

SX-100[®]

SX-200[®]

SUPERSWITCH[®]

VOLUME IV
(GENERIC 217)



sx-200

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-100®/SX-200®
SUPERSWITCH™
ELECTRONIC PRIVATE AUTOMATIC BRANCH EXCHANGE
TROUBLESHOOTING
GENERIC 217**

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1. GENERAL

Introduction

1.01 This Section contains information to be used when troubleshooting the SX-100/SX-200 Automatic Call Distribution System. The Practice is divided into seven parts and nine appendices:

- Part 1. General - gives a brief outline of the Practice and a general introduction to the troubleshooting philosophy.
- Part 2. Maintenance Aids - describes the maintenance aids provided by the system and gives a description of each indicator, switch and display.
- Part 3. Console and Test Line Functions - contains a description of the maintenance functions which can be dialed from the console or the test line.
- Part 4. Error Code Troubleshooting - describes the troubleshooting procedures to be used in conjunction with the system error code displays.
- Part 5. Fault Report Troubleshooting - this Part details troubleshooting procedures to be used when no error code is reported.
- Part 6. SX-100/SX-200 Power Supply Specifications - defines the electrical and operational specifications for the SX-100/SX-200 system power supplies.
- Part 7. RMATS - this Part briefly discusses RMATS. For further information, see Section MITL9105/9110-098-101-NA.
- Appendix A - MITEL Action Procedures (MAPs).
- Appendix B - provides a series of tables of all system parameters.
- Appendix C - provides installation and cabling information for the SX-100/SX-200 system.
- Appendix D - contains the mechanical information pertaining to the SX-100 system in the form of MAPs and tables.
- Appendix E - contains the mechanical information pertaining to the SX-200 in the form of MAPs and tables.
- Appendix F - contains all power checks pertaining to the SX-100/SX-200 system in the form of MAPs and tables.
- Appendix G - details, in the form of MAPs, the procedures required to locate and fix malfunctions in the systems.

- Appendix H - gives a brief description of the SUPERSET 4 set, including physical characteristics and electrical and environmental specifications.
- Appendix I - gives a brief description of the SUPERSET 3 set, including physical characteristics.

Reason for Reissue

1.02 This Section has been reissued to include additional UCD (Uniform Call Distribution) information.

1.03 It should be noted that certain sections and appendices must be used as interlocking information for complete troubleshooting.

The SUPERSET 3 and SUPERSET 4 Sets

1.04 For test information on the SUPERSET 3 set or the SUPERSET 4 set, see Section MITL9 105/9 11 0-096-320-NA. For Engineering Information on the SUPERSET 4 set, see Section MITL9105/9110-096-180-NA.

Basic Troubleshooting Philosophy

1.05 The SX-100/SX-200 system employs automatic diagnostics which, in most cases, can pinpoint faults to a specific printed circuit card. A system malfunction is generally corrected by the replacement of an indicated faulty circuit card with a known (good) spare. Should the need arise, the actual shelf backplane or power supply may be easily replaced by a new unit. The tables, MAPs and explanations in this Practice should be sufficient in most cases to cover any problems which may arise in the field.

1.06 Actual field repair of components on cards, shelves or power supplies is never done. All defective units should be returned to MITEL, as per Section MITL9105/911 0-096-200-NA.

2. CIRCUIT CARD AND MAINTENANCE PANEL AIDS

2.01 The SX-100/SX-200 system is equipped with various maintenance aids that will be of assistance to the repair person troubleshooting the system. This Part is a card-by-card description with specific reference to all indicators, switches and fuses on the cards. In addition, the connectors and switches on the maintenance panel are also described.

Card Shelf

2.02 Figure 2-1 illustrates the card locations in the equipment shelf or shelves. A visual display of all cards is shown in Figures 2-2, 2-3(a) and 2-3(b). Fuses on the backplane of the shelf are described in paragraph 2.25.

2.03 Both the SX-100 and SX-200 systems employ a minimum number of cards in the card shelf (Figure 2-2 and Figures 2-3(a) and (b)). These cards may be used in either system, minimizing stock and control problems for field maintenance.

IPC Card

2.04 The IPC (Integrated Processor Control) contains all operating software in the form of PROM and RAM and the microprocessor (68A09). There is 160 kbytes of PROM and 48 kbytes of RAM. Of the kbytes of RAM, 34 kbytes are write-protected and the remaining kbytes are not write-protected. All customer memory is protected from power failure by a card-mounted battery pack. When an IPC is shipped, the batteries are turned off (see Section MITL9105/9110-096-350-NA). The batteries must be turned on before the IPC can be programmed. The actual Generic information is contained in the PROM and is non-volatile (see Figure Z-2).

2.05 There is a RAM Load button that will enable a RAM data load from a recording device. This card also contains a LED that will be lit to indicate that the RAM batteries are charging. In addition to the RAM batteries LED, there are three other LEDs:

1. The top LED, when flashing, indicates that the automatic diagnostics are running. The LED will not flash (the diagnostics not run) when the system is in Programming Mode, or will flash less than four speech paths are idle. Under these circumstances the LED may be on or off; its state has no special meaning.
2. The second LED, when lit, indicates that the system is in test programmable mode.
3. The third LED, when lit, indicates that the RS-232 port is in use.
4. The fourth LED if supplied, when lit, indicates that the system is functioning normally.

Scanner Card

2.06 The Scanner card (Figure 2-2) contains a 2-digit display which is used to display faulty card positions. It may be used in conjunction with the test line to display the status of selected circuits and to support the customer data Load and Dump. The 2-digit display is read from top to bottom. If a card is malfunctioning, the displays will show the position number of the faulty card (01-22 for equipment shelf 1, and 31-42 for the SX-200 equipment shelf 2).

2.07 When used in conjunction with the test line, the display shows the status of the receiver and/or the speech path which has been selected. The top display shows the receiver status and the bottom display shows the speech path status. The customer data can be dumped or loaded in blocks. The displays used are shown in Table 2-1. This card also contains the night bells and night service relays.

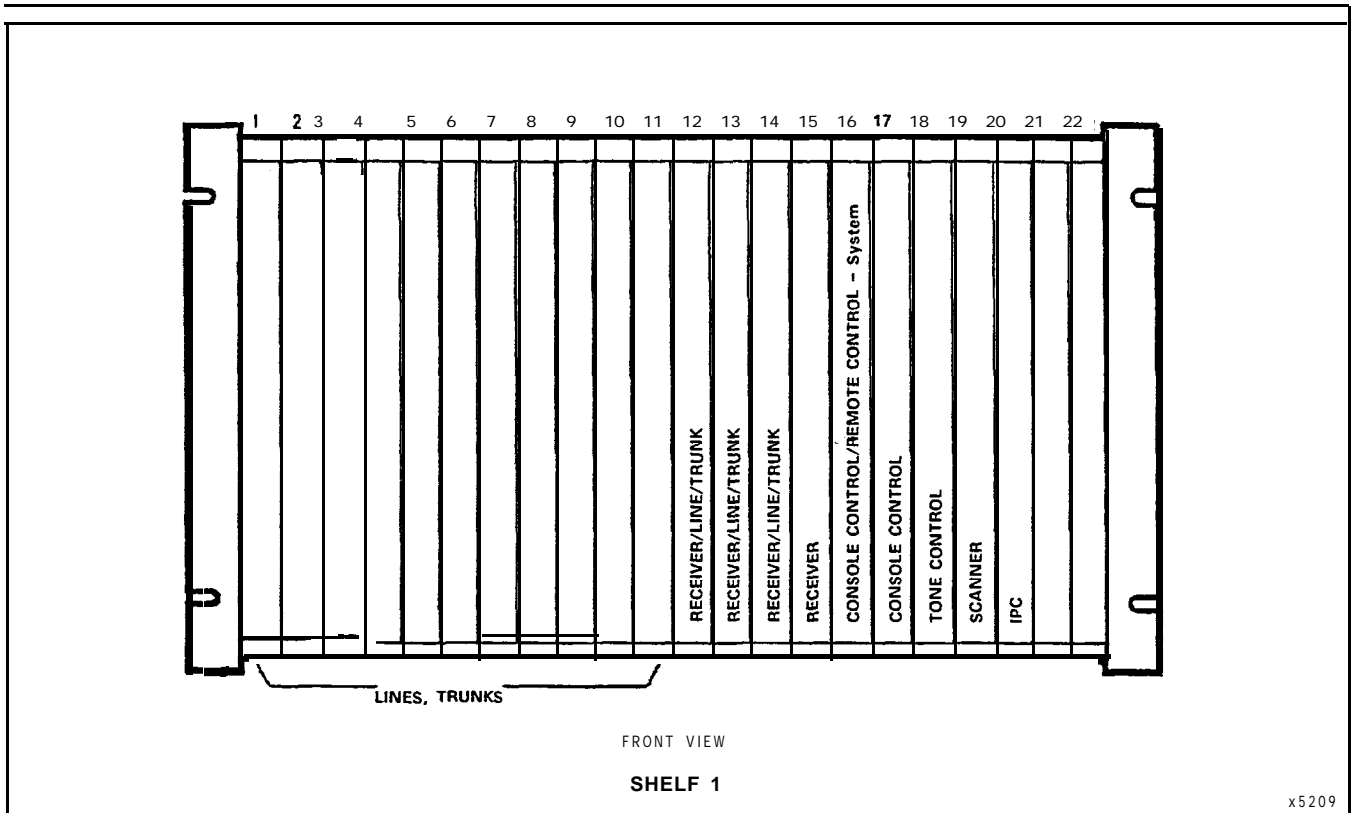


Figure 2-1 Equipment Shelf

**TABLE 2-1
SCANNER DISPLAYS**

Display	Meaning
A	Available - not in use
C	Conversation - in use
E	Error - found faulty by diagnostics
F	Found - in use by test line
0	Optional - no specific circuit selected
AA	Beginning of Data Load
01-99	Each Record increments
00-30	Scanner display
EE	Checksum Error on Data Load

2.08 The Master Reset button is used in the initial programming process as part of the RAM clearing procedure and may also be used to reset the system. When the Master Reset button is pressed, the processor is momentarily turned off, all existing calls are dropped, and all system crosspoints are released. The processor then starts, and the diagnostics begin operating, in the same manner as when the system power is first turned on.

2.09 The Baud Rate switch selects the RS-232 port baud rate as either 300 or 1200 baud. The number of stop bits, parity and word length is determined by the DIP switches on the face of this card.

Tone Control Card

2.10 This card provides dial tone, busy tone, ringback tone and miscellaneous tone, along with two DTMF generators and two rotary dial generators which are used for diagnostic tests. The DTMF generators are also used when dialing from the console. The four thumbwheel switches used with the test line and programming are also located on the tone control card. In addition, the circuits for Page 1 and Page 2 outputs, and the Music-on-Hold inputs are located on this card (see Figure 2-2).

2.11 **Tone Control Thumbwheel Switches.** The four thumbwheel switches on the Tone Control card are used in conjunction with programming, maintenance and load functions. The number settings read from top to bottom. Programming functions are shown in Table 2-2.

- (a) **Maintenance Functions:** The thumbwheel switches may be used in conjunction with the test line to select receivers and speech paths. The top two switches are used to select a receiver by setting the switches to the last digits of the required receiver equipment number (even numbers only, 90-20). If set to 99, any free receiver will be selected. The bottom two switches are used to select a speech path (01-31 for speech paths, or 32 for the Music-on-Hold speech path). If set to 99, any free speech path will be selected. When not using the test

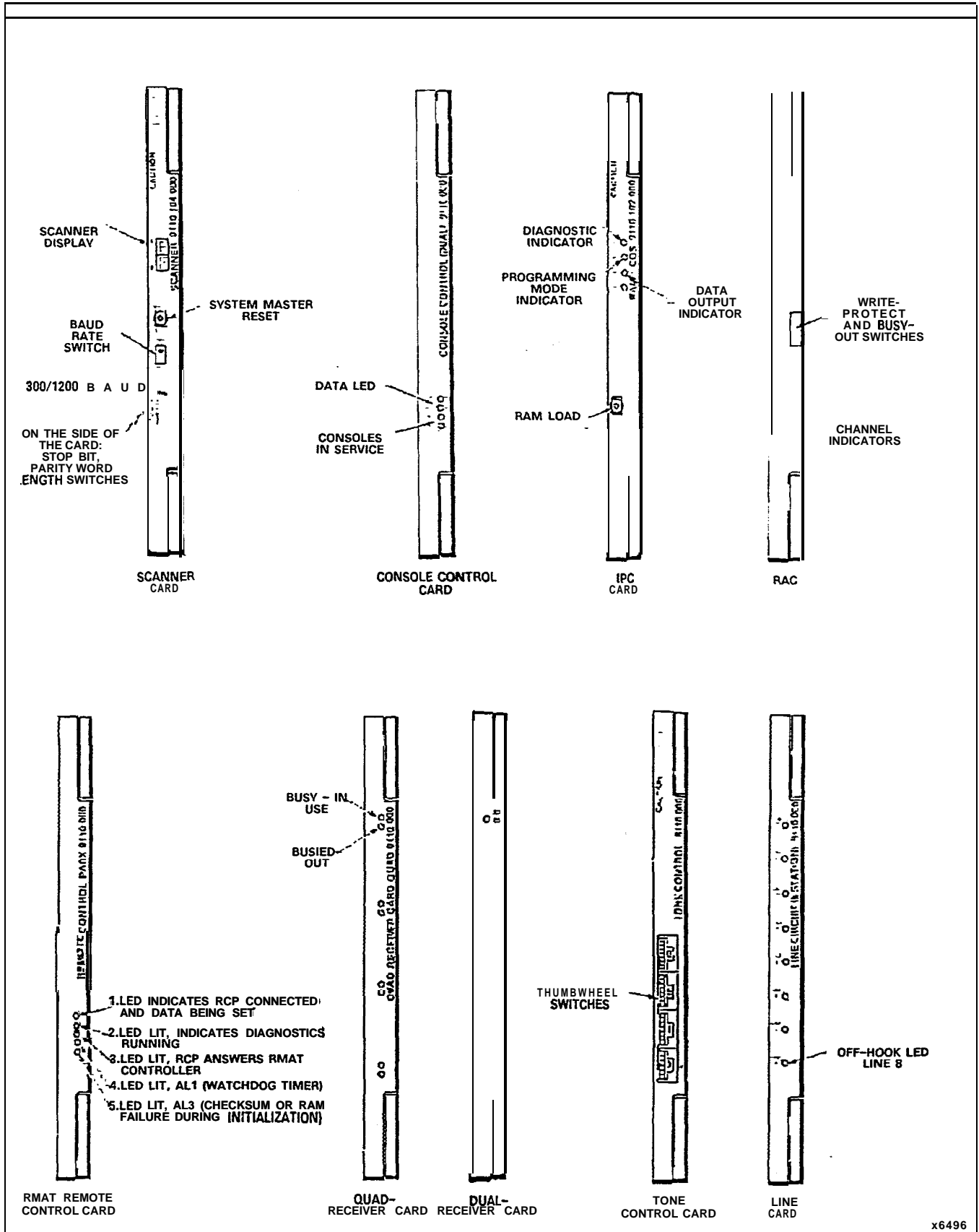
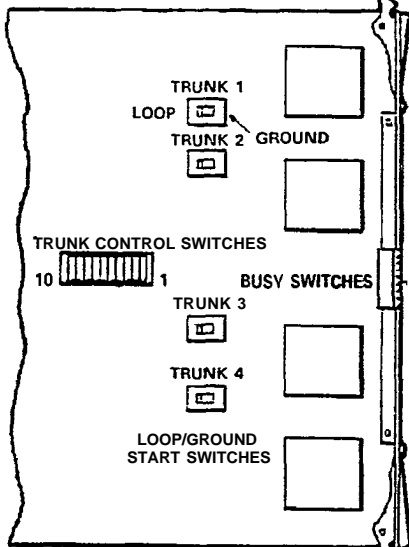


Figure 2-2 Equipment Cards

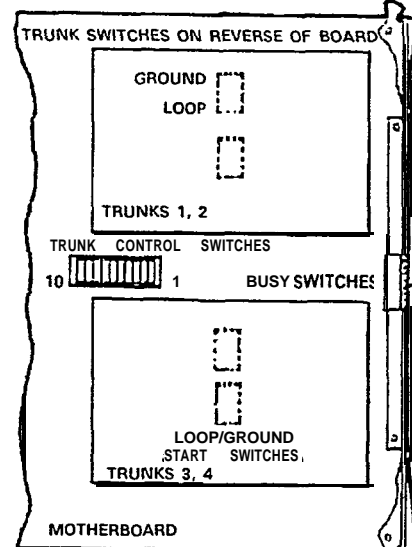
TWO VERSIONS OF CO TRUNK CIRCUIT CARD 91 10-01 I-000 DO EXIST

9110-011-000 (NON-MODULAR)



THIS IS A NONMODULAR CO TRUNK CARD. IT HAS THE ABILITY TO MAKE FOUR INDIVIDUAL TRUNKS EITHER LOOP OR GROUND START.

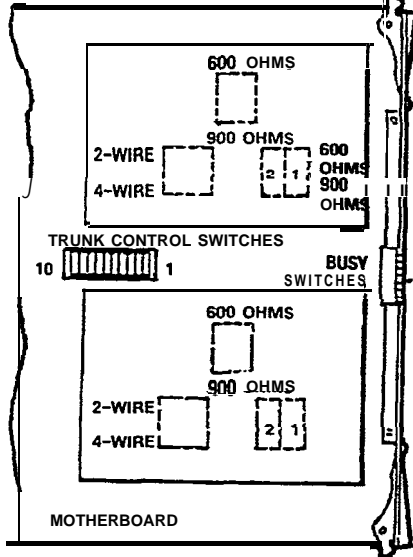
9110-011-000 (MODULAR)



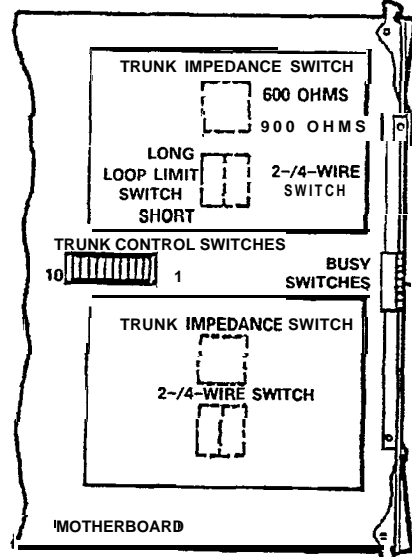
THIS IS THE MODULAR CO TRUNK CARD. FOUR INDIVIDUAL TRUNKS MAY BE SET FOR EITHER LOOP OR GROUND START.

TWO VERSIONS OF E&M TRUNK CIRCUIT 9710-013-000 DO EXIST

9110-013-000

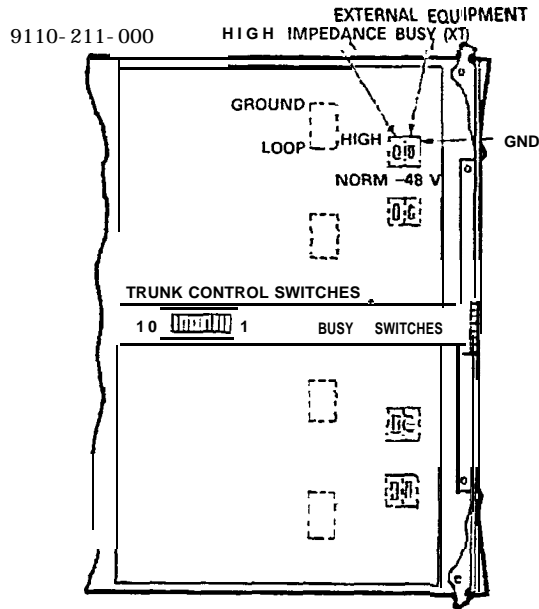


9110-013-000

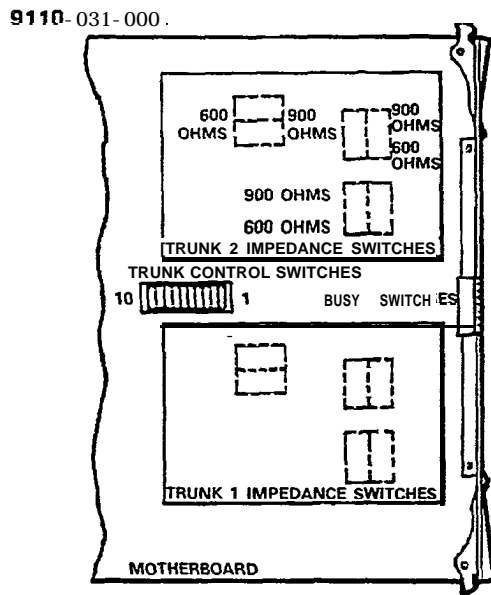


THIS IS A MODULAR E&M TRUNK CARD. TWO E&M TRUNK CIRCUITS ARE ACCOMMODATED. THE TRUNKS MAY BE SET FOR WINK START. STOP DIAL. 2- OR 4-WIRE OPERATION. SPECIAL GAIN AND 600 OHMS OR 900 OHMS IMPEDANCE.

Figure 2-3(a) Circuit Cards



THE 9110-211-000 IS A TRANSFORMER TRUNK CARD ACCOMMODATING FOUR CO TRUNKS.



THIS IS A MODULAR DID/TIE TRUNK CARD. TWO DID OR TIE TRUNKS ARE ACCOMMODATED. TRUNKS CAN BE SET FOR WINK START, INCOMING DIAL = OUTGOING AUTO AND DELAY DIAL.

X5170

Figure 2-3(b) Circuit Cards

line for maintenance purposes, the switches should be set to 8888.

- (b) **Load Functions:** The Customer Program Dump/Load Function requires the switches to be set to 5523 to initiate a load from an external storage device.

TABLE 2-2
SWITCH SETTINGS

Switch Settings	Function
7770	Enter Maintenance Console into programming mode
7771	Enter Supervisor Console 1 into programming mode
7772	Enter Supervisor Console 2 into programming mode
7776	Initialize System Configuration (Clear RAM)
XXXn	Take any console out of programming mode (one of the X = any digit except 7, n = 0-9)
777n	Enables reset from test line (n = 0-2); Dial 555-6
5623	Load Function

Console Control Card (Basic)

2.12 The console control card provides the interface between the system and two consoles. Console control card number 1 (position 17) is allocated to the maintenance console connector and the Supervisor console number 1 connector. Console control card number 2 (position 16) is allocated to the Supervisor console number 2 connector. The card provides both voice and data signals to and from each console (see Figure 2-2). To identify the console, the operator may press the IDENT button. The last segment in the DESTINATION Display identifies the console as 0 for maintenance, 1 for console 1, or 2 for console 2.

Console Control Line and Data LEDs

2.13 LINE 1 and LINE 2 LEDs, when lit, indicate that the associated console is active (i.e., the handset or headset is plugged in). The designations 1 and 2 refer to the two consoles handled by the card. The maintenance console will appear in slot 17, line 2. Console 1 will appear in slot 17, line 1. Console 2 will appear in slot 16, line 1. Line 2 in slot 16 is not used. The data LEDs indicate voice pair continuity to the console(s). The LEDs labeled DATA 1 and DATA 2 flicker whenever data is transmitted from the corresponding console to the console control card (data is transmitted when any console button is pressed).

Remote Control RMAT

2.14 The Remote Control System (RCP) card, can be fitted in slot 16 of the System shelf to provide the System console button functions remotely, under the control of the RMAT Controller (see Section MITL9105/9110-98-101-NA). The main components of the RCP card are as follows:

- The Micro-Processor Unit (MPU), which acts on commands received from the RMAT Controller via the modem.
- MEMORY PROM/RAM, which contains programmed memory and scratch pad memory for storage and execution of commands.
- MODEM, which provides the necessary tone transmitter and receiver, and contains the handshaking circuitry required to interface the MPU with the external 2-wire line.
- TRUNK INTERFACE, to provide the proper termination to the line with regard to impedance, ringing and supervisory condition.
- MASTER/SLAVE INTERFACE, to enable the MPU to access the System data bus and control lines.

Receiver Card

2.15 The dual-receiver card has two rotary dial and two DTMF receivers. Having received each dialed digit, the receiver informs the processor and prepares for the next digit. The dual-receiver card contains no LEDs or switches. The quad-receiver card contains four rotary dial, four DTMF receivers, four dial tone detectors, and four sets (two each) of LEDs labeled A1 B1, A2 B2, A3 B3 and A4 B4. In each case, the A LED indicates a busy condition and the B LED indicates a busied-out condition.

Trunk Card

2.16 The Trunk card contains either two or four trunks depending upon the trunk type (Figure 2-3 - four CO Trunks, two E&M Tie Trunks, or two DID Trunks per card). These circuits provide the interface between the system and the Central Office, other systems, or other equipment. Each trunk circuit repeats dial pulse signals from the speech path to the Tip and Ring and passes DTMF signals directly from the speech path to the trunk for outgoing calls. The busy switches on the trunk card may be used to make a trunk continuously busy. If the trunk is in use when the switch is set, the existing call is not disturbed. For exact details of the trunk busy switches, see Table 2-3.

- (a) **Trunk Busy/Idle LEDs:** Each trunk circuit has associated with it a LED which shows the busy/idle status of the trunk as follows:
- Trunk circuit idle - LED OFF
 - Trunk circuit seized - LED ON

J 14

BK/G
Console #2

- Trunk circuit busied - LED FLASHING (by switch on console or from the console).

- (b) Trunk Incoming and Outgoing Busy Switches: Associated with each trunk circuit are two busy switches: one for making the trunk busy outgoing and one for making the trunk busy incoming. Table 2-3 lists the switch settings and describes their effect.

Standard Line Card

2.17 The Line card contains eight separate line circuits. The Line card circuit detects on- and off-hook conditions, which are recognized by the scanner and reported to the processor for appropriate action. Dial signals (rotary dial or DTMF) are passed over the speech path selected for the conversation (see Figure 2-2). The LED on each line circuit provides an indication that the line circuit has detected an off-hook condition. The LED is driven directly from the off-hook detector circuit in the line circuit. It turns ON when an off-hook condition is detected and will flash when dial pulses are sent.

The SUPERSET Line Card

2.18 The SUPERSET 3 set or the SUPERSET 4 set requires a SUPERSET Line card that is not compatible with standard telephone sets. The card contains eight separate line circuits with eight LEDs indicating on-/off-hook conditions. The line circuits act as an interface between the SUPERSET sets and the system CPU (Central Processing Unit). The system processor continually polls all line circuits to determine calls for service, time updates, messaging, etc. No actual dial signals are sent between the SUPERSET 3 set or the SUPERSET 4 set and the system, as all communication is digitally sent. For further information, see Section MITL91 05/91 10-096-I 80-NA.

RAC

2.19 The Recorded Announcement Card (RAC) occupies one peripheral slot in the system and provides two different 8 second recordings using digital solid-state storage. Messages are recorded on the Supervisor's console. If required, the two 8 second messages can be linked to provide one 16 second message. In the front faceplate of the card there are eight DIP switches. The first four switches may be used to busy out a particular channel (two channels per recording). The fifth and seventh switches are the write-protect switches. The other two switches may be set to disable recording. In addition there are four indicator LEDs (one per channel) that are lit when a channel is busy out or in use.

Maintenance Panel

2.20 At the top of the equipment cabinet is the maintenance panel (Figure 2-4). This panel provides the service personnel with access to the system through the maintenance console connector and test line terminals. Also housed on the maintenance panel are the

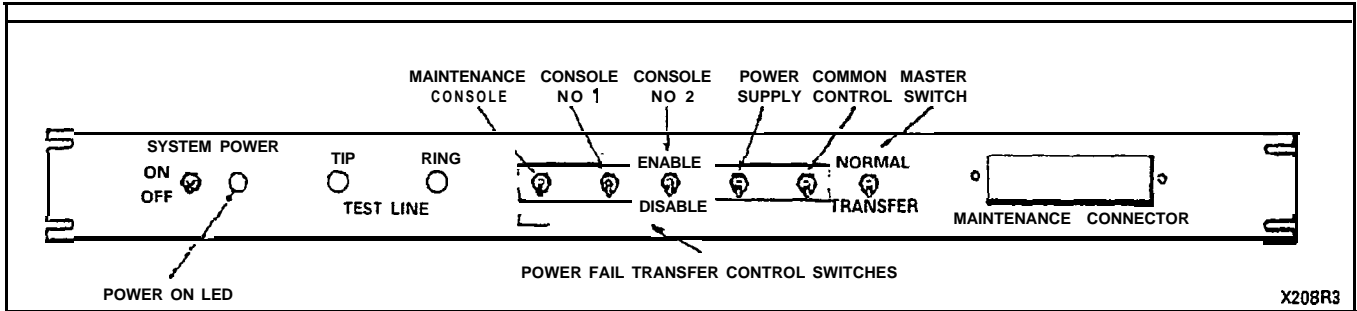


Figure 2-4 Maintenance Panel

Power Fail Transfer Control Switches, a System Power ON/OFF switch and a Power ON LED.

- (a) **Maintenance Console Connector:** This connector is provided to allow the installer/repair person to plug in a console for administration and test purposes: i.e., to program changes in system data.
- (b) **Power Fail Transfer Control Switches:** These switches are used to control the source of a power fail transfer. A Power Fail Transfer (PFT) may be caused: by a common control failure, by a power failure, by the operation of a failure transfer switch on one of the consoles, or by operating the Master Transfer Switch on the maintenance panel. The switches have two positions: **ENABLE** and **DISABLE**. When set to **ENABLE**, the system allows power fail transfer to be initiated from the designated source. When set to **DISABLE**, the designated source cannot initiate power fail transfer; e.g., with the **COMMON CONTROL** power fail transfer control switch set to **ENABLE**, a common control failure will cause a power fail transfer. The **MASTER** power fail transfer switch will set the system to power fail transfer when operated to the **TRANSFER** position. The switches associated with each console must be set to disable when that console is not in use. If the transfer switch on a console will never be used, the transfer enable switch may be left in the disable position at all times.
- (c) **Test Line Terminals:** The test line **TIP** and **RING** terminals may be used in conjunction with a test set (butt-in) and the thumb-wheel switches on the tone control card, to access individual speech paths, receivers, trunks, and lines for test purposes. The test line also has the capability of resetting system errors, initializing card slots, busying out and debussing receivers and speech paths and controlling the printer port. See Part 3 for a full description of the use of the Test Line.
- (d) **The System Power:** This switch has the ability to turn the shelf power on or off. Note that this does not turn the power supply off, but the system will go into a Power Fail Transfer. The system power should be disconnected from the commercial AC source (or DC if -48 Vdc fed) before any power supply maintenance is attempted.

**TABLE 2-3
OUTGOING/INCOMING SWITCH SETTINGS**

Trunk Busy Switches:

1. Outgoing busy switches (one per trunk) can be set for either of the following conditions:
 - Idle Setting - Normal trunk operation.
 - Busy Setting - Trunk cannot be seized for outgoing call.

If the switches are not set in this manner, "Ring - Don't Answer", may occur.
2. The "Outgoing Busy" condition may be set either by the outgoing busy switch, or by the console 'Trunk Busy-Out' function. When this condition is in effect, the incoming busy switch affects the trunk condition as follows:
 - Idle Setting - No answer will be given to incoming CO calls.
 - Busy Setting - A permanent seizure condition is given towards the CO when the trunk is seized for the first line.

For further information, see Sections MITL9105/911 0-096-200-NA and MITL9105/9110-096-210-NA.

Cards External to the Shelf

2.21 There are a number of cards that are external to the equipment shelf (shelves). These cards, and the system they are part of, are listed in Table 2-4.

The SX-200 Interconnect Card

2.22 The SX-200 Interconnect Card (Figure 2-5) provides a direct connection between the consoles (J13, J14 and J15) and the shelf backplane (P16 and P17). This board also contains the console fuse for protection of the console. Directly opposite the fuse is the RS-232 printer port J302. For a complete description of this port, see Section MITL9105/911 0-096-450-NA and Table 2-5. Plugs P301 and P303 are the maintenance panel connector and the power supply out-of-tolerance monitor, respectively. All power for the Interconnect card is supplied through the power supply terminal block TB301 on the board. Plugs J13, J14 and J15 are the console plugs. Plugs P16 and P17 provide interconnection between the Interconnect card and the shelf backplane. Plugs P18 and P19 provide a connection between the Interconnect card and the Cross-Connect Field. P18 carries Night Bell Contacts, Music on Hold, Tip and Ring for RMATS and Paging access circuitry. P19 carries Tips and Rings for the card shelf slots 13 and 14.

**TABLE 2-4
EXTERNAL SYSTEM CARDS**

Card	sx-200	Figure	sx-100	Figure
Interconnect	1 card	2-5	1 card	2-8
Power Fail Transfer	1 card	2-6	combined	
Console Interface	1 card (or 2, sx-200)	2-7		

TABLE 2-5
CONNECTORS P302, 5302 and J303

Pin No.	Signal Names
Connector P302	
1	O V
2	ALARM A
3	KEY
4	ALARM B
5	MAINT. CONS. SWA
6	CONS. 2 SWA
7	CONS. 2 SWB
8	C/O
9	PWR LED A
10	PWR LED B
11	PWR SW B
12	PWR SW A
13	MAINT. TIP
14	MAINT. RING
Connector J302	
1	O V
2	RECEIVE DATA
3	TRANSMIT DATA
4	
5	CLEAR TO SEND
6	DATA SET READY
7	SIGNAL GROUND
8	CARRIER DETECT
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	DATA TERM READY
21	
22	
23	
24	
25	
Connector J303	
1	KEY
2	O/T
3	- 10 V
4	PWR SWB
5	PWR SWA
6	SPARE

Thus the Interconnect card does as its name implies, by providing interconnection between the system and external equipment, as shown in Appendix C. Each component that terminates on the Interconnect card is listed in Table 2-6.

The SX-200 Power Fail Transfer Card

2.23 The SX-200 Power Fail Transfer Card (Figure 2-6) provides the possibility of 12 CO trunks to be connected to 12 extensions in the event of a commercial power or equipment failure. Ten amphenol connectors (P20 and P21, Table 2-6) are hardwired directly to the cross-connect field (Appendix C) to provide for power transfer. All power for this card is provided through the cable harness to the power terminal block (TB1) at the top of the card. The power fail transfer LED on this card, when not lit, indicates that the system is in power fail transfer condition.

The Console interface Card

2.24 The Console Interface Card (Figure 2-7) provides static protection for the SX-200 system against discharges to the console and console cable. This protection is achieved by placing a series transient voltage suppressors between the console connections and chassis ground. Any transient voltages will be routed to the ground.

2.25 The SX-100 system combines the Console Interface, Power Transfer, and Console Interconnect on one card (Figure 2-8). The plugs on this card perform the same functions as listed in Table 2-6. All power for the board is provided by the two terminal blocks (TB301 and TB302) fed by a cable from the power supply. In the event of commercial power or equipment failure, up to six CO trunks can be automatically connected to six extensions. In addition, the board has a power fail transfer LED which will go out when a transfer occurs. There are three fuses for user ringing, user -48 Vdc, and -48 Vdc for the console (F2 and F3).

Shelf Backplane

2.26 The same backplane and equipment shelf are used in both the SX-100 and SX-200 systems. Field replacement of only the backplane is not recommended; rather the whole equipment shelf should be replaced (Figure 2-10). The backplane essentially provides an interface between all printed circuit cards (paragraphs 2.01 - 2.04) and extensions, trunks and miscellaneous equipment. Physically the backplane has six 25-pair amphenol type connectors for equipment extensions and trunks. All power for the backplane is provided through terminal blocks TB1/2 and TB3/4. All PCB cards are held in position by PCB edge connectors on the backplane, and plastic guides on the shelf. In both the SX-100/SX-200 systems, the backplane power is fed by cable from the output of the power supply.

TABLE 2-6
INTERCONNECT CARD EQUIPMENT
TERMINATIONS

Component	Interconnect Card Plug Number
Consoles	J13, J14, J15
Shelf Backplane	P16, P17
Printer/Recording Device	J302
Maintenance Panel	P301
Power Out-of-Tolerance	P302
Cross-Connect	P18, P19
Power Fail Transfer	P20, P21
Power Terminal	TB30 1

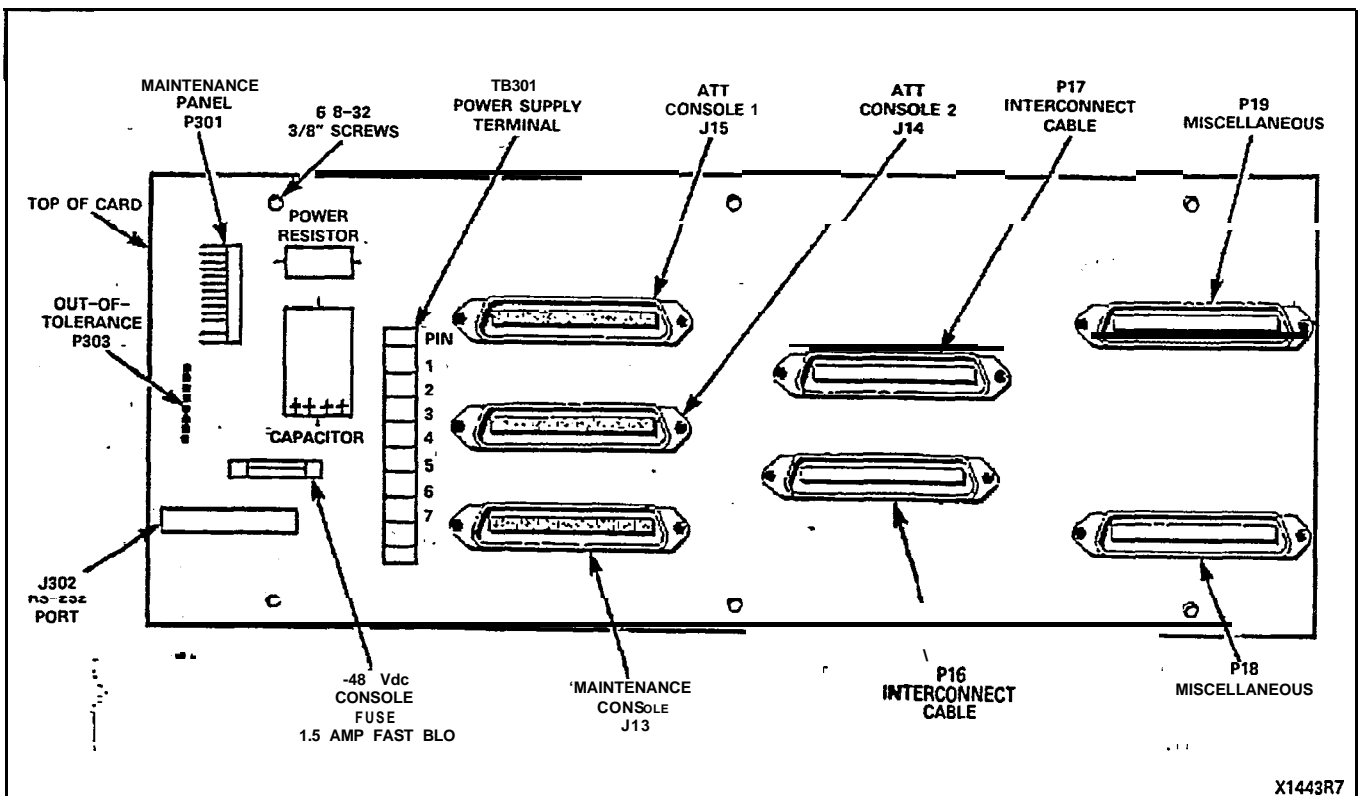


Figure 2-6 SX-200 Interconnect Card

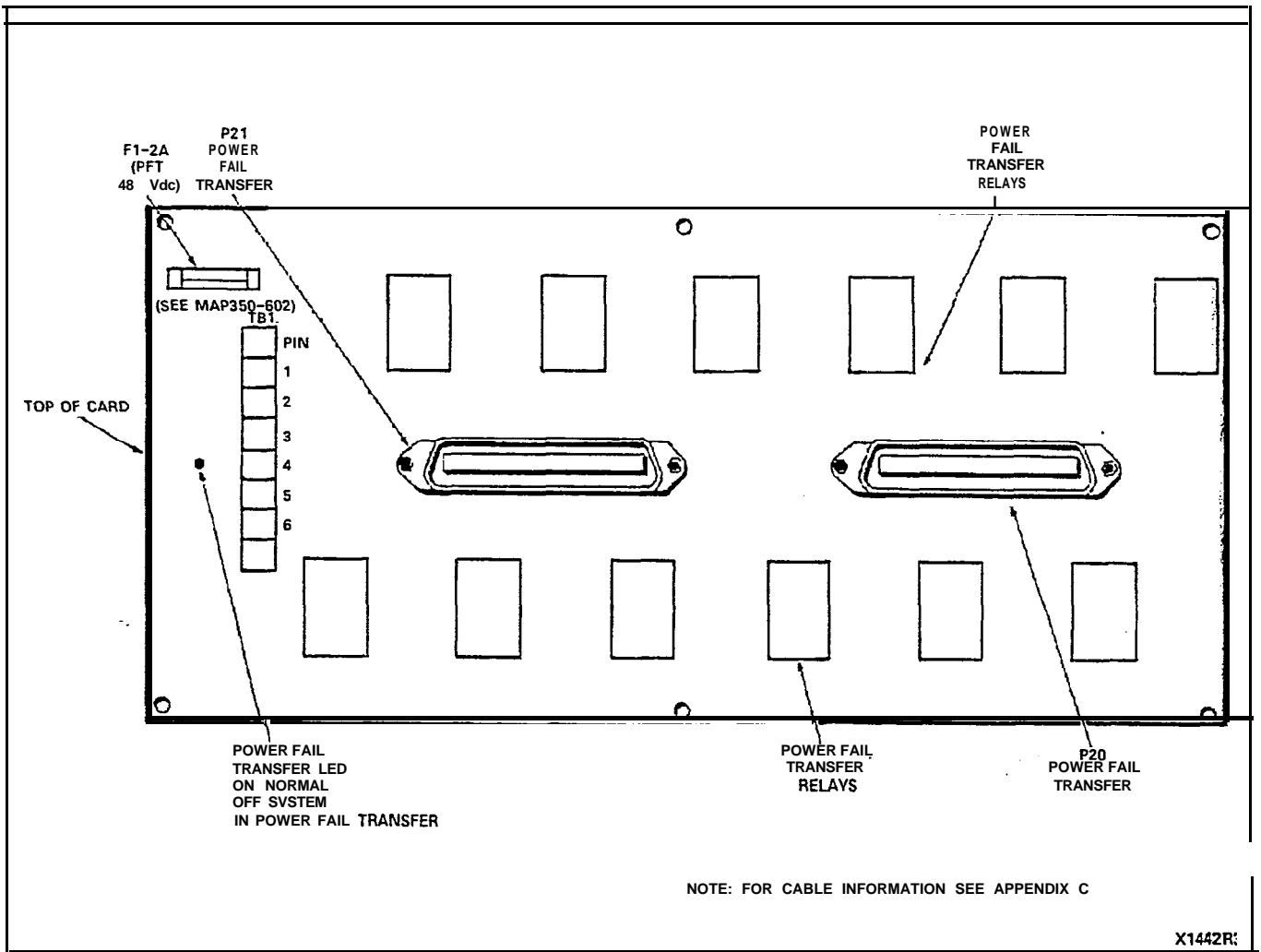


Figure 2-6 SX-200 Power Fail Transfer Card

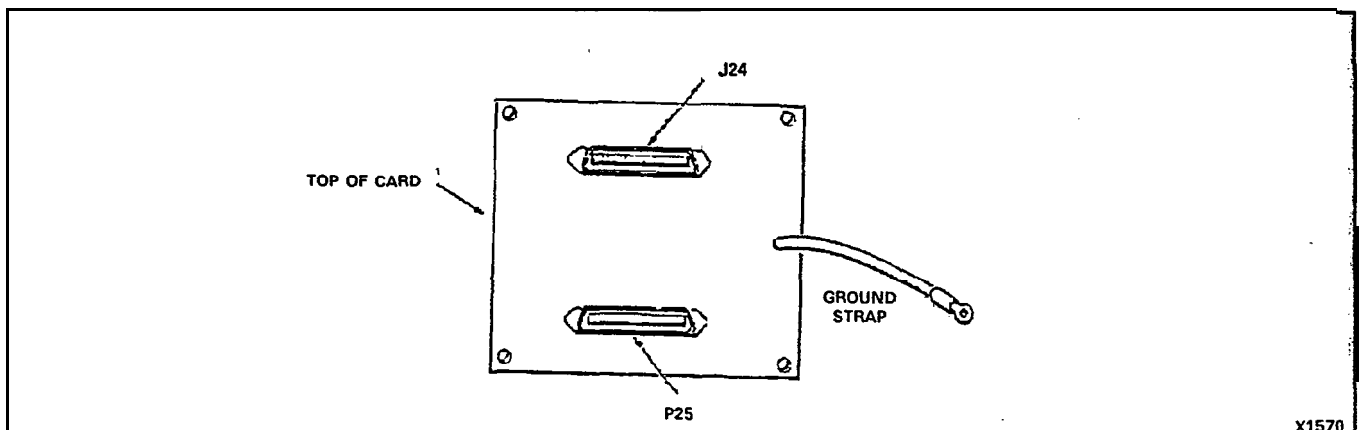
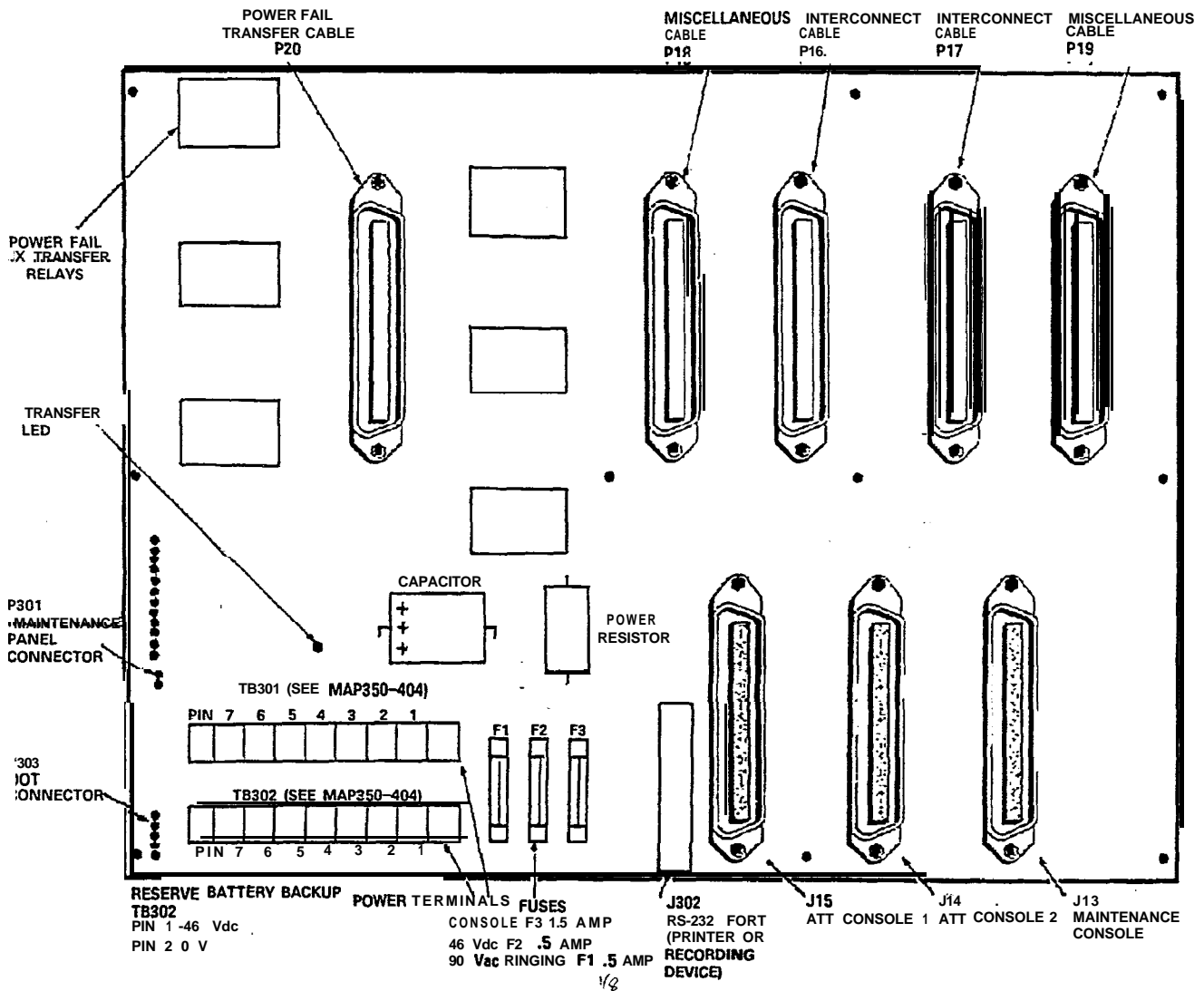


Figure 2-7 SX-200 Console Interface Card



NOTE: FOR CABLE INFORMATION SEE APPENDIX C.

X144

Figure 2-8 SX-100 Interconnect, Console Interface, Power Fail Transfer Card

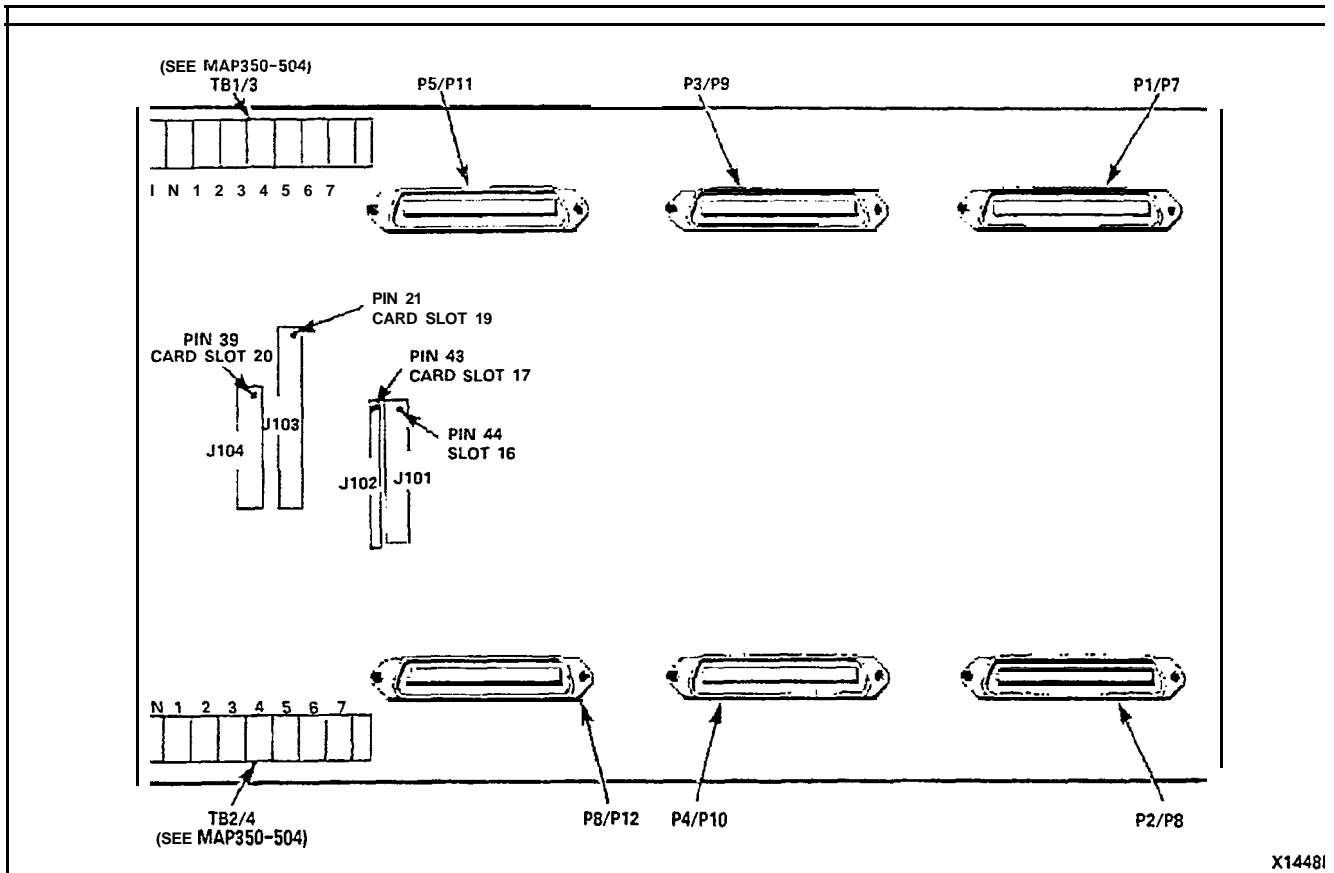


Figure 2-9 Backplane

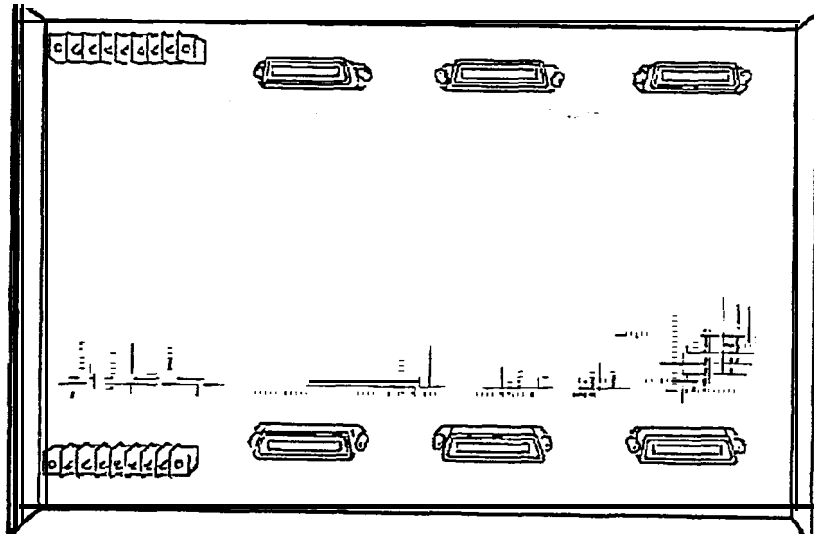
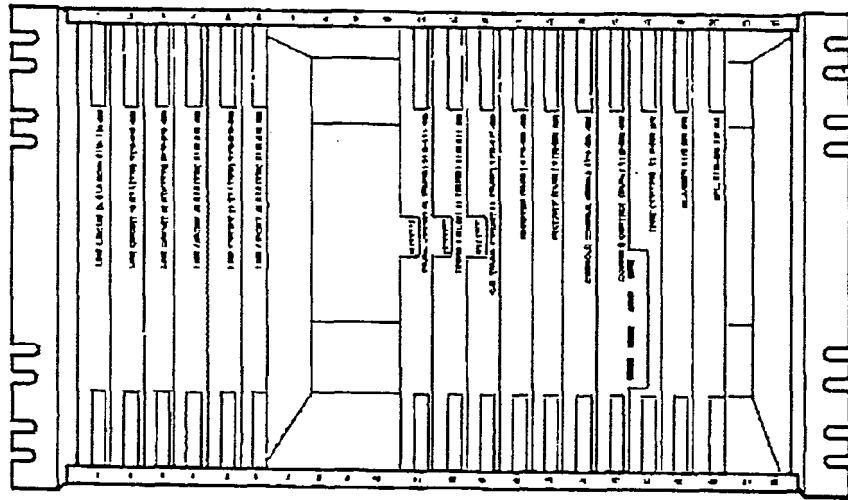
3. CONSOLE AND TEST LINE MAINTENANCE FUNCTIONS

3.01 The console and test line are of great importance when detecting and locating a fault. Each may be used individually or they may be used together in troubleshooting the system. This Part will discuss first the Console Alarm LEDs and Maintenance Aids, and then the Test Line Functions. The Console Alarm LEDs and Maintenance Aids will include all ERROR, Supervisor access and Maintenance Function access codes in the form of tables. The Test Line Function description will include an explanation of all features available to the test line.

Console Maintenance Functions

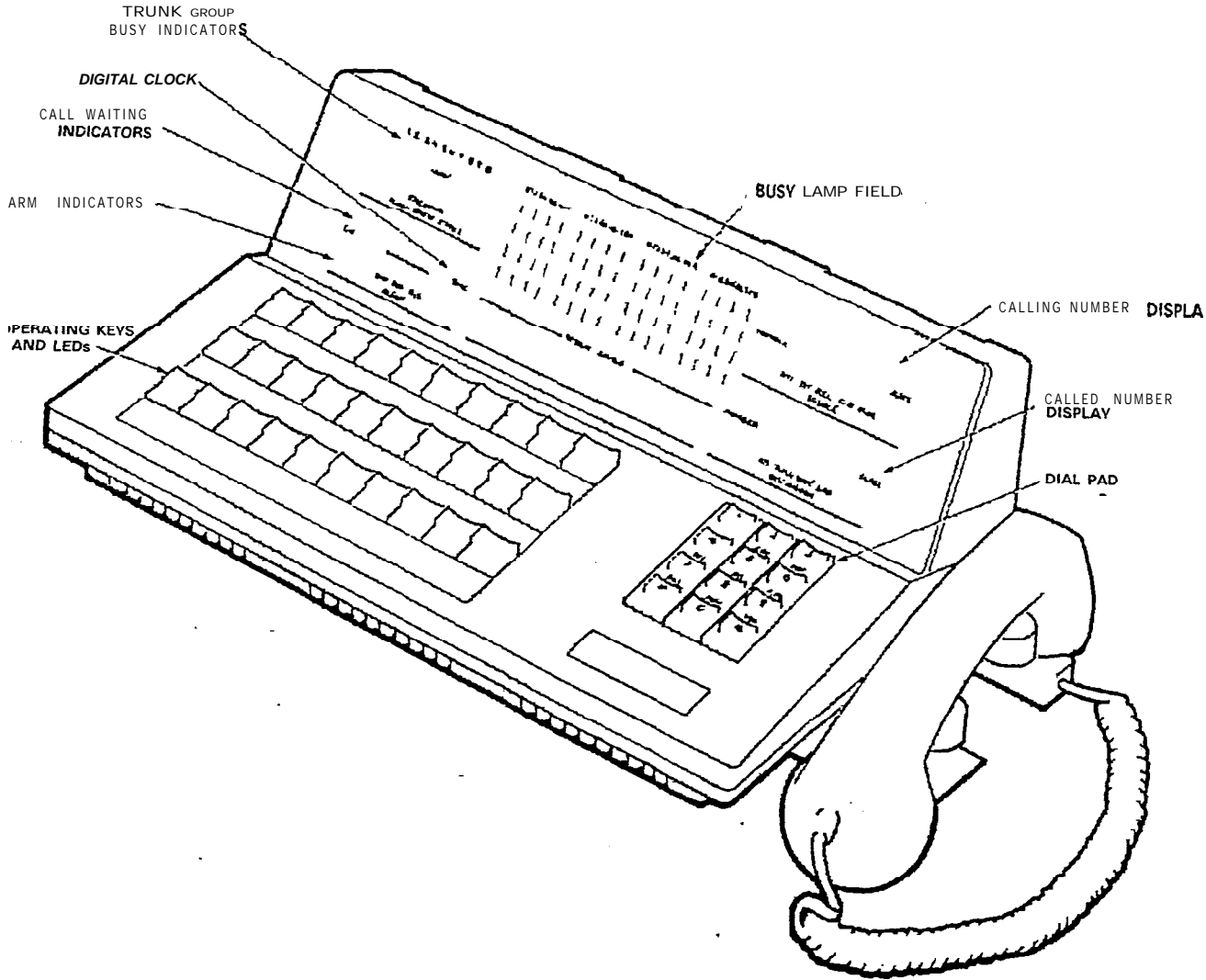
3.02 Each Attendant Console (Figure 3-1) is equipped with a number of maintenance aids and keys which are associated with maintenance functions. The following paragraphs describe the function of each maintenance-associated LED and key:

- (a) **Minor (MIN) Alarm LED:** This LED will flash whenever the automatic diagnostics detect a malfunction which is not sufficiently serious to cause a complete system failure. Typical examples would include receiver malfunction, speech path malfunction or crosspoint malfunction.



X5612

Figure 2-10 Equipment Shelf



X3480

Figure 3-1 Attendant Console

(b) **Console (CON) Alarm LED:** The Console Alarm LED flashes to indicate a console malfunction. The LED will go off when the alarm has been cleared or canceled.

(c) **Major (MAJ) Alarm LED:** The LED turns ON to indicate that a malfunction has occurred which has caused the power fail transfer relays to operate:

- When the MAJ Alarm LED is ON, the system is automatically in Power Fail Transfer mode.
- Typical examples of major alarms include Scanner failure or CPU malfunction, Power Supply voltages out-of-tolerance.
- The MAJ Alarm LED, unlike the other console LEDs, is hardwired from the system cabinet to the console.
- A colon in the time display indicates that the console is receiving power and the handset is plugged in.
- A time display indicates that the system and console processors are running. It also indicates that the link from the console control card to the console is correct. (Note: If cable is not in correctly, time will flash or will be incomplete.)

ALARM RESET Button

3.03 This button is used to reset the flashing MIN Alarm LED and the audible signal associated with the alarm indication. When the button is pressed it:

- Resets the flashing LED to steady and extinguish the audible alarm signal associated with the alarm condition.
- Displays in the SOURCE and DESTINATION fields, details of the alarm condition, including the location of the printed circuit card that has malfunctioned.

3.04 A typical alarm readout in the SOURCE display is shown in Figure 3-2. In addition, if the ALARM RESET button is pressed, the Busy Lamp Field changes to display lines and trunks which are locked out or have been busied-out. This display remains for as long as the ALARM RESET button is held down.

IDENT Button

3.05 If the IDENT button is pressed when the console is idle, the SOURCE display will show the installed firmware generic number, and its revision. The DESTINATION display shows an internal firmware code and the number of the console at which the key was pressed (see Figure 3-3). If the IDENT button is pressed when the Supervisor is connected to either a source or destination party, the SOURCE and DESTINATION displays will change to show the equip-

ment numbers and speech path number being used. The date v appear in the time display.

Error Codes

3.06 Table 4-4 is a list of error codes displayed on the console indicating the card causing the malfunction and the type malfunction. Figure 3-2 shows a typical error display and its interpretation.

Power Fail Transfer Switch

3.07 This switch (on the underside of the console), when in TRANSFER position, manually switches the system into power fail transfer (unless the appropriate power fail transfer enable switch on the maintenance panel is in the DISABLE position). Operation of this switch from the NORMAL to the TRANSFER position will cause existing calls on the transferred trunks to be released, and the MAJOR alarm LED will light. The switch should only be operated in emergency situations. For normal operation, the switch should be in the NORMAL position.

Test Line Functions

3.08 The test line is on equipment number 001, and appears both on connector P1 and on terminal posts on the maintenance panel. It must be programmed to be an extension, and should have full trunk access for use by maintenance personnel.

3.09 As well as its normal facilities as an extension, certain additional features exist exclusively for the test line. These are the ability to: directly access a trunk; set and clear the busy-out conditions of speech paths and receivers; clear all errors and busy-conditions in the system (except for trunks); and select a specific

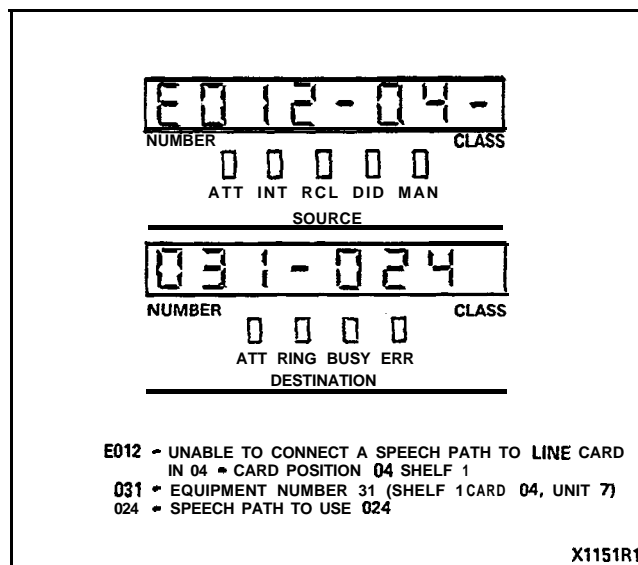


Figure 3-2 Typical Readout

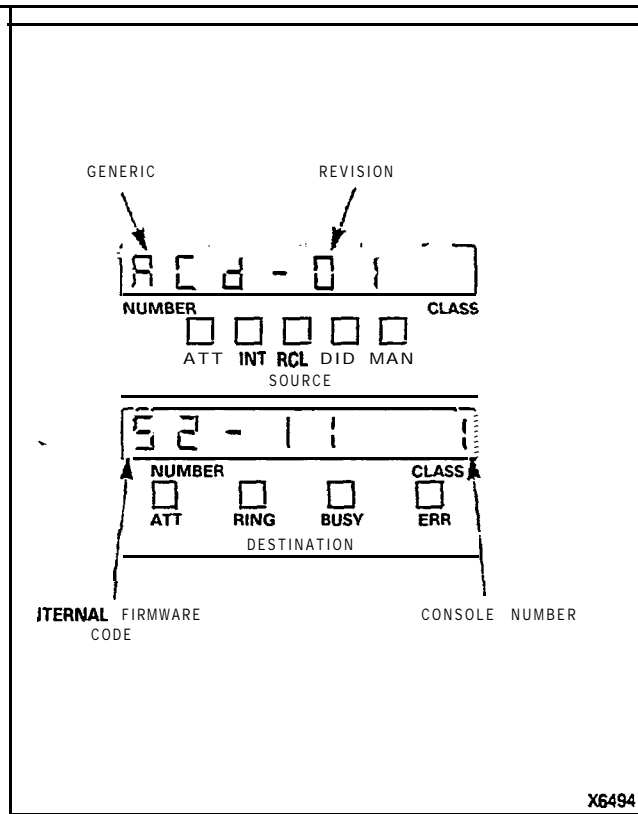


figure 3-3 Typical Identification Display

speech path and receiver for use and display their status on the Scanner card.

3.10 Most of these features require a special access code (the Maintenance Function code), which will normally be "555", but may be different if necessary to avoid number plan conflicts. This document assumes the use of the code 555.

Note: The rotary switches on the tone control card (slot 18) should be set to 8888 when the test line is not being used for maintenance purposes.

Direct Trunk Access

3.11 The test line (or console) dials 555 + 2 + nnn where "nnn" is the 3-digit equipment number of the trunk, including leading zeros. Reorder tone indicates that the equipment number is not that of a trunk Busy tone indicates that the trunk is busy; otherwise the line is connected to the trunk. If the trunk is a member of a group programmed "Wait for Dial Tone", the connection is not made until dial tone is received.

To Busy and Clear Busy-Out Receivers and Speech Paths

3.12 The test line (or console) dials:

555 + 33 + nn (where nn = the 2-digit speech path) to busy out the speech path

OR

555 + 43 + nn (where nn = the 2-digit speech path) to clear a busied-out speech path

OR

555 + 3 + nnn (where nnn = the 3-digit receiver equipment number) to busy out a receiver

OR

555 + 4 + nnn (where nnn = the 3-digit receiver equipment number) to clear a busied-out receiver.

Reorder tone indicates that the number is invalid and dial tone indicates that the operation is completed.

Clear All Errors

3.13 The test line (or console) dials 555 + 1. Dial tone is returned. All outstanding minor alarms are cleared. All busied-out receivers, generators and speech paths are set back to normal and the diagnostic tests are restarted.

Select a Speech Path and/or a Receiver

3.14 This procedure is used to select a speech path and/or a receiver when the test line goes off-hook

3.15 The top two switches on the tone card select the receiver to be used, set up as the last two digits of the receiver equipment number (even numbers, 90-20). If set to 99, any free receiver is used (Figure 3-4).

3.16 The bottom two switches select the speech path to be used, set up as the speech path number (01-31), or the Music-on-Hold speech path may be selected as 32 (in which case no receiver will be connected). If set to 99, any free speech path is used. When the switches are set and the test line goes off-hook, the system waits for the selected speech path to become free and seizes it. It then waits for the selected receiver to become free: A busied-out speech path- or receiver may be selected; the speech path may be accessed, but the receiver will not respond to dialing. If an illegal number is set up, no device will be selected.

3.17 The two 7-segment displays on the Scanner card show the status of the receiver and/or speech path when a specific one has been selected. The top display is for the receiver and the bottom display is for the speech path. The readouts are:

- A - Available - not in use
- C - Conversation - in use
- E - Error - found faulty by diagnostics
- F - Found - in use by test line
- 0 - Optional - no specific circuit selected.

3.18 Once the test line has obtained a speech path and a receiver, it does not change its selection until it originates a new call (changing the switch settings meanwhile will cause the display to change to reflect the status of the receiver, and speech path whose numbers are on the switches). If a valid speech path is selected, but an invalid receiver is selected (e.g., 91), then the line is connected to the speech path, no receiver is selected, and no dial tone is introduced. This provides the ability to listen to a speech path for the presence of noise. The test line, since it has not been assigned a receiver, will not time-out and revert to reorder tone. It is then possible to listen to any unused speech path by remaining off-hook and selecting the speech path number with the bottom two switches.

Slot Initialization Activate

3.19 Occasionally, when circuit cards are plugged into the system, the logic circuits on the card may not reset completely. In order to guarantee complete reset of all card logic, a slot initialization procedure has been provided. This procedure allows the service personnel, after inserting a card into a shelf, to initialize the card slot from the test line. To initialize the card slot, dial 555 + 5 + nn, where nn is the card slot number (1-17 shelf 1, 31-42 shelf 2). Since inserting a card may cause diagnostic errors, this procedure is normally followed by dialing 555 + 1 to clear all system errors.

Hardware Position Number	Dual- Receiver	Quad- Receiver
089 097 105 113		
090 098 106 114	----	----
091 099 107 115		
092 100 108 116	----	----
093 101 109 117		
094 102 110 118		----
095 103 111 119		
096 104 112 120		----
12 13 14 15	Card Position	
<p>Note: The ---- indicates the applicable equipment number.</p>		

Figure 3-4 Receiver Equipment Numbers

Forced Trunk Release

3.20 This feature allows service personnel to force a busy trunk in the idle state. The test line (or console) may dial *20+nnn+#, where nnn is the individual trunk equipment number and press the RELEASE button to force release a trunk. Care should be taken when force-releasing a trunk, as the trunk will be forced into the idle state even if the trunk is legitimately in use.

4. CONSOLE FUNCTIONS AND ERROR CODES

4.01 Systems may be assigned a system identifier (one to three digits) which will be unique to that system. To display the system ID, dial *17; the system ID appears in the SOURCE display. Press RELEASE button to clear the display. To change or enter the system ID, dial *17, enter the 1-3 digit system ID, press the RELEASE button and the display will clear (System Option 168 must be enabled).

Current Speech Path Display

4.02 This procedure is used to display the speech path number being used by a source or destination party. If the console has a destination party, pressing the console IDENT button causes the number of the speech path in use to be displayed in positions 7 and 8 of the DESTINATION display. Similarly, if the console has a source party, pressing the IDENT button causes the speech path number to be displayed in positions 7 and 8 of the SOURCE display.

Line and Trunk Status Display

4.03 This function allows the Supervisor to display certain information regarding the status of selected lines or trunks. This feature enables MITEL Field Engineers to diagnose malfunctions from a remote location. To display the line or trunk status, dial *#nnn#, where nnn is the equipment number of the line or trunk. Care should be taken when recording the status display. The record must include any blank dashes, or symbols exactly as shown in the SOURCE and DESTINATION displays.

4.04 Tables 4-1 and 4-2 are a listing of all system access codes. Table 4-3 is the Traffic Measurement Function Codes. For further description, see Sections MITL9105/9110-096-315-NA and MITL9105/9110-096-450-NA.

4.05 Table 4-4 is a list of error codes that may appear on the console during operation of the system. Table 4-5 is a list of programming error codes that may occur during standard programming of the system. Table 4-6 is a list of standard programming confirm codes. Table 4-7 is a list of Toll Control programming error codes that may occur during extended programming of the system. Table 4-8 lists all Toll Control Confirm codes. Table 4-9 lists all Special Call error codes. Table 4-10 lists all Automatic Route Selection (ARS) error codes and Table 4-11 lists all ARS Confirm codes. Table 4-12 lists all the SUPERSET set programming error codes. Figure 4-1 illustrates

brates the console overlays available for system programming. Table (4-13 lists all Attendant UCD Access Codes.

RMAT CONSOLE OVERLAV

LAMP TEST	SYSTEM ATT	SYSTEM PROG	SYSTEM EXPROG	SYSTEM RESET	SYSTEM DISAB	CODE CHANGE	CANCEL	CANCEL
-----------	------------	-------------	---------------	--------------	--------------	-------------	--------	--------

DATE SET	BELL OFF	READ DIAG	IDENT	EQPT	ENTER
----------	----------	-----------	-------	------	-------

GO	CALL ATT	NUMBER DIAL	REDIAL	ANSWER	REL
----	----------	-------------	--------	--------	-----

(A) RMAT PROGRAMMING

PROGRAMMING CONSOLE
(LAMP TEST LED LIT)

LAMP TEST	OPTION	COS DEFINE	FEATURE	EXTN	TRUNK	HUNT GROUP	TRUNK GROUP	CANCEL
-----------	--------	------------	---------	------	-------	------------	-------------	--------

TYPE	LDN NUMBER	DAY NUMBER	NIGHT-1	NIGHT-2	UC	QVFLO GROUP	ACCESS CODE	ADD	ENTER
------	------------	------------	---------	---------	----	-------------	-------------	-----	-------

EQPT NUMBER	EXTN NUMBER	COS NUMBER	TOLL DENY	BUSY NUMBER	LAMP NUMBER	PICKUP GROUP	CON-FIRM	DELETE	NEXT
-------------	-------------	------------	-----------	-------------	-------------	--------------	----------	--------	------

(B) STANDARD PROGRAMMING

X5981

Figure 4-1 Programming Overlays

EXTENDED PROGRAMMING
(LAMP TEST LED FLASHING)

LAMP TEST CONFIG/INIT TOLL CONTROL SPEED CALL CANCE

DENY TOLL TRUNK REV GROUP ABSORB PLAN CONTROL PLAN TABLE EQPT NUMBER ACCESS NUMBER NUMBER REDIAL ADD ENTER

COR NUMBER BASIC COND DISPLAY ENTRY ABSORB REPEAT ABSORB UNLOCK CON-FIRM DEL. NEXT

(C) EXTENDED PROGRAMMING

EXTENDED PROGRAMMING OVERLAP
AUTOMATIC ROUTE SELECTION
(LAMP TEST LED FLASHING)

LAMP TEST CONFIG/INIT ARS CANCEL

TABLE QTY CODE TABLE AREA CODE ROUTE TABLE OFFICE CODE SCHED A SCHED B SCHED C ADD ENTER

CHOICE NUMBER ROUTE NUMBER TRUNK GROUP MODIFY DIGITS DIGITS DELETE LOCAL AREA CON-FIRM DELETE NEXT

(D) ARS PROGRAMMING

X5981

Figure 4-1 Programming Overlays (Cont'd)

SUPER-SET PROGRAMMING OVERLAY
(LAMP TEST LED FLASHING)

LAMP TEST SUPER-SET CANCEL

SET PRIME SET TRUNK NEW SET REVIEW ADD ENTER
EQPT NO. K E Y KEY NO. EQPT # EQPT #

TYPE LISTED CDS TOLL BUSY PICKUP ANN. CON. DELETE NEXT
NO. NO. DENY LAMP # GROUP EQPT #

(E) SUPERSET PROGRAMMING

X56

Figure 4-1 Programming Overlays (Cont'd)

TABLE 4-1
SUPERVISOR FUNCTION ACCESS CODES

These codes assume the use of * as the Supervisor Function code (Feature Number 18). For Supervisor Function codes used in Traffic Measurement, see Section MITL9105/9110-096-450-NA.

To cancel all call forwarding:

- (a) Dial *1, or *11.
- (b) Dial #.
- (c) Press RELEASE button.

(d) Press RELEASE button.

To access an individual trunk:

- (a) Dial *20.
- (b) Dial individual trunk access number (equipment number).
- (c) Dial *.
- (d) Press RELEASE button.

To make trunk group extension and Supervisor access:

- (a) Dial *6.
- (b) Dial trunk group (1 through 10).
- (c) Dial #.
- (d) Press RELEASE button.

To force-release an individual trunk:

- (a) Dial *20.
- (b) Dial individual trunk access number (equipment number).
- (c) Dial ##.
- (d) Press RELEASE button.

To change the Direct Inward System Access Code:

- (a) Dial *7.
- (b) Dial DISA code.
- (c) Press RELEASE button.

To make flexible night service assignments (Note 3):

- (a) Dial *3.
- (b) Dial individual trunk access number (equipment number).
- (c) Press NIGHT 1 or NIGHT 2.
- (d) Dial extension number.
- (e) Press RELEASE button.

To cancel a minor alarm (Note 1):

- (a) Dial *8.
- (b) Dial #.
- (c) Press RELEASE button.

To cancel all system callbacks:

- (a) Dial *4.
- (b) Dial #.
- (c) Press RELEASE button.

To busy out an individual trunk (Note 3):

- (a) Dial *9.
- (b) Dial individual access number (equipment number).
- (c) Dial * .
- (d) Press RELEASE button.

To set the clock time:

- (a) Dial *5.
- (b) Dial time (2-digit hour plus 2-digit minutes).
- (c) Dial * for PM; otherwise AM.
- (d) Press RELEASE button.

To debusy an, individual trunk (Note 3):

- (a) Dial *9.
- (b) Dial individual trunk access number (equipment number).
- (c) Dial #.
- (d) Press RELEASE button.

To make trunk group Supervisor access only:

- (a) Dial *6.
- (b) Dial trunk group (1 through 10).
- (c) Dial * .

To change the status of all occupied clean rooms to occupied and needs cleaning:

- (a) Dial *10.
- (b) Dial * .
- (c) Press RELEASE button.

To change the status of all occupied rooms in the need of cleaning to occupied clean:

- (a) Dial *10.
- (b) Dial #.
- (c) Press RELEASE button.

TABLE 4-1 (CONT'D)
SUPERVISOR FUNCTION ACCESS CODES

<p>To set up call forwarding:</p> <ul style="list-style-type: none"> (a) Dial *1Innn, where nnn is the extension number of the forwarding extension. (b) Dial call forwarding code (I-4). (c) Dial mmm, where mmm is the number to which the calls are to be forwarded. (d) Press RELEASE button. <p>To cancel call forwarding for an extension:</p> <ul style="list-style-type: none"> (a) Dial *11nnn, where nnn is the extension number of the forwarding extension. (b) Dial #. (c) Press RELEASE button. <p>To display call forwarding set for an extension:</p> <ul style="list-style-type: none"> (a) Dial *1Innn, where nnn is the extension number of the forwarding extension. (b) Press RELEASE button. <p>To cancel all call forwarding:</p> <ul style="list-style-type: none"> (a) Dial *1# or *11#. (b) Press RELEASE button. <p>To busy out an extension (Note 3):</p> <ul style="list-style-type: none"> (a) Dial *12nnn, where nnn is the number of the extension to be busied-out. (b) Dial * . (c) Press RELEASE button. <p>To debusy an extension (Note 3):</p> <ul style="list-style-type: none"> (a) Dial *12nnn, where nnn is the number of the extension to be debused. (b) Dial #. (c) Press RELEASE button. <p>To suspend the printer (Note 3):</p> <ul style="list-style-type: none"> (a) Dial *14* . (b) Press RELEASE button. 	<p>To purge and ignore the printer (Note 3):</p> <ul style="list-style-type: none"> (a) Dial *1400. (b) Press RELEASE button. <p>To enable the printer (Note 3):</p> <ul style="list-style-type: none"> (a) Dial *14#. (b) Press RELEASE button. <p>To change the date:</p> <ul style="list-style-type: none"> (a) Dial *15 and 3- or 4-digit date (1- or 2-digit month, 2-digit day., 2-digit year) (b) Press RELEASE button. <p>To print the room register audit (Notes 2 and 3):</p> <ul style="list-style-type: none"> (a) Dial *16. (b) Press RELEASE button. <p>To change the system identity (Note 3):</p> <ul style="list-style-type: none"> (a) Dial *17nnn (1- to 3-digit ID, o-999). (b) Press RELEASE button. <p>To display current system identity:</p> <ul style="list-style-type: none"> (a) Dial *17. (b) Press RELEASE button. <p>To print the 'room status' audit (Note 2):</p> <ul style="list-style-type: none"> (a) Dial *18. (b) Press RELEASE button. <p>To print stored customer data (Note 4):</p> <ul style="list-style-type: none"> (a) Dial *19 + n, where n is: <ul style="list-style-type: none"> 0 A complete print (Note 5) 1 System Options, Feature Access Codes, Classes of Service, Hunt Groups and Extensions 2 Trunk and Trunk Group Data 3 Special Set Data 4 Toll Control Data 5 Speed Call Data 6 Automatic Route Selection Data * Systemwide Data (Note 6). (b) Press RELEASE button.
--	--

Notes to Table 4-1:

1. The errors will be sequentially stacked in the memory and may be recalled sequentially (most recent first) by repeating the above procedure.
2. Printer starts after RELEASE button is pressed.
3. **Requires System Options Programming.**
4. The customer must have programming access to the features in order to request a printout.
5. This prints all sections provided the customer has programming access to the features.
6. This will print only the systemwide speed call tables and the system special set messages.

TABLE 4-2
MAINTENANCE FUNCTION ACCESS CODES

To select any of the functions, the access code assigned for the maintenance function must be dialed (Feature Number 19). The code 555 is used in the following part for the maintenance code. This may be dialed from the test line or console.

To clear all errors:

- (a) Dial 555 + 1.

Direct trunk or station access:

- (a) Dial 555 + 2.
(b) Dial individual equipment number (3-digit equipment number for trunk or station).

To busy out a receiver:

- (a) Dial 555 + 3.
(b) Dial equipment number of receiver.

To busy out a speech path:

- (a) Dial 555 + 33.
(b) Dial speech path number (01-31).

To debusy a receiver:

- (a) Dial 555 + 4.
(b) Dial equipment number of receiver.

To debusy a speech path:

- (a) Dial 555 + 43.
(b) Dial speech path number (01-31).

To initialize card slot:

- (a) Dial 555 + 5.
(b) Dial card slot number (01-17, 31-42).

System reset (Notes 2 and 3):

- (a) Dial 555 + 6.

To initiate system dump (from test line):

- (a) Dial 555 + 71 * and hang up.
(b) Go off-hook.
(c) Dial 555 + 8 + # (or 2).

To initiate system dump (from console) (Note 6):

- (a) Dial 555 + 71 * - dial tone returned.
(b) Dial *14#.
(c) Press RELEASE button.

To suspend printer (Note 3):

- (a) Dial 555 + 8 + * (or 1), or
(b) Dial *14* console only.

To enable printer (Note 3):

- (a) Dial 555 + 8 + * (or 2), test line.
(b) Dial *14# console only.
(c) Press RELEASE button.

To purge and ignore printer (Note 3):

- (a) Dial 555 + 8 + 00, test line.
(b) Dial *1400 console only..
(c) Press RELEASE button.

To print stored Customer Data:

- (a) Dial 555 + 9 + n, where n is:
0 A complete print (Note 4)
1 System Options, Feature Access Codes, Classes of Service, Hunt Groups and Extensions
2 Trunk and Trunk Group Data
3 Special Set Data
4 Toll Control Data
5 Speed Call Data.
6 Automatic Route Selection Data
* Systemwide Data (Note 5).
(b) Press RELEASE button.

- Notes:
1. For Traffic Measurement Access Codes, see Section MITL9 1 05/91 00-096-450-NA.
 2. The thumbwheel switches on the Tone card must be set to 777X, where X = console number (i.e., 0, 1 or 2).
 3. If System Option 166 is enabled, system reset occurs, regardless of thumbwheel switch settings.
 4. This prints all sections.
 5. This will print only the systemwide speed call tables and the system special set messages.
 6. To dump customer data blocks 1, 3, 4, 5, 6, 7 or 8, see Part H., Section MITL9105/9110-096-500-NA.

**TABLE 4-3
TRAFFIC MEASUREMENT FUNCTION CODES**

Function Code	Description
*130	<p>Select Start Time. The start time for a Traffic Measurement run may be displayed and/or set by the console Supervisor as follows:</p> <ul style="list-style-type: none"> • Enter *130 from keypad. • SOURCE display shows: hhmmx (existing time) where: hh = hours mm = minutes x = P if PM x = space if AM or 24-hour clock • Enter new start time hhmy (new time) where: y = * if PM y is not required if AM or 24-hour clock • Press RELEASE button.
*131	<p>Select Length of Run. The run length (in multiples of 1 hour) may be displayed and/or set by the console Supervisor as follows:</p> <ul style="list-style-type: none"> • Enter *131 from keypad. • SOURCE display shows: tt (number of hours). • Enter new run time tt (1 to 24). • Press RELEASE button. A run length of 24 means that Traffic Measurement will run continuously.
*132	<p>Print Traffic Data. Traffic data may be output by the console Supervisor as follows:</p> <ul style="list-style-type: none"> • Enter *132 from keypad. • Press RELEASE button. The current count held in the storage registers are output to printer or tape.
*133	<p>Cancel Traffic Measurement. The traffic measurement run, if in progress, may be canceled by the Supervisor as follows:</p> <ul style="list-style-type: none"> • Enter *133 from keypad. • Press RELEASE button. <p>This function results in resetting the start time to 0:00 if System Option 150 is enabled (24 hour clock) or to 12:00 if System Option 150 is not enabled. It also resets the run length to 0, and zeroes the traffic registers. To restart traffic measurement, new start and run times must be entered. WARNING: If a new time is entered part or all of the Traffic Measurement may be missed.</p> <p>For further codes, see Table 4-1 and Table 4-2.</p>

**TABLE 4-4
ERROR CODES**

Code	Major/ Minor	Slot	Reason	First three digits of Destination Display	Last three digits of Destination Display	See Note
E001	major†/ minor	20	Error in RAM	Hi byte of address	bits found in error	7.
E002	major†/ minor	20	PROM checksum error	000 to 020 PROM Page number		7.
E003	major	19	Clock/scanner	1 = 1st interrupt missing, 2 = 2nd interrupt missing		
E004	minor	18	Speech path check circuit not "hi" when disconnected			1.
E005	minor	18	Bias circuit not connected to Speech path	Speech path number		2.
E006	minor	99 (slot not known)	Speech path short	Speech path that has bias applied	other Speech path number on which bias was seen	2.
E007	minor	18	Dial tone circuit not connected to speech path	Speech path number		2.
E008	minor	Receiver Card	Receiver not receiving tone digits	Receiver equipment number		3.
E009	minor	Receiver Card	Receiver not receiving pulse digits	Receiver equipment number		3.
E010	minor	18	Generator error	Generator number (1 and 2 are tone, 3 and 4 are pulse)		4.

†During Power-Up sequence only.

TABLE 4-4 (CONT'D)
ERROR CODES

Code	Major/ Minor	Slot	Reason	First three digits of Destination Display	Last three digits of Destination Display	See Note
E011	minor	Receiver Card	Generator/ Receiver Error isolated to a speech path NOTE - Error could be on receiver card or on tone control card (slot 18)	Speech path number		
E012	minor	Line Card or Trunk Card	Unable to connect the speech path to the line programmed as a "station" or "trunk"	Equipment number	Speech path number	5.
E013	minor	18	supervisory tone missing			6.
E014	minor	Receiver Card	Receiver dial- tone detector not working	Receiver equipment number		3.
E015	minor	Receiver Card	Probable receiver error			
E018	minor	99 (slot not known)	Speech path shorted out (not k n o w n)	Speech path number		2.
E019	minor	18	16 speech paths have been found in error, probably a fault in the checking circuit			
E020	minor	16 or 17	Excessive errors in console data circuits	Console number 0 - maintenance console 1 and 2 - Supervisor consoles		
E021	minor	20	Checksum error in RAM			8.

TABLE 4-4 (CONT'D)
ERROR CODES

Code	Major/ Minor	Slot	Reason	First three digits of Destination Display	Last three digits of Destination Display	See Note
E023	major	20	Battery Backup p r o b l e m	001 = battery switch open 002 = voltage out-of- tolerance		
E030	minor	Slot number	Trunk Failure	001 = no seize acknowledge 002 = no release acknowledge		
E088	minor	--	Automatic Wake-up not answered	Extension		
E096	minor	Slot number	SUPERSET Set disconnected	SUPERSET Set number		
E098	minor	- -	Printer Port disabled			
E099	minor	- -	Extension locked out	Extension number		

- Notes:
1. No more tests using the check circuit will be performed.
 2. The speech path shown in the first two digits of DESTINATION display is busied-out; a maximum of 16 speech paths may be busied-out.
 3. The receiver is busied-out; maximum one receiver on a Dual-Receiver card and two receivers on a Quad-Receiver card.
 4. The generator is busied-out; maximum one. No further generator tests are performed.
 5. No further tests on this slot are performed at this time. This error will occur if a card is not installed for the programmed line or trunk.
 6. No further test for supervisory tone presence are performed.
 7. No further tests are performed.
 8. E021 will reappear if the system is reset. If E021 is not cleared by initializing the RAM and reprogramming the system, replace the IPC card.

TABLE 4-5
STANDARD PROGRAMMING ERROR CODES

Error Code	Cause	Key Affected	Key Flashing	Meaning	Action Required
E0	Invalid key pressed.	ALL	None	The last key pressed is invalid at this time.	Check procedure and press correct key.
E1	Invalid number.	ALL	None	The number entered is out-of-range or contains corrupted data.	Press key associated with entry and re-entry number.
E2	Key other than ENTER or CANCEL pressed.	LAMP TEST, COS OPTION, FEATURE, EXTN NUMBER, TRUNK HUNT GROUP, TRUNK GROUP, NEXT, EQPT NUMBER	ENTER, CANCEL	An attempt was made to leave the current mode, after some parameters were changed. but before ENTER or CANCEL was pressed. ENTER may be used to write the new programming information back to the non-volatile RAM, or use CANCEL to ignore all programming changes made, since the last time ENTER was pressed.	Press ENTER to transfer the data to permanent or CANCEL to remove the data from the temporary store.
E3	Access code has not been entered.	HUNT GROUP, TRUNKGROUP	ACCESS CODE	Attempting to enter members into a hunt or trunk group before an access code has been assigned to the group.	Press ACCESS CODE key and enter required access code.
E4	The extension number or access code entered is already assigned.	EXTN, ACCESS CODE	None	The extension number of access code entered is already assigned to an extension, feature, hunt group or trunk group. In Trunk mode, an attempt is made to delete a member of a trunk group. Equipment Numbers desired must be entered. In Trunk Group mode, an attempt is made to place a trunk into a trunk group while that trunk is currently programmed into another trunk group. Callback and Executive Override conflict; i.e., trying to enter a Callback code while same code is assigned to Executive Busy Override and vice versa.	Check code entered: 1. If code is correct, terminate entry, remove other appearance of code and re-enter all new data. 2. If code is incorrect, press key associated with entry and re-enter extension number or access code.
E5	Number entered contains incorrect number of digits or conflicting option enabled in this COS.	EXTN NUMBER, ACCESS CODE	None	The extension number or access code is in conflict with the existing numbering plan. Attempting to add an option to a COS in which a conflicting option is enabled. Attempting to add a System Option when a conflicting option exists.	Check entry. Press key associated with entry and re-enter number.

**TABLE 4-5 (CONT'D)
STANDARD PROGRAMMING ERROR CODES**

Error Code	Cause	Key Affected	Key Flashing	Meaning	Action Required
E6	Incorrect equipment number entered.	EQPT NUMBER	None	Attempting to assign an equipment number that is: - undefined - defined as a trunk to an extension hunt group or extension - defined as an extension to a trunk group or a trunk - an extension with message registration to hunt group or pickup group. An equipment number assigned to an extension must be deleted as an extension, before being programmed as a trunk. An equipment number assigned to a trunk must be deleted as a trunk, before being programmed as an extension.	Remove conflicting option: (a) Assign equipment number correctly (b) Enter new equipment number.
E6	In extension mode, the equipment number is assigned as: a call announce port, a programmed SUPERSET set or a single line set with appearances.	EQPT NUMBER	None	The equipment number selected to be programmed has already been set programmed in the SUPERSET set programming as a SUPERSET set, a single line set with appearances or an announce port.	Enter correct equipment number or delete conflicting SUPERSET programming.
E6	In trunk mode the trunk selected has appearances on a SUPERSET set.	EQPT NUMBER	None	The trunk equipment number already has an appearance on a SUPERSET set.	Delete appearances on the SUPERSET set.
E7	System is busy.	ENTER	None	(a) Attempting to initialize a system while system is in use. (b) Attempting to change data of an extension or trunk while that extension or trunk is in use. it must be idle or busied-out.	(a) Wait until system is idle. (b) Wait until extension or trunk is idle.
	Extension has a message register that is not zeroed or has a message waiting, or has Do Not Disturb set.	ENTER	None	- A valid message register exists for this extension. - Extension has a message waiting or Do Not Disturb set.	Zero message register, reset message waiting or Do Not Disturb and reprogram.

TABLE 4-5 (CONT'D)
STANDARD PROGRAMMING ERROR CODES

Error Code	Cause	Key Affected	Key Flashing	Meaning	Action Required
E8	Trunk or equipment number already assigned.	ENTER	None		(a) Enter proper trunk or equipment number. (b) Press ENTER.
E9	Non-Volatile RAM error	ENTER	None	Ones and Zeros test failed.	
E020-20			None		Non-Volatile RAM must be initialized and/or reprogrammed.
E022-20	At Power-Up		None		Non-Volatile RAM must be initialized and/or reprogrammed.
E023-20-01	At Power-Up	None	None	RAM battery switches not enabled.	Turn RAM battery switches on.

**TABLE 4-6
STANDARD PROGRAMMING (CONFIRM) CODES**

Confirm Code	Cause	Key Affected	Flashing Lamp	Action Required
c o	Attempting to assign an equipment number for an extension to a slot containing a trunk card.	EQPT NUMBER	CONFIRM	Check assignment: - If correct, press CONFIRM button. Equipment number entered is accepted as the number for the equipment type being programmed. All data associated with the original appearance of the equipment number is removed. - If incorrect, press EQPT NUMBER and re-enter new equipment number.
c o	Attempting to assign an equipment number for a trunk to an empty slot or a slot containing an extension card.	EQPT NUMBER	CONFIRM	
C2	The busy lamp assignment already exists.	BUSY LAMP	CONFIRM	Check assignment: - If correct, press CONFIRM button. Busy lamp assignment is accepted for this equipment. All data associated with original assignment is removed. - If incorrect, press BUSY LAMP and re-enter busy lamp assignment.

**TABLE 4-7
EXTENDED PROGRAMMING TOLL PROGRAMMING ERRORS**

Error	Applies to:	Meaning
E0	All modes	Invalid key pressed. Consult MAP for correct procedure. System Option 292 may not be enabled.
E1	Absorb Plan mode Trunk Group mode Control Plan mode	Number is not within the range of the parameter being defined. Press parameter key defined and enter new correct number.
E2	All modes	An attempt was made to leave the current mode after some parameters were changed but before ENTER or CANCEL was pressed. ENTER may be used to write the new programming information back to the non-volatile RAM, or use CANCEL to ignore all programming changes made since the last time ENTER was pressed.
E3	Control Plan mode Table mode	The number entered is not valid.
E4	Table mode	<p>The table entry code is invalid for the table programmed. This occurs in the following situation:</p> <ol style="list-style-type: none"> 1. A code of more than three digits in length for an 800-entry or 20-range table. 2. A code not in the range of 200-999 for an 800-entry table. 3. A code which already exists or a code which would be ambiguous in conjunction with the existing table entries, for a 4-entry table.
E5	Table mode	The table is full and cannot hold the entry.
E7	Config/Init mode	Initialization is not allowed because the Tone Control card switches are not 7776 or the system is not idle.
E9	Configuration mode	A hardware failure was detected while clearing the extended customer non-volatile RAM.

**TABLE 4-8
EXTENDED PROGRAMMING TOLL CONTROL CONFIRM CODES**

Error	Applies to:	Meaning
c5	Control Plan mode Table mode	An attempt was made to assign a table which is currently assigned elsewhere. Pressing the confirm key will de-assign the table from wherever it was previously assigned, to assign it to the specified place.
C6	Table mode	A request has been made to delete all entries in a table. If CONFIRM is pressed, all entries will be de-assigned. The old data in the non-volatile RAM will not be destroyed until the ENTER button is pressed, and the table itself can be reprogrammed as desired before the ENTER button is used.

**TABLE 4-9
EXTENDED PROGRAMMING SPEED CALL ERROR CODES**

Error'	Applies To:	Meaning
E1	EQPT NUMBER	The equipment number entered is outside the range of valid numbers.
E1	NUMBER REDIAL	An invalid number redial value was entered.
E3	TABLE	The table number entered is not consistent with that allowed.
E4	ACCESS NUMBER	An attempt was made to enter an access number for common-use table.
E4	NUMBER REDIAL	An attempt was made to enter a number redial digit for a common-use table.
E5	ACCESS NUMBER	The access number entered already exists for another table assigned to the same equipment number.-
E5	NUMBER REDIAL	Number redial already exists for another table assigned to the same equipment number (only one number redial attribute per user is allowed).
E0		System Option not enabled or Wrong key pressed

TABLE 4-10
EXTENDED PROGRAMMING AUTOMATIC ROUTE SELECTION PROGRAMMING ERROR CODES

Error	Applies to:	Meaning
E0	All modes	Invalid key is pressed
E1	Area Code Table mode Area/Office Code Table mode Routing Table mode Local Area mode Table Quantity mode	Number is not within Range
E2	All modes	An attempt was made to leave the current mode after parameters were changed but before ENTER or CANCEL was pressed
E3	Office Code mode	The Office Code Table Number is not valid for this configuration
E4	Routing Table mode	An attempt was made to enter trunk group # that is not dialed
E5	Office Code Table mode	The Entry Office Code Table is full and cannot hold the entry
E6	Routing Table mode	Schedule A hours and Schedule B hours are not mutually exclusive
E7	Config/Init mode	Same as Toll Control programming
E8	Schedule Choice mode	Trunk Group not defined in Standard Programming

TABLE 4-11
EXTENDED PROGRAMMING AUTOMATIC ROUTE SELECTION CONFIRM ERROR CODE

Error	Applies to:	Meaning
C6	Area Code	A request has been made to delete all entries in a table

**TABLE 4-12
EXTENDED PROGRAMMING ERROR CODES - SUPERSET PROGRAMMING**

Error Code	Key Involved	Explanation
E0		This error is given when entering the SUPERSET set programming if either the SUPERSET sets are not enabled, or the Supervisor attempts to use Customer Programming of the SUPERSET set and System Option 272 is not enabled. This error is also given throughout the SUPERSET 4 set programming when an invalid key is pressed.
E1	PRIME KEY	Entering a SUPERSET set equipment number as slot 1 (equipment numbers 001-008).
E1	PRIME KEY	Number out-of-range error. Given in PRIME KEY mode when attempting to enter COS number, Toll Deny, Busy Lamp number, Pickup Group number, or Call Announce Port number.
E3	SET EQPT NUMBER	Given when entering a SUPERSET set equipment number if the number supplied is defined within the system is something other than a SUPERSET 4 set Also given if the key type supplied is not valid.
E3	PRIME KEY	Attempting to assign an equipment number as a SUPERSET set when other equipment numbers previously programmed for that slot identify the slot as other than a SUPERSET Line card.
E4	SET KEY NUMBER	Given if the key number supplies is invalid (other than 2-15)
E10	LISTED NUMBER	Directory number was not entered when attempting to define a Prime key.
E11	TYPE	Type was not entered when attempting to define a Non-Prime key.
E12	LISTED NUMBER	Directory number was not entered before defining a Non-Prime key.
E13	TRUNK EQPT NUMBER	Trunk equipment number was not entered when required when defining a Non-Prime key.
E20	LISTED NUMBER	The directory number supplied is conflicting with an existing system access code. This error is also given when attempting to add a key line appearance of a single line set. The appearance of a single line set must be multiple call.
E21	LISTED NUMBER	The directory supplied is invalid, because it would result in mixing key line and multiple call appearances with the same directory number. This error occurs when attempting to add a Non-Prime key, and the directory number exists as either prime with the wrong type of appearances or a primeless list of the wrong type (i.e., key line or multiple call).

**TABLE 4-12 (CONT'D)
EXTENDED PROGRAMMING ERROR CODES - SUPERSET PROGRAMMING**

Error Code	Key involved	Explanation
E22	PRIME KEY	<p>This occurs when attempting to add a prime, but the directory number supplied exists, and does not exist as a primeless list.</p> <p>This error is also given if the directory number supplied (when adding a prime) does not exist, but conflicts with an existing system access code.</p>
E23	REVIEW	<p>This is given in Review mode, when the directory number supplied does not exist, or is in conflict with an existing system access code.</p>
E24	REVIEW	<p>This is given in Review mode, when the directory number supplied exists, but not as either a prime line access code -or the access code for a primeless appearance list. This error indicates in the first three digits of the SOURCE display who the actual owner is.</p> <p>If the first digit is 0: -000 - 135 equipment numbers 1 to 136 -136 - 147 trunk group numbers 1 to 12 -148 - 159 hunt group numbers 1 to 12 -160 - 255 equipment numbers 161 to 256.</p> <p>If the first digit is a 1: 000 - 063 service routines 1 to 64 (features).</p>
E25	LISTED NUMBER	<p>An attempt has been made to change the DN of a Prime key, but the new directory number (listed number) is in use or is in conflict with an existing access code. The new listed number for a Prime key must be unique, and cannot be that of a primeless list even.</p>
E26	TRUNK EQPT NUMBER	<p>The equipment number entered (after pressing TRUNK EQPT NUMBER) is not that of a defined CO trunk or Dial-In trunk. The equipment number entered here must have been defined in Standard Programming as a trunk. Also, if in Review mode, this error means that the equipment number entered (after pressing TRUNK EQPT NUMBER) has not been used for either a DTS or private line key.</p>
E27		<p>The trunk is currently assigned to a DTS appearance list. An attempt has been made to use it for a private line key.</p>
E28		<p>An attempt has been made to assign a port for call announce use but the port is currently programmed for another function. The Call Announce Port must be dedicated to the call announce function.</p>

**TABLE 4-12 (CONT'D)
EXTENDED PROGRAMMING ERROR CODES - SUPERSET PROGRAMMING**

Error Code	Key involved	Explanation
E28	ANNOUNCE EQPT NUMBER	Attempting to assign an equipment number as a Call Announce Port when other equipment numbers previously programmed for that slot identify the slot as other than a Line card.
E30		An attempt has been made to delete a Prime key (this is equivalent to deleting the set) and a Non-Prime key on the set was defined. Before a set can be deleted, all Non-Prime keys must be undefined (deleted).
E31		An attempt has been made to define a Non-Prime key when the prime for the equipment number has not yet been defined (the set itself has not been defined). The Prime key must be the first key defined for a set.
E32	NEW SET EQPT NUMBER	When attempting to move a set the equipment number specified cannot be moved as it is not programmed as a SUPERSET set.
E33	NEW SET EQPT NUMBER	When attempting to move a set to a new equipment number that has been programmed already.
E33	NEW SET EQPT	Attempting to move a SUPERSET set to an equipment number when other equipment numbers previously programmed for that slot identify the slot as other than a SUPERSET Line card.
E40		A Prime key is being added, and the listed number is the same as an existing primeless list. This can normally be done, but in this case, the primeless list is not idle, so the addition of the prime cannot be performed.
E41		Addition of a key line appearance is attempted, but cannot be performed because the listed number is not idle. Or, addition of a DTS or private line was attempted, but cannot be performed because the trunk chosen for the key is not idle.
E42		An attempt has been made to delete a Prime key, but the listed number is not completely idle. Note: All multiple call appearances of a prime must be idle if the prime is to be deleted; i.e., when a multiple call appearance 'somewhere' is busy it will prevent prime deletion although the prime appears idle. When this happens, use the Review mode to find where all the appearances are, then delete each individually. The busy one will cause an error.

TABLE 4-12 (CONT'D)
EXTENDED PROGRAMMING ERROR CODES - SUPERSET PROGRAMMING

Error Code	Key Involved	Explanation
E43		An attempt was made to delete a prime, but the set has a message waiting, and deletion is not allowed.
E44		An attempt was made to delete a prime, but the set has a nonzero message register, and deletion is not allowed.
E45		An attempt was made to delete a Non-Prime/key, but the key was not idle, and deletion is not allowed. Also given when one of the Non-Prime keys is not idle when a deletion is attempted.
E50		An attempt was made to add a Prime key, but 64 sets have already been defined.
E51		An attempt was made to add a Non-Prime key which requires an internal system resource, of which all have been used. If any multiple call key, or an entire primeless key line list is deleted, one resource will be freed.
E52		An attempt was made to add a Non-Prime key which requires an internal system resource. This time, if either a complete DTS or private line list is deleted, one internal resource will be freed.

Special set error numbers are arranged in groups, with each numerical group having a general significance. The groups are:

- E0 - E9 No special significance.
- E10 - E19 The required parameters were not entered.
- E20 - E29 There are incompatibilities with the database values and the parameter values being entered to define or change a key.
- E30 - E39 There are prerequisites to the operation being attempted which have not been satisfied.
- E40 - E49 The desired operation cannot be performed due to system activity involving the set or key selected.
- E50 - E59 The desired operation cannot be performed due to internal system limitations.

Note: An E5 error will be given when entering (or moving) a SUPERSET equipment number to a slot that would indicate more than eight slots programmed.

**TABLE 4-13
ATTENDANT UCD ACCESS CODES**

To program a RAD from the console:

Dial *230
Dial RAD equipment number
Dial * to advance to next equipment number
Press RELEASE to terminate.

To program a RAC from the console:

Dial *231
Dial RAC equipment number
Dial * to advance to next equipment number
Press RELEASE to terminate.

To delete a RAD *230 <nnn>#, Cancel then Release.

To delete a RAC *231 <nnn>#, Cancel then Release.
nnn= Eq#

To review all defined RADs and RACs:

Dial *232
Continue to dial * to advance to next RAD/RAC
Press RELEASE to terminate.
The SOURCE display will show the equipment number in the left corner and a 0 or 1 in the right corner to indicate a RAD or RAC, respectively.

To record a message on the MITEL RAC, the following procedure is used:

Dial *240
Dial RAC equipment number
Dial *
When the attendant hears a 50 ms tone, the message may be spoken into handset. The recording can be up to 8 seconds in duration.
Press RELEASE to terminate.

To playback a recorded message from a RAC:

Dial *241
Dial RAC equipment number
Dial *
Message will be heard with handset; otherwise busy tone will be heard if the recording is currently in use.
Press RELEASE to terminate.

The length of the messages on the devices in each Recording Group must be specified:

Dial *242
Dial Recording Group access code recording duration, in 'L-digit seconds
Press RELEASE to terminate.

TABLE 4-13 (CONT'D)
ATTENDANT UCD ACCESS CODES

To specify the recording and delay time for an Agent Group:

Dial *243
Dial Agent Group access code
Dial 1
Dial Recording Group access code
Dial time delay, in 2-digit seconds
Dial *
Press RELEASE to terminate.

To review a recording assignment:

Dial *244
Dial Agent Group access code
Dial 1
Dial *
Press RELEASE to terminate.

To delete all data associated with an Agent Group (Recording Group and delay time assignments):

Dial *243
Dial Agent Group access code number
Press RELEASE to terminate.

To define which Recording Group a DID Intercept will be routed to:

Dial *233
Dial Recording Group access code
Press RELEASE to terminate.

To delete an existing DID Intercept recording:

Dial *233
Dial #
Press RELEASE to terminate.

To define which Recording Group an Automatic Wake-up will be routed to:

Dial *234
Dial Recording Group access code
Press RELEASE to terminate.

To delete an existing Automatic Wake-Up recording:

Dial *234
Dial #
Press RELEASE to terminate.

5. SYSTEM OPERATION

General

This Part will discuss events which occur within an SX-100/SX-200 system during the operation of extensions, trunks, consoles and SUPERSET 4 electronic telephone sets. From this Part the repair person should be able to discern a basic working knowledge of the system. Also in this Part is a series of tables which list error codes and problems that may occur. These tables will provide a solution to each problem, or reference a MAP in the appendices for the appropriate remedial action.

Extension Operation

5.01 Each extension is assigned to a specific equipment number on a specific Line card (Figure 5-1). When an extension goes off-hook, it will complete a circuit and draw loop current. This loop current will cause the LED (on the Line card) associated with that equipment number to light. At this time there are up to 31 speech paths available for assignment to the off-hook extension. Each Line card has an 8 x 32 switching matrix, providing access to 31 speech paths and one Music-on-Hold (MOH) path (Figure 5-1). The Scanner card will detect the off-hook condition on the Line card and report the equipment number to the Central Processor Unit (CPU). The CPU (through its Random Access Memory or RAM) will find a free speech path and test it, using circuits on the Tone Control card. After the speech path is tested, the CPU connects it to the line circuit and a free receiver is located. The selected receiver, and dial tone from the Tone Control card, are then connected to the free speech path (Figure 5-2).

5.02 When the first digit is dialed, it is detected by the Receiver card. (The Scanner card reports to the CPU that the Receiver card has a digit. The DTMF or DP information is decoded by the Receiver card.) The digit is read by the CPU. Upon reception of the first digit, the CPU will inform the Tone Control card to drop the dial tone. The Receiver card will continue to monitor and decode digits until the CPU recognizes a digit sequence or determines an invalid sequence. This digit sequence may access a feature, a trunk, the Supervisor, or another extension. If the option selected is busy, the extension will receive busy tone from the Tone Control card.

5.03 When an extension dials a sequence that requires the use of a feature, the CPU must first check that extension's COS. If the extension's COS does not allow access to that feature it will be assigned (by the CPU) reorder tone from the Tone Control card. If feature access is permitted, the CPU will act according to the memory stored in the RAM. All information will be stored in the system's RAM by the CPU. It should be noted that the Scanner card informs the CPU that the Receiver card has a digit decoded for each digit the extension dials. The CPU controls all tones (i.e., supervisory tones that the extension may receive) switching them on/off at the correct rates.

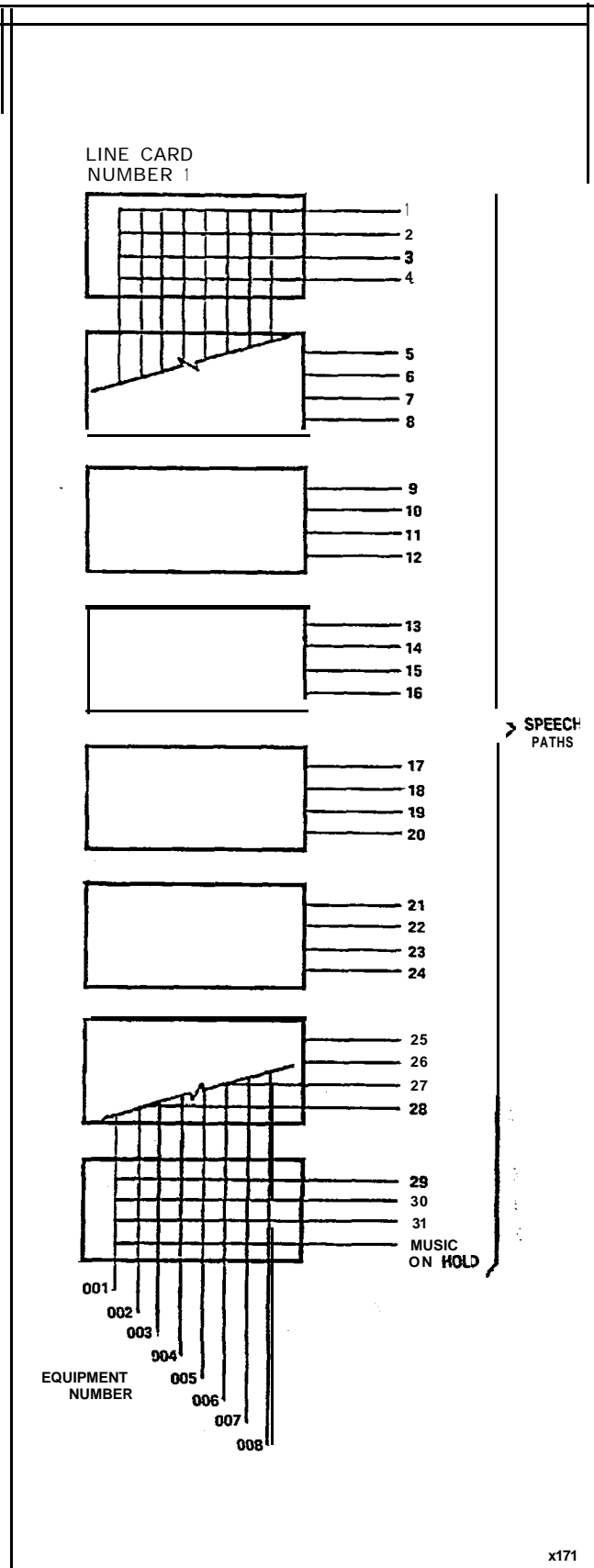


Figure S-I Speech Paths

5.04 If the call is an inside call (within the PBX), the extension must access a speech path as per paragraph 5.01. The receiver will decode the first digit dialed. The Scanner card will inform the CPU that the Receiver has a decoded digit for it. The CPU will consult the RAM as per paragraph 5.02 to determine the validity of the digit and the action required. Until the CPU is able to confirm an action to be performed with the digits received, all digits will be stored in the RAM. Should the first digit or digit sequence be considered invalid by the CPU, reorder tone (from the Tone Control card) is connected to the speech path. A valid extension number causes the Tone Control card to provide either ringback or busy tone (all tones are controlled by the CPU) to the calling extension. Before actually ringing the called extension, the CPU consults its RAM to check for any form of Call Forwarding, Do Not Disturb or extension restriction (i.e., Originate Only). In these cases, the calling extension will be forwarded or it will receive reorder tone (from the Tone Control card).

5.05 If the call is an outside call with no dialing restriction, the extension must be assigned a speech path (paragraph 5.02). The CPU will locate a free trunk corresponding to the access code dialed (see Section MITL9105/91 10-096-210-NA). If there is not a free trunk

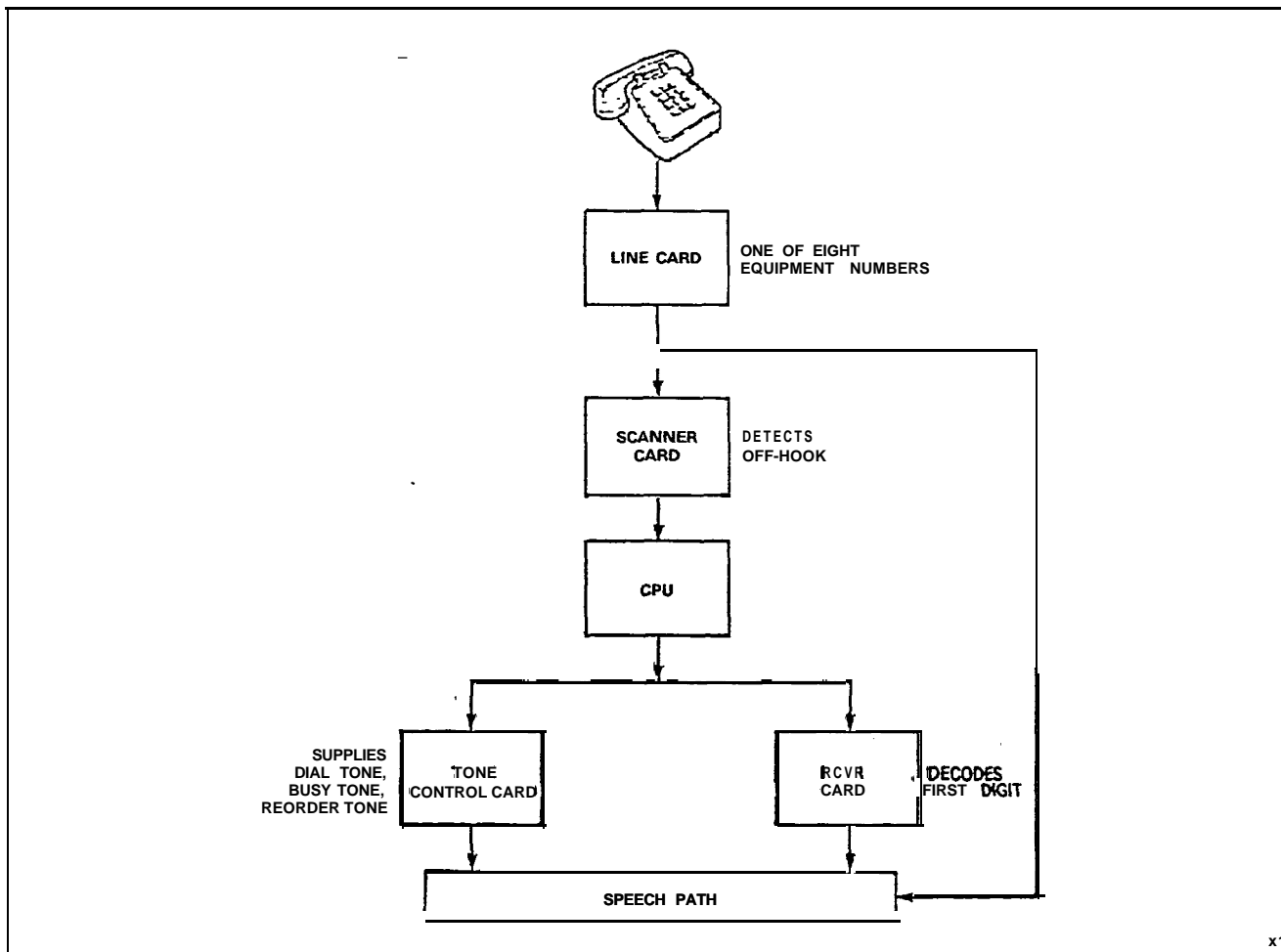


Figure 5-2 Select a Speech Path

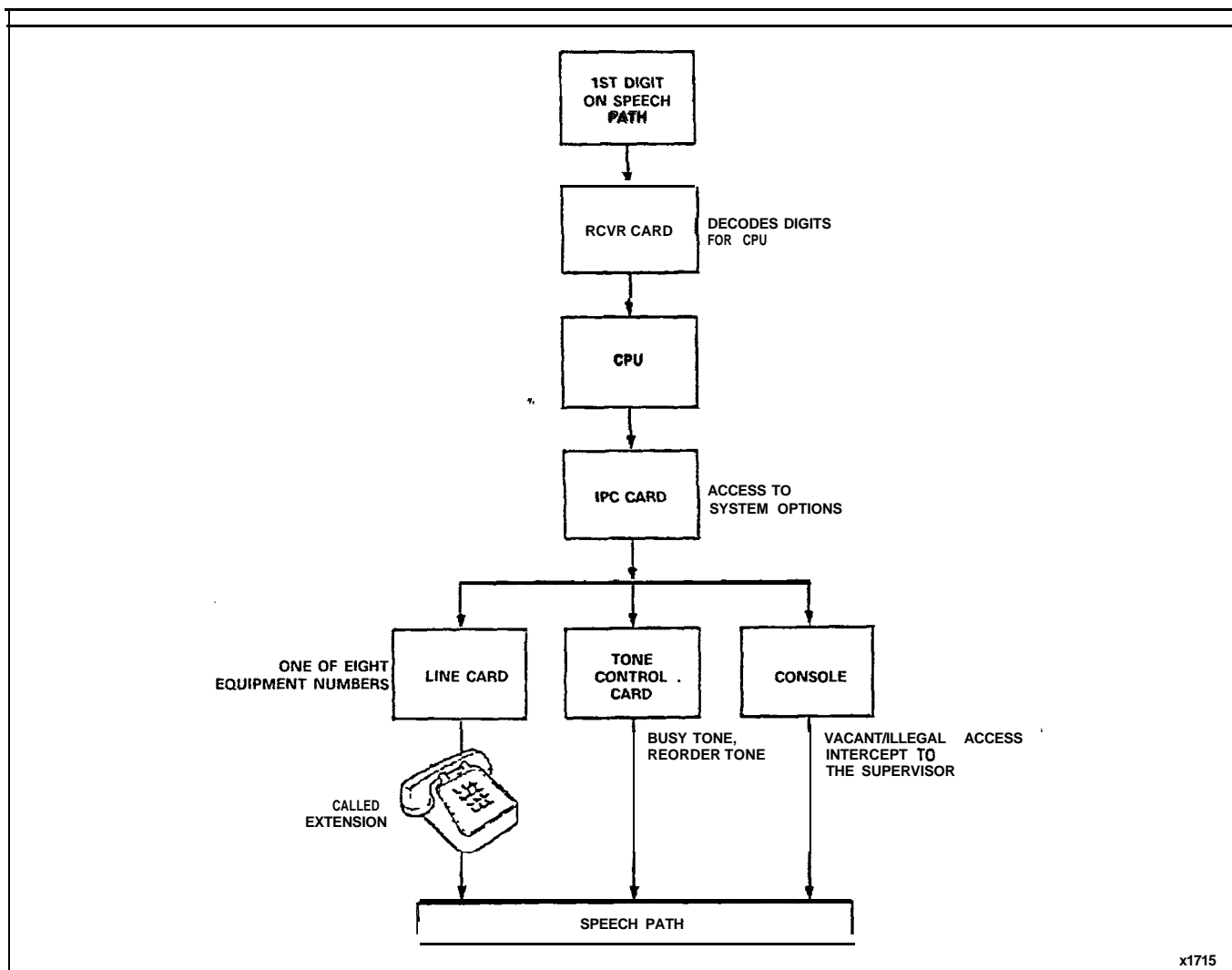


Figure 5-3 Inside Call

the CPU will connect busy tone (from the Tone Control card) to the speech path which the extension is assigned to. After recognition of a legitimate access code, the receiver will be dropped if tone-to-pulse conversion is not required. If tone-to-pulse conversion is required the receiver will decode the tones. The CPU will cause the Trunk card to outpulse the equivalent in pulses on the trunk

5.06 If the call is an outside call (Figure 5-4) with digits 0, 1, #, or ✕ dialing restriction, the extension must be assigned a speech path (paragraph 5.02). The CPU will then locate a free trunk corresponding to the access code dialed (see Section MITL9105/9110-090-205-NA). If there is not a free trunk, the CPU will connect busy tone (from the Tone Control card) to the speech path. The receiver will decode the first and second digit dialed into the trunk if System Option 291 (First Digit Toll Deny) is selected; only the first digit is monitored on the trunk. The CPU will then decide if the digit that has been decoded is a 0, 1, #, or ✕. If it is, then reorder tone (from the Tone Control card) will be supplied to the speech path that the extension is assigned to and the trunk will be released. If the second digit is

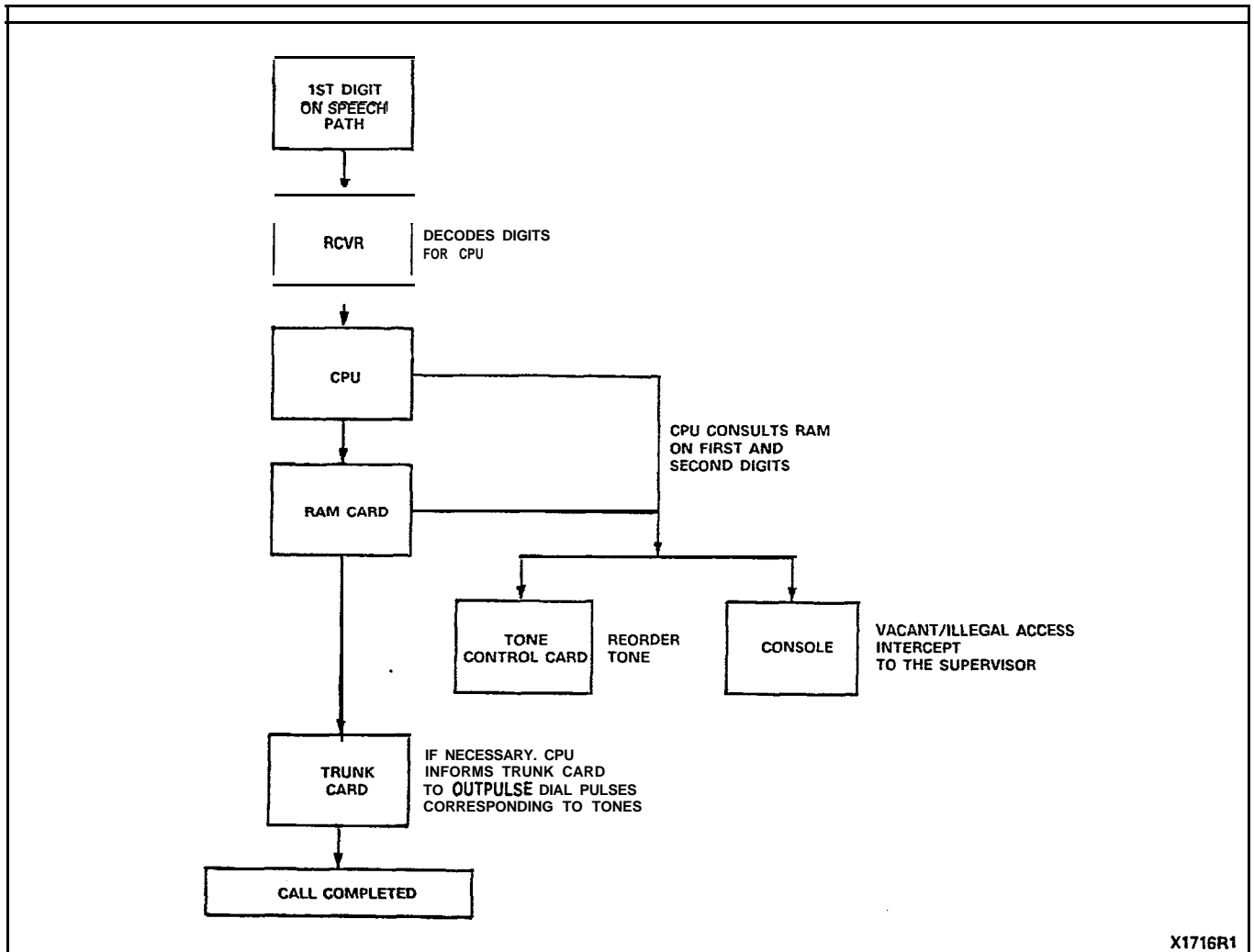


Figure 5-4 Outside Call - 0 and 1 Dialing Restriction

something other than a 0, 1, # or * the call will be allowed. The receiver will be dropped at this point if tone-to-pulse conversion is not required (see paragraph 5.03).

