SX-20®

SUPERSWITCH®

Mitel Standard Practice

Generic 503

PN9102-050-006-NA
Issue 3

MITEL

WARNING

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

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SX-20®

DOCUMENTATION INDEX

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. DOCUMENTATION 1
Documentation Index 1
Description of Sections 3

LIST OF TABLES

TABLE TITLE PAGE

2-1 Document List 2

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1. GENERAL

1.01 This Section lists the MITEL Standard Practices pertaining to the SX-20 communications system.

Reason for Issue

1.02 This Section is issued to indicate the issue levels of the MITEL Standard Practices contained in this perfect-bound technical manual. Also contained in this Section are brief descriptions of the content of each section within the manual.

2. DOCUMENTATION

Documentation Index

2.01 The complete set of practices are contained in one volume as listed in Table 2-1.

Note: System programming forms are contained in Part Number 9180-095-205-NA, Programming Forms. This document is not part of the perfect-bound technical manual.

TABLE 2-1
DOCUMENT LIST

Section	Title	Issue Number
MITL9102-095-100-NA	General Description	Issue 3, March 1985
MITL9102-095-105-NA	Features Description	Issue 3, March 1985
MITL9102-095-106-NA	SUPERSET 3™ and SUPERSET 4™ Description	Issue 3, March 1985
MITL9102-095-150-NA	Ordering Information	Issue 3, March 1985
MITL9102-095-180-NA	Engineering Information	Issue 3, March 1985
MITL9102-095-200-NA	Shipping, Receiving and Installation Procedures	Issue 3, March 1985
MITL9102-095-210-NA	System Programming	Issue 3, March 1985
MITL9102-095-212-NA	Toll Control Description	Issue 3, March 1985
MITL9102-095-215-NA	System Test Procedures	Issue 3, March 1985
MITL9102-095-220-NA	System Speed Call	Issue 3, March 1985
MITL9102-095-301-NA	Remote Maintenance, Administration and Test System (RMATS)	Issue 3, March 1985
MITL9102-095-315-NA	Attendant Console Description	Issue 3, March 1985
MITL9102-095-350-NA	Troubleshooting Procedures and General Maintenance Information	Issue 3, March 1985
MITL9102-095-451-NA	Station Message Detail Recording (SMDR)	Issue 3, March 1985

Description of Sections

2.02 In this manual, the only numbers which normally change from section to section, are the last three numbers (i.e., -100); all others remain the same. For a complete description of the content of each section, refer to the following:

(a) MITL9102-095-100-NA, General Description, contains a brief description of the SX-20 system, and gives the reader guidance as to the content of other pertinent sections.

(b) MITL9102-095-105-NA, Features Description, describes all the features available on the system along with the programming required, special conditions peculiar to that feature, and the feature operation.

(c) MITL9102-095-106-NA, SUPERSET 3 and SUPERSET 4 Description, contains complete descriptions of the features relating to the SUPERSET 3 set and the SUPERSET 4 set used in conjunction with the SX-20 PABX.

(d) MITL9102-095-150-NA, Ordering Information, lists the equipment that can be ordered for the SX-20 communications system.

(e) MITL9102-095-180-NA, Engineering Information, contains technical information relating to the SX-20 system.

(f) MITL9102-095-200-NA, Shipping, Receiving, and Installation Procedures, provides information required to install the system efficiently.

(g) MITL9102-095-210-NA, System Programming, describes how the system is programmed and the register content of each Command Number. All the forms needed to be completed before programming the system are given in PN9180-095-205-NA, Programming Forms.

(h) MITL9102-095-212-NA, Toll Control Description, contains a detailed description of the Toll Control package used by Generic 503.

(i) MITL9102-095-215-NA, System Test Procedures, is used to test the entire system to ensure everything has been properly installed and programmed.

(j) MITL9102-095-220-NA, System Speed Call, contains information regarding System Speed Call for Generic 503.

(k) MITL9102-095-301-NA, Remote Maintenance and Administration Test System (RMATS), contains information relating to RMATS. Included in this section is some installation, programming and operational information.

(l) MITL9102-095-315-NA, Attendant Console Description, describes the SX-20 Attendant Console used with Generic 503.

(m) MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information, describes the troubleshooting procedures if there is a problem with the operation of the SX-20 system after installation and/or programming.

(n) MITL9102-095-451-NA, Station Message Detail Recording (SMDR), describes aspects of SMDR, including installation, programming and operational parameters.

SX-20®

GENERAL DESCRIPTION

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1
Documentation Description 1

2. GENERAL DESCRIPTION 1
Installation 3
Maintenance 3
System Expansion 3

3. PHYSICAL DESCRIPTION 4
A. SX-20 PABX 4
Chassis 4
Printed Circuit Cards 5
Primary Power Supply 5
Cooling Fan 6
Attendant Console 6
Call Status Display 7
Optional Remote Call Status Display 7
Test Line 9
B. SUPERSET 3™ AND SUPERSET 4™ Sets 9

4. FEATURES 10
Feature Provisioning 10
Programming 10

5. SYSTEM OPERATION 11

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
2-1	Line/Trunk Configurations	1
2-2	SUPERSET™ Line/Trunk Configurations	2
3-1	SX-20 Equipment Cabinet	4
3-2	SX-20 Attendant Console	6
3-3	Keyboard Layout	7
3-4	SX-20 Optional Remote Call Status Display	8
5-1	SX-20 Block Diagram	14

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LIST OF TABLES

TABLE	TITLE	PAGE
3-1	Card Types	5
4-1	System Features	12

1. GENERAL

1.01 This Section contains a brief description and general overview of the SX-20 communications system. A general description of the SUPERSET 3 set and the SUPERSET 4 set is also included.

Reason for Issue

1.02 This Section has been issued to describe the Generic 503 feature package.

Documentation Description

1.03 The documentation package available for Generic 503 consists of the Documentation Index. The index lists all the documents, and a brief description of the contents of each one.

2. GENERAL DESCRIPTION

2.01 The SX-20 system is an extremely compact and reliable electronic telephone communications system employing solid-state space division switching and stored program control. The system can accommodate up to 8 trunks and 72 stations or 12 trunks and 48 stations (as shown in Figure 2-1), using either a fixed or flexible numbering plan. If SUPERSET sets are installed, the system can provide a maximum of 64 stations and 8 trunks or 40 stations and 12 trunks (refer to Figure 2-2). The SX-20 system is compatible with most Private Branch Exchanges (PBX) and Central Office (CO) equipment, and provides:

- Low power consumption
- Small size
- Low card count
- Simultaneous use of DTMF and Rotary Dial stations
- Selection of fixed or flexible numbering plans

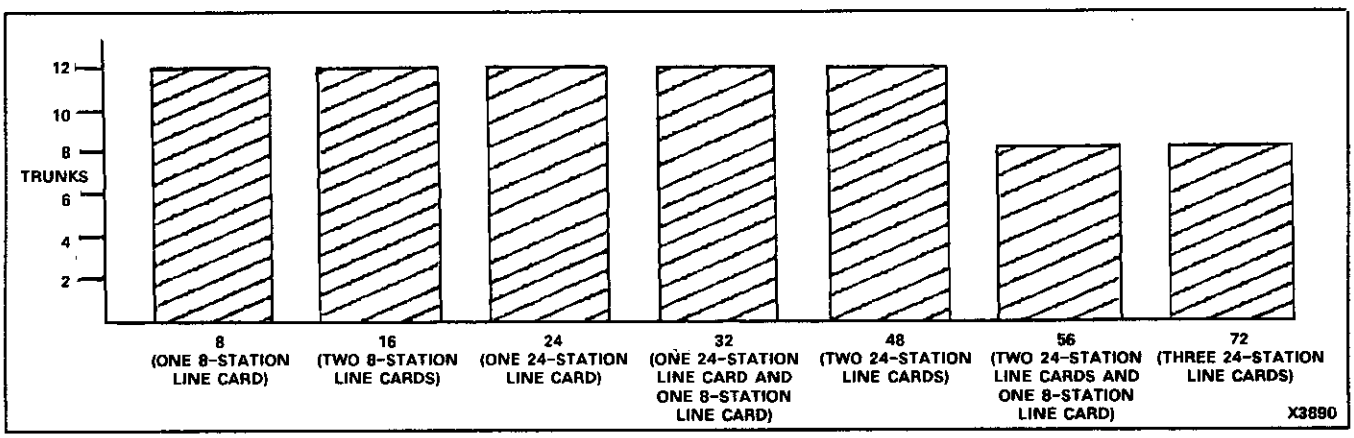

Figure 2-1 Line/Trunk Configurations

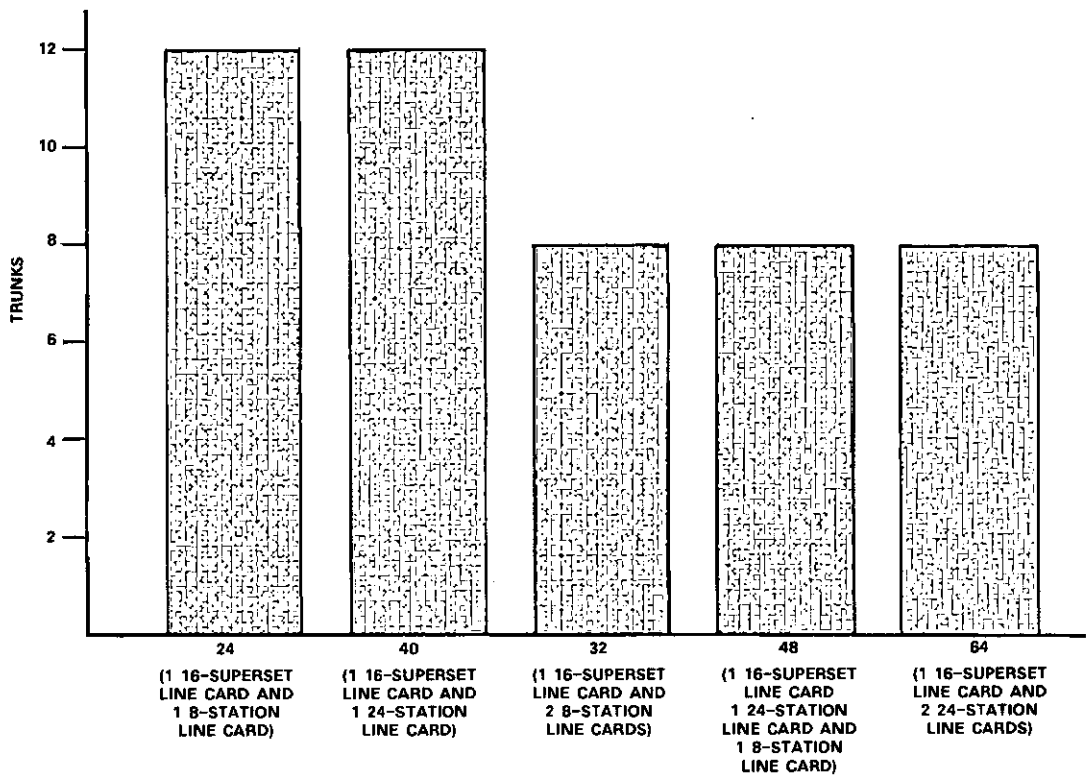

Figure 2-2 SUPERSET Line/Trunk Configurations

- Wide range of operating features
- Two power failure transfer circuits
- Standard cabinet call status display and optional remote display
- Choice of console or consoleless operation
- SUPERSET 3 set and SUPERSET 4 set operation.

2.02 Much of the equipment incorporated into the SX-20 system is common to other MITEL products, such as the SX-10™ and SUPER 10™ PABXs; a fact that can be of great significance for extra stock and maintenance considerations.

2.03 The SX-20 system consists of a single unit containing the system power supply, switching circuitry and the Cabinet Call Status Display. All connections between the SX-20 system, the distribution frame and the console are made using 25-pair connectorized cables.

2.04 Attractive design, small size - 168 mm (6.6 in.) x 419 mm (16.5 in.) x 566 mm (22.3 in.) (approximately 1.4 cubic feet) - and the capability of wall- or desk-mounting, allows the SX-20 system to be located in any office environment.

Installation

2.05 Installation of the SX-20 system consists of placing the equipment cabinet in the desired position, inserting the printed circuit boards in the required configuration and plugging the various cables into the appropriate sockets. Once the above has been completed, apply power and program the customer data. System expansion is achieved by the insertion of additional plug-in circuit boards. Refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

Maintenance

2.06 The low card count (maximum of five card types), modular design, and functional packaging of the SX-20 system permit rapid location of a defective item in the event of a circuit malfunction. If a malfunction occurs, the automatic diagnostic routines indicate to the service personnel, via alarm codes displayed in the numerical portion of the display, the suspect field-replaceable unit. Refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

System Expansion

2.07 System expansion is achieved by the addition of printed circuit cards. Lines are added in increments of 8 or 24 and CO trunks in increments of 2. The maximum configuration is 48 lines and 12 CO trunks, or for low traffic applications, 72 lines and 8 CO trunks.

3. PHYSICAL DESCRIPTION

A. SX-20 PABX

3.01 The SX-20 system consists of a metal chassis (holding the circuit cards, power supply, etc.) and an impact-resistant plastic cover. The overall dimensions of the SX-20 system are shown in Figure 3-1. The total weight of a fully equipped system is approximately 13.2 kg (29 lb).

Chassis

3.02 The SX-20 chassis holds the system power supply, the cooling fan, the Universal Console Connector Card and the equipment backplane. The equipment cards plug into the backplane and are held in position by card retainers. The hinged chassis side panel allows easy access to the circuit cards for removal and insertion. The chassis is completely enclosed within the lockable equipment case.

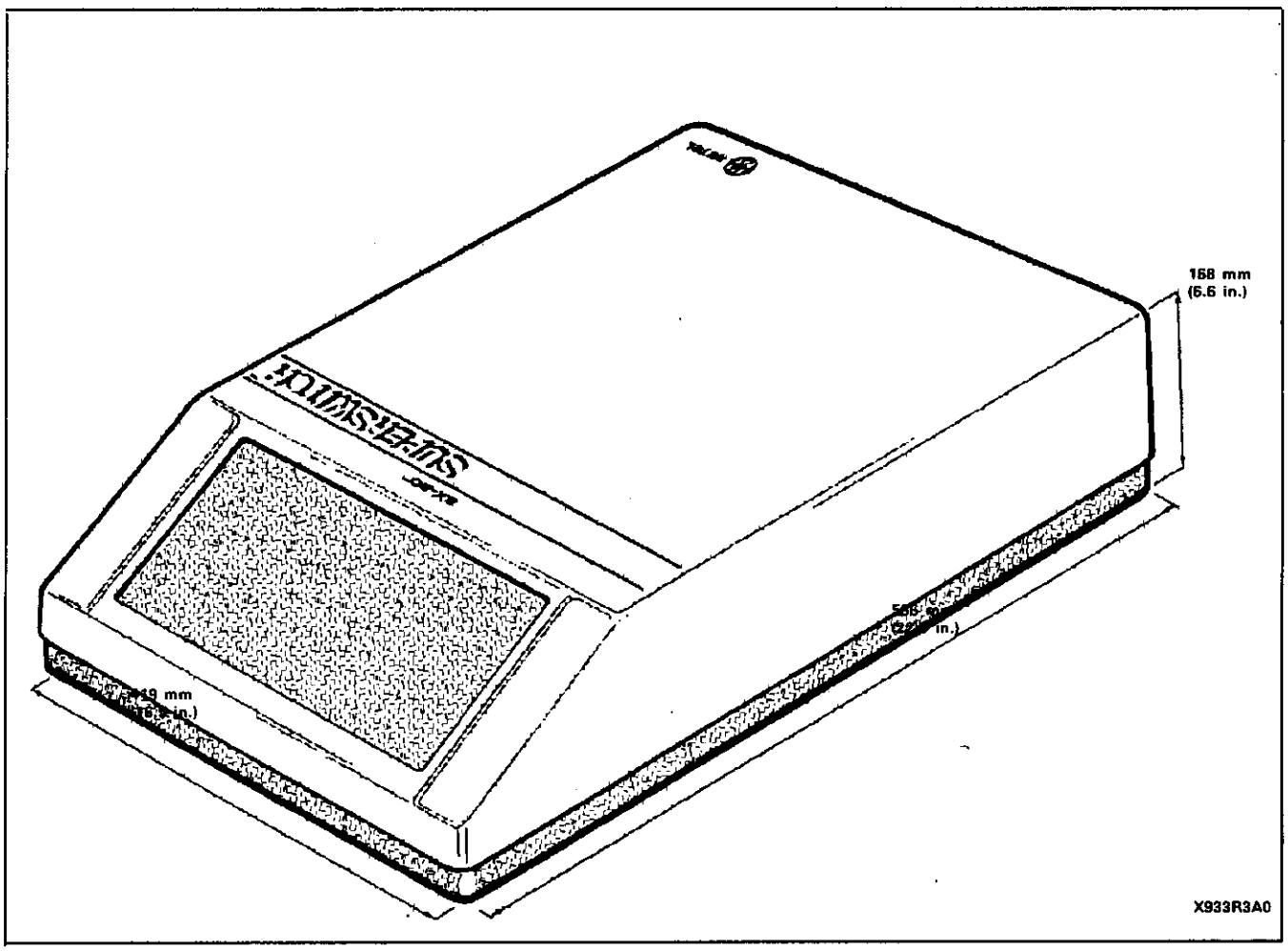

Figure 3-1 SX-20 Equipment Cabinet

Printed Circuit Cards

3.03 All printed circuit cards employed in the system are identical in construction, and consist of a fiberglass board with printed circuit patterns on both of their faces. Located on the front edge of the circuit board is an extractor clip which allows the cards to be easily removed from the equipment chassis. Each of the card types have a keyed connector preventing that card from being plugged into the incorrect card slot.

3.04 The system uses the following circuit cards: Line Cards, Trunk Expander Card, Miscellaneous Card, CPU II Card, Trunk Modules, PROM/RAM Module and RMATS Module. Refer to Table 3-1 for the dimensions and weights of each card, plus Section MITL9102-095-180-NA, Engineering Information, for a detailed description.

TABLE 3-1
CARD TYPES

Card Type	Dimensions	Weight
CPU II Card	259 mm X 406 mm (10.2 in. X 16 in.)	.9 kg (2.0 lb)
Miscellaneous Card	259 mm X 406 mm (10.2 in. X 16 in.)	.675 kg (1.5 lb)
Line Card (eight or 24 lines)	328 mm X 203 mm (12.9 in. X 8 in.)	.54 kg (1.2 lb)
PROM/RAM Module	183 mm X 178 mm (7.2 in. X 7.0 in.)	.20 kg (.43 lb)
SUPERSET Line Card	328 mm X 203 mm (12.9 in. X 8 in.)	.54 kg (1.2 lb)
RMATS Module	102 mm X 114 mm (4.0 in. X 4.5 in.)	.073 kg (.16 lb)
Trunk Module	152 mm X 111 mm (6 in. X 4.38 in.)	.17 kg (.37 lb)
Trunk Expander Card	328 mm X 203 mm (12.9 in. X 8 in.)	.45 kg (1.0 lb)

Primary Power Supply

3.05 The primary power supply for the system is mounted at the rear of the equipment chassis and provides all the system power from a 105-125 Vac, 47-63 Hz input with a maximum current drain of 3 A (230 V operation optional).

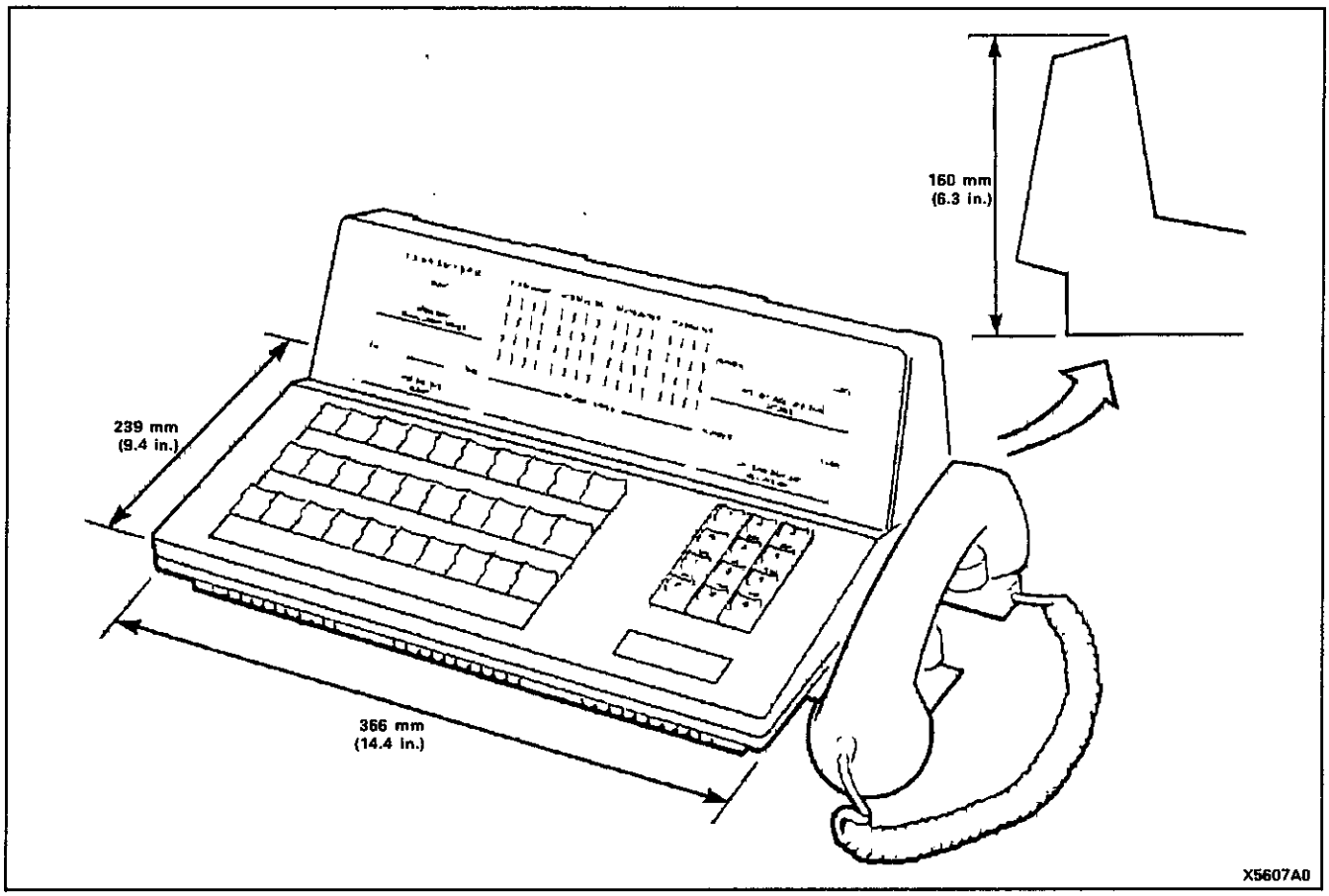

Figure 3-2 SX-20 Attendant Console

Cooling Fan

3.06 A quiet, full speed cooling fan is mounted at the rear of the cabinet. The fan draws cooling air through a filter mounted at the base of the cabinet and passes it over the circuit boards. The cooling air exits through vents in the side of the cabinet. A temperature sensor protects the circuit cards in the event of a fan failure by automatically disconnecting the power feed.

Attendant Console

3.07 The SX-20 system may be operated as a console or consoleless system. The Generic 503 feature package is used in conjunction with the MITEL SX-20 Attendant Console (as shown in Figure 3-2). The Attendant Console contains a full Call Status Display and sophisticated call handling features, including a 9-key Direct Station Selection and Superfunction keys (refer to Figure 3-3). Refer to Section MITL9102-095-315-NA, Attendant Console Description.

3.08 As a consoleless system, a single line telephone may be used in conjunction with the Remote Call Status Display as a temporary or night attendant position, with a subset of Attendant Console

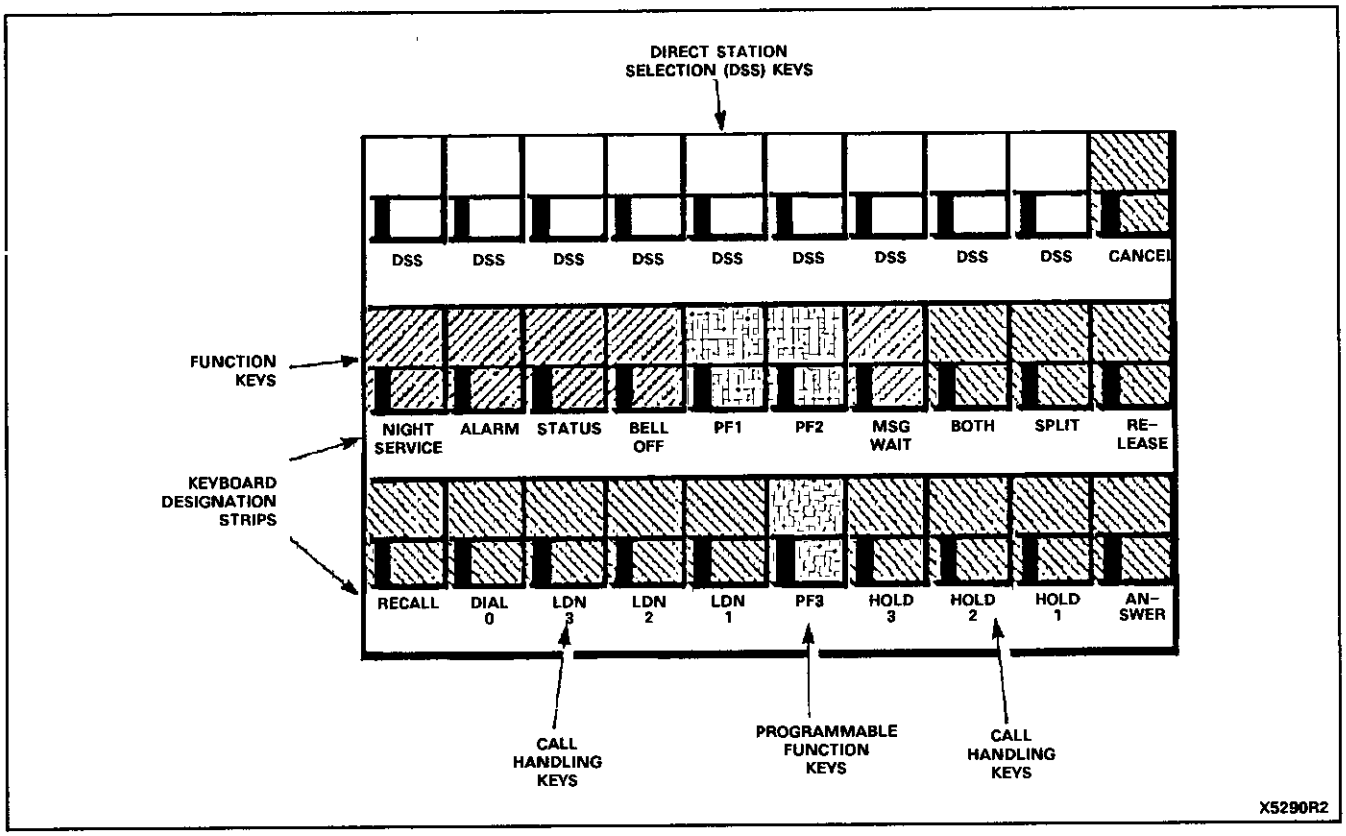

Figure 3-3 Keyboard Layout

features and full Call Status Display information. Refer to Section MITL9102-095-105-NA, Features Description (Test Line).

3.09 The Attendant Console used with the SX-20 system is connected to the equipment cabinet by a 25-pair connectorized cable of up to 152 m (500 ft) maximum length. Refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures, for wiring details.

Call Status Display

3.10 The Cabinet Call Status Display, located in the equipment cabinet, shows the active status of each line and trunk via a Busy Lamp Field. The time-of-day (if idle), programming information, alarms, called and calling party numbers are shown in an 8-digit numerical display. Four System Status LEDs indicate Night Service, ringer off, Equipment Busied, and Call Block. The display is seen through the transparent faceplate mounted on the front of the chassis.

Optional Remote Call Status Display

3.11 An Optional Remote Display (refer to Figure 3-4) can be connected via the remote display jack on the Universal Console Connector Card. This display provides all information available with the cabinet display. When the Miscellaneous Card is used, a 22-gauge

4-wire cable may be used to extend the length of the cable. In addition to the information available with the cabinet display, the remote display provides:

- Call Waiting indication
- Call Park Slot Occupancy indication
- Display of all stations with Message Waiting applied
- Programmable Busy Lamp Field
- Alarms, Pager, Reserve Power LEDs.

3.12 The numerical portion of the display consists of eight digits which show the same information as the cabinet Call Status Display. The display may be used in an interactive mode during programming and maintenance (refer to Section MITL9102-095-350-NA, Troubleshooting and General Maintenance).

3.13 The Remote Display may be used with the Test Line as a temporary or night attendant position with a full Call Status Display. When programming or maintenance is performed from the Test Line, the information is displayed on the remote and cabinet displays only. The console continues to display its current call status. When programming from the Attendant Console, the information is displayed on the Console Call Status Display only. The remote and cabinet displays continue to have the time shown in their respective 7-segment displays.

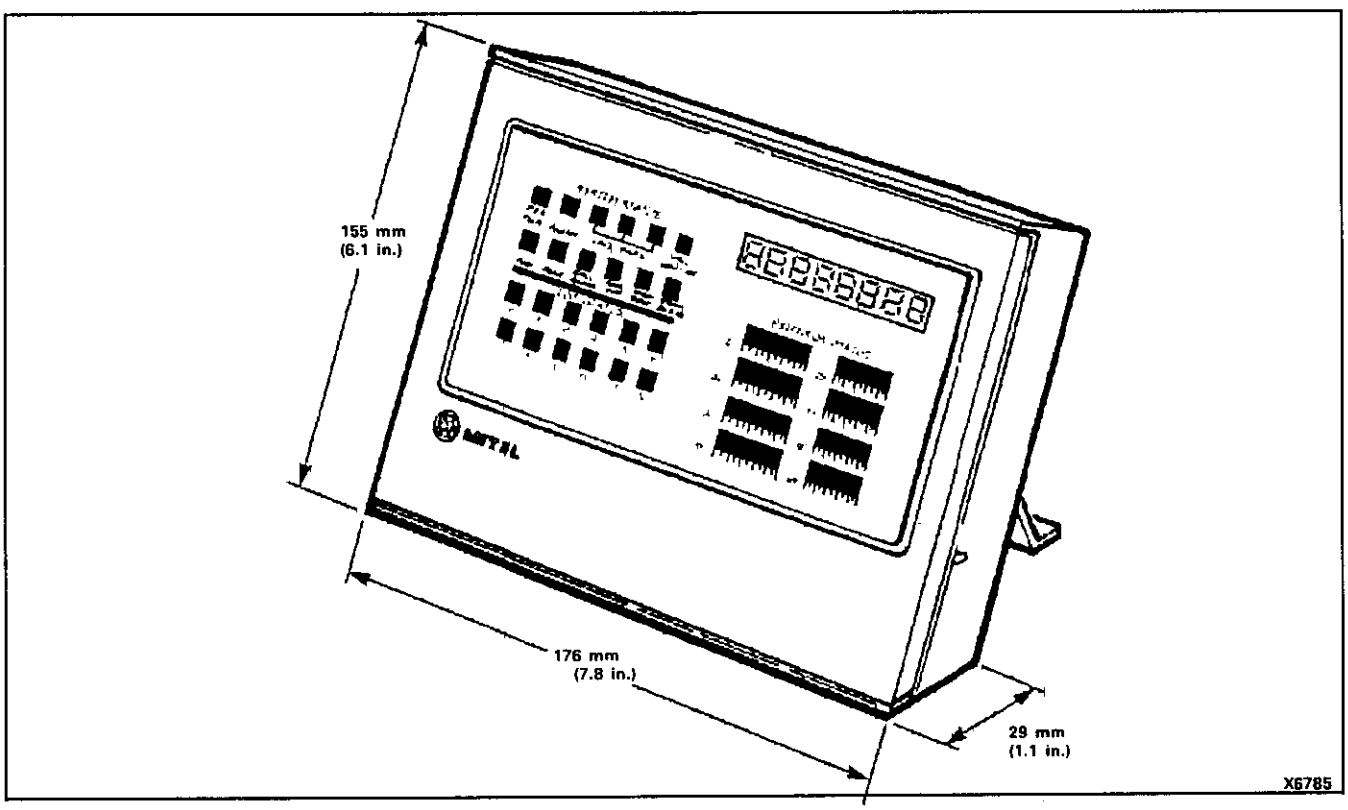

Figure 3-4 SX-20 Optional Remote Call Status Display

Test Line

3.14 The Test Line is assigned to Equipment Number 1. The station connected to this line can be used (dependent on the CPU II Card switch settings) as a normal station, or to perform any of the following tasks:

(a) Programming/reviewing the user data.

(b) All attendant functions including –

- Examining/deleting alarm indicators
- Busying out/restoring trunks
- Accessing busied-out/free trunks for testing
- Placing/removing system from night service
- Setting time-of-day (12/24-hour clock)
- Lamp test
- Cancelling all alarms and busy-outs.

3.15 The Test Line may be used in conjunction with the Remote Display to provide a second single line attendant position. It may be located up to 152 m (500 ft) from the equipment cabinet.

B. SUPERSET 3 AND SUPERSET 4 Sets

3.16 The SUPERSET set is an advanced microprocessor-controlled telephone set, employing digitally controlled integrated circuitry. The SUPERSET set can be used with the SX-20 system only when fitted with the SUPERSET Line Card. Up to 16 SUPERSET sets can be used with Generic 503 (one SUPERSET Line Card).

3.17 The SUPERSET 3 set provides the following features:

- Handsfree operation.
- Single button feature activation.
- Multiline appearances (installer-programmed) of up to three lines including Prime Line (set directory number). Multiline appearances may be a mixture of PABX lines and trunks, and may also be multi-appearances of same line.
- 12 speed call buttons.
- Automatic selection of Prime Line.
- Pushbutton selection of non-Prime Line.
- Automatic ringing line selection (PABX programmed option).
- Hold function for any call at the set.
- Volume controls for ringer and loudspeaker.

3.18 The SUPERSET 4 set is very similar to the SUPERSET 3 set but features a liquid crystal display, and offers more features to the user. The SUPERSET 4 set provides all the features that the SUPERSET 3 set offers plus the following:

- Multiline appearances (installer-programmed) of up to 15 lines including primary line (set directory number). Multiline appear-

ances may be a mixture of PABX lines and trunks, and may also be multi-appearances of the same line.
- Speed call entry at each unassigned line.
- User programming of call forward destination number, and speed call entry.
- Handsfree operation, with switchable microphone.
- Ringer pitch control for discriminating ringing.

3.19 A complete description of features available with SUPERSET 3 and SUPERSET 4 sets is found in Section MITL9102-095-106-NA.

4. FEATURES

4.01 The SX-20 system offers a full complement of features used in small business and standard hotel/motel applications. Table 4-1 lists the features available with Generic 503. For a complete description of features in the SX-20 system, refer to Section MITL9102-095-105-NA, Features Description.

Feature Provisioning

4.02 Station Features. All station features provided by the SX-20 system may be grouped into nine different Classes of Service (COS). Each Class of Service may contain any nonconflicting mixture of features. Feature programming for stations is achieved by assigning each station in the system a particular COS and determining which system features are accessible from that station. For the description of features in the SX-20 system, refer to Section MITL9102-095-105-NA, Features Description.

4.03 Console Features. Certain Attendant Console features may be enabled when programming. These programmable features concern Programmable Function keys which may not be required in all customer applications. There are three such programmable keys on the console. All other console functions are fixed and do not require programming. Refer to Section MITL9102-095-315-NA for a complete description of the Attendant Console.

4.04 SUPERSET Features. Features accessible to SUPERSET sets are grouped in the same way as station features; ie., nine different Classes of Service (COS). For a complete description, refer to Section MITL9102-095-106-NA.

Programming

4.05 Programming the system is easy, takes little time and can be carried out from the Attendant Console or the Test Line. This process consists of keying in the appropriate numerical information from the console dial keypad, or Test Line, until all programming requirements have been entered. The information provided to the system is stored in Random Access Memory (RAM). In the event of a complete power failure, the programmed data is preserved by a NiCad

battery. This battery maintains the memory contents intact for up to 4 weeks.

5. SYSTEM OPERATION

5.01 The SX-20 system is a solid-state communications system employing space division switching and microprocessor control of call processing. A block diagram of the SX-20 system is shown in Figure 5-1.

5.02 The microprocessor can access all areas of the SX-20 system either for information or to change the state of the equipment. The microprocessor scans the lines, trunks and the Attendant Console, and controls the connections to the 12 speech paths. All the lines, trunks and the Attendant Console have access to each of the 12 speech paths.

5.03 **Power Failure Transfer.** The power failure transfer relays provided can operate two Central Office trunks to station lines. For a complete description, refer to Section MITL9102-095-180-NA, Engineering Information.

TABLE 4-1
SYSTEM FEATURES

- Access Trunk by Equipment Number
- Alarm Indicators
- Attendant Access
- SX-20 Attendant Console
- Attendant and Maintenance Functions
- Attendant Overflow to TAFAS
- Automatic Callback - Busy
- Automatic Diagnostics
- Automatic Station Release
- Automatic Wake-Up
- Behind PABX Operation
- Bell Off
- Block Programming
- Busy Lamp Field
- Calibrated Flash
- Call Block
- Call Direction
- Call Forwarding - Busy
- Call Forwarding - Don't Answer
- Call Forwarding - Follow Me
- Call Hold (Attendant)
- Call Hold (Station)
- Call Selection
- Call Status Display (Cabinet and Remote)
- Camp-On
- Class of Service
- Configuration Switches
- Consoleless Operation
- Data Dump/Load
- Data Line Security
- Dial Call Pickup
- Dictation Trunks
- Direct-In Lines
- Direct Outward Dialing
- Direct Station Selection (DSS)
- Direct Inward System Access (DISA) Trunks
- Discriminating Ringing
- Distinctive Callback Ringing
- Distinctive Dial Tone
- E&M Trunks
- Executive Busy Override (Console)
- Executive Busy Override (Stations)
- External Call Forwarding
- Flash Disable
- Flash for Attendant
- Flash Is Release
- Flexible Night Service
- Flexible Numbering Plan
- Housephone (Manual Line)
- Identified Trunk Group
- Incoming Call Identification
- Individual Trunk Access
- Last Number Redial
- Lockout on Stations
- Make/Break Ratio and Pulse Rate
- Message Register Audit
- Message Registration
- Message Waiting
- Message Waiting Indication during Day Service Only
- Mixed Station Dialing
- Music on Hold
- Night Bells
- Paging Access
- Paging (Attendant)
- Power Failure Restart
- Power Failure Transfer
- Printer Port
- Programming
- RMATS (Remote Maintenance Administration and Test System)
- Restrictive Station Control
- Reversal Meaning
- Ring Group
- Rotary Dial Pulse-to-Digit Translation
- Selectable Ringing Frequency
- Selectable Tone Plans
- Speech Path Access

TABLE 4-1 (Cont'd)
SYSTEM FEATURES

Station Calls to Attendant Night Answer Point	Tone-to-Pulse Conversion
Station Feature Reset	Transfer/Add-On/Consultation Hold
Station Hunting	Transfer Dial Tone
Station Message Detail Recording (SMDR)	Trunk-to-Trunk plus Station Conferencing
Station Switchhook-Flash Timing	Trunk Alarm Control
Station Transfer Security	Trunk Answer From Any Station (TAFAS)
SUPERSET 3 Set and SUPERSET 4 Set	Trunk Busy-Out Enable
System Administration Access Code Display/Security Codes	Trunk Emergency Release
System Security Code Programming	Trunk Group Overflow
System Speed Call	Trunk Groups
Test Lines	Trunk Status Display
Time Display	Unlimited Wait for Dial Tone
Toll Control	User Security Code Programming
	Wait for Dial Tone

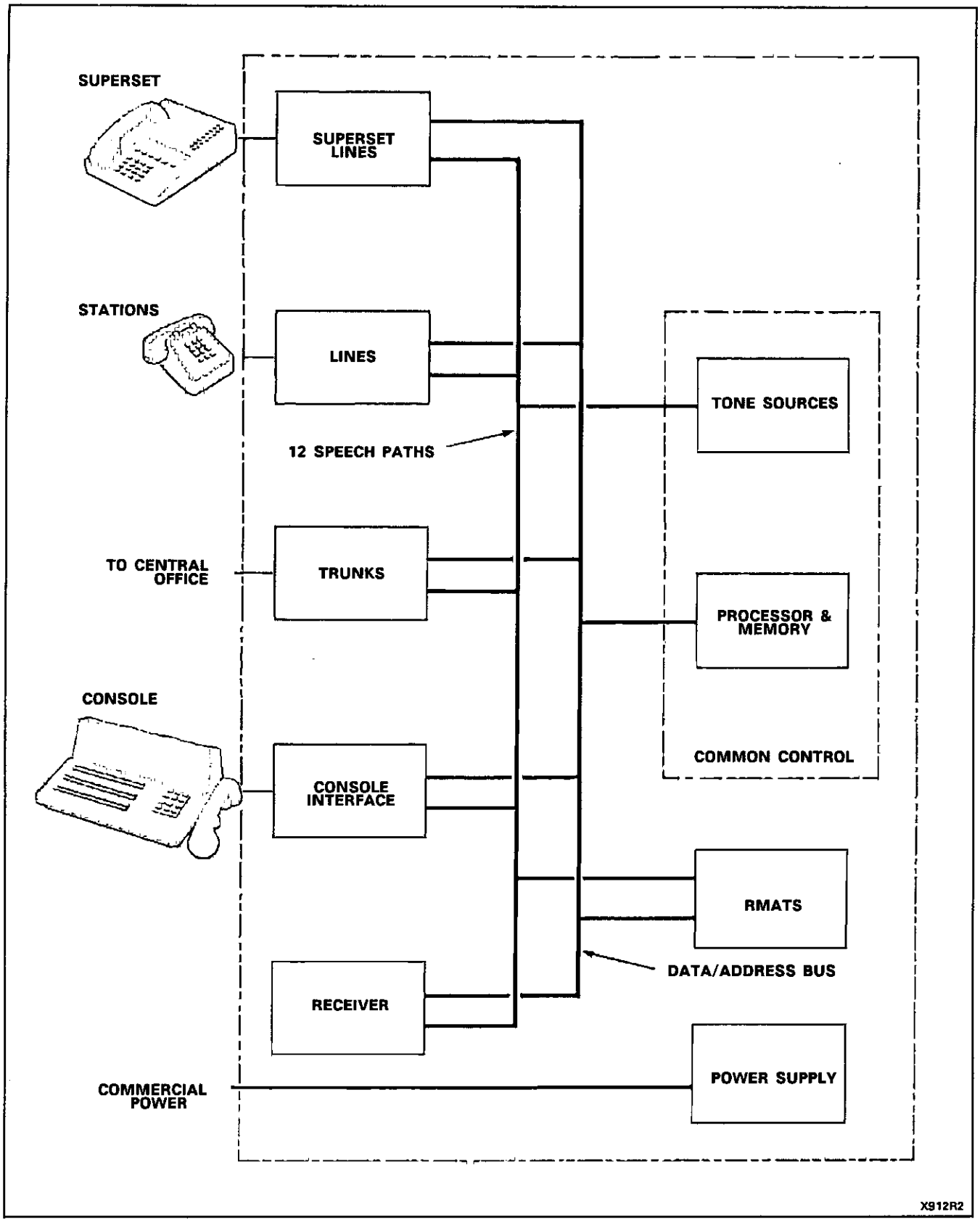

Figure 5-1 SX-20 Block Diagram

SX-20®
FEATURES DESCRIPTION

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. FEATURES DESCRIPTION 1
Alarm Indicators (CON) 2
Alarm Indicators (MAJ) 3
Alarm Indicators (MIN) 4
Attendant Access 6
Attendant Console 7
Attendant Console Display 9
Attendant and Maintenance Functions 11
Attendant Overflow to TAFAS 14
Automatic Callback - Busy 16
Automatic Diagnostics 17
Automatic Station Release 19
Automatic Wake-Up 20
Behind PABX Operation 22
Bell Off 24
Block Programming 25
Cabinet Display 26
Calibrated Flash 28
Call Block 29
Call Direction 30
Call Forwarding - Busy 31
Call Forwarding - Don't Answer 33
Call Forwarding - Follow Me 34
Call Hold (Attendant) 35
Call Hold (Station) 36
Call Selection 38
Camp-On 39
Class of Service (COS) 41
Configuration Switches 43
Consoleless Operation 44
Data Dump/Load 46
Data Line Security 48
Dial Call Pickup 49
Dictation Trunk 50
Direct-In Lines 5
Direct Outward Dialing 52
Direct Station Selection (DSS) 53
DISA Trunks 55
Discriminating Ringing 57
Distinctive Callback Ringing 58

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CONTENTS (CONT'D) PAGE

Distinctive Dial Tone 59
E&M Trunks 60
Executive Busy Override (Console) 62
Executive Busy Override (Stations) 64
External Call Forwarding 66
Flash Disable 68
Flash for Attendant 69
Flash Is Release 70
Flexible Night Service 71
Flexible Numbering Plan 73
Housephone (Manual Line) 74
Identified Trunk Group 75
Incoming Call Identification 76
Individual Trunk Access 77
Last Number Redial 78
Lockout on Stations 79
Make/Break Ratio and Pulse Rate 80
Message Register Audit 81
Message Registration 82
Message Waiting 84
Message Waiting Indication during Day Service Only 86
Mixed Station Dialing 87
Music on Hold 88
Night Bells 89
Paging Access 90
Paging (Attendant) 91
Power Failure Restart 92
Power Failure Transfer 93
Printer Port 94
Programming 97
Remote Call Status Display 99
Remote Maintenance Administration and Test System (RMATS) 101
Restrictive Station Control 103
Reversal Meaning 105
Ring Group 106
Rotary Dial Pulse-to-Digit Translation 108
Selectable Ringing Frequency 109
Selectable Tone Plans 110
Speech Path Access 111
Station Calls to Attendant Night Answer Point 112
Station Feature Reset 113
Station Hunting 115
Station Message Detail Recording (SMDR) 116
Station Switchhook Flash Timing 118
Station Transfer Security 119
SUPERSET 3™ and SUPERSET 4™ Sets 120
System Administration Access Code Display/Security Codes 121
System Security Code Programming 122
System Speed Call 123

CONTENTS (CONT'D) PAGE

TAFAS Overflow Key 124
Test Line 125
Time Display 126
Toll Control 127
Tone-to-Pulse Conversion 128
Transfer/Add-On/Consultation Hold 129
Transfer Dial Tone 131
Trunk Alarm Control 132
Trunk Answer From Any Station (TAFAS) 133
Trunk Busy-Out Enable 135
Trunk Emergency Release 136
Trunk Group Overflow 137
Trunk Groups 138
Trunk Hunting (Terminal or Circular) 139
Trunk-to-Trunk plus Station Conferencing 140
Unlimited Wait for Dial Tone 141
User Security Code Programming 143
Wait for Dial Tone 144

LIST OF TABLES

TABLE TITLE PAGE

2-1 Attendant and Maintenance Functions 12
2-2 Class-of-Service Options 42
2-3 CPU II Card Configuration Switch Functions 43
2-4 Printer Port Interconnections 94

1. GENERAL

1.01 This Section contains a description of the features provided by the SX-20 PABX and Generic 503. The selection of features and services is subject to minimal constraints, allowing each system to be configured to meet the individual requirements of the customer.

Reason for Issue

1.02 This Section has been issued to describe the features available with Generic 503.

1.03 Detailed instructions for the programming and testing of each feature are given in the following Sections:

- Section MITL9102-095-210-NA, System Programming
- Section MITL9102-095-215-NA, System Test Procedures.

2. FEATURES DESCRIPTION

2.01 This Part contains a description of each feature provided by the system. Each description contains four subparts:

- **Description** - a detailed description of the feature or service.
- **Conditions** - a list of any special condition which should be taken into account when selecting the feature or service.
- **Programming** - the parameters which must be programmed to allow selection and operation of the feature or service.
- **Operation** - a brief description of the feature operation. In a number of attendant feature operations the * symbol or 71 is shown. This is the Attendant Function Access Code.

Note: It is assumed throughout this Section that Default Data is used and only the console is being used to perform the features described.

ALARM INDICATORS (CON)

Description

A console alarm indicates that there has been a malfunction within the console. Call processing continues but the console operation is impaired. An external alarm (if connected) also rings. Refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

Conditions

- The system goes into Night Service.

Programming

None

Operation

If there has been a malfunction (i.e., checksum error), the CON Alarm LED lights. Refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

ALARM INDICATORS (MAJ)

Description

If the console does not receive any data from the system for 2 seconds, the MAJ LED lights, indicating there has been a malfunction between the PABX and the console. All other displays and indicators go dark, leaving only the MAJ LED lit. If the console handset is removed, there is no power to the console and the system automatically goes into Night Service.

Conditions

None

Programming

None

Operation

Refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

ALARM INDICATORS (MIN)

Description

The system continuously checks its own operation and, if a malfunction is detected, raises an alarm. Alarms are indicated by:

- The console bell rings.
- The ALARM key LED and the MIN Alarm LED on the Attendant Console flash.
- The A1 LED flashes on the Remote Display.
- The closure of an alarm contact.

The cause of the alarm may be determined by pressing the ALARM key or dialing the required Attendant Function Code (from either the Test Line or the Attendant Console), and interpreting the code shown on the System Call Status Display. For a full description of each alarm indication, refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

Conditions

- If the console bell has been disabled, the alarm indicators are visual only.
- Up to eight alarm indications may be stored by the system.

Programming

None

Operation

To Display the Most Recent Alarm Data:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 13 – check alarm code shown on the numeric portion of the Call Status Display and record in the Trouble Log.
- Press the RELEASE key. The alarm data is stored in the system memories, the audible alarm is cancelled and the system is returned to normal call processing.
- Note whether the equipment busied (EQPT BUSIED) LED is flashing.

To Sequentially Display All Entries in the Alarm Queue and Cancel the Alarm Indication at the Console as Displayed:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 31 – record the alarm code and the number of the device affected (shown on the display portion of the Call Status Display). The alarm indications clear (removed from memory) sequentially but does not de-busy the equipment which has been busied-out. Record the alarm in the Trouble Log.

- Dial * - the current alarm data is deleted from the system memories and the previous alarm code displayed. All alarm codes (up to eight) held in the system memories, may be displayed sequentially and deleted in this manner. When all alarm data has been displayed and removed from the console alarm queue, the display shows dashes. Please note that although the alarms have been cancelled, the equipment which caused the alarm is still busied-out.
- Press the RELEASE key. The system returns to normal call processing.
- Note whether the equipment busied (EQPT BUSIED) LED is flashing.

To Cancel All Alarm Data, Alarm Indications and Busy-Outs:

- Dial the Attendant Function Access Code (71 or *).
- Dial 32 - all alarm data, alarm indications and busy-outs are cancelled.

ATTENDANT ACCESS

Description

This feature automatically routes a station that dials the Attendant Access Code to the Attendant Console. The attendant is alerted to the call by the DIAL 0 and ANSWER key LEDs flashing and the console bell ringing.

Conditions

- Numbering Plan conflicts are not permitted. Station calls to the Attendant Night Answer Point routes these calls to a defined station during Night Service, System Options Programming (Command 601), Register 4.
- Station calls to attendant routed to TAFAS routes these calls to the Night Bells if the Attendant Console is not in use or when TAFAS Overflow is in effect (if one of the console keys has been programmed as a TAFAS Overflow key, System Options Programming, Command 601, Register 4).

Programming

Feature Access Code Programming (Command 602):

- The Attendant Access Code defaults to 0.
- The default code may be used or it may be changed.

Operation

To Answer a DIAL 0 Call:

- Press the ANSWER or DIAL 0 key – the ANSWER key LED lights solid, the number of the calling station is displayed on the left of the Call Status Display and the attendant is connected to the calling station.

Note: If additional calls arrive while the Attendant Console is already engaged in a call, the Call Waiting Indicator displays the number of calls waiting to be answered. In addition, the console bell rings intermittently to indicate that there are calls waiting.

ATTENDANT CONSOLE

Description

The console is connected to the equipment cabinet by a 25-pair cable. The various status displays show the active status of each station (on the Extension Status), each trunk (on the Trunk Status Display), the time-of-day and the called and calling numbers (on an 8-digit numerical display). Refer to ATTENDANT CALL STATUS DISPLAY, INCOMING CALL IDENTIFICATION, ATTENDANT AND MAINTENANCE FUNCTIONS in this Section. The Attendant Console has 30 keys in addition to the dial key pad. The function of these keys can be divided into two groups: the nine Direct Station Select (DSS) keys each of which may be assigned to a station, Trunk Group, Ring Group or Hunt Group; and the Function keys (some of which are programmable) which are laid out to provide efficient attendant call processing, control and support. The keys available on the console are:

- CANCEL
- RELEASE
- ANSWER
- BOTH
- SPLIT
- RECALL
- DIAL 0
- LDN 1, 2, 3
- HOLD 1, 2, 3
- NIGHT SERVICE
- ALARM
- STATUS
- BELL OFF
- MSG REG (Programmable)
- MSG WAIT
- PAGE (Programmable)
- CALL BLOCK (Programmable)
- OVERFLOW (Programmable)
- OVERRIDE (Programmable)
- AUTO WAKE-UP (Programmable).

Conditions

- Personality Module, Part Number 9102-009-004-NA must be used.
- For DSS keys, refer to DIRECT STATION SELECTION in this Section.
- Refer to Section MITL9102-095-315-NA, Attendant Console Description for complete details on the console.

Programming

- Three keys on the console are programmable. For location of these keys, refer to Section MITL9102-095-210-NA, System Programming.
- Of the 11 special functions provided by the Function keys (the MSG REG key also provides Restrictive Station Control), six are programmable. Refer to Function Key Programming (Command 972) in Section MITL9102-095-210-NA, System Programming.
- Assign one function to each of the three programmable keys.

Operation

- Refer to the Attendant Console Guide (Part Number 9180-953-101-NA) and Section MITL9102-095-315-NA for further details.

ATTENDANT CONSOLE DISPLAY

Description

The Attendant Console display indicates the following:

- Attendant and Maintenance functions
- System programming data
- Alarms
- Call Status information

The Attendant Console includes the following displays:

ALARM DISPLAY:

MIN LED: This LED flashes when the system has detected a malfunction. Refer to Section MITL9100-093-350-NA, Troubleshooting Procedures and General Maintenance Information for alarm code interpretations.

CON LED: This LED lights when the system has detected a malfunction within the console. Refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

MAJ LED: This LED lights when the console does not receive any data from the system for 2 seconds. All other displays and indicators go dark. Refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

Extension Status (Busy Lamp Field) Display: The Extension Status indicates the active status of each station. If the LED is on, the station is busy or ringing. If the LED is off, the station is idle. If the LED is flashing, the station is on hold at the console.

SYSTEM STATUS DISPLAY:

EQPT BUSIED LED: This LED is lit when an equipment unit is busied-out.

BELL OFF LED: This LED is lit when the Attendant Console ringer has been disabled.

NIGHT LED: This LED is lit when the system is in Night Service.

CALL BLOCK LED: This LED is lit when the Call Block feature is activated. Refer to CALL BLOCK in this Section.

RES PWR LED: This LED is lit when the system is operating on Reserve Battery Backup.

CALL WAITING DISPLAY:

TABLE 2-1
ATTENDANT AND MAINTENANCE FUNCTIONS

Function	Code
Night Service - ON	*11
Night Service - OFF	*12
Identifying and Clearing Audible Alarms†	*13
Set 12-Hour Clock (entered in 24-hour mode)	*14 + 2-digit hours, 2-digit minutes
Set 24-Hour Clock	*15 + 2-digit hours, 2-digit minutes
Lamp Test	*16
Lamp Test (on Remote Display only)	*16
Background Music - ON	*17
Background Music - OFF	*18
Access Trunk by Equipment Number	*19 + Trunk Equipment Number
Trunk Emergency Release	*20 + Trunk Equipment Number
Flexible Night Service	*21 + Trunk Equipment Number + new Night Answer Point Station No.
Message Registration/Restrictive Station Control	*22 + Station Number
Call Block - ON	*23
Call Block - OFF	*24
Access Speech Path by Equipment Number	*27 + Speech Path Number
Display All Message Waiting	*28
Cancel All Message Waiting	*29
Alarm Clear/Cancel Alarm Indications	*31
Cancel All Alarms, Alarm Indicators and Busy-Outs	*32
Busy Out Trunk	*41 + Trunk Equipment Number
Busy Out DTMF Generator	*42
Busy Out DTMF Receiver	*43 + DTMF Receiver Number
Busy Out Dial Tone Detector	*44 + Dial Tone Detector Number
Busy Out Speech Path	*45 + Speech Path Number
Unbusy Trunk	*51 + Trunk Equipment Number
Unbusy DTMF Generator	*52
Unbusy DTMF Receiver	*53 + DTMF Receiver Number
Unbusy Dial Tone Detector	*54 + Dial Tone Detector Number
Unbusy Speech Path	*55 + Speech Path Number

TABLE 2-1 (CONT'D)
ATTENDANT AND MAINTENANCE FUNCTIONS

Function	Code
To view Speed Dial Numbers programmed at the Prime Station/Console	⁎60 + two digits in the range 10 - 69
To program the Speed Dial Numbers for the Prime Station/Console	⁎65 + two digits in the range 10 - 69
To program Automatic Wake-Up at a station	⁎71 + Station Number
To view Automatic Wake-Up time at a station	⁎72 + Station Number
Message Registration Audit	⁎73
Printer - Suspend	⁎75 + ⁎
Printer - Purge and Suspend	⁎75 + 0
Printer - Resume	⁎75 + #
Set date at the console (Displayed on Remote Display and the SUPERSET 4 sets)	⁎80 + DD-MM-YY
Data Dump	⁎97 + Security Code
Data Load	⁎98 + Security Code
System Status - Trunks	#990⁎
System Status - Stations	#991⁎
System Status - System	#992⁎
Software Identity Display	#999⁎

† This function may be accessed by using a console key.

ATTENDANT OVERFLOW TO TAFAS

Description

This feature ensures that all calls coming to the Attendant Console (when the system is in Day Service) are answered when the console is idle or unmanned. The calls which have not been answered within a defined time-out, are routed to TAFAS. Any station having TAFAS pickup enabled in its Class of Service, can pick up the overflow calls. Console calls overflow to TAFAS if the preprogrammed time-out has expired, or if the programmable TAFAS Overflow key at the console has been pressed.

Conditions

- The system may be programmed so all incoming calls may be picked up through TAFAS/Night Bells.
- If the console is in use, then calls overflow to TAFAS only after the TAFAS Overflow key is pressed.
- If the TAFAS Overflow key is not pressed, then after the first call at the console which exceeds the TAFAS time-out, all subsequent calls route to Night Bells equipment immediately, until the console is used.
- A station cannot place a call on Consultation Hold, then answer a TAFAS call.

Programming

System Options Programming (Command 601), Register 4:

- Day TAFAS Mode must be set to 1 (Immediate Switching to TAFAS) or 2 (Automatic Switching to TAFAS After Time-out). Default is 2.
- Night TAFAS Mode must be set to 1 (Immediate Switching to TAFAS) or 2 (Automatic Switching to TAFAS After Time-out). Default is 1.
- Station calls to Attendant or Test Line Routed to Night Bells should be set to 1 (Enable During Day Service), 2 (Enable During Night Service) or 3 (Enable During Both Day and Night Service). Default is 1.
- Set Automatic Switching to TAFAS Time-out to desired time-out (1 → 7 x 10 Seconds). Default is 3 (30 Seconds).

Feature Access Code Programming (Command 602), Register 9:

- Assign required TAFAS Pickup Access Code. Default is 57.

Class-of-Service Programming (Commands 611 → 619), Register 3:

- TAFAS Access must be specified as 1 (Enable Pickup from Night Bells) or 2 (Enable Pickup from Night Bells/Attendant). Default is 2.

Function Key Programming (Command 972):

- Program one of the Programmable Function keys (1 through 3) as the TAFAS Overflow key.

Operation

Incoming Call to TAFAS/Night Bells Pickup:

- At station – lift handset and dial TAFAS Pickup Access Code.
- The station is connected to the call.
- At a SUPERSET 4 set – lift handset and press the NIGHT ANS feature button.

AUTOMATIC CALLBACK - BUSY

Description

Automatic Callback - Busy allows a station user, upon encountering a busy station number or trunk group, to have the call completed when the busy number becomes free. After the feature has been activated, the system continuously monitors the originating station and the called number. When both parties become idle, the system rings the originating station using distinctive ringing, if desired. When the originating station answers, the called station is rung or dial tone from a trunk in the required trunk group is heard. If more than one callback request is active on any number, the requests are queued and serviced on a first-in, first-out basis.

Conditions

- The Automatic Callback Access Code is 6. This code is not programmable.
- The Automatic Callback Access Code (6) must be dialed within 10 seconds of receiving busy tone.
- An individual callback cannot be cancelled by the attendant.
- A callback always rings the originating station; Call Forwarding has no effect.
- Automatic Callback may be activated on station numbers and Trunk Group Access Codes only.
- Up to 16 callback requests may be active within the system at any time.
- Callbacks from stations are cancelled (by the station only) upon dialing 444 (Station Feature Reset).
- If the two parties involved in callback hold a conversation (not a conference) before the callback is honoured, the callback is cancelled automatically.
- Duplicate callback requests are ignored (the original callback request is cancelled).
- If a callback is not answered by the originating station within four rings, it is automatically cancelled.
- If the called number (station only) becomes busy before the originating party answers a callback, the originating party hears a busy tone, but does not need to dial the Callback Code again as this is performed automatically by the system.
- All callback requests are lost after recovery from a power failure.
- Attendant cannot set up Automatic Callback - Busy.
- Automatic Callback cannot be set on Hunt Group(s) or Ring Group(s).
- A callback cancels if not activated within 8 hours.

Programming

System Options Programming (Command 601), Register 1:

- If desired, Distinctive Callback Ringing may be set to 1 (Enable). Default is 1.

Class-of-Service Programming (Commands 611 → 619), Register 3:

- Automatic Callback - Busy must be set to 1 (Enable). Default is 1.

Operation

To Set Up an Automatic Callback - Busy:

- Dial the required station number or Trunk Group Access Code - busy tone is heard.
- Dial 6 (Callback Access Code) within 10 seconds - dial tone is returned and the station is available for normal use.

To Answer an Automatic Callback - Busy:

- The station user hears distinctive callback ringing.
- Lift handset - ringing tone is heard, the called station rings or dial tone is heard from the trunk.
- If, on lifting the handset busy tone is heard - someone else has accessed the trunk or station. The system sets up Automatic Callback - Busy automatically unless the callback was placed on your own station.

AUTOMATIC DIAGNOSTICS

Description

The SX-20 system continuously runs automatic diagnostic checks which test the: memory, speech path connections, tone receivers, tone generator, supervisory tones, dial tone detectors and speech path biasing. If the automatic diagnostics detects a malfunctioning unit, the unit is busied-out and an alarm is raised. Refer to ALARM INDICATORS in this Section. For a full description of automatic diagnostics, refer to Section MITL9102-095-180-NA, Engineering Information.

Conditions

- To run diagnostics, Configuration Switch 2 on the CPU II Card must be set to CLOSED.
- To disable diagnostics, Configuration Switch 2 on the CPU II Card must be set to OPEN.
- The network trunk alarms may be disabled. Refer to TRUNK ALARM CONTROL in this Section.

Programming

System Options Programming (Command 601), Register 2:

- Automatic Diagnostics must be set to 1 (Enable). Default is 1.

Operation

To Display the Total Number of Busied-Out Units:

- Press the STATUS key once - the total number of busied-out units is shown on the left of the display (except trunks).
- Release the STATUS key - the display goes dark.
- Alternatively, dial #992* to display the individual devices of busied-out units.

To Display the Total Number of Busied-Out Trunks:

- Press the STATUS key twice - the display indicates the status of Trunks 1 → 8: 0 (trunk idle), 1 (trunk busy) and 2 (trunk busied-out).
- Press the STATUS key three times - the status of Trunks 9 → 12 are displayed.

AUTOMATIC STATION RELEASE

Description

The SX-20 system automatically releases and locks out a station if the user exceeds any of the following time-out periods:

- **Dial Time-out.** If a station user does not dial a digit within 10 seconds of receiving dial tone, dial tone is replaced with Reorder tone. Reorder tone is applied for a period of 20 seconds. If, during this time the station user flashes the switchhook, the station connects immediately to a receiver. After 20 seconds of reorder tone, the station is released and locked out. The station user must go on-hook to re-establish service.
- **Interdigit Time-out.** If, after dialing a digit, a user fails to dial further digits within 10 seconds (the interdigit time-out period), the receiver is released and reorder tone is applied to the station. If the station remains off-hook for an additional 20 seconds, reorder tone is removed and the station is locked out. The station must go on-hook to re-establish service.

Conditions

None

Programming

None

Operation

None

AUTOMATIC WAKE-UP

Description

This feature allows the attendant to set up a wake-up alarm call that rings the station at a prearranged time. After answering a wake-up alarm call, the station user receives either a special wake-up tone or music. If the call is not answered (or if the station is busy), the call repeats two more times at 5 minute intervals. Each time, the station rings four times.

Printouts: Every time the station rings (or an alarm is set up, changed or cancelled), a message is printed on the printer. The printer message would have the following format:

nnn mm/dd hh:mm WU HH:MM MESSAGE

- nnn - station number
- mm/dd - date (month and day)
- hh:mm - time-of-day
- WU - feature (Automatic Wake-Up)
- HH:MM - wake-up time (24-hour clock)
- MESSAGE - an explanation of what has occurred

The messages include **ANSWER, NO ANSWER X, SET, CHANGED** and **CANCELLED** where **X** is the wake-up call number (maximum of three attempts). After three unsuccessful wake-up call attempts, the wake-up call is abandoned and marked with five ⁎s; i.e., **NO ANSWER 3⁎⁎⁎⁎⁎.**

Conditions

- Upon system reset, the automatic wake-up resets to the system clock as opposed to the real time, except calls that have been rung more than once. Warning: Reset system clock to real time.
- The printer has a queue for auto wake-up reports. If this queue fills up, a minor alarm results: AL92 - Printer Queue Full. The system inhibits subsequent Automatic Wake-up calls until there is room in the queue. This could be due to a suspended printer. Refer to PRINTER PORT in this Section and to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

Programming

System Options Programming (Command 601), Register 6:

- Set Automatic Wake-Up to the required signal that the station hears upon answering the alarm call: 0 (Disable), 1 (Enable With Wake-up Tone) or 2 (Enable With Music). Default is 1.

- If a printout is required at each wake-up, set Automatic Wake-Up Printout to 1 (Enable). Default is 0 (Disable).

System Options Programming (Command 601), Register 7:

- Set printer to required baud rate. Default is 6 (300 Baud).
- Set Printer Parity to 0 (No Parity), 1 (Odd Parity), or 2 (Even Parity). Default is 0.
- Set Printer Number of Bits Tx to 5, 6, 7 or 8 Tx Bits . Default is 8 Tx Bits.
- Set Printer Number of Stop Bits to 1 or 2 Stop Bits. Default is 2 Stop Bits.
- Set Printer Slow Carriage Return Option to 0 (Disable) 1 (Output 2 Nulls at End-of-Line), 2 (Output 4 Nulls at End-of-Line), 3 (Output 8 Nulls at End-of-Line), 4 (Output 16 Nulls at End-of-Line), 5 (Output 32 Nulls at End-of-Line) or 6 (Output 64 Nulls at End-of-Line).

Function Key Programming (Command 972):

- Program one of the console keys as the AUTO WAKE-UP key.

Operation

Entering the Wake-Up Call:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial Attendant Function 71.
- Dial the station number requesting the Alarm Call. The system displays the station number and five dashes (nnn-----).
- The Attendant then enters the time in hours and minutes (24-hour clock).
- If the Attendant enters **9999**, the Alarm Call is cancelled.

Displaying the Wake-Up Call:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial Attendant Function 72.
- Dial the station number - the system displays the station number, a dash, and the time in hours and minutes (nnn-HHMM).

BEHIND PABX OPERATION

Description

Using a system in Behind PABX Operation, allows it to be installed as a 'slave' PABX to the customers' existing PABX (the host PABX) to increase its line size with a high level of transparency. This feature is accomplished by connecting a trunk circuit in the system to a line circuit of another PABX. This feature allows an established call to be transferred back and forth between the system and another PABX an unlimited number of times without re-establishing the call again. In other words, a call which is previously transferred from another PABX can be transferred back to that PABX as if the two PABXs were a single entity.

Conditions

- Cannot have Identified Trunk Groups in Behind PABX Operation.
- All trunks (involved in Behind PABX Operation) must have their equipment numbers programmed to the same Behind PABX Trunk Group.
- Cannot have numbering plan conflicts.
- The Trunk Group Access Code with Behind PABX Operation enabled can only be programmed to a single digit.
- When transferring a call from the slave PABX to the host PABX, the station user upon receiving transfer dial tone, must dial the the Trunk Group Access Code assigned to perform the Behind PABX Operation, then the station number to gain access of the host PABX.
- A switchhook-flash timing of 280 ms is provided.
- If the slave PABX is programmed for some type of Toll Control (for example, restrict on first digit 0) and the host PABX is not, then the slave PABX returns reorder tone. However, the host PABX console rings once before dropping the call.

Programming

Trunk Group Programming (Commands 821 → 826), Register 1:

- Behind PABX Access Code (i.e., the Trunk Group Access Code) must be programmed as a single digit.
- Behind PABX Operation must be set to 1 (Enable). Default is 0 (Disable).

Operation

- All features normally applicable to the system are still executed in the same manner.

To Consult With a Third Party in the Host PABX:

- The station flashes the switchhook - the call is placed on Consultation Hold.
- Dial the single digit Trunk Group Access Code - dial tone is received from the host PABX.
- Dial number of the third party - when the call is answered the user may consult privately.

To Add the Third Party in the Host to the Call:

- Flash switchhook - all three parties are connected together.

To Transfer the Call to the Third Party in the Host PABX:

- Replace handset - the original call is transferred to the third party in the host PABX.

BELL OFF

Description

This feature allows the attendant to disable and enable the console bell. When the bell is disabled, calls to the console are indicated by flashing LEDs only.

Conditions

None

Programming

None

Operation

To Turn Off the Console Bell:

- Press the BELL OFF key on the console.
- The BELL OFF key LED and the System Status Bell Off LED light.
- The bell is disabled.

To Turn On the Console Bell:

- Press the BELL OFF key if the key LED is lit.
- The BELL OFF key and the System Status Bell Off LEDs go dark.
- The bell is enabled.

BLOCK PROGRAMMING

Description

This feature allows sequential equipment numbers to be programmed as a whole. It is possible to program sequential station numbers or COS, Toll Restriction and Pickup Group Numbers. For detailed information, refer to Section MITL9102-095-210-NA, System Programming.

Conditions

- All station numbers in the same block must contain the same number of digits.

Programming

Station Numbering - Block Programming (Command 621):

- Assign station numbers to a block of equipment numbers.

Station COS, Toll Restriction and Pickup Group - Block Programming (Command 622):

- Assign COS, Toll Restriction and Pickup Group membership to a block of equipment numbers.

Operation

None

CABINET CALL STATUS DISPLAY

Description

The Cabinet Call Status Display is located in the system equipment cabinet. The display shows all call-handling information using the Extension Status, Status LEDs and Numerical Display. Note: SUPERSET Set Line Cards have no LEDs. Therefore, the status of SUPERSET sets is not displayed on the Cabinet Call Status Display.

Busy Lamp Field. The Busy Lamp Field displays the active status of each station. If the busy LED is on, the station is busy. If the LED is off, the station is idle, and if flashing the station is on hold at the console.

Status LEDs. The Status LEDs show the active state of each trunk and selected features.

- **Trunk Status LEDs.** Each trunk circuit has an associated Trunk Status LED. If the Status LED is on, the trunk is busy or busied-out. If the LED is off, the trunk is idle and if the LED is flashing, the trunk has been placed on hold.
- **Call Block LED.** This LED is lit when the Call Block feature is activated. Calls between stations with Call Block enabled in their COS are prevented.
- **Night LED.** This LED lights when the system is operating in Night Service.
- **Equipment Busied LED.** This LED lights to indicate that either the system automatic diagnostics or maintenance personnel have detected a malfunctioning device, and have busied-out that device.
- **Ring Off LED.** This LED lights to indicate that the console bell is disabled (either by using the Attendant Function or by the console key).

Numerical Display. The numerical display on the Cabinet Call Status Display shows the following call information: the called and/or calling number, programming information (command number and data), attendant/maintenance function information, recall indication (camp-on and ringing) or message registration counters. The Cabinet Call Status Display also indicates call park slots. When idle, the time-of-day may be displayed using either a 12- or 24-hour clock.

Conditions

- If the Attendant Console is used to program the system or to perform an attendant/maintenance function, the Console display shows the programming or attendant/maintenance function information.
- If the Test Line is used to program the system or to perform an attendant/maintenance function, the Cabinet Call Status Display (and Remote Call Status Display) show the appropriate information. Refer to REMOTE CALL STATUS DISPLAY in this Section.
- The display is not affected when RMATS is used.

Programming

Busy Lamp Field Programming (Command 970):

- Assign the station number at the beginning of each row. (Refer to Section MITL9102-095-210-NA, System Programming for details.)

Operation

None

CALIBRATED FLASH

Description

The Calibrated Flash feature (normally used in Europe and Mexico), is between 50 ms - 140 ms and is supported by rotary and DTMF station wherever possible. In some situations, it is not possible to determine whether a flash is intended, or if the digit 1 is intended. Whenever there is a conflict between a flash and the digit 1, it is assumed the digit 1 was intended. For example, when signaling out on a trunk and a flash between 50 - 140 ms is recorded, and the calibrated flash option had been enabled, the software treats the report as a digit 1. The problem arises whenever both flash and digit reports are valid.

Conditions

None

Programming

System Options Programming (Command 601), Register 5:

- Set Station Switchhook-Flash Timing to 3 (90 ms Calibrated Flash). Default is 0 (150 → 750 ms). The other Switchhook-Flash Timings are 1 (150 → 1500 ms) and 2 (Flash is Release).

Operation

None

CALL BLOCK

Description

This feature allows the attendant to inhibit calling between stations with Call Block enabled in their COS. An attempt to place a call between two stations with the above restriction, results in the caller receiving reorder tone. If, for example, COS 1 has Call Block enabled and COS 2 has Call Block disabled, a station with COS 1 cannot call another station WITHIN his COS if the feature has been enabled by the attendant, but CAN call stations in COS 2 since Call Block is disabled for that COS. The Call Block LED on the System Status Display indicates when the system is in this state.

Conditions

- When Call Block is enabled, access to trunks is still allowed.
- When the console key is first pressed, the system first determines if the feature has been enabled on a systemwide basis, then checks each COS to determine which stations are affected.

Programming

Class-of-Service Programming (Commands 611 → 619), Register 3:

- Controlled Station-to-Station Restriction (Call Block) must be set to 1 (Enable). Default is 0 (Disable).

Function Keys Programming (Command 972):

- Assign Call Block to the required function key.

Operation

(a) Console Key Operation:

- To enable Call Block, press the programmed key on the console once.
- The key LED and the Call Block LED on the System Status light.
- If the key is pressed again, Call Block is disabled and the key LED turns off.

(b) Attendant Function Operation:

To Set Up Call Block:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 23; the display blanks, and the Call Block LED and key LED light.

To Cancel Call Block:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 24; the display blanks, and the Call Block LED turns off.

CALL DIRECTION

Description

This COS option defines a station as Originate Only (cannot receive calls), Receive Only (cannot make calls), or Bothway Calling (can make and receive calls).

Conditions

- Originate Only and all features requiring call reception are mutually exclusive.
- Receive Only and all features requiring direct call origination are mutually exclusive with an incoming call.
- Receive Only may complete incoming calls using all features enabled in its COS.

Programming

Class-of-Service Programming (Commands 611 → 619), Register 2:

- If the station is defined as Originate Only, Call Direction must be specified as 0.
- If the station is defined as Bothway Calling, Call Direction must be specified as 1.
- If the station is defined as Receive Only, Call Direction must be defined as 2.
- Default is 1 (Bothway Calling).

Operation

None

CALL FORWARDING – BUSY

Description

This feature allows a user (forwarder) to have all calls forwarded to the attendant, Hunt Group, Ring Groups or to a selected station number (forwardee) within the SX-20 system, WHEN THE USER'S STATION IS BUSY. While this feature is active and the forwarder is idle, calls may be made and received normally.

Conditions

- Callbacks always ring the originating station; Call Forwarding has no effect.
- Only one type of Call Forwarding may be active on each station at any time. If a station has one type of Call Forwarding Code active and the user enters a new Call Forwarding Code, the first type of forwarding is cancelled.
- If an invalid number is selected as a forwardee, reorder tone is returned.
- Call Forwarding does not apply if the calling station (or attendant) is the party to which the call would be forwarded.
- Calls cannot be forwarded to a station designated as Originate Only.
- Call Forwarding can be applied to Night Service (NS) operation and Direct-In Lines (DIL).
- Stations may forward to a Station Hunt Group, or Ring Group but any forwarding in effect on the stations in that Hunt Group is ignored; i.e., calls may be forwarded on a one-step basis only.

Programming

Feature Access Code Programming (Command 602), Register 11:

- Assign required Call Forwarding – Busy Access Code. Default is 59.

Class-of-Service Programming (Commands 611 → 619), Register 4:

- Call Forwarding – Busy must be set to 1 (Enable). Default is 1.

Operation

To Set Up Call Forwarding – Busy:

- Lift the handset – dial tone.
- Dial the Call Forwarding – Busy Access Code.
- Dial the number to which calls are to be forwarded (station number, Hunt Group or Ring Group Access Code or the Attendant Access Code) – dial tone.

- The station is available for normal use.

To Cancel Call Forwarding - Busy:

- Lift the handset - dial tone.
- Dial the Call Forwarding - Busy Access Code - no tone is heard.
- Replace the handset.

CALL FORWARDING - DON'T ANSWER

Description

This feature specifies where all unanswered calls to a station (which are not answered within the selected time-out), are forwarded. The calls are forwarded to the preassigned station, Hunt Group, Ring Group or attendant.

Conditions

Refer to CALL FORWARDING - BUSY Conditions in this Section.

Programming

System Options Programming (Command 601), Register 3:

- Set the required Timed Recall - Don't Answer Time-out from 10 to 70 Seconds. Default is 30 Seconds.

Feature Access Code Programming (Command 602), Register 10:

- Assign required Call Forwarding - Don't Answer Access Code. Default is 58.

Class-of-Service Programming (Commands 611 - 619), Register 4:

- Call Forwarding - Don't Answer must be set to 1 (Enable). Default is 1.

Operation

To Set Up Call Forwarding - Don't Answer:

- Lift the handset - dial tone.
- Dial the Call Forwarding - Don't Answer Access Code.
- Dial the number of the forwarding station, Hunt Group Access Code, Ring Group Access Code or the Attendant Access Code - dial tone.
- The station is available for normal use.

To Cancel Call Forwarding - Don't Answer:

- Lift the handset - dial tone.
- Dial the Call Forwarding - Don't Answer Access Code - no tone is heard.
- Replace the handset.

CALL FORWARDING - FOLLOW ME

Description

This feature allows a station user (forwarder) to have all calls forwarded to the attendant, Hunt Group, Ring Group or a selected station (forwardee) within the SX-20 system. The forwardee is the only originating party that may call the forwarder. While Call Forwarding - Follow Me is active, the forwarder may originate calls in the normal manner.

Conditions

Refer to CALL FORWARDING - BUSY Conditions in this Section.

Programming

Feature Access Code Programming (Command 602), Register 08:

- Assign required Call Forwarding - Follow Me Access Code. Default is 56.

Class-of-Service Programming (Commands 611 - 619), Register 4:

- Call Forwarding - Follow Me for the originating station must be set to 1 (Enable). Default is 1.

Operation

To Set Up Call Forwarding - Follow Me:

- Lift handset - dial tone.
- Dial the Call Forwarding - Follow Me Access Code.
- Dial the number to which the calls are to be forwarded (station number, Hunt Group Access Code or the Attendant Access Code) - distinctive dial tone.
- Replace the handset - the station is available for call originations.

To Cancel Call Forwarding - Follow Me:

- Lift the handset - distinctive dial tone.
- Dial Call Forwarding - Follow Me Access Code - no tone is heard.
- Replace the handset - all Call Forwarding is cancelled.
- Normal system dial tone is returned.

CALL HOLD (ATTENDANT)

Description

This feature allows the attendant to place a call on hold in one of three slots. This frees the DIAL 0 or LDN key where the call originally appeared on. The call may then be picked up by any station upon dialing the correct Call Hold Access Code.

Conditions

- The Call Hold Access Code is shown on the Call Status display upon depression of the HOLD key.
- Trunk status LED flashes if a trunk call is placed on hold.
- Station Busy Lamp Field LED on the Extension Status display flashes if a call is placed on hold on the console.
- If Music on Hold is desired, a Trunk Expander Card is required.

Programming

System Options Programming (Command 601), Register 1:

- If Music on Hold is required, set Music on Hold to 1 (Enable). Default is 0 (Disable).

System Options Programming (Command 601), Register 3:

- Timed Recall - Call Hold (Test Line/Attendant) can be set to (1 → 7) X 10 Seconds. Default is 3 (30 Seconds Recall Time).

Feature Access Code Programming (Command 602), Registers 15, 16 and 17:

- Assign Call Hold Access Codes. Default data is 451 (Register 15), 452 (Register 16) and 453 (Register 17).

Operation

To Place a Call on Hold:

- Answer an incoming call.
- Press a HOLD key on the console.
- The call hold location is shown on the Extension Status Display. If a trunk has been placed on hold, the Station LED flashes and the associated Trunk LED flashes.
- The call is automatically released from the console - the ANSWER key goes dark.

To Pick Up a Held Call:

- Lift handset.
- Dial the call hold location number from a station, or press the lit HOLD key on the console.
- The station is connected to the held party.

CALL HOLD (STATION)

Description

This feature allows a station user (when engaged in an active call) to place the call on hold by dialing a code and then replace the station handset or use the station for other calls. All features normally active on the station may be selected while the call is held. The held call may be retrieved locally or remotely (from a different station) by dialing the required Call Hold Retrieve Access Code. A held call may be retrieved as part of Consultation Hold/Add-On. The holding station may originate a new call. The station may interchange the held call with an active call. If the held call is not retrieved within the selected recall time, the holding station is automatically recalled (refer to the following conditions):

Conditions

- If Music on Hold is desired, a Trunk Expander Card is required.

To recall a Station on Hold:

- **To busy station.** The station camps on to the station if Station Camp-On is enabled.
- **No Answer.** The station rings for 5 minutes and if not answered in that period the call is dropped. The held call does not recall any further than the station which originally put the call on hold.

To recall a Trunk on Hold:

- **To busy station.** The trunk call camps onto the station and then after the time-out, recalls to the attendant.
- **No Answer.** The trunk call rings the station and if the call is not answered within the Don't Answer time-out, it is directed to the Attendant.

Programming

System Options Programming (Command 601), Register 1:

- If Music on Hold is required, set Music on Hold to 1 (Enable, from Trunk Expander Card). Default is 0 (Disable).

System Options Programming (Command 601), Register 3:

- Assign required Timed Recall - Call Hold (Station), 1 through 4 Minutes. Default is 3 Minutes.

Feature Access Code Programming (Command 602):

- **Register 03.** Assign required Call Hold Access Code. Default Access Code is 51.

- **Register 04.** Assign required Call Hold Retrieve - LOCAL Access Code. Default Access Code is 52.
- **Register 05.** Assign required Call Hold Retrieve - REMOTE Access Code. Default Access Code is 53.

Class-of-Service Programming (Commands 611 → 619), Register 3:

- Call Hold for the holding station must be set to 1 (Enable). Default is 1.

Operation

At the Station:

- Originate or answer a call.
- Flash the switchhook.
- Dial the Call Hold Access Code - dial tone is returned. The original call is held. The holding station may make or receive calls or access features in the normal manner.

To Retrieve the Call Locally (from the holding station):

- Lift handset.
- Dial the Call Hold Retrieve - LOCAL Access Code.
- The call is returned to the holding station.

To Retrieve the Call Remotely (from a remote station):

- Lift handset.
- Dial the Call Hold Retrieve - REMOTE Access Code.
- Dial the number of the holding station. The call is connected to the remote station.

CALL SELECTION

Description

This feature allows the attendant to answer calls either in the order in which they arrive at the console, or by selecting a specific call type. As calls arrive at the console, they are queued and the LED associated with the call flashes. The attendant may answer the first call in the console queue by pressing the ANSWER key, or may select a call of a specific type by pressing the key associated with the flashing LED. The LEDs associated with the calls remaining in the attendant queue continue to flash. Six incoming call indicators are provided, identifying the following call types:

- ANS LED flashes for all incoming calls.
- DIAL 0 - calls from stations.
- RECALL - recalls.
- LDN 1-3 - These keys may be assigned to incoming trunks in order to arrange the trunks in up to three different groups as required.

Conditions

- Assignment of trunks to LDN keys is programmable. All trunks may be on one key, or they may be distributed across all three keys as required.

Programming

Trunk Programming (Commands 801 - 812), Registers 4 and 5.

Operation

To Answer the First Call in the Attendant Queue:

- Press the ANSWER key - the tone ringer stops, the LED associated with the call type goes dark, the Call Status Display shows the number of the calling trunk or station, and the attendant is connected to the calling party.
- ANSWER key LED remains lit.

To Answer a Specific Call Type:

- Press the key associated with the desired call type - the tone ringer stops, the key LED goes dark, the display shows the number of the originating party, and the attendant is connected to the calling party.
- ANSWER key LED remains lit.

CAMP-ON

Description

This feature connects (camps on) incoming trunk calls or station calls to a busy station, warns the station that there is a call waiting and completes the call automatically when the station becomes free. When a call is camped on to a station, the called station, and only that station, hears either a 200 ms burst of camp-on tone (which indicates a station has camped on) or two 100 ms bursts of camp-on tone (which indicates a trunk call has camped on to the station). If a trunk camped-on call was extended to the station from another station and the camped-on call is not answered within the time-out period, the camped-on call recalls to the station that originated the camp-on. Station camped-on calls do not recall.

Conditions

- If the Camp-On feature is disabled, the console can still perform a Camp-On to a station WITH indication.
- Depending on the option selected, either the attendant (only) or the attendant plus stations may camp trunk calls onto busy stations. Refer to Programming in this Description.
- Camped-on calls that are not completed within the selected Camp-On time-out period recall to the console (if the console originated the camp-on) as a Camp-On recall (trunks only).
- If the Camp-On feature is disabled, an attempt by a station to camp a call on to another station rings the trunk back to the station that made the Camp-On attempt.
- Stations with Data Line Security, COS Programming (Commands 611 → 619, Register 3) enabled in their Class of Service (COS) may have a call camped on, but the station does not receive the camp-on tone.

Programming

System Options Programming (Command 601), Register 1:

- Camp-On (Onto Stations Only) must be specified as 1 (Enable Stations → Stations), 2 (Enable, Trunks → Stations) or 3 (Enable, Both). Default is 3.

System Options Programming (Command 601), Register 3:

- Set Timed Recall - Camp-On to desired time period (1 → 7 X 10 Seconds). Default is 30 Seconds.

Operation

Station-to-Station:

- Establish station call to a busy station.

- The calling station hears a special busy tone but remains off-hook.
- After approximately 10 s, the busy station hears one burst of camp-on tone and the calling party hears a normal busy tone.
- When the busy station goes on-hook, the calling party hears ringback tone and the called station is rung.
- The called station lifts the handset; the station call is connected.

Trunk-to-Station (via Console Transfer):

- Establish a trunk call to the console.
- Console transfers the call to a busy station and releases.
- The trunk call is effectively on hold and hears music (if provided).
- The called station hears two bursts of camp-on tone.
- The busy (called) station goes on-hook. The trunk call hears ringback tone; the called station is rung.
- The called station lifts handset; the trunk call is connected.
- If the busy (camped on) station does not go on-hook within the time-out period, the camped-on call recalls to the console.

Trunk-to-Station (via Direct-In Line):

- Establish a trunk call to a busy station using a Direct-In Line (DIL).
- The called station hears two bursts of camp-on tone and the calling trunk hears ringback tone.
- When the station goes on-hook, it is automatically rung.
- The called station lifts the handset and the call is completed.
- If the called station ignores camp-on, the trunk hears ringback tone.

CLASS OF SERVICE (COS)

Description

The SX-20 system defines up to nine independent COS. Each COS defines the features that may be accessed by a station or Inward Dial Trunk assigned that COS. The features that may be assigned to a COS are listed in Table 2-2.

Conditions

- Maximum of nine independent COS per system.
- One COS may be assigned per station or Inward Dial Trunk.

Programming

Feature Access Code Programming (Command 602):

- Assign required Feature Access Codes.

Class-of-Service Programming (Commands 611 → 619), Registers 1, 2, 3, 4 and 5:

- Assign desired features to each Class of Service.

Station Programming (Command 620):

- Assign Class of Service to required stations or Inward Dial Trunks.

Block Programming - Class-of-Service, Toll Restriction and Pickup Group (Command 622):

- If groups of stations are given the same COS, Toll and Pickup Group, use this command number.

Trunk Programming (Commands 801 →812), Register 1:

- If the trunk is an Inward Dial Trunk, set Inward Dial Class of Service to the required COS, 1 through 9. Default is 0 (Not Inward Dial).

Operation

None

TABLE 2-2
CLASS-OF-SERVICE OPTIONS

Register	Option
Register 1	Trunk Group 1 Access Trunk Group 2 Access Trunk Group 3 Access Trunk Group 4 Access Trunk Group 5 Access Trunk Group 6 Access Access to Trunk Group Overflow
Register 2	Switchhook/Ground Button Flash Flash For Consultation Hold Flash For Test Line/Attendant Originate Only Receive Only Bothway Calling Housephone DISA Access Code Message Registration/Restrictive Station Control Message Waiting Rotary Only
Register 3	Automatic Callback - Busy Paging Access Data Line Security Call Hold Call Block TAFAS Access SMDR Enable
Register 4	Call Forwarding - Follow Me Call Forwarding - Busy Call Forwarding - Don't Answer Proceed To Be Call Forwarded Externally Executive Busy Override Executive Busy Override Security
Register 5	Access to Speed Dial Numbers 10 → 19 Access to Speed Dial Numbers 20 → 29 Access to Speed Dial Numbers 30 → 39 Access to Speed Dial Numbers 40 → 49 Access to Speed Dial Numbers 50 → 59 Access to Speed Dial Numbers 60 → 69 Last Number Redial Enable

CONFIGURATION SWITCHES

Description

There is a bank of switches located on the CPU II Card which are used by installers to set the configuration of the system. The purpose of these switches is listed in Table 2-3, and on the top of the chassis.

Conditions

- Programming Mode may be accessed from the console with Configuration Switch 8 in the CLOSED position, provided the system has been initialized or the User Security Code has been entered.
- If the attendant is viewing the programming information, dial # (no User Security Code is required for viewing only).

Programming

None

Operation

- Set the correct switch to the desired position.

TABLE 2-3
CPU II CARD CONFIGURATION SWITCH FUNCTIONS

Switch	Function
1	CLOSED - Cabinet Display Orientation, Desk-Mount OPEN - Cabinet Display Orientation, Wall-Mount
2	CLOSED - Automatic Diagnostics Enable OPEN - Automatic Diagnostics Inhibit
3	Reserved
4	Reserved
5	Reserved
6	CLOSED - Equipment No. 01 - Station OPEN - Equipment No. 01 - Test Line
7	CLOSED - 3-Digit Numbering Plan OPEN - 2-Digit Numbering Plan
8	CLOSED - Review Mode OPEN - Programming Mode

CONSOLELESS OPERATION

Description

The SX-20 system may be operated without the use of an Attendant Console. Under these conditions all features associated exclusively with the console are unavailable.

Conditions

- All incoming trunks must be assigned to Night Bells or a station. Refer to DIRECT-IN LINES, NIGHT BELLS, TAFAS, FLEXIBLE NIGHT SERVICE, and STATION CALLS TO ATTENDANT NIGHT ANSWER POINT in this Section.
- If stations are allowed to camp a trunk call onto a busy station, then Camp-On (Onto Stations Only) must reflect this requirement. Refer to the Programming of CAMP-ON in this Section.
- In this mode, programming and access to attendant functions must be performed from the Test Line.

Programming

System Options Programming (Command 601), Register 4:

- Station Calls to Attendant or Test Line Routed to Night Bells must be set to 1 (Enable During Day Service), 2 (Enable During Night Service) or 3 (Enable During Both Day and Night Service). Default is 1.

- Day TAFAS Mode must be set to 1 (Immediate Switching to TAFAS) or 2 (Automatic Switching to TAFAS After Time-out). Default is 2.

- Night TAFAS Mode must be set to 1 (Immediate Switching to TAFAS) or 2 (Automatic Switching to TAFAS After Time-out). Default is 1.

- Station Call to Attendant Answer Point During Console Inhibit or Night Service must be specified by equipment number. Default is 00 (Attendant).

- Console Inhibit must be set to 1 (Enable). Default is 0 (Disable).

Feature Access Code Programming (Command 602), Register 09:

- Assign Access Code for TAFAS pickup. Default is 57.

Class-of-Service Programming (Commands 611 - 619), Register 3:

- TAFAS Access Code must be set to 1 (Enable Pickup From Night Bells), or 2 (Enable Pickup From Attendant/Night Bells). Default

is 2.

Trunk Programming (Commands 801 → 812), Register 4:

- Day TAFAS Answer Mode must be set to 0 (Direct-In Line).
- Direct-In Line Equipment number must be specified. Default is 01 (Station Equipment Number 01).

Trunk Programming (Commands 801 → 812), Register 5:

- Night TAFAS Answer Mode must be set to 0 (Flexible Night Service).
- Night Service Equipment Number must be specified. Default is 01 (Station Equipment Number 01).

Operation

If the System is Operated in Night Service:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 11; dial tone is returned.
- The system is in Night Service.

If the System is Operated in Day Service:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 12; dial tone is returned.
- The system is in Day Service.

DATA DUMP/LOAD

Description

The Data Dump and Load feature allows a user to store the configuration of the system on tape and have the ability to reconfigure the system by loading data from the tape. A data dump or data load uses the printer port of the system. Thus, the tape must be set up locally and no other features can use the port; i.e., Message Register Audit, Auto Wake-Up or SMDR. The data dump can also dump onto a printer in an easy-to-read format. (Refer to PRINTER PORT in this Section.) Data Dump or Data Load is accessed by using a Maintenance Function Code number followed by the System Security Code. The PABX then proceeds to dump/load the header, then Commands 601 to 978, one command at a time. To determine if a load of data is possible, the header record is verified. If a load is not possible, the load aborts and an alarm indicating the problem occurs.

Conditions

- The Data Load stops the PABX during a load and resets it after the load is complete. Therefore, all calls are lost during a Data Load.
- The following commands are cleared before they are loaded: 631 to 639, 641, 910, 911, 920, 921, 931 and 932.
- If a checksum error is detected during a load, a flashing Err beside the command number results. The system remains here until it is manually reset. The Load must be reinitiated.
- When accessing the data dump or load and the printer port is not free, reorder tone is heard by the user.
- If an incorrect System Security Code is entered, the user also hears reorder tone.
- When loading data, and the tape label is not read correctly the load aborts, leaving the system the way it was and an alarm results.
- Refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information for alarm codes that occur while dumping or loading data.
- The printer for a Data Dump/Load must be set to 300 Baud.
- The stop bits and parity bits (which are configured in Command 601, Register 7) must match those of the printer.
- During a Data Load, Configuration Switch 8 must be OPEN to allow programming changes.
- Speed Call and DSS numbers are not saved during a Data Dump.

Programming

None

Operation

To Dump Data:

- Set up the tape machine at the printer port of the PABX.
- Press the WRITE (or RECORD) button on the tape machine.
- Dial the Attendant Function Access Code (71 or *); **A** is displayed on the Call Status Display.
- Dial 97 (Data Dump Access Code); **A97-** is displayed.
- Dial the System Security Code; **d---** is displayed.
- The display now steps through each command number (i.e., **d601**, **d602**, etc.) until all information is dumped.
- The display returns to normal when the function is complete.

To Load Data:

- Set up the tape machine at the printer port of the PABX (make ready to read).
- Dial the Attendant Function Access Code (71 or *); **A** is displayed on the Call Status Display.
- Dial 98 (Data Load Access Code); **A98-** is displayed.
- Dial the System Security Code; **L---** is displayed.
- When **L---** flashes, start read process from the tape machine by pressing the PLAYBACK (READ) button.
- The display now steps through each command number (i.e., **L601**, **L602**, etc.) until all the information is loaded.
- The system resets when the end of the tape is encountered.

DATA LINE SECURITY

Description

A station with this feature enabled in its COS cannot receive any audible tone (i.e., camp-on tone). A call may be camped on to a station with Data Line Security, but all forms of audio intrusion are prohibited.

Conditions

- When this feature is enabled, all Executive Busy Override attempts are prohibited.

Programming

Class-of-Service Programming (Commands 611 → 619), Register 3:

- Data Line Security must be set to 1 (Enable). Default is 0 (Disable).

Block Programming - Class-of-Service, Toll Restriction and Pickup Group (Command 622):

- If a group of stations have the same COS which has Data Line Security enabled, plus the same Toll and Pickup group, Block Programming may be used.

Operation

None

DIAL CALL PICKUP

Description

This feature assigns a station to a Pickup group and permits the station to answer any call directed to any station in that Pickup group by dialing the Dial Call Pickup Code.

Conditions

- A maximum of seven Pickup groups are permitted per system.
- Dial Call Pickup cannot be originated by a station with a call on Consultation Hold. If Dial Call Pickup is attempted, the originating station receives reorder tone and must flash to return to the held call.

Programming

Feature Access Code Programming (Command 602), Register 06:

- Assign required Feature Access Code for Dial Call Pickup. Default Access Code 54.

Station Programming (Command 620):

- Assign Pickup group membership (1 → 7). Default is 1 (Pickup Group 1).

Operation

- The trunk or station calls a station in the same Pickup group.
- Lift the handset – dial tone returned.
- Dial the Call Pickup Code – the call is connected.

DICTATION TRUNK

Description

The system can connect a centralized dictation equipment to a trunk to allow dial access of the equipment from the PABX and maintain control of all normal dictation system features.

Conditions

- Odd-numbered trunks are required for Dictation use.
- Requires the use of rotary dial only.
- Third-wire signaling required.

Programming

Trunk Programming (Commands 801 → 812), Register 2:

- Dictation Trunks (CO Trunk) must be set to 1 (Enable). Default is 0 (Disable).

Trunk Group Programming (Commands 821 → 826), Register 2:

- Set Tone-to-Pulse Conversion to 1 (Enable), or 2 (Enable, Disable Outgoing Audio Until Answer). Default is 0 (Disable).

Operation

None

DIRECT-IN LINES

Description

This feature assigns incoming trunks to specific stations, the Attendant Console, Ring Group, RMATS, Night Bells or Station Hunt Groups when the system is in Day or Night Service. Incoming calls on the trunk ring the selected devices directly; they do not appear at the Attendant Console. If the station is busy when a trunk call arrives, the station user hears camp-on tone, the incoming call is camped on to the station and the caller hears ringing tone. If the Station Hunt Group is busy when a trunk call arrives, the trunk is camped on to the Hunt Group. Camp-on tone is heard by the station queued to be rung next in the Hunt Group. If required, Direct-In Lines (DIL) can also have Call Forwarding - Busy or Follow Me applied if the station user is occupied. All call handling features normally active at the station are available for use with Direct-In Line calls. A Hunt Group can be assigned as the Day/Night Answering Point in the Direct-In Line service. This feature can be invoked by setting the Day/Night Answer Mode to Direct-In Line, and in addition, programming the equipment number of the Hunt Group into the Trunk Day/Night Answering Point. If a station is using DIL to access RMATS, that station automatically has Data Line Security, regardless of the COS normally assigned to it; another station/trunk can camp on, but no tones are transmitted.

Conditions

- If Direct-In Lines have Data Line Security enabled, the DIL does not receive camp-on tone, if a call is waiting when the DIL is busy.
- During Night Service, Direct-In Line calls are routed as directed by the Night Answer Mode for the trunk.
- If a Direct-In Line call is handled by the attendant as a result of a call transfer, the call recalls to the attendant in the event of a timed recall. Otherwise it recalls to the assigned device.
- Direct-In Line cannot be assigned to a station with a COS that makes it originate only.
- If a Direct-In Line is assigned to a Station Hunt Group with no valid stations, the call recalls to the console.

Programming

System Options Programming (Command 601), Register 1:

- If Direct-In Line stations are allowed to camp incoming trunk calls onto a busy station, Camp-On (Onto Stations Only) must be set to 2 (Enable, Trunks → Stations), or 3 (Enable, Both). Default is 3.

Trunk Programming (Commands 801 → 812), Register 4:

- Day Answer Mode must be assigned as 0 (Direct-In Line). Default is 1 (LDN1).

- Assign equipment number on which Direct-In Line is to appear. Valid station equipment numbers are 01 → 72. Station Hunt Group equipment numbers are 81 → 86 (Hunt Groups 1 → 6), 88 (RMATS), 87 (Ring Group), or 00 (TAFAS). Default is 01 (Station Equipment Number 01).

Operation

None

DIRECT OUTWARD DIALING

Description

Direct Outward Dialing allows a station to place external calls without the assistance of the attendant.

Conditions

- Refer to TOLL CONTROL in this Section.
- Refer to Section MITL9102-095-212-NA, Toll Control Description.

Programming

Class-of-Service Programming (Commands 611 → 619), Register 1:

- For each Trunk Group, Trunk Group Access must be set to 1 (Enable). Default is 1.

Station Programming (Command 620):

- Set the required COS for each station (defines the Trunk Groups which may be accessed by that station).

Trunk Group Programming (Commands 821 → 826), Register 1:

- Assign Trunk Group Access Code. Default is:
  9 (Trunk Group 1)
  8 (Trunk Group 2)
  78 (Trunk Group 3)
  79 (Trunk Group 4)

Operation

None

DIRECT STATION SELECTION (DSS)

Description

The SX-20 console is equipped with nine Direct Station Selection (DSS) keys. Each of the DSS keys may be assigned to a station, Trunk Group, Hunt Group or Ring Group. When a DSS key is pressed, the system automatically dials the number of the station to which it is assigned. Each DSS key has associated with it, a LED which indicates the busy (LED lit), idle (LED dark) or, held at console (LED flashing) status of its station.

Conditions

None

Programming

Timed-Key Down Programming:

- The console DSS keys may be programmed by holding a DSS key for 2 seconds (3 second time-out), then dialing in a directory number from the digit keypad when prompted on the display. The DSS key can be programmed as a station, Trunk Group, Hunt Group or Ring Group.

Operation

- Press the required DSS key - upon lifting the key, the Call Status display shows the station number selected. The attendant is connected to the station.

DISA TRUNKS

Description

The Direct Inward System Access (DISA) is a facility which enables an outside caller on a trunk to dial directly into a PABX system, without attendant intervention, and gain access to PABX facilities and outgoing trunk circuits (such as WATS lines and Tie lines). A DISA trunk hears one burst of ringback tone before being automatically answered by the PABX and given PABX dial tone. The delay in answering the DISA caller occurs so there won't be any doubt that the PABX has answered and that some action is required from the DISA caller. A 3-digit DISA Security Code (optional COS and programming) may be required at this point. If the DISA Security Code is not required, then the DISA caller may access PABX features as if it were a station. If the DISA Security Code is required, then the DISA caller must enter the code after which PABX dial tone returns and PABX features may be accessed.

Conditions

(a) A DISA call cannot:

- Be executed from a rotary set
- Flash the switchhook
- Override
- Call forward
- Pick up TAFAS
- Put on an Automatic Callback - Busy.

(b) DISA trunks can dial access codes for the following devices only:

- Stations
- Attendant
- Pager (DISA trunk must provide disconnect supervision)
- Trunks (trunk-to-trunk connection conditions must be met)
- RMATS.

(c) DISA trunks cannot access codes for the following devices:

- TAFAS
- Feature Access Codes requiring a flash to activate
- Call forwarding
- Console functions (except through RMATS)
- System administration (except through RMATS).

(d) If a DISA trunk is loop start, and an outside DISA user accesses another loop start trunk (through the DISA trunk), the two loop start trunks could get busied-out unless Disconnect Supervision Provided by the CO is enabled. Note: The system perceives that the CO provides Disconnect Supervision when "Disconnect Supervision Provided by the CO is set to 1 (default is 0). If "Disconnect Supervision Provided by the CO is disabled, then the system returns reorder tone when a DISA caller tries accessing a second loop start trunk.

Programming

Class-of-Service Programming (Commands 611 → 619), Register 2: •

- Set DISA Security Code to 1 (Enable) if a DISA Security Code is required. Default is 0 (Disable). Trunk Programming (Commands 801 → 812), Register 1:

- Assign the Inward Dial Trunk a Class of Service, 1 through 9.
- Select a toll restriction on the Inward Dial Trunk, 1 (Toll Restriction Code 1), or 2 (Toll Restriction Code 2). Default is 1.
- If an Inward Dial Delay Before Answer is required, set to 1 (Delay 8 Seconds). Default is 0.

Trunk Programming (Commands 801 → 812), Register 2:

- Disconnect Supervision Provided by the CO must be set to 1 (Yes), if the DISA Trunk is a loop start trunk. Default is 0 (No).

DISA Security Code Programming (Command 978):

- Enter required DISA Security Code. Default is 000.

Operation

- Dial in on a DISA trunk - the user hears one burst of ringback tone before the PABX answers and provides dial tone.
- Dial the 3-digit DISA Security Code (if necessary) - PABX dial tone returned.
- The DISA trunk now acts like a station and the user may now access the PABX features.

DISCRIMINATING RINGING

Description

Selection of this option allows a station user to distinguish between station calls and trunk or attendant calls, by distinctive ringing patterns associated with the type of call. Calls from other stations have a ringing pattern of 1 second ON, 3 seconds OFF. Incoming trunk calls and those from the attendant have a ringing pattern of 0.4 seconds ON, 0.2 seconds OFF, 0.4 seconds ON, 3 seconds OFF. For the SUPERSET 3 set and the SUPERSET 4 set, only the first cycle is discriminating.

Conditions

None

Programming

System Options Programming (Command 601), Register 1:

- Discriminating Ringing must be set to 1 (Enable). Default is 1.

Operation

None

DISTINCTIVE CALLBACK RINGING

Description

Selection of this option allows a station user to identify a Callback call by its distinctive ringing pattern: .3 s ON, 1.7 s OFF, repeated four times. For the SUPERSET 3 set and the SUPERSET 4 set, only the first cycle is distinctive.

Conditions

None

Programming

System Options Programming (Command 601), Register 1:

- Distinctive Callback Ringing must be specified as 1 (Enable). Default is 1.

Class-of-Service Programming (Commands 611 - 619), Register 3:

- Automatic Callback - Busy must be set to 1 (Enable). Default is 1.

Operation

- Set Automatic Callback - Busy on the station by dialing 6 after busy tone is returned - go on-hook.
- When the line becomes free, the originator is rung.

DISTINCTIVE DIAL TONE

Description

When a station user activates the Call Forwarding – Follow Me feature which requires presentation of a special dial tone, the system provides a unique audible indication (five tone bursts) before dial tone is first given to the caller, indicating that an operation feature is enabled.

Conditions

None

Programming

Class-of-Service Programming (Commands 611 → 619), Register 4:

- Call Forwarding – Follow Me must be set to 1 (Enable). Default is 1.

Operation

- Set Call Forwarding – Follow Me on a station. Return handset.
- Lift handset at the same station – Distinctive Dial Tone returned to indicate Call Forwarding – Follow Me is enabled at that station.

E&M TRUNKS

Description

E&M trunk circuitries are required to perform tied PABX operations. There are several hardware characteristics programmable in Trunk Programming. If the E&M Trunk is programmed as an Identified Trunk Group, then access is limited to stations at the tied PABX only. If programmed as a DISA trunk, then the user can access station and trunks at the tied PABX. If the E&M Trunk is not specified as a DISA Trunk or an Identified Trunk Group, then access is restricted to the attendant at the tied PABX.

Conditions

- The E&M Trunk Module must be used, Part Number 9102-011-010-NA.
- The E&M Trunk Module can be used on the Trunk Expander Card (Part Number 9102-013-000-NA). Four E&M Trunk Modules can be installed on the Miscellaneous II Card.
- An E&M Trunk always has an odd equipment number.
- An E&M Trunk Module incorporates two trunk circuits and cannot be used as a normal CO trunk.
- Refer to Section MITL9102-095-180-NA, Engineering Information for details.
- Disconnect Supervision must by provided by the CO to ensure that both trunks are dropped upon completion of the call.
- If Identified Trunk Groups are used, then refer to the Conditions detailed under IDENTIFIED TRUNK GROUPS in this Section.
- If DISA Trunks are used, then refer to the Conditions detailed under DISA TRUNKS in this Section.

Programming

Trunk Programming (Commands 801 → 812), Register 1:

- Trunk Group Membership must be set to 0 (Incoming Calls Only) or 1 → 6 (Trunk Groups 1 → 6).
- Set the Trunk Hardware Type to 2 (E&M Trunk) for each trunk used for E&M purposes. Default is 0 (Standard CO Trunk).
- Set Inward Dial Class of service to 1 → 9. Default is 0 (Not Inward Dial).

Trunk Programming (Commands 801 → 812), Register 2:

- Set Disconnect Supervision Provided by CO to 1 (Yes). Default is 0 (No).

Trunk Programming (Commands 801 → 812), Register 3:

- Set the 2dB Pad Control to 0 (Disable), 1 (Enable Receive), 2 (Enable Transmit) or 3 (Enable Both). Default is 0.

- Set the E&M Hardware Type to 0 (2-wire, 600 ohms), 1 (2-wire, 900 ohms), 2 (4-wire, 600 ohms) or 3 (4-wire, 900 ohms). Default is 0.
- Set the E&M Invert E Enable to 0 (Disable) or 1 (Enable). Default is 0.
- Set the E&M Wink Start Incoming Enable to 0 (Disable) or 1 (Enable). Default is 0.
- Set the E&M Wink Start Outgoing Enable to 0 (Disable) or 1 (Enable). Default is 0.
- Set the E&M Stop Dial Outgoing to 0 (Disable) or 1 (Enable). Default is 0.

Trunk Programming (Commands 801 - 812), Register 4:

- Set the Day Answer Mode to 0 (Direct-in Line), 1 (LDN 1), 2 (LDN 2) or 3 (LDN 3).

Trunk Programming (Commands 801 - 812), Register 5:

- Set the Night Answer Mode to 0 (Flexible Night Service), 1 (LDN 1), 2 (LDN 2) or 3 (LDN 3).

Trunk Group Programming (Commands 821 - 826), Register 1:

- Assign Trunk Group Access Code to each Trunk Group. Default Access Codes are 9, 8, 78, and 79 for Trunk Groups 1 - 4.

Operation

None

EXECUTIVE BUSY OVERRIDE (CONSOLE)

Description

This feature allows the attendant who encounters a busy station to press the OVERRIDE key (or dial the Executive Busy Override Access Code) and enter the conversation. Before voice contact is established, all parties (those in the original conversation plus the attendant) receive a 1 second warning tone (350/440 Hz). A 200 ms burst of warning tone is repeated every 6 s for the duration of the override. Once the OVERRIDE key is released, the console hears busy tone, then returns to normal operation as if the Executive Busy Override feature has not occurred. If the overridden station goes on-hook, the console is dropped and receives reorder tone, while the other party in the original call hears nothing and is dropped. If the overridden station flashes the switchhook, the console is again dropped while the other party in the original call is placed on Consultation Hold (if enabled).

Conditions

- The console cannot manipulate the original conversation in any way.
- The Executive Busy Overrride Access Code is 5. This code is not programmable.
- A call in which any station has Executive Busy Override Security or Data Line Security enabled cannot be overridden.
- Any station dialing, or receiving supervisory tone cannot be overridden.
- A station on all types of Hold cannot be overridden.
- A 3-way conference cannot be overridden.
- A station involved in RMATS cannot be overridden.
- A ringing station cannot be overridden.
- If the overridden station flashes the switchhook, the console receives reorder tone.

Programming

System Options Programming (Command 601), Register 2:

- Executive Busy Override (Console) must be set to 1 (Enable Except on Incoming Trunks) or 2 (Enable All Calls). Default is 0 (Disable).

Function Key Programming (Command 972):

- Select Key 1, 2, or 3 as the OVERRIDE key by setting the Function Code to 02 in the appropriate bit (1 - 3).

Operation

- Dial the station number – busy tone.
- Press and hold down the OVERRIDE key; after the warning tone the console is connected to the call. If the station cannot be overridden, the console receives reorder tone.

EXECUTIVE BUSY OVERRIDE (STATIONS)

Description

This feature allows a station user who encounters a busy station to dial the Executive Busy Override Access Code and enter the conversation. Before voice contact is established, all parties (those in the original conversation, plus the overriding station) receive a 1 second warning tone (350/440 Hz). A 200 ms burst of warning tone is repeated every 6 s for the duration of the override. If either station in the overridden conversation flashes the switchhook, the other party in the original call is placed on Consultation Hold (if enabled) and the overriding station receives reorder tone. If the overridden station goes on-hook, both parties are dropped and the overriding station receives reorder tone.

Conditions

- A 3-way conference cannot be overridden.
- The Executive Busy Override Access Code is 5. This code is not programmable.
- The overriding station cannot manipulate the original conversation in any way.
- A call in which any station has Executive Busy Override Security or Data Line Security enabled cannot be overridden.
- Any station speaking to the attendant, dialing, or receiving supervisory tone cannot be overridden.
- A station on hold cannot be overridden.
- A station with a call on Consultation Hold cannot be overridden.
- If the station initiating the Executive Busy Override has a party on Consultation Hold, the held party is retrieved by flashing the switchhook. The held party is camped on to the overridden station if the station initiating the Override goes on-hook (refer to CAMP-ON in this Section).
- A ringing station cannot be overridden.
- A station involved in RMATS cannot be overridden.

Programming

Class-of-Service Programming (Commands 611 → 619), Register 3:

- If Executive Busy Override is not intended on a station, set Data Line Security to 1 (Enable). Default is 0 (Disable).

Class-of-Service Programming (Commands 611 → 619), Register 4:

- If Executive Busy Override is not intended on a station, Executive Busy Override Security set to 1 (Enable). Default is 0 (Disable).

- Executive Busy Override must be set to 1 (Enable, Except on Incoming Trunks) or 2 (Enable All Calls). Default is 0 (Disable).

Operation

- Dial station number – busy tone.
- Dial 5 (Executive Busy Override Access Code) after the warning tone; the station is connected to the call. If the station cannot be overridden, the station receives reorder tone.

EXTERNAL CALL FORWARDING

Description

This feature allows a station to specify a system speed call number as the destination when programming Call Forwarding - Don't Answer, Busy or Follow Me. To use this feature, the station user dials the Call Forward Access Code, the System Speed Call Access Code, then the Speed Call Entry number.

Conditions

- Disconnect Supervision must be provided by the CO to ensure that both trunks are dropped at the end of the call.
- Ground start trunks should be used.
- Refer to CALL FORWARDING - BUSY Conditions in this Section.

Programming

System Options Programming (Command 601), Register 2:

- System Speed Dial Enable must be set to 1 (Enable). Default is 1.

Class-of-Service Programming (Commands 611 → 619), Register 4:

- If Call Forwarding - Follow Me, Call Forwarding - Busy or Call Forwarding - Don't Answer is allowed to have calls forwarded to external speed dial numbers, set to 2 (Enable, Plus Enable to External Speed Call Number). Default is 1 (Enable).
- Proceed To Be Call Forwarded Externally must be set to 1 (Enable). Default is 0 (Disable).

Class-of-Service Programming (Commands 611 → 619), Register 5:

- Each block of Speed Dial Numbers which are allowed access by the station, must be set to 1 (Enable). These blocks are in groups of 10, starting at 10 and ending at 69. Default is 1 (Enable) for all speed dial groups.

Trunk Programming (Commands 801 → 812), Register 1:

- All trunks used for External Call Forwarding must have Connect to Outgoing CO Trunk Without Third Party set to 1 (Enable). Default is 1.
- Trunk Hardware Type must be set to 1 (CO Conferencing Trunk). Default is 0 (Standard CO Trunk).

Trunk Programming (Commands 801 → 812), Register 2:

- Set Disconnect Supervision Provided by CO to 1 (Yes). Default is 0 (No).

Operation

- A station dials 56 + 55 + 10 to set up External Call Forwarding to the location specified in speed call entry number 10. Refer to CALL FORWARDING - BUSY, DON'T ANSWER and FOLLOW ME in this Section.

FLASH DISABLE

Description

This feature ignores a station if an attempt is made to select a feature by flashing the switchhook.

Conditions

- Any feature requiring a switchhook flash cannot be accessed.

Programming

Class-of-Service Programming (Commands 611 → 619), Register 2:

- Switchhook/Ground Button Flash must be set to 0 (Disable). Default is 1 (Flash for Consultation Hold).

Operation

None

FLASH FOR ATTENDANT

Description

This feature allows a station user who has an established call to flash the switchhook and automatically be connected to the Attendant Console. The established call is placed on Consultation Hold. The call appears on the console as a "DIAL 0" call.

Conditions

- This feature is inoperative if the station is not involved in a 2-party call.
- Flash for Attendant and Flash for Transfer/Add-On/Consultation Hold are mutually exclusive.

Programming

Class-of-Service Programming (Commands 611 - 619), Register 2:

- Switchhook/Ground Button Flash must be set to 2 (Flash for Attendant). Default is 1 (Flash for Consultation Hold).

Operation

On an Established Trunk Call:

- Flash the switchhook - the station user rings the attendant, the third party is placed on Consultation Hold.
- When the attendant answers, the Call Status Display shows the number of the flashing station on the left of the display and the number of the held party on the right of the display.

FLASH IS RELEASE

Description

This feature assigns a disconnect to a switchhook flash if used with a Euro Ground Button (EGB) line circuit.

Conditions

- This feature is normally used as Earth Recall with Line Card, Part Number 9102-010-010-NA.

Programming

System Options Programming (Command 601), Register 5:

- Station Switchhook-Flash Timing must be set to 2 (Flash Is Release). Default is 0 (150 → 750 ms).

Operation

- On an established call, flash the switchhook.
- The call is disconnected and dial tone is returned.

FLEXIBLE NIGHT SERVICE

Description

This feature routes incoming trunk calls to any selected station, station Hunt Group, Ring Group, the Attendant Console TAFAS or RMATS when the system is placed in Night Service by the attendant. If the station is busy when a trunk call arrives, the station user hears a camp-on tone, the incoming call is camped on to the station and the caller hears ringing tone. If the Station Hunt Group is busy when a trunk call arrives, the trunk is camped on to the Hunt Group. Camp-on tone is heard by the station queued to be rung next in the Hunt Group (refer to STATION HUNTING in this Section).

Conditions

- Incoming trunk calls cannot be assigned to stations with a COS that makes them Originate only.
- Refer to STATION HUNTING for Station Hunt Group conditions in this Section.
- Refer to RING GROUP for Ring Group conditions in this Section.

Programming

System Options Programming (Command 601), Register 1:

- If Flexible Night Service stations are allowed to camp incoming calls onto a busy station, Camp-On (Onto Stations Only) must be set to 2 (Enable, Trunks → Stations) or 3 (Enable Both). Default is 3.

Trunk Programming (Commands 801 → 812), Register 5:

- Night Answer Mode must be assigned as 0 (Flexible Night Service).
- Assign equipment number of station or Hunt Group to which calls are routed during Night Service: Station equipment numbers 01 → 72; Station Hunt Group equipment numbers 81 → 86; 88 to RMATS, 87 to Ring Group, 00 to route to Night Bells or 80 to route to the console. This is the initial assignment and may be changed subsequently from the Attendant Console or Test Line.

Operation

(a) Console Key Operation while the System is in Night Service:

- Press the Night Service key twice and hold.
- The key LED lights and the trunk number is on the left with its assignment flashing next to it.
- Dial a new station number, Feature Access Code, or press a DSS key to change assignment, or dial * to step the next trunk

that is equipped and has Flexible Night Service.

(b) Attendant Function Operation:

- Dial the Attendant Function Access Code (71 or *).
- Dial 21, which is the code for Flexible Night Service, plus the equipment number of the required trunk.
- The display now shows the trunk equipment number on the left of the display.
- The directory number (flashing) of the station, Ring Group or Hunt Group Access Code to which calls are routed during Night Service, is shown on the right of the display.
- This may now be changed by dialing another station number Feature Access Code or "0" (if calls are to be routed to the Attendant Console).
- Press the RELEASE key. The system returns to normal call processing.

FLEXIBLE NUMBERING PLAN

Description

The numbering plan used within the system permits the user to select any combination of 1-, 2- or 3-digit numbers for Feature Access Codes, Trunk Access Codes, and station directory numbers (Trunk Group Access Codes can only be 1- or 2- digit numbers). The only constraint in the selection of a numbering plan is that no conflicts may exist among station numbers and access codes, with the exception of Automatic Callback - Busy and Executive Busy Override features.

Conditions

- No first digit conflicts are allowed between station numbers and access codes, with the exception of Automatic Callback - Busy, which is set at 6, and Executive Busy Override which is set at 5.
- Configuration Switch 7 on the CPU II Card must be set to OPEN for 2-digit station numbering or to CLOSED for 3-digit station numbering.
- If a numbering conflict exists, access codes may be made blank by programming them as 00.

Programming

Feature Access Code Programming (Command 602):

- Assign access codes to features (two or three digits).

Station Programming (Command 620 or 621):

- Assign required station numbers (one, two or three digits).

Trunk Group Programming (Commands 821 - 826), Register 1:

- Assign Trunk Group Access Codes (one or two digits).

Operation

None

HOUSEPHONE (MANUAL LINE)

Description

A station with this option in its COS is automatically routed to the Attendant Console when the station user goes off-hook. Dial tone is not provided to these stations. Calls to Housephones can be dialed directly from a station or the Attendant Console. Refer also to MESSAGE WAITING in this Section.

Conditions

- Housephone and all features requiring call origination are mutually exclusive.

Programming

System Options Programming (Command 601), Register 6:

- Message Waiting System Enable must be set to 2 (Enable Message Waiting and 30 Second Housephone). Default is 1 (Enable, Message Waiting).

Class-of-Service Programming (Commands 611 - 619), Register 2:

- Housephone must be set to 1 (Enable). Default is 0 (Disable).

Operation

- Lift handset - the station rings the Attendant Console.

IDENTIFIED TRUNK GROUP

Description

When a Trunk Group has this feature enabled, the selected trunk (on an outgoing seizure after dial tone has been detected) automatically outpulses its Trunk Group Access Code. This allows a unified numbering plan to be used between PABXs and therefore used in conjunction with E&M Trunks.

Conditions

- When E&M Trunks are used in an Identified Trunk Group, Disconnect Supervision must be provided by the CO to ensure that both of the trunks are dropped at the end of the call.

Programming

Trunk Programming (Commands 801 → 812), Register 2:

- Set Disconnect Supervision Provided by CO to 1 (Yes). Default is 0 (No).

Trunk Group Programming (Commands 821 → 826), Registers 1 and 2:

- Identified Trunk Group must be set to 1 (Enable). Default is 0 (Disable).
- Assign the Trunk Group Access Code.
- Wait for Dial Tone must be set to 0 (No Wait). Default is 1.
- Supervision (Reversal or Change on Third Wire) must be set to 1 (Supervision is Both Answer and Message Unit). Default is 0 (No Supervision).
- Tone-to-Pulse Conversion must be set to 2 (Enable, Disable Outgoing Audio Until Answer). Default is 0 (Disable).

Operation

- Dial the Trunk Group Access Code.
- When the trunk is sucessfully accessed, the Trunk Access Code is outpulsed.

INCOMING CALL IDENTIFICATION

Description

Incoming trunk calls to the Attendant Console may appear on selected LDN keys such that trunk calls can be answered with the proper greeting. If all trunks have the same Listed Directory Number, then they can all be assigned to the same LDN key.

Conditions

None

Programming

Trunk Programming (Commands 801 → 812), Registers 4 and 5:

- Day Answer Mode and Night Answer Mode must be set to:
  1 = Incoming calls on this trunk appear on LDN 1.
  2 = Incoming calls on this trunk appear on LDN 2.
  3 = Incoming calls on this trunk appear on LDN 3.

Operation

- Refer to Attendant Console Guide, Part Number 9180-953-101-NA.

INDIVIDUAL TRUNK ACCESS

Description

This feature allows the attendant or Test Line to access a specific trunk by equipment number for maintenance or troubleshooting purposes.

Conditions

- An idle or busied-out trunk may be accessed by the attendant or Test Line only.

Programming

None

Operation

- Dial the Attendant Function Access Code (71 or *).
- To access a trunk by equipment number, dial 19 plus the Trunk Equipment Number (1 through 12). If the trunk is idle or "Busied-Out", dial tone is returned. If the trunk is busy, busy tone is returned.
- A busy trunk can be accessed by using Trunk Emergency Release but note that the caller will be dropped.

LAST NUMBER REDIAL

Description

This feature allows a station user with Last Number Redial enabled in its Class of Service to have the last number that was manually dialed on a trunk, automatically redialed by dialing the Redial Access Code (default is 55) + 0 or by pressing the # key (if enabled).

Conditions

- A speed call number cannot be accessed by Last Number Redial.
- If the # key is programmed to indicate Last Number Redial (Command 601, Register 2), then 70 must be dialed to enter Programming Mode.

Programming

System Options Programming (Command 601), Register 2:

- Last Number Dial Pound (#) Sign Access Enable must be set to 1 (Enable). Default is 0 (Disable).

Class-of-Service Programming (Commands 611 → 619), Register 5:

- Last Number Redial must be set to 1 (Enable). Default is 1.

Operation

- Manually dial out on a trunk - go on-hook.
- Dial Last Number Redial Access Code (default is 55) + 0 or press # if enabled.
- The last number that was manually dialed automatically redials.

LOCKOUT ON STATIONS

Description

This feature is activated immediately if one of the two parties engaged in a call goes on-hook. The party which remains off-hook automatically disconnects from the speech path, allowing that speech path to be used for another caller immediately. This feature is also activated when a station goes off-hook and exceeds the interdigit time-out (10 seconds). The user receives reorder tone for 20 seconds and is then locked out. The speech path is freed for other calls.

Conditions

- Station must go on-hook, then off-hook to return to normal service.

Programming

None

Operation

None

MAKE/BREAK RATIO AND PULSE RATE

Description

This feature allows the selection of four different outpulsing ratios (make/break) for outgoing trunks. It is therefore possible to accept digits from a station at 10/20 pps as well as to outpulse digits on a trunk at 10/20 pps. Make/break ratios of 60/40 and 66/33 are supported at 10/20 pps for trunk outpulsing. This allows the system to operate in any country by conforming to that country's outpulsing ratio.

Conditions

- Outpulsing ratio should meet CO conditions.

Programming

System Options Programming (Command 601), Register 5:

- Set Station Digit Collection to the required value, 1 (10 pps) or 2 (20 pps). Default is 1.

Trunk Programming (Commands 801 → 812), Register 2:

- Set required Trunk Outpulsing Break/Make Ratio to 0 (60/40), 1 (66/33), 2 (30/20) or 3 (33/17). Default is 0 (60/40).

Operation

None

MESSAGE REGISTER AUDIT

Description

This feature allows the attendant to print out the contents of the Message Registers (Message Registration Counter) and to optionally clear them. The printout consists of several lines. The first line is the Message Register Audit header and has the following format:

MM/DD hh:mmP

Where **MM/DD** is the month and day, and **hh:mmP** is the time in hours and minutes using a 12-hour clock. The remaining lines are of the same format. They state the station number and its Message Register contents as follows: **nnn - xxxx** (repeated six times across the page), where **nnn** is the station number, and **xxxx** is the contents of the Message Register.

Conditions

- Printer required; refer to PRINTER PORT in this Section.

Programming

System Options Programming (Command 601), Register 6:

- Message Register Audit must be set to 1 (Enable) or 2 (Enable With Clearing of Message Registers). Default is 0 (Disable).

Operation

- Dial the Attendant Function Access Code (71 or ✳).
- Dial Attendant Function 73.
- The contents of the Message Registers are printed out, and cleared (if enabled).

MESSAGE REGISTRATION

Description

This feature computes the number of local call units made from a station. The accumulated call unit count for each completed call is dependent on the call unit modifiers selected. The resulting counts are held in the system Message Registers. These registers are protected against power failure to ensure that the accumulated call count for a station is not lost in the event of a commercial power failure. Message Registration can be CO generated or PABX generated. If it is PABX generated, and continuous metering is not provided by the CO, Count Additional Message Units can be set to 2 (Enable Pseudo Message Unit Count (once per 6 s)) or 3 (Enable Pseudo Message Unit Count (once per 60 s)) in Trunk Group Programming. The original station who sets up the call is treated as the Message Registration device for the entire duration of that trunk call. This applies even when the trunk is transferred to another station. An initial charge is levied when answer supervision is received from the trunk (if provided) or the psuedo answer Timer generates a supervision. (The timer starts a programmable time period after the last digit has been dialed.) An additional charge is levied (if additional programmable supervision is received). These supervisions may be CO generated or PABX generated. There is a facility to generate psuedo supervisions every 6 or 60 seconds (Trunk Group Programming) throughout call duration.

Conditions

- The originating station always gets the Message Registration charge applied even if the trunk call is transferred to another station.
- A station designated as a Housephone cannot have Message Registrations.
- The maximum call count is 9998.
- If a station has Restrictive Station Control and the count is 9998, the next attempt to make a call receives reorder tone.
- Dialing 9999 restricts calls.
- When 9 is dialed to disable the Message Registration counter, the existing count is deleted from the records.

Programming

Class-of-Service Programming (Commands 611 - 619), Register 2:

- Message Registration/Restrictive Station Control must be set to 2 (Enable Message Registration Only) or 3 (Enable Both). Default is 0 (Disable Both).

Trunk Group Programming (Commands 821 - 826), Register 2:

- Supervision (Reversal or Change on Third Wire) must be set to 1 (Supervision is Answer/Message Unit) or 3 (Supervision is

Message Unit). Default is 0 (No Supervision).

Trunk Group Programming (Commands 821 → 826), Register 3:

- Message Registration must be set to 1 (Enable). Default is 0 (Disable).
- If Additional Message Units are to be counted, Count Additional Message Units must be set to 1 (Enable), 2 (Enable Pseudo Message Unit Count, Once Per 6 Seconds) or 3 (Enable Pseudo Message Unit Count, Once Per 60 Seconds). Default is 0 (Disable).
- If Initial Message Unit Charge is required, specify the amount 00 → 99. Default is 00.
- If an additional Message Unit Charge is required, specify the amount 00 → 99. Default is 01.
- If the trunk does not supply Answer Supervision, Pseudo Answer Timer must be set. One pseudo answer signal is generated after the selected time-out period (10 to 70 Seconds). Default is 30 Seconds.

Function Key Programming (Command 972), Registers 1 → 3:

- Select Key 1, 2 or 3 as the MSG REG key by setting the Function Code to 01 in the appropriate register (1 → 3).

Operation

(a) Console Key Operation:

- Press the Message Registration key (one of the programmable keys - Command 972), and hold.
- The display shows three dashes flashing.
- Dial the desired station number.
- The station number is shown on the left of the display and the counter status is shown on the right.
- Refer to the SX-20 Attendant Console Guide (Part Number 9180-953-101-NA) for further details.

(b) Attendant Function Operation:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 22 (which is the code for Message Registration), then the station number.
- The station number is shown on the left of the display and the 4-digit Message Registration counter on the right of the display.
- To clear the counter, dial 0.
- To disable Message Registration, dial 9, if Message Registration/Restrictive Station Control was set to 1.
- Press RELEASE key.
- Refer to SX-20 Attendant Console Guide - Function Key Operation, Part Number 9180-953-101-NA.

MESSAGE WAITING

Description

This feature allows the attendant to inform a guest that there is a message waiting. The station rings at the end of the selected "Message Waiting Indication Interval" with a distinctive ringing pattern (three cycles of 0.3 seconds ON, 1.7 seconds OFF). If the station is busy when Message Waiting is activated, the Message Waiting indication starts 10 seconds after the station becomes idle. If the station picks up the handset before the 30 s time-out (Housephone option only), the station automatically rings the console. The station also rings 10 seconds after every off- /on-hook condition until the Message Waiting is cancelled. When the guest returns and calls the attendant, the MSG WAIT LED flashes on the Attendant Console to indicate that there is a message waiting for that station. When the Message Waiting key is depressed, the Busy Lamp Field on the Remote Display, and the console Extension Status Display show all the stations that have Message Waiting applied.

Conditions

- Message Waiting indications are not lost during a power failure.
- With the console or Remote Display, it is possible to display all stations with Message Waiting enabled.
- If Message Waiting Automatic Cancel has been selected, the Message Waiting indication for a station is automatically cancelled when the attendant answers a call from that station.

Programming

System Options Programming (Command 601), Register 6:

- Set Message Waiting System Enable to 1 (Enable Message Waiting) or 2 (Enable Message Waiting and 30 Second Housephone - Manual Line). Default is 1. With Message Waiting set to 2, the station is automatically connected to the console if the station goes off-hook within 30 seconds of the Message Waiting indication.

- If Message Waiting indications during Day Service Only is required, set to 1. Default is 1.

- Set Message Waiting Indication Interval to desired time period (1 → 4 X 5 Minutes). Default is 3 (15 Minutes).

- If Message Waiting Automatic Cancel is required, set field to 1. Default is 0 (Disable).

Class-of-Service Programming (Commands 611 → 619), Register 2:

- The Class of Service of the station to which Message Waiting is applied must have Message Waiting set to 1 (Enable). Default is 1.

Operation

(a) Console Key Operation

To Apply Message Waiting to an Unanswered Station:

- Dial the required station number – no answer.
- Press the MSG WAIT key – the station number dialed and the Message Waiting status for that station is shown on the display (0 = not applied, 1 = applied). Each time the MSG WAIT key is pressed, it toggles the Message Waiting status for that station.

To Apply Message Waiting during a Recall:

- Press the flashing ANS or RECALL key – the trunk or station that was transferred to the ringing or busy station is shown in the left of the display.
- Press the MSG WAIT key – the console is still connected to the original trunk or station. Message Waiting has been applied to the called station.

To Cancel Message Waiting (if Message Waiting Automatic Cancel has not been enabled):

- Press the flashing ANS or DIAL 0 key – MSG WAIT key flashes.
- Press the MSG WAIT key – the display shows 0 to indicate Message Waiting has been cancelled for that station.

To Display All Message Waiting Indications:

- Press the MSG WAIT key and hold – the Extension Status Display and the DSS keys display all stations with Message Waiting applied.

(b) Attendant Function Operation

To Display Message Waiting Indications:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 28 – the Busy Lamp Field and the DSS keys display all stations with Message Waiting applied.

To Cancel Message Waiting:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 29 – all Message Waiting indications are cleared.

MESSAGE WAITING INDICATION DURING DAY SERVICE ONLY

Description

This feature enables all audible Message Waiting Indications during Day Service only. During Night Service all Message Waiting indications are suspended.

Conditions

- All Message Waiting indications are suspended (NOT Lost) during Night Service. When the system goes back into Day Service, all Message Waiting indications are re-enabled.

Programming

System Options Programming (Command 601), Register 6:

- Set Message Waiting Indication during Day Service Only to 1 (Enable). Default is 1.

Operation

(a) Console Key Operation

To Suspend Message Waiting Indications:

- Press the NIGHT SERVICE key. The Night Service key LED lights and the system is now in Night Service.
- Message Waiting indications applied to stations are suspended.

To Enable Message Waiting Indications:

- Press the NIGHT SERVICE key.
- The Night Service key LED turns off and the system is in Day Service.
- All Message Waiting indications applied to stations prior to the system going to Night Service, are re-enabled.

(b) Attendant Function Operation

To Suspend Message Waiting Indications:

- Dial the Attendant Function Access Code (71 or *).
- Dial 11.
- The system is now in Night Service.
- Message Waiting indications applied to stations are suspended.

To enable Message Waiting Indications:

- Dial the Attendant Function Access Code (71 or *).
- Dial 12.
- The system is now in Day Service.
- All Message Waiting indications applied to stations prior to the system going to Night Service, are re-enabled.

MIXED STATION DIALING

Description

This feature allows the simultaneous use of rotary and DTMF telephones on any or all station lines. All station features are available to both types of telephones. Programming of the system may be performed from a rotary or DTMF set.

Conditions

- If DTMF telephones are used, the system must be equipped with at least two DTMF receivers (Part Number 9102-012-000-NA).
- Refer to Section MITL9102-095-180-NA, Engineering Information, DTMF Receiver Provisioning Requirements for Tone-to-Pulse conversion.

Programming

None

Operation

None

MUSIC ON HOLD

Description

A music source may be connected to the system via the Trunk Expander Card (Part Number 9102-013-000-NA). Music on Hold is provided for trunk calls held by the Attendant Call Hold, Trunk Camp-On, or Station Call Hold features. If music is not provided, trunk calls on hold hear nothing.

Conditions

- Music source input is 600 ohms. A DC voltage must not be applied to this input.
- Music Source should be between 50 and 500 mVrms.
- Music on Hold is provided for trunk calls only.
- Music on Hold is not provided for calls put on Consultation Hold by stations.
- If a speech path is not available for the music speech path, the feature is temporarily disabled.
- Only one system speech path is used regardless of the number of calls placed on hold; i.e., seven calls could be placed on the Music on Hold speech path.

Programming

System Options Programming (Command 601), Register 1:

- Music on Hold must be set to 1 (Enable, From Trunk Expander Card). Default is 0 (Disable).

Operation

None

NIGHT BELLS

Description

The system provides a relay closure which may be used to ring Night Bells during Night Service. A ringing signal of 20 Hz, 90 Vrms is provided, but may be replaced with an external source provided the limitations imposed by the relay in the PABX are adhered to (i.e., the sum of the equipment loading, refer to Conditions).

Conditions

- A maximum of five equivalent ringer loads may be driven by Night Bells AT ANY ONE TIME (refer to the Manufacturers Standards).
- Refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.
- When using a mechanical ringer as a Night Bell, a 20 - 30 kohm bleeder resistor must be connected across the Tip and Ring connectors of the ringer.

Programming

- Refer to TRUNK ANSWER FROM ANY STATION (TAFAS) in this Section.

Operation

None

PAGING ACCESS

Description

A station with this feature enabled in its COS is allowed access to the customer-provided Paging Equipment. After dialing the required access code, the station user hears a short warning tone, indicating that the station is connected to the paging circuits. The paging announcement may now be made.

Conditions

- When a DISA Trunk accesses the paging equipment, "Disconnect Supervision must be provided by the Central Office to ensure that the DISA Trunk is dropped at the end of the page announcement.

Programming

Feature Access Code Programming (Command 602), Register 02:

- Assign required 1-, 2- or 3-digit Paging Access Code. Default Access Code is 50.

Class-of-Service Programming (Commands 611 - 619), Register 3:

- Paging Access must be set to 1 (Enable). Default is 1.

Trunk Programming (Commands 801 - 812), Register 2:

- Set Disconnect Supervision Provided by CO to 1 (Yes). Default is 0 (No).

Operation

- Lift handset - dial tone.
- Dial Paging Access Code. When the warning tone is heard, the station is connected to the Paging Equipment and may then make the announcement.

PAGING (ATTENDANT)

Description

This feature allows the attendant access to customer-provided Paging Equipment by pressing the PAGE key on the Attendant Console or by dialing the Paging Access Code. If the Paging Equipment is in use by a station user (the PAGE key LED on the Console lights), the paging system is overridden by the attendant. For wiring details, refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

Conditions

- The SX-20 system has a built in paging amplifier which has two outputs. The paging offers one zone in terms of message, but offers two zones in terms of volume; i.e., one message can be broadcast over two separate locations (zones), but the volume for one zone may be louder than for the other (applicable to warehouse - office situation where two different volumes may be desired).
- If the outputs are used individually, each paging circuit delivers 1 watt into 8 ohms, and can cover two separate paging zones.
- If the outputs are used together, they deliver 2 watts into 8 ohms, and cover one paging zone.
- The SX-20 paging volume potentiometer is on the Miscellaneous Card.

Programming

Feature Access Code Programming (Command 602), Register 02:

- Assign required 1-, 2- or 3-digit Paging Access Code. Default is 50.

Class-of-Service Programming (Commands 611 → 619), Register 3:

- Paging Access must be set to 1 (Enable). Default is 1.

Function Key Programming (Command 972):

- Program one of the Programmable Function keys (1 through 3) as a PAGE key.

Operation

- Press the PAGE key and hold.
- Make announcement.

POWER FAILURE RESTART

Description

The customer data describing each individual customer's requirements is held in the Random Access Memory (RAM). In the event of a commercial power failure, the RAM data is maintained by a battery backup on the PROM/RAM module which is on the CPU II Card. This battery backup maintains the RAM data intact for up to 600 hours. All SX-20 call processing programs are held in Read Only Memories (ROM). This type of memory is unaffected by power failure. Call processing can start immediately after power is applied to the system.

Conditions

- There is a switch on the PROM/RAM module used to disable/enable the batteries. The RAM batteries are shipped with the switch off to save the batteries. The switch should be turned on just before the system is powered-up. Refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

Programming

None

Operation

None

POWER FAILURE TRANSFER

Description

Two Power Failure Transfer circuits are provided. In the event of a commercial power failure, these circuits transfer two CO trunks (Trunks 1 and 2) to stations preselected at installation time. Refer to Cabling and Cross-Connections, for wiring details in Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

Conditions

- The Power Failure Transfer circuits apply to Trunks 1 and 2 only.
- If the CO trunks are ground start trunks the stations must be equipped with a ground start key, or a ground start/loop start converter.
- The SUPERSET 3 and SUPERSET 4 sets may NOT be used for power failure transfer.

Programming

None

Operation

None

PRINTER PORT

Description

An external printer can be connected to the PABX via the RS-232 port (Printer Port). Features using the printer include:

- SMDR (programmable)
- Automatic Wake-up (programmable)
- Message Register Audit (programmable)
- Data Dump/Load (requires System Security Code).

The SX-20 PABX monitors DTR (pin 20) of the printer (refer to Table 2-4). Mark condition (+V) indicates that the printer is ready to receive data and the space condition (-V) indicates that the printer is not ready to receive (i.e., paper out, buffer full or no ribbon). Note XON and XOFF are not monitored.

Conditions

- When the RS-232 port (J11) is used, the UCC card MUST be a Rev. 3 or higher.
- The printer may suspend, release and purge queues by using Attendant Function 75 (refer to Operation).
- The printer port must be initialized (load default data or program) before it is used.
- The following is required to interface a terminal (printer) to the SX-20 RS-232 Port.

TABLE 2-4
PRINTER PORT INTERCONNECTIONS

Pin Number	Source	Function
1	SX-20	Chassis Ground
2	Terminal	TX (Transmit)
3	SX-20	RX (Receive)
4	Terminal	RTS (Request to Send): Controls CTS if low.
5	SX-20	CTS (Clear to Send): +V unless RTS low
6	SX-20	DSR (Data Set Ready): controlled by SX-20
7	SX-20	Signal Ground
8	SX-20	DCD (Data Carrier Detector)
20	Terminal	DTR (Data Terminal Ready): monitored by SX-20, no data sent if it is -V.

