

MITEL NETWORKS

# SX-200 EL/ML

TECHNICIAN'S HANDBOOK  
LIGHTWARE 19, RELEASE 3.1

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**SX-200 Technician's Handbook**  
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## Chapter 1 Introduction

About This Handbook . . . . .	3
Purpose of This Handbook . . . . .	3
Who This Handbook is For . . . . .	3
Symbols Used in This Handbook . . . . .	3
Important Safety Instructions . . . . .	4
Where You Can Find More Information . . . . .	4
Configurations . . . . .	5
SX-200® EL System . . . . .	5
SX-200 ML (RM) System . . . . .	11
SX-200 ML (FD) PBX . . . . .	11
SX-200 LIGHT PBX . . . . .	13
SX-200 IP Node . . . . .	14
SX-200 SPINE Peripheral Bay . . . . .	16
SX-200 DIGITAL 672-Port PBX . . . . .	17
SX-200 DIGITAL 336-Port PBX . . . . .	18
SX-200 DIGITAL 456-Port PBX . . . . .	19
SX-200 DIGITAL 480-Port PBX . . . . .	20
LIGHTWARE™ 19 Software . . . . .	21

## Chapter 2 Routine Maintenance

Is the System Healthy? . . . . .	25
Checking a System for Alarms . . . . .	26
Checking a System for Database Errors . . . . .	26
Backing Up a Customer Database . . . . .	27
SX-200 EL/ML . . . . .	27
SX-200 LIGHT/ DIGITAL . . . . .	28
Loading New Software Onto a System . . . . .	28
SX-200 LIGHT/ DIGITAL . . . . .	28
SX-200 EL/ML Remote Software Download . . . . .	29
SX-200 EL/ML Flash Memory Card Replacement . . . . .	32
Upgrading Set Firmware . . . . .	33
Boot Codes . . . . .	33
Firmware Revision Levels . . . . .	33
Firmware Commands . . . . .	33
System Log Messages . . . . .	34
Enabling Options or Changing Options . . . . .	35
Options Are Password Protected . . . . .	35
Enabling Options On a SX-200 EL/ML System . . . . .	35

## Technician's Handbook

Enabling Options On a SX-200 LIGHT/DIGITAL System . . . . .	35
Upgrading an SX-200 IP Node . . . . .	36
Upgrading from CD-ROM . . . . .	36
Upgrading by Replacing Flash Memory . . . . .	38
Trunk SMDR Records Field Summary . . . . .	41

## Chapter 3 Troubleshooting and Repair

Identifying Faults . . . . .	47
Flowchart 1: Getting Started . . . . .	47
Flowchart 2: System Is Not Booting . . . . .	49
Flowchart 3: An Alarm Is Present . . . . .	50
Flowchart 4: Correcting Set / Dataset Problems . . . . .	51
Flowchart 5: Maintenance Terminal Problems . . . . .	53
Interpreting the Main Control Card Power-Up Error Codes . . . . .	54
Restoring the Database . . . . .	55
Restoring the SX-200 EL/ML Database . . . . .	55
Restoring the SX-200 LIGHT/DIGITAL Database . . . . .	55
Backing Up Log Entries . . . . .	56
Correcting System ID Errors . . . . .	57
If the System Reports a System ID Mismatch . . . . .	57
If the System Reports a Decryption Module Error . . . . .	57
Powering Down the Nodes . . . . .	57
Powering Down the SX-200 EL/ML Control Node . . . . .	57
Powering Down the SX-200 LIGHT Control Node . . . . .	58
Powering Down the Peripheral Nodes . . . . .	58
Powering Down the IP Node . . . . .	58
Powering Up the Nodes . . . . .	59
Powering Up the SX-200 EL/ML Control Node . . . . .	59
Powering Up the SX-200 LIGHT Control Node . . . . .	59
Powering Up the Peripheral Nodes . . . . .	59
Powering Up the IP Node . . . . .	59
Replacing Circuit Cards . . . . .	60
Replacing Peripheral Interface Cards . . . . .	60
Replacing a Main Controller Card . . . . .	61
Correcting Ground Path Problems . . . . .	62
Problems Caused by Incorrect PBX Grounding . . . . .	62
Ground Path AC Voltage Test . . . . .	63
Ground Path Resistance Test . . . . .	63
Testing the CO and PBX Ground Differential . . . . .	64
Checking the Port Connections to the PBX . . . . .	65

Checking the Receiver Allocation .....	65
Checking the FIM/CIM Carrier Cards .....	67
Checking the T1 Card, T1/E1 Module, and the PRI Card .....	68
Checking the Number of T1 Trunk Cards .....	69
Trunk Signaling and Supervision .....	70
General Signaling & Supervision Concepts .....	70
Loop Start Line/Trunk .....	71
Ground Start Trunk .....	73
Direct Inward Dial (DID)/Loop Trunk .....	75
Ear & Mouth (E&M) Trunk .....	77
T1 Trunk (D4 DS-1) .....	81
PBX Property Management System Interface .....	86
Property Management System Messages .....	86
PBX and PMS Cannot Communicate .....	89
Testing the PMS Interface of the PBX .....	89
Disk Drive Maintenance .....	91
SX-200 LIGHT/DIGITAL Floppy Disk Subsystem	
Troubleshooting Procedures .....	91
Disk Drive Strapping .....	93
Troubleshooting the SX-200 IP Node .....	93
SX-200 IP Node Troubleshooting .....	94
Test Line .....	100

## Chapter 4 Programming

Programming an Attendant Console .....	107
Programming a Printer Port .....	108
System Printer Port .....	108
Dataset Printer Port .....	108
Programming Stations/Sets Automatically .....	109
Deleting a device and all dependent resources .....	110
Deleting a range of devices and all dependent resources .....	111
Programming a Single Line Voice Station .....	112
Programming an Analog Device to a SIM2 .....	113
Programming a Multi-Line Set .....	113
Programming a Subattendant Set .....	115
Programming a PRI card .....	116
Programming a Non-Dial-In Trunk .....	120
Programming a range of Non Dial-in Trunks .....	121
Programming a Dial-In Trunk .....	123
Programming a range of Dial-in Trunks .....	124

## Technician's Handbook

Programming a DISA Trunk . . . . .	125
Programming ANI/DNIS on an Incoming Trunk . . . . .	126
Programming a CLASS Trunk . . . . .	130
Programming an SX-200 IP Node . . . . .	131
Initializing the SX-200 IP Node . . . . .	131
CDE Programming for the SX-200 IP Node . . . . .	132
Registering IP Phones (Optional) . . . . .	135
Programming a Circuit Descriptor for Hotel/Motel and ACD Datasets . . . . .	135
Programming the PMS Interface . . . . .	137
Programming Call Forwarding - External . . . . .	141
Feature Access Codes (CDE Form 02) . . . . .	142
Class of Service Options (CDE Form 03) . . . . .	145
System Options and Timers (CDE Form 04) . . . . .	153
CDE Cross Reference Guide . . . . .	158
SX-200 EL/ML Feature Limitations . . . . .	160

## Chapter 5 Installation

Cabinet Card Assignments . . . . .	167
SX-200 EL Control Cabinet Card Assignments . . . . .	167
SX-200 EL Peripheral Cabinet Card Assignments . . . . .	168
SX-200 ML (RM) Cabinet Card Assignments . . . . .	169
SX-200 ML (FD) Cabinet Card Assignment . . . . .	171
SX-200 LIGHT Cabinet Card Assignment . . . . .	172
SX-200 SPINE Peripheral Bay Module Assignment . . . . .	173
SX-200 Digital 672-Port Cabinet Card Assignment . . . . .	174
SX-200 Digital 336-Port Control Cabinet Card Assignment . . . . .	175
SX-200 Digital 456-Port Cabinet Card Assignment . . . . .	176
SX-200 Digital 480-Port Cabinet Card Assignment . . . . .	177
SX-200 DIGITAL Cable Routing . . . . .	178
SX-200 EL/ML Configuration Rules . . . . .	179
Initial Power-up Procedure (SX-200 EL/ML) . . . . .	185
System Initialization Sequence . . . . .	187
SX-200 EL/ML Initialization . . . . .	187
SX-200 LIGHT/DIGITAL Initialization . . . . .	188
Adding a Peripheral Cabinet . . . . .	191
Peripheral Interface Cards and Modules . . . . .	192
Control and Digital Services Cards and Modules . . . . .	195
E&M Trunk Card Settings . . . . .	197
Adding an SX-200 IP Node . . . . .	199

Control Triple CIM Card Switch Settings .....	201
Peripheral Interface Cabling .....	202
USOC Pin Designations .....	202
SX-200 EL/ML Peripheral Interface Card Slot Assignments . . .	202
Adding a PKM .....	230
PKM to an Attendant Console .....	232

## Chapter 6 Maintenance Commands

Basic Commands .....	237
Entering Command Sequences .....	237
Logging In .....	237
Logging Out .....	238
Displaying the Card Configuration .....	238
Showing the System Identity .....	238
Log Commands .....	239
System Commands .....	240
Report Commands .....	243
Diagnostic Commands .....	245
Traffic Measurement Commands .....	248
<b>Index</b> .....	<b>249</b>

## E-Docs Tips

### Figures

Figure 1: SX-200 ELx Cabinet .....	6
Figure 2: SX-200 ML (RM) and (FD) PBX .....	12
Figure 3: SX-200 LIGHT PBX .....	13
Figure 4: SX-200 IP Node Configuration .....	15
Figure 5: SX-200 SPINE Peripheral Bay .....	16
Figure 6: SX-200 DIGITAL (672-Port) PBX .....	17
Figure 7: SX-200 DIGITAL (336-Port) PBX .....	18
Figure 8: SX-200 DIGITAL (456-Port) PBX .....	19
Figure 9: SX-200 DIGITAL (480-Port) PBX .....	20
Figure 10: Removing the bottom panel .....	38
Figure 11: Removing the flash memory card .....	39
Figure 12: Inserting the flash memory card .....	40
Figure 13: Loop Start Line/Trunk .....	71
Figure 14: Ground Start Trunk .....	73
Figure 15: Direct Inward Dial (DID)/Loop Trunk .....	75
Figure 16: E&M Trunk - Type I (2-wire) .....	78

## Technician's Handbook

Figure 17:	E&M Trunk - Type V (4-wire) .....	79
Figure 18:	T1 Trunk Synchronization .....	81
Figure 19:	SX-200 EL Control Cabinet Card Assignments .....	167
Figure 20:	SX-200 EL Peripheral Cabinet Card Assignments .....	168
Figure 21:	SX-200 ML (RM) Cabinets with BCC III Cards .....	169
Figure 22:	SX-200 ML (RM) Cabinets with BCC II Cards .....	170
Figure 23:	SX-200 ML (RM) Cabinet with a PRI Card .....	170
Figure 24:	SX-200 ML (FD) Cabinet Card Assignment .....	171
Figure 25:	SX-200 LIGHT Cabinet Card Assignment .....	172
Figure 26:	SX-200 SPINE Peripheral Bay Module Assignment ...	173
Figure 27:	SX-200 Digital 672-Port Cabinet Card Assignment ...	174
Figure 28:	SX-200 Digital 336-Port Control Cabinet Card Assignment .....	175
Figure 29:	SX-200 Digital 456-Port Cabinet Card Assignment ...	176
Figure 30:	SX-200 Digital 480-Port Cabinet Card Assignment ...	177
Figure 31:	S1 Switch Settings for the PRI Card .....	184
Figure 32:	S1 Switch Showing 1 Closed .....	198
Figure 33:	Connecting a Triple CIM Card to the SX-200 IP Node	199
Figure 34:	Connecting an SX-200 IP Node to an Ethernet Switch	200
Figure 35:	PKM Connections to a SUPERSET™ 4025 .....	231
Figure 36:	PKM Connections to a SUPERSET 4150 .....	231
Figure 37:	PKM Connections to an Attendant Console .....	233

## Tables

Table 1:	Firmware Commands .....	34
Table 2:	Summary of Fields in Trunk SMDR Records .....	41
Table 3:	Main Control Card Error Code Summary .....	54
Table 4:	SX-200 SPINE Maximum Receiver Combinations Available .....	66
Table 5:	Maximum Number of T1 Trunk Cards Prior to LIGHTWARE 18 .....	69
Table 6:	Loop Start Line/Trunk Summary .....	71
Table 7:	Ground Start Trunk Summary .....	73
Table 8:	Direct Inward Dial/Loop Trunk Summary .....	76
Table 9:	E&M Trunk Summary .....	79
Table 10:	A-B Signalling States (Tie/E&M) .....	84
Table 11:	A-B Bit Signalling Example (T1/CO) .....	85
Table 12:	PMS Keyboard Commands .....	88
Table 13:	Floppy Disk Troubleshooting Summary .....	91



## Table of Contents

Table 14:	Floppy Disk Drive Error Code Summary .....	92
Table 15:	SX-200 IP Node Troubleshooting Table .....	94
Table 16:	Test Line Command Codes .....	101
Table 17:	Test Line Status Indicator Codes .....	102
Table 18:	Test Line Status Tones .....	103
Table 19:	ANI/DNIS Digits on Phone Display (COS Option 502 Enabled and COS Option 613 Disabled) .	128
Table 20:	ANI/DNIS Digits on Phone Display (COS Option 502 Enabled and COS Option 613 Enabled) ..	128
Table 21:	ANI/DNIS for ACD Agents .....	129
Table 22:	Feature Access Codes .....	142
Table 23:	Class of Service Options .....	145
Table 24:	LIGHTWARE 19 Release 2.0 System Options and Timers .....	153
Table 25:	Feature Limitations .....	160
Table 26:	SX-200 SPINE Configuration Rules .....	173
Table 27:	Cable Assignments for SX-200 DIGITAL Cabinets ....	178
Table 28:	Main Control Card Codes .....	187
Table 29:	Main Control Card Test Status Codes .....	188
Table 30:	Main Control Card Power-Up Error Code Summary ...	189
Table 31:	Peripheral Interface Cards and Modules .....	192
Table 32:	Digital Control and Digital Services Cards and Modules .....	195
Table 33:	E&M Trunk Module Switch Settings .....	197
Table 34:	Control Resource Card Switch Setting .....	198
Table 35:	BRI Port to Tip/Ring Assignment .....	203
Table 36:	SFT Port (J7) .....	204
Table 37:	Music-on-Hold/Pager Unit Pinouts .....	204
Table 38:	Copper Interface Ports .....	205
Table 39:	Maintenance Terminal and Printer Ports .....	205
Table 40:	Maintenance Module Port .....	206
Table 41:	T1 or PRI Trunk Port (J5 and J6, BCC III and PRI Faceplates) .....	206
Table 42:	T/R Cable Assembly Pinouts for SX-200 SPINE .....	207
Table 43:	SX-200 EL or SX-200 ML (RM) Tip and Ring Assignments .....	208
Table 44:	SX-200 EL or SX-200 ML (RM) Universal Card Tip and Ring Assignments .....	210
Table 45:	SX-200 DIGITAL Peripheral Bay Tip and Ring Assignments (High-power Slots) .....	212

## Technician's Handbook

Table 46:	SX-200 Digital Tip and Ring Assignments for Universal Card Modules .....	214
Table 47:	SX-200 DIGITAL Tip and Ring Assignments (Low-power Slots) .....	216
Table 48:	USOC Connector Pin Designations .....	218
Table 49:	Analog Bay P1 and P7 Tip and Ring Assignments .....	220
Table 50:	Analog Bay P2 and P8 Tip and Ring Assignments .....	222
Table 51:	Analog Bay P3 and P9 Tip and Ring Assignments .....	224
Table 52:	Analog Bay P4 and P10 Tip and Ring Assignments ...	226
Table 53:	Interconnect Card P19 Tip and Ring Assignments .....	228
Table 54:	Log Level Functions .....	239
Table 55:	System Level Functions .....	240
Table 56:	Report Level Functions .....	243
Table 57:	Diagnostic Level Functions .....	245
Table 58:	Traffic Measurement Level Functions .....	248

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# Chapter 1

## Introduction



# About This Handbook

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## Purpose of This Handbook

This handbook provides

- Quick reference to maintenance commands
- Abbreviated instructions for frequently used procedures
- Programming aids
- Troubleshooting flowcharts
- Installation information.

## Who This Handbook is For

This handbook is for a certified technician.

## Symbols Used in This Handbook



Indicates a hazardous situation which, if you don't avoid, could result in injury or death



Indicates a situation which, if you don't avoid, could result in damage to the equipment



Identifies an important note or a useful tip



Identifies an important cross reference

## Important Safety Instructions



**WARNING: Failure to follow all instructions may result in improper equipment operation and/or risk of electrical shock.**

See MITEL<sup>®</sup> document PN 56004737, Safety Instructions, for general safety information. The Safety Instructions document is packaged with each system.

## Where You Can Find More Information

See the MITEL SX-200<sup>®</sup> EL/ML Technical Documentation for more information.

# Configurations

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## SX-200 EL System

The SX-200 EL system contains one control cabinet with the following components:

- A Main Control Card IIIEL (MCC IIIEL) or Main Control Card IIIELx (MCC IIIELx) in slot 12
- One Bay Control Card (BCC II or BCC III) in slot 9
- One Bay Power Supply
- Up to two Control Dual FIM Carriers (CFCII), Control Triple FIM Carriers (CFCIII), or Control Triple CIM (CTC) cards in slots 10 and 11
- Up to 1 PRI card in unused slots 10 or 11
- Up to two T1 Trunk cards in unused slots 10 or 11
- Up to eight Peripheral Interface Cards in slots 1 to 8.

The SX-200 EL Control cabinet with an MCC IIIEL card or MCC IIIELx card supports up to six peripheral bays. The MCC IIIELx card can also support up to two SX-200 IP Nodes. The peripheral bays can be SX-200 EL peripheral cabinets, SX-200 LIGHT peripheral cabinets, SPINE Bays, ISDN Network Gateways, or PRI cards.



The SX-200 IP Node requires LIGHTWARE 19, Release 3.0 with Feature Level 4 enabled.

A seven cabinet system will provide a non-blocking system if a MCC IIIELx card in the SX-200 ELx cabinet (PN 9109-600-002-NA) is installed with each of the following combinations:

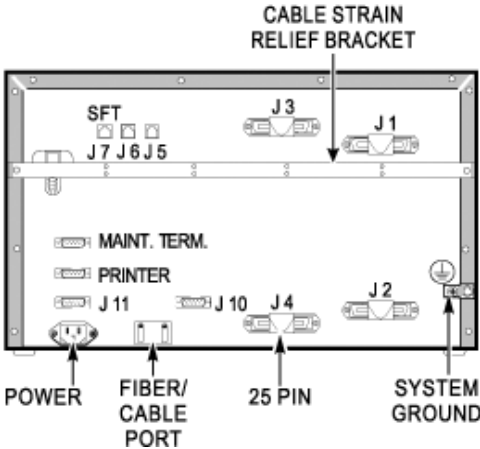
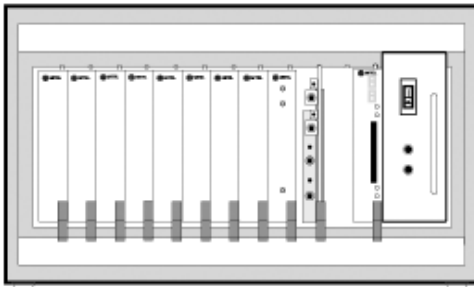
- Two CFCIII cards with LIGHTWARE 17 Release 3.1 or greater
- Two CTC cards set to the triple interface setting with LIGHTWARE 18 Release 2.0 or greater.

## Technician's Handbook

A seven cabinet system with a MCC IIIEL card and two CFCIII cards provides a system for low traffic configurations such as a hotel/motel environment.

The SX-200 EL and the SX-200 ML systems use the SX-200 ELx cabinet for the main control cabinet and the peripheral cabinets. Located on the rear of the cabinet are connectors for T1 trunks (J5 and J6), connectors for PRI maintenance (J10 and J11), a printer port, a maintenance terminal, and the SFT (System Fail Transfer) control port.

### SX-200 ELx CABINET



PORT	FUNCTION
J1	SLOTS 1 & 2
J2	SLOTS 3 & 4
J3	SLOTS 5 & 6
J4	SLOTS 7 & 8
J5	T1 (SLOT 10)
J6	T1 (SLOT 11)
J7	SYSTEM FAIL TRANSFER
J10	PRI MAINTENANCE
J11	PRI MAINTENANCE

CC0862

Figure 1: SX-200 ELx Cabinet



## Connectivity from the Main Control Cabinet

The following cards with an interface module connect the main control cabinet to the peripheral bays. The Control FIM Carrier cards support fiber connectivity. The Control Triple CIM card and the PRI card support copper and fiber connectivity.

- Control Dual FIM Carrier card - allows the fiber connection of up to two peripheral bays
- Control Triple FIM Carrier card - allows the fiber connection of up to three peripheral bays
- Control Triple CIM card - allows the copper connection of up to three peripheral bays; a copper connection may be substituted with a fiber connection
- PRI card - allows the fiber or copper connection of one peripheral bay

You can have either **two** or **three** links to each peripheral bay:

- With a MCC IIIEL / ELx control card, the Control Dual FIM Carrier card provides three links per peripheral bay
- With a MCC IIIEL control card, the Control Triple FIM Carrier card or the Control Triple CIM card (set to dual interface) provides two links per peripheral bay
- With a MCC IIIELx control card (installed in a SX-200 ELx cabinet PN 9109-600-002-NA), the Control Triple FIM Carrier card and the Control Triple CIM card (set to triple interface) provide three links per peripheral bay

If you provide **two** links to each bay:

- Calls must be evenly distributed across all bays
- Maximum channel blocking ratio is 0.58.



As a guideline to achieve a P.0001 grade of service (one failure in 10,000 calls) for a bay connected via a Control Triple FIM Carrier, the recommended maximum calls/hour is 500 based on traffic tables. With a typical call hold time of 2 minutes and 12 seconds the total Erlang rate is 18.33 (660 CCS) for the whole bay. The half bay would therefore be 9.17 Erlangs (330 CCS) at 250 calls/hour. It is important that calls be evenly distributed across all bays.

If you provide **three** links to each bay

- Maximum channel blocking ratio is 0.94.

### Connectivity from the Peripheral Bays

Peripheral bays connect to the main control cabinet with the use of an interface module on the Peripheral FIM Carrier II card, Peripheral Interface Module Carrier card (PIMCC), BCC III, or PRI card. The Peripheral FIM Carrier II card supports a FIM. The PIMCC, BCC III, or PRI card support a FIM II or a CIM. A FIM II or CIM sits on a PIMCC when the peripheral cabinet does not have a BCC III.



Remember to use the same distance variant of FIM or FIM II at both ends of the cable. You can connect a FIM to a FIM II.



Remember that the system sees the PRI card as a separate bay and therefore a PRI card in a peripheral cabinet must always have its own interface module (FIM II or CIM).



Remember that the CIM suits co-located systems; not remote systems. The CIM comes in only one variant. The CIM supports a distance of up to 30 meters or 100 feet between cabinets.

## Cabinet Configuration

- The SX-200 EL system can have a maximum of seven bays.



Remember to program CDE Form 04, Options 71 and 72, to match the configuration.

- The BCC III and the BRI card require LIGHTWARE 18 Release 2.0 or greater. The BCC III, BRI card, PRI card, and Control Triple CIM card require the SX-200 ELx cabinet.
- In a main control cabinet: a FIM II or a CIM never goes on a BCC III, a FIM II or a CIM can go on a PRI card.
- For CLASS line functionality on the ONS/CLASS Line card, you must install a DSP module (single) on the BCC III in the same SX-200 ELx cabinet. The ONS Line functionality on the ONS/CLASS Line card is backwards compatible with the older systems. The CLASS line functionality is dependant on LIGHTWARE 18 Release 2.0 or greater.
- For CLASS on the trunk side, you can install a LS/CLASS Trunk card in the SX-200 ELx cabinet or SX-200 ML (FD) cabinet, slots 1-8. The LS/CLASS Trunk card requires LIGHTWARE 19 Release 2.0. Prior to LIGHTWARE 19 Release 2, the system required a LS/CLASS module with the SPINE, a T1 (ANI/DNIS), or ISDN BRI, PRI, or Network Gateway (CLID and CNID).
- A DSP module (single) on the BCC III provides CLASS generators for 1-8 ONS/CLASS Line cards in the same bay. System wide, this DSP module provides 16 conference bridges for Record a Call and 16 DTMF receivers.
- MOSS System Option 96, Number of Links (0-8) monitors the number of T1 links from T1/E1 modules that the system will support. This count includes T1 links from the T1/E1 modules on the PRI cards and BCC III cards. This count does not include T1 links from the T1 cards.
- LIGHTWARE 18 Release 2.0 or greater supports a maximum of 8 T1 links (includes T1 links from T1/E1 modules and T1 cards) in the SX-200 EL system. Any bay can support up to two T1 links to a total of eight in the system.

## Technician's Handbook

- LIGHTWARE 17 supports one digital bay with two T1 trunk cards and the other digital bays with one T1 trunk card to total a max of 7.
- If a T1 trunk card is installed in slot 10 of a bay, you cannot install a peripheral interface card in slot 5; if a T1 trunk card is installed in slot 11, you cannot install a peripheral interface card in slot 6. T1 cards in slots 10 and 11 are seen by the software as slots 5 and 6.
- The two T1 links from the T1/E1 module on a BCC III card also occupy slots (in software) 5 and 6. The BCC III only supports one T1/E1 module.
- The BRI card is a low power peripheral interface card (slots 1-8) and requires a BCC III in the same SX-200 ELx cabinet. If the BRI card is in a control cabinet, the BCCIII must have a Maintenance module. A cabinet holds a maximum of two BRI cards.
- You can have one PRI card in a main control cabinet; up to two in a peripheral cabinet. PRI cards are installed in slots 10 or 11 in the SX-200 ELx cabinet Rev 4.4 or greater (PN 9109-600-002-NA). The PRI card requires a Statum 3 MCC. The system counts the PRI card as a peripheral bay.
- If a PRI card is installed in slot 10, you can install a peripheral interface card in slot 5; if a PRI card is installed in slot 11, you can install a peripheral interface card in slot 6. Because the system recognizes the PRI card as a peripheral bay, the PRI card does not occupy slots (in software) 5 or 6 in the bay that the card sits in.
- LIGHTWARE 18 and greater allows a maximum of 4 high power cards in any of the slots 1 through 8 (there are no high/low power slots). High power cards are DID, Universal, COV and T1. Low power cards are DNIC, OPS, ONS, BRI, LS/CLASS, and LS/GS. Unlike the T1 card, the PRI card is a separate bay and is not included in the count for the 4 high power cards.



If the cabinet has a BCC II, do not install more than seven DNICs per bay in high traffic applications. If you have more than seven DNICs per bay keep the device count to 84 or less. With two T1 cards in a bay, do not add more than five DNICs or 60 devices. With one T1 card in a bay, do not add more than six DNICs or 72 devices. If the cabinet has a BCC III, you can install eight DNICs per bay.

## SX-200 ML (RM) System

The **SX-200 ML (RM)** system contains one control cabinet with the following components:

- A Main Control Card IIIML (MCC IIIML) in slot 12
- One Bay Control Card (BCC II or BCC III) in slot 9
- One Bay Power Supply
- One Control Dual FIM Carrier card, one Control Triple CIM card, or one PRI card in slot 10
- Up to two T1 Trunk cards in unused slots 10 or 11
- Up to eight Peripheral Interface Cards in slots 1 to 8.



If the cabinet has a BCC II, do not install more than seven DNICs per bay in high traffic applications. If you have more than seven DNICs per bay keep the device count to 84 or less. With two T1 cards in a bay, do not add more than five DNICs or 60 devices. With one T1 card in a bay, do not add more than six DNICs or 72 devices. With a BCC III, you can install eight DNICs per bay.

The SX-200 ML system supports one peripheral bay. The one peripheral bay can be a SX-200 peripheral cabinet, SX-200 LIGHT peripheral cabinet, SPINE bay, or ISDN bay. The ISDN bay may be an ISDN Network Gateway or a PRI card. The PRI card fits into a main control cabinet.

## SX-200 ML (FD) PBX

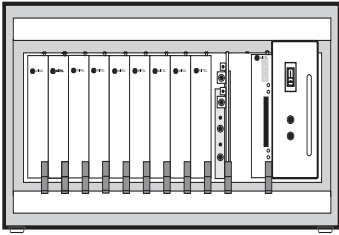
The **SX-200 ML (FD) PBX** cabinet resembles the SX-200 LIGHT cabinet. The SX-200 ML (FD) cabinet supports only one peripheral bay, SPINE Bay, or ISDN Network Gateway.

The SX-200 ML (FD) PBX contains one control cabinet with the following components:

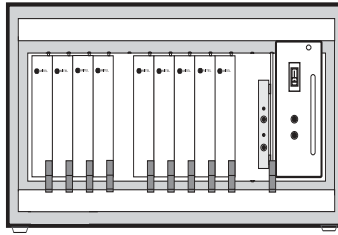
- a Main Control Card II (MCC II)
- one Bay Control Card and one Bay Power Supply
- one Control FIM Carrier in slot 4 connecting to Bay 2
- up to eight Peripheral Interface Cards in slots 1 to 8.



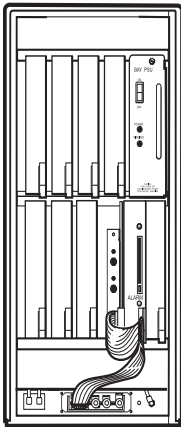
When a SX-200 ML (FD) PBX has a second bay, the Control FIM Carrier is installed in slot 4 of the control cabinet and therefore reduces the number of ports to 84 in the control cabinet.



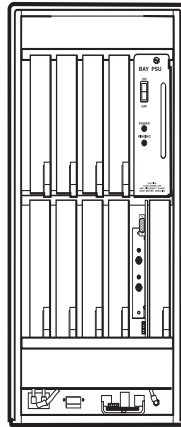
SX-200 EL/ML  
CONTROL CABINET



SX-200 EL/ML  
PERIPHERAL CABINET



SX-200 ML (FD)  
CONTROL CABINET



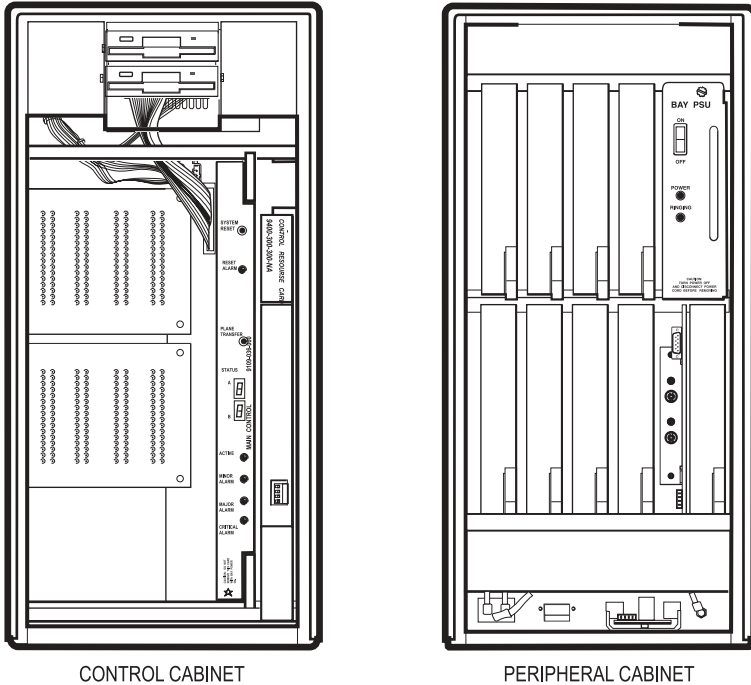
SX-200 LIGHT  
PERIPHERAL CABINET

CC0816

Figure 2: SX-200 ML (RM) and (FD) PBX

## SX-200 LIGHT PBX

The SX-200 LIGHT PBX consists of a Control cabinet with an MCC, a Control Resource card, two disk drives, and up to seven FIM carriers. Each 96-port digital peripheral bay (1 - 7) includes a Bay Control card (with attached FIM Carrier and FIM) and is connected to the Control cabinet by fiber cable.



CC0803

Figure 3: SX-200 LIGHT PBX

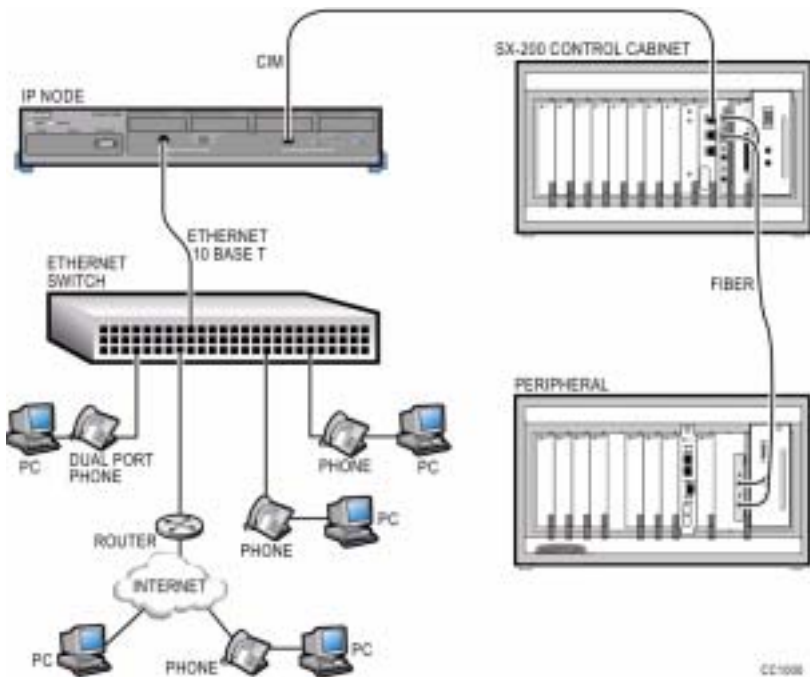
### SX-200 IP Node

You can connect up to two SX-200 IP Nodes to the SX-200 EL. The system requires one Control Triple CIM card (three onboard CIM circuits) in a 200 ELx Control Cabinet with a Main Control Card IIIELx.

The following connections are required to configure the SX-200 IP Node:

- Connections between peripheral bays and the main control cabinet are made with standard CIM connections.
- An Ethernet crossover cable connects the Control Triple CIM Card in the main control cabinet to CIM port on the IP Node. All voice and signalling communications are carried over this connection.
- Another Ethernet crossover cable connects the IP Node to the Ethernet switch on the LAN.
- The IP phones are connected to the LAN through the Ethernet switch.





**Figure 4: SX-200 IP Node Configuration**

The configuration rules that apply to connecting standard peripheral bays to the control cabinet through CIMs also apply to connecting IP Nodes. For more information about configuration, see the Configuration Rules in the SX-200 Technical Documentation for the

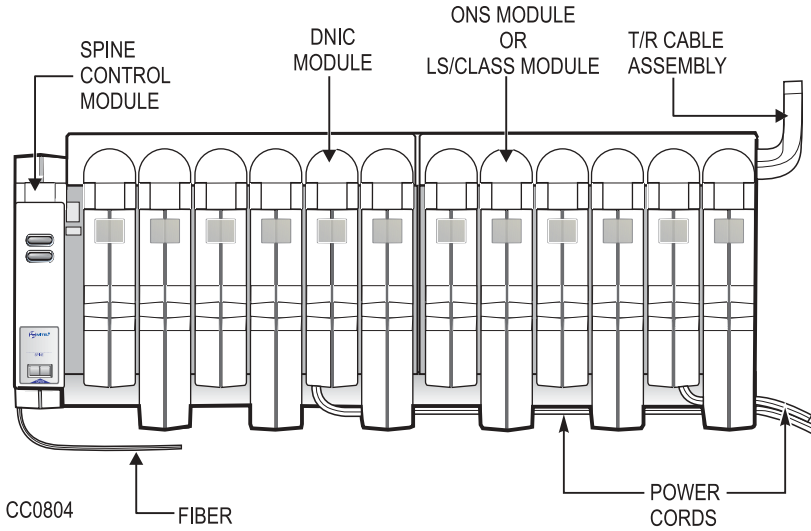
- SX-200 ELx Control Cabinet
- Bays supported by the SX-200 ELx System
- Control Triple CIM Card and the SX-200 ELx System
- SX-200 IP Node Local Area Network Design Guidelines

## SX-200 SPINE Peripheral Bay

The SX-200 SPINE Peripheral Bay can be used with the SX-200 EL, SX-200 ML, and SX-200 LIGHT Control cabinets.



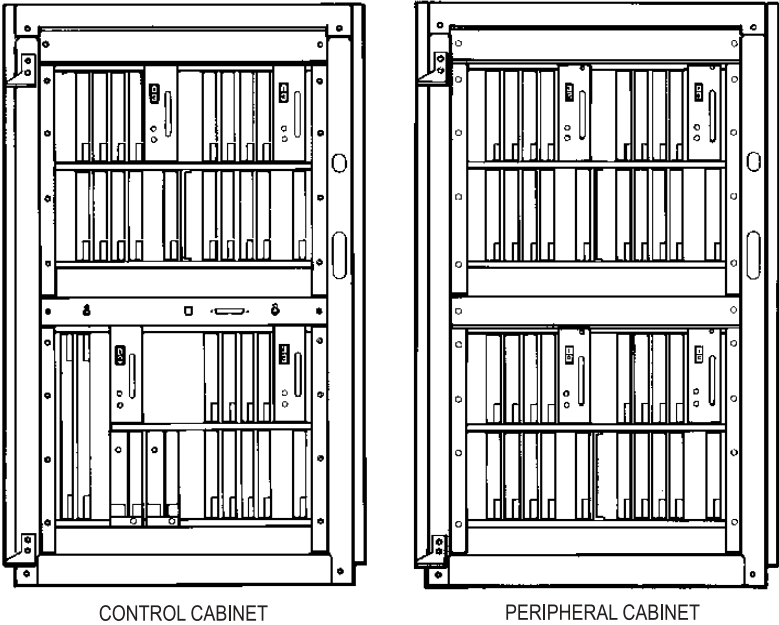
Refer to *SX-200 SPINE Peripheral Bay Module Assignment* (page 173).



**Figure 5: SX-200 SPINE Peripheral Bay**

# SX-200 DIGITAL 672-Port PBX

The SX-200 DIGITAL 672-port PBX consists of a Control cabinet with control bay 0, and digital peripheral bays 1, 2, and 3 (96 ports each). Its peripheral cabinet contains digital bays 4, 5, 6, and 7 (96 ports each). Bay 0 includes an MCC, a Switch Matrix Card, and two floppy disk drives.

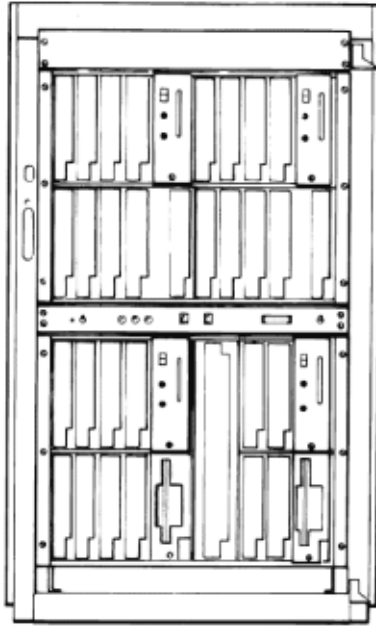


CC0799

Figure 6: SX-200 DIGITAL (672-Port) PBX

## SX-200 DIGITAL 336-Port PBX

The SX-200 DIGITAL 336-port PBX consists of a Control cabinet with COMBO bays 1 and 2 (144 ports), and digital peripheral bays 3 and 4 (96 ports each). The COMBO bay includes an MCC and two floppy disk drives. There is no peripheral cabinet.



CONTROL CABINET

Figure 7: SX-200 DIGITAL (336-Port) PBX

### SX-200 DIGITAL 456-Port PBX

The SX-200 DIGITAL 456-port PBX consists of a Control cabinet with COMBO bays 1 and 2 (144 ports), and digital bay 3 (96 ports). The COMBO bay includes an MCC and two floppy disk drives. The peripheral cabinet contains analog bay 4 (120 ports) and analog bay 5 (96 ports).

