SX-100™
SX-200™

SUPERSWITCH™

VOLUME IV
(GENERIC 217)

MITEL

PN 9110-096-002-NA

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 FFC RULES, WHICH ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST SUCH INTERFACE WHEN OPERATED IN COMMERCIAL ENVIROMENT. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL IS LIKELY TO CAUSE INTERFACE IN WHICH CASE THE USER AT HIS OWN EXPENSE WILL BE REQUIRED TO TAKE WHATEVER MEASURES MAY BE REQUIRED TO CORRECT THE INTERFERENCE.

SX - 100

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SX-100* AND 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 PABX's. The practice is divided into seven parts and eight 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-100/200 PABX power supplies.
- **Part 7. RMATS** – this Part briefly discusses RMATS. For further information see Section MITL9105/9110-098-101-NA.
- **Appendix 1** – MITEL Action Procedures (MAP's).
- **Appendix 2** – provides a series of tables of all system parameters.
- **Appendix 3** – provides installation and cabling information for the SX-100/200 PABX's.
- **Appendix 4** – contains the mechanical information pertaining to the SX-100 in the form of MAP's and tables.
- **Appendix 5** – contains the mechanical information pertaining to the SX-200 in the form of MAP's and tables.
- **Appendix 6** – contains all power checks pertaining to the SX-100/200 in the form of MAP's and tables.

- **Appendix 7 –** details, in the form of MAP's, the procedures required to locate and fix malfunctions in the PABX's.

- **Appendix 8 –** gives a brief description of the SUPERSET 4 including physical characteristics and electrical and environmental specifications.

Reason for Issue

1.02 This Section has been issued to include all Generic 217 information.

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

SUPERSET 4

1.04 For test information on the SUPERSET 4, see Section MITL9174-518-320-NA. For Engineering Information on the SUPERSET 4, see Section MITL9174-518-180-NA.

Basic Troubleshooting Philosophy

1.05 The SX-100/200 PABX's employ 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, MAP's 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 MITL9105/9110-097-200-NA.

2. CIRCUIT CARD AND MAINTENANCE PANEL AIDS

2.01 The SX-100/200 PABX's are 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 Fig. 2-1 illustrates the card locations in the equipment shelf or shelves. A visual display of all cards is shown in Fig. 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 employ a minimum number of cards in the card shelf (Fig. 2-2 and Fig. 2-3(a) and (b)). These cards may be used in either system, minimizing stocking 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 (68b09). There is 160K bytes of PROM and 48K bytes of RAM. Of the 48K bytes of RAM 34K bytes are write-protected and the remaining 14K bytes are not write-protected. All customer memory is protected from power failure by a card-mounted battery pack. The actual Generic information is contained in the PROM and is non-volatile. (See Fig. 2-2.)

2.05 There is a RAM Load button that will enable a RAM data load from a recording device. This card also contains a RAM battery pack with a LED that will be lit to indicate that the pack is seated correctly and is charging. In addition to the RAM battery pack LED, there are four other LED's:

- The top LED, when flashing, indicates that the automatic diagnostics are running. The LED will not flash (the diagnostics do not run) when the system is in Programming Mode, or when less than four speech paths are idle. Under these circumstances the LED may be on or off; its state has no special meaning.

- The second LED, when lit, indicates that the system is in the programmable mode.

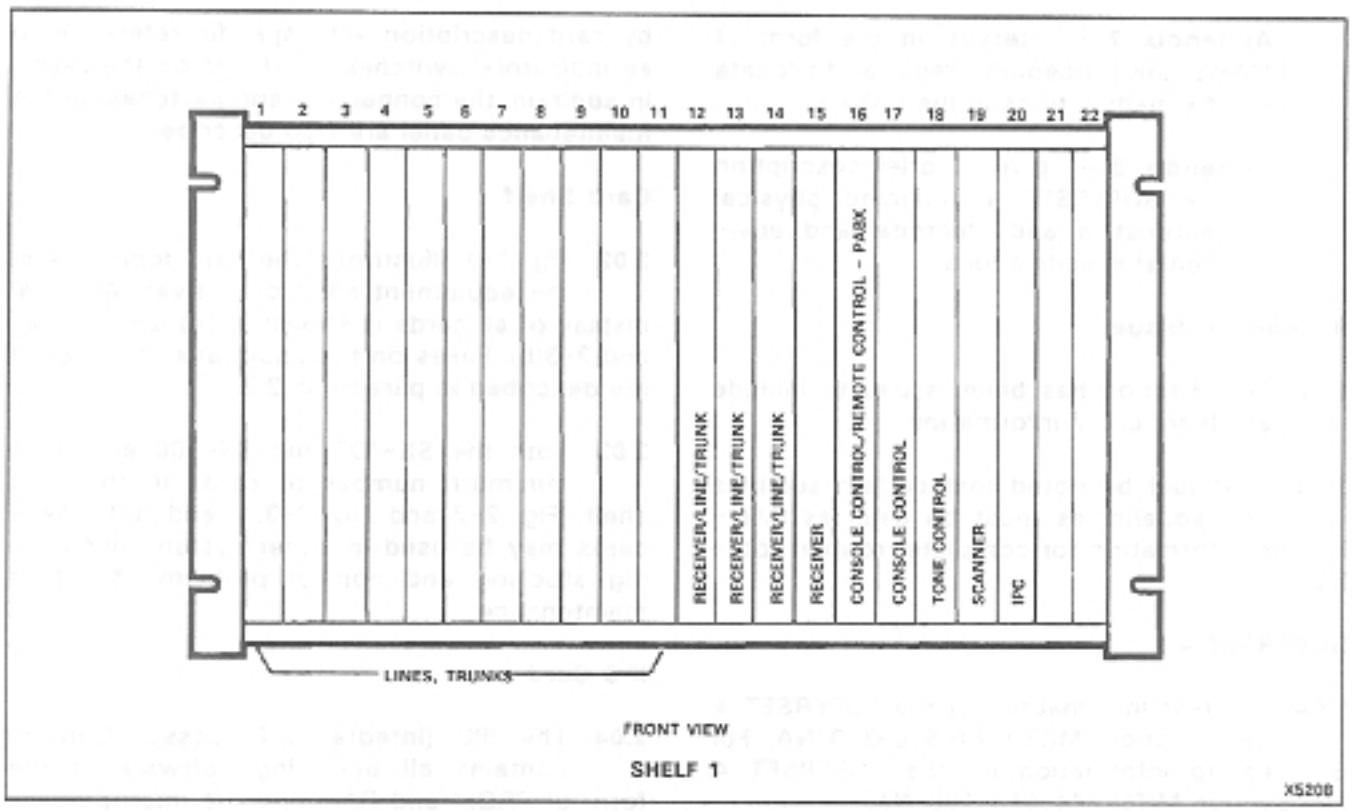


Fig. 2-1 Equipment Shelf

- The third LED, when lit, indicates that the RS232 port is in use.
- The fourth LED, when lit, indicates that a Data Dump or Load is in progress.

Scanner Card

2.06 The Scanner card (Fig. 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 display will show the position number of the faulty card (01-22 for equipment shelf 1, and 31-42 for 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 as the data port is divided into blocks (Table 2-2). The displays used are shown in Table 2-1. This card also contains the night bells and night service relays.

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.
O	Optional - no specific circuit selected.

TABLE 2-2

AA	Beginning of Data Load
01-99	Data Block 1-99
00-30	Data Block 100-130
EE	Checksum Error on Data Load

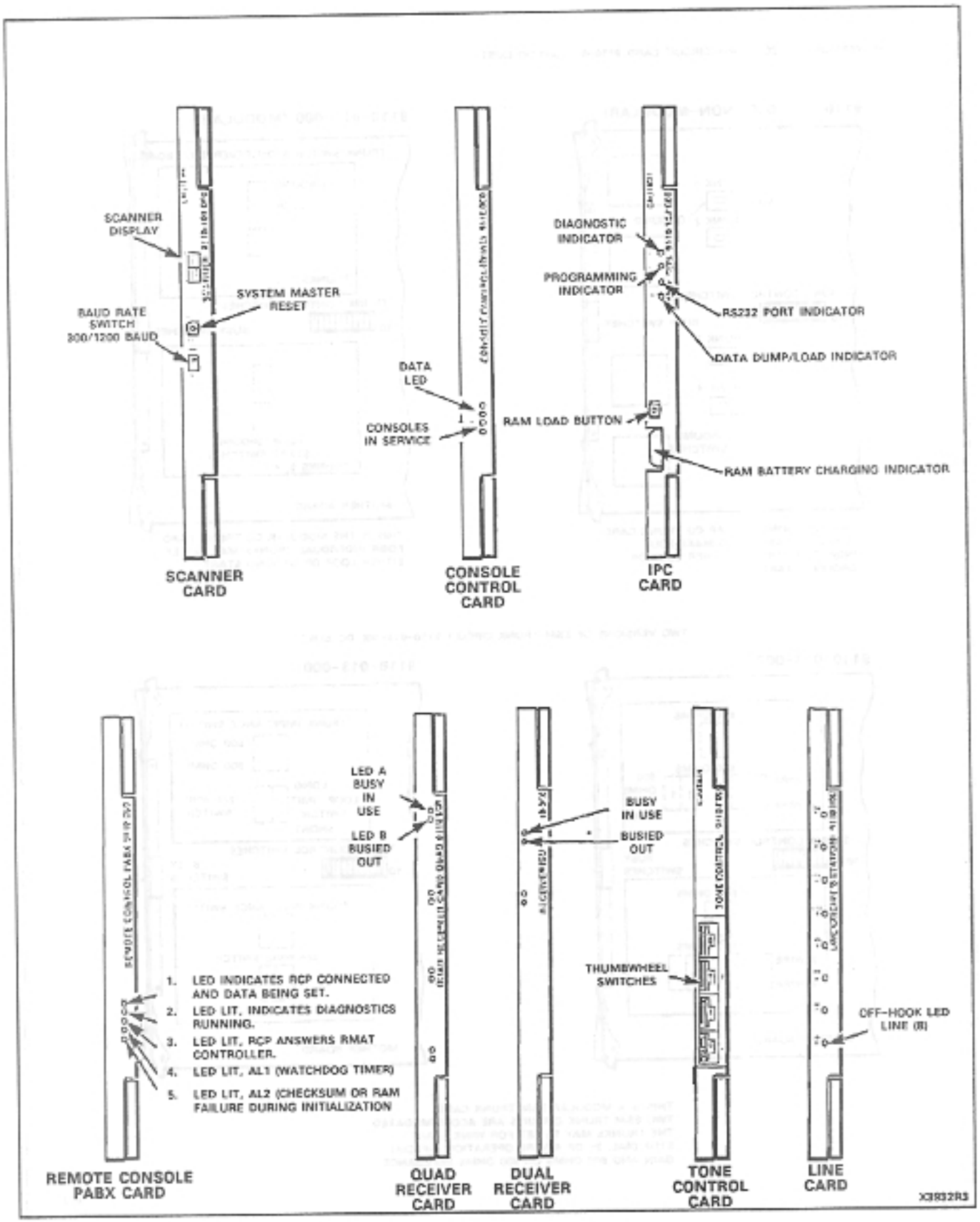


Fig. 2-2 Equipment Cards

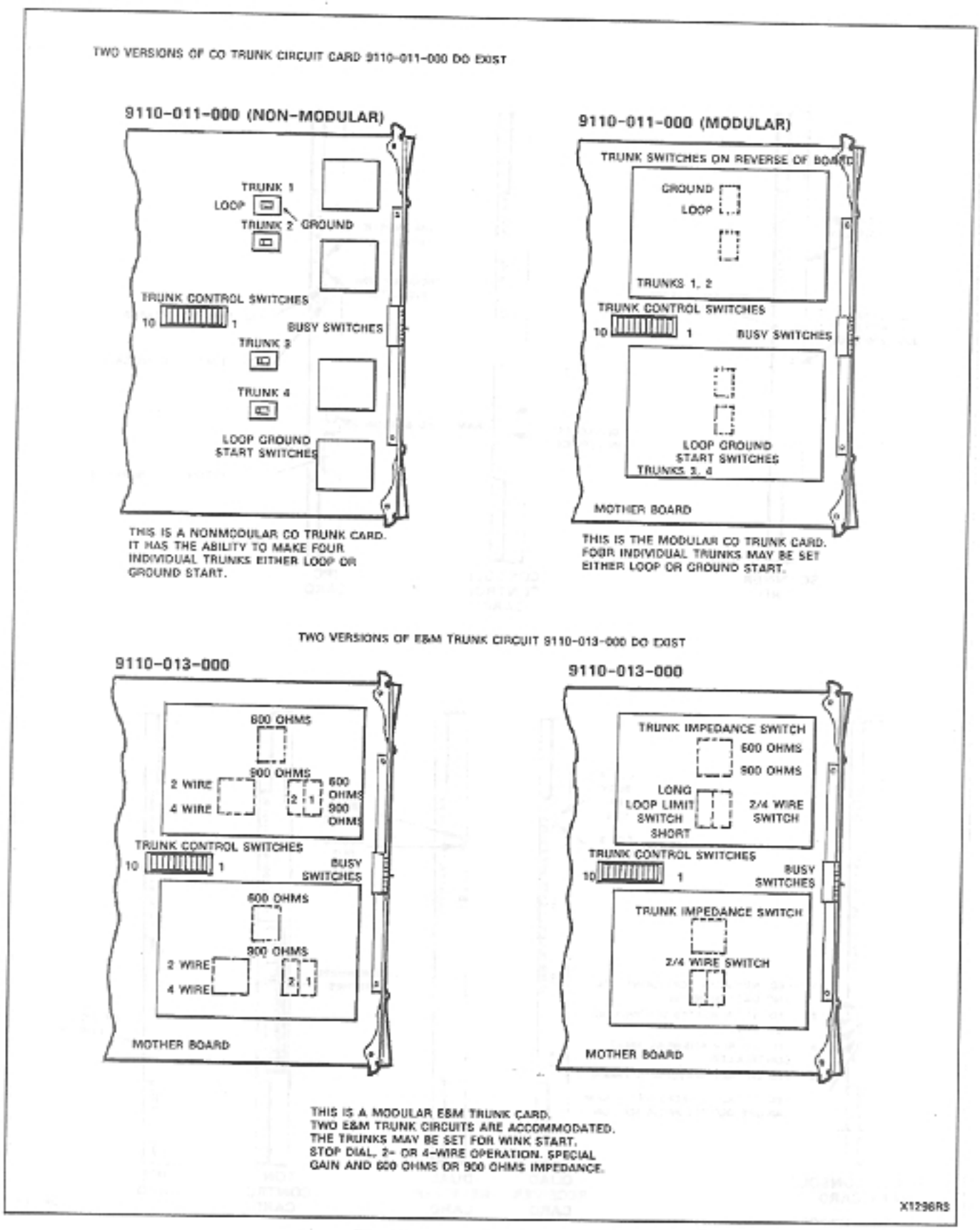


Fig. 2-3(a) Circuit Cards

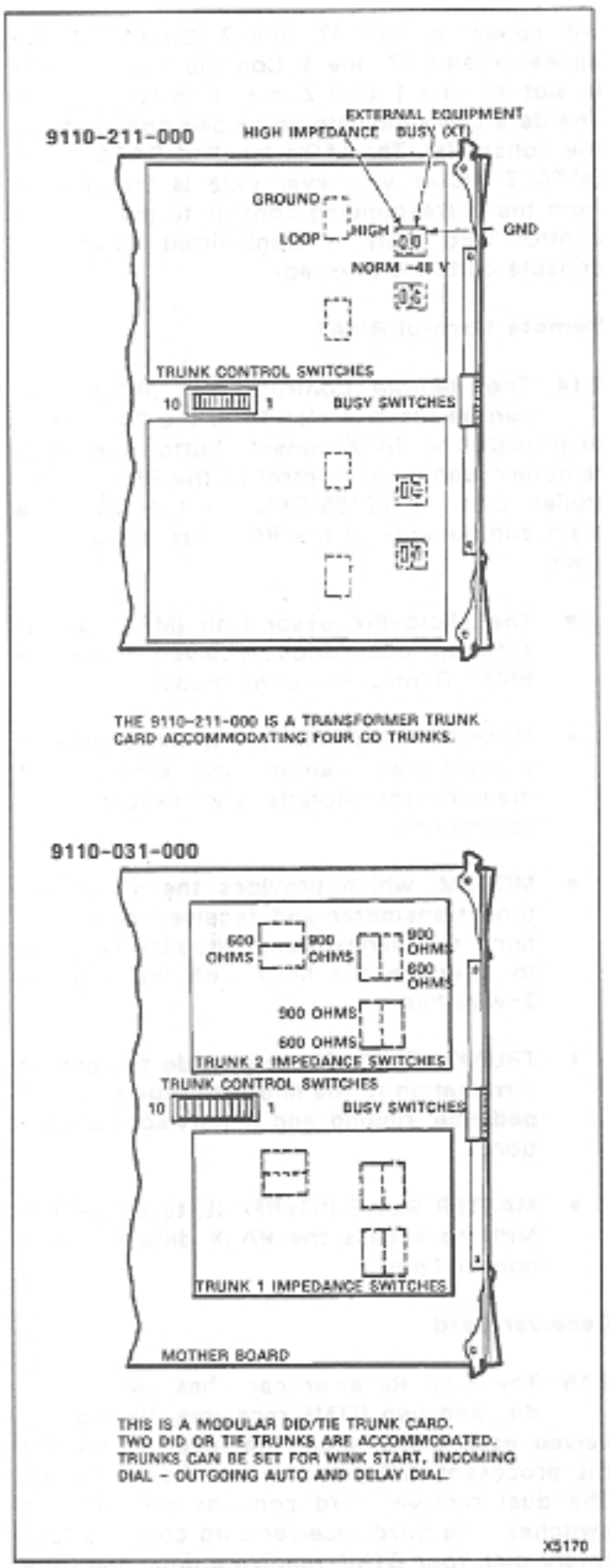


Fig. 2-3(b) Circuit Cards

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 PABX power is first turned on.

2.09 The Baud Rate switch selects the RS232 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 Fig. 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 2-3.

(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 line for

maintenance purposes, the switches should be set to 7780.

(b) **Load Functions:** The Customer Program Dump/Load Function requires the switches to be set to 5623 to initiate a load from an external storage device.

TABLE 2-3
SWITCH SETTINGS

SWITCH SETTINGS	FUNCTION
7770	Enter Maintenance Console into programming mode
7771	Enter Attendant Console 1 into programming mode
7772	Enter Attendant 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 = 0-9)
5623	Load Function

Console Control Card (Basic)

2.12 The console control card provides the interface between the PABX and two consoles. Console control card number 1 (position 17) is allocated to the maintenance console connector and the attendant console number 1 connector. Console control card number 2 (position 16) is allocated to the attendant console number 2 connector. The card provides both voice and data signals to and from each console (see Fig. 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 LED's

2.13 LINE 1 and LINE 2 LED's, 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 LED's indicate voice pair continuity to the console(s). The LED's labelled 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 PABX (RCP) card, can be fitted in slot 16 of the PABX shelf to provide the PABX console button functions remotely, under the control of the RMAT Controller (see 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 PABX 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 LED's or switches. The quad receiver card contains four rotary dial, four DTMF receivers, four dial tone detectors, and four sets (two each) of LED's

labelled 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 (Fig. 2-3; 4 CO Trunks, 2 E&M Tie Trunks, or 2 DID Trunks per card). These circuits provide the interface between the PABX and the Central Office, other PABX's, 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 2-4.

- **Trunk Busy/Idle LED's:** 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
  - Trunk circuit busied - LED FLASHING (by switch on card or from the console).
- **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 2-4 lists the switch settings and describes their effect.

Standard Line Card

2.17 The Line card contains eight separate line circuits. The line 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 Fig. 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 detect circuit in the line circuit. It turns ON when an off-hook condition is detected and will flash when dial pulses are sent.

SUPERSET 4 Line Card

2.18 The SUPERSET 4 requires a SUPERSET 4 line card that is not compatible with standard telephone sets. The card contains eight separate line circuits with eight LED's indicating on/off-hook conditions. The line circuits act as interfaces between the SUPERSET 4's and the system CPU (Central Processor

TABLE 2-4
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 MITL9105/9110-096-200-NA and MITL9105/9110-096-210-NA.

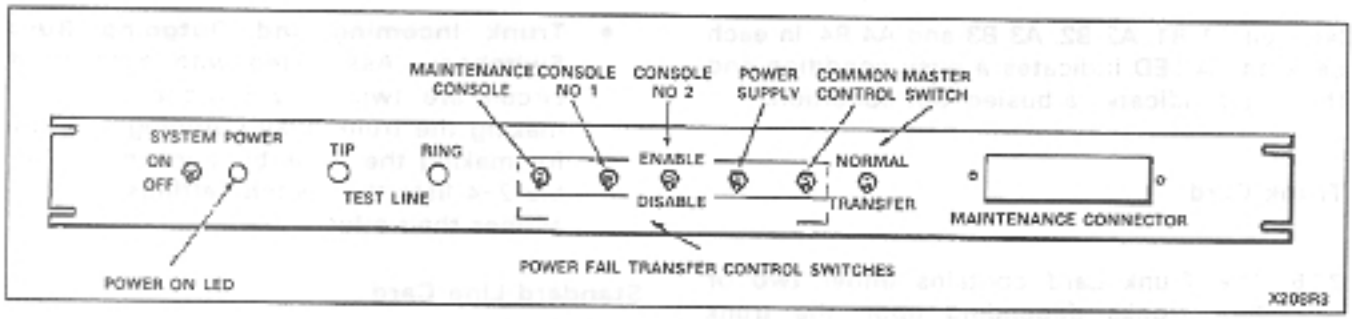


Fig. 2-4 Maintenance Panel

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 the SUPERSET 4 and the system, as all communication is digitally sent. For further information see Section MITL9174-518-180-NA.

Maintenance Panel

2.19 At the top of the equipment cabinet is the maintenance panel (Fig. 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 six Power Fail Transfer Control Switches, a system Power ON/OFF switch and a POWER ON LED.

- **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.

- **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, 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 PABX 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.

- **Test Line Terminals:** The test line TIP and RING terminals may be used in conjunction with a test set (butt-in) and the thumbwheel 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 debusying receivers and speech paths and

TABLE 2-5
EXTERNAL SYSTEM CARDS

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

TABLE 2-6
CONNECTORS P302, J302, J303

PIN NO.	SIGNAL NAMES
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

controlling the printer port. See Part 3 for a full description of the use of the Test Line.

- **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.

Cards External to the Shelf

2.20 There are a number of cards that are external to the equipment shelf (shelves). These cards, and the PABX they are part of, are listed in Table 2-5.

The SX-200 Interconnect Card

2.21 The SX-200 Interconnect Card (Fig. 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 RS232 printer port J302. For a complete description of this port, see MITL9105/9110-096-450-NA and Table 2-6. 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. Thus the Interconnect card does as its name implies, by providing an interconnection between the PABX and external equipment, as shown in Appendix 3. Each component that terminates on the Interconnect card is listed in Table 2-7.

The SX-200 Power Fail Transfer Card

2.22 The SX-200 Power Fail Transfer Card (Fig. 2-6) provides for the possibility of 12 CO trunks to be connected to 12 extensions in the event of a commercial power or equipment failure. Two amphenol connectors (P20 and P21, Table 2-7) are hard-wired directly to the cross-connect field (Appendix 3) to provide for power fail 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 a power fail transfer condition.

The Console Interface Card

2.23 The Console Interface Card (Fig. 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 of transient voltage suppressors between the console connections and a chassis ground. Any transient voltages will be routed to the ground.

TABLE 2-7
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	TB301

2.24 The SX-100 combines the Console Interface, Power Fail Transfer, and Console Interconnect on one card (Fig. 2-8). All plugs on this card perform the same functions as listed in Table 2-7. 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 a commercial power or equipment failure, up to six CO trunks can be automatically connected to six extensions. In addition, the board has a Transfer LED which

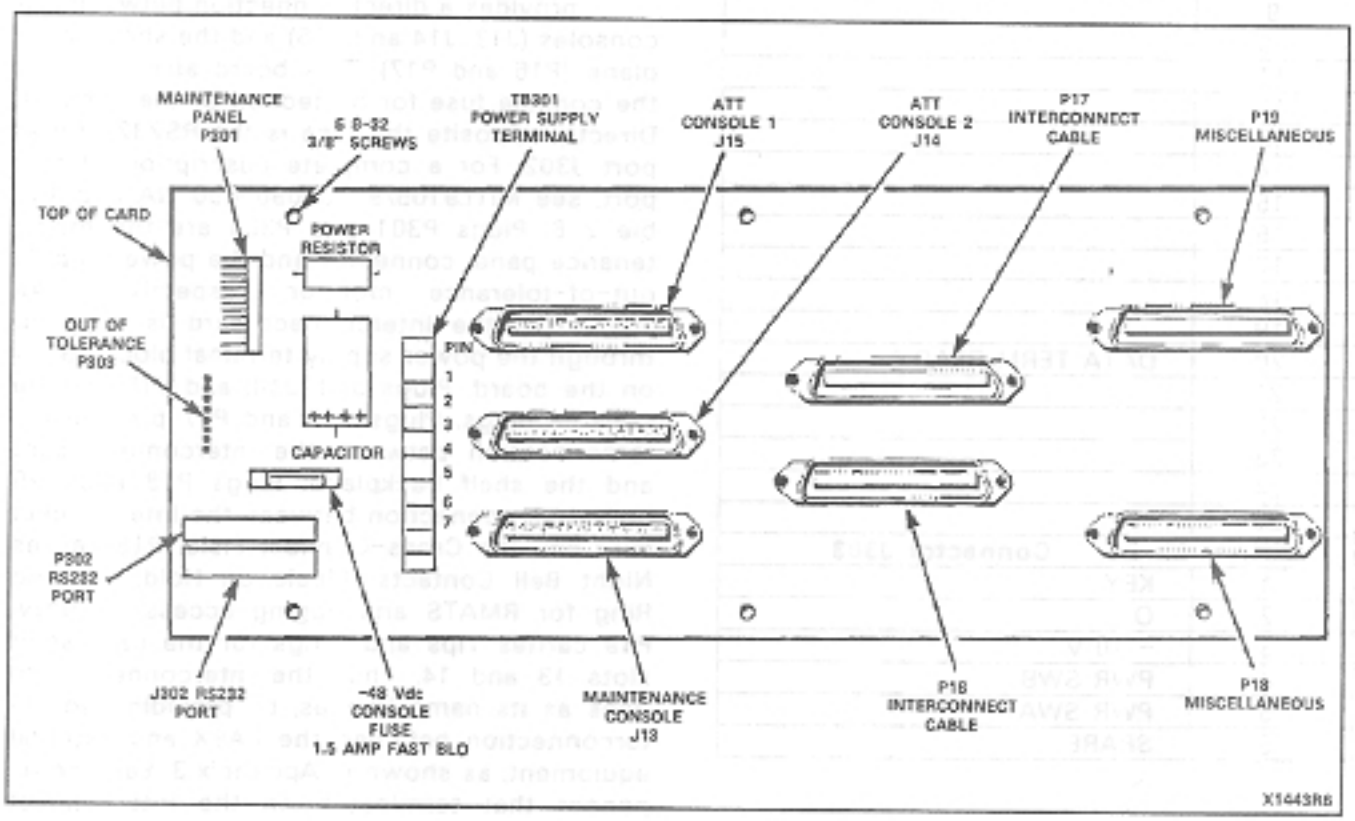


Fig. 2-5 SX-200 Interconnect Card

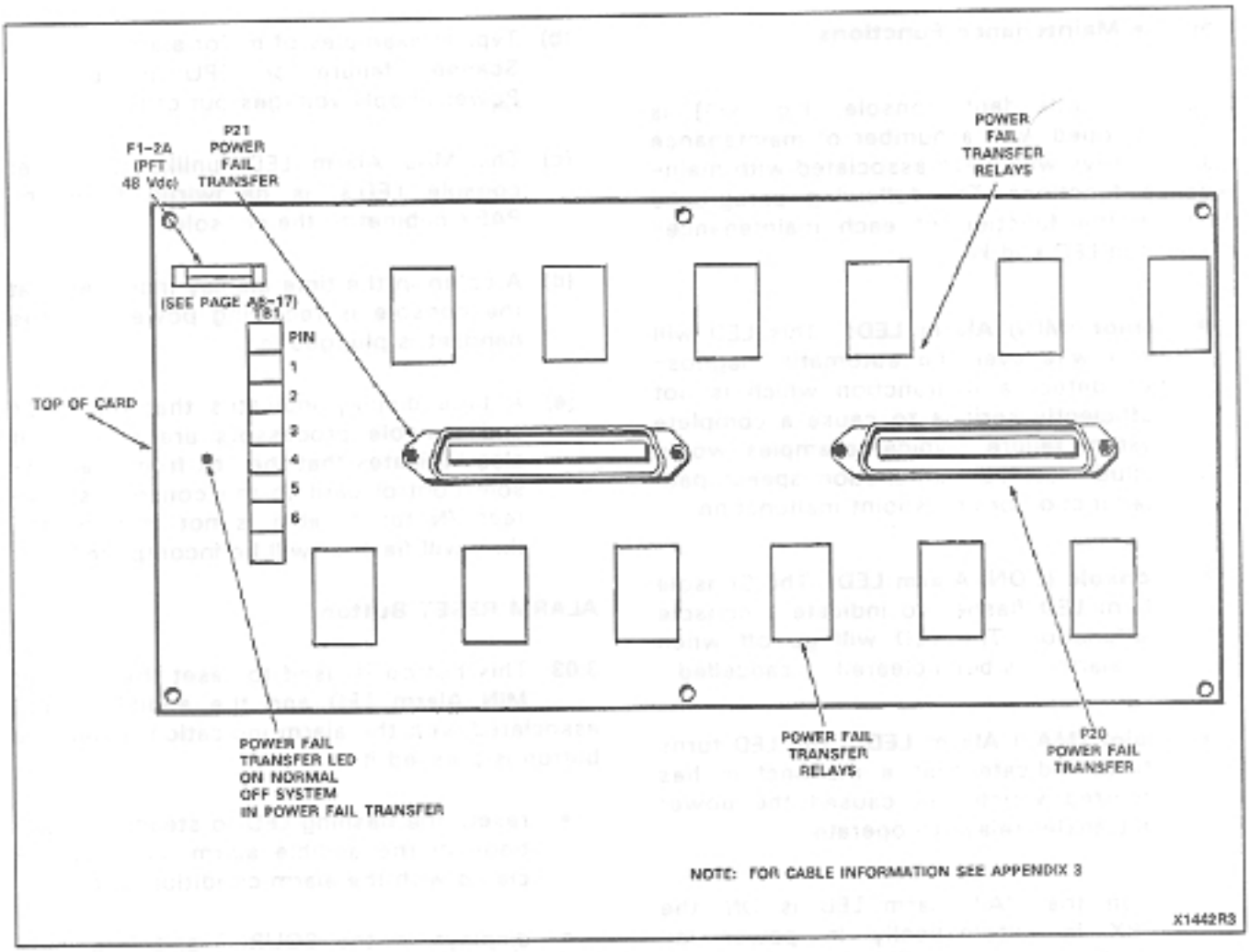


Fig. 2-6 SX-200 Power Fail Transfer Card

will go out when a transfer occurs. There are three fuses for user ringing, user -48 Vdc, and -48 Vdc for the console (F1, F2, F3).

Shelf Backplane

2.25 The same backplane and equipment shelf are used in both the SX-100 and SX-200. Field replacement of only the backplane is not recommended; rather the whole equipment shelf should be replaced (Fig. 2-10). The backplane essentially provides an interface between all printed circuit cards (paragraphs 2.01 - 2.18) 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 by 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 and SX-200 the backplane power is fed by a cable from the output of the power supply.

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 LED's and Maintenance Aids, and then the Test Line Functions. The Console Alarm LED's and Maintenance Aids will include all ERROR, Attendant 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 (Fig. 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.

- **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.

- **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 cancelled.

- **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:

(a) When the MAJ Alarm LED is ON, the PABX is automatically in power fail transfer mode.

(b) Typical examples of major alarms include Scanner failure or CPU malfunction, Power Supply voltages out of tolerance.

(c) The MAJ Alarm LED, unlike the other console LED's, is hardwired from the PABX cabinet to the console.

(d) A colon in the time display indicates that the console is receiving power and the handset is plugged in.

(e) A time display indicates that the PABX 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, and

- displays in the SOURCE and DESTINATION fields, details of the alarm condi-

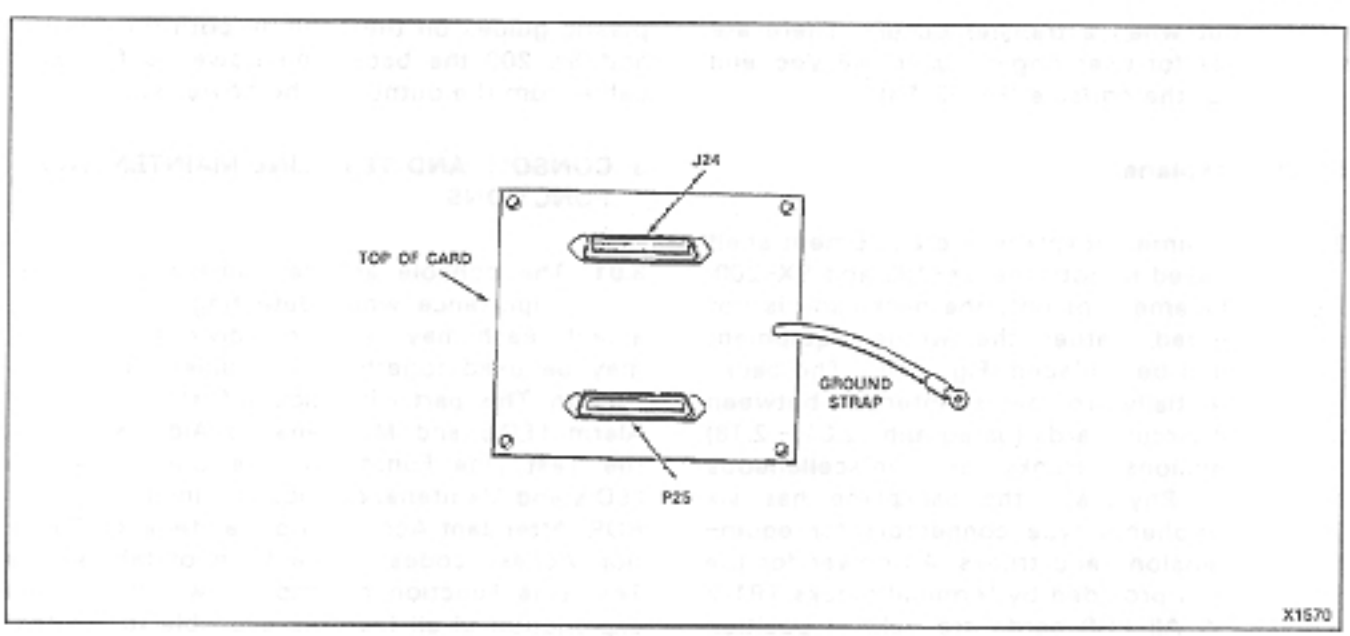


Fig. 2-7 SX-200 Console Interface Card

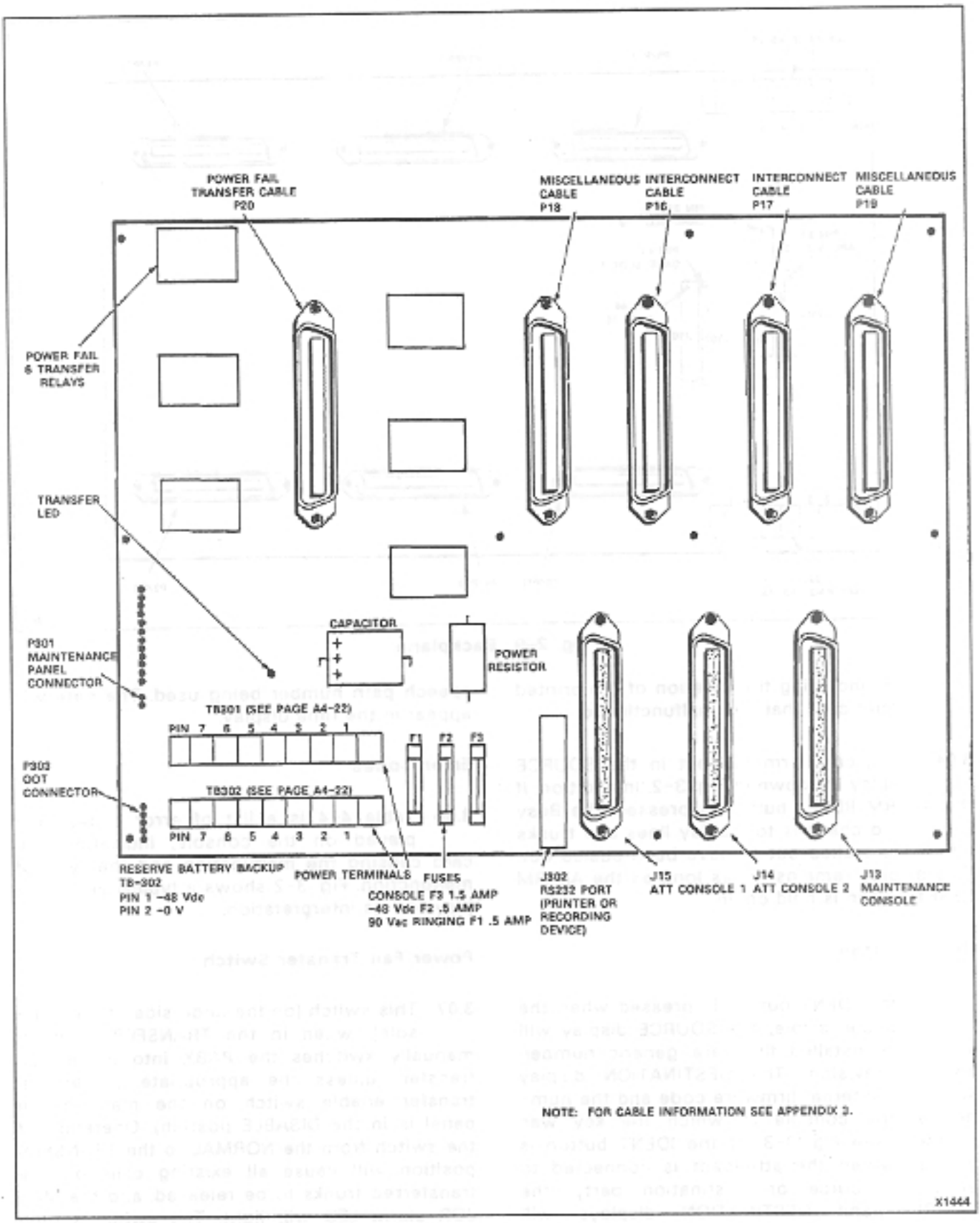


Fig. 2-8 SX-100 Interconnect, Console Interface, Power Fail Transfer Card

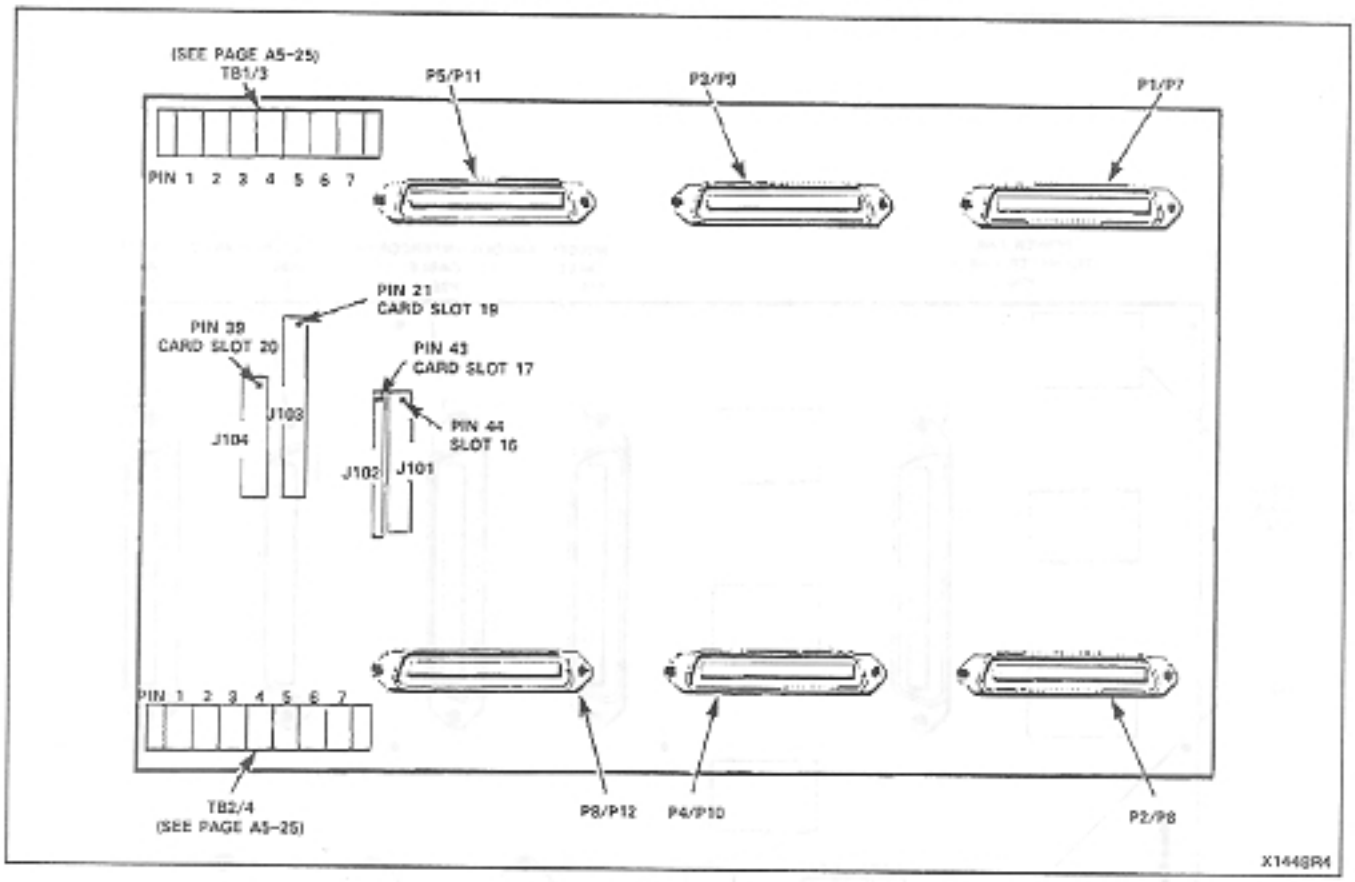


Fig. 2-9 Backplane

tion, including the location of the printed circuit card that has malfunctioned.

3.04 A typical alarm readout in the SOURCE display is shown in Fig. 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 Fig. 3-3). If the IDENT button is pressed when the attendant is connected to either a source or destination party, the SOURCE and DESTINATION displays will change to show the equipment numbers and speech path number being used. The date will 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 of malfunction. Fig. 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 the TRANSFER position, manually switches the PABX into power fail transfer (unless the appropriate power fail transfer enable switch on the maintenance panel is in the DISABLE postion). Operation of the switch from the NORMAL to the TRANSFER position will cause all 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

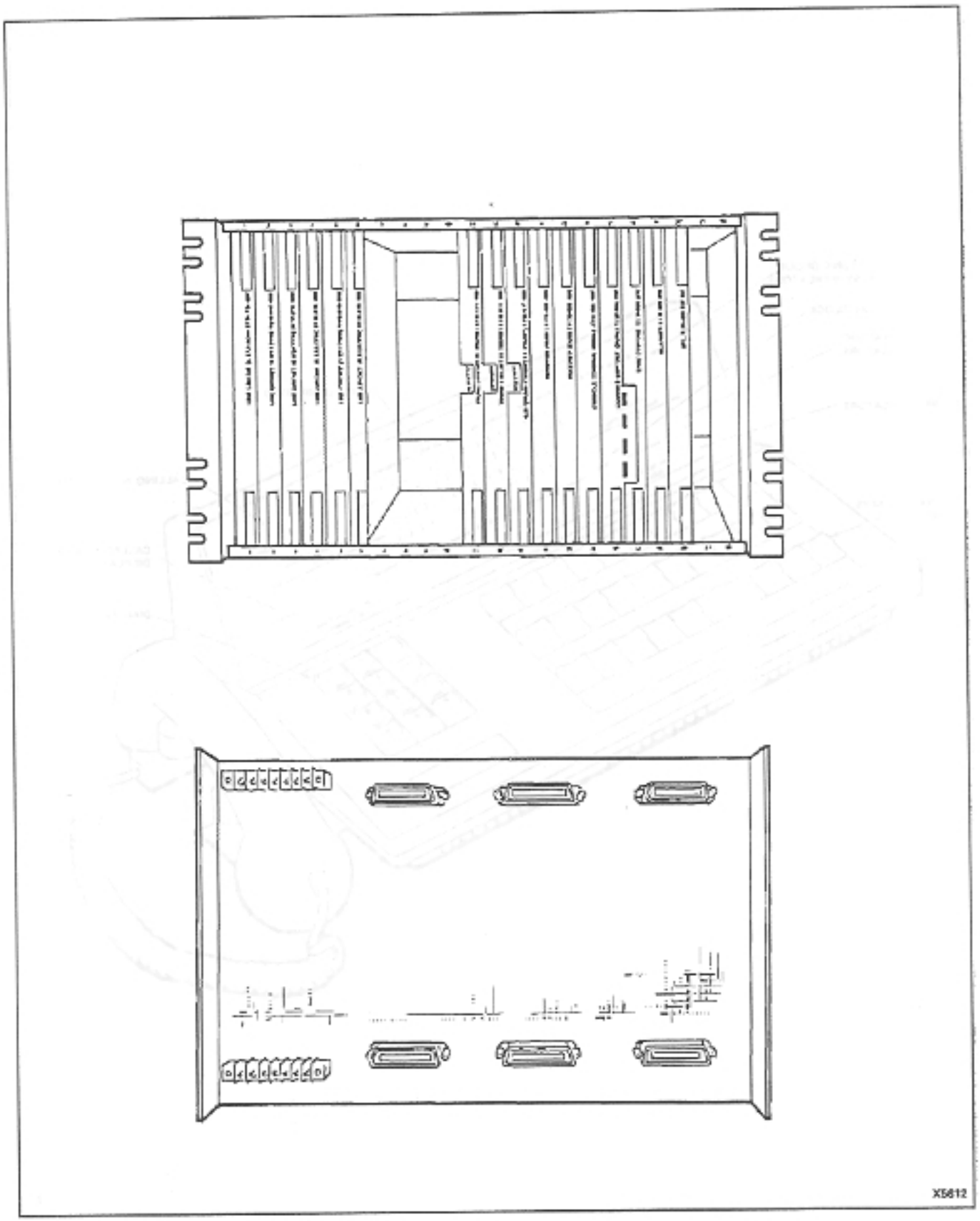


Fig. 2-10 Equipment Shelf

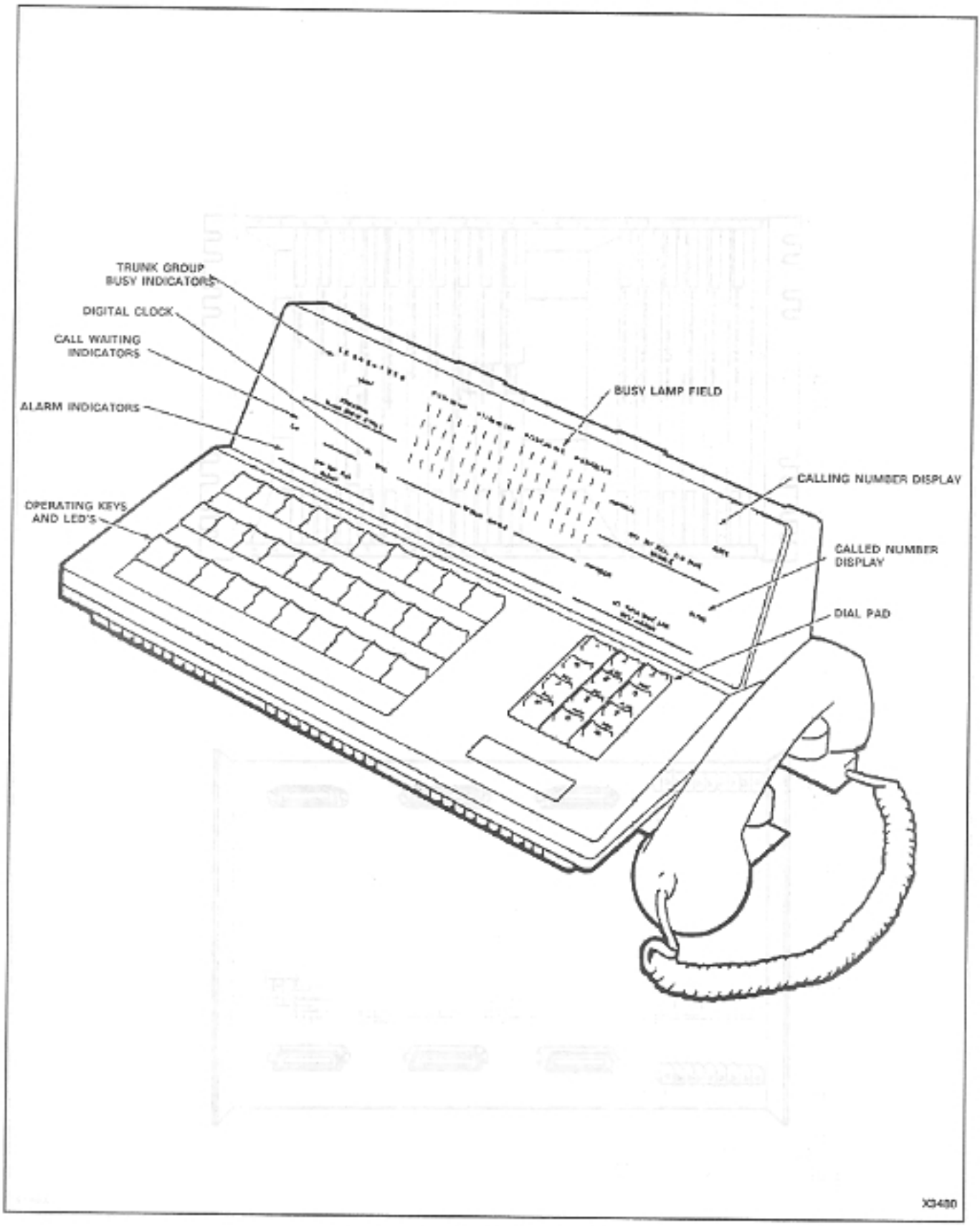


Fig. 3-1 Attendant Console

normal operation, the switch should be in the NORMAL position.

Test Line Functions

General

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 out conditions in the system (except for trunks); and select a specific 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 7780 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 Set and Clear Busy-Out of Receivers and Speech Paths

3.12 The test line (or console) dials 555 + 3 + nnn (set) or 555 + 4 + nnn (clear), where "nnn" is either the 3-digit equipment number of a receiver, or is 3 + the 2-digit speech path number (i.e. 301-331).

- 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 receiv-

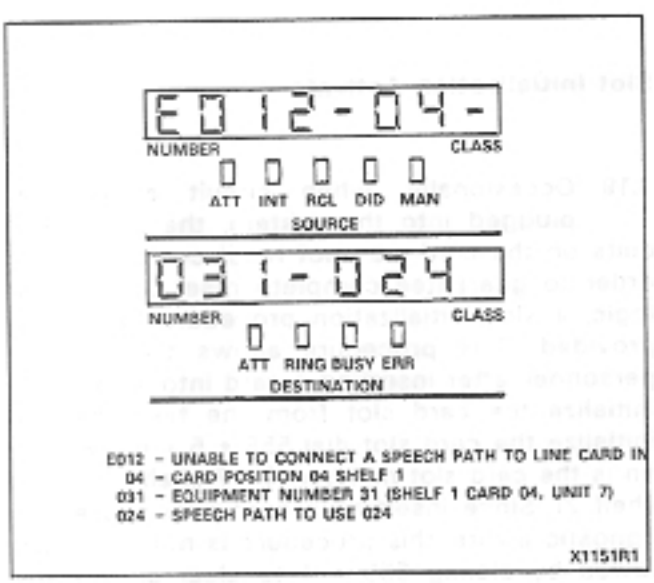


Fig. 3-2 Typical Readout

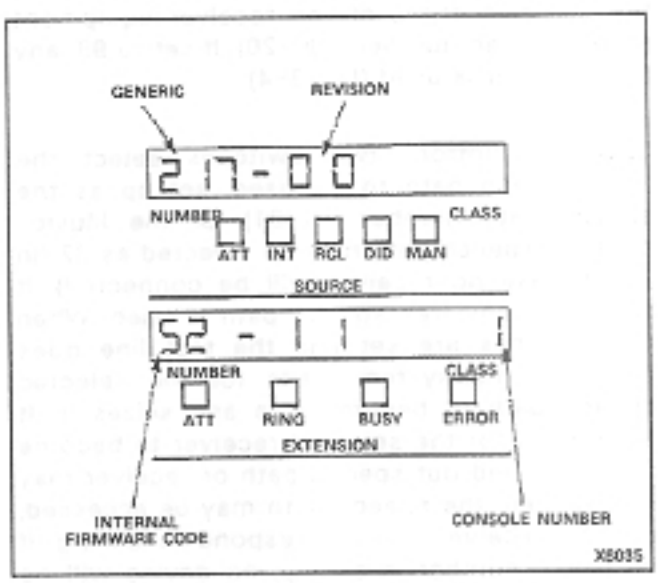


Fig. 3-3 Typical Identification Display

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	

NOTE: The ---- indicates the applicable equipment number.

Fig. 3-4 Receiver Equipment Numbers

ers, 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 (Fig. 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
- O - 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.

Forced Trunk Release

3.20 This feature allows service personnel to force a busy trunk into 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 (1-3 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.

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. Similarily, 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 attendant 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 blanks, dashes, or symbols exactly as shown in the SOURCE and DESTINATION displays.

4.04 Tables 4-1 through 4-2 are a listing of all system access codes. Table 4-3 is the Traffic Measurement Function Codes. For a further description see Sections MITL9105/9110-097-315-NA, and MITL9105/9110-097-450-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 Speed 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 SUPERSET 4 programming error codes. Fig. 4-1 illustrates the console overlays available for system programming.

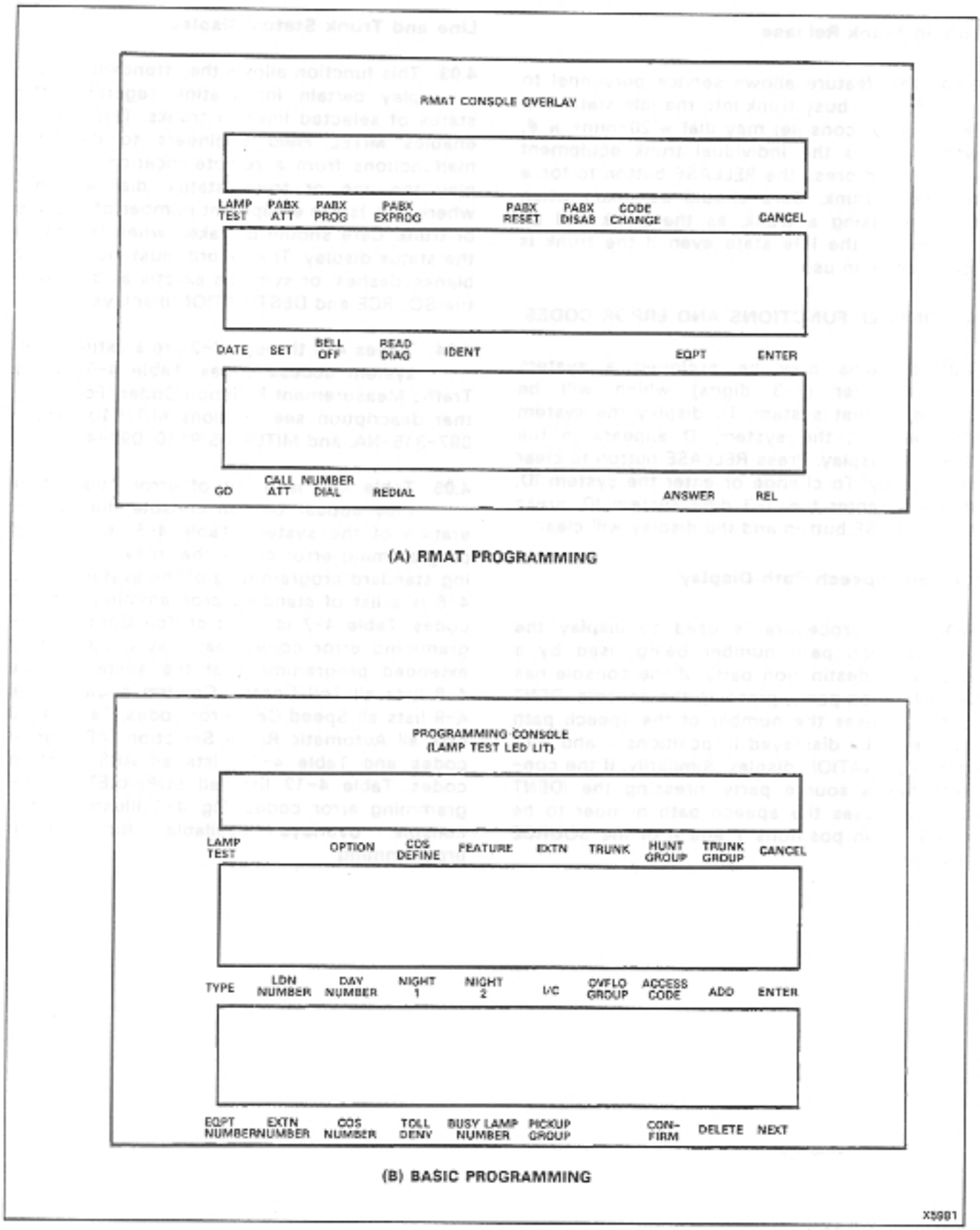


Fig. 4-1 Programming Overlays

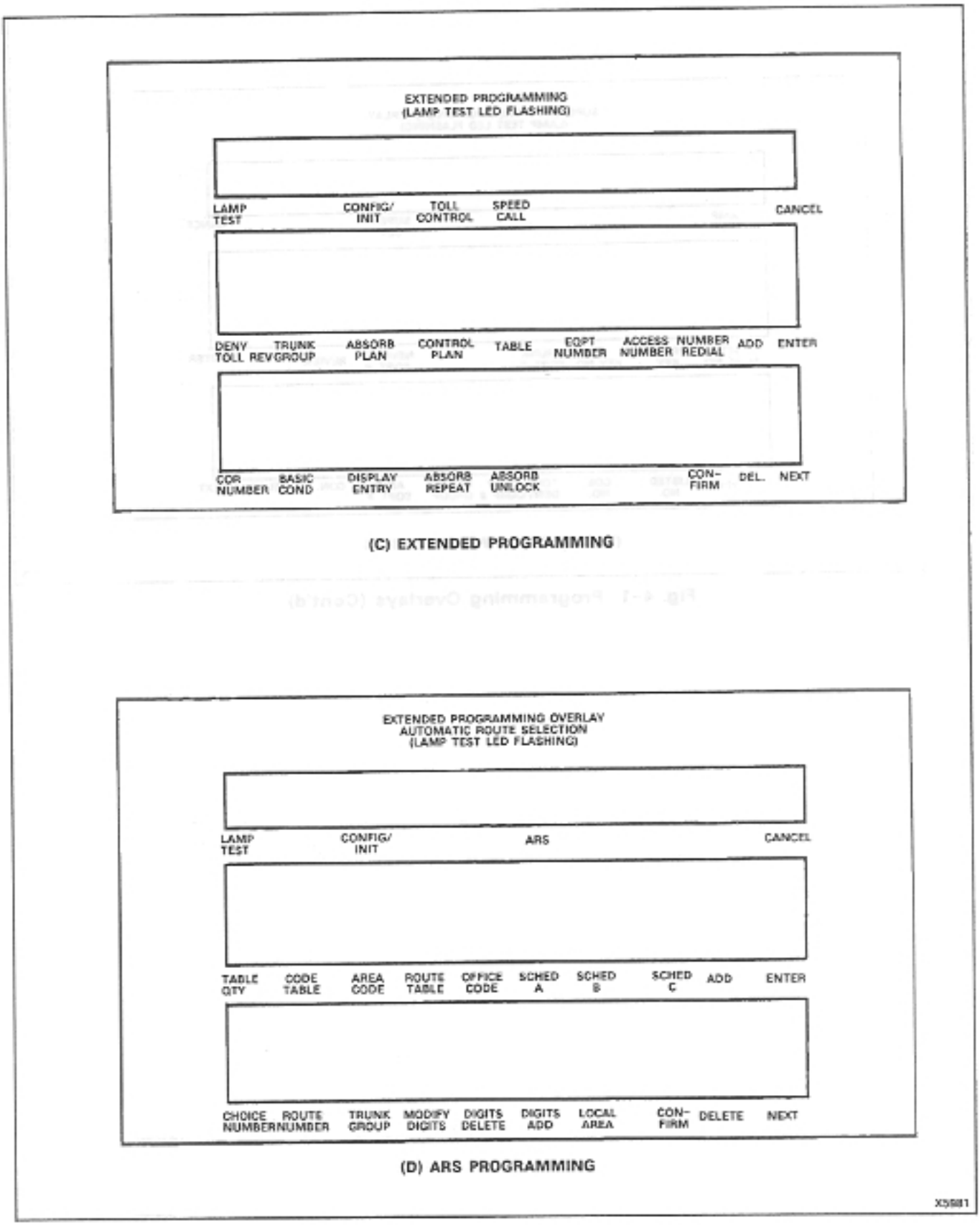


Fig. 4-1 Programming Overlays (Cont'd)

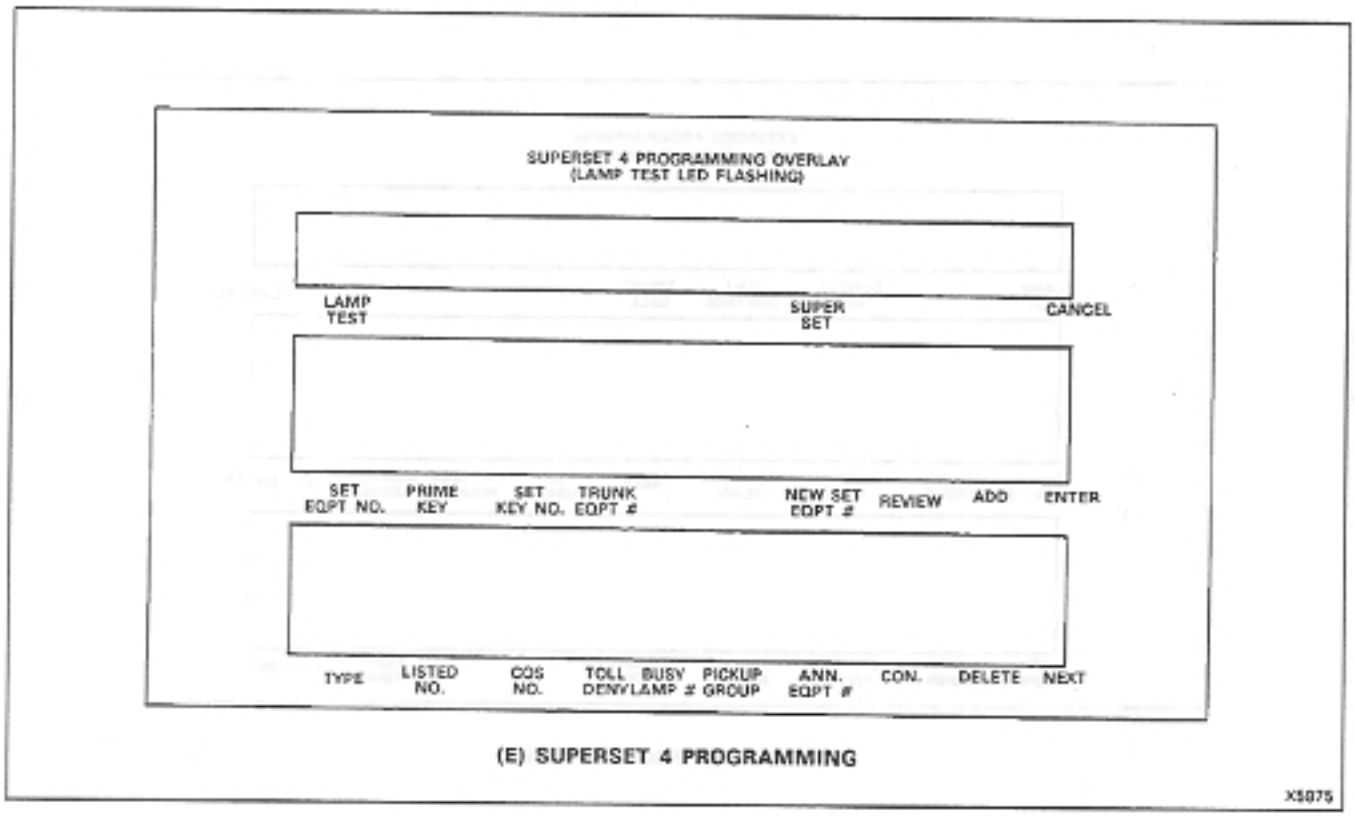


Fig. 4-1 Programming Overlays (Cont'd)

TABLE 4-1
ATTENDANT FUNCTION ACCESS CODES

R3

These codes assume the use of * as the Attendant Function code (Feature Number 18). For Attendant 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

To access an individual trunk:

a) Dial *20
b) Dial individual trunk access number (equipment number)
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 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 all system callbacks:

a) Dial *4
b) Dial #
c) Press RELEASE button

To set the clock time:

a) Dial *5
b) Dial time (2-digit hour plus 2-digit minutes plus 2-digit year)
c) Dial * for p.m., otherwise a.m.
d) Press RELEASE button

To make trunk group attendant access only:

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

To make trunk group extension and attendant access:

a) Dial *6
b) Dial trunk group (1 through 10)
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 cancel a minor alarm (Note 1):

a) Dial *8
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 de-busy an individual trunk (Note 3):

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

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)
ATTENDANT FUNCTION ACCESS CODES

To set up call forwarding:

a) Dial *11nnn, where nnn is the extension number of the forwarding extension
b) Dial call forwarding code (1-4)
c) Dial mmm, where mmm is the number to which the calls are to be forwarded
d) Press RELEASE button

To cancel call forwarding for an extension:

a) Dial *11nnn, where nnn is the extension number of the forwarding extension
b) Dial #
c) Press RELEASE button

To display call forwarding set for an extension:

a) Dial *11nnn, where nnn is the extension number of the forwarding extension
b) Press RELEASE button

To cancel all call forwarding:

a) Dial *1# or *11#
b) Press RELEASE button

To busy out an extension (Note 3):

a) Dial *12nnn, where nnn is the number of the extension to be busied out
b) Dial *
c) Press RELEASE button

To de-busy an extension (Note 3):

a) Dial *12nnn, where nnn is the number of the extension to be de-busied
b) Dial #
c) Press RELEASE button

To suspend the printer (Note 3):

a) Dial *14*
b) Press RELEASE button

To purge and ignore the printer (Note 3):

a) Dial *14 00
b) Press RELEASE button

To enable the printer (Note 3):

a) Dial *14 #
b) Press RELEASE button

To change the date:

a) Dial *15 and 3- or 4-digit date (1- or 2-digit month, 2-digit day)
b) Press RELEASE button

To print the room register audit (Notes 2 & 3):

a) Dial *16
b) Press RELEASE button

To change the system identity (Note 3):

a) Dial *17nnn (1- to 3-digit ID, 0-999)
b) Press RELEASE button

To display current system identity:

a) Dial *17
b) Press RELEASE button

To print the "room status" audit (Note 2):

a) Dial *18
b) Press RELEASE button

To print stored customer data (Note 4):

a) Dial *19 + n, where n is:
   0 A complete print (Note 5)
   1 System Options, Feature Acess 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
   * System-Wide Data (Note 6)
b) Press RELEASE button

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

Notes

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 option 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 system-wide speed call tables and the system special set messages.

TABLE 4-2
MAINTENANCE FUNCTION ACCESS CODES

R3

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.

Clear all errors:

a) Dial 555 + 1

Direct trunk or station access:

a) Dial 555 + 20
b) Dial individual equipment number (3-digit equipment number for trunk or station)

Busy out of a receiver

a) Dial 555 + 3
b) Dial equipment number of receiver

Busy out of a speech path:

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

De-busy a receiver

a) Dial 555 + 4
b) Dial equipment number of receiver

De-busy a speech path:

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

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 + 7 and hang up
b) Go off-hook
c) Dial 555 + 8 + # (or 2)

To initiate system dump (from console)

a) Dial 555 + 7
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
   - * System-Wide Data (Note 5)
b) Press RELEASE button

Note:
1. For Traffic Measurement Access Codes see MITL9105/9110-096-450-NA.
2. The thumbwheel switches on the Tone Control card should be set to XXYX, where X = any digit 0 - 9 and Y cannot be the digit 7.
3. Requires System Option Programming.
4. This prints all sections.
5. This will print only the system-wide speed call tables and and the system special set messages.

TABLE 4-3
TRAFFIC MEASUREMENT FUNCTION CODES

Function Code	Description
*130	**Select start time.** The start time for a Traffic Measurement run may be displayed and/or set by the console attendant as follows: • Enter *130 from keypad • SOURCE display shows: hhmmx (existing time) where: hh = hours mm = minutes x = P if p.m. x = space if a.m. or 24-hour clock • Enter new start time hhmmy (new time) where: y = * if p.m. y is not required if a.m. or 24-hour clock • Press RELEASE button
*131	**Select Length of Run.** The run length (in multiples of 1 hour) may be displayed and/or set by the console attendant as follows: • 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	**Print Traffic Data.** Traffic data may be output by the console attendant as follows: • Enter *132 from keypad • Press RELEASE button The current count held in the storage registers are output to printer or tape.
*133	**Cancel Traffic Measurement.** The traffic measurement run, if in progress, may be cancelled by the attendant as follows: • Enter *133 from keypad • Press RELEASE button This function results in resetting the start time to 0:00, the run length to 0, and zeroing 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. For further codes see Table 4-1 and Table 4-2.

TABLE 4-4
ERROR CODES

Code	Major Minor	Slot	Reason	First 3 digits of Destination Display	Last 3 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	0 if slot 20 1-7 if slot 21 (PROM page number)		7.
E003	major	19	Clock/scanner	1 = 1st interrupt missing, 2 = 2nd interrupt missing		
E004	minor	18	Speech path check circuit no "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
ERROR CODES (CONT'D)

Code	Major Minor	Slot	Reason	First 3 digits of Destination Display	Last 3 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		2.
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 known)	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 attendant consoles		
E021	minor	20	Checksum error in RAM			8.

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 a programmed time.
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 or the power is turned off, it may be cleared by initializing the RAM and reprogramming the system.

TABLE 4-5
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, TRUNK GROUP	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)
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 assigned as a; call announce port, programmed SUPERSET or a single line set with appearances.	EQPT NUMBER	None	The equipment number selected to be programmed has already been programmed in SUPERSET programming as; a SUPERSET, 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.	EQPT NUMBER	None	The trunk equipment number already has an appearance on a SUPERSET.	Delete appearances on SUPERSET.
E7	System is busy.	ENTER,	None	(a) Attempting to initialize a system while PABX 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)
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

TABLE 4-6
STANDARD PROGRAMMING (CONFIRM) CODES

Confirm Code	Cause	Key Affected	Flashing Lamp	Action Required
CO	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.
CO	Attempting to assign an equipment number for a trunk to an empty slot or a slot containing an extension card	EQPT NUMBER	CONFIRM	
C1	Attempting to assign an extension that already exists	EXTN NUMBER	CONFIRM	Check assignment- - if correct press CONFIRM button. The extension number entered is accepted as the extension number for the equipment being defined. All data associated with the original appearance of the extension number is removed. - If incorrect press EXTN NUMBER and re-enter extension number.
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
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	The table entry code is invalid for the table programmed. This occurs in the following situation: 1. A code of more than 3 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
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
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).

TABLE 4-10
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

TABLE 4-11
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 4 PROGRAMMING R1

Error Code	Key Involved	Explanation
EO		This error is given when entering SUPERSET 4 programming if either the SUPERSET 4's are not enabled, or the attendant attempts to use Customer Programming of SUPERSET 4 and System Option 272 is not enabled. This error is also given throughout SUPERSET 4 programming when an invalid key is pressed.
E1	PRIME KEY	Entering a SUPERSET 4 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 4 equipment number if the number supplied is defined within the system ss something other than a SUPERSET 4. Also given if the key type supplied is not valid.
E3	PRIME KEY	Attempting to assign an equipment number as a SUPERSET when other equipment numbers previously programmed for that slot identify the slot as other than a SUPERSET 4 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 a 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 4 PROGRAMMING

Error Code	Key Involved	Explanation
E22	PRIME KEY	This occurs when attempting to add a prime, but the directory number supplied exists, and does not exist as a primeless list. 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.
E23	REVIEW	This is given in Review mode, when the directory number supplied does not exist, or is in conflict with an existing system access code.
E24	REVIEW	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. If the first idgit 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 If the first digit is a 1: 000 - 063 service routines 1 to 64 (features)
E25	LISTED NUMBER	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.
E26	TRUNK EQPT NUMBER	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.
E27		The trunk is currently assigned to a DTS appearance list. An attempt has been made to use it for a private line key.
E28		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.

TABLE 4-12 (CONT'D)
EXTENDED PROGRAMMING ERROR CODES - SUPERSET 4 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 thay 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 can not be moved as it is not programmed as a SUPERSET.
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 move a SUPERSET 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 4 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 non-zero 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 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 (1) 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 (1) internal resource will be freed.

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

- E0 - E9 No special significance.
- E10 - E19 The required parameters were no entered.
- E20 - E29 There are incompatabilities with the data base values and the parameter values being entered to define or change a key.
- E30 - E39 There are prerequsites 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 4 equipment number to a slot that would indicate more than 8 slots programmed.

5. SYSTEM OPERATION

General

This Part will discuss events which occur within a SX-100/200 PABX 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 PABX. 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 (Fig. 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 1 Music on Hold (MOH) path (Fig. 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 (Fig. 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, trunk, the attendant, or an-

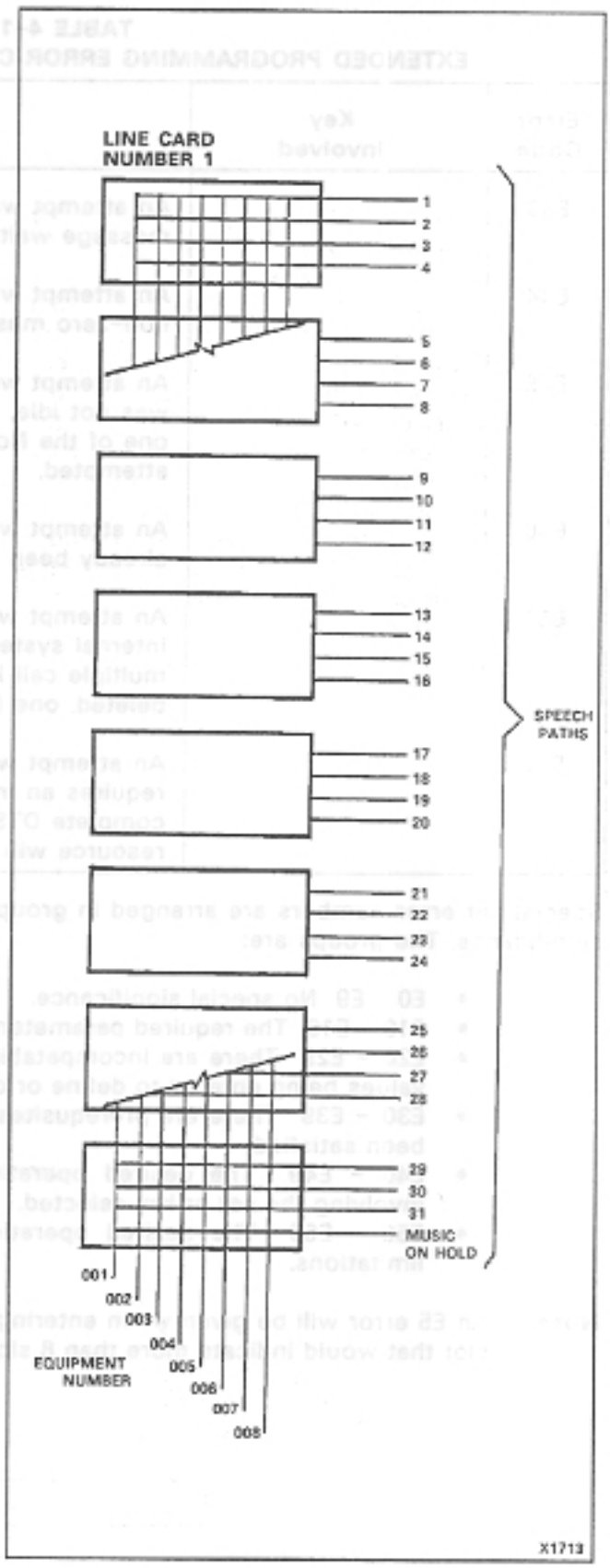


Fig. 5-1 Speech Paths

other 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.

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 re-

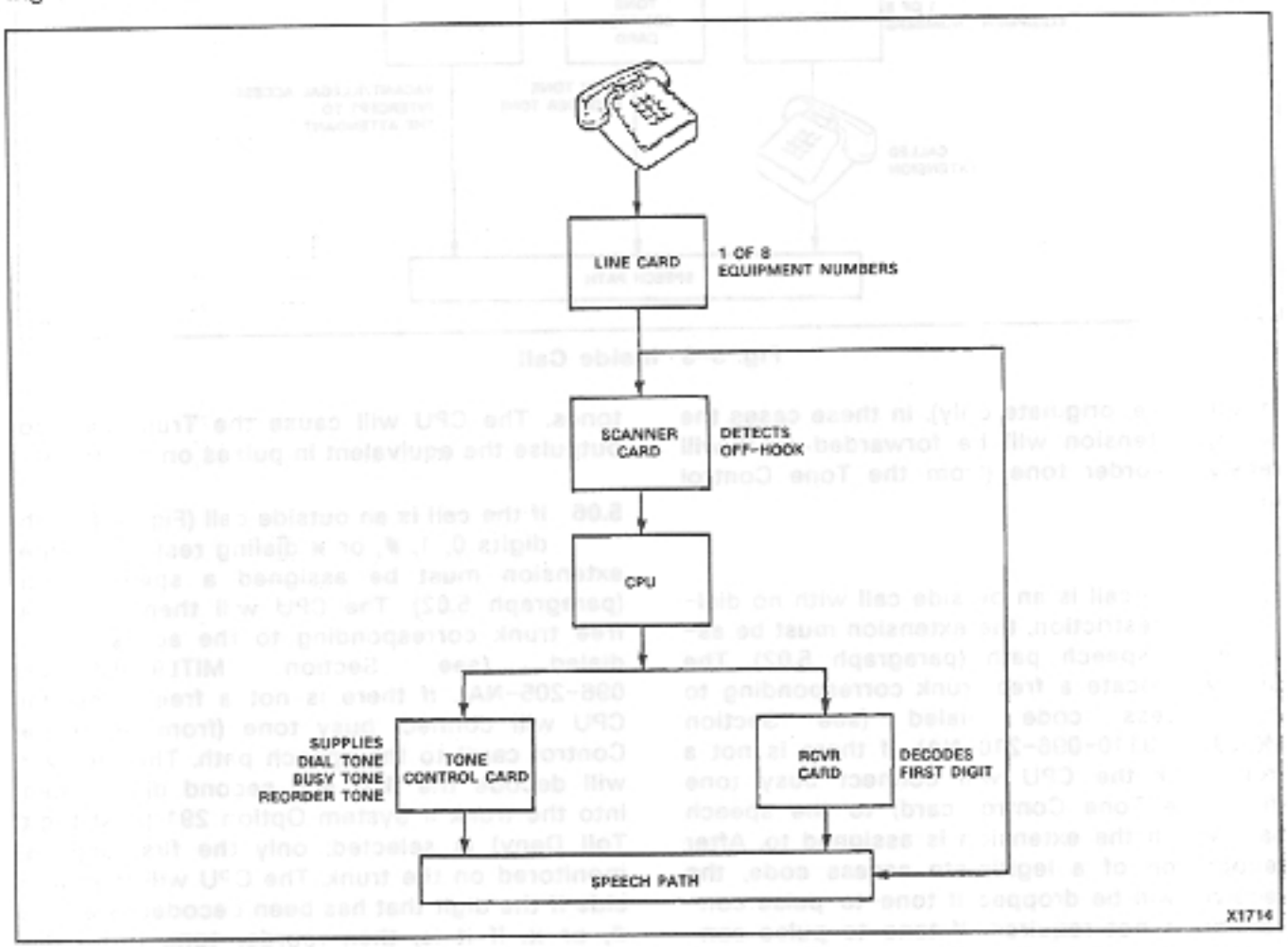


Fig. 5-2 Select a Speech Path

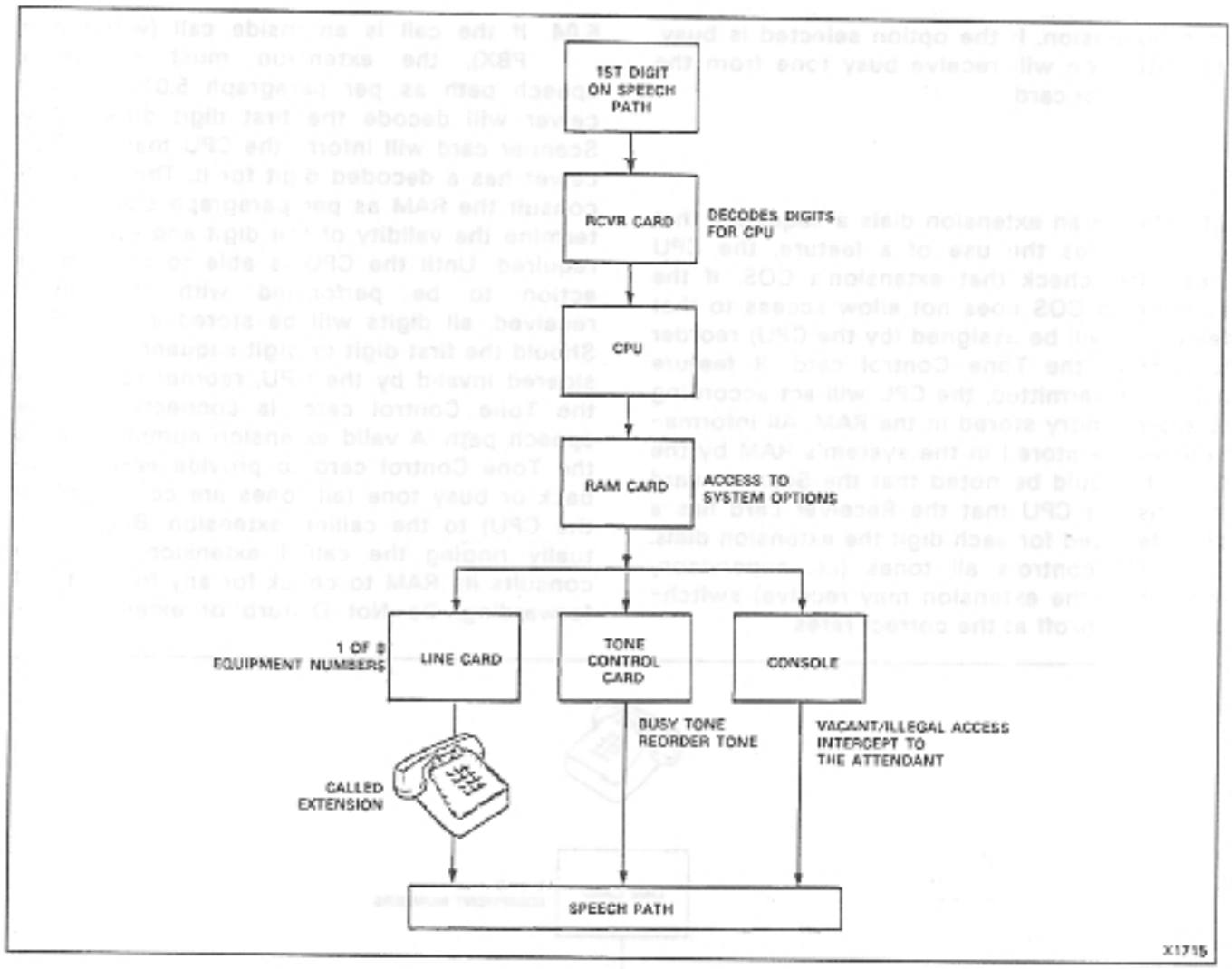


Fig. 5-3 Inside Call

striction (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 MITL9105/9110-096-210-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 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 (Fig. 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 MITL9105/9110-096-205-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

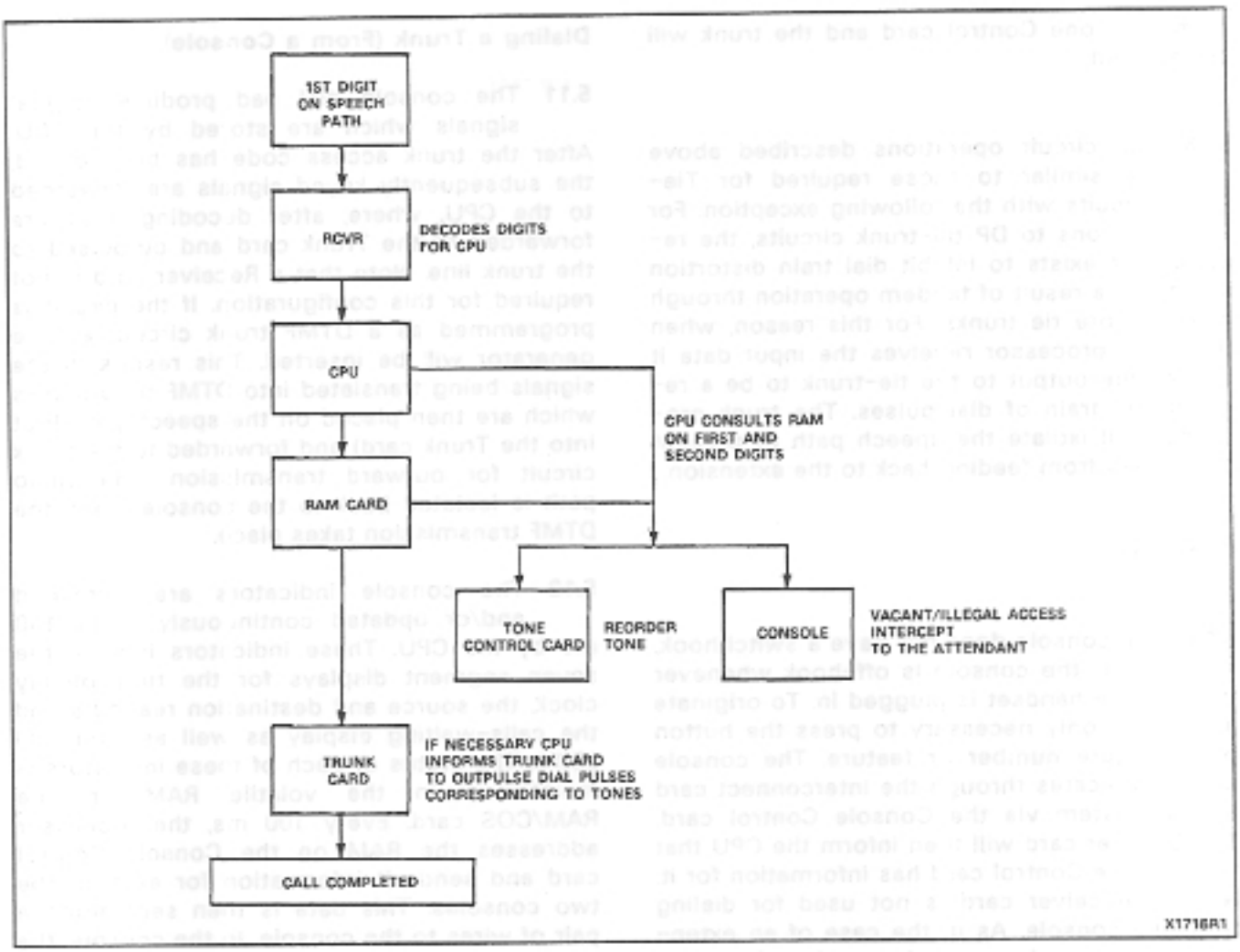


Fig. 5-4 Outside Call 0 and 1 Dialing Restriction

speech path that the extension 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 (see 5.03).