Programming

System Options Programming (Command 601), Register 7:

- Select Baud Rate. Valid entries are: 0 = 50 Baud, 1 = 75 Baud, 2 = 110 Baud, 3 = 135 Baud, 4 = 150 Baud, 5 = 200 Baud, 6 = 300 Baud, 7 = 600 Baud, 8 = 1200 Baud and 9 = 1800 Baud. Default is 300 Baud.
- Printer Parity must be set to 0 (No Parity), 1 (Odd Parity) or 2 (Even Parity). Default is No Parity.
- Printer Number of Tx Bits must be specified as 5 → 8 Tx Bits. Default is 8 Tx Bits.
- Printer Number of Stop Bits must be specified as 1 → 2 Stop Bits. Default is 2 Stop Bits.
- Printer Slow Carriage Return Option can be set to 0 (Disable), 1 (Output 2 Nulls at End-of-Line), 2 (Output 4 Nulls at End-of-Line), 3 (Output 8 Nulls of End-of-Line), 4 (Output 16 Nulls at End-of-Line), 5 (Output 32 Nulls at End-of-Line) or 6 (Output 64 Nulls at End-of-Line). Default is 0.

Operation

- Connect the Printer to the RS-232 port (Printer Port); refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

To Suspend Printer:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial Attendant Function 75 and ✳.
- The printer is suspended. When the printer is suspended, SMDR and Auto Wake-up may fill up the queues for the printer. If the SMDR Print queue is full, no trunks can be accessed. If the Auto Wake-up print queue is full, no wake-up calls are made and an Alarm is reported indicating that the queue is full.

To Release Printer:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial Attendant Function 75 and #.
- The Printer continues printing where it left off and prints records found in any of the print queues. If ✳**750** (suspend and purge) was previously dialed, the SMDR, and Auto Wake-up print options are enabled, providing the option was programmed.

To Suspend Printer and Purge Queues:

- Dial the Attendant Function Access (71 or ✳).
- Dial Attendant Function 75 and 0.

- This purges the SMDR and Auto Wake-up print queues and disables the SMDR and Auto Wake-up print options. The printer remains suspended.

PROGRAMMING

Description

Programming the PABX consists of completing the required Programming Forms, then entering the desired Command Number and data from the Test Line or Console. A full description of each feature is contained in Section MITL9102-095-105-NA, Features Description (with the programming requirements recorded in Section MITL9102-095-210-NA, System Programming).
In addition to the "cancel" function that was performed previously, the '#' key performs the following functions while in programming:

(a) It returns control to the Command Level when the FIRST field of data is flashing.

(b) At the Command Level, it can advance to the next command in the same homogeneous command group; i.e., Class-of-Service or Trunk Programming has a homogeneous or range of command numbers for that particular type of programming. If the command is nonhomogeneous, the '#' key at command level does nothing.

(c) When a programming error occurs, the '#' key performs an equivalent function as '**' (which returns the contents of the register to the state it was in before the change was attempted). Note that '##' is required in Toll Control Programming.

Conditions

- If Configuration Switch 8 on the CPU II Card is set to CLOSED, the System Security Code (default is 7772) allows the programming information to be changed.
- If the Configuration Switch 8 on the CPU II Card is set to CLOSED, the user can only view the programming data when the # sign is pressed OR if the User Security Code is dialed. Change ONLY the information detailed in User-Defined Programming Command.
- The user can NEVER view the System Security Code or Load Default Data (#998), when using the User Security Code.
- With Configuration Switch 8 OPEN, entering the Programming Access Code (70 or #) allows the programming information to be altered.
- Refer to Section MITL9102-095-210-NA, System Programming for programming details.

Programming

- Refer to Section MITL9102-095-210-NA, System Programming.

Operation

To Enter System Programming:

- Press STATUS key four times and hold – display shows the generic level.
- While holding the STATUS key down, dial the Security Code (default is 7772 for System Programming or 1234 for User Programming).
- If correct code is entered, the generic number flashes for 10 seconds.
- Release the STATUS key when it stops flashing.
- Press # within 10 seconds – display shows ?601 (Command 601) – system is in the Programming Mode.
- To exit from Programming Mode, press the RELEASE key – console returns to normal operation.
- Alternatively, set Configuration Switch 8 on the CPU II Card to OPEN. Dial the Programming Access Code (default is 70 or #).

REMOTE CALL STATUS DISPLAY

Description

An optional Remote Call Status Display is available for the SX-20 PABX. This display when connected, provides the call processing information associated with the Test Line connected to Equipment Number 01, together with the status of stations, trunks, system and time-of-day. The display is not affected when RMATS is used. The display portion of the Remote Display generally operates as a time display. If it is used in Consoleless Mode or the Configuration Switch 6 has been set which marks Equipment Number 01 as the Test Line, then the Remote Display indicates the following:

- Attendant function data (as before)
- System programming data (as before)
- Call status information (goes blank when Test Line originates a call), displays dialed digits, displays stations or other devices in call, recall or camp-on status, etc.).

Busy Lamp Field:

- The Busy Lamp Field displays the active status of each station. If the busy LED is on, the station is busy or ringing. If the LED is off, the station is idle, and if flashing the station is on hold at the console.

Line Status LEDs:

- Each trunk circuit has an associated Line Status LED. If the status LED is on, the trunk is busy or busied-out. If the LED is off, the trunk is idle and if the LED is flashing, the trunk has been placed on hold at the console/Prime Station.

System Status LEDs:

- RES PWR LED: This LED flashes when there has been a commercial power failure and the system is operating on Reserve Battery Backup.
- ALARM LED: This LED flashes to indicate that the system has detected a malfunction.
- CALL PARK: There are three call hold slots which indicate if there are any calls waiting to be picked up by stations or Attendant.
- CALL WAITING: This LED lights to indicate that another call is waiting to be answered at the Test Line.
- AUX LED: This LED is reserved at this time.
- PAGE LED: This LED lights to indicate the paging equipment has been accessed.
- CALL BLOCK LED: This LED is lit when the Call Block feature is activated. Calls between stations with Call Block are prevented.
- RING OFF: This LED lights to indicate if the bell has been turned off by using the BELL OFF key.

- NIGHT SERV LED: This LED is lit when the system is operating in Night Service.
- EQUIP BUSIED LED: This LED lights to indicate that either the system automatic diagnostics or maintenance personnel have detected a malfunctioning device, and have busied-out that device.

Numerical Display: The numerical display shows the called and/or calling number, programming information (command number and data), attendant/maintenance function information, recall indication (camp-on and ringing) or message registration counters. When idle, the time-of-day may be displayed using either a 12- or 24-hour clock.

Conditions

- If the Test Line is used to program the system, then Configuration Switch 6 on the CPU II Card must be OPEN.
- If the Test Line is used to program the system or to perform an attendant/maintenance function, then the Remote (and Cabinet) Call Status Display shows the appropriate information. Refer to CABINET CALL STATUS DISPLAY in this Section.
- Since the SX-20 system has a maximum of 72 stations, the last eight LEDs in the Busy Lamp Field do not light on the Remote Call Status Display.
- The display is not affected when RMATS is used.
- The Remote Call Status Disply may be used with a single line telephone set to provide a second answering position, in addition to the Attendant Console. Refer to TEST LINE in this Section.

Programming

System Options Programming (Command 601), Register 4:

- For Consoleless Operation, set Console Inhibit to 1 (Enable). Default is 0 (Disable).

Busy Lamp Field Programming (Command 970):

- Assign the station number at the beginning of each row. (Refer to MITL9102-095-210-NA, System Programming for details.)

Operation

None

REMOTE MAINTENANCE ADMINISTRATION AND TEST SYSTEM (RMATS)

Description

RMATS provides a customer with the ability to perform programming, maintenance and attendant functions on the SX-20 system from a remote location. The console and remote displays are not affected, thus the local operator is not aware that the PABX is being used by RMATS (unless the same facility that RMATS is currently using; i.e., attendant functions or programming, is used by the attendant).

Conditions

- Data Line Security is automatically enabled on RMATS DIL.
- Only junctors 5, 6, 7 and 8 can be used for RMATS. If all junctors are busy, and the RMATS Access Code is dialed, the carrier signal is not returned until one of those junctors becomes idle.
- There is no time-out if the junctors are busy and the RMATS user wishes to hold. The system continues to attempt access every 0.5 s until one is free.
- The console can never be used to access RMATS.
- Refer to Section MITL9102-095-301-NA, Remote Maintenance Administration and Test System (RMATS) for details.

Programming

Feature Access Codes Programming (Command 602), Register 25:

- Enter required RMATS Modem Access Code. Default is 498.

If a DIL Trunk is Used with RMATS During Day Service, Program the Following:

Trunk Programming (Commands 801 → 812), Register 4:

- Set Day Answer Mode to 0 (Direct-In Line).
- Set Direct-In Line Equipment Number to 88 (RMATS Modem). Default is 01 (Station Equipment Number 01).

If a DIL Trunk is Used with RMATS During Night Service, Program the Following:

Trunk Programming (Commands 801 → 812), Register 5:

- Set Night Answer Mode to 0 (Flexible Night Service).
- Set Night Service Equipment Number to 88 (RMATS). Default is 01 (Station Equipment Number 01).

Operation

- Refer to Section MITL9102-095-301-NA, Remote Maintenance, Administration and Test System. for a complete description.

RESTRICTIVE STATION CONTROL

Description

This feature allows the attendant to temporarily restrict a station from making outgoing trunk calls. Station-to-Station calls may be made in the normal manner, but attempts to access a trunk result in the station receiving reorder tone.

Conditions

None

Programming

Class-of-Service Programming (Commands 611 → 619), Register 2:

- Message Registration/Restrictive Station Control must be set to 1 (Enable Restrictive Station Control Only) or 3 (Enable Both). Default is 0 (Disable Both).

Function Key Programming (Command 972):

- If desired, program one of the Console keys (1 through 3) for Message Registration/Restrictive Station Control.

Operation

(a) Attendant Function Operation

To Enable Restrictive Station Control:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 22, plus the station number of the station to be restricted.
- Dial 9; the display shows the station number plus four 9s.
- Press the RELEASE key.
- The station is restricted.

Note: The count for that station is deleted when 9 is dialed.

To Disable Restrictive Station Control:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 22, plus the station number of the station on which the restriction is being removed.
- Dial 0; the display shows the station number plus four 0s.
- Press the RELEASE key.
- The station is no longer restricted.

(b) Console Key Operation

To Enable Restrictive Station Control:

- Press the MSG REG key and hold.
- Dial the station number of the station to be restricted.
- Dial 9 – the display shows the station number plus four 9s.
- Release the MSG REG key.

To Disable Restrictive Station Control:

- Press the MSG REG key and hold.
- Dial the station number from which the restriction is being removed.
- Dial 0 – the display shows the station number plus four 0s.
- Release the MSG REG key.

REVERSAL MEANING

Description

This entry in Trunk Programming defines the interpretation of Tip-Ring reversal.

Conditions

- In all cases, reversal implies Tip-Ring reversal.

Programming

Trunk Programming (Commands 801 → 812), Register 2:

- If a reversal is to indicate an incoming call only, Reversal Meaning must be set to 1 (Incoming Call). If a reversal is to indicate a disconnect, Reversal Meaning must be set to 2 (Incoming Call or Disconnect). Default is 0 (Not Incoming Call or Disconnect).

Operation

None

RING GROUP

Description

This feature defines up to nine stations as a group. These stations are rung simultaneously when the group is accessed, thus, it is termed as a Ring Group. The stations programmed into the Ring Group are called Ring Group members. There is only one Ring Group provided by the system and it is assigned an unique access code.

Conditions

- SUPERSET™ sets cannot be members of a Ring Group.
- The Ring Group can be accessed by directly dialing its access code.
- The Ring Group can be assigned as a Day or Night Answer point for DIL applications.
- Stations may forward calls to the Ring Group but any forwarding in effect on the Ring Group members is ignored; i.e., calls may be forwarded on a one-step basis only.
- A Ring Group member may forward calls on Follow Me and Busy to another station, but Call Forwarding - Don't Answer is not honored when the station is rung as part of the Ring Group.
- If a station is a Ring Group member and has Call Forwarding enabled to a Hunt Group or a SUPERSET set, the forwarding is not honored when the station is rung as part of the Ring Group.
- At any given time, there can only be one device allowed to camp on to the Ring Group when all Ring Group members are busy, in which case a tone burst (camp-on tone) is applied onto the first member to indicate the situation.
- Ensure only valid station numbers are programmed into the group; i.e., ensure that there is a corresponding equipment number for that station number.

Programming

Feature Access Code Programming (Command 602), Register 24:

- Assign required 1-, 2- or 3-digit Ring Group Access Code. Default is 497.

Station Ring Group Programming (Command 641):

- Assign the required station directory numbers for the Ring Group in Registers 1 to 9.

Trunk Programming (Commands 801-812), Registers 4 and 5:

- If the Direct-In Line (DIL) equipment number (during Day or Night Service) is assigned to the Ring Group, enter 87 (Ring Group). Default is 01 (Station Number 1).

Operation

- All members of the Ring Group are rung when the Ring Group Access Code is dialed. Ringing is terminated when a member answers the call.
- If all members in the Ring Group are busy, the next caller is automatically pended-on and hears ringback tone. Further callers to the Ring Group receive busy tone (except in the case of Direct-In Line, which is directed to the attendant).

ROTARY DIAL PULSE-TO-DIGIT TRANSLATION

Description

The system allows the selection of one of four different digit translation plans. Refer to Rotary Dial Pulse-to-Digit Translation Plans Table in Section MITL9102-095-210-NA, System Programming. This allows the PABX to be used in any country irrespective of that country's digit translation. Refer to SELECTABLE TONE PLANS and SELECTABLE RINGING FREQUENCY in this Section.

Conditions

- When initially programming the system, it is recommended a DTMF set is used.

Programming

System Options Programming (Command 601), Register 5:

- Select required translation plan for Trunk Digit-to-Pulse and Rotary Dial Station Pulse-to-Digit Translation. Default plan for all digit translations is Plan 0.

Operation

For a Station:

- The Translation Code (0, 1, 2 or 3) defines which make of telephone is used; i.e., European, North American, etc., so the system can determine HOW to outpulse the digits to the Central Office. For example, if a station dials the digit 6, the PABX would pulse seven pulses to the CO if Translation Plan 1 had been selected.

SELECTABLE RINGING FREQUENCY

Description

To accommodate the various ringing frequencies used throughout the world, the PABX provides a selection of one of three different ringing frequencies: 17.5 Hz, 20 Hz and 25 Hz. The selectable ringing frequency, when used in conjunction with the Tone Plans and Rotary Dial Pulse-to-Digit Conversion, enables the communications system to be used in any market place.

Conditions

None

Programming

System Options Programming (Command 601), Register 5:

- Select the required ringing frequency
  0 = 20 Hz
  1 = 25 Hz
  2 = 17.5 Hz
  Default is 0 (20 Hz).

Operation

None

SELECTABLE TONE PLANS

Description

To accommodate world wide users, the system provides four different Tone Plans. Refer to Selectable Tone Plans Table in Section MITL9102-095-210-NA, System Programming. Refer to ROTARY DIAL PULSE-TO-DIGIT TRANSLATION and SELECTABLE RINGING FREQUENCY in this Section.

Conditions

None

Programming

System Options Programming (Command 601), Register 5:

- Select desired Tone Plan. Default is Tone Plan 00.

Operation

None

SPEECH PATH ACCESS

Description

This feature allows the attendant (or Test Line) to access a particular speech path by equipment number.

Conditions

- A speech path may be accessed if it is busied-out, but not if it is busy.

Programming

None

Operation

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 27 + speech path equipment number (01 → 12). The console or Test Line is now connected to the chosen speech path.

STATION CALLS TO ATTENDANT NIGHT ANSWER POINT

Description

This feature assigns a specific station as the "Night Answer Point" for all DIAL 0 calls when the system is in Night Service.

Conditions

- Station calls to Attendant Night Answer Point must not be designated Originate Only.

Programming

System Options Programming (Command 601), Register 4:

- The Station Call to Attendant Answer Point During Console Inhibit or Night Service must be set as 00 (Attendant) or 01 – 72 (Station Equipment Number). Default is 00.

Operation

(a) Console Key Operation:

- Press the NIGHT SERVICE key on the console. The LED lights and the system is in Night Service.
- All calls to the attendant are now routed to the selected Night Answer Point.

(b) Attendant Function Operation:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 11; which is the code for Night Service ON.
- All calls to the attendant are now routed to the selected Night Answer Point.

STATION FEATURE RESET

Description

This is a function that is performed by the station user who wishes to reset the features that are currently active on his station.

Conditions

- All callbacks set up by the station are cancelled.
- Call Forwarding is no longer in effect.

Programming

Feature Access Code Programming (Command 602), Register 14:

- Assign the Station Feature Reset Access Code. Default is 444.

Operation

- Lift handset – dial tone.
- Dial the Station Feature Reset Code from the required station set – dial tone is returned.
- All features selected at that station are disabled.

STATION HUNTING

Description

This feature defines a group of stations as a Hunt Group and assigns a Hunt Group Access Code. A call to a Hunt Group connects to the first idle station in the group. There can be up to six Hunt Groups of eight stations defined, each with a unique access code. Alternatively, Hunt Groups may be linked to form larger Hunt Groups for a maximum configuration of one group of 48 stations. Two types of hunting are provided: Circular and Terminal Hunting.

Circular Hunting starts at the station after the last station in the Hunt Group to which a call was completed. Hunting is then performed in the sequence programmed. Hunting stops at the first idle station found.

Terminal Hunting starts at the first station in the Hunt Group and terminates at the first idle station found. Hunting takes place in the order in which stations were programmed into the Hunt Group.

Conditions

- A call can camp on to a busy Hunt Group.
- Stations may forward to a Station Hunt Group, but any forwarding in effect on the stations in that Hunt Group is ignored; i.e., calls may be forwarded on a one-step basis only.
- A maximum of six independent Hunt Groups may be defined each with eight directory number entries.
- A station number may be entered more than once in any or all Hunt Groups.
- Direct-In Lines can be directed to a Hunt Group. Refer to the conditions detailed under DIRECT-IN LINES in this Section.
- The Attendant Access Code cannot be assigned to a Hunt Group.
- Invalid station numbers assigned to a Hunt Group are ignored.

Programming

Station Hunting Programming (Commands 631 → 636), Register 1:

- The Hunt Type must be set to 0 (Circular) or 1 (Terminal). Default is 0.
- If the Hunt Group is linked to another group, assign one of the six Hunt Groups 1 → 6. Default is 0 (Unlinked Hunt Group).

Station Hunting Programming (Commands 631 → 636), Registers 2 → 9:

- Assign the required Station Directory Numbers in each of eight registers for each of the Station Hunt Groups.

Feature Access Code Programming (Command 602), Registers 18 to 23:

- Assign required 1-, 2- or 3-digit Hunt Group Access Codes. Default is 491 (Hunt Group 1) - 496 (Hunt Group 6).

Operation

- Any station in a Hunt Group may be accessed directly by dialing the station number, but if the station is busy, hunting does not occur.
- If a station dials a Hunt Group Access Code in which all stations are busy, busy tone is returned.
- If the attendant or a station transfers a trunk call to a Hunt Group in which all stations are busy, the trunk call may be camped on to the Hunt Group. The caller hears silence or Music on Hold, if provided.

STATION MESSAGE DETAIL RECORDING (SMDR)

Description

Station Message Detail Recording (SMDR), also known as Call Detail Recording, allows a business to analyze, and thus control its telephone costs. Data is collected for each outgoing and/or incoming trunk call. Each call generates a call record which is available at the RS-232 port of the PABX. This output can be connected to:

- A local printer which gives an on-line printout at the termination of each trunk call, or
- A magnetic tape recorder which collects data for each event, for subsequent processing by a service bureau to produce reports on telephone usage for management, or
- Directly to a service bureau via a dedicated line for more timely processing.
- Directly to the Mitel DART™ system or the VOYAGEUR™ system to provide detailed call costing.

Conditions

- Refer to Section MITL9102-095-451-NA, Station Message Detail Recording (SMDR), for details.

Programming

System Options Programming (Command 601), Register 8:

- SMDR: System Enable must be set to 1 (Enable Incoming Trunk Calls Only), 2 (Enable Outgoing Trunk Calls Only) or 3 (Enable Both Incoming And Outgoing Trunk Calls). Default is 0 (Disable).
- SMDR: Record Meter Pulses may be set to 1 (Enable). Default is 0 (Disable).
- SMDR: Long Call Indicator may be set to 1 (Enable). Default is 0 (Disable).
- SMDR: Record Only Incoming CO Trunk Calls may be set to 1 (Enable). Default is 0 (Disable).
- SMDR: Drop Calls of Less than Eight Digits may be set to 1 (Enable). Default is 0 (Disable).
- SMDR: Drop Incomplete Outgoing Calls may be set to 1 (Enable). Default is 0 (Disable).
- SMDR: Purge may be set to 1 (Enable). Default is 0 (Disable).
- Refer to Section MITL9102-095-451-NA, SMDR for details.

Operation

- Refer to Section MITL9102-095-451-NA, SMDR for details.

STATION SWITCHHOOK FLASH TIMING

Description

This feature defines the minimum and maximum duration of a switchhook flash. A switchhook flash of less than the minimum flash time (150 ms) is filtered by the system and is not treated as a flash. A flash of longer than the selected flash time (750 ms or 1500 ms) is considered by the software as an on-hook. Switchhook flashes of between the minimum flash time and the selected maximum flash time are considered as valid.

Conditions

None

Programming

System Options Programming (Command 601), Register 5:

- Station Switchhook-Flash Timing may be set to 0 (150 - 750 ms), 1 (150 - 1500 ms), 2 (Flash is Release), or 3 (90 ms Calibrated Flash). Default is 0 (150 - 750 ms).

Operation

None

STATION TRANSFER SECURITY

Description

This feature prevents lost trunk calls due to incorrect station handling. If a trunk call is transferred to an idle station which does not answer, or is camped on to a busy station and the station does not pick up the call within the programmed time-out period, the call automatically recalls. Also, if a station attempts to transfer a call before completing dialing, the call automatically recalls to the station attempting the transfer. Refer to CAMP-ON and TRANSFER/ADD-ON/CONSULTATION HOLD in this Section.

Conditions

None

Programming

None

Operation

None

SUPERSET 3 and SUPERSET 4 SETS

Description

The PABX allows a SUPERSET set to be connected provided that the proper equipment is installed. Refer to the following Sections for detailed information:

- Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.
- Section MITL9102-095-106-NA, SUPERSET 3 Set and SUPERSET 4 Set Features and Service Description.

Conditions

- When programming, the SUPERSET set must be on-hook.
- An auto-dial modem or an acoustic coupler cannot be connected in parallel to a SUPERSET 3 set or a SUPERSET 4 set.
- A SUPERSET set cannot be connected in parallel to other sets.
- A SUPERSET set cannot be connected to the Power Fail Transfer circuit.
- A SUPERSET set cannot be used as a Housephone.

Programming

System Options Programming (Command 601), Register 1:

- Set Auto-Hold on the SUPERSET Set Switch to New Line, to either 0 (Disable) or 1 (Enable). Default condition is 0.

System Options Programming (Command 601), Register 2:

- Set Auto-Answer Enable to 0 (Disable) or 1 (Enable). Default condition is 0.

System Options Programming (Command 601), Register 3:

- Set Delayed Ringing Time-out (SUPERSET set) to required time: either 10, 20 or 30 Seconds. Default is 10 Seconds.

SUPERSET Set Programming (Commands 701 to 740), Registers 01 to 15:

- Assign the required data for each SUPERSET set command number.

Operation

- Refer to Section MITL9102-095-106-NA, SUPERSET 3 and SUPERSET 4 Description.

SYSTEM ADMINISTRATION ACCESS CODE DISPLAY/SECURITY CODES

Description

If the Programming Access Code (default is 70) has been changed, move Configuration Switch 8 to the OPEN position. The new Programming Access Code is briefly displayed on the Remote Display and the Cabinet Call Status Display.

Conditions

- When Configuration Switch 8 is CLOSED: If the User Security Code was not entered, then all data can be viewed except User Security Code, the System Security Code and the DISA Access Code. None of the data can be altered.
- When Configuration Switch 8 is OPEN: All data including User/System Security Codes can be viewed and altered regardless of whether the User/System Security Codes were entered.

Programming

None

Operation

- Refer to SYSTEM SECURITY CODE PROGRAMMING and USER SECURITY CODE PROGRAMMING for details, in Section MITL9102-095-210-NA, System Programming.

TAFAS OVERFLOW KEY

Description

This is a programmable function key. Depressing this key causes the system to go into TAFAS Mode immediately, and light the associated key LED. While the key LED stays lit, the system remains in TAFAS Mode. When the same key is depressed again, its LED goes out, and the system returns to normal call processing. This key may be depressed at any time; i.e., the system may be active in superfunctions or call handling when it is "forced" into TAFAS Mode.

Conditions

None

Programming

Class-of-Service Programming (Commands 611 → 619), Register 3:

- Any Station allowed the ability to pick up TAFAS calls, must have TAFAS Access enabled in its Class of Service.

Function Key Programming (Command 972):

- Assign TAFAS Overflow key as one of the three programmable function keys.

Operation

- Refer to Attendant Console Guide, Part Number 9180-953-101-NA.

TEST LINE

Description

Station Equipment Number 01 may be used as a Test Line to program the system or to perform all Attendant or Maintenance Functions. It may also be used in conjunction with the Remote Display as a secondary or Night Console position. The Remote Display (when used with the Test Line) shows the same call status information as the SX-20 Cabinet Display; both displays are independent of the Attendant Console display. Refer to REMOTE CALL STATUS DISPLAY in this Section for a full description of the Remote Call Status Display. The Test Line may also be used as a regular station. Refer to ATTENDANT AND MAINTENANCE FUNCTIONS in this Section. Refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

Conditions

- Equipment Number 01 cannot be designated as a Housephone.
- Calls handled by the Test Line recall to the Test Line; there is no interaction with the Attendant Console.
- The Test Line and Attendant Console cannot access the Attendant Functions or programming functions simultaneously.
- If Equipment Number 01 is used as a Test Line rather than a station, Configuration Switch 6 on CPU II Card must be set to OPEN.
- While the Test Line is enabled, it is given a programmed COS. The Test Line is toll-allowed if no console is provided.

Programming

None

Operation

Attendant Function:

- Dial the Attendant Function Access Code (71 or *).
- Dial required Attendant or Maintenance Function Code, plus equipment number, if necessary.

Programming:

- Dial Programming Access Code.
- The Test Line may now be used to program the system.

TIME DISPLAY

Description

After initialization, the Time Display (Remote, Cabinet, and Console displays) continuously shows the time-of-day. The time is displayed as either a 12- or 24-hour clock depending on the option selected by the attendant.

Conditions

- If a power failure occurs, the clock is reset to 00:00, the display flashes and shows the elapsed time from the power failure.

Programming

None

Operation

To Select the 12-Hour Clock Display:

- Dial the Attendant Function Access Code (71 or *).
- Dial 14 + 2-digit hours and 2-digit minutes - the display shows A14-hhmm (e.g., for 6 PM enter 14 + 1800).

To Select the 24-Hour Clock:

- Dial the Attendant Function access Code (71 or *).
- Dial 15 + 2-digit hours and 2-digit minutes - the display shows A15-hhmm (e.g., for 1800 enter 15 + 1800).

TOLL CONTROL

Description

Toll Control denies a station the ability to make certain calls. Denials may be specified to be active on the receipt of the toll supervision, number of digits dialed, and the actual digits dialed. Two Toll Control Plans are available in the system. Each plan can be programmed to contain a maximum number of 99 digit patterns of up to 19 digits each. Two tables are provided to further expand the denial capability; each table contains 999 3-digit codes. Each or both tables can be assigned to either Toll Control Plan. Absorb Unlock and Absorb Repeat ability is also included in the Toll Control Plans.

For a detailed explanation of Toll Control, refer to Section MITL9102-095-212-NA, Toll Control Description.

Conditions

- Toll denial on receipt of supervision is dependent on the Central Office providing supervision on access of the toll network. Toll Control is dependent on:

  1. Station Class-of-Service Programming
  2. Inward Dial Trunk Toll Restriction Programming
  3. Trunk Group Programming
  4. Toll Control Plan Programming
     (a) Toll Supervision
     (b) Digit Counting Toll Control
     (c) Absorb Plans (Unlock and Repeat)
     (d) Digit String Programming
     (e) Toll Table Programming (if assigned)
- Refer to Section MITL9102-095-212-NA, Toll Control Description for details.

Programming

Refer to Section MITL9102-095-212-NA, Toll Control Description.

Operation

None

TONE-TO-PULSE CONVERSION

Description

This feature automatically converts DTMF signals to dial pulse (rotary) signals where the CO or distant end of the outgoing trunk is not equipped to accept DTMF signals.

Conditions

- If Tone-to-Pulse Conversion has been set to 1, then the DTMF signals also appear on the trunk (as well as the rotary pulses), as early line split is not provided. In those cases where this double signaling can cause difficulties in digit detection, answer supervision is supplied to the system. Tone-to-Pulse Conversion should be set to 2 (Enable, Disable Outgoing Audio Until Answer). In those cases where double signaling can cause difficulties but answer supervision cannot be supplied to the system, Transmit Audio is restored if:

- The digit # is dialed once the complete directory number has been dialed OR,

- The 10 second interdigit time is exceeded after the last digit of the directory number has been dialed.

- If Tone-to-Pulse Conversion has been set to 2, the following must also be programmed in Trunk Group Programming (Commands 821 → 826), Register 2. Supervision must be set to 1 (Supervision is Answer); default is 0. This enables transmit audio when the CO provides answer supervision. The audio is enabled only by the 10 second interdigit time or by dialing # after last digit or directory number with DTMF set. With a rotary set transmit audio is enabled upon completion of dialing.

Programming

Trunk Group Programming (Commands 821 → 826), Register 2:

- Tone-to-Pulse Conversion must be set to 1 (Enable), or 2 (Enable, Disable Transmit Audio Until Answer). Default is 0 (Disable).

Operation

None

TRANSFER/ADD-ON/CONSULTATION HOLD

Description

This feature allows a station user in an active call to place the call on Consultation Hold and originate a new call. The user may then consult privately with the third party, add the third party to the call or transfer the original call to the third party.

Conditions

- If a station is connected to a trunk call, Transfer/Add-On/Consultation Hold to another trunk (i.e., as the third party) is not permitted unless Trunk-to-Trunk Plus Station Conferencing is enabled.
- Flash for Transfer/Add-On/Consultation Hold and Flash for Attendant are mutually exclusive.
- The call may be camped onto a busy station only if station controlled camp-on is enabled. Any attempt to camp on a call with station controlled camp-on not enabled, results in the station being recalled.
- A transferred call that is "Ring No Answer" or "Camp-On" for a certain period, recalls to the controlling station.

Programming

System Options Programming (Command 601), Register 1:

- If the station is allowed the ability to camp on trunk calls to other stations, Camp-On (Onto Stations Only) must be set at 2 (Enable, Trunks → Stations) or 3 (Enable, Both). Default is 3.

System Options Programming (Command 601), Register 3:

- Set Timed Recall - Camp-On to the desired time, 10 through 70 Seconds. Default is 30 Seconds.
- Set Timed Recall - Don't Answer to the desired time, 10 through 70 Seconds. Default is 30 Seconds.

Class-of-Service Programming (Commands 611 → 619), Register 2:

- Set Switchhook/Ground Button Flash to 1 (Flash for Consultation Hold). Default is 1.

Operation

To Consult with a Third Party:

- While engaged in a call, flash the switchhook - the original call is placed on Consultation Hold.
- Dial number of the third party - when the call is answered the user may consult privately.

To Add the Third Party to the Call:

- Flash the switchhook - all three parties are connected together.

To Transfer the Call to the Third Party:

- Replace the handset - the original call is transferred to the third party.
- If the handset is replaced while the third party station is ringing or on the receipt of busy tone, the original call is ringing the third party or is camped on to the third party.

TRANSFER DIAL TONE

Description

Transfer Dial Tone is returned to a station user who flashes the switchhook and places an existing call on hold in order to consult or transfer the call. The Transfer Dial tone returned is dependent on the Tone Plan selected in the System Options Programming.

Conditions

None

Programming

System Options Programming (Command 601), Register 1:

- Transfer Dial Tone must be set to 1 (Enable). Default is 1.

System Options Programming (Command 601), Register 5:

- Tone Plan may be specified as 00, 01, 02, or 03. Default is 00.

Operation

- Originate or answer a call.
- The station user flashes the switchhook.
- Transfer Dial Tone is returned.

TRUNK ALARM CONTROL

Description

This option enables or disables trunk alarms on a per-trunk basis. This should only be done under adverse conditions (e.g., improper CO trunk conditions cannot be corrected by your telephone company). Disabling trunk alarms does not correct improper trunk operation, it only prevents alarms from continually ringing the console.

Conditions

Trunk Alarm disabled:

- There is no visual or audible indication of trunk alarms.
- A trunk alarm is not reported in the alarm stack.
- Trunks detecting improper CO conditions are not busied-out.

Programming

Trunk Programming (Commands 801 - 812), Register 1:

- Set Trunk Alarm Control to 0 (Disable). Default is 1 (Enable).

Operation

None

TRUNK ANSWER FROM ANY STATION (TAFAS)

Description

TAFAS (Trunk Answer From Any Station) allows incoming calls normally directed to the Attendant Console to be routed to a common alerting device (Night Bells) when the system is in Night Service or when TAFAS Day Service has been specified. Any station user with the feature enabled in its COS may answer the TAFAS call by dialing the TAFAS Access Code. The answering station may exercise any feature associated with the incoming call that is normally available at that station.

Conditions

- If one of the console keys has not been programmed as a TAFAS Overflow key, after the first call which exceeds the TAFAS Time-Out at the Attendant Console, all subsequent calls are routed to TAFAS immediately, until the console is no longer busy.
- If a console key has been programmed, the attendant can press the key when there are too many calls to handle by one person, thereby switching all calls immediately to TAFAS.
- A station cannot place a call on Consultation Hold, then answer a TAFAS call.

Programming

System Options Programming (Command 601), Register 1:

- If a station is allowed to camp on to a TAFAS call, Camp-On (Onto Stations Only) must be specified as 2 (Enable, Trunks → Stations) or 3 (Enable, Both). Default is 3.

System Options Programming (Command 601), Register 4:

- If station calls to the attendant are routed to Night Bells, Station Calls to Attendant or Test Line Routed to Night Bells must be set to 1 (Enable During Day Service), 2 (Enable During Night Service) or 3 (Enable Both). Default is 1.

- If TAFAS is used when the system is in Day Service, Day TAFAS Mode must be specified as 1 (Immediate Switching to TAFAS) or 2 (Automatic Switching to TAFAS After Time-out). Subsequent calls immediately route to the Night Bells equipment as long as the console is idle. Default is 2.

- If TAFAS is used when the system is in Night Service, Night TAFAS Mode must be set to 1 (Immediate Switching to TAFAS), or 2 (Automatic Switching to TAFAS After Time-out). Subsequent calls immediately route to the Night Bells equipment as long as the console is idle. Default is 1.

- Set Automatic Switching to TAFAS Time-Out to desired time (1 - 7 X 10 Seconds). Default is 30 Seconds.

Feature Access Code Programming (Command 602), Register 09:

- Assign required TAFAS Pickup Access Code. Default is 57.

Class-of-Service Programming (Commands 611 - 619), Register 3:

- TAFAS Access Code must be specified as 1 (Enable Pickup from Night Bells) or 2 (Enable Pickup from Night Bells/Attendant). Default is 2. If TAFAS Access Code is set to 2, calls at the Attendant Console may be answered by any station with the feature enabled in its Class of Service, even though the calls have not been routed to the Night Bells equipment.

Function Key Programming (Command 972):

- If the console is to have a TAFAS Overflow key, program one of the three programmable keys for TAFAS.

Operation

Incoming Call to Night Bells Equipment:

- At station - lift handset and dial TAFAS Pickup Access Code.
- The user is connected to the call.

TRUNK BUSY-OUT ENABLE

Description

This function allows the attendant or Test Line to "Busy-Out" a selected trunk. Once busied-out, the trunk may only be accessed from the console or Test Line by dialing ✳19 and the trunk equipment number. Stations attempting to access the trunk receive busy tone. Refer to ATTENDANT AND MAINTENANCE FUNCTIONS in this Section.

Conditions

None

Programming

None

Operation

To Busy Out a Trunk:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 41 + the trunk equipment number.
- Press the RELEASE key.
- The trunk is busied-out and the associated Trunk Status LED lights and EQPT BUSIED LED lights.

To Unbusy a Trunk:

- Dial the Attendant Function Access Code (71 or ✳).
- Dial 51 + the trunk equipment number.
- Press the RELEASE key.
- The trunk may now be accessed in the normal manner and the associated trunk LED is off and the EQPT BUSIED LED goes dark.

OR

- Dial Attendant Function Access Code (71 or ✳).
- Dial 32.
- All busied-out trunks and equipment (DTMF Receivers) are cancelled.

TRUNK EMERGENCY RELEASE

Description

This feature allows the console user or the maintenance person to release occupied trunk circuits for emergency reasons. This procedure disconnects callers on the trunk and should therefore be used with caution.

Conditions

- Trunk Emergency Release does not release a busied-out trunk.

Programming

None

Operation

- Dial the Attendant Function Access Code (71 or *).
- Dial 20.
- Dial the trunk equipment number.
- The trunk is now free and may be accessed.

TRUNK GROUP OVERFLOW

Description

When this feature is enabled in Trunk Group Programming, calls directed to or from that group route through another specified Trunk Group if all the members in that group are busy. The dialing station must have permission to overflow programmed in its Class of Service.

Conditions

None

Programming

Class-of-Service Programming (Commands 611 - 619), Register 1:

- Access to Trunk Group Overflow must be set to 1 (Enable). Default is 0 (Disable).

Trunk Group Programming (Commands 821 - 826), Register 1:

- Trunk Group Overflow (Automatic Trunk Select Only) must be set for one of the six Trunk Groups by entering 1, 2, 3, 4, 5 or 6. Default is 0 (Disable).

Operation

None

TRUNK GROUPS

Description

The SX-20 system may be assigned up to six independent outgoing Trunk Groups. A station may access all Trunk Groups specified in its COS by dialing the required access code. When a Trunk Group has been accessed, a station's toll restriction defines its dialing capabilities. Refer to TOLL CONTROL in this Section.

Conditions

- A trunk may be a member of only one Trunk Group.
- Applicable for outgoing trunks only.

Programming

Class-of-Service Programming (Commands 611 → 619), Register 1:

- Assign Trunk Group Access. If stations assigned this Class of Service are allowed access to a Trunk Group, assign the Trunk Group Access as 1. If the stations are denied access, assign the Trunk Group Access as 0. Default is 1 (Allow Access) for all Trunk Groups.

Trunk Programming (Commands 801 → 812), Register 1:

- Assign Trunk Group Membership for each trunk.

Trunk Group Programming (Commands 821 → 826), Trunk Groups 1 → 6:

- Assign required parameters for each command; refer to Trunk Group Programming Form in Section MITL9102-095-210-NA, System Programming.

Operation

None

TRUNK HUNTING (TERMINAL OR CIRCULAR)

Description

This feature connects a station user (when dialing a Trunk Group Access Code) to the first idle trunk in that group. There are two forms of hunting available: Circular and Terminal.

Circular Hunting starts at the first trunk after the last trunk that was accessed, then hunts in order of trunk equipment number, for the first idle trunk (for only one loop). Busy tone is returned if an idle trunk has not been found.

Terminal Hunting starts at the first trunk in the Trunk Group and terminates at the first idle trunk found. Hunting takes place in the order of trunk equipment number.

Conditions

- Terminal trunk hunting always hunts to Trunk Equipment Numbers 01 and 02 last when they are included in a Trunk Group programmed for Terminal Hunting. For example, if Trunk Equipment Numbers 01 through 08 were in such a Trunk Group, hunting would always begin with Equipment Number 03, and proceed up to Equipment Number 08, before accessing Equipment Numbers 01 and 02. This allows outgoing only trunks to be placed at the beginning of a trunk group programmed for Terminal Hunting, without conflicting with the two Power Fail Transfer trunks.
- If all trunks are busy, the calling party hears busy tone.

Programming

Trunk Group Programming (Commands 821 – 826), Register 1:

- Trunk Hunting may be set to 0 (Circular) or 1 (Terminal). Default is 0.

Operation

None

TRUNK-TO-TRUNK PLUS STATION CONFERENCING

Description

This feature allows a station user, who is involved in an established trunk call, to place the trunk on Consultation Hold and access a second trunk. The user may then converse privately with the third party, or form a 3-party conference.

Conditions

- Only Conference Trunk (Part Number 9102-011-002-NA) may be part of a conference.
- The trunks used in conferences must be programmed as conferencing trunks in trunk programming.

Programming

Trunk Programming (Commands 801 - 812), Register 1:

- If a trunk is allowed to be a member of a conference in which another trunk is involved, Trunk Hardware Type must be set to 1 (CO Conferencing Trunk). Default is 0 (Standard CO Trunk).

Trunk Programming (Commands 801 - 812), Register 2:

- Disconnect Supervision Provided by CO must be set to 1 (Yes) if the trunks do not provide supervision themselves. Default is 0 (No).

Note: If Disconnect Supervision Provided by CO is disabled, then when the SX-20 station (which was involved in a trunk-to-trunk conference) goes on-hook, both trunks are dropped. If Disconnect Supervision Provided by CO is enabled, then when the SX-20 station goes on-hook, the two trunks remain connected.

Operation

- Establish a trunk call.
- Flash the switchhook - the first trunk is put on Consultation Hold; transfer dial tone is returned.
- Dial the required Trunk Group Access Code and directory number - 2-way conversation with the third party.
- Flash the switchhook to connect the held trunk to the existing call and form a 3-party conference.

UNLIMITED WAIT FOR DIAL TONE

Description

This feature allows interconnection to extremely slow COs (i.e., dial tone delays of 30 minutes). This feature seizes a trunk and holds for an indefinite period. Upon the receipt of dial tone, the station can outpulse the digits.

Conditions

- In most cases, the dial tone provided by the Central Office CAN be detected by the dial tone detectors within the system. In this case, Wait for Dial Tone must be set to 2 (Unlimited Wait, with Polling Dial Tone Verification once per 5 s). Once dial tone is heard, a dial tone detector connects to the trunk and outpulsing may begin once the detector detects the dial tone. This condition ensures the correct operation of Toll Restriction.
- In some cases, the dial tone provided by the Central Office cannot be detected by the dial tone detectors within the system. In this case, Wait for Dial Tone must be set to 3 (Unlimited Wait, with Manual Dial Tone Verification). Once dial tone has been heard, and the switchhook has been flashed (the SUPERSET sets must dial the digit "1"), a tone receiver connects to the trunk and outpulsing may begin immediately.

Programming

Trunk Group Programming (Commands 821 → 826), Register 2:

- Wait for Dial Tone must be set to 2 (Unlimited Wait, with Polling Dial Tone Verification, Once Per 5 Seconds) or 3 (Unlimited Wait, with Manual Dial Tone Verification). Default is 1 (Wait 5 Seconds).

Operation

With Unlimited Wait Set to 2:

- Go off-hook at a station.
- Dial the Trunk Group Access Code.
- The Dial Tone detector checks for dial tone.
- If no dial tone is detected after 5 seconds, the Dial Tone Detector and Dial Tone Receiver are removed.
- The system then waits 5 seconds before reconnecting the Dial Tone Detector to check again for dial tone.
- When the 5 seconds has elapsed, the Dial Tone Detector is connected for 1.5 seconds to check for dial tone.
- If there is still no dial tone, the Dial Tone Detector is removed for another 5 seconds.

- This process of connecting the Dial Tone Detector at 5 seconds OFF, 1.5 seconds ON intervals is continued until dial tone has been detected, at which time the receiver is connected.

With Unlimited Wait Set to 3:

- Go off-hook at a station.
- Dial a Trunk Group Access Code.
- Dialed digits are not outpulsed but the trunk and Dial Tone Detector remains seized.
- When dial tone is heard, flash the switchhook (or dial "1" on a SUPERSET set). The receiver is assigned to the trunk, allowing digits dialed to be outpulsed normally.

USER SECURITY CODE PROGRAMMING

Description

The user may perform limited programming of the system by dialing the User Security Code. This programming is possible only if the relevant System Options have been set in System Programming, (Command 975).

Conditions

- If the User Security Code was entered, then all data can be viewed except the System Security Code and only the data specified by the user programming facility can be altered.
- Configuration Switch 8 must be CLOSED (to prevent programming changes).
- The User Security Code must be different from the System Security Code to prevent user access to System Programming.
- Although the User Security Code may be viewed under these conditions, in order to change the code it must be specified as user programmable data.
- Default Data (#998) cannot be loaded using the User Security Code.

Programming

User-Defined Programming (Command 975), Registers 1, 2 and 3:

- Set the fields for the command number to which the user has access, 1 (Enable All Fields) or where applicable 2 (Enable All Fields Except TOLL-related). Default is 0 (Disable).

User Security Code Programming (Command 977), Register 1:

- Assign the required 4-digit User Security Code. Default is 1234.

Operation

To Enter Programming Mode:

- Depress STATUS key four times and hold - display shows the generic number.
- Enter 4-digit User Security Code (default 1234) and if correct, the generic number flashes on display for 10 seconds.
- Release STATUS key.
- Dial # and command 601 appears on display.
- Perform programming as required.
- Press RELEASE key (system is removed from Programming Mode after 10 seconds).

WAIT FOR DIAL TONE

Description

This option selects the maximum period of time the system waits to receive dial tone from a trunk. Digits dialed before dial tone is received, or before the time-out period specified, are not outpulsed by the system.

Conditions

- Refer to Section MITL9102-095-212-NA, Toll Control Description.
- In most cases, the Dial Tone provided by the Central Office can be detected by the Dial Tone detectors within the system. In this case, Wait for Dial Tone must be set to 1 (Wait 5 seconds). This condition ensures the correct operation of Toll Restriction.

Programming

Trunk Group Programming (Commands 821 - 826), Register 2:

- Wait for Dial Tone must be specified as 0 (No Wait) or 1 (Wait 5 Seconds). Default is 1.

Note: If Wait for Dial Tone is set to 2 or 3, refer to UNLIMITED WAIT FOR DIAL TONE in this Section.

Operation

None

SX-20®
SUPERSET 3™ AND SUPERSET 4™
DESCRIPTION

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. GENERAL DESCRIPTION 1
A. Physical Description 2
Base Assembly 2
Cover Assembly 2
B. Power-Up Sequence 6
C. Functional Description (SUPERSET 3 Set) 6
D. Functional Description (SUPERSET 4 Set) 8

3. LINE TYPES 14

4. FEATURES DESCRIPTION 16
Automatic Callback - Busy 17
Call Forwarding - Busy; Don't Answer; Follow Me 19
Call Hold 22
Camp-On 24
Display 26
Do Not Disturb 27
Executive Busy Override 28
External Call Forwarding 29
Handsfree Operation 30
Messaging 32
Paging Access 33
Privacy/Privacy Release 34
Redial 35
Speed Call 36
Transfer/Add-On/Consultation Hold 38
Trunk Answer From Any Station (TAFAS) 39

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LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
2-1	SUPERSET 4 Dimensions	3
2-2	SUPERSET 4 Faceplate	4
2-3	SUPERSET 3 Dimensions	5
2-4	SUPERSET 3 Feature Location	7
2-5	Line Status Display Symbols	10
2-6	SUPERSET 4 Features Display Layout	11

1. GENERAL

1.01 This Section contains a description of the features provided by the SUPERSET 3 set and the SUPERSET 4 set. Also included is a description of the various line types available with these SUPERSET™ sets.

1.02 The features available are determined by the PABX connected to the SUPERSET 3 and SUPERSET 4 sets.

Reason for Issue

1.03 This Section is issued to include the features of the SUPERSET 3 set and the SUPERSET 4 set when used with the SX-20 PABX.

1.04 Detailed instructions for the programming and testing of each feature are given in Section MITL9102-095-210-NA, System Programming and Section MITL9102-095-215-NA, System Test Procedures.

2. GENERAL DESCRIPTION

2.01 The SUPERSET is an advanced microprocessor-controlled telephone set employing digitally controlled integrated circuitry.

2.02 The SUPERSET 3 set provides the following features:

- Single button feature activation.
- Multiline appearances (installer-programmed) of up to three lines including Prime Line (set directory number). Multiline appearances may be a mixture of PABX lines and trunks and may also be multi-appearances of the same line.
- Speed call entry at each unassigned line.
- Automatic selection of Prime Line.
- Pushbutton selection of non-Prime Line.
- Automatic ringing line selection (PABX programmed option).
- Hold function for any call at the set.
- Handsfree operation.
- Volume controls for ringer and loudspeaker.

2.03 The SUPERSET 4 set is very similar to the SUPERSET 3 set but features a liquid crystal display and offers more features to the user. The SUPERSET 4 set provides all the features that the SUPERSET 3 set offers plus the following:

- Multiline appearances (installer-programmed) of up to 15 lines including Prime Line (set directory number). Multiline appearances may be a mixture of PABX stations and trunks and may also be multi-appearances of the same line.

- Handsfree operation with switchable microphone.

- Ringer pitch control.

A. Physical Description

2.04 SUPERSET sets are constructed of a molded plastic cover and base. The connections between the handset, the SUPERSET set and telephone line are made using plug-ended line cords. The SUPERSET 4 set also has a rear support which can be clipped into position beneath the set. The dimensions, with the handset on-hook, are shown in Figure 2-1 (SUPERSET 4 Dimensions), and Figure 2-3 (SUPERSET 3 Dimensions). The two main assemblies (the base assembly and cover assembly) are detailed in the following paragraphs.

Base Assembly

2.05 The base assembly contains the switchhook, modular jacks for the handset and line cards, a microphone (for handsfree operation) and a speaker assembly (for handsfree operation and tone ringer output). The microphone is positioned to permit sound to pass through the front of the base assembly. The speaker assembly is mounted between the handset recesses and projects sound upwards through a grill beneath the handset. A control for adjusting ringer pitch is accessible underneath the base assembly using a slotted screwdriver.

Cover Assembly

2.06 The cover assembly houses a volume control assembly, a keypad module, and a line selection/repertory dial module. Each of these are described in detail in the following paragraphs.

2.07 **Volume Control Assembly.** There are two volume control dials on the SUPERSET 4 set (one each for speaker and ringer), which are mounted in the upper left-hand corner of the cover assembly. The controls are mounted on the edge and are identified with a printed card insert. This card also has space for the installation telephone number and is held in place by a transparent plastic lens that is clipped in position. On the SUPERSET 3 set, the speaker/ringer volume control (slide switch) is located at the left side of the set, closest to the handset.

2.08 **Keypad Module.** Both the SUPERSET 3 set and the SUPERSET 4 set contain a standard 12-button keypad for the characters 0 - 9, * and #.

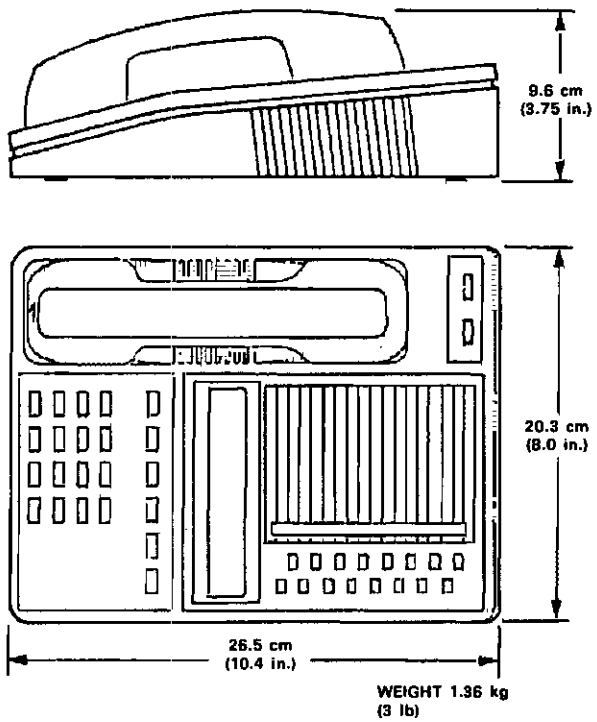

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Figure 2-1 SUPERSET 4 Dimensions

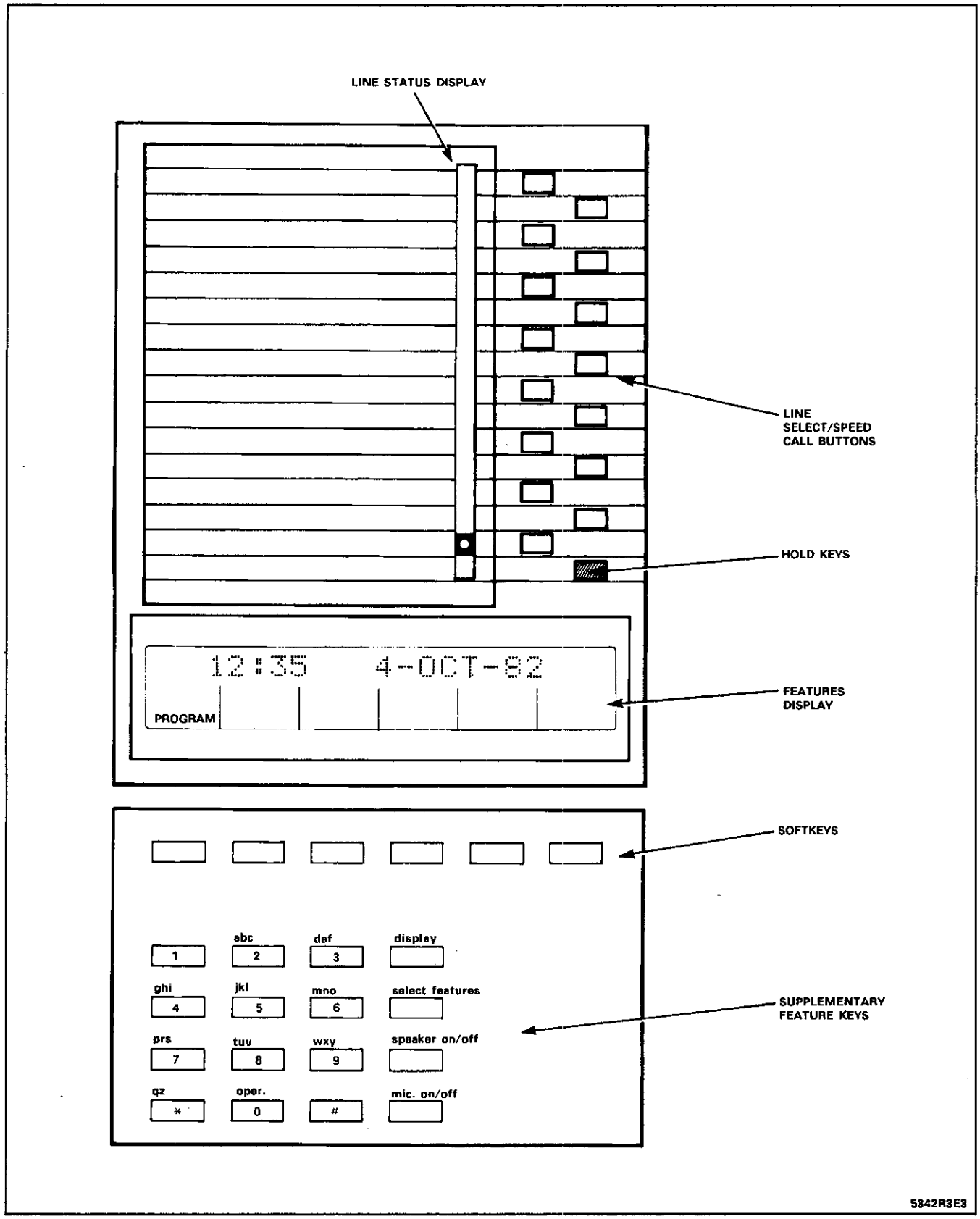

Figure 2-2 SUPERSET 4 Faceplate

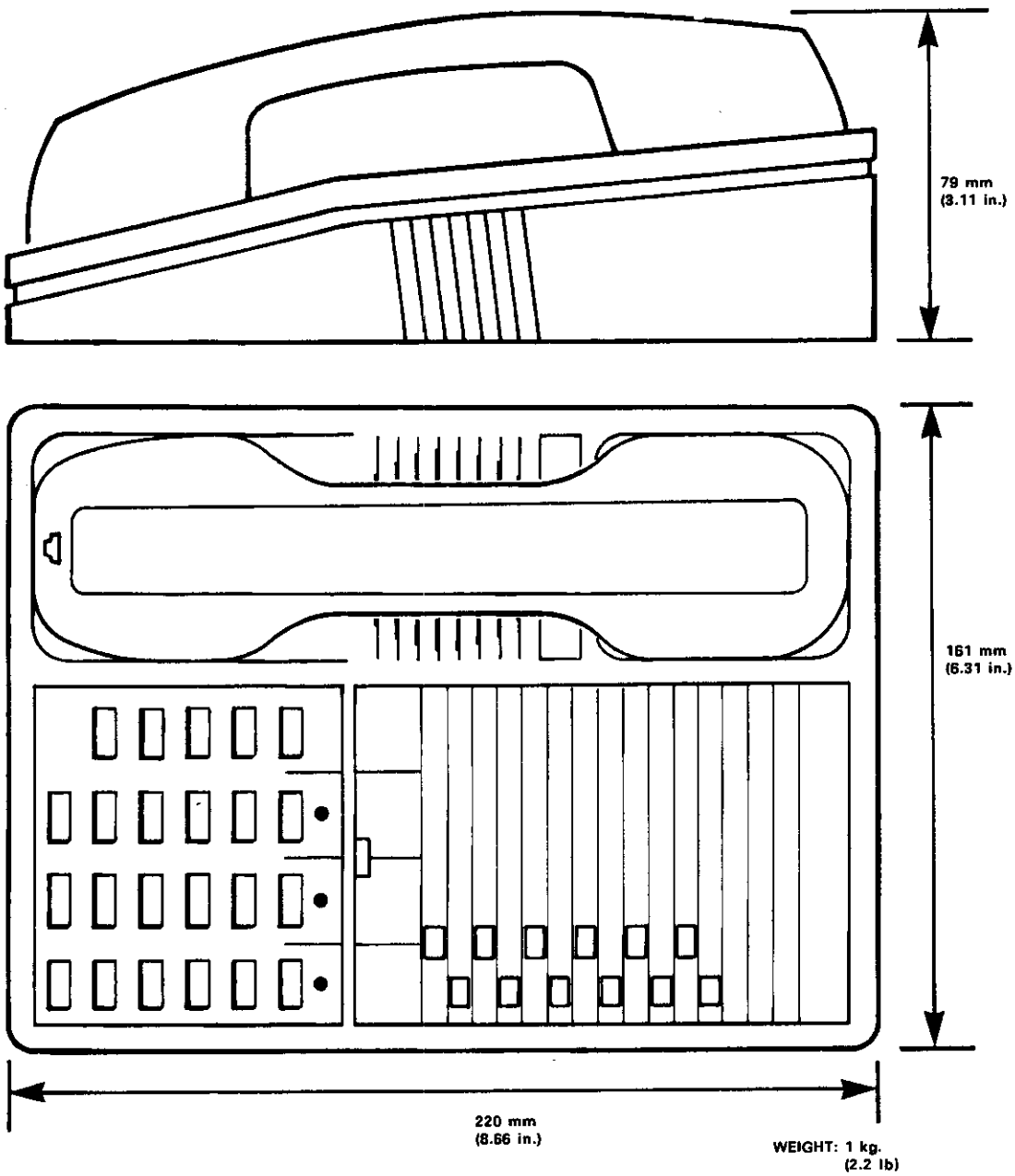

Figure 2-3 SUPERSET 3 Dimensions

B. Power-Up Sequence

2.09 On the SUPERSET 3 set power-up, all three line indicator LEDs light momentarily. The Prime Line indicator LED flashes for approximately 1 minute. When this LED goes dark, the SUPERSET 3 set is ready for normal operation.

2.10 On the SUPERSET 4 set power-up, the Features Display shows the software identity for about 5 seconds and then shows the message "NO COMMUNICATIONS" for approximately 30 seconds. The ringer sounds once and the Features Display flashes the date and time. When the date and time remain solid, the SUPERSET 4 set may commence normal operation.

C. Functional Description (SUPERSET 3 Set)

2.11 **Line Select Buttons and Indicators.** There are three line select buttons and 12 speed call buttons which can be configured (at the time of PABX programming) to select preassigned lines, in order to receive or originate calls. These lines can be a mix of variety of line types (e.g., key, multiple call, direct line select, direct trunk select, personal outgoing and private).

2.12 Directly above the three line select buttons are three line indicator LEDs which indicate the status of each of the three lines. When the LED is off, the line is idle. When the LED is on, the line is in use. When the LED is flashing, the line is being rung or is on hold.

2.13 **Feature Buttons.** There are eight feature buttons as follows:

- Hold – This button allows the set user to hold any call at the set. The line on which the call is held is indicated by the indicator LED flashing directly above the line select button.
- Swap – This button allows the set user to alternate between a call on Consultation Hold and the current call.
- Trans/Conf – This button places the current call on Consultation Hold, organizes a 3-way conference call or transfers a call.
- Redial – Pressing this button automatically outpulses the last manually dialed number on a trunk.
- Cancel – Cancel drops the current caller when retrieving a call from Consultation Hold. Cancel acts as a hang-up during speaker operation when the handset is on-hook. Cancel also aborts speed call programming.
- Program/Save – This button programs and saves new numbers for speed call numbers.
- Speaker ON/OFF – This button allows the set user to receive or originate calls without use of the handset. Pressing the button once switches the speaker and microphone on.

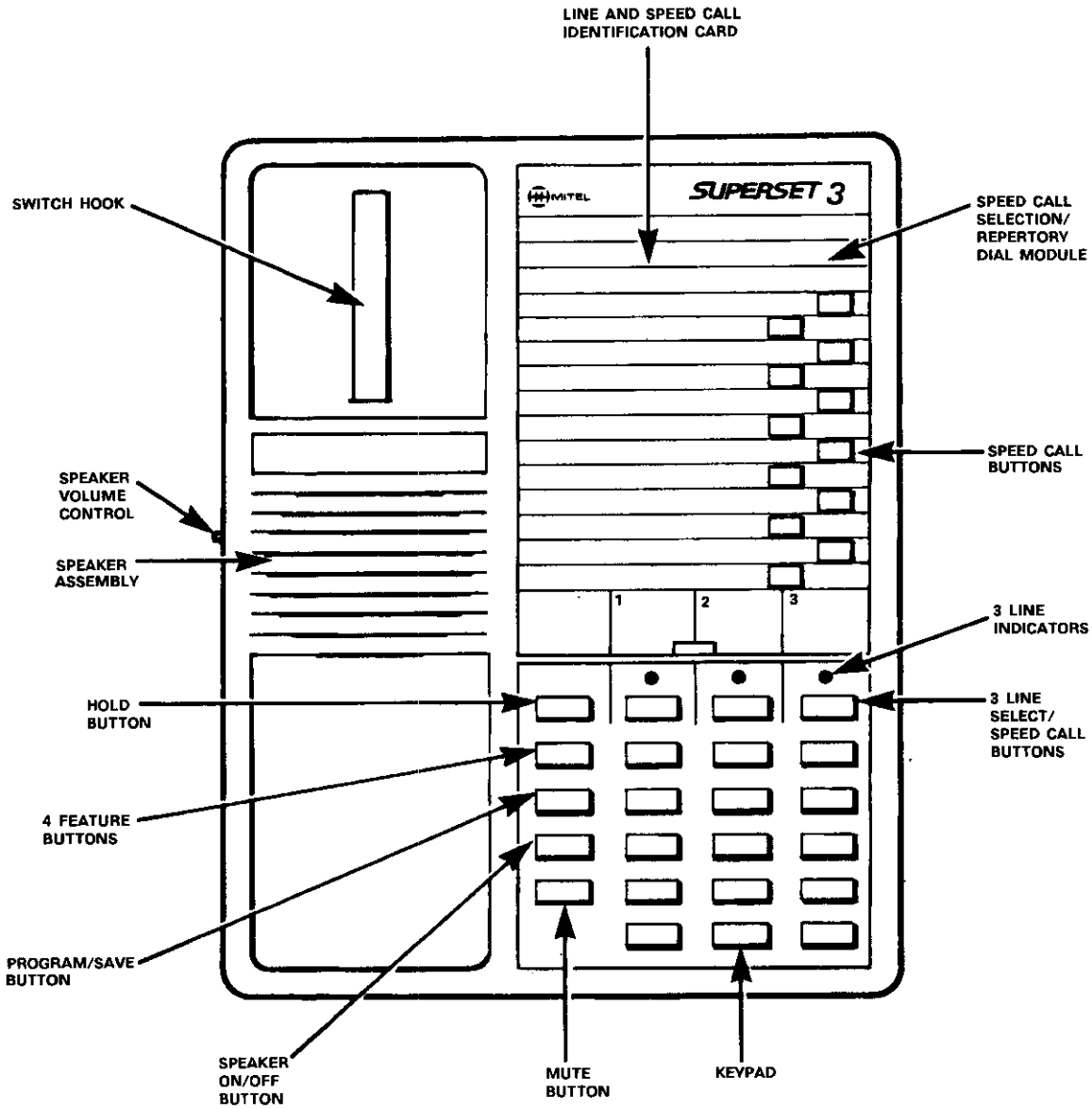

Figure 2-4 SUPERSET 3 Feature Location

- Mute - Pressing and holding down this button disables the microphone.

D. Functional Description (SUPERSET 4 Set)

2.14 The SUPERSET 4 faceplate is shown in Figure 2-2. The line selection repertory dial module contains 15 line select/speed call buttons, a hold button, an LCD line status display and an LCD feature display. The following text describes the function of each button and display. All buttons are noninterlocking.

2.15 There is a line identification card associated with the buttons and the Line Status Display. This card provides space for the identification of the Prime Line (station), directory numbers and function identification (i.e., line and speed call numbers) of the remaining buttons. The card is held in place with a transparent plastic lens that is clipped in position.

2.16 **Line Select/Speed Call Buttons.** There are 15 line select/speed call buttons which can be configured (at the time of PABX programming) to preassigned lines, in order to receive or originate calls. These lines can be a mix of a variety of line types (e.g., key, multiple call, direct line select, direct trunk select, personal outgoing and private). Those buttons not assigned a line are available for speed call numbers.

2.17 **Hold Button.** This button allows the set user to hold any call at the set. The line on which the call is held is indicated by the adjacent line status display flashing on and off. When a call is held, the Alphanumeric Display prompts the user to select another line (only after another line is selected is dial tone returned). The call is held and can be retrieved by pressing the associated line select button.

2.18 **Feature Buttons.** There are six feature buttons. Each button is associated with a specific group of word prompts on the Features Display. The display shows only the word prompts that are valid at that time. In any specific group of prompts, only one prompt can be displayed. The user selects the feature or PABX action, by pressing the button immediately below the prompt that describes that action.

2.19 **Display.** Displays on the Alphanumeric Display:

- Identification of lines at the set
- Saved numbers for speed call
- Number saved for redial
- Messages
- Identification of source of incoming calls
- Identification of caller camping on

- Call forward destination (station number).

2.20 The actual item displayed is selected after the display button is pressed, by either pressing a line select/speed call button (for line identification, caller identification or speed call number) or pressing a feature button under the prompt associated with the item. To clear the display, the EXIT feature button is pressed.

2.21 **Select Features.** Features which may be activated at any time (as opposed to those which may be selected only at fixed times), are displayed on the Features Display area when the Select Features button is pressed. The features which can be selected and their reference number, are displayed on either side of the Alphanumeric Display. When the Alphanumeric Display instructs the user to "DIAL FEATURE NO." the user dials the reference number from the keypad and then presses the ON or OFF feature button.

2.22 **Speaker on/off.** This button allows the set user to receive or originate calls without use of the handset. Pressing the button once switches the speaker and microphone on and selects the prime line. Each time this button is pressed, the speaker and microphone are switched alternately on and off, and the set is switched between on- and off-hook conditions. While the microphone is on, a visual reminder (MIC ON) is displayed on the Features Display.

2.23 **Mic.on/off.** This button disables the microphone during hands-free operation, to prevent transmission of local sound and improve reception. While the microphone is on, a visual reminder (MIC ON) is displayed on the Features Display.

2.24 **Line Status Display.** This is a liquid crystal display mounted adjacent to the line select buttons. The display provides line or trunk status indication; the symbols are aligned with the line select/speed call buttons. The different states of a symbol group and the meaning of each state are shown in Figure 2-5.

2.25 **Features Display.** This is a liquid crystal display mounted adjacent to the feature buttons. The Features Display is divided into three functional areas, as shown in Figure 2-6.

2.26 **Features display area.** The words displayed in this area indicate the features that may be selected at any time. Those features which are not in the Class of Service are not displayed. Display of the words is initiated by pressing the Select Features button.

2.27 The meaning of each feature name is as follows:

1:FWD — Call Forward. This feature is automatically invoked after setting up Call Forwarding type and destination. When active, the prompt FWD is displayed as a reminder. To cancel the feature, the user must press the Select Features button, dial '1' and then press the OFF feature button. To reacti-

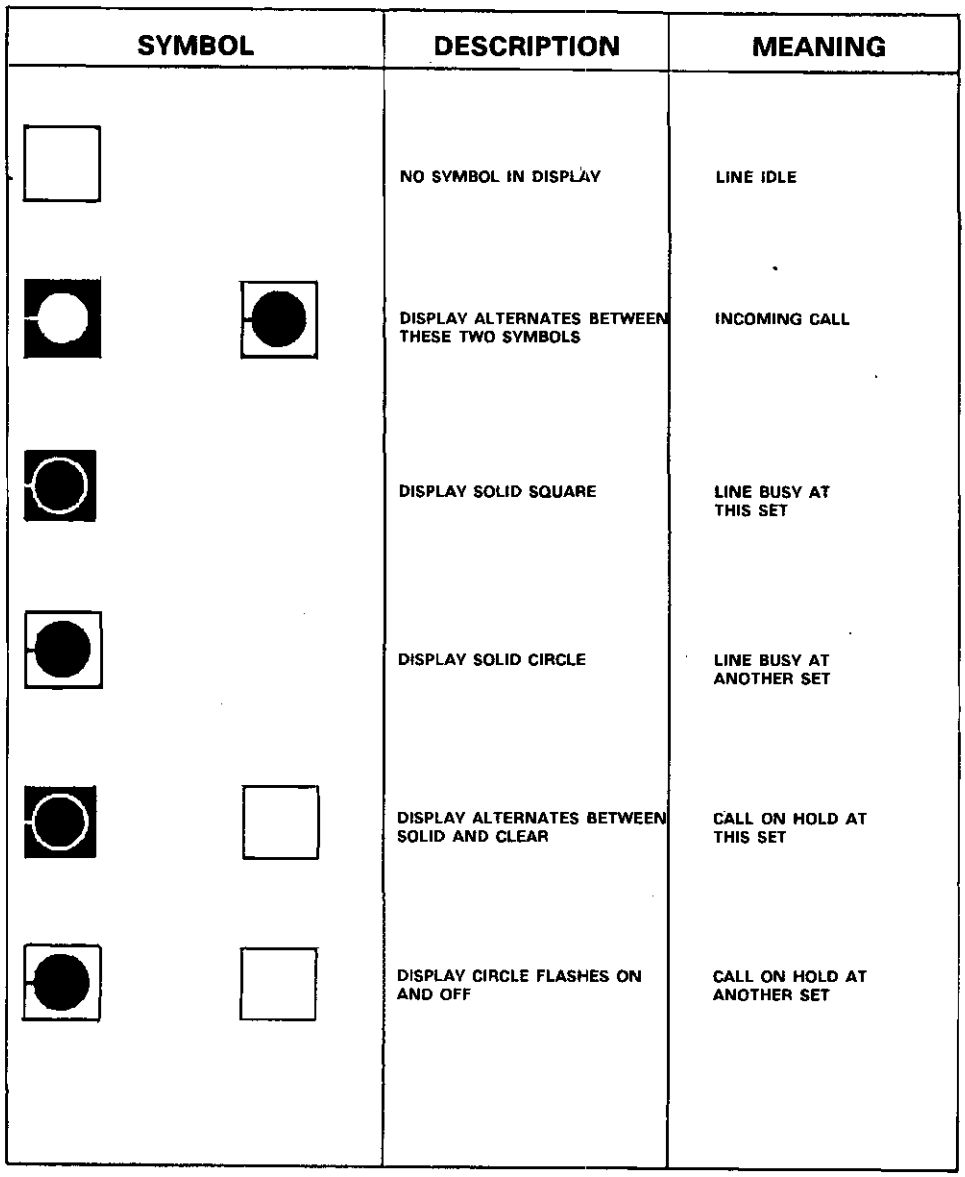

Figure 2-5 Line Status Display Symbols

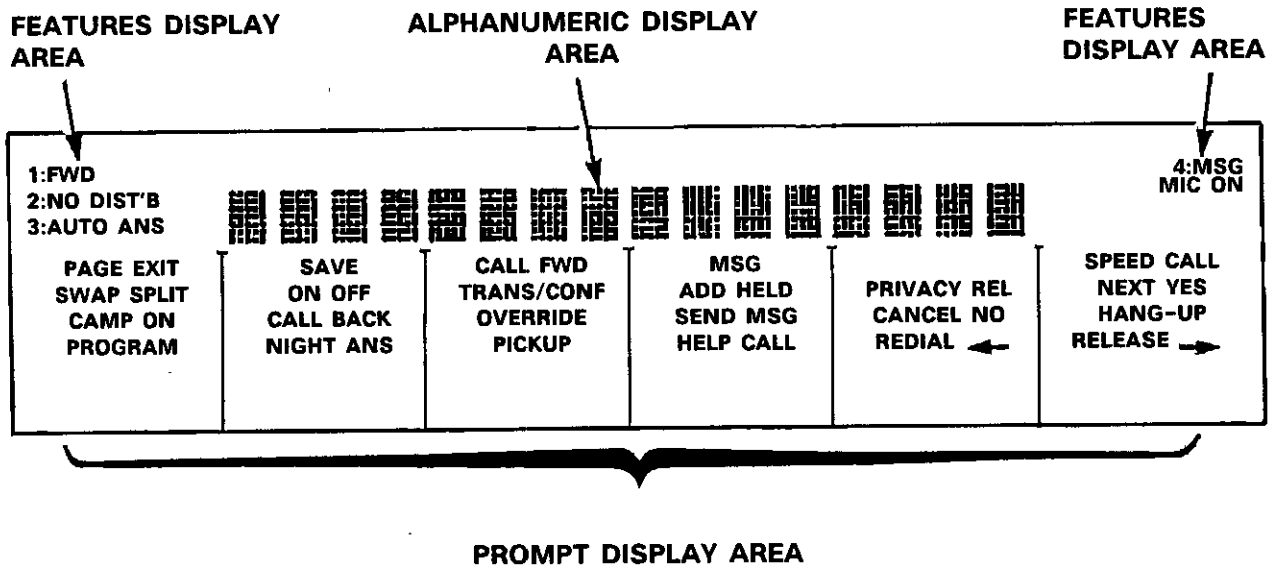

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Figure 2-6 SUPERSET 4 Features Display Layout

vate the feature, the user must press the Select Features button, dial '1' and then press the ON feature button.

2:NO DIST'B — Do Not Disturb. Prevents an incoming call from ringing the user's set. Stations phoning the Do Not Disturb set receive ringback tone. To activate this feature, the user must press the Select Features button, dial '2' and then press the ON feature button. When active, the prompt NO DIST'B is displayed as a reminder. To cancel this feature, the user must press the Select Features button, dial '2' and then press the OFF feature button.

3:AUTO ANS — Automatic Answer. Allows a user to answer an incoming call without touching the set. The incoming call signals the user with one ringing cycle and communication follows by means of the speaker and microphone. To activate this feature, the user must press the Select Features button, dial '3' and then press the ON feature button. When active, the prompt AUTO ANS is displayed as a reminder. To cancel this feature,the user must press the Select Features button, dial '3' and then press the OFF feature button.
Note: Auto-Answer must also be enabled in Command 601, Register 2. Default is disable.

4:MSG — Messaging. Reads system messages during an established call. The prompt MSG flashing in the display notifies a user that there is a message waiting to be read. To read the message during an established call, the user must press the Select Features button and then dial '4'. The Alphanumeric Display then shows the originator of the message (station number) and the time the message was sent. The SUPERSET 4 set user now has three choices of action:

- Press the CALL feature button. The SUPERSET 4 set automatically dials the set that sent the message.
- Press the CANCEL feature button. The message is cleared.
- Press the NEXT feature button. This searches for additional messages.

2.28 Alphanumeric Display Area. This is a 16-character display used for presenting time-of-day and date (provided by PABX), digit echoing, speed call number, call forward destination number, last number dialed, call identification, call elapsed time and messages from the system. Each character is formed from a 5x7 dot matrix .

2.29 **Prompt Display Area.** There are six groups of word prompts which signify all valid call-handling options at any given time. Each group relates to one of the six feature buttons. The prompts act as a guide to the set user; they indicate to the user what can be done and when they can be implemented. To select a function or feature indicated, the user presses the feature button beneath the prompt.

2.30 The prompts are organized such that only one word above any feature button is displayed at any time (except for SWAP CAMP ON feature). Whenever the feature is not in the Class of Service of a particular set or if the choices of actions are less than six, the area above some feature buttons is left blank. Pressing these buttons has no effect.

3. LINE TYPES

3.01 The SUPERSET 4 set can be programmed with up to 15 line appearances and the SUPERSET 3 set can be programmed with up to three line appearances. This Part describes the different line types that may be programmed on the SX-20 system and how they differ functionally. All line appearances are programmed using SUPERSET Set Programming, Commands 701 → 740 (refer to Section MITL9102-095-210-NA, System Programming).

3.02 PRIME LINE. The Prime Line is always key number 1 on a SUPERSET 3 set or a SUPERSET 4 set. Every SUPERSET set has only one Prime Line, as the Prime Line Access Code is the SUPERSET station directory number. A SUPERSET set that has only a Prime Line programmed operates as a standard telephone set as far as incoming and outgoing calls are concerned.

3.03 KEY LINE. Key Lines are "appearances" of a listed number in the system; the listed number may be that of a Prime Line. When one set seizes the line, all other appearances of that listed number are busy. Dialing a pseudo station (a listed number that does not have a designated equipment number) on a Key Line rings all SUPERSET 4 sets that have that assigned pseudo number.

3.04 MULTIPLE CALL LINE. Multiple Call keys are also appearances of a listed number in the system. They are different from Key Line appearances in that while one appearance of the listed number may be busy, other appearances of that listed number are idle. As many simultaneous calls to or from that line's directory number may be made as there are numbers of keys programmed to this line. Dialing a pseudo station number on a Multiple Call Line rings all the SUPERSET 4 sets that have that pseudo number. This could be termed as a Ring Group effect.

3.05 DIRECT TRUNK SELECT. The Direct Trunk Select key represents specified trunks. Each DTS key is assigned a trunk equipment number. Direct Trunk Select keys may share the same trunk equipment number. When a shared DTS trunk is in use by one user in the system, all other DTS keys assigned to that trunk are busy.

3.06 DIRECT LINE SELECT. A Direct Line Select key (DLS) is essentially a DTS line that cannot be transferred to another station. This operation was required to obtain a Key Line tariff.

3.07 PRIVATE LINE. A Private Line is a Central Office line (incoming and outgoing) which may not be transferred to another station and which is permitted to have only a single appearance throughout the system.

3.08 PERSONAL OUTGOING LINE. A Personal Outgoing Line (POG) is considered as an appearance of the set's Prime Line. Having this key, guarantees that there is always at least one free line on the set (for an outgoing call only) should all other lines be busy. A set can

have many POG line appearances so that many outgoing calls can be made, put on hold, etc.

Note: When Personal Outgoing Lines are enabled in SUPERSET Set Programming (Commands 701 → 740), they are automatically enabled as "No Ring" and "Originate Only." Therefore, POG calls put on hold using the HOLD button on the SUPERSET 4 set ring at the time of a recall.

4. FEATURES DESCRIPTION

4.01 This Part contains a description of features available at a SUPERSET 4 set. Only those features that are special to a SUPERSET 4 user or are activated at a SUPERSET 4 set in a way different to the method used by a standard telephone instrument user are described. Other features of the SX-20 system that are also available to standard telephone instrument users are not described (refer to Section MITL9102-095-105-NA, Features Description). Each description contains:

- Description - a detailed description of the feature.
- Conditions - any special conditions which should be taken into account when selecting the feature.

Note: As feature selection is a response to displayed prompts, no attempt can be made by a user to select a feature that is not available. When a prompt is displayed, the conditions applicable are as stated in this Section. Otherwise, the conditions are as described in Section MITL9102-095-105-NA, Features Description.

- Operation - a brief description of feature operation.

Note: For further information, and for programming details on a feature basis, refer to Section MITL9102-095-105-NA, Features Description.

4.02 This Part lists all feature descriptions in alphabetical order. The names of the features used refer directly to the text of the PABX documentation as closely as possible, to allow direct reference from any part of the documentation.

AUTOMATIC CALLBACK - BUSY

Description

Automatic Callback - Busy allows a SUPERSET 4 user, upon encountering a busy station or trunk group, to have the call completed when the station or trunk group becomes idle. After the feature has been activated, the system continuously monitors the originating station and the called number. When both are idle, the system rings the originating station and when that station goes off-hook, the system rings the called station. When the trunk and station are free, the system accesses the trunk and then rings the station. If more than one callback request is active on any number, the requests are queued and serviced on a first-in, first-out basis.

Conditions

- A callback can be cancelled by the originating station by using the Station Features Reset Code (444).
- A callback always rings the originating station; Call Forwarding has no effect.
- If the two parties involved in a callback hold a telephone conversation (not a conference) before the callback is honoured, the callback is cancelled automatically.
- Any callback outstanding for more than 8 hours is cancelled automatically.
- Duplicate callback requests are ignored (the original callback request is cancelled).
- If a callback is not answered by the originating station within four rings, it is automatically cancelled.
- If the called party becomes busy before the originating party answers the callback, the originating party hears busy tone and by going on-hook, the system automatically reactivates the feature.
- All callback requests are lost in the event of a power failure.

Operation

To set up an Automatic Callback - Busy:

- Dial the required station number or Trunk Group Access Code - busy tone is heard.
- Press the CALL BACK feature button - dial tone is returned and the SUPERSET 4 set is available for normal use.

OR

- Dial 6 - dial tone is returned and the SUPERSET 4 is available for normal use.

To answer an Automatic Callback - Busy:

- The SUPERSET 4 set rings.
- Lift the handset - either audible ringing tone is returned and the called number rings, or CO dial tone is heard.

CALL FORWARDING - BUSY; DON'T ANSWER; FOLLOW ME

Description

Call Forwarding - Busy (When Set is Busy):

This feature allows a SUPERSET 4 user to have all calls (which are directed to his station number, Ring Group or Hunt Group) forwarded either to the attendant, to another station number within the system or to an external number (via the system or the SUPERSET 4 Speed Call facility), WHEN THE STATION IS BUSY. While the feature is active and the set is idle, calls may be made and received normally.

Call Forwarding - Don't Answer (When No Answer):

This feature allows a SUPERSET 4 user to have all calls (which are directed to his station number, Ring Group or Hunt Group) that are NOT ANSWERED WITHIN THE SELECTED TIME, forwarded either to the attendant, to another station number within the system or to an external number (via the system or the SUPERSET 4 Speed Call facility). While the feature is active and the station is idle, calls may be made and received normally.

Call Forwarding - Follow Me (Always Forward):

This feature allows a SUPERSET 4 user to have all calls (which are directed to his station number, Ring Group or Hunt Group) forwarded either to the attendant, to another station within the system or to an external number (via the system or the SUPERSET 4 Speed Call facility). The number to which the calls are forwarded (attendant or another station only) is the only originating party that may call the forwarding station while Call Forwarding - Follow Me is active. The forwarding station may originate calls in the normal manner.

Conditions

- Call Forwarding has no effect on Callbacks.
- Call Forwarding has no effect on calls directed to a station via hunting.
- Only one type of Call Forwarding may be active at a station at any time. If a station has one type of Call Forwarding active and the user enters a new Call Forwarding type, the first type of Call Forwarding is cancelled.
- Call Forwarding - Don't Answer has no effect if the SUPERSET 4 set is operated in the auto-answer (handsfree) mode.
- If an invalid number is selected as a forwarding number, reorder tone is returned and the Alphanumeric Display indicates this fact.

- Call forwarding does not apply if the calling station is the party to which the call would be forwarded.

- Calls can be forwarded to a Hunt Group or a Ring Group.

Operation

Note: The current Call Forwarding type and destination can be displayed on the Alphanumeric Display by pressing the Display and CALL FWD feature buttons in that order.

To set up or modify Call Forwarding:

- With the handset on-hook, press the PROGRAM feature button.

- Press the CALL FWD feature button.

- The Alphanumeric Display shows a Call Forwarding type. If the displayed type is required, press the YES feature button. If the type is not required, press the NO feature button; another Call Forwarding type is then displayed.

- Check the Call Forwarding destination as displayed on the Alphanumeric Display. If correct, press SAVE feature button. The Call Forwarding type and destination are now stored.

- Call Forwarding is now active and the prompt FWD is displayed as a reminder.

Note: There are two ways to correct a programming error before SAVE is pressed:
1. Use the feature button directly below the ← prompt to backspace and clear the incorrect entry.
2. To cancel the entire current entry, press the EXIT feature button.

To deactivate Call Forwarding:

- Press the Select Features button.

- Dial '1' (feature number 1 is Call Forwarding (1:FWD)).

- Press the OFF feature button.

To reactivate Call Forwarding:

- Press the Select Features button.

- Dial '1' (feature number 1 is Call Forwarding (1:FWD)).

- Press the ON feature button.

Note: If a station camps on to the SUPERSET 4 set, the CALL FWD prompt appears on the Alphanumeric Display. Pressing the CALL FWD feature button routes the camped-on call to the last Call Forward destination.

CALL HOLD

Description

Call Hold allows a SUPERSET 4 user (engaged in an active call), to place the call on hold, then to replace the handset or use the set for other calls. All features normally active on the set may be selected while the call is held. A held call may be retrieved locally or at another SUPERSET 4 set that has an appearance of the line the call is held on. A call held on a line other than a line on which a conference has been organized may be added to that conference. All calls appearing at a SUPERSET 4 set may be put on hold.

Conditions

- The Attendant Console cannot be put on hold.

Operation

To place a call on Hold:

- Inform the caller, then press the red Hold button. The call is held and the caller hears music, if provided. The holding station may select another line to make or receive calls or access features in the normal manner or hang up. The Line Status Display associated with the call on hold flashes as a reminder.

  OR

- At a SUPERSET 4 set, press the TRANS/CONF feature button and dial the Call hold Access Code. Default is 51.

To retrieve the call Locally (at the holding station):

- Press the Line Select button associated with the call on hold.
- The call is returned to the holding station.

  OR

- Dial the Call Hold Retrieve – LOCAL Access Code. Default is 52.

To retrieve the call Remotely (at another SUPERSET 4 set that has an appearance of the line the call is held on):

- Press the line select button associated with the call on hold.
- The call is connected to the remote SUPERSET 4 set.

To Retrieve the Call Remotely (from any set):

- Dial the Call Hold Retrieve – REMOTE Access Code and SUPERSET 4 set station number (where the call was put on hold). Default is 53.

To add a call on hold to another line which has been accessed:

- While hearing dial tone or during a conversation, press the ADD HELD feature button, then the Line Select button associated with the call on Hold.

CAMP-ON

Description

This feature connects (camps on) incoming trunk calls or station calls to a busy station, warns the busy station that there is a call pending and completes the call automatically when the station becomes free. When a call is camped on to a station, the called station, and only that station, hears a 200 ms burst of camp-on tone (which indicates a station has camped on) or two 100 ms bursts of camp-on tone (which indicates a trunk call has camped on). If a camped-on trunk call was extended to the SUPERSET set from another station and is not answered within the time-out period, then the camped-on call recalls to the originating station. Station camped-on calls do not recall.

Conditions

- Camp-on tone is not supplied to trunks or stations using paging equipment.
- A station with a COS that includes Data Line Security can be camped onto, but camp-on tone is not supplied.

Operation

Station-to-Station:

- While receiving the special busy tone, press the CAMP ON feature button. Remain off-hook.
- The called party hears camp-on tone. In the case of another SUPERSET 4 set, the Features Display shows the SWAP CAMP ON prompts and XXX CAMPED ON (where XXX is the number of the camped-on station).
- The busy station hangs up, the camped-on station user hears ringback tone and the called station rings.

  OR

- The busy SUPERSET 4 set SWAP CAMP ON feature is selected and the calling party is connected.

Trunk-to-Station:

- Establish a trunk call.
- Press the TRANS/CONF feature button; the trunk call is placed on Consultation Hold. Dial tone is returned.
- Establish a call to a busy station.
- Press the CAMP ON feature button and then press the RELEASE feature button. The SUPERSET 4 set returns to normal operation.

- The busy station hears two bursts of camp-on tone. In the case of another SUPERSET 4 set, the Features Display shows the SWAP CAMP ON prompt and TXX CAMPED ON (where XX is the number of the camped-on trunk).

- To identify the camped-on party before answering, press the Display feature button. The Feature Display then shows the TXX CAMPED ON prompt and the SWAP ON prompt. Press the EXIT feature button to clear the display.

DISPLAY

Description

This feature allows a SUPERSET 4 user to display on the set's Alpha-numeric Display:

- speed call numbers
- identities of lines appearing at the SUPERSET set
- last external number dialed
- call forwarding type and destination
- identity of calling party.

Conditions

None

Operation

- Press the display button.
- Press either the:
  - LINE SELECT button (for saved speed call number, line or calling party identification),
  - REDIAL feature button, for last external number dialed, or
  - CALL FWD feature button, for current Call Forwarding type and destination.
- To clear the display, press the EXIT feature button. The display reverts to time-of-day and date.

DO NOT DISTURB

Description

The Do Not Disturb feature disables the SUPERSET 4 set's ringer. The Line Status Display still indicates incoming calls (refer to Figure 2-2). Station users calling a SUPERSET 4 set with Do Not Disturb activated, receive ringback tone. Calls originating from a station with this feature active are not affected in any way.

Conditions

- Automatic Wake-Up overrides Do Not Disturb; the ringer remains disabled.

Operation

To set Do Not Disturb:

- Press the select features button.
- Dial '2' (Feature Number 2 is Do Not Disturb (2:NO DIST'B)).
- Press the ON feature button.

To cancel Do Not Disturb:

- Press the select features button.
- Dial '2'.
- Press the OFF feature button.

EXECUTIVE BUSY OVERRIDE

Description

This feature allows a SUPERSET 4 user who encounters a busy station, to enter the conversation. Before override voice contact is established, all parties involved in the conversation receive a 1 second warning tone (440 Hz). A 200 ms burst of 440 Hz tone is repeated every 6 s for the duration of the override. If the overridden station flashes the switchhook or goes on-hook, the overriding station is dropped and receives reorder tone.

Conditions

- The overriding station cannot manipulate the original connection in any way.
- Any station speaking to the attendant, dialing or receiving supervisory tone cannot be overridden.
- A station on hold cannot be overridden.
- A station with a parked or held call cannot be overridden.
- Executive Busy Override must be enabled in the SUPERSET 4 set's Class-of-Service Programming (Commands 611 - 619, Register 4).

Operation

- Dial the station number - busy tone is returned.
- Press the OVERRIDE feature button. After the warning tone, the SUPERSET 4 set is connected to the call.

EXTERNAL CALL FORWARDING

Description

This feature allows a SUPERSET 4 user to set up Call Forwarding to a number external to the PABX. This is accomplished by storing the external number as a speed call entry and using the entry as the number to which the caller is forwarded.

Conditions

- The station must have one of the Call Forwarding options enabled and also have the capability of storing one or more Speed Call Numbers.
- External Call Forwarding must be enabled in the SUPERSET set's Class-of-Service Programming (Commands 611 → 619, Register 4).

Operation

To set up External Call Forwarding:

- Set up the required external number as a speed call entry (refer to SPEED CALL in this Section).
- Dial the Call Forwarding destination (to another station or the attendant). If to an outside number, press the Speed Call (line select) button associated with that number or dial the System Speed Call Access Code (default is 55) and the Speed Call Entry Number.
- Set up Call Forwarding to the speed call location (refer to Call Forwarding - Busy; Don't Answer; Follow Me).

HANDSFREE OPERATION

Description

Handsfree operation allows a SUPERSET 4 user to speak with a caller or called party by means of the set speaker and microphone (the handset is left on-hook).

There are two differing modes of operation which are independently selected as either auto-answer or speaker on/off features.

The auto-answer feature (when selected) answers an incoming call to the SUPERSET 4 station (prime directory) number automatically and connects to the SUPERSET speaker and microphone. No action is necessary by the station user. The caller receives 1 second of audible ringing tone and is then connected to the station. The station user hears a single ring as an indication of the incoming call. The station user can originate calls normally.

The speaker on/off feature allows a SUPERSET user to receive and make calls without lifting the handset. This feature can be activated during a call (or prior to making or answering a call) and can be used on any of the lines appearing at the set. The SUPERSET 4 user can also dial from keypad or use speed call or redial features (without previously lifting the handset, selecting a line or obtaining dial tone).

Conditions

- Call Forwarding – Don't Answer, Callback and Automatic Wake-up have no effect if the SUPERSET 4 set is operated in the auto-answer mode.
- Auto-Answer must be enabled in System Options Programming (Command 601, Register 2).

Operation

To operate a SUPERSET 4 set in the Auto-Answer Mode:

- Press the select features button.
- Dial '3' (Feature Number 3 is auto-answer (3:AUTO ANS)).
- Press the ON feature button. With the handset on-hook, any incoming call to the SUPERSET station number rings the set ringer once and is then connected to the speaker and microphone.
- On completion of the call (when the call hangs up), the SUPERSET set line becomes idle.

To disable the Auto-Answer Feature:

- Press the select features button.

- Dial '3'.
- Press the OFF feature button.

To use Handsfree Feature to make or receive calls:

- Select the line required to originate or answer a call. If originating a call, dial tone is heard from the speaker. If answering a call, the caller can be communicated with by means of the speaker and microphone.

On completion of a call:

- Press the HANG-UP feature button.

Note: The microphone can be turned off (when required to consult privately with another person near the SUPERSET 4 set) by pressing the mic. on/off button. The advisory prompt MIC ON disappears from the Feature Display.

At any time, the conversation can be made private by using the handset. Lifting the handset disables the speaker and microphone. To return to handsfree mode (whether or not the auto-answer feature was used originally), press the Speaker on/off button and replace the handset.

Speaker volume can be adjusted by means of a speaker volume control.

MESSAGING

Description

This feature allows a SUPERSET 4 user to send a visual message (to a SUPERSET set that is busy or isn't answered), requesting the called party to call the message sender. Messages can be read during a call or when the set is idle.

Conditions

- A message is cancelled automatically if the sender and receiver have a telephone conversation before the message is read.
- Messages are cancelled after 24 hours.
- If the message was sent by the attendant, then only the visual indication (not the message) can be cancelled.

Operation

To send a Message requesting a Callback:

- If the number dialed (another SUPERSET set) is busy or isn't answered, press the SEND MSG feature button. The message is sent to the called party whose SUPERSET set flashes the MSG prompt.

To receive a Message:

(a) A message requesting a callback is indicated on the receiving SUPERSET set by the flashing MSGOP flashing on and off.

(b) If the receiving SUPERSET set is idle, the message can be read as follows:

- Press the MSG feature button. The first message is displayed as: HH:MM CALL XXX where XXX = station number or ATT for the attendant.
- If there are more messages to be read, the NEXT prompt is activated. To read additional messages, press the NEXT feature button.
- To clear a message once it has been read, press the CANCEL feature button.
- To respond to the request, press the CALL feature button, and the returned call is made automatically.

PAGING ACCESS

Description

A SUPERSET 4 user with this feature is permitted access to the system paging equipment. If a station tries to access busy paging equipment, busy tone is returned.

Conditions

- Camp-On or Automatic Callback - Busy may not be activated on busy paging equipment.
- Any paging announcement may be overridden by the attendant.
- If the attendant accesses the paging equipment when a station is using it, then the station receives busy tone.
- Handset must be off-hook.

Operation

- Lift the handset.
- Press and hold down the PAGE feature button - the user hears a short pulse of tone, is then connected to the paging system and may make the required announcement.

PRIVACY/PRIVACY RELEASE

Description

A SUPERSET 4 user may have appearances of lines at his station that are shared with other SUPERSET users in a key system mode. Unless otherwise selected, privacy is automatic; i.e., another SUPERSET set with an appearance of the line a SUPERSET 4 set has accessed cannot break into the conversation. If so desired, the SUPERSET 4 user can permit the intrusion by activating the privacy release feature.

Conditions

- Privacy and Privacy Release are effective only against stations with an appearance of the line(s) that the SUPERSET 4 user owns. It has no effect on Executive Busy Override.

Operation

- During an established call, press the PRIVACY REL feature button. Another SUPERSET user with an appearance of the same line can now enter the conversation by pressing the appropriate line select button.

REDIAL

Description

This feature allows a SUPERSET 4 (or SUPERSET 3) user to outpulse the last external telephone manually dialed number by pressing a single button.

Conditions

- Only the last external telephone number is stored automatically.

Operation

- When dial tone is heard, press the REDIAL feature button. The last external telephone number is dialed automatically.
- The last external number dialed may be displayed on the Alpha-numeric Display by pressing the Display and REDIAL feature buttons in that order.

SPEED CALL

Description

This feature allows a SUPERSET 4 user to save frequently dialed telephone numbers and to access these numbers by pressing a single button. The quantity of speed call numbers available to a SUPERSET 4 user is dependent on the number of lines programmed to appear at the set. Any unassigned line select buttons can be used to save speed call numbers.

Conditions

None

Operation

Note: To check saved numbers, press the display button then the required speed call button. The currently saved speed call number is displayed on the Alphanumeric Display.

To set up or modify Speed Call Number:

- With the handset on-hook, press the PROGRAM feature button.
- Press the SPEED CALL feature button.
- Press speed call button.
- Dial the number to be stored.

Note: Insert into the dialing sequence:
*1 Where a pause is required (5 s).
*2 Where a wait for dial tone is required.
*3 Where, during the automatic dialing sequence, other digits must be dialed manually; e.g., the general number for directory assistance is 1 + (area code) + 555 + 1212; the area code is to be dialed manually. The *3 must be followed by a 1-digit number signifying the quantity of digits dialed. This number is between 1 and 9. In the directory assistance example, the number stored would be:
9*21*335551212
(where 9 is a Trunk Group Access Code).

- Check the saved speed call number as displayed on the Alphanumeric Display. If correct, press the SAVE feature button. The speed call number is now saved.

Note: There are two ways to correct a programming error before SAVE is pressed:
1. Use the ← feature button to backspace and clear the incorrect entry.

2. To cancel the entire current entry, press the EXIT feature button.

TRANSFER/ADD-ON/CONSULTATION HOLD

Description

This feature allows a SUPERSET 4 user on an established call to hold the call, add a third party to the call, transfer the original call to a third party or speak privately with either of the called parties.

Conditions

- If Trunk-to-Trunk Conferencing is required, then Trunk Hardware Type (Trunk Programming, Commands 801 → 812, Register 1) must be set to 1 (CO Conferencing Trunk).

Operation

On an established call:

- Press the TRANS/CONF feature button - transfer dial tone is returned; the called party is held and hears music if provided.
- Dial the number of the required station.

Note: If the number is busy or doesn't answer, press the CANCEL feature button to return to the held call.

- After the called party answers, private conversation with this party exists.
- To establish a 3-party call, press the CONF feature button.

OR

- To connect held party with third party and to back out of conversation, press the RELEASE feature button - dial tone is returned.

OR

- To speak privately with only one party in a 3-party call, press the SPLIT feature button. The other party is put on hold. To alternate held and spoken to parties, press the SWAP feature button.

TRUNK ANSWER FROM ANY STATION (TAFAS)

Description

TAFAS allows incoming trunk calls to ring a common alerting device(s) when selected by the attendant and to have the incoming call answered at a SUPERSET 4 set with the appropriate COS. The answering station may exercise any feature associated with incoming calls that are normally available at the station.

Conditions

- If a call is picked up by TAFAS, and is then transferred to a station which does not answer, it recalls to the original station.
- SUPERSET 4 sets with a call on Consultation Hold do not receive the NIGHT ANS prompt of the Features Display.

Operation

- An incoming CO trunk call rings a common alerting device.
- At the SUPERSET set, lift handset – dial tone is returned.
- Press the NIGHT ANS feature button and converse with the caller on the incoming trunk.

SX-20®

ORDERING INFORMATION

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. ORDERING INFORMATION
Warranty 1
Spares Level 1

LIST OF TABLES

TABLE TITLE PAGE

2-1 Basic Equipment 2
2-2 Additional Equipment for Installation Requirements 3
2-3 Additional Items Available 5
2-4 SX-20 Compatible Attendant Consoles 11

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1. GENERAL

1.01 This Section contains the ordering information for the SX-20 PABX.

Reason for Issue

1.02 This document provides all hardware and software orderable Part Numbers for the SX-20 system.

2. ORDERING INFORMATION

2.01 The ordering information is divided into the following tables:

- Table 2-1, lists the equipment provided with the basic system.
- Table 2-2, lists all optional equipment required to complete the individual customer requirements.
- Table 2-3, contains any additional items such as marketing and installation aids.
- Table 2-4, lists all compatible consoles plus the required personality modules for each type of console used.

Warranty

2.02 The MITEL SX-20 communications system is warranted against defective material and workmanship. Equipment requiring service or repair during the warranty period must be packaged in accordance with Section MITL9102-095-200-NA, Shipping, Receiving, and Installation Procedures, and returned prepaid to the supplier. Repaired or replacement equipment is returned to the customer, post prepaid by MITEL.

Spares Level

2.03 MITEL recommends a minimum spare level of 10% of installed systems, including 10% sparing of the basic system. The sparing recommended for the PROM module and PROM/RAM assembly is 5%. This means that service personnel can carry a complete spare system on field trips and therefore, if required, replace a complete system.

TABLE 2-1
BASIC EQUIPMENT

Description	Part Number	Comments
Basic SX-20 PABX (115 V operation)	9102-100-007-NA	Chassis Assembly, 9102-101-004-NA Equipment Cover for chassis, 9102-002-000-NA Miscellaneous Card, 9102-005-002-NA
Equipment subassemblies consist of the following:		
Chassis Assembly (115 V operation)	9102-101-004-NA	Includes: Metalwork, backplane, primary power supply, cooling fan, UCC Card, and Miscellaneous cable.
Miscellaneous Card	9102-005-002-NA	Includes Miscellaneous Card and two DTMF Receivers. Accepts up to four Trunk Modules.

TABLE 2-2
ADDITIONAL EQUIPMENT FOR INSTALLATION REQUIREMENTS

Description	Part Number	Comments
CPU PROM Kit	9102-024-XXX-NA	One required per system. Three digits (XXX) define the software Generic: 400 - Generic 400; Business/Hotel-Motel feature Package for use with Keyset Consoles. Includes CPU Card, RAM Battery Pack, PROM Module containing software Generic, System Documentation, and UCC Card Personality Modules for Keyset Consoles. 500 - Generic 500; Business/Hotel-Motel feature package for use with SX-20 Attendant Console. Includes CPU Card, RAM Battery Pack and PROM Module containing software Generic, System Documentation, Console UART Module, CPU Cable, and Personality Module for SX-20 Attendant Console.
CPU II PROM Kit		503 - Generic 503 ; Enhanced Business/Hotel-Motel feature package for use with the SUPERSET 3™ and SUPERSET 4™ sets. Includes CPU II Card, PROM/RAM Module containing software Generic, System Documentation CPU Cable, and Personality Module for SX-20 Attendant Console.
Standard Line Card (24 lines)	9102-010-000-NA	Supports 24 standard DTMF and rotary phones. Up to three Line Cards may be installed in a system. Not for use with the SUPERSET 3 and SUPERSET 4 sets.
Standard Line Card (8 lines)	9102-010-001-NA	Supports eight standard DTMF and rotary phones. Up to three Line Cards may be installed in a system. Not for use with the SUPERSET 3 and SUPERSET 4 sets.
SUPERSET™ Line Card (16 lines)	9102-010-002-NA	Only one SUPERSET Line Card may be installed per system. For use with any combination of the SUPERSET 3, the SUPERSET 4 or standard telephone sets (16 sets total) supported by Generic 503 only.
CO Trunk Module	9102-011-002-NA	Provides two loop or ground start trunks, 900 ohms nominal impedance. Four modules may be installed on the Miscellaneous Card and two modules may be installed on the Trunk Expander Card.

TABLE 2-2 (CONT'D)
ADDITIONAL EQUIPMENT FOR INSTALLATION REQUIREMENTS

Description	Part Number	Comments
E&M Trunk Module	9102-011-010-NA	Provides one 4-wire, Type 2 E&M Trunk interface. System has capacity for two E&M Trunk Modules on the Trunk Expander Card (PN9102-013-000-NA) and four modules on the E&M variant of the Miscellaneous Card (PN9102-005-003-NA).
DTMF Receiver	9102-012-000-NA	In addition to the two DTMF Receivers provided with the Miscellaneous Card, two more DTMF Receivers may be installed on the Trunk Expander Card.
Trunk Expander Card	9102-013-000-NA	Increases system capacity to 12 CO trunks and four DTMF receivers. Has the Music on Hold input.
RMATS Module	9102-015-000-NA	Plugs onto CPU II Card. Required for Remote Maintenance, Administration and Test System (RMATS) operation. Supported by Generic 503 only.
Remote Call Status Display	9102-014-000-NA	Provides call status information remote from the equipment cabinet. Customer must provide cabling. Refer to Section MITL9102-095-200-NA, MAP200-006 for cable specifications.
SX-20 Attendant Console	9102-018-000-NA	Provides full Call Status display and advanced call handling capacity. Supported by Generics 500 and 503.
~~Miscellaneous Card - E&M Variant~~	~~9102-005-003-NA~~ Delete.	~~Miscellaneous Card which accepts up to four E&M Trunk Modules (PN9102-011-010-NA). Available as spare only.~~

TABLE 2-3
ADDITIONAL ITEMS AVAILABLE

Description	Part Number	Comments
A. HARDWARE		
UCC Card Personality Module	9102-009-XXX-NA	Adapts Universal Console Connect Card to the following Consoles: XXX= 002 Keyset Consoles with Generic 400 (refer to Compatible Attendant Consoles List, Table 2-4). XXX= 003 Northern Telecom QSK-200, QSK-2200 with mounting cord D50QE XXX= 004 SX-20 Attendant Console PN9102-018-000-NA.
Universal Console Connector Card	9102-009-001-NA	Provides connection between the SX-20 system and Attendant Console. Includes UCC Card Personality Modules for Keyset Consoles (UCC Personality Module - US Keyset, PN9102-009-002-NA and UCC Personality Module - NT Keyset, PN9102-009-003-NA).
UCC Card and Attendant Console Personality	9102-009-005-NA	Provides connection between the SX-20 system and Attendant Console. Includes UCC Personality Module - SX-20 Console (PN9102-009-004-NA).
Console UART Module	9102-019-000-NA	Spare part - Plugs into CPU Card for use with the SX-20 Attendant Console. For use with Generic 500 only.
CPU/Miscellaneous Card Packing Box	9102-040-000-NA	Packing box for CPU or Miscellaneous Card.
External Modular Connection Kit	9102-041-000-NA	Consists of two lengths of amphenol line cord and two connector blocks (required for international use only).
Pack of eight SLICs	9102-043-000-NA	Provided to facilitate ease of standard Line Card maintenance.
Pack of eight SUPERSLICs	9102-043-003-NA	Provided to facilitate ease of the SUPERSET Line Card maintenance. Generic 503 only.
Pack of 10 Filters for the Cooling Fan	9102-044-000-NA	Replaces fan filters (once/2 years normal office environment or once/year dusty environment).

TABLE 2-3 (CONT'D)
ADDITIONAL ITEMS AVAILABLE

Description	Part Number	Comments
Ribbon Cable - Misc. (five Spare)	9102-045-002-NA	Spare parts. Package of five. Ribbon cable to interconnect Miscellaneous Card and Universal Console Connect Card.
Ribbon Cable - CPU (five Spare)	9102-045-003-NA	Spare parts. Package of five. Ribbon cable to interconnect CPU Card and Universal Console Connect Card. Required for the SX-20 Attendant Console operation only.
Display Repair Kit	9110-078-000-NA	Common with the SX-100®/SX-200® systems. Contains seven LED blocks and 7-segment displays.
Antistatic Wrist Strap	9110-079-000-NA	Recommended for use while handling printed circuit boards.
Firmware - spare (Generic 400)	9102-020-400-NA	Spare part - Generic 400 PROM Card only.
Firmware - spare (Generic 500)	9102-020-500-NA	Spare part - Generic 500 PROM Card only.
Firmware - spare (Generic 503)	9102-020-503-NA	Spare part - Generic 503 PROM/RAM Card only.
CPU Card	9102-004-000-NA	Spare part - Accepts PROM module and RAM battery pack. (Generics 400 and 500.)
CPU II Card	9102-004-001-NA	Spare part - Accepts PROM/RAM Module and RMATS Module. Generic 503 only.
RAM Battery Pack	9102-007-000-NA	Spare part - Mounts on CPU Card. (Generics 400 and 500.)

TABLE 2-3 (CONT'D)
ADDITIONAL ITEMS AVAILABLE

Description	Part Number	Comments
B. PERIPHERAL EQUIPMENT		
KONTACT™ Terminal	9200-000-401-NA	Executive workstation providing point-to-point electronic mail, word processing and other application packages. Compatible with all SX-20 generics.
DART™ System	9162-001-001-NA	Compact, call costing system. Connects to SMDR output. Requires Generic 503.
VOYAGEUR™ System	9163-001-001-NA	Sophisticated call costing system. Requires Generic 503.
Static Protection Unit	9180-067-001-NA	Protects system against static discharges at stations. Installed at Main Distribution Frame. One unit handles 25 stations. Compatible with all Generics.
SUPERSET 3 Set	9173-000-001-NA	Multifunction feature phone. Refer to Section MITL9102-095-100-NA for a general description of the SUPERSET 3 set. Requires Generic 503.
SUPERSET 4 Set	9174-000-005-GM	Fully featured multiline telephone. Refer to Section MITL9102-095-100-NA for a general description of the SUPERSET 4 set. Requires Generic 503.
Handset	9170-048-001-NA	Spare Part for the SUPERSET 4 set.
Handset Cord	9170-048-000-NA	Spare Part for the SUPERSET 4 set.
Rear Support Stand	9174-001-000-NA	Spare Part for the SUPERSET 4 set.
SUPERSET 4 Label Kit	9174-002-001-NA	Consists of a package of Telephone Number and Line Identification labels.
SUPERSET 4 Lens Kit	9174-002-000-NA	Consists of protective lenses for the SUPERSET 4 labels.

TABLE 2-3 (CONT'D)
ADDITIONAL ITEMS AVAILABLE

Description	Part Number	Comments
C. DOCUMENTATION		
System Documentation (SX-20 MITEL Standard Practices)	9102-050-XXX-NA	SX-20 Installation and Maintenance Manual XXX = 002 for Generics 400 and 500. XX = 006 for Generic 503.
SX-20 Pocket Reference Guide	9102-953-004-NA	Pertinent SX-20 facts in convenient pocketbook.
SX-20 Programming Guide	9102-953-003-NA	SX-20 Programming forms on a folded pocket card, Generic 400.
SX-20 Pocket Programming Forms	9102-953-006-NA	SX-20 Programming Forms in a convenient pocket-sized format, Generic 500.
Supergeneric Programming Guide	9180-953-002-NA	Complete information for programming the SX-20 system, Generic 503.
SUPERSWITCH® Numbering Sheets	9102-098-024-NA	For renumbering the SX-20 Remote Display or the SX-20 Attendant Console Display.
Repair Tags	9110-098-018-NA	Used for SX-100, SX-200, SX-20 and SX-10™ systems.
User Guide	9180-953-100-NA	Details station and the SUPERSET 3 and SUPERSET 4 features operation.
Console Operating Instructions	9102-052-000-NA	Details Keyset Attendant Console operation, Generic 400.
Attendant Console Guide	9180-953-101-NA	Details SX-20 Attendant Console operation, Generics 500 and 503.
Customer Programming Instructions	9102-053-000-NA	
SX-20 General Information Book	9102-952-018-NA	Contains 100, 105, 150 Practices.
Extension Feature Access Code Labels	9102-959-XXX-NA	Box of 100 white and 100 black XXX=101 Generic 400. XXX=103 Generic 500.
Extension Feature Access Code Labels	9180-959-100-NA	Box of 100 white and 100 black Generic 503 only.

TABLE 2-3 (CONT'D)
ADDITIONAL ITEMS AVAILABLE

Description	Part Number	Comments
D. SALES AIDS		
SUPERSWITCH Videotape	9180-957-XXX-NA	Contains latest promotional material for the SUPERSWITCH PABX (SX-5™ through SX-200) and the SUPERSET 3 and SUPERSET 4 sets. XXX = 005 - 1/2 inch VHS XXX = 006 - 1/2 inch Betamax
SX-20 Slide/Cassette Package	9102-957-003-NA	Audio-visual introduction to the SX-20 system (slide/cassette format)
SX-20 Poster	9102-958-000-NA	Illustration of Attendant Console (Generic 500)
E. BROCHURES		
SX-20 General Brochure	9102-951-001-NB/NC	General SX-20 brochure
Generic 500 Flyer	9102-951-005-NA	Single page, black and white flyer. Ideal for mail-outs
Hotel/Motel End-User Flyer	9102-951-010-NB/NC	Hotel/Motel Applications
End-User Flyer Folio	9180-951-010-NA	Folio for presenting proposals
Manufacturing End-User Flyer	9180-951-011-NA	Manufacturing Applications
Schools, Municipal End-User Flyer	9180-951-012-NA	Schools, Municipal Applications
Professional End-User Flyer	9180-951-013-NA	Professional Business Applications
Health Care End-User Flyer	9180-951-014-NA	Health Care Applications
Retail End-User Flyer	9180-951-015-NA	Retail Applications
Recreation End-User Flyer	9180-951-016-NA	Clubs, Recreation Applications

TABLE 2-3 (CONT'D)
ADDITIONAL ITEMS AVAILABLE

Description	Part Number	Comments
F. DEMONSTRATION AIDS		
SX-20 PABX Carrying Case	9102-046-010-NA	Rigidized aluminum carrying case on wheels with custom foam interior for safely transporting an SX-20 system.
SX-20 Accessory Case	9102-046-011-NA	Rigidized aluminum carrying case on wheels with custom foam interior for safely transporting demonstration accessories. Includes: pockets for phones, the SX-20 accessory connector, night bell, paging speaker, radio, and documentation.
SX-20 Accessory Connector	9102-046-012-NA	Quick connection box for conveniently hooking up phones and other accessories necessary for an SX-20 demonstration.

TABLE 2-4
SX-20 COMPATIBLE ATTENDANT CONSOLES

The following 6- and 10-button keysets are directly compatible with the SX-20 system when the Universal Console Connector Card Personality Modules shown below are used.

Personality module: PN9102-009-002-NA

Module Label:

MITEL	CAUTION	PN105668301
	KEYSETS ONLY	
	(Refer to Compatible Keyset List)	

Compatible Keysets:

Manufacturer	Model Number
ITT	K564 ( ) 40, 41 K830 ( ) 42, 46 K854 ( ) 42, 46 K2564 ( ) 40, 41 K2830 ( ) 42, 46 K2854 ( ) 42, 46
Western Electric	830 CM 2830 CM
Stromberg-Carlson	0830 ( ) 42, 46 2830 ( ) 42, 46 0854 ( ) 42, 46 2854 ( ) 42, 46
Northern Telecom	QSK-200, QSK-2200 - with mounting cord D50QJ

Personality Module: PN9102-009-003-NA

Module Label:

MITEL	CAUTION	PN105667301
	NORTHERN TELECOM	
	QSK-2XXX WITH D50QE CORD ONLY	

Compatible Keysets:

Manufacturer	Model Number
Northern Telecom	QSK-200, QSK-2200 - with mounting cord D50QE

NOTE:

The following Personality Module is not compatible with keysets, but is required for the **SX-20 Attendant Console**.

Personality Module: PN9102-009-004-NA

Module Label:

MITEL	CAUTION	PN105669301
	SX-20 CONSOLE (PN9102-018-000-NA) ONLY	

SX-20®

ENGINEERING INFORMATION

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1
System Characteristics 1

2. TECHNICAL DESCRIPTION 1
A. Description of Circuit Cards 3
CPU II Circuit Card 3
PROM/RAM Module 5
Miscellaneous Circuit Card 5
Line Card 8
SUPERSET™ Line Card 8
Trunk Expander Card 8
CO Trunk Module 8
Universal Console Connector (UCC) Card 8
RMATS Module 9
E&M Trunk Module 9
B. Interface 10
Backplane 10
Line Circuit Interface 10
SUPERSET Line Circuit Interface 10
Trunk Interface 11
C. Operation 12
Off-Hook (Station) 12
Off-Hook (Console) 12
Dial Tone (Station) 12
Dialing Internally (From a Station) 12
Dialing Internally (From a Console) 13
Speech Path (System Junctor) Accessing 13
Ringing a Station 13
Switchhook Flash 14
D. Trunk Operation 15
Ground Start/Loop Start 15
Incoming Calls 15
Outgoing Calls - Ground Start 16
Outgoing Calls - Loop Start 17
Trunk Release 17
E. Power Requirements 18
Power Supplies 18
Grounding 18
F. Electrical Characteristics 18

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CONTENTS (CONT'D) PAGE

3. SIGNALING AND SUPERVISION 21
Switchhook Flash 21
Dial Pulses and DTMF Tones 21
Third-Wire Signaling 21
E&M Signaling 23
Rotary Dial Pulse-to-Digit Conversion 23
Ringing Frequencies 23
Time-Outs 24
Terminating Conditions 24

4. DIAGNOSTICS 28
A. Power-Up System Diagnostics 29
B. Automatic System Diagnostics 30
Tests 30
C. Trunk Diagnostics 33

5. TRANSMISSION 34
Transmission Characteristics 34

6. TRAFFIC CONSIDERATIONS 36
Typical Station Traffic Characteristics 36
Assumptions 37
Total Traffic Handling Capacity (Network) 39
Calculation of Number of Trunks Required 39
Calculation of Number of DTMF Receivers Required 39
Calculation of Level of Traffic per Line 41
Equipment Provisioning Tables 43

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
2-1	CPU II Card Block Diagram	4
2-2	Miscellaneous Card Block Diagram	6
2-3	Line Interface	10
2-4	Trunk Interface Detector	11
2-5	Speech Path Accessing	14
2-6	Central Office Trunk Circuit - Ground Start	15
2-7	Central Office Trunk Circuit - Loop Start	16

LIST OF TABLES

TABLE	TITLE	PAGE
1-1	System Feature Limitations	2
1-2	Environmental Conditions (Storage - Transport)	3
2-1	SX-20 Electrical Characteristics	20
3-1	Dial Pulse Limits	22
3-2	DTMF Tone Limits	22
3-3	E&M Lead Polarities for Trunk Signaling	24
3-4	Selectable Tone Plans	26
3-5	Translation Codes	27
3-6	Time-Out Information	27
3-7	Station/SUPERSET Loop Length vs Wire Gauge (SUPERSET Line Card)	28
3-8	Station Loop Length vs Wire Gauge (Standard Line Card)	28
5-1	Attenuation Variation	35
6-1	Typical Traffic Characteristics	38
6-2	Hotel/Motel Traffic (1.5 ccs/Line)	44
6-3	Light Business Traffic (3.0 ccs/Line)	45
6-4	Medium Business Traffic (5.0 ccs/Line)	46
6-5	Heavy Business Traffic (6.5 ccs/Line)	47
6-6	Maximum Station Traffic	48

1. GENERAL

1.01 This Section contains basic engineering information for the SX-20 communications system.

Reason for Issue

1.02 This Section has been issued to provide engineering information for Generic 503 of the SX-20 system.

1.03 Other relevant sections are:

- MITL9102-095-200-NA for the system environmental and installation requirements
- MITL9102-095-210-NA for programming information.

System Characteristics

1.04 The SX-20 system has certain characteristics relating to hardware and/or software limitations. Those conditions pertaining to this PABX are listed in Table 1-1, System Feature Limitations.

1.05 There are also environmental conditions for the storage and transport of the SX-20 system. These are listed in Table 1-2, Environmental Conditions (Storage - Transport).

2. TECHNICAL DESCRIPTION

2.01 The SX-20 system is a processor-controlled PABX using solid-state space division switching techniques.

2.02 The SX-20 system contains 12 copper tracks known as system junctors. The calling and called parties are connected together by means of the same system junctor using space division switching. During a call, various tone sources and other system functions (such as dial tone detectors) are also connected to the system junctors using the MITEL solid-state crosspoint integrated circuits as the connection matrix.

2.03 The processor/memory controls the system. The programs controlling the system operation are contained in PROM and CMOS RAM integrated circuits. Another RAM contains the working data of the system. The processor continuously monitors the status of the lines, trunks, console interface card and receivers. Depending upon the status found and the programming, the processor then decides on the next course of action.

TABLE 1-1
SYSTEM FEATURE LIMITATIONS

Maximum number of simultaneous calls = 12 (i.e., number of speech paths).
Maximum number of speech paths used by any call = 1.
Maximum number of process control blocks, used with the system for call records, etc. = 16.
Number of process control blocks used by a 2-party call = 1.
Number of process control blocks used by a held call (placed on hold using the Call Hold (station) feature) = 1.
Maximum number of calls that can simultaneously be placed on hold using the Call Hold (station) feature = 15 (i.e., 16 minus 1, because 1 process control block used by station placing call on hold).
Number of process control blocks used by a Consultation Hold = 2.
Maximum number of calls that can simultaneously be camped on within the system = 12.
Maximum number of simultaneous Call Forwards that can be enabled = number of stations with Call Forwarding enabled as a COS option.
Maximum number of simultaneous "DIAL 0" calls = 12 (i.e., length of "DIAL 0" queue).
Maximum number of dial call pickup groups = 7.
Maximum number of stations in a dial call pickup group = number of stations in the system.
Maximum number of trunks which can be assigned to night stations = number of trunks in the system.
Maximum number of trunks in a trunk group = number of trunks in the system.
Maximum number of trunk groups = 6 (trunks not assigned to any group are incoming only).
SX-20 numbering schemes may be one, two or three digits or a combination of one, two and three digits, as long as there are no conflicts in the first digits.
Maximum number of simultaneously ringing stations = 3 (with a maximum of 15 stations in the silent period at any one time).

TABLE 1-2
ENVIRONMENTAL CONDITIONS (STORAGE - TRANSPORT)

• Temperature Range:	-40°C to +60°C (-40°F to +140°F)
• Relative Humidity:	5-95% relative humidity, noncondensing
• Vibration:	.5 G (Sinusoidal) 10 to 500 Hz
• Shock:	Up to 75 cm (30 in.) drop depending on package
• Low Pressure:	87 mm Hg (50,000 feet)
• Temperature Shock:	-50°C to +25°C (-58°F to +77°F) in 5 minutes

2.04 When the processor has made a decision, it transmits orders to implement the decision. The orders are transferred along the data/address bus to modify logic states in the system and the contents of various registers. The resulting combination of logic signals connects the system junctors to the required system resources, via solid-state crosspoint switches, as required.

2.05 The system logic also contains a continuously running diagnostic program. This program identifies failures or any error in the operation of the system. The associated alarm appears on the numeric portion of both Call Status Displays.

A. Description of Circuit Cards

2.06 The SX-20 equipment cabinet consists of a metal chassis and a molded plastic cover. The removable cover allows access to the circuit cards and power supply held on the equipment chassis. The system uses the following circuit cards: Line Cards, a SUPERSET Line Card (optional), Trunk Expander Card (optional), Miscellaneous Card, CPU II Card, Trunk Modules, E&M Trunk Modules (optional), a RMATS Module (optional) and a PROM/RAM Module. Each of the card types has a keyed connector preventing that card from being plugged into the incorrect card slot. All circuit cards used in the system are constructed of a fiberglass board with printed circuit tracks on both faces.

CPU II Circuit Card (Figure 2-1)

2.07 This card contains the microprocessor, the interface to the console, and the Programmable Read Only/Random Access Memory module (PROM/RAM) which plugs onto the CPU II Card. It contains the system operating programs in PROM, and holds the customer data in RAM. The CPU II Card also contains the following functions:

(a) A crystal-controlled clock operating at 6.0 MHz.

(b) A set of CPU II Card switches (Programming Switches). These are set during installation to suit customer requirements. (Refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures, MAP200-003.)

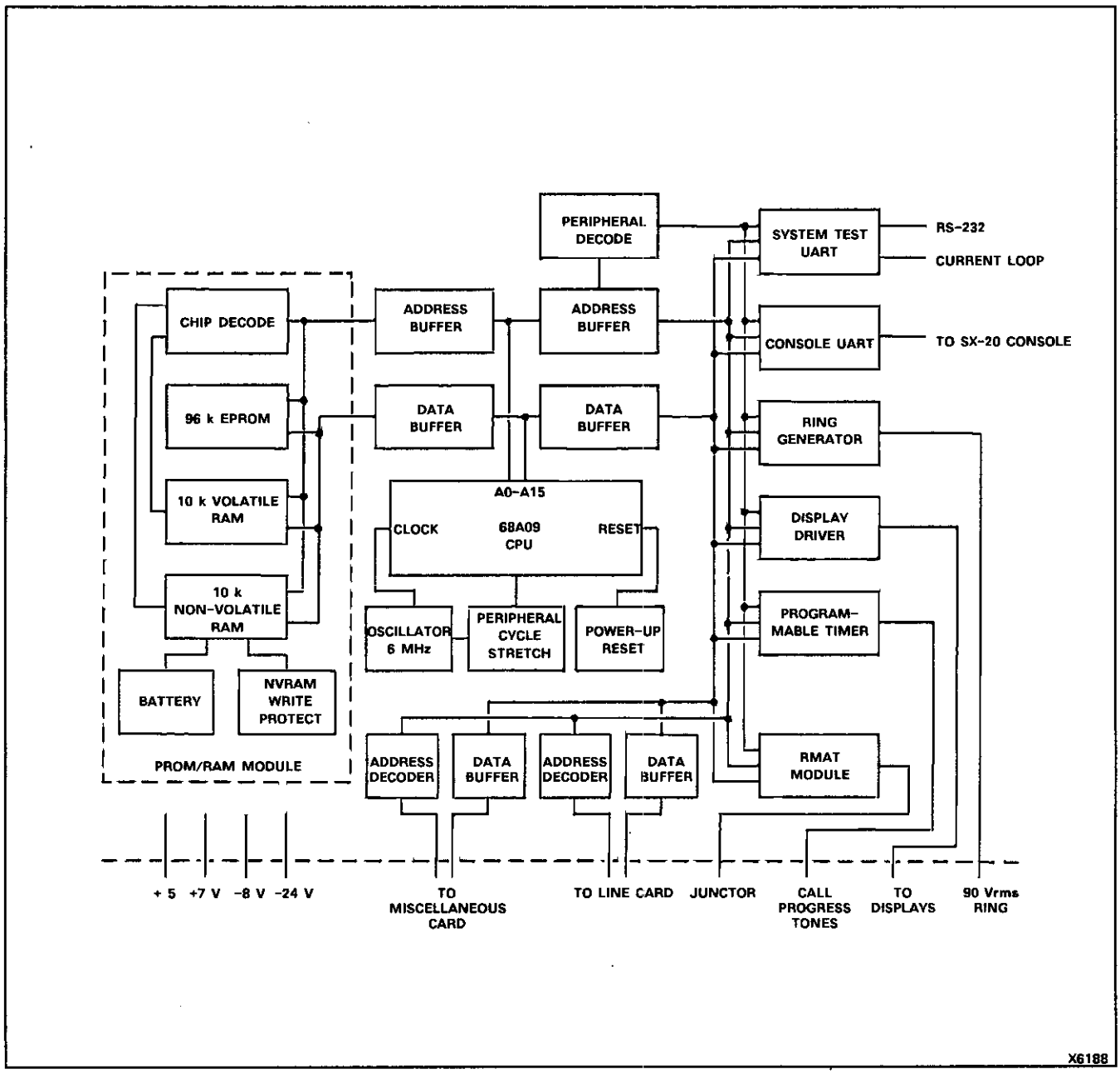

Figure 2-1 CPU II Card Block Diagram

(c) A set of timers for generating the various basic progress tones required during call processing.

(d) A ringing generator, driven by a 20 Hz signal provided by one of the timers, which produces a sine wave signal.

(e) A set of "device enable" registers. The processor treats the Line Cards, console and other system functions as peripheral devices. The CPU selects the next device to interrogate via the

device select register. Each device can also have up to eight R/W registers associated with it.

(f) A 6809 microprocessor which controls the flow of data along the data bus. The data is switched between points defined by the addresses placed on the address bus by the 6809.

(g) PROM/RAM port.

(h) RMATS port (for Remote Testing).

(i) MITEL SX-20 console port. The SX-20 console is interfaced to the CPU II Card through a 6402 UART. Transmit and receive Baud rate is 12.5 k. Interconnection to the console is through a 20-pin header on the CPU II Card through a ribbon cable on to the Universal Console Connector Card.

PROM/RAM Module

2.08 This module contains the system operating programs in PROM, the customer data in RAM, and plugs onto the CPU II Card. To change Generics, it is only necessary to change the PROM/RAM module. The RAM is protected against power failure, and therefore loss of customer data, by a battery pack housed on the module. This backup power maintains the RAM data for up to 600 hours. The PROM/RAM module also contains the following:

- 96 kbytes of PROM used to store the fixed programs controlling operation of the system. The fixed data stored in the PROM is set during manufacture and is the firmware of the system. It cannot be altered by the customer.

- 10 kbytes of CMOS RAM (volatile) used as a fast read/write store by the processor. At any given instant, it contains the data representing the busy/free states of the system components, the data defining the functions connected to the system junctors and the queues associated with various system operations.

- 10 kbytes of Non-Volatile CMOS RAM, with a battery backup supply. This contains the data representing the system options, Classes of Service, etc., programmed on the site. In the event of a power failure, the batteries maintain the data for up to 600 hours.

Miscellaneous Circuit Card (Figure 2-2)

2.09 This circuit card accommodates the DTMF tone generator, DTMF receivers (if required), and up to four dual Trunk Modules. This card also filters the call progress tones generated on the CPU II Card and provides the interface to the customer-provided paging equipment. The trunk status LEDs on the front of the card show the status of each trunk circuit (on = seized, off = idle, flashing = busied-out). Located at the front of the card is an 8-digit display. This display

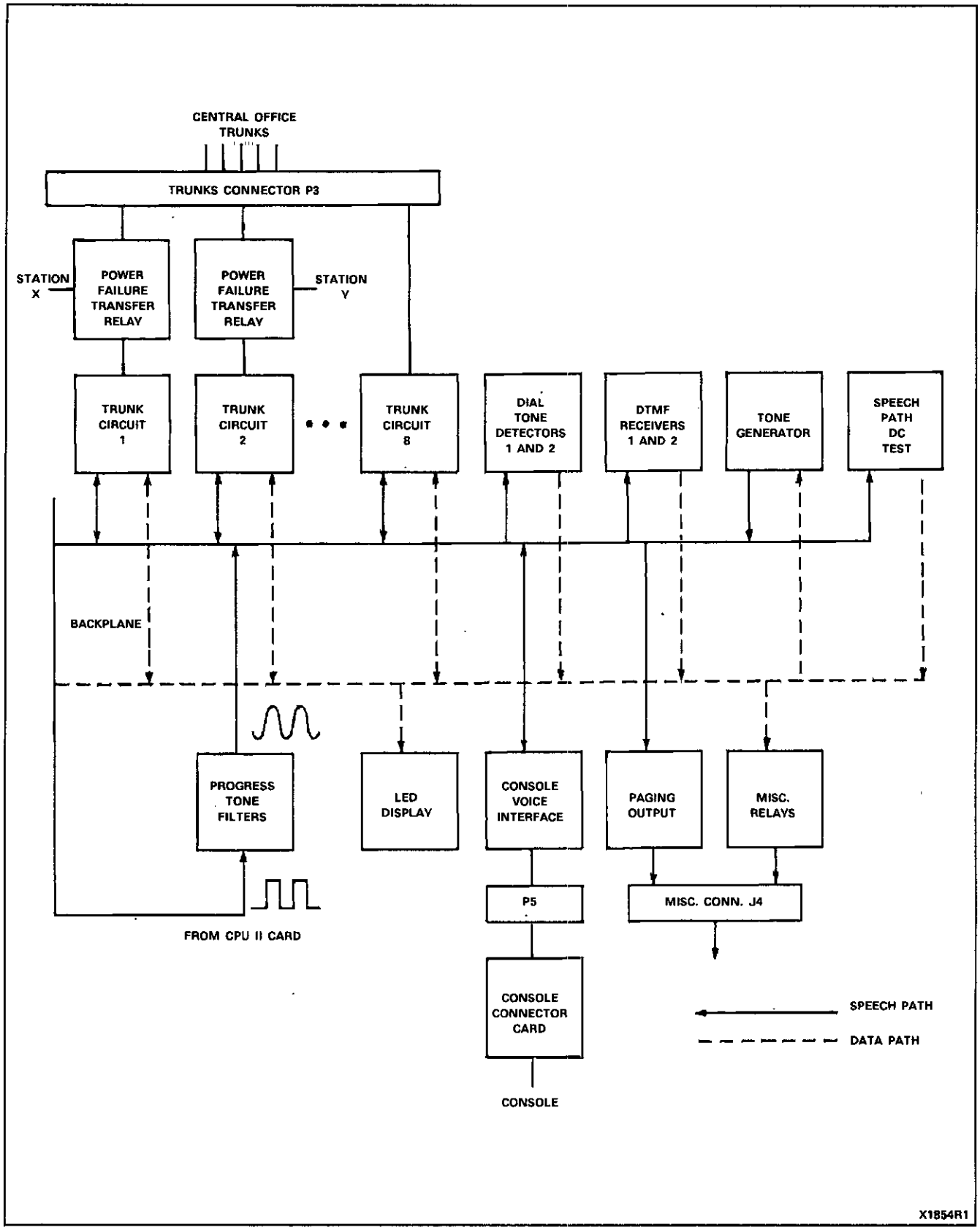

Figure 2-2 Miscellaneous Card Block Diagram

shows the time-of-day (when the console is idle), programming information, call park slot, recall information, calling and called number, and in the event of a malfunction, the alarm code indicating the faulty circuit. The functions associated with the interfacing of the lines, trunks and the console on this card are as follows:

(a) The progress tone filters which convert the square waves (generated by the timers on the CPU II Card) into sine waves.

(b) The Call Status display which is used to indicate the SX-20 status using 16 single LEDs, and eight 7-segment LEDs. The display shows all call-handling information using the Busy Lamp Field, Status Lamps and Numerical Display. Refer to Section MITL9102-095-105-NA, Features and Services Description, Attendant Console Guide (Part Number 9180-953-101-NA) and MITL9102-095-350-NA, Troubleshooting and General Maintenance.

(c) The console interface provides switching of audio signals to the console from the system junctors and vice versa.

(d) The PA output circuit which is fitted with two amplifiers, to permit the control of volume in two zones. The amplifiers are connected to system junctors under control of the signals arriving on the data bus from the processor.

(e) The miscellaneous relays which can be used for Night Bells, Alarms and/or Paging.

(f) The speech path DC test circuit, which monitors the line conditions.

(g) A tone generator, which supplies the tone signals used by speed dialing, rotary to DTMF conversion and the system diagnostics. This operation is controlled by signals from the data BUS, which connects the tone generator to the system junctors.

(h) One or two DTMF receivers, which are connected to the system junctors when the CPU decides that tone dialing is being used. They convert the multifrequency signals into logic pulses fed to the CPU.

(i) Two dial tone detectors, which are connected to the system junctor during establishment of a trunk call, to detect Central Office dial tone.

(j) Up to eight trunk circuit interfaces. These are supplied in pairs on modules. Each interface provides the correct terminating conditions to suit a variety of types of trunks.

(k) Two power failure transfer relays, which connect up to two incoming trunks to two selected stations, if the power fails or if there is a cooling fan blockage.

Line Card

2.10 Up to three Line Cards (each serving either eight or 24 lines) can be plugged into the SX-20 chassis, providing a maximum of 72 lines. The uppermost Line Card may be removed and replaced by the Trunk Expander Card. A row of eight or 24 LEDs runs along the edge of each Line Card to indicate the status of the lines (on = busy, flashing = ringing or rotary dialing, off = idle). The Line Cards act as interfaces between the station equipment and the SX-20 switching circuits.

SUPERSET Line Card

2.11 A maximum of one SUPERSET Line card (serving up to 16 lines or SUPERSET sets) can be plugged into the SX-20 chassis. The SUPERSET Line Card acts as an interface between the station lines (or the SUPERSET sets) and the SX-20 switching circuits.

Trunk Expander Card

2.12 The Trunk Expander Card carries two Trunk Modules, two DTMF Receiver Modules, a dial tone detector and the Music on Hold input terminal. The card is inserted in place of the uppermost Line Card, thus reducing the maximum number of lines to 48 but increasing the number of trunks to 12. Refer to MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

CO Trunk Module

2.13 Up to four Trunk Modules can be installed on the Miscellaneous Card, to provide eight standard CO trunks. Each card carries two switches which should be adjusted for Ground Start or Loop Start operation by the installer. Two additional Trunk Modules can be installed on the Trunk Expander Card, increasing the system capacity to 12 trunks.

2.14 **Trunk Module Conferencing.** The Conferencing Trunk Module provides access to two CO trunks as well as allowing trunk-to-trunk plus station conferencing. Up to four such modules may be mounted on the Miscellaneous Card and up to two may be mounted on the Trunk Expander Card.

Universal Console Connector (UCC) Card

2.15 The UCC Card is compatible with all types of consoles used with the SX-20 system. There are three types of piggyback Personality Modules; one for each of the three console wiring options for the Canadian Logic 10, American Logic 10 and MITEL Attendant Console. There is a special hybrid (SPIC) which contains static protection circuitry for the Logic 10 console. The UCC Card also contains a 26-pin header for interconnection to the Miscellaneous Card, a 20-pin header for interconnection to the console UART on the CPU II Card and a Remote Display jack for connection to the Remote Call Status Dis-

play. The MITEL Attendant Console must be used with Generic 503. The RS-232 port is also located on this card.

RMATS Module

2.16 The RMATS (Remote Maintenance Administration and Test System) Module is a 300 Baud, Full Duplex, FSK answer-only modem designed to interface to the network through any trunk in the PABX.

The RMATS Module connects directly to the CPU II Card and includes the following:

- UART
- Modem
- Transmit Filter
- Duplexer
- Switching Matrix
- Receive Filter
- Two Biquadratic Active Filters (notch frequencies of 2225 Hz and 2025 Hz)
- Limiter
- Level Shifter.

Note: The CPU provides the 1 MHz clock for the UART and the Modem. The transmit and receive frequencies are listed below:

	Mark (Logic 1)	Space (Logic 0)
Transmit	2025 Hz	2225 Hz
Receive	1070 Hz	1270 Hz

E&M Trunk Module

2.17 The E&M Trunk Module is a 600 or 900 ohm, 2-wire or 4-wire configured trunk circuit. The E&M Trunk Circuit is the "cleanest" of all trunk types in that the signaling information is separated from the audio information. On a 2-wire trunk, TIP and RING carry all of the audio information; on a 4-wire trunk, TIP and RING carry the outgoing audio and TR (Tip Receive) and RR (Ring Receive) carry the incoming audio. The E lead is the signal from the distant end. It is expected to be an open circuit (on-hook) or a ground (off-hook). The M lead is the local signal. It is a high current connection to ground (on-hook) or -48 V (off-hook). Unlike the CO Trunk Module which provides access to two CO trunks, the E&M Trunk Module provides access to only one E&M trunk. Up to two such modules may be mounted on the Trunk Expander Card. E&M Trunks are numbered using odd equipment numbers only.

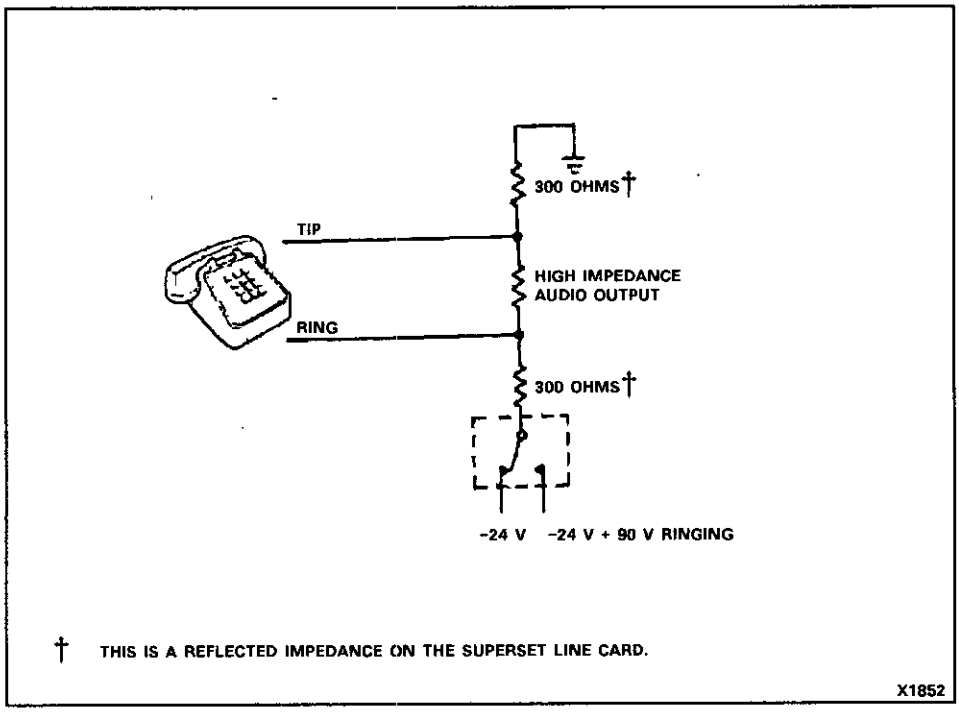

Figure 2-3 Line Interface

B. Interface

Backplane

2.18 All the SX-20 cards plug into the backplane except the Trunk Modules, the PROM/RAM Module and the RMATS Module. The backplane carries the power supply rails, the data/address bus, various R/W and control tracks, the 12 system junctors, the tracks connecting the miscellaneous circuits and the 90 Vac ringing track. A 3 A fuse (F1) is also present on the -24 V rail.

Line Circuit Interface

2.19 The interface between the SX-20 system and the stations is provided by the SLIC circuit. The terminating impedance is 600 ohms (refer to Figure 2-3). A supply of -24 Vdc or 90 Vac (ringing) can feed the line from the ring lead. The high impedance audio circuits are in parallel with the 600 ohm termination, but have no effect on the impedance.

SUPERSET Line Circuit Interface

2.20 The interface between the SX-20 system and stations or the SUPERSET sets are provided by the HYPERSLIC circuit. The reflected terminating impedance is 600 ohms (refer to Figure 2-3). A supply of -24 V or 90 Vac (ringing) can feed the line from the ring lead. The high impedance audio circuits are in parallel with the reflected 600 ohm termination, but have no effect on the impedance.