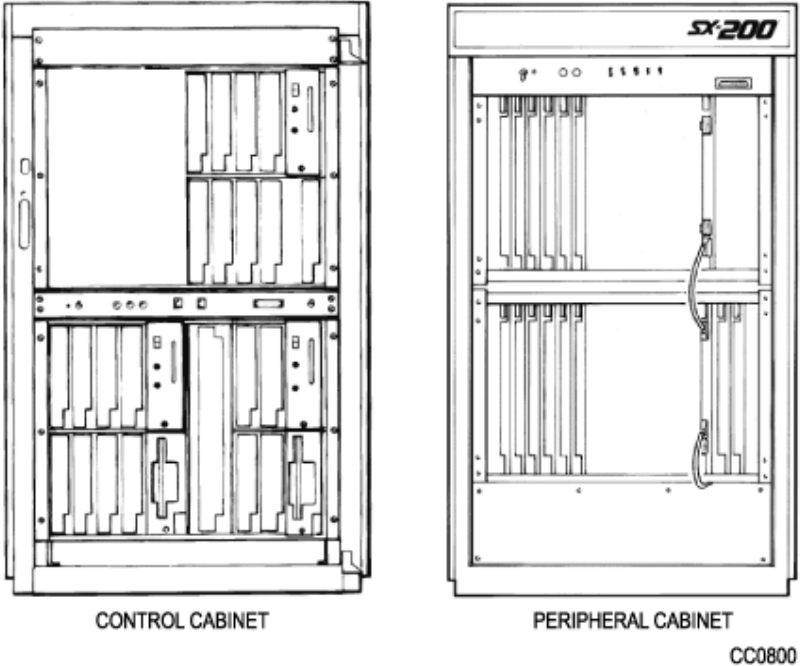
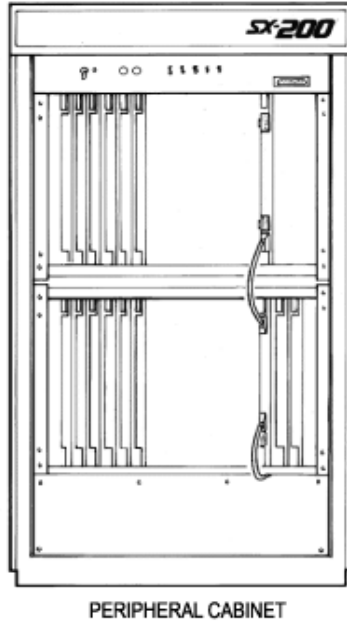
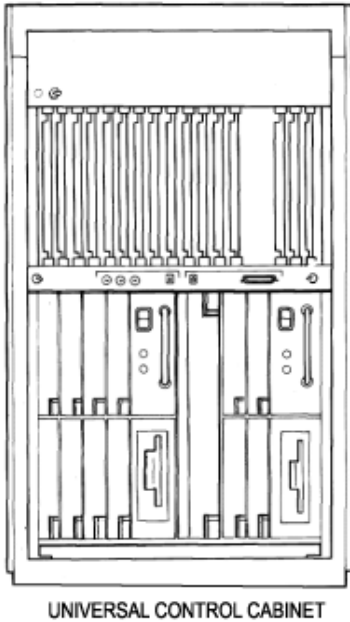


Figure 8: SX-200 DIGITAL (456-Port) PBX

## SX-200 DIGITAL 480-Port PBX

The SX-200 DIGITAL 480-port PBX consists of a Control cabinet with COMBO bays 1 and 2 (144 ports) and an analog bay 3 (120 ports). The COMBO bay includes an MCC and two disk drives. The peripheral cabinet contains analog bay 4 (120 ports) and analog bay 5 (96 ports).



CC0801

Figure 9: SX-200 DIGITAL (480-Port) PBX

## LIGHTWARE 19 Software

The following types of SX-200 systems support the LIGHTWARE 19 software

- SX-200 EL
- SX-200 ML (RM)
- SX-200 ML (FD).



LIGHTWARE 17 and greater software are not available for the SX-200 LIGHT or the SX-200 DIGITAL systems.

LIGHTWARE 18 introduced the MOSS System Option #102, Feature Level to obtain the new features that are offered with major releases. The feature level for LIGHTWARE 19 Release 2.0 is 3.





---

## Chapter 2

# Routine Maintenance



# Is the System Healthy?

---

## System checklist

- No alarms present
- No database errors
- Backed-up database available  
for SX-200 EL/ML onto PC  
for SX-200 LIGHT/DIGITAL onto disks

## Checking a System for Alarms

---

---

1. Log onto the maintenance terminal and select Maintenance mode.



Refer to *Logging In (page 237)* for instructions on how to log into a maintenance terminal.

The Maintenance screen displays the version of system software and the system alarm status.

2. Select the following commands:

**REPORTS**

**SHOW ALARMS** (DEVICE\_TYPE or ALL)

or

**REPORTS**

**SHOW STATUS** (Bay/Slot/Circuit or SWID or Ext\_Num or ALL)

SHOW ALARMS displays alarms by device type (or all)

SHOW STATUS displays status by Bay/Slot/Circuit (PLID) or SWID or Ext\_Num or ALL or Logs Read All

## Checking a System for Database Errors

---

---

1. Access CDE.
2. Select Form 01.
3. Select VERIFY DATA.

# Backing Up a Customer Database

---

Keeping three backups allows you to go further back in time to find an error-free database.

## SX-200 EL/ML

Backing up the database copies the database from memory to a file on the attached maintenance PC. Back up a database after you make changes to it. To back up the customer database, use the Maintenance screen in the Terminal or Hyperterminal Communication's Package and proceed with the following steps:

1. Select the following commands:

```
SYSTEM  
DATABASE  
BACKUP  
ENTER
```

The system prompts you for the file name.



Think of a meaningful filename. It can include abbreviations for the name of a remote site, the purpose or function of the database, or the version of the software.

2. Enter the file name.

```
ENTER  
CONFIRM
```

The system then prompts you to exit to a local Kermit session. Ensure that the Kermit session is set to binary mode because the customer database information must be saved as a binary file.

3. In the Kermit session, issue the RECEIVE command.

While the backup is in progress, the top seven-segment LED on the MCC shows "A", and the lower seven-segment LED shows a dash that is circling in a clockwise direction.

After the file transfer has completed, the maintenance screen returns.

The message "Download/Upload Successful " appears on the screen.

## SX-200 LIGHT/ DIGITAL

To back up the customer database, from the Maintenance screen, do the following:

1. Select the following commands:

SYSTEM  
COPY  
DATABASE

The system verifies the data.

The system prompts the user to insert new disks into drives A and B.

2. Insert the new disks into drives A and B.

After inserting new disks, wait for 5 seconds before entering CONTINUE to allow the system to recognize the new disks.

3. Select CONTINUE.

The system notifies the user upon completion.

4. For the same level of software, select CONTINUE.

5. For a different level of software, select RESET.

## **Loading New Software Onto a System**

---

### SX-200 LIGHT/ DIGITAL

To load new software you must

1. Copy the existing database to new software disks.
2. Reset the system using the main control card switch.

## SX-200 EL/ML Remote Software Download

### Requirements:

- A 4 MB Flash card. Make sure the toggle switch on the edge opposite the connector edge of the Flash card has the Write Protect disabled.
- System option 109 (Remote Software Download) must be enabled. This is a purchasable system option.
- The latest software downloaded onto your PC provided by MITEL On-Line or MITEL Product Support.



The remote software download time can take up to 3 hours. We recommend that you do this operation during a slow time since the traffic on the switch affects the download time. To shorten the remote software download time to approximately 30 minutes, increase the size of the packet length to 900 and change the block check type to 3 bytes CRC.

### To Speed Up the Remote Software Download

To speed up the remote software download, increase the packet length to 900 and the block check type to 3 bytes CRC, using the Kermit protocol on your maintenance terminal.

To change the packet length

1. Select SYSTEM from the Maintenance screen.

2. Select the following softkeys:

DATABASE  
 SET\_PARAM  
 RECEIVE  
 PACKET\_SIZE  
 ENTER

The following message will display:  
 "Enter Packet Length (10-1024)"

3. Enter the Packet length (900) and select CONFIRM.

The screen confirms your setting with a display of the Kermit Receive Parameters and the Kermit Send Parameters.

## Technician's Handbook

To change the block check type

1. Select SYSTEM from the Maintenance screen:
2. Select the following softkeys:  
DATABASE  
SET\_PARAM  
BLOCK\_CHECK  
ENTER
3. Enter the Block Check (03) and select CONFIRM.  
The screen confirms your setting with a display of the Kermit Receive Parameters and the Kermit Send Parameters.

### Downloading the Remote Software

Downloading LIGHTWARE 19 software for the BCC III and the MCC with a 4 Meg Flash card requires a two step procedure. You download the software for the MCC first and then download the software for the BCC III. Because the system only accepts software that is compatible, the system will inform you of the status of the software during the download process.



Note that upgrading software for the BCC III with a 4 Meg Flash card always requires you to download the software for the main control card first.

1. Back up the database.



Refer to *Backing Up a Customer Database (page 27)*.

2. Load the new operating software from the PC.  
Select the following commands from SYSTEM maintenance:  
DATABASE  
SW\_RESTORE  
ENTER
3. Select CONFIRM if you agree with the terms stated in the window.



4. When the message "Exit to your local KERMIT session now" appears, return to your KERMIT session.
5. Follow the prompts issued by your local communication application software. When prompted, enter the name of the MCC software file (remote.fix) to be transferred to the SX-200 and transfer the file. A system with a BCC III requires the MCC load before downloading the BCC III load.

If the system has a BCC II and the MCC file transfer has completed, the maintenance screen shows the message "Download/Upload Successful".

If the system has a BCC III, the maintenance screen shows the status of the software that is on the Flash card.

"No BCC III load on Flash card" or "Main Load not compatible with BCC III on Flash card" requires you to download a compatible BCC III load."

The System Identity screen from the Maintenance screen (softkeys System/Show/Identity) also shows incompatible loads of software. An asterisk beside a load tag in the Load on Flash Card column, identifies an incompatibility between this bay load and the main load on the flash card. If there is an incompatible load, you must download another load of BCC III software.

6. If necessary, transfer the compatible BCC III load (bccIII.fix). The maintenance screen will again display the status of the software on the Flash card.
7. After all the file transfers are complete and at a time of low or no traffic, return to the Maintenance application. Select SYSTEM, RESTART, then RESET SYSTEM, and then CONFIRM to reset the system to activate the new software. After the system has been reset, the new load is activated and the previous load is removed from the Flash Memory card.
8. Log into Maintenance to verify that the new load was correctly downloaded.
9. Restore the database.



Refer to *Restoring the Database* (page 55).

# SX-200 EL/ML Flash Memory Card Replacement

1. Back up the database.

 Refer to *Backing Up a Customer Database (page 27)*.

2. Power down the Control cabinet.


 Refer to *Powering Down the Nodes (page 57)*.

3. Remove the flash memory card and install the new flash memory card. Make sure the toggle switch on the edge opposite the connector edge of the Flash card has the Write Protect disabled. After installing the card, look at the facing edge. You should see the switch in the down position.

4. Power up the system.

 Refer to *Powering Up the Nodes (page 59)*.

5. Enable new options if new feature options have been purchased.

 Refer to *Enabling Options or Changing Options (page 35)*.

# Upgrading Set Firmware

---

Upgrade the firmware for SUPERSET™ 4025, SUPERSET 4090, SUPERSET 4125, and SUPERSET 4150 telephones, only if the revision on the system is higher than the set revision. The boot code and the firmware revision levels must be checked.

## Boot Codes

The SUPERSET boot code **must** be at revision Boot 3.10 or greater or the SX-200 system cannot successfully upgrade the set's firmware.

The boot code appears when a set is first plugged in.



If you attempt to upgrade a set with a boot code lower than 3.10, the system will erase the set's firmware and you will not be able to download the new firmware. The set then becomes unusable.

## Firmware Revision Levels

The firmware revision level of the set that you are upgrading must meet the firmware revision level stated in **SYSTEM** maintenance. Use the **SET\_FIRMWARE STATUS** maintenance command to identify the revision level.

## Firmware Commands

Access the firmware commands in the **SYSTEM** maintenance level and then choose **SET\_FIRMWARE** to obtain the softkeys to qualify your target set. See Table 1 on page 34.

Table 1: Firmware Commands

Set_Firmware Qualifiers	Result
STATUS	Displays the software revision level the set is running and whether the set is scheduled for a download.
DOWNLOAD	Erases and updates the firmware on all specified sets. The set must be idle and the set's firmware revision must be older than the firmware to be downloaded.
ABORT_DOWNLOAD	Removes specified sets from the scheduled download.
FORCE_DOWNLOAD	Forces the download to occur even if the set firmware is newer than the firmware being downloaded. This command allows a set's firmware to be returned to a previous firmware version when required.

### System Log Messages

If a firmware download fails, the reason for the failure will be reported in the system logs. If a failure occurs, the download will be aborted and the remaining sets on the list will not receive the download.



The conditions and restrictions that apply to the firmware download are described in Upgrading Set Firmware in the Maintain section of the SX-200 EL/ML Technical Documentation.

# Enabling Options or Changing Options

---

## Options Are Password Protected

Call the MITEL Order Desk to purchase a new set of options. You will receive a new MITEL options password that will enable the options on the system. The working hours for the MITEL Order Desk are Monday to Friday 8:00 to 18:00 E.S.T.

## Enabling Options On a SX-200 EL/ML System

1. Select Customer Data Entry mode.
2. Select Form 04, System Options.
3. Set all purchasable options to match those on the MITEL Options Selection Sheet (MOSS). Set all other options as required. Press ENTER only once after each entry.
4. Enter the MITEL options password (from the MOSS sheet received with the software); press ENTER twice to activate the purchased options.
5. Quit the form.

An E.8 error appears on the MCC if the enabled options and purchased options do not match or if the password is incorrect. You can still program a system with an E.8 error but the bays will not bootup.



When no system identification is installed, or when invalid software is loaded into the system, the default system identification number 65535 appears.

## Enabling Options On a SX-200 LIGHT/DIGITAL System

1. Verify that the correct decryption module is installed for the options required.

# Upgrading an SX-200 IP Node

---

## Upgrading from CD-ROM



The upgrade procedure will install new software in the IP Node.

### Installer's PC requirements

- Windows NT 4.0 or Windows 2000 operating system
- FTP server running (with IIS installed)
- A communications program such as VT100 or HyperTerm
- A serial connection to the SX-200 Maintenance port
- Windows 2000 users must clear the browser cache.

### You also need

- The IP address of the SX-200 IP Node. The IP address must also be correctly programmed before you begin. For more information, see "Initializing the SX-200 IP Node" on page 131.
- SX-200 IP Node software CD-ROM
- Time: The entire upgrade procedure takes approximately 20 minutes.

### To upgrade the Sx-200 IP Node software

1. Connect both the PC and the SX-200 IP Node to the LAN.
2. Connect the serial cable from the PC to the Maintenance Port on the SX-200 IP Node.
3. From your PC, ping the SX-200 IP Node to verify that you have a TCP/IP connection.
4. Insert the Mitel Networks SX-200 IP Node software CD-ROM into the CD drive of the installer's PC.
5. Run the "Setup.exe" program from the CD.

6. Select New Installation.
7. Choose a location for the installSetup program to install files (normally this is C:\intpub\ftpboot). The installSetup program provides a progress indicator and a log file.
8. Click Finish when prompted.  
You are presented with a text file providing instructions.
9. Launch a data communication application, such as Hyperterminal on the PC.
10. Specify the PC COM port that is connected to the SX-200 IP Node Maintenance port.
11. Set the communication parameters: 9600, 8, N, 1, None.
12. Enter "reboot" to reboot the SX-200 IP Node.
13. Press a key at the "Press any key to stop auto-boot" prompt to stop the auto-boot.
14. At [VxWorks Boot] type "c" and then press Enter.
15. Change the following parameters as indicated:
  - Boot device : motfcc
  - File name : Lite\_Install
  - Host inet : <the IP address of the ftp server PC host (your PC)>
  - User (u) : <user name for FTP server in PC host>
  - Ftp password (pw) (blank = use rsh) : <password for FTP server in PC host>
  - Flags (f) : 0x0 (this is the default setting and should not have to be changed).
16. Press the reset button on the SX-200 IP Node, or at the PC, enter "@" to reboot the SX-200 IP Node.  
The software installation takes about 10 minutes. The SX-200 IP Node reboots two times.

## Upgrading by Replacing Flash Memory

You can upgrade SX-200 IP Node software by replacing the flash memory card in the SX-200 IP Node.

To replace the flash memory card

1. Disconnect all cables from the SX-200 IP Node.
2. Turn the SX-200 IP Node upside down.
3. Remove the six screws on the removable panel, as indicated in the figure below.



Do not remove the four screws indicated in the figure. If you remove the four screws, components will fall into the interior of the box.

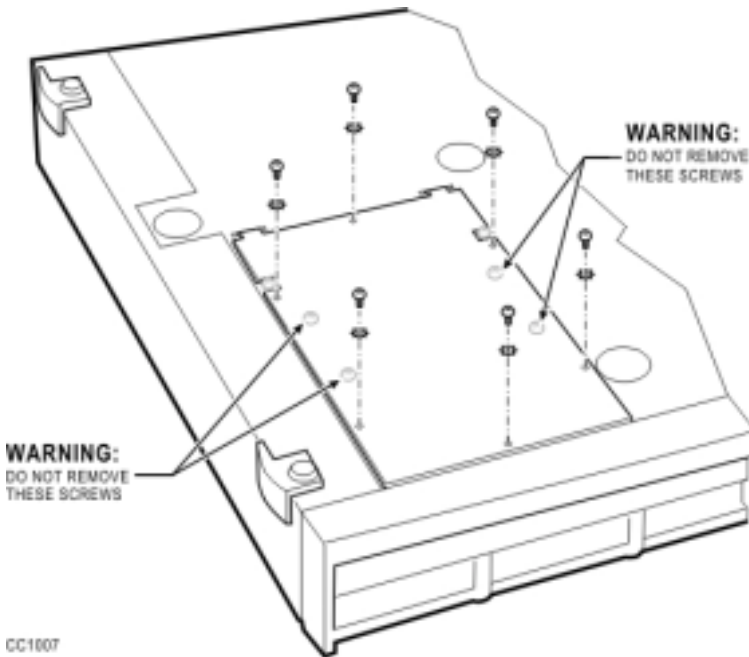
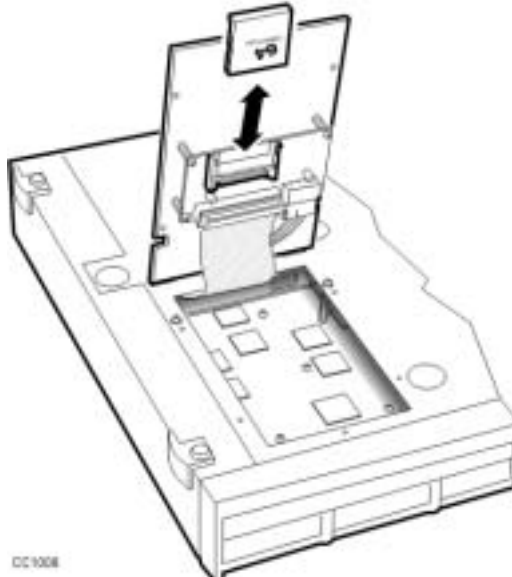


Figure 10: Removing the bottom panel

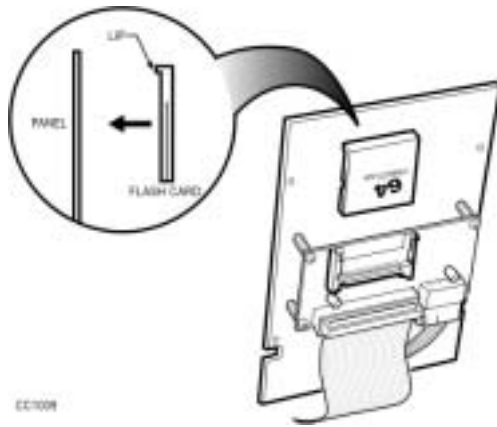


4. Gently flip the panel open. Do not remove the panel. If you remove the panel, you might disconnect wires.
5. Pull out the flash memory card.



**Figure 11: Removing the flash memory card**

6. Insert the new flash memory card. Orient the card as shown in the following figure. The lip that extends from the bottom of the card must face the panel.



**Figure 12: Inserting the flash memory card**

7. Gently lower the panel.
8. Replace the six screws.
9. Reconnect the cables to the SX-200 IP Node.

# Trunk SMDR Records Field Summary

Table 2: Summary of Fields in Trunk SMDR Records

NAME	COLUMN	FORMAT	DEFINITION	NOTE
Optional Long Call	1	z	- = 5-9 min % = 10-29 min + = 30 or more min	
Date	2-6	mm/dd	mm = Month dd = Day	mm = 01-12 dd = 01-31
Spacer	7			
Start Time	8-13	hh:mmp	hh = Hours mm = Minutes p = PM (12-hour clock)	00-2300-59
Spacer	14			
Duration of call	15-22	hh:mm:ss	hh:mm:ss = duration in hours:minutes:seconds	hh = 00-18 mm = 00-59 ss = 00-59 maximum = 18:12:15
Spacer	23			
Calling Party	24-27	pppp	cccc = Extension Number, Tnnn = Trunk Number (CO), Xnnn = Trunk Number (Non-CO), mmmm = Attendant Console Directory Number	c = 0-9, *, #nnn = 001-200 m = 0-9, *, #
Spacer	28			

Routine Maintenance

Table 2: Summary of Fields in Trunk SMDR Records (Continued)

NAME	COLUMN	FORMAT	DEFINITION	NOTE
Attendant	29	f	* = Attendant -- = Attendant not involved	Attendant answered or initiated the call, then transferred it to an extension.
Leading Digits	30-33	cccc	cccc = Access Code (outgoing and tandem calls only)	c = 0-9, *, #, left-justified
Time to answer (Alternate)	30-32	ttt	ttt = time in seconds *** = Call unanswered	ttt = 000 - 255, leading zeroes output, incoming calls only
Digits dialed on the trunk	34-59	xx .... x	Up to 26 (20 if metering) digits dialed on the trunk	x = 0-9, *, or #; private speed call numbers are not recorded
Optional Meter	55-59	mmmmm	mmmmm = number of meter pulses	mmmmm = 00000 to 65535, leading zeroes output
Call Completion Status	60	h	A = Answer Supervision B = Callee is Busy E = Caller Error T = TAFAS answered R = Incoming call recalled and was answered by transferer N = Incoming call recalled and was not answered by transferer	Outgoing/Incoming Direct/Dial-In Incoming/Dial-In Incoming Incoming/Outgoing

Table 2: Summary of Fields in Trunk SMDR Records (Continued)

NAME	COLUMN	FORMAT	DEFINITION	NOTE
Speed Call or Call Forward Flags	61	C,F, or R	C = Number was Speed called (ARS implied) F = Forwarded through External Call Forward R = default (ARS implied)	Outgoing - All trunk calls are ARS by default.
Called Party	62-65	qqqq	cccc = Extension Number Tnnn = Trunk Number (CO) Xnnn = Trunk Number (Non-CO) mmmm = Attendant Console Directory Number	c = 0-9, *, # nnn = 001-200 m = 0-9, *, #
Transfer/ Conference Call	66	K	T = Supervised Transfer X = Unsupervised Transfer C = 3-Way or Conference	
Spacer	67			
Third Party	68-71	rrrr	cccc = Extension Number Tnnn = CO Trunk Number Xnnn = Non-CO Trunk Number mmm = Attendant	c = 0-9, *, # n = 001 - 200 m = 0 - 9, *, #
Spacer	72			
Optional Account Code	73-84	aa .... a	Length of 1 to 12 digits	a = 0-9, space-filled

Routine Maintenance

Table 2: Summary of Fields in Trunk SMDR Records (Continued)

NAME	COLUMN	FORMAT	DEFINITION	NOTE
Optional Spacer	85			
Optional System Identifier	86-88	iii	Programmed at System level	i = 0-9 iii = 000-999 000 = no code entered
Optional Spacer	89			
Optional ANI CLASS Digits	90-99	nn .... n	Up to 10 digits from an incoming ANI/DNIS or CLASS trunk	n = 0-9, *, #
Optional Spacer	100-102			
Optional DNIS Digits	103-112	dd .... d	Up to 10 digits from an incoming ANI/DNIS trunk	d = 0-9, *, #
Optional Spacer	113			
Optional CLASS Name	114-128	15 char's	Up to 15 characters from an incoming CLASS trunk	

---

## Chapter 3

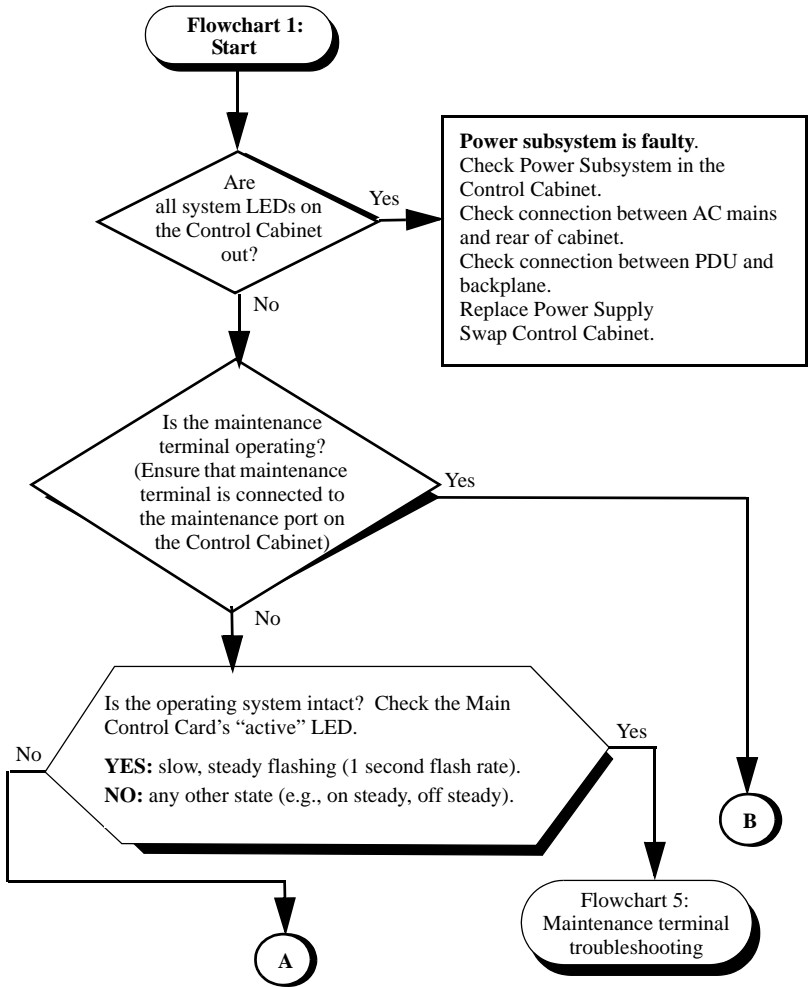
# Troubleshooting and Repair





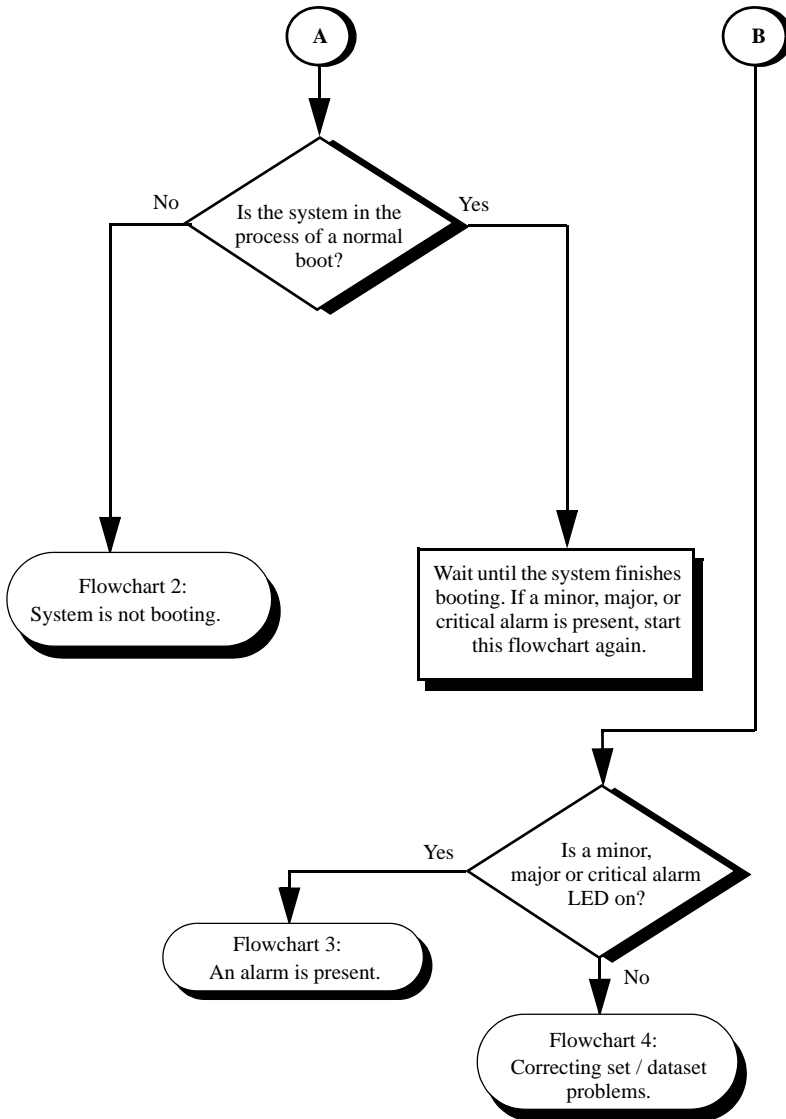
# Identifying Faults

Flowchart 1: Getting Started

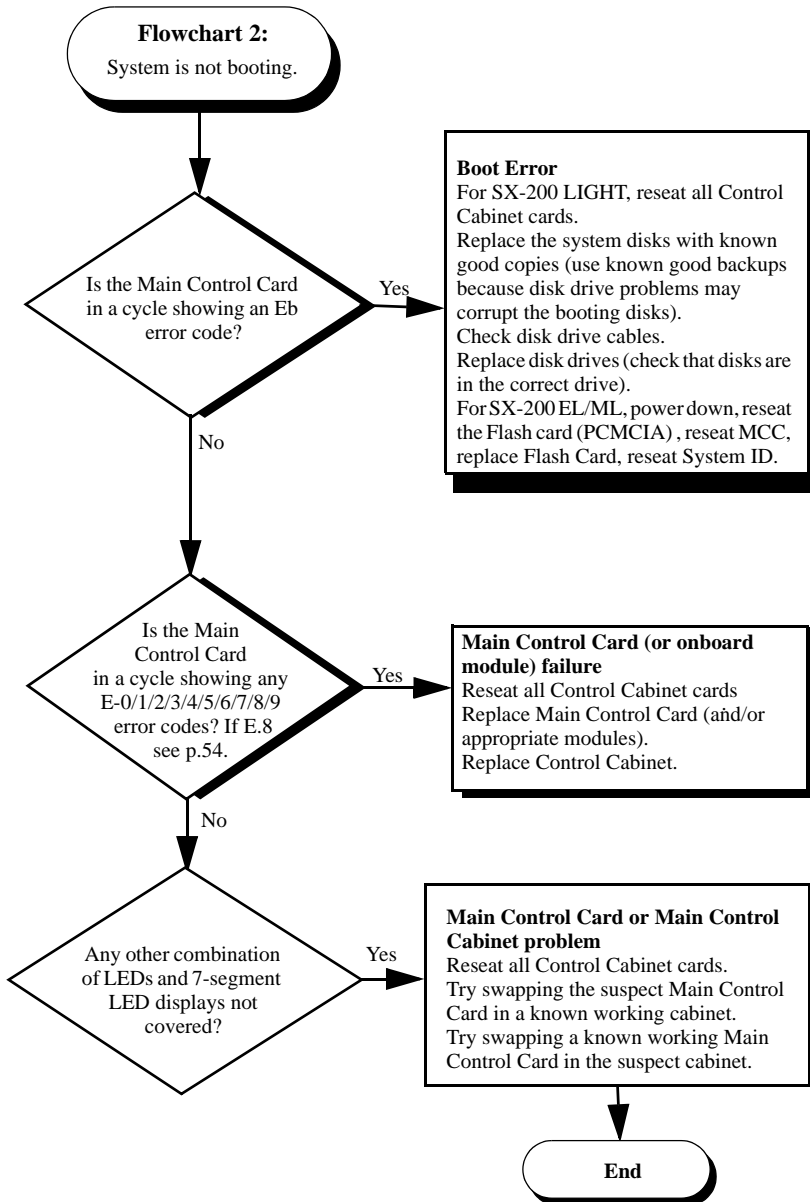


Troubleshooting

Flowchart 1: continued

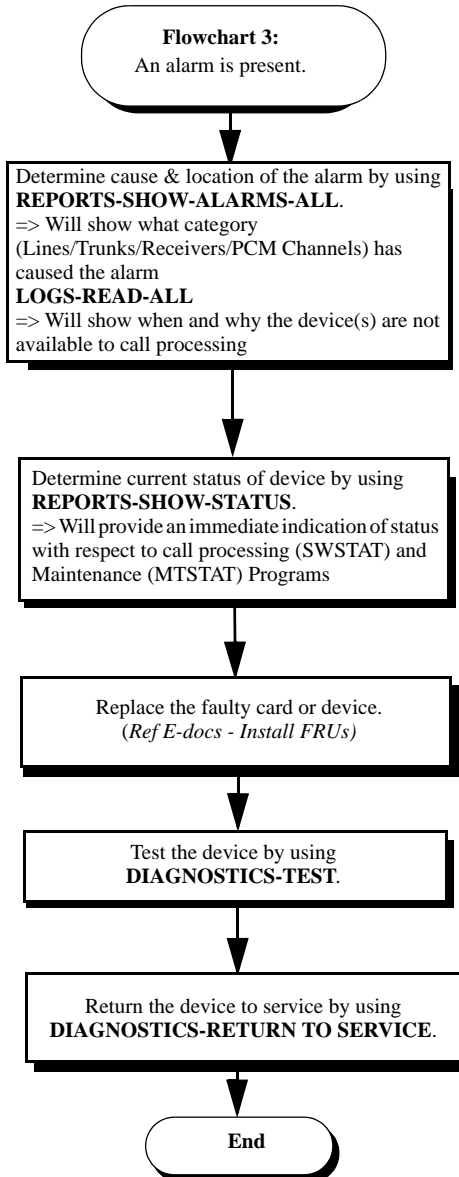


Flowchart 2: System Is Not Booting

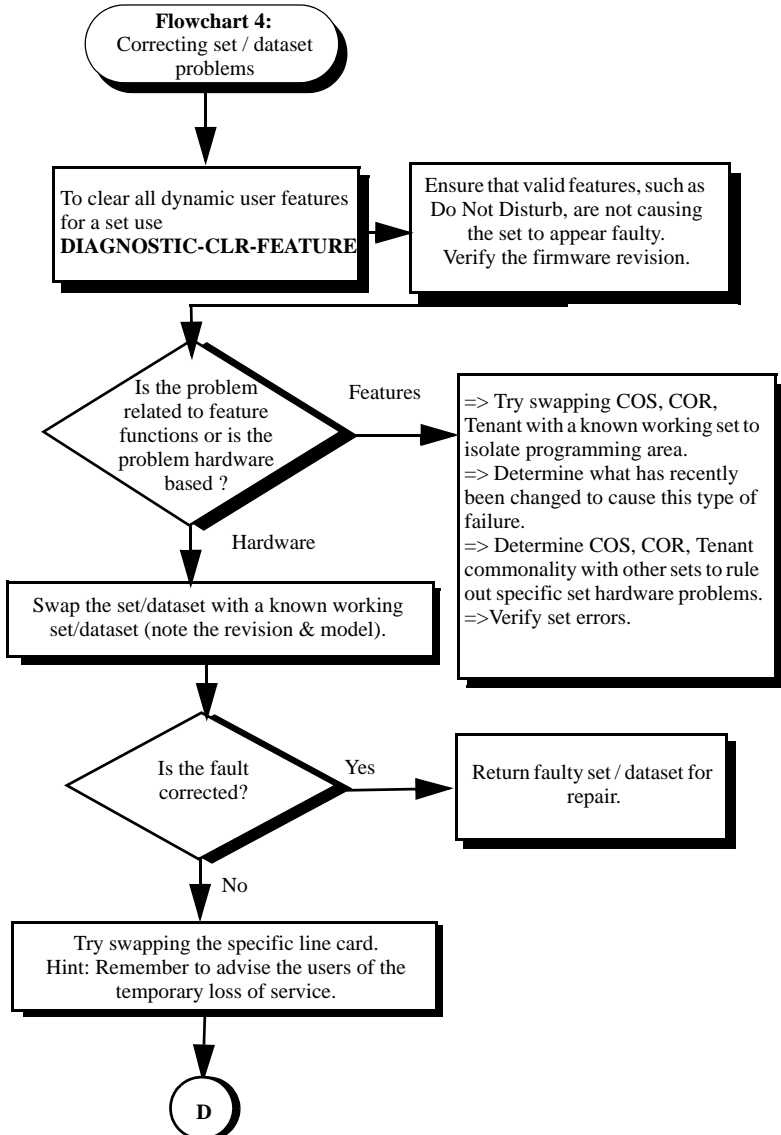


Troubleshooting

### Flowchart 3: An Alarm Is Present

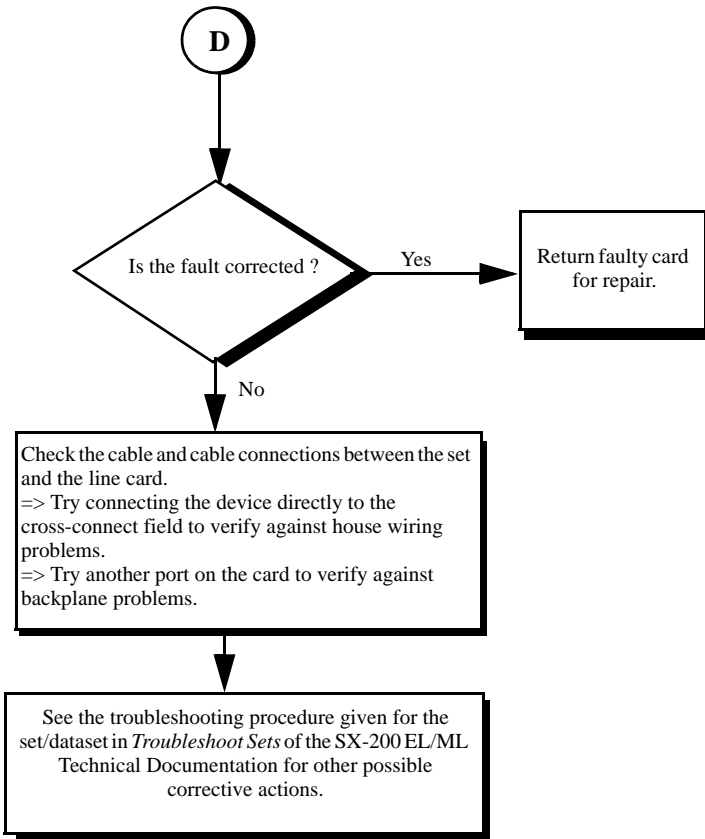


Flowchart 4: Correcting Set / Dataset Problems

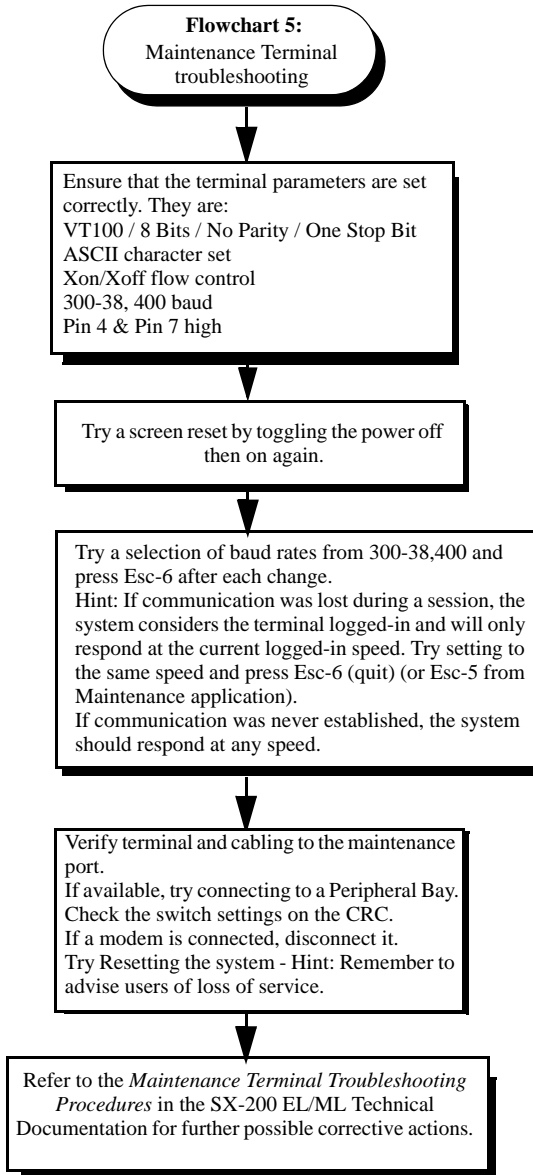


Troubleshooting

Flowchart 4: continued



Flowchart 5: Maintenance Terminal Problems



Troubleshooting

# Interpreting the Main Control Card Power-Up Error Codes

---

The error codes listed in Table 3 may appear on the Main Control Card numeric display during startup.