5.07 For an outside call with SMDR, Multi-Digit Toll Control or ARS in effect (Figure 5-5), the extension must first successfully access a speech path (paragraph 5.02). The CPU must find a free trunk according to the access code dialed, and that extension's COS (unless ARS is in effect). If there is not a free trunk, busy tone will be returned from the Tone Control card. If the access code dialed is not in the extension's COS, reorder tone will be returned from the Tone Control card. If the ARS is in effect, digits dialed will be compiled in a receiver buffer until the entire number has been collected. The receiver will decode all digits for the CPU until the last digit or a maximum of 26 digits is dialed. In the case of SMDR all digits dialed will be stored in a trunk buffer until they may be output to a recording device. If ARS is in effect, the CPU will consult the RAM as to the correct route (trunk group) to select (subject to time, availability and preference). The CPU will cause the receiver to inform the trunk selected of the digits to be

output. At this time, digits being sent by the Trunk card are monitored by the receiver and are subject to Multi-Digit Toll Control (if enabled). The CPU will consult the RAM memory as to toll control for each digit received. If the call is allowed by toll control, the call will go through. If the call is not allowed, reorder tone will be returned from the Tone Control card and the trunk will be released.

5.08 The circuit operations described above are similar to those required for Tie-Trunk circuits with the following exception. For DP extensions to DP tie-trunk circuits, the requirement exists to inhibit dial-train distortion arising as a result of tandem operation through one or more tie trunks. For this reason, when the trunk processor receives the input data it causes the output to the tie-trunk to be a regenerated train of dial pulses. The trunk processor will isolate the speech path to prevent dial pulses from feeding back to the extension.

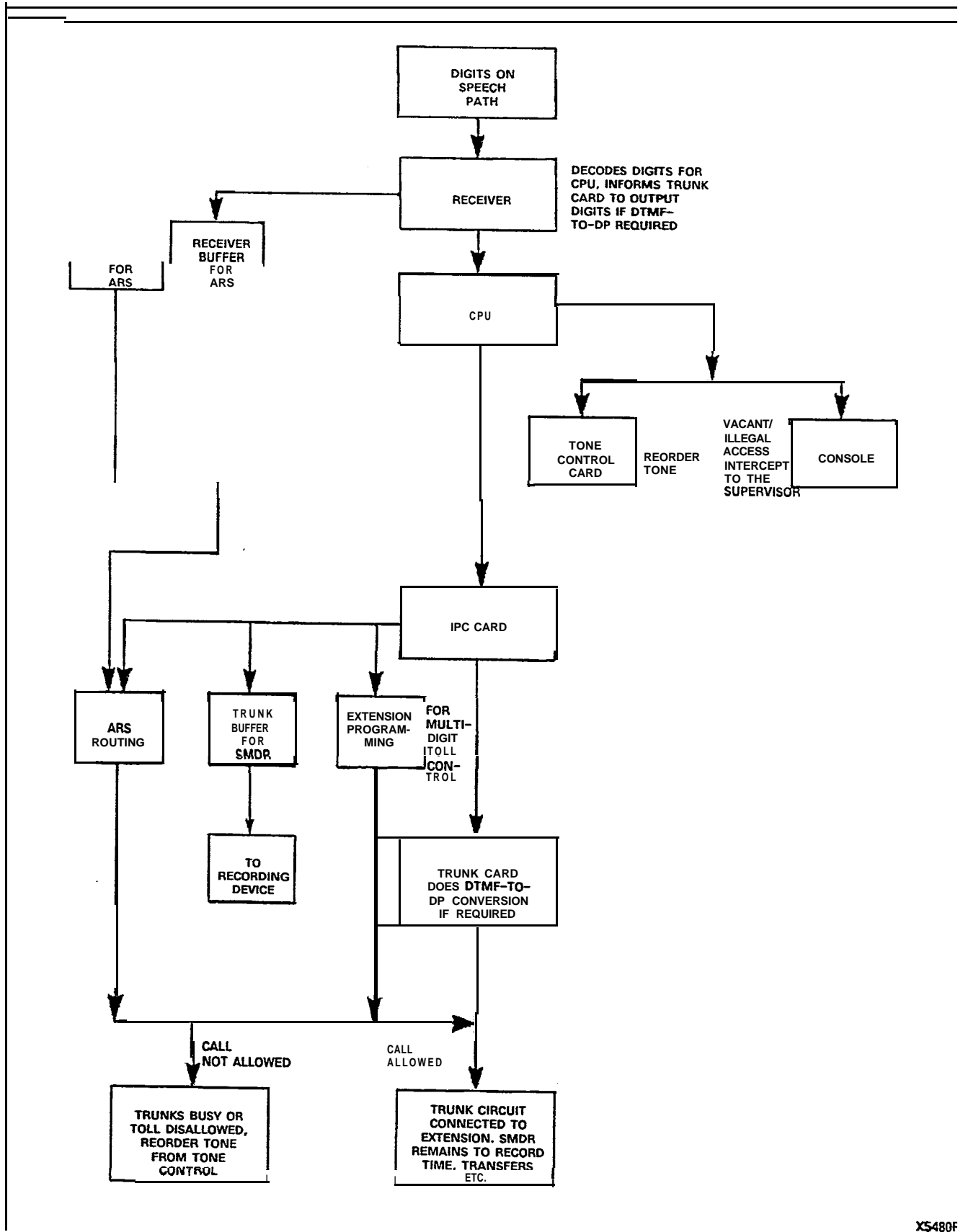
Console

5.09 The console does not have a switchhook, rather the console is off-hook whenever the console handset is plugged in. To originate a call it is only necessary to press the button of the figure number or feature. The console communicates through the Interconnect card to the system via the Console Control card. The Scanner card will then inform the CPU that the Console Control card has information for it. Note: A Receiver card is not used for dialing from the console. As in the case of an extension the console must be assigned a free speech path. This is done after the first button (1-9, #, * or feature button) is pressed. If an invalid digit or digit sequence is entered, the console will receive reorder tone from the Tone Control card. If all speech paths are occupied, the console will receive no tones or audio from the system. The Tone Control card will also provide ringback or busy tone for the console.

5.10 The dialing of a valid extension number prompts the CPU to select a particular extension on a particular Line card (as determined by the programming in the non-volatile RAM). The CPU sends a command to turn ringing current on and off to the extension. When the extension is answered, the CPU detects an off-hook and disconnects ringing. The CPU then connects the called extension to the speech path of the console.

Dialing a Trunk (From a Console)

5.11 The console dial pad produces digital signals which are stored by the CPU. After the trunk access code has been dialed, the subsequently keyed signals are forwarded to the CPU, where, after decoding, they are forwarded to the Trunk card and outpulsed to the trunk line. Note that a Receiver card is not required for this configuration. If the circuit is programmed as a DTMF trunk circuit, a tone generator will be inserted. This results in the signals being translated into DTMF tone pulses which are then placed on the speech path (not into the Trunk card) and forwarded to the trunk circuit for outward transmission. The audio path is isolated back to the console when the DTMF transmission takes place.



XS480F

Figure 5-5 Outside Call - Multi-Digit Toll Control, or SMDR or ARS in Effect

Note: If wait for Dial tone is programmed on the trunk group, the console will use a receiver, if available; otherwise no receiver is assigned.

5.12 The console indicators are refreshed and/or updated continuously every 100 ms by the CPU. These indicators include the 7-segment display for the time-of-day clock, the source and destination readouts and the calls-waiting display as well as over 200 LEDs. The status of each of these indicators is maintained in the volatile RAM on the IPC card. Every 100 ms, the processor addresses the RAM on the Console Control card and sends it information for each of the two consoles. This data is then sent along a pair of wires to the console. In the console, the information is stored in a RAM. At this point, the console's CPU takes control and sorts this input "file" into the form required to turn the LEDs and the console ringer on/off.

Hook-Flash

5.13 A hook-flash is defined for the system as an on-hook condition, of between 200 ms and 1500 ms (700, 900 or 1100 ms may be used as a System Option). A flash may occur in an off-hook condition where a speech path has been established between an extension and a trunk or between two extensions. When an extension flashes the switchhook, the Scanner informs the CPU. The CPU checks its memory to determine whether a flash is legal. If not, the extension is disconnected from the speech path. The flash is interpreted as the beginning of a new call. However, when a flash is determined to be a legal operation, the CPU starts a timer. If the extension goes back off-hook within the specified time period, it is considered to be flashing. An on-hook of less than 200 ms is considered to be a noise glitch, while an on-hook greater than 1500 ms (700, 900 or 1100 ms alternatively) is considered as a call termination (hang-up).

5.14 When a flash is detected; the processor disconnects the flashing extension from its speech path, finds a free speech path which it tests, and connects the extension to it. It then provides transfer dial tone (from the Tone Control card) and connects a receiver to the speech path, allowing the extension to dial and converse privately with a third party. If the extension had flashed out of a conference, the conference is unaffected. However, if the other party was not in conference, it is disconnected from its speech path and connected instead to HOLD.

Incoming Calls (GS/LS Trunks)

5.15 When the trunk circuit detects ringing voltage, forward or reverse current, or a tip ground (ground start trunks), the trunk's microprocessor informs the CPU. The LED on the Trunk card will light and the CPU reads a status report from the trunk. The CPU finds and tests a speech path and notifies the programmed equipment. The CPU then connects it, and the trunk to the speech path, and sends a command to the Trunk card. The Trunk card then terminates the trunk circuit and enables the audio. If the trunk has been programmed for DISA, the system processor waits 10 seconds before answering and

then connects a receiver and a dial-tone generator. This allows the trunk to appear as though it were an extension. A DISA trunk enables a dial-in caller to dial internal stations and features.

5.16 Figure 5-6 identifies all equipment numbers that may be assigned in an SX-100/SX-200 system. This figure will aid the repair person in the association of equipment numbers to specific slots and thereby specific cards. There are eight extensions per Line card slot, two E/M or tie trunks per trunk card slot or four CO trunks per Trunk card. All trunk equipment numbers will appear as even numbers (i.e., 50). For the explanation of the error codes and their meaning see Part 4 of this Practice.

SUPERSET 4 Set Operation

5.17 Each SUPERSET set is assigned to a specific equipment number on a specific SUPERSET Line card. When a SUPERSET set goes off-hook, the UART on the Line card informs the CPU, and the CPU causes the LED (on the Line card) associated with that equipment number to light. At this time there are up to 31 speech paths available for assignment to the off-hook SUPERSET set. Each Line card has an 8 x 32 switching matrix, providing access to 31 speech paths and one Music-on-Hold (MOH) path. The CPU (through its Random Access Memory (RAM)) will find a free speech path and test it, using circuits on the Tone Control card. After the speech path is tested, the CPU connects it to the line circuit. Dial tone from the Tone Control card is then connected to the free speech path.

5.18 When the first digit is dialed, the CPU determines if the digit is a requirement for an internal call or external call, or if more digits are required to define the call. Regardless, upon reception of the first digit, the CPU will inform the Tone Control card to drop the dial tone. If the option selected (as defined by the digits dialed) is busy, the SUPERSET set will receive busy tone from the Tone Control card. The CPU will react to the first digit or the remaining digits as per the following paragraphs.

5.19 When a SUPERSET set dials a sequence that requires the use of a feature, the CPU must first check the SUPERSET set's COS. If the SUPERSET set's COS does not allow access to that feature, it will be assigned (by the CPU) reorder tone from the Tone Control card. If feature access is permitted, the CPU will act according to the memory stored in the RAM. All information will be stored in the system's RAM by the CPU. It should be noted that the Scanner card informs the CPU that the Receiver card has a digit decoded for each digit on a trunk the SUPERSET set dials. The CPU controls all tones (i.e., supervisory tones that the SUPERSET set may receive), switching them on/off at the correct rates.

5.20 If the call is an inside call (within the PBX), the SUPERSET set must access a speech path as per paragraph 5.17. The CPU will decode the first digit dialed. The CPU will consult the RAM as per paragraph 5.18 to determine the validity of the digit and the action required. Until the CPU is able to confirm an action to be performed

with the digits received, all digits will be stored in the RAM. Should the first digit or digit sequence be considered invalid by the CPU, reorder tone (from the Tone Control card) is connected to the speech path. A

HARDWARE POSITION NUMBER	PLUG 7						PLUG 9						PLUG 11						EXTENSION UNIT NO.	TRUNK UNIT NO. (1-TRUNK)	TRUNK UNIT NO. (2-TRUNK)			
	161	169	177	185	193	201	209	217	225	233	241	249											1	
162	170	178	186	194	202	210	218	226	234	242	250								2	1	1			
163	171	179	187	195	203	211	219	227	235	243	251								3					
164	172	180	188	196	204	212	220	228	236	244	252								4	2				
165	173	181	189	197	205	213	221	229	237	245	253								5					
166	174	182	190	198	206	214	222	230	238	246	254								6	3	2			
167	175	183	191	199	207	215	223	231	239	247	255								7					
168	176	184	192	200	208	216	224	232	240	248	256								8	4				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18						
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
	PLUG 8						PLUG 10						PLUG 12						CARD POSITION					
	PLUG 8						PLUG 10						PLUG 12						SLOT NUMBER					

SHELF 2 (SX-200 ONLY)

HARDWARE POSITION NUMBER	PLUG 1						PLUG 3						PLUG 5						EXTENSION UNIT NO.	TRUNK UNIT NO. (1-TRUNK)	TRUNK UNIT NO. (2-TRUNK)			
	001	009	017	025	033	041	049	057	065	073	081	089	097	105	113									
002	010	018	026	034	042	050	058	066	074	082	090	098	106	114										
003	011	019	027	035	043	051	059	067	075	083	091	099	107	115										
004	012	020	028	036	044	052	060	068	076	084	092	100	108	116										
005	013	021	029	037	045	053	061	069	077	085	093	101	109	117										
008	014	022	030	038	046	054	062	070	078	086	094	102	110	118										
007	015	023	031	039	047	055	063	071	079	087	095	103	111	119										
008	016	024	032	040	048	056	064	072	080	088	096	104	112	120										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
	PLUG 2						PLUG 4						PLUG 6						CARD POSITION					
	PLUG 2						PLUG 4						PLUG 6						SLOT NUMBER					

SHELF 1

- NOTES:
1. DUAL-/QUAD-RECEIVER EQUIPMENT NUMBERS ARE 090, 098, 106, 114, 092, 100, 108 AND 116.
 2. QUAD-RECEIVER EQUIPMENT NUMBERS ARE 094, 102, 110, 118, 096, 104, 112 AND 120.
 3. EQUIPMENT POSITION 001 IS RESERVED FOR THE TEST LINE AND MUST THEREFORE BE EQUIPPED WITH A LINE CARD.
 4. TRUNK EQUIPMENT NUMBER IS SAME AS INDIVIDUAL TRUNK ACCESS CODE.
 5. SLOT 15 IS RESERVED FOR RECEIVER NO. 1.
 6. MAXIMUM NUMBER OF SUPERSET 4 SETS = 64.
 7. THE EQUIPMENT NUMBER FOR RAC'S WILL BE THE 2nd AND 8th EQUIPMENT NUMBERS OF THE SLOT THE CARD IS INSTALLED.

Figure 5-6 Equipment Numbering

valid SUPERSET number causes the Tone Control card to provide either ringback or busy tone (all tones are controlled by the CPU) to the calling SUPERSET set. Before actually ringing the called SUPERSET set, the CPU consults its RAM to check for any form of Call Forwarding, Do Not Disturb or a SUPERSET set restriction (i.e., Originate Only). In these cases, the calling SUPERSET set will be forwarded or it will receive reorder tone (from the Tone Control card). At the same time, if the call is to another SUPERSET set, the CPU will cause the appropriate prompts to be lit at the SUPERSET set involved.

5.21 If the call is an outside call with no dialing restriction, the SUPERSET set must be assigned a speech path (paragraph 5.17). The CPU will locate a free trunk corresponding to the access code dialed (see Section MITL9105/9110-096-210-NA). If there is not a free trunk, the CPU will connect busy tone (from the Tone Control card) to the speech path which the SUPERSET set is assigned to. After recognition of a legitimate access code, the SUPERSET set is connected directly to the trunk. The CPU will cause the Trunk card to output the equivalent tones in pulses on the trunk

5.22 If the call is an outside call with digits 0, 1, #, or ✕ dialing restriction, the SUPERSET set must be assigned a speech path (paragraph 5.17). The CPU will then locate a free trunk corresponding to the access code dialed (see Section MITL9105/9110-096-210-NA). If there is not a free trunk, the CPU will connect busy tone (from the Tone Control card) to the speech path. The receiver will decode the first and second digit dialed into the trunk if System Option 291 (First Digit Toll-Deny) is selected; only the first digit is monitored on the trunk. The CPU will then decide if the digit that has been decoded is a 0, 1, # or ✕. If it is, then reorder tone (from the Tone Control card) will be supplied to the speech path that the SUPERSET set is assigned to and the trunk will be released. If the second digit is something other than a 0, 1, # or ✕, the call will be allowed. The receiver will be dropped at this point if tone-to-pulse conversion is not required.

5.23 For an outside call with SMDR, Multi-Digit Toll Control or ARS in effect, the SUPERSET set must first successfully access a speech path (paragraph 5.17). The CPU must find a free trunk according to the access code dialed, and that SUPERSET set's COS (unless ARS is in effect). If there is not a free trunk, busy tone will be returned from the Tone Control card. If the access code dialed is not in the SUPERSET set's COS, reorder tone will be returned from the Tone Control card. If ARS is in effect, digits dialed will be compiled in a receiver buffer until the entire number has been collected. The receiver will decode all digits for the CPU until the last digit or a maximum of 26 digits is dialed. In the case of SMDR, all digits dialed will be stored in a trunk buffer until they may be output to a recording device. If ARS is in effect, the CPU will consult the RAM as to the correct route (trunk group) to select (subject to time, availability and preference). The CPU will cause the receiver to inform the trunk selected of the digits to be output. At this time digits being sent by the Trunk card are monitored by the receiver and are subject to Multi-Digit Toll Control (if enabled). The CPU will consult the RAM memory as to toll control for each digit received. If the call is allowed by toll control, the call will go through. If

the call is not allowed, reorder tone will be returned from the Tone Control card and the trunk will be released.

Tables

5.24 Table 5-1 is a list of all tables to be used in the actual troubleshooting of the SX-100/SX-200 system. Table 5-2 is a list of the error codes that may appear on the console during regular operation, Table 5-3 is a list of extension faults, Table 5-4 is a list of console faults, Table 5-5 is a list of trunk faults and Table 5-6 is a list of system faults. All tables suggest immediate remedial action or provide a direct reference to a MAP that will incorporate the proper actions.

TABLE 5-1
TABLE LISTING FOR TROUBLESHOOTING

Table	Title
5-2	Error Code Procedures
5-3	Extension Fault Report Procedures
5-4	Console Faults
5-5	Trunk Fault Report Procedures
5-6	System Faults

5.25 In the following tables (5-2 to 5-6) a STOP indication should be taken as: STOP; contact your nearest authorized MITEL Service representative.

**TABLE 5-2
ERROR CODE PROCEDURES**

Source Display	Alarm	Reason	Step 1	Step 2	Step 3
E001-22	major+/ minor	Error in RAM	Change IPC card (slot 20) and reprogram	Perform Common Control Test MAP350-701	STOP
E002-20 (21)	major†/ minor	PROM checksum error	Change IPC card (slot 20)	Perform Common Control Test MAP350-701	STOP
E003-19	major	Clock/Scanner error	Change Scanner card (slot 19)	Perform Common Control Test MAP350-701	STOP
E004-18	minor	Speech path check circuit not "hi" when disconnected	Change Tone Control card (slot 18)	Perform Common Control Test MAP350-701	STOP
E005-18	minor	Bias circuit not connected to speech path	Change Tone Control card (slot 18)	Perform Common Control Test MAP350-701	STOP
E006-99	minor	Speech path short	Change Tone Control card (slot 18)	Perform Speech Path Test MAP350-702	STOP
E007-18	minor	Supervisory tone circuit not connected to speech path	Change Tone Control card (slot 18)	Change Receiver cards one at a time	Perform Speech Path Test MAP350-702
E008-Receiver Number	minor	Receiver not receiving tone digits	Replace Receiver card specified in SOURCE display	Replace Tone Control card (slot 18)	STOP
E009-Receiver Number	minor	Receiver not receiving pulse digits	Replace Receiver card specified in SOURCE display	Replace Tone Control card (slot 18)	STOP
E010	minor	Generator error	Replace Tone Control card (slot 18)	Change Receiver card	Perform Common Control Test MAP350-701 STOP
E011	minor	Generator/Receiver error isolated to a speech path Note: error could be on Receiver card or on Tone Control card (slot 18)	Replace Receiver specified in SOURCE display	Change Tone Control card (slot 18)	Perform Speech Path Test MAP350-702 STOP
E012	minor	Unable to connect the speech path to the line programmed as a "station" or "trunk"	Ensure that there is a card in the slot and it is programmed correctly	Change the card specified in the SOURCE display	Perform Common Control Test MAP350-701 STOP

† During power-up sequence only.

TABLE 5-2 (CONT'D)
ERROR CODE PROCEDURES

Source Display	Alarm	Reason	Step 1	Step 2	Step 3
E013	minor	Supervisory tone missing	Replace Tone card	Replace Receiver cards one at a time	Perform Speech Path Test MAP350-702
E014	minor	Receiver dial-tone detector not working	Replace Receiver card specified in the SOURCE display	Change Tone Control card (slot 18)	STOP
E015	minor	Probable receiver error	Replace Receiver card specified in the SOURCE display	Replace the Tone Control card (slot 18)	Perform Speech Path Test MAP350-702 STOP
E018	minor	Speech path shorted out	Perform Speech Path Test MAP350-702	Perform Common Control Test MAP350-701	
E019	minor	16 speech paths have been found in error, probably a fault in the checking circuit	Dial maintenance code followed by 1. Wait to see if error returns	Replace Tone Control card. Perform Common Control Test MAP350-701	Perform Speech Path Test MAP350-702 STOP
E020	minor	Excessive errors in console data circuits	Change console Control card specified in the DESTINATION display	Change console specified in MAP350-501	Check voltages on interconnect card MAP350-601 STOP
E020-22	minor	Checksum error in the RAM	If the system presented error during normal operation change IPC card (slot 20), initialize Memory as per MAP Section MITL9105/9110-096-210-NA. This error will occur on a (new) unprogrammed RAM card.	Replace IPC card and reprogram the system STOP	
E023-20-002	minor	RAM battery Voltage Out of Tolerance	Ensure that a backup of RAM Data is made before IPC card is replaced.	Replace IPC Card	

TABLE 5-3
EXTENSION FAULT REPORT PROCEDURES

Fault Reported As	Step 1	Step 2	Step 3
Extension dead; no battery (side tone)	Check the equipment number; locate the Line card. See if the line LED is lit. If it is, check with a butt-in at the frame to verify set and house wiring. Buzz the pair. Ensure the console has not busied-out the extension.	At the console check that the extension programming is correct.	Change the Line card STOP
No dial tone at the extension; battery (side tone) present	Check the equipment number LED on the Line card. If it is lit, check the extension wiring by dialing with a butt-in at the frame. Buzz the pair.	Check other extensions on the same card for dial tone. If dial tone is missing on all card extensions, replace the line card. If the dial tone is absent systemwide, replace the tone control card. Note: Dial tone delays will occur if all receivers are busy.	STOP
Busy lamp on Line card stays on permanently	Check extension for locked-out.	Buzz extension for cable short.	STOP
Extension cannot break System dial tone	Check extension with a butt-in at the cross-connect field. From the test line use the thumbwheel switches on the Tone Control card to select each receiver and verify dial tone can be broken.	Replace the Line card.	STOP
Extension can receive calls but cannot make calls	At the console check the extension's COS to ensure it is not receive-only. Check the extension with a butt-in at the cross-connect field.	Replace the Line card.	STOP
Extension can make internal calls but cannot access a Trunk (busy or intercept tone returned)	Check for all trunks-busy condition. At the console check the extension's COS.	Check that the Controlled Outgoing Restriction is not in effect (see Section MITL9105/9110-096-105-NA). Ensure that the trunks are available and working by accessing them directly from the test line or console.	Check that the Trunk Group is not Supervisor Access only
Extension cannot access a feature	At the console check the extension's COS and check the feature access code.		STOP
Extension cannot break CO dial tone	At the cross-connect field check that the trunk is returning CO dial tone and can be broken. If the extension is DTMF, check that the CO trunks are capable of DTMF or that the Trunk Group is programmed for DTMF-to-DP conversion.	Check that the 3rd-wire trunk switch setting is closed. If open ensure that there is no ground on the XT lead.	Replace Trunk card STOP

**TABLE 5-3 (CONT'D)
EXTENSION FAULT REPORT PROCEDURES**

Fault Reported As	Step 1	Step 2	Step 3
Wrong numbers after accessing a trunk	If CO trunk can accept DTMF, ensure that the DTMF-to-DP conversion is not programmed in the Trunk Group.	Replace Trunk card.	STOP
Wrong numbers local	Do Receiver card test from the test line.	STOP	
Crosstalk on most extensions and trunks	~ 48 Vdc bad; replace power supply.		

Note: Some problems that Line card replacement may cure: no ring, noisy battery and noisy lines.

**TABLE 5-4
CONSOLE FAULTS**

Fault Reported As	Step 1	Step 2	Step 3
Console dead except for colon in time display and minor alarm	Ensure that the handset is properly inserted in the jack Try the other jack	Replace Console Control card	Check interconnect card voltages: SX-100, MAP350-605 SX-200, MAP350-601 STOP
Console dead no displays	Check that the console cable is plugged firmly into the console and interconnect card. Check that the console cable is plugged into the correct position on interconnect card.	Check interconnect card voltages: SX- 100, MAP350-605 SX-200, MAP350-601 Replace console MAP350-501	STOP
Dial or feature button inoperative	At the console check that this feature button is programmed.	Press a console button and observe the Console Control card to see if the Data LED flickers. If it doesn't, there may be a console problem; see MAP350-501	Replace the Console Control card Replace the console, MAP350-501 STOP
Console noisy or no audio	Change the handset/headset Change the handset to the other jack	Replace Console Control card. Replace console.	STOP
Console displays garbage	Unplug console control card and plug it back in. If the console returns to normal, it has been affected by static discharge. Ensure the system has a console interface card (SX-200 only).	Perform the Common Control Test MAP350-701	STOP
Incoming trunk calls not coming to the console	Check console for Night Service. Ensure Printer buffer is not full; i.e., SMDR in effect and the printer stopped (X14X).	Check that the console handset is plugged into the console and the console power fail transfer switch is set to normal.	Check programming to ensure trunk is not a direct-in line STOP
Random errors indicating fault on second shelf	Check that programming is complete for second shelf.	Check intershelf connectors and tables. Ensure that it is located correctly.	STOP

TABLE 5-5
TRUNK FAULT REPORT PROCEDURES

Fault Reported As	Step 1	Step 2	Step 3
Wrong numbers trunk card	Check the trunk at the cross-connect field DTMF and DP. Ensure that the system is not programmed to outpulse both DTMF and DP to a DTMF trunk. Check that DTMF tones are not going into a DP Trunk	Check for reverse, or check the System ground. Check trunk and trunk group type. Ensure that the DTMF and DP are not going into a DTMF trunk. Ensure you are not dialing tie trunk-to-tie trunk	Replace the Trunk card. Replace the Receiver card if there is DTMF-to-DP conversion STOP
Always receives busy tone after dialing a trunk access code	Check for correct trunk access code. Check for Call Blocking. Check Trunk Group for Supervisor Access only. Check for full printer buffers, Automatic Wake-Up and SMDR.	Check for reverse or open tip and ring on trunk. Check System ground. Check for two loop start trunks connected together. Check for ground start open.	Replace suspect trunk card STOP
Cannot break CO dial tone	Check the trunks at the cross-connect field for DTMF and DP switches. Check Trunk card, Section MITL9105/911 0-096-200-NA. If there is tone-to-pulse conversion, replace the Receiver card.	If the trunk tests good replace the Line card. Check the dial dictation.	STOP
Trunks dropped by the system	Check for intermittent extension switchhook. At the cross-connect field check the trunk with a butt-in; ensure this is not a CO problem.	On the Trunk card, check that the 50 ms switch in position. Program for longer switchhook flash (System Options 114, 180, 181, 182).	Replace the Trunk card STOP
Trunks being hung on the system	Check trunk type and trunk group programming; i.e., tie trunk-to-CO trunk connections or loop starts trunk together. Ensure there is a good ground for ground start trunks.	Check the trunks provide release supervision. Replace the Trunk card.	STOP
Two trunks ring when only one trunk is rung	Check trunk programming that even numbers are not programmed and odd equipment numbers are wired.	STOP	

Note: These are other trunk card problems that may occur:

- Calls ring in, but don't show up on the console
- One-way transmission
- Noisy trunks (eliminate CO trunk with a butt-in at the cross-connect field first)
- Trunk card alarm LED lit
- Dropped calls from the CO (eliminate CO trunk with a butt-in at the cross-connect field first)
- Station conference oscillations with two or more trunks
- Collisions due to one loop start trunk being seized same time (i.e., incoming and outgoing)
- AC induction on trunks
- Trunks out by one pair when punched down
- Low ringing current (from the CO) at the cross-connect.

**TABLE 5-6
SYSTEM FAULTS**

Fault Reported As	Step 1	Step 2	Step 3
System completely dead - no power	Check power at commercial AC outlet.	Check that the system power switches are on.	Go to Appendix F, paragraph F1.03 STOP
Shelf 2 dead - no power	Check Shelf 2 power MAP350-603.		
Calls cannot be made within the system. Power on.		Perform Common Control Test, MAP350-701.	STOP
Meaningless diagnostics or system resets	Perform Common Control Test, MAP350-701.		
Error E012 with an equipment number greater than 160	Intermittent shelf cables.	STOP	
Error E008	Change tone control card or if the problem is intermittent, change shelf.	STOP	
Double connections	Replace Scanner card.	STOP	
Lockout shown on console while station conversing	Replace Scanner card.	STOP	
Shelf power will not come up	Check P301.	Replace Interconnect card.	STOP
If only on Trunk calls check for a tip/ring reversal	Replace Console		
Calls with no one there (at console)	Replace Console.	STOP	
Low console volume	Replace Console.	STOP	
Station Conference oscillates	Trunk limitations.	STOP	
System powered-down; requires new programming	RAM battery dead.	STOP	
Console goes to Night 1 - no reason	Bad handset.	STOP	
<u>1/8 A</u> ringing fuse blows	Short on external ringing leads.	STOP	
Extension cannot page	Check programming. Check extension COS. Check access codes.	Go to MAP350-704 STOP	
Night bells don't ring	Check user 48 Vdc and 90 Vac fuses.	Check trunk programming.	Go to MAP350-705 STOP
Music on Hold is not audible	Check input at cross-connect field by clipping a butt-in on incoming pair or by dialing 32 on thumbwheel on Tone Control card and listening on test line.	Change Tone Control card. STOP	

6. SX-1 OO/SX-200 POWER SUPPLY

6.01 The SX-100/SX-200 power supply forms an integral part of the equipment cabinets. The SX-100 power supply is housed immediately to the right-hand side (front view) of the equipment shelf (Figure 6-1). In the SX-200 system the power supply is housed in a metal cabinet forming the lower rear door of the system (Figure 6-2). Both supplies are fully R.F.-filtered and may be operated from either AC or DC inputs to produce multiple DC output rails as well as ringing voltage. This Part will discuss the power supplies in four subparts, as follows: AC/DC Converter, DC/DC Converter, Ringing Generator and Out-of-Tolerance. There are also subparts on the Reserve Battery Backup and Charger, and Fusing.

AC/DC Converter

6.02 The SX-100/SX-200 AC/DC converter is designed to operate with an AC power source in the range of 100 - 130 Vac or 200 - 250 Vac, with an internal modification for the SX-200 system and a converter for the SX-100 system (see Section MITL9105/9110-096-200-NA). The SX-200 converter has an output of -60 to -64 Vdc, while the SX-100 converter has an output of -50 Vdc to -56 Vdc.

DC/DC Converter

6.03 The converter output is fed to the main DC/DC converter and Control Voltage Supply. The DC/DC converter may also be fed by a 48 Vdc reserve power supply. The battery supply may be connected permanently and will allow instantaneous cutover should the AC power fail. The control voltage section provides the following voltages:

- +8 Vdc
- -5 Vdc
- 0 Vdc
- -10 Vdc
- -48 Vdc.

Ringing Generator

6.04 The ringing generator uses a -48 Vdc output from the main converter to produce a 90 Vac, 20 Hz (optional 17 Hz or 25 Hz) supply for the system ringing.

Out-of-Tolerance

6.05 All voltage levels are regulated 5 % except for the -48 Vdc which may vary 10 %. An Out-of-Tolerance (OOT) circuit monitors all levels continuously (see Table CI-2). Should a deviation occur, an OOT signal will activate the power fail transfer circuit through the interconnect card. It should be noted that if a -48 Vdc reserve power supply is used, the power fail transfer will not be activated in the event of a power failure. In the SX-100 and SX-200 systems there are provisions to program a port as a Contact Monitor (MITL9105/9110-

090-105-NA). This monitor may be used to alert the Supervisor that the system is on battery power (Wiring - Appendix C) by wiring it to a contact monitor port (at the cross-connect field).

Reserve Battery Backup and Charger

6.06 The SX-100 and SX-200 systems both accept a -48 Vdc source fed to the terminals indicated on the terminal blocks shown in Figures 6-2 and 6-3. The installation of the reserve supply in the system is described in MITL9105/9110-096-200-NA. A pictorial view of the power supply is shown in Figures 6-2 and 6-4. The MITEL reserve battery and charger (MITEL Part Number 9110-014-000-NA) has an OOT circuit which may be used to alert the Supervisor that the system is on reserve battery power. The indicator is a dry relay contact that may be used to ring an external alarm or it may be wired to a system port as a Contact Monitor.

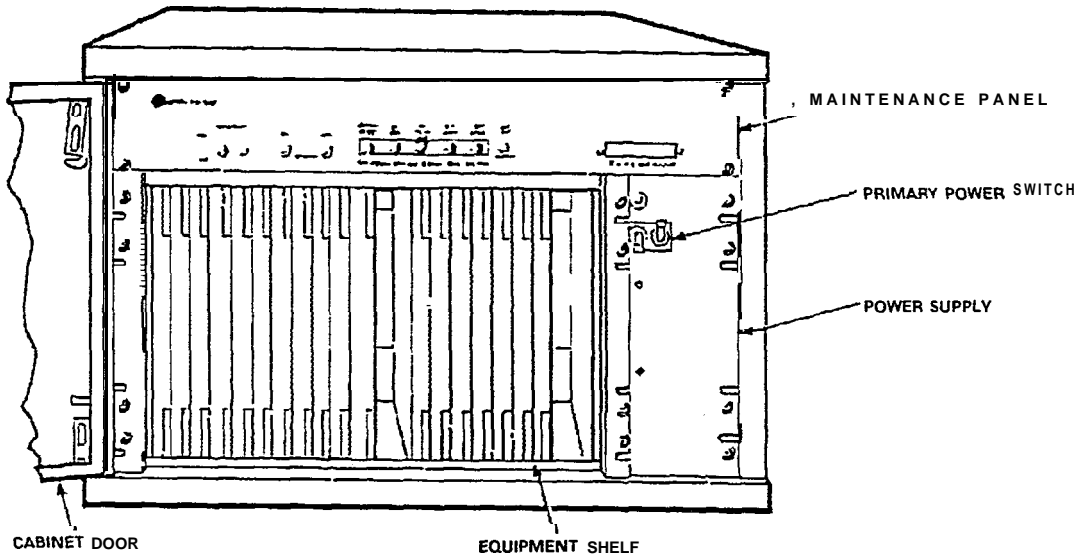
Fusing

6.07 The SX-200 system is protected by fuses which are located on the back door of the cabinet (Figure 6-4). The back door has imprinted upon it a circuit description defining each fuse and the circuit breaker. In addition to these fuses there are a series of LEDs which also are defined by the circuit on the back door. These LEDs will be lit if there is power in the area that they designate, or in the case of the reserve battery backup, if the battery is connected. In addition to the cabinet door fuses, there are fuses located on the backplane, Interconnect card and Power Fail Transfer card. The fuse on the Interconnect card protects the console's -48 Vdc and the fuse on the power fail transfer card protects the power fail transfer -48 Vdc.

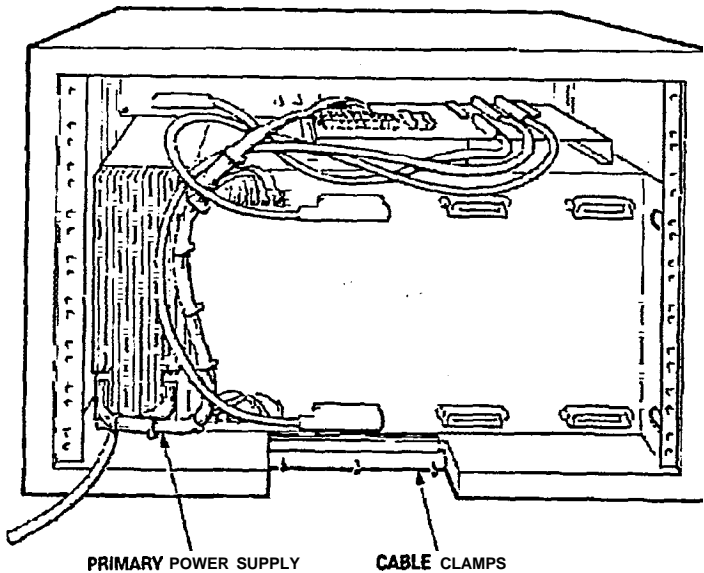
- (a) The SX-100 system has the same backplane as the SX-200; hence the same fusing appears on the backplane. There are three fuses on the Interconnect card for: user 90 Vac, user -48 Vdc and the console - 48 Vdc (Figure 6-3). The front panel of the power supply has two circuit breakers: one is for the DC battery supply and the other is for the AC supply (Figure 6-1).

Note: Some early versions of the SX-100/SX-200 system do not have all the fusing of later models. This point should be taken into account when troubleshooting the system.

- (b) If the system is equipped with a reserve battery backup, separate fusing is included in the charger unit itself (Figure 6-6). There are three fuses: a 1 amp charging fuse, a 5 amp output fuse and a 2 amp AC fuse. In addition, there are two 20 amp circuit breakers (one on the battery pack, one on the charger unit) for the battery protection. All reserve battery and charger connections are shown in Figure 6-2 and Figure 6-3. Installation of the reserve battery backup is described in Section MITL9105/9110-096-200-NA.



FRONT VIEW

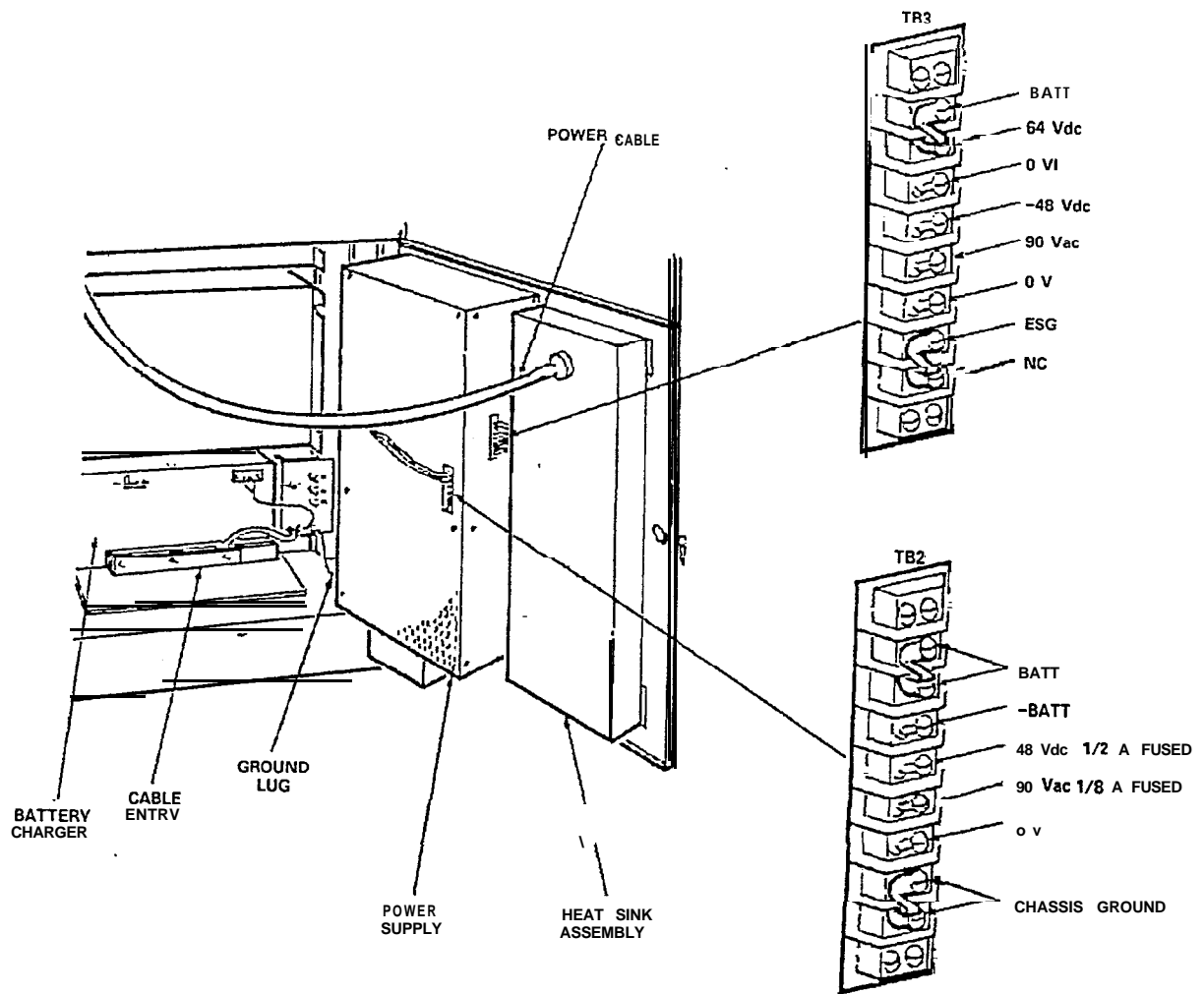


REAR VIEW

WEIGHT	HEIGHT	WIDTH	DEPTH
31.8 kg (70 lb)	422 mm (16.62 in.)	635 mm (25 in.)	470 mm (18.5 in.)

X561

Figure 6-1 SX-100 Equipment Cabinet and Power Supply



X3158R1

Figure 6-2 SX-200 Power Supply

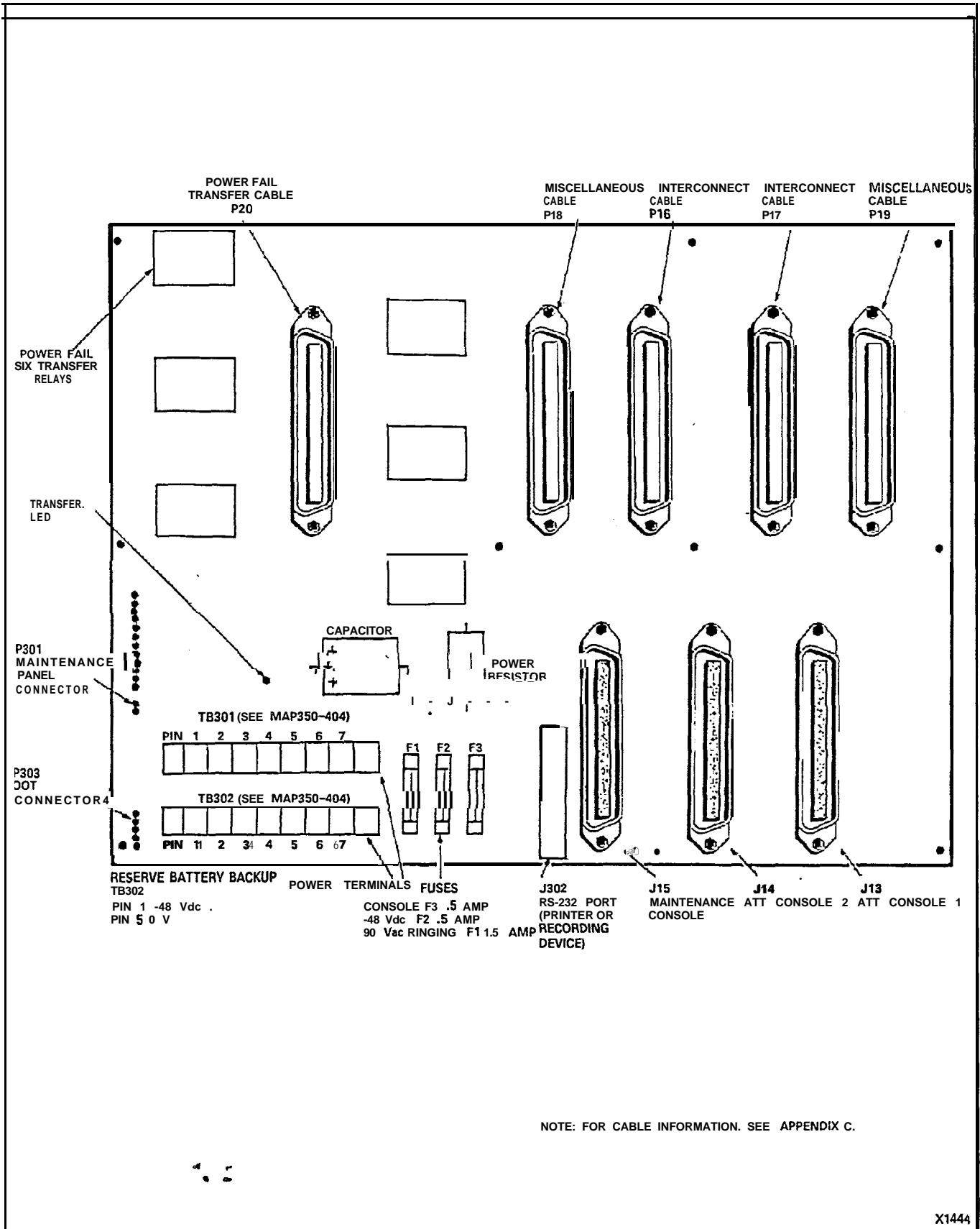
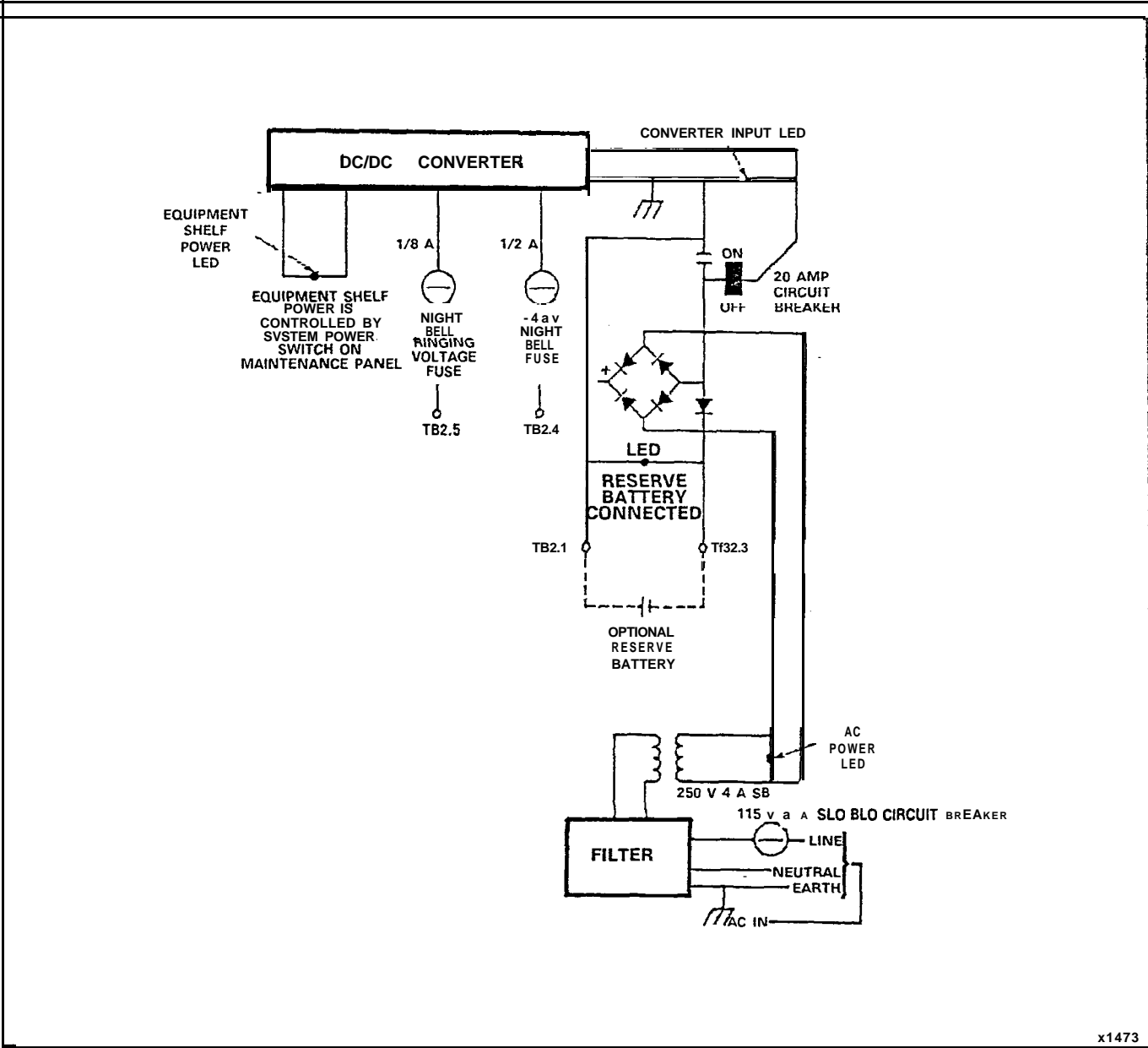


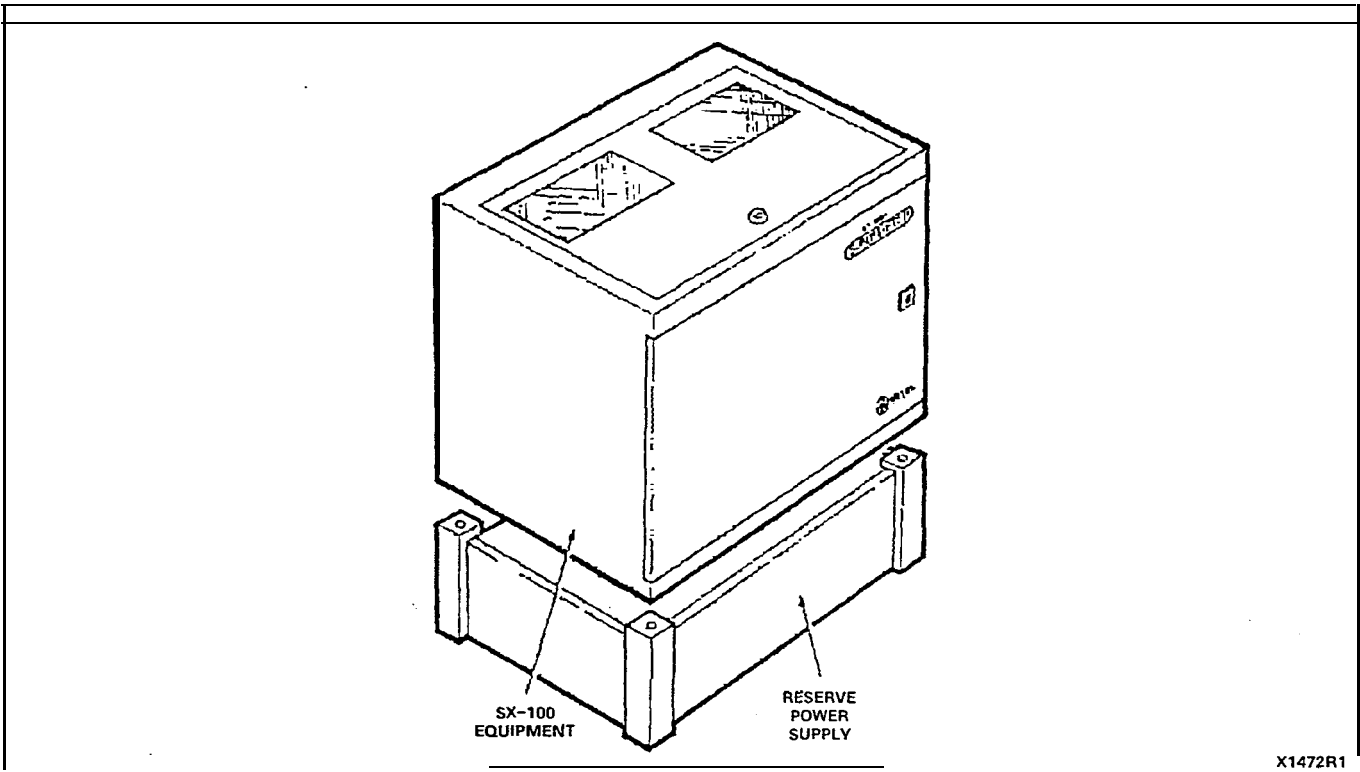
Figure 6-3 SX-100 Interconnect Card



x1473

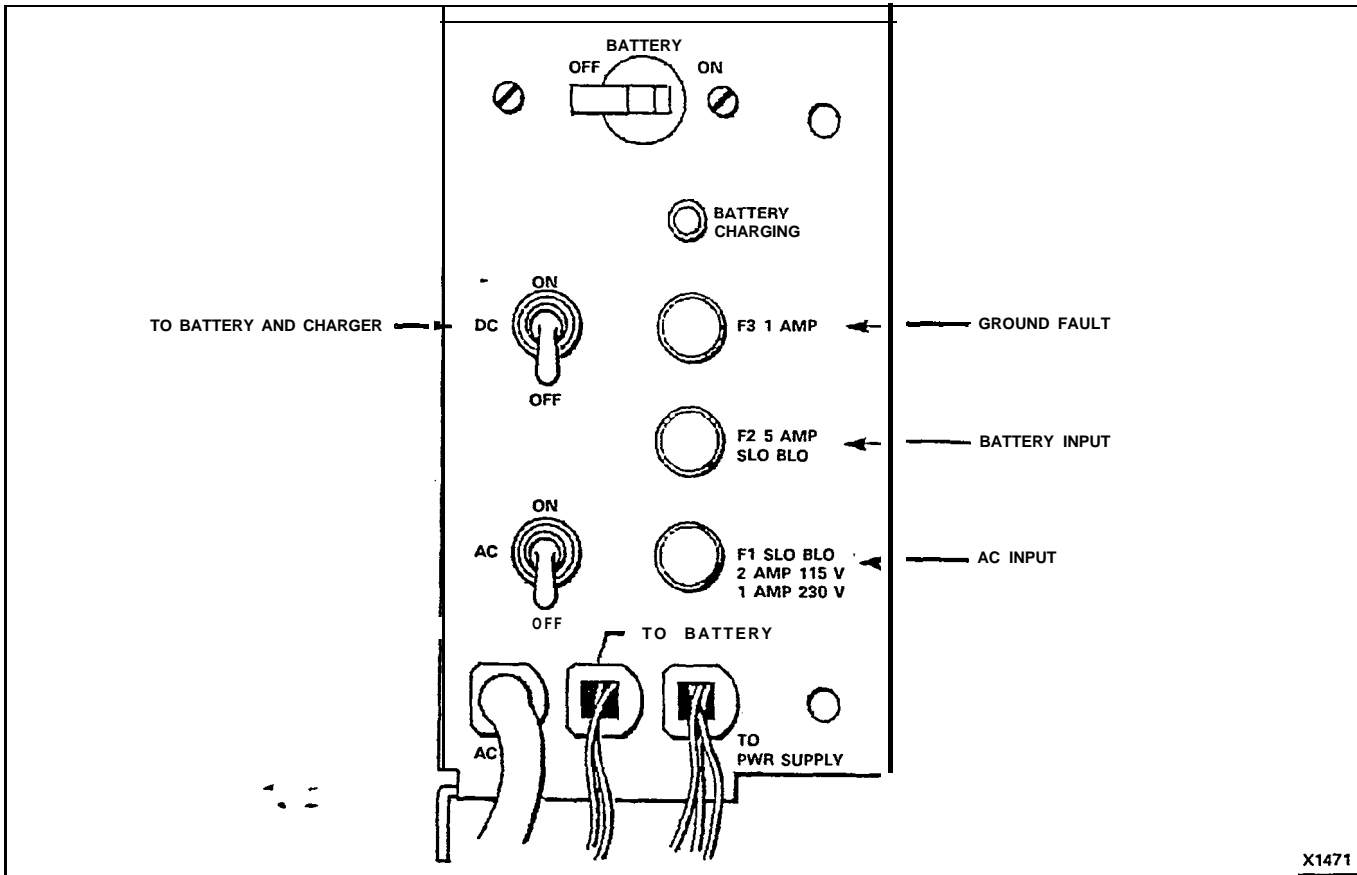
Figure 6-4 SX-200 Back Door Electrical Schematic

6.08 When troubleshooting the systems for power failures, the Power Supply Block Diagram (Figure 6-7), and Charts 6-1 through 6-10 should be consulted. The charts outlined cover the trouble and its effect on the system. In most cases the repair person will be directed to a specific MAP for remedial action. Under the heading "Check", a yes answer to the question asked is an indication to go on to the next question in the "Check" column. If a no answer is encountered, the repair person should go to the "Action" column and follow the instructions listed there. There is also a column indicating (by an X) to which system the action applies. Above all, it must be remembered that fuse replacement is not a remedy. The probable cause of a power failure should be determined before the system is powered-up. Utilizing the information provided in this Section and the MAPs referred to in Charts



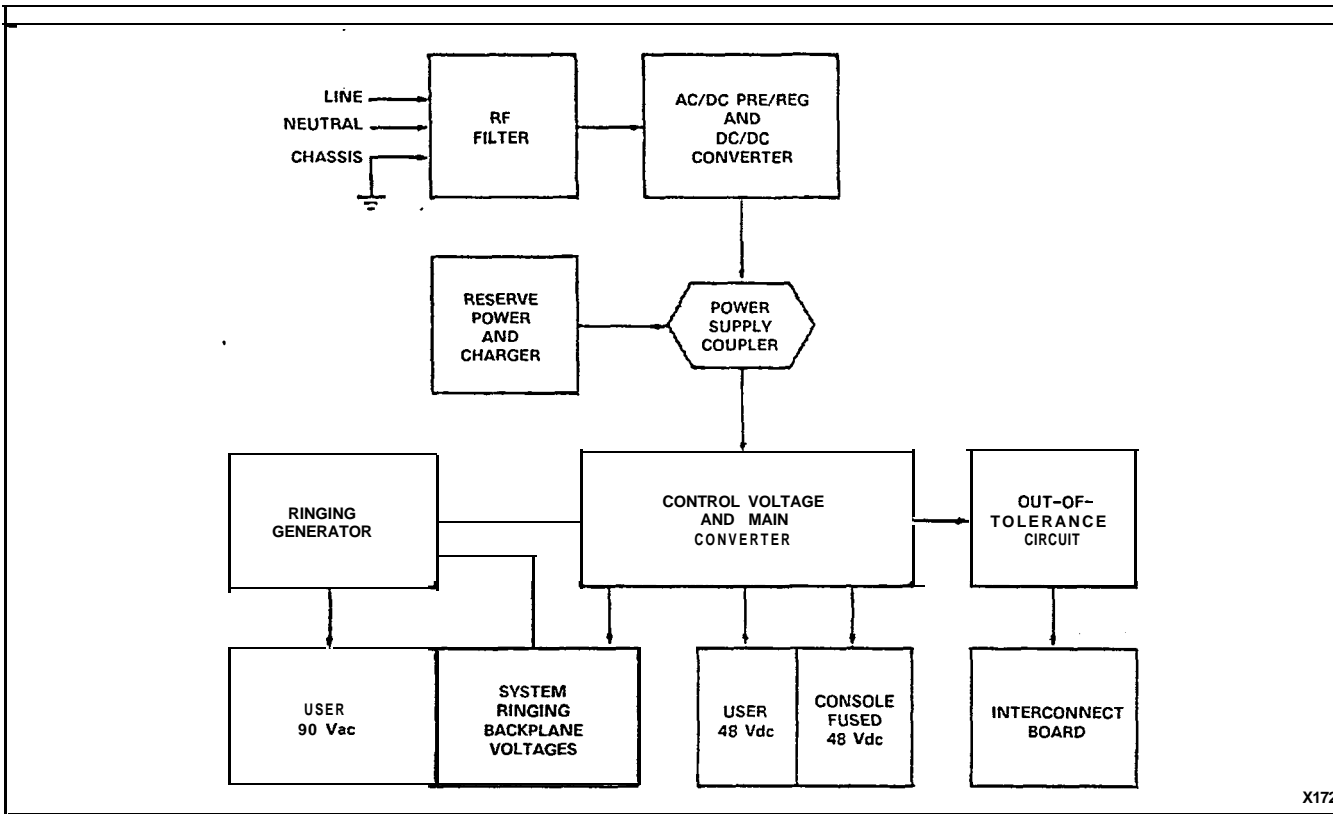
X1472R1

Figure 6-5 SX-100 Reserve Battery Backup



X1471

Figure 6-6 Reserve Battery Charger



X17

Figure 6-7 Power Supply Block Diagram

6-1 through 6-10, the repair person should be able to pinpoint fault and take proper replacement action. At all times the repair person should follow all safety precautions suggested in the MAPs to ensure maximum personal and equipment safety.

CAUTION - DANGEROUS OR LETHAL VOLTAGES

CHART 6-1

Trouble	Check	SX-100	SX-200	Action	
System completely dead. Suspect primary power failure. No reserve battery backup.	1. Is the AC power LED lit?		X	On the SX-200 system, check the rear door, bottom right-hand corner for the AC power LED.	
			X	Check that the system is plugged in.	
			X	Check the AC power fuse on the back of the system.	
	2. Is the converter LED lit?		X		Check the AC power at the commercial source with a suitable AC meter or by plugging another device into the outlet.
			X		There is 5.5 amp converter circuit breaker on the front of the SX-100 power supply. If it is in the ON position, the LED beside it should be lit.
				X	There is a 20 amp circuit breaker on the back door of the SX-200 system. If it is in the ON position, the LED beside it will be lit.
	3. Is the maintenance panel LED (power on) lit?		X	X	If the circuit breaker is off, reset it. If the breaker trips again, replace power supply - MAP350-403 (SX-100), MAP350-507 (SX-200).
			X	X	Check that the maintenance panel power on switch is on.
			X	X	Ensure that the maintenance panel cable is connected correctly to the Interconnect card.
	4. Replace the SX-100 power supply, MAP350-403.		X	X	Check backplane voltages as per MAP350-603.
5. Replace Heat Sink assembly, MAP350-506. Replace the SX-200 power supply, MAP350-507.				X	
				X	

CHART 6-2

Trouble	C h e c k	sx-100	sx-200	Action
System power on but no LEDs lit on console. Appears to be no power to the console.	1. Is the handset plugged into the console?	X	X	Plug in handset.
	2. Is the console cable secure?	X	X	Secure console cable.
	3. Is the fuse on the Interconnect card good?	X	X	Check the fuses on the Interconnect cards and replace if blown. Power system up. Replace cable if the fuse blows. Try again.
	4. Is the Interconnect card passing -48 Vdc to the console?	X	X	MAP350-605, SX-100 MAP350-601, SX-200

CHART 6-3

Trouble	Check	SX-100	sx-200	Action
Major Alarm on console. System appears to operate normally; ie., calls can be processed.	1. Check that the master transfer switch on the maintenance panel is in operating position.	X	X	Set all switches as per paragraph 2.16.
	2. Check the Power Fail Transfer LED on the PFT board. Is it not lit?	X	X	Change card as per MAP350-401.
	3. Disable all console switches. Did the system remove itself from Power Fail Transfer	X	X	OOT condition may exist. Refer to Appendix F. Ensure that the console is in the correct plug.
		X	X	Change the console as per MAP350-501.
		X	X	Change the console cable as per MAP350-501.
		X	X	Change the maintenance panel, MAP350-511.
		X	X	Change the maintenance panel, MAP350-511. (SX-200), MAP350-405 (SX-100).
	4. Replace the maintenance panel as per MAP350-511 (SX-200) MAP350-405 (SX-100).	X	X	
	5. Replace the power supply as per MAP350-507 (SX-200) MAP350-403 (SX-100).	X	X	

CHART 6-4

Trouble	Check	Isx-100	sx-200	Action
No telephones ring, but there is dial tone	1. Ensure that the PFT LED is not on	X	X	Set all switches as per paragraph 2.16
	2. Check that all PFT switches are in normal position	X	X	Paragraph 2.16
		X	X	Go to Appendix F

CHART 6-5

Trouble	Check	SX-100	SX-200	Action
Ringing on all telephones low or intermittent	Check 90 Vac	X	X	Go to MAP350-603

CHART 6-6

Trouble	Check	SX-100	s x - 2 0 0	Action
Call cannot be made within the system	Is the system in PFT?	X	X	Go to System Power test, Appendix F.

CHART 6-7

Trouble	Check	sx-100	sx-200	Action
Shelf 2 dead	Is all power on shelf 2 present?		X	Go to MAP350-603

CHART 6-8

Trouble	Check	SX-100	sx-200	Action
Apparent radical power fluctuations	Under heavy (or light) traffic conditions system power remains unstable	X	X	Go to Appendix F

CHART 6-9

Trouble	Check	sx-100	sx-200	Action
System cannot be released from PFT	Reset the PFT switches. Is the system returned to normal?	X	X	Check fuse on interconnect card as per MAP350-605 (SX-100) MAP350-601 (SX-200).

CHART 6-10

Trouble	Check	sx-100	sx-200	Action
Reserve battery backup not holding the system up	1. Are all reserve battery backup connections as per Figures 6-2 and 6-3?	X	X	Make connections as shown in Figures 6-2 and 6-1. Give batteries time to charge (24 hours).
	2. Is the battery circuit breaker in the ON position?	X	X	Reset breaker.
	3. Is the battery charging LED lit?	X	X	Go to MAP350-604 (SX-200) MAP350-606 (SX-100).
	4. Are the fuses F1, F2 and F3 good?	X	X	Go to MAP350-605 (SX-200) MAP350-606 (SX-100).
	5. Are the batteries less than 4 years old?	X	X	Replace batteries as per Section MITL9105/91 10-096-200-NA.
	6. Unplug the system AC power cord. Is there an audible click from the charger unit or does the system indicate an "on battery condition" (i.e., Contact Monitor, Section MITL9105/9110-096-105-NA)?	X	X	OOT not properly hooked up. OOT not functioning. Replace charger unit.

7. REMOTE MAINTENANCE, ADMINISTRATION AND TEST SYSTEM

RMAT System

7.01 The RMAT System was designed to be used by personnel maintenance centers to remotely access systems installed at customer's premises. These personnel may obtain maintenance formation or cause programming changes. The system provides means of rapidly identifying potential system problem areas and allow programming changes to be done without the necessity of visiting the user's premises.

7.02 The facility is provided by:

- (a) A Remote Maintenance Administration and Test (RMAT) System Controller installed at the Maintenance Center. It consists of 1 SX-100/SX-200 hardware with a Generic 290 or 291 RM PROM, and includes a Remote Control - Central (RCC) card and a standard operating console.
- (b) A Remote Control - System (RCP) card installed in slot 16 Shelf Unit 1 of each SX-100/SX-200 system.

- (c) The interconnecting facilities between the RMAT Controller and the RCP-installed systems. This communication's link is in most cases provided by the public switched network, with the RMAT Controller dialing up the required system. Access to each system may be provided by dialing a dedicated number (trunk), or by dialing the listed directory number for the system. A user defined security code within each system provides protection against unauthorized access.

Note: The RCP Card occupies slot 16, which might otherwise have been used for a second console Control card. The system then has a single Supervisor console. If, however, a second Supervisor console is required together with the RMAT facility, then the second console is connected to the maintenance port. Under these conditions certain limitations are imposed such as:

- Shared HOLD positions between the two consoles.
- Shared conference call setting capability.
- No time-out to night service on the second console.
- Audio connection between Supervisor consoles when both are idle.
- Separate console configuration in a tenant installation is not possible.

3.03 Once the RCP card has been accessed the RMAT Controller can perform the following functions at the system:

- (a) Duplication by the RMAT Console operator of the system normal Supervisor console functions and displays. (Note: No speech path is available to the RMAT console operator once the RCP is accessed.)
- (b) Programming functions for the remote system including extended programming for Multi-Digit Toll Control purposes.
- (c) Detection of alarm conditions at the system and the ability to clear alarms, to busy out lines and trunks and perform reset and system disable conditions.
- (d) If the RCP is connected as a system extension, the system Supervisor, or any other system extension, has the facility of originating an RMAT call to the RMAT Controller. In addition, if the RCP extension has the COS option "Flash for Supervisor" enabled, the RMAT operator can re-enter into speech mode with the system Supervisor after being in the Remote Administration Mode.

- (e) The RMAT Controller can access the RCP card by dialing the RCP access code, and has the capability to change the access code when required.
 - (f) The RMAT Controller's receiver and trunk cards may be programmed by its console for the type of operation required to access the remote system equipments; local features such as time or date display can also be programmed from the console.
 - (g) The RMAT Controller equipment includes the capability of displaying and clearing diagnostic registers for its own or for the remote system RCP Card.
- 7.04 For further information, see Section MITL9 105/9110-098-101-NA and MITL9105/9110-098-301-NA.



11

APPENDIX A

MITEL ACTION PROCEDURES

GENERAL

AI.01 Task-oriented functions in this Appendix are implemented using MITEL Action Procedures (MAPs). Also there is a brief discussion of tools and safety practices.

AI.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 two levels of information as follows:

- (a) For experienced personnel, a series of steps (level one) each numbered (n) and annotated with minimal information.
- (b) For inexperienced personnel, each step referred to in (a) above is amplified by a connected series of numbered substeps (n) (level two).

AI.03 A typical example of a MAP is shown in Figure AI-1, with the two levels detailed.

MAP SYMBOLS

AI.04 There are four basic symbol shapes which may be used in a MAP, and are defined as follows.

AI.05 **AND Block:** Used to indicate a level one step that must be performed. Consists of a square with the word AND centered in the block.

AI.06 **OR Block:** Used to indicate a choice of level one steps, one of which must be performed. Consists of a rectangle, with the text centered in the block, and with the word OR appearing between the alternative operations.

AI.07 The rectangle is also used to border instructions which imply that the operator must perform a task outside the scope of the MAP. The text is centered in the rectangle.

AI.08 **Decision Block:** Used to indicate a decision within the level one steps which must be made. The symbol is based on a hexagon with the top and bottom sides extended. Decision text is centered in the symbol.

AI.09 **START/FINISH/Jump to Block:** Used to indicate the start or finish of a MAP. Also used to indicate "jump to" points within the MAP; for example "go to (n)" or "from (n)" or "return to (n)".

UNPACKING AND INSPECTION OF EQUIPMENT
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Sheet 1 of 1

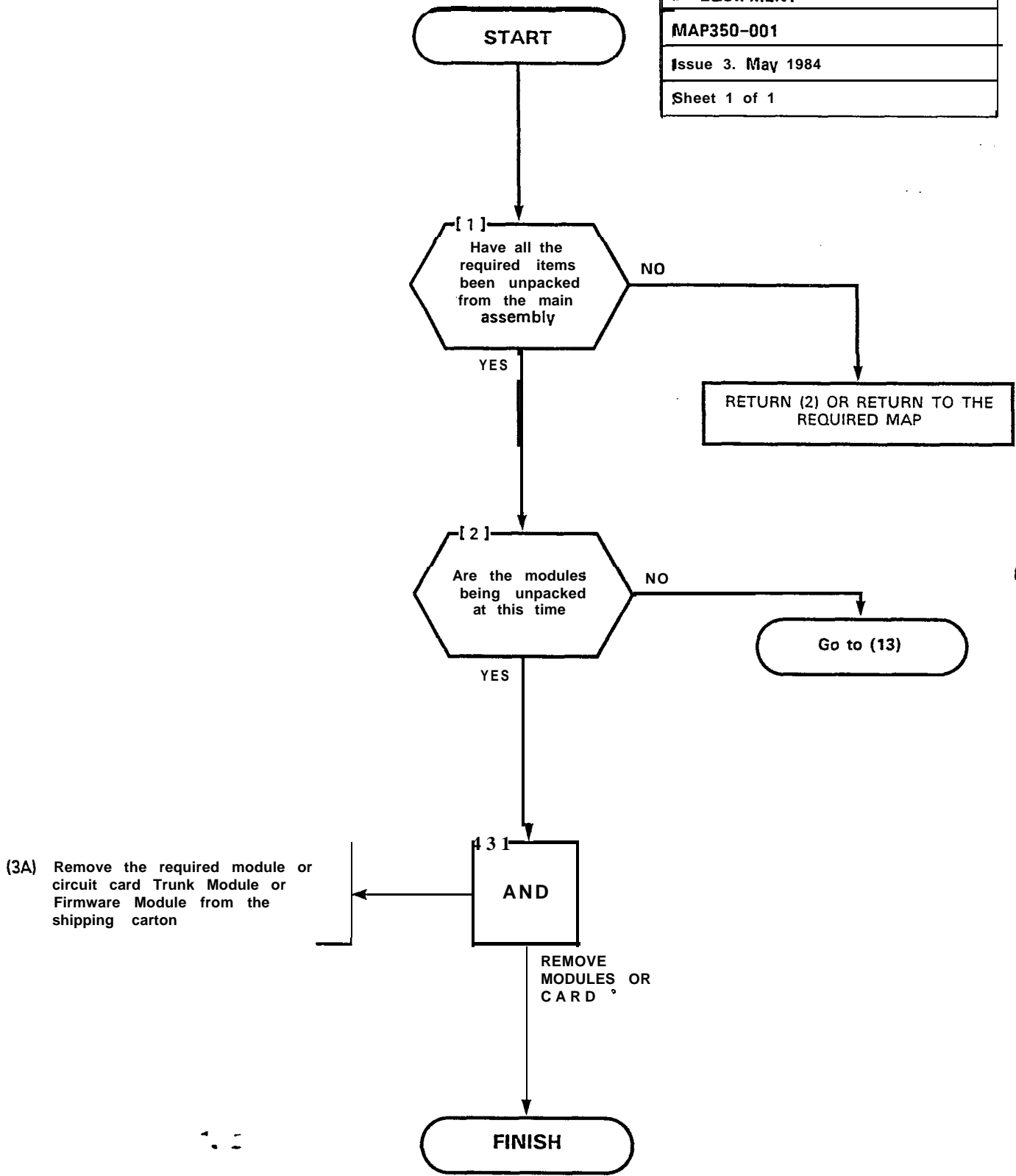


Figure AI-1 Typical Map Page

symbol is a rectangle with semicircular ends. Text is centered in the symbol.

THE OPERATOR'S USE OF MAPS

Experienced Operator

AI.10 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 AI-I as an example, the experienced operator would proceed as follows.

AI.11 At (1), makes a decision based on the information within the block. If the answer is YES the operator must proceed to a different MAP. If the answer is NO the operator is faced with another decision at block (2).

AI.12 At (2), if the decision is NO there is no requirement to proceed further and the test is abandoned. This naturally results in a FINISH block. If the decision is YES the operator proceeds to (3) and (4) in succession; i.e., dials the DID station number and completes the call to the check extension.

AI.13 The description of the instructions carried out in paragraphs AI.05 and AI.06 have assumed that the level of competence of the operator is such that short 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

AI.14 If the operator's experience is such that the level one instructions do not contain sufficient information, the level two substeps should be referred to as follows.

AI.15 Using Figure AI-I as an example the path followed should be:

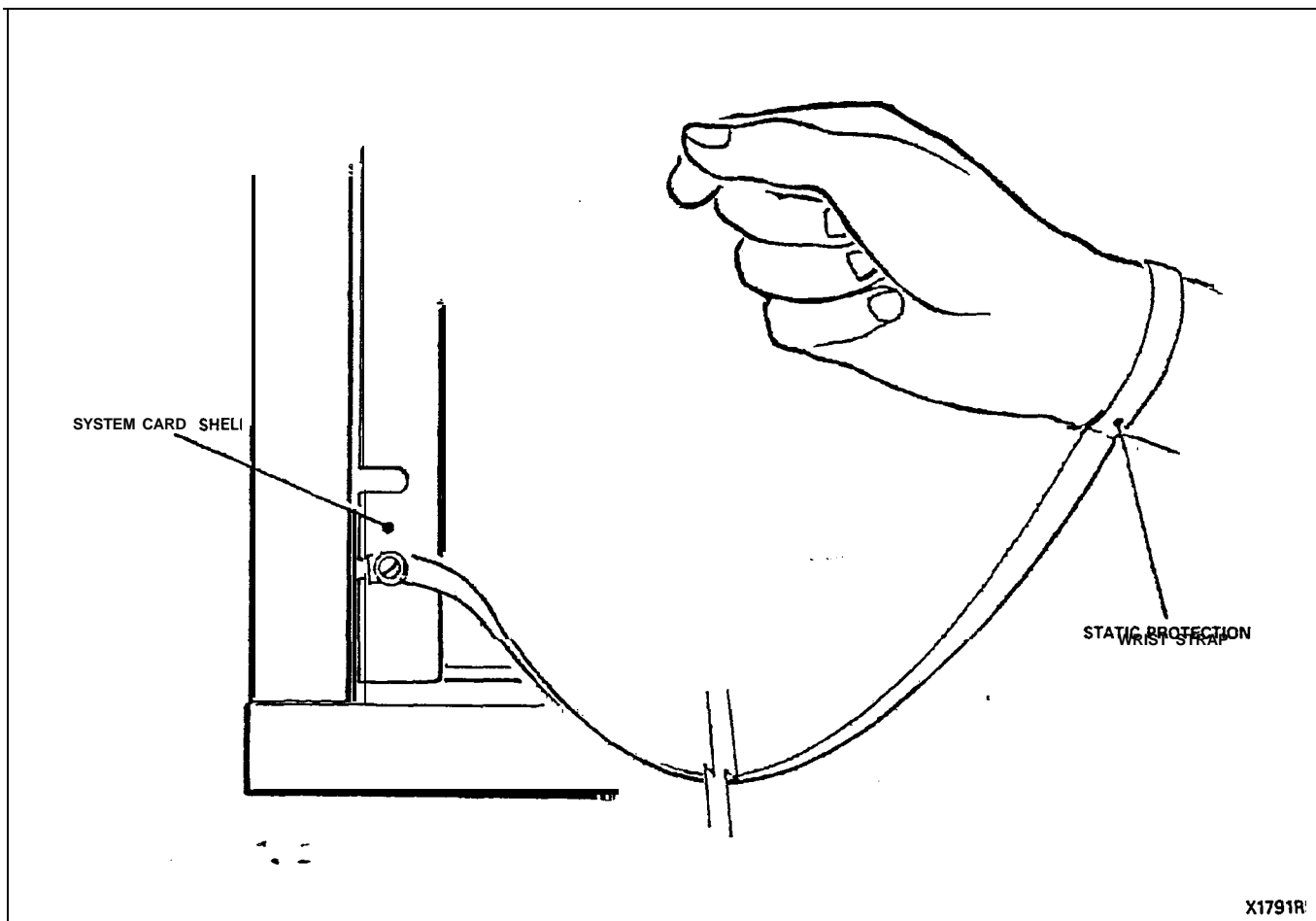
- (a) At (1) and (2) make the decisions called for at these steps as before.
- (b) At Step (3) dial the DID station number by performing substeps (3A), (3B) and (3C).

In terms of steps and substeps, the operator follows a decision, and then follows the step and substep paths in the example shown.

TOOLS, TEST EQUIPMENT AND SPECIAL INSTRUCTIONS

AI.16 Any tools, test equipment or special instructions that the operator requires or needs to know are stated on the first page of each MAP. If the MAP is long, and contains a number of subprocedures, these are listed in synopsis form on the first page.

AI.17 CAUTION: CAUTION IS NECESSARY, DURING INSTALLATION AND MAINTENANCE OF THE SYSTEM TO AVOID POSSIBLE DAMAGE TO THE SYSTEM ELECTRONICS BY STATIC DISCHARGE. A SIMPLE MEANS OF AVOIDING THE POSSIBILITY OF SUCH DAMAGE, IS THE USE OF A "STATIC PROTECTION WRIST STRAP" ATTACHED TO THE SYSTEM, AS SHOWN BELOW (FIGURE AI-2).



X1791R

Figure AI -2 Static Protection

APPENDIX B

SYSTEM OVERVIEW

GENERAL

B1.01 The SX-100/SX-200 is an advanced electronic system employing digitally controlled solid-state, space-division switching with stored program control. The capacities of the system are follows:

- SX-100: 112 ports are available for assignment to lines, trunks and additional receivers.
- SX-200: 208 ports are available for assignment to lines, trunks and additional receivers.
- Each line requires one port, each CO trunk requires two ports and additional receivers require four ports each. E&M Tie Trunk Cards and Transformer Trunk Cards require four ports.
- The maximum possible combination of trunks and lines which can be accommodated is dependent upon the number of receivers installed and is illustrated in Figure BI-1.

Compatibility

81.02 The systems are compatible with:

- Line cards of 1A1/2 telephone key system.
- Standard Dial Pulse and DTMF telephone sets equipped with without message waiting lamps.
- Commonly used step-by-step, crossbar and electronic central office equipment.

PHYSICAL OVERVIEW

81.03 The SX-100 Cabinet (Basic Version) is of metal construction and has the following dimensions: height 422 mm (16.62 in.), width 635 mm (25 in.), and depth 470 mm (18.5 in.). The weight of a fully equipped system is approximately 31.8 kg (70 lb).

B1.04 The SX-100 Primary Power Supply is mounted to the right side of the equipment shelf (total weight 6.75 kg (15 lb)) and provides all system power from a 115 Vac, (or a 220 V adapter), 48 Hz to 64 Hz commercial supply OR from -44 to -56 Vdc supply.

81.05 The SX-200 Equipment Cabinet is of metal construction and has the following dimensions: height 965 mm (38 in.), width 600 mm (23.5 in.), and depth 700 mm (27.5 in.). The weight of a fully equipped system is approximately 131.7 kg (290 lb).

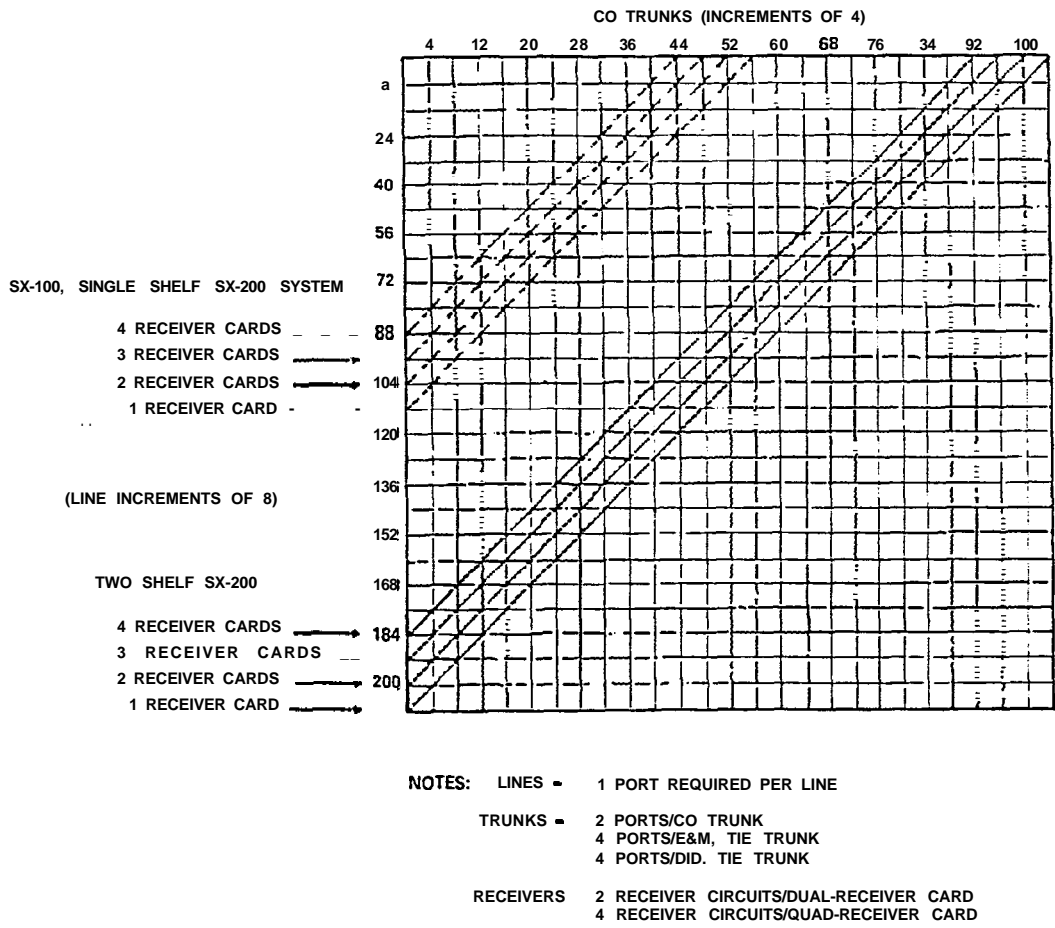
B1.06 The SX-200 Primary Power Supply is mounted directly on the cabinet back panel, (total weight 31.8 kg (70 lb)) and provides all system power from either a 115 Vac, or a 220 Vac, 44 Hz - 64 Hz commercial supply, OR a -44 to -56 Vdc supply.

81.07 The SX-100/SX-200 Equipment Shelf holds up to 22 printed circuit cards which plug into the shelf backplane. On the rear of the backplane are a number of Amphenol-type plugs providing interconnections between the shelves and external equipment. In addition to the plugs are a number of screw-down terminals, allowing shelf connections to the primary power supply unit. The equipment shelves measure 273 mm (10.75 in.) high, 480 mm (19 in.) wide, 415 mm (15.375 in.) deep and weigh approximately 12.3 kg (27 lb) fully equipped. Equipment Shelf 2 (SX-200 only) is identical in construction to Equipment Shelf 1 and holds up to 12 additional line or trunk cards.

B1.08 The Reserve Power Supply in the system provides a -48 Vdc source. The supply consists of a shelf unit containing eight Globe Gel 6200 A batteries providing -48.3 Vdc nominal at 20°C (68°F). A separate temperature-compensated charging unit maintains the correct battery voltage level. The SX-200 reserve battery power supply measures 178 mm (7 in.) high, 483 mm (19 in.) wide, 381 mm (15 in.) deep and weighs 43 kg (110 lb). The SX-100 reserve battery power supply measures 200.9 mm (8.2 in.) high, 635 mm (25 in.) wide, 40 mm (1.57 in.) deep, and weighs 125 lb. The SX-100/SX-200 charging unit measures 127 mm (5 in.) wide, 178 mm (7 in.) high, 355 mm (14 in.) deep and weighs 6.4 kg (14 lb).

B1.09 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 Figure 3-1 and are described in the following paragraphs. The overall dimensions of the console housing are 366 mm (14.40 in.) wide, 239 mm (9.40 in.) deep and 160 mm (6.30 in.) high.

81.10 Table BI-1 lists all the tables that comprise the remainder of this Appendix.



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Figure B1-1 Maximum Line and Trunk Configuration

TABLE BI-1
TABLES

Table Number	Table Name	Description
BI-2	SX-1 OO/SX-200 Electrical Characteristics	Lists general electrical characteristics of the SX- 1 OO/SX-200 system
B1-3	System Feature Limitations	Describes the SX-100/SX-200 system general limitations (i.e., number of callbacks, etc.)
B1-4	Time-Out Information	Lists the time-out information of various system features
BI-5	Dial Pulse Limits	Lists all dial pulse information
BI-6	System Tones	Lists all the system tones
BI-7	DTMF Tone Limits	Lists DTMF information
BI-8	System Power	Lists general power supply information
BI-9	Environmental Conditions	Outlines environmental conditions for the SX-1 OO/SX-200 system
BI-10	Supervisory Data	Provides general supervisory data on the system
BI-11	Electrical Characteristics SX- 1 OO/SX-200 RMAT Controller	Lists all the electrical characteristics SX-1 OO/SX-200 RMAT Controller
BI-12	Electrical Characteristics Remote Control - System (RCP) Card	Lists all the electrical characteristics of the RCP card

TABLE BI-2
SX-1 OO/SX-200 ELECTRICAL CHARACTERISTICS

SUPERSET 4 set loop limit	200 ohms
Station Loop Limit	1200 ohms including set
Maximum Number of Ringers per Line	five
Ringing:	90 Vac, 20 Hz - immediate ringing
Standard	1 s on, 3 s off
Special	0.5 s on, -0.5 s off, 0.5 s on, -2.5 s off
Ring Trip	During silent or ringing period
Dial Tone	350/440 Hz, continuous
Transfer Dial Tone	350/440 Hz, 3 bursts of 100 ms, then continuous
Busy Tone	480/620 Hz, interrupted at 60 ipm
Special Busy Tone	440 Hz interrupted at 60 ips
Standard Ringback Tone	440/480 Hz, 1 s on, 3 s off
Special Ringback Tone	440/480 Hz, 0.5 s on, 0.5 s off, 0.5 s on, 2.5 s off
Callback	six rings of standard ringing
Reorder Tone	480/620 Hz, interrupted at 120 ipm
Conference Tone	440 Hz, one burst of 1 s
Camp-On Tone	440 Hz, one or two bursts of 200 ms
Override Tone	440 Hz, one burst of 900 ms followed by a 200 ms burst every 6 s
Crosstalk	75 dB minimum
Insertion Loss:	
Station-to-Station	5 dB \pm 0.5 dB at 1004 Hz
Station-to-Trunk	0.5 dB \pm 0.3 dB at 1004 Hz
Trunk-to-Trunk	0.5 dB \pm 0.3 dB at 1004 Hz
Longitudinal Balance	54 dB minimum, 200-3000 Hz
Return Loss	14 dB minimum
Idle Circuit Noise	16 dBrnC maximum
Impulse Noise	No counts over 46 dBrnC
Envelope Delay	150 μ s maximum
System Impedance	600 ohms nominal for lines 600 or 900 ohms nominal for trunks
Traffic Capacity	7.5 ccs/line minimum at 100 lines at P = 0.01
Primary Power	100-125 V, 47-63 Hz, 4 A maximum
Central Office	
Trunk Loop Limit	1600 ohms
Maximum Distance of Console from Equipment	300 m (1000 ft) of 26 AWG cable
Operating Environment	0° C to 40° C (32° F to 104° F), 10 % to 90 % Relative Humidity
Maximum number of SUPERSET 4 sets	64

**TABLE B1-3
SYSTEM FEATURE LIMITATIONS**

Maximum number of simultaneous calls = 31.
Maximum number of speech paths used by any call = 2.
Maximum number of simultaneous consultations = 15.
Maximum number of simultaneous add-on (3-way) calls = 30.
Maximum number of simultaneous station-controlled conference calls = 30.
Maximum number of calls that can simultaneously be camped on to an extension, trunk group or hunt group = 30.
Maximum number of simultaneous callbacks that can be enabled = 32.
Maximum number of simultaneous call forwards that can be enabled = 208 (SX-200); 112 (SX-100).
Maximum number of simultaneous "dial 0" calls = 31.
Maximum number of hunting groups = 12.
Maximum number of calls that can be simultaneously connected to music on hold = 31.
Maximum number of stations in a station hunting group = 208 (SX-200); 112 (SX-100).
Maximum number of stations in a call pickup group = 208 (SX-200); 112 (SX-100).
Maximum number of dial call pickup groups = 30.
Maximum number of trunks assignable to night stations = 100 (SX-200); 52 (SX-100).
Maximum number of trunks in a trunk group = 104 (SX-200); 56 (SX-100).
Maximum number of trunk groups = 12.
Maximum number of calls that can override a given extension = 1.
Maximum number of calls that can be simultaneously parked = 31.
Maximum number of simultaneous meet-me conferences = 1.
Maximum number of simultaneous Attendant-controlled conferences = 1.
Maximum number of, calls that can be simultaneously held by one Attendant = 4.
Maximum number of simultaneous incoming calls that can be separately identified by the Attendant = 6 (Recall, Dial 0, LDN 1 through LDN 4).
Maximum number of LDNs that can be identified at the Attendant console = 4.
Maximum number of simultaneously ringing Wake-Ups = 10.
System numbering schemes may be 1-, 2-, 3- or 4-digit or a combination of 1-, 2-, 3- and 4-digit, as long as there are no conflicts in the first digits.

**TABLE B1-4
TIME-OUT INFORMATION**

Supervisor-Timed Recall (Don't Answer)	10 s, 20 s, 30 s, or 40 s
Supervisor-Timed Recall (Camp-On)	20 s, 30 s, 40 s
Supervisor-Timed Recall (Hold)	20 s, 30 s, or 40 s
Automatic Night Switching	20 s, 30 s, or 40 s
Automatic Wake-Up Ringing	six rings
Dial Tone Time-Out	15 s
Interdigit Time-Out	15 s lines, 10 s trunks, or 15 s trunks (System Option 172)
Lockout Time-Out	45 s
Callback Clear Time-Out	8 hours
Callback - Don't Answer Reset	six rings
Call Park Recall	2, 3, or 4 minutes
Call Hold Recall	2, 3, or 4 minutes
Call Forwarding - Don't Answer Time-Out	10 s, 20 s, 30 s, or 40 s
Switchhook Flash	minimum 250 ms, 700 ms, 900 ms, 1100 ms or maximum 1500 ms
Ringing Time-Out	5 minutes

**TABLE BI-5
DIAL PULSE LIMITS**

Parameter	Min.	Max.
(Accept)		
Pulse Rate (pps)	8.0	12.0
Break Duration (percent)	50.0	80.0
Break Interval (ms)	52.7	80.0
Make Interval (ms)	32.7	52.5
Interdigit Time (ms)	300.0	
(Generate)		
• Pulse Rate (pps)	9	11
• Break Interval (percent)	58	62
• Interdigit Time (ms)	800	

TABLE BI-6
SYSTEM TONES

Dial Tone	350/440 Hz, continuous, -13 dBm
Transfer Dial Tone	350/440 Hz, three bursts 100 ms off followed by continuous 350/440 Hz, -13 dBm
Busy Tone	480/620 Hz, interrupted at 60 ipm, -24 dBm
Camp-On Busy Tone	440 Hz at 60 ips, -13 dBm
Ringback Tone	440/480 Hz, 1 s on, 3 s off, -19 dBm
Reorder Tone	480/620 Hz, interrupted at 120 ipm, -24 dBm
Camp-On Tone	440 Hz, one burst of 200 ms, -16 dBm
Override Tone	440 Hz, one burst of 800 ms followed by a 200 ms burst every 6 s, -16 dBm
Supervisor Error Tone	440 Hz at 10 ips for 400 ms, -16 dBm
Conferencing Tone	440 Hz, one burst of 1 s, -16 dBm
Miscellaneous Tone	440 Hz, -16 dBm
DTMF Dialing Conditions	
• Frequency Deviation	+1 percent
• Duration	Greater than 40 ms
• Interdigit Time	Greater than 40 ms
• Level, Low Group	Greater than -10 dBm
• Level, High Group	Greater than -8 dBm
• Level, DTMF Signal	Greater than +2 dBm
• Level, Third Frequency	Less than -40 dB
• Twist	Less than 4 dB

TABLE BI-7
DTMF TONE LIMITS

Low Frequency (Hz)	High Frequency (Hz)			
	1209	1336	1477	
697	1	2	3	Frequency deviation: $\pm 1\%$ Signal interval (2 frequency): 40 ms (minimum) Per frequency, minimum level: -17 dBm on line circuit Twist, maximum (at -10 dBm): +4 to -8 dBm (High f relative to low f)
770	4	5	6	
852	7	8	9	
941	*	0	#	

- Notes: 1. Tolerance of call progress tone levels is ± 1.15 dBm.
 2. Individual tones of any compound tone are within 1 dB of each other.
 3. Tolerance of individual tones are $\pm 1\%$ of the frequency stated.

**TABLE EI-8
SYSTEM POWER**

Characteristic	sx-100	sx-200
AC Power Supplies		
Input Voltage	115 Vac or 230 Vac, -20 % to + 10 %	115 Vac or 230 Vac, -20 % to +10 %
Frequency	44 Hz to 64 Hz	44 Hz to 64 Hz
Holdover Time	Momentary interruptions in commercial power up to 250 ms duration	Momentary interruptions in commercial power up to 250 ms duration
Input Current	2.5 A maximum at 115 Vac	4 A maximum at 115 Vac
Talk Battery Noise	Does not exceed 28 dBrc	Does not exceed 28 dBrc
Reserve Battery Supply		
Voltage Range	48.3 V to 52 V	48.3 V to 52 V
Holdover Time	2 hours minimum	2 hours minimum
Battery Life Time	4 to 6 yrs	4 to 6 yrs
RAM/COS Battery Pack		
Holdover Time	4 weeks	4 weeks
Battery Life Time	4 years	4 years
Ringing Supply		
Output Voltage	90 Vac \pm 10 %	90 Vac \pm 10 %
Frequency	20 Hz \pm 1 Hz	20 Hz \pm 1 Hz

**TABLE BI-9
ENVIRONMENTAL CONDITIONS**

Storage Conditions	
• Temperature Range:	-50°C to + 71°C (-58°F to 160°F)
• Relative Humidity:	Up to 100 % RH at 18°C (64°F) (i.e., 15 mm Hg water vapour pressure)
• Shock:	Up to 750 mm (30 inch) drop
• Low Pressure:	87 mm Hg (50,000 feet)
• Temperature Shock:	-50°C to + 25°C (-58°F to 77°F) in 5 minutes
Environmental Conditions	
• Acoustic Noise:	The systems do not radiate acoustic noise greater than 45 dB SPL, "A" Weighted, measured 1200 mm (47.2 in.) from the center of the cabinet.
• Vibration:	The systems operate satisfactorily when subjected to a continuous vibration of 5-200 Hz with an acceleration of 0.5 g.
• Electrostatic Discharge:	<p>The systems meet the following electrostatic discharge test. With the common equipment grounded, a voltage of 75 kV placed to various parts of the equipment such as faceplates, switches, etc., has no noticeable effect on the operation of the system. With all the exposed metal of the peripheral equipment grounded, a voltage of 15 kV applied to various parts of the peripheral equipment, has no noticeable effect on the operation of the system.</p> <p>Note: The high voltage DC is derived from an induction type generator with an output capacity of 250 pF and a series resistance of 3.9 ohms.</p>
• Electromagnetic Susceptibility:	The systems are able to work in an electric field of 5 V/m without major degradation of service.

Note: For the SUPERSET 4 set, see Appendix H.

TABLE BI-10
SUPERVISORY DATA

- The system responds to hookswitch flashes with a duration of between 200 ms and a programmable maximum time (0.7, 0.9, 1.1 or 1.5 s) in order to activate the Transfer/Consultation Hold/Add-On features.
- An open tip lead condition of 500 ms (optional 50 ms) or more on a CO trunk will release the system connection.
- Momentary open loop conditions of up to 350 ms (optional 40 ms) generated by the Central Office on outgoing system calls, will not release system calls.
- System station hookswitch flashes will not be repeated towards the Central Office.
- System station on-hook conditions will release a trunk connection after the selected flash time.
- Station Loop. The station loop range, including the station apparatus can be up to a maximum of 1200 ohms.
- The SUPERSET 4 set loop limit = 200 ohms.
- Supervisor Console Range. The Supervisor console can be remotely connected from the cabinet..up to a maximum of 300 m (1000 ft) with 26 AWG cable.
- CO Trunk Group. The system will operate with CO trunks up to a maximum of 1600 ohms loop resistance.
- CO Trunk Seizure. The system nominal seizure resistance is 270 ohms at 30 mA.
- CO Trunk Resistance. In the idle state, the resistance towards the system from the trunk circuit is 20 kohms tip to ground and 20 kohms ring to ground for ground starts, and not less than 10 Mohms for loop start trunks.
- Tie Trunk Resistance. The maximum resistance towards the tie trunk is:
 - 2 kohms for Loop
 - 3 kohms for E&M.

TABLE BI-11
ELECTRICAL CHARACTERISTICS
SX-1 OO/SX-200 RMATS CONTROLLER

Modem Signaling Parameters:	
Operation Mode	Full or half duplex over 2-wire public switched network, originate mode
Data Rate	300 baud asynchronous
Transmit Tones	Mark 1270 Hz; Space 1070 Hz
Transmit Levels	Nominal - 10 dBm with automatic gain to -3 dBm, 0 dBm, or +0.4 dBm for loop attenuation compensation
Receive Tones	Mark 2225 Hz; Space 2025 Hz
Receive Sensitivity	-4 to -45 dBm
Line Interface:	CO Trunk, loop/ground start (rotary dial or DTMF signaling) (see Note)
Primary Power Supply:	
SX-100 Cabinet	90 to 125 Vac (optionally 200 to 250 Vac); 44 to 64 Hz; 2 A
SX-200 Cabinet	90 to 125 Vac or 185 to 250 Vac; 44 to 64 Hz, 4 A

Note: See Section MITL9105/91 10-096-210-NA for CO Trunk Card full capabilities.

TABLE B1-12
ELECTRICAL CHARACTERISTICS
REMOTE CONTROL-SYSTEM (RCP) CARD

Modem Signaling Parameters:

Operation Mode	Full or half duplex over 2-wire public switched network with automatic answer feature
Data Rate	300 baud asynchronous
Transmit Tones	Mark 2225 Hz; Space 2025 Hz
Transmit Level	Nominal -10 dBm with automatic gain to -3 dBm, 0 dBm or + 0.4 dBm for loop attenuation compensation
Receive Tones	Mark 1270 Hz; Space 1070 Hz
Receive Sensitivity	-4 to -45 dBm

Line Interface Parameters:

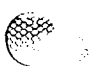
On-hook DC Resistance	Minimum 10 meg ohms
On-hook Impedance	10 kohms in series with 1 μ F
Ringing	Minimum 30 Vrms at 20 Hz
Off-hook DC Resistance	260 ohms at 20 mA (line reversal ignored)
Off-hook Impedance	600 ohms in series with 2 μ F
Return Loss	Minimum 14 dB at 200 Hz 25 dB at 1 kHz 35 dB at 3 kHz
Common Mode Rejection	60 Vrms maximum at 60 Hz
Longitudinal Balance	Minimum 63 dB at 1 kHz 56 dB at 13 kHz
Transient Protection	Withstands 1000 V or 10/1000 μ s and 22 ohms source resistance between Tip and ground or Ring and ground

Power Supply and Digital Interface Parameters:

Compatible with Console Control Card
(MITEL PN91 10-006-000-NA)



4
6



APPENDIX C

SYSTEM CABLING

Cabling and Cross-Connections

General

CI.01 This Appendix details the cabling and cross-connections required when installing the SX-100/SX-200 system.

Telephone Set and Trunk Cabling

CI.02 Telephone set and trunk cabling terminates on the building cross-connection terminal in the normal manner. The cabling requirements and limits for stations and consoles are shown in Figure CI-1(a) and (b).

Cable Terminations, SX-100

CI.03 All interconnecting cables must be terminated in accordance with Tables CI-1, CI-2 and Figure CI-2.

Cable Terminations, SX-200

CI.04 All interconnecting cables must be terminated in accordance with Figure CI-3 and Tables CI-1, CI-2, CI-3 and CI-4. In addition, if Shelf 2 is installed, the interconnecting cables listed in Table CI-4 must be terminated.

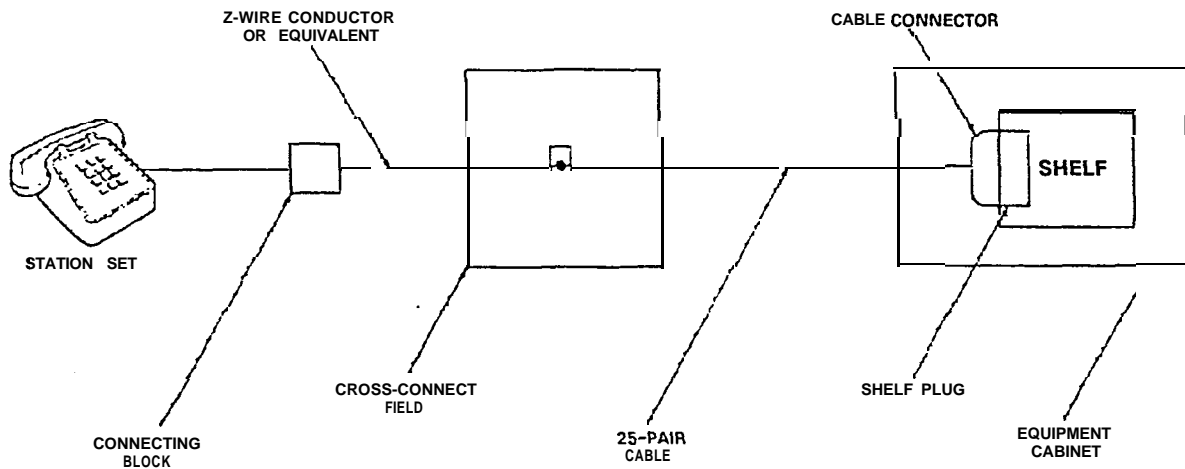
Cross-Connections

CI.05 Jumpers should be run using Z-type 24 AWG cross-connecting cables or equivalent.

CI.06 Connection between the equipment cabinet, cross-connect field, stations, trunks and consoles should be made using 26 AWG connector-ended cable in accordance with Tables CI-1 through CI-4.

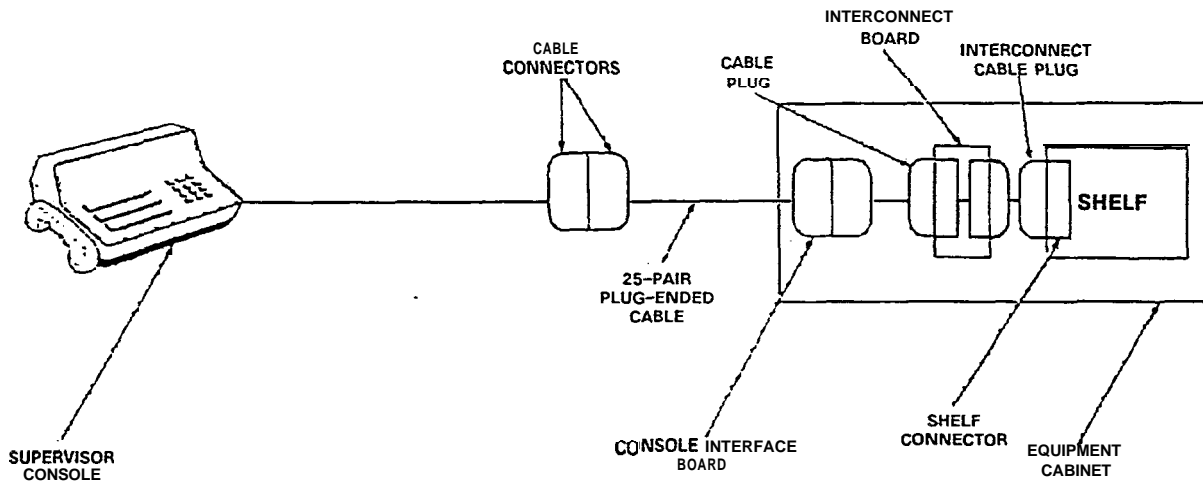
CI.07 Cabling connections between Shelf 1, the interconnect board and cross-connect field are shown in Figures CI-3 and CI-7.

CI.08 Figures CI-4 and CI-5 illustrate typical block and -wiring diagrams for a power fail transfer circuit. Figure CI-6 illustrates typical night bell wiring connections and Figure CI-7 shows the connections for music and PA requirements.



NOTE: STATION LOOP LIMIT 1200 ohms (INCLUDING STATION SET): SUPERSET 4 LOOP LIMIT = 200 OHMS

(A) STATION CABLING & LIMITS



NOTE: CABLING LIMIT 205 m (1000 ft) - 26 AWG MINIMUM
CABLE CONSOLE TO EQUIPMENT CABINET.

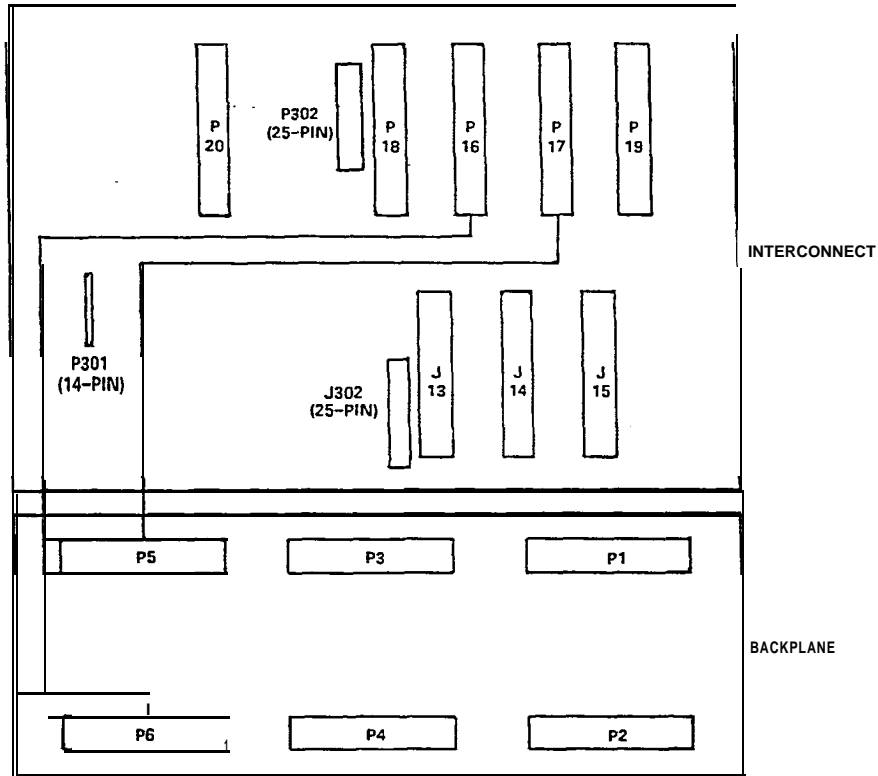
(B) SUPERVISOR CONSOLE CABLING & LIMITS

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Figure CI-I Station and Console Cabling Requirements

CI.09 When backplane translator boards are used with the lines ar trunk circuits, different terminal connections result. In this cas the cabling arrangements must conform to the termination conne tions shown in Figure CI-8 and Table CI-6 of this Appendix.

CI.10 Figures C1-9, CI-10 and CI-11 are in-depth wiring explan tions. These figures outline the card position in relation to specific Amphenol-type connector to the cross-connect frame.