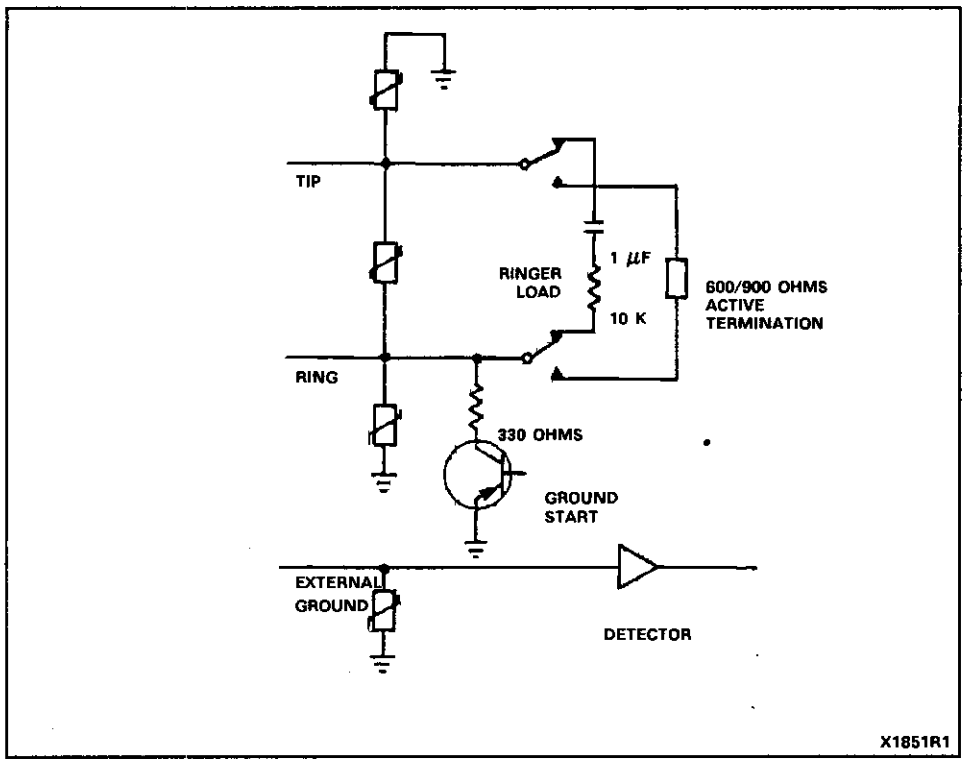

Figure 2-4 Trunk Interface Detector

Trunk Interface

2.21 The trunk interface provides several functions associated with adapting the SX-20 system to suit the various stages in establishing a trunk call. It also protects the SX-20 system from over voltages (refer to Figure 2-4).

2.22 During ringing of the SX-20 system from the CO, the SX-20 system must present a termination equivalent to that of a standard telephone. This is achieved by means of the ringer load shown in Figure 2-4. The high voltage used during ringing, and other high voltages which could arise on the trunk, could damage the SX-20 circuitry. To avoid this, the SX-20 system is protected by varistors, connected as shown in Figure 2-4. When the voltages between the tip, ring and ground increase, the resistance between them decreases rapidly, and the associated increase in current load prevents the input voltage from rising above 250 V.

2.23 Some types of trunks require the application of a ground to the ring lead. This is achieved using the 330 ohm resistor, which is grounded via a transistor during establishment of an outgoing call.

2.24 For certain types of calls (metered calls, dictation trunks and calls requiring supervision), provision is made for connection of either a third lead or two extra leads to the SX-20 system, here terminating in a logic circuit, after passing over a protection varistor.

2.25 When the speech path is established, the trunk termination is switched by a reed relay to a 600 or 900 ohm (active impedance) value within the SX-20 system. The loop current level is controlled during conversation by an apparent DC loop resistance of 200 ohms. The timing associated with the changes of state is indicated in Part 3, Signaling and Supervision.

C. Operation

Off-Hook (Station)

2.26 When a station on a Line Card goes off-hook, the loop current is detected by an op-amp which turns on a LED on the Line Card and sets a signal, OFF-HOOK X (where X represents one of the eight or 24 lines on the Line Card). This is fed to an analog switch together with a similar signal for each of the remaining lines. When the CPU addresses each of these lines via the data bus, the OFF-HOOK X state is presented on the data line for that particular line circuit. The data line, having changed state for the station addressed, causes the CPU to stop scanning. The CPU reads the line and card addresses, and the data on the data bus and commences scanning.

Off-Hook (Console)

2.27 The console does not have a hookswitch similar to that of a station. Rather, the OFF-HOOK signal is true whenever the console handset is plugged in. To originate a call, it is necessary only to depress the key of the first digit to be dialed.

Dial Tone (Station)

2.28 When the processor is informed of an off-hook condition, it interrogates its RAM to find a free system junctor, which it checks via a diagnostic circuit. The tested system junctor is then connected to the line circuit that went off-hook. The processor then searches for an idle receiver (DTMF). Using the card select, address and data lines, the processor connects the selected receiver and dial tone functions to the same system junctor as the line circuit, thus providing dial tone to the station.

Dialing Internally (From a Station)

2.29 DTMF signals originate at a station and are passed over Tip and Ring through the line circuit to a system junctor. DTMF digits are detected by the receiver which has been connected to the same system junctor. A receiver is connected whenever a station originates a call or whenever the switchhook is flashed. A receiver accepts only DTMF signals. The off-hook signal which is controlled by the SLIC, is read directly onto a data line. Rotary digits are detected by using this off-hook signal.

2.30 The CPU reads the first digit, then disconnects dial tone from the system junctor. If the processor determines that the digit is valid but does not completely define a number, it simply stores the

digit in the volatile RAM memory. Should the digit be considered invalid by the processor, reorder tone is connected to the system junctor.

2.31 If the station number is valid, the processor disconnects the receiver from the system junctor and reconnects a tone source to provide ringback tone to the originator. If a busy station is encountered, busy tone is connected to the speech path.

Dialing Internally (From a Console)

2.32 Unlike a station, the console keypad generates neither DTMF nor DP (dial pulse). Instead the microprocessor inside the console notes which key was depressed and looks in the console ROM to find the corresponding 8-bit code. This code is converted by a UART to a serial string of data, complete with start and stop bits, and is sent as a differential signal along one of the 25 pairs of wires leading to the Interconnect Card and from there to the Console Control Card.

2.33 In the system, this signal enters the console UART module. It is converted by the UART into parallel data and sets a DATA READY bit which goes out onto the data bus when the processor addresses this console circuit.

2.34 The processor reads the dialed code from the data bus, determines which digit has been sent, and stores the digit in the RAM (refer to Off-Hook Console in this Section). If the digit is considered invalid, the processor connects reorder tone to the console's speech path. When the firmware's logic decides that the number is complete, it rings the station dialed. (Refer to Ringing a Station in this Section.) It also connects a tone generator to the console's speech path to provide ringback tone. Note that a receiver is not used for dialing from a console.

Speech Path (System Junctor) Accessing

2.35 Each speech path is directly wired on the Miscellaneous Card, Trunk Expander Card and each Line Card to an 8804 which can (under processor control) connect the speech path to any circuit on the card (i.e., a line circuit or a tone generator). The processor sends a card-select signal to access a particular card, together with a combination of address and data signals which close the required "contacts". This concept is illustrated in Figure 2-5 and shows that Line Circuit Numbers 2 and 7 have been connected to each other using Speech Path Number 2.

Ringing a Station

2.36 The dialing of a valid station number prompts the processor to select a particular line on a particular Line Card (as determined by the programming in the non-volatile RAM). It sends a data line command to turn on ringing current to the station. When the station answers, the line circuit detects an off-hook condition. (Refer to Off-Hook Station in this Section.) The CPU disconnects ringing and then

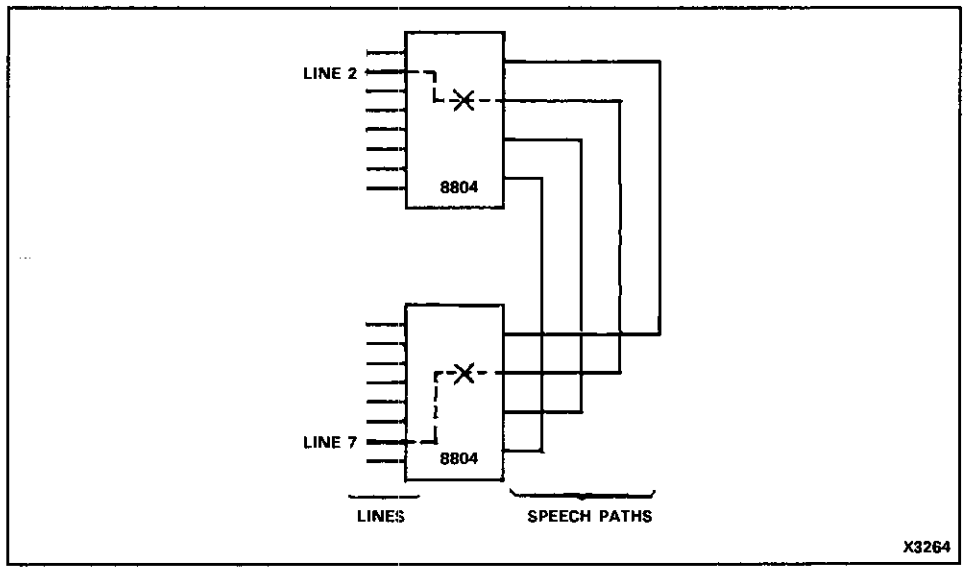

Figure 2-5 Speech Path Accessing

connects the called station to the same system junctor as the calling device (station, console or trunk).

Switchhook Flash

2.37 A switchhook flash is defined for the PABX as an on-hook condition of between 150 ms and 750 ms (150 and 1500 ms as a system option), followed by an off-hook condition where a connection has been established between two or three parties. When a station goes on-hook, the processor first checks its memory to determine whether a flash is legal at that point. If not, the station is disconnected from the speech path and a subsequent off-hook is considered as the beginning of a new call. (Refer to Off-Hook in this Section.) However, when a flash is determined as a legal operation, the firmware is designed to start a timer. If the station goes back off-hook within the specified time period, it is considered to be flashing. An on-hook of less than 150 ms is considered to be noise glitch, while an on-hook greater than 750 ms or 1500 ms is considered as a call termination (hang-up).

2.38 When a flash is detected, the processor disconnects the non-flashing station(s) or trunk(s) from the system junctor. It then provides transfer dial tone to the flashing station (if this option is enabled) and connects a receiver to the system junctor, allowing the station to dial and converse privately with a third party, or to access features. However, if the station had flashed out of a conference, the conference is unaffected. If the other party was not in conference, it is disconnected from the system junctor and either Mute is activated or the nonflashing station is connected to QUIET tone. No hold junctor is provided.

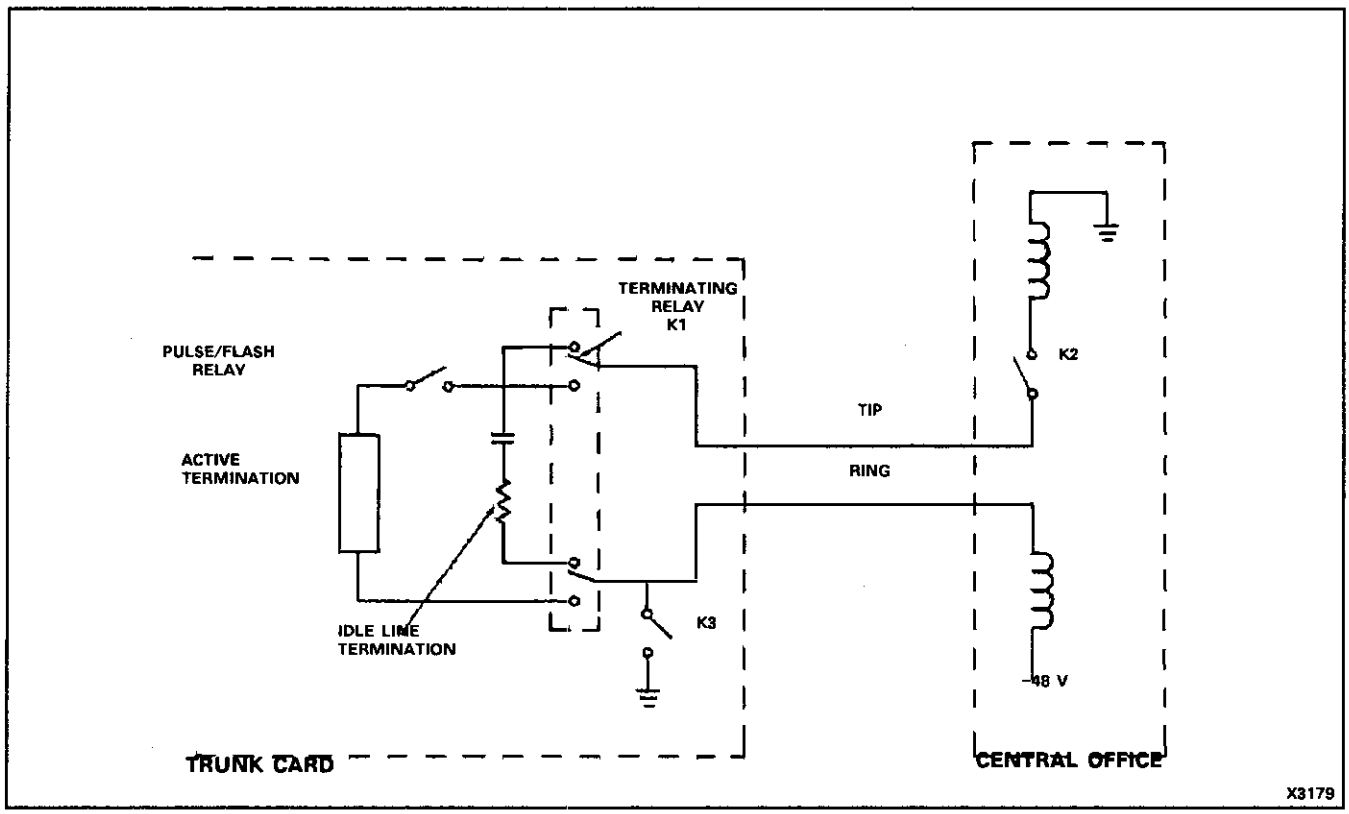

Figure 2-6 Central Office Trunk Circuit - Ground Start

D. Trunk Operation

Ground Start/Loop Start

2.39 Ground Start (refer to Figure 2-6). Ground start is a hand-shake method of initiating a CO trunk call. The local trunk circuit grounds the RING lead and awaits recognition by the CO. The CO signals recognition by grounding the previously floating TIP lead. Forty ms after the trunk recognizes 100 ms ground on the TIP lead, a termination is placed across TIP and RING and 40 ms later the ground on the RING lead is removed. The CO then provides dial tone.

2.40 Loop Start (refer to Figure 2-7). To seize a loop-start trunk, the trunk circuit places a termination across TIP and RING. The CO senses the current flow through the loop and signals that the trunk is available by providing dial tone.

Incoming Calls

2.41 The Trunk Card has various methods of recognizing an incoming call. If the trunk is ground start, 6 s of ground on the TIP lead or 240 ms of ringing after TIP ground signals that an incoming call is waiting. If the trunk is loop start, either battery reversal or 240 ms of ringing voltage signals that an incoming call is waiting. Once an incoming call is recognized, the trunk circuit informs the processor that

a call is waiting. The call is answered at the PABX by placing a termination across TIP and RING.

Outgoing Calls - Ground Start

2.42 In the idle state, the following conditions exist:

- Terminating relay contacts are open (no termination)
- RING ground relay contacts are open
- Audio path is open in both directions
- Idle line termination is placed across Tip and Ring.

2.43 When a station dials the correct access code, the CPU (if a trunk is available) gives the trunk a seize command. The seize command is carried out by the grounding of the RING lead. The CO should see the ground on the RING lead and signal dial tone availability recognition by grounding the previously floating TIP lead. TRUNK waits 100 ms before looking for TIP ground. If this recognition does not occur within 60 s, Alarm AL11 is reported (unless trunk alarms have been disabled). The trunk is then busied-out and may be released by:

- Resetting the system
- Attendant Function 32
- Attendant Function 51.

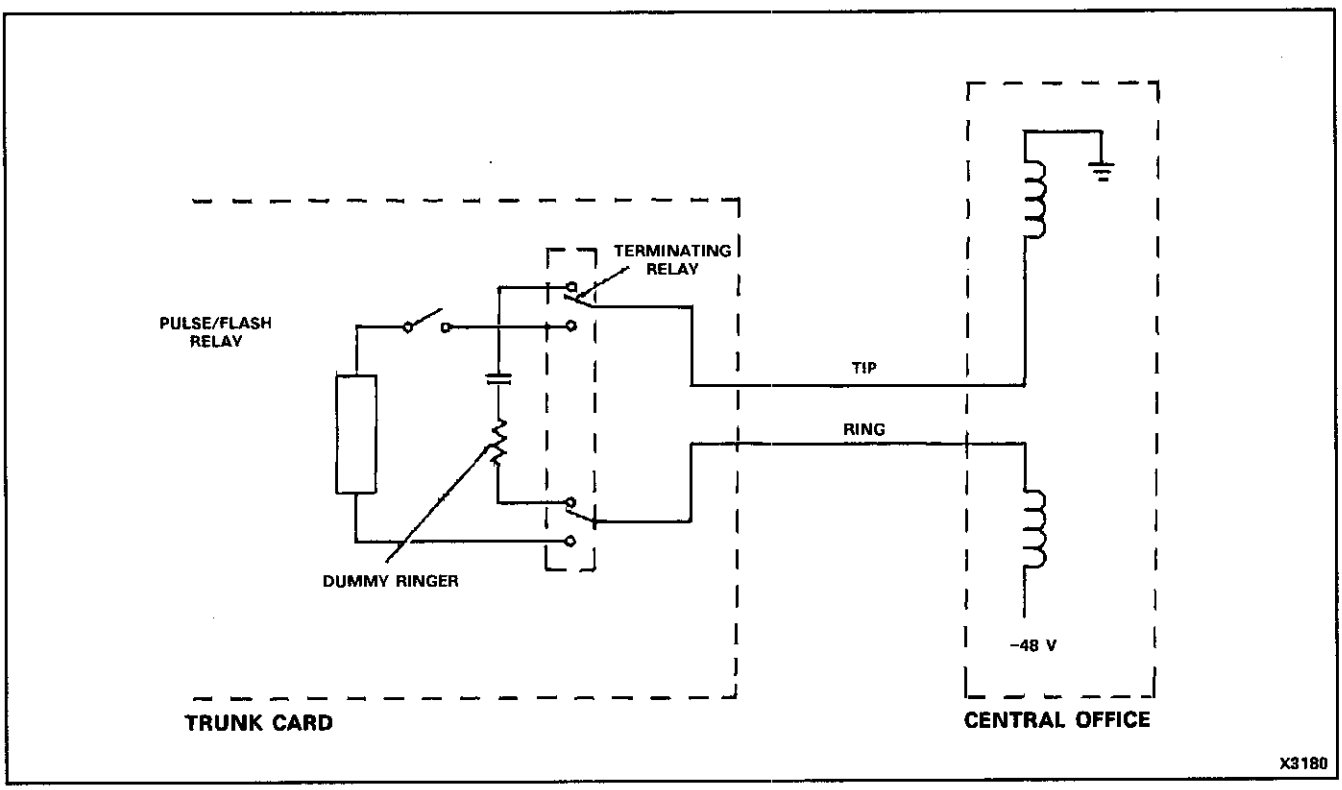

Figure 2-7 Central Office Trunk Circuit - Loop Start

2.44 If the CO signals recognition by grounding the TIP lead for 100 ms or more within the 60 seconds waiting for seize acknowledge period, the active termination is connected, and 40 ms later the ground is removed from the RING lead. 100 ms after the ground is removed from the RING lead, the audio path is closed. It is now necessary to identify the called party, either by rotary dial pulsing or DTMF signaling (refer to Part 3, Signaling and Supervision).

Outgoing Calls - Loop Start

2.45 In the idle state, the following conditions exist:

- Terminating relay contacts are open (no termination)
- RING ground relay contacts are open
- Audio path is open in both directions
- Idle line termination is placed across Tip and Ring.

2.46 When a station dials the correct access code, the processor (if a trunk is available) gives the trunk the seize command. Forty ms later the termination relay contacts are closed. 140 ms later the audio path is closed. At this point the trunk is connected.

2.47 Once the trunk is connected, it is necessary to identify the called party. This identification is accomplished by Rotary Dial Pulsing or DTMF signaling (refer to Part 3, Signaling and Supervision).

Trunk Release

2.48 To release a trunk, the current loop must be broken. This can occur if:

(a) The station goes on-hook. The processor detects the on-hook and issues a command to the trunk to remove the termination and break the loop.

(b) The distant party goes on-hook on a ground start trunk. The CO signals the station that the distant party has gone on-hook by removing the ground on the TIP lead. The PABX detects a break in the loop current and releases.

(c) The trunk cable is physically broken. If the loop is broken, the Trunk Card senses a loss of current and releases.

2.49 To interface with different central offices, different disconnect timing may be programmed. These are:

- 60 ms
- 500 ms
- 1.5 s
- 4.0 s

which are found in Section MITL9102-095-210-NA (Commands 801 - 812, Register 2).

E. Power Requirements

Power Supplies

2.50 The primary power supply is 105-125 Vac (optionally 230 Vac), 47-63 Hz, with a peak current of 3 A and a maximum continuous current of 2 A. The internal DC power supplies produce voltages of -24 V ± 5%, +5.0 V ± 5%, +7.0 V ± 5% and -8 V ± 5%. These values are chosen in order to obtain the correct voltage on the devices, taking into account voltage drops in the tracks. The maximum ripple level on the power supplies is 1.5 mVrms and 5 mVp-p.

2.51 The SX-20 system has a holdover time of 100 ms. As a result, the maximum permitted length of a failure in the primary power supply is 100 ms.

2.52 The 90 Vac ringing supply is generated from a square wave source followed by a shaper which produces a sine wave. The sine wave output is divided into four time-slots by the system software via the CPU. Each time-slot equates to one "brush". Five lines can be simultaneously connected to the system junctor representing the brush. Thus, 20 lines can be rung in a virtually simultaneous manner. The normal 90 Vac ringing voltage has tolerances of -15 V and +25 V (no load).

2.53 The maximum output current permitted is 20 mA at 90 Vac. The lines can withstand voltage surges complying with the FCC Part 68 Rules.

Grounding

2.54 All ground wires in the SX-20 system should be combined at a common point within the cabinet. This common point should also be used to ground all peripheral devices. A ground lug is attached to the SX-20 chassis in front of the Universal Console Connector Card. When the individual circuits are tested or touched, the wrist should be grounded to this point to avoid electrostatic discharge damage. Refer to Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedure, for detailed information.

F. Electrical Characteristics

2.55 The electrical characteristics of the SX-20 system are listed in Table 2-1.

2.56 **Power Failure Transfer.** The power failure transfer relays provided can connect two Central Office Trunks to selected stations. These relays operate under either of the following conditions:

- Commercial power failure
- Excess temperature caused by fan failure or cooling air obstruction.

(a) **Incoming Calls.** After a power failure transfer has occurred, ringing of stations for incoming calls is applied directly to the selected station line from the Central Office (CO).

(b) **Outgoing Calls.** To place an outgoing call through a ground start CO trunk, with the system in the Power Failure Transfer Mode, the station originating the call must be equipped with a ground key or a Loop-to-Ground Converter (CM1470). When the ground key is momentarily pressed, a ground is applied to the Ring side of the trunk, energizing the CO equipment. One side of the ground key must be connected to a ground and the other to the Ring conductor of the station. Call origination over loop start trunks does not require the use of a ground start key.

2.57 **Power Failure Transfer Reset.** The system may be returned to normal operation from power failure transfer in one of two ways:

(a) **Reset from High Temperature.** If a high temperature condition is detected (nominally 65°C (149°F), the system switches off the 24 volt supply and enters the Power Failure Transfer Mode. When the temperature returns to within the accepted operating limits, the system automatically returns to normal operation.

(b) **Reset from Commercial Power Failure.** The system automatically returns to normal operation when commercial power is restored.

TABLE 2-1
SX-20 ELECTRICAL CHARACTERISTICS

Parameter	Detail
Station Loop Limit	600 ohms including set at 20 mA
Minimum Leak Resistance	15,000 ohms
Maximum Number of Ringers per Line	5
Ringing Voltage†	90 Vrms, 20 Hz
Ring Trip	During silent or ringing period
Dial Tone††	350/440 Hz, continuous, -19 dBm
Busy Tone††	480/620 Hz, 500 ms On, 500 ms Off, -24.0 dBm
Ringback Tone††	440/480 Hz, 1 s On, 3 s Off, -19.0 dBm
Reorder Tone††	480/620 Hz, 250 ms On, 250 ms Off, -24 dBm
Camp-on Tone††	440/480 Hz, one burst of 200 ms, -19.0 dBm
Dial Tone Detector Level	350/440 Hz minimum -23 dBm
Crosstalk	Better than 75 dB down
Insertion Loss: Station-to-Station Station-to-Trunk	5 dB ± 0.5 dB at 1000 Hz 0.6 dB ± 0.4 dB at 1000 Hz
Longitudinal Balance	60 dB minimum, 200-3400 Hz (on trunks)
Return Loss	16 dB singing, 24 dB echo
Idle Circuit Noise	16 dBrnC maximum
Impulse Noise	0 counts above 47 dBrnC for 90% of cases
System Impedance	600 ohms nominal for lines 900 ohms nominal for trunks
AC Rejection	60 Hz, 180 Hz at 50 Vrms
Typical Traffic Capacity	9.7 ccs/line maximum at 24 lines and P = 0.01 4.8 ccs/line maximum at 48 lines and P = 0.01
Primary Power	105-125 Vac, 47-63 Hz, 3 A maximum, 1 A typical (230 V operation optional)
Central Office Loop Limit	1600 ohms maximum
Maximum Distance of Attendant Console from Equipment Cabinet	152 m (500 ft) of 26 AWG cable
Maximum Distance of Remote Display from Equipment Cabinet	152 m (500 ft) of 22 AWG cable
FCC Registration Number	BN285B-67526-PF-E

† Ringing frequency is programmable. Available frequencies are 17.5 Hz, 20 Hz, and 25 Hz.

†† The frequencies illustrated are those provided under Tone Plan 00. For other combinations, refer to MITL9102-095-105-NA, Selectable Tone Plans.

3. SIGNALING AND SUPERVISION

3.01 This Part details the technical parameters of the SX-20 system with regard to signaling and supervisory condition.

Switchhook Flash

3.02 The details of switchhook flash operation are described in paragraph 2.37. A switchhook flash is defined for the PABX as a no loop (on-hook) current condition lasting between 150 ms and 750 ms (150 ms to 1500 ms option). Any SX-20 station switchhook flashes of less than the maximum selected time are not repeated towards the Central Office. Any SX-20 station on-hook conditions (of greater than the selected maximum time) release a trunk connection.

Dial Pulses and DTMF Tones

3.03 The SX-20 system is capable of accepting and repeating DP signals from telephone sets which have the parameters shown in Table 3-1, Dial Pulse Limits.

3.04 The SX-20 system is capable of accepting and repeating DTMF signals from telephone sets which have parameters shown in Table 3-2, DTMF Tone Limits. When any of the frequencies shown in Table 3-2 are present at the system input, any other single frequency (200 to 3400 Hz) must be a minimum of 40 dB below the former. However, DTMF pulses are registered, in the presence of precise dial tone at a level of -10 dBm.

3.05 The SX-20 system provides the following signal characteristics:

- Dial Pulse Conditions

Pulse Rate	9 to 11 pps
Break Interval	58 to 64%
Interdigit Time	800 ms.

Third-Wire Signaling

3.06 A third wire is available for signaling. It has several functions:

(a) **Dictation Trunk.** If a central dictation facility is available, it may be busy. If so, a ground is present on the third wire. This indicates a busy state to the SX-20 system via a logic gate which is read every cycle.

(b) **Signaling from the CO.** When the SX-20 system is initialized, the state existing on the third wire is taken as the originating condition. Subsequent to that, a change of state may be programmed to indicate a call from the CO. The two states are "ground" or "negative" potential (i.e., -24 V, -48 V or floating).

TABLE 3-1
DIAL PULSE LIMITS

A. DIAL PULSE DETECTION		
Parameter	**Min**	**Max**
Pulse Rate (pps)	8.0	12.0
Break Duration (percent)	50.0	70.0
Break Interval (ms)	41.7	87.5
Make Interval (ms)	25.0	62.5
B. DIAL PULSE OUTPULSING		
Parameter	**60/40**	**66/33**
Pulse Rate (pps)	10.0	9.0
Break Duration (percent)	60.0	64.0
Break Interval (ms)	60.0	70.0
Make Interval (ms)	40.0	40.0
Make Duration (percent)	40.0	36.0

TABLE 3-2
DTMF TONE LIMITS

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

Frequency Deviation	+ 1.5%
Per frequency, minimum level	-17 dBm on line circuit
On Time	Greater than 40 ms
Interdigit Time	Greater than 40 ms
Level, Low Group	Greater than -10 dBm
Level, High Group	Greater than -8 dBm
Level, DTMF Signal	Less than +2 dB
Level, Third Frequency	Greater than 40 dB below DTMF signal

(c) **Metering.** The third wire can be used to accept metering pulses from the CO. These are detected by the SX-20 system. Noise pulses are removed by a long time-constant circuit before arriving on the logic gate.

(d) The SX-20 system accepts reversal of the line, as equivalent to a change of state on the third wire, for signaling purposes.

3.07 Two-Wire Signaling. A second pair of wires (other than Tip and Ring) may be used to accept Message Registration pulses. This pair is available with the Trunk Expander Card and new revisions of the Miscellaneous Card.

E&M Signaling

3.08 E&M signaling is another method of interoffice signaling. It uses four signal leads (the 4-lead signaling interface should not be confused with the 2- or 4-wire transmission or audio interface). This method of signaling is preferred to positive-negative signaling since its operation is not impaired by differences in the earth potential. The M lead is used for signaling from the trunk circuit; the E lead is used for signaling to the trunk circuit. The SB lead supplies battery to the trunk circuit for signaling on the M lead and the SG lead supplies ground to the signaling circuit for signaling on the E lead. As a result, signals are sent from office A to office B on the M lead of the trunk circuit in office A and arrive on the E lead of office B. Similarily, signals are sent from office B on the M lead and arrive on the E lead of office A. These leads provide all the signaling required between central offices; the speech path is free for communications exclusively.

3.09 The tone plans available with the SX-20 system are shown in Table 3-4. These are selected during Programming Mode. Refer to Section MITL9102-095-210-NA, System Programming for details.

Rotary Dial Pulse-to-Digit Conversion

3.10 A variety of encoding dialing systems are used by different PTT administrations. These can be automatically adapted to, by means of an integrated code conversion facility. The translation codes available are shown in Table 3-5. Refer to Section MITL9102-095-210-NA, System Programming for programming details.

Ringing Frequencies

3.11 The nominal ringing frequency of 20 Hz can be set to 17.5 Hz, 20 Hz or 25 Hz during the initialization of the system. Refer to Section MITL9102-095-210-NA, System Programming.

TABLE 3-3
E&M LEAD POLARITIES FOR TRUNK SIGNALING

ORIGINATING OFFICE			DIRECTION OF TRANSMITTED SIGNAL	TERMINATING OFFICE		
Calling Subscriber Trunk State	E Lead	M Lead		E Lead	M Lead	Called Subscriber State
Trunk Idle	BATT	OPEN	None	BAT	Open	On-Hook
Trunk Seized	BATT	GND	→	GND	Open	On-Hook
Off-Hook (Conversation Period)	GND	GND	←	GND	GND	Off-Hook
On-Hook Calling Subscriber Disconnects	GND	Open	→	BATT	GND	Off-Hook
Trunk Disconnected	BATT	Open	None	BATT	Open	On-Hook

Note: This Table assumes that SG and SB are connected to ground and that the polarity of the E lead and M lead was not reversed in System Programming.

Time-Outs

3.12 Table 3-6 shows the time-out data for the SX-20 system. These can, in some cases, be set during system initialization. Refer to Section MITL9102-095-210-NA, System Programming.

Terminating Conditions

3.13 The SX-20 system provides the following line and trunk parameters:

(a) **Station and SUPERSET Loop** - The station loop resistance, including the station apparatus, can be up to a maximum of 600 ohms at 25 mA. The station and the SUPERSET loop lengths are given in Table 3-7 (SUPERSET Line Card) and Table 3-8 (Standard Line Card).

(b) **Remote Call Status Display** - The Remote Display can be located up to a maximum of 152 m (500 ft) with 22 AWG cable from the equipment cabinet.

(c) **CO Trunk Loop** - The SX-20 system operates with CO trunks up to a maximum of 1600 ohms loop resistance.

(d) **CO Trunk Seizure** - The SX-20 maximum seizure resistance is 270 ohms at 30 mA.

(e) **CO Trunk Resistance** – In the idle state the resistance towards the CO from the trunk circuit is not less that 30 kohms for ground start, and not less than 10 Mohms for loop-start trunks.

TABLE 3-4
SELECTABLE TONE PLANS

Tone	Tone Plan 00	Tone Plan 01	Tone Plan 02	Tone Plan 03
Dial Tone	350/440 Hz Continuous	350/450 Hz Continuous	400 Hz Continuous	425 Hz Continuous
Busy Tone	480/620 Hz 500 ms On, 500 ms Off Repeated continuously	400 Hz 350 ms On, 350 ms Off Repeated continuously	400 Hz 500 ms On, 500 ms Off Repeated continuously	425 Hz 250 ms On, 250 ms Off Repeated continuously
Ringback Tone	440/480 Hz 1 s On, 3 s Off Repeated continuously	400/450 Hz 400 ms On, 200 ms Off 400 ms On, 2 s Off Repeated continuously	400/450 Hz 400 ms On, 200 ms Off 400 ms On, 2 s Off Repeated continuously	425 Hz 1 s On, 4 s Off Repeated continuously
Reorder Tone	480/620 Hz 250 ms On, 250 ms Off Repeated continuously	400 Hz Continuous	400 Hz 250 ms On, 250 ms Off Repeated continuously	425 Hz 250 ms On, 750 ms Off Repeated continuously
Camp-On Tone	440/480 Hz Single burst of 200 ms	400/450 Hz Single burst of 200 ms	400/450 Hz Single burst of 200 ms	425 Hz Single burst of 200 ms
Transfer Dial Tone	350/440 Hz 100 ms On, 100 ms Off Repeated three times then continuous Dial tone	350/450 Hz 100 ms On, 100 ms Off Repeated three times then continuous Dial tone	400 Hz 100 ms On, 100 ms Off Repeated three times then continuous Dial tone	425 Hz 100 ms On, 100 ms Off Repeated three times then continuous Dial tone
Busy Override Tone	440/480 Hz 1 s On, 6 s Off then 200 ms burst of Busy Override Process tone repeated every 6 s	400/450 Hz 1 s On, 6 s Off then 200 ms burst of Busy Override Process tone repeated every 6 s	400/450 Hz 1 s On, 6 s Off then 200 ms burst of Busy Override Process tone repeated every 6 s	425 Hz 1 s On, 6 s Off then 200 ms burst of Busy Override Process tone repeated every 6 s
Discriminating Dial Tone	350/440 Hz 100 ms On, 100 ms Off Repeated six times then continuous Dial Tone	350/450 Hz 700 ms On, 700 ms Off Repeated six times then continuous Dial Tone	400 Hz 100 ms On, 100 ms Off Repeated six times then continuous Dial Tone	425 Hz 100 ms On, 100 ms Off Repeated six times then continuous Dial Tone
Trunk Camp-On Tone	440/480 Hz 100 ms On, 50 ms Off, 100 ms On	400/450 Hz 100 ms On, 50 ms Off, 100 ms On	400 Hz 100 ms On, 50 ms Off, 100 ms On	425 Hz 100 ms On, 50 ms Off, 100 ms On
Special Busy Tone	350/440 Hz 500 ms On 500 ms Off continuous for 10 s then busy tone	400 Hz 500 ms On 500 ms Off continuous for 10 s then busy tone	400 Hz 500 ms On 500 ms Off continuous for 10 s then busy tone	425 Hz 500 ms On 500 ms Off continuous for 10 s then busy tone
Message Waiting Ringing	Three cycles of 200 ms On, 200 ms Off	Three cycles of 200 ms On, 200 ms Off	Three cycles of 200 ms On, 200 ms Off	Three cycles of 200 ms On, 200 ms Off
Auto Wake-Up Ringing	Four cycles of ringing at up to four 5-minute intervals	Four cycles of ringing at up to four 5-minute intervals	Four cycles of ringing at up to four 5-minute intervals	Four cycles of ringing at up to four 5-minute intervals

Notes: 1. Tolerance of call progress tone levels is ±1.5 dBm.
2. Individual tones of any compound tone are within 1 dB of each other.
3. Tolerance of individual tones are ±0.5% of the frequency stated.

TABLE 3-5
TRANSLATION CODES

Translation Code	Digit Dialed 1	2	3	4	5	6	7	8	9	0
0	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	1
2	9	8	7	6	5	4	3	2	1	10
3	10	9	8	7	6	5	4	3	2	1

Number of Pulses

TABLE 3-6
TIME-OUT INFORMATION

Attendant-Timed Recall (Don't Answer)	(1-7) X 10 s
Attendant-Timed Recall (Camp-On)	(1-7) X 10 s
Attendant-Timed Recall (Call Park/Hold)	(1-7) X 10 s
Automatic Switching to TAFAS	Immediate or (1-7) X 10 s
Dial Tone Time-Out	10 s
Ringing Time-Out	5 - 5.5 minutes
Interdigit Time-Out	10 s
Lockout Time-Out	10 s
Callback Clear Time-Out	8 hours or four rings
Call Hold Recall (Station)	(1-4) X 1 minute
Switchhook Flash	150 ms - 750 ms or 150 ms - 1500 ms
Tip-Ground CO Acknowledgement	100 ms minimum

TABLE 3-7
STATION/SUPERSET LOOP LENGTH VS WIRE GAUGE (SUPERSET LINE CARD)

Wire Gauge	SUPERSET Loop Length*	Station Loop Length†
19	701 m (2,300 ft)	9,163 m (30,000 ft)
20	549 m (1,800 ft)	7,317 m (24,000 ft)
22	367 m (1,200 ft)	4,576 m (15,000 ft)
24	229 m (750 ft)	2,896 m (9,500 ft)
26	152 m (500 ft)	1,830 m (6,000 ft)

* SUPERSET DC Loop Resistance is approximately 40 ohms.
† 500 set DC Loop Resistance is approximately 525 ohms.

TABLE 3-8
STATION LOOP LENGTH VS WIRE GAUGE (STANDARD LINE CARD)

Wire Gauge	Station Loop Length†
19	7242 m (23,900 ft)
20	5758 m (19,000 ft)
22	3637 m (12,000 ft)
24	2273 m (7,500 ft)
26	1424 m (4,700 ft)

† Assuming the telephone set's impedance is 200 ohms and draws 20 mA.
DC Loop Resistance without set = 400 ohms.

4. DIAGNOSTICS

4.01 There are three main diagnostic routines used by the SX-20 system: Power-Up Diagnostics, Automatic Diagnostics, and Trunk Diagnostics.

4.02 **Alarms Generated by Diagnostics.** Two types of alarms (major and minor) can be generated. A major alarm (only generated immediately after a system reset or on power-up) causes the system to halt operation entirely. A minor alarm is reported to the attendant by flashing of the console ALARM key and "AL" being displayed beside the time on the 8-digit display. A minor alarm also causes the minor alarm relay contacts to close and the console ringer to be operated. Minor alarm information can be displayed using a "System Function". The alarm codes and their causes are detailed in Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

A. Power-Up System Diagnostics

4.03 Each time the system is reset, either by being powered-up, a watchdog time-out or a reset button being pressed, the SX-20 processor performs the following tests:

- PROM Checksum Test
- Volatile RAM Comprehensive Test
- Non-Volatile RAM Checksum Test
- Non-Volatile RAM Comprehensive Test
- Reset Cause Check.

4.04 **PROM Checksum Test.** The PROM check consists first of compiling the sum of all bytes in the Peripheral Processor (PP) PROM. If the sum is not "00", Major Alarm "0" results. If this test is successful, then a similar check is performed on the Call Processor (CP) PROM. This time a failure results in Major Alarm "1".

4.05 **Volatile RAM Comprehensive Test.** The Volatile RAM is checked by first setting a single bit in every location, then reading every location. The contents of each location are then complemented to determine whether or not data written in this location has an effect on any other location. The test is repeated eight times, each time with a different bit set in the test pattern. Any fault results in Major Alarm "2".

4.06 **Non-Volatile RAM Checksum Test.** The Non-Volatile RAM checksum test consists of compiling a checksum of all the bits in the non-volatile RAM and comparing this with the checksum generated when the non-volatile RAM was last programmed. A difference in the checksums result in a Minor Alarm (ALARM 02).

4.07 **Non-Volatile RAM Comprehensive Test.** As part of the power-up sequence, the installer has the option of loading the default database. Just prior to loading the database, the non-volatile RAM is checked by setting a single bit in every location, then reading every location. Next the contents of each location are complemented to determine whether or not data written in this location has an effect on any other location. The test is repeated eight times, each time with a different bit set in the test pattern. Any faults detected result in a Minor Alarm (ALARM 01).

4.08 **Reset Cause Check.** The final test of the power-up sequence determines the cause of the reset. A Minor Alarm (ALARM 50) results if the reset had been caused by an internal system failure (as opposed to a power supply interruption).

B. Automatic System Diagnostics

4.09 The SX-20 Automatic Diagnostics test the memory, speech path connections, tone receivers and generator, supervisory tones, dial tone detectors, and speech path biasing. Unless disabled, the automatic diagnostics run at all times. Tests which require a speech path are suspended whenever there are four or less speech paths free in the system. Note that automatic diagnostics require at least one installed DTMF receiver.

4.10 Faults found are reported as minor alarms and the failing unit is busied-out, if possible. The automatic diagnostics do not busy out more than one receiver, more than one dial tone detector or more than six speech paths, to guard against the possibility of an error in the fault detection circuitry shutting down the system.

4.11 **Organization.** The automatic diagnostics consist of the following set of test routines (run in sequence):

- Memory Sum Test
- Volatile RAM Read/Write Test
- Basic Speech Path Test
- Speech Path Short Test
- Speech Path Connection Test
- Dial Tone Detector Test
- DTMF Receiver/Generator Test.

4.12 Each test selects any speech path, receiver, tone generator, etc., necessary to perform the test. If any of the necessary hardware is not available, the test is skipped and the next test in the sequence is run. All of the tests are attempted on an average of once every 5 minutes. In a busy system, this time is reduced as a result of skipped tests.

4.13 **Restarting the Diagnostics.** Dialing Attendant Function 32 (Clear All Alarms and Busy-Outs) causes the automatic diagnostics (when the current test is finished) to initialize and resume testing with the first test in the sequence. Removing a Line Card from the SX-20 system will also cause the automatic diagnostics (when the current test is finished) to initialize and resume testing with the first test in the sequence.

Tests

4.14 **Memory Sum Test.** This test performs a checksum on the PROM and the non-volatile RAM. These tests are similar to those performed in the Power-Up Diagnostics. Any errors are reported as minor alarms (PP PROM: ALARM 04, CP PROM: ALARM 05, Non-Volatile RAM: ALARM 02). Once an alarm has been reported for a given memory, any subsequent errors detected on that memory do not report until the diagnostics are restarted.

4.15 **Volatile RAM Read/Write Test.** Each byte of the RAM is checked with two different data patterns. Any error is reported as ALARM 03. Once an alarm has been reported, this test is inhibited from generating further alarms until the diagnostics are restarted.

4.16 **Basic Speech Path Test.** A free speech path is selected and checked for a high logic level (not in use). Detection of a malfunction results in an ALARM 20 and the speech path busies out. Each of the three supervisory tones and the quiet termination (0) is connected in turn to the speech path and checked with the speech path test circuit to see that the speech path goes to "0". Detection of a malfunction results in an ALARM 21 and the speech path busies out. This test is repeated for the 12 speech paths (if free).

4.17 **Speech Path Short Test.** This test consists of the following steps:

(a) A primary speech path is selected.

(b) The remaining free speech paths are selected as secondary speech paths.

(c) The primary speech path is first checked for a high logic level (i.e., not connected).

(d) A secondary speech path is connected to "0".

(e) The primary speech path is checked again to determine if it still has a high logic level.

(f) If it is not high, ALARM 22 is reported for each of the two speech paths and both speech paths are busied-out. A new primary speech path is selected and the above test repeats. Every possible combination of speech path pairs is checked.

4.18 **Speech Path Connection Test.** This test consists of the following steps:

(a) A free speech path is selected.

(b) Each idle line/trunk is connected to the speech path and the speech path is checked (using the speech path test circuit) to see if it is at "0".

(c) If NOT "0", the test is repeated four more times at 100 ms intervals to ensure that the line/trunk had not just gone busy.

(d) If the speech path does not go to "0" and the line/trunk is still idle, ALARM 30 (for a line) or ALARM 31 (for a trunk) is reported.

(e) In the case of LINES, no further tests are performed on this line until the diagnostics are restarted.

(f) In the case of TRUNKS, no further tests are performed on this Trunk Module until the diagnostics are restarted.

(g) A new speech path is selected and the above test is repeated until all free lines and trunks have been tested on the 12 speech paths.

4.19 **Dial Tone Detection Test.** This test consists of the following steps:

(a) A free speech path is selected.

(b) A free dial tone detector is selected.

(c) One of the supervisory tone sources is connected to the speech path; the dial tone detector is connected to the speech path and after 1 s is examined to verify that it has detected the tone. If no tone is detected, then the two other supervisory tone sources are connected until a tone is detected. Trying all tone sources is necessary since certain tone plans may require that one of the tone sources be disabled. The tone source is removed and after 1 s, the detector is examined to see if it no longer detects a tone. The results are stored.

(d) Steps (b) and (c) are repeated for each free dial tone detector. If at least one detector detects dial tone properly and one of the others does not, then the one that fails to detect a dial tone is reported as having failed (ALARM 40) and the dial tone detector is busied-out. If at least two detectors had been available for testing (and if none of the detectors tested had detected dial tone), it is assumed that there is a speech path failure; ALARM 23 (speech path failure) is reported and the speech path is busied-out.

4.20 **DTMF Receiver/Generator Test.** This test is performed as follows:

(a) A free speech path is selected and the DTMF generator (if free) is connected to it.

(b) A free receiver is selected and checked that it can receive each of the four tone pairs: L1H2, L2H1, L3H4 or L4H3. The results are stored.

(c) Step (b) is repeated for each free receiver in the system. If at least one of the receivers passes the test, and one of the others fails, the receiver that fails the test is reported as having failed (ALARM 42 - receiver failure) and the receiver is busied-out. If at least two receivers had been available for testing and neither of them passed, it is assumed that the generator is at fault. ALARM 41 - DTMF generator failure is reported and the DTMF generator is busied-out to ensure that the error is not repeated in each pass.

C. Trunk Diagnostics

4.21 As the SX-20 system processes calls, trunk diagnostics are performed to detect possible trunk malfunctions. Trunk diagnostics perform the following tests:

- Loop Current Test
- Seize Acknowledge Test
- Release Acknowledge Test.

4.22 **Loop Current Test.** This test is performed on both loop start and ground start trunk types. With a loop-start trunk circuit, an active termination is placed across TIP and RING to seize the trunk. 100 ms after this termination is inserted, the existence of loop current is verified. A minimum of 100 ms of loop current is required to indicate to the PABX that loop current is present. If no loop current is detected by the PABX within 15 s of inserting the termination, the CPU busies out that trunk and reports Alarm AL 10 (if the alarms are enabled).

4.23 When using a ground start circuit the presence of 100 ms of current is checked. Once again, if no loop current is detected within 15 s, the CPU busies out the trunk. If the alarms are enabled, the CPU reports Alarm AL 10.

4.24 **Seize Acknowledge Test.** This test is performed only on ground start trunk circuits. The PABX trunk circuit places a ground on the RING lead to indicate to the CO that it would like to seize the trunk. Having placed the ground on the RING lead, the PABX waits 100 ms before checking for the TIP ground (which the CO returns as a form of recognition). If no such recognition is received within 15 s, the CPU busies out that trunk and (if the alarms are enabled) reports Alarm AL 11.

4.25 **Release Acknowledge Test.** In order to release a trunk the loop current must be broken. On a loop-start trunk circuit, this is accomplished by the distant party or local station going on-hook, causing an interruption in loop current. The minimum duration of this loop current interruption which the PABX recognizes, is known as the disconnect timing and is programmable to a length of 60 ms, 500 ms, 1.5 s or 4 s. Having recognized this loop current interruption, the CPU then removes the active termination from the trunk. Should the CPU not acknowledge this break in loop current after the disconnect time, Alarm AL 12 is reported (if the trunk alarms are enabled).

4.26 With a ground start trunk circuit, the CO signals the PABX that the distant phone has gone on-hook by removing the ground on the TIP lead. The PABX detects a break in loop current and (if it is of sufficient duration with respect to the disconnect timing) the CPU then removes the active termination from the trunk, thus releasing it. If this release acknowledge (TIP ground) is not received by the PABX after the

desired disconnect time, Alarm AL 12 is reported (if the trunk alarms are enabled).

5. TRANSMISSION

5.01 This Part specifies the SX-20 transmission characteristics.

Transmission Characteristics

5.02 The insertion loss at 1004 Hz is as follows:

- **Station-to-Station connection:** 5 dB ± 0.5 dB
- **Station-to-Trunk connection:** 0.6 dB ± 0.4 dB.

5.03 The attenuation variation, relative to the 1004 Hz insertion loss, does not exceed the limits as shown in Table 5-1.

5.04 Distortion. The second or third harmonic does not exceed a level of -55 dBm with a 200 or 1004 Hz signal at -10 dBm. With an input signal consisting of 900 Hz and 1004 Hz (each at -13 dBm), the rms sum of all the intermodulation products will not exceed -45 dBm when measured at the output. The equations to calculate the intermodulation distortion (which are applicable to both station-to-station and station-to-trunk) are:

$$R_2 = 20 \log_{10} \frac{\text{level at 700 Hz}}{\text{level at 1400 Hz}} \geq 50 \text{ dB}$$

$$R_3 = 20 \log_{10} \frac{\text{level at 700 Hz}}{\text{level at 2100 Hz}} \geq 50 \text{ dB}$$

5.05 Overload. The change in attenuation when the level of a 1004 Hz signal is increased from 0 to +7 dBm does not exceed 0.1 dB.

5.06 Return Loss. The Return Loss parameters in the talking state are:

(a) Station to Station -
ERL > 18 dB
SRL > 12 dB

(b) Station to Trunk -
ERL > 18 dB
SRL > 12 dB

TABLE 5-1
ATTENUATION VARIATION

Transmission Plan	Frequency or Frequency Band (Hz)	Variation in Attenuation w/r to 1004 Hz (dB)
Line to Line	200 300 to 3000 3400	-0.1 to +0.6 -0.1 to +0.4 -0.1 to +0.6
Line to Trunk	200 300 to 3000 3400	-0.1 to +0.3 -0.1 to +0.2 -0.1 to +0.3

Note: (+) is more loss, (-) is less loss

5.07 Longitudinal Balance. All connections meet the following requirements with respect to Longitudinal Balance.

Minimum		Maximum
200 Hz	1000 Hz	3000 Hz
58 dB	58 dB	54 dB

5.08 Crosstalk Attenuation. The crosstalk attenuation (or coupling loss) between any established connection through the PABX (and at least 95% of all other connections), when both paths are terminated in 600 or 900 ohms (as required) at each end is:

Station to Station : -75 dB minimum
Station to Trunk : -75 dB minimum.

The level of the disturbing signal is 0 dBm and the applicable frequency range is 200 to 3400 Hz.

5.09 Message Circuit Noise. The total level of all noise sources within the system does not exceed the following limits (on 95% of the connections):

- Station to Station -

  < 16 dBrnC (message weighted)
  < 35 dBrn (3 kHz flat)

- Station to Trunk -

  < 16 dBrnC (message weighted)
  < 35 dBrn (3 kHz flat).

5.10 Impulse noise in the voiceband results in zero counts above a level of 47 dBrnc for 90% of all cases.

5.11 System Impedances. System impedances are:

- 600 ohms nominal for Stations
- 900 ohms nominal for trunks.

5.12 Envelope Delay. The delay difference between 400–3200 Hz is:

- Station to Station – < 100 μs
- Station to Trunk – < 100 μs

6. TRAFFIC CONSIDERATIONS

6.01 Part 6 provides data used in determining three parameters which are traffic-dependent. They are:

- Quantities of trunks required
- Quantities of DTMF receivers required
- Level of traffic per line.

6.02 This part provides quick reference tables to assist in estimating the SX-20 hardware requirements for a range of typical applications. The tables can be used to determine station traffic characteristics of a business, and then estimate the required number of CO trunk modules and DTMF receivers (required only if DTMF station sets are used). Finally, Table 6-6, Maximum Station Traffic provides the maximum allowable station traffic for configurations from 16 to 72 stations.

Typical Station Traffic Characteristics

6.03 The provisioning of an SX-20 system for a particular application depends upon the average station usage (traffic), as characterized by two parameters:

- Traffic per station (Busy Hour, Busy Day)
- Percent Trunk Traffic (versus intercom).

6.04 The traffic per station depends upon how much the average job function in the business requires the use of a telephone; for example, a regional wholesale distributor may have a large group of buyers and salespersons handling outside calls, and therefore have a relatively high traffic per station (5-7 ccs/station).

6.05 The division between internal intercom and trunk traffic is related to the density of telephones; for example, in professional or service industries where employees are close enough to speak to each other in person, intercom traffic is low (i.e., Trunk traffic 70%-90%). In department stores or manufacturing sites where employee and telephone density is low, the proportion of intercom calls would be higher.

6.06 As a guideline, Table 6-1 provides typical station traffic characteristics for a number of potential SX-20 applications. Used in conjunction with the customer's specific requirements, the equipment provisioning tables (refer to Tables 6-2 through 6-6) indicate the quantity of CO trunks and DTMF receivers required.

Assumptions

6.07 To ensure meaningful results with the following calculations and tables, certain standard assumptions must be made:

- All CO trunks are in one trunk group.
- Trunk blocking = 1.0%, i.e., 1% of requests for a CO trunk are unsuccessful and receive busy tone.
- If DTMF stations are provided, all stations are DTMF.
- Call originations are random (Poisson) - no Automatic Callback - Busy used.
- Average receiver holding times are:

  Intercom = 2.4 s

  - Trunk (no Tone-to-Pulse conversion) = 7.8 s

  - Trunk (with Tone-to-Pulse conversion) = 21.64 s.
- Average length of call = 100 s (1 ccs).
- Station numbering plan = three digits.
- Trunk group access codes = two digits.
- Toll Control evaluates the first four digits after the Trunk Access Code.
- DTMF receiver blocking = 1.5%, i.e., 98.5% of requests for service receive dial tone in less than 3 seconds.
- Two ratios for Trunk Traffic direction have been quoted in the following equipment provisioning tables:

  - 100% Outgoing, 0% Incoming

  - 50% Outgoing, 50% Incoming.

Note: 100% outgoing traffic represents a worst case figure to indicate maximum receiver provisioning; typically, outgoing traffic is substantially less than this.

- Trunk Traffic and Intercom Traffic have been calculated as a percentage of the total System (speech path) Traffic.

TABLE 6-1
TYPICAL TRAFFIC CHARACTERISTICS

SX-20 Applications	Busy Hour Traffic per Station (ccs)	% Trunk Traffic	Typical Trunk Traffic Characteristics	
			% Incoming	% Outgoing
Hotel/Motel	1 - 2	50	20	80
Restaurant (table phones)	1 - 2	50	50	50
Nursing Home	2 - 3	50 - 70	80	20
Mobile Applications				
- Construction Site	3 - 5	10 - 50	10	90
- Ships	3 - 5	10 - 50	10	90
- Drilling Rigs	3 - 5	10 - 50	10	90
Department Stores	3 - 6	50 - 70	90	10
Retail - Automotive	3 - 6	50 - 80	90	10
- Furniture	3 - 6	50 - 80	90	10
- Pharmacy	3 - 6	50 - 80	90	10
- Building Suppliers	3 - 6	50 - 80	90	10
Schools	3 - 5	50 - 70	70	30
Manufacturing				
- Plant	3 - 5	40 - 60	50	50
- With Sales Group	4 - 6	70 - 90	50†	50†
Professional				
- Legal	5 - 7	70 - 90	50	50
- Medical	5 - 7	80 - 90	80	20
- Engineering	5 - 7	70 - 90	50	50
- Finance	4 - 6	70 - 90	30	70
- Real Estate	5 - 8	90	30	70
- Wholesale Distributor	5 - 8	90	70	30
- Stockbroker	9 - 10	90	70	30

† Depends on application

Total Traffic Handling Capacity (Network)

6.08 With 12 speech paths, equally accessible as inputs or outputs, using "Tables for Dimensioning Single-Stage Switching Arrays, Teletraffic Engineering Manual", there is:

k = N = 12

and with desired blocking = 0.01

Total traffic = 5.88 Erlang
= 212 ccs.

Calculation of Number of Trunks Required

6.09 To calculate the number of trunks required with the total traffic handling capacity of 212 ccs (calculated in paragraph 6.08):

Set X = $\frac{\text{intercom traffic}}{\text{total traffic}}$

therefore 1-X = $\frac{\text{trunk traffic}}{\text{total traffic}}$ (both incoming and outgoing)

therefore, trunk traffic = (1-X) (212 ccs).

6.10 **Sample Calculation. Given:** 50% intercom traffic, where X = (intercom traffic) = (0.5) total traffic, and (1-X) = (trunk traffic) = (0.5) total traffic, therefore:

trunk traffic = (0.5) (212 ccs)
= 106 ccs
= 2.94 Erlang = A

6.11 Using "Tables for Dimensioning Single-Stage Switching Arrays, Teletraffic Engineering Manual", with the following conditions, it can be seen that eight trunks are sufficient when:

k = N
A = 2.94 Erlang
B = 0.01.

Calculation of Number of DTMF Receivers Required

6.12 To calculate the number of DTMF receivers required, the average receiver holding for Intercom (Internal) and trunk traffic must be calculated.

(a) Average receiver holding time (Intercom)

= $\frac{0.8\ s}{\text{digit}}$ x 3-digit station number

= 2.4 s

(b) Average receiver holding time (trunk)

= $\frac{0.8\ s}{\text{digit}}$ x 2-digit Trunk Access Code

+ 3 s wait for dial tone +

$\frac{0.8\ s}{\text{digit}}$ x 4-digit toll control

= 7.8 s

(c) Desired:

In 98.5% of all cases, dial tone is received within 3 s; i.e., P (>t) must be less than 0.015.

6.13 Sample Calculation. Given: 40% intercom traffic; i.e., X = intercom traffic = (0.4) total traffic, and (1-X) = trunk traffic = (0.6) total traffic that is,

X = (0.4) (212 ccs) = 84.8 ccs
(1-X) = (0.6) (212 ccs) = 127.2 ccs

therefore:

Receiver traffic = A =
$\frac{\text{average receiver holding time}}{\text{maximum call duration}}$ x total traffic

6.14 Considering trunk traffic and intercom traffic separately, there is:

A = $\frac{7.8\ s}{100\ s}$ (127.2 ccs)

+ $\frac{2.4\ s}{100\ s}$ (84.8 ccs)

= 11.96 ccs

= 0.33 Erlang.

6.15 Considering Intercom receiver holding time and Trunk receiver holding time, the average receiver holding time is:

= 7.8 s (0.6) + 2.4 s (0.4)

= 5.64 s

therefore,

$$t/tm = \frac{\text{maximum allowable wait for dial tone}}{\text{average receiver holding time}}$$

$$= \frac{3 \text{ s}}{5.64 \text{ s}}$$

= 0.53

therefore:

A = 0.33 Erlang

t/tm = 0.53

Consider 2 receivers; i.e., N = 2, therefore

$$\frac{A}{N} = \frac{0.33 \text{ Erlang}}{2 \text{ Receivers.}}$$

6.16 From "Diagrams for Dimensioning Waiting Systems for Exponential Holding Times, Teletraffic Engineering Manual", with (N = 2), it can be seen that P (>t) = 0.015. Therefore, two receivers are sufficient.

Calculation of Level of Traffic per Line

6.17 The formula to calculate the traffic per line is:

$$\frac{\text{traffic (ccs)}}{\text{line}} = \frac{\text{trunk traffic}}{\text{number of lines}}$$

$$+ \frac{\text{intercom traffic x 2}}{\text{number of lines}}$$

$$= \frac{(1-X) \text{ total traffic}}{N} + \frac{(2X) \text{ total traffic}}{N}$$

$$= \frac{(1+X)}{N} \text{ total traffic}$$

6.18 **Sample Calculation. Given.** 80% trunk traffic, 72 lines and eight trunks; there is:

X = 0.2
(1-X) = 0.8

$2X = 0.4$

therefore,

$$\frac{\text{ccs}}{\text{line}} = \frac{(1+0.2)\ (212\ \text{ccs})}{72\ \text{lines}}$$

= 3.53 ccs/line.

6.19 However, an investigation must be made into the traffic handling capabilities of the trunks.

trunk traffic = (0.8) (212 ccs)
= 169.6 ccs

with 8 trunks there is:

$$\frac{\text{ccs}}{\text{trunk}} = \frac{169.6\ \text{ccs}}{8\ \text{trunks}}$$

= 21.2 ccs/trunk

= 0.59 Erlang/trunk.

6.20 From "Diagrams for Dimensioning Waiting Systems for Exponential Holding Times, Teletraffic Engineering Manual", there is t/tm = 0, since trunks are either available immediately or busy tone is returned. There also is A/N = 0.59 Erlang and N = 8, therefore P(>t) = 0.14 which is not acceptable.

6.21 For P(>t) = 0.015, from the table it can be seen that A/N must = 0.39 Erlang/trunk. Therefore:

(a) The maximum traffic handling capacity of the trunks

= 0.39

$$\frac{\text{Erlang}}{\text{trunk}} \times 8\ \text{trunks}$$

= 3.12 Erlang

= 112.32 ccs.

(b) The maximum traffic handling capability of the system

= trunk traffic + (2) intercom traffic

= 112.32 ccs + (2) (0.2) (total traffic)

= 112.32 ccs + 84.8 ccs

= 197.12 ccs

this corresponds to –

$$\frac{197.12 \text{ ccs}}{72 \text{ lines}}$$

= 2.74 ccs/line.

Equipment Provisioning Tables

6.22 The following tables (Table 6-2 through Table 6-6) provide an easy to use guide for equipment provisioning. Table 6-2 shows traffic allowable in a Hotel/Motel situation. Table 6-3 through Table 6-5 shows light, medium and heavy business traffic, and Table 6-6 shows maximum station traffic allowable as a function of the number of stations on a system.

6.23 Notice that in the following tables, the product of the number of stations and the traffic per line (ccs) does not equal the total system traffic. This occurs because an intercom call generates twice the amount of traffic on a per-line basis (two stations are involved) than a station to trunk call.

Note: If DTMF service is required, it should be noted that a minimum of two DTMF Receiver Modules are required, Part Number 9102-012-000-NA.

TABLE 6-2
HOTEL/MOTEL TRAFFIC
(1.5 CCS/LINE)

Number of Stations	Total Traffic (ccs)	Trunk Traffic (%)	2-Way CO Trunk Requirement[1]	DTMF Receiver Requirement[2]			
				Without Tone-to-Pulse Conversion		With Tone-to-Pulse Conversion	
				A	B	A	B
16	16	50	3	2	2	2	2
16	18	70	3	2	2	2	2
16	22	90	4	2	2	2	2
24	24	50	3	2	2	2	2
24	28	70	4	2	2	2	2
24	33	90	4	2	2	2	2
32	32	50	3	2	2	2	2
32	37	70	4	2	2	2	2
32	44	90	5	2	2	2	2
40	40	50	4	2	2	2	2
40	46	70	5	2	2	2	2
40	55	90	5	2	2	3†	2
48	48	50	4	2	2	2	2
48	55	70	5	2	2	2	2
48	65	90	6	2	2	3†	2
72	72	50	5	2	2	2	2
72	83	70	6	2	2	N/A	2
72	98	90	7	2	2	N/A	N/A

Notes: 1 - There are two CO Trunks provided per Trunk Module (Part Number 9102-011-002-NA)
2 - Required only if DTMF Station Sets are provided
† - Requires the Trunk Expander Card (Part Number 9102-013-000-NA)
A - 100% Outgoing Trunk Traffic (worst case)
B - 50% Outgoing Trunk Traffic
N/A- Not allowed, hardware limitations, must use external Tone-to-Pulse Conversion if 98.5% grade of service is to be maintained.

TABLE 6-3
LIGHT BUSINESS TRAFFIC
(3.0 CCS/LINE)

Number of Stations	Total Traffic (ccs)	Trunk Traffic (%)	2-Way CO Trunk Requirement[1]	DTMF Receiver Requirement[2]			
				Without Tone-to-Pulse Conversion		With Tone-to-Pulse Conversion	
				A	B	A	B
16	32	50	3	2	2	2	2
16	37	70	4	2	2	2	2
16	44	90	5	2	2	3†	2
24	48	50	4	2	2	2	2
24	55	70	5	2	2	3†	2
24	65	90	6	2	2	3†	2
32	64	50	5	2	2	2	2
32	74	70	6	2	2	3†	2
32	87	90	7	2	2	3†	3†
40	80	50	5	2	2	3†	2
40	92	70	6	2	2	3†	2
40	110	90	8	2	2	4†	3†
48	96	50	5	2	2	3†	2
48	111	70	7	2	2	3†	3†
48	131	90	9†	2	2	4†	3†

Notes: 1 - There are two CO Trunks provided per Trunk Module (Part Number 9102-011-002-NA)
2 - Required only if DTMF Station Sets are provided
† - Requires the Trunk Expander Card (Part Number 9102-013-000-NA)
A - 100% Outgoing Trunk Traffic (worst case)
B - 50% Outgoing Trunk Traffic

TABLE 6-4
MEDIUM BUSINESS TRAFFIC
(5.0 CCS/LINE)

Number of Stations	Total Traffic (ccs)	Trunk Traffic (%)	2-Way CO Trunk Requirement[1]	DTMF Receiver Requirement[2]			
				Without Tone-to-Pulse Conversion		With Tone-to-Pulse Conversion	
				A	B	A	B
16	53	50	4	2	2	2	2
16	62	70	5	2	2	3†	2
16	73	90	6	2	2	3†	2
24	80	50	5	2	2	3†	2
24	92	70	6	2	2	3†	2
24	109	90	8	2	2	3†	3†
32	107	50	6	2	2	3†	2
32	123	70	7	2	2	3†	3†
32	145	90	9†	3†	2	4†	3†
40	133	50	6	2	2	3†	3†
40	154	70	8	2	2	4†	3†
40	182	90	11†	3†	2	4†	3†
48	160	50	6	2	2	3†	3†
48	185	70	10†	3†	2	4†	3†
48	212 (4.9 ccs/line)	90	12†	3†	2	4†	3†

Notes: 1 – There are two CO Trunks provided per Trunk Module (Part Number 9102-011-002-NA)
2 – Required only if DTMF Station Sets are provided
† – Requires the Trunk Expander Card (Part Number 9102-013-000-NA)
A – 100% Outgoing Trunk Traffic (worst case)
B – 50% Outgoing Trunk Traffic

TABLE 6-5
HEAVY BUSINESS TRAFFIC
(6.5 CCS/LINE)

Number of Stations	Total Traffic (ccs)	Trunk Traffic (%)	2-Way CO Trunk Requirement[1]	DTMF Receiver Requirement[2]			
				Without Tone-to-Pulse Conversion		With Tone-to-Pulse Conversion	
				A	B	A	B
16	69	50	5	2	2	2	2
16	80	70	6	2	2	3†	2
16	95	90	7	2	2	3†	2
24	104	50	6	2	2	3†	2
24	120	70	7	2	2	3†	3†
24	142	90	9†	2	2	4†	3†
32	139	50	7	2	2	3†	3†
32	160	70	8	2	2	4†	3†
32	189	90	11†	3†	2	4†	3†
40	173	50	7	2	2	3†	3†
40	200	70	10†	3†	2	4†	3†
40	212 (5.8 ccs/line)	90	12†	3†	2	4†	3†

Notes: 1 – There are two CO Trunks provided per Trunk Module (Part Number 9102-011-002-NA)
2 – Required only if DTMF Station Sets are provided
† – Requires the Trunk Expander Card (Part Number 9102-013-000-NA)
A – 100% Outgoing Trunk Traffic (worst case)
B – 50% Outgoing Trunk Traffic

TABLE 6-6
MAXIMUM STATION TRAFFIC

Number of Stations	Maximum Traffic/ Station (ccs)	Trunk Traffic (%)	Total System Traffic (ccs)
16	20	50	212
16	17	70	212
16	15	90	212
24	13	50	212
24	12	70	212
24	9.7	90	212
32	9.9	50	212
32	8.6	70	212
32	7.3	90	212
40	7.9	50	212
40	6.9	70	212
40	5.8	90	212
48	6.6	50	212
48	5.7	70	212
48	4.9	90	212
72	3.8	50	180†
72	2.3	70	130†
72	1.25	90	100†

† Hardware limitations reduce the maximum total system traffic.

SX-20®

SHIPPING, RECEIVING AND INSTALLATION PROCEDURES

CONTENTS PAGE

1. INTRODUCTION 1
Reason for Issue 1

2. SHIPPING AND RECEIVING 1
System Packaging 2

3. DELIVERY CHECK 2
Unpacking and Handling 2
Inspection 2
Defective Items 4
Repacking for Reshipment 4

4. INSTALLATION REQUIREMENTS 4
Environmental Requirements 4
Space Requirements 5
Equipment Cabinet Location 5
Power Supply Requirements 8
Grounding 8

5. CABLING AND CROSS-CONNECTIONS 9
Telephone Set and Trunk Cabling 9
Cable Terminations 10
Cross-Connections 10
FCC Cross-Connection Frame Recommendations 10

6. INSTALLATION CHECKLIST 19
Before Power-up 19
After Power-up 21
After Programming 21
Synopsis 22

APPENDIX A
MITEL ACTION PROCEDURES A-1

APPENDIX B
INSTALLATION PROCEDURES B-1
Grounding Procedure, MAP200-000 . . . . . B-3/4
Equipment Unpacking, MAP200-001 . . . . . B-5
Install Equipment Cabinet, MAP200-002 . . . . . B-17
System Installation, MAP200-003 . . . . . B-25
Station Number Installation (Cabinet), MAP200-004 . . . . B-49
Remote Display Installation, MAP200-005 . . . . . B-59
SUPERSET 4™ Set Installation, MAP200-006 . . . . . B-65
Console Installation, MAP200-007 . . . . . B-69
Console Designations, MAP200-008 . . . . . B-77

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CONTENTS (CONT'D) PAGE

Ground Lug Installation, MAP200-009 . . . . . B-81

APPENDIX C
FCC INTERCONNECTION REQUIREMENTS C-1

APPENDIX D
SYSTEM GROUNDING AND SURGE PROTECTION
REQUIREMENTS D-1

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
2-1	System Packaging	3
2-2	Console Packaging	4
2-3	Printed Circuit Module Packaging	5
2-4	SUPERSET 4 Set Packaging	6
4-1	Minimum Space Requirements	7
5-1	Plug Locations	14
5-2	Power Failure Transfer Connections	15
5-3	Paging Connections	16
5-4	Night Bell Connections	17
5-5	Alarm Connections	17
5-6	Examples of 2-Wire Message Registration	18
5-7	Examples of 1-Wire Message Registration	18
5-8	Music on Hold	19
5-9	E&M Trunk Wiring	20
5-10	E&M Interfacing	20

LIST OF TABLES

TABLE	TITLE	PAGE
5-1	Console Connector J-1	11
5-2	Interconnecting Cables - Trunks and Miscellaneous	12
5-3	Interconnecting Cables - Stations	13
6-1	Equipment Installation	22

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

1. INTRODUCTION

1.01 This Section provides installation, shipping, receiving and cabling information for the SX-20 communications system. The system consists of two major components: the SX-20 equipment cabinet and the Attendant Console. The Attendant Console is supplied by MITEL, but the system may be operated without a console. Part 2 details shipping and receiving of the SX-20 system and Part 3 details the delivery check, which includes the unpacking and inspection of the items delivered. The installation requirements are in Part 4 and the cabling and cross-connections are in Part 5. Part 6 contains an installation summary of all MAPs contained in Appendix B.

Reason for Issue

1.02 This Section has been issued to describe the Generic 503 features package.

1.03 There are four appendices as follows:

- Appendix A explains how to use MITEL Standard Procedures (MAPs).
- Appendix B details instructions for equipment unpacking and installation of all SX-20 equipment.
- Appendix C contains FCC interconnection requirements.
- Appendix D describes system grounding and surge protection requirements.

2. SHIPPING AND RECEIVING

2.01 The SX-20 equipment cabinet is shipped in a single carton (Figure 2-1) containing only the equipment cabinet. If a large number of systems are to be shipped to one location, 10 SX-20 shipping cartons are packaged on a single shipping pallet. The SX-20 console is also shipped in a single carton (refer to Figure 2-2), and the circuit cards are packaged as shown in Figure 2-3.

System Packaging

2.02 The equipment cabinet is shipped with no circuit cards in position. The cabinet is enclosed in a polyethylene sheet and held in position within the shipping container by two preformed shock-absorbant supports, as shown in Figure 2-1. The miscellaneous card is packaged in its own static-free container, and packed on top of the cabinet. Pertinent system documentation items and mounting template are packaged in the same container as the equipment cabinet. The shipping container consists of a completely enclosed triwall carton supported along two sides by wooden frames for maximum rigidity. During transportation, the carton is held closed by two nylon shipping straps. The total weight of a complete system, including packaging, is approximately 18.5 kg (42 lb).

2.03 The SUPERSET 4 set is shipped in a single carton (Figure 2-4) which contains the SUPERSET 4 set disassembled into main assembly, handset, handset cord, line cord, and rear support. Additional items in the carton are identification cards (for telephone number and lines) and protective lenses for these cards, reference guide, installation guide, and warranty tag.

3. DELIVERY CHECK

3.01 On arrival at the installation site, all items must be checked against the order form and packaging slip. Any discrepancies must be reported immediately. All SX-20 PCBs are delivered in individual cartons. Before handling any of the cards, the antistatic wrist strap attached to the SX-20 system should be put on. NO cards should be handled without wearing the antistatic wrist strap. Before using the antistatic wrist strap, the SX-20 chassis must be installed and its 6 AWG ground wire installed (refer to MAP200-000 in this Section.).

Unpacking and Handling

3.02 The SX-20 circuit cards may be damaged by static discharge when not installed in the SX-20 chassis. The procedure to be used when unpacking and positioning the SX-20 equipment is detailed in MAP200-001 and MAP200-002 in this Section. To ensure correct installation and operation, follow these instructions explicitly.

Inspection

3.03 After unpacking the equipment cabinet, a visual inspection should be performed to ensure that:

(a) The cabinet has not been dented or scratched during shipping.

(b) All components mounted on the equipment chassis are secure.

(c) All connections to the power supply are tight.

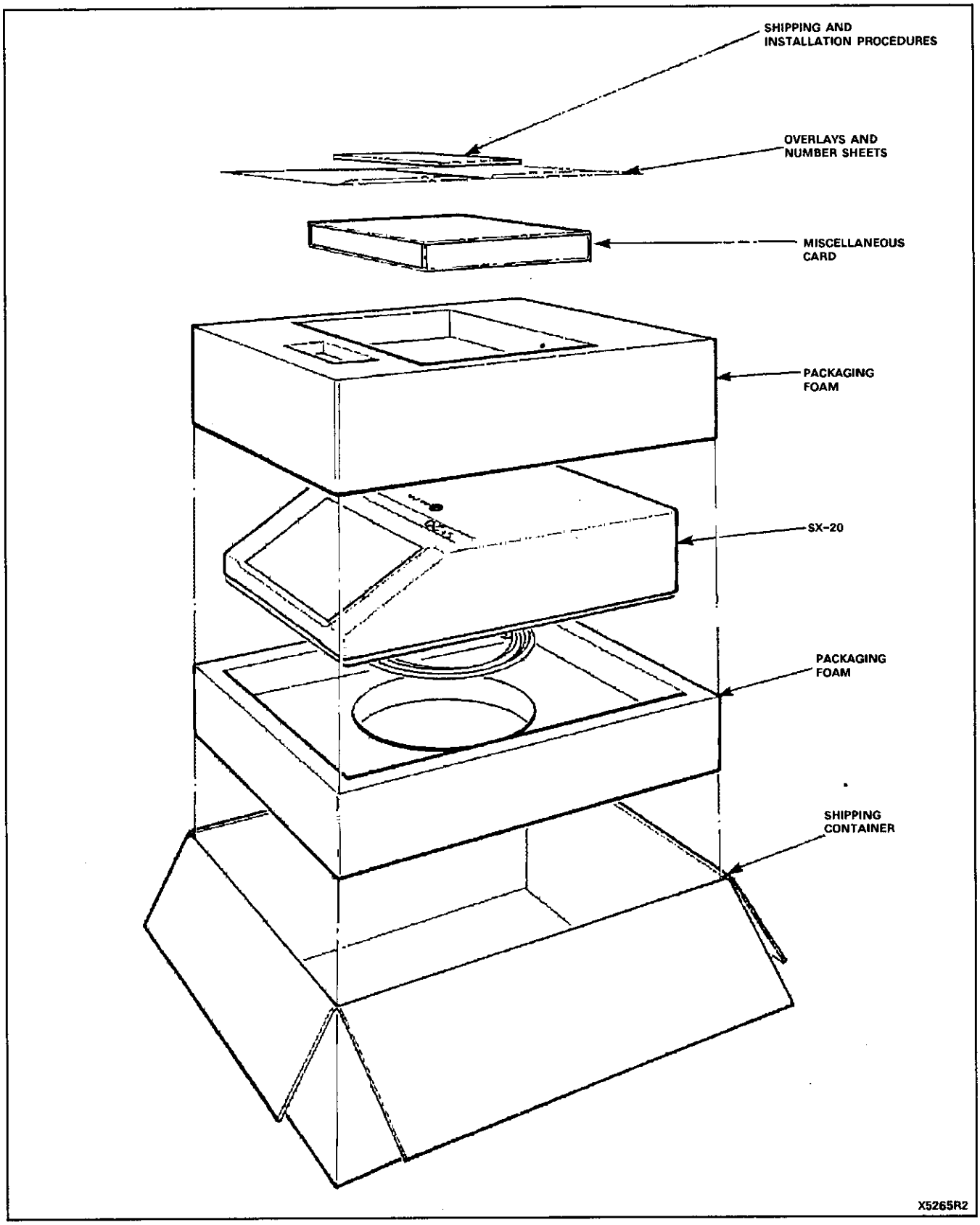


Figure 2-1 System Packaging

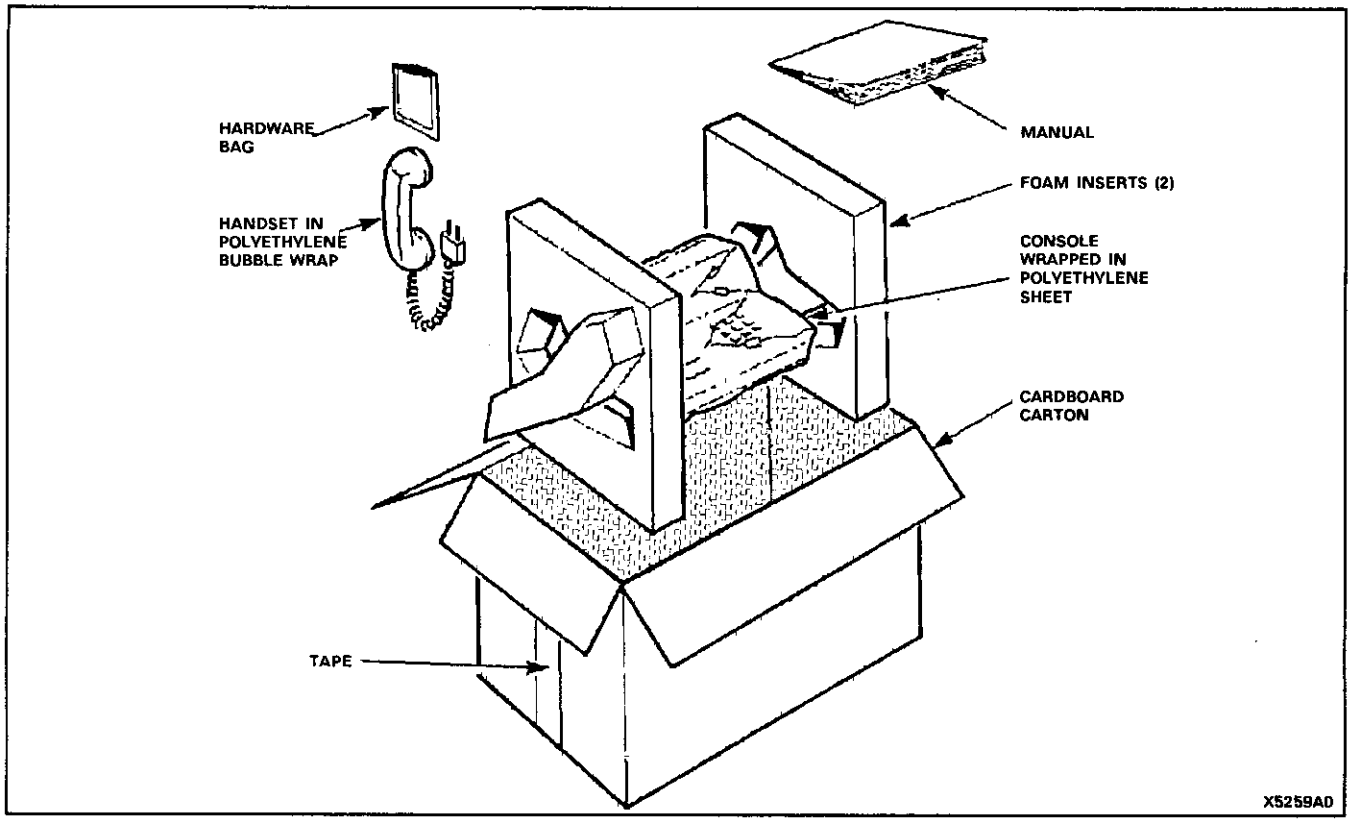


Figure 2-2 Console Packaging

Defective Items

3.04 If the cabinet is found to be defective, it should be tagged and returned to the supplier in the original packing materials. Indicate the reason for return on the MITEL PABX Repair Tag provided.

Repacking for Reshipment

3.05 When the SX-20 equipment is shipped from one location to another, all items must be packaged to prevent damage. Figures 2-1, 2-2, 2-3 and 2-4 show how the equipment was originally packaged. This method of packaging should be followed as closely as possible.

4. INSTALLATION REQUIREMENTS

Environmental Requirements

4.01 The SX-20 equipment cabinet may be installed in any location which fulfills the requirements of paragraphs 4.02 and 4.03, and is within the following temperature and humidity limits:

- Temperature: 0° - 40°C (32° - 104°F)
- Relative Humidity: 10-90% (noncondensing).

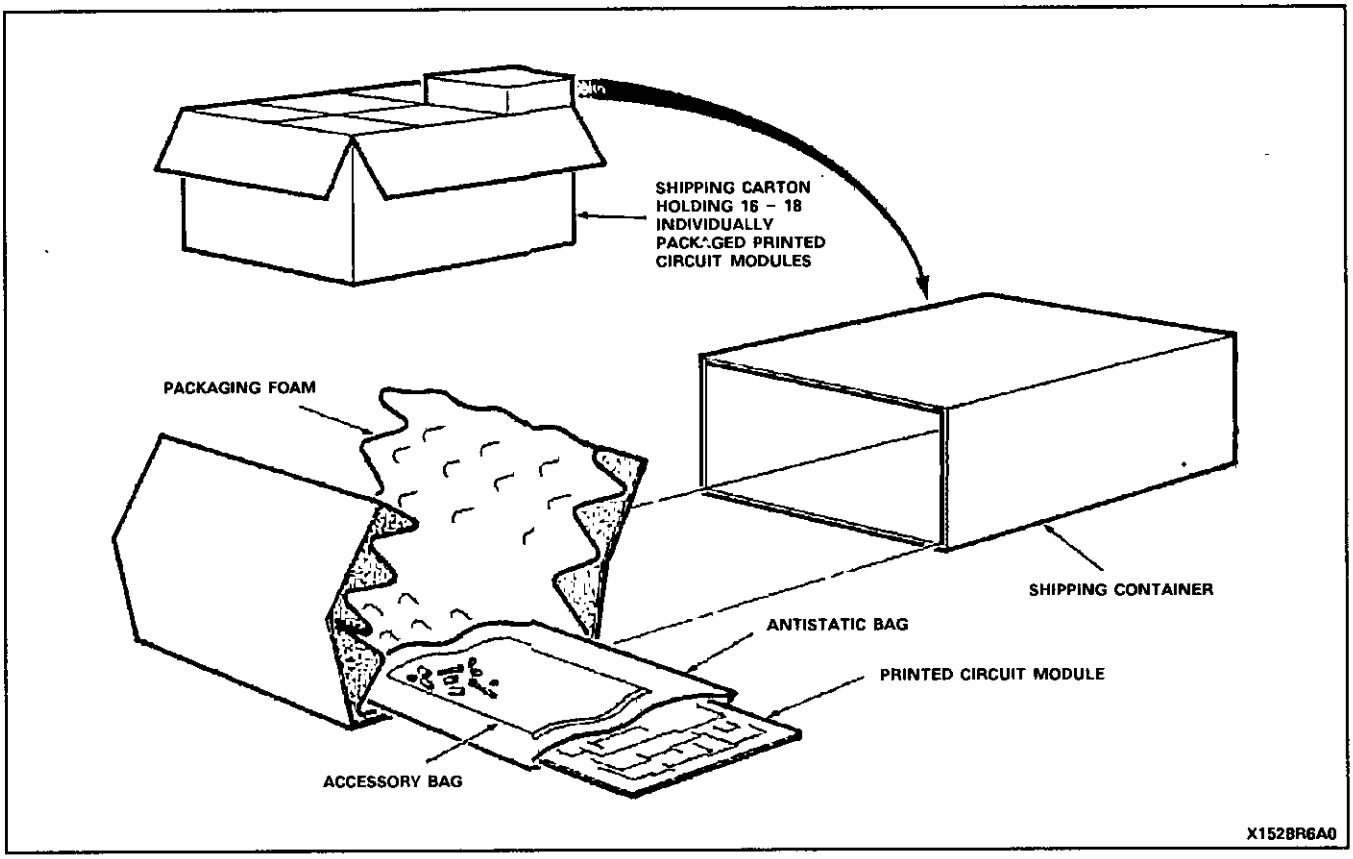


Figure 2–3 Printed Circuit Module Packaging

4.02 Operating Environment for SUPERSET™ sets are as follows:

- Ambient Temperature: 0 to 50°C (32 to 122°F).
- Ambient Humidity: 10 to 90% RH, noncondensing.

Storage/Shipping Environment:

- Ambient Temperature: –20 to 50°C (–4 to 122°F).
- Ambient Humidity: 10 to 90% RH, noncondensing.

Space Requirements

4.03 The minimum space required for installation of the SX–20 system is shown in Figure 4–1.

Equipment Cabinet Location

4.04 The following requirements must be met when selecting a location for the SX–20 equipment cabinet.

The location MUST BE:

- Dry and clean

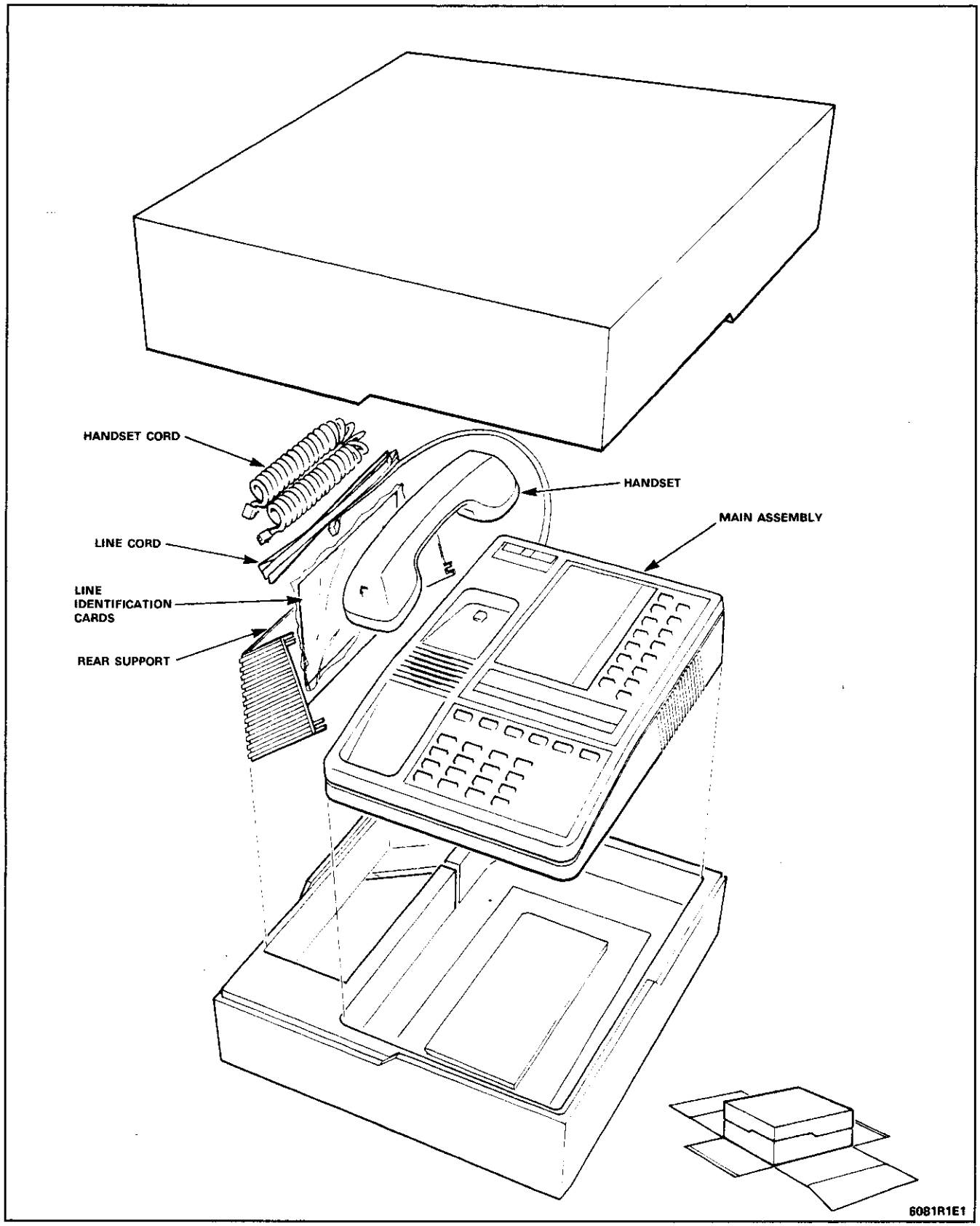


Figure 2-4 SUPERSET 4 Set Packaging

- Well ventilated
- Well lit
- Easily accessible.

The location MUST NOT BE:

- Near a sprinkler system, sweating pipes, steam pipes or steam vents
- In areas with extreme heat or cold
- In areas where corrosive fumes or exhaust from machinery is present
- In passageways used for moving equipment
- Next to a reproducing or copying machine. A minimum clearance of 3 m (10 ft) must be provided, and the room should be ventilated by an exhaust fan if the reproducing machine is not equipped with a filtering system.

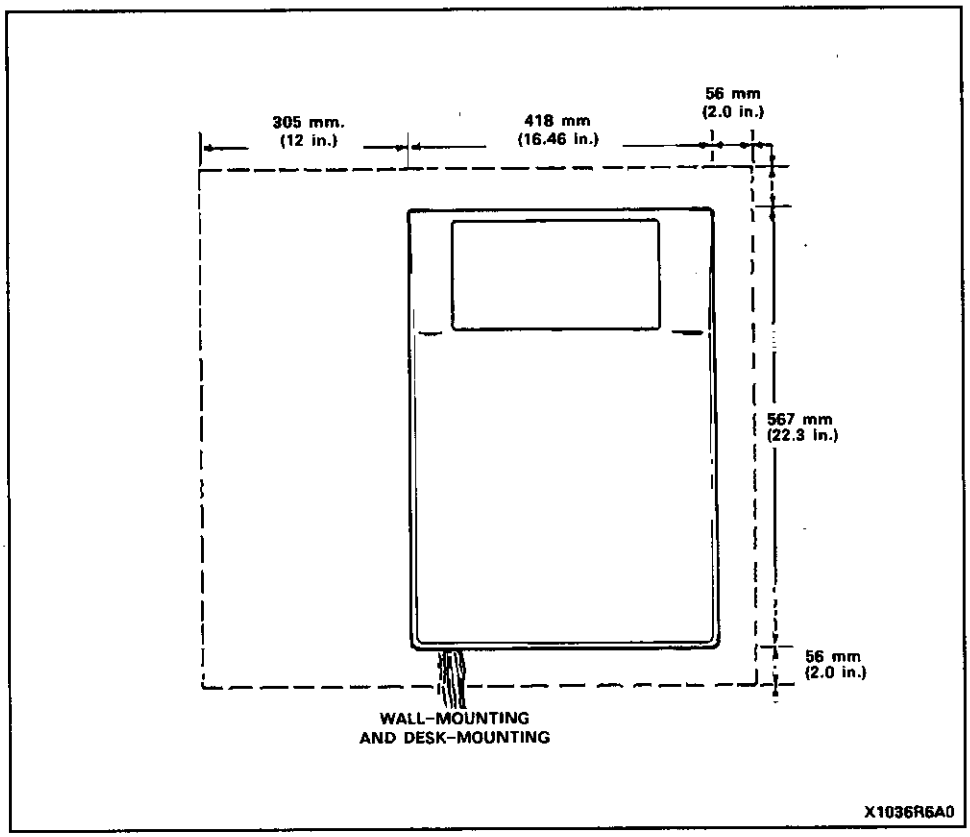


Figure 4-1 Minimum Space Requirements

Power Supply Requirements

4.05 The customer must provide a single phase power receptacle, which should adhere to the following recommendations:

- 115 V, 60 Hz, fused, and capable of delivering 3 A (230 V, 50 Hz delivering 2 A).
- The power receptacle should be wired and fused independently from all other receptacles.
- A warning tag should be attached to circuit-breaker-type fuses to prevent unauthorized manual operation.
- The power receptacle must not be controlled by a switch.
- The power receptacle must be a 3-wire type, with the third wire grounded to the ground of the electrical system.
- The receptacle should be easily accessible for the removal of the plug for maintenance.
- The receptacle location should be selected to prevent accidental removal of the power.
- The power cord between the cabinet and the receptacle should not present a hazard to the subscriber.
- A warning tag should be attached to the plug end of the power cord to prevent accidental removal of the cord by the subscriber.
- A surge protector should be supplied (refer to Appendix D, System Grounding and Surge Protection Requirements).

Grounding

4.06 The correct grounding of the SX-20 system is essential to reliable operation. Improper grounding may cause:

- Faulty trunk operation
- Single line or trunk faults
- Dropped connections
- Fading, intermittent, or 1-way audio transmission
- Intermittent faults which are environmentally and seasonally dependent.

4.07 **Approved Ground.** The minimal ground that may be used may be a cold metallic water pipe of not less than 13 mm (.5 in.) continuous diameter, and connected electrically to the street side of

the water meter. An alternate ground may be a 1.82 m (6 ft) solid rod driven 1.52 m (5 ft) into moist earth. In either case a sized (6 AWG) bonded connector must be used to connect the ground wire (6 AWG) to the pipe or rod. The SX-20 equipment ground (ground stud) on the equipment chassis must be connected to the approved ground with a copper wire 6 AWG (MAP200-002). All connections must be tight and secure. Refer to Appendix D for grounding details.

4.08 Equipment Ground. The following is a description of the required PABX equipment grounding practice:

(a) All circuit commons within the cabinet shall derive ground from a single ground concentration point within the cabinet.

(b) The system cabinet and all associated ducting hardware, along with all colocated peripherals, shall not be exposed to any ground source other than the system single point ground described in (a) above.

(c) AC service wires bringing AC power to the cabinet shall not share an enclosure or raceway with any other system grounds, DC power distribution wires, or signaling wires. All nonconnectorized AC power terminations shall be enclosed by raceways and termination boxes whether these enclosures appear outside or within the system cabinet. This is to ensure that AC service wires cannot fault to circuitry within the system cabinet or associated ducting hardware.

(d) All system hardware shall be provided with an AC fault return path to the system single point ground, which in turn shall be provided with a reliable path to the equipment grounding conductor (i.e., green wire ground or safety ground). The path from system equipment to system single point ground need not be a direct dedicated path, but can be any reliable path to other system hardware which receives the above grounding path.

(e) See Appendix C for FCC Interconnection Requirements.

(f) All sources of external ground (i.e., system signaling ground to the approved ground source, etc.) shall connect only to the system single point ground. The intent of providing for a system single point ground is to minimize ground loops and prevent lightning from finding a path through system components.

5. CABLING AND CROSS-CONNECTIONS

5.01 This Part details the cabling and cross-connections required when installing the SX-20 communications system.

Telephone Set and Trunk Cabling

5.02 Telephone set and trunk cabling terminates on the building cross-connect terminal in the normal manner. The station loop limit is 600 ohms, including station set and the console loop limit is

600 ohms Tip to Ring, including console set. Central Office trunk loop limit is 1600 ohms.

Cable Terminations

5.03 All interconnecting cables must be terminated in accordance with Figure 5-1 and Table 5-1 (Console Connector J-1), Table 5-2 (Interconnecting Cables - Trunks and Miscellaneous) and Table 5-3 (Interconnecting Cables - Stations).

Cross-Connections

5.04 Jumpers should be run using Z-type 24 AWG cross-connecting cables.

5.05 Connection between the equipment cabinet, stations, trunks, and console should be made using 26 AWG connector-ended 25-pair cables in accordance with Tables 5-1, 5-2 and 5-3.

5.06 Power fail transfer cabling connections between the SX-20 system, and the cross-connect field are shown in Figure 5-2. The Paging connections are shown in Figure 5-3 and the Night Bell connections are shown in Figure 5-4. (Special attention should be paid to Note 2 in Figure 5-4. The bleed resistor described there must be connected to insure proper operation of the system.) Examples of 2-wire and 1-wire Message Registration connections are shown in Figures 5-6 and 5-7, respectively. 1- or 2-wire connections are used depending on the number of wires used by the CO.

5.07 If Music on Hold is required, then connections are made between the customer-provided music source and the terminal block located on the Trunk Expander Card. Refer to Figure 5-8 for wiring details.

5.08 If an alarm condition is detected, the MIN, MAJ, or CON alarm LED on the Attendant Console flashes, the Console Ringer is activated and AL is shown with the time on the system display. In addition to these system indicators, a contact closure is provided to allow an external alarm indicator to be connected, if desired. The cabling details for the external alarm indicator are shown on Figure 5-5 and in Table 5-2.

FCC Cross-Connection Frame Recommendations

5.09 Trunk circuits must be connected to the telephone company interface jack sequentially. The cabling requirements and limits for trunks are as detailed in the previous paragraphs. All cables connecting trunk circuit pairs must be connectorized.

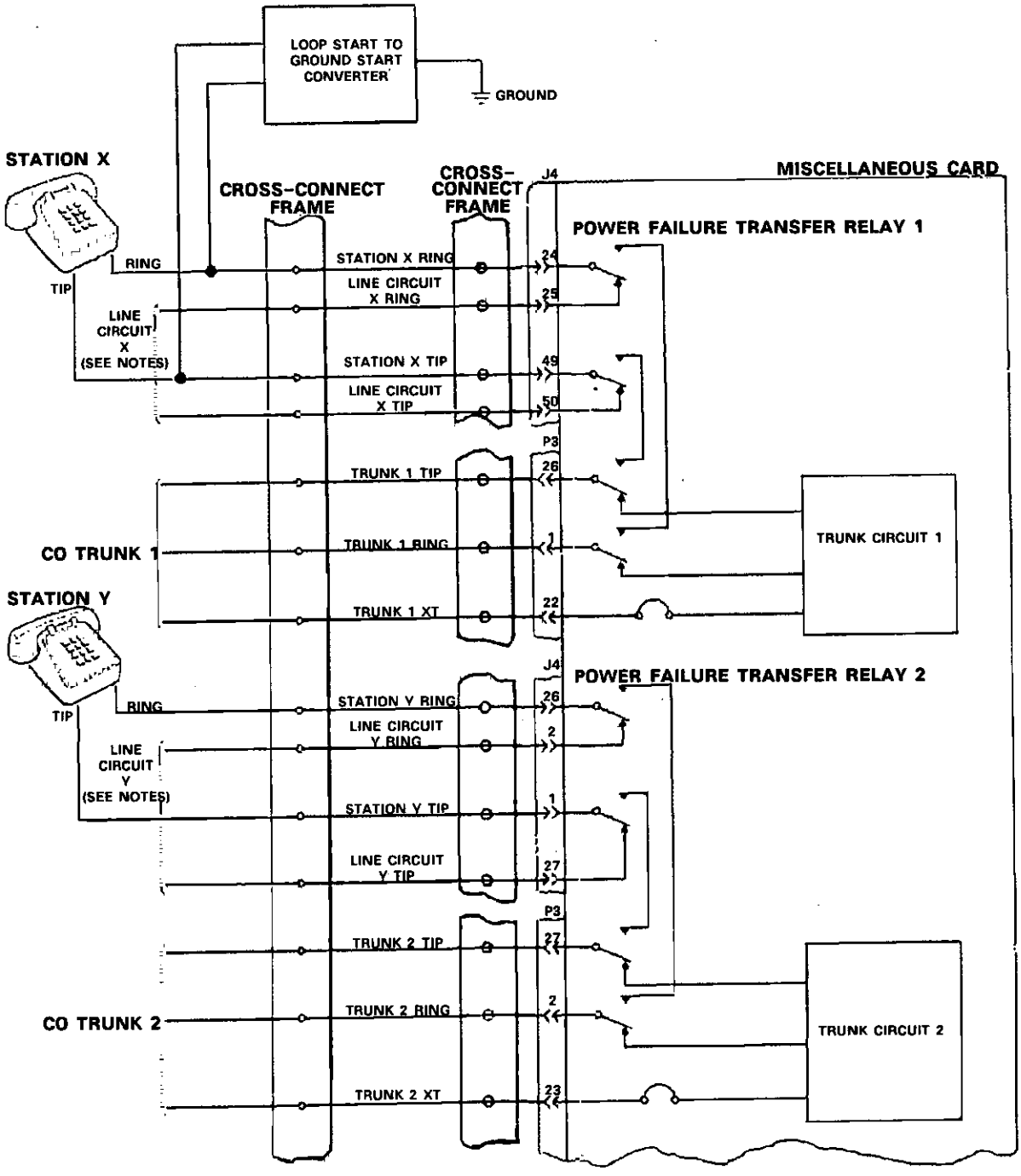
TABLE 5-1
CONSOLE CONNECTOR J-1
(Used with Personality Module PN9102-009-004-NA)

Pin Number	Color	Signal Name	Pin Number	Color	Signal Name
1	BL-W	-24 Vdc	26	W-BL	0 Vdc
2	O-W	ESG	27	W-0	
3	G-W		28	W-G	
4	BR-W	-24 Vdc	29	W-BR	0 Vdc
5	S-W		30	W-S	
6	BL-R		31	R-BL	
7	O-R	-24 Vdc	32	R-O	0 Vdc
8	G-R	ESG	33	R-G	
9	BR-R		34	R-BR	
10	S-R	-24 Vdc	35	R-S	0 Vdc
11	BL-BK	ESG	36	BK-BL	
12	O-BK		37	BK-O	
13	G-BK	-24 Vdc	38	BK-G	0 Vdc
14	BR-BK	-24 Vdc	39	BK-BR	
15	S-BK		40	BK-S	
16	BL-Y	-24 Vdc	41	Y-BL	0 Vdc
17	O-Y		42	Y-O	
18	G-Y	ESG	43	Y-G	0 Vdc
19	BR-Y	TIP	44	Y-BR	RING
20	S-Y		45	Y-S	
21	BL-V		46	V-BL	ESG
22	O-V	-24 Vdc	47	V-O	0 Vdc
23	G-V	DATAOUT R	48	V-G	DATAOUT T
24	BR-V	-24 Vdc	49	V-BR	0 Vdc
25	S-V	DATAIN R	50	V-S	DATAIN T

TABLE 5-2
INTERCONNECTING CABLES - TRUNKS AND MISCELLANEOUS (CONNECTORS P3, P8 AND J4)

Pin	Pair Color	Connector P3 (Trunks)	Connector P8 Optional Trunks		Connector J4 (Miscellaneous)	
			C.O.	E&M †‡		
26	W-BL	Trunk 1 Tip	Trunk 9 Tip	Trunk 1 Tip	Station Y Ring	Power
1	BL-W	Trunk 1 Ring	Trunk 9 Ring	Trunk 1 Ring	Station Y Tip	Failure
27	W-O	Trunk 2 Tip		Trunk 1 E	Line Circuit Y Tip	Transfer 2
2	O-W	Trunk 2 Ring		Trunk 1 SG	Line Circuit Y Ring	(refer to Figure 5-2)
28	W-G	Trunk 3 Tip	Trunk 10 Tip	Trunk 1 M	GND (refer to	
3	G-W	Trunk 3 Ring	Trunk 10 Ring	Trunk 1 SB	Figure 5-4)	
29	W-BR	Trunk 4 Tip	Trunk 9 M‡			
4	BR-W	Trunk 4 Ring	Trunk 9 MM			
30	W-S	Trunk 5 Tip	Trunk 10 M		PA-A	Paging Output
5	S-W	Trunk 5 Ring	Trunk 10 MM		PA-B	(refer to Figure 5-3)
31	R-BL	Trunk 6 Tip		Trunk 1 Tip Receive	ALARM A	Alarm Output
6	BL-R	Trunk 6 Ring		Trunk 1 Ring Receive	ALARM B	(refer to Figure 5-5)
32	R-O	Trunk 7 Tip	Trunk 11 Tip	Trunk 2 Tip		
7	O-R	Trunk 7 Ring	Trunk 11 Ring	Trunk 2 Ring		
33	R-G	Trunk 8 Tip		Trunk 2 E	PA1	Paging Circuit
8	G-R	Trunk 8 Ring		Trunk 2 SG	PA2	(refer to Figure 5-3)
34	R-BR		Trunk 12 Tip	Trunk 2 M	GND	
9	BR-R		Trunk 12 Ring	Trunk 2 SB	GND	
35	R-S		Trunk 11 M		NIGHT BELL A	(refer to Figure 5-4)
10	S-R		Trunk 11 MM		NIGHT BELL B	
36	BK-BL		Trunk 12 M			
11	BL-BK		Trunk 12 MM			
37	BK-O			Trunk 2 Tip Receive		
12	O-BK			Trunk 2 Ring Receive		
38	BK-G					
13	G-BK					
39	BK-BR					
14	BR-BK					
40	BK-S					
15	S-BK					
41	Y-BL				90 V Ringing (refer to Figure 5-4)	
16	BL-Y				-24 V (refer to Figure 5-5)	
42	Y-O					
17	O-Y					
43	Y-G					
18	G-Y					
44	Y-BR					
19	BR-Y					
45	Y-S				GND (refer to Figure 5-5)	
20	S-Y					
46	V-BL				GND	
21	BL-V					
47	V-O	Trunk 5 XT				
22	O-V	Trunk 1 XT				
48	V-G	Trunk 6 XT				
23	G-V	Trunk 2 XT				
49	V-BR	Trunk 7 XT			Station X Tip	Power
24	BR-V	Trunk 3 XT			Station X Ring	Failure
50	V-S	Trunk 8 XT			Line Circuit X Tip	Transfer 1
25	S-V	Trunk 4 XT			Line Circuit X Ring	(refer to Figure 5-2)

Notes:
† If the 12-trunk version is used, the upper line card is replaced with a Trunk Expander Card.
‡ M and MM designate Message Restriction leads. Refer to Figures 5-6 and 5-7 for typical Message Registration connections.
†‡ External ground required for Pin 2 and/or 3 plus Pin 8 and/or 9.

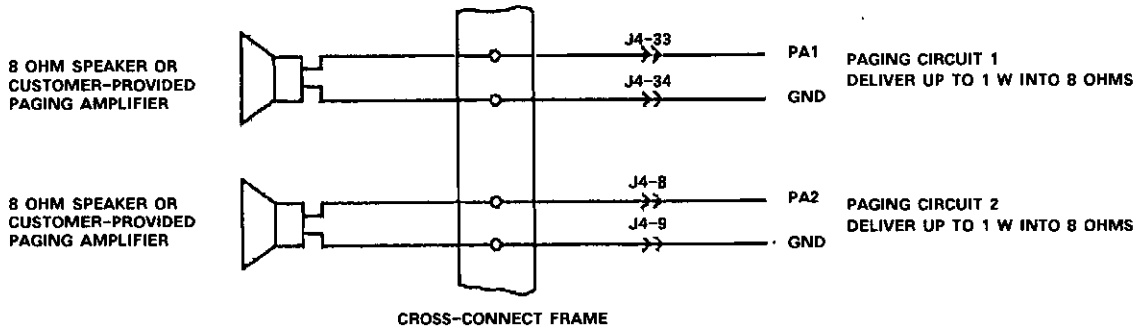


NOTES:
1. IF TRUNKS ARE GROUND START, A LOOP START TO GROUND START CONVERTER (SUCH AS MITEL'S CM1470 LOOP START TO GROUND START CONVERTER) OR A GROUND BUTTON INSTALLED ON THE TELEPHONE SET MUST BE USED TO SEIZE THE TRUNK OUTGOING.
2. SUPERSET SETS CANNOT BE USED AS POWER FAILURE TRANSFER STATIONS.

X1258R3A0

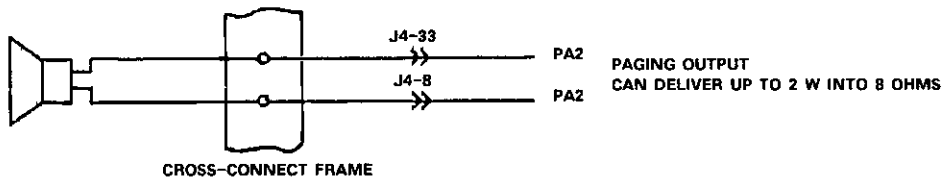
Figure 5-2 Power Failure Transfer Connections

NOTE: THERE IS ONLY ONE PAGING ACCESS. THIS CAN BE EITHER OUTPUT TO TWO SEPARATE ZONES (a), OR TO A SINGLE ZONE (b). WHEN WIRED AS IN (a) THE OUTPUT LEVELS ARE SEPARATELY ADJUSTABLE AS IN (c).

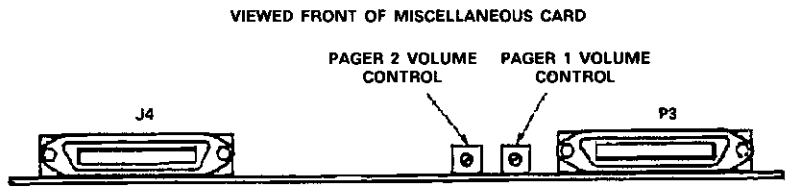


(a) WIRING DIAGRAM FOR TWO PAGING ZONES

PAGING OUTPUTS PA1 AND PA2 ARE IN ANTIPHASE AND MAY BE CONNECTED AS SHOWN BELOW TO PROVIDE AN OUTPUT OF 2 W INTO AN 8 OHM LOAD.

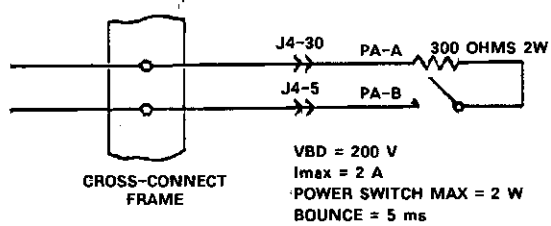


(b) WIRING DIAGRAM FOR HIGH POWER OUTPUT, SINGLE ZONE



(c) PAGING VOLUME CONTROLS (TURN CLOCKWISE TO INCREASE VOLUME)

WHEN PAGER IS OPERATED A REED RELAY CLOSES, THIS RELAY CLOSURE MAY BE USED TO CONTROL EXTERNAL PAGING EQUIPMENT.

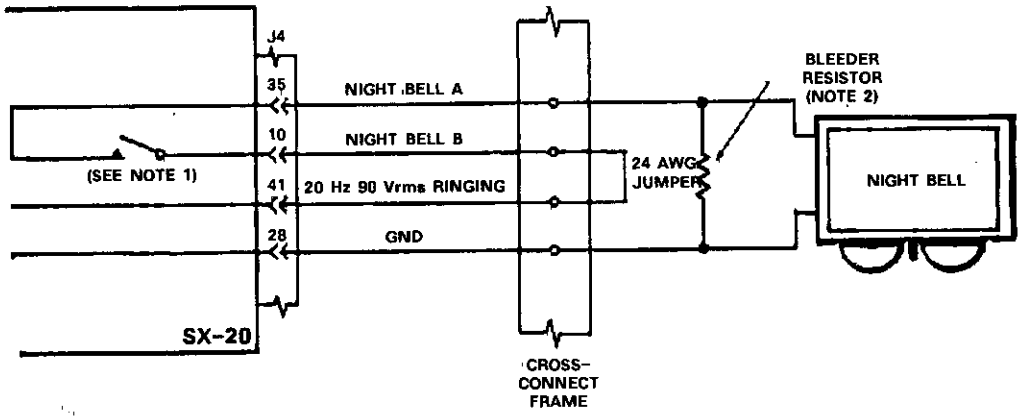


NOTE: IMPEDANCE MATCHING IS NOT REQUIRED IF CUSTOMER-PROVIDED PAGING EQUIPMENT HAS AN INPUT IMPEDANCE GREATER THAN 8 OHMS.

(d) EXTERNAL EQUIPMENT CONTROL

X1255R6A1

Figure 5-3 Paging Connections



NOTES 1: THE RELAY IS ELECTROMECHANICAL WITH THE FOLLOWING SPECIFICATIONS:

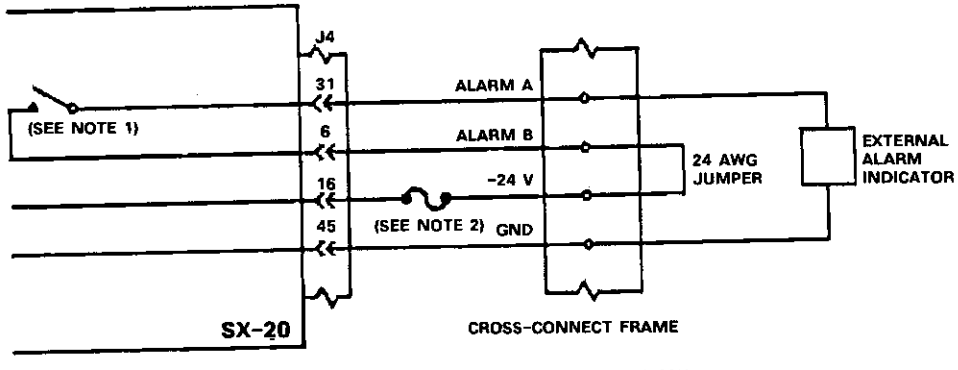
VBD = 200 V
Imax = 2 A
POWER SWITCHED = 20 W
BOUNCE = 20 ms MAXIMUM

EXTERNAL RINGING MAY BE USED IF THE LIMITATIONS IMPOSED BY THE RELAY SPECIFICATIONS ARE ADHERED TO.

2: A CUSTOMER-PROVIDED 20 TO 30 kOHMS 1/2 WATT BLEED RESISTOR MUST BE CONNECTED ACROSS THE NIGHT BELL RINGER.

X1256R5A0

Figure 5-4 Night Bell Connections



NOTES 1: THE RELAY IS ELECTROMECHANICAL WITH THE FOLLOWING SPECIFICATIONS:

VBD = 200 V
Imax = 2 A
POWER SWITCHED = 20 W
BOUNCE = 20 ms MAXIMUM

EXTERNAL RINGING MAY BE USED IF THE LIMITATIONS IMPOSED BY THE RELAY SPECIFICATIONS ARE ADHERED TO.

2: IF THE SYSTEM -24 V SUPPLY IS USED TO DRIVE AN EXTERNAL ALARM INDICATOR A 0.5 AMP FUSE (FAST BLOW) MUST BE PROVIDED.

X1260R6A1

Figure 5-5 Alarm Connections

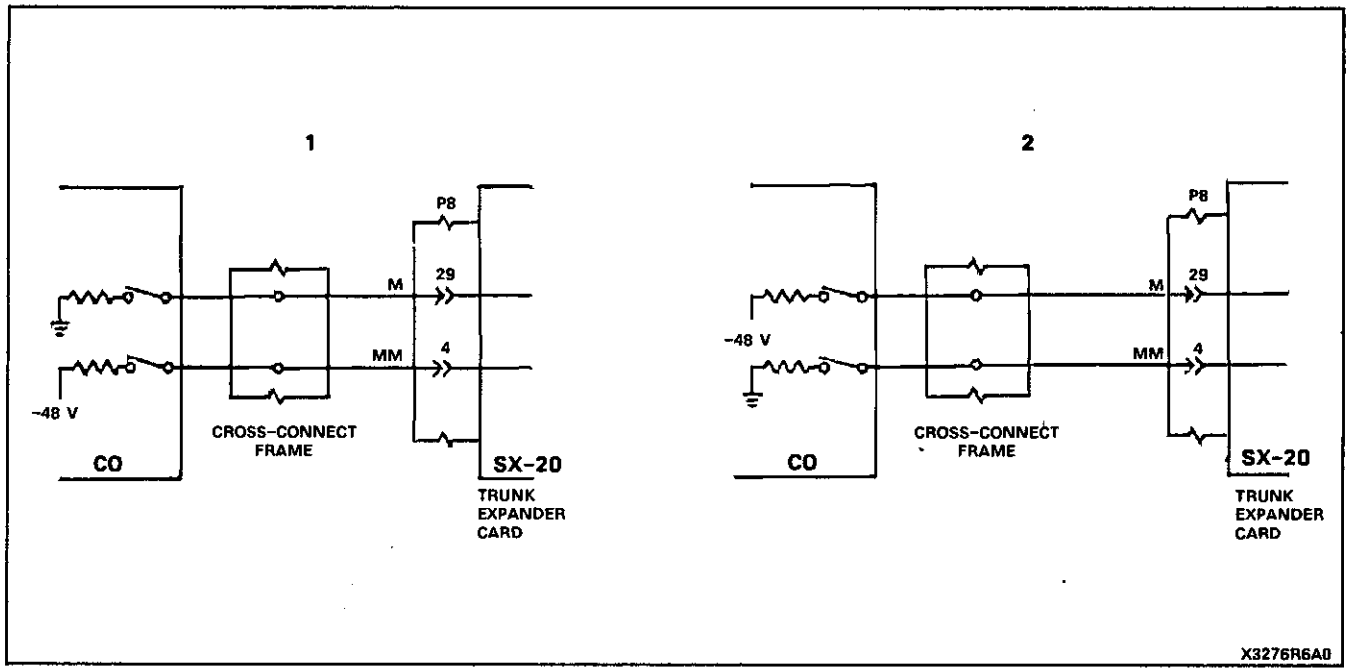


Figure 5-6 Examples of 2-Wire Message Registration

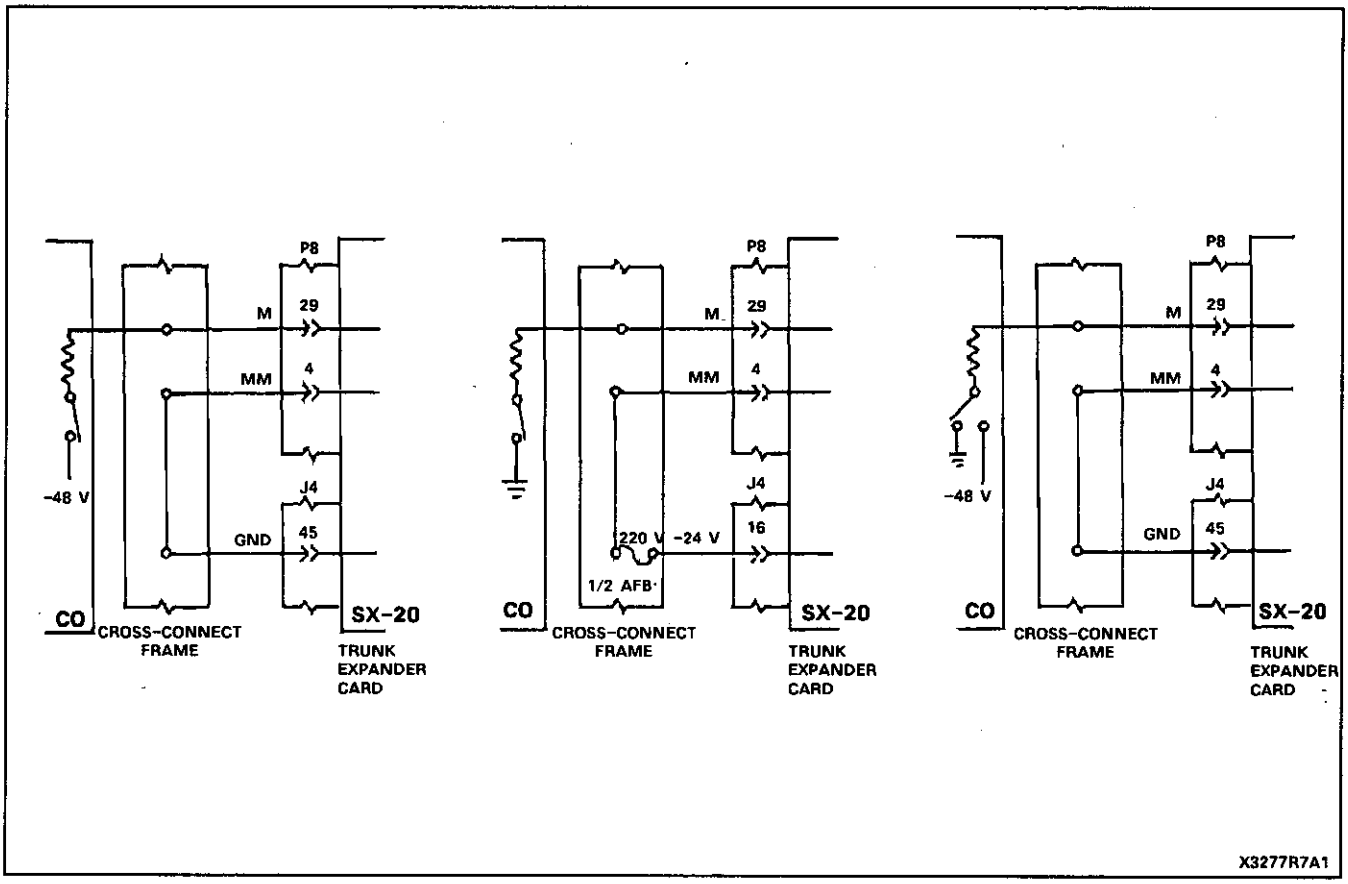


Figure 5-7 Examples of 1-Wire Message Registration

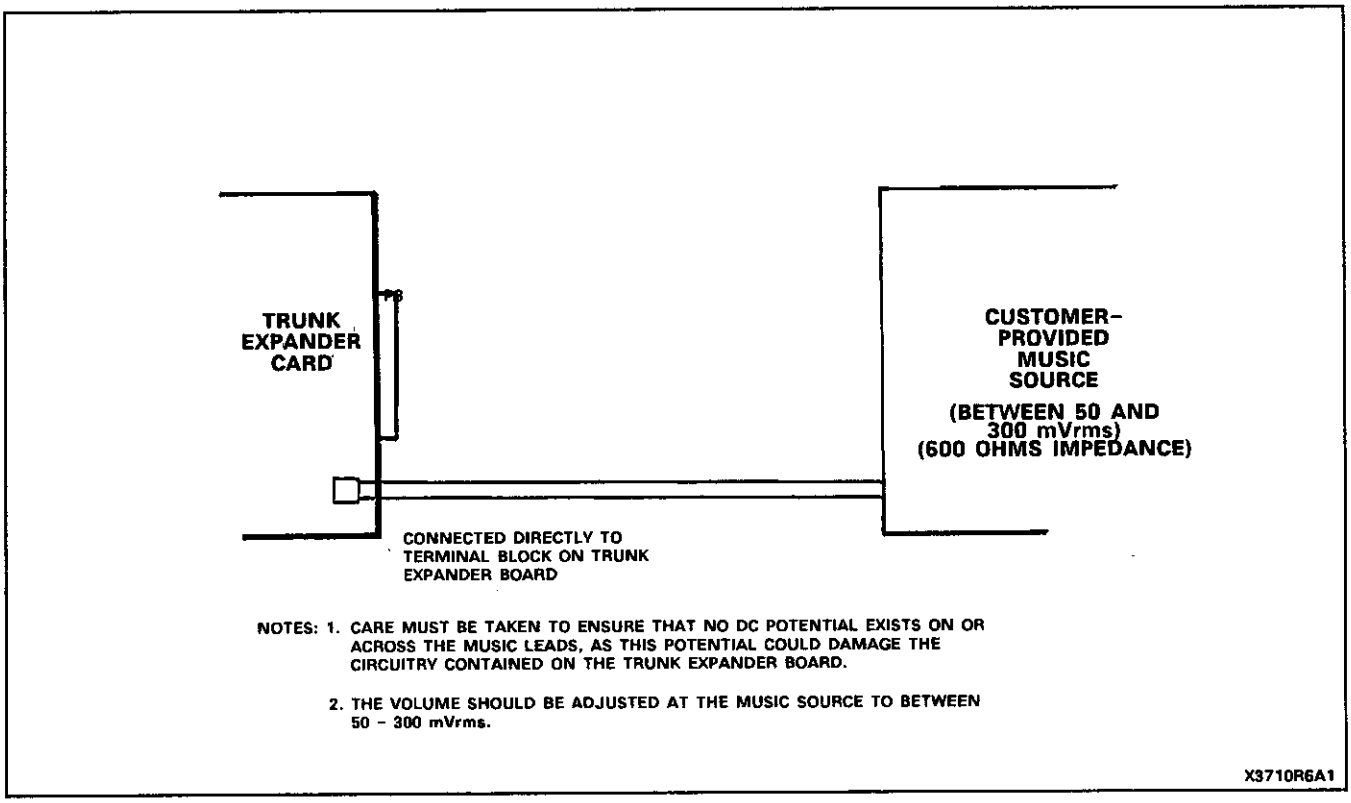


Figure 5-8 Music on Hold

6. INSTALLATION CHECKLIST

Before Power-up

6.01 The following items should be checked before the SX-20 system is powered-up, to ensure there will not be any damage to the system. The points to note are:

- Verify PABX grounding using the procedure detailed in Appendix B, MAP200-009.
- Ensure the PROM/RAM card is seated and installed correctly on the CPU II Card.
- The battery backup switch on the PROM/RAM Module should be turned on just before the system is powered-up.
- Ensure DTMF Receivers are installed correctly.
- Ensure trunk ground start, loop-start switches are set correctly (CO trunks only).
- Ensure Trunk Modules are seated and installed correctly.
- Ensure the CPU II, Miscellaneous, Line and Trunk Expander Cards are seated firmly in their respective backplane connectors.

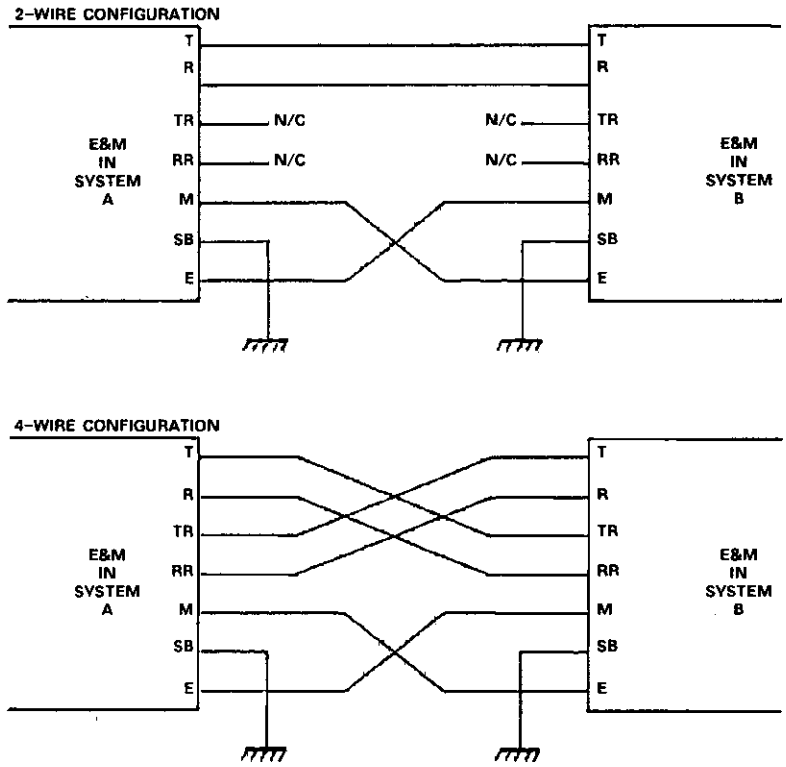


Figure 5-9 E&M Trunk Wiring

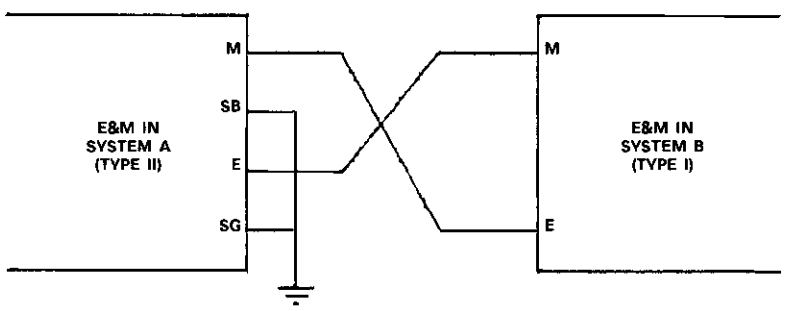


Figure 5-10 E&M Inferfacing

- Ensure that the proper personality module is installed on the universal console connector card and that all cabling to the console is correct.

- Ensure switches on CPU II Card are set correctly for:

  - Wall-mount or desk-mount

  - Automatic diagnostics enabled

  - 2- or 3-digit numbering plan

  - Equipment 01 as Test Line or station

  - Configuration Switch 8 closed.

After Power-up

6.02 Once the before power-up checklist has been verified and the system has been powered-up, check the following points:

- Check power supply voltages and ensure that they are within specifications.

- Ensure default data has been loaded correctly.

- Ensure dial tone is present at the test line when off-hook.

- Ensure the clock display can be set to the correct time.

- Let the system idle for 10 minutes and ensure that there are no alarms.

- Program the SX-20 system.

After Programming

6.03 After the system is running smoothly for 10 to 15 minutes, check the following:

- Ensure dial tone is present on stations.

- Check trunk polarity; make sure Tip and Ring are not reversed.

- Ensure that trunks can be seized outgoing. If not refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance.

- Measure loop current on all trunks (with trunk in the seized condition) and make sure it falls within the limits of 23 mA and 65 mA.

- Ensure trunks function incoming, if not refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance.

- Ensure all features function correctly. Refer to Section MITL9102-095-105-NA, Features Description and Section MITL9102-095-215-NA, System Test Procedures.

- Ensure that dial tone received from central office is at a level of - 26 dBm to - 10 dBm with a noise level of 40 dBrnc.

Synopsis

6.04 The following paragraphs contain a synopsis for each of the MAPs included in Appendix B, Installation Procedures. These outlines may be used by the experienced installer, consequently the contents of the MAPs may then be used only as a reference. Table 6-1 lists equipment installation procedures.

TABLE 6-1
EQUIPMENT INSTALLATION

Step	Procedure	Map
1.	Grounding Procedure	MAP200-000
2.	Equipment Unpacking	MAP200-001
3.	Install Equipment Cabinet	MAP200-002
4.	System Installation	MAP200-003
5.	Station Number Installation	MAP200-004
6.	Remote Display Installation	MAP200-005
7.	SUPERSET 4 Set Installation	MAP200-006
8.	Console Installation	MAP200-007
9.	Console Designations	MAP200-008
10.	Ground Lug Installation	MAP200-009
11.	Program System	MITL9102-095-210-NA
12.	System Test Procedures	MITL9102-095-215-NA

6.05 Grounding Procedure, MAP200-000. A proper ground must be supplied for the SX-20 system in accordance with the grounding information in paragraph 4.06. MAP200-000 discusses the implementation of a proper ground.

6.06 Equipment Unpacking, MAP200-001:

- Open equipment cabinet carton

- Open console carton if required

- Remove console if required. Remove the SX-20 equipment cabinet

- Store shipping material.

6.07 Install Equipment Cabinet, MAP200-002:

- Remove equipment cover
- Inspect equipment
- Report any missing and/or defective items
- If the system is to be desk-mounted - place in required position
- If the system is to be wall-mounted -
    - mount backboard, if required
    - use the template and insert mounting bolts (leave 1.9 cm (.75 in.) of bolts exposed)
    - mount system and tighten bolts
- Attach approved ground to system. Refer to MAP200-000.

6.08 System Installation, MAP200-003:

- Unpack accessory bag
- Unpack CPU II Card
- Loosen the two card retainers
- Unpack and install PROM/RAM module
- Unpack and install RMAT module (optional)
- Set CPU II Card switches to closed
- Set Switch 1 to OPEN if the SX-20 system is wall-mounted
- Set Switch 6 to OPEN if Equipment Number 01 used as a Test Line
- Set Switch 7 to OPEN if 2-digit default station data required
- **Install CPU II Card**
- Unpack Miscellaneous Card
- Unpack Trunk Modules
- Set Loop/Ground Start switches
- Install Trunk Modules

- Install cable to Universal Console Connect Card (UCC) if required
- **Install Miscellaneous Card**
- **Install Line Card(s)**
- Unpack Trunk Expander Card if required then –
  - unpack, set switches (on CO Trunk Modules only) and install Trunk Modules
  - unpack and install DTMF Receivers
- **Install Trunk Expander Card**
- Tighten card retainer
- Connect line, trunk and miscellaneous connectors
- Connect remote display cable, if required
- Close hinged side of cabinet
- Set power switch to OFF
- Plug in power cord
- Mail warranty and survey cards.

6.09 Station Number Installation (Cabinet), MAP200-004:

- Remove cover
- Locate Station 1 on faceplate
- Attach station numbers in correct order
- Attach clear plastic overlay to faceplate
- Replace cover.

6.10 Remote Display Installation, MAP200-005:

- Unpack Remote Display
- Remove cover
- Attach station numbers
- Replace cover
- Attach table stand

- Check for correct cable
- Run and connect cable using the Remote Display Connector Kit if required
- Turn power ON
- Adjust the power adjustment screw.

6.11 SUPERSET 4 Set Installation, MAP200-006:

- Attach Rear Support
- Connect Handset Cord
- Identify and Install Telephone
- Identification Number Card
- Identify and Install Line Identification Card
- Connect the SUPERSET 4 set to wall jack
- Test the SUPERSET 4 set.

Notes:

- Do not connect SUPERSET sets to standard lines.
- Do not connect SUPERSET sets in parallel.
- Do not connect SUPERSET sets as Power Fail Transfer stations.
- Do not use a hand test telephone (buttinski) to check SUPERSET lines.

6.12 Console Installation, MAP200-007:

- Ensure that UCC Card is installed
- Ensure that CPU II and Miscellaneous ribbon cables are installed
- Install console cable
- Ensure that Personality Module is installed
- Plug in handset.

6.13 Console Designations, MAP200-008:

- Unpack console designations
- Type in appropriate words for DSS keys

- Install designation strips using appropriate designations for programmable keys.

6.14 **Ground Lug Installation, MAP200-009.** This MAP details proper ground lug installation for the older SX-20 systems that may require updating.

APPENDIX A
MITEL ACTION PROCEDURES

GENERAL

A1.01 Task orientated functions in this Section are implemented using MITEL Action Procedures (MAPs).

A1.02 A MAP is a step-by-step procedure using a flow chart principle, written and illustrated, where necessary, to a level of detail that allows both experienced and inexperienced personnel to carry out the tasks detailed. A MAP contains three levels of information as follows:

(a) **SYNOPSIS.** This level contains the instructions required to complete the procedure.

(b) For experienced personnel, a series of steps (level one), each numbered (n) and annotated with minimal information.

(c) For inexperienced personnel, each step referred to in (b) above is amplified by a connected series of numbered substeps (nA) (level two).

A1.03 A typical example of a MAP is shown in Figure A1-1, with levels (b) and (c) detailed.

MAP SYMBOLS

A1.04 There are four basic symbol shapes which may be used in a MAP, and are defined as follows.

A1.05 AND Block. Indicates a level one step that must be performed. Consists of a square with the word AND centered in the block.

A1.06 Rectangle Block. The rectangle borders instructions which imply that the operations must perform a task outside the scope of the MAP. The text is centered in the rectangle.

A1.07 Decision Block. Indicates a decision within the level one steps which must be made. The symbol is based on the hexagon with the top and bottom sides extended. Decision text is centered in the symbol.

A1.08 START/FINISH/Jump To Block: Indicates the start and finish of a MAP. Also indicates "jump to" points with the MAP, for example "go to (n)" or "return to (n)". The symbol is a rectangle with semicircular ends. Text is centered in the symbol.

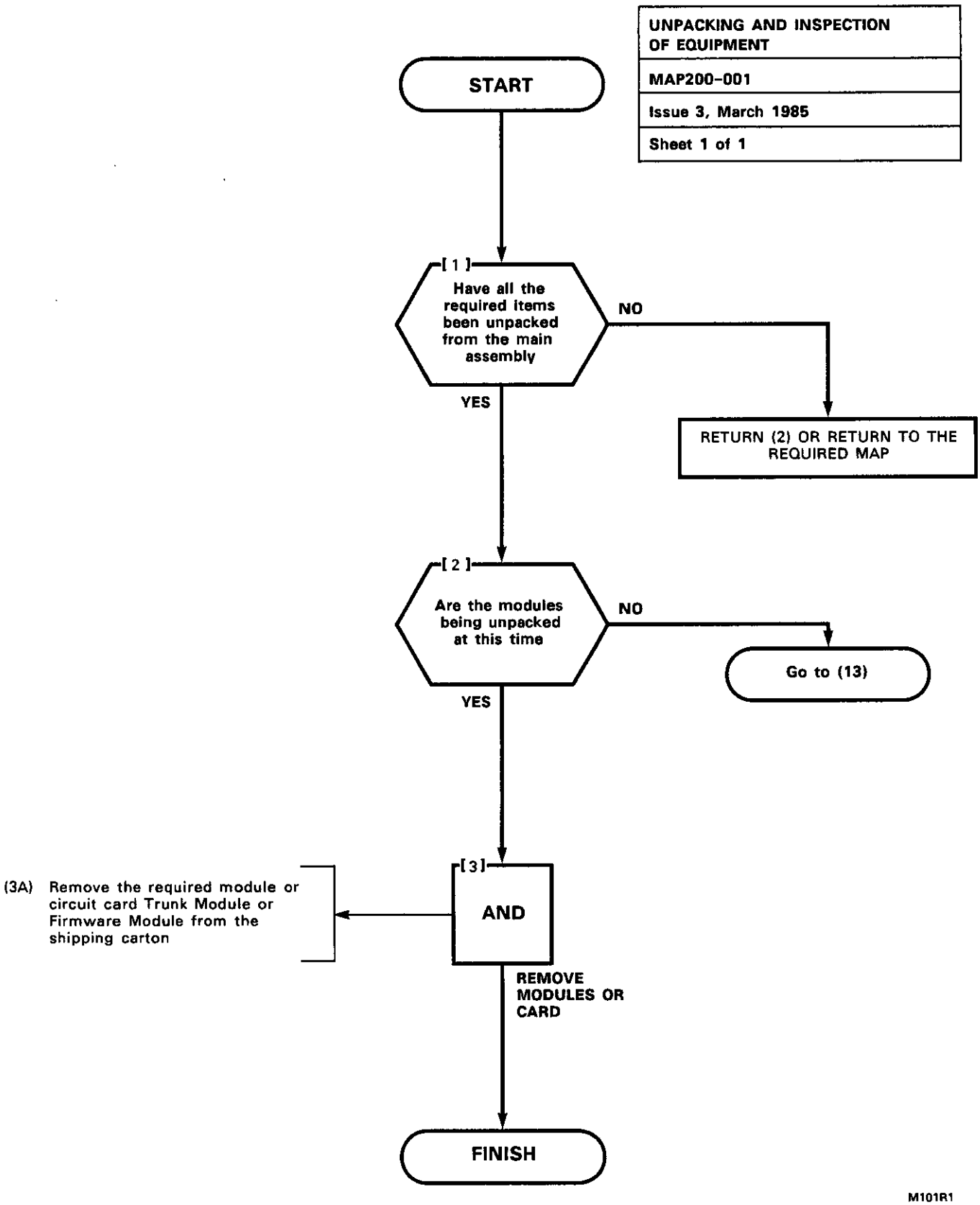


Figure A1-1 Typical Map Page

THE OPERATOR'S USE OF MAPS

Experienced Operator

A1.09 For the experienced operator to complete a task using a MAP, reference to the sequential short form level one steps is usually all that is necessary. Using Figure A1-1 as an example, the experienced operator proceeds as follows.

A1.10 At decision block (1) the experienced operator makes a decision based on the information within the block. Depending on whether the answer is YES or NO, the operator must then proceed to another MAP, decision block or action block within the same MAP, or to a FINISH/Jump To block.

A1.11 The description of the instructions carried out in paragraphs A1.05 and A1.06 have assumed that the level of competence of the operator is such that, form level one steps contain sufficient information, and therefore the operator reads only the center column of the MAP, top to bottom of the page.

Inexperienced Operator

A1.12 If the operator's experience is such that the level one instructions do not contain sufficient information, refer to the level two substeps. They are located on the left side of each AND block, with each individual instruction numbered with the AND block, number and consecutive lettering.

TOOLS, TEST EQUIPMENT AND SPECIAL INSTRUCTIONS

A1.13 All tools, test equipment and special instructions that the operator requires to complete a procedure are stated on the first page of each MAP.

APPENDIX B

INSTALLATION PROCEDURES

1. GENERAL

B1.01 The following MAPs detail the procedures required to complete the physical installation of an SX-20 communications system. For programming instructions refer to Section MITL9102-095-210-NA, System Programming.

TABLE B1-1
MAP INDEX

Map	Page
MAP200-000 Grounding Procedure	B-3/4
MAP200-001 Equipment Unpacking	B-5
MAP200-002 Install Equipment Cabinet	B-17
MAP200-003 System Installation	B-25
MAP200-004 Station Number Installation (Cabinet)	B-49
MAP200-005 Remote Display Installation	B-59
MAP200-006 SUPERSET 4 Set Installation	B-65
MAP200-007 Console Installation	B-69
MAP200-008 Console Designations	B-77
MAP200-009 Ground Lug Installation	B-81

Caution: Caution is necessary, during installation and maintenance of the SX-20 system to avoid possible damage to the system electronics by static discharge. The use of a "Static Protection Wrist Strap" attached to the Console Connector Card (refer to Figures B1-1 and B1-2) is a simple method of avoiding static discharge damage.