**Table 3: Main Control Card Error Code Summary**

Error Code	Likely Cause(s)
(blank)	<ul style="list-style-type: none"> <li>• Faulty power system.</li> <li>• Faulty Main Control Card.</li> </ul>
0	<ul style="list-style-type: none"> <li>• Faulty Main Control Card.</li> </ul>
E. 8	<ul style="list-style-type: none"> <li>• MOSS password was not purchased, a purchased option is not enabled, an enabled option is not purchased, the system password does not match, or the system id does not match.</li> <li>• Faulty System ID module.</li> </ul>
C	<ul style="list-style-type: none"> <li>• Faulty Flash memory or Main Control Card - This code shows for approximately 15 seconds during a proper power-up sequence. If the code remains, then a problem exists.</li> </ul>
- -	<ul style="list-style-type: none"> <li>• Nothing - indicates successful software download. This display may be immediately changed to display post-boot-up codes (see note 1).</li> </ul>

- NOTE:**
1. A normal running system may show other codes (card diagnostics or errors). However, during start-up, only the codes in this table are possible. Any other code shown during start-up indicates a faulty Main Control Card.
  2. Codes possible AFTER start-up include card diagnostics codes (last card location tested - top number indicates bay number, bottom number indicates card slot number). Maintenance logs give results of test, pass or fail with cause.



# Restoring the Database

---

## Restoring the SX-200 EL/ML Database

To restore a customer database, your communication package must support the Kermit protocol. We recommend Terminal or Hyper Terminal.

1. Select the following maintenance commands:

```
SYSTEM
DATABASE
RESTORE
ENTER
```

2. Exit to a local Kermit session.
3. Specify the name and location of the software file that you want to transfer to the system and send it to the system.
4. After the file transfer has completed, the message "Download/Upload Successful " appears on the screen.  
After the database file is restored, the system automatically resets the system and the following entry is added to the log file : Main Control was reset due to Database Restore.  
The system will reboot automatically when it detects the presence of a new database.

## Restoring the SX-200 LIGHT/DIGITAL Database

1. Reset the system.
2. Remove the disks.
3. Insert the disks with the backed-up database.
4. Reset the system.
5. After the system restabilizes, copy the database to the previous disks.

## Backing Up Log Entries

---

To back up log entries, your communication package must support the Kermit protocol. This log back-up procedure allows you to copy all maintenance log entries into a text file on either a directory on your PC's hard disk, or on a diskette in the PC's disk drive.

To back up log entries:

1. Select the following commands:

```
SYSTEM
DATABASE
LOGS_BACKUP
ENTER
```

The system prompts you for the file name.



Ensure that the file name is meaningful to you. It can include abbreviations for the name of a remote site, the purpose or function of the database, the version of the software, or the number of the database.

2. Enter the file name.
3. Press ENTER.

The system then prompts you to exit to a local Kermit session.



Ensure that the Kermit session is set to text mode, because the maintenance log entries must copy into a text file.

4. In the Kermit session, issue the Receive command.

While the backup is in progress, the top seven-segment LED on the MCC shows "A", and the lower seven-segment LED shows a dash that is circling in a clockwise direction.

## Correcting System ID Errors

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### If the System Reports a System ID Mismatch

If the system reports a System ID mismatch, the problem may be one of the following:

- The System ID module is faulty
- The wrong System ID module is installed
- The Password is incorrect.

Verify that the options selected on Form 04, System Options, and the password entered match the data provided on the MOSS sheet.

Contact MITEL Product Support for assistance. Have your tech ID number available.

### If the System Reports a Decryption Module Error

If the system reports a decryption module error, your decryption module is faulty or wrong for the software that is in your system.

Contact MITEL Product Support for assistance.

## Powering Down the Nodes

---

### Powering Down the SX-200 EL/ML Control Node

1. End any customer data entry sessions.
2. If you don't have an up-to-date database backup, perform a database backup.



Refer to *Backing Up a Customer Database (page 27)*.

3. Switch-off power at the Bay Power Supply. Disconnect the power cords from the AC power source.

### Powering Down the SX-200 LIGHT Control Node

1. End any customer data entry sessions.
2. If you don't have an up-to-date database backup, perform a database backup.



Refer to *Backing Up a Customer Database* (page 27).

3. Push the System Reset Button.
4. Remove the disks.
5. Turn off the AC power by pushing the 0 (off) button at the rear of the cabinet. Disconnect the power cords from the AC power source.

### Powering Down the Peripheral Nodes

1. Set the Bay Power Supply switch to O (OFF).
2. Unplug the AC power cord from the rear of the node.

### Powering Down the IP Node

Unplug the AC power cord from the rear of the node.

## Powering Up the Nodes

---

### Powering Up the SX-200 EL/ML Control Node

1. Connect the external AC power cord(s) at the rear of the node.
2. Switch on the Bay Power Supply switch to ON. Set the power switch(es) on the rear of the node to I (ON) or set the Bay Power Supply switch to I (ON).

### Powering Up the SX-200 LIGHT Control Node

1. Connect the external AC power cord(s) at the rear of the cabinet.
2. Set the power switch(es) on the rear of the node to I (ON).
3. Insert the disks into the MCC.

### Powering Up the Peripheral Nodes

1. Connect the external AC power cord at the rear of the node.
2. Set the Bay Power Supply switch to I (ON).

### Powering Up the IP Node

1. Ensure the SX-200 IP Node is NOT connected to a power source.
2. Using a serial cable, connect a PC to the Maintenance Port on the IP Node.
3. Launch a data communication application, such as Hyperterminal on the PC.
4. Set the parameters: 9600, 8, N, 1, None.
5. Plug the IP Node into a power source.

# Replacing Circuit Cards

---



**WARNING:** Hazardous voltages can exist on installed peripheral cards even when power is removed from the system. Grasp cards by the lock latches only. Do not touch the sides of cards.



Power must be off when inserting the Main Control card, Bay Control Card, Control FIM Carrier Card, or Bay Power Supply. Cards that must not be inserted while system power is on carry a caution notice.

Wear an anti-static wrist strap whenever you handle circuit cards.

## Replacing Peripheral Interface Cards

You may replace the peripheral interface cards with the power on.

1. From the maintenance terminal select:

```
DIAGNOSTICS  
MORE_KEYS  
BUSY-OUT  
<bay/slot/circuit> (plid of faulty card).
```

2. Wait until all the circuits are busied out.
3. Replace the faulty card with a new card of the same type.



Set switches or jumpers on the new card to match switches or jumpers on the existing card.

4. To return the circuits to service, select:  
 DIAGNOSTICS  
 MORE\_KEYS  
 RET-TO-SVC <plid>.

### Replacing a Main Controller Card

When replacing a main controller card (MCC), you must ensure that the replacement MCC and the installed MCC match — both in card type and stratum clock type. This procedure applies to the MCC II, MCC IIIEL, MCC Yields, MCC IIIML, and the MCC in the SX-200 LIGHT/DIGITAL PBX.

1. Quit the customer data entry mode.
2. If you do not have an up-to-date database backup, create one now.



Refer to *Backing Up a Customer Database* (page 27).

3. Power-down the Control cabinet.



Refer to *Powering Down the Nodes* (page 57).



**CAUTION:** Wear an anti-static wrist strap whenever you handle circuit cards.

4. Remove the old MCC.
5. Remove the system ID module or decryption module from the old MCC and install it onto the new MCC.
6. Transfer any modules from the old MCC to the new MCC.
7. Install the new MCC.
8. Power-up the cabinet.



Refer to *Powering Up the Nodes* (page 59).

9. Verify the system date and time. Correct as required.
10. Restore the database.



Refer to *Restoring the Database* (page 55).

## Correcting Ground Path Problems

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**Safety ground** absorbs the dangerous voltages that come in contact with the PBX cabinet. The safety ground connects to the PBX through the ground termination of the system's three-prong power cord.

**System ground** provides a stable ground reference for the voltages the system uses. The system ground attaches to the PBX through a separate ground wire (6 AWG recommended) that connects directly to a system cabinet ground-stud.

In most buildings, the metallic cold water system provides the ground source. It must provide a metallic connection all the way back to the building entry point (including a metallic strap that connects around the water meter).

### Problems Caused by Incorrect PBX Grounding

If the CO and PBX have different ground reference voltages, each can fail to recognize the signals that the other sends. For example:

- Ground start trunks may not seize when the PBX grounds the ring lead.
- The CO may not release trunks when the PBX removes its termination.

Low-frequency AC ground differentials can disrupt the operation of PBX logic circuits and cause incorrect operation or system failures.

AC ground differentials at radio frequencies can cause audio interference and possibly disrupt PBX logic circuits.



## Ground Path AC Voltage Test

This test measures the presence of AC voltage in the metallic loop.

1. With your meter connected in the same way as you did for the resistance test, measure the AC voltage.
2. Start with your meter set for high AC voltages and adjust it down until you get a reading.
3. You should get a reading of 1 Vac or less.

If your reading is greater than 1 Vac, check to see if your electrical panel ground connects to the building ground. Depending on local utility regulations, the connection usually exists between the electrical panel ground and a cold water pipe entering the building. If this connection is present, try an alternate ground point(s) and measure the AC voltage again.

If the system ground and safety ground both connect to the building ground, your measurement is the metallic loop from the PBX chassis, to the electrical panel ground, to the cold water pipe, and back through the system ground wire.

If the safety ground and system ground do not connect at the electrical panel, your measurement indicates the AC voltage differential between protective earth and the building ground.

## Ground Path Resistance Test

1. Turn off the main PBX system circuit breaker.
2. At the PBX system, connect the cabinet's chassis ground to the electrical panel ground. The wire should be a minimum 10 AWG and not longer than 15 meters.
3. At the PBX system, disconnect the ground wire from the system's ground-stud.
4. Set your meter to OHMS at the highest scale.
5. Measure the resistance between the PBX chassis safety ground and the ground wire that provides the system ground. Adjust your meter down until you get a reading.

## Technician's Handbook

6. The resistance between the two grounds should be less than five OHMS. If not, try alternate ground point(s) and repeat the test.

### Testing the CO and PBX Ground Differential

If a PBX experiences trunk lock-ups, or trunk seize failures, perform the CO/PBX Ground Differential Test.

This test determines whether the DC ground potential between the selected building ground point and the CO ground point is within acceptable limits by measuring the two currents: "Loop" current and "Ring" current.

Divide the measured "Ring" current by the measured "Loop" current to determine the relation of the building ground potential to the CO ground potential. The result is 2.0 if the CO and PBX ground points are the same potential.

A result between 1.85 and 2.15 indicates an acceptable building ground. A result outside these limits means that you must locate an alternate building ground.

1. Disconnect the building ground wire from the PBX ground-stud.
2. Disconnect a loop-start or ground-start trunk from the PBX.
3. Measure the Loop current.
  - Set the meter to Milliampere = DC and Range = 200 Milliampere.
  - Connect the meter between the Tip and Ring trunk leads.
  - For a ground-start trunk, apply the building ground momentarily to the ring side of the trunk. This application of ground will signal the CO to complete the loop and provide DC loop current.
  - Allow sufficient time for the current to stabilize and record the loop current.
  - DC Loop Current = \_\_\_\_\_

4. Measure the Ring current:
  - Set the meter to Milliamperes = DC and Range = 200 Milliamperes.
  - Connect the meter between the Ring trunk lead and the building's open-ended ground wire. Be sure that you disconnect the building ground wire from the PBX ground-stud.
5. Allow sufficient time for the current to stabilize and record the Ring current.
  - DC Ring current = \_\_\_\_\_
6. Calculate the CO/PBX ground potential by dividing the Ring current value by the Loop current value.

## Checking the Port Connections to the PBX

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Refer to information showing the pin numbers and signals for the T1 and PRI Trunk Port, Table 41 on page 206, the SFT Port, Table 36 on page 204, the Copper Interface Ports, Table 38 on page 205, the Maintenance Terminal and Printer Ports, Table 39 on page 205, or the Maintenance Module Port Table 40 on page 206, in this handbook.

## Checking the Receiver Allocation

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Receivers allow devices which use DTMF signaling to communicate dialing information to the PBX.

### DTMF Receivers (DTMF Module)

DTMF receiver modules may be installed on a Universal Card. Each Universal Card can contain up to four receiver modules; each receiver module contains four receivers, for a total of 16 receivers.

## Technician's Handbook

### BCC III (DSP Module)

Sixteen DTMF receivers are provided by a DSP module on a BCC III.

### DTMF Receivers (DSP on MCC IIIEL, MCC IIIELx, MCC IIIML, or MCC II)

Seven DTMF receivers are standard on each MCC (CDE Form 04, Option 68).

### CLASS / DTMF Receivers (SPINE Control Module II)

Seven DTMF receivers are standard on Control Module II. Receivers not assigned as CLASS receivers are available to the system as DTMF receivers. CLASS receivers are only available to the devices in the same bay.

SPINE Receiver provisioning for CLASS trunks (CDE Form 04, Options 61-67) is provided in the following table.

**Table 4: SX-200 SPINE Maximum Receiver Combinations Available**

<b>CLASS Receivers</b>	<b>DTMF Receivers</b>
0	7
1	6
2	5
3	4
4	3
5	1

## Checking the FIM/CIM Carrier Cards

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1. Verify that the cards with the interface module are installed in the correct card slot for the assigned bay.
2. Verify that the interface modules in the main control cabinet are correctly connected to its peripheral bays. The configuration positions are hard coded in the software.
3. Verify that the same distance variant of FIM is installed at each end of the link.
4. Verify that the dip switch on the Control Triple CIM card is set properly. Open switch 4 to set the card as a triple interface card and close switch 4 to set the card as a double interface card. Opening another switch substitutes a CIM circuit for the add on FIM II.



Setting the Control Triple CIM card as a triple interface card without a MCC IIIELx provides a system for low traffic configurations such as hotel/motel. For heavy traffic conditions a MCC IIIELx should be used.

5. Verify that the PRI card in a peripheral cabinet has its own FIM II or CIM.
6. Verify the System Options 71 and 72 in CDE Form 04.



Place the first FIM carrier card or Control Triple CIM card in Slot 10; the second FIM Carrier card or Control Triple CIM card in slot 11.

7. Verify that the configuration in a seven cabinet system meets your needs.
  - With an MCC IIIEL control card, the Control Triple FIM Carrier card and the Control Triple CIM card provide two links per peripheral bay. Blocking may occur if two T1 trunk cards are installed in a peripheral bay that connect to the Control Triple FIM Carrier or the Control Triple CIM card.
  - With an MCC IIIELx control card (installed in a SX-200 ELx cabinet PN 9109-600-002-NA) the Control Triple FIM Carrier card and the Control Triple CIM card provide three links per peripheral bay. The MCC IIIELx card supports a non-blocking seven cabinet system.

## Checking the T1 Card, T1/E1 Module, and the PRI Card

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- In the SX-200 EL system, LIGHTWARE 17 supports one digital bay with two T1 trunk cards and the other digital bays with one T1 trunk card to total a maximum of seven T1 trunk cards. LIGHTWARE 18 and greater supports a maximum number of eight T1 links in the SX-200 EL system. These links can be from the T1 cards and from the T1/E1 modules. Any bay can have a maximum of two T1 links to a total of eight T1 links in the SX-200 EL system.
- The system (with MOSS option, Number of Links 0-8) allows a maximum of eight T1 type links. Included in the count are T1 trunks from the T1/E1 module on the BCC III and the T1 ISDN links from the T1/E1 module on the PRI card.
- The BCC III supports one T1/E1 module that provides one or two T1 links. The SX-200 ML system supports a maximum of two T1/E1 modules with a system maximum of four T1 links. The SX-200 EL system supports a maximum of seven T1/E1 modules with a system maximum of eight T1 links.
- The T1/E1 module has two LT/NT connectors (jumpers), one for each T1/E1 link. These connectors must be set to the NT position (the default setting) for T1/D4 functionality.
- If you install a T1 trunk card in slot 10 of a bay, you cannot install a peripheral interface card in slot 5; if you install a T1 trunk card in slot 11, you cannot install a peripheral interface card in slot 6.
- If you program the first T1 link from a T1/E1 module on the BCC III, you cannot install a peripheral interface card in slot 5; if you program the second T1 link from a T1/E1 module on the BCC III, you cannot install a peripheral interface card in slot 6.
- If a PRI card is installed in slot 10, you can install a peripheral interface card in slot 5; if a PRI card is installed in slot 11, you can install a peripheral interface card in slot 6. Because you program the PRI card as its own bay, the PRI card does not occupy slots 5 or 6 in the bay that the card sits in. The T1 links from the PRI card occupy the software slots 5 and 6 in its own bay.
- The PRI card requires a SX-200 ELx cabinet and a Stratum 3 MCC.

# Checking the Number of T1 Trunk Cards

With LIGHTWARE 18 Release 2.0 or greater software, any peripheral bay can have up to two T1 cards to a total maximum of eight T1 links (with T1 Cards and T1/E1 modules) in the system.

Prior to LIGHTWARE 18 Release 2.0, the maximum number of T1 cards was seven. The following table defines the maximum number (prior to LIGHTWARE 18) of T1 Trunk cards in peripheral bays that can connect to a Control Triple FIM Carrier or a Control Dual FIM Carrier in the Control cabinet (cabinet 1).

**Table 5: Maximum Number of T1 Trunk Cards  
Prior to LIGHTWARE 18**

Cab #	0 CFCII or 0 CFCIII	1 CFCII (ML)	1 CFCII (EL)	2 CFCII (EL)	1 CFCIII (EL)	2 CFCIII (EL)	1 CFCII (10) 1 CFCIII (11) (EL)
1	2	1	1	0	1	0	0
2		2	2	2	2	2	2
3			1	1	1	1	1
4				1		1	1
5				1		1	1
6					1	1	
7						1	1
max.	2	3	4	5	5	7	6

Troubleshooting

# Trunk Signaling and Supervision

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## General Signaling & Supervision Concepts

All trunks share similar basic handshaking functions. The actual signaling mechanism will vary with the trunk type.

**Seize:** (request to make a call) The calling party initiates the call by requesting service from the called party.

**Seize Acknowledgment:** (ready to receive) The called party indicates that the call can commence.

This acknowledgment occurs when the calling party expects a response (Dial Tone) or when the called party needs time to establish appropriate resources (DTMF receivers).

**Digits:** (who to talk with) The calling party generates the rotary pulse or DTMF.

**Stop Dial:** (slow down, can't handle the pace) The called party generates a signal to indicate that digits are in risk of being lost.

**Receipt of Digits:** (status of call) The called party generates audible tones to indicate the status of the call (for example, Ringback, Busy, and Reorder).

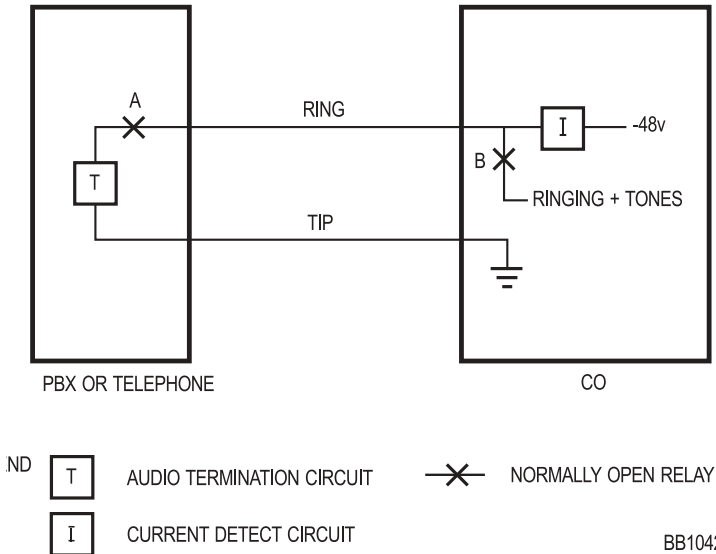
**Answer Supervision:** (called party has answered) The called party indicates that the call has been answered. This signal is for billing purposes (Hotel/Motel), generation of SMDR reports, etc.

**Disconnect Supervision:** (release and go back to idle) Either party generates this signal to indicate the termination of a call and to return the trunk to the idle condition.



## Loop Start Line/Trunk

The Loop Start Line/Trunk serves the standard domestic applications and small businesses that have key systems and PBX applications.



Troubleshooting

**Figure 13: Loop Start Line/Trunk**

**Table 6: Loop Start Line/Trunk Summary**

Signal	Loop Start Line PBX Outgoing	Loop Start Line PBX Incoming
Seize	Tip-Ring leads activated (shorted); Loop Current flows in line	90Vac is applied to Ring lead in 2 sec on, 4 sec off cadence
Seize Acknowledgment	Loop Current and/or dial tone generated	-
Digits	Loop Current toggled (Rotary) or DTMF	-
Stop Dial	-	-

(Sheet 1 of 2)

**Table 6: Loop Start Line/Trunk Summary (Continued)**

Signal	Loop Start Line PBX Outgoing	Loop Start Line PBX Incoming
Receipt of Digits	Audible Tones - Busy, Reorder, Ringback dependent upon digits dialed and called party condition	-
Answer Supervision	Some COs can reverse current flow	Tip-Ring leads activated (shorted); Loop Current flows in line
Disconnect Supervision	Near- end termination: PBX/Telephone can break Loop Current	Near- end termination: PBX/Telephone can break Loop Current
(Sheet 2 of 2)		

**Test/Verify (Loop Start)**

Verify far-end (CO) circuits by using a standard telephone set in place of the Loop Start trunk circuit.

Verify near-end (PBX Loop Start) circuits by connecting to a local PBX ONS circuit.

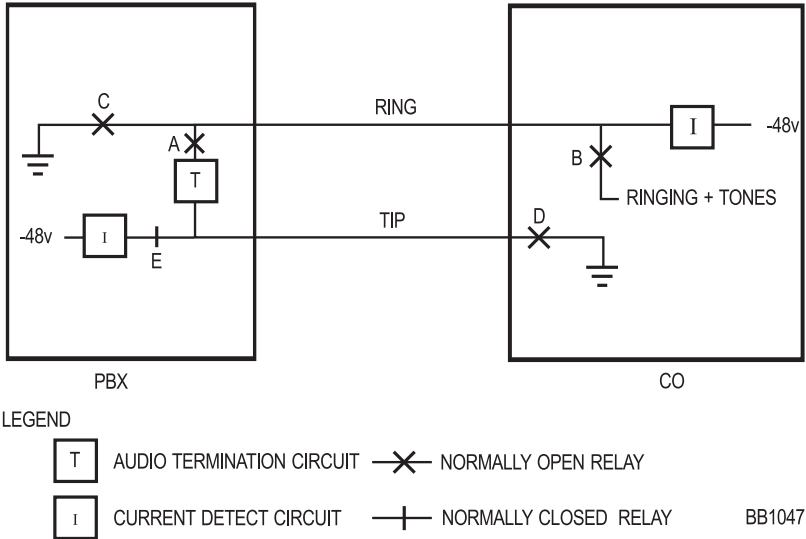
Check for appropriate voltages on Tip-Ring in each call state.

During off-hook condition, 18 mA DC minimum should be drawn from the CO (typical 25-40 mA).

Some Key/PBX systems may be polarity sensitive; reverse Tip-Ring to verify.

## Ground Start Trunk

The Ground Start Trunk serves most PBX-CO connections in an analog environment.



Troubleshooting

Figure 14: Ground Start Trunk

Table 7: Ground Start Trunk Summary

Signal	Ground Start Trunk PBX Outgoing	Ground Start Trunk PBX Incoming
Seize	Ring lead goes active. PBX grounds the ring lead	Tip lead goes active; 90 Vac is applied to Ring lead in 2 sec on, 4 sec off cadence
Seize Acknowledgment	Tip lead goes active; Audible Dial Tone generated; ground returned on tip	Tip-Ring leads activated (shorted); Loop Current flows in line
Digits	Loop Current toggled (Rotary) or DTMF	-

(Sheet 1 of 2)

**Table 7: Ground Start Trunk Summary (Continued)**

Signal	Ground Start Trunk PBX Outgoing	Ground Start Trunk PBX Incoming
Stop Dial	-	-
Receipt of Digits	Audible Tones - Busy, Reorder, Ringback dependent upon digits dialed and called party condition	-
Answer Supervision	CO reverses current flow in Tip-Ring	
Disconnect Supervision	Near-end: PBX opens loop Far-end: CO removes ground from ring	Near or Far-end termination: Loop Current is broken
(Sheet 2 of 2)		

**Test/Verify (Ground Start)**

Verify the far-end (CO) circuits by using a standard telephone for incoming calls. Verify outgoing calls by using a Butt Set with a ground-start lead (momentarily shorting the ring lead to the ground will produce a dial tone from the far end).

Verify the near-end (PBX Ground Start) circuits by connecting to known working far end Ground Start circuits.

Verify that appropriate voltages are present on Tip-Ring in each call state.

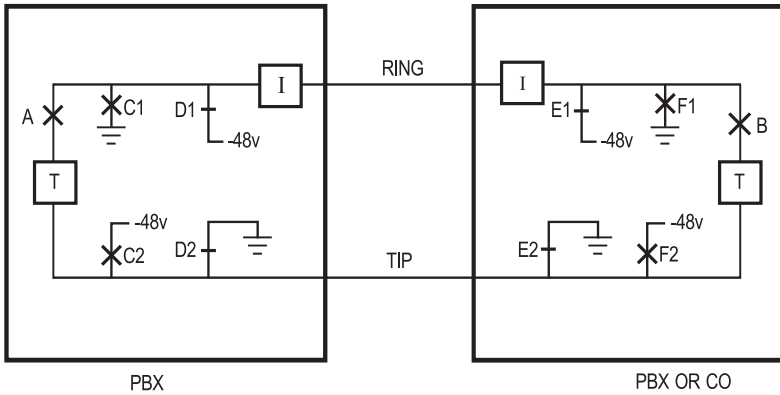
During off-hook condition, 18 mA DC minimum should be drawn from the CO (typical 35-40 mA).

Tip-Ring is polarity sensitive. PBX will be unable to initiate calls if reversed. Reverse polarity to verify.

## Direct Inward Dial (DID)/Loop Trunk

You use the Direct Inward Dial (DID)/Loop trunk primarily in analog DID applications; rarely in PBX-PBX Loop Tie trunk applications.

This trunk uses current reversal to signal supervision information and provides digit flow capability in both directions, when the trunk is in the loop/tie mode.



Troubleshooting

LEGEND

- T AUDIO TERMINATION CIRCUIT    NORMALLY OPEN RELAY
- I CURRENT DETECT CIRCUIT    NORMALLY CLOSED RELAY

BB104

**Figure 15: Direct Inward Dial (DID)/Loop Trunk**

**Table 8: Direct Inward Dial/Loop Trunk Summary**

Signal	DID/Loop Trunk PBX Outgoing	DID/Loop Trunk PBX Incoming
Seize	Tip-Ring leads are activated (shorted); Loop Current flows in line	Tip-Ring leads are activated (shorted); Loop Current flows in line
Seize Acknowledgment	Immediate Dial - Tip-Ring leads stay active Outgoing Wink - Tip-Ring leads toggle Loop Current direction Delay Dial - Tip-Ring leads reverse Loop Current following seizure; reverse again when ready to go	Immediate Dial - Tip-Ring leads stay active. Incoming Wink - Tip-Ring leads toggle Loop Current direction
Digits	Loop Current toggled (Rotary) or DTMF	Loop Current toggled (Rotary) or DTMF
Stop Dial	Tip-Ring leads reverse Loop Current direction; forward again when ready	-
Receipt of Digits	Audible Tones - Busy, Reorder, Ringback dependent upon digits dialed and called party condition	Audible Tones - Busy, Reorder, Ringback generated and sent to calling party dependent upon digits received and state of called party
Answer Supervision	Current flow in Tip-Ring is reversed	Current flow in Tip-Ring is reversed
Disconnect Supervision	Near or Far-end termination: Loop Current broken	Near or Far-end termination: Loop Current is broken

### Test/Verify (DID)

Verify the far-end circuits by the use of a standard telephone for outgoing calls.

Verify the near-end circuits by connecting to known working DID/Loop circuits.

Verify that appropriate voltages are present on Tip-Ring in each call state.

During off-hook condition, 20-25 mA should be drawn from the far-end.

### Ear & Mouth (E&M) Trunk

You use the E&M trunk in Tie Trunk applications. The E&M trunks support all the signaling information.

The Tip-Ring is used in a 2-wire operation shown in Figure 12 - E&M Trunk - Type I (2-wire) on page 78.



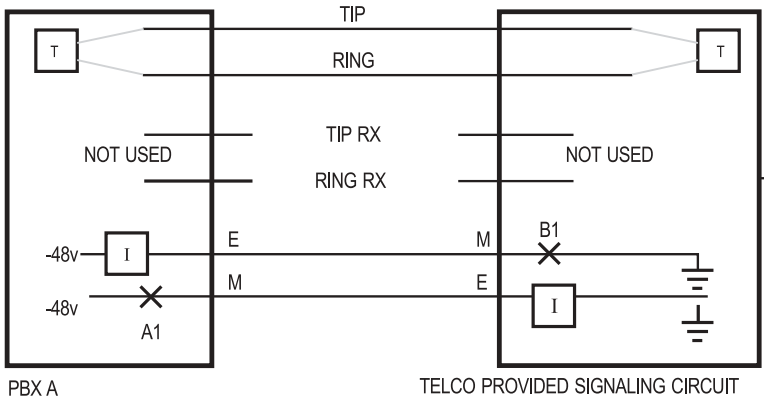
Type 1 may be used in a 2-or 4-wire operation.

The Tip-Ring and Tip Rx-Ring Rx is used in a 4-wire operation shown in Figure 13 - E&M Trunk - Type V (4-wire) on page 79.

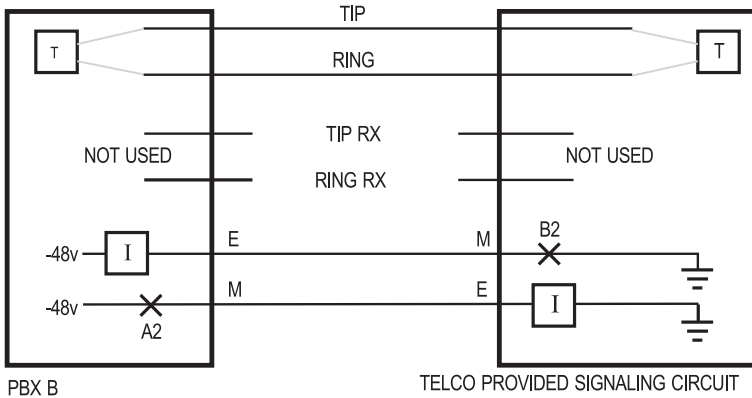
### Type I

Type 1 is used in applications when a telephone company is providing a transmission path between PBXs. The E&M circuits connect to Telco-provided Signaling circuits, which prepare the E&M signals for long distance use.

Each end is identical to the other; all required voltage translation is provided by the cable carrier.



FIBER, CABLE,  
SATELLITE  
WIRELESS ETC...



LEGEND

AUDIO TERMINATION CIRCUIT

CURRENT DETECT CIRCUIT

NORMALLY OPEN RELAY

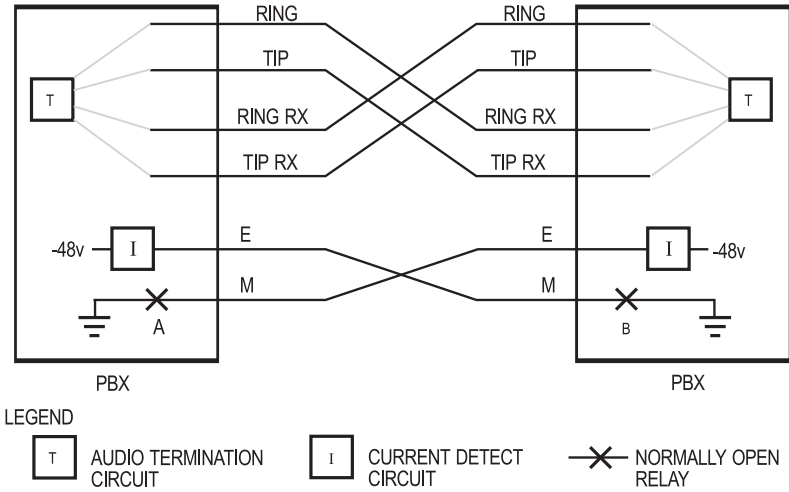
BB1043

Figure 16: E&M Trunk - Type I (2-wire)



**Type V**

Type V is used in applications where short distance direct back-to-back operation is desired. The M-lead invert is required at both ends.



BB1045

**Figure 17: E&M Trunk - Type V (4-wire)**

**Table 9: E&M Trunk Summary**

Signal	E&M Trunk PBX Outgoing	E&M Trunk PBX Incoming
Seize	M lead goes active (voltage is dependent on Type I or Type V operation)	E lead goes active
Seize Acknowledgment	Immediate Dial - E Lead stays idle. Outgoing Wink - E Lead toggles active/idle. Delay Dial - E Lead goes active following M; goes idle when ready to go	Immediate Dial - M Lead stays idle. Incoming Wink - M Lead toggles active/idle

(Sheet 1 of 2)

Troubleshooting

**Table 9: E&M Trunk Summary (Continued)**

Signal	E&M Trunk PBX Outgoing	E&M Trunk PBX Incoming
Digits	M toggles (Rotary) or DTMF through audio path	E toggles (Rotary) or DTMF through audio path
Stop Dial	E lead goes active; goes inactive when ready to go	-
Receipt of Digits	Audible Tones - Busy, Reorder, Ringback dependent upon digits dialed and called party condition	Audible Tones - Busy, Reorder, Ringback generated and sent to calling party dependent upon digits received and called party condition
Answer Supervision	E lead goes active	M lead goes active
Disconnect Supervision	Near-end termination: M lead goes inactive; E follows Far-end termination: E lead goes inactive; M follows	Near-end termination: M lead goes inactive; E follows Far-end termination: E lead goes inactive; M follows

(Sheet 2 of 2)

**Test/Verify (E&M)**

Loop back to self whenever more than 1 E&M type V circuit is available.

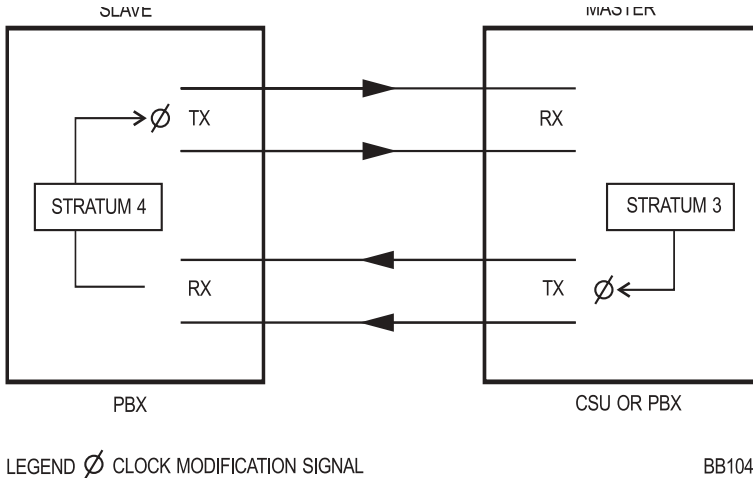
Verify far-end circuits by activating near-end M lead and listening for far-end dial tone.

Verify near-end circuits by activating near-end E lead and listening for near-end dial tone.

Verify that appropriate voltages are present on E&M leads in each call state.

## T1 Trunk (D4 DS-1)

A T1 Trunk is a digital trunking standard that supports multiple users. Unlike analog trunks, the T-1 hardware signaling layer is independent of trunk usage; synchronization & signaling are dealt with separately.



Troubleshooting

**Figure 18: T1 Trunk Synchronization**

### Synchronization

The T1 trunk establishes and maintains a connection between the two systems. Sampling clocks of each partner must be synchronized.

- The Master-Slave arrangement defines the leader and follower; if connecting to a Public Network T1, the PBX will always be a slave.
- The stratum clock levels define the accuracy of the clock and the ability to match with the incoming master clock signal. The higher stratum number synchronizes to the same or lower stratum number. For example, a Stratum 4 (PBX) clock synchronizes to a Stratum 3 (CO/PBX/Channel Service Unit) clock.
- When the PBX is connecting to more than one T-1 signal, choose the order of preference of clocking sources in CDE Form

44, T1 Network Sync (always choose a connection as close as possible to the defined master source clock).

### Signaling Types

#### Channel Associated Signaling

The original idea behind the T1 is to emulate 24 independent analog trunks. The Channel Associated signaling supports Loop Start, Ground Start, DID/Loop, and E&M trunks. The function of each channel is decided and programmed at each end.

All handshake signaling is done with bits (A&B) stolen from the bit stream; used to emulate the various analog signals, (offhook, onhook, current reversal, etc.) and is used as the equivalent to that of the analog trunks.

Because A&B bits are taken from the bit stream, this signaling method is not appropriate for direct transmission of digital information unless it is modulated into an analog signal with a modem.

#### Common Channel Signaling

The Handshake signaling for the first 23 channels is managed by the 24th channel. The Common Channel signaling allows for transmission of digital information and more advanced digital trunk applications (MITEL's MSDN, Bell Canada's Megalink, ISDN, etc.). Signaling protocol is defined by the type of service.

### Test/Verify (T1)

#### Synchronization

- Most T1 issues are a result of connectivity problems.

Verify that the incoming T1 signal is seen at both ends; verify all hardware connections. Failure at either end indicates loss of an incoming synchronizing signal.

Verify that the switch settings on the T1 card are set for proper operation. For example: 1 is closed and 2-8 are open.



Refer to *The S1 Switch Settings for the T1 Trunk Cable Length (not loop length)* (page 198).

### Loopback

Loopback is used to verify and locate the source of either a cable or a synchronization problem through the devices in a T1 transmission path. Devices in the T1 transmission path (PBX, CSU, Channel bank, smart jacks, etc.) will generally have some type of loopback mode. Loopback modes will typically have the effect of taking the input T1 stream and transmitting the stream back to the source; the nodes thereby verify that portion of the link.

In the absence of a loopback mode, the T1 transmits and receives pairs that can be directly connected together to physically create a loopback condition.

### A&B bits

Taken from each of the 24 Channels to emulate the various analog trunk signalling conditions (off-hook, on-hook, disconnect supervision, etc.) in either of the two following methods.

**Superframe:** Over a cycle of twelve frames, bits A&B are taken in frames 6 & 12 to provide basic analog trunk emulation over the T1 facility.

**Extended superframe (ESF):** ESF is not supported by the SX-200 EL/ML or the SX-200 LIGHT. ESF is supported by an ISDN.

**Table 10: A-B Signalling States (Tie/E&M)**

PBX Port Type	CSU Type	PBX port condition to channel	Transmit		Receive		CSU condition to analog facility
			A	B	A	B	
Tie Trunk (loop start)	DPO Tx	loop open	0	0	x	x	x
		loop closure	1	1	x	x	x
	DPO Rx	x	x	x	0	x	normal battery
		x	x	x	1	x	reverse battery
DID or Tie Trunk (loop start)	DPT Tx	normal battery	0	0	x	x	x
		reverse battery	1	1	x	x	x
	DPT Rx	x	x	x	0	x	loop open
		x	x	x	1	x	loop closure
TIE Trunk 4wire/2 wire E&M	E&M Tx	M-lead grounded or open	0	0	x	x	x
		M-lead battery	1	1	x	x	x
	E&M Rx	x	x	x	0	x	E-lead open
		x	x	x	1	x	E-lead grounded or open

**Table 11: A-B Bit Signalling Example (T1/CO)**

State	Transmit		Receive	
	A	B	A	B
Outgoing call - Basic Operation				
Idle state	0	1	1	*
PBX grounds ring (wait for dial tone)	0	0	1	*
CO ground tip (dial tone applied)	0	0	0	*
PBX closes loop and removes ring ground	1	1	0	*
Dial pulsing	DP	1	0	*
Completion of dialing	1	1	0	*
Incoming call - Basic Operation				
Idle state	0	1	1	*
CO ground tip (interval between ringing)	0	1	0	1
CO ground tip (during ringing application)	0	1	0	0
PBX presents call	0	1	0	1
PBX answers call	1	1	0	*
Talking state	1	1	0	*
CO disconnects				
Talking state	1	1	0	*
CO removes tip ground (far end hangs up)	1	1	1	*
PBX opens loop (idle)	0	1	1	*
PBX disconnects				
Talking state	1	1	0	*
PBX opens loop (near end hangs up)	0	1	0	*
CO removes tip ground (idle)	0	1	1	*

Troubleshooting

# PBX Property Management System Interface

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The PBX's Property Management System (PMS) interface collects and sends the following Hotel/Motel information to a customer's PMS computer through a dedicated bidirectional RS-232 port – typically a Dataset programmed to a DNIC port.

- Maid and room status
- Guest check-in and check-out
- Guest name
- Auto wake-up and message waiting
- PMS related maintenance logs.

## Property Management System Messages

A PMS message is a string of ASCII text characters.

For example, to light a message waiting lamp for guest room extension number 2129, the customer's PMS computer will send a string of ASCII keyboard commands to the PMS interface.

The PMS message sent is:

`^BMW 1 2129^C`

When the PBX's PMS interface receives and understands the message, it will send an **ACK**nowledge character back to the customer's PMS computer.



The following is a PMS message format that enables a telephone's message waiting lamp.