5.07 For an outside call with SMDR, Multi-Digit Toll Control or ARS in effect (Fig. 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.

5.12 The console indicators are refreshed and/or updated continuously every 100 ms by the CPU. These indicators include the seven segment displays for the time-of-day clock, the source and destination readouts and the calls-waiting display as well as over 200 LED's. The status of each of these indicators is maintained in the volatile RAM on the RAM/COS 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 LED's and the console ringer on/off.

Hook-Flash

5.13 A hook-flash is defined for the PABX 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

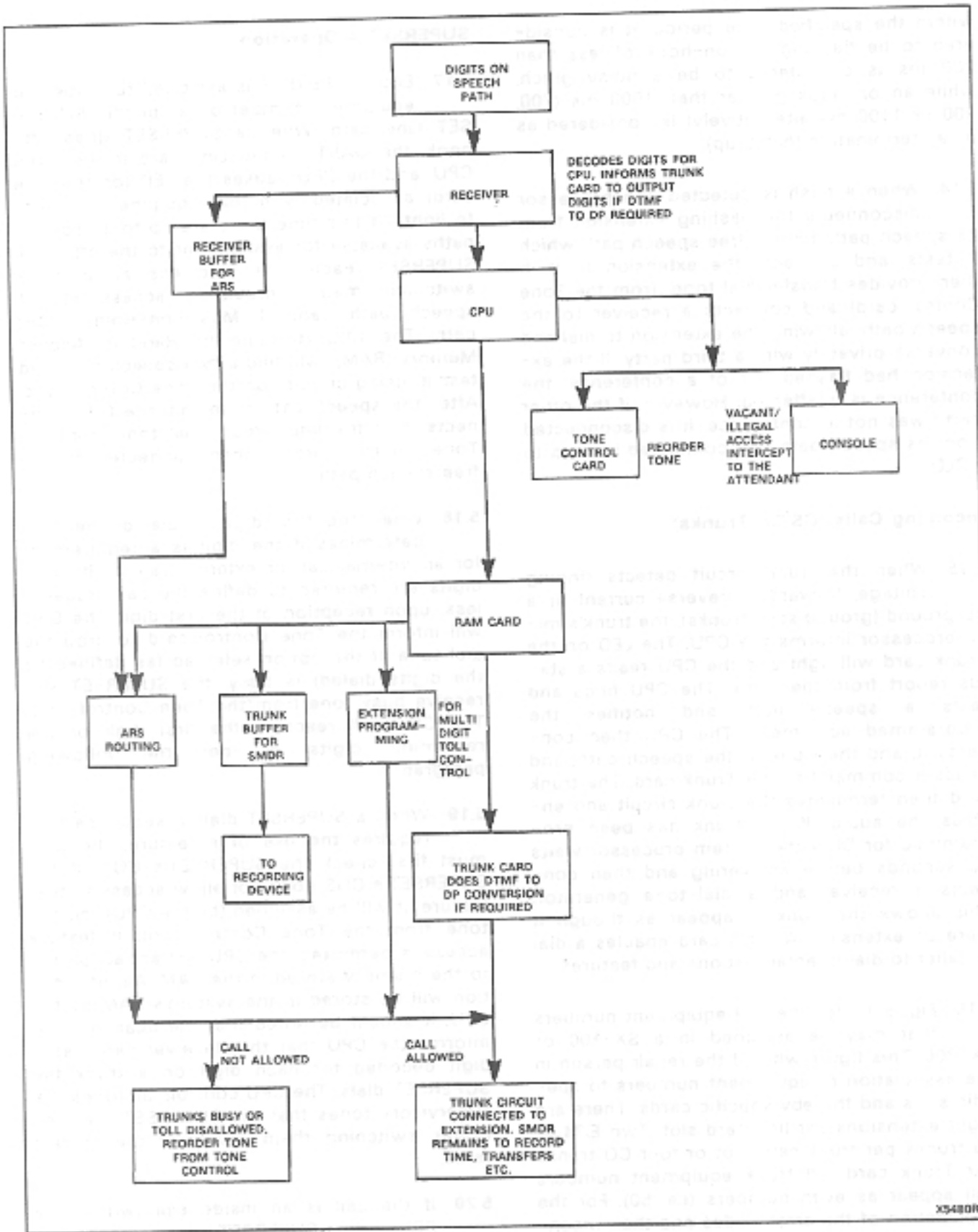


Fig. 5-5 Outside Call - Multi-Digit Toll Control, or SMDR or ARS in Effect

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 card enables a dial in caller to dial internal stations and features.

5.16 Fig. 5-6 identifies all equipment numbers that may be assigned in a SX-100 or SX-200. 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 Operation

5.17 Each SUPERSET is assigned to a specific equipment number on a specific SUPERSET Line card. When a SUPERSET 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. Each Line card has an 8 x 32 switching matrix, providing access to 31 speech paths and 1 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 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 dials a sequence that requires the use of a feature, the CPU must first check the SUPERSET's COS. If the SUPERSET'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 dials. The CPU controls all tones (i.e. supervisory tones that the SUPERSET may receive), switching them on/off at the correct rates.

5.20 If the call is an inside call (within the PBX), the SUPERSET 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 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. Before actually ringing the called SUPERSET, the CPU consults its RAM to check for any form of call forwarding, Do Not Disturb or SUPERSET restriction (i.e. originate only). In these cases the calling SUPERSET 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, the CPU will cause the appropriate prompts to be lit at the SUPERSET's involved.

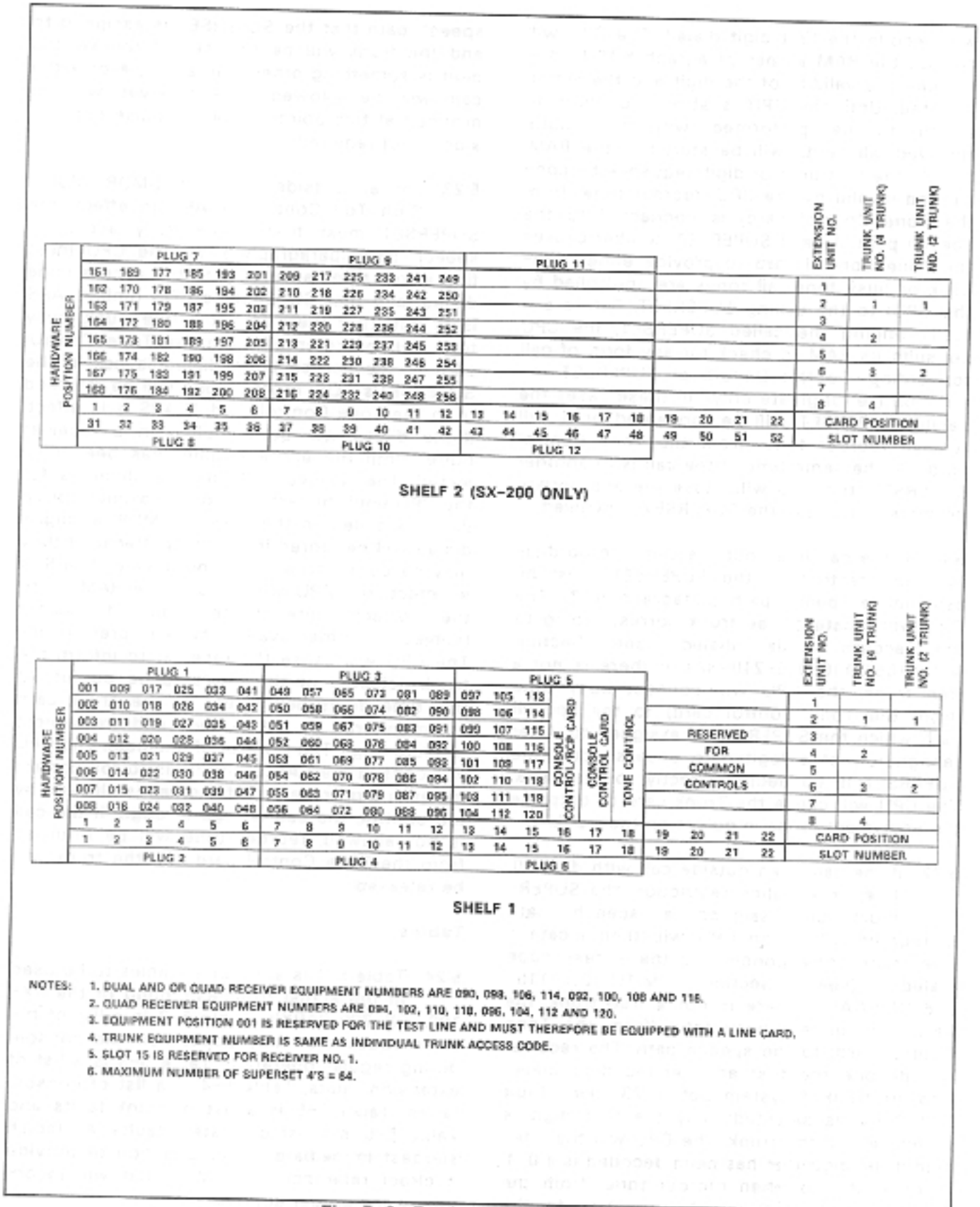
5.21 If the call is an outside call with no dialing restriction, the SUPERSET must be assigned a speech path (paragraph 5.17). The CPU will locate a free trunk corresponding to the access code dialed (see Section MITL9105/9110-096-210-NA). If there is not a free trunk, the CPU will connect busy tone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



HARDWARE POSITION NUMBER	PLUG 7						PLUG 9						PLUG 11										EXTENSION UNIT NO.	TRUNK UNIT NO. (4 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	19	20	21	22	CARD POSITION		
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	SLOT NUMBER		
	PLUG 8						PLUG 10						PLUG 12												

SHELF 2 (SX-200 ONLY)

HARDWARE POSITION NUMBER	PLUG 1						PLUG 3						PLUG 5										EXTENSION UNIT NO.	TRUNK UNIT NO. (4 TRUNK)	TRUNK UNIT NO. (2 TRUNK)
	001	009	017	025	033	041	049	057	065	073	081	089	097	105	113								1		
	002	010	018	026	034	042	050	058	066	074	082	090	098	106	114								2	1	1
	003	011	019	027	035	043	051	059	067	075	083	091	099	107	115				RESERVED				3		
	004	012	020	028	036	044	052	060	068	076	084	092	100	108	116				FOR				4	2	
	005	013	021	029	037	045	053	061	069	077	085	093	101	109	117				COMMON				5		
	006	014	022	030	038	046	054	062	070	078	086	094	102	110	118				CONTROLS				6	3	2
	007	015	023	031	039	047	055	063	071	079	087	095	103	111	119								7		
	008	016	024	032	040	048	056	064	072	080	088	096	104	112	120								8	4	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	CARD POSITION		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	SLOT NUMBER		
	PLUG 2						PLUG 4						PLUG 6												

CONSOLE CONTROL/RCP CARD | CONSOLE CONTROL CARD | TONE CONTROL

SHELF 1

NOTES:
1. DUAL AND OR 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'S = 64.

Fig. 5-6 Equipment Numbering

TABLE 5-1

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 - 5-6) a STOP indication should be taken as: STOP, contact your nearest authorized MITEL Service representative.

6. SX-100/SX-200 POWER SUPPLY

6.01 The SX-100/SX-200 power supplies form 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 (Fig. 6-1). In the SX-200 the power supply is housed in a metal cabinet forming the lower rear door of the system (Fig. 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 converters are 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 and a converter for the SX-100 (see 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 cut over 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

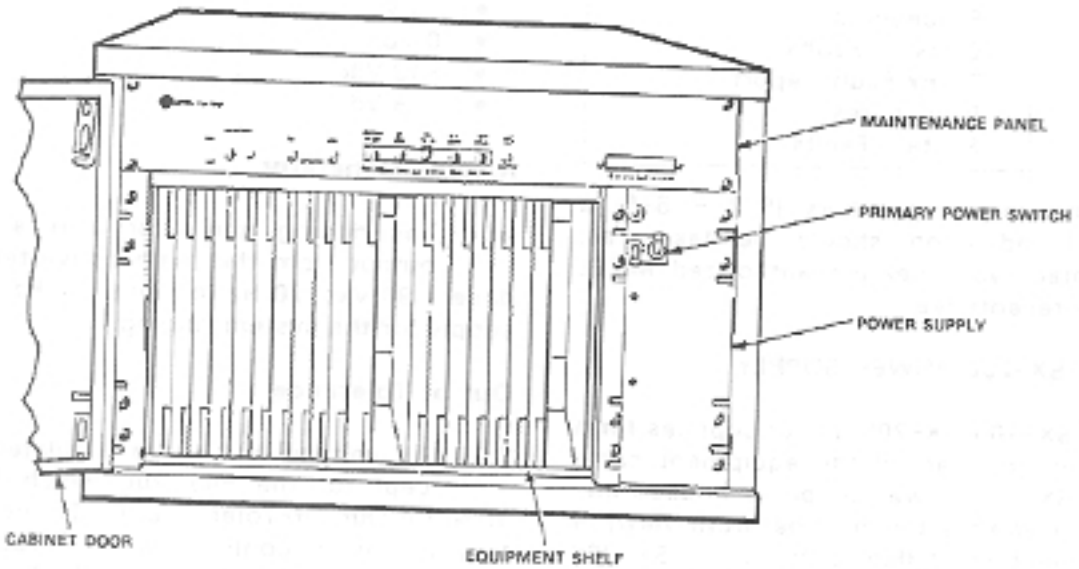
6.04 The ringing generator uses a -48 Vdc output from the main converter to produce a 90 Vac, 20 Hz (optional 17 Hz or 25 Hz) supply for the system ringing.

Out of Tolerance

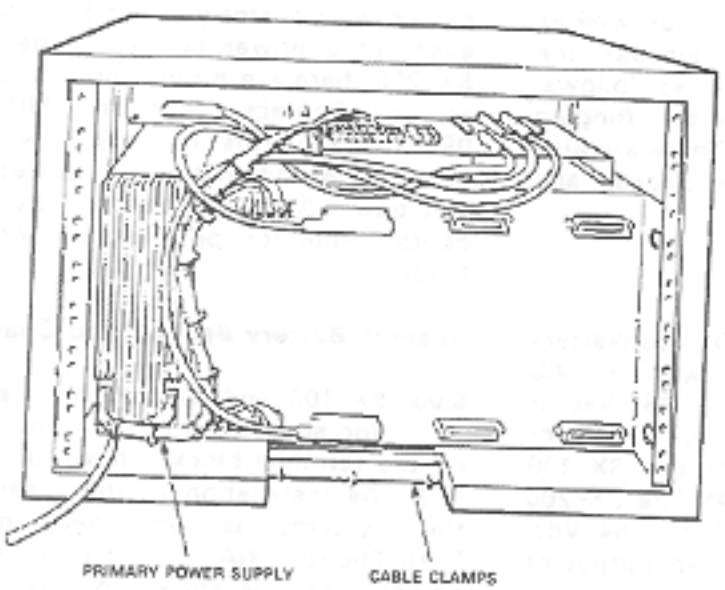
6.05 All voltage levels are regulated 5% except for the -48 Vdc which may vary 10%. An Out-Of-Tolerance (OOT) circuit monitors all levels continously (see Table A3-2). Should a deviation occur, an OOT signal will activate the power fail transfer circuit through the Interconnect card. It should be noted 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 there are provisions to program a port as a Contact Monitor (MITL9105/9110-096-105-NA) This monitor may be used to alert the attendant that the system is on battery power (Wiring Appendix 3) by wiring it to a contact monitor port (at the cross-connect field).

Reserve Battery Backup and Charger

6.06 SX-100 and SX-200 both accept a -48 Vdc source fed to the terminals indicated on the terminal blocks shown in Figs. 6-2 and 6-3. The installation of the reserve supply in the systems is described in MITL9105/9110-096-200-NA. A pictorial view of the power supply is shown in Figs. 6-2 and 6-4. The MITEL reserve battery and charger (MITEL part number 9110-014-000) has an OOT circuit which may be used to alert the attendant 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.



FRONT VIEW



REAR VIEW

WEIGHT	HEIGHT	WIDTH	DEPTH
70 lb (31.8 kg)	18.62 in. (422 mm)	25.0 in. (635 mm)	18.5 in. (470 mm)

X5611

Fig. 6-1 SX-100 Equipment Cabinet and Power Supply

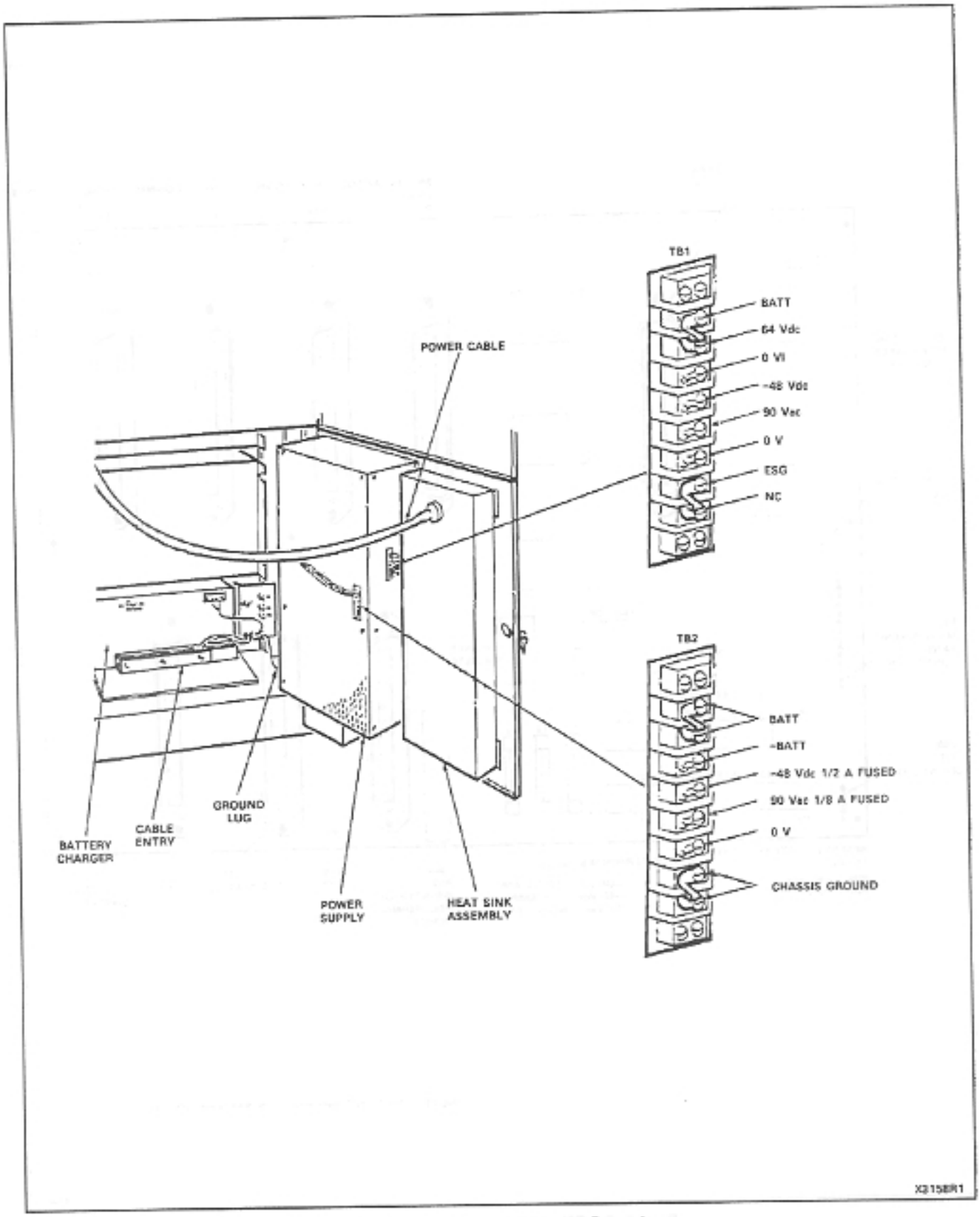


Fig. 6-2 SX-200 Power Supply

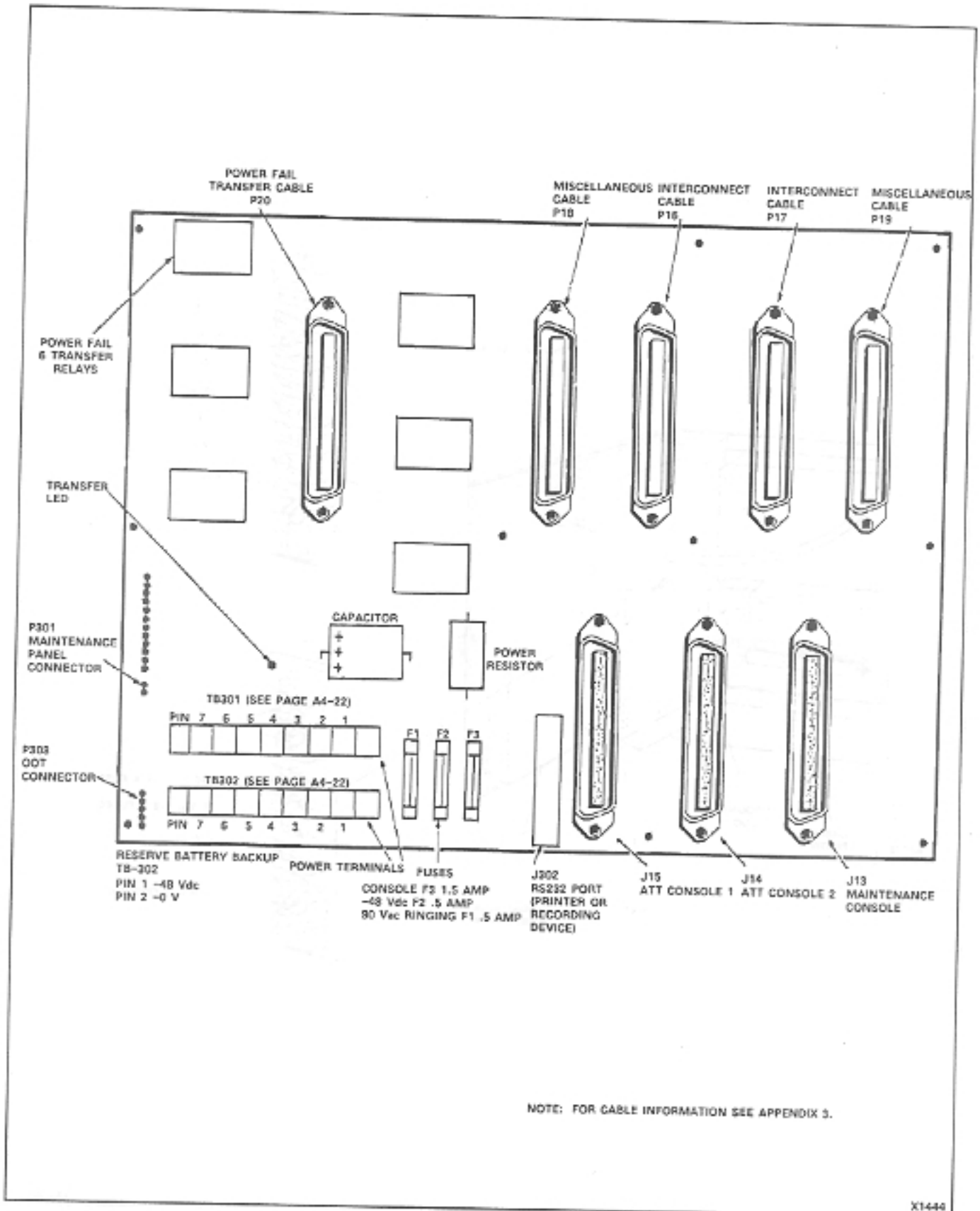


Fig. 6-3 SX-100 Interconnect Card

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
ERROR CODE PROCEDURES (CONT'D)

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	

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 system wide 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 PABX 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 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 Attendant Access only
Extension cannot access a feature	At the console check the extension's COS, 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 are closed. If open ensure that there is no ground on the XT lead	Replace Trunk card STOP

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

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, noisy lines.

TABLE 5-4
CONSOLE FAULTS

Fault Reported As	Step 1	Step 2	Step 3
Console dead except for for colon in time display and minor alarm	Try 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 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 (* 14 *).	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 Check that DTMF pulses are not going into a DP Trunk	Check for reverse or Check the PABX 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 Attendant Access only Check for full printer buffers Automatic Wake-Up and SMDR	Check for reverse or open tip and ring on trunk Check PABX 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 MITL9105/9110-096-200-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 wired	STOP	

Note 1: 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 2 or more trunks
- Collisions due to 1 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 6 A6.03 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
Apparent CPU problem, recent software change	Software rev levels not compatible. Check ignore reversal switch set open	STOP	
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	
1/8 A 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	

Fusing

6.07 The SX-200 is protected by fuses which are located on the back door of the cabinet (Fig. 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 LED's which also are defined by the circuit on the back door. These LED's 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.

- The SX-100 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 (Fig. 6-3). The front panel of the power supply has two circuit breakers: one is for the DC battery supply, the other is for the AC supply (Fig. 6-1).

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

- If the system is equipped with a reserve battery backup (MITL9110-014-000, SX-200 or 9105-014-000, SX-100) separate fusing is included in the charger unit itself (Fig. 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 Fig. 6-2 and Fig. 6-3. Installation of the reserve battery backup is described in MITL9105/ 9110-096-200-NA.

6.08 When troubleshooting the systems for power failures, the Power Supply Block Diagram (Fig. 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 Secion and the MAP's referred to in Charts 6-1 through 6-10, the repair person should be able to pinpoint faults and take proper replacement action. At all times the repair person should follow all safety precautions suggested in the MAP's to ensure maximum personal and equipment safety.

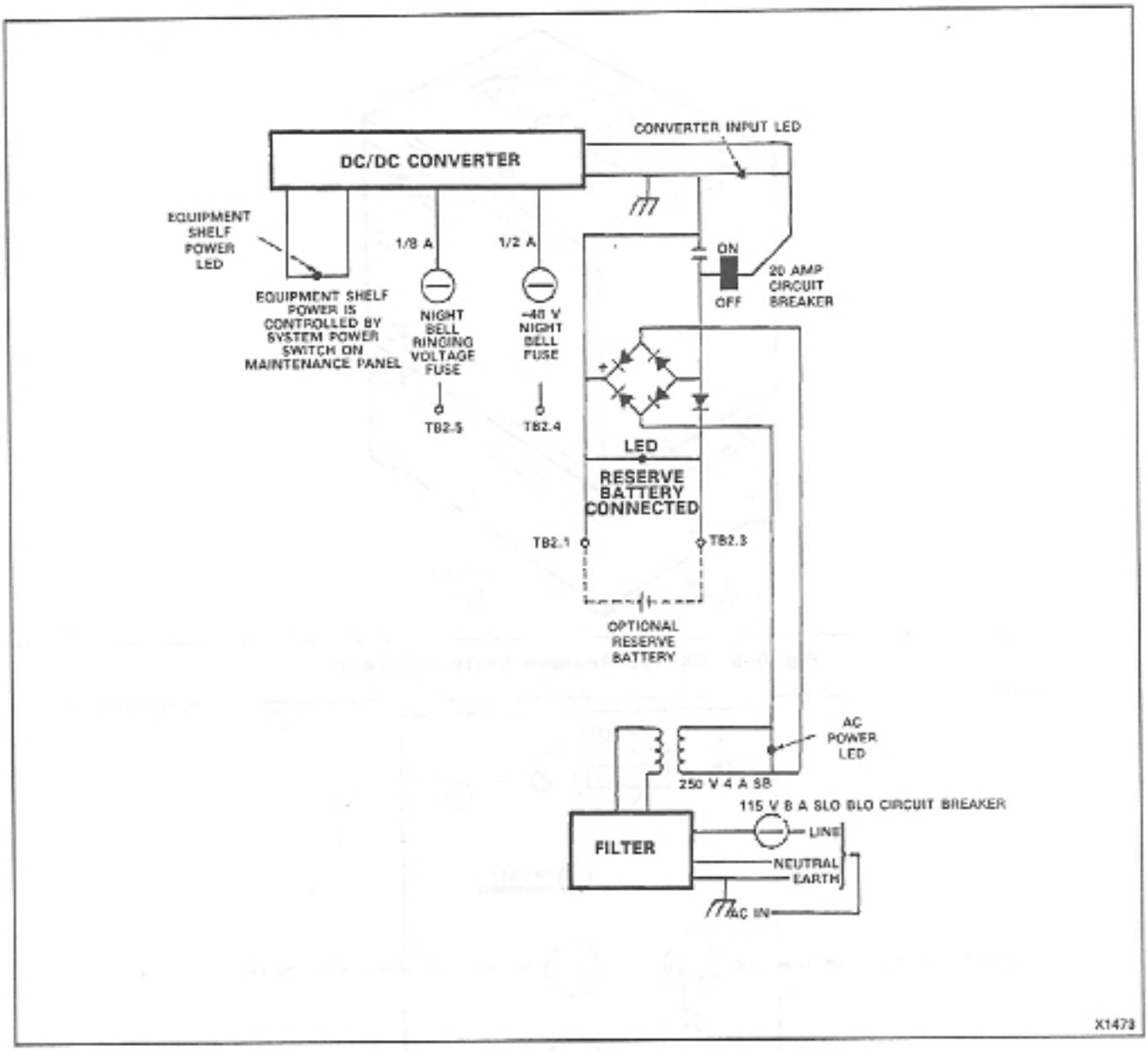


Fig. 6-4 SX-200 Back Door Electrical Schematic

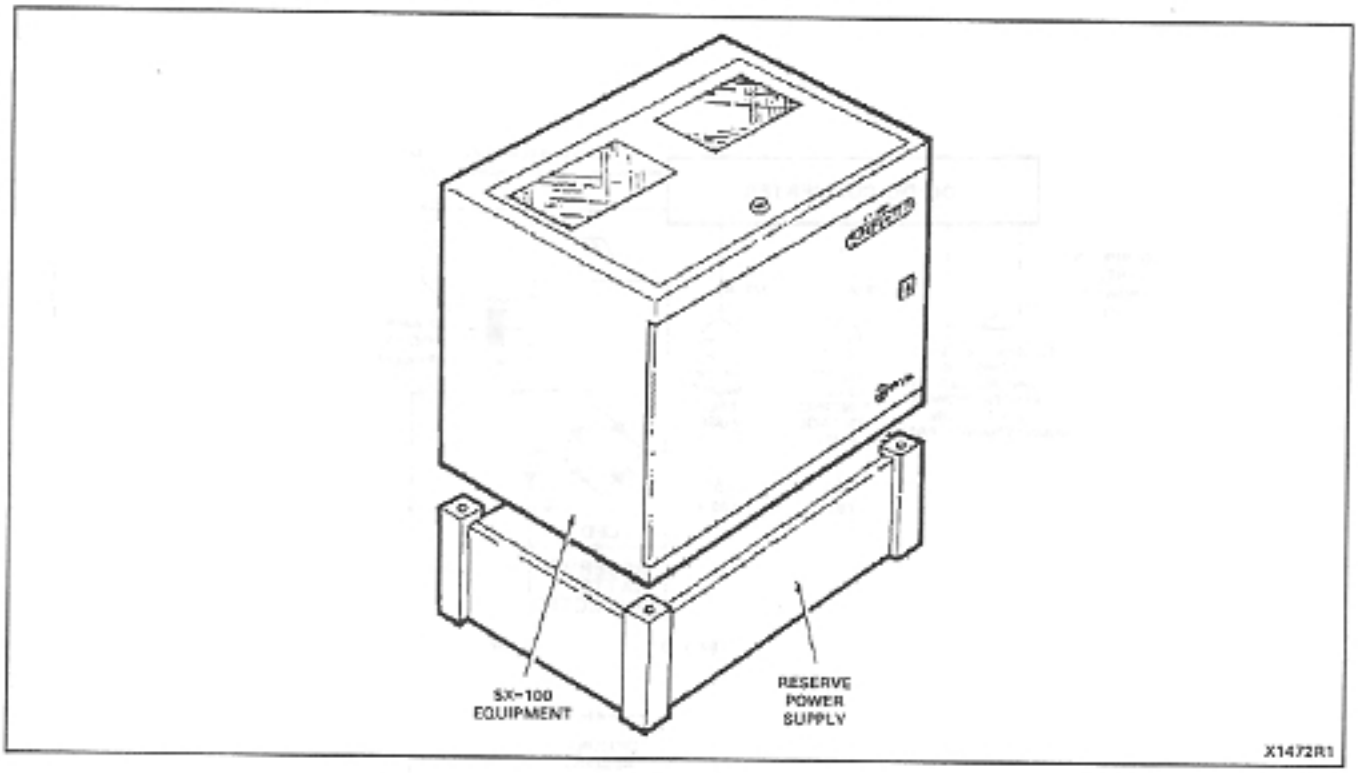


Fig. 6-5 SX-100 Reserve Battery Backup

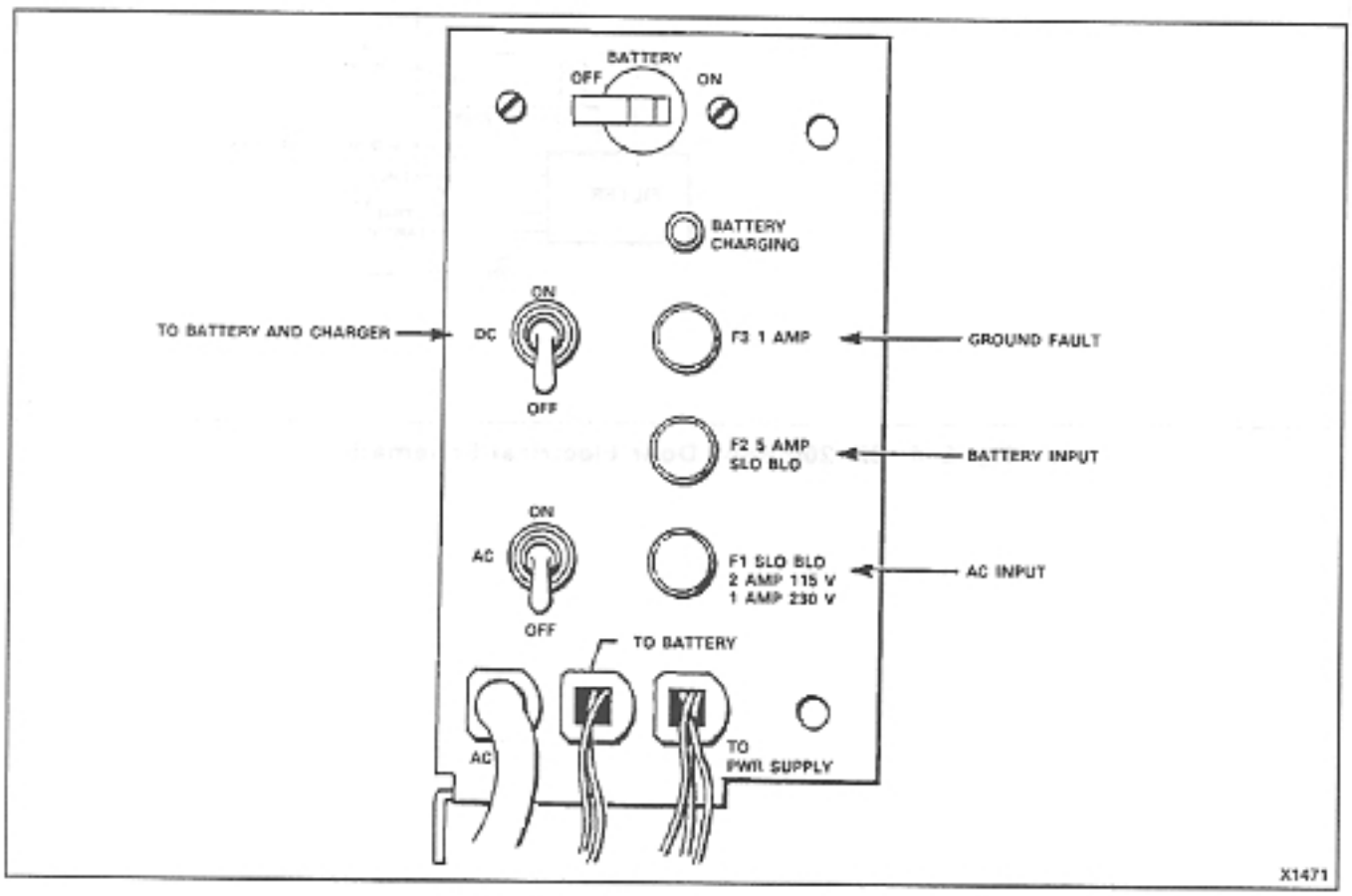


Fig. 6-6 Reserve Battery Charger

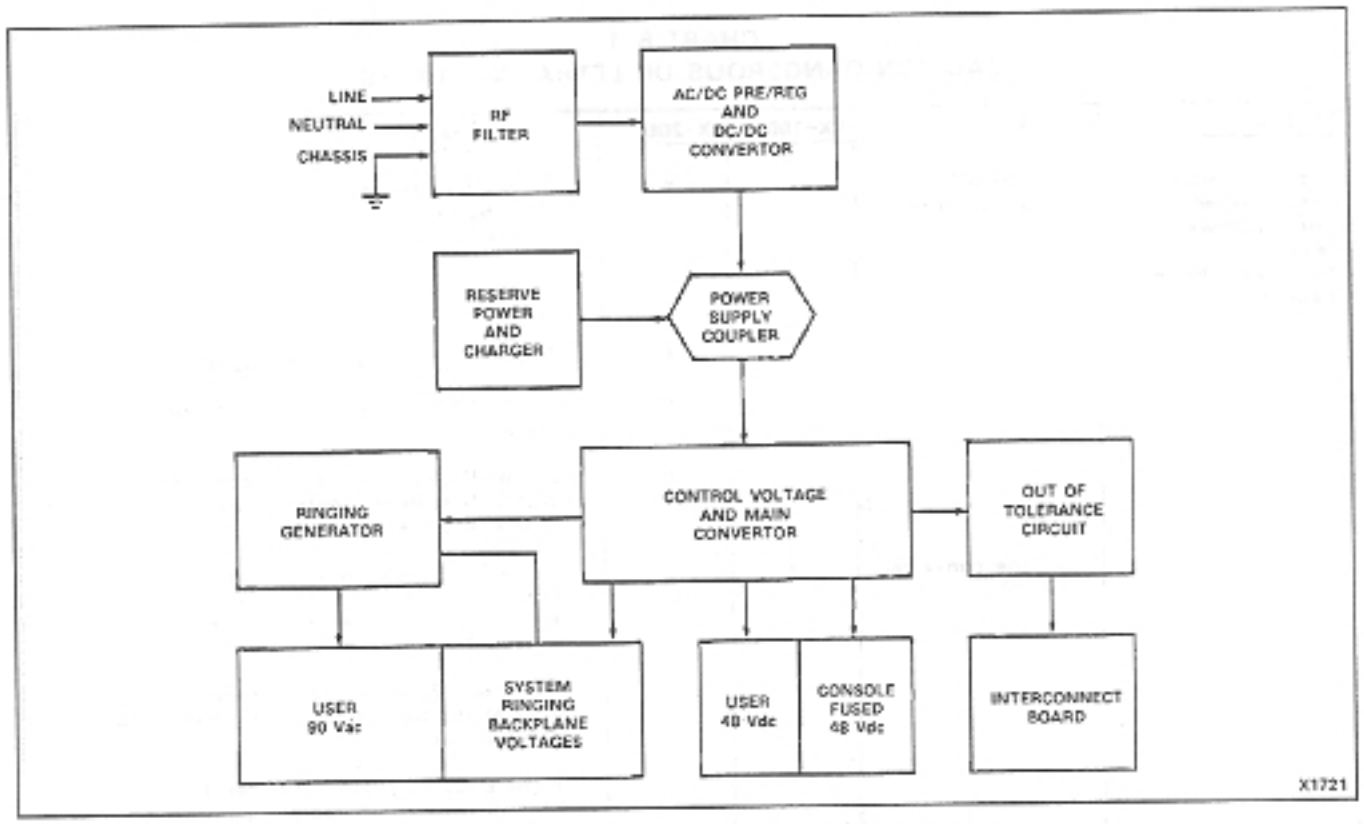


Fig. 6-7 Power Supply Block Diagram

CHART 6-1
CAUTION DANGEROUS OR LETHAL VOLTAGES

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 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
			X	Check the AC power at the commercial source with a suitable AC meter or by plugging another device into the outlet
	2. Is the converter LED lit?	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. If it is in the ON position, the LED beside it will be 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
	3. Is the maintenance panel LED (power on) lit?	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
		X	X	Check backplane voltages as per MAP350-603
	4. Replace SX-100 power supply MAP350-403	X		
	5. Replace Heat Sink assembly MAP350-506		X	
	Replace SX-200 power supply MAP350-507		X	

CHART 6-2

Trouble	Check	SX-100	SX-200	Action
System power on but no LED's 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 the master transfer switch on the maintenance panel are 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 6
		X	X	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 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 MAP350-512 SX-200 MAP350-403 SX-100	X	X	

CHART 6-4

Trouble	Check	SX-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 6

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	SX-200	Action
Call cannot be made within the system	Is the system in PFT?	X	X	Go to System Power test Appendix 6

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 6

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 Fig. 6-2 and 6-3?	X	X	Make connections as shown in Fig. 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 MAP350-604 SX-200 MAP350-606 SX-100
	5. Are the batteries less than 4 years old?	X	X	Replace batteries as per MITL9105/9110-096-200-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 MITL 9105/9110-096-105-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 at maintenance centers to remotely access systems installed at a customer's premises. These personnel may obtain maintenance information or cause programming changes. The System provides a means of rapidly identifying potential PABX problem areas and allows programming changes to be done without the necessity of visiting the user's premises.

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 SX-100 or SX-200 hardware with a Generic 290 or 291 RMAT PROM, and includes a Remote Control - Central (RCC) card and a standard operating console.

(b) A Remote Control - PABX (RCP) card installed in slot 16 of Shelf Unit 1 of each SX-100 or SX-200 PABX.

(c) The interconnecting facilities between the RMAT Controller and the RCP-installed PABX's. This communications, link is in most cases provided by the public switched network, with the RMAT Controller dialing up the required PABX. Access to each PABX may be provided by dialing a dedicated number (trunk), or by dialing the listed directory number for the PABX. A user defined security code within each PABX 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 PABX then has a single attendant console. If, however, a second attendant 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 attendant consoles when both are idle
- separate console configuration in a tenant installation is not possible

7.03 Once the RCP card has been accessed the RMAT Controller can perform the following functions at the PABX:

(a) Duplication by the RMAT Console operator of the PABX normal attendant 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 PABX including extended programming for Multi-Digit Toll Control purposes.

(c) Detection of alarm conditions at the PABX and the ability to clear alarms, to busy out lines and trunks and perform reset and PABX disable conditions.

(d) If the RCP is connected as a PABX extension the PABX attendant, or any other PABX extension, has the facility of originating a RMAT call to the RMAT Controller. In addition, if the RCP extension has the COS option "Flash for Attendant" enabled, the RMAT operator can reenter into speech mode with the PABX attendant 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 PABX 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 diagnostics registers for its own or for the remote PABX RCP Card.

7.04 For further information see Section MITL9105/9110-98-101 and 9105/9110-98-301.

APPENDIX 1

MITEL ACTION PROCEDURES

GENERAL

A1.01 Task-oriented functions in this Appendix are implemented using MITEL Action Procedures (MAP's). Also there is a brief discussion of tools and safety practices.

A1.02 A MAP is a step-by-step procedure using a flow chart principle, written and illustrated where necessary to a level of detail that allows both experienced and inexperienced personnel to carry out the tasks detailed. A MAP contains 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 (nA) (level two).

A1.03 A typical example of a MAP is shown in Fig. A1-1, with the two levels detailed.

MAP SYMBOLS

A1.04 There are four basic symbol shapes which may be used in a MAP, and are defined as follows.

A1.05 **AND Block:** Used to indicate a level one step that must be performed. Consists of a square with the word AND centered in the block.

A1.06 **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.

A1.07 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.

A1.08 **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.

A1.09 **START/FINISH/JUMP TO Block:** Used to indicate the start and 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)". The symbol is a rectangle with semicircular ends. Text is centered in the symbol.

THE OPERATOR'S USE OF MAP'S

Experienced Operator

A1.10 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 Fig. A1-1 as an example, the experienced operator would proceed as follows.

A1.11 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).

A1.12 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.

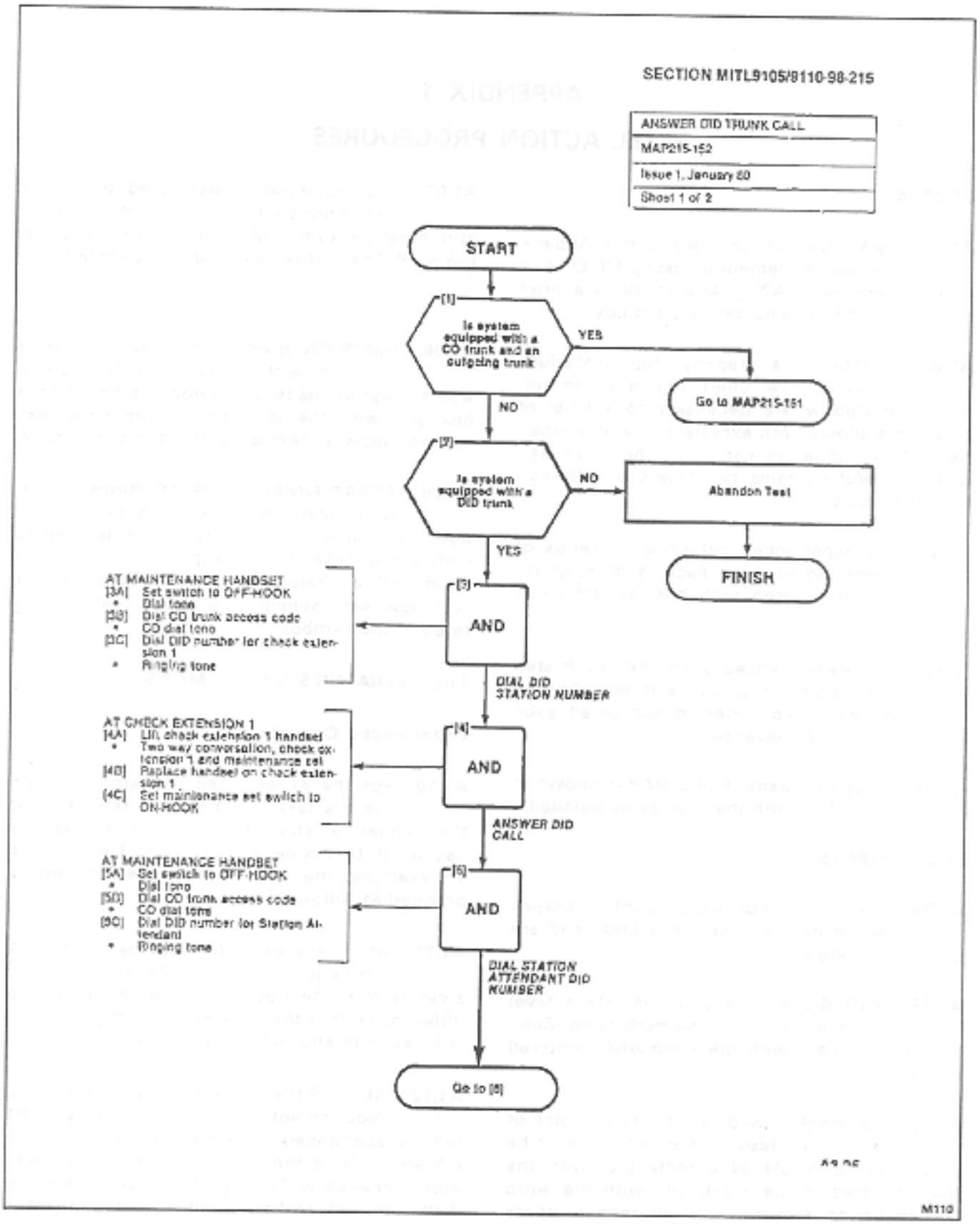


Fig. A1-1 Typical MAP Page

A1.13 The description of the instructions carried out in A1.05 and A1.06 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

A1.14 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.

A1.15 Using Fig. A1-1 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, decision then step and substep paths in the example shown.

TOOLS, TEST EQUIPMENT AND SPECIAL INSTRUCTIONS

A1.16 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.

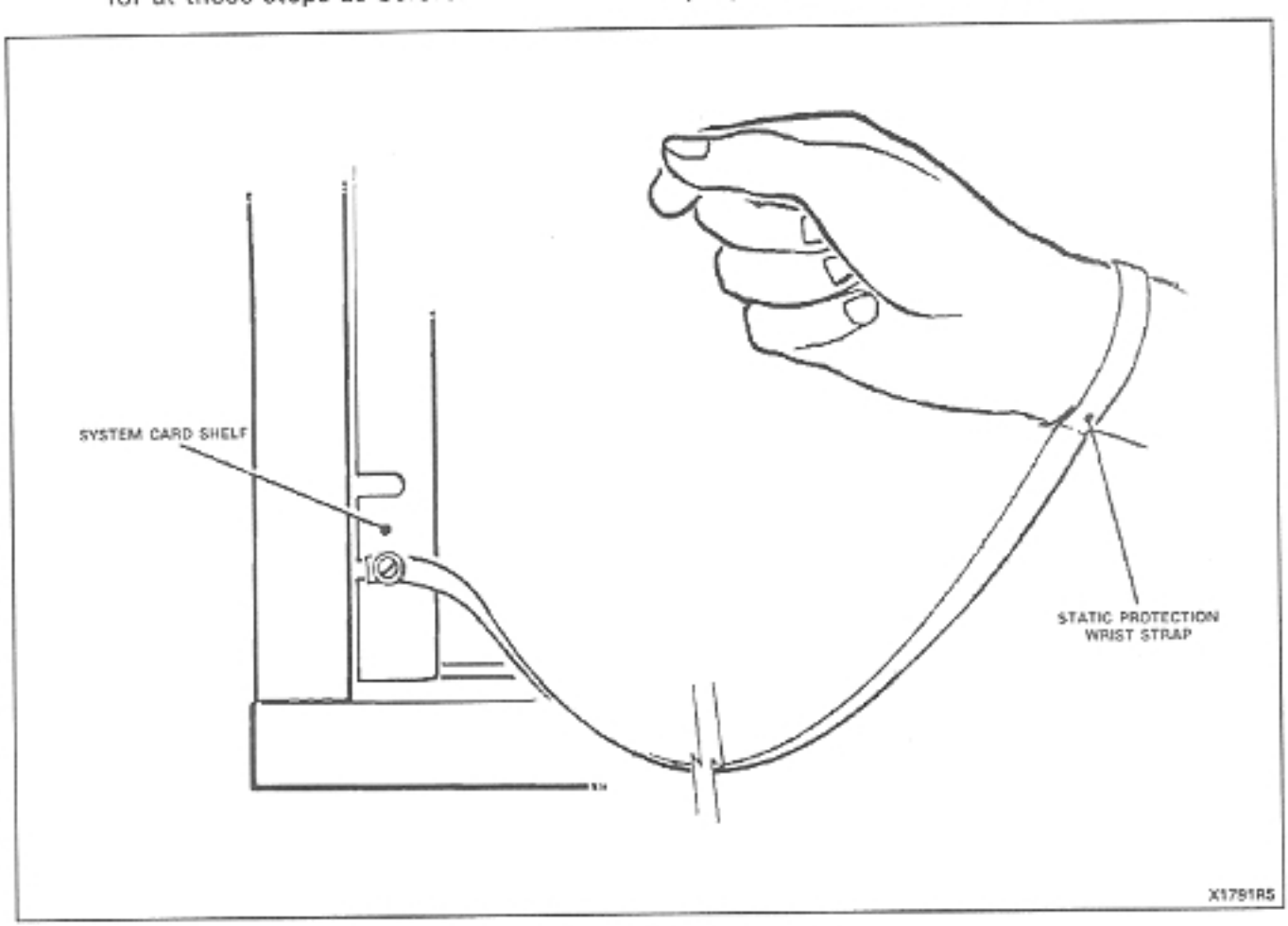


Fig. A1-2 Static Protection

A1.17

Caution: Is necessary, during installation and maintenance of the PABX 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 (Fig. A1-2).

APPENDIX 2
SYSTEM OVERVIEW

GENERAL

A2.01 The SX-100 and SX-200 are advanced electronic PABX's employing digitally controlled solid-state, space-division switching with stored program control. The capacities of the PABX's are as 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 Fig. A2-1.

Compatibility

A2.02 The systems are compatible with:

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

PHYSICAL OVERVIEW

A2.03 SX-100 Cabinet (Basic Version) is of metal construction and has the following dimensions: height 16.62 in. (422 mm), width 25 in. (635 mm), and depth 18.5 in. (470 mm). The weight of a fully equipped PABX is approximately 70 lb (31.8 kg).

A2.04 The SX-100 Primary Power Supply is mounted to the right of the equipment shelf (total weight 15 lb (6.75 kg)) 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.

A2.05 The SX-200 Equipment Cabinet is of metal construction and has the following dimensions: height 38 in. (965 mm), width 23.5 in. (600 mm), and depth 27.5 in. (700 mm). The weight of a fully equipped PABX is approximately 290 lb (131.7 kg).

A2.06 The SX-200 Primary Power Supply is mounted directly on the cabinet back panel, (total weight 70 lb (31.8 kg)) 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.

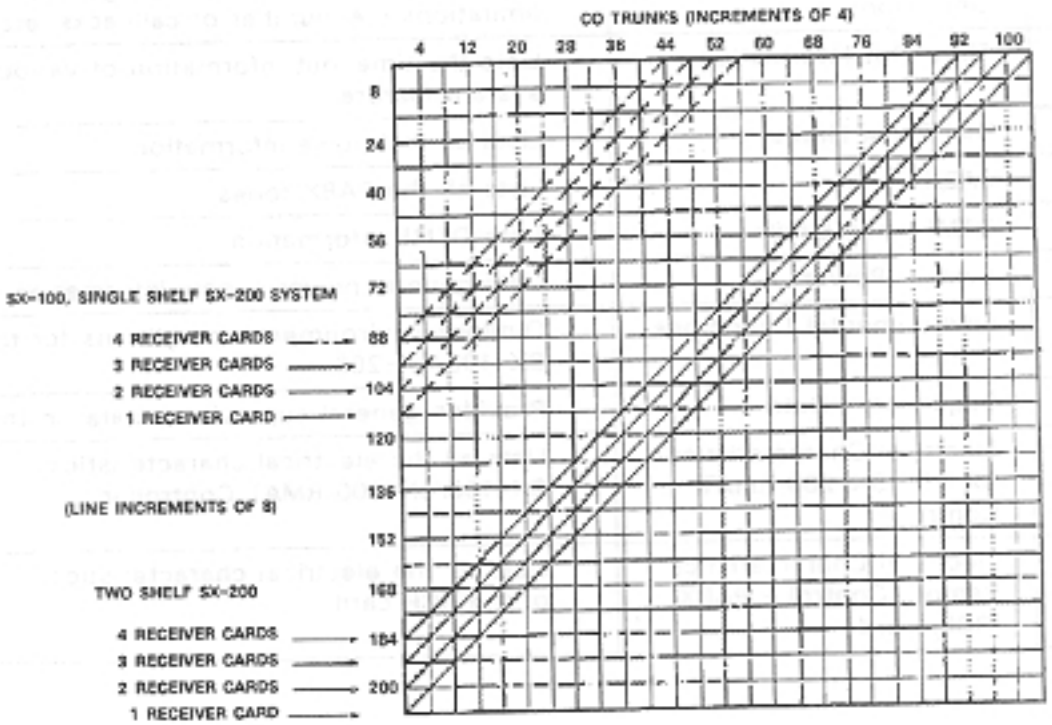
A2.07 The SX-100/SX-200 Equipment Shelf holds up to 22 printed circuit cards which plug into the shelf backplane. On the rear of the backplane are a number of Amphenol type plugs providing interconnections between the shelves and external equipment. In addition to the plugs are a number of screw-down terminals, allowing shelf connections to the primary power supply unit. The equipment shelves measure 10.75 in. (273 mm) high, 19 in. (480 mm) wide, 15.375 in. (415 mm) deep and weigh approximately 27 lb (12.3 kg) 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.

A2.08 The Reserve Power Supply in the PABX's 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 68°F (20°C). A separate temperature-compensated charging unit maintains the correct battery voltage level. The SX-200 reserve battery power supply measures 7 in. (178 mm) high, 19 in. (483 mm) wide, 15 in. (381 mm) deep and weighs 110 lb (43 kg). The SX-100 reserve battery power supply measures 8.2 in. (200.9 mm) high, 25.0 in. (635 mm) wide, 18.5 in. (40 mm) deep, and weighs 125 lb. The SX-100/SX-200 charging unit measures 5 in. (127 mm) wide, 7 in. (178 mm) high, 14 in. (355 mm) deep and weighs 14 lb (6.4 kg).

A2.09 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 Fig. 3-1 and described in the following paragraphs. The overall dimensions of the console housing are 14.40 in. (366 mm) wide, 9.40 in. (239 mm) deep and 6.30 in. (160 mm) high.

A2.10 Table A2-1 lists all the tables that comprise the remainder of this Appendix.



NOTES: LINES – 1 PORT REQUIRED PER LINE

TRUNKS – 2 PORTS/CO TRUNK
4 PORTS/E&M, TIE TRUNK
4 PORTS/DID, TIE TRUNK

RECEIVERS 2 RECEIVER CIRCUITS/DUAL RECEIVER CARD
4 RECEIVER CIRCUITS/QUAD RECEIVER CARD

X02R4

Fig. A2-1 Maximum Line and Trunk Configuration

TABLE A2-1
TABLES

TABLE NUMBER	TABLE NAME	DESCRIPTION
A2-2	Generic 217 Features and Services	System feature availability as per Generic level
A2-3	SX-100/SX-200 Electrical Characteristics	Lists general electrical characteristics of the SX-100/SX-200
A2-4	System Feature Limitations	Describes the SX-100/SX-200 general limitations (i.e. number of callbacks, etc.)
A2-5	Time-Out Information	Lists the time-out information of various system features
A2-6	Dial Pulse Limits	Lists all dial pulse information
A2-7	PABX Tones	Lists all the PABX tones
A2-8	DTMF Tone Limits	Lists DTMF information
A2-9	System Power	Lists general power supply information
A2-10	Environmental Conditions	Outlines environmental conditions for the SX-100/SX-200
A2-11	Supervisory Data	Provides general supervisory data on the PABX
A2-12	Electrical Characteristics SX-100/SX-200 RMAT Controller	Lists all the electrical characteristics SX-100/SX-200 RMAT Controller
A2-13	Electrical Characteristics Remote Control - PABX (RCP) Card	Lists all the electrical characteristics of the RCP card

TABLE A2-2
GENERIC 217 SYSTEM FEATURES AND SERVICES

R1

- Attendant-Called Number Display
- Attendant Calling Number Display
- Attendant Calls Waiting Indicator
- Attendant Camp-On with Indication
- Attendant CCSA Access
- Attendant Class-of-Service Display
- Attendant CO Trunk - CO Trunk Connect Enable
- Attendant Console Emergency Transfer
- Attendant Console Flash
- Attendant Console Ringer Codes
- Attendant-Controlled Conference
- Attendant Date Display
- Attendant DISA Code Setup Enable
- Attendant Function
- Attendant Hold Circuits
- Attendant Individual Trunk Access
- Attendant Jacks
- Attendant Lamp Test
- Attendant Lockout
- Attendant Non-CO Trunk - Non-CO Trunk Connect Enable
- Attendant Secrecy
- Attendant Serial Call
- Attendant Station Busy Out
- Attendant Time Display
- Attendant Time Recall
- Attendant Trunk Busy Out
- Automatic Callback Busy - (Extensions)
- Automatic Callback - Don't Answer
- Automatic Route Selection
- Automatic Station Release
- Automatic Wake-Up (Alarm Call)
- Both Button Enable
- Both Mode Standard
- Broker's Call
- Busy Lamp Field
- Busy Trunk Release
- Busy Verification
- Call Blocking
- Callback Button
- Call Forwarding - Busy (Extensions)
- Call Forwarding - Busy/Don't Answer
- Call Forwarding (System - DID, CCSA, Dial-In Tie Trunks)
- Call Forwarding - Busy/Don't Answer (System - DID, CCSA, Dial-In Tie Trunks)
- Call Forwarding - Don't Answer (Extensions)
- Call Forwarding - Follow Me
- Call Forwarding System Inhibit
- Call Hold
- Call Park
- Call Retrieve (Extensions)
- Call Selection
- Camp-On
- Can Flash if Talking to an Incoming Trunk
- Can Flash if Talking to an Outgoing Trunk
- Can Flash if Talking to an Extension
- Cannot Dial a Trunk After Flashing
- Cannot Dial a Trunk After Flashing if Holding or in Conference with a Trunk
- CCSA
- Class of Service (COS)
- Common Alerting Devices (Night Bells)
- Console-less Operation
- Contact Monitor
- Control of Trunk Group Access
- Controlled Outgoing Restriction Setup
- Controlled Station Restriction (Do Not Disturb)

TABLE A2-2 (CONT'D)
GENERIC 217 SYSTEM FEATURES AND SERVICES

- CO Trunk Via Attendant Inhibit
- Customer-Controlled Programming
- Customer Data Dump/Load
- Customer Data Print
- Data Demultiplexer
- Data Security
- Diagnostics
- Dial Access to the Attendant
- Dial Call Pickup
- Dial Pulse Signaling
- DID/Dial-In/CCSA Vacant/Illegal Access Intercept to Attendant
- DID to Non-CO Trunks via Attendant Inhibit
- Direct-In Lines
- Direct Inward Dial (DID) Trunks
- Direct Inward System Access (DISA)
- Direct Outward Dialing
- Direct Trunk Access
- Directed Call Pickup
- Discriminating Dial Tone
- Discriminating Ringing
- Do Not Disturb
- Do Not Disturb Display
- Do Not Overflow (Trunks)
- DTMF to Rotary Dial Conversion (Tone-to-Pulse Conversion)
- Earth Ground Button
- Enable Non-CO Trunk - Trunk Connecting by Extension
- End of Dial Signal or Outgoing Trunks
- Executive Busy Override (Extensions)
- External Call Forwarding
- Feature Access
- First Digit Toll Deny
- Fixed Night Service
- Flash Disable
- Flash for Attendant
- Flexible Night Service
- Flexible Numbering Plan
- Guest Room Button
- Hands-Free Operation
- Hands-Free Operation SUPERSET 4
- Hold Pickup
- Hunting
- Identified Trunk Groups
- Illegal Access Intercept to Attendant
- Immediate Ring
- Incoming Trunk Call Rotary Only
- Individual Trunk Access
- Inhibit Automatic Supervision
- Limited Wait for Dial Tone
- Line Lockout
- Listed Directory Numbers (LDN)
- Lockout Alarm
- Maid In Room
- Manual Line
- Meet-Me Conference
- Message Registration
- Message Register Audit
- Message Waiting
- Message Waiting Display
- Message Waiting Print
- Minor Alarm Contact - see Contact Monitor
- Mixed Station Dialing
- Multi-Console Operation
- Multi-Digit Toll Control
- Multiple Extensions
- Multiple Trunk Groups with Overflow
- Music on Hold
- Music on Hold Disable
- Never a Consultee
- Never a Forwardee
- New Call Tone
- Night Bells - see Common Alerting Devices
- Night Service Automatic Switching
- No Dial Tone
- Non-CO Trunk Via Attendant Inhibit
- Originate Only
- Outgoing Trunk Callback
- Outgoing Trunk Camp-On
- Page Button
- Paging Access (Extensions)
- Pickup Groups
- Power Failure Transfer
- Power Supply Requirements

TABLE A2-2 (CONT'D)
GENERIC 217 SYSTEM FEATURES AND SERVICES

- Printer and Recording Devices
- Printer Transmit Additional Nulls
- Printouts Extra Line Feeds (Hotel/Motel Only)
- Programming Security
- Range Programming
- Receive Only
- Receiver – Busy Out
- Receiver Direct Selection
- Remote Maintenance Administration and Test System (RMATS)
- Remote System Reset – Protection Override
- Reserve Power Supply
- Reset the System
- Ringing Timeout 1 Minute
- Room Status Audit
- Room Status Update
- Serial Call Override Flash Button Enable
- Single Digit Dialing
- SMDR – see Station Message Detail Recording
- Speech Path – Busy Out
- Speech Path – Direct Selection
- Speed Call
- Station Conference
- Station Message Detail Recording
- Station Override Security
- Station Transfer Consultation Hold/Add-On
- Station Transfer Security
- SUPERSET 4
- SUPERSET 4 Disconnect Alarm
- SUPERSET 4 Immediate Line Selection
- SUPERSET 4 Last Number Redial
- SUPERSET 4 Sub-Attendant
- Switchhook Flash Timer
- System Identifier
- Tandeming – see Tie Trunks
- Test Line
- Through Dialing
- Tie Trunks
- Timed Automatic Answer Supervision
- Toll Restriction
- Toll Reversal
- Traffic Measurement
- Transfer Dial Tone
- Transfer with Privacy
- Trunk Answer From Any Station (TAFAS) Available During the Day
- Trunk Answer From Any Station (TAFAS) (Night Service)
- Trunk Busy Out Enable
- Trunk Groups
- Trunk Groups Hunting
- Trunk Recall Partial Inhibit
- Trunk-to-Trunk (Attendant)
- Trunk-to-Trunk (Extensions)
- Vacant Number Intercept to the Attendant
- Variable Timers

TABLE A2-3
SX-100/SX-200 ELECTRICAL CHARACTERISTICS

SUPERSET 4 loop limit	200 ohms
Station Loop Limit	1200 ohms including set
Maximum Number of Ringers per Line	5
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	490/620 Hz, interrupted at 60 ipm
Special Busy Tone	350/440 Hz interrupted at 60 ips
Standard Ringback Tone	440/490 Hz, 1 s on, 3 s off
Special Ringback Tone	440/490 Hz, 0.5 s on, 0.5 s off, 0.5 s on, 2.5 s off
Callback	6 rings of standard ringing
Reorder Tone	490/620 Hz, interrupted at 120 ipm
Conference Tone	440 Hz, 1 burst of 1 s
Camp-On Tone	440 Hz, 1 or 2 bursts of 200 ms
Override Tone	440 Hz, 1 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 μs 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	1000 ft. (300 m) 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's	64

TABLE A2-4
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 of 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 LDN's that can be identified at the attendant console = 4.
Maximum number of simultaneously ringing Wake-Ups = 10.
Maximum number of tenants = 4; 2 with consoles.
PABX 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 A2-5
TIME-OUT INFORMATION

Attendant-Timed Recall (Don't Answer)	10 s, 20 s, 30 s, or 40 s
Attendant-Timed Recall (Camp-On)	20 s, 30 s, 40 s
Attendant-Timed Recall (Hold)	20 s, 30 s, or 40 s
Automatic Night Switching	20 s, 30 s, or 40 s
Automatic Wake-Up Ringing	6 rings
Dial Tone Time-Out	15 s
Interdigit Time-Out	15 s lines, 10 s trunks
Lockout Time-Out	45 s
Callback Clear Time-Out	8 hours
Callback Don't Answer Reset	6 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 A2-6
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 A2-7
PABX TONES

Dial Tone	350/440 Hz, continuous, -13 dBm
Transfer Dial Tone	350/440 Hz, 3 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	350/440 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, 1 burst of 200 ms, -16 dBm
Override Tone	440 Hz, 1 burst of 800 ms followed by a 200 ms burst every 6 s, -16 dBm
Attendant 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 Dialling 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 A2-8
DTMF TONE LIMITS

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

Frequency deviation: ±1%
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)

Note: 1. Tolerance of call progress tone levels is ± 1 1.5 dBm.
2. Individual tones of any compound tone are within 1 dB of each other.
3. Tolerance of individual tones are ± 1% of the frequency stated.

TABLE A2-9
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 dBrnc	Does not exceed 28 dBrnc
Reserve Battery Supply		
Voltage Range Holdover Time Battery Life Time	48.3 V to 52 V 2 hours minimum 4 to 6 yrs	48.3 V to 52 V 2 hours minimum 4 to 6 yrs
RAM/COS Battery Pack		
Holdover Time Battery Life Time	4 weeks 4 years	4 weeks 4 years
Ringing Supply		
Output Voltage Frequency	90 Vac ±10% 20 Hz ±1 Hz	90 Vac ±10% 20 Hz±1 Hz

TABLE A2-10
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 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 47.2 in. (1200 mm) 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:	The systems meet the following electrostatic discharge test. With the common equipment grounded, a voltage of 15 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. 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.
• Electromagnetic Susceptibility:	The systems are able to work in an electric field of 5 V/m without major degradation of service.
Note: For SUPERSET 4 for see Appendix 8.	

TABLE A2-11
SUPERVISORY DATA

- The PABX responds to hookswitch flashes with a duration of between 200 ms and a programmable maximum time (0.7, 0.9, 1.1 units 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 PABX connection
- Momentary open loop conditions of up to 350 ms (optional 40 ms) generated by the Central Office on outgoing PABX calls, will not release PABX calls
- PABX station hookswitch flashes will not be repeated towards the Central Office
- PABX 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
- SUPERSET 4 loop limit = 200 ohms
- Attendant Console Range. The attendant console can be remoted from the cabinet up to a maximum of 1000 ft (300 m) with 26 AWG cable
- CO Trunk Group. The PABX will operate with CO trunks up to a maximum of 1600 ohms loop resistance
- CO Trunk Seizure. The PABX nominal seizure resistance is 270 ohms at 30 mA
- CO Trunk Resistance. In the idle state the resistance towards the PABX 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 kohm for Loop
  3 kohm for E&M

TABLE A2-12
ELECTRICAL CHARACTERISTICS
SX-100/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) (NOTE 1)
NOTE 1: See Section MITL9105/9110-096-210-NA for CO Trunk Card full capabilities.	
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

TABLE A2-13
ELECTRICAL CHARACTERISTICS
REMOTE CONTROL-PABX (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 μF
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 μF
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 μs 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 P/N9110-006-000)

APPENDIX 3
SYSTEM CABLING

Cabling and Cross-Connections

General

A3.01 This Appendix details the cabling and cross-connections required when installing the SX-100 or SX-200 PABX's.

Telephone Set and Trunk Cabling

A3.02 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 Fig. A3-1(a) and (b).

Cable Terminations, SX-100

A3.03 All interconnecting cables must be terminated in accordance with Tables A3-1, A3-2 and Fig. A3-2.

Cable Terminations, SX-200

A3.04 All interconnecting cables must be terminated in accordance with Fig. A3-3 and Tables A3-1, A3-2, A3-3, and A3-4. In addition, if Shelf 2 is installed, the interconnecting cables listed in Table A3-4 must be terminated.

Cross-Connections

A3.05 Jumpers should be run using Z-type 24 AWG cross-connecting cables or equivalent.

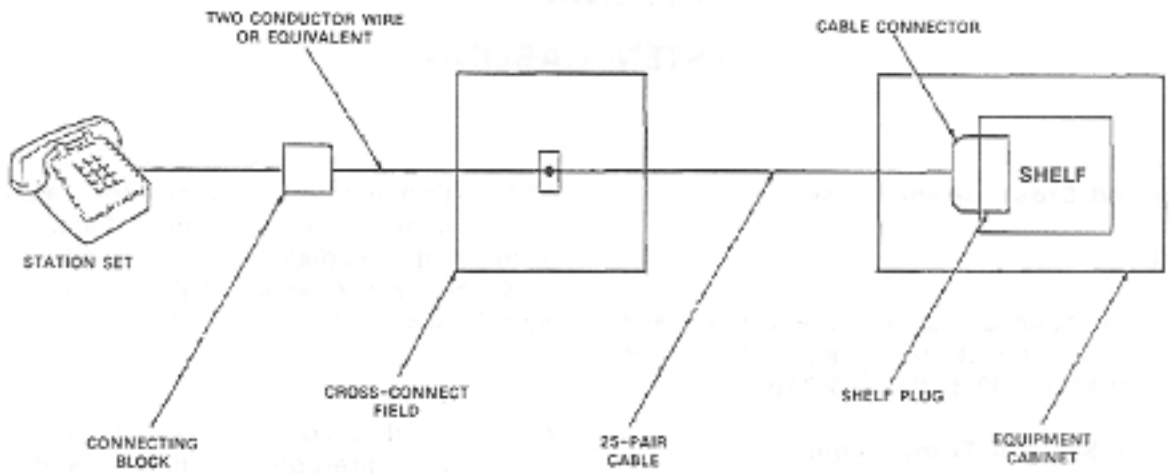
A3.06 Connection between the equipment cabinet, cross-connect field, stations, trunks and consoles should be made using 26 AWG connector ended cable in accordance with Tables A3-1 through A3-4.

A3.07 Cabling connections between Shelf 1, the interconnect board, and cross-connect field are shown in Figures A3-7 and A3-3.

A3.08 Figures A3-4 and A3-5 illustrate typical block and wiring diagrams for a power fail transfer circuit. Fig. A3-6 illustrates typical night bell wiring connections and Fig. A3-7 shows the connections for music and PA requirements.

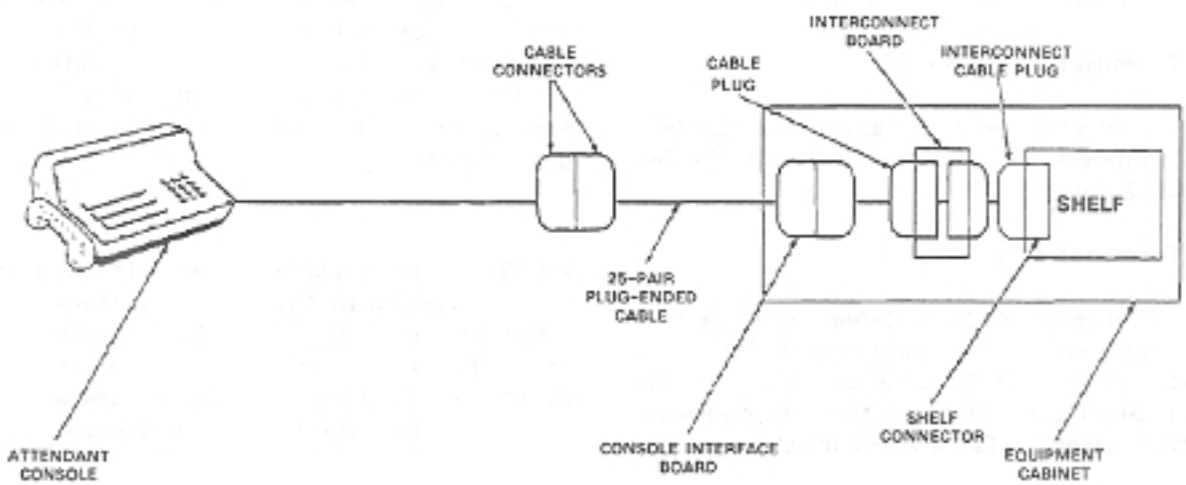
A3.09 When backplane translator boards are used with the lines and trunk circuits, different terminal connections result. In this case, the cabling arrangements must conform to the termination connections shown in Fig. A3-8 and Table A3-6 of this Appendix.

A3.10 Figures A3-9, A3-10 and A3-11 are in depth wiring explanations. These figures outline the card position in relation to a specific Amphenol type connector to the cross-connect frame.



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

(A) STATION CABLING & LIMITS



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

(B) ATTENDANT CONSOLE CABLING & LIMITS

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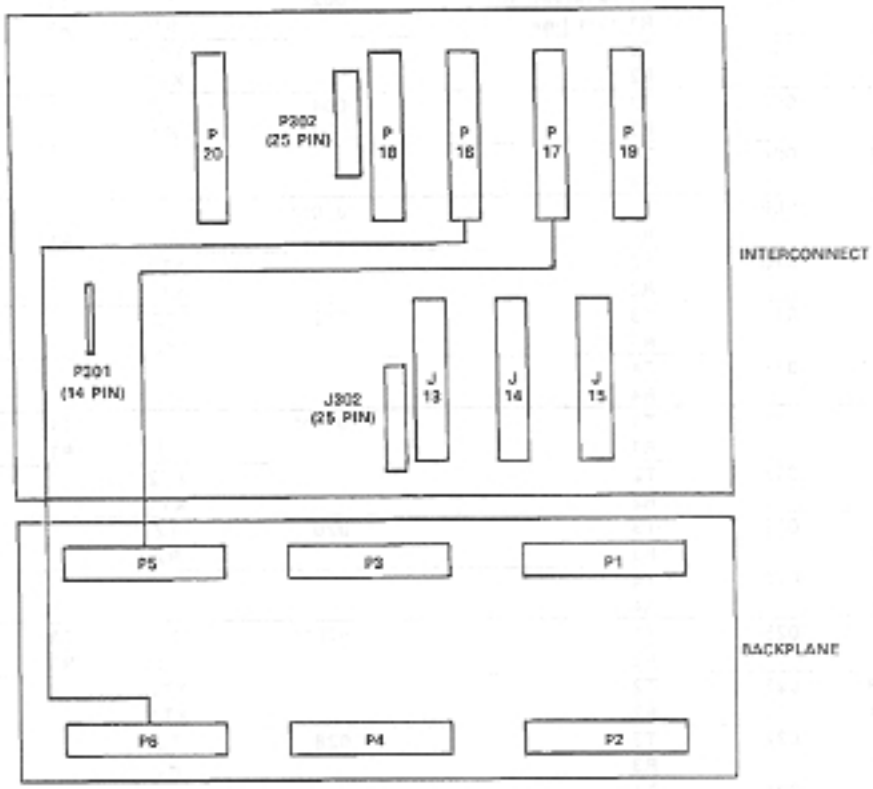
Fig. A3-1 Station and Console Cabling Requirements



BOARD	CONNECTOR NO.	DESTINATION	BOARD	CONNECTOR NO.	DESTINATION
SHELF BACKPLANE	P1	X - CONNECT	INTERCONNECT	J13	MAINTENANCE CONSOLE
	P2	X - CONNECT			
	P3	X - CONNECT		J14	ATTENDANT CONSOLE 2
	P4	X - CONNECT			
	P5	P17		J15	ATTENDANT CONSOLE 1
	P6	P16			
				P16	P6
				P17	P5
				P18	X - CONNECT
				P19	X - CONNECT
				P20	X - CONNECT
				J302	TO MODEM
				J302	LOCAL TERMINAL
				P301	MAINTENANCE PANEL

NOTE: ALL PLUGS AND CONNECTORS EXCEPT 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.

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Fig. A3-2 SX-100 Connector Locations

TABLE A3-1 SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS

PLUG P1 (Connects to Cross-Connect Field)

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

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

TABLE A3-1 SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS (CONT'D)

PLUG P2 (Connects to Cross-Connect Field)

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

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

^^ Trunk Equipment Number for 2 Trunk Card Only.

TABLE A3-1 SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS (CONT'D)

PLUG P3 (Connects to Cross-Connect Field)

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

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 for 2 Trunk Card.

