	both off	10	RX on	**
DIC Hardware Timer Test	both off	13	RX on	**
* all tests passed	both off	14		
* waiting for download	both off	bb		

* Due to the speed of the testing, if all tests pass, the scanner card LEDs will appear to display "bb" immediately.
** Indeterminate

Scanner Card

8.13 On the Scanner card, there are a pair of 7-segment display status indicators, a pushbutton, and eight DIP switches. All of these controls and indicators are labelled clearly on the Scanner card's front panel (see Figure 8-l). The functions of the controls and indicators are described in the following paragraphs.

8.14 Master Reset Pushbutton. Pressing the master reset pushbutton on the Bay 3 scanner card will cause all activity in Bay 3 to cease, all PROM-based tests on the Bay 3 peripheral control complex to run, and the peripheral software to be reloaded into Bay 3. Pressing the master reset pushbutton on the Bay 4 scanner card will cause all activity in Bays 4 and 5 to cease, all PROM-based tests on the Bay 4 and 5 control cards to run, and the peripheral software to be reloaded into Bay 4. Note that this should never be done while the SX-200 DIGITAL PABX is handling traffic, as all calls in the affected bay(s) will immediately be dropped.

8.15 Seven-Segment Display Status Indicators. The Scanner card 7-segment display LEDs, arranged vertically, as shown in Figure 8-l. The top display LED is the most significant while the lower display LED is the least significant. The function of the displays depends upon the software currently being executed. At system initialization, they indicate the status of the Peripheral Control card and Digital Interface Card PROM-based tests; these are summarized in Tables 8-4 and 8-5.

8.16 DIP Switches. These have no functionality.

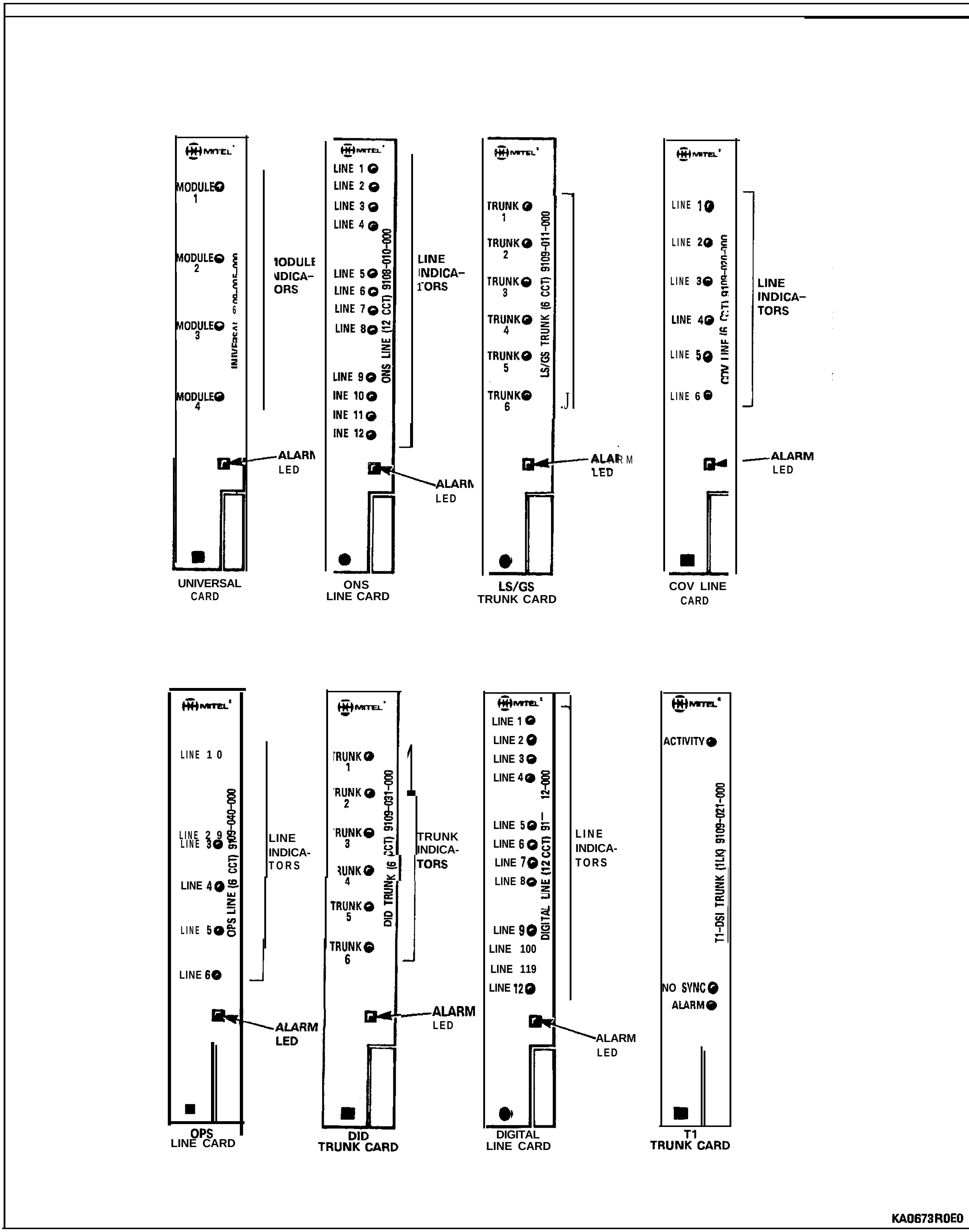

Figure 8-2 Peripheral Card Front Panels

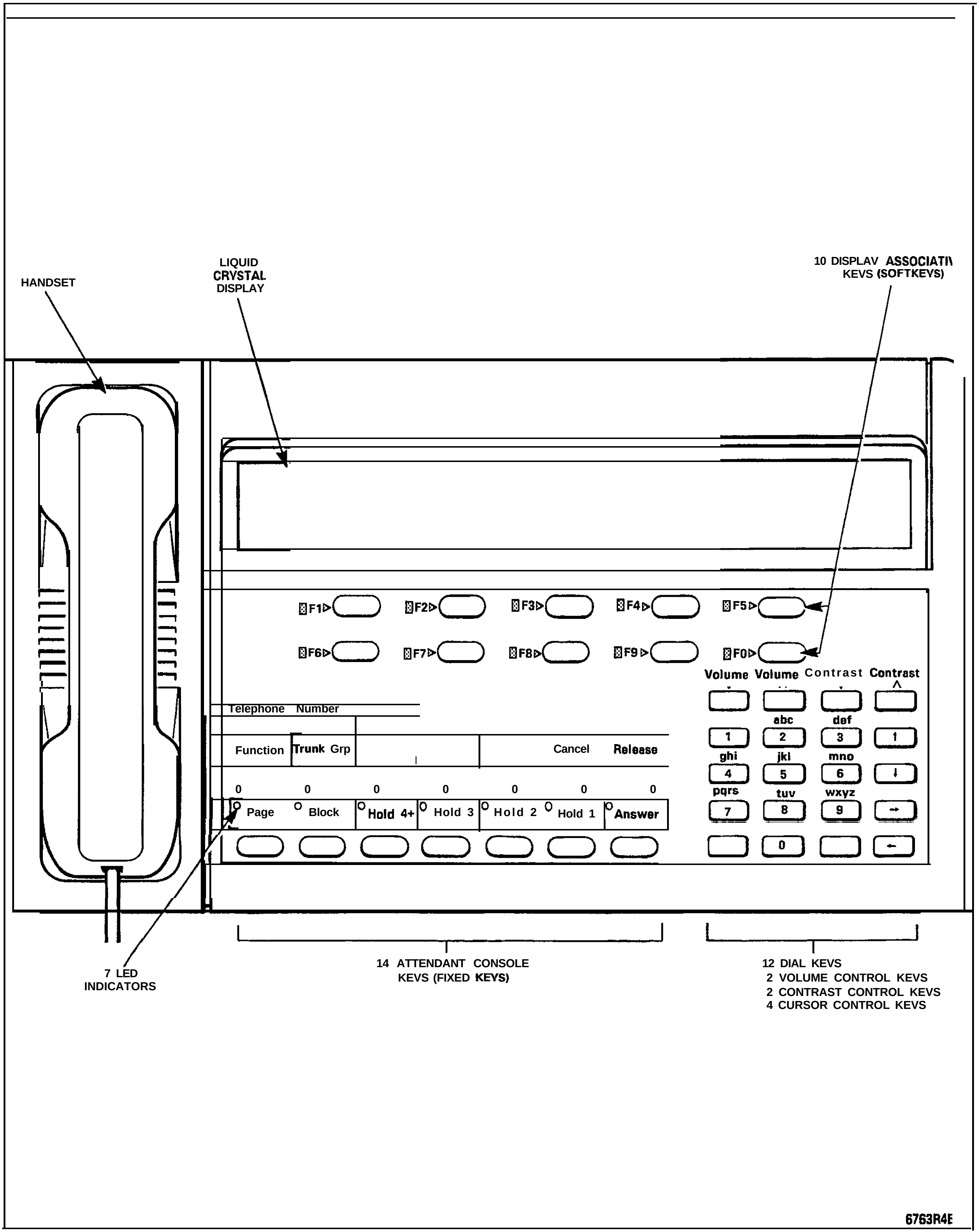

Figure 8-3 Attendant Console Keyboard

Peripheral Circuit Cards

8.17 **Analog Cards.** Analog line and trunk peripheral cards have a small red LED associated with each circuit. When a circuit is involved in a call, its associated LED will be on; when it is not in use, the LED will be off. Line circuit LEDs will flash at a rate of 10 pulses per second when the circuit is receiving dial pulses.