<b>Start Transaction STX</b>	<b>Function Code</b>	<b>Status Code</b>	<b>Station's Extension (Room) Number</b>	<b>End Transaction ETX</b>
The CTRL (^) B character signals the start of a PMS message	The MW followed by a space indicates that the PMS requests a message waiting function	1 followed by a space turns on the message waiting lamp. 0 turns the lamp off	Identifies the extension number of the telephone on which the message waiting lamp lights. The PMS inserts leading space(s) to indicate that no number is present	The CTRL (^) C character signals the end of a PMS message

**Troubleshooting**

## Message Formats from PBX to PMS

### Maid in Room status

Maid in Room status is sent as a 10-character message, as follows:

```

-----
function code           STS
status code            n space (n is assigned room status code)
station number         nnnnn (with trailing spaces)
    
```

### Message Registration of Outgoing Trunk Calls

Message Registration of Outgoing Trunk Calls status is sent as a 12-character message, as follows:

```

-----
function code           MRspace
status code            nnnn (nnnn is a 4-byte peg count)
station number         nnnnn (with trailing spaces)
    
```

## PBX and PMS 5-digit Extension Number Formats

The extension number is sent between the PBX and the PMS as a 5-digit number. Numbers that are fewer than 5 digits include spaces:

PBX to PMS      extension number nnnnn with trailing spaces  
 PMS to PBX     extension number nnnnn with leading spaces

Table 12: PMS Keyboard Commands

Commands	PMS Keyboard Keys	Comments
Enquire (ENQ)	^E	^ = CTRL key
Acknowledged (ACK)	^F	
Not Acknowledged (NAK)	^U	
Start Transaction (STX)	^B	
End Transaction (ETX)	^C	
Check In	^BCHK1 XXXXX^C	XXXXX is the 5-digit extension number (use leading spaces).
Check Out	^BCHK0 XXXXX^C	
Add Name	^BNAM1 a-z XXXXX^C	a-z is the extension name, 20 characters in length (use trailing spaces), followed by a single space, followed by the extension number. Only the first 10 characters of the name are displayed.
Replace Name	^BNAM2 a-z XXXXX^C	
Delete Name	^BNAM3 a-z XXXXX^C	
Send Message	^BMW 1 XXXXX^C	Insert a space before and after the digit 1.
Delete Message	^BMW 0 XXXXX^C	Insert a space before and after the digit 0.
Set Wakeup	^BWKPTTTTXX XXX^C	TTTT is the time in hours:minutes. Use a 24-hour clock.

## PBX and PMS Cannot Communicate

If the PBX's PMS interface and the customer's PMS computer cannot communicate, the system will generate PMS related maintenance log messages. Typically, PMS maintenance log messages will identify

- Operating status of the PMS
- Invalid **start** (STX) and **end** (ETX) of text message characters
- Invalid **function** code message characters
- Invalid **status** code message characters
- Invalid **room number** message characters.

## Testing the PMS Interface of the PBX

PMS problems typically occur in these areas:

- **PMS Protocol settings:** Ensure that the communication parameters between the systems match.
- **PMS Programming:** Verify that all the recommended PMS and Dataset programming is complete.
- **PMS Cabling:** Use a straight-through cable between the customer's PMS computer and the Dataset.

Test the PBX's PMS interface as follows:

1. Disconnect the customer's PMS computer from the Dataset.
2. Connect a personal computer or terminal to the Dataset's RS-232 port.
  - Ensure that the communications parameters of the personal computer / terminal match those expected by the PBX's PMS interface.
  - Verify that you receive the **ENQUIRE** character from the PBX's PMS interface. If not, verify that all the programming and the connections are correct.
3. Type the PMS message required to light a telephone's message waiting lamp, using CAPITAL letters only. See the following example.

# Technician's Handbook

^B	M	W	space	1	space	X	X	X	X	X	^C
<b>Start Transaction STX</b> (CTRL B)	<b>Function Code</b>	<b>Status Code</b> 1 = ON 0 = OFF		<b>Station's Extension (Room) Number</b> Enter the telephone's extension number (5 digits with leading spaces).							<b>End Transaction ETX</b> (CTRL C)

4. Verify that the telephone's message waiting lamp is lit.
  - If the lamp is not lit, check the PMS-related logs in Maintenance. The logs will indicate which section of the PMS message is invalid.



For the PMS to light a lamp station the Dial 0 for that tenant must be a console, and the Dial 0 must be the same for Night 1 and Night 2.

5. Type the PMS message required to turn off the telephone's message waiting lamp.
6. Verify that the telephone's message waiting lamp is off.

Turning a telephone's message waiting lamp on and off from a PC confirms that the PBX's PMS interface works correctly.

If problems continue when you reconnect the customer's PMS computer, check the maintenance logs for PMS related information, identifying problems with the customer's PMS hardware/software.



Faster PMS PCs may have to be forced to wait for a reply from the PBX.

# Disk Drive Maintenance

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## SX-200 LIGHT/DIGITAL Floppy Disk Subsystem Troubleshooting Procedures

Table 13 outlines the most likely causes of Floppy Disk Subsystem failure.

**Table 13: Floppy Disk Troubleshooting Summary**

Step	Possible Malfunction Source
1.	Drive units require resets - power down the control bay (Bay 2 or Bay 0), and power up again. Check for error codes on the Main Control Card numeric display - see Table 14.
2.	Faulty backplane connections.
3.	Faulty or improperly installed floppy disk.
4.	Faulty / corrupt / obsolete software - reload with correct software.
5.	Faulty power supply unit(s) - refer to Power System Troubleshooting.
6.	Faulty Disk Drive unit.
7.	Faulty Main Control.
8.	Faulty cable connections.

Troubleshooting

**Table 14: Floppy Disk Drive Error Code Summary**

Error Code	Likely Cause(s)
E. 1	Original system diskette has been replaced, and logs are pending. Either re-insert original diskette, or restart system. See Note 2.
E. 2	Original system diskette has been replaced. Either re-insert original diskette, or restart system. See Note 2.
E. 3	Disk drive is empty, and disk updates are pending. Either re-insert original diskette, or restart system. Disks may be locked (try backups). See Note 2.
E. 4	Disk drive is empty. Either re-insert original diskette, or restart system. See Note 2.
E. 5	There is an obstruction over the diskette "write notch" (a write-protect sticker) - remove it, or on a 3 1/2" disk, slide protector over the hole.
E. 6	Diskettes A and B don't match (are not of the same load) - insert proper diskettes and restart system.
E. 7	Restart system. If this persists, assume faulty Main Control - refer to the Main Control procedures.
E. 8	Decryption Module is missing - install correct module, and restart system. If this persists, assume faulty Main Control - refer to the Main Control procedures.
E. F	Information cannot be accessed on disks. Either re-insert diskette, or restart system.

- NOTE:**
1. Be aware of the difference between the code "E" and the code "E.". "E" indicates MCC error and "E." indicates disk drive errors.
  2. If system is restarted at this point, the pending logs will be lost.

### Disk Drive Strapping

When replacing a floppy disk drive on an SX-200 LIGHT PBX, verify that the switch settings for the drives are set as follows:

- Drive A: AT DC MO D0
- Drive B: AT DC MO D1

When replacing a floppy disk drive on an SX-200 DIGITAL PBX, verify that the switch settings for the drives that are mounted on a floppy disk mounting card are set as follows:

- Drive A: AT DC MO D0
- Drive B: AT DC MO D0

On an ISDN Node, verify that the switch settings for the drive are:

- Drive A: AT DC MO D1

## Troubleshooting the SX-200 IP Node

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To observe error messages from the SX-200 IP Node

1. Using a serial cable, connect a PC to the Maintenance Port on the IP Node.
2. Launch a data communication application, such as Hyperterminal on the PC.
3. Set the parameters: 9600, 8, N, 1, None.
4. Look for error messages in the SX-200 IP Node Troubleshooting Table on page 94.

## SX-200 IP Node Troubleshooting

**Table 15: SX-200 IP Node Troubleshooting Table**

Indication	Possible Causes	Action
<p>WARNING: SX200 Main control not connected or IP Node not supported</p>	<p>Defective Ethernet cables</p>	<p>Replace the Ethernet Crossover cable and CIM cable.</p>
	<p>The Control Triple CIM card is programmed as a Dual CIM card.</p>	<p>Reprogram the Triple CIM Card.</p>
	<p>The CIM cable is connected to the wrong port on the SX-200 IP Node</p>	<p>Check the hardware connections.</p>
	<p>The IP Bay is not programmed in CDE Form 01</p>	<p>Program the IP Bay in CDE Form 01.</p>
	<p>Programming in CDE Form 04 and CDE Form 47 is not correct</p>	<p>Check the programming in CDE Form 04 and CDE Form 47.</p>
<p>(Sheet 1 of 6)</p>		



Table 15: SX-200 IP Node Troubleshooting Table (Continued)

Indication	Possible Causes	Action
<p>WARNING: Startup incomplete after 1800</p>	<p>The DHCP server is not functioning properly.</p>	<p>1. If you're not using a Mitel DHCP server, disconnect all DHCP servers OR Disconnect the IP Node from the subnet. 2. In the serial port window on the PC, type RetrieveDhcpDefaults. 3. Type Reboot and press Enter. Allow the IP Node to reboot. If the IP Node is still not working: 1. Reboot the IP Node. 2. Stop at Autoboot. 3. At the [VxWorks Boot] prompt, type c. 4. Check all settings.</p>
<p>(Sheet 2 of 6)</p>		

Table 15: SX-200 IP Node Troubleshooting Table (Continued)

Indication	Possible Causes	Action
<p>"External Busy" on Sx200 Set calling 3300</p>	<p>IP network unreachable</p>	<p>Use "PING" or "TRACEROUTE" to check the IP network routing. IP nodes or MN3300s must be able to PING each other. Ask your IP network Administrator to solve all IP routing related issues</p>
	<p>Exceed MAX calls</p>	<p>Check Form 48, MAX Calls, If this field is empty. It means allow 0 calls to this remote node.</p>
	<p>Exceed Concurrent calls on selected Route</p>	<p>Check Form 23, Concurrent Calls, If this field is empty. It means allow 0 calls using this route.</p>
	<p>Incorrect IP node Number or IP address</p>	<p>IP trunks use IP addresses to find call route destinations. In both the local and remote IP node, the remote IP node IP address must match the IP node number specified in Form 48 and the Form 23 sub form . On MN3300 the PBX number is the IP node number on SX-200.</p>
	<p>Incorrect programming of Form 22: Modified Digit Table</p>	<p>Check Form 22 and delete or add the digits as required for the specific route number identified in Form 23</p>
<p>(Sheet 3 of 6)</p>		

Table 15: SX-200 IP Node Troubleshooting Table (Continued)

Indication	Possible Causes	Action
"External Busy" on Sx200 Set calling 3300 (con't)	Incorrect COS options	Enable Options 801,802,811 in Form 3
	Remote Profile mismatch	The remote profile number that is programmed on the SX-200 must be programmed as a local profile number on the MN3300.
"External Busy" on Sx200 Set calling another Sx200 Or "Xnet Busy" on 3300 Set calling a Sx200	IP network unreachable	Use "PING" or "TRACEROUTE" to check the IP network routing. IP nodes or MN3300s must be able to PING each other. Ask your IP network Administrator to solve all IP routing related issues
	Exceed MAX calls	Check Form 48, MAX Calls, If this field is empty. If this field is empty, it means you are allowing 0 calls to this remote node.
	Exceed Concurrent calls on selected Route	Check Form 23, Concurrent Calls, If this field is empty, it means you are allowing 0 calls on this route.
(Sheet 4 of 6)		

Troubleshooting

**Table 15: SX-200 IP Node Troubleshooting Table (Continued)**

Indication	Possible Causes	Action
"External Busy" on Sx200 Set calling another Sx200 Or "Xnet Busy" on 3300 Set calling a Sx200 (con't)	Incorrect IP node Number or IP address	IP trunks use IP addresses to find call route destinations. In both the local and remote IP node, the remote IP node IP address must match the IP node number specified in Form 48 and the Form 23 sub form . On MN3300 the PBX number is the IP node number on SX-200
	Incorrect programming of Form 22: Modified Digit Table	Check Form 22 and delete or add the digits as required for the specific route number identified in Form 23
	Incorrect COS options	Enable Options 801,802,811 in Form 3
Busy tone before you finish dialing digits. Only dialed the displayed digits.	Form 26 has the wrong ARS digit strings programmed	Check the ARS digit strings in Form 26
Silence after Dial all digits, then got busy tone. All dialed digits displayed	Incorrect COS options	Enable Options 801,802,811 in Form 3
(Sheet 5 of 6)		

Table 15: SX-200 IP Node Troubleshooting Table (Continued)

Indication	Possible Causes	Action
Silence after Dial all digits, (No Busy, Reorder or Ringback).	Recent IP network failure (within the last 90 seconds)	Use "PING" or "TRACEROUTE" to check the IP network routing. IP nodes or MN3300 s should be able to PING each other. Ask your IP network Administrator to solve all IP routing related issues
(Sheet 6 of 6)		

# Test Line

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The test line is on the ONS line card at Bay 1, Slot 1, Circuit 1 for the SX-200 EL/ML or Bay 2, Slot 1, Circuit 1 for the SX-200 LIGHT/DIGITAL. An access code for Feature 18, Maintenance Function - Test Line, must first be programmed in CDE Form 02 (Feature Access Codes).



Refer to Table 22, "Feature Access Codes," on page 142.



The test line cannot be accessed while CDE or maintenance is active.

## Specifying Equipment From Test Line

Circuits are specified using their physical location numbers (bay, slot, circuit, subcircuit) or by Link and Channel number.

A receiver circuit at location Bay 1, Slot 3, Circuit 3, Subcircuit 4 is specified as "01 03 03 04".

A line circuit at location Bay 1, Slot 1, Circuit 6 is specified as "01 01 06 00". Circuits with no subcircuit number (such as lines and trunks) must be specified with "00" as the subcircuit.

Channels are specified by using the required Link number and Channel number. The link number is a two-digit number (Links 0, 1, 14, or 15 cannot be tested). The Channel number is a two-digit number from 00 to 31. Channel 30 on Link 9 is specified as "09 30".

Commands are entered on the test line by dialing command codes listed in Table 16 using the DTMF keypad or the rotary dial of the set being used.

**Table 16: Test Line Command Codes**

<b>Numeric</b>	<b>Alpha</b>	<b>Command Codes Description</b>
22	BC	Busy Out Channel (Remove Channel)
26	BO	Busy Out device
35	DL	Dump Logs
38	DT	Direct Trunk select
72	RC	Return Channel
73	SD	Stop Dump Logs
77	RS	Return Device to Service
78	ST	Stop Test Printers
82	TC	Test Channel
83	TD	Test Device
872	TPB	Test Printer Bay_Slot_Circuit
873	TPE	Test Printer Extension_Number
877	TPP	Test Printer Port

Test Line Indicator LEDs

After the maintenance person enters a command sequence, the MCC LEDs display the results as explained in the following table.

Table 17: Test Line Status Indicator Codes

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.
E5	Invalid command or device location entered; only those commands in Table 16 are acceptable.
bb	Device was busy. Try again later.
7E	An invalid physical location number was entered. Enter bay number (01), slot number (04), and circuit number (06).
FF	Unknown error. Attempt operation again - ensure correct use of command codes (see Table 16).
1E	Error in acquiring the software ID of the test line. Attempt operation again - ensure correct use of command codes (see Table 16). If necessary, use maintenance terminal or console.
2E	Possible software error. Attempt operation again - ensure correct use of command codes (see Table 16). Use maintenance terminal or console if necessary.

**NOTE:** Failure of any test line command sequence necessitates using more sophisticated maintenance tools.



**Test Line Tones**

Approximately ten seconds after the maintenance person 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 the command input. After the maintenance person enters a command sequence, the returned tone, described in Table 18, indicates the result of the action performed.

**Table 18: 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). See Note after Table 10.
Trunk camp-on tone (double beep)	Test was inconclusive.
Ringback tone (single beep or ring)	Initial maintenance access.
Busy Tone	Device was busy. Try again later.



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## Chapter 4

# Programming



# Programming an Attendant Console

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1. Form 01, System Configuration
  - Program a Digital Line Card (assigned as a high-power card in the SX-200 LIGHT) or a DNIC module for a DNIC Console. Use the first port on the Digital Line Card for the console.or
  - Program a Console Module on a Universal Card for an LCD Console.
2. Form 07, Console Assignment
  - Assign an extension number, COS, COR, and Tenant for each console bay/slot/circuit entry.
3. Form 08, Console LDN Assignment
  - Assign a directory number and label to each required console LDN key.

## Console Descriptions

**SUPERCONSOLE 1000® Attendant Console:** uses a two-wire connection to connect to one circuit on a Digital Line Card or DNIC Module (Tip to Tip and Ring to Ring). With LIGHTWARE 18 or greater, the SUPERCONSOLE 1000, PN 9189-000-300 and 9189-000-301 can directly connect up to two PKM48 devices; these consoles with software prior to LIGHTWARE 18 and the SUPERCONSOLE 1000, PN 9189-000-001-NA and 9189-000-003 NA require a DSS/BLF Interface Unit to associate with the PKM48.

**SUPERSET 7000 Attendant Console:** includes a RS-232 port and requires a 2-wire connection to a DNIC port. This console requires a DSS/BLF Interface Unit in order to associate with a PKM48.

**LCD Console:** does not include a RS-232 port and requires a 4-wire connection to a console module. The SX-200 EL LIGHTWARE 17 Release 1.1, 2.0, and 3.0 do not support the LCD console; Release 3.1 and greater does.

# Programming a Printer Port

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## System Printer Port

1. Form 34, Directed I/O
  - Program the printer port in Form 34.
  - Define Printout Types that are to be delivered to the system printer port.
  - Remove printer port for print types not used.
  - Speed of printer port is programmed in Maintenance.



Printer ports only work on main control cabinets, not on peripheral cabinets.

## Dataset Printer Port

1. Form 11, Data Circuit Descriptor
  - Define a circuit descriptor to match characteristics of device type. Refer to Form 04, System Options and Timers on page 131 for typical circuit descriptor.
2. Form 12, Dataset Assignment
  - Assign type of data device for the dataset PLID.

DSCONS	Console (output only, maximum 2400 baud)
1101M	MiLINK <sup>®</sup> Dataset
1103/2103	Standalone dataset
  - Assign a Tenant, Extension number, COS, COR, and circuit descriptor number.
3. Form 34, Directed IO
  - Define printout type to be delivered to defined dataset.

# Programming Stations/Sets Automatically

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The AUTO PROGRAM function in CDE Form 09, Desktop Device Assignments, checks for unprogrammed circuits on all installed and programmed ONS cards, OPS cards, and DNIC cards. Cards that are installed in Spines are not supported.

All unprogrammed circuits are automatically programmed as follows:

- Extension numbers are automatically assigned according to a Bay, Slot, Circuit address format "BSCC", where
  - B is the Bay number (1-7)
  - S is the slot number (1-8)
  - CC is the cct number (01-12).

For example, extension number 2608 is assigned to a phone connected to Bay 2, Slot 6, Circuit 08.
- Other parameters for ONS and OPS devices are assigned as
  - COS = 1
  - COR = 1
  - Tenant = 1
- Other parameters for DNIC sets are assigned as
  - COS = 2
  - COR = 4 for all set types except SUPERSET 430 and SUPERSET 4150
  - COR = 5 for the SUPERSET 430 and SUPERSET 4150
  - Tenant = 1

**NOTE:** Before an extension number can be automatically assigned, a DNIC set or DMP must be physically connected to the circuit. If no set or console is detected on a circuit, that circuit is skipped and no extension number is assigned.

## Technician's Handbook

1. To automatically program all connected stations, DNIC sets and DMPs
2. Install all ONS cards, OPS cards, and DNIC cards. Do not program stations, DNIC, sets or DMPs.
3. Connect the DNIC sets or DMPs to the circuits.
4. Access Form 09, Desktop Device Assignments.
5. Press Auto Program.

After verifying that the unprogrammed sets are physically connected, the system automatically programs all unprogrammed circuits. The system displays all of the devices that have been programmed.

If a circuit cannot be programmed because an extension number has already been assigned to that circuit, a warning is displayed. Press ABORT to cancel the procedure or press CONTINUE to skip the device and resume programming the other devices in the range.

### Deleting a device and all dependent resources

The DELETE softkey in CDE Form 09, Desktop Device Assignments, deletes a device and all of its dependent resources including

- All line keys (including DLN) that are programmed on a deleted set, standalone BLF, or PKM module
- All line and feature keys that are programmed on associated BLF or PKM modules
- The associated BLF and PKM modules
- Any other line appearances and BLF's of the deleted station or set.

A warning message appears if any of the above conditions exists. To continue, press CONFRIM. To abort, press CANCEL.



## Deleting a range of devices and all dependent resources

The RANGE DELETE softkey in CDE Form 09, Desktop Device Assignments, allows block deletion of devices and all dependent resources.

To delete a range of devices and all dependent resources

1. Press RANGE DELETE.  
The system displays: FROM BAY: SLOT: CIRCUIT:.
2. Enter valid Bay, Slot and Circuit numbers for the first device and press the ENTER softkey.  
The system displays: TO BAY: SLOT: CIRCUIT:.
3. Enter valid Bay, Slot and Circuit numbers for the last device and press the ENTER softkey.  
The system prompts you to choose whether or not you want to receive warnings as devices are deleted.
4. To receive a warning prior to deleting each device and its dependent resources, press YES. To delete all devices and dependent resources without warning, press NO.  
The system prompts you once again to confirm the deletion of the range.
5. To proceed with the deletion of the range of devices and all dependent resources, press CONFIRM. Press CANCEL to abort.  
If you chose to receive warnings each time a device is deleted, the system displays "deleting all keys, ..." for each device in the range.
6. To proceed, press CONFIRM. Press CANCEL to abort the deletion of the specific device and continue with the next device.

To abort the deletion of a range of devices at any time during the procedure, press ABORT. Any devices that were deleted prior to pressing the ABORT key will remain deleted.

# Programming a Single Line Voice Station

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1. Form 01, System Configuration
  - Program an ONS or OPS line card
  - Program a Digital Line card or DNIC module for SUPERSET 401, SUPERSET 401+, and SUPERSET 4001 sets.
2. Form 09, Desktop Device Assignments
  - Assign an extension number, COS, COR, and name (optional) for each bay/slot/circuit (set type remains STATION).
3. Form 30, Device Interconnection Table (optional)
  - Set the required interconnect restrictions (for example, to restrict connections between specific device types).
4. Form 05, Tenant Interconnection Table (optional)
  - Set the required interconnect restrictions (for example, to restrict connections between specific tenants).
5. Form 19, Call Rerouting Table (optional)
  - Program the action that the system will take to handle the caller's call violations.
  - Each tenant requires its own Call Rerouting Table.
6. Form 03, COS Define (optional)
  - Create a unique class of service (COS) if required.
7. Form 20, ARS: COR Group Definition
  - Create a COR group that includes the COR number which you will assign to the station.
  - This COR group restricts the external calls that the station user can dial.



Ensure that the system is provisioned with a sufficient number of DSP/DTMF receivers.

## Programming an Analog Device to a SIM2

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The analog interface in the SIM2 supports devices such as analog telephones, fax machines, or modems. The SUPERSET provides the power to the analog interface.

Ensure that the set firmware revision level meets the system firmware revision level. If the revision level on the system is higher than the set revision level, upgrade the set firmware.



Refer to *Upgrading Set Firmware (page 33)*.

When adding an analog set to a SIM2, use CDE Form 12 to program the port. The port type is AIM.

## Programming a Multi-Line Set

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### 1. Form 01, System Configuration

- Program a Digital Line Card, DNIC module, or COV line card.



LIGHTWARE 16 for the SX-200 ML and LIGHTWARE 17 and greater for the SX-200 EL/ML do not support SUPERSET 3 or SUPERSET 4 sets (COV). COVs are reserved for voice mail only.

### 2. Form 09, Desktop Device Assignments

- Assign set type, extension number, COS, COR, and name (optional) for each bay/slot/circuit.
- Set types are SUPERSET 4001, 4015, 4025, 4125, 4090, 4150, 401+, 410, 420, 430, 4150 S/Att, 430 S/Att, 3DN, and 4DN.
- Complete the Form 09 sub-form for key types and options.

## Technician's Handbook

3. Form 30, Device Interconnection Table (optional)
  - Set the required interconnect restrictions (for example, to restrict connections between specific device types).
4. Form 05, Tenant Interconnection Table (optional)
  - Set the required interconnect restrictions (for example, to restrict connections between specific tenants).
5. Form 19, Call Rerouting Table (optional)
  - Program the action that the system will take to handle the caller's call violations.
  - Each tenant requires its own Call Rerouting Table.
6. Form 03, COS Define (optional)
  - Create a unique class of service (COS) if required, or use an existing COS.
7. Form 20, ARS: COR Group Definition
  - Create a COR group that includes the COR number which you will assign to the station, or use an existing COR.
  - This COR group restricts the external calls that the station user can dial.



LIGHTWARE 17 Release 3.1 and greater support SUPERSET 3DN and SUPERSET 4DN sets. This feature is a purchasable system option.

# Programming a Subattendant Set

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## 1. Form 01, System Configuration

- Program a Digital Line Card or DNIC module.

## 2. Form 09, Desktop Device Assignments

- Assign set type to SUB, extension number, COS, COR, and name (optional) for each bay/slot/circuit.



Assign a separate COS with subattendant options.



Set type SUB can only be SUPERSET 4150, SUPERSET 430, or SUPERSET 4DN.

- Complete the sub-form for assigned keys, types, and options.

## Programming a PRI card

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The PRI card supports the following purchasable MOSS options: Q.SIG (option 86), NFAS (option 91), D-Channel Backup (option 92), Remote LAN Access (option 93), Min/Max (option 94), Auto Min/Max (option 95), Number of Links 0-8 (option 96). Option 91 to 95 are downloaded to each PRI card installed. Option 96 enables the number of ISDN T1 links on the PRI card (these links do not pertain to the ISDN Network Gateway). These MOSS options serve all the PRI cards in the system. If you change any of these options, you must reset the PRI card to enable them, and you may need to download a new IMAT database on to the PRI card(s).



If you purchase a number of T1 links (System Option 96) less than the number of T1 links you install and program, Mitel Networks cannot reliably predict which T1 links the SX-200 EL/ML system will use after a reset.


If you purchase a number of T1 links (System Option 96) greater than the number of T1 links you install and program, the T1 links programmed will remain consistent.

### 1. Form 01, System Configuration

- Program the PRI card node type as an ISDN bay. The ISDN trunks are programmed in slot 6 and slot 8.

### 2. Form 03, Class of Service (for the ISDN trunks)

- Enable COS Option 701 (No Dial Tone).
- Disable COS Option 800 (ANI Applies). Ensure this is NOT in the class of service of the ISDN trunks.
- Enable COS Option 801 (Incoming Trunk Call Rotary).
- Enable COS Option 802 (Limited Wait for Dial Tone).
- Enable COS option 811 (ANI/DNIS Trunk) to display CLID (the caller's number) and DDI (the number the caller dialed) on incoming trunks.

- Enable COS option 246 (SMDR - Extended Record) to allow the calling name to appear in SMDR reports for Inciming calls.
  - Enable COS Option 814 (SMDR - Record ANI/DNIS) to allow CLID digits to appear in SMDR reports for Incoming calls.
  - Enable COS Option 702 (SMDR - Overwrite Buffer) if SMDR - Record Incoming Calls Option 806 is Enabled.
3. Form 03, Class of Service (for the sets & stations)
- Enable COS option 502 (Display ANI/DNIS Information) or COS option 613 (Display ANI Information Only) to allow display of CLID digits on display telephones.
  - Enable COS option 503 (Enable Calling Name Display)
  - Enable COS option 702 (SMDR - Overwrite Buffer).
  - Disable COS option 236 (Outgoing Trunk Callback).
  - Disable COS option 237 (Outgoing Trunk Campon).
4. Form 04, System Options/System Timers - Assign a one to five second value to the System Timer Limited Wait For Dial Tone if ISDN trunks are present.
- Enable the MOSS option, Number of Links 0-8 (option 96). If desired, enable Q.SIG (option 86), NFAS (option 91), D-Channel Backup (option 92), Min/Max (option 94), and Auto Min/Max (option 95).
-  For option 92 to be changed to ENABLED. Option 91 must already be ENABLED. Similarly, if both are ENABLED, option 92 must be DISABLED first.
- For option 95 to be changed to ENABLED. Option 94 must already be ENABLED. Similarly, if both are ENABLED, option 95 must be DISABLED first.
5. Form 13, Trunk Circuit Descriptors
- Assign the ISDN trunk with a T1 trunk circuit descriptor. To receive CLID or DDI digits, the ISDN trunk must be a non-DISA trunk that is programmed with a T1 E&M, T1 E&M DISA, T1 TIE DISA, or T1 DID/TIE trunk circuit descriptor.

# Technician's Handbook

## 6. Form 13, Options Subform

- Set the "DTMF" option to "No"
- If you are connecting the ISDN trunk to a Toll Office, set the Toll Office option to "Yes".
- If you are connecting the ISDN trunk to a Local Office, set the Toll Office option to "No", and set the "Is a CO?" option to "Yes".



The Toll Office setting takes precedence over the Local Office setting. Also, if neither "Toll Office" nor "Is a CO?" is set to "yes", the switch assumes a digital TIE trunk is connected.

- Set the Debounce Timer to 100 milliseconds.
- Set the Incoming Start Type to WINK.
- Set the Outgoing Start Type to WINK.

## 7. Form 14, Non Dial-In Trunks OR Form 15, Dial-In Trunks

- Define the incoming ISDN trunk as a non-dial-in trunk in Form 14, or as a dial-in trunk in Form 15. You cannot program a trunk into both Form 14 and Form 15.

## 8. Form 16, Trunk Groups

- Assign the ISDN trunks to a trunk group. The trunk group number that you program for the ISDN trunks in this form must match the trunk group numbers that you program for the ISDN trunks in the PRI card bay.

## 9. Form 42, T1 Link Descriptor

- Select a T1 Link Descriptor for the ISDN trunks in Form 42. In the Link Descriptor Options Subform, enter the following values for the T1 Link Descriptor:

Option Name	Value
Alarm debounce timer (300-3200)	500
B8ZS zero code suppression	YES
Slip rate - maintenance limit (0-9000)/24 hrs	255
Slip rate - service limit (0-9000)/24 hrs	7000

(Sheet 1 of 2)



Option Name	Value
Slip rate - network sync limit (0-9000)/24 hrs	7
BER - maintenance limit (10 <sup>**</sup> -n, n = (3,4,5,6))/hr	3
BER - service limit (10 <sup>**</sup> -n, n = (3,4,5,6))/hr	3
Framing losses - maintenance limit (0-9000)/24 hrs	225
Framing losses - service limit (0-9000)/24 hrs	9000
RTS timer - service limit exceeded (1-255 min)	30
RTS timer - net slip limit exceeded (1-255 min)	30
RTS timer - after alarm (0-300 sec)	10
(Sheet 2 of 2)	

10. Form 43, T1 Link Assignment

- Assign the ISDN trunk T1 Link Descriptor to slot 6 and/or slot 8 on the PRI card bay.

11. Form 44, T1 Network Sync

- Enter the links, according to their PLIDs, in the order that you want them to be used as the network synchronization source.

12. Form 22, Modified Digit Table

- DID Calling Party Number to the network interacts with the current SX-200 system networking functionality and ignores programmed node-id's in the PRI card. The Node ID Information Element ("\*8") for Analog Networking, if programmed in the Modified Digit Table, will be ignored by the PRI card. If \*6 is programmed in the digit modification table the DID calling extension number is sent to the PRI card and can be sent to the network as the calling party. The extension must belong to a block of DID numbers purchased from the Network provider.

## Technician's Handbook

The following table shows how Analog Networking and Call-by-Call information co-exist in the Modified Digit Table.

Entry	Quantity to Delete	Digits to be Inserted	Comments
01	1	*4000*6*4	ISDN CxC and DID

In the "Digits to be Inserted" field, the definition of characters are:

- \*4 No SMDR for further modified digits
- 000 Call-by-Call digits, (speech, default O/G, clid)
- \*6 Send caller id (DID to network)
- \*4 Start SMDR again for further modified digits

### 13. Complete ARS programming

- ARS programming must match with the service selection programming that is entered through the ISDN Maintenance Administration Tool (IMAT) computer.



Refer to the IMAT online Help file for information about programming the IMAT database.

## Programming a Non-Dial-In Trunk

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1. Form 01, System Configuration
  - Program a trunk card that meets the trunk type requirements.
2. Form 13, Trunk Circuit Descriptor
  - Create a trunk circuit descriptor that corresponds to the type of trunk that you are programming.
3. Form 03, Class of Service
  - Assign trunk options only.

#### 4. Form 14, Non-Dial-in Trunks

- Assign COS and Tenant.
- Assign the directory number or an abbreviated dial number which incoming calls will ring for Day Service, Night Service 1, and Night Service 2 modes.
- Assign a Circuit Descriptor Number (CDN) (links this form to Form 13).
- Assign a Trunk Name if desired. This name appears on the consoles and on the set displays for incoming and outgoing calls.
- Assign a Trunk Number.



CDE Form 14 does not accept trunk programming changes if the T1 card or T1/E1 module is installed and the T1 link is down but active. To make a programming change for a T1 card, unplug the T1 card, make the programming change and then re-insert the T1 card. To make a programming change for a T1/E1 module, insert a Peripheral Interface Card (PIC) into the software location (slots 5 or 6) for that T1 link, make the programming change, and then remove the PIC from the slot to reset the T1 link.

#### 5. Form 16, Trunk Groups

- Assign to a trunk group if outgoing.

### Programming a range of Non Dial-in Trunks

The RANGE PRGRM softkey allows block programming of trunks on the same card. You must program the first trunk in the range and then press RANGE PRGM to copy the values to the range of trunks that you specify. The following fields are copied from the first trunk in the range:

- COS, TEN, DAY, N1, N2, CDN

The TK NAME and COMMENTS fields are left blank.

The trunk numbers are assigned in sequence, beginning with the first trunk in the range. If there are trunks that are already programmed

## Technician's Handbook

within that range, those trunks are skipped. The trunk number sequence is incremented each time a trunk is skipped. If the trunk number is incremented to a value that is already used, the sequence continues to increment until a free number is found. The trunk numbers restart at 1 if necessary. An error message is displayed if there are no more free trunk numbers.

**NOTE:** BRI trunks are not supported.

To program a range of trunks:

1. Program the first trunk in the range. Enter values for the COS, TEN, DAY, N1, N2, CDN fields.
2. Press RANGE PRGRM.  
The system displays: FROM BAY: SLOT: CIRCUIT:.
3. Enter valid Bay, Slot and Circuit numbers for the first trunk and press the ENTER softkey.  
The system displays: TO BAY: SLOT: CIRCUIT:.
4. Enter valid Bay, Slot and Circuit numbers for the last trunk and press the ENTER softkey.  
The system copies the values from the first trunk to all the trunks specified in the range.

# Programming a Dial-In Trunk

---

1. Form 01, System Configuration
  - Program a trunk card that meets the trunk type requirements.
2. Form 13, Trunk Circuit Descriptor
  - Create a trunk circuit descriptor that corresponds to the type of trunk that you are programming.
3. Form 03, Class of Service
  - Assign trunk options only.
4. Form 15, Dial-in Trunks
  - Assign COS, COR, and Tenant.



Assign a separate COS for the Dial-In Trunk.

- Column N lists the number of expected digits.



If this digit is 0, the system treats this as a Tie trunk. If this digit is not 0, the system treats this as a DID trunk.

- Column M lists the number of digits to absorb. To absorb no incoming digits, set to 0. To absorb n digits, enter n (a whole number).
- Column X defines the number of digits to insert.



**Do not insert 0 as a blank.** To insert no digits, leave blank. To insert digits, enter the actual digits.

- Assign a Trunk Name if desired. This name appears on the consoles and on the set displays for incoming and outgoing calls.



CDE Form 15 does not accept trunk programming changes if the T1 card or T1/E1 module is installed and the T1 link is down but active. To make a programming change for a T1 card, unplug the T1 card, make the programming change and then re-insert the T1 card. To make a programming change for a T1/E1 module, insert a Peripheral Interface Card (PIC) into the software location (slots 5 or 6) for that T1 link, make the programming change, and then remove the PIC from the slot to reset the T1 link.

### 5. Form 16, Trunk Groups

- Assign to a trunk group if outgoing.

## Programming a range of Dial-in Trunks

The RANGE PRGRM softkey allows block programming of trunks on the same card. You must program the first trunk in the range and then press RANGE PRGM to copy the values to the range of trunks that you specify. The following fields are copied from the first trunk in the range:

- COS, COR, TEN, N1, M, X, CDN

The TK NAME and COMMENTS fields are left blank.

The trunk numbers are assigned in sequence, beginning with the first trunk in the range. If there are trunks that are already programmed within that range, those trunks are skipped. The trunk number sequence is incremented each time a trunk is skipped. If the trunk number is incremented to a value that is already used, the sequence continues to increment until a free number is found. The trunk numbers restart at 1 if necessary. An error message is displayed if there are no more free trunk numbers.

**NOTE:** BRI trunks are not supported.

To program a range of trunks:

1. Program the first trunk in the range. Enter values for the COS, COR, TEN, N1, M, X, CDN fields.
2. Press RANGE PRGRM.  
The system displays: FROM BAY: SLOT: CIRCUIT:.

3. Enter valid Bay, Slot and Circuit numbers for the first trunk and press the ENTER softkey.  
The system displays: TO BAY: SLOT: CIRCUIT:.
4. Enter valid Bay, Slot and Circuit numbers for the last trunk and press the ENTER softkey.
5. The system copies the values from the first trunk to all the trunks specified in the range.

## Programming a DISA Trunk

---

1. Form 01, System Configuration
  - Program a trunk card that meets the trunk type requirements.
2. Form 13, Trunk Circuit Descriptors
  - Select a DISA circuit descriptor to match hardware type.



Assignment of a DISA circuit descriptor to a trunk changes the trunk to a DISA trunk.

3. Form 03, Class of Service
  - Assign trunk options only.
4. Form 15, Dial-In Trunks
  - Assign COS, COR, and Tenant.



Assign a separate COS for the Dial-In Trunk.

- Column N: set to 0
- Column M: set to 0
- Column X: leave blank
- Assign a Trunk Name if desired. This name appears on the consoles and on the set displays for incoming and outgoing calls.

Recommended Options for system security include:

**Form 03:** Enable Option 808 (Special DISA).

**Form 04:** Enable Option 5 (Verified Account Codes) and specify a time for Option 54 (DISA Answer Timer).

**Form 33:** Enter appropriate DISA access codes.



If the DISA trunk is a loop-start CO trunk, then loop-start interconnection rules apply and the restrictions on-loop start CO trunks applies.



Four-circuit/Eight-circuit LS/CLASS trunks can also be programmed as DISA trunks.

## Programming ANI/DNIS on an Incoming Trunk

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**ANI** (Automatic Number Identification) - the local carrier sends to the PBX the phone number of the calling party.

**DNIS** (Dialed Number Identification Service) - the local carrier sends to the PBX the digits dialed by the calling party.

ANI/DNIS is available only to incoming trunks with trunk descriptor "T1-E&M" and "T1-DID/TIE", which accept DTMF signaling and have the wink timer active.

Only MCI and US Sprint Standards are supported. MCI sends the ANI digits without delimiters. Sprint delimits the DNIS and ANI digits with asterisks.

DNIS digits on a dial-in trunk are used to route that trunk call, and no further digits will be expected.

1. Create an ANI/DNIS trunk by creating a separate COS . Set the following options in the trunk's Class Of Service:
  - COS Option 811 - ANI/DNIS Trunk to ENABLED
  - COS Option 801 - Incoming Trunk Rotary to DISABLED
  - COS Option 800 - ANI Applies to DISABLED
  - COS Option 246 - SMDR Extended Record to ENABLED (for SMDR to report the ANI and DNIS digits).



2. In the Trunk Circuit Descriptor parameters set
  - Incoming Start Type to Wink
  - Wink Timer to 100-350 for MCI and 140-290 for US SPRINT
  - Debounce Timer to 100 ms or greater.
3. To define which information will be displayed on the sets, ANI, DNIS, both, or none (standard trunk label display), select the required following COS options:
  - COS Option 502 - Display ANI/DNIS Information = ENABLE / DISABLE
  - COS Option 613 - Display ANI Information Only = ENABLE / DISABLE
  - COS Option 503 - Display CLASS Name if required.
4. To display ANI and DNIS digits on a console when talking to an ANI/DNIS trunk, enable COS Option 502 - Display ANI/DNIS Information for the console.

Intercept reason (FROM xxx DND) and Forwarding Information (FWD FROM xxxx) take priority over DNIS.

Tenant Name and Calling Line ID take priority over ANI information (immediately following the word TRUNK).

COS Option 613 - Display ANI Information Only does not apply to a console.

The following tables identify displays during each call state according to digits sent by the trunk and COS options selected for the display set.



If a name is received on the incoming trunk in the scenario where you would see the DNIS in the ringing state, you will see the ANI instead.