BOARD	CONNECTOR NO.	DESTINATION	BOARD	CONNECTOR NO.	DESTINATION
SHELF BACKPLANE	P1	X = CONNECT	INTERCONNECT	J13	MAINTENANCE CONSOLE SUPERVISOR
	P2	X = CONNECT		J14	CONSOLE 2 SUPERVISOR
	P3	X = CONNECT		J15	CONSOLE 1
	P4	X = CONNECT		P16	P6
	P5	P17		P5	X = CONNECT
	P6	P16		P18	X = CONNECT
NOTE: AU PLUGS AND CONNECTORS MCEPT AS NOTED ARE STANDARD 25-PAIR (AMPHENOL-TYPE). THE MALE AND FEMALE DESIGNATORS REFER TO THE CONNECTORS MOUNTED ON THE EQUIPMENT, NOT TO THE CABLE CONNECTORS.				P19	X = CONNECT
				P20	X = CONNECT
				J302	TO MODEM
				J301	LOCAL TERMINAL
				P301	MAINTENANCE PANEL

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Figure CI -2 SX-100 Connector Locations

TABLE CI-I
SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					CD	DID/TIE	E & M*	
PLUG P1 (Connects to Cross-Connect Field)								
26 1	W-BL BL-W	001	T1 reserved for R1 test line	002**	T1 R1	T1 R1	T1 R1	
27 2	W-O O-W	002	T2 R2		XT2 XT1		TR1 RR1	1
28 3	W-G G-W	003	T3 R3	004	T2 R2		EI MI	
29 4	W-BR BR-W	004	T4 R4					
30 5	W-S S-W	009	T1 R1	010**	T1 R1	T1 R1	T1 R1	
31 6	R-BL BL-R	010	T2 R2		XT2 XT1		TR1 RR1	2
32 7	R-O O-R	011	T3 R3	012	T2 R2		E1 M1	
33 8	R-G G-R	012	T4 R4					
34 9	R-BR BR-R	017	T1 R1	018**	T1 R1	T1 R1	T1 R1	
35 10	R-S S-R	018	T2 R2		XT2 XT1		TR1 RR1	
36 11	BK-BL BL-BK	019	T3 R3	020	T2 R2		E1 M1	3
37 12	BK-O O-BK	020	T4 R4					
38 13	BK-G G-BK	025	T1 R1	026**	T1 R1	T1 R1	T1 R1	
39 14	BK-BR BR-BK	026	T2 R2		XT2 XT1		TR1 RR1	
40 15	BK-S S-BK	027	T3 R3	028	T2 R2		E1 M1	4
41 16	Y-BL BL-Y	028	T4 R4					
42 17	Y-O O-Y	033	T1 R1	034**	T1 R1	T1 R1	T1 R1	
43 18	Y-G G-Y	034	T2 R2		XT2 XT1		TR1 RR1	
44 19	Y-BR BR-Y	035	T3 R3	036	T2 R2		E1 M1	5
45 20	Y-S S-Y	036	T4 R4					
46 21	V-BL BL-V	041	T1 R1	042**	T1 R1	T1 R1	T1 R1	
47 22	o-v v-o	042	T2 R2		XT2 XT1		TR1 RR1	
48 23	V-G G-V	043	T3 R3	044	T2 R2		E1 M1	6
49 24	V-BR BR-V	044	T4 R4					
50 25	v-s s-v		SPARE SPARE		SPARE SPARE			

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

** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-I (CONT'D)
SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					co	DID/TIE	E&M*	
PLUG P2 (Connects to Cross-Connect Field)								
26 1	W-BL BL-W	005	T5 R5	006**	T3 R3	T2 R2	T2 R2	
27 2	W-O O-W	006	T6 R6		XT4 XT3		TR2 RR2	1
28 3	W-G G-W	007	T7 R7	008	T4 R4		E2 M2	
29 4	W-BR BR-W	008	T8 R8					
30 5	W-S S-W	013	T5 R5	014**	T3 R3	T2 R2	T2 R2	
31 6	R-BL BL-R	014	T6 R6		XT4 XT3		TR2 RR2	2
32 7	R-O O-R	015	T7 R7	016	T4 R4		E2 M2	
33 8	R-G G-R	016	T8 R8					
34 9	R-BR BR-R	021	T5 R5	022**	T3 R3	T2 R2	T2 R2	
35 10	R-S S-R	022	T6 R6		XT4 XT3		TR2 RR2	
36 11	BK-BL BL-BK	023	T7 R7	024	T4 R4		E2 M2	3
37 12	BK-O O-BK	024	T8 R8					
38 13	BK-G G-BK	029	T5 R5	030**	T3 R3	T2 R2	T2 R2	
39 14	BK-BR BR-BK	030	T6 R6		XT4 XT3		TR2 RR2	
40 15	BK-S S-BK	031	T7 R7	032	T4 R4		E2 M2	4
41 16	Y-BL BL-Y	032	T8 R8					
42 17	Y-O O-Y	037	T5 R5	038**	T3 R3	T2 R2	T2 R2	
43 18	Y-G G-Y	038	T6 R6		XT4 XT3		TR2 RR2	
44 19	Y-BR BR-Y	039	T7 R7	040	T4 R4		E2 M2	5
45 20	Y-S S-Y	040	T8 R8					
46 21	V-BL BL-V	045	T5 R5	046**	T3 R3	T2 R2	T2 R2	
47 22	V-O O-V	046	T6 R6		XT4 XT3		TR2 RR2	
48 2 3	V-G G-V	047	T7 R7	048	T4 R4		E2 M2	6
49 2 4	V-BR BR-V	048	T8 R8					
50 25	V-S S-V		SPARE SPARE		SPARE SPARE			

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

** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-I (CONT'D)
SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					co	DID/TIE	E & M *	
PLUG P3 (Connects to Cross-Connect Field)								
26 1	W-BL BL-W	049	T1 R1	050**	T1 R1	T1 R1	T1 R1	
27 2	W-O O-W	050	T2 R2		XT2 XT1		TR1 RR1	7
28 3	W-G G-W	051	T3 R3	052	T2 R2		E1 M1	
29 4	W-BR BR-W	052	T4 R4					
30 5	W-S S-W	057	T1 R1	058**	T1 R1	T1 R1	T1 R1	
31 6	R-BL BL-R	058	T2 R2		XT2 XT1		TR1 RR1	8
32 7	R-O O-R	058	T3 R3	060	T2 R2		E1 M1	
33 8	R-G G-R	060	T4 R4					
34 9	R-BR BR-R	065	T1 R1	066**	T1 R1	T1 R1	T1 R1	
35 10	R-S S-R	066	T2 R2		XT2 XT1		TR1 RR1	
36 11	BK-BL BL-BK	067	T3 R3	068	T2 R2		E1 M1	9
37 12	BK-O O-BK	068	T4 R4					
38 13	BK-G G-BK	073	T1 R1	074**	T1 R1	T1 R1	T1 R1	
39 14	BK-BR BR-BK	074	T2 R2		XT2 XT1		TR1 RR1	
40 15	BK-S S-BK	075	T3 R3	076	T2 R2		E1 M1	10
41 16	Y-BL BL-Y	076	T4 R4					
42 17	Y-O O-Y	081	T1 R1	082**	T1 R1	T1 R1	T1 R1	
43 18	Y-G G-Y	082	T2 R2		XT2 XT1		TR1 RR1	
44 19	Y-BR BR-Y	083	T3 R3	084	T2 R2		E1 M1	11
45 20	Y-S S-Y	084	T4 R4					
46 21	W-BL BL-W	089	R1	090**	R1	R1	R1	
47 22	v-o o-v	090	T2 R2		XT2 XT1		TR1 RR1	
48 23	V-G G-V	091	T3 R3	092	T2 R2		E1 M1	12 See Note
49 24	V-BR BR-V	092	T4 R4					
50 25	v-s s-v		SPARE SPARE		SPARE SPARE			

Note: Position 12 can be used for lines, trunks, or receiver #4 card.
 * For 2-Wire E&M Trunk operation DO NOT connect RR and TR leads.
 ** Trunk Equipment Number 2 for Trunk Card only.

**TABLE CI-I (CONT'D)
SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS**

Pin	Pair Color	Equipment Numbers Lines	Trunks	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					CO	DID/TIE	E&M*	
PLUG P4 (Connects to Cross-Connect Field)								
26 1	W-BL BL-W	053	T5 R5	054**	T3 R3	T2 R2	T2 R2	
27 2	W-O O-W	054	T6 R6		XT4 XT3		TR2 RR2	7
28 3	W-G G-W	055	T7 R7	056	T4 R4		E2 M2	
29 4	W-BR BR-W	056	T8 R8					
30 5	W-S S-W	061	T5 R5	062**	T3 R3	T2 R2	T2 R2	
31 6	R-BL BL-R	062	T6 R6		XT4 XT3		TR2 RR2	8
32 7	R-O O-R	063	T7 R7	064	T4 R4		E2 M2	
33 8	R-G G-R	064	T8 R8					
34 9	R-BR BR-R	069	T5 R5	070**	T3 R3	T2 R2	T2 R2	
35 10	R-S S-R	070	T6 R6		XT4 XT3		TR2 RR2	
36 11	BK-BL BL-BK	071	T7 R7	072	T4 R4		E2 M2	9
37 12	BK-O O-BK	072	T8 R8					
38 13	BK-G G-BK	077	T5 R5	078**	T3 R3	T2 R2	T2 R2	
39 14	BK-BR BR-BK	078	T6 R6		XT4 XT3		TR2 RR2	
40 15	BK-S S-BK	079	T7 R7	080	T4 R4		E2 M2	10
41 16	Y-BL BL-Y	080	T8 R8					
42 17	Y-O O-Y	085	T5 R5	086**	T3 R3	T2 R2	T2 R2	
43 18	Y-G G-Y	086	T6 R6		XT4 XT3		TR2 RR2	
44 19	Y-BR BR-Y	087	T7 R7	088	T4 R4		E2 M2	11
45 20	Y-S S-Y	088	T8 R8					
46 21	V-BL BL-V	093	T5 R5	094**	T3 R3	T2 R2	T2 R2	
47 22	V-O O-V	094	T6 R6		XT4 XT3		TR2 RR2	
48 23	V-G G-V	095	T7 R7	096	T4 R4		E2 M2	12 See Note
49 24	V-BR BR-V	096	T8 R8					
50 25	V-S S-V		SPARE SPARE		SPARE SPARE			

Note: Position 12 can be used for lines, trunks or receiver card #4.
 * For 2-Wire E&M Trunk operation DO NOT connect RR and TR leads.
 ** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-I (CONT'D)
SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					CD	DID/TIE	E & M *	
PLUG P5 (Connects to Plug P17)								
26 1	W-BL BL-W	097	T1 R1	098**	T1 R1	T1 R1	R1	
27 2	W-O O-W	098	T2 R2		XT2 XT1		TR1 RR1	
28 3	W-G G-W	099	T3 R3	100	T2 R2		E1 M1	13 See Note
29 4	W-BR BR-W	100	T4 R4					
30 5	W-S S-W	105	T1 R1	106**	T1 R1	T1 R1	T1 R1	
31 6	R-BL BL-R	106	T2 R2		XT2 XT1		TR1 RR1	
32 7	R-O O-R	107	T3 R3	108	T2 R2		E1 M1	14 See Note
33 8	R-G G-R	108	T4 R4					
34 9	R-BR BR-R							
35 10	R-S S-R		RECEIVER No. 1					15
36 11	BK-BL BL-BK							
37 12	BK-O O-BK							
38 13	BK-G G-BK		T (A) R (A)					
39 14	BK-BR BR-BK		S DATA IN T (A) S DATA IN R (A)		SUPERVISOR CONSOLE No. 2			16
40 15	BK-S S-BK		S DATA OUT T (A) S DATA OUT R (A)					
41 16	Y-BL BL-Y		PA2 Control B PA2 Control A					
42 17	Y-O O-Y		T (A) R (A)					
43 18	Y-G G-Y		S DATA IN T (A) S DATA IN R (A)		SUPERVISOR CONSOLE No. 1			17
44 19	Y-BR BR-Y		S DATA OUT T (A) S DATA OUT R (A)					
45 20	Y-S S-Y		PA1 Control B PA1 Control A					
46 21	V-BL BL-V		MUSIC IN B MUSIC IN A		MUSIC ON HOLD			
47 22	V-O O-V		TEST LINE TEST LINE					18
48 23	V-G G-V		PA1 OUT B PA1 OUT A					
49 24	V-BR BR-V		PA2 OUT B PA2 OUT A					
50 25	V-S S-V		SPARE SPARE		SPARE SPARE			

Note: Positions 14 and 13 can be used for lines or trunks, or for receiver cards #2 and #3, respectively.
* For 2-Wire E&M Trunk operation DO NOT connect RR and TR leads.
** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-I (CONT'D)
SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation. Trunks			Card Positions
					CO	DID/TIE	E&M*	
PLUG P6 (Connects to Plug P16)								
26 1	W-BL BL-W	101	T5 R5	102**	T1 R1	T1 R1	T1 R1	
27 2	w - o o - w	102	T6 R6 Lines		XT2 XT1		TR1 RR1	13 See Note
28 3	W-G G-W	103	T7 R7	108	T2 R2		E1 M1	
29 4	W-BR BR-W	104	T8 R8					
30 5	w - s s - w	109	T5 R5	110**	T1 R1	T1 R1	T1 R1	
31 6	R-BL BL-R	110	T6 R6 Lines		XT2 XT1		TR1 RR1	14 See Note
32 7	R-O O-R	111	T7 R7	112	T2 R2		E1 M1	
33 8	R-G G-R	112	TB R8					
34 9	R-BR BR-R							
35 10	R-S S-R		RECEIVER No. 1					15
36 11	BK-BL BL-BK							
37 12	BK-O O-BK							
38 13	BK-G G-BK		T (A) R (A)					
39 14	BK-BR BR-BK		S DATA OUT T (B) S DATA OUT R (B)		SUPERVISOR CONSOLE SPARE			
40 15	BK-S S-BK		S DATA IN T (B) S DATA IN R (B)		NOT USED			16
41 16	Y-BL BL-Y		R (K1) K1		NIGHT BELL 1			
42 17	Y-O O-Y		T (A) R (A)					
43 18	Y-G G-Y		S DATA OUT T (B) S DATA OUT R (B)		MAINTENANCE CONSOLE			17
44 19	Y-BR BR-Y		S DATA IN T (B) S DATA IN R (A)(B)					
45 20	Y-S S-Y		UART IN UART OUT					
46 21	V-BL BL-V		R (K5) K5		NIGHT BELL 1			
47 22	v - o o - v		R (K4) K4		NIGHT SERVICE			18
48 23	V-G G-V		R (K3) K3		NIGHT BELL 3			
49 24	V-BR BR-V		R (K2) K2		NIGHT BELL 2			
50 25	v - s s - v		SPARE SPARE		SPARE SPARE			

Note: Positions 14 and 13 can be used for lines or trunks, or for receiver cards #2 and #3, respectively.

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

** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-2
INTERCONNECT BOARD PLUG AND JACK CONNECTIONS

Pin	Pair Color	Lead Designation
CONNECTOR J13 MAINTENANCE CONSOLE (Connected To Maintenance Panel)		
26	W-EL	ELECTROSTATIC GROUND
1	BL-w	ELECTROSTATIC GROUND
27	w-o	ELECTROSTATIC GROUND
2	o-w	ELECTROSTATIC GROUND
28	W-G	ELECTROSTATIC GROUND
3	G-W	ELECTROSTATIC GROUND
29	W-BR	ELECTROSTATIC GROUND
4	BR-W	ELECTROSTATIC GROUND
30	w-s	DATA IN COMMON
5	s-w	DATA IN
31	R-BL	ELECTROSTATIC GROUND
6	BL-R	ELECTROSTATIC GROUND
32	R-O	DATA OUT COMMON
7	O-R	DATA OUT
33	R-G	ELECTROSTATIC GROUND
8	G-R	ELECTROSTATIC GROUND
9	R-BR	ELECTROSTATIC GROUND
35	BR-R	ELECTROSTATIC GROUND
	R-S	CUTOVER SWB
10	S-R	CUTOVER SWA
36	BK-BL	ELECTROSTATIC GROUND
11	EL-BK	ELECTROSTATIC GROUND
37	BK-O	MAJOR ALARM
12	O-BK	MAJOR ALARM
38	BK-G	TIP
13	G-BK	RING
39	BK-BR	ELECTROSTATIC GROUND
14	BR-BK	ELECTROSTATIC GROUND
40	BK-S	ELECTROSTATIC GROUND
15	S-BK	ELECTROSTATIC GROUND
41	Y-BL	ELECTROSTATIC GROUND
16	BL-Y	ELECTROSTATIC GROUND
42	Y-O	ELECTROSTATIC GROUND
17	O-Y	ELECTROSTATIC GROUND
43	Y-G	o v
18	G-Y	-48 Vdc
44	Y-BR	o v
19	BR-Y	-48 Vdc
45	Y-S	o v
20	S-Y	-48 Vdc
46	V-BL	o v
21	BL-V	-48 Vdc
47	v-o	o v
22	o-v	-48 Vdc
48	V-G	o v
23	G-V	-48 Vdc
49	V-BR	o v
24	BR-V	-48 Vdc
50	v-s	o v
25	s-v	-48 Vdc

Pin	Pair Color	Lead Designation
CONNECTOR J14 SUPERVISOR CONSOLE NO. 2		
26	W-BL	ELECTROSTATIC GROUND
1	EL-W	ELECTROSTATIC GROUND
27	w-o	ELECTROSTATIC GROUND
2	o-w	ELECTROSTATIC GROUND
28	W-G	ELECTROSTATIC GROUND
3	G-W	ELECTROSTATIC GROUND
29	W-BR	ELECTROSTATIC GROUND
4	BR-W	ELECTROSTATIC GROUND
30	w-s	DATA IN COMMON
5	s-w	DATA IN
31	R-BL	ELECTROSTATIC GROUND
6	BL-R	ELECTROSTATIC GROUND
32	R-O	DATA OUT COMMON
7	O-R	DATA OUT
33	R-G	ELECTROSTATIC GROUND
8	G-R	ELECTROSTATIC GROUND
34	R-BR	ELECTROSTATIC GROUND
9	BR-R	ELECTROSTATIC GROUND
35	R-S	CUTOVER SWB
10	S-R	CUTOVER SWA
36	BK-BL	ELECTROSTATIC GROUND
11	BL-BK	ELECTROSTATIC GROUND
37	BK-O	MAJOR ALARM
12	O-BK	MAJOR ALARM
38	BK-G	TIP
13	G-BK	RING
39	BK-BR	ELECTROSTATIC GROUND
14	BR-BK	ELECTROSTATIC GROUND
40	BK-S	ELECTROSTATIC GROUND
15	S-BK	ELECTROSTATIC GROUND
41	Y-BL	ELECTROSTATIC GROUND
16	BL-Y	ELECTROSTATIC GROUND
42	Y-O	ELECTROSTATIC GROUND
17	O-Y	ELECTROSTATIC GROUND
43	Y-G	o v
18	G-Y	-48 Vdc
44	Y-BR	o v
19	BR-Y	-48 Vdc
45	Y-S	o v
20	S-Y	-48 Vdc
46	V-BL	o v
21	BL-V	-48 Vdc
47	v-o	o v
22	o-v	-48 Vdc
48	V-G	o v
23	G-V	-48 Vdc
49	V-BR	o v
24	BR-V	-48 Vdc
50	v-s	o v
25	s-v	-48 Vdc

TABLE CI-2 (CONT'D)
INTERCONNECT BOARD PLUG AND JACK CONNECTIONS

Pin	Pair Color	Lead Designation
CONNECTOR J15 SUPERVISOR CONSOLE NO. 1		
26	W-BL	ELECTROSTATIC GROUND
1	BL-W	ELECTROSTATIC GROUND
27	w - o	ELECTROSTATIC GROUND
2	o - w	ELECTROSTATIC GROUND
28	W-G	ELECTROSTATIC GROUND
3	G-W	ELECTROSTATIC GROUND
29	W-BR	ELECTROSTATIC GROUND
4	BR-W	ELECTROSTATIC GROUND
30	w - s	DATA IN COMMON
5	s - w	DATA IN
31	R-BL	ELECTROSTATIC GROUND
6	BL-R	ELECTROSTATIC GROUND
32	R-O	DATA OUT COMMON
7	O-R	DATA OUT
33	R-G	ELECTROSTATIC GROUND
a	G-R	ELECTROSTATIC GROUND
34	R-BR	ELECTROSTATIC GROUND
9	BR-R	ELECTROSTATIC GROUND
35	R-S	CUTOVER SWB
10	S-R	CUTOVER SWA
36	BK-BL	ELECTROSTATIC GROUND
11	BL-BK	ELECTROSTATIC GROUND
37	BK-O	MAJOR ALARM
12	O-BK	"MAJOR ALARM
38	BK-G	TIP
13	G-BK	RING
39	BK-BR	ELECTROSTATIC GROUND
14	BR-BK	ELECTROSTATIC GROUND
40	BK-S	ELECTROSTATIC GROUND
15	S-BK	ELECTROSTATIC GROUND
41	Y-BL	ELECTROSTATIC GROUND
16	BL-Y	ELECTROSTATIC GROUND
42	Y-O	ELECTROSTATIC GROUND
17	O-Y	ELECTROSTATIC GROUND
43	Y-G	o v
18	G-Y	-48 Vdc
44	Y-BR	o v
19	BR-Y	-48 Vdc
45	Y-S	o v
20	S-Y	-48 Vdc
46	V-BL	o v
21	BL-V	-48 Vdc
47	v - o	o v
22	o - v	-48 Vdc
48	V-G	o v
23	G-V	-48 Vdc
49	V-BR	o v
24	BR-V	-48 Vdc
50	v - s	o v
25	S-V	-48 Vdc

TABLE CI-2 (CONT'D)
SHELF 2 (SX-200 ONLY) EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Trunks	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					CO	DID/TIE	E&M*	
PLUG P7 (Connects to Cross-Connect Field)								
26 1	W-BL BL-W	161	T1 R1	162**	T1 R1	T1 R1	T1 R1	
27 2	W-O O-W	162	T2 R2		XT2 XT1		TR1 RR1	1
28 3	W-G G-W	163	T3 R3	164	T2 R2		E1 M1	
29 4	W-BR BR-W	164	T4 R4					
30 5	W-S S-W	169	T1 R1	170**	T1 R1	T1 R1	T1 R1	
31 6	R-BL BL-R	170	T2 R2		XT2 XT1		TR1 RR1	2
32 7	R-O O-R	171	T3 R3	172	T2 R2		E1 M1	
33 8	R-G G-R	172	T4 R4					
34 9	R-BR BR-R	177	T1 R1	178**	T1 R1	T1 R1	T1 R1	
35 10	R-S S-R	178	T2 R2		XT2 XT1		TR1 RR1	
36 11	BK-BL BL-BK	179	T3 R3	180	T2 R2		E1 M1	3
37 12	BK-O O-BK	180	T4 R4					
38 13	BK-G G-BK	185	T1 R1	186**	T1 R1	T1 R1	T1 R1	
39 14	BK-BR BR-BK	186	T2 R2		XT2 XT1		TR1 RR1	
40 15	BK-S S-BK	187	T3 R3	188	T2 R2		E1 M1	4
41 16	Y-BL BL-Y	188	T4 R4					
42 17	Y-O O-Y	193	T1 R1	194**	T1 R1	T1 R1	T1 R1	
43 18	Y-G G-Y	194	T2 R2		XT2 XT1		TR1 RR1	
44 19	Y-BR BR-Y	195	T3 R3	196	T2 R2		E1 M1	5
45 20	Y-S S-Y	196	T4 R4					
46 21	V-BL BL-V	201	T1 R1	202**	T1 R1	T1 R1	T1 R1	
47 22	V-O O-V	202	T2 R2		XT2 XT1		TR1 RR1	
48 23	V-G G-V	203	T3 R3	204	T2 R2		E1 M1	6
49 24	V-BR BR-V	204	T4 R4					
50 25	V-S S-V		SPARE SPARE		SPARE SPARE			

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

** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-2 (CONT'D)
SHELF 2 (SX-200 ONLY) EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					CD	DID/TIE	E&M*	
PLUG P8 (Connects to Cross-Connect Field)								
26 1	W-BL BL-W	165	T5 R5	166**	T3 R3	T2 R2	T2 R2	
27 2	W-O O-W	166	T6 R6		XT4 XT3		TR2 RR2	1
28 3	W-G G-W	167	T7 R7	168	T4 R4		E2 M2	
29 4	W-BR BR-W	168	T8 R8					
30 5	W-S S-W	173	T5 R5	174**	T3 R3	T2 R2	T2 R2	
31 6	R-BL BL-R	174	T6 R6		XT4 XT3		TR2 RR2	2
32 7	R-O O-R	175	T7 R7	176	T4 R4		E2 M2	
33 8	R-G G-R	176	T8 R8					
34 9	R-BR BR-R	181	T5 R5	182**	T3 R3	T2 R2	T2 R2	
35 10	R-S S-R	182	T6 R6		XT4 XT3		TR2 RR2	
36 11	BK-BL BL-BK	183	T7 R7	184	T4 R4		E2 M2	3
37 12	BK-O O-BK	184	T8 R8					
38 13	BK-G G-BK	189	T5 R5	190**	T3 R3	T2 R2	T2 R2	
39 14	BK-BR BR-BK	190	T6 R6		XT4 XT3		TR2 RR2	
40 15	BK-S S-BK	191	T7 R7	192	T4 R4		E2 M2	4
41 16	Y-BL BL-Y	192	T8 R8					
42 17	Y-O O-Y	197	T5 R5	198**	T3 R3	T2 R2	T2 R2	
43 18	Y-G G-Y	198	T6 R6		XT4 XT3		TR2 RR2	
44 19	Y-BR BR-Y	199	T7 R7	200	T4 R4		E2 M2	5
45 20	Y-S S-Y	200	T8 R8					
46 21	V-BL BL-V	205	T5 R5	206**	T3 R3	T2 R2	T2 R2	
47 22	V-O O-V	206	T6 R6		XT4 XT3		TR2 RR2	
48 23	V-G G-V	207	T7 R7	208	T4 R4		E2 M2	6
49 24	V-BR BR-V	208	T8 R8					
50 25	v-s s-v		SPARE SPARE		SPARE SPARE			

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

** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-2 (CONT'D)
SHELF 2 (SX -200 ONLY) EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					CO	DID/TIE	E&M*	
PLUG P9 (Connects to Cross-Connect Field)								
26	W-BL BL-W	209	T1 R1	210**	T1 R1	T1 R1	T1 R1	
27	w - o o - w	210	T2 R2		XT2 XT1		TR1 RR1	7
28	W-G G-W	211	T3 R3	212	T2 R2		E1 M1	
29	W-BR BR-W	212	T4 R4					
30	W-S s - w	217	T1	218**	T1 R1	T1 R1	T1 R1	
31	R-BL BL-R	218	-- R2		XT2 XT1		TR1 RR1	8
32	R-O O-R	219	T3 R3	220	T2 R2		E1 M1	
31	R-G G-R	220	T4 R4					
34	R-BR BR-R	225	T1 R1	226**	T1 R1	T1 R1	T1 R1	
35	R-S S-R	226	T2 R2		XT2 XT1		TR1 RR1	
36	BK-BL BL-BK	227	T3 R3	228	T2 R2		E1 M1	9
37	BK-O O-BK	228	T4 R4					
38	BK-G G-BK	233	T1 R1	234**	T1 R1	T1 R1	T1 R1	
39	BK-BR BR-BK	234	T2 R2		XT2 XT1		TR1 RR1	
40	BK-S S-BK	235	T3 R3	236	T2 R2		E1 M1	10
41	Y-BL BL-Y	236	T4 R4					
42	Y-O O-Y	241	T1 R1	242**	T1 R1	T1 R1	T1 R1	
43	Y-G G-Y	242	T2 R2		XT2 XT1		TR1 RR1	
44	Y-BR BR-Y	243	T3 R3	244	T2 R2		E1 M1	11
45	Y-S S-Y	244	T4 R4					
46	v-BL BL-V	249	T1 R1	250**	T1 R1	T1 R1	T1 R1	
47	v - o o - v	250	T2 R2		XT2 XT1		TR1 RR1	
48	V-G G-V	251	T3 R3	252	T2 R2		E1 M1	12
49	V-BR BR-V	252	T4 R4					
50	V-S		SPARE		SPARE			
25	S-V		S P A R E		SPARE			

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

** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-2 (CONT'D)
SHELF 2 (SX-200 ONLY) EXTERNAL PLUG AND JACK CONNECTIONS

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation, Trunks			Card Positions
					co	DID/TIE	E & M *	
PLUG P10 (Connects to Cross-Connect Field)								
26 1	W-BL BL-W	213	T5 R5	214**	T3 R3	T2 R2	T2 R2	
27 2	W-O O-W	214	T6 R6		XT4 XT3		TR2 RR2	7
28 3	W-G G-W	215	T7 R7	216	T4 R4		E2 M2	
28 4	W-BR BR-W	216	T8 R8					
30 5	W-S S-W	221	T5 R5	222**	T3 R3	T2 R2	T2 R2	
31 6	R-BL BL-R	222	T6 R6		XT4 XT3		TR2 RR2	8
32 7	R-O O-R	223	T7 R7	224	T4 R4		E2 M2	
33 8	R-G G-R	224	T8 R8					
34 9	R-BR BR-R	229	T5 R5	230**	T3 R3	T2 R2	T2 R2	
35 10	R-S S-R	229	T6 R6		XT4 XT3		TR2 RR2	
96 11	BK-BL BL-BK	231	T7 R7	232	T4 R4		E2 M2	3
37 12	BK-O O-BK	232	T8 R8					
38 13	BK-G G-BK	237	T5 R5	238**	T3 R3	T2 R2	T2 R2	
39 14	BK-BR BR-BK	238	T6 R6		XT4 XT3		TR2 RR2	
40 15	BK-S S-BK	239	T7 R7	240	T4 R4		E2 M2	10
41 16	Y-BL BL-Y	240	T8 R8					
42 17	Y-O O-Y	245	T5 R5	246**	T3 R3	T2 R2	T2 R2	
43 18	Y-G G-Y	246	T6 R6		XT4 XT3		TR2 RR2	
44 19	Y-BR BR-Y	247	T7 R7	248	T4 R4		E2 M2	11
45 20	Y-S S-Y	248	T8 R8					
46 21	V-BL BL-V	253	T5 R5	254**	T3 R3	T2 R2	T2 R2	
47 22	V-O O-V	254	T6 R6		XT4 XT3		TR2 RR2	
48 23	V-G G-V	255	T7 R7	256	T4 R4		E2 M2	12
49 24	V-BR BR-V	256	T8 R8					
50 25	V-S S-V		SPARE SPARE		SPARE SPARE			

* For 2-Wire E&M Trunk operation DO NOT connect RR and TR leads.
** Trunk Equipment Number 2 for Trunk Card only.

TABLE CI-2 (CONT'D)
INTERCONNECT BOARD PLUG AND JACK CONNECTIONS

Pin	Pair Color	Lead Designation
PLUG P18 (Miscellaneous Connections to Cross-Connect Field)		
26	w-BL	SPARE
1	BL-W	SPARE
27	w - o	SPARE
2	o - w	SPARE
28	W-G	SPARE
3	G-W	SPARE
29	W-BR	SPARE
4	BR-W	SPARE
30	w - s	SPARE
5	s - w	SPARE
31	R-BL	SPARE
6	BL-R	SPARE
32	R-O	SPARE
3 :	O-R	SPARE
	R-G	SPARE
8	G-R	SPARE
9	R-BR	SPARE
35	BR-R	SPARE
	R-S	SPARE
10	S-R	SPARE
11	BK-BL	SPARE
37	BL-BK	SPARE
	BK-O	SPARE
12	O-BK	SPARE
38	BK-G	SPARE
13	G-BK	SPARE
39	BK-BR	SPARE
14	BR-BK	SPARE
40	BK-S	SPARE
15	S-BK	SPARE
41	Y-BL	SPARE
16	BL-Y	SPARE
42	Y-O	MUSIC IN B
17	O-Y	MUSIC IN A
43	Y-G	PA2 OUT B
18	G-Y	PA2 OUT A
44	Y-BR	NIGHT BELL 2B
19	BR-Y	NIGHT BELL 2A
45	Y-S	PA1 OUT B
20	S-Y	PA1 OUT A
46	V-BL	NIGHT BELL 1B
21	BL-V	NIGHT BELL 1A
47	v - o	PA1 CONTROL B
22	o - v	PA1 CONTROL A
48	V-G	PA2 CONTROL B
23	G-V	PA2 CONTROL A
49	V-BR	NIGHT SERVICE B
24	BR-V	NIGHT SERVICE A
50	V-S	NIGHT BELL 3B
25	S-V	NIGHT BELL 3A

- Notes: 1. Night service relay operates permanently when in night service.
 Night Bell continuous rating:
 Open circuit voltage 120 Vrms
 Closed circuit current 75 mArms.
2. Music in 100 mV
 Impedance 600 ohms.
3. PA Output Level 100 mV
 Impedance 600 ohms.

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TABLE CI-2 (CONT'D)
INTERCONNECT BOARD PLUG AND JACK CONNECTIONS

Pin	Pair Color	Lead Line Designation	Lead Designation,		Trunks E & M *	Card Positions
			CO	DID/TIE		
PLUG P19 On Interconnect Card PN9110-02A						
(Miscellaneous Connections to Cross-Connect Field)						
26 1	W-BL BL-W	SPARE SPARE				
27 2	w - o o - w					
28 3	W-G G-W	RECEIVER 1				15
29 4	W-BR BR-W					
30 5	W-S s - w					
31 6	R-BL BL-R	T8 R8				
32 7	R-O O-R	T7 R7	T4 R4		E2 M2	14
33 8	R-G G-R	T6 R6	XT3 XT4		TR2 RR2	
34 9	R-BR BR-R	T5 R5	T3 R3	T2 R2	T2 R2	
35 10	R-S S-R	T8 R8				
36 11	BK-BL BL-BK	T7 R7	T4 R4		E2 M2	13
37 1-2	BK-O O-BK	T6 R6	XT3 XT4		TR2 RR2	
38 13	BK-G G-BK	T5 R5	T3 R3	T2 R2	T2 R2	
39 14	BK-BR BR-BK					
40 15	BK-S S-BK	RECEIVER 1				15
41 16	Y-BL BL-Y					
42 17	Y-O O-Y					
43 18	Y-G G-Y	T4 R4				
44 19	Y-BR BR-Y	T3 R3	T2 R2		EI M1	14
45 20	Y-S S-Y	T2 R2	XT1 XT2		TR1 RR1	
46 21	V-BL BL-V	T1 R1	T1 R1	T1 R1	T1 R1	
47 22	v - o o - v	T4 R4				
48 23	V-G G-V	T3 R3	T2 R2		EI M1	
49 24	V-BR BR-V	T2 R2	XT2 XT1		TR1 RR1	13
50 25	v - s s - v	T1 R1	T1 R1	T1 R1	T1 R1	

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

TABLE CI-2 (CONT'D)
INTERCONNECT BOARD PLUG AND JACK CONNECTIONS

Pin	Lead Designation
CONNECTOR 5302 DATA PORT (See Notes)	
1	0 V
2	TRANSMIT DATA
3	RECEIVE DATA
4	
5	CLEAR TO SEND
6	DATA SET READY
7	SIGNAL GROUND
8	CARRIER DETECT
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	DATA TERM READY
21	
22	
23	
24	
25	

- Notes: 1. Connector J302 is common to the SX-100/SX-200 system.
2. See Section MITL91 05/9110-096-450-NA, Traffic Measurement, for applications of the connectors.

**TABLE CI-3
POWER FAIL TRANSFER BOARD PLUG AND JACK CONNECTIONS**

Pin	Pair Color	Lead Designation
PLUG P20 (Power Fail Transfer Connections to Cross-Connect Field)		
26	W-BL	STATION T1
1	BL-W	STATION R1
27	w - o	LINE CARD T1
2	o - w	LINE CARD R1
28	W-G	TRUNK T1
3	G-W	TRUNK R1
29	W-BR	TRUNK CARD T1
4	BR-W	TRUNK CARD R1
30	w - s	STATION T2
5	s - w	STATION R2
31	R-BL	LINE CARD T2
6	BL-R	LINE CARD R2
32	R-O	TRUNK T2
7	O-R	TRUNK R2
33	R-G	TRUNK CARD T2
8	G-R	TRUNK CARD R2
34	R-BR	STATION T3
9	BR-R	STATION R3
35	R-S	LINE CARD T3
10	S-R	LINE CARD R3
36	BK-BL	TRUNK T3
11	BL-BK	TRUNK R3
37	BK-O	TRUNK CARD T3
12	O-BK	TRUNK CARD R3
38	BK-G	STATION T4
13	G-BK	STATION R4
39	BK-BR	LINE CARD T4
14	BR-BK	LINE CARD R4
40	BK-S	TRUNK T4
15	S-BK	TRUNK R4
41	Y-BL	TRUNK CARD T4
16	BL-Y	TRUNK CARD R4
42	Y-O	STATION T5
17	O-Y	STATION R5
43	Y-G	LINE CARD T5
18	G-Y	LINE CARD R5
44	Y-BR	TRUNK T5
19	BR-Y	TRUNK R5
45	Y-S	TRUNK CARD T5
20	S-Y	TRUNK CARD R5
46	V-BL	STATION T6
21	BL-V	STATION R6
47	v - o	LINE CARD T6
22	o - v	LINE CARD R6
48	V-G	TRUNK T6
23	G-V	TRUNK R6
49	V-BR	TRUNK CARD T6
24	BR-V	TRUNK CARD R6
50	v - s	SPARE
25	s - v	SPARE

Pin	Pair Color	Lead Designation
PLUG P21 (Power Fail Transfer Connections to Cross-Connect Field)		
26	W-BL	STATION T7
1	BL-W	STATION R7
27	w - o	LINE CARD T7
2	o - w	LINE CARD R7
28	W-G	TRUNK T7
3	G-W	TRUNK R7
29	W-BR	TRUNK CARD T7
4	BR-W	TRUNK CARD R7
30	w - s	STATION T8
5	s - w	STATION R8
31	R-BL	LINE CARD T8
6	BL-R	LINE CARD R8
32	R-O	TRUNK T8
7	O-R	TRUNK R8
31	R-G	TRUNK CARD T8
8	G-R	TRUNK CARD R8
34	R-BR	STATION T9
9	BR-R	STATION R9
35	R-S	LINE CARD T9
10	S-R	LINE CARD R9
36	BK-BL	TRUNK T9
11	BL-BK	TRUNK R9
37	BK-O	TRUNK CARD T9
12	O-BK	TRUNK CARD R9
38	BK-G	STATION T10
13	G-BK	STATION R10
39	BK-BR	LINE CARD T10
14	BR-BK	LINE CARD R10
40	BK-S	TRUNK T10
15	S-BK	TRUNK R10
41	Y-BL	TRUNK CARD T10
16	BL-Y	TRUNK CARD R10
42	Y-O	STATION T11
17	O-Y	STATION R11
43	Y-G	LINE CARD T11
18	G-Y	LINE CARD R11
44	Y-BR	TRUNK T11
19	BR-Y	TRUNK R11
45	Y-S	TRUNK CARD T11
20	S-Y	TRUNK CARD R11
46	V-BL	STATION T12
21	BL-V	STATION R12
47	v - o	LINE CARD T12
22	o - v	LINE CARD R12
48	V-G	TRUNK T12
23	G-V	TRUNK R12
49	V-BR	TRUNK CARD T12
24	BR-V	TRUNK CARD R12
50	v - s	SPARE
25	s - v	SPARE

Note: Plug 21 is not installed on the SX-100 equipment.

TABLE CI-4
CONSOLE INTERFACE BOARD PLUG AND JACK CONNECTIONS (SX-200 ONLY)

Pin	Pair Color	Lead	Designation
JACK J22 (Connects to Supervisor Console 1)			
26	W-BL	ELECTROSTATIC	GROUND
1	BL-W	ELECTROSTATIC	GROUND
27	w - o	ELECTROSTATIC	GROUND
2	o - w	ELECTROSTATIC	GROUND
28	W-G	ELECTROSTATIC	GROUND
3	G-W	ELECTROSTATIC	GROUND
29	W-BR	ELECTROSTATIC	GROUND
4	BR-W	ELECTROSTATIC	GROUND
30	w - s	DATA IN COMMON	
5	s - w	DATA IN	
31	R-BL	ELECTROSTATIC	GROUND
6	BL-R	ELECTROSTATIC	GROUND
32	R-O	DATA OUT COMMON	
7	O-R	DATA OUT	
33	R-G	ELECTROSTATIC	GROUND
8	G-R	ELECTROSTATIC	GROUND
34	R-BR	ELECTROSTATIC	GROUND
9	BR-R	ELECTROSTATIC	GROUND
35	R-S	CUTOVER SWB	
10	S-R	CUTOVER SWA	
36	BK-BL	ELECTROSTATIC	GROUND
11	BL-BK	ELECTROSTATIC	GROUND
37	BK-O	MAJOR ALARM	
12	O-BK	MAJOR ALARM	
38	BK-G	TIP	
13	G-BK	RING	
39	BK-BR	ELECTROSTATIC	GROUND
14	BR-BK	ELECTROSTATIC	GROUND
40	BK-S	ELECTROSTATIC	GROUND
15	S-BK	ELECTROSTATIC	GROUND
41	Y-BL	ELECTROSTATIC	GROUND
16	BL-Y	ELECTROSTATIC	GROUND
42	Y-O	ELECTROSTATIC	GROUND
17	O-Y	ELECTROSTATIC	GROUND
43	Y-G	o v	
18	G-Y	-48 Vdc	
44	Y-BR	o v	
19	BR-Y	-48 Vdc	
45	Y-S	o v	
20	S-Y	-48 Vdc	
46	V-BL	o v	
21	BL-V	-48 Vdc	
47	v - o	o v	
22	o - v	-48 Vdc	
48	V-G	o v	
23	G-V	-48 Vdc	
49	V-BR	o v	
24	BR-V	-48 Vdc	
50	v-s	o v	
25	s-v	-48 Vdc	

Pin	Pair Color	Lead	Designation
PLUG P23 (Connects to Jack J15)			
26	W-BL	ELECTROSTATIC	GROUND
1	BL-W	ELECTROSTATIC	GROUND
27	w - o	ELECTROSTATIC	GROUND
2	o - w	ELECTROSTATIC	GROUND
28	W-G	ELECTROSTATIC	GROUND
3	G-W	ELECTROSTATIC	GROUND
29	W-BR	ELECTROSTATIC	GROUND
4	BR-W	ELECTROSTATIC	GROUND
30	w - s	DATA IN COMMON	
5	s - w	DATA IN	
31	R-BL	ELECTROSTATIC	GROUND
6	BL-R	ELECTROSTATIC	GROUND
32	R-O	DATA OUT COMMON	
7	O-R	DATA OUT	
33	R-G	ELECTROSTATIC	GROUND
8	G-R	ELECTROSTATIC	GROUND
34	R-BR	ELECTROSTATIC	GROUND
9	BR-R	ELECTROSTATIC	GROUND
35	R-S	CUTOVER SWB	
10	S-R	CUTOVER SWA	
36	BK-BL	ELECTROSTATIC	GROUND
11	BL-BK	ELECTROSTATIC	GROUND
37	BK-O	MAJOR ALARM	
12	O - B K	MAJOR ALARM	
38	BK-G	TIP	
13	G-BK	RING	
39	BK-BR	ELECTROSTATIC	GROUND
14	BR-BK	ELECTROSTATIC	GROUND
40	BK-S	ELECTROSTATIC	GROUND
15	S-BK	ELECTROSTATIC	GROUND
41	Y-BL	ELECTROSTATIC	GROUND
16	BL-Y	ELECTROSTATIC	GROUND
42	Y-O	ELECTROSTATIC	GROUND
17	O-Y	ELECTROSTATIC	GROUND
43	Y-G	o v	
18	G-Y	-48 Vdc	
44	Y-BR	o v	
19	BR-Y	-48 Vdc	
45	Y-S	OV	
20	S-Y	-48 Vdc	
46	V-BL	o v	
21	BL-V	-48 Vdc	
47	v - o	o v	
22	o - v	-48 Vdc	
48	V-G	o v	
23	G-V	-48 Vdc	
49	V-BR	o v	
24	BR-V	-48 Vdc	
50	v - s	o v	
2 5	s - v	-48 Vdc	

TABLE CI-4 (CONT'D)
 CONSOLE INTERFACE BOARD PLUG AND JACK CONNECTIONS (SX-200 ONLY)

Pin	Pair Color	Lead Designation
JACK J24 (Connects to Supervisor Console 2)		
26	w-BL	ELECTROSTATIC GROUND
	BL-W	ELECTROSTATIC GROUND
27	w-o	ELECTROSTATIC GROUND
28	o-w	ELECTROSTATIC GROUND
29	W-G	ELECTROSTATIC GROUND
30	G-W	ELECTROSTATIC GROUND
31	W-BR	ELECTROSTATIC GROUND
32	BR-W	ELECTROSTATIC GROUND
33	w-s	DATA IN COMMON
34	s-w	DATA IN
35	R-BL	ELECTROSTATIC GROUND
36	BL-R	ELECTROSTATIC GROUND
37	R-O	DATA OUT COMMON
38	O-R	DATA OUT
39	R-G	ELECTROSTATIC GROUND
40	G-R	ELECTROSTATIC GROUND
41	R-BR	ELECTROSTATIC GROUND
42	BR-R	ELECTROSTATIC GROUND
43	R-S	CUTOVER SWB
44	S-R	CUTOVER SWA
45	BK-BL	ELECTROSTATIC GROUND
46	BL-BK	ELECTROSTATIC GROUND
47	BK-O	MAJOR ALARM
48	O-BK	MAJOR ALARM
49	BK-G	TIP
50	G-BK	RING
51	BK-BR	ELECTROSTATIC GROUND
52	BR-BK	ELECTROSTATIC GROUND
53	BK-S	ELECTROSTATIC GROUND
54	S-BK	ELECTROSTATIC GROUND
55	Y-BL	ELECTROSTATIC GROUND
56	BL-Y	ELECTROSTATIC GROUND
57	Y-O	ELECTROSTATIC GROUND
58	O-Y	ELECTROSTATIC GROUND
59	Y-G	o v
60	G-Y	-48 Vdc
61	Y-BR	o v
62	BR-Y	-48 Vdc
63	Y-S	o v
64	S-Y	-48 Vdc
65	V-BL	o v
66	BL-V	-48 Vdc
67	v-o	o v
68	o-v	-48 Vdc
69	V-G	o v
70	G-V	-48 Vdc
71	V-BR	o v
72	BR-V	-48 Vdc
73	v-s	o v
74	s-v	-48 Vdc

Pin	Pair Color	Lead Designation
PLUG 25 (Connects to Jack J14)		
26	W-BL	ELECTROSTATIC GROUND
27	BL-w	ELECTROSTATIC GROUND
28	W-O	ELECTROSTATIC GROUND
29	O-W	ELECTROSTATIC GROUND
30	W-G	ELECTROSTATIC GROUND
31	G-W	ELECTROSTATIC GROUND
32	W-BR	ELECTROSTATIC GROUND
33	BR-W	ELECTROSTATIC GROUND
34	w-s	DATA IN COMMON
35	s-w	DATA IN
36	R-BL	ELECTROSTATIC GROUND
37	BL-R	ELECTROSTATIC GROUND
38	R-O	DATA OUT COMMON
39	O-R	DATA OUT
40	R-G	ELECTROSTATIC GROUND
41	G-R	ELECTROSTATIC GROUND
42	R-BR	ELECTROSTATIC GROUND
43	BR-R	ELECTROSTATIC GROUND
44	R-S	CUTOVER SWB
45	S-R	CUTOVER SWA
46	BK-BL	ELECTROSTATIC GROUND
47	BL-BK	ELECTROSTATIC GROUND
48	BK-O	MAJOR ALARM
49	O-BK	MAJOR ALARM
50	BK-G	TIP
51	G-B	RING
52	BK-BR	ELECTROSTATIC GROUND
53	BR-BK	ELECTROSTATIC GROUND
54	BK-S	ELECTROSTATIC GROUND
55	S-BK	ELECTROSTATIC GROUND
56	Y-BL	ELECTROSTATIC GROUND
57	BL-Y	ELECTROSTATIC GROUND
58	Y-O	ELECTROSTATIC GROUND
59	O-Y	ELECTROSTATIC GROUND
60	Y-G	o v
61	G-Y	-48 Vdc
62	Y-BR	o v
63	BR-Y	-48 Vdc
64	Y-S	o v
65	S-Y	-48 Vdc
66	V-BL	o v
67	BL-V	-48 Vdc
68	v-o	o v
69	o-v	-48 Vdc
70	V-G	o v
71	G-V	-48 Vdc
72	V-BR	o v
73	BR-V	-48 Vdc
74	v-s	o v
75	s-v	-48 Vdc

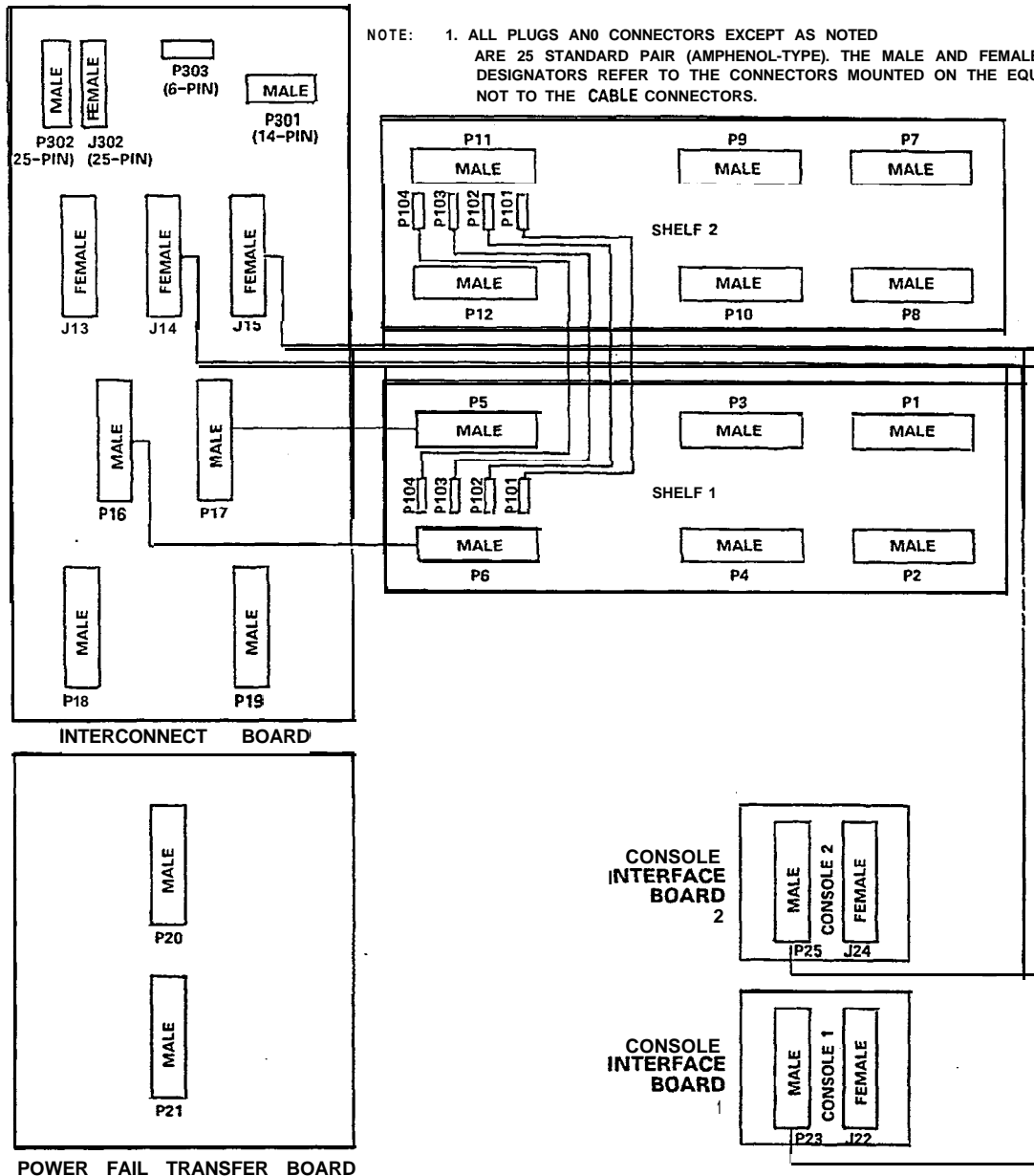


Figure CI-3(a) SX-200 Connector Locations

SECTION MITL9105/911 0-096-350-NA

CONNECTOR			CONNECTOR			CONSOLE INTERFACE CONNECTOR		
SHELF	NO.	DESTINATION	BOARD	NO.	DESTINATION	BOARD	NO.	DESTINATION
1	P1	X-CONNECT	INTER-CONNECT	J13	MAINTENANCE CONSOLE		J22	CONSOLE 1
	P2	X-CONNECT		J14	P25		J23	J15
	P3	X-CONNECT		J15	P23		J24	CONSOLE 2
	P4	X-CONNECT		P16	P6		P25	J14
	P5	P17		P17	P5			
	P6	P16		P18	X-CONNECT			
2	P7	X-CONNECT	P19	X-CONNECT				
	P8	X-CONNECT	P301	POWER SUPPLV				
	P9	X-CONNECT	P302	PRINTER				
	P10	X-CONNECT	5302	MODEM				
	P11	(SPECIAL FEATURES)	P303	MAINTENANCE PANEL				
	P12		P20	X-CONNECT				
			P21	X-CONNECT				

Figure CI -3(b) SX-200 Connector Locations

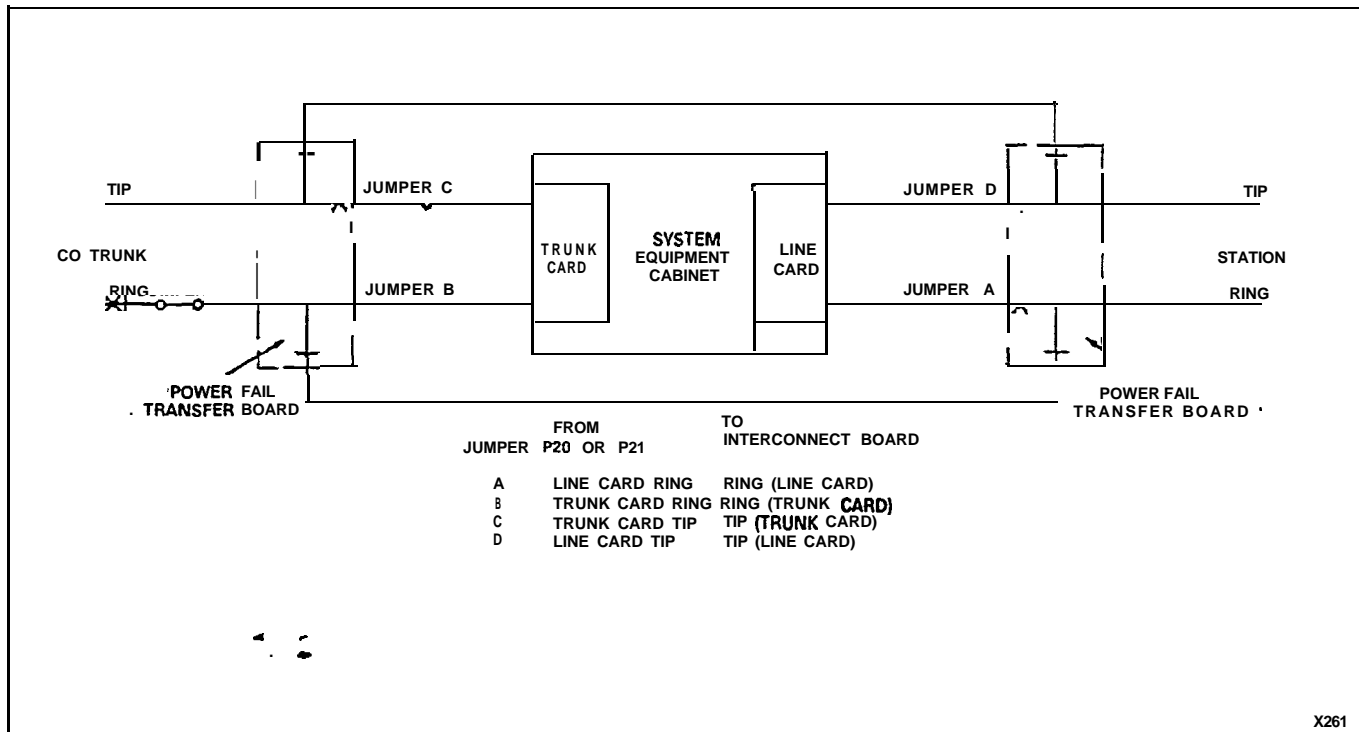


Figure CI-4 Power Fail Transfer Block Diagram

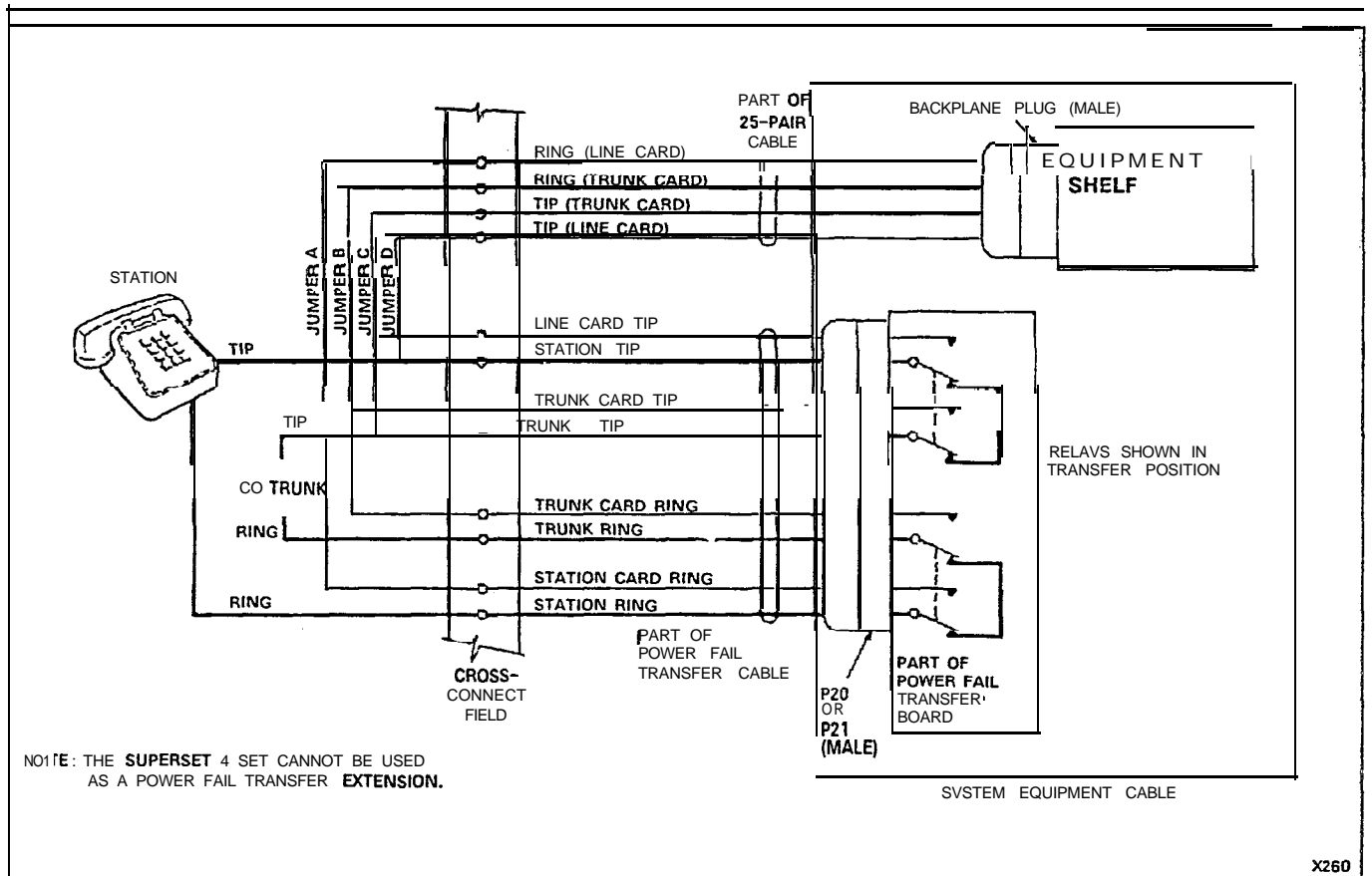
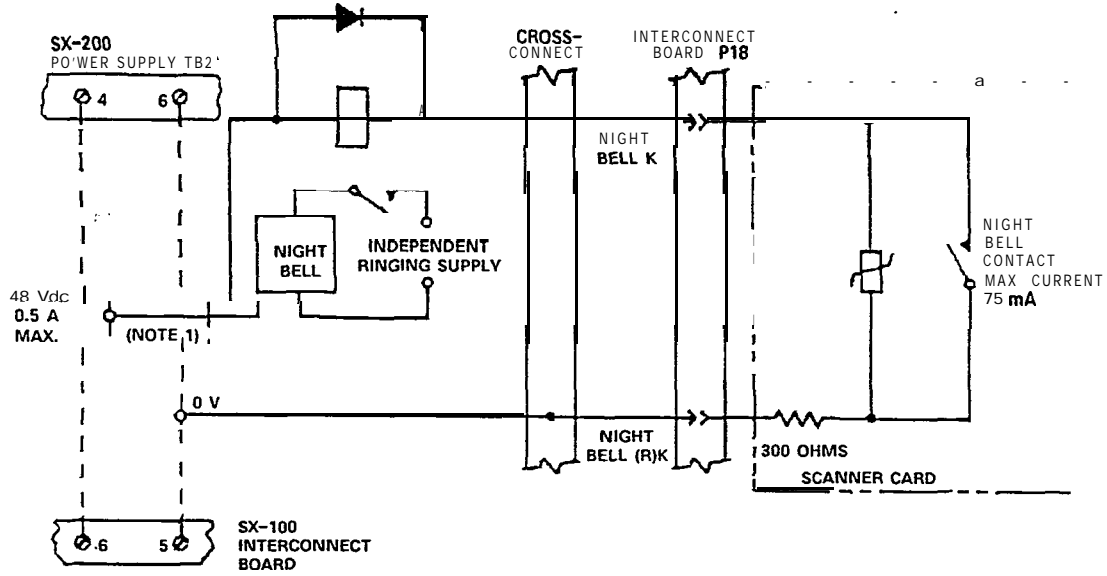
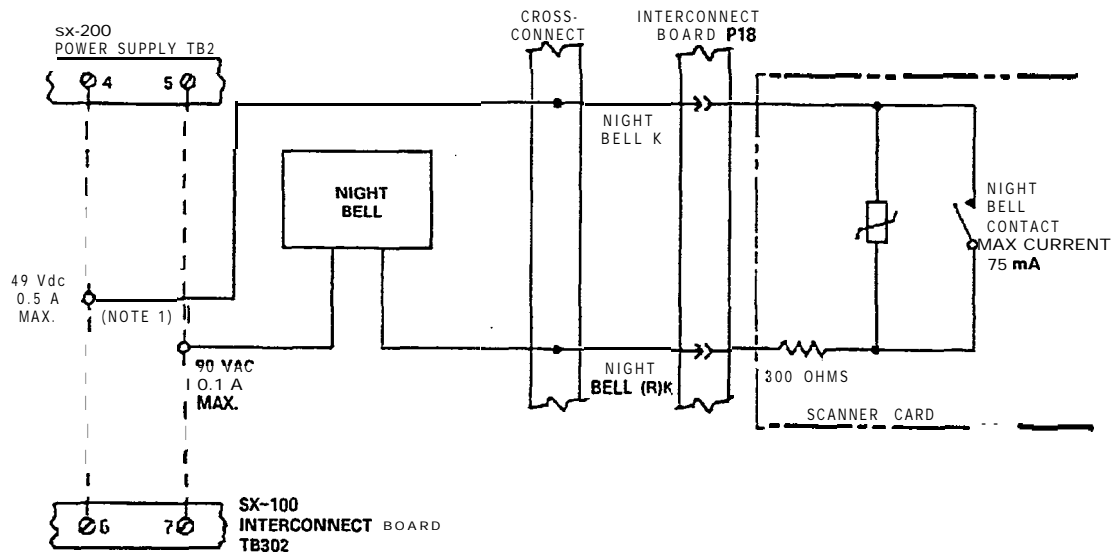


Figure CI-5 Power Fail Transfer Wiring Diagram

NIGHT BELL CONNECTION AUXILIARY RELAY



NIGHT BELL RELAY DIRECT



INTERCONNECT BOARD PLUG P18							
PIN	DESTINATION	PIN	DESTINATION	PIN	DESTINATION	PIN	DESTINATION
46	NIGHT BELL 1 (K1)	44	NIGHT BELL 2 (K2)	50	NIGHT BELL 3 (K3)	49	NIGHT SERVICE A (K4)
21	NIGHT BELL 1 R (K1)	19	NIGHT BELL 2 R (K2)	25	NIGHT BELL 3 R (K3)	24	NIGHT SERVICE B (K4)

- NOTES:
- 1a THE FACILITY IS WIRED TO EITHER THE SX-100 SYSTEM OR THE SX-200 TERMINAL BLOCKS AS INDICATED BY THE DASHED LINES.
 2. THE NIGHT SERVICE RELAY K4 CONTACTS ARE IDENTICAL TO THE NIGHT BELL CONTACT ARRANGEMENTS. IT MAY BE USED TO OPERATE A LAMP TO SHOW WHEN THE SYSTEM IS IN NIGHT SERVICE, OR SIGNAL THE CO FOR THIS CONDITION.

X572R

Figure CI-6 Night Bell Connections

TABLE CI-6
BACKPLANE TRANSLATOR BOARD CONNECTIONS (SHELF 1) TO CROSS-CONNECT FIELD

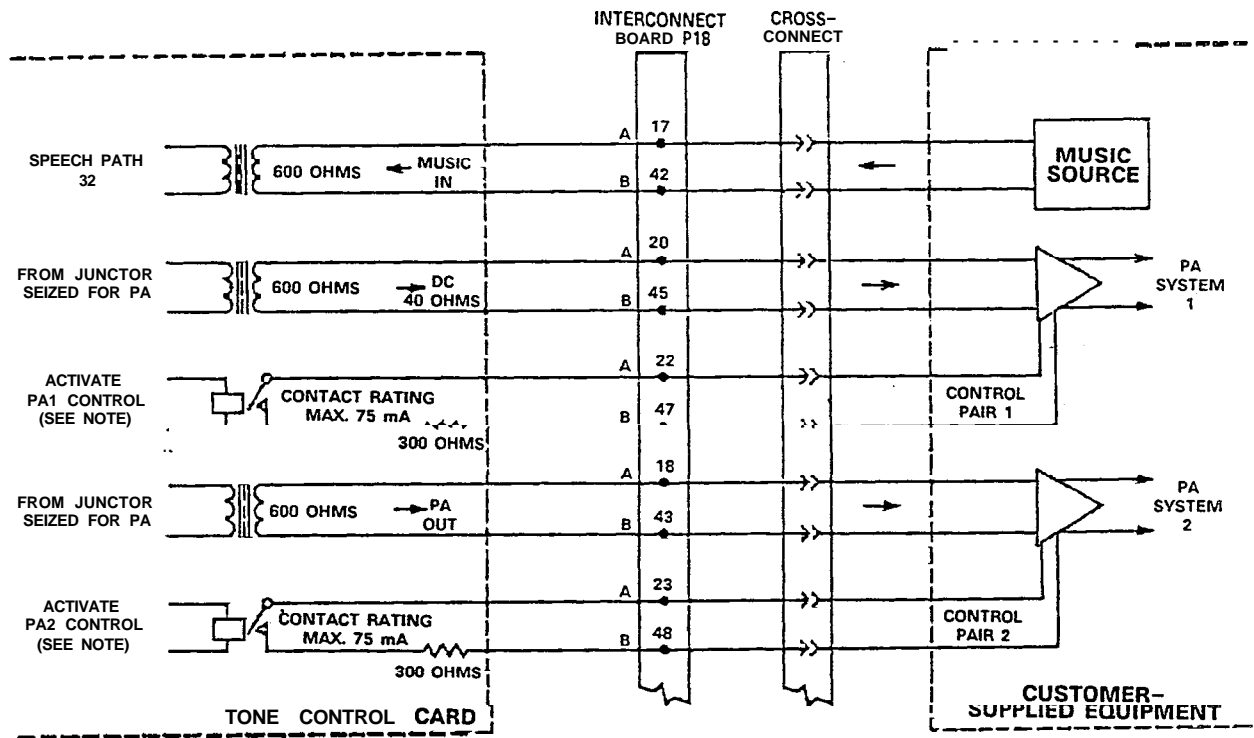
Pin	Pair Color	Line and Trunk Connections				Shelf 1 Translator Board Plug Numbers			
		Extn	c o	DID/Tie	E&M+	P1	P2	P3	P4
26	W-BL	T1	T1	T1	T1	001 Equipment Numbers Card Position 1	025 Equipment Numbers Card Position 4	049 Equipment Numbers Card Position 7	073 Equipment Numbers Card Position 10
1	EL-W	R1	R1	R1	R1				
27	w - o	T2	XT2		TR1				
2	o - w	R2	XT1		RR1				
26	W-G	T3	T2		E1				
3	G-W	R3	R2		M1				
29	W-BR	T4							
4	BR-W	R4							
30	w - s	T5	T3	T2	T2	005 Equipment Numbers Card Position 2	029 Equipment Numbers Card Position 5	053 Equipment Numbers Card Position 8	077 Equipment Numbers Card Position 11
5	s - w	R5	R3	R2	R2				
31	R-BL	T6	XT4		TR2				
6	EL-R	R6	XT3		RR2				
32	R-O	T7	T4		E2				
7	O-R	R7	R4		M2				
33	R-G	T8							
8	G-R	R8							
34	R-BR	T1	T1	T1	T1	009 Equipment Numbers Card Position 3	033 Equipment Numbers Card Position 6	057 Equipment Numbers Card Position 9	081 Equipment Numbers Card Position 12
9	BR-R	R1	R1	R1	R1				
35	R-S	T2	XT2		TR1				
10	S-R	R2	XT1		RR1				
38	BK-BL	T3	T2		E1				
11	BL-BK	R3	R2		M1				
37	BK-O	T4							
12	O-BK	R4							
38	BK-G	T5	T3	T2	T2				
13	G-BK	R5	R3	R2	R2				
39	BK-BR	T6	XT4		TR2				
14	BR-BK	R6	XT3		RR2				
40	BK-S	T7	T4		E2				
15	S-BK	R7	R4		M2				
41	Y-BL	T8							
16	EL-Y	R8							
42	Y-O	T1	T1	T1	T1	017 Equipment Numbers Card Position 4	041 Equipment Numbers Card Position 7	065 Equipment Numbers Card Position 10	089 Equipment Numbers Card Position 13
17	O-Y	R1	R1	R1	R1				
43	Y-G	T2	XT2		TR1				
18	G-Y	R2	XT1		RR1				
44	Y-BR	T3	T2		E1				
19	BR-Y	R3	R2		M1				
45	Y-S	T4							
20	S-Y	R4							
46	V-BL	T5	T3	T2	T2				
21	BL-V	R5	R3	R2	R2				
47	v - o	T6	XT4		TR2				
22	o - v	R6	XT3		RR2				
48	V-G	T7	T4		E2				
23	G-V	R7	R4		M2				
49	V-BR	T8							
24	BR-V	R8							
50	v - s	SPARE							
25	s - v	SPARE							

Note: Position 12 can be used for lines, trunks or receiver #4 card.
+ For 2-Wire E&M Trunk operation 00 NOT connect RR and TR leads.

TABLE CI-6 (CONT'D)
BACKPLANE TRANSLATOR BOARD CONNECTIONS (SHELF 1) TO CROSS-CONNECT FIELD

Pin	Pair Color	Line and Trunk Connections				Shelf 2 Translator Board Plug Numbers			
		Extn	CO	DID/Tie	E&M+	P7	P8	P9	P10
26 1	W-BL BL-W	T1 R1	T1 R1	T1 R1	T1 R1	161	185	209	233
27 2	w - o o - w	T2 R2	XT2 XT1		TR1 RR1	162	186	210	234
28 3	W-G G-W	T3 R3	T2 R2		EI M1	163	187	211	235
29 4	W-BR BR-W	T4 R4				164	188	212	236
30 5	w - s s - w	T5 R5	T3 R3	T2 R2	T2 R2	165	189	213	237
31 6 32	R-EL EL-R R-O	T6 R6 T7	XT4 XT3 T4		TR2 RR2 E2	166 167	190 191	214 215	238 239
7 33 8	O-R R-G G-R	R7 T8 R8	R4		M2	168	192	216	240
34 9	R-BR BR-R	T1 R1	T1 R1	T1 R1	T1 R1	169	193	217	241
35 10	R-S S-R	T2 R2	XT2 XT1		TR1 RR1	170	194	218	242
36 11	BK-BL BL-BK	T3 R3	T2 R2		EI M1	171	195	219	243
37 12	BK-O O-SK	T4 R4				172	196	220	244
38 13	BK-G G-BK	T5 R5	T3 R3	T2 R2	T2 R2	173	197	221	245
39 14 40	BK-BR BR-BK BK-S	T6 R6 T7	XT4 XT3 T4		TR2 RR2 E2	174 175	198 199	222 223	246 247
15 41 16	S-BK Y-EL BL-Y	R7 T8 R8	R4		M2	176	200	224	248
42 17	Y-O O-Y	T1 R1	T1 R1	T1 R1	T1 R1	177	201	225	249
43 18	Y-G G-Y	T2 R2	XT2 XT1		TR1 RR1	178	202	226	250
44 19 45	Y-BR BR-Y Y-S	T3 R3 T4	T2 R2		EI M1	179	203	227	251
20 46 21	S-Y V-EL BL-V	R4 T5 R5		T2 R2	T2 R2	180 181	204 205	228 229	252 253
47 22	v - o o - v	T6 R6	XT4 XT3		TR2 RR2	182	206	230	254
48 23	V-G G-V	T7 R7	T4 R4		E2 M2	183	207	231	255
49 24	V-BR BR-V	T8 R8				164	208	232	256
50 25	v - s s - v	SPARE SPARE							

Note: Position 12 can be used for lines, trunks or receiver #4 card.
+ For 2-Wire E&M Trunk operation DO NOT connect RR and TR leads.



NOTE: THE PA LEADS ARE LOCATED ON THE SCANNER CARD.

X5373

Figure CI-7 Music and PA Connections

HARDWARE/EQUIPMENT NUMBERING

HARDWARE POSITION NUMBER	PLUG 7			PLUG 8			PLUG 9			PLUG 10		
	161	169	177	185	193	201	209	217	225	233	241	249
	162	170	178	186	194	202	210	218	226	234	242	250
	163	171	179	187	195	203	211	219	227	235	243	251
	164	172	180	188	196	204	212	220	228	236	344	252
	165	173	181	189	197	205	213	221	229	237	245	153
	166	174	182	190	198	206	214	222	230	238	246	154
	167	175	183	191	199	207	215	223	231	239	247	155
	168	176	184	192	200	208	216	224	232	240	248	156
	1	2	3	4	5	6	7	8	9	10	11	12

SHELF 2 (SX-200)

HARDWARE POSITION NUMBER	PLUG P1			PLUG P2			PLUG P3			PLUG P4		
	001 002	009 010	017 018	025	033 034	041 042	049 050	057 058	065 066	074 075	081 082	089 090
	003 004	011 012	019 020	027 028	035 036	043 044	051 052	059 060	067 068	075 076	083 084	091 092
	005	013	021	029	037	045	053	061	069	077	085	093
	006	014	022	030	038	046	054	062	070	078	086	094
	007	015	023	031	039	047	055	063	071	079	087	095
	008 1	016 2	024 3	032 4	040 5	048 6	056 7	064 8	072 9	080 10	088 11	096 12

SHELF 1 SX-100/SX-200

NOTE: **EQUIPMENT POSITION 001** IS RESERVED FOR THE TEST LINE AND MUST THEREFORE BE EQUIPPED WITH A LINE CARD. TRUNK **EQUIPMENT NUMBER** IS SAME AS INDIVIDUAL TRUNK ACCESS CODE.

X1311

Figure CI-8 Backplane Translator Board Plug Appearances

CARD POSITION	LEAD DESIGNATION				P5	P17	J14	J15	P18	P19	P25	P24	P23	P22	DESTINATION
	LINE	CO	TRUNKS DID/TIE	E&M											
13	T1	T1	T1	T1	26	26				50					X-CONNECT
	R1	R1	R1	R1	1	1				25					
	T2	XT2		TR1	27	27				49					
	R2	XT1		RR1	2	2				24					
	T3	T2		E1	28	28				48					
	R3	R2		M1	3	3				23					
	T4				29	29				47					
	R4				4	4				22					
14	T1	T1	T1	T1	30	30				46					X-CONNECT
	R1	R1	R1	R1	5	5				21					
	T2	XT2		TR1	31	31				45					
	R2	XT1		RR1	6	6				20					
	T3	T2		E1	32	32				44					
	R3	R2		M1	7	7				19					
	T4				33	33				43					
	R4				8	8				18					
15	RECEIVER 1 NOT CONNECTED TO CABLE				34	34				42					X-CONNECT
					9	9				17					
					35	35				41					
					10	10				16					
					36	36				40					
					11	11				15					
					37	37				39					
16	CONSOLE 2				38	38	38			38	38				X-CONNECT
	T(A)				13	13	13			13	13				
	R(A)				39	39	30			30	30				
	DATA OUT T(A)				14	14	5			5	5				
	DATA OUT R(A)				40	40	32			32	32				
	DATA IN T(A)				15	15	7			7	7				
	DATA IN R(A)				41	41		48							
	PA2 CONTROL B				16	16		22							
17	CONSOLE 1				42	42	38					38	38		X-CONNECT
	T(A)				17	17	13					13	13		
	R(A)				43	43	30					30	30		
	DATA OUT T(A)				18	18	5					5	5		
	DATA OUT R(A)				44	44	32					32	32		
	DATA IN T(A)				19	19	7					7	7		
	DATA IN R(A)				45	45		47							
	PA2 CONTROL B				20	20		22							
18	MISCELLANEOUS				46	46			42						X-CONNECT
	MUSIC IN B				21	21			17						
	MUSIC IN A				48	48			45						
	PA1 OUT B				23	23			20						
	PA1 OUT A				49	49			43						
	PA2 OUT B				24	24			18						
	PA2 OUT A				47	47			47						
					22				22						

NOTE: CONSOLE 1 CONNECTED TO J22, THROUGH P23
 CONSOLE 2 CONNECTED TO J24, THROUGH P25

Figure CI-9 interconnect Board Cabling

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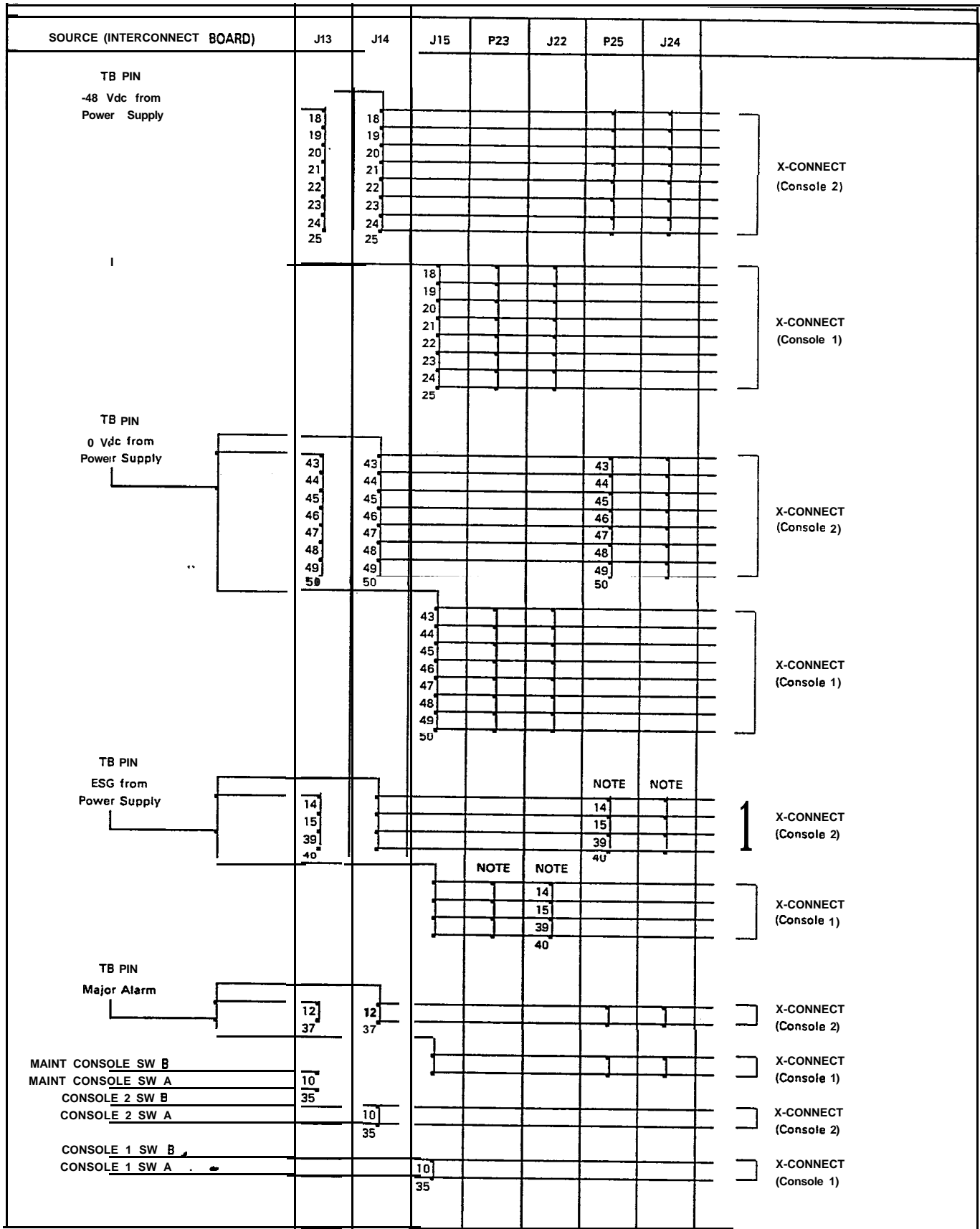


Figure CI-9 Interconnect Board Cabling (Cont'd)

CARD POSITION	LEAD DESIGNATION	P6	P16	J13	P18	P19	DESTINATION			
13	LINE	TRUNK								
	CO	DID/TIE	E&M							
	T5	T3	T2	T2	26	26	38	X-CONNECT		
	R5	R3	R2	R2	1	1	13			
	T6	XT4		TR2	27	27	37			
	R6	XT3		RR2	2	2	12			
	T7	T4		E2	28	28	36			
	R7	R4		M2	3	3	11			
	T8				29	29	35			
R8		LAMP 2		4	4	10				
14	LINE	TRUNK								
	CO	DID/TIE	E&M							
	T5	T3	T2	T2	30	30	34	X-CONNECT		
	R5	R3	R2	R2	5	5	9			
	T6	XT4		TR2	31	31	33			
	R6	XT3		RR2	6	6	8			
	T7	T4		E2	32	32	32			
	R7	R4		M2	7	7	7			
	T8				33	33	31			
R8		LAMP 2		8	8	6				
15	RECEIVER 1 NOT CONNECTED TO CABLE								X-CONNECT	
	34	34			30					
	9	9			5					
	35	35			29					
	10	10			4					
	36	36			28					
	11	11			3					
	37	38			27					
	12	12			2					
	16	CONSOLE SPARE								X-CONNECT
		T(B)			38	38				
		R(B)			13	13				
S DATA OUT T(B)				39	39					
S DATA OUT R(B)				14	14					
S DATA IN T(B)				40	40					
S DATA IN R(B)				15	15					
NIGHT BELL 1 R(K1)				41	41	21				
NIGHT BELL 1 K1			16	16	46					
17	MAINTENANCE CONSOLE							MAINTENANCE CONSOLE PLUG P303 - PIN 2 PLUG P302 - PIN 3		
	T(B)			42	42	38				
	R(B)			17	17	13				
	S DATA OUT T(B)			43	43	30				
	S DATA OUT R(B)			18	18	5				
	S DATA IN T(B)			44	44	32				
	S DATA IN R(B)			19	19	7				
	UART IN			45	45					
	UART OUT			20	20					
	18	MISCELLANEOUS							X-CONNECT	
ALARM R(K5)				46	46					
ALARM K5				31	31					
NIGHT SERVICE R(K4)				47	47	24				
NIGHT SERVICE K4				22	22	49				
NIGHT BELL 3 R(K3)				48	48	25				
NIGHT BELL 3 K3				23	23	50				
NIGHT BELL 2 R(K2)				49	49	19				
NIGHT BELL 2 K2				24	24	44				
			WIRE WRAP FROM P19							

Figure CI-9 Interconnect Board Cabling (Cont'd)



4.2

APPENDIX D

SX-100 MECHANICAL INFORMATION

GENERAL

D1.01 The MAPs contained in this Appendix detail the procedures to be performed in all mechanical work on the SX-100 system. These MAPs are used in conjunction with the MAPs outlined in other sections of this Practice.

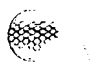
D1.02 Due to the similarity of the SX-100 system to the SX-200 system, MAPs 350-501, 350-510 and 350-511 are common to both systems and these MAPs will be found in Appendix E.

D1.03 There are three versions of the SX-100 system: rack-mounted, wall-mounted and cabinet-mounted. MAP350-400 deals with exposing each of the three versions of the system for mechanical work.

D1.04 The basic synopsis of these MAPs is that if a component has been found to be defective, replace it. MAPs in this Appendix describe how to replace a part which is known to be defective. Location of the defective components is the topic of Appendices F and G, Parts 5 and 6.

TABLE DI-1
SX-100 MECHANICAL PROCEDURE

Title	Reference
Expose System	MAP350-400
Replace Interconnect, Power Fail Transfer and Console Interface Card	MAP350-401
Replace Equipment Shelf	MAP350-402
Replace Power Supply	MAP350-403
Replace Reserve Battery Backup Unit	MAP350-404
Replace Maintenance Panel	MAP350-405
Replace 220 V Adapter	MAP350-406



1

1

EXPOSE THE SYSTEM (SX-100)
MAP350- 400
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TOOLS REQUIRED
1 1/4 inch flatblade screwdriver
1 Phillips screwdriver

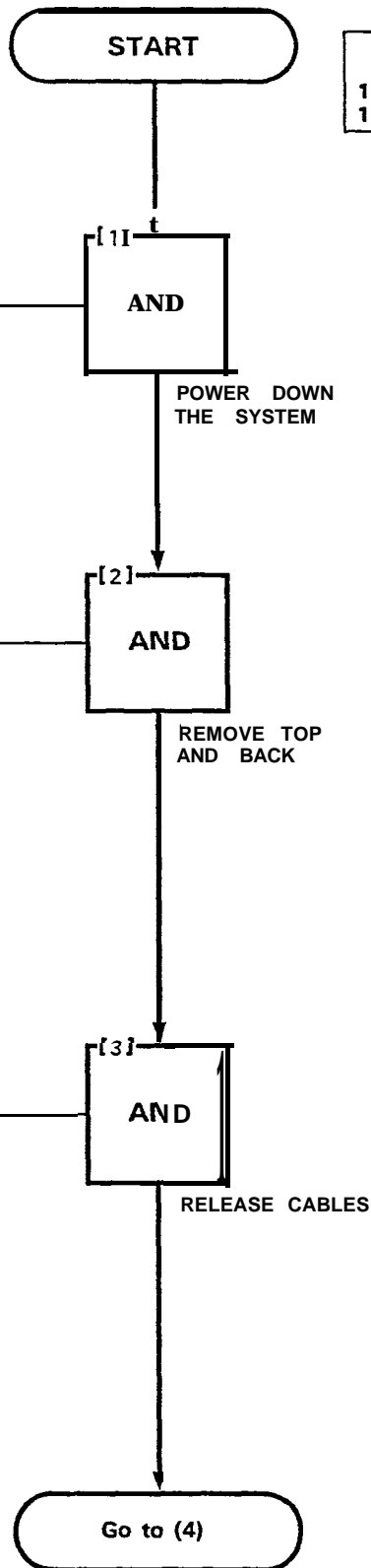
**AT FRONT OF CABINET
(FIGURE 400-1)**

- (1A) Open the front equipment cabinet door
- (1B) Turn shelf power off by turning the system power switch to OFF
- (1C) Turn both primary power switches off. If there is a reserve battery pack turn the battery pack switch off also
- (1D) Remove all AC power cords from their receptacles

- (2A) Unlock top cover from cabinet
- (2B) Remove the cabinet top cover
- (2C) If the cabinet is wall-mounted (Figure 400-2), release the strikes and allow the system to swing down gently
- (2D) Remove the four 5-16 in. binding head screws from the back cabinet cover
- (2E) Remove the back cabinet cover

AT REAR OF SYSTEM (FIGURE 400-3)

- (3A) Loosen the cable clamp to allow 25.4 cm (10 in.) of slack
- (3B) Disconnect cables P1, P2, P3, P4, P18, P19, P20, J13, J14 and J15
- (3C) Disconnect J302 (optional), the maintenance panel connector and the OOT cable
- (3D) Disconnect the four cable clamp screws from the power supply (Figure 400-4)
- (3E) Remove the power cables from the back of the power supply
- (3F) Disconnect ground wires (from system cable harness and power supply) on system ground lug
- (3G) If system was wall-mounted, swing back into position



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EXPOSE THE SYSTEM (SX-100)
MAP350- 400
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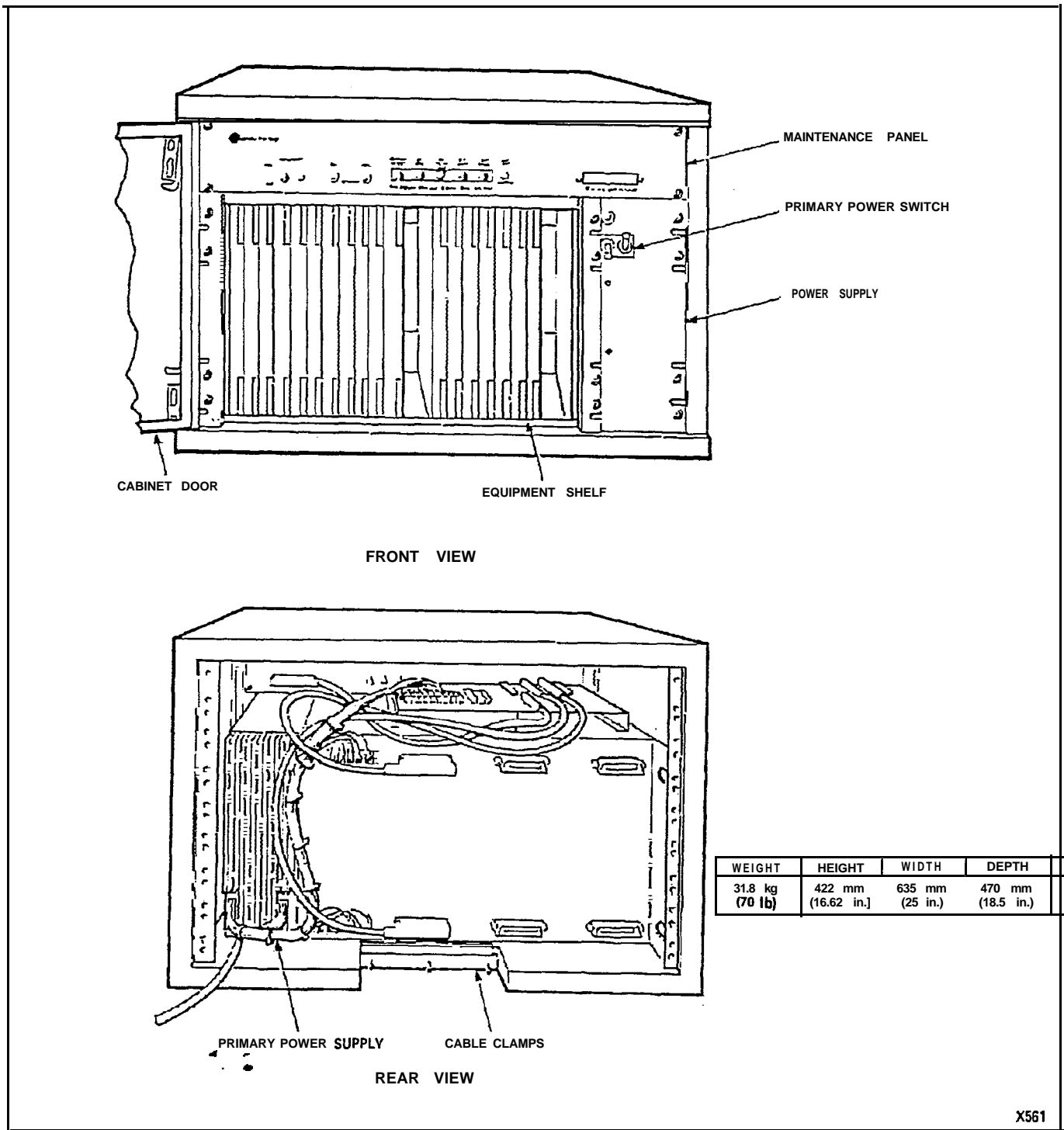


Figure 400-1 SX-100 Cabinet-Mount

EXPOSE THE SYSTEM (SX-100)
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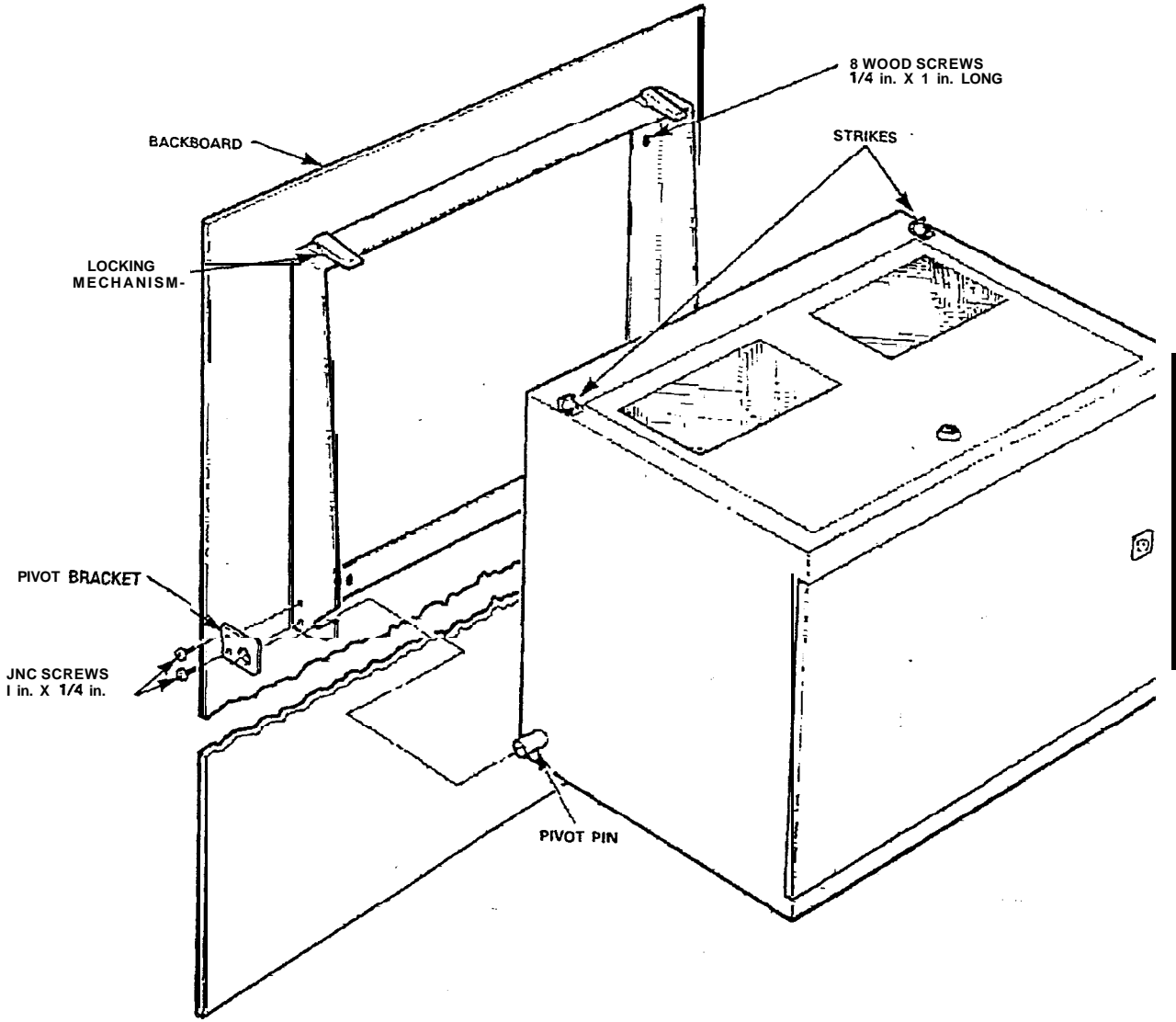
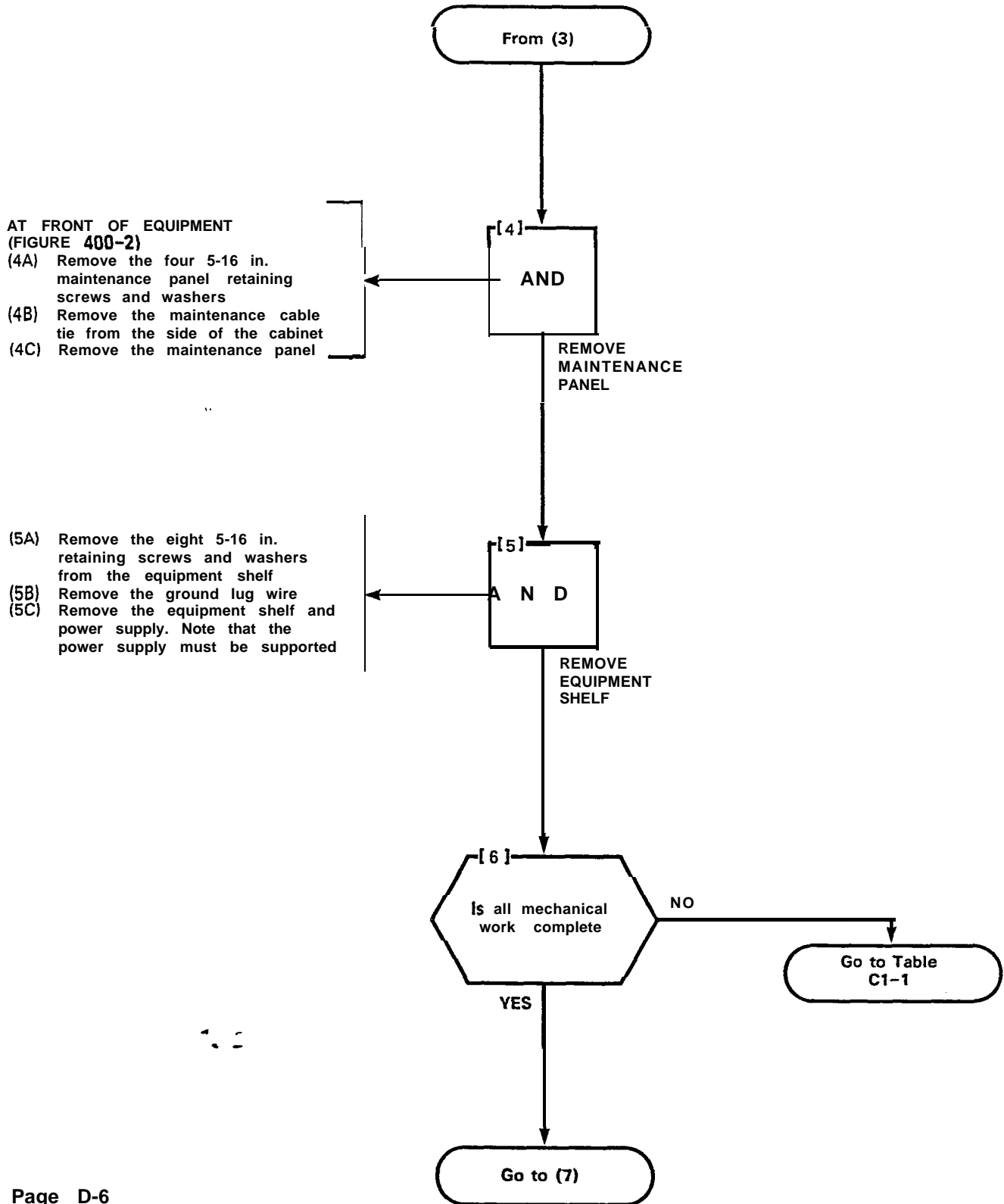


Figure 400-2 Wall-Mounting

X661R1*

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EXPOSE THE SYSTEM (SX-100)
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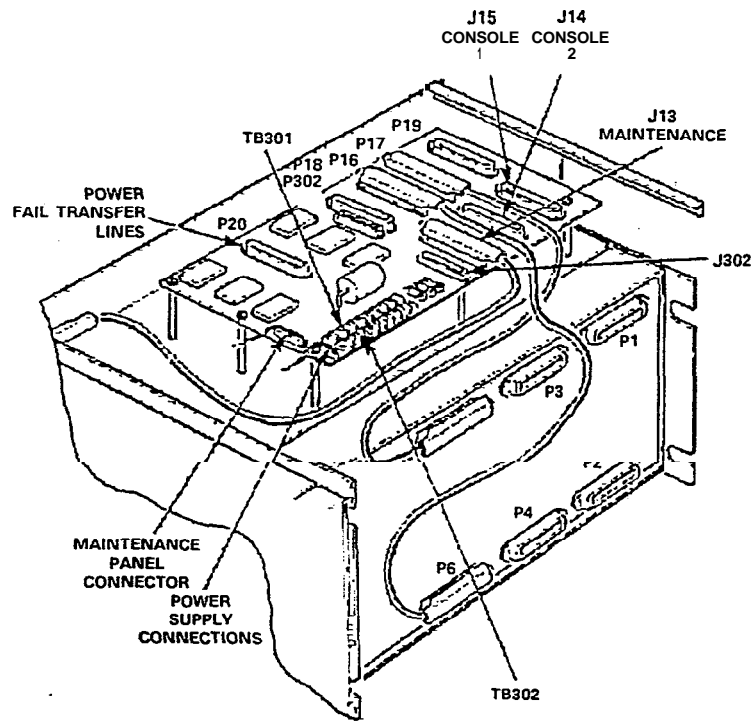


EXPOSE THE SYSTEM (SX-100)

MAP350-400

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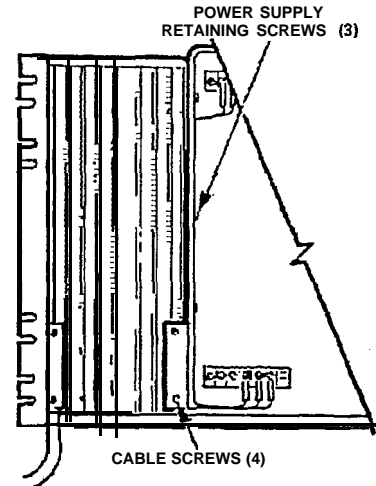
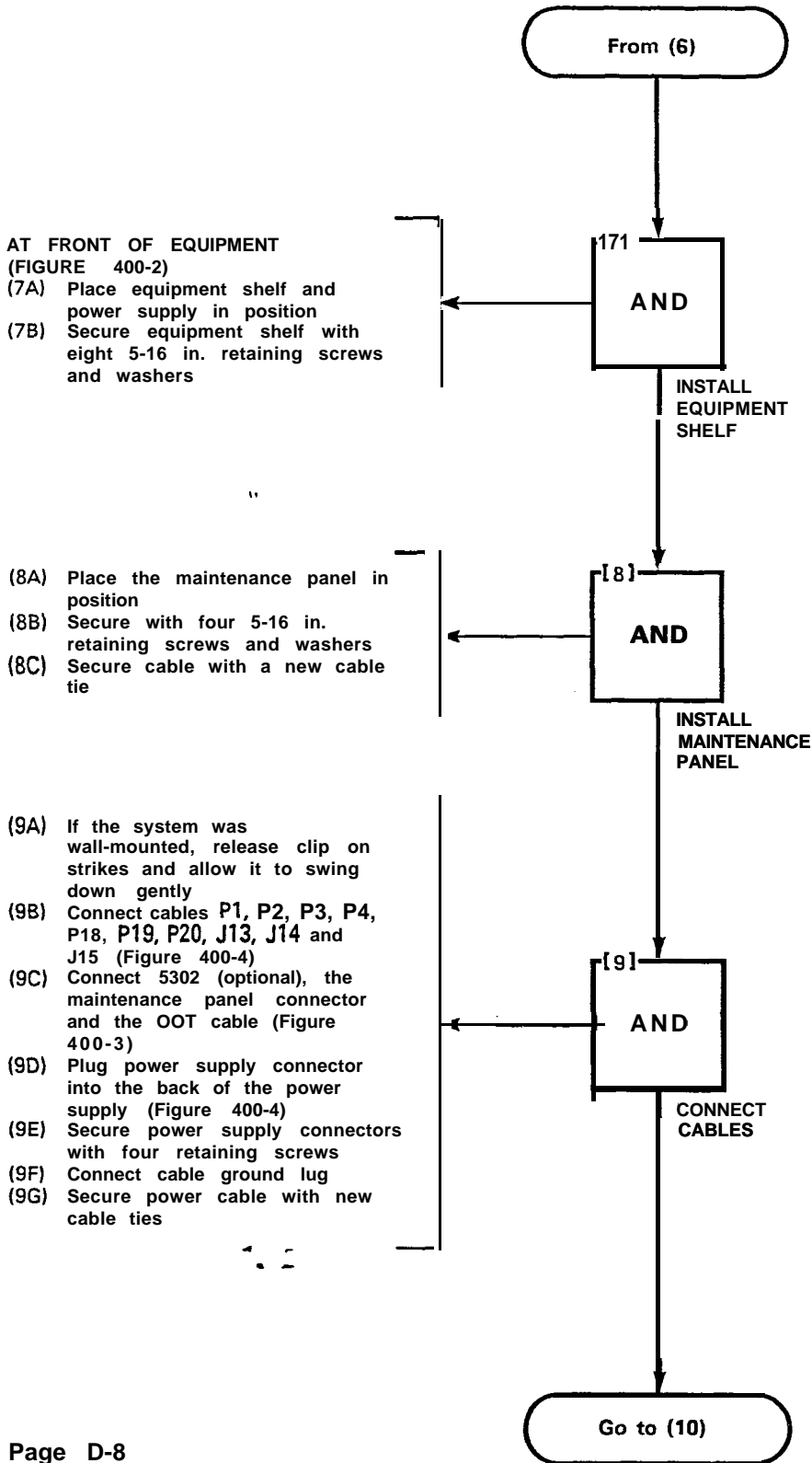
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X952R3

Figure 400-3 Rear Cable View

EXPOSE THE SYSTEM (SX-100)
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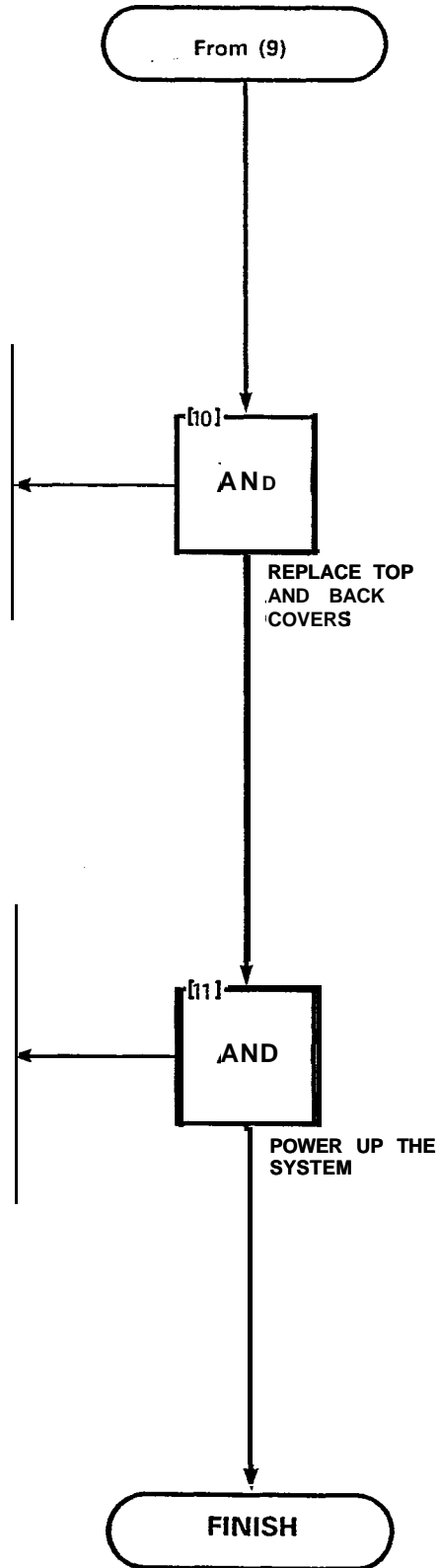
X1588

Figure 400-4
Power Supply Cable Harness

EXPOSE THE SYSTEM (SX-100)
MAP350- 400
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- AT THE CABINET LOCATION
- (10A) Replace rear cover
 - (10B) Secure the rear cover with four 5-16 in. retaining screws
 - (10C) Replace top cover
 - (10D) Secure top cover by locking it
 - (10E) If the equipment was wall-mounted, swing the cabinet up gently and secure in position with the clips on the strikes

- (11A) Connect the AC power cords to their receptacles
- (11B) Turn both primary power switches on. LED on power supply panel lights
- (11C) Turn battery pack switch to on (optional)
- (11D) Turn shelf power to on by turning the system shelf power switch on
- (11E) Close and lock front door





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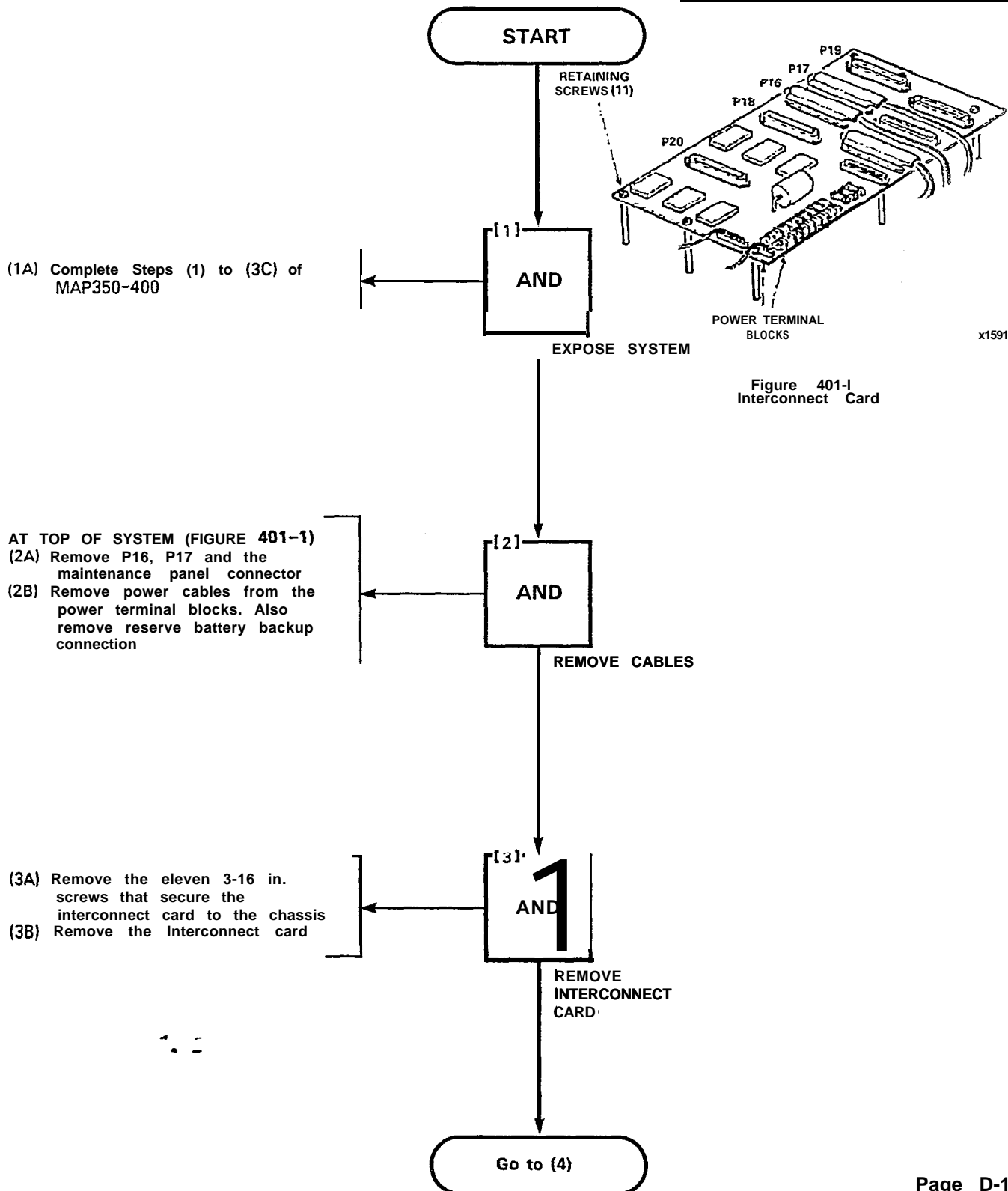


REPLACE INTERCONNECT, POWER FAIL TRANSFER AND CONSOLE INTERFACE CARD (SX-100)

MAP350-401

Issue 3. Mav 1984

Sheet 1 of 4



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EPLACE INTERCONNECT, POWER AIL TRANSFER AND CONSOLE UTERFACE CARD (SX-100)
MAP350- 401
me 3, May 1984
heet 2 of 4

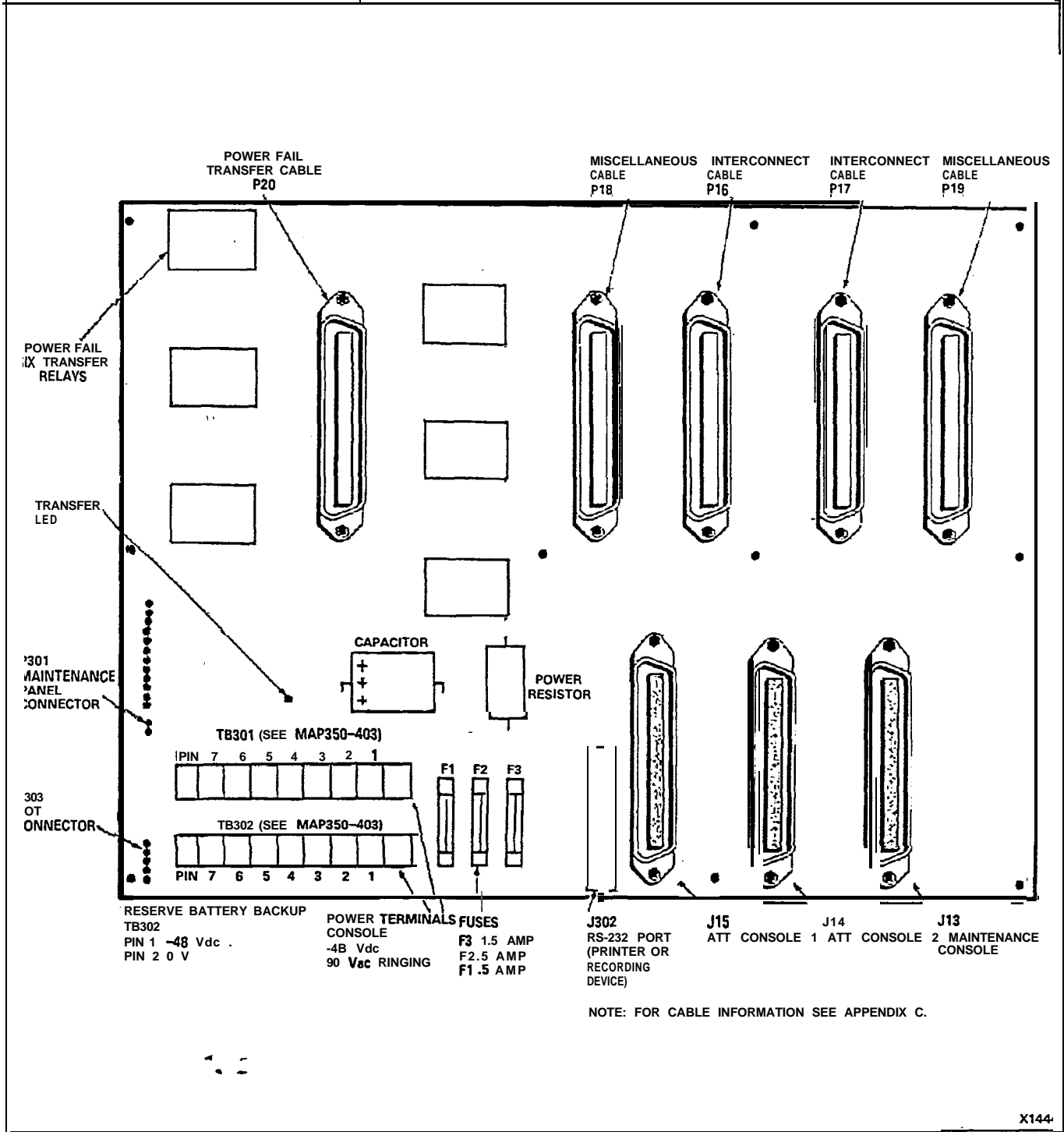


Figure 401-2 Interconnect Card

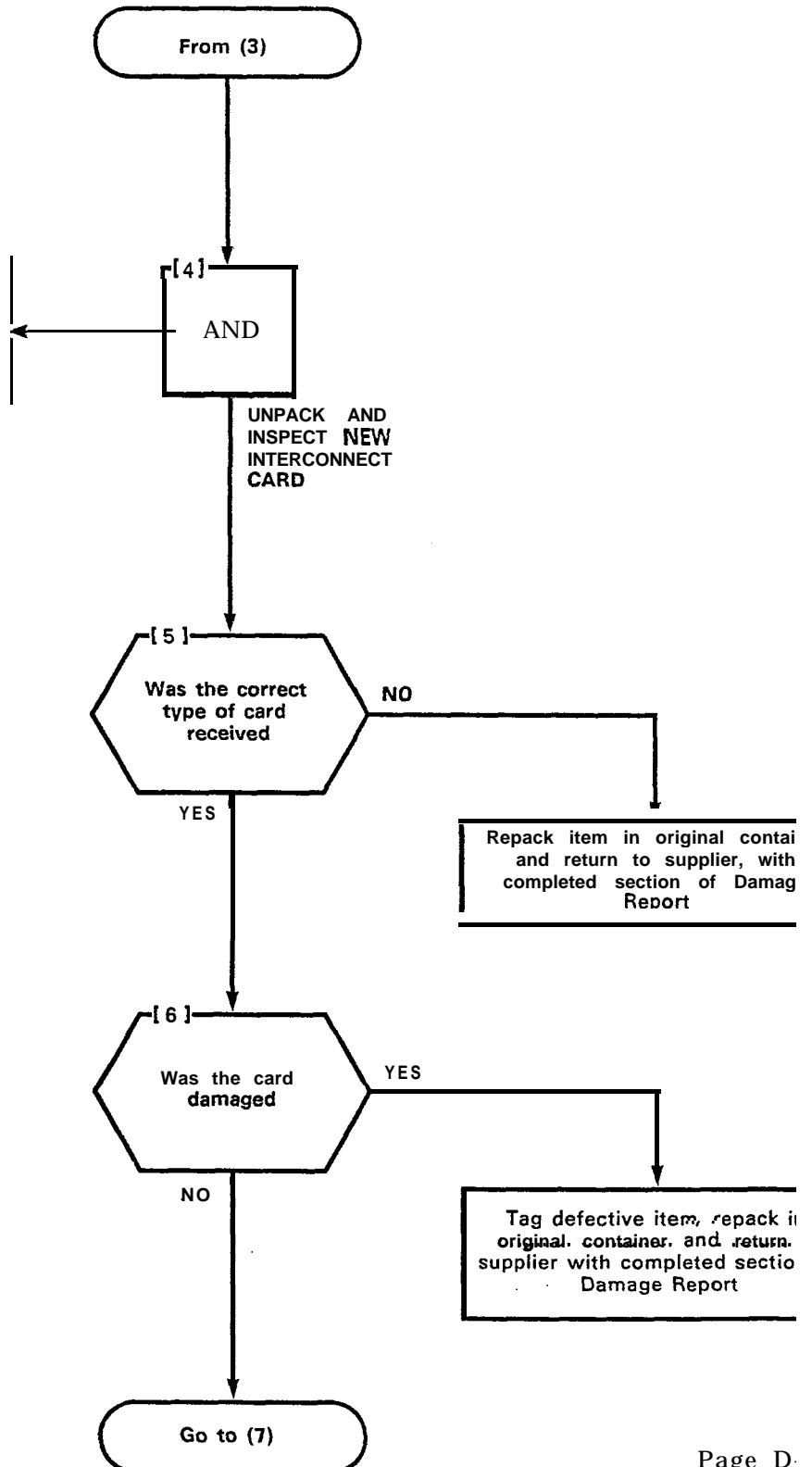
REPLACE INTERCONNECT, POWER FAIL TRANSFER AND CONSOLE INTERFACE CARD (SX-100)

MAP350-401

Issue 3, May 1984

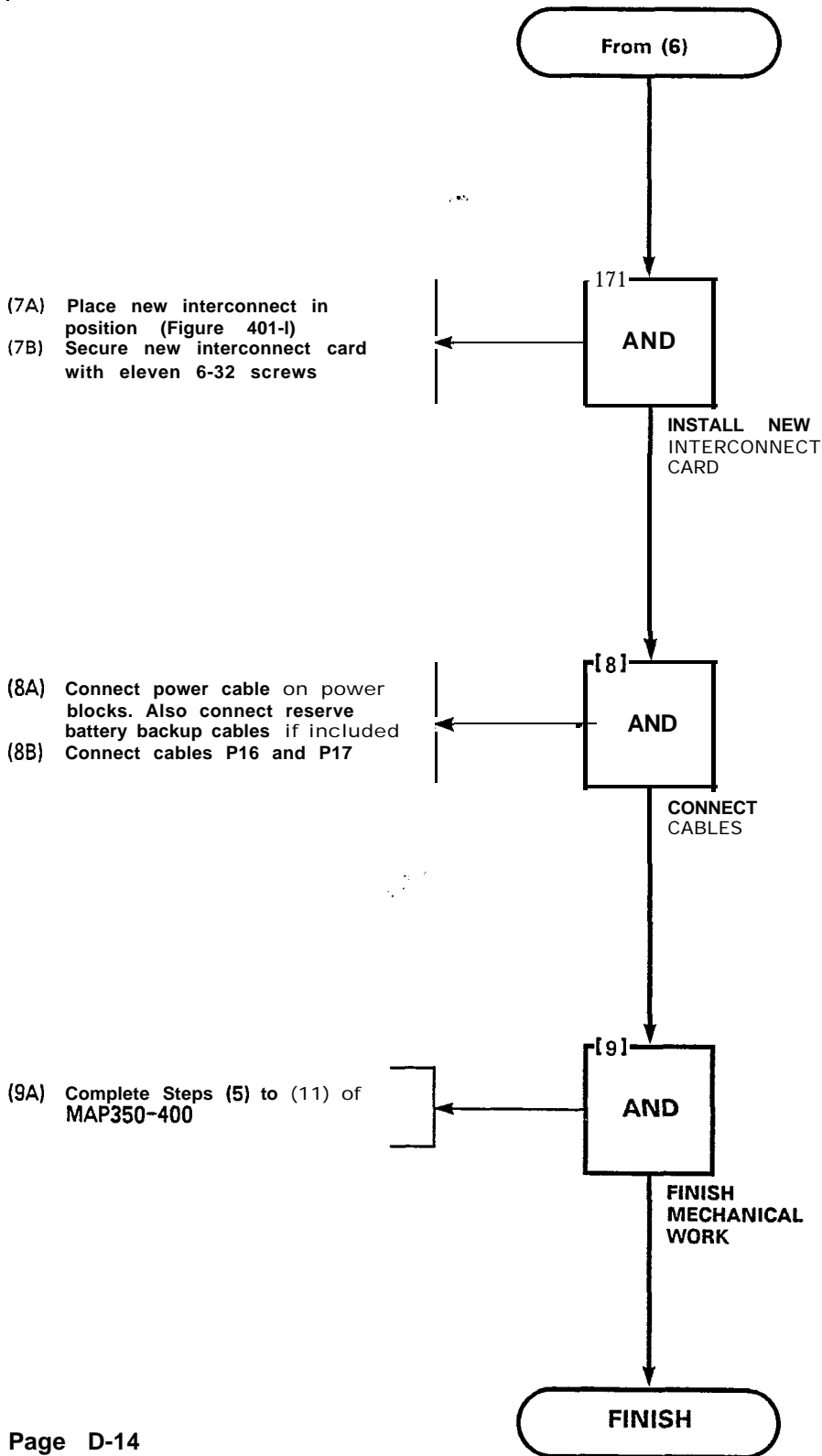
Sheet 3 of 4

- (4A) Unpack new card from container
(4B) Inspect new card for damage
(Figure 401-2)
(4C) Check card type and quantity
against invoice