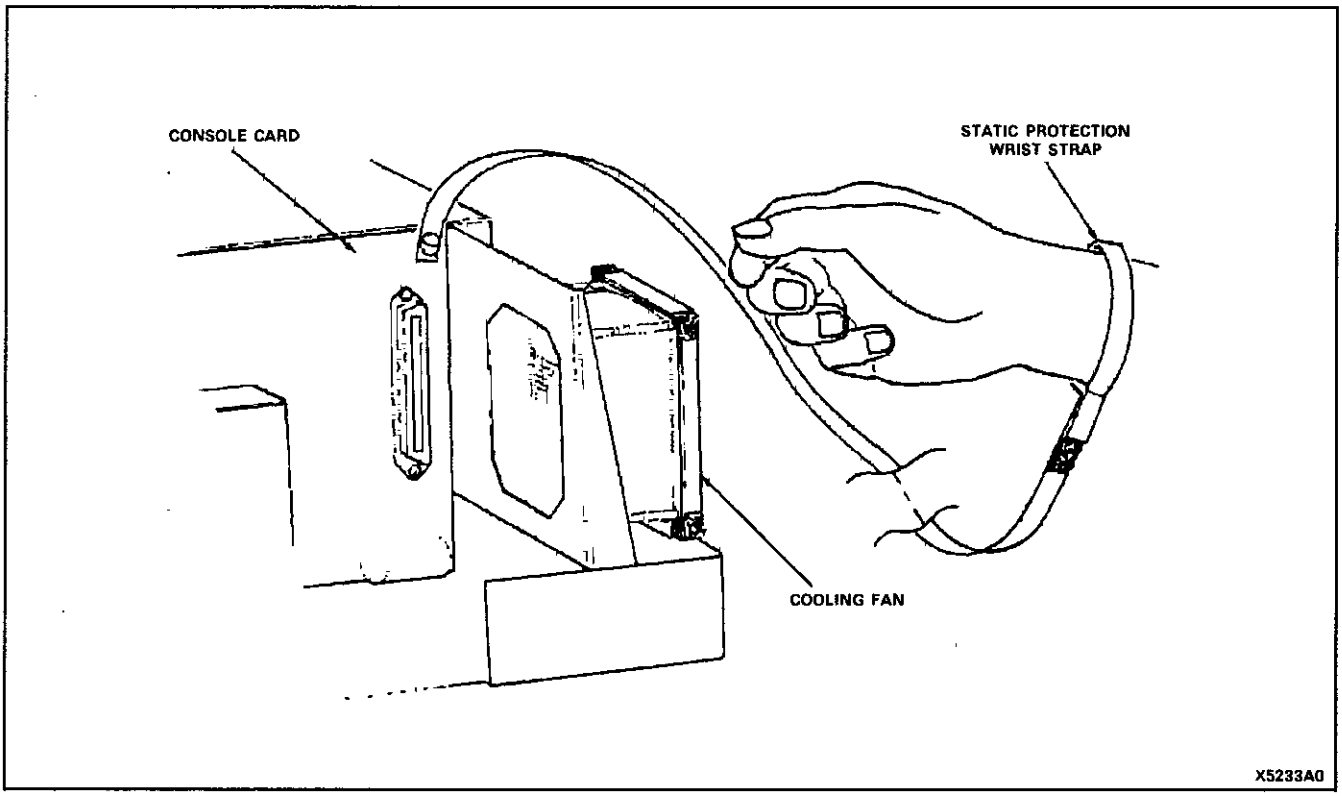


Figure B1-1 Grounding

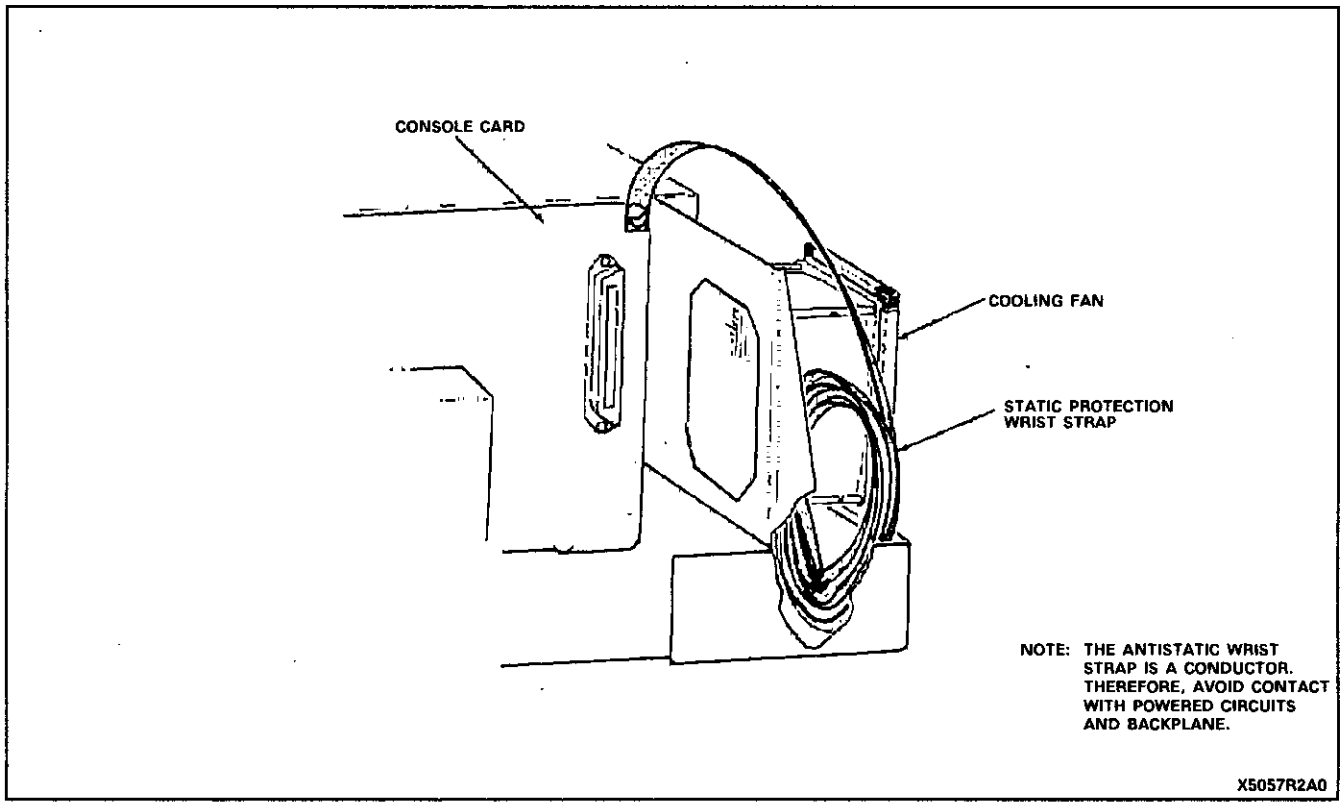
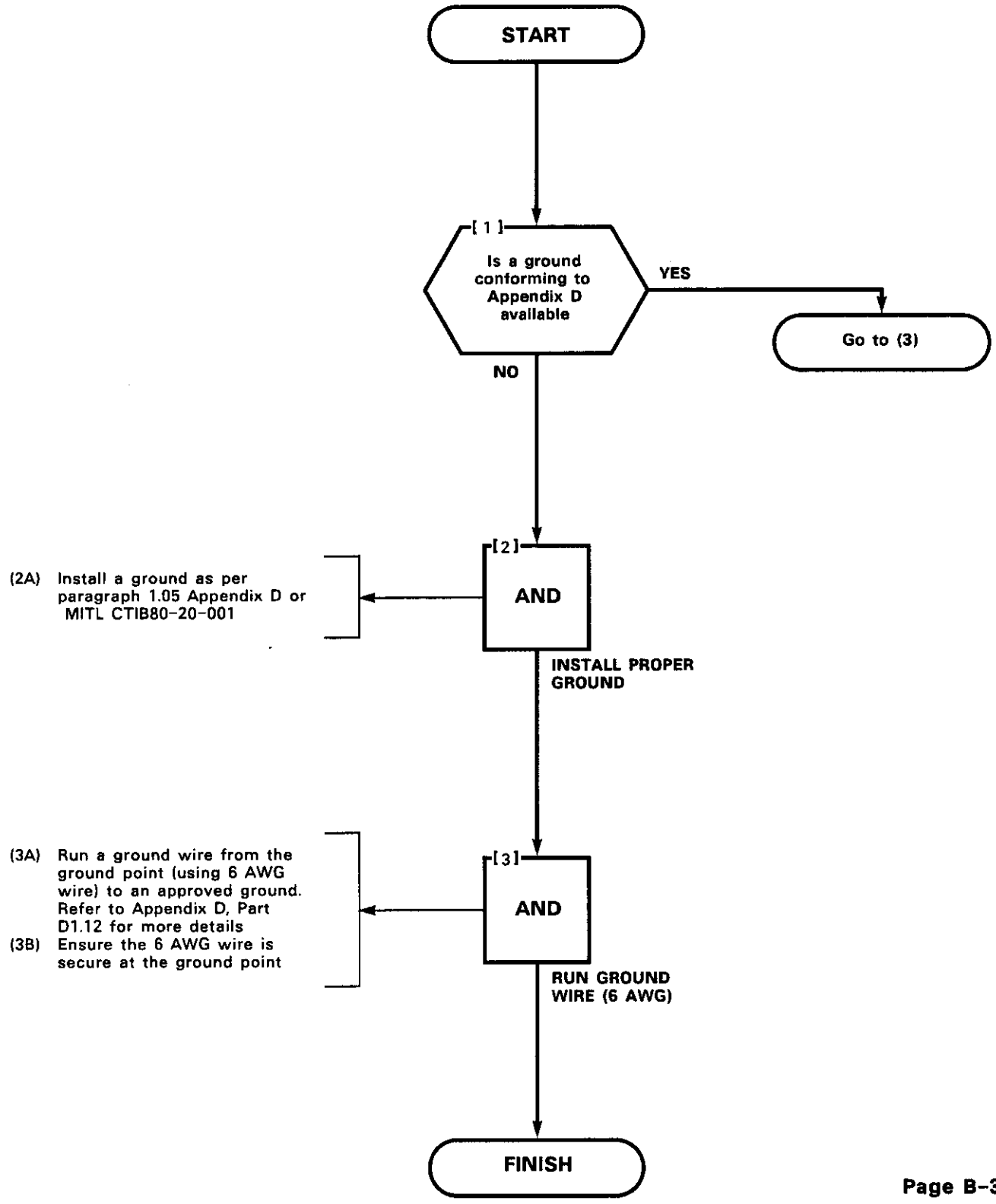
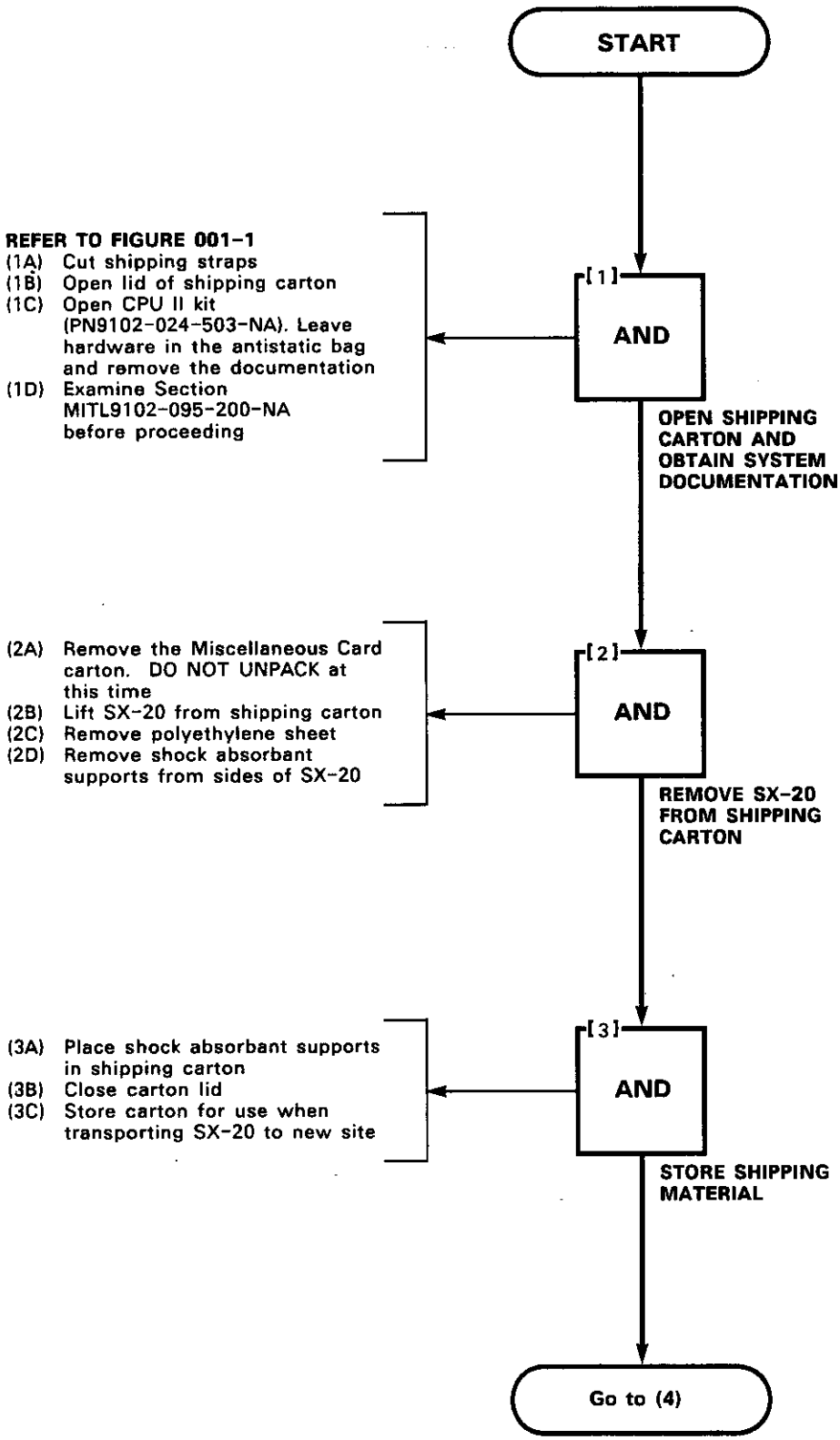


Figure B1-2 Recommended Wrist Strap Storage Location

GROUNDING PROCEDURE
MAP200- 000
Issue 3, March 1985
Sheet 1 of 1



EQUIPMENT UNPACKING
MAP200-001
Issue 3, March 1985
Sheet 1 of 11



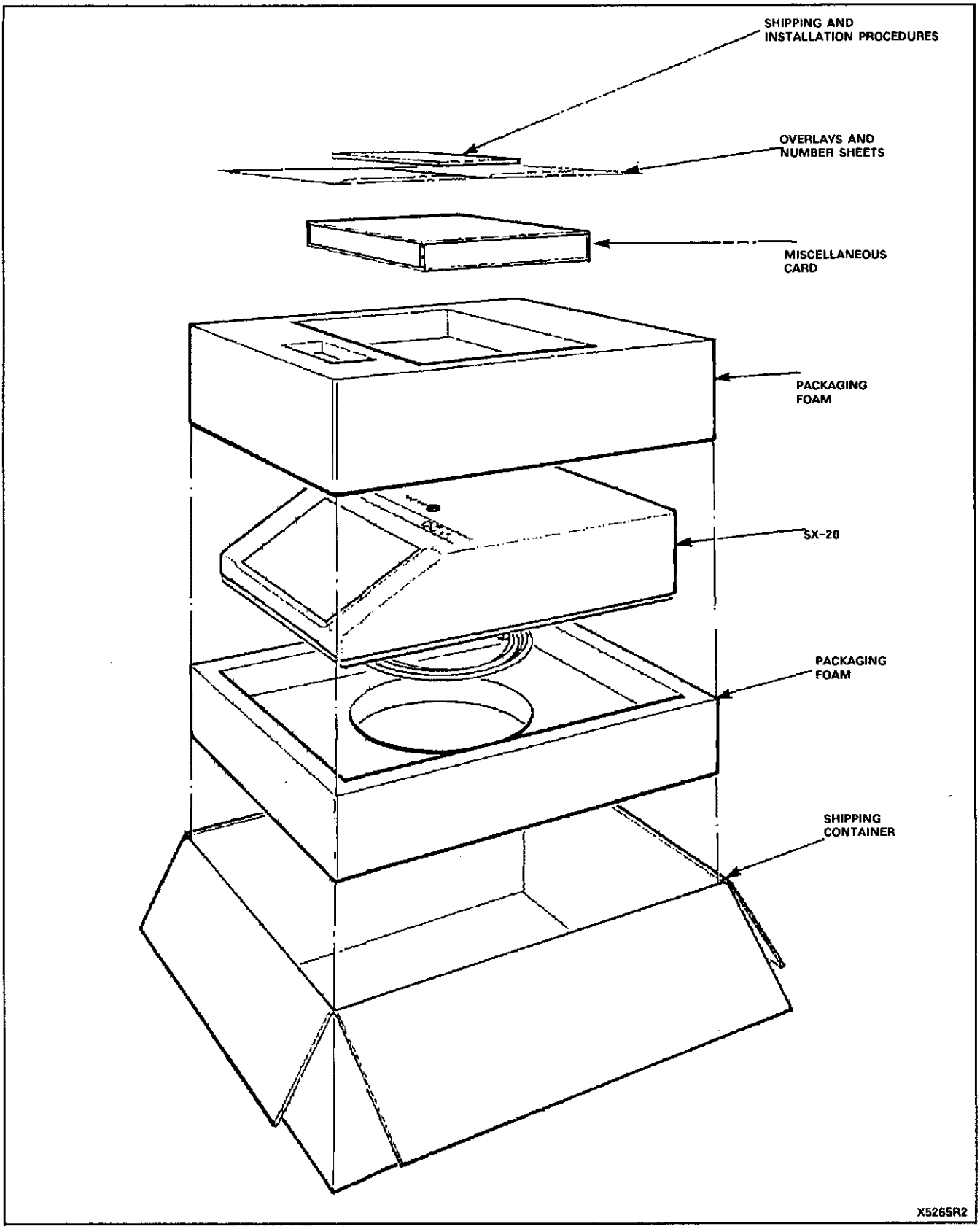
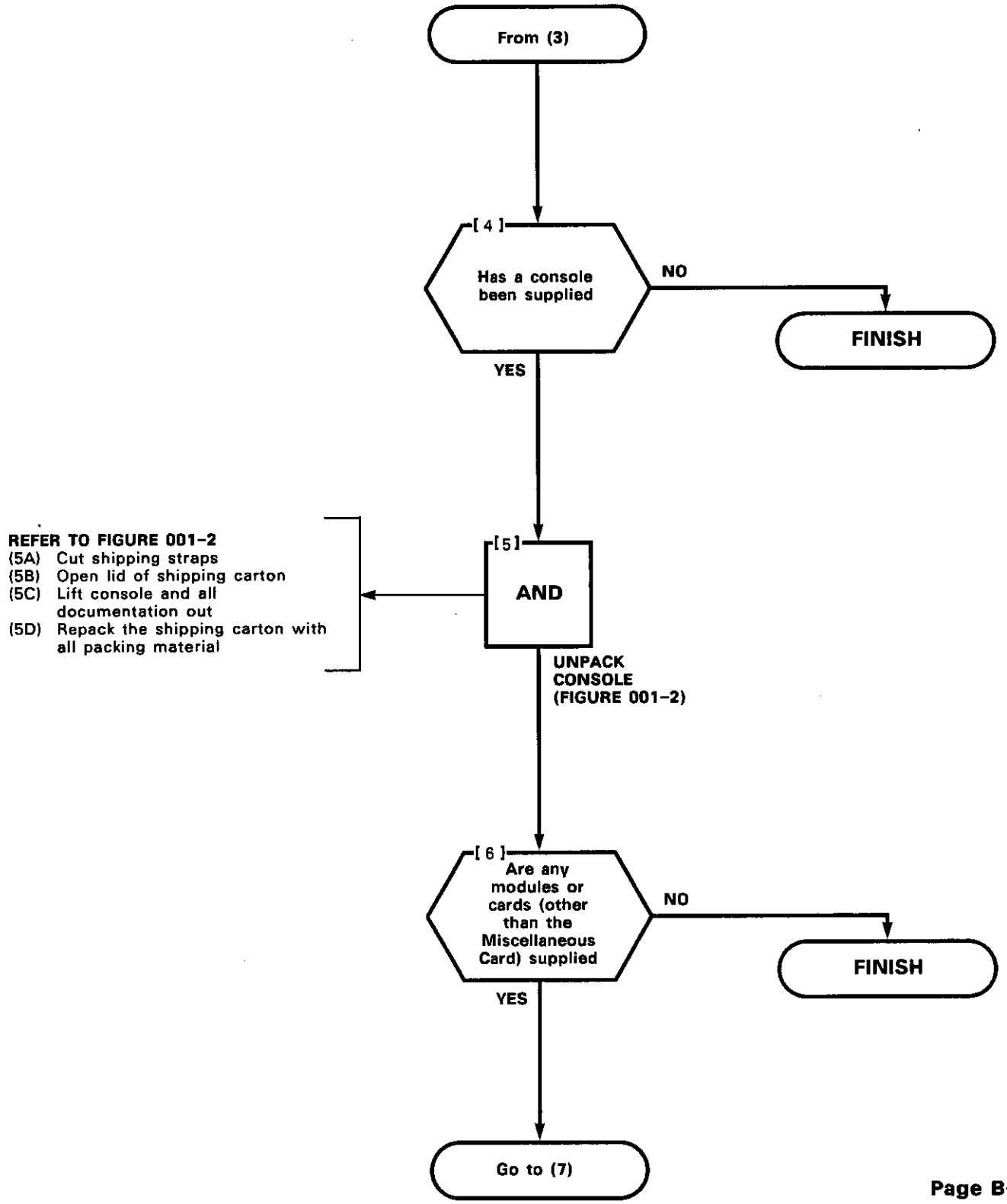


Figure 001-1 SX-20 Packaging

EQUIPMENT UNPACKING
MAP200- 001
Issue 3, March 1985
Sheet 3 of 11



EQUIPMENT UNPACKING
MAP200- 001
Issue 3, March 1985
Sheet 4 of 11

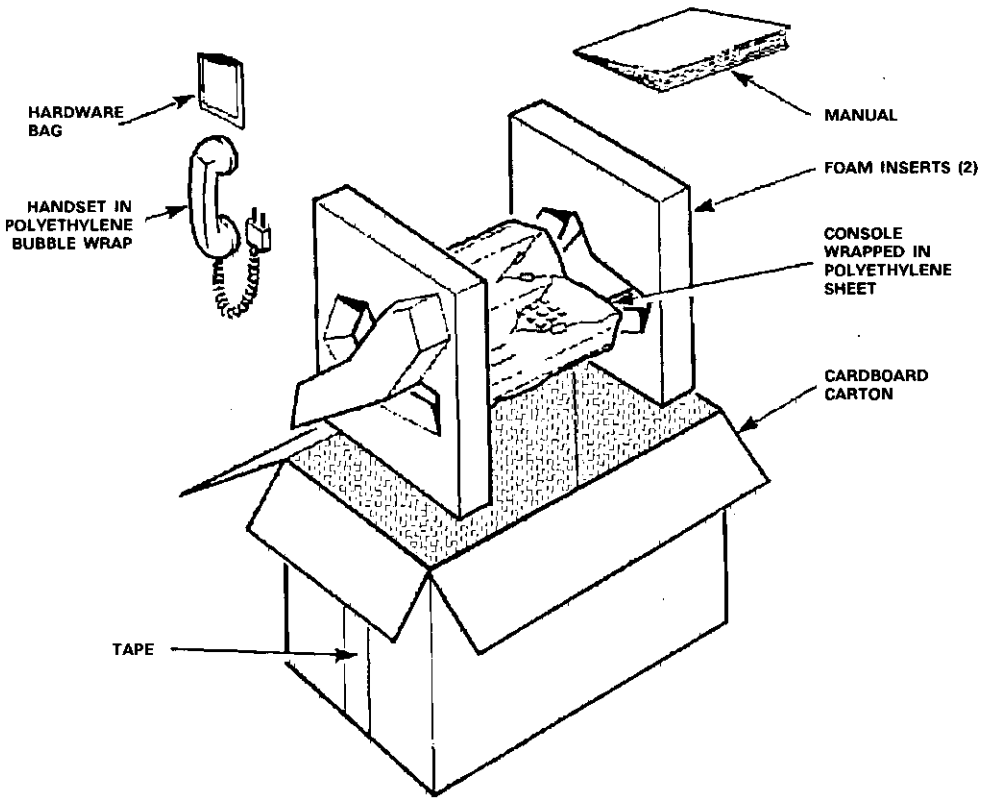
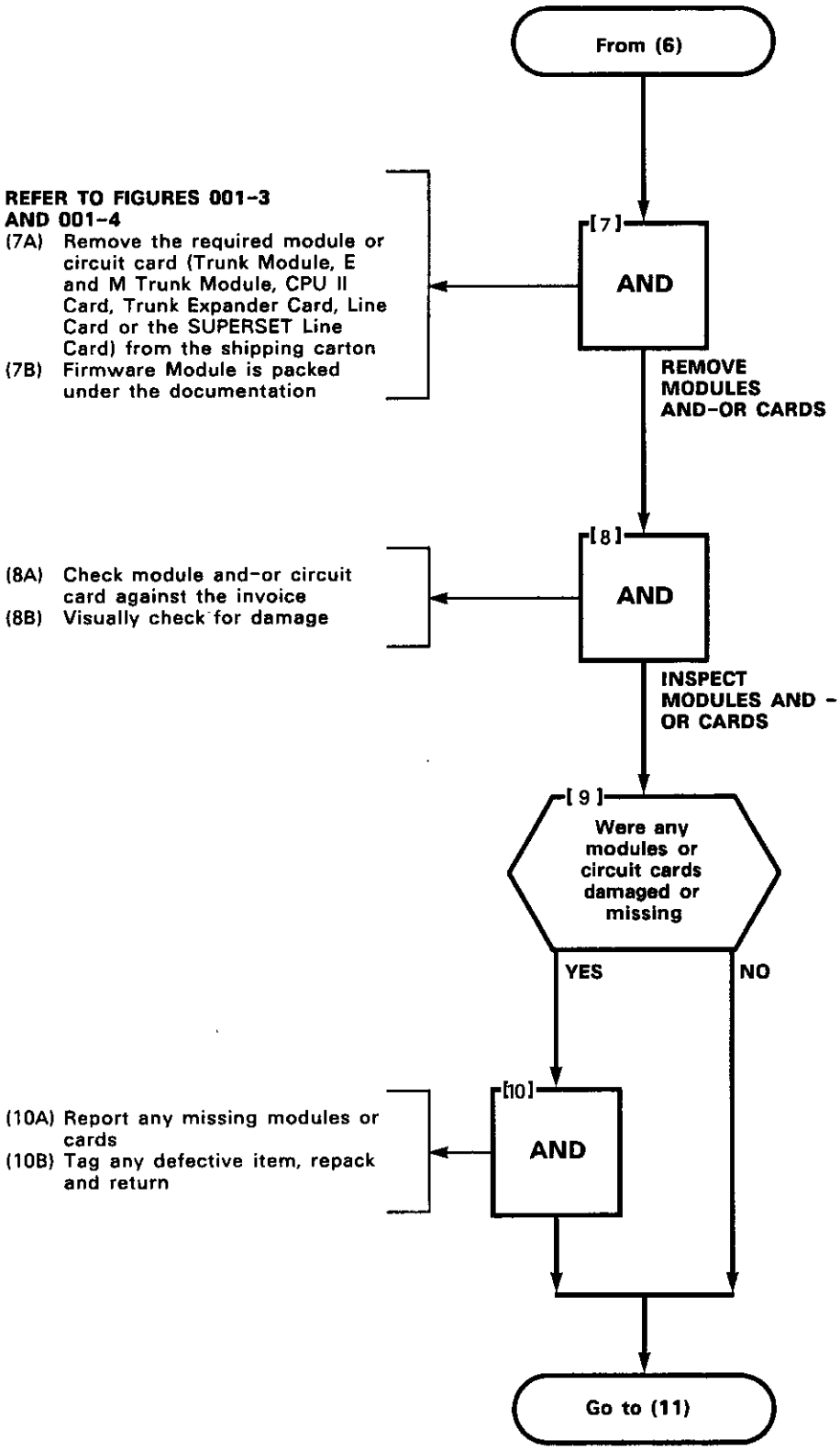


Figure 001-2 Attendant Console Packaging

EQUIPMENT UNPACKING
MAP200-001
Issue 3, March 1985
Sheet 5 of 11



EQUIPMENT UNPACKING
MAP200- 001
Issue 3, March 1985
Sheet 6 of 11

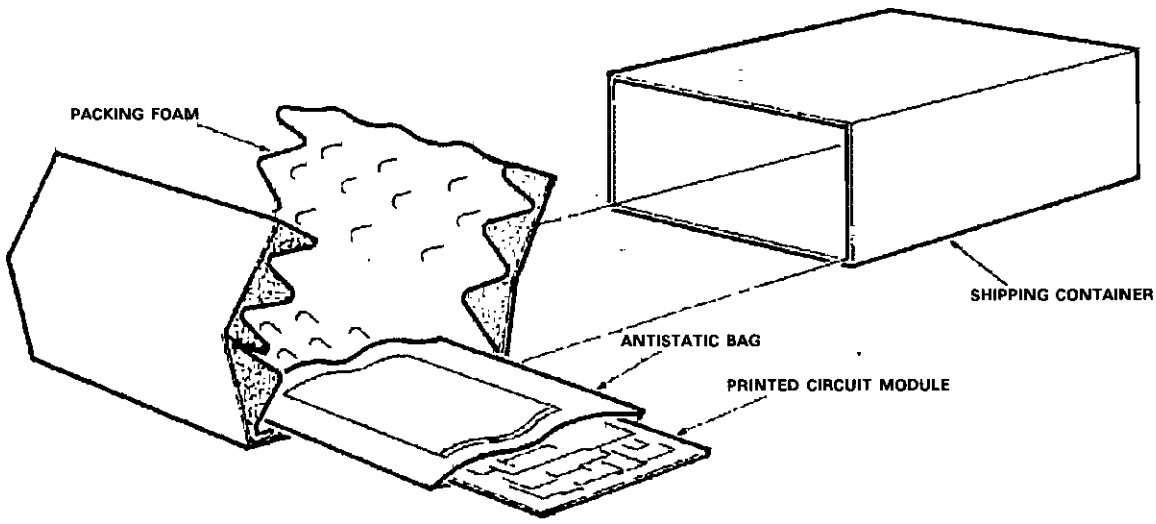


Figure 001-3 Printed Circuit Card Packaging

EQUIPMENT UNPACKING
MAP200- 001
Issue 3, March 1985
Sheet 7 of 11

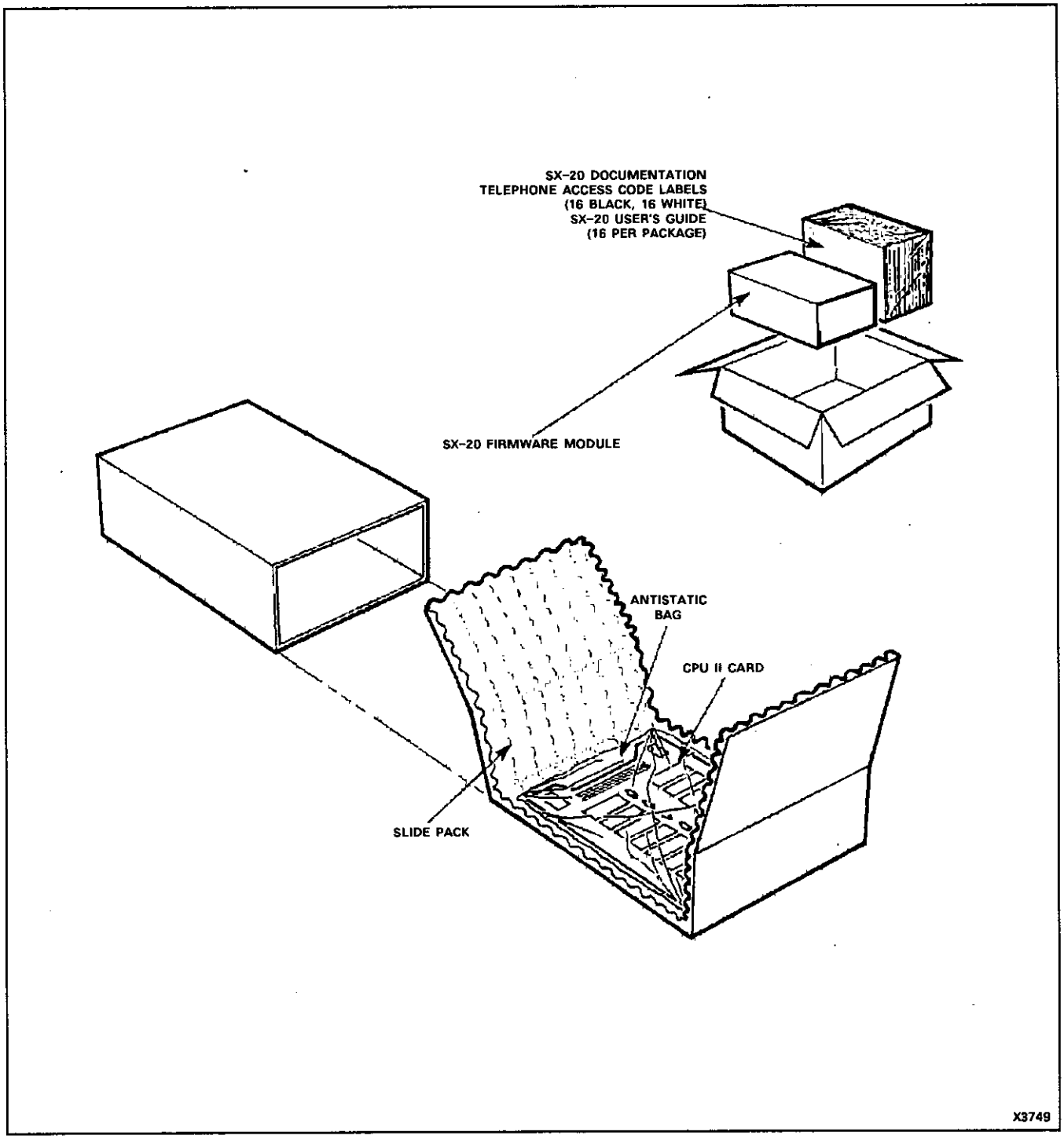
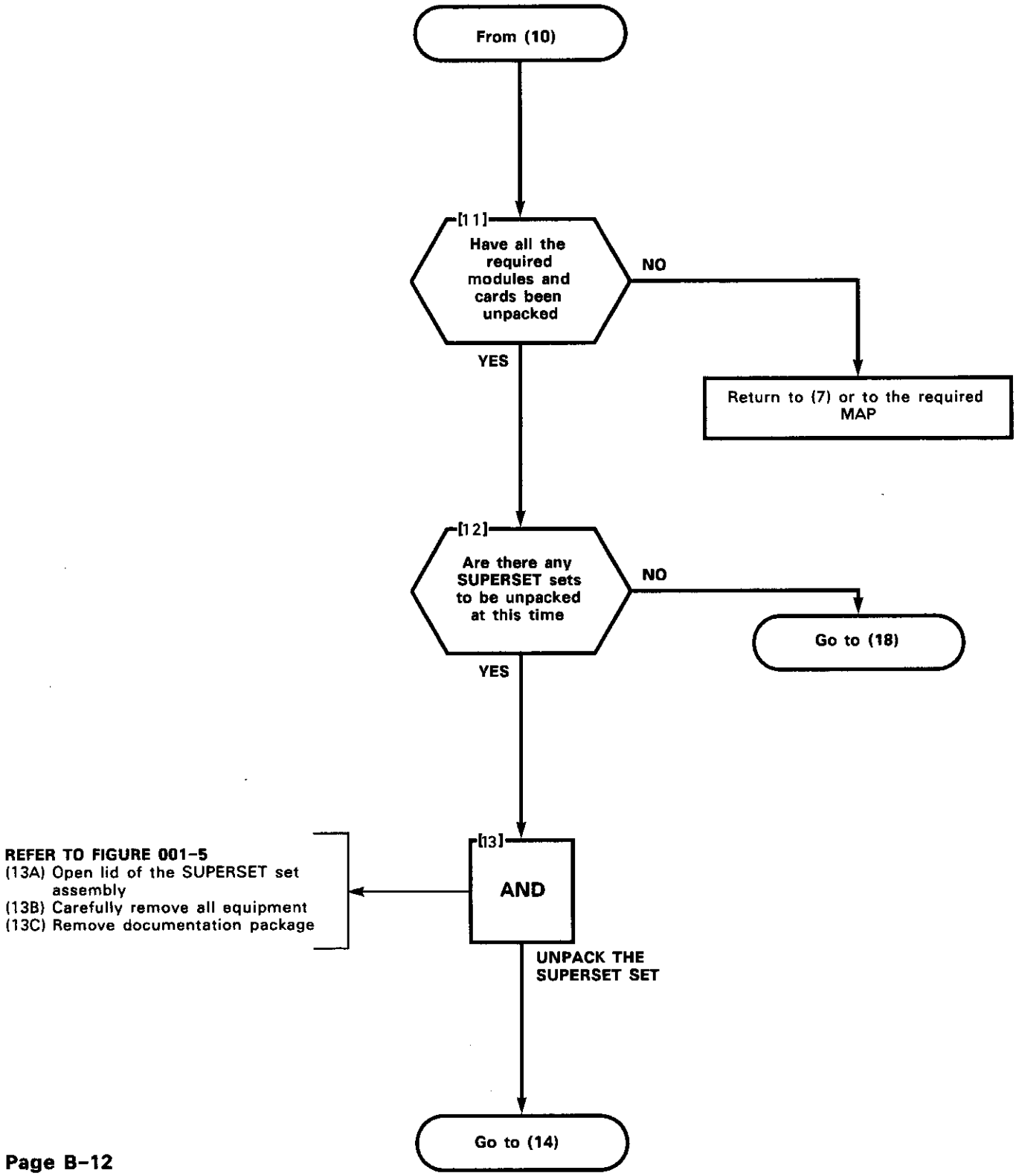


Figure 001-4 Firmware and Documentation Packaging

EQUIPMENT UNPACKING
MAP200- 001
Issue 3, March 1985
Sheet 8 of 11



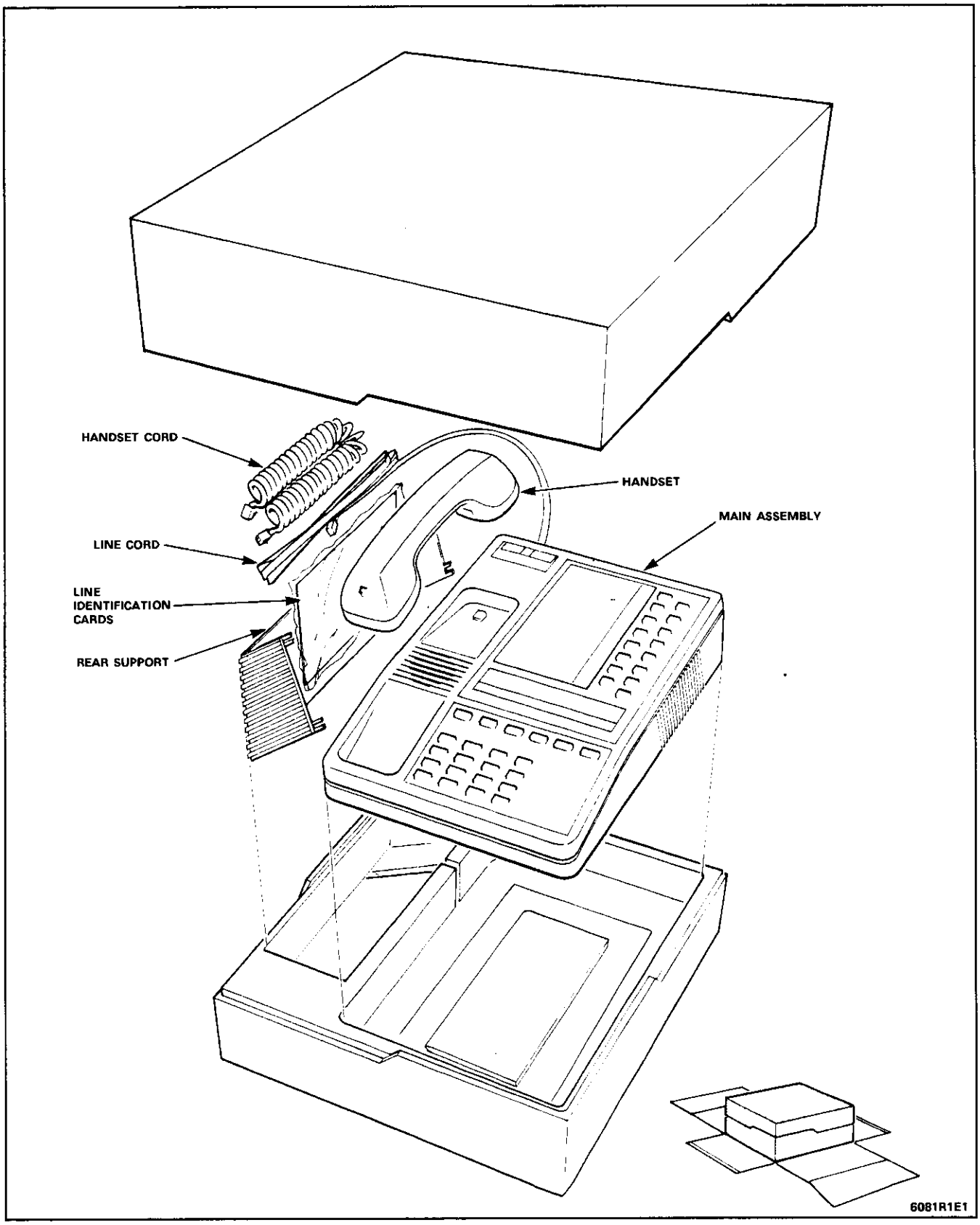
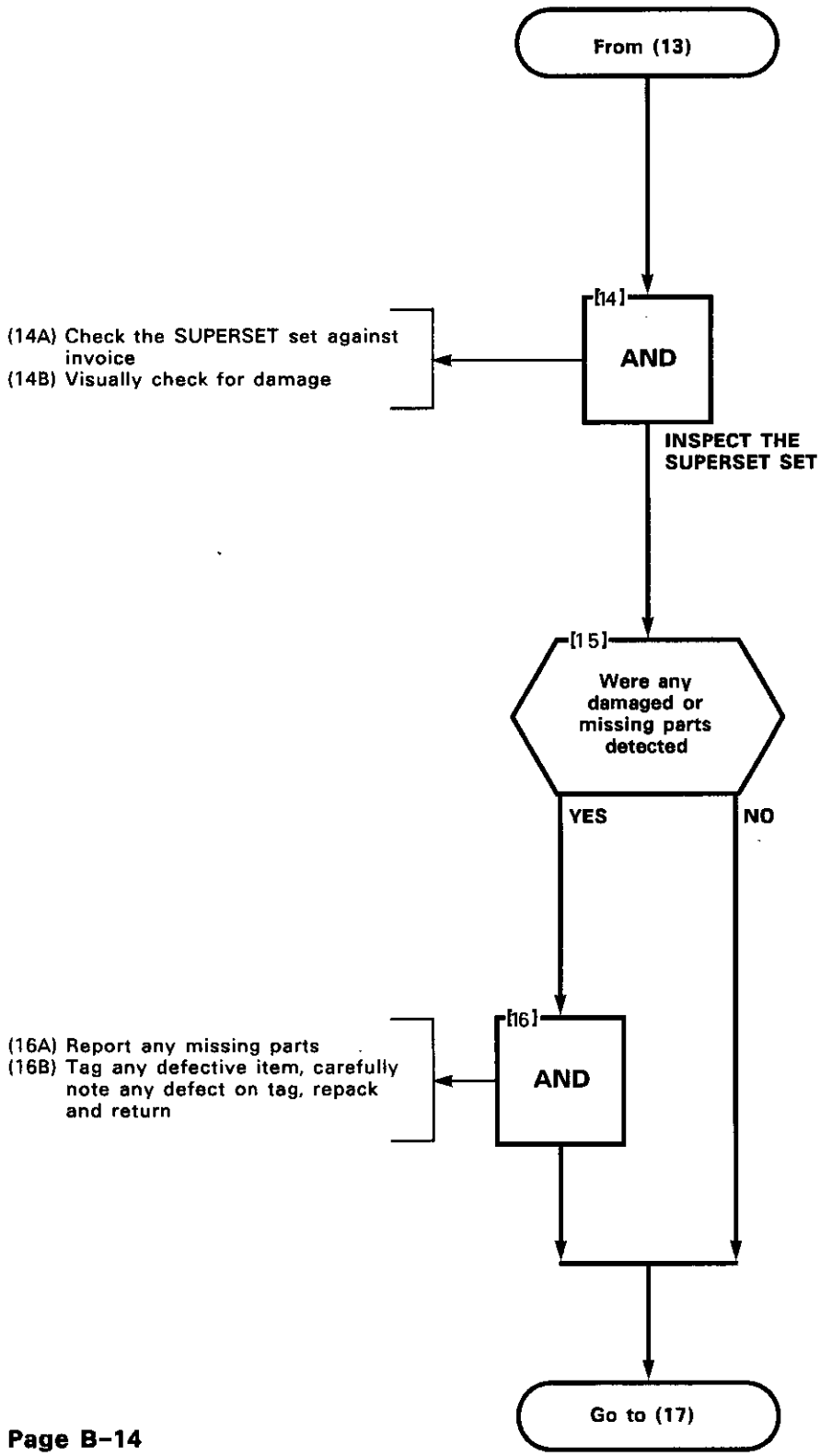
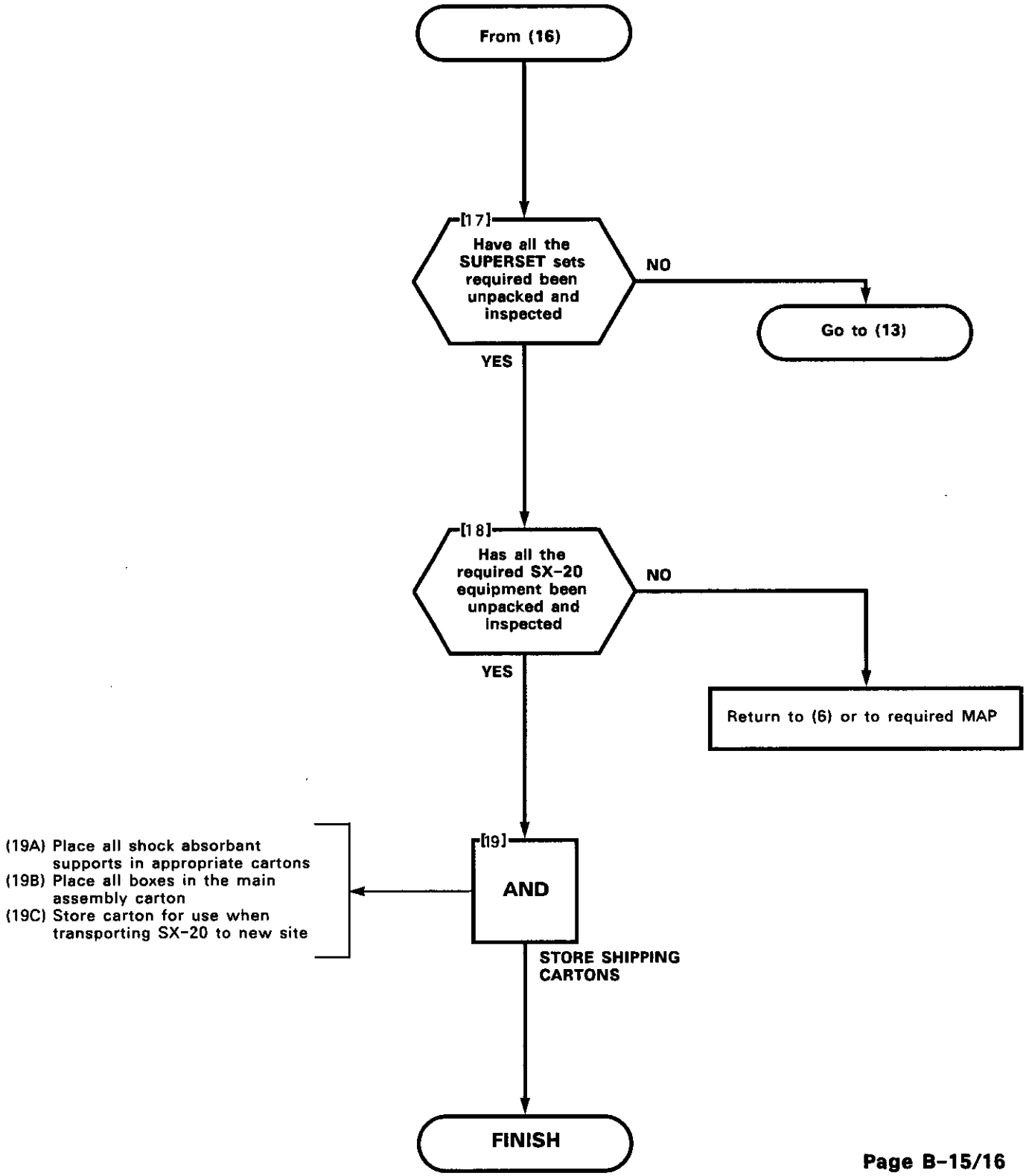


Figure 001-5 SUPERSET Set Packaging

EQUIPMENT UNPACKING
MAP200- 001
Issue 3, March 1985
Sheet 10 of 11



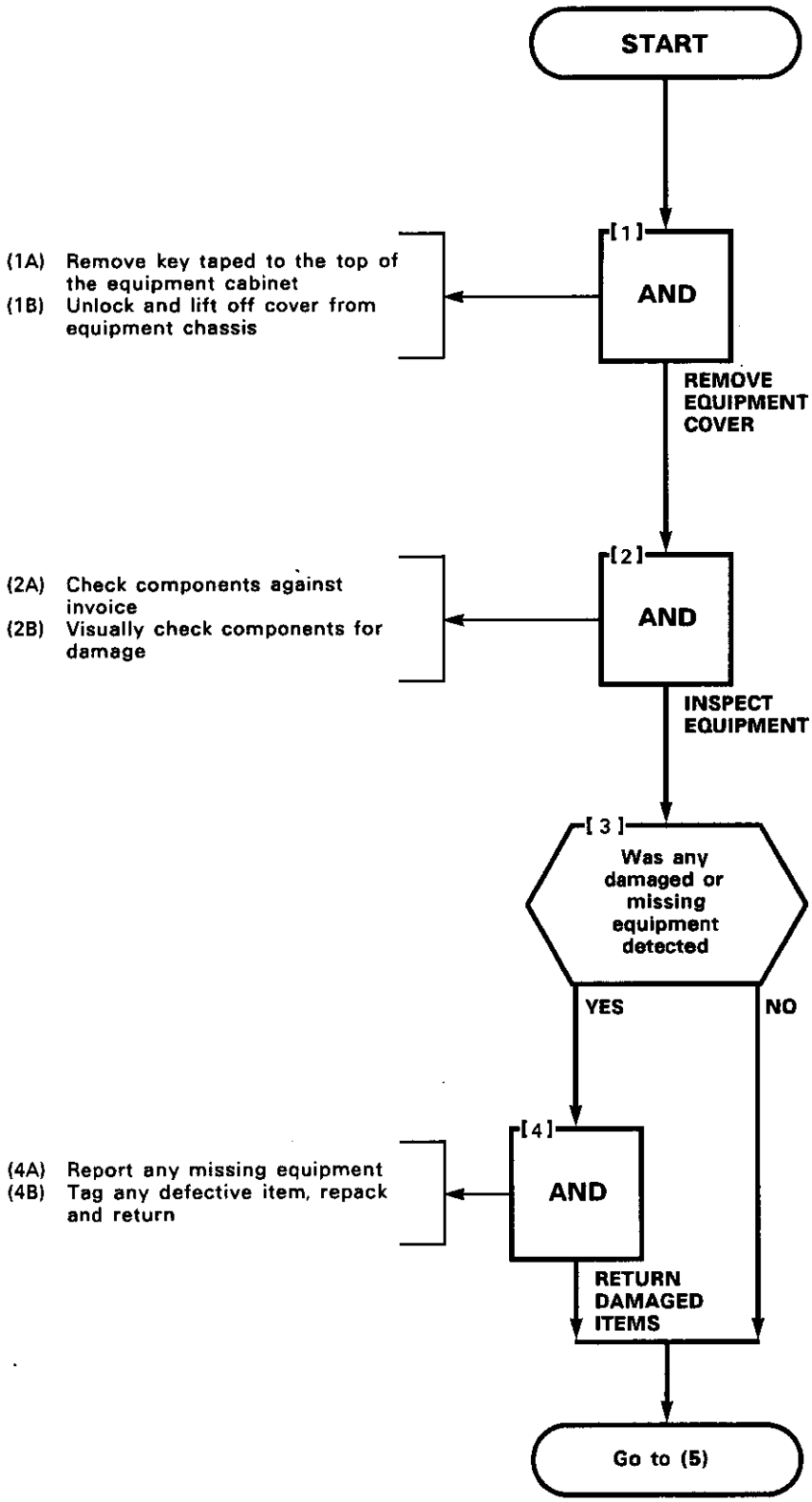
EQUIPMENT UNPACKING
MAP200-001
Issue 3, March 1985
Sheet 11 of 11



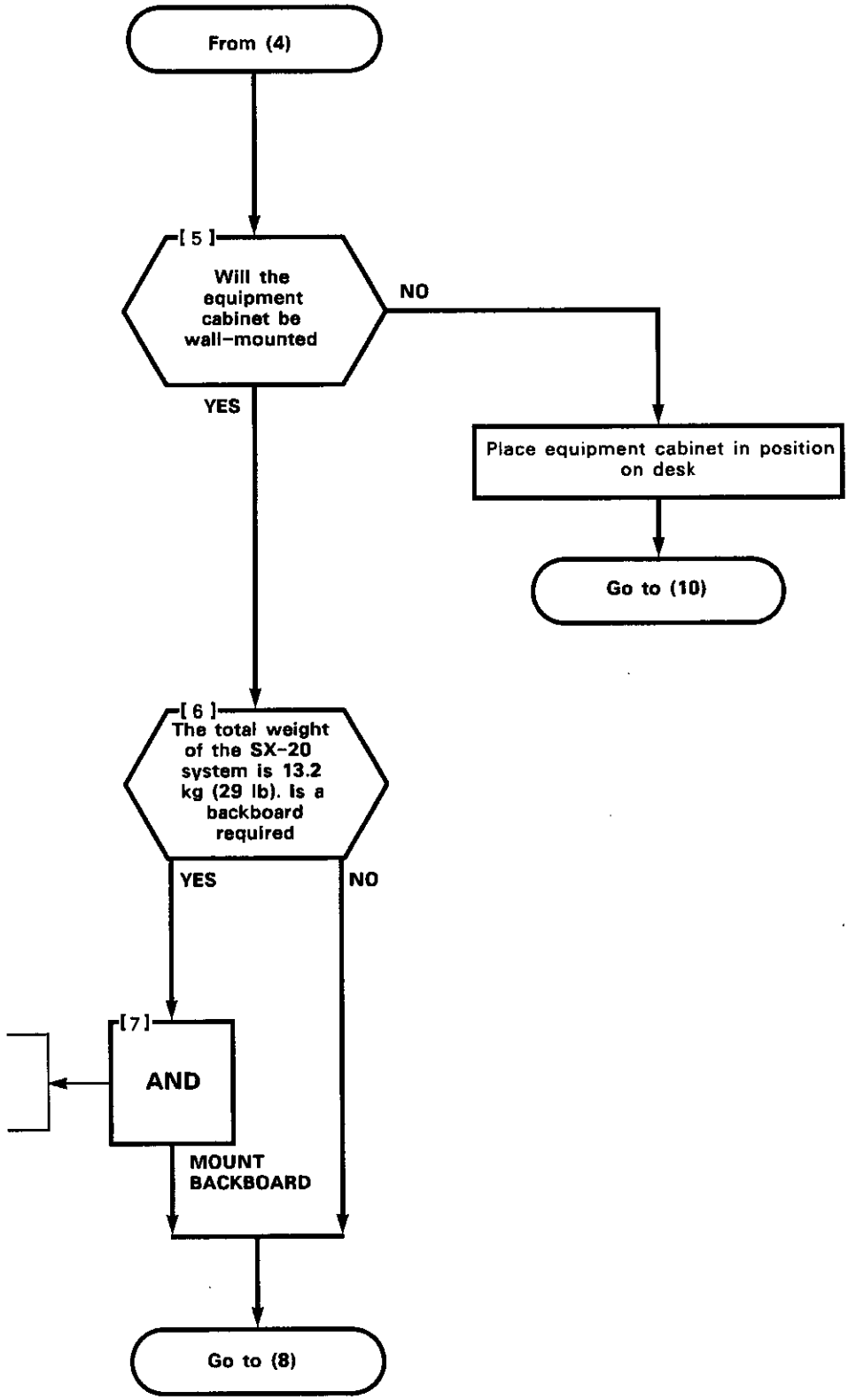
INSTALL EQUIPMENT CABINET
MAP200-002
Issue 3, March 1985
Sheet 1 of 7

TOOL REQUIRED

Screwdriver (Size 6)
Backboard (optional) Minimum size 585 mm (23.4 in.) x 420 mm (16.5 in.)
Four Mounting screws (Shank 0.25 in., length 1.5 in. min.)



INSTALL EQUIPMENT CABINET
MAP200- 002
Issue 3, March 1985
Sheet 2 of 7



(7A) Mark position of backboard (Figure 002-1)
(7B) Mount backboard

INSTALL EQUIPMENT CABINET
MAP200- 002
Issue 3, March 1985
Sheet 3 of 7

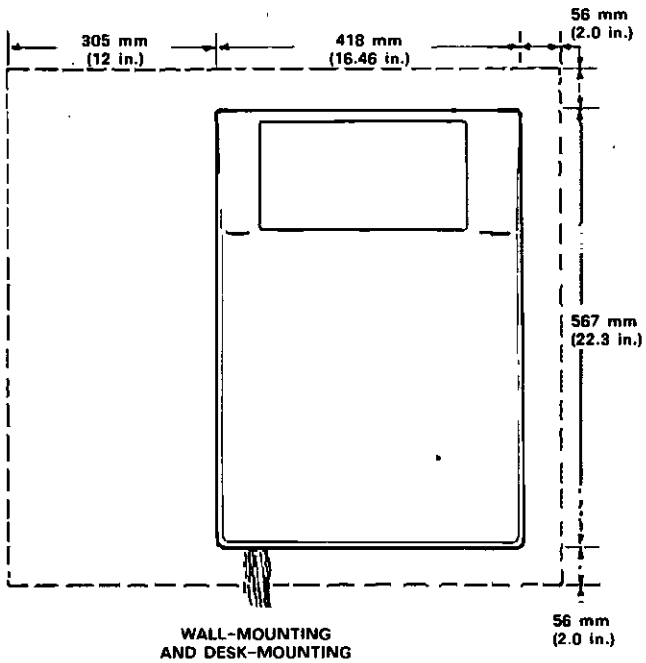


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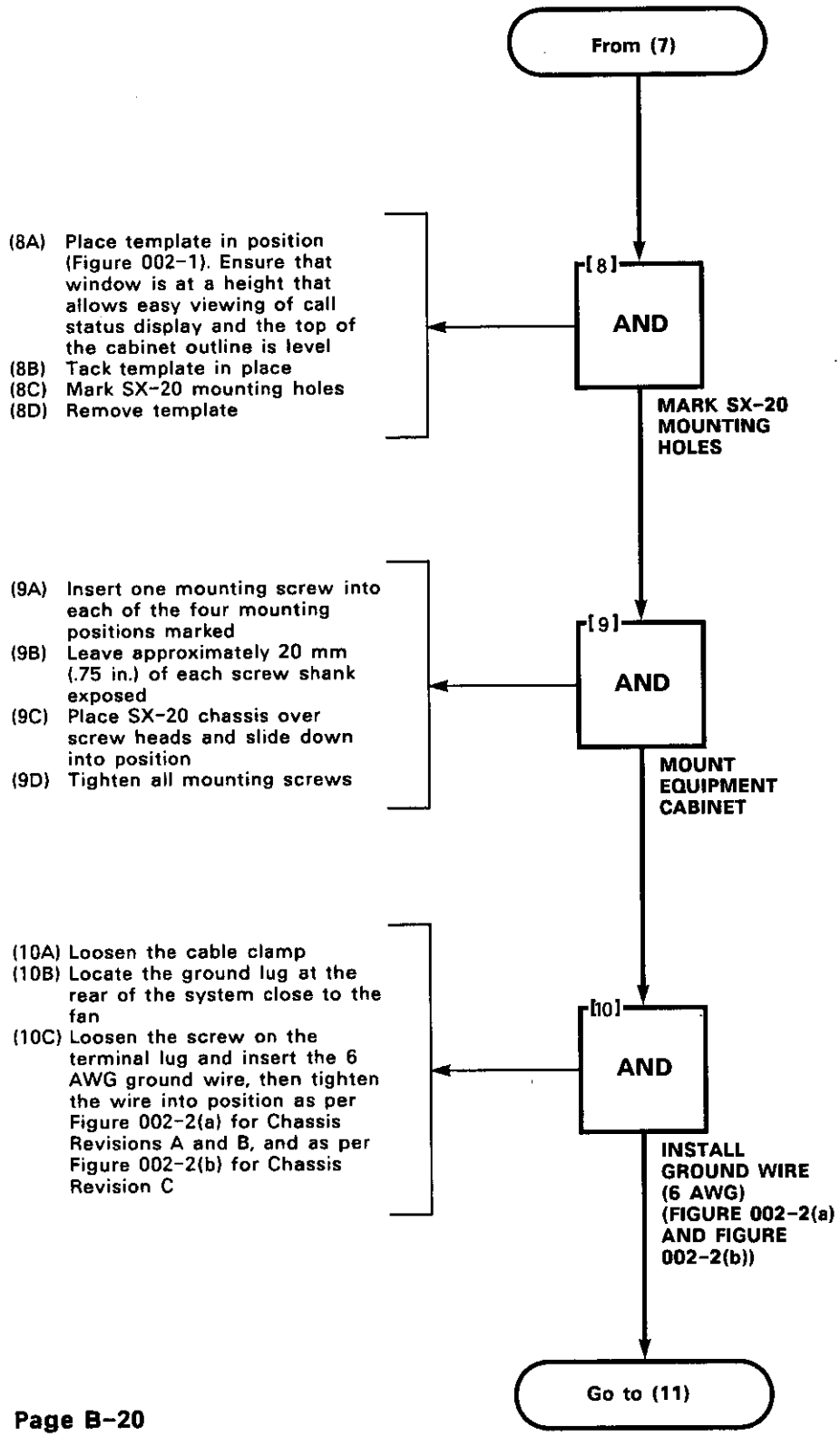
Figure 002-1 Space Requirements

INSTALL EQUIPMENT CABINET
MAP200- 002
Issue 3, March 1985
Sheet 4 of 7



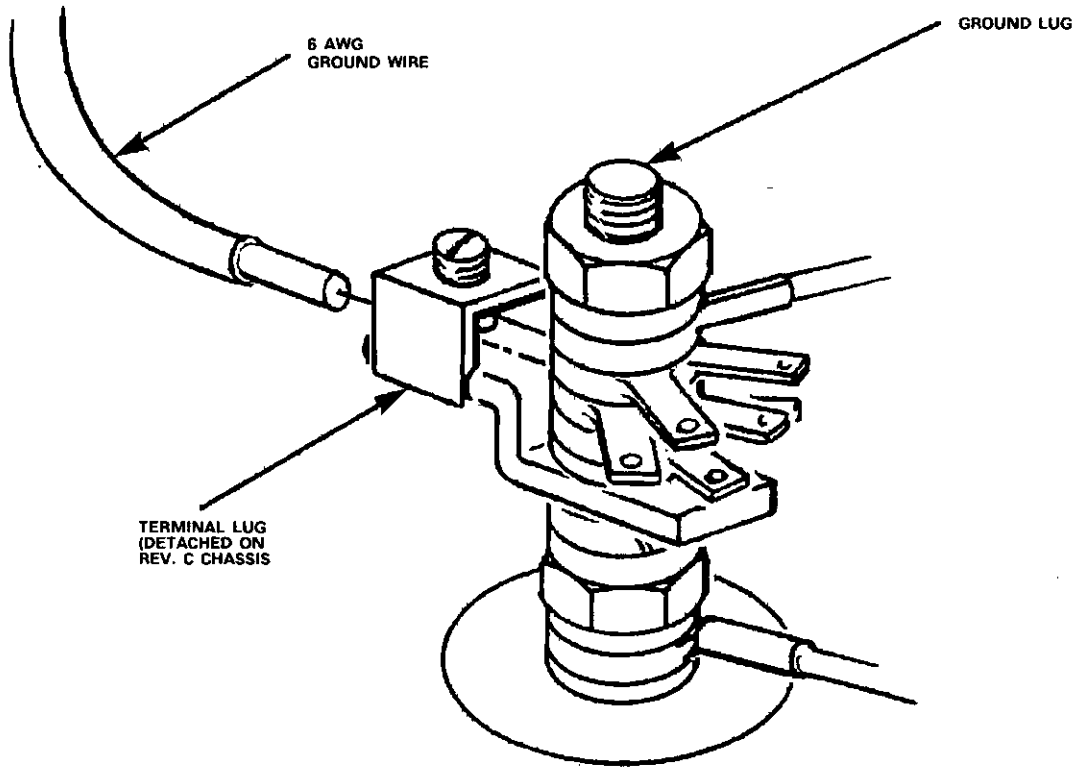


Figure 002-2(a) Ground Wire Terminal Lug Connection (Chassis Revisions A and B)

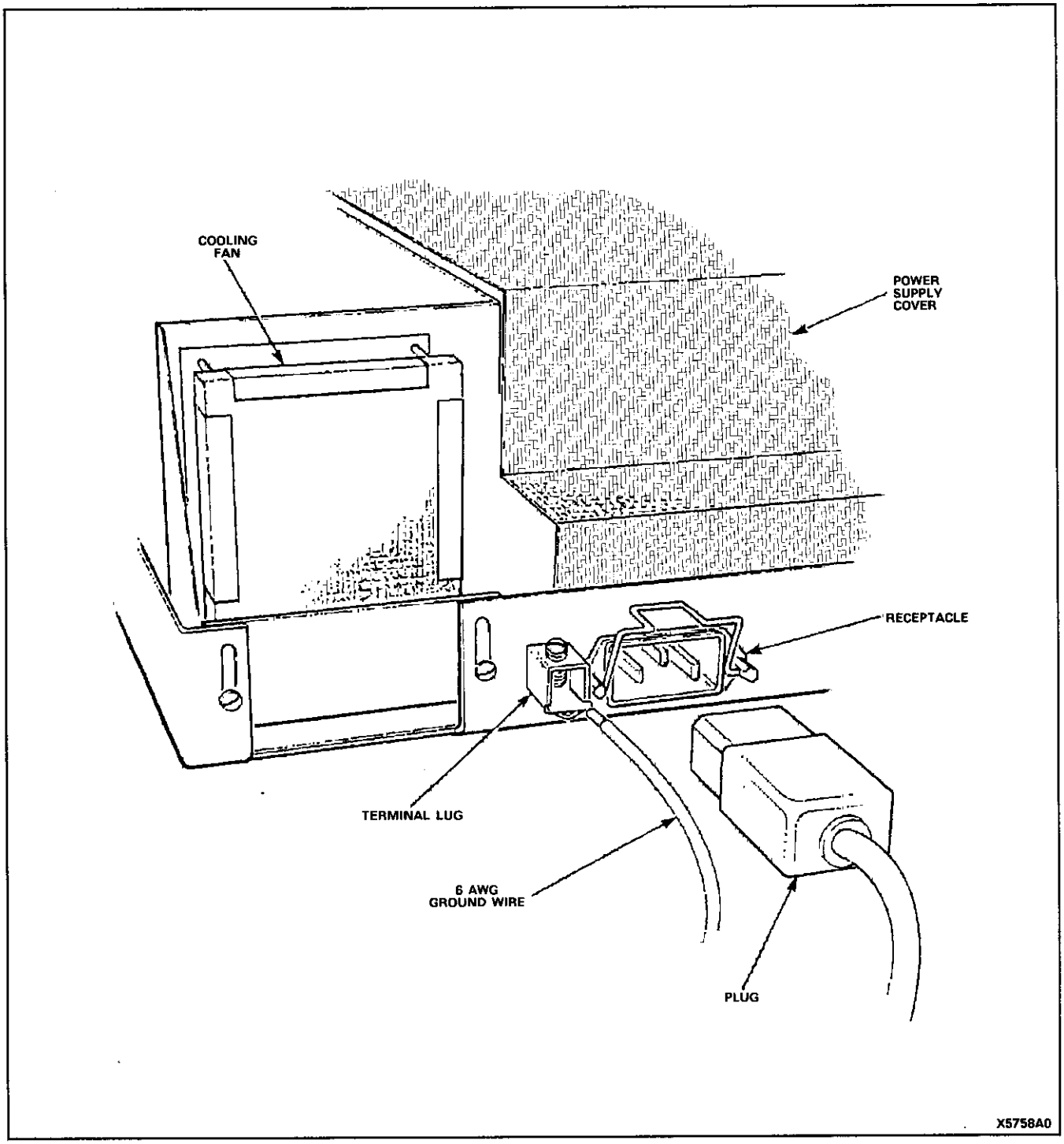
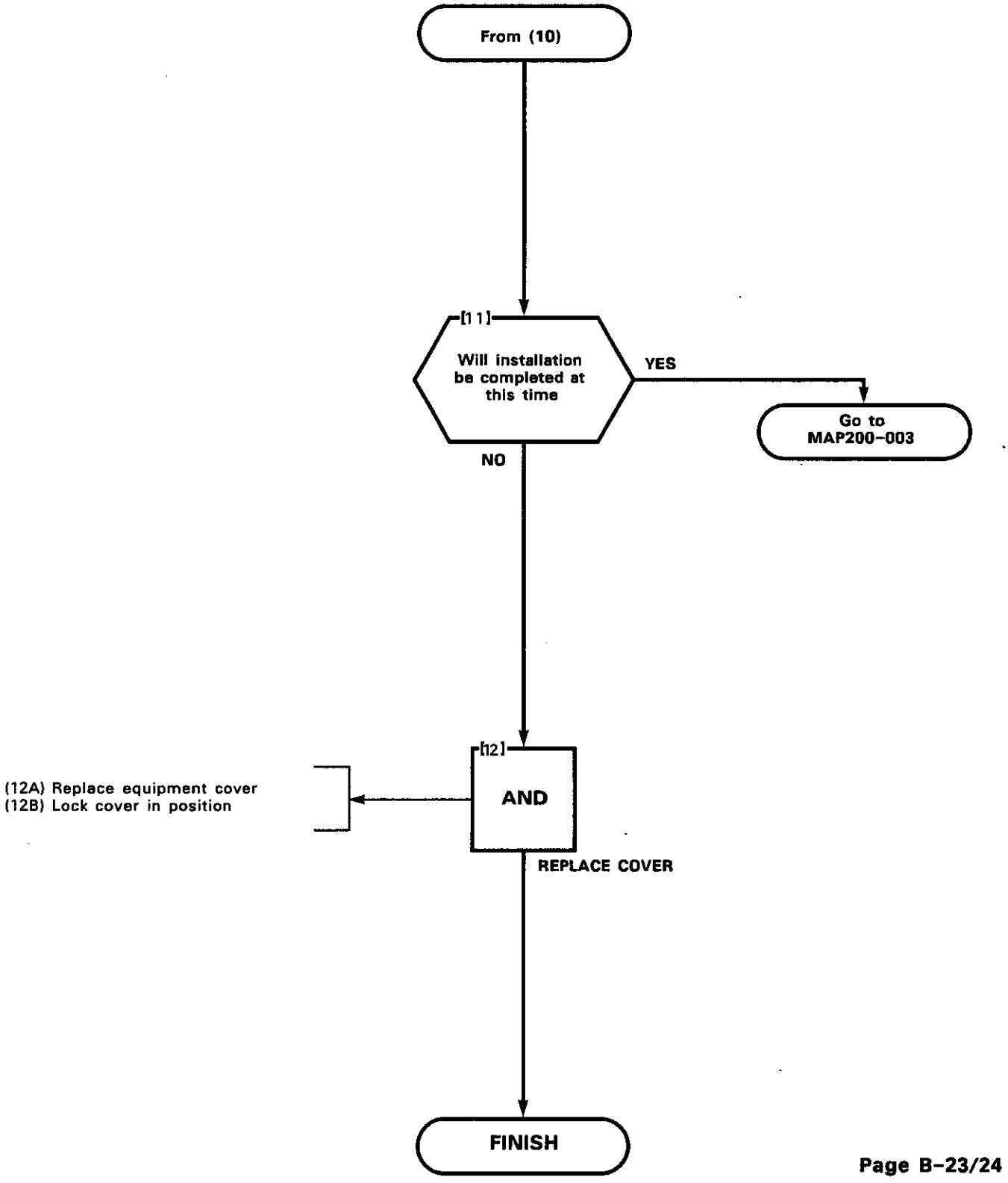
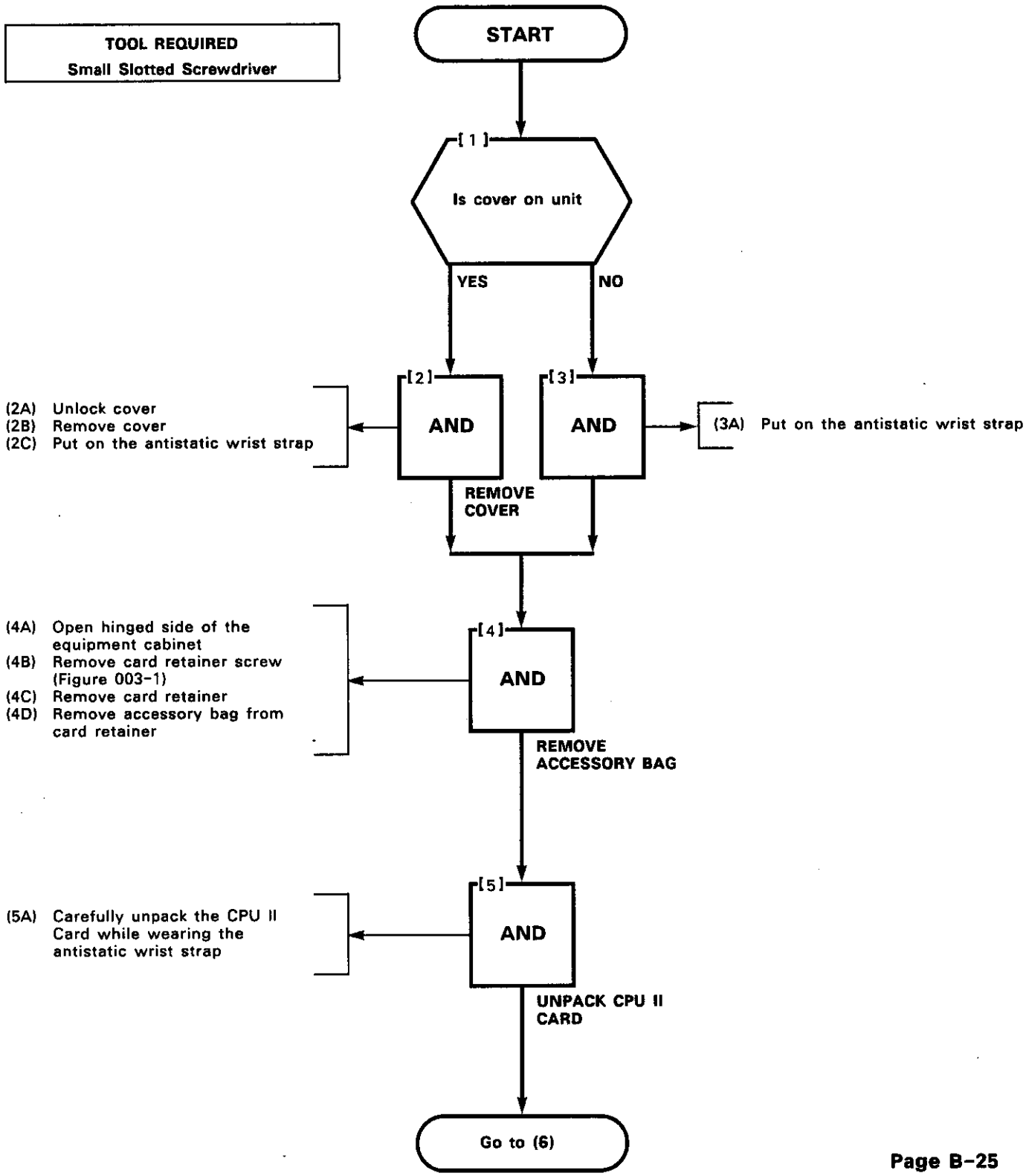


Figure 002-2(b) Ground Wire Terminal Lug Connection (Revision C)

INSTALL EQUIPMENT CABINET
MAP200- 002
Issue 3, March 1985
Sheet 7 of 7



SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 1 of 23



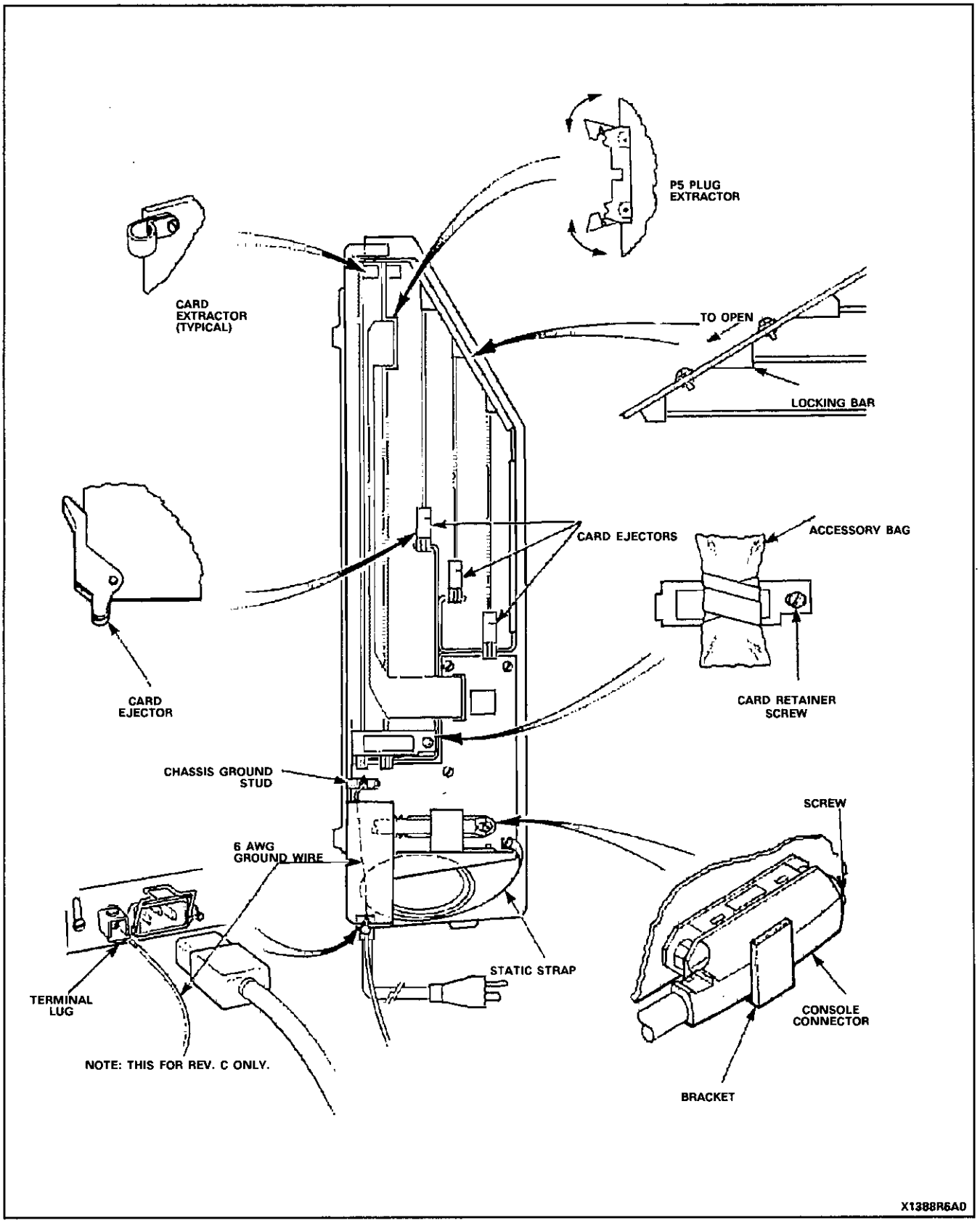
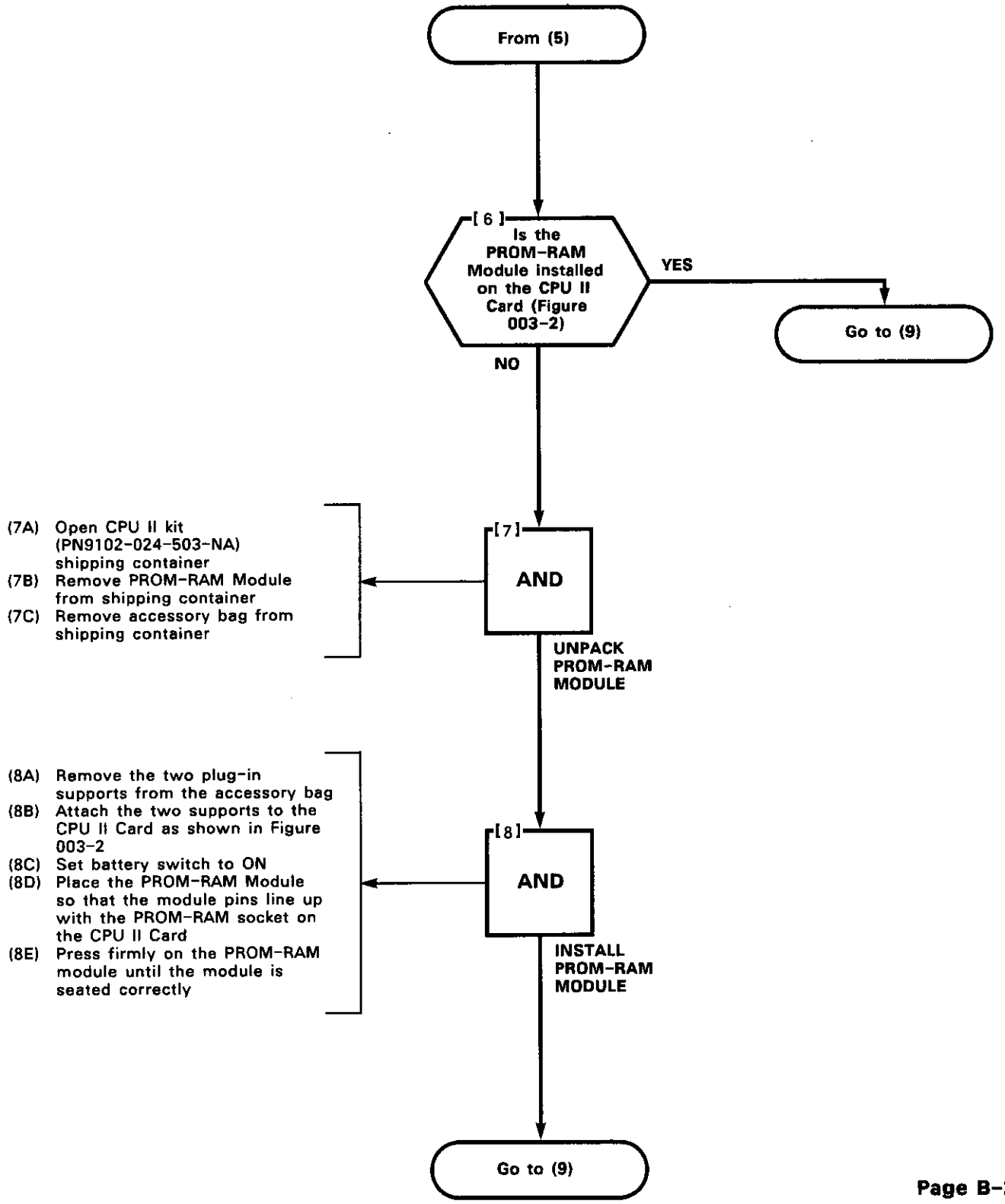
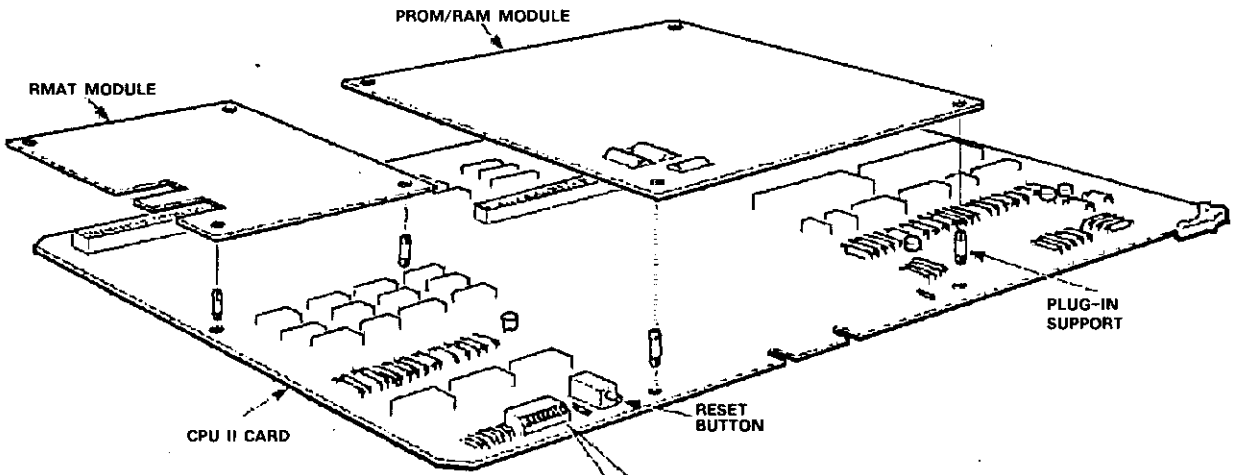


Figure 003-1 Installation/Equipment Mechanism

SYSTEM INSTALLATION
MAP200-003
Issue 3, March 1985
Sheet 3 of 23





SWITCH FUNCTIONS

1	OPEN	- WALL-MOUNT
	CLOSED	- DESK-MOUNT
2	OPEN	- AUTOMATIC DIAGNOSTICS INHIBIT
	CLOSED	- AUTOMATIC DIAGNOSTICS ENABLE
3	RESERVED	- SET SWITCH TO CLOSED
4	RESERVED	- SET SWITCH TO CLOSED
5	RESERVED	- SET SWITCH TO CLOSED
6	OPEN	- EQUIPMENT NUMBER 01-TEST LINE
	CLOSED	- EQUIPMENT NUMBER 01-STATION
7	OPEN	- 2-DIGIT DEFAULT STATION NUMBERING (10-41)
	CLOSED	- 3-DIGIT DEFAULT STATION NUMBERING (100-171)
8	OPEN	- PROGRAM AND REVIEW CUSTOMER DATA
	CLOSED	- REVIEW (ONLY) CUSTOMER DATA

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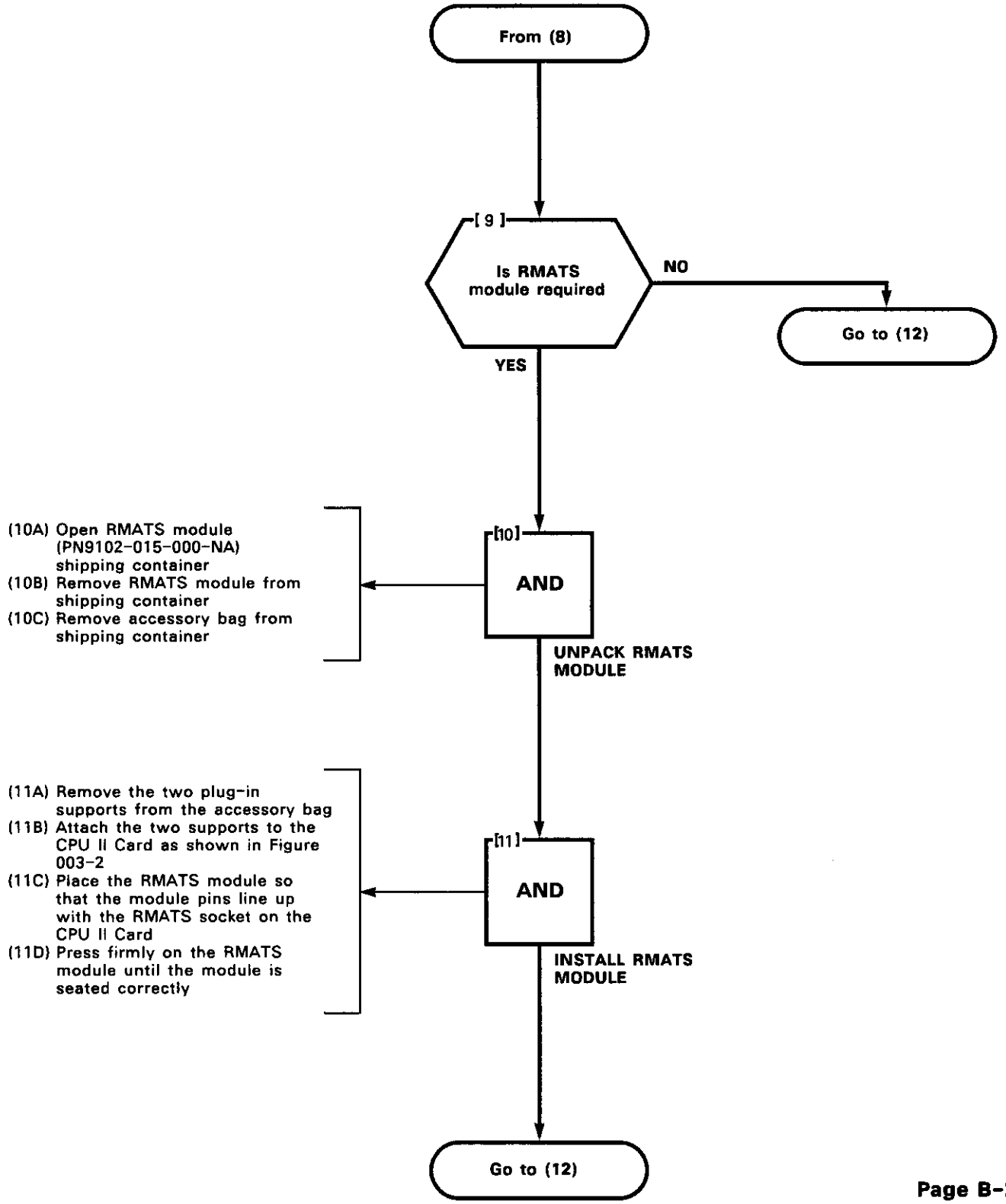
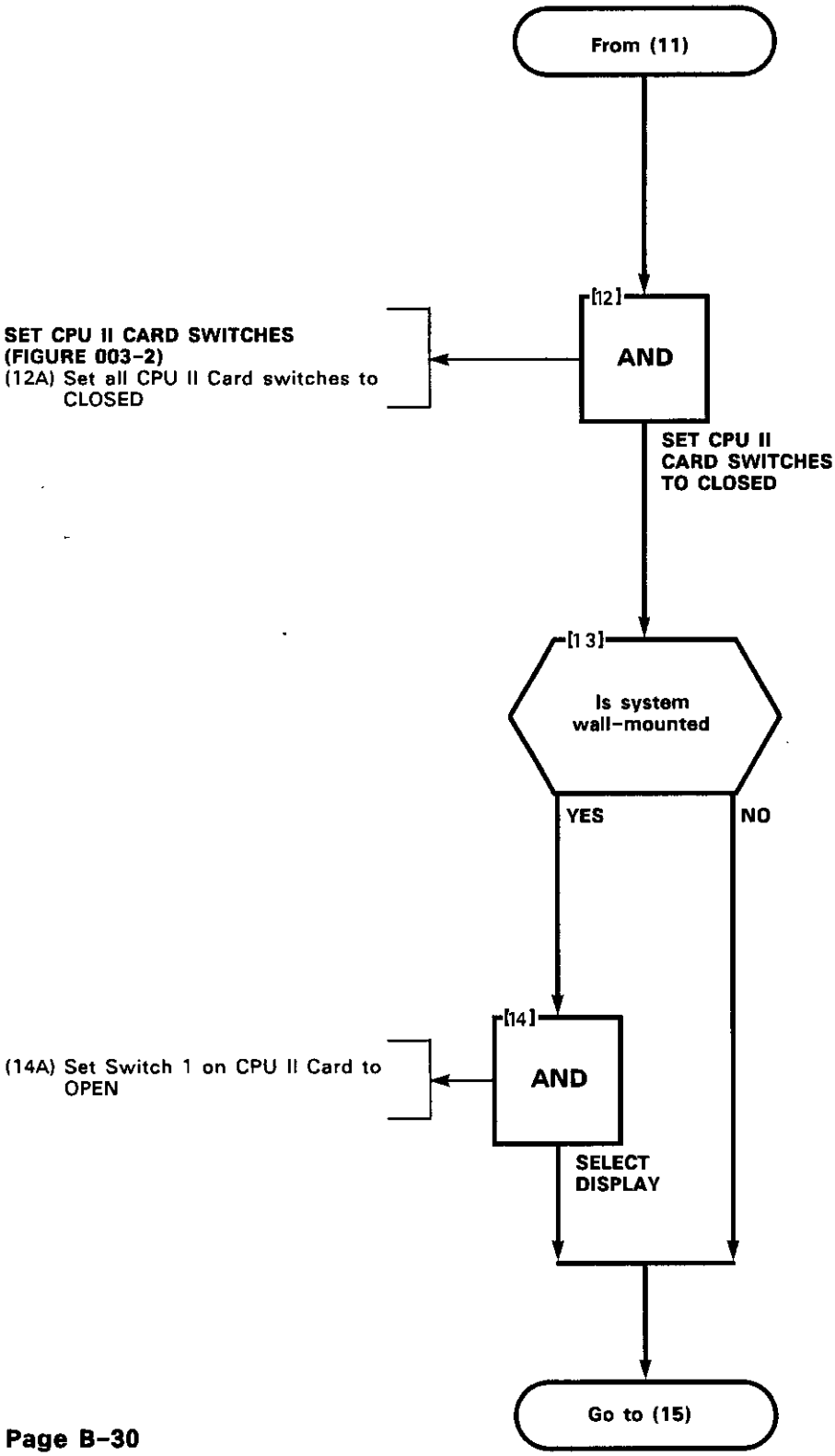
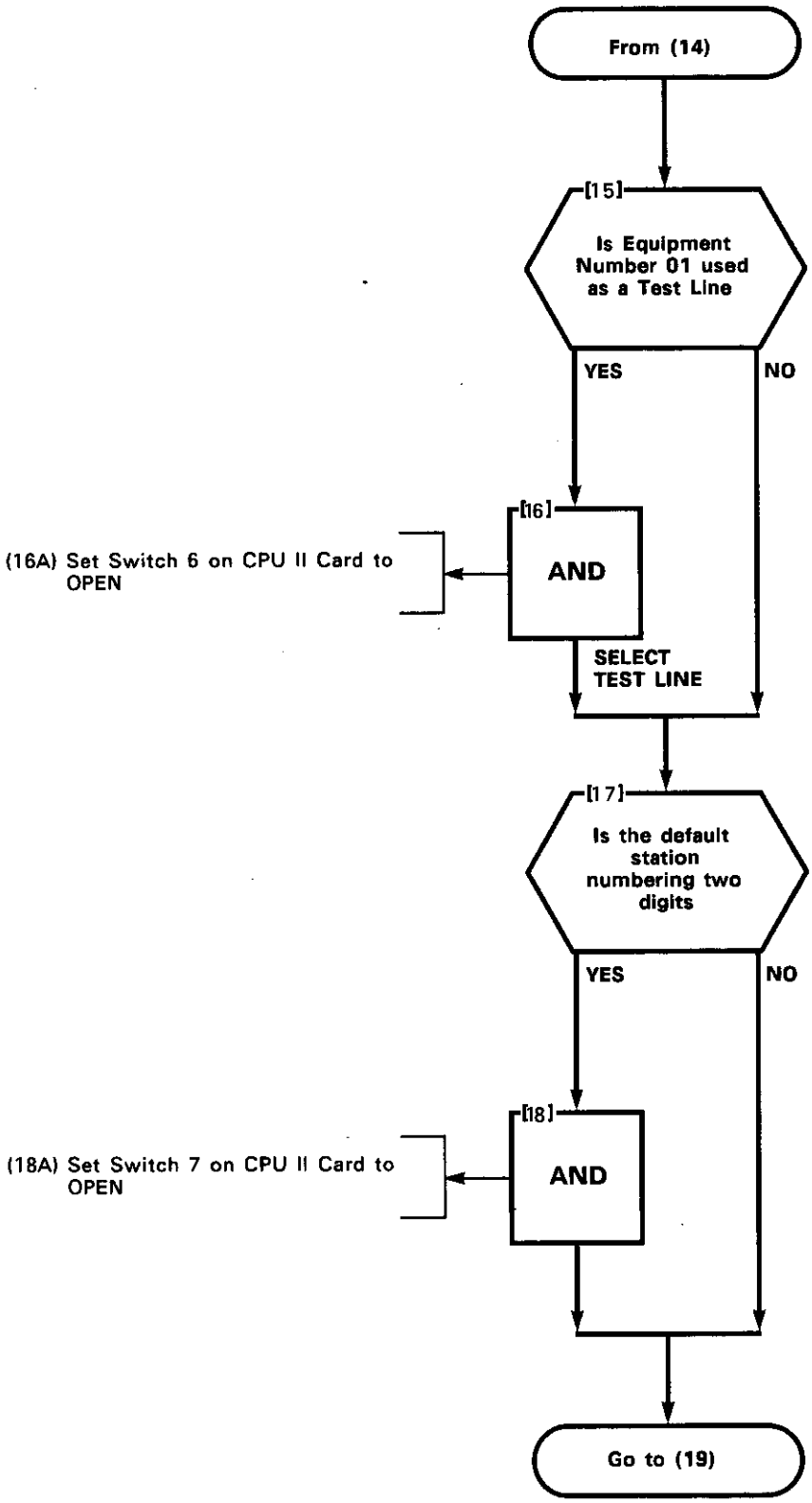
Figure 003-2 CPU II CARD

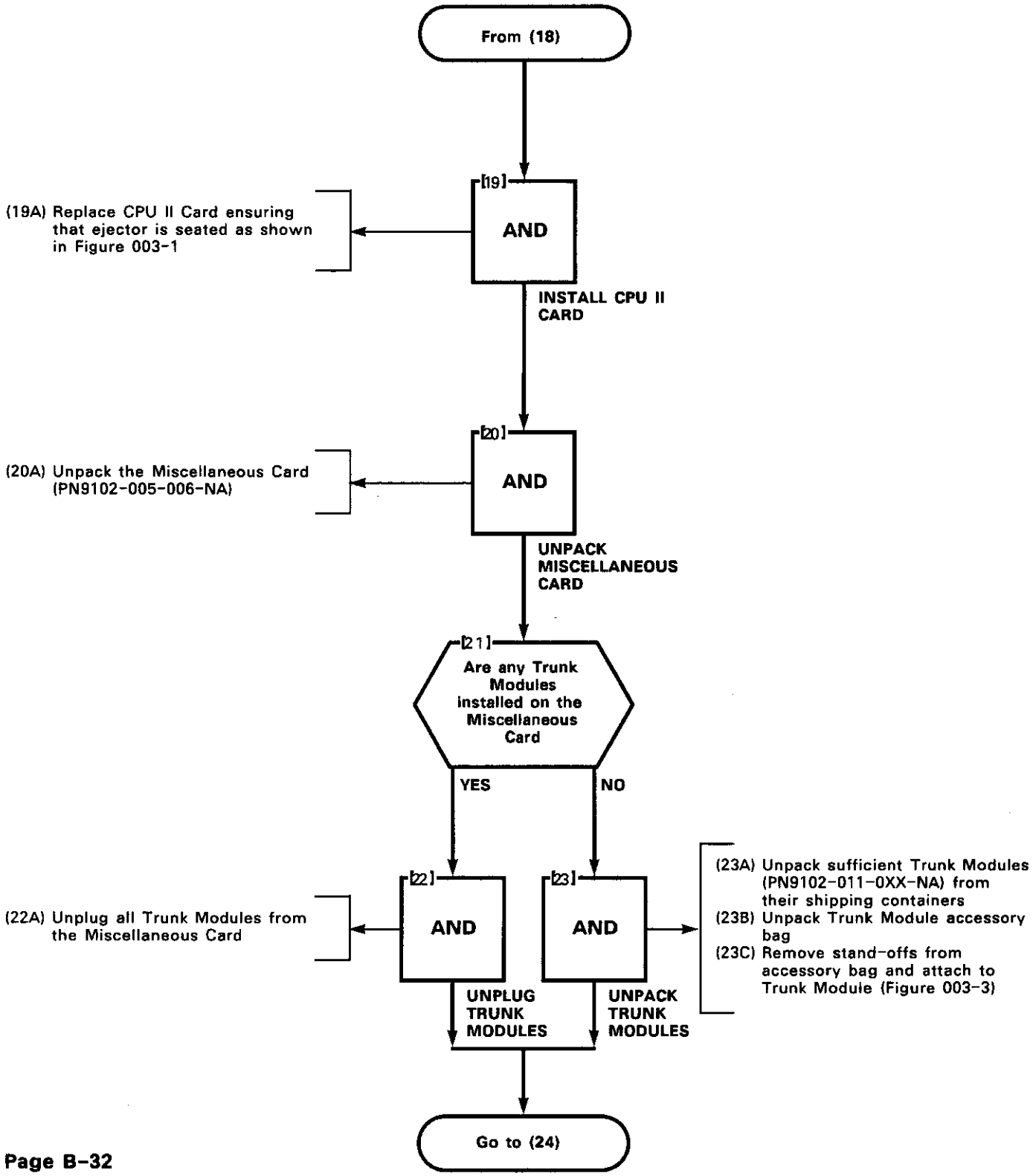
SYSTEM INSTALLATION
MAP200-003
Issue 3, March 1985
Sheet 5 of 23



SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 6 of 23




From (14)
[15]
Is Equipment Number 01 used as a Test Line
YES
NO
[16]
AND
(16A) Set Switch 6 on CPU II Card to OPEN
SELECT TEST LINE
[17]
Is the default station numbering two digits
YES
NO
[18]
AND
(18A) Set Switch 7 on CPU II Card to OPEN
Go to (19)


From (18)
[19]
AND
(19A) Replace CPU II Card ensuring that ejector is seated as shown in Figure 003-1
INSTALL CPU II CARD
[20]
AND
(20A) Unpack the Miscellaneous Card (PN9102-005-006-NA)
UNPACK MISCELLANEOUS CARD
[21]
Are any Trunk Modules installed on the Miscellaneous Card
YES
NO
[22]
AND
(22A) Unplug all Trunk Modules from the Miscellaneous Card
[23]
AND
(23A) Unpack sufficient Trunk Modules (PN9102-011-0XX-NA) from their shipping containers
(23B) Unpack Trunk Module accessory bag
(23C) Remove stand-offs from accessory bag and attach to Trunk Module (Figure 003-3)
UNPLUG TRUNK MODULES
UNPACK TRUNK MODULES
Go to (24)

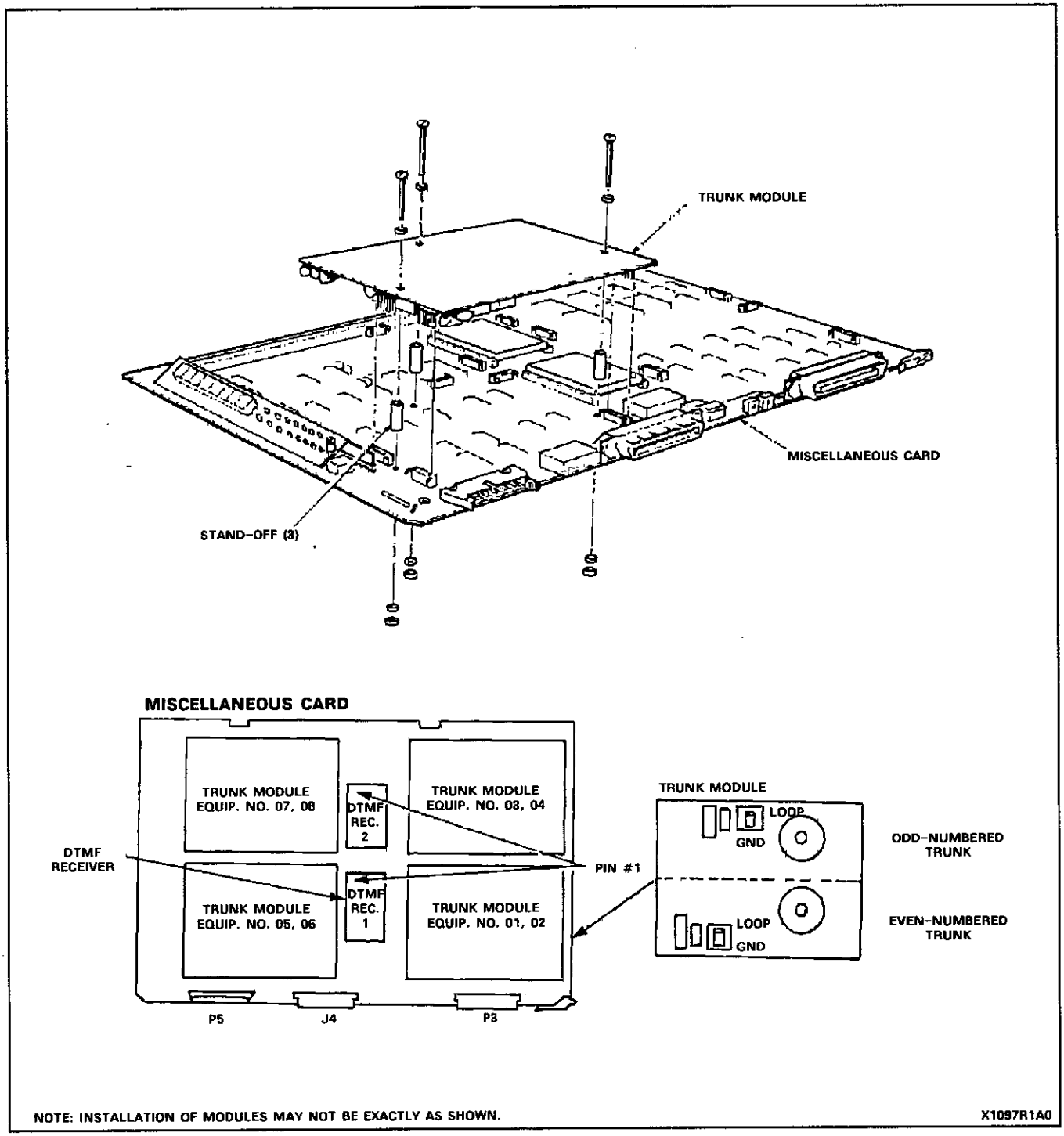
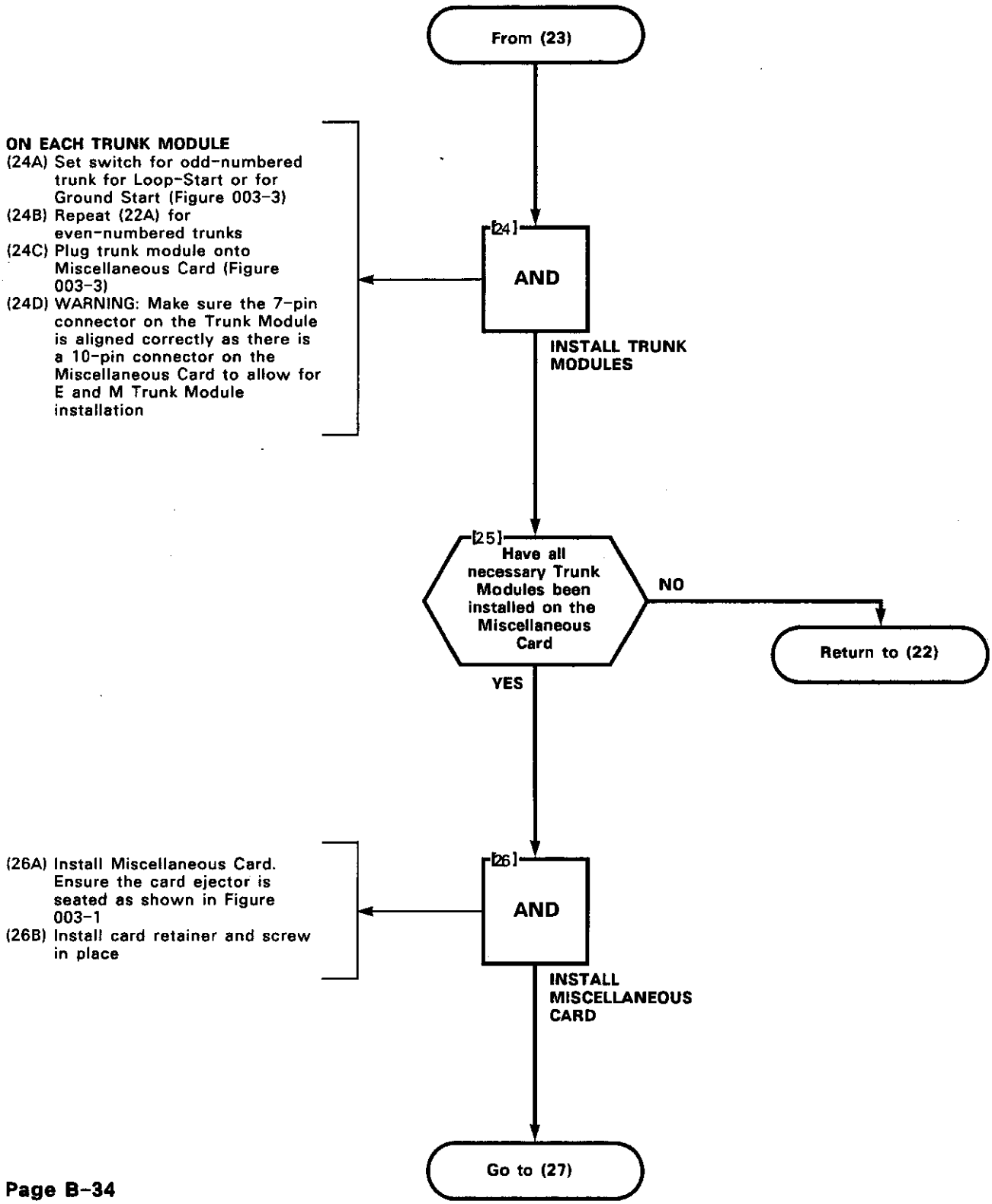
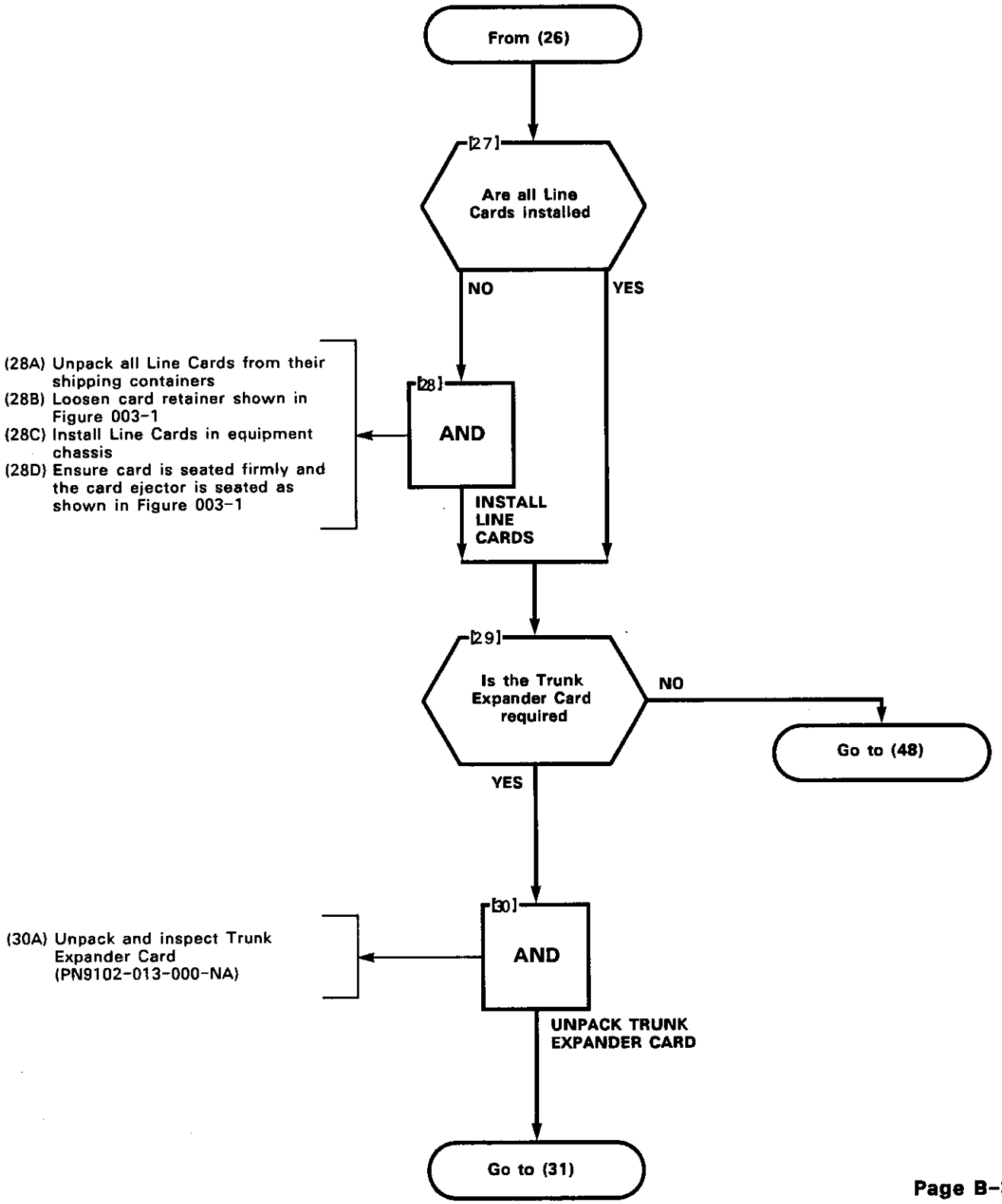


Figure 003-3 Miscellaneous Card

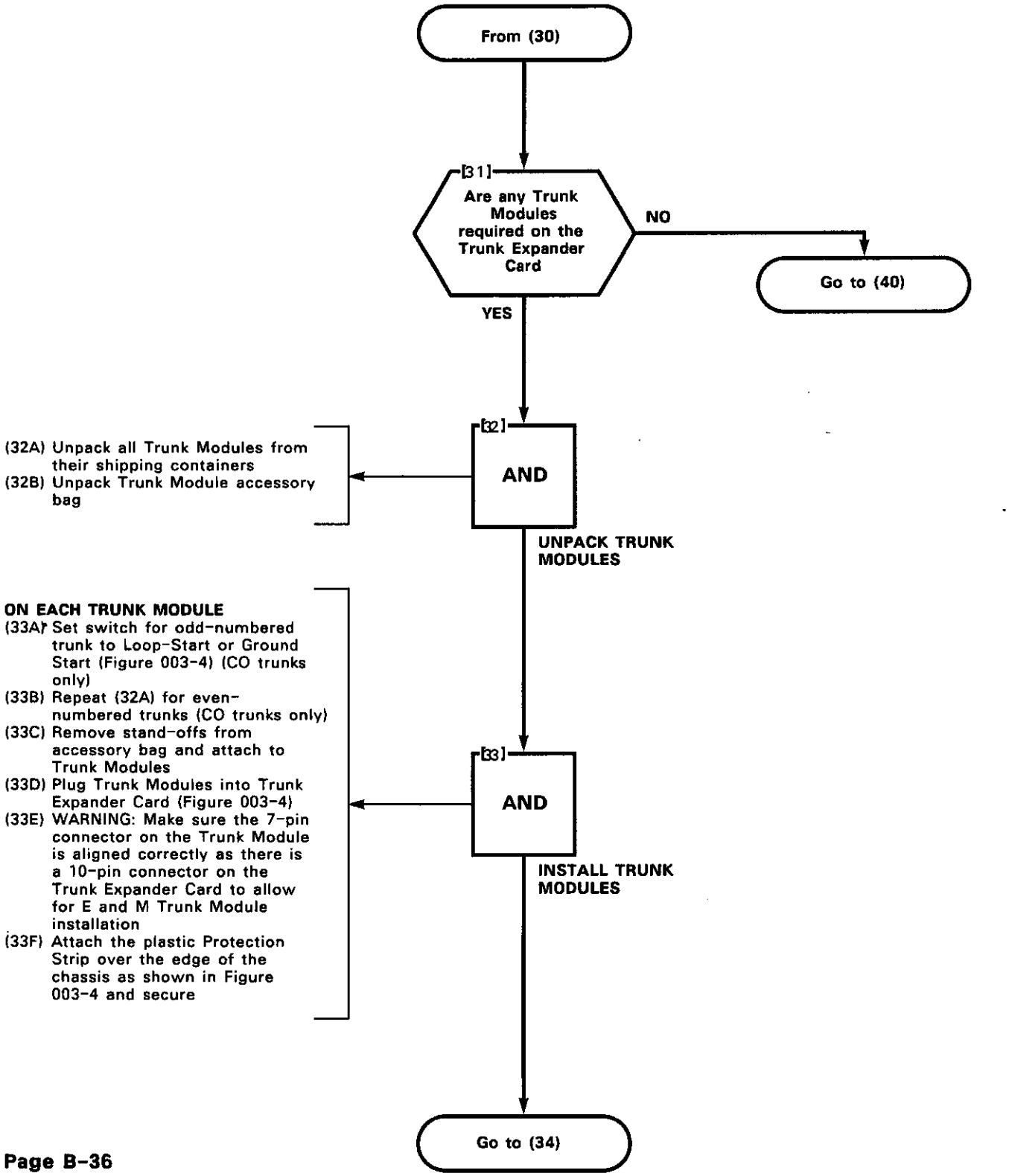
SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 10 of 23



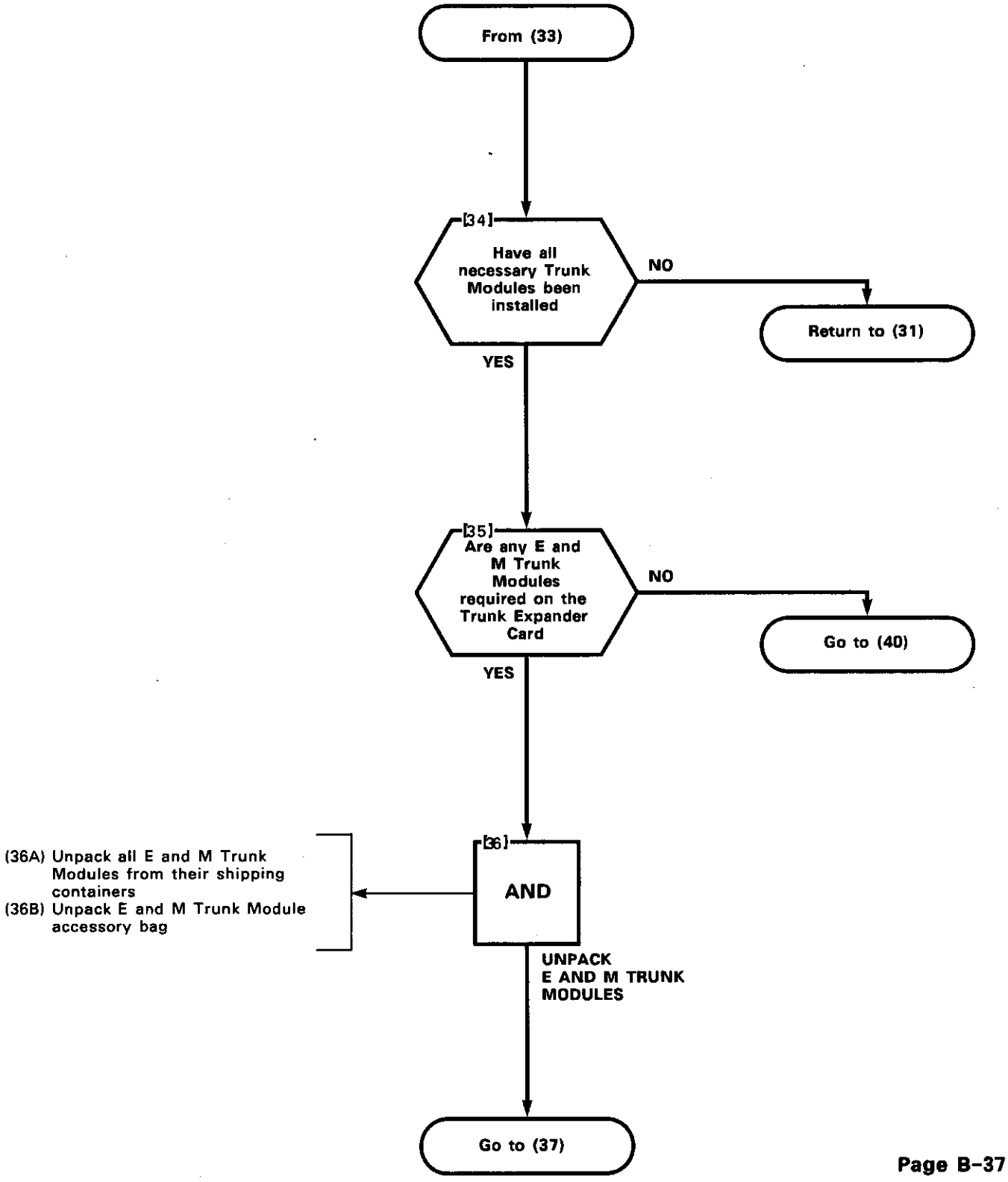
SYSTEM INSTALLATION
MAP200-003
Issue 3, March 1985
Sheet 11 of 23



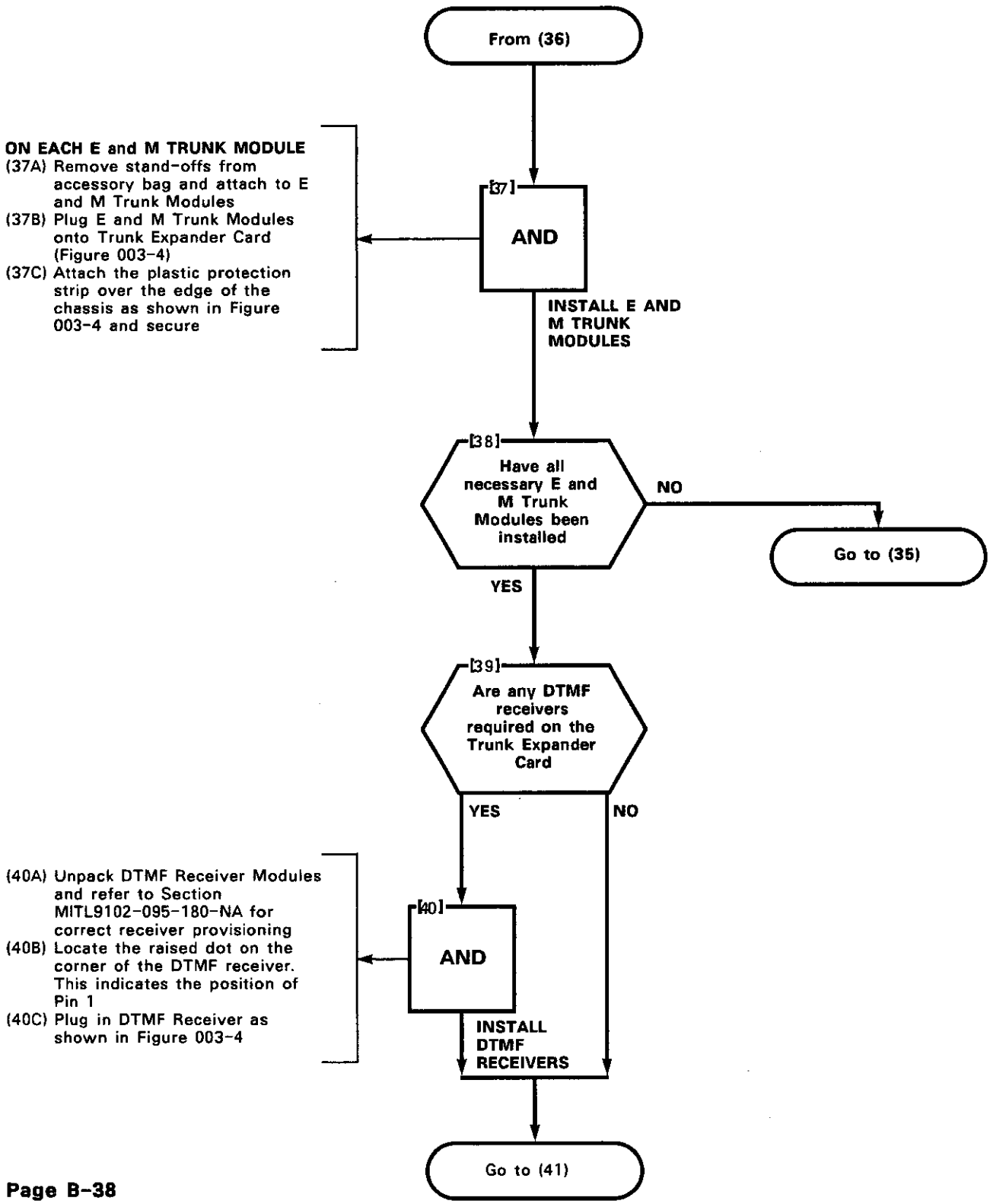
SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 12 of 23

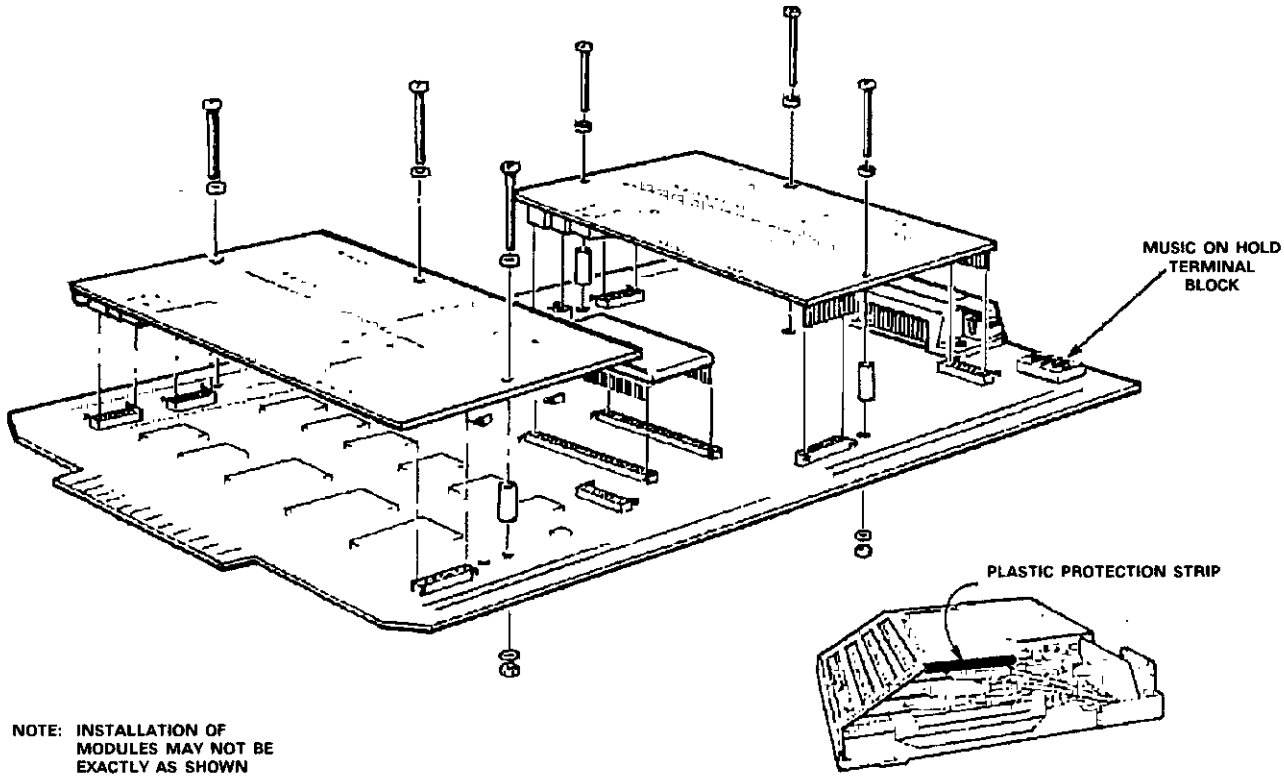


SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 13 of 23



SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 14 of 23





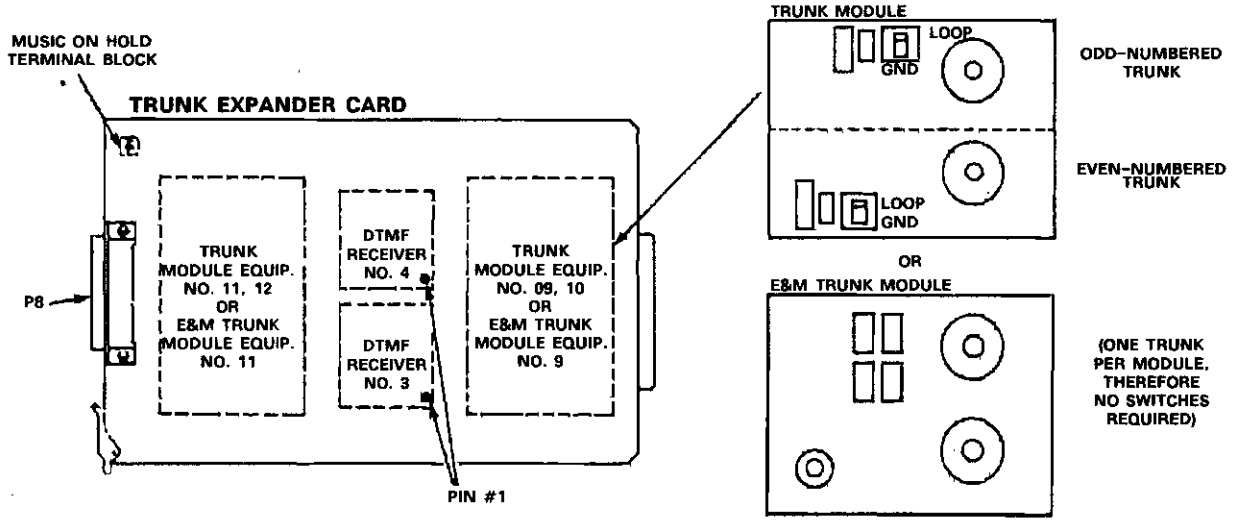


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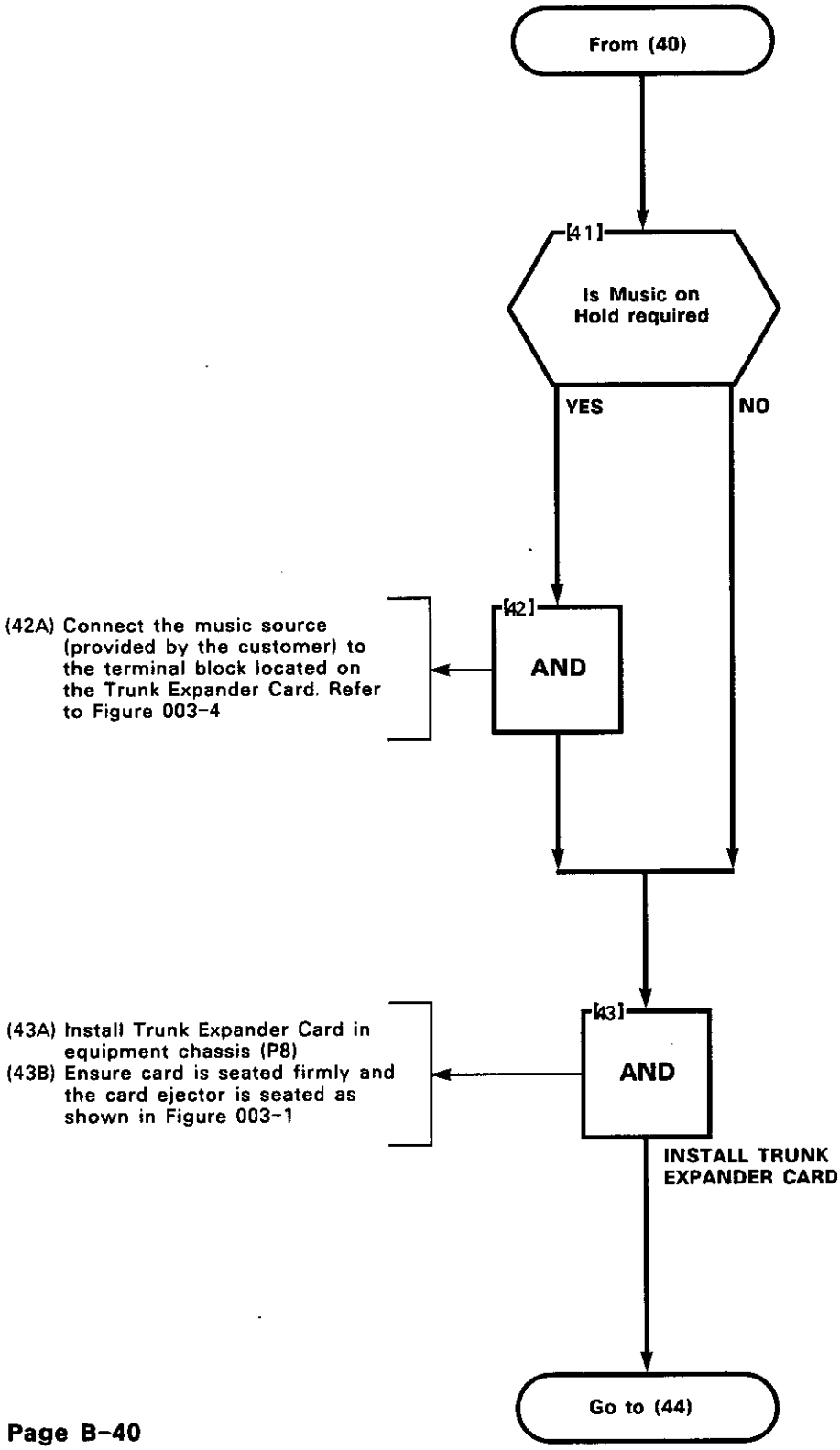
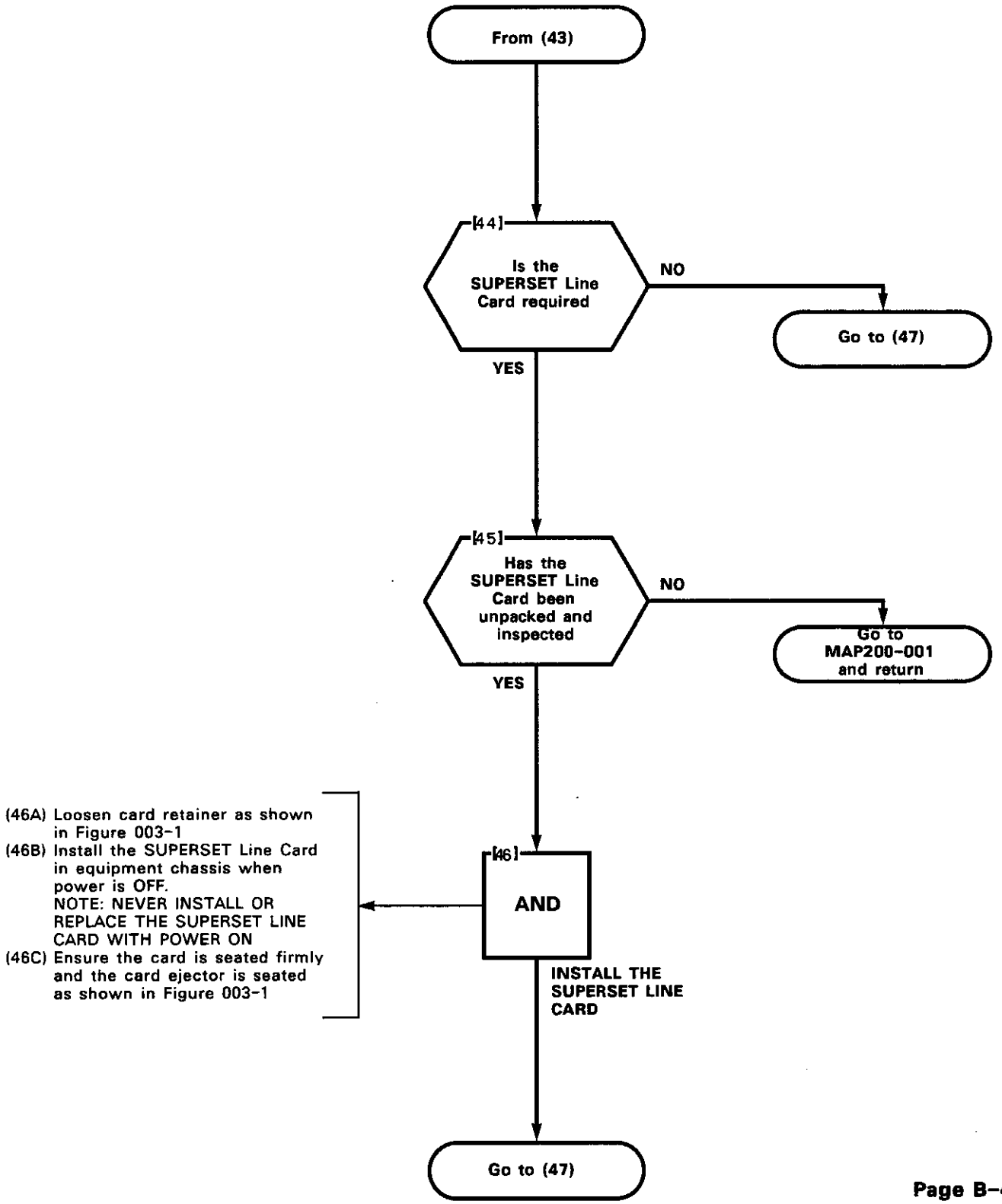
Figure 003-4 Trunk Expander Card

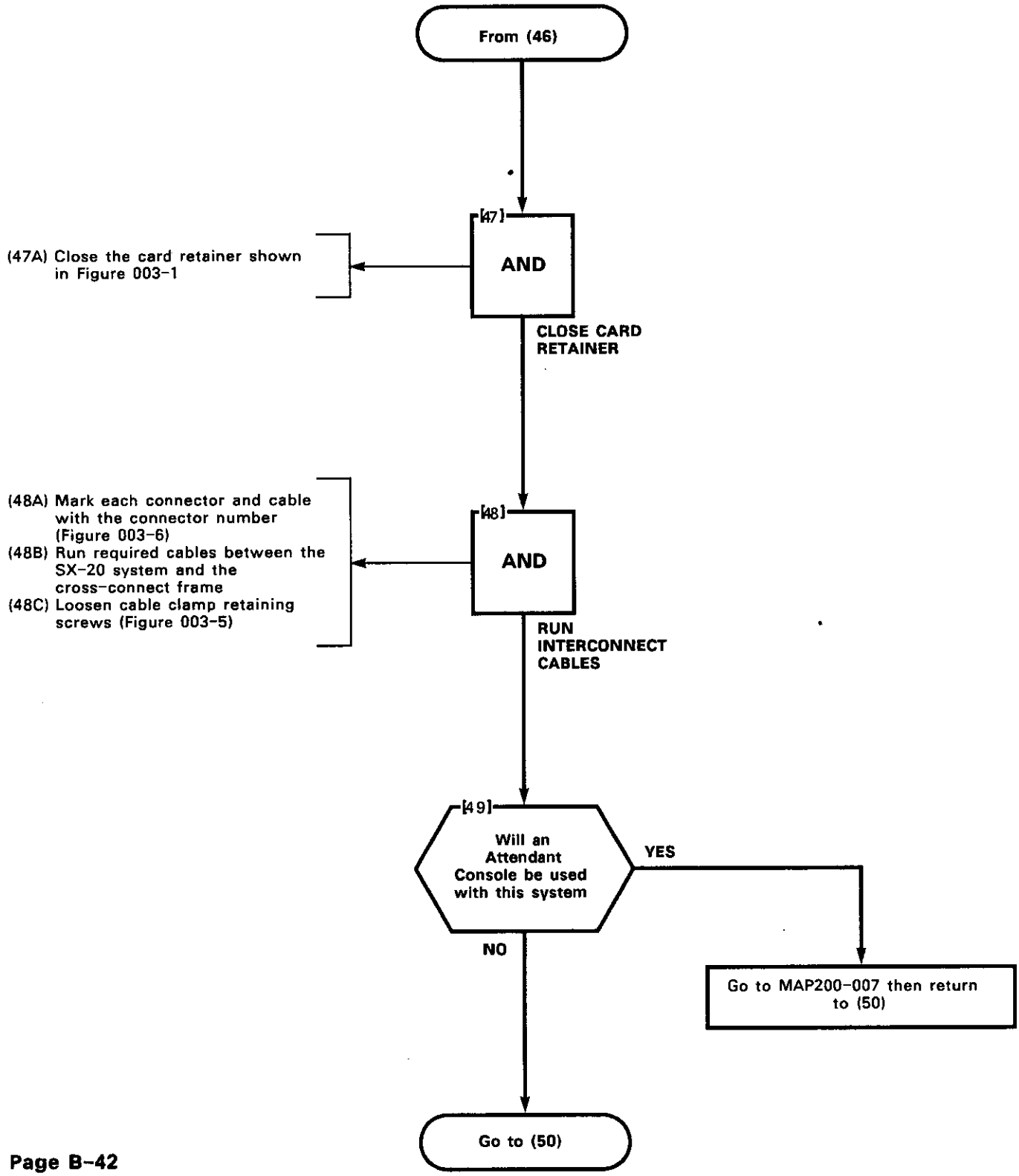
SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 16 of 23



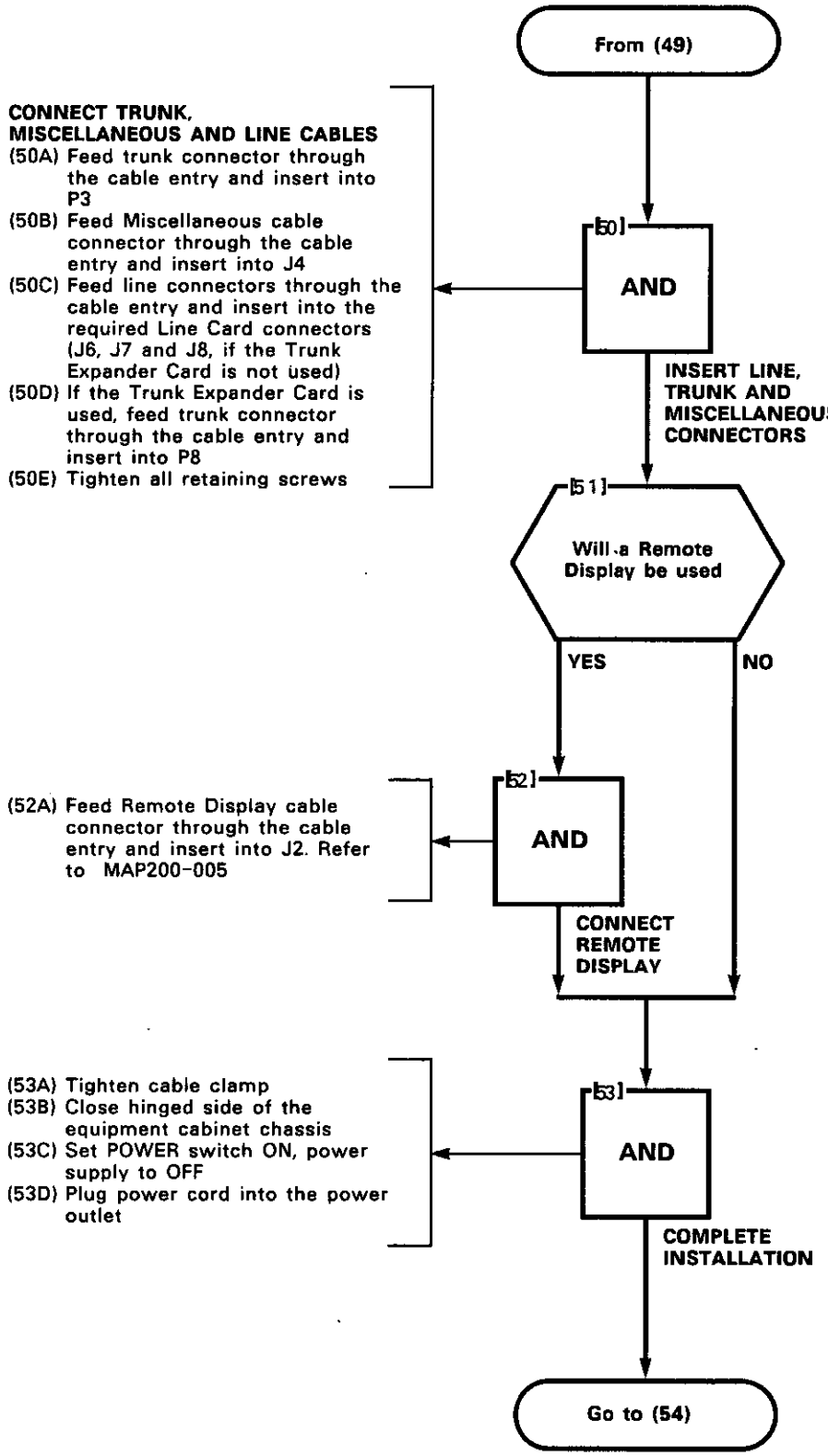
SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 17 of 23



SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 18 of 23



SYSTEM INSTALLATION
MAP200-003
Issue 3, March 1985
Sheet 19 of 23



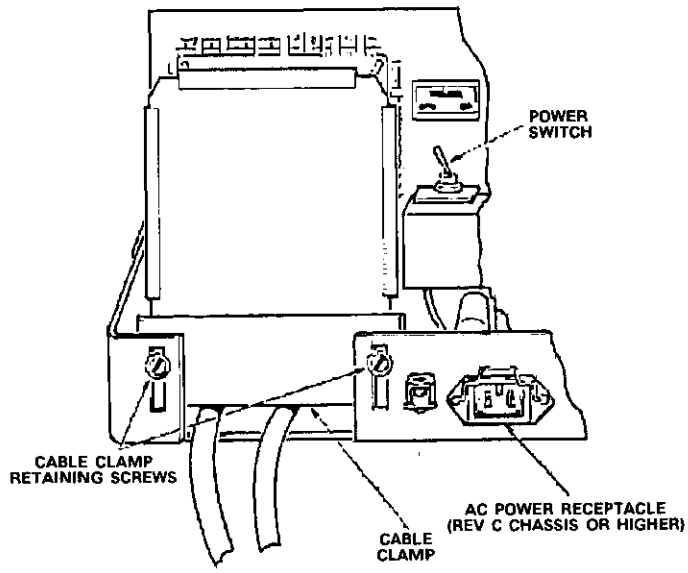
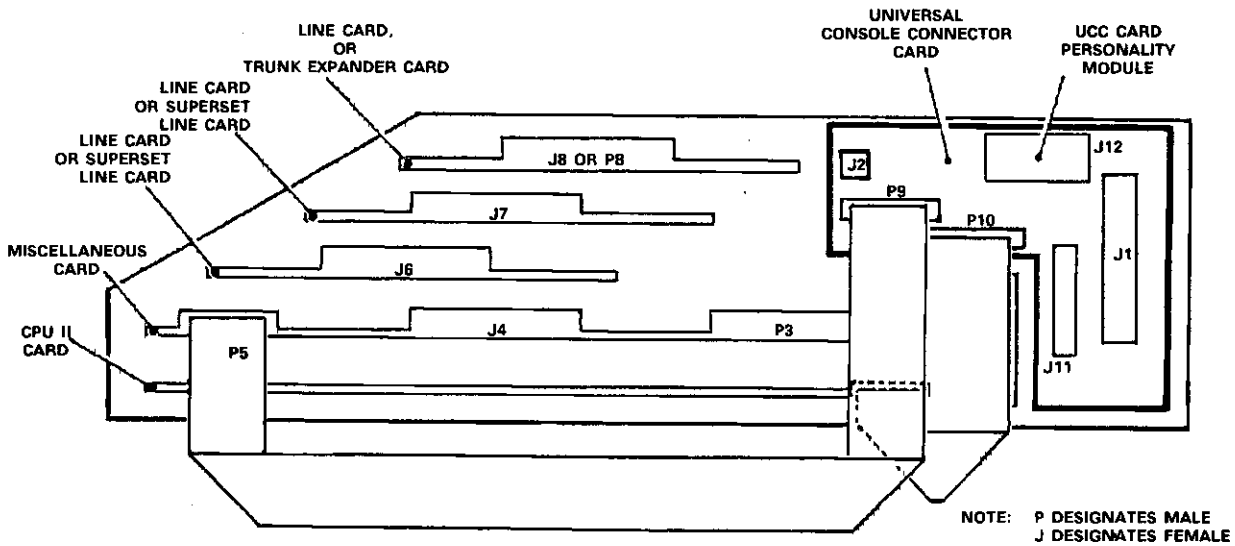


Figure 003-5 Cable Entry

SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 21 of 23



J1 - 25-PAIR FEMALE CONNECTOR - FOR CABLE TO CONSOLE
J2 - MINI-JACK - FOR CABLE TO REMOTE DISPLAY
P3 - 25-PAIR MALE CONNECTOR - FOR CABLE TO TRUNKS
J4 - 25-PAIR FEMALE CONNECTOR - FOR CABLE TO MISCELLANEOUS EQUIPMENT
J6, J7, J8 - 25-PAIR FEMALE CONNECTORS - FOR CABLES TO STATIONS
P5, P9 - 26-PIN HEADER, MISCELLANEOUS CARD RIBBON CABLE
P10 - 20-PIN HEADER, CPU II CARD RIBBON CABLE
J11 - 25-PIN RS-232 FEMALE CONNECTOR
J12 - 40-PIN DIP CONNECTOR UCC CARD PERSONALITY MODULE

NOTES: 1. IF A TRUNK EXPANDER CARD IS USED, J8 IS REPLACED BY P8 (A 25-PAIR MALE CONNECTOR) FOR THE CABLES TO THE TRUNKS.
2. ONE OR TWO SUPERSET LINE CARDS ARE ALLOWED PER SYSTEM.