TABLE A3-1 SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS (CONT'D)

PLUG P4 (Connects to Cross-Connect Field)

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

TABLE A3-1 SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS (CONT'D)

PLUG P5 (Connects to Plug P17)

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

TABLE A3-1 SHELF 1 EXTERNAL PLUG AND JACK CONNECTIONS (CONT'D)

PLUG P6 (Connects to Plug P16)

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

TABLE A3-2 INTERCONNECT BOARD PLUG AND JACK CONNECTIONS

CONNECTOR J13 MAINTENANCE CONSOLE (Connected To Maintenance Panel)

Pin	Pair Color	Lead Designation
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	0 V
18	G-Y	-48 Vdc
44	Y-BR	0 V
19	BR-Y	-48 Vdc
45	Y-S	0 V
20	S-Y	-48 Vdc
46	V-BL	0 V
21	BL-V	-48 Vdc
47	V-O	0 V
22	O-V	-48 Vdc
48	V-G	0 V
23	G-V	-48 Vdc
49	V-BR	0 V
24	BR-V	-48 Vdc
50	V-S	0 V
25	S-V	-48 Vdc

CONNECTOR J14 ATTENDANT CONSOLE NO. 2

Pin	Pair Color	Lead Designation
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	0 V
18	G-Y	-48 Vdc
44	Y-BR	0 V
19	BR-Y	-48 Vdc
45	Y-S	0 V
20	S-Y	-48 Vdc
46	V-BL	0 V
21	BL-V	-48 Vdc
47	V-O	0 V
22	O-V	-48 Vdc
48	V-G	0 V
23	G-V	-48 Vdc
49	V-BR	0 V
24	BR-V	-48 Vdc
50	V-S	0 V
25	S-V	-48 Vdc

TABLE A3-2 INTERCONNECT BOARD PLUG AND JACK CONNECTIONS (CONT'D)

CONNECTOR J15 ATTENDANT CONSOLE NO. 1

Pin	Pair Color	Lead Designation
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	0 V
18	G-Y	-48 Vdc
44	Y-BR	0 V
19	BR-Y	-48 Vdc
45	Y-S	0 V
20	S-Y	-48 Vdc
46	V-BL	0 V
21	BL-V	-48 Vdc
47	V-O	0 V
22	O-V	-48 Vdc
48	V-G	0 V
23	G-V	-48 Vdc
49	V-BR	0 V
24	BR-V	-48 Vdc
50	V-S	0 V
25	S-V	-48 Vdc

TABLE A3-2 SHELF 2 (SX-200 ONLY) EXTERNAL PLUG AND JACK CONNECTIONS

PLUG P7 (Connects to Cross-Connect Field)

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

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

TABLE A3-2 SHELF 2 (SX-200 ONLY) EXTERNAL PLUG AND JACK CONNECTIONS (CONT'D)

PLUG P8 (Connects to Cross-Connect Field)

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

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

** Trunk Equipment Number for 2 Trunk Card.

TABLE A3-2 SHELF 2 (SX-200 ONLY) EXTERNAL PLUG AND JACK CONNECTIONS (CONT'D)

PLUG P9 (Connects to Cross-Connect Field)

Pin	Pair Color	Equipment Numbers Lines	Lead Designation	Equipment Numbers Trunks	Lead Designation, CO	DID/TIE	Trunks E&M*	Card Positions
26	W-BL	209	T1	210**	T1	T1	T1	
1	BL-W		R1		R1	R1	R1	
27	W-O	210	T2		XT2		TR1	
2	O-W		R2		XT1		RR1	7
28	W-G	211	T3	212	T2		E1	
3	G-W		R3		R2		M1	
29	W-BR	212	T4					
4	BR-W		R4					
30	W-S	217	T1	218**	T1	T1	T1	
5	S-W		R1		R1	R1	R1	
31	R-BL	218	T2		XT2		TR1	
6	BL-R		R2		XT1		RR1	8
32	R-O	219	T3	220	T2		E1	
7	O-R		R3		R2		M1	
33	R-G	220	T4					
8	G-R		R4					
34	R-BR	225	T1	226**	T1	T1	T1	
9	BR-R		R1		R1	R1	R1	
35	R-S	226	T2		XT2		TR1	
10	S-R		R2		XT1		RR1	
36	BK-BL	227	T3	228	T2		E1	9
11	BL-BK		R3		R2		M1	
37	BK-O	228	T4					
12	O-BK		R4					
38	BK-G	233	T1	234**	T1	T1	T1	
13	G-BK		R1		R1	R1	R1	
39	BK-BR	234	T2		XT2		TR1	
14	BR-BK		R2		XT1		RR1	
40	BK-S	235	T3	236	T2		E1	10
15	S-BK		R3		R2		M1	
41	Y-BL	236	T4					
16	BL-Y		R4					
42	Y-O	241	T1	242**	T1	T1	T1	
17	O-Y		R1		R1	R1	R1	
43	Y-G	242	T2		XT2		TR1	
18	G-Y		R2		XT1		RR1	
44	Y-BR	243	T3	244	T2		E1	11
19	BR-Y		R3		R2		M1	
45	Y-S	244	T4					
20	S-Y		R4					
46	V-BL	249	T1	250**	T1	T1	T1	
21	BL-V		R1		R1	R1	R1	
47	V-O	250	T2		XT2		TR1	
22	O-V		R2		XT1		RR1	
48	V-G	251	T3	252	T2		E1	12
23	G-V		R3		R2		M1	
49	V-BR	252	T4					
24	BR-V		R4					
50	V-S		SPARE		SPARE			
25	S-V		SPARE		SPARE			

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

TABLE A3-2 SHELF 2 (SX-200 ONLY) EXTERNAL PLUG AND JACK CONNECTIONS (CONT'D)

PLUG P10 (Connects to Cross-Connect Field)

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

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

** Trunk Equipment Number for 2 Trunk Card.

TABLE A3-2 INTERCONNECT BOARD PLUG AND JACK CONNECTION (CONT'D)

PLUG P18 (Miscellaneous Connections to Cross-Connect Field)

Pin	Pair Color	Lead Designation
26	W-BL	RMATS TIP
1	BL-W	RMATS RING
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
7	O-R	SPARE
33	R-G	SPARE
8	G-R	SPARE
34	R-BR	SPARE
9	BR-R	SPARE
35	R-S	SPARE
10	S-R	SPARE
36	BK-BL	SPARE
11	BL-BK	SPARE
37	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

Note:

(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

TABLE A3-2 PLUG AND JACK CONNECTIONS TO INTERCONNECT BOARD (CONT'D)

PLUG P19 On Interconnect Card PN9110-02A
(Miscellaneous Connections to Cross-Connect Field)

Pin	Pair Color	Lead Line Designation	Lead Designation, CO	DID/TIE	Trunks E&M*	Card Positions
26	W-BL	SPARE				
1	BL-W	SPARE				
27	W-O					
2	O-W					
28	W-G					15
3	G-W	RECEIVER 1				
29	W-BR					
4	BR-W					
30	W-S					
5	S-W					
31	R-BL	T8				
6	BL-R	R8				
32	R-O	T7	T4		E2	
7	O-R	R7	R4		M2	14
33	R-G	T6	XT3		TR2	
8	G-R	R6	XT4		RR2	
34	R-BR	T5	T3	T2	T2	
9	BR-R	R5	R3	R2	R2	
35	R-S	T8				
10	S-R	R8				
36	BK-BL	T7	T4		E2	
11	BL-BK	R7	R4		M2	13
37	BK-O	T6	XT3		TR2	
12	O-BK	R6	XT4		RR2	
38	BK-G	T5	T3	T2	T2	
13	G-BK	R5	R3	R2	R2	
39	BK-BR					
14	BR-BK					
40	BK-S					15
15	S-BK	RECEIVER 1				
41	Y-BL					
16	BL-Y					
42	Y-O					
17	O-Y					
43	Y-G	T4				
18	G-Y	R4				
44	Y-BR	T3	T2		E1	
19	BR-Y	R3	R2		M1	14
45	Y-S	T2	XT1		TR1	
20	S-Y	R2	XT2		RR1	
46	V-BL	T1	T1	T1	T1	
21	BL-V	R1	R1	R1	R1	
47	V-O	T4				
22	O-V	R4				
48	V-G	T3	T2		E1	
23	G-V	R3	R2		M1	
49	V-BR	T2	XT2		TR1	13
24	BR-V	R2	XT1		RR1	
50	V-S	T1	T1	T1	T1	
25	S-V	R1	R1	R1	R1	

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

TABLE A3-2 INTERCONNECT BOARD PLUG AND JACK CONNECTIONS (CONT'D)

CONNECTOR J302
DATA PORT (SEE NOTES)

Pin	Lead Designation
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	

Note 1. Connector J302 is common to the SX-100 and SX-200 PABX.
2. See Section MITL9105/9110-096-450-NA, Traffic Measurement, for applications of the connectors.

TABLE A3-3 POWER FAIL TRANSFER BOARD PLUG AND JACK CONNECTIONS

PLUG P20
(Power Fail Transfer Connections to Cross-Connect Field)

Pin	Pair Color	Lead Designation
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

PLUG P21
(Power Fail Transfer Connections to Cross-Connect Field)

Pin	Pair Color	Lead Designation
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
33	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 SX-100 equipment.

TABLE A3-4 CONSOLE INTERFACE BOARD PLUG AND JACK CONNECTIONS (SX-200 ONLY)

JACK J22
Connects to Attendant Console 1)

Pin	Pair Color	Lead Designation
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	0 V
18	G-Y	-48 Vdc
44	Y-BR	0 V
19	BR-Y	-48 Vdc
45	Y-S	0 V
20	S-Y	-48 Vdc
46	V-BL	0 V
21	BL-V	-48 Vdc
47	V-O	0 V
22	O-V	-48 Vdc
48	V-G	0 V
23	G-V	-48 Vdc
49	V-BR	0 V
24	BR-V	-48 Vdc
50	V-S	0 V
25	S-V	-48 Vdc

PLUG P23
(Connects to Jack J15)

Pin	Pair Color	Lead Designation
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	0 V
18	G-Y	-48 Vdc
44	Y-BR	0 V
19	BR-Y	-48 Vdc
45	Y-S	0 V
20	S-Y	-48 Vdc
46	V-BL	0 V
21	BL-V	-48 Vdc
47	V-O	0 V
22	O-V	-48 Vdc
48	V-G	0 V
23	G-V	-48 Vdc
49	V-BR	0 V
24	BR-V	-48 Vdc
50	V-S	0 V
25	S-V	-48 Vdc

TABLE A3-4 CONSOLE INTERFACE BOARD PLUG AND JACK CONNECTIONS (SX-200 ONLY) (CONT'D)

JACK J24
(Connects to Attendant Console 2)

Pin	Pair Color	Lead Designation
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	0 V
18	G-Y	-48 Vdc
44	Y-BR	0 V
19	BR-Y	-48 Vdc
45	Y-S	0 V
20	S-Y	-48 Vdc
46	V-BL	0 V
21	BL-V	-48 Vdc
47	V-O	0 V
22	O-V	-48 Vdc
48	V-G	0 V
23	G-V	-48 Vdc
49	V-BR	0 V
24	BR-V	-48 Vdc
50	V-S	0 V
25	S-V	-48 Vdc

PLUG P25
(Connects to Jack J14)

Pin	Pair Color	Lead Designation
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	0 V
18	G-Y	-48 Vdc
44	Y-BR	0 V
19	BR-Y	-48 Vdc
45	Y-S	0 V
20	S-Y	-48 Vdc
46	V-BL	0 V
21	BL-V	-48 Vdc
47	V-O	0 V
22	O-V	-48 Vdc
48	V-G	0 V
23	G-V	-48 Vdc
49	V-BR	0 V
24	BR-V	-48 Vdc
50	V-S	0 V
25	S-V	-48 Vdc

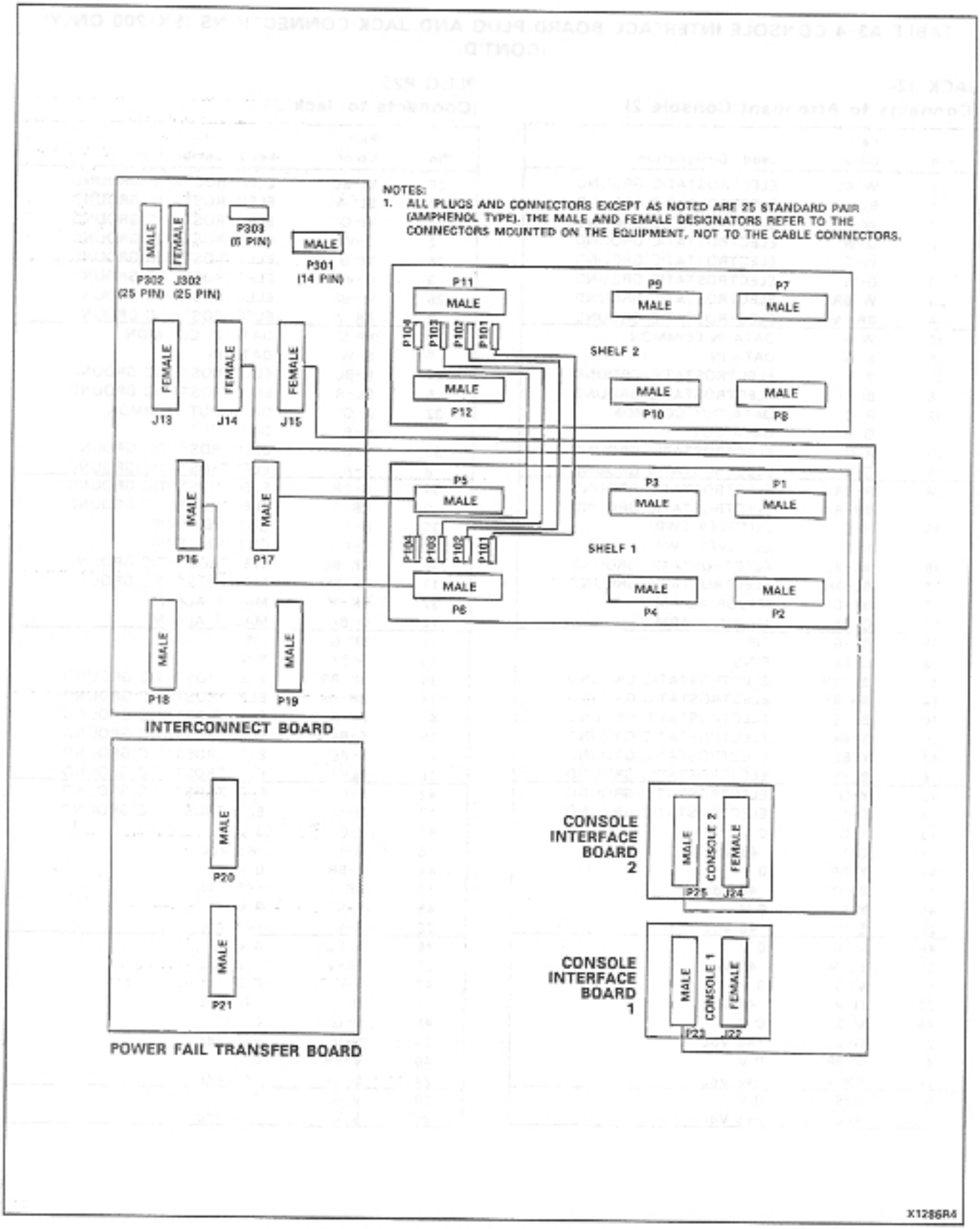


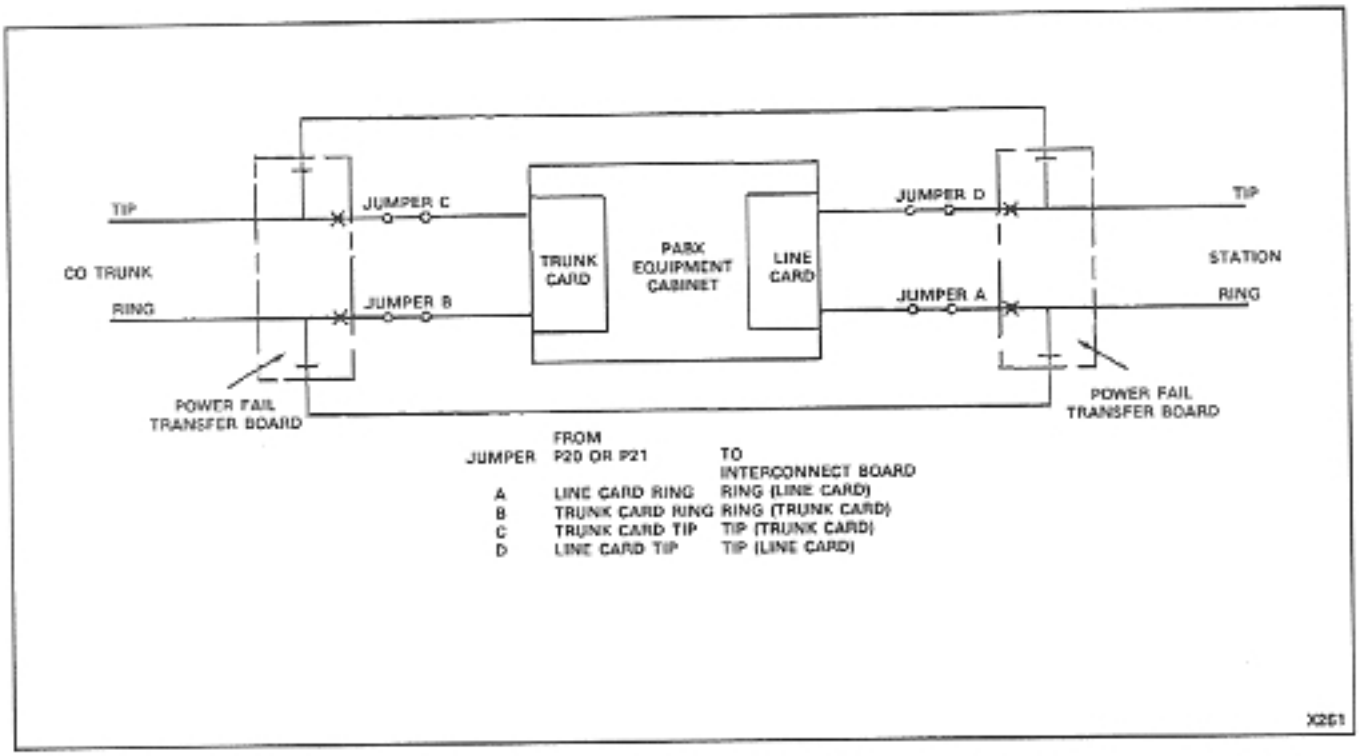
Fig. A3-3(a) SX-200 Connector Locations

CONNECTOR		
SHELF	NO.	DESTINATION
1	P1	X-CONNECT
	P2	X-CONNECT
	P3	X-CONNECT
	P4	X-CONNECT
	P5	P17
	P6	P16
2	P7	X-CONNECT
	P8	X-CONNECT
	P9	X-CONNECT
	P10	X-CONNECT
	P11	(SPECIAL
	P12	FEATURES)

CONNECTOR		
BOARD	NO.	DESTINATION
INTER-CONNECT	J13	MAINTENANCE CONSOLE
	J14	P25 (NOTE 2)
	J15	P23 (NOTE 2)
	P16	P6
	P17	P5
	P18	X-CONNECT
	P19	X-CONNECT
	P301	POWER SUPPLY
	P302	PRINTER
	J302	MODEM
	P303	MAINTENANCE PANEL
	P20	X-CONNECT
	P21	X-CONNECT

CONSOLE INTERFACE CONNECTOR		
BOARD	NO.	DESTINATION
	J22	CONSOLE 1
	P23	J15 (NOTE 2)
	J24	CONSOLE 2
	P25	J14 (NOTE 2)

Fig. A3-3(b) SX-200 Connector Locations



JUMPER	FROM P20 OR P21	TO INTERCONNECT BOARD
A	LINE CARD RING	RING (LINE CARD)
B	TRUNK CARD RING	RING (TRUNK CARD)
C	TRUNK CARD TIP	TIP (TRUNK CARD)
D	LINE CARD TIP	TIP (LINE CARD)

Fig. A3-4 Power Fail Transfer Block Diagram

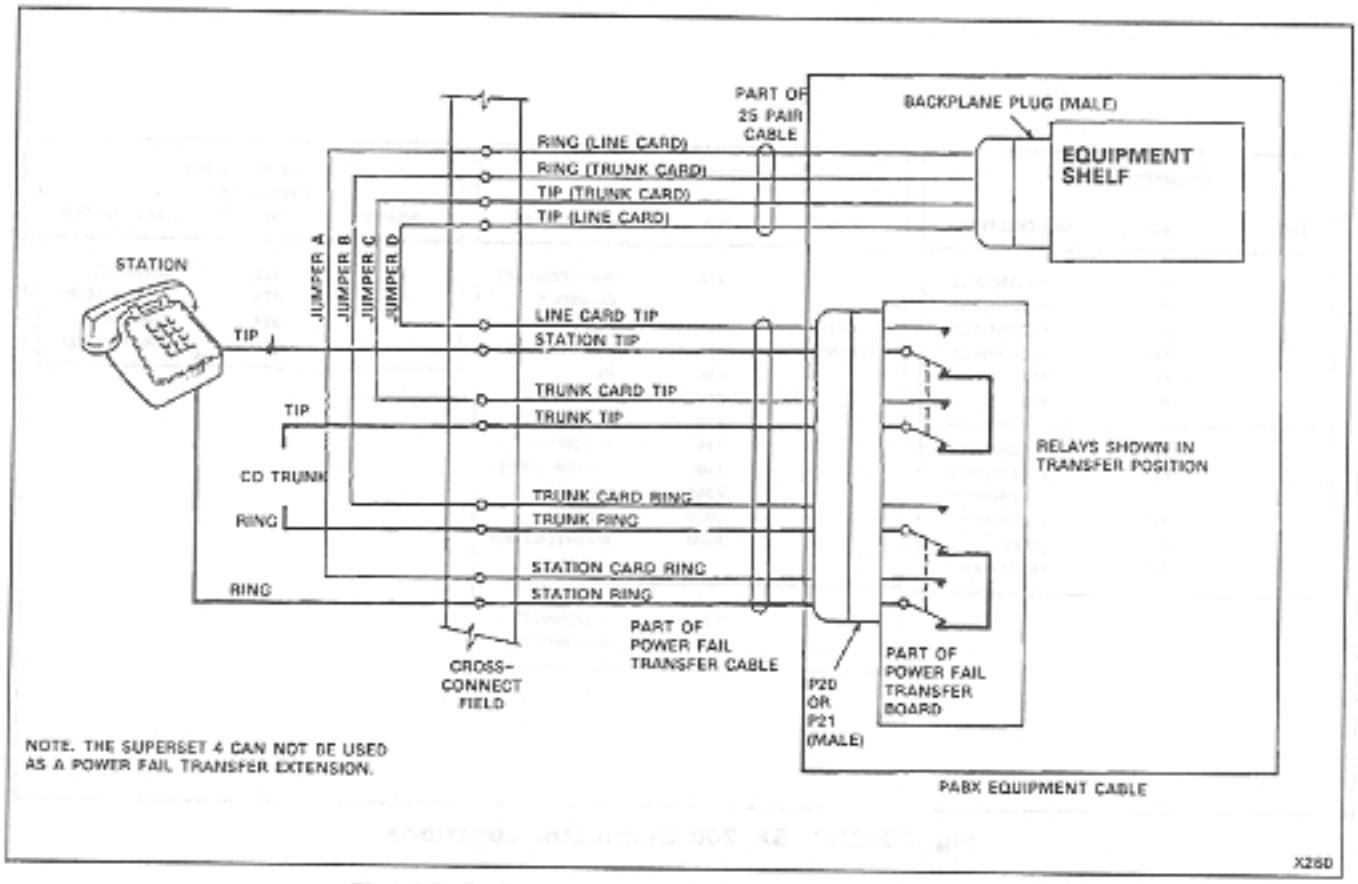
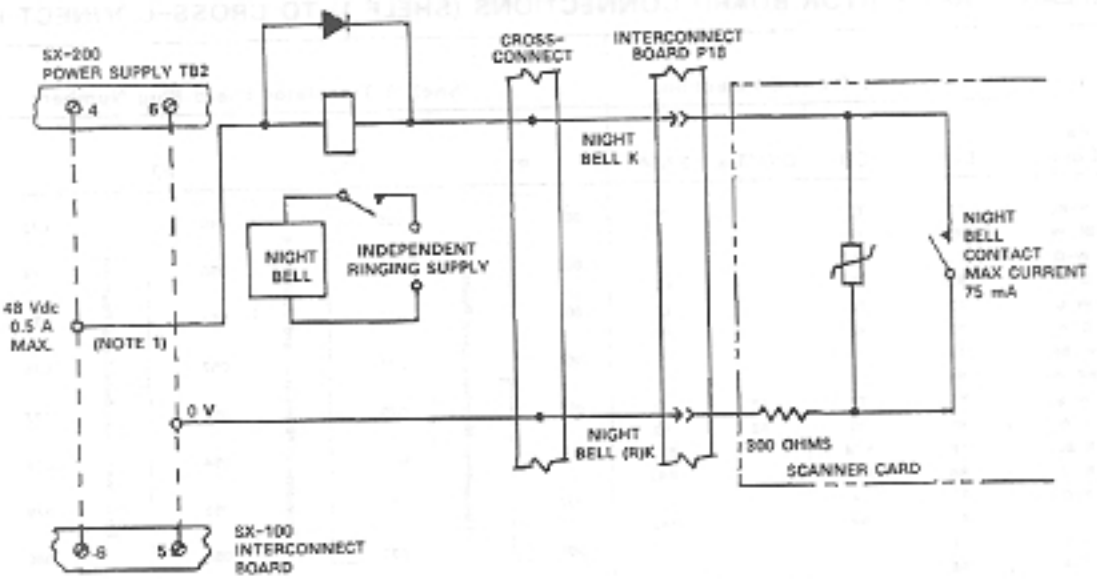
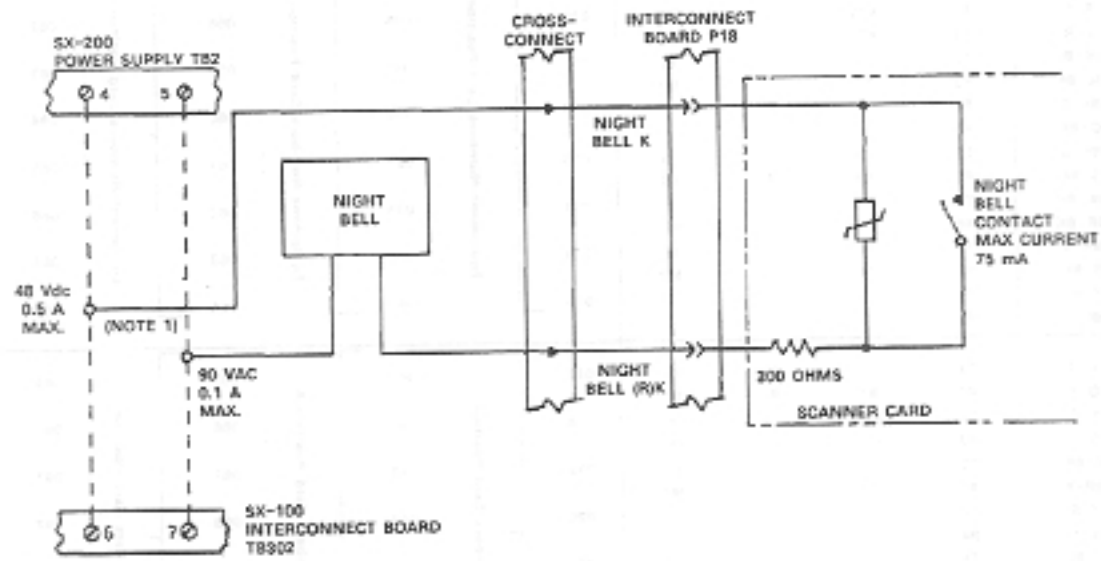


Fig. A3-5 Power Fail Transfer Wiring Diagram

NIGHT BELL CONNECTION AUXILLIARY RELAY



NIGHT BELL RELAY DIRECT



INTERCONNECT BOARD PLUG P1B							
PIN	DESTINATION	PIN	DESTINATION	PIN	DESTINATION	PIN	DESTINATION
46	NIGHT BELL 1 (K1)	44	NIGHT BELL 2 (K2)	50	NIGHT BELL 3 (K3)	48	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)

NOTE 1: THE FACILITY IS WIRED TO EITHER THE SX-100 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 PABX IS IN NIGHT SERVICE, OR SIGNAL THE CO FOR THIS CONDITION.

X572R4

Fig. A3-6 Night Bell Connections

TABLE A3-6
BACKPLANE TRANSLATOR BOARD CONNECTIONS (SHELF 1) TO CROSS-CONNECT FIELD

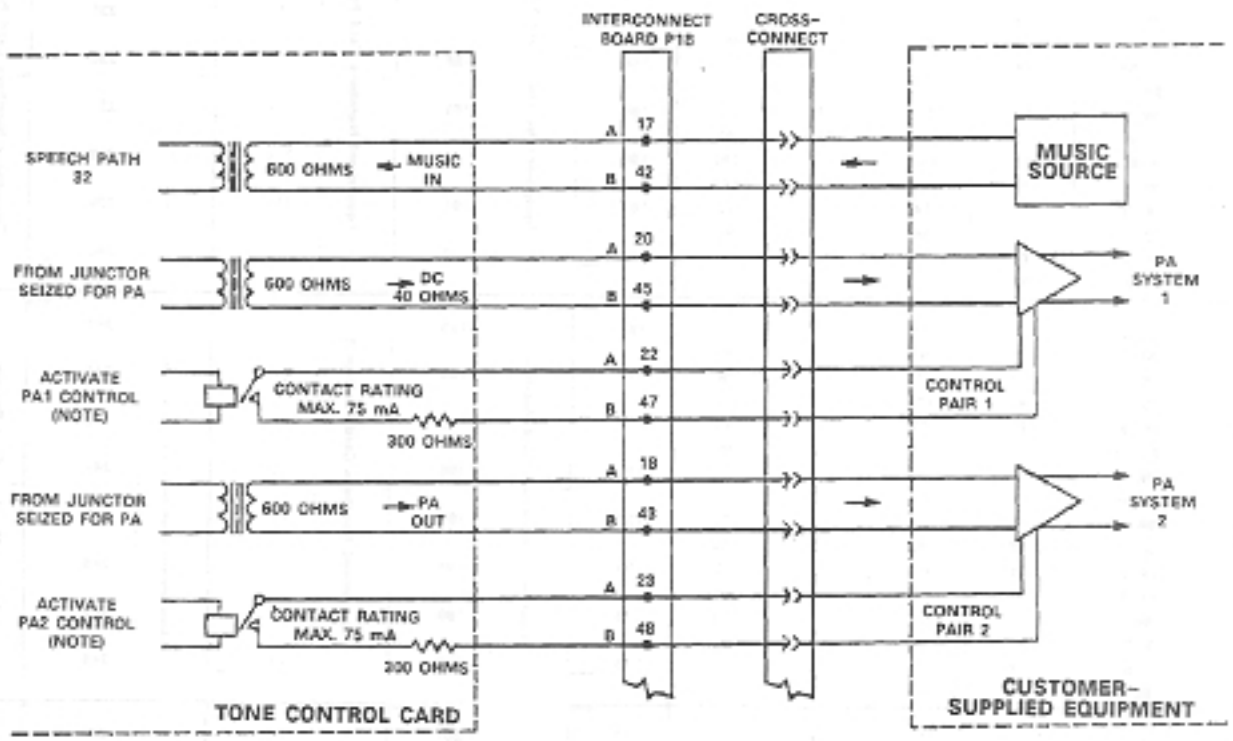
Pin	Pair Color	Line and Trunk Connections				Shelf 1 Translator Board Plug Numbers			
		Extn	CO	DID/Tie	E&M+	P1	P2	P3	P4
26	W-BL	T1	T1	T1	T1	001	025	049	073
1	BL-W	R1	R1	R1	R1	002	026	050	074
27	W-O	T2	XT2		TR1	003	027	051	075
2	O-W	R2	XT1		RR1	004	028	052	076
28	W-G	T3	T2		E1	005	029	053	077
3	G-W	R3	R2		M1	006	030	054	078
29	W-BR	T4				007	031	055	079
4	BR-W	R4				008	032	056	080
30	W-S	T5	T3	T2	T2	Equipment Numbers Card Position 1	Equipment Numbers Card Position 4	Equipment Numbers Card Position 7	Equipment Numbers Card Position 10
5	S-W	R5	R3	R2	R2				
31	R-BL	T6	XT4		TR2				
6	BL-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	033	057	081
9	BR-R	R1	R1	R1	R1	010	034	058	082
35	R-S	T2	XT2		TR1	011	035	059	083
10	S-R	R2	XT1		RR1	012	036	060	084
36	BK-BL	T3	T2		E1	013	037	061	085
11	BL-BK	R3	R2		M1	014	038	062	086
37	BK-O	T4				015	039	063	087
12	O-BK	R4				016	040	064	088
38	BK-G	T5	T3	T2	T2	Equipment Numbers Card Position 2	Equipment Numbers Card Position 5	Equipment Numbers Card Position 8	Equipment Numbers Card Position 11
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	BL-Y	R8							
42	Y-O	T1	T1	T1	T1	017	041	065	089
17	O-Y	R1	R1	R1	R1	018	042	066	090
43	Y-G	T2	XT2		TR1	019	043	067	091
18	G-Y	R2	XT1		RR1	020	044	068	092
44	Y-BR	T3	T2		E1	021	045	069	093
19	BR-Y	R3	R2		M1	022	046	070	094
45	Y-S	T4				023	047	071	095
20	S-Y	R4				024	048	072	096
46	V-BL	T5	T3	T2	T2	Equipment Numbers Card Position 3	Equipment Numbers Card Position 6	Equipment Numbers Card Position 9	Equipment Numbers Card Position 12 (See Note)
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 DO NOT connect RR and TR leads.

TABLE A3-6 (CONT'D)
BACKPLANE TRANSLATOR BOARD CONNECTIONS (SHELF 1) TO CROSS-CONNECT FIELD

		Line and Trunk Connections				Shelf 2 Translator Board Plug Numbers			
Pin	Pair Color	Extn	CO	DID/Tie	E&M+	P7	P8	P9	P10
26	W-BL	T1	T1	T1	T1	161	185	209	233
1	BL-W	R1	R1	R1	R1				
27	W-O	T2	XT2		TR1	162	186	210	234
2	O-W	R2	XT1		RR1				
28	W-G	T3	T2		E1	163	187	211	235
3	G-W	R3	R2		M1				
29	W-BR	T4				164	188	212	236
4	BR-W	R4							
30	W-S	T5	T3	T2	T2	165	189	213	237
5	S-W	R5	R3	R2	R2				
31	R-BL	T6	XT4		TR2	166	190	214	238
6	BL-R	R6	XT3		RR2				
32	R-O	T7	T4		E2	167	191	215	239
7	O-R	R7	R4		M2				
33	R-G	T8				168	192	216	240
8	G-R	R8				Equipment Numbers Card Position 1	Equipment Numbers Card Position 4	Equipment Numbers Card Position 7	Equipment Numbers Card Position 10
34	R-BR	T1	T1	T1	T1	169	193	217	241
9	BR-R	R1	R1	R1	R1				
35	R-S	T2	XT2		TR1	170	194	218	242
10	S-R	R2	XT1		RR1				
36	BK-BL	T3	T2		E1	171	195	219	243
11	BL-BK	R3	R2		M1				
37	BK-O	T4				172	196	220	244
12	O-BK	R4							
38	BK-G	T5	T3	T2	T2	173	197	221	245
13	G-BK	R5	R3	R2	R2				
39	BK-BR	T6	XT4		TR2	174	198	222	246
14	BR-BK	R6	XT3		RR2				
40	BK-S	T7	T4		E2	175	199	223	247
15	S-BK	R7	R4		M2				
41	Y-BL	T8				176	200	224	248
16	BL-Y	R8				Equipment Numbers Card Position 2	Equipment Numbers Card Position 5	Equipment Numbers Card Position 8	Equipment Numbers Card Position 11
42	Y-O	T1	T1	T1	T1	177	201	225	249
17	O-Y	R1	R1	R1	R1				
43	Y-G	T2	XT2		TR1	178	202	226	250
18	G-Y	R2	XT1		RR1				
44	Y-BR	T3	T2		E1	179	203	227	251
19	BR-Y	R3	R2		M1				
45	Y-S	T4				180	204	228	252
20	S-Y	R4							
46	V-BL	T5	T3	T2	T2	181	205	229	253
21	BL-V	R5	R3	R2	R2				
47	V-O	T6	XT4		TR2	182	206	230	254
22	O-V	R6	XT3		RR2				
48	V-G	T7	T4		E2	183	207	231	255
23	G-V	R7	R4		M2				
49	V-BR	T8				184	208	232	256
24	BR-V	R8				Equipment Numbers Card Position 3	Equipment Numbers Card Position 6	Equipment Numbers Card Position 9	Equipment Numbers Card Position 12 (See Note)
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 DO NOT connect RR and TR leads.



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

X5373

Fig. A3-7 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	009	017	025	033	041	049	057	065	073	081	089
	002	010	018	026	034	042	050	058	066	074	082	090
	003	011	019	027	035	043	051	059	067	075	083	091
	004	012	020	028	036	044	052	060	068	076	084	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	016	024	032	040	048	056	064	072	080	088	096
	1	2	3	4	5	6	7	8	9	10	11	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.

X131B

Fig. A3-8 Backplane Translator Board Plug Appearances

CARD POSITION	LEAD DESIGNATION	P5	P17	J14	J15	P18	P19	P25	P24	P23	P22	DESTINATION
13	LINE / TRUNKS: CO, DID/TIE, E&M T1 T1 T1 T1 R1 R1 R1 R1 T2 XT2 TR1 R2 XT1 RR1 T3 T2 E1 R3 R2 M1 T4 R4	26 1 27 2 28 3 29 4	26 1 27 2 28 3 29 4				50 25 49 24 48 23 47 22					X-CONNECT
14	LINE / TRUNKS: CO, DID/TIE, E&M T1 T1 T1 T1 R1 R1 R1 R1 T2 XT2 TR1 R2 XT1 RR1 T3 T2 E1 R3 R2 M1 T4 R4	30 5 31 6 32 7 33 8	30 5 31 6 32 7 33 8				46 21 45 20 44 19 43 18					X-CONNECT
15	RECEIVER 1 NOT CONNECTED TO CABLE	34 9 35 10 36 11 37 12	34 9 35 10 36 11 37 12				42 17 41 16 40 15 39 14					X-CONNECT
16	CONSOLE 2 T(A) R(A) DATA OUT T(A) DATA OUT R(A) DATA IN T(A) DATA IN R(A) PA2 CONTROL B PA2 CONTROL A	38 13 39 14 40 15 41 16	38 13 39 14 40 15 41 16	38 13 30 5 32 7		48 23		38 13 30 5 32 7	38 13 30 5 32 7			X-CONNECT
17	CONSOLE 1 T(A) R(A) DATA OUT T(A) DATA OUT R(A) DATA IN T(A) DATA IN R(A) PA2 CONTROL B PA2 CONTROL A	42 17 43 18 44 19 45 20	42 17 43 18 44 19 45 20		38 13 30 5 32 7	47 22				38 13 30 5 32 7	38 13 30 5 32 7	X-CONNECT
18	MISCELLANEOUS MUSIC IN B MUSIC IN A PA1 OUT B PA1 OUT A PA2 OUT B PA2 OUT A	46 21 48 23 49 24 22	46 21 48 23 49 24 47 22			42 17 45 20 43 18 47 22						X-CONNECT TEST LINE TIP TEST LINE RING

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

Fig. A3-9 Interconnect Board Cabling

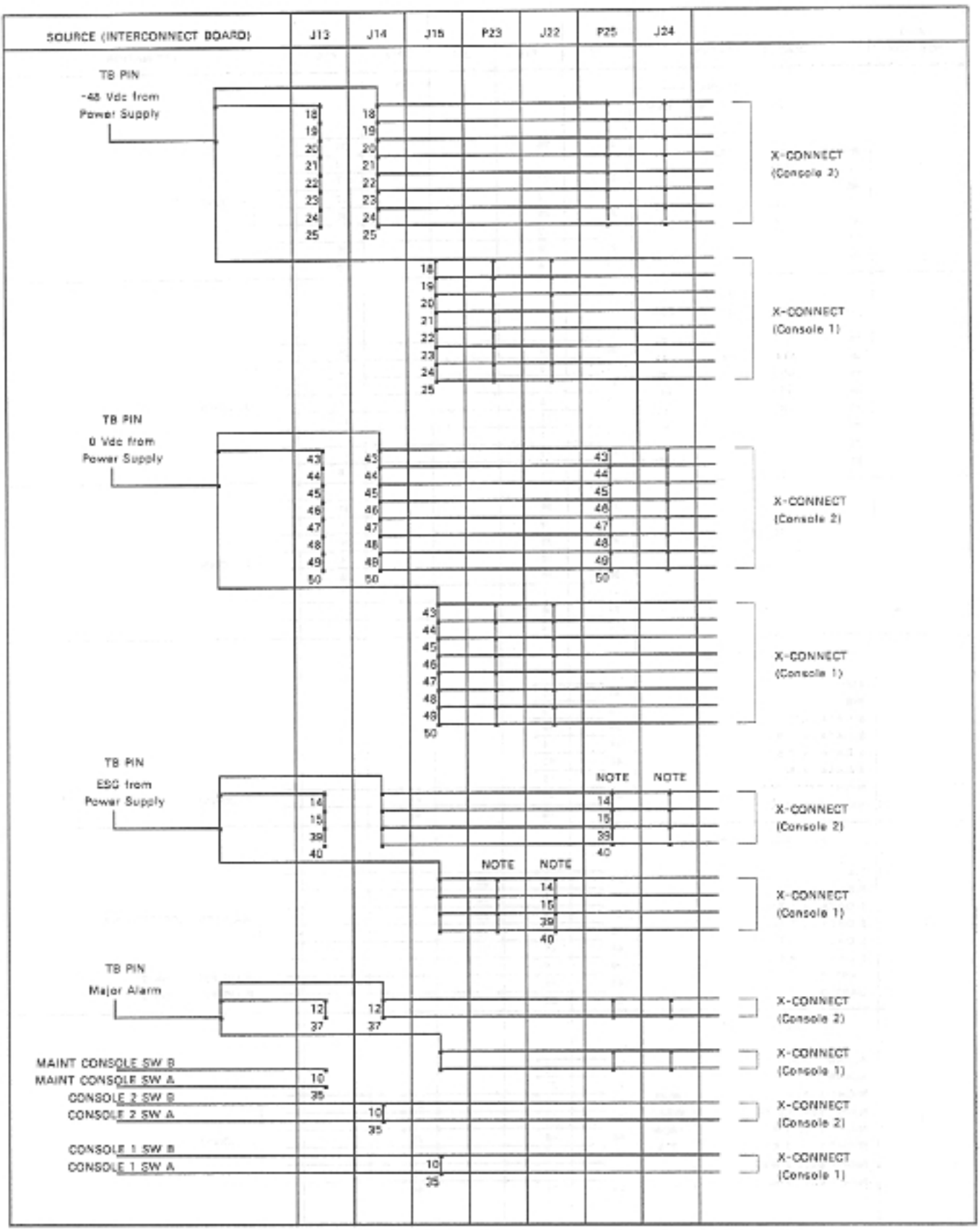


Fig. A3-10 Interconnect Board Cabling (Cont'd)

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

Fig. A3-11 Interconnect Board Cabling (Cont'd)

APPENDIX 4

SX-100 MECHANICAL INFORMATION

1. GENERAL

A4.01 The MAP's contained in this Appendix detail the procedures to be performed in all mechanical work on the SX-100. These MAP's are used in conjunction with the MAP's outlined in other sections of this practice.

A4.02 Due to the similarity of the SX-100 to the SX-200, MAP's 350-501, 350-510, 350-511 are common for both systems and these MAP's will be found in Appendix 5.

A4.03 There are three versions of the SX-100: rack-mounted, wall-mounted and cabinet-mounted. MAP350-400 deals with exposing each of the three versions of the system for mechanical work.

A4.04 The basic synopsis of these MAP's is: a component has been found to be defective, replace it. MAP's 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 6 and 7, Parts 5 and 6.

TABLE A4-1
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

EXPOSE THE SYSTEM SX-100
MAP350-400
Issue 1, December 1982
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TOOLS REQUIRED

1 1/4 inch flatblade screwdriver
1 Phillips screwdriver

START

AT FRONT OF CABINET (FIG. 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

[1] AND

POWER DOWN THE SYSTEM

(2A) Unlock top cover from cabinet
(2B) Remove the cabinet top cover
(2C) If the cabinet is wall-mounted (Fig. 400-2), release the strikes and allow the system to swing down gently
(2D) Remove the four, 10-32 binding head screws from the back cabinet cover
(2E) Remove the back cabinet cover

[2] AND

REMOVE TOP AND BACK

AT REAR OF SYSTEM (FIG. 400-3)

(3A) Loosen the cable clamp to allow 10 inches (25.4 cm) of slack
(3B) Disconnect cables P1, P2, P3, P4, P18, P19, P20, J13, J14, J15
(3C) Disconnect J302 (optional), the maintenance panel connector and the OOT cable
(3D) Disconnect the four cable clamp screws from the power supply (Fig. 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

[3] AND

RELEASE CABLES

Go to (4)

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MAP350- 400
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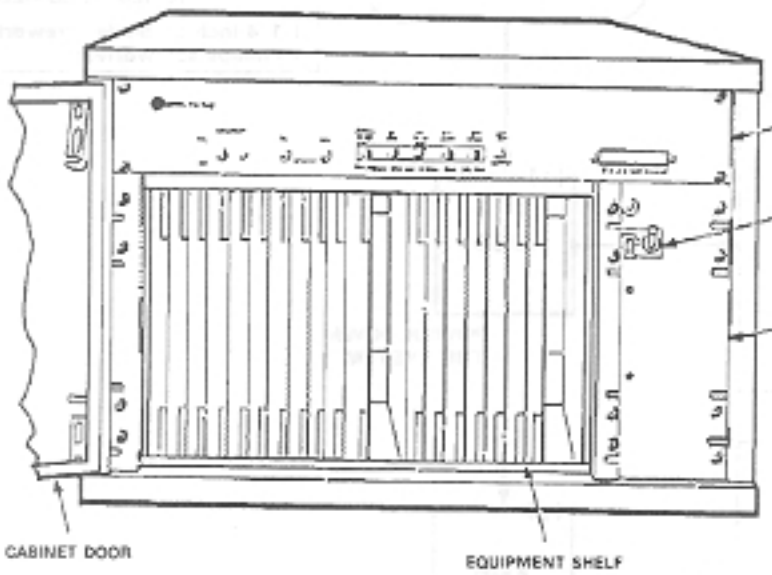
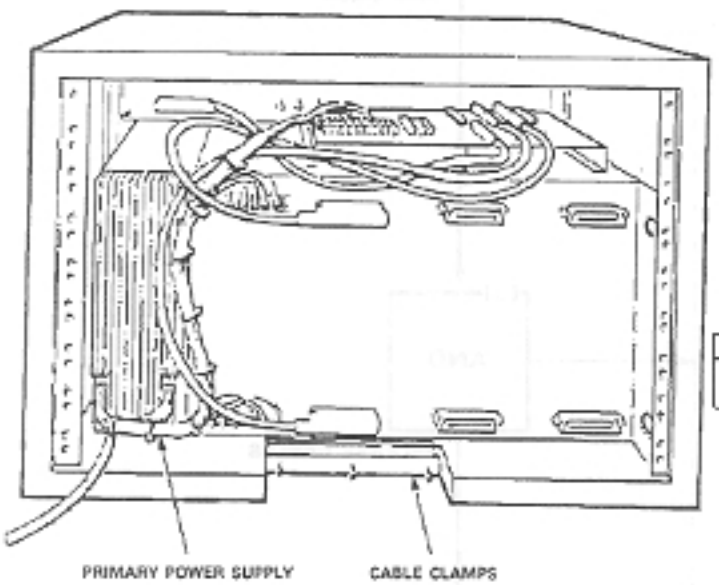


FRONT VIEW



REAR VIEW

WEIGHT	HEIGHT	WIDTH	DEPTH
70 lb (31.8 kg)	16.62 in. (422 mm)	25.0 in. (635 mm)	18.5 in. (470 mm)

X5611

Fig. 400-1 SX-100 Cabinet Mount

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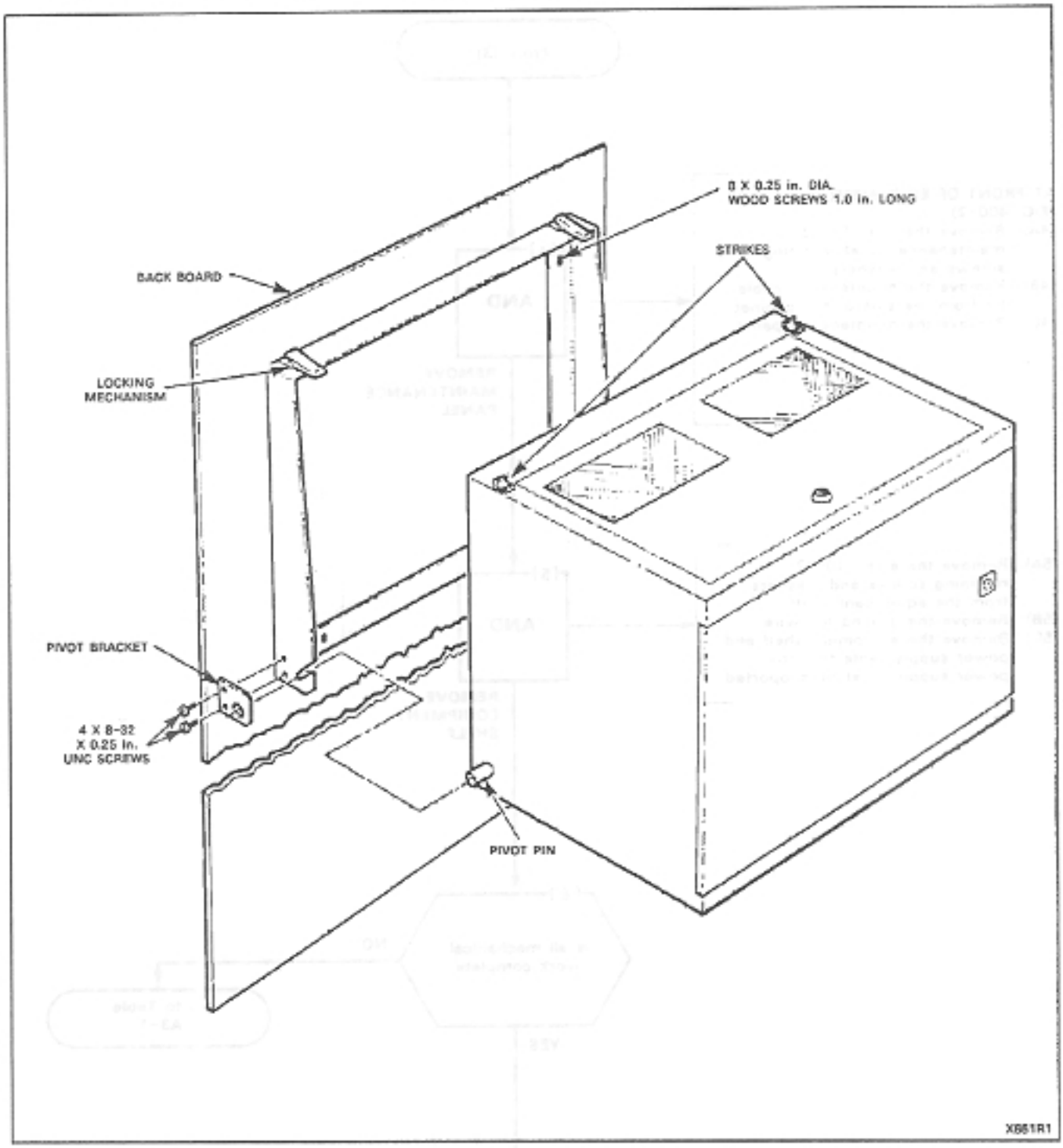

Fig. 400-2 Wall Mounting

EXPOSE THE SYSTEM SX-100
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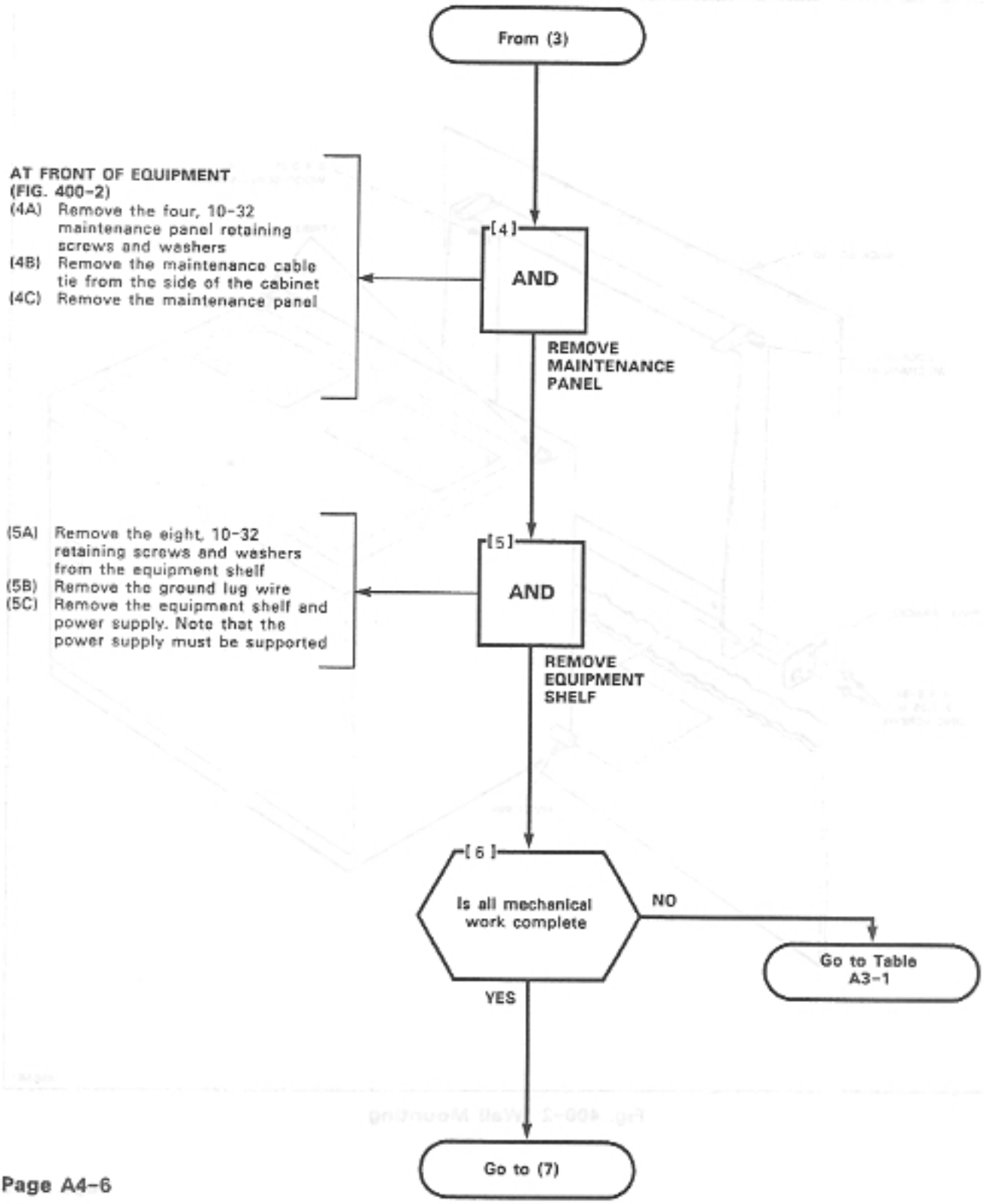

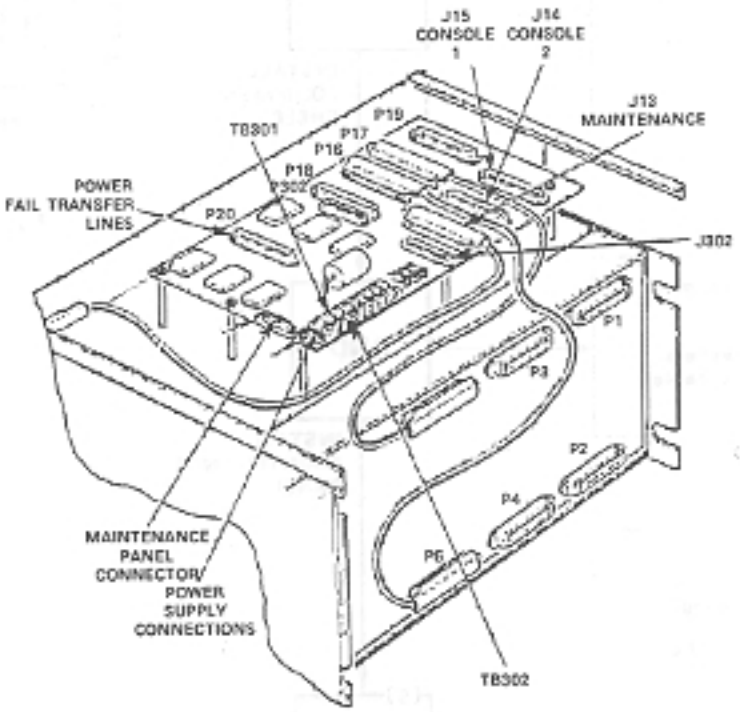

Fig. 400-3 Rear Cable View

EXPOSE THE SYSTEM SX-100
MAP350- 400
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From (6)

AT FRONT OF EQUIPMENT
(FIG. 400-2)
(7A) Place equipment shelf and power supply in position
(7B) Secure equipment shelf with eight, 10-32 retaining screws and washers

[7] AND

INSTALL EQUIPMENT SHELF

(8A) Place the maintenance panel in position
(8B) Secure with four, 10-32 retaining screws and washers
(8C) Secure cable with a new cable tie

[8] AND

INSTALL MAINTENANCE PANEL

(9A) If the system was wall-mounted, release clip on strikes and allow it to swing down gently
(9B) Connect cables P1, P2, P3, P4, P18, P19, P20, J13, J14, J15 (Fig. 400-4)
(9C) Connect J302 (optional), the maintenance panel connector and the OOT cable (Fig. 400-3)
(9D) Plug power supply connector into the back of the power supply (Fig. 400-4)
(9E) Secure power supply connectors with four retaining screws
(9F) Connect cable ground lug
(9G) Secure power cable with new cable ties

[9] AND

CONNECT CABLES

Go to (10)

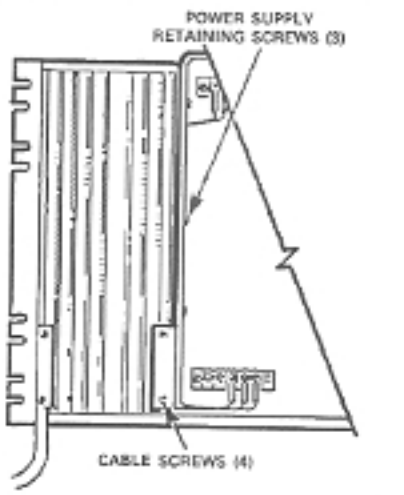

Fig. 400-4 Power Supply Cable Harness

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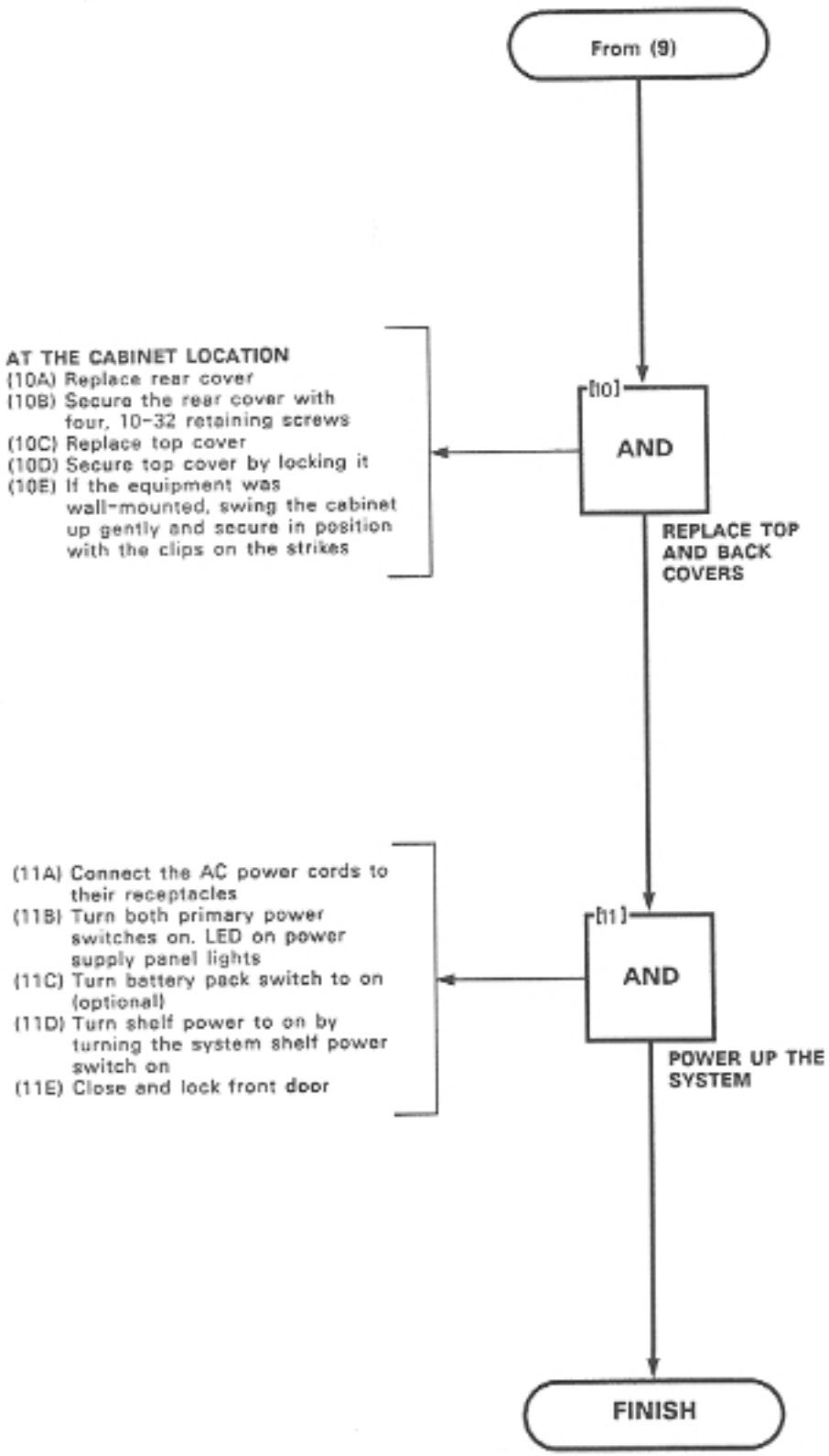

REPLACE INTERCONNECT, POWER FAIL TRANSFER AND CONSOLE INTERFACE CARD SX-100
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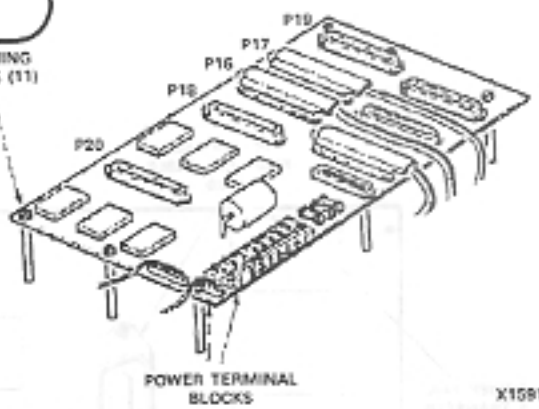
START

RETAINING SCREWS (11)



[1] AND

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

EXPOSE SYSTEM

Fig. 401-1 Interconnect Card

[2] AND

AT TOP OF SYSTEM (FIG. 401-1)
(2A) Remove P16, P17 and the maintenance panel connector
(2B) Remove power cables from the power terminal blocks. Also remove reserve battery backup connection

REMOVE CABLES

[3] AND

(3A) Remove the eleven, 6-32 screws that secure the interconnect card to the chassis
(3B) Remove the interconnect card

REMOVE INTERCONNECT CARD

Go to (4)

REPLACE INTERCONNECT, POWER FAIL TRANSFER AND CONSOLE INTERFACE CARD SX-100
MAP350- 401
Issue 1, December 1982
Sheet 2 of 4

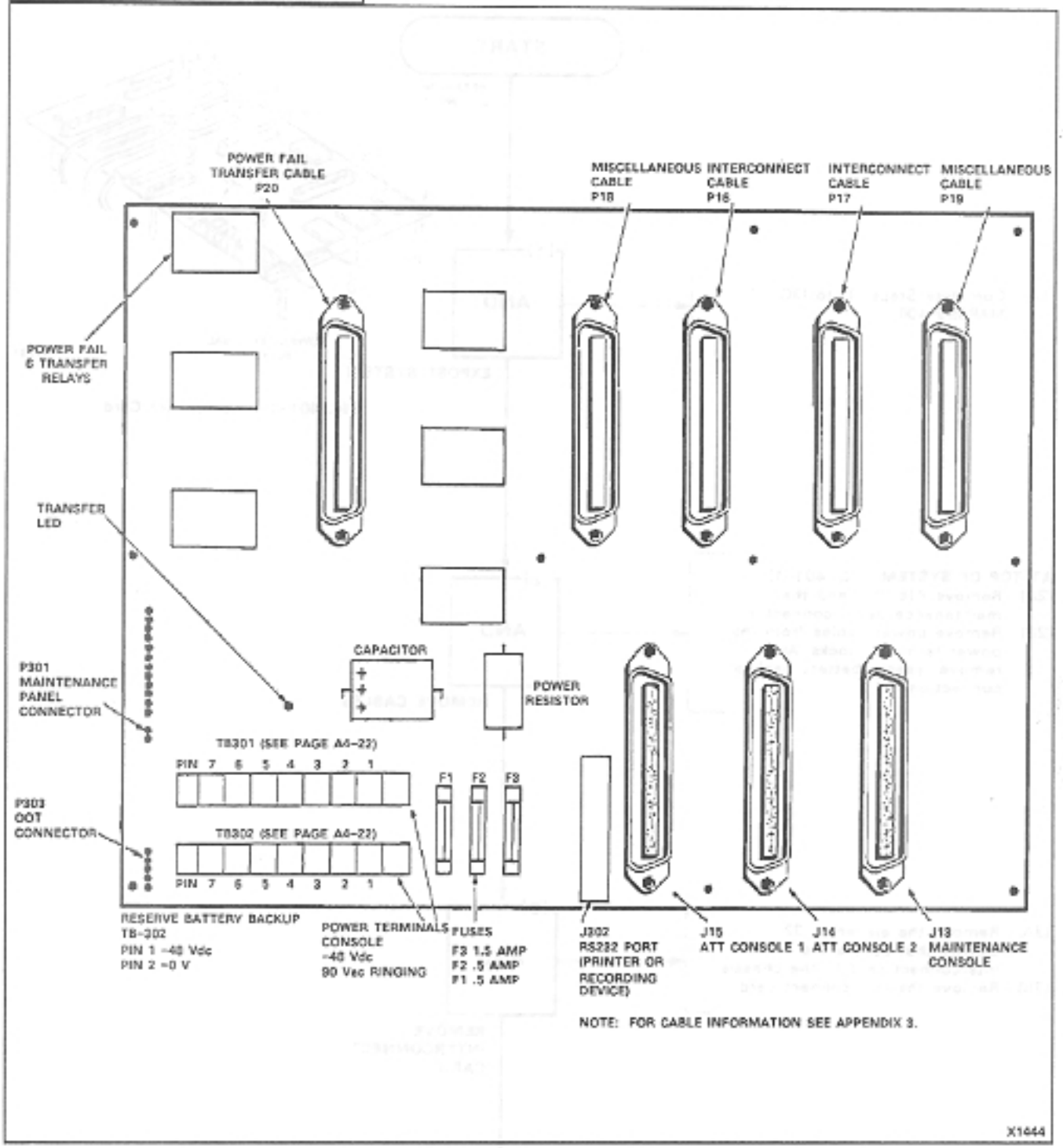
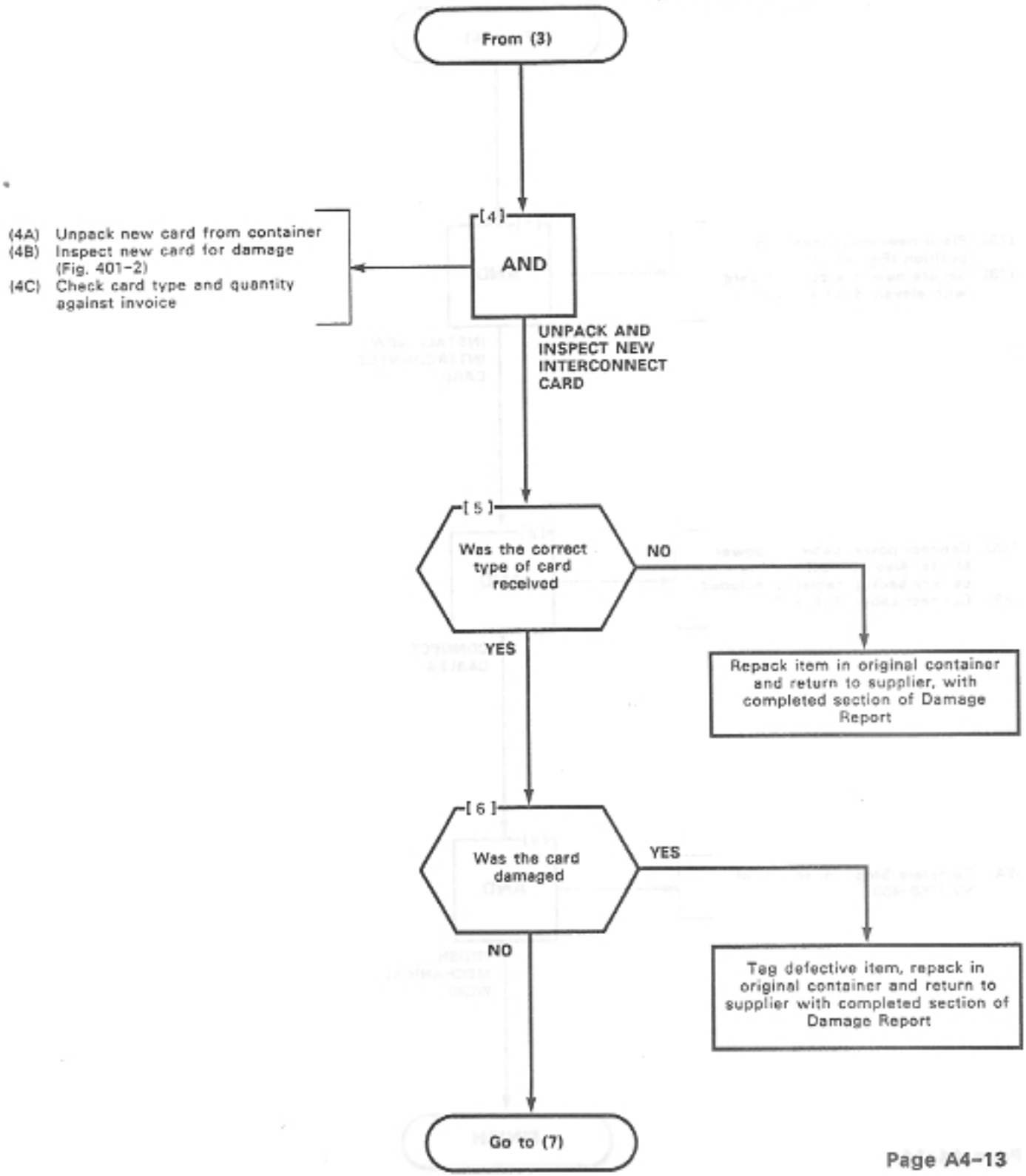
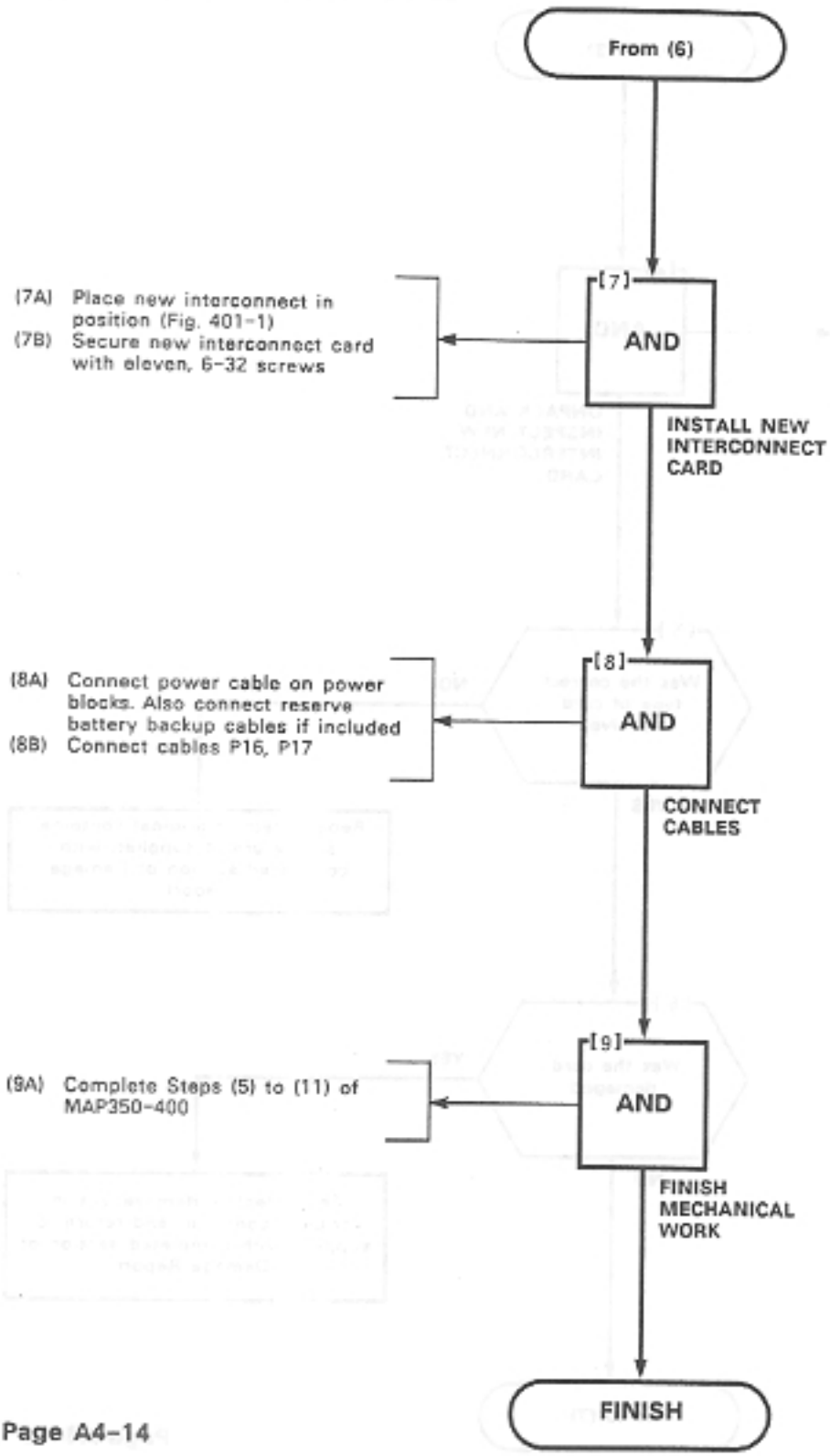


Fig. 401-2 Interconnect Card

REPLACE INTERCONNECT, POWER FAIL TRANSFER AND CONSOLE INTERFACE CARD SX-100
MAP350-401
Issue 1. December 1982
Sheet 3 of 4



REPLACE INTERCONNECT, POWER FAIL TRANSFER AND CONSOLE INTERFACE CARD SX-100
MAP350- 401
Issue 1, December 1982
Sheet 4 of 4



REPLACE EQUIPMENT SHELF SX-100
MAP350-402
Issue 1, December 1982
Sheet 1 of 5

TOLLS REQUIRED

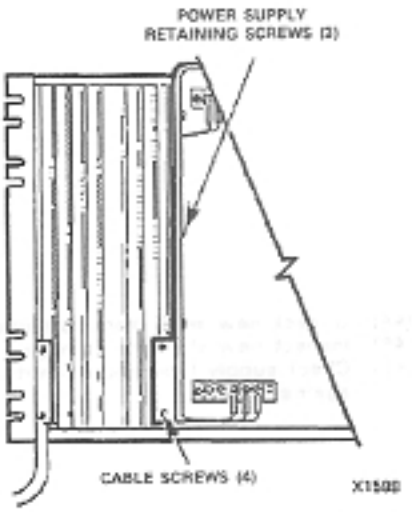
1 flatblade screwdriver
1 Phillips screwdriver

START

[1] AND

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

EXPOSE THE SYSTEM



[2] AND

AT REAR OF SYSTEM (FIG. 402-1)
(2A) Remove the three screws that hold the power supply to the equipment shelf
(2B) Remove the power supply

REMOVE POWER SUPPLY

Fig. 402-1 Power Supply Mounting

[3] AND

AT THE FRONT OF THE EQUIPMENT
(3A) Remove the eight, 10-32 retaining screws and finishing washers
(3B) Remove the equipment shelf carefully sliding it forward

REMOVE THE EQUIPMENT SHELF

Go to (4)

REPLACE EQUIPMENT SHELF SX-100
MAP350- 402
Issue 1, December 1982
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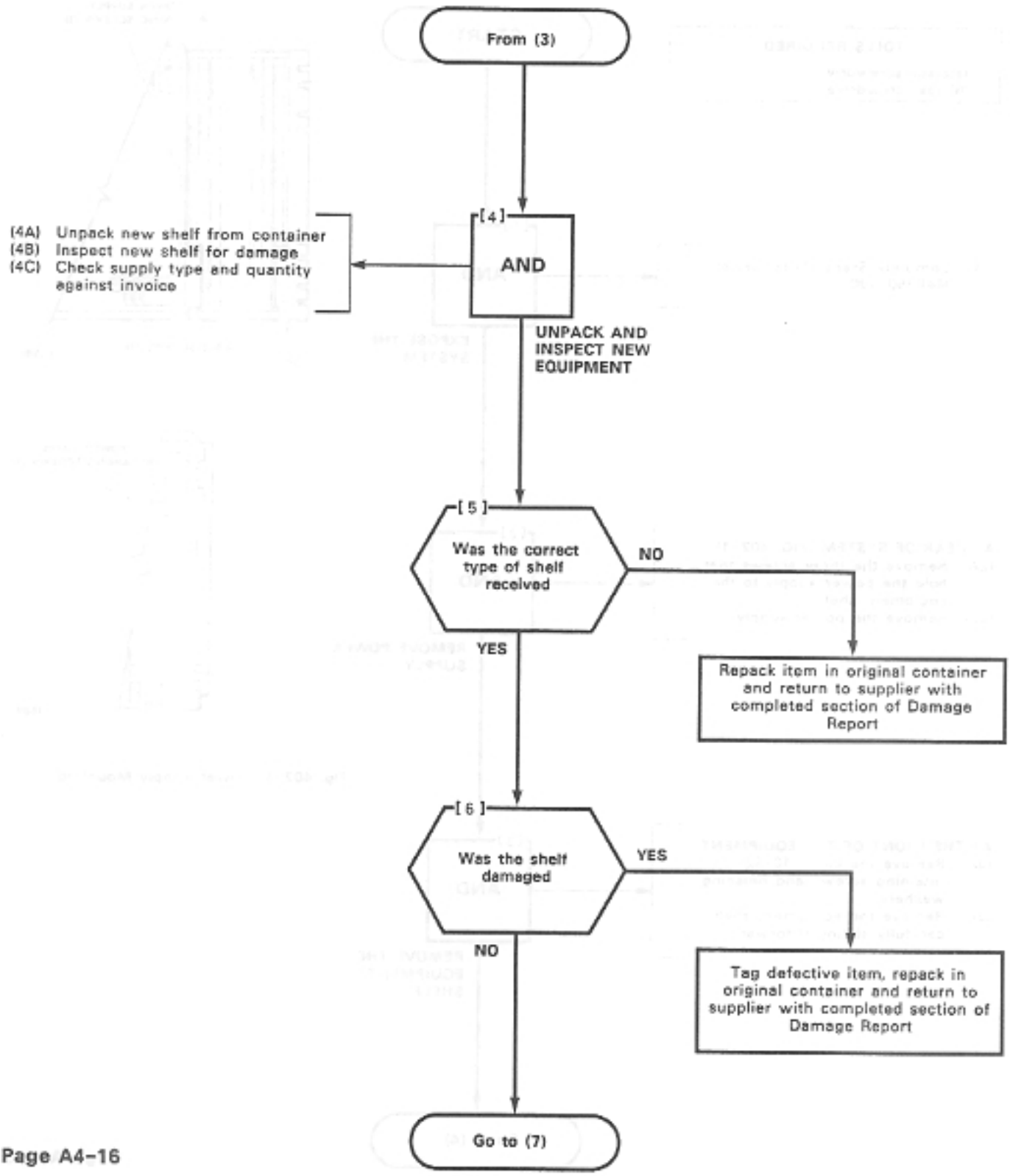
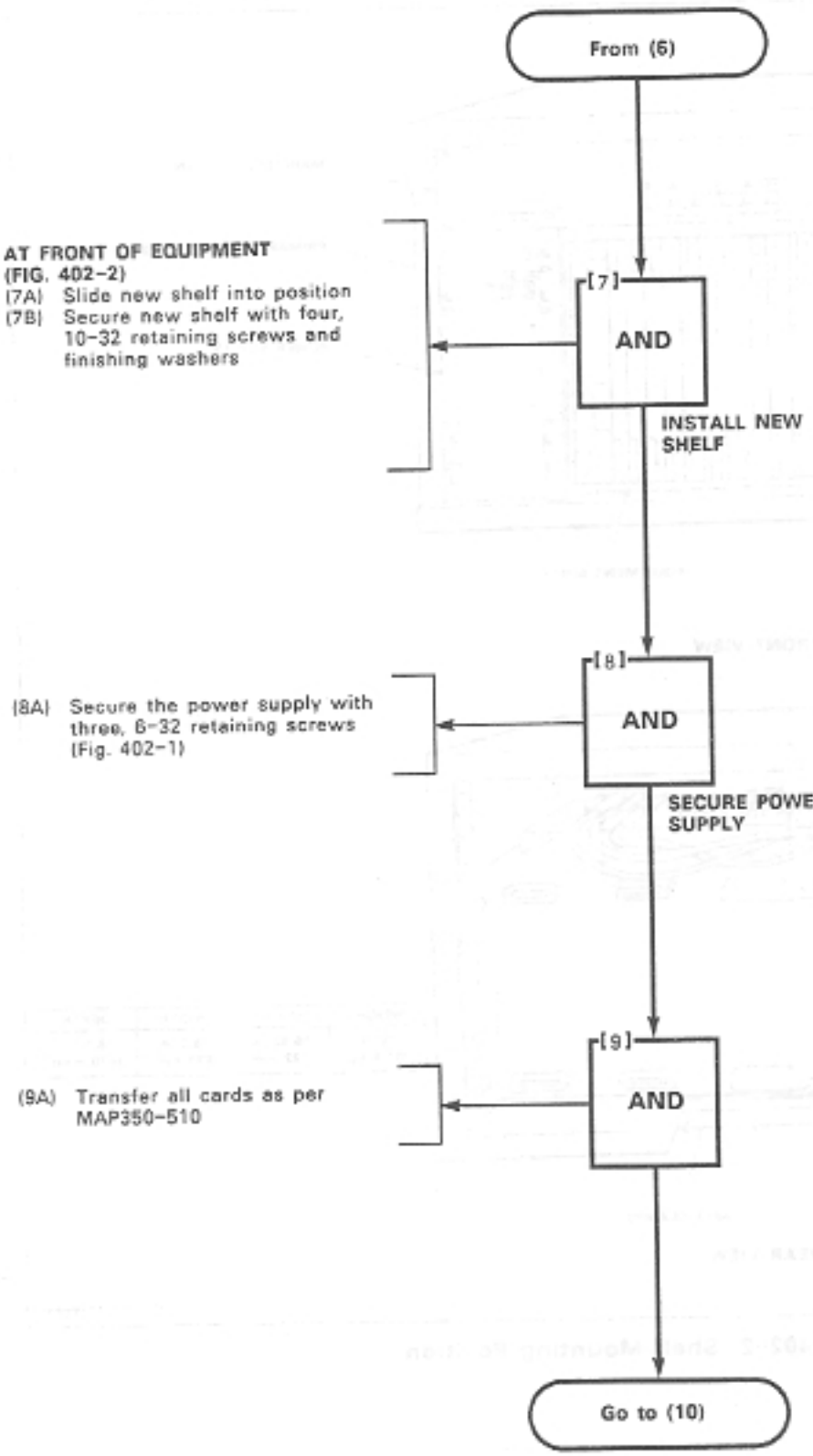