8.18 **Digital Cards.** Digital card LEDs have all of the functionality of the analog card LEDs, but with several enhancements. When a digital circuit is removed from service by the maintenance system, the associated LED will flash with a period of 1/2 second on and 1/2 second off. Each digital peripheral card has an alarm LED located at the bottom of the card's front panel. If any circuit on the card has a known fault or if a card is installed in an unprogrammed or incorrect card slot, the alarm LED will flash with a period of 1/2 second on and 1/2 second off. See Figure 8-2.

Attendant Console

8.19 The *SX-200* DIGITAL PABX Attendant Console function LEDs (see Figure 8-3) are use'd as maintenance indicators during the console initialization sequence. Tables 8-6 and 8-7 describe the console maintenance indicators.

TABLE 8-6
ATTENDANT CONSOLE MAINTENANCE LED INDICATORS

Test Name	Test Fail Indication
Console RAM Test	HOLD 1 LED flashes.
Console EPROM Test	HOLD 2 LED flashes.
Console IRQ Test	HOLD 3 LED flashes.
Console LED Test	Any of the console LEDs fail to go on, and stav on for 2 seconds.

TABLE 8-7
ATTENDANT CONSOLE LCD DISPLAY MESSAGES

Message	Meaning
CONSOLE HARDWARE FAILURE 123456789 ERROR CODE 1 PLEASE NOTE DETAILS ON REPAIR TAG	Console power-up tests failed.
WAITING FOR SYNCHRONIZATION 123456789 PLEASE WAIT	Power is available, but there is no synchronization to the line.
WAITING FOR COMMUNICATION 123456789 PLEASE WAIT	Console is synchronized, but no messages are being received from the system.

Note: In all cases, refer to Section MITL9109-094-350-NA, Troubleshooting.

Power Supplies

8.20 **Rear Door Power Supplies.** Any SX-200 DIGITAL PABX cabinet that includes analog bays will use a rear do-or power supply (see Figure 8-4). The AC POWER LED indicates the presence of AC power connected to the power supply. The CONVERTER INPUT LED indicates the presence of transformed power at the DC converter input. The EQUIPMENT SHELF POWER ON LED indicates whether or not the TOP SHELF POWER ON switch on the maintenance panel is in the ON position. The RESERVE BATTERY CONNECTED LED is not used.

8.21 **Bay Power Supplies.** Each digital equipment bay requires one Bay Power Supply (see Figure 8-5). There are two LED indicators located on the front panel of the bay power supply; the top LED is the power ON indicator, and the bottom LED is the ring generator indicator. The ring generator indicator will flash on only when ringing signal is applied.

Floppy Disk Drive

8.22 The SX-200 DIGITAL PABX floppy disk drive has one LED on its front panel; it indicates when the disk drive magnetic heads are in contact with the floppy diskette. Note that power should never be turned off while this LED is on. Powering down with the heads engaged can cause corruption of data on the diskette, if powering down is necessary, first wait for the LED to go off, then turn the lever to the 'diskette removal position' (see Figure 8-6).

Power Fail Transfer Card

8.23 The Power Fail Transfer card is located on the inside of the equipment cabinet on the side panel (see Figure 8-7). The power fail transfer LED is located at the top of the card (see Figure 8-9). When this LED is on, the system is in normal operation; when the LED is off, the system is in power fail transfer mode. The PFT card in the Universal Cabinet has no status LEDs, and is mounted on the right side as viewed from the rear. (See Figure 8-10).