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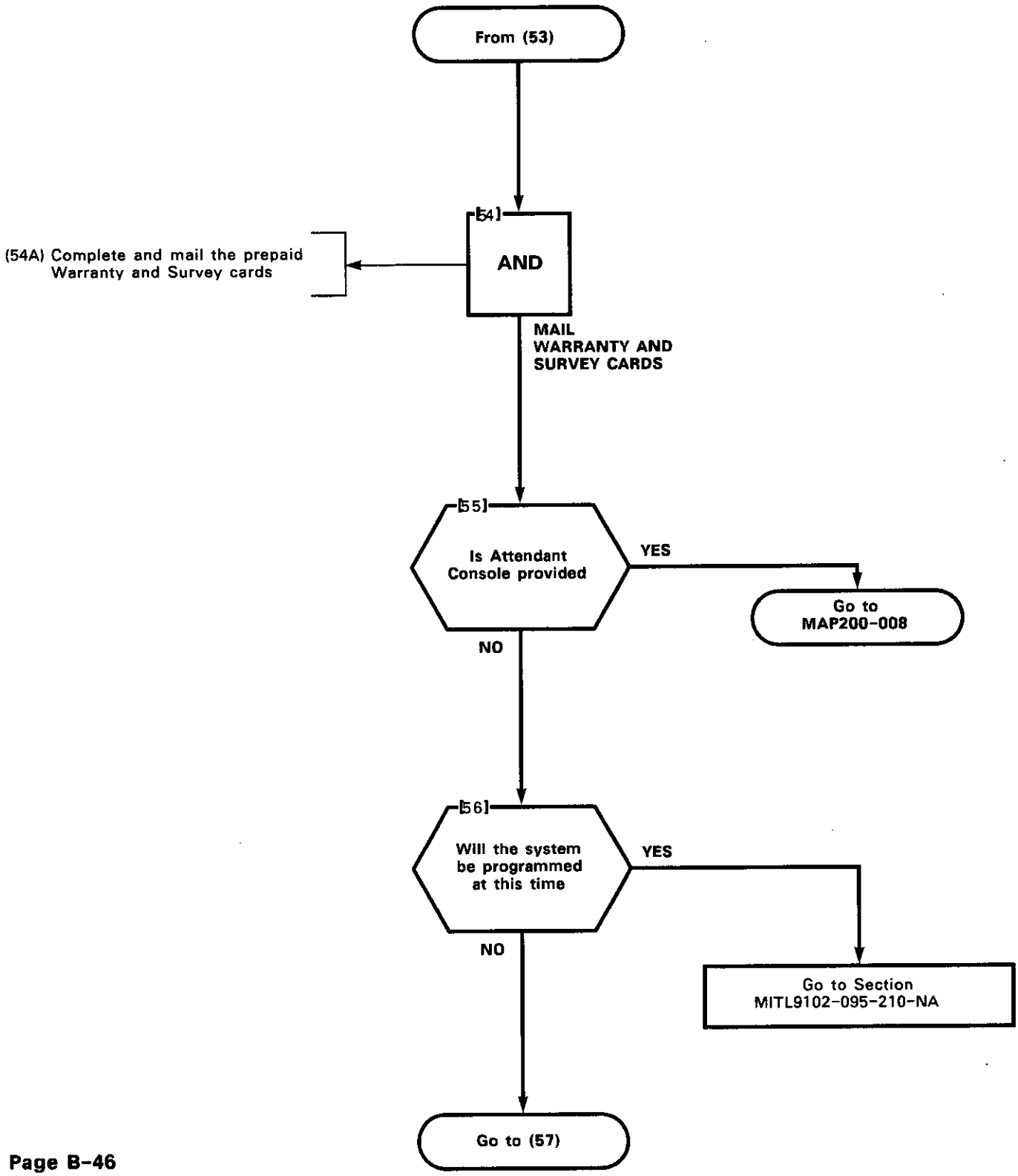
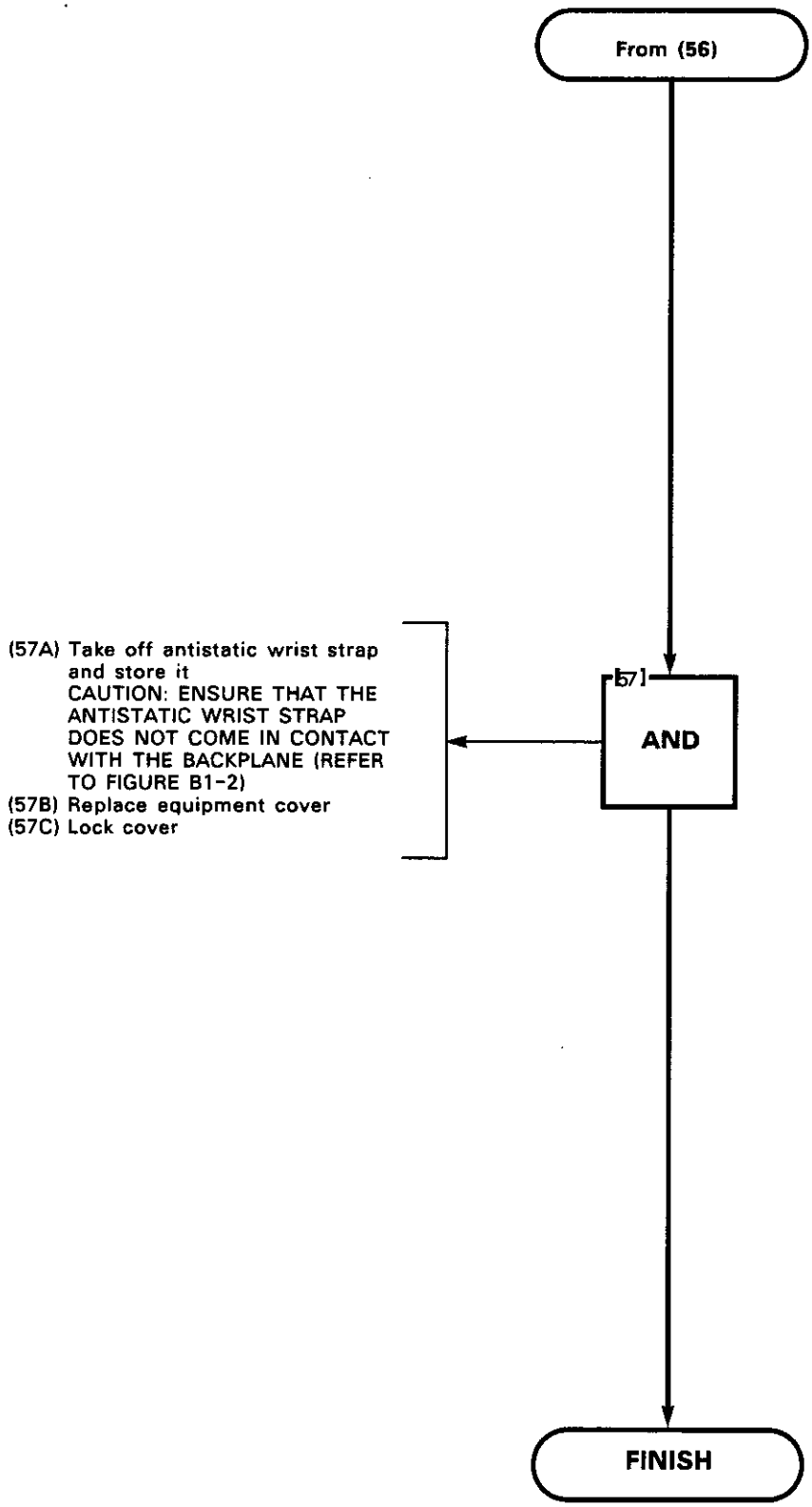
Figure 003-6 Plug Locations

SYSTEM INSTALLATION
MAP200- 003
Issue 3, March 1985
Sheet 22 of 23




From (56)
[57]
AND
(57A) Take off antistatic wrist strap and store it
CAUTION: ENSURE THAT THE ANTISTATIC WRIST STRAP DOES NOT COME IN CONTACT WITH THE BACKPLANE (REFER TO FIGURE B1-2)
(57B) Replace equipment cover
(57C) Lock cover
FINISH

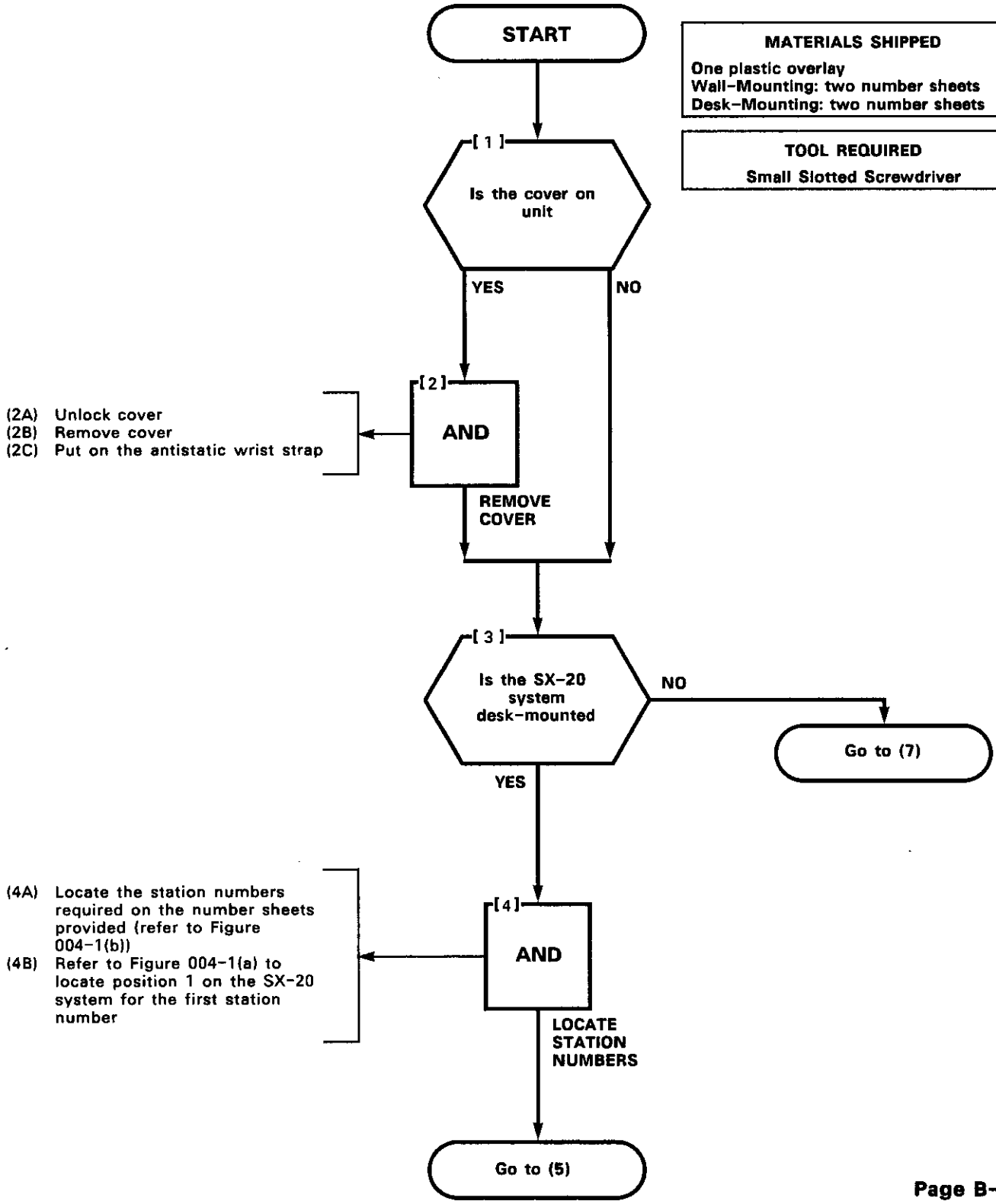
STATION NUMBER INSTALLATION (CABINET)
MAP200- 004
Issue 3, March 1985
Sheet 1 of 9

MATERIALS SHIPPED

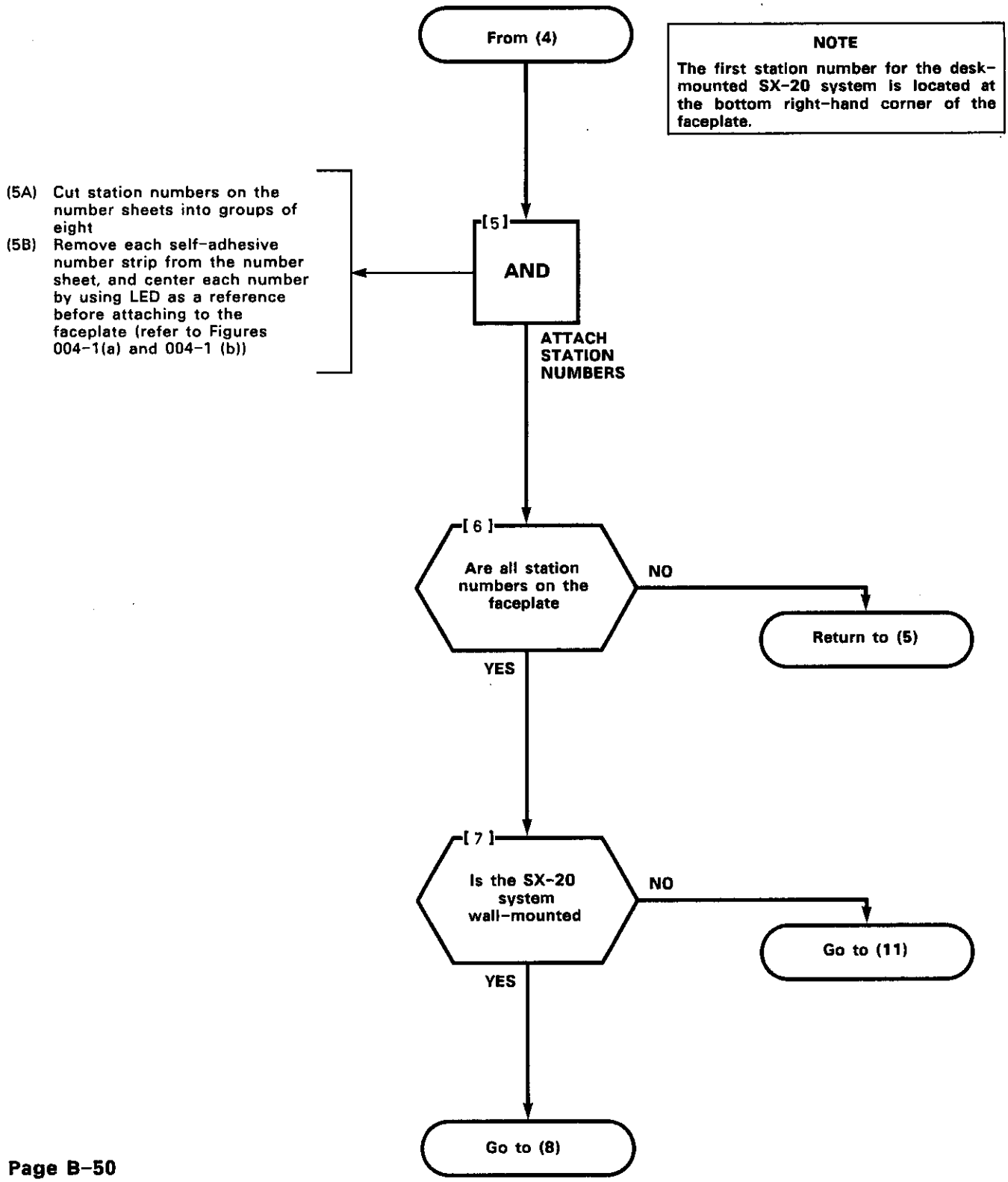
One plastic overlay
Wall-Mounting: two number sheets
Desk-Mounting: two number sheets

TOOL REQUIRED

Small Slotted Screwdriver



STATION NUMBER INSTALLATION (CABINET)
MAP200- 004
Issue 3, March 1985
Sheet 2 of 9



STATION NUMBER INSTALLATION (CABINET)
MAP200-004
Issue 3, March 1985
Sheet 3 of 9

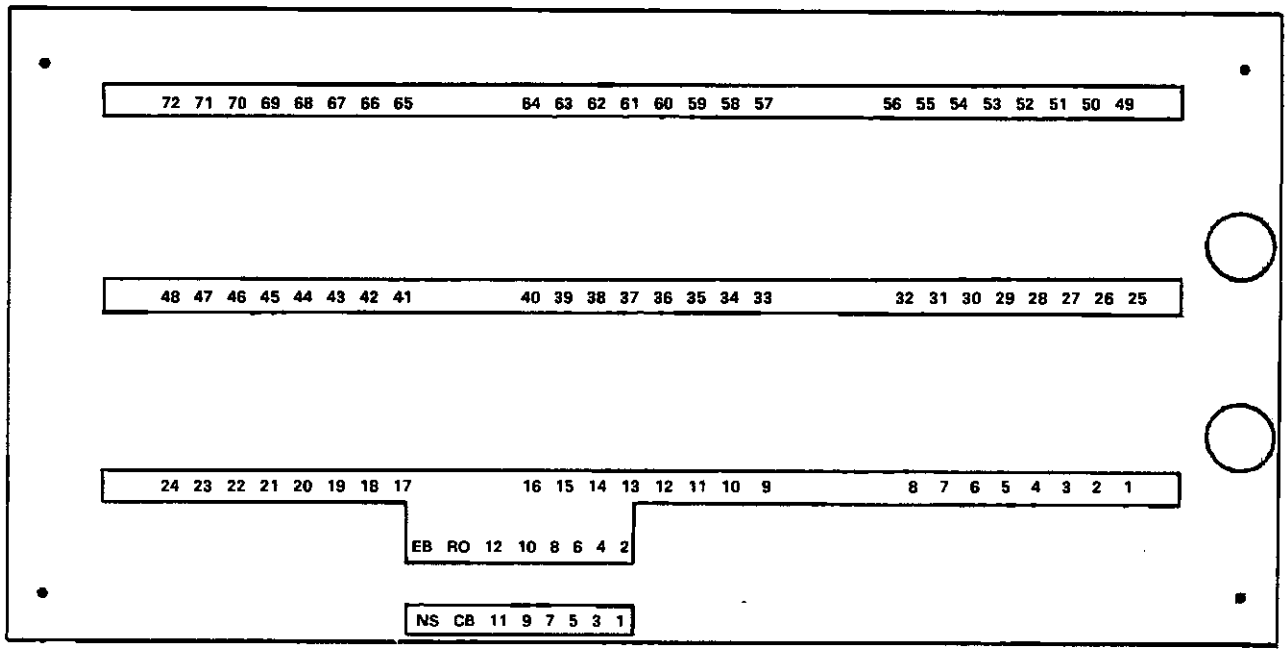


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Figure 004-1(a) Desk-Mounted

STATION NUMBER INSTALLATION (CABINET)
MAP200- 004
Issue 3, March 1985
Sheet 4 of 9

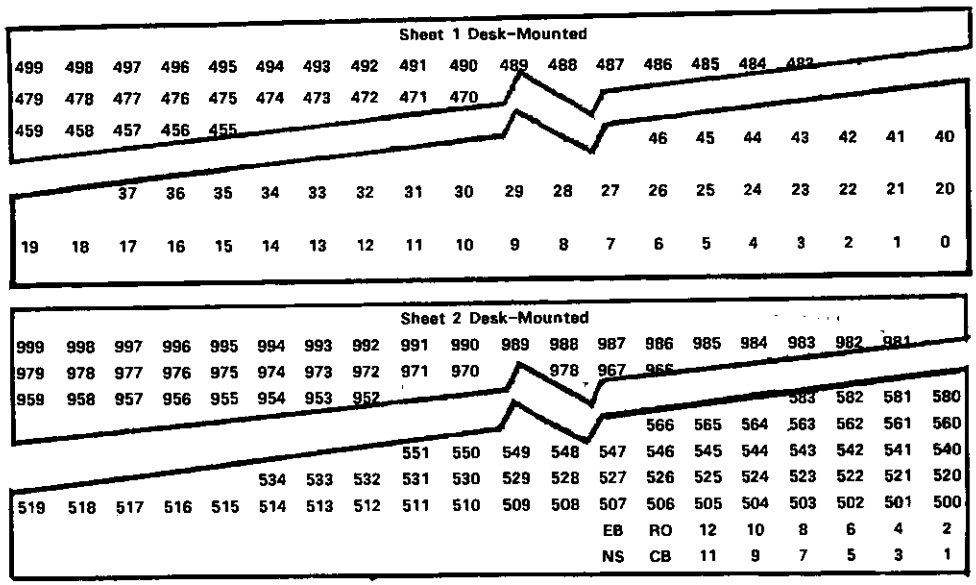

Figure 004-1(b) Desk-Mounted Number Sheets

STATION NUMBER INSTALLATION (CABINET)
MAP200-004
Issue 3, March 1985
Sheet 5 of 9

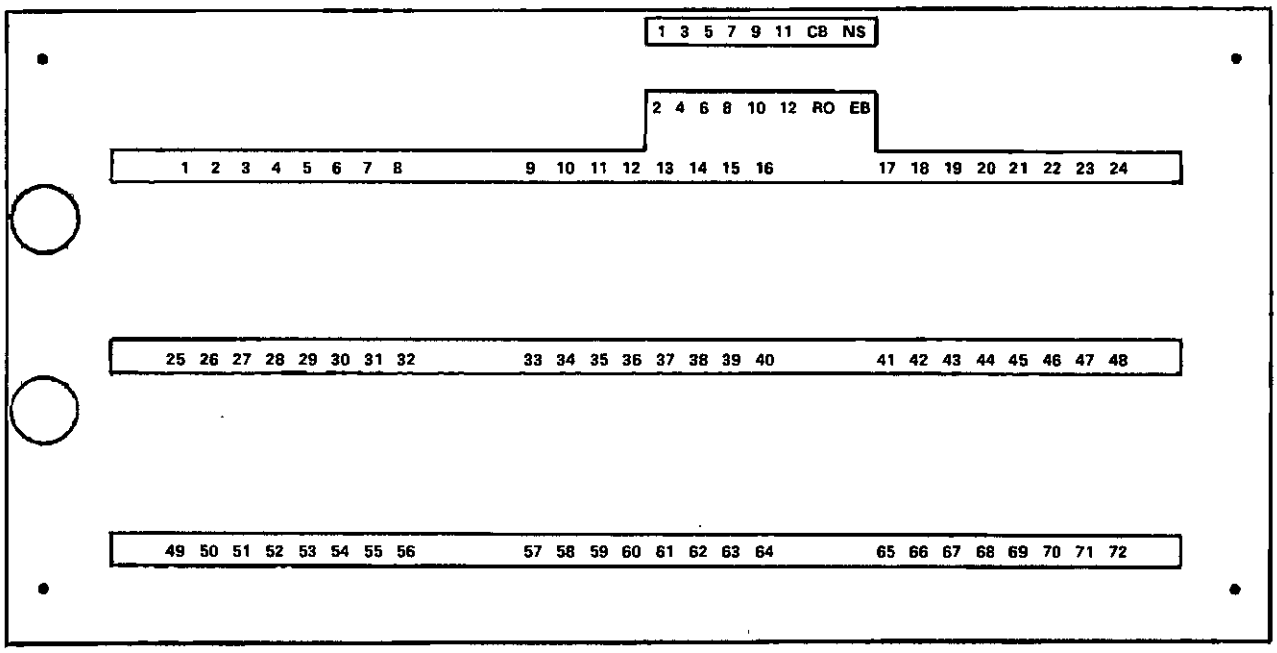

Figure 004-2(a) Wall-Mounted

STATION NUMBER INSTALLATION (CABINET)
MAP200- 004
Issue 3, March 1985
Sheet 6 of 9

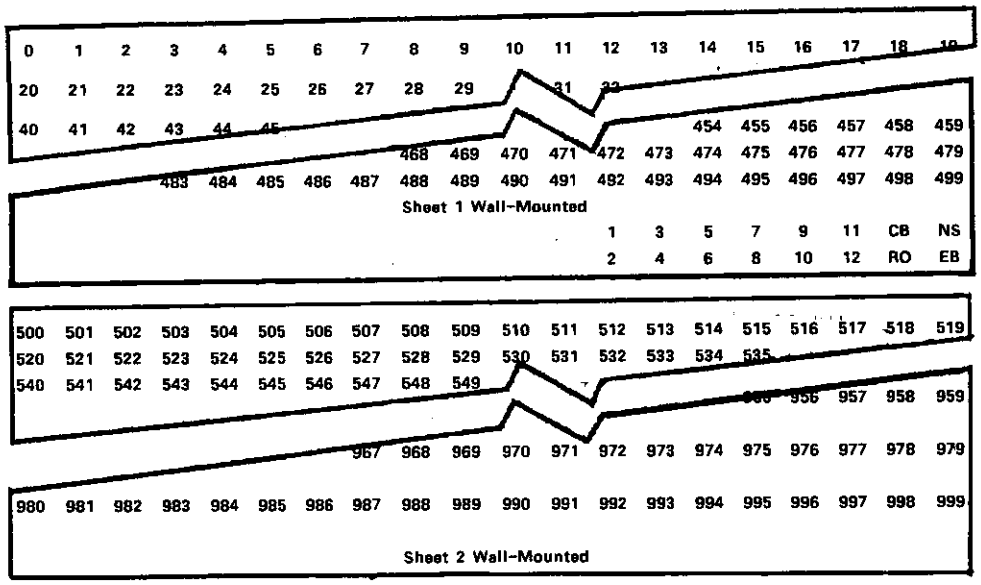

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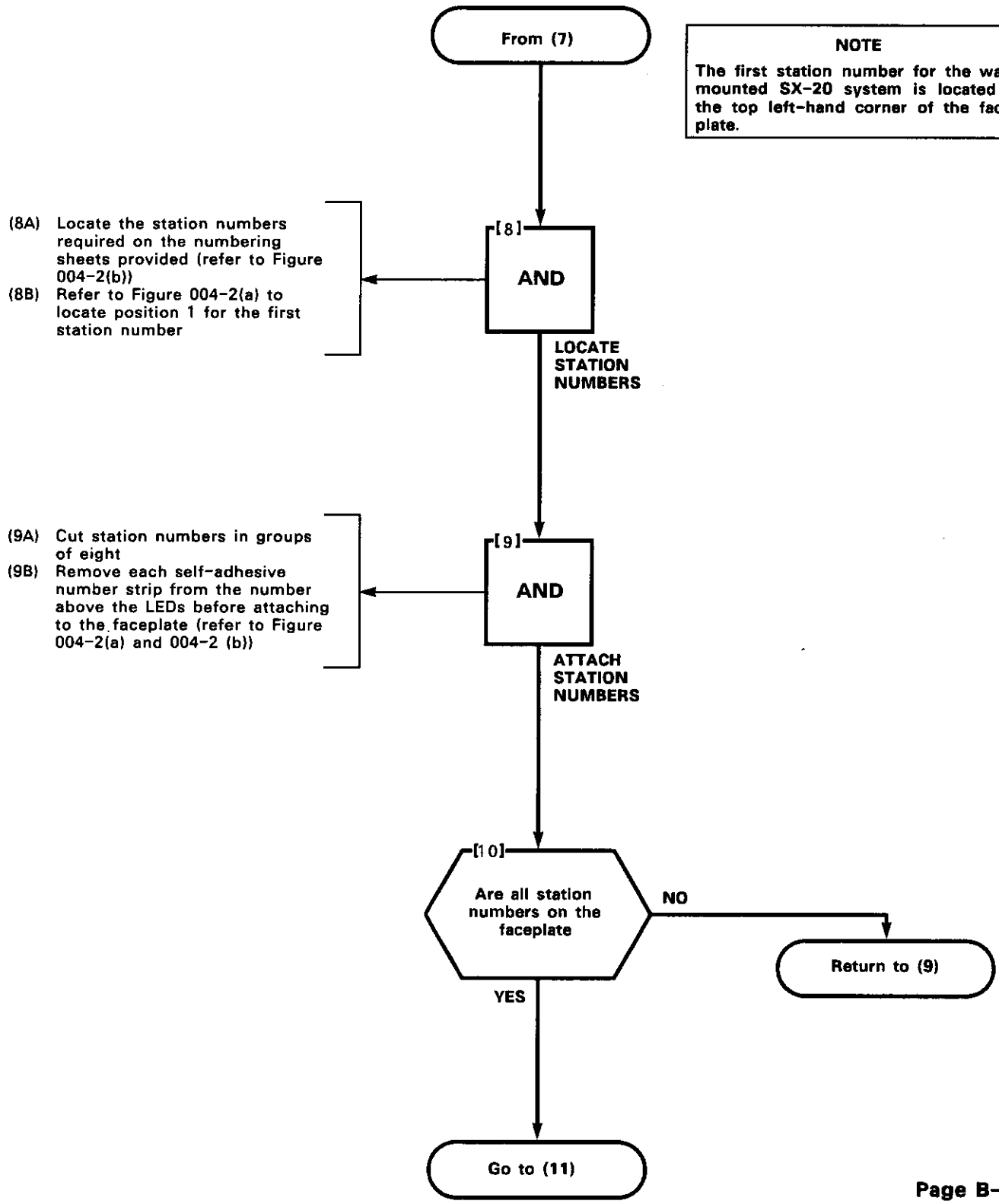
Figure 004-2(b) Wall-Mounted Number Sheets

STATION NUMBER INSTALLATION (CABINET)
MAP200-004
Issue 3, March 1985
Sheet 7 of 9



STATION NUMBER INSTALLATION (CABINET)
MAP200- 004
Issue 3, March 1985
Sheet 8 of 9

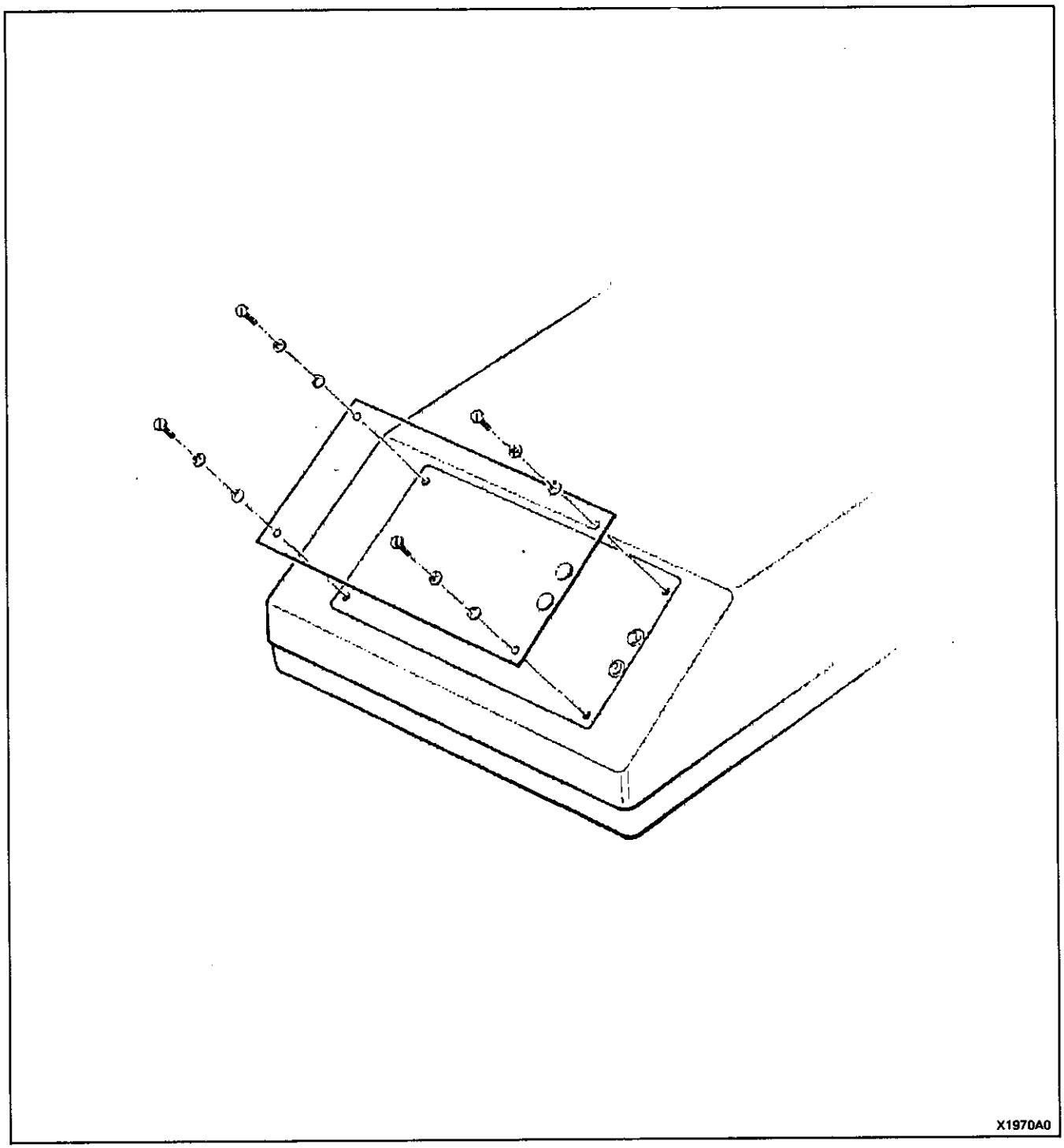
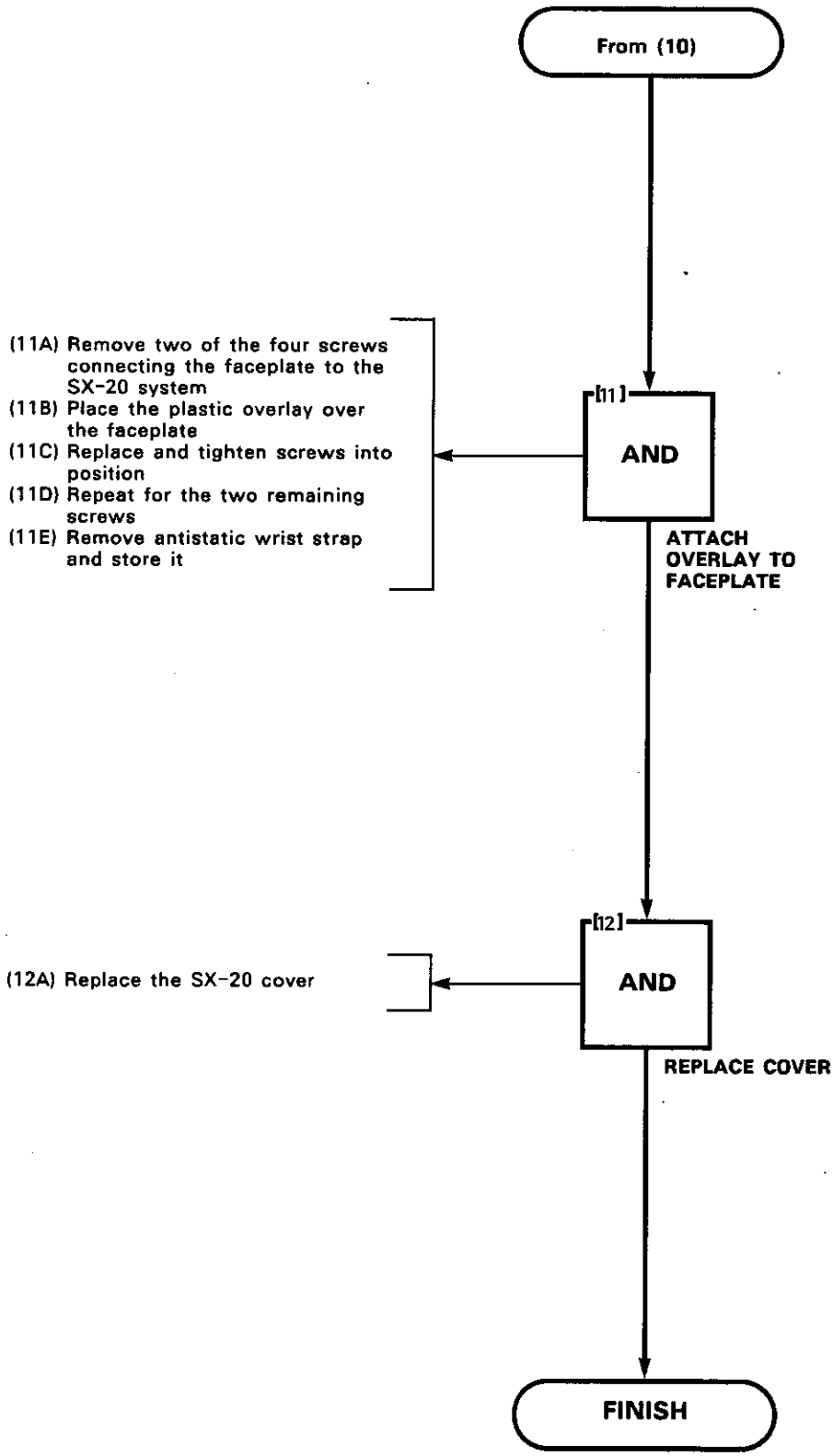


Figure 004-3 Installation of Overlay SX-20

STATION NUMBER INSTALLATION (CABINET)
MAP200-004
Issue 3, March 1985
Sheet 9 of 9



REMOTE DISPLAY INSTALLATION
MAP200- 005
Issue 3, March 1985
Sheet 1 of 6

TOOL REQUIRED
Small Phillips Screwdriver

START

[1] Is the Remote Display unpacked

YES → Go to (3)

NO

[2] AND

REFER TO FIGURE 005-1
(2A) Open shipping container
(2B) Remove instructions and table stand
(2C) Remove the Remote Display from antistatic bag

UNPACK REMOTE DISPLAY

[3] Are the station group numbers on the display

YES → Go to (8)

NO

Go to (4)

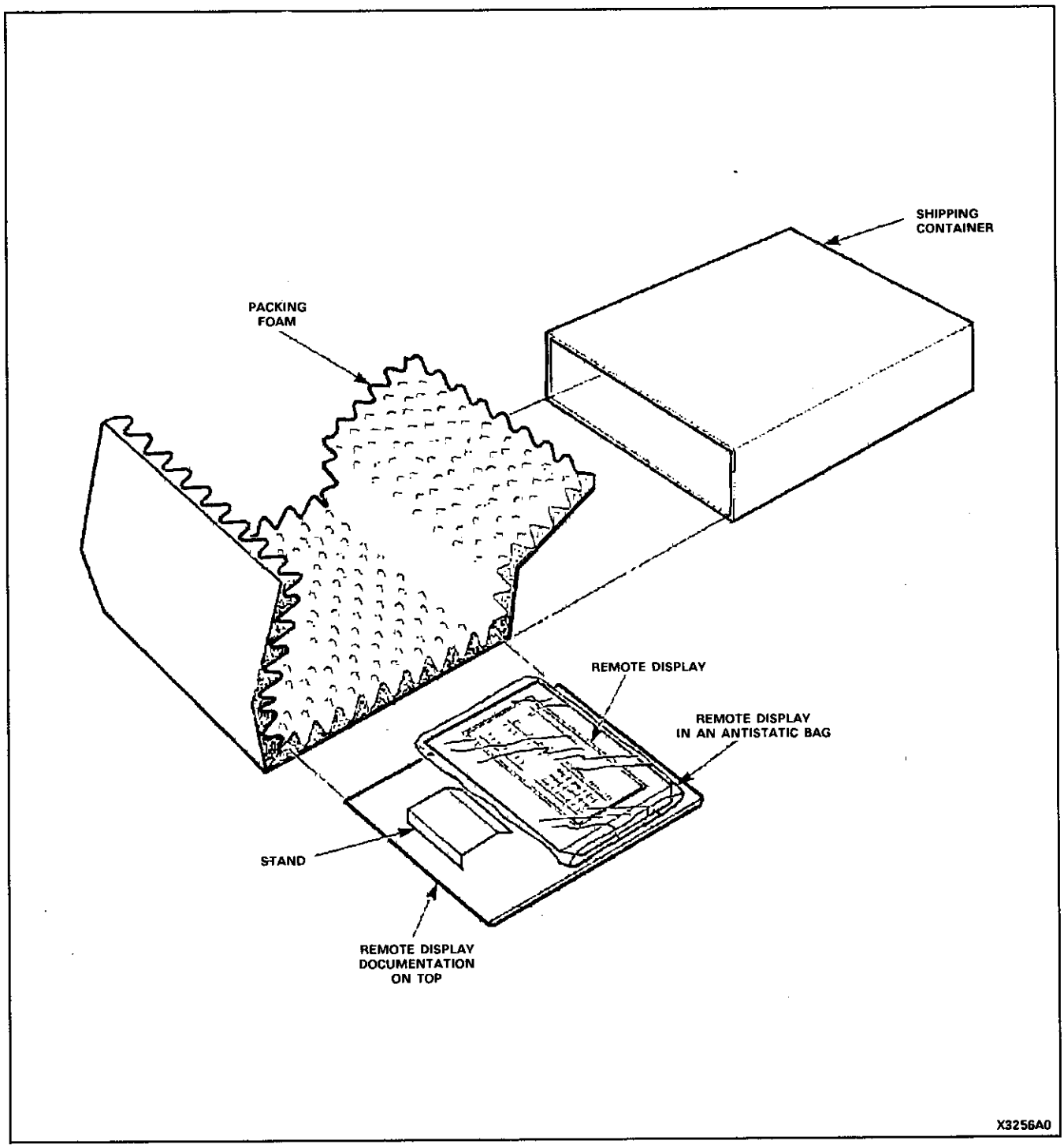


Figure 005-1 Remote Display Packaging

REMOTE DISPLAY INSTALLATION
MAP200-005
Issue 3, March 1985
Sheet 3 of 6

From (3)

[4]

AND

REFER TO FIGURE 005-2

(4A) Remove the four Phillips screws from the back panel of the Remote Display

(4B) Remove the cover and place the display face-up

REMOVE COVER

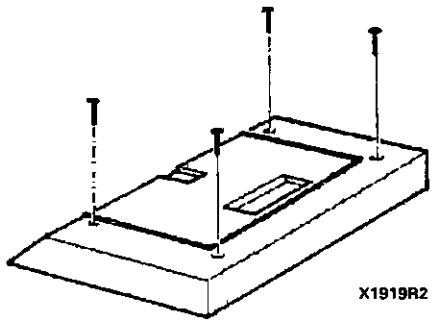


Figure 005-2

[5]

AND

(5A) On the number sheet provided, locate the numbers required to identify each group of 10 stations used on the Remote Display. Refer to Figure 005-3

ATTACH STATION NUMBERS

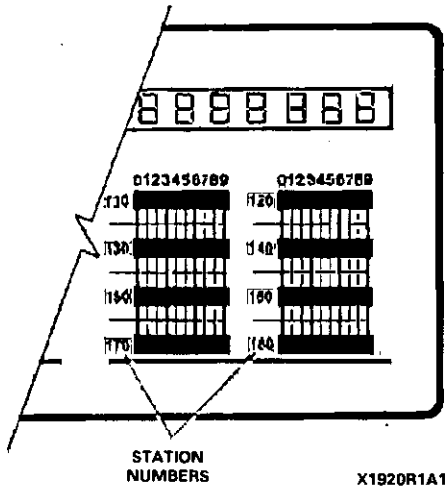


Figure 005-3

[6]

Are all numbers on the display

NO

Return to (5)

YES

Go to (7)

REMOTE DISPLAY INSTALLATION
MAP200- 005
Issue 3, March 1985
Sheet 4 of 6

From (6)

[7] AND

(7A) Replace the front cover and turn the unit over
(7B) Replace the Phillips screws, and tighten

REPLACE COVER

[8] Is the table stand attached to the Remote Display

NO

YES

REFER TO FIGURE 005-4
(9A) Insert the table stand into the slot at the rear of the Remote Display, and push up

[9] AND

ATTACH TABLE STAND

[10] AND

(10A) The Remote Display may be mounted up to 152 m (500 ft) from the equipment cabinet

CONSTRUCT CORRECT CABLE

Go to (11)

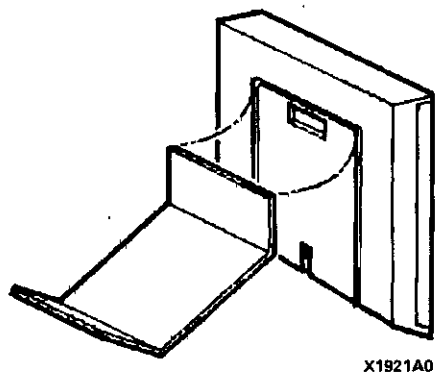


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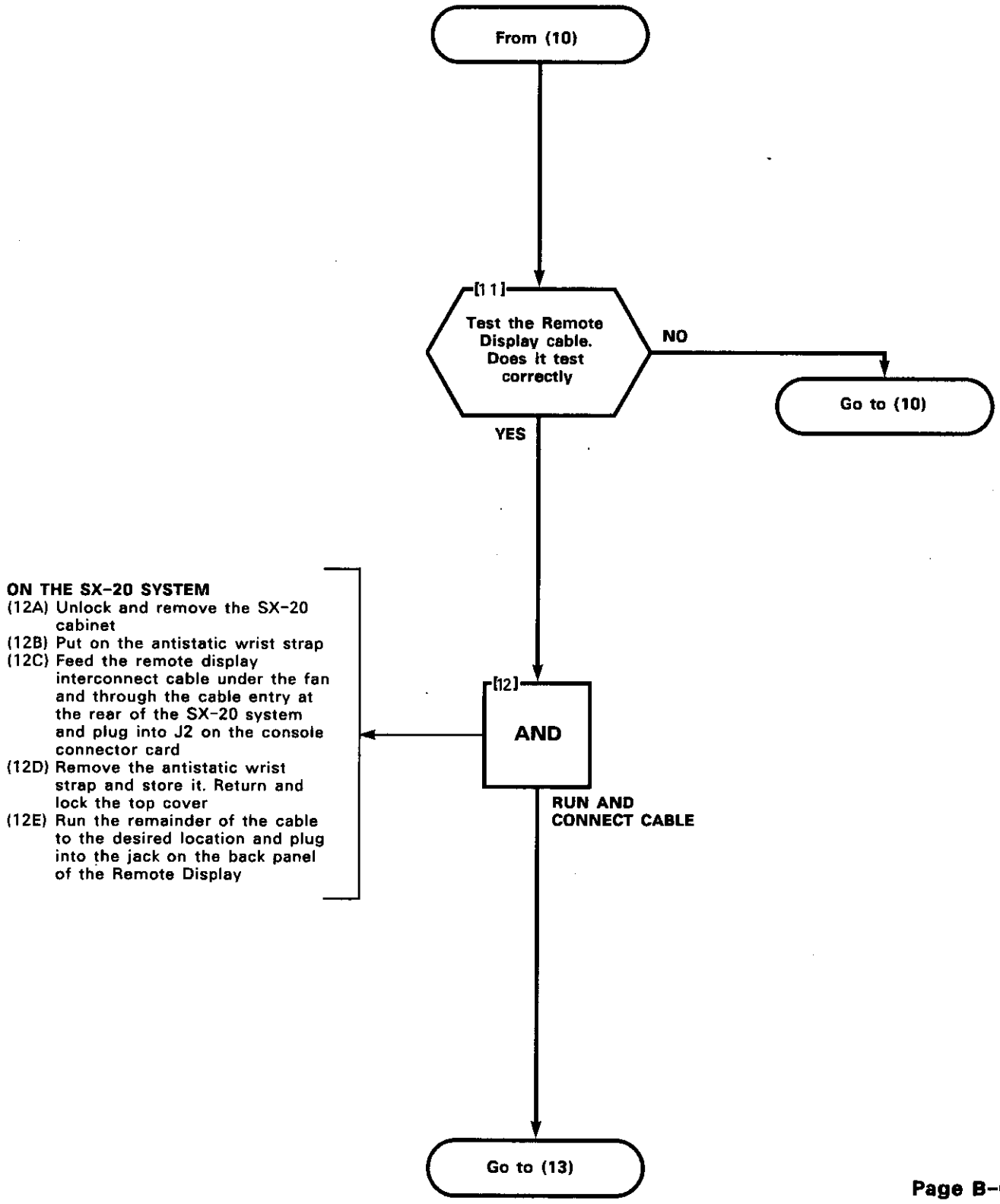
Figure 005-4

REMOTE DISPLAY INSTALLATION
MAP200-005
Issue 3, March 1985
Sheet 5 of 6



REMOTE DISPLAY INSTALLATION
MAP200- 005
Issue 3, March 1985
Sheet 6 of 6

From (12)

[13]

AND

(13A) Using a slotted screwdriver, turn the power adjustment screw (Figure 005-5) located at the right-hand side of the Remote Display clockwise, until the display initially turns on. Continue to turn until the display turns off and note this position

(13B) Turn the power adjustment screw counter-clockwise until the display initially turns on. Continue to turn until the display turns off and note this position

(13C) Once the turn-off points have been located, turn the power adjustment screw to the point halfway between the two positions found in (13A) and (13B)

POWER ON, ADJUST THE POWER ADJUSTMENT SCREW

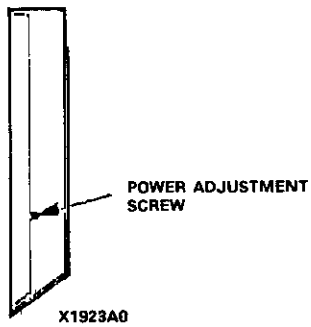


Figure 005-5

[14]

Is the display on

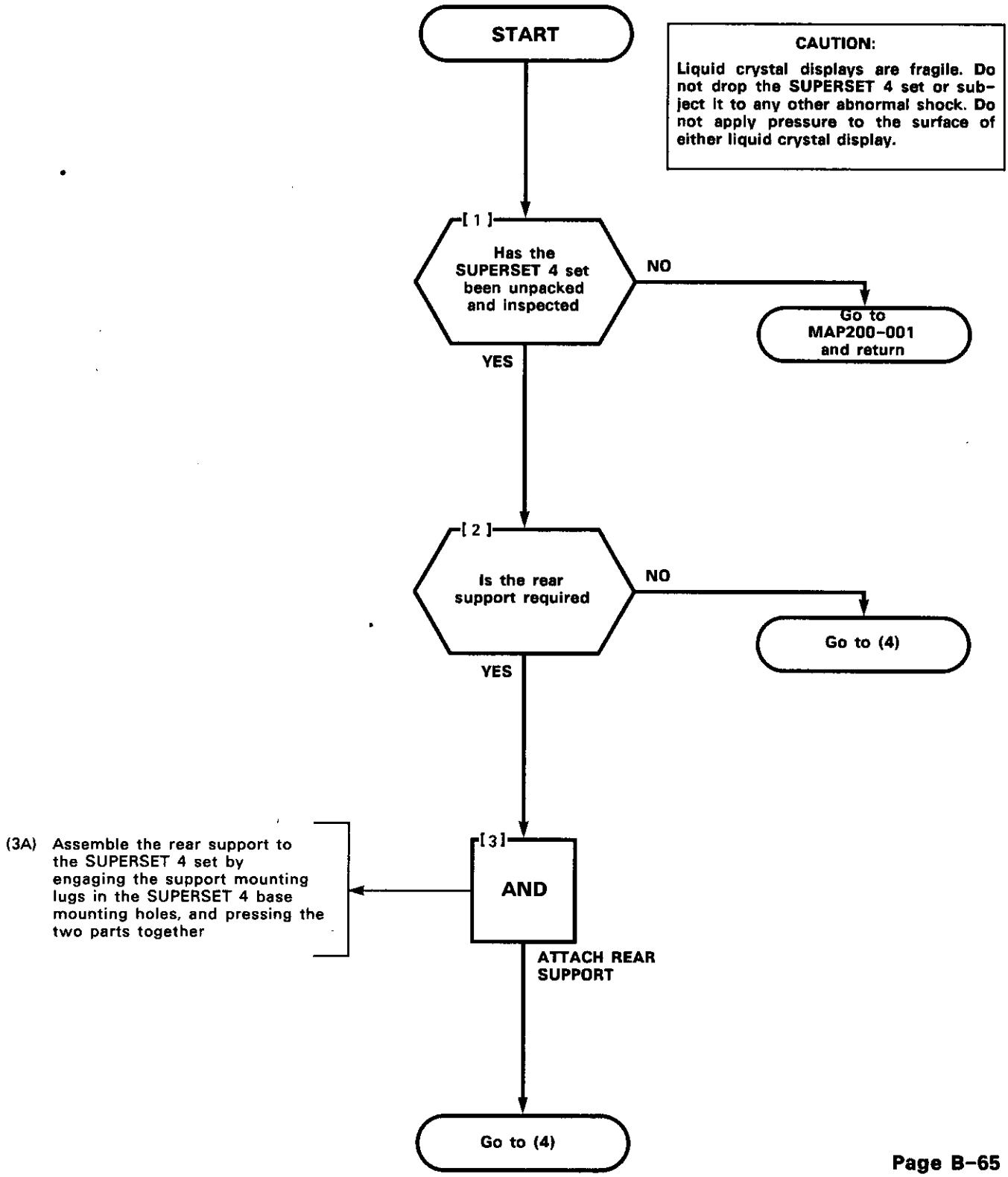
NO

Return to (13)

YES

FINISH

SUPERSET 4 SET INSTALLATION
MAP200-006
Issue 3, March 1985
Sheet 1 of 4



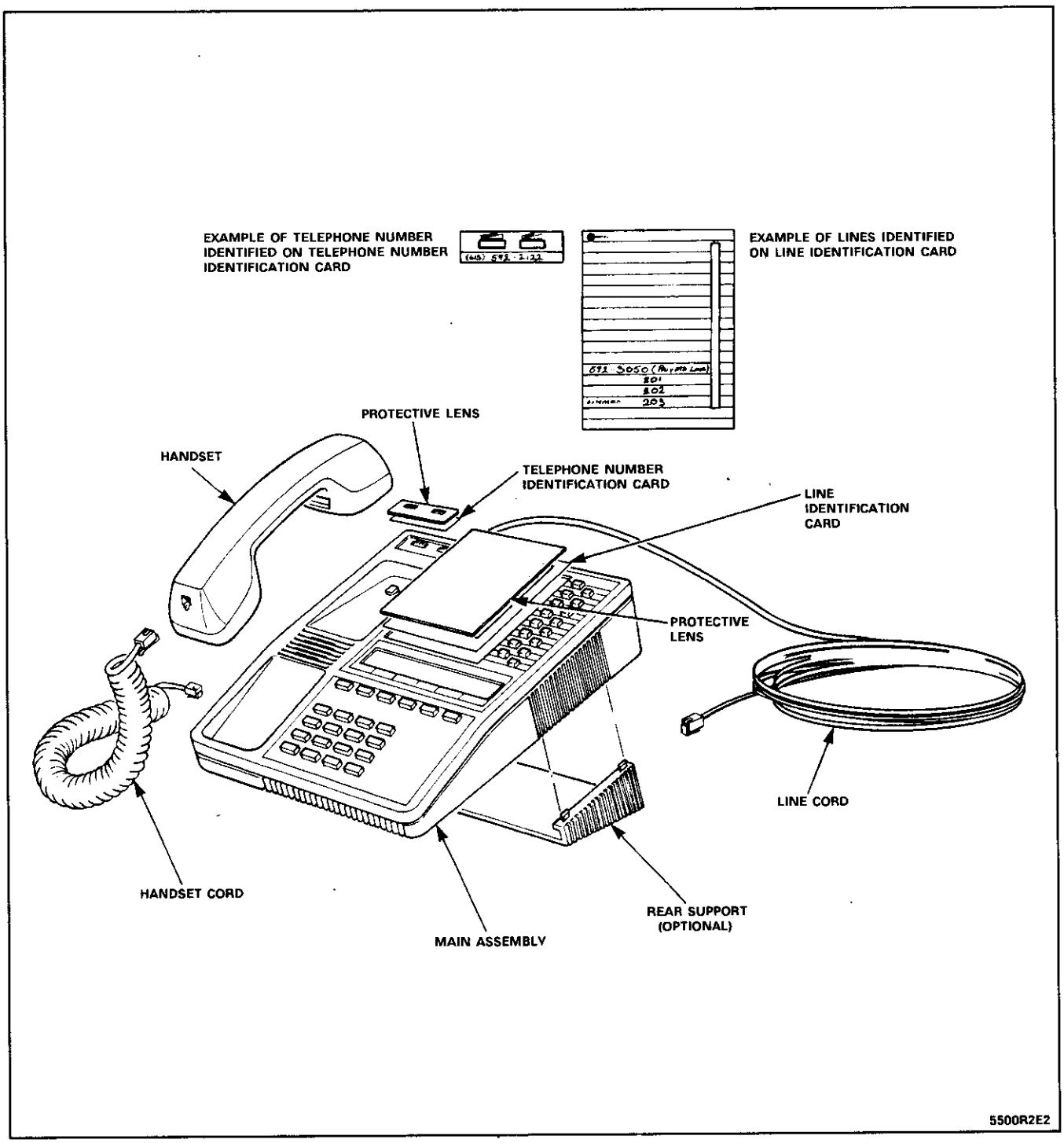
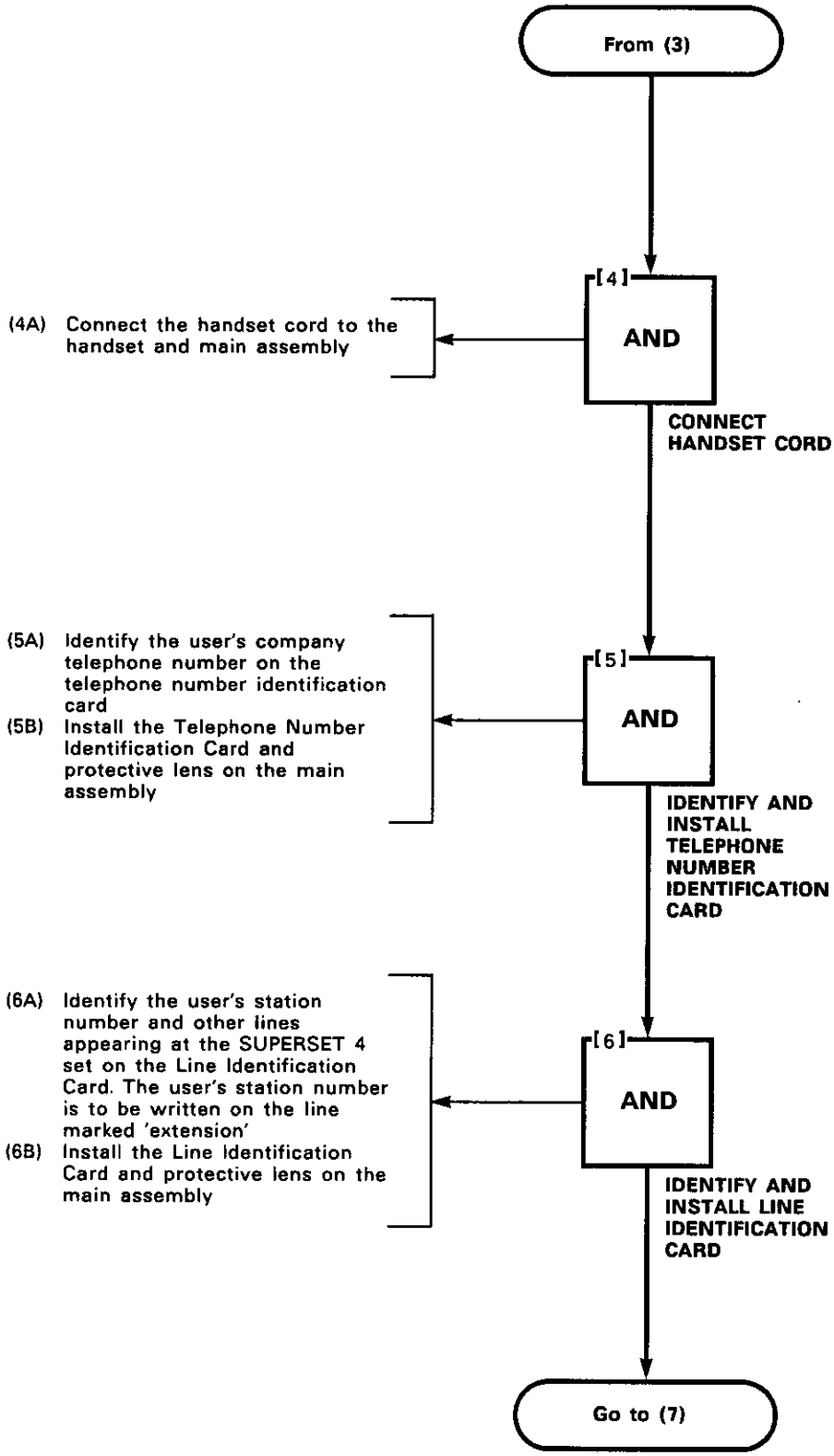
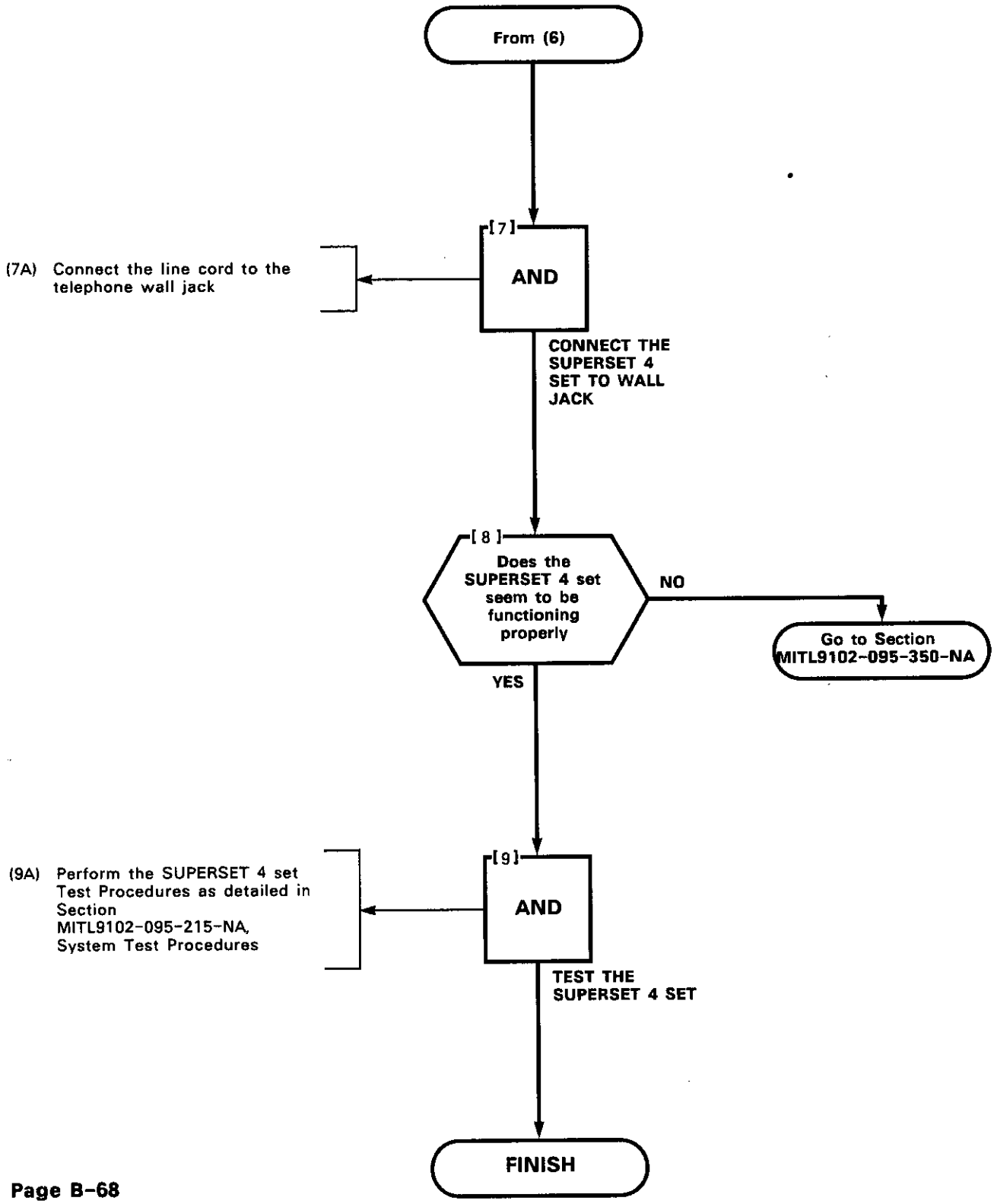


Figure 006-1 SUPERSET 4 Set Assembly

SUPERSET 4 SET INSTALLATION
MAP200-006
Issue 3, March 1985
Sheet 3 of 4

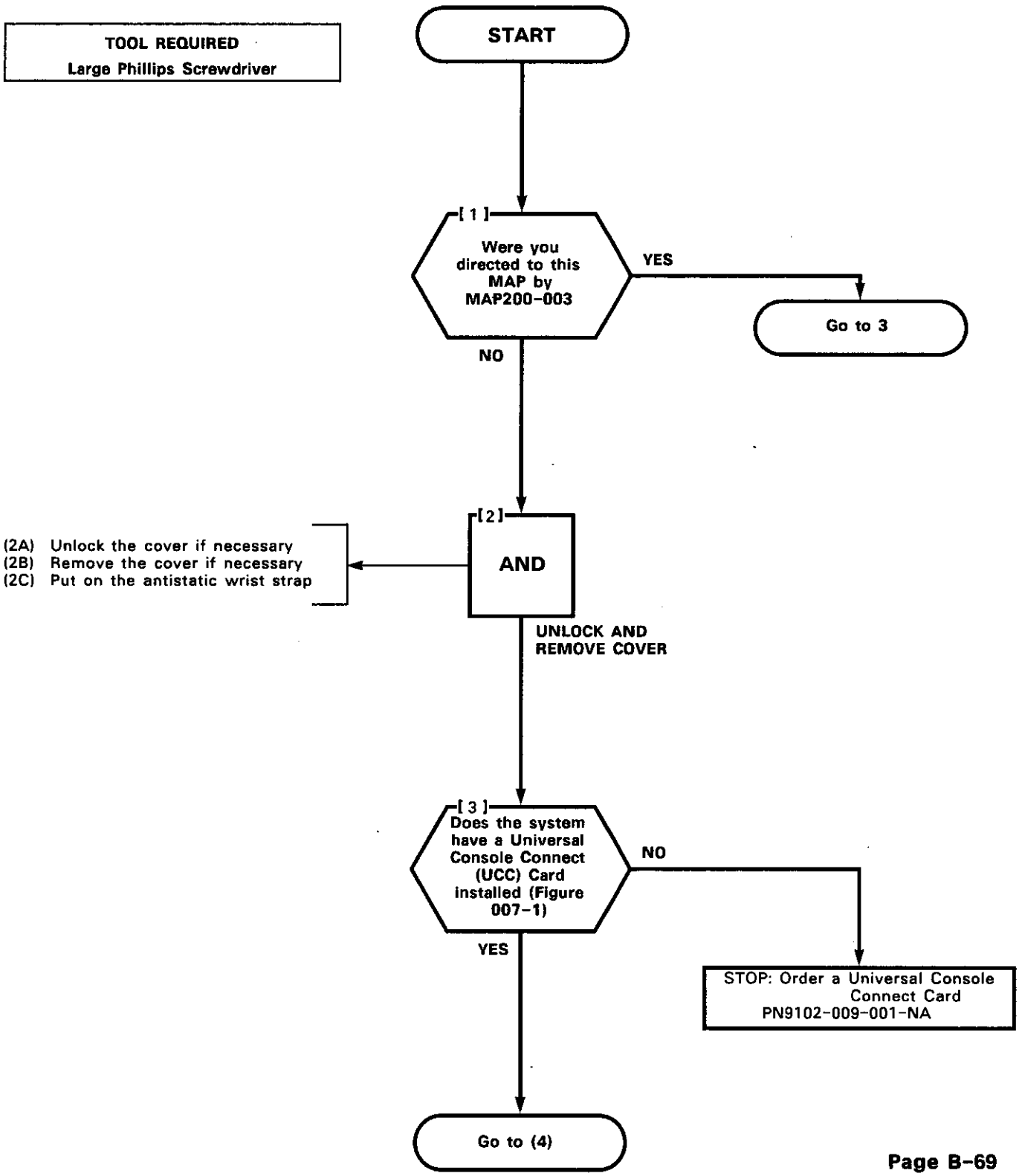


SUPERSET 4 SET INSTALLATION
MAP200- 006
Issue 3, March 1985
Sheet 4 of 4



CONSOLE INSTALLATION
MAP200-007
Issue 3, March 1985
Sheet 1 of 8

TOOL REQUIRED
Large Phillips Screwdriver



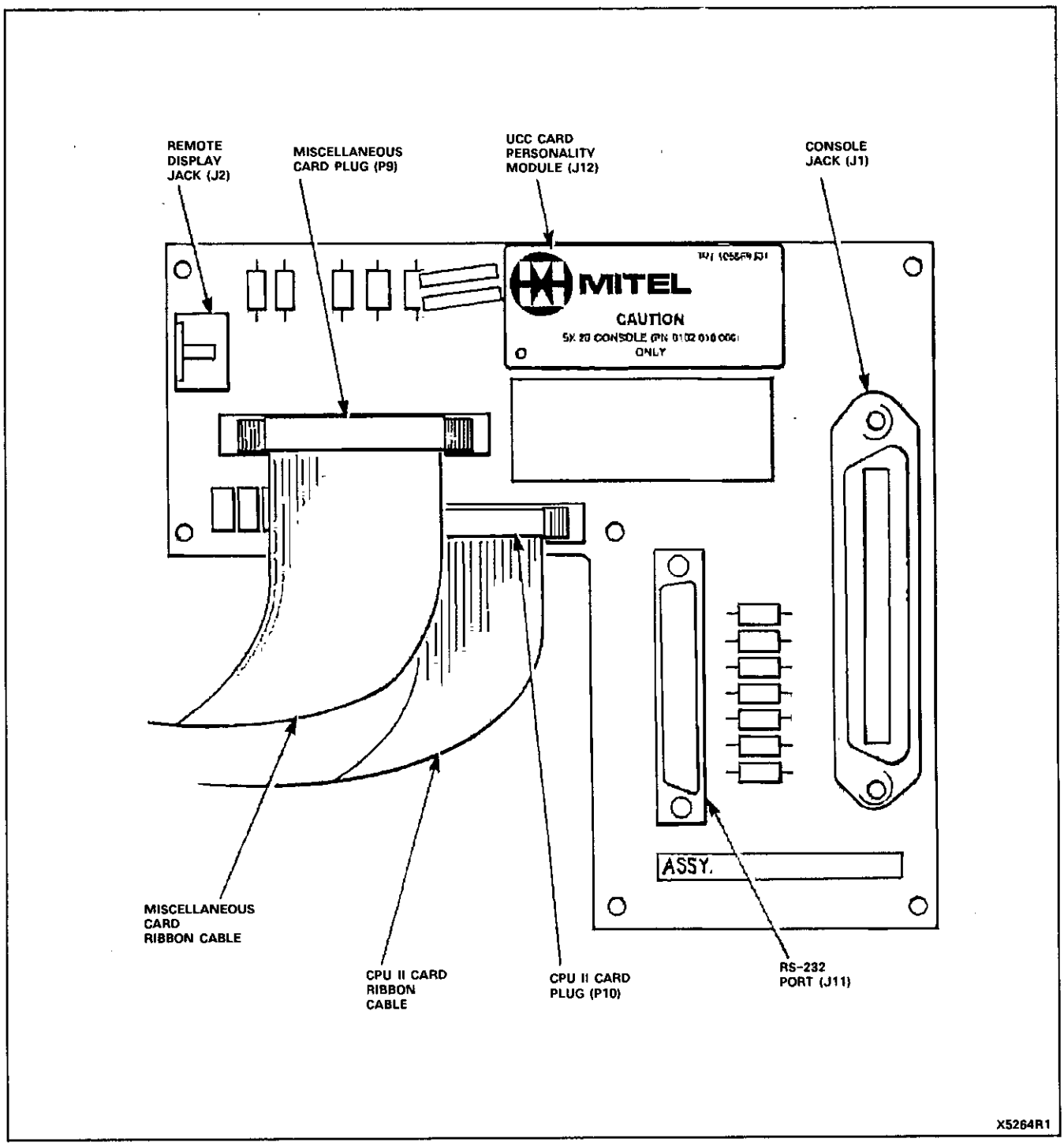
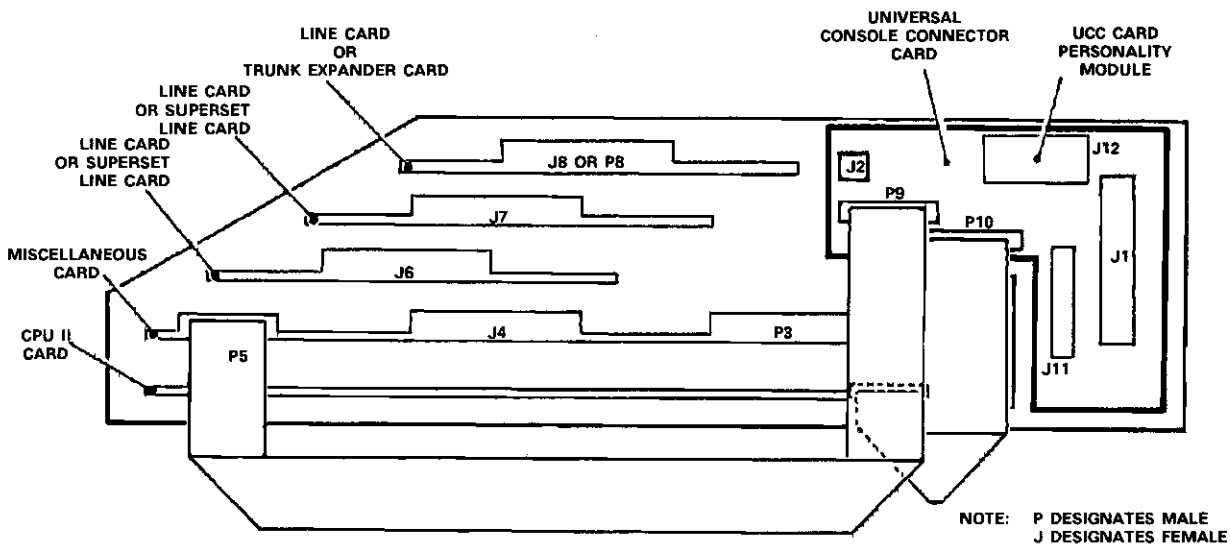


Figure 007-1 Universal Console Connect Card (UCC Card)

CONSOLE INSTALLATION
MAP200- 007
Issue 3, March 1985
Sheet 3 of 8



J1 – 25-PAIR FEMALE CONNECTOR – FOR CABLE TO CONSOLE
J2 – MINI-JACK – FOR CABLE TO REMOTE DISPLAY
P3 – 25-PAIR MALE CONNECTOR – FOR CABLE TO TRUNKS
J4 – 25-PAIR FEMALE CONNECTOR – FOR CABLE TO MISCELLANEOUS EQUIPMENT
J6, J7, J8 – 25-PAIR FEMALE CONNECTORS – FOR CABLES TO STATIONS
P5, P9 – 26-PIN HEADER, MISCELLANEOUS CARD RIBBON CABLE
P10 – 20-PIN HEADER, CPU II CARD RIBBON CABLE
J11 – 25-PIN RS-232 FEMALE CONNECTOR
J12 – 40-PIN DIP CONNECTOR UCC CARD PERSONALITY MODULE

NOTES: 1. IF A TRUNK EXPANDER CARD IS USED, J8 IS REPLACED BY P8 (A 25-PAIR MALE CONNECTOR) FOR THE CABLES TO THE TRUNKS.
2. ONE OR TWO SUPERSET LINE CARDS ARE ALLOWED PER SYSTEM.

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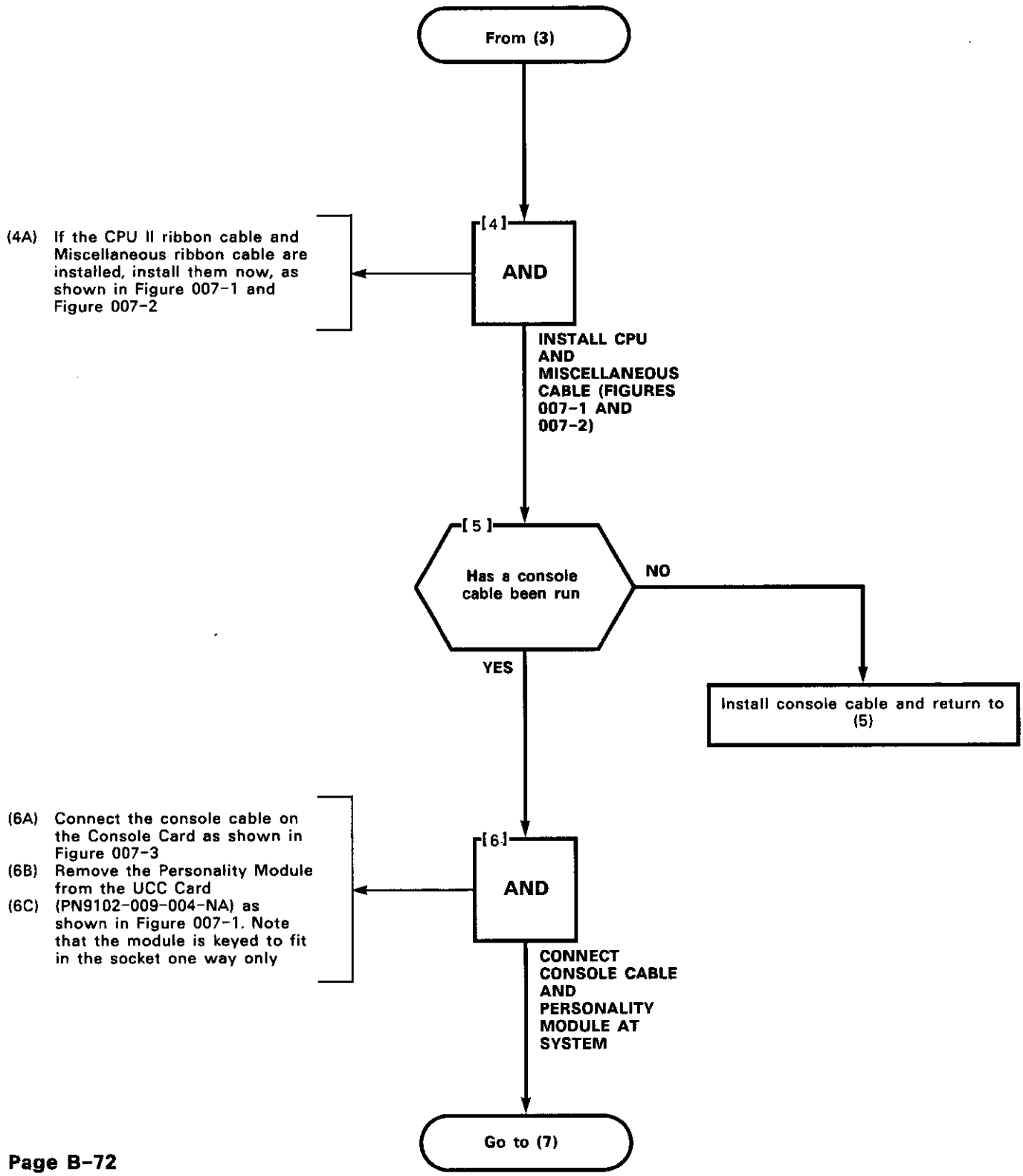
Figure 007-2 Plug Locations

CONSOLE INSTALLATION
MAP200~ 007
Issue 3, March 1985
Sheet 4 of 8



CONSOLE INSTALLATION
MAP200- 007
Issue 3, March 1985
Sheet 5 of 8

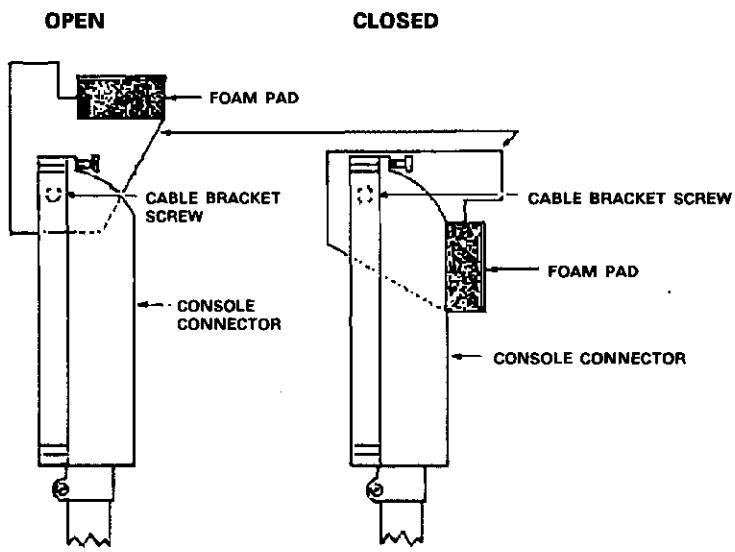
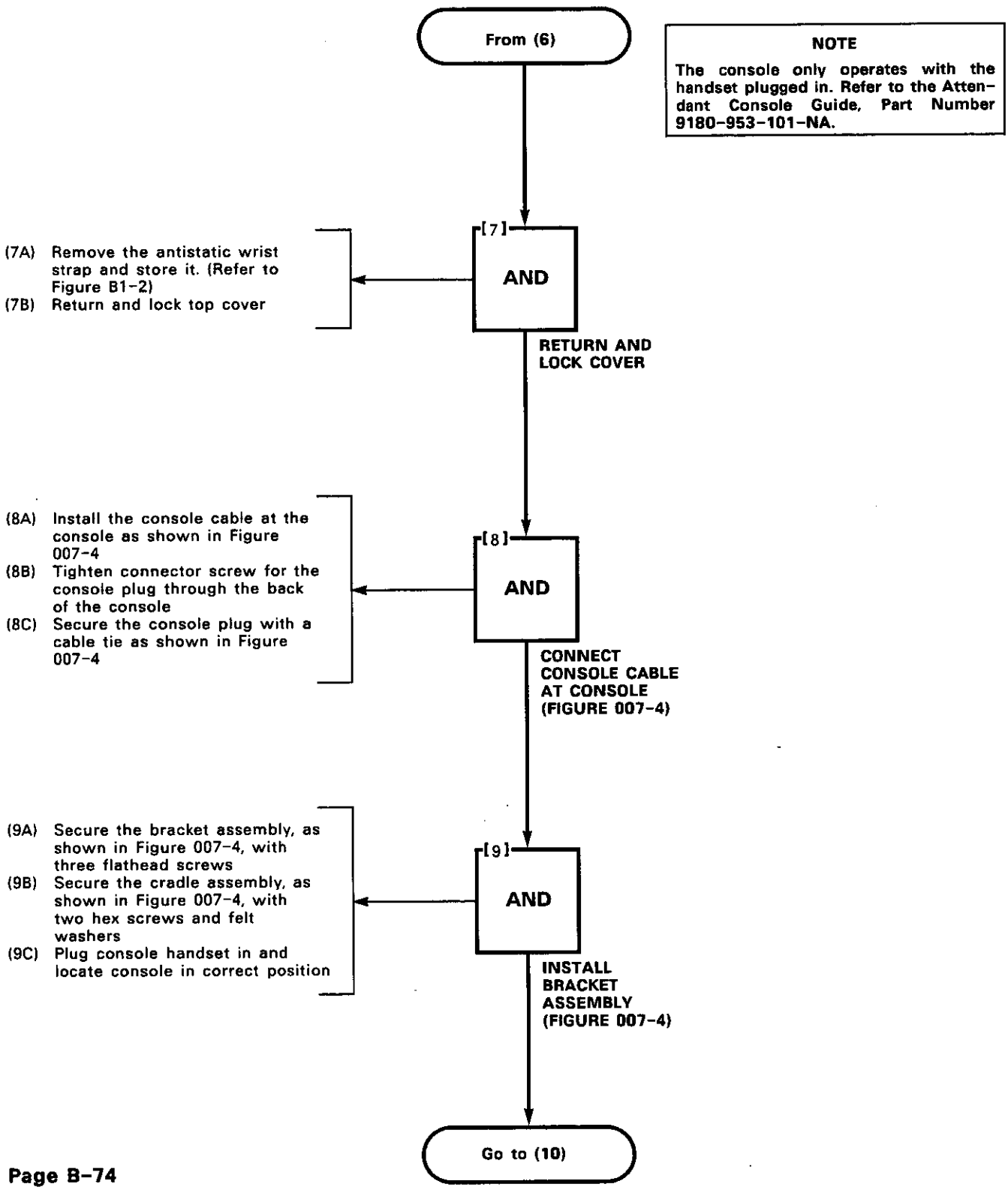


Figure 007-3 Console Cable Connector

CONSOLE INSTALLATION
MAP200- 007
Issue 3, March 1985
Sheet 6 of 8



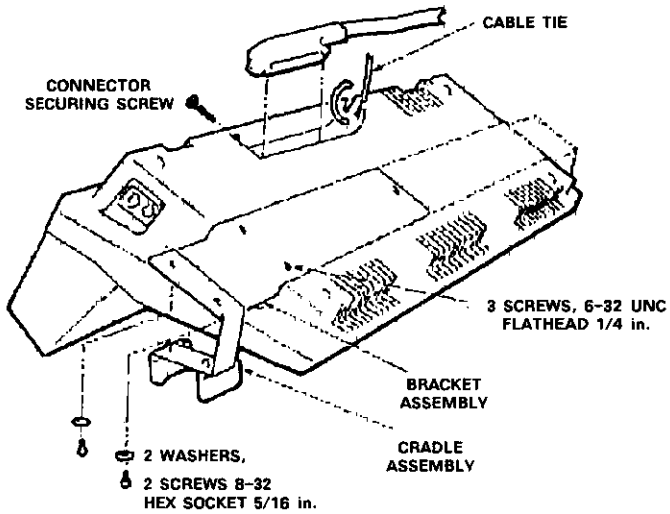


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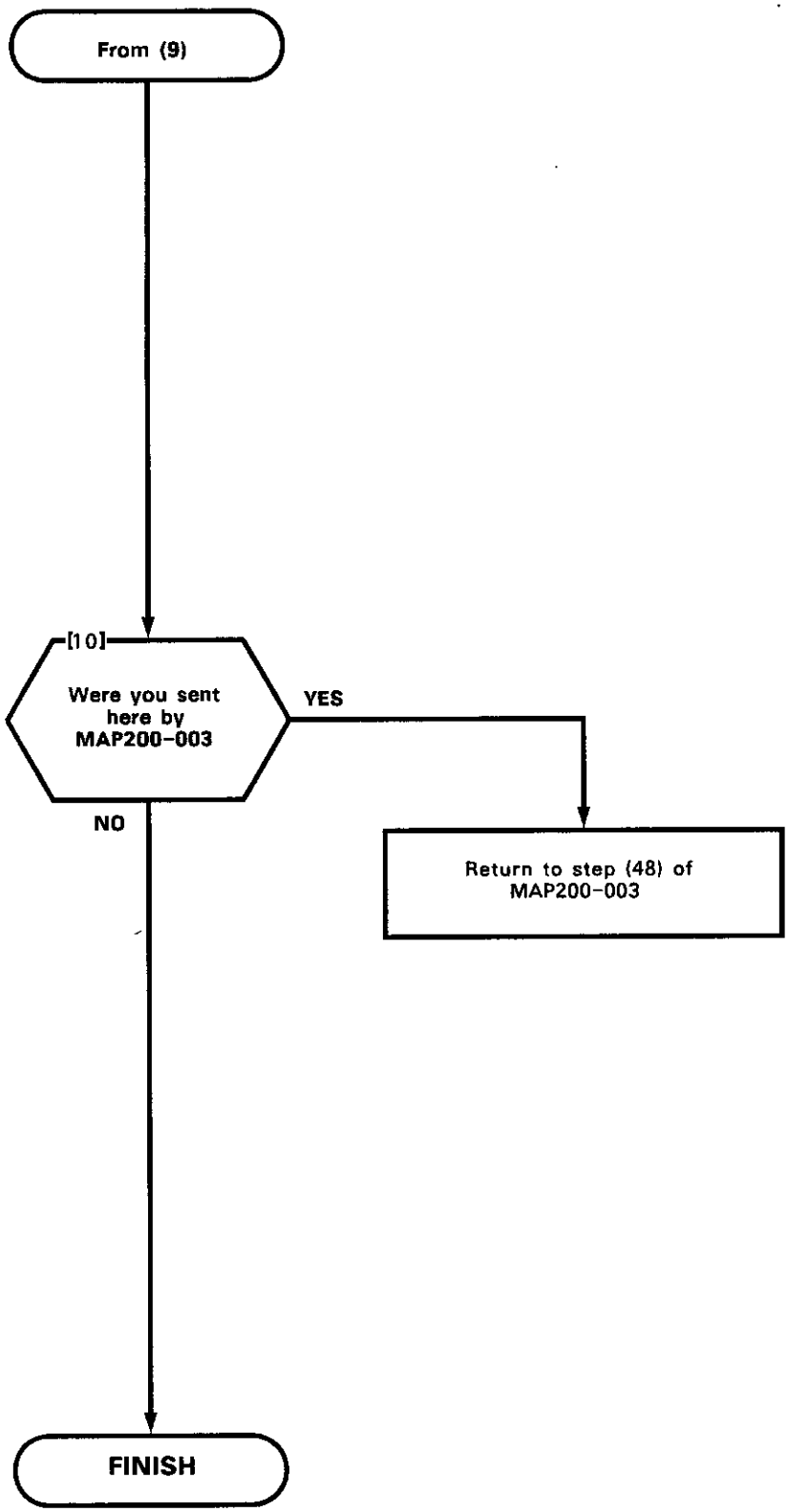
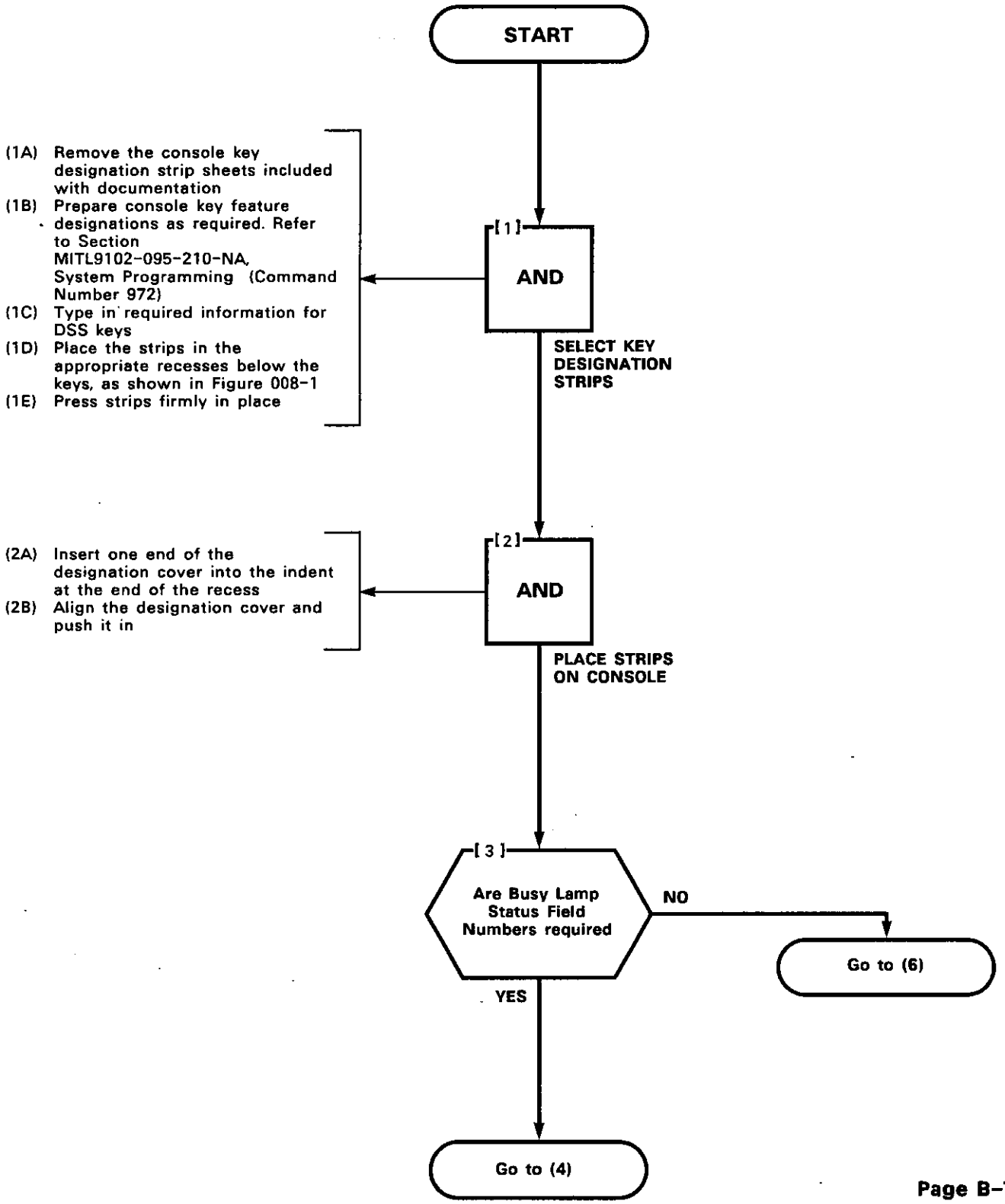
Figure 007-4 Install Console Cable

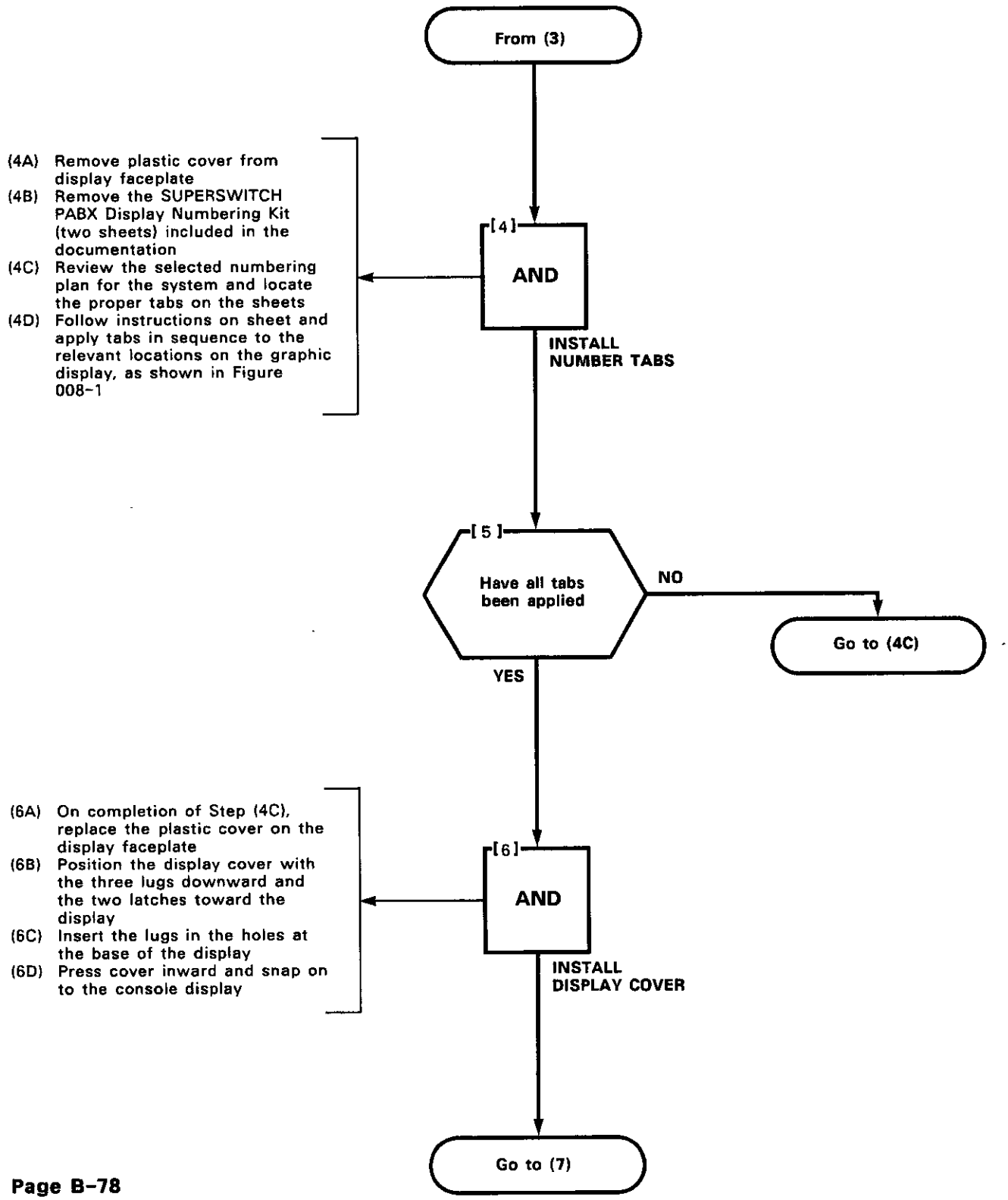
CONSOLE INSTALLATION
MAP200- 007
Issue 3, March 1985
Sheet 8 of 8



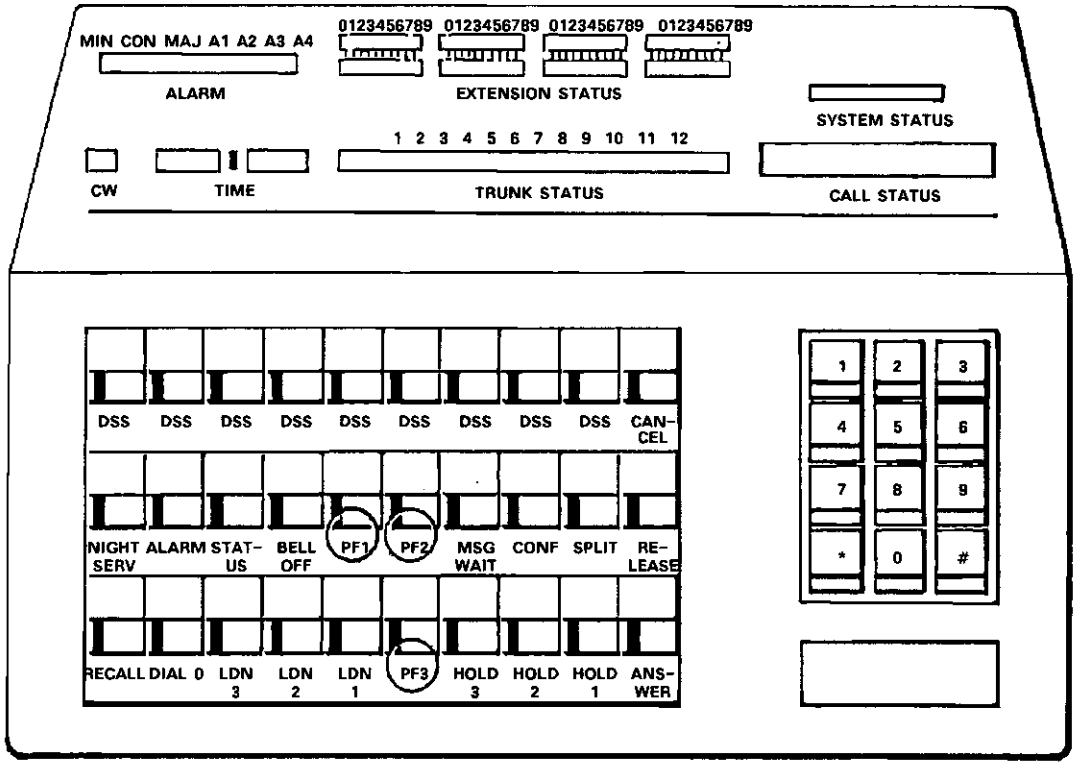
CONSOLE DESIGNATIONS
MAP200-008
Issue 3, March 1985
Sheet 1 of 4



CONSOLE DESIGNATIONS
MAP200- 008
Issue 3, March 1985
Sheet 2 of 4



CONSOLE DESIGNATIONS
MAP200- 008
Issue 3, March 1985
Sheet 3 of 4



KEYS PF1, PF2, AND PF3 ARE PROGRAMMABLE AND REQUIRE THE PROPER SELECTION OF TITLE AS PER PROGRAMMING SECTION MITL9102-095-210-NA. DSS KEYS REQUIRE INFORMATION AS TO THEIR TITLES TYPED IN.

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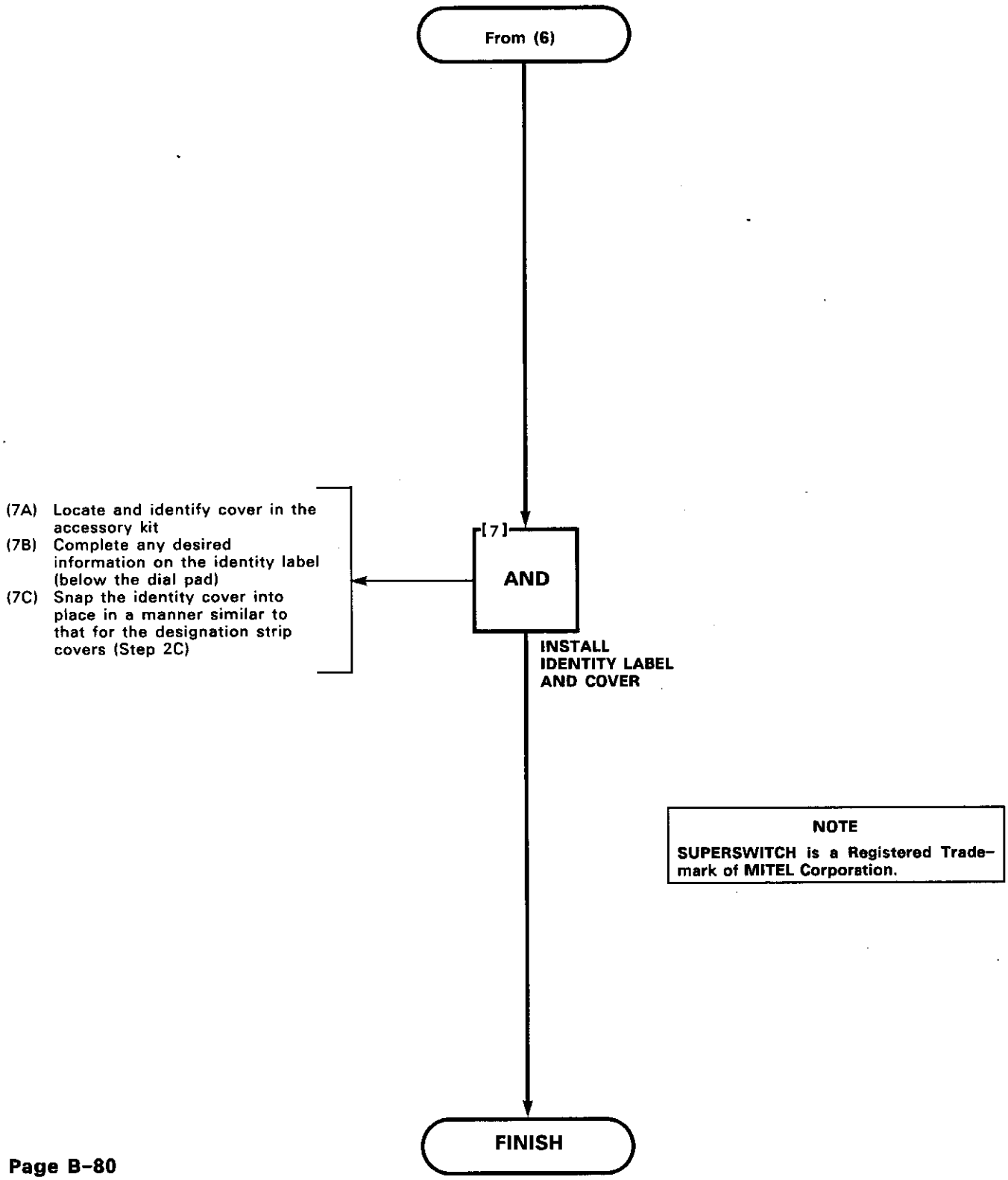
Figure 008-1 Attendant Console Faceplate and Keyboard

CONSOLE DESIGNATIONS
MAP200- 008
Issue 3, March 1985
Sheet 4 of 4



NOTE

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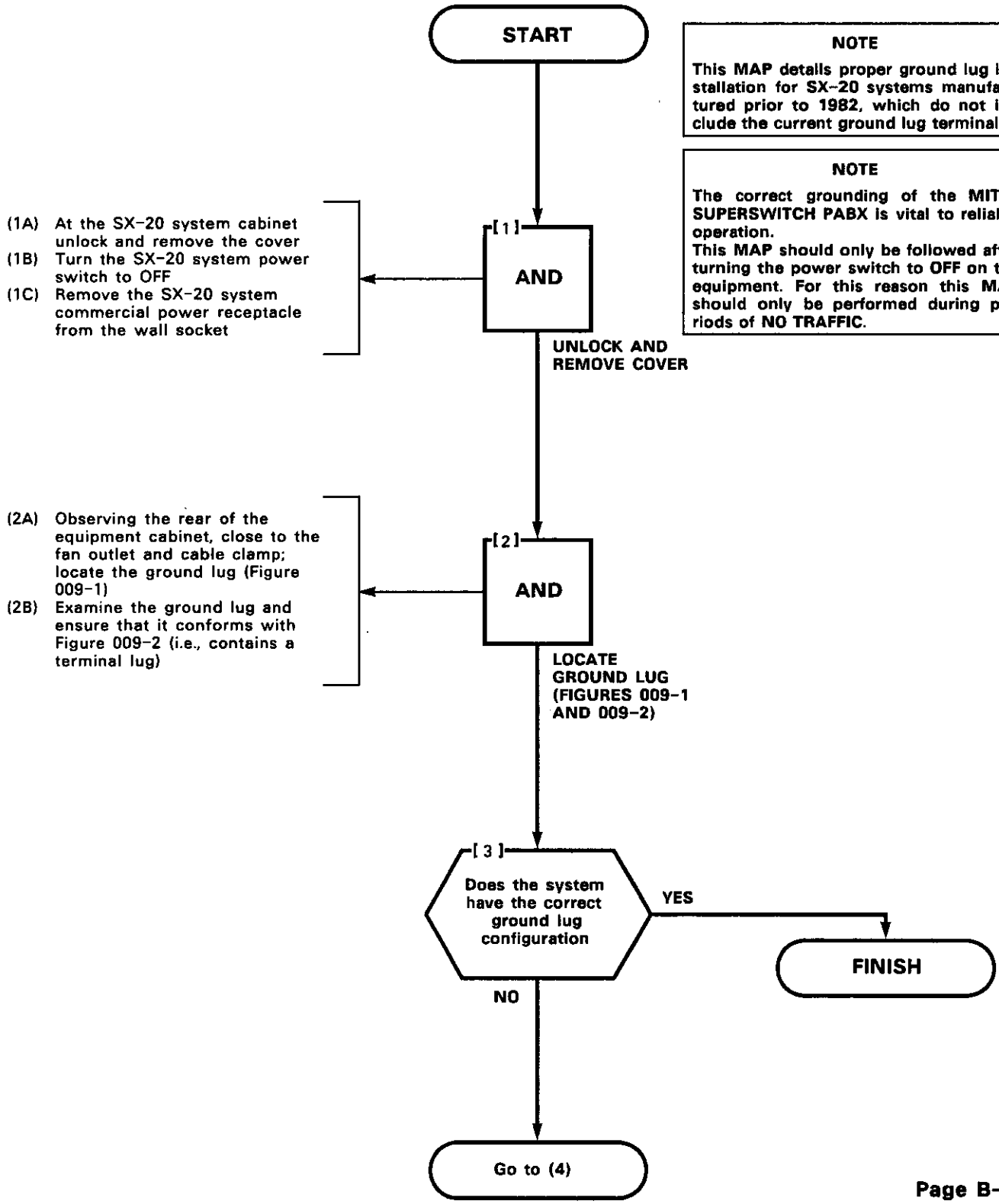
GROUND LUG INSTALLATION
MAP200-009
Issue 3, March 1985
Sheet 1 of 8



GROUND LUG INSTALLATION
MAP200- 009
Issue 3, March 1985
Sheet 2 of 8

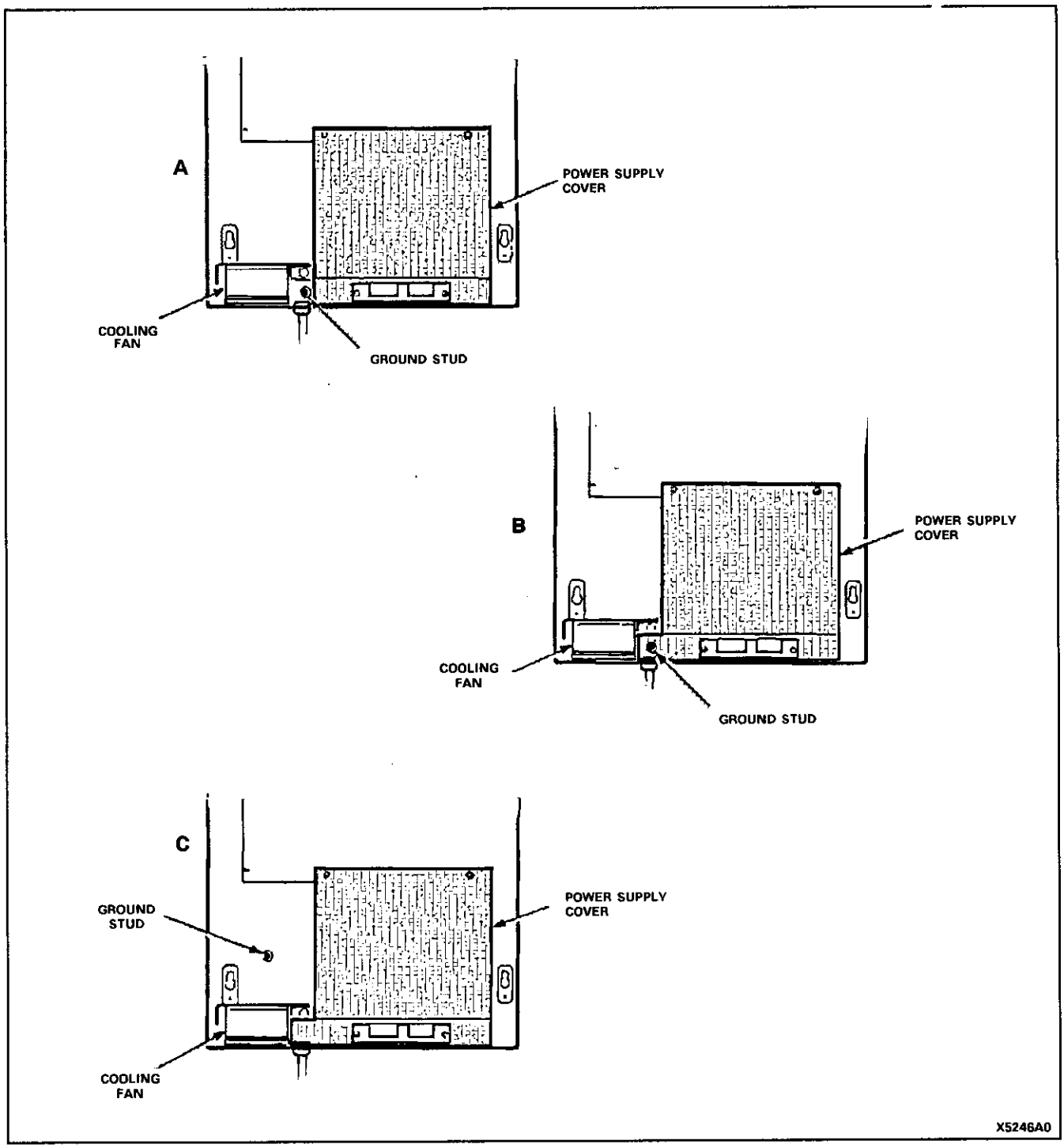


Figure 009-1 Ground Lug Location

GROUND LUG INSTALLATION
MAP200- 009
Issue 3, March 1985
Sheet 3 of 8

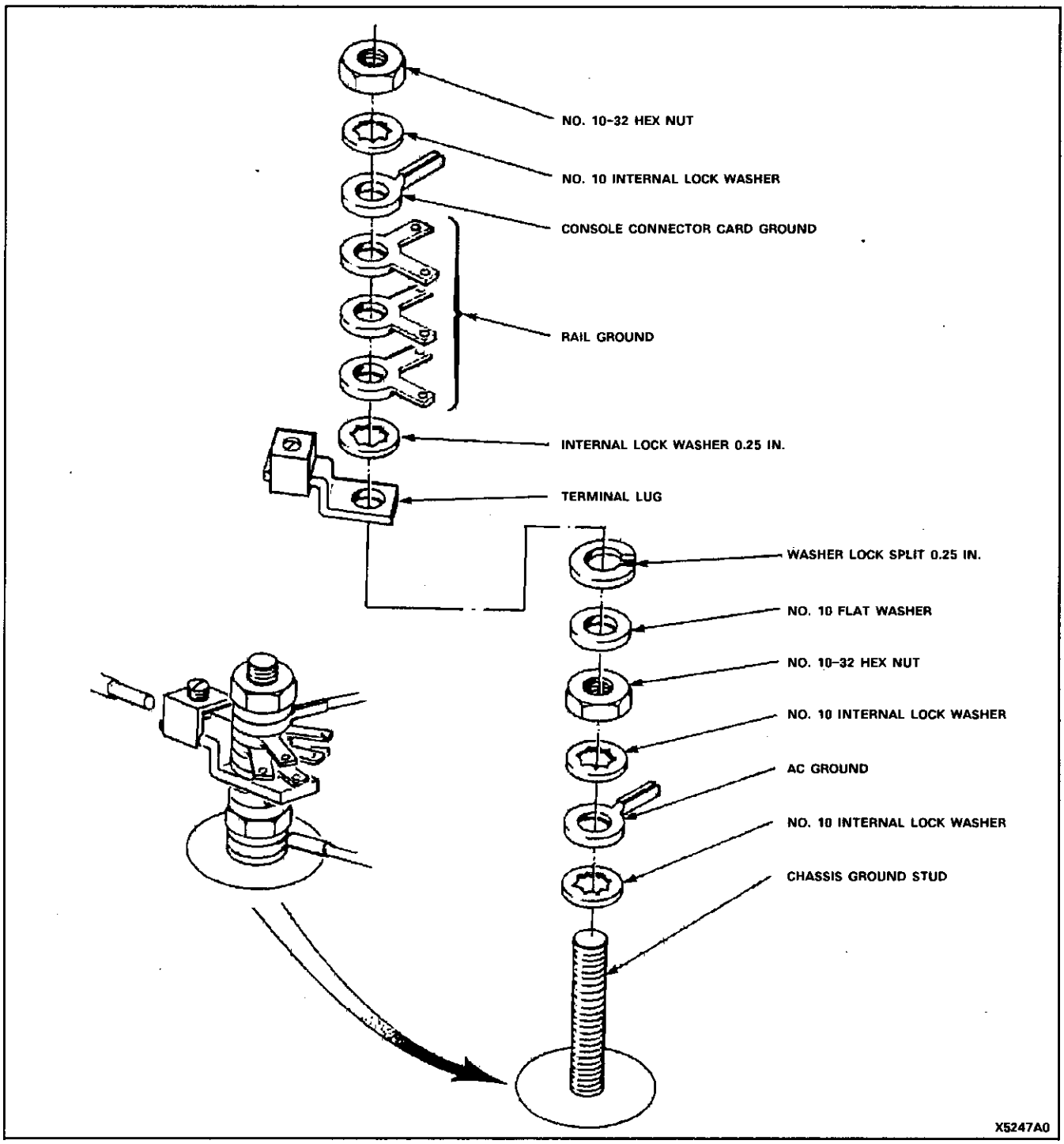
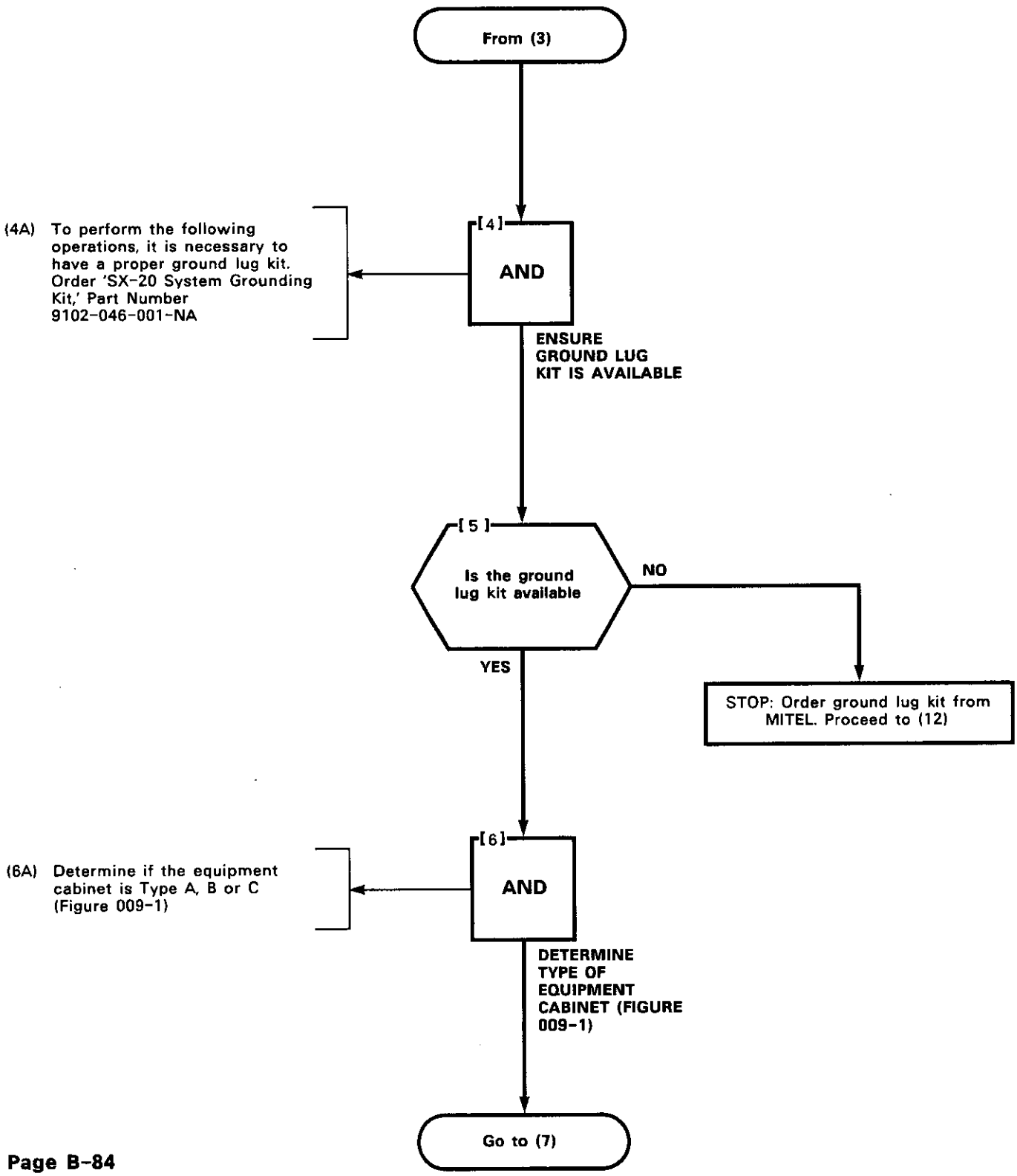
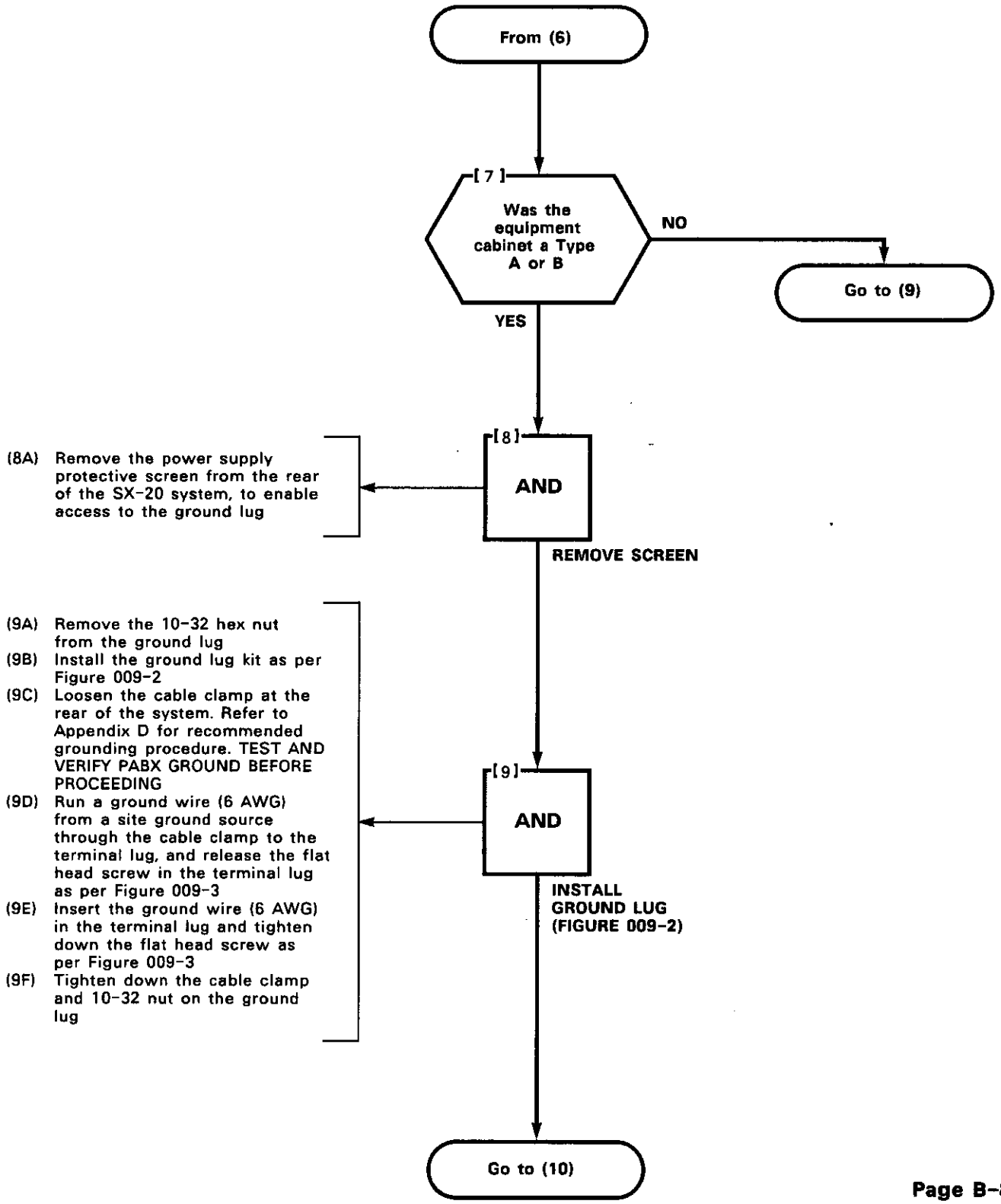


Figure 009-2 Ground Lug

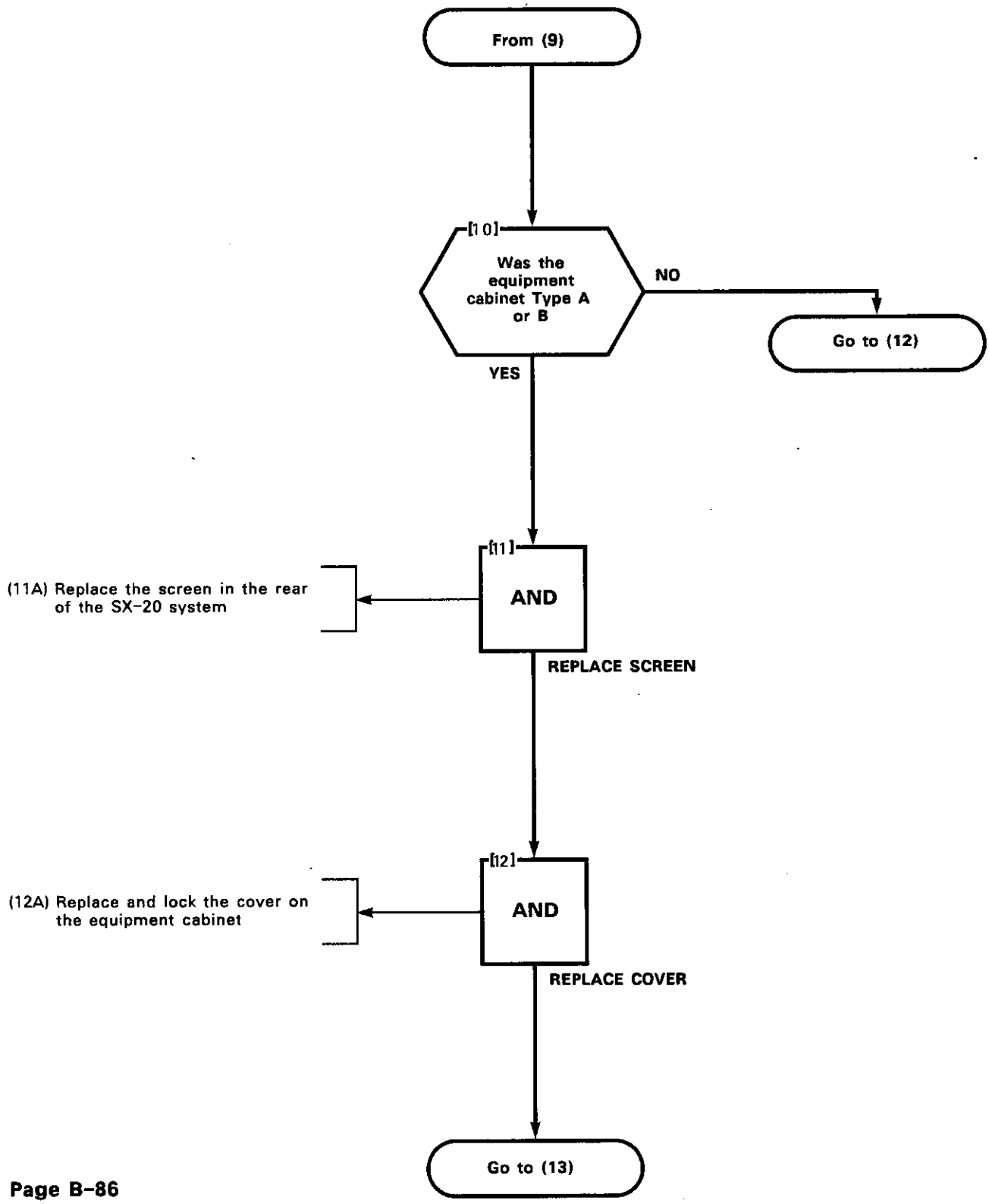
GROUND LUG INSTALLATION
MAP200- 009
Issue 3, March 1985
Sheet 4 of 8



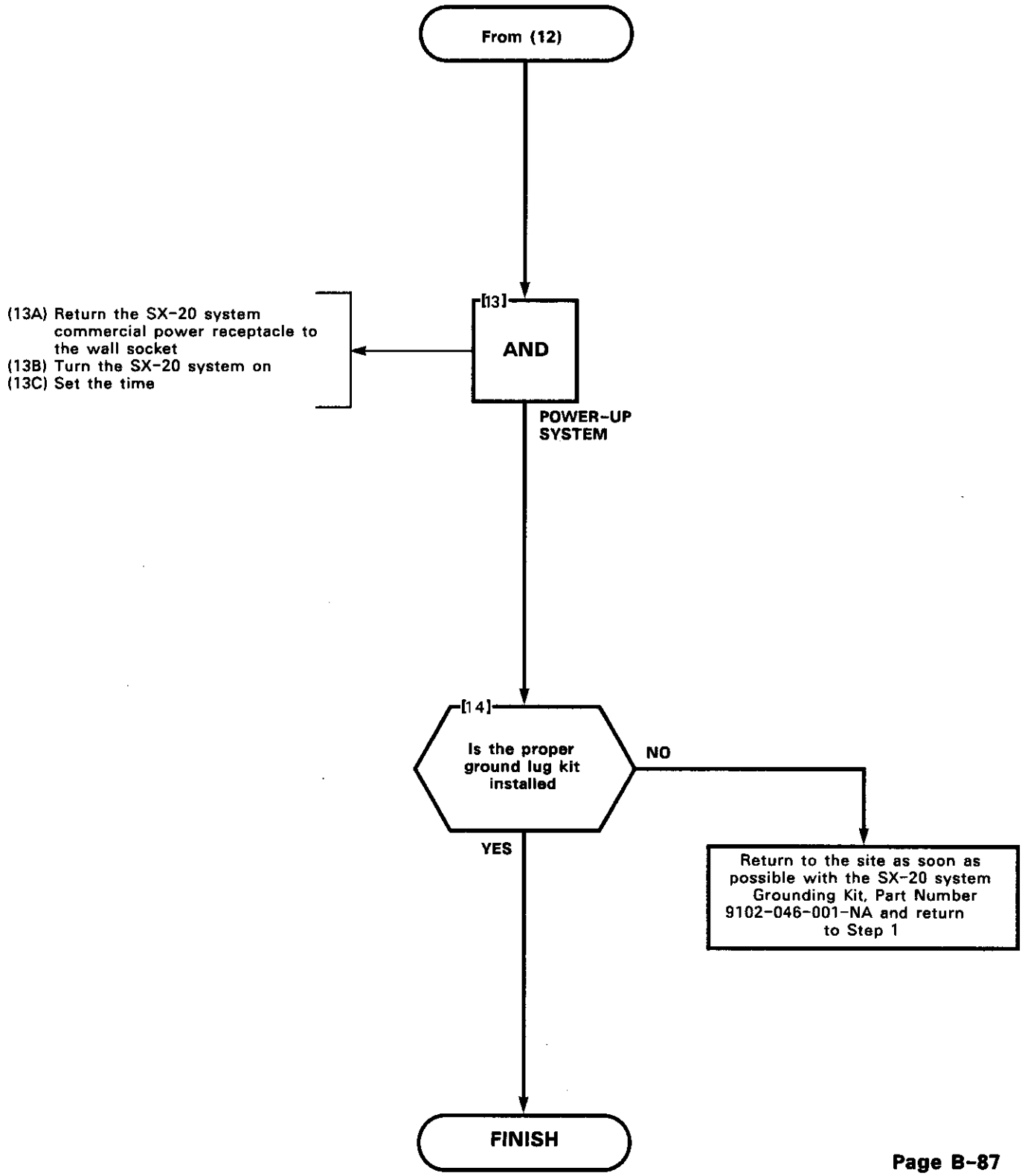
GROUND LUG INSTALLATION
MAP200- 009
Issue 3, March 1985
Sheet 5 of 8



GROUND LUG INSTALLATION
MAP200- 009
Issue 3, March 1985
Sheet 6 of 8



GROUND LUG INSTALLATION
MAP200-009
Issue 3, March 1985
Sheet 7 of 8



GROUND LUG INSTALLATION
MAP200- 009
Issue 3, March 1985
Sheet 8 of 8

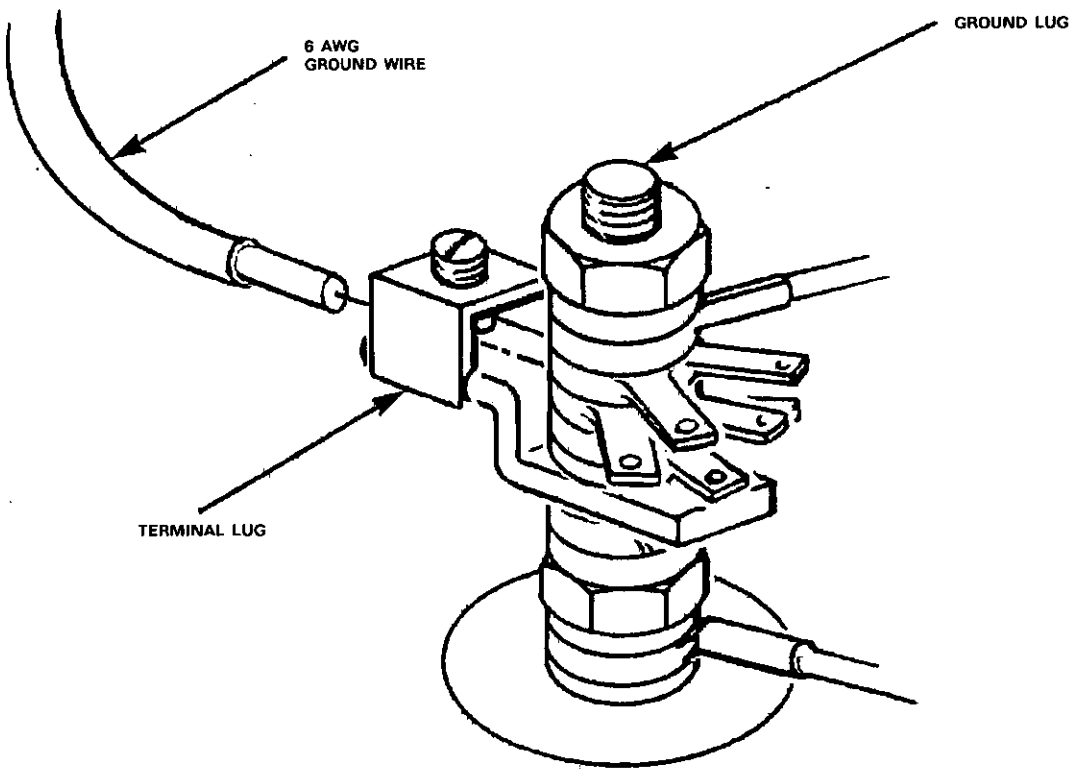


Figure 009-3 Ground Wire Terminal Lug Connection

APPENDIX C

FCC INTERCONNECTION REQUIREMENTS

TELEPHONE COMPANY INTERCONNECTION

C1.01 This equipment has been approved by the Federal Communications Commission (FCC) as not being harmful to the telephone network, when connected directly to the telephone lines through the standard 50-pin blue ribbon plug prescribed by the FCC Rule. This Section is applicable to telephone interconnection in the United States.

Notification

C1.02 Prior to the interconnection of this equipment, the local telephone company must be notified; inform the company of the registered FCC equipment connected to their trunks. Give the following information:

- The communications system being connected is a MITEL Model SX-20.
- The 14-digit FCC Registration Number which is BN285B-12349-MF-E.
- The Ringer Equivalence Number which is 1.6B.
- The jacks or connectors required are RJ21X (one jack is required for each group of 25 trunks).

Connection Limitations

C1.03 Due to the FCC Part 68 Rule, no connection can be made to party lines and to coin telephone service.

Private Line Terminations

C1.04 SX-20 private line terminations are:

Circuit	Fac Int Code	Conn/Jack
2-wire E&M Type 2	TL12M	RJ2EX
4-wire E&M Type 2	TL32M	RJ2HX

Network Changes

C1.05 The telephone company may make changes to its communication service; such changes may include the change of trunk circuit, changes in the operational characteristics of its trunks, etc. Before doing this, however, the company shall provide official notification, so that the operation of the PABX service is not interrupted.

Maintenance Limitations

C1.06 This equipment has been registered with the FCC for direct connection to the telephone network. Under the FCC Program, the user is restricted from making any changes or repairs and from performing any maintenance operations other than those specifically included in this Standard Practice.

C1.07 Circuit cards may be removed by the user; however, replacement cards are supplied only by MITEL or its authorized agent. No field repair of circuit cards by the user is authorized.

C1.08 No cabling or wiring changes within the console are permitted by the user. Plug-ended cables, as detailed in this Standard Practice, are used for all external connections between the console and the telephone company interface jack.

C1.09 Power supply components and cabling are only changed or maintained by MITEL, or by an authorized agent of MITEL.

Trouble Corrections

C1.10 Most troubles are diagnosed by the circuitry of the system, and the console readout indicates the circuit and card that is malfunctioning. Card replacement can be made by the user.

C1.11 For more complex malfunctions, appropriate field service is provided by MITEL or its authorized agents.

APPENDIX D

SYSTEM GROUNDING AND SURGE PROTECTION REQUIREMENTS

General

D1.01 This Appendix describes the basic theory of protection techniques with associated installation procedures. These techniques have proved effective in electronic equipment protection. For further details refer to CTIB80-20-100/CHART 200-001.

D1.02 Reliable service from electronic switching systems can only be ensured if care is taken to protect the solid-state circuitry of the switching system from the effects of electrical surges of various kinds. Typically this electrical energy enters the switching system electronics through external connections. The three classical energy types are:

(a) AC power cord surges due to lightning storms, brown-outs and inductive "kicks" produced by heavy-duty electrical machinery (motors, generators, air conditioners, etc.), which perturb the AC input supply.

(b) Lightning or fallen power lines can cause surges, which enter the PABX via off-premises cables, which may be telephone company trunks or private off-premises stations (OPXs). An OPX for the purposes of this document is any pair of wires connected to the PABX and terminated outside the building in which the PABX is located.

(c) Electrostatic discharges from telephone set users, which enter the PABX when subscribers touch telephone instruments.