REPLACE EQUIPMENT SHELF SX-100
MAP350-402
Issue 1, December 1982
Sheet 3 of 5



REPLACE EQUIPMENT SHELF SX-100
MAP350- 402
Issue 1, December 1982
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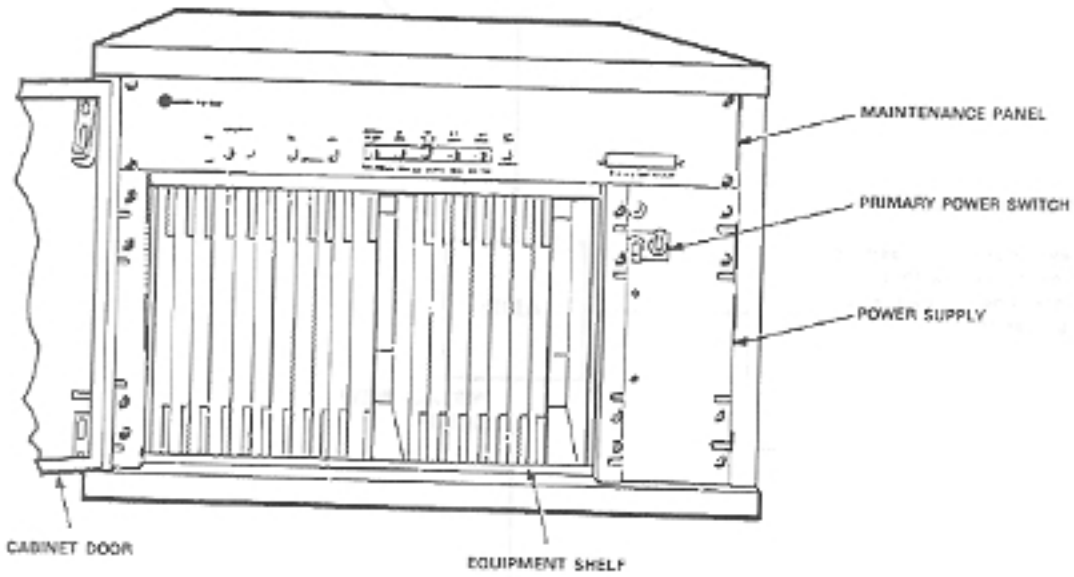
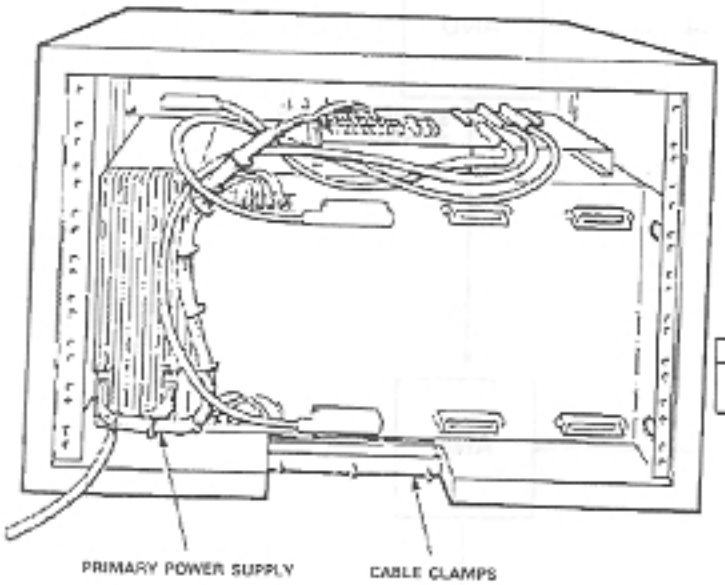


FRONT VIEW



REAR VIEW

WEIGHT	HEIGHT	WIDTH	DEPTH
70 lb (31.8 kg)	16.62 in. (422 mm)	25.0 in. (635 mm)	18.5 in. (470 mm)

X5611

Fig. 402-2 Shelf Mounting Position

REPLACE EQUIPMENT SHELF SX-100
MAP350-402
Issue 1, December 1982
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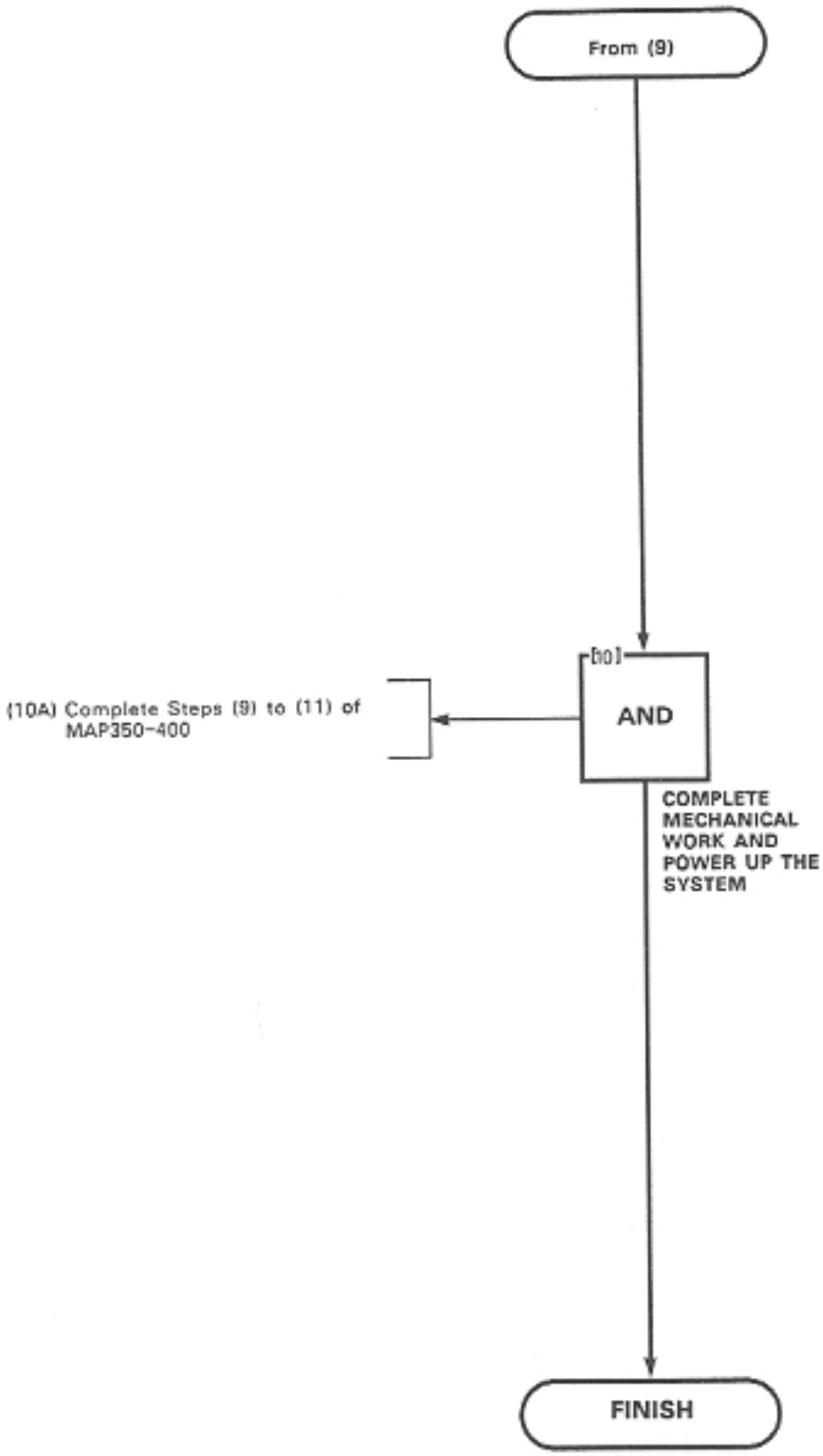


REPLACE POWER SUPPLY SX-100
MAP350-403
Issue 1, December 1982
Sheet 1 of 3

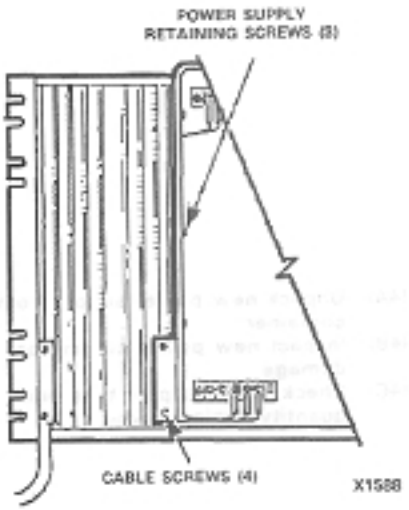
TOOL REQUIRED
1 flatblade screwdriver

START

[1] AND

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

EXPOSE THE SYSTEM



[2] AND

AT REAR OF SYSTEM (FIG. 403-1)
(2A) Remove four, 10-32 retaining screws that secure the power supply cables

REMOVE POWER SUPPLY CABLES

Fig. 403-1 Power Supply Mounting

[3] AND

(3A) Remove the three, 6-32 power supply retaining screws
(3B) Remove the power supply to the rear of the system

REMOVE POWER SUPPLY

Go to (4)

REPLACE POWER SUPPLY SX-100
MAP350- 403
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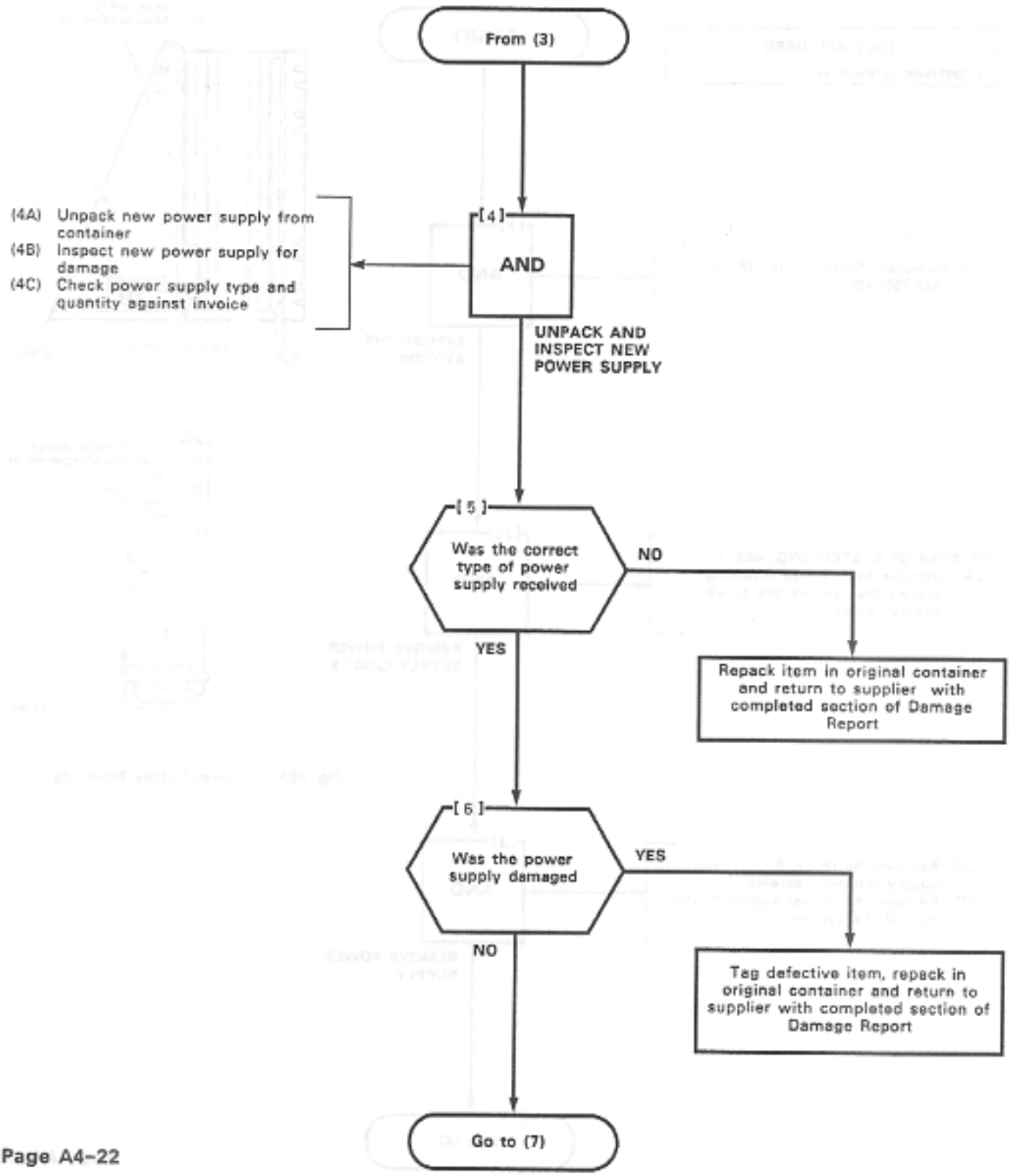

REPLACE POWER SUPPLY SX-100
MAP350-403
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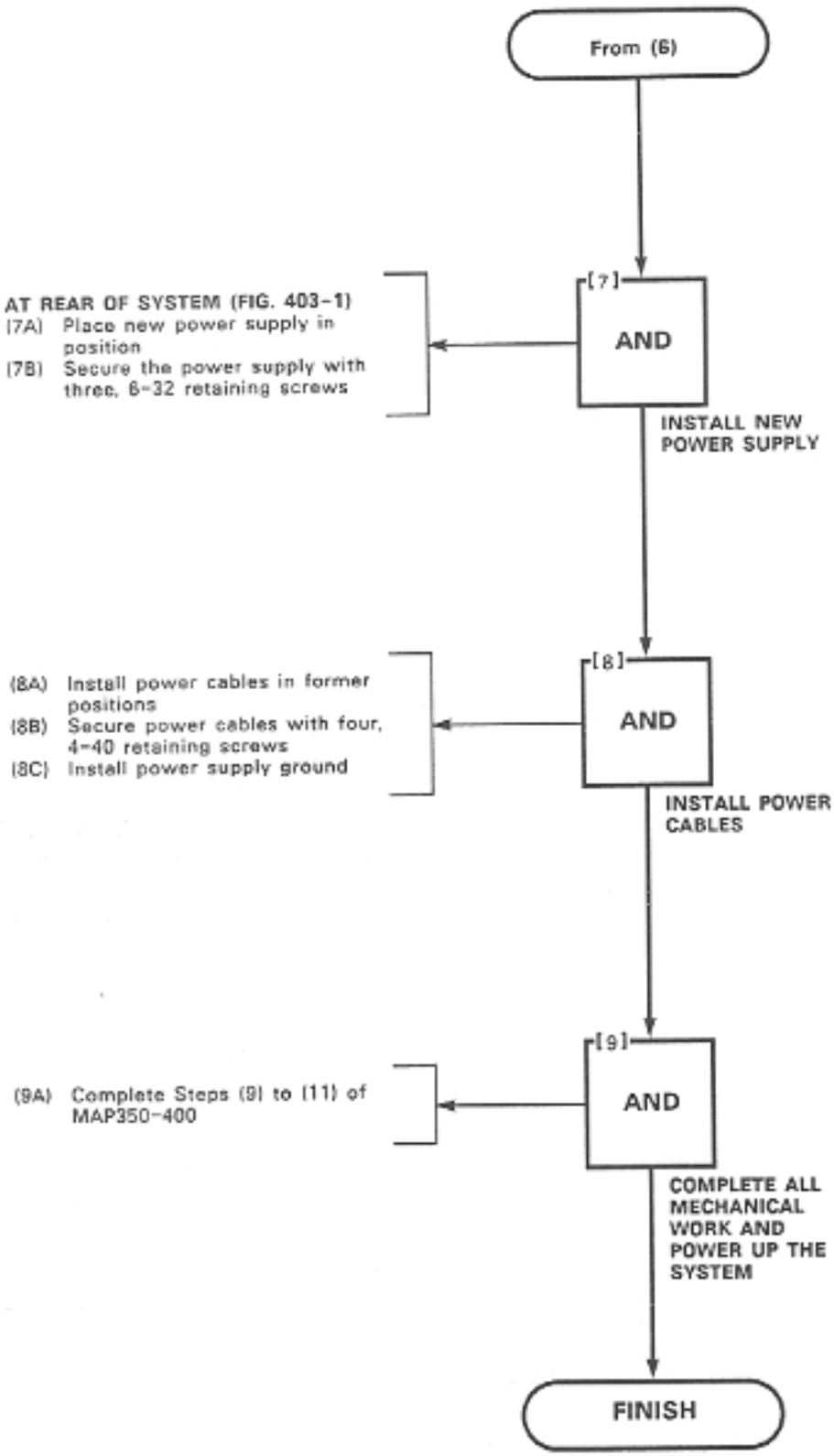

AND
AND
AND

REPLACE RESERVE BATTERY BACKUP UNIT SX-100

MAP350-404

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START

CAUTION

The reserve battery pack weight is 50 kg (125 lb) Care must be taken when lifting the battery pack.

[1] AND

(1A) Complete Steps (1) and (2) of MAP350-400

EXPOSE THE SYSTEM

[2] AND

CAUTION

Check that the BATTERY switch on the reserve battery pack is set to OFF. Check that the three switches on the battery charging unit are set to OFF.

AT TOP OF SYSTEM (FIG. 404-1)

(2A) Remove the battery backup power cable from the terminal block on the interconnect card

REMOVE POWER CABLES

[3] AND

(3A) Remove reserve battery backup unit from existing location. Note that the charger and batteries are supplied as one unit

REMOVE RESERVE BATTERY BACKUP UNIT

Go to (4)

REPLACE RESERVE BATTERY BACKUP UNIT SX-100
MAP350- 404
Issue 1, December 1982
Sheet 2 of 5

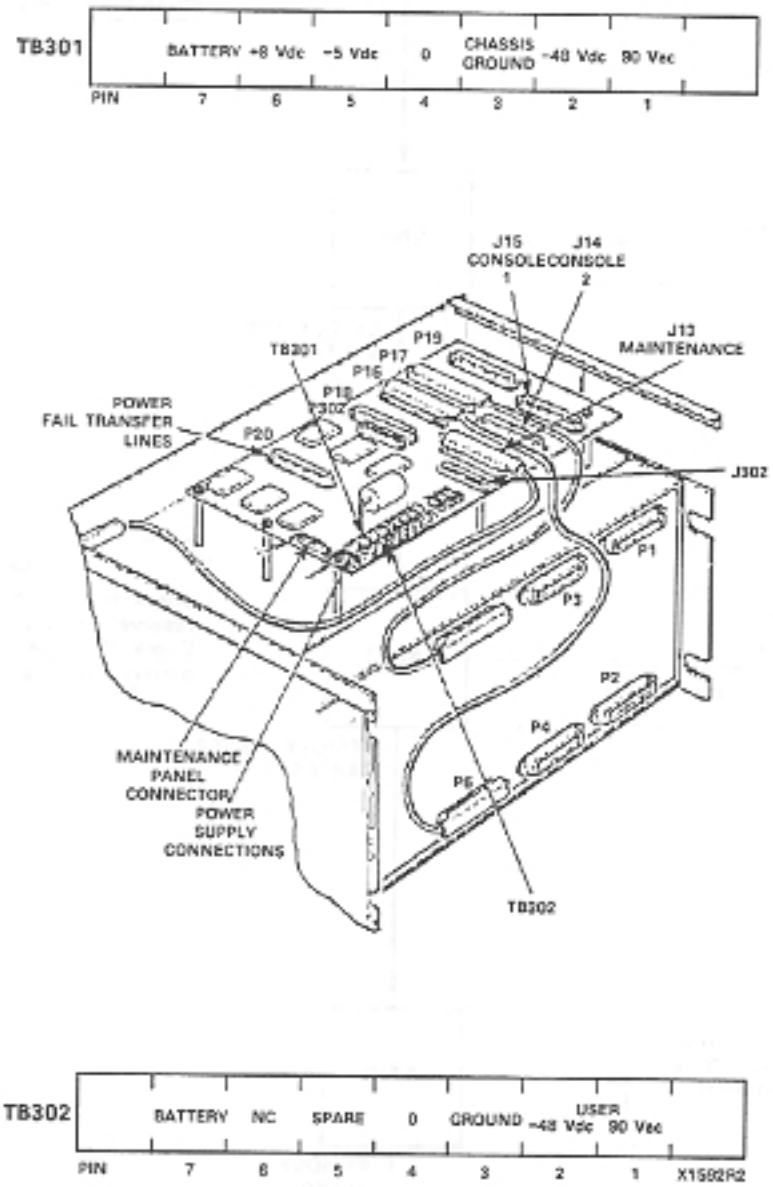

Fig. 404-1 SX-100 Power Terminal Blocks (Interconnect Board)

REPLACE RESERVE BATTERY BACKUP UNIT SX-100
MAP350-404
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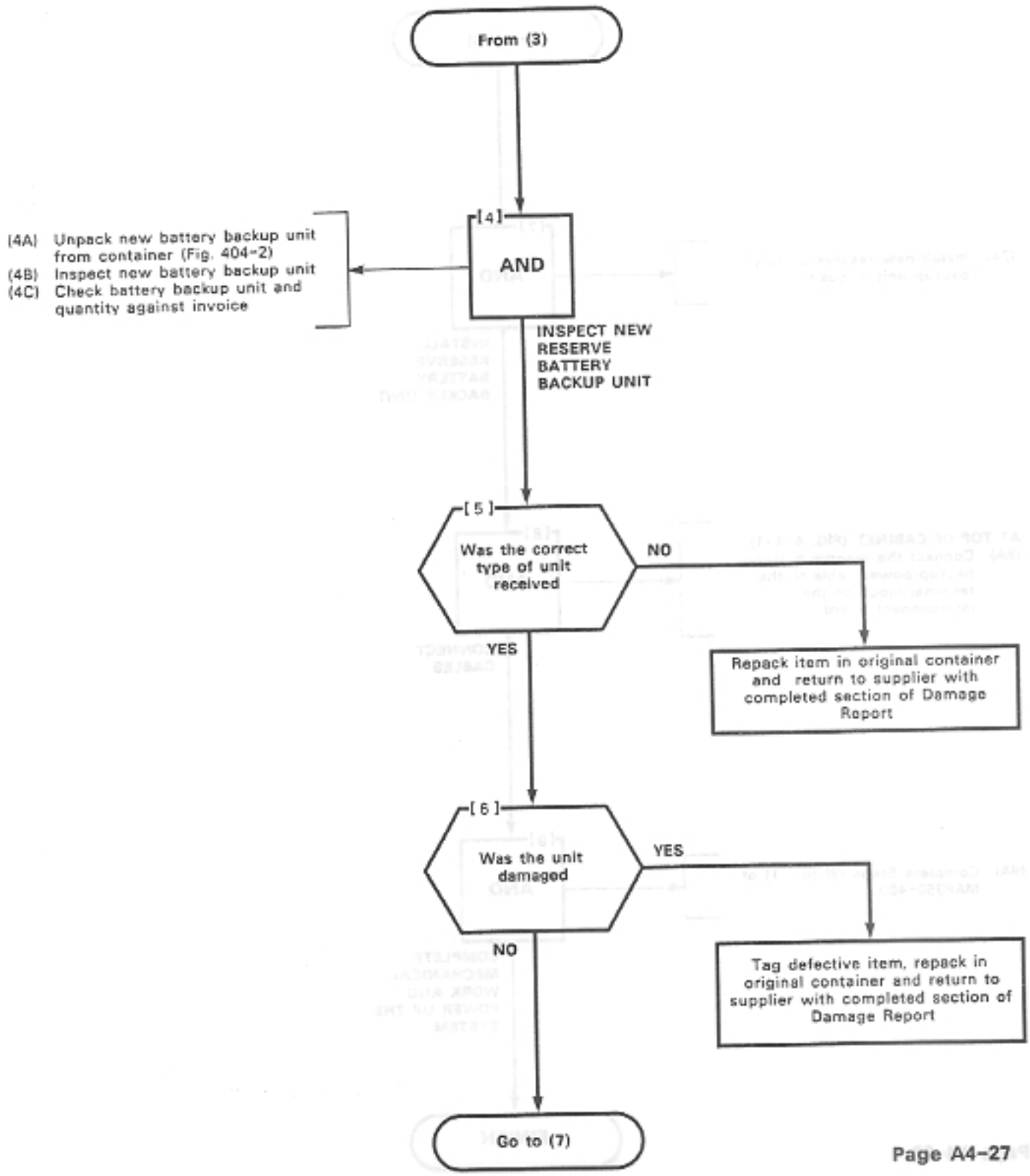
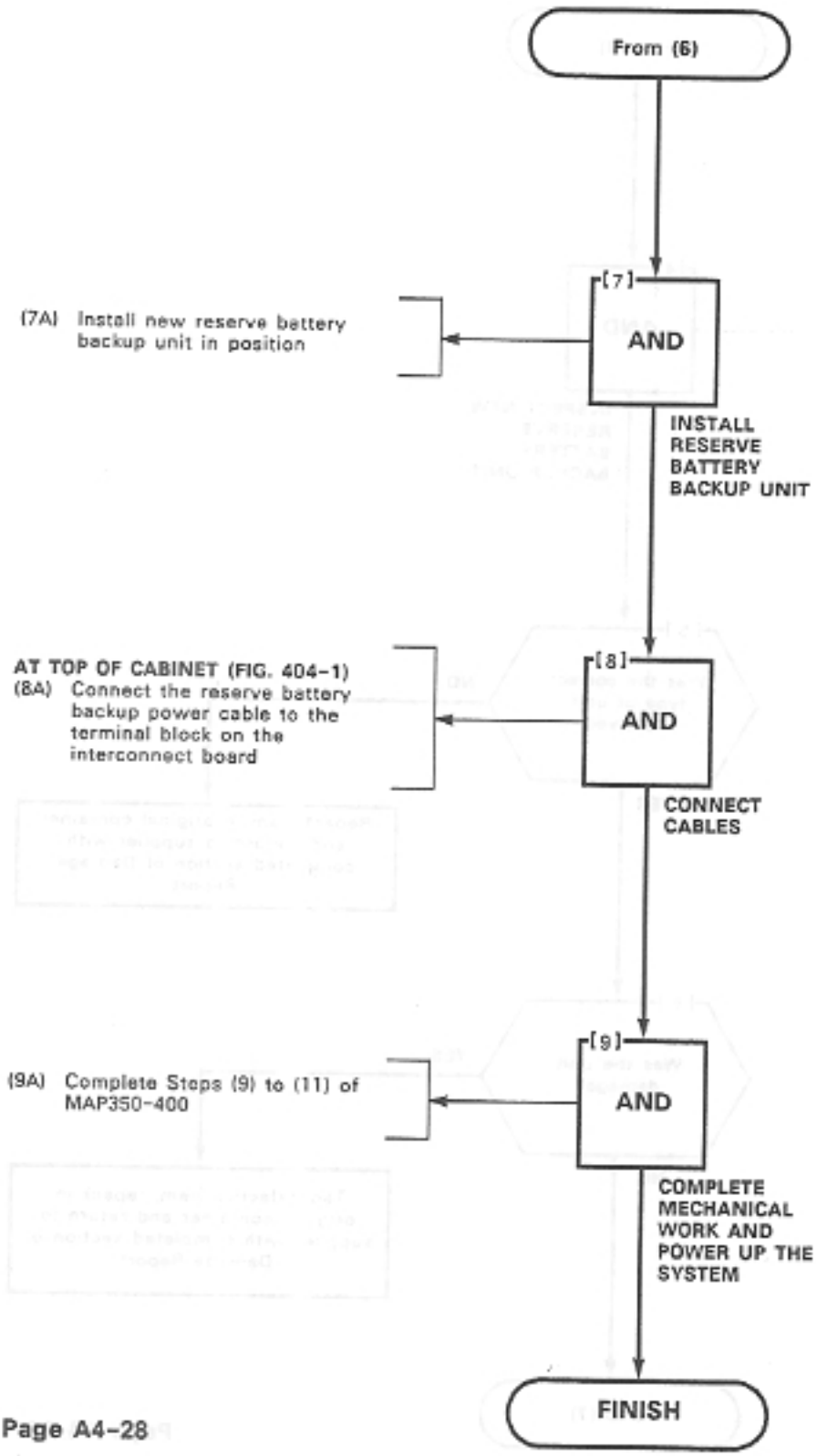


REPLACE RESERVE BATTERY BACKUP UNIT SX-100
MAP350- 404
Issue 1, December 1982
Sheet 4 or 5



REPLACE RESERVE BATTERY BACKUP UNIT SX-100
MAP350-404
Issue 1, December 1982
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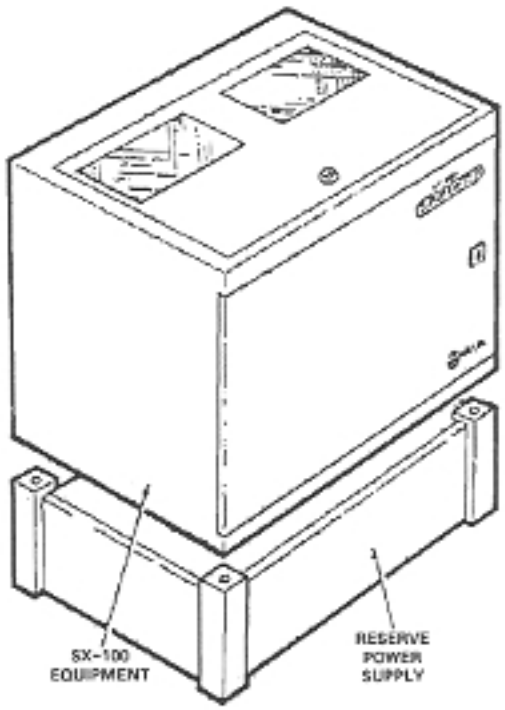

X1472R1

Fig. 404-2 Example of Reserve Battery Backup Unit

REPLACE MAINTENANCE PANEL SX-100
MAP350-405
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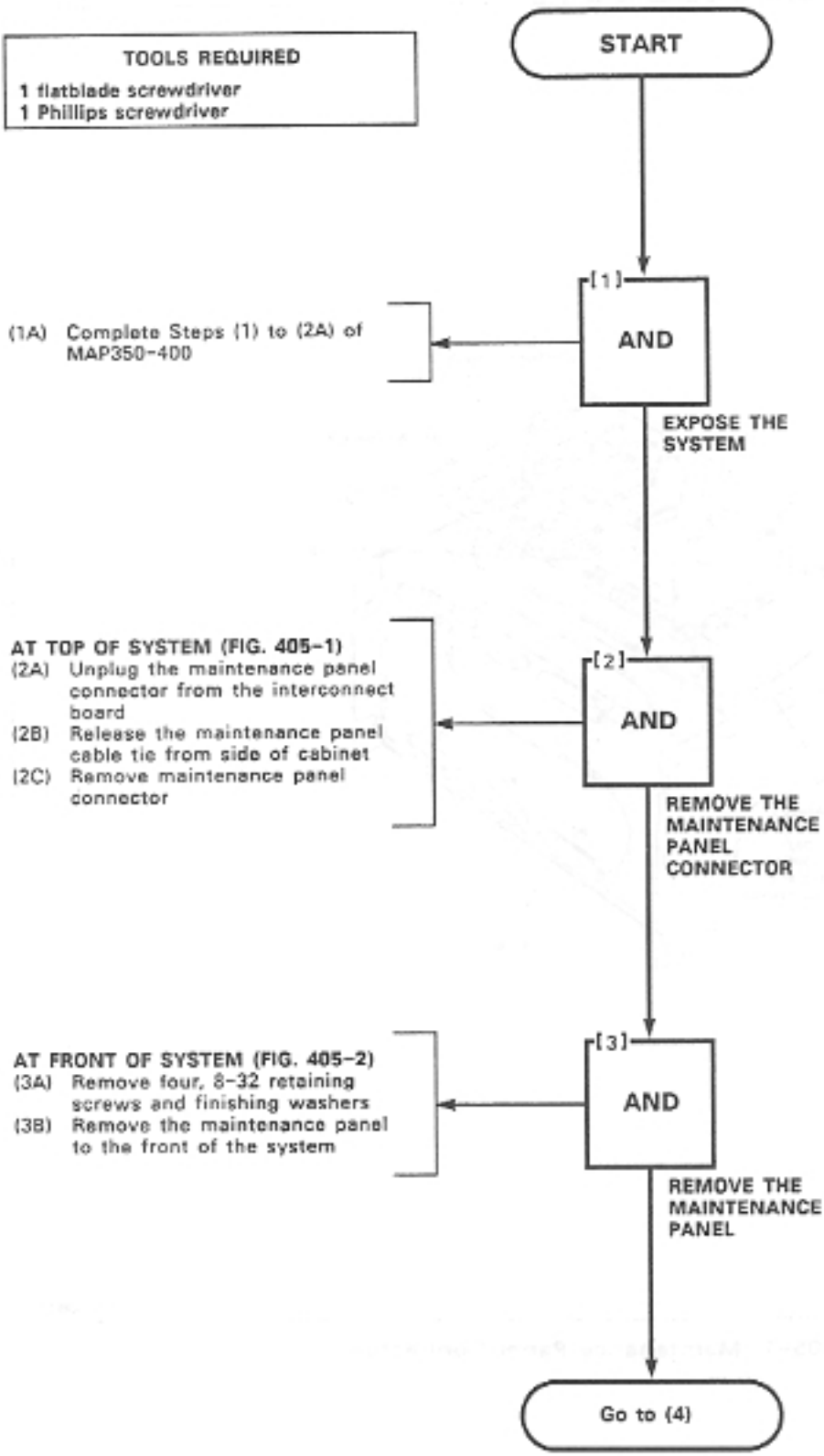

REPLACE MAINTENANCE PANEL SX-100
MAP350- 405
Issue 1, December 1982
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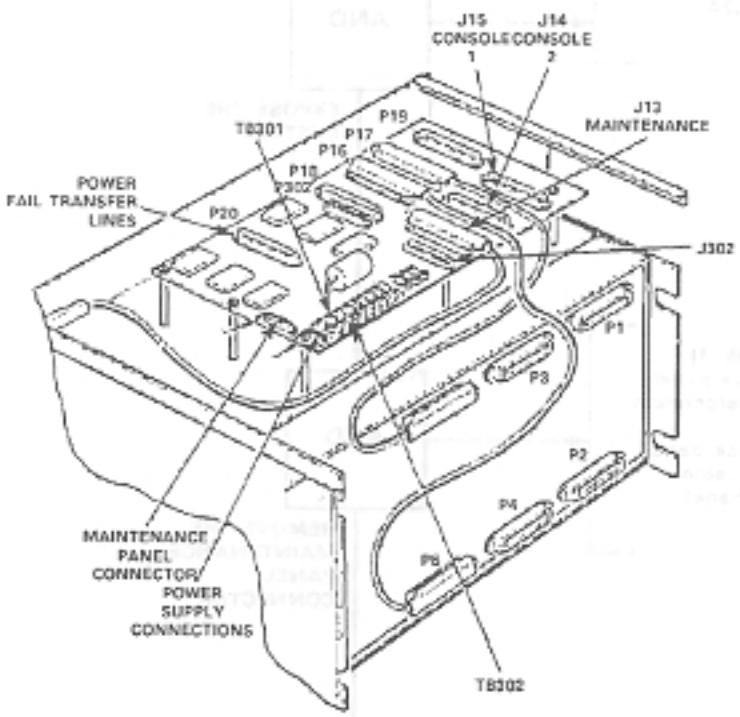

Fig. 405-1 Maintenance Panel Connector

REPLACE MAINTENANCE PANEL SX-100
MAP350-405
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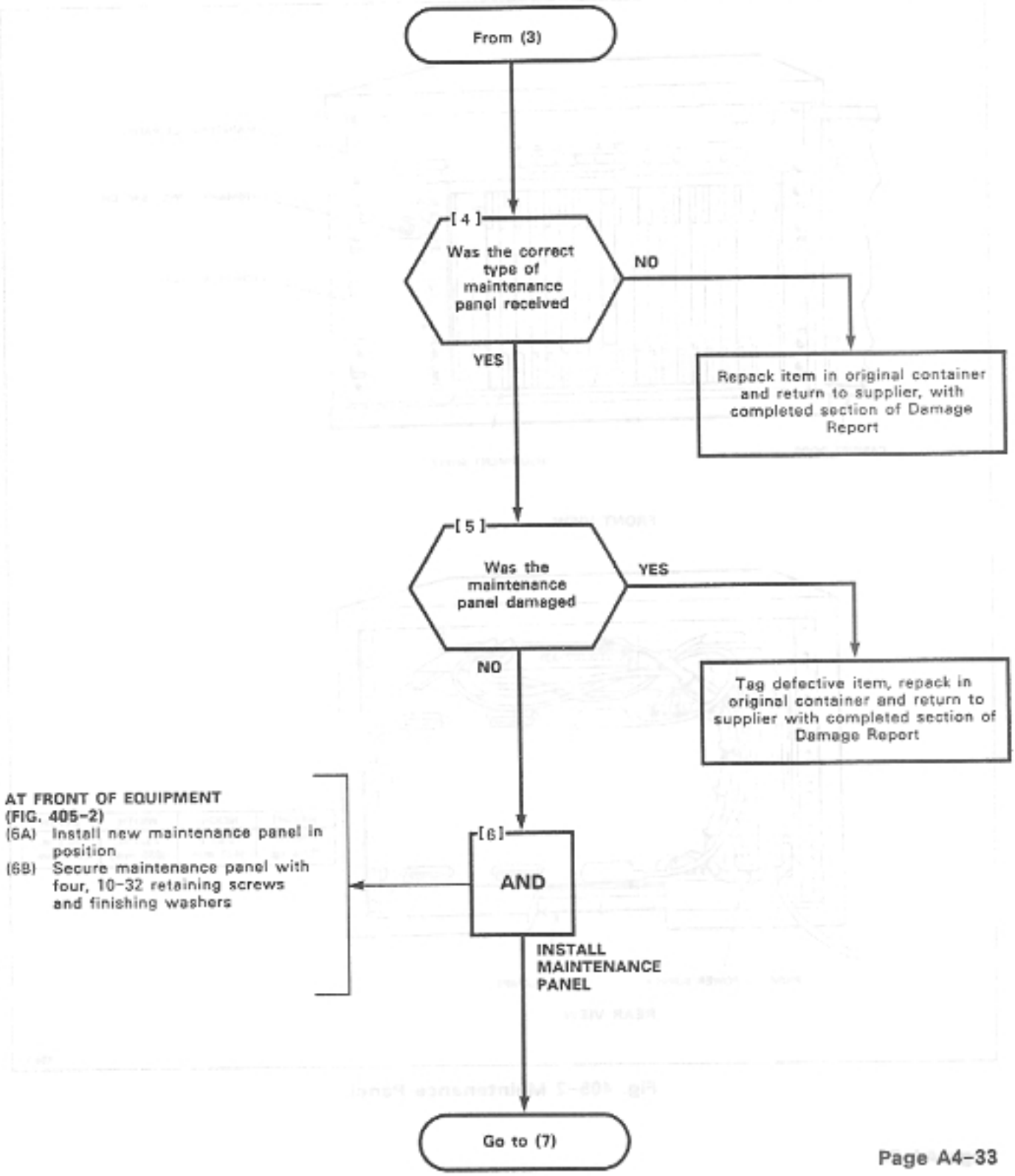

REPLACE MAINTENANCE PANEL SX-100
MAP350- 405
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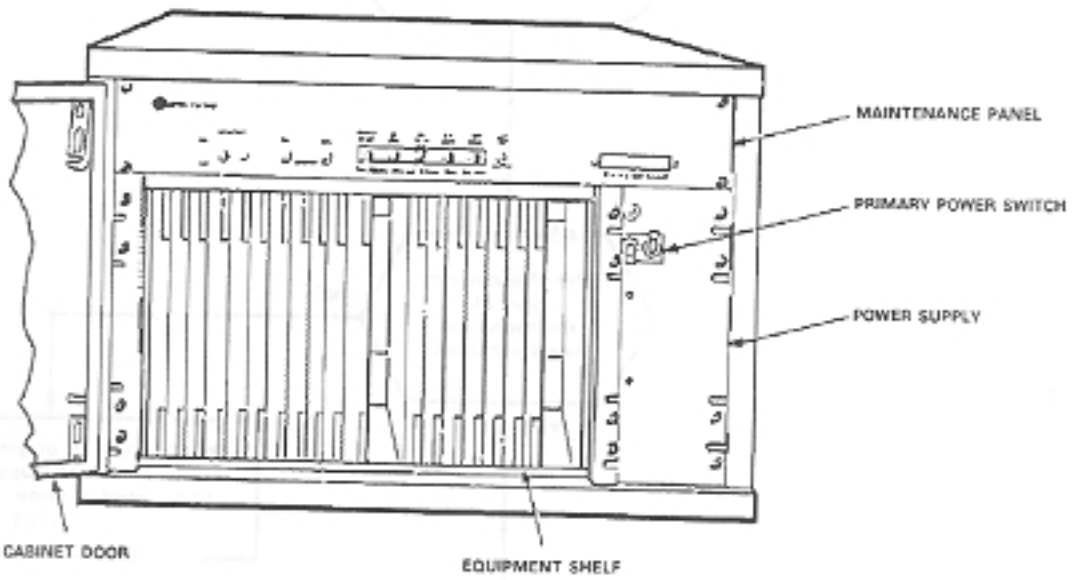
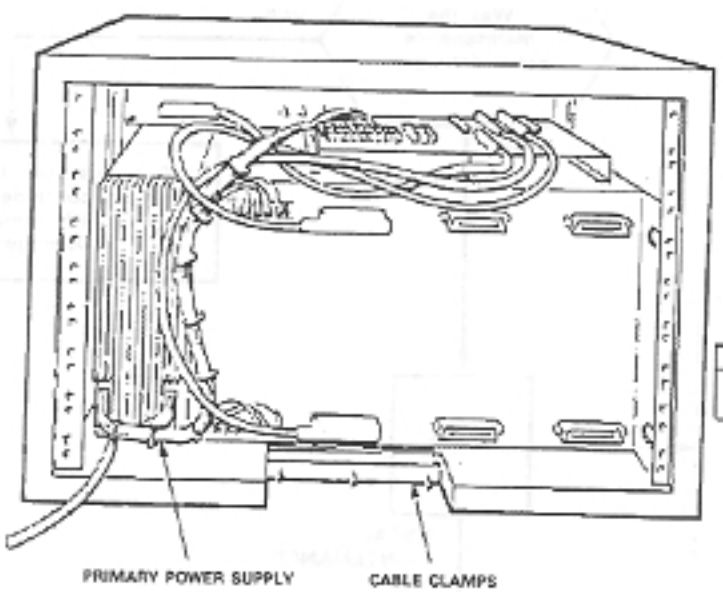


FRONT VIEW



REAR VIEW

WEIGHT	HEIGHT	WIDTH	DEPTH
70 lb (31.8 kg)	16.62 in. (422 mm)	25.0 in. (635 mm)	18.5 in. (470 mm)

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Fig. 405-2 Maintenance Panel

REPLACE MAINTENANCE PANEL SX-100
MAP350-405
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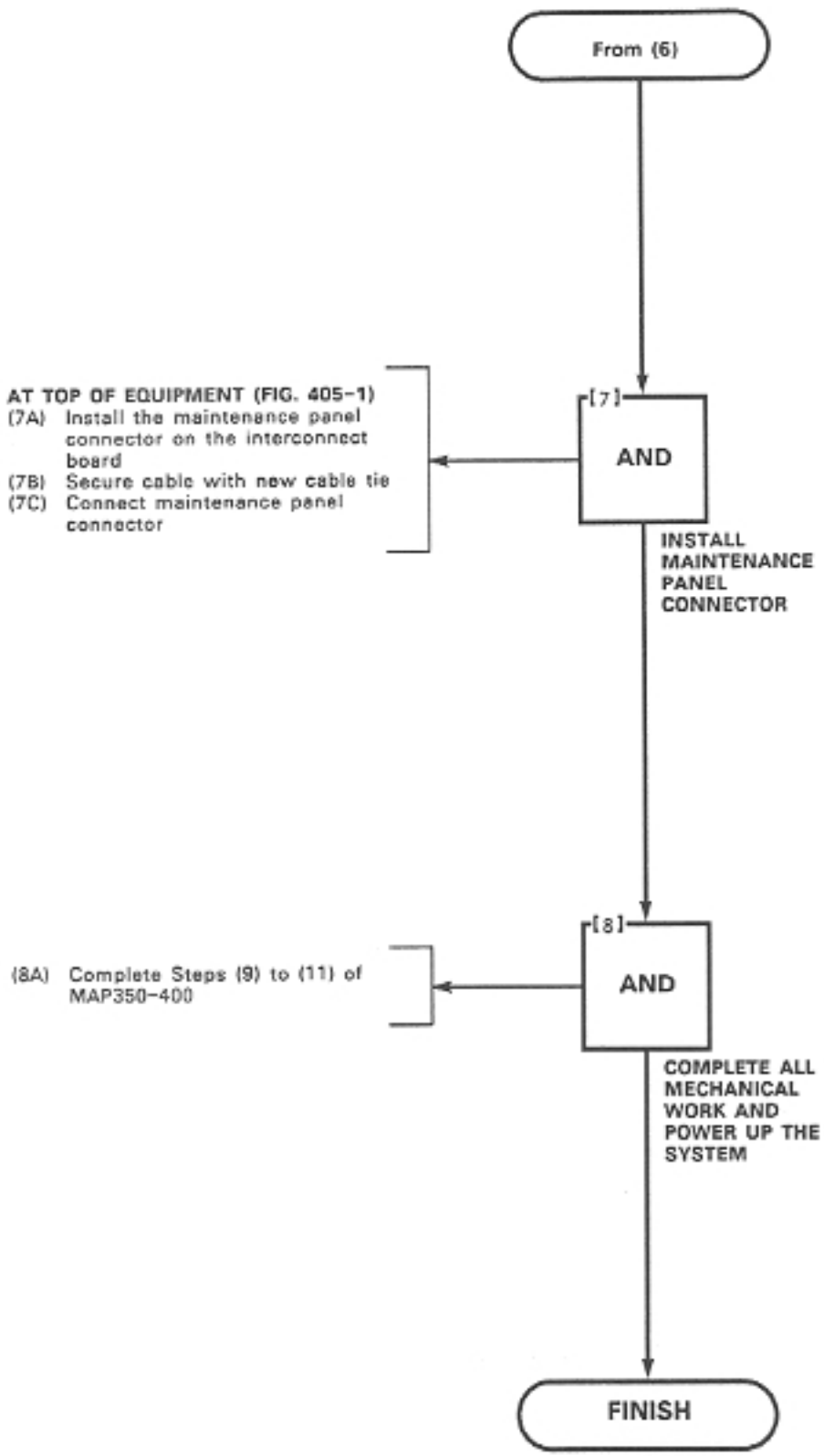

AND
AND

REPLACE 220 V ADAPTER SX-100
MAP350-406
Issue 1, December 1982
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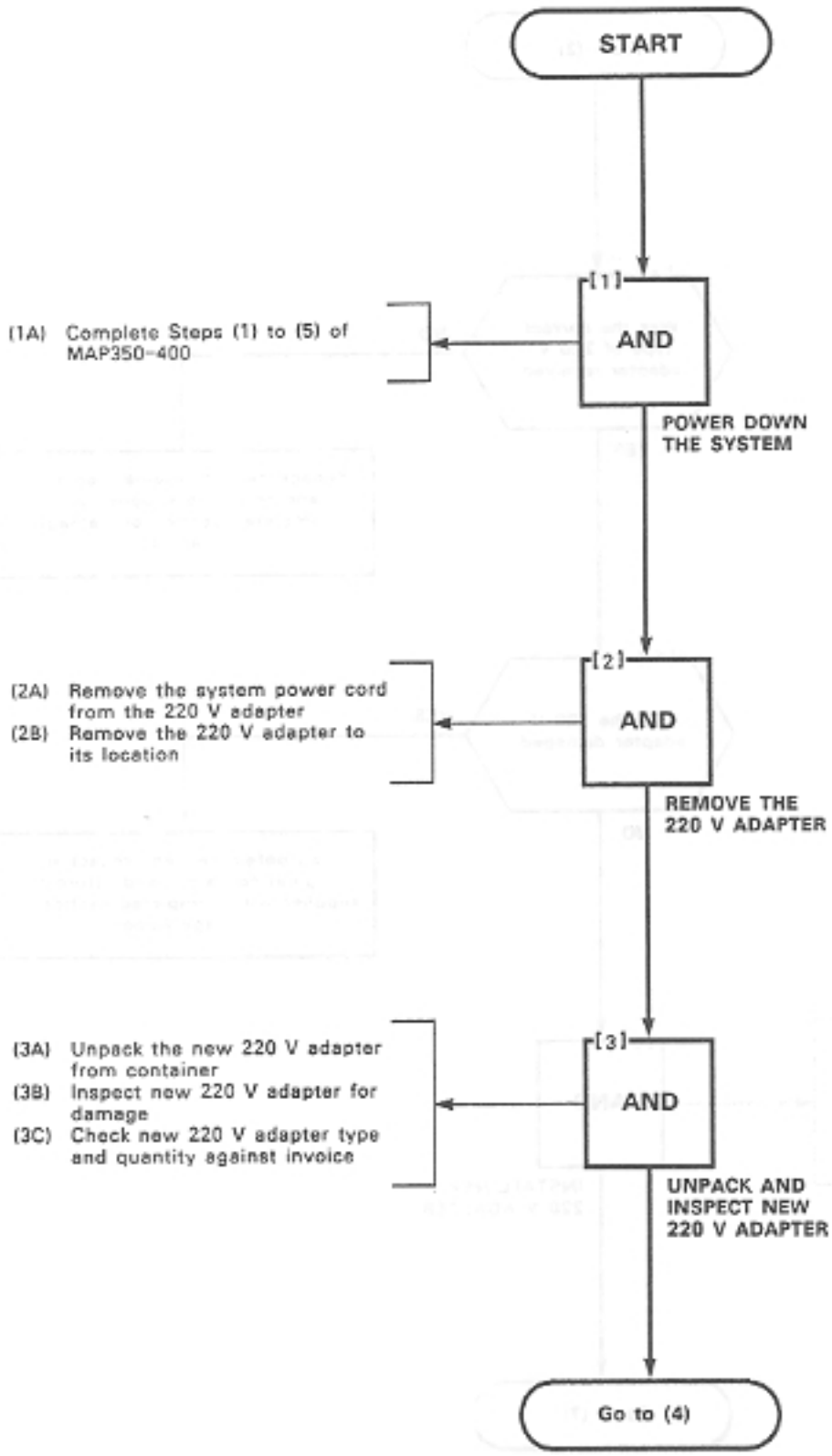

REPLACE 220 V ADAPTER SX-100
MAP350- 406
Issue 1, December 1982
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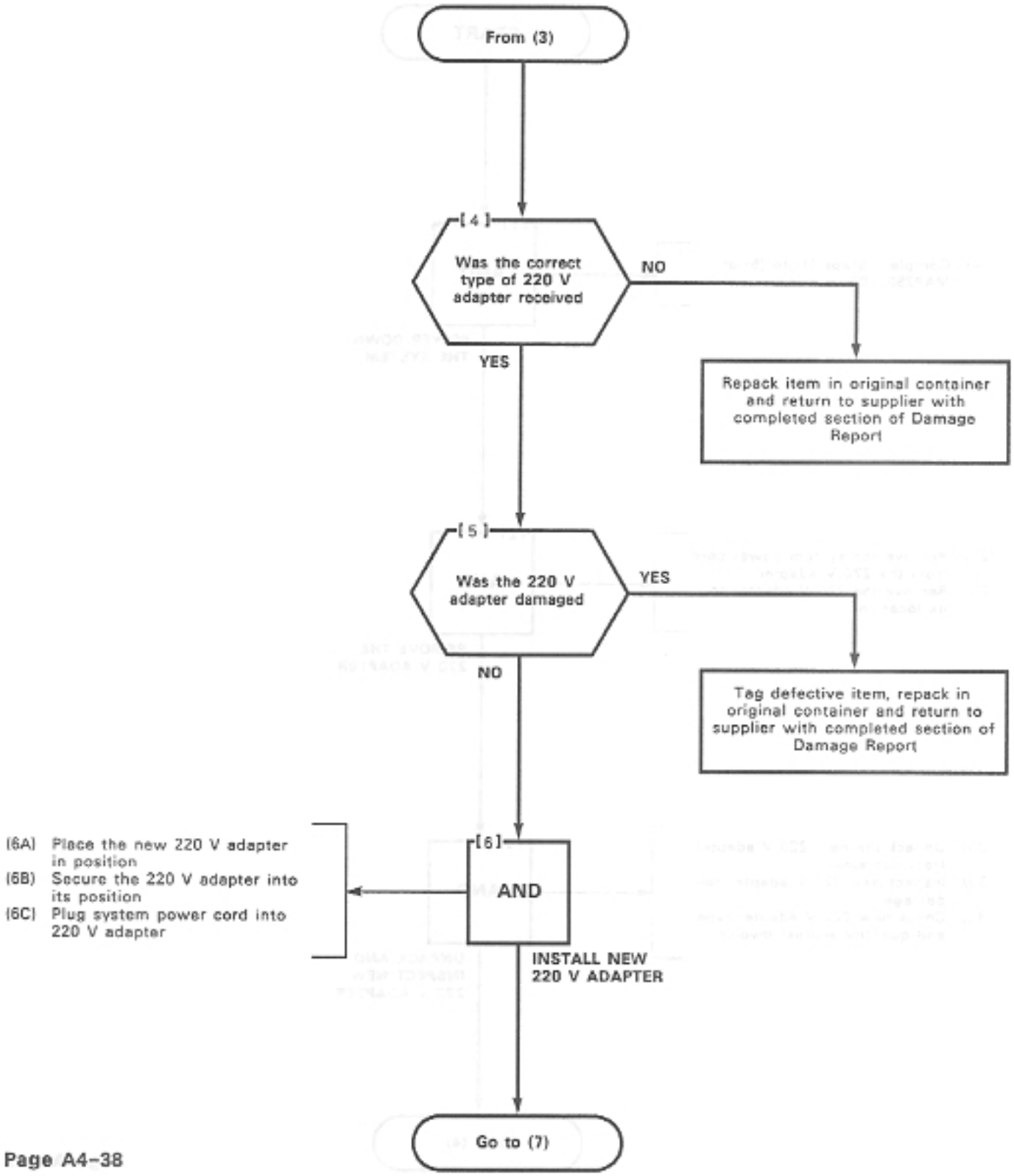

REPLACE 220 V ADAPTER SX-100
MAP350-406
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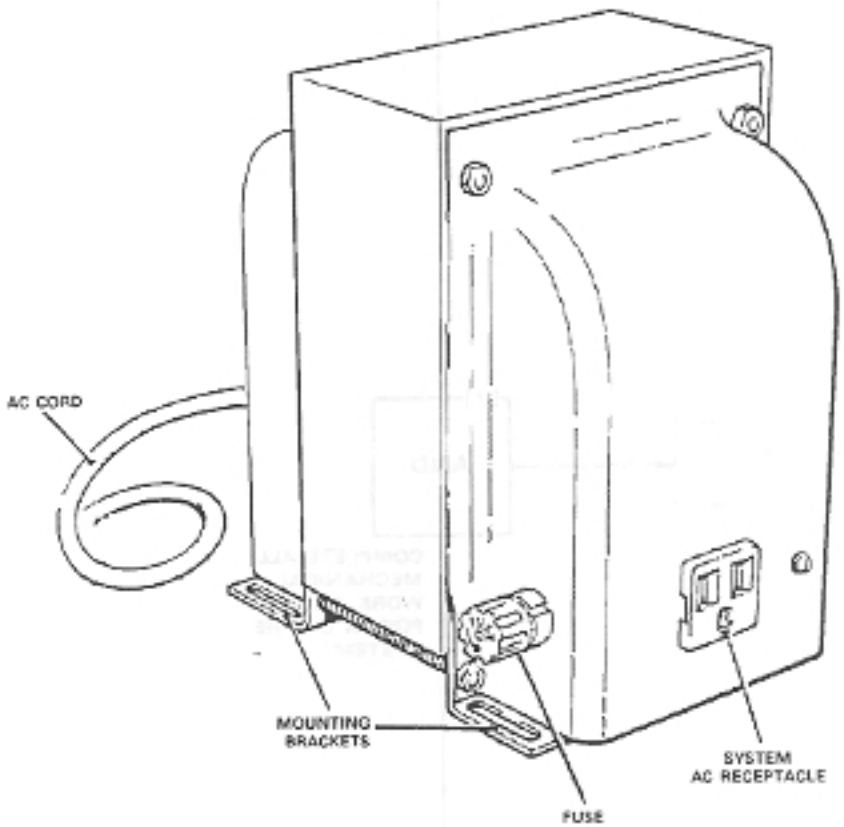

Fig. 406-1 220 V Adapter

REPLACE 220 V ADAPTER SX-100
MAP350- 406
Issue 1, December 1982
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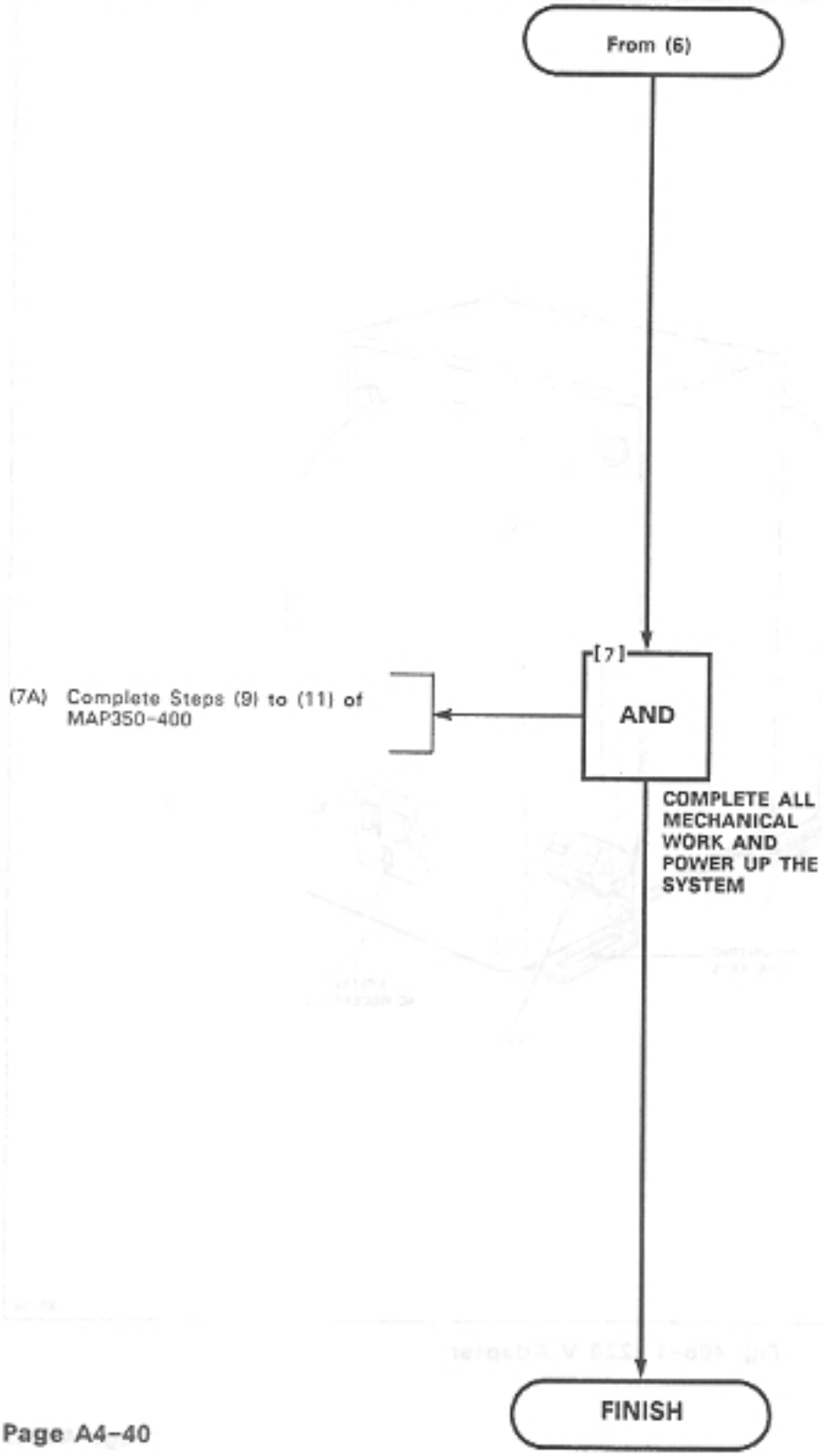

APPENDIX 5
SX-200 MECHANICAL PROCEDURES

1. GENERAL

A5.01 The MAP's contained in this Appendix detail the procedures to be performed in all mechanical work on the SX-200. These MAP's are used in conjunction with the MAP's outlined in other sections of this practice. They will facilitate ease of replacement of component parts.

A5.02 The basic synopsis of this Appendix: if a component part has been judged to be defective by the use of the MAP's, replace it.

TABLE A5-1
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
Issue 1, December 1982
Sheet 1 of 4

TOOL REQUIRED

1 Phillips screwdriver

START

[1] Is the console to be replaced

NO → Go to (5)

YES

[2] AND

AT THE NEW CONSOLE

(2A) Remove fiberglass tape from top of packing case
(2B) Open packing case and remove foam sheet
(2C) Remove foam inserts from ends of console (if installed)
(2D) Remove console accessory bag from insert
(2E) Remove console from packing case
(2F) Remove polyethylene sheet from console
(2G) Place all packing materials in packing case for use in reshipment

UNPACK NEW CONSOLE

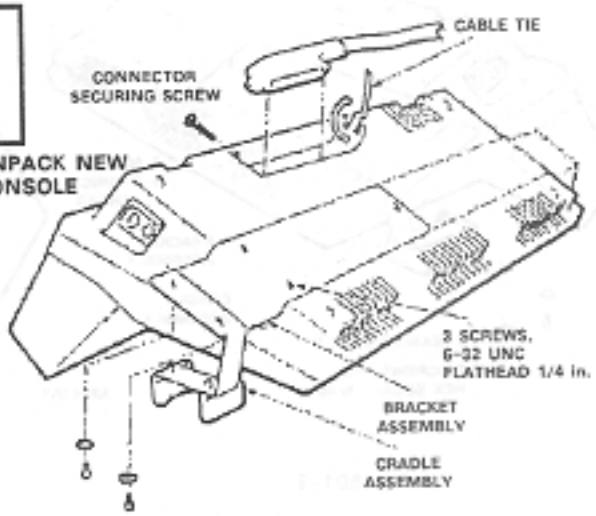

Fig. 501-1

[3] AND

AT NEW CONSOLE

(3A) Remove the cradle bracket, three Phillips screws and two Allen head screws with key from accessory bag
(3B) Place console face down on desk top
(3C) Position one cradle bracket as shown in Fig. 501-1. (Cradle bracket may be placed at other end of console if preferred)
(3D) Attach cradle bracket to console using three Phillips screws
(3E) Attach cradle hook to console with two Allen head screws. Tighten with Allen key

INSTALL NEW CRADLE BRACKET (FIG. 501-1)

Go to (4)

REPLACE CONSOLE AND/OR CONSOLE CABLE SX-200
MAP350- 501
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Sheet 2 of 4

From (3)

[4]

AND

(4A) Remove the screw securing the connector (Fig. 501-2)
(4B) Cut the cable tie

REMOVE OLD CONSOLE CONNECTOR (FIG. 501-2)

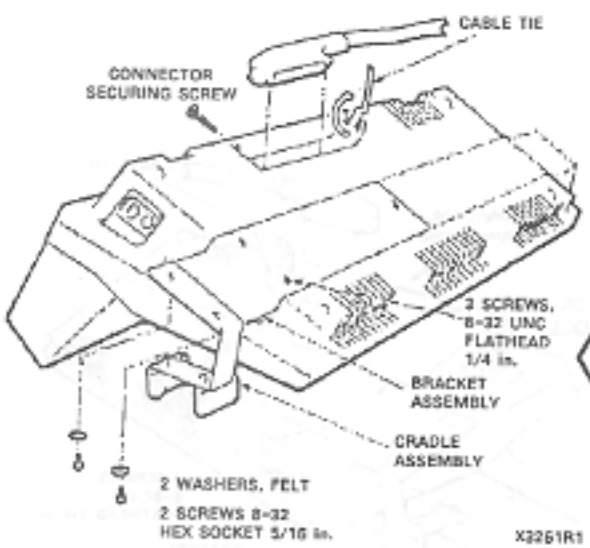

Fig. 501-2

[5]

Is a new console cable to be used

NO → Go to (7)

YES

[6]

AND

(6A) Construct and run a new console cable as per Appendix 2

CONSTRUCT A NEW CABLE

Go to (7)

REPLACE CONSOLE AND/OR CONSOLE CABLE SX-200
MAP350-501
Issue 1, December 1982
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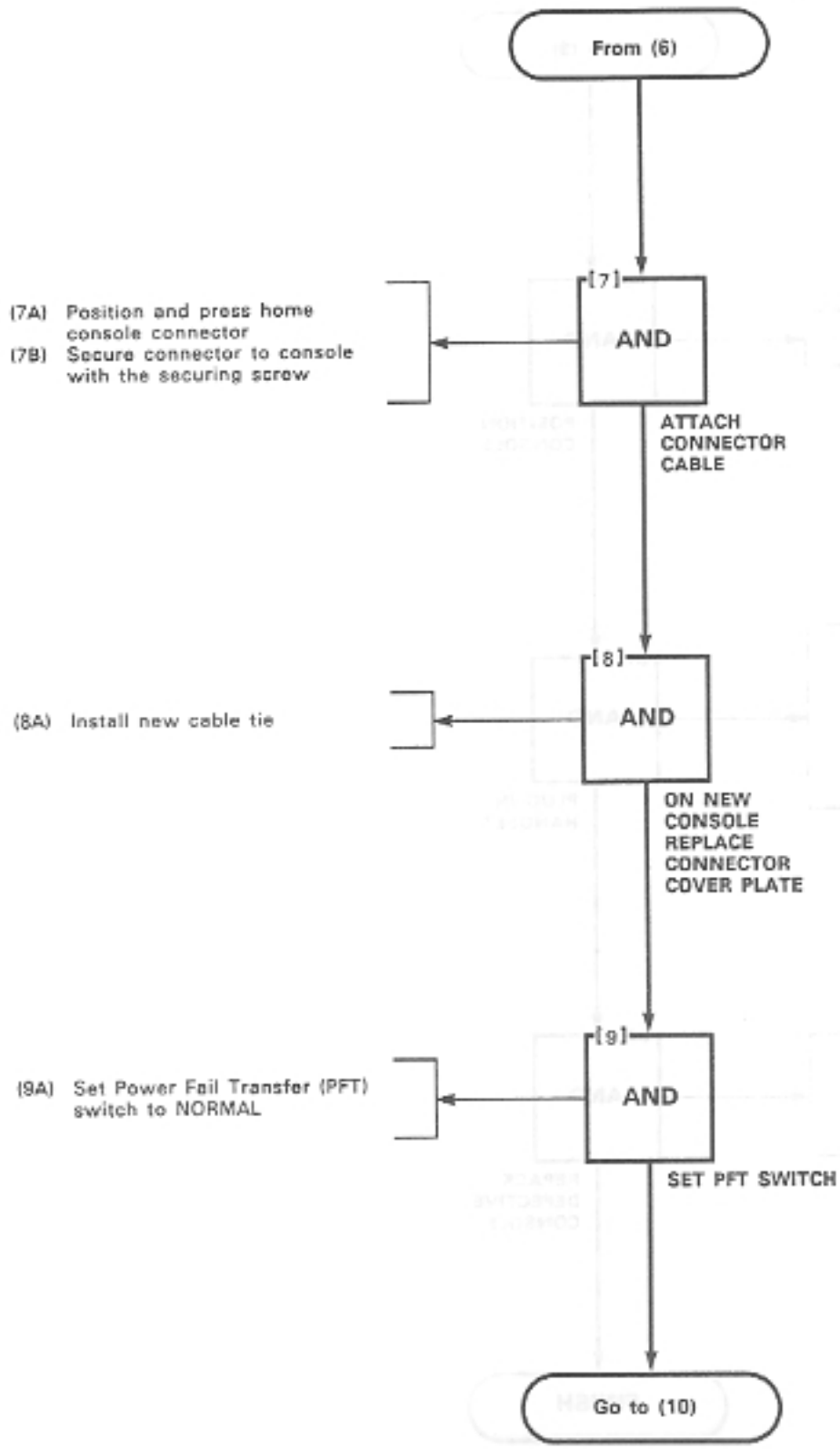

REPLACE CONSOLE AND/OR CONSOLE CABLE SX-200
MAP350- 501
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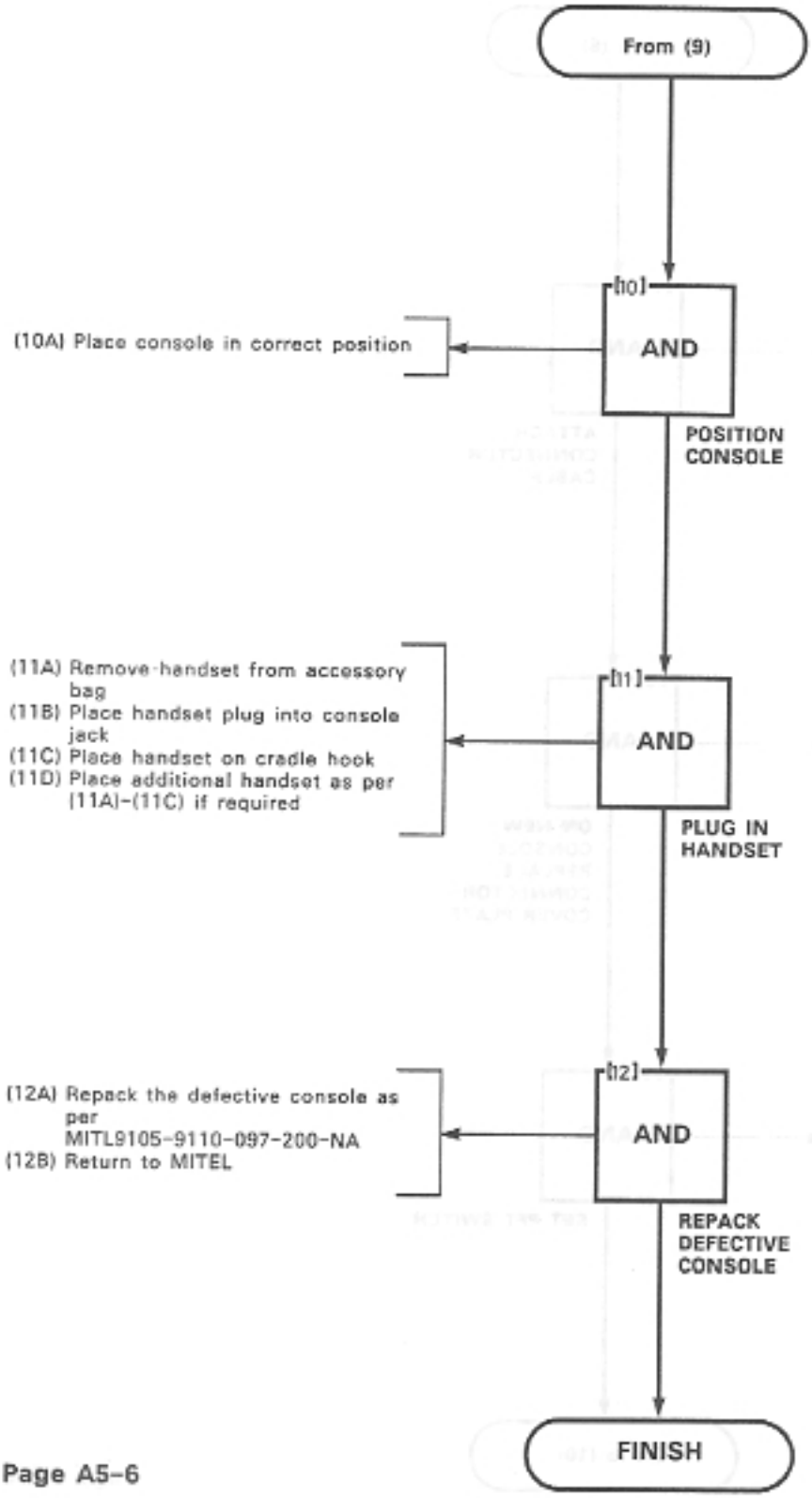

REPLACE INTERCONNECT CARD SX-200
MAP350-502
Issue 1, December 1982
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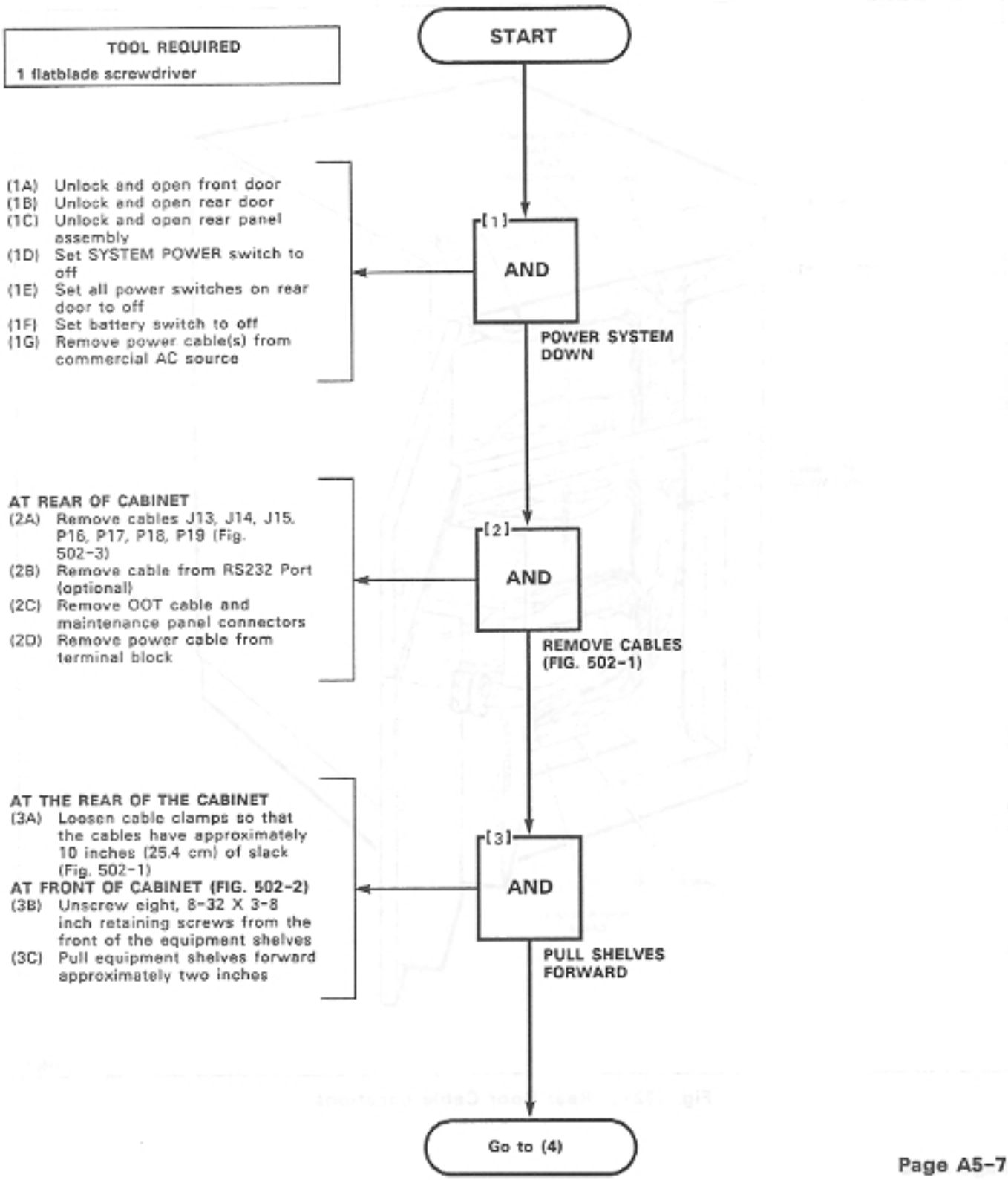

REPLACE INTERCONNECT CARD 474X-200
MAP350- 502
Issue 1. December 1982
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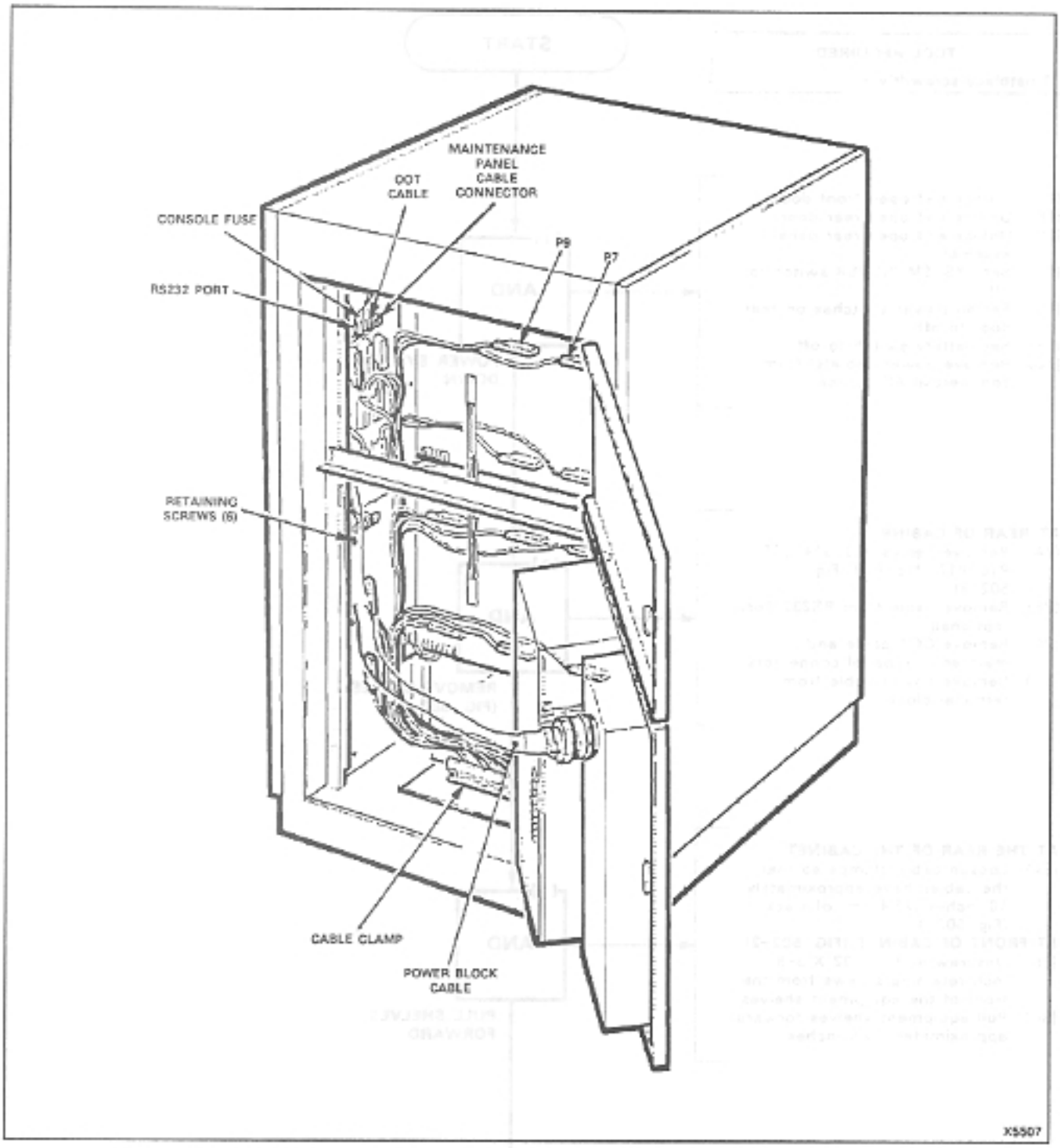

Fig. 502-1 Rear Door Cable Locations

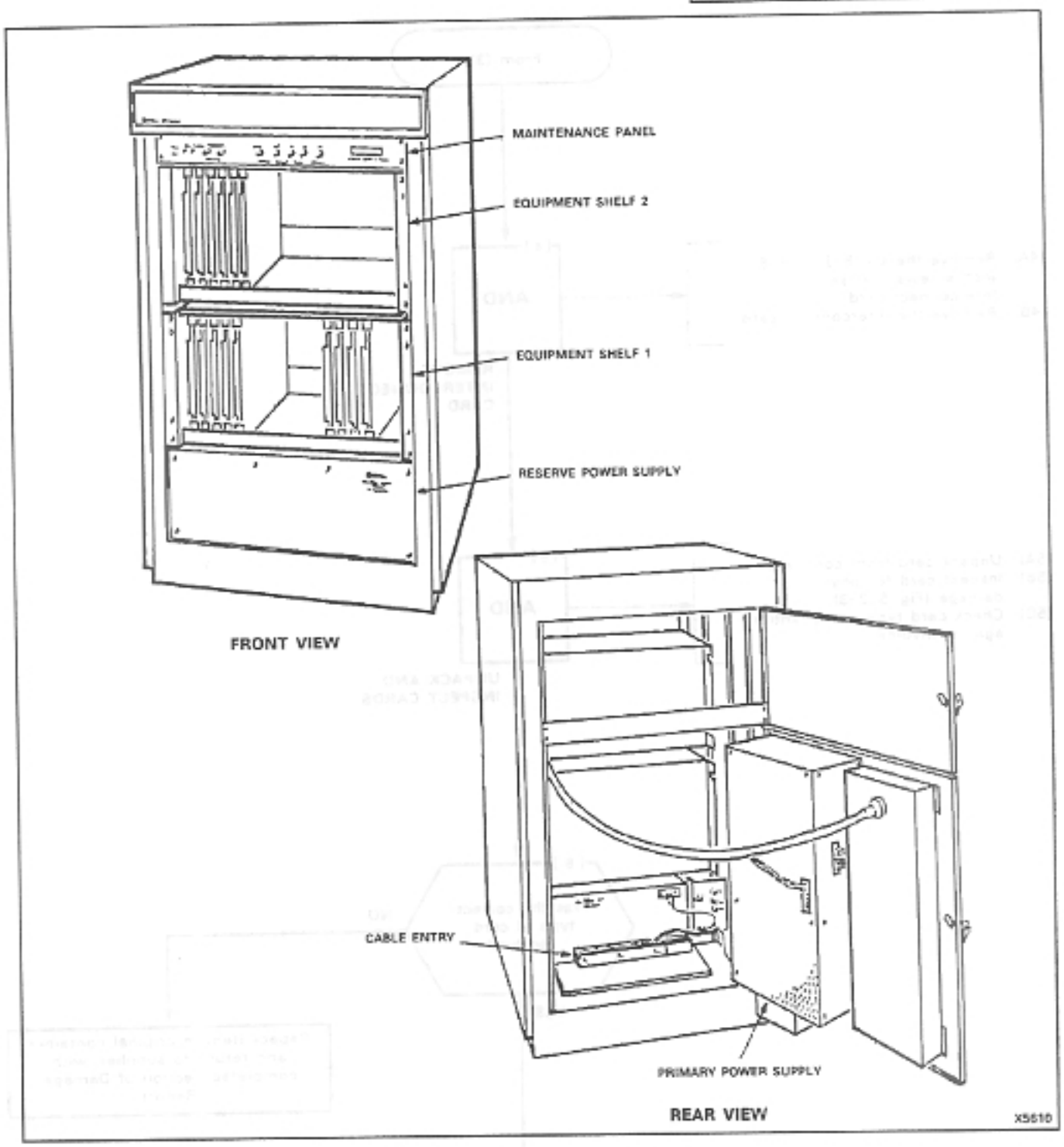

Fig. 502-2 Equipment Shelf

REPLACE INTERCONNECT CARD 474X-200
MAP350- 502
Issue 1, December 1982
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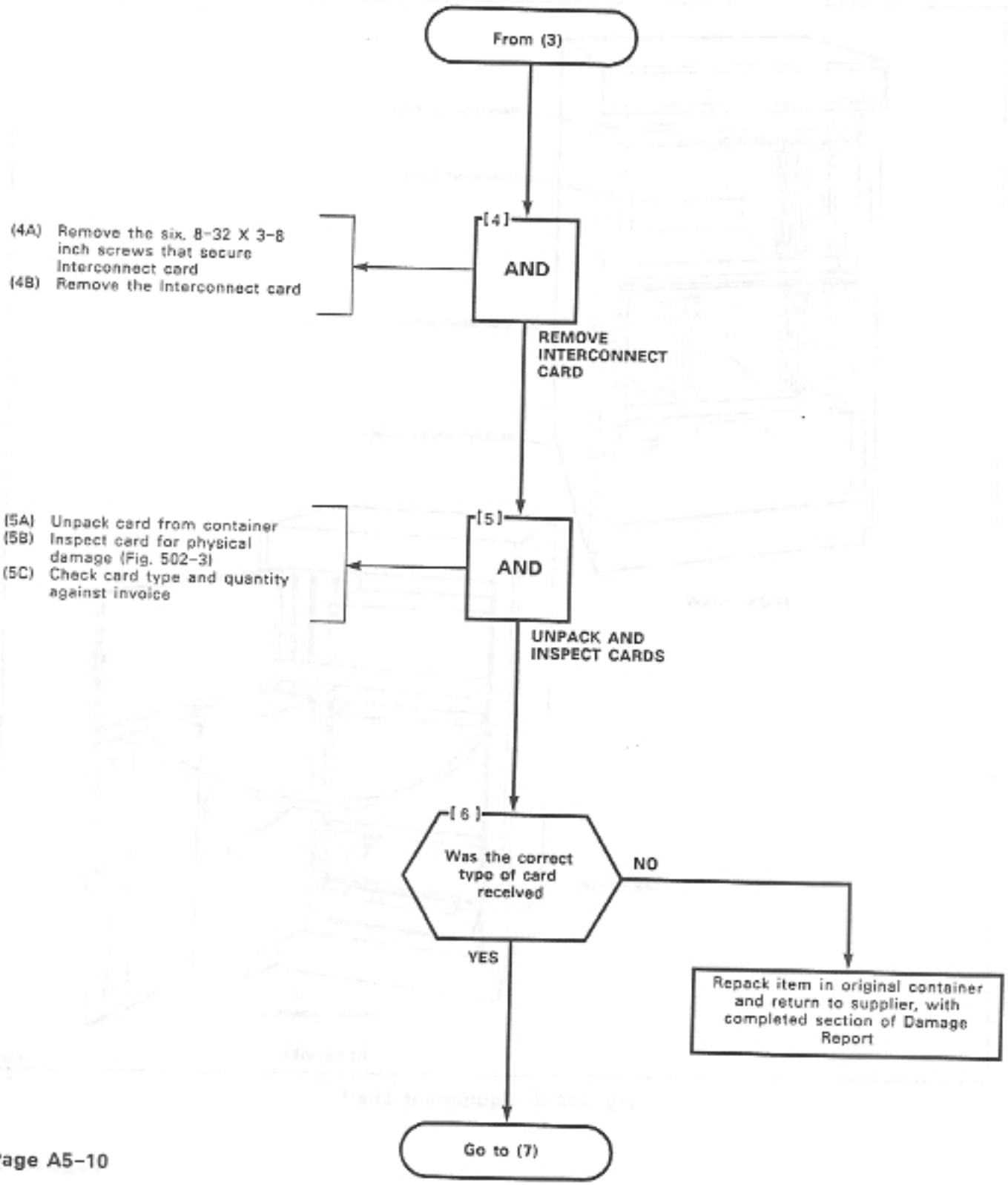