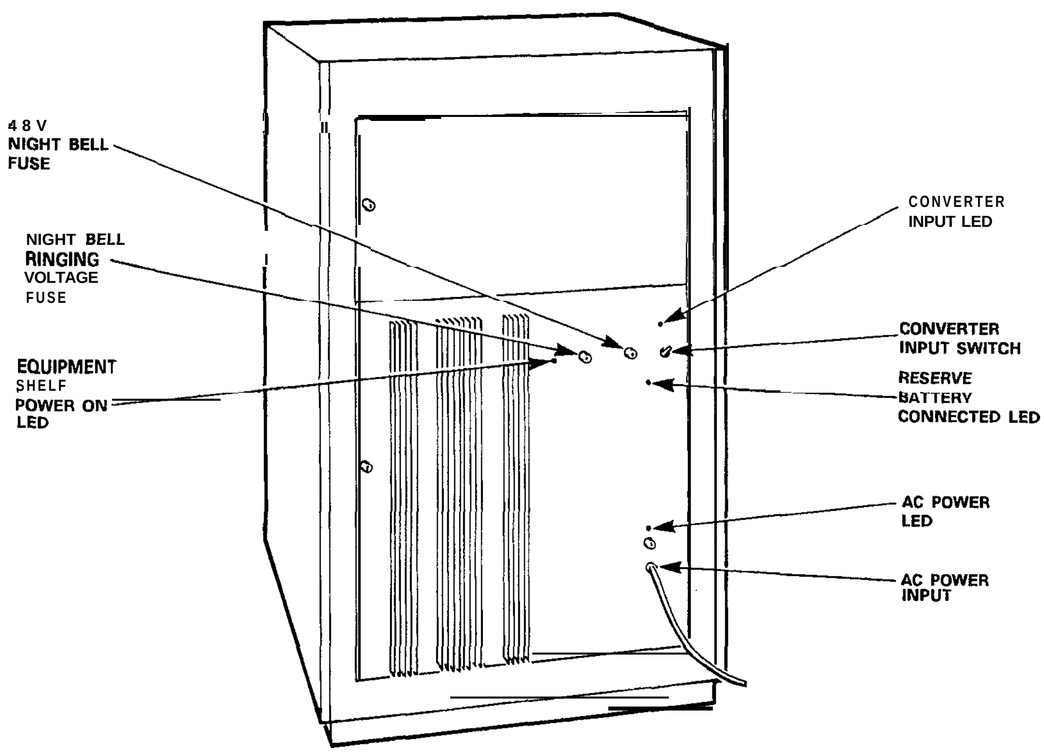

Figure 8-4 Rear Door Power Supply Indicators

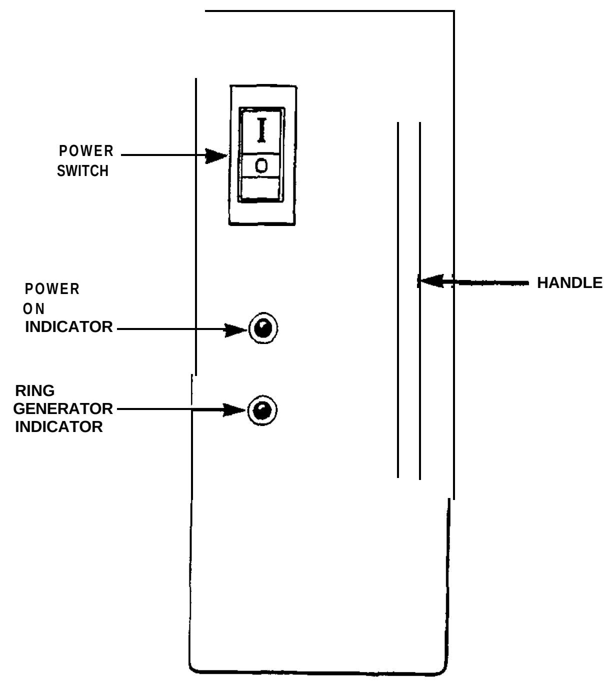

Figure 8-5 Bay Power Supply

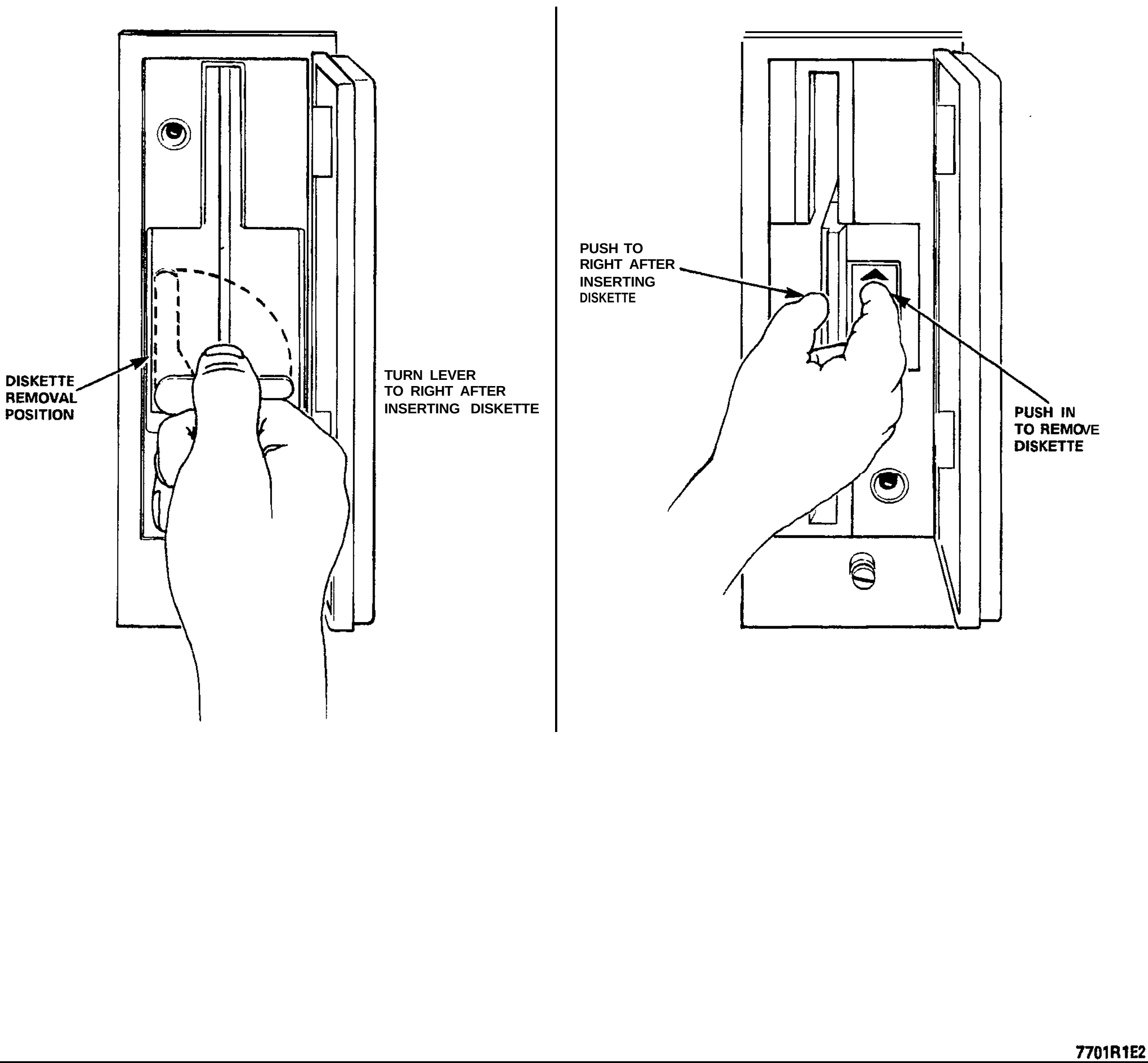

Figure 8-6 SX-200 DIGITAL Disk Drive

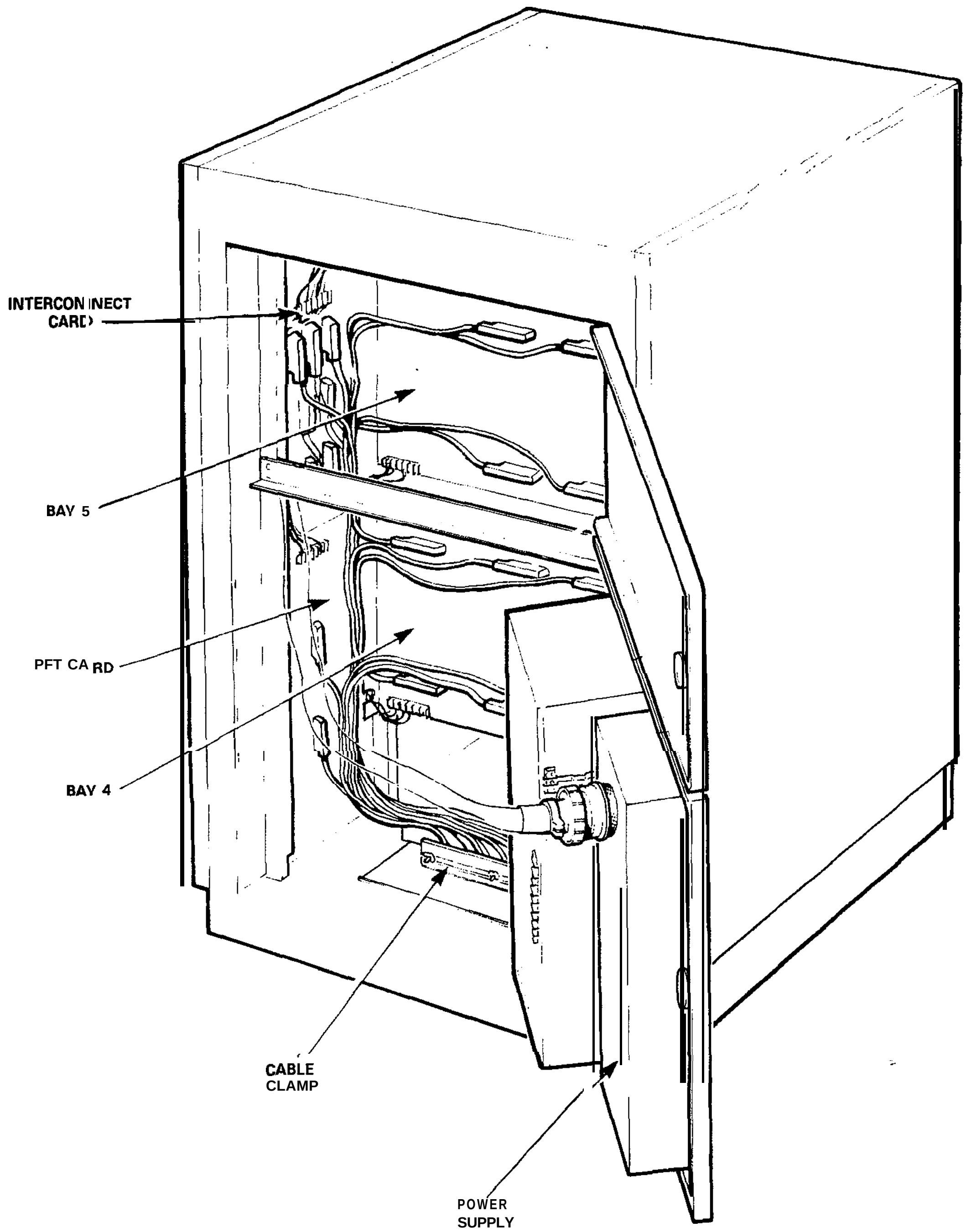

Figure 8-7 Power Fail Transfer Card Location – Peripheral Cabinet

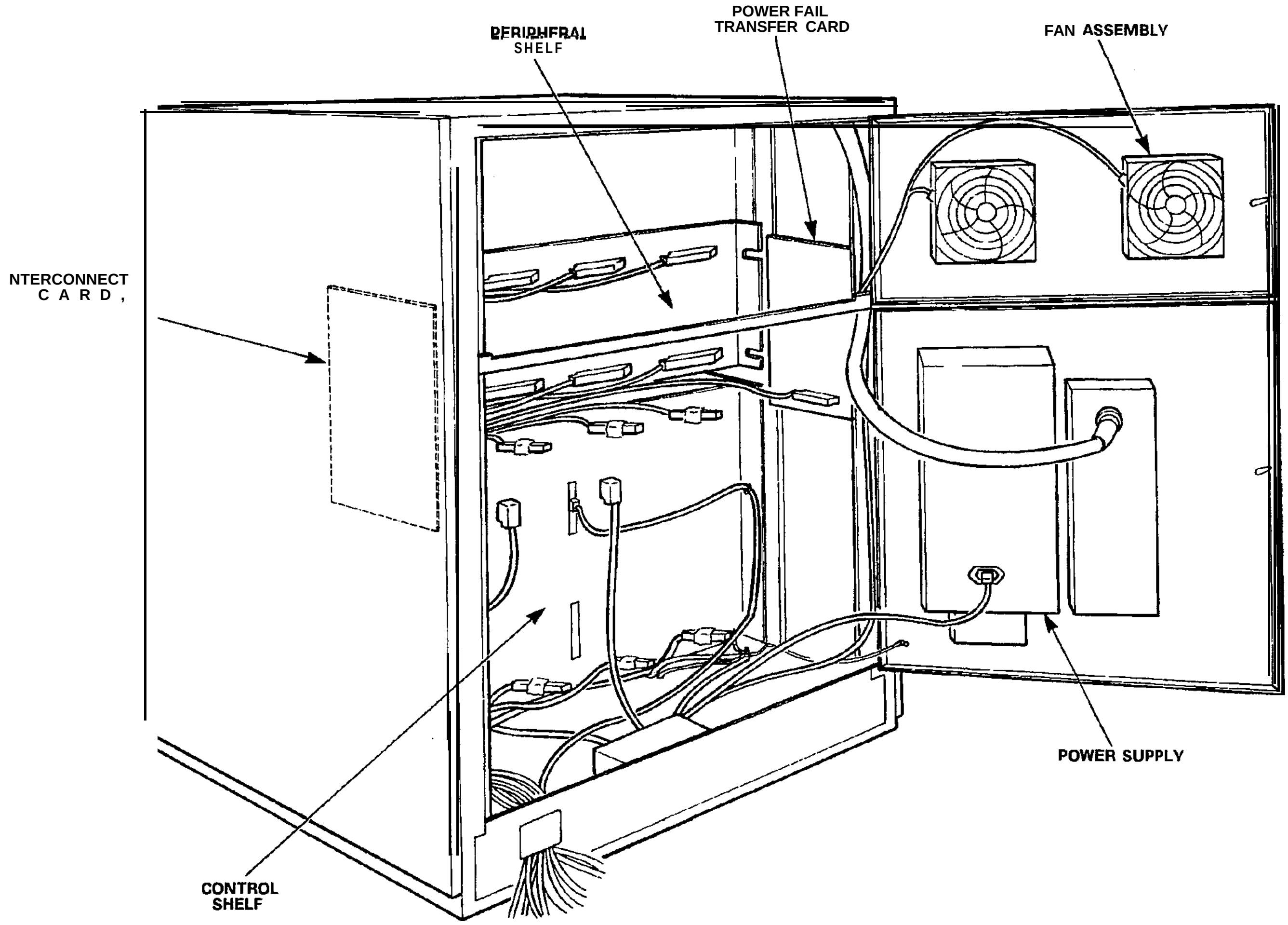

Figure 8-8 Power Fail Transfer Card Location – Universal Control Cabinet

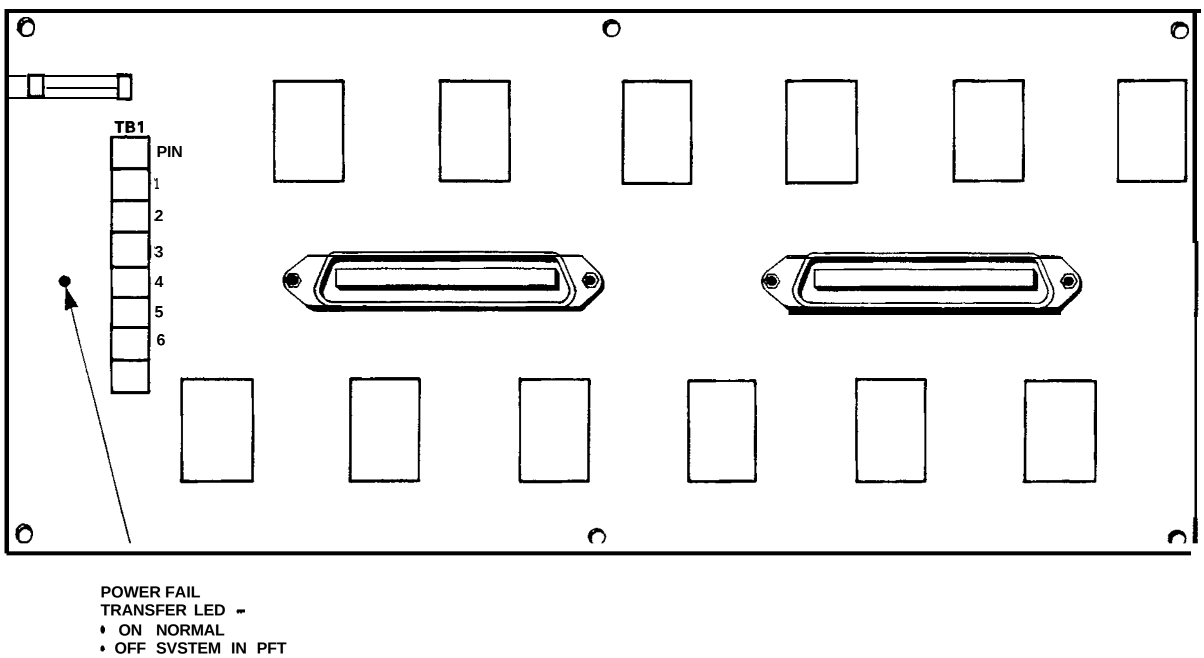

Figure 8-9 PFT Card (480-Port Configuration and Welded Control Cabinet)

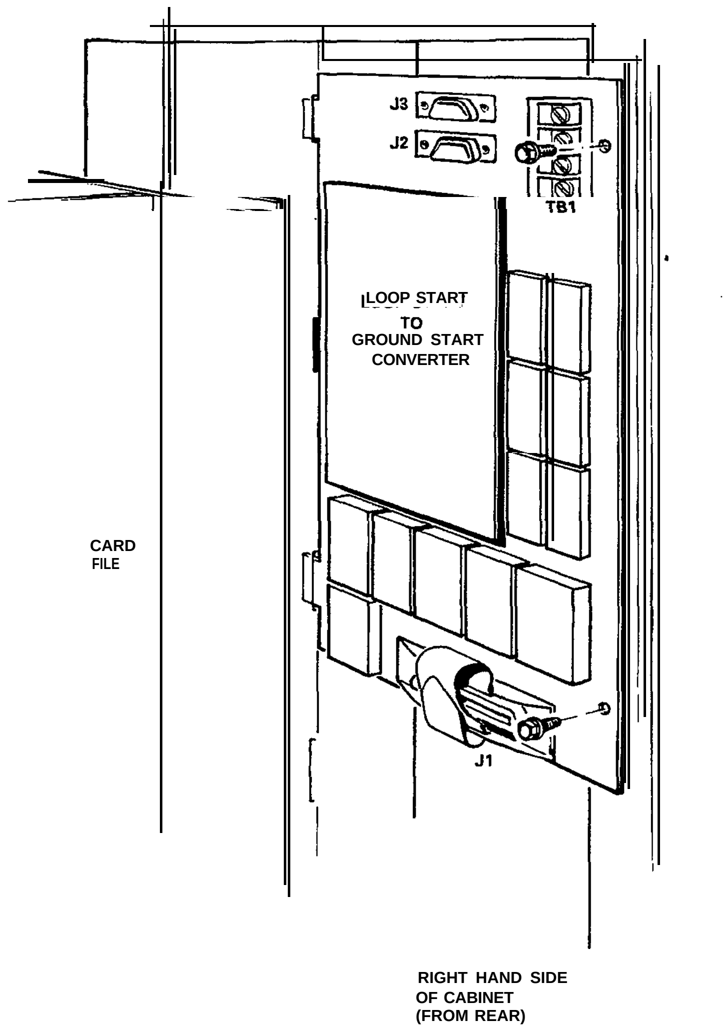

Figure 8-10 PFT Card for a Universal Cabinet

APPENDIX A

ROUTINE MAINTENANCE

Al.01 The procedures described in the following paragraphs are the only routines required for the SX-200 DIGITAL PABX, and are necessary due to the mechanical nature or limited operational life of the components concerned.

Air Filter

Al.02 An air filter is positioned in the SX-200 DIGITAL PABX control cabinet to remove dust and particles from the air flow so as to maintain a clean environment within the cabinet. It is important that the filter be checked frequently, and cleaned regularly, since failure to do so will cause a reduction in the airflow, and a consequent buildup of excess heat within the cabinet, leading ultimately to component failure.

Al.03 The air filter is located on the inside of the control cabinet front door, at the bottom. It is held over the intake vent by a self-sticking strip bordering the vent. To remove the filter, simply pull it from the self-sticking strip border. To install the filter, simply place it over the vent, and firmly press the edges onto the self-sticking border.

Al.04 The filter may be cleaned by washing in hot water and detergent. After several washings, the filter may begin to deteriorate; at this point, it should be replaced.

Al.05 The intervals at which this should be done will depend upon the environment in which the SX-200 DIGITAL PABX is located. Regardless of environmental considerations, however, the filter should be changed at least every 6 months.

SX-200” DIGITAL
PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX)
FIELD-REPLACEABLE UNITS

NOTICE

CONTENTS PAGE

LIST OF TABLES

LIST OF CHARTS

LIST OF ILLUSTRATIONS

1. INTRODUCTION

1.01 This Section contains ordering information and field replacement instructions for the SX-200® DIGITAL Private Automatic Branch Exchange (PABX).

Reason for Issue

1.02 This document is issued to provide hardware and software orderable part numbers for the SX-200 DIGITAL PABXs, with Generic 1003 software, for the 480-port configuration, the 336-port fully digital configuration, the 456-port configuration, and the 672-port fully digital configuration, Instructions for the removal and installation of Field-Replaceable Units (FRUs) are also included within this Section.

2. ORDERING INFORMATION

2.01 The ordering information is divided into the following tables:

Table 2-l lists all digital cards and modules required to complete the customer requirements.

Table 2-2 lists spares for all configurations.

Table 2-3 lists all analog cards required to complete the customer requirements.

Table 2-4 lists all peripheral equipment.

Table 2-5 lists the shelf upgrade kits.

Table 2-6 lists the system documentation.

Warranty

2.02 The MITEL SX-200 DIGITAL communications system is warranted against defective material and workmanship. Equipment requiring service or repair during the warranty period must be packaged in accordance with Chart 3-16 and returned prepaid to the supplier. Repaired or replacement equipment is returned to the customer, post prepaid by MITEL.

Spares Level

2.03 MITEL recommends that a minimum spares level of 10% of installed systems, including 10% sparing of the basic system, be maintained. The sparing recommended for the Memory Module is 5%. This means that service personnel can carry a complete spare system on field trips, and therefore, if required, replace a complete system.

TABLE 2-1
DIGITAL PERIPHERAL CARDS

Marketing Name	Part Number	Comments
ONS Line Card (12 Circuit)	9109-010-000-NA	for Rotary and DTMF Telephones
COV Line Card	9109-020-000-NA	6 COV Circuits per card
OPS Line Card	9109-040-000-NA	6 OPS Circuits per card
Digital Line Card	9109-012-000-NA	12 DNIC circuits per card
LS/GS Trunk Card	9109-011-000-NA	6 CO Trunk Interfaces per card
LS/GS Trunk Card - CSA	9109-011-001-NA	6 CO Trunk Interfaces (for use in Canada)

TABLE 2-I (CONT'D)
DIGITAL PERIPHERAL CARDS

Marketing Name	Part Number	Comments
DID Trunk	9109-031-000-NA	
6 DID Circuits per card		
T1 Trunk Card	9109-021-000-NA	
T1 Trunk Adapter	9109-121-000-NA	
T1 Clock Module	9109-060-000-NA	Stratum 3 clock module
T1 Clock Module	9109-061-000-NA	Stratum 4 clock module
Universal Card	9109-005-000-NA	supports: - E&M Trunk Module - Music On Hold/Pager Module - Receiver/Relay Module - Console Module
Receiver/Relay Module	9109-016-000-NA	4 DTMF Receivers and 2 General Purpose Relays
Music On Hold/Pager Module	9109-018-000-NA	Music Input, Paging Preamp Output, and Relay to control external amplifier
Console Module	9109-025-000-NA	Console Interface (LCD Console)
E&M Trunk Module	9109-013-000-NA	one E&M Trunk Circuit per Module
E&M Trunk Module - CSA	9109-013-001-NA	one E&M Trunk Circuit per Module (for use in Canada)

TABLE 2-2
SPARES

Marketing Name	Part Number	Comments
Basic Control Cabinet	9108-000-001-01	Universal Cabinet with COMBO Control Bay (Bays 1 and 2)
Basic Control Cabinet	9109-000-002-01	Universal Cabinet with 672-port Control Bay (Bays 0 and 1)
Basic Control Cabinet	9109-000-012-00	Universal Cabinet with 672-port Control Bay (Bays 0 and 1) for Canada
672 port Peripheral Cabinet	9109-000-004-01	for 672 port configurations only
672 port Peripheral Cabinet	9109-000-014-00	for 672 port configurations only (for Canada)
Spare PCM Cable	9109-050-000-NA	
Intercabinet Cable Assembly (672 Port)	9109-026-000-NA	for 672 port configurations only
Digital Peripheral Bay Shelf Assembly	9109-015-000-NA	