AC Power-Line Surges

D1.03 A power-line surge protector plugs into any standard 115 Vac 3-prong duplex receptacle and provides effective overvoltage protection for AC-powered PABXs. This protector is recommended in geographic areas subject to severe lightning storms, where AC power is disrupted by inductive "kicks" (produced by heavy machinery) or where local AC transient protection is suspect. AC power surge protectors are manufactured with many clipping voltages which must be specified when ordering.

D1.04 Operation of Surge Protectors. The surge protector can be effective for both transient overvoltage and persistent overvoltage as follows:

- **Transient Overvoltage.** Overvoltage on either line and/or neutral (refer to Figure D1-1) of the AC input will cause the gas

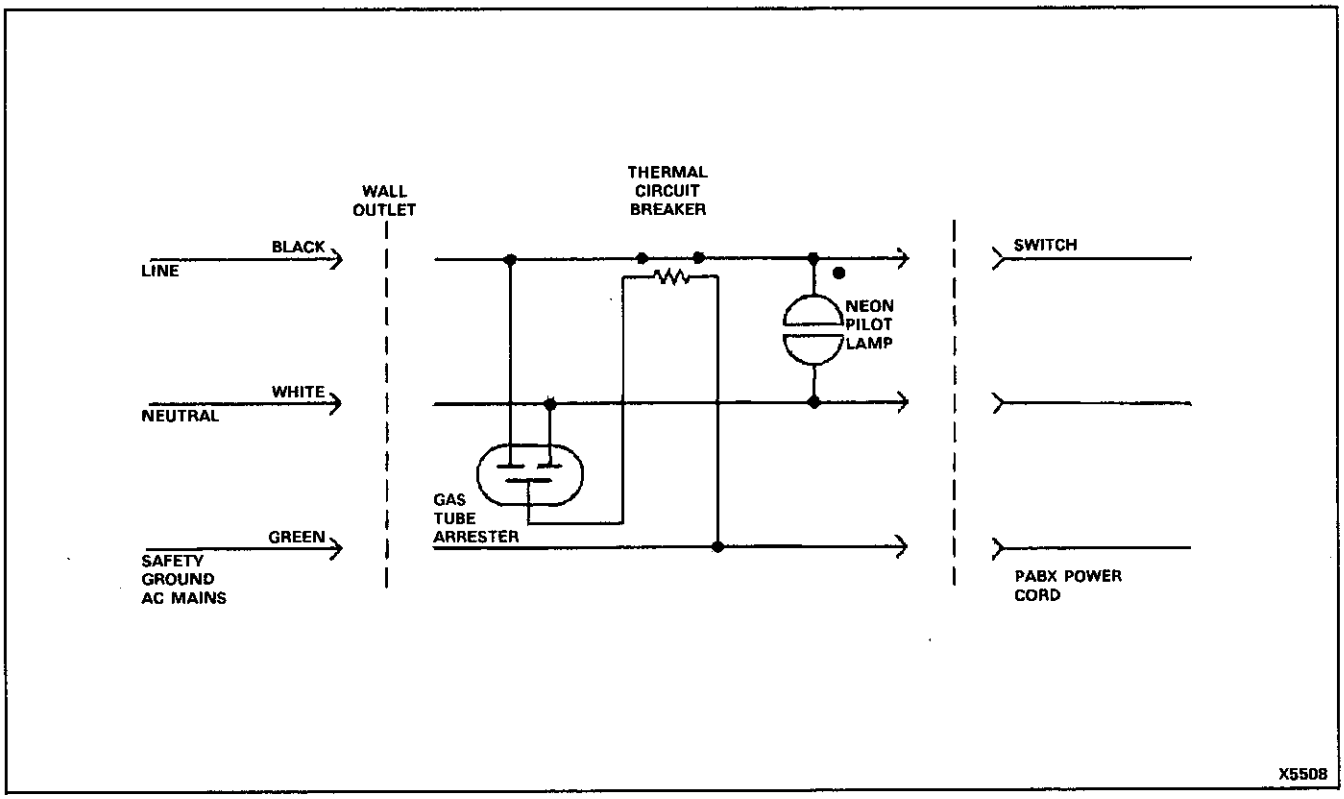


Figure D1-1 Surge Protector

tube arrester to break down at a safe voltage level. The excess energy on the line or neutral is shunted harmlessly to the safety ground for the duration of the transient.

- **Persistent Overvoltage.** If the overvoltage on the AC input persists, a "thermal circuit breaker" in the arrester mechanically disconnects the PABX. When "safe", AC input voltage returns, the gas tube arrester stops conducting and the thermal circuit breaker reconnects the PABX.

D1.05 Installation. Installation is accomplished quickly and easily, since the surge protector plugs into the standard 3-prong outlet and then provides a receptacle for the PABX power cord. The installer should check that the 3-prong AC input receptacle has been properly wired with a safety ground. Devices are commercially available, which indicate if the outlet has been wired correctly. Note that this type of surge protector can be used on AC circuits equipped with ground fault detectors, however, the ground fault detector may operate when the surge protector shunts to ground.

Protection for Off-Premises Cables

D1.06 Although AC input surge protection is recommended in problem areas, it is mandatory to provide protection on off-premises wiring (trunks, OPXs). Failure to ensure such protection results in unreliable PABX service (equipment failures) and may invalidate the manufacturer's warranty.

D1.07 Lightning is an atmospheric effect produced by very high voltages existing for a very short period of time. Currents produced by lightning in the earth's surface induce large currents in buried telephone cables, typically 100 amps per conductor. A small PABX with 10 off-premises circuits (trunks or OPXs) can easily experience 20 X 100 = 2000 amps of total induced current flowing in the underground cable. Overhead cables are susceptible to direct strikes by lightning with the same results.

D1.08 Classical PABX Protection. For PABX protection, MITEL recommends 3-element gas tube protectors (not carbon blocks or 2-element gas tubes) where the off-premises wiring enters the building. Figure D1-2 illustrates the equivalent circuit run-on. When the voltage at node A exceeds the protector breakdown voltage, the protector arcs, causing the surge current to shunt into the protector ground. For electronic PABXs, 3-element gas tubes are recommended, as they have uniform breakdown characteristics for both Tip and Ring.

D1.09 Incremental Transient Protection. This protection is not necessary for MITEL PABXs; some installations provide incremental transient protection during the surge rise-time by use of a "coupled bonding wire". This "coupled" wire is usually No. 10 AWG stranded copper wire tie-wrapped in the center of off-premises cabling and bonded at both the "protector ground point" and the "equipment ground" point. Figure D1-3 is the equivalent circuit.

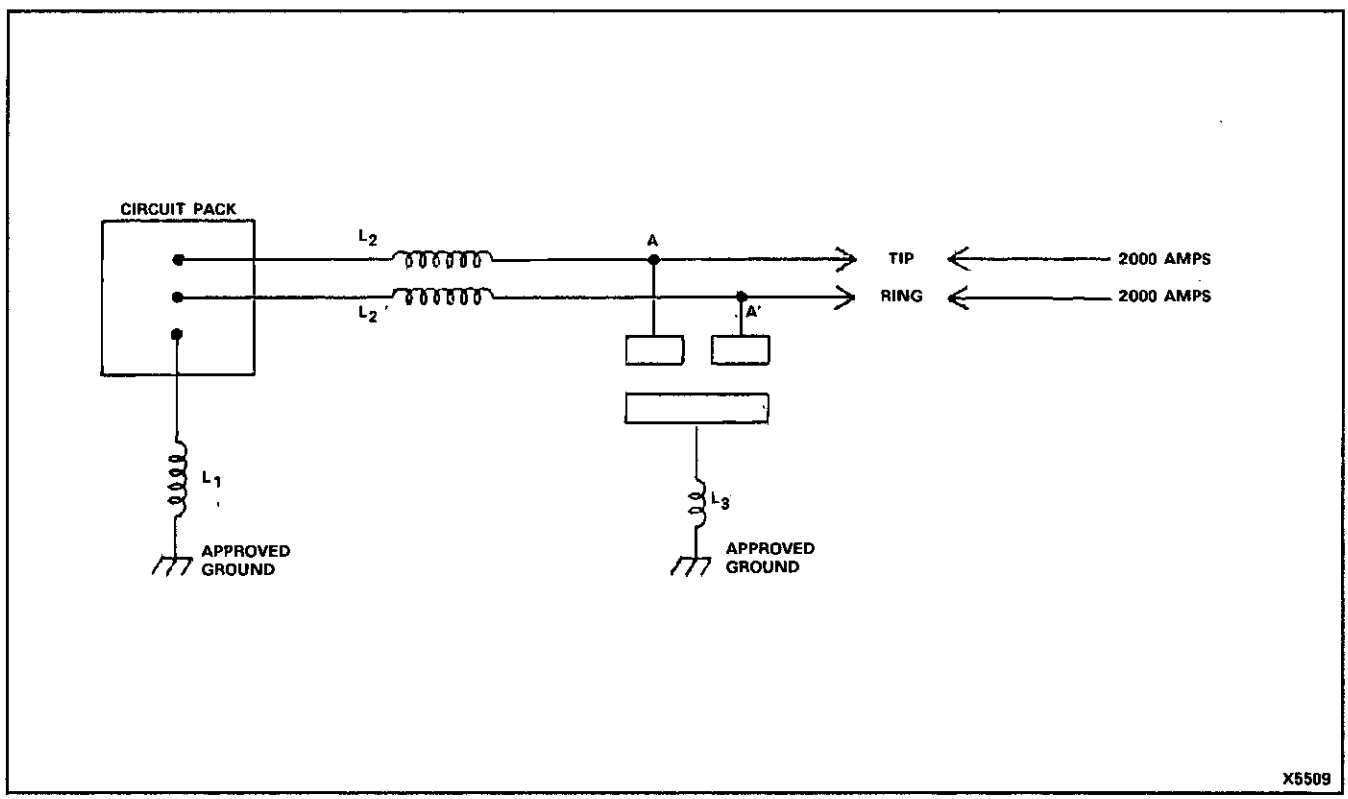


Figure D1-2 Classical Protection of Trunks/OPXs

D1.10 In Figure D1-3, the "coupled" conductor develops an induced voltage in L4 equal to the surge voltage developed in L2. If L2 and L4 are coupled as an ideal transformer, the resultant voltage across the circuit pack is zero. The circuit pack thus receives improved protection.

D1.11 Installation. The installation practice is critical in ensuring reliable, safe protection. Figure D1-4 illustrates an installation arrangement using protector blocks, AC input surge protection and coupled bonding conductors. Two important items in the installation are:

- An approved ground, and
- Quality power connectors (lug-type) at ground bonding points.

D1.12 The following definitions apply to the installation description:

- **Approved Ground.** A cold metallic water pipe. The cold (not hot) water pipe must have a continuous diameter of not less than 1.25 cm (0.5 in.), and be electrically connected to the street side of the water meter. Even when the water meter is metallic, a No. 6 bond wire must be placed around the meter. Appropriate clamps must be used to bond the No. 6 wire to the wire pipe. The bond wire must be copper.

- **Bonded Connection.** A bonded connection implies that appropriate lug type connectors are to be used. Such connectors are "sized" to the wire gauge.

- **AC Ground.** The AC ground is the "green wire" safety ground which appears at the AC duplex receptacle.

- **PABX Equipment Ground.** The PABX equipment ground is a No. 6 AWG copper wire which connects from the ground stud on the PABX chassis to an "approved ground" (refer to Approved Ground definition).

- **Protector Ground.** The protector ground is a No. 6 AWG copper wire which connects the ground lug on the protector to an "approved ground" (refer to Approved Ground definition).

D1.13 Once installation has been completed, check the following:

- Ensure the presence of primary protection for trunks and OPXs. Three-element gas tubes are recommended as they provide consistent breakdown characteristics for both Tip and Ring, thus avoiding metallic voltages between Tip and Ring. Appropriate protectors are readily available from various distributers.

- Ensure protector ground wire (No. 6 AWG) is bonded to an "approved ground". The quality of this connection is important, - use approved connectors. If a cold water pipe ground is used

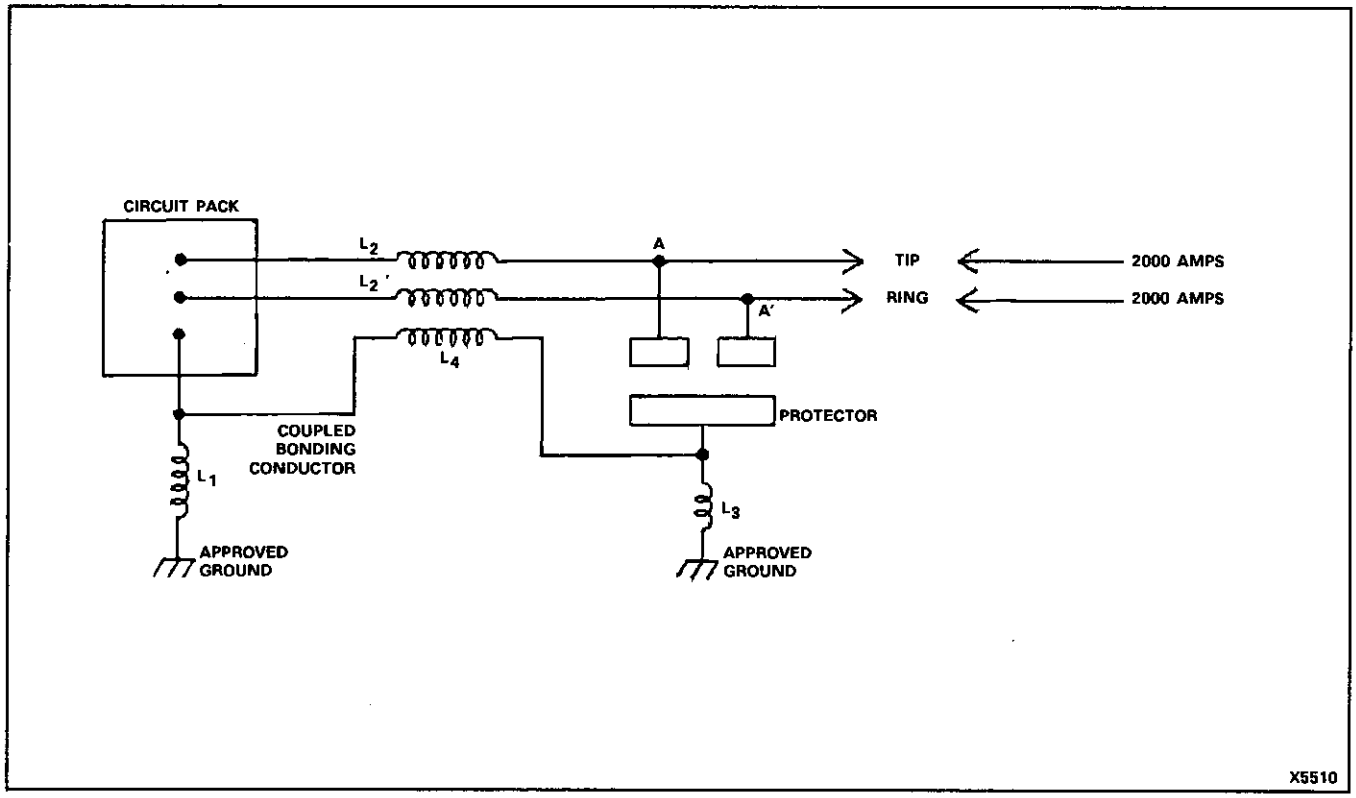


Figure D1-3 Protection With "Coupled Bonding Conductor"

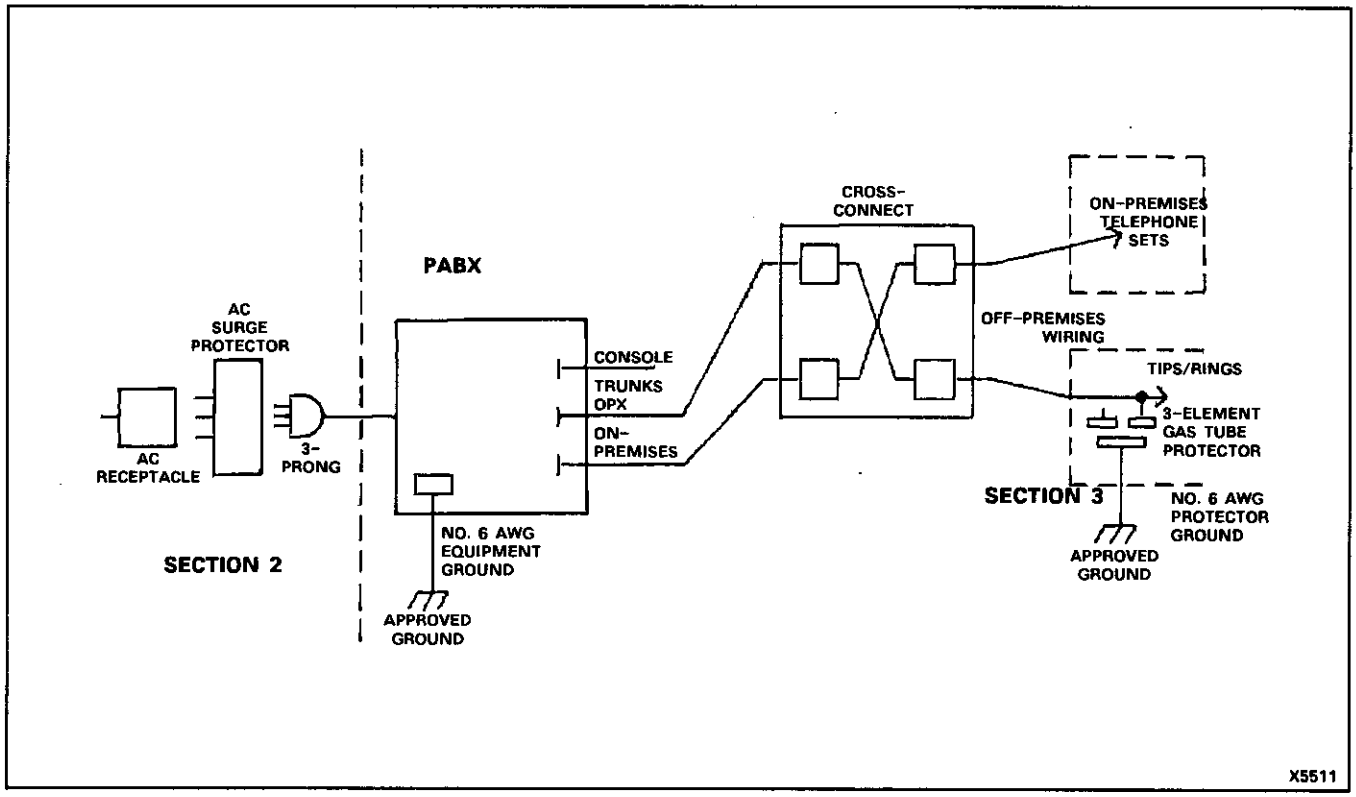


Figure D1-4 Installation of Protectors

as the "approved ground", ensure it is clean (shiny) and free of contaminants at the bonding point.

- Where possible, physically separate the off-premises cabling from on-premises cabling in the "in-house wiring". Separate ducts or compartmentalized ducts are preferred.

D1.14 Equipment Ground Test. This test should be done before connecting the No. 6 AWG equipment ground to the PABX ground lug. Complete this test as follows:

1. Plug the PABX AC cord into the surge protector and the AC receptacle. It is not necessary to power-up the PABX.

2. Use a good quality, calibrated digital multimeter and prepare to measure any AC voltage between the PABX ground lug and the "approved ground". Set the multimeter to the "highest AC voltage" range and measure between the ground lug and the "approved ground" (i.e., No. 6 AWG cable connected to the cold water pipe). Switch the multimeter from the highest AC range through to the lowest voltage range. If voltages greater than 1.0 volt are found, stop and locate an alternative "approved ground", or refer the problem to an engineering support group.

3. After ensuring that the voltage between the PABX ground lug and the "approved ground" is less than 1.0 volt, set the meter to "ohms". The meter should read less than 5 ohms. If the reading is higher than 5 ohms, stop and take steps to reduce the resistance to 5 ohms, or refer the problem to an engineering support group.

Electrostatic Protection at the Telephone Set

D1.15 If static is a problem at specific installation sites, it may be necessary to provide some protection on a per-line (telephone set) basis. Such protection is seldom necessary if the cabling between the telephone set and PABX equipment is greater than 30 m (100 ft). In cases where the cables are less than 30 m (100 ft), it may become necessary to provide a 30 m (100 ft) cable loop on a per-line basis (or a MITEL Static Protection Unit, Part Number 9180-067-001-NA), between the station set and the PABX.

SX-20®

SYSTEM PROGRAMMING

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. PROGRAMMING 1
Clearing Memory and Loading Default Data 3
Programming Access 3
Programming Display 3
Control Operations 7
Command Mode Entry 7
Data Entry 9
Command Mode Re-entry 9
Exit from Programming Mode 9

3. PROGRAMMING ERRORS 10
Incorrect Data Entry Detected by the Programmer 10
Incorrect Data Entry Detected by the System 10
Exit from the Error Mode 10

4. PROGRAMMING OPTIONS 12
A. General 12
B. Programming Options 12
System Options Programming (Command 601) 14
Feature Access Code Programming (Command 602) 23
Class-of-Service Programming (Commands 611 - 619) 25
Station Programming (Command 620) 30
Station Numbering - Block Programming (Command 621) . . 31
Class-of-Service, Toll Restriction and Pickup Group - Block Programming (Command 622) 32
Station Hunting Programming (Commands 631 - 636) 33
Station Ring Group Programming (Command 641) 34
SUPERSET™ Set Programming (Commands 701 - 740) 35
Trunk Programming (Commands 801 - 812) 36
Trunk Group Programming (Commands 821 - 826) 41
Toll Control Plan 1 - Basic Programming (Command 910) . . . 44
Toll Control Plan 1 - Digit String Programming (Command 911) 46
Toll Control Plan 2 - Basic Programming (Command 920) . . . 47
Toll Control Plan 2 - Digit String Programming (Command 921) 49
Toll Table 1 Item Programming (Command 931) 50
Toll Table 2 Item Programming (Command 932) 51
Toll Table 1 Block Programming (Command 941) 52
Toll Table 2 Block Programming (Command 942) 53

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CONTENTS (CONT'D) PAGE

Busy Lamp Field Programming (Command 970) 54
Function Key Programming (Command 972) 55
User-Defined Programming (Command 975) 57
System Security Code Programming (Command 976) 60
User Security Code Programming (Command 977) 61
DISA Security Code Programming (Command 978) 62

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
2-1	CPU II Card	5
3-1	Error Code	10
4-1	Programmable Function Keys	56

LIST OF TABLES

TABLE	TITLE	PAGE
2-1	To Clear Memory and Load Default Data	4
2-2	Programming Commands	8
3-1	Error Codes	11
4-1	Selectable Tone Plans	19
4-2	Rotary Dial Pulse-to-Digit Translation Plans	20
4-3	Feature Access Codes Default Data	23
4-4	Nonprogrammable Access Codes	24
4-5	Trunk Group Membership Default Data	36
4-6	Day and Night Answer Mode Default Data	40
4-7	Trunk Group Access Code Default Data	41
4-8	Default Numbering Plan	54
4-9	Default Key Function Assignments	55

1. GENERAL

1.01 Installation of the SX-20 communications system consists of mounting and connecting external equipment to the system and/or cross-connect frame, applying power, completing the required programming forms and programming the system. Section MITL9102-095-200-NA details the physical installation procedures for the system. This Section contains a general description of the system installation, and a detailed description of programming the system. All forms required to complete system programming are contained in Part Number 9180-095-205-NA, Programming Forms.

Reason for Issue

1.02 This Section has been issued to provide programming information for Generic 503.

1.03 Other documents used with this Section are:

- Part Number 9180-095-205-NA, Programming Forms.

2. PROGRAMMING

2.01 Programming the system consists of completing the required forms, and entering data into the system using the system commands. Different aspects of the system configuration to be entered into the system memory are as follows:

- **Systems Options Programming (Command 601).** Defines the options that may be enabled on a systemwide basis.

- **Feature Access Codes (Command 602).** This program allows the customer to specify the access codes to be assigned to each feature if the default data is not to be used.

- **Class-of-Service (COS) Programming (Commands 611 - 619).** Each system can accommodate up to nine different Classes of Service. Each COS details which features may be accessed by stations assigned the COS.

- **Station Programming (Command 620).** Each station in the system may be programmed with a specific COS, Toll Restriction, Pickup Group, and Station Number.

- **Station Numbering - Block Programming (Command 621).** Where it is desirable to assign sequential station numbers to sequential station equipment numbers (i.e., a block of stations), block programming may be used.

- **COS, Toll Restriction and Pickup Group - Block Programming (Command 622).** This program allows the same COS, Toll Restriction and Pickup Group access to be assigned to a block of station equipment numbers.

- **Station Hunting Programming (Commands 631 - 636).** Up to six hunt groups may be defined per system. Each Hunt Group can have up to eight station numbers listed, and any number of Hunt Groups may be linked together to form larger Hunt Groups.

- **Station Ring Group Programming (Command 641).** This program allows up to nine stations to be rung simultaneously by dialing the Ring Group Access Code. Each member of the group acts independently of each other.

- **SUPERSET Set Programming (Commands 701 - 740).** This program is used to assign up to 16 SUPERSET 4™ sets or SUPERSET 3™ sets in the system.

- **Trunk Programming (Commands 801 - 812).** This program allows each customer to specify the types of trunks employed in the system, their characteristics, and the day and night answer modes.

- **Trunk Group Programming (Commands 821 - 826).** A maximum of six individual trunk groups may be programmed within each system. This command allows the parameters for each individual trunk group to be entered.

- **Basic Toll Control Plan and Digit String Programming (Commands 910, 911, 920 and 921).** A toll control plan defines the sequence and number of digits dialed by a station to access a trunk.

- **Toll Table Item Programming (Commands 931, 932).** Used to assign individual 3-digit Toll Restrictions to stations.

- **Toll Table Block Programming (Commands 941, 942).** Used to assign blocks of 3-digit Toll Restrictions to stations.

- **Busy Lamp Field Programming (Remote and Console Displays) (Command 970).** This program allows each station to be assigned to a specific busy lamp on the remote and console displays. Command Number 970 allows the station number (0 or a multiple of 10) assigned to the first lamp in each row of the Busy Lamp Field to be specified.

- **Function Key Programming (Command 972).** A number of the Attendant Console keys can be programmed to have a particular function assigned to a specific key.

- **User-Defined Programming (Command 975).** This program allows the System Programmer to specify which System Commands may be modified by user programming. This command may be viewed by the user but not modified.

- **System Security Code Programming (Command 976).** This command contains a 4-digit security code for system programming access.

- **User Security Code Programming (Command 977).** This command contains a 4-digit security code for User Programming access as defined in Command 975. Command 976 cannot be entered from User Programming, thereby safeguarding the System Security Code.

- **DISA Security Code Programming (Command 978).** This command contains a 3-digit security code for DISA access.

Clearing Memory and Loading Default Data

2.02 When the system is first installed, the system memories must be cleared and loaded with Default Data. Clearing the system memories and loading the default data is accomplished by following the procedures detailed in Table 2-1. The default data puts the system into a standard configuration for station numbers and system options enabled. After this data has been loaded, it may be changed to reflect the customer's specific requirements, forming the customer database. The system can be returned to the default data configuration by dialing #998* while in the System Programming mode.

Programming Access

2.03 Access to System Programming may be accomplished in one of two ways:

1. Set Switch 8 on the CPU II Card to OPEN to enable programming (refer to Figure 2-1). Dial the Programming and Special Functions Access Code (default is 70 or #).

2. Using the System Programming Security Code or the User Programming Security Code, enter Programming mode (Switch 8 on the CPU II Card must be set to CLOSED). System Programming Security Code allows access to system programming, which enables the programmer to modify any part of the customer database and load default data. The User Security Code enables the programmer to modify only those parts of the customer database specified in Command 975 registers.

Programming Display

2.04 Programming of the SX-20 system may be performed from either the Attendant Console or the Test Line (but not both simultaneously). The station with Equipment Number 01 acts as the Test Line when Configuration Switch 6 on the CPU II Card is set to OPEN (refer to Figure 2-1). When programming from the Test Line, the information is displayed on the Remote Display and the Cabinet Display only. The console continues to display its current call status. When programming from the Attendant Console, the information is displayed on the Console Call Status Display only. The Remote Display

TABLE 2-1
TO CLEAR MEMORY AND LOAD DEFAULT DATA

A. To Load Default Data on Initial Power-up

- Set Configuration Switches on the CPU II Card 1, 6, and 7 to desired positions (refer to Figure 2-1).
- Set Configuration Switch 8 on the CPU II Card to CLOSED.
- Turn power on.
- Console display shows `8 8 8 8 8 8 8 8` then flashes `? ? ? ? ? ? ? ?`
- Within 6 s set Configuration Switch 8 to OPEN.
- Console display shows `- - - - - - - -`
- Set Configuration Switch 8 to CLOSED.
- Time display shows `0 0 - 0 0`
- Default Data has been loaded.

B. To Load Default Data from Console Keyboard

To Enter Programming Mode:

- Press STATUS key four times and HOLD DOWN.
- Console display shows `  X X X - Y Y  ` (the Generic Number and Revision Level).
- Dial the System Programming Code (default 7772) within 6-8 seconds.
- Console display shows Generic Number and Revision level flashing to indicate access code has been accepted.
- Release the STATUS key (display blanks).
- Dial # (or 70) within 10 s.
- Console display shows `? 6 0 1 _ _ _ _` to indicate system is in Programming Mode.

To Load Default Data:

- Dial #998*.
- Console display shows `? 9 9 8 _ _ _ _`
- Default Data has been loaded once display flashes.

To Exit from Programming Mode:

- Press RELEASE key.
- Console returns to normal call processing.

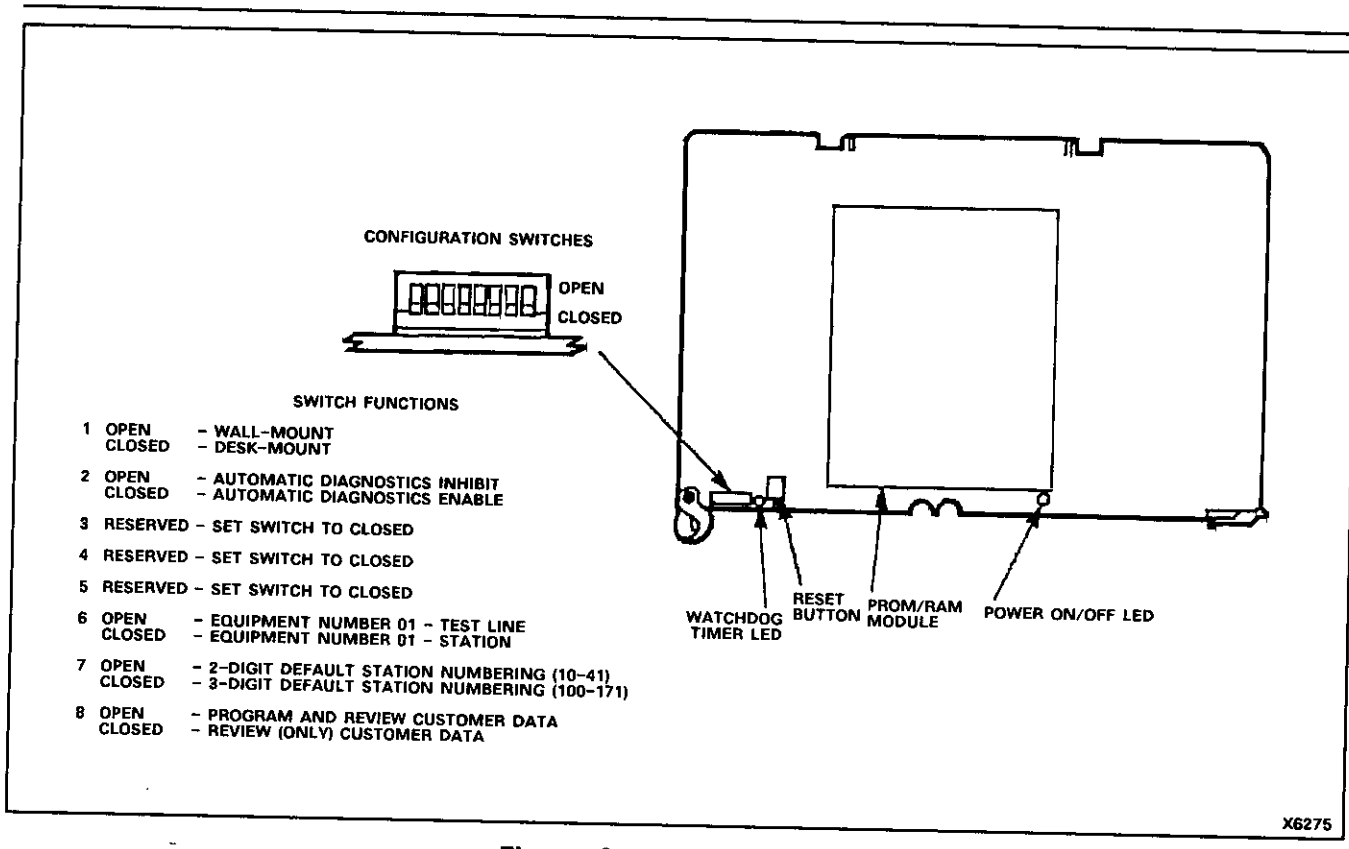


Figure 2-1 CPU II Card

and Cabinet Display continue to show the time shown in their respective 7-segment displays.

2.05 The 8-digit numerical display operates in an interactive manner, such that the number of digits flashing indicates the size of that particular field. A flashing digit is shown in bold as follows:

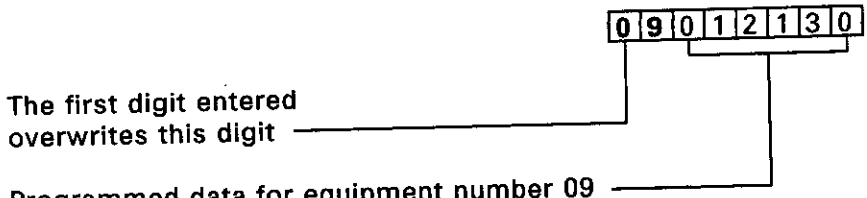
	3						

- The next action/digit input causes a change to the field that is flashing.
- If a single digit field is flashing, the next digit dialed overwrites the flashing digit.

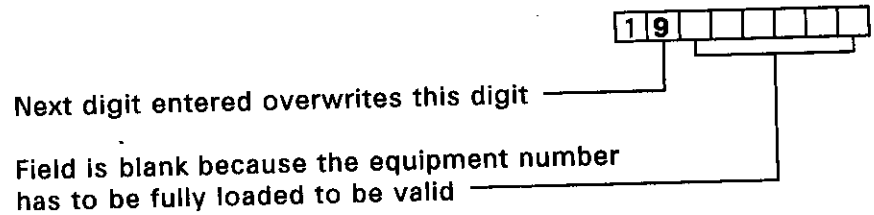
2	1	**0**	1	1	2	2	0

Next digit entered overwrites flashing digit

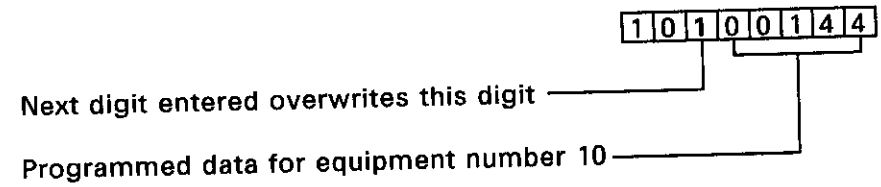
- If two digits at the start of the display are flashing, the field is an equipment number or a register number. The following is an example of an equipment number:



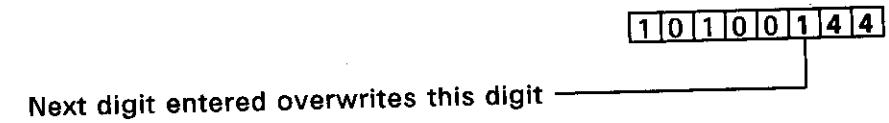
- Dial first digit of equipment number.



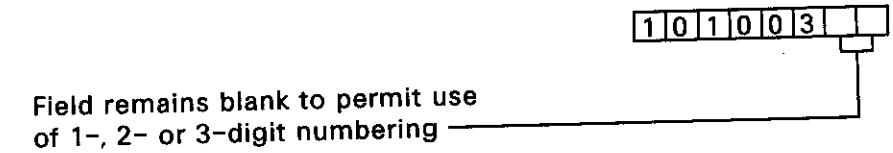
- Dial second digit of equipment number.



- If two or three digits in the display (other than in Segments 1 and 2) are flashing, the field is a station number or an access code. The following is an example of a station number:



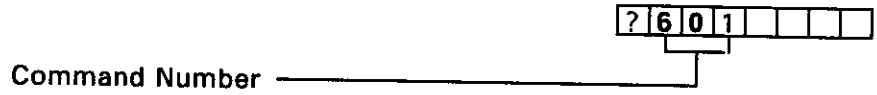
- Dial first digit of station number.



- Dial remaining digits for the station number

Notes:
1. If it is necessary to blank a station number or access code, dial 00. This is particularly useful to prevent numbering plan conflicts.
2. All data up to the last digit to be changed must be entered.

- If a ? is displayed, it indicates that the system is in Programming Command Mode. If the command number is flashing, it may be changed.



Control Operations

2.06 System Programming may be performed from the Attendant Console or the Test Line, using either a rotary dial or DTMF telephone set. Control operations are provided by each type of set, as follows:

(a) **ENTER/NEXT** – To transfer the data entered into a register to the system memory, or to step to the next register within a program, press the * key on a DTMF set (flash the switchhook once on a rotary set).

(b) **RESET DISPLAY** – If during programming, an error is made (e.g., misdialed digit) and is detected by the programmer, pressing the # key on a DTMF set causes a reset to the start of the register without changing the original data. If a rotary set is used, it is necessary to complete the data entry for the register, reselect the register, and enter the correct data.

(c) **EXIT FROM ERROR MODE** – The SX-20 system can detect certain errors made during programming (refer to Part 3). To exit from the Error Mode, dial # from a DTMF set (or flash the switchhook twice on a rotary set). The system returns to the start of the register being displayed when the error occurred, and shows the original data.

Command Mode Entry

2.07 When the system enters Programming Mode, it does through the Command Mode. The 8-segment display shows the command number. For example, the command number for System Options (601) flashes, indicating that it may be changed to any desired command number (refer to Table 2-2). After the required command number has been selected, * is dialed from a DTMF set (or the switchhook is flashed on a rotary set) and the Data Mode is entered. (Refer to Part 2.08).

TABLE 2-2
PROGRAMMING COMMANDS

Programming Code	Function
601	System Options Programming
602	Feature Access Code Programming
611 - 619	Class-of-Service (COS) Programming
620	Station Programming
621	Station Numbering - Block Programming
622	COS, Toll Restriction, Pickup Group - Block Programming
631 - 636	Station Hunting Programming
641	Station Ring Group Programming
701 - 740	SUPERSET Set Programming
801 - 812	Trunk Programming
821 - 826	Trunk Group Programming
910, 920	Toll Control Plan 1/2 - Basic Programming
911, 921	Toll Control Plan 1/2 - Digit String Programming
931, 932	Toll Table Item Programming
941, 942	Toll Table Block Programming
970	Busy Lamp Field Programming
972	Function Key Programming
975	User-Defined Programming
976	System Security Code Programming
977	User Security Code Programming
978	DISA Security Code Programming
990	Trunk Status Display
991	Station Status Display
992	System Status Display
998	Load Default Database
999	Software Identity Display

Data Entry

2.08 Associated with each program (command) type are a number of registers describing the parameters specified. The data in these registers is changed to reflect the requirements of each individual customer by dialing codes from the Attendant Console or Test Line. As data is entered, it is left justified on the system display and placed in temporary storage. After all data has been entered for a selected register, it is transferred from temporary storage to permanent storage by dialing * from a DTMF set, or flashing the switchhook on a rotary set.

Command Mode Re-entry

2.09 After all the data has been entered for the selected command, and transferred to permanent storage, the Command Mode may be re-entered by any of the following methods:

(a) Increment registers using the ENTER/NEXT function (refer to Part 2.06) until display shows:

?	6	0	1				

Dial desired command number.

(b) Dial last register under that command number. Then use the ENTER/NEXT function. Display appears as in (a) above. Dial command number.

(c) Exit from Programming Mode (press RELEASE on the Attendant Console or replace the handset). Re-enter Programming Mode (dial special code - default is 70 or #). Display appears as in (a) above. Dial command number.

(d) If ONLY Segment 1 of the display is flashing, dial 0. Display appears as in (a) above. Dial command number.

(e) If Segments 1 AND 2 of the display are flashing, dial 00. Display appears as in (a) above. Dial command number.

(f) Access next command number by dialing # while one of the following command numbers is displayed: 611-619 (COS), 631-636 (Station Hunting), 701-740 (SUPERSET Sets), 801-812 (Trunk Programming) or 821-826 (Trunk Group Programming).

Exit from Programming Mode

2.10 To exit from the Programming Mode (i.e., after all data has been entered or reviewed), press the RELEASE key on the Attendant Console or replace the handset. When programming is complete, set Configuration Switch 8 on the CPU II Card to CLOSED (refer to Figure 2-1). The system operation returns to normal; data may be reviewed.

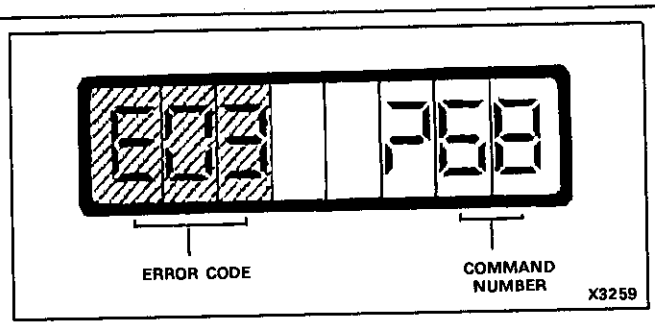


Figure 3-1 Error Code

3. PROGRAMMING ERRORS

3.01 During programming, there are two types of error detection:

- Incorrect data entry detected by the programmer
- Incorrect data entry detected by the system.

Incorrect Data Entry Detected by the Programmer

3.02 If an incorrect entry is made during programming, the data entered for that register (which is held in temporary storage) may be erased and the register restored to its original contents, by pressing the # key on a DTMF set. Note that in Toll Programming, ## is required. If a rotary set is used to program the system, it is necessary to complete the data entry for that register (i.e., flash switchhook to enter error into system memory), reselect the register or equipment number, then enter the correct data.

Incorrect Data Entry Detected by the System

3.03 During programming, the SX-20 system checks all data entered into the system. If an error is detected, an error code is shown in positions one, two and three of the display and the current command number in positions six, seven and eight (refer to Figure 3-1). The meaning of each error code is detailed in Table 3-1, Error Codes. The command number indicates the type of programming being performed at the same time the error occurred.

Exit from the Error Mode

3.04 After the error code has been checked and the correct data determined, dial # from a DTMF set (or flash the switchhook twice on a rotary set). Note that in Toll Programming, ## is required. The system returns to the beginning of the register that contained the error and shows the original data.

TABLE 3-1
ERROR CODES

Error Code	Function
E01	Illegal Command Number entered
E02	Digit (0-9) dialed while error code was being displayed
E03	Number (access code) already exists (i.e., Numbering Plan Conflict)
E04	Data out of range
E05	Attempt to dial an illegal directory number length (four or more digits)
E06	Illegal station number block. When programming station numbers by block, the last number in the block is valid only if all the station numbers in the block are sequential
E07	Too many digits dialed
E08	Illegal range of equipment numbers used in block programming (e.g., 01-75)
E09	Data field (a command) is write-protected
E10	Command or data accessed is not available in this features package
E11	Data entered is write-protected
E12	Data field incomplete - enter all data for field that was flashing
E13	Busy Lamp Field numbering conflict. Station number for first digit in the row on the Busy Lamp Field of the Remote and Console Displays must be 0 or a multiple of 10
E14	Programming duplicate of DSS key assignments
E15	Do not loop back to a Hunt Group already assigned in a Hunt sequence; i.e., Hunt Group 1 goes to Hunt Group 6 then back to Hunt Group 1
E16	Console Function key conflict. E16 is displayed when a conflict is programmed in Command 972
E17	Attempt to program a key currently in use (SUPERSET sets only)
E18	Attempt to delete Prime Line or program a second key as Prime Line (SUPERSET sets only)
E20	Invalid double-digit command (Toll Programming error)
E21	Invalid control digit; i.e., not deny or except (Commands 911, 921)
E22	Control digit in incorrect position
E23	Attempt to program at the middle of a digit string
E24	Digit string conflict
E25	Toll Digit String Programming register overflow (Attempt to program another register while 99 registers have already been programmed)
E26	Embedded empty digit string register
E27	Digit area full (Storage area assigned to Toll Programming is full - no more digits can be entered)
E28	Toll table number out of range (e.g., 1000)
E29	Toll table prefix too long
E30	Toll table prefix conflict
E31	Occurs when programming a DTS, DLS or Private Line in SUPERSET Programming and the trunk does not have a Trunk Group assignment
E55	Attempt to display the System Security Code (Command 976), using the User's Security Code (Command 977) when Switch 8 on the CPU II Card is set to CLOSED
E56	Attempt to display the User Security Code. Should enter System Security Code and Configuration Switch 8 must be OPEN
E57	Attempt to display DISA Access Code. Must enter System or User Security Access Code and Configuration Switch 8 must be OPEN

4. PROGRAMMING OPTIONS

A. General

4.01 This Part contains a detailed listing of all data used during the programming operation of the system. On initial power-up, the "Default Data" for the system must be loaded, and the Programming Mode selected. Programming then consists of entering the required data from the programming forms previously completed in Part Number 9180-095-205-NA, Programming Forms. Only those customer data which differ from the default data need be programmed.

4.02 Also included in this Part are points that must be remembered during programming. The Default Numbering Plan is automatically loaded into the system's memory (if Default Data has been loaded), on initial power-up of the system. This numbering plan may be changed to reflect each customer's requirements.

B. Programming Options

4.03 Each command specifies the codes that are entered for each of the features or options, and also shows the default data associated with each register. To complete each form (from Part Number 9180-095-205-NA, Programming Forms), enter the required code in the space provided. Programming then consists of entering the codes exactly as shown on the programming forms.

4.04 The following commands provide all the information required to define the data entered during programming.

REMEMBER:

- TO ENTER DATA AND/OR DISPLAY THE NEXT REGISTER, DIAL *
- ERROR DETECTED BY THE PROGRAMMER: DIAL # TO RETAIN THE ORIGINAL CONTENTS OF THE REGISTER (IN TOLL COMMANDS, ## IS REQUIRED)
- ERROR DETECTED BY THE SYSTEM; REFER TO TABLE 2-1
- THE DIGIT(S) DIALED CHANGES THE FLASHING DIGIT(S)
- TO LOAD DEFAULT DATA, DIAL #998* WHEN IN SYSTEM PROGRAMMING MODE
- TO ENTER PROGRAMMING MODE, PRESS THE STATUS KEY FOUR TIMES AND HOLD. SOFTWARE GENERIC NUMBER AND RELEASE LEVEL ARE DISPLAYED, DIAL THE SYSTEM SECURITY CODE OR THE USER SECURITY CODE. RELEASE STATUS KEY AND PRESS # KEY TO ENTER PROGRAMMING MODE. IF THE # KEY IS PROGRAMMED TO INDICATE LAST NUMBER REDIAL (COMMAND 601, REGISTER 2), THEN 70 MUST BE DIALED TO ENTER PROGRAMMING MODE.
- TO REVIEW DATA, DIAL # FOLLOWED BY THE APPROPRIATE COMMAND NUMBER. DIAL * AS REQUIRED TO DISPLAY REGISTER CONTENTS
- ALL DATA UP TO THE LAST DIGIT TO BE CHANGED MUST BE ENTERED
- TO EXIT FROM THE SELECTED COMMAND MODE, DIAL 0 ONLY IF THE FIRST DIGIT IN THE REGISTER IS FLASHING OR 00 ONLY IF THE FIRST TWO DIGITS ARE FLASHING
- TO EXIT FROM THE PROGRAMMING MODE, PRESS RELEASE
- TO ACCESS THE NEXT COMMAND NUMBER, DIAL # WHILE ONE OF THE FOLLOWING COMMAND NUMBERS IS DISPLAYED: 611-619 (COS), 631-636 (STATION HUNTING), 701-740 (SUPERSET SETS), 801-812 (TRUNK PROGRAMMING), OR 821-826 (TRUNK GROUP PROGRAMMING).

SYSTEM OPTIONS PROGRAMMING (COMMAND 601)

DEFAULT DATA REGISTER 1

1	1	3	1	1	0		0
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Transfer Dial Tone** 0 = Disable 1 = Enable
C	**Camp-on (Onto Stations Only)** 0 = Disable 1 = Enable, Stations → Stations 2 = Enable, Trunks → Stations 3 = Enable, Both
D	**Discriminating Ringing** 0 = Disable 1 = Enable
E	**Distinctive Callback Ringing** 0 = Disable 1 = Enable
F	**Music on Hold** 0 = Disable 1 = Enable, From Trunk Expander Card
G	**Not Used**
H	**Auto-hold on SUPERSET Set Switch to New Line** 0 = Disable 1 = Enable

SYSTEM OPTIONS PROGRAMMING (COMMAND 601) (CONT'D)

DEFAULT DATA REGISTER 2

2	1	0	1	0	0		
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Automatic Diagnostics** 0 = Disable 1 = Enable
C	**Executive Busy Override (Console)** 0 = Disable 1 = Enable Except on Incoming Trunks 2 = Enable All Calls
D	**System Speed Dial Enable** 0 = Disable 1 = Enable
E	**Last Number Dial Pound (#) Sign Access Enable** 0 = Disable 1 = Enable
F	**Auto-Answer Enable** 0 = Disable 1 = Enable
G,H	**Not Used**

Notes:
1. Auto-Answer should not be enabled unless all trunks are provided with Disconnect Supervision.
2. If Last Number Dial Access is enabled, then only 70 can be used for the Programming Access Code.

SYSTEM OPTIONS PROGRAMMING (COMMAND 601) (CONT'D)

DEFAULT DATA REGISTER 3

3	3	3	3	3	1	1	
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Timed Recall - Camp-on** B = (1 → 7) X 10 s
C	**Timed Recall - Don't Answer Time-out** C = (1 → 7) X 10 s
D	**Timed Recall - Call Hold (Station)** D = (1 → 4) X 1 min
E	**Timed Recall - Call Hold (Test Line/Attendant)** E = (1 → 7) X 10 s
F	**Call Forward - Don't Answer Time-out** F = (1 → 7) X 10 s
G	**Delayed Ringing Time-out (SUPERSET Set)** G = (1 → 3) X 10 s
H	**Not Used**

SYSTEM OPTIONS PROGRAMMING (COMMAND 601) (CONT'D)

DEFAULT DATA REGISTER 4

4	2	1	3	1	0	0	0
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Day TAFAS Mode** 0 = Disable 1 = Immediate Switching to TAFAS 2 = Automatic Switching to TAFAS after Time-out
C	**Night TAFAS Mode** 0 = Disable 1 = Immediate Switching to TAFAS 2 = Automatic Switching to TAFAS after Time-out
D	**Automatic Switch to TAFAS Time-out** D = (1 → 7) X 10 s
E	**Station Calls to Attendant or Test Line Routed to Night Bells** 0 = Disable 1 = Enable during Day Service 2 = Enable during Night Service 3 = Enable during both Day and Night Service
F,G	**Station to Attendant Answer Point during Console Inhibit or Night Service** XX = 00 for Attendant 01 → 72 for Station Equipment Number
H	**Console Inhibit** 0 = Disable 1 = Enable

SYSTEM OPTIONS PROGRAMMING (COMMAND 601) (CONT'D)

DEFAULT DATA REGISTER 5

5	0	0	0	0	0	0	1
A	B	C	D	E	F	G	H

A	**Register Number**
B,C	**Tone Plan** B,C = 00 → 03 (refer to Table 4-1, Selectable Tone Plans)
D	**Ringing Frequency** 0 = 20 Hz 1 = 25 Hz 2 = 17.5 Hz
E	**Trunk Digit-to-Pulse Translation** E = 0 → 3 (refer to Table 4-2, Rotary Dial Pulse-to-Digit Translation Plan)
F	**Rotary Dial Station Pulse-to-Digit Translation** F = 0 → 3 (refer to Table 4-2)
G	**Station Switchhook-Flash Timing** 0 = 150-750 ms 1 = 150-1500 ms 2 = Flash is Release 3 = 90 ms Calibrated Flash (DTMF sets only)
H	**Station Digit Collection** 1 = 10 pps 2 = 20 pps

TABLE 4-1
SELECTABLE TONE PLANS

Tone	Tone Plan 00	Tone Plan 01	Tone Plan 02	Tone Plan 03
Dial Tone	350/440 Hz Continuous	350/450 Hz Continuous	400 Hz Continuous	425 Hz Continuous
Busy Tone	480/620 Hz 500 ms On, 500 ms Off Repeated continuously	400 Hz 350 ms On, 350 ms Off Repeated continuously	400 Hz 500 ms On, 500 ms Off Repeated continuously	425 Hz 250 ms On, 250 ms Off Repeated continuously
Ringback Tone	440/480 Hz 1 s On, 3 s Off Repeated continuously	400/450 Hz 400 ms On, 200 ms Off 400 ms On, 2 s Off Repeated continuously	400/450 Hz 400 ms On, 200 ms Off 400 ms On, 2 s Off Repeated continuously	425 Hz 1 s On, 4 s Off Repeated continuously
Reorder Tone	480/620 Hz 250 ms On, 250 ms Off Repeated continuously	400 Hz Continuous	400 Hz 250 ms On, 250 ms Off Repeated continuously	425 Hz 250 ms On, 750 ms Off Repeated continuously
Camp-On Tone	440/480 Hz Single burst of 200 ms	400/450 Hz Single burst of 200 ms	400/450 Hz Single burst of 200 ms	425 Hz Single burst of 200 ms
Transfer Dial Tone	350/440 Hz 100 ms On, 100 ms Off Repeated three times then continuous Dial tone	350/450 Hz 100 ms On, 100 ms Off Repeated three times then continuous Dial tone	400 Hz 100 ms On, 100 ms Off Repeated three times then continuous Dial tone	425 Hz 100 ms On, 100 ms Off Repeated three times then continuous Dial tone
Busy Override Tone	440/480 Hz 1 s On, 6 s Off then 200 ms burst of Busy Override Process tone repeated every 6 s	400/450 Hz 1 s On, 6 s Off then 200 ms burst of Busy Override Process tone repeated every 6 s	400/450 Hz 1 s On, 6 s Off then 200 ms burst of Busy Override Process tone repeated every 6 s	425 Hz 1 s On, 6 s Off then 200 ms burst of Busy Override Process tone repeated every 6 s
Discriminating Dial Tone	350/440 Hz 100 ms On, 100 ms Off Repeated six times then continuous Dial Tone	350/450 Hz 700 ms On, 700 ms Off Repeated six times then continuous Dial Tone	400 Hz 100 ms On, 100 ms Off Repeated six times then continuous Dial Tone	425 Hz 100 ms On, 100 ms Off Repeated six times then continuous Dial Tone
Trunk Camp-On Tone	440/480 Hz 100 ms On, 50 ms Off, 100 ms On	400/450 Hz 100 ms On, 50 ms Off, 100 ms On	400 Hz 100 ms On, 50 ms Off, 100 ms On	425 Hz 100 ms On, 50 ms Off, 100 ms On
Special Busy Tone	350/440 Hz 500 ms On 500 ms Off continuous for 10 s then busy tone	400 Hz 500 ms On 500 ms Off continuous for 10 s then busy tone	400 Hz 500 ms On 500 ms Off continuous for 10 s then busy tone	425 Hz 500 ms On 500 ms Off continuous for 10 s then busy tone
Message Waiting Ringing	Three cycles of 200 ms On, 200 ms Off	Three cycles of 200 ms On, 200 ms Off	Three cycles of 200 ms On, 200 ms Off	Three cycles of 200 ms On, 200 ms Off
Auto Wake-Up Ringing	Four cycles of ringing at up to four 5-minute intervals	Four cycles of ringing at up to four 5-minute intervals	Four cycles of ringing at up to four 5-minute intervals	Four cycles of ringing at up to four 5-minute intervals

TABLE 4-2
ROTARY DIAL PULSE-TO-DIGIT TRANSLATION PLANS

Translation Code	Digit Dialed 1	2	3	4	5	6	7	8	9	0
0	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	1
2	9	8	7	6	5	4	3	2	1	10
3	10	9	8	7	6	5	4	3	2	1

Number of Pulses

SYSTEM OPTIONS PROGRAMMING (COMMAND 601) (CONT'D)

DEFAULT DATA REGISTER 6

6	1	1	3	0	1	0	0
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Message Waiting System Enable** 0 = Disable Message Waiting 1 = Enable Message Waiting 2 = Enable Message Waiting and 30 s Housephone (Manual Line)
C	**Message Waiting Indications During Day Service Only** 0 = Disable 1 = Enable
D	**Message Waiting Indication Interval** D = (1 → 4) X 5 min
E	**Message Waiting Automatic Cancel** 0 = Disable 1 = Enable
F	**Automatic Wake-Up** 0 = Disable 1 = Enable with Wake-Up Tone 2 = Enable with Music
G	**Automatic Wake-Up Printout** 0 = Disable 1 = Enable
H	**Message Register Audit** 0 = Disable 1 = Enable 2 = Enable with clearing of Message Registers

SYSTEM OPTIONS PROGRAMMING (COMMAND 601) (CONT'D)

DEFAULT DATA REGISTER 7

7	0	6	0	8	2	1	
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Data Demultiplexer Enable** 0 = Disable 1 = Enable
C	**Printer Baud Rate** 0 = 50 Baud 1 = 75 Baud 2 = 110 Baud 3 = 135 Baud 4 = 150 Baud 5 = 200 Baud 6 = 300 Baud 7 = 600 Baud 8 = 1200 Baud 9 = 1800 Baud
D	**Printer Parity** 0 = No Parity 1 = Odd Parity 2 = Even Parity
E	**Printer Number of Tx Bits** 5, 6, 7, 8 = Number of Tx Bits
F	**Printer Number of Stop Bits** 1, 2 = Number of Stop Bits
G	**Printer Slow Carriage Return Option** 0 = Disable 1 = Output 2 nulls at End-of-Line 2 = Output 4 nulls at End-of-Line 3 = Output 8 nulls at End-of-Line 4 = Output 16 nulls at End-of-Line 5 = Output 32 nulls at End-of-Line 6 = Output 64 nulls at End-of-Line
H	**Not Used**

SYSTEM OPTIONS PROGRAMMING (COMMAND 601) (CONT'D)

DEFAULT DATA REGISTER 8

8	0	0	0	0	0	0	0
A	B	C	D	E	F	G	H

A	**Register Number**
B	**SMDR System Enable** 0 = Disable 1 = Enable Incoming Trunk Calls Only 2 = Enable Outgoing Trunk Calls Only 3 = Enable Both Incoming and Outgoing Trunk Calls
C	**SMDR: Record Meter Pulses** 0 = Disable 1 = Enable
D	**SMDR: Long Call Indicator** 0 = Disable 1 = Enable
E	**SMDR: Record Only Incoming CO Trunk Calls** 0 = Disable 1 = Enable
F	**SMDR: Drop Calls of Less Than Eight Digits** 0 = Disable 1 = Enable
G	**SMDR: Drop Incomplete Outgoing Calls** 0 = Disable 1 = Enable
H	**SMDR Purge** 0 = Disable 1 = Enable

FEATURE ACCESS CODE PROGRAMMING (COMMAND 602)

TABLE 4-3
FEATURE ACCESS CODES DEFAULT DATA

Register		Access Code						
A	B	C	D	E	F	G	H	Feature
0	1	0						Dial Access to Attendant
0	2	5	0					Paging Access
0	3	5	1					Call Hold
0	4	5	2					Call Hold Retrieve - LOCAL
0	5	5	3					Call Hold Retrieve - REMOTE
0	6	5	4					Dial Call Pickup
0	7	5	5					System Speed Call Access Code
0	8	5	6					Call Forwarding - Follow Me
0	9	5	7					TAFAS Pickup
1	0	5	8					Call Forwarding - Don't Answer
1	1	5	9					Call Forwarding - Busy
1	2	7	0					Programming & Special Functions
1	3	7	1					Attendant Functions
1	4	4	4	4				Station Features Reset†
1	5	4	5	1				Call Hold ┐
1	6	4	5	2				Call Hold ├ Attendant
1	7	4	5	3				Call Hold ┘
1	8	4	9	1				Hunt Group 1 ┐
1	9	4	9	2				Hunt Group 2 ┐ Hunt Group
2	0	4	9	3				Hunt Group 3 ├ Access
2	1	4	9	4				Hunt Group 4 ┘ Code
2	2	4	9	5				Hunt Group 5 ┐
2	3	4	9	6				Hunt Group 6 ┘
2	4	4	9	7				Ring Group Access
2	5	4	9	8				RMATS Modem Access

† Cancels Call Forwarding, Callback and Do Not Disturb.

TABLE 4-4
NONPROGRAMMABLE ACCESS CODES

Access Code	Meaning
5	Executive Busy Override
6	Automatic Callback - Busy

CLASS-OF-SERVICE PROGRAMMING (COMMANDS 611 - 619)

DEFAULT DATA REGISTER 1

1	1	1	1	1	1	1	0
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Trunk Group 1 Access** 0 = Disable 1 = Enable
C	**Trunk Group 2 Access** 0 = Disable 1 = Enable
D	**Trunk Group 3 Access** 0 = Disable 1 = Enable
E	**Trunk Group 4 Access** 0 = Disable 1 = Enable
F	**Trunk Group 5 Access** 0 = Disable 1 = Enable
G	**Trunk Group 6 Access** 0 = Disable 1 = Enable
H	**Access to Trunk Group Overflow** 0 = Disable 1 = Enable

CLASS-OF-SERVICE PROGRAMMING (COMMANDS 611 → 619) (CONT'D)

DEFAULT DATA REGISTER 2

2	1	1	0	0	0	1	0
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Switchhook/Ground Button Flash** 0 = Disable 1 = Flash for Consultation Hold 2 = Flash for Test Line/Attendant
C	**Call Direction** 0 = Originate Only 1 = Bothway Calling 2 = Receive Only
D	**Housephone (Manual Line)** 0 = Disable 1 = Enable
E	**DISA Security Code Required** 0 = Disable 1 = Enable
F	**Message Registration/Restrictive Station Control** 0 = Disable Both 1 = Enable Restrictive Station Control Only 2 = Enable Message Registration Only 3 = Enable Both
G	**Message Waiting** 0 = Disable 1 = Enable
H	**Rotary Only** 0 = Disable 1 = Enable

CLASS-OF-SERVICE PROGRAMMING (COMMANDS 611 - 619) (CONT'D)

DEFAULT DATA REGISTER 3

3	1	1	0	1	0	2	1
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Automatic Callback - Busy** 0 = Disable 1 = Enable
C	**Paging Access** 0 = Disable 1 = Enable
D	**Data Line Security** 0 = Disable 1 = Enable
E	**Call Hold** 0 = Disable 1 = Enable
F	**Controlled Station-to-Station Restriction (Call Block)** 0 = Disable 1 = Enable
G	**TAFAS Access** 0 = Disable 1 = Enable Pickup from Night Bells 2 = Enable Pickup from Night Bells/Attendant
H	**SMDR Enable** 0 = Disable 1 = Enable

CLASS-OF-SERVICE PROGRAMMING (COMMANDS 611 - 619) (CONT'D)

DEFAULT DATA REGISTER 4

4	1	1	1	0	0	0	
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Call Forward – Follow Me** 0 = Disable 1 = Enable 2 = Enable, plus enable to External Speed Call Number
C	**Call Forward – Busy** 0 = Disable 1 = Enable 2 = Enable, plus Enable to External Speed Call Number
D	**Call Forward – Don't Answer** 0 = Disable 1 = Enable 2 = Enable, plus Enable to External Speed Call Number
E	**Proceed To Be Call Forwarded Externally** 0 = Disable 1 = Enable
F	**Executive Busy Override** 0 = Disable 1 = Enable Except on Incoming Trunks 2 = Enable on All Calls
G	**Executive Busy Override Security** 0 = Disable 1 = Enable
H	**Not Used**

CLASS-OF-SERVICE PROGRAMMING (COMMANDS 611 - 619) (CONT'D)

DEFAULT DATA REGISTER 5

5	1	1	1	1	1	1	1
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Access to Speed Dial Numbers 10 through 19 (Table 1)** 0 = Disable 1 = Enable
C	**Access to Speed Dial Numbers 20 through 29 (Table 2)** 0 = Disable 1 = Enable
D	**Access to Speed Dial Numbers 30 through 39 (Table 3)** 0 = Disable 1 = Enable
E	**Access to Speed Dial Numbers 40 through 49 (Table 4)** 0 = Disable 1 = Enable
F	**Access to Speed Dial Numbers 50 through 59 (Table 5)** 0 = Disable 1 = Enable
G	**Access to Speed Dial Numbers 60 through 69 (Table 6)** 0 = Disable 1 = Enable
H	**Last Number Redial Enable** 0 = Disable 1 = Enable

STATION PROGRAMMING (COMMAND 620)

DEFAULT DATA

X	X	1	1	1	Y	Y	Y
A	B	C	D	E	F	G	H

A,B	**Station Equipment Number** XX = 01 → 72
C	**Class-of-Service (COS) Number** 0 = Station Disabled (no COS Number) 1 → 9 = COS 1 → 9
D	**Toll Restriction Code** 0 = Toll-Allowed 1 = Toll Restriction Code 1 (Command 910) 2 = Toll Restriction Code 2 (Command 920)
E	**Pickup Group** 0 = No Pickup Group 1 → 7 = Pickup Groups 1 → 7
F,G,H	**Station Number** YYY = 1-, 2- or 3-Digit Numbering (Numbering Conflicts not permitted) Default Numbering Plan Two digits - 10, 11,... Three digits - 100, 101,...

STATION NUMBERING – BLOCK PROGRAMMING (COMMAND 621)

DEFAULT DATA

X	X	Y	Y	Z	Z	Z	
A	B	C	D	E	F	G	H

A,B	**First Station in Block** XX = Station Equipment Number 01 → 72
C,D	**Last Station in Block** YY = Station Equipment Number 01 → 72
E,F,G	**First Station Number Assignment** ZZZ = Station Directory Number to be assigned to the first equipment number in the block.
H	**Not Used**

Notes:
1. When changing the station directory number, ensure that all station sets and SUPERSET sets are on-hook. This prevents the Extension Status LEDs from remaining lit on the SX-20 Console and Remote Display.
2. DSS Key assignments and Busy Lamp Field assignments must be changed to reflect any directory number changes.

CLASS-OF-SERVICE, TOLL RESTRICTION AND PICKUP GROUP – BLOCK PROGRAMMING (COMMAND 622)

DEFAULT DATA

X	X	Y	Y	1	1	1	
A	B	C	D	E	F	G	H

A,B	**First Station in Range** XX = Station Equipment Number 01 → 72
C,D	**Last Station in Range** YY = Station Equipment Number 01 → 72
E	**Class of Service (COS)** 0 = Station Disabled 1 → 9 = COS 1 → 9
F	**Toll Restriction Code** 0 = Toll-Allowed 1 = Toll Restriction Code 1 2 = Toll Restriction Code 2
G	**Pickup Group** 0 = No Pickup Group 1 → 7 = Pickup Groups 1 → 7
H	**Not Used**

STATION HUNTING PROGRAMMING (COMMANDS 631 - 636)

DEFAULT DATA REGISTER 1

1	0	0					
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Hunt Type** 0 = Circular 1 = Terminal
C	**Hunt Group Linking** 0 = Unlinked Hunt Group 1 → 6 = Link to Hunt Groups 1 → 6
D,E,F, G,H	**Not Used**

DEFAULT DATA REGISTERS 2 - 9

X	Y	Y	Y				
A	B	C	D	E	F	G	H

A	**Register Number** X = Register Numbers 2 → 9
B,C,D	**Station Directory Number** YYY = any valid Station Directory Number
E,F,G,H	**Not Used**

STATION RING GROUP PROGRAMMING (COMMAND 641)

DEFAULT DATA REGISTERS 1 → 9

X	Y	Y	Y				
A	B	C	D	E	F	G	H

A	**Register Number** X = Register Number 1 → 9
B,C,D	**Station Directory Number** YYY = any valid Station Directory Number
E,F,G,H	**Not Used**

SUPERSET SET PROGRAMMING (COMMANDS 701 - 740)

DEFAULT DATA KEY 01

0	1	1	1	1	d	d	d
A	B	C	D	E	F	G	H

DEFAULT DATA KEYS 02 → 15

X	X	0					
A	B	C	D	E	F	G	H

A,B	**Key Number** XX= 01 to 15 for keys 1 to 15
C	**Equipment Function Type (EFT)** 0 = Speed Call 1 = Prime Line 2 = Key Line 3 = Multiple-Call Line 4 = Direct Trunk Select 5 = Direct Line Select 6 = Private Line 7 = Personal Outgoing Line
D	**Ringing Type** 0 = No Ring 1 = Ring Immediately 2 = Delayed Ring - (refer to SYSTEM OPTIONS for time-out period)
E	**Call Direction** 0 = Originate Only 1 = Bothway Calling 2 = Receive Only
F,G,H	**Directory Number or Trunk Equipment Number** If bit 'EFT' is 0, then ddd = Speed Call XXX If bit 'EFT' is 1, 2 or 3, then ddd = Station Directory Number XXX If bit 'EFT' is 4 or 5, then ddd = Trunk Equipment Number XX

Notes:

1. The SUPERSET Line Card can be installed in Slot 1 or Slot 2 of the SX-20 System. If it is installed in Slot 1, then the equipment numbers range from 01 to 16. (Equipment Numbers 17 to 24 do not exist.) If it is installed in Slot 2, then the equipment numbers range from 25 to 40.
2. If Bit C (EFT) is set to 7 (Personal Outgoing Line), then the system automatically sets Bit D (Ringing Type) to 0 (No Ring) and Bit E (Call Direction) to 0 (Originate Only).

TRUNK PROGRAMMING (COMMANDS 801 - 812)

DEFAULT DATA REGISTER 1

1	X	1	0	0	1	0	1
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Trunk Group Membership (refer to Table 4-5)** X = 0 for Incoming Calls Only = 1 → 6 for Trunk Groups 1 → 6
C	**Trunk Alarm Control** 0 = Disable 1 = Enable
D	**Trunk Hardware Type** 0 = Standard CO Trunk 1 = CO Conferencing Trunk 2 = E&M Trunk
E	**Inward Dial Class of Service** 0 = Not Inward Dial 1 → 9 = COS 1 → 9
F	**Toll Restriction on Inward Dial Trunks** 0 = Toll-Allowed 1 = Toll Restriction Code 1 2 = Toll Restriction Code 2
G	**Inward Dial Delay Before Answer** 0 = Disable (no delay) 1 = Enable (delay 8 s)
H	**Connect to Outgoing CO Trunk Without Third Party** 0 = Disable 1 = Enable

TABLE 4-5
TRUNK GROUP MEMBERSHIP DEFAULT DATA

Equipment Number	Trunk Group Membership
01	1
02	2
03	3
04	4
05 → 12	0

TRUNK PROGRAMMING (COMMANDS 801 - 812) (CONT'D)

DEFAULT DATA REGISTER 2

2	0	0	0	1	0	0	0
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Trunk Outpulsing Break/Make Ratio** 0 = 60/40 1 = 66/33 2 = 30/20 3 = 33/17
C	**Disconnect Supervision Provided by CO** 0 = No 1 = Yes
D	**Reversal Meaning (on Call Origination/Termination)** 0 = Not Incoming Call or Disconnect 1 = Incoming Call 2 = Incoming Call or Disconnect
E	**Disconnect Timing** 0 = 60 ms 1 = 500 ms 2 = 1.5 s 3 = 4.0 s
F	**Start Type (CO trunk)** 0 = Loop-Start 1 = Ground Start
G	**Dictation Trunks (CO Trunk)** 0 = Disable 1 = Enable
H	**Trunk Hang-up Delay Timing** H = (0 - 9) x 1 s

TRUNK PROGRAMMING (COMMANDS 801 - 812) (CONT'D)

DEFAULT DATA REGISTER 3

3	0	0	0	0	0	0	
A	B	C	D	E	F	G	H

A	**Register Number**
B	**2 dB Pad Control** 0 = Disable 1 = Enable Receive 2 = Enable Transmit 3 = Enable Both
C	**E&M Hardware Type** 0 = 2-Wire, 600 ohms 1 = 2-Wire, 900 ohms 2 = 4-Wire, 600 ohms 3 = 4-Wire, 900 ohms
D	**E&M Invert E Enable** 0 = Disable 1 = Enable
E	**E&M Wink Start Incoming Enable** 0 = Disable 1 = Enable
F	**E&M Wink Start Outgoing Enable** 0 = Disable 1 = Enable
G	**E&M Stop Dial Outgoing** 0 = Disable 1 = Enable
H	**Not Used**

TRUNK PROGRAMMING (COMMANDS 801 - 812) (CONT'D)

DEFAULT DATA REGISTER 4

4	X	0	1				
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Day Answer Mode (refer to Table 4-6)** 0 = Direct-In Line 1 = LDN 1 2 = LDN 2 3 = LDN 3
C,D	**Direct-In Line Equipment Number** 01 - 72 = Station Equipment Number 81 - 86 = Hunt Groups 1 - 6 87 = Ring Group 88 = RMATS Modem 00 = TAFAS
E,F,G,H	**Not Used**

Note: Bits C and D (Direct-In Line Equipment Number) are accessed only if Bit B (Day Answer Mode) is set to 0 (Direct-In Line).

TRUNK PROGRAMMING (COMMANDS 801 → 812) (CONT'D)

DEFAULT DATA REGISTER 5

5	X	0	1				
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Night Answer Mode (refer to Table 4-6)** 0 = Flexible Night Service 1 = LDN 1 2 = LDN 2 3 = LDN 3
C,D	**Flexible Night Service Equipment Number** 01 → 72 = Station Equipment Number 81 → 86 = Hunt Groups 1 → 6 87 = Ring Group 88 = RMATS Modem 00 = to TAFAS 80 = to Console
E,F,G,H	**Not Used**

Note: Bits C and D (Flexible Night Service Equipment Number) are accessed only if Bit B (Night Answer Mode) is set to 0 (Flexible Night Service).

TABLE 4-6
DAY AND NIGHT ANSWER MODE DEFAULT DATA

Trunk Equipment Number	Answer Mode
01	1
02	1
03	2
04	2
05 → 12	3

TRUNK GROUP PROGRAMMING (COMMANDS 821 - 826)

DEFAULT DATA REGISTER 1

1	0	0	0	0	0	X	X
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Reserved - set to 0**
C	**Trunk Hunting** 0 = Circular 1 = Terminal
D	**Trunk Group Overflow (Automatic Trunk Select only)** 0 = Disable 1 → 6 = Trunk Groups 1 to 6
E	**Identified Trunk Group** 0 = Disable 1 = Enable
F	**Behind PABX Operation** 0 = Disable 1 = Enable
G,H	**Trunk Group Access Code** G,H = 2-digit Trunk Group Access Code (refer to Table 4-7)

TABLE 4-7
TRUNK GROUP ACCESS CODE DEFAULT DATA

Trunk Group Number	Trunk Group Access Code
1	9
2	8
3	78
4	79

TRUNK GROUP PROGRAMMING (COMMANDS 821 - 826) (CONT'D)

DEFAULT DATA REGISTER 2

2	1	0	1	1	0	0	1
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Wait for Dial Tone** 0 = No Wait 1 = Wait 5 s 2 = Unlimited Wait, with Polling Dial Tone Verification Once per 5 s 3 = Unlimited Wait, with Manual Dial Tone Verification
C	**Supervision (Reversal or Change on Third Wire)** 0 = No Supervision 1 = Supervision is Answer/Message Unit 2 = Supervision is Toll Call 3 = Supervision is Message Unit
D	**Toll Control Plan if Station (or Inward Dial Trunk) Toll Restriction Code is 1** 0 = Toll-Allowed 1 = Basic Toll Control Plan 1 (Command 910) 2 = Basic Toll Control Plan 2 (Command 920)
E	**Toll Control Plan if Station (or Inward Dial Trunk) Toll Restriction Code is 2** 0 = Toll-Allowed 1 = Basic Toll Control Plan 1 (Command 910) 2 = Basic Toll Control Plan 2 (Command 920)
F	**Tone-to-Pulse Conversion** 0 = Disable 1 = Enable 2 = Enable, Disable Outgoing Audio Until Answer
G	**Simulate CO Dial Tone (PABX Dial Tone replaces CO Dial Tone)** 0 = Disable 1 = Enable
H	**SMDR Enable** 0 = Disable 1 = Enable

TRUNK GROUP PROGRAMMING (COMMANDS 821 → 826) (CONT'D)

DEFAULT DATA REGISTER 3

3	0	0	0	0	0	1	3
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Message Registration** 0 = Disable 1 = Enable
C	**Count Additional Message Units** 0 = Disable 1 = Enable 2 = Enable Pseudo Message Unit Count (once per 6 s) 3 = Enable Pseudo Message Unit Count (once per 60 s)
D,E	**Initial Message Unit Charge** D,E = 00 → 99
F,G	**Additional Message Unit Charge** F,G = 00 → 99
H	**Pseudo Answer Timer** H = (1 → 7) x 10 s

DEFAULT DATA REGISTER 4

4	0	1	0				
A	B	C	D	E	F	G	H

A	**Register Number**

B	**Sending Answer on Incoming Dial Trunks**
	0 = Send Answer When Answer Received (Supervision is Answer only)
	1 = Send Answer After End of Dialing (i.e., Time-out or # sign drop out)
	2 = Send Answer Upon Accessing Outgoing Trunk

C	**Local Ringback Until Answer Supervision** 0 = Disable 1 = Enable
D	**Interringing Delay (Signaling Incoming Seizure)** 0 = 5.5 s 1 = 10.0 s
E,F, G,H	**Not Used**

TOLL CONTROL PLAN 1 - BASIC PROGRAMMING (COMMAND 910)

DEFAULT DATA REGISTER 1

1	1	0	0	0	3	0	
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Restrict on Toll Calls as Indicated by Supervision within Trunk Group Programming** 0 = Disable 1 = Enable
C	**Digit Counting Toll Control** 0 = Disable 1 = Enable
D,E	**Minimum Digit Count** D,E = 00 → 30 Digits Dialed
F,G	**Maximum Digit Count** F,G = 01 → 30 Digits Dialed
H	**Not Used**

Note: There are three methods of TOLL CONTROL:

1. Based on SUPERVISION received
2. Based on the NUMBER of digits outpulsed
3. Based on the ACTUAL digits outpulsed

TOLL CONTROL PLAN 1 – BASIC PROGRAMMING (COMMAND 910) (CONT'D)

DEFAULT DATA REGISTER 2

2	X	X	X	X	X	X	
A	B	C	D	E	F	G	H

A	**Register Number**
B,C,D, E,F,G	**Absorb Unlock Digits** Default is No Absorb Unlock **Note:** Load '00' to remove Absorb Unlock. Display is blank on next access.
H	**Not Used**

DEFAULT DATA REGISTER 3

3	X	X	X	X	X	X	
A	B	C	D	E	F	G	H

A	**Register Number**
B,C,D, E,F,G	**Absorb Repeat Digits** Default is no Absorb Repeat **Note:** Load '00' to remove Absorb Repeat. Display will be blank on next access.
H	**Not Used**

TOLL CONTROL PLAN 1 – DIGIT STRING PROGRAMMING (COMMAND 911)

DEFAULT DATA REGISTER 01

A	B	C	D	E	F	G	H
0	1						

FIRST CONTINUATION

A	B	C	D	E	F	G	H
–							

SECOND CONTINUATION

A	B	C	D	E	F	G	H
=							

A,B	**Register 01 → 99**
C	**Control Digit** #1 = Deny #2 = Except
D,E,F, G,H	**Digits (refer to Note)** 0–9 = Enter any Digit 0 to 9 #3 = Table #4 = Don't Care #5 = Delete Entry #6 = Insert Entry ## = Cancel * = Enter

Note: A maximum of 19 entries (digits or conditions) may be entered per register. If more than five entries are programmed, the display indicates each continuation of the entry. The '–' indicates the first continuation, and the '=' indicates the second continuation for the register being programmed.

TOLL CONTROL PLAN 2 - BASIC PROGRAMMING (COMMAND 920)

DEFAULT DATA REGISTER 1

1	1	0	0	0	3	0	
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Restrict on Toll Calls as Indicated by Supervision within Trunk Group Programming** 0 = Disable 1 = Enable
C	**Digit Counting Toll Control** 0 = Disable 1 = Enable
D,E	**Minimum Digit Count** D,E = 00 → 30 Digits Dialed
F,G	**Maximum Digit Count** F,G = 01 → 30 Digits Dialed
H	**Not Used**

TOLL CONTROL PLAN 2 - BASIC PROGRAMMING (COMMAND 920) (CONT'D)

DEFAULT DATA REGISTER 2

2	X	X	X	X	X	X	
A	B	C	D	E	F	G	H

A	**Register Number**
B,C,D, E,F,G	**Absorb Unlock Digits** Default is No Absorb Unlock **Note:** Load '00' to remove Absorb Unlock. Display will be blank on next access.
H	**Not Used**

DEFAULT DATA REGISTER 3

3	X	X	X	X	X	X	
A	B	C	D	E	F	G	H

A	**Register Number**
B,C,D, E,F,G	**Absorb Repeat Digits** Default is no Absorb Repeat **Note:** Load '00' to remove Absorb Repeat. Display will be blank on next access.
H	**Not Used**

TOLL CONTROL PLAN 2 – DIGIT STRING PROGRAMMING (COMMAND 921)

DEFAULT DATA REGISTER 01

0	1						
A	B	C	D	E	F	G	H

FIRST CONTINUATION

–							
A	B	C	D	E	F	G	H

SECOND CONTINUATION

=							
A	B	C	D	E	F	G	H

A,B	**Register 01 → 99**
C	**Control Digit** #1 = Deny #2 = Except
D,E,F, G,H	**Digits (refer to Note)** 0-9 = Enter any Digit 0 to 9 #3 = Table #4 = Don't Care #5 = Delete Entry #6 = Insert Entry ## = Cancel * = Enter

Note: A maximum of 19 entries (digits or conditions) may be entered per register. If more than five entries are programmed, the display indicates each continuation of the entry. The '–' indicates the first continuation, and the '=' indicates the second continuation for the register being programmed.

TOLL TABLE 1 ITEM PROGRAMMING (COMMAND 931)

DEFAULT DATA

X	X	X		X			
A	B	C	D	E	F	G	H

A,B,C	**Item Number** 000 = Exit Condition XXX = 001 → 999
D	**Delimiter (Blank)** Delimiter automatically inserted
E	**Item Value** 0 = Disabled 1 = Enabled
F,G,H	**Not Used**

TOLL TABLE 2 ITEM PROGRAMMING (COMMAND 932)

DEFAULT DATA

X	X	X		X			
A	B	C	D	E	F	G	H

A,B,C	**Item Number** 000 = Exit Condition XXX = 001 → 999
D	**Delimiter (Blank)** Delimiter automatically inserted
E	**Item Value** 0 = Disabled 1 = Enabled
F,G,H	**Not Used**

TOLL TABLE 1 BLOCK PROGRAMMING (COMMAND 941)

DEFAULT DATA

X	X	X	Y	Y	Y		X
A	B	C	D	E	F	G	H

A,B,C	**Item Number (Low)** 000 = Exit Condition XXX = 001 → 999
D,E,F	**Item Number (High)** 000 = Exit Condition YYY = 001 → 999
G	**Delimiter (Blank)** Delimiter automatically inserted
H	**Item Value** 0 = Disabled 1 = Enabled

TOLL TABLE 2 BLOCK PROGRAMMING (COMMAND 942)

DEFAULT DATA

X	X	X	Y	Y	Y		X
A	B	C	D	E	F	G	H

A,B,C	**Item Number (Low)** 000 = Exit Condition XXX = 001 → 999
D,E,F	**Item Number (High)** 000 = Exit Condition YYY = 001 → 999
G	**Delimiter (Blank)** Delimiter automatically inserted
H	**Item Value** 0 = Disabled 1 = Enabled

BUSY LAMP FIELD PROGRAMMING (COMMAND 970)
*** FOR REMOTE DISPLAY AND CONSOLE ***

DEFAULT DATA (refer to Table 4-8)

X	Y	Y	Y				
A	B	C	D	E	F	G	H

A	**Row Number** X = 1 → 8
B,C,D	**Station Number for First Digit in Row** B,C,D = Any Number which is 0 or a multiple of 10
E,F,G,H	**Not Used**

TABLE 4-8
DEFAULT NUMBERING PLAN

2-Digit Numbering Plan		3-Digit Numbering Plan	
X	YYY	X	YYY
1	10	1	100
2	20	2	110
3	30	3	120
4	40	4	130
5	blank	5	140
6	blank	6	150
7	blank	7	160
8	blank	8	170

Note: Since the SX-20 system has a maximum of 72 stations, the last eight lamps in the Busy Lamp Field remain dark on the Remote Call Status Display.

FUNCTION KEY PROGRAMMING (COMMAND 972)

DEFAULT DATA (refer to Table 4-9)

X	Y	Y					
A	B	C	D	E	F	G	H

A	**Key Number** X = 1 → 3
B,C	**Function Code** 00 = Unassigned 01 = Message Registration/Restrictive Station Control 02 = Executive Busy Override 03 = Page 04 = Call Block 05 = TAFAS Overflow 06 = Auto Wake-up
D,E,F, G,H	**Not Used**

TABLE 4-9
DEFAULT KEY FUNCTION ASSIGNMENTS

Key Number	Default Function Code	Meaning
PF1	01	MESSAGE REGISTRATION
PF2	03	PAGE
PF3	02	EXECUTIVE BUSY OVERRIDE

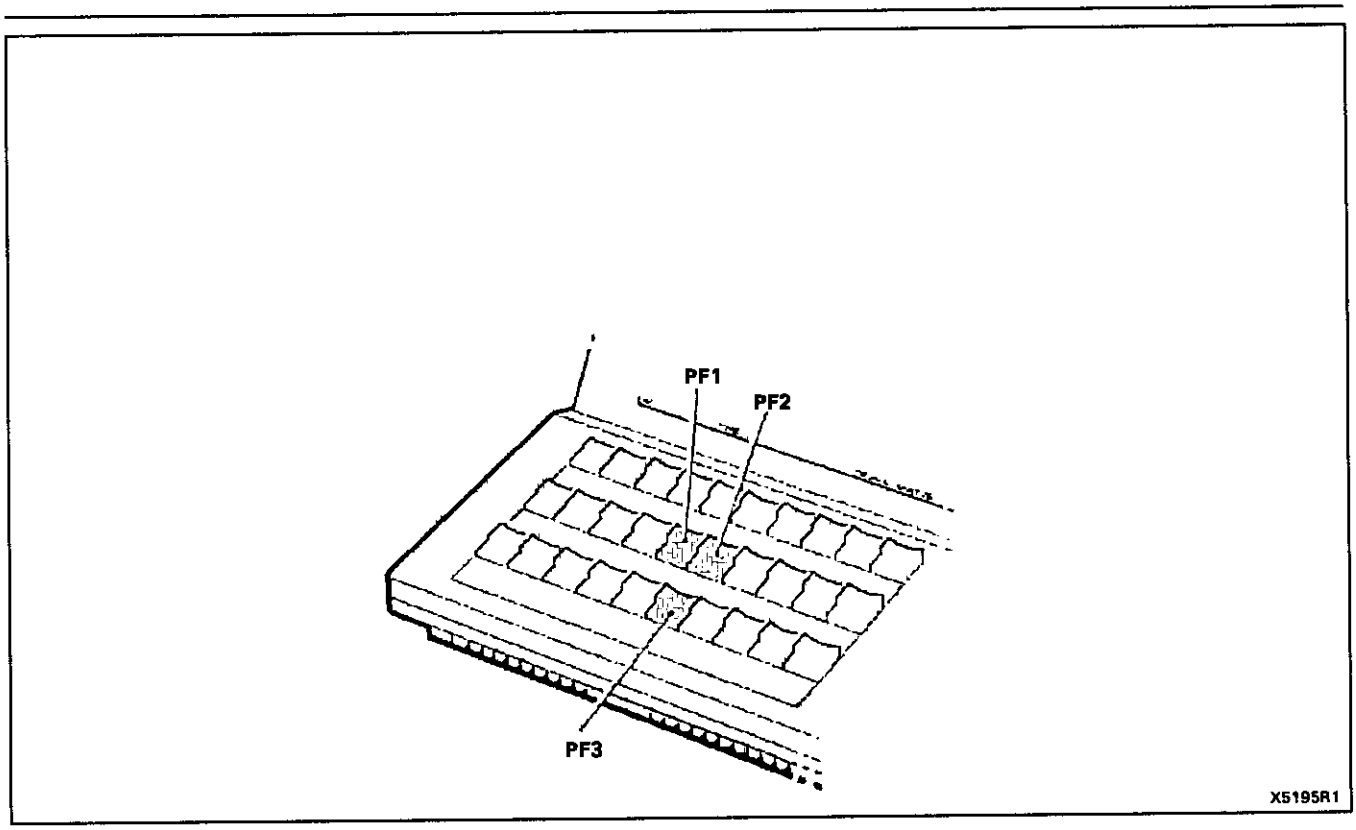


Figure 4-1 Programmable Function Keys

USER-DEFINED PROGRAMMING (COMMAND 975)

DEFAULT DATA REGISTER 1

1	0	0	0	0	0	0	0
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Command 601 – System Options** 0 = Disable 1 = Enable
C	**Command 602 – Feature Access Codes** 0 = Disable 1 = Enable
D	**Commands 611 → 619 – Class-of-Service Programming** 0 = Disable 1 = Enable
E	**Command 620 – Station Programming** 0 = Disable 1 = Enable All Fields 2 = Enable All Fields except TOLL-related fields
F	**Command 621 – Block Programming, Station Numbering** 0 = Disable 1 = Enable
G	**Command 622 – Block Programming, COS, Toll Restriction, Pickup Group** 0 = Disable 1 = Enable All Fields 2 = Enable All Fields except TOLL-related fields
H	**Commands 631 → 636 – Station Hunting** 0 = Disable 1 = Enable

USER-DEFINED PROGRAMMING (COMMAND 975) (CONT'D)

DEFAULT DATA REGISTER 2

2	0	0	0	0	0		
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Command 641 - Ring Group Programming** 0 = Disable 1 = Enable
C	**Commands 701 - 740 - SUPERSET Set Programming** 0 = Disable 1 = Enable
D	**Commands 801 - 812 - Trunk Programming** 0 = Disable 1 = Enable
E	**Commands 821 - 826 - Trunk Group Programming** 0 = Disable 1 = Enable All Fields 2 = Enable All Fields except TOLL-related fields
F	**Toll Control Plans 910/911, 920/921, 931/932, 941/942** 0 = Disable 1 = Enable
G,H	**Not Used**

USER-DEFINED PROGRAMMING (COMMAND 975) (CONT'D)

DEFAULT DATA REGISTER 3

3	0	0	0	0	0		
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Command 970 – Busy Lamp Field Programming** 0 = Disable 1 = Enable
C	**Command 972 – Function Key Programming** 0 = Disable 1 = Enable
D	**Command 976 – System Security Code Programming** 0 = Disable (always disable)
E	**Command 977 – User Security Code Programming** 0 = Disable 1 = Enable
F	**Command 978 – DISA Access Code Programming** 0 = Disable 1 = Enable
G,H	**Not Used**

SYSTEM SECURITY CODE PROGRAMMING (COMMAND 976)

DEFAULT DATA REGISTER 1

1	7	7	7	2			
A	B	C	D	E	F	G	H

A	**Register Number**
B	**System Security Code – Digit 1** B = Any digit from 0 → 9
C	**System Security Code – Digit 2** C = Any digit from 0 → 9
D	**System Security Code – Digit 3** D = Any digit from 0 → 9
E	**System Security Code – Digit 4** E = Any digit from 0 → 9
F,G,H	**Not Used**

USER SECURITY CODE PROGRAMMING (COMMAND 977)

DEFAULT DATA REGISTER 1

1	1	2	3	4			
A	B	C	D	E	F	G	H

A	**Register Number**
B	**User Security Code – Digit 1** B = Any digit from 0 → 9
C	**User Security Code – Digit 2** C = Any digit from 0 → 9
D	**User Security Code – Digit 3** D = Any digit from 0 → 9
E	**User Security Code – Digit 4** E = Any digit from 0 → 9
F,G,H	**Not Used**

DISA SECURITY CODE PROGRAMMING (COMMAND 978)

DEFAULT DATA REGISTER 1

1	0	0	0				
A	B	C	D	E	F	G	H

A	**Register Number**
B	**DISA Security Code – Digit 1** B = Any digit from 0 → 9
C	**DISA Security Code – Digit 2** C = Any digit from 0 → 9
D	**DISA Security Code – Digit 3** D = Any digit from 0 → 9
E,F,G,H	**Not Used**

SX-20®

TOLL CONTROL DESCRIPTION

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. GENERAL DESCRIPTION 1
Elements of Toll Restriction 1

3. STATION, COS, TRUNK, AND TRUNK GROUP PROGRAMMING . . 3
A. Station and Trunk Programming 3
COS Programming 4
Toll Restriction 4
B. Trunk Group Programming 4

4. TOLL PROGRAMMING 5
A. Basic Toll Programming (Commands 910 and 920) 7
Register 1 7
Register 2 7
Register 3 8
B. Digit String Programming (Commands 911 and 921) 8
Control Digit 8
Allow/Deny Digit Strings 8
Programming of a Digit String 9
Display of a Long Digit String 9
Special Key Definitions 9
Digit String Conflict 10
Toll Programming Error Codes 11
C. Toll Table Programming
(Commands 931, 932, 941 and 942) 11
D. Toll Table Item Programming 12
Toll Table Block Programming 12

5. EXAMPLES OF TOLL CONTROL 13
A. Programming Examples 13
B. Examples of Toll Control Operation 16
Case 1 17
Case 2 17
Case 3 17
Case 4 17

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LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
2-1	Toll Control	2
4-1	Toll Control Structure	6
5-1	Example Data	19

LIST OF TABLES

TABLE	TITLE	PAGE
4-1	Special Key Definitions	9
4-2	Toll Programming Error Codes	11
5-1	Example 1: Digit String Programming	15
5-2	Example 2: Digit String and Toll Table Item Programming	15
5-3	Example 3: Digit String and Table Programming	16
5-4	Example 4: Digit String and Table Programming	16

1. GENERAL

1.01 This Section contains a description and explanation of Toll Control utilized by the SX-20 system.

Reason for Issue

1.02 This Section has been issued to describe how Toll Control is programmed and operated for Generic 503.

1.03 Other MITEL practices applicable to this Section are:

- Section MITL9102-095-210-NA, System Programming.
- Section MITL9102-095-105-NA, Features Description.

Note: Throughout this Section, only the application of toll control to stations is described. Note that although only stations have been mentioned specifically, this description applies to Inward Dial Trunks as well, since they operate in exactly the same manner. For a detailed description of Inward Dial Trunks, refer to Section MITL9102-095-105-NA, Features Description.

2. GENERAL DESCRIPTION

2.01 Toll Restriction provides a method of controlling the sequence of digits which a station or an Inward Dial Trunk may dial on a trunk. Toll Restriction is applied on a station (or an Inward Dial Trunk) basis; the control plan applied to the digits dialed is dependent on the station accessing the trunk. Should no Toll Restriction on a station be required, the station is Toll-Allowed (dialing is unrestricted).

Elements of Toll Restriction

2.02 Two flexible Toll Control Plans may be defined in the SX-20 system. Application of a particular Toll Control Plan is dependent on five levels of programming (refer to Figure 2-1). They are:

- Class of Service (COS)
- Station Programming
- Trunk Programming
- Trunk Group Programming
- Toll Control Programming.

2.03 **Class of Service (COS).** The SX-20 system can accommodate up to nine different COS. Each COS details which features and Trunk Groups may be accessed by stations or Inward Dial Trunks assigned that COS.

2.04 **Station Programming.** Each station is assigned a COS plus a Toll Restriction Code. The COS defines the Trunk Groups accessible from the station and the Toll Restriction Code specifies if a Toll Control Plan is applied to that station when accessing a particular trunk in a Trunk Group. If the Toll Restriction Code is specified as "0",

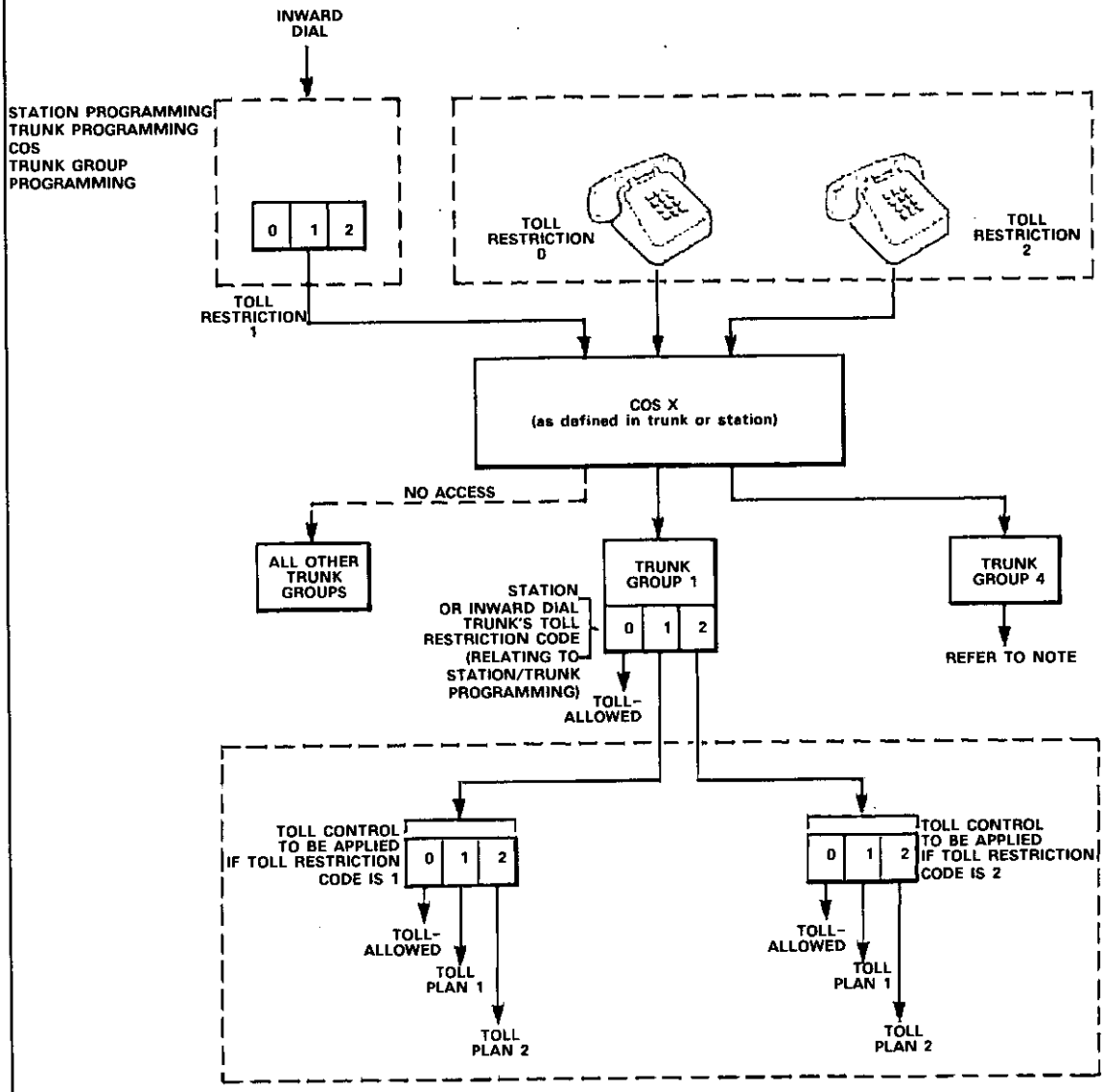

Figure 2-1 Toll Control

the station is Toll-Allowed, permitting unrestricted dialing on all Trunk Groups specified in the station's COS. If the restriction is specified as "1" or "2", the station may have some toll restriction applied.

2.05 Trunk Programming. Each Inward Dial Trunk is assigned a COS plus a Toll Restriction Code. The COS and Toll Restriction Codes define exactly the same parameters for Inward Dial Trunks as for stations as detailed in paragraph 2.04.

2.06 Trunk Group Programming. The Toll Control Plan applied to a station (or Inward Dial Trunk), is controlled by the Toll Restriction Code assigned to the calling station. Note that although a station may be assigned a Toll Restriction Code of 1 or 2 in Station Programming, toll calls may still be allowed in the specific Trunk Group selected.

2.07 Toll Control Programming. Each Toll Control Plan specifies the actual digits a station or an Inward Dial Trunk may or may not dial on a trunk in the Trunk Group accessed. Toll Control Programming is is described in detail in Part 5.

Note: The terms Toll Control Plan and Toll Restriction Code have two very different meanings. The two should not be confused. A Toll Restriction Code steers the required Toll Control Plan towards the station (or Inward Dial Trunk). The Toll Control Plan is the actual control (through SUPERVISION, the NUMBER of digits dialed and the ACTUAL digits dialed) applied to the station.

2.08 In some localities, certain leading digits are absorbed by the Central Office (CO) equipment. By the use of Absorb Plans, the PABX matches the CO conditions. Two Absorb Plans may be incorporated. Each Absorb Plan defines Absorb Repeat and Absorb Unlock digits. Absorb Repeat digits are continually ignored until a nonabsorb repeat digit is dialed. An Absorb Unlock digit is ignored only on its first occurrence. All other occurrences of the digit(s) are considered as digits for toll purposes. Note that the application of an Absorb Plan to a Trunk Group never causes the PABX to prevent dialed digits from going to the CO. The "absorbed" digits are simply ignored by the PABX in terms of toll control checking.

3. STATION, COS, TRUNK, AND TRUNK GROUP PROGRAMMING

A. Station and Trunk Programming

3.01 Station Programming consists of only one command number (620), while Trunk Programming consists of 12 command numbers (801 to 812, one command number for each trunk). When programming the station or Inward Dial Trunk, two conditions relating to Toll Control must be programmed: the COS and the Toll Restriction Code. Portions of the programming forms detailed in Section MITL9102-095-210-NA, are used to illustrate the key entries used in this Section for toll control.

COS Programming

3.02 COS Programming consists of nine command numbers: 611 to 619 (one command number for each COS). Each station or Inward Dial Trunk is assigned one of nine COS, with each COS containing seven major entries relating to Toll Control. Bits B through G in Register 1 contain information regarding Trunk Group access for each COS. The entries for each Trunk Group (i.e., Bit B corresponds to Trunk Group 1, Bit C corresponds to Trunk Group 2, etc.) in each COS are:

- 0 = Disable (deny access to the Trunk Group).
- 1 = Enable (allow access to the Trunk Group).

Toll Restriction

3.03 Each station and Inward Dial Trunk is assigned a Toll Restriction Code. This Toll Restriction Code indicates whether unrestricted access to all toll networks (regardless of the Trunk Group accessed), or whether some toll restriction is applied after accessing a particular Trunk Group. One of three Toll Restriction Codes may be selected as follows:

- 0 = Toll-Allowed (unrestricted access to all toll networks).
- 1 = Toll Restriction 1 (the station may have some toll control depending on the Trunk Group accessed).
- 2 = Toll Restriction 2 (the station may have some toll control depending on the Trunk Group accessed).

3.04 The entries related to Toll Restriction in Station and Trunk Programming are illustrated in Section MITL9102-095-210-NA, Commands 620, and 801 to 812.

B. Trunk Group Programming

3.05 Trunk Group Programming consists of six command numbers, (821 → 826, one command number for each of the six Trunk Groups). Trunk Group Programming (in relation to Toll Control) consists of four entries in Register 2 (Commands 821 to 826) as described below:

- Bit C - Supervision (Reversal or Change on Third Wire).
- Bit D - Toll Control Plan if Station (or Inward Dial Trunk) Toll Restriction Code is 1.
- Bit E - Toll Control Plan if Station (or Inward Dial Trunk) Toll Restriction Code is 2.

3.06 **Bit C - Supervision (Reversal or Change of State on Third Wire).** The meaning of supervision is dependent on conditions in the CO. The PABX can be programmed to match these conditions as follows:

- 0 = Ignore Supervision.
- 1 = Reception of the supervision signal indicates the called party has answered or that a message call unit has been registered.

- 2 = Reception of the supervision signal indicates that the call is a toll call.

3.07 Bit D – Toll Control Plan if Station (or Inward Dial Trunk) Toll Restriction Code is 1. This entry specifies the Toll Control Plan implemented if the originating station or Inward Dial Trunk has a Toll Restriction Code of 1.

- 0 = All calls, including toll calls, are allowed.
- 1 = Apply Toll Control Plan 1.
- 2 = Apply Toll Control Plan 2.

3.08 Bit E – Toll Control Plan if Station (or Inward Dial Trunk) Toll Restriction Code is 2. This entry specifies the Toll Control Plan implemented if the originating station or Inward Dial Trunk has a Toll Restriction Code of 2. The options available with the entries are as described in paragraph 3.07.

4. TOLL PROGRAMMING

4.01 Each Toll Control Plan specifies the actual digits a station or Inward Dial Trunk may dial after the trunk group has been accessed. A Toll Control Plan consists of a Basic Toll Control Plan (Commands 910 and 920, three registers each) and Digit String Programming (Commands 911 and 921, 99 registers each). Programming Commands 910 and 911 define Toll Control Plan 1. Similarly, Commands 920 and 921 define Toll Control Plan 2. The toll tables may be used with either plan, each table consisting of 999 registers. Commands 931 and 932 define Toll Table Item Programming while Commands 941 and 942 define Toll Table Block Programming. The entries which may be programmed into each register of these commands are described in the following paragraphs. The toll structure is illustrated in Figure 4-1.

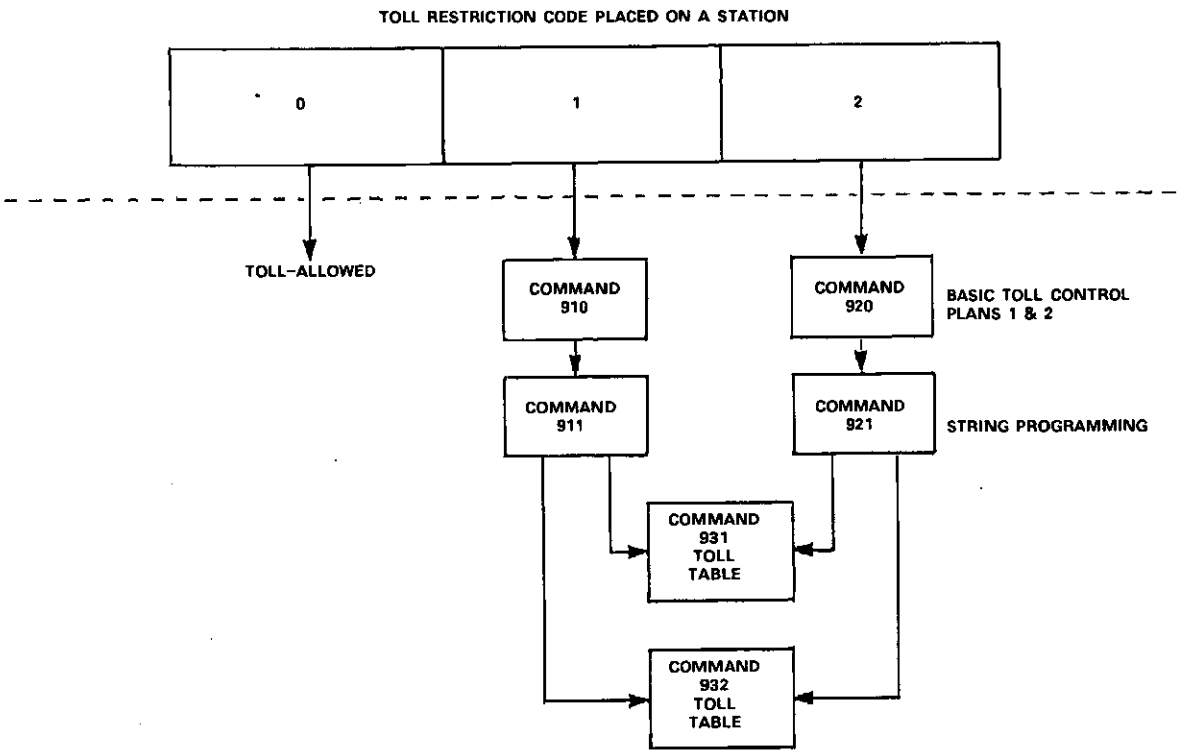

Figure 4-1 Toll Control Structure

A. Basic Toll Control Programming (Commands 910 and 920)

4.02 Two Basic Toll Control Plans are available, each specifying the number of digits a station or an Inward Dial Trunk must dial on a trunk in the Trunk Group accessed and the Absorb Plans to be applied. Each Basic Toll Control Plan consists of three registers. The data that can be entered into each of these registers is described below.

Register 1

4.03 **Bit B – Restrict on Toll Calls as Indicated by Supervision within Trunk Group Programming.** Bit B defines whether toll calls are allowed or denied after receipt of toll supervision. Supervision is defined as indicating a toll call in Trunk Group Programming (Bit C – Supervision, Reversal or Change on Third Wire). The entries are:

- 0 = Allow on receipt of supervision.
- 1 = Deny on receipt of supervision.

4.04 **Bit C – Digit Counting Toll Control.** When Bit C is enabled, the system counts the dialed digits and then restricts the call from being completed according to the minimum (Bits D and E) and maximum (Bits F and G) parameters for both stations and Inward Dial Trunks.

4.05 **Bits D,E – Minimum Digit Count.** Bits D and E define the minimum number of digits dialed on a trunk (when Bit C, Digit Counting Toll Control is enabled). The minimum digit count may be any number of digits between 0 and 30.

4.06 **Bits F,G – Maximum Digit Count.** Bits F and G define the maximum number of digits dialed on a trunk (when Digit Counting Toll Control is enabled). The maximum digit count may be any number of digits between 1 and 30.

Register 2

4.07 **Absorb Plans.** If the PABX is connected to a CO which absorbs specific digits, it is desirable to define an Absorb Plan. The Absorb Plan causes the toll plan to ignore dialed digits exactly as the CO absorbs them. The system can accommodate two independent Absorb Plans. Each plan specifies the "Absorb Repeat" digits and the "Absorb Unlock" digits required to match CO conditions. Either, both or neither of the Absorb Plans may be selected for use by a Trunk Group. In this case, the PABX checks the digits which the CO (and toll network) acts upon.

4.08 **Absorb Unlock Digits.** The Absorb Plan may contain up to six unlock digits. The first time an absorb unlock digit is dialed, it is passed without further analysis by the PABX. At this point, the Absorb Plan is unconditionally terminated and all subsequent digits are analyzed for toll control purposes.

4.09 Bits B through G define the digits used for absorb unlock (enter the exact digits to be absorbed). To remove any previously programmed absorb unlock digits, "00" must be loaded into Bits B and C.

Register 3

4.10 **Absorb Repeat Digits.** The Absorb Plan may contain up to six repeat digits. If the first digits dialed on the trunk are absorb repeat digits, the PABX waits for a nonabsorb digit before implementing the toll plan. When a nonabsorb digit is received, the effects of the Absorb Plan are terminated and the nonabsorb digit and all subsequent digits are analyzed.

4.11 Bits B through G define the digits to be used for absorb repeat. To remove any previously programmed absorb repeat digits, "00" must be loaded into Bits B and C.

B. Digit String Programming (Commands 911 and 921)

4.12 Two Digit String Plans are available to extend the capabilities of the basic Toll Control Plans. Digit String Programming identifies the actual digits (digit string) that a station or Inward Dial Trunk is either allowed or denied to dial on the trunk in the accessed Trunk Group. A Digit String may be specified as a few digits or as an entire table of digit sequences. Each Digit String Plan is associated with a Basic Toll Control Plan and contains 99 registers. The data that is entered into each register is described following.

Control Digit

4.13 **Bit C – Control Digit.** Whether a digit string is allowed or denied depends on the control condition entered. The valid entries are:

- #1 = Deny (digit string)
- #2 = Except (digit string).

4.14 **Deny and Except.** The deny and except functions are obtained by keying "#1" and "#2" as indicated. There is no display shown at the time when the "#" is keyed. The "d" or "E" is displayed after the "1" key or "2" key is pressed. Refer to paragraph 4.18, Special Key Definitions.

Allow/Deny Digit Strings

4.15 Bits D through H define the digit string to be allowed or denied. The valid entries are listed in Table 4–1 and are described in paragraph 4.18, Special Key Definitions.

Programming of a Digit String

4.16 A digit string may consist of up to 19 digits. By utilizing the double-key definitions, a digit string can easily be programmed. Note that the whole string is treated as a single entity (just like a directory number) and cannot be edited on a digit basis. Attempting to program a digit in the middle of a string, results in an error.

Display of a Long Digit String

4.17 Since the system has only an 8-digit 7-segment display, a long digit string overflows the display. A dash "-" and an equal sign "=" are used to designate continuation(s) of a digit string; for example, to program "deny 001-353-61-61435" into Register 1, the display shows the following when the digits are keyed in sequence:

```
01d00135
-3616143   first continuation
=5         second continuation.
```

Special Key Definitions

4.18 The toll control digit string programming requires several special keys such as "deny", "except", "table", etc. To allow the use of a regular telephone set (in the case of consoleless systems), double-key definition is necessary. The following table shows the keystrokes required to define the desired functions:

TABLE 4-1
SPECIAL KEY DEFINITIONS

Function	Keystrokes	Display
deny	#1	d
except	#2	E
table	#3	t
don't care	#4	_
delete entry	#5	
insert entry	#6	
enter	*	
cancel	##	

Note: The double-keystroke definitions apply only to the Toll Control Digit String Programming. All other programming is performed using the usual single key operation as in previous generics.

4.19 **Don't Care.** A "don't care" digit is defined as digits 0 to 9. In practice, it would be convenient to be able to program a "don't care" digit within a digit string; for example, "deny 1 don't care 1" means deny 101, 111, 121, 131, ... 191. The bottom segment "_" is displayed after both "#" and "4" are entered.

4.20 **Table.** A table is defined by Commands 931, 932, 941 and 942 (refer to Toll Table Programming). The table function is obtained by keying #3. There is no display shown at the time when the "#" key is pressed. A **t** is displayed after the "3" key is pressed.

4.21 **Toll Table Prefix.** When including a table in a deny/except string, the number of digits preceding the table (referred to as the toll table prefix) can be a maximum of eight; for example, the string 'deny 1416 table 1' contains four prefix digits -- '1416'. A toll table can be referenced more than once by the two toll plans. However, the prefix digits in each case must be identical or else an error code is returned on the display.

4.22 **Delete Entry and Insert Entry.** The "Delete Entry" and "Insert Entry" functions are programmed by keying "#5" and "#6", respectively as shown in Table 4-1. The "Delete Entry" function is used to delete a previously programmed digit string. If the deleted string is an exception string, only this string is deleted. However, if the deleted string is a deny string, all exception strings associated with it (if any) are also deleted. The "Insert Entry" function is used to insert a new digit string into a previously programmed toll plan without re-entering the whole plan. All entries after the inserted entry will be moved down one position in the table.

4.23 **Enter and Cancel.** These functions enter and cancel programming data. Two #s are required to obtain the cancel/exit function. Note also that "*" performs an "advance" function if the current register contains a long digit string.

Digit String Conflict

4.24 Since the digit string scheme is so flexible, a user may program some conflicting digit strings without realizing the situation. If this situation exists, the system may interpret the ambiguity created by the conflict differently from the original intention, such that, an incorrect decision may be made on a toll call. Specifically, a conflict is defined as:

- A deny digit string is identical to, includes, or is included by another existing deny string.
- An exception digit string is identical to, includes, or is included by another existing exception string within the same deny/except group.

In order to avoid incorrect toll denial decisions, the digit string programming checks the occurrence of any digit string conflict and an error code (refer to Table 4-2) is returned if one is detected. Examples of conflicts are:

(a) d1xx
d1x1 (included in d1xx)

(b) d1x1
e1416

d1x1 (identical to d1x1)
e1419

(c) d1x
d1t1 (includes d1x since a table represents three digits)

(d) d1x
e1416
e1416 (identical to previous exception).

4.25 An error code is displayed if an attempt is made to leave a register (which falls between programmed registers), blank. If, after the error code is displayed, the condition is exited via the CANCEL or RELEASE keys on the console or by going on-hook at the Test Line, the blank register is automatically eliminated and the contents of the subsequent registers are shifted upwards.

Toll Programming Error Codes

4.26 The following error codes are assigned to invalid cases during Toll Control Programming:

TABLE 4-2
TOLL PROGRAMMING ERROR CODES

Error Code	Function
E04	Data out of range.
E07	Too many digits dialed.
E12	Data field incomplete - enter all data for field that was flashing.
E20	Invalid double-digit command. (Refer to Table 4-1.)
E21	Bit C - Control digit error: missing "deny" or "except" as first digit.
E22	Bit C - Control digit error: "deny" or "except" not as first digit.
E23	Attempt to program at the middle of a digit string.
E24	Digit string conflict.
E25	Toll digit string programming register overflow.
E26	Embedded empty digit string register detected.
E27	Digit memory full.
E28	Invalid toll table number.
E29	Toll table prefix too long.
E30	Toll table prefix conflict.

C. Toll Table Programming (Commands 931, 932, 941, and 942)

4.27 In some localities, toll calls do not contain explicitly distinct digit patterns. In these cases, the denial rules usually deny/allow a large number of 3-digit codes. Therefore, the 99 registers provided in Commands 911 or 921 are insufficient to program them. In order to cover these special cases and still conserve memory usage, the system's toll scheme allows denying or excepting a table, which can be programmed to contain up to 999 entries of 3-digit codes. Two toll tables are provided in the system. Programming of these tables is

accomplished through Toll Table Item and Toll Table Block Programming. Either, or both of the tables may be assigned to either Toll Control Plan, and may be referenced to more than once within the system. Refer to Toll Table Prefix (described in Digit String Programming) for limitations on referencing a table. To assign a table to a plan, simply include it in a digit string (refer to Digit String Programming).

D. Toll Table Item Programming

4.28 Commands 931 (Table 1) and 932 (Table 2) are used to program individual items in the tables. The display is formatted as **nnn x** where **nnn** is the item number (001 to 999, while 000 is used as an exit condition). The **x** represents the status of the item (0 for disable and 1 for enable); other values are invalid.

4.29 Toll Table Item Programming performs the following functions:

- Enables an item in the toll table
- Disables an item in the toll table
- Examines a previously enabled item.

4.30 **Enable/Disable an Item.** Enabling or disabling an item is best explained in terms of an example. Sample programming data for a digit string register (e.g., Command 921, Register 01), and two toll table item registers (e.g., Command 931) are shown below:

Example: Command 921: 01dt1 (deny Table 1)

control digit ——————┘

Command 931: 102 0 (102 not present)
103 1 (103 present)

item value ——┘

The item value (0 or 1) is used in conjunction with the control digit to derive the final meaning of deny/except. In this example, the programmed data "102 0" means the digits 102 are not present in the table; the control condition is not applicable. Therefore, the digits 102 are allowed. However, "103 1" means the digits 103 are present in the table; the control condition "dt1" is applicable. Therefore, the digits 103 are denied.

4.31 **Examine an enabled item.** To examine a previously enabled item, the * key is used. Pressing the * key enters the data of the current register and displays the next enabled entry. The display shows '___ _' if no further enabled item is found.

Toll Table Block Programming

4.32 Commands 941 (Table 1) and 942 (Table 2) are used to program a large number of sequential items in the tables. The display is formatted as **mmmnnn x**, where **mmm** is the low item number, **nnn** is the high item number, and **x** represents the item status. The item

number can range from 001 to 999 (000 is the exit condition), while the item status may be 0 (not present) or 1 (present).

4.33 Toll Table Block Programming is used to perform the following functions:

- Enables a range of items in the toll table
- Disables a range of items in the toll table
- Examines a previously enabled item.

4.34 **Enable/Disable a Block of Items.** Table Block Programming is used to enable/disable a range of items as shown in the following example. Sample programming data for a digit string register (e.g., Command 911, Register 05), and two Toll Table Block registers (e.g., Command 942) is shown below:

Example: Command 911: 05Et2 (except Table 2)

control digit ——————┘

Command 942: 104106 0 (items 104, 105, 106 not present)
107109 1 (items 107, 108, 109 present)

item value ——————┘

Again, the item value (0 or 1) is used in conjunction with the control digit to derive the final meaning of deny/except. In this example, the programmed data, "104106 0" means the digits 104, 105 and 106 are not present in the table; the control condition "Et2" is not applicable. Therefore, the digits 104, 105 and 106 are denied. However, "107109 1" means the digits 107, 108 and 109 are present in the table; the control condition "Et2" is applicable. Therefore, the digits 107,108 and 109 are allowed.

5. EXAMPLES OF TOLL CONTROL

A. Programming Examples

5.01 The following tables illustrate some typical toll control examples and the corresponding system 7-segment display at the time of programming. The symbols used in these tables are:

(a) d -- deny

(b) e -- except

(c) t -- table

(d) x -- don't care (digits 0-9).

5.02 The following example (Table 5-1) illustrates Digit String Programming for Toll Control Plan 1 (Command 911). The command number and required register number are accessed first. The required strings are then programmed, one per register.

5.03 Example 2 (Table 5-2) shows how a table could be denied in Digit String Programming for Toll Control Plan 2 (Command 921). The contents of the table are also shown as programmed in Toll Table Item Programming (Command 931). Note that Table 1 was chosen since either table can apply to either plan.

5.04 Tables 5-3 and 5-4 are further examples of how a table can be included in a digit string.

TABLE 5-1
EXAMPLE 1: DIGIT STRING PROGRAMMING

Requirements	Display	Remarks
Plan 1	?911	Toll Control Plan 1 Digit String Programming
d0	01d0	Deny 1st digit 0
d1	02d1	Deny 1st digit 1
e1613	03E1613	Except 1-613
e1416	04E1416	Except 1-416
e15x9	05E15-9	Except 1-5x9
e16025672344	06E16025 -672344	Except 1-602-567-2344
e16025681234	07E16025 -681234	Except 1-602-568-1234
e1800	08E1800	Except 1-800

TABLE 5-2
EXAMPLE 2: DIGIT STRING AND TOLL TABLE ITEM PROGRAMMING

Requirements	Display	Remarks
Plan 2	?921	Toll Control Plan 2 Digit String Programming
		Allow and deny a large number of 3-digit codes
dt1	01dt1	Deny entries in Table 1
Table 1	?931	Table 1 Item Programming
	102 1	Deny 102 (The last digit 1 represents enable)
	105 1	Deny 105
	980 1	Deny 980

TABLE 5-3
EXAMPLE 3: DIGIT STRING AND TABLE PROGRAMMING

Requirements	Display	Remarks
Plan 2	?921	Toll Control Plan 2 Digit String Programming
d0	01d0	Deny 1st digit 0
d1613t1	02d1613t -1	Deny 1-613-(entries in Table 1)
e16135922122	03E16135 -922122	Except 1-613-592-2122
Table 1	?931 233 1 235 1 238 1 592 1 829 1	Table 1 Item Programming Deny 1-613-233 Deny 1-613-235 Deny 1-613-238 Deny 1-613-592 Deny 1-613-829

TABLE 5-4
EXAMPLE 4: DIGIT STRING AND TABLE PROGRAMMING

Requirements	Display	Remarks
Plan 1	?911	Toll Control Plan 1 Digit String Programming Allow a set of 3-digit codes
d1	01d1	Deny 1st digit 1
e1t2	02E1t2	Except entries in Table 2
Table 2	?932 124 1 125 1 130 1 982 1 985 1	Table 2 Item Programming Allow 1-124 Allow 1-125 Allow 1-130 Allow 1-982 Allow 1-985

B. Examples of Toll Control Operation

5.05 The following examples illustrate the operation of the the system's Toll Control Plans. Example data is shown in Figure 5-1. Should the station encounter a 'denial', reorder tone is returned and the trunk is dropped.

Note: The * must not be dialed on a trunk when the system is checking toll control conditions. If the interdigit time-out is exceeded when the system is checking toll control conditions, the system returns reorder tone and drops the trunk.

Case 1

5.06 Station R attempts to make a toll call. The processor checks the Toll Restriction Code of Station R, which is 0 (Toll-Allowed). Therefore, no further check is needed on any trunk and the call is allowed.

Case 2

5.07 Station S attempts to make a toll call on a trunk in Trunk Group 1. The processor checks the Toll Restriction Code for Station S (which is 1). Therefore, some toll restriction could exist for this station.

5.08 The processor checks Trunk Group 1 data. The Trunk Group has a Toll Restriction Code of 0. Bit D indicates that for calls on this Trunk Group, no restriction is applied. Therefore, all toll calls made by a station with Toll Restriction Code 1 on this trunk group are allowed.

Case 3

5.09 Station S attempts to make a toll call on a trunk in Trunk Group 2. The processor checks the Toll Restriction Code of Station S (which is 1). Therefore, some toll restriction could exist for this station. The processor then checks Trunk Group 2 data. Bit C indicates supervision is considered an answer or a message unit. Also, since the station has a Restriction Code of 1, Bit D indicates that for calls in this Trunk Group, Toll Control Plan 1 is applied.

5.10 The processor then checks Toll Control Plan 1 data in Register 1, Command 910. According to Bit B, supervision is ignored, even if it had been programmed as indicating a toll call. However, Bit C indicates that digit counting toll control has been enabled. Therefore, the call is denied if the number of digits dialed is more than eight or less than one. The call is denied if the first digit dialed is a 0 as indicated by Register 1, Command 911, Digit String Programming (Plan 1). Therefore, any station whose Toll Restriction Code is 1 can make any call on this Trunk Group provided the first digit dialed is not a 0 and the number of digits dialed is not more than eight and not less than one. Note that for simplicity, it is assumed in this example, that only Register 1 of Command 911 has been used for Digit String Programming.

Case 4

5.11 Station T attempts to make a toll call on a trunk in Trunk Group 3. The processor checks the Toll Restriction Code of Station T, (which is 2). Therefore, some toll restriction could exist for this station. The processor checks Trunk Group 3 data. Bit C indicates that supervision is considered a toll call indication. Also, since the station has a

Toll Restriction Code of 2, Bit E indicates that for calls on this Trunk Group, Toll Control Plan 2 is applied.

5.12 The processor then checks Toll Control Plan 2 data in Register 1, Command 920. According to Bit B, should supervision be received, it is considered as a toll indication and the call is denied. However, should no supervision be received, the call is analyzed under the conditions set in Digit String Programming (Plan 2), Command 921. Register 1 of Command 921 is programmed to deny all entries in Table 1 (Command 931). Therefore, if no supervision is received, all calls beginning with the digits programmed in Table 1 are denied.

	STATION R DATA	x x x **0** x x x X D
COMMAND 620	STATION S DATA	x x x **1** x x x x D
	STATION T DATA	x x x **2** x x x x D
COMMAND 821	TRUNK GROUP 1 DATA	**2** x 0 **0** 1 x X x A C D E
COMMAND 822	TRUNK GROUP 2 DATA	**2** x **1** **1** **2** x x x A C D E
COMMAND 823	TRUNK GROUP 3 DATA	**2** x **2** **1** **2** x x x A C D E
COMMAND 910 REGISTER 1	BASIC TOLL CONTROL PLAN 1 DATA	**1** **0** **1** **0** **1** **0** **8** x A B C D E F G
COMMAND 911 REGISTER 1	DIGIT STRING PLAN 1 DATA	**0** **1** d **0** x x x x A B C D
COMMAND 920 REGISTER 1	BASIC TOLL CONTROL PLAN 2 DATA	**1** x x x x x x x A B
COMMAND 921 REGISTER 01	DIGIT STRING PLAN 2 DATA	**0** **1** d t **1** x x x A B C D E
COMMAND 931	TOLL TABLE 1 DATA	**1** **0** **2** x **1** X x A B C E
		1 **0** **5** x **1** x x x A B C E
		9 **8** **0** x **1** x x x A B C E

Figure 5-1 Example Data

SX-20®

SYSTEM TEST PROCEDURES

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. TEST AND OPERATIONAL PROCEDURES 1
Operating Procedures 1

3. CONSOLE TEST PROCEDURES 1
Chart 3-1 Access Trunk by Equipment Number 2
Chart 3-2 Attendant Access 2
Chart 3-3 Attendant Camp-On 3
Chart 3-4 Automatic Switching to TAFAS after Time-Out 3
Chart 3-5 Automatic Wake-up 4
Chart 3-6 Busy Out/Unbusy a Speech Path 5
Chart 3-7 Busy Out/Unbusy a Trunk 6
Chart 3-8 Call Block 7
Chart 3-9 Call Hold (Attendant) 8
Chart 3-10 Console Bell 9
Chart 3-11 Console Lamp Test 10
Chart 3-12 Executive Busy Override 11
Chart 3-13 Flexible Night Service 12
Chart 3-14 Incoming Call Identification 13
Chart 3-15 Message Registration/Restrictive Station Control 14
Chart 3-16 Message Waiting 16
Chart 3-17 Paging 17
Chart 3-18 Remote Status Display and Cabinet Lamp Test . . 18
Chart 3-19 Set Time Display 18
Chart 3-20 Speech Path Access 19
Chart 3-21 Station Calls to Attendant Night Answer Point . . 19
Chart 3-22 Tone-to-Pulse Conversion 20
Chart 3-23 Trunk Alarm Control 21
Chart 3-24 Trunk Emergency Release 21

4. STATION TEST PROCEDURES 22
Chart 4-1 Automatic Callback - Busy 22
Chart 4-2 Call Block 23
Chart 4-3 Call Forwarding - Busy 24
Chart 4-4 Call Forwarding - Don't Answer 25
Chart 4-5 Call Forwarding - Follow Me 26
Chart 4-6 Call Hold (Station) 27
Chart 4-7 Call Hold Pickup 28
Chart 4-8 Camp-On (Onto Stations Only) 29
Chart 4-9 Consultation Hold/Add-On/Transfer 30
Chart 4-10 Dial Call Pickup 31
Chart 4-11 Direct-In Lines 31

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CONTENTS (CONT'D) PAGE

Chart 4-12 Direct Outward Dialing 32
Chart 4-13 Discriminating Ringing 33
Chart 4-14 External Call Forwarding 34
Chart 4-15 Flash for Attendant 35
Chart 4-16 Flash Is Release 35
Chart 4-17 Housephone (Manual Line) 36
Chart 4-18 Message Waiting 36
Chart 4-19 Music on Hold 36
Chart 4-20 Paging Access 37
Chart 4-21 Ring Group 37
Chart 4-22 Station-to-Station Call 38
Chart 4-23 Station Hunting 39
Chart 4-24 Transfer Dial Tone 40
Chart 4-25 Through Dialing 40
Chart 4-26 Trunk Answer From Any Station (TAFAS) 41
Chart 4-27 Trunk-to-Trunk plus Station Conferencing 41

5. SUPERSET 4™ TEST PROCEDURES 42
Chart 5-1 Establish a Call 42
Chart 5-2 Answer an Incoming Call 44
Chart 5-3 Hold/Transfer/Conference Call 45
Chart 5-4 Splitting a Conference Call 46
Chart 5-5 Swapping Calls 46
Chart 5-6 Sending a Message 46
Chart 5-7 Receiving a Message 47
Chart 5-8 Automatic Callback - Busy 48
Chart 5-9 Camp-On 48
Chart 5-10 Selecting Features 49
Chart 5-11 Displaying Features 49
Chart 5-12 Testing the Line Select/Speed Call Buttons and the Hold Button 50
Chart 5-13 Set Date 50

6. SUPERSET 3™ TEST PROCEDURES 54
Chart 6-1 Establish a Call 54
Chart 6-2 Answer an Incoming Call 56
Chart 6-3 Placing a Call on Hold 56
Chart 6-4 Establishing a Broker's Call 57
Chart 6-5 Redial 57
Chart 6-6 Setting Up A Conference Call 58

LIST OF ILLUSTRATIONS

FIGURE TITLE PAGE

5-1 SUPERSET 4 Feature Buttons 51
5-2 Line Status Display Symbols 52
5-3 SUPERSET 4 Features Display Layout 53
6-1 SUPERSET 3 Features 59

1. GENERAL

1.01 This Section describes the test procedures for the SX-20 PABX. These procedures should be performed as operational tests upon installation of the console and stations after the initial system installation. Refer to Section MITL9102-095-200-NA, for system installation instructions.

Reason for Issue

1.02 This Section has been issued to describe the console and station test procedures for Generic 503.

2. TEST AND OPERATIONAL PROCEDURES

2.01 Satisfactory completion of the operating procedure tests confirms that the apparatus has been installed and programmed correctly.

2.02 If any operating procedure cannot be completed as described, verify that:

- The procedure is applicable to the station (i.e., the feature being tested is assigned to the station in programming).
- The apparatus which provides the feature (i.e., night bells) is correctly installed.

2.03 If the operating procedure still fails, refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

Operating Procedures

2.04 The operating procedures are divided into two parts: Console Test Procedures and Station Test Procedures. The Console Test Procedures are described in Charts 3-1 through 3-24 and the Station Test Procedures are described in Charts 4-1 through 4-27. The SUPERSET 4 set and the SUPERSET 3 set Test Procedures are detailed in Charts 5-1 through 5-13 and Charts 6-1 through 6-6. Please note that the Station Test Procedures are applicable to the SUPERSET™ sets.

2.05 Throughout this practice, all Feature Access Codes used are DEFAULT DATA FEATURE ACCESS CODES. The Attendant Function Access Code default is * or 71.

3. CONSOLE TEST PROCEDURES

3.01 The following charts explain the tests associated with the console. If any test cannot be verified, check the installation instructions detailed in Section MITL9102-095-200-NA and/or the Programming Forms completed from Section MITL9102-095-210-NA, System Programming.

Note: If the SX-20 system is used as a consoleless system, the terms "Call Status Display" and "Attendant Console" should be replaced by "Remote Display" and "Test Line", respectively.

CHART 3-1
ACCESS TRUNK BY EQUIPMENT NUMBER

Step	Action	Verification
1.	Dial the Attendant Function Access Code (✳ or 71).	**A** is shown on the left of the Call Status Display.
2.	Dial 19, plus trunk equipment number.	The trunk number is shown on the left of the display. The console is connected to the trunk with the equipment number dialed. Dial tone is returned if the trunk is idle or busied-out (EQPT BUSIED lamp flashing). Busy tone is returned if the trunk is in use.
3.	Press the RELEASE key.	

CHART 3-2
ATTENDANT ACCESS

Step	Action	Verification
To Answer a Dial 0 Call:		
1.	Establish a Dial 0 call to the attendant.	The Call Waiting digit and Extension Status displays light. The DIAL 0 and ANSWER key LEDs flash. The console bell rings.
2.	Press the flashing DIAL 0 or ANSWER key.	The DIAL 0 LED and the Call Waiting Display go dark. The ANSWER key LED lights solid, and the number of the calling station is displayed on the left of the Call Status Display. The attendant is connected to the calling station. (Refer to Section MITL9102-095-105-NA, Attendant Access.)
3.	Press the RELEASE key.	

CHART 3-3
ATTENDANT CAMP-ON

Step	Action	Verification
1.	Establish an incoming trunk call to the attendant.	
2.	Press the flashing LDN key.	The trunk number is shown on the left of the Call Status Display. The attendant is connected to the calling party.
3.	Dial a busy station number.	Busy tone is returned to the attendant.
4.	Press the RELEASE key.	The busy station hears two tone bursts to indicate that a call has been camped on to the station. If enabled as a system feature, Music on Hold is provided to the camped-on trunk.
5.	Go on-hook at the station.	The station rings. The camped-on caller hears ringback tone. If unanswered within a predetermined time, the camped-on call recalls the attendant.
6.	Go off-hook at the station.	The incoming call connects to the station.

CHART 3-4
AUTOMATIC SWITCHING TO TAFAS AFTER TIME-OUT
(refer to Note)

Step	Action	Verification
During Day Service:		
1.	Establish a trunk call to the console.	Console rings.
2.	Wait 30 seconds (default TAFAS time-out).	The call is transferred to the TAFAS equipment.
3.	Dial the TAFAS Access Code at another station.	The incoming call is connected to the station.

Note: If the above procedure is performed in Night Service, Night TAFAS Mode (Command 601, Register 4) must be set 2 (Automatic Switching to TAFAS after Time-out). Default is Immediate Switching to TAFAS.

CHART 3-5
AUTOMATIC WAKE-UP

Step	Action	Verification
To Enter the Automatic Wake-up Time:		
1.	Dial the Attendant Function Access Code.	**A** is shown on the left of the Call Status Display.
2.	Dial 71 and the station number requesting the Automatic Wake-up.	The station number and five dashes for hours and minutes **nnn-----** are shown on the Call Status Display.
3.	Dial 2-digit hours and 2-digit minutes (24-hour clock).	The Automatic Wake-up time is entered and the selected station rings at the preselected time.
To Cancel the Automatic Wake-up Time:		
4.	Repeat Steps 1 and 2.	
5.	Dial 9999.	Automatic Wake-up is cancelled. Call Status Display blanks.
To Display the Automatic Wake-up Time:		
6.	Repeat Step 1.	**A** is shown on the left of the Call Status Display.
7.	Dial 72 and the station number to be displayed.	The station number, a dash, and the time in hours and minutes are shown on the Call Status Display **(nnn-hhmm)**. If there is no Automatic Wake-up requested, dashes are shown in place of the time **(nnn-----)**.

CHART 3-6
BUSY OUT/UNBUSY A SPEECH PATH

Step	Action	Verification
To Busy Out a Speech Path:		
1.	Dial the Attendant Function Access Code (* or 71).	**A** is shown on the left of the Call Status Display.
2.	Dial 45, plus the Speech Path equipment number (01 - 12) (e.g., 02).	The Speech Path is busied-out and the EQPT BUSIED LED flashes.
3.	Dial the Programming and Special Functions Access Code (# or 70).	**?601** flashes on the display.
4.	Dial the System Status Display Function (Command 992) followed by * .	Register 1 is shown on the display with field D displaying 2 (busied-out) as Equipment Number 2 used as an example.
5.	Press RELEASE. OR	
6.	Press the STATUS key on the console once and hold.	Register 1 is shown on the display with fields A and B showing the total number of speech paths currently busied-out.
7.	Release STATUS key.	
To Unbusy a Speech Path:		
8.	Repeat Step 1.	
9.	Dial 55, plus the Speech Path equipment number (01 - 12) (e.g., 02).	The Speech Path may now be accessed. EQPT BUSIED LED goes dark.
10.	Dial the Programming and Special Functions Access Code (# or 70).	**?601** flashes on the display.

CHART 3-6 (CONT'D)
BUSY OUT/UNBUSY A SPEECH PATH

Step	Action	Verification
11.	Dial the Status Display Function - System Command 992 followed by ✳ .	Register 1 is shown on the display with field D displaying 0 (idle) as Equipment Number 2 is used as an example.
12.	Press RELEASE. OR	
13.	Press the STATUS key to display Register 1.	The total number of speech paths currently busied-out is shown in fields A and B.

CHART 3-7
BUSY OUT/UNBUSY A TRUNK

Step	Action	Verification
To Busy Out a Trunk:		
1.	Dial the Attendant Function Access Code (✳ or 71).	**A** is shown on the left of the Call Status Display.
2.	Dial 41, plus the trunk equipment number.	The trunk is busied-out, its associated trunk status lamp lights and the EQPT BUSIED LED flashes. The trunk can only be accessed from the console or the Test Line by unbusying the trunk, or by accessing the trunk by its equipment number (refer to Chart 3-1).
3.	Press the STATUS key two and three times to verify the trunk status.	
To Unbusy a Trunk:		
1.	Dial the Attendant Function Access Code (✳ or 71).	**A** is shown on the left of the Call Status Display.
2.	Dial 51, plus the trunk equipment number of the busied-out trunk.	The trunk status lamp and EQPT BUSIED LED go dark. The trunk is free and may be accessed normally.
3.	Press the STATUS key two and three times to verify the trunk status.	

CHART 3-8
CALL BLOCK

Step	Action	Verification
To Enable Call Block:		
1.	Dial the Attendant Function Access Code (* or 71).	**A** is shown on the left of the Call Status Display.
2.	Dial 23. OR	The display blanks. The CALL BLOCK LED in the System Status Display and the CALL BLOCK key LED light.
3.	Press the CALL BLOCK key on the console.	The CALL BLOCK LED and the CALL BLOCK key LED light.
To Cancel Call Block:		
4.	Dial the Attendant Function Access Code (* or 71).	**A** is shown on the left of the Call Status Display.
5.	Dial 24. OR	The display blanks. The CALL BLOCK LED and the CALL BLOCK key LED go dark.
6.	Press the CALL BLOCK key on the console.	The CALL BLOCK LED and the CALL BLOCK key LED go dark.

Note: Call Block only operates if the feature is enabled in the station's Class of Service (Commands 611 - 619, Register 3). The CALL BLOCK key must be programmed in Function Key Programming (Command 972).

CHART 3-9
CALL HOLD (ATTENDANT)

Step	Action	Verification
To Place a Call on Hold:		
1.	Establish an incoming call to the attendant.	The Call Waiting Display shows the number of calls waiting to be answered by the attendant. If the call is a trunk call, the appropriate LED in the Trunk Status Display lights. If the call is a station call, a LED in the Extension Status Display lights. The ANSWER key LED and either the LDN (1, 2 or 3), or the DIAL 0 key LED flash.
2.	Press the flashing LDN (1, 2 or 3), DIAL 0 or ANSWER key.	The LDN (1, 2, or 3), or the DIAL 0 key LED goes dark and the ANSWER key LED lights solid. The trunk or station number is shown on the left of the Call Status Display. The attendant is connected to the calling party.
3.	Press the HOLD (1, 2 or 3) key.	The ANSWER key LED goes dark, the Call Hold Access Code is displayed on the left of the Call Status Display, and then blanks. If the call is a trunk call, the appropriate LED in the Trunk Status Display flashes. If the call is from a station, the LED in the Extension Status Display remains lit. The call is placed on hold. Calls placed on hold receive Music on Hold (if enabled). The held call may be accessed from any station by using the Call Hold Access (REMOTE or LOCAL) Code, or by the attendant by pressing the appropriate HOLD key. If a recall occurs, the associated HOLD key flashes.

CHART 3-9 (CONT'D)
CALL HOLD (ATTENDANT)

Step	Action	Verification
To Retrieve the Held Call Before a Recall:		
4.	Press the HOLD (1, 2 or 3) key.	The HOLD key LED goes dark, the appropriate Trunk Status Display LED (for a trunk call) and ANSWER key LED light solid. The Call Status Display shows the trunk or station number. The attendant is connected to the held party.
To Retrieve the Held Call After Recall:		
5.	Press the flashing HOLD RECALL or ANSWER key.	The HOLD key LED goes dark, the appropriate Trunk Status Display LED (for a trunk call) and ANSWER key LED light solid. The Call Status Display shows the trunk or station number. The attendant is connected to the held party.

CHART 3-10
CONSOLE BELL

Step	Action	Verification
To Turn Off the Console Bell:		
1.	Press the BELL OFF key.	The BELL OFF LED in the System Status Display and the BELL OFF key LED light.
2.	Dial the Attendant Access Code from a station.	The ANSWER and DIAL 0 key LEDs flash, but the console bell does not ring.
To Turn On the Console Bell:		
3.	Press the lit BELL OFF key.	The BELL OFF LED in the System Status Display and the BELL OFF key LED go dark.
4.	Dial the Attendant Access Code from a station (default is 0).	The console bell rings, and the ANSWER and DIAL 0 key LEDs flash.