REPLACE INTERCONNECT CARD SX-200
MAP350-502
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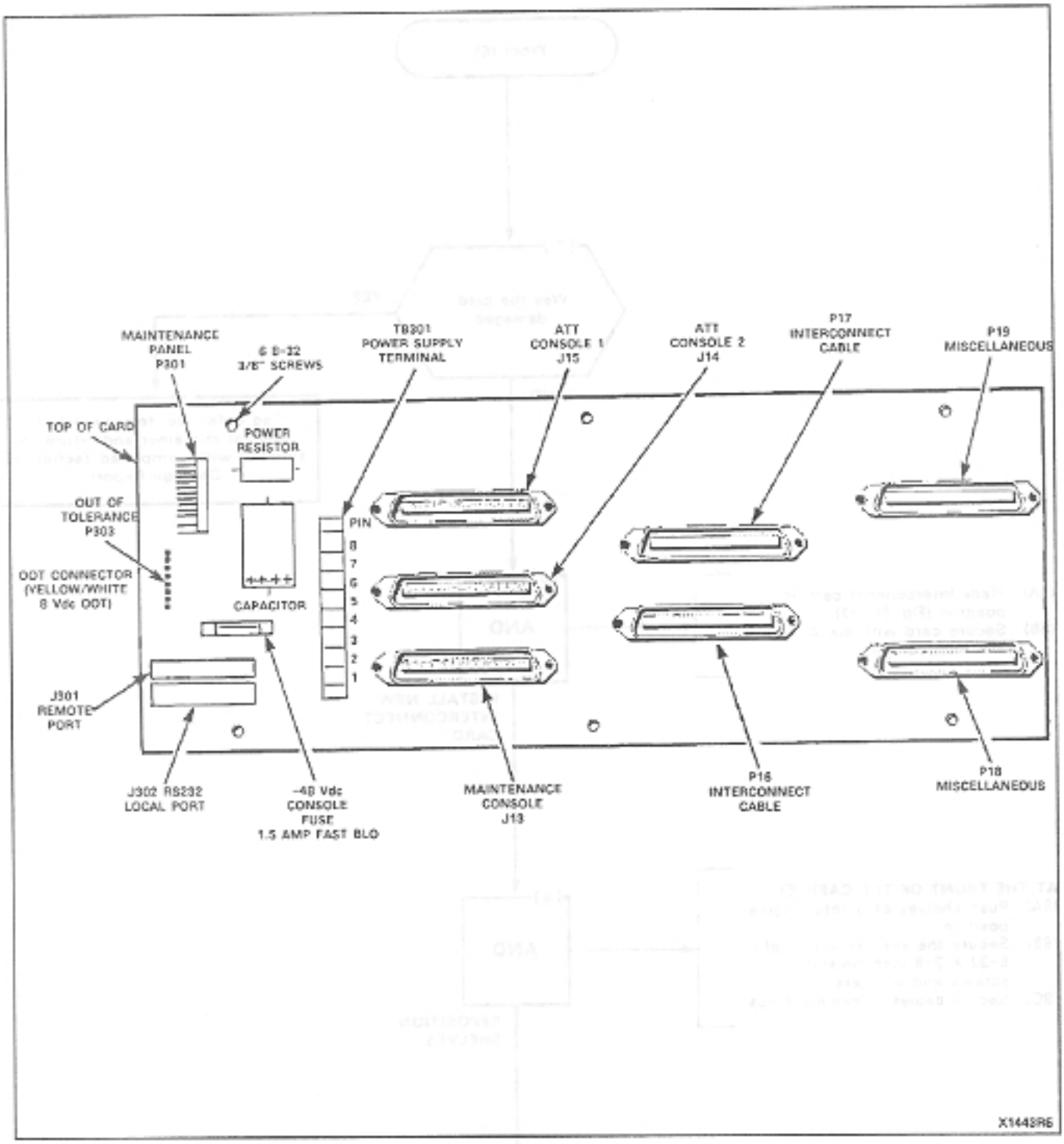

Fig. 502-3 Interconnect Card

REPLACE INTERCONNECT CARD 474X-200
MAP350- 502
Issue 1, December 1982
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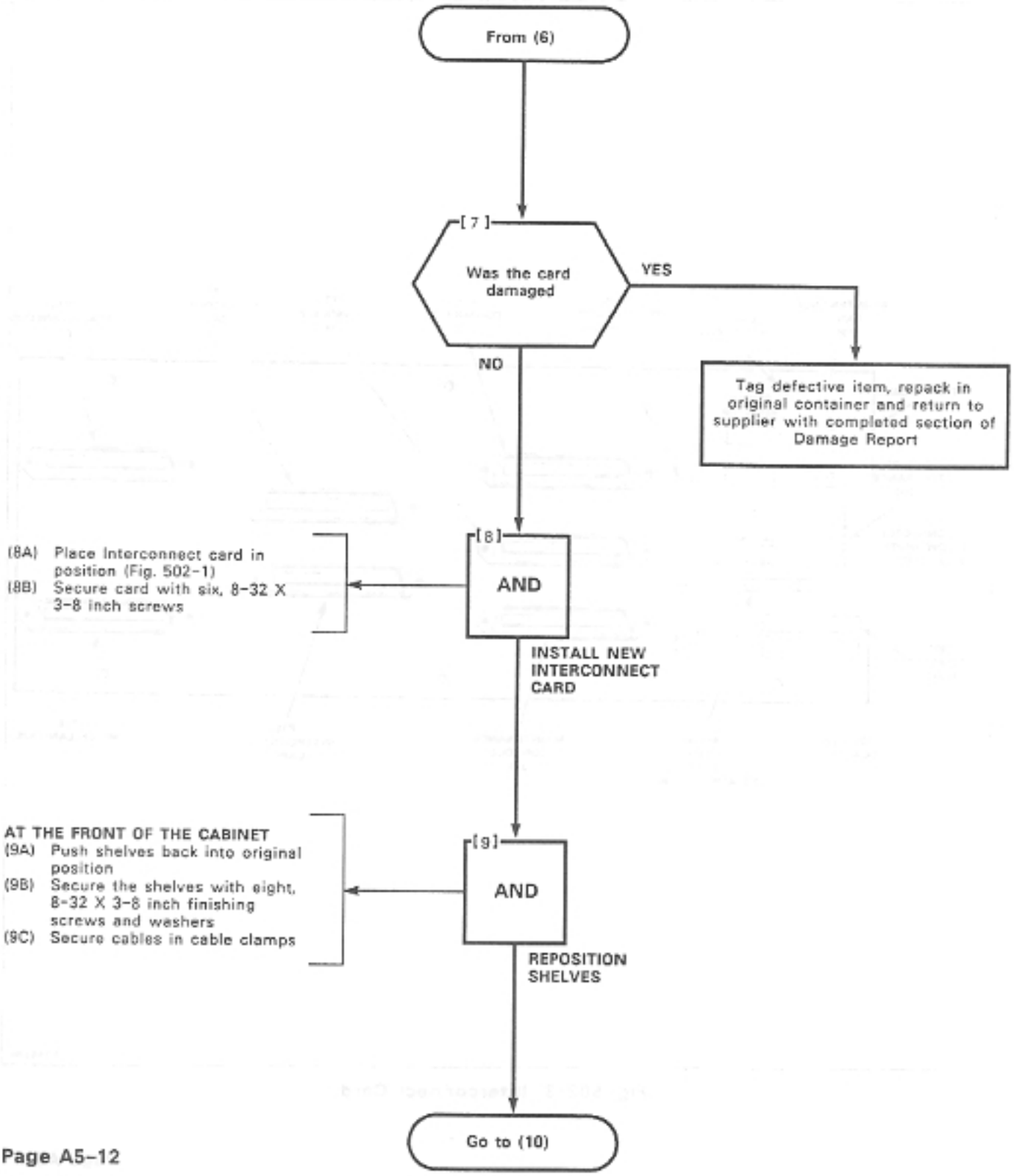

REPLACE INTERCONNECT CARD SX-200
MAP350-502
Issue 1, December 1982
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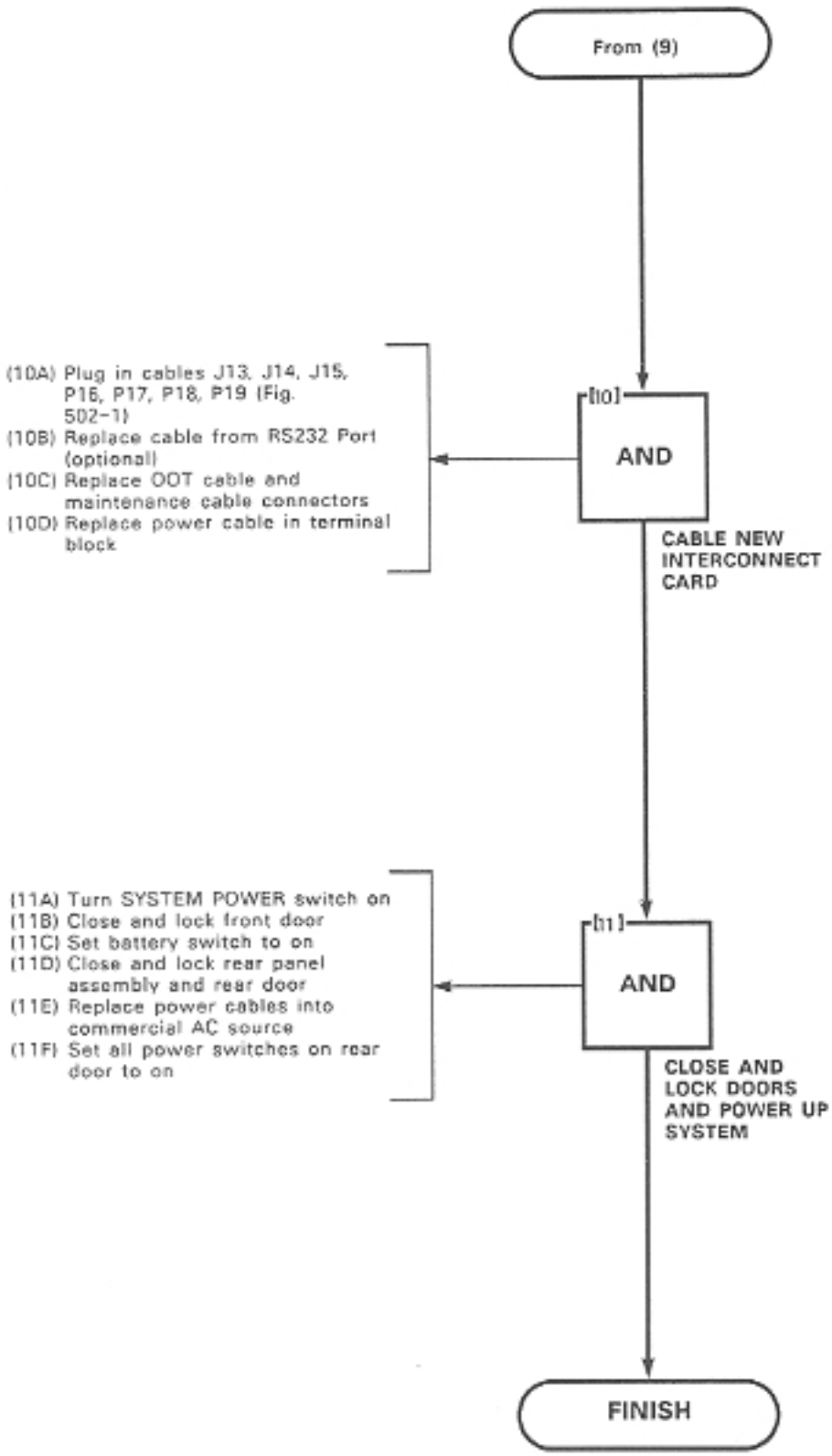

AND
AND

REPLACE POWER FAIL TRANSFER CARD SX-200
MAP350- 503
Issue 1, December 1982
Sheet 1 of 7

TOOL REQUIRED

1 flathead screwdriver

START

[1] AND

(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

POWER SYSTEM DOWN

[2] AND

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

REMOVE CABLES (FIG. 503-1)

[3] AND

AT REAR OF CABINET
(3A) Loosen all cable clamps so that the cables have approximately 10 inches (25.4 cm) of slack (Fig. 503-1)

AT FRONT OF CABINET (FIG. 503-2)
(3B) Unscrew eight, 8-32 X 3-8 inch retaining screws from the front of the equipment shelves
(3C) Pull equipment shelves forward approximately 2 inches
(3D) Unplug J20
* J21 if used to on.

PULL SHELVES FORWARD

Go to (4)

REPLACE POWER FAIL TRANSFER CARD SX-200
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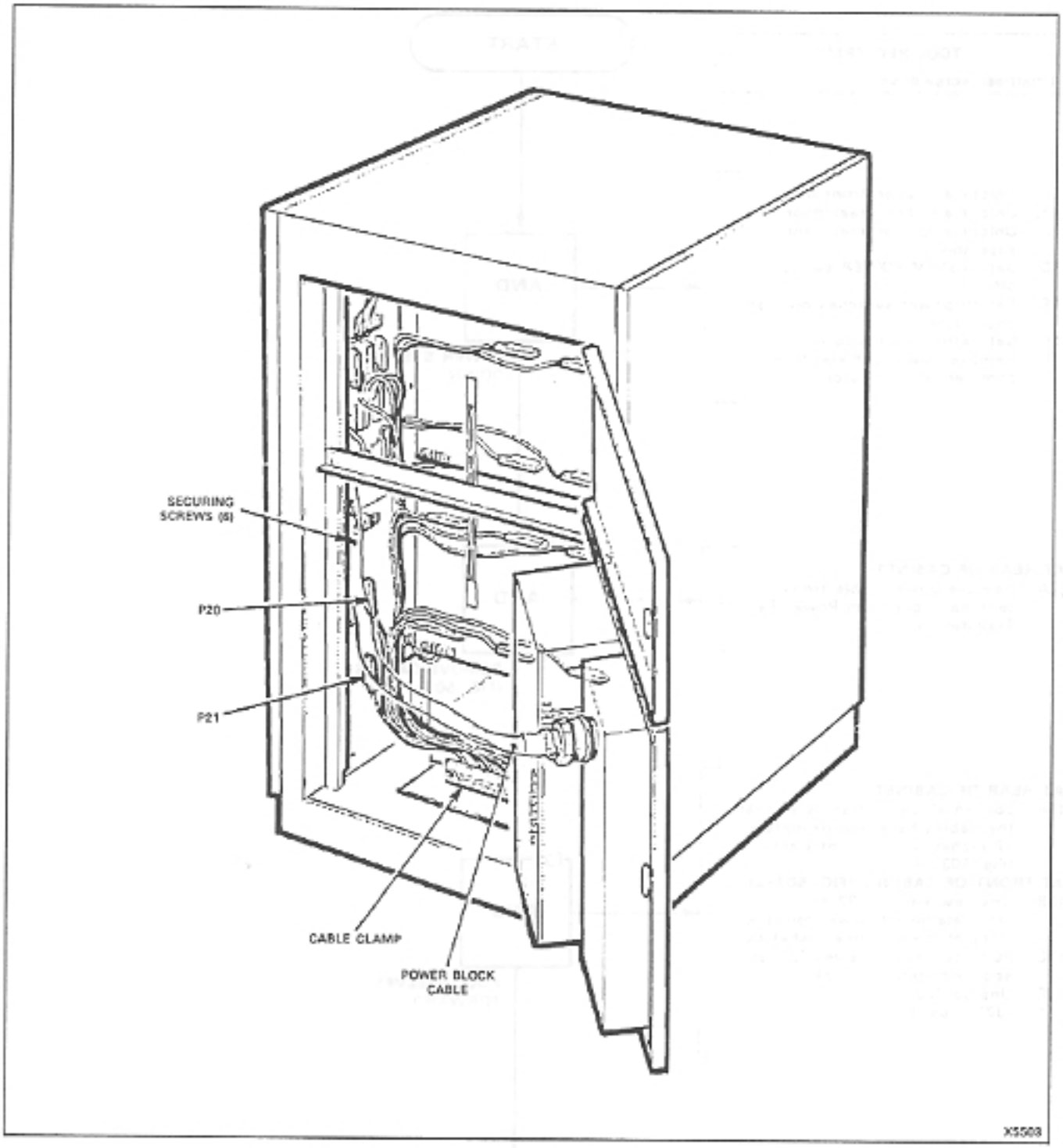

Fig. 503-1 Cables

REPLACE POWER FAIL TRANSFER CARD SX-200
MAP350-503
Issue 1, December 1982
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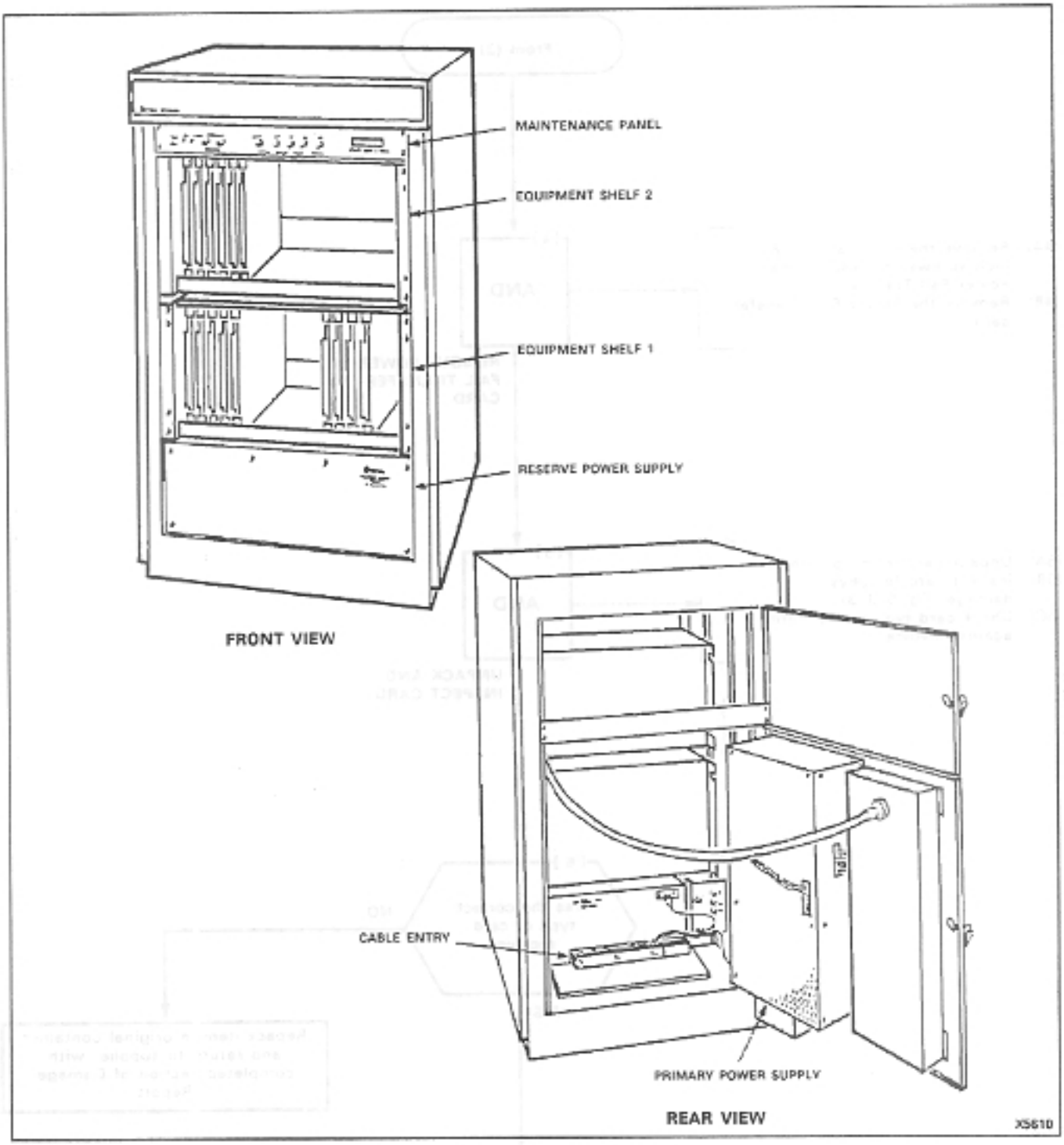

Fig. 503-2 Equipment Shelf

REPLACE POWER FAIL TRANSFER CARD SX-200
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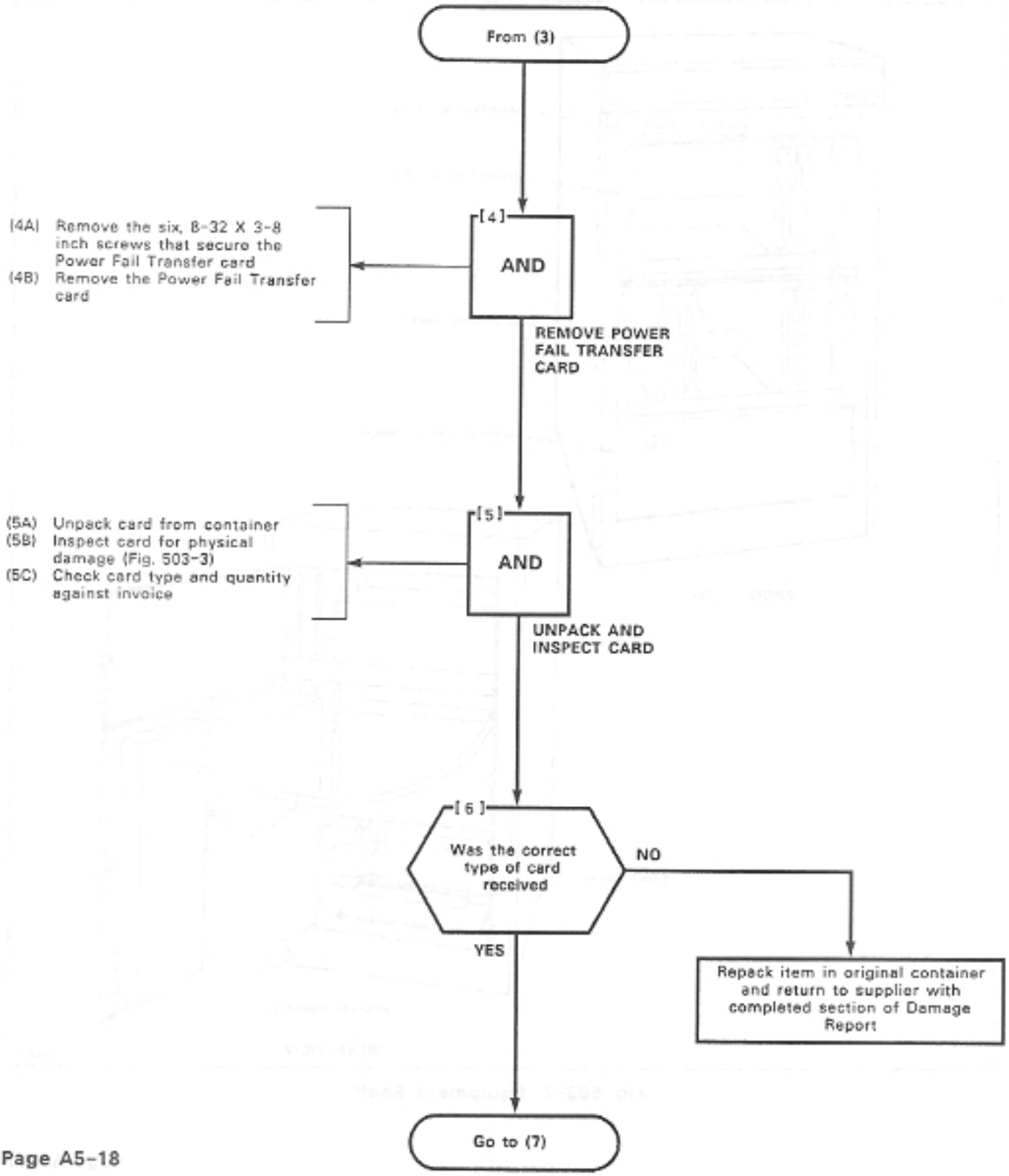

REPLACE POWER FAIL TRANSFER CARD SX-200
MAP350-503
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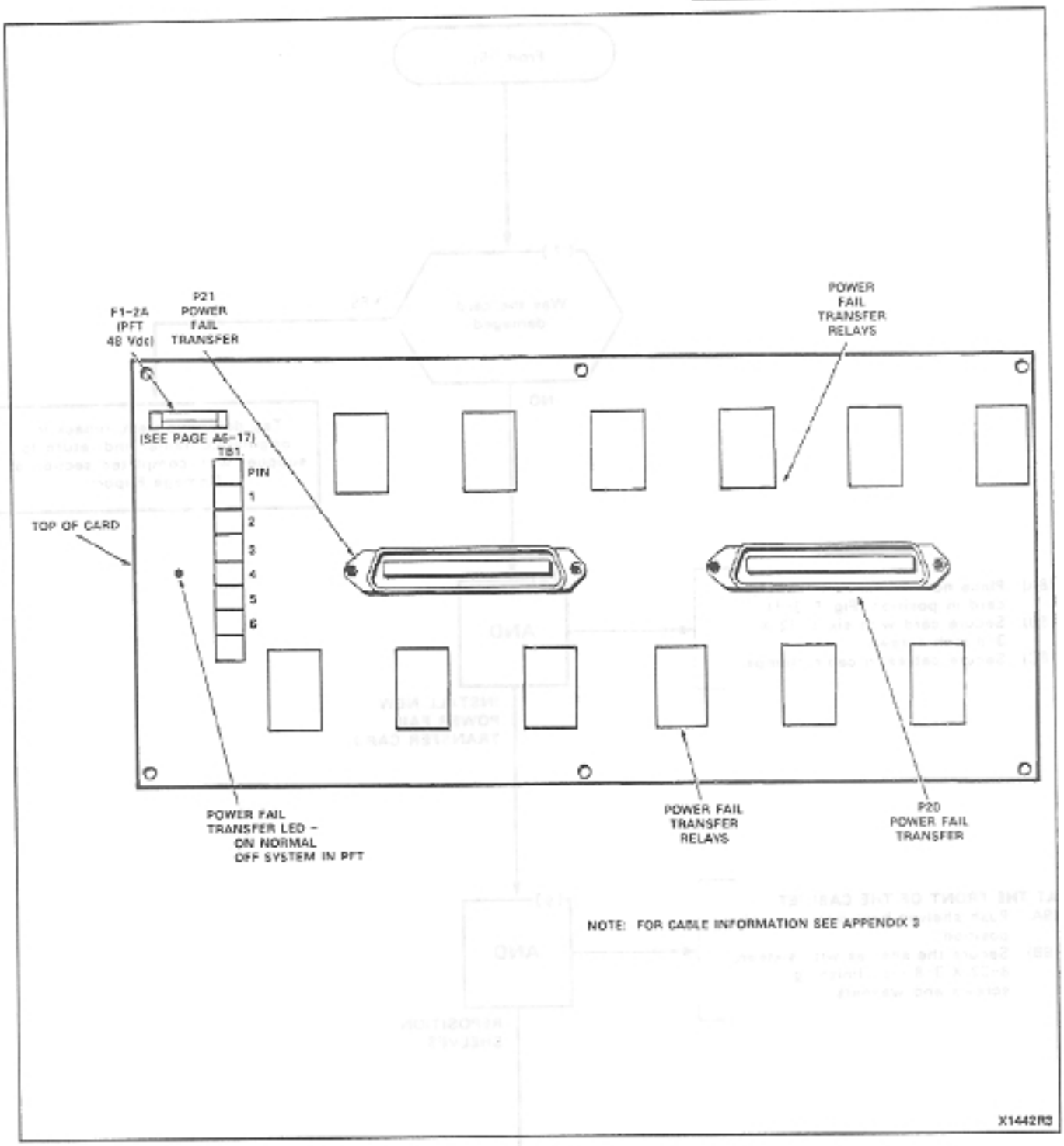

Fig. 503-3

REPLACE POWER FAIL TRANSFER CARD SX-200
MAP350- 503
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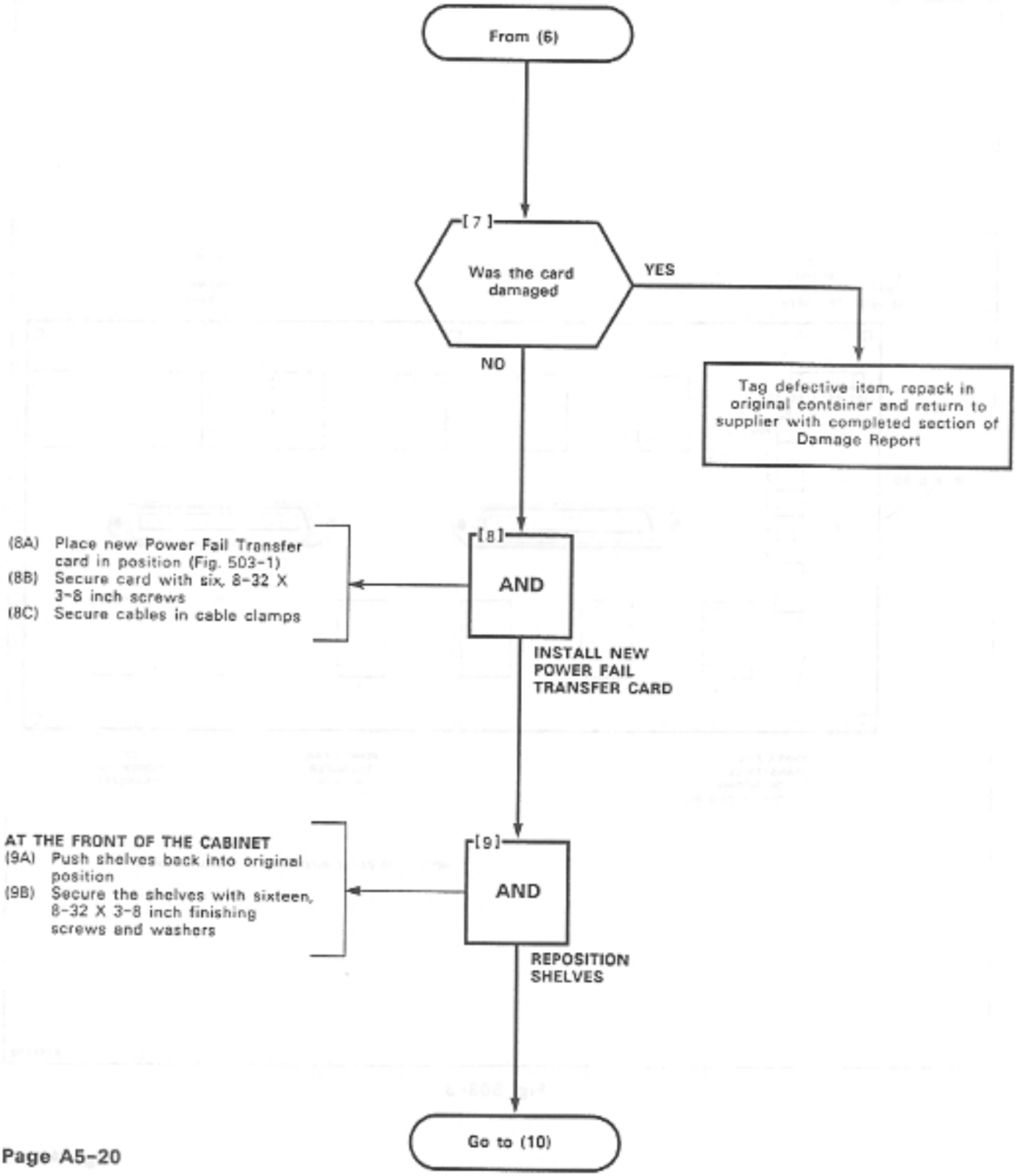

REPLACE POWER FAIL TRANSFER CARD SX-200
MAP350-503
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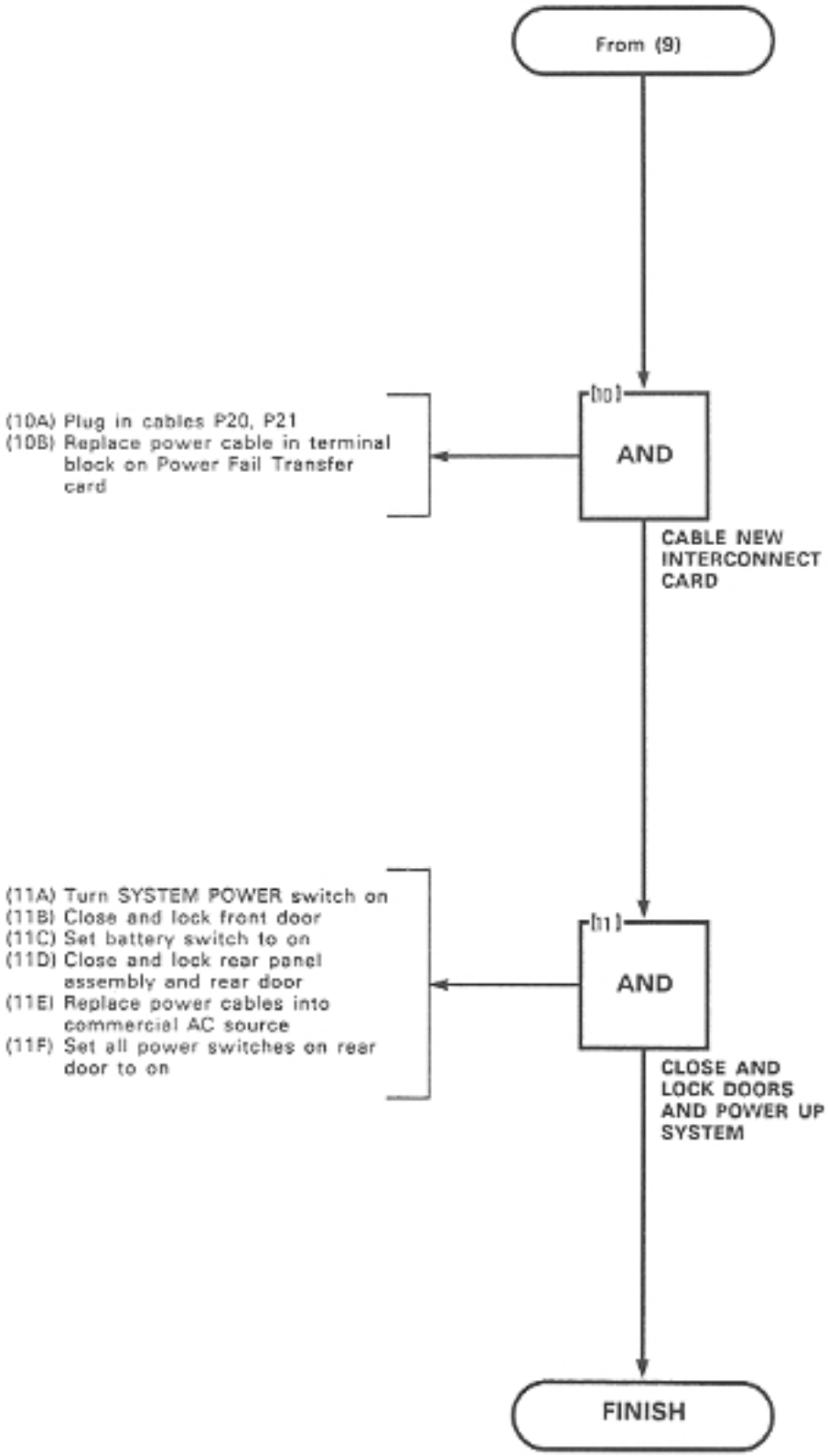

AND
AND

REPLACE CONSOLE INTERFACE CARD SX-200
MAP350-504
Issue 1, December 1982
Sheet 1 of 5

TOOLS REQUIRED
1 1/4 inch screwdriver
1 7/16 inch wrench

START

[1] AND

(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

POWER SYSTEM DOWN

[2] AND

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

REMOVE CABLES (FIG. 504-1)

AT REAR OF THE CABINET
(3A) Loosen all cable clamps so that the cables have approximately 10 inches (25.4 cm) of slack (Fig. 504-1)
AT FRONT OF CABINET (FIG. 504-2)
(3B) Unscrew eight, 8-32 X 3-8 inch retaining screws from the front of the equipment shelves
(3C) Pull equipment shelves forward approximately 2 inches

[3] AND

PULL SHELVES FORWARD

Go to (4)

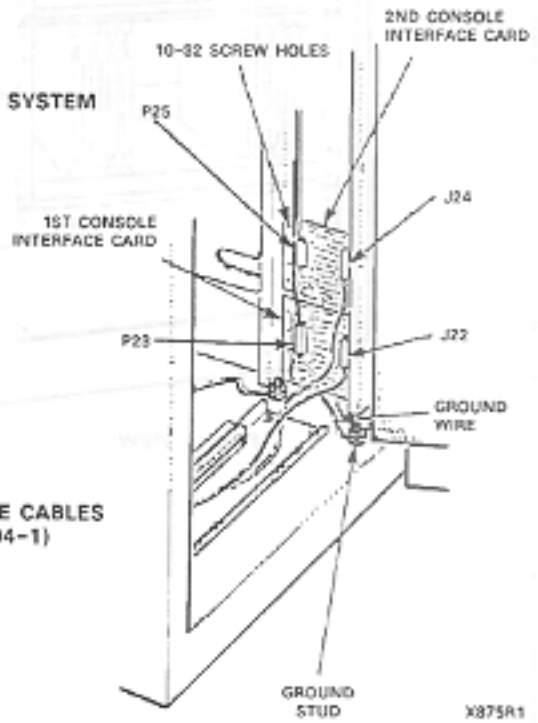

Fig. 504-1 Console Interface Card Position

REPLACE CONSOLE INTERFACE CARD SX-200
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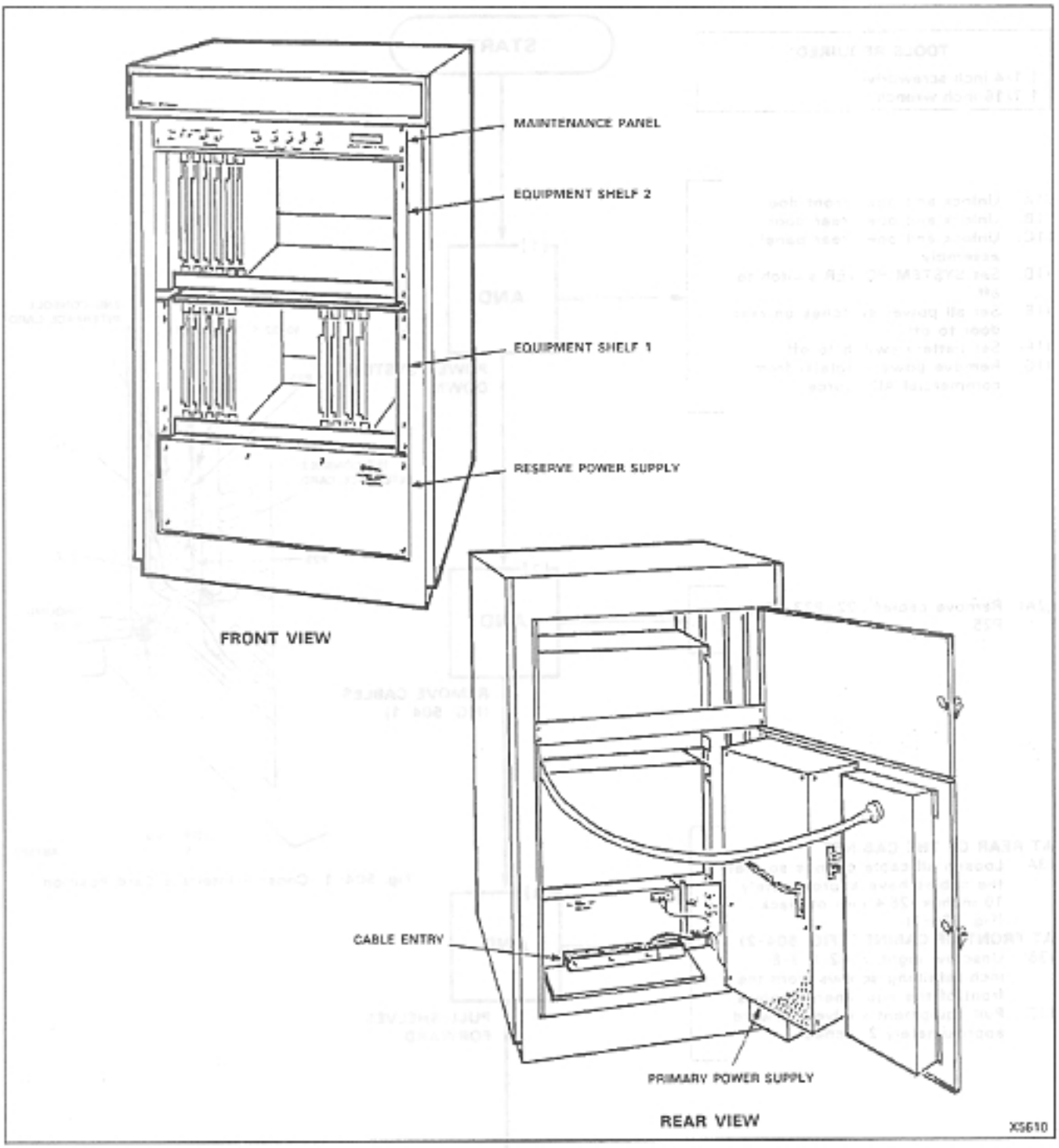

Fig. 504-2 Equipment Shelf

REPLACE CONSOLE INTERFACE CARD SX-200
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From (3)

[4]

AND

(4A) Remove the six, 8-32 X 3-8 inch screws that secure the Console Interface card
(4B) Remove card ground from ground lug
(4C) Remove Console Interface card

REMOVE CONSOLE INTERFACE CARD

[5]

AND

(5A) Unpack cards from containers
(5B) Inspect cards for physical damage (Fig. 504-3)
(5C) Check card type and quantity against invoice

UNPACK AND INSPECT CARDS

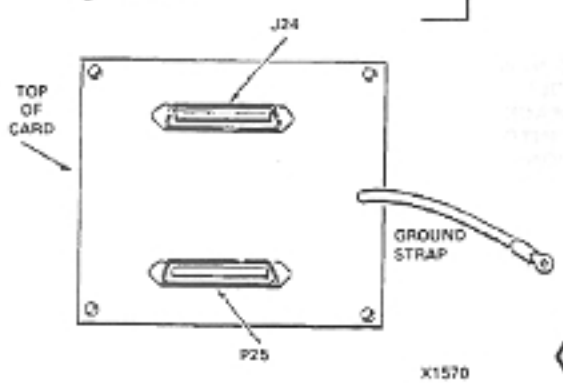

Fig. 504-3 Console Interface Card

[6]

Was the correct type of card received

NO

Repack item in original container and return to supplier with completed section of Damage Report

YES

Go to (7)

REPLACE CONSOLE INTERFACE CARD SX-200
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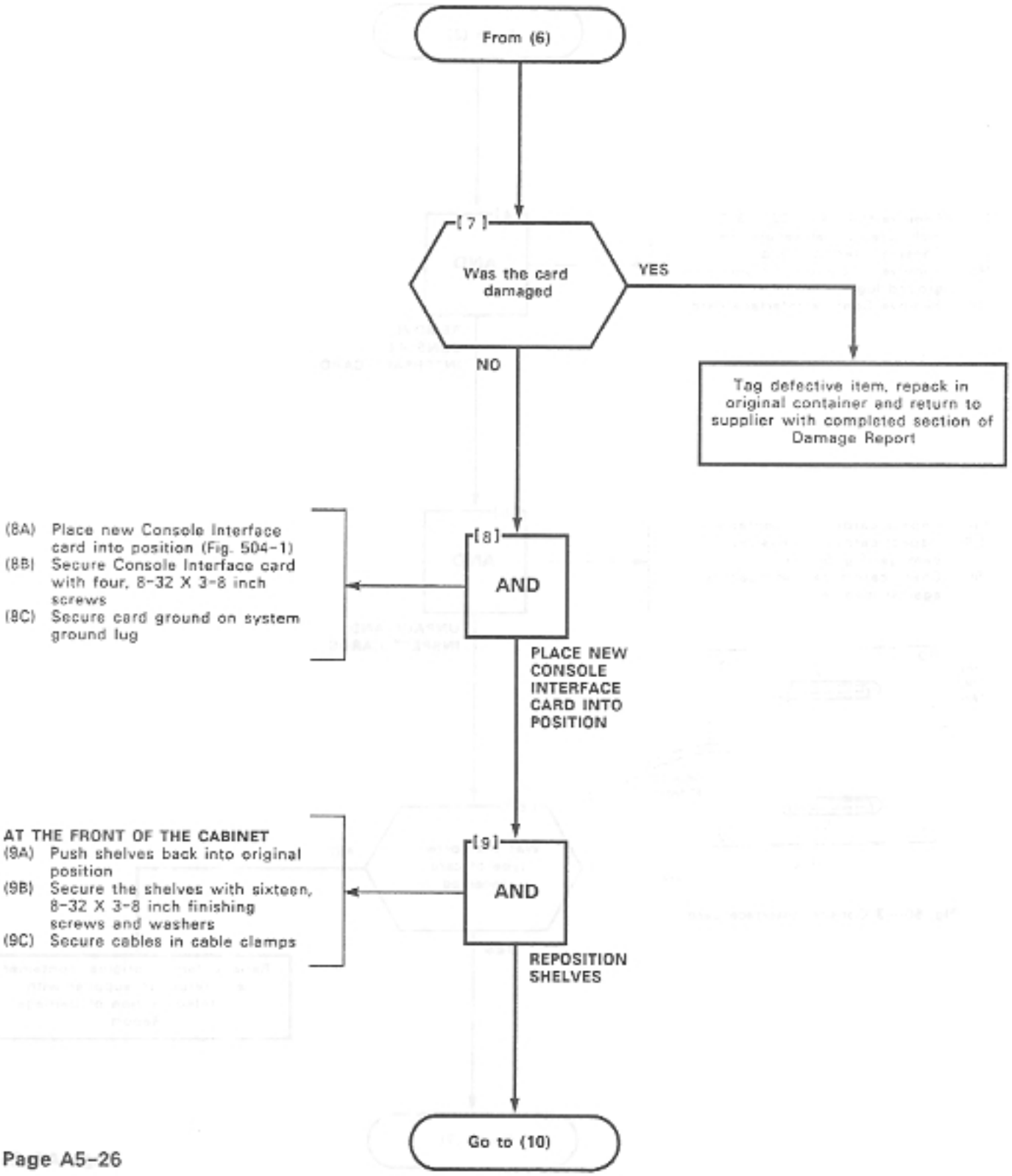

REPLACE CONSOLE INTERFACE CARD SX-200
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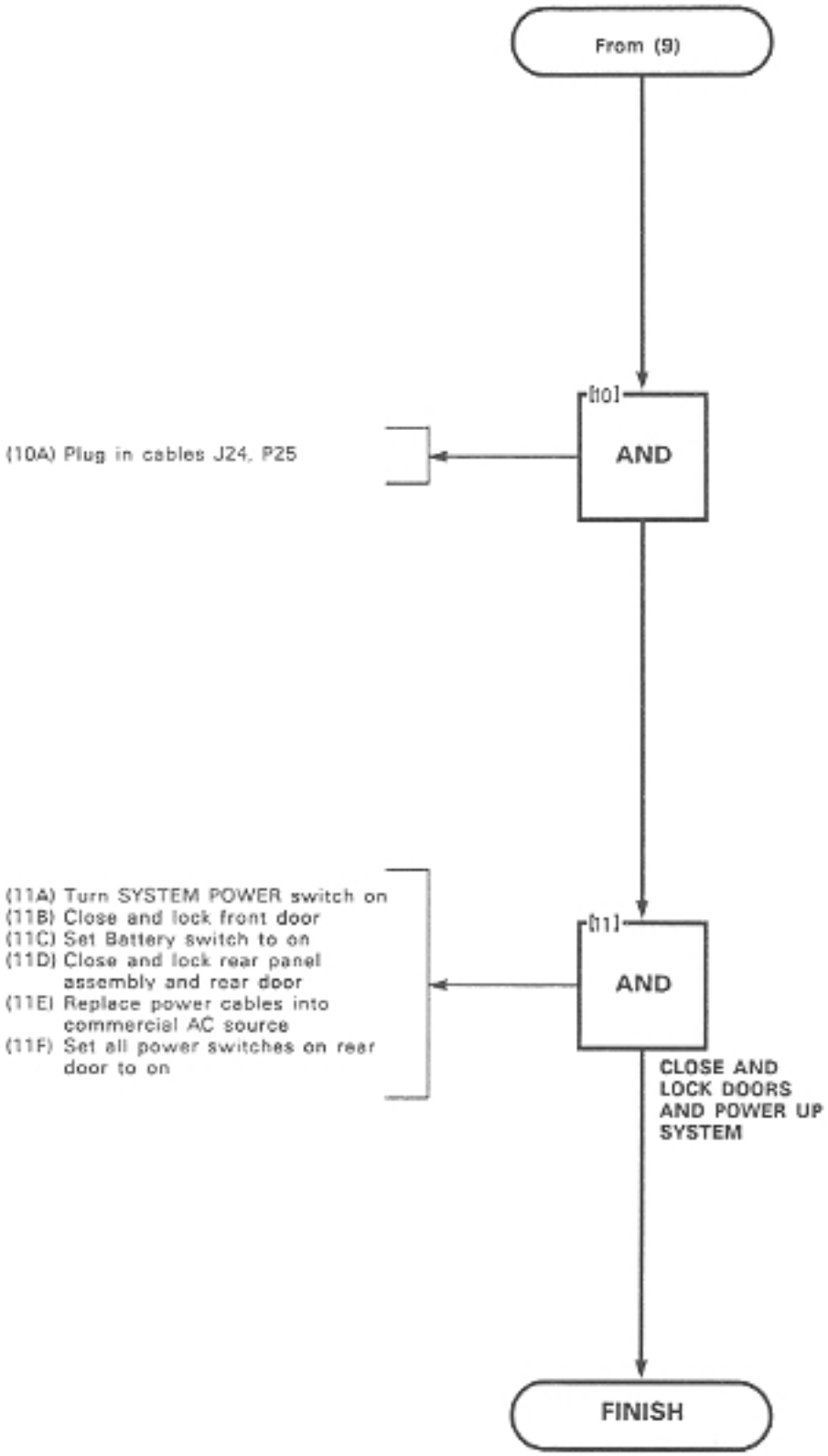

REPLACE FIRST OR SECOND SHELF SX-200

MAP350-505

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TOOLS REQUIRED

1 flatblade screwdriver
1 Phillips screwdriver

START

NOTE

The second shelf applies only to SX-200 equipment

WARNING

All power to the system must be removed

[1] AND

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

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

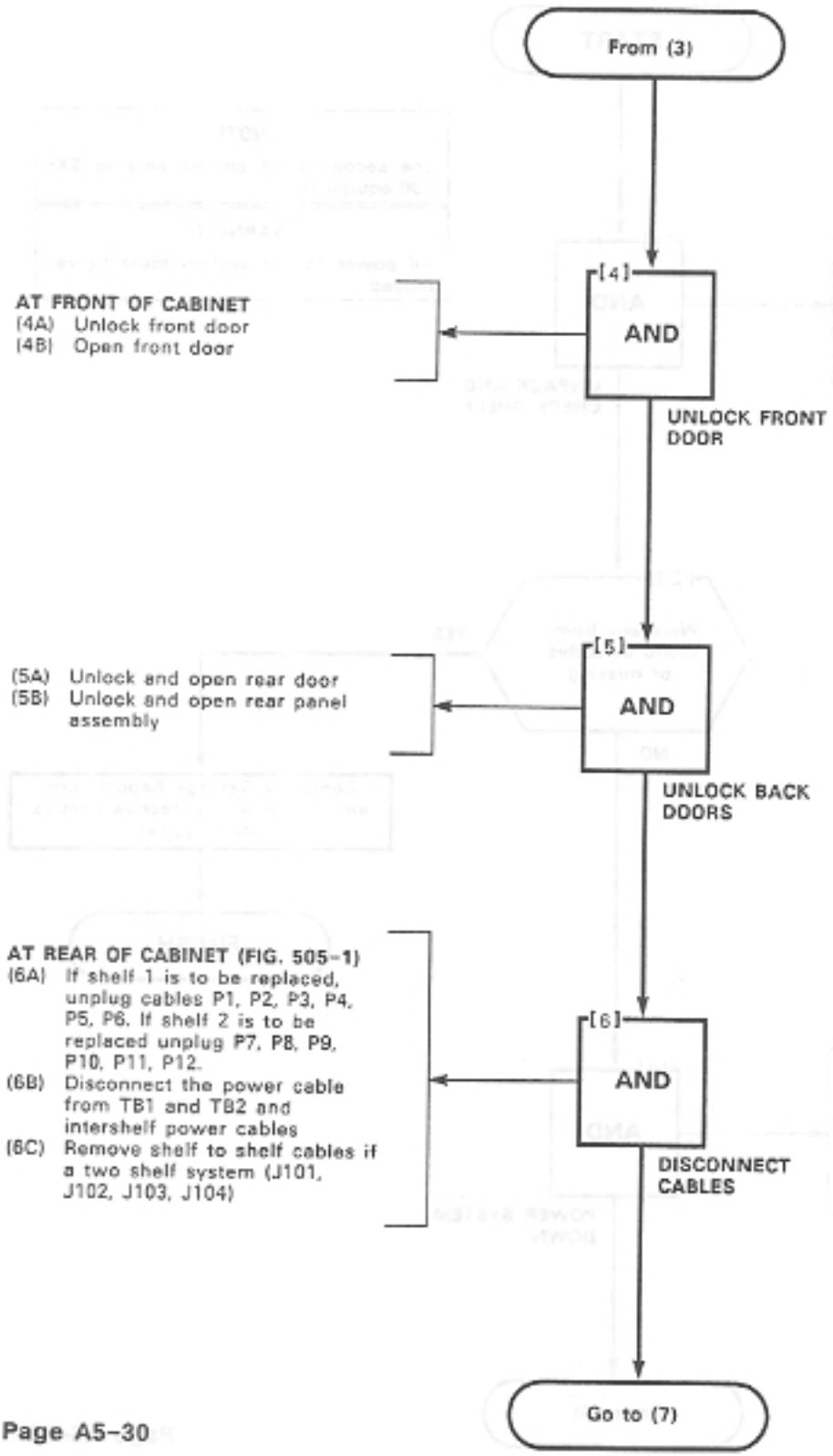
[3] AND

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

POWER SYSTEM DOWN

Go to (4)

REPLACE FIRST OR SECOND SHELF SX-200
MAP350- 505
Issue 1, December 1982
Sheet 2 of 8



REPLACE FIRST OR SECOND SHELF SX-200
MAP350-505
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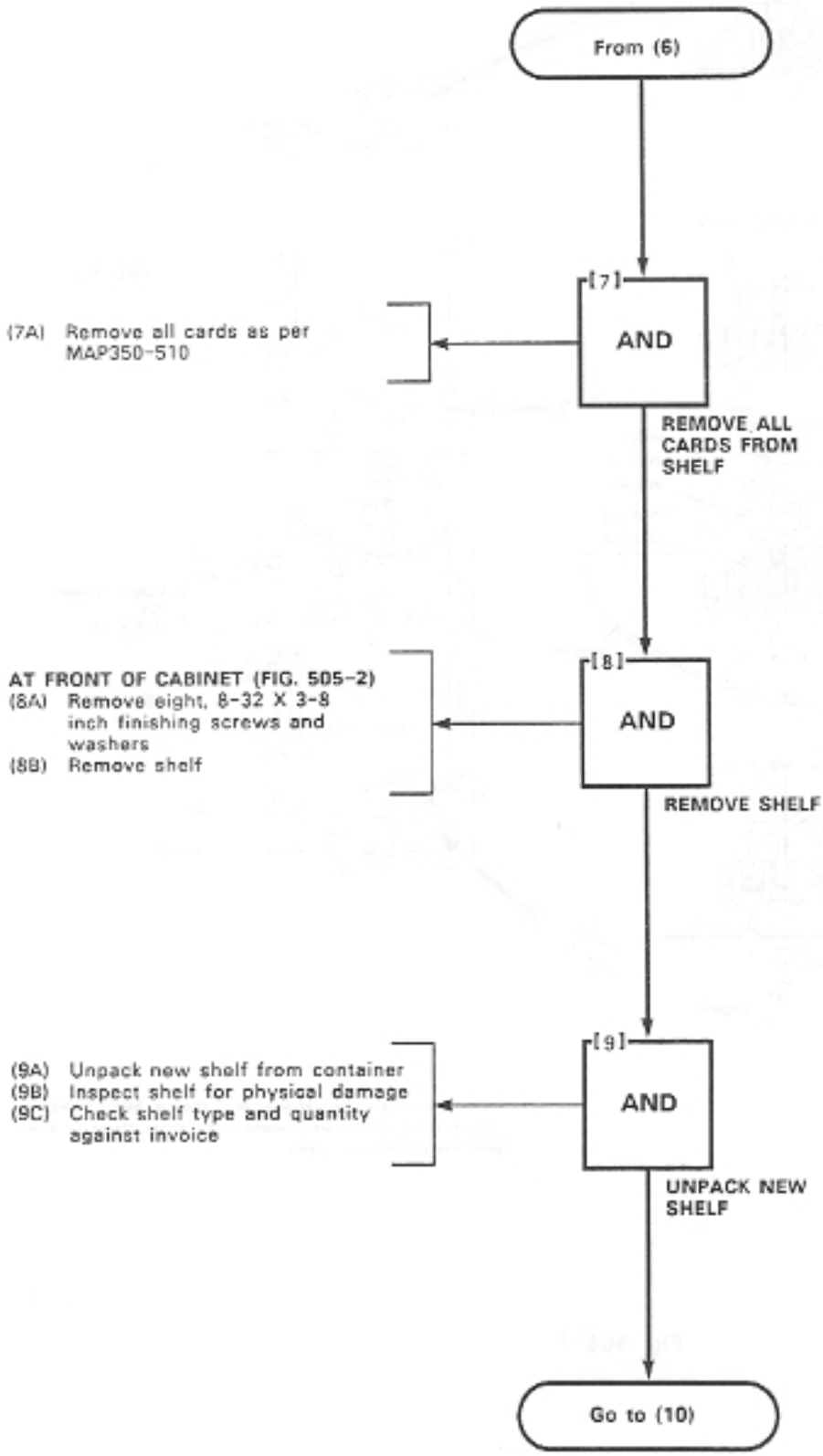

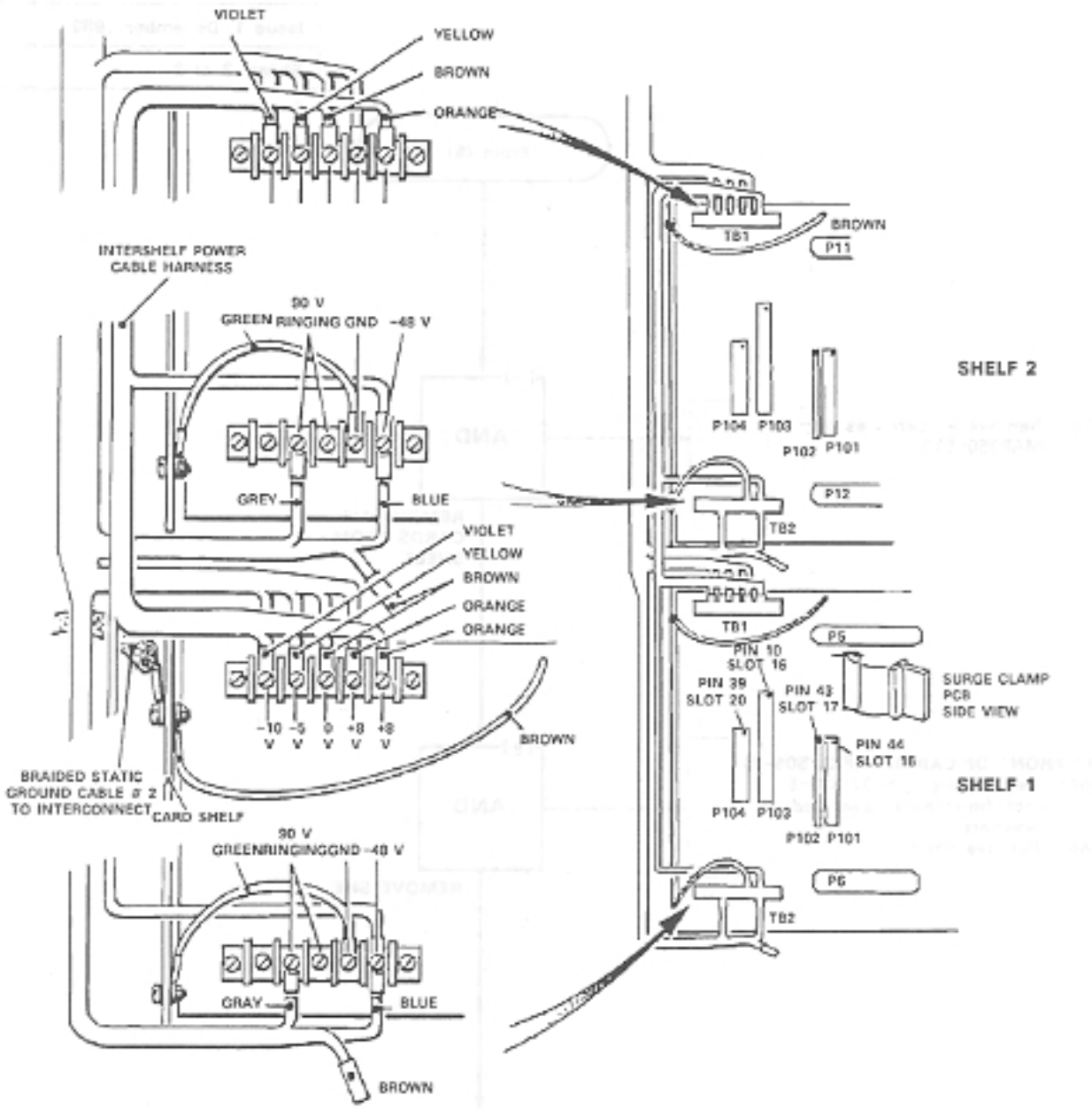

Note: There is a surge clamp on both shelves. Surge clamps on second shelf not shown. Second shelf surge clamp in same positions as first shelf clamp.

X11BR4

Fig. 505-1

REPLACE FIRST OR SECOND SHELF SX-200
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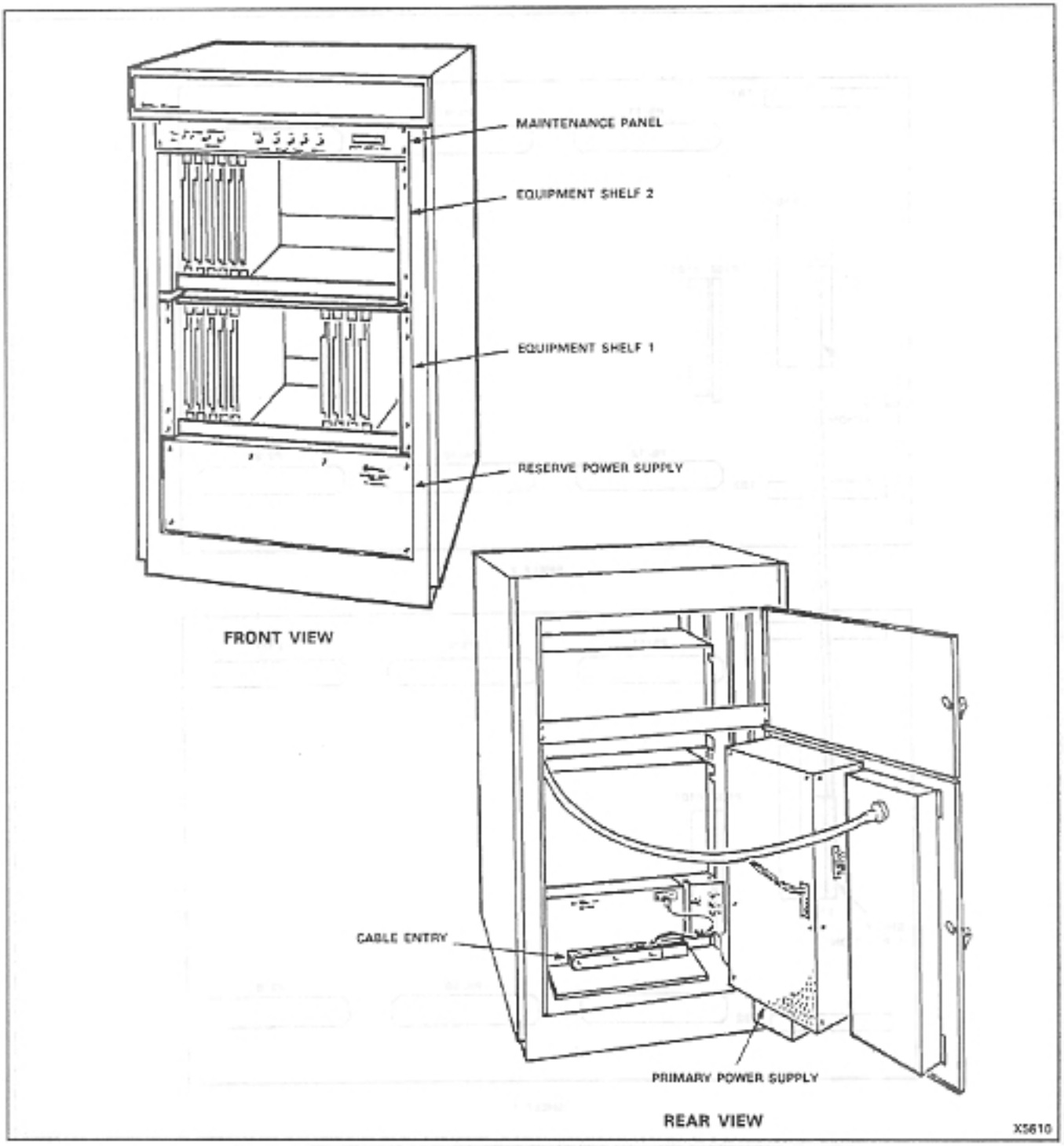

Fig. 505-2

REPLACE FIRST OR SECOND SHELF SX-200
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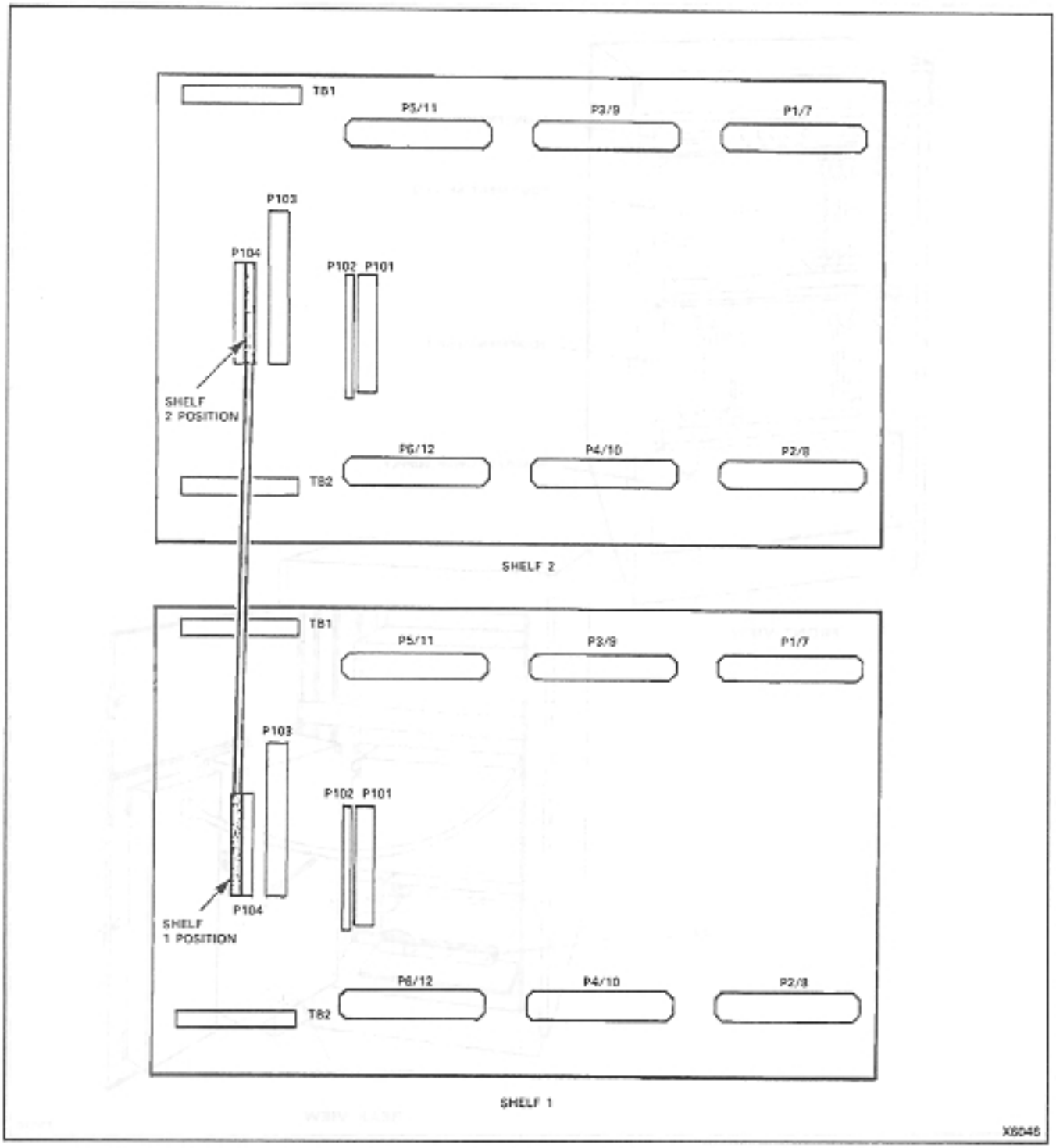

Fig. 505-3 P104 Backplane Connections

REPLACE FIRST OR SECOND SHELF SX-200
MAP350-505
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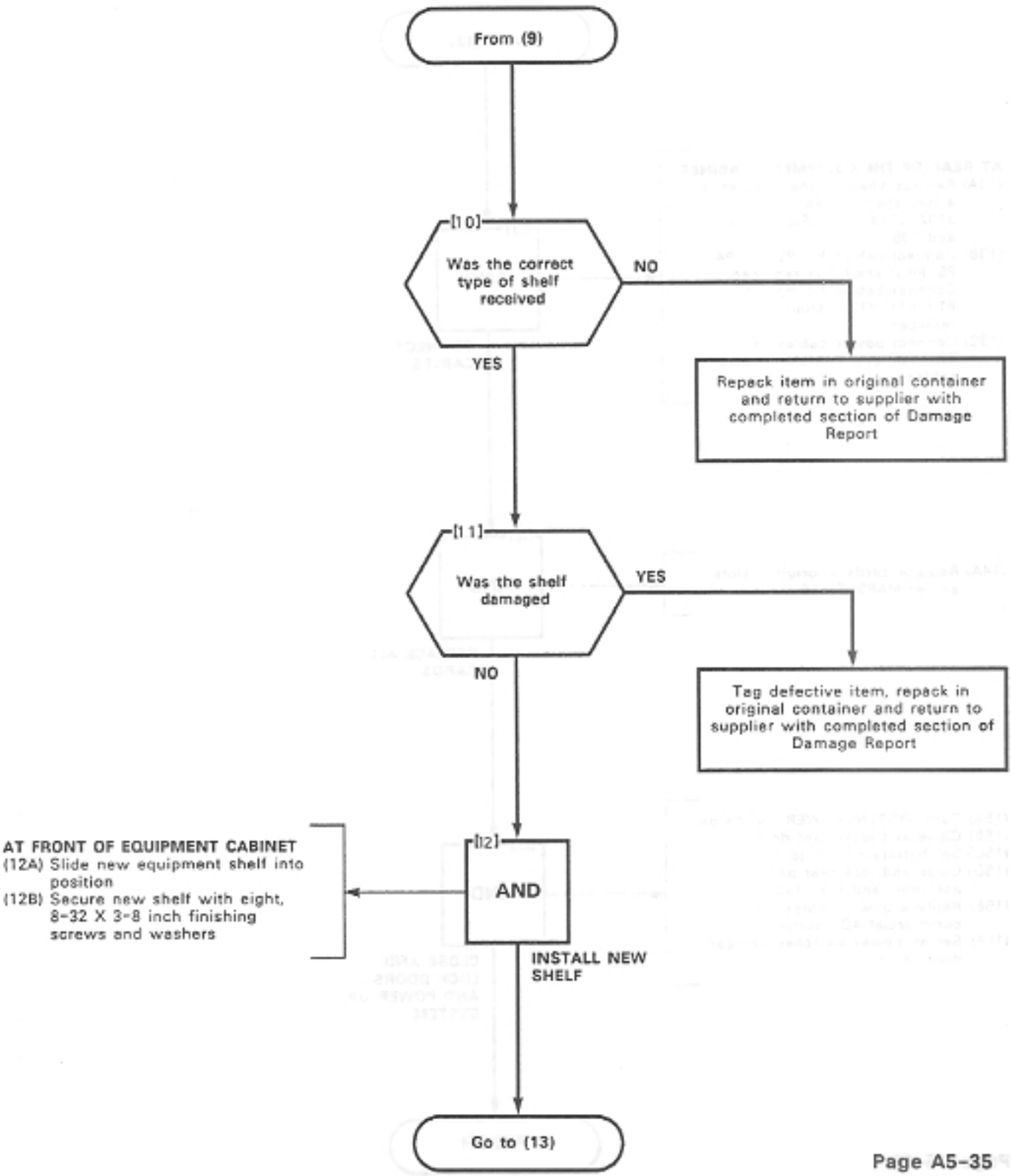

REPLACE FIRST OR SECOND SHELF SX-200
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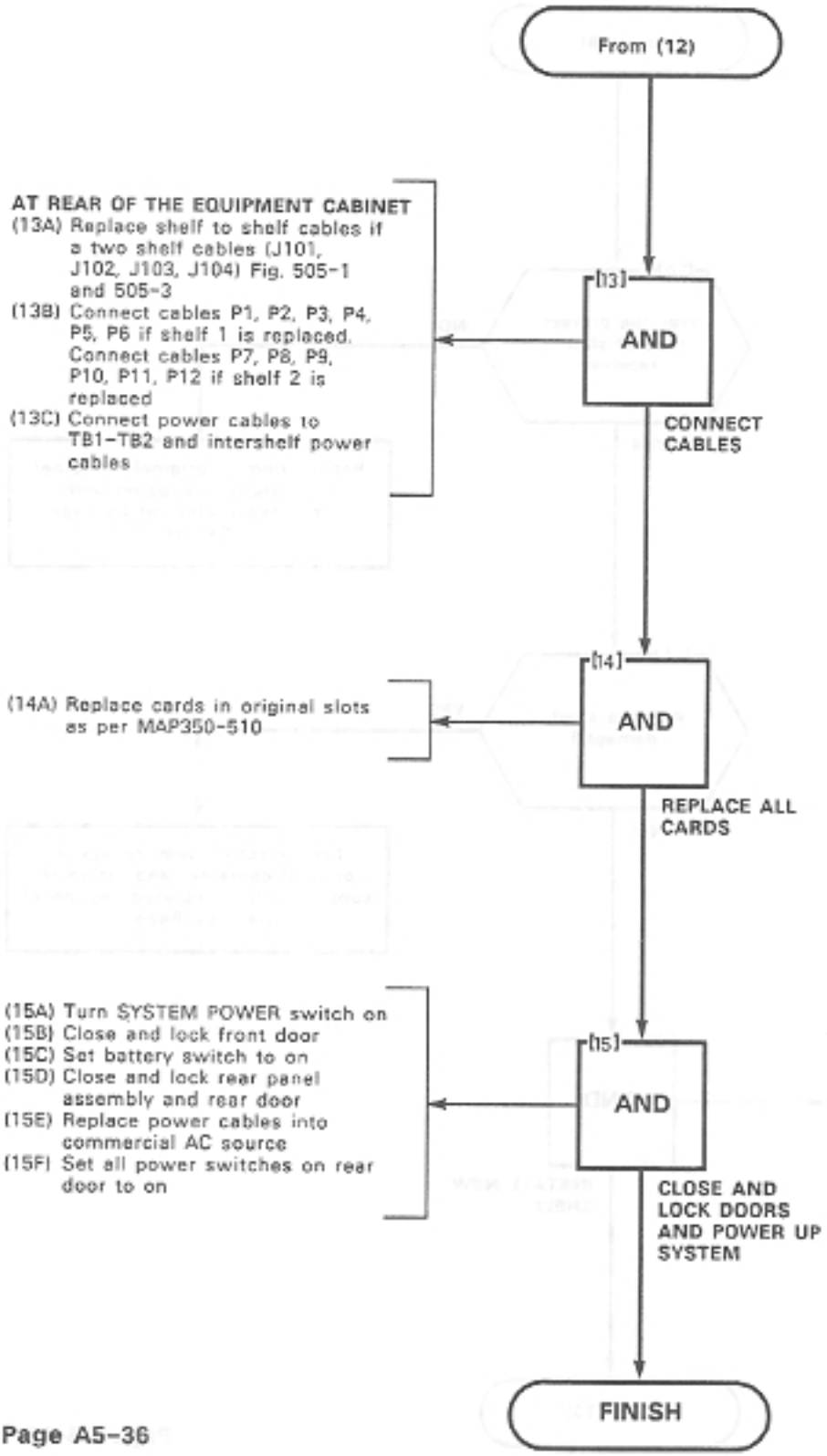

REPLACE HEAT SINK ASSEMBLY SX-200
MAP350-506
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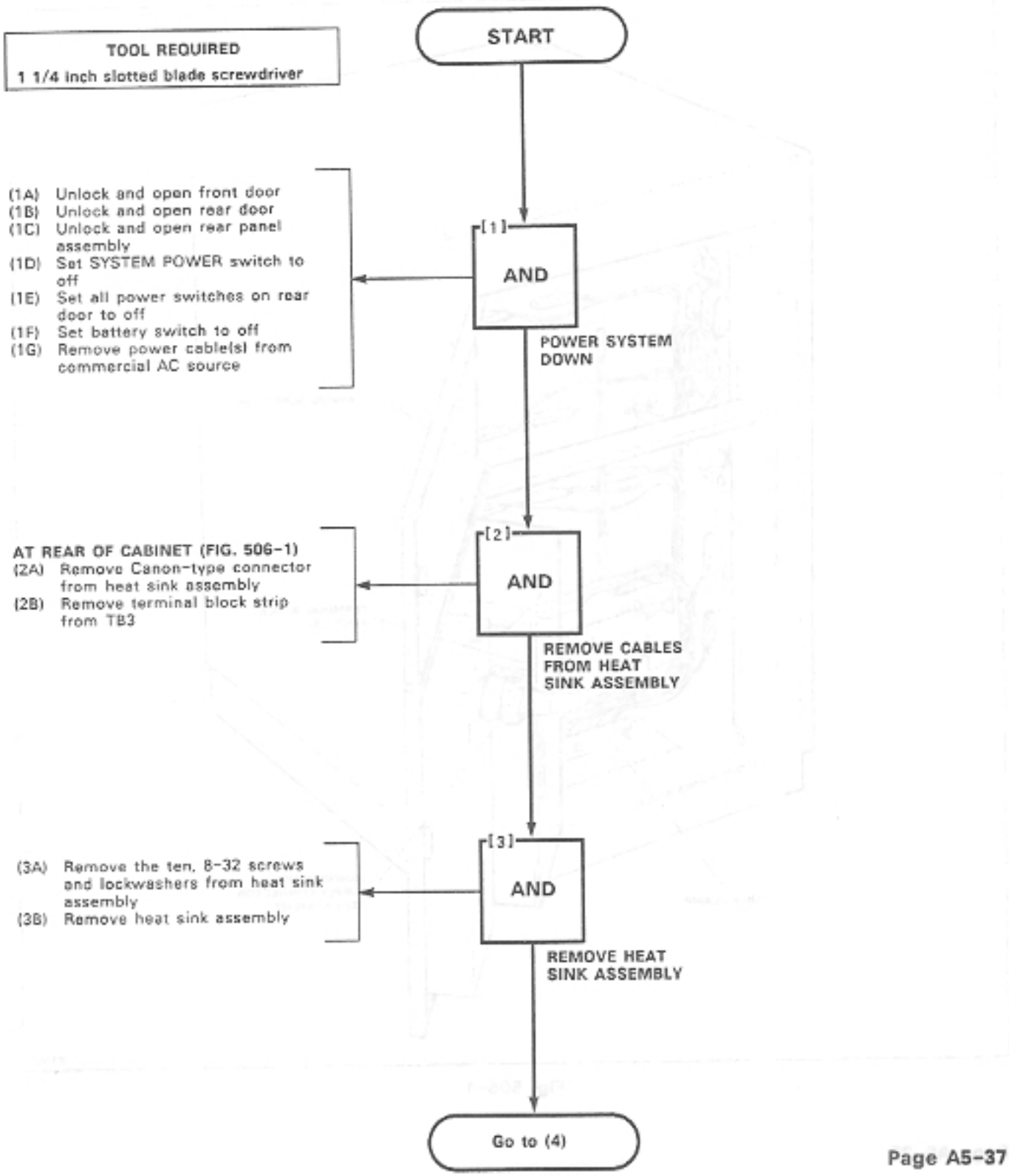
TOOL REQUIRED