TABLE 2-2 (CONT'D)
SPARES

Marketing Name	Part Number	Comments
Spare Fan	9109-032-000-NA	
Rear Door Fan Assembly	9108-032-000-NA	for 480 port system
Replacement Filter	9109-037-000-NA	
Floppy Disk Drive Assembly	9109-124-000-NA	for Universal Cabinet
Floppy Disk Drive Assembly	9109-024-000-NA	for welded cabinet only - not sold in Canada
Disk Drive Adapter	9108-038-000-NA	for welded cabinet, Bay 2
Disk Drive Adapter	9108-037-000-NA	for welded cabinet, Bay 1
System Disks Generic 1001 - 336 Port	9109-034-000-NA	3 Floppy Diskettes
System Disks Generic 1001 - 480 Port	9108-034-001-NA	3 Floppy Diskettes
System Disks Generic 1002 - all configurations	9 109-034-00 1 -NA	6 Floppy Diskettes
System Disks Generic 1003 Base	9109-034-301-NA	6 Floppy Diskettes
System Disks Generic 1003 ACD	9109-034-302-NA	6 Floppy Diskettes
System Disks Generic 1003 672 port Base	9109-034-31 I-NA	6 Floppy Diskettes
System Disks Generic 1003 672 port ACD	9109-034-312-NA	6 Floppy Diskettes
Main Control Card	9109-036-000-NA	without modules
1 Meg Memory Module	9109-002-001-NA	Generics 1000 and 1001
2 Meg Memory Module	9109-002-003-NA	Generics 1002 and 1003
2.5 Meg Memory Module	9109-002-004-NA	Generic 1003 with ACD
DX Module	9109-004-000-NA	
Switch Matrix Card	9109-006-000-NA	
Bay Power Supply	9109-008-000-NA	one required in each equipped digital Bay

TABLE 2-2 (CONT'D)
SPARES

Marketing Name	Part Number	Comments
Bay Control Card	9109-017-000-NA	
Power Fail Transfer Card	9109-023-000-NA	6 Power Fail Transfer Circuits
PCM Cable (Bay 2-3)	9108-025-000-NA	
PCM and Ground Cable (Bay 2-4)	9108-026-000-NA	for 480 port and 456 port systems
PCM Cable (Bay 4-5)	9108-027-000-NA	for 480 port and 456 port systems
PFT Monitor Cable	9108-028-000-NA	for 480 port and 456 port systems
SX-200 Rear Door Power Supply 1 10V	91 10-108-003-NA	for 480 port analog Bay 3
Digital Interface Card	9108-002-000-NA	
Peripheral Control Card	9108-203-100-NA	
PFT KIT	9109-030-000-NA	6-Circuit Power Fail Transfer card
LS/GS Conversion Module	9109-043-000-NA	Converts six Circuits from Loop Start to Ground Start (mounts onto PFT card)

TABLE 2-3
ANALOG PERIPHERAL CARDS

Marketing Name	Part Number	Comments
E&M Trunk Card	91 10-013-000-NA	
DID/TIE Trunk Card	91 10-031-000-NA	
DID/TIE Trunk Card - CSA	91 IO-031-OOI-NA	for use in Canada
Scanner Card (1200 BAUD)	91 10-104-000-NA	
Line Card (8-Station)	9110-I 10-000-NA	
CO Trunk Card	91 10-21 I-OOO-NA	4-Circuit CO Trunk Card
CO Trunk Card - CSA	91 IO-21 1-001-NA	4-Circuit CO Trunk Card for use in Canada
SUPERSET® Line Card	9110-410-000-NA	8-Circuit *SUPERSET 3*™ and *SUPERSET* 4 ® Line Card
Calibrated Flash Line Card	91 10-310-000-NA	Required when using Calibrated Flash (50-140 ms) telephones.

TABLE 2-4
PERIPHERAL EQUIPMENT

Marketing Name	Part Number	Comments
LCD Console	9108-007-001-NA	ESD enhanced
Superconsole *1000*™ attendant console	9189-000-001-NA	console with tilt LCD display (interfaces to Digital Line Card)
LCD Console Lens and Label Kit	9108-036-000-NA	Keypad Label and Protective Lens
LCD Console French Conversion Kit	9108-040-000-CA	French Keypad Label and French Attendant Console Guide
SUPERSET 3 Telephone	9173-000-021-NA	Multi-feature 3-line Telephone
SUPERSET 3 French Conversion Kit	9173-070-000-CA	25 Telephones of French Labels and User Reference Cards
SUPERSET 3 Label Kit	9173-002-000-NA	***SUPERSET*** 3 Protective Lens (quantity: 10)
SUPERSET 4 Telephone	9174-000-025-NA	Full Feature Multiline Telephone
SUPERSEJ 4 Telephone French	9174-000-022-CA	French ***SUPERSET*** 4 Telephone
SUPERSET 4 Label Kit (Mark I)	9174-002-001-NA	Telephone number and Line Identification labels (quantity: 25)
SUPERSET 4 Lens Kit (Mark I)	9174-002-000-NA	***SUPERSET*** 4 Protective Lens (quantity: 10)
SUPERSET 4 Label Kit (Mark II and Mark III)	9174-002-002-NA	Telephone number and Line Identification labels (quantity: 25)
SUPERSET 4 Lens Kit (Mark II and Mark III)	9174-002-003-NA	***SUPERSET*** 4 Protective Lens (quantity: 10)
SUPERSET 4 Support Stand	9174-001-000-NA	Spare Stand for ***SUPERSET*** 4 Telephone (quantity: 8)
Handset	9170-048-002-NA	Spare Handset for ***SUPERSET*** 3 and ***SUPERSET*** 4 Telephones (quantity: 10)
Handset Cord	9170-048-001-NA	Spare Handset Cord for ***SUPERSET*** 3 and ***SUPERSET*** 4 Telephones (quantity: 10)
SUPERSET Line Cord Pack	9170-048-004-NA	Spare Line Cord (quantity: 10)
Static Protection Unit	9180-067-001-NA	Protects system against static discharges at stations. Installed at distribution frame. One unit handles 25 stations.
SUPERSET 3™DN Telephone	9183-000-001-NA	Multi-feature Multiline Digital Telephone

TABLE 2-4 (CONT'D)
PERIPHERAL EQUIPMENT

Marketing Name	Part Number	Comments
SUPERSET 3DN Lens Kit	9183-002-001-NA	*SUPERSET* 3DN Protective Lens (quantity: 10)
SUPERSET 3DN Label Kit	9183-000-001-NA	*SUPERSET* 3DN Telephone number labels (quantity: 25)
SUPERSET 4™DN Telephone	9184-000-001-NA	Full Feature Multiline Digital Telephone
SUPERSET 4DN Lens Kit	9184-002-000-NA	*SUPERSET* 4DN Protective Lens (quantity: 10)
SUPERSET 4DN Lens Kit	9184-002-001-NA	*SUPERSET* 4DN Telephone number label (quantity: 25)
SUPERSET 3DN Telephone	9183-000-101-NA	with DATASET 1101 asynchronous cartridge installed
SUPERSET 4DN Telephone	9184-000-101-NA	with DATASET 1101 asynchronous cartridge installed
DATASET 1102 card	9141-110-200-NA	Dual Rack-Mounted asynchronous DATASET
Standalone DATASET 1103	9141-I IO-300-NA	Standalone asynchronous DATASET
DATASET 2102 card	9141-210-200-NA	Rack-Mounted synchronous/asynchronous DATASET
Standalone DATASET 2103	9141-210-300-NA	Standalone synchronous/asynchronous DATASET
DATACABINET 9000	9141-900-100-NA	Cabinet to hold datashelves
DATASHELF 9100	9141-901-100-NA	Shelf to hold rack-mounted DATASETs
Modem Interconnect Panel	9141-940-100-NA	

TABLE 2-5
SHELF UPGRADE KITS

Marketing Name	Part Number	Comments
Bay 4 kit 230 Volt	9108-000-003-NA	
Bay 4 kit (Peripheral cabinet)	9108-001-000-NA	
Bay 3 kit	9108-012-000-NA	
Bay 3 kit 230 Volt	9108-012-000-NA	
Bay 5 kit	9108-013-000-NA	
Control Cabinet PFT Kit	9108-030-000-NA	

TABLE 2-5 (CONT'D)
SHELF UPGRADE KITS

Marketing Name	Part Number	Comments
PFT Kit	9109-030-000-NA	
Peripheral Bay Kit with Shelf	9109-046-000-NA	
Peripheral Bay Kit with Shelf 230 Volt	9109-046-001-NA	
Peripheral Bay Kit without Shelf	9109-047-000-NA	
Peripheral Bay Kit without Shelf 230 Volt	9109-047-001-NA	
336 to 672 Port Upgrade Kit (for USA)	9109-129-000-NA	
336 to 672 Port Upgrade Kit (for Canada)	9109-129-010-NA	

TABLE 2-6
DOCUMENTATION

Marketing Name	Part Number	Comments
Generic 1003 System Documentation	9109-035-003-NA	Contains Volumes l-4 of Technical Documentation, which cover Generic 1003 features, and contains reference cards and end user manuals.
Generic 1003 Volume 1 Practices	9109-094-001-NA	
Generic 1003 Volume 2 Practices	9109-094-002-NA	
Generic 1003 Volume 3 Practices	9109-094-003-NA	
Generic 1003 Volume 4 Practices	9109-094-004-NA	
Attendant Console Guide	9109-090-010-NA	Details LCD Attendant Console Operation.
SX-200 DIGITAL Generic 1003 System Doc. French	9109-035-000-CA	Technical Documentation Volumes 1-4 (French)
French Attendant Console Guide	9108-090-010-CA	
LCD Console French Conversion Kit	9108-040-000-CA	French Keypad Label and French Attendant Console Guide

TABLE 2-6 (CONT'D)
DOCUMENTATION

Marketing Name	Part Number	Comments
General Information Book	9110-952-026-NA	includes an overall description of the SX-200 DIGITAL PABX features and peripheral devices.
SUPERSET 4 User Guide	9109-953-004-NA	
SUPERSET 3 User Guide	9109-953-003-NA	
500/2500 Telephone User Guide	9109-953-002-NA	
ACD Agent Reference Card	9109-953-005-NA	
ACD Supervisor/Senior Supervisor Guide	9109-953-006-NA	
Attendant Console Guide	9 108-090-O 1 0-NA	
ACD PC Reporting Guide	9109-953-007-NA	
Supervisor Reference Guide		
General Information Book	9109-952-003-NA	

3. FIELD-REPLACEABLE UNITS

Only persons who have successfully completed a MITEL Installation and Maintenance training course for the SX-200 DIGITAL PABX should perform removal and replacement procedures.