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REPLACE INTERCONNECT, POWER FAIL TRANSFER AND CONSOLE INTERFACE CARD (SX-100)
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REPLACE EQUIPMENT SHELF (SX-100)
MAP350- 402
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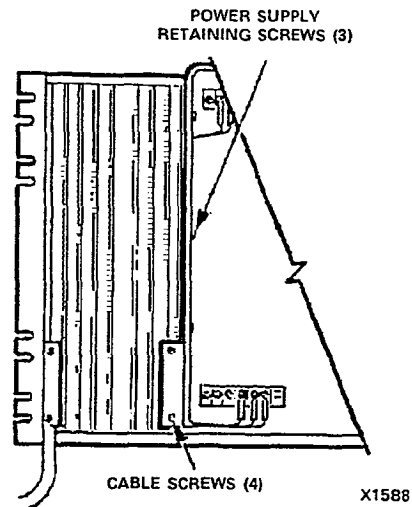
TOLLS REQUIRED
 1 flatblade screwdriver
 1 Phillips screwdriver

START

(1A) Complete Steps (1) to (3F) of MAP350-400

[1]
 AND

EXPOSE THE SYSTEM



AT REAR OF SYSTEM (FIGURE 402-1)

(2A) Remove the three screws that hold the power supply to the equipment shelf

(2B) Remove the power supply

[2]
 AND

REMOVE POWER SUPPLY

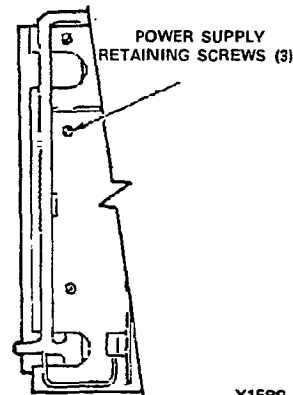


Figure 402-1
 Power Supply Mounting

AT THE FRONT OF THE EQUIPMENT
 (3A) Remove the eight 5-16 in. retaining screws and finishing washers

(3B) Remove the equipment shelf carefully sliding it forward

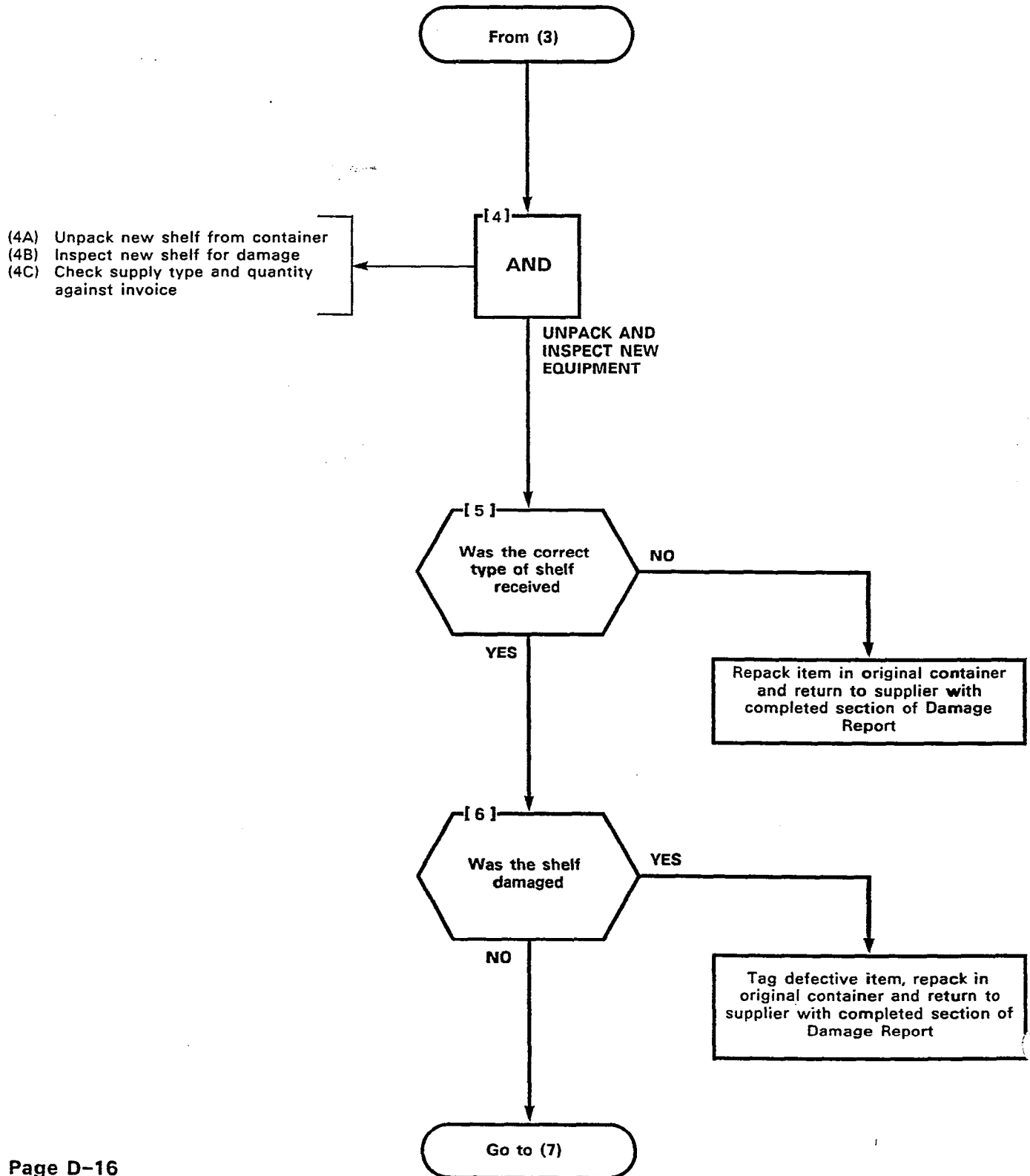
[3]
 AND

REMOVE THE EQUIPMENT SHELF

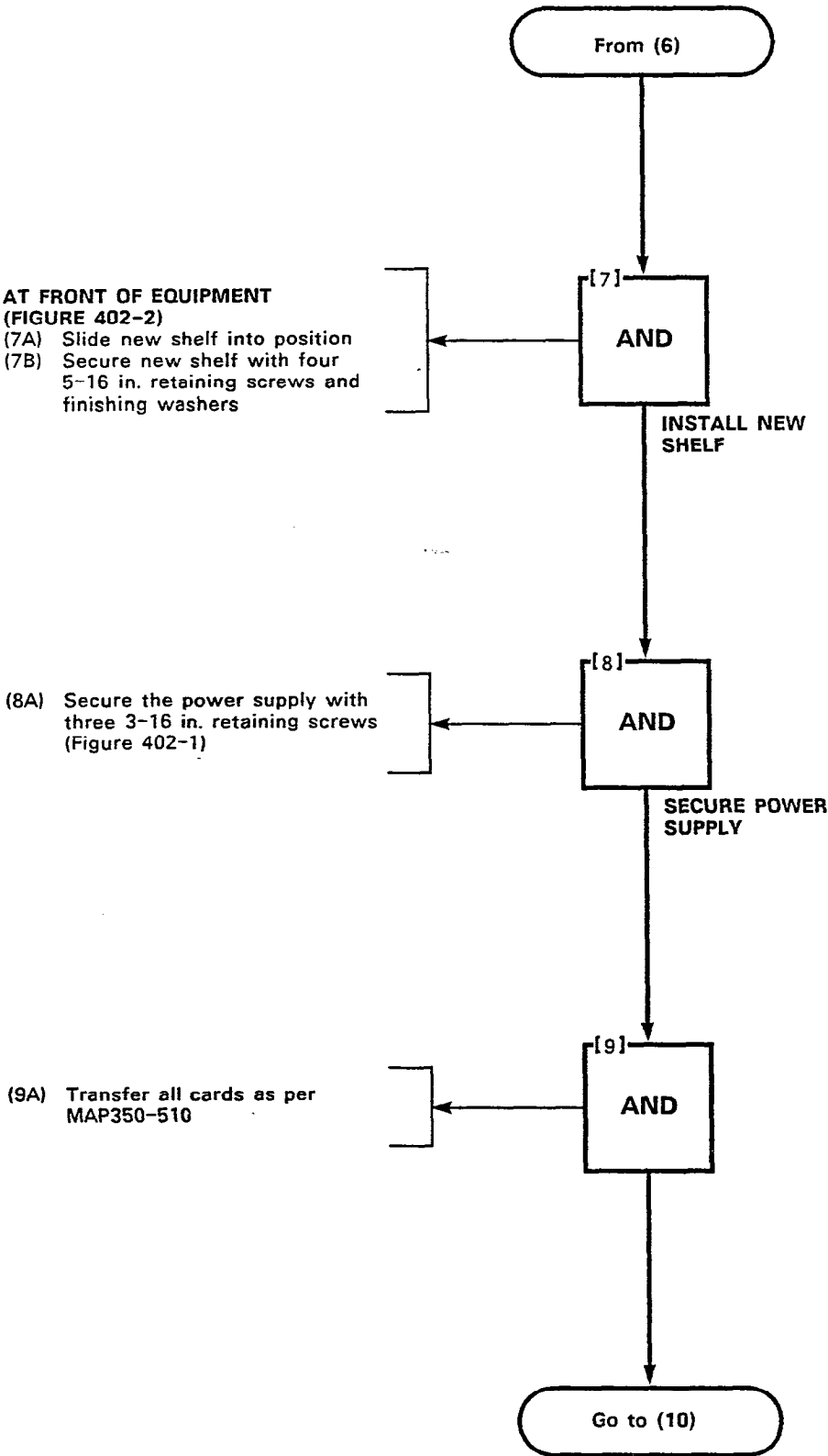
Go to (4)

SECTION MITL9105/9110-096-350-NA

REPLACE EQUIPMENT SHELF (SX-100)
MAP350- 402
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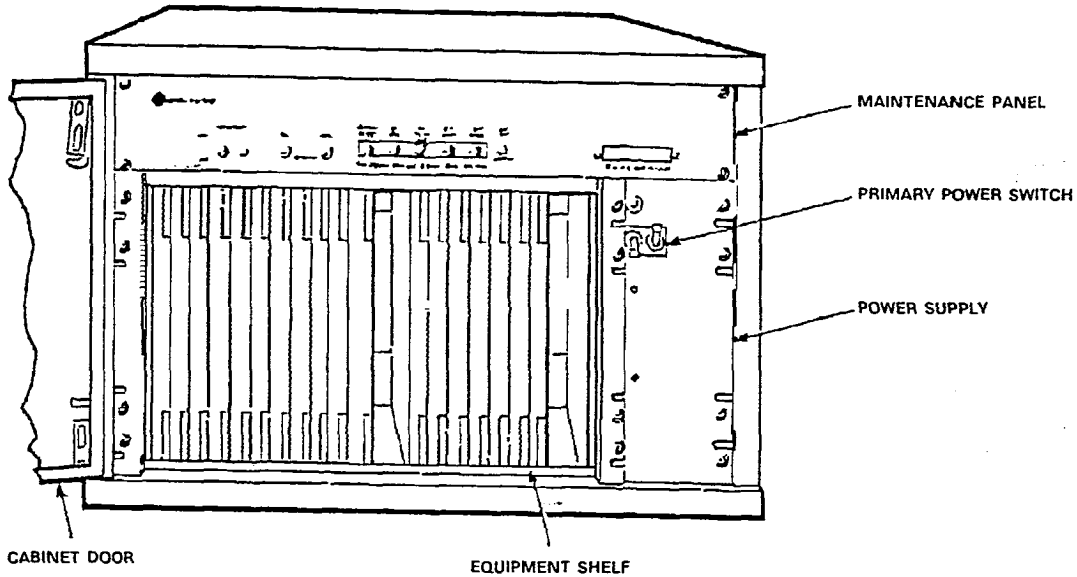


REPLACE EQUIPMENT SHELF (SX-100)
MAP350-402
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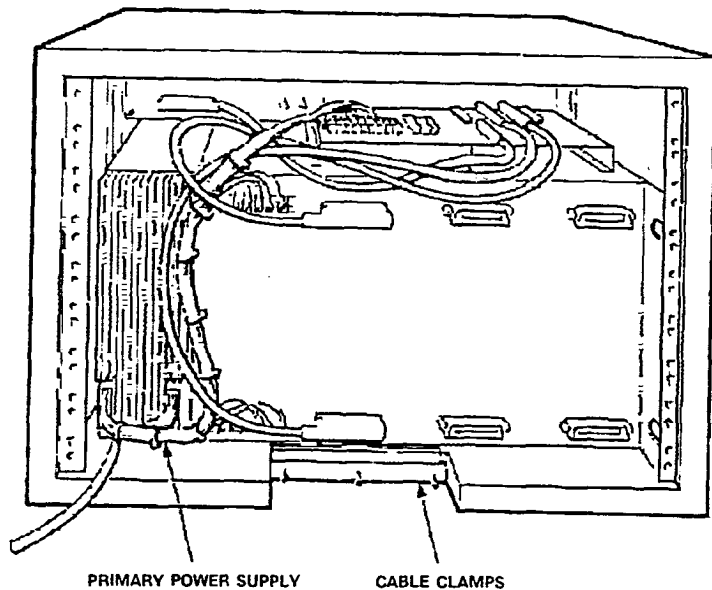


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REPLACE EQUIPMENT SHELF (SX-100)
MAP350- 402
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FRONT VIEW



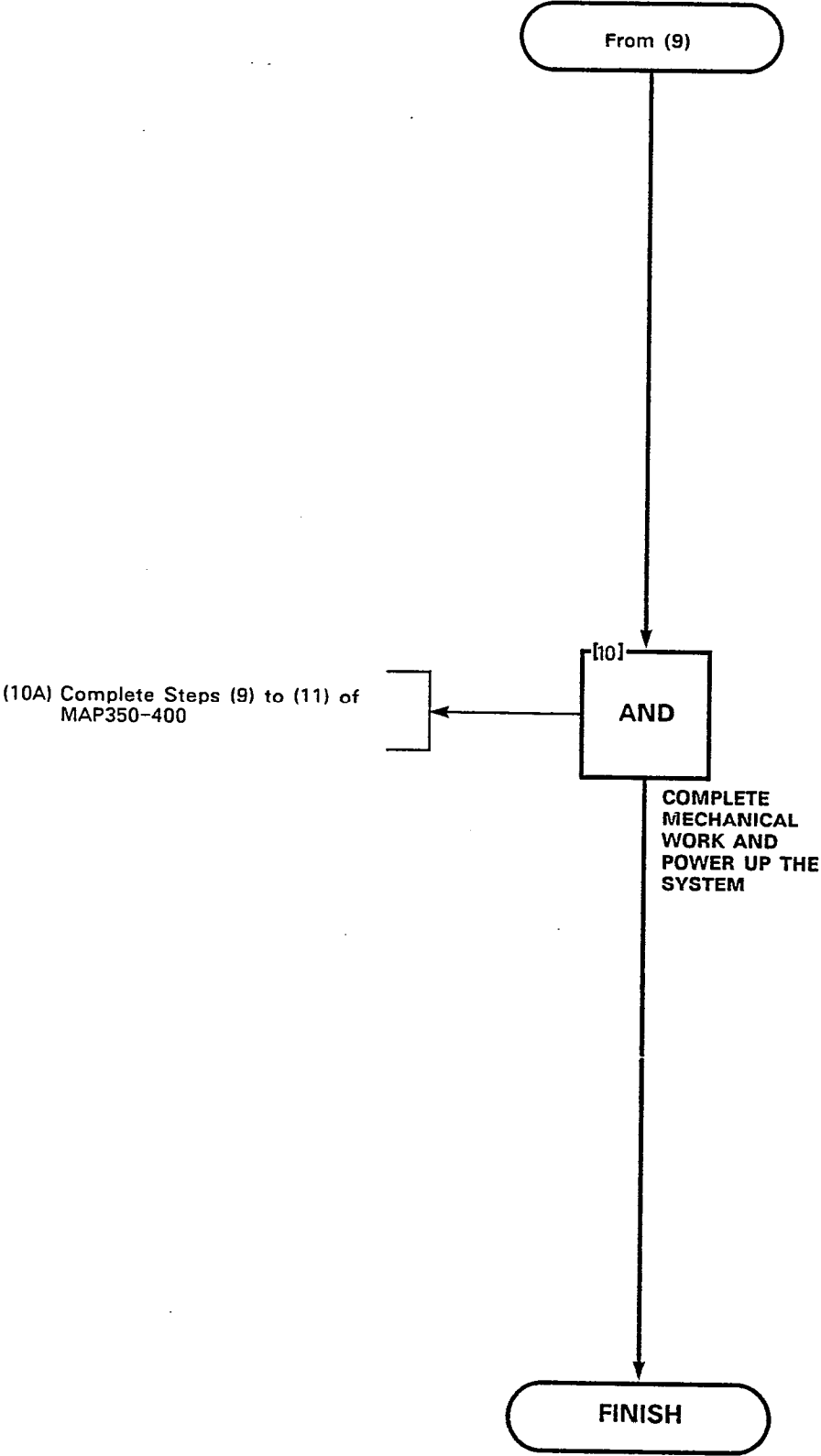
REAR VIEW

WEIGHT	HEIGHT	WIDTH	DEPTH
31.8 kg (70 lb)	422 mm (16.62 in.)	635 mm (25 in.)	470 mm (18.5 in.)

X5611

Figure 402-2 Shelf-Mounting Position

REPLACE EQUIPMENT SHELF (SX-100)
MAP350- 402
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100

100

REPLACE POWER SUPPLY (SX-100)
MAP350-403
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TOOL REQUIRED
1 flatblade screwdriver

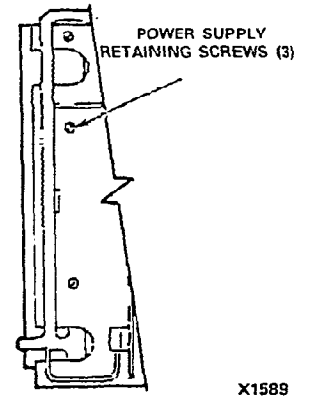
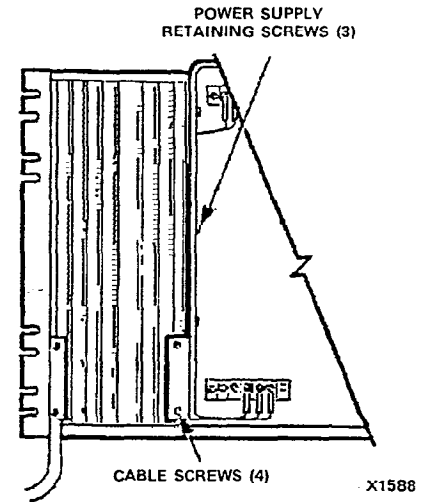
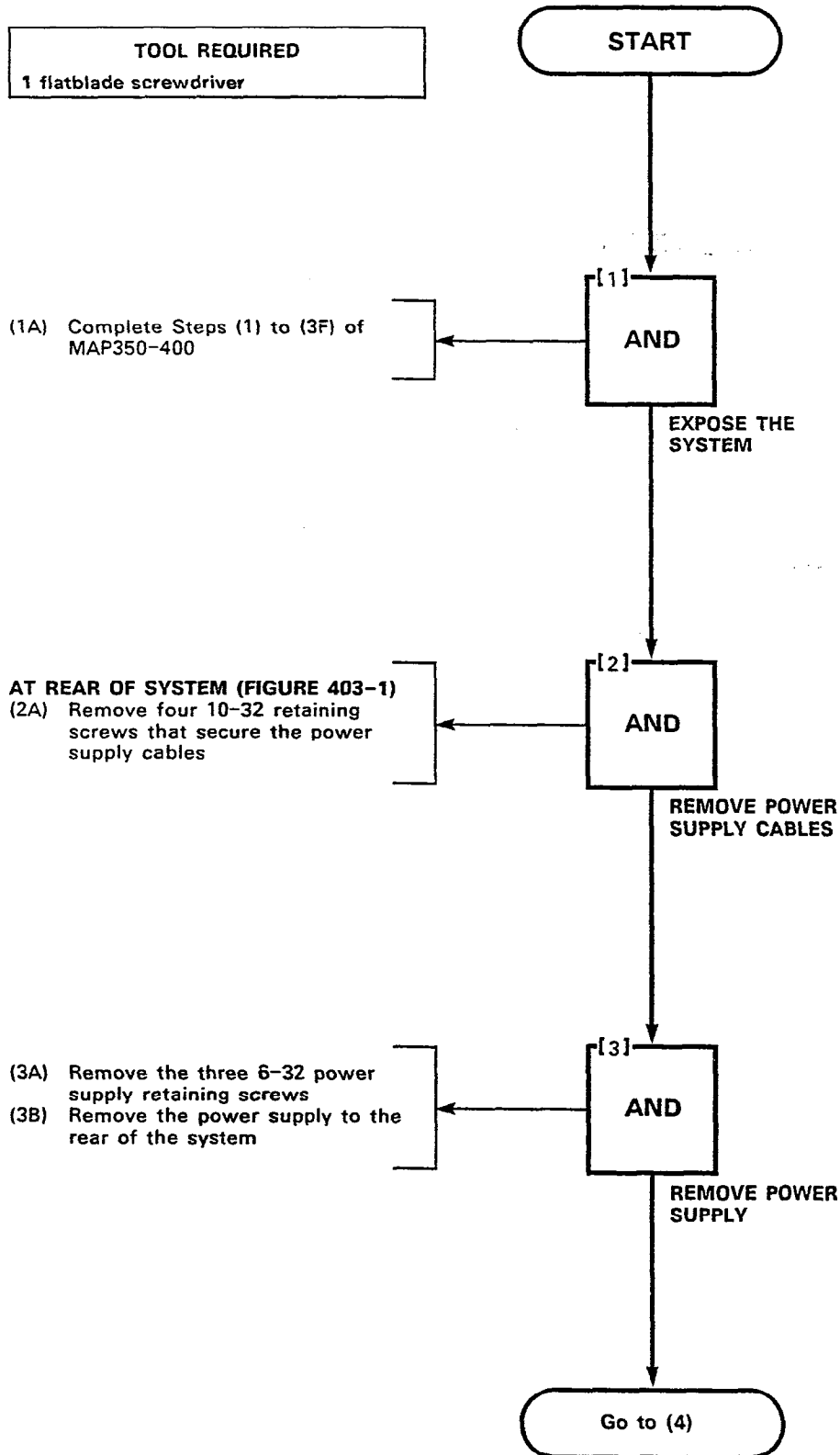
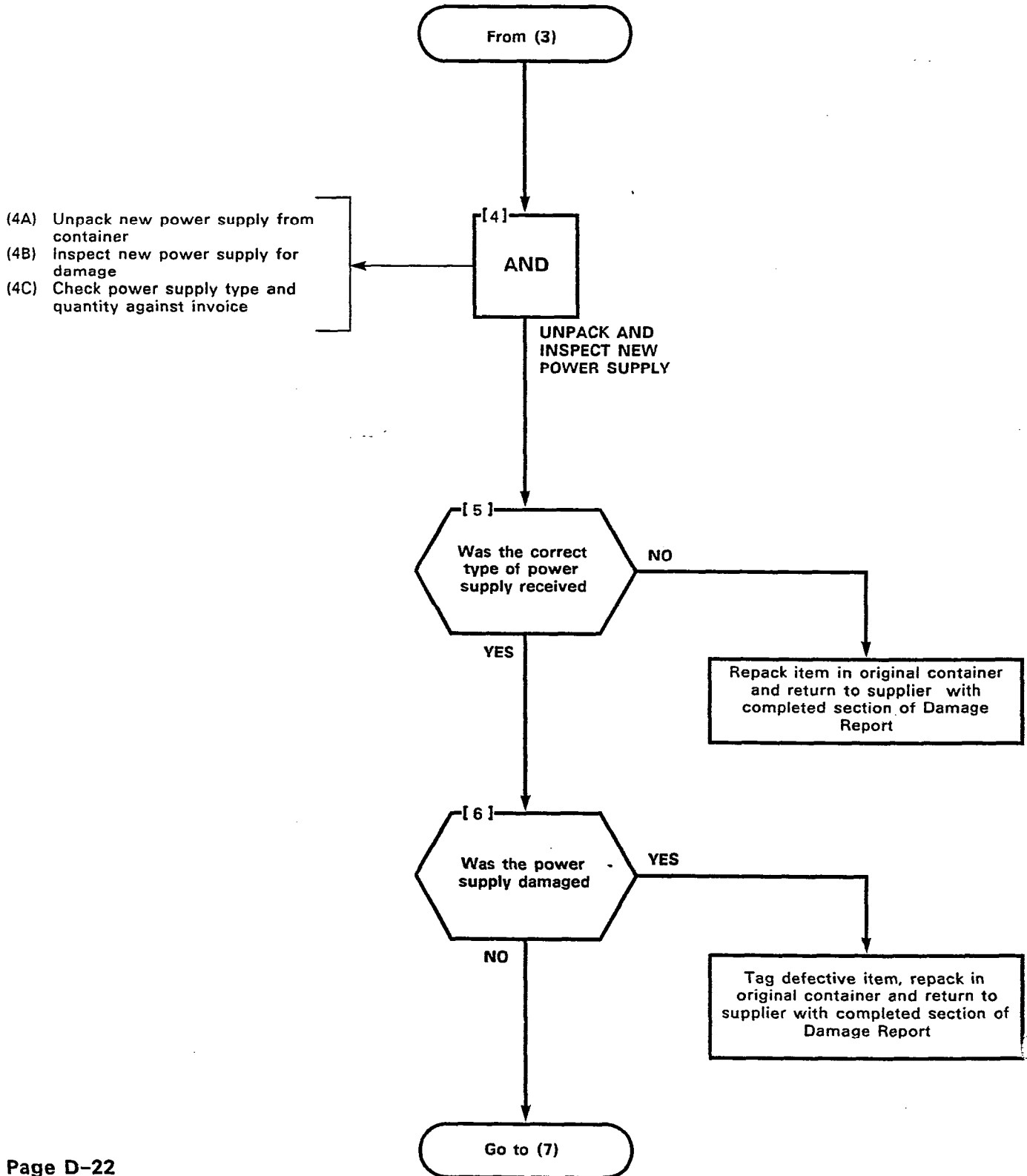
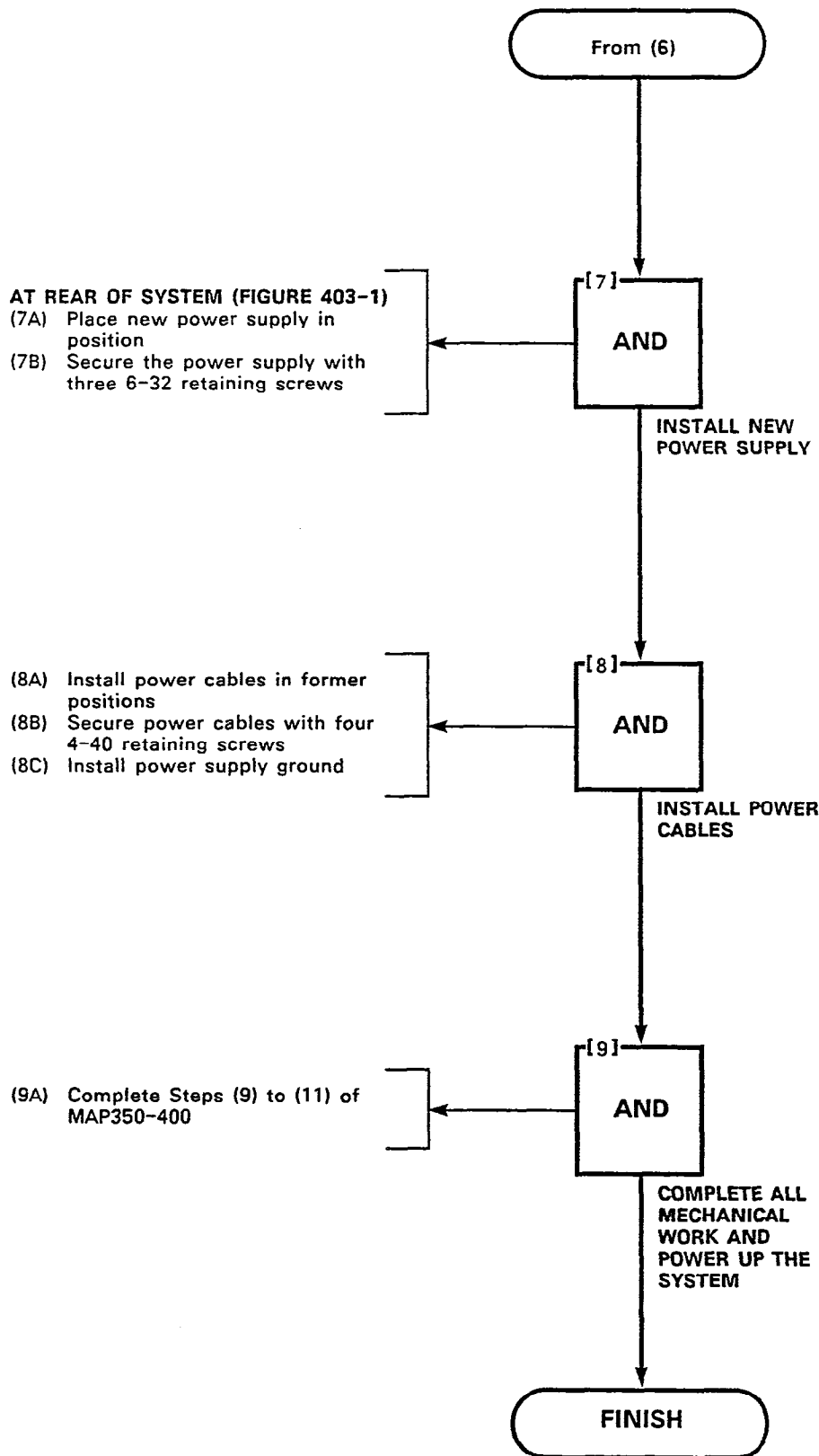


Figure 403-1
Power Supply Mounting

REPLACE POWER SUPPLY (SX-100)
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REPLACE POWER SUPPLY (SX-100)
MAP350-403
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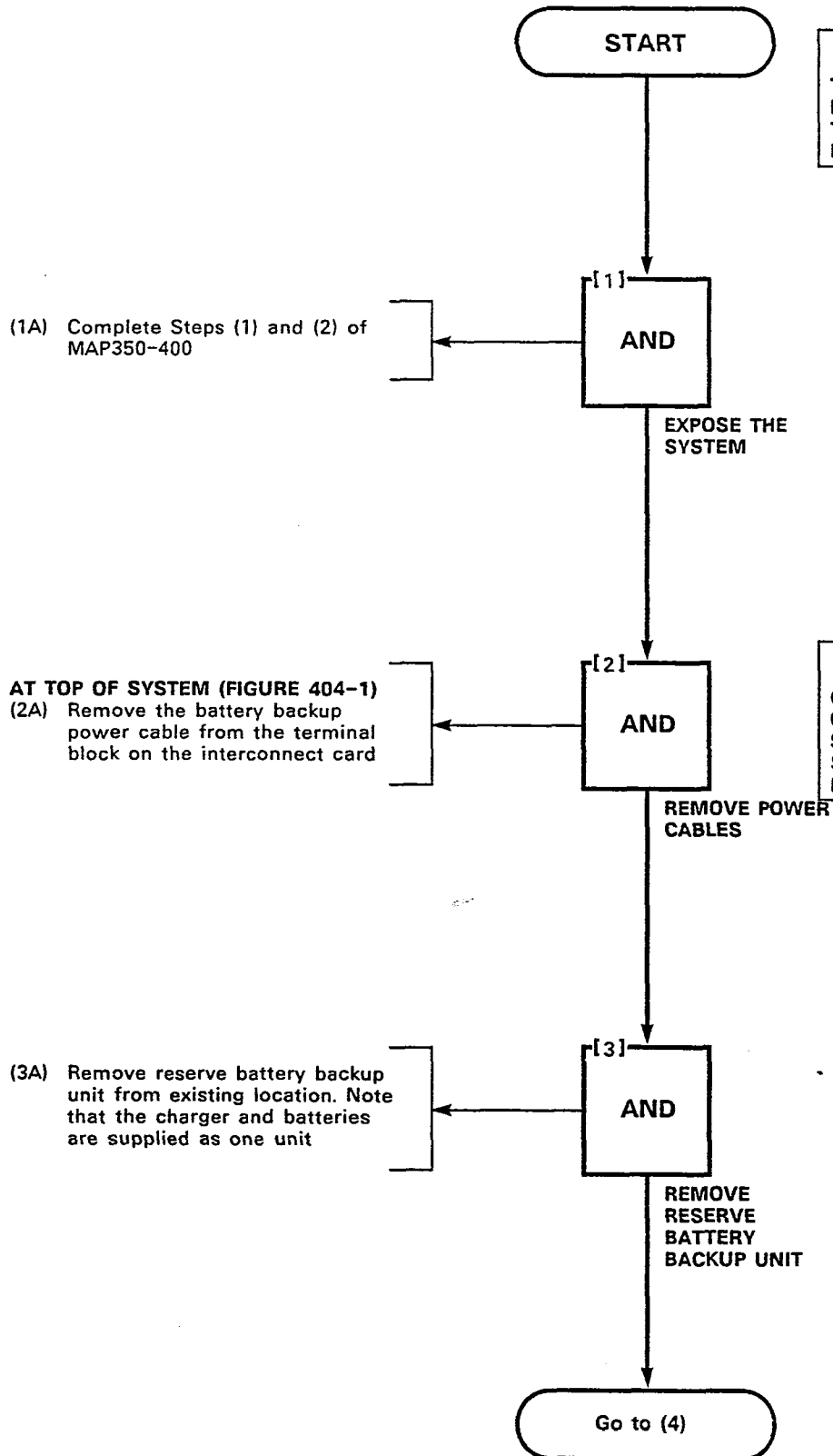


()

()

REPLACE RESERVE BATTERY BACKUP UNIT (SX-100)
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CAUTION
THE RESERVE BATTERY PACK WEIGHT IS 50 KG (125 LB). CARE MUST BE TAKEN WHEN LIFTING THE BATTERY PACK.



REPLACE RESERVE BATTERY BACKUP UNIT (SX-100)
MAP350- 404
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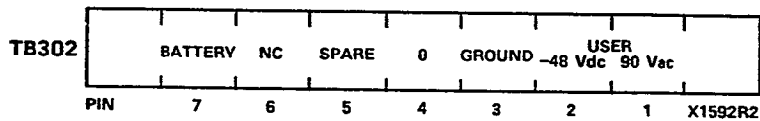
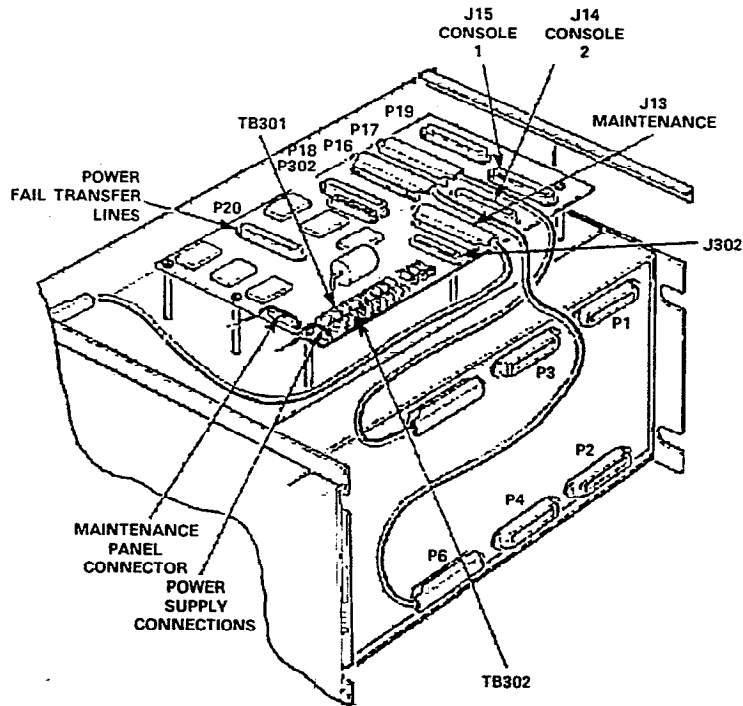
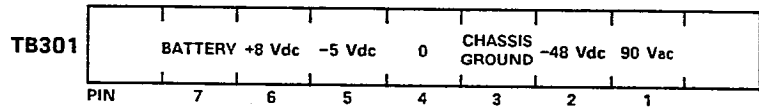
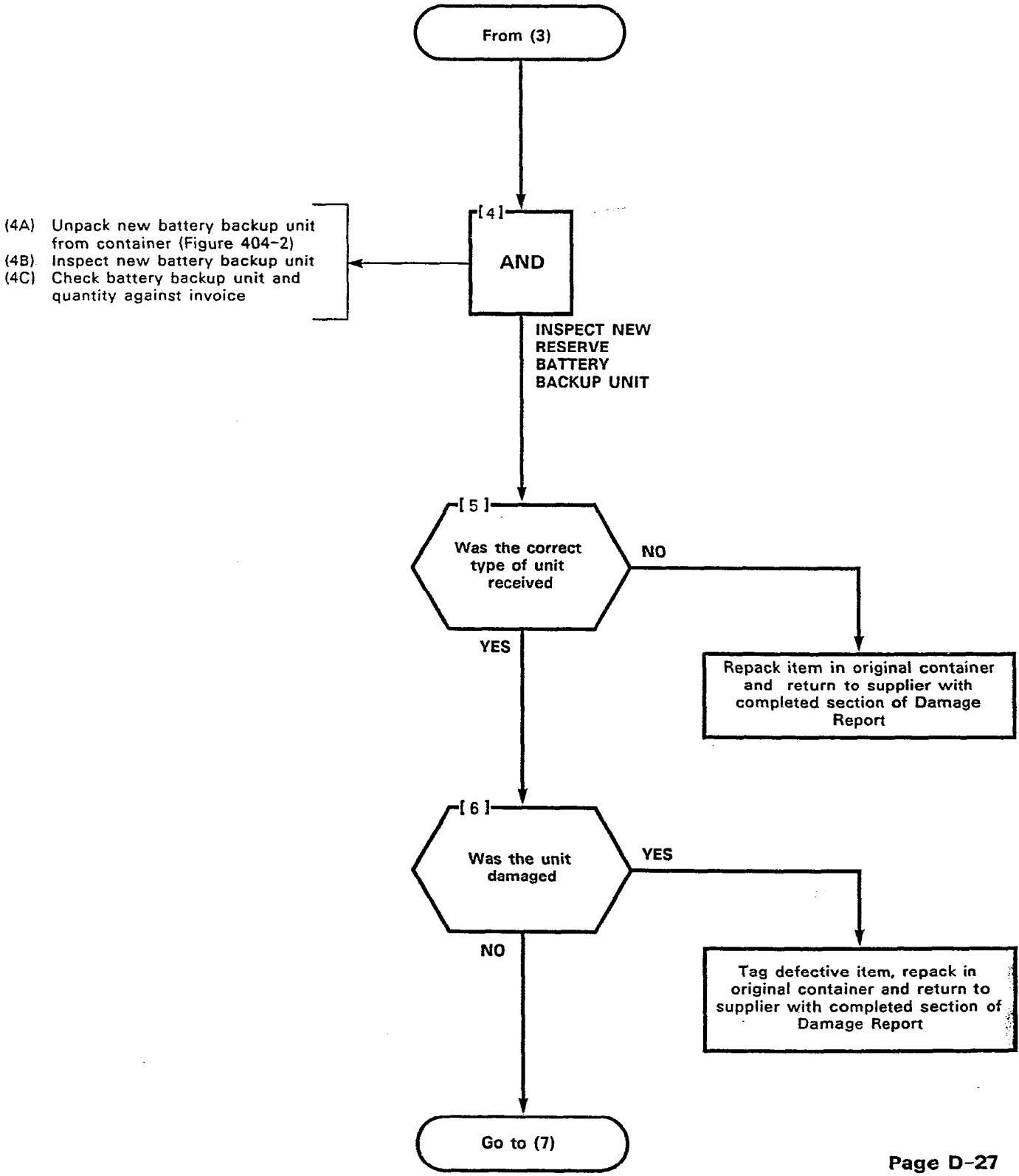


Figure 404-1 SX-100 Power Terminal Blocks (Interconnect Board)

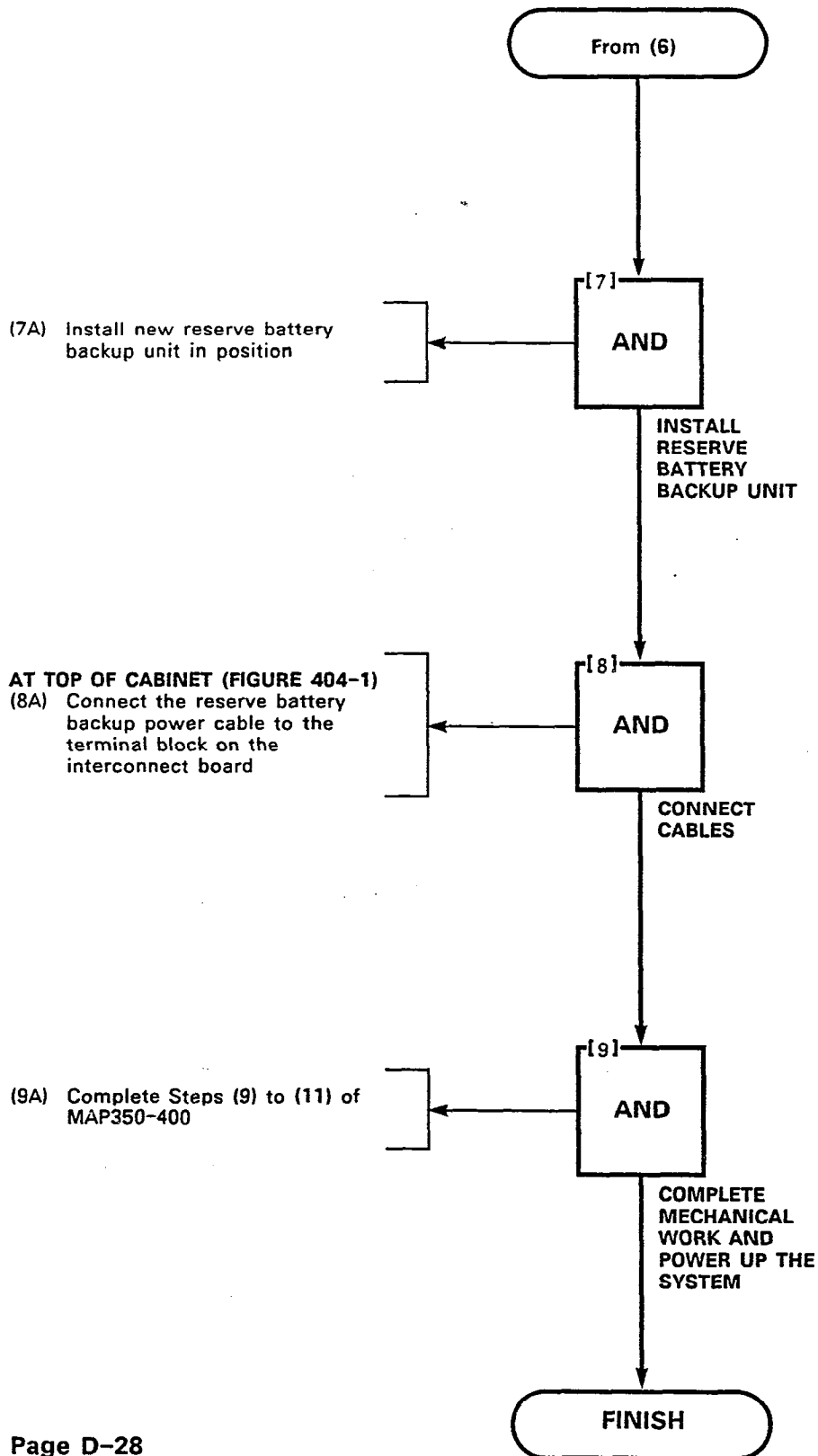
X952R3

REPLACE RESERVE BATTERY BACKUP UNIT (SX-100)
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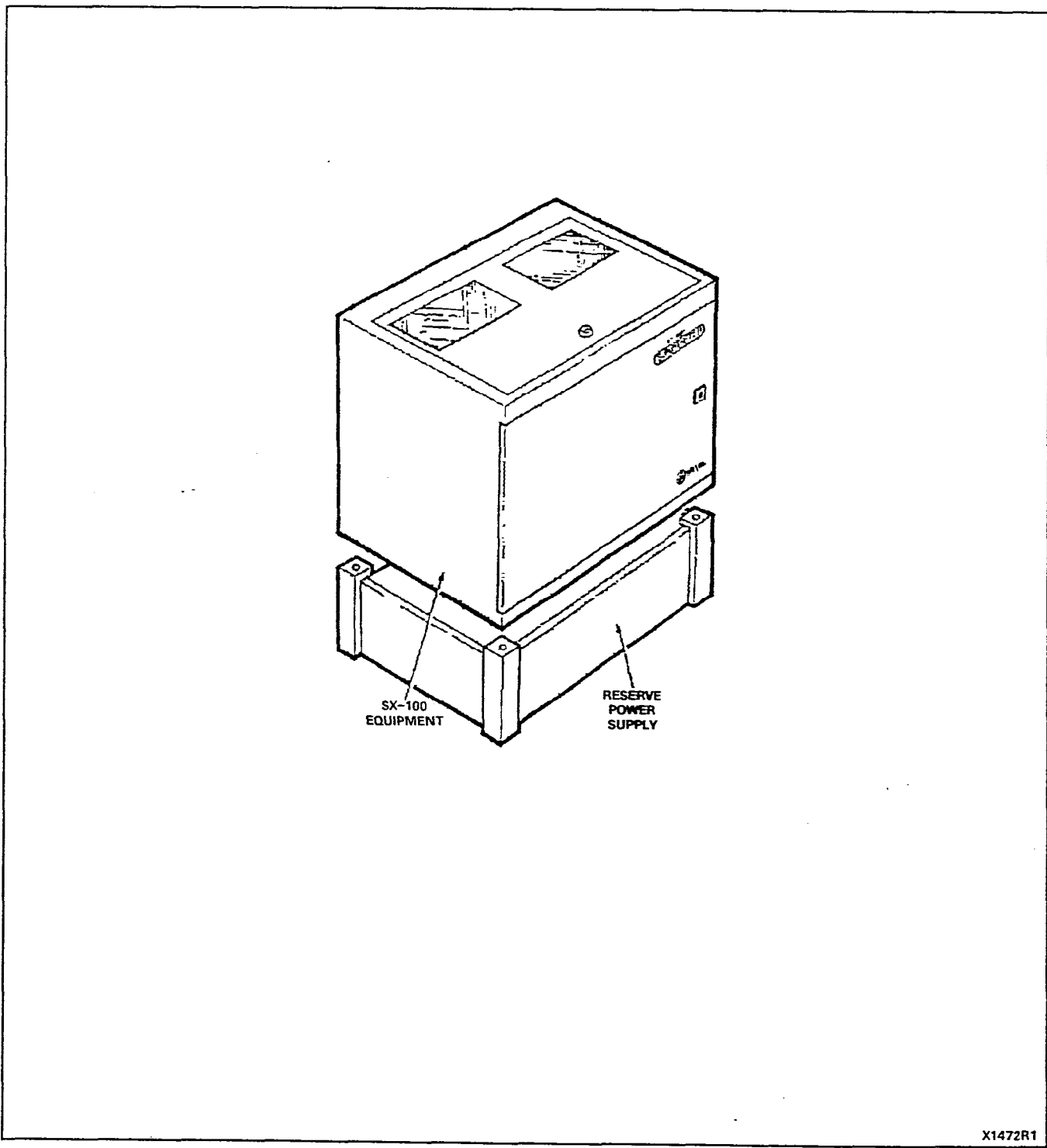


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REPLACE RESERVE BATTERY BACKUP UNIT (SX-100)
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REPLACE RESERVE BATTERY BACKUP UNIT (SX-100)
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X1472R1

Figure 404-2 Example of Reserve Battery Backup Unit

1000

1000

1000



1000

1000

1000

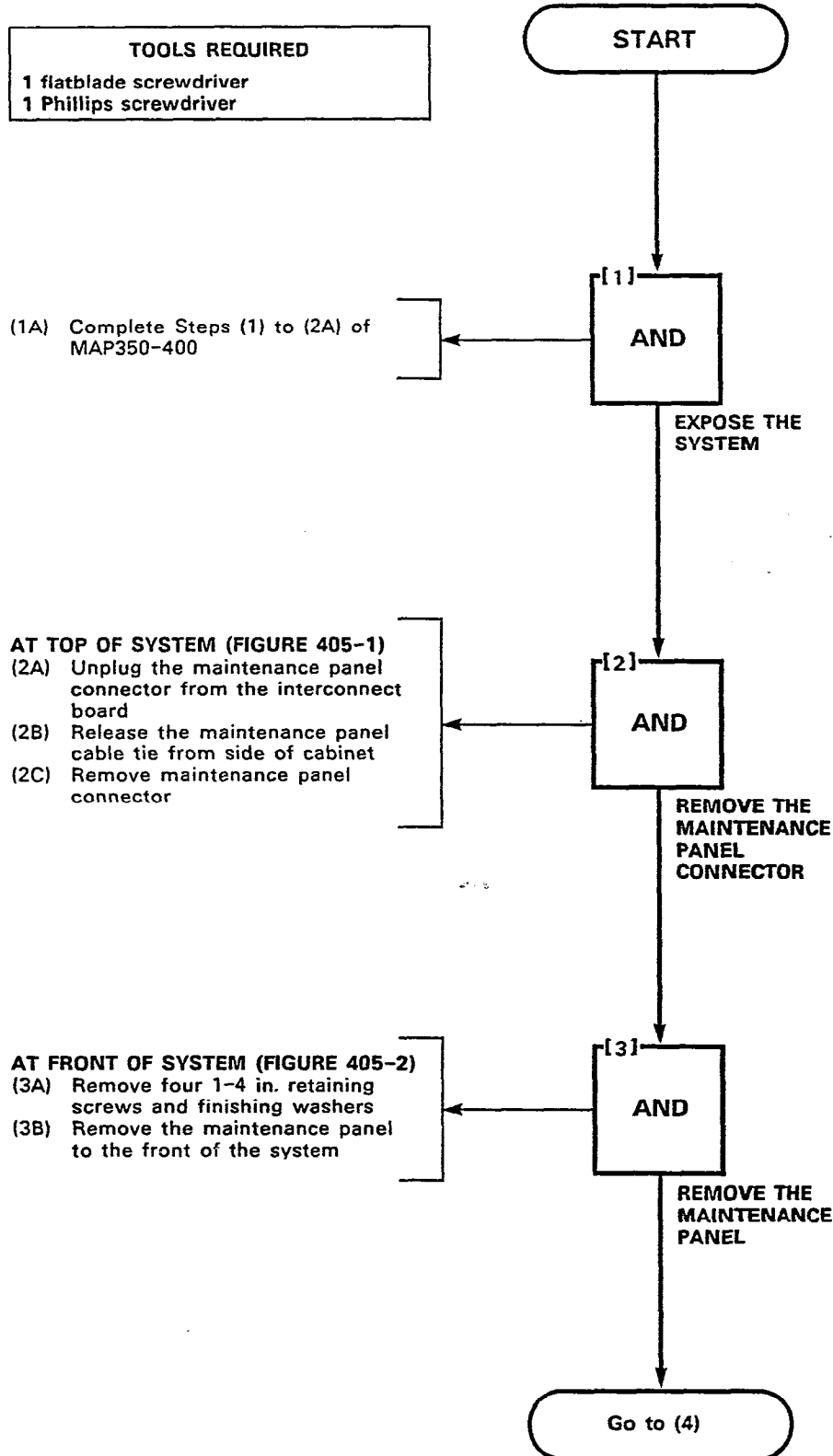
1000

1000

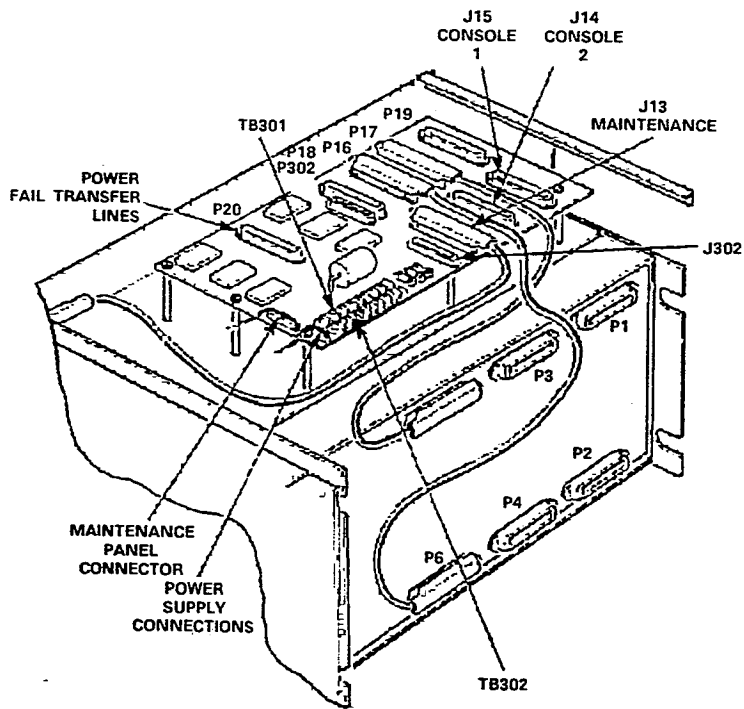
1000

REPLACE MAINTENANCE PANEL (SX-100)
MAP350-405
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TOOLS REQUIRED
 1 flatblade screwdriver
 1 Phillips screwdriver



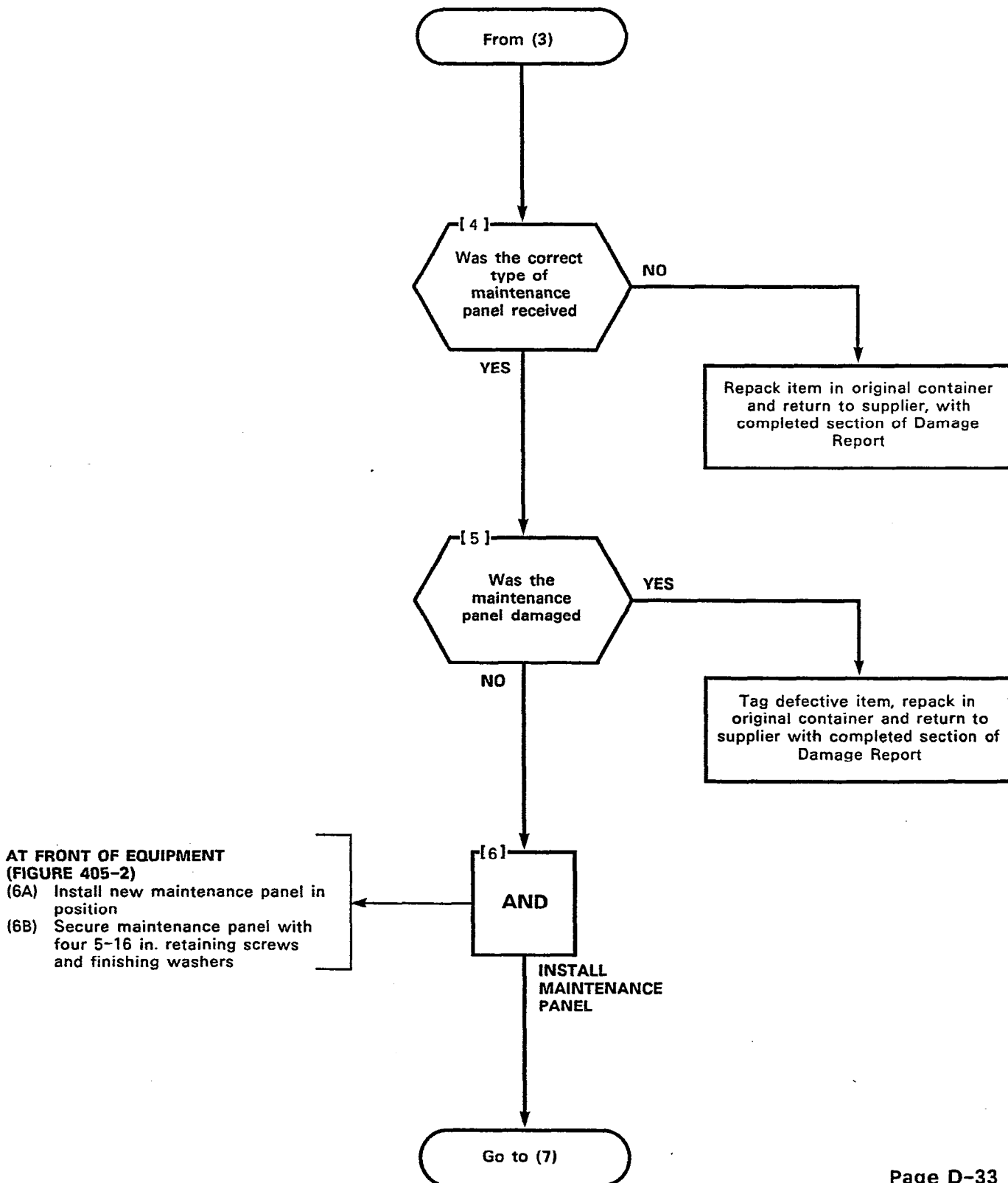
REPLACE MAINTENANCE PANEL (SX-100)
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X952R3

Figure 405-1 Maintenance Panel Connector

REPLACE MAINTENANCE PANEL (SX-100)
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REPLACE MAINTENANCE PANEL (SX-100)
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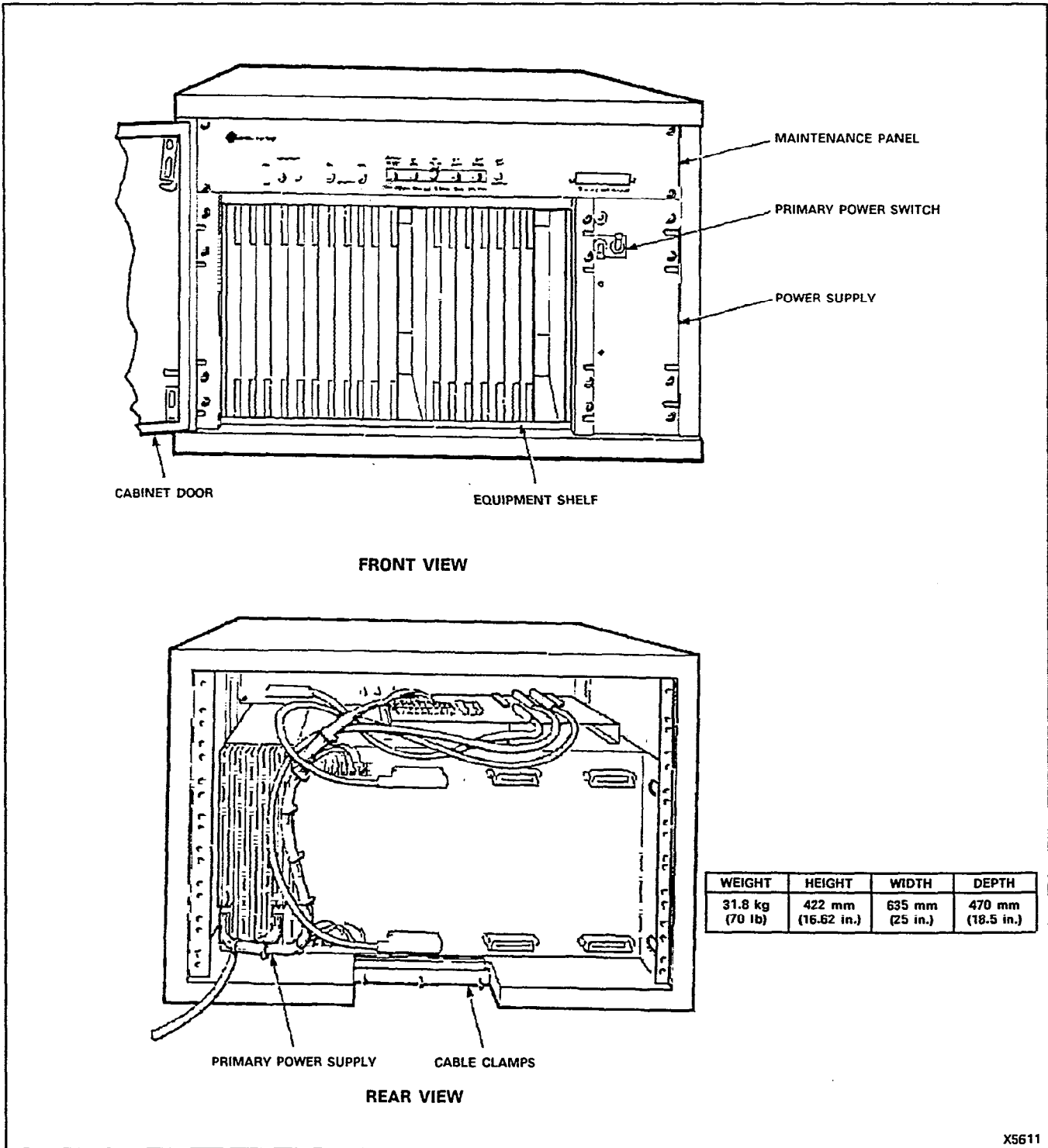
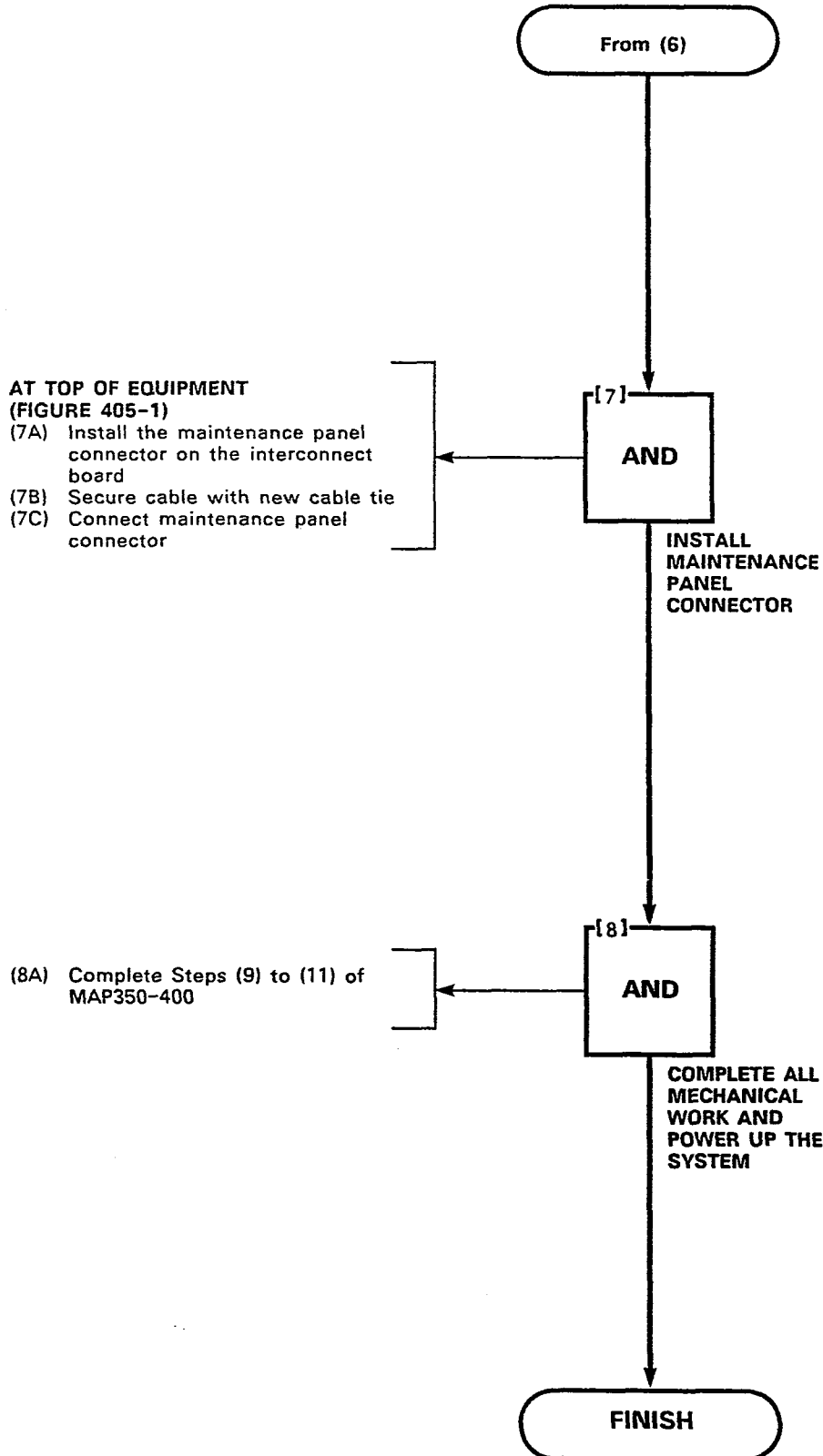
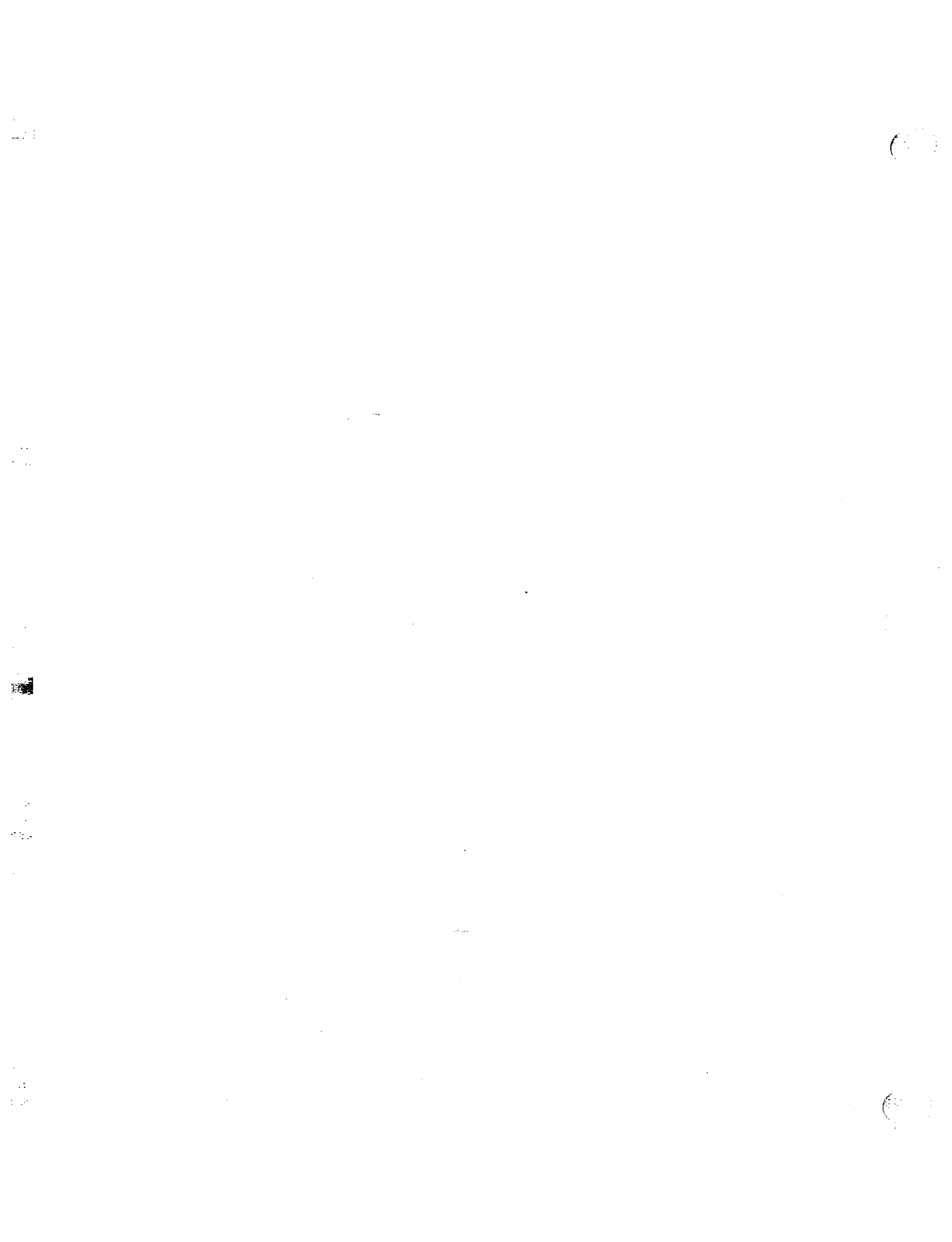


Figure 405-2 Maintenance Panel

REPLACE MAINTENANCE PANEL (SX-100)
MAP350- 405
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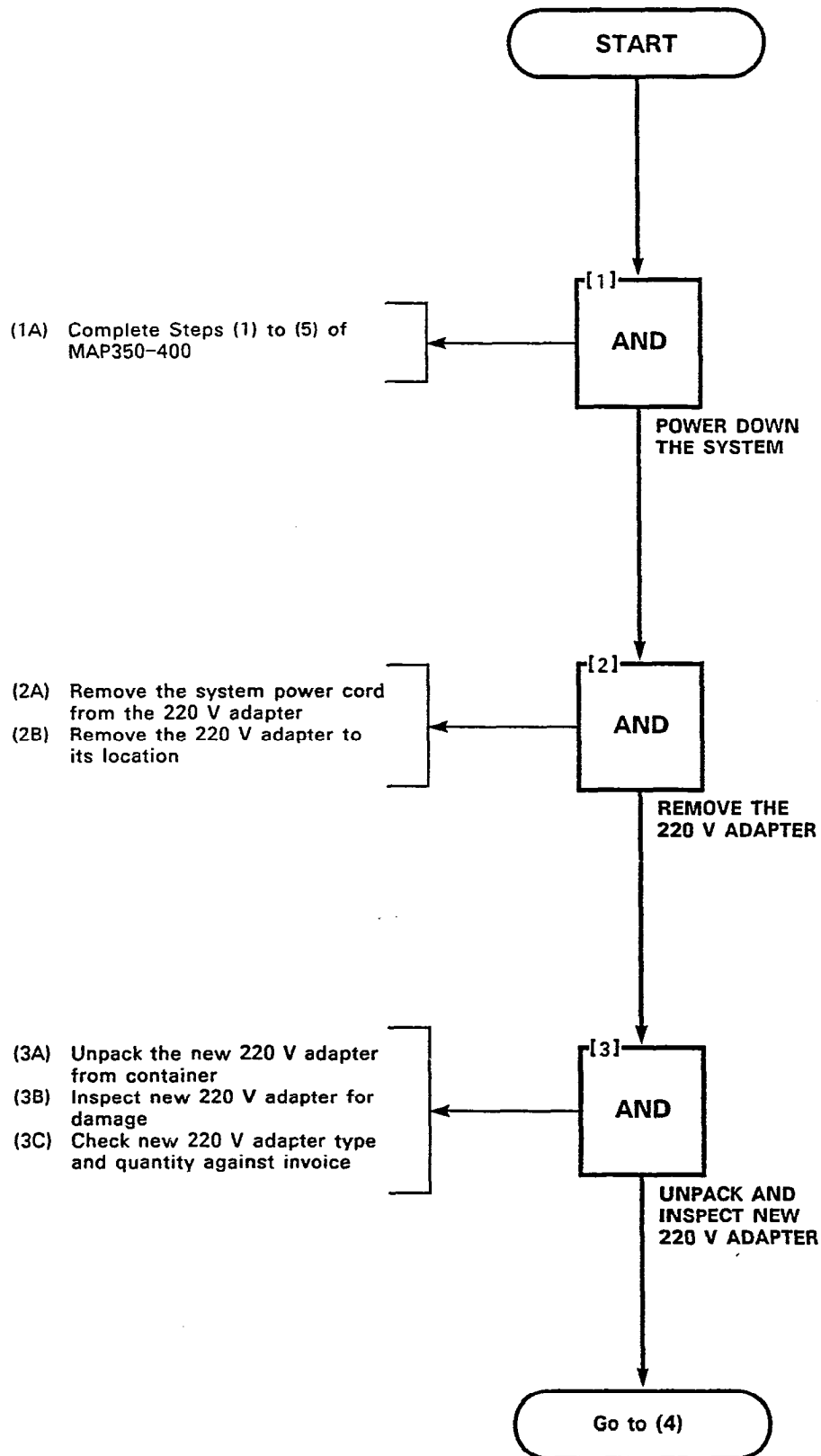


REPLACE 220 V ADAPTER (SX-100)

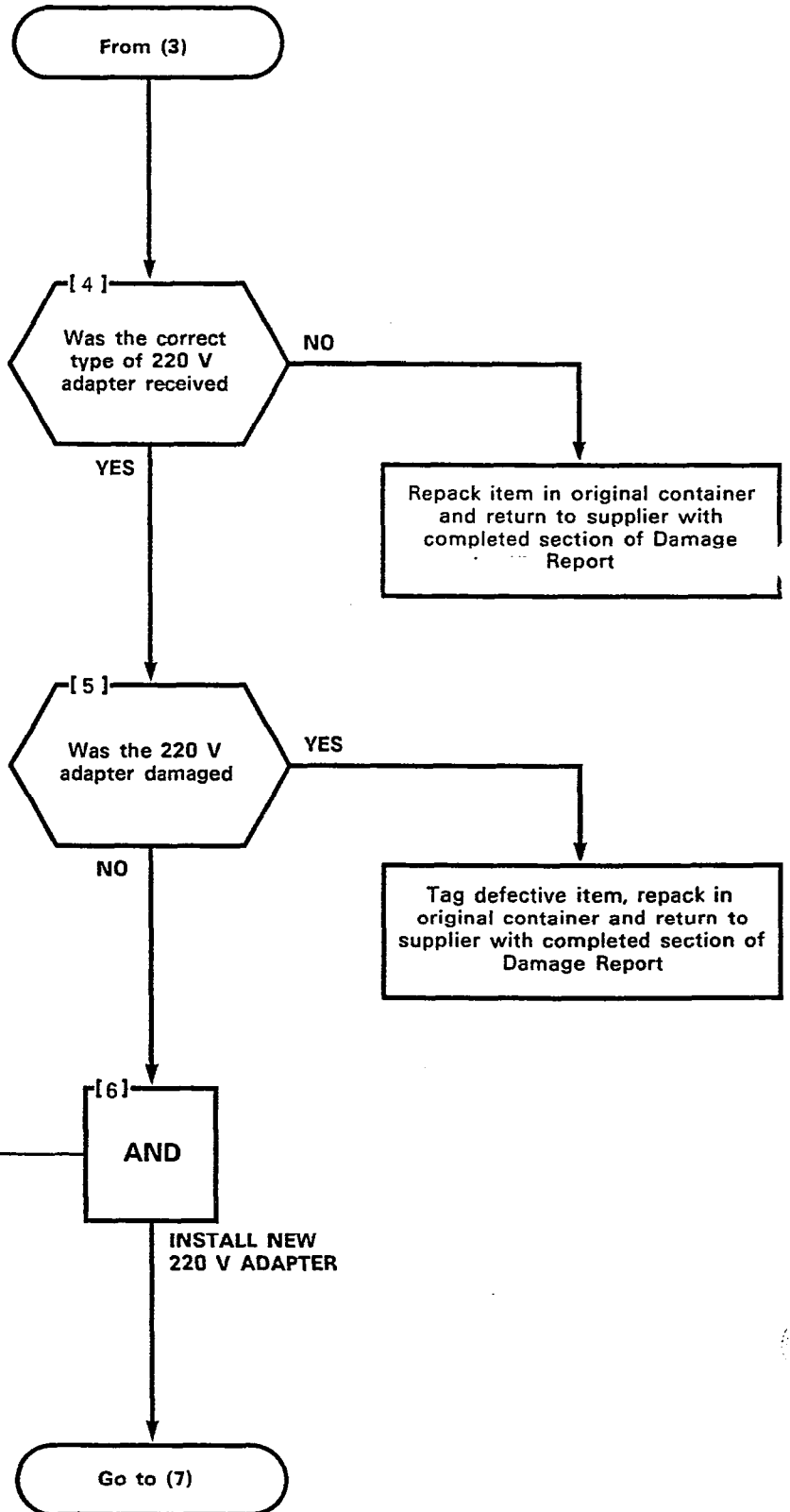
MAP350-406

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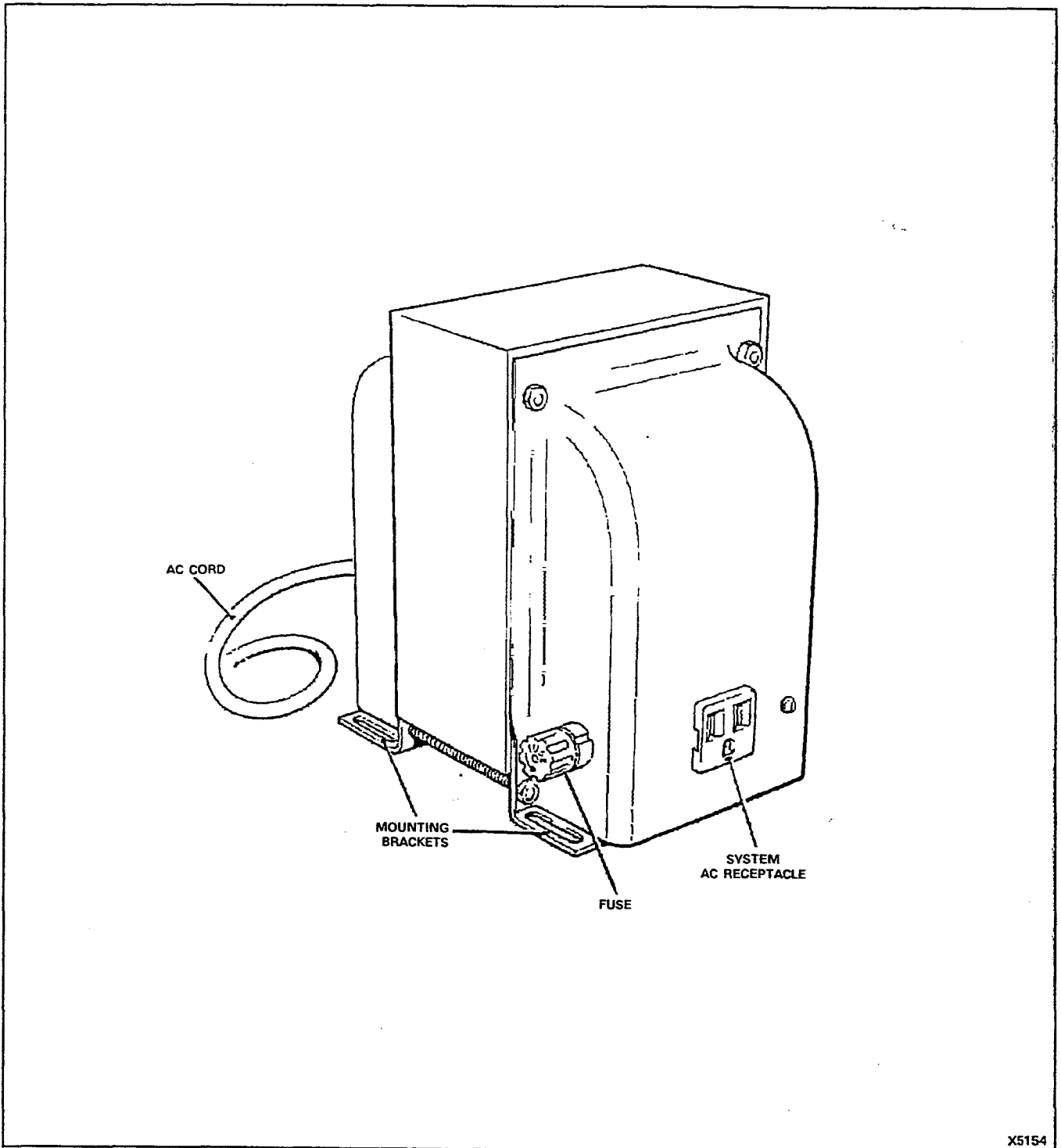


REPLACE 220 V ADAPTER (SX-100)
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- (6A) Place the new 220 V adapter in position
- (6B) Secure the 220 V adapter into its position
- (6C) Plug system power cord into 220 V adapter

REPLACE 220 V ADAPTER (SX-100)
MAP350- 406
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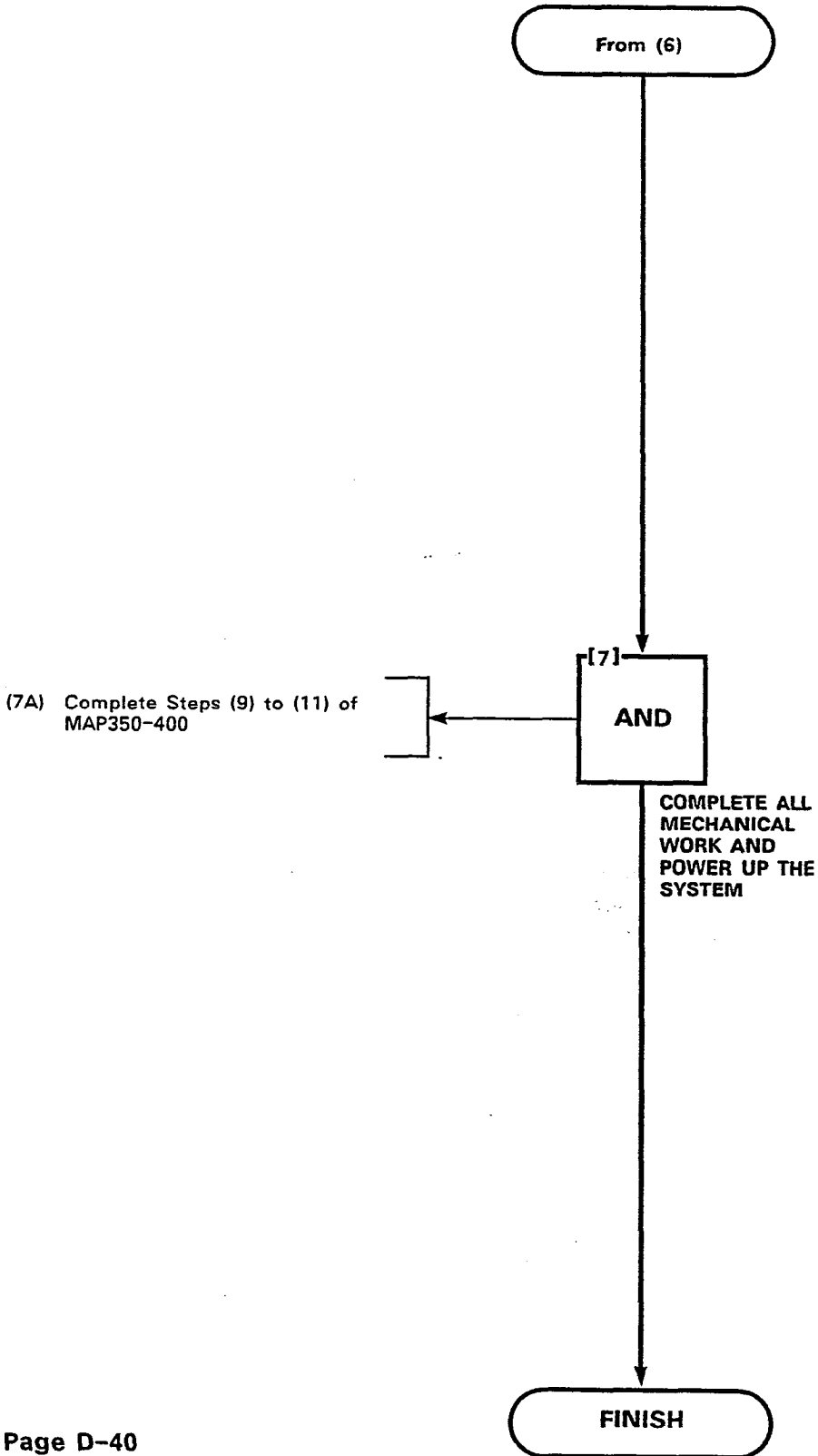


X5154

Figure 406-1 220 V Adapter

SECTION MITL9105/9110-096-350-NA

REPLACE 220 V ADAPTER (SX-100)
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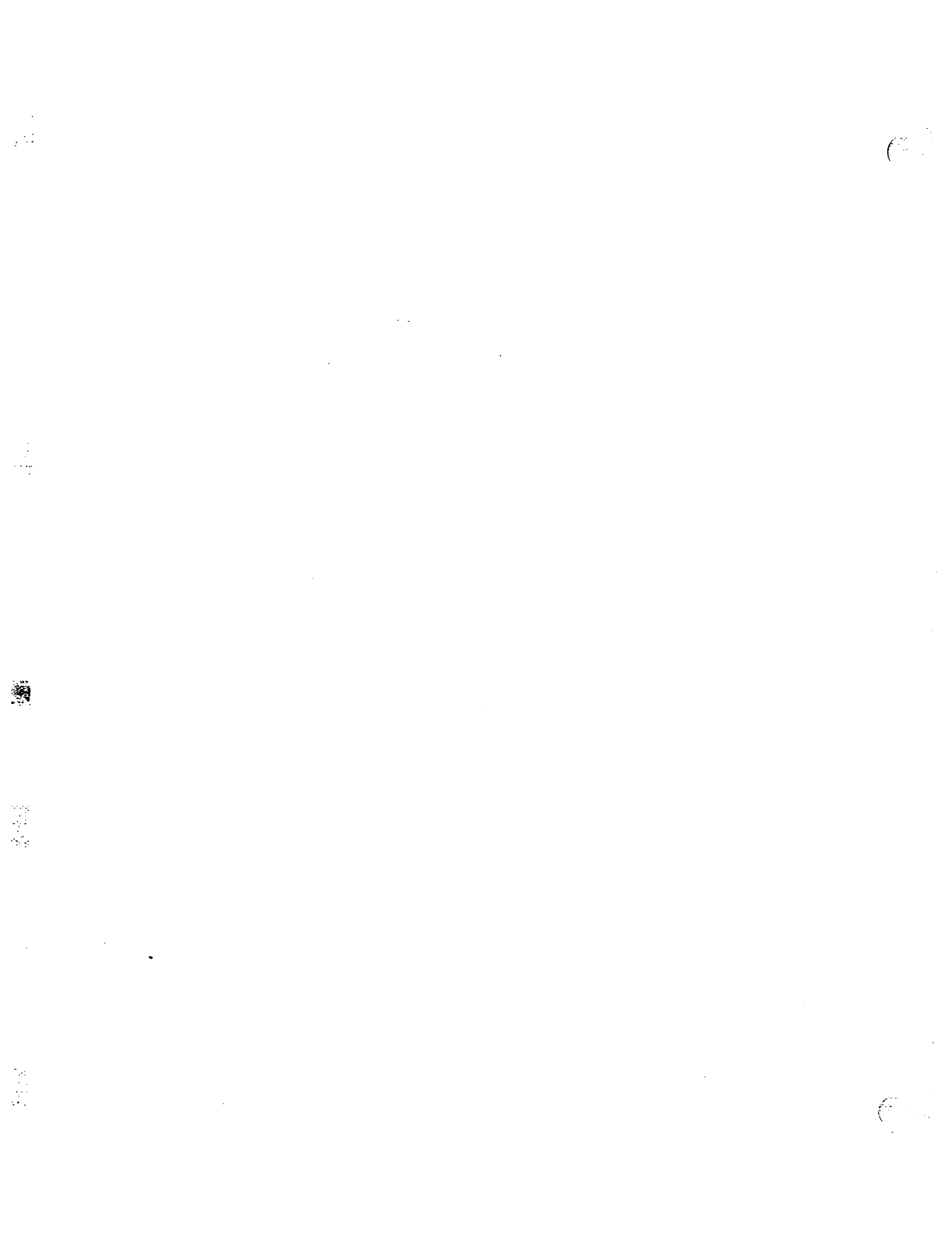
APPENDIX E**SX-200 MECHANICAL PROCEDURES****GENERAL**

E1.01 The MAPs contained in this Appendix detail the procedures to be performed in all mechanical work on the SX-200 system. These MAPs are used in conjunction with the MAPs outlined in other sections of this Practice. They will facilitate ease of replacement of component parts.

E1.02 The basic synopsis of this Appendix is that if a component part has been judged to be defective by the use of the MAPs, replace it.

**TABLE E1-1
SX-200 MECHANICAL PROCEDURE**

Title	Reference
Replace Console and/or Console Cable	MAP350-501
Replace Interconnect Card	MAP350-502
Replace Power Fail Transfer Card	MAP350-503
Replace Console Interface Card	MAP350-504
Replace First or Second Shelf	MAP350-505
Replace Heat Sink Assembly	MAP350-506
Replace Power Supply Assembly	MAP350-507
Replace Reserve Battery Backup Supply	MAP350-508
Replace Backplane Translator Board	MAP350-509
Replace Cards in Shelf	MAP350-510
Replace Maintenance Panel	MAP350-511
Replace Wiring Harness	MAP350-512



REPLACE CONSOLE AND/OR CONSOLE CABLE (SX-200)
MAP350- 501
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TOOL REQUIRED
1 Phillips screwdriver

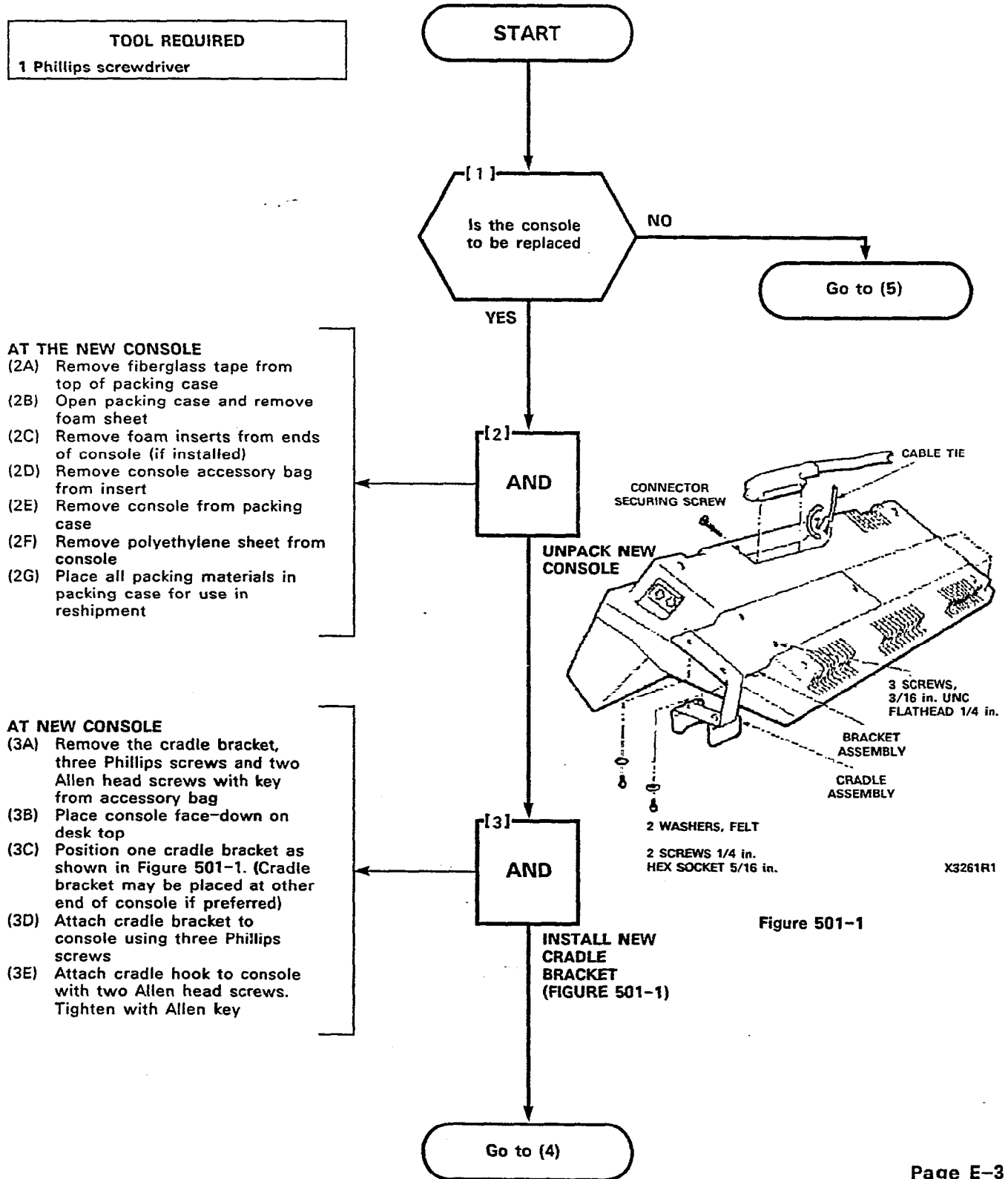
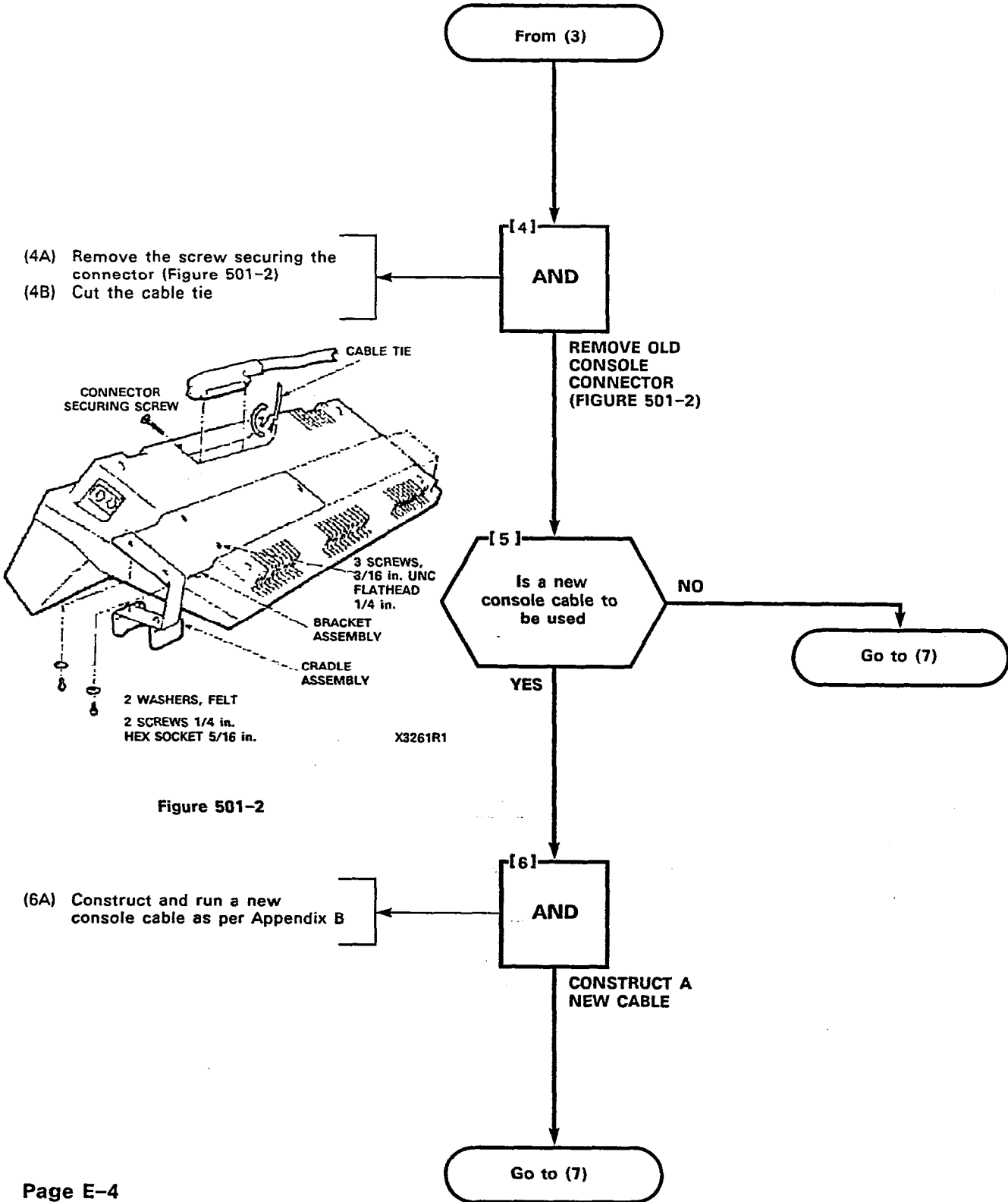


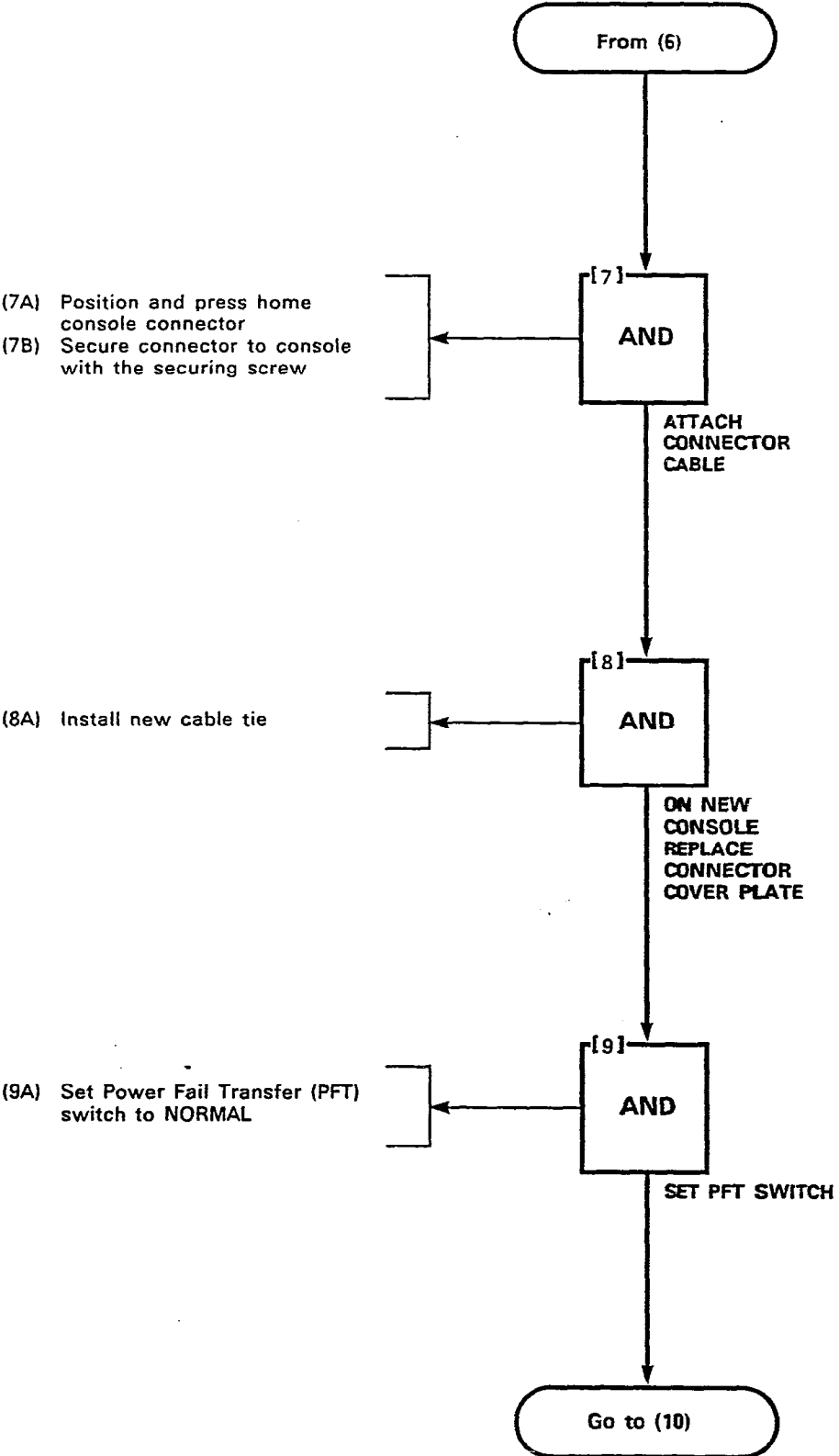
Figure 501-1

X3261R1

REPLACE CONSOLE AND/OR CONSOLE CABLE (SX-200)
MAP350- 501
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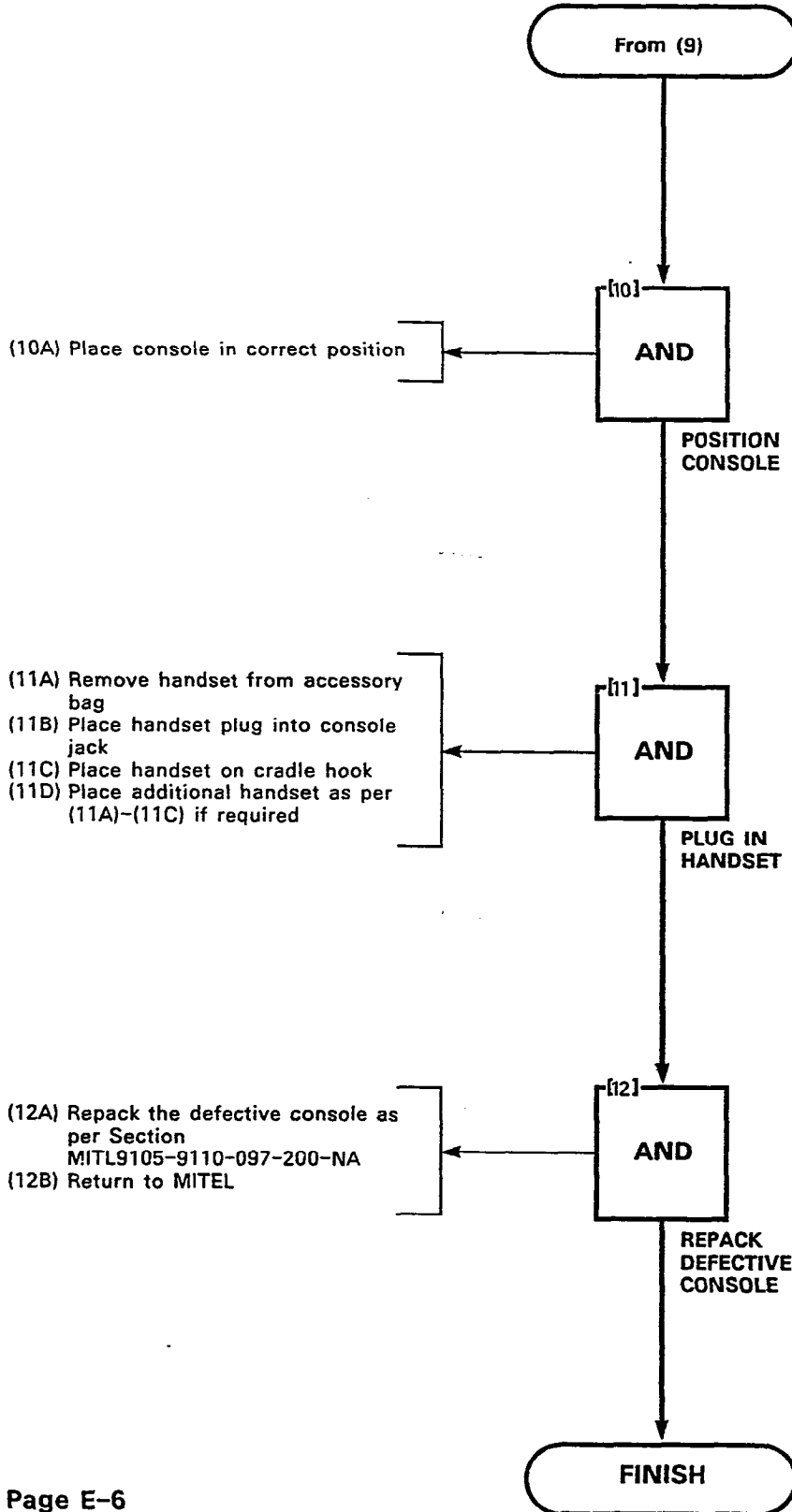


REPLACE CONSOLE AND/OR CONSOLE CABLE (SX-200)
MAP350-501
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REPLACE CONSOLE AND/OR CONSOLE CABLE (SX-200)
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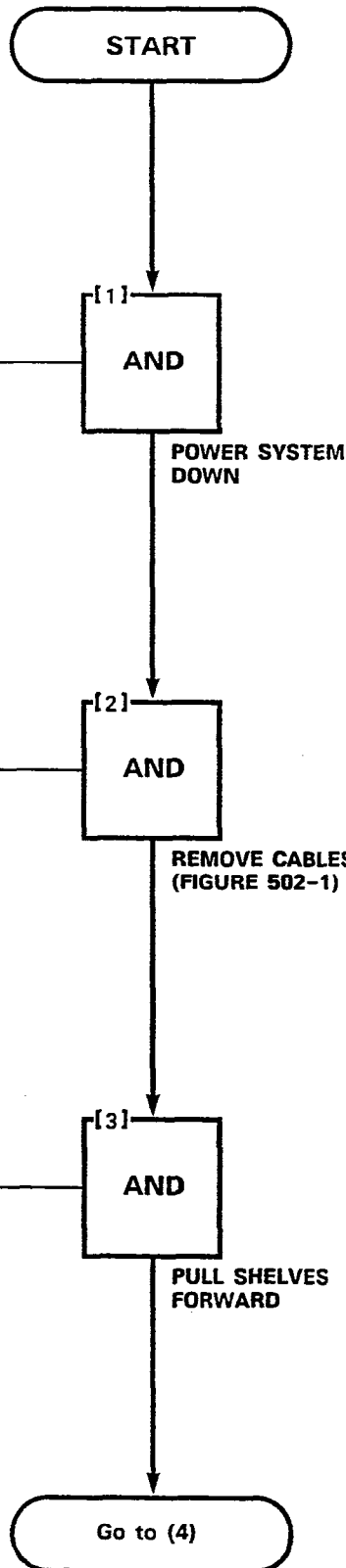
REPLACE INTERCONNECT CARD (SX-200)
MAP350- 502
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TOOL REQUIRED
1 flatblade screwdriver

- (1A) Unlock and open front door
- (1B) Unlock and open rear door
- (1C) Unlock and open rear panel assembly
- (1D) Set system power switch to OFF
- (1E) Set all power switches on rear door to OFF
- (1F) Set battery switch to OFF
- (1G) Remove power cable(s) from commercial AC source

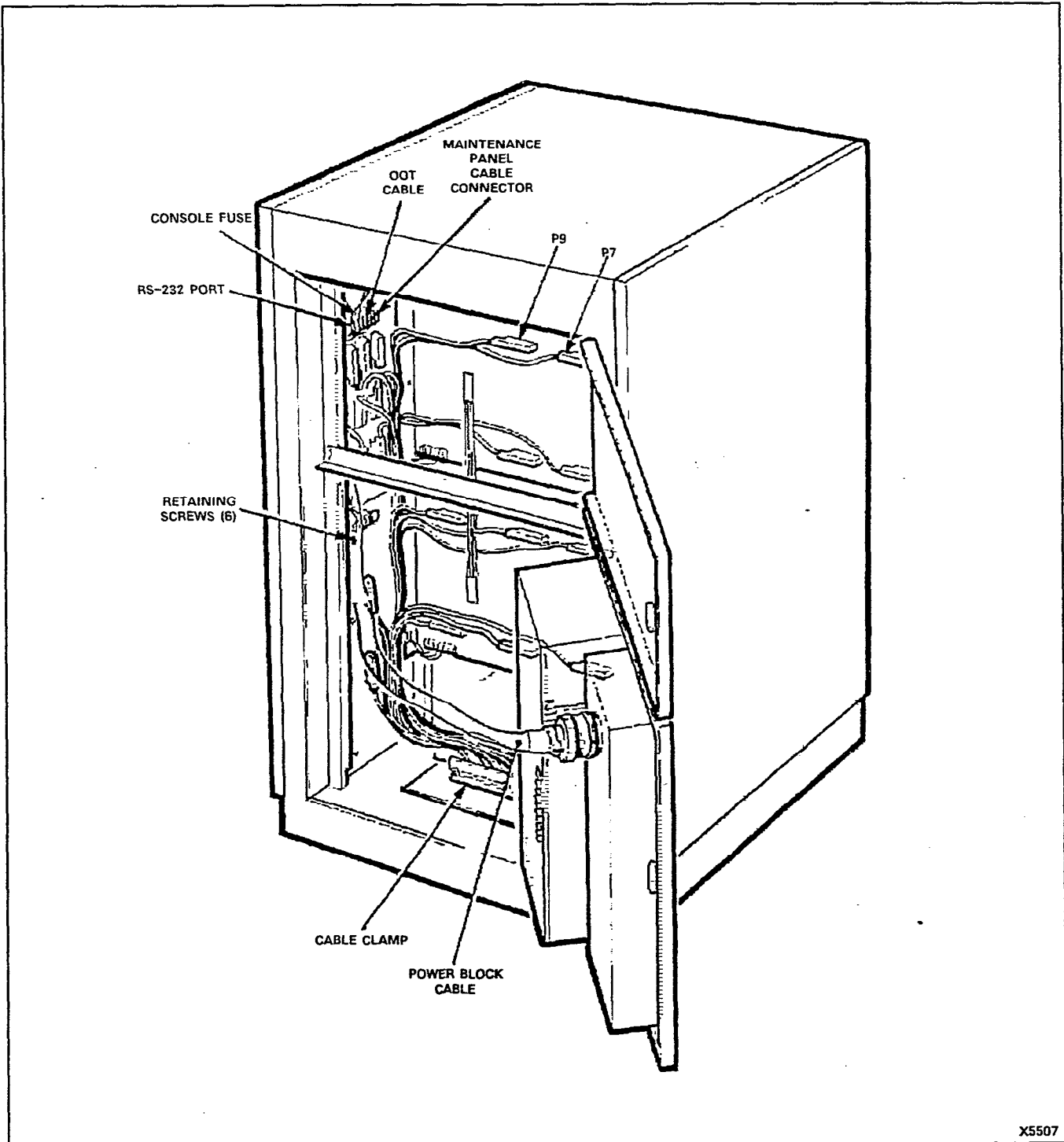
- AT REAR OF CABINET**
- (2A) Remove cables J13, J14, J15, P16, P17, P18 and P19 (Figure 502-3)
 - (2B) Remove cable from RS-232 port (optional)
 - (2C) Remove OOT cable and maintenance panel connectors
 - (2D) Remove power cable from terminal block

- AT THE REAR OF THE CABINET**
- (3A) Loosen cable clamps so that the cables have approximately 25 cm (10 in.) of slack (Figure 502-1)
- AT FRONT OF CABINET (FIGURE 502-2)**
- (3B) Unscrew eight 1-4 X 3-8 retaining screws from the front of the equipment shelves
 - (3C) Pull equipment shelves forward approximately 5 cm (2 in.)