**Table 19: ANI/DNIS Digits on Phone Display  
(COS Option 502 Enabled and COS Option 613 Disabled)**

COS Option 502- Display ANI/DNIS = YES (enable)		
COS Option 613 - Display ANI only = NO (disable)		
	Phone display during ringing	Phone display after answer
ANI and DNIS sent	DNIS	ANI
ANI sent	ANI	ANI
DNIS sent	DNIS	DNIS
Neither sent	Trunk Number or Label	Trunk Number or Label

**Table 20: ANI/DNIS Digits on Phone Display  
(COS Option 502 Enabled and COS Option 613 Enabled)**

COS Option 502- Display ANI/DNIS = YES (enable)		
COS Option 613 - Display ANI only = YES (enable)		
	Phone display during ringing	Phone display after answer
ANI and DNIS sent	ANI	ANI
ANI sent	ANI	ANI
DNIS sent	Trunk Number or Label	Trunk Number or Label
Neither sent	Trunk Number or Label	Trunk Number or Label

The following table describes the set display for logged in ACD Agents with the delivery of ANI/DNIS digits on the incoming trunks.

**Table 21: ANI/DNIS for ACD Agents**

COS 502	COS 613	COS 654	Path Name	Ringing State	Talking State
Enabled	Enabled	Disabled	None	ANI	ANI
Enabled	Disabled	Disabled	None	DNIS	ANI
Disabled	Disabled	Disabled	None	Path Number	Trunk Name
Disabled	Enabled	Disabled	None	Path Number	Trunk Name
Disabled	Disabled	Enabled	None	Path Number	Path Number
Disabled	Enabled	Enabled	None	Path Number	Path Number
Enabled	Enabled	Enabled	None	ANI	Path Number
Enabled	Disabled	Enabled	None	DNIS	Path Number
Enabled	Enabled	Disabled	Yes	Path Name	ANI
Enabled	Disabled	Disabled	Yes	Path Name	ANI
Disabled	Disabled	Disabled	Yes	Path Name	Calling Trunk Name
Disabled	Enabled	Disabled	Yes	Path Name	Calling Trunk Name
Disabled	Disabled	Enabled	Yes	Path Name	Calling Path Name
Disabled	Enabled	Enabled	Yes	Path Name	Calling Path Name
Enabled	Enabled	Enabled	Yes	Path Name	Path Name
Enabled	Disabled	Enabled	Yes	Path Name	Path Name

# Programming a CLASS Trunk

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Programming a LS/CLASS Trunk card requires LIGHTWARE 19 Release 2.0 or greater software.

1. Form 01, System Configuration
  - Program the LS/CLASS Trunk module or the LS/CLASS Trunk card.
2. Form 03, Class of Service, Define for trunks.



Assign a separate COS for the trunk.

- To have Calling Line ID digits reported in the SMDR records, enable COS Option 806 (SMDR-Record Incoming Calls) and COS Option 814 (SMDR-Record ANI/DNIS/CLASS). Enable COS Option 702 (SMDR - Overwrite Buffer).
  - To have CLASS name reported in the SMDR records, enable COS Option 246 (SMDR-Extended Record) and COS Option 814 (SMDR-Record ANI/DNIS/CLASS).
3. Form 03, Class of Service, Define for SUPERSET sets.
    - To display Calling Line ID digits on a SUPERSET display set or console, enable COS Option 502 (Display ANI/DNIS/CLASS Information) in the class of service for the set/console. Enable COS Option 613 - Display ANI Information Only if required.
    - To display CLASS name before Calling Line ID digits on a SUPERSET small display set (SUPERSET 4025, SUPERSET 4125, or SUPERSET 420 telephones), enable COS Option 503 (Display CLASS Name) in the class of service for the set.
  4. Form 13, Trunk Circuit Descriptor
    - Assign the CLASS trunk with the circuit descriptor. An LS/CLASS Trunk module uses "4-CIRCUIT CLASS ". An LS/CLASS Trunk card uses "8-CIRCUIT CLASS"

- Program the option “CLASS Trunk” in the circuit descriptor options subform for the appropriate 4 or 8-circuit CLASS trunk.
- 5. Form 14, Non-Dial-In Trunks or Form 15, Dial-in Trunks
  - Program the CLASS trunks.



In Form 15 the CLASS trunk becomes a DISA trunk.

- 6. Form 04, System Options and Timers
  - Program the CLASS receivers for the LS/CLASS Trunk module. The LS/CLASS Trunk card provides its own CLASS receivers and does not require programming in Form 04.

## Programming an SX-200 IP Node

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### Initializing the SX-200 IP Node

1. Ensure the SX-200 IP Node is not connected to a power source.
2. Disconnect the the Ethernet cable from the Ethernet port on the SX-200 IP Node.
3. Using a serial cable, connect a PC to the Maintenance Port on the IP Node.
4. Launch a data communication application, such as Hyperterminal on the PC.
5. Set the parameters: 9600, 8, N, 1, None.
6. Plug in the SX-200 IP Node to a power source.
7. At the “Press any key to stop and auto-boot” prompt, press any key.
8. At the [VxWorks Boot] prompt, type ‘c’ and press Enter.
9. Press Enter to type data in the following fields:
  - inet on ethernet (e): *IP address of the SX-200 IP Node*
  - gateway inet (g): *IP address of the WAN gateway or router*

## Technician's Handbook

10. Press Enter until the [VxWorks Boot] prompt appears.
11. Type '@' and press Enter.
12. After the Critical Alarm LED turns off, reconnect the Ethernet cable.
13. From VxWorks "Ping" all the destination IP Nodes that will be on IP Trunks. For example:  
->ping "192.168.8.2". The VxWorks Ping command requires quotes.

## CDE Programming for the SX-200 IP Node

1. If you are using IP Trunking, access CDE Form 04, System Options and enable the following options:
  - Option 86: Enable PRI Q.sig
  - Option 115: Set the maximum number of IP Trunks to a value from 1 to 60. Note that each IP phone to IP Trunk call consumes two channels per call, which means up to 30 such calls are supported per IP Node. For more information about each type of call and the number of channels consumed, see the Maximum IP Trunks description for CDE Form 04 in the SX-200 Technical Documentation.
  - Option 100: Enter the MOSS password
  - Option 48: Set to 1 to 2 seconds.
  - Options 71 and 72: ensure these settings match the card types installed.
2. Form 01 - System Configuration
  - Assign an IP Node to a bay.
  - Assign IP Line Cards to slots 1 to 5 of any bay that is assigned to an IP Node.
  - If you are using IP Trunking, assign IP Trunk Cards to slot 6 of any bay that is assigned to an IP Node.
3. Form 48 - IP Nodes (optional - used for IP trunking only)
  - For each local IP Node, specify an IP Node number and bay number.

- For each remote IP Node, specify an IP Node number, IP Address and maximum number of calls.
  - If you plan to route calls to remote IP Nodes or 3300 ICPs, enter the IP Addresses of these nodes and specify the maximum number of calls.
4. Form 03 - COS Define
    - Enable options 801, 802 and 811.
  5. Form 13 - Trunk Circuit Descriptors
    - Set a descriptor to T1 E&M.
    - Set Incoming Start Type to WINK.
    - Set Outgoing Start Type to WINK.
    - Set QSIG Supplementary Services to YES.
  6. Form 15 - Dial-in Trunks
    - In the CDN Field, enter the descriptor number for T1 E&M that is specified in Form 13.
  7. Form 16 - Trunk Groups
    - Assign Trunk Groups to IP Trunks. All IP Trunks must be programmed in the same Group. To avoid collisions, program the trunks in reverse order at each end.
  8. Program Form 26 - ARS: Digit Strings.
  9. Program Form 22 - ARS: Modified Digit Table.
  10. Program Form 23 - Route Definition.
    - Specify the routes of IP Trunk Groups.
    - In Subform 23 - Show IP, specify the destination IP Node Number for each route.
  11. Form 47 - IP & DCHP Parameters
    - Enter the IP Controller Address. Enter the SX-200 IP Node address.
    - Enter the DHCP Server Subnet.

## Technician's Handbook

- Enter the DHCP Server Subnet mask.
- Enter the DHCP Assignable IP Address Start. Enter the start range of the IP phones.
- Enter the DHCP Assignable IP Address End. Enter the end range of the IP phones.
- Enter the TFTP Server Address. Enter the IP address of any SX-200 IP Node.
- Enter the Gateway/Router IP Address.
- Leave blank the Mitel Only field.
- Enter the VLAN ID (optional). Enter a unique ID between 1 and 4095 for the dual-port IP phones.
- Enter the IP phone Priority. Use a priority of 7 (highest).
- Enter the IP Address Lease Time. Enter the number of minutes before a device is disconnected and its IP address is re-assigned elsewhere. Applies only to the specific bay. To assign an infinite lease time, use 0 minutes.
- Press Enable to enable the DHCP Server.

### 12. Form 09 - Desktop Device Assignments

- Assign the IP phones to Bay/Slit/Ccts.
- (Optional) Enter the MAC Addresses of the IP phones.

### 13. (Optional) Form 02 - Feature Access Codes

- Specify the access codes for the IP phones.

### 14. (Optional) Form 03 - COS Define

- Enable voice compression by selecting COS number 688.

### 15. Use CDE Forms to program all other station features (for example, Class of Service, Interconnect Restriction, Set Key Assignments, and Class of Restriction).



## Registering IP Phones (Optional)

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- Ensure you have the access code--if you programmed one--for set registration in CDE Form 02, Feature Access Codes.
- Ensure the directory number and device type is programmed in CDE Form 09, Desktop Device Assignments.

To register IP phones

1. Connect the IP phone to an RJ-45 Ethernet port on the LAN.
2. Press \* during power-up (to clear any directory number in memory).
3. Type the *access code* followed by the *directory number*.
4. Press Superkey.

## Programming a Circuit Descriptor for Hotel/Motel and ACD Datasets

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1. Form 03 - COS Define
  - Select the COS number.
  - Enable the following COS Options:
    - 901 - DTRX Herald
    - 904 - DTRX Complete Message Text
    - 906 - Data SMDR - Does Not Apply
2. Form 29 - DTE Profile
  - Select a DTE profile number. You will use this profile number in Form 12 - Data Assignment.
  - Select the SEL. Option Subform.
  - Enable: DTRX Echoplex, Editing, and Edit Character = 127.

## Technician's Handbook

### 3. Form 11 - Data Circuit Descriptor

- Select a Circuit Descriptor (CDN). You will use this CDN in Form 12 in the next step.

Match the CDN values to those of the selected Terminal. For example, All Baud Rates = 9600, Parity = None, Character Length = 8, and Stop Bits = 1.

### 4. Form 12 - Data Assignment

- Select an available PLID and program the selected dataset. In the Data Terminal Equipment profile (DTE) field enter the DTE number you used in Form 29. Use the same CDN you used in Form 11.

# Programming the PMS Interface

1. Determine the customer's PMS communications protocol requirements: baud rate, parity, character length, and number of stop bits.
2. Form 11, Circuit Descriptor
  - Program to match the protocol.
  - Select the Circuit Descriptor Options.

Option Name	Value
Session Inactivity Timer	0
Guard Timer	2
Minimum Baud Rate	match customer's PMS
Default Baud Rate	match customer's PMS
Maximum Baud Rate	match customer's PMS
Always use Default Baud Rate when called	YES
DTR Off Disconnect Timer	5
DTR to CTS Delay Timer	100
DTR Forced High	YES
RTS Forced High	YES
DSR Is held High when device is Idle	YES
CTS Is held High when device is Idle	YES
Originate a DTRX Call with Low - High transition of DTR	NO
Action taken if the Idle DTE has DTR Low ( Auto-Answer )	REFUSE
ASYNC: Keyboard Origination Allowed ( Auto Baud)	DISABLE
ASYNC: ADL Auto Baud	DISABLE
ASYNC: Flow Control	XON/XOFF
ASYNC:Break Key Function	Transparent
ASYNC: PBX Attention Character	0
ASYNC: Parity	match customer's PMS
ASYNC: Character Length	match customer's PMS
ASYNC: Number Of Stop Bits	match customer's PMS
DS2100: Operating Mode	ASYNCHRONOUS



If you make changes to a Dataset's Circuit Descriptor after it is powered-up you must power down then power up the Dataset for the changes to take effect.

## Technician's Handbook

### 3. Form 12, Dataset Assignment

- Assign the Circuit Descriptor COS, COR, and Tenant.
- Ensure that the DTE profile is blank.

### 4. Form 04, System Options: program the following:

System Options / Timers	Status
04 Message Waiting and Message Register Clear Print	ENABLE
11 Automatic Wake-Up	ENABLE
13 Automatic Wake-Up Print	ENABLE
32 Outgoing Call Restriction	ENABLE
108 Property Management System	ENABLE
27 Room Status Audit	DISABLE
33 Room Status	DISABLE
34 Auto Room Status Conversion / Wake Up Print	DISABLE

5. Form 03, Class of Service Define: program the following table:

Device	COS Option	Status
Attendant Consoles	101 Attendant Outgoing Restriction / Room Status Set Up	ENABLE
	105 Attendant Guest Room Key	ENABLE
Room Telephones	202 Alarm Call	ENABLE
	220 Do Not Disturb	ENABLE
	232 Message Waiting SETUP Lamp	ENABLE
	703 Message Register Applies	ENABLE
	239 Priority Dial 0 (optional - see step 6)	ENABLE
	244 Room Status Applies	DISABLE
	608 SUPERSET Status Display	DISABLE

6. Form 19, Call Rerouting: program "Station Dial 0" routing

- The "Station Dial 0" answer point for all tenants must be a Console LDN or Subattendant LDN. To allow the customer's PMS to set message waiting, you must program Day, Night 1, and Night 2 answer points to the same LDN.

[ Tenant ____ ] Type Of Call	Day	N1	N2
Station Dial 0 Routing	Same LDN	Same LDN	Same LDN

- If you require different "Dial 0" answer points for Day, N1, and N2 use "Priority Dial 0" as an alternate method.

7. Form 34, Directed I/O: program the PMS.

EXT NUM	PRINTOUT	PRINTOUT TYPE	GUARANTEED
From Form 12	PMS	AUTOPRINT	NO

8. Connect the Dataset to the programmed PLID.

- All three Dataset LED's should light. If not, verify your programming and hardware connections.

## Technician's Handbook

9. Connect the customer's PMS computer to the Dataset's RS-232 connector.
10. Verify that the customer's PMS computer communicates with the PBX.
  - If the PBX's PMS interface and the customer's PMS computer communicate properly, you will see an exchange of ENQ (Enquire) and ACK (Acknowledge) commands at the customer's PMS computer.
  - If the PBX's PMS interface and the customer's PMS computer do not communicate properly, test the PBX's PMS interface.



Refer to *PBX and PMS Cannot Communicate* (page 89).

# Programming Call Forwarding - External

---

Call Forwarding - External forwards all calls received to a personal speed call key, system abbreviated dial number, or a key system personal speedcall.

- Call Forwarding - External requires a receiver for dialing. If one is not available in Call Forward - Don't Answer, forwarding is ignored. If one is not available during a reroute, the caller is dropped or given reorder tone.

1. Program the following COS options in the extension's COS:

- Enable COS Option 245 (Abbreviated Dialing Access).
- Enable COS Option 208 (Call Forwarding External).



The device which is calling the destination that is an external call forward must have COS Option 208, Call Forward External, enabled.



Check for split forwarding COS 260 and COS 709.

- Disable COS Option 200 (Account Code, Forced Entry - External Calls) to allow call forwarding to system abbreviated dial numbers.
2. Enable System Option 21 (Incoming to Outgoing Call Forward) for a trunk or party with a single party trunk on hold to forward externally.
  3. Program a feature access code for Feature Access Code 03 (Call Forwarding - All Calls).
  4. CDE Form 30 - Device Interconnection Table specifies which devices can be connected together. For external call forwarding that involves two trunks, verify that they can be connected together.

Toll Control applies to the calling party for Call Forwarding - External to personal speed call keys or to key system personal speedcalls.

Toll Control does not apply when forwarding to system abbreviated dial external numbers.

Toll Control does not apply to CO trunks which are externally call forwarded.

The forwarding destination is the current stored speedcall key number, personal abbreviated dial number, or system abbreviated dial number.



On a Call Forward - Busy or Call Forward - Always call, the COS of the caller (trunk or extension) is checked. Keep this in mind when transferring calls to a phone which is externally Call Forwarded.

## Feature Access Codes (CDE Form 02)

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Table 22 provides a list of the features which can be assigned an access code.

Table 22: Feature Access Codes

Feature Numbers For LIGHTWARE 19 Release 2.0	Feature Names
01	Account Code Access
02	Auto-Answer Activation
03	Call Forwarding - All Calls
04	Call Forwarding - Internal Only
05	Call Forwarding - External Only
06	Call Forwarding - I'm Here
07	Call Forwarding - Cancel I'm Here
08	Dial Call Pickup
09	Directed Call Pickup
10	Do Not Disturb
11	Extension General Attendant Access
12	Paging Access To Default Zone(s)

(Sheet 1 of 3)



Table 22: Feature Access Codes (Continued)

Feature Numbers For LIGHTWARE 19 Release 2.0	Feature Names
13	Paging Access To Specific Zones
14	TAFAS - Any
15	TAFAS - Local Tenant
16	Hold Pickup Access (Attendant Hold Slots)
17	Console Lockout Access Code
18	Maintenance Functions (Test Line)
19	Direct Inward System Access
20	Callback Busy <<single digit>>
21	Call Hold
22	Call Hold Retrieve (Local)
23	Call Hold Retrieve (Remote)
24	Abbreviated Dial Access
25	Clear All Features
26	SUPERSET 4 Telephone Loopback Test
27	Tone Demonstration
28	ADL Call Setup
29	ADL Disconnect
30	Last Number Redial
31	Executive Busy Override <<single digit>>
32	Automatic Wakeup
33	Call Park
34	Node ID
35	Maid In Room
36	SUPERSET 4 Tel. Room Status Display
37	Direct To ARS
38	UCD Agent Login / Logout
39	Analog Network Accept Caller's Extension
40	SUPERSET 4 Tel. Maid In Room Status Display

(Sheet 2 of 3)

Table 22: Feature Access Codes (Continued)

Feature Numbers For LIGHTWARE 19 Release 2.0	Feature Names
41	Send Message
42	Call Message Sender of Oldest Message
43	Callback - No Answer
44	ACD Login / Logout
45	ACD Silent Monitoring
46	Flash Over Trunk
47	Program Feature Key
48	Key System - Direct Paging
49	Key System - Group Page Meet-Me-Answer
50	Key System - Direct CO Line Select
51	Key System - Store Personal Speed Call
52	Key System - Retrieve Personal Speed Call
53	Double Flash Over Trunk
54	Analog Network Accept Call Forward Data
55	Analog Network Accept Call Forward Reason
56	Headset Mode On/Off
57	Call Park Orbit Retrieve
(Sheet 3 of 3)	

# Class of Service Options (CDE Form 03)

**Table 23: Class of Service Options**

Option #	Class of Service Option / Name
100	Attendant Bell Off
101	Attendant O/G Restriction/Room Status Setup
102	Attendant Display of System Alarms
103	Attendant DISA Code Setup
104	Attendant Flexible Night Service Setup
105	Attendant Guest Room Key
106	Attendant New Call Tone
107	Attendant Automatic Call Forward - No Answer
108	Attendant Audible Alarm
109	Attendant Serial Call
110	Attendant Abbr. Dial Confidential Number Display
111	Attendant Abbreviated Dial Programming
112	Attendant Station Busy-Out
113	Attendant Call Block Key
114	Attendant Trunk Busy-Out
115	Attendant-Timed Recall (No Ans) 5 - 240 s; 0=Disable
116	Attendant-Timed Recall (Hold) 5 - 240 s; 0=Disable
117	Attendant-Timed Recall (Camp-On) 5 - 240 s; 0=Disable
118	Attendant Call Forward - No Answer Timer 10 - 240 s.
119	Attendant Tone Signaling
120	Attendant Conference Disable
121	Attendant Station Do Not Disturb
122	Attendant Setup Time/Date
123	Attendant Call Forward Setup and Cancel
124	Attendant Hold Position Security
125	Attendant Multi-New Call Tone
126	Apply Key Line Conference Warning Tone

(Sheet 1 of 8)

Table 23: Class of Service Options (Continued)

Option #	Class of Service Option / Name
150	Sub-Attendant Station Setup Advisory Messages
151	RESERVED
152	RESERVED
153	RESERVED
200	Account Code, Forced Entry - External Calls
201	Account Code, Forced Entry - Long Distance Calls
202	Alarm Call
203	Broker's Call
204	Call Block Applies (Room To Room)
205	Flash For Waiting Call
206	Call Forwarding - Busy
207	Call Forwarding - No Answer
208	Call Forwarding - External
209	Call Forwarding - Always
210	Call Forwarding Inhibit on Dial-In Trunks
211	Call Hold and Retrieve Access
212	Can Flash If Talking to an Incoming Trunk
213	Can Flash If Talking to an Outgoing Trunk
214	Cannot Dial a Trunk after Flashing
215	Cannot Dial a Trunk if Holding or in Conference with One
216	Data Security
217	Direct To ARS
218	Directed Call Pickup
219	Discriminating Dial Tone
220	Do Not Disturb
221	Clear All Features
222	Call Forward Inhibit on Hold Timeout
223	Flash Disable
224	Flash for Attendant
225	Hold Pickup (Attendant Paged Access)
226	Inward Restriction (DID)
227	Lockout Alarm Applies
(Sheet 2 of 8)	

Table 23: Class of Service Options (Continued)

Option #	Class of Service Option / Name
228	Manual Line (Dial 0 Hotline)
229	COV/DNIC Voice Mail Port
230	Message Register Overflow Alarm
231	Message Waiting Setup - Bell
232	Message Waiting Setup - Lamp
233	Never a Consultee
234	Never a Forwardee
235	Originate Only
236	Outgoing Trunk Callback
237	Outgoing Trunk Camp-On
238	Override Security
239	Priority Dial 0
240	Line Privacy
241	Receive Only
242	Repeated Camp-On Beep
243	Non-Busy Extension
244	Room Status Applies
245	Abbreviated Dialing Access
246	SMDR - Extended Record
247	SMDR - Record Meter Pulses
248	TAFAS Any Access
249	TAFAS Access Tenant
250	TAFAS Access During Day Service
251	Transfer Dial Tone
252	Broker's Call with Transfer
253	Call Forward - Don't Answer Timer (2 - 6 Rings)
254	Call Hold Recall Timer (PBX Telephones) 0 - 10 Minutes
255	Repeated Camp-On Beeps Timer (5 - 15 Seconds)
256	UCD Music On Hold Timer (0 - 50 Minutes)
257	Flash Over Trunk
258	Display Prime as Forwarder
259	Message Sending
(Sheet 3 of 8)	

**Table 23: Class of Service Options (Continued)**

Option #	Class of Service Option / Name
260	Internal / External Split Call Forwarding
261	ONS Voice Mail Port
262	Ignore Forward Busy with Free Appearance
263	Delay Ring Timer (2 - 6 Rings)
264	Half Fwd NA timer for DID call with VM msg on
265	Voice Mail System Speed Dial Index (0-255)
266	Camp-on before Forward on Busy
267	Softkey Support for Voicemail
268	Record a Call in Voicemail
269	Record a Call: Start Recording Automatically
270	Record a Call: Start Recording on Hangup
271	Privacy Released at Start of Call
272	Guest Suite Extension
273	Display Held Caller ID to ONS/CLASS
274	ONS Ring Group Member
300	Automatic Callback
301	Camp-On
302	Flash-in Conference
303	Paging Zone 1 Access
304	Paging Zone 2 Access
305	Paging Zone 3 Access
306	Paging Zone 4 Access
307	Paging Zone 5 Access
308	Paging Zone 6 Access
309	Paging Zone 7 Access
310	Paging Zone 8 Access
311	Paging Zone 9 Access
312	Paging Default (0 - 9) (0 Gives All Enabled Zones)
313	CO Trunk to CO Trunk Connect
314	CO Trunk to TIE Trunk Connect
315	CO Trunk to DID Trunk Connect
316	TIE Trunk to TIE Trunk Connect
(Sheet 4 of 8)	

Table 23: Class of Service Options (Continued)

Option #	Class of Service Option / Name
317	TIE Trunk to DID Trunk Connect
318	DID Trunk to DID Trunk Connect
319	Extension Non-CO Trunk to Trunk Connect
320	Transparent Multi-Console Operation
321	Ignore Call Forward After Transfer
322	Confirm Wakeup by Off-hook
323	RESERVED
324	RESERVED
325	RESERVED
326	Account Code, Forced Entry - Data Internal Calls
327	Account Code, Forced Entry - Data External Calls
328	Account Code, Forced Entry - Data Long Distance Calls
329	RESERVED
330	RESERVED
331	RESERVED
400	Contact Monitor
401	Call Park
402	Long Loop (Off-Premise Extensions Only)
403	Trunk Recall Partial Inhibit
404	Recording Failure to Hangup Timer (1 - 255 Seconds)
405	RESERVED
406	RESERVED
407	RESERVED
500	Override
501	Override Announce
502	Display ANI/DNIS/CLASS Information
503	Display CLASS Name
504	SUPERSET 420 Optional Class Display
505	ONS Stations Support CLASS
506	ONS Positive Disconnect
507	Station/Set: Allow My Number to be Displayed
508	Station/Set: Show Internal Numbers on My Phone
(Sheet 5 of 8)	

**Table 23: Class of Service Options (Continued)**

Option #	Class of Service Option / Name
509	Display Caller ID for Non-Prime Lines
600	SUPERSET Tel. - Auto-Answer
601	SUPERSET Tel. - Auto-Hold Disable
602	SUPERSET Tel. - Background Music
603	SUPERSET Tel. - Disconnect Alarm
604	PBX SUPERSET Tel. - Automatic Outgoing Line
605	SUPERSET Tel. - Message Program
606	SUPERSET Tel. - Enhanced Answering Position
607	SUPERSET Tel. - Associated Modem Line
608	SUPERSET Tel. - Room Status Display
609	SUPERSET Tel. - Night Service Switching
610	SUPERSET Tel. - Guest Room Template (0 - 3) (DN)
611	SUPERSET Tel. - Limited New Call Ring
612	SUPERSET Tel. - Headset Operation
613	Display ANI Information Only
614	SUPERSET Tel. - Handset Volume Saved
615	SUPERSET Telephone - Offhook Voice Announce
616	Alarm Monitor Point
617	Immediate Off Hook Alarm
618	Alarm Audio Level for Sets
619	Direct Speak@Ease Access
620	SUPERSET Telephone - Max Call Logs Allowed <0-20>
650	ACD - Agent Template (0 - 3; 0 = Disable)
651	ACD - Supervisor Template (0 - 3; 0 = Disable)
652	ACD - Senior Supervisor Template (0 - 3; 0 = Disable)
653	ACD - Agent Always Auto-Answer
654	ACD - Display Path Always
655	ACD - Allow Continuous Monitor of Agent
680	Key System - Direct CO Access
681	Key Set/Sub Att. - Call Hold Notify Timer (0 -600 s)
682	Key System - Auto Answer - Internal Calls (For SUPERSET 3DN and 4DN only)
683	Key System - Direct Paging Handsfree Answerback

(Sheet 6 of 8)



Table 23: Class of Service Options (Continued)

Option #	Class of Service Option / Name
684	Can Make All Set Page
685	Can Receive All Set Page
686	Group Page Includes Overhead Paging
687	All Set Page Includes Overhead Paging
700	SMDR - Does Not Apply
701	No Dial Tone
702	SMDR - Overwrite Buffer
703	Message Register Applies
704	Incoming / Internal Modem Pooling Access
705	Automatic Overflow From Attendant
706	RESERVED
707	RESERVED
708	RESERVED
709	Follow External Call Forward
710	RESERVED
800	ANI Applies
801	Incoming Trunk Call Rotary
802	Limited Wait for Dial Tone
803	SMDR - Drop Calls < n Digits (0... 11, 0 = disable)
804	SMDR - Drop Incomplete Outgoing Calls
805	Trunk No Dial Tone Alarm
806	SMDR - Record Incoming Calls
807	SMDR - Display Private Speedcall
808	Special DISA
809	Standard Ring Applies
810	DISA During Night Service Only
811	ANI/DNIS Trunk
812	Loop Start Trunk to ACD Path Connect
813	Delay ONS Ring - Wait for Network Name (0-6 s)
814	SMDR - Record ANI/DNIS/CLASS
815	DTS/CO LINE KEY Honors Forwarding
816	CENTREX Flash over Trunk

(Sheet 7 of 8)

Table 23: Class of Service Options (Continued)

Option #	Class of Service Option / Name
900	Data Station Queuing
901	DTRX Herald
902	DTRX Message Code
903	DTRX Message Code Text
904	DTRX Complete Message Text
905	DTRX Herald Text Select (1- 4)
906	DATA SMDR - Does Not Apply
907	DATA SMDR - Extended Record
908	DATA SMDR - Overwrite Buffer
(Sheet 8 of 8)	

# System Options and Timers (CDE Form 04)

The following table lists system options and timers for LIGHTWARE 19 Release 2.0 software. Earlier software versions will not include all these options.

**Table 24: LIGHTWARE 19 Release 2.0 System Options and Timers**

Option #	System Option / System Timer Name
01	Clock Format (example 16:00, 4:00, 4:00 a)
02	Message Lamp Test Enable
03	Single Paging Amplifier
04	Message Waiting and Message Register Clear Print
05	Verified Account Codes
06	Analog Networking SMDR
07	Cancel 24-Hour Message Waiting
08	Five-Digit SMDR
09	Attendant Call Block
10	Attendant Conference Beeps
11	Automatic Wake-up
12	Automatic Wake-up Alarm
13	Automatic Wake-up Print
14	Automatic Wake-up Music
15	Data Demultiplexer
17	Discriminating Ringing
18	Discriminating Ringing Always
20	Holiday Messages
21	Incoming to Outgoing Call Forward
22	Last Party Clear - Dial Tone

(Sheet 1 of 5)

**Table 24: LIGHTWARE 19 Release 2.0 System Options and Timers  
(Continued)**

Option #	System Option / System Timer Name
23	Message Register Count Additional Supervisions
24	Message Register Audit
25	Message Register Zero After Audit
26	No Overlap Outpulsing
27	Room Status Audit
28	SMDR Indicate Long Call
29	Telephone Last Number Redial
31	Satellite PBX
32	Outgoing Call Restriction
33	Room Status
34	Auto Room Status Conversion / Auto Wake-up Print
35	DSS/BLF Call Pickup
36	End Of Dial Character (#)
37	Calibrated Flash
38	Switch-Hook Flash
39	DATA SMDR Indicate Long Calls
40	Message Register Follows Talker
42	ACD Silent Monitoring
43	ACD Silent Monitoring Beeps
44	ACD Reports
45	Disable PMS Logs
46	Digit Translation Plan (0 - 3)
47	ARS Unknown Digit Length Time-out (2 - 60 Seconds)
48	Limited Wait For Dial Tone (1 - 15 Seconds)
49	Pseudo Answer Supervision Timer (10 - 60 Seconds)
50	Dialing Conflict Timer (2 - 10 Seconds)
(Sheet 2 of 5)	

**Table 24: LIGHTWARE 19 Release 2.0 System Options and Timers  
(Continued)**

Option #	System Option / System Timer Name
51	Final Ring Time-out (1 - 30 Minutes)
52	Minimum Flash Timer (20 - 50 ms; in 10 ms increments)
53	Maximum Flash Timer (20 - 150 ms; in 10 ms incr)
54	DISA Answer Timer (1 - 8 Seconds)
55	Account Code Length (Variable or 4 - 12 Digits)
56	Auto Room Status Conversion / Wakeup Print Timer
57	Vacant / Reserved Room Default Call Restriction
58	Occupied Room Default Call Restriction
59	Receivers Reserved for Non-Auto-Attendant Use
60	Tone Plan Changing this value will cause a system reset
61	CLASS Receivers in SPINE Bay #1 (0..5)
62	CLASS Receivers in SPINE Bay #2 (0..5)
63	CLASS Receivers in SPINE Bay #3 (0..5)
64	CLASS Receivers in SPINE Bay #4 (0..5)
65	CLASS Receivers in SPINE Bay #5 (0..5)
66	CLASS Receivers in SPINE Bay #6 (0..5)
67	CLASS Receivers in SPINE Bay #7 (0..5)
68	DSP DTMF Receiver Channels (0..7) default = 7 Changing this value will cause a system reset
69	DTMF ON Timer (5-15 in 10 ms increments) default = 9 (90 ms)
70	DTMF OFF Timer (5-15 in 10 ms increments) default = 9 (90 ms)
71	Slot 10 FIM/CIM Capacity (2 or 3 Bays) Changing this value will cause a system reset
72	Slot 11 FIM/CIM Capacity (2 or 3 Bays) Changing this value will cause a system reset
73	Advance to Daylight Savings Time (mm:dd:hh)
76	Go Back to Standard Time (mm:dd:hh)
79	Daylight - Standard Time Difference (30 to 240 minutes)

(Sheet 3 of 5)

**Table 24: LIGHTWARE 19 Release 2.0 System Options and Timers  
(Continued)**

Option #	System Option / System Timer Name
80	MyAdministrator Access
84	Multiple Guest Suite Phones
85	Speak@Ease Integration
86	PRI Card: Q.SIG
87	Record a Call
88	Max TAPI desktops (0...50 in increments of 5)
89	CLASS Functionality for ONS Sets
90	ACD Real Time Event
91	PRI Card: NFAS
92	PRI Card: D-Channel Backup
93	PRI Card: Remote LAN Access
94	PRI Card: Min/Max
95	PRI Card: Auto Min/Max
96	Number of Links (0-8)
97	Support Softkey Access to Voicemail
98	Support 3DN and 4DN Set Types
99	Fax Tone Detection
100	MITEL Options Password
101	System Identity Code
102	Feature Level <0-99>
103	Maximum Devices
104	Maximum ACD Agents (Automatic Call Distribution, 0-100)
105	MITEL Application Interface
106	Automated Attendant
107	Lodging
108	Property Management System
109	Remote Software Download
(Sheet 4 of 5)	

**Table 24: LIGHTWARE 19 Release 2.0 System Options and Timers  
(Continued)**

Option #	System Option / System Timer Name
110	Maximum BNIC Cards (0 - 40)
111	Maximum BONS Cards (0 - 40)
112	SS4000 Series Sets
113	Centralized Attendant / Voicemail
(Sheet 5 of 5)	

# CDE Cross Reference Guide

FORM DEVICE or OPTION	01 - System configuration	02 - Feature Access Codes	03 - COS Define	04 - System Options/System Timers	05 - Tenant Interconnection Table	06 - Tenant Night Switching Control	07 - Console Assignments	08 - Attendant LDN Assignments	09 - Desktop Device Assignments	10 - Pickup Groups	11 - Data Circuit Descriptor	12 - Data Assignment	13 - Trunk Circuit Descriptors	14 - Non-Dial-In Trunks	15 - Dial-In Trunks	16 - Trunk Groups	17 - Hunt Groups	18 - Miscellaneous System Ports	19 - Call Rerouting Table	20 - ARS: COR Group Definition	21 - ARS: Day Zone Definition	22 - ARS: Modified Digit Table	23 - ARS: Route Definition	
ACD		A7	A4	A1	C	C					C	C		C	C				C					
Console	A1		B2	B	C	C	A2	B1						C	C				C	C		C	C	
Dataset	A1	C	B1		C	C	C			A2	A3					C			C			C	C	
DID Trunk	A1		B1		C	C	C	C				A2		A3					B	C				
DISA Dial In	A1	C	B1	C	C	C		C				A2		A3	B				B	A4		C	C	
E&M "Tie Trk"	A1	C	B1		C	C		C				A2		A3	A4				B	A5		C	C	
Hotel		C	B	A	C	C		C	B										C			C	C	
ISDN Device	A2		A5	A1					B		C	A3			B									
KeySystem	A1	C	B1		C	C		C	A2	C			C	C		C			C	C		C	C	
Modem	A1		A4					A2			C	C					B							
MOH	A1		C		C	C												A2	B					
Multiline set	A1	C	B1		C	C		C	A2	C			C	C		C			C	C		C	C	
Night Bell	A1												C	C				A2	C					
Non Dial In Trk	A1		B1		C	C		C	C			A2	A3		A4				C					
Pager	A1	B	C															A2						
Printer																								
RAD	A1		B1		C	C			A2							A3			C					
Single Line	A1	C	B1		C	C		C	A2	C			C	C		C			C	C		C	C	
UCD		C	C		C	C			C				C			A1			A2					
Verified Acct.		A2		A3			C		C			C			C						B1			B2

**Legend:**

- A Forms must have specific programming completed to perform the task.
- B Forms have direct impact on device operation.
- C Related to process, or device, but not mandatory. Digits denote the required order of entry.



24 - ARS: Route Lists	25 - ARS: Route Plans	26 - ARS: Digit Strings	27 - ARS: Maximum Dialed Digits	28 - Form Access Restriction Defn.	29 - DTE Profile	30 - Device Interconnection Table	31 - System Abbreviated Dial Entry	32 - CDE Data Print	33 - Account Code Entry	34 - Directed IO	35 - Global Find Access Code	36 - Modem Assignment	37 - Guest Rm SUPERSET KeysTemplate	38 - ACD Keys Template	39 - ACD Agent Groups	40 - ACD Supervisors	41 - ACD Paths	42 - T1 Link Descriptors	43 - T1 Link Assignment	44 - Network Synchronization	45 - BRI Devices	46 - Key System Toll Control	FORM /	DEVICE OR OPTION
				C		C	C		C	C			A5	A2	A3	A6								ACD
C	C	C				C	C		C	B		B												Console
C	C	C			A4				C	B		B												Dataset
						B	C																	DID Trunk
C	C	C				B	C		B2															DISA Dial In
C	C	C				A6	C		C															E&M "Tie Trk"
C	C	C								C		B												Hotel
		B																			A4			ISDN Device
C	C	C					C		C													C		Key System
					C							A3												Modem
																								MOH
C	C	C					C		C															Multiline set
						B																		Night Bell
																								Non Dial In Trk
																								Pager
										B1														Printer
																								RAD
C	C	C					C		C													C		Single Line
																								UCD
								A1														C		Verified Acct.

The CDE Cross Reference Guide identifies forms that require completion for each listed device.

Programming

## SX-200 EL/ML Feature Limitations

The SX-200 EL/ML system offers a wide range of features through software packages. A full description of these features appears in the E-docs under Program Features. Maximum capacities that apply to system features are listed in the following table.