WARNING

INSTRUCTIONS MUST BE FOLLOWED EXPLICITLY WHEN THEY INVOLVE WORK WITH AND CHANGES TO THE PRIMARY POWER SUPPLY OF THE UNIT.

Precautions

3.01 Observe the following precautions when working on the system, particularly when handling PCB cards or using test equipment to measure voltages.

(a) When replacing PCB cards turn power off (when possible), but maintain the ground connections to the equipment. Power must be OFF, when inserting or removing common control cards, which are identified with appropriate warnings on their faceplates.

(b) Always wear an antistatic wrist strap when handling printed circuit cards. Handle PCB cards only by the edges and avoid contact with any exposed electrical connections. When removing a new card from its package, touch the package to the cabinet frame first to release any static voltage buildup, prior to removing the card and inserting it into the equipment.

(c) Conductive packages (antistatic bags) should be grounded prior to opening them to remove the contents, and similarly grounded prior to placing a card in the package. Suspected faulty cards should be placed in conductive packages to prevent further possible damage to the cards. Cards that are not correctly packed in antistatic bags when returned will not be covered by any warranty.

CHART 3-1
POWER DOWN SYSTEM

Step	Action	Comments
1.	Unlock and open front and rear doors.	
2.	While disk drive LEDs are OFF, remove diskettes from drives.	
3.	Turn off Bay Power Supply switches, Peripheral Shelf power switches (if present), and remove cabinet line cord(s) from wall outlet.	The system is now properly powered down, and its doors are open to provide access to all equipment contained within.

CHART 3-2
POWER UP SYSTEM

Step	Action	Comments
1.	Plug cabinet line cord(s) into wall outlet. Turn on Bay Power Supply switches and Peripheral Shelf power switches (if present).	
2.	While disk drive LEDs are OFF, reinsert diskettes into drives. Press RESET on the Main Control Card.	
3.	Replace any covers or barriers that were removed previously. Close and lock front and rear doors.	The system is now properly powered up, and its doors closed and locked to prevent unauthorized access to equipment contained within the cabinet.

CHART 3-3
REMOVE AND INSTALL DIGITAL PERIPHERAL SHELF

Step	Action	Comments
1.	**Power down system.**	Refer to Chart 3-1.
2.	**Remove cards from shelf** • Attach antistatic strap to your wrist, and remove all cards from shelf • Identify each card with the location from which it was removed.	Note that the Bay Power Supply has a line cord (which must be unplugged) attached to it at the back of the shelf. Store each card nearby in an antistatic bag. The Floppy Disk Drive and the Bay Power Supply are secured to the shelf by locking screws at the front.
3.	**Disconnect wiring from backplane** • Identify and label all wires and cables connected to backplane. • Disconnect all wires and cables from backplane.	
4.	**Remove shelf** • At front of cabinet, remove and retain screws holding shelf, then slide shelf out of cabinet.	
5.	**Install new shelf** • Similarly, slide new shelf into cabinet and replace mounting screws previously removed.	

CHART 3-3 (CONT'D)
REMOVE AND INSTALL DIGITAL PERIPHERAL SHELF

Step	Action	Comments
6.	**Reconnect wiring to backplane** • Reconnect signal cables and ground wires to the Bay backplane, the same as they had been connected to the original backplane.	
7.	**Replace cards in shelf** • At front of cabinet, put on antistatic wrist strap and reinstall cards removed previously.	
8.	**Power up system.**	Refer to Chart 3-2.

CHART 3-4
CONTROL CABINET REMOVAL AND REPLACEMENT

Step	Action	Comments
1.	**Unpack and inspect new cabinet.** • Unpack replacement cabinet, check for damaged or missing items, and position it near the cabinet to be replaced.	
2.	**Power down system.**	Refer to Chart 3-l.
3.	**Place new cabinet in position.** • Move the existing cabinet (with its green ground wire attached) aside and place the new cabinet in its assigned location.	This allows the cards and other components to be transferred directly from the old cabinet to the new cabinet.
4.	**Connect system ground.** • Connect the green ground wire to the ground stud in the new cabinet; then connect a temporary ground wire from this stud to the ground stud in the old cabinet.	

CHART 3-4
CONTROL CABINET REMOVAL AND REPLACEMENT

Step	Action	Comments
5.	**Transfer wires and cables.** • Identify and remove wires and cables from old cabinet and reconnect to same locations in new cabinet.	If a peripheral shelf is present, transfer it when its cables have been disconnected (refer to shelf removal and replacement). The upper PFT card must be removed after the shelf is removed from the old cabinet, and installed in the new cabinet before the shelf is installed (refer to removal and replacement of PFT).
5.	**Transfer cards.** ● While wearing the antistatic wrist strap, remove cards from old cabinet and install into same locations in new cabinet.	
7.	Remove old cabinet. • When all items have been transferred to the new cabinet, remove the temporary ground wire, and remove the cabinet.	
3.	Power up system.	Refer to Chart 3-2.

CHART 3-5
6-CIRCUIT POWER FAIL TRANSFER CARD REMOVAL AND REPLACEMENT

Step	Action	Comments
1.	Power down system.	Refer to Chart 3-l.
2.	Disconnect PFT wiring • Identify and disconnect wires and cables from PFT card to be replaced.	This identification and/or labeling simplifies reconnecting the wires and cables to the replacement PFT card.
3.	Remove PFT card • Attach antistatic wrist strap to your wrist and carefully remove the screws which hold the PFT card in place; remove the PFT card.	The top PFT card is held by four screws; to access two of the screws, it is necessary, at the front of the cabinet, to remove the screws which hold the shelf in place, and slide the shelf forward to expose the screws. After replacing the PFT card, return the shelf to its proper position and replace its mounting screws at the front.

CHART 3-5 (CONT'D)
6-CIRCUIT POWER FAIL TRANSFER CARD REMOVAL AND REPLACEMENT

Step	Action	Comments
4.	**Remove LS/GS Module** • If there is a Loop Start to Ground Start module on the PFT card, remove it and transfer it to the replacement PFT card.	
5.	**Install new PFT card** • Place the replacement PFT card into position, and replace mounting screws.	For an upper PFT card, return the shelf to its proper position and replace the shelf mounting screws at the front of the cabinet.
6.	**Reconnect cables** • Reconnect the wires and cables removed previously, to their original connections.	
7.	**Power up system.**	Refer to Chart 3-2.

CHART 3-6
ANALOG BAY REMOVAL AND REPLACEMENT

Step	Action	Comments
1.	**Power down system.**	Refer to Chart 3-1.
2.	**Remove cards from shelf** • While wearing the antistatic wrist strap, remove all cards from the shelf, place into antistatic bags, and store in a safe nearby location.	Identify all card assignments, to ensure that all cards are replaced into their original positions in the new shelf.
3.	**Remove wiring from shelf** • At the back of the shelf, identify and remove all power, ground, and signal cables from the backplane.	This identification simplifies reconnecting the wires and cables to the replacement backplane.
4.	**Remove shelf** • Remove the screws from the front of the shelf, and remove the shelf by pulling it forward.	

CHART 3-6 (CONT'D)
ANALOG BAY REMOVAL AND REPLACEMENT

Step	Action	Comments
5.	**Install new shelf** • Place the replacement shelf onto shelf guides, slide into place, and fasten with the eight screws removed previously.	
6.	**Connect cables to new shelf** • At rear of cabinet, reconnect the power, ground, and signal cables to the new backplane.	
7.	**Replace Surge Clamp** • Replace Surge Clamp if one was present on old backplane. Ensure that the top of the Surge Clamp is towards the top of the shelf; its top pins plug onto pins 9 and 10.	
8.	**Install printed circuit cards** • Reinstall printed circuit cards into original positions in new shelf.	
9.	**Power up system.**	Refer to Chart 3-2.

CHART 3-7
REMOVAL AND REPLACEMENT OF PRINTED CIRCUIT CARDS

Step	Action	Comments
	CAUTION: Do not open or unpack any printed circuit card cartons unless you are wearing the antistatic wrist strap.	THE ANTISTATIC WRIST STRAP MUST BE CONNECTED TO THE PABX CABINET, WHICH MUST BE CONNECTED TO AN APPROVED GROUND TO PROVIDE PROTECTION FROM STATIC DISCHARGES.
1.	**Put on wrist strap** • Attach the antistatic wrist strap to your wrist, and handle printed circuit cards by their edges only.	Note: If the card faceplate identifies this card as one which cannot be removed while power is on, power down the system before removing the card.

CHART 3-7 (CONT'D)
REMOVAL AND REPLACEMENT OF PRINTED CIRCUIT CARDS

Step	Action	Comments
2.	**Remove the printed circuit card** • Remove the printed circuit card to be replaced from its card slot by pulling forward on its latch or latches and sliding the card forward out of its slot.	Note that the Bay Power Supply and the Floppy Disk Drive are secured to the shelf by a screw which must be released to remove the unit, and secured when replacing the unit.
3.	**Prepare replacement card** • Unpack the replacement card; if there are modules or jumpers on the removed card, transfer them to the replacement card. Ensure that any switches on the replacement card are set the same on the removed card.	
4.	**Install new card** • Install the replacement card into its slot; if power had been turned off, power up the system.	