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REPLACE INTERCONNECT CARD (SX-200)
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X5507

Figure 502-1 Rear Door Cable Locations

REPLACE INTERCONNECT CARD (SX-200)
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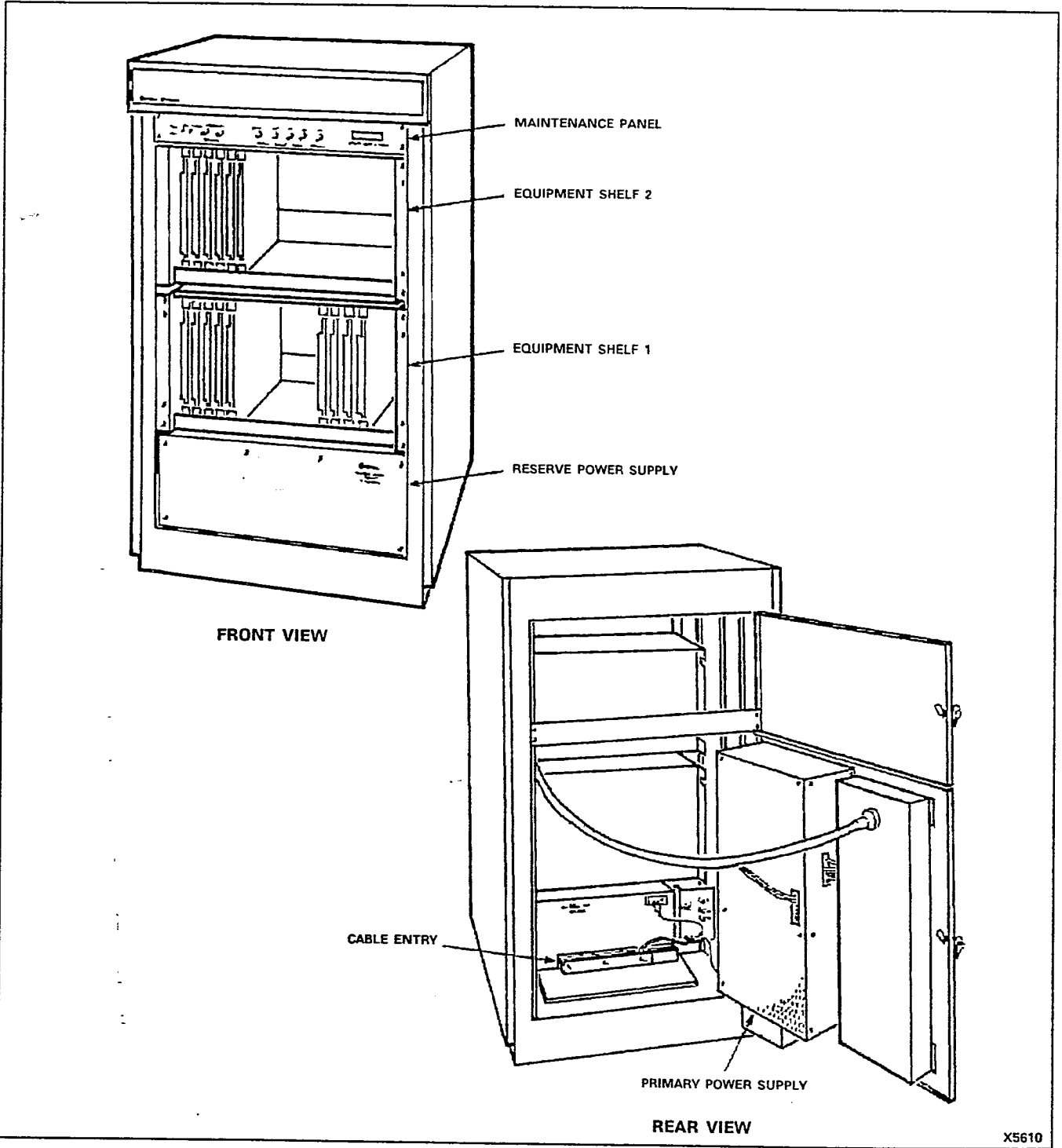
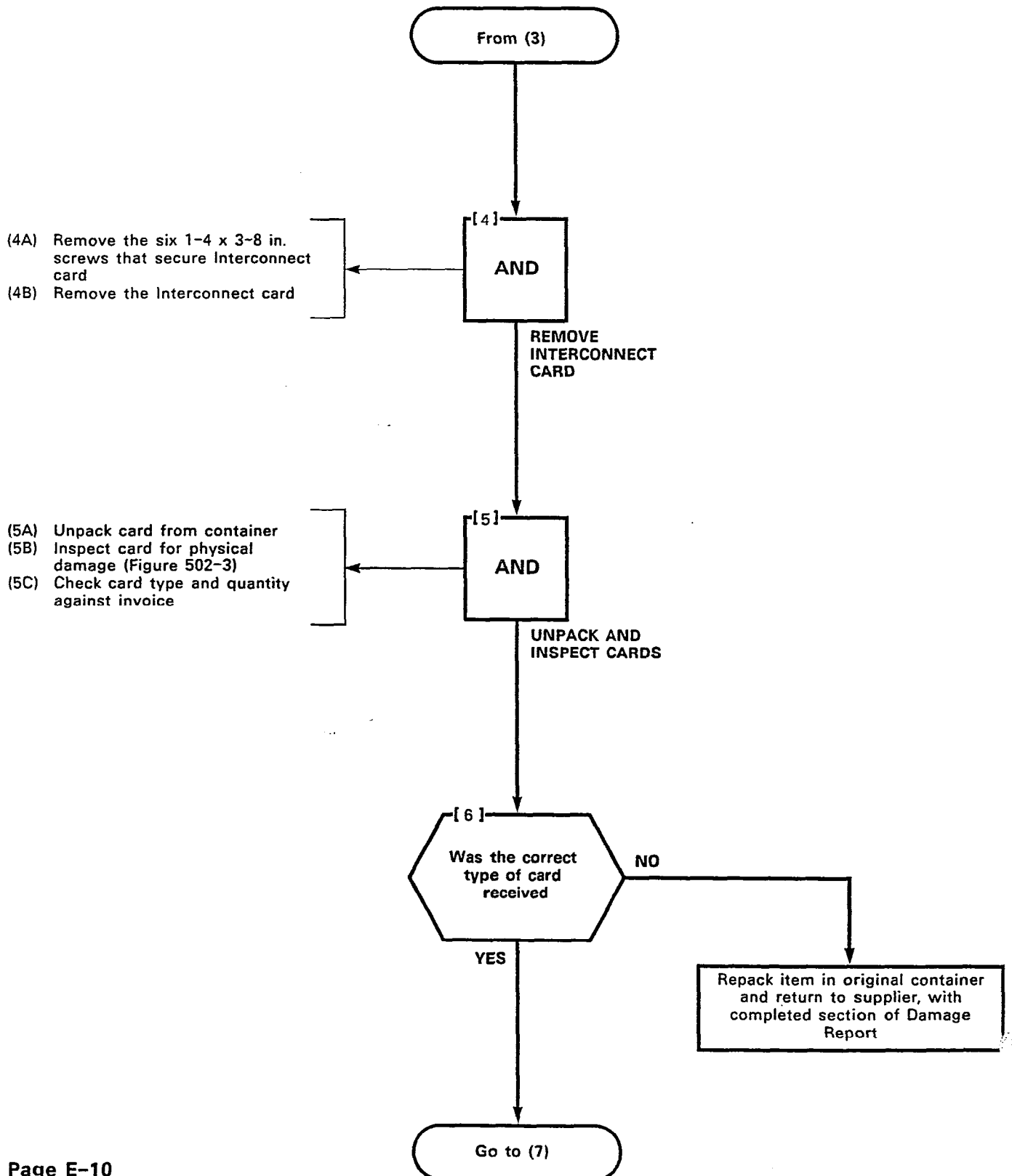


Figure 502-2 Equipment Shelf

X5610

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REPLACE INTERCONNECT CARD (SX-200)
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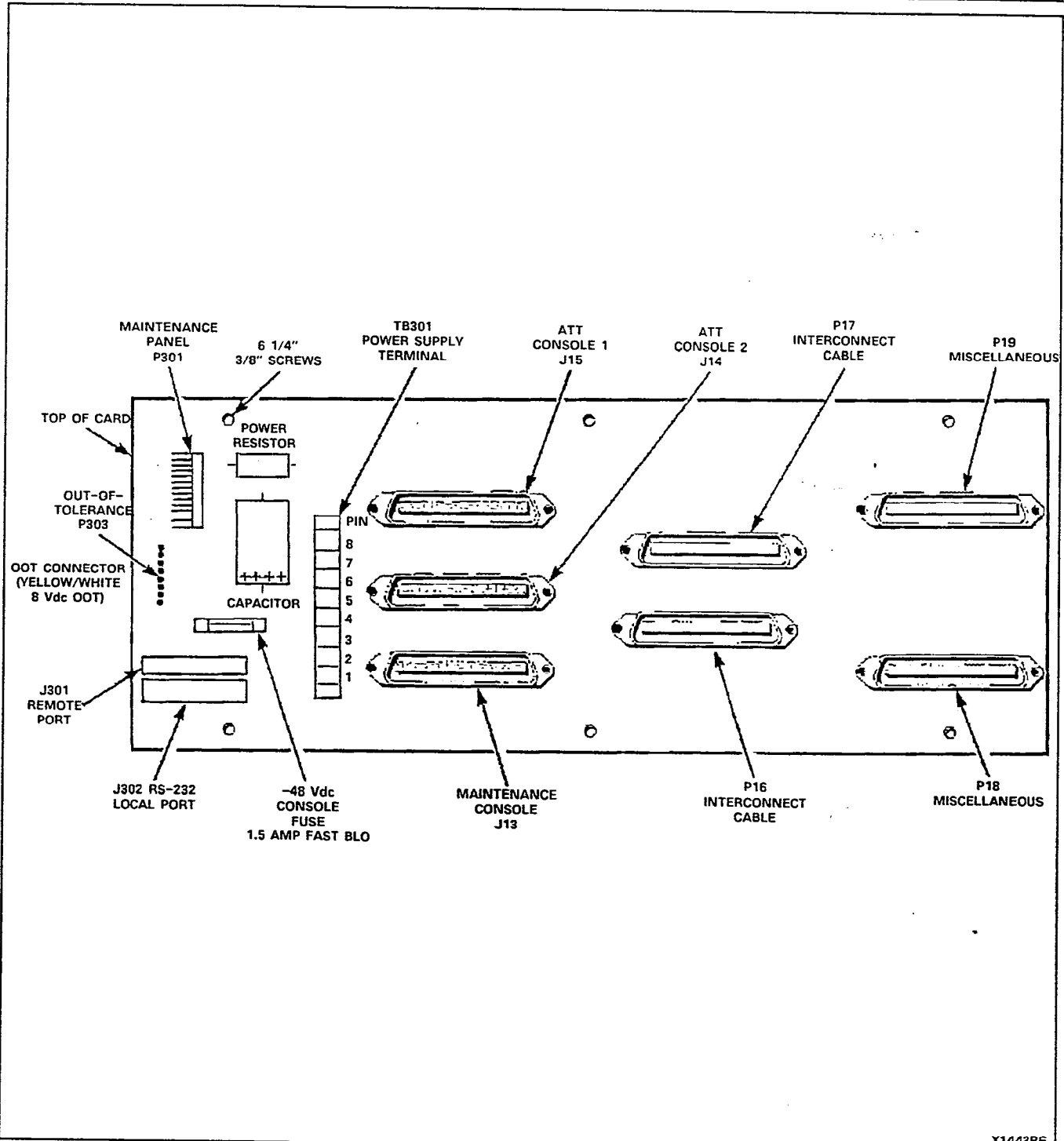
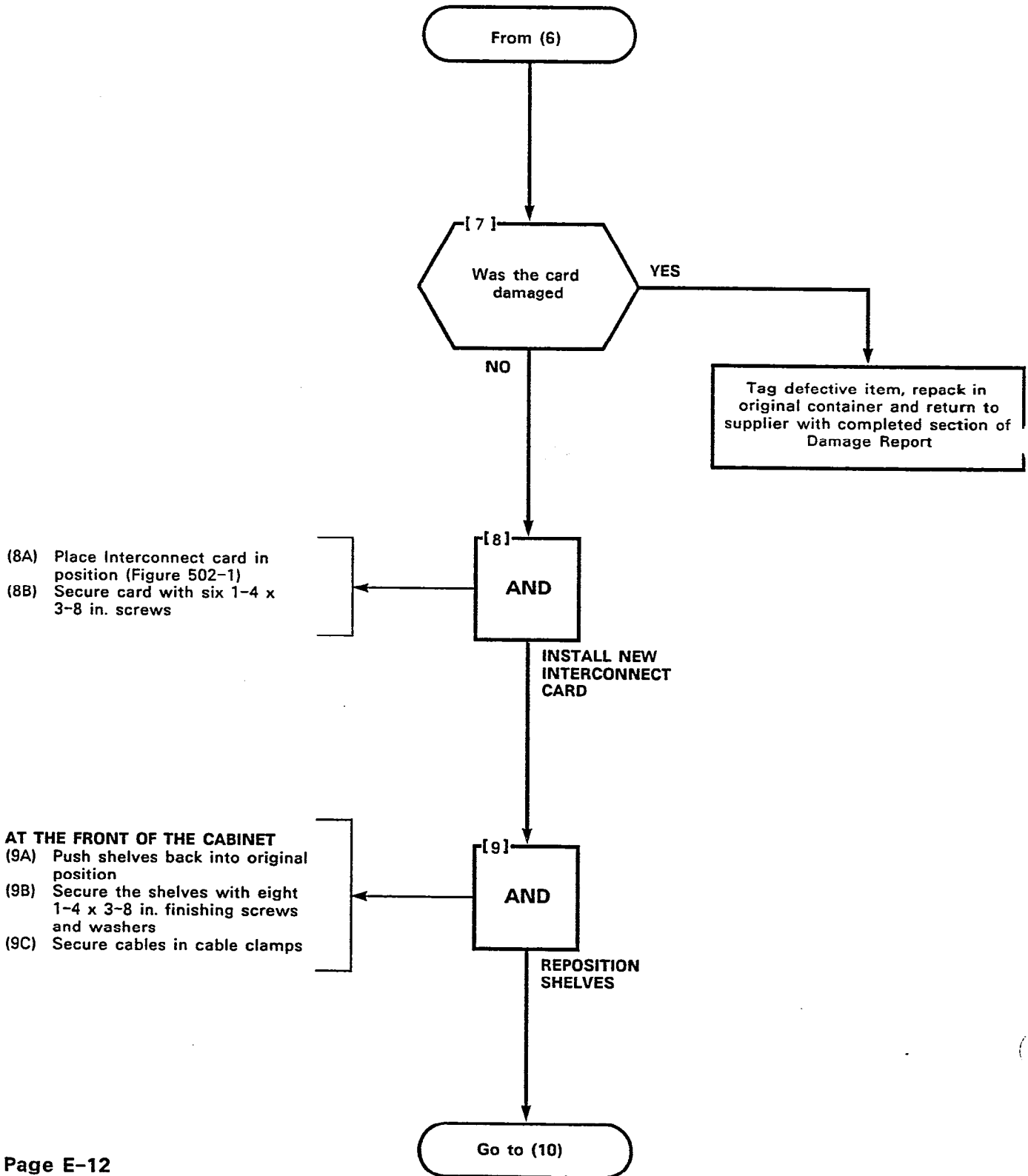


Figure 502-3 Interconnect Card

REPLACE INTERCONNECT CARD (SX-200)
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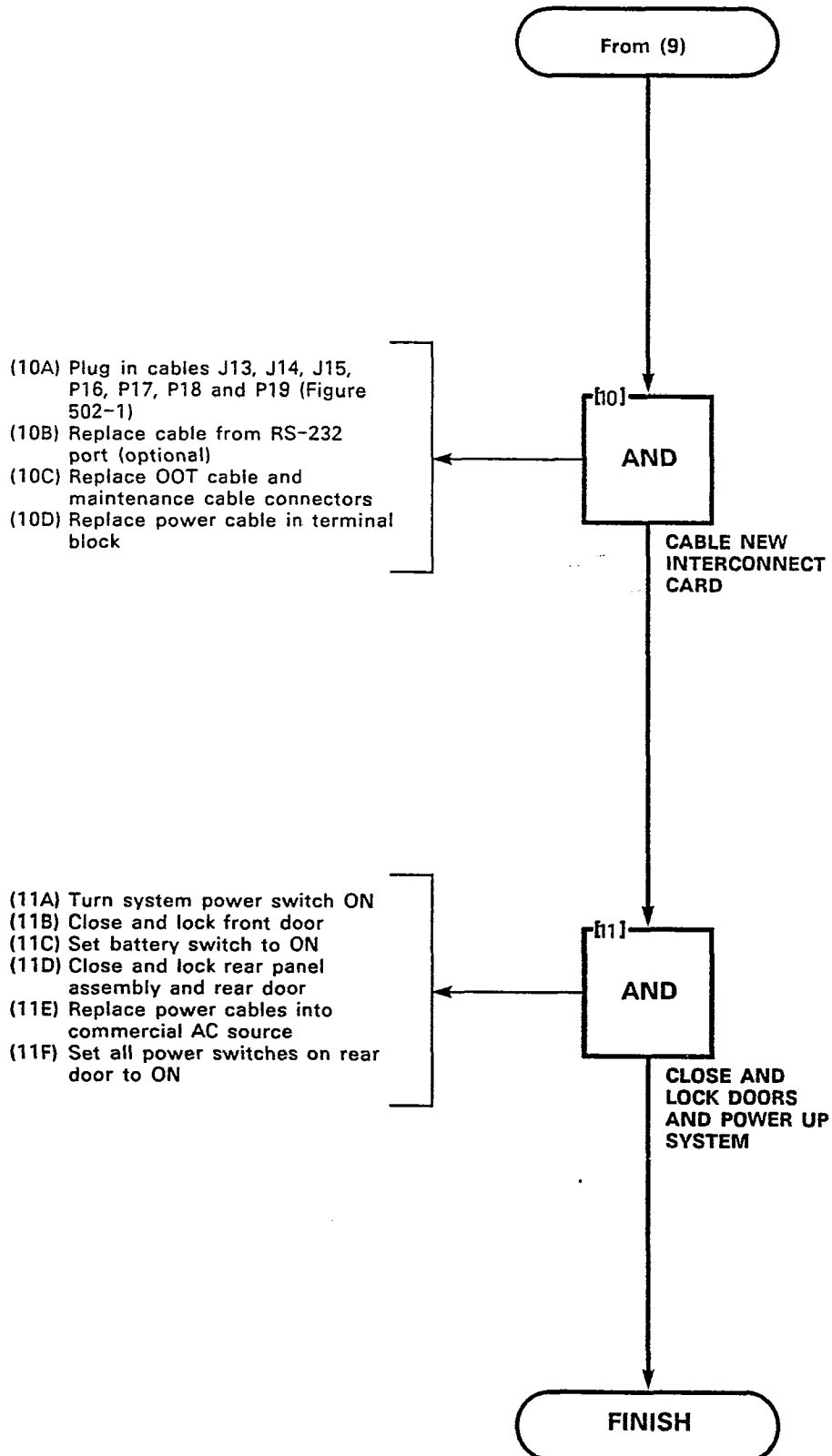


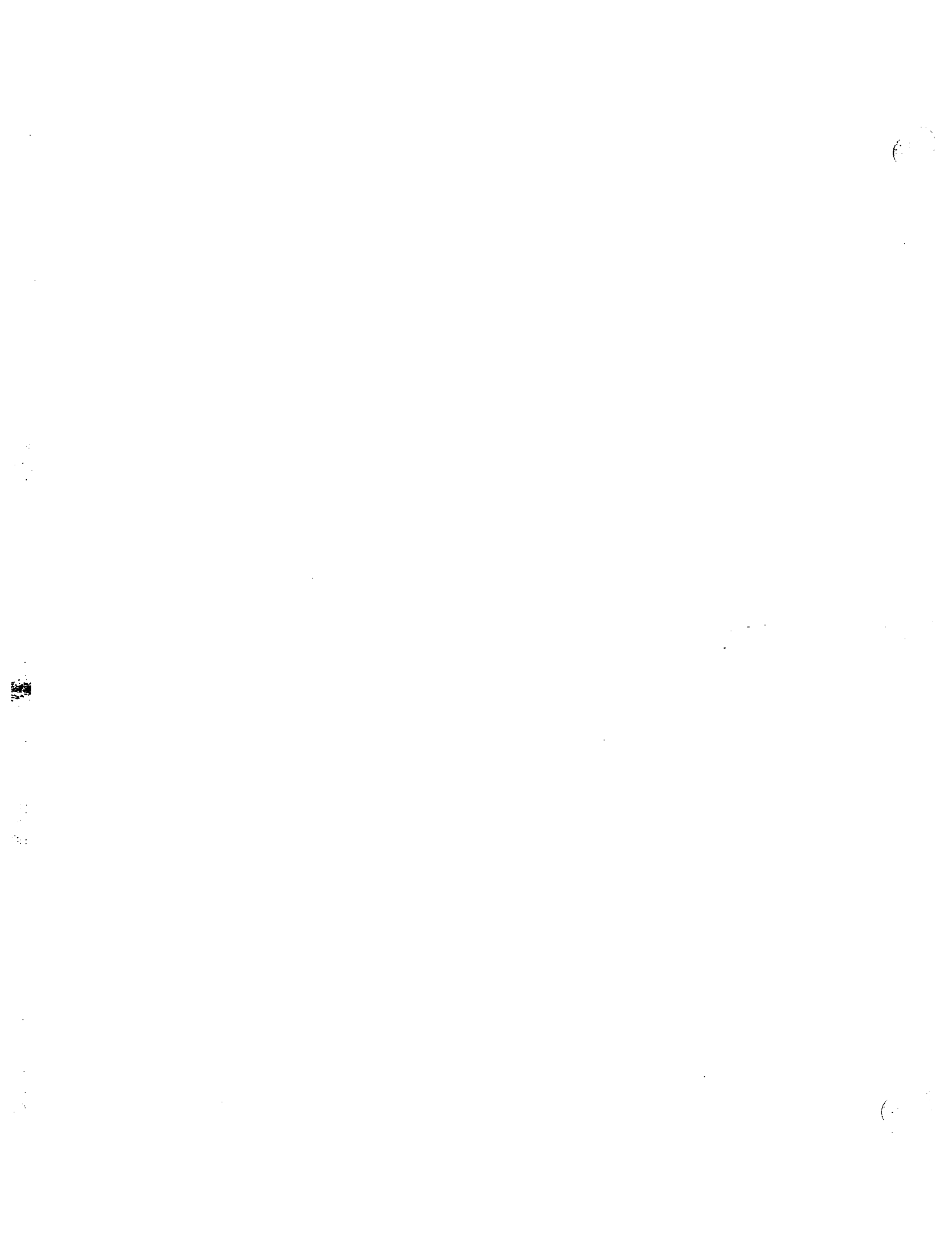
REPLACE INTERCONNECT CARD (SX-200)

MAP350- 502

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REPLACE POWER FAIL TRANSFER CARD (SX-200)
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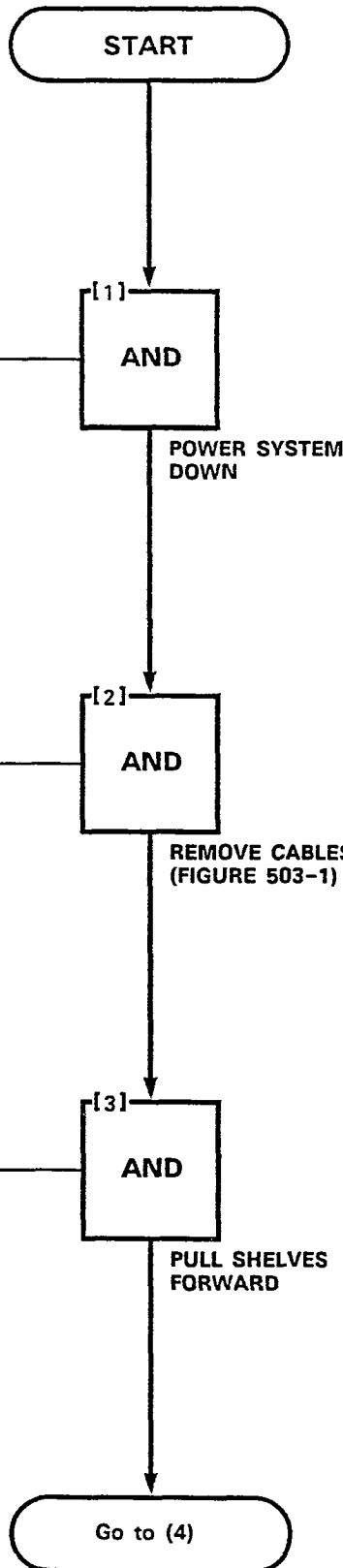
TOOL REQUIRED
1 flathead screwdriver

- (1A) Unlock and open front door
- (1B) Unlock and open rear door
- (1C) Unlock and open rear panel assembly
- (1D) Set system power switch to OFF
- (1E) Set all power switches on rear door to OFF
- (1F) Set battery switch to OFF
- (1G) Remove power cable(s) from commercial AC source

- AT REAR OF CABINET**
- (2A) Remove power cable from terminal block from Power Fail Transfer card

- AT REAR OF CABINET**
- (3A) Loosen all cable clamps so that the cables have approximately 25 cm (10 in.) of slack (Figure 503-1)

- AT FRONT OF CABINET (FIGURE 503-2)**
- (3B) Unscrew eight 1-4 X 3-8 in. retaining screws from the front of the equipment shelves
 - (3C) Pull equipment shelves forward approximately 5 cm (2 in.)
 - (3D) Unplug J20 and J21 if used



REPLACE POWER FAIL TRANSFER CARD (SX-200)
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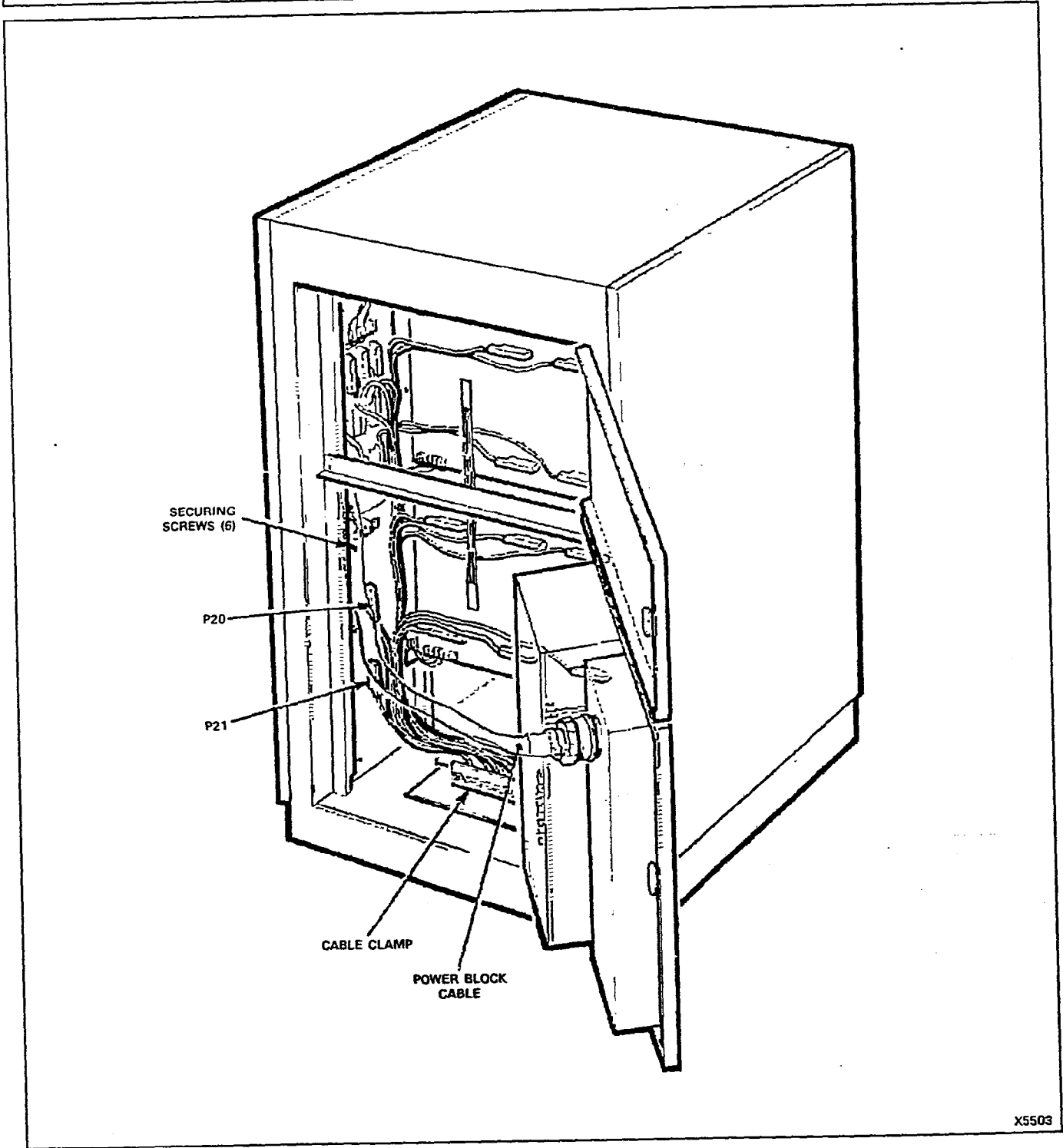
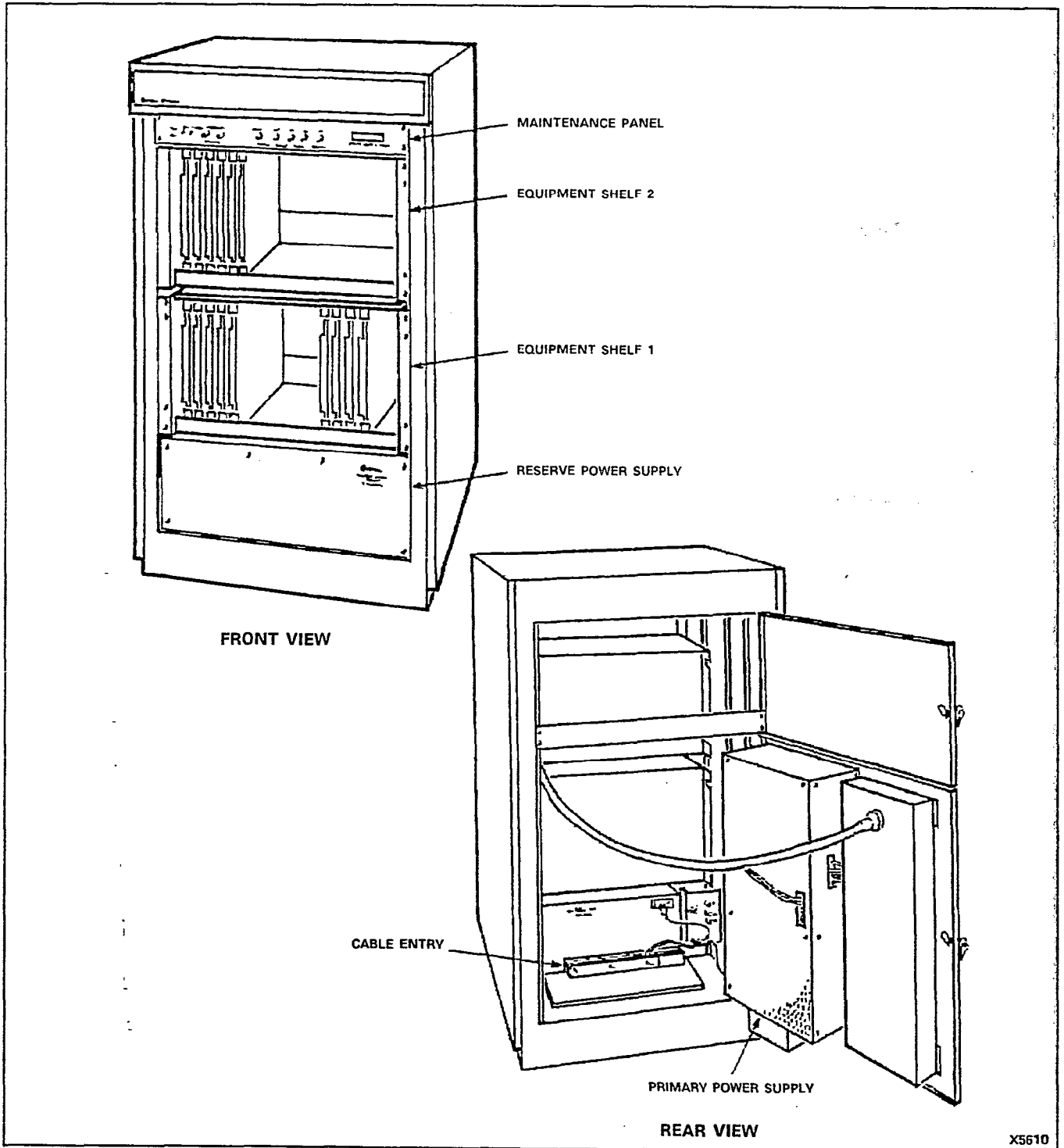


Figure 503-1 Cables

REPLACE POWER FAIL TRANSFER CARD (SX-200)
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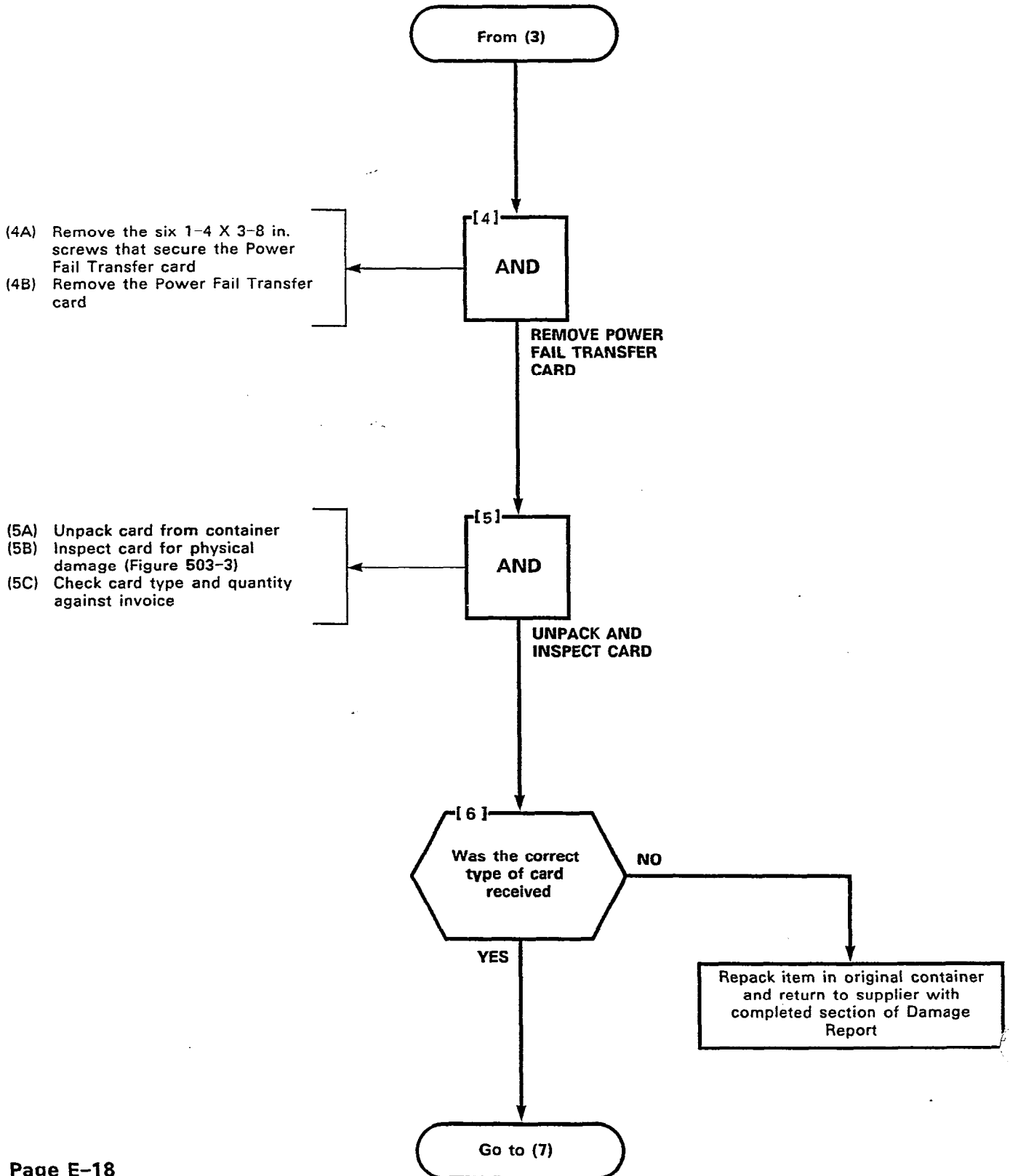


X5610

Figure 503-2 Equipment Shelf

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REPLACE POWER FAIL TRANSFER CARD (SX-200)
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REPLACE POWER FAIL TRANSFER CARD (SX-200)
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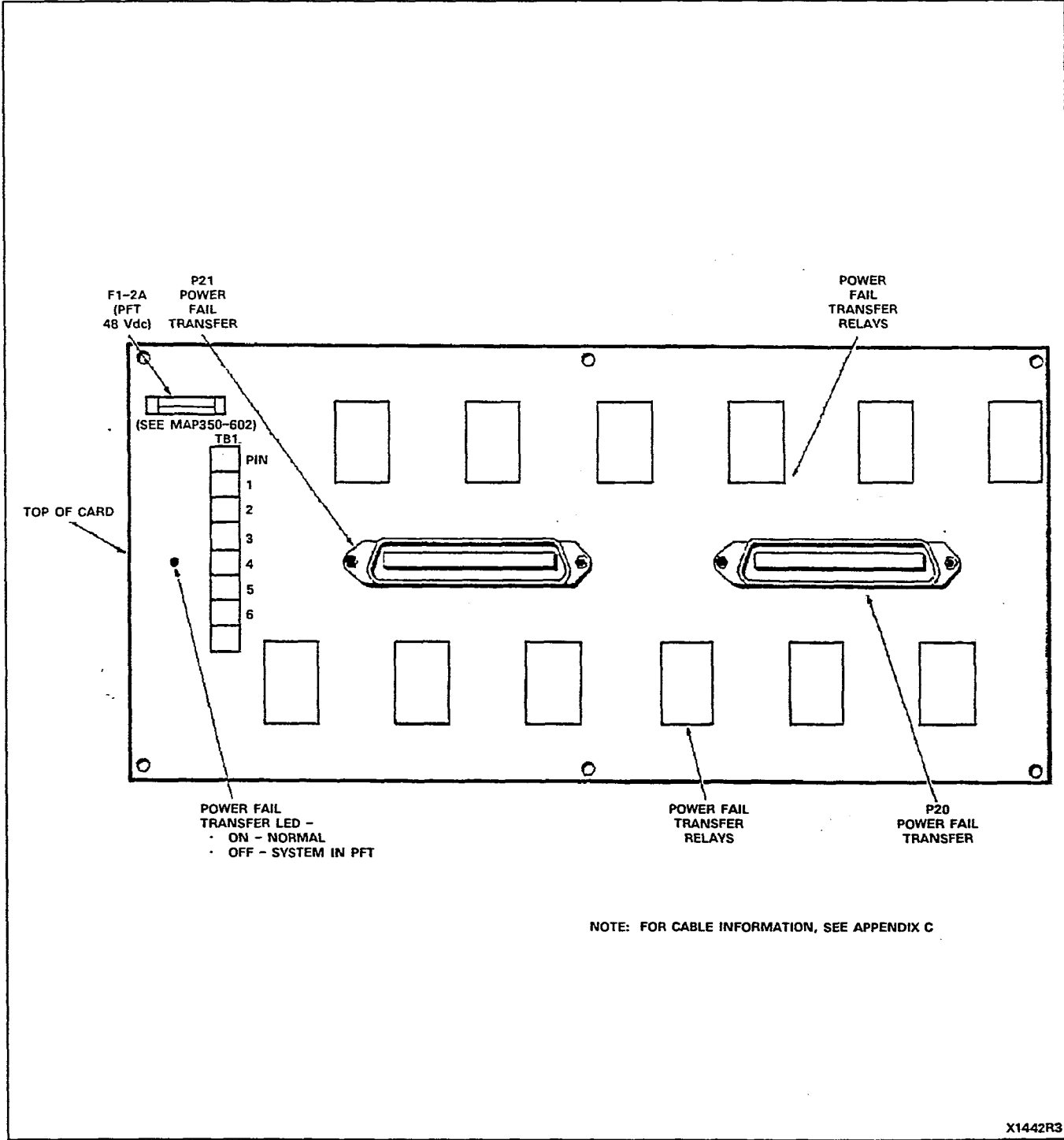
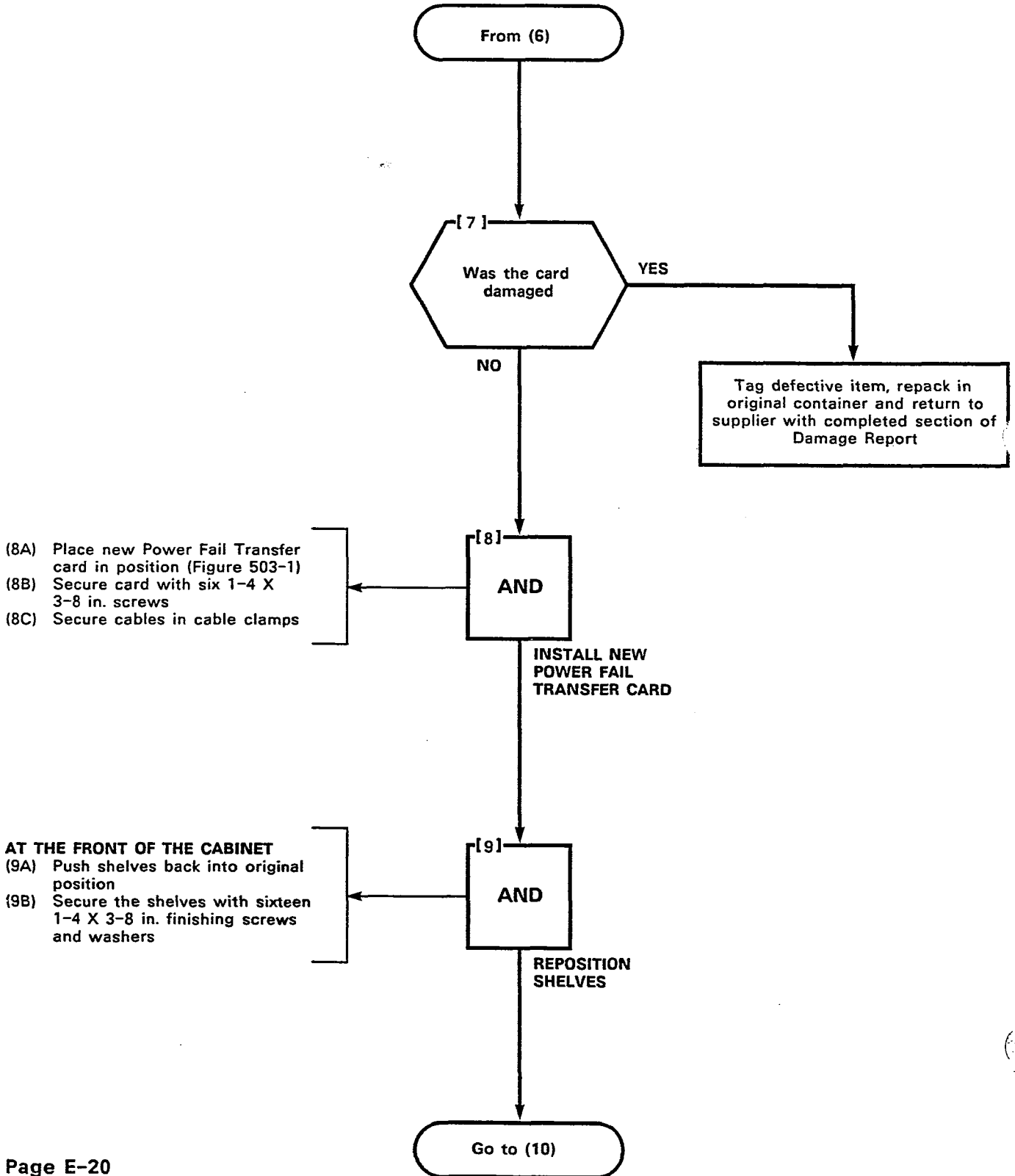
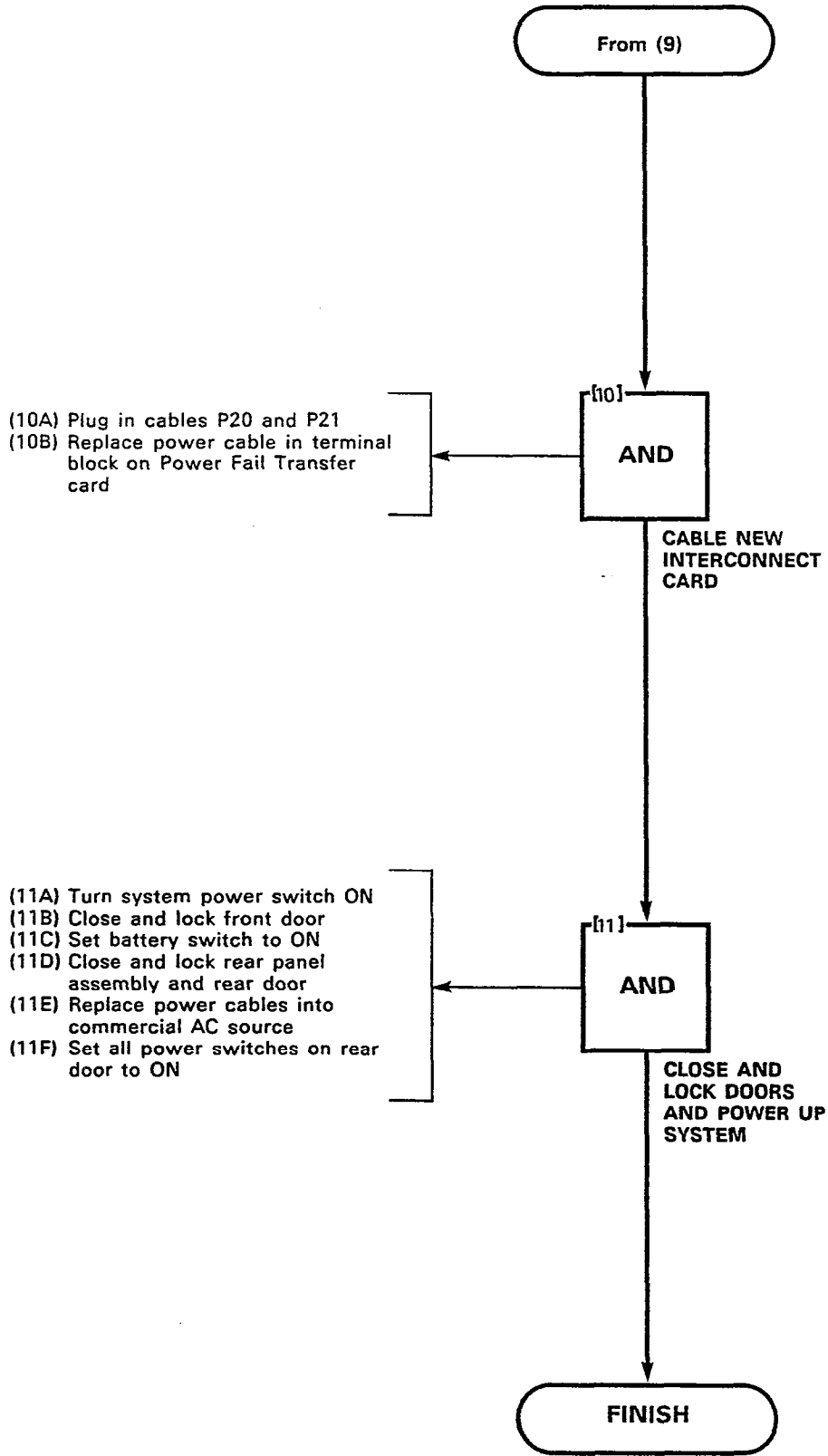


Figure 503-3 SX-200 Interconnect Card

REPLACE POWER FAIL TRANSFER CARD (SX-200)
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REPLACE POWER FAIL TRANSFER CARD (SX-200)
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(1)

(2)

REPLACE CONSOLE INTERFACE CARD (SX-200)
MAP350-504
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TOOLS REQUIRED
 1 1/4 inch screwdriver
 1 7/16 inch wrench

- (1A) Unlock and open front door
- (1B) Unlock and open rear door
- (1C) Unlock and open rear panel assembly
- (1D) Set system power switch to OFF
- (1E) Set all power switches on rear door to OFF
- (1F) Set battery switch to OFF
- (1G) Remove power cable(s) from commercial AC source

- (2A) Remove cables J22, P23, J24 and P25

- AT REAR OF THE CABINET**
- (3A) Loosen all cable clamps so that the cables have approximately 25 cm (10 in.) of slack (Figure 504-1)
- AT FRONT OF CABINET (FIGURE 504-2)**
- (3B) Unscrew eight 1-4 x 3-8 inch retaining screws from the front of the equipment shelves
 - (3C) Pull equipment shelves forward approximately 5 cm (2 in.)

START

[1]
AND

POWER SYSTEM DOWN

[2]
AND

REMOVE CABLES (FIGURE 504-1)

[3]
AND

PULL SHELVES FORWARD

Go to (4)

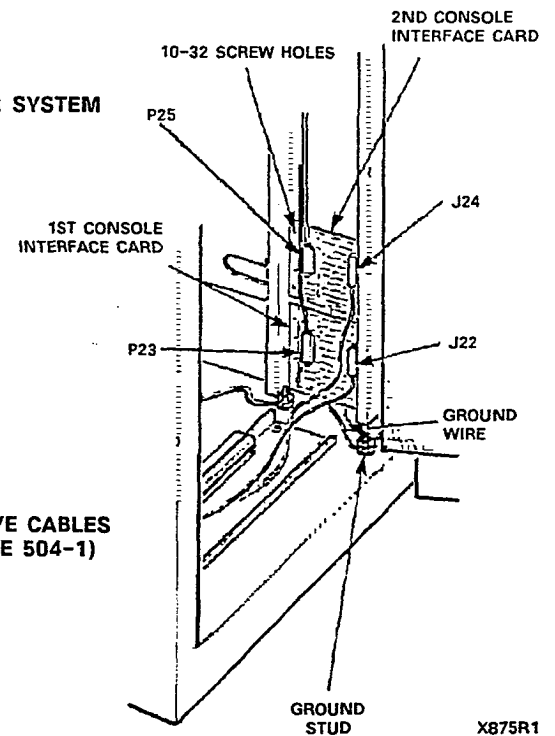


Figure 504-1
 Console Interface Card Position

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REPLACE CONSOLE INTERFACE CARD (SX-200)
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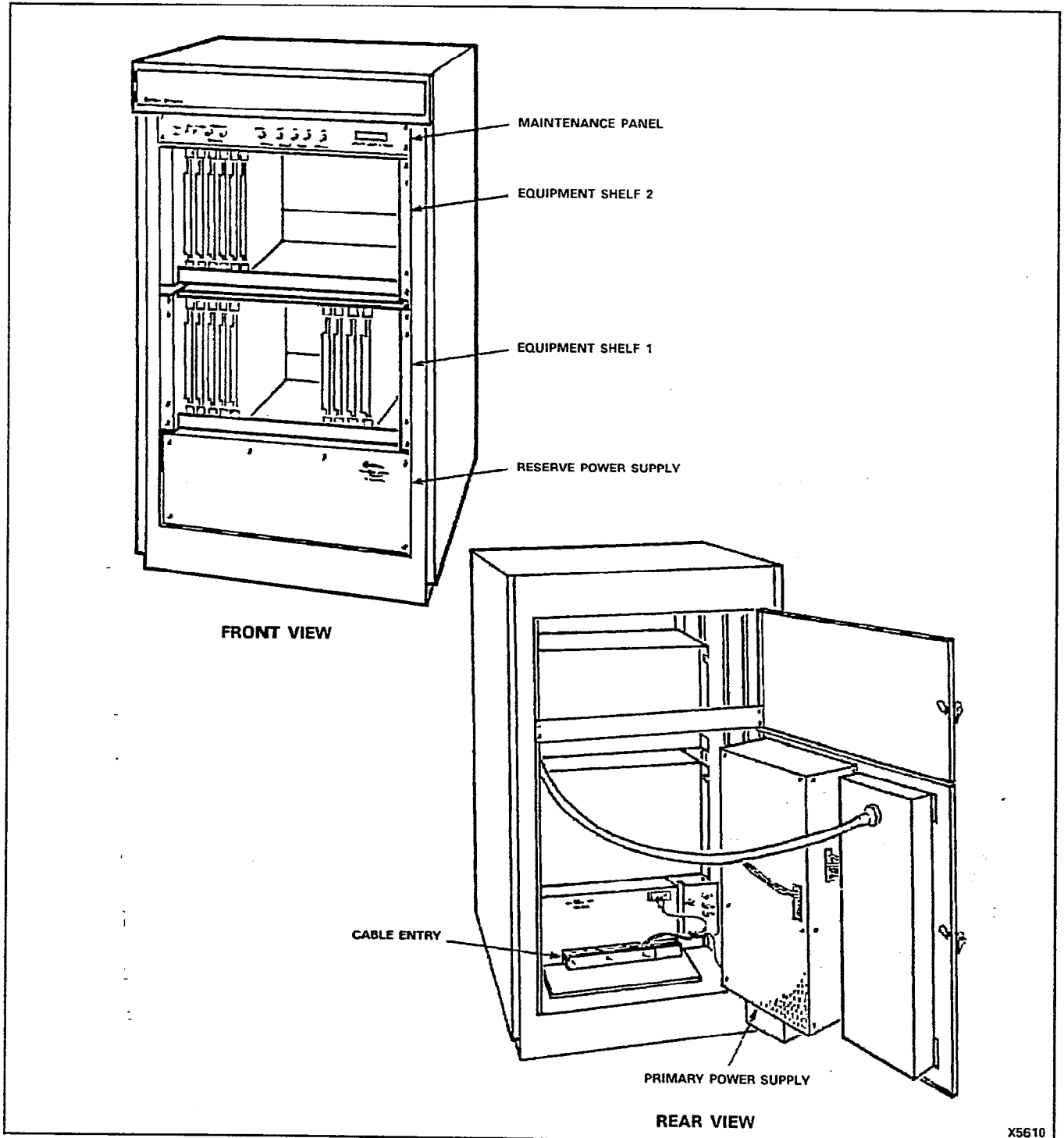
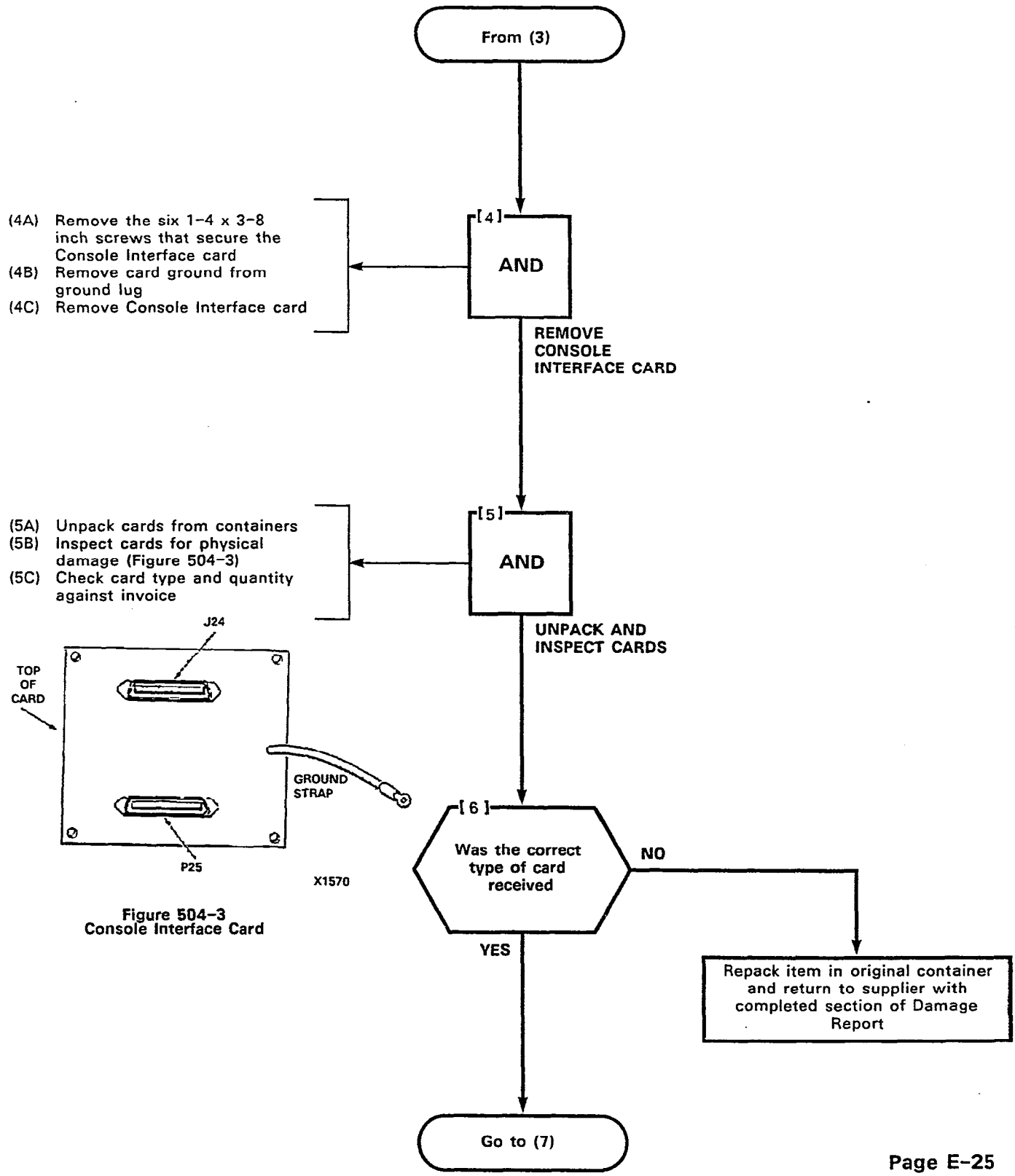


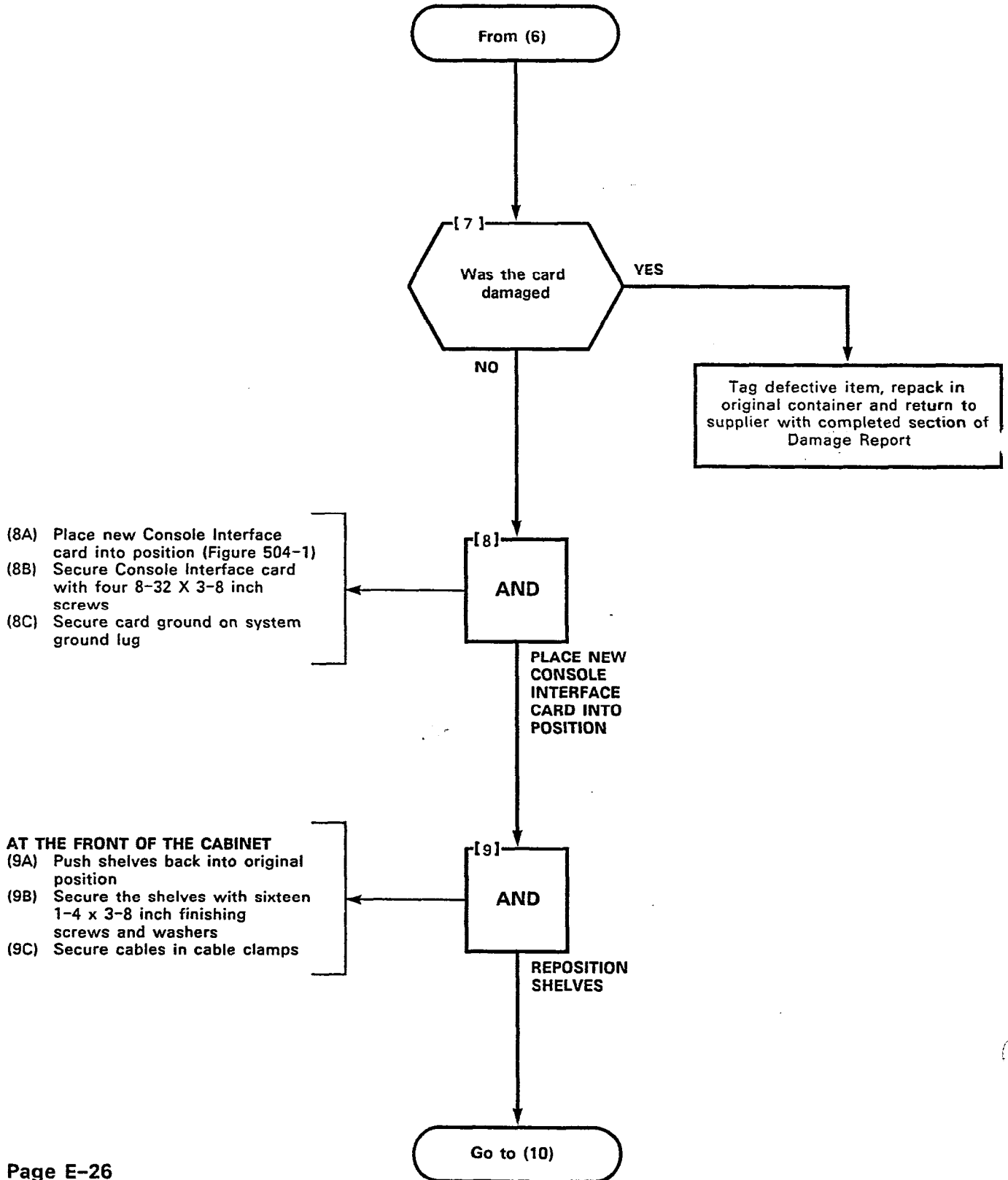
Figure 504-2 Equipment Shelf

X5610

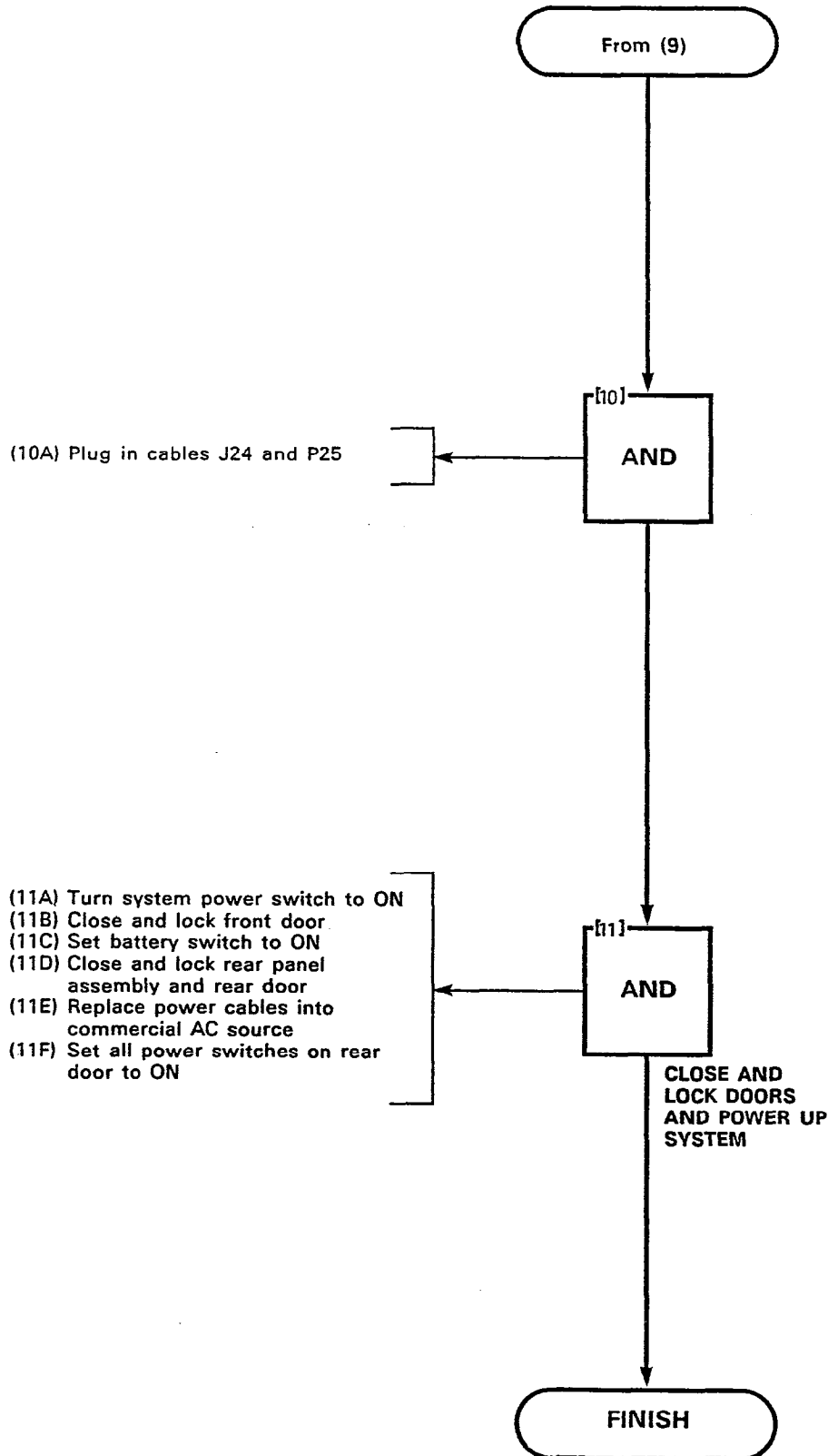
REPLACE CONSOLE INTERFACE CARD (SX-200)
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REPLACE CONSOLE INTERFACE CARD (SX-200)
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REPLACE CONSOLE INTERFACE CARD (SX-200)
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REPLACE FIRST OR SECOND SHELF (SX-200)
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TOOLS REQUIRED
 1 flatblade screwdriver
 1 Phillips screwdriver

Note
 The second shelf applies only to the SX-200 equipment.

WARNING
 ALL POWER TO THE SYSTEM MUST BE REMOVED.

- (1A) Unpack new shelf
- (1B) Check backplane for cracks and bent pins
- (1C) Check hardware against packing slip
- (1D) Check fuses (if supplied)

START

[1]
 AND

UNPACK AND CHECK SHELF

[2]
 Were any items found defective or missing

YES

Complete Damage Report Form and return with defective item to the Supplier

FINISH

NO

[3]
 AND

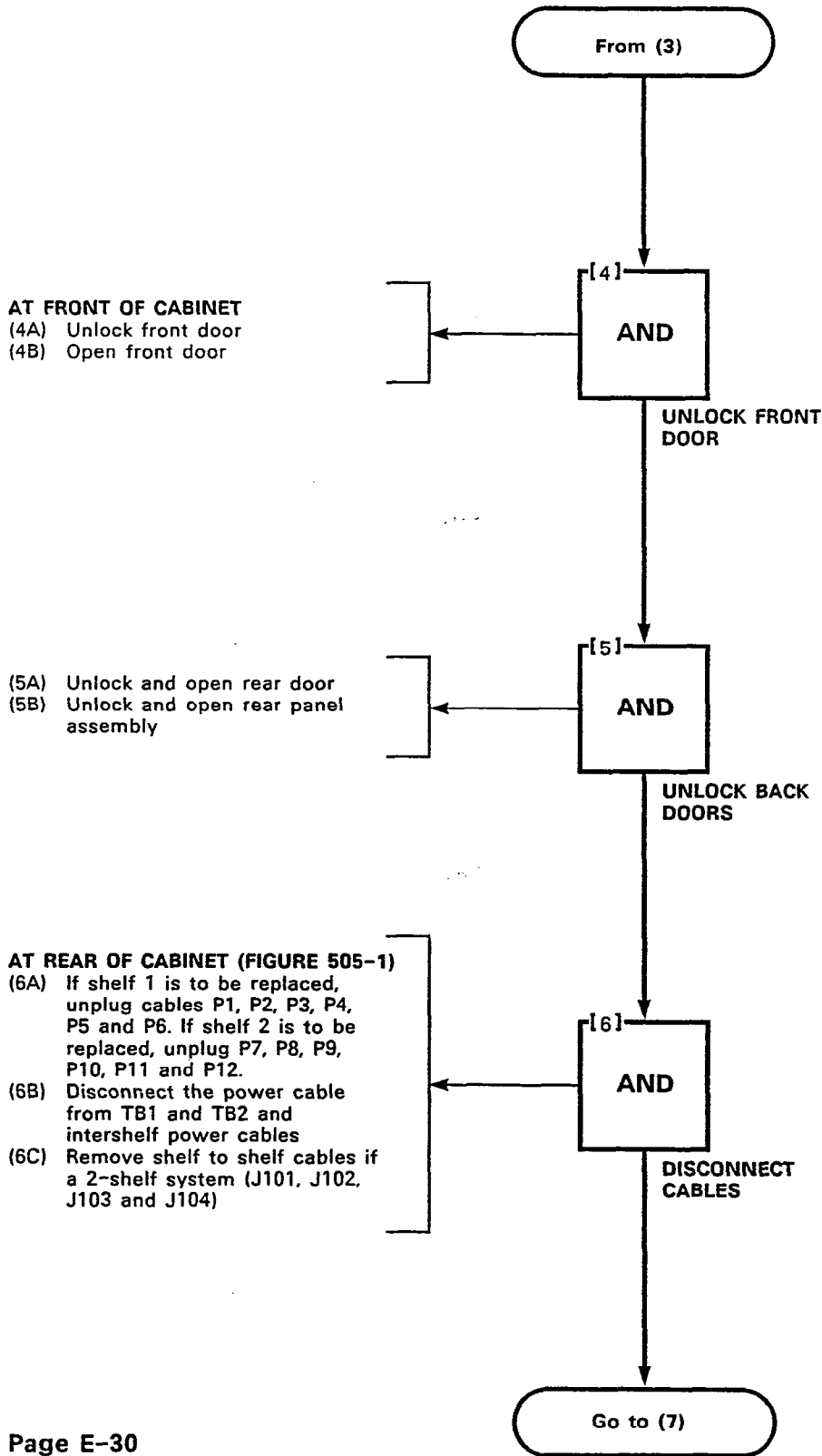
POWER SYSTEM DOWN

Go to (4)

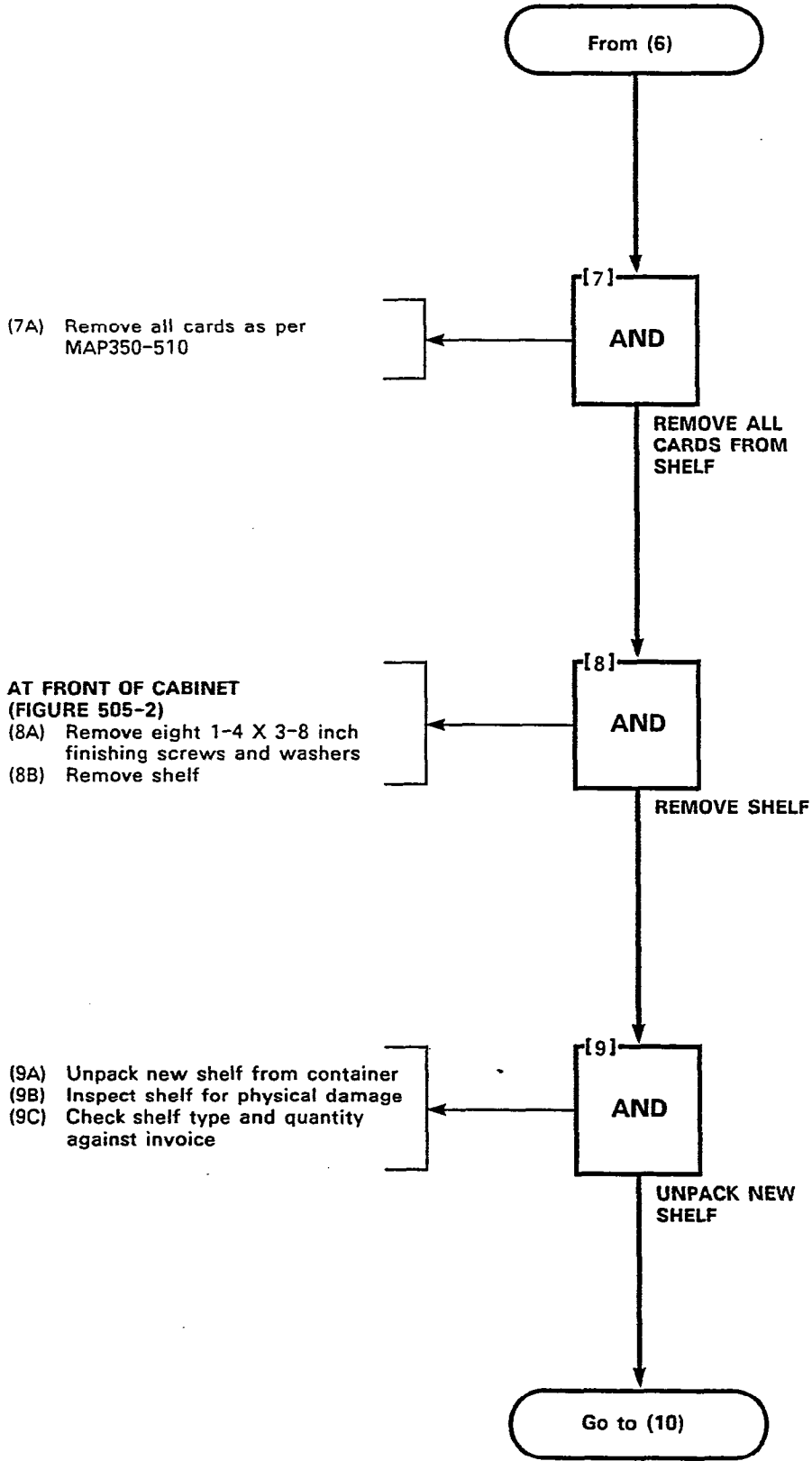
- AT THE REAR OF CABINET**
- (3A) Set converter input switch to OFF
 - (3B) Set battery switch to OFF
 - (3C) Remove power plug(s) from outlet

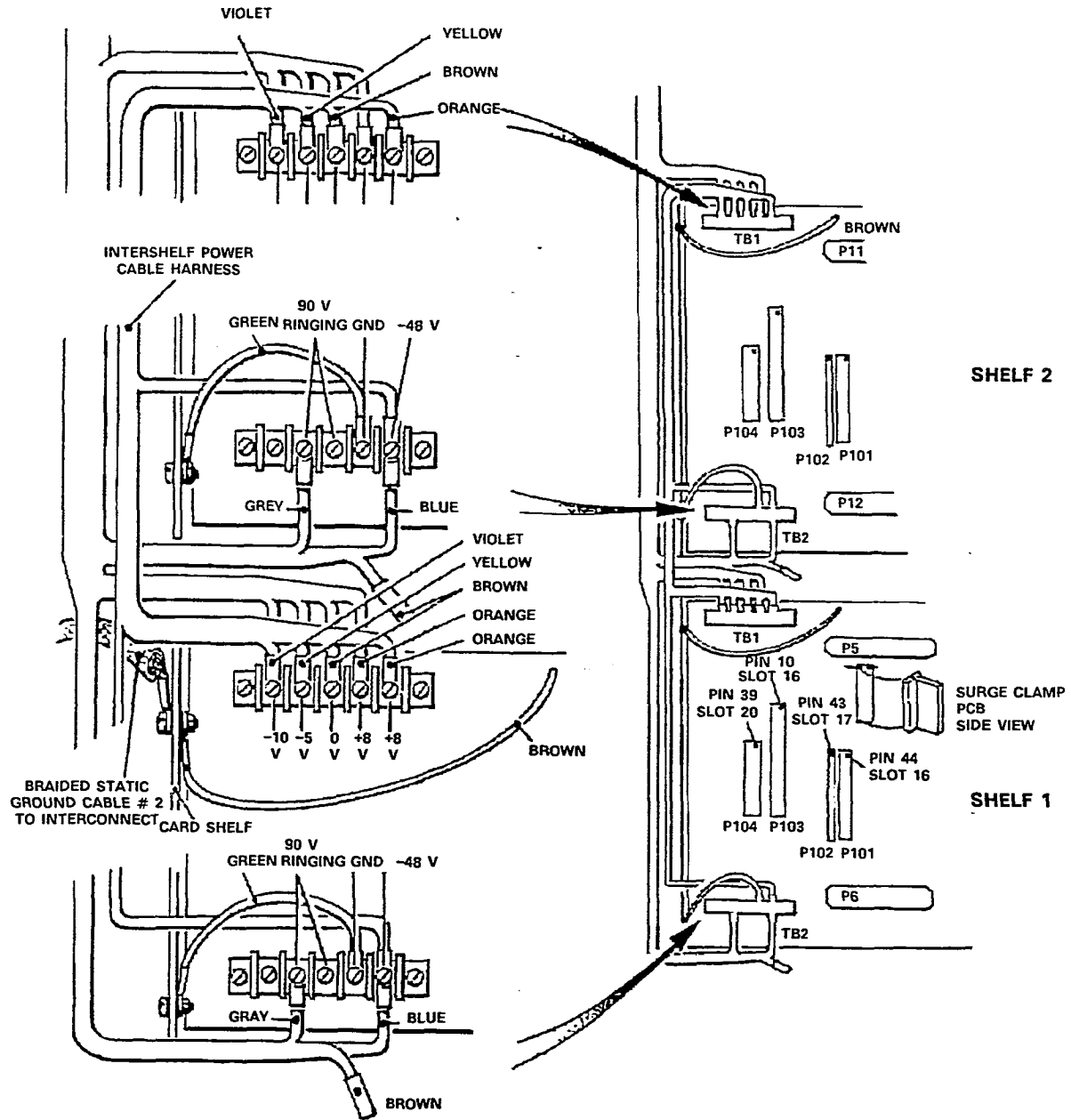
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REPLACE FIRST OR SECOND SHELF (SX-200)
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REPLACE FIRST OR SECOND SHELF (SX-200)
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NOTE: THERE IS A SURGE CLAMP ON BOTH SHELVES. SURGE CLAMPS ON SECOND SHELF NOT SHOWN. SECOND SHELF SURGE CLAMP IN SAME POSITIONS AS FIRST SHELF CLAMP.

X116R4

Figure 505-1 SX-200 Intershelf Cables

REPLACE FIRST OR SECOND SHELF (SX-200)
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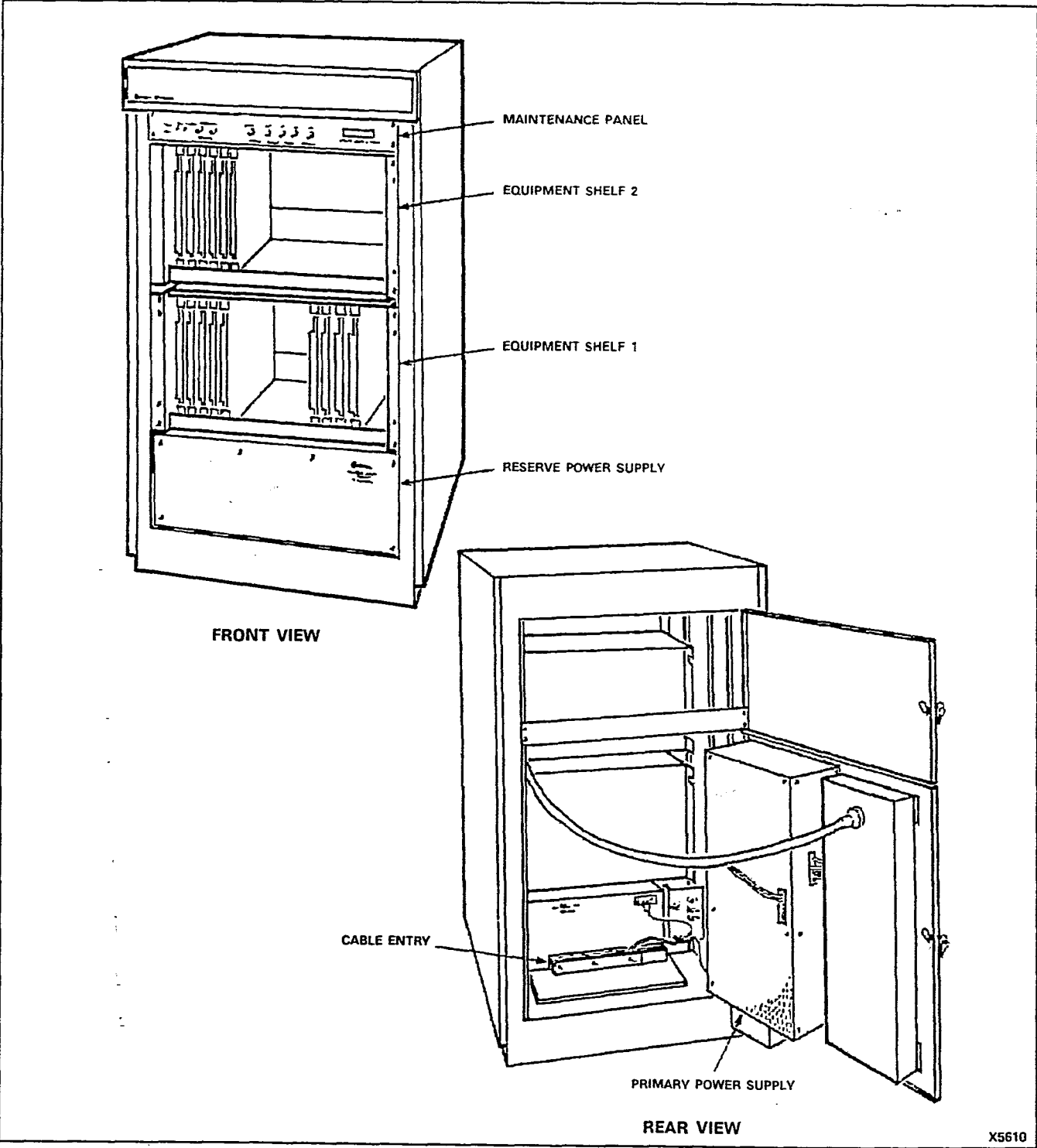


Figure 505-2 SX-200 Cabinet

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REPLACE FIRST OR SECOND SHELF (SX-200)
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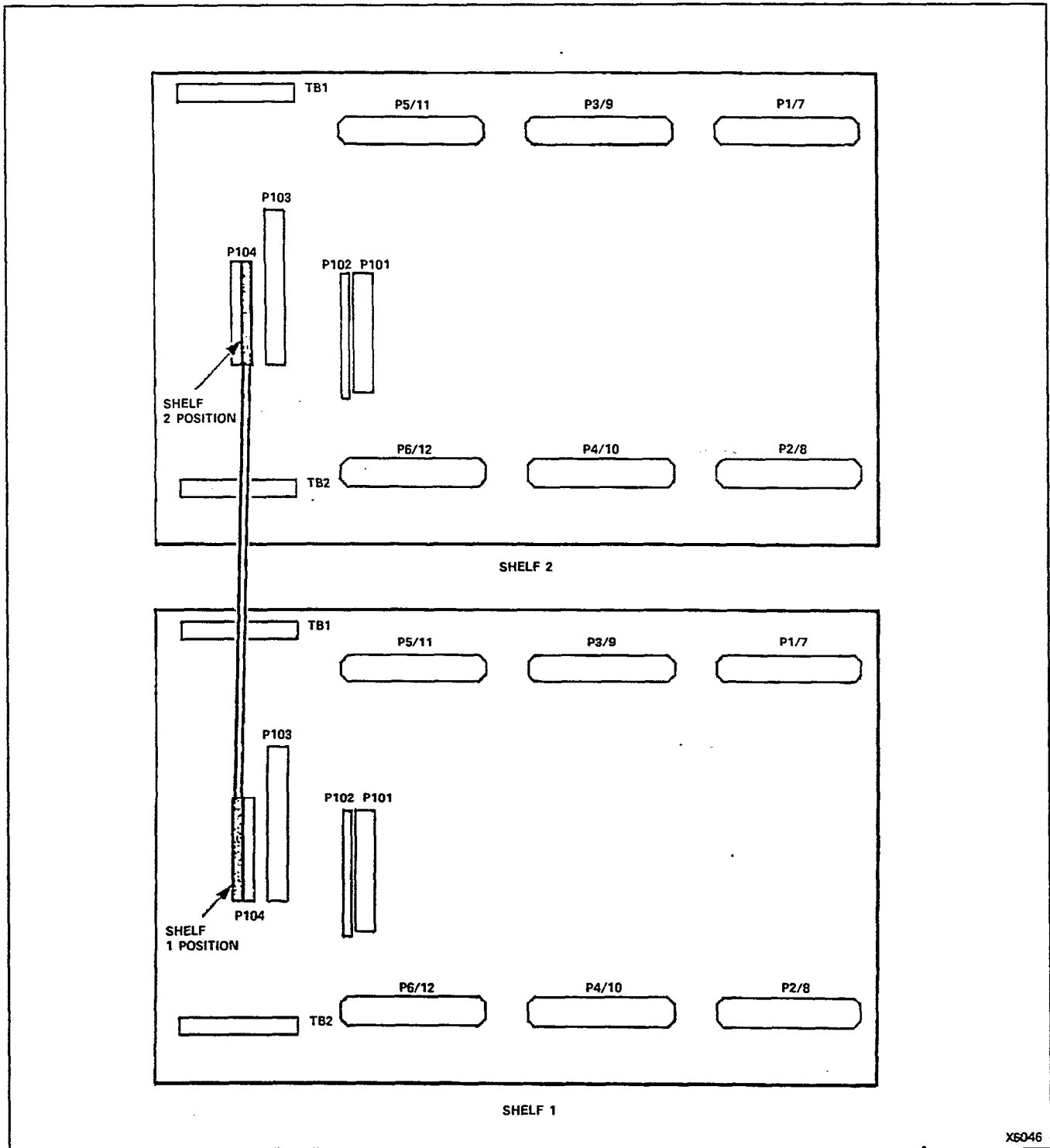
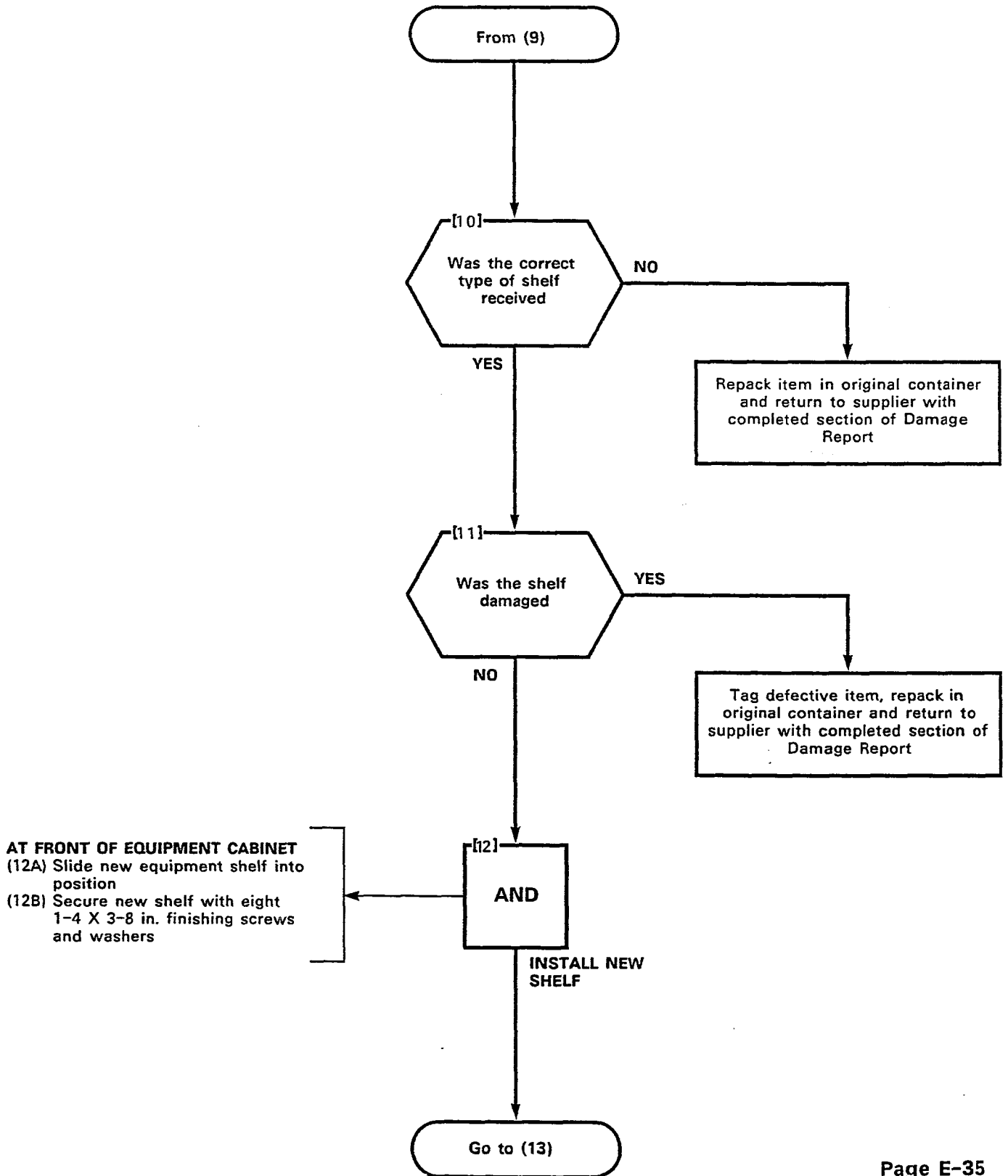


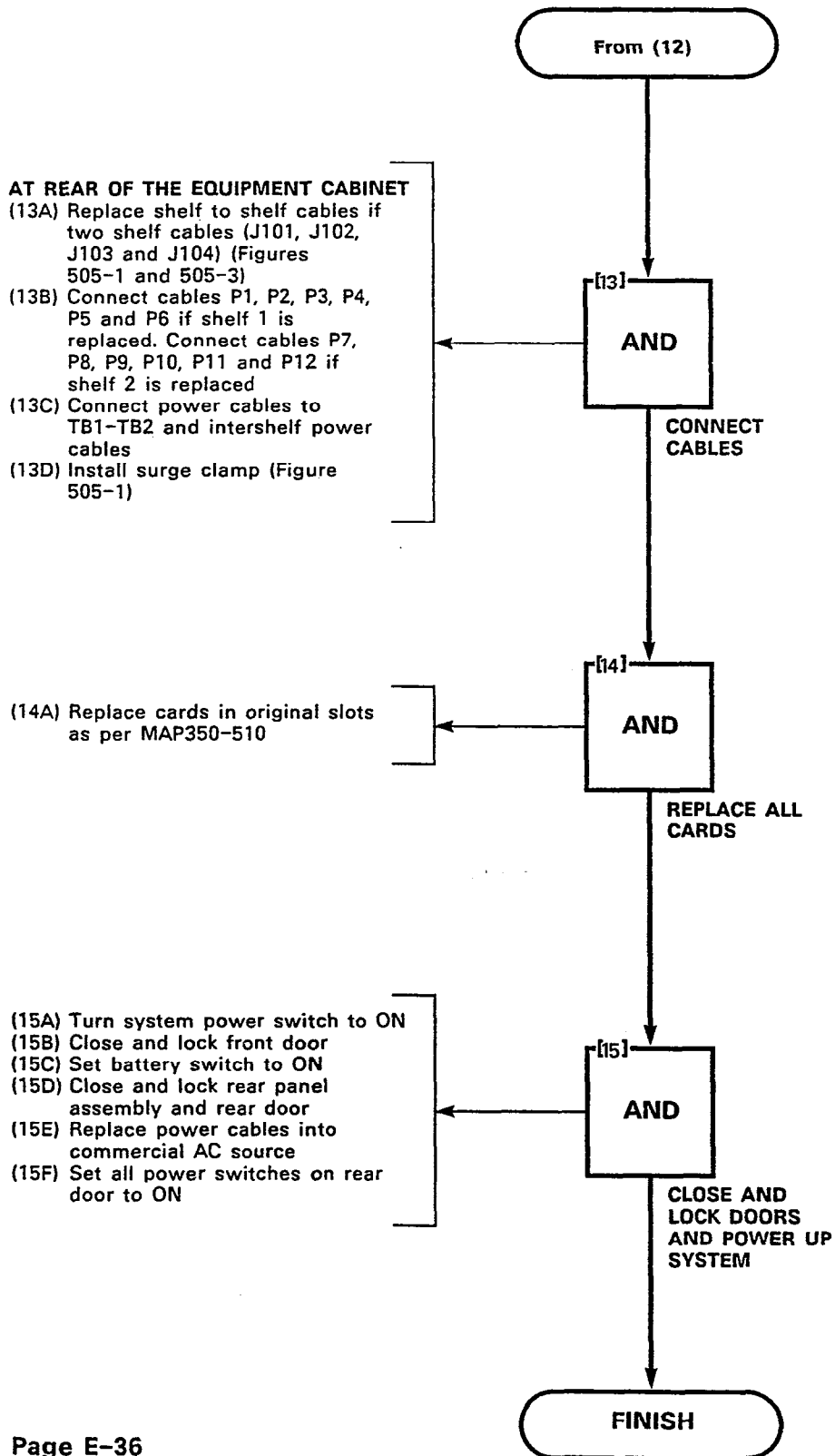
Figure 505-3 P104 Backplane Connections

REPLACE FIRST OR SECOND SHELF (SX-200)
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REPLACE FIRST OR SECOND SHELF (SX-200)
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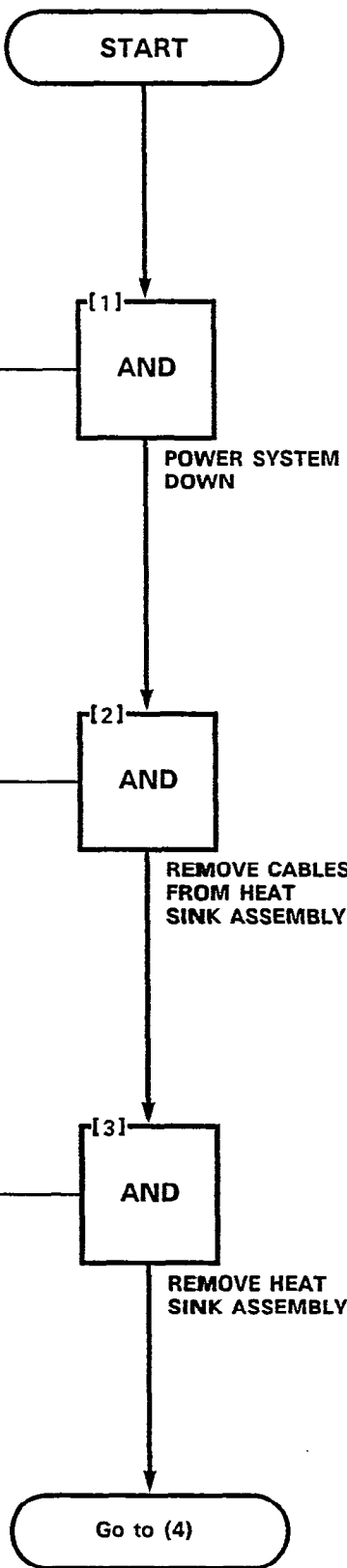
REPLACE HEAT SINK ASSEMBLY (SX-200)
MAP350- 506
Issue 3, May 1984
Sheet 1 of 4

TOOL REQUIRED
1 1/4 inch slotted blade screwdriver

- (1A) Unlock and open front door
- (1B) Unlock and open rear door
- (1C) Unlock and open rear panel assembly
- (1D) Set system power switch to OFF
- (1E) Set all power switches on rear door to OFF
- (1F) Set battery switch to OFF
- (1G) Remove power cable(s) from commercial AC source

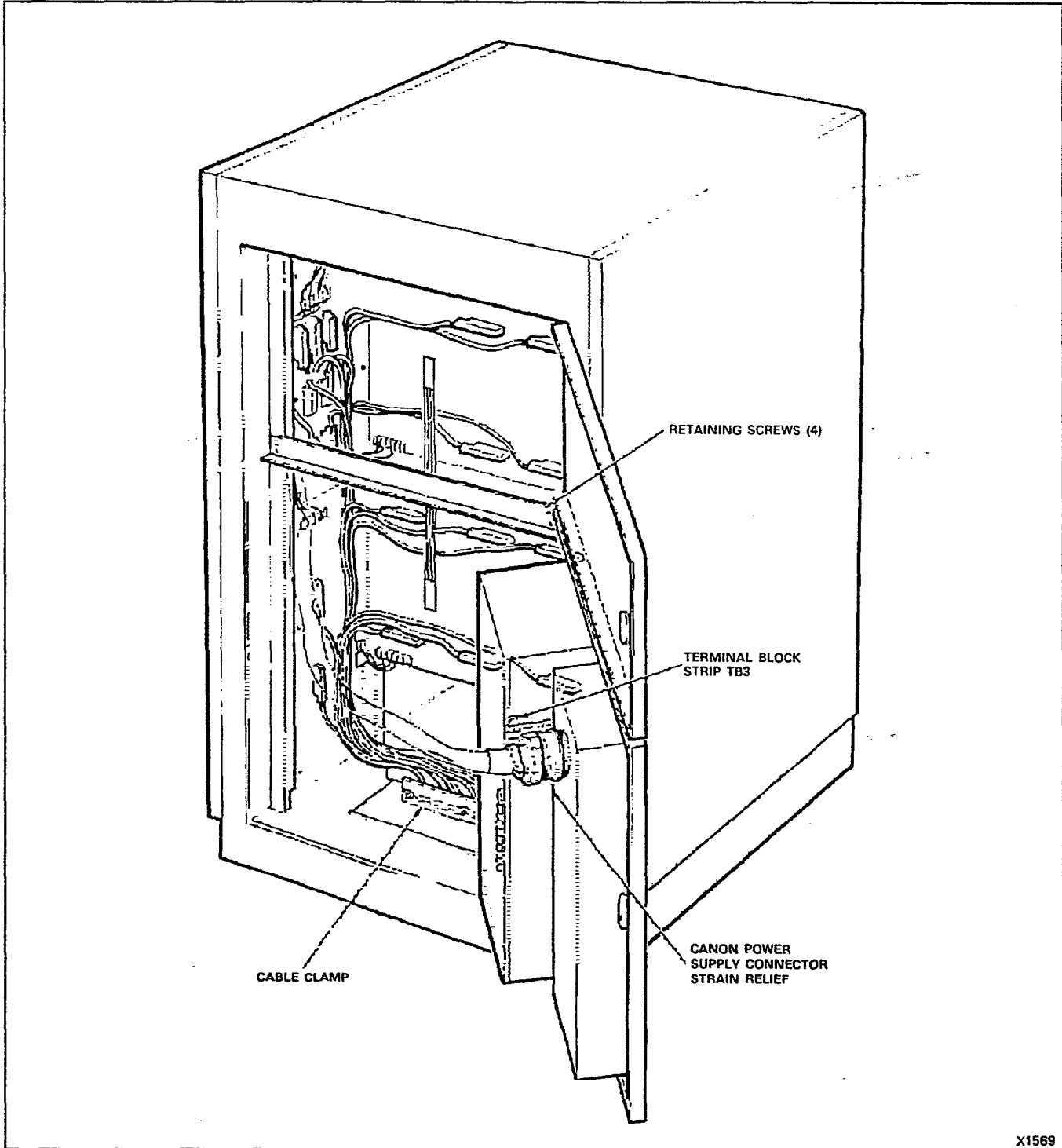
- AT REAR OF CABINET (FIGURE 506-1)**
- (2A) Remove Canon-type connector from heat sink assembly
 - (2B) Remove terminal block strip from TB3

- (3A) Remove the ten 1-4 in. screws and lockwashers from heat sink assembly
- (3B) Remove heat sink assembly



SECTION MITL9105/9110-096-350-NA

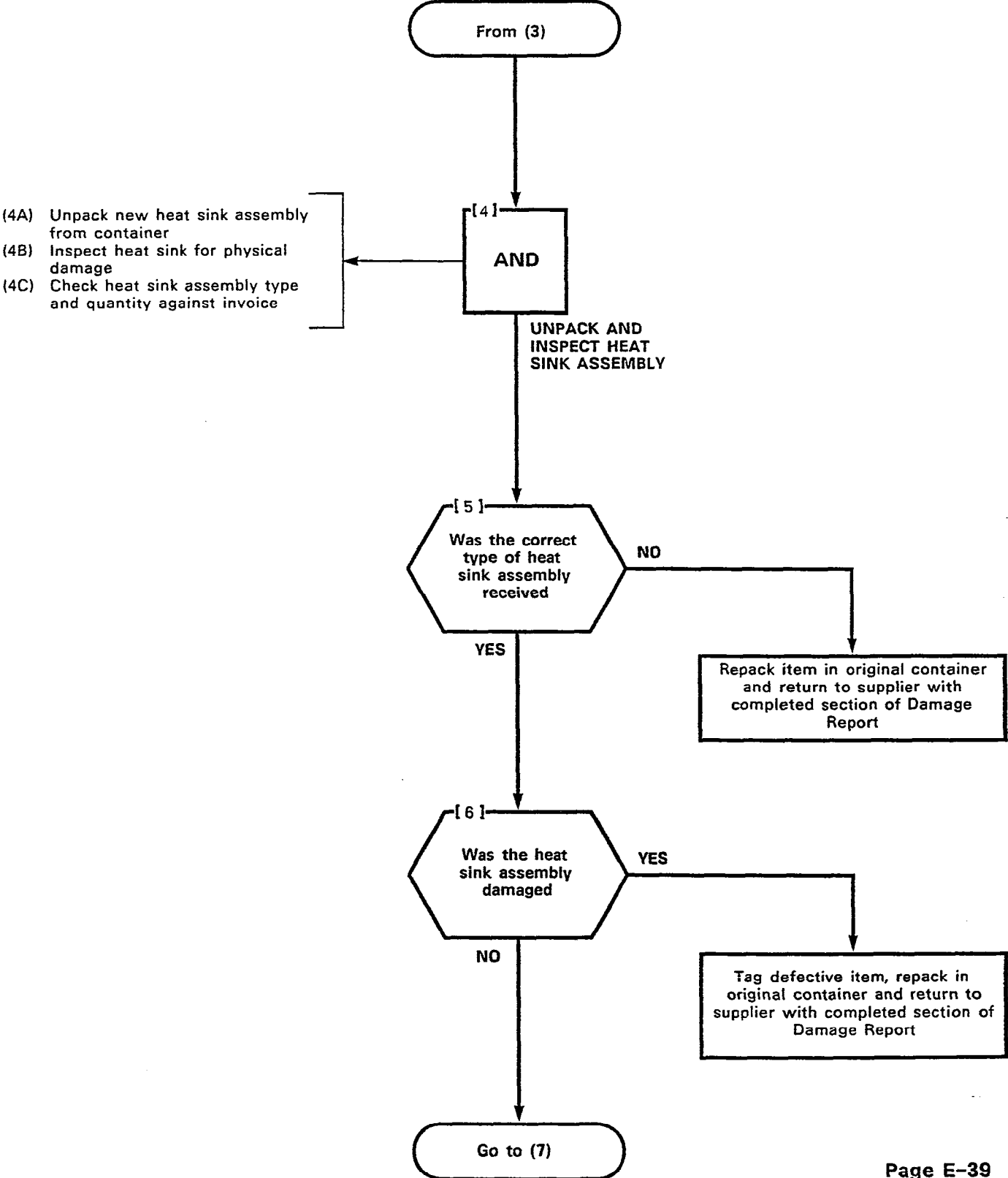
REPLACE HEAT SINK ASSEMBLY (SX-200)
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X1569

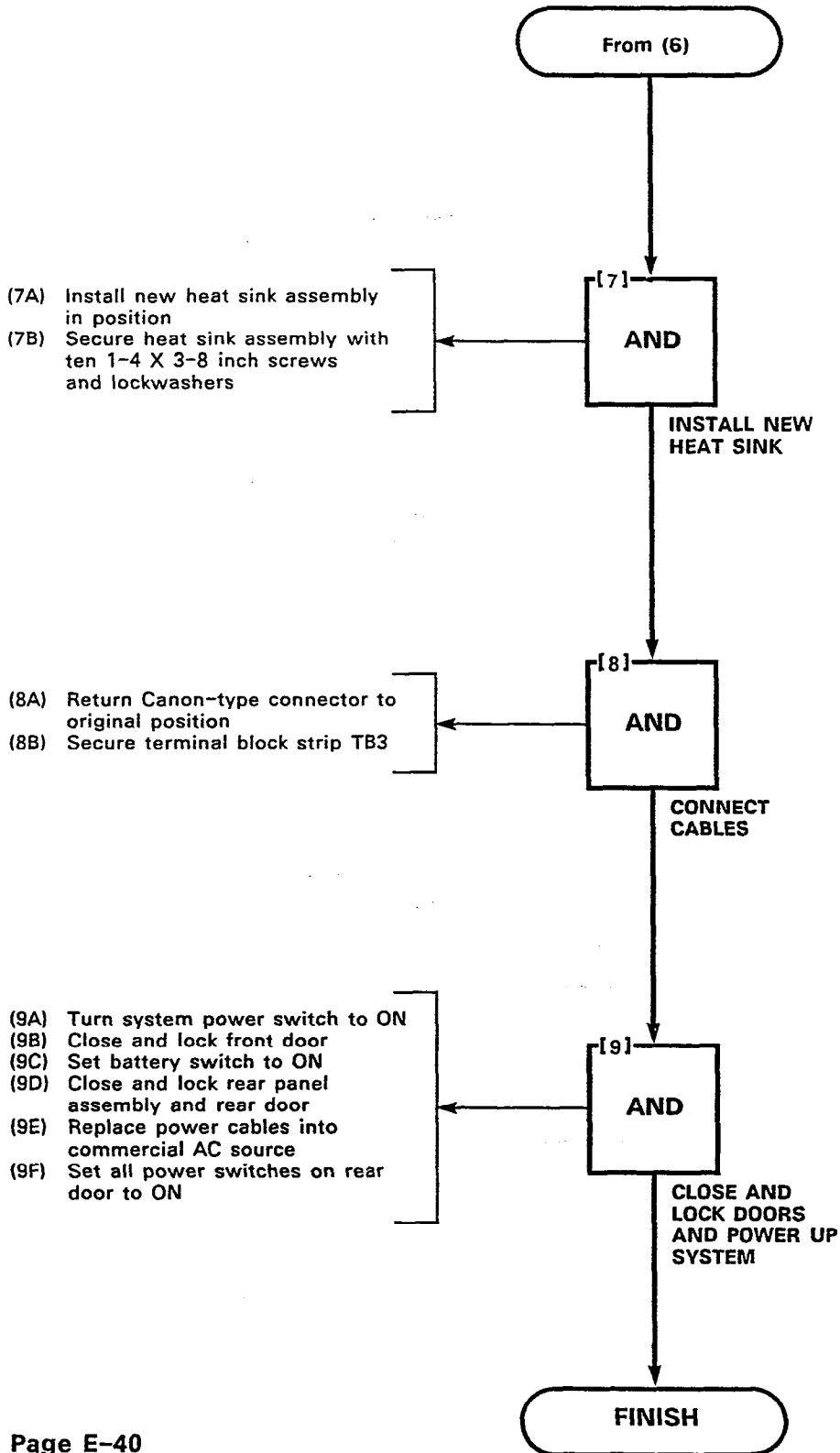
Figure 506-1 SX-200 Rear Door

REPLACE HEAT SINK ASSEMBLY (SX-200)
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SECTION MITL9105/9110-096-350-NA

REPLACE HEAT SINK ASSEMBLY (SX-200)
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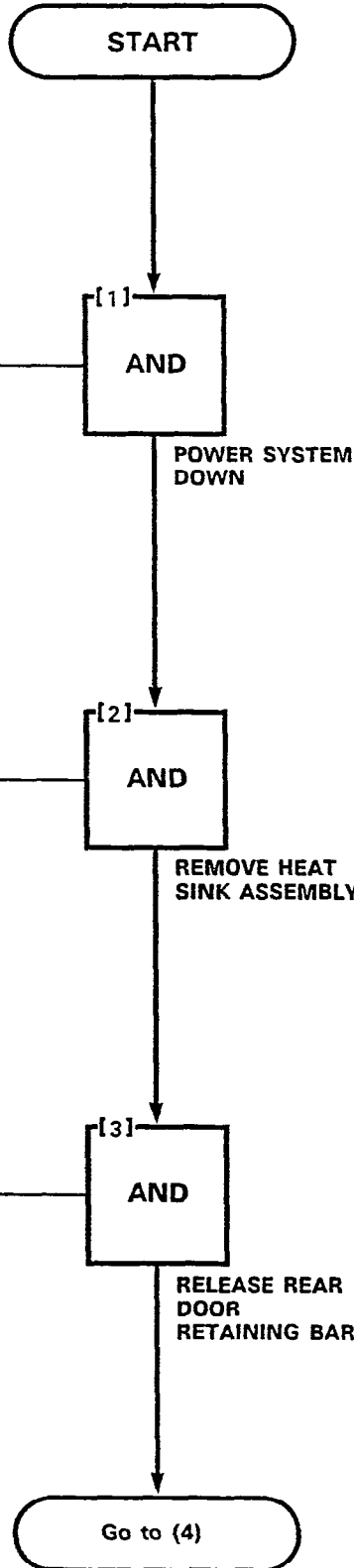
REPLACE POWER SUPPLY ASSEMBLY (SX-200)
MAP350-507
Issue 3, May 1984
Sheet 1 of 5

TOOLS REQUIRED
 1 wrench
 1 flatblade screwdriver
 1 nutdriver

- (1A) Unlock and open front door
- (1B) Unlock and open rear door
- (1C) Unlock and open rear panel assembly
- (1D) Set system power switch to OFF
- (1E) Set all power switches on rear door to OFF
- (1F) Set battery switch to OFF
- (1G) Remove power cable(s) from commercial AC source

- AT CABINET REAR DOOR (FIGURE 507-1)**
- (2A) Remove rear panel with a 11-32 in. nutdriver
 - (2B) Repeat Steps (2) and (3) of MAP350-506
 - (2C) Disconnect Ground Lug (Figure 507-2)
 - (2D) Disconnect Reserve Battery Connections (Figure 507-2) if connected

- (3A) Release the four retaining screws from the rear door retaining bar
- (3B) Slide retaining bar up, releasing the rear door
- (3C) Support power supply unit final removal



SECTION MITL9105/9110-096-350-NA

REPLACE POWER SUPPLY ASSEMBLY (SX-200)
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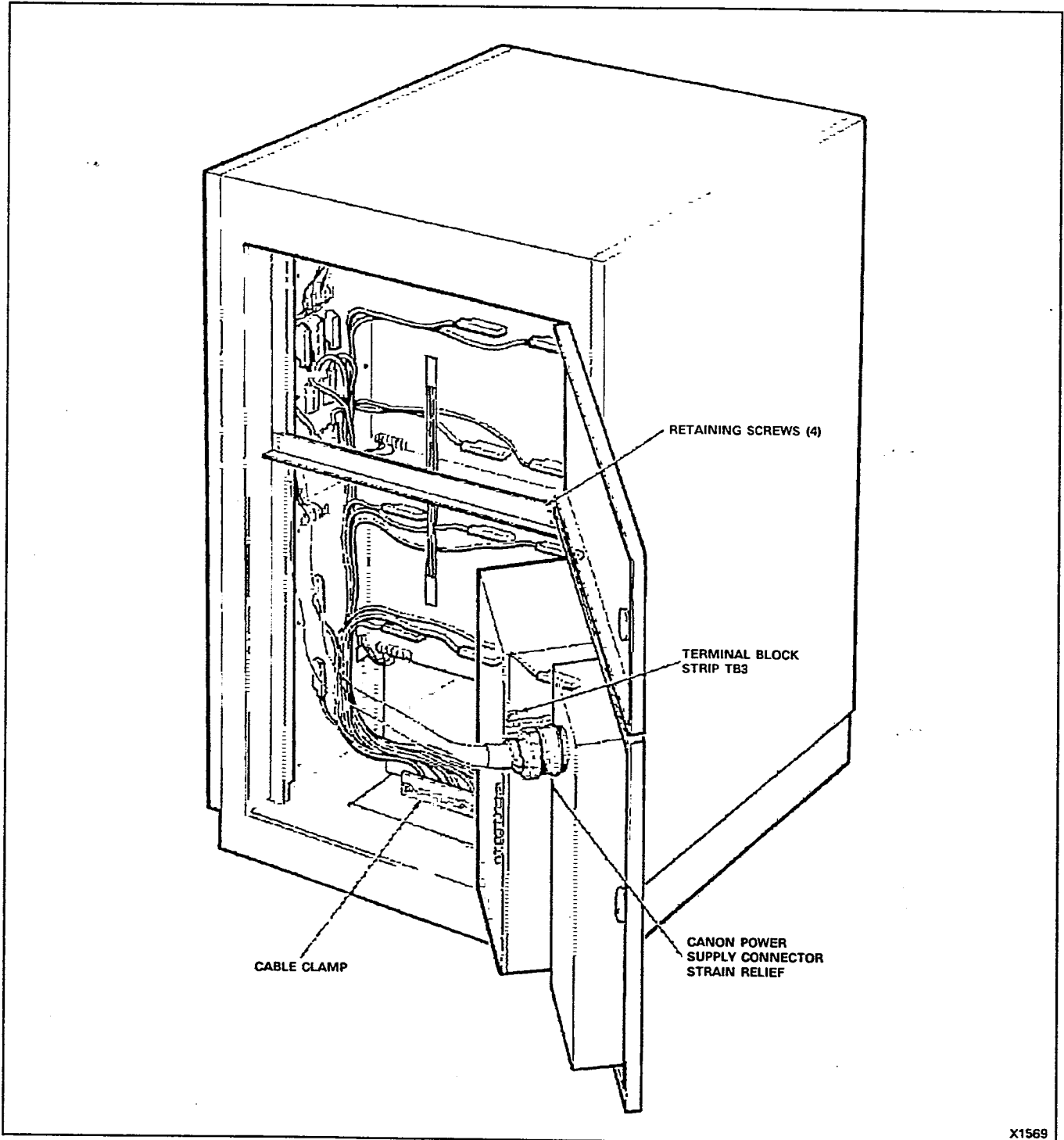


Figure 507-1 SX-200 Rear Door

X1569

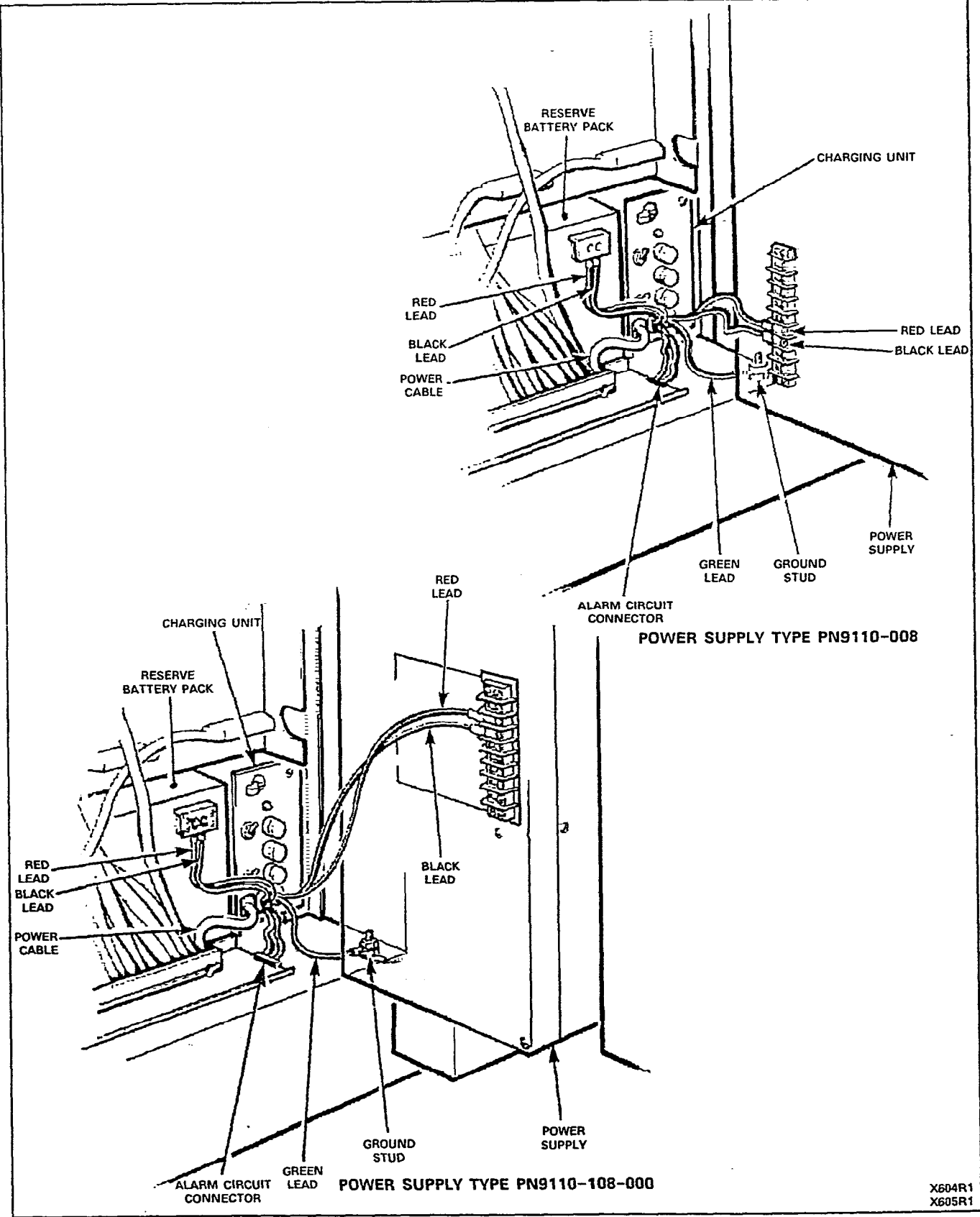


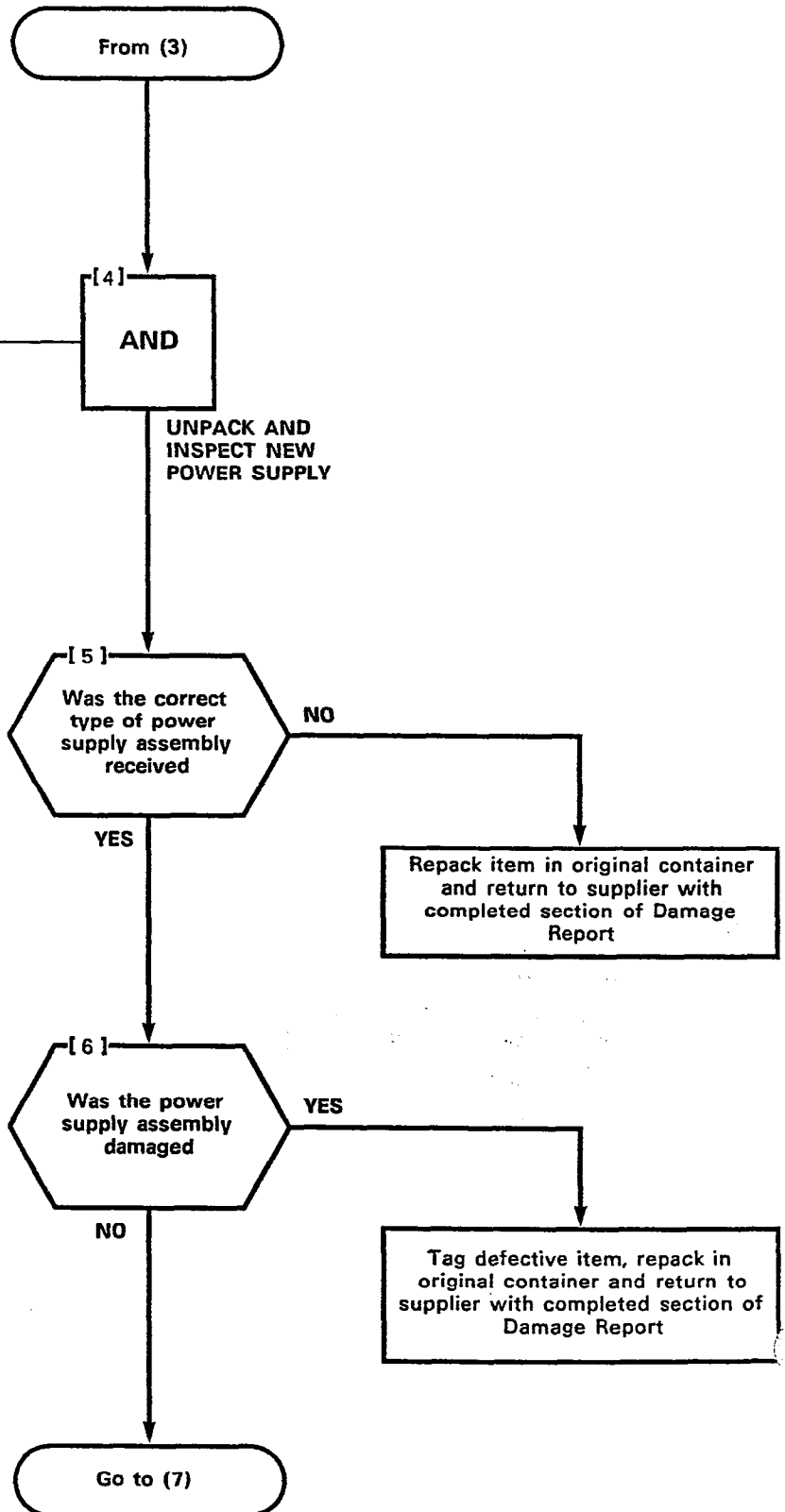
Figure 507-2 Reserve Power Supply Connections

X604R1
X605R1

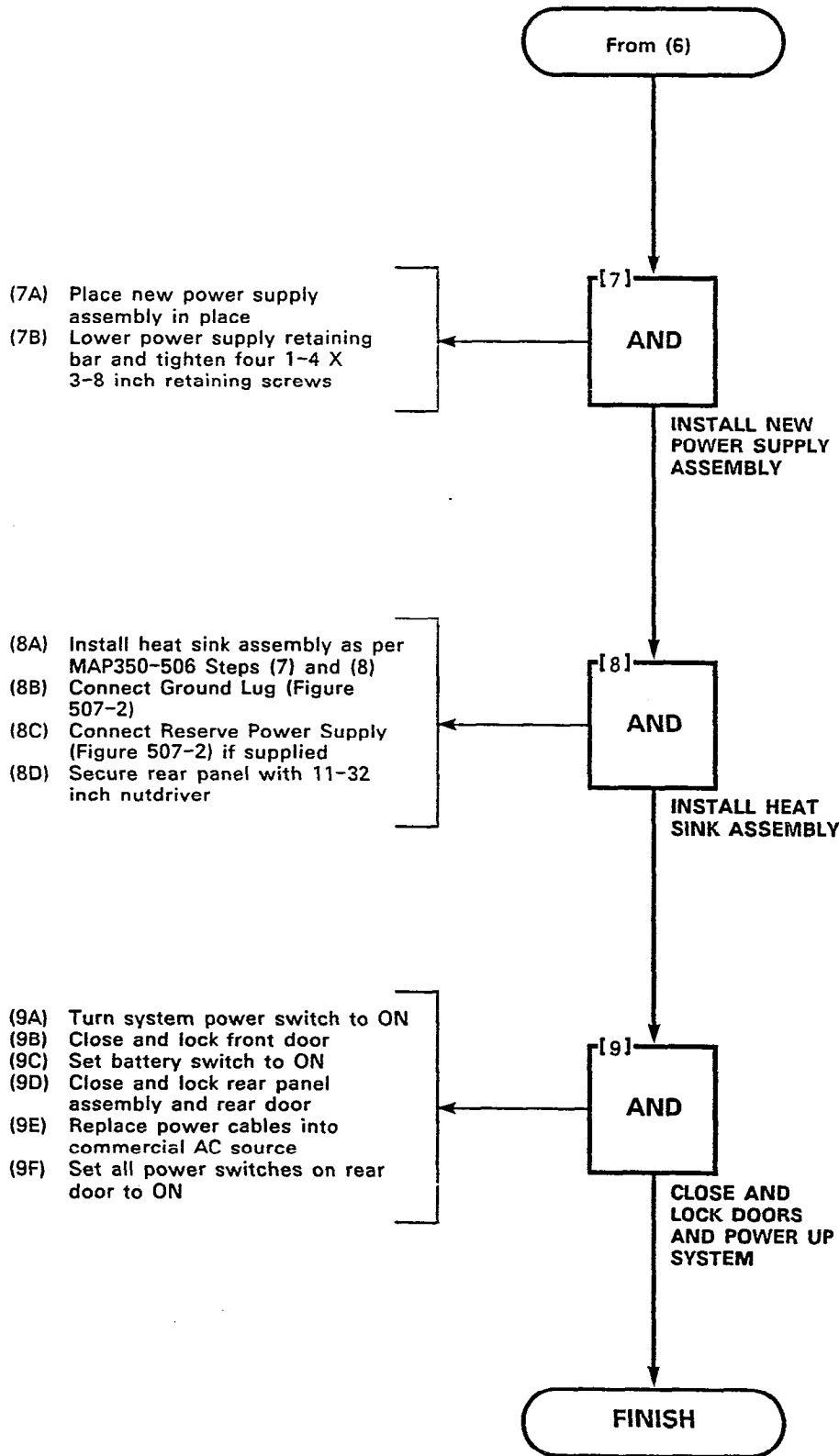
SECTION MITL9105/9110-096-350-NA

REPLACE POWER SUPPLY ASSEMBLY (SX-200)
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- (4A) Unpack new power supply assembly from container
- (4B) Inspect power supply assembly for physical damage
- (4C) Check power supply type and quantity against invoice



REPLACE POWER SUPPLY ASSEMBLY (SX-200)
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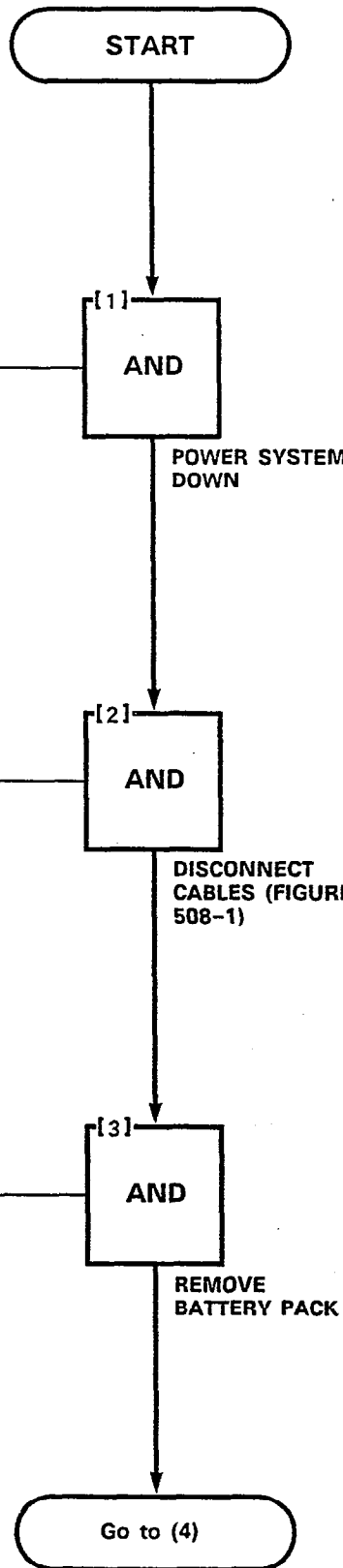
REPLACE RESERVE BATTERY BACKUP SUPPLY (SX-200)
MAP350- 508
Issue 3, May 1984
Sheet 1 of 8