**Table 25: Feature Limitations**

Feature	SX-200 EL/ML Limitations
Maximum number of simultaneous calls 2 cabinet configuration 7 cabinet configuration	90 248
Maximum number of speech paths or channels used by any call any call with DTMF	2 3
Maximum number of simultaneous consultations	5
Maximum number of simultaneous add-on (3-way) calls	5
Maximum number of simultaneous station-controlled conference calls	5
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	247
Maximum number of simultaneous callbacks that can be enabled	100
Maximum number of simultaneous call forwards that can be enabled	650
Maximum number of simultaneous "Dial 0" calls	48
Maximum number of ONS telephones ringing simultaneously per bay.	32
Maximum number of messages queued in the system	750
Maximum number of hunt groups	99

(Sheet 1 of 4)

**Table 25: Feature Limitations (Continued)**

Feature	SX-200 EL/ML Limitations
Maximum number of paths in ACD	99
Maximum number of ACD agents that may be defined	999
Maximum number of active agents in ACD per bay	25
Maximum number of calls that can be simultaneously connected to Music-on-Hold	unlimited
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 attendant consoles	11
Maximum number of attendant consoles on a Digital Line Card	4
Maximum number of calls that can be simultaneously held by one attendant	8
Maximum number of incoming calls that can be separately identified at the attendant console	8
Maximum number of LDNs that can be identified at the attendant console	9
Maximum number of LDNs	100
Maximum Number of Night Bells	25
Maximum number of calls waiting that can be displayed at a console	99
Maximum number of calls that can be waiting at a console	200
Maximum number of abbreviated dial numbers	1000
Maximum number SUPERSET Speed Dial numbers	2212
(Sheet 2 of 4)	

Programming

**Table 25: Feature Limitations (Continued)**

Feature	SX-200 EL/ML Limitations
Maximum number of trunk buffers for SMDR	200
Maximum number of DATA SMDR buffers	128
Maximum number of stations for SUPERSET 4001, SUPERSET 4015, SUPERSET 4025, SUPERSET 4090, SUPERSET 4125, SUPERSET 4150, SUPERSET 401+, SUPERSET 410, SUPERSET 420, SUPERSET 430, SUPERSET 3DN and 4DN telephones, DSS Modules, DSS/BLF Interface Units and ONS sets.	650
Maximum number of user devices (all sets, stations, trunks, consoles, stand alone datasets, and DMP units)	768
Maximum number of TAPI desktops running simultaneously per system	50
Maximum number of telephones sets using TAPI running simultaneously per bay	24
Maximum number of telephone sets using TAPI per DNIC card	3
Maximum number of lines: SX-200 EL Control cabinet SX-200 ML (RM) Control cabinet SX-200 ML (FD) Control cabinet SX-200 ML (FD) Control cabinet with a Control FIM Carrier SX-200 ML SPINE bay SX-200 Peripheral cabinet	96 96 96 84 48 96
Maximum number of T1 links per system SX-200 EL	8
SX-200 ML	4
Maximum Number of Page Groups	50
Maximum Number of Paging Zones	9
Maximum Number of Stations in a Page Group	unlimited
Maximum Number of Sub-attendants	25
Maximum Number of LDN Appearances	16
Maximum Number of Line Appearances	32

(Sheet 3 of 4)

Table 25: Feature Limitations (Continued)

Feature	SX-200 EL/ML Limitations
Maximum Number of Physical Ports SX-200 EL SX-200 ML	672 192
Maximum number of ISDN bays	6
Maximum number of T1 links including analog, ISDN Gateway, and ISDN PRI cards	8
Maximum number of BRI cards per bay	2
(Sheet 4 of 4)	



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## Chapter 5

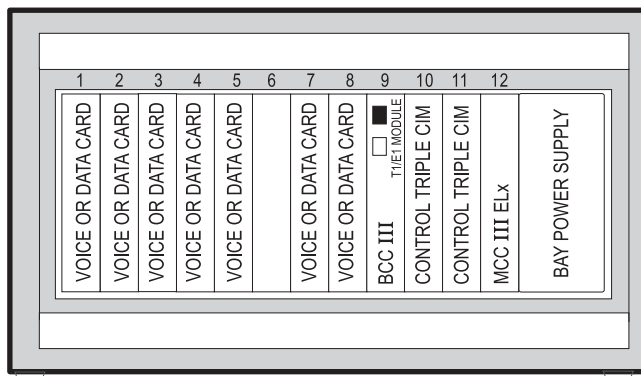
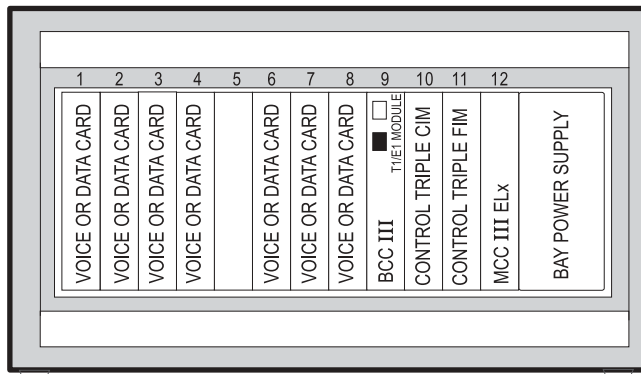
# Installation





# Cabinet Card Assignments

## SX-200 EL Control Cabinet Card Assignments

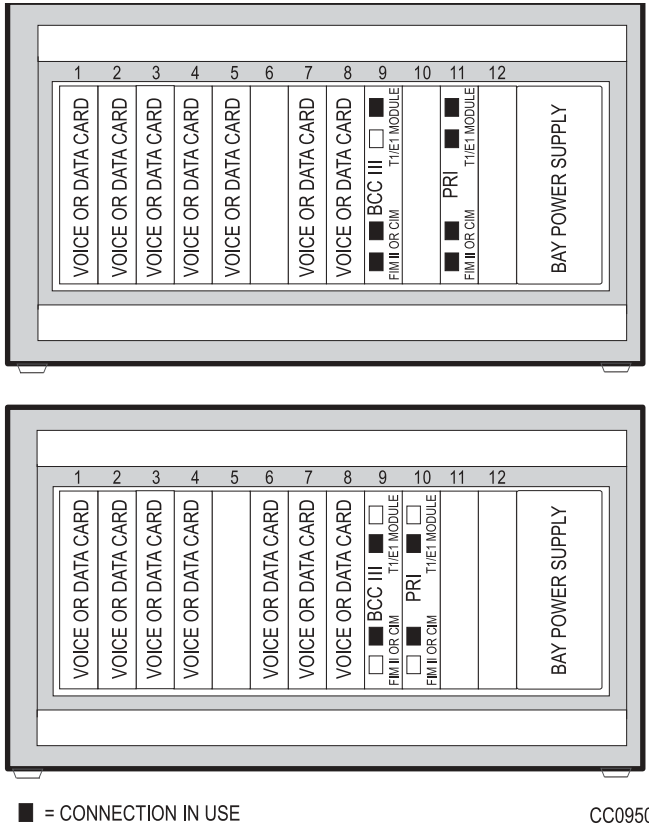


■ = CONNECTION IN USE

CC0949

Figure 19: SX-200 EL Control Cabinet Card Assignments

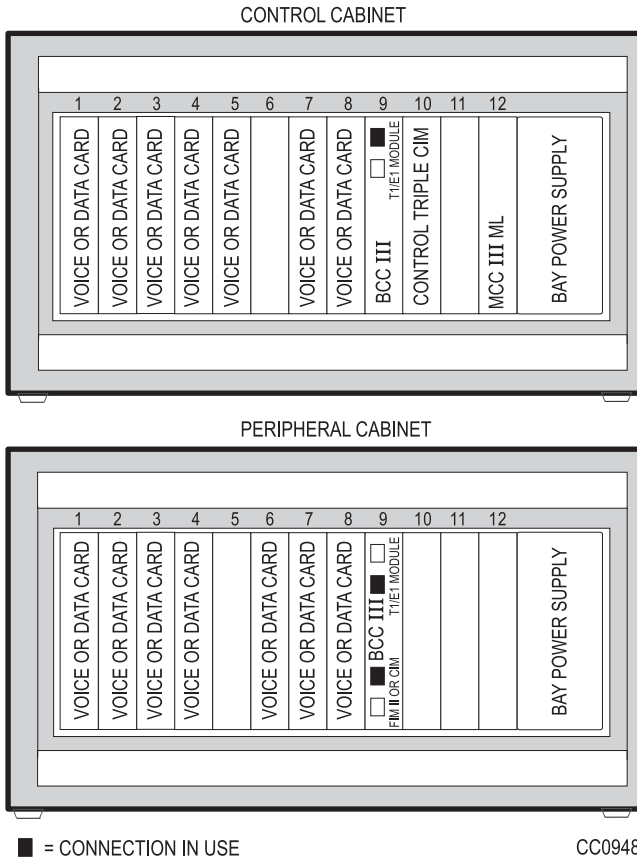
## SX-200 EL Peripheral Cabinet Card Assignments



**NOTE:** On the BCC III faceplate, a CIM uses only one of the connections; the FIM II uses two.

**Figure 20: SX-200 EL Peripheral Cabinet Card Assignments**

## SX-200 ML (RM) Cabinet Card Assignments



**NOTE:** On the BCC III faceplate, a CIM uses only one of the connections; the FIM II uses two.

**Figure 21: SX-200 ML (RM) Cabinets with BCC III Cards**

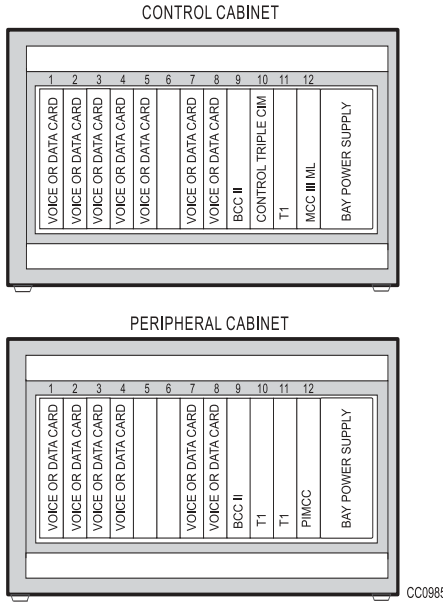


Figure 22: SX-200 ML (RM) Cabinets with BCC II Cards

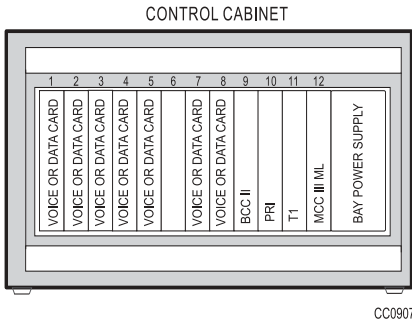
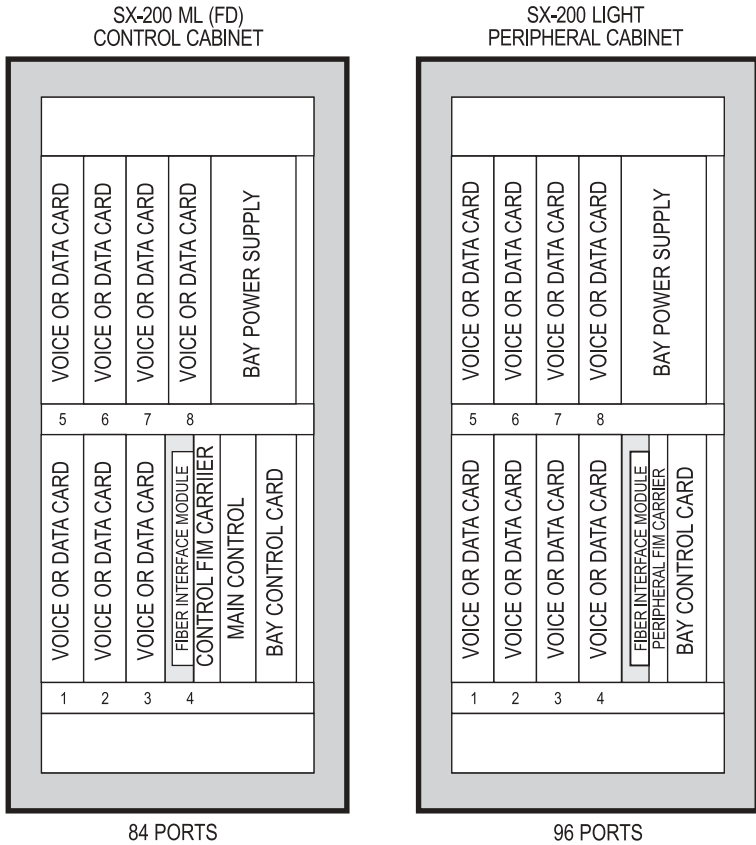


Figure 23: SX-200 ML (RM) Cabinet with a PRI Card

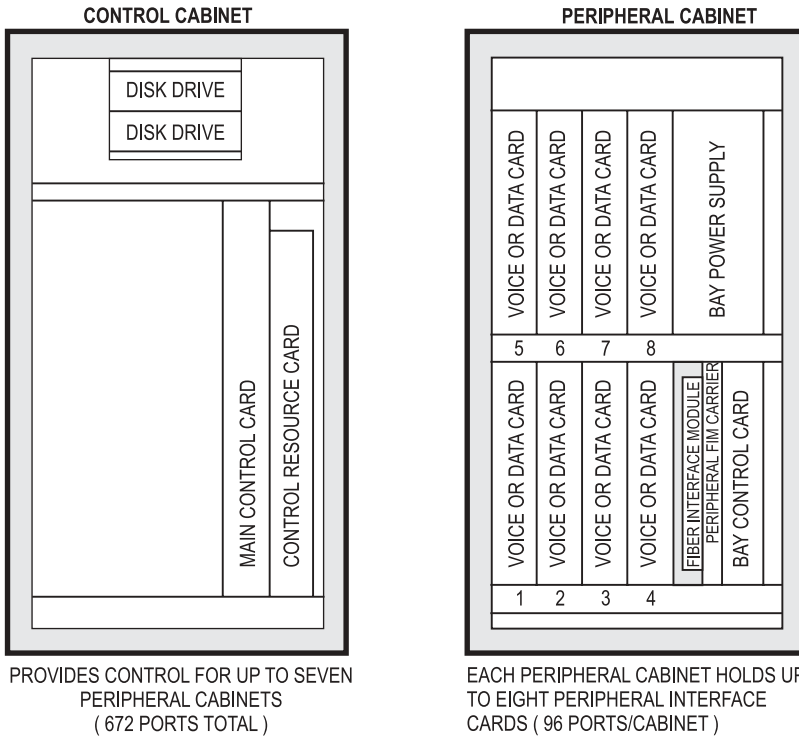
## SX-200 ML (FD) Cabinet Card Assignment



CC0813

Figure 24: SX-200 ML (FD) Cabinet Card Assignment

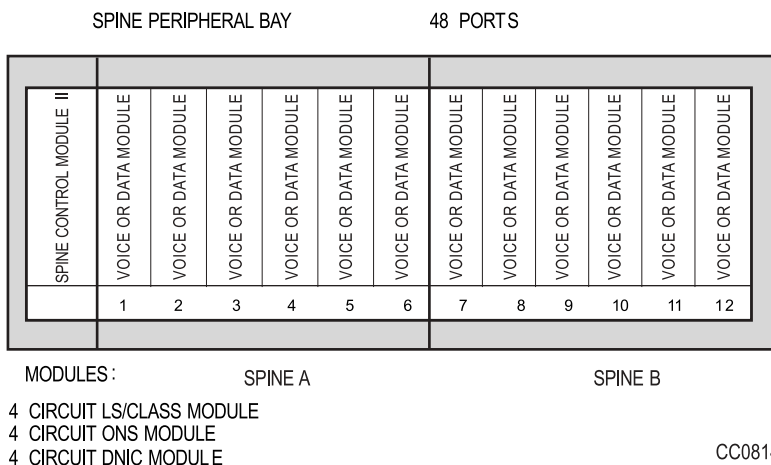
## SX-200 LIGHT Cabinet Card Assignment



CC0810

**Figure 25: SX-200 LIGHT Cabinet Card Assignment**

## SX-200 SPINE Peripheral Bay Module Assignment



**Figure 26: SX-200 SPINE Peripheral Bay Module Assignment**

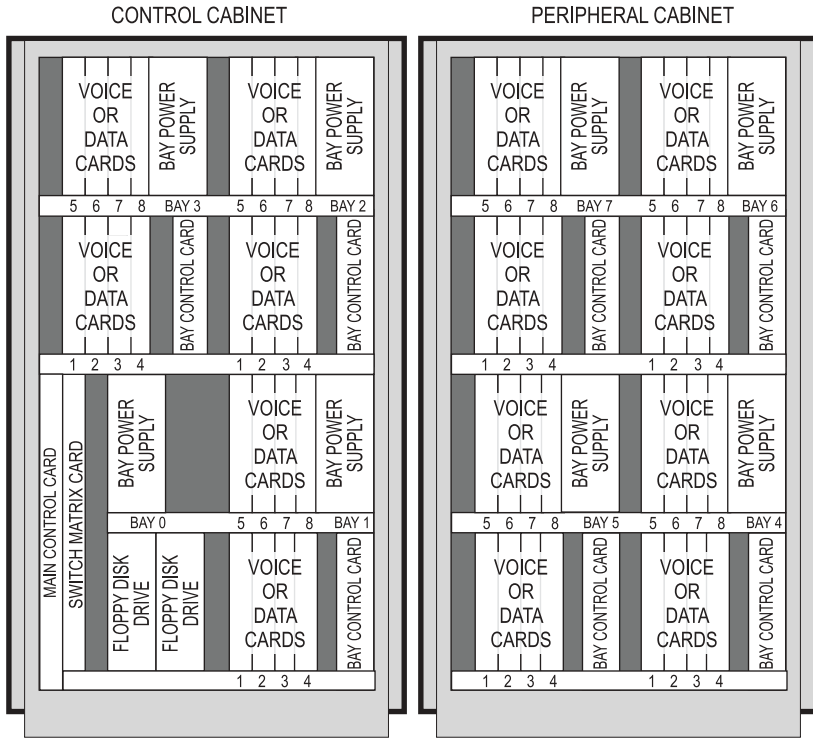
### SX-200 SPINE Configuration Rules

Allowable combinations of ONS modules with DNIC or LS/CLASS modules on each SPINE are described in the following table.

**Table 26: SX-200 SPINE Configuration Rules**

ONS Modules installed in SPINE A or SPINE B	DNIC and/or LS/CLASS Modules Allowed	
	SPINE A	SPINE B
0	6	6
1	4	5
2	2	4
3	0	3

SX-200 Digital 672-Port Cabinet Card Assignment



288 PORTS

384 PORTS

VOICE/DATA CARDS

6 CCT/CARD TRUNK

12 CCT/CARD ON PREMISE STATION

12 CCT/CARD DIGITAL LINE

6 CCT CONTROL OVER VOICE

6 CCT OFF PREMISE STATION

6 CCT DIRECT INWARD DIAL

T1/DS1 TRUNK

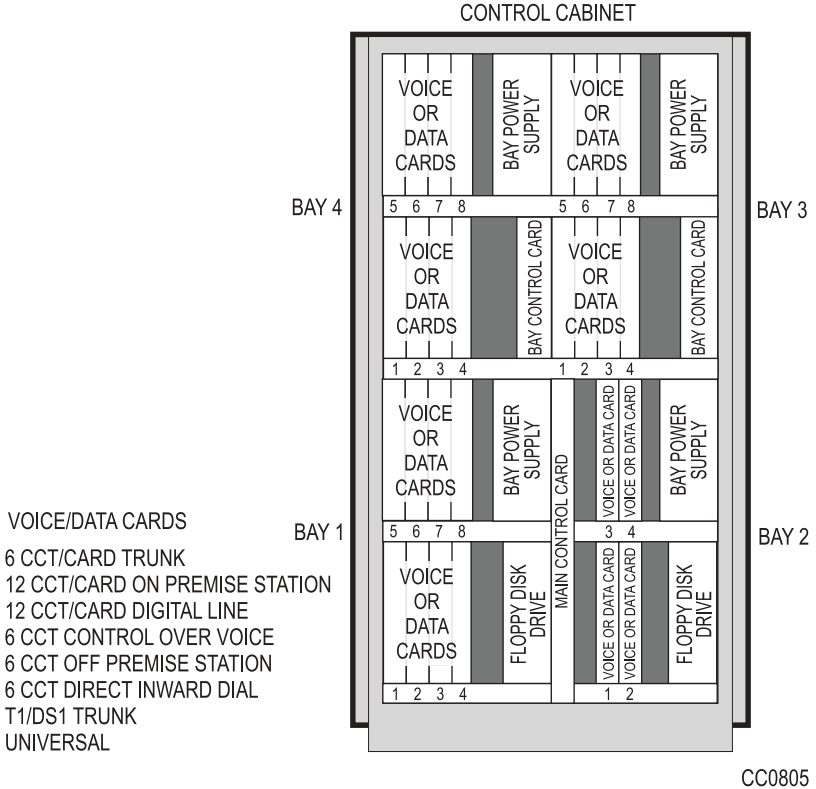
UNIVERSAL

CC0809

Figure 27: SX-200 Digital 672-Port Cabinet Card Assignment

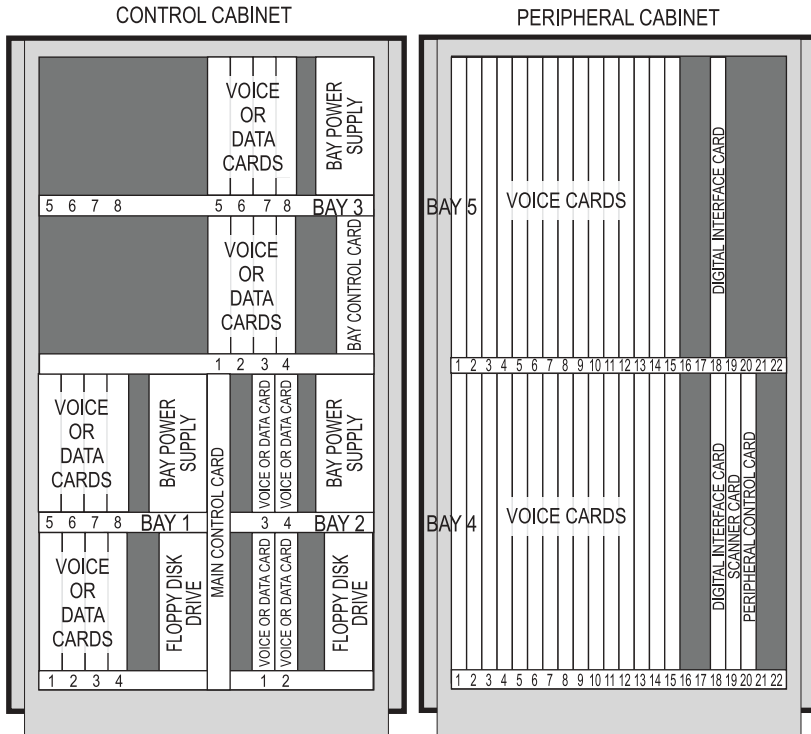


# SX-200 Digital 336-Port Control Cabinet Card Assignment



**Figure 28: SX-200 Digital 336-Port Control Cabinet Card Assignment**

## SX-200 Digital 456-Port Cabinet Card Assignment



**VOICE/DATA CARDS**

- 6 CCT/CARD TRUNK
- 12 CCT/CARD ON PREMISE STATION
- 12 CCT/CARD DIGITAL LINE
- 6 CCT CONTROL OVER VOICE
- 6 CCT OFF PREMISE STATION
- 6 CCT DIRECT INWARD DIAL
- T1/DS1 TRUNK
- UNIVERSAL

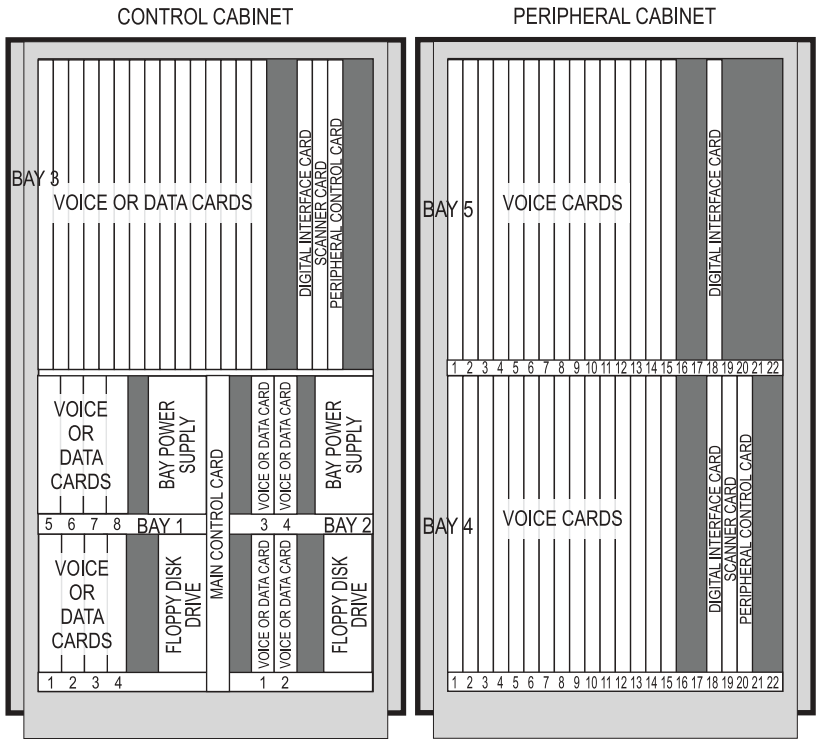
**VOICE CARDS**

- 8 CCT/CARD SS OR REGULAR
- 4 CCT/CARD C.O. TRUNK
- 2 CCT/CARD E&M
- LOOP-TIE TRUNK

CC0806

**Figure 29: SX-200 Digital 456-Port Cabinet Card Assignment**

# SX-200 Digital 480-Port Cabinet Card Assignment



144 VOICE/DATA PORTS (12 CARDS)  
 120 VOICE PORTS (15 CARDS)

CC0808

VOICE CARDS  
 8 CCT/CARD SS OR REGULAR  
 4 CCT/CARD C.O. TRUNK  
 2 CCT/CARD E&M  
 LOOP-TIE TRUNK

**Figure 30: SX-200 Digital 480-Port Cabinet Card Assignment**

Installation

# SX-200 DIGITAL Cable Routing

Table 27 identifies the cable routing for SX-200 DIGITAL PBX configurations.

**Table 27: Cable Assignments for SX-200 DIGITAL Cabinets**

Analog Bay Cables
Control cables P103 and P104 must remain (if P104 has single row of pins, it goes on the left side of the connector in Bay 4, and right side of the connector in Bay 5)
Voice cables P101 and P102 must be removed
480-port PCM Cables
COMBO Bay J17A to Analog Bay 3 DIC P2
COMBO Bay J17B to Analog Bay 4 DIC P2
Analog Bay 4 DIC P1 to Analog Bay 5 DIC P3
456-port PCM Cables
COMBO Bay J17A to Digital Bay 3 J17A
COMBO Bay J17B to Analog Bay 4 DIC P2
Analog Bay 4 DIC P1 to Analog Bay 5 DIC P3
336-port PCM Cables
COMBO Bay J17A to Bay 3 J17A
COMBO Bay J17B to Bay 4 J17A
672-port PCM Cables
Bay 0 J40A to Bay 1 J17A
Bay 0 J40B to Bay 2 J17A
Bay 0 J40C to Bay 3 J17A
Bay 0 J40D to Bay 4 J17A (intercabinet cable assembly)
Bay 0 J42A to Bay 5 J17A (intercabinet cable assembly)
Bay 0 J42B to Bay 6 J17A (intercabinet cable assembly)
Bay 0 J42C to Bay 7 J17A (intercabinet cable assembly)

# SX-200 EL/ML Configuration Rules

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## Cabinet Configuration Rules

- SX-200 EL Control Cabinet with MCC IIIEL or MCC IIIELx plus a maximum of six cabinets that include the following:
  - SX-200 RM Peripheral Cabinet
  - SX-200 LIGHT Peripheral Cabinet
  - SPINE Peripheral Bay
  - ISDN Bay (Network Gateway or PRI card)
- SX-200 ML (RM) Control Cabinet with MCC IIIML plus only one of:
  - SX-200 RM Peripheral Cabinet
  - SX-200 LIGHT Peripheral Cabinet
  - SPINE Peripheral Bay
  - ISDN Bay (Network Gateway or PRI card)
- SX-200 ML (FD) Control Cabinet with MCC II plus only one of:
  - SX-200 RM Peripheral Cabinet
  - SX-200 LIGHT Peripheral Cabinet
  - SPINE Peripheral Bay
  - Network Gateway (ISDN)

## Main Control Card Assignments for Each Cabinet Type

- Main Control Card IIIELx in a SX-200 ELx Control cabinet
- Main Control Card IIIEL in a SX-200 EL Control cabinet
- Main Control Card IIIML in an SX-200 ML (RM) Control cabinet
- Main Control Card II in an SX-200 ML (FD) Control cabinet

### FIM Carrier Assignments for Each Cabinet Type

- Control Triple CIM card (FIM II optional) with the SX-200 ELx control cabinet
- Control Triple FIM Carrier and FIM with the SX-200 EL control cabinet
- Control Dual FIM Carrier and FIM with the SX-200 EL control cabinet or SX-200 ML (RM) control cabinet
- Control FIM Carrier and FIM with the SX-200 ML (FD) control cabinet
- Peripheral Interface Module Carrier (FIM II or CIM) with the SX-200 ELx peripheral cabinet
- Peripheral FIM Carrier II with the SX-200 RM peripheral cabinet
- Peripheral FIM Carrier with the SX-200 LIGHT peripheral cabinet



In an SX-200 ELx cabinet, the BCC III can support a FIM II or a CIM in a peripheral cabinet and the PRI card can support a FIM II or a CIM in the main control cabinet and in the peripheral cabinet. Taking advantage of this can replace the need for a Peripheral FIM Carrier II or the Control Dual FIM Carrier.

### Configuration Rules for the Control Dual FIM Carrier Card

The SX-200 ML (RM) system is limited to only one peripheral cabinet (Bay 2):

- Slot 10 onboard FIM interfaces to first peripheral cabinet (Bay 2)
- Slot 10 add-on FIM interfaces to second peripheral cabinet (Bay 3)
- Slot 11 onboard FIM interfaces to third peripheral cabinet (Bay 4)
- Slot 11 add-on FIM interfaces to fourth peripheral cabinet (Bay 5)

### Configuration Rules for the Control Triple FIM Carrier Card

The Control Triple FIM Carrier Card can only be installed in a SX-200 EL system.

- Slot 10 first on-board FIM interfaces to first peripheral cabinet (Bay 2)
- Slot 10 second on-board FIM interfaces to second peripheral cabinet (Bay 3)
- Slot 10 add-on FIM interfaces to fifth peripheral cabinet (Bay 6)
- Slot 11 first on-board FIM interfaces to third peripheral cabinet (Bay 4)
- Slot 11 second on-board FIM interfaces to fourth peripheral cabinet (Bay 5)
- Slot 11 add-on FIM interfaces to sixth peripheral cabinet (Bay 7)

### Configuration Rules for the Control Triple CIM Card

The Control Triple CIM card has a S1 switch that sets the card as a triple interface card (switch 4 closed) or a double interface card (switch 4 opened).

If the S1 switch on the Control Triple CIM card is set to take two circuits (emulates the control dual carrier card), the following positions are hard coded in the software:

- Slot 10 embedded CIM #1 interfaces to Bay 2.
- Slot 10 embedded CIM #2 interfaces to Bay 3.
- Slot 11 embedded CIM #1 interfaces to Bay 4.
- Slot 11 embedded CIM #2 interfaces to Bay 5.

If the S1 switch on the Control Triple CIM card is set to take three circuits (emulates the control triple carrier card), the following positions are hard coded in the software:

- Slot 10 embedded CIM #1 interfaces to Bay 2.
- Slot 10 embedded CIM #2 interfaces to Bay 3 .
- Slot 10 embedded CIM #3 interfaces to Bay 6.
- Slot 11 embedded CIM #1 interfaces to Bay 4.

## Technician's Handbook

- Slot 11 embedded CIM #2 interfaces to Bay 5.
- Slot 11 embedded CIM #3 interfaces to Bay 7.



A FIM II module can take the place of a CIM circuit on the Control Triple CIM Card. Setting switch 1, 2, or 3 closed on the S1 switch defines which specific CIM circuit that the FIM II replaces. The FIM II will then interface to the bay that was assigned to that CIM circuit.

### Configuration Rules for the PRI Card

The main control cabinet supports one PRI card in Slot 10 or 11.

- The PRI card in slot 10 is Bay 2.
- The PRI card in slot 11 is Bay 4.
- The FIM II or CIM on the PRI card in slot 10 interfaces to Bay 3.
- The FIM II or CIM on the PRI card in slot 11 interfaces to Bay 5.

### T1 Trunk Rules for SX-200 RM Cabinets

- LIGHTWARE 18 and greater software supports up to two T1 links (includes T1 links from T1/E1 modules and T1 cards) in any bay with a maximum of eight T1 links in the system.
- The MOSS System Option 96, Number of Links (0-8) monitors how many T1 links (from T1/E1 modules) that the system will support. This count includes T1 links from the T1/E1 modules on the PRI cards and BCC III cards. The count does not include T1 links from the T1 cards.
- PIC slot 5 must be left vacant when a T1 card is installed in slot 10 or when Link 1 from a T1/E1 module on a BCC III is programmed.
- PIC slot 6 must be left vacant when a T1 card is installed in slot 11 or when Link 2 from a T1/E1 module on a BCC III is programmed.



Do NOT insert T1 trunk cards into slots 5 or 6.



## Digital Line Card Rules for SX-200 RM Cabinets

Systems with BCC II cards have performance limits:

- In high traffic configurations, keep the Digital Line Card (DLC) count to a maximum of 7 per bay when using BCC II cards. If you have 8 DLCs per bay, keep the device count to 84 or less. This will avoid slow softkey response during peak traffic periods.
- With 2 T1 cards in a bay, do not add more than 5 DLCs or 60 devices. This avoids dial tone delays during peak traffic periods.
- With 1 T1 card in a bay, do not add more than 6 DLCs or 72 devices. This avoids dial tone delays during peak traffic periods.



A BCC III supports 8 DLCs per bay and is therefore ideal for high traffic conditions.

## PRI Card Rules for SX-200 RM Cabinets

- The PRI card requires the SX-200 ELx cabinet Rev. 4.4 or greater (PN 9109-600-002-NA) with LIGHTWARE 17 Release 4.0 or greater. The PRI card also requires a Stratum 3 MCC.



You can only install the PRI card in a SX-200 ELx cabinet. Inserting the PRI card in a peripheral interface card slot in any other SX-200 cabinet will cause the power supply to fail.

- Only install one PRI card in a main control cabinet; Slot 10 for the SX-200 ML and Slot 10 or 11 for the SX-200 EL.
- Install the PRI card in a peripheral cabinet for a SX-200 EL system with six or seven bays. This avoids the PRI card using the slot for the Control Triple FIM Carrier card in the main control cabinet.



To change the termination type (the transmit and receive) for the PRI links, change the stuffing of the jumper block on the LT/NT connector. Two LT/NT connectors on the T1 module accommodate the two T1 links. LT is for the network side and NT is for the user side.

## Technician's Handbook

- The PRI card in slot 10 of the main control cabinet will appear to the system as Bay 2. The PRI card in slot 11 of the main control cabinet will appear to the system as Bay 4.



Because the system counts the PRI card as a peripheral bay, the T1/E1 module on the PRI card does NOT occupy the peripheral interface slots 5 and 6 in its residing cabinet.

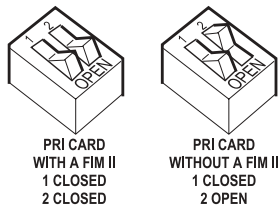
- The PRI card in a main control cabinet does not require a FIM II or CIM because the PRI card connects directly to the backplane. You can put a FIM II or CIM on the PRI card to connect the main control cabinet to a peripheral cabinet. The interface module (FIM II or CIM) on the PRI card in slot 10 would connect to Bay 3; in slot 11 would connect to Bay 5.
- Install a maximum of two PRI cards into a SX-200 EL peripheral cabinet; slots 10 and 11.
- The PRI card in a peripheral cabinet does require a FIM II or CIM to connect to the main control cabinet. The system counts the PRI card as a peripheral bay. The PRI card bay number corresponds to the position that the FIM II or CIM terminates on with the Control FIM Carrier card or the Control Triple CIM card.



A S1 switch on the PRI card controls where the source of the clock and link signals come from (the backplane or the interface module: FIM II or CIM).

Switch 1 closed and 2 open provides a backplane source.

Switch 1 and 2 closed provides an interface module source.



CC0919

**Figure 31: S1 Switch Settings for the PRI Card**

# Initial Power-up Procedure (SX-200 EL/ML)

---



If powering up a single cabinet system, immediately revise Alarm Thresholds to eliminate PCM alarms (software defaults to a multi-cabinet system).



Users must purchase the option and its associated password through their usual ordering channels prior to attempting to install or implement the option.

When the system is first installed, use the following procedure to enter the database into the system using CDE.

1. Verify that the options identified on the MOSS have been purchased.
2. Ensure that the System ID module is installed.



Refer to the *SX-200 EL/ML Technical Documentation, Installation Procedures*.

3. Insert the flash memory card into the slot on the Main Control Card (make sure the toggle switch on the edge opposite the connector edge of the flash memory card has the Write Protect disabled).
4. Turn the power supply ON, and wait for the power-up sequence to complete.
5. Press RETURN four times; the terminal display returns:
  - 1 - VT100™ COMPATIBLE
  - 2 - TTY TYPE
  - 3 - IBM PC
 SELECT A TERMINAL TYPE :
6. Select the terminal type by entering "1". The display returns:
  - 1 - MAINTENANCE
  - 2 - CDE
  - 6 - QUIT
 SELECT AN APPLICATION ( OR QUIT TO START OVER ) :

## Technician's Handbook

7. Select the Customer Data Entry application by entering "2". The display returns:  
ENTER USERNAME :
8. Enter the INSTALLER level of access. The display returns:  
ENTER PASSWORD:
9. Enter the required password to access Customer Data Entry. The default password is 1000.  
  
A list of the system's forms is displayed.
10. Select Form 04 and press the return key once to enable the software options that were purchased .You must enter the Maximum Devices and Maximum ACD Agents options, if these options are purchased.



For a seven cabinet configuration set option 71 to 3 bays. Confirm. Set option 72 to 3 bays. Confirm. Enter to save the options. A message appears that states a reset is required. Select Confirm to reset the system.

11. Enter the 8 right-most digits of the MITEL Options password to activate the enabled features. The password must be the password that is printed on the MOSS sheet. The MOSS sheet is included with the system software package.
12. Press ENTER.



Enable only the purchased options listed on the MOSS sheet for this system.



An E.8 error results when a purchased option is not enabled, when an enabled option is not purchased, or when the MOSS password does not match, or when the system id does not match.

Both the top and lower seven-segment LEDs show "-" when completed successfully.

# System Initialization Sequence

## SX-200 EL/ML Initialization

**Table 28: Main Control Card Codes**

Codes	System Function	Action
Top LED: E. Lower LED: 8	MOSS Verification	For SX-200 EL/ML, the MITEL Options password, selected options, or system id does not match. Verify the options and the system id; then, enter the password again. For SX-200 LIGHT/DIGITAL, the decryption module is not correct.
Top LED: A Lower LED: - circles clockwise	Database Upload	Indicates that a customer database backup is in progress, or that a log text file is being saved to the user's PC storage medium.
Top LED: A Lower LED: - circles counter-clockwise	Database Restore	Indicates that a customer database restore from the user's PC storage medium to the system is in progress.
Top LED: C Lower LED: -	Database Verification	During a system reboot or power up (after C is pressed within 10 sec.) the system clears the default customer database in the random access memory and resets the system.
Top LED: F Lower LED: - circles counter-clockwise	Flash Memory Access	Indicates that the system software on the flash memory card is being accessed.
Top LED: H Lower LED: - circles clockwise	Software Decompression	Indicates that the system software is in the process of decompressing.
Top LED: - Lower LED: -	Normal Operation	Indicates normal system operation when no applications are using the status indicators.

SX-200 LIGHT/DIGITAL Initialization

**Table 29: 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 Independent Test	7	E7
Memory Address Test	8	E8
Memory Space Test	9	E9
** Booting System Software	b or b.	Eb or Eb.
Parity Test	P	EP
Top of RAM determined and displayed	1.2.2.2.4. 005C0	
Main load being read in from disk	L	E (flashing) L
Huffman encoded load being decoded	H	E (flashing) H
Main load running	- -	

\* Power Supply Power Fail Sense can cause this test to fail.

\*\* Upon test failure, test error codes will be flashed for 1 second, after which testing will begin again from test 1.

**SX-200 LIGHT/DIGITAL Main Control Card Power-Up Error Codes**

Table 30 shows the Main Control Card numeric display error codes which may appear during start-up. Also shown are the most likely causes of the error condition.

**Table 30: Main Control Card Power-Up Error Code Summary**

Error Code	Likely Cause(s)
(blank)	<ul style="list-style-type: none"> <li>• Faulty power system - refer to that procedure.</li> <li>• Faulty Main Control Card.</li> </ul>
0	<ul style="list-style-type: none"> <li>• Faulty or loose flea clip W3 (if applicable)</li> <li>• Faulty Main Control Card.</li> </ul>
E 0	<ul style="list-style-type: none"> <li>• Unseated DRAM Module or DX Module.</li> <li>• Faulty DRAM or DX module (see Note).</li> </ul>
E 1   E 3   E 4   or   E 5	<ul style="list-style-type: none"> <li>• Faulty Main Control Card.</li> </ul>
E 2	<ul style="list-style-type: none"> <li>• Unseated EPROM IC.</li> <li>• Faulty EPROM IC - replace Main Control Card.</li> </ul>
E 6   E 7   E 8   or   E 9	<ul style="list-style-type: none"> <li>• Unseated DRAM Module.</li> <li>• Faulty DRAM Module - replace Main Control Card.</li> </ul>
E b.	<ul style="list-style-type: none"> <li>• Please note difference between "E" and "E.". (See below in this table for E. codes.)</li> <li>• Faulty disk drive connections.</li> <li>• Faulty installation of diskette.</li> <li>• Incorrect or damaged diskette - ensure that the write protect sticker has been removed.</li> <li>• Faulty diskette - replace.</li> <li>• Incorrect setting of switch S3 on Main Control Card - ensure that it is in the OFF, or OPEN position (pointed upward with respect to the board).</li> <li>• Faulty disk drive.</li> <li>• Faulty Main Control Card.</li> </ul>
E C	<ul style="list-style-type: none"> <li>• System will not boot, unable to change system configuration.</li> </ul>
Sequence: 2 3 8   9   b   b	<ul style="list-style-type: none"> <li>• Faulty power system - refer to that procedure.</li> <li>• No disk in drive, bad drive, bad disks.</li> </ul>
(Sheet 1 of 2)	

Installation

**Table 30: Main Control Card Power-Up Error Code Summary (Continued)**

Error Code	Likely Cause(s)
2 3 4 5 6 or 7 0 0 0 0 0 0	<ul style="list-style-type: none"> <li>Problem in a digital bay/node - upper digit is the bay number. Refer to Bay Control Card procedures.</li> </ul>
2 3 4 5 6 7 n n n n n or n (where n is any number)	<ul style="list-style-type: none"> <li>Problem in a peripheral bay/node - upper digit is the bay/node number, lower digit is the card slot number. Use SHOW ALARMS command to gain further information (see note 2).</li> </ul>
E. n (where n is any number)	<ul style="list-style-type: none"> <li>Note difference between "E" and "E." (see above in this table for "E" codes).</li> <li>Problem with Disk Subsystem - refer to Floppy Disk Subsystem Troubleshooting.</li> </ul>
- -	<ul style="list-style-type: none"> <li>Nothing - indicates successful software download. This display may be immediately changed to display post boot-up codes (see note 2).</li> </ul>
(any other code)	<ul style="list-style-type: none"> <li>Faulty Main Control Card (see note 2).</li> </ul>
(Sheet 2 of 2)	

- NOTE:**
- The SX-200 LIGHT system must be equipped with the Switch Matrix Module instead of the DX Module used in the 336, 456 & 480-port systems or the Switch Matrix Card used in the 672 -port system.
  - A normal running system may show other codes (card diagnostics or errors). However, during start-up, only the codes in this table are possible. Any other code shown during start-up indicates a faulty Main Control Card.
  - Codes possible AFTER start-up include card diagnostics codes (last card location tested, top number indicates bay number, bottom number indicates card slot number - maintenance logs give results of test, i.e., pass or fail with cause), or disk error codes.