CHART 3-8
REMOVAL AND REPLACEMENT OF MODULES ON PRINTED CIRCUIT CARDS

Step	Action	Comments
	MODULE REMOVAL	
1.	**Remove card from system** • Verify that the antistatic wrist strap is correctly connected to the PABX, and that the PABX is correctly grounded; then attach the strap to your wrist. Remove the printed circuit card from the system.	Ensure power is switched off if required by the card type.
2.	**Place card on flat surface** • Place the card component side up onto its antistatic bag on top of the PABX or any nearby firm surface. Do not place it onto a deformable surface since the pcb may bend as pressure is applied to seat the connectors.	
3.	**Remove module** • Pop the module pcb from the standoffs by applying pressure with your thumb onto the short portion of the standoff projecting through the hole in the module, while pinching with one or two fingers on the opposite side of the module right near the standoff.	This "pinching action" avoids bending the pcb any more than is necessary to release it from the standoff.
4.	**Separate connectors** • Carefully separate the connectors by applying pressure at each end of connector; lift the module from the card. DO NOT BEND or FLEX the module by pulling up on the corners.	DO NOT USE a screwdriver or any similar object to pry the modules away from the card; damage to components or pcb tracks may result.

CHART 3-8
REMOVAL AND REPLACEMENT OF MODULES ON PRINTED CIRCUIT CARDS

Step	Action	Comments
	MODULE INSTALLATION	
1.	Put on wrist strap • Verify that the antistatic wrist strap is correctly connected to the PABX, and that the PABX is correctly grounded; then attach the strap to your wrist.	The PABX must be properly grounded for the wrist strap to be effective.
2.	Check card • Verify that the jumpers and switches are correctly positioned on the card.	If the card is also being replaced, set any switches and jumpers to the same positions as on the removed card.
3.	Install standoffs • Install the plastic standoffs into the card (where required to mate with the modules). • Do not attempt to install standoffs into holes that are obstructed by components or wire.	Some modules do not have standoffs.
4.	nstall module • Unpack the module and place it onto the card. • Press its connector into place with the palm of your hand. • Press the standoffs into place. • Reseat the connector.	

CHART 3-9
REMOVAL AND REPLACEMENT OF A T1 TRUNK ADAPTER

Step	Action	Comments
1.	Busy out T1 trunk • At the Maintenance Terminal, busy out the associated T1 trunk (if not already done).	

CHART 3-9 (CONT'D)
REMOVAL AND REPLACEMENT OF A T1 TRUNK ADAPTER

Step	Action	Comments
2.	Remove T1 Trunk Adapter • Open the rear door of the cabinet. • Remove the T1 Adapter Cable Assembly from the T1 Adapter by removing its connector mounting screws. • Remove the T1 Trunk Adapter card by removing its two mounting screws.	Retain all mounting hardware for reuse.
3.	Install new T1 Adapter Card • Install the replacement T1 Adapter Card with removed hardware. • Reattach the T1 cable, using removed hardware.	

CHART 3-10
REMOVAL AND REPLACEMENT OF A T1 ADAPTER CABLE ASSEMBLY

Step	Action	Comments
1.	Busy out T1 trunk • At the Maintenance Terminal, busy out the associated T1 trunk (if not already done).	
2.	Remove T1 Adapter Cable Assembly • Disconnect the T1 Adapter Cable Assembly from the T1 Adapter Card. • Disconnect the T1 trunk cable from the T1 Adapter Cable Assembly. • Remove the T1 Adapter Cable Assembly by removing two screws which attach it to the side of the cabinet.	

CHART 3-10 (CONT'D)
REMOVAL AND REPLACEMENT OF A T1 ADAPTER CABLE ASSEMBLY

Step	Action	Comments
3.	**Install T1 Adapter Cable Assembly** • Install the replacement T1 Adapter Cable Assembly to the side of the cabinet with two self-tapping screws (and external tooth washers) just removed. • Reconnect it to the T1 Adapter Card and to the T1 Trunk Cable.	
4.	**Enable the T1 trunk** • At the Maintenance Terminal, enable the T1 trunk.	

CHART 3-11
REMOVAL AND REPLACEMENT OF BAY POWER SUPPLY

Step	Action	Comments
1.	**Turn off BPS** • Unlock and open front and rear doors of cabinet. • Turn off power switch of Bay Power Supply to be removed.	If the Bay Power Supply is in Bay 2 of a 336 port, 456 port, or 480 port Control Shelf or in Bay 0 of a 672 port Control Shelf, perform the "POWER DOWN SYSTEM" sequence instead (these bays power the Floppy Disk Drives and the Main Control Card).
2.	**Remove BPS line cord** • At the rear of the shelf, remove the ac line cord from the Bay Power Supply.	
3.	**Remove BPS** • At the front of the cabinet, release the locking screw which holds the BPS to the shelf. • Pull the BPS from the shelf.	

CHART 3-11 (CONT'D)
REMOVAL AND REPLACEMENT OF BAY POWER SUPPLY

Step	Action	Comments
4.	**Install new BPS** • Install the replacement BPS into the slot. • Secure its locking screw to the shelf.	
5.	**Connect ac line cord** • At the rear of the cabinet, attach the ac line cord to the BPS.	
6.	**Turn on power** • At the front, turn on the power switch on the BPS.	If a "POWER DOWN SYSTEM" had been done, do a "POWER UP SYSTEM" instead.

CHART 3-12
REMOVE AND REPLACE A FLOPPY DISK DRIVE

Note: Remove power from the Bay before removing or installing a disk drive

Remove or install diskette in drive while power is on and LED is off.

Step	Action	Comments
	REMOVE OLD FLOPPY DISK DRIVE	
1.	Power down system.	
2.	If working on an SX-200 welded cabinet, open the rear door and disconnect the adapter from the disk drive.	Refer to Figure 3-1.
3.	Unfasten locking screw. Unlock latch and withdraw disk drive through front of card slot.	Drive PN9109-024-000 has no latch.
	INSTALL FLOPPY DISK DRIVE PN9109-124-000	
1.	While wearing antistatic wrist strap, unpack and inspect new disk drive.	
2.	Install the drive into its slot. Secure it with its latch and locking screw.	
3.	If installing the drive into an SX-200 welded cabinet, open the rear door and follow steps 4 through 7 below. Otherwise proceed to step 8.	
4.	If replacing drive PN9109-024-000, an adapter is required. Follow steps 5 and 6, below. Otherwise proceed to step 7.	
3.	Attach adapter ground wire to shelf using screw, external tooth washer, and nut. Refer to Figure 3-l.	Bay 1 Adapter is PN9109-037-000. Bay 2 Adapter is PN9109-038-000.
6.	Connect adapter ribbon cable to Control Shelf backplane. Refer to Figure 3-l .	Bay 1 adapter connects to J37 (ribbon cable) and J33 (power cable). Bay 2 adapter connects to J35 and J39.
7.	Plug adapter into DIN connector of floppy disk drive.	
8.	Power up and initialize system.	

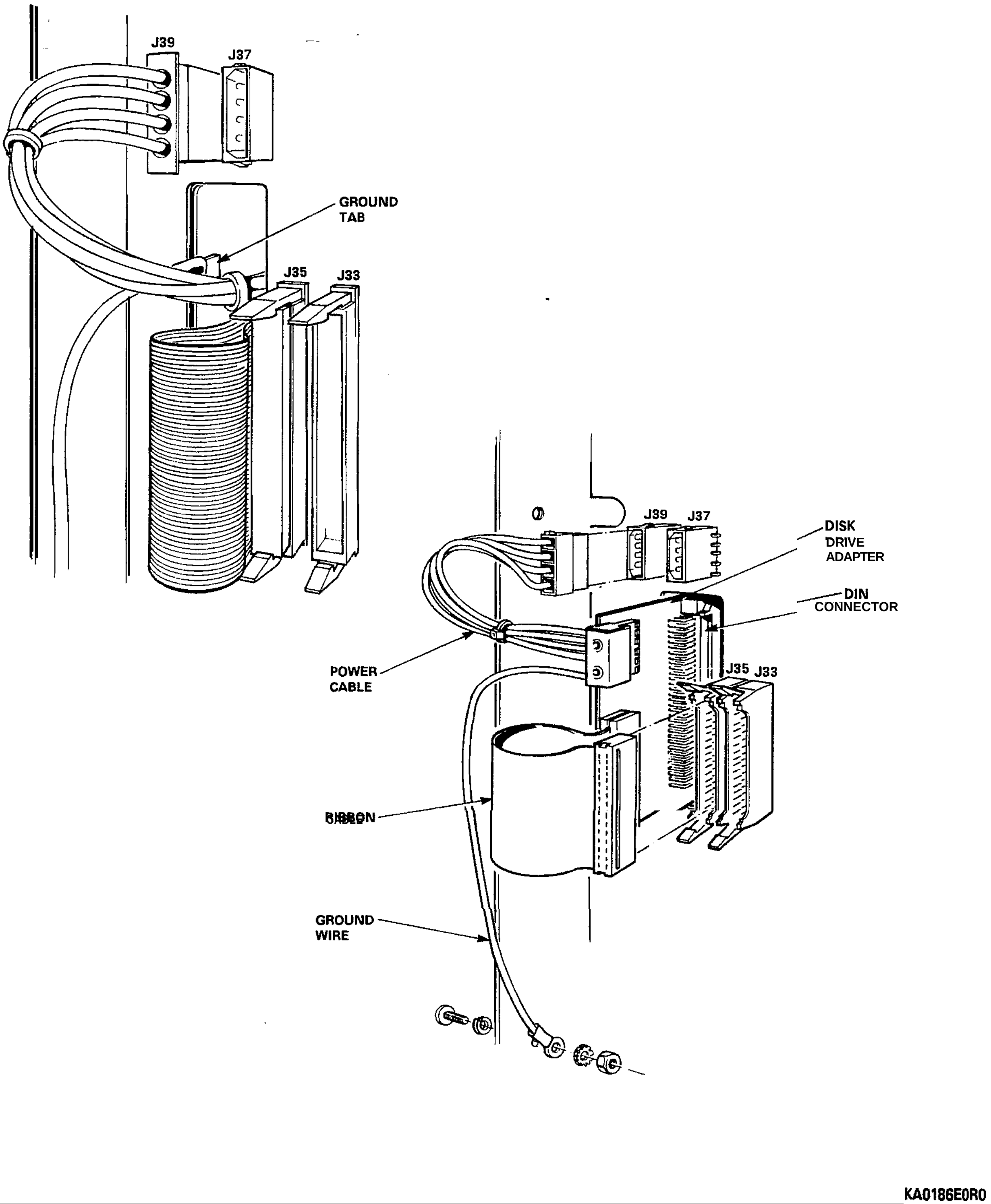

Figure 3-1 Floppy Disk Drive Connections (SX-200 Welded Cabinet)