TOOLS REQUIRED
 1 wrench
 1 flatblade screwdriver

- (1A) Unlock and open front door
- (1B) Unlock and open rear door
- (1C) Unlock and open rear panel assembly
- (1D) Set system power switch to OFF
- (1E) Set all power switches on rear door to OFF
- (1F) Set battery switch to OFF
- (1G) Remove power cable(s) from commercial AC source

- AT CABINET REAR DOOR (FIGURE 508-1)**
- (2A) Turn battery pack circuit breaker off
 - (2B) Disconnect reserve power supply ground lug
 - (2C) Disconnect all reserve power supply connections
 - (2D) Loosen the cable clamp and remove the AC power cord

- AT FRONT OF EQUIPMENT (FIGURE 508-2)**
- (3A) Remove the four 1-4 X 3-8 inch finishing screws and washers from the front panel of the battery pack
 - (3B) Remove the reserve battery backup supply by sliding it forward carefully



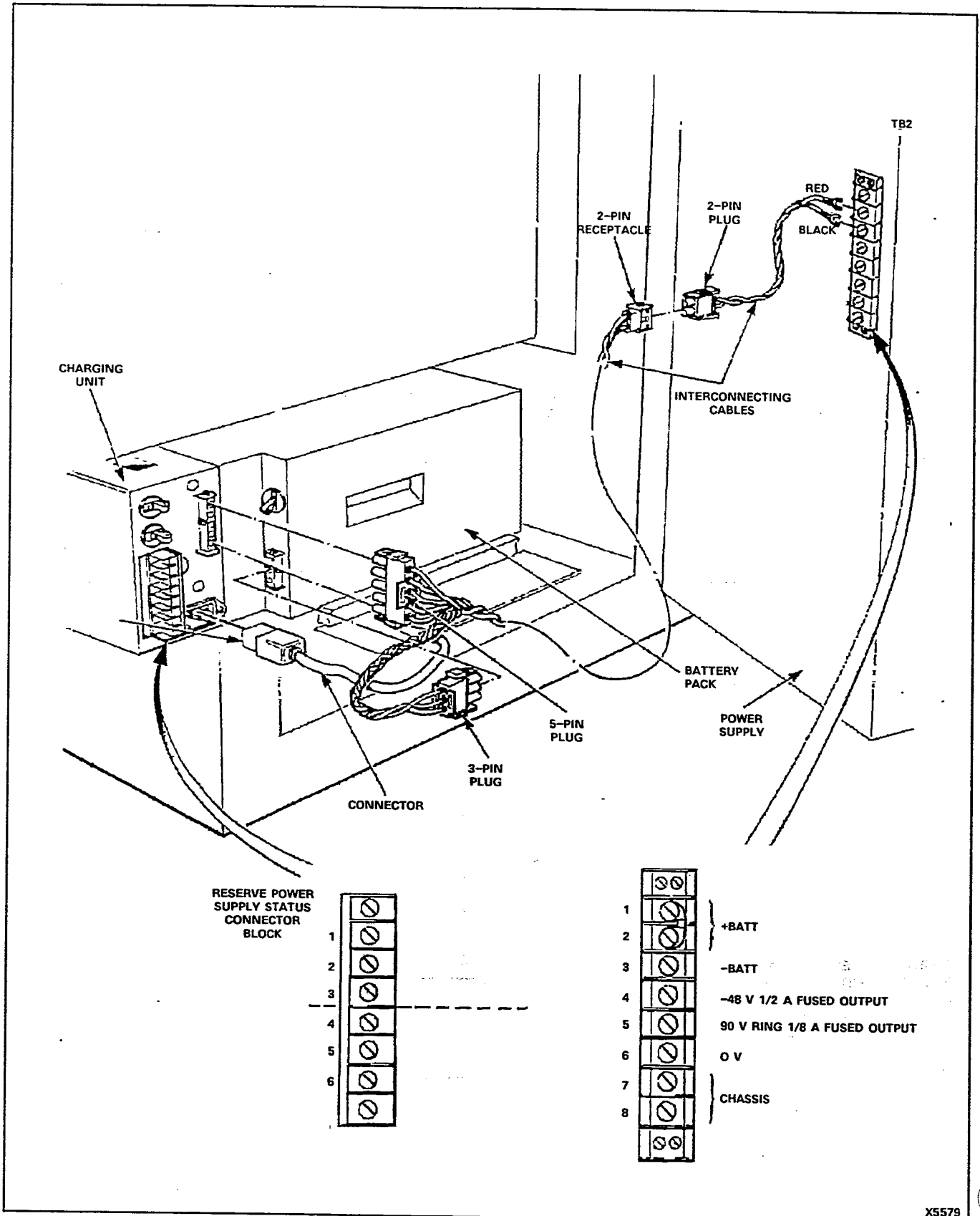


Figure 508-1 Reserve Power Supply

X5579

REPLACE RESERVE BATTERY BACKUP SUPPLY (SX-200)
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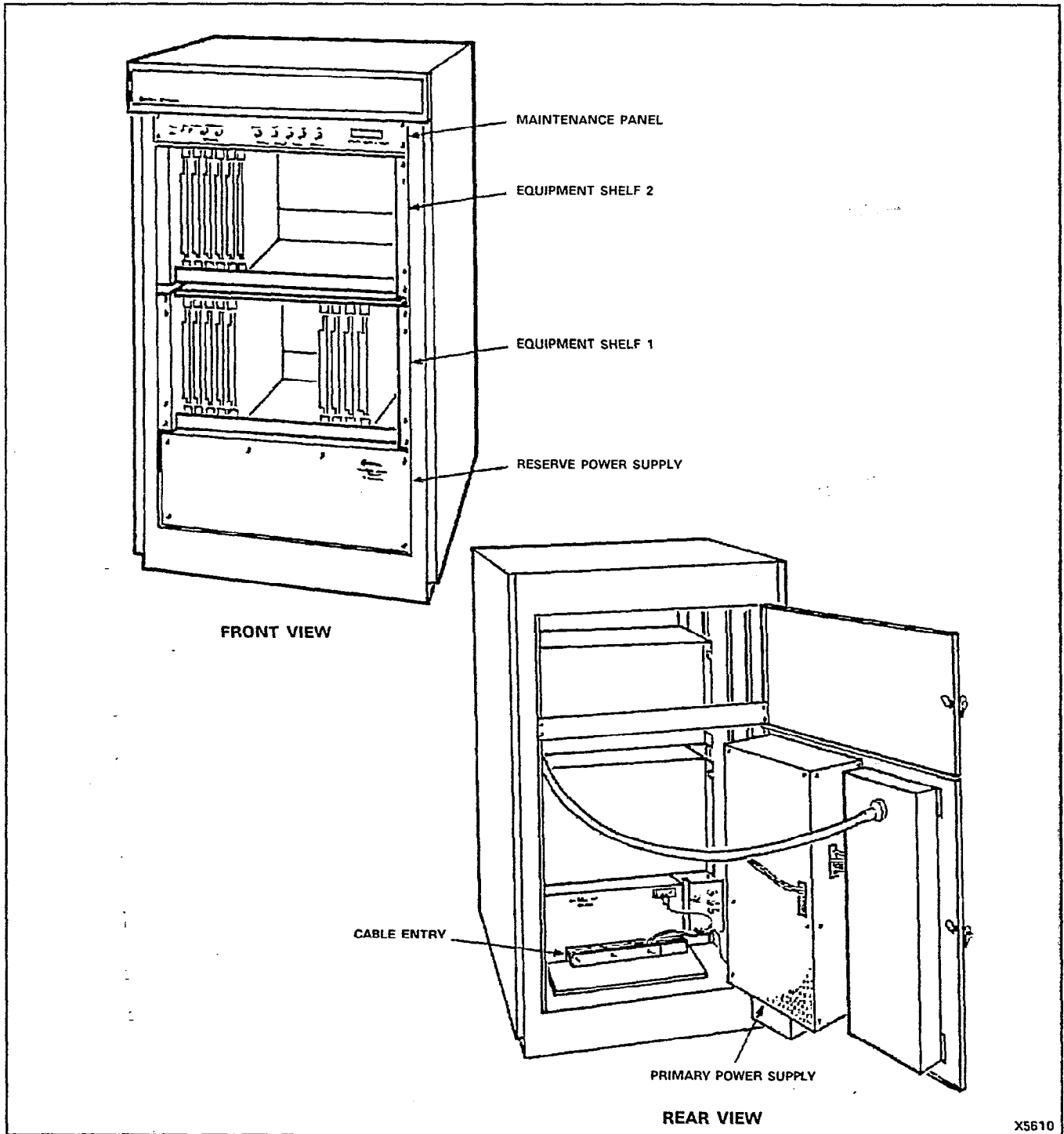
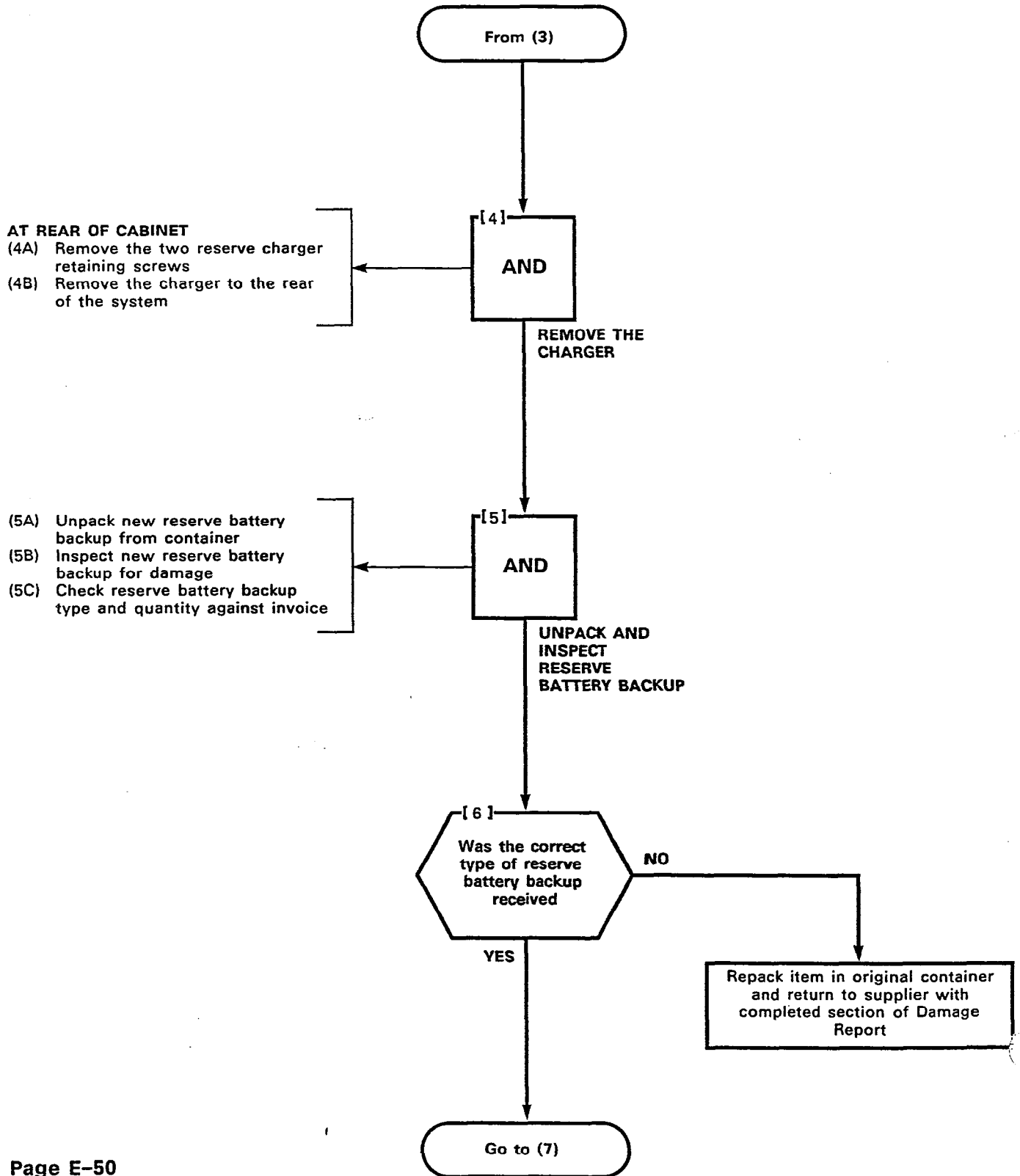


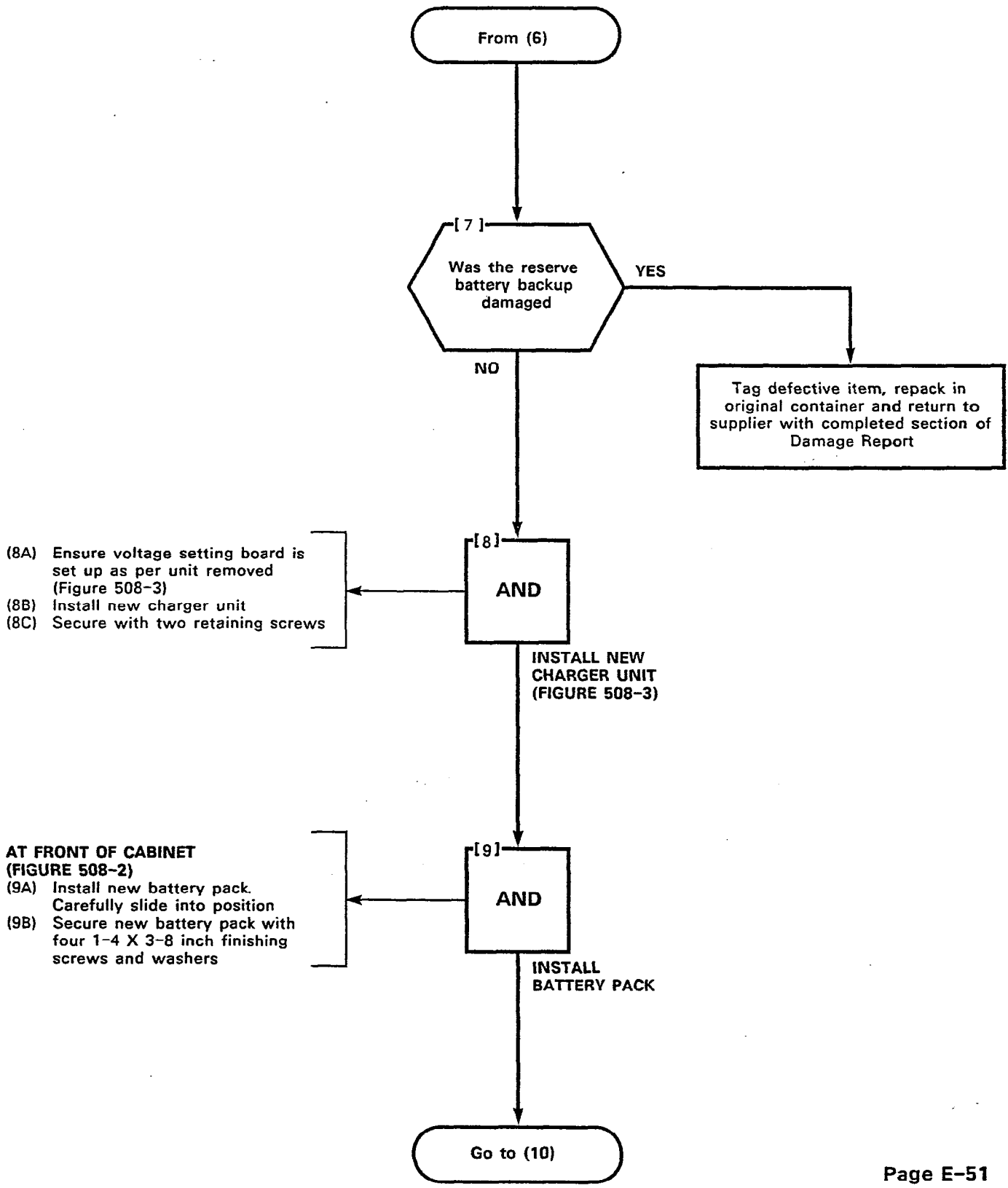
Figure 508-2 SX-200 Cabinet

SECTION MITL9105/9110-096-350-NA

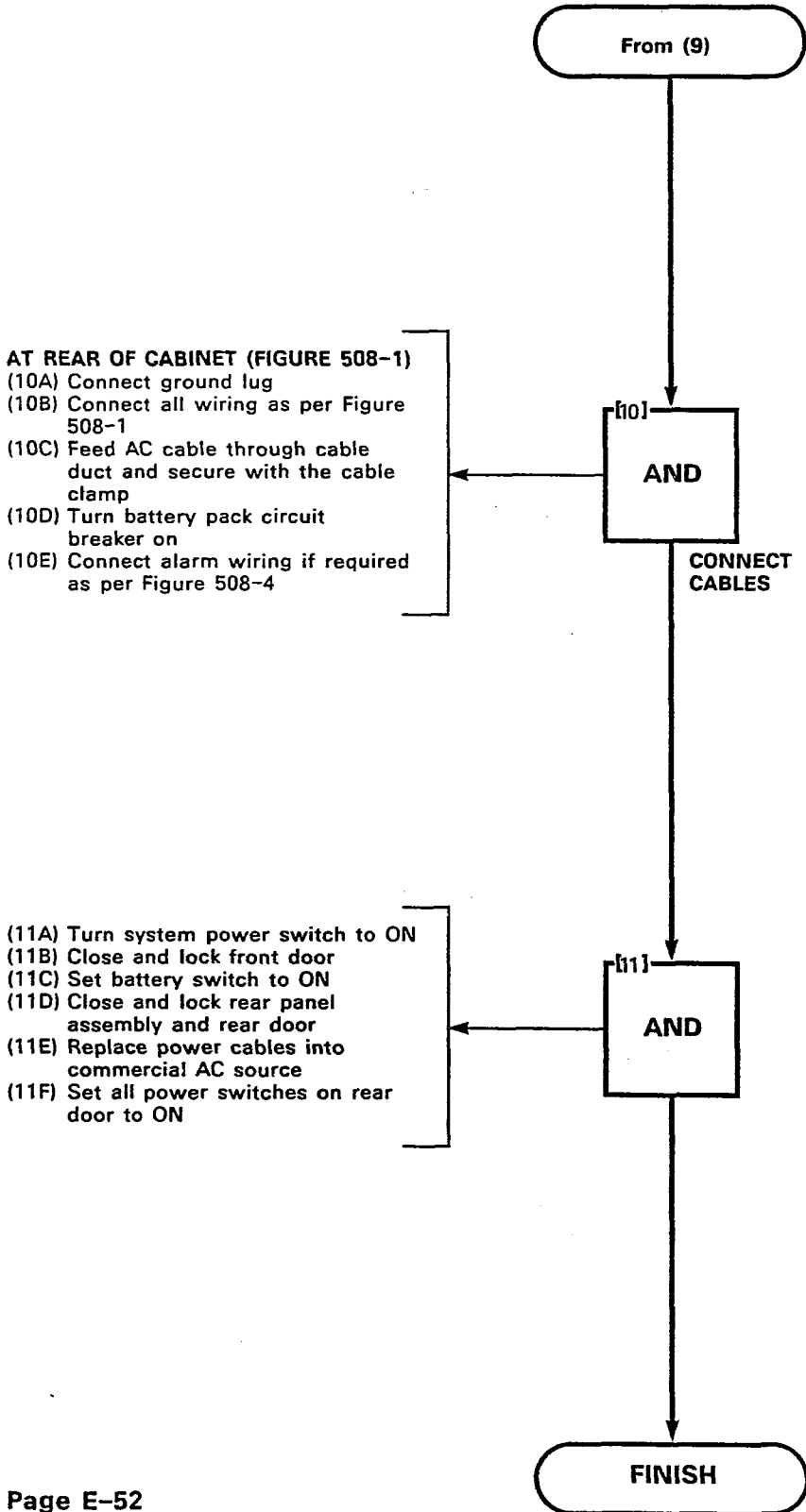
REPLACE RESERVE BATTERY BACKUP SUPPLY (SX-200)
MAP350- 508
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REPLACE RESERVE BATTERY BACKUP SUPPLY (SX-200)
MAP350-508
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REPLACE RESERVE BATTERY BACKUP SUPPLY (SX-200)
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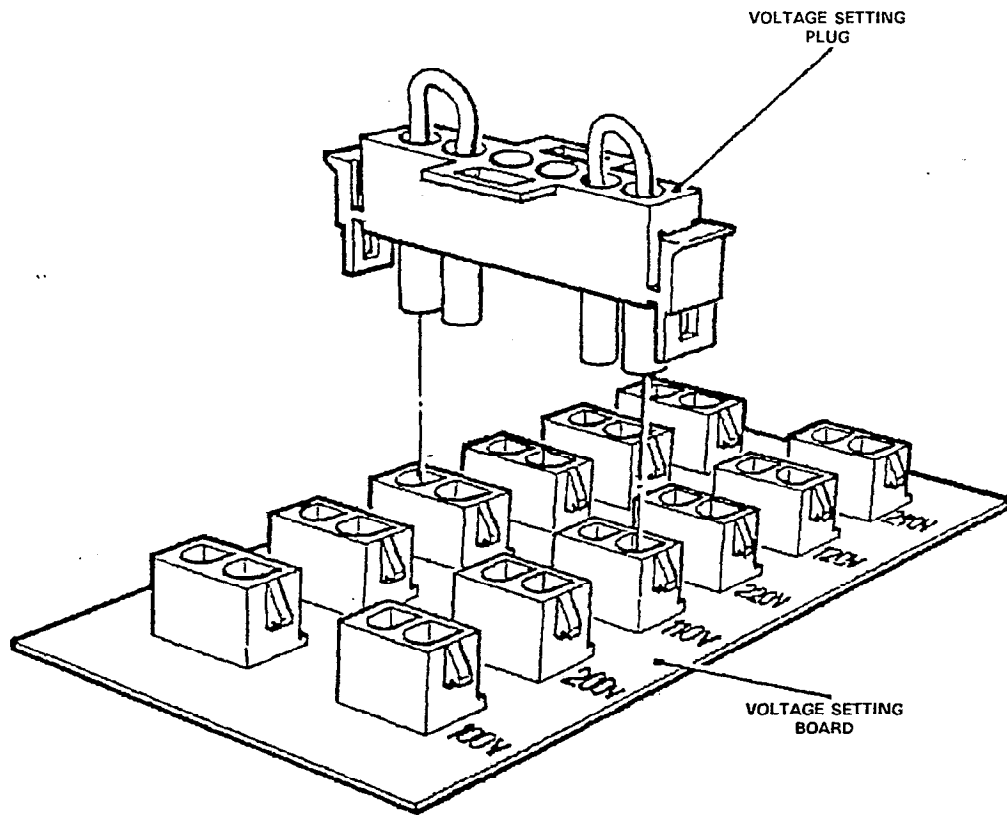


REPLACE RESERVE BATTERY
BACKUP SUPPLY (SX-200)

MAP350-508

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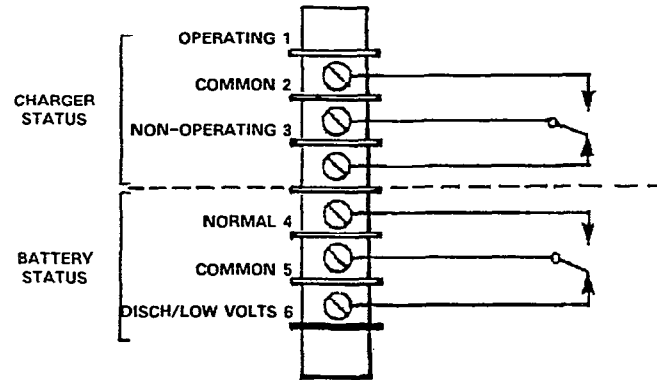
NOTE: PLUG IS LINED UP FOR INSERTION INTO RECEPTACLE CORRESPONDING TO 110 V INPUT POWER.

X5578

Figure 508-3 Voltage Setting Board and Plug

REPLACE RESERVE BATTERY BACKUP SUPPLY (SX-200)
MAP350- 508
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RELAY CONTACT RATING:
RESISTIVE LOAD- 2 A, 28 Vdc
-1 A, 110 Vac



- NOTES:
1. WHERE CHARGER STATUS INDICATION IS REQUIRED, USE TERMINALS 1, 2 AND 3. WHERE RESERVE BATTERY STATUS INDICATION IS REQUIRED, USE TERMINALS 4, 5 AND 6.
 2. CONNECT ONE LEAD OF THE ALARM INDICATOR TO THE COMMON TERMINAL OF THE STATUS INDICATION REQUIRED (TERMINAL 2 FOR CHARGER STATUS; TERMINAL 5 FOR BATTERY STATUS).
 3. WHERE ALARM INDICATOR REQUIRES A LOOP FOR ACTIVATION, CONNECT THE SECOND LEAD TO TERMINAL 3 (FOR CHARGER STATUS) OR TERMINAL 6 (FOR BATTERY STATUS).
 4. WHERE ALARM INDICATOR REQUIRES A LOOP DISCONNECTION FOR ACTIVATION, CONNECT THE SECOND LEAD TO TERMINAL 1 (FOR CHARGER STATUS) OR TERMINAL 4 (FOR BATTERY STATUS).

X5580

Figure 508-4 Alarm Indicator Connections

REPLACE BACKPLANE
TRANSLATOR BOARD (SX-200)

MAP350-509

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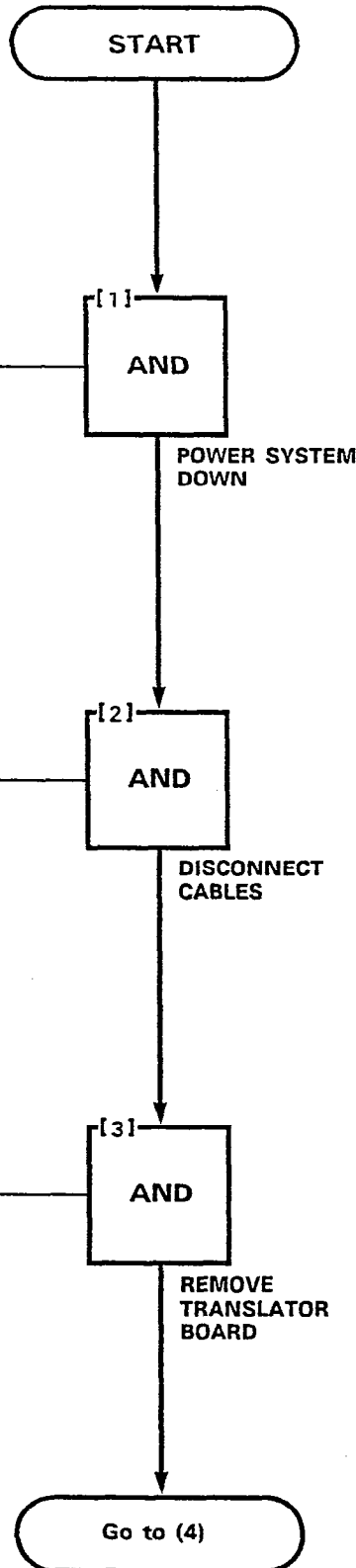
Sheet 1 of 4

TOOL REQUIRED
1 flatblade screwdriver

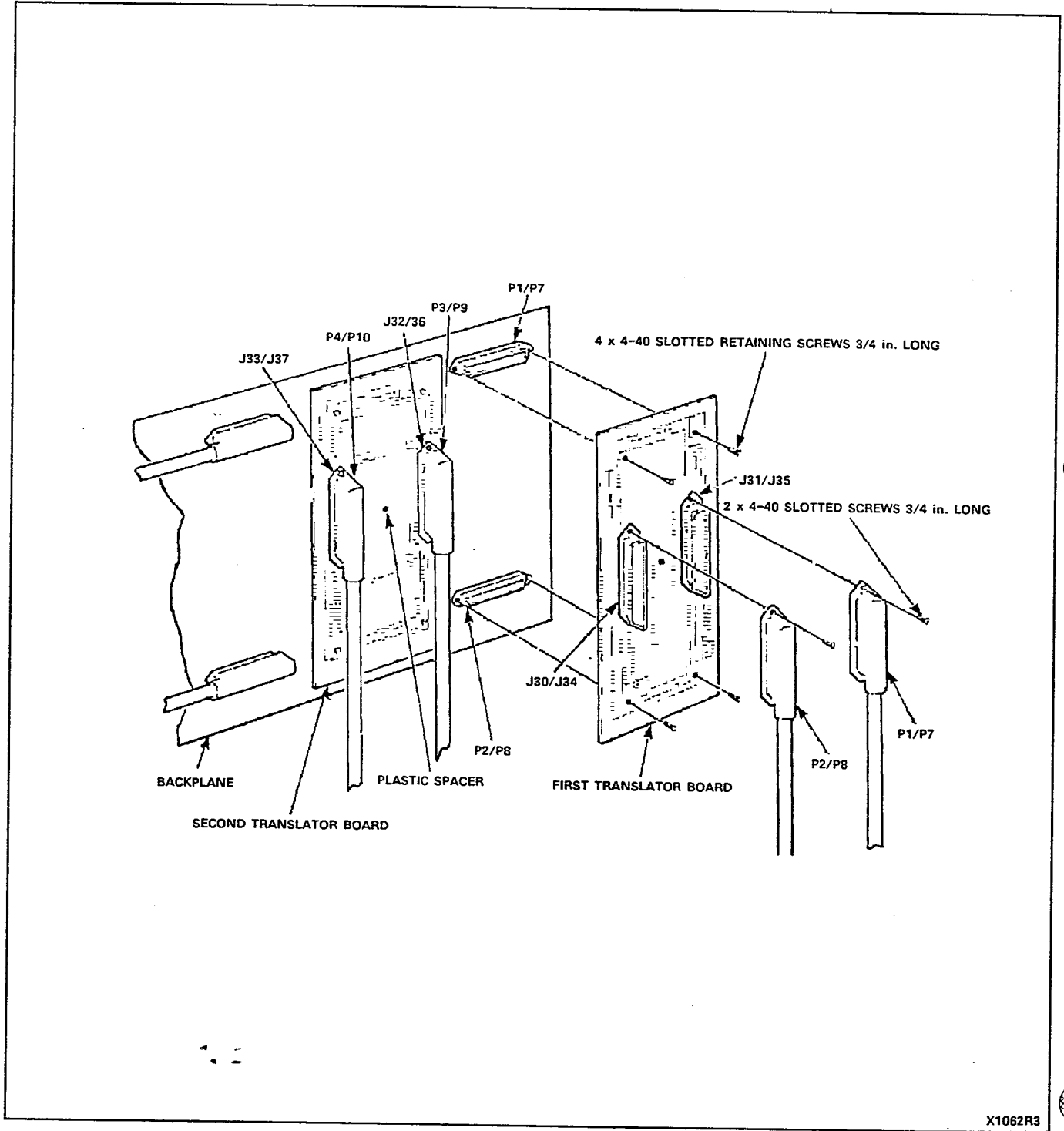
- (1A) Unlock and open front door
- (1B) Unlock and open rear door
- (1C) Unlock and open rear panel assembly
- (1D) Set system power switch to OFF
- (1E) Set all power switches on rear door to OFF
- (1F) Set battery switch to OFF
- (1G) Remove power cable(s) from commercial AC source

- AT CABINET REAR DOOR (FIGURE 509-1)**
- (2A) Unscrew the two 4 X 40 screws from the amphenol-type connector
 - (2B) Unplug cables in pairs: P2 or P8 and P1 or P7, P3 or P9 and P4 or P10

- (3A) Remove the four 4 X 40 slotted retaining screws
- (3B) Remove the translator board



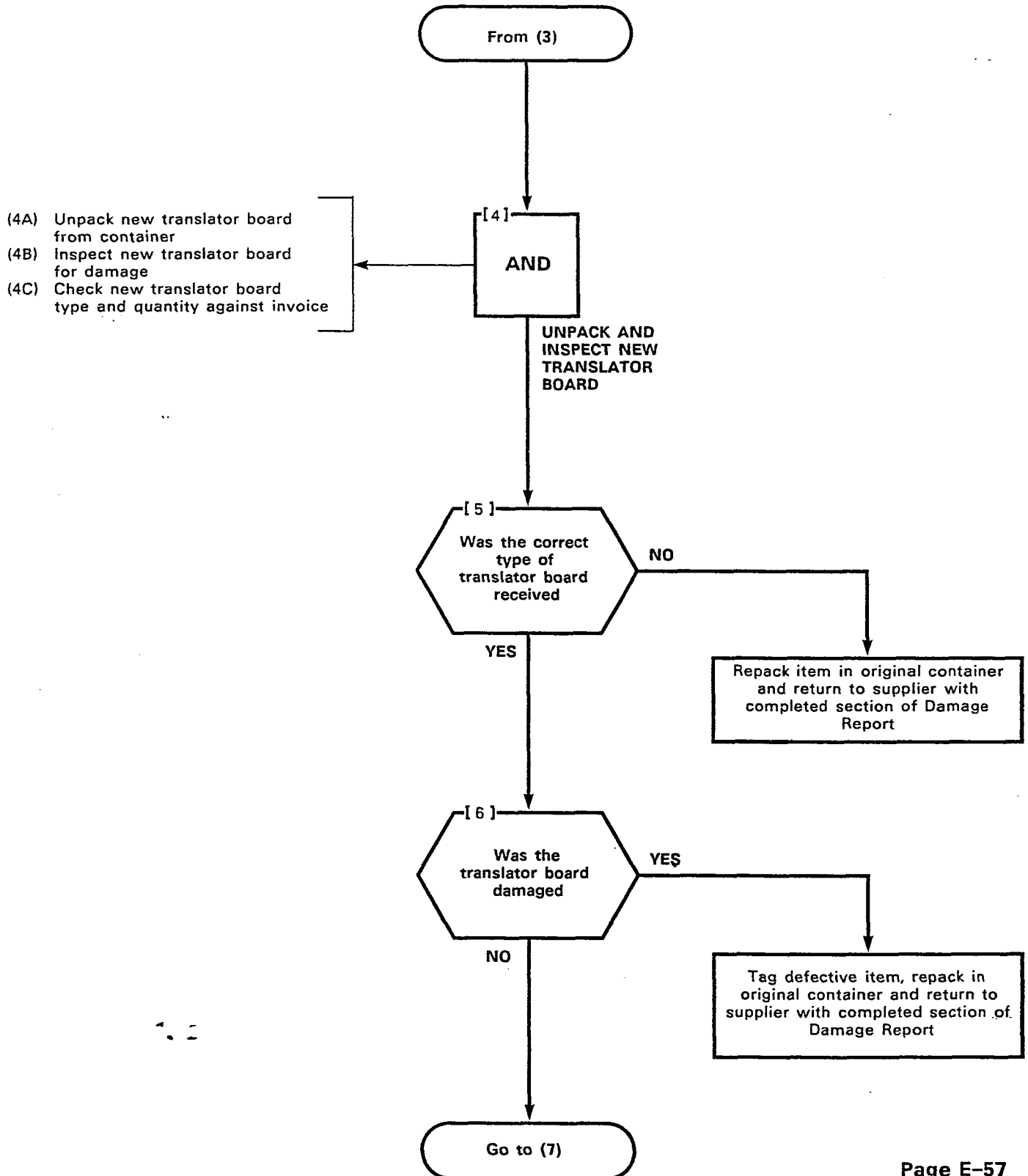
REPLACE BACKPLANE TRANSLATOR BOARD (SX-200)
MAP350- 509
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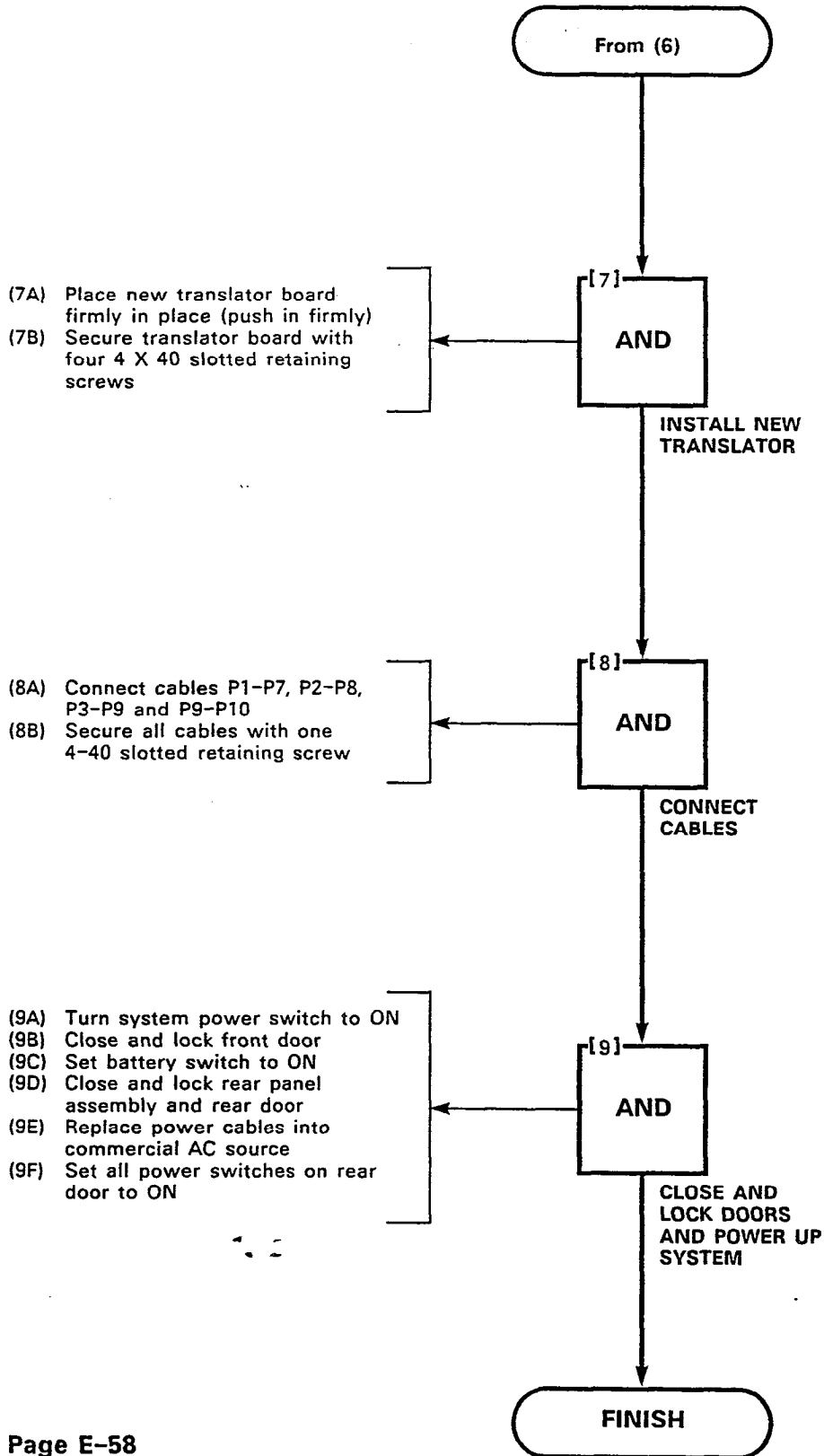
X1062R3

Figure 509-1 Translator Board

REPLACE BACKPLANE TRANSLATOR BOARD (SX-200)
MAP350-509
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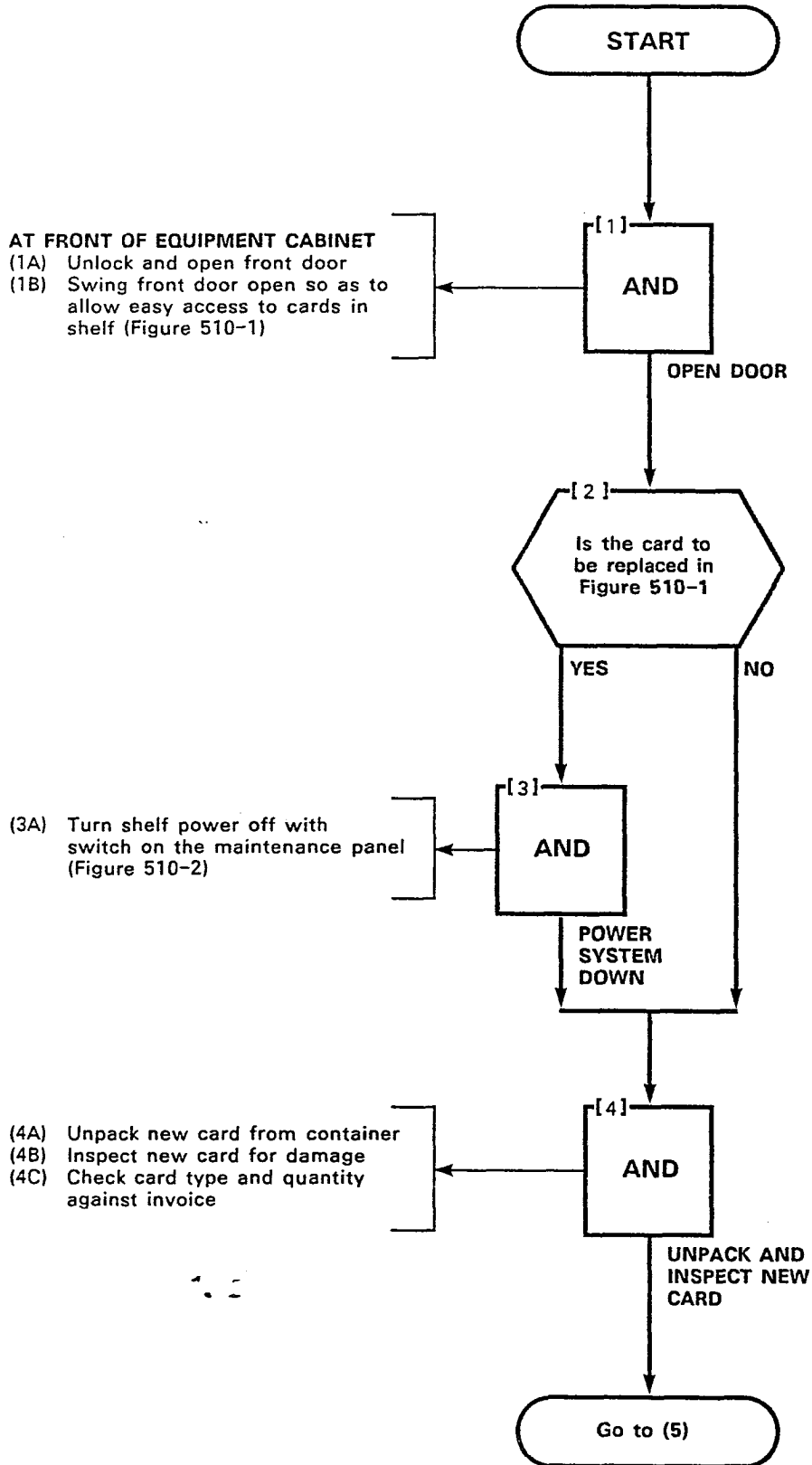


REPLACE BACKPLANE TRANSLATOR BOARD (SX-200)
MAP350- 509
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REPLACE CARDS IN SHELF (SX-200)
MAP350-510
Issue 3, May 1984
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NOTE
1. Do not handle card by gold inlay contacts.
2. Beware of static; service person must wear a ground strap.
3. Don't store batteries for cards in place on cards, while in storage.



REPLACE CARDS IN SHELF (SX-200)
MAP350- 510
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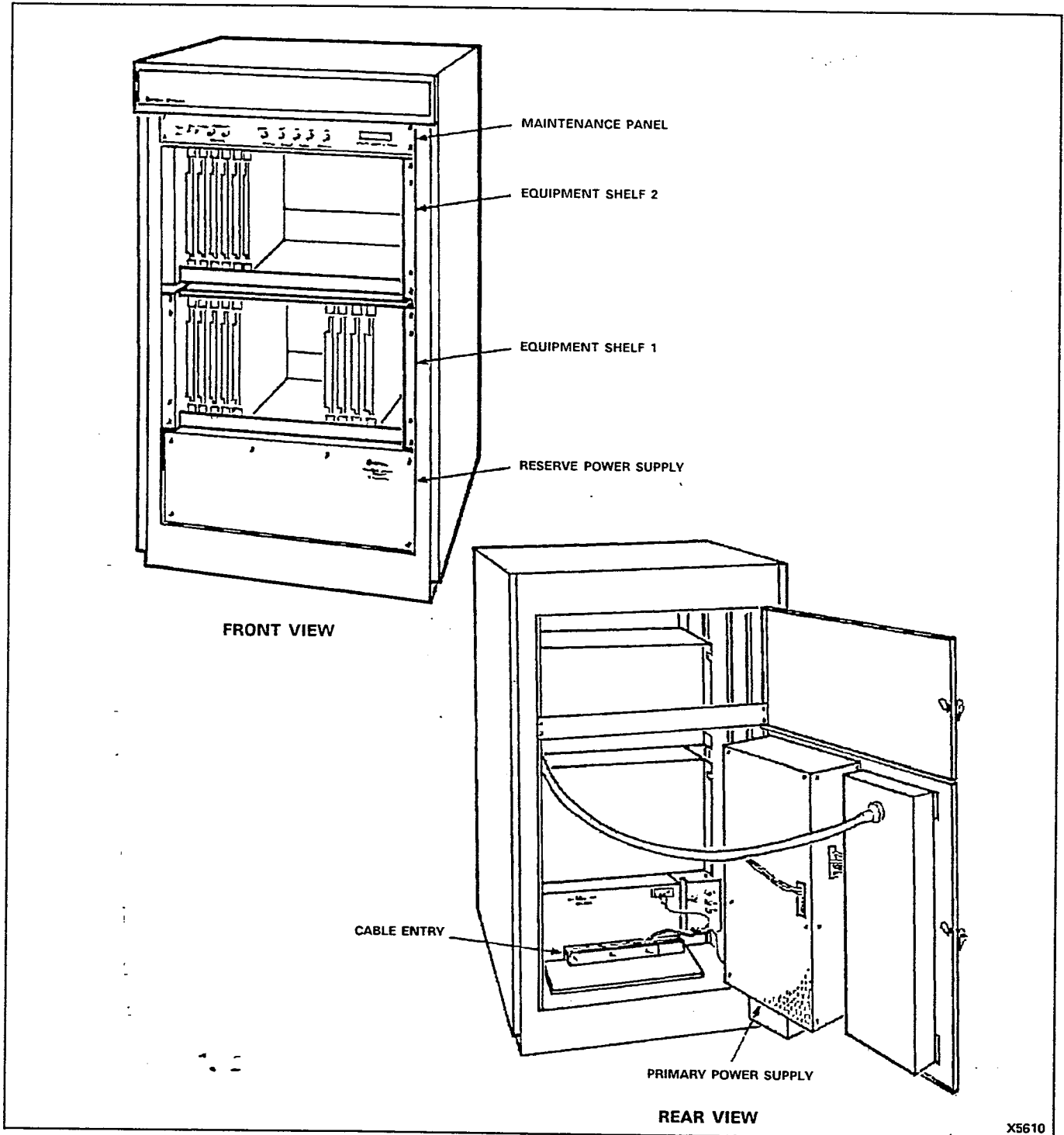
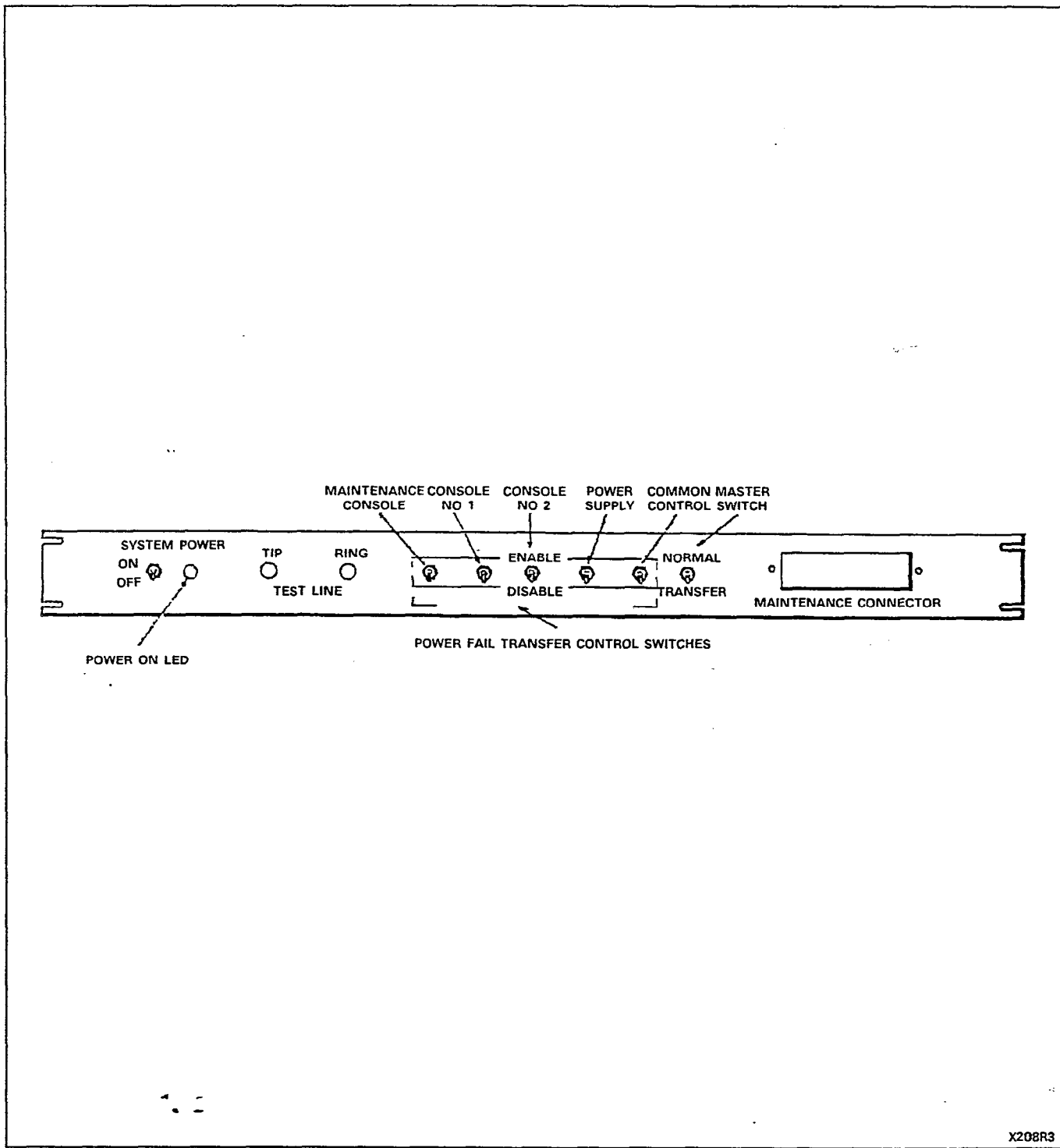


Figure 510-1 SX-200 Cabinet

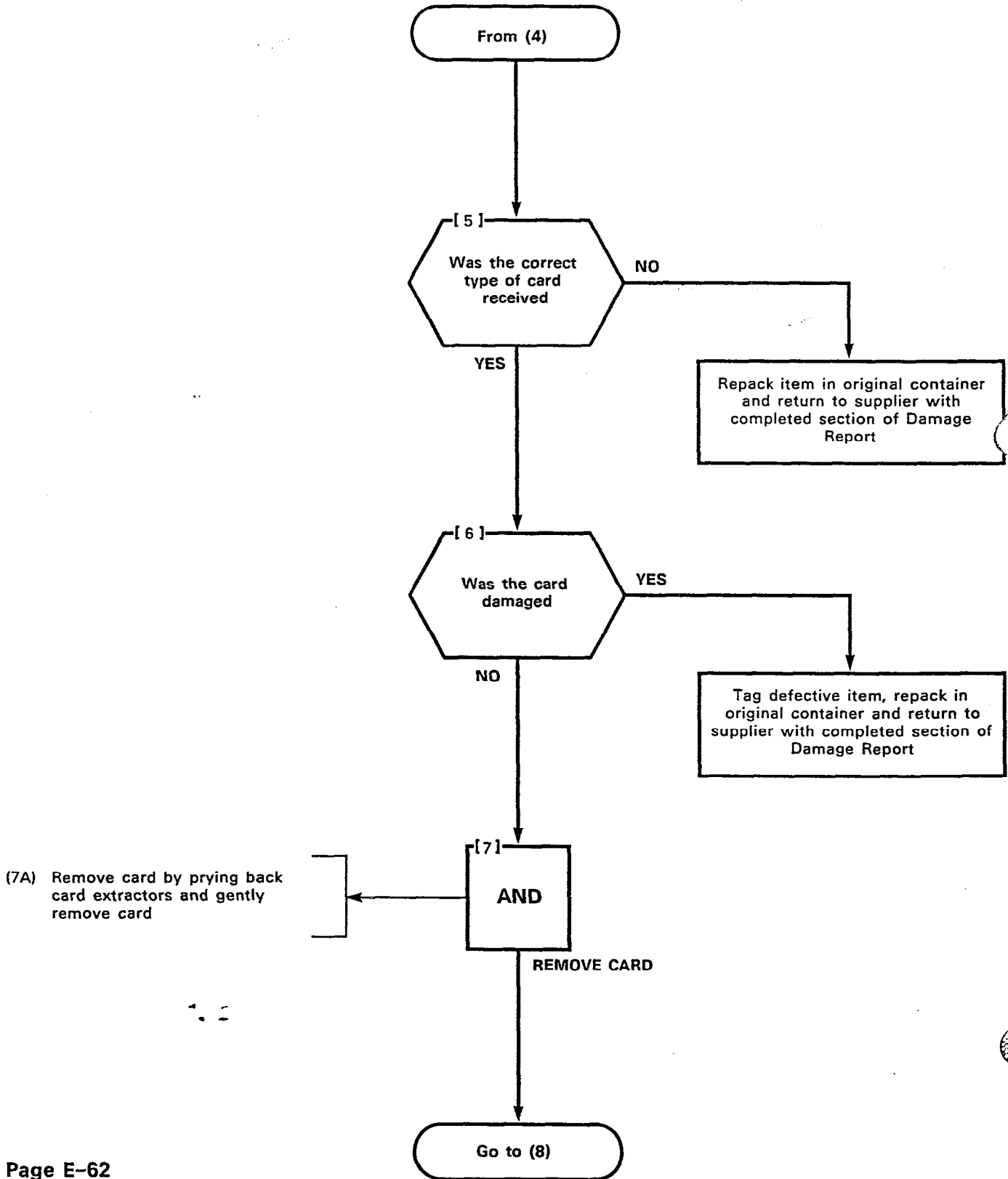
REPLACE CARDS IN SHELF (SX-200)
MAP350-510
Issue 3, May 1984
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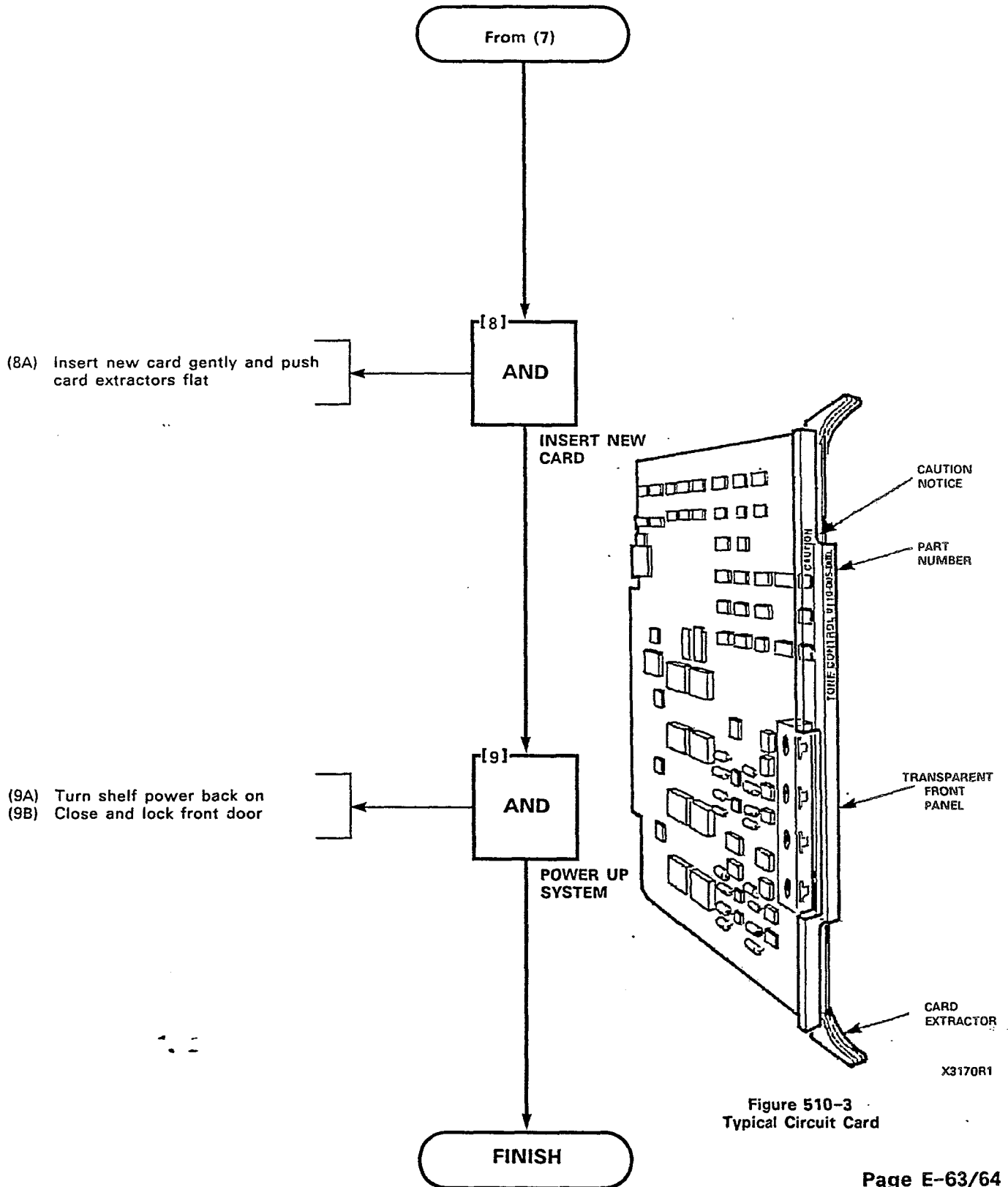
X208R3

Figure 510-2 Maintenance Panel

REPLACE CARDS IN SHELF (SX-200)
MAP350- 510
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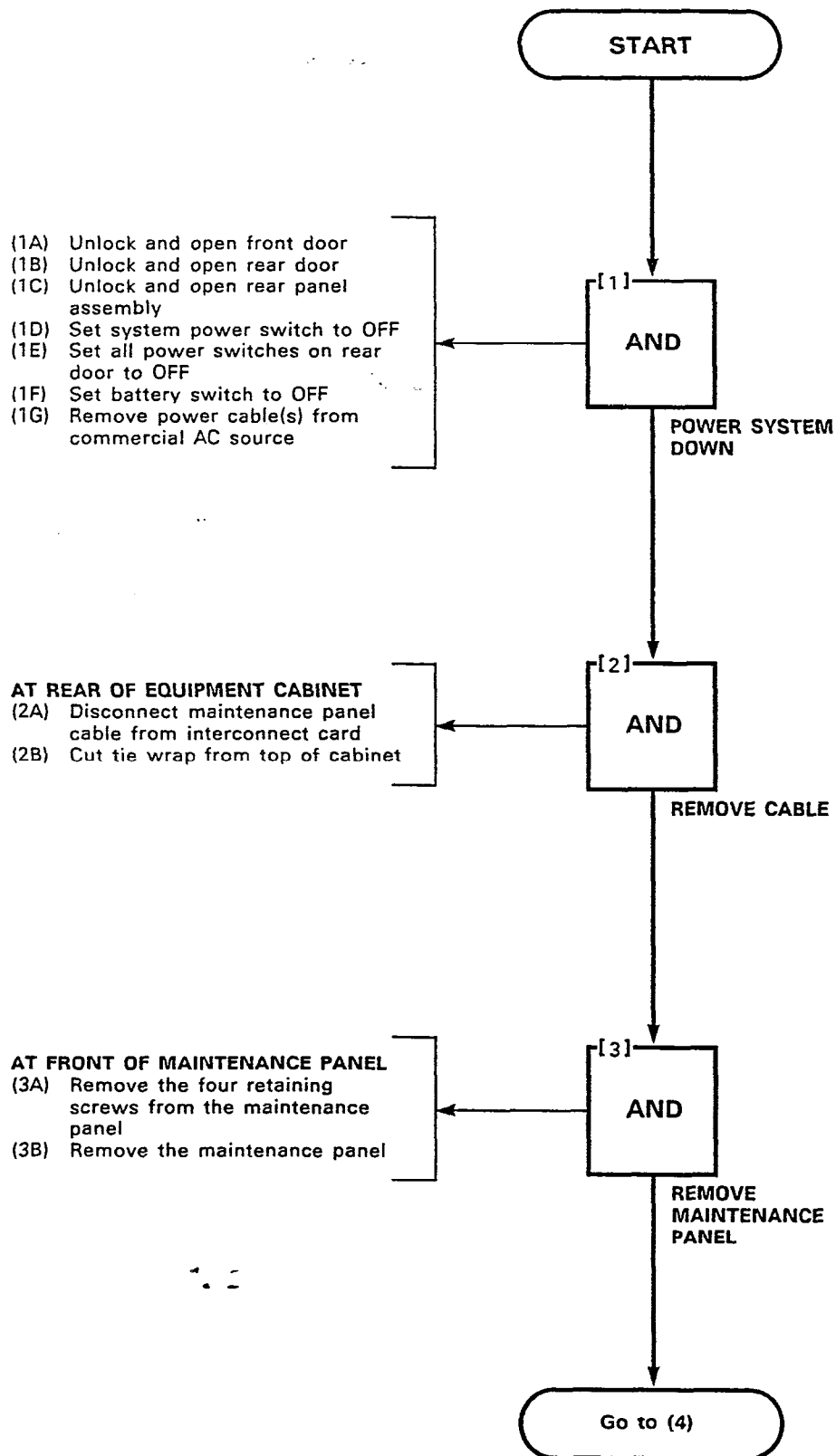
REPLACE CARDS IN SHELF (SX-200)
MAP350-510
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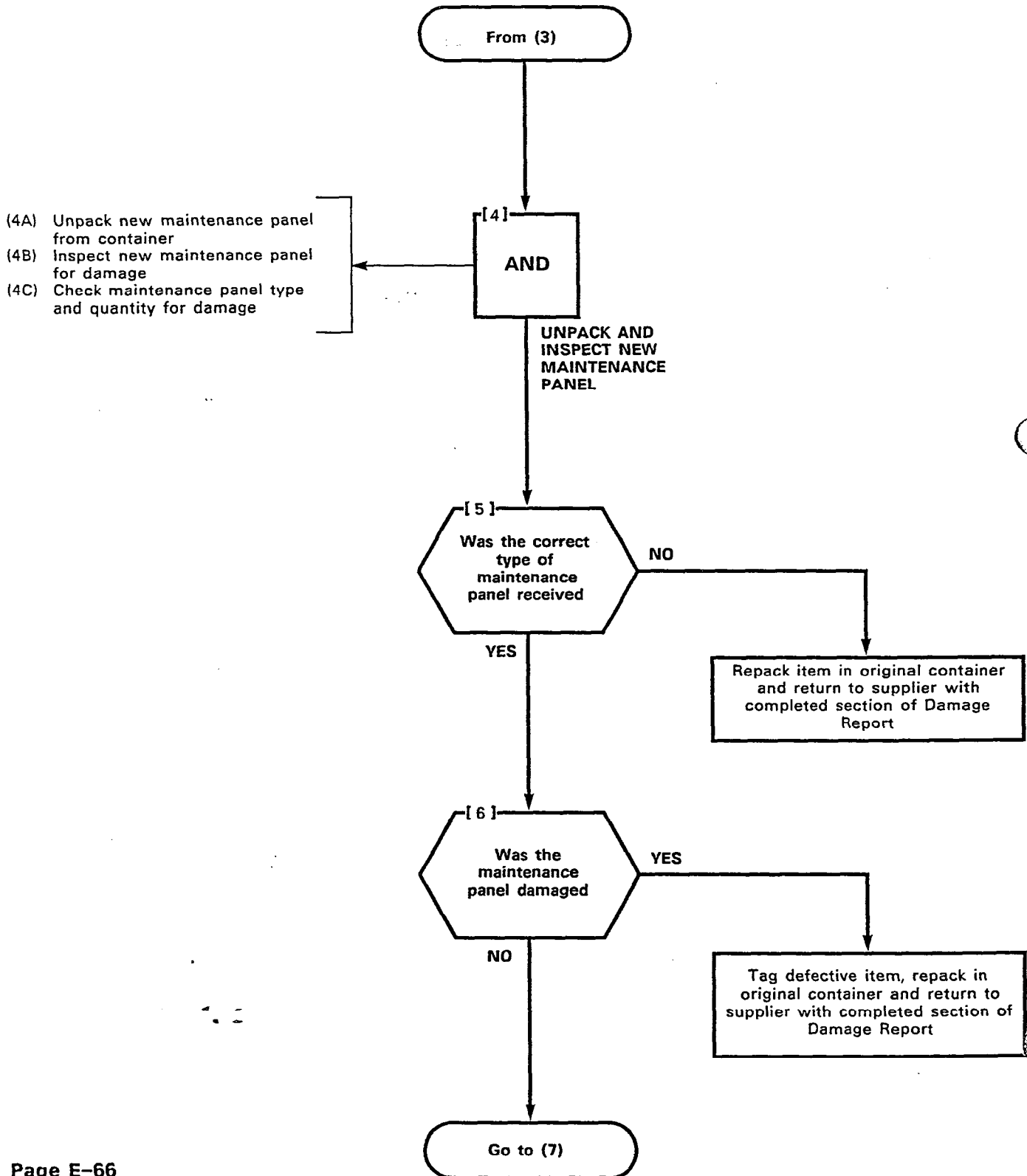


11

REPLACE MAINTENANCE PANEL (SX-200)
MAP350- 511
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REPLACE MAINTENANCE PANEL (SX-200)
MAP350- 511
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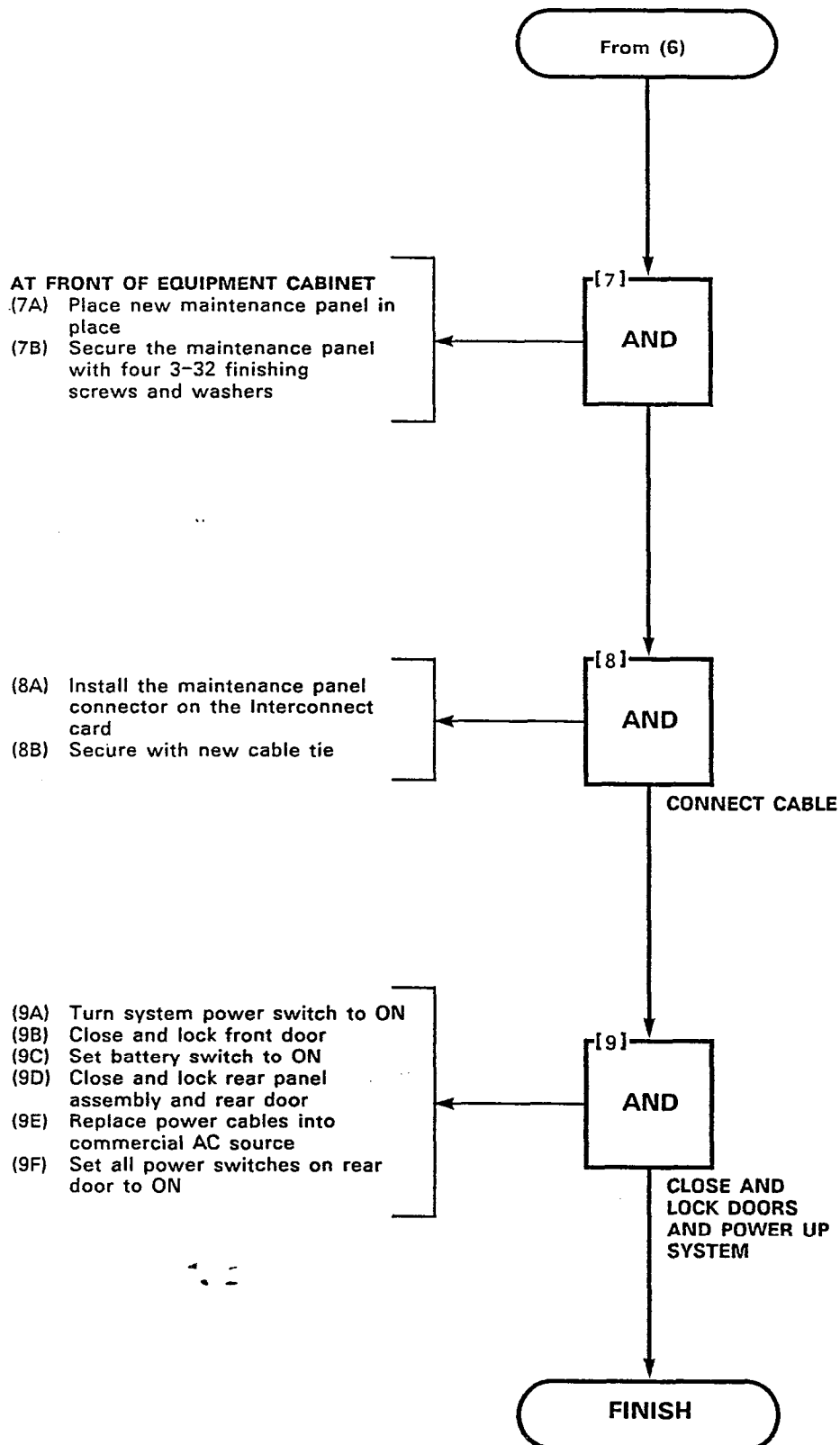


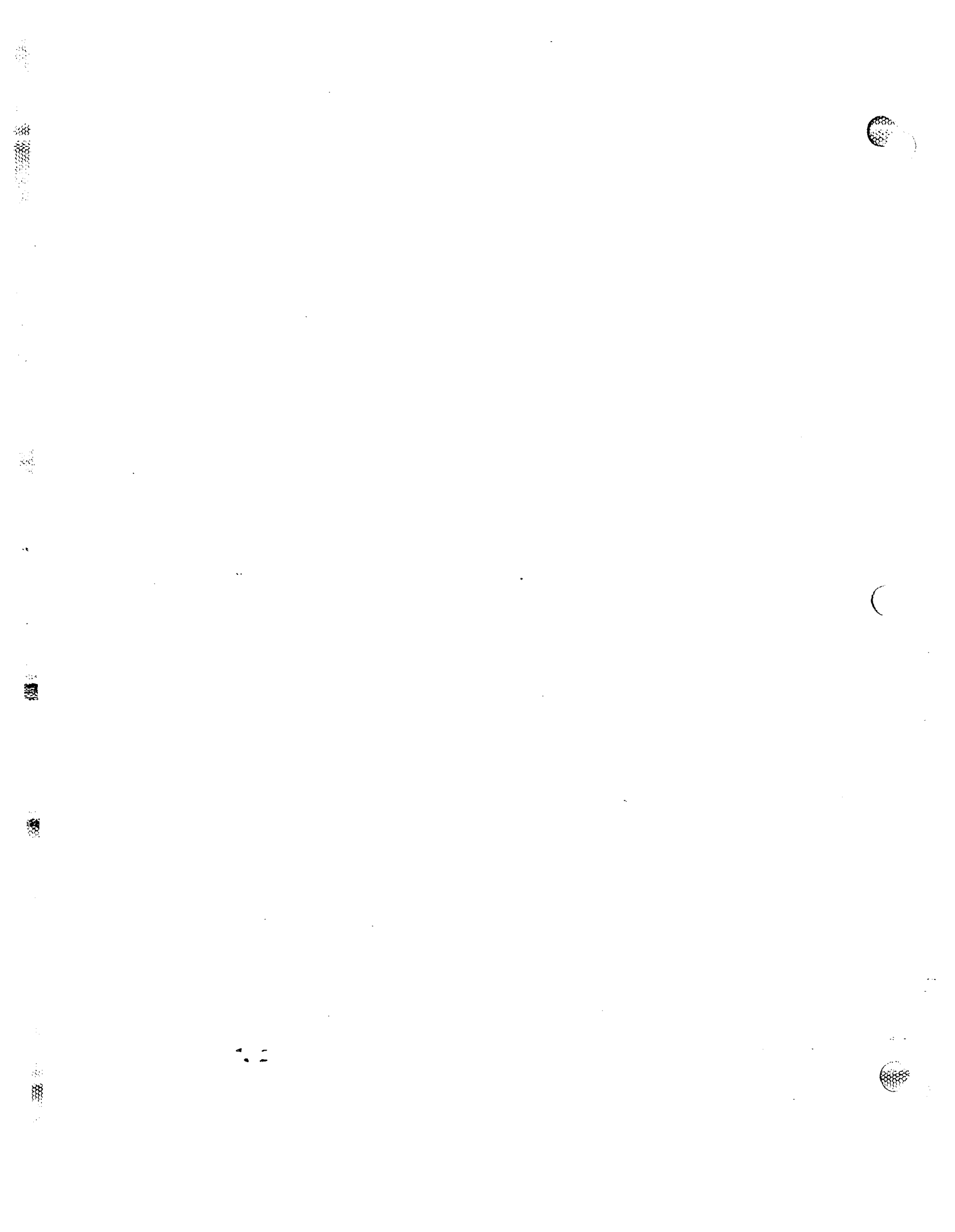
REPLACE MAINTENANCE PANEL (SX-200)

MAP350-511

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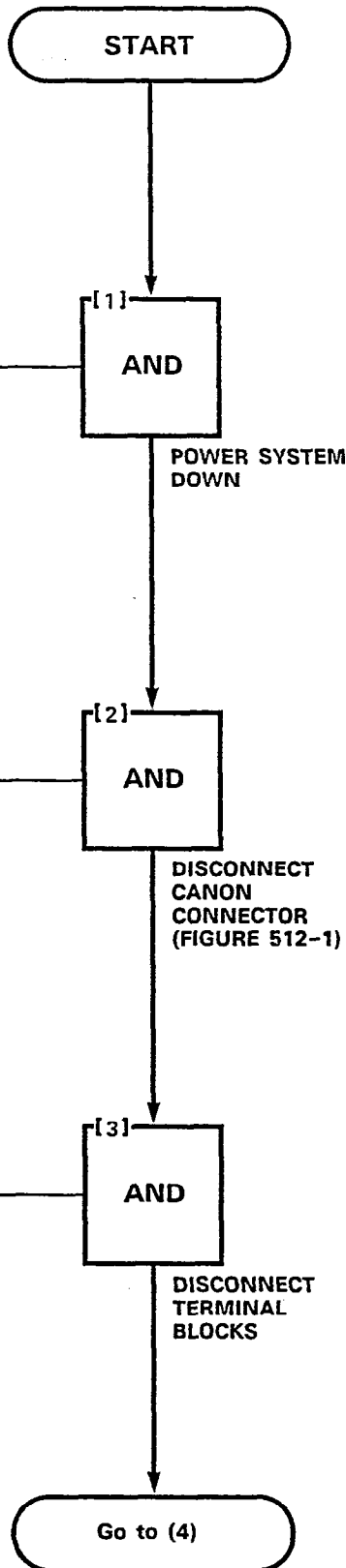
REPLACE WIRING HARNESS (SX-200)
MAP350- 512
Issue 3, May 1984
Sheet 1 of 5

TOOL REQUIRED
1 flatblade screwdriver

- (1A) Unlock and open front door
- (1B) Unlock and open rear door
- (1C) Unlock and open rear panel assembly
- (1D) Set system power switch to OFF
- (1E) Set all power switches on rear door to OFF
- (1F) Set battery switch to OFF
- (1G) Remove power cable(s) from commercial AC source

- AT BACK OF EQUIPMENT CABINET**
- (2A) Unscrew Canon connector
 - (2B) Cut all cable ties associated with the power cable

- (3A) Disconnect all terminal blocks on Power Fail Transfer cards, Interconnect card and Shelf Backplanes (Figure 512-2)
- (3B) Cut all cable ties



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REPLACE WIRING HARNESS (SX-200)
MAP350- 512
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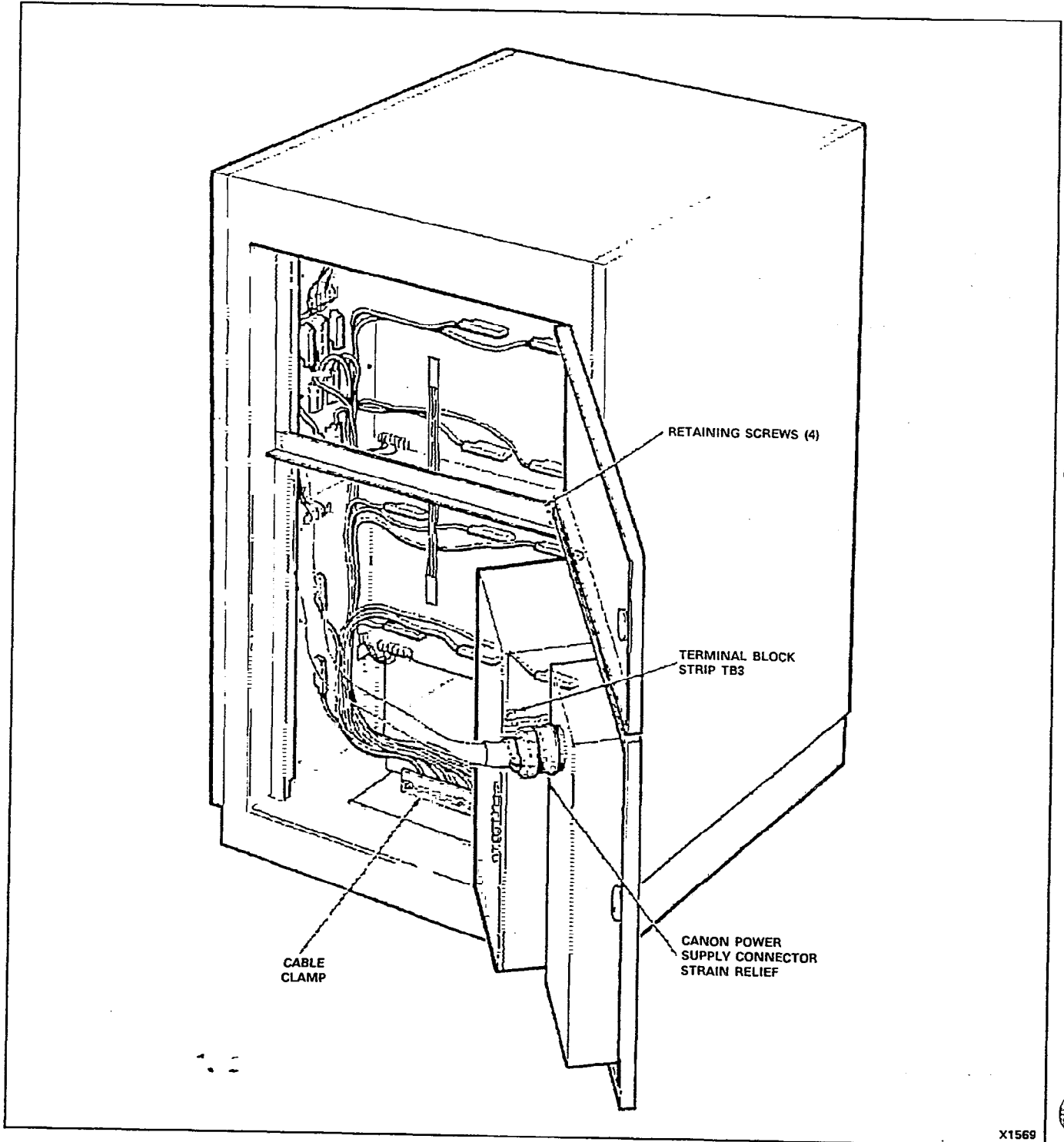
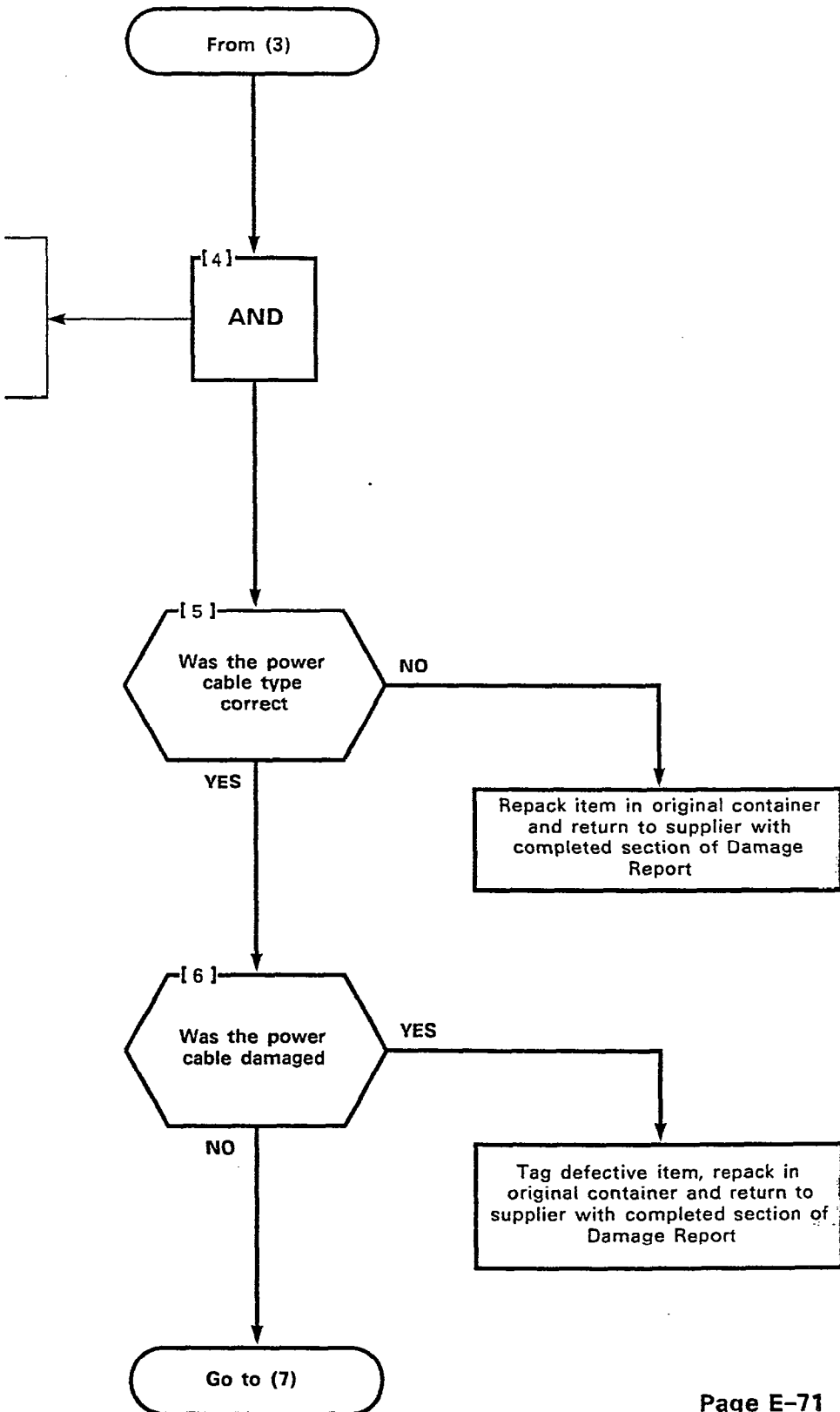


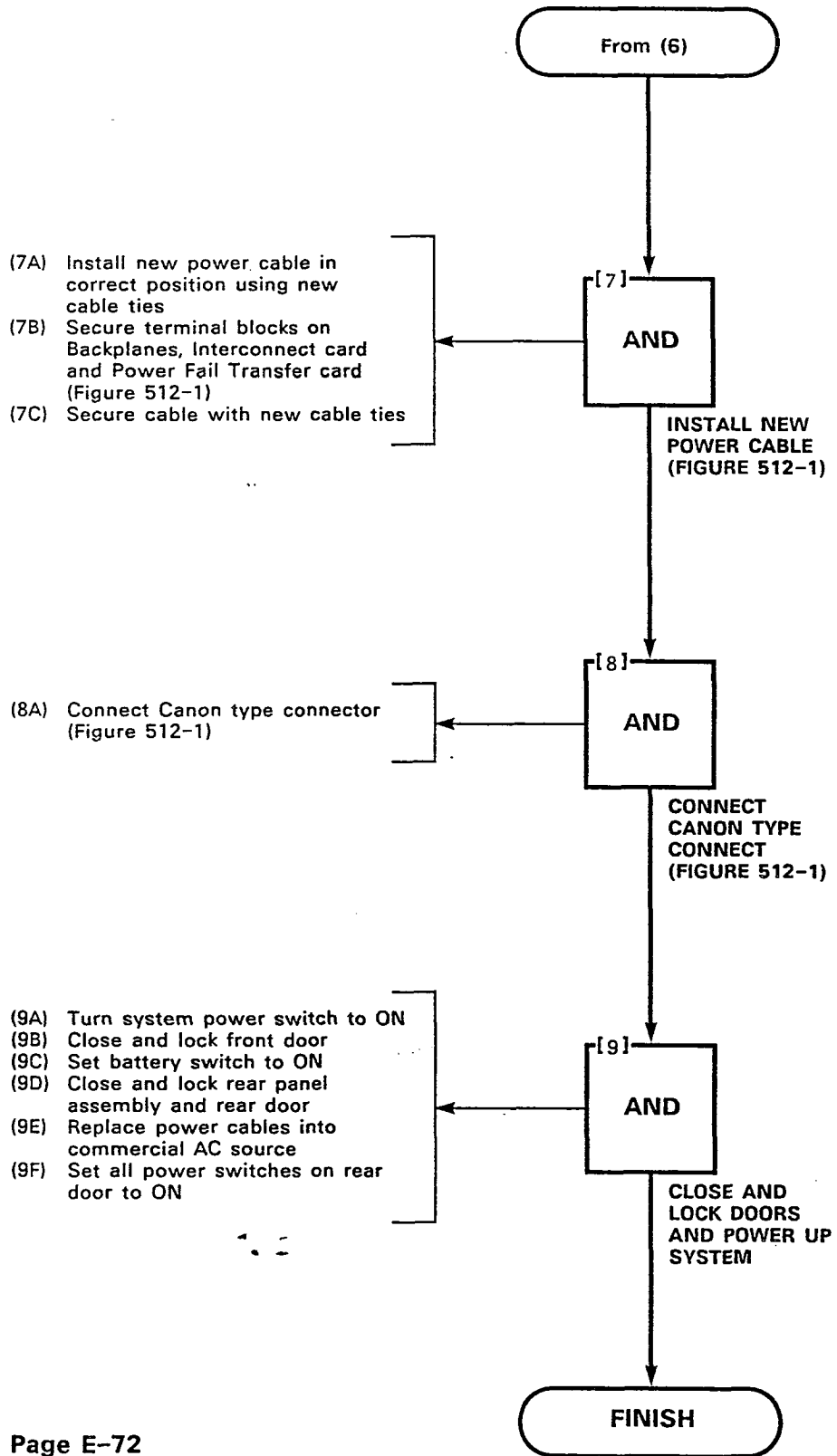
Figure 512-1 SX-200 Rear Door

REPLACE WIRING HARNESS (SX-200)
MAP350-512
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- (4A) Unpack new power cable from container
- (4B) Inspect new power cable for damage
- (4C) Check power cable type and quantity against invoice



REPLACE WIRING HARNESS (SX-200)
MAP350- 512
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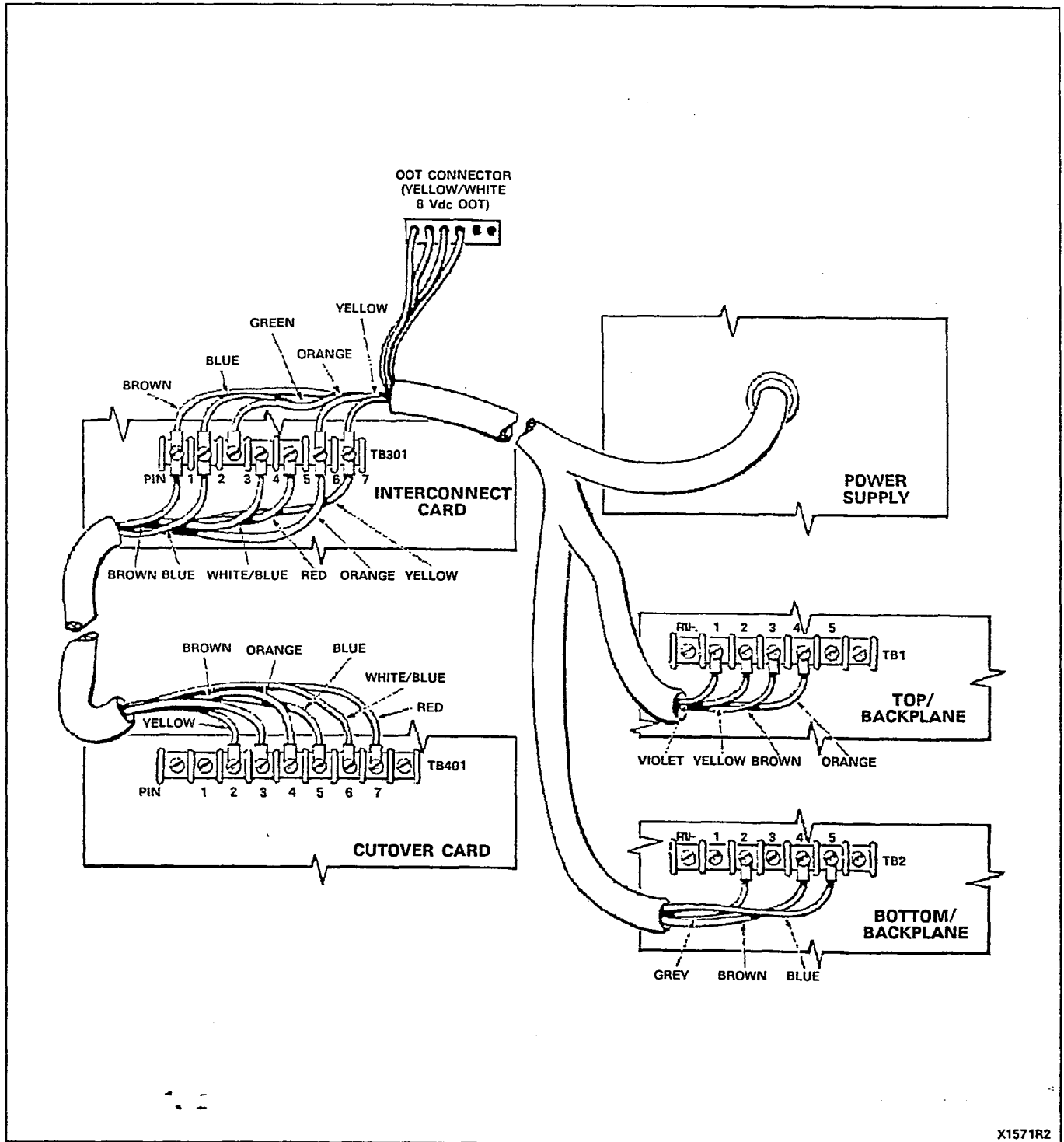


REPLACE WIRING HARNESS (SX-200)

MAP350-512

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X1571R2

Figure 512-2 Wiring Diagram



APPENDIX F

POWER CHECKS

General

F1.01 This Appendix consists of a series of MAPs which will be directly referenced by the charts of Part 6, SX-100/SX-200 Power Supply. The Appendix is also referenced directly by the tables of Part 5, Report Troubleshooting and Cross-Reference.

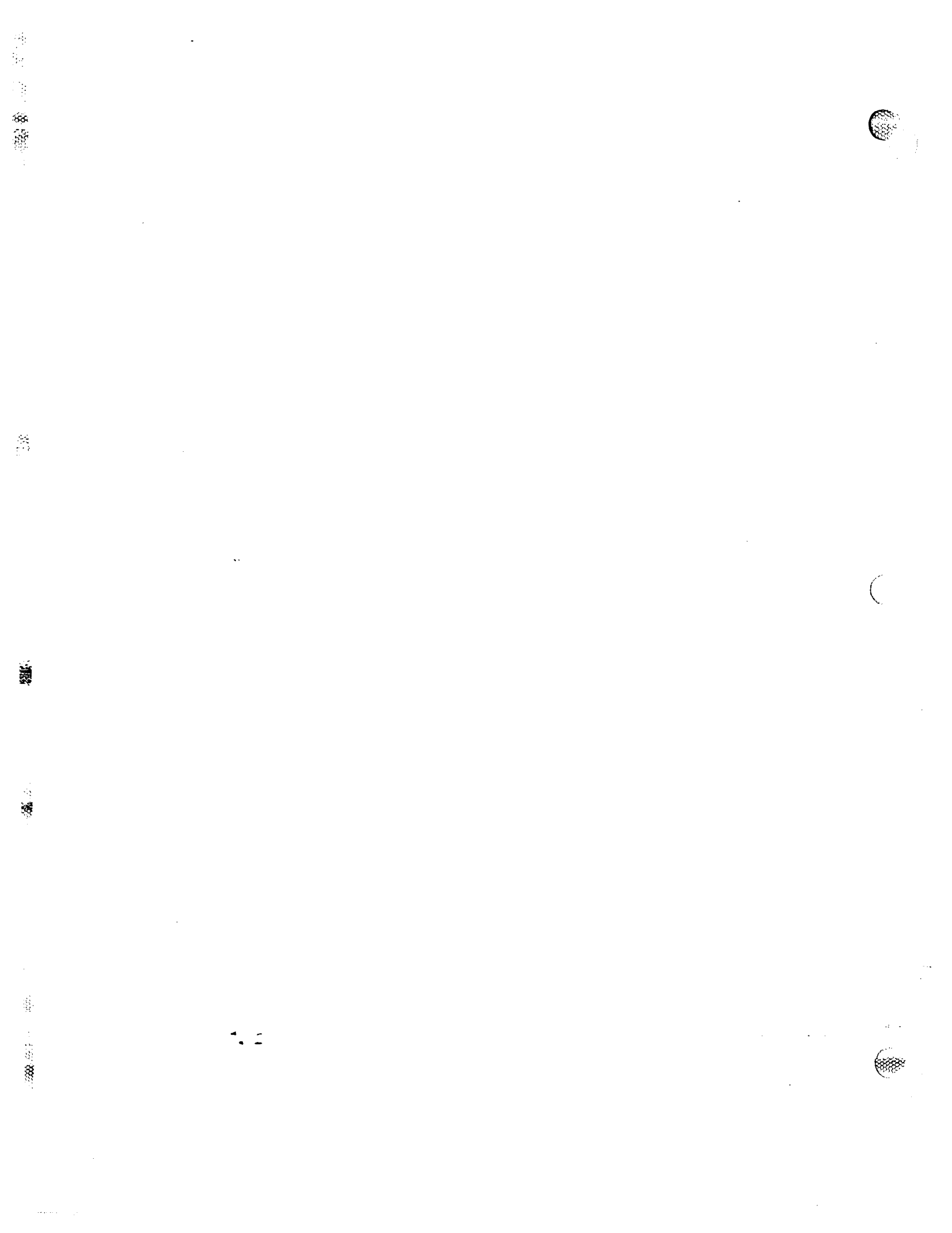
F1.02 These MAPs describe how to measure the electrical voltages in key areas of the SX-100/SX-200 system. The measurements will aid the repair person in the location of a specific fault. At all times the repair person should follow the safety precautions suggested in the MAPs to ensure personal and equipment safety.

F1.03 Table F1-1 is a listing of all power checks that may be performed when troubleshooting an SX-100/SX-200 system:

- MAP350-600, deals with the SX-200 system power supply only. This map deals primarily with the system not running or a major power failure.
- MAP350-601 deals with a suspected power failure on or at the Interconnect card of the SX-200 system.
- MAP350-602 deals with a suspected power failure on the Power Fail Transfer card where the system may or may not be in a transfer condition.
- MAP350-603 deals with the voltages that appear on the terminal blocks of the backplanes in an SX-100/SX-200 system.
- MAP350-604 outlines the procedure for checking the voltage on the SX-200 Reserve Battery Backup.
- MAP350-605 outlines the procedure for checking the voltages to the combined Console Interface, Power Fail Transfer and Interconnect card of the SX-100 system.
- MAP350-606 outlines the procedure for checking the voltage on the SX-100 Reserve Battery Backup.

TABLE F1-1
POWER CHECKS

SX-200	MAP	SX-100	MAP
Power Supply Check	350-600	Interconnect Card	350-605
Interconnect Card	350-601	Reserve Battery Backup	350-606
Power Fail Transfer Card	350-602		
Backplane(s)	350-603		
Reserve Battery Backup	350-604		



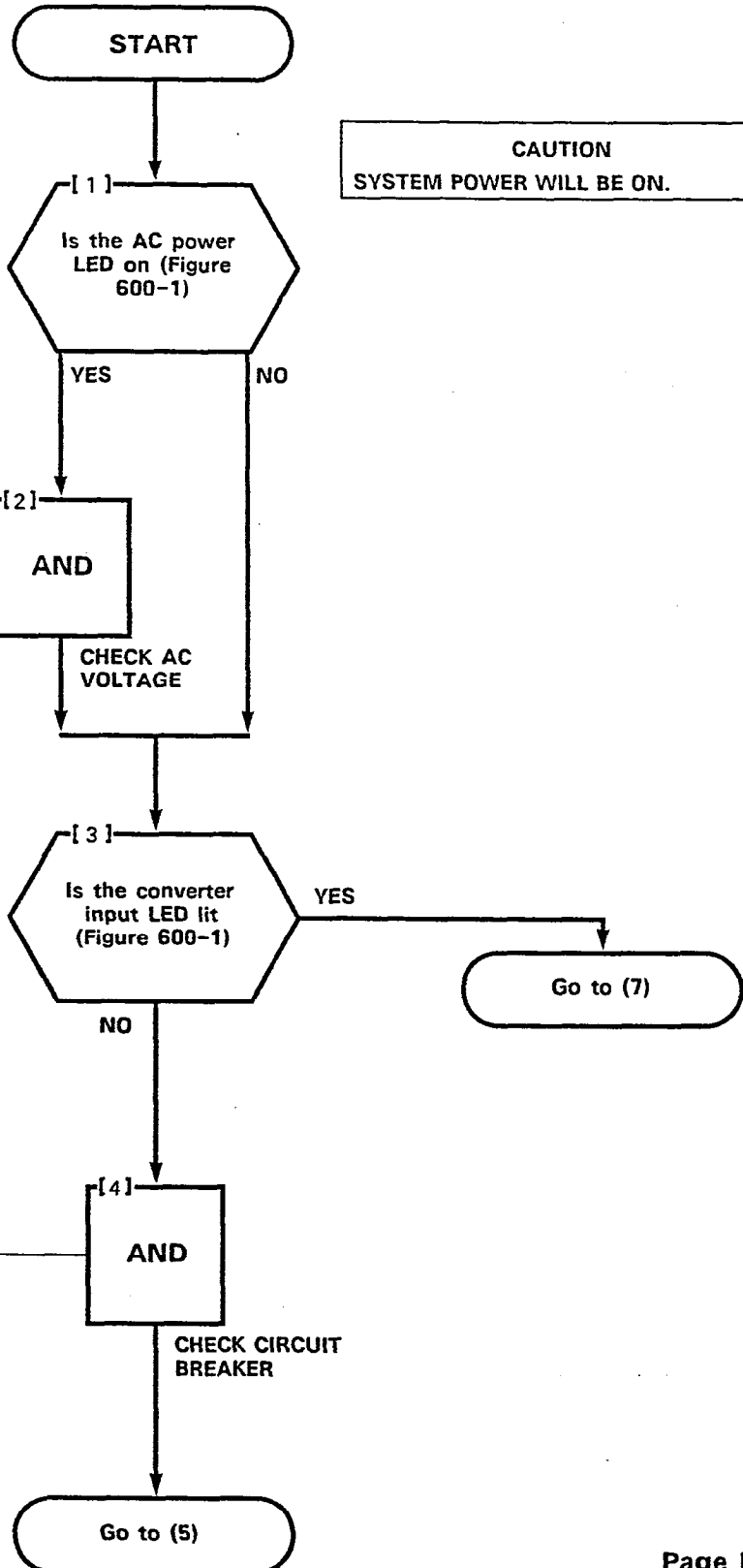
POWER SUPPLY CHECK (SX-200)
MAP350-600
Issue 3, May 1984
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TOOLS REQUIRED
 1 AC/DC Voltmeter
 1 trouble lamp

CAUTION
 SYSTEM POWER WILL BE ON.

- (2A) Check that the AC power cord is plugged in
- (2B) Check the AC power fuse (Figure 600-1). If the fuse is blown, replace it with one of equal value. If it blows again, replace the power supply as per MAP350-507
- (2C) Plug a trouble light (or other piece of equipment) into the outlet as a test for the presence of AC voltage. If no voltage is present, check for a faulty AC outlet

- ON THE POWER SUPPLY DOOR**
- (4A) Check that the converter 20 Amp circuit breaker is in the ON position. If it is off, flip it to the ON position



POWER SUPPLY CHECK (SX-200)
MAP350- 600
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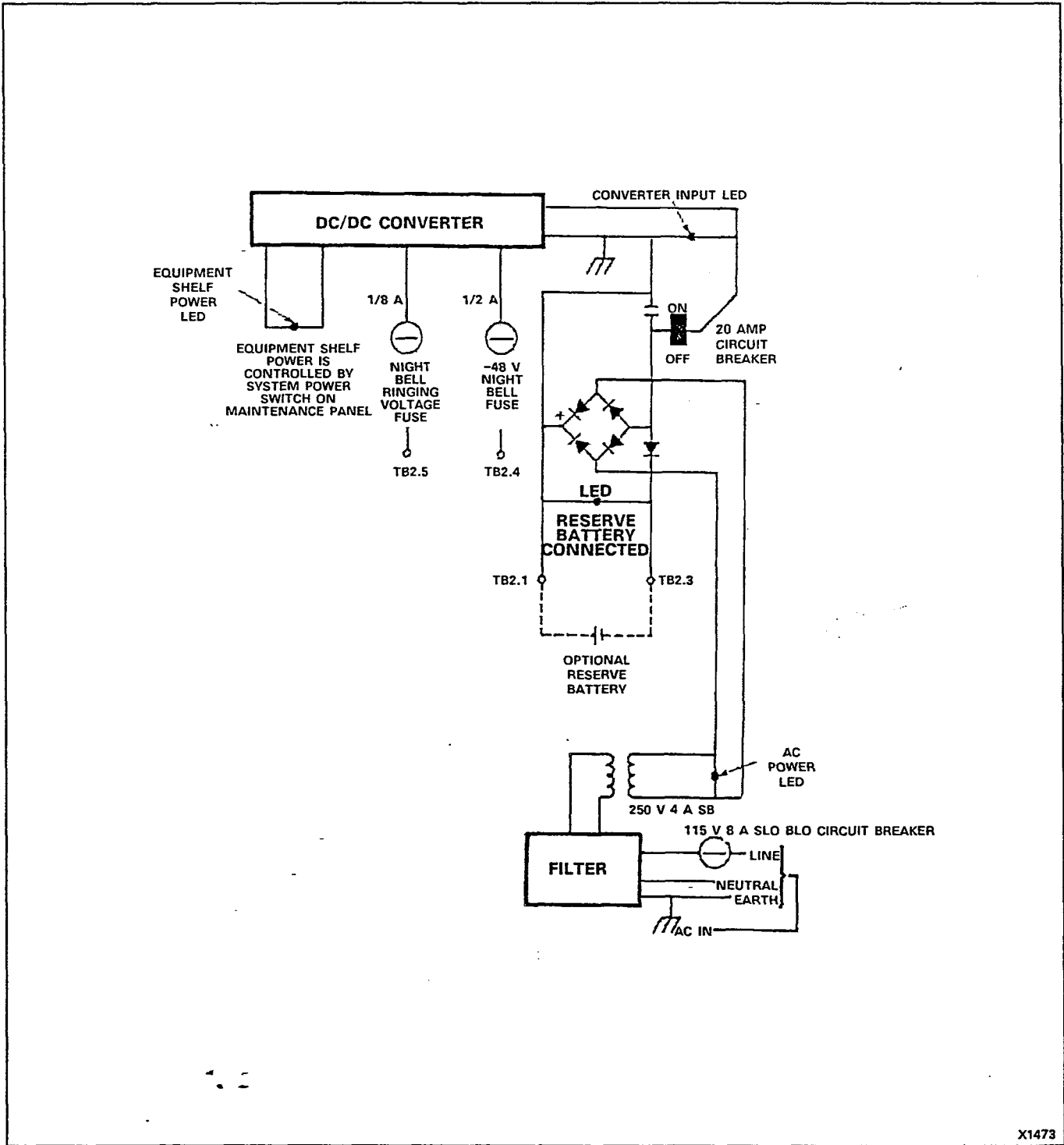
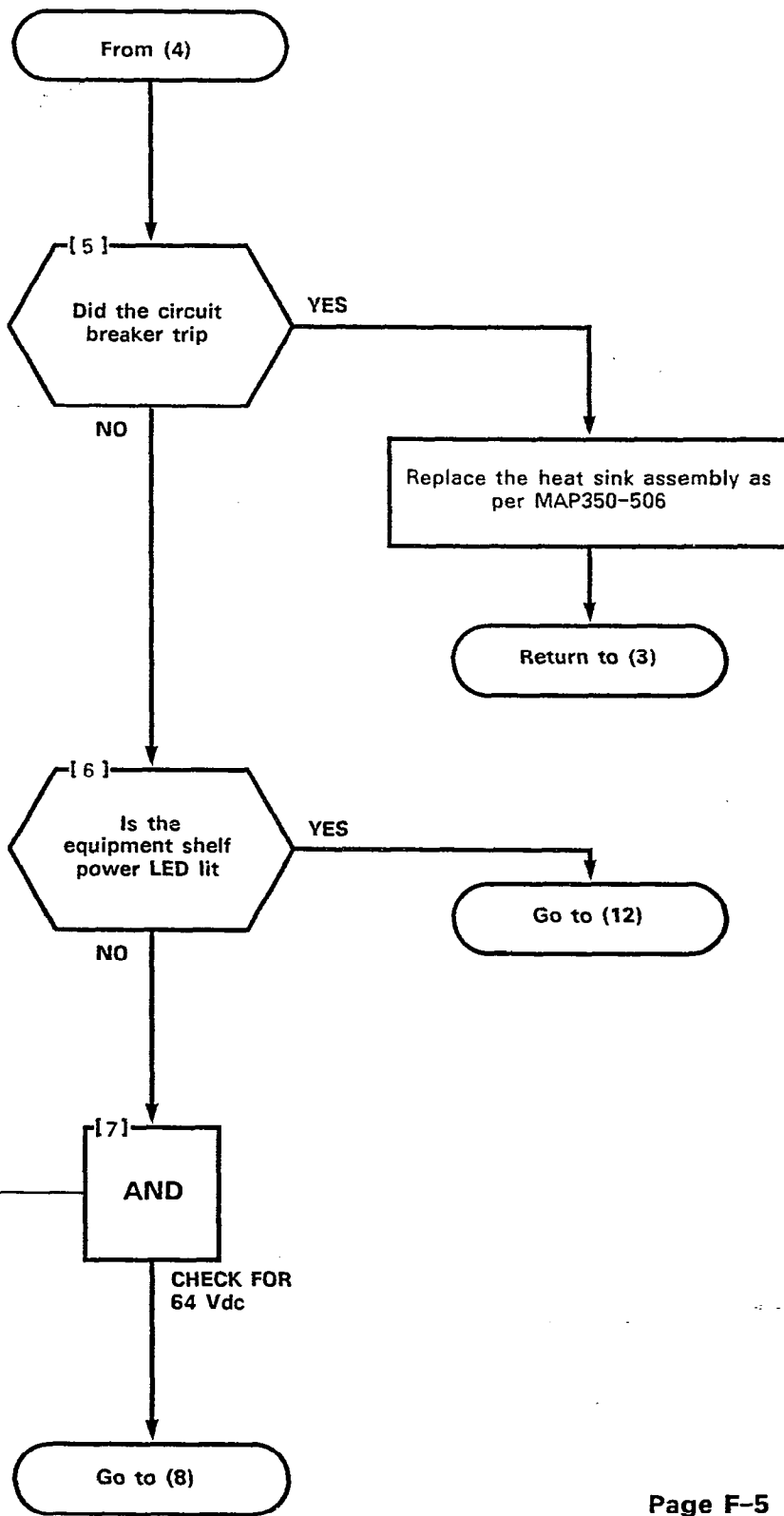


Figure 600-1 SX-200 Back Door Electrical Schematic

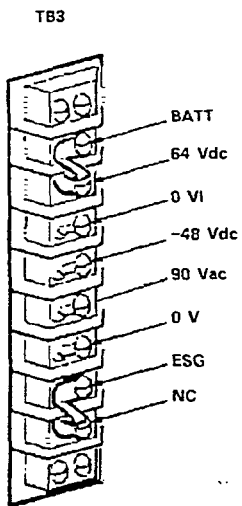
X1473

POWER SUPPLY CHECK (SX-200)
MAP350-600
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- (7A) Unlock and open front door
- (7B) Ensure that the maintenance power switch is on
- (7C) Unlock and open the back door of the system
- (7D) Measure for 64 Vdc reference to 0 VI at TB3 on the backdoor of the system as per Figure 600-2

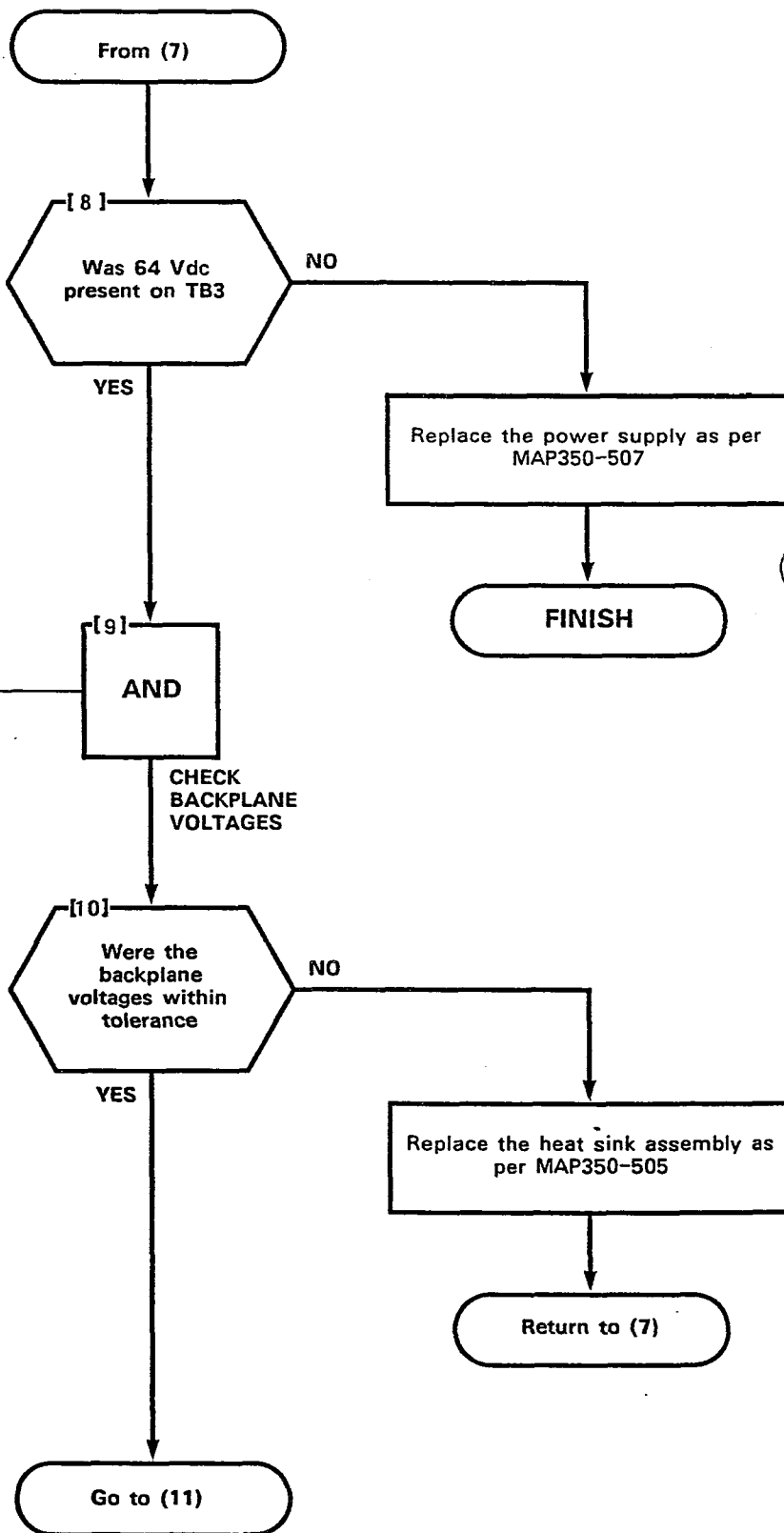
POWER SUPPLY CHECK (SX-200)
MAP350- 600
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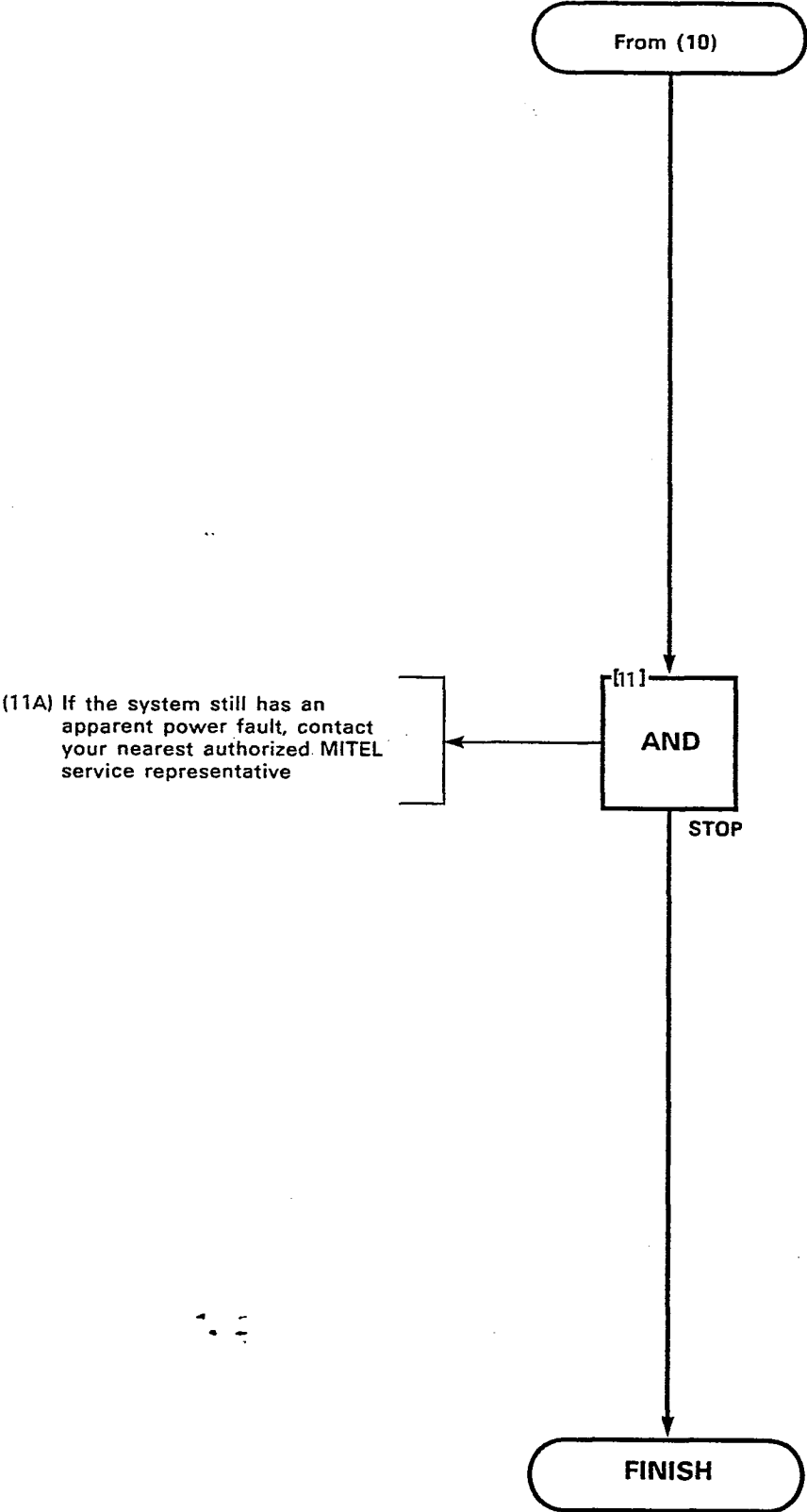
X1634R1

Figure 600-2
Terminal Block 3

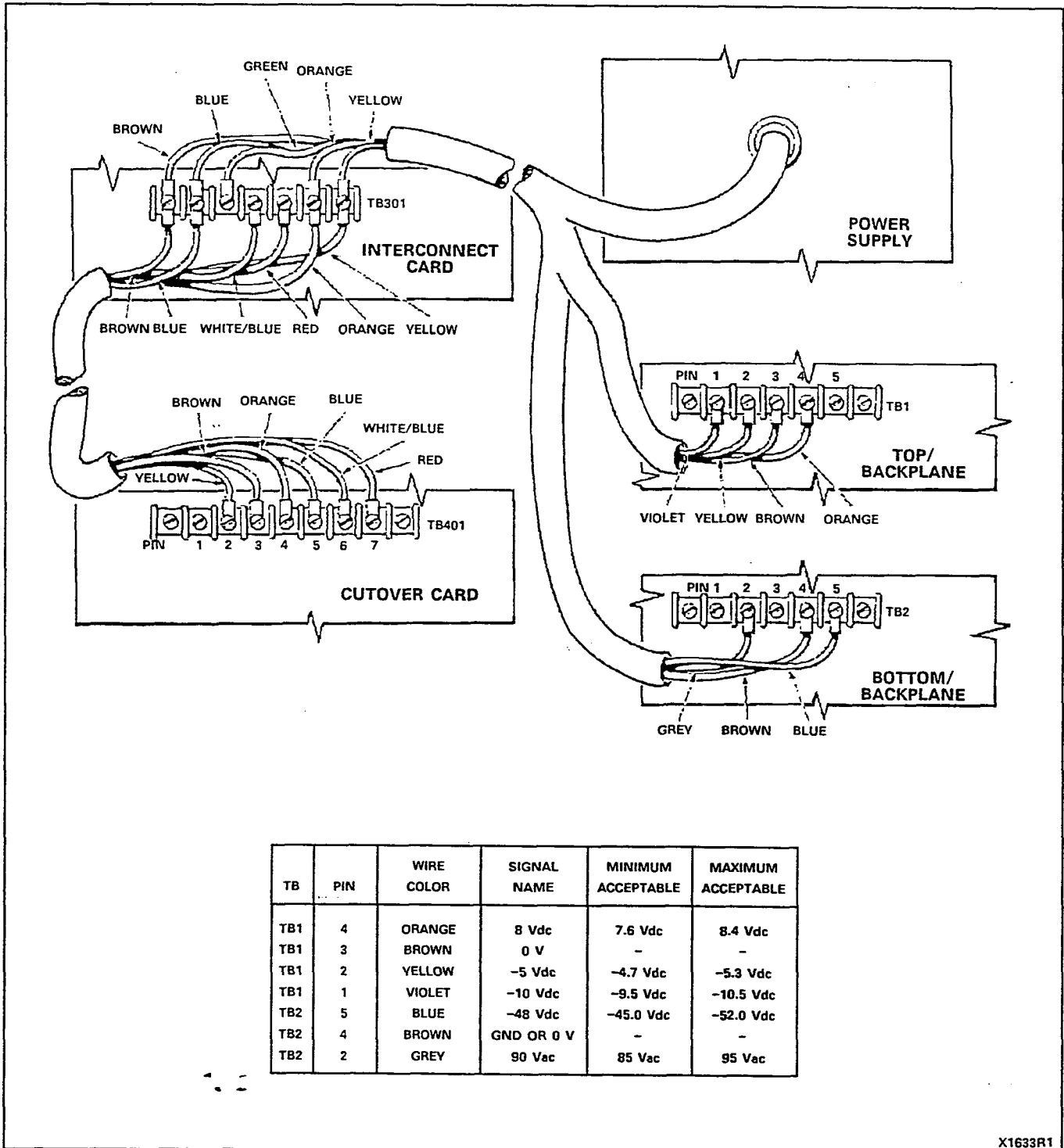
(9A) Check the backplane voltages (reference to ground) as per Figure 600-3



POWER SUPPLY CHECK (SX-200)
MAP350- 600
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POWER SUPPLY CHECK (SX-200)
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TB	PIN	WIRE COLOR	SIGNAL NAME	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
TB1	4	ORANGE	8 Vdc	7.6 Vdc	8.4 Vdc
TB1	3	BROWN	0 V	-	-
TB1	2	YELLOW	-5 Vdc	-4.7 Vdc	-5.3 Vdc
TB1	1	VIOLET	-10 Vdc	-9.5 Vdc	-10.5 Vdc
TB2	5	BLUE	-48 Vdc	-45.0 Vdc	-52.0 Vdc
TB2	4	BROWN	GND OR 0 V	-	-
TB2	2	GREY	90 Vac	85 Vac	95 Vac

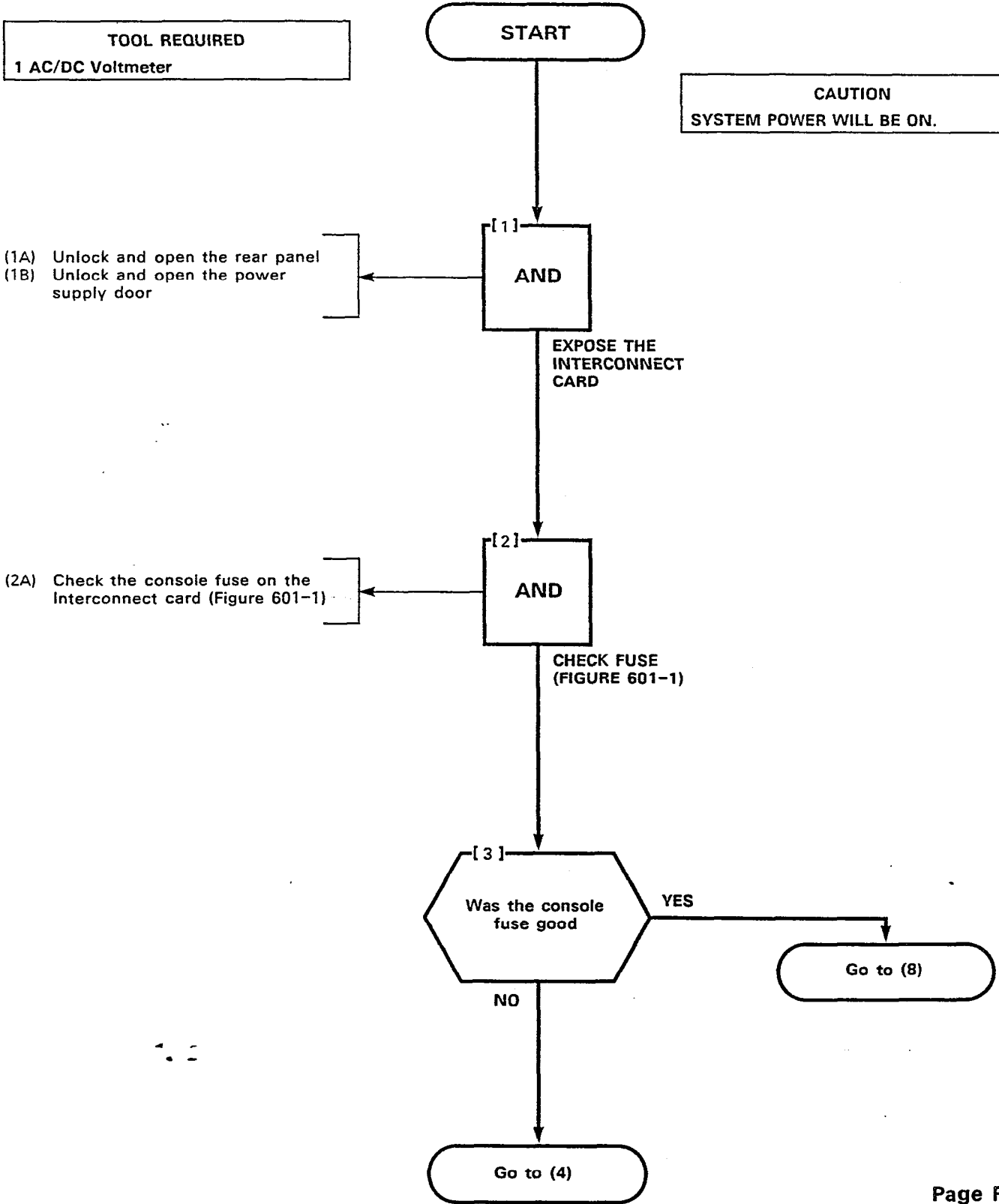
X1633R1

Figure 600-3 Backplane Voltages SX-200

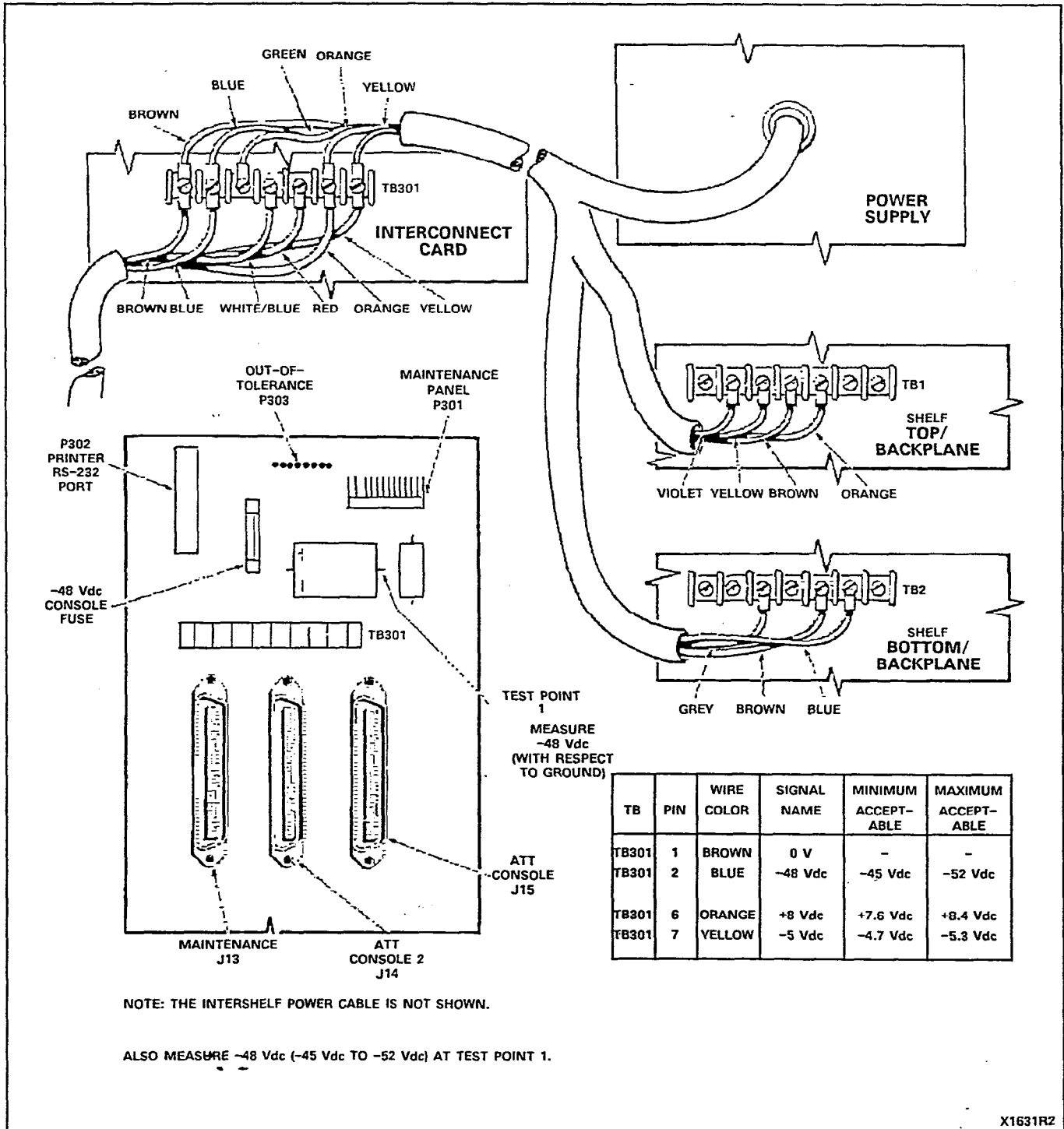
INTERCONNECT CARD (SX-200)
MAP350- 601
Issue 3, May 1984
Sheet 1 of 8

TOOL REQUIRED
1 AC/DC Voltmeter

CAUTION
SYSTEM POWER WILL BE ON.