CHART 3-11
CONSOLE LAMP TEST

Step	Action	Verification
1.	Press the ANSWER and * keys at the same time, and hold.	Depending upon previous conditions, the following occurs: A) All 7-segment LEDs in the CW, Time and Call Status displays light; or B) All LEDs on the keys, the System Status, the Extension Status, Trunk Status and Alarm displays light. By repeatedly pressing the * key, conditions A and B may be viewed.
2.	Press the RELEASE key. OR	The ANSWER key LED goes dark.
3.	Press the STATUS key six and hold. Press the STATUS key once more and hold.	Upon pressing the STATUS key a sixth time and holding it down, the console bell rings. The console busy LEDs and all key LEDs light if the STATUS key is pressed a seventh time and held down. The 7-segment LEDs for the Call Status, CW and Time displays light.

CHART 3-12
EXECUTIVE BUSY OVERRIDE

Step	Action	Verification
From the Console:		
1.	Press a busy DSS key.	Busy tone returned.
2.	Press the OVERRIDE key and hold.	All parties hear a 1 second override tone and are then connected, provided the key remains held down. Every 6 seconds, all parties hear 200 ms of override tone. If the station cannot be overridden, the attendant receives reorder tone. **Note:** The attendant may only access a station with Executive Busy Override Security and Data Line Security features disabled in its Class of Service.
3.	Release the OVERRIDE key.	Busy tone is returned again and the console returns to the same state it was in before the OVERRIDE key was pressed.
From the Station:		
4.	Dial a busy station.	Busy tone returned.
5.	Dial 5.	All parties hear a 1 second override tone and are then connected, provided all parties have Executive Busy Override Security and Data Line Security disabled in their Class of Service. Every 6 seconds, all parties hear 200 ms of override tone.
6.	Go on-hook.	

Notes: 1. Executive Busy Override must be programmed in System Options Programming (Command 601, Register 2).
2. Program one of the programmable console keys (1 through 3) as an EXECUTIVE BUSY OVERRIDE key (Function Key Programming, Command 972).
3. Executive Busy Override must be enabled in Class-of-Service Programming (Commands 611 - 619, Register 4).

CHART 3-13
FLEXIBLE NIGHT SERVICE

Step	Action	Verification
If the System is in Day Service:		
1.	Press the NIGHT SERVICE key and hold down. (To view the assigned trunk numbers sequentially, dial ✳).	The Call Status Display shows the trunk equipment number on the left of the display, and the number (flashing) of the station to which calls are routed during Night Service on the right of the display.
2.	Release the NIGHT SERVICE key. OR	
3.	Dial the Attendant Function Access Code.	**A** is shown on the left of the Call Status Display.
4.	Dial 21, plus the equipment number of the required trunk.	The trunk number is shown on the left of the display. The number (flashing) of the station to which calls are routed during Night Service is shown on the right of the display.
5.	The flashing number may be changed by dialing another station number or the TAFAS Pickup Access Code (default is 57) if calls are routed to TAFAS or 0 if calls are routed to the console.	Incoming calls are now routed to the new station, Console or TAFAS, during Night Service.
6.	Press the RELEASE key.	
If the System is in Night Service:		
7.	Press the NIGHT SERVICE key.	The NIGHT SERVICE key LED goes dark and the system is in Day Service.
8.	Repeat Steps 1 and 2 or 3 through 6.	

Notes: 1. If ALL incoming calls are directed to a specific station, the programmer must individually program all the trunks to that station by the above procedure. If only the calls on Trunk 2 (for example) are to be directed to a specific station, only that trunk needs to be reprogrammed.

2. Flexible Night Service must be enabled for each trunk in Trunk Programming. (Commands 801 → 812, Register 5). (Flexible Night Service is not enabled in Default Data.)

CHART 3-14
INCOMING CALL IDENTIFICATION

Step	Action	Verification
Station Call:		
1.	Establish a station call (Dial 0) to the console.	The DIAL 0 key LED flashes.
2.	Press the DIAL 0 or ANSWER key.	The DIAL 0 key LED goes dark and the ANSWER key LED lights solid. The attendant is now connected to the call and the number of the calling station is shown on the left of the Call Status Display.
3.	Press the RELEASE key.	
Trunk Call:		
4.	Establish an incoming trunk call to the console.	The Trunk Status LED lights, and the LDN key assigned in Trunk Programming flashes.
5.	Press the LDN or ANSWER key.	The LDN key LED goes dark, and the ANSWER key LED lights solid. The attendant is now connected to the call and the number of the calling trunk is shown on the left of the Call Status Display.
6.	Press the RELEASE key.	

CHART 3-15
MESSAGE REGISTRATION/RESTRICTIVE STATION CONTROL

Step	Action	Verification
To Enable Message Registration:		
1.	Dial the Attendant Function Access Code (✳ or 71).	**A** is shown on the left of the Call Status Display.
2.	Dial 22, plus station number.	If **0000** is not shown on the right of the display, go to Step 3. If **0000** is displayed, go to Step 4. (Refer to Notes.)
3.	Dial 0. (Please note that the number of outgoing calls that a station is charged with, cancels when dialing 0).	The station number dialed is shown on the left of the display and **0000** is show on the right of the display.
4.	Press RELEASE. OR	
5.	Press and hold the MSG REG key and dial the station number.	If **0000** is not shown on the right of the display, go to Step 6. If **0000** is displayed, go to Step 7. (Refer to Notes.)
6.	Dial 0.	The station number dialed is shown on the left of the display and **0000** is shown on the right of the display.
7.	Release the MSG REG key.	
To Enable Restrictive Station Control:		
8.	Dial the Attendant Function Access Code (✳ or 71).	**A** is shown on the left of the Call Status Display.
9.	Dial 22, plus station number.	If **9999** is not shown on the right of the display, go to Step 10. If **9999** is displayed, go to Step 11. (Refer to Notes.)
10.	Dial 9. (Refer to Step 3 for Note).	The station number dialed is shown on the left of the display and **9999** is shown on the right of the display.
11.	Press RELEASE.	That station is restricted from making outside calls but not from making internal calls.

CHART 3-15 (CONT'D)
MESSAGE REGISTRATION/RESTRICTIVE STATION CONTROL

Step	Action	Verification
	OR	
12.	Press and hold the MSG REG key and dial the station number.	If **9999** is not shown on the right of the display, go to Step 13. If **9999** is displayed, go to Step 14. (Refer to Notes.)
13.	Dial 9.	The station number dialed is shown on the left of the display and **9999** is shown on the right of the display.
14.	Release the MSG REG key.	The Call Status Display blanks.
To Disable Restrictive Station Control:		
15.	Press and hold the MES REG key and dial the station number.	If **9999** is shown, go to Step 16.
16.	Dial 0.	The display shows the station number and **0000**. The station is no longer restricted from making external calls.
17.	Press RELEASE.	

Notes: 1. If **9998** is displayed, the message register has reached the maximum permitted count and Restrictive Station Control is enabled. If any number other than **9998** or **9999** is displayed, Message Registration is enabled and Restrictive Station Control is disabled. Dialing 0 resets the Message Register, dialing 9 disables Message Registration and enables Restrictive Station Control, or leave Message Registration and Restrictive Station Control as shown by pressing the RELEASE key.

2. Message Registration/Restrictive Station Control must be enabled in Class-of-Service (Commands 611 → 619, Register 2) and Trunk Group Programming (Commands 821 → 826, Register 3).
3. Program one of the programmable console keys (1 through 3) as a MSG REG key (Function Key Programming, Command 972).

CHART 3-16
MESSAGE WAITING

Step	Action	Verification
To Set Message Waiting:		
1.	Press a DSS key.	The DSS key LED lights. Ringback tone is returned. Station number **nnn** is shown on the Call Status Display.
2.	Press the MSG WAIT key.	The MSG WAIT key LED lights. Station number, a dash, and a 1 (i.e., **nnn-1**) are shown on Call Status Display.
3.	Press RELEASE.	The station rings at programmed intervals. Call Status Display blanks.
	OR	
4.	Press the MSG WAIT key and hold.	
5.	Dial station number followed by 1.	Call Status Display shows station number, dash, and 1 **(nnn-1).**
6.	Press RELEASE.	The station rings at programmed intervals.
To Cancel Message Waiting†:		
7.	From a station with Message Waiting applied, call the console.	The DIAL 0 and ANS key LEDs flash, and the DSS key LED lights solid.
8.	Press the DIAL 0 or ANS key to answer the call.	The MSG WAIT key LED flashes.
9.	Press the MSG WAIT key.	The MSG WAIT key LED turns off. Call Status Display blanks.
10.	Press RELEASE.	
	OR	
11.	Press MSG WAIT key and hold.	
12.	Dial station number followed by 0.	Call Status Display shows station number, dash, and 0 **(nnn-0).**
13.	Press RELEASE.	The Message Waiting indication is cancelled.

† Message Waiting can be automatically cancelled by setting Message Waiting Automatic Cancel to 1 (Command 601, Register 6).

CHART 3-16 (CONT'D)
MESSAGE WAITING

Step	Action	Verification
To Display all Stations with Message Waiting:		
14.	Press the MSG WAIT key and hold.	All DSS key LEDs which have Message Waiting applied, light. All station LEDs on the Extensions Status Display which have Message Waiting applied light.

CHART 3-17
PAGING

Step	Action	Verification
1.	Press the PAGE key and hold (or dial the Paging Access Code - default is 50).	The attendant is connected to the paging equipment. The PAGE key LED lights solid.
2.	Make an announcement.	
3.	Release the PAGE key (or press RELEASE).	

Note: Program one of the programmable console keys (1 through 3) as a PAGE key (Function Key Programming, Command 972).

CHART 3-18
REMOTE STATUS DISPLAY AND CABINET LAMP TEST

Step	Action	Verification
1.	Dial the Attendant Function Access Code.	**A** is shown on the left of the Call Status Display.
2.	Dial 16.	All display lamps in the Cabinet Call Status Display (apart from the station Busy Lamp Field) are lit. Since the SX-20 system has a maximum of 72 stations, the last eight lamps in the Busy Lamp Field do not light on the Remote Call Status Display. All other lamps are lit.
3.	Press the RELEASE key.	

CHART 3-19
SET TIME DISPLAY

Step	Action	Verification
1.	Dial the Attendant Function Access Code (✳ or 71).	**A** is shown on the left of the Call Status Display.
To Select the 12-hour Clock Display:		
2.	Dial 14, plus 2-digit hours and 2-digit minutes. **Note:** 12 hours must be added to the AM Time Display to change from AM to PM (i.e., to change 2:30 AM to 2:30 PM, dial 14, plus 14 and 30).	The Call Status Display shows **A14-hhmm**. Once the time is entered, the clock starts automatically.
To Select the 24-hour Clock Display:		
3.	Dial 15 plus 2-digit hours and 2-digit minutes.	The Call Status Display shows **A15-hhmm**. Once the time is entered, the clock starts automatically.

CHART 3-20
SPEECH PATH ACCESS

Step	Action	Verification
1.	Dial Attendant Function Access Code (* or 71).	A is shown on the left of the Call Status Display.
2.	Dial 27, plus Speech Path equipment number (01 →12).	The console is now connected to the chosen Speech Path.
3.	Press RELEASE.	

CHART 3-21
STATION CALLS TO ATTENDANT NIGHT ANSWER POINT

Step	Action	Verification
1.	Set the system for Night Service.	The NIGHT SERVICE LED in the Cabinet Display lights. The NIGHT LED in the System Status Display and the NIGHT SERVICE key LED light.
2.	Establish a DIAL 0 call.	The console or the designated station (defined in Command 601) rings.

CHART 3-22
TONE-TO-PULSE CONVERSION (refer to Note)

Step	Action	Verification
With Tone-to-Pulse Conversion Disabled:		
1.	Using a DTMF set, access a trunk group.	CO dial tone returned.
2.	Dial digits.	Either reorder tone is returned from CO, or dial tone cannot be broken.
3.	Go on-hook.	
4.	Using a Rotary set, access a trunk group.	CO dial tone returned.
5.	Dial digits.	The dialed digits are accepted.
With Tone-to-Pulse Conversion Enabled:		
6.	Using a DTMF set, access a trunk group.	CO dial tone returned.
7.	Dial digits.	The dialed digits are accepted.

Note: This test is dependent on equipment provided in the CO. It is assumed for this test that the CO does not understand DTMF signals.

CHART 3-23
TRUNK ALARM CONTROL

Step	Action	Verification
With Trunk Alarms Enabled:		
1.	Unplug trunk connector from P3.	
2.	Dial the Trunk Group Access Code.	
3.	Wait for the trunk time-out (minimum 30 s).	A trunk alarm is raised. A short burst occurs every 4 seconds.
4.	Dial the Attendant Function Access Code (✳ or 71).	**A** is shown on the left of the Call Status Display.
5.	Dial 32.	The Trunk Alarm is cleared, and the trunk is unbusied.
With Trunk Alarms Disabled:		
6.	Repeat Steps 1 through 3.	No alarm is raised.
7.	Plug trunk connector into P3.	

Note: Trunk Alarm Control is enabled/disabled in Trunk Programming (Commands 801 → 812, Register 1).

CHART 3-24
TRUNK EMERGENCY RELEASE (refer to Note)

Step	Action	Verification
1.	Dial the Attendant Function Access Code (✳ or 71).	**A** is shown on the left of the Call Status Display.
2.	Dial 20, plus the trunk equipment number.	The occupied trunk, assigned to the equipment number shown on the right of the display, is now free and may be accessed.

Note: This procedure disconnects callers on the trunk and should therefore be used with discretion.

4. STATION TEST PROCEDURES

4.01 The following charts explain the tests associated with stations (and the SUPERSET sets). If any tests cannot be verified, check the installation instructions detailed in Section MITL9102-095-200-NA, and/or the Programming Forms completed from Section MITL9102-095 -210-NA.

CHART 4-1
AUTOMATIC CALLBACK - BUSY

Step	Action	Verification
To Set Up an Automatic Callback - Busy:		
1.	Dial the required station number or Trunk Group Access Code.	Busy tone is heard.
2.	Dial the digit 6 within 10 seconds of receipt of busy tone.	Dial tone is returned and the station is available for normal use.
3.	Go on-hook.	
To Answer an Automatic Callback - Busy:		
3.	The station user hears Distinctive Callback Ringing Tone when the called station or trunk becomes free.	
4.	Lift handset.	Ringing tone is heard from the called station or CO dial tone is heard from the trunk.

Notes: 1. Distinctive Callback Ringing must be enabled in System Options Programming (Commands 611 → 619, Register 3).
2. Automatic Callback - Busy must be enabled in the station's Class of Service (Command 601, Register 1).
3. Automatic Callback - Busy may be activated on a trunk only when Trunk Select has been set to 0 (automatic) in Trunk Group Programming (Commands 821 → 826, Register 1).

CHART 4-2
CALL BLOCK

Step	Action	Verification
With Call Block Activated:		
1.	From a station with Call Block enabled in its COS, dial another station WITH THE SAME COS.	Calling station receives reorder tone. If the station dials a station without this feature enabled, the call is not blocked.
2.	Go on-hook at the station.	
3.	From the same station dial a Trunk Group Access Code.	CO dial tone returned.
4.	Go on-hook.	
With Call Block not Activated:		
5.	From a station with Call Block enabled in its COS, dial another station with the same COS.	Called station rings. Calling Station hears ringback tone.
6.	Repeat Steps 2 to 4.	

CHART 4-3
CALL FORWARDING - BUSY

Step	Action	Verification
To Set Up Call Forwarding - Busy:		
1.	Lift the handset at the first station.	Dial tone is returned.
2.	Dial the Call Forward - Busy Access Code (default is 59).	NO tone is heard.
3.	Dial the number that calls are to be forwarded to (station number, Hunt Group, Ring Group or the console).	Dial tone is returned. The station is available for normal use.
4.	Remain off-hook at the first station.	
5.	Establish call to the first station.	The station (to which calls are forwarded) rings.
To Cancel Call Forwarding - Busy:		
6.	Lift the handset of the first station.	Dial tone is returned.
7.	Dial the Call Forward - Busy Access Code.	NO tone is heard.
8.	Replace the handset at the first station.	Call Forwarding is not cancelled until the station goes on-hook after dialing the code.
9.	Go off-hook at the first station.	
10.	Establish call to the first station.	Busy tone is returned to calling station.

Note: Call Forwarding - Busy must be enabled in the station's Class of Service (Commands 611 → 619, Register 4).

CHART 4-4
CALL FORWARDING - DON'T ANSWER

Step	Action	Verification
To Set Up Call Forwarding - Don't Answer:		
1.	Lift the handset at the first station.	Dial tone is returned.
2.	Dial the Call Forward - Don't Answer Access Code (default is 58).	NO tone is heard.
3.	Dial the number that calls are to be forwarded to (station number, Ring Group Access Code, Hunt Group Access Code or Attendant Access code).	Dial tone is returned.
4.	Replace the handset.	The station is available for normal use.
5.	Establish a call to the first station and do not answer.	The first station rings until the time-out period expires. The station to which calls are forwarded, rings.
To Cancel Call Forwarding - Don't Answer:		
6.	Lift the handset.	Dial tone is returned.
7.	Dial the Call Forward - Don't Answer Access Code.	NO tone is heard.
8.	Replace the handset.	Call Forwarding - Don't Answer is cancelled.
9.	Establish a call to the first station.	First station rings.

Note: Call Forwarding - Don't Answer must be enabled in the station's Class of Service (Commands 611 - 619, Register 4).

CHART 4-5
CALL FORWARDING - FOLLOW ME

Step	Action	Verification
To Set Up Call Forwarding - Follow Me:		
1.	Lift the handset at the first station.	Dial tone is returned.
2.	Dial the Call Forward - Follow Me Access Code (default is 56).	NO tone is heard.
3.	Dial the number that calls are forwarded to (station number or the console).	Distinctive dial tone is returned.
4.	Replace the handset.	The station is available for call originations.
5.	Establish a call to the first station.	The station to which calls are forwarded, rings.
To Cancel Call Forwarding - Follow Me:		
6.	Lift the handset.	Distinctive dial tone is returned.
7.	Dial Call Forward - Follow Me Access Code.	NO tone is heard.
8.	Replace the handset.	Call Forwarding is cancelled.
9.	Establish a call to the first station.	First station rings.

Note: Call Forwarding - Follow Me must be enabled in the station's Class of Service (Commands 611 - 619, Register 4).

CHART 4-6
CALL HOLD (STATION)

Step	Action	Verification
To Place an Established Trunk Call on Hold:		
1.	Station flashes switchhook.	The flashing station receives Transfer Dial Tone (if programmed). No tones are heard by trunk on Hold unless Music on Hold is provided.
2.	Station dials the Call Hold Code (default is 51).	Dial tone is returned, and the original call is held. The holding station may make calls, receive calls or access features in the normal manner.
To Retrieve the Held Call Locally (at the holding station):		
3.	Lift handset.	Dial tone is returned.
4.	Dial the Call Hold Retrieve - LOCAL Code (default is 52).	The station is connected to the call which was placed on Hold.
To Retrieve the Held call Remotely (at a remote station):		
5.	Lift handset.	Dial tone is returned.
6.	Dial the Call Hold Retrieve - REMOTE Code (default is 53).	
7.	Dial the station number of the station at which the call was placed on Hold.	The station is connected to the Held call.

Notes: 1. Call Hold must be enabled in the station's Class of Service (Commands 611 - 619, Register 3).
2. If Music on Hold is requested, a Trunk Expander Card is required.

CHART 4-7
CALL HOLD PICKUP

Step	Action	Verification
1.	The station user is notified that call is parked at the console and can be accessed by dialing a code (Call Park Access Code default data is 451, 452 and 453 for keys HOLD 1, HOLD 2 and HOLD 3, respectively).	
2.	The station user dials the code specified.	Upon dialing the code, the station user is connected to the held call.
3.	Go on-hook.	

CHART 4-8
CAMP-ON (ONTO STATIONS ONLY)

Step	Action	Verification
Station-to-station Camp-On:		
1.	Establish a station-to-station call.	
2.	From a third station, dial one of the busy stations.	Busy tone is returned.
3.	Wait and listen to busy tone for 10 seconds.	The calling station hears a faster busy tone and the called station hears one burst indicating a station has been camped on.
4.	Busy stations go on-hook.	The station with Camp-On receives ringing and the calling station hears Ringback Tone.
5.	Station lifts handset.	The two stations are connected.
Trunk-to-station Camp-On:		
6.	Establish a station-to-station call.	
7.	From a third station, answer an incoming trunk call directed through the console, or by dialing the TAFAS Pickup Code.	
8.	Third station flashes switchhook, dials either station in the station-to-station call and then goes on-hook.	Incoming call placed on hold. Two tone bursts are heard by the busy station indicating a trunk call has been camped on.
9.	Busy stations go on-hook.	The station with Camp-On receives ringing and the incoming trunk call hears Ringback Tone.
10.	Station lifts handset.	The station is connected to the incoming trunk call.

Notes: 1. Camp-On must be enabled in System Options Programming (Command 601, Register 1).
2. A station with Data Line Security enabled in its COS does not receive camp-on tone (Commands 611 - 619, Register 3).

CHART 4-9
CONSULTATION HOLD/ADD-ON/TRANSFER

Step	Action	Verification
Consultation Hold:		
1.	Establish a call to a station.	
2.	Either station flashes switchhook.	Flashing station receives Transfer Dial Tone if programmed. Second station in conversation is put on Consultation Hold. (Stations on Consultation Hold do not receive Music on Hold.)
3.	Station which flashed the switchhook, dials third station.	Third station rings.
4.	Third station answers.	Flashing station and third station are connected. Second station remains on Consultation Hold.
Add-On:		
5.	Perform Steps 1 to 4 in Consultation Hold.	
6.	Station which originally flashed the switchhook, flashes switchhook again.	All three stations are connected.
Transfer:		
7.	Perform Steps 1 to 3 in Consultation Hold.	Third station rings.
8.	Flashing station goes on-hook.	Station on Consultation Hold receives ringing tone, and is connected to third station when it is answered.

Note: Switchhook/Ground Button Flash must be set to 1 (Flash for Consultation Hold) in the station's Class of Service (Commands 611 → 619, Register 2).

CHART 4-10
DIAL CALL PICKUP

Step	Action	Verification
1.	Lift the handset of an idle station in the same pickup group as a ringing station.	Dial tone is returned.
2.	Dial the Call Pickup Code (default is 54).	The station is connected to the call.

CHART 4-11
DIRECT-IN LINES

Step	Action	Verification
1.	Set the system into Day Service.	The NIGHT LED in the System Status Display, and the NIGHT SERVICE key LED go dark.
2.	Establish incoming trunk call to a trunk designated as a Direct-In Line.	The designated station rings: 0.4 seconds ON, 0.2 seconds OFF, 0.4 seconds ON, 3 seconds OFF, if Discriminating Ringing enabled. The console does not ring for call on that trunk.
3.	Go on-hook.	

Note: Direct-In Lines must be programmed in Trunk Programming (Commands 801 - 812, Register 4).

CHART 4-12
DIRECT OUTWARD DIALING

Step	Action	Verification
If Trunk is Idle:		
1.	Lift handset.	Dial tone is returned.
2.	Dial Trunk Group Access Code.	CO dial tone is returned.
3.	Dial desired digits.	
If Trunk is Busy:		
4.	Lift handset.	Dial tone is returned.
5.	Dial Trunk Group Access Code.	Busy tone is returned. (Refer to Notes.)
6.	Go on-hook.	

Notes: 1. The station user has the option (before going on-hook) to activate "Automatic Callback - Busy" (Chart 4-1) after busy tone is returned.
2. Trunk Group Access must be enabled in the station's Class of Service (Commands 611 - 619, Register 1).

CHART 4-13
DISCRIMINATING RINGING

Step	Action	Verification
With Discriminating Ringing Enabled:		
1.	At a station, place a call to another station.	The called station has a ringing pattern of 1 second ON, 3 seconds OFF.
2.	Go on-hook at the station.	
3.	At the console dial a station number.	The called station has a ringing pattern: 0.4 seconds ON, 0.2 seconds OFF, 0.4 seconds ON, 3 seconds OFF.
4.	Press the RELEASE key.	
With Discriminating Ringing Disabled:		
5.	Repeat Steps 1 and 2.	
6.	At the console dial a station number.	The called station has a ringing pattern of 1 second ON, 3 seconds OFF.
7.	Press the RELEASE key.	

Note: Discriminating Ringing is set in System Options Programming (Command 601, Register 1).

CHART 4-14
EXTERNAL CALL FORWARDING

Step	Action	Verification
To Set Up External Call Forwarding:		
1.	Lift the handset at the first station.	Dial tone is returned.
2.	Dial the Call Forward - Busy, Don't Answer or Follow Me Access Code.	
3.	Dial the System Speed Call Access Code and speed call entry number.	Dial tone is returned. (Distinctive dial tone is returned with Call Forwarding - Follow Me only). The station is available for normal use.
4.	Replace the handset if either Call Forward - Don't Answer or Follow Me Codes were dialed in Step 2. Remain off-hook if Call Forward - Busy Code was dialed.	
5.	Establish a call to the first station.	The station (to which calls are forwarded) rings. Station rings after time-out period in the case of Call Forwarding - Don't Answer.
To Cancel External Call Forwarding:		
6.	Lift the handset.	Dial tone is returned.
7.	Dial Call Forward - Busy, Don't Answer or Follow Me Access Code.	NO tone is heard.
8.	Replace the handset.	Call Forwarding is cancelled.
9.	Establish a call to the first station.	First station rings.

Notes: 1. System Speed Dial Enable must be set to 1 (enable) in System Options Programming (Command 601, Register 2).
2. Call Forward - Busy, Don't Answer or Follow Me must be set to 2 (Enable, plus Enable to External Speed Call Number) in the station's COS (Commands 611 → 619, Register 4).
3. Proceed To Be Call Forwarded Externally must be enabled in the station's Class of Service (COS) (Commands 611 → 619, Register 4).
4. Access to Speed Dial Numbers must be enabled in the station's COS (Commands 611 → 619, Register 5).
5. All trunks used for External Call Forwarding must have Connect to Outgoing CO Trunk Without Third Party enabled (Trunk Programming, Commands 801 → 812, Register 1).

CHART 4-15
FLASH FOR ATTENDANT

Step	Action	Verification
On an Established Call:		
1.	Flash the switchhook.	The station is ringing the console, and the first party is placed on Consultation Hold.
2.	Attendant answers.	Call Status Display shows the number of the flashing station on the left of the Call Status Display and the number of the held party on the right of the Call Status Display.
3.	Attendant presses RELEASE.	Caller is reconnected to first party.

Note: Flash for Attendant must be enabled in Class-of-Service Programming (Commands 611 → 619, Register 2).

CHART 4-16
FLASH IS RELEASE
(For use with European Ground Button (EGB) line circuits)

Step	Action	Verification
1.	Establish a 2-party call.	
2.	Switchhook flash.	The call is disconnected.

Note: Flash Is Release must be enabled in System Options Programming (Command 601, Register 5). This feature is not normally used in North America.

CHART 4-17
HOUSEPHONE (MANUAL LINE)

Step	Action	Verification
1.	Lift handset at station assigned as Housephone.	The station rings the console.

Note: Housephone must be enabled in Class-of-Service Programming (Commands 611 ~ 619, Register 2).

CHART 4-18
MESSAGE WAITING

Step	Action	Verification
1.	Set Message Waiting on a station from the console (refer to Chart 3-16).	
2.	At the station go off-hook, then on-hook.	Ten seconds later, the station rings three short rings, indicating that there is a message waiting at the console.
3.	If 30 second Housephone has been enabled, go off-hook within 30 seconds after the station rings; if not dial 0.	The station automatically rings the attendant if the 30 second Housephone has been enabled. The station rings the attendant only when 0 has been dialed if the 30 second Housephone has not been enabled.
4.	Go on-hook.	

CHART 4-19
MUSIC ON HOLD

Step	Action	Verification
1.	Establish a trunk call.	
2.	Station flashes switchhook.	The flashing station receives Transfer Dial Tone. No tones heard by call on hold.
3.	Station dials the Call Hold Code.	Dial tone returned to the flashing station. The held call hears music.

Notes: 1. Music on Hold must be enabled in System Options Programming (Command 601, Register 1).
2. A Trunk Expander Card (PN9102-013-000-NA) must be installed.
3. An external music source is required.

CHART 4-20
PAGING ACCESS

Step	Action	Verification
1.	Lift handset.	Dial tone is returned.
2.	Dial Paging Access Code (default is 50).	When Warning Tone is heard, the station is connected to the paging equipment and may make the announcement.
3.	Go on-hook.	

Note: Paging must be enabled in Class-of-Service Programming (Commands 611 → 619, Register 3).

CHART 4-21
RING GROUP

Step	Action	Verification
If All Members of Ring Group are Idle:		
1.	Dial the Ring Group Access Code (default is 497).	All stations in Ring Group ring.
If All Members of Ring Group are Busy:		
2.	Repeat Step 1.	Station assigned to first register (in Command 641) hears camp-on tone.

Notes: 1. Ring Group Access Code is programmed in Feature Access Code Programming (Command 602).
2. Assign required station directory numbers for the Ring Group in Station Ring Group Programming (Command 641).

CHART 4-22
STATION-TO-STATION CALL

Step	Action	Verification
If Called Station is Idle:		
1.	Lift handset.	Dial tone is returned.
2.	Dial any station number. Ringback Tone is heard after completion of dialing.	
3.	Called station answers.	Ringback Tone is removed; 2-way conversation.
4.	Go on-hook at called and calling stations.	
If Called Station is Busy:		
5.	Lift handset.	Dial tone is returned.
6.	Dial a busy station number.	Dial tone is removed after first digit dialed; busy tone is heard after completion of dialing.
7.	Go on-hook at calling station.	

CHART 4-23
STATION HUNTING

Step	Action	Verification
Circular Hunting:		
1.	Dial the Station Hunt Access Code (default is 491 - 496).	The first station in Hunt Group rings.
2.	Go on-hook.	
3.	Repeat Step 1.	The second station in the Hunt Group rings.
4.	Go on-hook.	
5.	Repeat Step 1.	The third station in Hunt Group rings.
6.	Go on-hook.	
Terminal Hunting:		
7.	Dial the Station Hunt Group Access Code.	The first station in Hunt Group rings.
8.	Go on-hook.	
9.	Repeat Step 7.	The first station in the Hunt Group rings. Refer to Note.
10.	Go on-hook.	

Notes: 1. With Terminal Hunting, the second station rings only when the first station is busy.
2. Station Hunting is programmed in Commands 631 - 636.

CHART 4-24
TRANSFER DIAL TONE

Step	Action	Verification
1.	Establish a station-to-station or station-to-trunk call (refer to Note).	The two parties are connected when the called party answers.
2.	One station flashes the switchhook.	Upon flashing the switchhook, the station hears three tone bursts, then dial tone, indicating the switchhook flash has been successful and the other party has been placed on Consultation. Hold.
3.	The station may dial another station or access a trunk.	

Note: If a station-to-trunk call is set up, another trunk cannot be accessed after Transfer Dial Tone has been received, unless the Conferencing Trunk Module (Part Number 9102-011-002-NA) is installed and programmed.

CHART 4-25
THROUGH DIALING

Step	Action	Verification
1.	The station user dials the Attendant Access Code.	
2.	After answering the call, the attendant dials the Trunk Group Access Code and then presses RELEASE. **Note:** If desired the Attendant may dial any required digit once the Trunk Group has been accessed. The attendant must dial all the required digits before pressing the RELEASE key because once the trunk transfer is recognized, it means 'end of dialing'.	The station user hears CO dial tone and may now dial on the trunk or connect to the trunk while the trunk is in the ringing state, to bypass toll control.

CHART 4-26
TRUNK ANSWER FROM ANY STATION (TAFAS)

Step	Action	Verification
Incoming Call to NIGHT BELLS Equipment:		
1.	Lift handset and dial TAFAS Access Code (default is 57).	Night Bells ring. The station is connected to the incoming call.

CHART 4-27
TRUNK-TO-TRUNK PLUS STATION CONFERENCING†

Step	Action	Verification
1.	Establish a trunk call.	
2.	Station flashes switchhook.	Station receives Transfer Dial Tone. Trunk call is placed on Consultation Hold.
3.	Station dials a Trunk Group Access Code.	CO dial tone returned.
4.	Station dials an external number.	External number rings.
5.	External number answers.	Station and second trunk call connected. First trunk call remains on Consultation Hold.
6.	Station flashes switchhook.	The two trunk calls plus the station are connected.

† Trunk-to-trunk plus station conferencing requires Trunk Module Part Number 9102-011-002-NA.
Trunks must be programmed as Conference Trunks in Trunk Programming (Commands 801 → 812, Register 1).

5. SUPERSET 4 TEST PROCEDURES

5.01 The following charts explain the tests associated with the SUPERSET 4 set. The SUPERSET 4 set is used for both the originating and receiving sets. If any test cannot be verified, check the installation instructions detailed in Section MITL9102-095-200-NA and/or the Programming Forms completed from Section MITL9102-095-210-NA, System Programming.

5.02 On the SUPERSET 4 power-up, the Features Display shows the software identity for about 5 seconds and then shows the message "NO COMMUNICATIONS" for approximately 30 seconds. The ringer sounds once and the Features Display flashes the time and date. When the date and time remain solid, the SUPERSET 4 set may commence normal operation.

CHART 5-1
ESTABLISH A CALL

Step	Action	Verification
Standard Operation:		
1.	Lift the handset.	The Features Display shows the **PAGE** and **HANG-UP** prompts (refer to Figure 5-3). The Line Status Display indicates an off-hook condition (refer to Figure 5-2). Dial tone is heard.
2.	Dial the number (station or or Trunk Group Access Code).	The Features Display now shows the **SEND MSG** (for station calls), the **HANG-UP** prompts and the number dialed (the station number or the trunk number). Ringback tone is heard and **TX** or **XXX RINGING** is displayed (where **XXX** is the station number and **X** is the trunk number). When the called station answers, **TRANS/CONF** prompt replaces the **SEND/MSG** prompt and the station number **XXX** remains on the Features Display.
3.	Replace the handset.	The Line Status Display goes blank and the Features Display shows the time, date and the **PROGRAM** prompt. The call is terminated.

CHART 5-1 (CONT'D)
ESTABLISH A CALL

Step	Action	Verification
Handsfree Operation:		
1.	Press the **speaker on/off** button. **Note:** This step can be omitted; that is, begin with Step 2.	The Features Display shows the **MIC ON, HANG-UP** prompts. The Line Status Display indicates an off-hook condition (refer to Figures 5-2 and 5-3). Dial tone is heard (through the speaker).
2.	Dial the number (station or Trunk Group Access Code).	The Features Display shows the **(SEND MSG,** the **MIC ON** and **HANG-UP)** prompts and the number dialed (station or trunk number). Ringback tone is heard (through the speaker) and **TX** or **XXX RINGING** is displayed (where **X** is the trunk number and **XXX** is the station number). When the called station answers, the station number **XXX** remains on the display and the **TRANS/CONF** prompt replaces the **SEND MSG** prompt.
3.	Press the **mic. on/off** button.	The **MIC ON** prompt on the Features Display blanks. The microphone is disabled.
4.	Press the **mic. on/off** button.	The **MIC ON** prompt on the Features Display reappears. The microphone is enabled.
5.	Press the **speaker on/off** button or the feature button directly below the **HANG-UP** prompt.	The Line Status Display blanks and the time, date and **PROGRAM** prompt appear on the Features Display. The call is terminated.

CHART 5-2
ANSWER AN INCOMING CALL

Step	Action	Verification
Standard Operation:		
1.	Establish an incoming call to the SUPERSET 4 set.	The Line Status Display indicates an incoming call (refer to Figure 5-2). The Features Display shows the time, date and the **PROGRAM** prompt. The ringer sounds on the SUPERSET 4 set.
2.	Lift the handset.	The Line Status Display indicates an off-hook condition. The calling station number (or trunk), the **TRANS/CONF** and **HANG-UP** prompts appear on the Features Display. The incoming call connects to the station.
3.	Replace the handset.	The Line Status Display blanks and the time, date and the **PROGRAM** prompt appear on the Features Display. The call is terminated.
Handsfree Operation:		
1.	Establish an incoming call to the SUPERSET 4 set.	The Line Status Display indicates an incoming call (refer to Figure 5-2). The time, date and the **PROGRAM** prompt appear on the Features Display. The ringer sounds on the SUPERSET 4 set.
2.	Press the **speaker on/off** button or the Line Select button opposite the incoming call indication on the Line Status Display (refer to Figure 5-2).	The Line Status Display indicates an off-hook condition. The number of the calling station (or trunk), the **TRANS/CONF, MIC ON** and **HANG-UP** prompts appear on the Features Display. The incoming call is connected to the SUPERSET 4 set.
3.	Press the **speaker on/off** button or the feature button directly below the **HANG-UP** prompt.	The Line Status display blanks and the time, date and **PROGRAM** prompt appear on the Features Display. The call is terminated.

CHART 5-3
HOLD/TRANSFER/CONFERENCE CALL

Step	Action	Verification
1.	Establish a call (refer to Chart 5-1).	
2.	Press the feature button directly below the **TRANS/CONF** prompt (refer to Figure 5-3).	Transfer dial tone is heard and the called station is held (as indicated by the flashing box beside the station number on the Features Display.
3.	Press the feature button directly below the **CANCEL** prompt. OR	The called station is now connected to the originator.
4.	Establish a call to another station.	The number of both called stations are displayed on the Features Display. The first called station is on hold (on the right of the display with a flashing box) and the second called station is connected to the originator (shown on the left of the display). The Features Display also shows the **SWAP**, **CONF**, **CANCEL** and **RELEASE** prompts.
5.	Press the feature button directly below the **RELEASE** prompt. OR	The originator is disconnected and the two called stations are connected.
6.	Press the feature button directly below the **CONF** prompt.	A Conference Call is established; all three station are connected. The Features Display shows one called station, a plus sign and the other called station. Subsequently, the prompts **SPLIT** and **HANG-UP** also appear.

CHART 5-4
SPLITTING A CONFERENCE CALL

Step	Action	Verification
1.	Establish a Conference Call (refer to Chart 5-3).	
2.	Press the feature button directly below the **SPLIT** prompt.	The Conference Call terminates; the originator is connected to one called station (the station number is displayed on the left on the Features Display). The other called station is held (the station number is displayed on the right with a flashing box).

CHART 5-5
SWAPPING CALLS

Step	Action	Verification
1.	Split a Conference Call (refer to Chart 5-4).	
2.	Press the feature button directly below the **SWAP** prompt.	The held station interchanges with the station connected to the originator.

CHART 5-6
SENDING A MESSAGE

Step	Action	Verification
1.	Establish a call to an unanswered/busy SUPERSET 4 set.	
2.	Press the feature button directly below the **SEND MSG** prompt.	The Features Display blanks (except for the **HANG-UP** prompt) and dial tone is heard.
3.	Terminate the call (refer to Chart 5-1).	

CHART 5-7
RECEIVING A MESSAGE

Step	Action	Verification
1.	A message is pending on the SUPERSET 4 set.	The Features Display shows the time, date the **PROGRAM** prompt and two **MSG** prompts (one flashing in the upper right corner).
2.	Press the feature button directly below the solid **MSG** prompt.	The time the message was sent and a message appears on the Features Display. The prompts **EXIT**, **CALL** and **CANCEL** also appear.
3.	Press the feature button directly below the **EXIT** prompt. OR	The message is replaced by the real time and date and the following prompts: **PROGRAM**, **MSG** and a flashing **MSG**.
4.	Press the feature button directly below the **CALL** prompt. OR	The SUPERSET 4 set automatically outpulses the number of the station that sent the message.
5.	Press the feature button directly below the **CANCEL** prompt.	The Features Display blanks except for the **EXIT** prompt and the message is cancelled.
6.	Then press the feature button directly below the **EXIT** prompt.	The SUPERSET 4 set returns to normal call processing; the Features Display shows the time, date and the **PROGRAM** prompt.

CHART 5-8
AUTOMATIC CALLBACK - BUSY

Step	Action	Verification
1.	Establish a call to a busy SUPERSET 4 set.	Special busy tone is heard and the following prompts appear on the Features Display: **CAMP ON, CALL BACK, SEND MSG** and **HANG-UP.**
2.	Press the feature button directly below the **CALL BACK** prompt.	Dial tone is heard and the Features Display shows the **HANG-UP** prompt.
3.	Terminate the call, refer to Chart 5-1.	
4.	Go on-hook at the busy SUPERSET 4 set.	The Line Status Display indicates an incoming call (refer to Figure 5-2) and the ringer sounds. The Features Display shows the prompt **CALL BACK.**
5.	Go off-hook.	The call is automatically made to the SUPERSET 4 set that was busy.

CHART 5-9
CAMP-ON

Step	Action	Verification
1.	Establish a call to a busy SUPERSET 4 set.	Special busy tone is heard and the following prompts appear on the Features Display: **CAMP ON, CALL BACK, SEND MSG** and **HANG-UP.**
2.	Press the feature button directly below the **CAMP ON** prompt. **Note:** If the feature button is not pressed before the time-out period, camp-on occurs automatically, (refer to Command 601 in Section MITL9102-095-210-NA).	Normal busy tone is heard and the Features Display shows the called station's number **(XXX BUSY)** and the **HANG-UP** prompt. The Features Display of the receiving set shows **XXX CAMPED ON** (where **XXX** is the number of the calling station) and **SWAP, CAMP ON** and **HANG-UP** also appear.
3.	Accept the camp-on call by pressing the feature button directly below the **SWAP** and **CAMP ON** prompts.	The Features Display of both SUPERSET sets shows the connected station number (on the left of the display) and the held call (on the rights of the display with a flashing box).

CHART 5-10
SELECTING FEATURES

Step	Action	Verification
1.	Press the **select feature** button.	The Features Display shows the **DIAL FEATURE NO.** message and the features (refer to Figure 5-3). To program the SUPERSET 4 set, refer to USER GUIDE, Part Number 9180-953-100-NA.

CHART 5-11
DISPLAYING FEATURES

Step	Action	Verification
1.	Press the **display** button.	The Features Display shows **DISPLAY....** and any features that were programmed in with the feature button directly below the **PROGRAM** prompt. To program the SUPERSET 4 set, refer to USER GUIDE, Part Number 9180-953-100-NA.

CHART 5-12
TESTING THE LINE SELECT/SPEED CALL BUTTONS AND THE HOLD BUTTON

Step	Action	Verification
1.	Program a **Line Select/Speed Call** button with a Speed Call number (refer to USER GUIDE, Part Number 9180-095-103-NA).	
2.	Press a **Line Select/Speed Call** button and dial a station number.	The Line Status Display indicates a busy line for the button pressed. The SUPERSET 4 set rings that station.
3.	Press the **Hold** button.	The Line Status Display indicates that the connected station is on hold (refer to Figure 5-2). The Features Display shows the following message: **SELECT LINE.**
4.	Press the appropriate **Line Select/Speed Call** button. (Only those lines programmed as non-Prime Line are valid. Refer to Section MITL9102-095-210-NA, Commands 701 - 716.)	The SUPERSET 4 set outpulses that number programmed for that **Speed Call** button.

CHART 5-13
SET DATE

Step	Action	Verification
1.	Dial the Attendant Function Access Code.	**A** is shown on the left of the Features Display.
2.	Dial 80 plus two digits for the day, two digits for the month, and two digits for the year.	The date entered is displayed on the SUPERSET 4 set.

Note: The date is set at the console, but is displayed on the SUPERSET 4 set.

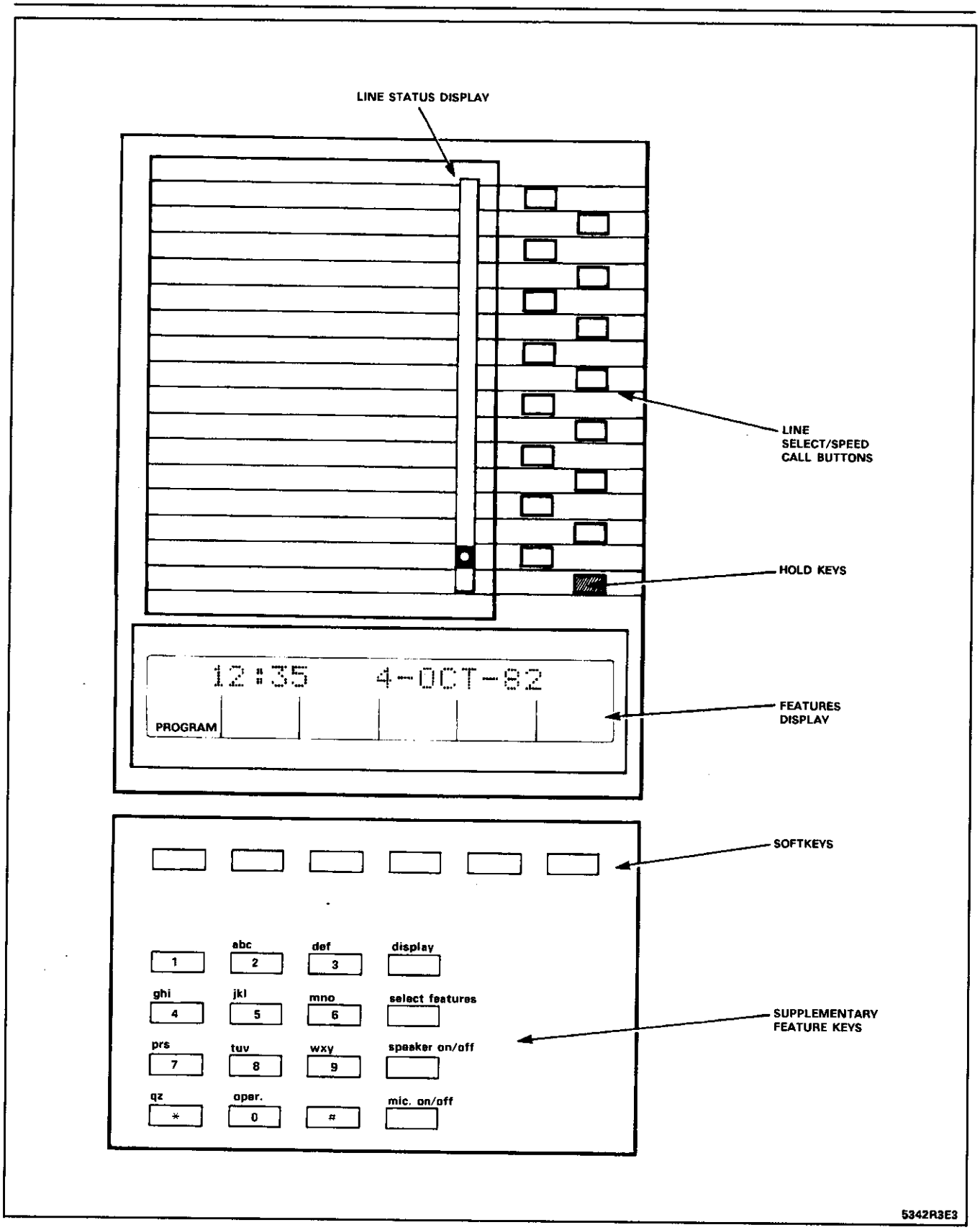

Figure 5-1 SUPERSET 4 Feature Buttons

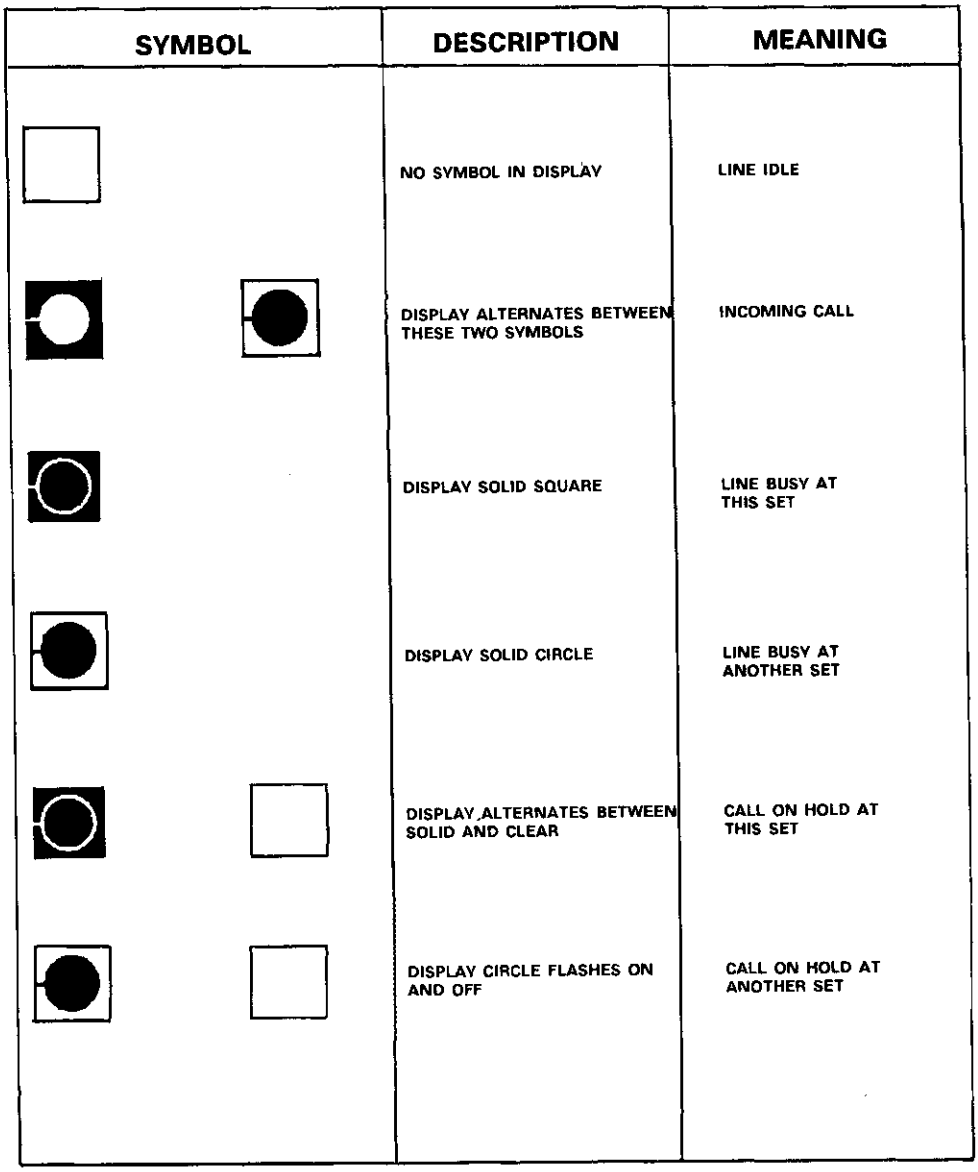

Figure 5-2 Line Status Display Symbols

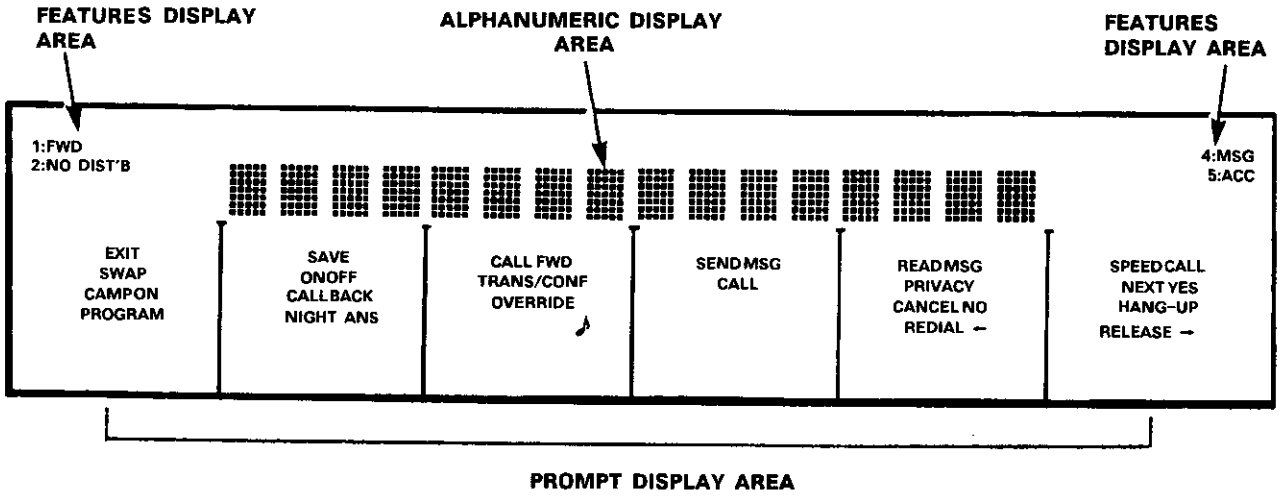

Figure 5-3 SUPERSET 4 Features Display Layout

6. SUPERSET 3 TEST PROCEDURES

6.01 The following charts explain the tests associated with the SUPERSET 3 set. The SUPERSET 3 set is used for both the originating and receiving sets. If any test cannot be verified, check the installation instructions detailed in Section MITL9102-095-200-NA and/or the Programming Forms completed from Section MITL9102-095-210-NA, System Programming.

6.02 On the SUPERSET 3 power-up, all three line indicator LEDs light momentarily. The Prime Line indicator LED flashes for approximately 1 minute. At this time, the SUPERSET 3 set is ready for normal operation.

CHART 6-1
ESTABLISH A CALL

Step	Action	Verification
Standard Operation:		
1.	Lift handset.	The **Prime Line Indicator** lights (refer to Figure 6-1). If no digits are dialed within the time-out period, the **Prime Line Indicator** goes dark.
2.	Dial the number (station or Trunk Group Access Code).	Ringback tone is heard. When the called station answers, the call is established. If the Trunk Group Access Code was dialed, CO dial tone is returned.
3.	Replace handset.	The **Prime Line Indicator** goes dark; the call is terminated.

CHART 6-1 (CONT'D)
ESTABLISH A CALL

Step	Action	Verification
Handsfree Operation:		
1.	Press the **speaker on/off** button. **Note:** This step can be omitted; that is, begin with Step 2.	The **Prime Line Indicator** lights and dial tone is heard. If no digits are dialed, then reorder tone is heard and the **Prime Line Indicator** goes dark (the line is dropped).
2.	Dial the number (station or Trunk Group Access Code).	Ringback tone is heard. When the called station answers, the call is established. If the Trunk Group Access Code was dialed, CO dial tone is returned.
3.	Set the **microphone** switch to **off.**	The microphone is disabled.
4.	Set the **microphone** switch to **on.**	The microphone is enabled.
5.	Press the **speaker on/off** button or the **cancel** button.	The **Prime Line Indicator** goes dark; the call is terminated.

CHART 6-2
ANSWER AN INCOMING CALL

Step	Action	Verification
Standard Operation:		
1.	Establish an incoming call to the SUPERSET 3 set.	The ringer sounds and the **Prime Line Indicator** flashes (refer to Figure 6-1).
2.	Lift the handset.	The **Prime Line Indicator** lights solid; the call is established.
3.	Replace the handset.	The **Prime Line Indicator** goes dark; the call is terminated.
Handsfree Operation:		
1.	Establish an incoming call to the SUPERSET 3 set.	The ringer and the **Prime Line Indicator** flashes.
2.	Press the **speaker on/off** button.	The **Prime Line Indicator** lights solid; the call is established.
3.	Press the **speaker on/off** button or the **cancel** button.	The **Prime Line Indicator** goes dark; the call is terminated.

CHART 6-3
PLACING A CALL ON HOLD

Step	Action	Verification
1.	Establish an incoming call to the SUPERSET 3 set (refer to Chart 6-1).	
2.	Press the **hold** button.	The **Prime Line Indicator** flashes; the call is held by the SUPERSET 3 set.
3.	Press the **Line Select** button below flashing **Line Indicator.**	The **Prime Line Indicator** lights solid; the call is returned to the SUPERSET 3 set.

CHART 6-4
ESTABLISHING A BROKER'S CALL

Step	Action	Verification
1.	Establish a call (refer to Chart 6-1).	
2.	Press the **trans/conf** button.	Transfer dial tone is returned and the original call is placed on hold.
3.	Establish a call to another party.	When this station answers it is connected to the SUPERSET 3 set. The original call is still on hold.
4.	Press the **SWAP** button.	The original call is now connected to the SUPERSET 3 set and the second call is on hold.
5.	Press the **cancel** button.	The held call is connected to the SUPERSET 3 set and the other call is terminated.

CHART 6-5
REDIAL

Step	Action	Verification
1.	Dial manually, an external outgoing call from the SUPERSET 3 set.	
2.	Terminate the call.	
3.	Press the **redial** button.	The last external call made on the SUPERSET 3 set is automatically outpulsed.

CHART 6-6
SETTING UP A CONFERENCE CALL

Step	Action	Verification
1.	Establish a call from the SUPERSET 3 set (refer to Chart 6-1).	
2.	Press the **trans/conf** button.	Transfer dial tone is returned and the called station is held.
3.	Establish a second call from the SUPERSET 3 set (refer to Chart 6-1).	
4.	Press the **trans/conf** button.	All three stations are connected.
5.	Press the **cancel** button.	The two called stations are connected and the SUPERSET 3 set is disconnected.

Note: Disconnect Supervision Guaranteed must be enabled in Trunk Programming (Commands 801 - 812, Register 2).

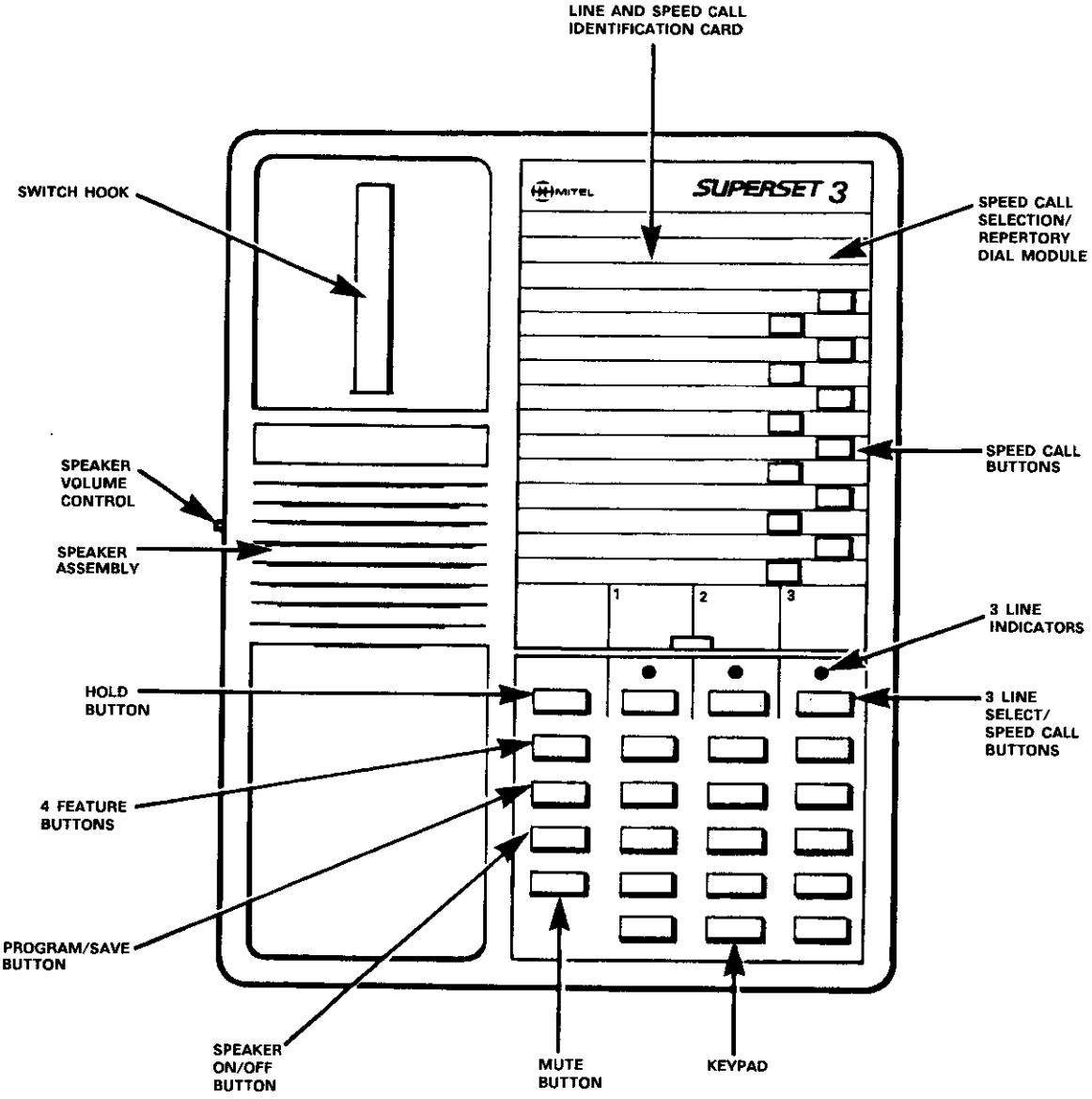

Figure 6-1 SUPERSET 3 Features

SX-20®

SYSTEM SPEED CALL

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. SYSTEM DESCRIPTION 1

3. FEATURE PROGRAMMING 2
System Programming 2
Definition of Speed Call Numbers 4
Verifying Entries 4

4. SPECIAL PROGRAMMING CHARACTERS 6

LIST OF ILLUSTRATIONS

FIGURE TITLE PAGE

2-1 System Speed Call Table Access 3

LIST OF TABLES

TABLE TITLE PAGE

3-1 System Programming 5

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1. GENERAL

1.01 System Speed Call is a feature which allows a station user to access System Speed Call table(s). Each Speed Call number can be accessed from a station by keying only four digits: two to access the Speed Call feature, and two to select the desired table entry. The system will then outpulse all the digits stored in that entry to establish the call. Any station equipped with a SUPERSET 3™ set or a SUPERSET 4™ set can access System Speed Call numbers and also its own personal speed call numbers as well.

Reason for Issue

1.02 This Section has been issued to describe how System Speed Call is programmed and operated with Generic 503 software.

1.03 Additional documents which should be used in conjunction with this Section are as follows:

- Section MITL9102-095-100-NA, General Description. This Section gives an overview of the PABX.
- Section MITL9102-095-210-NA, System Programming. This Section details all programming required to operate System Speed Call.

2. SYSTEM DESCRIPTION

2.01 System Speed Call is comprised of six Speed Call Tables with each table containing up to 10 System Speed Call entry numbers. These numbers are defined (entered) from the Attendant Console, Test Line or RMATS as System Speed Call Numbers. A Speed Call number can be either an internal (any station directory number within the PABX), or external number (consisting of the outgoing Trunk Group Access Code, followed by the appropriate digits required to reach the 'outside' number). The Speed Call feature is activated by the station first dialing the System Speed Call Access Code, followed by the Entry number for the desired destination. The system then retrieves the full number from the appropriate table, and completes the call automatically.

2.02 **System Speed Call Tables.** The Speed Call tables used for storing all Speed Call numbers have the following characteristics:

- Each of the six tables has a maximum capacity of 10 Speed Call numbers, with each number containing a maximum of 26 digits.
- It is programmed for common use, whereby the attendant and/or stations with the appropriate Class of Service may make use of the tables.

2.03 Access to Tables. Any station with a Class of Service which has one or more blocks of Entry Numbers (tables) enabled (refer to Figure 2-1), may access all the individual System Speed Call numbers contained in that table(s). The actual Speed Call numbers are previously programmed by the attendant at the console, Test Line or RMATS.

2.04 Accessing Speed Call Numbers. Every Speed Call number is identified by an individual Entry Number(s); for example, numbers 10 → 19 would identify programmed System Speed Call numbers in Table 1, numbers 20 → 29, Table 2, etc. If a table has less than the maximum of 10 Speed Call numbers, the unused access codes are ineffective. If a station user attempts accessing those numbers, reorder tone is returned, indicating an invalid Entry Number has been dialed.

3. FEATURE PROGRAMMING

3.01 Usually, the Speed Call programming is undertaken at the same time as the basic programming for the PABX; however, it is assumed here that the basic programming has already been completed, and that the Speed Call feature is being added to an operating system.

System Programming

3.02 Feature Enabling. The Speed Call feature must be enabled on a systemwide basis by selecting, then enabling System Speed Call in Command 601, Register 2. The System Speed Call Access Code must then be reprogrammed unless the PABX default code, which is 55, in Command 602, Register 7, is used. To enable the feature for specific stations, the station is assigned a Class of Service, which allows access to some or all of the Speed Call tables. Classes of Service 1 through 9 are allowed access to Speed Call tables by enabling of appropriate bits of Register 5, Commands 611 → 619, respectively. A brief summary of programming steps is given in Table 3-1. Refer to Section MITL9102-095-210-NA for detailed programming instructions.

3.03 Basic Default Condition. The default condition for the Speed Call feature (Command 601 not reprogrammed), leaves the feature enabled. With no restriction entered for Commands 611 → 619, unrestricted access is granted to all Speed Call tables.

3.04 Feature Conditions. Other conditions which apply to System Speed Call are listed as follows:

- The PABX must be fitted with the correct software package.
- The Speed Call Access Code should not conflict with other feature access codes, nor with the station numbering scheme.
- Speed Call numbers are always Toll-Allowed when accessed by any station (with a Class of Service having table access), re-

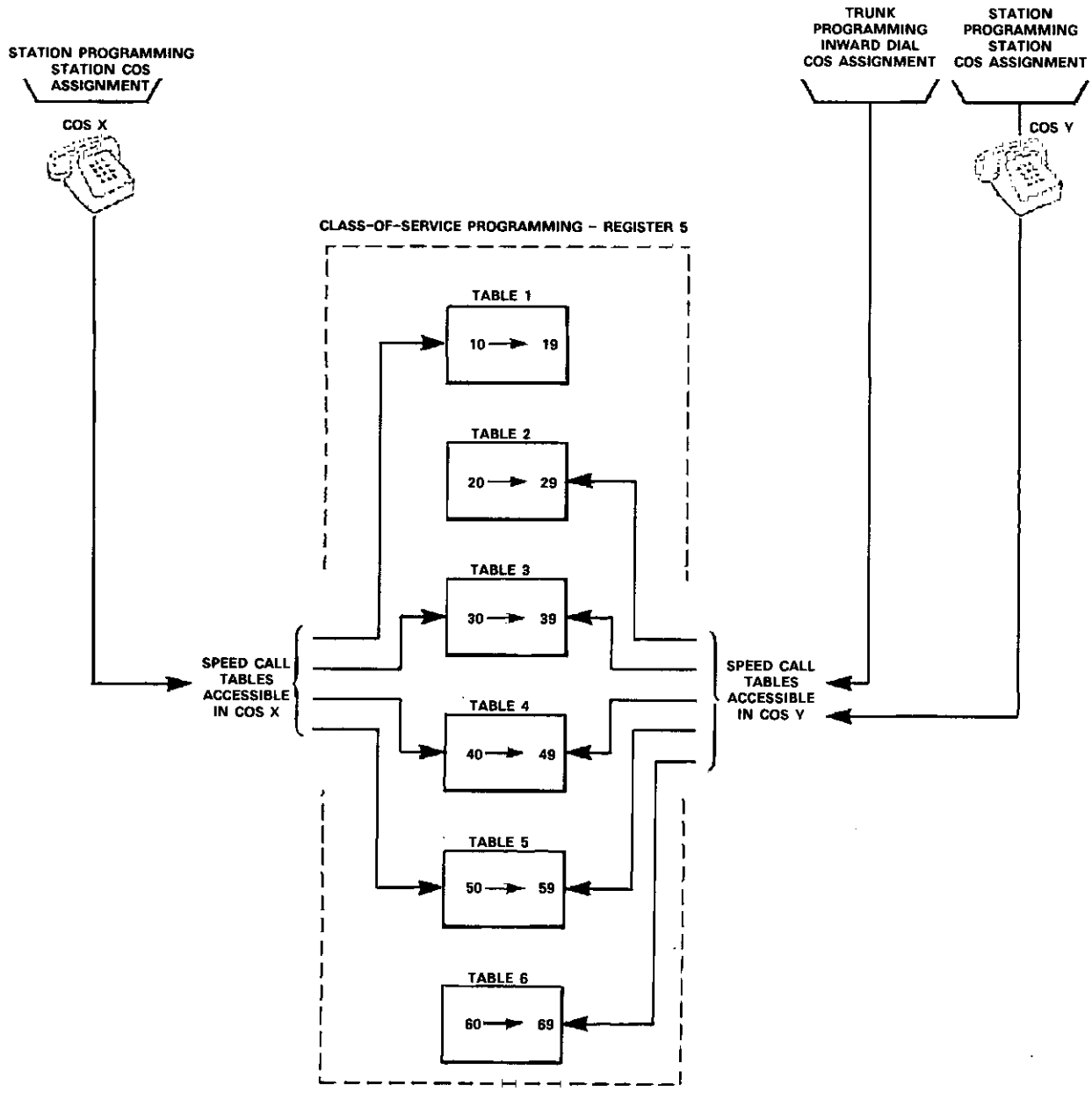

Figure 2-1 System Speed Call Table Access

gardless of conditions previously defined in Station Programming.

- Speed Call Number duplications are allowed from table to table.

Definition of Speed Call Numbers

3.05 System Speed Call numbers are defined by the customer and entered into the tables by the attendant via the console (if provided), Test Line or RMATS. If the system is not equipped with an Attendant Console and verification of the dialing codes is required, a Remote Display Unit must be connected to the PABX. In order to define the Speed Call numbers, the following steps must be followed:

- Dial the Attendant Function Access Code (✳ or 71).
- Dial the 2-digit (nonprogrammable) Speed Call Entry Programming Code (65). This code permits access to the Speed Call numbers for the purposes of entering, deleting or changing information.
- Dial the Speed Call Entry Number. This is a nonprogrammable 2-digit code which identifies the actual position of the routing digits in the Speed Call tables.
- Enter the full Speed Call number. This is comprised of either a station number, or a Trunk Group Access Code followed by the routing digits to reach the required end party. In order to accommodate special conditions, it may be necessary to include special characters in the Speed Call number. These special characters and their functions are described in Part 4.
- Exit from the Attendant Function Speed Call entry mode. If an Attendant Console is used, press the RELEASE key to exit. If the Test Line or RMATS is used, exit is automatic upon replacement of the handset. This will enter the Speed Call digits into the assigned Speed Call table location.

3.06 If the System Speed Call Access Code has been dialed, and it is subsequently determined that changes are not required, or input errors have been made, an exit can be made from the Speed Call entry mode without affecting the contents of the Speed Call tables. From a console, operation of the CANCEL key causes exit by deleting the contents of that particular entry, thereby leaving it blank, but does not affect the rest of the table. The same result is obtained by dialing ✳0 from a Test Line or from RMATS.

Verifying Entries

3.07 Speed Call entries may be verified via RMATS, from an Attendant Console or, from the Test Line if a Remote Display Unit is used. To verify a Speed Call entry, the Attendant Function Access Code (✳ or 71) then the Speed Call Entry Viewing Code (60) (which is nonprogrammable) is dialed, followed by the 2-digit Entry Number to

TABLE 3-1
SYSTEM PROGRAMMING (refer to Note)

Step	Action	Verification
1.	Complete the Programming Forms which correspond to Speed Call from Part Number 9180-095-205-NA.	
2.	Enter the Programming Mode by using the System Security Code method from the Attendant Console. (Refer to Section MITL9102-095-210-NA, System Programming).	The following is displayed ?|6|0|1|||||
3.	If necessary, modify the contents of Command 601, Register 2 to enable the Speed Call feature on a systemwide basis. Dial 601, then *2 to select Register 2.	If Register 2 is selected the following is displayed 2|1|0|1|1|1|0|| (The control element for the Speed Call feature is located in bit 'D' of Register 2.)
4.	Press * to enter the data.	The next register is shown.
5.	Dial '0' to get out of Command 601, dial 602, then *07 to access the register for the Speed Call Access Code. If necessary, modify the contents of Command 602, Register 7 for the access code.	The following is displayed 0|7|5|5|||||
6.	Press * to enter the data.	The next register is shown.
7.	Dial '00' to get out of Command 602, dial 611, then *5 to access Register 5 of the first Class of Service. Modify the register content if necessary.	The following is displayed 5|1|1|1|1|1|1|1
8.	Press * to enter the data.	The display shows Command 611.
9.	If the next Class of Service is to be modified, dial # to access Command 612, then *5 to access Register 5 and enter the desired information.	
10.	Repeat Steps 8 and 9 until all of the required Class of Service commands have been updated.	
11.	Press RELEASE when all the necessary changes have been made to system programming.	

Note: Step-by-step programming instructions are detailed in Section MITL9102-095-210-NA, System Programming. The registers illustrated in the verification column of this table show the default data for the command's register.

be verified. The Speed Call Entry Number is displayed, along with the first five digits of the stored number. If no number has been previously programmed, the five digit-display locations remain blank. There are two methods of viewing numbers after the first five are shown: Scrolling, and Block display.

3.08 Scrolling Method. To view further digits by the scrolling method, press the '*' key. Each time the '*' key is depressed the display scrolls left, one digit at a time, until the last digits of the stored number have scrolled off the display, and the digit-display locations are blank. When the '#' key is depressed, the next entry in the Speed Call table is viewed. Repeated operations of the # key permits sequential 'stepping' through each Speed Call table.

3.09 Block Method. To view the Speed Call entry in blocks of five digits rather than one digit at a time, enter any digit other than '*' or '#'. The first five digits of the Speed Call number are replaced by the next block of five digits, or by the remaining digits if the stored number is less than 10 digits in length. If, after all digit blocks have been displayed, a digit key is again depressed, the display scrolls back to the first five digits of the stored number. The '#' key permits sequential viewing of Speed Call entries.

4. SPECIAL PROGRAMMING CHARACTERS

4.01 Certain characters are entered into the Speed Call tables ahead of, between, or after the routing digits if it is necessary to provide instructions or indications to the PABX or Central Office. These characters are preceded by a '*', but the '*' and digit combined, occupy only one digit space in the Speed Call table. The following characters are used in the SX-20 System Speed Call feature:

- *1 - Each appearance of the *1 character causes a 5 second delay in the outpulsing sequence at the point of insertion. It is used, for example, to allow time for distant offices to complete internal switching operations.

- *2 - The appearance of the *2 character pauses the outpulsing of digits until another dial tone is detected. Since the wait for second dial tone is 'infinite' (i.e., there is no time-out), the receivers are 'polled', or seized at intervals and applied to the line to check if dial tone is on the outgoing trunk. This avoids unnecessary holding of a dial tone detector.

- *3(N) - Appearance of the *3(N) character suspends the outpulsing of digits from the Speed Call entry table, then allows a sequence of manually predialed digits to be inserted, after which outpulsing is resumed. A maximum of nine digits may be manually dialed in by the station user immediately after the Speed Call Access Code and Entry Number have been entered. Therefore, if the Speed Call number being entered in a table is to have the *3(N) character, the next number entry indicates the maximum number of digits allowed to be manually inserted by the station user. Thus, a total of two digit locations are

required to signal manual entry (*3), and the quantity of manual digits to be entered (N). If less than the preprogrammed maximum of manually inserted digits (N) are entered, the pound sign (#) must be pressed to indicate a shortened digit string. If "#" is not pressed, the system waits for another digit, then, after the 10 second interdigit time-out period, it returns reorder tone to the station user.

- "#" - This special character is used under certain conditions as a signal to indicate a change in signaling from DP to DTMF. The character is only effective in this function if the outpulsing mode is DP, and, under these conditions the character is only used as a mode change indicator and has no function as a routing digit. If the mode of outpulsing is DTMF, the character is transmitted as a digit.

SX-20®

REMOTE MAINTENANCE, ADMINISTRATION AND TEST SYSTEM (RMATS)

CONTENTS PAGE

1. INTRODUCTION 1
Reason for Issue 1
RMAT System 1

2. OPERATIONAL REQUIREMENTS 2
A. General Description 2
B. Hardware Requirements 4
RMATS Module 4
C. Software Requirements 4

3. PROGRAMMING 4
RMATS Commands 5

4. SYSTEM OPERATION 8
Methods of Accessing RMATS 9

5. INSTALLATION/OPERATIONAL PROBLEMS 18

LIST OF ILLUSTRATIONS

FIGURE TITLE PAGE

1-1 Block Diagram - RMAT System 3
3-1 Programming Levels 6

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LIST OF TABLES

TABLE	TITLE	PAGE
3-1	RMATS Programming Commands	7
3-2	RMATS Attendant Function Commands	8
4-1(a)	Attendant and Maintenance Functions Abbreviations	9
4-1(b)	Code Abbreviations	10
4-2	Programming Command Numbers	11
4-3	RMATS Access - via Attendant	12
4-4	RMATS Access - via Direct-In Line	13
4-5	RMATS Access - via DISA Trunk	13
4-6	RMATS Access - via a Station	14
4-7	Sample Programming Session - Programming Functions	15
4-8	Sample Programming Session - Attendant (and Maintenance) Functions	17
5-1	Installation Problems	18

1. INTRODUCTION

1.01 This Section describes the operational procedures for the Remote Maintenance and Test System (RMATS) for the SX-20 System. Section MITL9102-095-210-NA, System Programming and Part Number 9180-095-205-NA, Programming Forms, should also be referred to when reading this Section, and when using RMATS.

Reason for Issue

1.02 This Section has been issued to describe the RMAT System used by the SX-20 PABX.

1.03 Related sections which should be read and understood before attempting to use RMATS are as follows:

- Section MITL9102-095-105-NA, Features Description
- Section MITL9102-095-210-NA, System Programming.

RMAT System

1.04 The RMAT system was designed to be used by personnel at a video terminal, a printer for hard copy usage or at Maintenance Center to remotely access an SX-20 PABX system installed at a customer's premises, in order to obtain data information relating to maintenance aspects, or cause programming changes to be made to the PABX. The system provides a means of rapidly identifying potential PABX problem areas and allows programming changes to be done without the necessity of visiting the user's premises. The cost and the fact that RMATS will save a majority of field service calls, makes this feature both attractive and cost effective.

1.05 Figure 1-1 shows a block diagram of the typical arrangement of a RMAT system. The RMATS controller may access any PABX which has been fitted with the RMATS software and hardware, by dialing the required PABX directory number, and performing one of the four system accessing methods detailed in Part 4. The controller may then access the required information. Once the PABX has been accessed, the RMAT system can perform most of the functions normally active at the Attendant Console.

1.06 The main components used by RMATS are:

(a) CPU which acts on commands received from the RMATS controller via the modem and line circuit components and processes these commands.

(b) MEMORY PROM/RAM which contains programmed memory and scratch pad memory for storage and execution of commands.

(c) MODEM which provides the necessary tone transmitter, receiver and handshaking signaling.

(d) TRUNK to provide the interface to the Central Office.

2. OPERATIONAL REQUIREMENTS

A. General Description

2.01 RMATS provides a customer with the ability to perform maintenance and attendant functions plus input and program the system data from a remote location. The console and remote display will not be affected, thus the local operator will not be aware the PABX is being used by RMATS unless the operator tries to access the feature/function RMATS is using; i.e., the attendant functions or programming command. RMATS also has data line security, therefore, when accessing RMATS, the customer will not be interrupted. The call cannot be overridden and if camped on, no camp-on tone will be heard.

2.02 RMATS can be accessed like any station, for example, via station, Console, DISA Trunk, trunk - through operator, Direct-In Line trunk, and Flexible Night Service. All that is required is a terminal or a printer, a modem with an acoustic coupler or with direct connect capability, and a telephone having access to a Central Office trunk.

2.03 Depending on the setup of the PABX, RMATS can usually be accessed from the station or the console by dialing the RMATS Access Code (default is 498). Alternatively, RMATS can be accessed from a remote phone by dialing the PABX directory number, and performing one of the four system accessing methods detailed in Part 4. Once 498 has been dialed, a carrier signal will then be heard, and the user has 30 seconds to connect the telephone to the modem and enter <cr>(carriage return). The user will then be prompted to enter the System Security Code. Failing to enter the correct code within four tries will result in the user being automatically logged off.

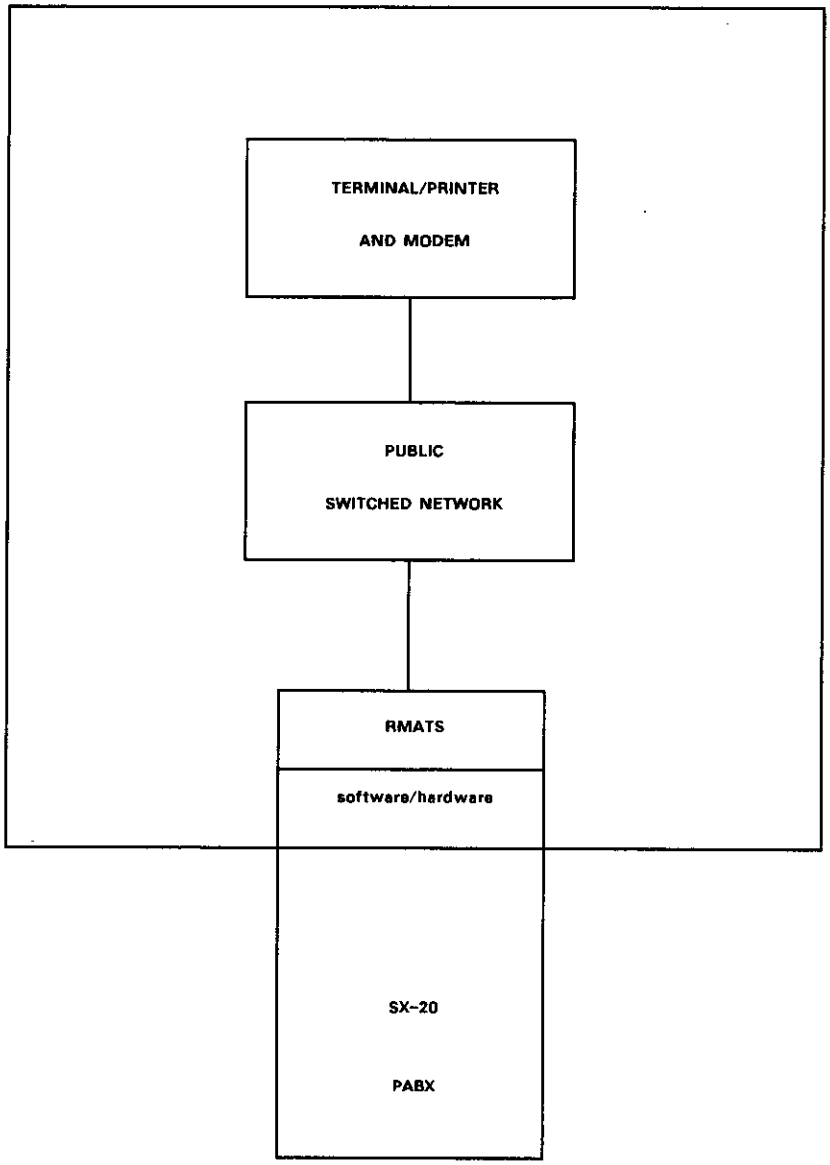

Figure 1-1 Block Diagram - RMAT System

B. Hardware Requirements

2.04 To access the RMAT system the following hardware is required:

(a) A terminal or a printer with the following conditions set:

- Baud rate: 300
- Parity: even
- Stop bits: 2
- Word length: 7 bits
- Full duplex.

(b) A modem with an acoustic coupler or a direct connect modem.

(c) RMATS Module (PN9102-015-000-NA).

(d) Backplane, Rev F.9 or higher.

RMATS Module

2.05 The RMATS module is a 300 Baud Full Duplex, FSK (Frequency-Shift Keying) Answer Only Modem designed to interface to the network through any trunk in the PABX. The module connects directly on the CPU II in the SX-20 system.

C. Software Requirements

2.06 The SX-20 system must have the Generic 503 feature package to access RMATS.

3. PROGRAMMING

3.01 If the RMAT System is required, then the PABX must be initially programmed at the installation site. This information allows a Controller/RMATS operator to access the remote system. The programming required is as follows:

(a) Feature Access Code Programming (Command 602), Register 25 -

- Set the RMATS Modem Access to the required code (default is 498).

(b) Class-of-Service Programming (Commands 611 - 619), Register 2 -

- If RMATS is to be accessed through a DISA Trunk, set 'DISA Access Code' to 1 (enable). Default is 0 (disable).

(c) Trunk Programming (Commands 801 - 812), Register 4 and 5 -

- If RMATS is to be allowed access to the PABX when the system is in Day Service and/or Night Service, set the

equipment number to 88 (RMATS). Default is 01 (Equipment Number 01).

(d) System Security Code Programming (Command 976) -

- Set the System Security Code for the PABX. Default is 7772.

(e) DISA Security Code Programming (Command 978) -

- If RMATS is to be accessed through a DISA Trunk, a DISA Security Code can be programmed. Default is 000.

Refer to Section MITL9102-095-210-NA, System Programming and PN9180-095-205-NA, Programming Forms for detailed programming information.

RMATS Commands

3.02 When programming the system via RMATS, certain commands are used to communicate to the PABX. These levels are illustrated in Figure 3-1 and listed in Tables 3-1 and 3-2. Table 3-1 lists commands applicable only to RMATS Programming and Table 3-2 lists the commands used with Attendant Functions. The three main commands (used when programming the PABX), use the Control (CTRL) key on the terminal and a character of the alphabet. The commands are:

- <CTRL - S> No scroll
- <CTRL - Q> Scroll
- <CTRL - X> Exit scroll.

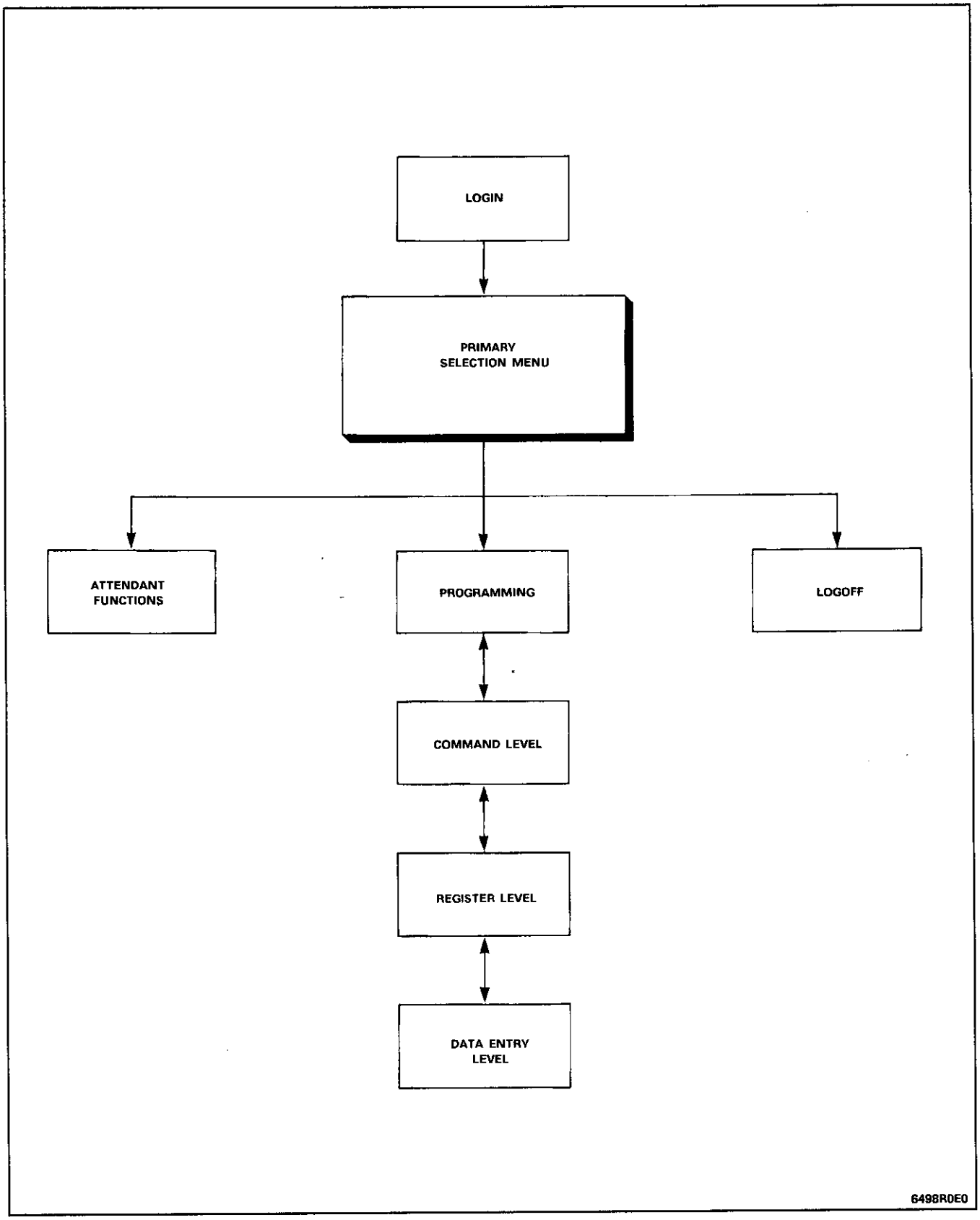

Figure 3-1 Programming Levels

TABLE 3-1
RMATS PROGRAMMING COMMANDS

Command	Function	
Codes at the Command Level:		
<cr>	Enter command or default PABX command	
<DEL>	Delete character	
E, e	Exit	
N, n	Next PABX command	
R, r	Register display	
S, s	Summary of PABX commands	
Codes at the Register Level:		
E, e	Exit register level	
N, n	Next register	
R, r	Register display	
Codes at the Data Entry Level:		
<CR>	Save register	
<space>	Echo register field	
C, c	Cancel register changes	
D, d	Deny	(used for TOLL programming)
E, e	Except	(used for TOLL programming)
T, t	Table	(used for TOLL programming)
_ (underscore)	Don't Care	(used for TOLL programming)
I, i	Insert	(used for TOLL programming)
<DEL>	Delete	(used for TOLL programming)

TABLE 3-2
RMATS ATTENDANT FUNCTION COMMANDS

Command	Function	
E, e	Exit	
<cr>	Enter command	
<DEL>	Delete character	
<ESC>	Exit PABX command	
S, s	Summary of Attendant Functions	
B, b	#	(used for Speed Call)
C, c	⁎1 Wait for dial tone	(used for Speed Call)
D, d	⁎2 Delay dial by 5 s	(used for Speed Call)
E, e	⁎3(N) Manual insert digits	(used for Speed Call)

4. SYSTEM OPERATION

4.01 Prior to conducting the operational procedures outlined in the tables contained in this Section, the RMATS installation must be checked to ensure that the following conditions are met:

1. The RMATS operator (which can be the installer, engineer, etc.), must have the proper generic installed in the remote PABX which is to be programmed.

2. The external communication lines are properly connected.

3. The terminal or printer must be set to 300 Baud, 7-bit word length even parity, 2 stop bits and full duplex.

4. The terminal should transmit ASCII characters.

5. The initial programming of the system must be performed at the remote site; for example, if RMATS is to be used as a DIL or on a DISA Trunk, the appropriate programming is to be completed before accessing RMATS.

6. A modem with an acoustic coupler or a direct connect modem must be used.

4.02 Table 4-1(a) shows the Attendant and Maintenance Functions and the associated abbreviation used by the system when RMATS is used for programming. Table 4-1(b) lists the full meaning of the abbreviations used. Table 4-2 lists all the Programming Command Numbers which can be accessed when using RMATS.

Methods of Accessing RMATS

4.03 There are four methods of accessing RMATS, as follows:

1. Accessing RMATS with the aid of the Attendant - Table 4-3.
2. Accessing and using RMATS as a DIL to the system - Table 4-4.
3. Accessing and using RMATS through a DISA Trunk - Table 4-5.
4. Accessing RMATS at a station within the PABX to be programmed - Table 4-6.

4.04 In most cases, the terminal or printer will display a '>>' whenever the RMATS operator is required to input information. The only time this prompt is not displayed is when the operator has accessed a register. Once the system has been accessed, you may program the PABX. Refer to Table 4-7 for an example of a programming session when accessing the Programming Functions, and Table 4-8 when accessing the Attendant Functions.

TABLE 4-1(A)
ATTENDANT AND MAINTENANCE FUNCTIONS ABBREVIATIONS

Code	Terminal Display
11	NIGHT SERV ON
12	NIGHT SERV OFF
13	CLR ALARM IN
14	12-HR CLOCK
15	24-HR CLOCK
20	REL TRK
21	FLX NIGHT,TRK: EXT xxx:
22	MSGREG EXT: EXT xxx:
23	CALL BLK ON
24	CALL BLK OFF
29	CLR MSGWAIT IND
31	CLR ALARM-SCROLL
32	CLR ALL ALARMS
41	BSY TRK
42	BSY DTMF GEN
43	BSY DTMF RCV
44	BSY DT DET
45	BSY SPCH PATH
51	UNB TRK
52	UNB DTMF GEN
53	UNB DTMF RCV
54	UNB DT DET
55	UNB SPCH PATH
60	VIEW SPD CALL
65	PRGM SPD CALL
80	DATE

4.05 Anything shown in brackets [ ] throughout the tables given in Part 4, indicates an action is required by the RMATS operator, or the input example shown has been typed in at the terminal or printer by the operator. The information contained in these brackets throughout this Section are examples only. If a register does not contain information in the last bit, a '.' is displayed to indicate a nonprogrammable area.

TABLE 4-1(B)
CODE ABBREVIATIONS

Code	Meaning
SERV	service
CLR	clear
IND	indicator
HR	hour
BCKGND	background
REL	release
TRK	trunk
EXT	extension/station
FLX	flexible
MSGREG	Message Registration
MSGWAIT	Message Waiting
BSY	busy
GEN	generator
DT	dial tone
DET	detector
SPCH	speech
UNB	unbusy
RCV	receiver
PRGM	program
SPD	speed

TABLE 4-2
PROGRAMMING COMMAND NUMBERS

Code	Programming Function
601	System Options Programming
602	Feature Access Code Programming
611 → 619	COS Programming
620	Station Programming
621	Block Programming - Station Numbering
622	Block Programming - Station Data
631 → 636	Station Hunting Programming
641	Ring Group Programming
701 → 740	SUPERSET™ Set Programming
801 → 812	Trunk Programming
821 → 826	Trunk Group Programming
910, 920	Toll Control Programming
911, 921	Toll Digit String Programming
931, 932	Toll Table Item Programming
941, 942	Toll Table Range Programming
970	Busy Lamp Field Programming
972	Function Key Programming
975	User-Controlled Programming
976	System Security Code Programming
977	User Security Code Programming
978	DISA Security Code Programming
990	Trunk Status Display
991	Station Status Display
992	System Status Display
998	Install Default Database
999	Software Identity Display

TABLE 4-3
RMATS ACCESS - VIA ATTENDANT

Step	Input Action	Terminal Display
1.	Set up terminal or printer in accordance with Part 4 in this Section.	
2.	Dial the remote PABX directory number - the attendant answers (see Note).	
3.	The attendant places the RMATS operator on Consultation Hold, then dials the RMATS Access Code or the Attendant can dial directly without soft hold.	
4.	The operator is automatically connected to RMATS, and the attendant is disconnected from the call.	
5.	The operator will hear a carrier signal for 30 s. During this time, the operator MUST put the handset into the modem and press the carriage return.	RMATS ENTER SYSTEM SECURITY CODE >>
6.	The operator then must dial the System Security Code at the terminal. If an incorrect code is entered, the terminal will indicate that an error has been made, then return to the original display as shown.	INVALID CODE ENTER SYSTEM SECURITY CODE >>
7.	The terminal or printer then displays the terminal types which can be selected.	ENTER TERMINAL TYPE P PRINTER S SCREEN
8.	The operator then dials the required terminal type; i.e., S or P (P is used in this example).	>>[P<cr>]
9.	The terminal then displays the next option.	PRIMARY SELECTION MENU P PROGRAMMING FUNCTIONS A ATTENDANT FUNCTIONS E EXIT
10.	The operator then dials the required selection menu; i.e., P.	>>[P <cr>]
11.	The operator is now in programming mode at the remote PABX.	PABX PROGRAMMING SYSTEM OPTIONS CMD 601 >>
12.	The RMATS operator may then enter one of the possible command numbers (go to Table 4-7).	

Note: An operator accessing the RMAT System via the attendant is one of four methods. Refer to Tables 4-4 through 4-6 for other accessing methods.

TABLE 4-4
RMATS ACCESS - VIA DIRECT-IN LINE

Step	Input Action	Terminal Display
1.	Set up terminal or printer in accordance with Part 4 in this Section.	
2.	Dial the remote PABX directory number for the Direct-In Line trunk - the operator is connected directly to the trunk designated for RMATS.	
3.	The operator will hear a carrier signal for 30 s. During this time, the operator MUST put the handset into the modem and press the carriage return.	RMATS ENTER SYSTEM SECURITY CODE >>
4.	Repeat Steps 6 through 12 in Table 4-3.	

TABLE 4-5
RMATS ACCESS - VIA DISA TRUNK

Step	Input Action	Terminal Display
1.	Set up terminal or printer in accordance with Part 4 in this Section.	
2.	Dial the PABX directory number for the DISA Trunk.	
3.	When dial tone is returned, the operator then dials the DISA Access Code if one had been previously programmed for the trunk. Dial tone is returned again, and operator dials the RMATS Access Code.	
4.	The operator will hear a carrier signal for 30 s. During this time, the operator MUST put the handset into the modem and press the carriage return.	RMATS ENTER SYSTEM SECURITY CODE >>
5.	Repeat Steps 6 through 12 in Table 4-3.	

TABLE 4-6
RMATS ACCESS - VIA A STATION

Step	Input Action	Terminal Display
1.	Set up a terminal or printer in accordance with Part 4 in this Section. **Note:** A CO trunk is not required when accessing RMATS by a station.	
2.	At a station, dial the RMATS Access Code.	
3.	The operator will hear a carrier signal for 30 s. During this time, the RMATS operator MUST put the handset into the modem and press the carriage return.	ENTER SYSTEM SECURITY CODE >>
4.	Repeat Steps 6 through 12 in Table 4-3.	

TABLE 4-7
SAMPLE PROGRAMMING SESSION - PROGRAMMING FUNCTIONS

Step	Input Action	Terminal Display
1.	Access the remote PABX (refer to Tables 4-3 → 4-6 for required method).	SYSTEM OPTIONS CMD 601 >>
2	Enter 998 <cr> Enter Y or N <cr> If Y (yes)	Install Default Data Y/N? CMD 998 >>
3.	Enter the required command; i.e., 601. If Command 601 is required, press the carriage return. If another command is required, enter the command number and press <cr>. The terminal displays the first register in that command number with the cursor flashing under the first position in the register. If an incorrect command number is entered, the terminal displays an error code to indicate a typing error has been made, and the original display is returned to the screen.	CMD 601 >>[<cr>] A B C D E F G H 1 1 0 0 1 0 0 . [ ] SYSTEM OPTIONS CMD 601 >>[996] 301 601 CMD 601 >>
4.	If only the data in register is to be modified, use the space bar (<sp>) to step through the register; for example, to change Bit D to 1, and Bit F to 1, type the data shown at the right.	1 [<sp>] [<sp>] [1] 1 [1] [<cr>]
5.	The information 1 1 0 1 1 1 0 . would then be entered into the system memory and the display now shows Register 2.	A B C D E F G H 2 1 0 1 1 1 0 .
6.	If an incorrect value is attempted for any field (i.e., an attempt to enter 5 in Bit E), an error code will be displayed, and then the register being programmed will be displayed once more.	A B C D E F G H 2 1 0 1 1 5 E 0 4 ? 6 0 1 A B C D E F G H 2 1 0 1 1 1 0 .
7.	To display the registers, type "r" at the cursor. If a <cr> is pressed at the register level, the display will jump to the next register only.	A B C D E F G H 2 1 0 1 1 1 0 . r 1 1 0 0 1 0 0 . 2 1 0 1 1 1 0 . 3 3 3 1 3 1 1 . 4 0 1 3 1 0 2 . 5 0 0 0 0 0 0 1 6 1 1 3 0 1 0 0 7 6 0 7 1 0 . . 8 0 0 0 0 0 0 .

TABLE 4-7 (CONT'D)
SAMPLE PROGRAMMING SESSION - PROGRAMMING FUNCTIONS

Step	Input Action	Terminal Display
8.	If a <cr> is pressed at the last register in the command, the terminal will prompt you to input another command number as shown.	SYSTEM OPTIONS CMD 601 >>
9.	When all programming functions are complete, enter 'E' to exit from this function. The display returns to the Primary Selection Menu.	>>[E] PRIMARY SELECTION MENU P PROGRAMMING FUNCTIONS A ATTENDANT FUNCTIONS E EXIT >>
10.	Enter 'A' if Attendant Functions are required (see Table 4-8), or enter 'E' to exit from RMATS programming.	>>[E] RMATS LOGOFF

TABLE 4-8
SAMPLE PROGRAMMING SESSION -
ATTENDANT (AND MAINTENANCE) FUNCTIONS

Step	Input Action	Terminal Display
1.	Access the remote PABX (refer to Tables 4-3 → 4-6 for required method).	
2.	The terminal displays the Primary Selection Menu.	PRIMARY SELECTION MENU P PROGRAMMING FUNCTIONS A ATTENDANT FUNCTIONS E EXIT >>
3.	The operator then dials the required selection. For Attendant Functions dial 'A'.	>>[A <cr>]
4.	The terminal now displays the Attendant Function Commands. **Note:** If 'S' is entered, the information contained in Table 4-1(a) is displayed on the terminal. If 'E' is entered, the terminal will display the Primary Selection Menu.	ATTENDANT FUNCTIONS AF >>
5.	Enter the required Attendant Function Code as shown. Once the carriage return has been pressed, the terminal function accessed beside the code, then indicates that the function is complete.	AF >>[11 <cr>] NIGHT SERV ON * FUNCTION COMPLETE *
6.	If an Attendant Function is entered which requires additional information before completion, a colon is displayed at the end of the function name to indicate additional information is necessary. When the required information is entered, the terminal will indicate when the function is complete or incomplete.	AF >>[45 <cr>] BSY SPCH PATH:[1] * FUNCTION COMPLETE * OR * FUNCTION NOT COMPLETE *
7.	If incorrect information is entered, the terminal will beep once and return to the original display as shown.	AF >>[02] "beep" AF >>
8.	To exit from Attendant Function, enter 'E'. The display shows the Primary Selection Menu.	AF >>[E] PRIMARY SELECTION MENU P PROGRAMMING FUNCTIONS A ATTENDANT FUNCTIONS E EXIT >>
9.	Enter 'P', if the Programming Functions are required (see Table 4-7), or enter 'E' to exit from RMATS programming.	>>[E] RMATS LOGOFF

5. INSTALLATION/OPERATIONAL PROBLEMS

5.01 When the system is first installed, RMATS should be attempted from the following locations to ensure proper operation:

- A remote location from where the PABX is installed using standard CO trunks.
- From a station within the PABX.

5.02 If there are any problems which cannot be located quickly, the following documents should be consulted for system testing and troubleshooting/maintenance procedures:

- Section MITL9102-095-215-NA, System Test Procedures.
- Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information.

TABLE 5-1
INSTALLATION PROBLEMS

Problem	Procedure
No response from terminal when the carriage return is pressed after the handset set in modem and <cr> entered.	• The terminal and/or modem may not be hooked-up properly - recheck the installation. • The outside line may be bad or noisy, therefore the data received by the PABX could be corrupted: - check parity and baud rate - go on-hook at the site, and redial the system.
The System Security Access Code is entered at the terminal but the system returns with the same prompt.	• The outside line may be bad or noisy therefore the data received by the PABX could be corrupted: - check parity - check security code.
No carrier tone.	Refer to Section MITL9102-095-350-NA, for troubleshooting procedures.

Note: If problems persist, refer to Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information for complete details on fault location for the PABX.

SX-20®

ATTENDANT CONSOLE DESCRIPTION

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1

2. GENERAL DESCRIPTION 1
Release Loop Operation 2

3. PHYSICAL DESCRIPTION 2
Upper Assembly 2
Lower Assembly 4
Additional Hardware 5

4. FUNCTIONAL DESCRIPTION 5
Keys and Indicators 6
Displays 10

5. ATTENDANT AND MAINTENANCE FUNCTIONS 11
Attendant Functions 11

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
2-1	SX-20 Attendant Console	1
3-1	Attendant Console Assembly	3
3-2	Keyboard Layout	4
3-3	Display Layout	6

LIST OF TABLES

TABLE	TITLE	PAGE
5-1	Attendant Functions	12

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1. GENERAL

1.01 This Section describes the attendant programming and maintenance functions of the SX-20 Attendant Console. It contains a brief description of each key function, and the displays.

Reason for Issue

1.02 This Section has been issued to describe the Attendant Console used with Generic 503.

2. GENERAL DESCRIPTION

2.01 The version of the Attendant Console (refer to Figure 2-1) described in this Section incorporates certain additional features to those features provided by earlier consoles. The console is electrically and physically compatible with Generic 503 of the SX-20 system. Console features are:

- 12-Key Dial Pad
- 30 Operating Keys and LEDs

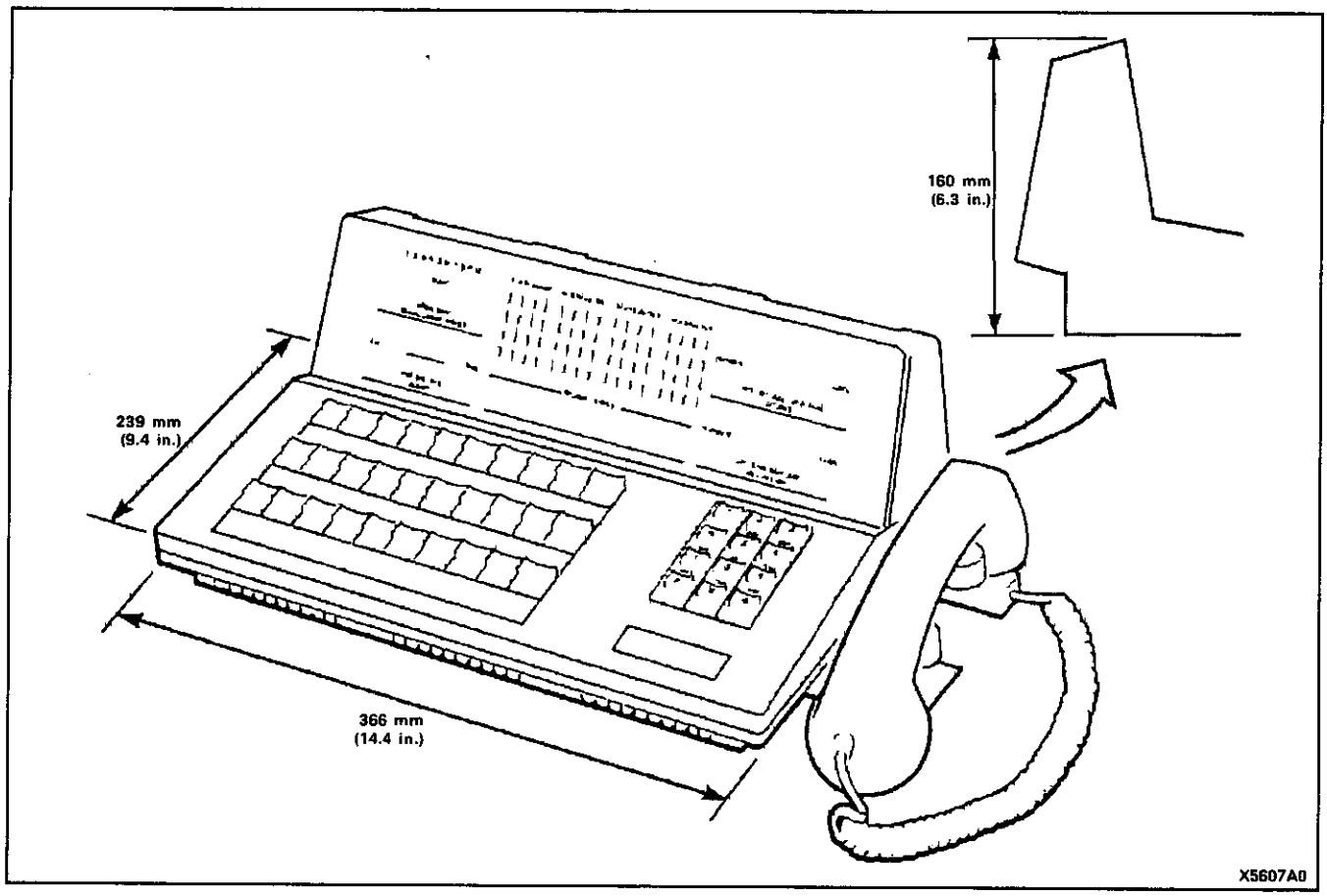


Figure 2-1 SX-20 Attendant Console

- Trunk Status Display
- Three Alarm Indicators (MIN, CON, MAJOR)
- Call Status Display
- Extension Status Display
- Digital Clock
- Call Waiting Display.

Release Loop Operation

2.02 Release loop operation is used by the SX-20 system. This method of operation allows the attendant to camp on (or connect) a call to a trunk or station, and release from the call before the called number answers. If the released call is not answered within the selected recall time period, it returns to the console as a recall.

3. PHYSICAL DESCRIPTION

3.01 The console consists of two major assemblies: an upper and a lower assembly. Each major assembly consists of the minor assemblies which are shown in Figures 3-1, and are described in the following paragraphs. The overall dimensions of the console housing are 366 mm (14.4 in.) wide, 239 mm (9.4 in.) deep and 160 mm (6.3 in.) high. The weight of the console is 2.9 kg (6.3 lb).

Upper Assembly

3.02 The upper assembly (refer to Figure 3-1) consists of the following parts:

(a) **Keyboard Printed Circuit Assembly (PCA).** A printed circuit board assembly with 30 keys (each incorporating a LED), a dial pad and a cable harness, the free end of which plugs into the motherboard assembly. Refer to Figure 3-2 for the keyboard layout.

(b) **Keyboard Support.** A molded plastic structure designed to physically support the keyboard assembly.

(c) **Housing Top.** The plastic moulded top of the console housing.

(d) **Static Protection Panel.** An aluminum plate made to fit under the top cover to provide a path to ground for static discharge.

(e) **Display Window.** A protective window for the graphic display panel. It is removable for the purpose of applying designations to the Busy Lamp Field.

(f) **Keyboard Designation Strips.** The keyboard designation strips are shown in Figure 3-2. In addition to the keys shown, the DSS

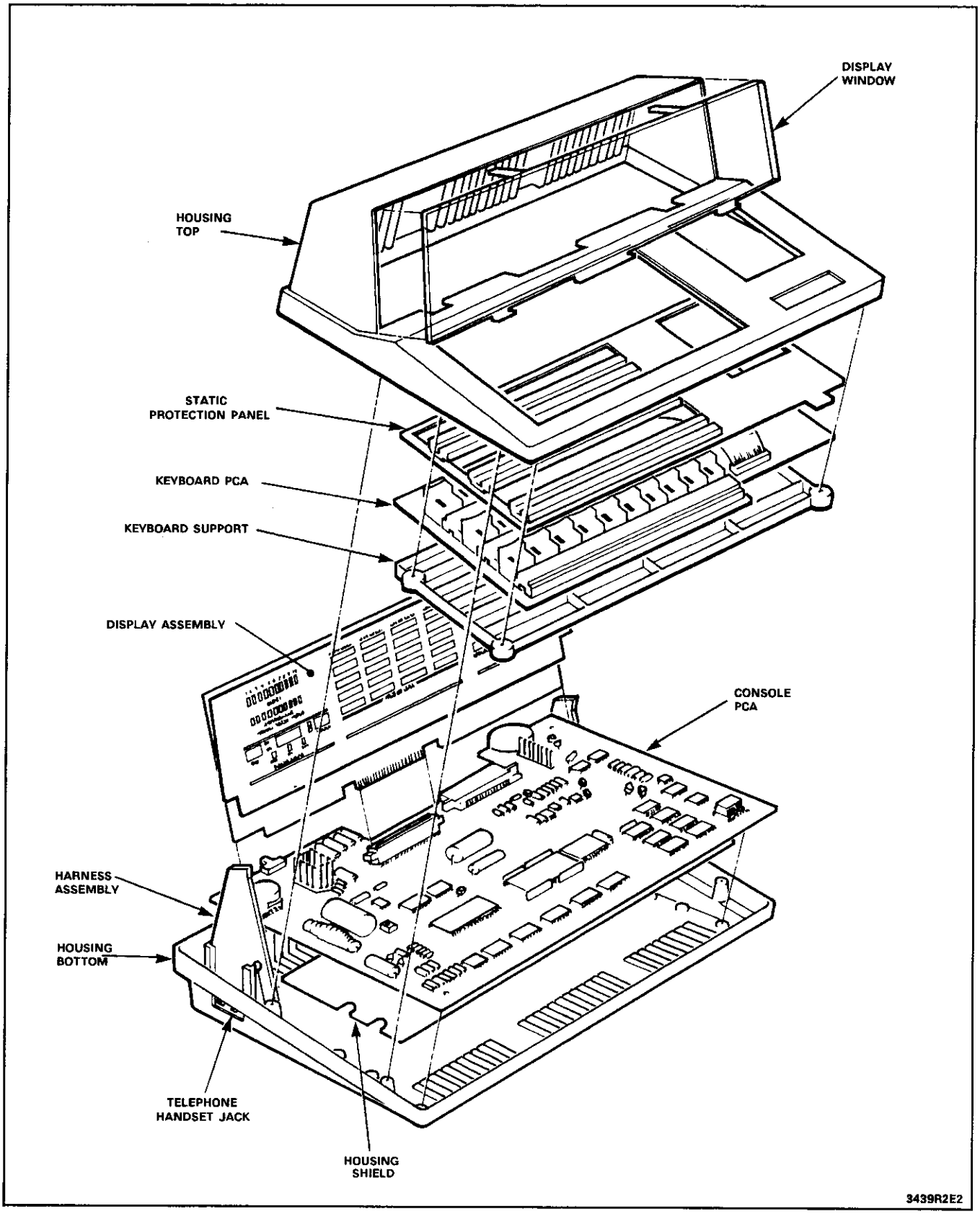


Figure 3-1 Attendant Console Assembly

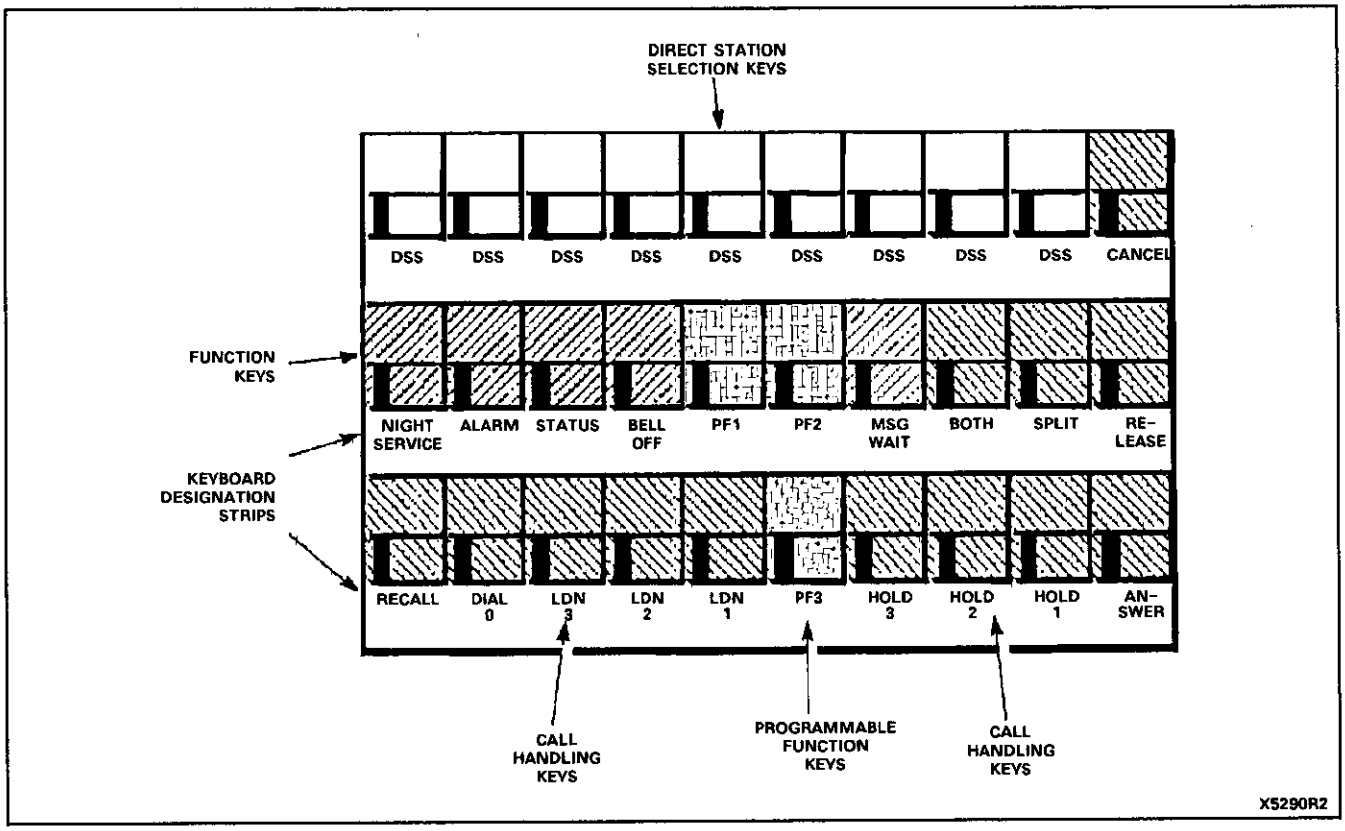


Figure 3-2 Keyboard Layout

keys may have information typed or handwritten on them, showing the name of a station they directly access.

(g) **Designation Strip Covers.** Three transparent covers fit over the key designation strips. They are removable for the purpose of changing the key designations. One cover is also provided for the console telephone number insert.

Lower Assembly

3.03 The lower assembly (refer to Figure 3-1) consists of the following parts:

(a) **Console Printed Circuit Assembly (PCA).** A printed circuit board (PCB) assembly which holds the main console circuits, power supply circuitry and processor. Slots are provided into which the display assembly, the keyboard assembly, the speaker and handset jack leads are plugged. The PCB assembly also has a connector installed which extends the console circuits via the 25-pair cable assembly to the PABX system. The ringer volume control is also mounted on the card, and is accessible from the rear of the housing.

(b) **Display Assembly.** A PCB assembly of LED arrays and 7-segment displays to which a laminated graphic artwork panel

is attached. The Display Assembly holds the LEDs for the following individual displays (refer to Figures 3-2 and 3-3):

- Trunk Status
- Calls Waiting
- Extension Status
- System Status
- Call Status
- Alarm Status.
- Time Display.

(c) **Housing Bottom.** The plastic moulded bottom of the console housing.

(d) **Housing Shield.** An aluminum plate made to fit in the housing bottom, which connects to the top shield and provides a path to ground for static discharge.

(e) **Harness Assembly.** Two pairs of handset jacks and a speaker are connected to the Console PCA via a wiring harness. The phone jacks are mounted on the card guides which are channeled into the housing bottom. The speaker fits into channels in the back wall of the housing bottom.

(f) **Handset.** The removable handset may be connected to either side of the console.

Note: The Console does not operate unless the handset is plugged in.

Additional Hardware

3.04 The following hardware must be installed in the PABX to ensure proper operation of the SX-20 Attendant Console.

- Universal Console Connect Card (UCC Card, PN9102-009-001-NA)
- UCC Card Personality Module, PN9102-009-004-NA
- Generic 503 Feature Package
- CPU II Card, Rev 2 or greater.

4. FUNCTIONAL DESCRIPTION

4.01 The Attendant Console keyboard layout shown in Figure 3-2 applies to the normal type of installation. Programmable Function key designations change to meet the different requirements for a customer. The following description details the function of the 30 console keys (refer to Figure 3-2), the indicators and displays.

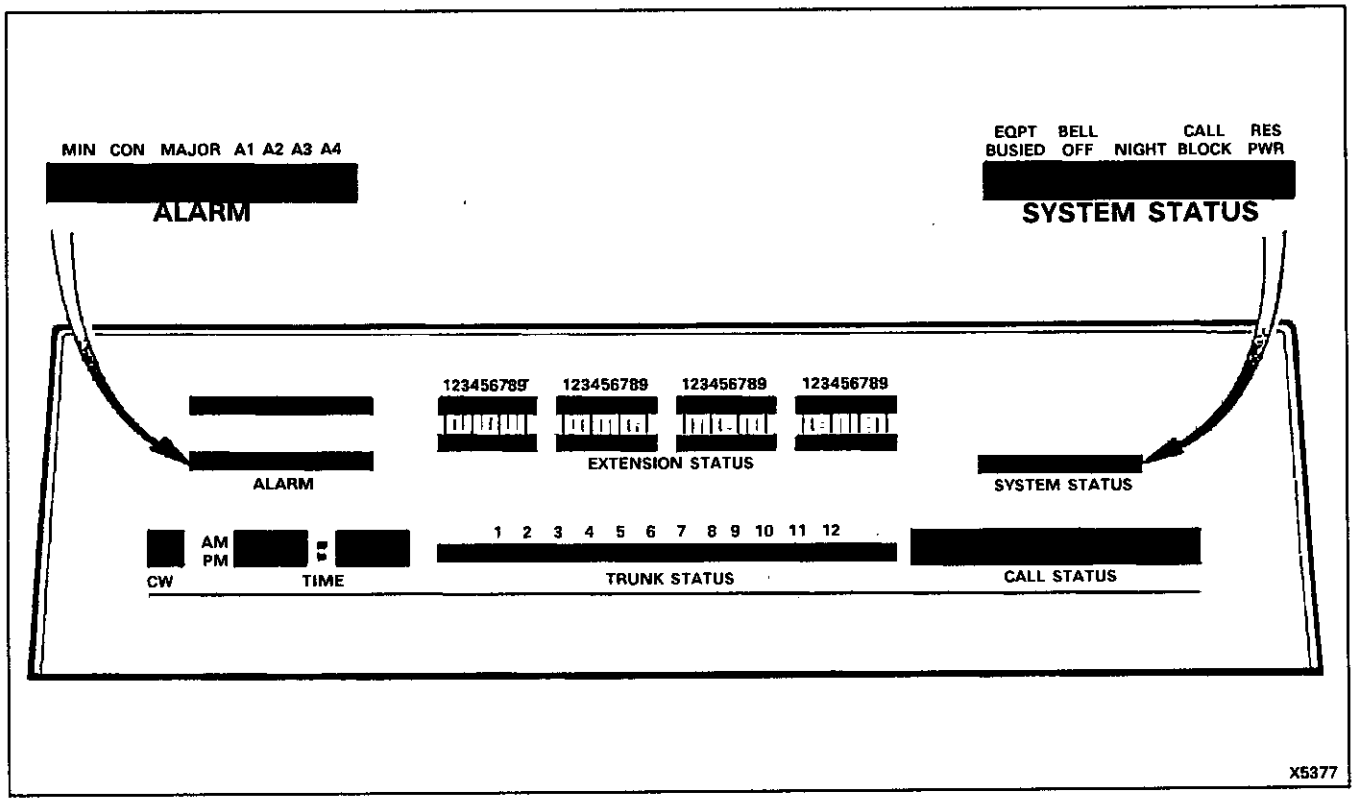


Figure 3-3 Display Layout

Keys and Indicators

4.02 Each function key on the Attendant Console contains a light-emitting diode (LED) visible on the surface of the key. The function of each key is designated on the strip immediately under the key. The state of the LED indicates the condition of the key:

- LED flashing – the system expects a response from the associated key.
- LED lit – the feature associated to the key is presently active.
- LED off – the feature is not active.

4.03 ALARM. If the system detects an alarm, the console rings and the ALARM key LED flashes. Pressing the ALARM key stops the console ringer, displays the alarm code in the Call Status Display and lights the ALARM LED. Releasing the ALARM key causes the display to go dark, stores the alarm code and lights the LED indicating that the code has been stored. The ALARM LED remains lit until the alarm is cleared using the Maintenance Function Codes.

4.04 BELL OFF. This key when pressed, disables the console tone ringer and lights the BELL OFF key LED and the BELL OFF LED in the System Status Display. With the console ringer disabled, incoming calls to the Attendant Console are indicated by a flashing LED and by the Calls Waiting display; no audible signal is given. If the BELL OFF key

is pressed when its associated LED is lit, the tone ringer is reactivated and the LED is extinguished. The BELL OFF LED in the System Status Display lights when the Bell is off.

4.05 **NIGHT SERVICE.** This key is used to switch the system in and out of Night Service. When the key is pressed, the system is switched into Night Service, connecting incoming trunk and/or station calls to the attendant, to selected stations, Hunt Groups or the Night Bells equipment. The key LED lights to show that Night Service has been selected. Pressing the NIGHT SERVICE key a second time returns the system to normal operation and the LED turns off. The NIGHT LED in the System Status Display lights when in Night Service.

4.06 **MSG REG/RESTRICTIVE STATION CONTROL.** This programmable key allows the attendant to view the number of trunk call units made from a station that has Message Registration enabled in its Class of Service (COS). This key can also restrict a station (with Restrictive Station Control enabled in its COS) from making outgoing trunk calls. This is done by pressing and holding down the key, and dialing the station number, followed by 9.

4.07 **MSG WAIT.** This key allows the attendant to place, cancel or display a Message Waiting indication on a station. To apply Message Waiting, the key is pressed, and the station number is dialed, followed by 1. To cancel the indication, the key is pressed, and the station number is dialed, followed by 0. A Message Waiting indication may be a distinctive ring every 5, 10, 15 or 20 minutes (three cycles of 3.5 ips ringing). If the station is busy when Message Waiting is activated, the Message Waiting indication is initiated 10 seconds after the station becomes idle. The attendant may see which stations have a message waiting on the Status Display at any time, by pressing the MSG WAIT key.

4.08 **CANCEL.** The CANCEL key cancels a misdialed call, or a call directed to a busy number.

4.09 **HOLD 1, 2 and 3.** These keys allow the attendant to put on hold, up to three independent calls at the console. When the attendant presses a HOLD key, the associated LED lights and the active call at the console is placed on hold. If a trunk call is on hold, the Trunk LED flashes in the Trunk Status Display. If the attendant, or a station using the Hold Pickup feature, does not retrieve the held call within the hold recall time, the HOLD key LED flashes along with the RECALL key LED, indicating that the call has been returned to the console.

4.10 **BOTH.** The BOTH key allows a 3-party conference to be set up (of which one of the parties is the attendant). Pressing the BOTH key connects the attendant to the other two parties. Once a 3-party conference is established, the SPLIT key may be used to speak privately to either party.

4.11 **CALL BLOCK.** Stations may be restricted from calling other stations for specific time periods. This restriction is controlled by the attendant. When the console CALL BLOCK key (note that this key is programmable) is pressed, the restriction is set up for calls between stations with CALL BLOCK enabled in their COS, and the CALL BLOCK LED on the System Status Display lights. Upon pressing the CALL BLOCK key again, the restriction is lifted and the LED is extinguished.

4.12 **PAGE.** Pressing the programmable PAGE key connects the console handset or headset directly to the paging equipment, allowing the attendant to make all-zone paging announcements. The PAGE key LED is lit whenever the paging circuit is in use. The attendant has priority access to the paging circuits, and may override any station that is using the paging equipment by pressing the PAGE key; the station is automatically released and receives reorder tone.

4.13 **RELEASE.** The RELEASE key releases a call from the console. The call may be released in the busy or ringing state, or after a talking connection has been established.

4.14 **RECALL.** The RECALL key LED flashes to indicate that a call has not been answered within the time-out period and has been returned to the console. Pressing the RECALL key connects the console to the returned call.

4.15 **DIAL 0.** When a station user calls the attendant, the DIAL 0 key LED flashes. If the DIAL 0 key is pressed, the console is connected to the call.

4.16 **LDN 1, 2 and 3.** These keys allow the attendant to answer incoming calls to the customer's Listed Directory Numbers (LDN). When an outside call is made to the console, the LED associated with the incoming call flashes, allowing the attendant to select the call by pressing LDN 1 - 3 and to answer with the correct response.

4.17 **SPLIT.** This key allows the attendant to speak privately to either party in a 3-party connection. Each time the SPLIT key is pressed, the active party and the held party are interchanged.

4.18 **ANSWER.** The ANSWER key answers any incoming call to the console. When a call is presented to the console, the LED associated with the call type and the ANSWER key LED flash. If the attendant presses the ANSWER key, the LED associated with the first call in the console queue lights, indicating the call type. The ANSWER key LED lights indicating the attendant is connected to the call. The LEDs associated with the remaining calls in the console queue continue to flash. Pressing the ANSWER key to answer incoming calls, answers calls to the console in the order in which they arrive at the console, independent of the call type.

4.19 **STATUS.** This console key allows the attendant to display the status of the various equipment. The required display is selected by pressing the STATUS key a required number of times. The STATUS key queue is outlined below:

(a) Upon pressing the STATUS key the first time and holding it down, the CALL STATUS display shows the equipment busied, and the reserve power.

(b) Upon pressing the STATUS key a second time and holding it down, the status of the eight trunks on the Miscellaneous Card is shown (Equipment Numbers 01 → 08). Note that 0 = idle, 1 = busy, and 2 = busied-out.

(c) Pressing the STATUS key a third time and holding it down, shows the status of the four trunks on the Trunk Expander Card (Equipment Numbers 09 → 12).

(d) Upon pressing the STATUS key a fourth time and holding it down, the Generic and Revision level appear in the CALL STATUS display.

(e) Upon pressing the STATUS key a fifth time and holding it down, the system performs a lamp test on the Cabinet Display and the Remote Call Status Display.

(f) Upon pressing the STATUS key a sixth time and holding it down, the console bell rings, the console busy LEDs and all key LEDs light.

(g) Upon pressing the STATUS key a seventh time and holding it down, the 7-segment displays for the CALL STATUS, CW and TIME displays light.

(h) If the STATUS key is pressed again, the display sequence starts at the beginning of the Status Display queue. If any key is pressed between selections, the Status Display starts at the beginning of the queue.

4.20 **DSS (Direct Station Selection).** These keys may be assigned to specific stations, Hunt Groups, Ring Groups or Trunk Group Access Codes, and may be accessed at any time by the attendant. When the attendant presses a programmed DSS key, that station, Hunt Group, Ring Group or Trunk Group is directly accessed without using the dial pad. The DSS keys are programmed using a time-key down mode. Refer to Section MITL9102-095-105-NA, Direct Station Selection (DSS).

4.21 **OVERFLOW.** This key is used to switch the system into and out of TAFAS Mode. When the key is pressed, the system is switched into TAFAS Mode. (All codes are routed to the Night Answer Point, and TAFAS Pickup may be used to answer the calls.) The key LED lights to show that TAFAS has been selected. Pressing the key a second time returns the system to normal operation and the LED turns off. This key may be depressed at any time; i.e., the system may be active in superfunctions or call handling when it is "forced" into TAFAS Mode. Note that this key is programmable.

4.22 **OVERRIDE.** By pressing and holding this programmable key, the attendant, upon encountering a busy station, can enter the conversation. Before voice contact is established, all parties (those in the original conversation plus the attendant) receive a 1 second warning tone (440 Hz). A 200 ms burst of warning tone is repeated every 6 s for the duration of the override. If the overridden station goes on-hook, the console is dropped and receives reorder tone while the other party in the original call hears no tone and is dropped. If the overridden station flashes the switchhook, the console is again dropped while the other party is placed on Consultation Hold (if enabled).

Displays

4.23 The console displays provide the attendant with all relevant information on calls directed to or made by the attendant. The following descriptions detail the information provided by each display (refer to Figure 3-3):

4.24 **TRUNK STATUS.** The Trunk Status display shows the operational status of up to 12 trunks. A lit LED indicates that the trunk is busy; when flashing it indicates the trunk is on hold and when dark it indicates that the trunk is idle.

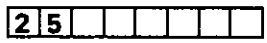
4.25 **CW (Call Waiting).** The Call Waiting indicator shows the current number of calls in the attendant queue. As calls are answered or new calls are directed to the console, the display is updated to reflect the new status of the queue.

4.26 **TIME.** Each Attendant Console is equipped with a digital clock. The clock continuously displays the time in hours and minutes, with a choice of either 12- or 24-hour clock display. If the 12-hour clock display is selected, a LED lights to indicate AM or PM.

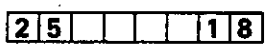
4.27 **ALARM.** The ALARM display contains the MAJ, MIN, and CON alarm LEDs. When the system detects an alarm condition, the appropriate LED flashes or lights and the console ringer sounds. A MAJ alarm indicates that a malfunction has been detected which affects the complete system operation. A MIN alarm is raised when the system detects a fault which degrades system operation, but does not stop processing. A CON alarm indicates that a malfunction has occurred within the console. Call processing continues but the console operation is impaired.

4.28 **EXTENSION STATUS.** The EXTENSION STATUS display shows the busy (LED lit) and not busy (LED off) states of the station numbers.

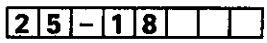
4.29 **CALL STATUS.** The CALL STATUS display shows the active status of the call currently handled at the console. The number of the party the attendant is connected to is always shown on the left of the display and the other party in the connection is shown on the right. The CALL STATUS display is also used for displaying a variety of information, including alarms and other status displays.



The attendant is connected to Station 25.

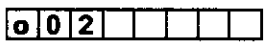


The attendant is connected to Station 25; Station 18 is on hold.

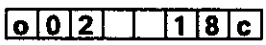


The attendant is connected to Station 25 and Station 18 is in a 3-party conference.

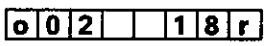
Three symbols are used on the CALL STATUS display to show special functions.



This display indicates that the attendant is connected to Trunk 2.



Trunk 2 is recalling the console after camping onto Station 18.



Trunk 2 is recalling the console after ringing and not being answered at Station 18.

4.30 SYSTEM STATUS. Provides information as to when EQPT BUSIED (equipment busied), BELL OFF, NIGHT (Night Service), CALL BLOCK and RES PWR (reserve power) are in effect, by lighting the associated LED.

5. ATTENDANT AND MAINTENANCE FUNCTIONS

5.01 Certain maintenance functions can be performed from the Attendant Console (or from the Test Line). A full description of their use is contained in Section MITL9102-095-350-NA, Troubleshooting Procedures and General Maintenance Information. Refer also to Section MITL9102-095-105-NA, Features Description.

Attendant Functions

5.02 An attendant may perform certain system functions, such as setting the console clock, accessing individual trunks, etc., by dialing specific codes. These functions are fully detailed in the Console Operating Instructions. A listing of these functions is also included in Table 5-1.

TABLE 5-1
ATTENDANT FUNCTIONS

Function	Action
To turn Night Service ON:	• Dial ✳11 • Press RELEASE (refer to NIGHT SERVICE key operation)
To turn Night Service OFF:	• Dial ✳12 • Press RELEASE (refer to NIGHT SERVICE key operation)
To identify and store Alarms:	• Dial ✳13 • Press RELEASE (refer to ALARM key operation)
To set 12-hour Clock:	• Dial ✳14 • Dial 2-digit hours and 2-digit minutes • Press RELEASE
To set 24-hour Clock:	• Dial ✳15 • Dial 2-digit hours and 2-digit minutes • Press RELEASE
To perform a Lamp Test (Cabinet and Remote Displays only):	• Dial ✳16 • Press RELEASE (refer to STATUS key operation)
To Access Trunk by Equipment Numbers:	• Dial ✳19 • Dial trunk equipment number • Make the call • Press RELEASE
To release a trunk by Trunk Emergency Release:	• Dial ✳20 • Dial the trunk equipment number • Press RELEASE

TABLE 5-1 (CONT'D)
ATTENDANT FUNCTIONS

Function	Action
To change Night Service assignment (Flexible Night Service):	• Dial ⁎21 • Dial the trunk equipment number • Dial the new Night Answer Point (2- or 3-digit station number) • Press RELEASE (refer to NIGHT SERVICE key operation)
To enable Message Registration and disable Restrictive Station Control:	• Dial ⁎22 • Dial the station equipment number • Dial 0 • Press RELEASE
To enable Restrictive Station Control and disable Message Registration:	• Dial ⁎22 • Dial the station equipment number • Dial 9 • Press RELEASE
To turn Call Block ON:	• Dial ⁎23 • Press RELEASE
To turn Call Block OFF:	• Dial ⁎24 • Press RELEASE
To display all stations with Message Waiting applied:	• Dial ⁎28 • Press RELEASE
To cancel all Message Waiting indications:	• Dial ⁎29 • Press RELEASE
To clear Alarms:	• Dial ⁎31 • Press RELEASE
To clear Alarms and Busy-Outs:	• Dial ⁎32 • Press RELEASE

TABLE 5-1 (CONT'D)
ATTENDANT FUNCTIONS

Function	Action
To Busy-Out a trunk:	• Dial ⁎41 • Dial the trunk equipment number • Press RELEASE
To Unbusy a trunk:	• Dial ⁎51 • Dial the trunk equipment number • Press RELEASE
To view Speed Call numbers:	• Dial ⁎60 • Dial required entry number (2-digit number in the range 10-69) • Press RELEASE
To program Speed Call numbers:	• Dial ⁎65 • Dial required entry number (10-69) • Press RELEASE
To program Auto Wake-up:	• Dial ⁎71 • Dial station number • Enter the new Wake-up time (HHMM) • Press RELEASE
To view Auto Wake-up:	• Dial ⁎72 • Dial station number • Press RELEASE
To print out Message Register Audit:	• Dial ⁎73 • Press RELEASE
To suspend the Printer:	• Dial ⁎75 • Dial ⁎ • Press RELEASE
To start the Printer after being suspended:	• Dial ⁎75 • Dial # • Press RELEASE
To suspend the Printer and purge the printer queues:	• Dial ⁎75 • Dial 0 • Press RELEASE

TABLE 5-1 (CONT'D)
ATTENDANT FUNCTIONS

Function	Action
To set the Date (displayed on the SUPERSET 4™ Set):	• Dial ⁎80 • Enter the date (DD/MM/YY)
To Dump Data:	• Dial ⁎97 • Dial the System Security Code
To Load Data:	• Dial ⁎98 • Dial the System Security Code

Note: ⁎ is used here as the Attendant Function Access Code.

SX-20®
TROUBLESHOOTING PROCEDURES AND GENERAL MAINTENANCE INFORMATION

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1
Basic Troubleshooting Philosophy 1

2. TROUBLESHOOTING AIDS 2
System Function Codes 2
Status Display Functions 4
Use of Status Display Functions to Determine Trunk Tip and Ring Status 9
Alarm Indications 9
Maintenance LEDs and Displays 29
Power Supply Voltage Checks 33

3. TROUBLESHOOTING PROCEDURES 38
Power Supply Voltage Checks 39
Troubleshooting Procedure Tables 39

APPENDIX A
TROUBLESHOOTING KIT A-1/2

APPENDIX B
LOOP CURRENT MEASUREMENT B-1

APPENDIX C
LOOP START VS GROUND START CHECK C-1

APPENDIX D
REMOTE DISPLAY D-1/2

APPENDIX E
SYSTEM OPERATION E-1

APPENDIX F
TROUBLE LOG AND ALARM LOG F-1

LIST OF ILLUSTRATIONS

FIGURE TITLE PAGE

2-1 CPU II Card 7
2-2 Function Display 8
2-3 Alarm Display 24

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LIST OF ILLUSTRATIONS (CONT'D)

FIGURE	TITLE	PAGE
2-4	Maintenance LEDs	30
2-5	Cabinet Call Status Display	31
2-6	Remote Call Status Display	34
2-7	SX-20 Attendant Console Display	35
2-8	Power Supply Block Diagram	37
2-9	Backplane Voltage Test Points	38
3-1	Troubleshooting Procedure	40
3-2	Major Alarm Fault Isolation	45

LIST OF TABLES

TABLE	TITLE	PAGE
2-1	Attendant Functions	5
2-2	Maintenance Functions	6
2-3	Function Access Point and Display Locations	8
2-4	Trunk Status Display (Command 990)	10
2-5	Station Status Display (Command 991)	14
2-6	System Status Display (Command 992)	17
2-7	Software Identity Display (Command 999)	22
2-8	Tip and Ring Status	23
2-9	Alarm Codes	25
2-10	Voltage Reference Points and Specifications	36
2-11	Backplane Voltage Connections	36
3-1	Information Collection and Preliminary Checks	41
3-2	SX-20 Completely Inoperative Troubleshooting Procedure	43
3-3	Major Alarm Fault Isolation Procedure	44
3-4	Problem Clarification Procedure	46
3-5	Problem Confirmation by Duplication Procedure	47
3-6	Problem Categorization Procedure	48
3-7	Trunk Interfacing Troubleshooting Procedure	49
3-8	Station Troubleshooting Procedure	53
3-9	Attendant Console Troubleshooting Procedure	55
3-10	Memory Troubleshooting Procedure	56
3-11	Speech Paths Troubleshooting Procedure	57
3-12	Peripherals Troubleshooting Procedure	58
3-13	Other Alarms	58
3-14	Remote Display Troubleshooting Procedure	59
3-15	Remote Maintenance, Administration and Test System (RMATS)	60

1. GENERAL

1.01 This Section contains detailed troubleshooting procedures and general maintenance information to assist field service engineers/installers in solving problems within the SX-20 system. This system includes:

- The SX-20 PABX
- The Central Office (CO) interface
- The telephone sets
- The AC power (including grounding)
- The user.

Reason for Issue

1.02 This Section has been issued to provide troubleshooting and general maintenance information for Generic 503.

1.03 Included in this Section are step-by-step procedures to aid field service personnel in solving any problem relating to the SX-20 system. Specific Sections which may be helpful when troubleshooting are:

- Section MITL9102-095-180-NA, Engineering Information for System Operation.
- Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.
- Section MITL9102-095-210-NA, System Programming Information.
- Section MITL9102-095-301-NA, Remote Maintenance, Administration, and Test System.

1.04 **Programming System Features.** The features of the SX-20 system are detailed in Section MITL9102-095-105-NA, Features Description. The features which are customer-programmable may also be referred to in Part Number 9180-095-205-NA, System Programming.

Basic Troubleshooting Philosophy

1.05 To troubleshoot a problem within this system, the following approach is recommended:

- **Clarify.** Ensure you understand the nature of the problem.
- **Confirm.** If possible, confirm the existence of the problem by duplication.

- **Isolate and Correct.** Use the troubleshooting procedures detailed in this Section to isolate and correct the problem.

1.06 The SX-20 PABX provides automatic diagnostics and other troubleshooting aids (refer to Part 2) which assist in pinpointing faults to specific parts of the system. The information and procedures contained in Part 3 should be sufficient to resolve most problems which may arise in the field.

1.07 Actual field repair of components on cards or power supplies is never done. All defective units should be returned to MITEL as per Section MITL9102-095-200-NA.

1.08 **Maintenance.** The SX-20 system contains no major moving parts and therefore requires little routine maintenance. The only item requiring periodic maintenance is the fan filter. The fan filter should be changed approximately every 12 to 18 months in a normal office environment, or if in a dusty environment checked every 6 months and changed then, if necessary.

2. TROUBLESHOOTING AIDS

2.01 This Part deals with certain functions which aid service personnel in identifying a problem. These troubleshooting aids are divided into the following categories:

- System Function Codes
- Status Display Functions
- Alarm Indications
- Maintenance LEDs and Displays.

System Function Codes

2.02 System Function Codes and their associated displays are used by maintenance personnel to assist in identifying specific problems. They may be accessed from the SX-20 Attendant Console or the Test Line. A visual indication of the status of the desired system function is also provided on the Call Status Display on the Attendant Console or on the numeric/time display provided on the equipment cabinet display and the remote status display (refer to Figure 2-2).