1 1/4 inch slotted blade screwdriver



REPLACE HEAT SINK ASSEMBLY SX-200
MAP350- 506
Issue 1, December 1982
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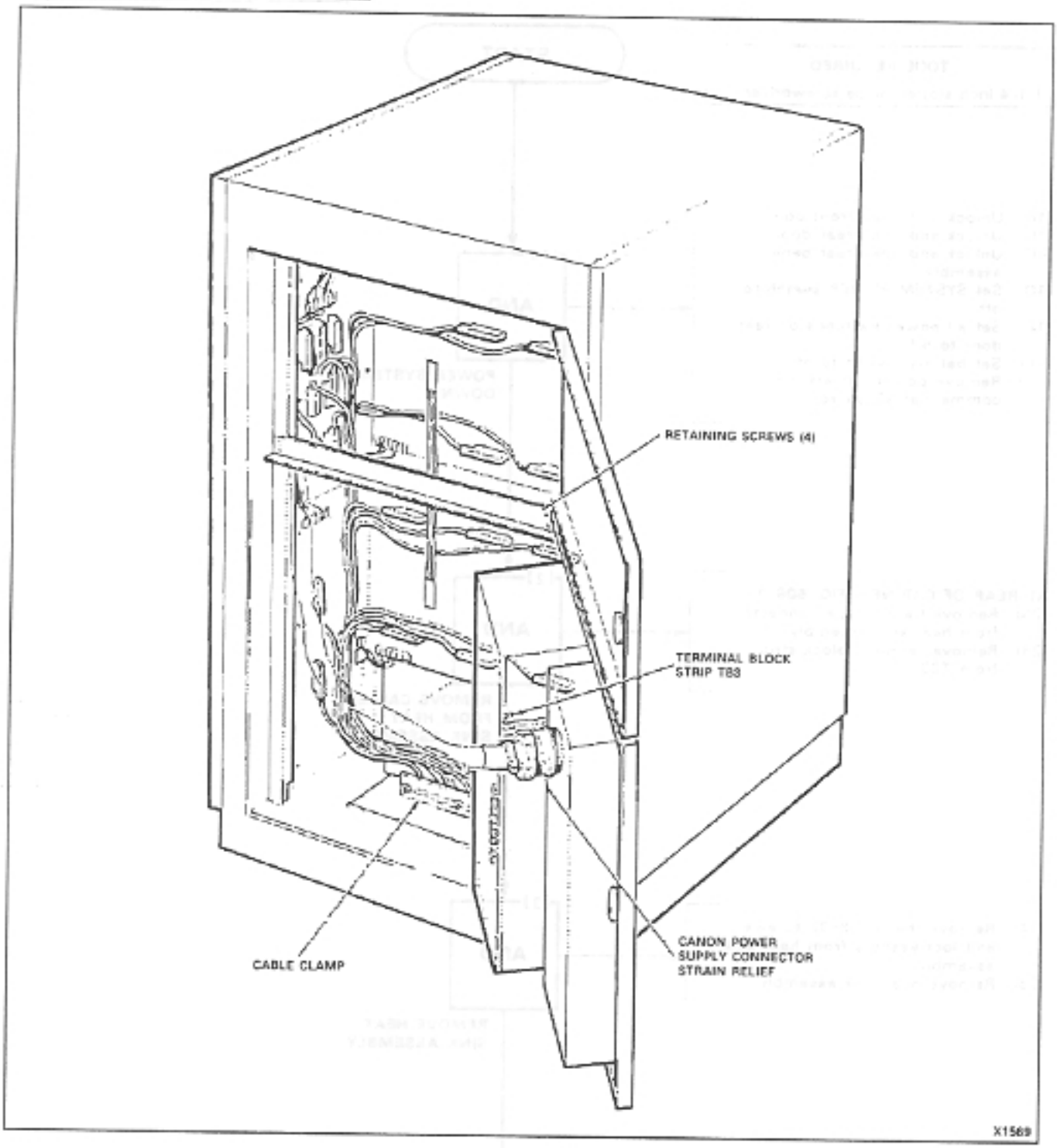

Fig. 506-1

REPLACE HEAT SINK ASSEMBLY SX-200
MAP350-506
Issue 1, December 1982
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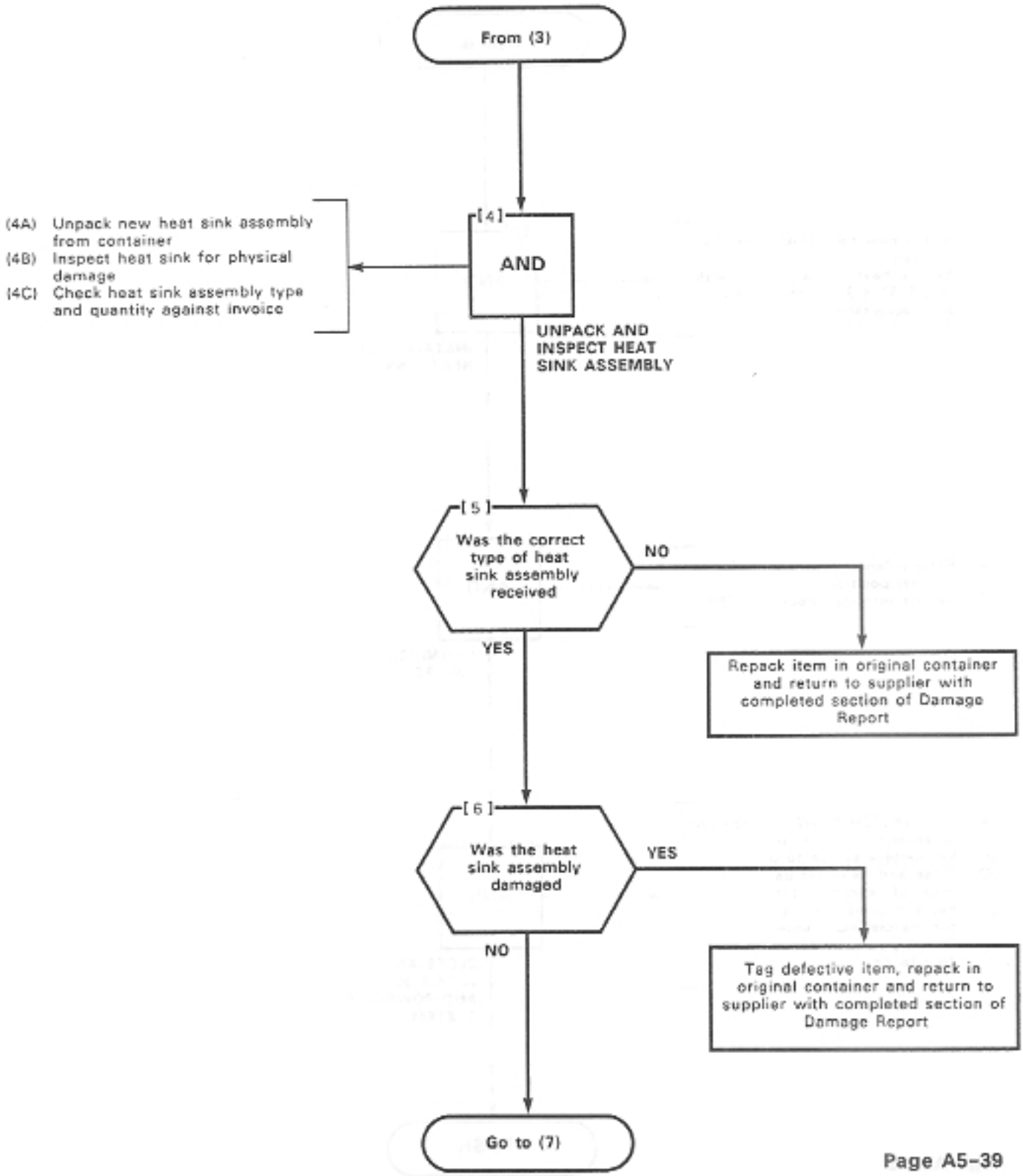

REPLACE HEAT SINK ASSEMBLY SX-200
MAP350- 506
Issue 1, December 1982
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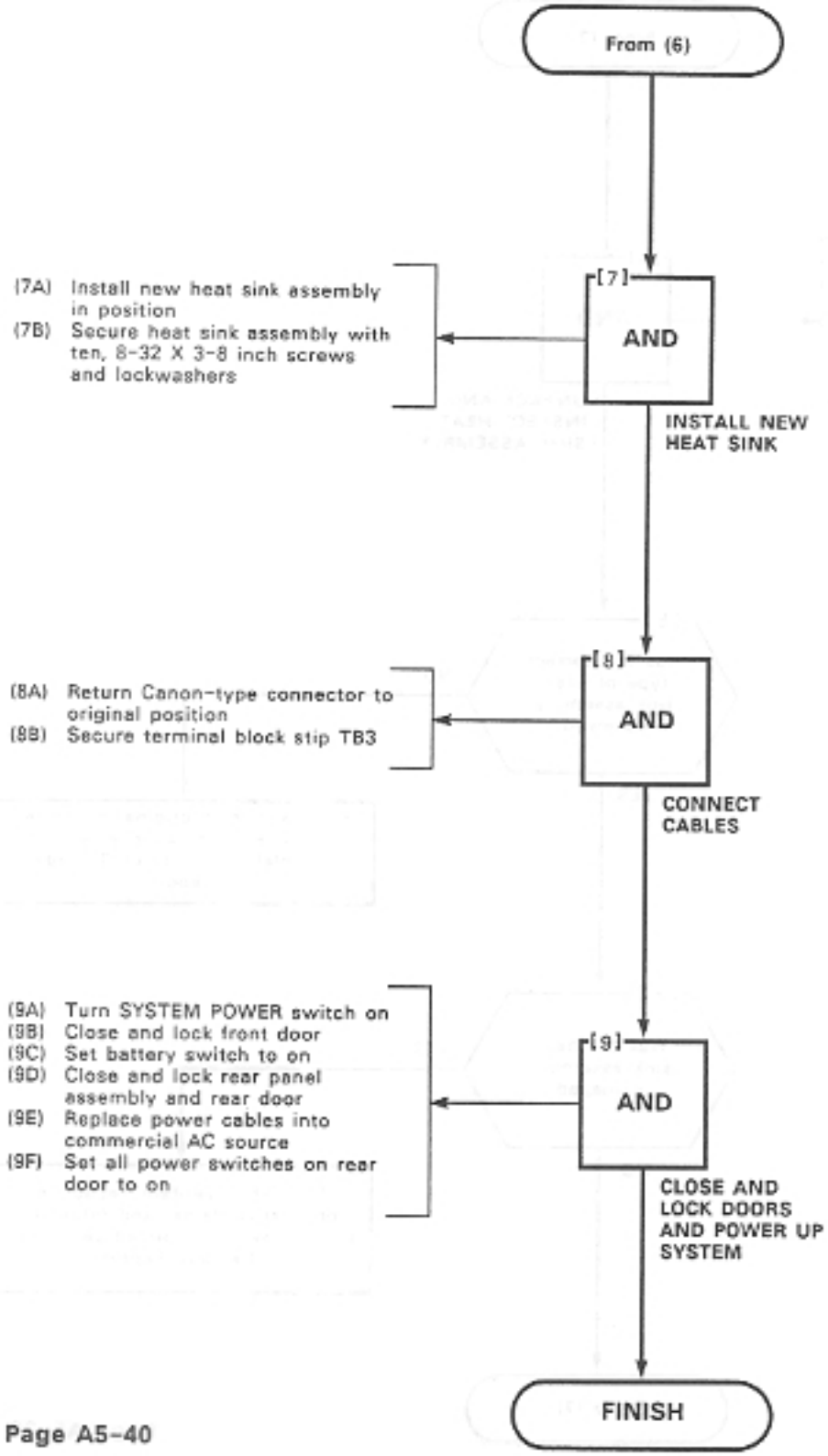

REPLACE POWER SUPPLY ASSEMBLY SX-200
MAP350-507
Issue 1, December 1982
Sheet 1 of 5

TOOLS REQUIRED

1 wrench
1 flatblade screwdriver
1 nutdriver

START

[1] AND

(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

POWER SYSTEM DOWN

[2] AND

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

REMOVE HEAT SINK ASSEMBLY

[3] AND

(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

RELEASE REAR DOOR RETAINING BAR

Go to (4)

REPLACE POWER SUPPLY ASSEMBLY SX-200
MAP350- 507
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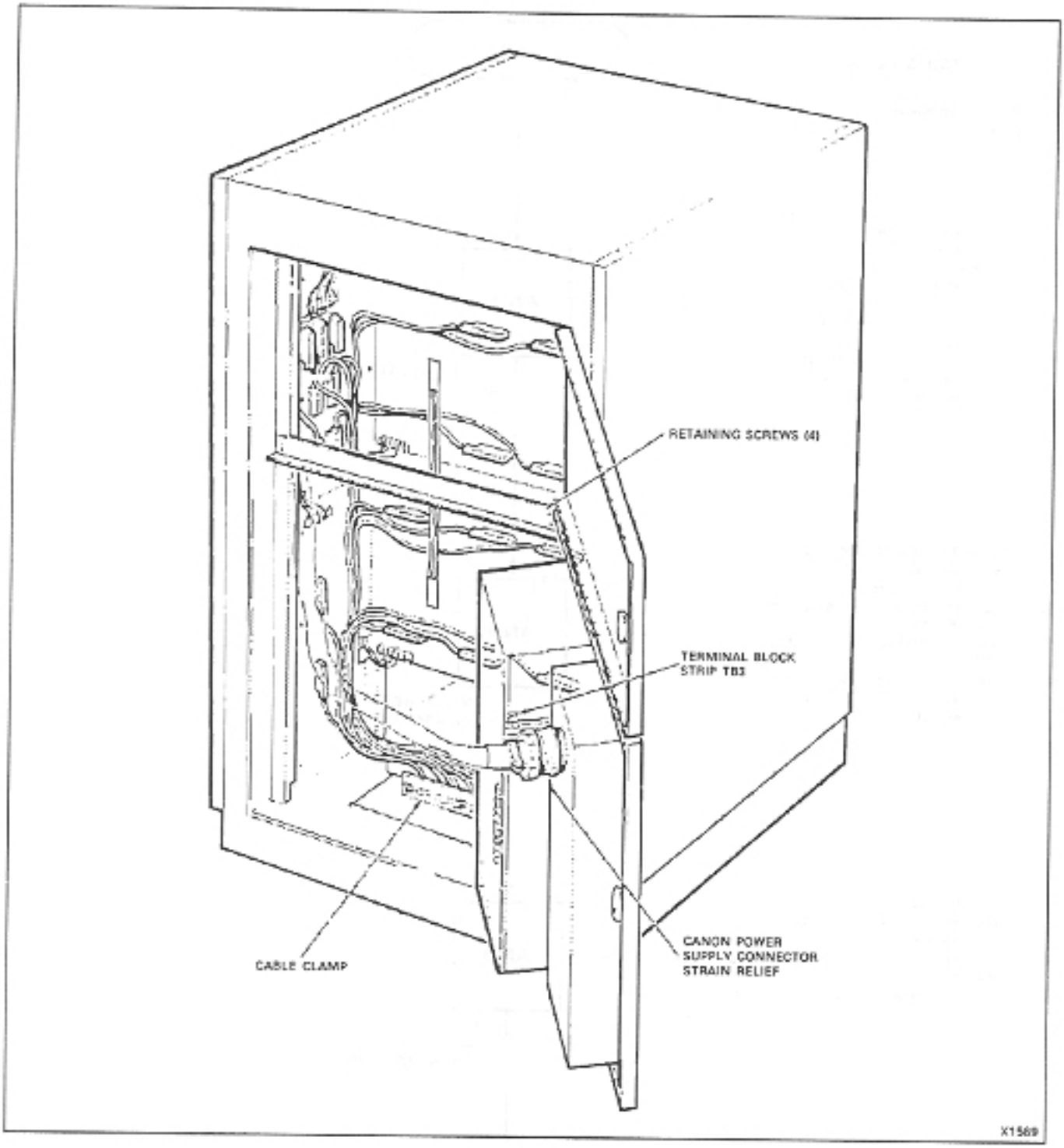

Fig. 507-1

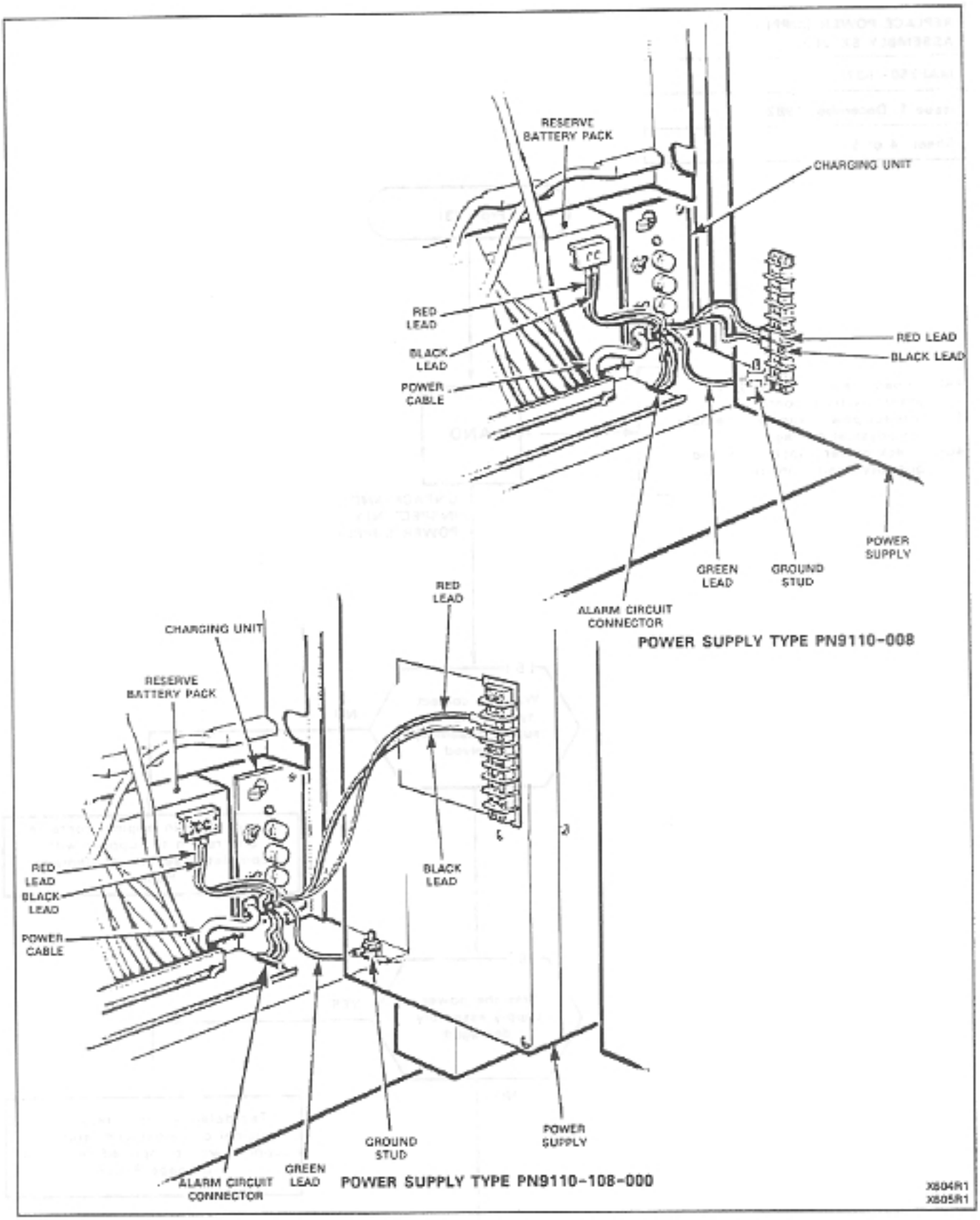
RESERVE BATTERY PACK
CHARGING UNIT
RED LEAD
BLACK LEAD
POWER CABLE
RED LEAD
BLACK LEAD
POWER SUPPLY
GREEN LEAD
GROUND STUD
ALARM CIRCUIT CONNECTOR
POWER SUPPLY TYPE PN9110-008
RED LEAD
CHARGING UNIT
RESERVE BATTERY PACK
RED LEAD
BLACK LEAD
POWER CABLE
BLACK LEAD
GROUND STUD
POWER SUPPLY
ALARM CIRCUIT CONNECTOR
GREEN LEAD
POWER SUPPLY TYPE PN9110-108-000
X804R1
X805R1

Fig. 507-2

REPLACE POWER SUPPLY ASSEMBLY SX-200
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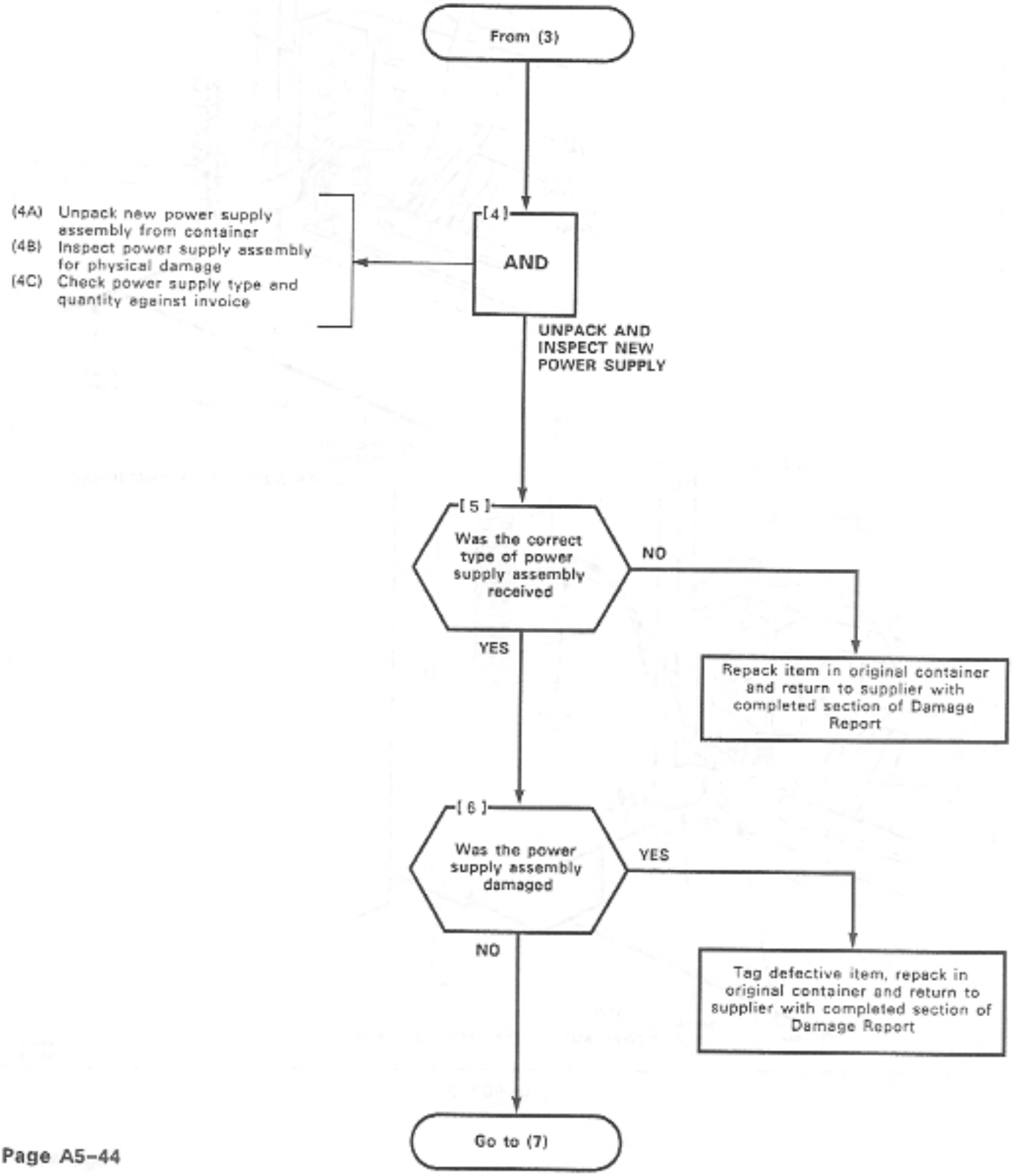

REPLACE POWER SUPPLY ASSEMBLY SX-200
MAP350-507
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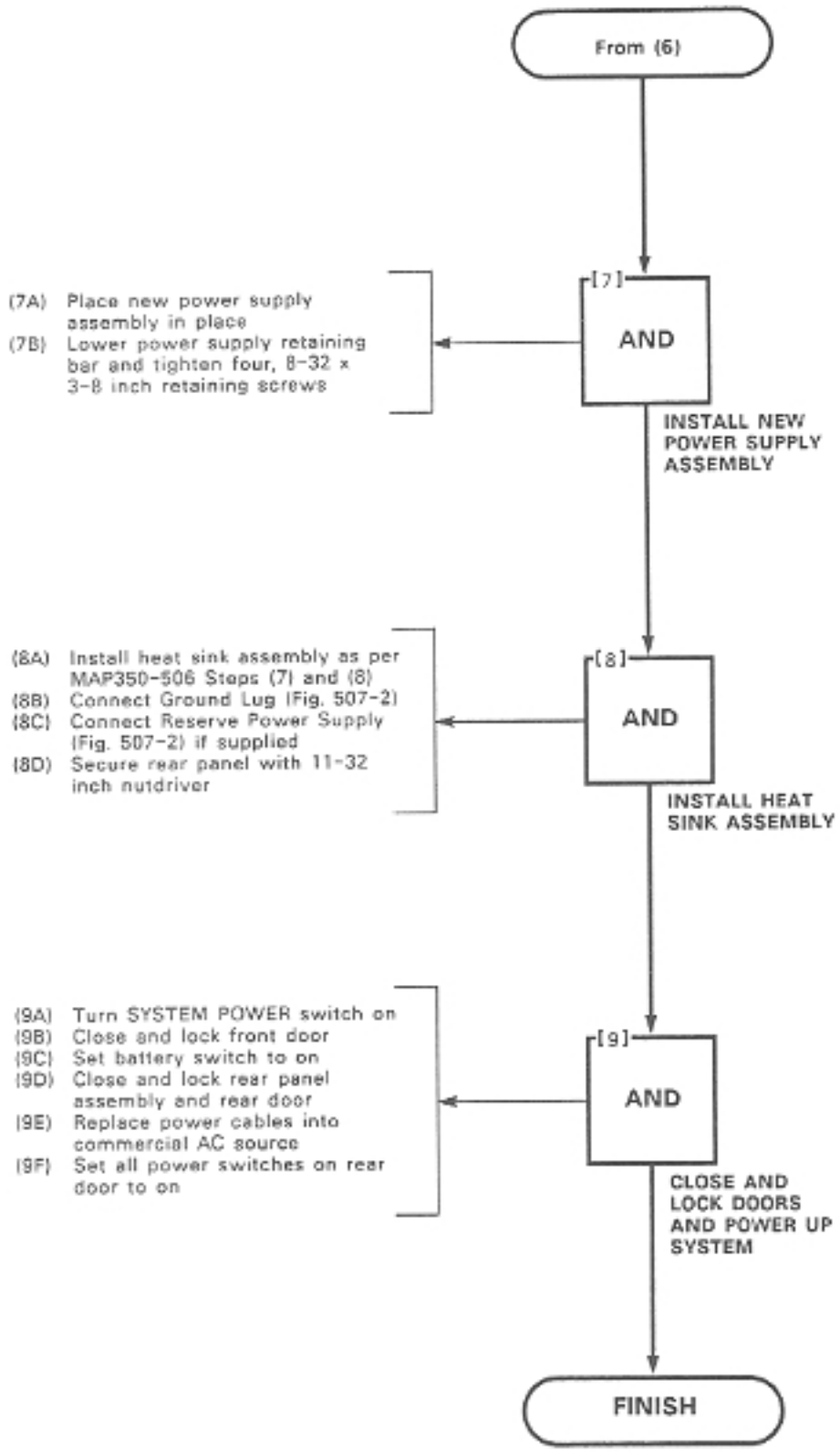

REPLACE RESERVE BATTERY BACKUP SUPPLY SX-200
MAP350-508
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TOOLS REQUIRED

1 wrench
1 flatblade screwdriver

START

[1] AND

(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

POWER SYSTEM DOWN

[2] AND

AT CABINET REAR DOOR (FIG. 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

DISCONNECT CABLES (FIG. 508-1)

[3] AND

AT FRONT OF EQUIPMENT (FIG. 508-2)

(3A) Remove the four, 8-32 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

REMOVE BATTERY PACK

Go to (4)

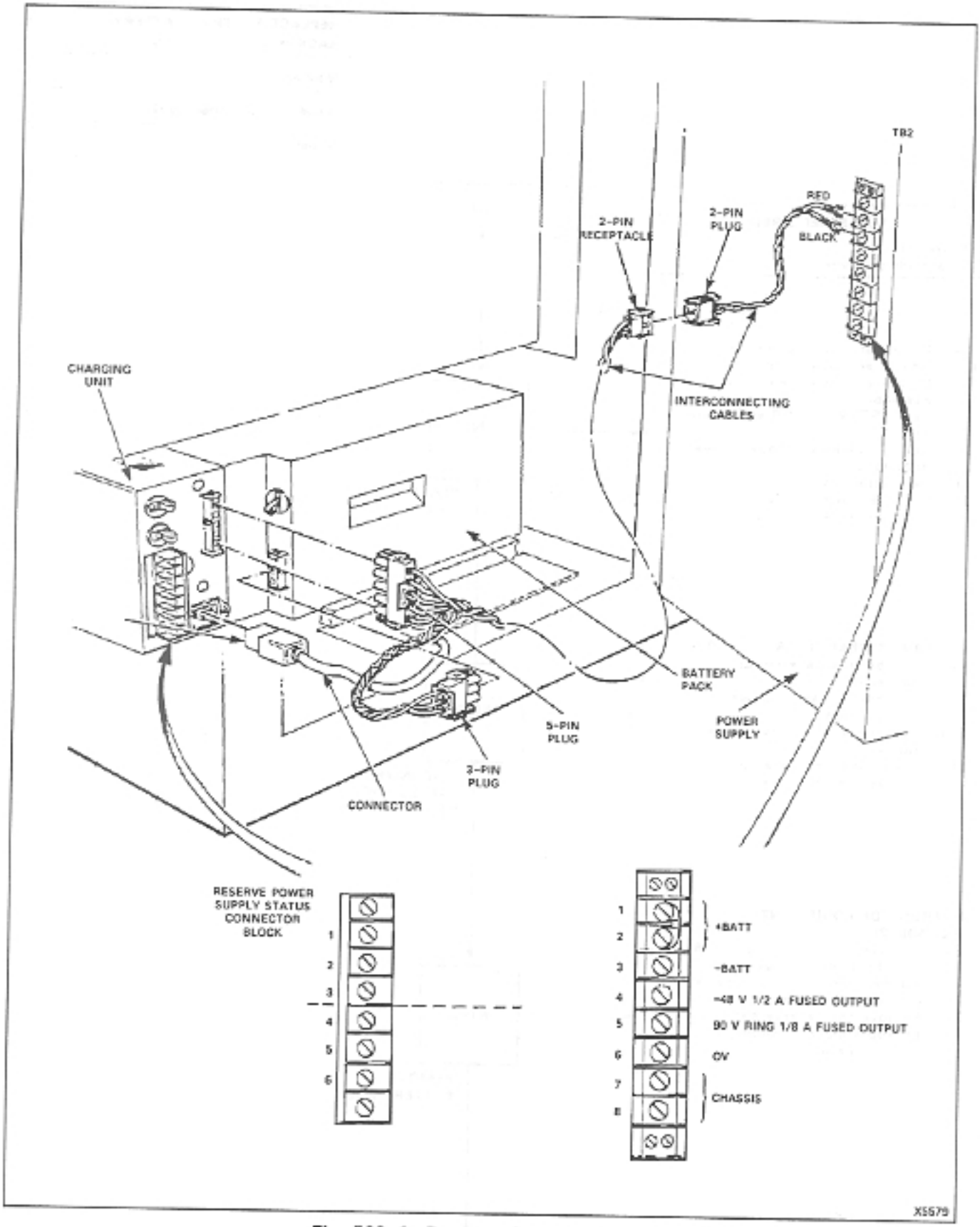

Fig. 508-1 Reserve Power Supply

REPLACE RESERVE BATTERY BACKUP SUPPLY SX-200
MAP350-508
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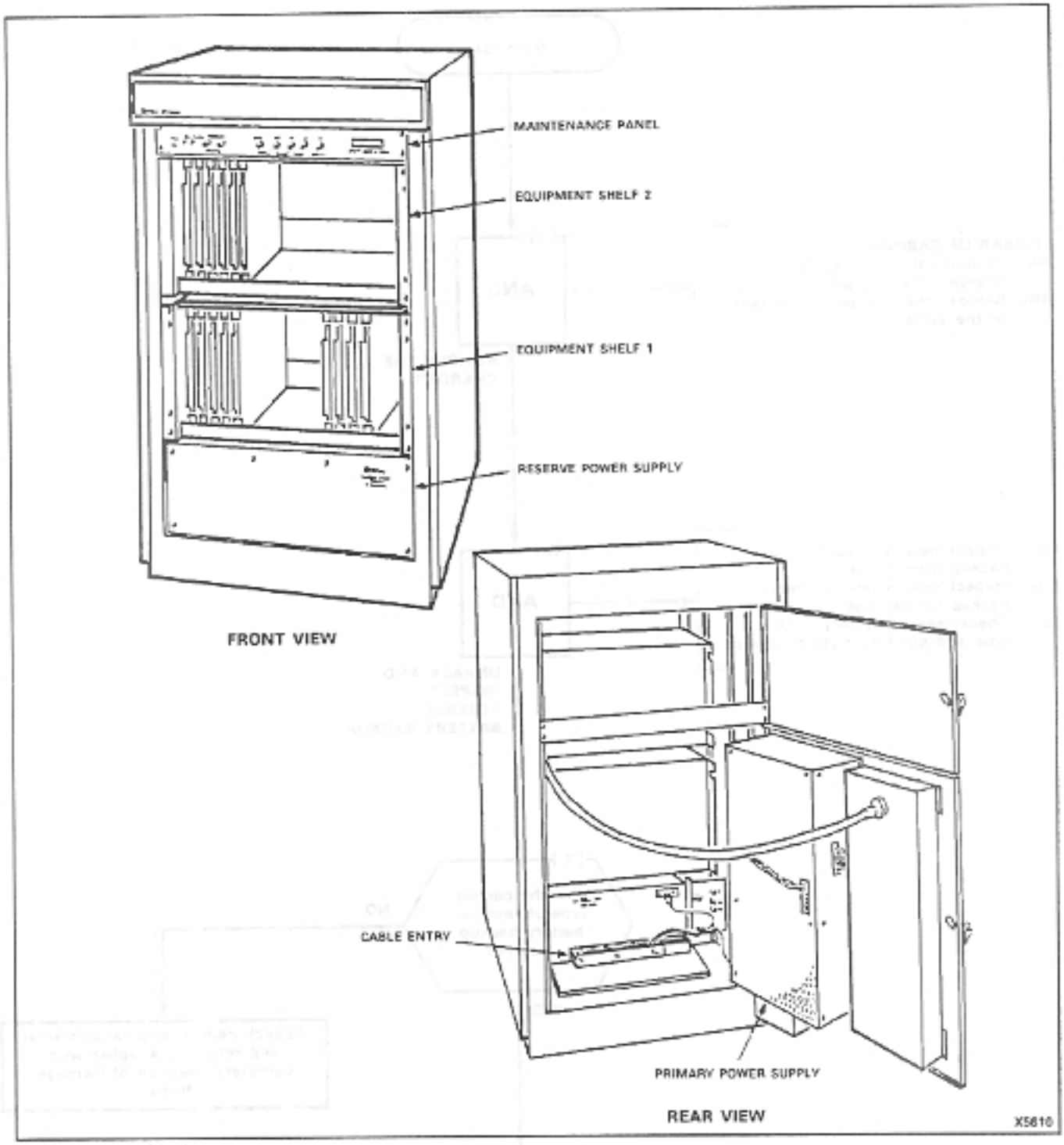

Fig. 508-2

REPLACE RESERVE BATTERY BACKUP SUPPLY SX-200
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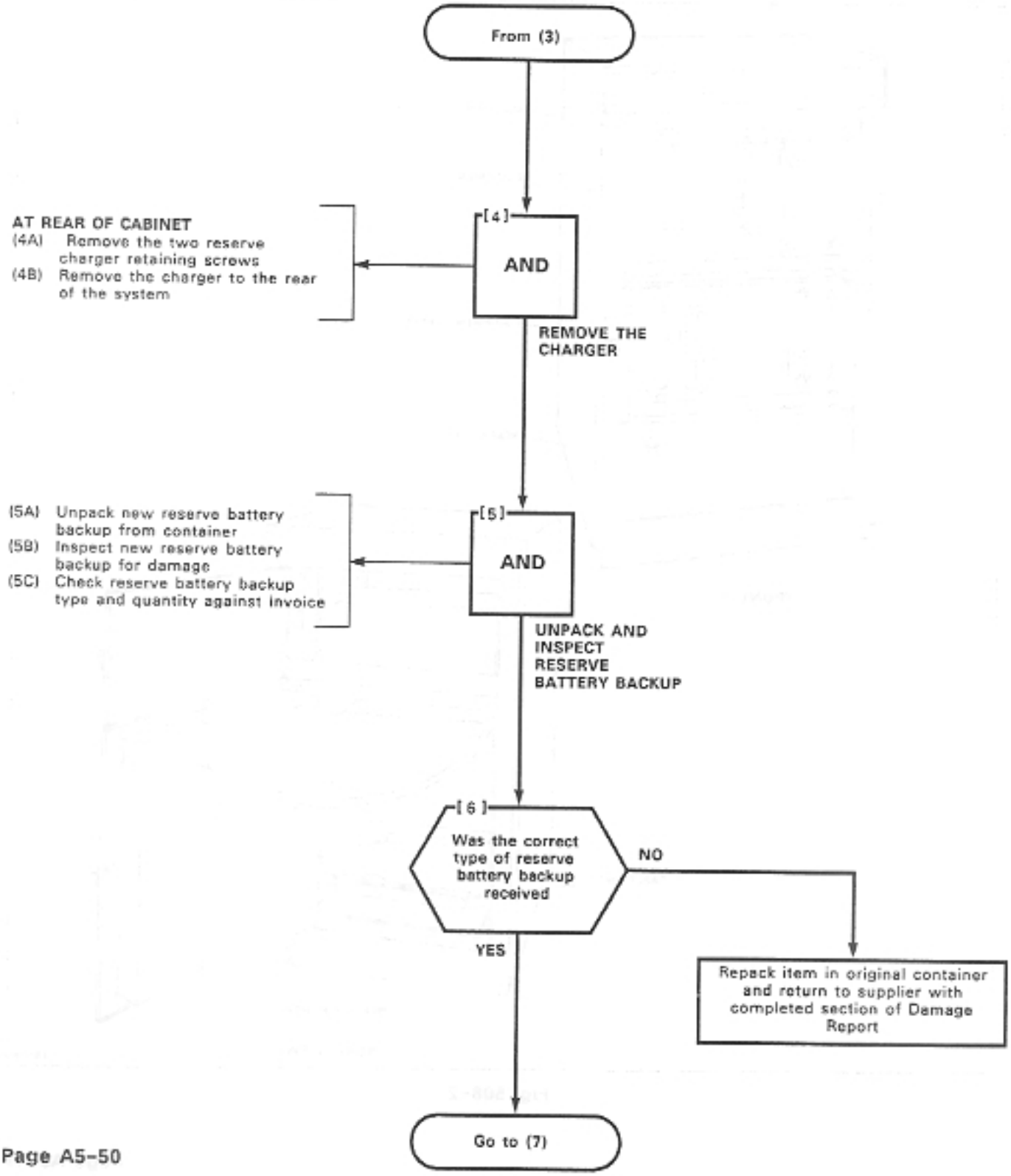

REPLACE RESERVE BATTERY BACKUP SUPPLY SX-200
MAP350-508
Issue 1, December 1982
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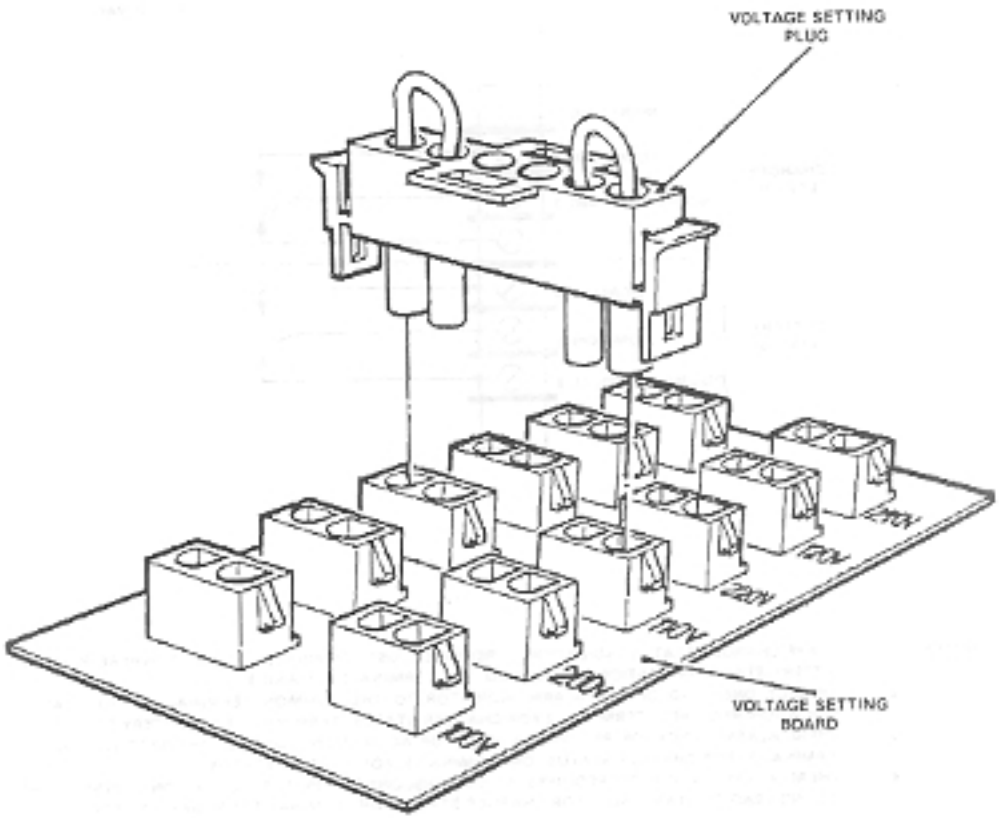

NOTE: PLUG IS LINED UP FOR INSERTION INTO RECEPTACLE CORRESPONDING TO 110 V INPUT POWER.

X5578

Fig. 508-3 Voltage Setting Board and Plug

REPLACE RESERVE BATTERY BACKUP SUPPLY SX-200
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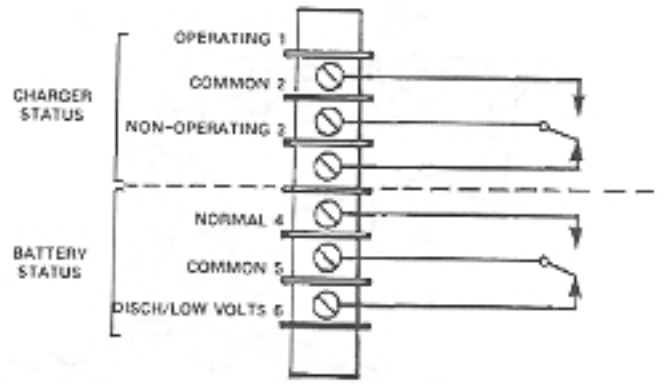
RELAY CONTACT RATING:
RESISTIVE LOAD- 2 A, 28 VDC
=1 A, 110 VAC



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

Fig. 508-4 Alarm Indicator Connections

REPLACE RESERVE BATTERY BACKUP SUPPLY SX-200
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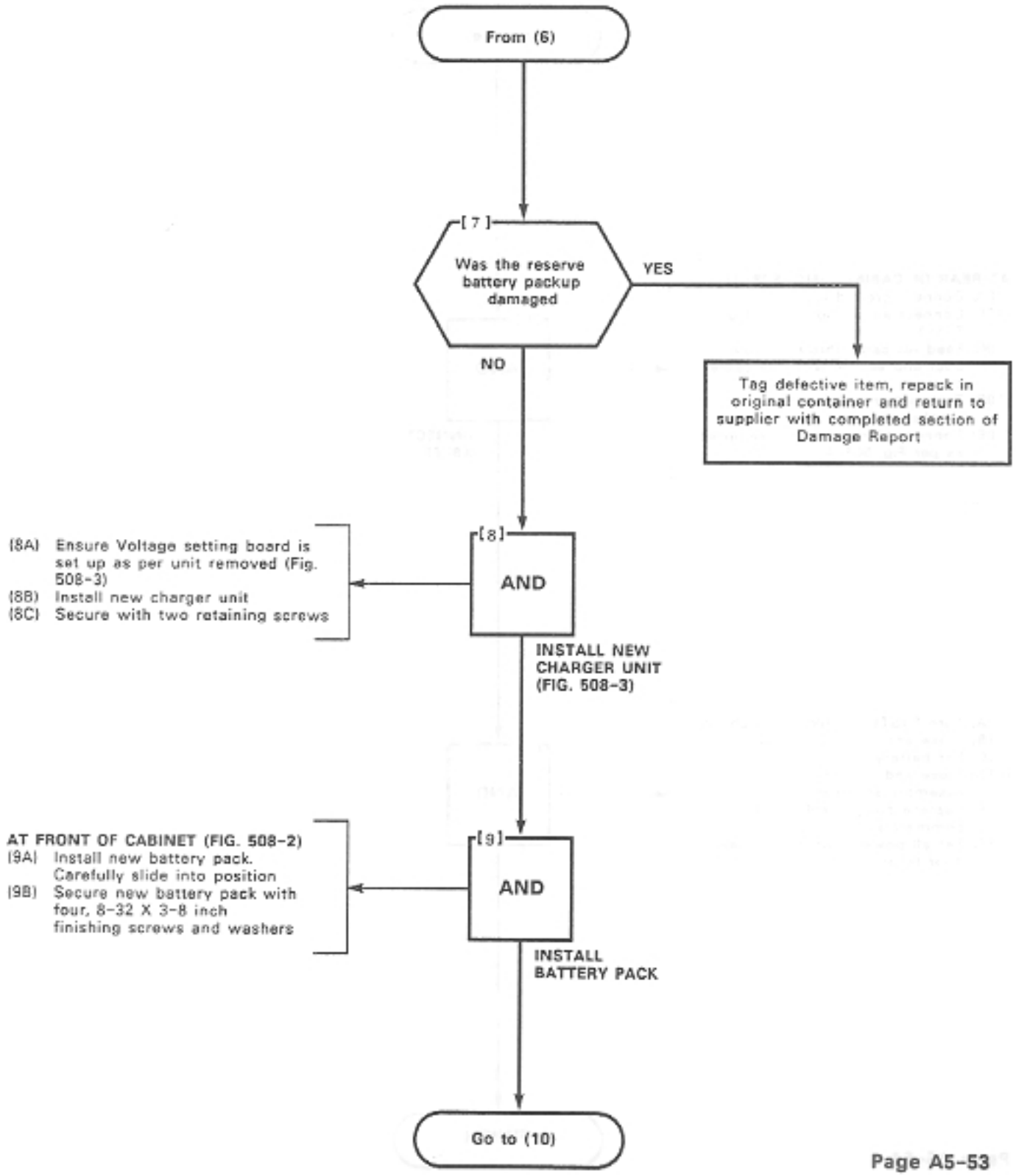

REPLACE RESERVE BATTERY BACKUP SUPPLY SX-200
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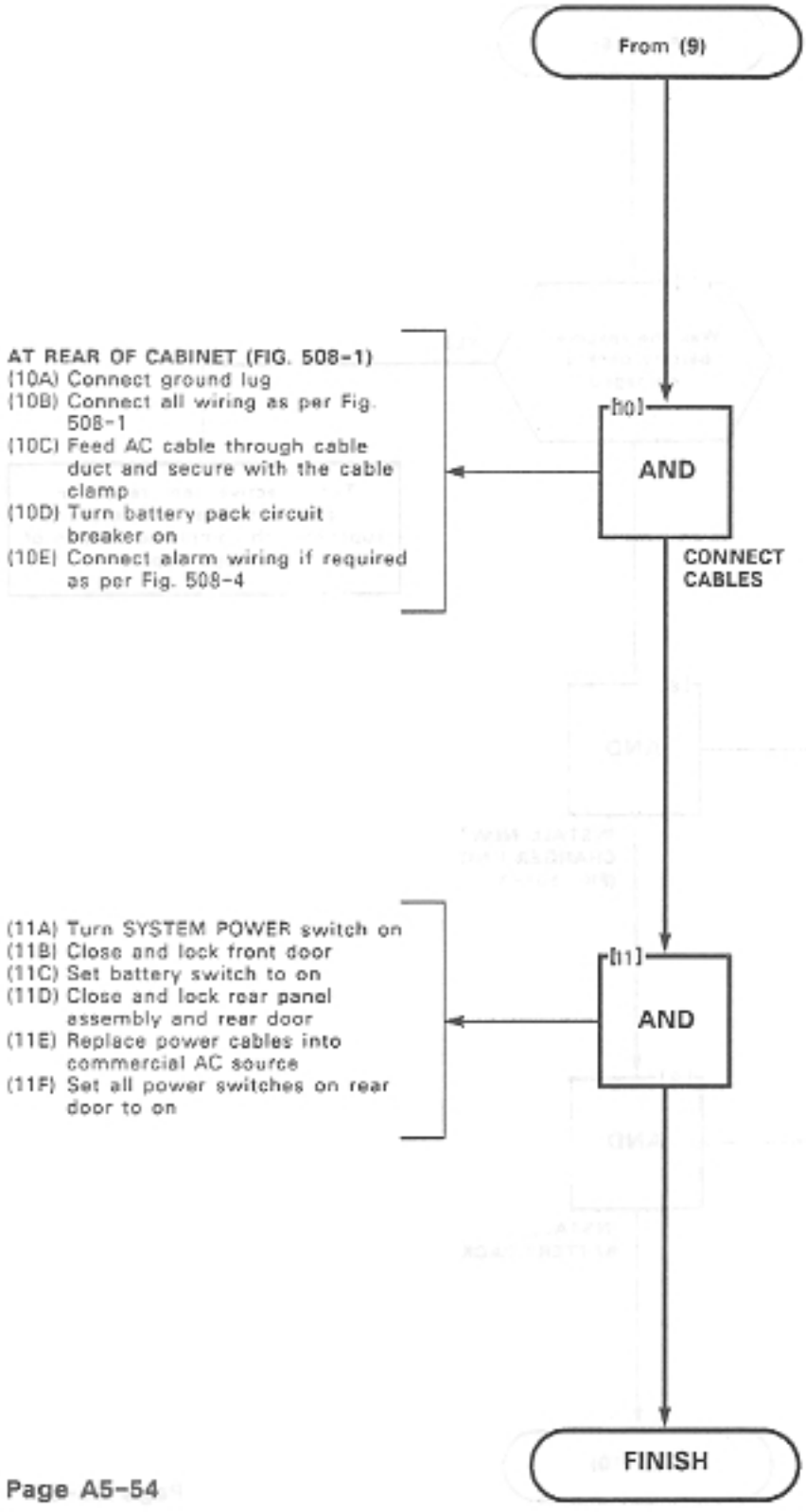

REPLACE BACKPLANE TRANSLATOR BOARD SX-200
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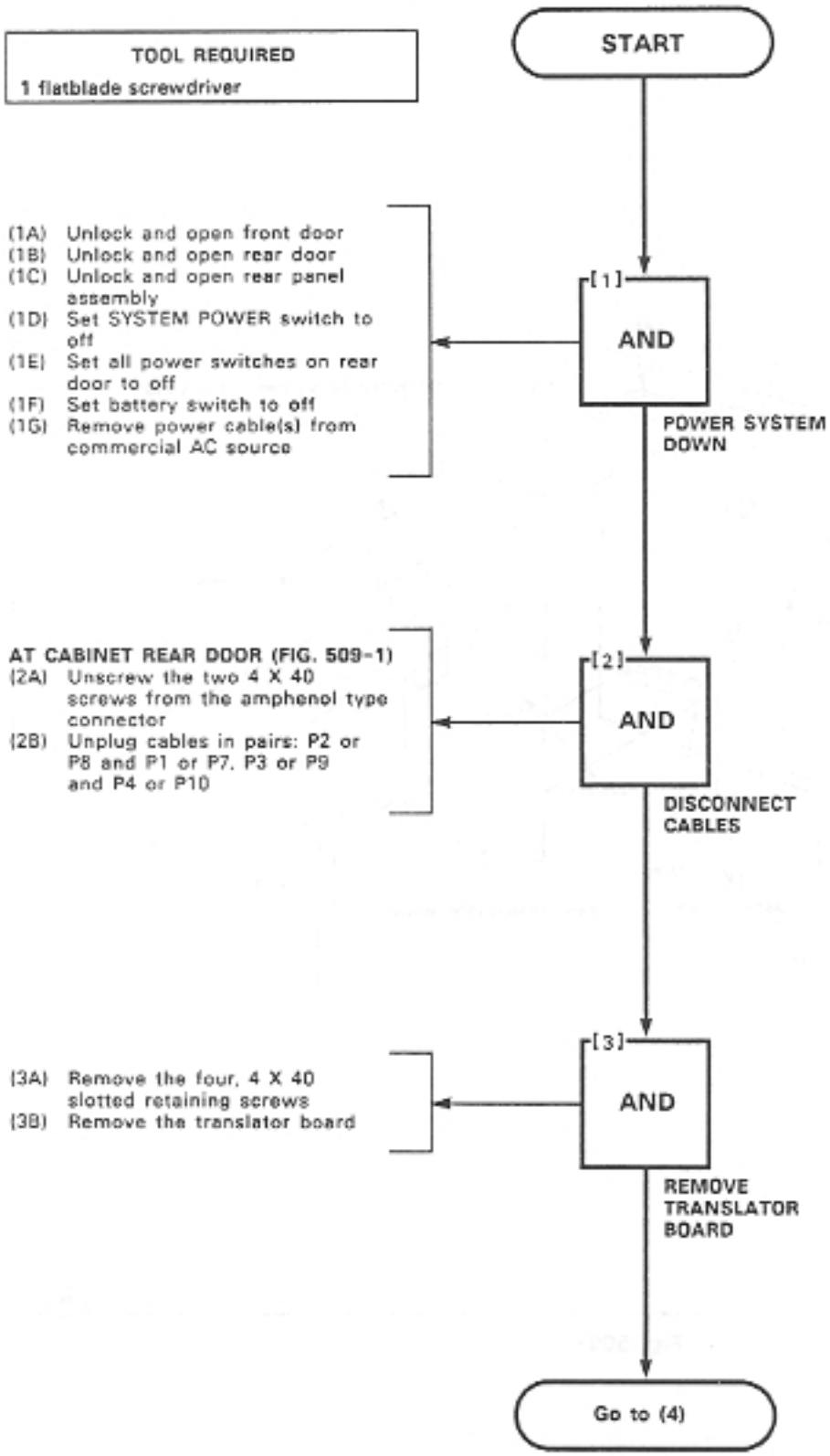

REPLACE BACKPLANE TRANSLATOR BOARD SX-200
MAP350- 509
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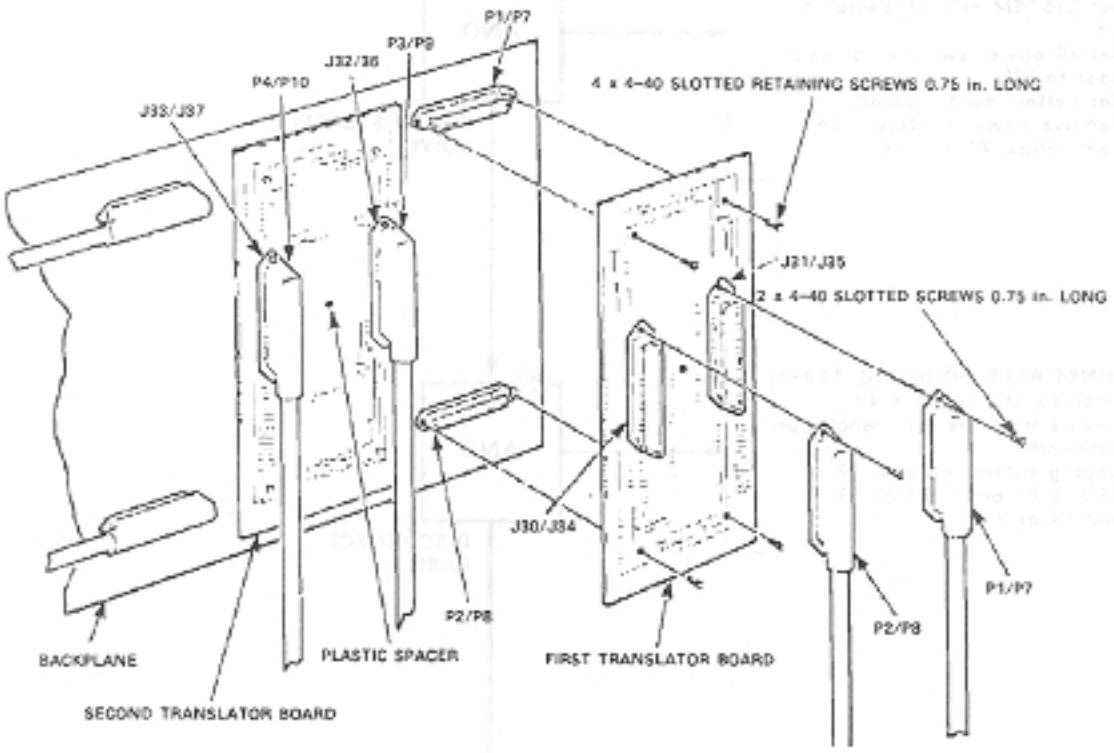

X1062R3

Fig. 509-1

REPLACE BACKPLANE TRANSLATOR BOARD SX-200
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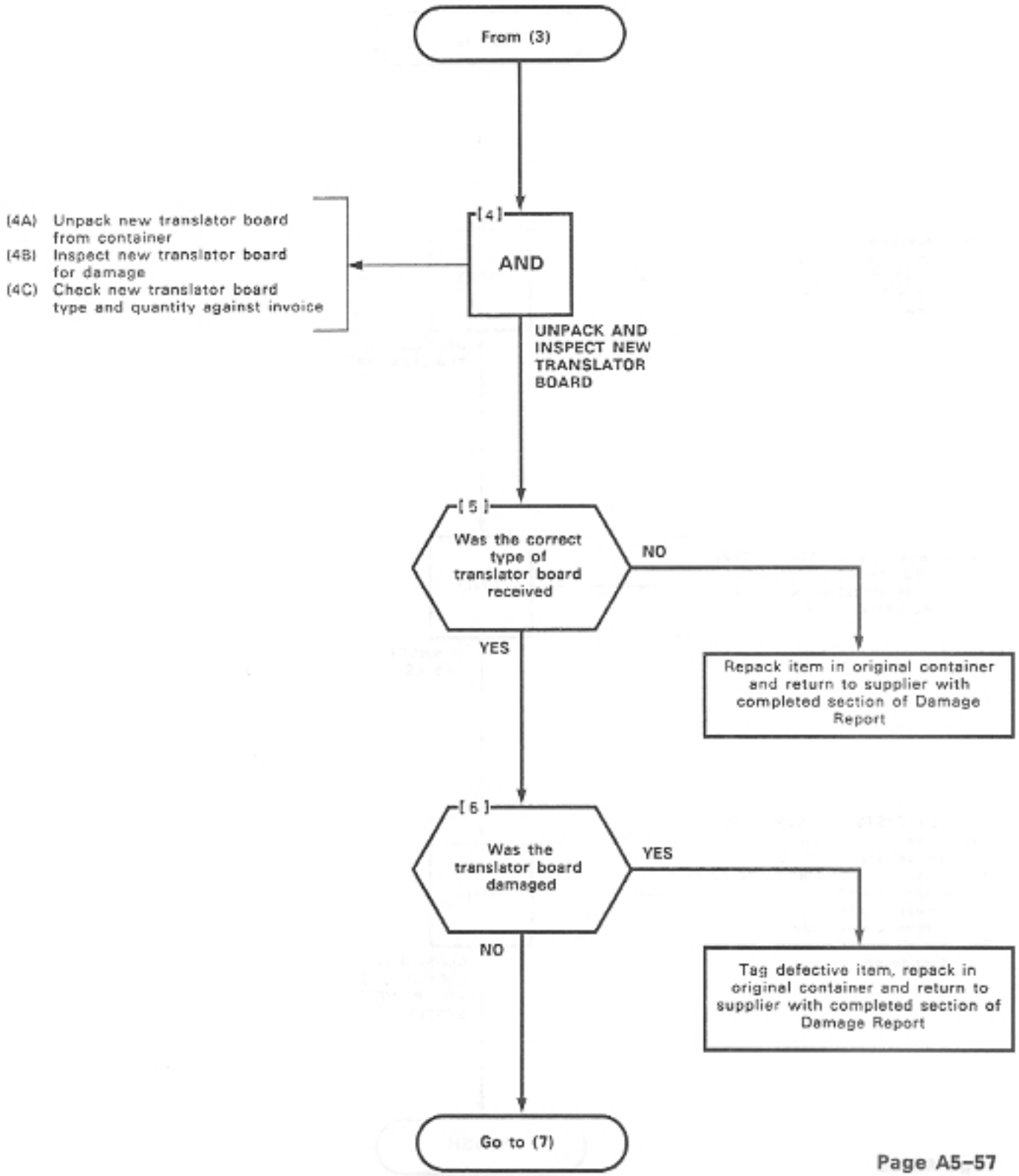

REPLACE BACKPLANE TRANSLATOR BOARD SX-200
MAP350- 509
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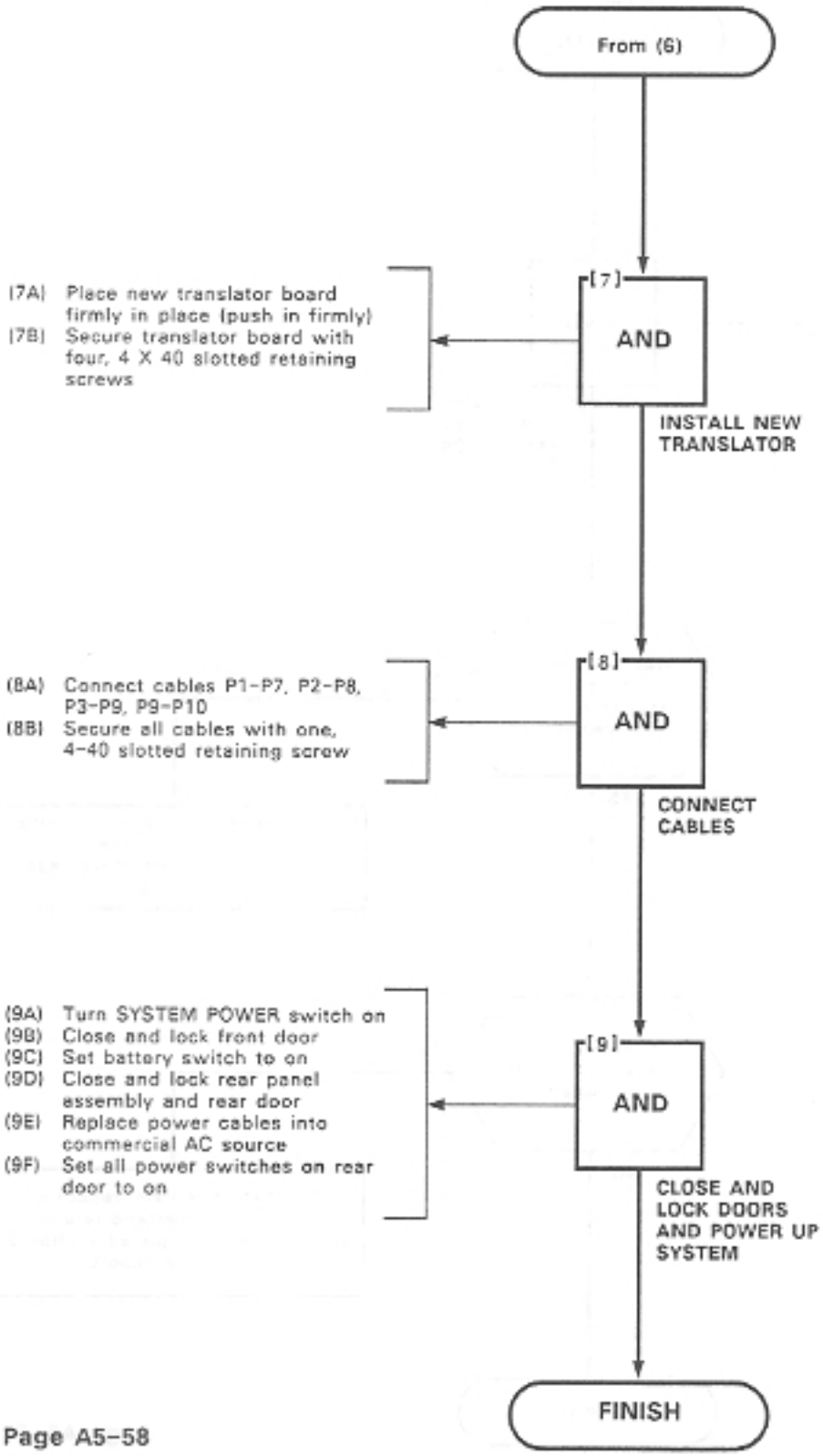

REPLACE CARDS IN SHELF SX-200
MAP350-510
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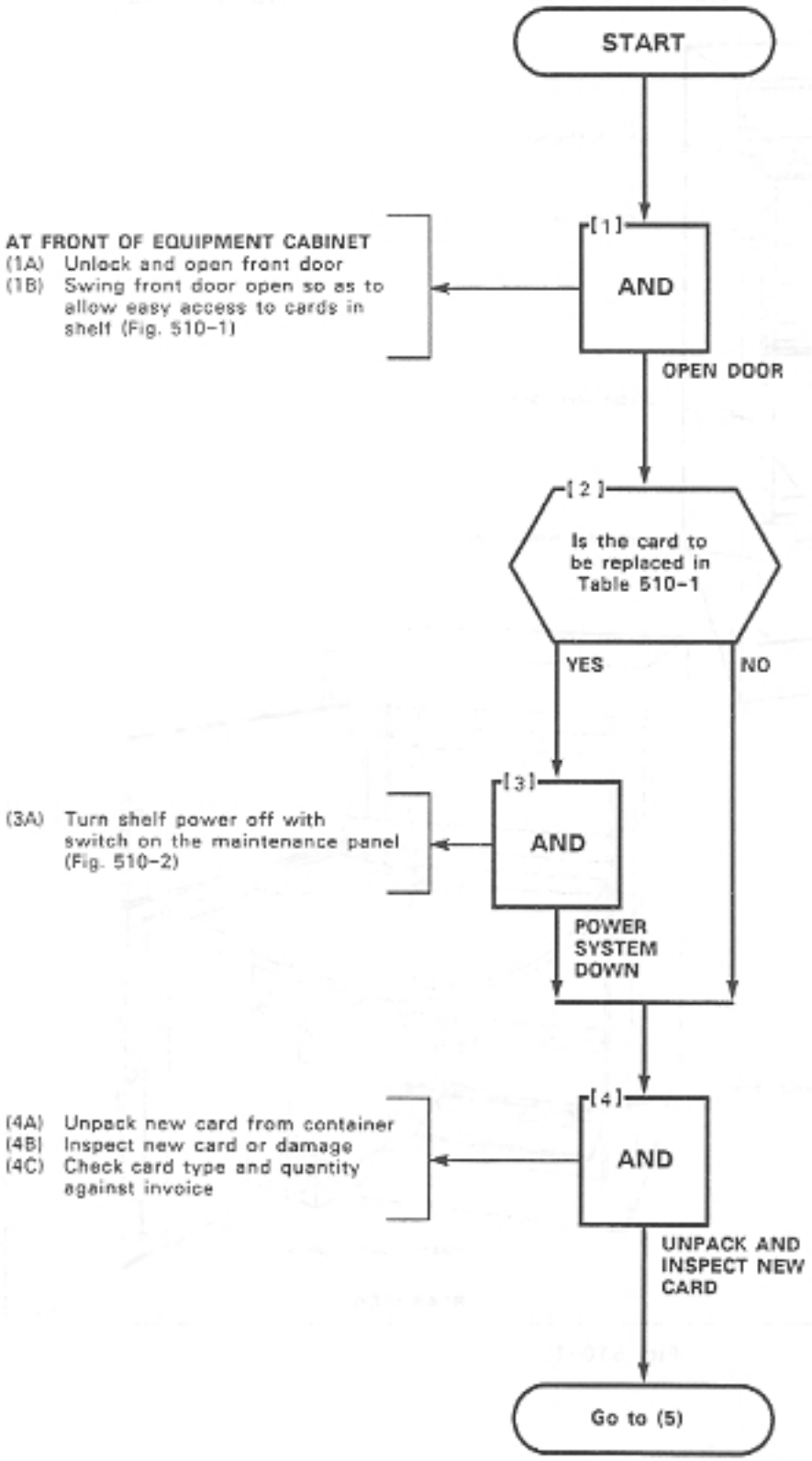
NOTE

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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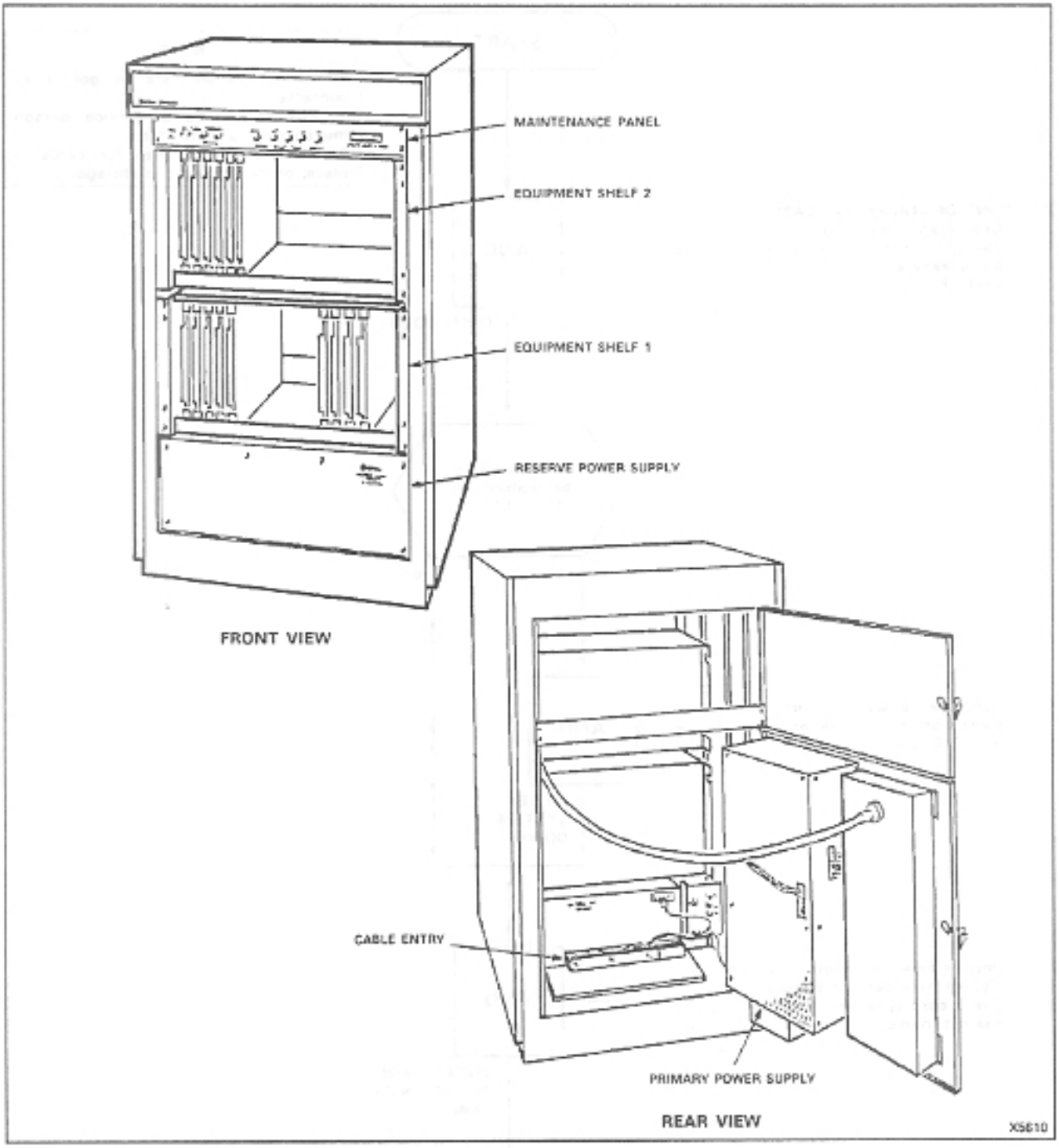

Fig. 510-1

REPLACE CARDS IN SHELF SX-200
MAP350-510
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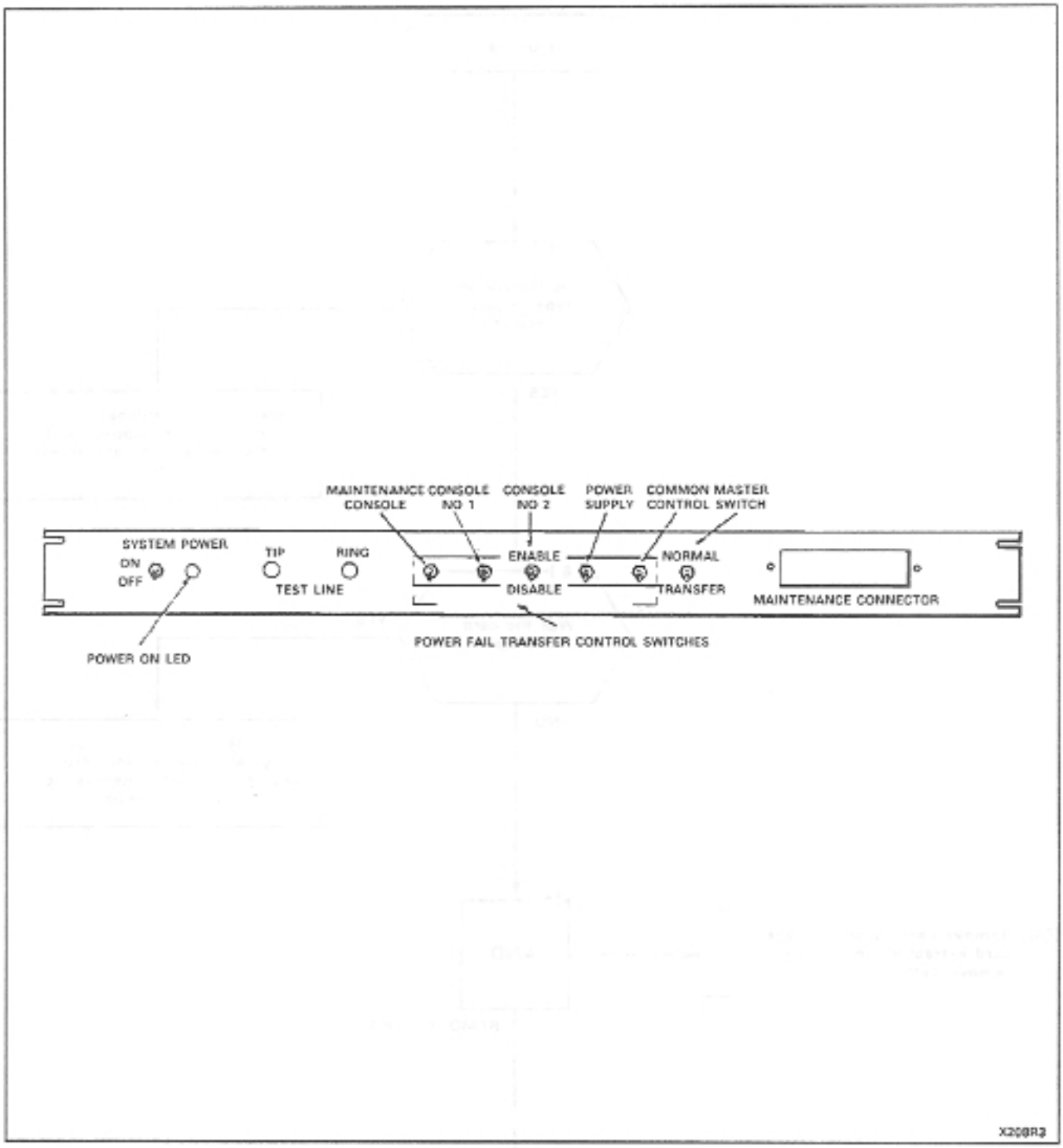

Fig. 510-2 Maintenance Panel

REPLACE CARDS IN SHELF SX-200
MAP350- 510
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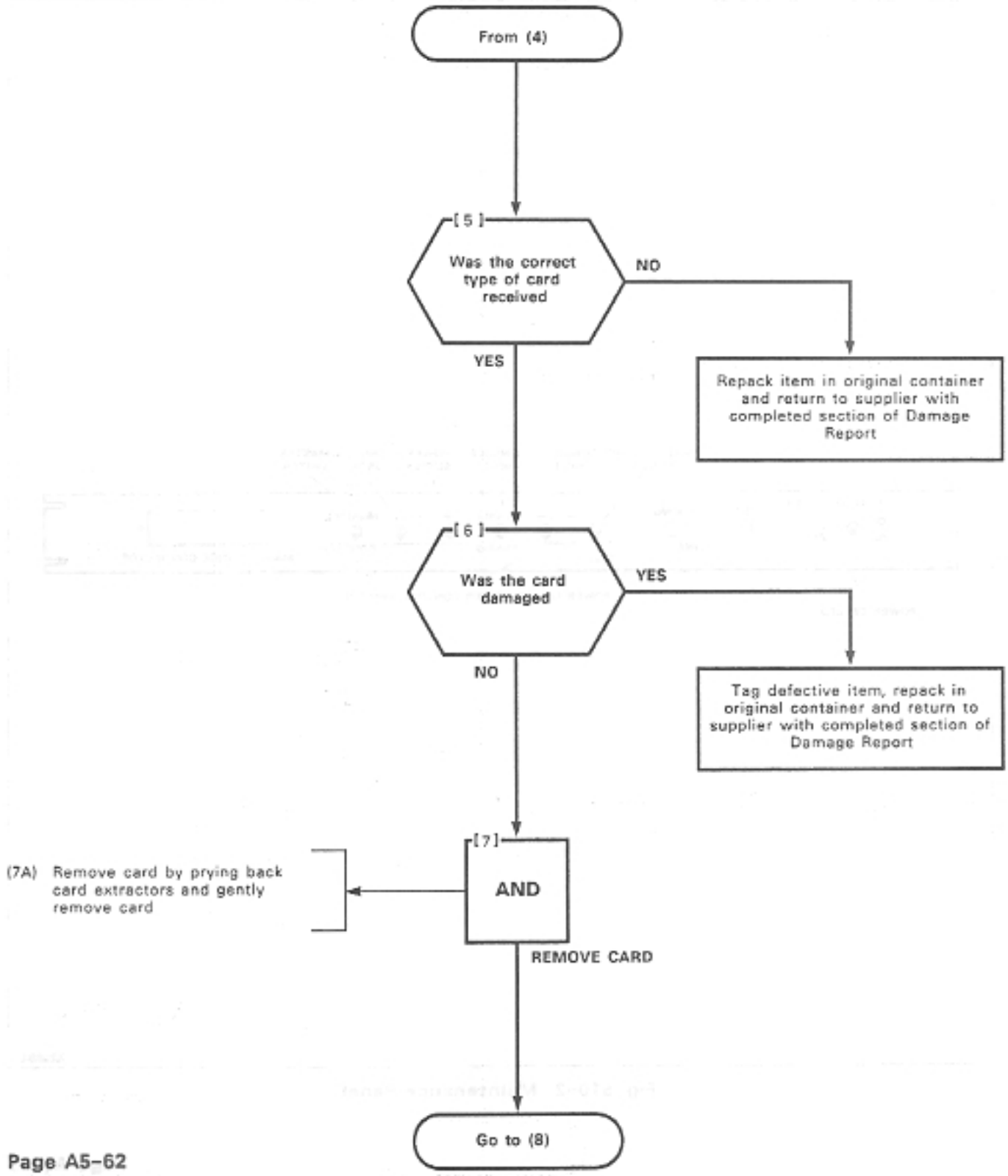


REPLACE CARDS IN SHELF SX-200
MAP350-510
Issue 1, December 1982
Sheet 5 of 5

From (7)

[8]

AND

(8A) Insert new card gently and push card extractors flat

INSERT NEW CARD

[9]

AND

(9A) Turn shelf power back on
(9B) Close and lock front door

POWER UP SYSTEM

FINISH

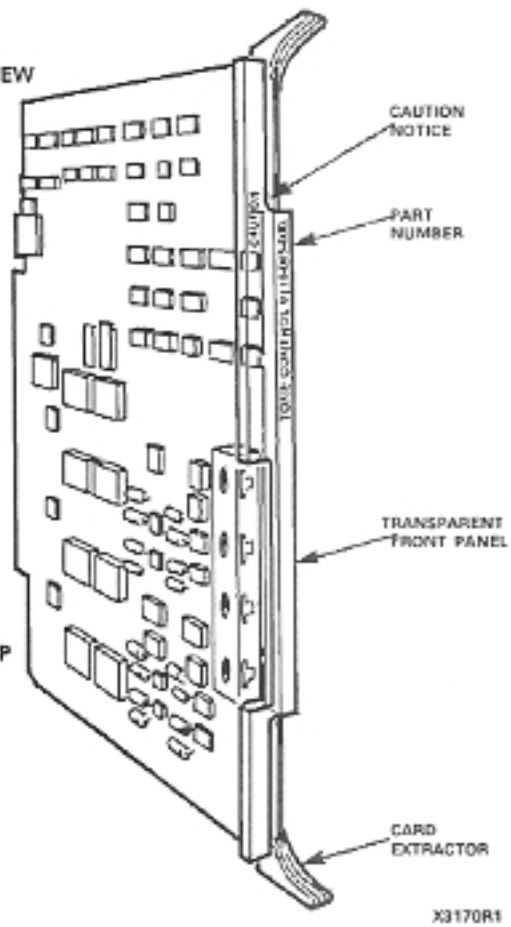
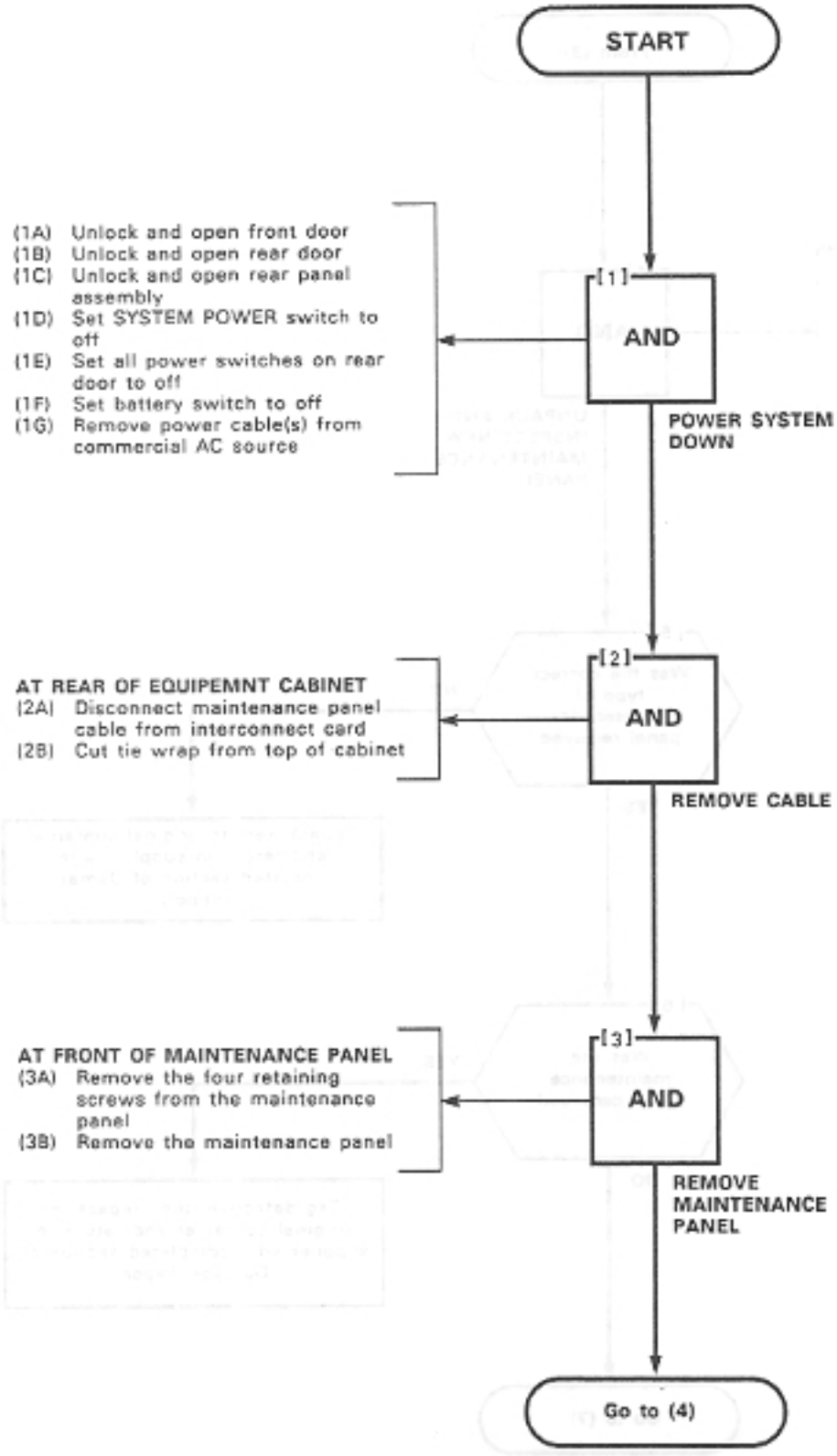