Refer to *SX-200 LIGHT/DIGITAL Floppy Disk Subsystem Troubleshooting Procedures (page 91)*.



## Adding a Peripheral Cabinet

---

1. Install the peripheral cabinet (including Bay Power Supply, Bay Control Card, and required Fiber or Copper Interface Module).
2. Connect the fiber or copper cable to the interface module in the control cabinet.
3. Power up the cabinet.

 Refer to *Powering Up the Nodes* (page 59).

4. Enter CDE mode on the maintenance terminal.
5. Select Form 01, System Configuration and configure the new cards (select node type as required).
6. Complete remaining CDE for the new cards.



Make sure there are enough devices available (CDE Form 04, Option 103).

Peripheral Interface Cards and Modules

Table 31: Peripheral Interface Cards and Modules

Peripheral interface card	Devices supported	Circuits	Maximum loop resistance/loop lengths
COV Line card high power	Voice Mail devices	6	Loop resistance: 280 W Loop length: 26 AWG - 1000 m (3300 ft.) 24 AWG - 1500 m (5000 ft.) 22 AWG - 2000m (6000 ft.)
DID Trunk card high power	Direct Inward Dial (DID) trunks from CO	6	Loop resistance: 2450 W Loop length: 26 AWG - 7986 m (25955 ft.) 22 AWG - 19995 m (64984 ft.)
LS/GS Trunk card low power	Ground start and Loop start CO trunks	6	not applicable
LS/CLASS Trunk card low power	Loop Start CO trunks	8	not applicable
ONS/CLASS Line card low power	DTMF telephone sets Rotary telephone sets	12	External loop resistance: 600 W External wire resistance: 400 W External loop length: 22 AWG - 1000 m (3300 ft.) 24 AWG - 1500 m (4875 ft.)
OPS Line card high power (low power in SX-200 EL/ML)	DTMF telephone sets Rotary telephone sets	6	External loop resistance: 1800 W External wire resistance: 1600 W External loop length: 26 AWG - 5853 m (19022 ft.) 22 AWG - 15240 m (49530 ft.)

(Sheet 1 of 3)

**Table 31: Peripheral Interface Cards and Modules (Continued)**

Peripheral interface card	Devices supported	Circuits	Maximum loop resistance/loop lengths
BRI card low power	Video conferencing Group 4 fax Internet Access Xpress Office Teleworker	24	Loop length of up to 18,000 feet (5.4 km)
Digital Line card (DNIC) low power (high power if a console is connected to a SX-200 LIGHT)	SUPERSET 4001, SUPERSET 4015, SUPERSET 4025, SUPERSET 4090, SUPERSET 4125, SUPERSET 4150, SUPERSET 401+, SUPERSET 410, SUPERSET 420, SUPERSET 430, SUPERSET 3DN, SUPERSET 4DN, DATASET 1100 and DATASET 2100, SUPERCONSOLE 1000 and SUPERSET 7000 consoles; MiLINK Data Module, and MiLINK PKM, DSS/BLF Interface Unit, MOH/Pager Unit, Digital Line Monitor	12	24 AWG (25 IWG) - 1000 m (3300 ft.) including up to 50 m (162.5 ft.) 22 AWG (22 IWG) quad wire and up to 3 m modular line cord without bridge taps
Mitel Express Messenger Card (DNIC, low power)	2, 4, 6, and 8 voice mail ports	NA	NA

(Sheet 2 of 3)

**Table 31: Peripheral Interface Cards and Modules (Continued)**

Peripheral interface card	Devices supported	Circuits	Maximum loop resistance/loop lengths
T1 Trunk Card high power	to CO or other PBX	24	maximum 655 shielded cable to Channel Service Unit
Universal card high power	Four modules: MOH/Paging DTMF Receiver, E&M Trunk, Console		Total power rating of modules on Universal card cannot exceed 10
Music-on Hold/Paging module		1 each	power rating = 1 loop length - not applicable
DTMF receiver module	DTMF telephone key-pads and end-to-end signaling equipment.	4	power rating = 2 loop length - not applicable
E&M trunk module	E&M tie trunk	1	power rating = 3 26 AWG - 1068 m (3500 ft.) 24 AWG - 1708 m (5600 ft.) 22 AWG - 2715m (8900 ft.)
Console module	interfaces to LCD console only (4-wire)	1	power rating = 5 loop length - 305 m (1000 ft.)
Peripheral Spine Node	Three Modules: LS/CLASS Trunk DNIC, ONS Line		
LS/CLASS Trunk module	4 LS/CLASS trunks plus SFT for circuit 1 (SPINE Bay only)	4	External loop resistance: 1600 W
DNIC module	(for SPINE Bay only)	4	22 or 24 AWG - 1000 m (3300 ft.) including up to 50 m (162.5 ft.) 22 AWG) quad wire and up to 3 m modular line cord without bridge taps.
ONS Line module	(for SPINE Bay only)	4	26 AWG - 700 m (2300 ft.) 24 AWG - 1128 m (3700 ft.) 22 AWG - 1784m (5850 ft.)
(Sheet 3 of 3)			

## Control and Digital Services Cards and Modules

Table 32: Digital Control and Digital Services Cards and Modules

Card or Module	Important Details
Main Controller II	For SX-200 ML FD control cabinet only
Main Controller IIIEL	For SX-200 EL control cabinet only
Main Controller IIIELx	For SX-200 EL control cabinet. Use the ELx cabinet (9109-600-002-NA)
Main Controller IIIML	For SX-200 ML (RM) control cabinet only
Main Controller	For SX-200 LIGHT and DIGITAL control cabinet only
Circuit Switch Matrix II	For SX-200 DIGITAL 672-port Bay 0 only
Control Resource Card	For SX-200 LIGHT control cabinet only
Bay Control Card II	One for each bay (except SX-200 LIGHT control cabinet and SX-200 DIGITAL COMBO bays)
Bay Control Card III	Requires the SX-200 ELx cabinet
Control Triple CIM Card	Requires the SX-200 ELx cabinet
Control FIM Carrier Card	For SX-200 ML FD and SX-200 LIGHT control cabinets
Control Dual FIM Carrier Card	For SX-200 EL and SX-200 ML (RM) control cabinets
Control Triple FIM Carrier Card	For SX-200 EL control cabinet only
T1 Trunk Card	A 24 circuit, high power card to CO or to another PBX, maximum distance is 655 feet of shielded cable to the Channel Service Unit
PRI Card	For the SX-200 ELx cabinet Rev 4.4 or greater (PN 9109-600-002-NA) with LIGHTWARE 17 Release 4.0 or greater Supports the T1/E1 module and the FIM II or CIM. The PRI card is not included in the high power card count. The PRI card is a separate bay.
T1/E1 module	Provides up to 2 T1 links of ISDN connectivity (24 or 48 channels) on the PRI card. Provides up to 2 T1 links of T1/D4 connectivity on the BCC III.
(Sheet 1 of 2)	

**Table 32: Digital Control and Digital Services Cards and Modules (Continued)**

Card or Module	Important Details
FIM II	Installs on the Control Triple CIM Card in the main control cabinet, on the BCC III in a peripheral cabinet , on the PRI card in a main control cabinet or a peripheral cabinet, or on the Peripheral Interface Module Carrier Card
Copper Interface Module (CIM)	Installs on the BCC III in a peripheral cabinet , on the PRI card in a main control cabinet or a peripheral cabinet, or on the Peripheral Interface Module Carrier Card
DSP Module (Single)	Installs on the BCC III. Provides CLASS functionality for 8 ONS/CLASS Line cards, 16 DTMF receivers and 16 conference conference bridges for Record a Call.
(Sheet 2 of 2)	

## E&M Trunk Card Settings

Set switches S-1 to S-8 on the E&M trunk module (1 = closed = on, 0 = open = off, x = don't care).

**Table 33: E&M Trunk Module Switch Settings**

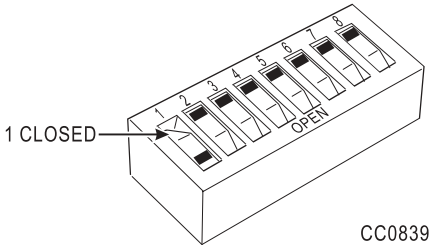
Function	Switches							
	1	2	3	4	5	6	7	8
<b>PBX to Line Gain</b>								
3 dB	0	X	X	X	X	X	X	X
-13 dB	1	X	X	X	X	X	X	X
<b>Line to PBX Gain</b>								
-4 dB	X	0	X	X	X	X	X	X
-11dB	X	1	X	X	X	X	X	X
<b>Termination</b>								
600 ohm	X	X	1	0	X	X	X	X
Complex	X	X	0	1	X	X	X	X
<b>Transmission</b>								
2-wire	X	X	X	X	1	X	X	X
4-wire	X	X	X	X	0	X	X	X
<b>Signaling</b>								
Type 1	X	X	X	X	X	1	X	X
Type 5	X	X	X	X	X	0	X	X

**The S1 Switch Settings for the T1 Trunk Cable Length (not loop length)**

0 - 45.8 m (0 - 150 ft.) 1 only closed (see figure below)

45.8 - 137.3 m (150 - 450 ft.) 2, 3, 4 closed

137.3 - 200.5 m (450 - 655 ft.) 5, 6, 7 closed



**Figure 32: S1 Switch Showing 1 Closed**

**Control Resource Card Switch Settings**

**Table 34: Control Resource Card Switch Setting**

	<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>S4</b>
Normal Operation	Closed	Closed	Not Used	Not Used
Forced Maintenance to Control	Open or Closed	Open	Not Used	Not Used
Forced Maintenance to Peripheral	Open	Closed	Not Used	Not Used

**NOTE:** Open is pressing the switch to the left (away from the PCB); close, to the right (towards the PCB).



## Adding an SX-200 IP Node

---

1. Install the SX-200 EL Cabinet.
2. Install the SX-200 MCC IIIELx Card.
3. Install the Control Triple CIM Card.
4. Install an Ethernet Switch.
5. Position the IP Node.
6. Using an Ethernet crossover cable, connect the Control Triple CIM Card to the CIM Port on the SX-200 IP Node.

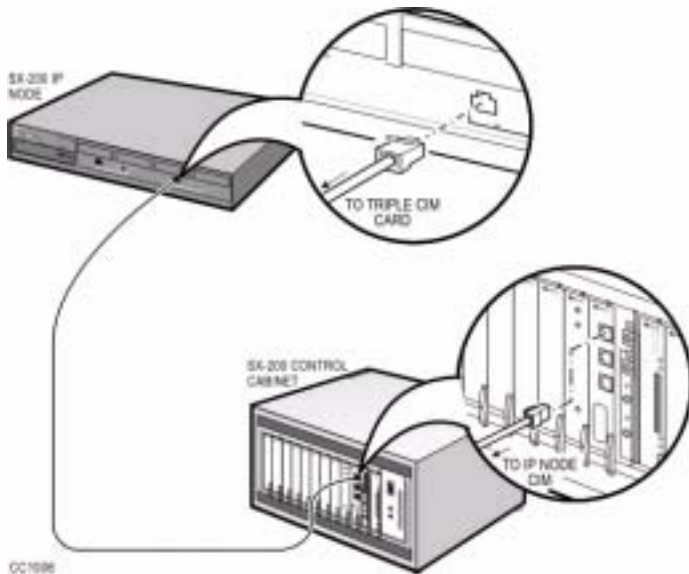
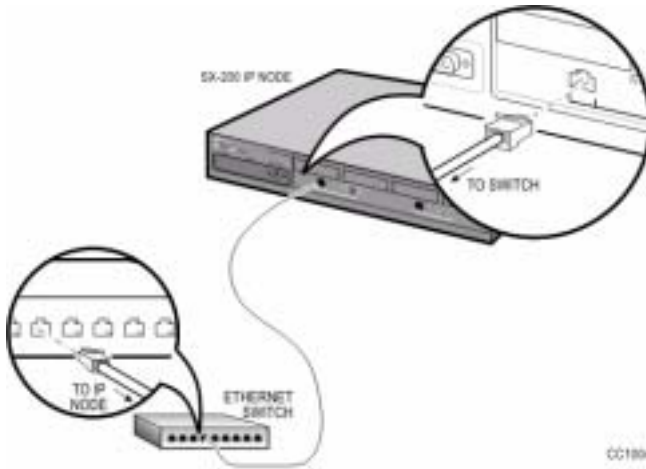


Figure 33: Connecting a Triple CIM Card to the SX-200 IP Node

- Using an Ethernet crossover cable with RJ45 Connectors, connect the SX-200 IP Node to an Ethernet Switch.



CC1804

**Figure 34: Connecting an SX-200 IP Node to an Ethernet Switch**

- Program the IP Node as documented in "Programming an SX-200 IP Node" on page 131.
- Connect the IP phones to the Ethernet Switch.
- If you did not program the MAC Addresses of each IP phone in CDE Form 09, register the IP Phones as documented in "Registering IP Phones (Optional)" on page 135.

# Control Triple CIM Card Switch Settings

The S1 switch (switch 4) on the Control Triple CIM card determines whether the card provides a double interface or a triple interface.

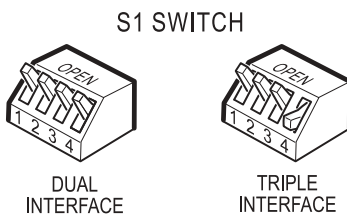
The S1 switch (switch 1, 2, or 3) substitutes one of the CIM circuits for a fiber circuit.

If the Control Triple CIM card is to provide a triple interface (emulate a control triple carrier card with 9 links), verify that switch 4 on the S1 switch is in the closed position (the default).

If the Control Triple CIM card is to provide a double interface (emulate a control dual carrier card with 6 links), set switch 4 to the open position.

If a FIM II is installed on the Control Triple CIM card, set the S1 switch to assign a circuit to the FIM II. Closing switch 1, 2, or 3 replaces the CIM circuit 1, 2, or 3 respectively. Close only one of these switches. The FIM II takes on the configuration rules of the CIM circuit that it replaces.

For example, a FIM II replacing CIM circuit #1 (in slot 10) connects to the FIM or FIM II in Bay 2. A FIM II replacing CIM circuit #1 (in slot 11) connects to the FIM or FIM II in Bay 4.



SWITCH	FUNCTION	
	OPEN	CLOSED
1	-----	FIM ON BAY 2/4
2	-----	FIM ON BAY 3/5
3	-----	FIM ON BAY 6/7
4	DUAL	TRIPLE

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# Peripheral Interface Cabling

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Use the tables in this section to connect backplane connectors to the main distribution frame.

## USOC Pin Designations

The USOC connector numbers are

- RJ21X for CO trunks
- RJ2EX for 2-wire E&M trunks
- RJ2FX for 4-wire E&M trunks
- RJ2GX for 4-wire E&M trunks
- RJ2HX for 4-wire E&M trunks.

## SX-200 EL/ML Peripheral Interface Card Slot Assignments

With LIGHTWARE 17 and greater, the SX-200 EL/ML cabinets do not have high power and low power designations. Slots 1 to 8 can accept any peripheral interface card, except T1 trunk. A maximum of four high-power cards are allowed (there are no high-power or low-power slots). Beginning at slot 1, the system accepts the first four high power cards it detects. The high-power cards are DID, Universal, COV, and T1. T1 Trunk cards can be installed in slots 10 and 11 only, but they require slots 5 and 6 respectively to be left empty. Software recognizes slots 5 and 6 as being occupied and the T1 cards are counted as high power cards in slots 5 and 6.

Table 35: BRI Port to Tip/Ring Assignment

BRI Module Number	BRI Module Port Number	Tip/Ring Pair Number
1	1	9
1	2	10
1	3	11
1	4	12
2	1	3
2	2	4
2	3	5
2	4	6
3	1	1
3	2	2
3	3	7
3	4	8

- NOTE:**
1. The number 1 BRI module is installed in the upper left corner of the BRI card. The number 2 BRI module is installed below the number 1 BRI module, and the number 3 BRI module is installed beside the number 2 BRI module.
  2. BRI cards are "hot-swappable"; that is, that you can replace a configured, running BRI card while the power is on. You may also de-program the BRI card, install the card, and re-configure the card for another slot.
  3. Each BRI module can be configured with either line-side or trunk-side interfaces (all four circuits on a module must be in the same mode). Line and trunk side interfaces are software-programmable (using CDE forms), and no jumper changes are needed.
  4. If you deprogram a BRI card, remove the BRI card from the cabinet as soon as possible. This action decreases the load on the BCC III.
  5. After deprogramming a BRI card, remove the BRI card from the slot BEFORE installing a BRI card in another slot.
  6. The U bus can be converted to an S/T interface using an NT 1 where required.
  7. Use IMAT to obtain the BRI card's maintenance logs. The Maintenance module provides serial connectivity to the PC (IMAT) for BRI maintenance.

**Table 36: SFT Port (J7)**

Pin	Signal
1	nc
2	-48 V SFT
3	-48 R SFT
4	SFT0R
5	SFT0
6	nc

**Table 37: Music-on-Hold/Pager Unit Pinouts**

Wire	Signal	Color	Description
32	MOH-	R-O	Music-on-Hold Inputs
7	MOH+	O-R	
34	PAGE-	R-BR	Paging Input/Output
9	PAGE+	BR-R	
36	PAGEREL(NC)	BK-BL	Page Relay, Normally Closed contact
11	PAGEREL(C)	BL-BK	Page Relay Common
37	PAGEREL(NO)	BK-O	Page Relay, Normally Open contact
12	PAGEREL(C)	O-BK	Page Relay Common
39	NIGHTBELL1-	BK-BR	Night Bell 1 relay contacts
14	NIGHTBELL1+	BR-BK	
41	NIGHTBELL2-	Y-BL	Night Bell 2 relay contacts
16	NIGHTBELL2+	BL-Y	
45	ALARM-	Y-S	Alarm relay contacts
20	ALARM+	S-Y	
50	RING	V-S	Connection to DNIC Line
25	TIP	S-V	Connection to DNIC Line

**Table 38: Copper Interface Ports**

Pin	Signal	
1	RX+	TX+
2	RX-	TX-
3	TX+	RX+
4		
5		
6	TX-	RX-
7		
8		

**NOTE:** The CIM ports are the same whether the card has a control end connection or a peripheral end connection. Connections from the control cabinet to the peripheral cabinet require Category 5 UTP (unshielded twisted pair) cable with TX and RX pairs reversed.

**Table 39: Maintenance Terminal and Printer Ports**

Pin	Signal
1	DTR *
2	RXD
3	TXD
4	DTR *
5	GND
6	DSR *
7	RTS **
8	CTS **
9	nc


**NOTE:** The RS-232 ports (Maintenance, Printer, J10, J11) are all configured as DTE type. All backplane connections use DB-9 connectors. The pins with \* and \*\* are connected together on PRI maintenance ports (slots 10 and 11).

**Table 40: Maintenance Module Port**

Pin	Signal
1	RTS *
2	CTS *
3	TXD
4	GND
5	RXD
6	DSR **
7	DTR **
8	DCD **

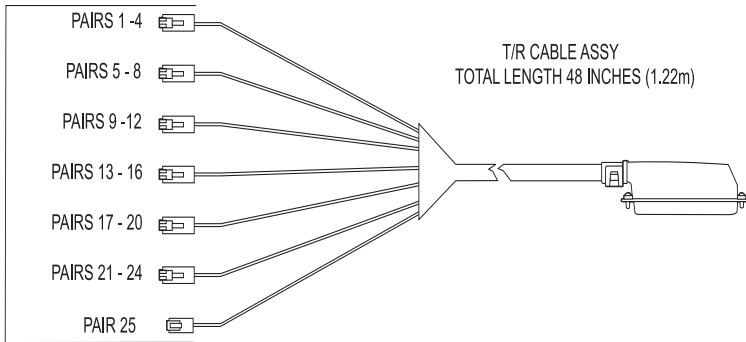
**NOTE:** Pins with a \* and a \*\* are connected together.

**Table 41: T1 or PRI Trunk Port (J5 and J6, BCC III and PRI Faceplates)**

Pin	Signal																												
1	RxRing	<p>MODULAR JACK(S) ON THE DUAL T1/E1 CARD</p>  <p>LINE 0</p> <table border="1"> <thead> <tr> <th>PIN #</th> <th>LINE PAIR JUMPERS (NETWORK MODE)</th> <th>LINE PAIR JUMPERS (USER MODE)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>TX RING</td> <td>RX RING</td> </tr> <tr> <td>2</td> <td>TX TIP</td> <td>RX TIP</td> </tr> <tr> <td>3</td> <td>UNUSED</td> <td>UNUSED</td> </tr> <tr> <td>4</td> <td>RX RING</td> <td>TX RING</td> </tr> <tr> <td>5</td> <td>RX TIP</td> <td>TX TIP</td> </tr> <tr> <td>6</td> <td>UNUSED</td> <td>UNUSED</td> </tr> <tr> <td>7</td> <td>UNUSED</td> <td>UNUSED</td> </tr> <tr> <td>8</td> <td>UNUSED</td> <td>UNUSED</td> </tr> </tbody> </table> <p style="text-align: right; font-size: small;">BB1041</p>	PIN #	LINE PAIR JUMPERS (NETWORK MODE)	LINE PAIR JUMPERS (USER MODE)	1	TX RING	RX RING	2	TX TIP	RX TIP	3	UNUSED	UNUSED	4	RX RING	TX RING	5	RX TIP	TX TIP	6	UNUSED	UNUSED	7	UNUSED	UNUSED	8	UNUSED	UNUSED
PIN #	LINE PAIR JUMPERS (NETWORK MODE)		LINE PAIR JUMPERS (USER MODE)																										
1	TX RING		RX RING																										
2	TX TIP		RX TIP																										
3	UNUSED		UNUSED																										
4	RX RING		TX RING																										
5	RX TIP		TX TIP																										
6	UNUSED		UNUSED																										
7	UNUSED	UNUSED																											
8	UNUSED	UNUSED																											
2	RxTip																												
3	nc																												
4	TxRing																												
5	TxTip																												
6	nc																												
7	nc																												
8	nc																												



**Table 42: T/R Cable Assembly Pinouts for SX-200 SPINE**



EE0172

**T/R Cable Assembly Pin Outs**

Assignment	Module Connector	MDF	Wire Color
Circuits 1-4 8-pin mod	4,5	26, 01	white/blue, blue/white
	3,6	27, 02	white/orange, orange/white
	2,7	28, 03	white/green, green/white
Circuits 5-8 8-pin mod	1,8	29, 04	white/brown, brown/white
	4,5	30, 05	white/slate, slate/white
	3,6	31, 06	red/blue, blue/red
Circuits 9-12 8-pin mod	2,7	32, 07	red/orange, orange/red
	1,8	33, 08	red/green, green/red
	4,5	34, 09	red/brown, brown/red
Circuits 13-16 8-pin mod	3,6	35, 10	red/slate, slate/red
	2,7	36, 11	black/blue, blue/black
	1,8	37, 12	black/orange, orange/black
Circuits 17-20 8-pin mod	4,5	38, 13	black/green, green/black
	3,6	39, 14	black/brown, brown/black
	2,7	40, 15	black/slate, slate/black
Circuits 21-24 8-pin mod	1,8	41, 16	yellow/blue, blue/yellow
	4,5	42, 17	yellow/orange, orange/yellow
	3,6	43, 18	yellow/green, green/yellow
Circuit 25 (PFT) 4-pin mod	2,7	44, 19	yellow/brown, brown/yellow
	1,8	45, 20	yellow/slate, slate/yellow
	4,5	46, 21	violet/blue, blue/violet
	3,6	47, 22	violet/orange, orange/violet
	2,7	48, 23	violet/green, green/violet
	1,8	49, 24	violet/brown, brown/violet
	4,3	50, 25	violet/slate, slate/violet

**Table 43: SX-200 EL or SX-200 ML (RM)  
Tip and Ring Assignments**

J1, J2, J3, and J4			Lead Designation									
Slot / Plug	Pin	Pair	Cct	ONS or DLC	Cct	LS/GS	Cct	LS/CLASS	Cct	COV	Cct	OPS or DID
2-J1 or 4-J2 or 6-J3 or 8-J4	26	W-BL	1	T1	1	T1	1	T1	1	T1	1	T1
	1	BL-W		R1		R1		R1		R1		R1
	27	W-O	2	T2		MM1	2	T2	2	T2		
	2	O-W		R2		M1		R2		R2		
	28	W-G	3	T3	2	T2	3	T3	3	T3	2	T2
	3	G-W		R3		R2		R3		R3		R2
	29	W-BR	4	T4		MM2	4	T4	4	T4		
	4	BR-W		R4		M2		R4		R4		
	30	W-S	5	T5	3	T3			5	T5	3	T3
	5	S-W		R5		R3				R5		R3
	31	R-BL	6	T6		MM3			6	T6		
	6	BL-R		R6		M3				R6		
32	R-O	7	T7	4	T4	5	T5			4	T4	
7	O-R		R7		R4		R5				R4	
33	R-G	8	T8		MM4	6	T6					
8	G-R		R8		M4		R6					
34	R-BR	9	T9	5	T5	7	T7			5	T5	
9	BR-R		R9		R5		R7				R5	
35	R-S	10	T10		MM5	8	T8					
10	S-R		R10		M5		R8					
36	BK-BL	11	T11	6	T6					6	T6	
11	BL-BK		R11		R6						R6	
37	BK-O	12	T12		MM6							
12	O-BK		R12		M6							
	38	BK-G	SPARE									

(Sheet 1 of 2)

**Table 43: SX-200 EL or SX-200 ML (RM)  
Tip and Ring Assignments (Continued)**

J1, J2, J3, and J4			Lead Designation									
Slot/ Plug	Pin	Pair	Cct	ONS or DLC	Cct	LS/GS	Cct	LS/ CLASS	Cct	COV	Cct	OPS or DID
	13	G-BK	SPARE									
1-J1 or	39	BK-BR	1	T1	1	T1	1	T1	1	T1	1	T1
	14	BR-BK		R1		R1		R1		R1		R1
3-J2 or	40	BK-S	2	T2		MM1	2	T2	2	T2		
	15	S-BK		R2		M1		R2		R2		
5-J3 or	41	Y-BL	3	T3	2	T2	3	T3	3	T3	2	T2
	16	BL-Y		R3		R2		R3		R3		R2
7-J4	42	Y-O	4	T4		MM2	4	T4	4	T4		
	17	O-Y		R4		M2		R4		R4		
	43	Y-G	5	T5	3	T3			5	T5	3	T3
	18	G-Y		R5		R3				R5		R3
	44	Y-BR	6	T6		MM3			6	T6		
	19	BR-Y		R6		M3				R6		
	45	Y-S	7	T7	4	T4	5	T5			4	T4
	20	S-Y		R7		R4		R5				R4
	46	V-BL	8	T8		MM4	6	T6				
	21	BL-V		R8		M4		R6				
	47	V-O	9	T9	5	T5	7	T7			5	T5
	22	O-V		R9		R5		R7				R5
	48	V-G	10	T10		MM5	8	T8				
	23	G-V		R10		M5		R8				
	49	V-BR	11	T11	6	T6					6	T6
	24	BR-V		R11		R6						R6
	50	V-S	12	T12		MM6						
	25	S-V		R12		M6						

(Sheet 2 of 2)

**Table 44: SX-200 EL or SX-200 ML (RM) Universal Card  
Tip and Ring Assignments**

J1, J2, J3, and J4			Lead Designation					
Slot / Plug	Pin	Pair	Cct	MOH/ Pager	Cct	DTMF Relay	Cct	E&M Trunk
2-J1 or 4-J2 or 6-J3 or 8-J4	26	W-BL	1	MIA1	1		1	T1
	1	BL-W		MIB1				R1
	27	W-O	2	POA1	2		2	TR1
	2	O-W		POB1				RR1
	28	W-G		PKA1				E1
	3	G-W		PKB1				M1
	29	W-BR	3	MIA2	3		3	T2
	4	BR-W		MIB2				R2
	30	W-S		POA2				TR2
	5	S-W		POB2				RR2
	31	R-BL		PKA2				E2
	6	BL-R		PKB2				M2
32	R-O	MIA3		T3				
7	O-R	MIB3		R3				
33	R-G	POA3	TR3					
8	G-R	POB3	RR3					
34	R-BR	PKA3	E3					
9	BR-R	PKB3	M3					
35	R-S	4	MIA4	4		4	T4	
10	S-R		MIB4				R4	
36	BK-BL		POA4				TR4	
11	BL-BK		POB4				RR4	
37	BK-O	PKA4	E4					
12	O-BK	PKB4	M4					
	38	BK-G	SPARE					

(Sheet 1 of 2)

**Table 44: SX-200 EL or SX-200 ML (RM) Universal Card  
Tip and Ring Assignments (Continued)**

J1, J2, J3, and J4			Lead Designation					
Slot / Plug	Pin	Pair	Cct	MOH/ Pager	Cct	DTMF Relay	Cct	E&M Trunk
	13	G-BK	SPARE					
1-J1 or 3-J2 or 5-J3 or 7-J4	39	BK-BR	1	MIA1	1	K5A1	1	T1
	14	BR-BK		MIB1				R1
	40	BK-S		POA1		K5A1		TR1
	15	S-BK		POB1		K5B1		RR1
	41	Y-BL		PKA1		K6A1		E1
	16	BL-Y		PKB1		K6B1		M1
	42	Y-O	2	MIA2	2	K5A2	2	T2
	17	O-Y		MIB2				R2
	43	Y-G		POA2		K5A2		TR2
	18	G-Y		POB2		K5B2		RR2
	44	Y-BR		PKA2		K6A2		E2
	19	BR-Y		PKB2		K6B2		M2
	45	Y-S	3	MIA3	3	K5A3	3	T3
	20	S-Y		MIB3				R3
	46	V-BL		POA3		K5A3		TR3
	21	BL-V		POB3		K5B3		RR3
	47	V-O		PKA3		K6A3		E3
	22	O-V		PKB3		K6B3		M3
	48	V-G	4	MIA4	4	K5A4	4	T4
	23	G-V		MIB4				R4
	49	V-BR		POA4		K5A4		TR4
	24	BR-V		POB4		K5B4		RR4
	50	V-S		PKA4		K6A4		E4
	25	S-V		PKB4		K6B4		M4

(Sheet 2 of 2)

**Table 45: SX-200 DIGITAL Peripheral Bay  
Tip and Ring Assignments (High-power Slots)**

J5 and J9 Bay 2 slots 5 to 8			Lead Designation									
Slot / Plug	Pin	Pair	Cct	ONS or DLC	Cct	LS/GS	Cct	LS/ CLASS	Cct	COV	Cct	OPS or DID
6-J5 or 8-J9	26	W-BL	1	T1	1	T1	1	T1	1	T1	1	T1
	1	BL-W		R1		R1		R1		R1		R1
	27	W-O	2	T2		MM1	2	T2	2	T2		
	2	O-W		R2		M1		R2		R2		
	28	W-G	3	T3	2	T2	3	T3	3	T3	2	T2
	3	G-W		R3		R2		R3		R3		R2
	29	W-BR	4	T4		MM2	4	T4	4	T4		
	4	BR-W		R4		M2		R4		R4		
	30	W-S	5	T5	3	T3			5	T5	3	T3
	5	S-W		R5		R3				R5		R3
	31	R-BL	6	T6		MM3			6	T6		
	6	BL-R		R6		M3				R6		
32	R-O	7	T7	4	T4	5	T5			4	T4	
7	O-R		R7		R4		R5				R4	
33	R-G	8	T8		MM4	6	T6					
8	G-R		R8		M4		R6					
34	R-BR	9	T9	5	T5	7	T7			5	T5	
9	BR-R		R9		R5		R7				R5	
35	R-S	10	T10		MM5	8	T8					
10	S-R		R10		M5		R8					
36	BK-BL	11	T11	6	T6					6	T6	
11	BL-BK		R11		R6						R6	
37	BK-O	12	T12		MM6							
12	O-BK		R12		M6							
	38	BK-G	SPARE									

(Sheet 1 of 2)

**Table 45: SX-200 DIGITAL Peripheral Bay  
Tip and Ring Assignments (High-power Slots) (Continued)**

J5 and J9 Bay 2 slots 5 to 8			Lead Designation									
Slot / Plug	Pin	Pair	Cct	ONS or DLC	Cct	LS/GS	Cct	LS/ CLASS	Cct	COV	Cct	OPS or DID
	13	G-BK	SPARE									
5-J5 or 7-J9	39	BK-BR	1	T1	1	T1	1	T1	1	T1	1	T1
	14	BR-BK		R1		R1		R1		R1		R1
	40	BK-S	2	T2		MM1	2	T2	2	T2		
	15	S-BK		R2		M1		R2		R2		
	41	Y-BL	3	T3	2	T2	3	T3	3	T3	2	T2
	16	BL-Y		R3		R2		R3		R3		R2
	42	Y-O	4	T4		MM2	4	T4	4	T4		
	17	O-Y		R4		M2		R4		R4		
	43	Y-G	5	T5	3	T3			5	T5	3	T3
	18	G-Y		R5		R3				R5		R3
	44	Y-BR	6	T6		MM3			6	T6		
	19	BR-Y		R6		M3				R6		
45	Y-S	7	T7	4	T4	5	T5			4	T4	
20	S-Y		R7		R4		R5				R4	
46	V-BL	8	T8		MM4	6	T6					
21	BL-V		R8		M4		R6					
47	V-O	9	T9	5	T5	7	T7			5	T5	
22	O-V		R9		R5		R7				R5	
48	V-G	10	T10		MM5	8	T8					
23	G-V		R10		M5		R8					
49	V-BR	11	T11	6	T6					6	T6	
24	BR-V		R11		R6						R6	
50	V-S	12	T12		MM6							
25	S-V		R12		M6							

(Sheet 2 of 2)

Installation

**Table 46: SX-200 Digital Tip and Ring Assignments for Universal Card Modules**

J5 and J9 Bay 2 slots 5 to 8			Lead Designation				
Slot / Plug	Pin	Pair	Cct	MOH/ Pager	DTMF Relay	E&M Trunk	DLIC Console
6-J5 or 8-J9	26	W-BL	1	MIA1		T1	T1
	1	BL-W		MIB1		R1	R1
	27	W-O	2	POA1	K5A1	TR1	T2
	2	O-W		POB1	K5B1	RR1	R2
	28	W-G		PKA1	K6A1	E1	
	3	G-W		PKB1	K6B1	M1	
	29	W-BR	MIA2		T2	T1	
	4	BR-W	MIB2		R2	R1	
	30	W-S	POA2	K5A2	TR2	T2	
	5	S-W	POB2	K5B2	RR2	R2	
	31	R-BL	PKA2	K6A2	E2		
	6	BL-R	PKB2	K6B2	M2		
	32	R-O	3	MIA3		T3	T1
	7	O-R		MIB3		R3	R1
	33	R-G	POA3	K5A3	TR3	T2	
	8	G-R	POB3	K5B3	RR3	R2	
34	R-BR	PKA3	K6A3	E3			
9	BR-R	PKB3	K6B3	M3			
35	R-S	4	MIA4		T4	T1	
10	S-R		MIB4		R4	R1	
36	BK-BL	POA4	K5A4	TR4	T2		
11	BL-BK	POB4	K5B4	RR4	R2		
37	BK-O	PKA4	K6A4	E4			
12	O-BK	PKB4	K6B4	M4			
	38	BK-G	SPARE				

(Sheet 1 of 2)



**Table 46: SX-200 Digital Tip and Ring Assignments for Universal Card Modules (Continued)**

J5 and J9 Bay 2 slots 5 to 8			Lead Designation				
Slot / Plug	Pin	Pair	Cct	MOH/ Pager	DTMF Relay	E&M Trunk	DLIC Console
	13	G-BK	SPARE				
5-J5 or 7-J9	39	BK-BR	1	MIA1		T1	T1
	14	BR-BK		MIB1		R1	R1
	40	BK-S		POA1	K5A1	TR1	T2
	15	S-BK		POB1	K5B1	RR1	R2
	41	Y-BL		PKA1	K6A1	E1	
	16	BL-Y		PKB1	K6B1	M1	
	42	Y-O	2	MIA2		T2	T1
	17	O-Y		MIB2		R2	R1
	43	Y-G		POA2	K5A2	TR2	T2
	18	G-Y		POB2	K5B2	RR2	R2
	44	Y-BR		PKA2	K6A2	E2	
	19	BR-Y		PKB2	K6B2	M2	
	45	Y-S	3	MIA3		T3	T1
	20	S-Y		MIB3		R3	R1
	46	V-BL		POA3	K5A3	TR3	T2
	21	BL-V		POB3	K5B3	RR3	R2
	47	V-O		PKA3	K6A3	E3	
	22	O-V		PKB3	K6B3	M3	
	48	V-G	4	MIA4		T4	T1
	23	G-V		MIB4		R4	R1
49	V-BR		POA4	K5A4	TR4	T2	
24	BR-V		POB4	K5B4	RR4	R2	
50	V-S		PKA4	K6A4	E4		
25	S-V		PKB4	K6B4	M4		

(Sheet 2 of 2)

**Table 47: SX-200 DIGITAL Tip and Ring Assignments (Low-power Slots)**

J7 and J11 Bay 2 slots 1 to 4			Lead Designation					
Slot / Plug	Pin	Pair	Cct	ONS or DLC	Cct	LS/GS	Cct	LS/CLASS
2-J7 or 4-J11	26	W-BL	1	T1	1	T1	1	T1
	1	BL-W		R1		R1		R1
	27	W-O	2	T2		MM1	2	T2
	2	O-W		R2		M1		R2
	28	W-G	3	T3	2	T2	3	T3
	3	G-W		R3		R2		R3
	29	W-BR	4	T4		MM2	4	T4
	4	BR-W		R4		M2		R4
	30	W-S	5	T5	3	T3		
	5	S-W		R5		R3		
	31	R-BL	6	T6		MM3		
	6	BL-R		R6		M3		
	32	R-O	7	T7	4	T4	5	T5
	7	O-R		R7		R4		R5
	33	R-G	8	T8		MM4	6	T6
	8	G-R		R8		M4		R6
	34	R-BR	9	T9	5	T5	7	T7
	9	BR-R		R9		R5		R7
35	R-S	10	T10		MM5	8	T8	
10	S-R		R10		M5		R8	
36	BK-BL	11	T11	6	T6			
11	BL-BK		R11		R6			
37	BK-O	12	T12		MM6			
12	O-BK		R12		M6			
	38	BK-G	SPARE					

(Sheet 1 of 2)

**Table 47: SX-200 DIGITAL Tip and Ring Assignments (Low-power Slots) (Continued)**

J7 and J11 Bay 2 slots 1 to 4			Lead Designation						
Slot / Plug	Pin	Pair	Cct	ONS or DLC	Cct	LS/GS	Cct	LS/CLASS	
	13	G-BK	SPARE						
1-J7 or 3-J11	39	BK-BR	1	T1	1	T1	1	T1	
	14	BR-BK		R1		R1		R1	
	40	BK-S	2	T2		MM1	2	T2	
	5	S-BK		R2		M1		R2	
	41	Y-BL	3	T3	2	T2	3	T3	
	16	BL-Y		R3		R2		R3	
	42	Y-O	4	T4		MM2	4	T4	
	17	O-Y		R4		M2		R4	
	43	Y-G	5	T5	3	T3			
	18	G-Y		R5		R3			
	44	Y-BR	6	T6		MM3			
	19	BR-Y		R6		M3			
	45	Y-S	7	T7	4	T4	5	T5	
	20	S-Y		R7		R4		R5	
	46	V-BL	8	T8		MM4	6	T6	
	21	BL-V		R8		M4		R6	
	47	V-O	9	T9	5	T5	7	T7	
	22	O-V		R9		R5		R7	
	48	V-G	10	T10		MM5	8	T8	
	23	G-V		R10		M5		R8	
	49	V-BR	11	T11	6	T6			
	24	BR-V		R11		R6			
	50	V-S	12	T12		MM6			
	25	S-V		T12		M6			

(Sheet 2 of 2)

Installation

Table 48: USOC Connector Pin Designations

Pin	Color	RJ21X	RJ2EX	RJ2GX
26	W-BL	T	T	T
1	BL-W	R	R	R
27	W-O	T	E	T1
2	O-W	R	M	R1
28	W-G	T	T	E
3	G-W	R	R	M
29	W-BR	T	E	T
4	BR-W	R	M	R
30	W-S	T	T	T1
5	S-W	R	R	R1
31	R-BL	T	E	E
6	BL-R	R	M	M
32	R-O	T	T	T
7	O-R	R	R	R
33	R-G	T	E	T1
8	G-R	R	M	R1
34	R-BR	T	T	E
9	BR-R	R	R	M
35	R-S	T	E	T
10	S-R	R	M	R
36	BK-BL	T	T	T1
11	BL-BK	R	R	R1
37	BK-O	T	E	E
12	O-BK	R	M	M
38	BK-G	T	T	T
13	G-BK	R	R	R
39	BK-BR	T	E	T1