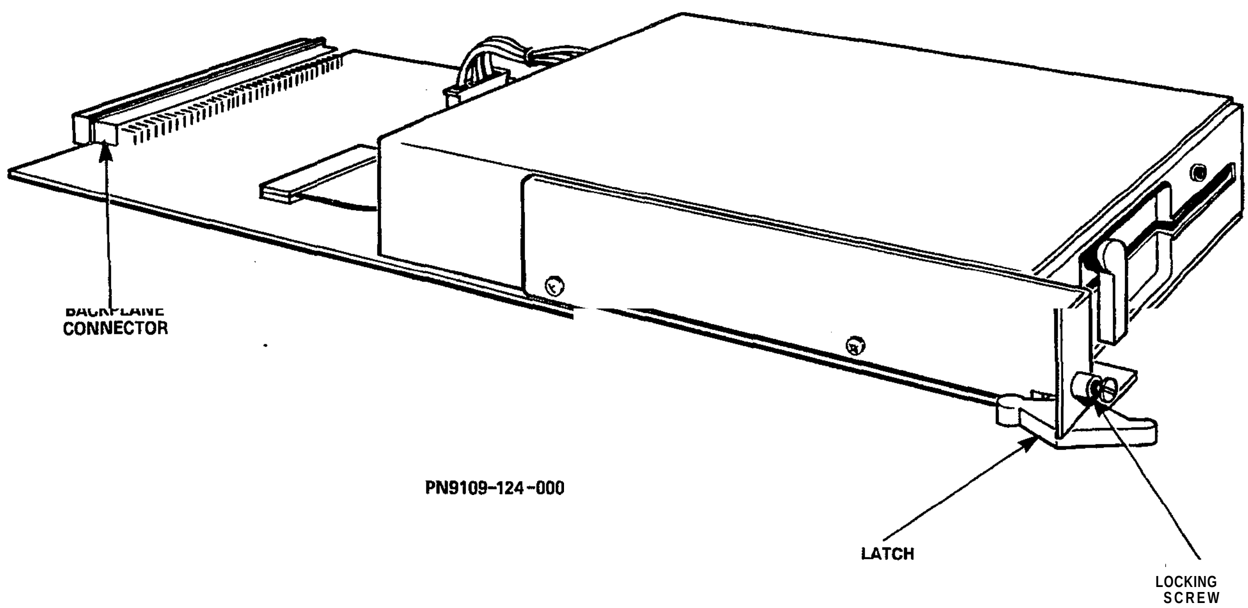

Figure 3-2 Floppy Disk Drive

CHART 3-13
REAR DOOR FAN ASSEMBLY REPLACEMENT ON A WELDED SX-200 CABINET

Step	Action	Comments
	REMOVE OLD FAN ASSEMBLY	
1.	Power down system.	Refer to Chart 3-1.
2.	Unplug fan supply cord.	
3.	Remove and retain nuts holding fan unit to fan door. Remove unit.	
	INSTALL NEW FAN ASSEMBLY	
1.	Unpack kit and inspect contents for loose, damaged, or missing items.	
2.	Install rear door fan assembly.	
3.	Plug fan power supply cord into connector on fan unit.	
4.	Power up system.	Refer to Chart 3-2.

CHART 3-14
REAR DOOR FAN REPLACEMENT ON SX-200 DIGITAL UNIVERSAL CABINET

Step	Action	Comments
	REMOVE OLD FANS	
1.	Power down system.	Refer to Chart 3-1.
2.	Unplug fan supply cord at each fan.	
3.	Remove each fan by removing the 4 screws that hold it. Retain all mounting hardware and the fan guards.	
	INSTALL NEW FAN ASSEMBLY	
1.	Unpack kit and inspect contents for loose, damaged, or missing items.	
2.	Mount each fan so that its terminals are on its upper left corner and air flow is OUT OF the cabinet. Four external tooth lockwashers are required between each fan and the door panel (one at each screw). The mounting nuts hold the fan guard against the fan.	Apply thread locking adhesive to hold each nut.
3.	Connect both fans to the fan supply cord.	
4.	Power up system.	Refer to Chart 3-2.

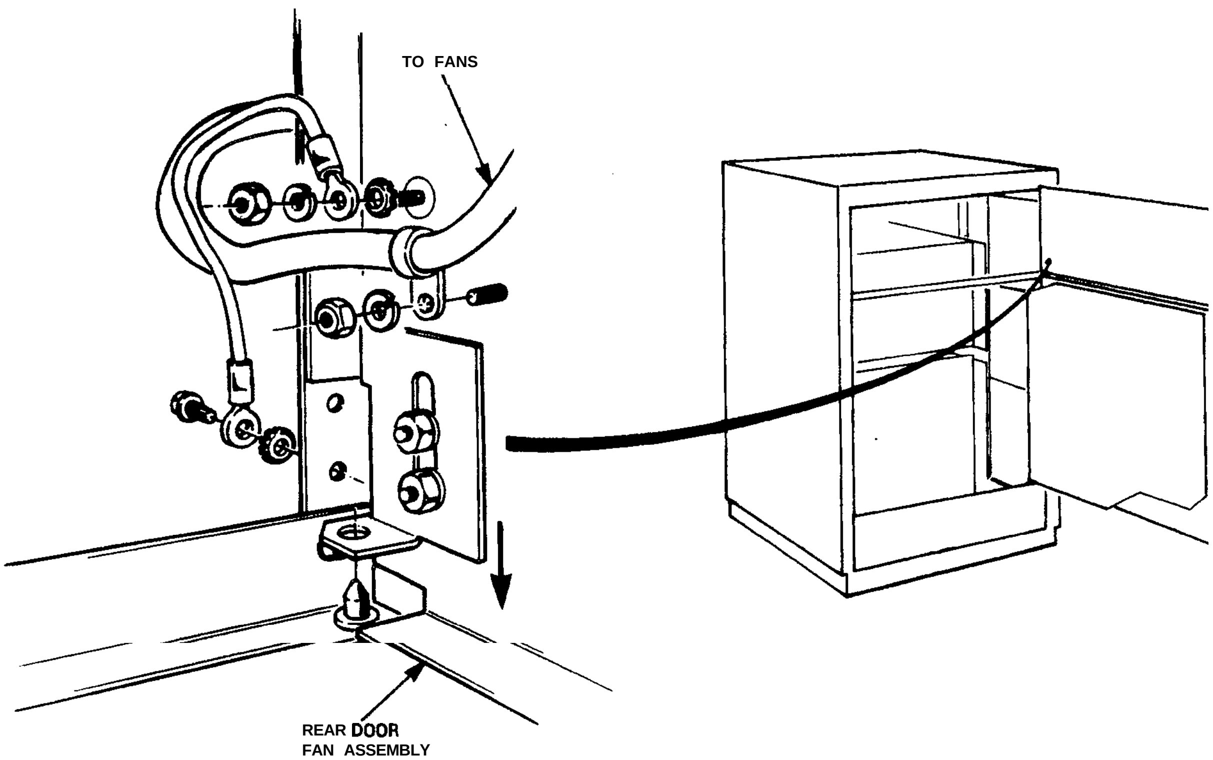

Figure 3-3 Installation of Fan Assembly

CHART 3-15
ATTENDANT CONSOLE REMOVAL AND REPLACEMENT

Step	Action	Comments
1.	**Remove cords from Console** • Unplug the Console modular line cord from the attendant console, and unplug the headset from the console; remove the Console.	
2.	Replace the Console • Place the replacement console where the removed console had been.	The replacement console must be the same type as the console being removed.
3.	**Plug cords into Console** • Plug the console modular cord into the jack at the back of the console, and plug the handset into the handset jack.	

Notes:

The LCD Console connects to a Console Module on the Universal Card using a four-wire connection. The Superconsole 1000™ attendant console (with the tilt display and printer port) connects to a Digital Line Card using a two-wire connection.

CHART 3-16
REPACKING EQUIPMENT FOR SHIPMENT

Step	Action	Comments
	Note: Do not disconnect the system ground connection until after all printed circuit cards have been properly packed. The PABX must be properly grounded for the wrist strap to be effective.	Whenever possible, re-use original packing material to repack SX-200 DIGITAL PABX equipment for shipment.
1.	**Pack all printed circuit cards** • Pack all printed circuit cards in antistatic bags and in regular PC card shipping cartons. • Handle cards by the edges only, and follow all the usual card handling procedures.	Wear the antistatic wrist strap while handling cards.

CHART 3-16 (CONT'D)
REPACKING EQUIPMENT FOR SHIPMENT

Step	Action	Comments
2.	**Wrap all items** • Wrap all items with air-cushion type material, and surround with loose paper to minimize movement within the carton.	Ensure that items within the carton cannot shift about, and will not get scratched or damaged.
3.	**Pack all equipment** • Repack all items carefully, and list the contents of each carton on the label.	