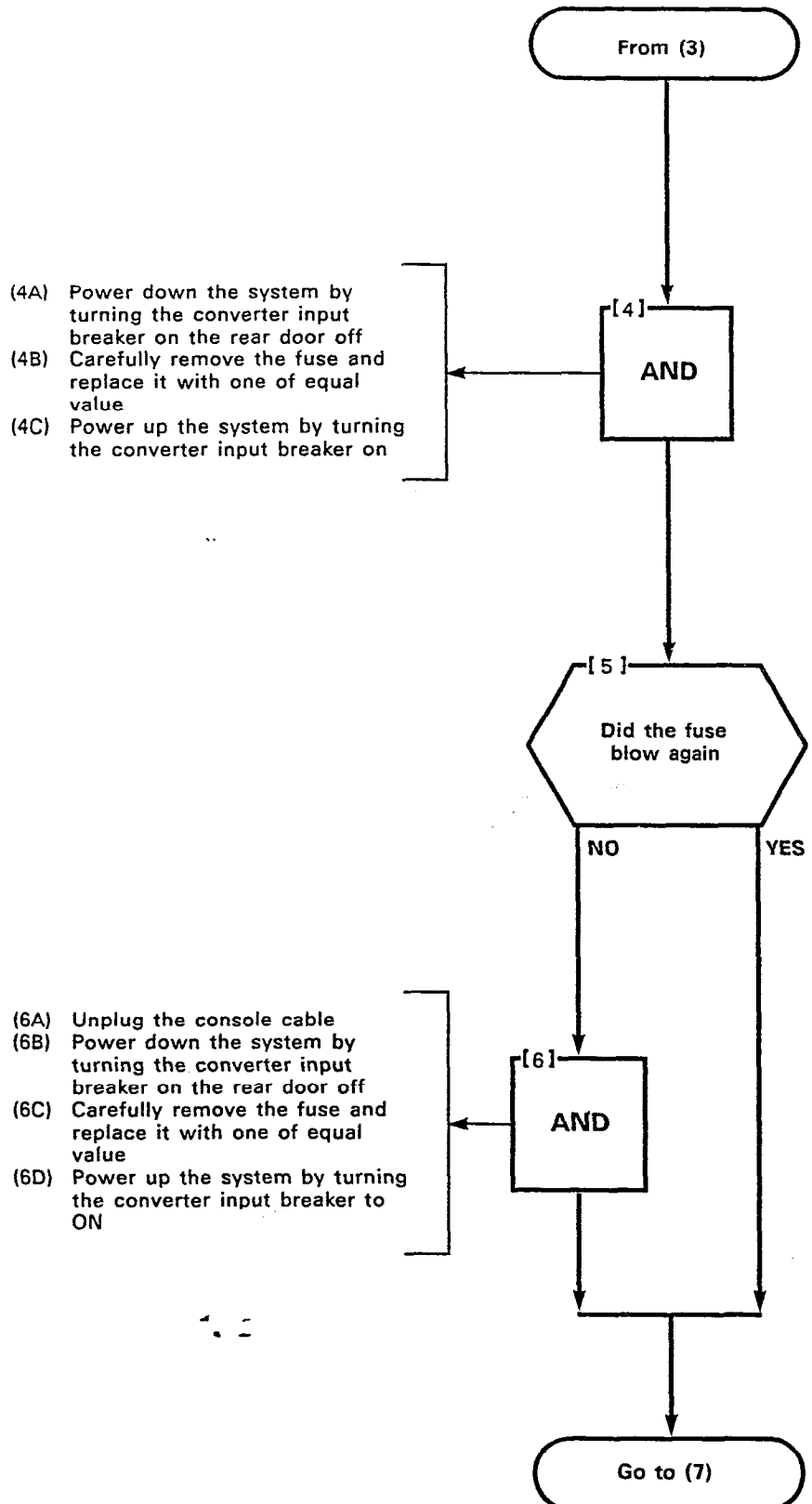
INTERCONNECT CARD (SX-200)
MAP350- 601
Issue 3, May 1984
Sheet 2 of 8



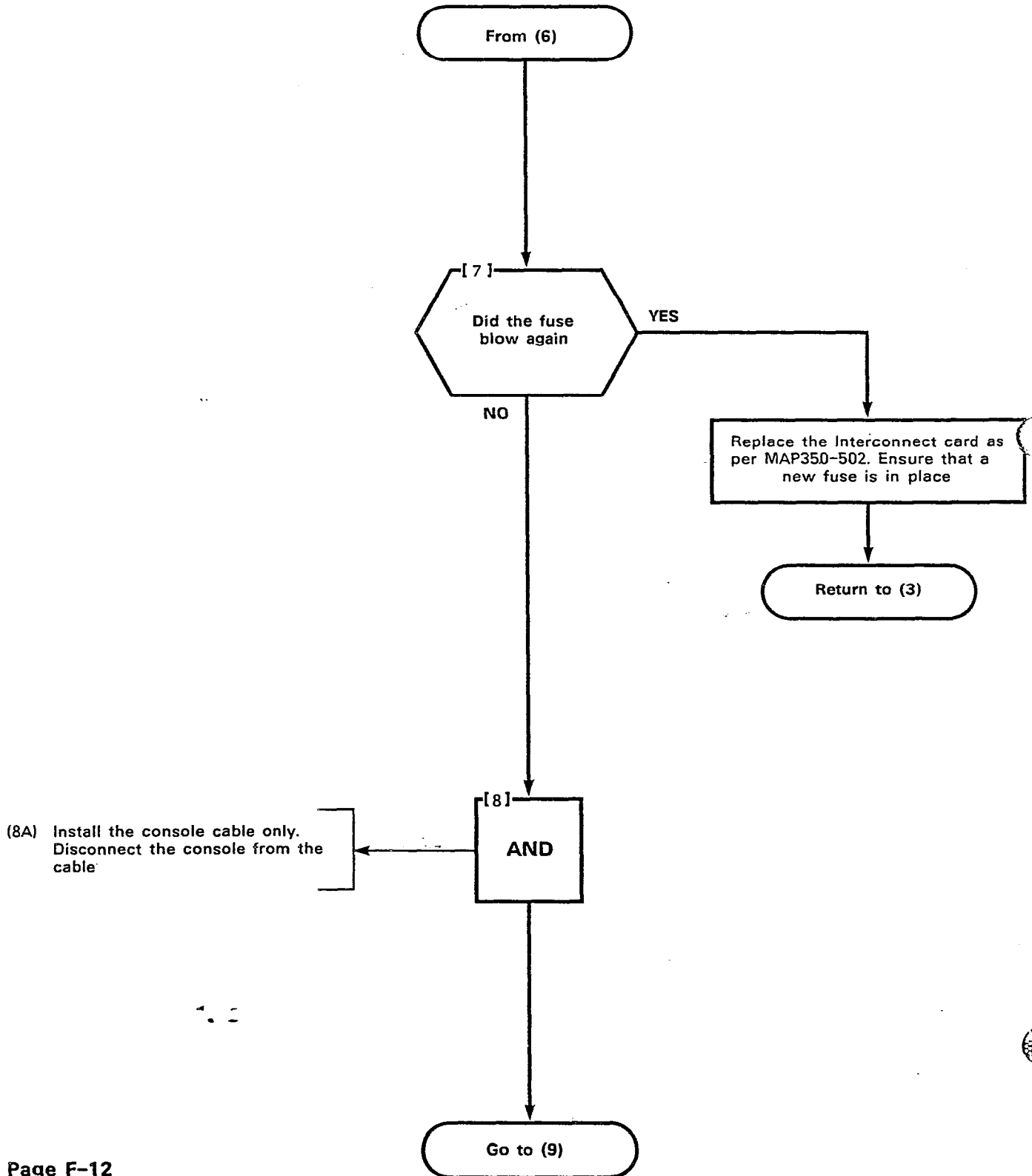
X1631RZ

Figure 601-1 Interconnect Card

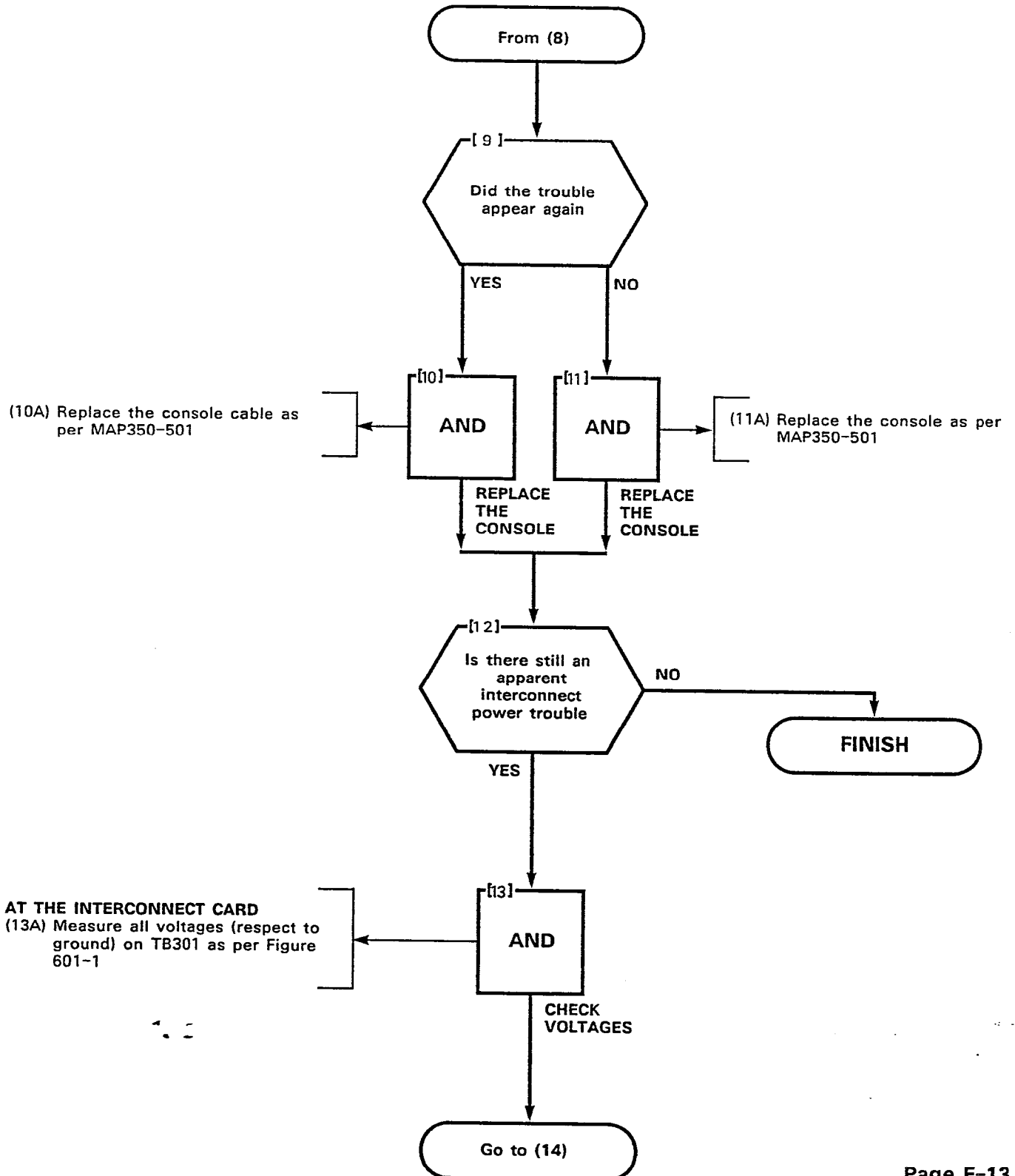
INTERCONNECT CARD (SX-200)
MAP350-601
Issue 3, May 1984
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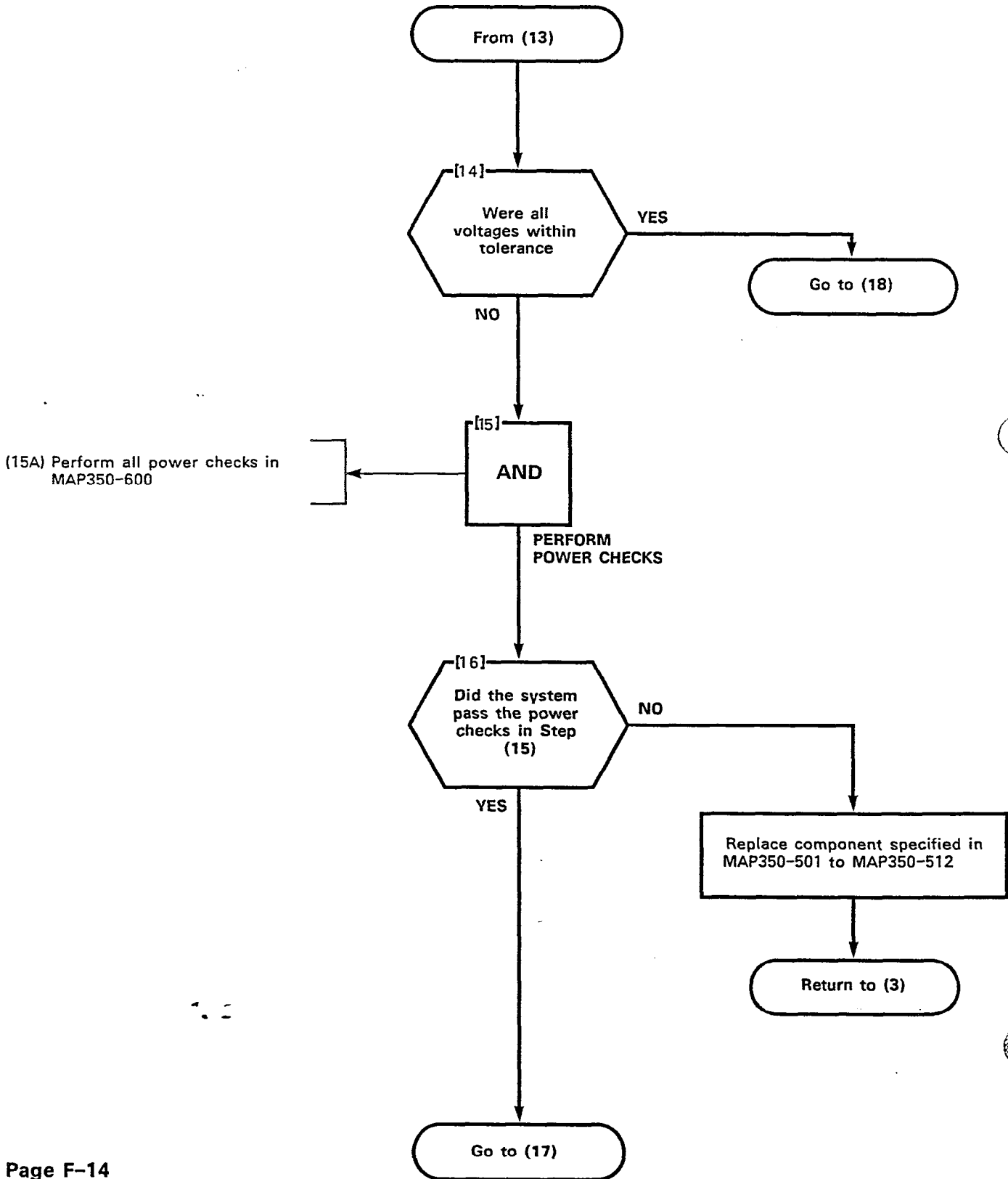
INTERCONNECT CARD (SX-200)
MAP350- 601
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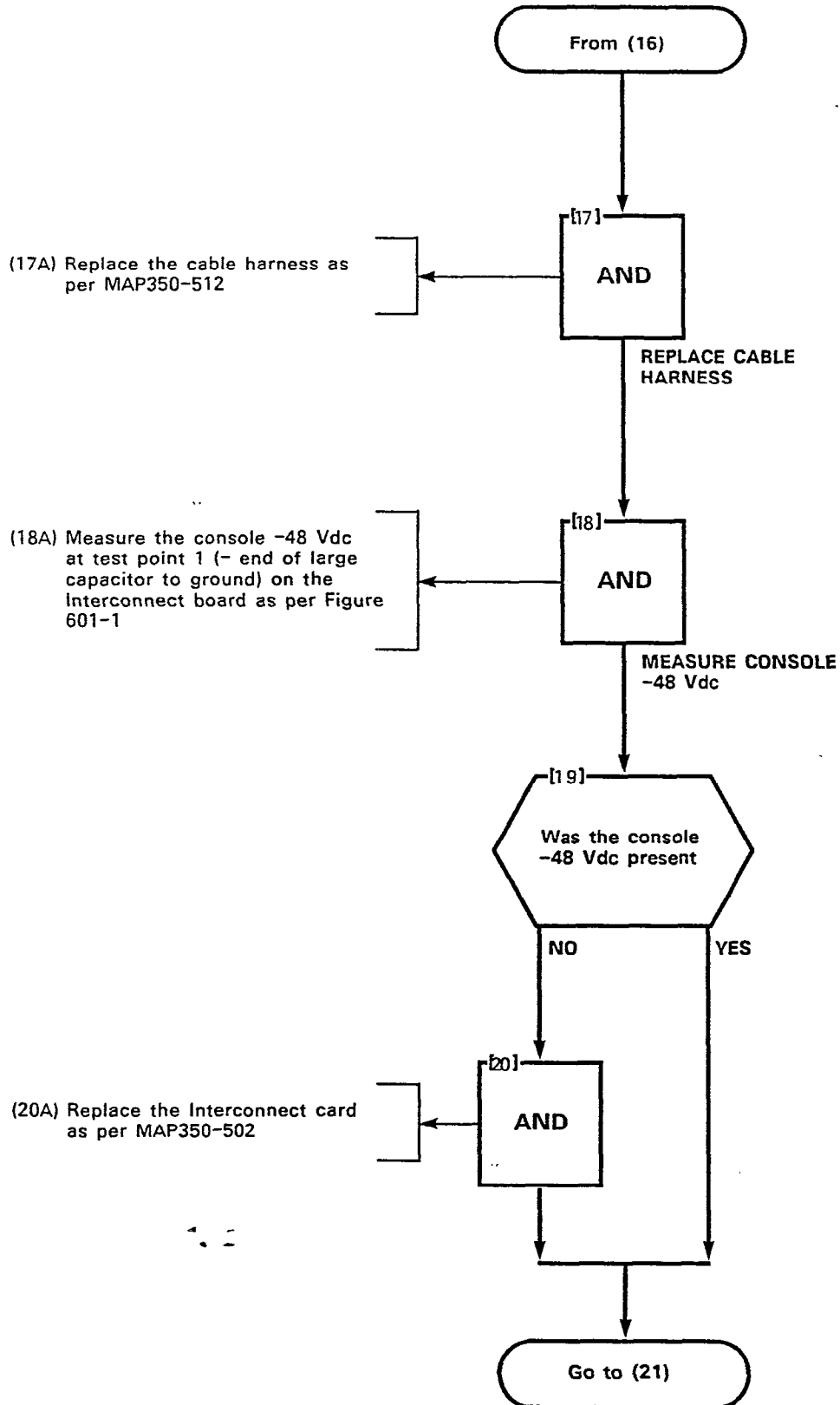
INTERCONNECT CARD (SX-200)
MAP350-601
Issue 3, May 1984
Sheet 5 of 8



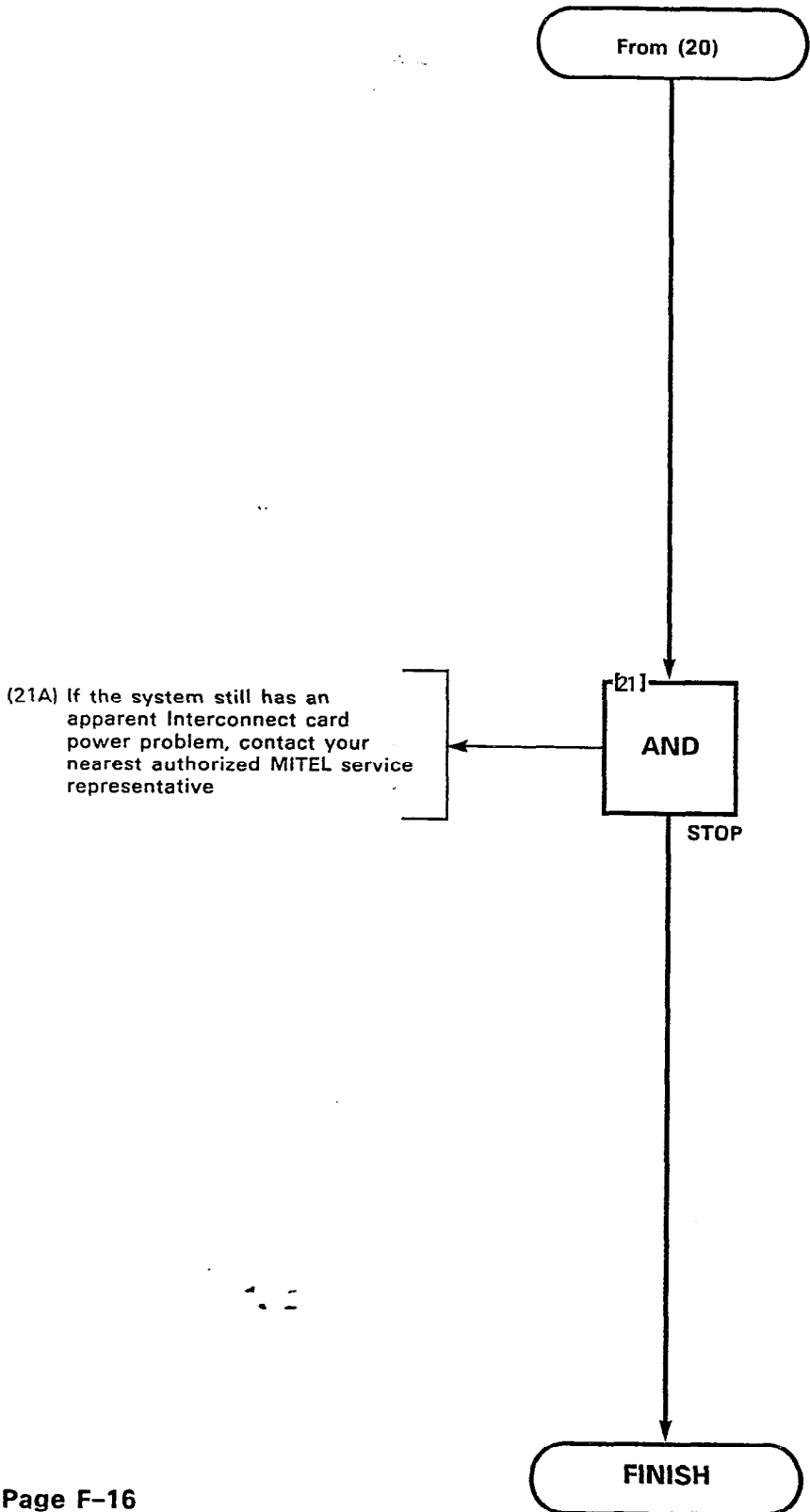
INTERCONNECT CARD (SX-200)
MAP350- 601
Issue 3, May 1984
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INTERCONNECT CARD (SX-200)
MAP350-601
Issue 3, May 1984
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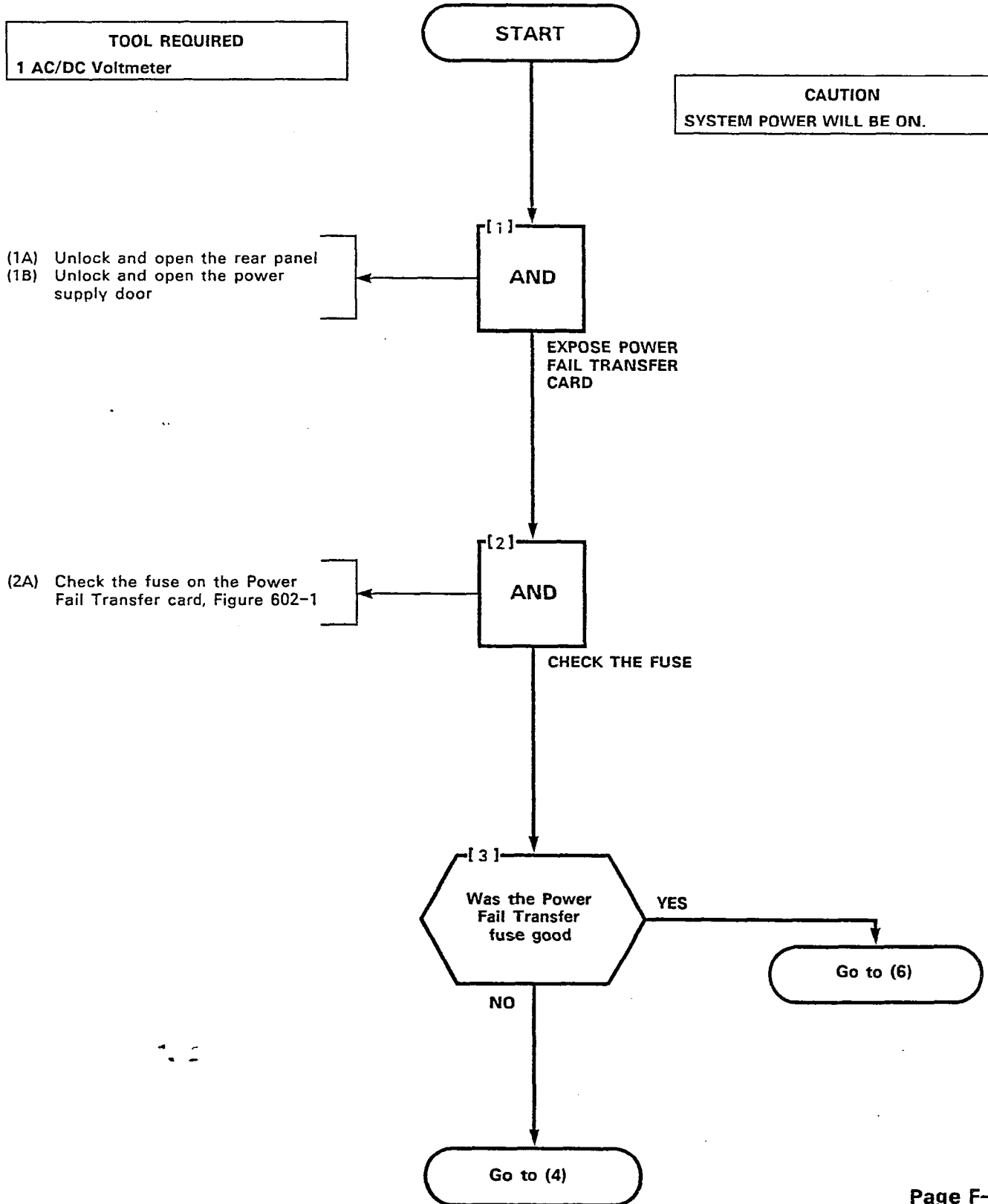
INTERCONNECT CARD (SX-200)
MAP350- 601
Issue 3, May 1984
Sheet 8 of 8



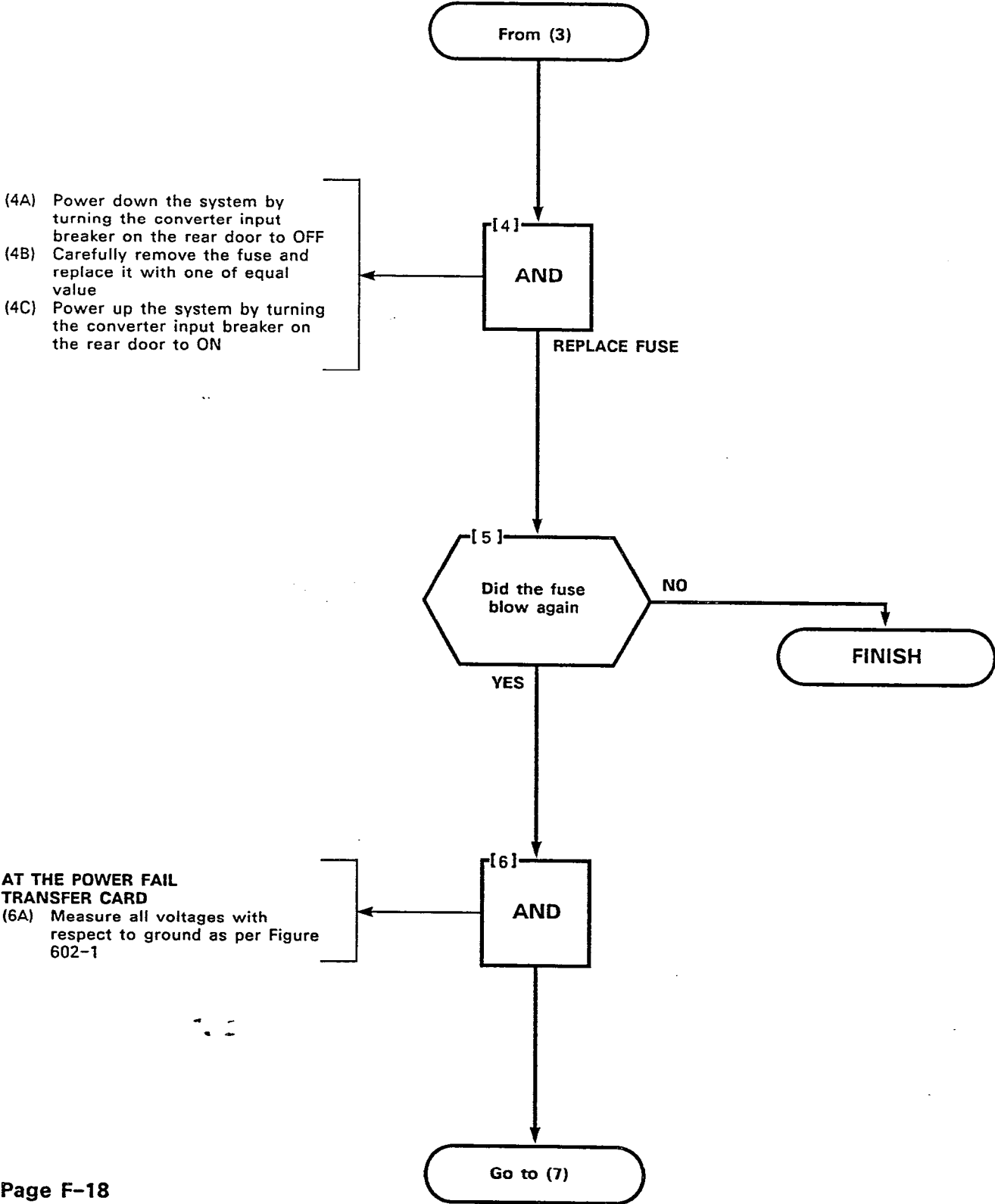
POWER FAIL TRANSFER CARD (SX-200)
MAP350-602
Issue 3, May 1984
Sheet 1 of 5

TOOL REQUIRED
1 AC/DC Voltmeter

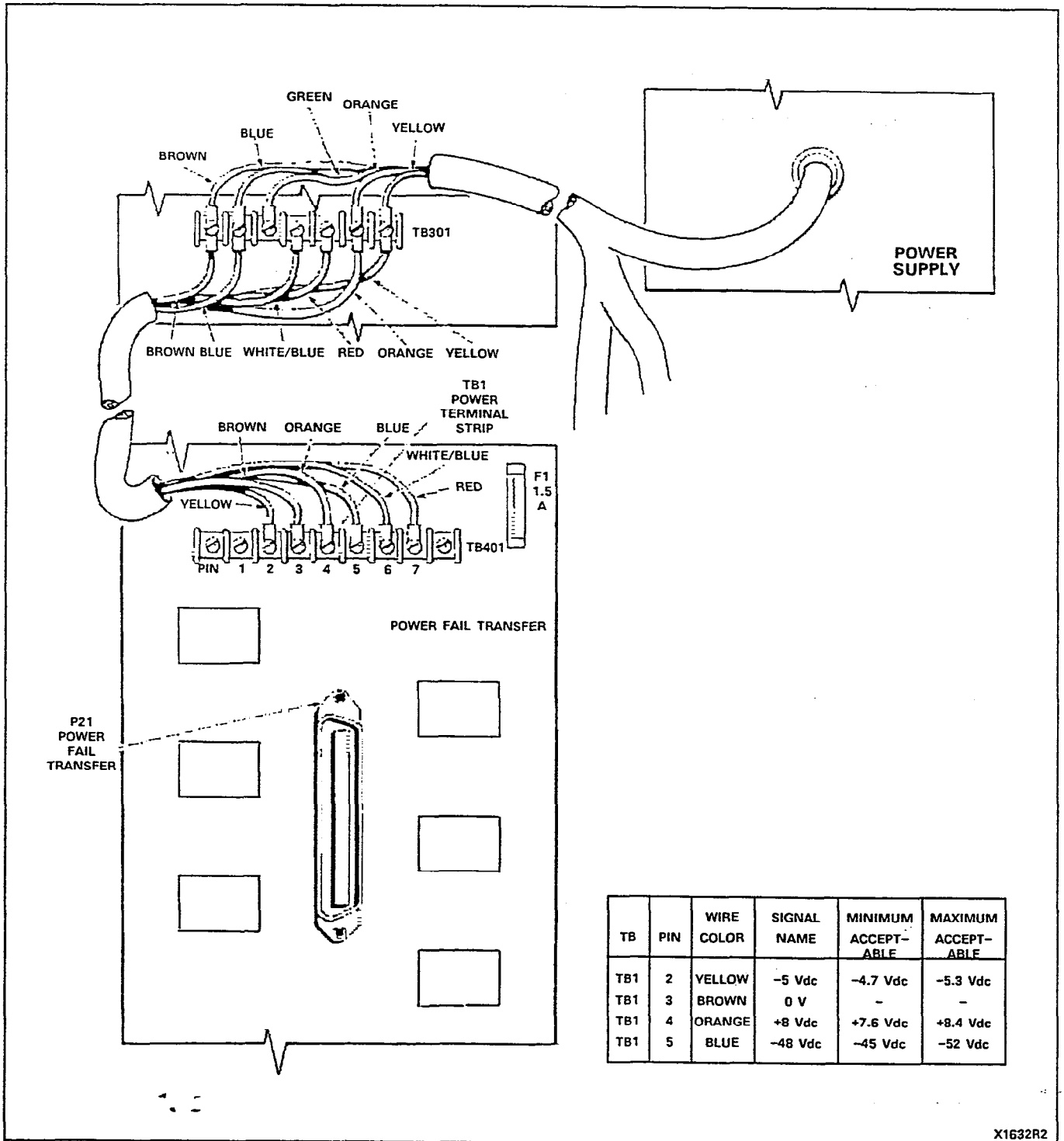
CAUTION
SYSTEM POWER WILL BE ON.



POWER FAIL TRANSFER CARD (SX-200)
MAP350- 602
Issue 3, May 1984
Sheet 2 of 5



POWER FAIL TRANSFER CARD (SX-200)
MAP350-602
Issue 3, May 1984
Sheet 3 of 5

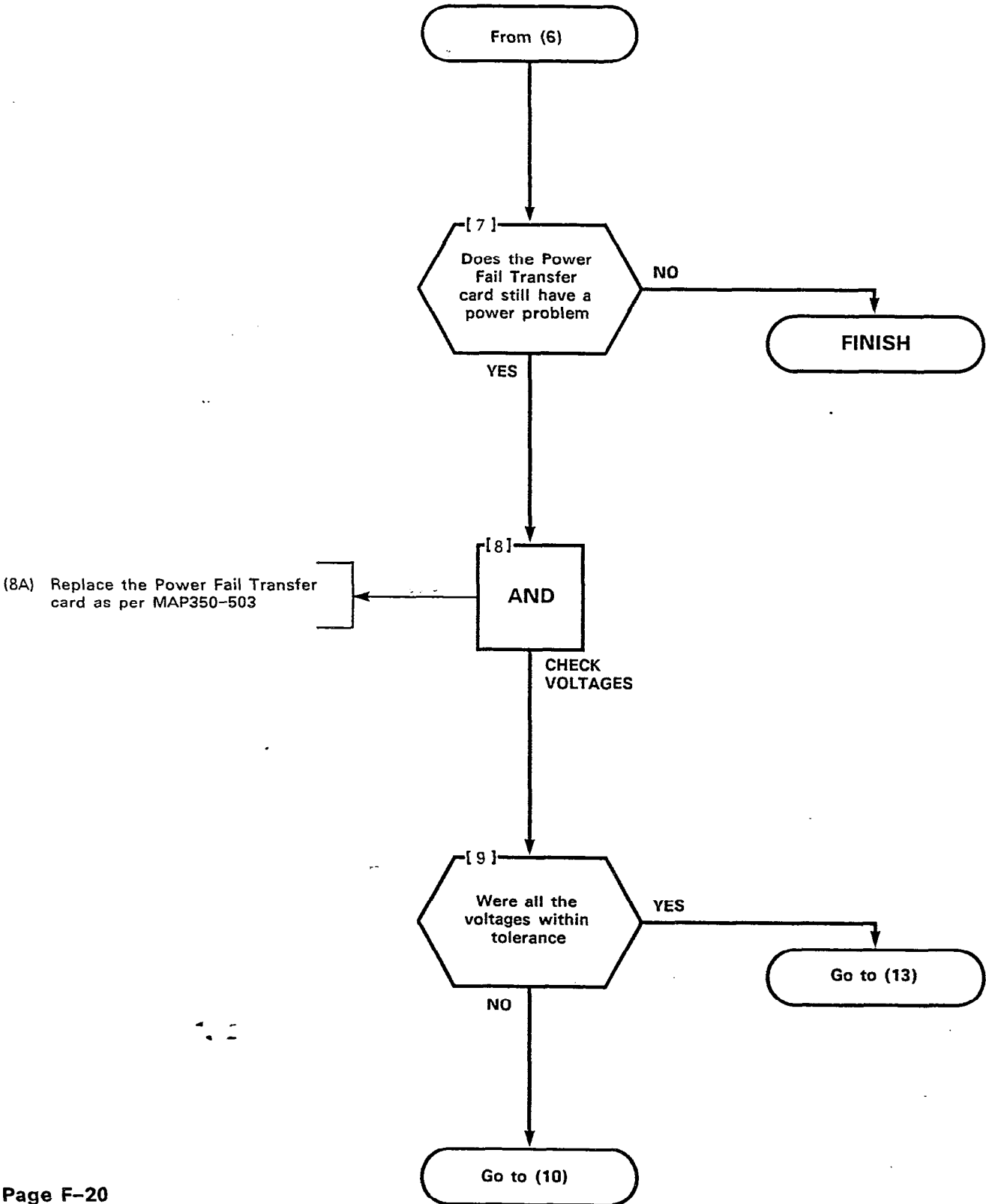


TB	PIN	WIRE COLOR	SIGNAL NAME	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
TB1	2	YELLOW	-5 Vdc	-4.7 Vdc	-5.3 Vdc
TB1	3	BROWN	0 V	-	-
TB1	4	ORANGE	+8 Vdc	+7.6 Vdc	+8.4 Vdc
TB1	5	BLUE	-48 Vdc	-45 Vdc	-52 Vdc

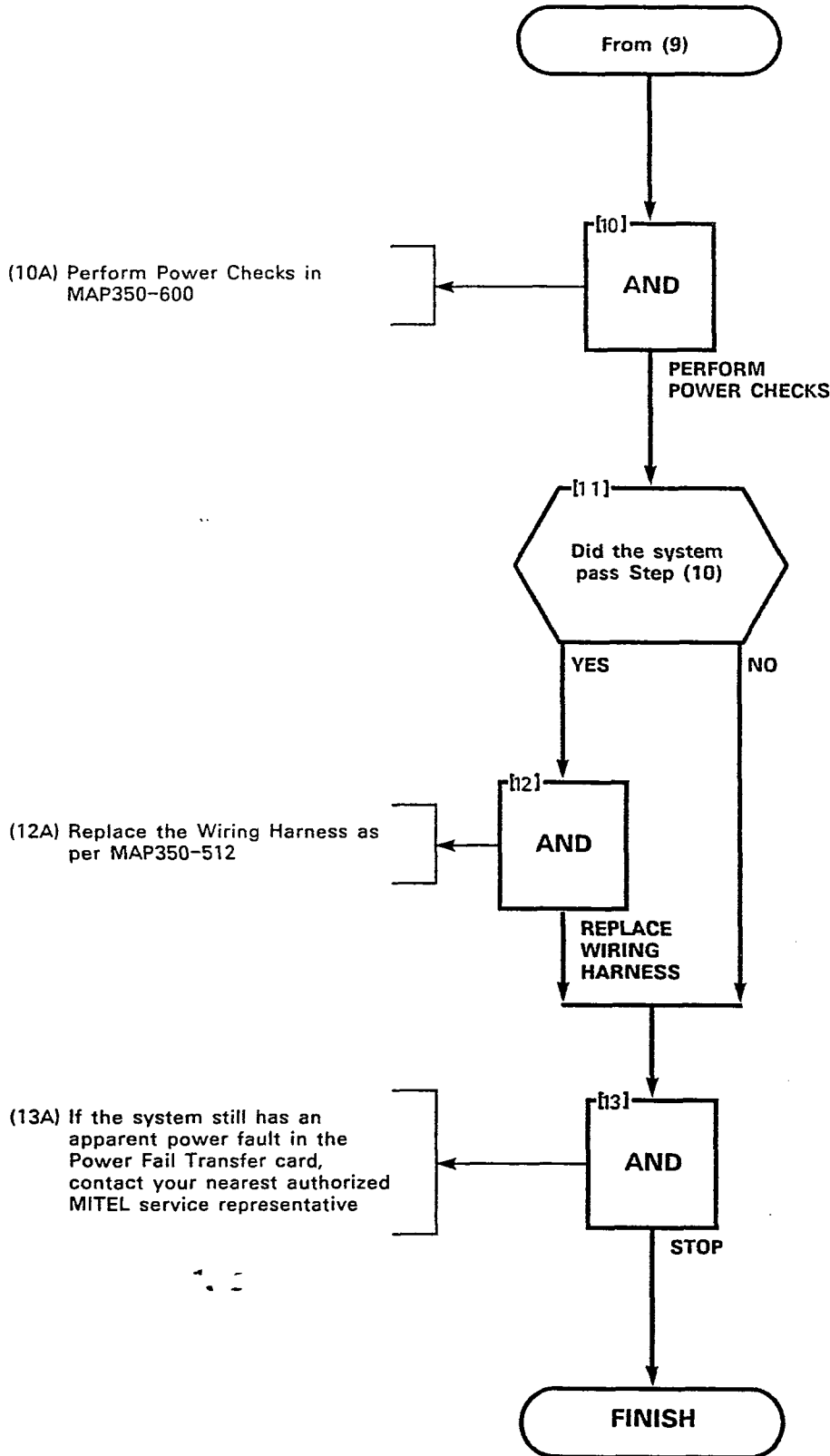
Figure 602-1 Power Fail Transfer Card

X1632R2

POWER FAIL TRANSFER CARD (SX-200)
MAP350- 602
Issue 3, May 1984
Sheet 4 of 5



POWER FAIL TRANSFER CARD (SX-200)
MAP350-602
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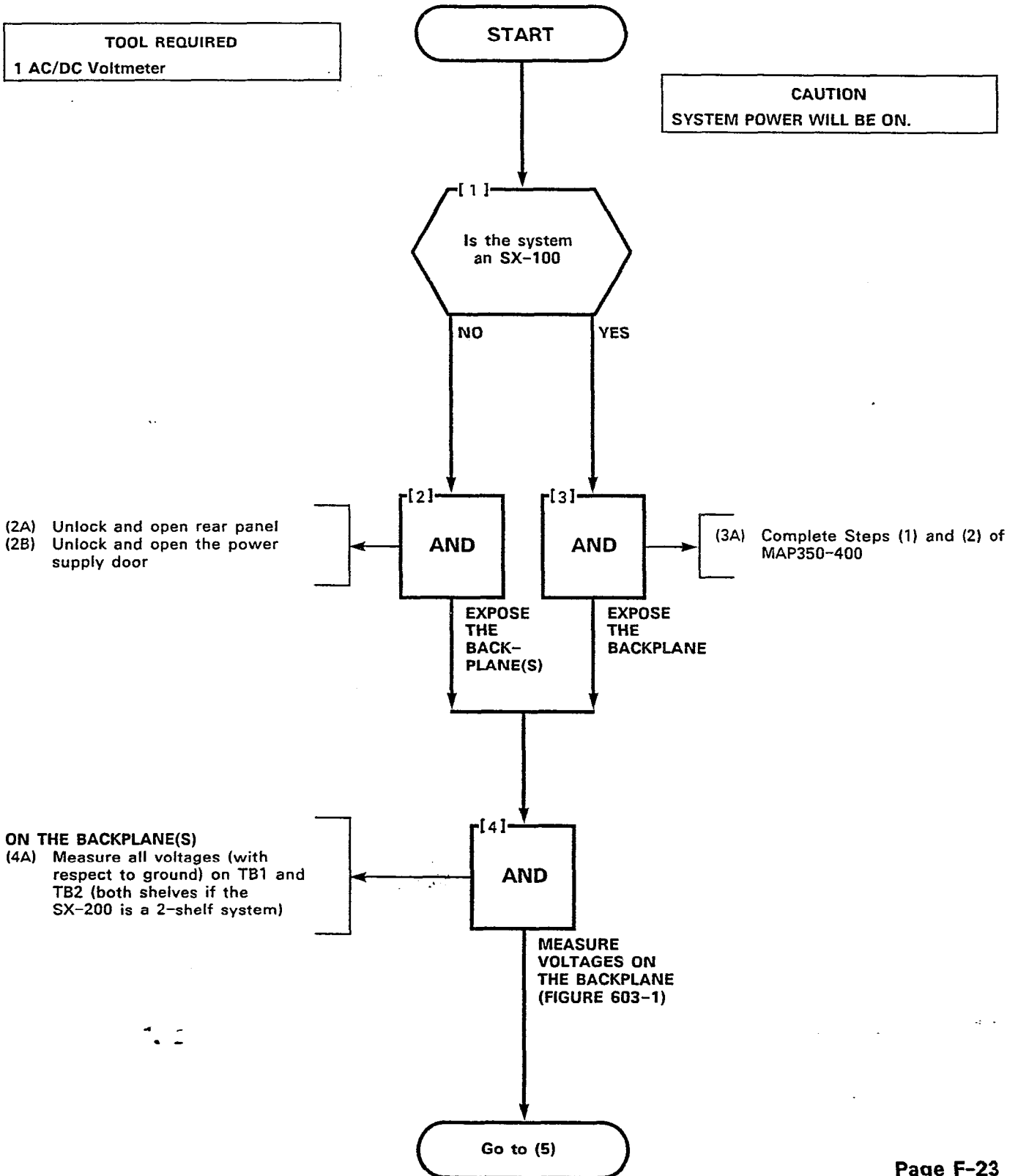


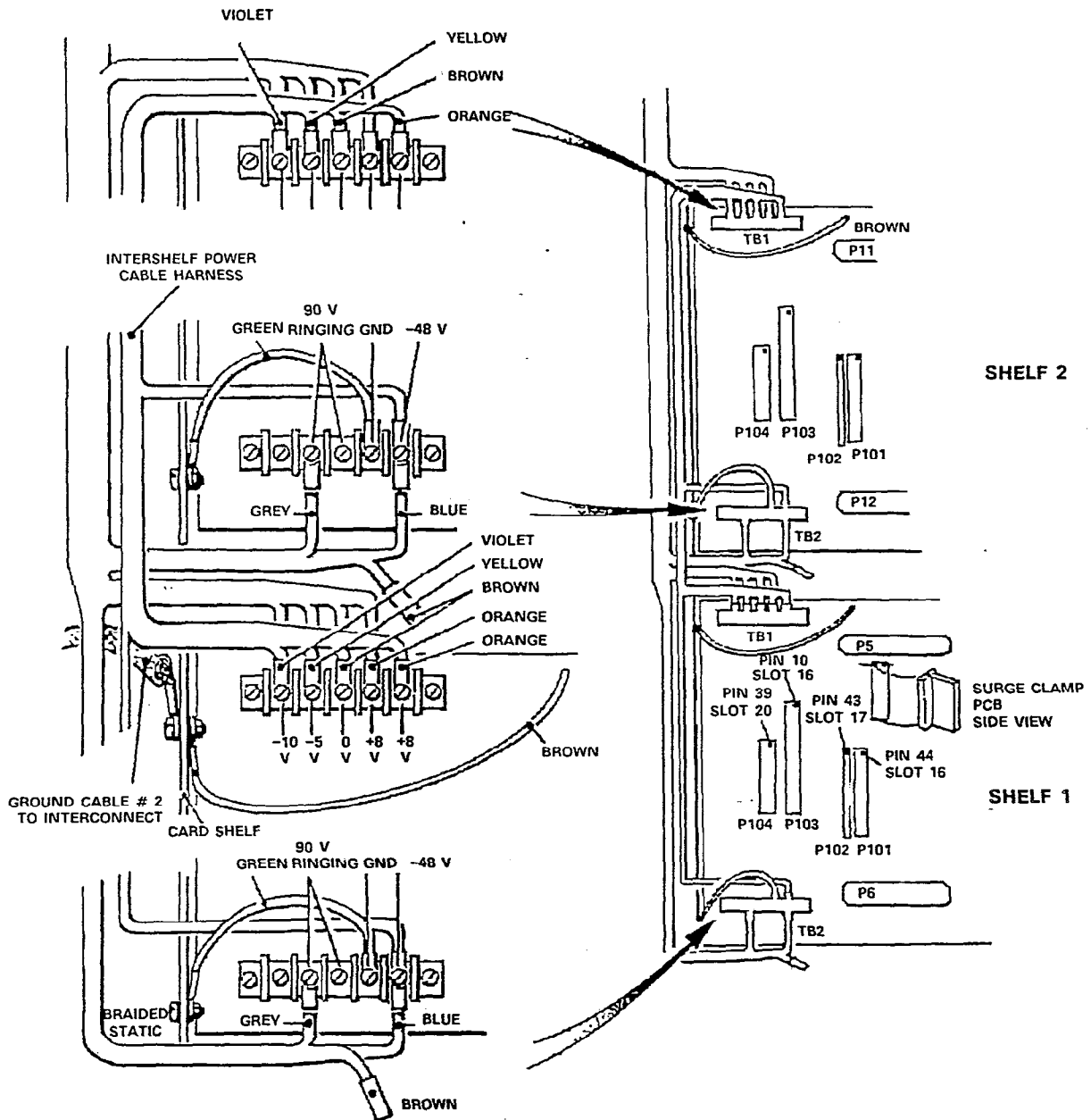


BACKPLANE(S) (SX-200)
MAP350-603
Issue 3, May 1984
Sheet 1 of 4

TOOL REQUIRED
1 AC/DC Voltmeter

CAUTION
SYSTEM POWER WILL BE ON.





NOTE: THERE IS A SURGE CLAMP ON BOTH SHELVES. SURGE CLAMPS ON SECOND SHELF NOT SHOWN. SECOND SHELF SURGE CLAMP IN SAME POSITIONS AS FIRST SHELF CLAMP.

X116R4

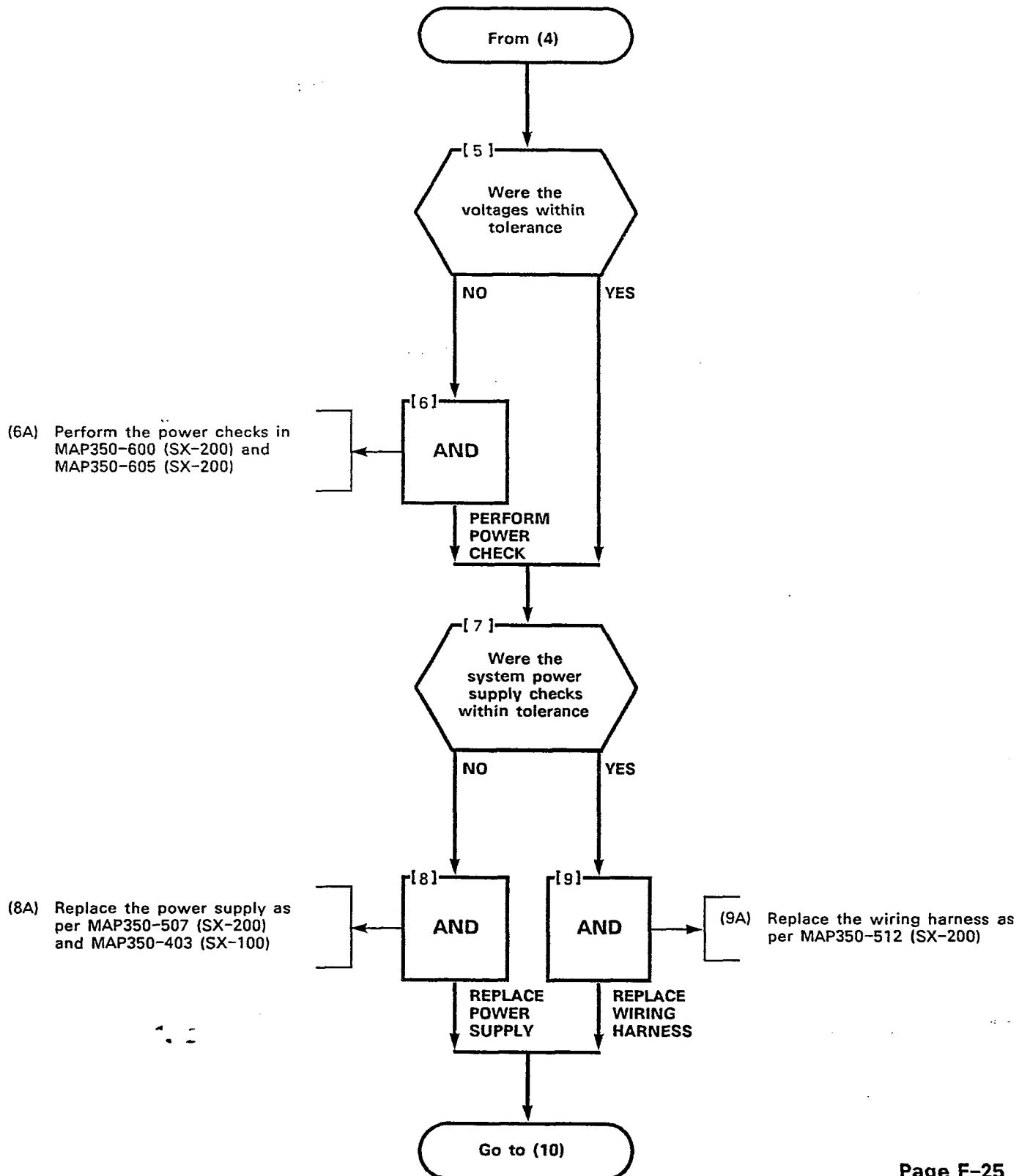
Figure 603-1 Backplane Voltages

BACKPLANE(S) (SX-200)

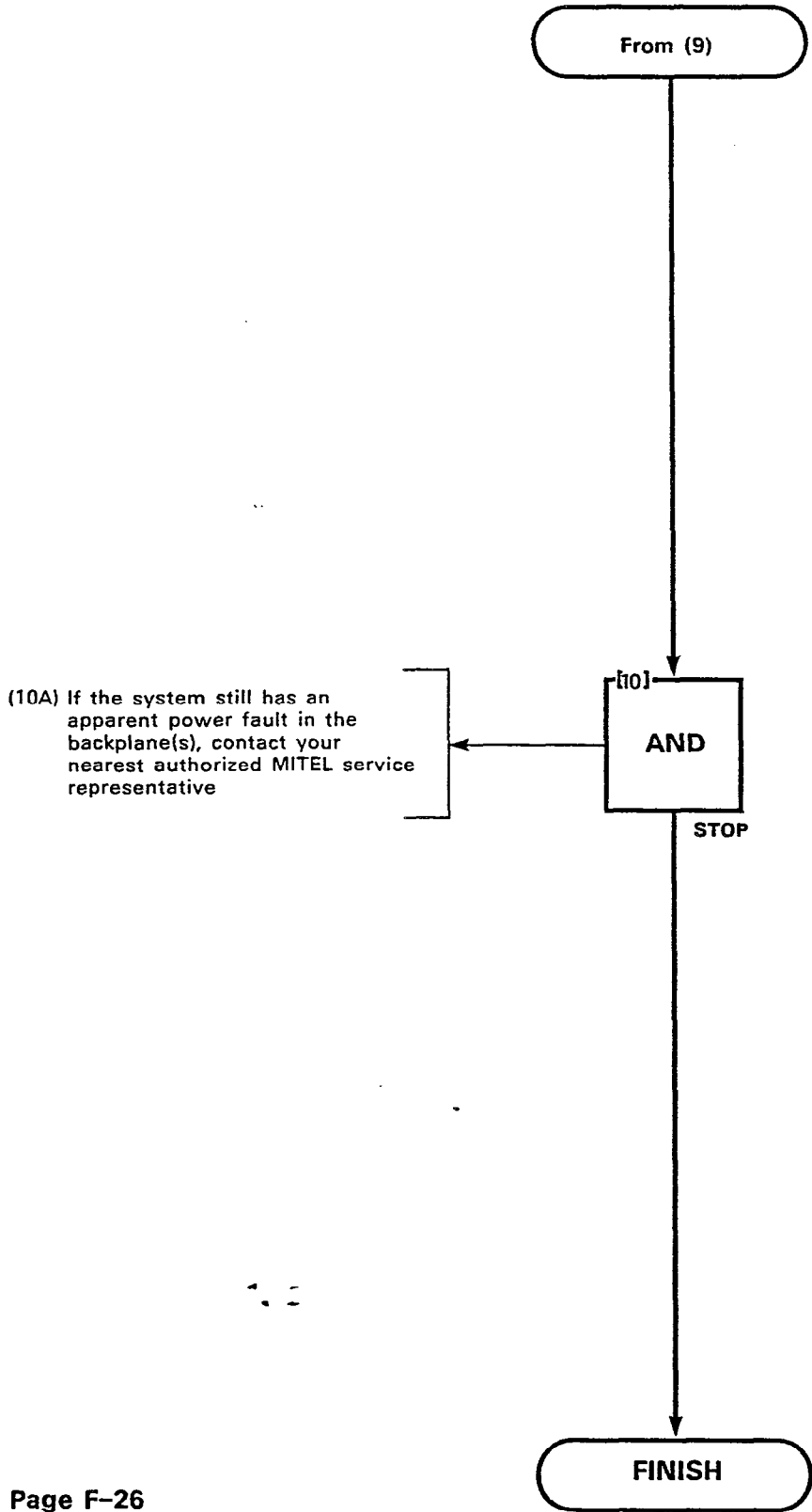
MAP350-603

Issue 3, May 1984

Sheet 3 of 4



BACKPLANE(S) (SX-200)
MAP350- 603
Issue 3, May 1984
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POWER FAIL TRANSFER CARD (SX-200)
MAP350-604
Issue 3, May 1984
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TOOL REQUIRED
1 AC/DC Voltmeter

CAUTION
SYSTEM POWER WILL BE ON.

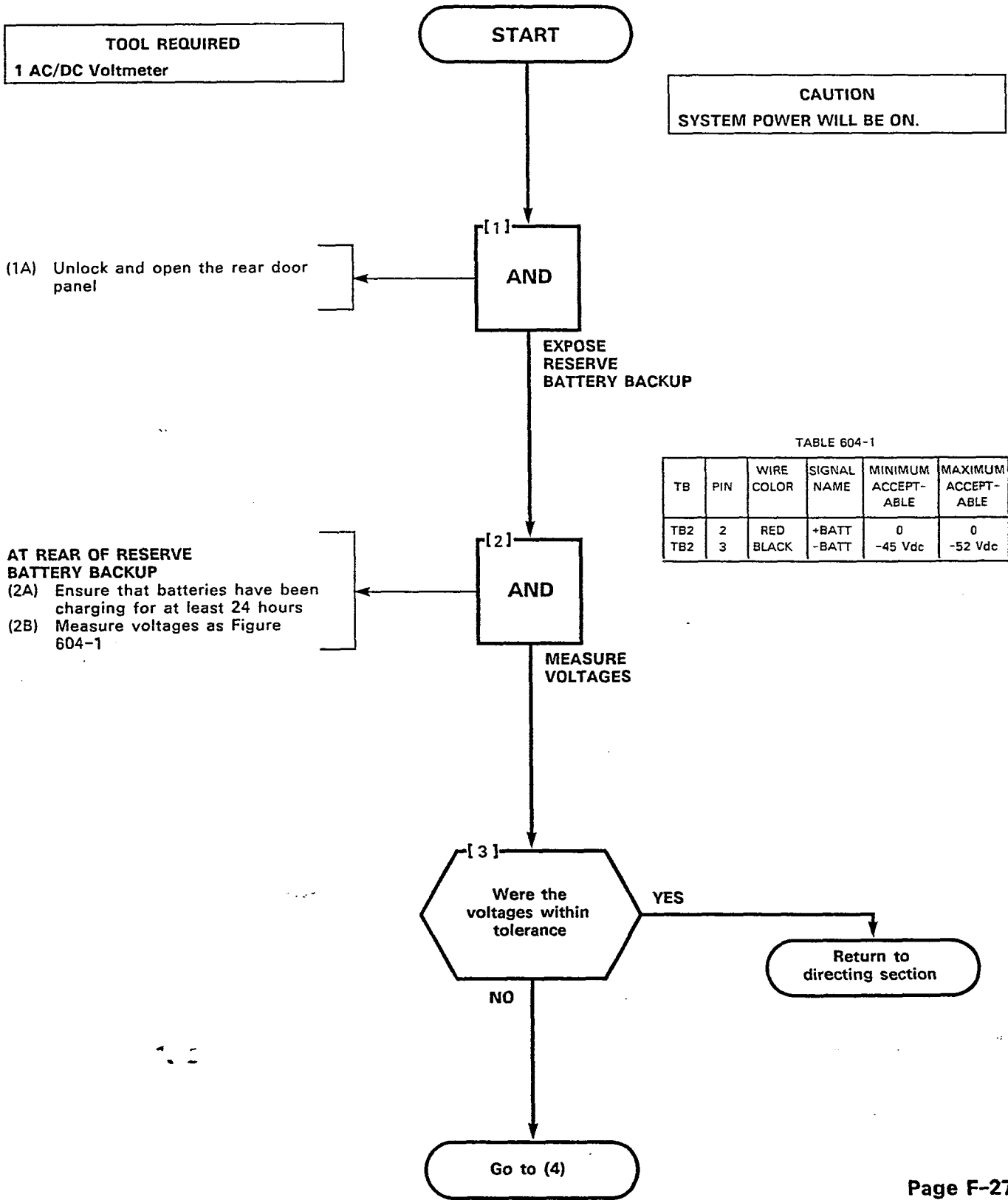
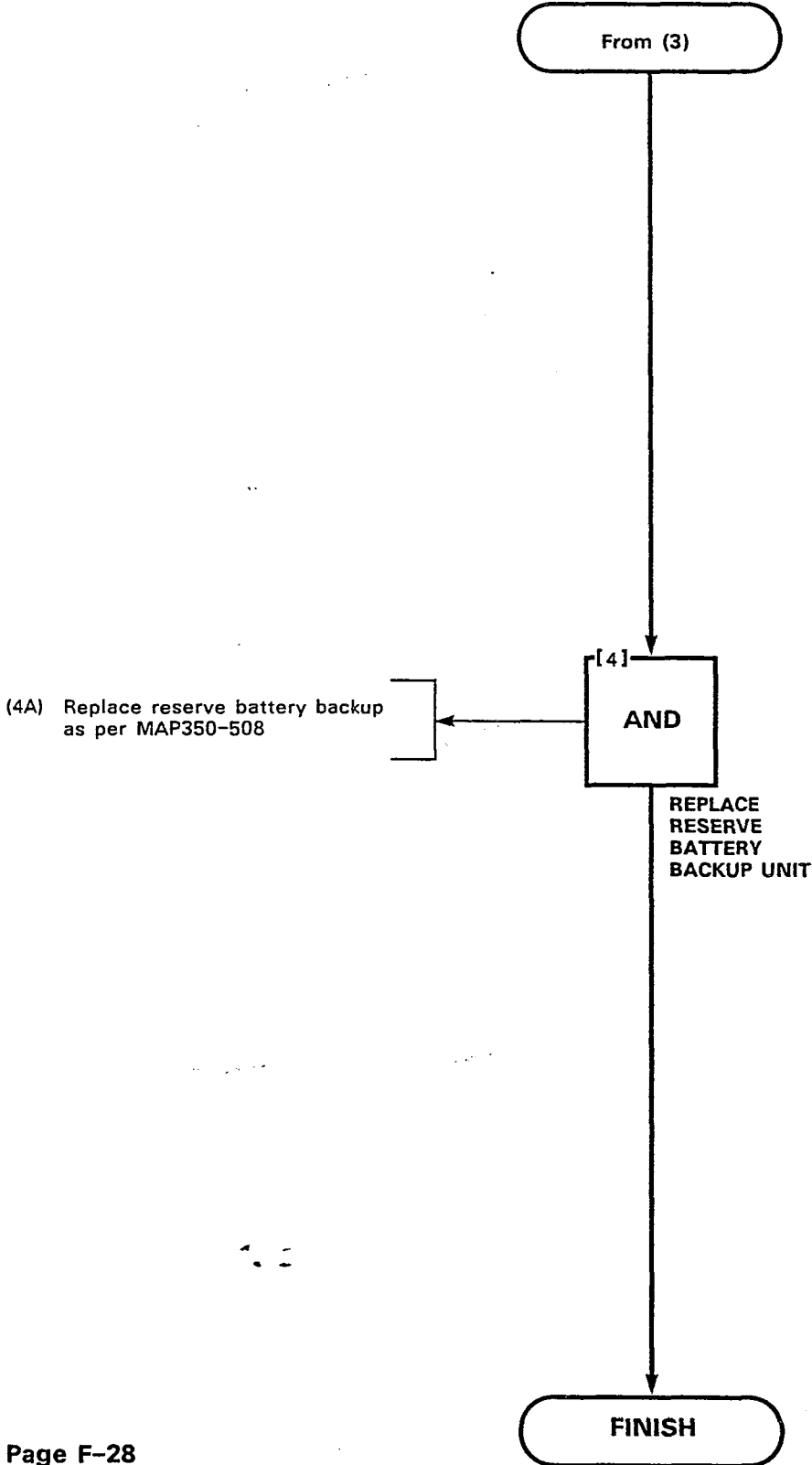
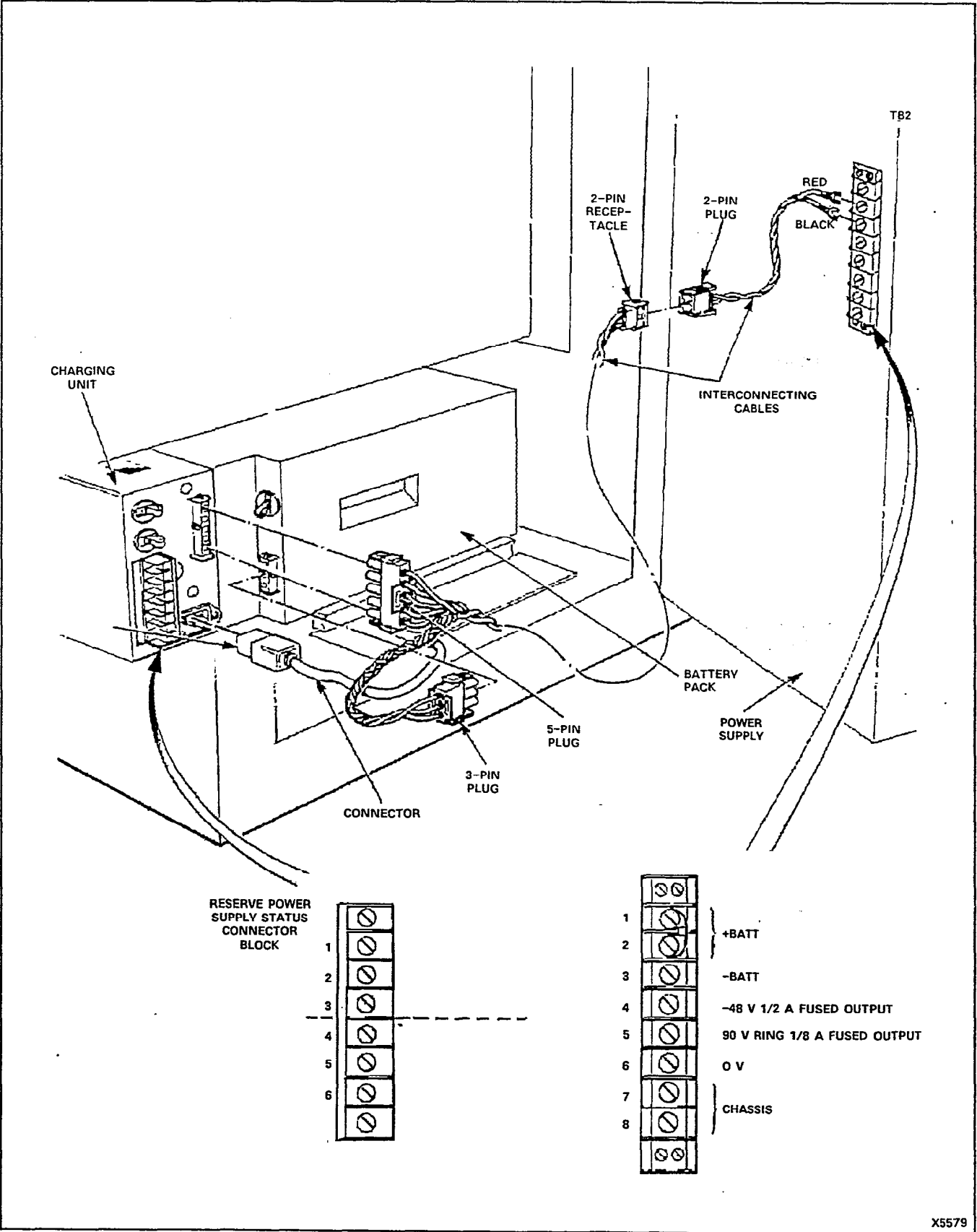


TABLE 604-1

TB	PIN	WIRE COLOR	SIGNAL NAME	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
TB2	2	RED	+BATT	0	0
TB2	3	BLACK	-BATT	-45 Vdc	-52 Vdc

POWER FAIL TRANSFER CARD (SX-200)
MAP350- 604
Issue 3, May 1984
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X5579

Figure 604-1 Reserve Power Supply

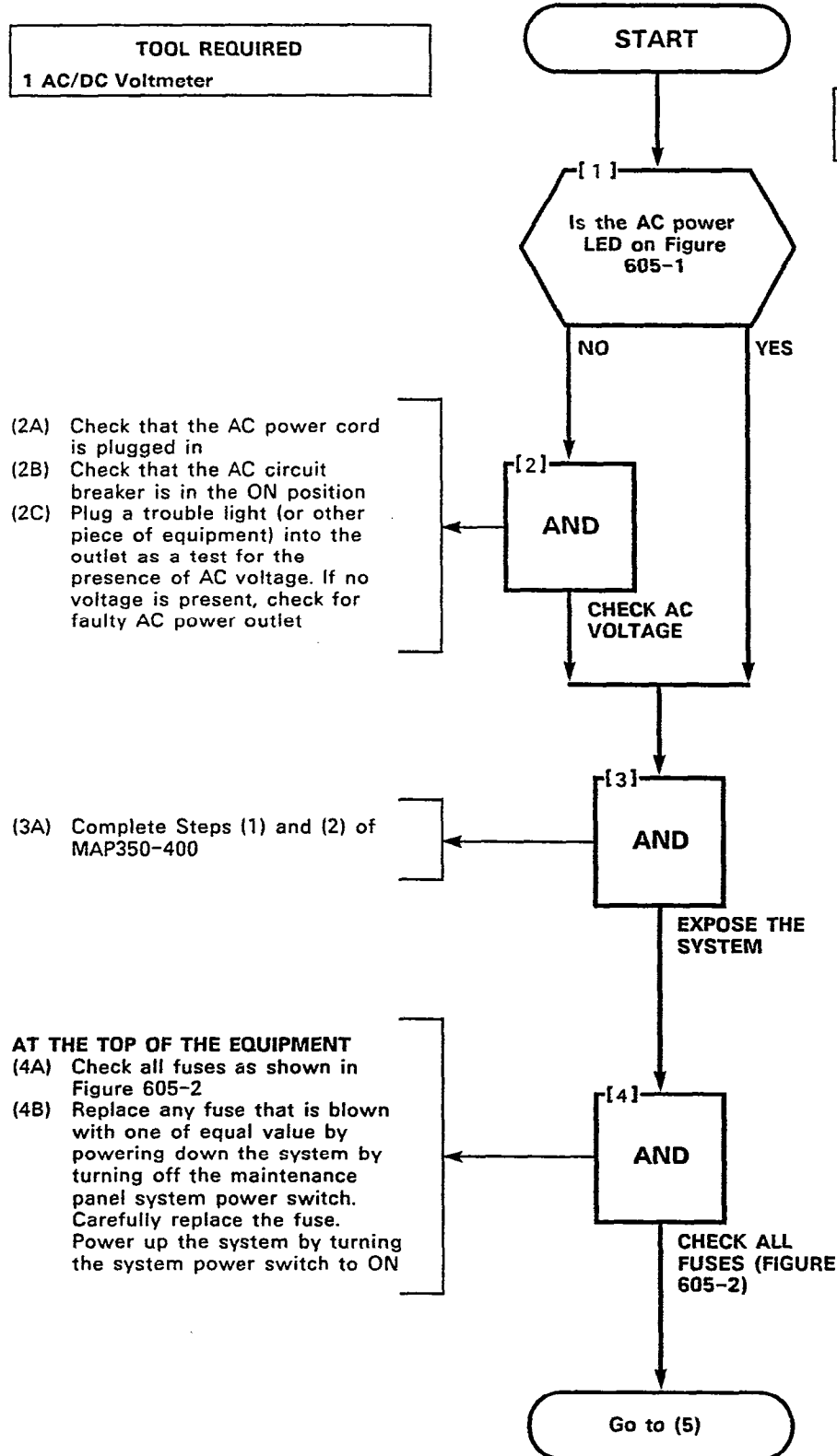
(

)

INTERCONNECT CARD (SX-100)
MAP350-605
Issue 3, May 1984
Sheet 1 of 9

TOOL REQUIRED
1 AC/DC Voltmeter

CAUTION
SYSTEM POWER WILL BE ON.



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INTERCONNECT CARD (SX-100)
MAP350- 605
Issue 3, May 1984
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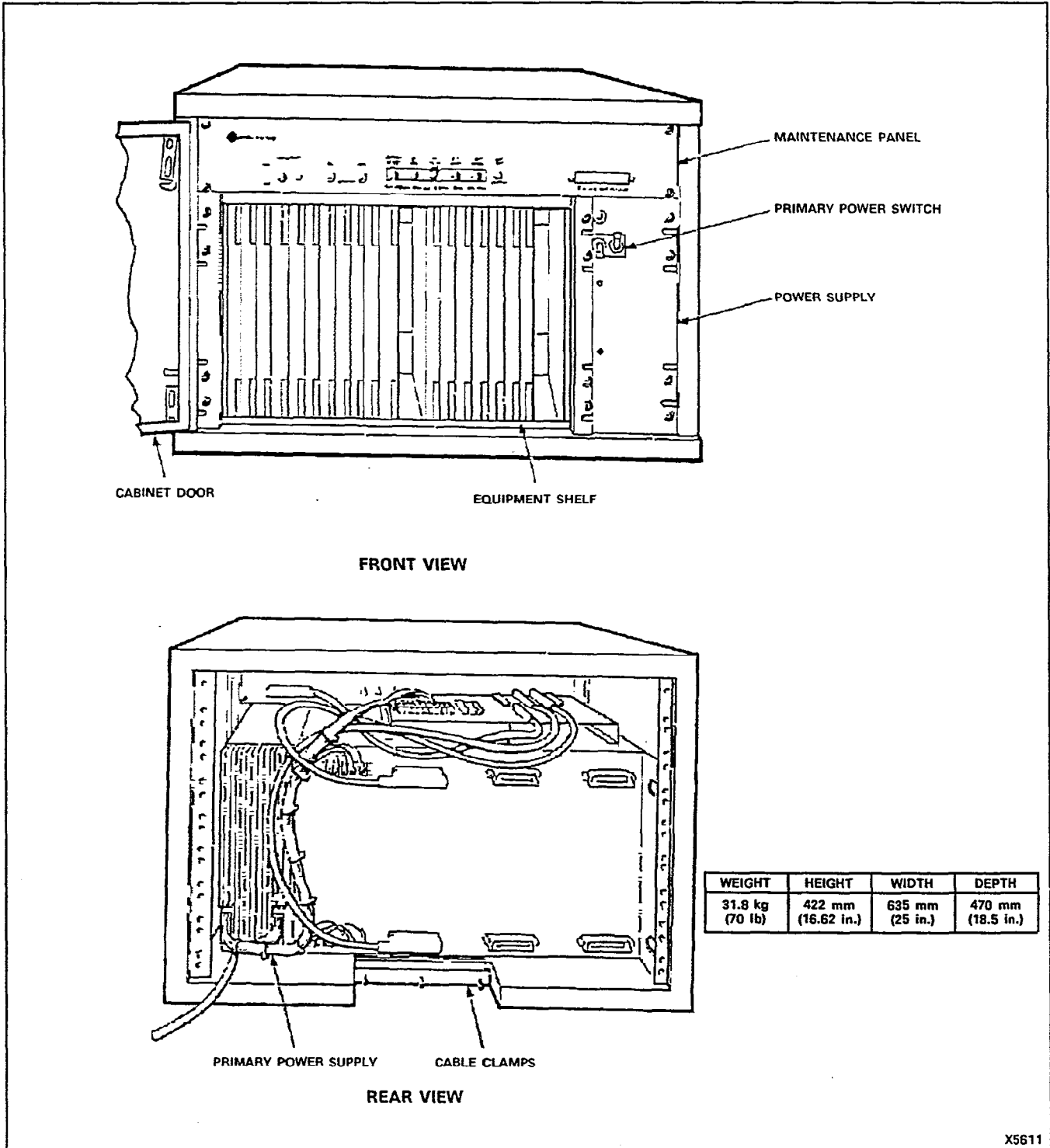
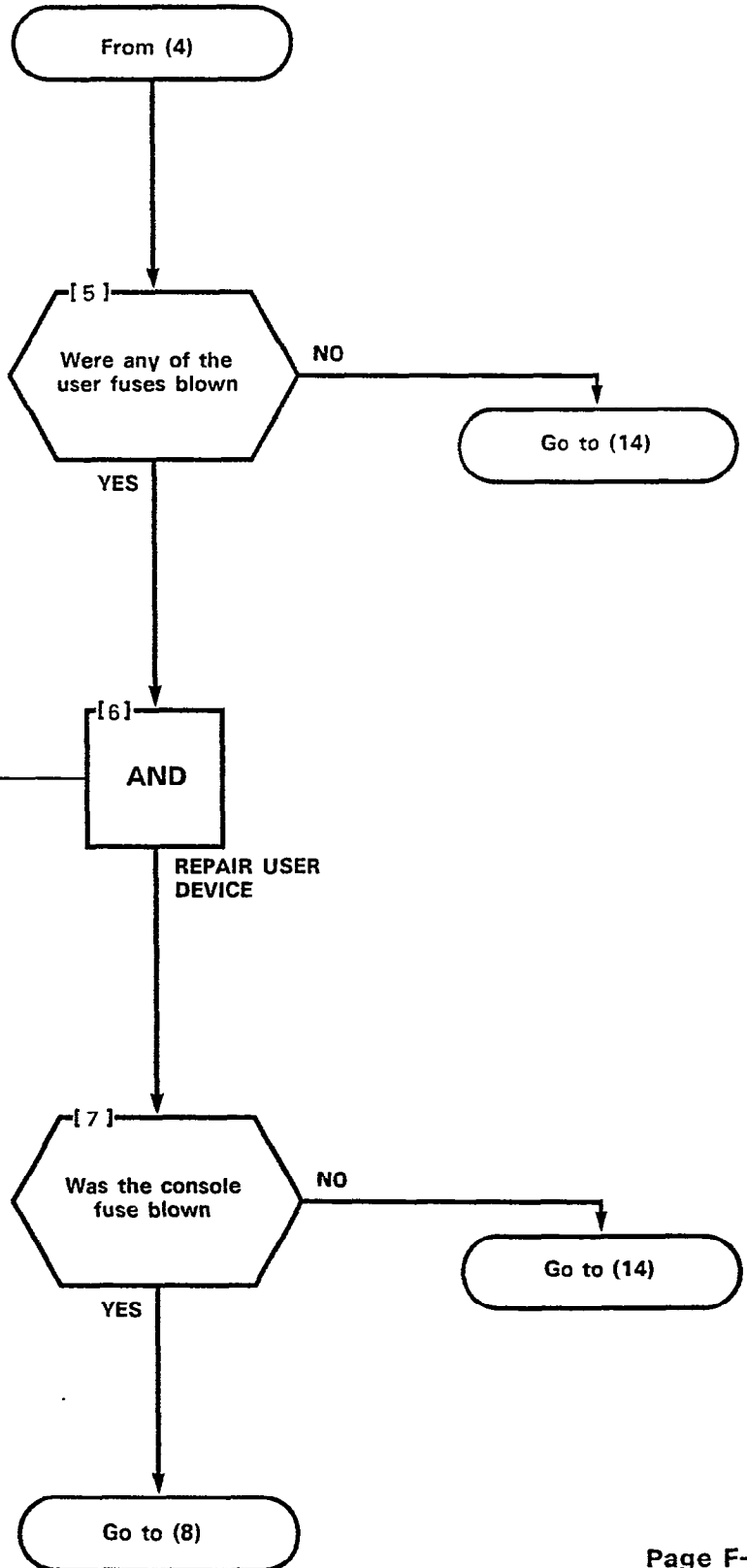


Figure 605-1 The SX-100 System

INTERCONNECT CARD (SX-100)
MAP350- 605
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(6A) Troubleshoot the user device as recommended by the manufacturer of the user device

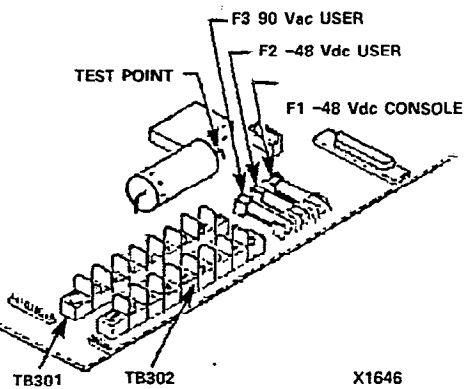
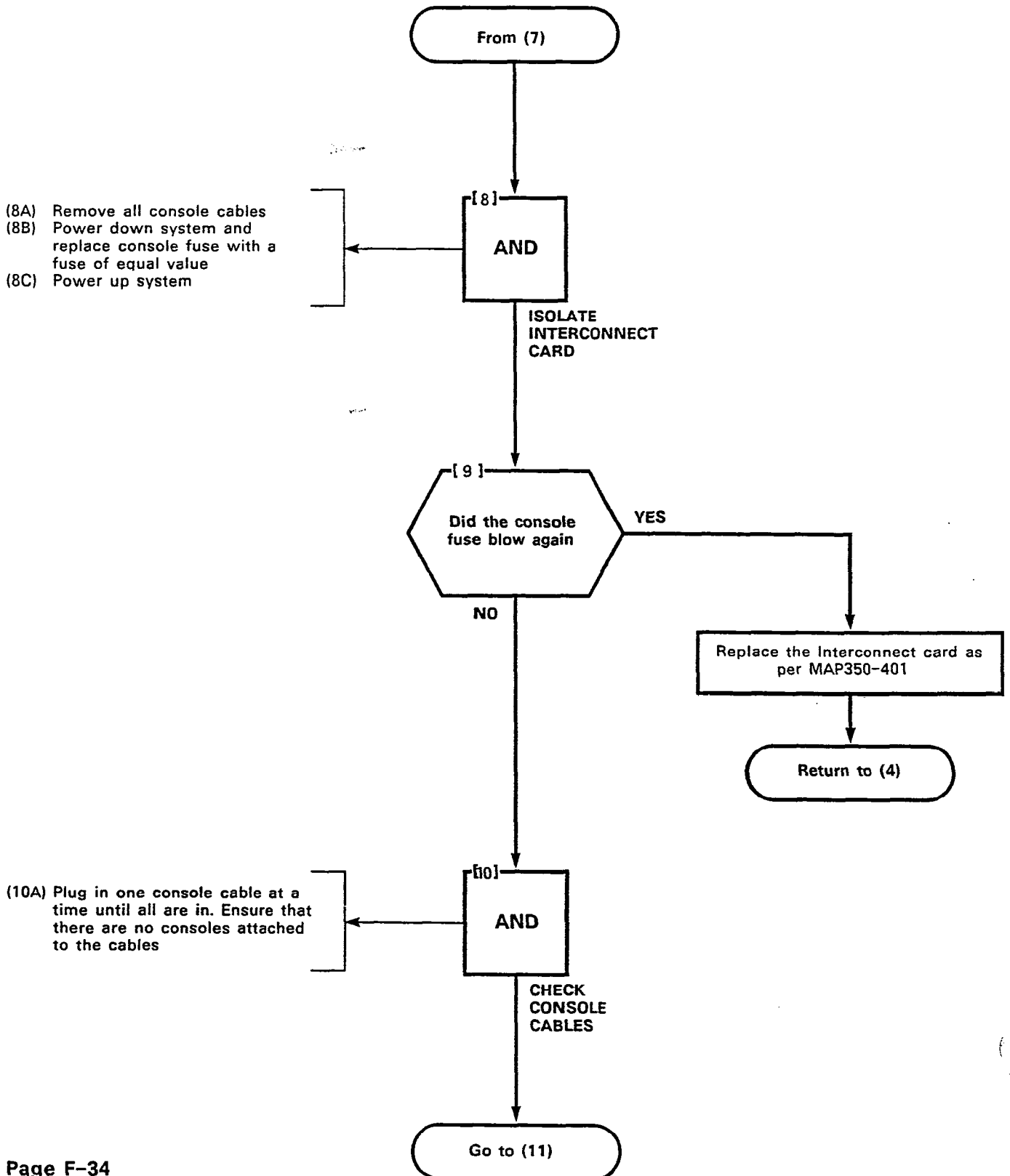


Figure 605-2 Fuses

SECTION MITL9105/9110-096-350-NA

INTERCONNECT CARD (SX-100)
MAP350- 605
Issue 3, May 1984
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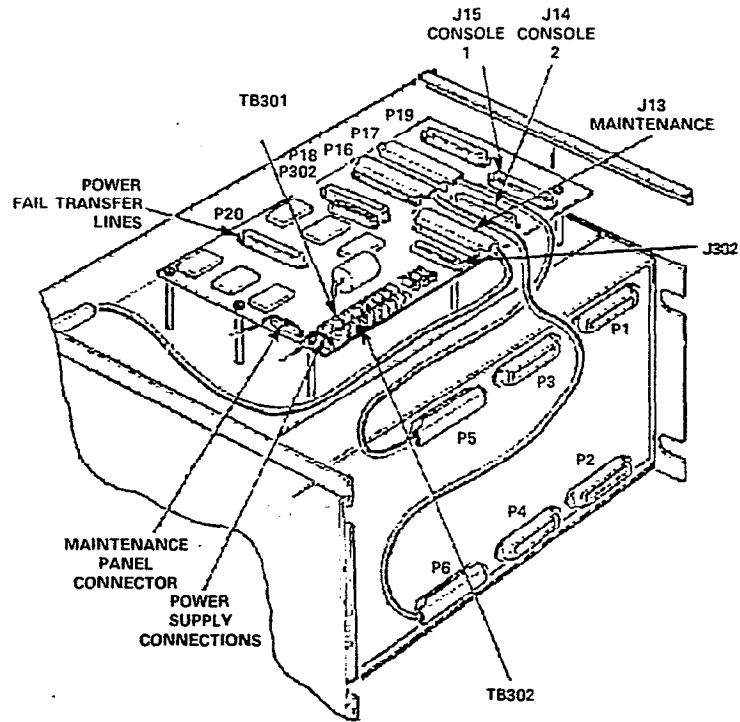


INTERCONNECT CARD (SX-100)

MAP350-605

Issue 3, May 1984

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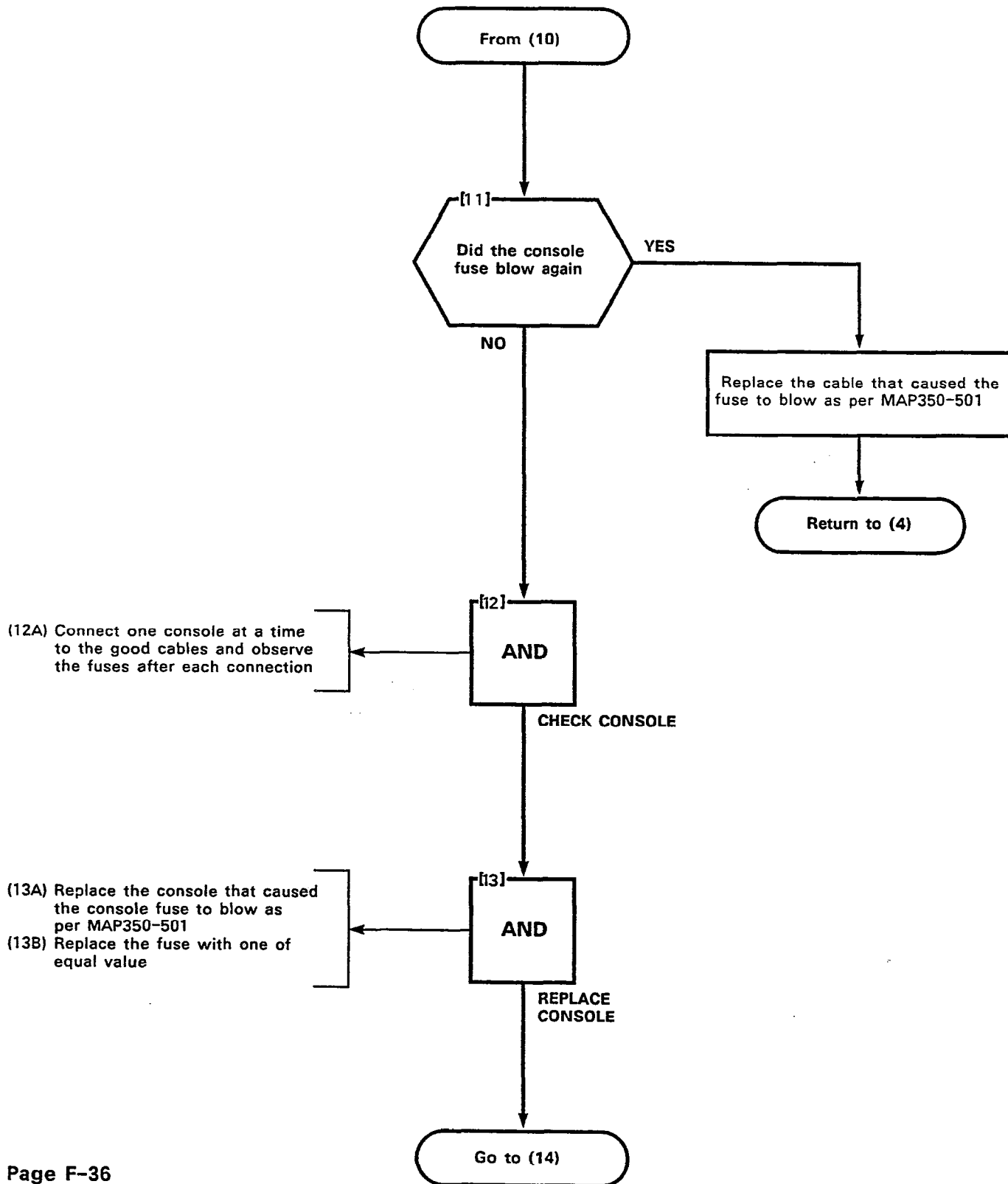


TB	PIN	WIRE COLOR	SIGNAL NAME	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
TB301	1	WHITE	BATT		
TB301	2	ORANGE	+8 Vdc	+7.6 Vdc	+8.4 Vdc
TB301	3	YELLOW	-5 Vdc	-4.7 Vdc	-5.3 Vdc
TB301	4	BROWN	0 V		
TB301	5	GREEN	0 V		
TB301	6	BLUE	-48 Vdc	-45.0 Vdc	-52.0 Vdc
TB301	7	GREY	90 Vac	80 Vac	99 Vac
TB302	7		BATT	-45.0 Vdc	-52 Vdc
TB302	6	BLUE/WHITE	OOT 8 Vdc	+7.6 Vdc	-8.4 Vdc
TB302	5				
TB302	4		0 V		
TB302	3		0 V		
TB302	2		USER -48 Vdc	-45.0 Vdc	-52.0 Vdc
TB302	1		USER 90 Vac	80 Vac	99 Vac
TB303	3		OOT 8 Vdc	+7.6 Vdc	+8.4 Vdc
P303		GREEN/WHITE	OOT 8 Vdc	+7.60 Vac	+8.4 Vdc

X952R3

Figure 605-3 Interconnect Card

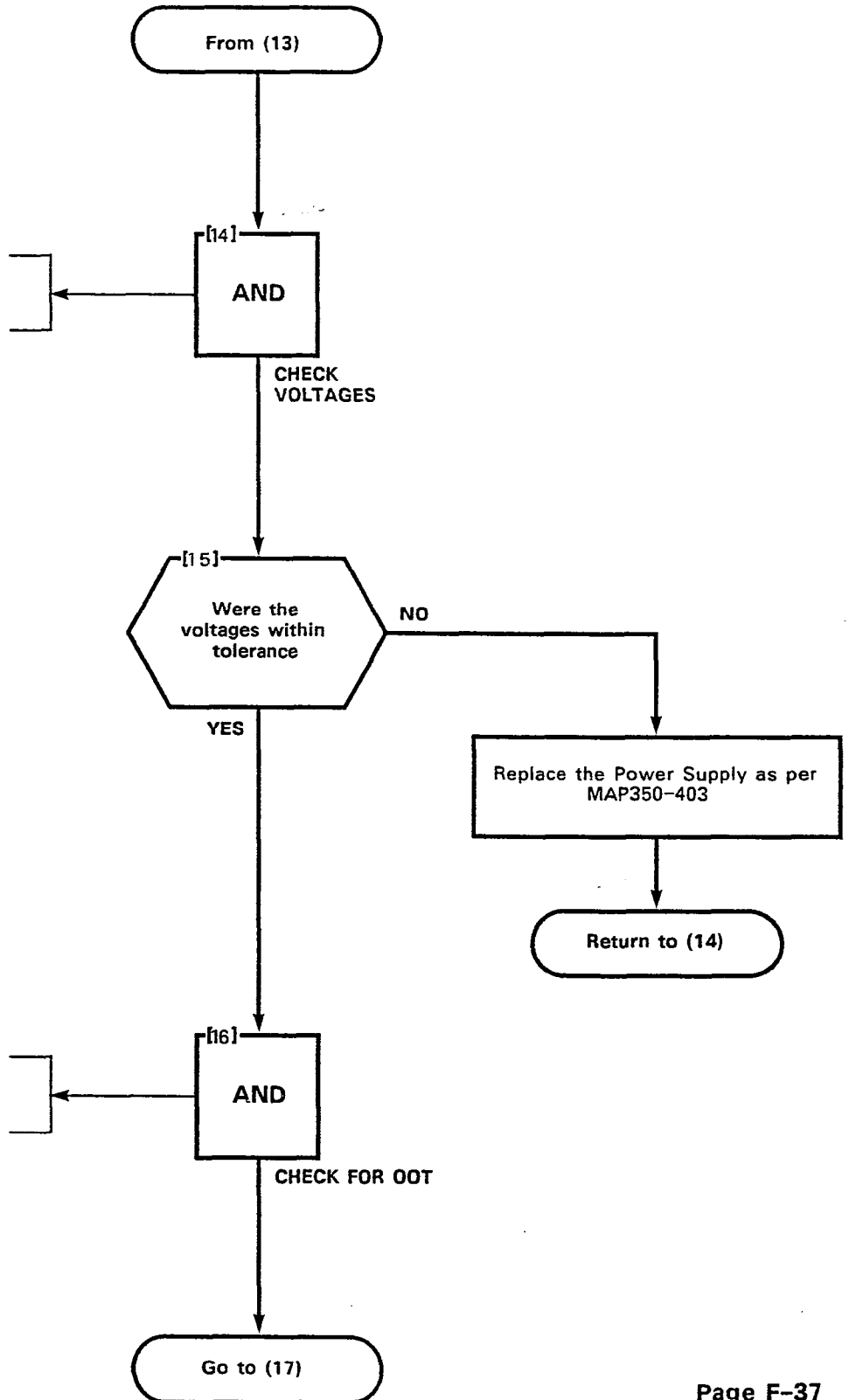
INTERCONNECT CARD (SX-100)
MAP350- 605
Issue 3, May 1984
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INTERCONNECT CARD (SX-100)
MAP350- 605
Issue 3, May 1984
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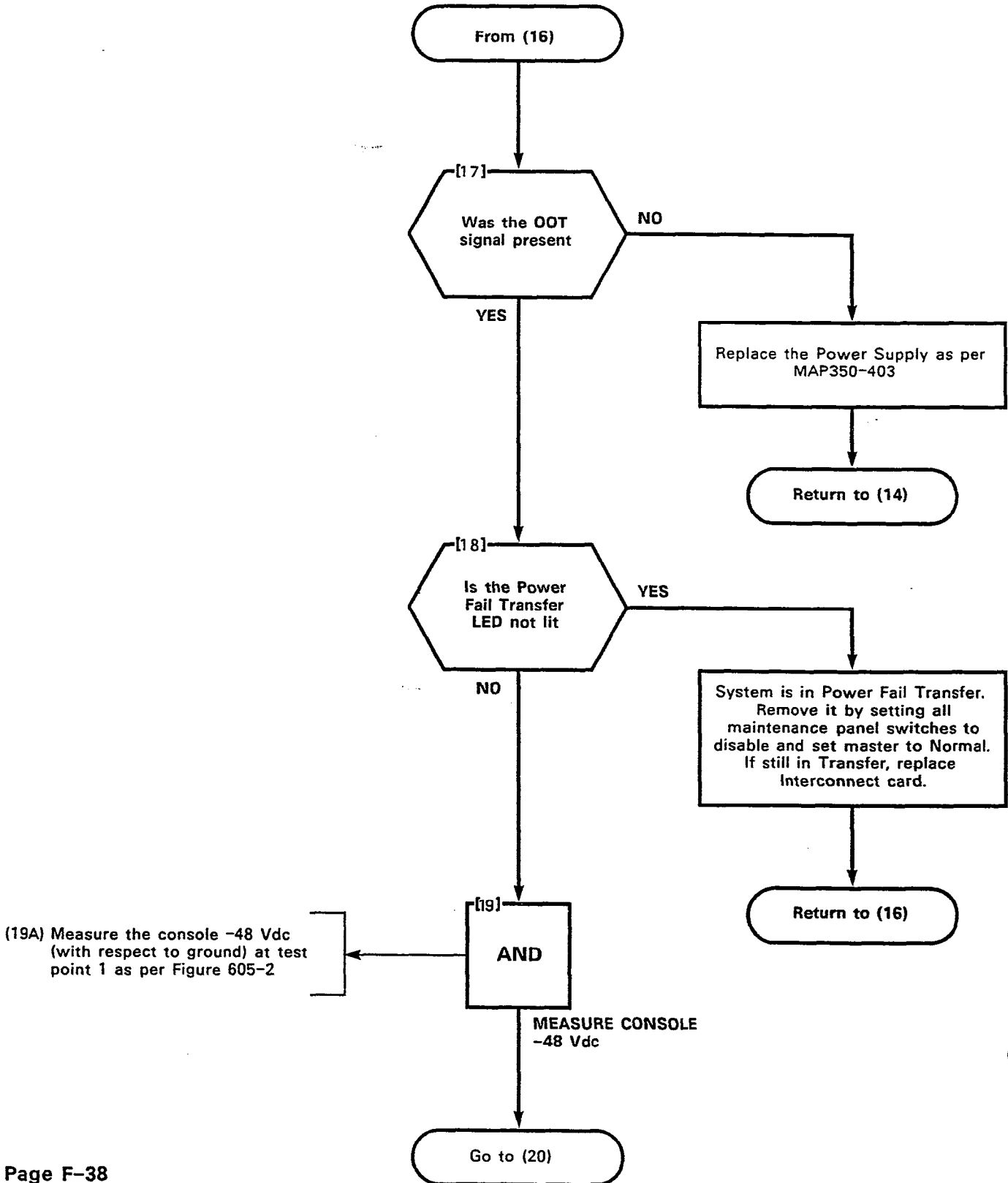
(14A) Measure all voltages as per Figure 605-3

(16A) Measure +8 Vdc (OOT) on the white-green wire of P303

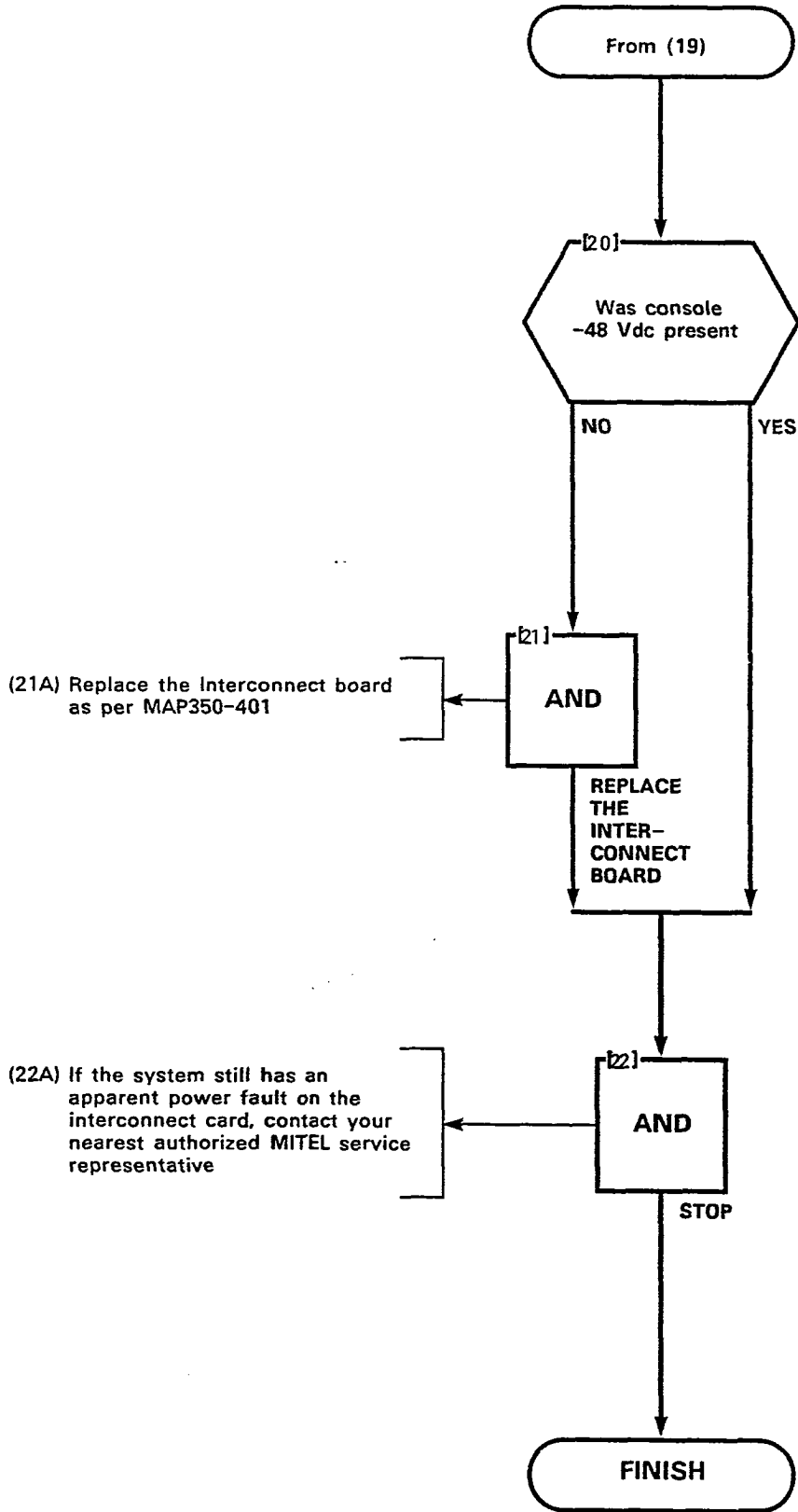


SECTION MITL9105/9110-096-350-NA

INTERCONNECT CARD (SX-100)
MAP350- 605
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INTERCONNECT CARD (SX-100)
MAP350-605
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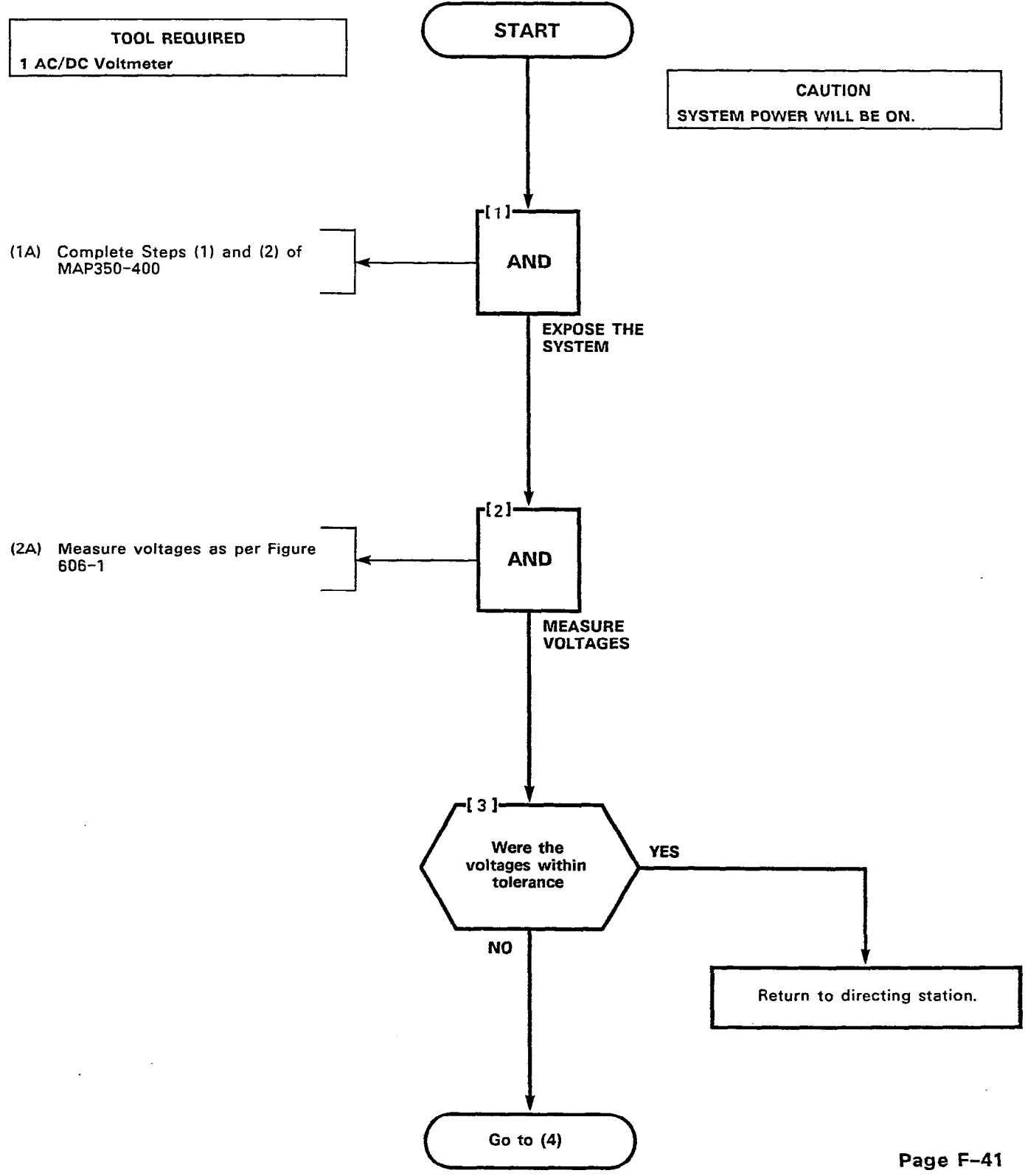




RESERVE BATTERY BACKUP (SX-100)
MAP350- 606
Issue 3, May 1984
Sheet 1 of 3

TOOL REQUIRED
1 AC/DC Voltmeter

CAUTION
SYSTEM POWER WILL BE ON.