(Sheet 1 of 2)

**Table 48: USOC Connector Pin Designations (Continued)**

Pin	Color	RJ21X	RJ2EX	RJ2GX
14	BR-BK	R	M	R1
40	BK-S	T	T	E
15	S-BK	R		R
41	Y-BL	T	E	T
16	BL-Y	R	M	R
42	Y-O	T	T	T1
17	O-Y	R	R	R1
43	Y-G	T	E	E
18	G-Y	R	M	M
44	Y-BR	T	T	T
19	BR-Y	R	R	R
45	Y-S	T	E	T1
20	S-Y	R	M	R1
46	V-BL	T	T	E
21	BL-V	R	R	M
47	V-O	T	E	T
22	O-V	R	M	R
48	V-G	T	T	T1
23	G-V	R	R	R1
49	V-BR	T	E	E
24	BR-V	R	M	M
50	V-S	SPARE		
25	S-V	SPARE		

(Sheet 2 of 2)

**NOTE:** RJ21X is a standard trunk.  
 RJ2EX is a two-wire E&M trunk.  
 RJ2GX is a four-wire E&M trunk.

**Table 49: Analog Bay P1 and P7 Tip and Ring Assignments**

P1 for Bay 3 or 4 (480-port), Bay 4 (456-port), or P7 for Bay 5 (480- or 456-port)							
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M
1	1	26	W-BL	T1	T1	T1	T1
		1	BL-W	R1	R1	R1	R1
	2	27	W-O	T2	XT2		TR1
		2	O-W	R2	XT1		RR1
	3	28	W-G	T3	T2		E1
		3	G-W	R3	R2		M1
	4	29	W-BR	T4			
		4	BR-W	R4			
2	1	30	W-S	T1	T1	T1	T1
		5	S-W	R1	R1	R1	R1
	2	31	R-BL	T2	XT2		TR1
		6	BL-R	R2	XT1		RR1
	3	32	R-O	T3	T2		E1
		7	O-R	R3	R2		M1
	4	33	R-G	T4			
		8	G-R	R4			
3	1	34	R-BR	T1	T1	T1	T1
		9	BR-R	R1	R1	R1	R1
	2	35	R-S	T2	XT2		TR1
		10	S-R	R2	XT1		RR1
	3	36	BK-BL	T3	T2		E1
		11	BL-BK	R3	R2		M1
	4	37	BK-O	T4			
		12	O-BK	R4			
4	1	38	BK-G	T1	T1	T1	T1
		13	G-BK	R1	R1	R1	R1
	2	39	BK-BR	T2	XT2		TR1
		14	BR-BK	R2	XT1		RR1
	3	40	BK-S	T3	T2		E1
		15	S-BK	R3	R2		M1
	4	41	Y-BL	T4			
		16	BL-Y	R4			

(Sheet 1 of 2)

**Table 49: Analog Bay P1 and P7 Tip and Ring Assignments  
(Continued)**

P1 for Bay 3 or 4 (480-port), Bay 4 (456-port), or P7 for Bay 5 (480- or 456-port)							
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M
5	1	42	Y-O	T1	T1	T1	T1
		17	O-Y	R1	R1	R1	R1
	2	43	Y-G	T2	XT2		TR1
		18	G-Y	R2	XT1		RR1
	3	44	Y-BR	T3	T2		E1
		19	BR-Y	R3	R2		M1
	4	45	Y-S	T4			
		20	S-Y	R4			
6	1	46	V-BL	T1	T1	T1	T1
		21	BL-V	R1	R1	R1	R1
	2	47	V-O	T2	XT2		TR1
		22	O-V	R2	XT1		RR1
	3	48	V-G	T3	T2		E1
		23	G-V	R3	R2		M1
	4	49	V-BR	T4			
		24	BR-V	R4			
		50	V-S	SPARE			
		25	S-V	SPARE			

(Sheet 2 of 2)

**NOTE:** For 2-wire E&M Trunk operation DO NOT connect RR and TR leads.

**Table 50: Analog Bay P2 and P8 Tip and Ring Assignments**

P2 for Bay 3 or 4 (480-port), Bay 4 (456-port), or P8 for Bay 5 (480- or 456-port)							
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M
1	5	26	W-BL	T5	T3	T2	T2
		1	BL-W	R5	R3	R2	R2
	6	27	W-O	T6	XT4		TR2
		2	O-W	R6	XT3		RR2
	7	28	W-G	T7	T4		E2
		3	G-W	R7	R4		M2
	8	29	W-BR	T8			
		4	BR-W	R8			
2	5	30	W-S	T5	T3	T2	T2
		5	S-W	R5	R3	R2	R2
	6	31	R-BL	T6	XT4		TR2
		6	BL-R	R6	XT3		RR2
	7	32	R-O	T7	T4		E2
		7	O-R	R7	R4		M2
	8	33	R-G	T8			
		8	G-R	R8			
3	5	34	R-BR	T5	T3	T2	T2
		9	BR-R	R5	R3	R2	R2
	6	35	R-S	T6	XT4		TR2
		10	S-R	R6	XT3		RR2
	7	36	BK-BL	T7	T4		E2
		11	BL-BK	R7	R4		M2
	8	37	BK-O	T8			
		12	O-BK	R8			
4	5	38	BK-G	T5	T3	T2	T2
		13	G-BK	R5	R3	R2	R2
	6	39	BK-BR	T6	XT4		TR2
		14	BR-BK	R6	XT3		RR2
	7	40	BK-S	T7	T4		E2
		15	S-BK	R7	R4		M2
	8	41	Y-BL	T8			
		16	BL-Y	R8			
(Sheet 1 of 2)							



**Table 50: Analog Bay P2 and P8 Tip and Ring Assignments  
(Continued)**

P2 for Bay 3 or 4 (480-port), Bay 4 (456-port), or P8 for Bay 5 (480- or 456-port)							
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M
5	5	42	Y-O	T5	T3	T2 R2	T2
		17	O-Y	R5	R3		R2
	6	43	Y-G	T6	XT4	T2 R2	TR2
		18	G-Y	R6	XT3		RR2
		7	44	Y-BR	T7		T4
8	19	BR-Y	R7	R4	M2		
6	5	20	S-Y	R8	T3 R3	T2 R2	T2
		46	V-BL	T5			T3
	6	21	BL-V	R5	R3	R2	R2
		47	V-O	T6	XT4	T2 R2	TR2
	7	22	O-V	R6	XT3		RR2
		48	V-G	T7	T4	E2	
	8	23	G-V	R7	R4	M2	
		49	V-BR	T8	SPARE	SPARE	
24	BR-V	R8					
		50	V-S				
		25	S-V				

(Sheet 2 of 2)

**NOTE:** For 2-wire E&M Trunk operation DO NOT connect RR and TR leads.

**Table 51: Analog Bay P3 and P9 Tip and Ring Assignments**

P3 for Bay 3 or 4 (480-port), Bay 4 (456-port), or P9 for Bay 5 (480- or 456-port)								
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M	
7	1	26	W-BL	T1	T1	T1 R1	T1	
		1	BL-W	R1	R1		R1	
	2	27	W-O	T2	XT2	XT1	TR1	
		2	O-W	R2	R2		RR1	
	3	28	W-G	T3	T2	R2	E1	
		3	G-W	R3	R2		M1	
		4	29	W-BR	T4		R4	
			4	BR-W	R4			
8	1	30	W-S	T1	T1	T1 R1	T1	
		5	S-W	R1	R1		R1	
	2	31	R-BL	T2	XT2	XT1	TR1	
		6	BL-R	R2	R2		RR1	
	3	32	R-O	T3	T2	R2	E1	
		7	O-R	R3	R2		M1	
	4	33	R-G	T4	R4			
			8	G-R		R4		
1		34	R-BR	T1		T1	T1 R1	T1
		9	BR-R	R1		R1		R1
2	35	R-S	T2	XT2	XT1	TR1		
	10	S-R	R2	R2		RR1		
3	36	BK-BL	T3	T2	R2	E1		
		11	BL-BK	R3		R2	M1	
	4	37	BK-O	T4		R4		
		12	O-BK	R4				
10	1	38	BK-G	T1	T1	T1 R1	T1	
		13	G-BK	R1	R1		R1	
	2	39	BK-BR	T2	XT2	XT1	TR1	
		14	BR-BK	R2	R2		RR1	
	3	40	BK-S	T3	T2	R2	E1	
		15	S-BK	R3	R2		M1	
	4	41	Y-BL	T4	R4			
		16	BL-Y	R4				

(Sheet 1 of 2)

**Table 51: Analog Bay P3 and P9 Tip and Ring Assignments  
(Continued)**

P3 for Bay 3 or 4 (480-port), Bay 4 (456-port), or P9 for Bay 5 (480- or 456-port)							
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M
11	1	42	Y-O	T1	T1	T1	T1
		17	O-Y	R1	R1	R1	R1
	2	43	Y-G	T2	XT2		TR1
		18	G-Y	R2	XT1		RR1
	3	44	Y-BR	T3	T2		E1
		19	BR-Y	R3	R2		M1
	4	45	Y-S	T4			
		20	S-Y	R4			
12	1	46	V-BL	T1	T1	T1	T1
		21	BL-V	R1	R1	R1	R1
	2	47	V-O	T2	XT2		TR1
		22	O-V	R2	XT1		RR1
	3	48	V-G	T3	T2		E1
		23	G-V	R3	R2		M1
	4	49	V-BR	T4			
		24	BR-V	R4			
		50	V-S	SPARE			
		25	S-V	SPARE			

(Sheet 2 of 2)

**NOTE:** For 2-wire E&M Trunk operation DO NOT connect RR and TR leads.

**Table 52: Analog Bay P4 and P10 Tip and Ring Assignments**

P4 for Bay 3 or 4 (480-port), Bay 4 (456-port), or P10 for Bay 5 (480- or 456-port)							
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M
7	5	26	W-BL	T5	T3	T2	T2
		1	BL-W	R5	R3	R2	R2
	6	27	W-O	T6	XT4		TR2
		2	O-W	R6	XT3		RR2
	7	28	W-G	T7	T4		E2
		3	G-W	R7	R4		M2
	8	29	W-BR	T8			
		4	BR-W	R8			
8	5	30	W-S	T5	T3	T2	T2
		5	S-W	R5	R3	R2	R2
	6	31	R-BL	T6	XT4		TR2
		6	BL-R	R6	XT3		RR2
	7	32	R-O	T7	T4		E2
		7	O-R	R7	R4		M2
	8	33	R-G	T8			
		8	G-R	R8			
9	5	34	R-BR	T5	T3	T2	T2
		9	BR-R	R5	R3	R2	R2
	6	35	R-S	T6	XT4		TR2
		10	S-R	R6	XT3		RR2
	7	36	BK-BL	T7	T4		E2
		11	BL-BK	R7	R4		M2
	8	37	BK-O	T8			
		12	O-BK	R8			
10	5	38	BK-G	T5	T3	T2	T2
		13	G-BK	R5	R3	R2	R2
	6	39	BK-BR	T6	XT4		TR2
		14	BR-BK	R6	XT3		RR2
	7	40	BK-S	T7	T4		E2
		15	S-BK	R7	R4		M2
	8	41	Y-BL	T8			
		16	BL-Y	R8			

(Sheet 1 of 2)

**Table 52: Analog Bay P4 and P10 Tip and Ring Assignments  
(Continued)**

P4 for Bay 3 or 4 (480-port), Bay 4 (456-port), or P10 for Bay 5 (480- or 456-port)							
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M
11	5	42	Y-O	T5	T3	T2	T2
		17	O-Y	R5	R3	R2	R2
	6	43	Y-G	T6	XT4		TR2
		18	G-Y	R6	XT3		RR2
	7	44	Y-BR	T7	T4		E2
		19	BR-Y	R7	R4		M2
	8	45	Y-S	T8			
		20	S-Y	R8			
12	5	46	V-BL	T5	T3	T2	T2
		21	BL-V	R5	R3	R2	R2
	6	47	V-O	T6	XT4		TR2
		22	O-V	R6	XT3		RR2
	7	48	V-G	T7	T4		E2
		23	G-V	R7	R4		M2
	8	49	V-BR	T8			
		24	BR-V	R8			
		50	V-S	SPARE			
		25	S-V	SPARE			

(Sheet 2 of 2)

**NOTE:** For 2-wire E&M Trunk operation DO NOT connect RR and TR leads.

**Table 53: Interconnect Card P19 Tip and Ring Assignments**

P19 for Bay 3 or 4 (480-- or 456-port)								
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M	
		26 1	W-BL BL-W	SPARE SPARE				
15	8	27 2	W-O O-W	T8 R8				
	7	28 3	W-G G-W	T7 R7	T4 R4		E2 M2	
		6	29 4	W-BR BR-W	T6 R6	XT3 XT4		TR2 RR2
	5		30 5	W-S S-W	T5 R5	T3 R3	T2 R2	T2 R2
		14	8	31 6	R-BL BL-R	T8 R8		
	7		32 7	R-O O-R	T7 R7	T4 R4		E2 M2
6			33 8	R-G G-R	T6 R6	XT3 XT4		TR2 RR2
	5		34 9	R-BR BR-R	T5 R5	T3 R3	T2 R2	T2 R2
13			8	35 10	R-S S-R	T8 R8		
	7		36 11	BK-BL BL-BK	T7 R7	T4 R4		E2 M2
		6	37 12	BK-O O-BK	T6 R6	XT3 XT4		TR2 RR2
	5		38 13	BK-G G-BK	T5 R5	T3 R3	T2 R2	T2 R2
		15	4	39 14	BK-BR BR-BK	T4 R4		
	3		40 15	BK-S S-BK	T3 R3	T2 R2		E1 M1
2			41 16	Y-BL BL-Y	T2 R2	XT1 XT2		TR1 RR1
	1		42 17	Y-O O-Y	T1 R1	T1 R1	T1 R1	T1 R1

(Sheet 1 of 2)

**Table 53: Interconnect Card P19 Tip and Ring Assignments  
(Continued)**

P19 for Bay 3 or 4 (480-- or 456-port)							
Slot	Cct	Pin	Color	Lines	CO	DID/TIE	E&M
14	4	43	Y-G	T4			
		18	G-Y	R4			
	3	44	Y-BR	T3	T2		E1
		19	BR-Y	R3	R2		M1
	2	45	Y-S	T2	XT1		TR1
		20	S-Y	R2	XT2		RR1
	1	46	V-BL	T1	T1	T1	T1
21		BL-V	R1	R1	R1	R1	
13	4	47	V-O	T4			
		22	O-V	R4			
	3	48	V-G	T3	T2		E1
		23	G-V	R3	R2		M1
	2	49	V-BR	T2	XT1		TR1
		24	BR-V	R2	XT2		RR1
	1	50	V-S	T1	T1	T1	T1
25		S-V	R1	R1	R1	R1	

(Sheet 2 of 2)

**NOTE:** For 2-wire E&M Trunk operation DO NOT connect RR and TR leads.

## Adding a PKM

---

A Programmable Key Module (PKM) provide the user with additional personal keys for their telephone set. Two types are available: The Mitel Networks Programmable Key Module 48 (PKM 48) and the Mitel Networks Programmable Key Module 12 (PKM 12).

The PKM 48 provides SUPERSET 4025, SUPERSET 4125, and the SUPERSET 4150 telephone users with 48 additional personal keys; the PKM 12 provides 12. The programming for both are the same. Up to two PKM 48 devices can be attached to the telephone or attendant console.

The telephone requires a SUPERSET Interface Module (SIM1 or SIM2) to interface with a PKM. The SUPERSET Interface Module requires programming through CDE to associate with the PKM.



Any connection of this set to an off-premise application, an out of plant application, or to any other exposed plant application may result in a safety hazard, and/or defective operation, and/or equipment damage.

For a SUPERSET Interface Module to work correctly with a SUPERSET 4000-series telephone, the SUPERSET 4000-series telephone must have a Boot Revision of 4.2 or greater, and the SUPERSET 4000-series telephone must be upgraded to the latest firmware available from the system maintenance firmware download command. The SUPERSET Interface Module also requires LIGHTWARE 17 Release 3.0 or greater software.



The PKM 12 and the PKM 48 are the only programmable key modules qualified by Mitel Networks for connection to SUPERSET 4000-series telephones.

The PKM 12 is not designed to connect to a PKM 48.



The SUPERSET 4025 telephone requires a power adapter for the SUPERSET Interface Module connection. The unpowered power adapter plugs into the interface module's power jack.

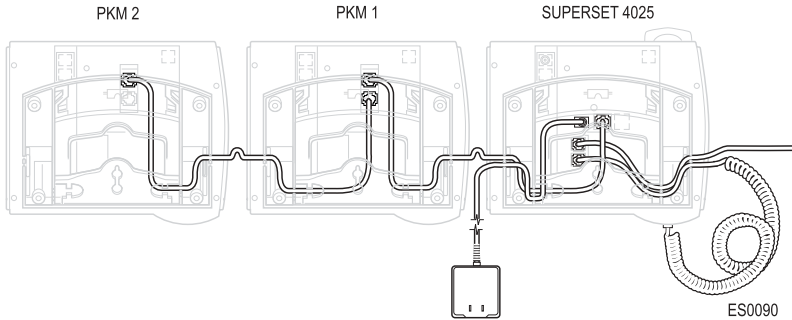


Figure 35: PKM Connections to a SUPERSET 4025

The SUPERSET 4150 and the SUPERSET 4125 telephones come with a power adapter. The unpowered power adapter plugs into the telephone itself.

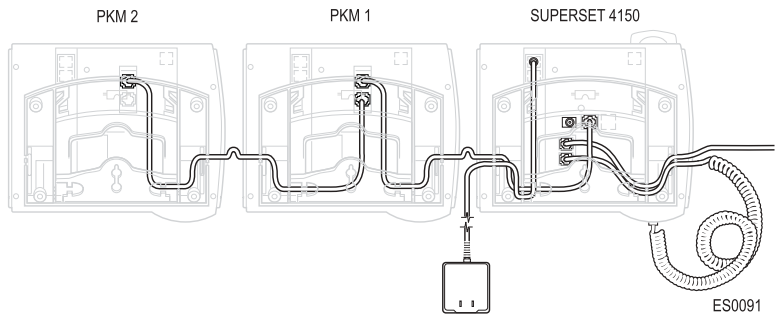


Figure 36: PKM Connections to a SUPERSET 4150



Never plug a power supply into a SIM1 or a SIM2 installed in a SUPERSET 4150 or SUPERSET 4125 telephone. If you do, you will lose the full duplex functionality of the speaker phone.



Refer to *Programming an Analog Device to a SIM2* (page 113) for instructions on adding an analog device.

### PKM to an Attendant Console

The PKM 48 provides an attendant console user with 48 DSS/BLF keys. Up to two PKM 48 devices can be attached.

A SUPERCONSOLE 1000 with part numbers 9189-000-300 and 9189-000-301 can directly connect up to two PKM 48 devices. Direct connection requires a power adapter, LIGHTWARE 18 and greater software and the purchasable MOSS System Option 102, Feature Level 1 or greater.

The attendant console (excluding the SUPERCONSOLE 1000 PN 9189-000-300 and 9189-000-301 with LIGHTWARE 18 or greater) requires a DSS/BLF Interface unit to associate the PKM 48 devices. The DSS/BLF Interface unit requires a power adapter, LIGHTWARE 17 Release 3.1 or greater software, and needs to be programmed in CDE to associate with the PKM.



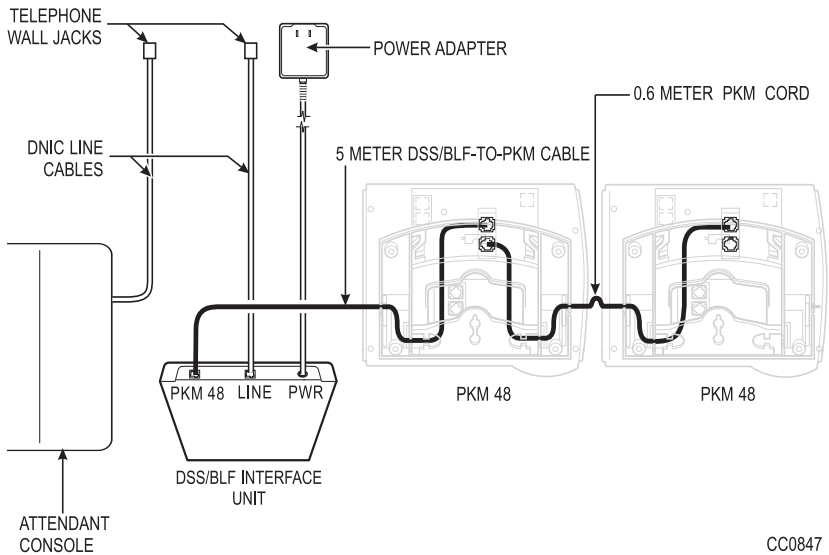
The SUPERCONSOLE 1000 supports the connection of PKM 48 devices or a printer, both are not supported.

The following diagram shows the connection of two PKM 48 devices with the DSS/BLF Interface Unit. The maximum cable length between the DSS/BLF Interface Unit and the first PKM is 5.0 m. The maximum cable length between the first PKM and second PKM is 0.6 m.



Only use the modular cables that are supplied with the DSS/BLF Interface Unit and the PKM 48 device.

**DSS/BLF CONSOLE INTERFACE BOX**



**Figure 37: PKM Connections to an Attendant Console**



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## Chapter 6

# Maintenance Commands



## Basic Commands

---

Maintenance port characteristics are: 8 bits/1 start/1 stop/no parity.  
Baud rates are: 300, 600, 1200, 2400, 4800, 9600, or 19,200.

Maintenance commands do not require the ESC sequence used with CDE commands.

### Entering Command Sequences

Maintenance commands are entered by selecting a softkey from a menu, and then selecting another softkey from the subsequent menu.

Start all maintenance sequences from the Maintenance screen.

Press the DELETE key to delete the most recently entered softkey or device number.

At the end of a command sequence, press ENTER.

Press the CANCEL softkey at any time to exit the current operation without committing (saving) any changes, or press the ENTER softkey, when it is available, to commit changes or initiate an activity.

For example, to show time:

- Select SYSTEM from the Maintenance screen.

- Select SHOW from the System screen.

- Select TIME from the Show screen.

- Select ENTER from the Show screen or Press ENTER at the keyboard.

### Logging In

1. Hit RETURN 4 times within 1 second, (2 times for SX-200 LIGHT/DIGITAL) and then follow the prompts.
2. Select a Terminal Type.
3. Select an Application.
4. Enter your username.
5. Enter your password.

### Logging Out

1. Press QUIT (softkey 6).
2. Press key 6 (or wait for logout timer to time out).

### Displaying the Card Configuration

From CDE mode:

1. View Form 01, System Configuration

From Maintenance mode:

1. Press:  
REPORTS  
SHOW  
CONFIG  
ALL

### Showing the System Identity

From Maintenance mode:

1. Press:  
SYSTEM  
SHOW  
IDENTITY  
ENTER



# Log Commands

---

Table 54: Log Level Functions

COMMAND	PARAMETER	QUALIFIER
1-SET	4-AUTOPRINT	1-ON
		2-OFF
2-READ	1-NEWEST [number]	
	2-OLDEST [number]	
	4-ALL	
	8-LOGS_TEXT*	
	9-TRACE_INFO*	
3-PRINT	1-NEWEST [number]	
	2-OLDEST [number]	
	4-ALL	
	8-LOGS_TEXT*	
4-DELETE	1-NEWEST [number]	
	2-OLDEST [number]	
	4-ALL	
	9-TRACE_INFO*	
8-STOP		

\* TRACE\_INFO is a diagnostic tool used only by MITEL personnel.

# System Commands

**Table 55: System Level Functions**

COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER	
1-SET	1-DATE [dd/mm/yy]				
	2-TIME [hh:mm]				
	3-PASSWORD		1-ATTENDANT		
			2-SUPERVISOR		
			3-MAINT2		
			4-MAINT1		
			7-INSTALLER		
	4-SPEED		1-MAINT-PORT [speed]		
			8-PRINTER_PORT [speed]		
	8-RESET_TIME		1-AFTER_N_FLTS		
			2-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	1-TIME [hh:mm]	
			8-SUNDAY	1-TIME [hh:mm]	
			9-DAILY	1-TIME [hh:mm]	
			3-IMMEDIATELY		
9-ALARM_THRESH		1-LINES	1-SYSTEM	8-CONFIRM	
			2-BAY (user must enter Bay number)	8-CONFIRM	
		2-TRUNKS	1-SYSTEM	8-CONFIRM	
			2-BAY (user must enter Bay number)	8-CONFIRM	
		3-RECEIVERS	1-SYSTEM	8-CONFIRM	
			2-BAY (user must enter Bay number)	8-CONFIRM	
		4-PCM_CHANNELS	1-SYSTEM	8-CONFIRM	
			2-BAY (user must enter Bay number)	8-CONFIRM	
2-SHOW	1-DATE				
	2-TIME				
	4-DEVICE		1-MAINT-PORT		
			4-DATASTN_PLID	1-BAY/SLOT/CCT	
				3-EXT-NUM	
		8-PRINTER_PORT			

(Sheet 1 of 3)

Table 55: System Level Functions (Continued)

COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER
	7-LN_APP_COUNT			
	8-RESET-TIME			
	9-IDENTITY			
3-DATABASE	1-BACKUP			
	2-RESTORE			
	3-SW_RESTORE			
	4-SHOW_PARAM			
	6-TRAP_BACKUP*			
	7-SW-VERIFY			
	8-LOGS_BACKUP			
	9-SET_PARAM	1-DEFAULT		
		2-RETRIES		
		3-BLOCK_CHECK		
		4-RECEIVE	1-EOL_CHAR	
			2-8_BIT_CHAR	
			3-CTRL_CHAR	
			4-REPEAT_CHAR	
			6-PAD_CHAR	
			7-PACKET_SIZE	
			8-RX_TIMEOUT	
			9-NUM_PAD_CHAR	
4-MONITOR	1-SMDR			
	2-DATA_SMDR			
	3-DIAGNOSTICS	1-STEP	1-STEP	
			2-SLOW_SCAN	
			3-FREE_RUN	
		2-SLOW_SCAN	1-STEP	
			2-SLOW_SCAN	
		3-FREE_RUN	1-STEP	
			3-FREE_RUN	
	7-LOGS	1-MAINT_PORT		
		2-SYS_PRINTERS		
5-SUSPEND_PRTR	7-PRINTER_PLID	1-BAY/SLOT/CCT		
		3-EXT-NUM		
	8-PRINTER_PORT			
6-QUIT				
7-RESUME_PRTR	7-PRINTER_PLID	1-BAY/SLOT/CCT		
		3-EXT-NUM		
	8-PRINTER_PORT			
8-RE-START	2-RESET_SYSTEM			
9-STOP	7-LOGS			
MORE_KEYS	1-SET_FIRMWARE	1-STATUS	1-BAY/SLOT/CCT	

(Sheet 2 of 3)

Table 55: System Level Functions (Continued)

COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER
			2-SET_TYPE	1-SS4150
				2-SS4025
				3-SS4090
			3-EXT_NUM	
			4-ALL	
		2-DOWNLOAD	1-BAY/SLOT/CCT	
			2-SET_TYPE	1-SS4150
				2-SS4025
				3-SS4090
			3-EXT_NUM	
			4-ALL	
		3 ABORT_DOWNLOAD	1-BAY/SLOT/CCT	
			2-SET_TYPE	1-SS4150
				2-SS4025
				3-SS4090
			3-EXT_NUM	
			4-ALL	
		4-FORCE_DOWNLOAD	1-BAY/SLOT/CCT	
			2-SET_TYPE	1-SS4150
				2-SS4025
				3-SS4090
			3-EXT_NUM	
			4-ALL	

(Sheet 3 of 3)

# Report Commands

Table 56: Report Level Functions

COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER
2-SHOW	1-CONFIG	1-BAY/SLOT/CCT		
		3-EXT-NUM [number]		
		4-ALL		
	2-ALARMS	2-DEVICE TYPE	1-LINES	
			2-TRUNKS	
			3-RECEIVERS	
			4-PCM-CHANNELS	
		4-ALL	0-MORE	
	3-STATUS	1-BAY/SLOT/CCT	DEVICE STATUS	See Note
		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
			9-SW_DATA_STN	See Note
			0-MORE_KEYS	1-SW_CO_TRUNK
				2-SW_DID_TRUNK
				3-SW_TIE_TRUNK
				4-SW_DISA_TRUNK
				6-SW_CAP
				7-SW_TRUNK_GRP
				8-SW_HUNT_GRP
				0-MORE_KEYS
		3-EXT-NUM [number]		
		4-ALL	1-CP_DWA	
			2-CP_DWA_MEM	
			3-LINK STATUS	

(Sheet 1 of 2)

Table 56: Report Level Functions (Continued)

COMMAND	PARAMETER	QUALIFIER	QUALIFIER	QUALIFIER
			6-MT_DWA	
			7-MT_DWA_MEM	
			8-UP_1_PAGE	
			9-DOWN_1_PAGE	
		7-DSP		
	6-CHANNEL-MAP	1-LOGICAL	1-CHANNEL NUM	
		2-PHYSICAL	1-BAY_NUM	
			2-LINK_NUMBER	
	7-ERRORS	2-DEVICE_TYPE	1-SS3_SS4	
			3-DIGITAL_SETS	
			4-HDLC	
			6-DATASETS	
			7-CONSOLE	
			9-T1_TRUNK	
3-CLEAR	7-ERRORS	1-BAY/SLOT/CCT		
		2-DEVICE_TYPE	1-SS3_SS4	
			3-DIGITAL_SETS	
			4-HDLC	
			6-DATASETS	
			7-CONSOLE	
			9-T1_TRUNK	
		3-EXT-NUM		
		4-ALL	8-CONFIRM	
6-QUIT				

(Sheet 2 of 2)

**NOTE:** The following softkeys are presented when a SWID selection is made: 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. Press CP\_DWA to view the device work area for the selected device.

# Diagnostic Commands

Table 57: Diagnostic Level Functions

COMMAND	SUBCOMMAND	PARAMETER	QUALIFIER	QUALIFIER
1-TEST	1-BAY/SLOT/CCT			
	2-DEVICE_TYPE	1-ONS		
		2-LS/GS-TRUNK		
		3-RECEIVERS		
		4-JUNCTOR		
		7-CONSOLE		
		9-EM		
		0-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			
2-CLR_FEATURE	1-FORWARD	1-BAY/SLOT/CCT		
		3-EXT_NUM		
	2-DO_N_DISTURB	1-BAY/SLOT/CCT		
		3-EXT_NUM		
	3-CALL_BACK	1-BAY/SLOT/CCT		
		3-EXT_NUM		
4-ALL	1-BAY/SLOT/CCT			
	3-EXT_NUM			
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	

(Sheet 1 of 3)

Table 57: Diagnostic Level Functions (Continued)

COMMAND	SUBCOMMAND	PARAMETER	QUALIFIER	QUALIFIER
				7-CONSOLE
				9-EM
				0-MORE_KEYS
				1-COV
				2-LINK/CHANNEL
				3-DID
				4-OPS
				6-DNIC
				9-T1_TRUNK
			3-EXT-NUM	
0-MORE_KEYS	1-RANGE_B_OUT			
	2-ENABLE-DIAG	2-POWER-UP	1-BAY/SLOT/CCT	
			2-DEVICE_TYPE	1-ONS
				2-LS/GS-TRUNK
				3-RECEIVERS
				4-JUNCTOR
				7-CONSOLE
				9-EM
				0-MORE_KEYS
				1-COV
				2-LINK/CHANNEL
				3-DID
				4-OPS
				6-DNIC
				9-T1_TRUNK
			3-EXT-NUM	
	3-BUSY-OUT	1-BAY/SLOT/CCT		
		2-DEVICE_TYPE	2-LINK/CHANNEL	
		3-EXT-NUM		
	4-SPINE_WA	1-BAY/SLOT/CCT		
	5-RANGE_RTS			
	6-QUIT			
	7-DISABLE-DIAG	1-BACKGROUND	1-BAY/SLOT/CCT	
			2-DEVICE_TYPE	1-ONS
				1-LS/GS-TRUNK
				3-RECEIVERS
				4-JUNCTOR
				7-CONSOLE

(Sheet 2 of 3)



Table 57: Diagnostic Level Functions (Continued)

COMMAND	SUBCOMMAND	PARAMETER	QUALIFIER	QUALIFIER
				9-EM
				0-MORE_KEYS
				1-COV
				2-LINK/CHANNEL
				3-DID
				4-OPS
				6-DNIC
				9-T1_TRUNK
			3-EXT-NUM	
	7-DISABLE-DIAG	2-POWER-UP	1-BAY/SLOT/CCT	
			2-DEVICE_TYPE	1-ONS
				2-LS/GS-TRUNK
				3-RECEIVERS
				4-JUNCTOR
				7-CONSOLE
				9-EM
				0-MORE_KEYS
				1-COV
				2-LINK/CHANNEL
				3-DID
				4-OPS
				6-DNIC
				9-T1_TRUNK
			3-EXT-NUM	
	8-RET-TO-SVC	1-BAY/SLOT/CCT		
		2-DEVICE_TYPE	2-LINK/CHANNEL	
			4-JUNCTOR	
		3-EXT-NUM		
	9-DISC_TRUNK	1-BAY/SLOT/CCT		

(Sheet 3 of 3)

# Traffic Measurement Commands

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**Table 58: Traffic Measurement Level Functions**

COMMAND	PARAMETER	QUALIFIER
1-SET	1-UNITS	1-CCS
		2-ERLANGS
	2-PERIOD	
	3-DURATION	
	4-AUTOPRINT	1-ON
		2-OFF
	5-CANCEL	
	7-START_TIME	
	8-CONDENSED	1-ON
		2-OFF
2-SHOW	3-STATUS	
3-PRINT		
4-READ		
6-QUIT		
4-DELETE		
9-STOP	1-TRAFFIC_RPT	
	3-PRINT	

**A**

- Alarm
  - check 26
  - flowchart 50
- ANI/DNIS incoming 126
- Attendant console 107

**B**

- Backup
  - database 27
  - log entries 56
- Basic maintenance
  - commands 237
- Boot code 33
- BRI installation 203

**C**

- Cabling, peripheral interface 201
- Call Forwarding - External 141
- Card configuration, display 238
- CFCII card 5
- Changing options 35
- Channel associated signaling 82
- Circuit cards, replacing 60
- CLASS trunks 130
- Command sequences 237
- Common channel signaling 82
- Configuration
  - 336 port 18
  - 456 port 19
  - 480 port 20
  - 672 port 17
  - EL 5
  - LIGHT 13
  - SPINE 16
- Configuration Rules - SX-200
  - EL/ML 179
- Connector pin designations 218
- Control 201

- Control cards 195
- Control Dual FIM Carrier card 5
- Control Triple CIM Card Switch
  - Settings 201
- Copper Interface Ports 205
- Correcting
  - ground path problems 62
  - set / dataset problems 51
- COS Option Name
  - SMDR-Record ANI/DNIS/  
CLASS (814) 130
  - SMDR-Record Incoming Calls  
(806) 130
- COS Option Number
  - 806 (SMDR-Record Incoming  
Calls) 130
  - 814 (SMDR-Record ANI/DNIS/  
CLASS) 130
- COS options 145

**D**

- Database
  - backup 27
  - error check 26
  - restore 55
- Decryption module 35
- Decryption module error 57
- Diagnostics commands 245
- Dial-in trunk 123
- Direct inward dial (DID)/Loop
  - trunk 75
- DISA trunks 125
- Disk drive 91
- Disk drive strapping 93
- Displaying the card
  - configuration 238
- DNIC rules 183
- DNIS 126
- DSS/BLF Interface Unit 232

### E

- E&M Trunk
  - card settings 197
  - Type I 77
  - Type V 79
- E.8 error 35
- EL 5
- ELx cabinet 6
- Enabling options 35
- Entering command
  - sequences 237
- Error codes, MCC power-up 189

### F

- Faults
  - alarms, investigate 50
  - identifying 47
  - maintenance terminal 53
  - set / dataset 51
  - system not booting 49
- Feature Limitations 160
- FIM Carrier troubleshooting 67
- FIM II 184
- Firmware
  - commands 33
  - download failure 34
  - revision levels 33
  - system logs 34
  - upgrading 33
- Flash Memory
  - Upgrading in SX-200 IP Node 38
- Flowcharts, troubleshooting 47
- Form 34, Directed I/O 108

### G

- General signalling & supervision
  - concepts 70
- Getting started 47
- Ground start trunk 73

### Ground, System

- AC voltage test 63
- CO and PBX differential 64
- problems 62
- resistance test 63

### I

- ID errors, correcting 57
- IMAT 120
- Initialization sequence 187
- Interface cards, peripheral 192
- IP Trunks 132

### L

- LIGHT 13
- LIGHTWARE 19 software 21
- Loading new software 28
- Log entries, backing up 56
- Logging in 237
- Logging out 238, 255
- Logs commands 239
- Loop Start Line/Trunk 71

### M

- Main Control Card IIIEL 5
- Main controller 195
  - power-up error codes 189
- Main controller card, replacing 61
- Main distribution frame 202
- Maintenance
  - commands 237
  - logs commands 239
  - port characteristics 237, 255
  - terminal problem 53
- Maintenance Module Port 206
- MCC IIIEL 5
- MDF 202
- Mitel options selection sheet 35
- MOSS 35
- Multiline sets 113
- Music On Hold/Pager Unit
  - Pinouts 204

**N**

Non-dial-in trunk 120

**O**

Options and timers, system 153

Options password 35

Options, changing or enabling 35

**P**

PBX - PMS interface 137

PBX and PMS cannot  
communicate 89

Peripheral

cabinet, add 191

interface cabling 201

interface cards 192

interface cards, replacing 60

Pinouts for SX-200 SPINE 207

PMS

5-digit extension number 87

message - PBX to PMS 87

messages 86

programming interface 137

Pointer, meaning of 3

Power cards (EL)

high 10

low 10

PRI card

programming 116

rules 183

S1 Switch settings 184

Printer ports 108

Programmable Key Modules 230

Programming

an analog device to a SIM2 113

ANI/DNIS On Incoming Trunks  
126

attendant console 107

Call Forwarding - External 141

CLASS trunks 130

dial-in trunk 123

DISA Trunks 125

multiline sets 113

non-dial-in trunk 120

PBX PMS Interface 137

PRI card 116

printer port 108

subattendant sets 115

voice stations 112

Property Management System 86

**R**

Receivers 65

Remote Software Download 29

Replacing

circuit cards 60

main controller card 61

peripheral interface cards 60

Reports commands 243

**S**

S1 Switch Setting 198

Set Firmware, upgrading 33

SFT Port (J7) 204, 206

Show alarms 26

Show status 26

Signaling

and supervision 70

channel associated 82

common channel 82

SMDR Trunk Record

definitions 41

Software, loading 28

SPINE

Module assignment 173

Peripheral Bay 16

Subattendant sets 115

Superframe 83

SX-200

336 Port 18

456 Port 19

480 Port 20

672 Port 17

## Technician's Handbook

- EL/ML configuration rules 179
- ELx cabinet 6
- LIGHT 13
- ML (FD) and (RM) 12
- SPINE Bay 16
- SX-200 IP Node
  - Configuration 14
  - IP Trunks 132
  - Programming 132
  - Troubleshooting 93
  - Upgrading 36
- SX-200 RM peripheral interface
  - card slot assignments 202
- Symbols 3
- System
  - checklist 25
  - commands 240
  - correcting ID errors 57
  - ID mismatch 57
  - initialization sequence 187
  - is not booting 49
  - options and timers 153
- T**
- T1 or PRI Trunk port
  - (J5 and J6) 206
- T1 Trunk
  - A&B bits 83
  - A-B signalling states 84
  - loopback 83
  - maximum numbers 69
  - signaling types 82
  - superframe 83
  - synchronization 81, 82
- T1/E1 Module 184
- Table
  - Hotel/Motel
    - COS Options 139
    - System Options 138
  - LIGHTWARE 19 system
    - options and timers 153
  - PMS Circuit
    - Descriptor 118, 137
  - SPINE receivers 66
  - SX-200 DIGITAL cable
    - assignments 178
    - typical business COS options 145
  - Test Line
    - commands 100
    - indicator LEDs 102
    - specifying equipment 100
    - tones 103
  - Testing the PBX's PMS
    - interface 89
  - Tip and ring assignments 208
  - Troubleshooting 47
    - alarm, investigate 50
    - disk drive 91
    - FIM carriers 67
    - getting started 47
    - maintenance terminal 53
    - set / dataset 51
    - system not booting 49
  - Trunk Signaling
    - answer supervision 70
    - digits 70
    - disconnect supervision 70
    - receipt of digits 70
    - seize 70
    - seize acknowledgment 70
    - stop dial 70
  - Trunk Test/Verify
    - DID 75
    - E&M 80
    - Ground Start 74
    - Loop Start 72
    - T1 82

Trunks

- ANI/DNIS 126
- CLASS 130
- Dial-In 123
- DISA 125
- IP 132
- Non-Dial-In 120

**U**

- Upgrading set firmware 33
- USOC connector pin  
designations 218

**V**

- Voice stations 112

**W**

- Wrist strap 60

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