2.03 The accessible system functions can be divided into two groups: attendant system functions and maintenance system functions. Attendant system functions and maintenance system functions are listed, with their corresponding Function Codes, in Tables 2-1 and 2-2, respectively. It should be noted that attendant system functions may be accessed not only by the attendant, but also by maintenance or service personnel as a powerful troubleshooting aid. Likewise, maintenance system functions may be accessed by the attendant.

2.04 Access to any system function contained in Table 2-1 or Table 2-2 can be gained by using the SX-20 Attendant Console or the Test Line, and the following simple procedure:

- When using the SX-20 Attendant Console, a DTMF station connected to the Test Line (refer to Note), or a DTMF "Butt Set" connected to the Test Line, simply dial * followed by the 2-digit Function Code.

Note: When using the Test Line to access System Function Codes, the CPU II Card Switch 6 must be set to the OPEN position as shown in Figure 2-1.

- When using a rotary station connected to the Test Line, or a rotary butt set connected to the Test Line, simply dial the Attendant Access Code followed by the 2-digit System Function Code.

2.05 The location of the display is dependent upon which piece of equipment (the SX-20 Attendant Console or the set connected to the Test Line) is used to access a system function. The relationship between the display location and the access point is shown in Table 2-3. The configuration of these displays is shown in Figure 2-2.

2.06 **Maintenance System Function Codes.** Maintenance Codes associated with trunk circuits (Codes 19, 20, 41, and 51) and the system (Codes 27, 42-45 and 52-55) are described as follows:

- **Access Trunks by Equipment Number (Code 19 + Trunk Equipment Number).** This function gives a connection to the trunk equipment number dialed. If the trunk is busied-out (trunk LED lit) or idle (trunk LED dark), dial tone is received from the Central Office if facilities are connected. If the trunk is busy (trunk LED lit), busy tone is heard. A busied-out trunk accessed in this way remains busied-out.

- **Trunk Emergency Release (Code 20 + Trunk Equipment Number).** This procedure is designed to release an occupied trunk and therefore should be used with caution. The trunk with the equipment number dialed is now free, and may be used.

Note: This code cannot be used to release a busied-out trunk.

- **Busy Out Trunk (Code 41 + Trunk Equipment Number).** The trunk is busied-out and its associated Trunk Status LED remains on solid. The trunk can only be accessed from the Attendant Console, or the Test Line, using Attendant Function 19. If the trunk is busy when this code is used, it is not busied-out until it is idle. The Equipment Busied LED flashes as long as the trunk is busied-out.

- **Unbusy Trunk (Code 51 + Trunk Equipment Number).** The trunk is unbusied using this function. The Trunk Status LED may

remain lit for up to 45 seconds, after which time the trunk is idle and may be accessed in the normal way.

- **Access Speech Path by Equipment Number (Code 27 + Speech Path Number).** This function provides a connection to the speech path number dialed. If the speech path is busy, busy tone is heard. If the path is idle, dial tone is not returned even though the junctor is accessed.

- **Busy Out DTMF Generator (Code 42).** Busying out the DTMF generator causes the diagnostics to bypass all tests that make use of it. The Equipment Busied LED flashes indicating that a system resource is busied-out.

- **Unbusy DTMF Generator (Code 52).** The diagnostics may now do tests that involve the DTMF generator. The Equipment Busied LED is dark if the generator was the only resource busied.

- **Busy Out DTMF Receiver (Code 43 + DTMF Receiver Number).** Refer to Busy Out Speech Path.

- **Busy Out Dial Tone Detector (Code 44 + Dial Tone Detector Number).** Refer to Busy Out Speech Path.

- **Busy Out Speech Path (Code 45 + Speech Path Number).** The procedure for busying out each of the above resources is the same. If a resource is being used by another party, it is busied-out as soon as it becomes idle; otherwise, it is busied-out immediately. If the resource is being used by the party dialing the busy-out code, it cannot be busied-out. When any resource is busied-out, the Equipment Busied LED flashes.

- **Unbusy DTMF Receiver (Code 53 + DTMF Receiver Number).** Refer to Unbusy Speech Path.

- **Unbusy Dial Tone Detector (Code 54 + Dial Tone Detector Number).** Refer to Unbusy Speech Path.

- **Unbusy Speech Path (Code 55 + Speech Path Number).** The procedure for unbusying each of the above resources is the same. After dialing the required Code and equipment number, the resource is idle. The Equipment Busied Led is dark when the last busied-out resource releases.

Status Display Functions

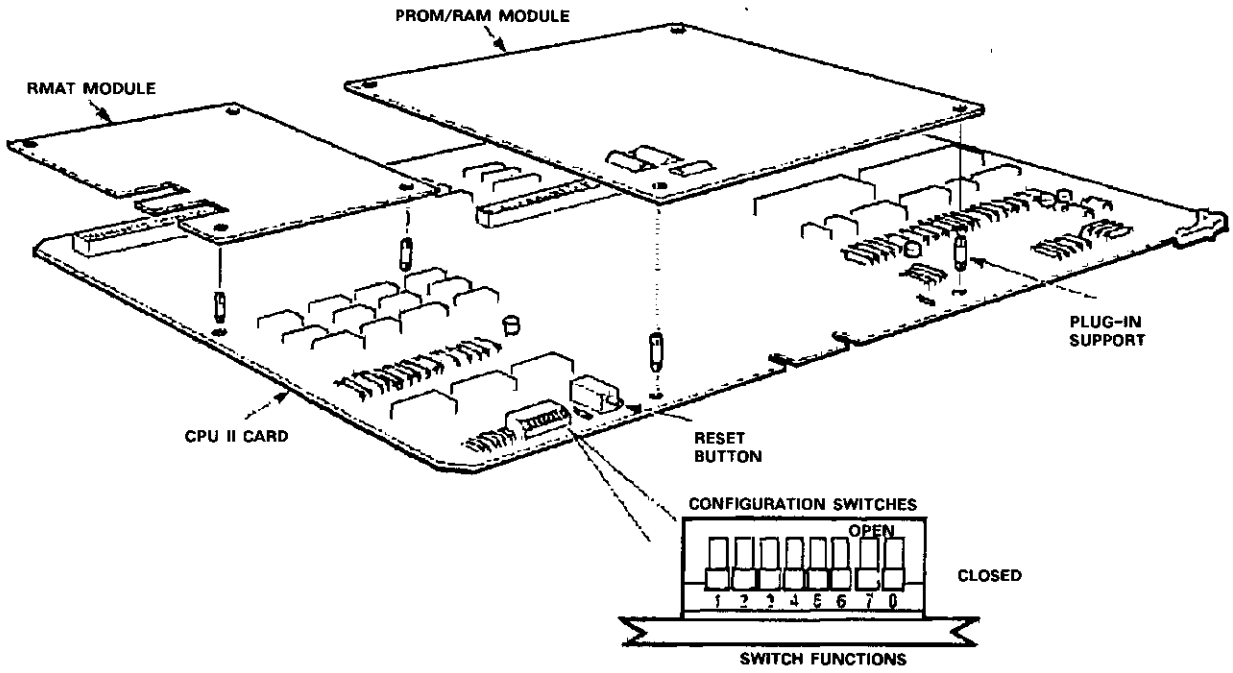
2.07 There are four Maintenance Display Functions that may be accessed in the same manner as the Maintenance System Function Codes. These display functions are designed to provide maintenance personnel with information regarding the status of the SX-20 equipment, to assist in troubleshooting a system problem. These four functions are:

TABLE 2-1
ATTENDANT FUNCTIONS

Attendant System Functions	Code
Night Service - ON	⁎11
Night Service - OFF	⁎12
Identifying and Resetting Alarms	⁎13
Set 12-Hour Clock	⁎14 + 2-digit hours, 2-digit minutes
Set 24-Hour Clock	⁎15 + 2-digit hours, 2-digit minutes
Lamp Test (Cabinet and Remote Display only)	⁎16
Access Trunk by Equipment Number	⁎19 + Trunk Equipment Number
Trunk Emergency Release	⁎20 + Trunk Equipment Number
Flexible Night Service	⁎21 + Trunk Equipment Number + New Night Answer Point Station Number
Message Registration/Restrictive Station Control	⁎22 + Station Number
Call Block - ON	⁎23
Call Block - OFF	⁎24
Display of all Stations with Message Waiting Applied (Console and Remote Display)	⁎28
Cancel All Message Waiting	⁎29
Busy Out Trunk	⁎41 + Trunk Equipment Number
Unbusy Trunk	⁎51 + Equipment Number
To view Speed Dial Numbers Programmed at the Console	⁎60 + two digits in the range 10 - 69
To program Speed Dial Numbers for the Console	⁎65 + two digits in the range 10 - 69
To program the Automatic Wake-up Time for a Station	⁎71 + Station Number
To view the Automatic Wake-up Time for a Station	⁎72 + Station Number
Message Registration Audit	⁎73
Printer-Suspend	⁎75 + ⁎
Purge	⁎75 + 0
Resume	⁎75 + #
Set Date at the Console (Displayed on the SUPERSET™ set)	⁎80 + DD-MM-YY

TABLE 2-2
MAINTENANCE FUNCTIONS

Maintenance System Function	Code
Identifying and Resetting Alarms	⁎13
Lamp Test (Cabinet and Remote Display only)	⁎16
Access Trunk by Equipment Number	⁎19 + Trunk Equipment Number
Trunk Emergency Release	⁎20 + Trunk Equipment Number
Access Speech Path by Equipment Number	⁎27 + Speech Path Number
Alarm Clear/Cancel Alarm Indications	⁎31
Cancel All Alarms, Alarm Indicators and Busy-outs	⁎32
Busy Out Trunk	⁎41 + Trunk Equipment Number
Busy Out DTMF Generator	⁎42
Busy Out DTMF Receiver	⁎43 + DTMF Receiver Number
Busy Out Dial Tone Detector	⁎44 + Dial Tone Detector Number
Busy Out Speech Path	⁎45 + Speech Path Number
Unbusy Trunk	⁎51 + Trunk Equipment Number
Unbusy DTMF Generator	⁎52
Unbusy DTMF Receiver	⁎53 + DTMF Receiver Number
Unbusy Dial Tone Detector	⁎54 + Dial Tone Detector Number
Unbusy Speech Path	⁎55 + Speech Path Number
Data Dump	⁎97 + System Security Code
Data Load	⁎98 + System Security Code
System Status - Trunks	#990⁎
System Status - Stations	#991⁎
System Status - System	#992⁎
System Status - Identity	#999⁎



1	OPEN	- WALL-MOUNT DISPLAY ORIENTATION
	CLOSED	- DESK-MOUNT DISPLAY ORIENTATION
2	OPEN	- AUTOMATIC DIAGNOSTICS INHIBIT
	CLOSED	- AUTOMATIC DIAGNOSTICS ENABLE
3	RESERVED	- SET SWITCH TO CLOSED
4	RESERVED	- SET SWITCH TO CLOSED
5	RESERVED	- SET SWITCH TO CLOSED
6	OPEN	- EQUIPMENT NUMBER 01-TEST LINE
	CLOSED	- EQUIPMENT NUMBER 01-STATION
7	OPEN	- 2-DIGIT DEFAULT STATION NUMBERING (10-41)
	CLOSED	- 3-DIGIT DEFAULT STATION NUMBERING (100-171)
8	OPEN	- PROGRAM AND REVIEW CUSTOMER DATA
	CLOSED	- REVIEW (ONLY) CUSTOMER DATA

X6088R1

Figure 2-1 CPU II Card

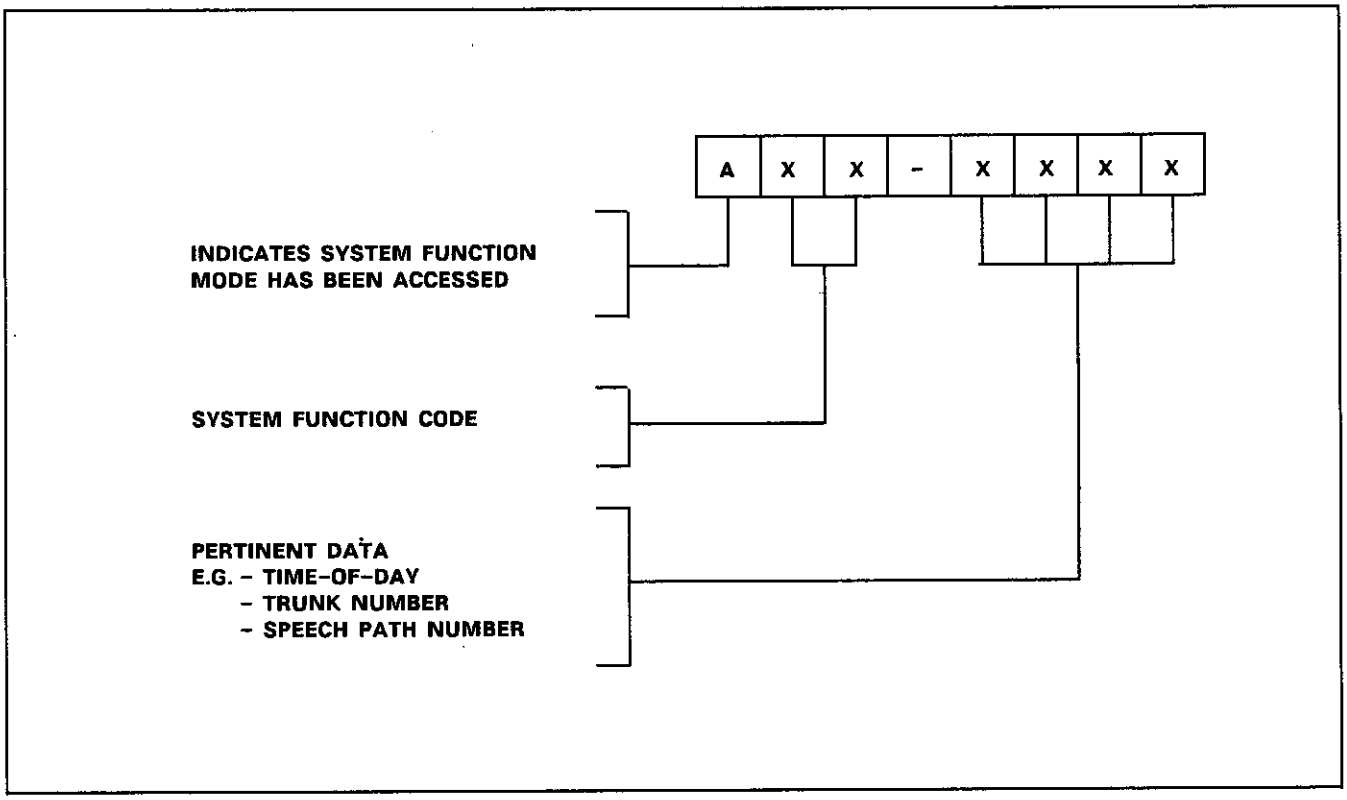


Figure 2-2 Function Display

TABLE 2-3
FUNCTION ACCESS POINT AND DISPLAY LOCATIONS

System Function Access Point	Display Location		
	SX-20 Console	Remote Display	Equipment Cabinet
Attendant Console	Yes	No	No
Test Set	N/A	Yes	Yes

- Trunk Status Display Function
- Station Status Display Function
- System Status Display Function
- Software Identity Display Function.

2.08 Access to the maintenance display functions can be gained by using the console or the Test Line, and following the simple procedure outlined at the beginning of each table. A detailed description of the data contained in each register when these special functions are accessed is contained in the following tables:

- Table 2-4, Trunk Status Display (Command 990)
- Table 2-5, Station Status Display (Command 991)
- Table 2-6, System Status Display (Command 992)
- Table 2-7, Software Identity Display (Command 999).

Use of Status Display Functions to Determine Trunk Tip and Ring Status

2.09 To demonstrate the capabilities of the system status functions, the following example of how the Trunk Status Display Function is used to determine Trunk Tip and Ring status has been provided:

1. From the console, access Command 990. Using Register 1, select the trunk circuit. Advance to Register 5 to display Trunk Circuit Forward Current Status (Bit F).

2. From a station, seize the trunk circuit. This may require busying out other trunks in that trunk group to ensure the station seizes the correct trunk.

3. After seizure of the trunk, update the display by depressing "#" from the console or redialing the register number.

4. Check the forward current status. Forward current must be present after seizure, otherwise there is an error condition on Tip and/or Ring.

5. Refer to Table 2-8, which shows the status of forward and reverse current for the correct Trunk Start mode and a number of error conditions on Tip and Ring, after trunk seizure.

Alarm Indications

2.10 The SX-20 system continuously checks its own operation by employing power-up diagnostics or automatic diagnostics. (Refer to Section MITL9102-095-180-NA, Engineering Information, for a full description of diagnostic routines.) Should either of these diagnostic routines detect a malfunction, or if an abnormal condition is detected, an alarm is raised.

TABLE 2-4
TRUNK STATUS DISPLAY (COMMAND 990)

Note: To display specific information related to each trunk, dial **#990**✳. If the status of the register changes (while viewing), then the technician must redial the register number to update the contents of the register.

REGISTER 1

1	X	X					
A	B	C	D	E	F	G	H

A	**Register Number**
B,C	**Trunk Equipment Number** XX = 01 → 12
D,E,F, G,H	**Not Used**

REGISTER 2

2	X	X	Y	Y		Z	Z
A	B	C	D	E	F	G	H

A	**Register Number**
B,C	**Call Processing State Number** XX = 88 if device is executing maintenance procedures
D, E	**Call Processing Substate Number** YY = 88 if device is executing maintenance procedures
F	**Delimiter** Blank delimiter automatically inserted
G,H	**Peripheral Processing State Number** Applicable to MITEL personnel only

TABLE 2-4 (CONT'D)
TRUNK STATUS DISPLAY (COMMAND 990)

REGISTER 3

3	X	X		Y		Z	
A	B	C	D	E	F	G	H

A	**Register Number**
B,C	**Speech Path Number** XX = 01 → 12
D	**Delimiter** Blank delimiter automatically inserted
E	**DTMF Receiver Number** Y = 1 → 4
F	**Delimiter** Blank delimiter automatically inserted
G	**Dial Tone Detector Number** Z = 1 → 3
H	**Not Used**

Note: A display of – or –– indicates that the device is not equipped.

REGISTER 4

4	M	M	M		N	N	N
A	B	C	D	E	F	G	H

A	**Register Number**
B,C,D	**Device Directory Number Connected to Trunk (First Party)** (Blank if none)
E	**Delimiter** Blank delimiter automatically inserted
F,G,H	**Device Directory Number Connected to Trunk (Second Party)** (Blank if none)

TABLE 2-4 (CONT'D)
TRUNK STATUS DISPLAY (COMMAND 990)

REGISTER 5

5		M	S	X	C		
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C	**Presence of Trunk Module** M = 0 if Absent = 1 if Present
D	**Trunk Start Type** S = 0 if Loop Start = 1 if Ground Start
E	**XT Lead Status** X = 0 if Not Grounded = 1 if Grounded
F	**Forward Current Condition (not applicable during ringing)** C = 0 if Absent = 1 if Present (Ring more negative than Tip)
G,H	**Not Used**

TABLE 2-4 (CONT'D)
TRUNK STATUS DISPLAY (COMMAND 990)

REGISTER 6

6		C	A	T	R		
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C	**Reverse current condition (not applicable during ringing)** C = 0 if Absent = 1 if Present (Tip more negative than Ring)
D	**Applied Ringing** A = 0 if Absent = 1 if Present (from CO)
E	**Tip Condition** T = 0 if Not Grounded = 1 if Grounded
F	**Ring Condition** R = 0 if Not Grounded = 1 if Grounded
G,H	**Not Used**

TABLE 2-5
STATION STATUS DISPLAY (COMMAND 991)

Note: To display specific information related to each station, dial **#991**✳. If the status of the register changes (while viewing), then the technician must redial the register number to update the contents of the register.

REGISTER 1

1	X	X					
A	B	C	D	E	F	G	H

A	**Register Number**
B,C	**Station Equipment Number** XX = 01 → 72
D,E,F,G,H	**Not Used**

REGISTER 2

2	X	X	Y	Y		Z	Z
A	B	C	D	E	F	G	H

A	**Register Number**
B,C	**Call Processing State Number** XX = 88 if device is executing maintenance functions
D,E	**Call Processing Substate Number** YY = 88 if device is executing maintenance functions
F	**Delimiter** Blank delimiter automatically inserted
G,H	**Peripheral Processing State Number** Applicable to MITEL personnel only

TABLE 2-5 (CONT'D)
STATION STATUS DISPLAY (COMMAND 991)

REGISTER 3

3	X	X		Y		Z	W
A	B	C	D	E	F	G	H

A	**Register Number**
B,C	**Speech Path Number** XX = 01 → 12
D	**Delimiter** Blank delimiter automatically inserted
E	**DTMF Receiver Number** Y = 1 → 4
F	**Delimiter** Blank delimiter automatically inserted
G	**Dial Tone Detector Number** Z = 1 → 3
H	**Not Used**

Note: A display of - or -- indicates that the device is not equipped.

REGISTER 4

4	M	M	M		N	N	N
A	B	C	D	E	F	G	H

A	**Register Number**
B,C,D	**Device Directory Number Connected to Station (First Party)** (Blank if none)
E	**Delimiter** Blank delimiter automatically inserted
F,G,H	**Device Directory Number Connected to Station (Second Party)** (Blank if none)

TABLE 2-5 (CONT'D)
STATION STATUS DISPLAY (COMMAND 991)

REGISTER 5

5		S	1	X	Y		
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C	**Station Condition** S = 0 if On-hook = 1 if Off-hook (SUPERSET sets always indicate a 1)
D	**Presence of Line Card** 0 = Absent 1 = Present
E	**EGB (Earth Ground Button)** X = 0 if EGB inactive = 1 if EGB active
F	**Loop Current (Valid only if the SUPERSET Line Card is installed)** Y = 0 if < 25 mA = 1 if > 25 mA
G,H	**Not Used**

REGISTER 6

6		0	0	0	X		
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C,D,E	**Reserved**
F	**Presence of the SUPERSET Line Card (SX-20 only)** X = 0 if Absent = 1 if Present
G,H	**Not Used**

TABLE 2-6
SYSTEM STATUS DISPLAY (COMMAND 992)

Note: To display specific information related to the system, dial **#992*.** If the status of the register changes (while viewing), then the technician must redial the register number to update the contents of the register.

REGISTER 1

1		X	X	X	X	X	X
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C	**Status of Speech Path 1** 0 = Idle 1 = Busy 2 = Busied-Out
D	**Status of Speech Path 2** 0 = Idle 1 = Busy 2 = Busied-Out
E	**Status of Speech Path 3** 0 = Idle 1 = Busy 2 = Busied-Out
F	**Status of Speech Path 4** 0 = Idle 1 = Busy 2 = Busied-Out
G	**Status of Speech Path 5** 0 = Idle 1 = Busy 2 = Busied-Out
H	**Status of Speech Path 6** 0 = Idle 1 = Busy 2 = Busied-Out

TABLE 2-6 (CONT'D)
SYSTEM STATUS DISPLAY (COMMAND 992)

REGISTER 2

2		X	X	X	X	X	X
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C	**Status of Speech Path 7** 0 = Idle 1 = Busy 2 = Busied-Out
F	**Status of Speech Path 8** 0 = Idle 1 = Busy 2 = Busied-Out
G	**Status of Speech Path 9** 0 = Idle 1 = Busy 2 = Busied-Out
F	**Status of Speech Path 10** 0 = Idle 1 = Busy 2 = Busied-Out
G	**Status of Speech Path 11** 0 = Idle 1 = Busy 2 = Busied-Out
H	**Status of Speech Path 12** 0 = Idle 1 = Busy 2 = Busied-Out

TABLE 2-6 (CONT'D)
SYSTEM STATUS DISPLAY (COMMAND 992)

REGISTER 3

3		X	X	X	X		
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C	**Status of DTMF Receiver 1** 0 = Idle 1 = Busy 2 = Busied-Out - = Receiver Not Equipped
D	**Status of DTMF Receiver 2** 0 = Idle 1 = Busy 2 = Busied-Out - = Receiver Not Equipped
E	**Status of DTMF Receiver 3** 0 = Idle 1 = Busy 2 = Busied-Out - = Receiver Not Equipped
F	**Status of DTMF Receiver 4** 0 = Idle 1 = Busy 2 = Busied-Out - = Receiver Not Equipped
G,H	**Not Used**

TABLE 2-6 (CONT'D)
SYSTEM STATUS DISPLAY (COMMAND 992)

REGISTER 4

4		X	X	X			
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C	**Status of Dial Tone Detector 1** 0 = Idle 1 = Busy 2 = Busied-Out
D	**Status of Dial Tone Detector 2** 0 = Idle 1 = Busy 2 = Busied-Out
E	**Status of Dial Tone Detector 3** 0 = Idle 1 = Busy 2 = Busied-Out
F	**Delimiter** Blank delimiter automatically inserted
G,H	**Not Used**

TABLE 2-6 (CONT'D)
SYSTEM STATUS DISPLAY (COMMAND 992)

REGISTER 5

5		N					
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C	**Running Diagnostic Test** N = 0 – No Test is Running = 1 – Memory Checksum = 2 – RAM Diagnostics = 3 – Basic Junctor Diagnostics = 4 – Junctor Short Diagnostics = 5 – Line/Trunk Junctor Connection Diagnostics = 6 – Dial Tone Detector Diagnostics = 7 – MF Receiver/Generator Diagnostics
D,E,F, G,H	**Not Used**

TABLE 2-7
SOFTWARE IDENTITY DISPLAY (COMMAND 999)

Note: To display the Software Identity, dial **#999**✳.

REGISTER 1

1		X	X	X		Y	Y
A	B	C	D	E	F	G	H

A	**Register Number**
B	**Delimiter** Blank delimiter automatically inserted
C,D,E	**Software Generic Number**
F	**Delimiter** Blank delimiter automatically inserted
G,H	**Software Revision Number**

TABLE 2-8
TIP AND RING STATUS
USING TRUNK STATUS DISPLAY TO CHECK STATUS ON TIP & RING

- Using Command 990, Registers 5 and 6, Bit C
- Update display after attempting to seize trunks

CO Tip & Ring Status	Loop-Start Mode			Ground Start Mode		
	Alarm	For. Cur.	Rev. Cur.	Alarm	For. Cur.	Rev. Cur.
Normal Condition	No Alarm	1 Present	0 Absent	No Alarm	1 Present	0 Absent
Tip Open	AL10XX	1 Present	0 Absent	AL11XX	1 Present	0 Absent
Ring Open	AL10XX	0 Absent	0 Absent	AL11XX	0 Absent	1 Present
T & R Open	AL10XX	0 Absent	0 Absent	AL11XX	0 Absent	0 Absent
T & R Reversed	No Alarm	0 Absent	1 Present	AL11XX	0 Absent	1 Present
T & R Shorted	AL10XX	0 Absent	0 Absent	AL11XX	0 Absent	0 Absent

Notes: 1. In general, after attempting to seize a particular trunk and then checking the forward current status, forward current must be "PRESENT", otherwise there is an error condition on Tip and/or Ring.

2. In all error conditions, except Tip and Ring reversed in loop-start operation, the PABX rings in an "alarm" and "busies out" the particular trunk circuit after the time-out period.

3. The alarm can be cleared using Maintenance Function "*31". The Maintenance Function *51 + Trunk Number unbusies the particular trunk only after the error condition has been removed.

2.11 Two general types of alarms may be reported. A major alarm indicates the existence of a malfunction which does not allow the PABX to operate satisfactorily. The other general alarm type is a Minor Alarm, which is used to indicate the presence of a fault which does not degrade PABX operation appreciably.

2.12 If a Major Alarm occurs, it is indicated immediately by the illumination of a Major Alarm LED on the SX-20 Attendant Console, or by the flashing of AL next to the time-of-day on the numeric display (equipment cabinet display or remote cabinet display). The occurrence of a Minor Alarm flashes the ALARM key LED on the SX-20 Attendant Console and rings the bell. A Minor Alarm LED is also provided, which flashes until recognized and then remains solidly lit until the alarm is cleared or stored.

2.13 A Minor Alarm also causes AL to appear in the last two positions of the 8-digit displays located at the equipment cabinet display and the remote status display.

2.14 A Minor Alarm is identified as follows. When the ALARM key is pressed on the SX-20 Attendant Console, the alarm is displayed (refer to Figure 2-3) in the Call Status Display as long as the ALARM key remains depressed. The alarm is displayed in the Call Status Display (Figure 2-3) on the Cabinet and/or the Remote Display as long as the Test Line remains off-hook.

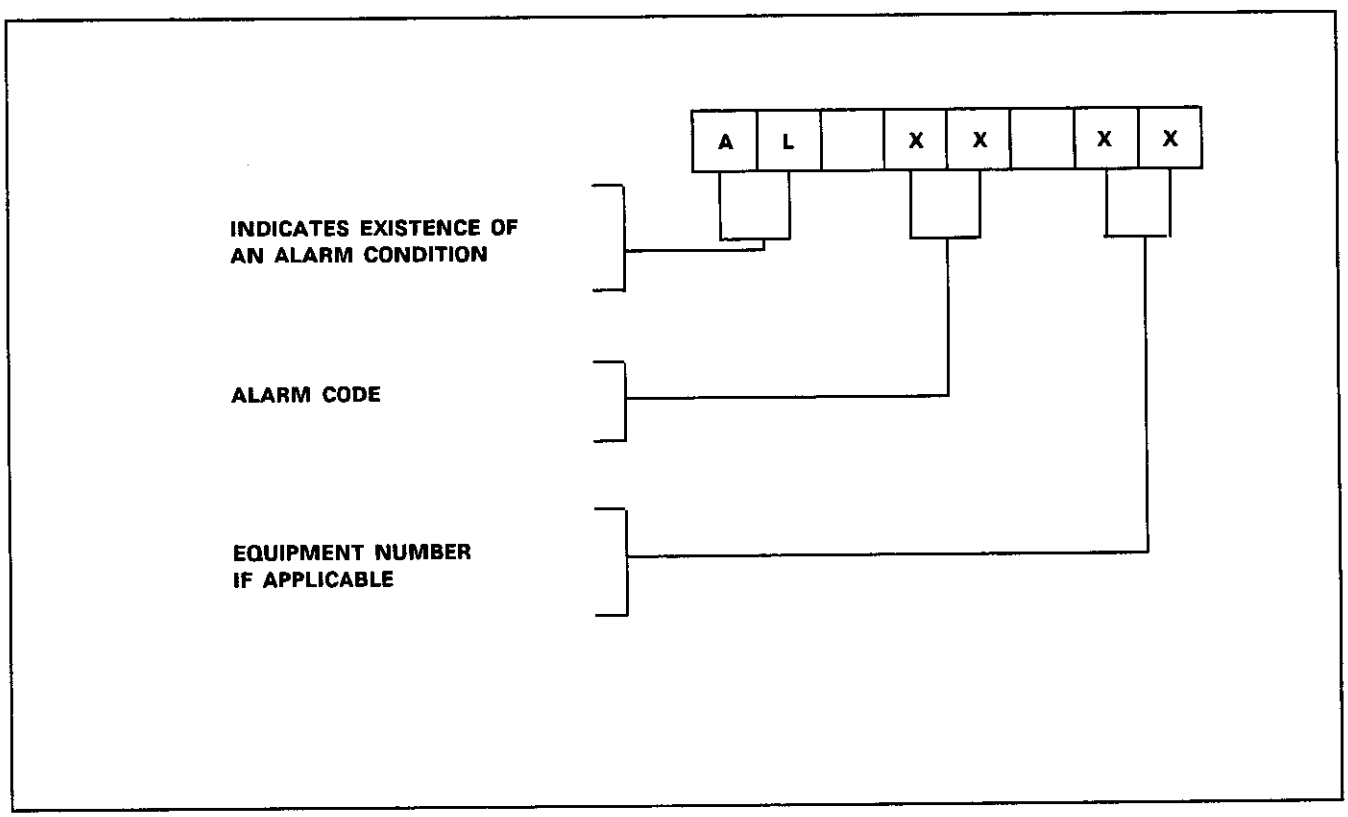


Figure 2-3 Alarm Display

TABLE 2-9
ALARM CODES

SECTION A - Major Alarm Codes			
Code Display	**Category**	**Cause**	**Required Action (refer to Note)**
-------0	Power-up Diagnostics Test	Checksum error in peripheral processor PROM.	Refer to Table 3-3.
-------1	Power-up Diagnostics Test	Checksum error in call processor PROM.	Refer to Table 3-3.
-------2	Power-up Diagnostics Test	Failure in volatile RAM comprehensive test.	Refer to Table 3-3.
SECTION B - Minor Alarm Codes			
Code Display	**Category**	**Cause**	**Required Action**
AL 01	Power-up Diagnostics Test	Failure in non-volatile RAM comprehensive test.	Refer to Table 3-10.
AL 02	Power-up or Automatic Diagnostics Test	Checksum error in non-volatile RAM test.	Refer to Table 3-10.
AL 03	Automatic Diagnostics Test	Failure in volatile RAM Read/Write test. No further alarms are generated until the diagnostics are restarted.	Refer to Table 3-10.
AL 04	Automatic Diagnostics Test	Checksum error in peripheral processor PROM.	Refer to Table 3-10.
AL 05	Automatic Diagnostics Test	Checksum error in call processor PROM.	Refer to Table 3-10.

TABLE 2-9 (CONT'D)
ALARM CODES

SECTION B - Minor Alarm Codes (Cont'd)			
Code Display	**Category**	**Cause**	**Required Action (refer to Note)**
AL 10 XX	Trunk Condition (No loop current detected on outgoing trunk XX)	Open on trunk line. Slow Central Office. Ground start/loop-start switch set incorrectly. Trunk Module malfunction.	Unbusy trunk, access trunk by equipment number (refer to Attendant Console Guide, Part Number 9180-953-101-NA). If unable to seize, check for open circuit, battery feed, etc, using Status Display Function - Trunks (Command Number 990). If fault still persists, replace Trunk Module. If fault persists, call the telephone company. Refer to Table 3-7.
AL 11 XX	Trunk Condition (No seize acknowledge when trunk XX seized)	As above for AL 10 XX.	As above for AL 10 XX.
AL 12 XX	Trunk Condition (No release acknowledge given when trunk XX is released)	Central Office interface problem. Trunk Module malfunction.	As above for AL 10 XX.
AL 15 XX	Station XX Ring Ground Fault Detected	Ground on Ring side at Station	Check for ground on Ring Side at Station: MDF wiring, replace line card.
AL 20 XX	Automatic Diagnostics Test	Speech path number XX is stuck low and busied-out.	Refer to Table 3-11.
AL 21 XX	Automatic Diagnostics Test	Speech path number XX is stuck high, and busied-out.	Refer to Table 3-11.

TABLE 2-9 (CONT'D)
ALARM CODES

SECTION B - Minor Alarm Codes (Cont'd)			
Code Display	**Category**	**Cause**	**Required Action (refer to Note)**
AL 22 XX and AL 22 YY	Automatic Diagnostics Test	Speech path number XX found shorted to speech path number YY, and both speech paths busied-out.	Refer to Table 3-11.
AL 23 XX	Automatic Diagnostics Test	Speech path number XX failure as a result of a dial tone detector test.	Refer to Table 3-11.
AL 30 XX	Automatic Diagnostics Test	Unable to connect a speech path to line XX.	Refer to Table 3-11.
AL 31 XX	Automatic Diagnostics Test	Unable to connect a speech path to trunk XX.	Refer to Table 3-11.
AL 40 OX	Automatic Diagnostics Test	Dial tone detector X failure, and detector busied-out.	Refer to Table 3-12.
AL 41 OX	Automatic Diagnostics Test	DTMF Generator X failure and generator busied-out.	Refer to Table 3-12.
AL 42 OX	Automatic Diagnostics Test	DTMF Receiver X failure and receiver busied-out.	Refer to Table 3-12.
AL 50	Power-Up Diagnostics Test	Power fail and reset caused by internal malfunction (not external power source interruption).	Refer to Table 3-13.
AL 63 nn		Software Alarm where nn is the high byte address where the error occurred.	

TABLE 2-9 (CONT'D)
ALARM CODES

SECTION B - Minor Alarm Codes (CONT'D)			
Code Display	**Category**	**Cause**	**Required Action (see Note)**
AL 64 dd	Software Alarm	dd is the data ID.	Contact the nearest authorized MITEL dealer.
AL 73	SX-20 Attendant Console	SX-20 Attendant Console UART malfunction.	Refer to Table 3-9.
AL 80 XX	Trunk Alarm	Trunk XX hang-up detected.	No action; system clears alarm automatically.
AL 90 NN	Data Dump/Load Error	Reader error NN = 00 = Illegal generic 01 = Load not possible 02 = Header Checksum Error 03 = Parity/Frame Error 04 = Overrun Error	Check tape for correct data Execute the Data Dump again. More End-of-Line nulls are required, refer to Section MITL9102-095-210-NA (Command 601, Register 7).
AL 91	Printer Alarm	Printer Inoperative	Troubleshoot Printer according to the Printer Operating Manual.
AL 92	Printer Alarm	Printer Queue Full	Enable printer (*75#) or Enable printer and Purge the queue (*750).

Note: Action normally taken is as noted but fault may also occur due to other causes.

2.15 Table 2-9 lists all the Alarm Codes which might be displayed, the area which the malfunction was detected in, plus the possible cause of the alarm.

2.16 Identify and Store Alarm Data (Code 13). This system function allows the attendant or maintenance personnel to determine the cause of an alarm and to record it in the PABX memory for review at a later time. Up to eight entries are stored in the memory at one time, utilizing a first-in, last-out configuration. That is, the first entry would be the last entry read from the memory, with more recent alarm

data being read first. Should there be more than eight entries, only the most recent eight are retained, while the older entries are lost.

2.17 **Identify an Alarm and Cancel Alarm Data (Code 31).** This system function allows the attendant or maintenance personnel to determine the cause of an alarm and cancel or delete it from system memory.

2.18 By dialing any digit after viewing and deleting the current alarm, it is possible to view and delete a previously entered Alarm Code. All Alarm Codes stored (maximum of eight) may be viewed and deleted in this manner. When all alarm data has been displayed and deleted the display shows dashes.

Note: Since the alarm indications and data are no longer retained by the system memory, it is strongly recommended that each alarm indication and data is recorded in an alarm log for future use by repair or maintenance personnel (refer to Appendix F).

2.19 **Cancel All Alarm Data, Alarm Indications, and Busy-Outs (Code 32).** This system function allows the attendant or maintenance personnel to:

- Delete from the PABX the retention of any alarm data stored.
- Clear any alarm indications present or any busy-out conditions which may exist at that time.

Automatic system diagnostics are then restarted.

Maintenance LEDs and Displays

2.20 The SX-20 system not only has self-diagnostics which assist installation and repair personnel, but also includes visual indications or displays to aid in rapidly locating faults. These displays consist of maintenance LEDs provided on the PCBs (Printed Circuit Boards) and a combination of 7-segment displays and LEDs located on the SX-20 Attendant Console, Remote Display, Call Status Display and the Equipment Cabinet Display.

2.21 **Maintenance LEDs.** The maintenance LEDs are mounted on the CPU II Card and Miscellaneous Card (refer to Figure 2-4) and perform the following functions:

(a) **Power ON/OFF LED.** This LED is located on the CPU II Card next to the switchbank, and, when lit, indicates that the +5 V power supply is energized and operating satisfactorily.

(b) **Watchdog Timer LED.** This LED is located on the CPU II Card next to the RESET button. During normal system operation, the Watchdog Timer monitors the system to ensure that it is functioning correctly. If a malfunction is detected in the system Central Processing area, the Watchdog LED lights and the soft-

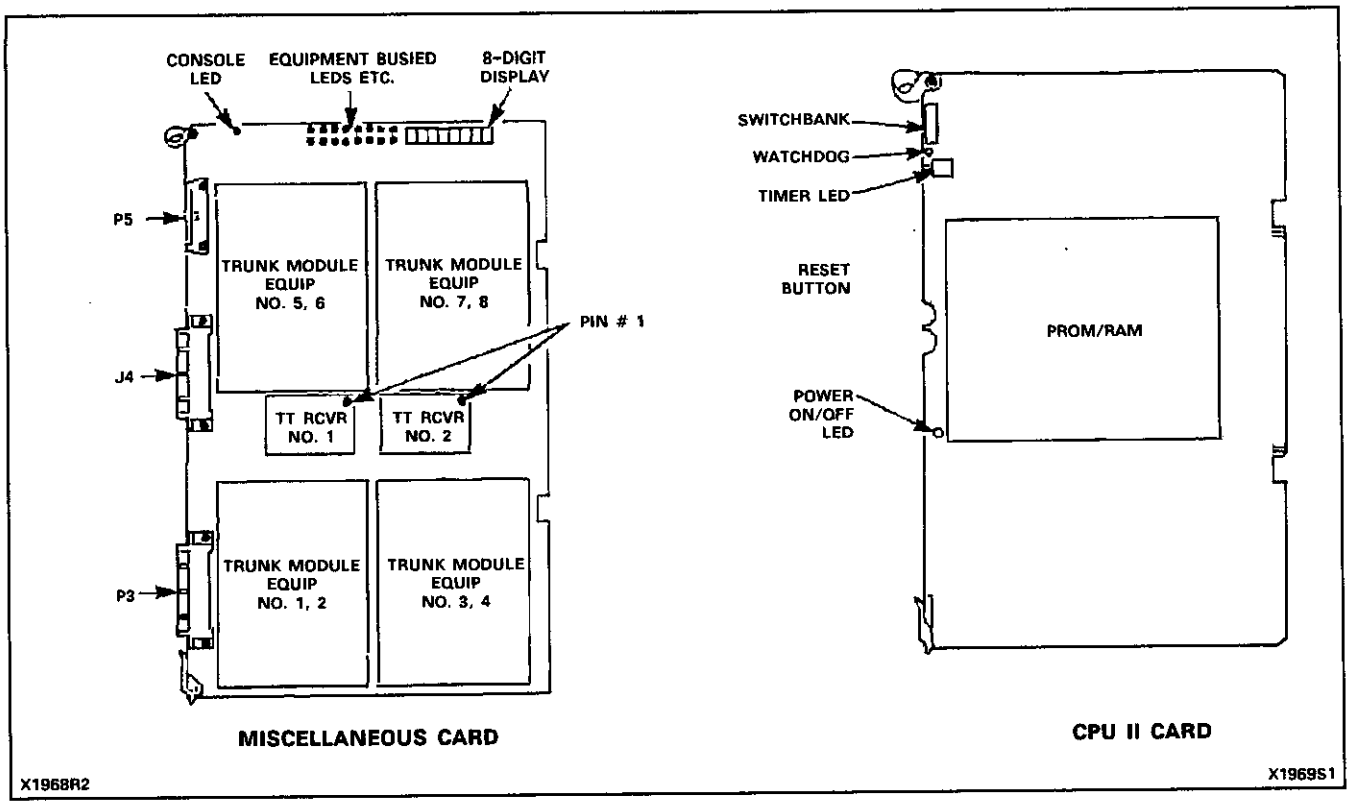


Figure 2-4 Maintenance LEDs

ware is restarted. If the malfunction is not cleared, the LED flashes continuously.

(c) **Equipment Busied (EB) LED.** This LED is located on the Miscellaneous Card in the Cabinet Status Display, the Remote Display and the SX-20 Attendant Console. During normal operation, the system continuously checks itself to ensure that all circuits are operating correctly. Should the automatic diagnostics detect a faulty resource, an alarm is reported, the resource is busied-out and the EB LED flashes. The LED flashes for manual busy-outs as well.

2.22 **Equipment Displays.** Located on the SX-20 Attendant Console, the equipment cabinet and on the Remote Status Display, are LEDs and numeric displays which are used to indicate the presence of various operating conditions (refer to Figures 2-5 through 2-7). These indicators, as well as their meanings when illuminated, are listed below. Unless otherwise specified, the indicator is provided on all three displays.

- **Major Alarm LED.** This LED indicates the existence of a fault which halts operation of the PABX.

- **Minor Alarm LED.** This LED indicates the existence of a fault (detected during automatic diagnostics), which does not degrade PABX operation appreciably.

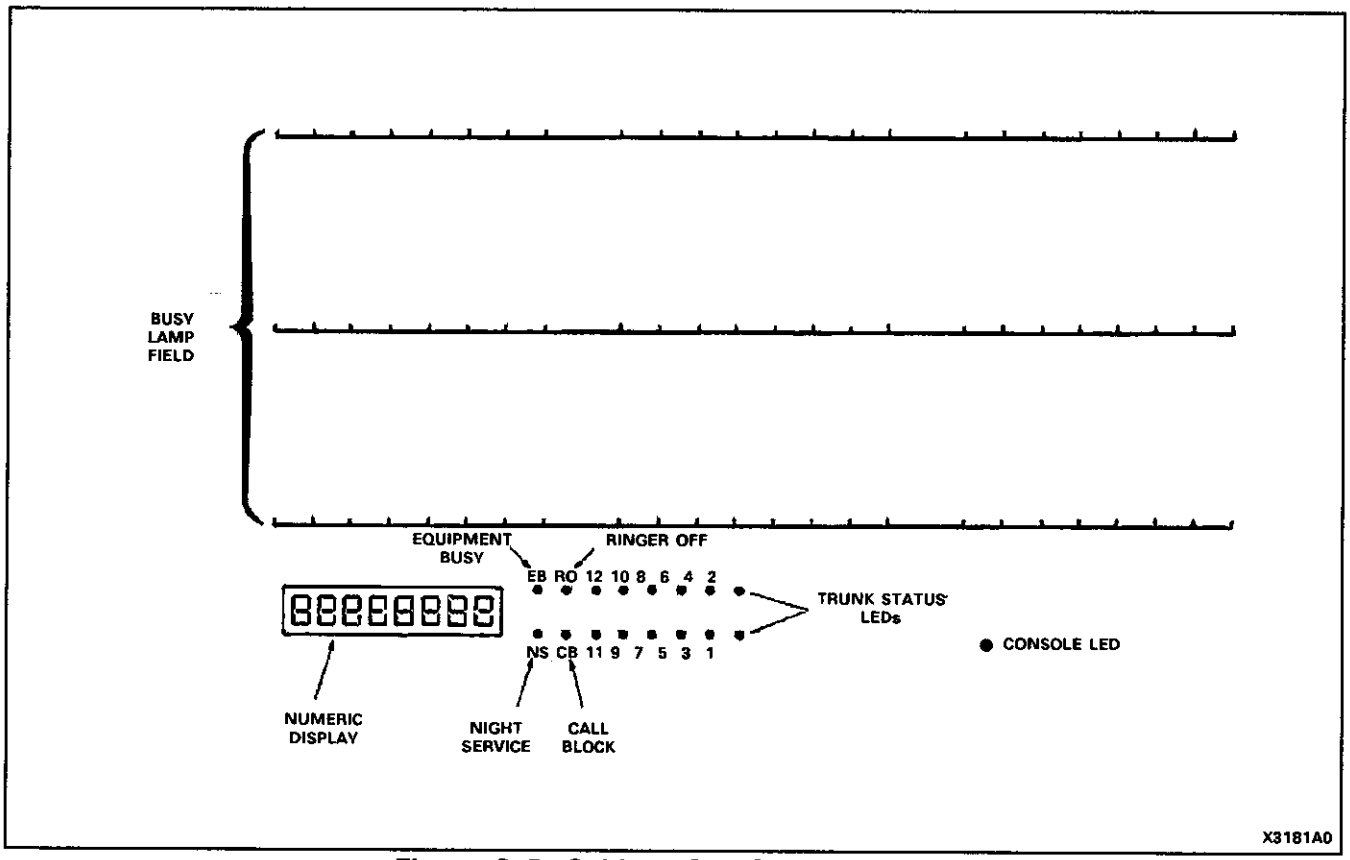


Figure 2-5 Cabinet Call Status Display

- **Console Alarm LED.** Indicates the existence of a fault within the SX-20 Attendant Console circuitry.

- **Console LED.** This LED (located on the cabinet display) shows the on- or off-hook status of the Attendant Console. It is always on when the SX-20 Attendant Console is used.

- **Station Status LEDs.** These LEDs indicate the on-hook or off-hook condition of the various PBX stations. For an on-hook condition the LED is not illuminated; for an off-hook condition the LED is illuminated, and if busied-out, it flashes. If a station is called, the LED on the cabinet display flashes while the station is being rung and the LEDs on the Remote Display and console light.

- **Equipment Busied LED.** This LED indicates the presence of a busied-out system circuit (e.g., speech path, trunk circuit, receiver circuit).

- **Ringer or Bell Off LED.** This LED indicates that the console bell has been disabled.

- **Night or Night Service LED.** This LED indicates that the PBX is operating in the Night Service Mode. (Refer to Section MITL9102-095-105-NA for details.)

- **Call Block or CB LED.** This LED indicates that Call Blocking is activated. (Refer to Section MITL9102-095-105-NA for details of Call Blocking operation.)

- **Call Waiting or CW LED.** This LED indicates to the attendant that there is a call (or calls) waiting to be answered. On the SX-20 Attendant Console, the number of calls waiting is displayed.

- **Call Park LEDs.** These LEDs are located on the Remote Status Display only. Illumination of any of these LEDs indicates that the Call Park system option is being used.

- **Numeric Display or Time Display.** These numeric displays indicate the time-of-day during normal PABX operation. A flashing display indicates time has not been set (after a system reset).

- **Trunk Status LEDs.** These LEDs indicate the availability of system trunks. An illuminated LED indicates an occupied trunk. If trunk is busied-out, the LED will remain solidly lit.

- **Call Status Display.** Consists of a numeric display which can indicate the active status of the call being handled at the console (e.g., the trunk or station that the user is presently connected to). This same indication is performed on the Numeric Displays provided on the Equipment Cabinet Display (also on the Remote Status Display).

2.23 **Remote Display LED Replacement.** The blocks of 10 LEDs on the Remote Display may be replaced using the Display Repair Kit. To change the LEDs follow the steps below:

- Remove the five Phillips screws at the rear of the remote display.

- Remove cover.

- Remove screws connecting the faceplate to the assembly.

- Remove faceplate.

- Carefully remove the faulty block of 10 LEDs.

- Insert the new block of LEDs.

- Replace faceplate and screws.

- Replace cover and screws.

Power Supply Voltage Checks

2.24 Power Supply Faults. Variation in the SX-20 power supply output voltages may cause a variety of problems. The permissible voltage variations are shown in Table 2-10. Note that the 0 V terminal on TB1 is strapped to the GND terminal on TB1. If a fault is located to one of the three power supplies, the SX-20 equipment cabinet must be returned to the supplier for replacement and repair action.

CAUTION: THE USE OF A VOM IS RESTRICTED TO TERMINAL BOARDS TB1 AND TB2. PROBING THE BACKPLANE PRINTED CIRCUIT WIRING WITH A VOM COULD CAUSE DAMAGE TO CIRCUIT COMPONENTS.

2.25 When performing voltage measurements, it is important to remember that any voltage measurement made is done with respect to a reference point. Use of a reference point other than that specified in Table 2-10 results in an inaccurate voltage measurement. A digital voltmeter must be used when performing voltage measurements.

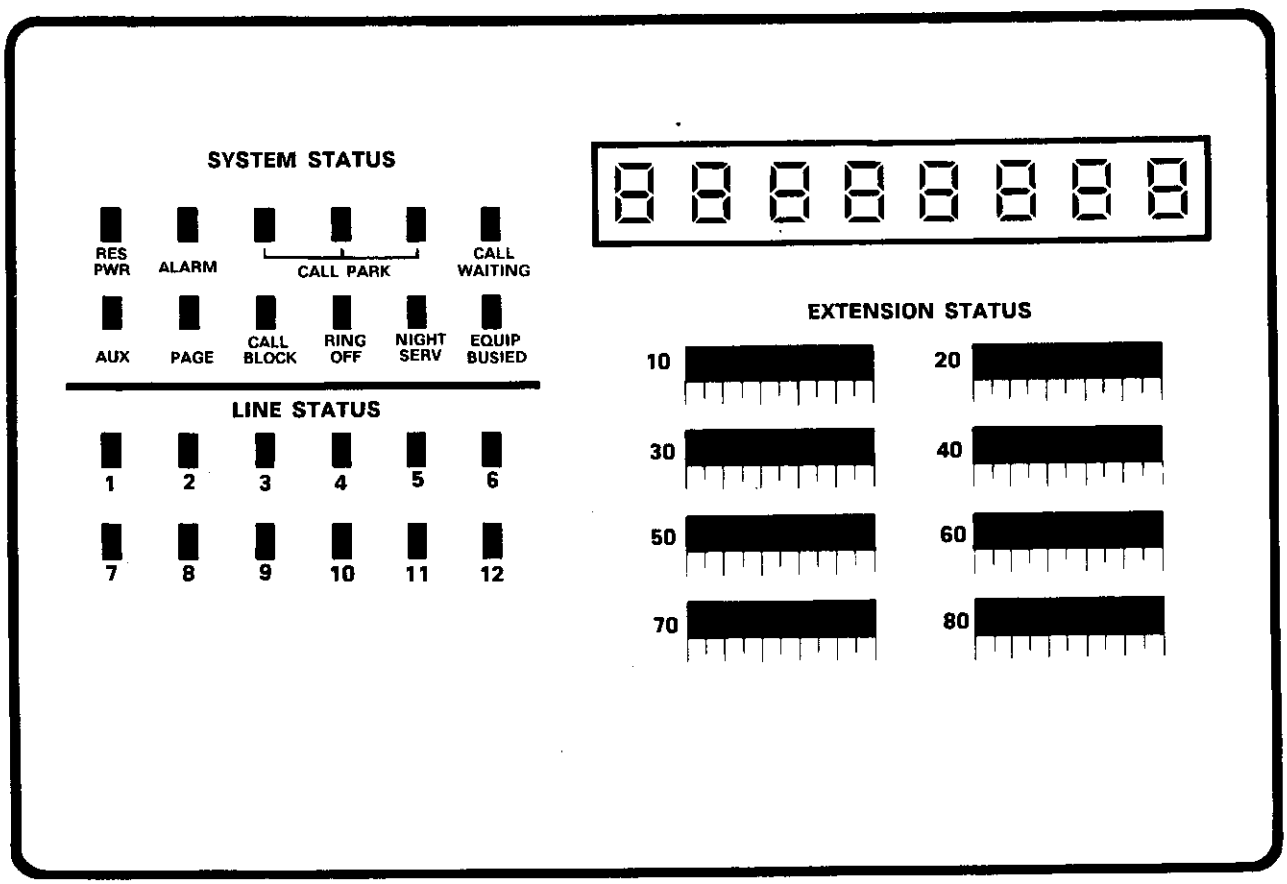


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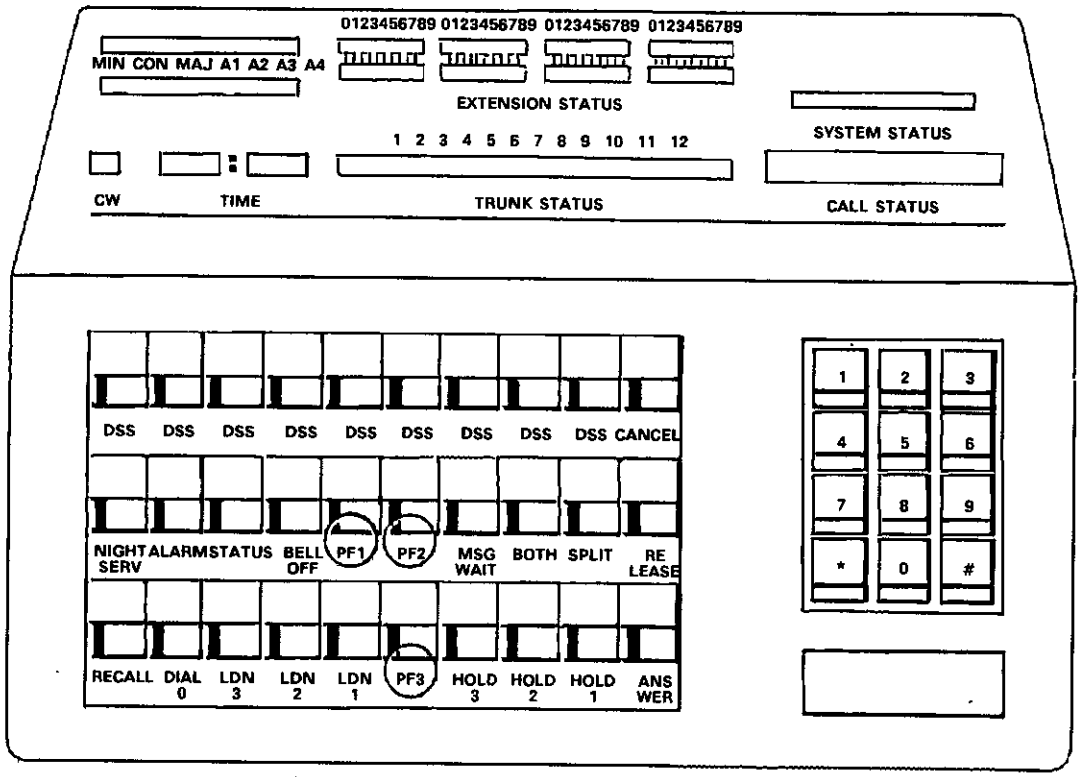
Figure 2-6 Remote Call Status Display



KEYS PF1, PF2 AND PF3 ARE PROGRAMMABLE AND REQUIRE THE PROPER SELECTION OF TITLE AS PER PROGRAMMING (REFER TO PART NUMBER 9180-095-205-NA). THEY MAY BE LABELLED USING OPTIONAL KEY DESIGNATIONS (PART NUMBER 1902-050-009-NA). DSS KEYS REQUIRE THEIR TITLES TO BE TYPED.

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Figure 2-7 SX-20 Attendant Console Display

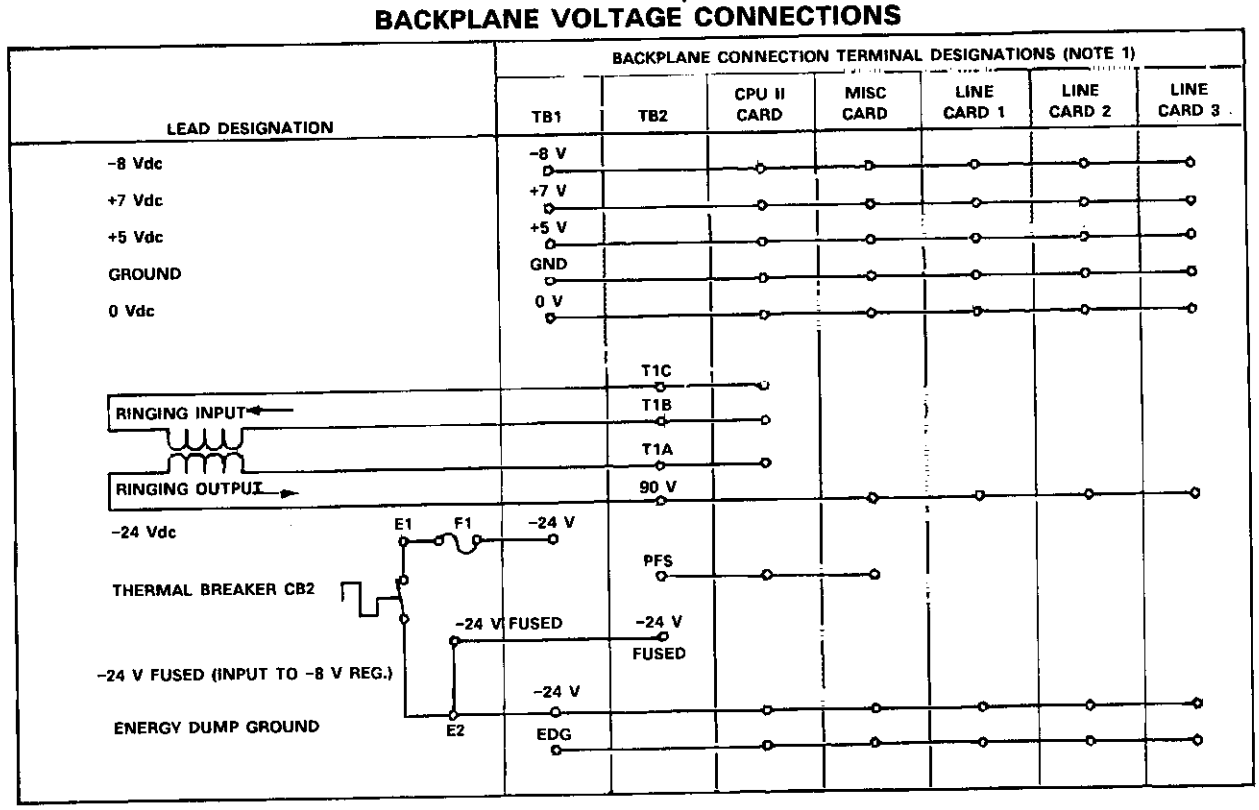
TABLE 2-10
VOLTAGE REFERENCE POINTS AND SPECIFICATIONS

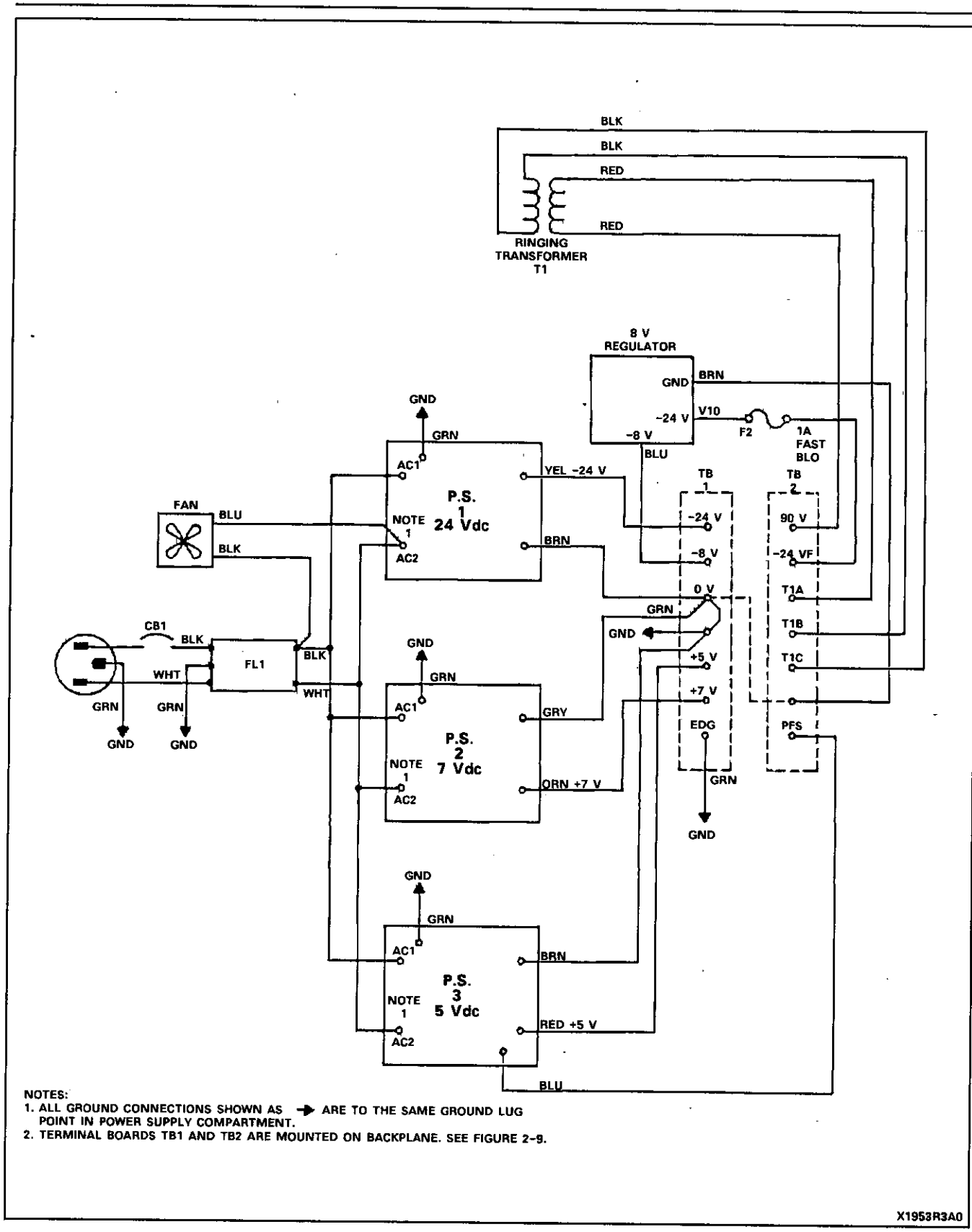
Voltage to be Measured	Measurement Point	Reference Point	Voltage Range	
			Minimum	Maximum
-24 Vdc	TB1 PIN 1	0 V TB1 PIN 3 OR GND TB1 PIN 4	-23.0 Vdc	-25.0 Vdc
-8 Vdc	TB1 PIN 2	" "	-7.6 Vdc	-8.4 Vdc
+5 Vdc	TB1 PIN 5	" "	+5.1 Vdc	+5.3 Vdc
+7 Vdc	TB1 PIN 6	" "	+6.7 Vdc	+7.3 Vdc
-24 V FUSED (INPUT TO -8 V REGULATOR)	TB2 PIN 2	" "	-23.0 Vdc	-25.0 Vdc
90 Vac†	TB2 PIN 1	" "	75 Vac	115 Vac

†Ringing voltage present only when telephone is being rung.

2.26 Table 2-10 lists the various voltages used by the SX-20 system, as well as their reference points and specifications. Figure 2-8 shows the block diagram of the SX-20 power supply. Figure 2-9 illustrates where the voltages can be measured.

TABLE 2-11
BACKPLANE VOLTAGE CONNECTIONS





NOTES:
1. ALL GROUND CONNECTIONS SHOWN AS → ARE TO THE SAME GROUND LUG POINT IN POWER SUPPLY COMPARTMENT.
2. TERMINAL BOARDS TB1 AND TB2 ARE MOUNTED ON BACKPLANE. SEE FIGURE 2-9.

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Figure 2-8 Power Supply Block Diagram

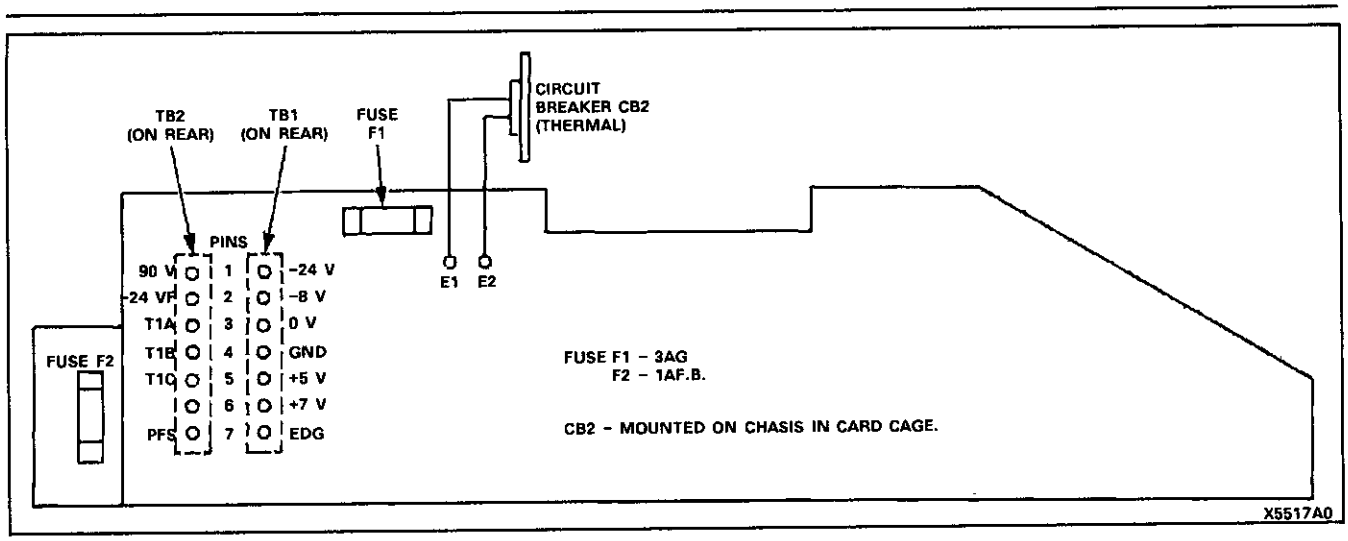

Figure 2-9 Backplane Voltage Test Points

3. TROUBLESHOOTING PROCEDURES

3.01 This Part presents a step-by-step guide to aid the field service engineer/installer in analyzing and troubleshooting a problem. The guide uses the following philosophy:

- Clarify the problem.
- Confirm the problem by duplication, if possible.
- Isolate and correct the problem.

Remember:

- Handle the circuit cards by their edges only (using a ground strap) or card damage may result.
- If a card has been replaced and the problem has been cured, the original card should always be retried to confirm that it is defective.
- Ensure continuing reliable operation of the SX-20 system by providing proper system ground and surge protection. (Refer to Appendix D of Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.)
- Card Repair Tags should always be completed. They should provide information on the symptoms of the problem.
- A system trouble log should be maintained. It should contain all the related information and should be kept on-site.

Power Supply Voltage Checks

3.02 When troubleshooting the SX-20 system, it is recommended that the format outlined in Figure 3-1 be followed. All procedures are detailed in Tables 3-1 to 3-15.

Troubleshooting Procedure Tables

3.03 The troubleshooting procedures relating to the SX-20 system are divided into the following tables:

- Table 3-1, Information Collection and Preliminary Checks
- Table 3-2, SX-20 Completely Inoperative Troubleshooting Procedure
- Table 3-3, Major Alarm Fault Isolation Procedure
- Table 3-4, Problem Clarification Procedure
- Table 3-5, Problem Confirmation by Duplication Procedure
- Table 3-6, Problem Categorization Procedure
- Table 3-7, Trunk Interfacing Troubleshooting Procedure
- Table 3-8, Stations Troubleshooting Procedure
- Table 3-9, SX-20 Attendant Console Troubleshooting Procedure
- Table 3-10, Memory Troubleshooting Procedure
- Table 3-11, Speech Paths Troubleshooting Procedure
- Table 3-12, Peripherals Troubleshooting Procedure
- Table 3-13, Other Alarms
- Table 3-14, Remote Display Troubleshooting Procedure
- Table 3-15, Remote Maintenance, Administration and Test System (RMATS).

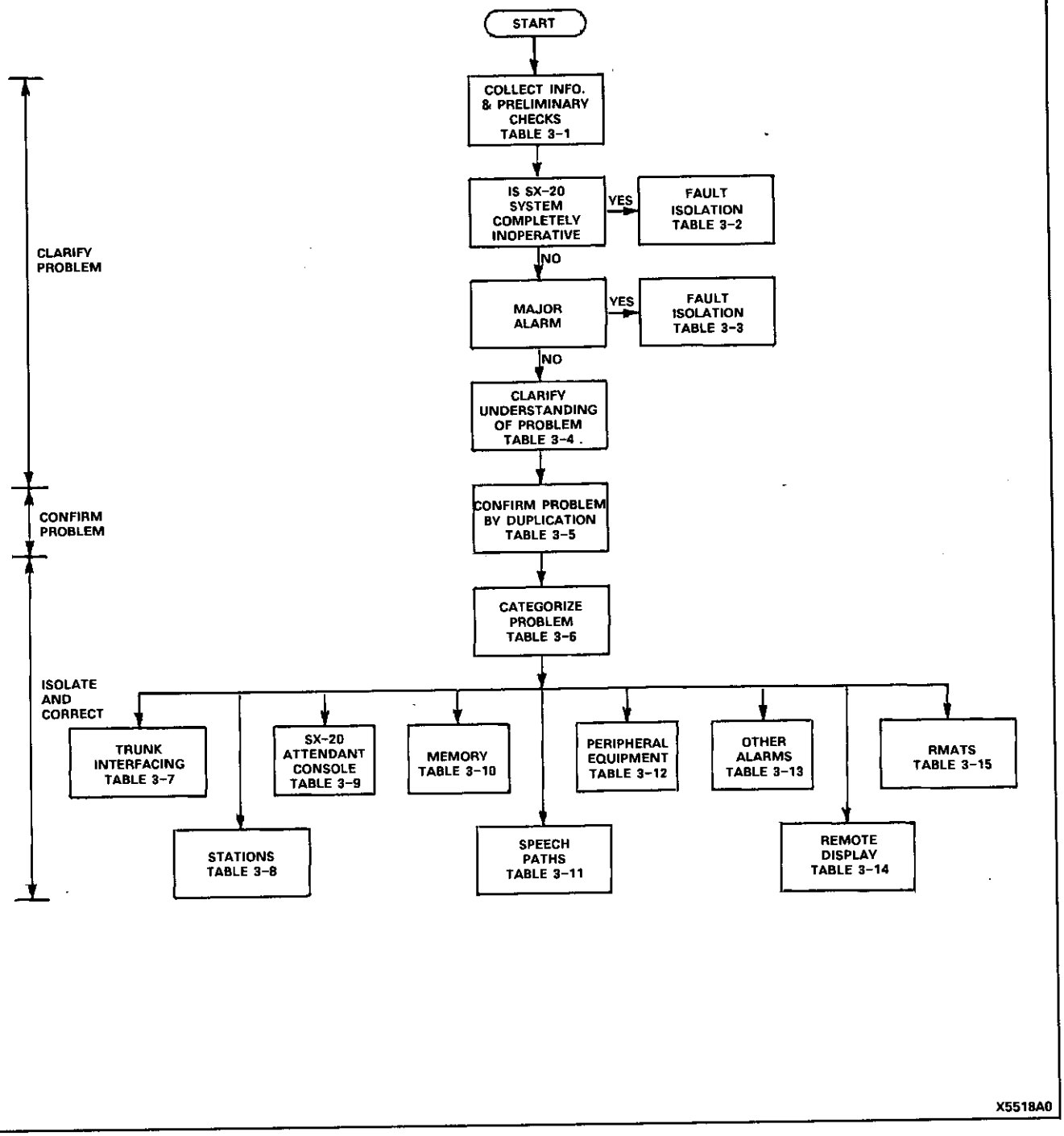

Figure 3-1 Troubleshooting Procedure

TABLE 3-1
INFORMATION COLLECTION AND PRELIMINARY CHECKS

The following information should be recorded in a trouble log, such as the one located in Appendix F of this Section.

Step	Action	Procedure
1.	Talk to attendant and users to obtain information on the problem, such as:	• How frequent is the problem. • Is the problem intermittent or continuous. • In what area of the system does the problem occur. • Does the problem occur during a specific period of the day. • Is the problem experienced by all users or some users. • Can the attendant or a user make the problem occur.
2.	Inspect display for:	• Night service. • Alarms (refer to Part 2). • Flashing clock display indicating a system reset. • Busied-out equipment (the EB LED flashes to indicate equipment busied-out).
3.	Note environmental conditions, such as:	• Check for water spillage around PABX. • Low humidity or high humidity. • Temperatures above 24°C - 27°C (75°F - 80°F) or below 0°C (32°F). • Static. • The proximity of a heat source, photocopier or plumbing. • Vibration. • Dust.
4.	If this is a new installation:	• Refer to the Installation Checklist (Section MITL9102-095-200-NA).
5.	Has something recently been added to, or altered on the system; for example:	• Has loop treating equipment been added to one or more trunks. • Have features been added or deleted.
6.	Check programming for:	• Class-of-Service assignments (i.e., COS in Command 620 must be 1, 2, 3, 4, 5, 6, 7, 8, or 9). • Enabling of correct options and features (refer to Programming Sheets). • Correct Feature Access Code assignments. • Outgoing trunks programmed in a trunk group. • Changes in programming (refer to Programming Forms in Part Number 9180-095-205-NA).
7.	Check MDF for:	• Loose wiring. • Debris.

TABLE 3-1 (CONT'D)
INFORMATION COLLECTION AND PRELIMINARY CHECKS

Step	Action	Procedure
8.	Ensure PROM/RAM, and Trunk Modules are properly seated and installed. Make sure Battery Switch is ON.	
9.	Note Electrical Environment:	• Large electric motors, air conditioning units, air compressors, etc. • Static, thunderstorm activity.

TABLE 3-2
SX-20 COMPLETELY INOPERATIVE TROUBLESHOOTING PROCEDURE

- Use the following procedure, Table 2-10 and Figure 2-9 to isolate the fault.
- The precautions given in Part 3 of this Section should be followed when troubleshooting the SX-20 system.
- When replacing cards, observe precaution notes in paragraph 3.01.

Step	Problem	Procedure
1.	SX-20 power failure- no alarms or LEDs lit.	• Investigate for obvious faults (e.g., power cord removed, main breaker tripped). • If problem appears to be in cabinet, remove cover.
2.	Any LEDs lit, particulary the power on/off LED.	• Remove cabinet cover. • Ensure that fuse F1 is good. • Check that all voltages meet Table 2-10 requirements. • Replace card(s) to isolate faulty item.
3.	Voltages do not meet Table 2-10 requirements.	• Remove all PCB Cards. • Check all voltages with Table 2-10. • Replace card(s) to isolate faulty items.
4.	No LEDs lit, particulary the power on/off LED.	• Check if the fan is operating. • Check whether circuit breaker CB1 is tripped to OFF position. If not, return to Step 2. • Remove all plug-in PCB Cards, and check for any visual evidence of damage to any item. If visual damage is present, refer to Step 5. • With cards removed, reset circuit breaker CB1. If CB1 does not stay set, refer to notes at the end of this procedure. • Ensure that fuse F1 is good. • Check that all voltages meet Table 2-10 requirements.
5.	Visual evidence of damage to any item.	• If damage evident on a card, replace damaged Card. • If damage evident on another item (e.g., backplane), refer to the notes at the end of this procedure.

If the problem was not corrected, package equipment and return to supplier with fault details.
If the problem was corrected, perform any necessary programming and replace cabinet cover.

TABLE 3-3
MAJOR ALARM FAULT ISOLATION PROCEDURE

This procedure covers the required actions for alarms **-----0, -----1, -----2**

It should be noted that these alarms only occur after a system reset or a power-up sequence. Therefore, determine if there could have been any external influences causing a reset or power failure, and note these reasons in the trouble log. Some possible causes are:

- lack of surge protection
- insufficient grounding
- unregulated AC
- power supply failure
- card failure
- static discharge.

To isolate and rectify the problem, refer to Figure 3-2.

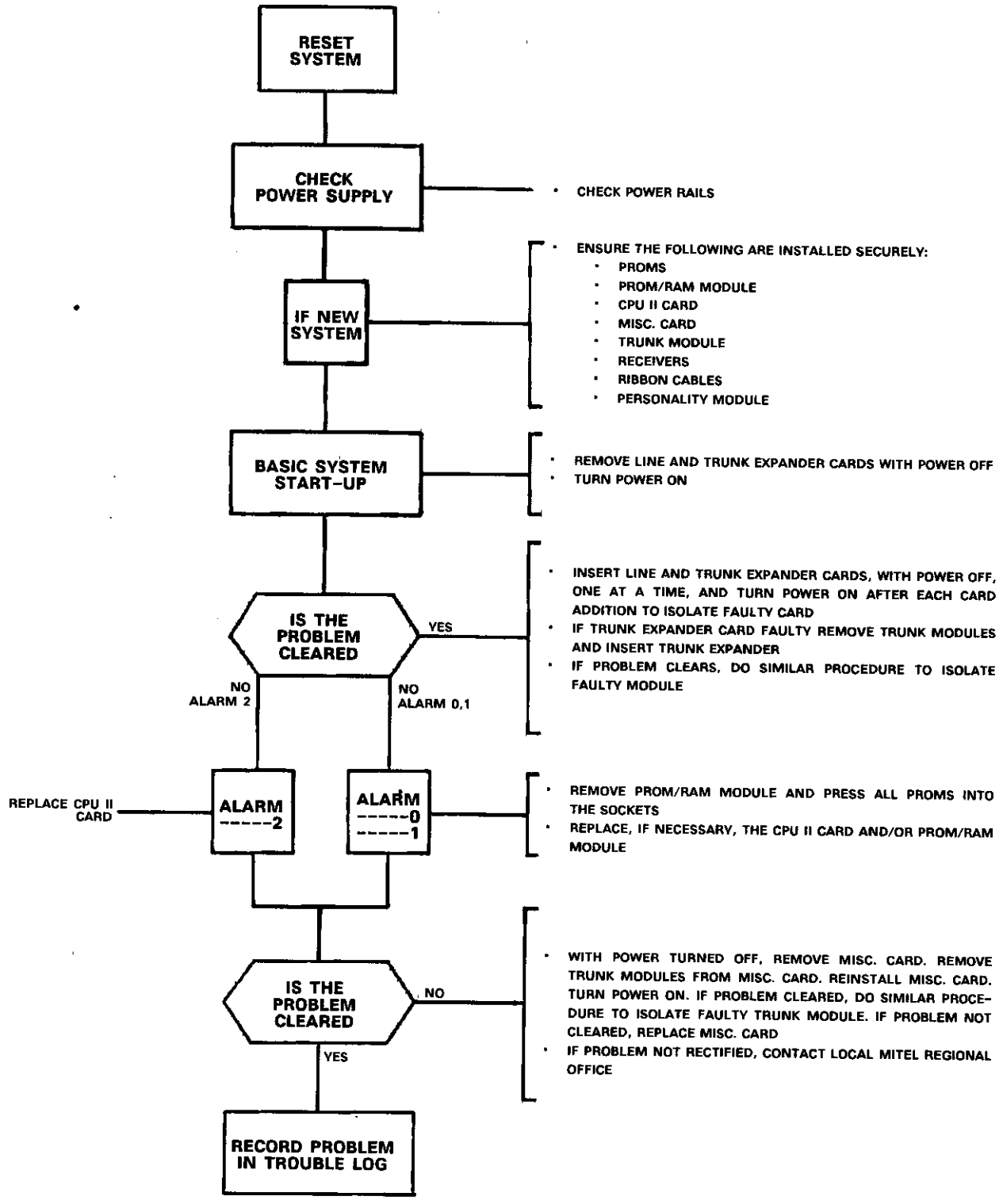

Figure 3-2 Major Alarm Fault Isolation

TABLE 3-4
PROBLEM CLARIFICATION PROCEDURE

Step	Problem	Procedure
1.	Intermittent problem:	• Note the following in trouble log: – How often does problem occur? – Does it occur during a specific time of day? – Does it occur during high traffic times in system or CO? • Are there any abnormal environmental or electrical occurrences to cause the problem, such as: – power fluctuations – lightning storms – humidity – dust – temperature – radio frequency interference (i.e., radio stations can be heard above dial tone or conversation).
2.	Minor alarms:	• Record alarm in trouble log (alarm descriptions can help to isolate/categorize the problem). • Note area of machine alarm relates to.
3.	Is the problem and its relationship to call processing understood:	• Confirm operation of machine by referring to the following aids: – System Operation (refer to Section MITL9102-095-180-NA) – Troubleshooting Features (Part 2) – Feature Operation and Programming Requirements (refer to Section MITL9102-095-105-NA) – Attendant Console Guide (Part Number 9180-953-101-NA).
4.	A feature or option does not appear to be functioning properly:	• Refer to Features and Service Description (Section MITL9102-095-105-NA), to ensure that Feature or Option is used correctly or in the proper application– – Note the conditions and programming requirements. • Confirm with Programming Forms that programming requirements are met.

TABLE 3-5
PROBLEM CONFIRMATION BY DUPLICATION PROCEDURE

Attempt to duplicate problem using the information gathered to this point. Some useful methods which can be used are:

Method	Function
System Test Line	- to access specific equipment under test - to check or modify program - to check status display of system, trunks or stations
Call Status Displays (Cabinet or Remote)	- to display the hardware status of stations, or software trunks, receivers, dial tone detectors and speech paths
Station, Trunk Status LEDs (Cabinet Display or Remote Display)	- to monitor on-hook and off-hook conditions, or ringing of a station - to determine whether a trunk is idle, seized or busied-out
Maintenance Functions	- access specific equipment numbers - display Alarm Codes - busy out/unbusy equipment

TABLE 3-6
PROBLEM CATEGORIZATION PROCEDURE

Step	Problem	Procedure
1.	Minor alarm:	• Associate alarm with a specific area of the equipment: - Alarms AL01-AL05, refer to Memory Troubleshooting Procedures - Alarms AL40XX-AL42XX, refer to Peripherals Troubleshooting Procedures - Alarms AL20XX-AL31XX, refer to Speech Path Troubleshooting Procedures - Alarms AL10XX-AL12XX, refer to Trunk Interface Troubleshooting Procedures.
2.	Station-to-Station call:	• Determine if problem occurs on some or all lines. • Refer to Station Troubleshooting Procedures.
3.	Station-to-Console call:	• Determine if problem occurs on all lines to console; if so refer to Console Troubleshooting Procedures. • If problem occurs on one line to console, refer to Station Troubleshooting Procedures.
4.	Console-to-Trunk call:	• Refer to Console Troubleshooting and Trunk Troubleshooting Procedures.
5	Station-to-Trunk call:	• Some symptoms of trunk related problems are: - Wrong number (outgoing calls) - Slow CO dial tone - Trunk alarms (i.e., AL10XX-AL12XX) - Low level audio from CO - Fading audio from CO - 1-way audio to or from CO - Ringback when hanging up from outside call - No CO dial tone - Oscillation heard on CO call. • Refer to Trunk Interface Troubleshooting Procedures.
6.	Grounding:	• Consistent or intermittent problem in any one of the above areas can be caused by improper grounding. Refer to System Grounding Requirements, Appendix D of Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

TABLE 3-7
TRUNK INTERFACING TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
1.	The system is a new installation:	• Ensure that all cards and modules are secured properly. • Check programming to ensure that: – Correct options are enabled – Trunk Group Access is enabled in station's COS – Outgoing trunks are placed in a trunk group – In Trunk Group Programming: (a) Supervision (reversal or change on third wire) is usually set for No Supervision. The installer should check if the CO provides supervision. (b) Wait for Dial Tone is usually set for No Wait – Correct trunk type is specified in trunk programming – In Trunk Programming, Reversal Meaning is normally set to Not Incoming Call or Disconnect – If problem is with long distance or operator calls, check Toll Control Programming for restrict on first or second digit being "0" or "1". • Use trunk status display (#990) for: – Forward current on seizure – Loop/Ground switches in proper position – Trunk busy. • Manually check the trunks with a butt set to determine if dial tone can be obtained or if a call can be made.
2.	The system was previously functional:	• Unbusy trunk: – Access by equipment number – Check trunk facility for loop/ground mode (refer to Appendix C).
3.	Alarms:	• If no alarms are generated, ensure that Programming Switch 2 (automatic diagnostics) on CPU II Card is closed, and that trunk alarms are enabled (Commands 801 → 812, Register 1, Bit C should be set to 1). • If an alarm is present, note the alarm cause and category (refer to Part 2 of this Section). Make a number of outside calls. Check for more alarms and their cause and category. This information is useful to determine if the problem is with one or multiple trunks.

TABLE 3-7 (CONT'D)
TRUNK INTERFACING TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
4.	Problem with some or all stations:	• Check telephone for: - Sticking keys - Faulty handset - Proper wiring (a) Tip and Ring reversal (b) Dial pad wired correctly. • Check user operation of telephone: - Proper Access Code dialed. • Check programming for: - Enabling of Trunk Group Access in station's COS - Toll control.
5.	Intermittent problem:	• Check if the problem is on any or all trunks or only one trunk. • Possible causes: Intermittent connection to CO caused by traffic congestion at peak hours 10-12 AM, 2-4 PM on any or all trunks. - Loop current on trunks out of tolerance. Loop current should be in the range of 23-65 mA. - High AC voltage on trunks. Limits: (a) Tip-Ring 4 Vrms (b) Tip to ground, ring to ground 150 Vrms - Ground differential between trunks and the SX-20 PABX.
6.	Consistent problem:	• Test all trunks individually for outgoing and incoming calls, completing the call to its natural conclusion.

TABLE 3-7 (CONT'D)
TRUNK INTERFACING TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
7.	Problem is on only one trunk:	• Exchange facilities; i.e., if Trunk 4 is in trouble and Trunk 3 is OK, take cable facilities from Trunk 4, put them on Trunk 3 and Trunk 3 to Trunk 4. Test to see if trouble follows cable facilities or trunk. If trouble is with trunk, replace Trunk Expander Card/Module; if not, proceed. • If fault persists, check for Tip/Ring reversal by: - using status display (Command 990), or - using a voltmeter. In the idle state the Tip and Ring voltages should be as follows, with cable facilities of trunk disconnected from PABX: **LOOP START** (a) ground on the Tip (b) -48 Vdc on the Ring **GROUND START** (a) Open on the Tip (no battery or ground) (b) -48 Vdc on the Ring. **Note:** If Tip and Ring are reversed on a ground start trunk, the trunk cannot be seized outgoing from the PABX. If the trunk is loop start and programmed for Answer Supervision the trunk does not operate if Tip and Ring are reversed. • If problem not cured, perform tests explained in Multiple Trunk Faults.
8.	Problem is on multiple trunks:	• If the problem appears to be phantom incoming or dropped call, check: - Trunk Programming 'Reversal Meaning' - unless there is a special application this should normally be set to "0". - Trunk Programming 'Disconnect Timing' - if periodic opens in loop current are experienced during call progression through a CO, and if the disconnect timing is too short, it may cause calls to be dropped. Therefore, increase the timing by one step at a time until calls no longer drop. - Dropped calls could also be caused by wrong data in the toll control programming.

TABLE 3-7 (CONT'D)
TRUNK INTERFACING TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
8. (Cont'd)		• If the problem is fading audio, slow dial tone or no dial tone, do the following: – Remove jumper or bridging clip on trunk in trouble, connect a telephone set (either rotary or DTMF depending on service provided by the CO), then test outgoing and incoming, allowing calls to proceed to their natural conclusion. – Also test loop current, particularly in cases of 1-way, both or fading audio (min. 23 mA, max. 65 mA). (Refer to Appendix B, Loop Current Measurement.) – Do transmission measurement in cases of low level audio, using the milliwatt supply from the serving CO. Level should not exceed -5 dBm loss. • Have telephone company check loop resistance for cases of no or slow dial tone, wrong numbers, etc. Resistance should not exceed serving CO's limitation (approx. 12 ohms). – If current loss resistance or dial tone is outside normal, refer trouble to telephone company for corrective measures. – For cases where CO dial tone is slow, or cannot be broken, measure the level of CO dial tone using a digital voltmeter. The level of dial tone should be a minimum of 47.5 mVrms (-26 dBm).
9.	Trunk conferencing:	• Ensure that appropriate trunk modules are trunk conferencing modules, Part Number 9102-011-002-NA. • Proceed with previous trunk tests listed for single and multiple trunk problems.

If the trouble was found, record in the trouble log.
If it was not found, contact the local MITEL Regional Office.

TABLE 3-8
STATION TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
1.	New system:	• Check system cabling (refer to Cabling and Cross-connections, Section MITL9102-095-200-NA). • Check station programming: – Ensure station has COS other than "0". – If feature is inactive, ensure that feature is allowed for the station's COS and that feature is enabled in System Options Programming. – Check station, COS, Toll Restriction and Pickup Group programming. • If DTMF phones are used, ensure that two receivers are equipped on the Miscellaneous Card.
2.	No dial tone:	• Ensure that programming for the station has not been changed. • Check that the LED associated with the line circuit lights when the station goes off-hook. • If the LED does not light, check: – telephone – cabling – possible bad SLIC with no alarm (replace SLIC or Line Card). • Check or replace telephone set. • If the cabinet LED lights but remote display does not show line off-hook, replace the SLIC. If the problem is not rectified, replace Line Card. • If the problem is intermittent it may be a function of system traffic; high traffic could intermittently busy all receivers.
3.	Cannot break dial tone:	• When using DTMF phones, ensure that both receivers are present and functional. • Use the Status Display for System Command 992 to determine if receivers are present and functional. • If you cannot break CO dial tone, refer to Trunk Interfacing Procedure. **Note:** Some manufacturers of tone-to-pulse conversion or DTMF phones require correct polarization of Tip and Ring leads to allow the keypad to be functional. Therefore, test with a butt set, or reverse Tip and Ring. • If CO dial tone is CO rotary only.
4.	No ringing:	• If the problem is with one station, check the telephone set or try another telephone. Check cabling to the telephone set. If the problem is not cured, replace the SLIC or Line Card.

TABLE 3-8 (CONT'D)
STATION TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
4. (Cont'd)		• If the problem is with a group of stations: - Check the telephones - Check cabling (refer to Section MITL9102-095-200-NA - Cabling and Cross-connections) and verify continuity - Check the amphenol 25-pair connector for bent or broken pins - Replace the Line Card. • If the problem occurs on all stations: - Check telephones - Check cabling (refer to Section MITL9102-095-200-NA - Cabling and Cross-connections) and verify continuity - Check amphenol 25-pair connector for bent or broken pins - Place a call from the console to a station and leave the station on-hook. Measure the voltage from the ringing generator on the SX-20 backplane. If the ringing voltage is within tolerance, check telephones, cabling, connectors and Line Cards again. If the ringing voltage is out of tolerance, replace CPU II Card. If the problem not cured, replace chassis. If problem still not cured, contact the local MITEL Regional Office.
5.	Calls dropped when the switchhook is flashed:	• Ensure that the user is operating switchhook flash correctly. • If timing is too short, increase it by programming; however, ensure that problems do not arise when flashing while connected to a trunk.

If the trouble was found, record in the trouble log.
If it was not found, contact the local MITEL Regional Office.

TABLE 3-9
ATTENDANT CONSOLE TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
1.	New installation:	• Verify installation of console (refer to Section MITL9102-095-200-NA), noting: - Proper Personality Module properly installed in a new Universal Console Connector Card. - Proper cable connections between the Console Connector Card, and the console. - Proper cable connection between Miscellaneous Card and the Universal Console Connector Card. - Proper cable connection for the UART cable to CPU II Card. - Ensure that console is less than 500 feet from the equipment cabinet.
2.	Console alarms:	• Refer to Part 2 of this Section for Alarm Description. • For the following alarms: **AL73 Clear the alarm from the Test Line:** - Attempt a call from the console and if the alarm returns, then: Check cable connection between the console and the Universal Console Connector Card. - If the problem is not rectified, replace the console.
3.	Unable to place a call to a station:	• If the call is being placed successfully from the dial keypad but not from DSS keys: - Check the programming of the DSS keys. • If a call cannot be placed from dial keypad or DSS keys check or replace the following, in order, testing at each step: - Station programming - Console cabling - Miscellaneous and/or CPU II cable - Console SLIC on Miscellaneous Card - Personality module on Universal Console Connector Card - Universal Console Connector Card - CPU II Card - Miscellaneous Card.
4.	Unable to place a call to a trunk:	• Check programming. • If problem is not rectified, follow Trunk Interfacing Procedure.

If the trouble was found, record in the trouble log.
If it was not found, contact the local MITEL Regional Office.

TABLE 3-10
MEMORY TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
1.	Alarm 01	• Reset the system. If the alarm persists, replace the CPU II Card.
2.	Alarm 02	• Reload Default Data and reprogram the system. • Ensure that the Battery Switch (located on the PROM/RAM Module) is ON. • If the alarm persists, replace the CPU II Card.
3.	Alarm 03	• Clear the alarm. If the alarm persists, replace the CPU II Card.
4.	Alarms 04 and 05	• Replace PROM/RAM assembly. • If the alarm persists, replace the CPU II Card.

If the trouble was found, record in the trouble log.
If it was not found, contact the local MITEL Regional Office.

TABLE 3-11
SPEECH PATHS TROUBLESHOOTING PROCEDURE

Note: Refer to Part 2, Troubleshooting Aids, for procedures to unbusy equipment and clear alarms.

Step	Problem	Procedure
1.	Alarms 20 XX, 21 XX, 22 XX/22 YY, 23 XX	• Unbusy the speech path and clear the alarm. • Access the speech path from the Test Line and attempt to recreate the alarm. • If the alarm persists, remove the Line Cards and/or Trunk Expander Card. Clear the alarm and unbusy the speech path. If the alarm persists, replace the Miscellaneous Card. If the alarm does not recur, install Line Cards and/or Trunk Expander Card one at a time, waiting approximately 10 minutes between the installation of each card, until the alarm recurs. • Replace the faulty card. • Clear the alarm and unbusy the speech path.
2.	Alarm 30 XX	• Unbusy the speech path and clear the alarm • Access the speech path from line XX. If the alarm persists: – replace the SLIC corresponding to the particular line circuit, or replace the Line Card.
3.	Alarm 31 XX	• Unbusy the speech path and clear the alarm. • From the Test Line, access the trunk directly several times. If the alarm persists: – replace the cards in the following order, testing for the alarm each time: – Trunk Module – Trunk Expander Card – Miscellaneous Card.
4.	Trouble persists	• There is a possible grounding problem. Refer to Appendix D of Section MITL9102-095-200-NA, Shipping, Receiving and Installation Procedures.

If the trouble was found, record in the trouble log.
If it was not found, contact the local MITEL Regional Office.

TABLE 3-12
PERIPHERALS TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
1.	Alarm 40 0X	• Unbusy the detector and clear the alarm. • Busy out the other detector. • Place a station-to-trunk call where the trunk is programmed as Wait for Dial Tone. If unable to dial out, replace Miscellaneous Card or Trunk Expander Card. • If the alarm recurs, unbusy the detector and replace the corresponding Trunk Expander Card or Miscellaneous Card.
2.	Alarm 41 0X	• Unbusy the generator and clear alarm. • Attempt a console-to-trunk call on a DTMF trunk. • If the call fails or an alarm is generated, replace the Miscellaneous Card.
3.	Alarm 42 0X	• Unbusy the DTMF Receiver and clear the alarm. • Busy out the other receiver. • Attempt a call from the Test Line with a DTMF phone. • If the calls fails or the alarm recurs, then replace, in order: – Receiver Module – Corresponding Miscellaneous or Trunk Expander Card.

If the trouble was found, record in the trouble log.
If it was not found, contact the local MITEL Regional Office.

TABLE 3-13
OTHER ALARMS

Step	Action	Procedure
1.	Problem Alarm 50	• If alarm occurs, note in Trouble Log with details about frequency and operation being performed at time of alarm. • Contact MITEL Regional Office.
2.	Problem Alarm 60 through 69	• If alarms occur, note and report alarm details. • Contact MITEL Regional Office.

TABLE 3-14
REMOTE DISPLAY TROUBLESHOOTING PROCEDURE

Step	Problem	Procedure
1.	New installation:	• Check the installation of the remote display (refer to Section MITL9102-095-200-NA) noting the following: - Cabling between the SX-20 cabinet and the remote display. - Ensure Remote Display is not more than 152 m (500 ft) from PABX. - Cable between the Universal Console Connector Card and the Miscellaneous Card.
2.	Display not functioning:	• If the Remote Display is not functioning, do the following: - Perform the Remote Display power adjustment outlined in Appendix D. - Verify the system ground, using the procedure in Appendix D of Section MITL9102-095-200-NA. - Replace the Remote Display. - Replace the CPU II Card. - Replace the Universal Console Connector Card.

If the trouble was found, record in the trouble log.
If it was not found, contact the local MITEL Regional Office.

TABLE 3-15
REMOTE MAINTENANCE, ADMINISTRATION AND TEST SYSTEM (RMATS)

Step	Problem	Procedure
1.	No carrier tone	• Check programming. • Go on-hook and redial the system. • Replace RMATS Module.
2.	No response from terminal when the carriage return is pressed after the handset set in modem and entered	• The terminal and/or modem may not be hooked up properly - Check the installation, Baud rate, parity and number of data bits. • The outside line may be bad or noisy, therefore the information at the PABX may not be echoing back to the terminal. • Go on-hook at the site, and redial the system. • Replace RMATS Module.
3.	The System Security Code is entered at the terminal but the system returns with the same prompt	• Check System Security Code. • The outside line may be bad or noisy, therefore the data received by the PABX could be corrupted. • Go on-hook at the site and redial the system.
4.	In the middle of a session no response from terminal, or incorrect or scrambled information is viewed at the terminal	• Outside line may be bad or noisy - redial the system.

APPENDIX A
TROUBLESHOOTING KIT

A1.01 The following is a recommended list of items required in the Field Service Engineering Troubleshooting Kit:

- One of each Circuit Card as spares, including modules
- Butt Set
- Digital Multimeter
- Static Strap
- Ground Mat
- Slotted Screwdriver
- Long Nose Pliers
- Adjustable 6-inch Wrench
- Spare Fuses - 1 A - 250 V - SB - 3AG, 10 A - 250 V - 3AG, 1 A - 250 V - 1AG, 1 A - pico
- Wire Strippers
- Small Slotted Screwdriver
- Fan Filter.

APPENDIX B
LOOP CURRENT MEASUREMENT

B1.01 There are two methods available to measure loop current:

- In-Line method.
- Voltage conversion measurement.

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

B1.02 In-Line Method. The procedure for the in-line method of measuring loop current is shown in Figure B1-1 and described as follows:

- Open either the Tip or Ring lead of the trunk facility by removing one of the bridge clips, if possible.
- Insert an ammeter where the clip was.
- Take reading of current when the trunk is seized and again after a call has been completed in both incoming and outgoing directions.
- Release the trunk and repeat measurement several times on the same Central Office at peak and low traffic hours.
- Repeat measurements as above using different Central Office trunks.

B1.03 Voltage Conversion Method. This is the second method of measuring loop current. Although it is not as accurate as the first, the calculations are as follows:

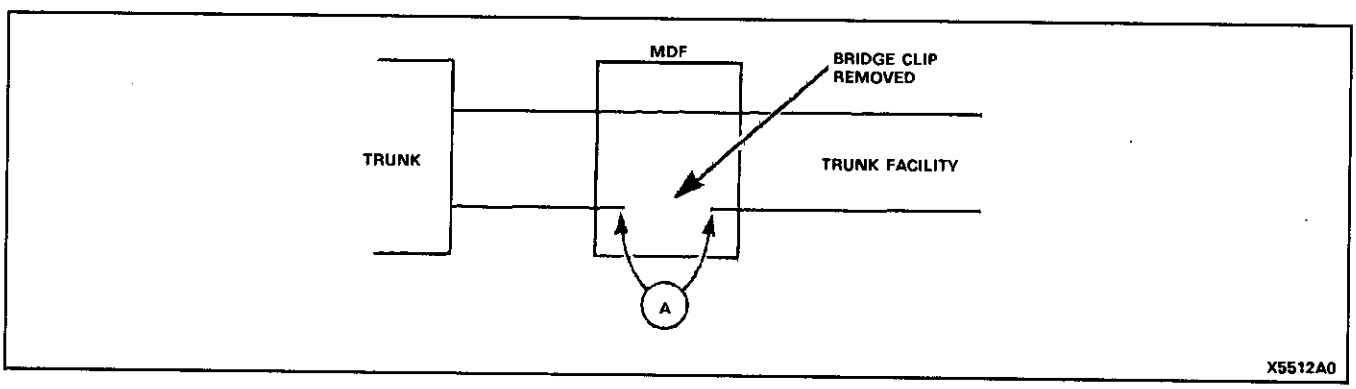

Figure B1-1 In-Line Method

- With the trunk seized, use a voltmeter to measure the voltage between Tip and Ring of the trunk.
- This voltage measurement is then used to calculate the loop current.
- Release the trunk and repeat measurement several times on the same Central Office at peak and low traffice hours.
- Repeat measurements as above using different Central Office trunks.
- Typical equivalent resistance seen between Tip and Ring, when the trunk is seized, is approximately 250 ohms.
- A calculation can now be done using Ohm's Law, to obtain a rough idea of loop current:

$$I = \frac{V}{R}$$

Example:

V = 12 volts
R = 250 ohms

Therefore $I = \frac{12}{250} = 48$ mA.

where V = voltage measured
R = equivalent resistance.

TABLE B1-1
SX-20 ELECTRICAL CHARACTERISTICS

Parameter	Detail
Station Loop Limit	600 ohms including set at 20 mA
Minimum Leak Resistance	15,000 ohms
Maximum Number of Ringers per Line	5
Ringing Voltage†	90 Vrms, 20 Hz
Ring Trip	During silent or ringing period
Dial Tone††	350/440 Hz, continuous, -19 dBm
Busy Tone††	480/620 Hz, 500 ms On, 500 ms Off, -24.0 dBm
Ringback Tone††	440/480 Hz, 1 s On, 3 s Off, -19.0 dBm
Reorder Tone††	480/620 Hz, 250 ms On, 250 ms Off, -24 dBm
Camp-on Tone††	440/480 Hz, one burst of 200 ms, -19.0 dBm
Dial Tone Detector Level	350/440 Hz minimum -23 dBm
Crosstalk	Better than 75 dB down
Insertion Loss: Station-to-Station Station-to-Trunk	5 dB ± 0.5 dB at 1000 Hz 0.6 dB ± 0.4 dB at 1000 Hz
Longitudinal Balance	60 dB minimum, 200-3400 Hz (on trunks)
Return Loss	16 dB singing, 24 dB echo
Idle Circuit Noise	16 dBrnC maximum
Impulse Noise	0 counts above 47 dBrnC for 90% of cases
System Impedance	600 ohms nominal for lines 900 ohms nominal for trunks
AC Rejection	60 Hz, 180 Hz at 50 Vrms
Typical Traffic Capacity	9.7 ccs/line maximum at 24 lines and P = 0.01 4.8 ccs/line maximum at 48 lines and P = 0.01
Primary Power	105-125 Vac, 47-63 Hz, 3 A maximum, 1 A typical (230 V operation optional)
Central Office Loop Limit	1600 ohms maximum
Maximum Distance of Attendant Console from Equipment Cabinet	152 m (500 ft) of 26 AWG cable
Maximum Distance of Remote Display from Equipment Cabinet	152 m (500 ft) of 22 AWG cable
FCC Registration Number	BN285B-67526-PF-E

† Ringing frequency is programmable. Available frequencies are 17.5 Hz, 20 Hz, and 25 Hz.

†† The frequencies illustrated are those provided under Tone Plan 00. For other combinations, refer to MITL9102-095-105-NA, Selectable Tone Plans.

APPENDIX C
LOOP START VS GROUND START CHECK

C1.01 The loop start vs ground start check should be performed as follows, and as shown in Figure C1-1 (refer to Table C1-1 for details of Trunk Electrical Characteristics):

- Locate PABX trunk circuit Tip and Ring on connecting block at MDF.
- Remove bridge clips on Tip and Ring (i.e., disconnect PABX trunk circuit from CO Tip and Ring).
- Put butt set across CO Tip and Ring.
- Go off-hook with butt set. If CO dial tone is returned, then CO trunk is loop start.
- If no dial tone is returned, then momentarily ground the Ring lead with butt set off-hook across Tip and Ring. If CO dial tone is returned, then CO trunk is ground start.

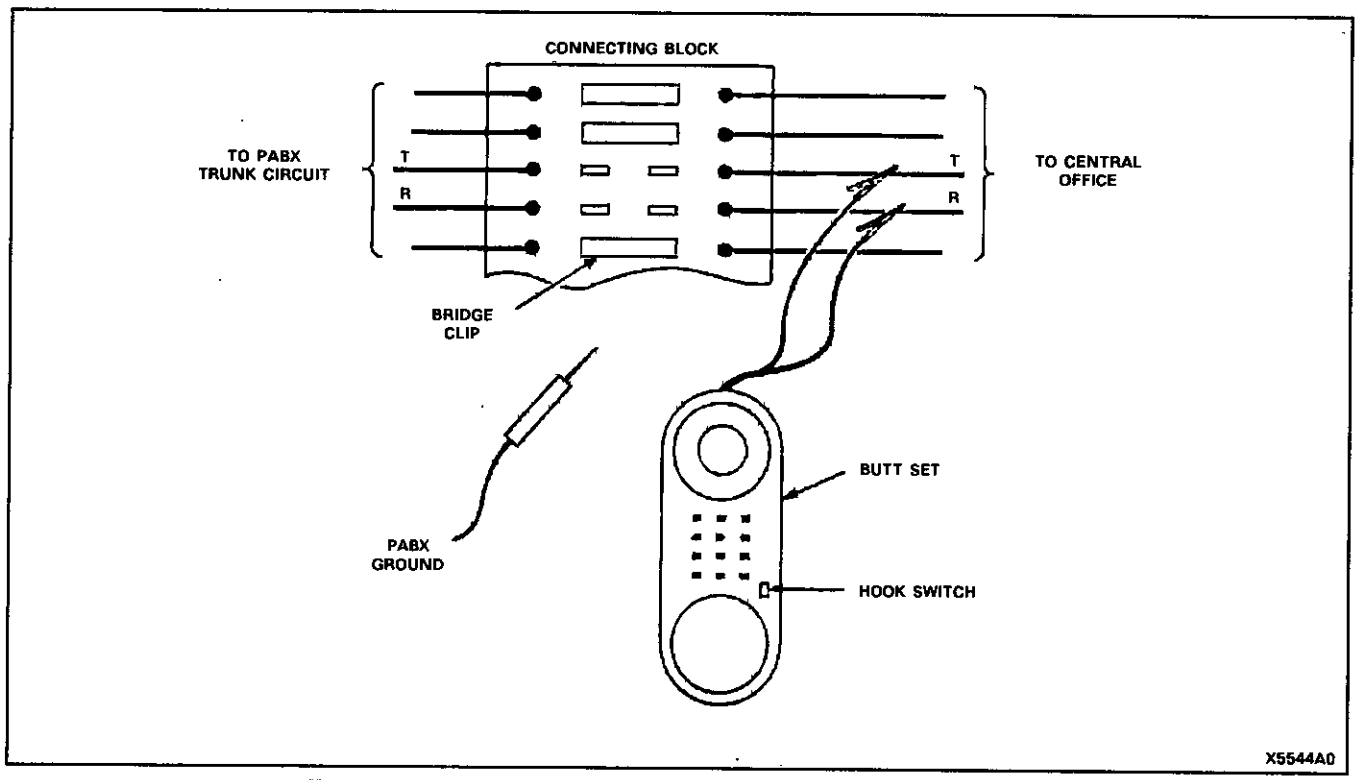

Figure C1-1 Loop Start Versus Ground Start Check

- If still no dial tone is returned, repeat Step 5 and ground the Tip lead instead. If CO dial tone is returned, then CO trunk is ground start (however the Tip and Ring are reversed).

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

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

TABLE C1-1
TRUNK ELECTRICAL CHARACTERISTICS

Methods of recognizing an incoming Central Office trunk call	1. **Ground Start** (a) Six seconds of Tip ground or (b) Tip ground followed by a 0.7 second burst of ringing every 6.3 seconds. 2. **Loop Start** (a) Battery reversal or (b) A 0.7 second burst of ringing every 6.3 seconds.
Central Office trunk interface time-out on SX-20	3. **Loop Start Trunk** If the SX-20 system has not detected 100 ms of loop current in 15 seconds, the SX-20 system busies out the trunk and reports an alarm (if trunk alarms are enabled). If trunk alarms are not enabled, trunk returns to idle. 4. **Ground Start Trunk** If the SX-20 system has not detected 100 ms of Tip ground within 60 seconds of grounding the Ring lead, or the SX-20 system has not detected 100 ms of loop current within 15 seconds of removing Ring ground and placing the active termination across Tip and Ring, the SX-20 system busies out the trunk and reports an alarm (if trunk alarms are enabled). If trunk alarms are not enabled the trunk returns to idle.

APPENDIX D
REMOTE DISPLAY

Lead Designations (Remote Display Cord)

D1.01 The lead designations for the Remote Display Cord are as follows:

- Red - Ground
- Yellow - Ground
- Black - Data
- Green - +11 Vdc.

Power Adjustment

D1.02 The power adjustment procedure is as follows:

- Using a slotted screwdriver, turn the power adjustment screw (Figure D1-1), located at the right-hand side of the remote display, clockwise until the display initially turns on. Continue to turn until the display turns off and note this position.
- Turn power adjustment screw counter-clockwise until the display initially turns on. Continue to turn until the display turns off and note this position. Once the turn-off points have been located, turn the power adjustment screw to the point halfway between the two positions.

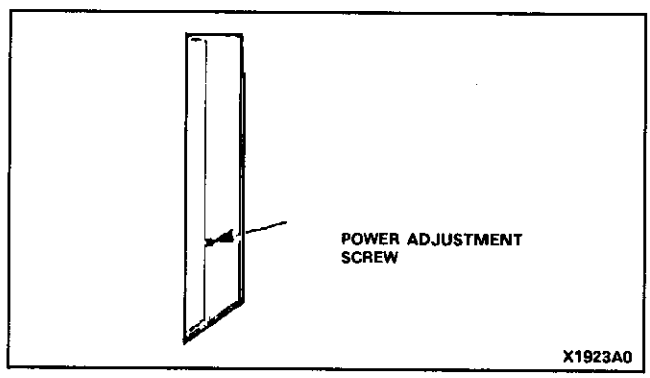

Figure D1-1 Remote Display

APPENDIX E
SYSTEM OPERATION

E1.01 The system call processing information is detailed in the subsequent tables and further explained in the paragraphs that follow:

- Table E1-1, Station-to-Station Call
- Table E1-2, Console-to-Station Call
- Table E1-3, Outgoing Call
- Table E1-4, Incoming Call.

TABLE E1-1
STATION-TO-STATION CALL

Step	Action	Procedure
1.	Station goes off-hook	• Loop current drawn by the station indicates off-hook. The associated SLIC signals that the station is off-hook via its off-hook LED. The CPU detects the off-hook condition by continually scanning the entire system (one device at a time) for a change in state.
2.	CPU checks COS	• CPU checks for valid COS. If no COS is assigned or assigned as receive only, CPU ignores off-hook.
3.	CPU searches for free speech path & idle receiver	
4.	CPU connects speech path, receiver and dial tone to station	• If no idle receiver or speech path, CPU does not connect dial tone to the station. The CPU waits 1 minute for an idle receiver. If an idle receiver is not found within that time the station becomes idle.
5.	Station dial digits	• DTMF tones sent via Tip and Ring to line circuit. Rotary dialing causes off-hook signal of line circuit to be pulsed according to digit dialed.
6.	CPU reads dialed digit	• DTMF tones are decoded by receiver that is connected to line circuit via speech path. • For rotary dialing CPU monitors off-hook signal of line circuit to read dial digit. • Dial tone is removed after CPU detects first valid digit.
7.	CPU checks validity of digits	• CPU checks digits for: - Validity - If digits not valid CPU returns reorder tone. - Feature Access Code - CPU responds with appropriate action. - Trunk Access Code - Refer to Table E1-3, Outgoing Call. - Station Number - CPU checks status of station. **Note:** In this case, digits correspond to station number.

TABLE E1-1 (CONT'D)
STATION-TO-STATION CALL

Step	Action	Procedure
8.	CPU has valid station number and it checks status of station	• CPU interrogates non-volatile RAM to determine whether station is busy or idle. • Checks station's Class of Service. • If station is busy, CPU connects busy tone to calling station via speech path.
9.	CPU connects ringing to the idle called station. Calling station hears ringback tone	• CPU applies ringing by closing ringing relay of called station and then turns on ringing generator. CPU connects ringback tone to calling station via speech path.
10.	Called station answers; CPU connects it to same speech path as calling station	• When called station answers, CPU disconnects ringing from called station and ringback tone from calling station.
11.	Call established	
12.	CPU checks for hang-up by monitoring off-hook leads of both parties	• If on-hook is longer than what 'Station Switchhook-Flash Timing is programmed, CPU detects on-hook.
13.	CPU detects an on-hook signal and releases speech path	

TABLE E1-2
CONSOLE-TO-STATION CALL

Step	Action	Procedure
1.	Digit key or DSS key depressed	• CPU enables audio circuit to handset (the equivalent of talk battery).
2.	Key data sent to CPU	• Circuitry on the keyboard card decodes which key was depressed and passes this data to the CPU.
3.	CPU receives and interprets data	• If a DSS key is depressed, system CPU automatically obtains station number from memory. • If a dial pad key is depressed, system CPU waits to collect all digits. CPU then checks these digits for: • Validity - If digits not valid CPU returns reorder tone. • Feature Access Code - CPU responds with appropriate action. • Trunk Access Code - Refer to Table E1-3, Outgoing Call. • Station Number - CPU checks status of station. **Note:** In this case, digits correspond to station number.
4.	CPU searches for free speech path	
5.	Refer to Table E1-1, Station-to-Station Call	

TABLE E1-3
OUTGOING CALL

Step	Action	Procedure
1.	Station or console dials Trunk Group Access Code	• For station originating a call refer to Table E1-1, Station-to-Station Call. For console originating call refer to Table E1-2, Console-to-Station Call.
2.	CPU searches for idle trunk	• If no idle trunk in trunk group is found, CPU returns busy tone. CPU returns reorder tone if there are no trunks programmed in trunk group, or trunk group access not allowed in Class-of-Service programming.
3.	CPU issues seize command to trunk	• If trunk is loop start, then: – Trunk places active termination across Tip and Ring and waits 100 ms before checking for loop current. If 100 ms of loop current is not found in 15 seconds, CPU busies out trunk and reports alarm if trunk alarms enabled. If trunk alarms not enabled, trunk returns to idle. • If trunk is ground start, then: – Trunk grounds Ring lead and waits 100 ms before checking for 100 ms of Tip ground. If this recognition does not occur within 60 seconds, the CPU busies out the trunk and rings an alarm, if trunk alarms are enabled. If trunk alarms not enabled, trunk returns to idle.
4.	CO returns dial tone	• Once 100 ms of Tip ground has been detected, an active termination is placed across Tip and Ring, and ground is removed from Ring. Trunk then checks for 100 ms of loop current. If 100 ms of loop current is not found in 15 seconds, CPU busies out trunk and reports an alarm as above.
5.	Trunk connect to speech path and trunk audio enabled	• If trunk group is programmed for "Wait for Dial Tone", Dial Tone Detector is connected to trunk speech path and audio enabled after dial tone is detected or time-out. While the Dial Tone Detector is connected to trunk speech path, the station or console is disconnected from trunk speech path.
6.	Calling party receives CO dial tone and proceeds to dial	

TABLE E1-4
INCOMING CALL

Step	Action	Procedure
1.	CPU continually scans trunks for incoming call	• If trunk is ground start, either 6 seconds of Ring ground or Tip ground followed by ringing, is recognized as incoming call. • If trunk is loop start, either battery reversal or ringing will be recognized as an incoming call. The SX-20 system requires 0.7 seconds of ringing every 3 seconds.
2.	CPU recognizes incoming trunk call	
3.	CPU searches for free speech path	
4.	CPU notifies console of incoming call	
5.	Console rings	• CPU passes data to the keyboard card to enable the console ringer. CPU also passes data to the keyboard card to flash the appropriate LDN key.
6.	Attendant answers console	• Attendant depresses flashing LDN key or ANS key. • The keyboard card decodes which was depressed and passes this data to the CPU.
7.	CPU trips CO ringing	• CPU recognizes that the attendant has answered from the data received. • CPU connects active termination across Tip and Ring and removes dummy ringer load.
8.	CPU connects trunk and console to speech path	• Trunk and console audio path enabled.
9.	Attendant extends call to station	• When attendant dials the station the CPU puts the trunk on quiet termination or mutes its audio. • CPU rings the station and applies ringback tone to the console over the speech path. • When attendant presses the RELEASE key the console is removed from the speech path and the trunk is connected.
10.	CPU monitors off-hook signal of station to determine hang-up	
11.	Station hangs up	• CPU releases speech path, removes active termination on trunk and connects dummy ringer load to trunk.

APPENDIX F

TROUBLE LOG AND ALARM LOG

F1.01 Figure F1-1 illustrates how a PABX Repair Tag is completed for return with faulty equipment. Included in this Appendix are examples of a Trouble Log sheet (completed when service personnel are called to a site). Also included is a suggested Alarm Log, which may be left with the attendant to help ensure that the customer records all relevant information when an alarm occurs.

For Customer Use

PABX REPAIR TAG

1. Date: DECEMBER 1, 1981
2. Location: JOHN DOE'S MOTEL
3. Telephone Company: TELEPHONE CO. LTD.
4. System Serial Number: 12345
5. Assembly Number: 9102-010-000-NA
6. Trouble Symptoms: DO NOT RECEIVE DIAL TONE ON LINE 10
7. Error Display on Console:

SX-100®/SX-200®

Number	Class	Source: ATT INT RCL DID MAN

Number	Class	Destination: ATT Ring Busy Error

SX-10™/SX-20®

A	L		3	0		1	0

8. Failure Occurred: During Installation [ ] In Service [X]
9. Type of Central Office: MANUFACTURER'S NAME
   Step: X XBar: _____ Electronic: _____
   Other (Please Specify): _____
10. Software Identity:

5	0	3	0	1
Generic			Revision	

MITEL

ORDER NO. 9110-098-018-NA
FURTHER DETAILS

TRIED TWO DIFFERENT PHONES ON LINE 10. RECEIVED NO DIAL TONE. CHECK PROGRAM FOR WRONG COS BUT WAS CORRECT. NEW LINE CARD CURED PROBLEM. RETRIED OLD LINE CARD AND PROBLEM RETURNED.

CAUTION: PLEASE ENSURE PCB IS RETURNED IN ANTISTATIC BAG. DISABLE BATTERY PACK WHEN SHIPPING.

Figure F1-1 Example of Completed Repair Tag

TROUBLE LOG

SITE:

TYPE OF EQUIPMENT:

DATE:

TECH:

DATE OF INSTALLATION:

GENERIC ----------

- ☐ New Installation
- ☐ Previous Program Changes
- ☐ System Ground OK
- ☐ Fan Filter Clean and Functional
- ☐ Abnormal Conditions
- ☐ Alarm Present
- ☐ Power Supply Voltages OK
- ☐ Consistent Problem
- ☐ Intermittent Problem Frequency of Occurrence --------
- ☐ Light Traffic
- ☐ Heavy Traffic
- ☐ Single Line Problem
- ☐ Multiline Problem
- ☐ Single Trunk Problem
- ☐ Multitrunk Problem
- ☐ Repeat Service Call for Same Trouble

MACHINE INDICATORS (LEDs, ALARMS, LED DISPLAYS)

TROUBLE SYMPTOMS

PROBLEM CLEARED BY PERFORMING

PROBLEM NOT CLEARED, REFERRED TO

ADDITIONAL INFORMATION:

SX-20 ALARM LOG

DATE	ALARM CODE	OTHER SYMPTOMS	COMPANY NOTIFIED	OTHER ACTION

SX-20®

STATION MESSAGE DETAIL RECORDING (SMDR)

CONTENTS PAGE

1. GENERAL 1
Reason for Issue 1
Brief Description 1

2. DETAILED DESCRIPTION 1
Recorded Information 2

3. INSTALLATION 6
Printer Configuration 6
Magnetic Tape Recorder Configuration 6

4. PROGRAMMING 6
Programming Procedures 7

5. OPERATIONAL PARAMETERS 8
Nonrecording Conditions 8
Attendant-Handled Calls 10
Incoming Calls 10
Examples 11

LIST OF TABLES

TABLE TITLE PAGE

2-1 Summary of Fields in SMDR Records 3
3-1 Character Set 7
4-1 SMDR Options - Command 601, Register 8 9
5-1 SMDR Printouts 12

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1. GENERAL

1.01 This Section gives a general description of the Station Message Detail Recording (SMDR) feature which is applicable to the SX-20 Private Automatic Branch Exchanges when fitted with the Generic 503 software package. It also describes the installation, programming and operational parameters for the SMDR feature.

Reason for Issue

1.02 This Section is issued to describe the SMDR feature.

Brief Description

1.03 Station Message Detail Recording, also known as "Call Detail Recording", allows a business to analyze, and thus control, its telephone costs. Data is collected for each outgoing and/or incoming trunk call. Each such call generates a call record which is available at the RS-232 port of the PABX. This output can be connected to:

- A local printer which gives an on-line printout at the termination of each trunk call, or
- A magnetic tape recorder or similar storage medium which collects data for each event, for subsequent processing by a service bureau to produce reports on telephone usage for management, or
- Directly to a service bureau via a dedicated line for faster processing.

1.04 Each time a trunk is seized by a call outgoing from the PABX a record is generated. This record is applicable regardless of the call duration, the identity of the originating party (i.e., a station, the attendant or another incoming trunk) or whether the call is completed. Examples of such calls are contained in Part 5. If the trunk cannot be seized (e.g., the trunk is busy), a record is not made of the call.

1.05 Incoming trunk call data may be recorded. The record is generated regardless of the call duration, or whether the call is completed (e.g., the called party is busy).

1.06 Internal calls; i.e., calls between stations or between the station and the attendant, are not recorded.

2. DETAILED DESCRIPTION

2.01 Each time a trunk is seized, information is collected for the trunk until the trunk is released. The descriptive record is formatted and is available as output. If two or more trunks are involved in a call, a separate record is generated for each trunk. This allows each trunk to be analyzed for costing purposes. If a station dials a trunk, talks to it, then transfers it to another station, only one call record is generated. However, the number of the second station appears in the record.

Recorded Information

2.02 SMDR data which is recorded provides information on the following items:

- Outgoing, and Incoming calls
- Digits Dialed on the Trunk (maximum capacity 26 digits)
- Meter Pulses (optional)
- Long Calls Identified (with programmed durations)
- Time to Answer for Incoming Calls
- Identifies second station in a Transfer
- Identifies Conferences
- Records Answer Supervisions
- Indicates if the Attendant was involved in the call.

2.03 The data is output at the RS-232 port (Part 3), and each record occupies an 80-character row. Each field which appears in an SMDR record is described in the following paragraphs. The complete group of fields is summarized in Table 2-1. This Table includes information with regard to the field symbols used in the following descriptions.

2.04 **Long Call Indicator.** This optional field contains a "-" for calls of duration 5 to 14 minutes 59 seconds, a "%" for calls of duration 15 to 29 minutes 59 seconds, and a "+" for calls of 30 or more minutes. This is useful when records are to be manually scanned.

2.05 **Date (mm/dd).** The date is reported numerically as a 2-digit month followed by a 2-digit day. The year is not reported.

2.06 **Start Time (hh.mmp).** The start time of a call is reported in hours and minutes. Either 12-hour or 24-hour format may be employed.

2.07 **Duration of Call (hh:mm:ss).** The call duration (total time that equipment is in use) is reported in hours, minutes and seconds. Leading zeroes are output (Maximum time = 23 hr, 59 min, 59 s).

2.08 **Calling Party (pppp).** This is the party that originated the call. It may be a station, the attendant, or an incoming trunk, as described below:

- Station Number as Calling Party (ccc--). A station number may be from one to three digits (0-9). It is left-justified and space-filled.
- Attendant as Originating Party (ATT0). Calls originated by the attendant that do not involve a third party, report a calling party of ATT0. If the attendant calls an outside party on behalf of a station or trunk, that station or trunk is reported as the caller but the Attendant Flag symbol * appears in the "Attendant was Involved" field.
- Trunk Equipment Number as Calling Party (Tnnn or Xnnn). If the originating party is an incoming trunk, it is output as "Tnnn" for CO trunks and "Xnnn" for non-CO trunks. The "nnn" is the

equipment number of the trunk. It has a range from 001 to 008 includes leading zeroes. The "T" or "X" ensures that, and CO trunks may be distinguished from tie trunks.

TABLE 2-1
SUMMARY OF FIELDS IN SMDR RECORDS

Name	Columns	Format	Definition	Notes
Long Call	1	z	(blank) = 0-4 min - = 5-14 min % = 15-29 min + = 30 or more min	See System Options Table
Date	2-6	mm/dd	mm = Month dd = Day	mm = 01-12 dd = 01-31
Spacer	7		_ = Space	
Start Time	8-13	hh:mmp	hh = Hours mm = Minutes p = pm _ = am	1-12 or 0-23 00-59 p = PM, 12-hour clock _ = AM, 24-hour clock
Spacer	14		_ = Space	
Duration of call	15-22	hh:mm:ss	hh:mm:ss = duration in hours:minutes:seconds	hh = 00-23, mm = 00-59 and ss = 00-59
Spacer	23		_ = Space	
Calling Party	24-27	pppp	ccc = Station Number Tnnn = Trunk Equipment Number (CO) Xnnn = Trunk Equipment Number (Non-CO) ATT0 = Attendant	c = 0-9 nnn = 001-008
Spacer	28		_ = Space	
Attendant	29	f	* = Attendant _ = Attendant not involved	Attendant answered or initiated the call, then transferred it to a station
Trunk Group Access	30-33	gggg	cccc = Access Code	c = 0-9 left-justified Outgoing and Tandem Calls Only

TABLE 2-1 (CONT'D)
SUMMARY OF FIELDS IN SMDR RECORDS

Name	Columns	Format	Definition	Notes
Time to Answer (Alternate)	30-33	ttt_	ttt-- = Time in seconds (000-256) *** = Call unanswered	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 #
Meter (Optional)	55-59	mmmm	mmmm = Number of meter pulses	mmmm = 0000 to 65535 Leading zeroes outputted
Call Completion Status	60	h	A = Answer Supervision B = Callee is Busy E = Caller Error T = Toll Denied or TAFAS answered	Outgoing Incoming Direct/Dial-In Incoming/Dial-In Incoming/Outgoing
Speed Call Flags	61	S or F	S = Number was Speed called F = Forwarded Externally	Outgoing
Called Party	62-65	qqqq	ccc_ = Station Number Tnnn = Trunk Equipment No. (CO) Xnnn = Trunk Equipment No. (Non-CO) ATT0 = Attendant I	C = 0-9 nnn = 001-008
Transfer/ Conference Call	66	K	T = Supervised Transfer X = Unsupervised Transfer C = 3-Way or Conference	"Dead Transfer" or "Transfer into Busy"
Spacer	67		_ = Space	
Third Party	68-71	rrrr	ccc-- = Station Number	c = 0-9

2.09 Attendant made or answered the Call (f). This 1-digit field identifies calls originated by or initially answered by the attendant, and reported as a "*". This flag will not appear under other circumstances; i.e., if a call is transferred to the attendant.

2.10 Trunk Group Access Code (gggg). This field applies to outgoing calls. For incoming calls this field is used to report Time to Answer (see below). The Trunk Group Access Code may be from one to three digits long (0-9). It is left-justified and space-filled.

2.11 Time to Answer (ttt). This is the number of seconds from the time the trunk is seized incoming, until the call is answered. If the call is never answered, this field displays *** . It applies to incoming calls only; the same field is used to define the Trunk Group Access

Code for outgoing calls (see paragraph 2.10). Leading zeroes are output. It reverts to zero after reaching 256.

2.12 **Digits Dialed on the Trunk (xxx---x).** The maximum number of digits (0-9, *, #) recorded is 26. If the "SMDR Record Meter Pulses" option is selected, this reduces to 20, to leave room for the 5-digit meter. On outgoing calls, this field does not include the Trunk Group Access Code unless it is an "Identified Trunk Group", in which case this is pulsed out on the trunk in front of the digits dialed. On dial-in trunk calls, the digits dialed in on the trunk are recorded. If more than 26 digits are dialed, the digits after the 26th are not recorded.

2.13 **Meter Pulses (mmmm).** The number of reversals or XT lead increments received from an outgoing trunk is optionally recorded. The range is 0 to 9998. Leading zeroes are output. The "SMDR: Record Meter Pulses" option must be selected. The trunk group must be programmed for "Supervision is Answer" to enable this option.

2.14 **Call Completion Status (h) (Outgoing Calls).** This field is used to report the completion of an outgoing call in so far as the PABX is able to determine it. If the outgoing call fails the toll deny checking, and is dropped, this field contains a "T". If the trunk group is programmed to take "Supervision is Answer" and a supervision is received, an "A" is reported. If the trunk group is programmed for "Toll Reversal" and a supervision is received, a "T" is reported.

2.15 **Call Completion Status (Incoming Calls).** On incoming calls, the PABX knows the outcome of the call and thus can report it more fully. If the station or Hunt Group to which the call is directed is busy, a "B" is recorded. If an incoming dial-in trunk dials an invalid number and receives reorder tone, an "E" is reported. The field is blank for incomplete calls. A "T" is reported if the incoming trunk is answered with TAFAS.

2.16 **Speed Call Flags.** This field contains an "S" if the number was speed dialed and an F for forwarded externally.

2.17 **Called Party (qqqq).** This is the party to whom the call is directed. It may be a station number, the attendant or, for outgoing calls, the equipment number of the trunk. The format in which the called party is output is identical to that used for the calling party. See Calling Party (pppp). On incoming calls directed to the attendant, the called party would be the attendant unless the attendant transfers it to a station, in which case, it is the station number. For Direct-In Lines, it would be the station number. For more information, see paragraph 5.05.

2.18 **Transfer/Conference Call (K).** Calls that involve three parties are indicated by means of this field. It contains a "T" for supervised transfers, "X" for unsupervised transfers (i.e., dead transfer or transfer into busy) and a "C" for 3-way conversations and conferences.

2.19 Third Party (rrrr). The third party field contains the number of the station to which a trunk call has been transferred by another station. If several transfers take place for one trunk call, the first party is the only one reported. The format is identical to that of the Calling Party (pppp).

3. INSTALLATION

3.01 Installation to meet the Station Message Detail Recording requirements consists of the following steps:

(a) Verification that Generic 503 software is included in the SX-20 system.

(b) Determination of the required output configuration.

(c) Installing the hardware items.

(d) Programming and operation of the completed system (Parts 4 and 5).

Printer Configuration

3.02 The PABX has an RS-232 data port to the SMDR facility. A local printer may be connected to this port to provide an on-premises printout. The port may also be connected to a remotely-located facility via an RS-232 adapter and a modem. The required printer characteristics are as follows:

- 80-character line length.
- 300 Baud character rate.
- The subset of required ASCII characters is illustrated in Table 3-1.
- Each line printout from the PABX data port is terminated by a "carriage return" and "line feed" character. For printers which required an extra delay, six "NULL"' characters may be added to the termination.

Magnetic Tape Recorder Configuration

3.03 The data port may also be (locally or remotely) terminated by an RS-232 compatible magnetic tape recorder or similar storage medium instead of a printer. The SMDR data thus stored may be subsequently retrieved as required.

4. PROGRAMMING

4.01 This Part describes the programming options and procedures which are required in connection with Station Message Detail Recording and also refers to other options which are of particular interest to SMDR.

TABLE 3-1
CHARACTER SET

Bit Numbers													
b7								0	0	1	1	0	0
b6								0	0	1	1	0	0
b5								0	1	0	1	0	1
b7	b6	b5	b4	b3	b2	b1	Column	0	1	2	3	4	5
							Row						
			0	0	0	0	0	NUL		SP	0		P
			0	0	0	1	1		DC1	!	1	A	Q
			0	0	1	0	2			"	2	B	R
			0	1	1	1	3		DC3	#	3	C	S
			0	1	0	0	4				4	D	T
			0	1	0	1	5			%	5	E	U
			0	1	1	0	6			&	6	F	V
			0	1	1	1	7	BELL		/	7	G	W
			1	0	0	0	8			(	8	H	X
			1	0	0	1	9			)	9	I	Y
			1	0	1	0	A	LF		*	:	J	Z
			1	0	1	1	B			+	;	K	
			1	1	0	0	C	FF		,		L	
			1	1	0	1	D	CR		-	=	M	
			1	1	1	0	E			.		N	
			1	1	1	1	F			/	?	O	

Notes: 1. Control DC1 or a "break" or NULL causes printing.
2. Control DC3 suspends printer.

4.02 System options which are directly applicable to SMDR, and other options which are required for printer operation are described in Table 4-1.

4.03 COS and Trunk Group Programming. There are two fields which must also be programmed for a station basis and/or trunk group basis: the first is in COS programming and the second in Trunk Group programming. If a station is to be monitored via SMDR, COS SMDR Enable must be enabled in the required Commands 611 → 619, Register 3. This will automatically record all calls from/to any station having a COS with that feature enabled. The second field to be programmed is Trunk Group SMDR Enable in Trunk Group Programming, Commands 821 → 826, Register 2. When this is enabled, any station accessing that trunk group, regardless of whether COS SMDR Enabled had been programmed in that station's COS, will be recorded.

Programming Procedures

4.04 Programming procedures for PABX are detailed in Section MITL9102-095-210-NA, System Programming. When the SMDR facility is a requirement (Generic 503 software must be used), the SMDR options and features should be programmed with the other

options and features for new installations, or they may be added for existing installations.

4.05 The SMDR facility is not effective unless the Trunk Group type is programmed. Thus, SMDR reporting can be restricted to only certain Trunk Groups. Note that the Class of Service and Trunk Groups have SMDR enabled.

4.06 On completion of programming the SMDR facility will be operational. A brief outline of the operational procedures with examples of SMDR printouts is contained in Part 5.

5. OPERATIONAL PARAMETERS

5.01 There are no special operational procedures employed by the attendant or station. The following operational parameters should be noted when SMDR is used.

Nonrecording Conditions

5.02 SMDR is initiated when an outgoing trunk is seized, and (if enabled) when an incoming trunk is seized SMDR is not initiated under the following conditions:

- Busy tone is obtained by the attendant or a station when a trunk group is dialed (because all trunks in the group are busy).
- The attendant intercepts a station attempting to access a trunk group.
- During a power failure condition no SMDR records are made because storage is in the volatile RAM.

5.03 SMDR is also not initiated if the Trunk Group is not programmed for SMDR (paragraph 4.06), or if the following System Option is enabled and the relevant conditions (Table 4-1) apply:

- System Option - SMDR Drop Incomplete Outgoing Calls.

TABLE 4-1
SMDR OPTIONS - COMMAND 601, REGISTER 8

System Option	Description
SMDR: System Enable	Enable Incoming Trunk Calls Only: This option enables the SMDR feature for incoming trunk calls. Enable Outgoing Trunk Calls Only: This option enables the SMDR feature for outgoing trunk calls. Enable Both Incoming and Outgoing Trunk Calls: This option enables the SMDR feature for incoming and outgoing calls.
SMDR: Record Meter Pulses	If this option is selected, the number of meter pulses generated by the Central Office is reported in the SMDR record. This option is not meaningful unless SMDR System Enable: Enable Outgoing Trunk Calls or both Incoming and Outgoing Trunk Calls is selected.
SMDR: Long Call Indicator	If this option is selected, calls of 5 minutes or longer are flagged in the SMDR record.
SMDR: Record Only Incoming CO Trunk Calls	If this option is selected, incoming calls on incoming CCSA (Common Control Switching Arrangement) and nondial tie trunks are not recorded. The recording of incoming calls on dial-in trunks and DISA trunks is controlled by COS Option SMDR Enable (Commands 611 - 619, Register 3).
SMDR: Drop Calls of Less Than Eight Digits	If this option is selected, outgoing calls in which less than eight digits are dialed on the trunk are not reported. This option is only meaningful if SMDR System Enable: Enable Outgoing Trunk Calls Only is also selected.

TABLE 4-1 (CONT'D)
SMDR OPTIONS - COMMAND 601, REGISTER 8

System Option	Description
SMDR: Drop Incomplete Outgoing Calls	If this option is selected, incomplete outgoing calls are not recorded. If a Trunk Group is programmed for Answer Supervision (Commands 821 → 826, Register 2), calls that do not receive supervision are not reported. If a Trunk Group is not programmed for Answer Supervision, a "10 second interdigit time-out" is assumed. Calls that endure less than this time are not reported.
SMDR: Purge	If this option is selected, the SMDR Buffer automatically loses the first call and records the last call when the printer is suspended. The SMDR Buffer can hold a maximum of 18 records.

Attendant-Handled Calls

5.04 The following conditions are reported as shown when the attendant handles a call:

(a) If the attendant dials a trunk with no station or other trunk involved, the calling party is the attendant.

(b) If the attendant makes an unsupervised transfer to a station, the called party is the attendant, and the station appears as a third party.

(c) If the attendant answers a trunk call and does not transfer it to a station, the called party is the attendant.

(d) If the attendant dials a trunk while it has an station as its source, the calling party reported is the station and "*" appears in the "Attendant was Involved" field.

(e) If the attendant has a trunk as Source, then dials a station, the station answers, the attendant presses RELEASE, the calling party is the trunk, the called party is the station, and "*" appears in the "Attendant was Involved" field.

Incoming Calls

5.05 When SMDR is enabled for incoming calls, the following conditions are reported:

(a) Digits dialed on incoming DISA trunks are reported in the "Digits Dialed on the Trunk" field. If the dial-in trunk dials an illegal or vacant number or hangs up before completing the

number, the call is still reported. The called party is the station dialed. The DISA Security Code is not reported.

(b) The called party is the attendant unless the attendant then dials a station. In that case, the called party becomes the station and an "*" is reported in "Attendant was Involved". Attendant-handled calls are further discussed in paragraph 5.04.

(c) Direct-in trunks will show the station number as the called party; for example, dial-in trunks. However, the "Digits Dialed" field is blank. If the trunk is directed to a hunt group, the station that answered the call is reported.

(d) On incoming calls, an "E" is reported if the trunk hangs up while listening to reorder tone, or a "B" if the trunk hangs up while listening to busy tone. A "T" is reported if the incoming call is answered with TAFAS.

Examples

5.06 Typical SMDR printouts are shown in Table 5-1.

TABLE 5-1
SMDR PRINTOUTS

```
0        1         2         3         4         5         6         7         8         9
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789
```

EXAMPLE 1 - 2-PARTY OUTGOING CALL

```
-06/13 11:42   00:08:29   101  9   16135922122                A T002
```

On June 13th at 11:42 AM, Station 101 dialed "9" to get an outside line. The station obtained Trunk Equipment Number 002 and dialed "1-613-592-2122". Answer supervision was provided. The conversation lasted 8 minutes, 29 seconds.

EXAMPLE 2 - 2-PARTY OUTGOING CALL

```
05/17 10:51   00:01:52   102  5   103                        A X005
```

On May 17 at 10:51 AM, Station 102 dialed 5 to get an identified trunk group, then 103 to obtain an station in the other PABX. The other PABX provided supervision and the conversation lasted 1 minute, 52 seconds. The Trunk Equipment Number was 005.

EXAMPLE 3 - 2-PARTY INCOMING CALL

```
01/30 03:10P  00:02:22   T002 008 115                    115
```

On January 30 at 3:10 PM, incoming Direct-In Trunk Number 002 rang into Station 115. The station answered after 8 seconds and they talked for 2 minutes, 22 seconds.

EXAMPLE 4 - 2-PARTY INCOMING CALL

```
03/12 09:11   00:01:12   X003 007 491                    124
```

On March 12 at 9:11 AM, DISA Trunk 003 dialed Hunt Group With Access Code "491". Station 124 answered after 7 seconds, and the conversation lasted 1 minute, 12 seconds.

EXAMPLE 5 - ATTENDANT-HANDLED CALL - OUTGOING TRUNK

```
+01/30 03:27P  00:35:11   101  *9  16545996951            A T002
```

On January 30, Station 101 dialed the attendant and asked for an outside line. The attendant dialed 9, followed by 1-654-599-6951, then pressed RELEASE. At 3:27 PM, the other party answered and the conversation lasted 35 minutes, 11 seconds and Answer Supervision was provided. Trunk Equipment 002 was used.

TABLE 5-1 (CONT'D)
SMDR PRINTOUTS

```
0         1         2         3         4         5         6         7         8         9
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789
```

EXAMPLE 6 - ATTENDANT-HANDLED CALL - INCOMING TRUNK

```
04/15 01:42P  00:00:31   T008 009                              ATTO
```

On April 15th at 1:42 PM, Trunk 008 rang into the attendant. After 9 seconds, the attendant answered. The trunk party spoke to the attendant for 31 seconds, then hung up.

EXAMPLE 7 - CALLING STATION TRANSFER CALL

```
04/02 09:36   00:04:55   103   78  5922122                T002T     100
```

On April 2nd at 9:36 AM, Station 103 dialed Trunk Access Code 78 followed by 592-2122. The called party answered, and after conversing, the caller transferred the called party to Station 100. After further conversation, Station 100 hung up. The total period for both conversations was 4 minutes, 55 seconds. Trunk Equipment 002 was used for the call.

EXAMPLE 8 - CALLED STATION TRANSFER CALL

```
03/12 07:42   00:03:06   *003                               121T      115
```

On March 12th at 7:42 AM, Trunk 002 rang the console and requested to speak to Station 121. The attendant took 3 seconds to answer the call. After speaking to Station 121 the latter station then transferred the call to Station 115. The total conversation lasted 3 minutes, 6 seconds.

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