Fig. 510-3 Typical Circuit Card

REPLACE MAINTENANCE PANEL SX-200
MAP350-511
Issue 1, December 1982
Sheet 1 of 3



REPLACE MAINTENANCE PANEL SX-200
MAP350- 511
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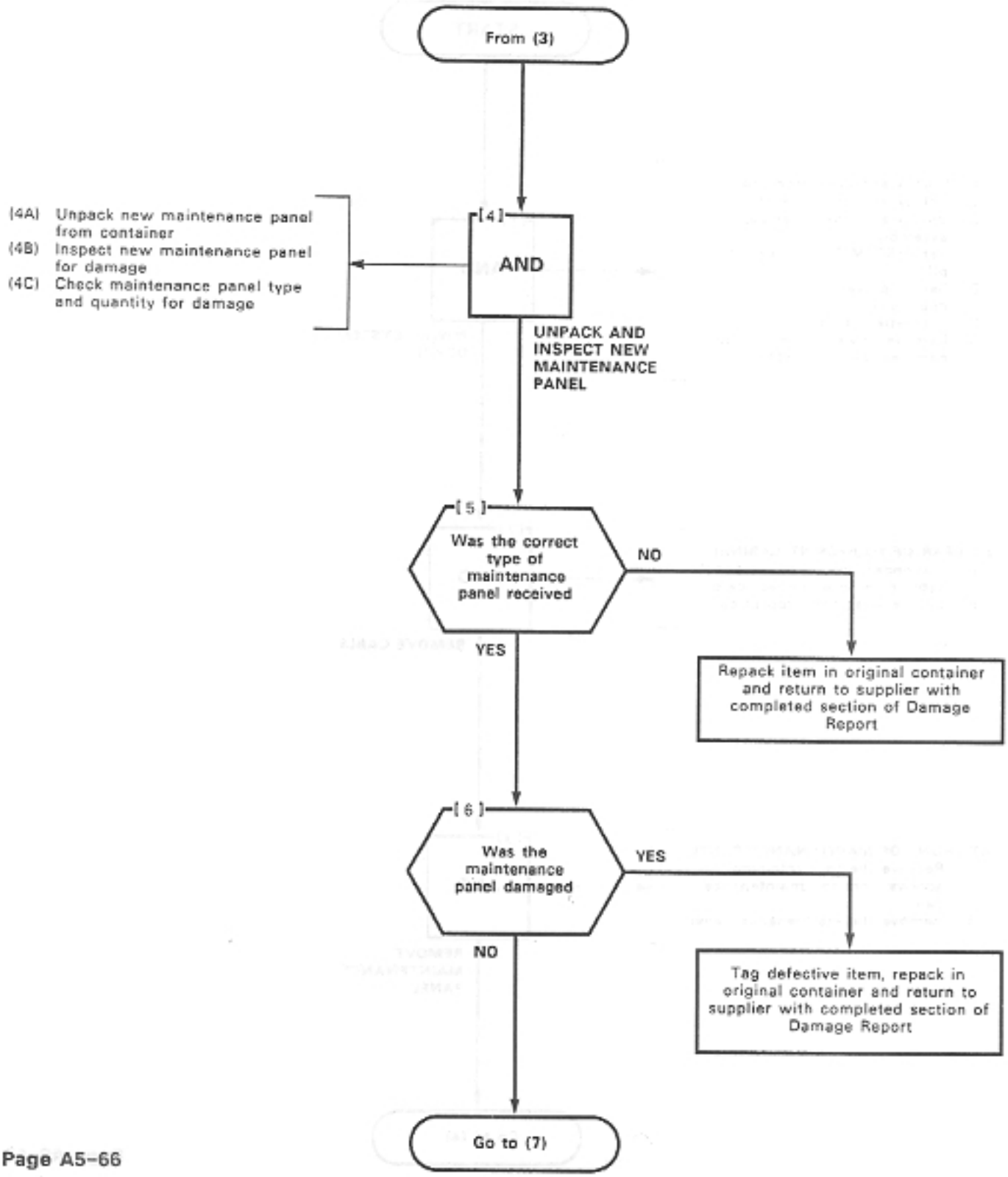

REPLACE MAINTENANCE PANEL SX-200
MAP350-511
Issue 1, December 1982
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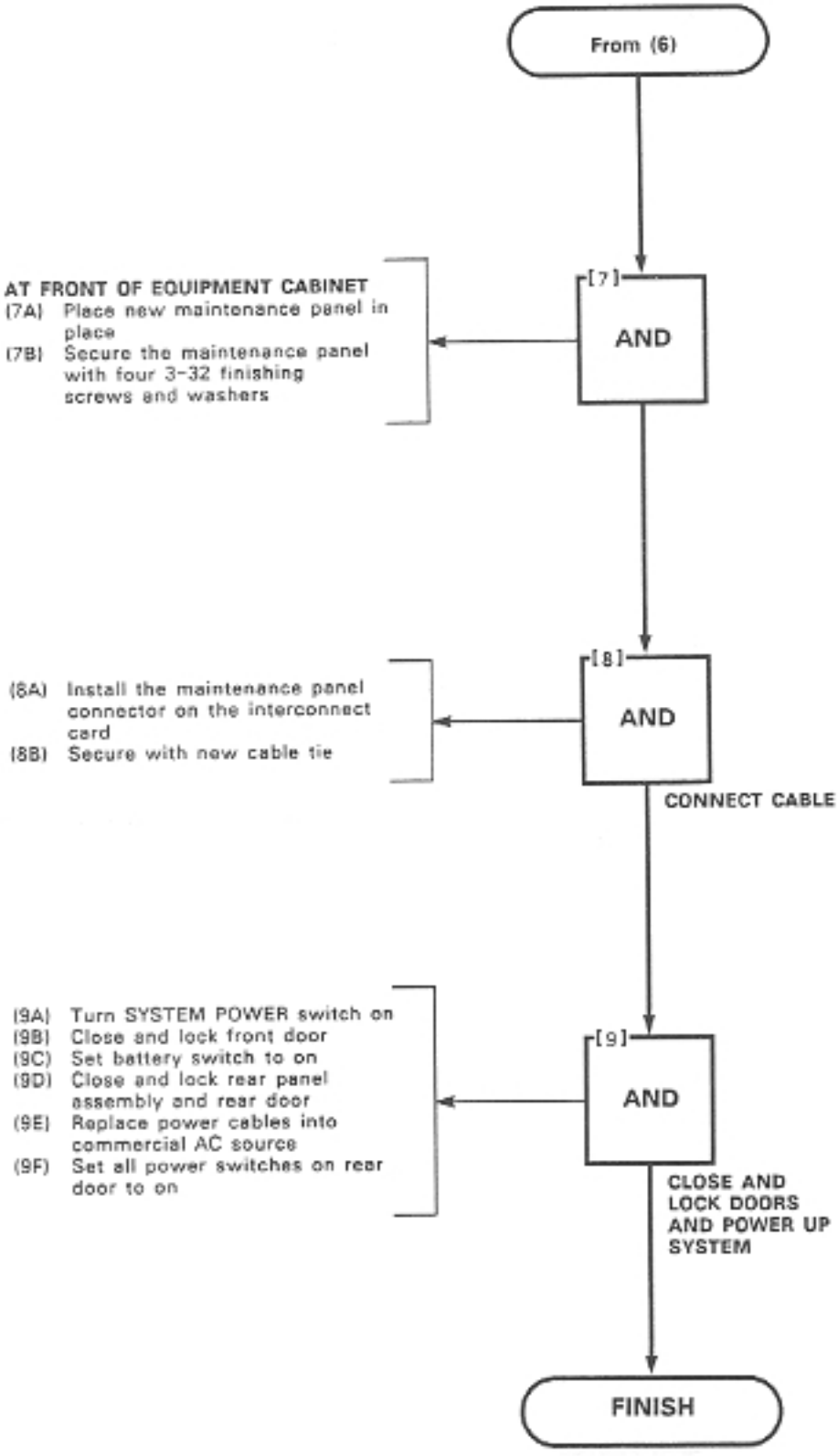

REPLACE WIRING HARNESS SX-200
MAP350-512
Issue 1, December 1982
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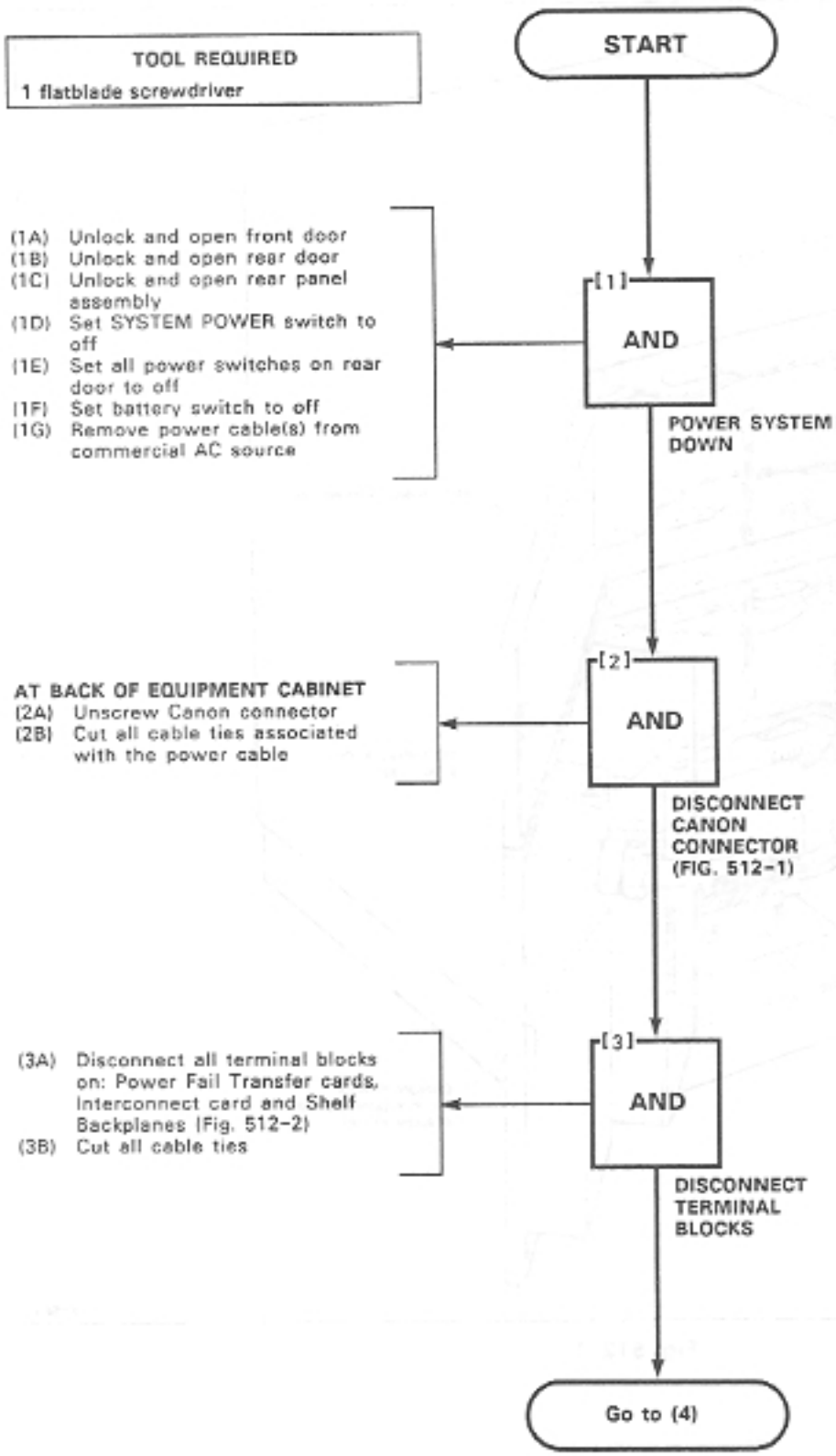

REPLACE WIRING HARNESS SX-200
MAP350- 512
Issue 1, December 1982
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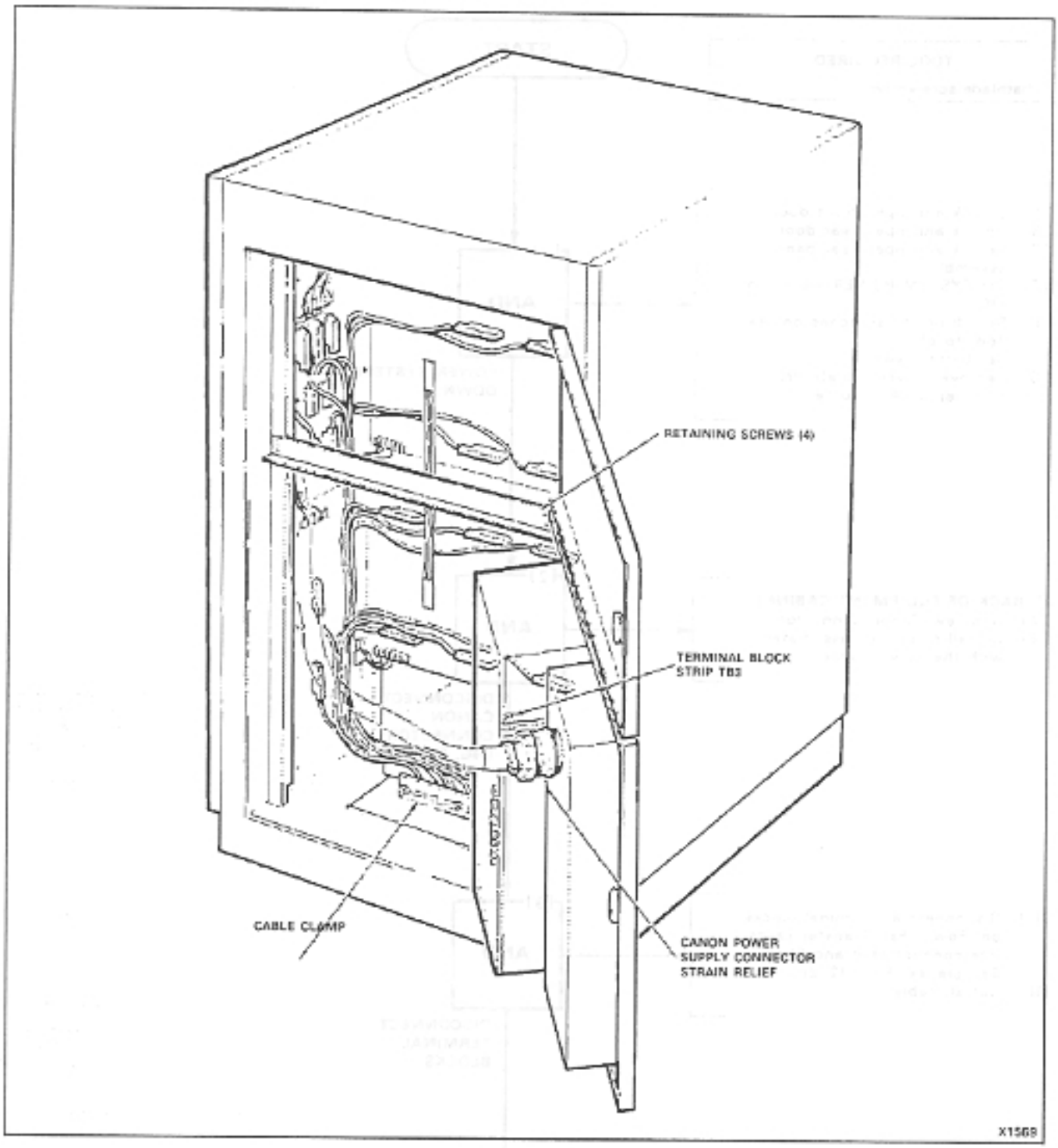

Fig. 512-1

REPLACE WIRING HARNESS SX-200
MAP350-512
Issue 1, December 1982
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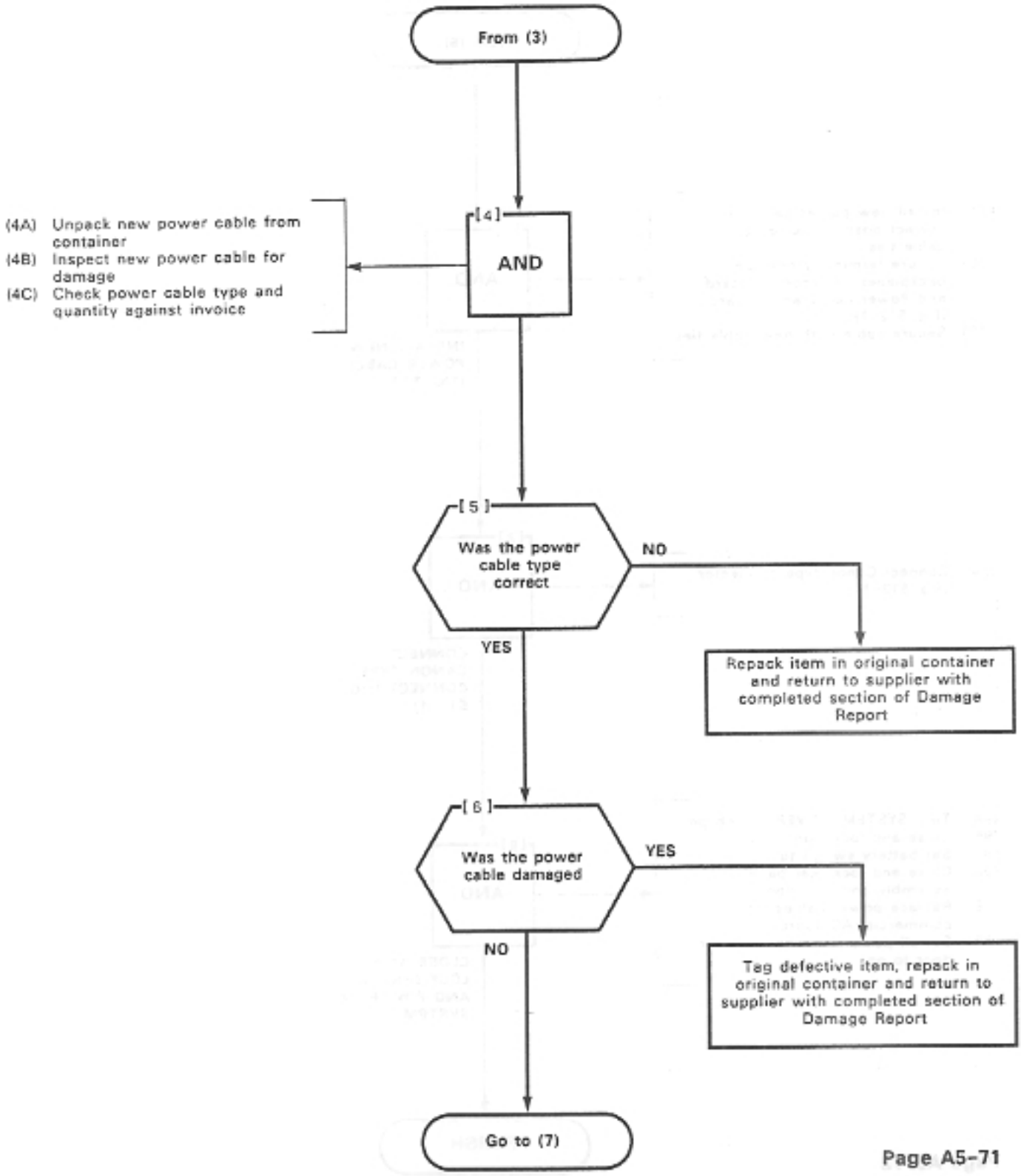

REPLACE WIRING HARNESS SX-200
MAP350- 512
Issue 1, December 1982
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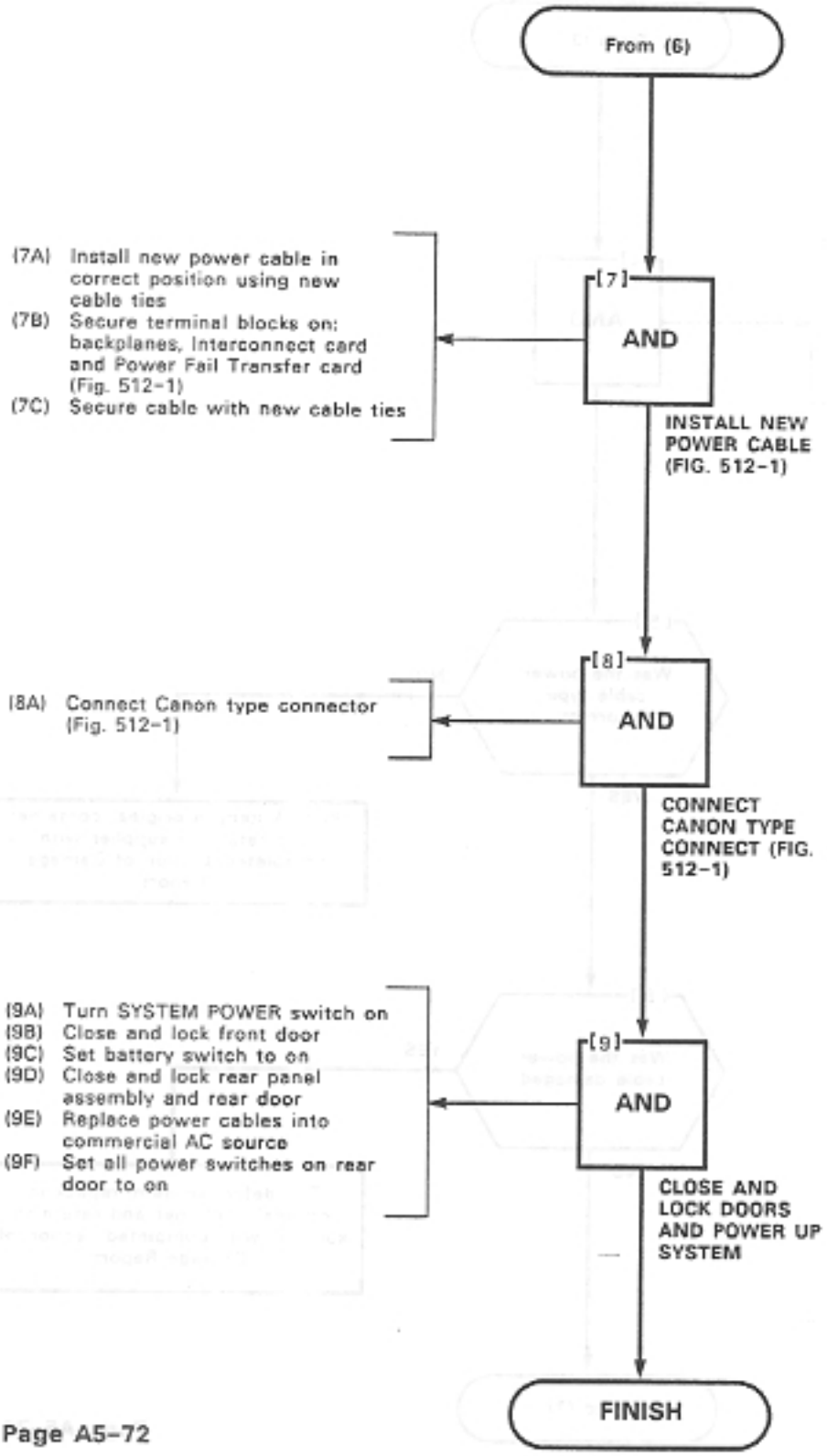

REPLACE WIRING HARNESS SX-200
MAP350-512
Issue 1, December 1982
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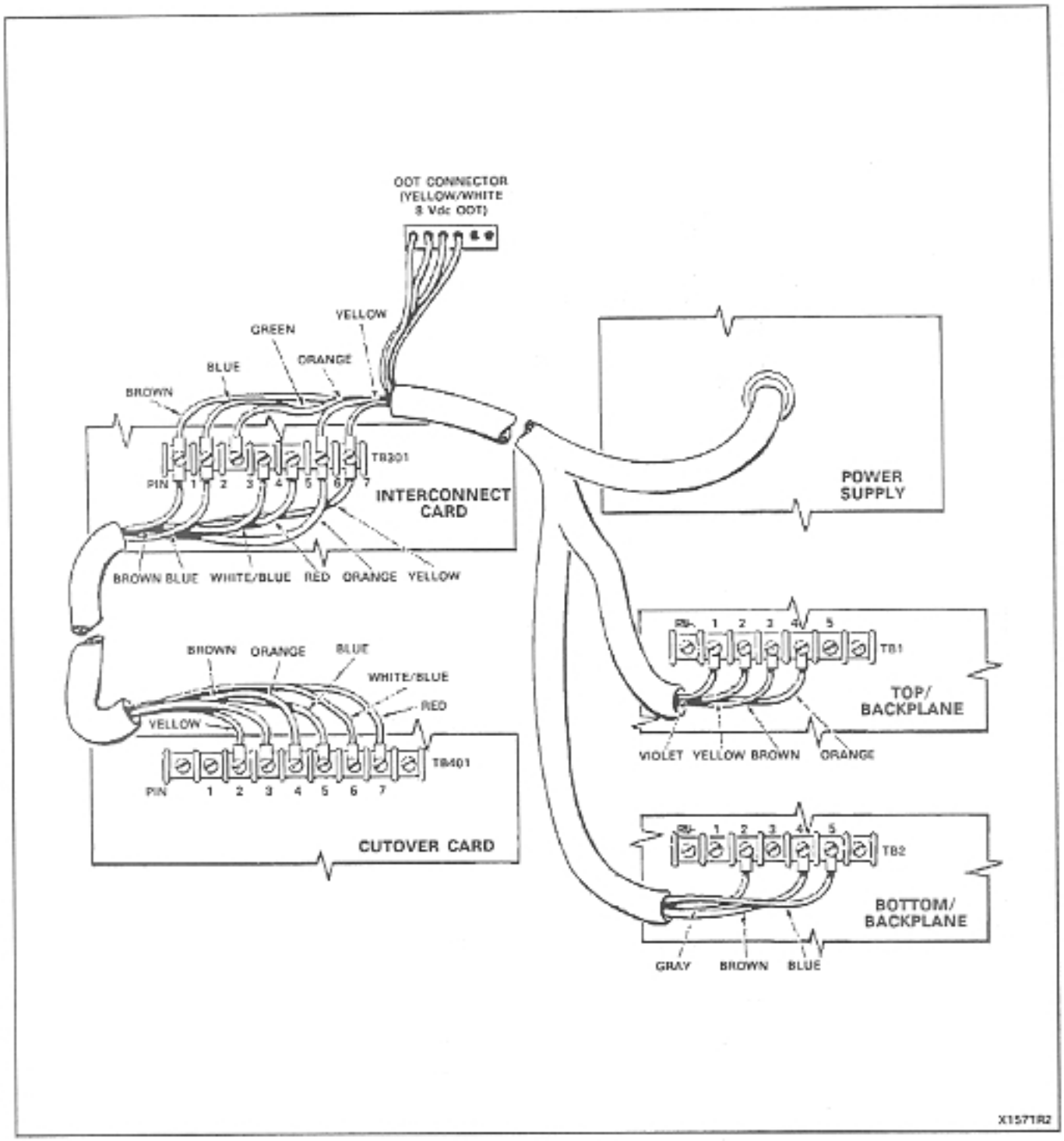

Fig. 512-2 Wiring Diagram

APPENDIX 6
POWER CHECKS

General

A6.01 This Appendix consists of a series of MAP's 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.

A6.02 These MAP's describe how to measure the electrical voltages in key areas of the SX-100 or SX-200. 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 MAP's to ensure personal and equipment safety.

A6.03 Table A6-1 is a listing of all power checks that may be performed when troubleshooting an SX-100 or SX-200.

- MAP350-600, Power Supply Check deals with the SX-200 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
- 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 or SX-200
- 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
- MAP350-606 outlines the procedure for checking the voltage on the SX-100 Reserve Battery Backup

TABLE A6-1
POWER CHECKS

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

POWER SUPPLY CHECK SX-200
MAP350-600
Issue 1, December 1982
Sheet 1 of 6

TOOLS REQUIRED

1 AC/DC Voltmeter
1 trouble lamp

CAUTION

System power will be on.

START

[1] Is the AC power LED on (Fig. 600-1)

YES

NO

(2A) Check that the AC power cord is plugged in
(2B) Check the AC power fuse (Fig. 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.

[2] AND

CHECK AC VOLTAGE

[3] Is the converter input LED lit (Fig. 600-1)

YES

Go to (7)

NO

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

[4] AND

CHECK CIRCUIT BREAKER

Go to (5)

POWER SUPPLY CHECK SX-200
MAP350- 600
Issue 1, December 1982
Sheet 2 of 6

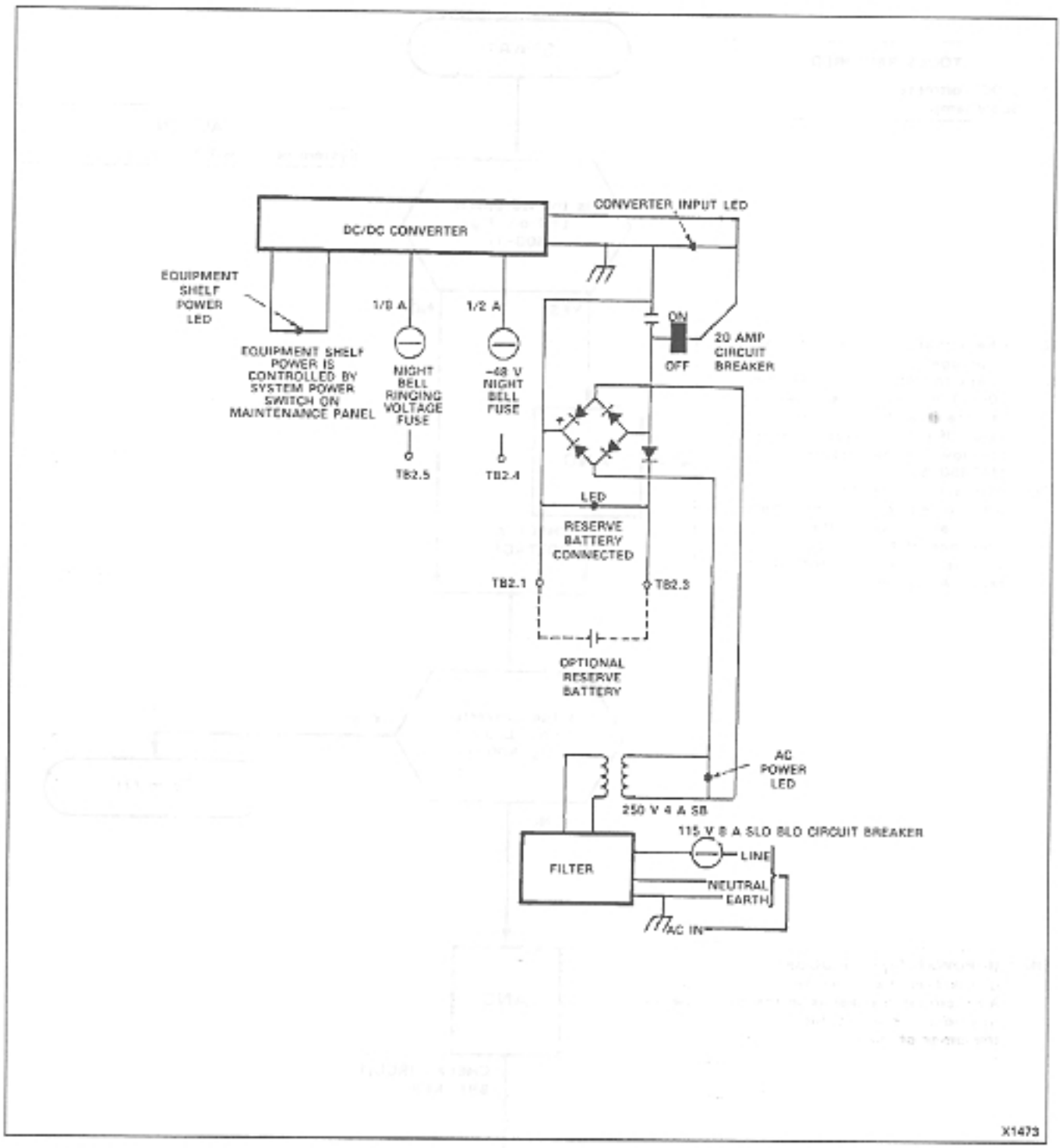

Fig. 600-1 SX-200 Back Door Electrical Schematic

POWER SUPPLY CHECK SX-200
MAP350-600
Issue 1, December 1982
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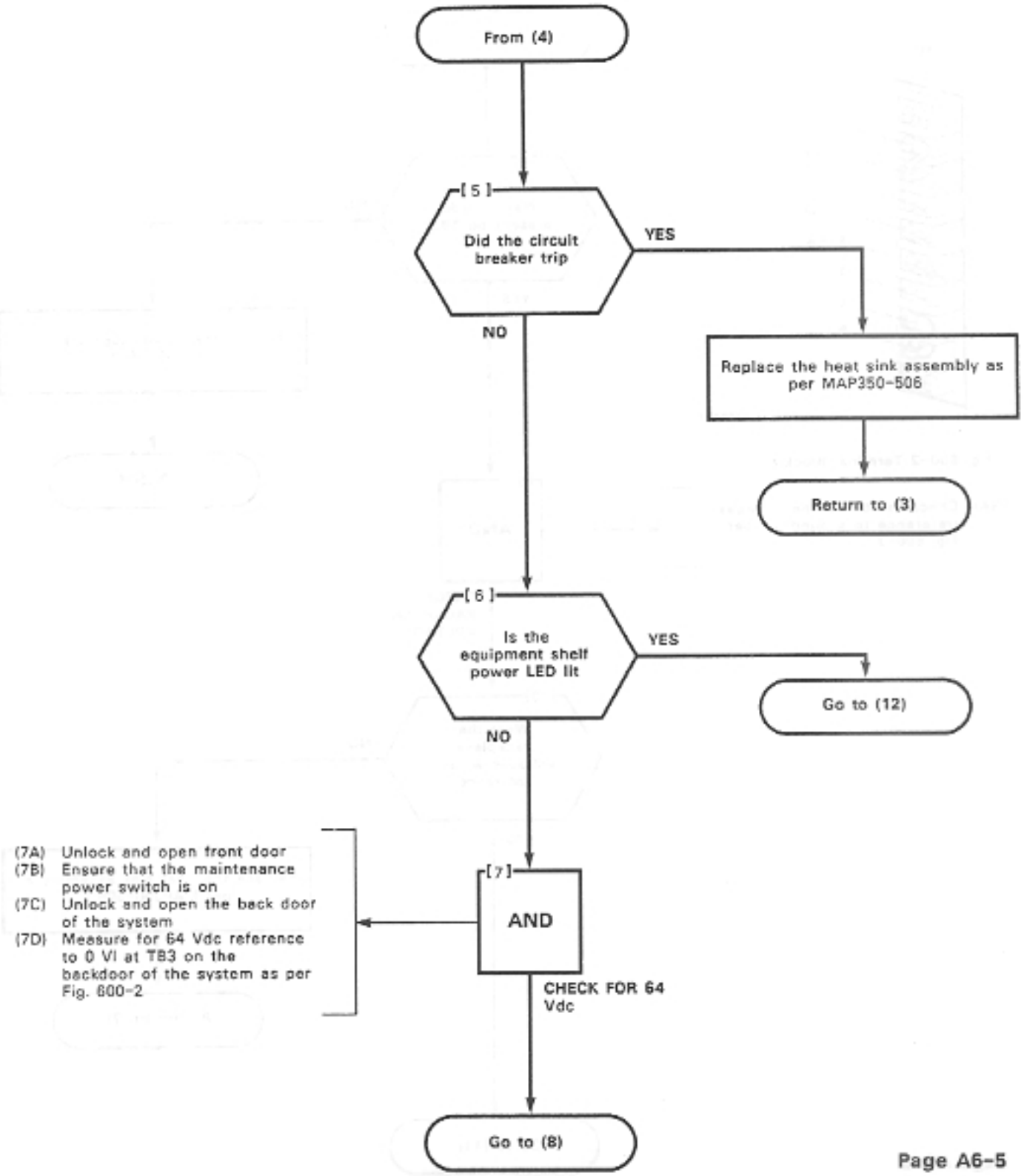

POWER SUPPLY CHECK SX-200
MAP350- 600
Issue 1, December 1982
Sheet 4 of 6

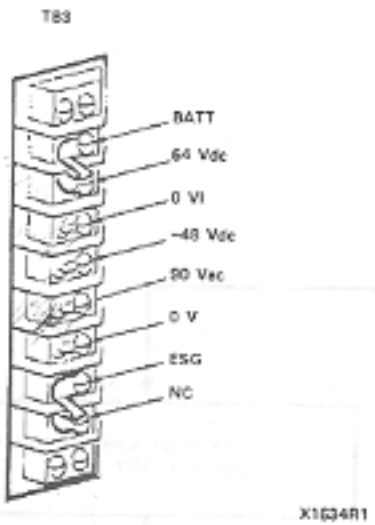

Fig. 600-2 Terminal Block 3

From (7)

[8] Was 64 Vdc present on TB3

NO

Replace the power supply as per MAP350-507

FINISH

YES

[9] AND

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

CHECK BACKPLANE VOLTAGES

[10] Were the backplane voltages within tolerance

NO

Replace the heat sink assembly as per MAP350-505

Return to (7)

YES

Go to (11)

POWER SUPPLY CHECK SX-200
MAP350-600
Issue 1, December 1982
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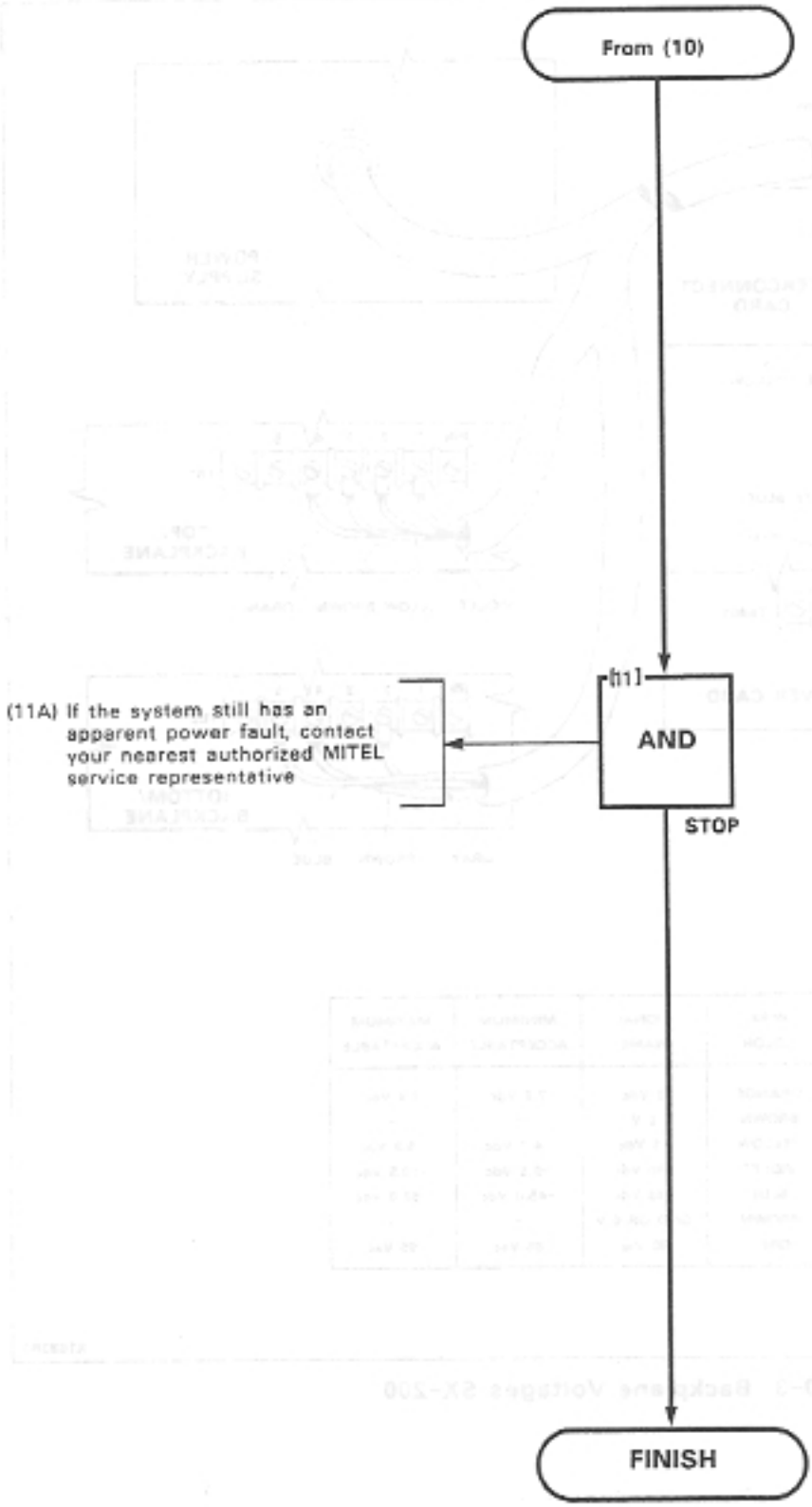
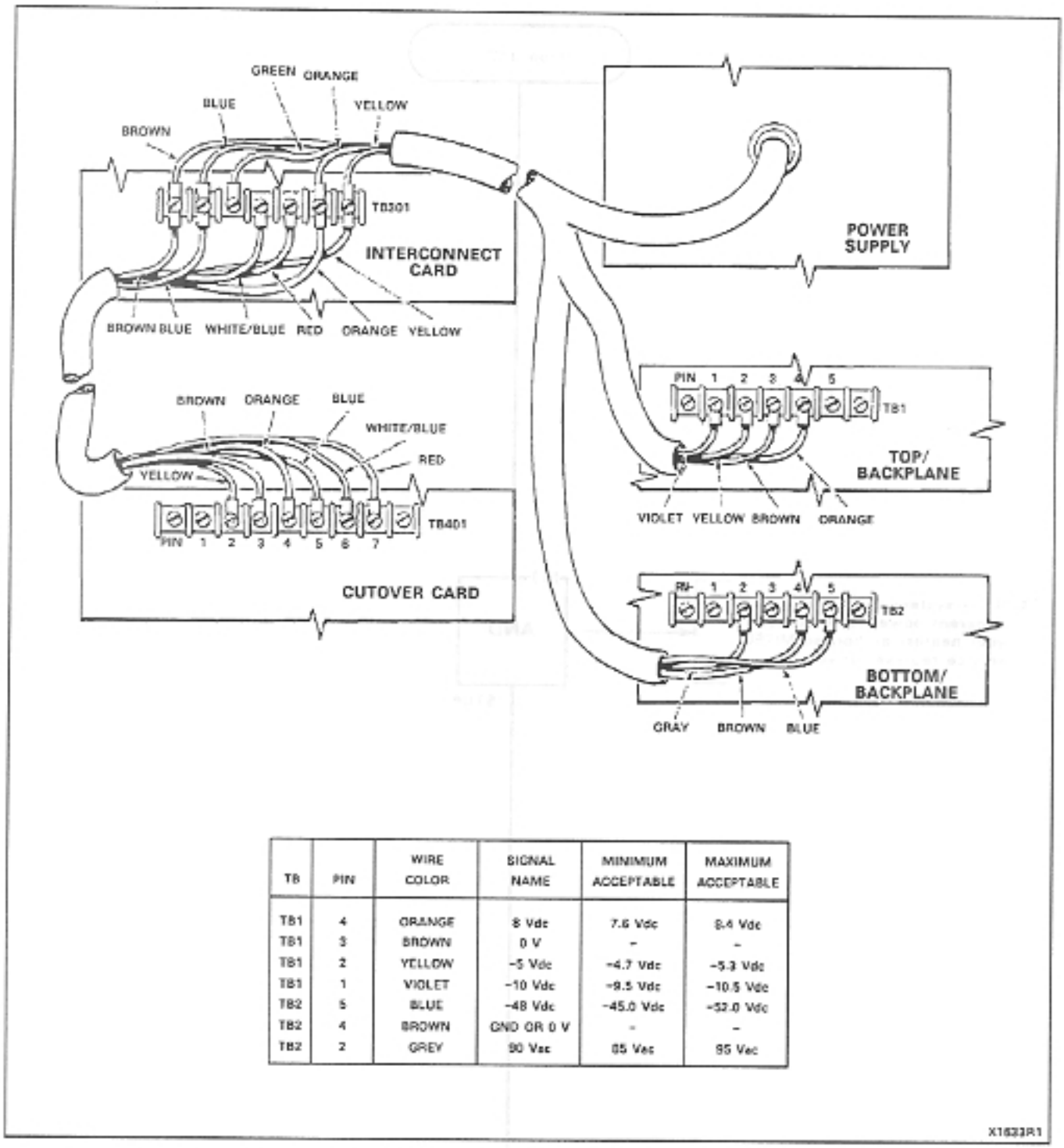


POWER SUPPLY CHECK SX-200
MAP350- 600
Issue 1, December 1982
Sheet 6 of 6



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

Fig. 600-3 Backplane Voltages SX-200

INTERCONNECT CARD SX-200
MAP350-601
Issue 1, December 1982
Sheet 1 of 8

TOOL REQUIRED

1 AC/DC Voltmeter

START

CAUTION

System power will be on.

[1] AND

[1A] Unlock and open the rear panel
[1B] Unlock and open the power supply door

EXPOSE THE INTERCONNECT CARD

[2] AND

(2A) Check the console fuse on the interconnect card (Fig. 601-1)

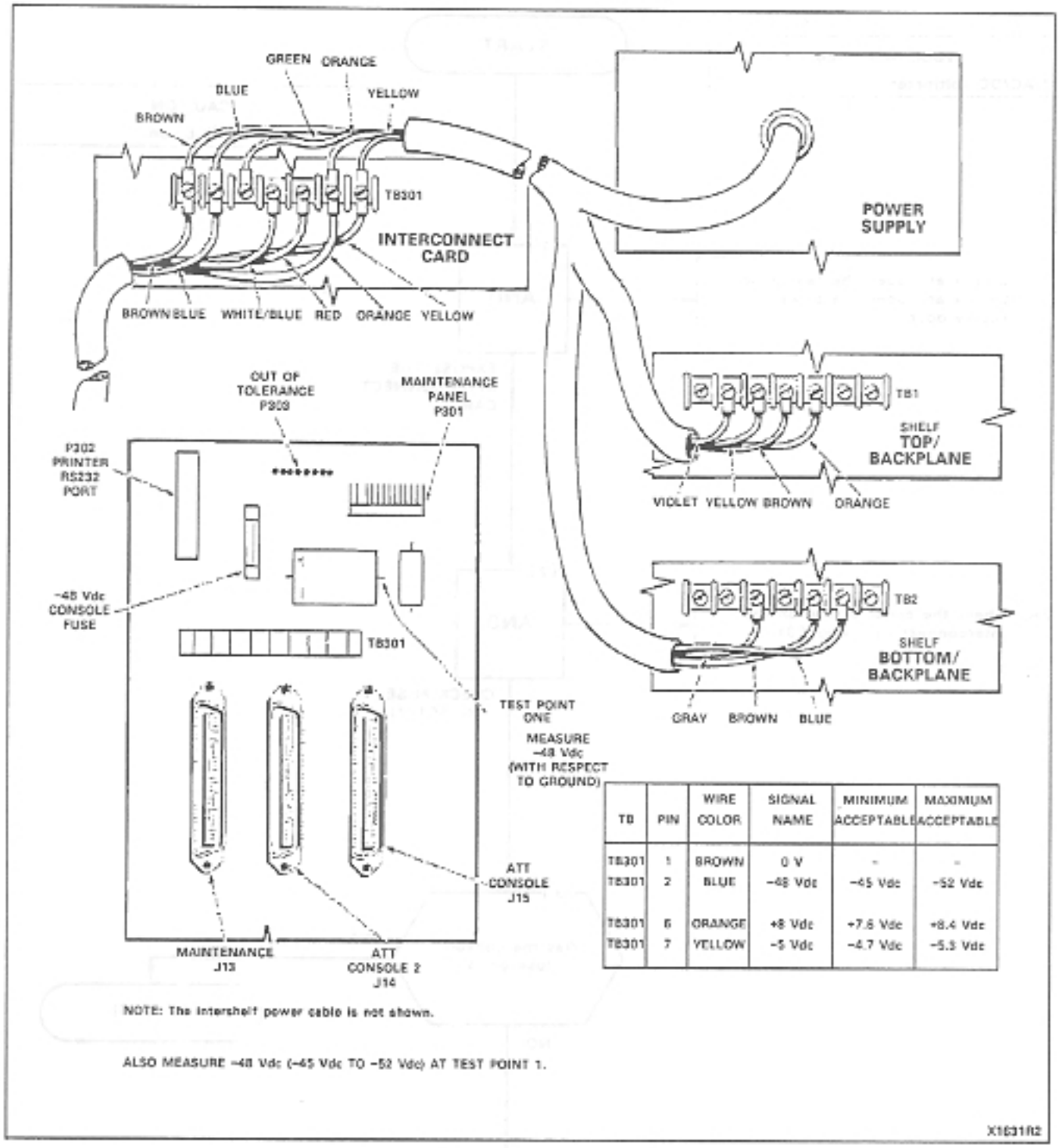
CHECK FUSE (FIG. 601-1)

[3] Was the console fuse good

YES → Go to (8)

NO → Go to (4)

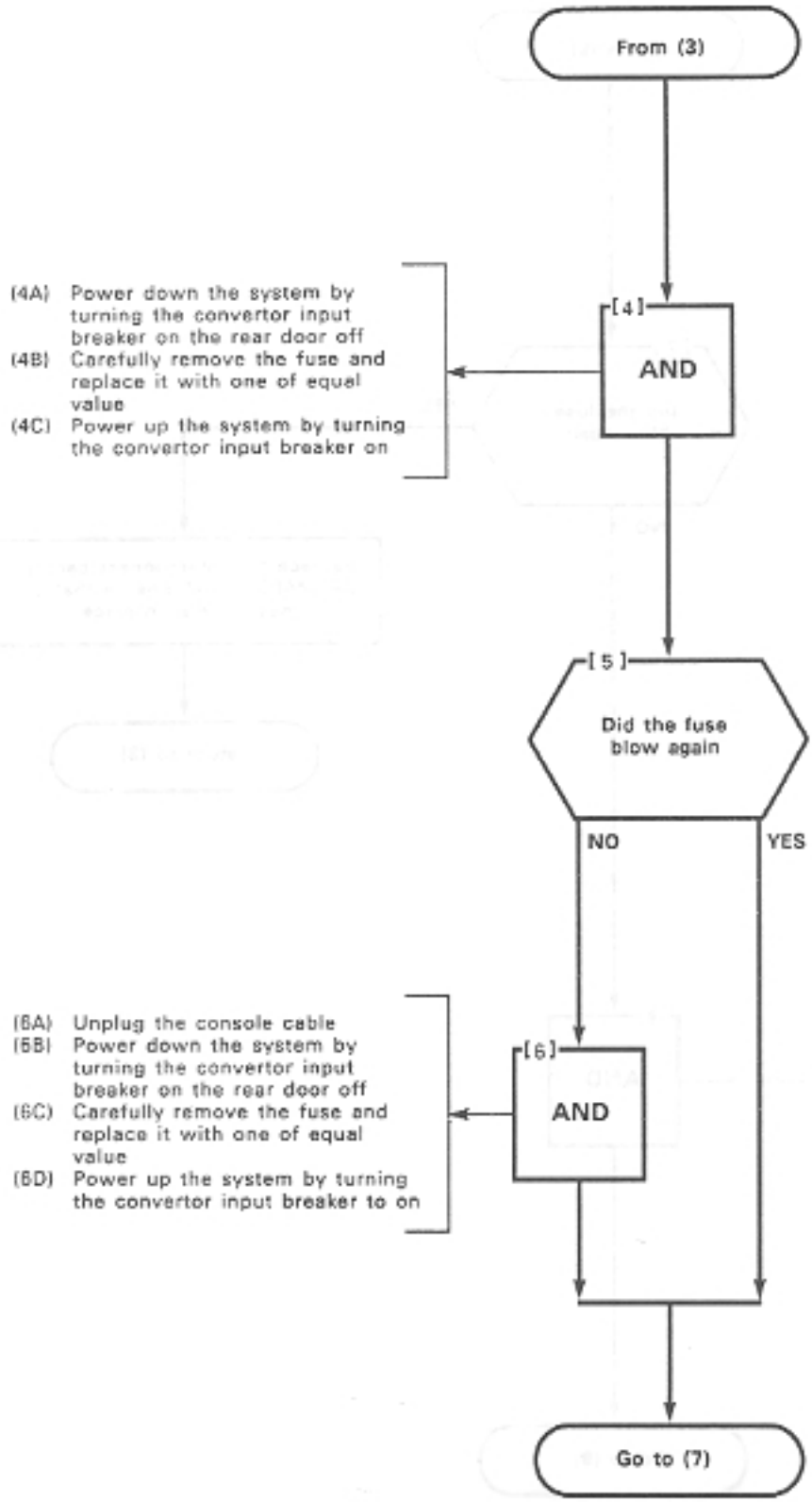
INTERCONNECT CARD SX-200
MAP350- 601
Issue 1, December 1982
Sheet 2 of 8



TB	PIN	WIRE COLOR	SIGNAL NAME	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
T8301	1	BROWN	0 V	-	-
T8301	2	BLUE	-48 Vdc	-45 Vdc	-52 Vdc
T8301	6	ORANGE	+8 Vdc	+7.6 Vdc	+8.4 Vdc
T8301	7	YELLOW	-5 Vdc	-4.7 Vdc	-5.3 Vdc

Fig. 601-1 Interconnect Card

INTERCONNECT CARD SX-200
MAP350-601
Issue 1, December 1982
Sheet 3 of 8



INTERCONNECT CARD SX-200
MAP350- 601
Issue 1, December 1982
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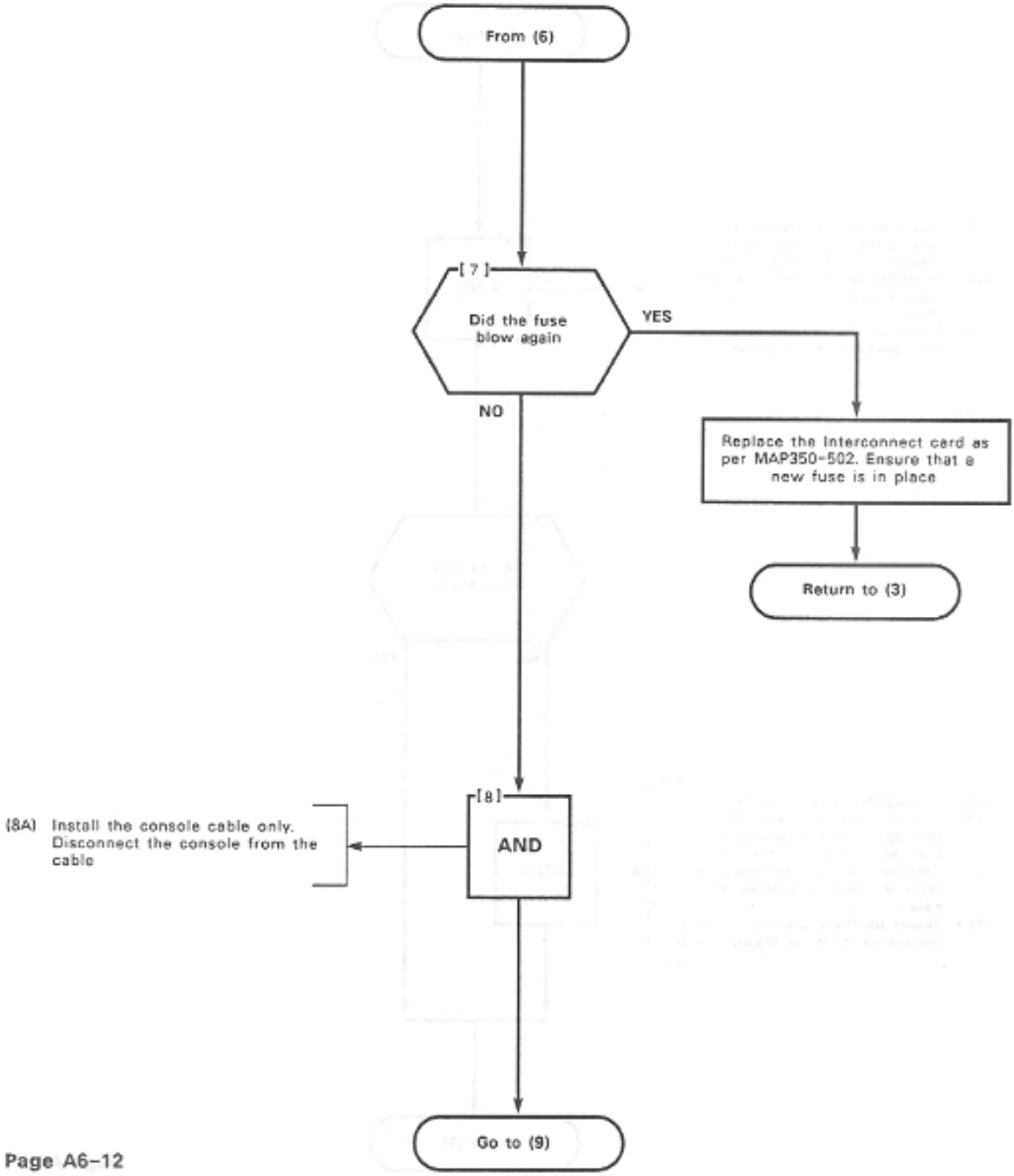
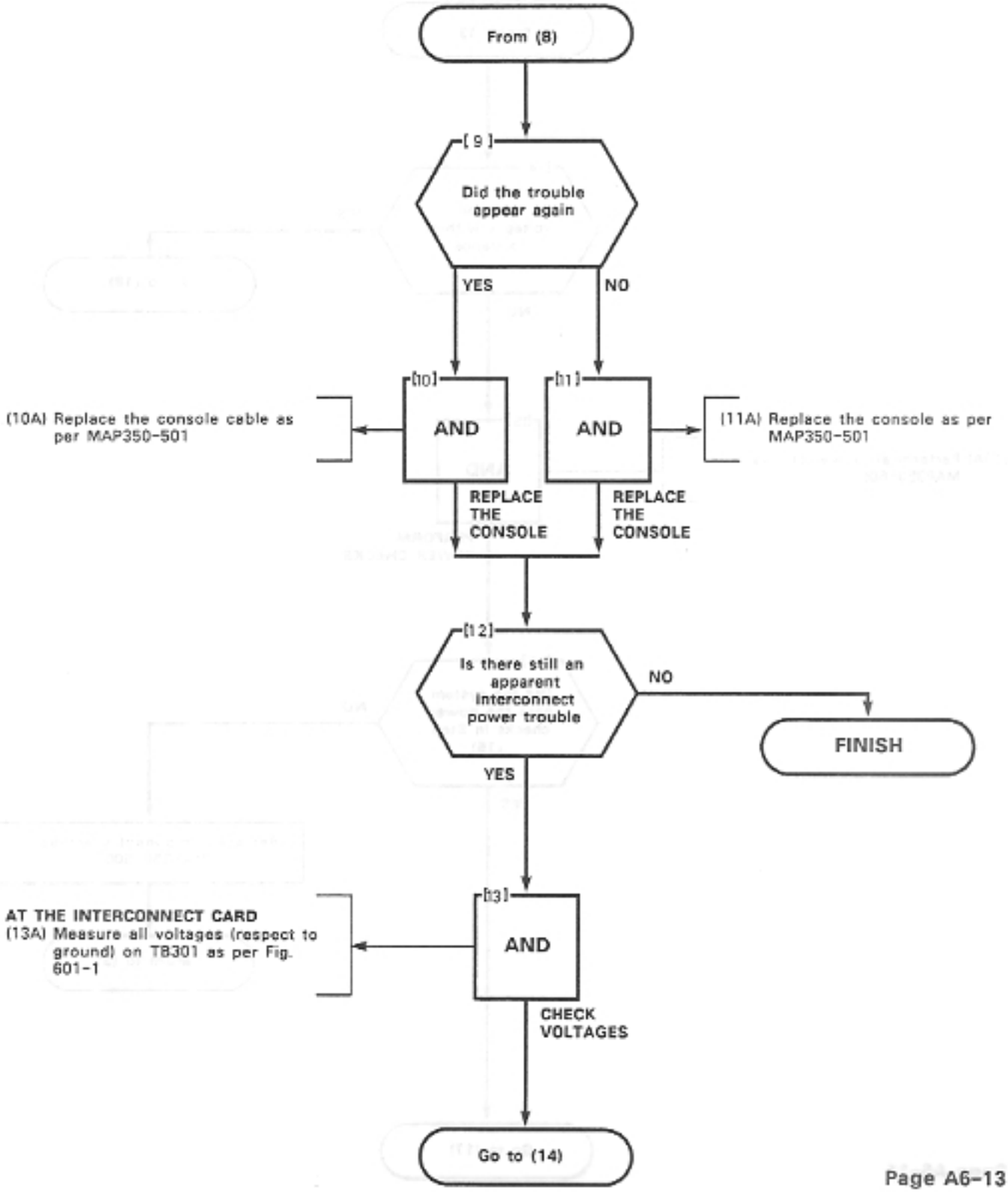
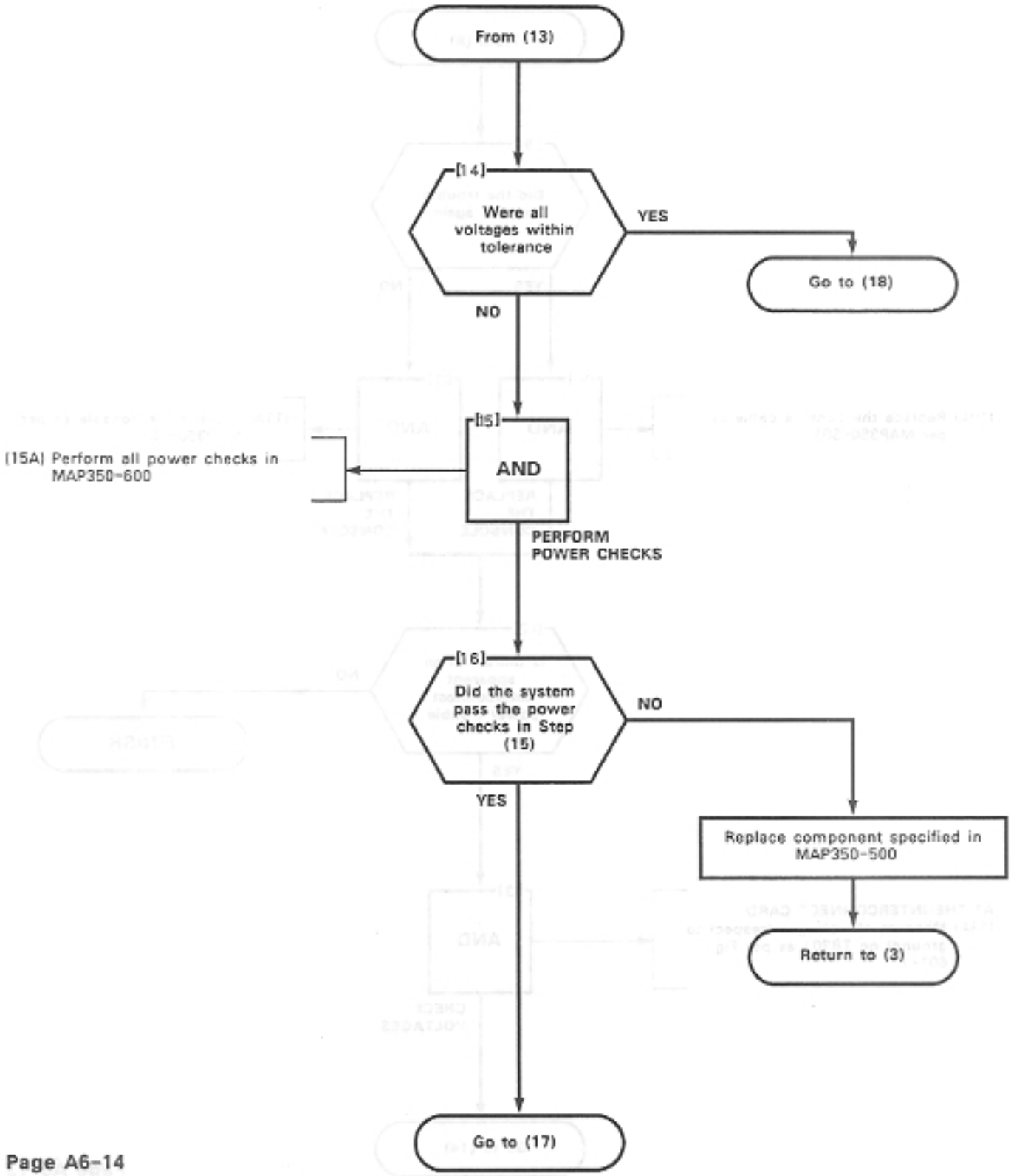


INTERCONNECT CARD SX-200
MAP350-601
Issue 1, December 1982
Sheet 5 of 8



INTERCONNECT CARD SX-200
MAP350- 601
Issue 1, December 1982
Sheet 6 of 8



INTERCONNECT CARD SX-200
MAP350-601
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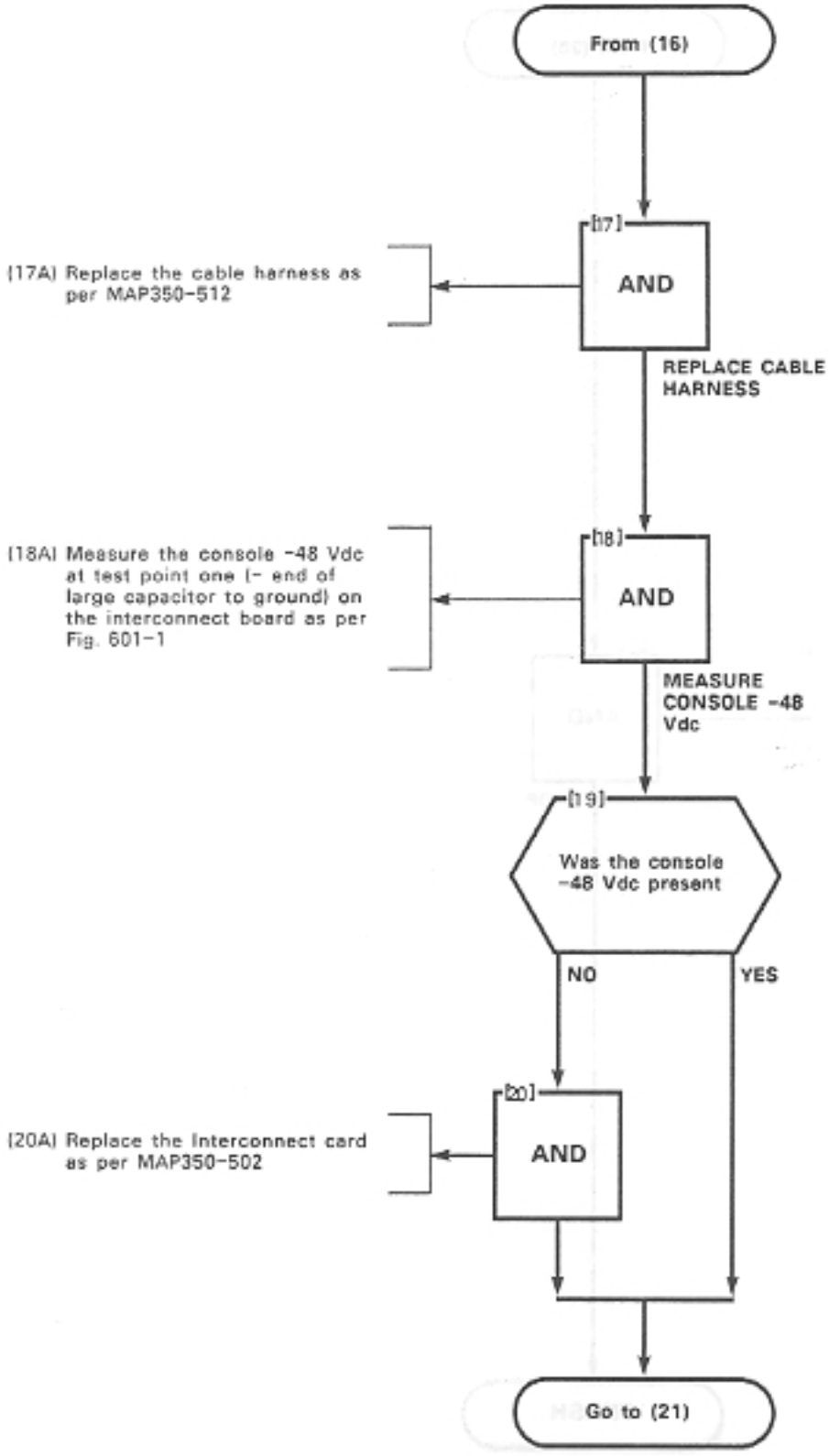

INTERCONNECT CARD SX-200
MAP350- 601
Issue 1, December 1982
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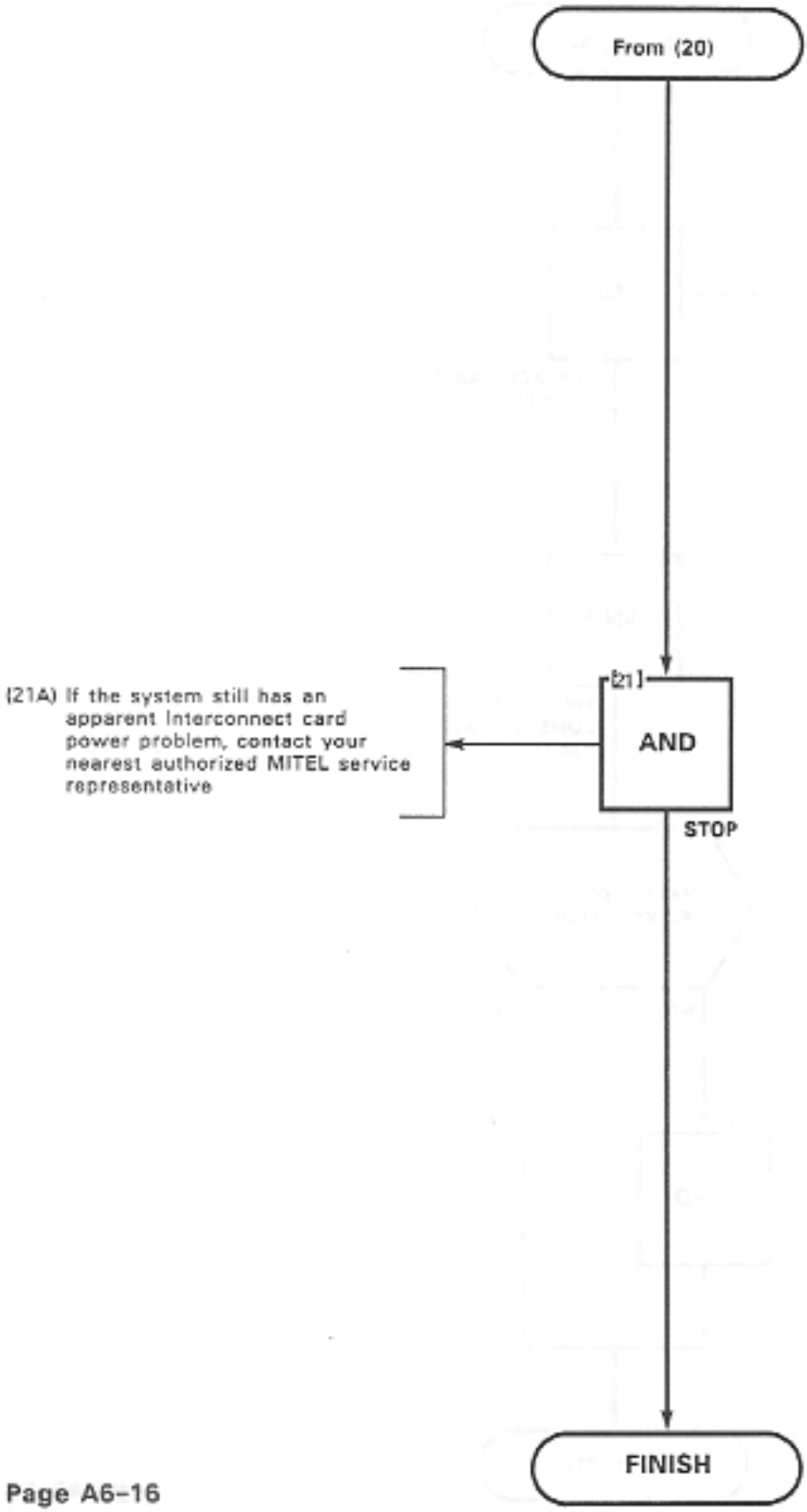
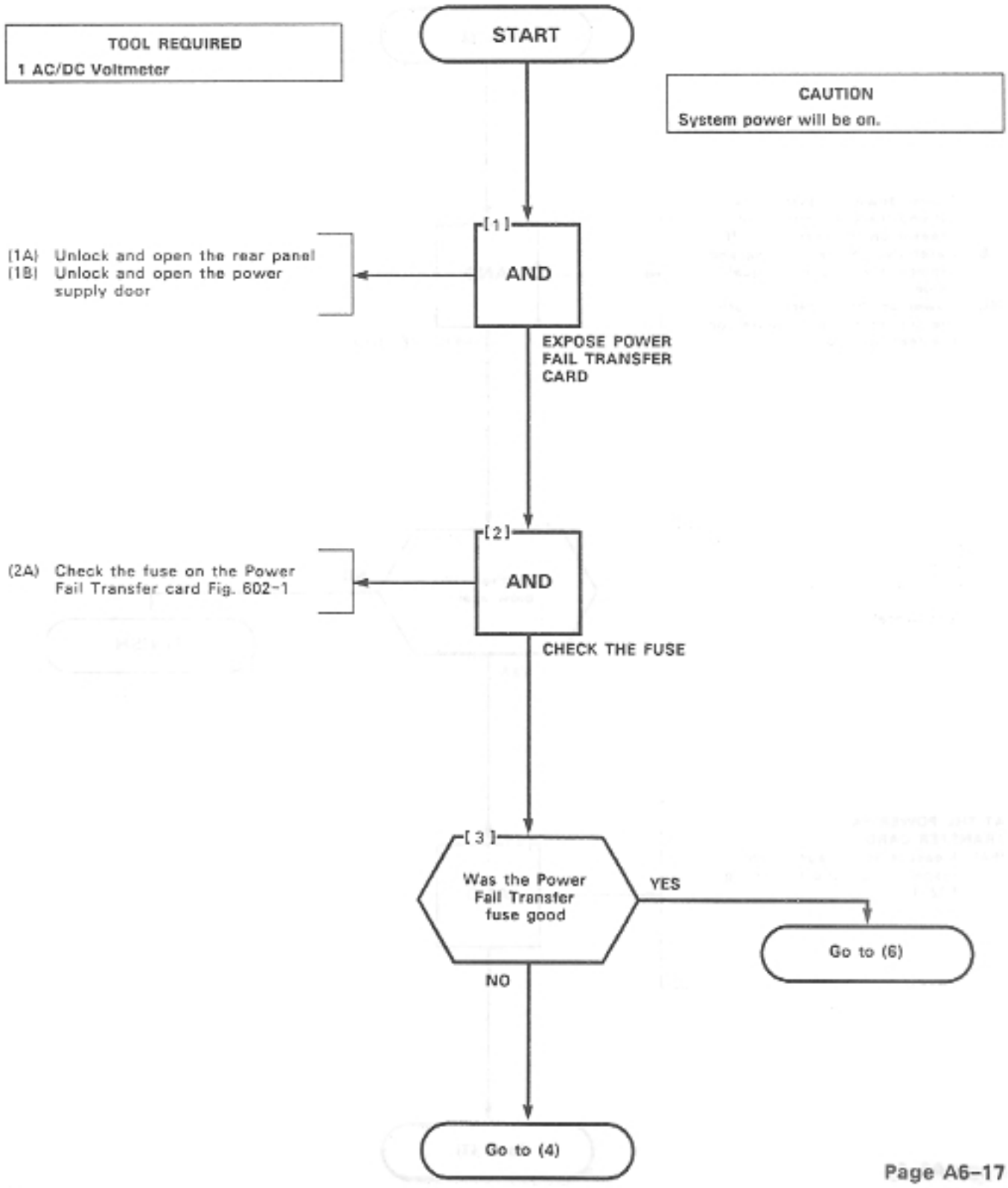
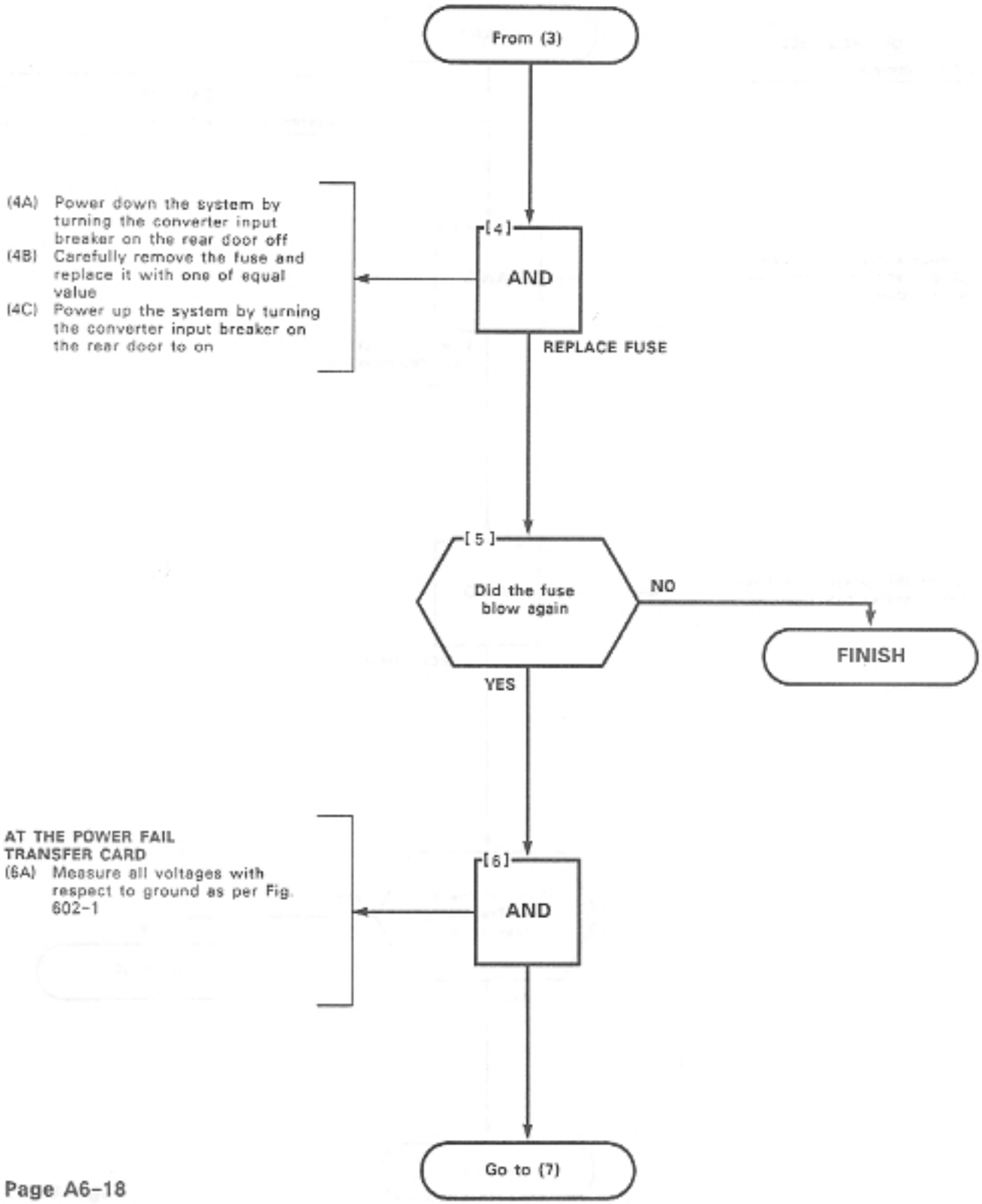