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RESERVE BATTERY BACKUP (SX-100)
MAP350- 606
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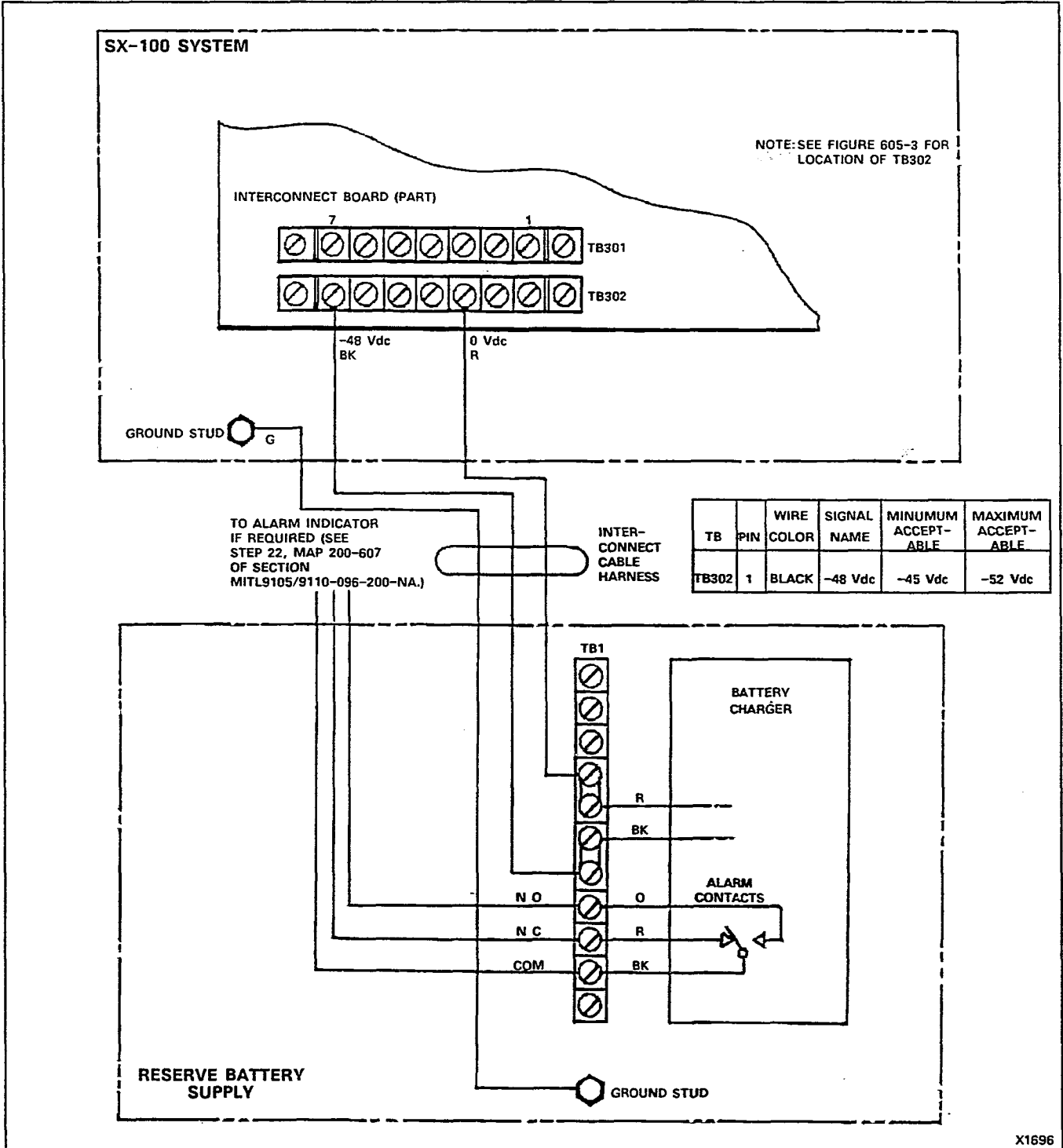
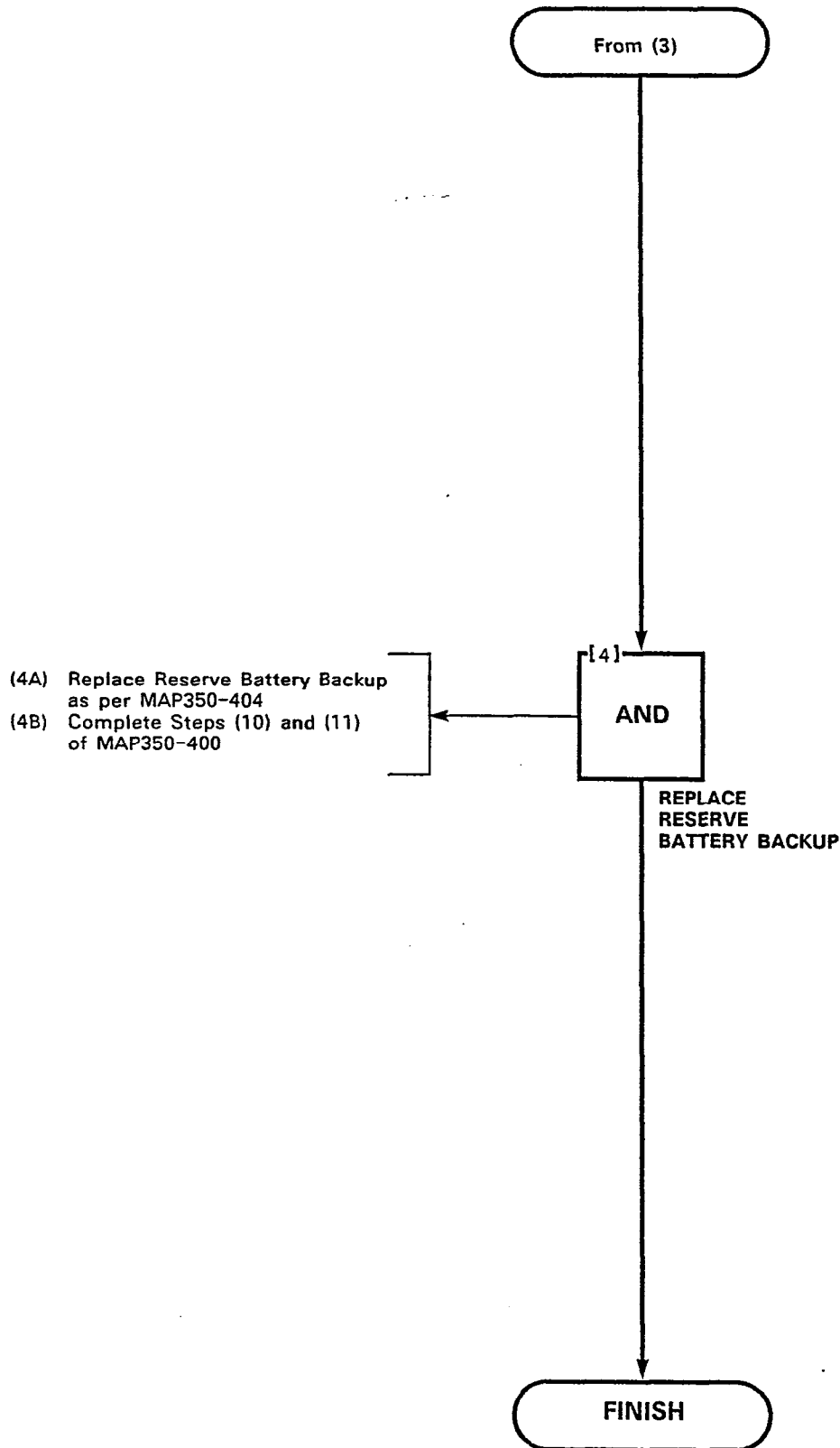
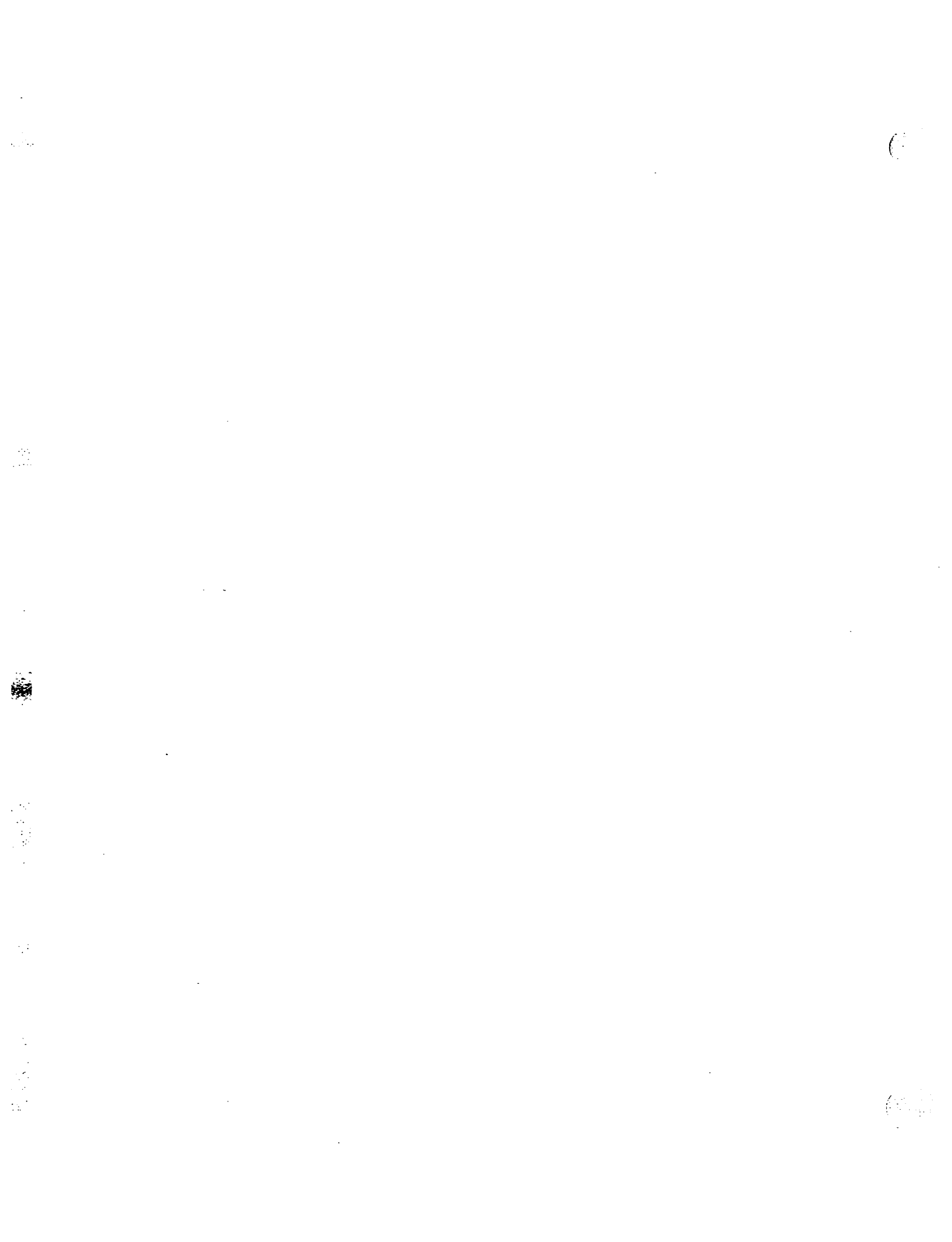


Figure 606-1 Reserve Battery Backup

RESERVE BATTERY BACKUP (SX-100)
MAP350-606
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APPENDIX G

TROUBLESHOOTING MAPs

GENERAL

G1.01 The MAPs contained in this Appendix detail the procedures to be performed in all actual card troubleshooting on the system. These MAPs are used in conjunction with the MAPs outlined in other sections of this Practice. Due to the similarity of the SX-100 and SX-200 systems, all the MAPs of this Appendix are common to each system.

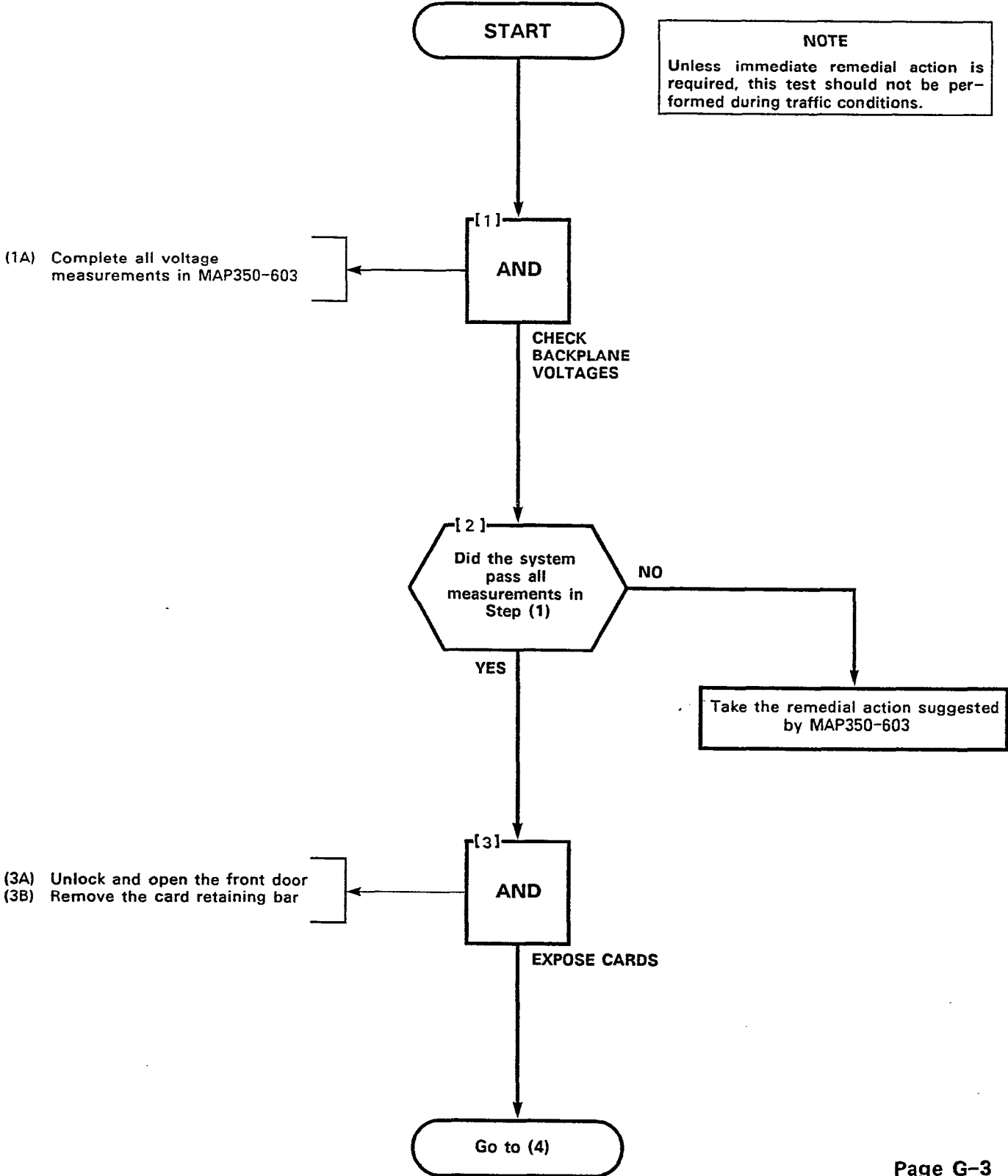
G1.02 Table G1-1 is a listing of all MAPs contained in this Appendix.

TABLE G1-1
TROUBLESHOOTING

Title	Reference
Common Control Test	MAP350-701
Speech Path Test	MAP350-702
Cabling Test	MAP350-703
Paging Test	MAP350-704
Night Bell Test	MAP350-705
Music-on-Hold Test	MAP350-706

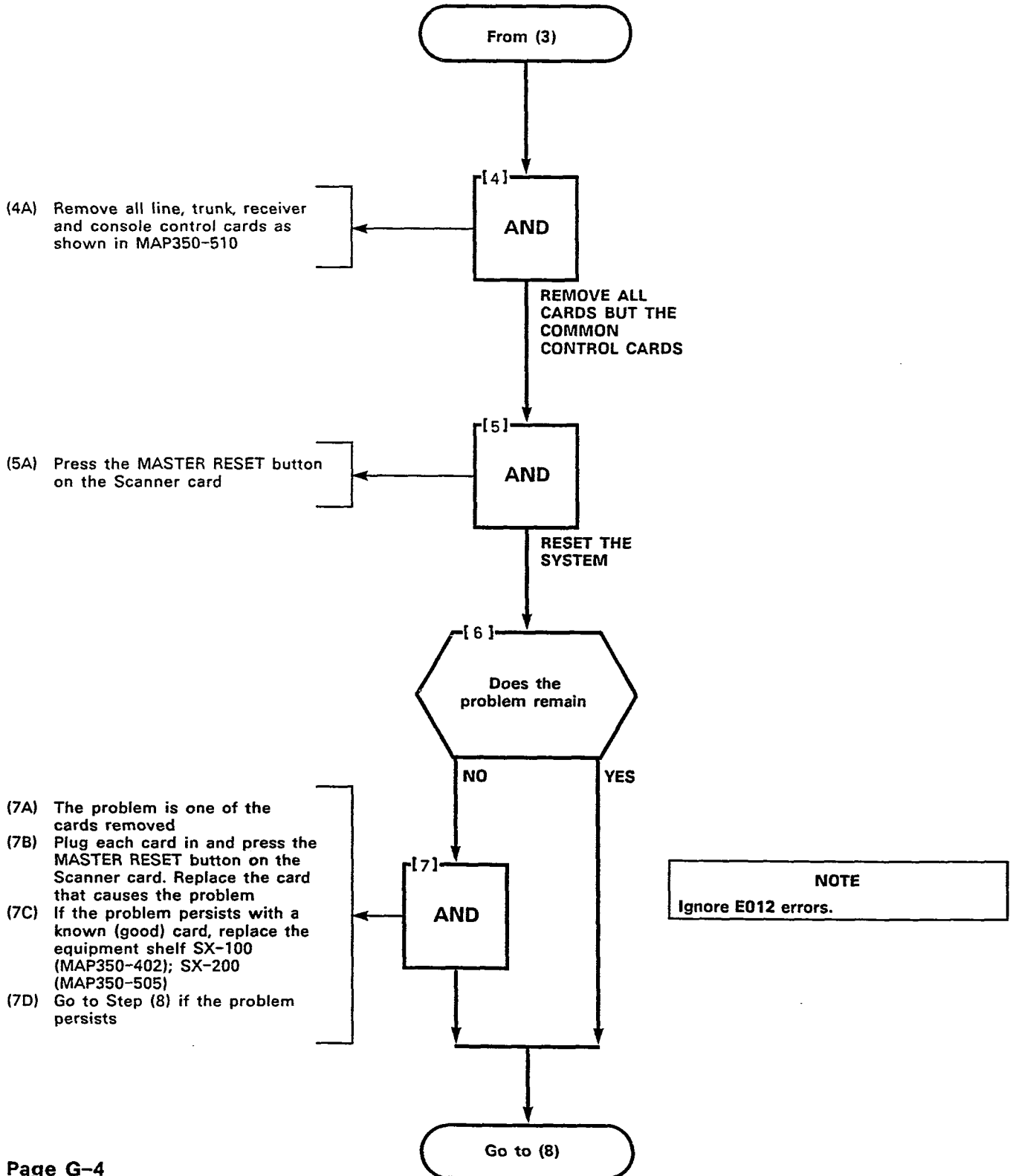
COMMON CONTROL TEST
MAP350-701
Issue 3, May 1984
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NOTE
Unless immediate remedial action is required, this test should not be performed during traffic conditions.



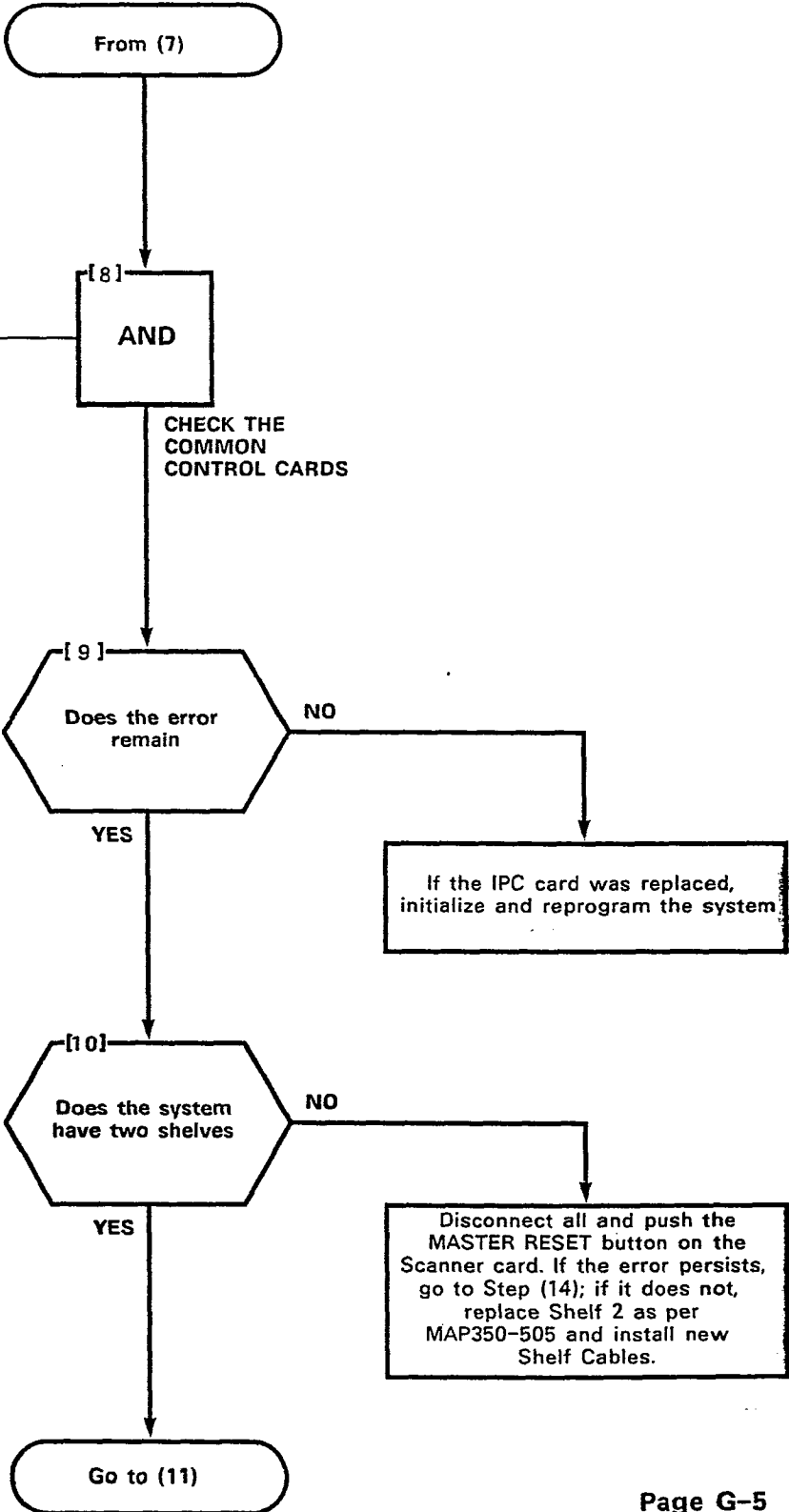
SECTION MITL9105/9110-096-350-NA

COMMON CONTROL TEST
MAP350- 701
Issue 3, May 1984
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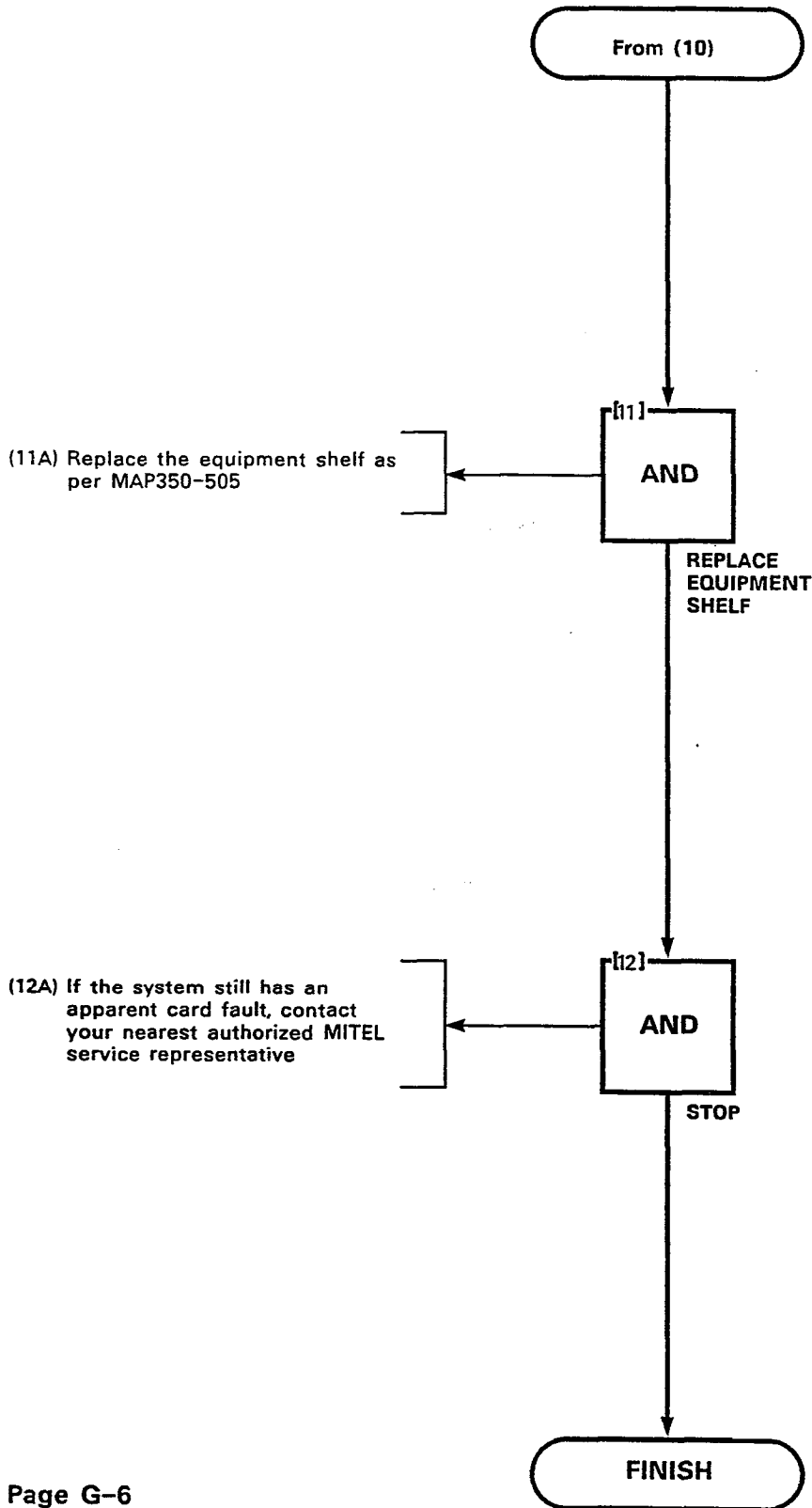
COMMON CONTROL TEST
MAP350-701
Issue 3, May 1984
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- (8A) Change the Common Control cards one at a time with the system power off at each card change
- (8B) Press the MASTER RESET button on the Scanner card after each power up
- (8C) Continue Steps (8A) and (8B) until all cards have been replaced



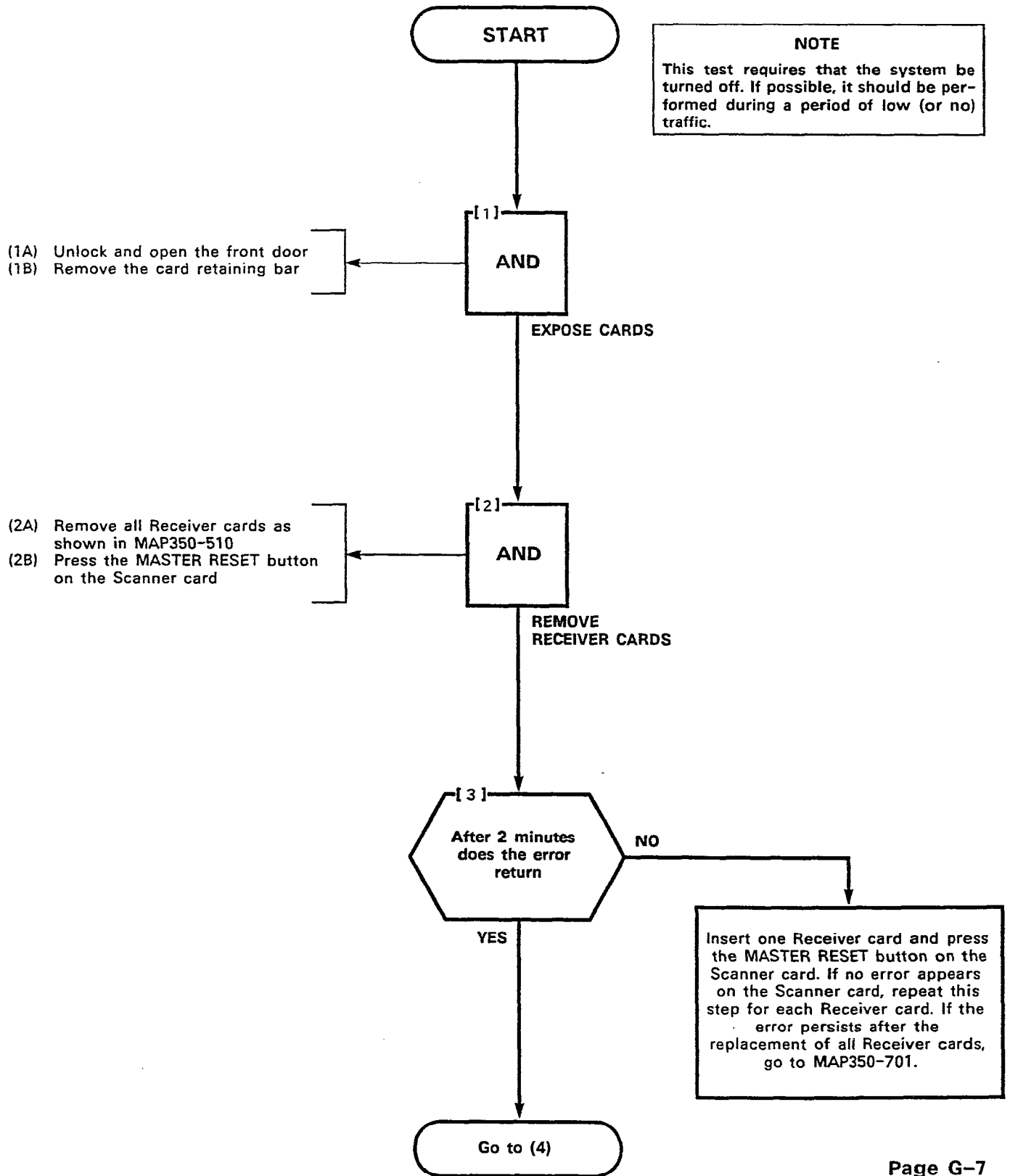
SECTION MITL9105/9110-096-350-NA

COMMON CONTROL TEST
MAP350- 701
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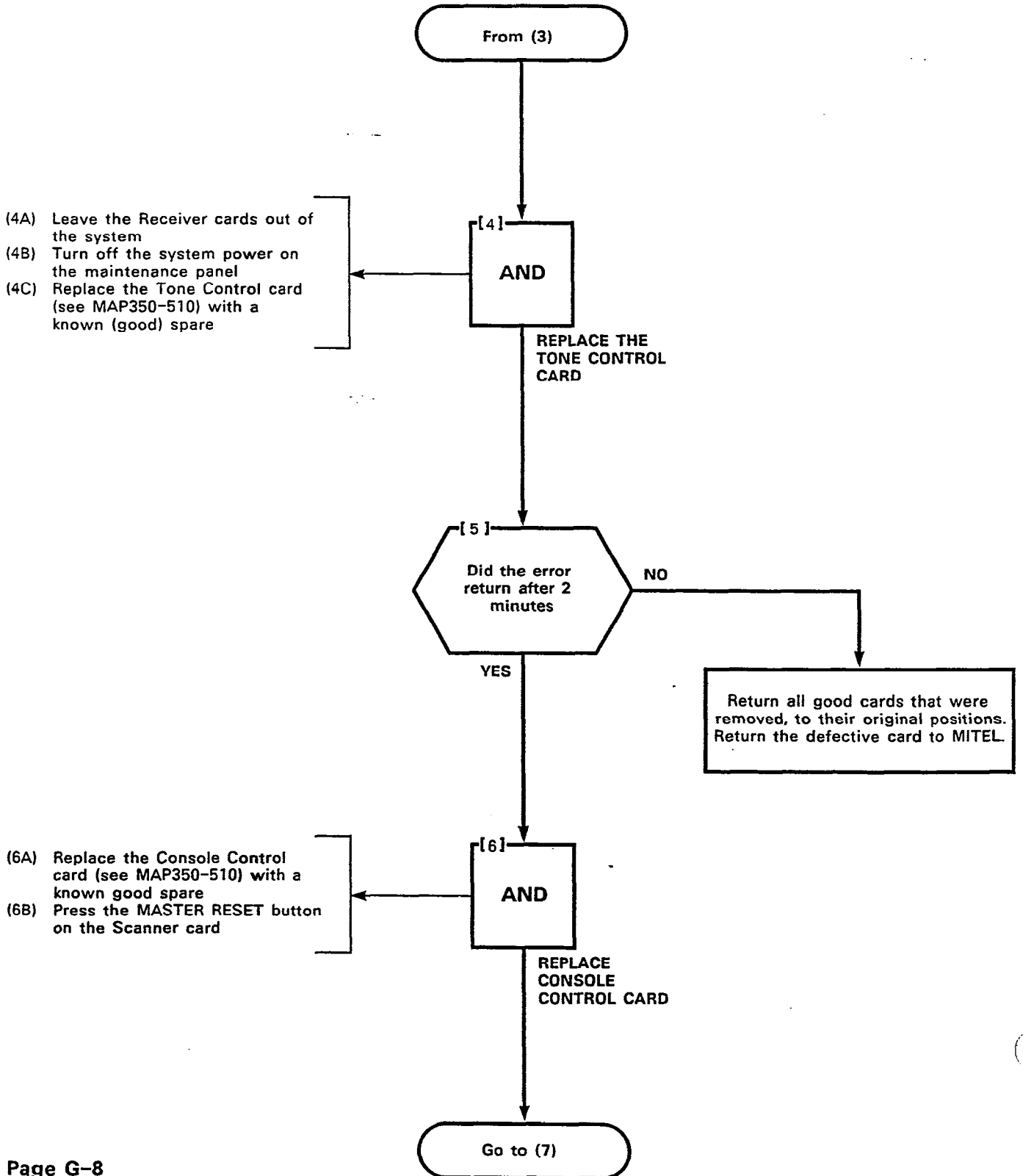
SPEECH PATH TEST
MAP350- 702
Issue 3, May 1984
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NOTE
 This test requires that the system be turned off. If possible, it should be performed during a period of low (or no) traffic.

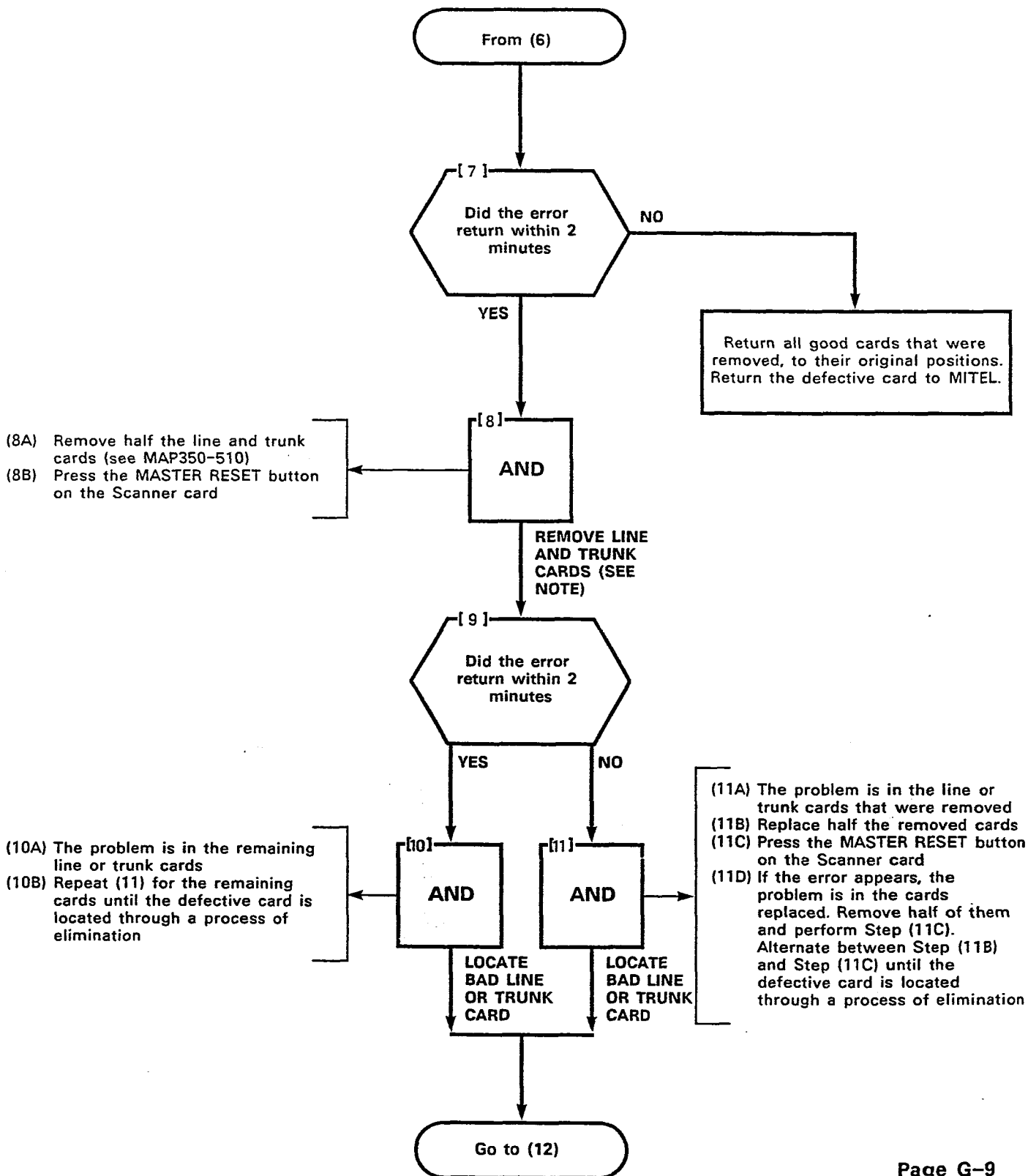


SECTION MITL9105/9110-096-350-NA

SPEECH PATH TEST
MAP350- 702
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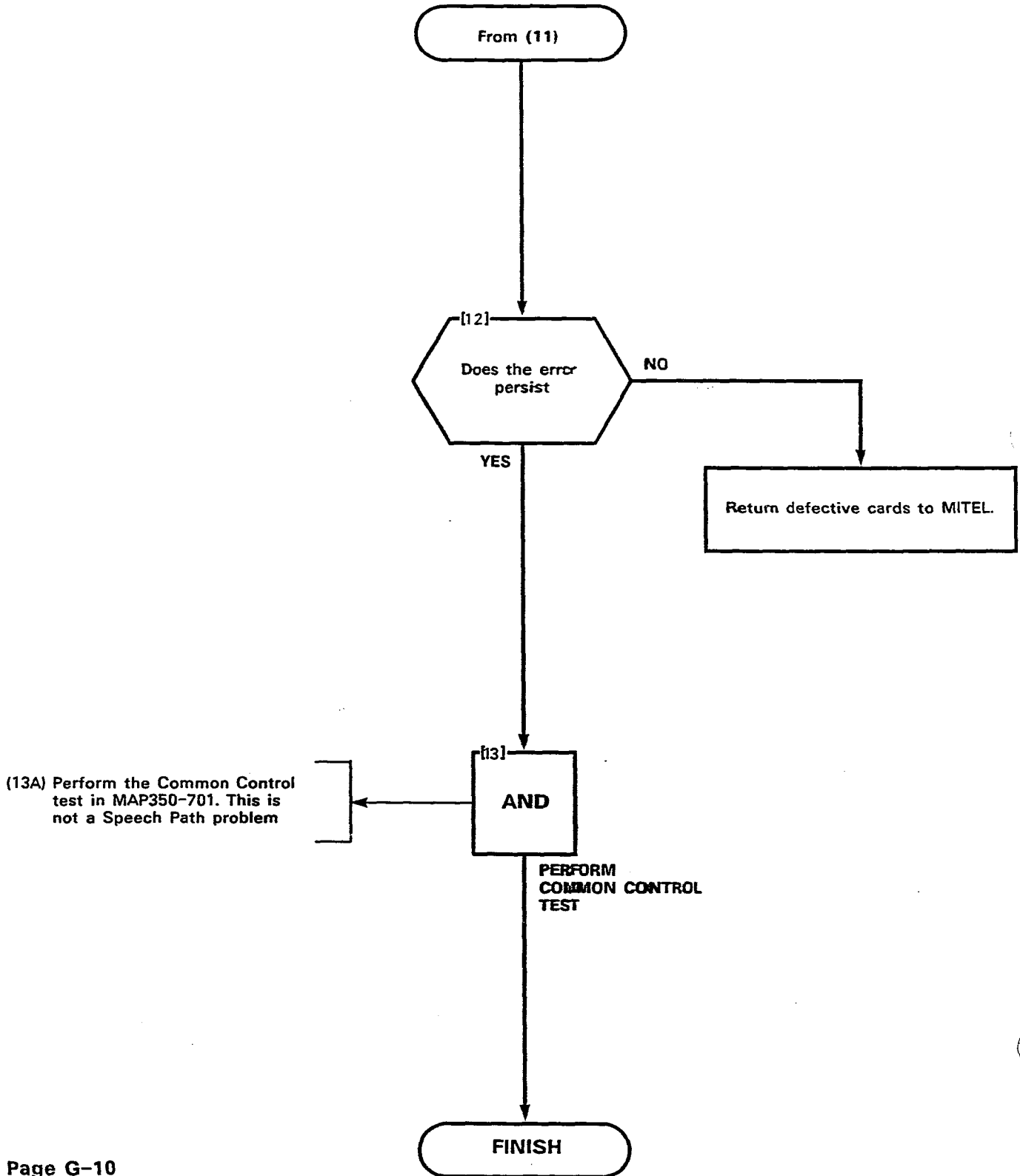


SPEECH PATH TEST
MAP350- 702
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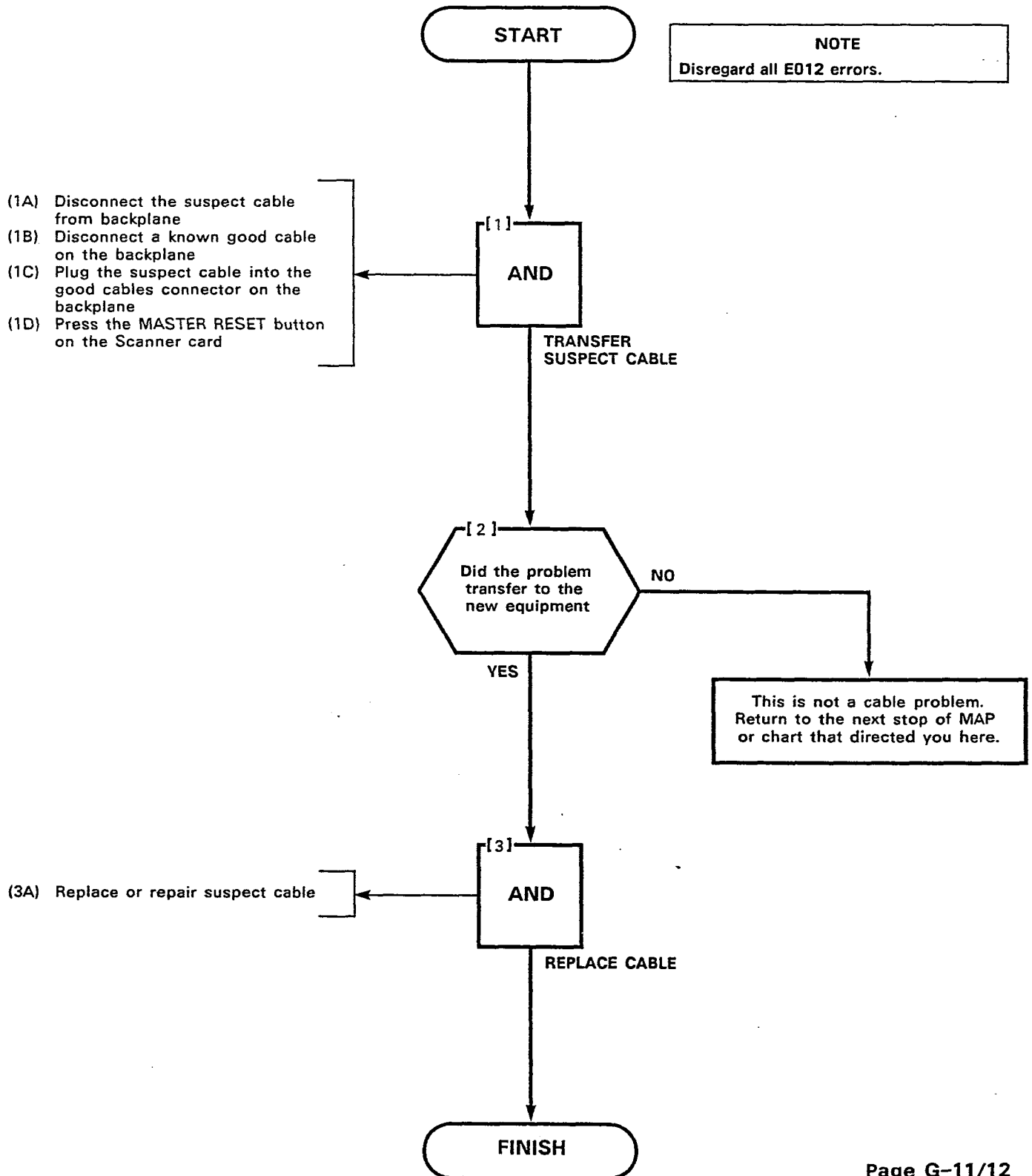
SECTION MITL9105/9110-096-350-NA

SPEECH PATH TEST
MAP350- 702
Issue 3, May 1984
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CABLING TEST
MAP350- 703
Issue 3, May 1984
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NOTE
Disregard all E012 errors.



()

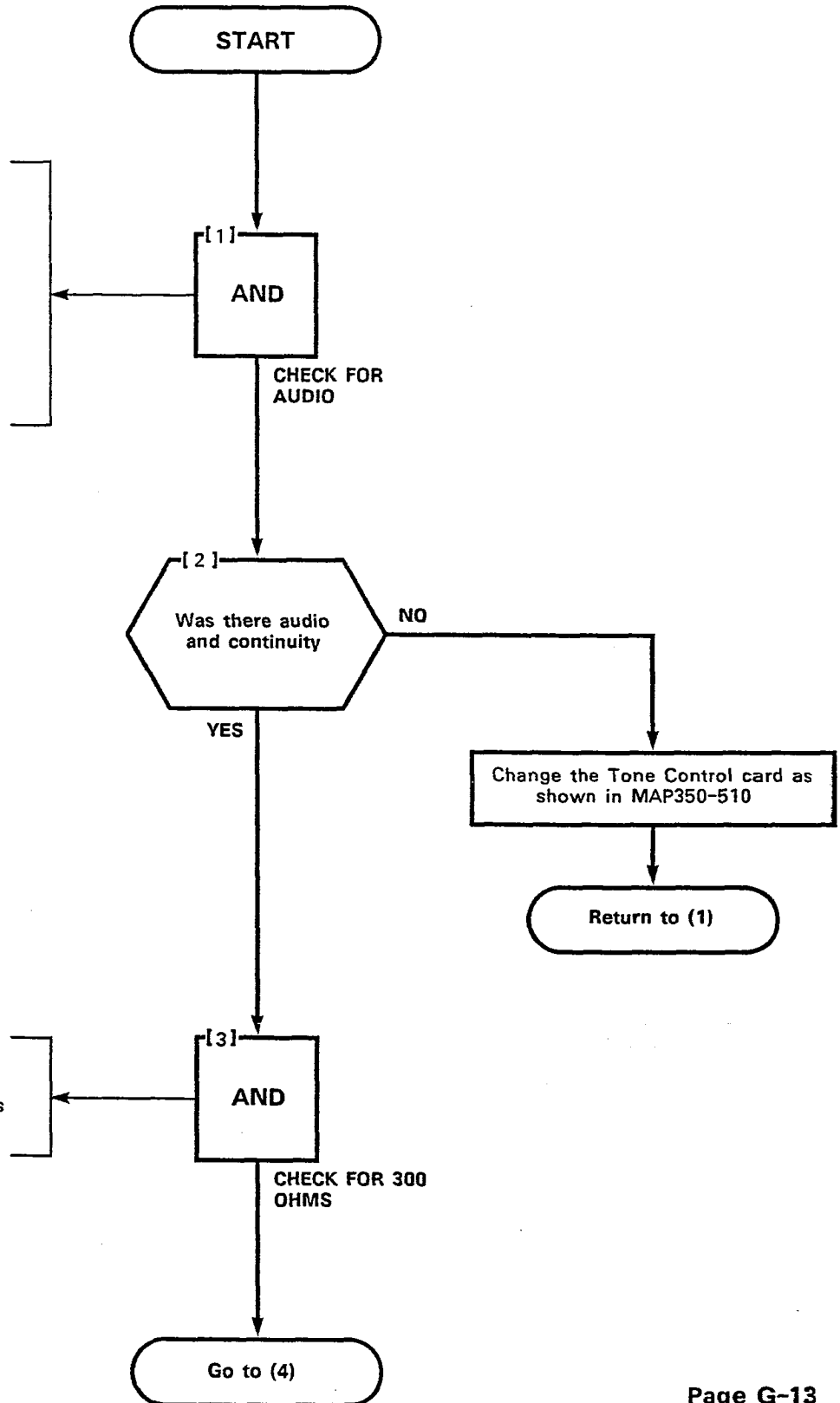
()

()

PAGING TEST
MAP350- 704
Issue 3, May 1984
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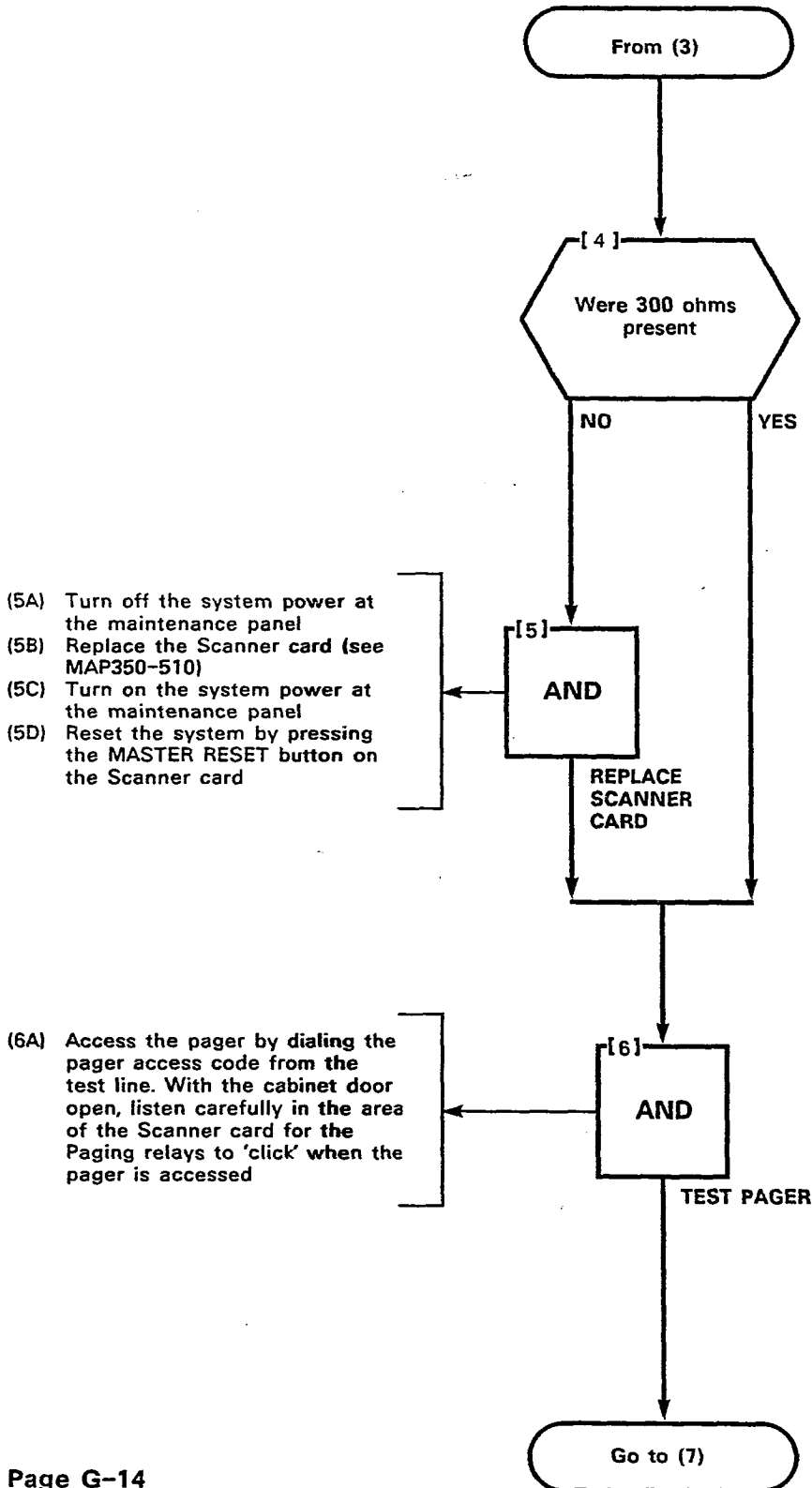
AT THE CROSS-CONNECT FIELD
 (1A) Clip a butt-in on the check points indicated by Figure 704-1 and listen for audio after dialing the access code
 (1B) Check the continuity of the cable by measuring the DC resistance of the circuit. The resistance of the paging transformer is 40 ohms (test point 1, Figure 704-1)

(3A) Measure for 300 ohm DC resistance test point 2 (Figure 704-1), after the paging access code has been dialed



SECTION MITL9105/9110-096-350-NA

PAGING TEST
MAP350- 704
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PAGING TEST
MAP350-704
Issue 3, May 1984
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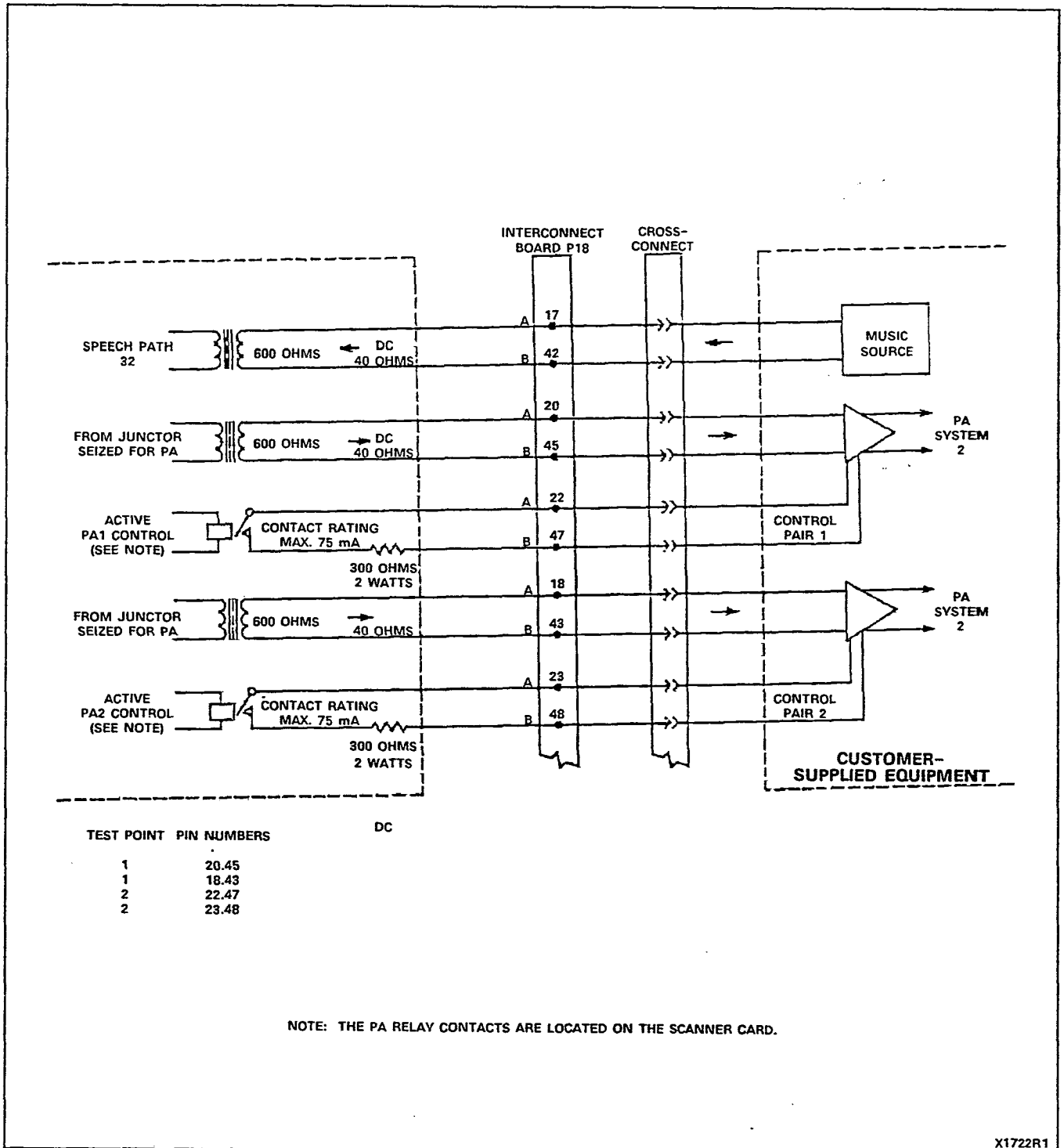
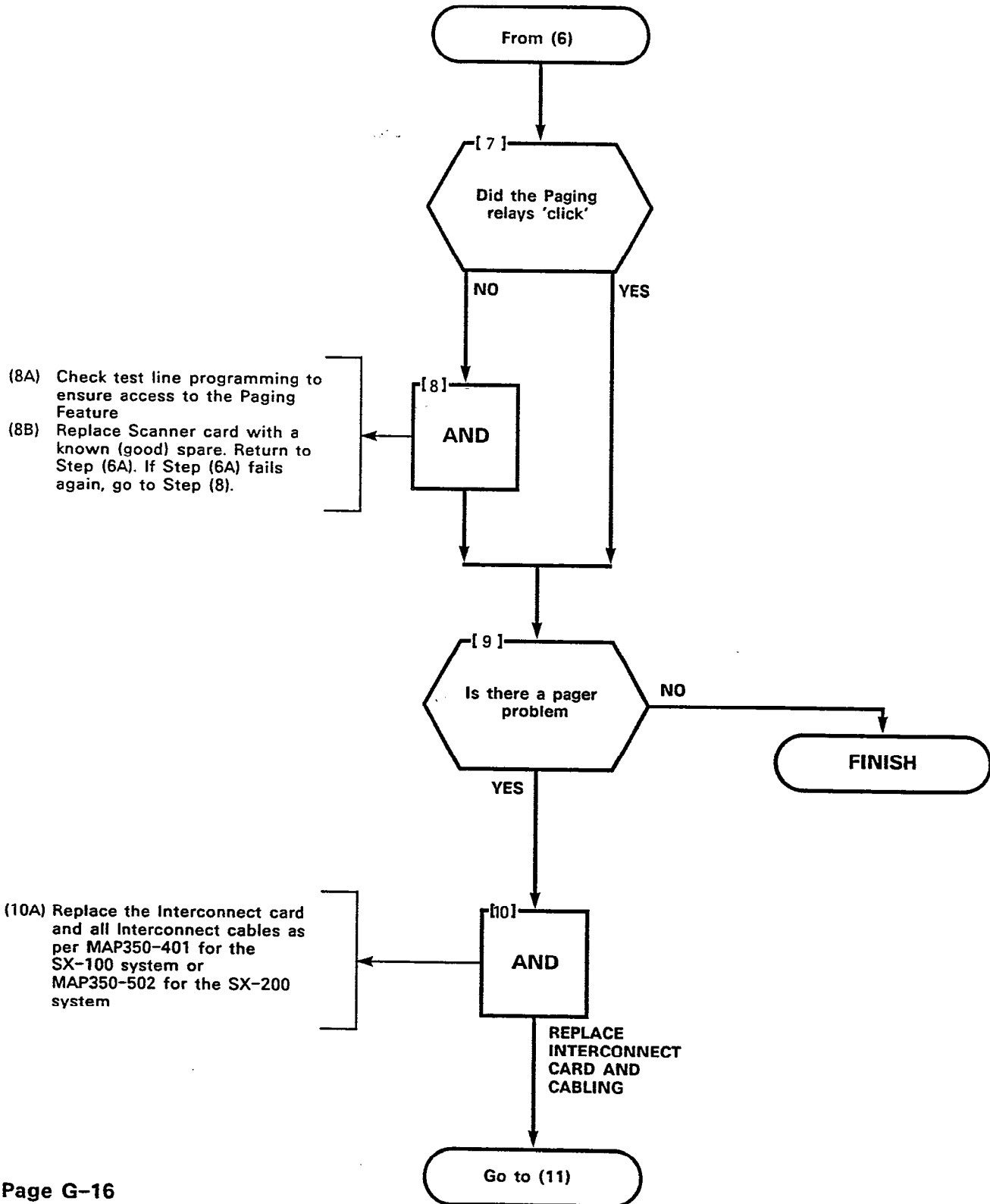


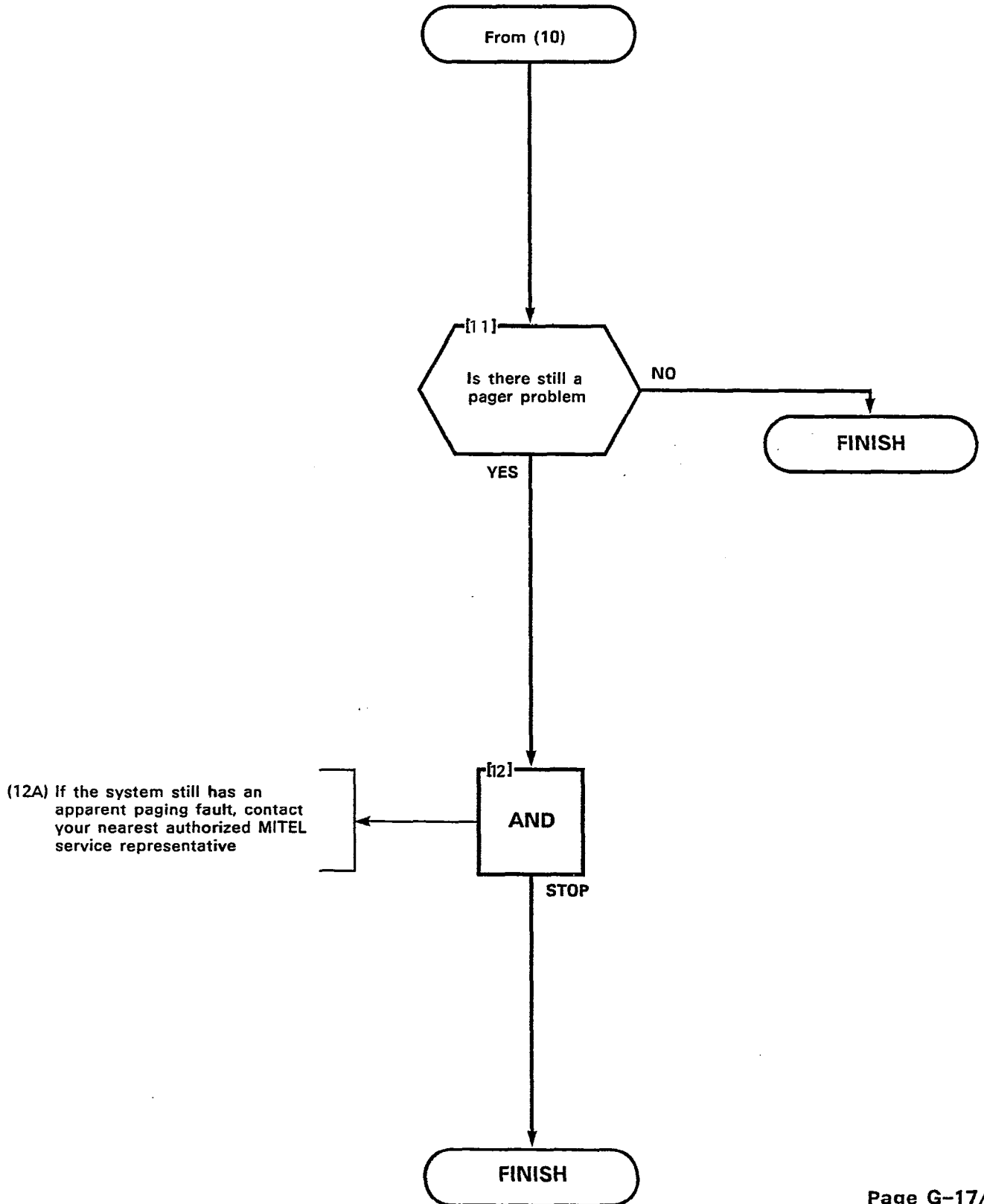
Figure 704-1 Music and PA Connections

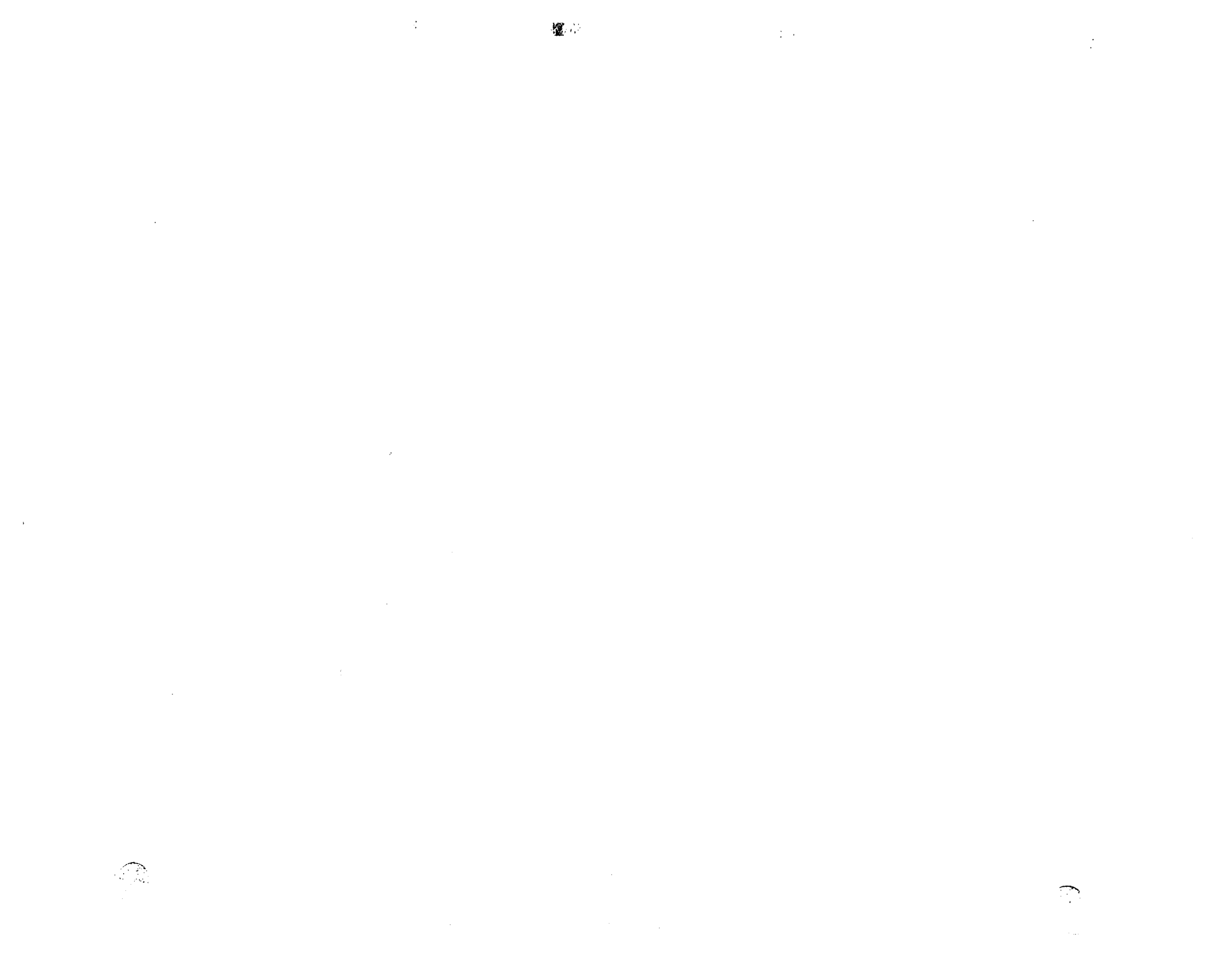
SECTION MITL9105/9110-096-350-NA

PAGING TEST
MAP350- 704
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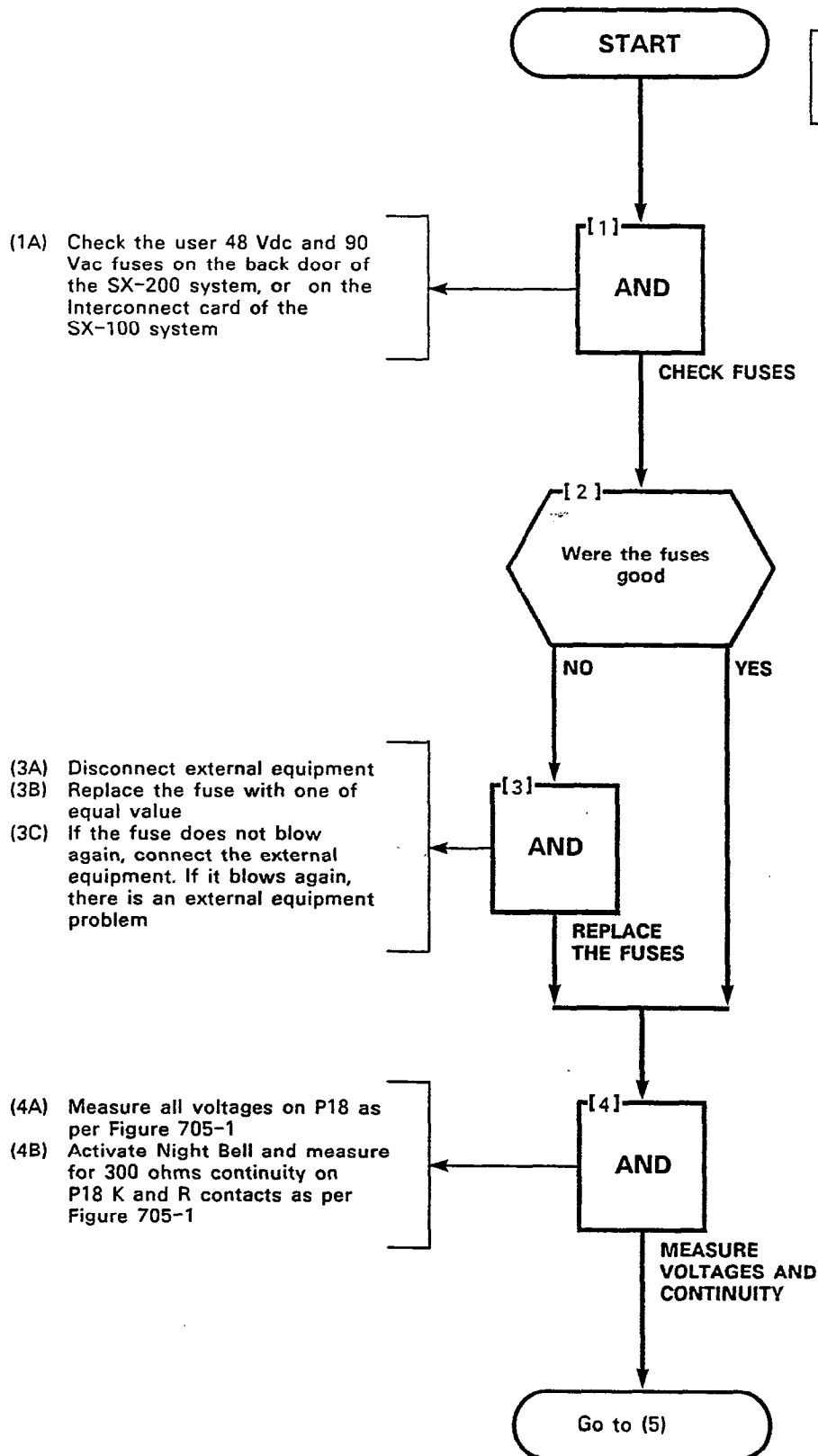
PAGING TEST
MAP350- 704
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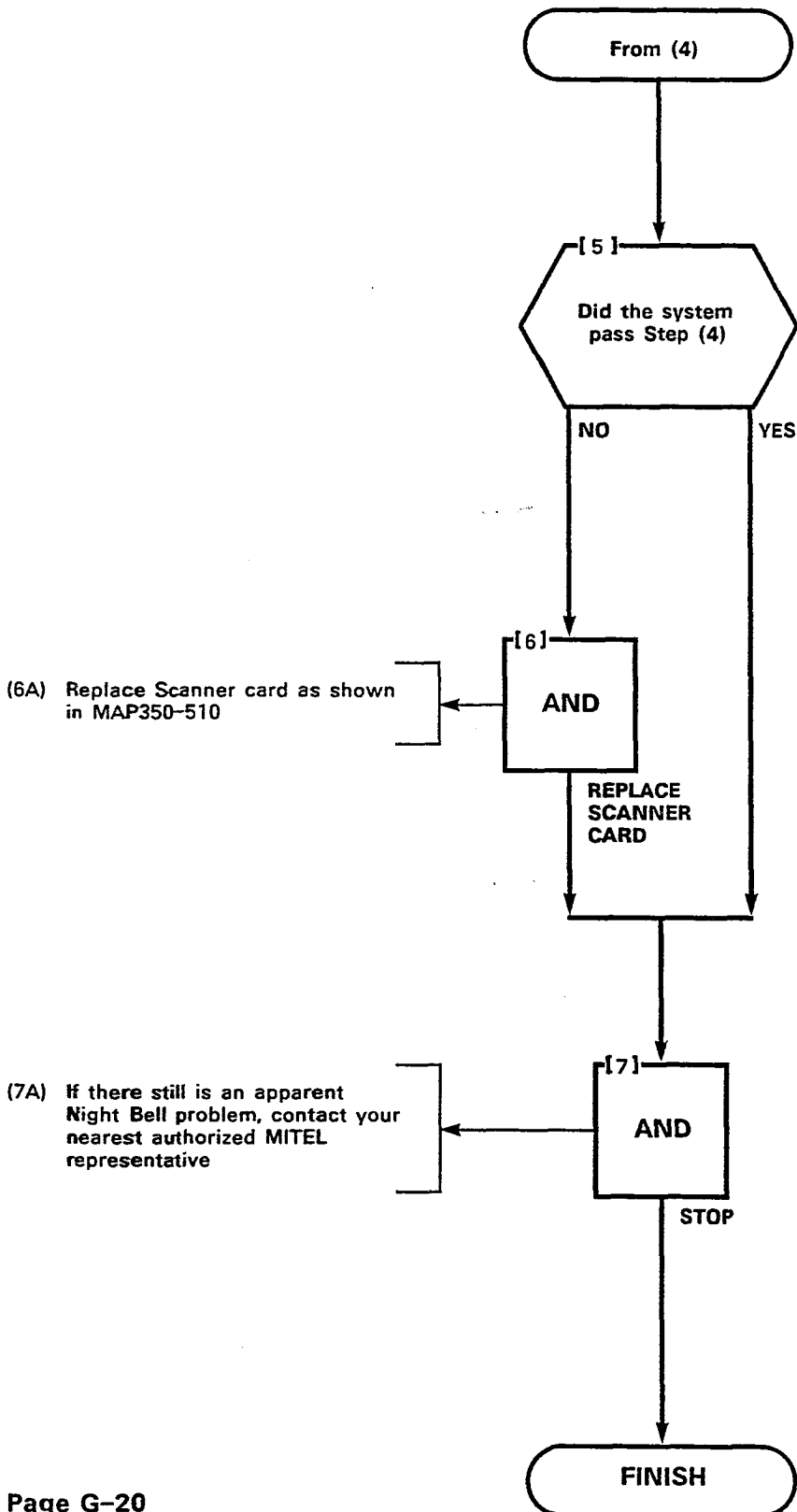
NIGHT BELL TEST
MAP350- 705
Issue 3, May 1984
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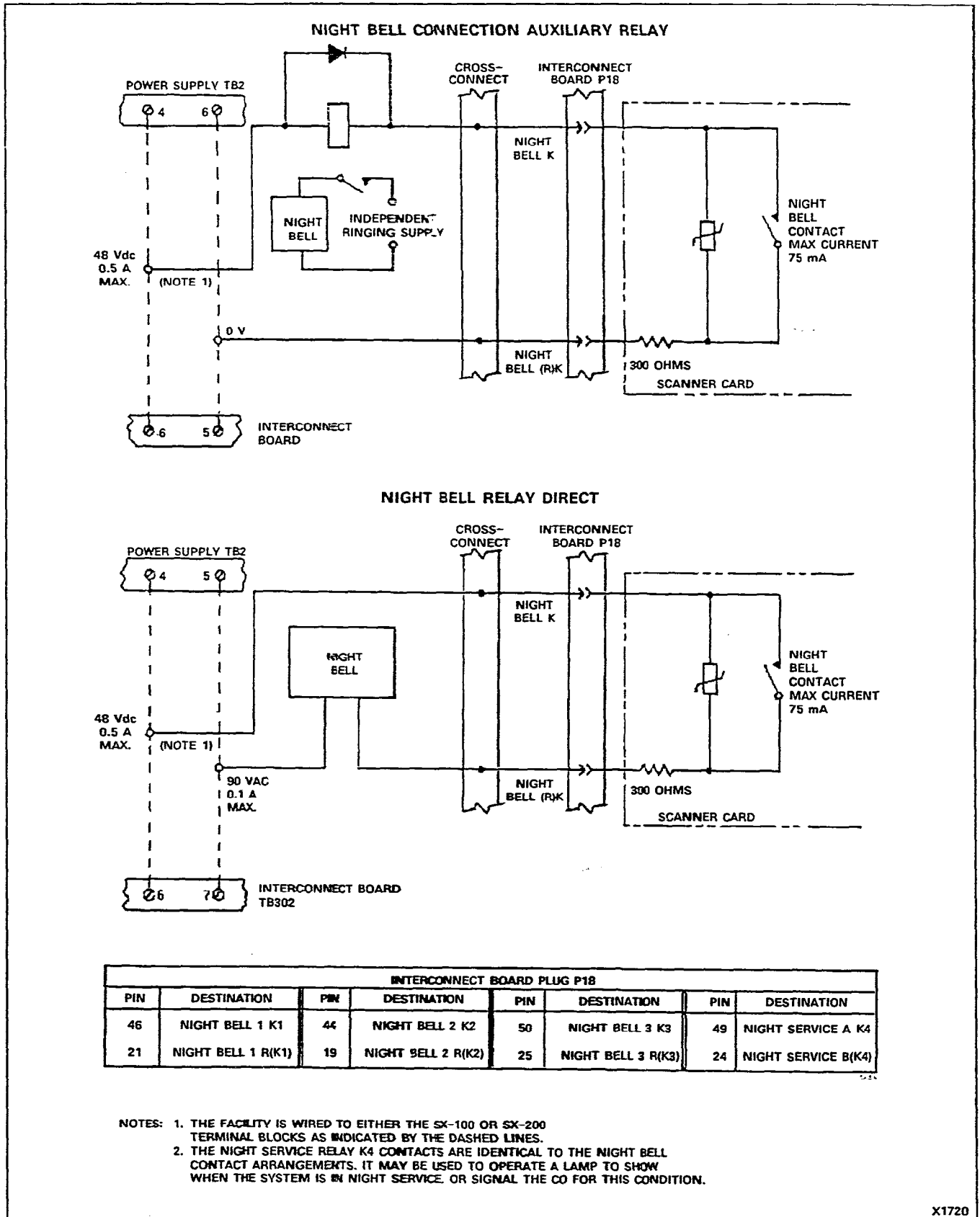
TOOLS REQUIRED
1 AC/DC Voltmeter
1 ohm meter



SECTION MITL9105/9110-096-350-NA

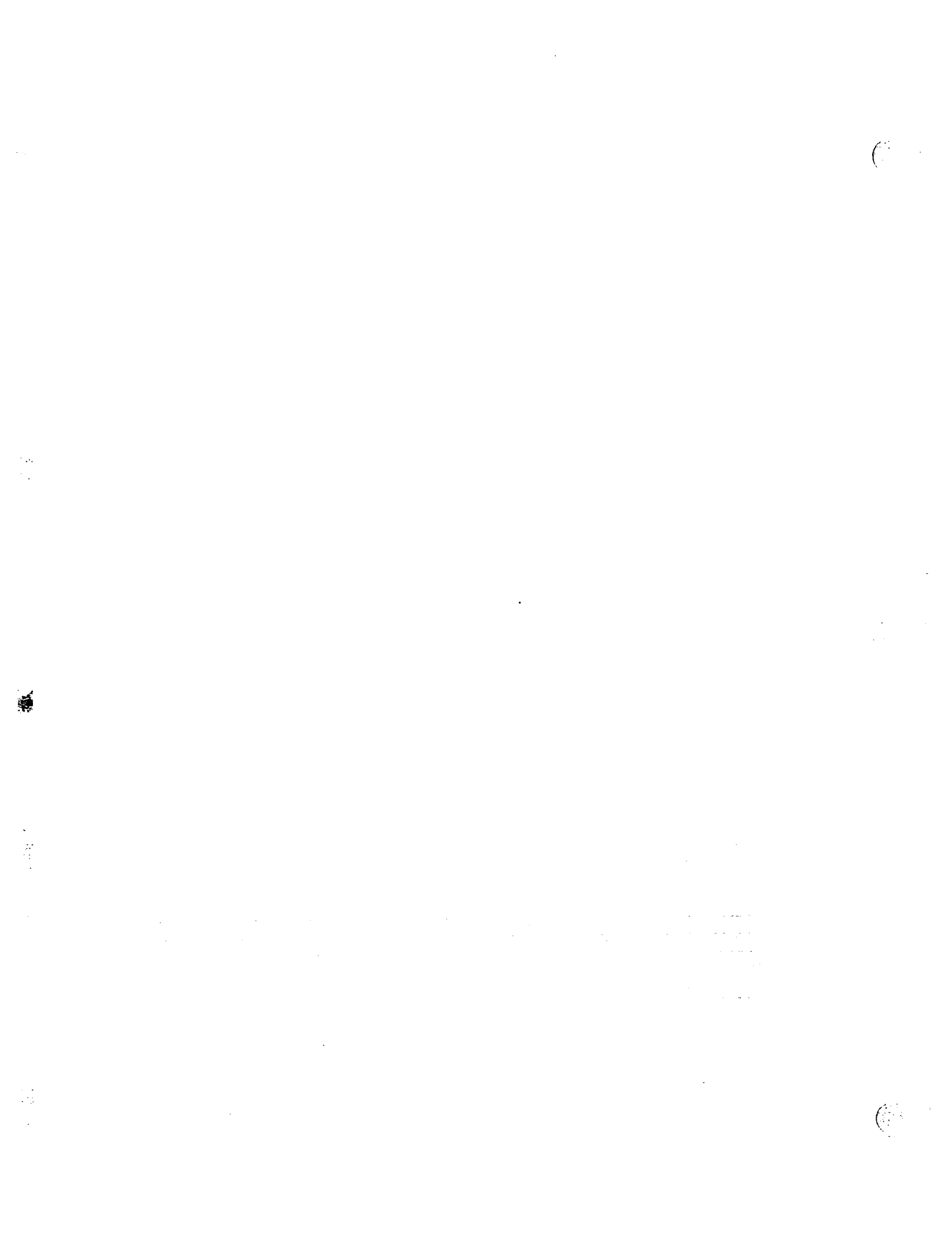
NIGHTBELL TEST
MAP350- 705
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X1720

Figure 705-1 Night Bell Connections



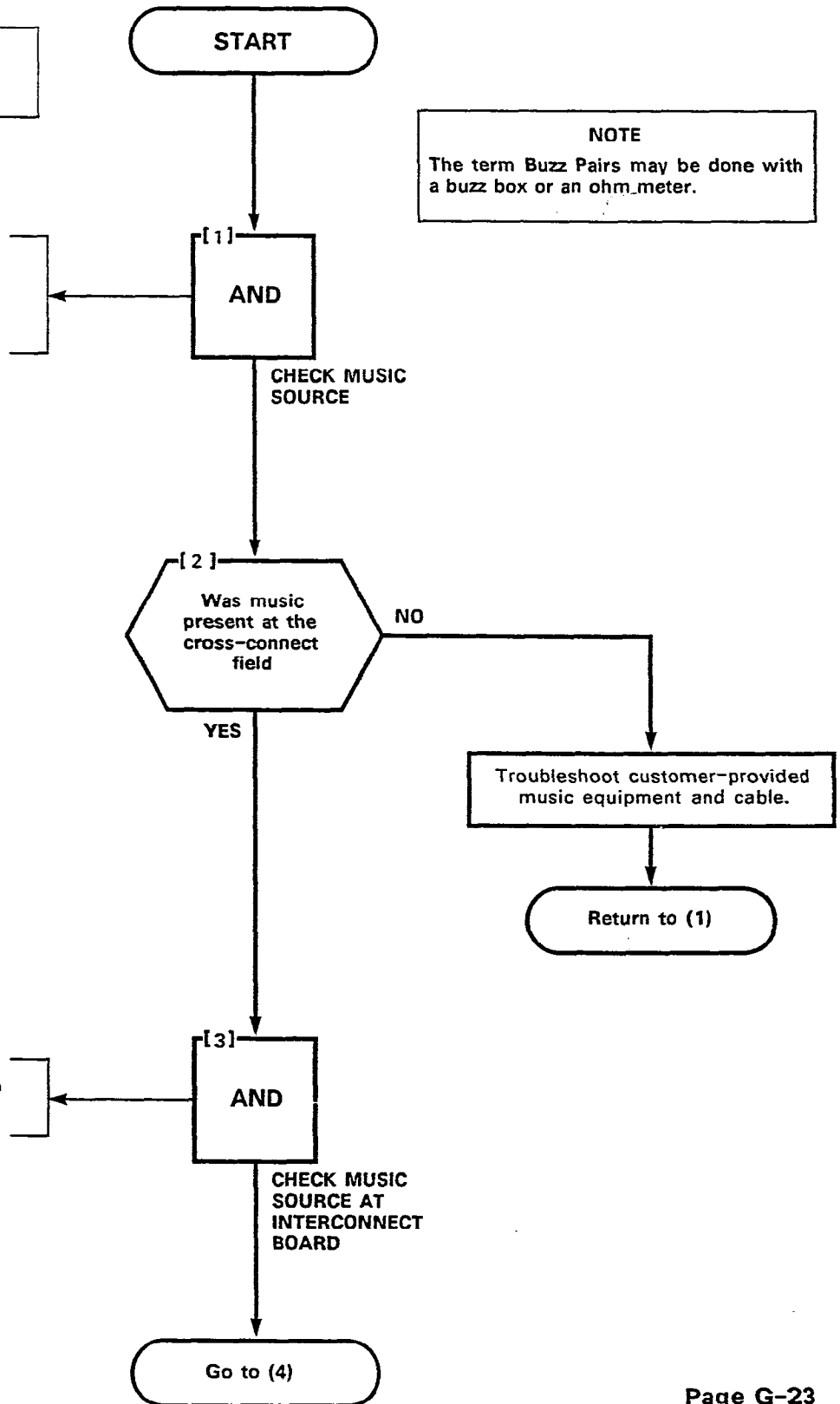
MUSIC-ON-HOLD TEST
MAP350- 706
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TOOLS REQUIRED
 1 AC/DC Voltmeter
 1 ohm meter

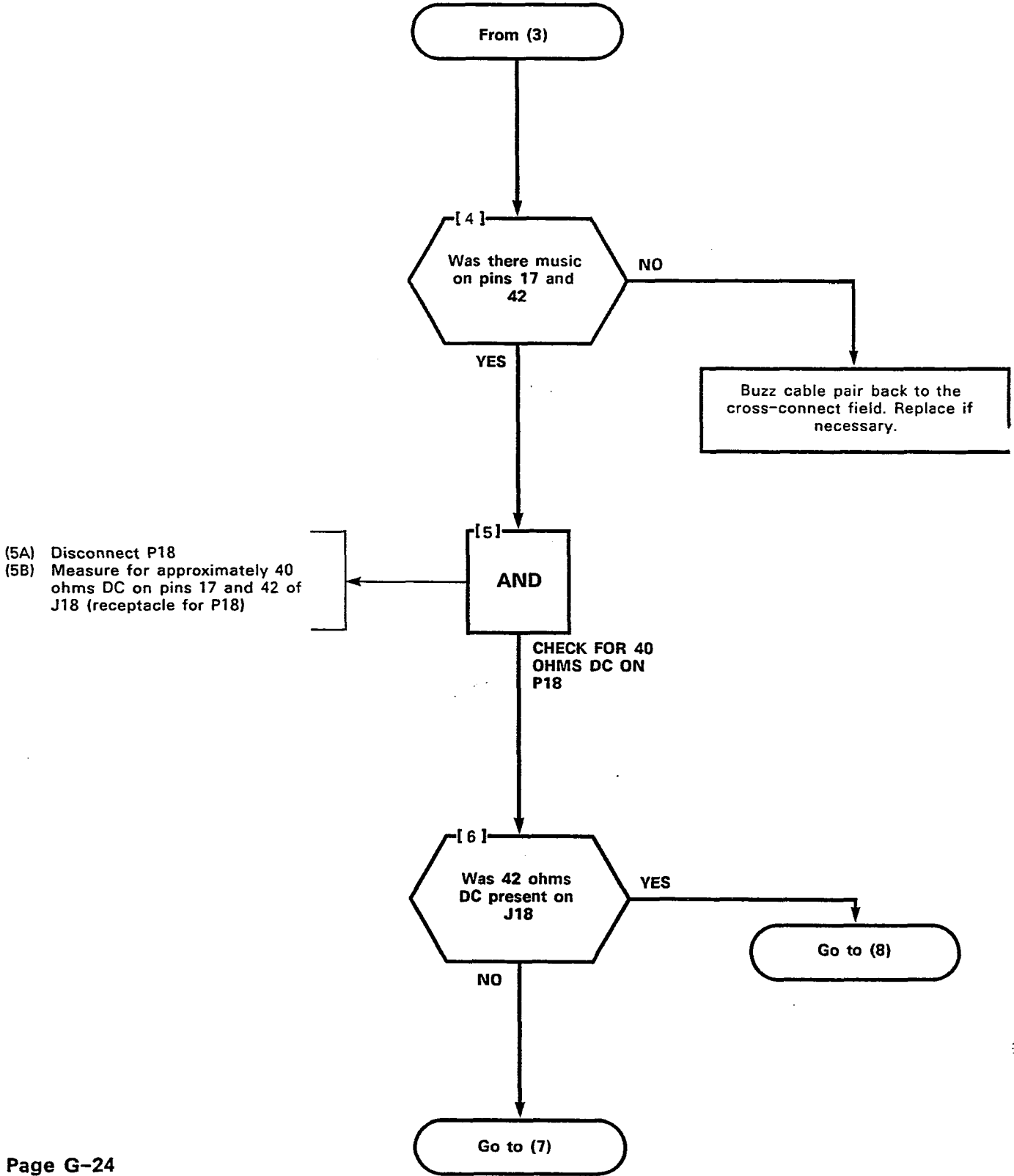
NOTE
 The term Buzz Pairs may be done with a buzz box or an ohm meter.

(1A) Check music source at cross-connect field with a butt-in to ensure music is supplied

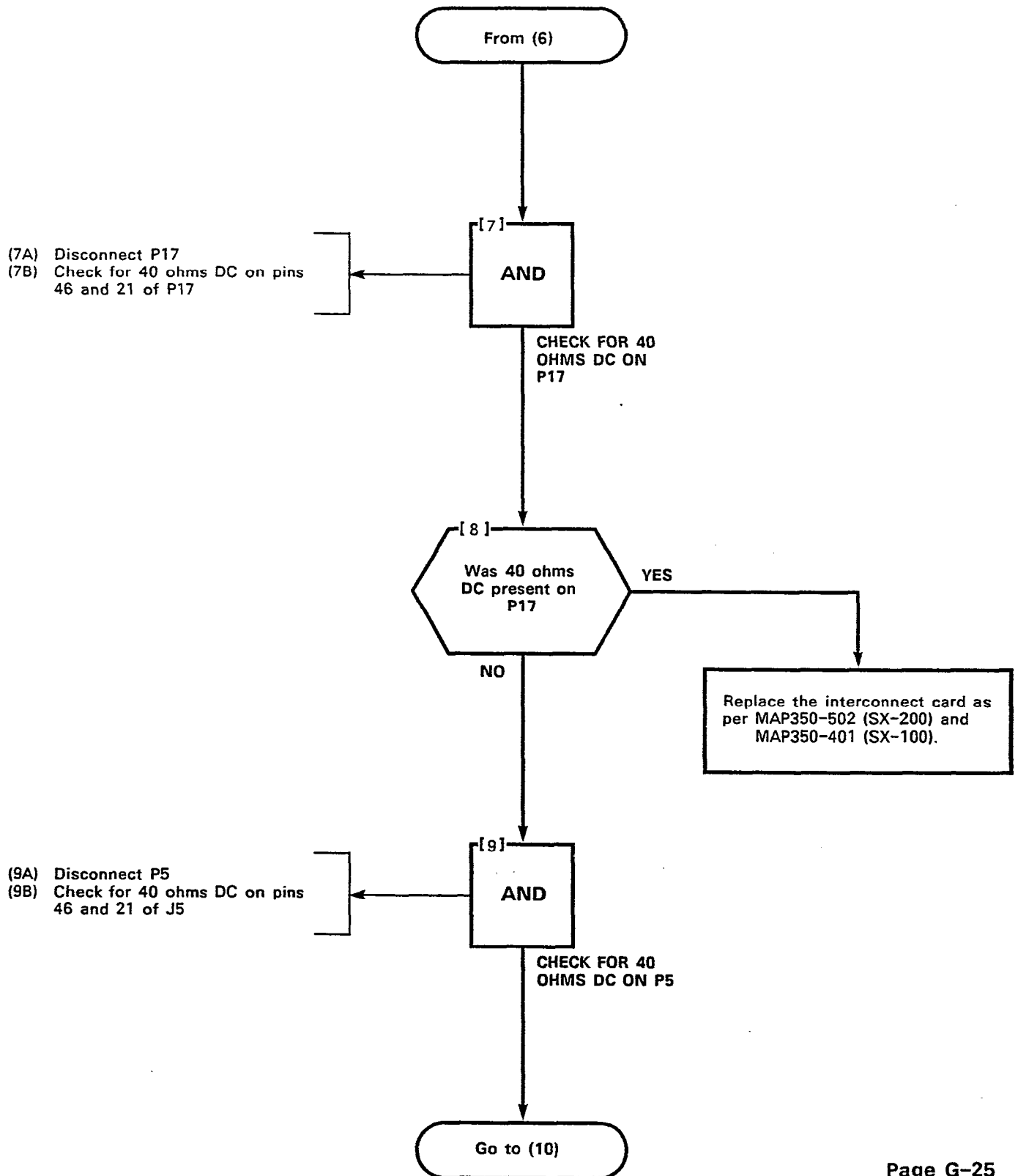
(3A) Check for music with a butt-in on pins 17 and 42 of P18



MUSIC-ON-HOLD TEST
MAP350- 706
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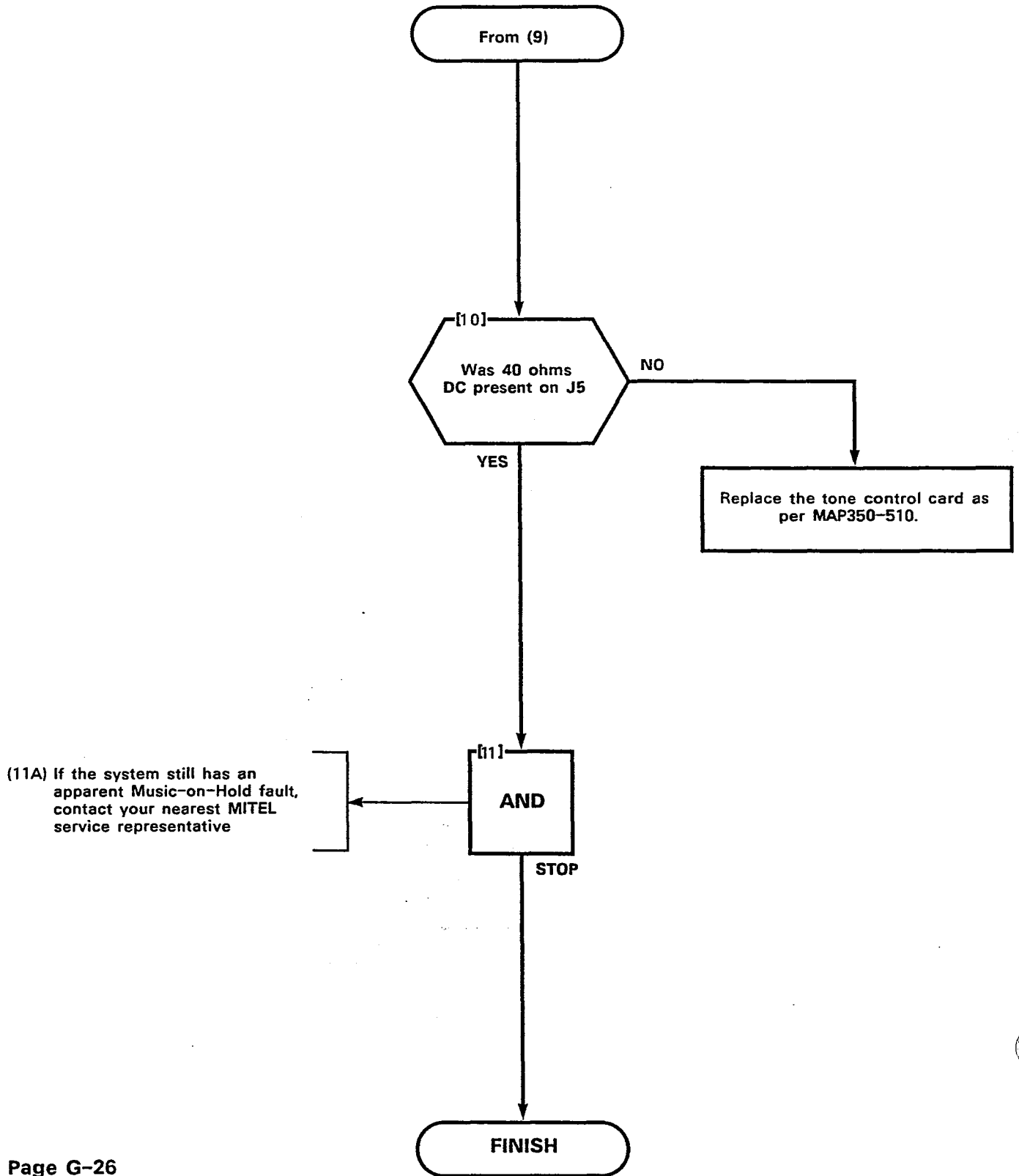


MUSIC-ON-HOLD TEST
MAP350- 706
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MUSIC-ON-HOLD TEST
MAP350- 706
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APPENDIX H

THE SUPERSET 4 SET

GENERAL

Introduction

H1.01 This Appendix describes the general, physical and electrical characteristics of the SUPERSET 4 set.

H1.02 It also includes a brief description of the major features, and the installation and maintenance considerations. Other details are included in the MITEL Practices listed in Table H1-1.

GENERAL DESCRIPTION

H1.03 The SUPERSET 4 set is an advanced microprocessor-controlled telephone set, employing digitally controlled integrated circuitry and liquid crystal displays (LCDs).

H1.04 The SUPERSET 4 set is intended for use with the SX-100/SX-200 Generic ACD system.

H1.05 The SUPERSET 4 set provides:

- (a) User confidence in handling incoming or outgoing calls, through application of visual word prompts automatically displayed on a LCD. These prompts signify all valid call-handling options at any given time.
- (b) User capability to make the fullest use of all system features in the assigned Class of Service, by means of the visual word prompts mentioned above.
- (c) Single button feature activation.
- (d) Multiline appearances (installer-programmed) of up to 15 lines including primary line (set directory number). Multiline appearances may be a mixture of system lines and trunks, and may also be multi-appearances of the same line.
- (e) Speed call entry at each unassigned line (not associated with system speed call feature).
- (f) Visual line or trunk status indication by means of LCD symbols adjacent to each line select button.
- (g) Automatic selection of primary line.

**TABLE H1-1
RELATED MITEL PRACTICES**

Section No.	Title
MITL9105/9110-096-107-NA	SUPERSET 4 Features and Services Description
MITL9105/9110-096-180-NA	Engineering Information
MITL9105/9110-096-200-NA	Shipping, Receiving and Installation Procedures
MITL9105/9110-096-320-NA	Extension Test Procedures

- (h) Pushbutton selection of nonprimary line.
- (i) Automatic ringing line selection (System programmed option).
- (j) Hold function for any call at the set.
- (k) Ease of installation. No power supply required other than that derived from the system and distributed through the line. Line connection by means of modular jack. Only 2-wire local area wiring required. Turn key installation. Only nonessential user programming required.
- (l) User programming of timed reminder, call forward destination number and speed call entry.
- (m) 16-character alphanumeric display for time-of-day and date (provided by system), digit echoing, speed call number, call forward destination number, timed-reminder setting, caller identification and messages from the system.
- (n) Handsfree operation, with switchable microphone.
- (o) Volume controls for ringer and loudspeaker.
- (p) Ringer pitch control.

PHYSICAL DESCRIPTION

General

H1.06 The SUPERSET 4 set body and handset are of plastic construction. The dimensions of the SUPERSET 4 set, with handset on-hook, are given in Figure H1-1.

H1.07 The body and handset are interconnected via a modular detachable handset cord, plugged into the side of the body. Line connection to the set is by means of a captive 2-wire line cord, terminated in a modular plug.

Body

H1.08 The body of the SUPERSET 4 set comprises two parts - a base assembly and a cover assembly (see Figure H1-2).

Base Assembly

H1.09 The base assembly contains a microphone (for handsfree operation), the switchhook and a modular jack for the handset cord. The microphone is mounted in a position permitting it to receive sound passing through an aperture in the front of the base assembly.

H1.10 A screwdriver slotted control for adjusting ringer pitch is user-accessible underneath the base assembly.

Cover Assembly

H1.11 The cover assembly houses a volume control assembly, a speaker assembly (for handsfree operation), a keypad module, and a line selection/repertory dial module.

Volume Control Assembly

H1.12 Two volume controls, one each for speaker and ringer, are mounted in the upper left-hand corner of the cover assembly. The controls are edge-mounted 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.

Speaker Assembly

H1.13 A loudspeaker is mounted under a grille that occupies space beneath the handset.

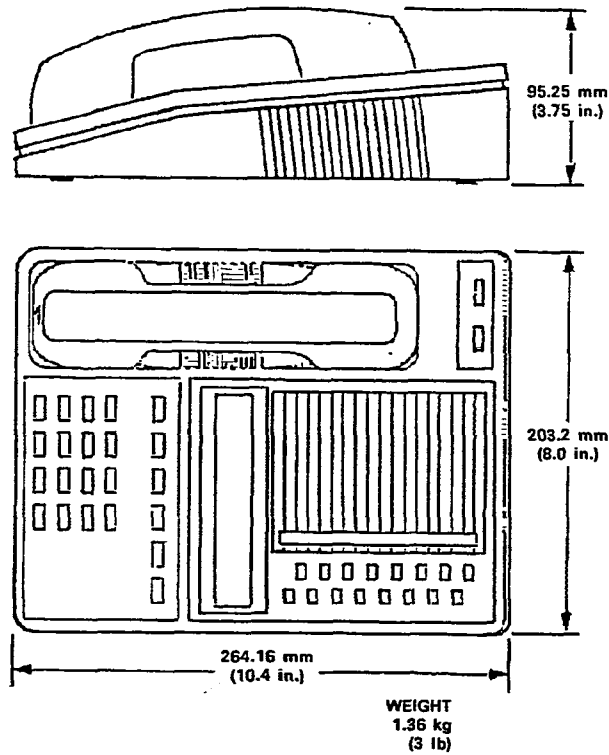
Keypad Module

H1.14 The keypad module contains a standard 12-button keypad, six feature buttons and four supplementary feature buttons.

Line Selection/Repertory Dial Module

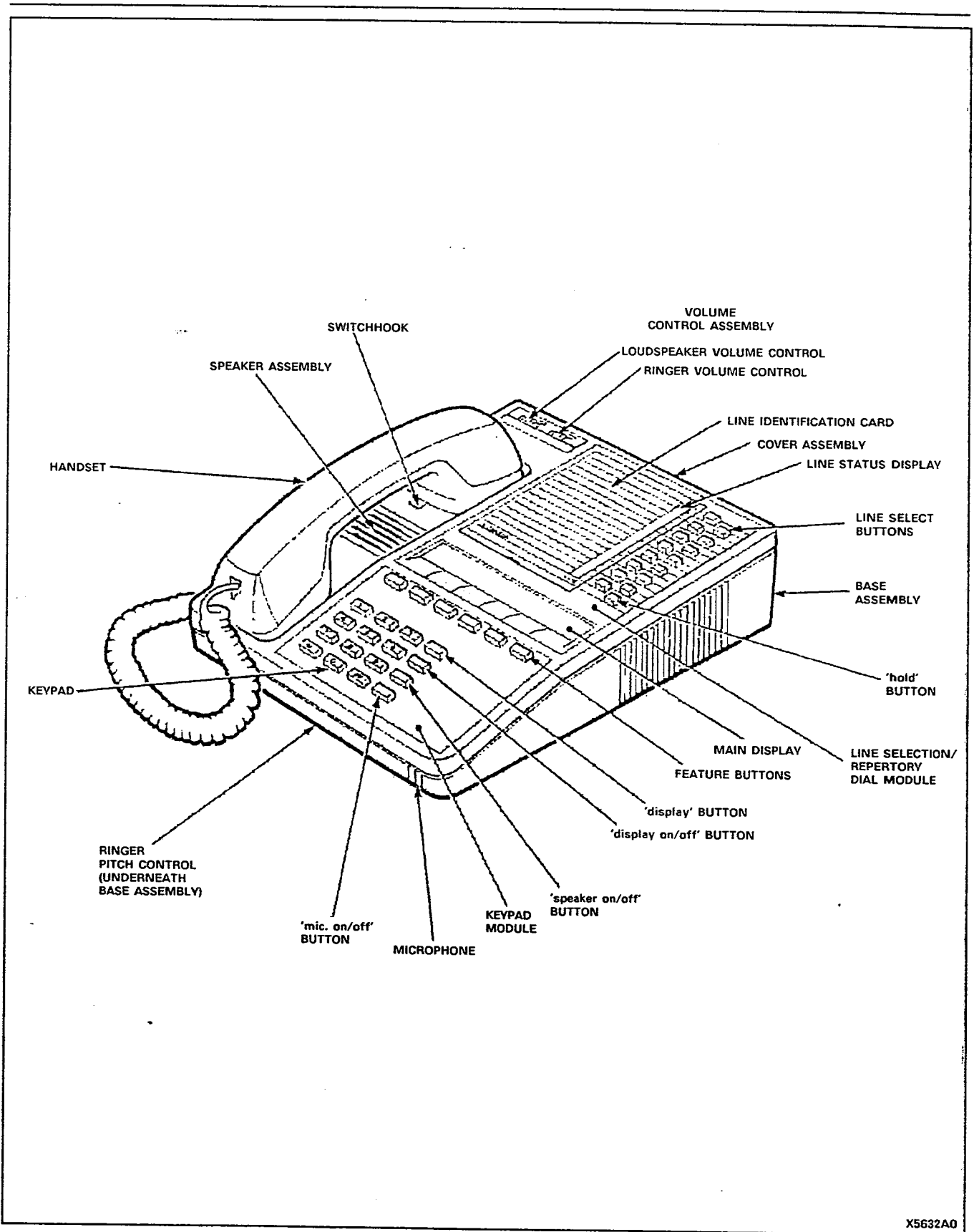
H1.15 The line selection/repertory dial module contains 15 line select buttons, a hold button, a LCD repertory display and a LCD feature display.

H1.16 Associated with the buttons and the repertory display is a line identification card. This card identifies the primary line (extension) and hold buttons and provides space for function identification (i.e., line and speed call identities) of the remaining buttons. The card is held in place with a transparent plastic lens that is clipped in position.



X5501A0

Figure H1-1 The SUPERSET 4 Set Dimensions



X5632A0

Figure H1-2 The SUPERSET 4 Set

FUNCTIONAL DESCRIPTION

General

H1.17 For a description of the SUPERSET 4 set, see Section MITL9105/9110-096-100-NA.

INSTALLATION AND MAINTENANCE CONSIDERATIONS

CAUTION: INSTALLERS SHOULD NOT ATTEMPT TO USE A BUTT-IN ON THE SUPERSET 4 LINES, AS NO LINE VERIFICATION CAN BE MADE AND LINE CARD OPERATION MAY BE AFFECTED. A SUPERSET 4 SET CANNOT BE USED AS A POWER FAIL TRANSFER EXTENSION.

Installation

H1.18 Installation of the SUPERSET 4 set is simplified because of the following:

- (a) Handset and line cords are modular-connector-ended.
- (b) Line cord is captive.
- (c) No local power supply is required. Power is provided by the system and distributed through the line.
- (d) Only nonessential user programming is required (i.e., speed call entry, call forward destination, name and timed reminder).
- (e) Installers can use set display feature to identify lines programmed to appear at the set.
- (f) Initialization of the SUPERSET 4 set occurs automatically when power is applied to the set.

H1.19 Installation of a SUPERSET 4 set into a powered-up system consists of:

- Assembly of handset, handset cord and main body of the SUPERSET 4 set.
- Connection of line cord to local modular jack.
- Verifying initialization procedures have been executed. This should take approximately 10 s.
- When procedures are complete, time and date are displayed.
- Identification of customer telephone number and lines appearing at the set.
- Performance of installer loop test procedures. This verifies transmission and reception paths and key and display operation.

Operating Environment

H1.20 Ambient Temperature: 0°C to 50°C (32°F to 122°F).

H1.21 Ambient Humidity: 10 to 90 % RH, noncondensing.

Maintenance

H1.22 No regular or scheduled maintenance is required and no field repairs may be effected. Performance of the installer loop test procedure can be carried out at any time to check out set operation.

H1.23 The installer loop test procedure is performed at the SUPERSET 4 set. After dialing the loop test access code, the installer can confirm correct key operation, liquid-crystal display activation, hook-switch functioning and ringer (speaker) output.



APPENDIX I

THE SUPERSET 3 SET

GENERAL

Introduction

11.01 The SUPERSET 3 set provides the following operational features:

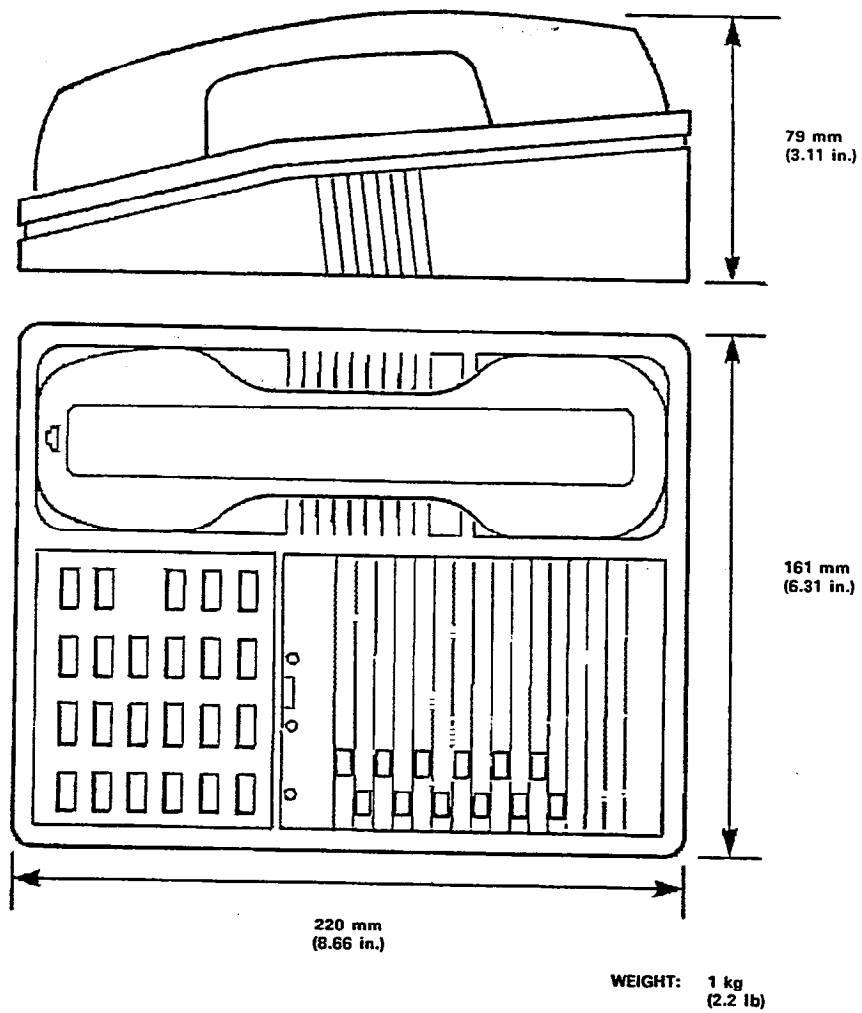
- Single button feature activation.
- Multiline appearances (installer-programmed) of up to three lines including primary line (set directory number). Multiline appearances may be a mixture of lines and trunks, and may also be multi-appearances of same line.
- Speed Call.
- Automatic selection of primary line.
- Pushbutton selection of nonprimary line.
- Automatic ringing line selection (programmed option).
- Hold function for any call at the SUPERSET 3 set.
- User programming of call forward destination number and speed call entry.
- Handsfree operation, with switchable microphone.
- Volume controls for ringer and loudspeaker.
- Ringer pitch control.

11.02 The SUPERSET 3 set provides the following installation features:

- Turn-key installation. Connection to local area wiring by means of a modular jack.
- No additional wiring - power, signaling and voice carried over a single pair. Additional pair required only if Call Announce service is set up.

11.03 In addition, the SUPERSET 3 set provides user confidence in handling incoming or outgoing calls. The user makes the fullest use of all features in the user's assigned Class of Service by various key assignments.

11.04 The SUPERSET 3 body and handset are of plastic construction. The dimensions of the SUPERSET 3 set, with handset on-hook, are given in Figure 11-1. The body and handset are interconnected via a modular detachable handset cord, plugged into the side of the body. Line connection to the set is by means of a modular detachable line cord, plugged into the rear of the set. An optional rear support can be clipped in position beneath the set. This would be used when the set is likely to be placed some distance from the user.



X6492

Figure I1-1 The SUPERSET 3 Set Dimensions

Body

11.05 The body of the SUPERSET 3 set comprises two parts - a base assembly and a cover assembly.

Base Assembly

11.06 The base assembly contains a microphone (for handsfree operation), the switchhook, modular jacks for the handset and line cords and a speaker assembly (for handsfree operation and tone ringer output). The microphone is mounted in a position permitting it to receive sound passing through an aperture in the front of the base assembly. The speaker is mounted between the handset recesses and projects sound upwards through a grill beneath the handset. A screw-driver slotted control for adjusting ringer pitch is user-accessible underneath the base assembly.

Cover Assembly

11.07 The cover assembly houses a volume control assembly, a keypad module and a line selection/repertory dial module.

Volume Control Assembly

11.08 The volume control for the speaker and ringer, is mounted on the left-hand side of the cover assembly. There is also a paper for the installation telephone number, which is held in place by a plastic lens that is clipped in position.

Keypad Module

11.09 The keypad module contains a standard 12-button keypad, seven feature buttons and three supplementary line select buttons.

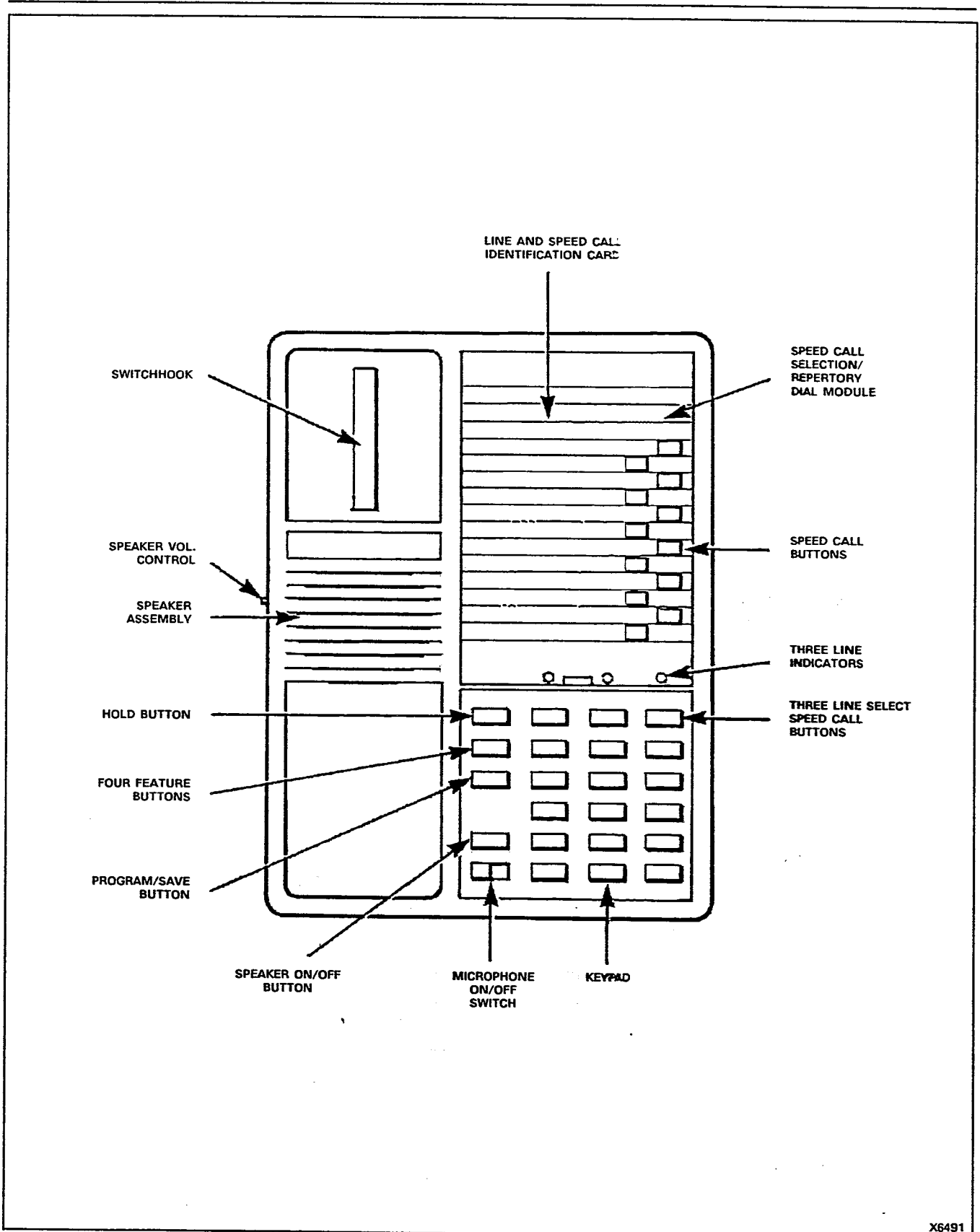
Line Selection/Repertory Dial Module

11.10 The line selection/repertory dial module contains three line select buttons and LED line status display. In addition there are 12 Speed Call keys.

11.11 Associated with the keys and the line status display is a line identification card. The card identifies the primary line (extension) and hold buttons and provides space for function identification (i.e., line and speed call identities) of the remaining buttons. The card is held in place with a transparent plastic lens that is clipped in position.

Functional Description

11.12 The SUPERSET 3 set face layout is shown in Figure 11-2: The following text describes the function of each button and display. All buttons are noninterlocking.



X6491

Figure I1-2 The SUPERSET 3 Set

Line Select/Speed Call Buttons

11.13 There are three line select keys which can be configured (at the time of programming) to select preassigned lines, in order to receive or originate calls. In addition there are 12 Speed Call keys.

Hold Button

11.14 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. The call may be retrieved by pressing the HOLD key.

Feature Buttons

11.15 There are six feature buttons. Each button is associated with a specific feature. The user selects the feature, or action, by pressing the appropriate feature button.

Supplementary Feature Buttons

11.16 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.

11.17 Mic on/off. This switch is used to switch the microphone off during handsfree operation, in order to either prevent transmission of local sound or improve reception when the set is installed in a noisy environment.

11.18 SWAP. The SWAP key allows the user to effect a Broker's Call between two calls.

11.19 TRANS/CONF. This key allows the user to put a call on Hold, dial a new number and conference the call or transfer the Call on Hold to the new number.

11.20 REDIAL. This key when pressed automatically redials the last manually dial trunk call.

11.21 CANCEL. This key cancels any dial action performed at the SUPERSET 3 set.

11.22 PROGRAM/SAVE. This key allows the user to program and save Speed Call dial numbers at specified speed dial key locations.