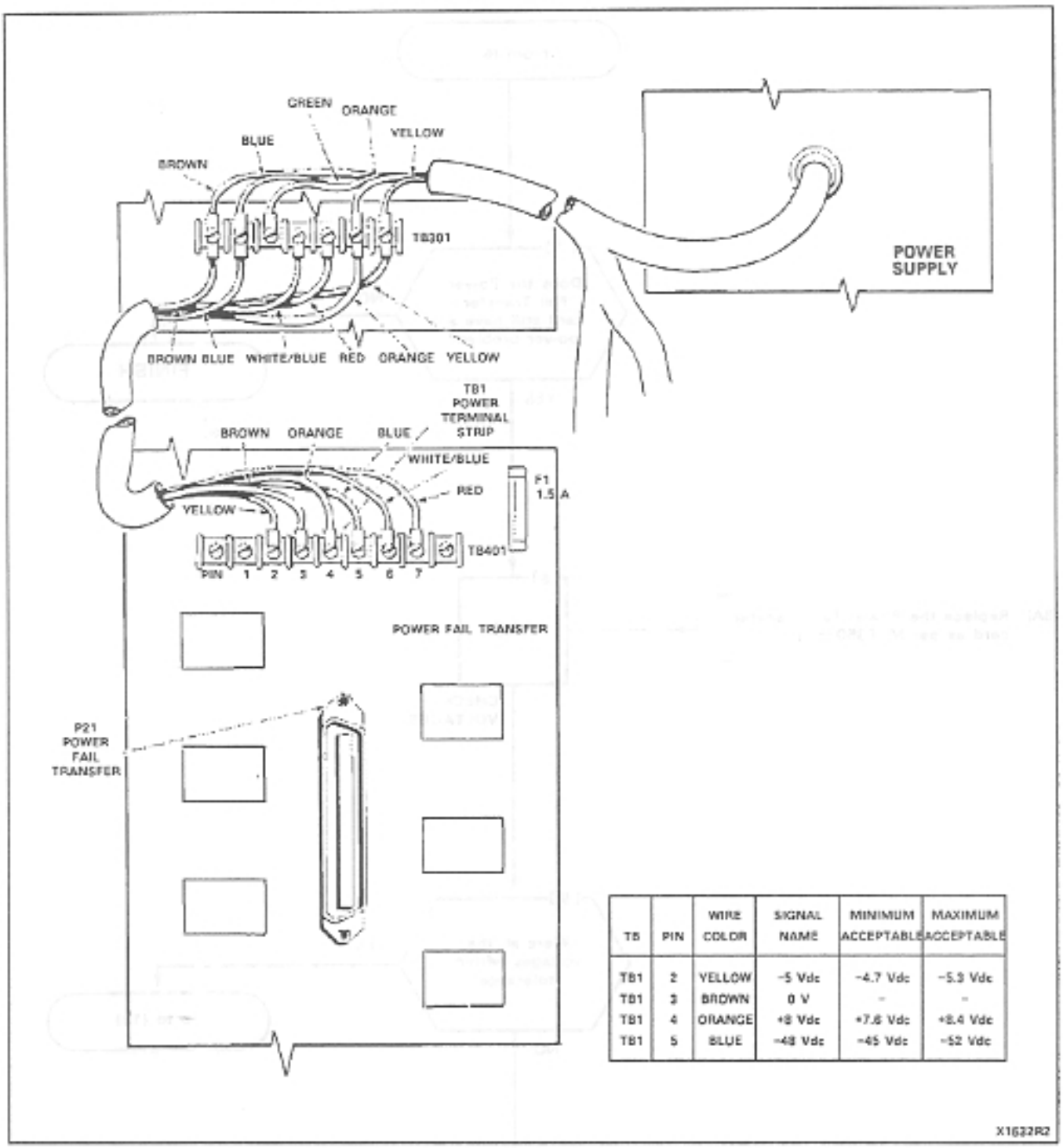
POWER FAIL TRANSFER CARD
MAP350-602
Issue 1, December 1982
Sheet 1 of 5



POWER FAIL TRANSFER CARD
MAP350- 602
Issue 1, December 1982
Sheet 2 of 5



POWER FAIL TRANSFER CARD
MAP350-602
Issue 1, December 1982
Sheet 3 of 5

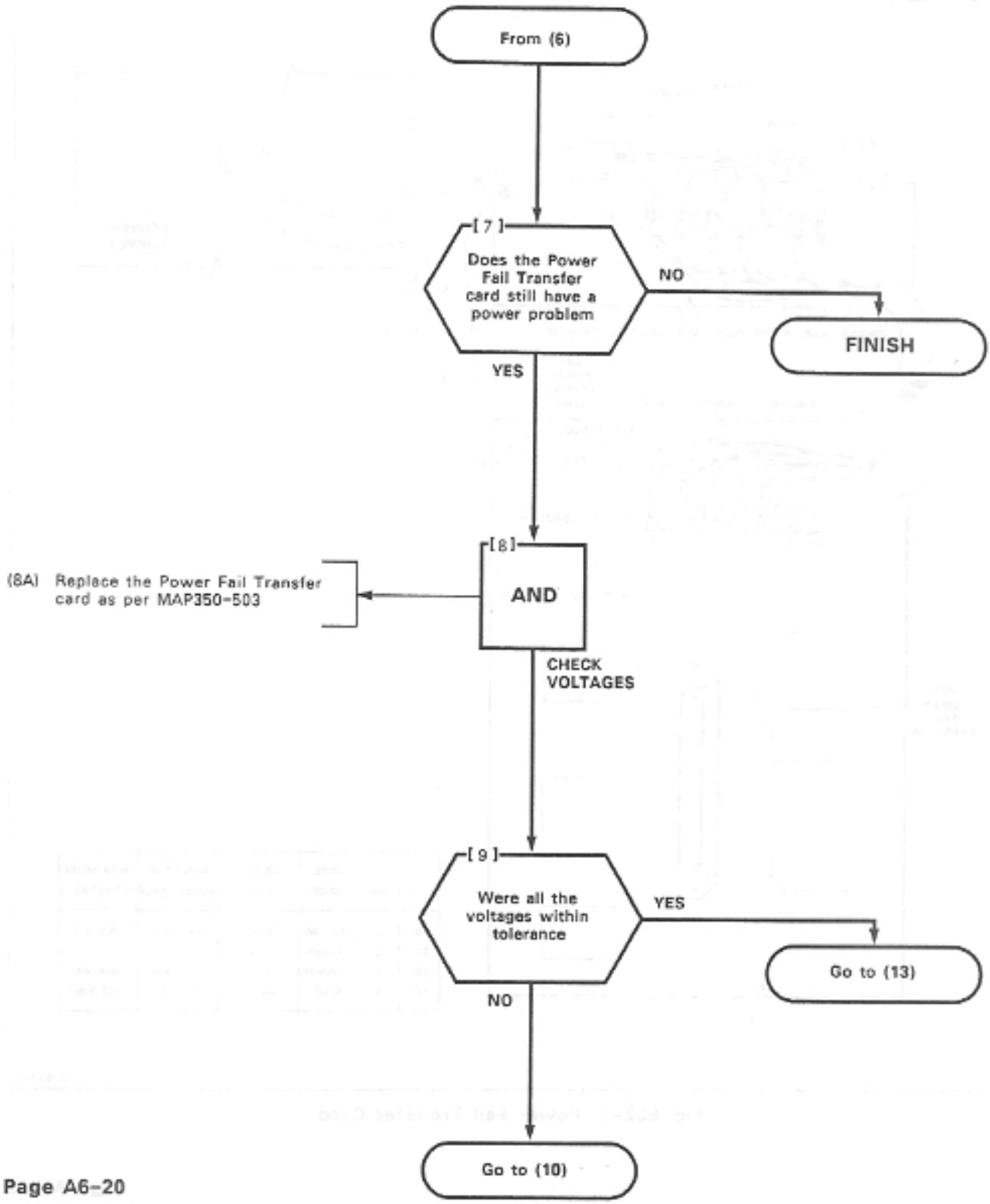


TB	PIN	WIRE COLOR	SIGNAL NAME	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
TB1	2	YELLOW	-5 Vdc	-4.7 Vdc	-5.3 Vdc
TB1	3	BROWN	0 V	-	-
TB1	4	ORANGE	+8 Vdc	+7.6 Vdc	+8.4 Vdc
TB1	5	BLUE	-48 Vdc	-45 Vdc	-52 Vdc

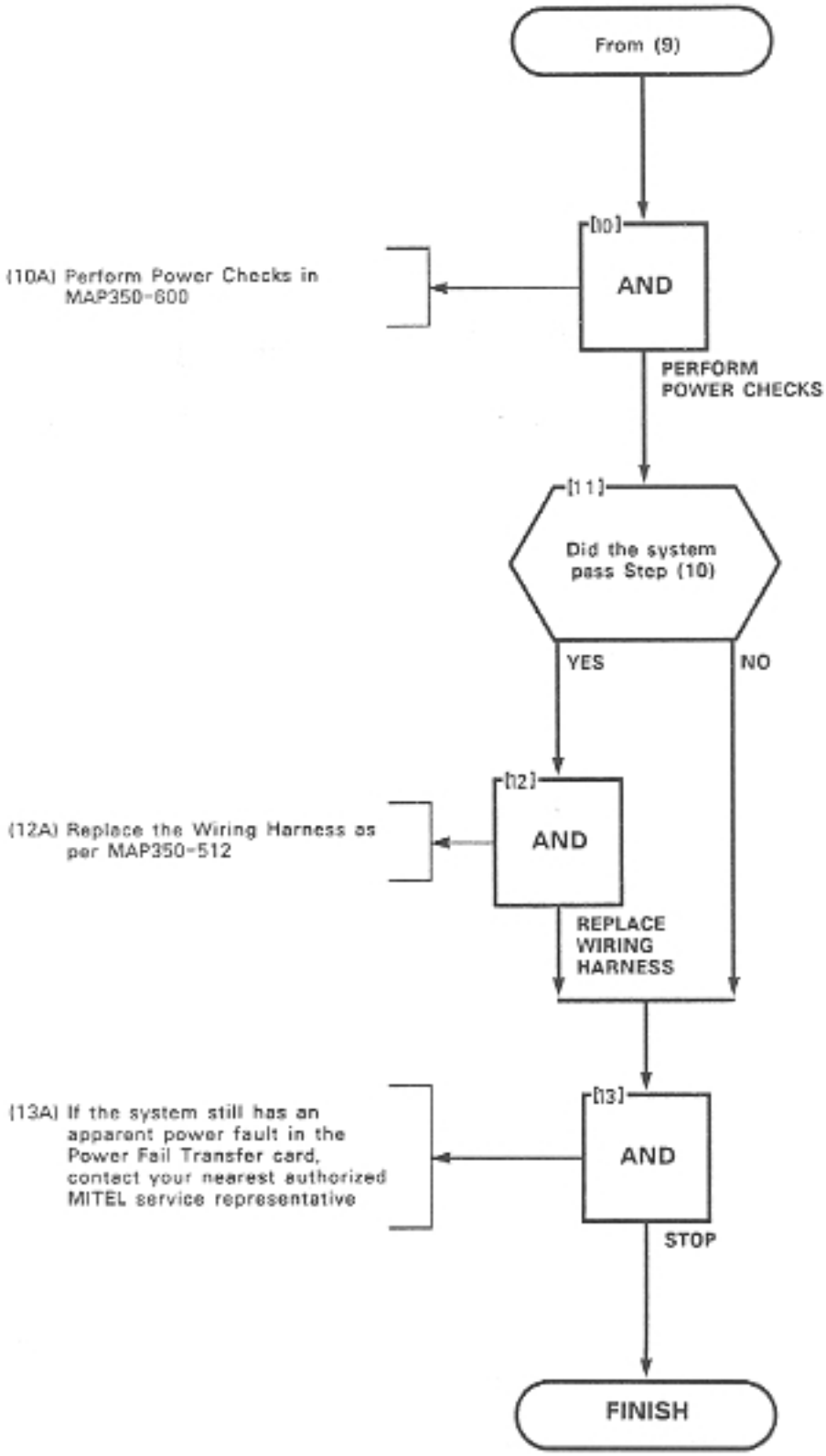
X1622R2

Fig. 602-1 Power Fail Transfer Card

POWER FAIL TRANSFER CARD
MAP350- 602
Issue 1. December 1982
Sheet 4 of 5

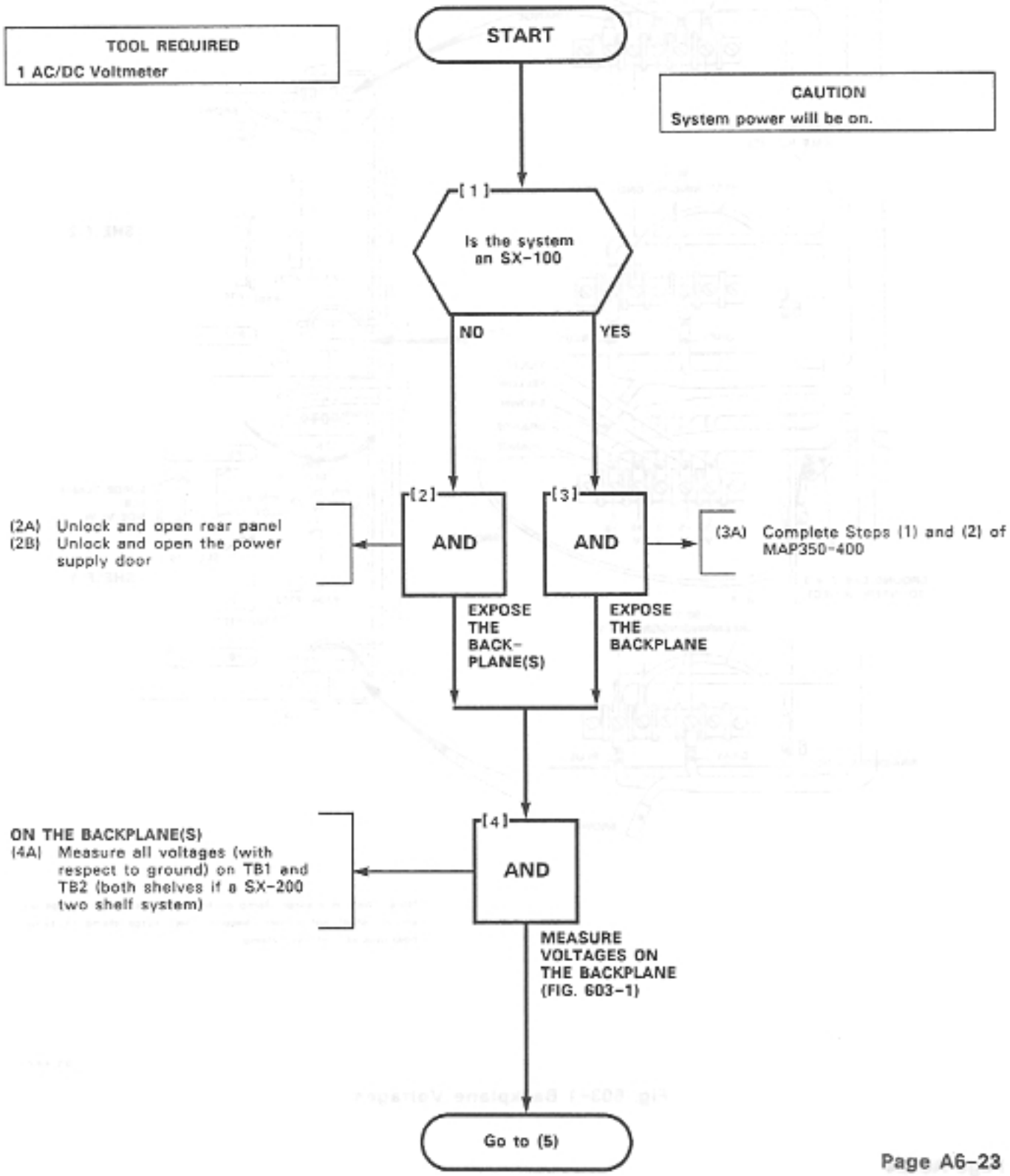


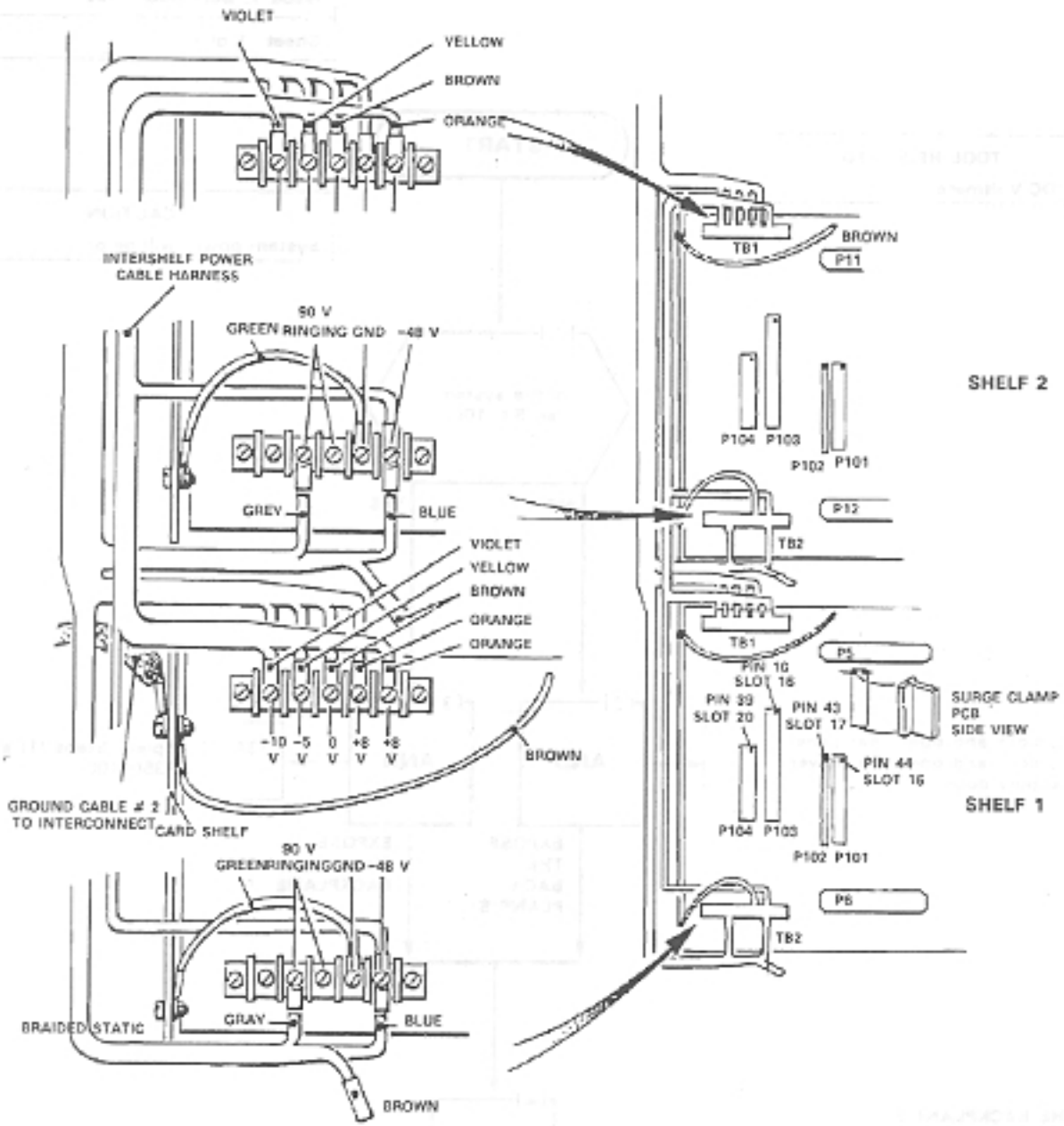
POWER FAIL TRANSFER CARD
MAP350-602
Issue 1, December 1982
Sheet 5 of 5



AND
AND
AND

BACKPLANE(S)
MAP350-603
Issue 1. December 1982
Sheet 1 of 4



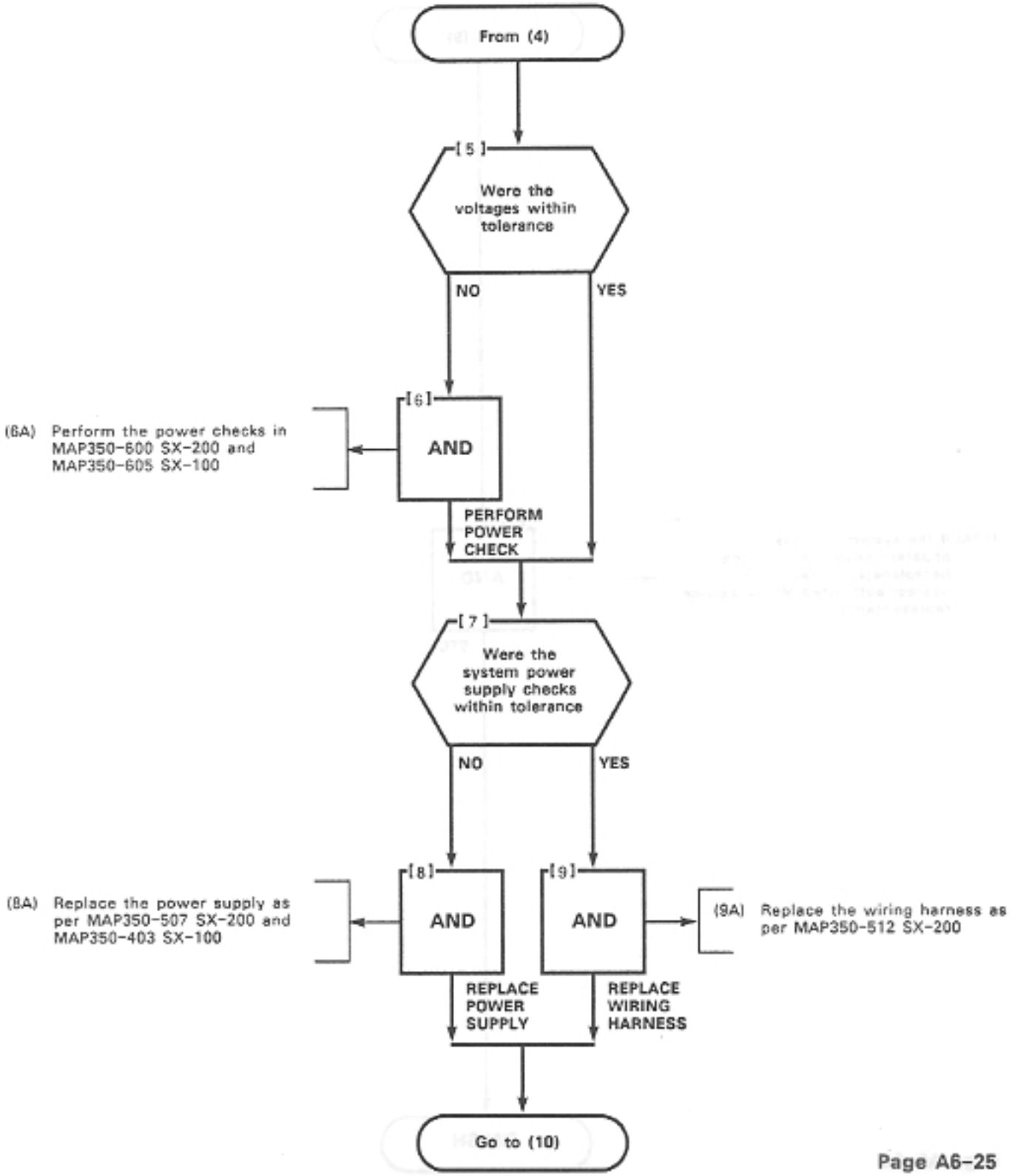


Note: There is a surge clamp on both shelves. Surge clamps on second shelf not shown. Second shelf surge clamp in same positions as first shelf clamp.

X116R4

Fig. 603-1 Backplane Voltages

BACKPLANE(S)
MAP350- 603
Issue 1, December 1982
Sheet 3 of 4



BACKPLANE(S)
MAP350- 603
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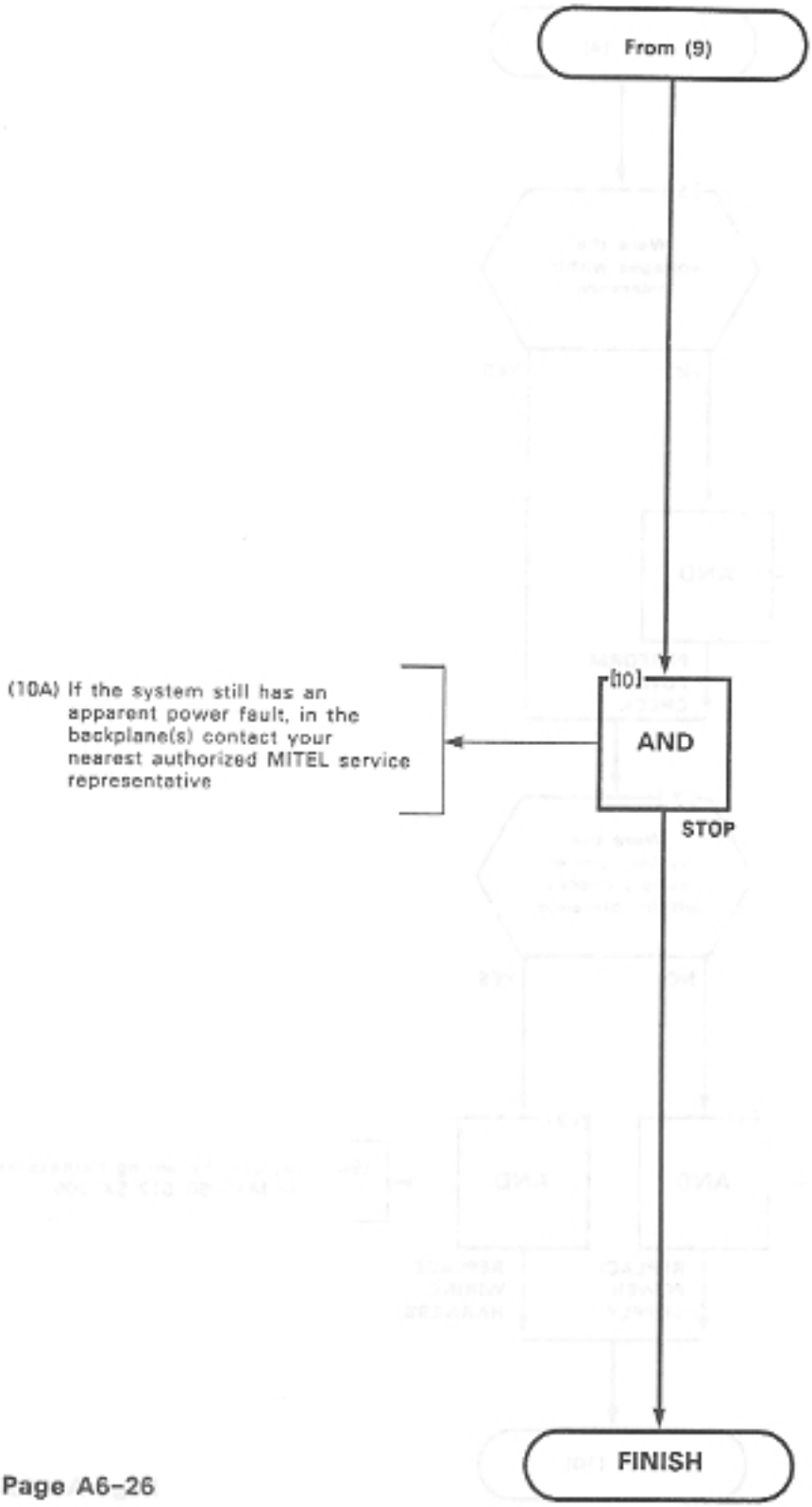


RESERVE BATTERY BACKUP SX-200
MAP350-604
Issue 1, December 1982
Sheet 1 of 3

TOOL REQUIRED
1 AC/DC Voltmeter

START

CAUTION
System power will be on.

[1]
AND

(1A) Unlock and open the rear door panel

EXPOSE RESERVE BATTERY BACKUP

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

Table 604-1

[2]
AND

AT REAR OF RESERVE BATTERY BACKUP
(2A) Ensure that batteries have been charging for at least 24 hours
(2B) Measure voltages as Table 604-1

MEASURE VOLTAGES

[3]
Were the voltages within tolerance

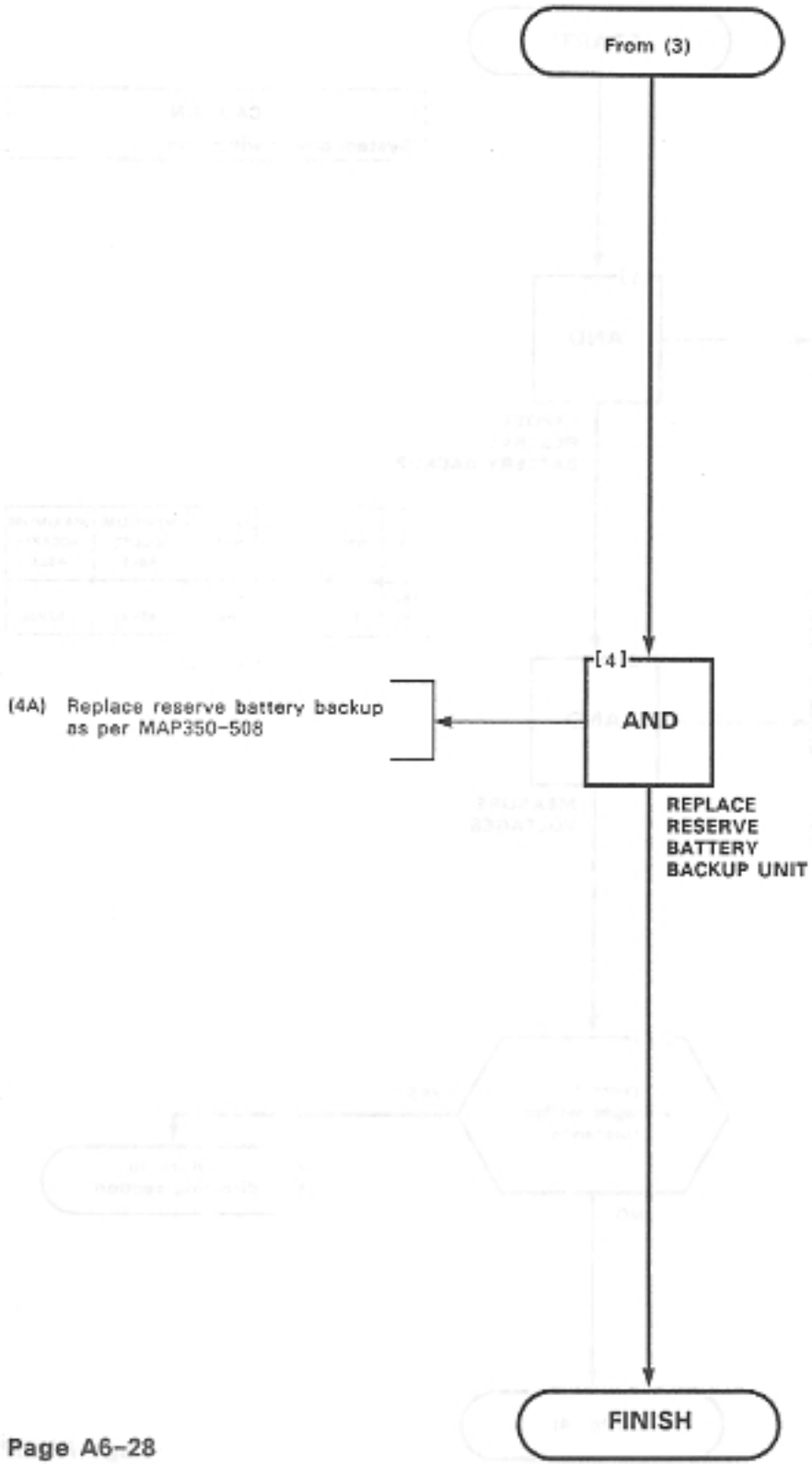
YES

Return to directing section

NO

Go to (4)

RESERVE BATTERY BACKUP SX-200
MAP350- 604
Issue 1, December 1982
Sheet 2 of 3



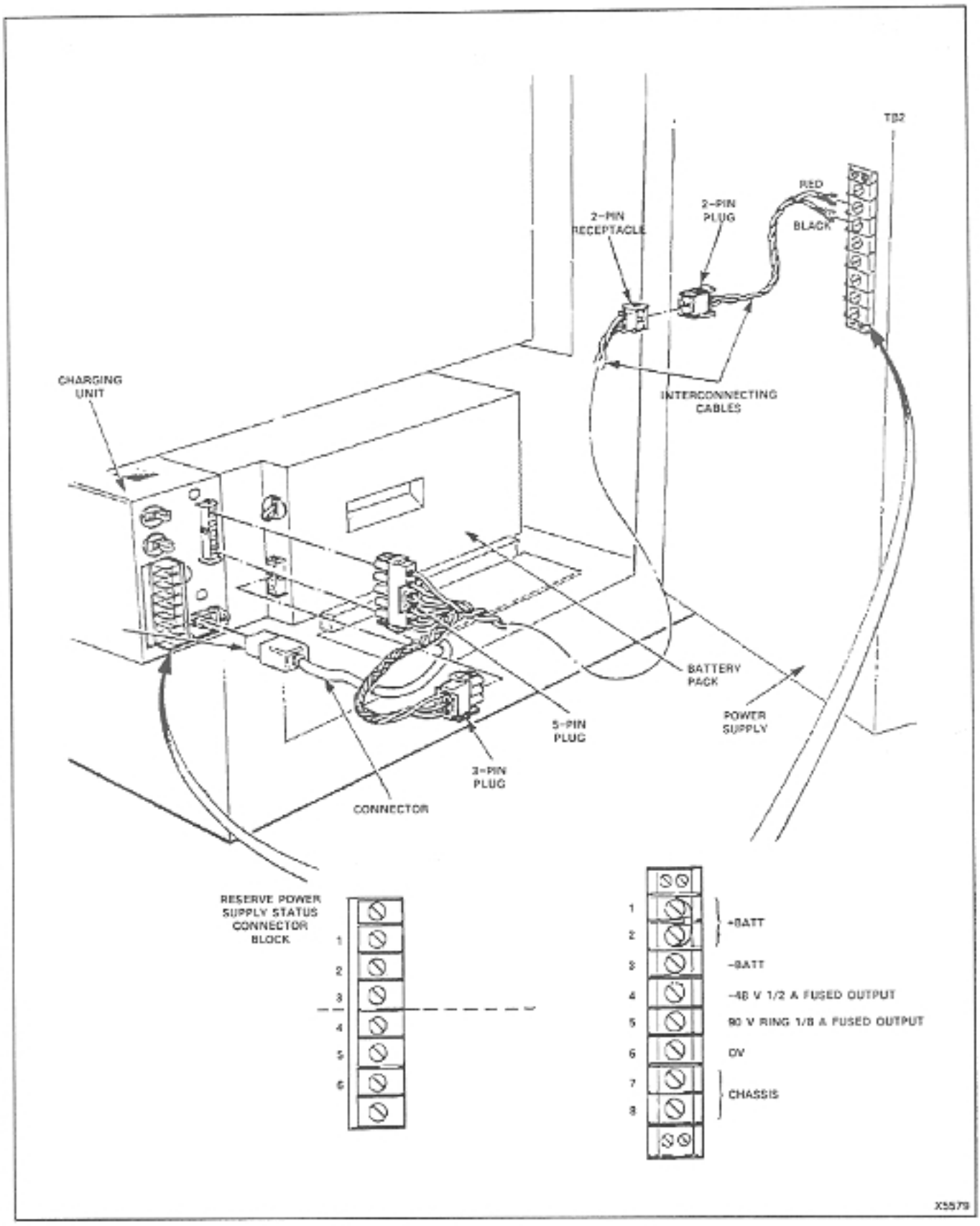


Fig. 604-1 Reserve Power Supply

INTERCONNECT CARD SX-100
MAP350-605
Issue 1, December 1982
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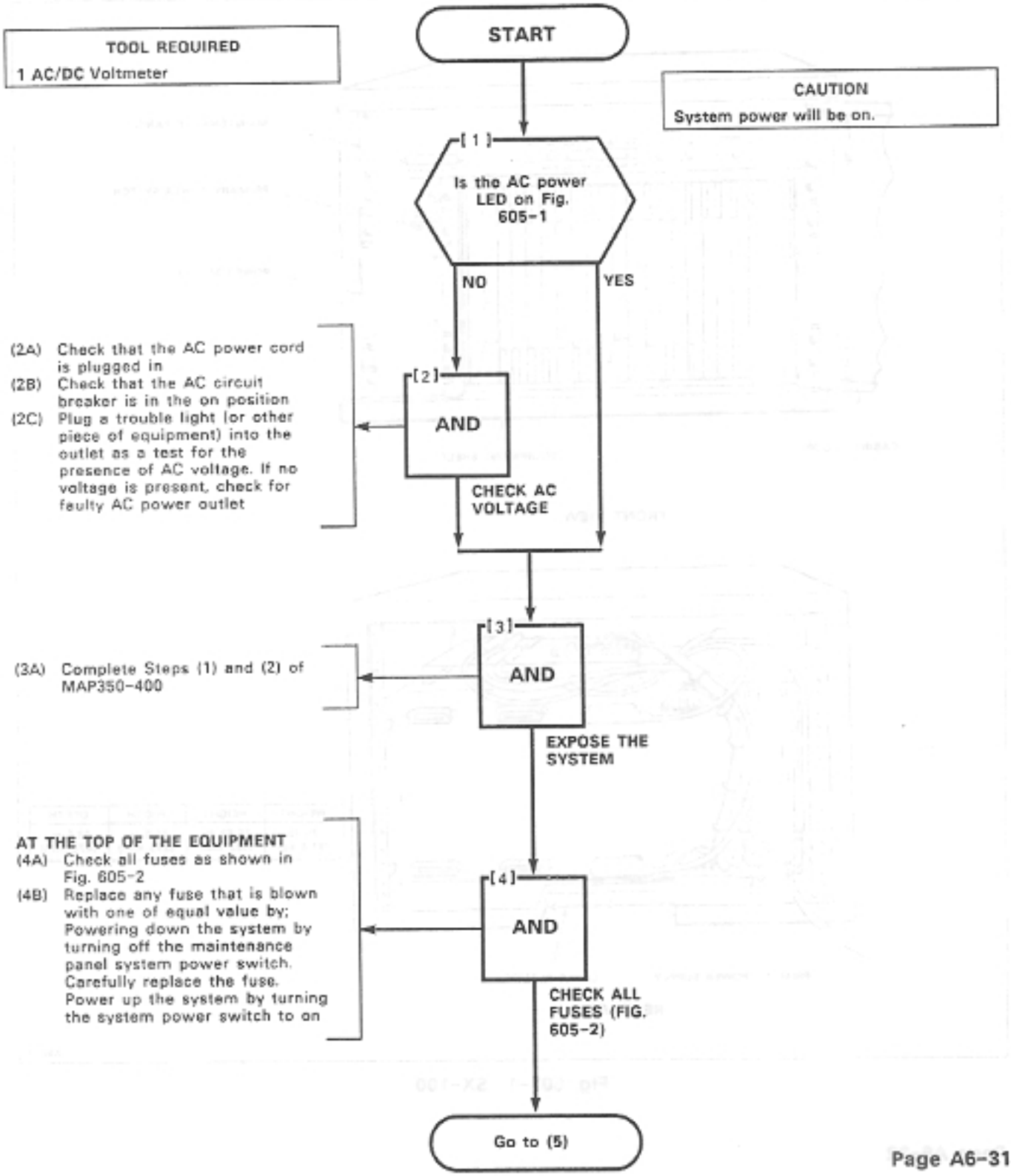
TOOL REQUIRED

1 AC/DC Voltmeter

CAUTION

System power will be on.



INTERCONNECT CARD SX-100
MAP350- 605
Issue 1, December 1982
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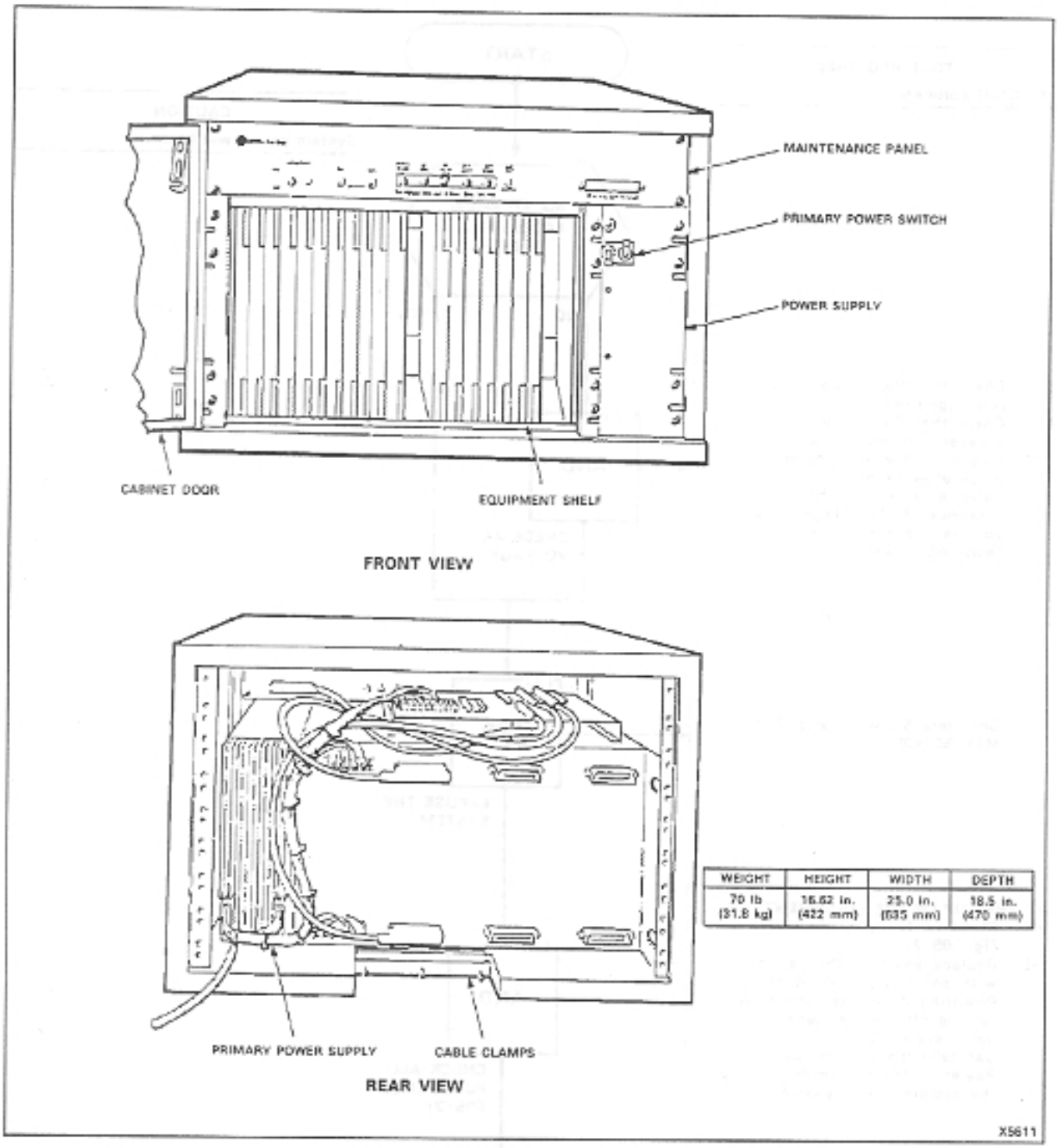

WEIGHT	HEIGHT	WIDTH	DEPTH
70 lb (31.8 kg)	16.62 in. (422 mm)	25.0 in. (635 mm)	18.5 in. (470 mm)

Fig. 605-1 SX-100

INTERCONNECT CARD SX-100
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From (4)

[5]

Were any of the user fuses blown

NO

Go to (14)

YES

[6]

AND

(6A) Troubleshoot the user device as recommended by the manufacturer of the user device

REPAIR USER DEVICE

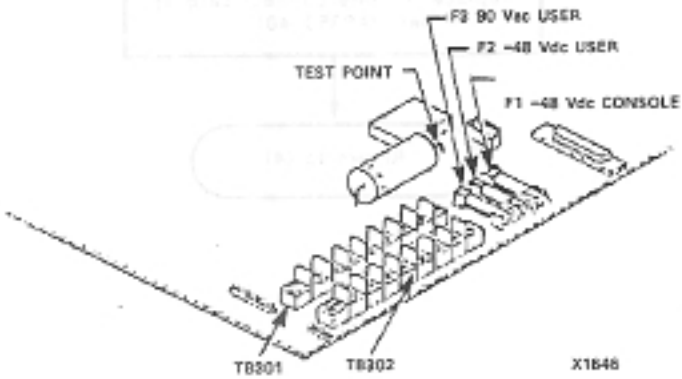

Fig. 605-2 Fuses

[7]

Was the console fuse blown

NO

Go to (14)

YES

Go to (8)

INTERCONNECT CARD SX-100
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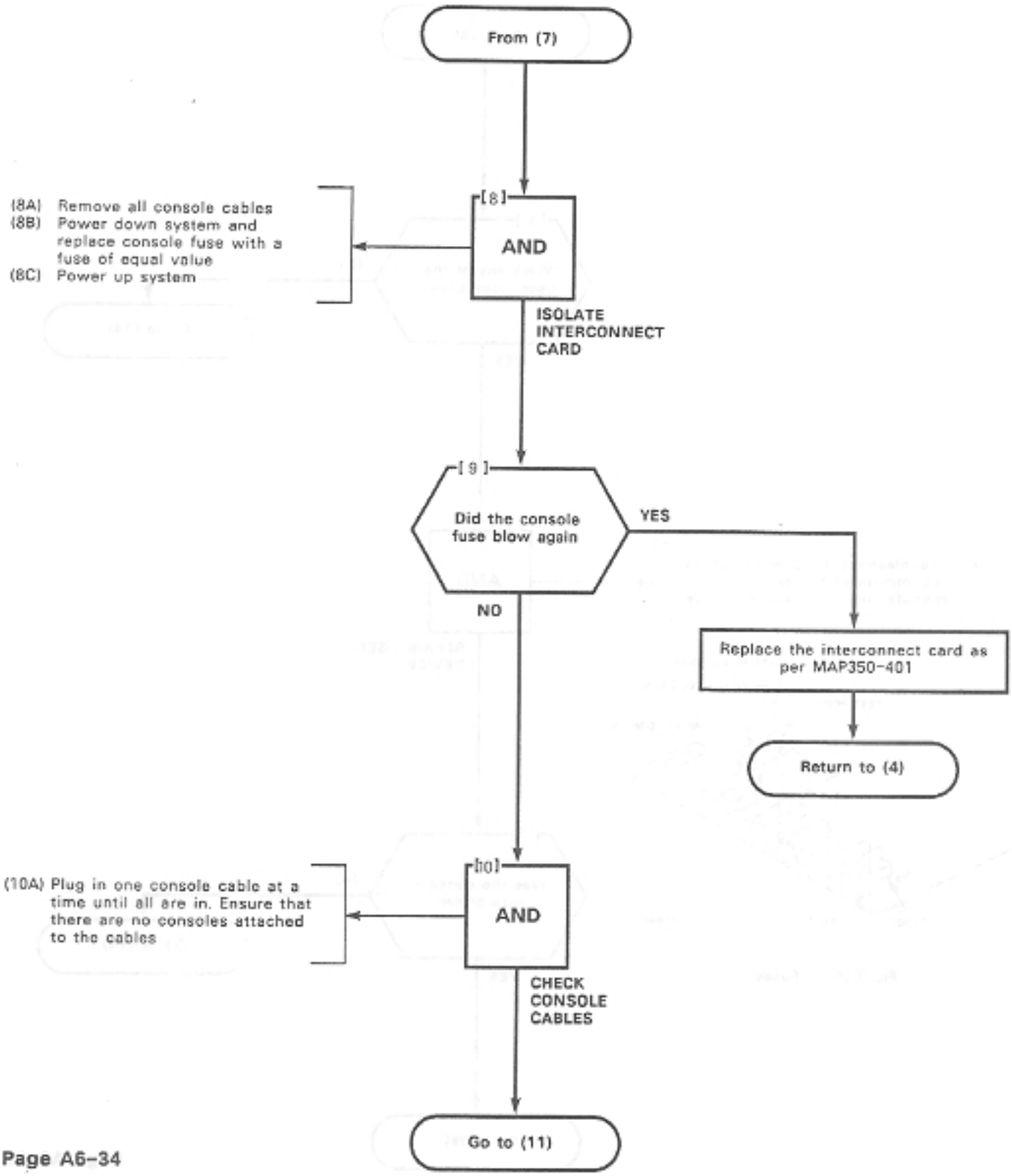

INTERCONNECT CARD SX-100
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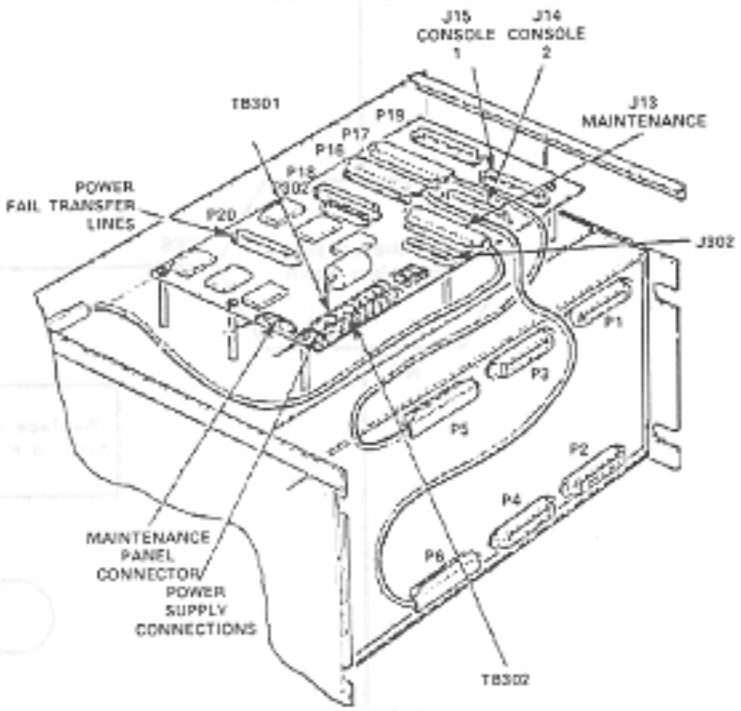

TB	PIN	WIRE COLOR	SIGNAL NAME	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
TB301	1	WHITE	BATT		
TB301	2	ORANGE	+8 Vdc	+7.6 Vdc	+8.4 Vdc
TB301	3	YELLOW	-5 Vdc	-4.7 Vdc	-5.3 Vdc
TB301	4	BROWN	0 V		
TB301	5	GREEN	0 V		
TB301	6	BLUE	-48 Vdc	-45.0 Vdc	-52.0 Vdc
TB301	7	GREY	90 Vac	80 Vac	99 Vac
TB302	7		BATT	-45.0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

X952R3

Fig. 605-3 Interconnect Card

INTERCONNECT CARD SX-100
MAP350- 605
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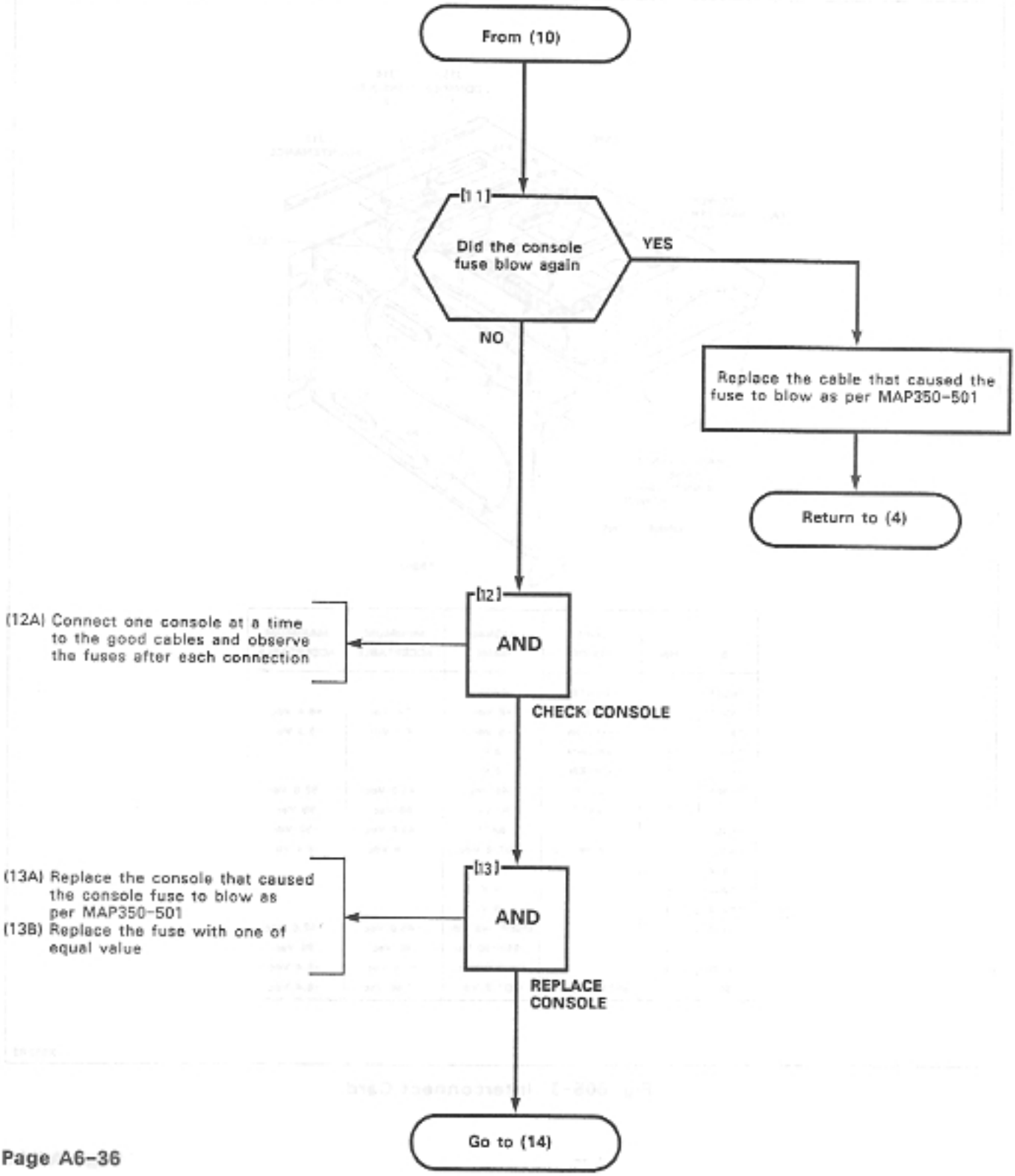

INTERCONNECT CARD SX-100
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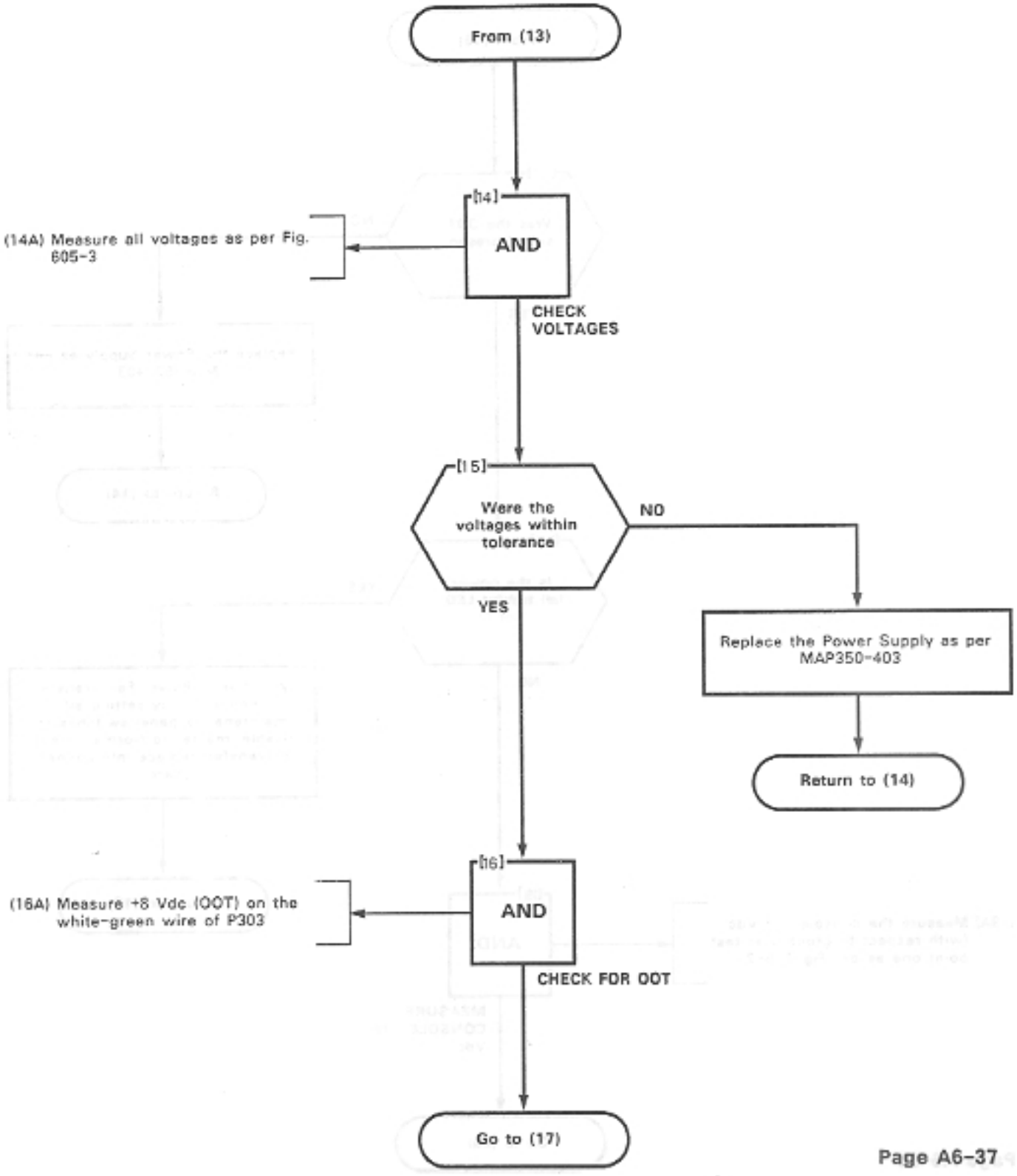

INTERCONNECT CARD SX-100
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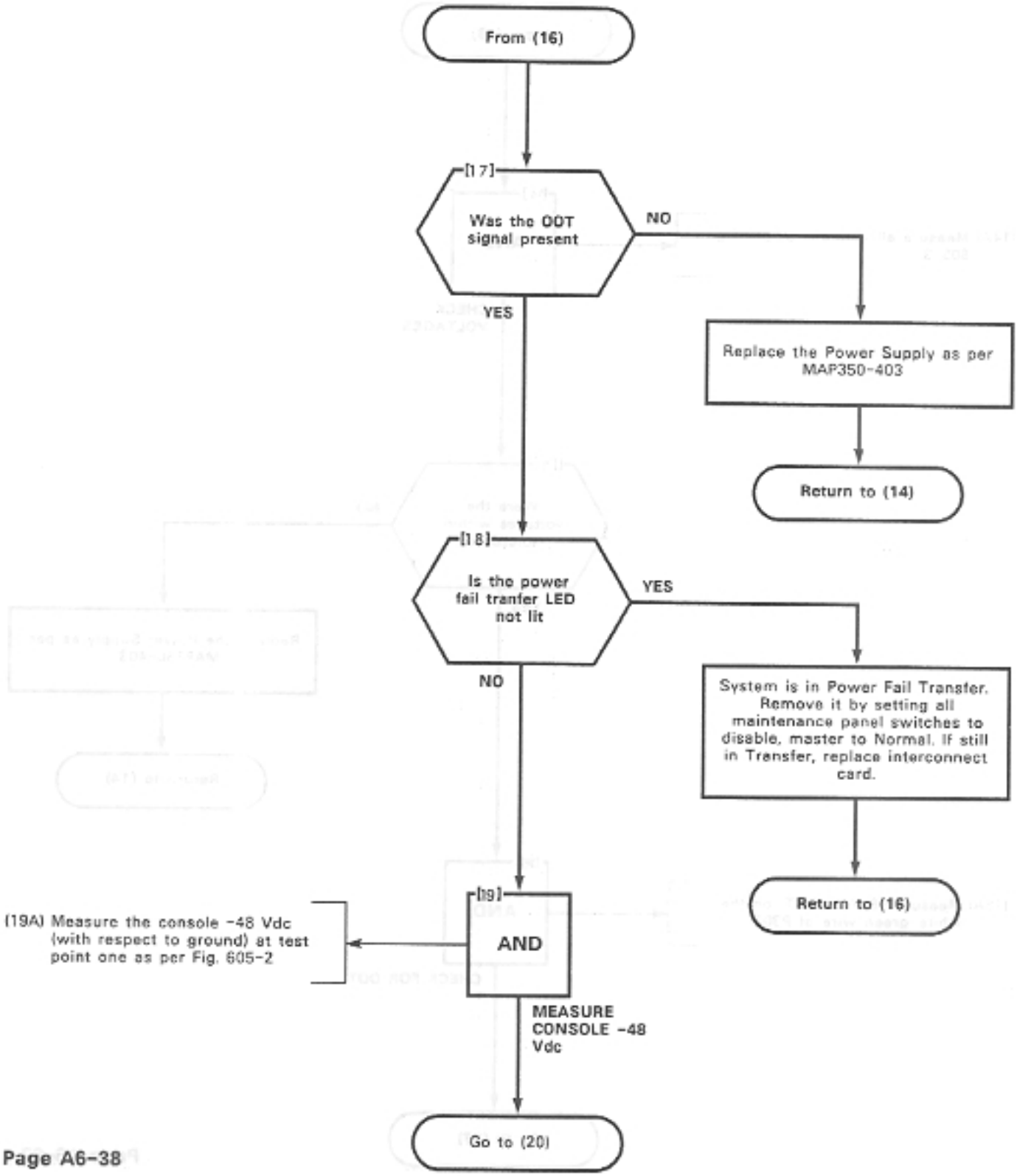

INTERCONNECT CARD SX-100
MAP350-605
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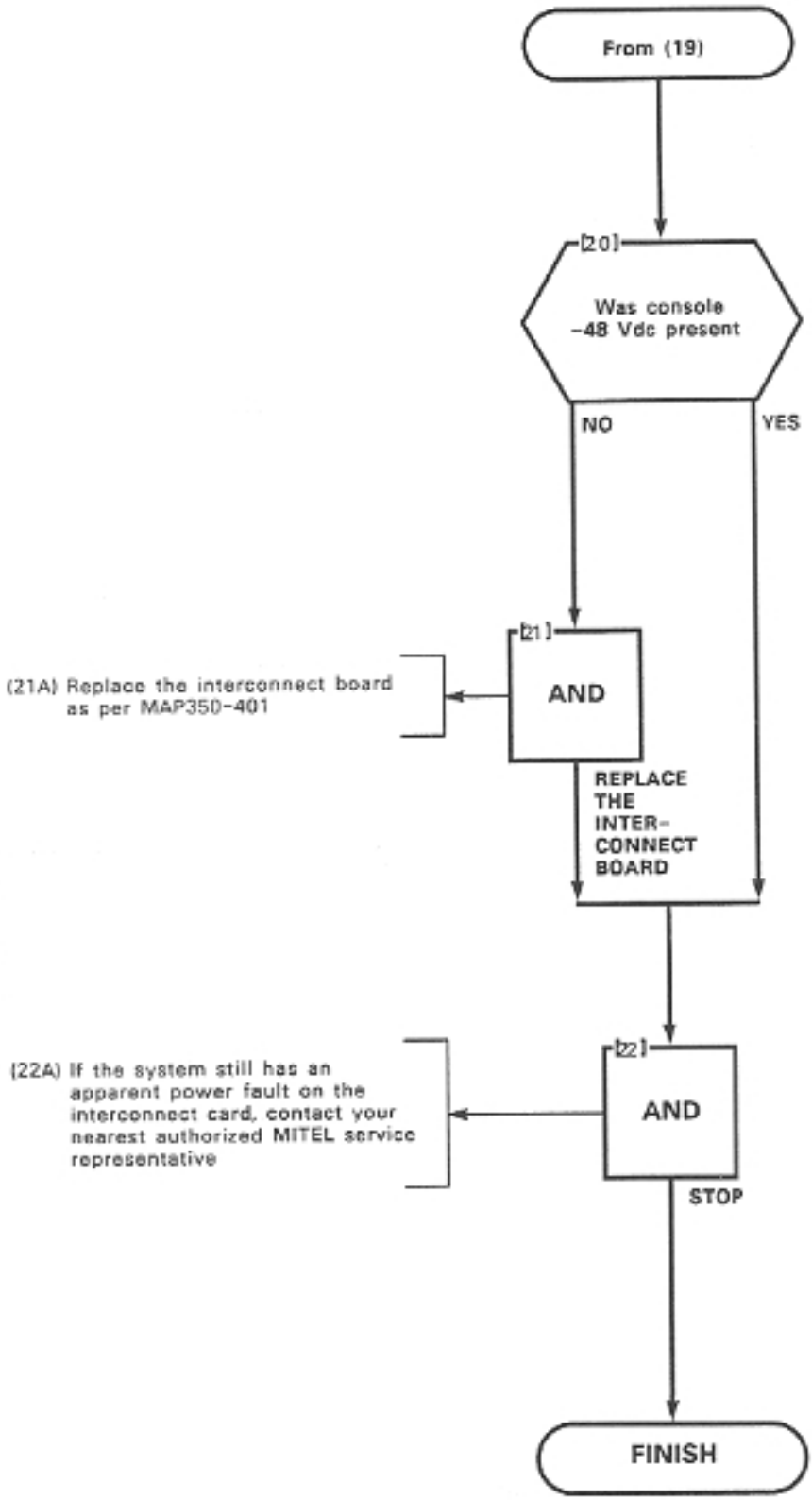

RESERVE BATTERY BACKUP SX-100
MAP350-606
Issue 1. December 1982
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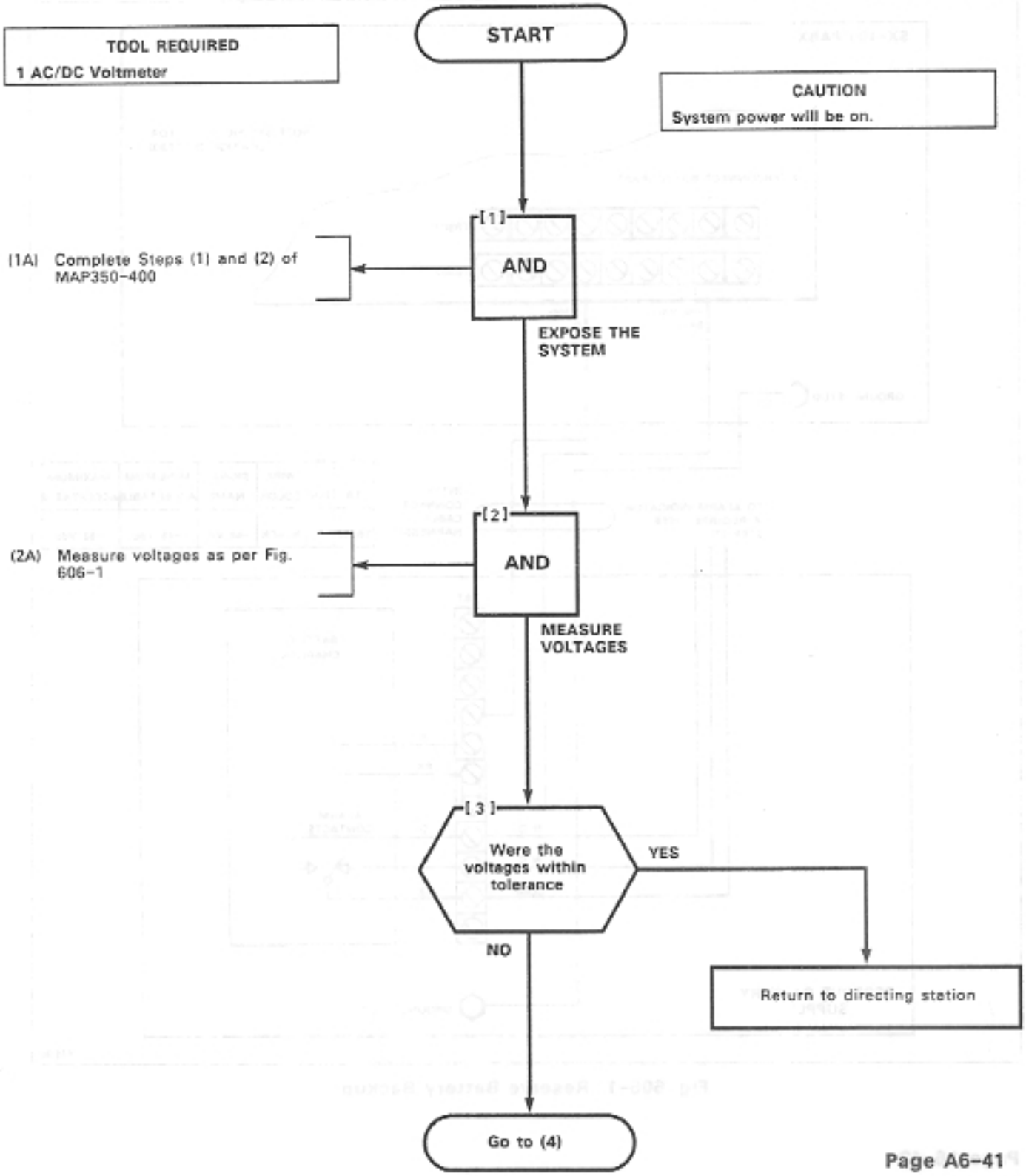
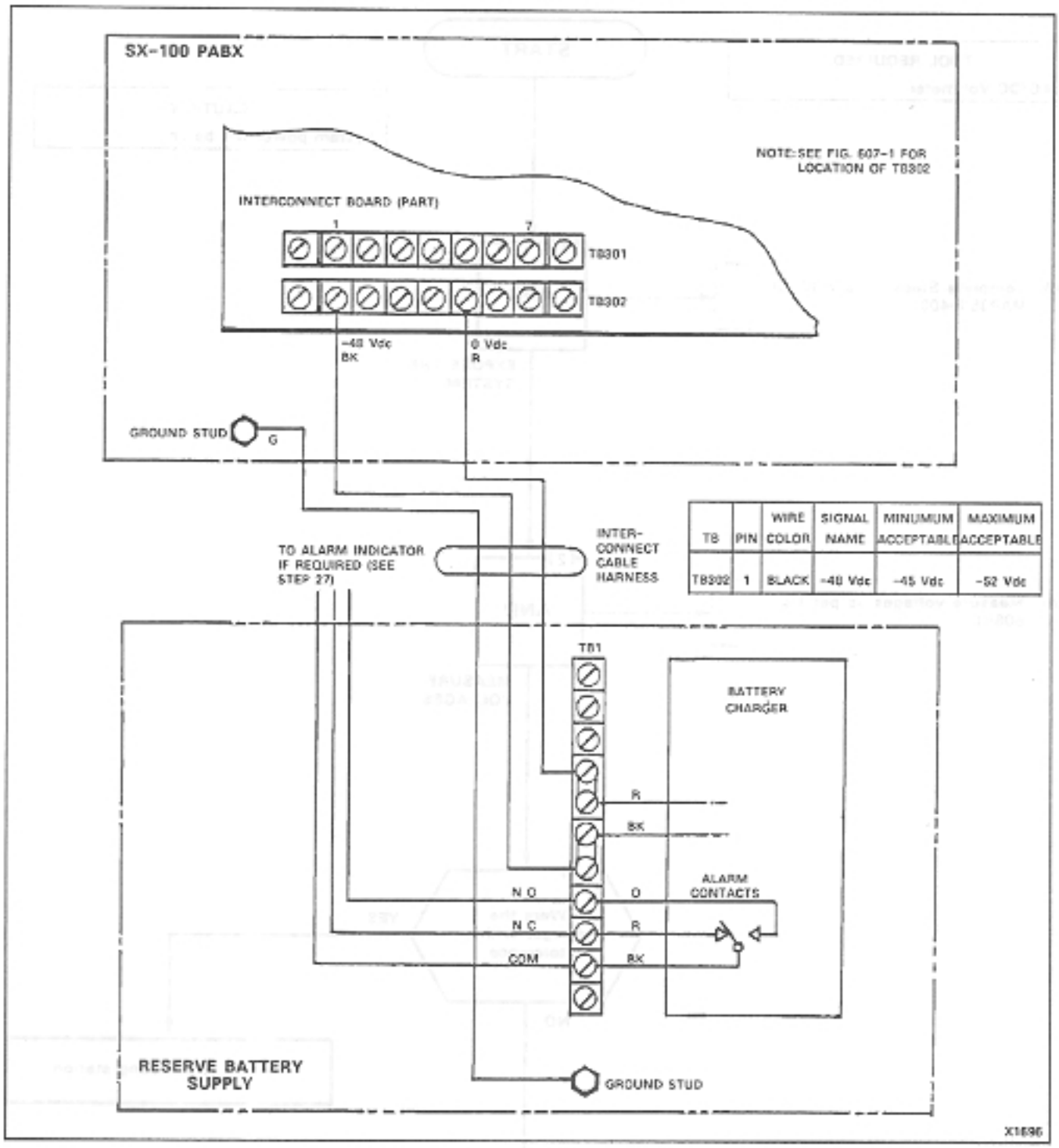


RESERVE BATTERY BACKUP SX-100
MAP350- 606
Issue 1, December 1982
Sheet 2 of 3



TB	PIN	WIRE COLOR	SIGNAL NAME	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
T8302	1	BLACK	-48 Vdc	-45 Vdc	-52 Vdc

Fig. 606-1 Reserve Battery Backup

RESERVE BATTERY BACKUP SX-100
MAP350-606
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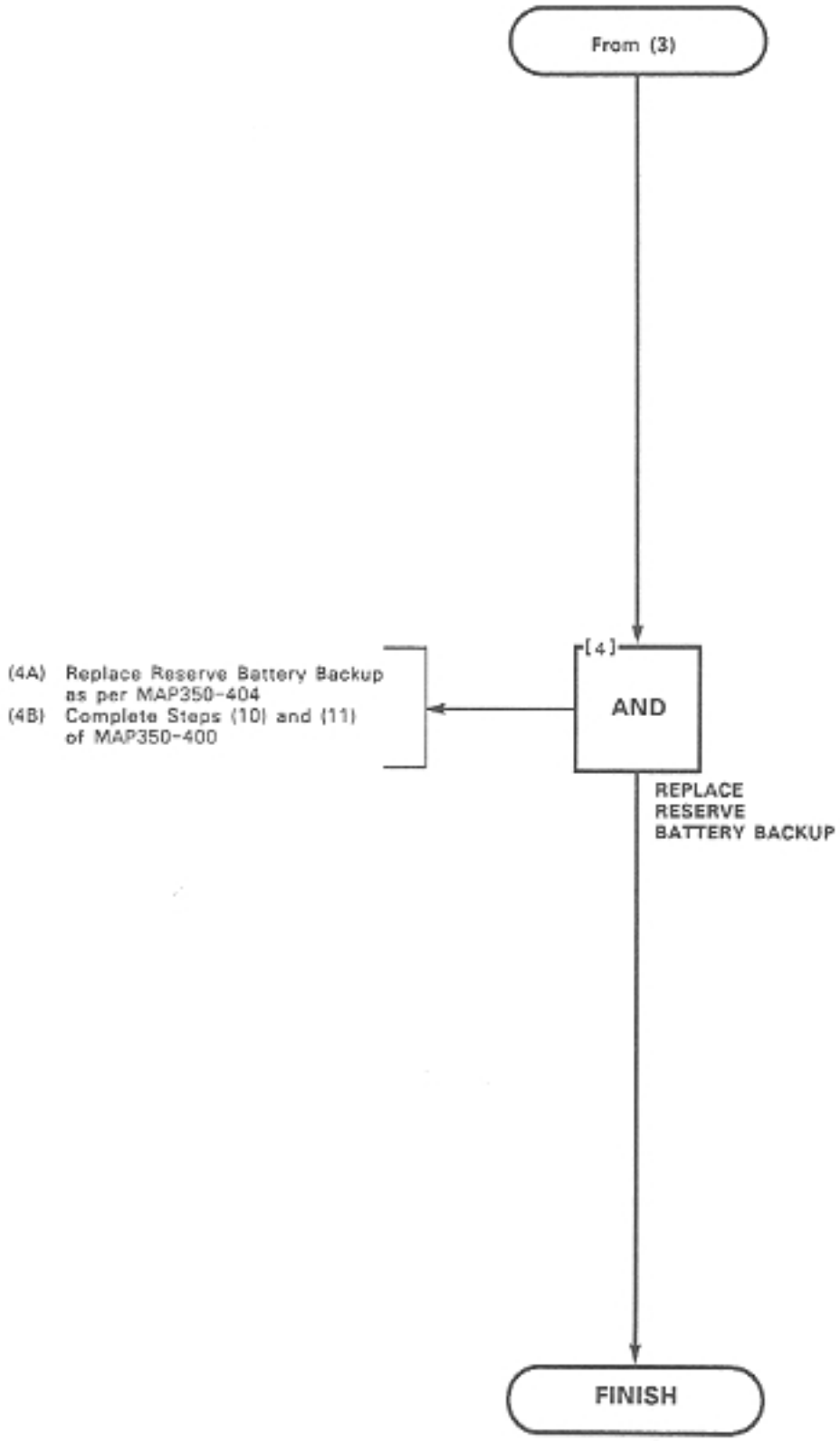


APPENDIX 7
TROUBLESHOOTING MAP'

1. GENERAL

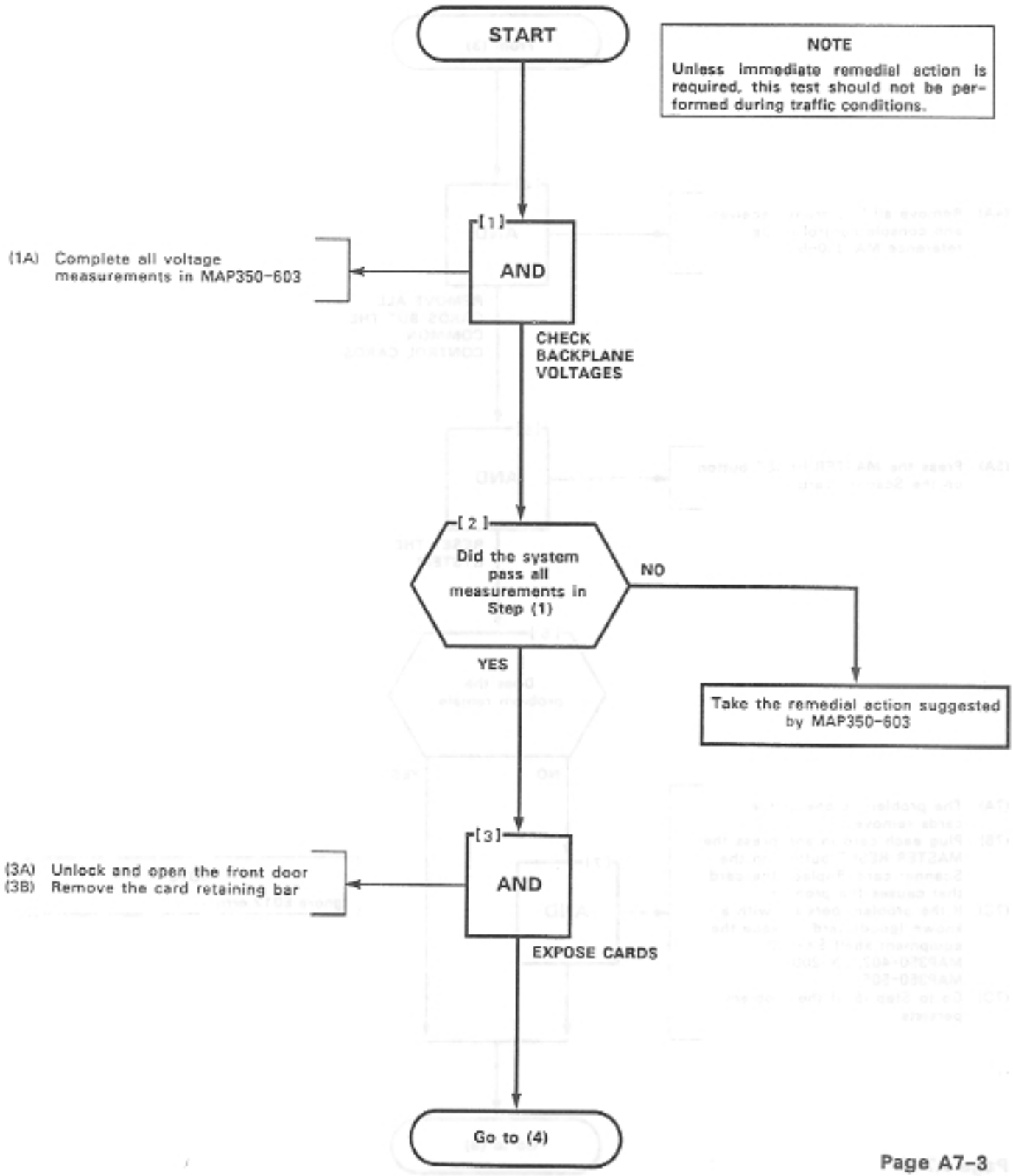
A7.01 The MAP's contained in this Appendix detail the procedures to be performed in all actual card troubleshooting on the system. These MAP's are used in conjunction with the MAP's outlined in other sections of this practice. Due to the similarity of the SX-100/SX-200 PABX's all the MAP's of this Appendix are common to each system.

A7.02 Table A7-1 is a listing of all MAP's contained in this Appendix.

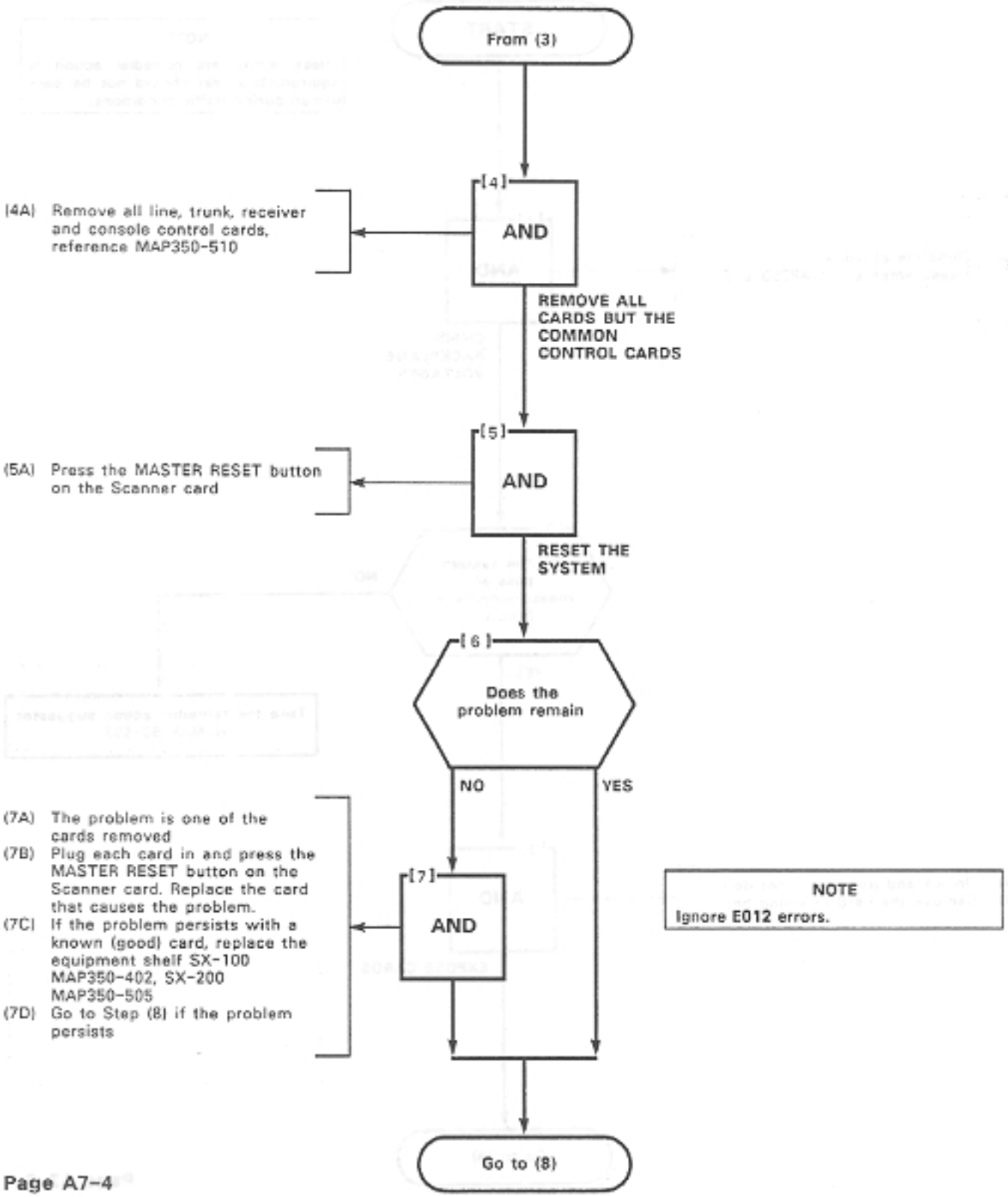
TABLE A7-1
TROUBLESHOOTING

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

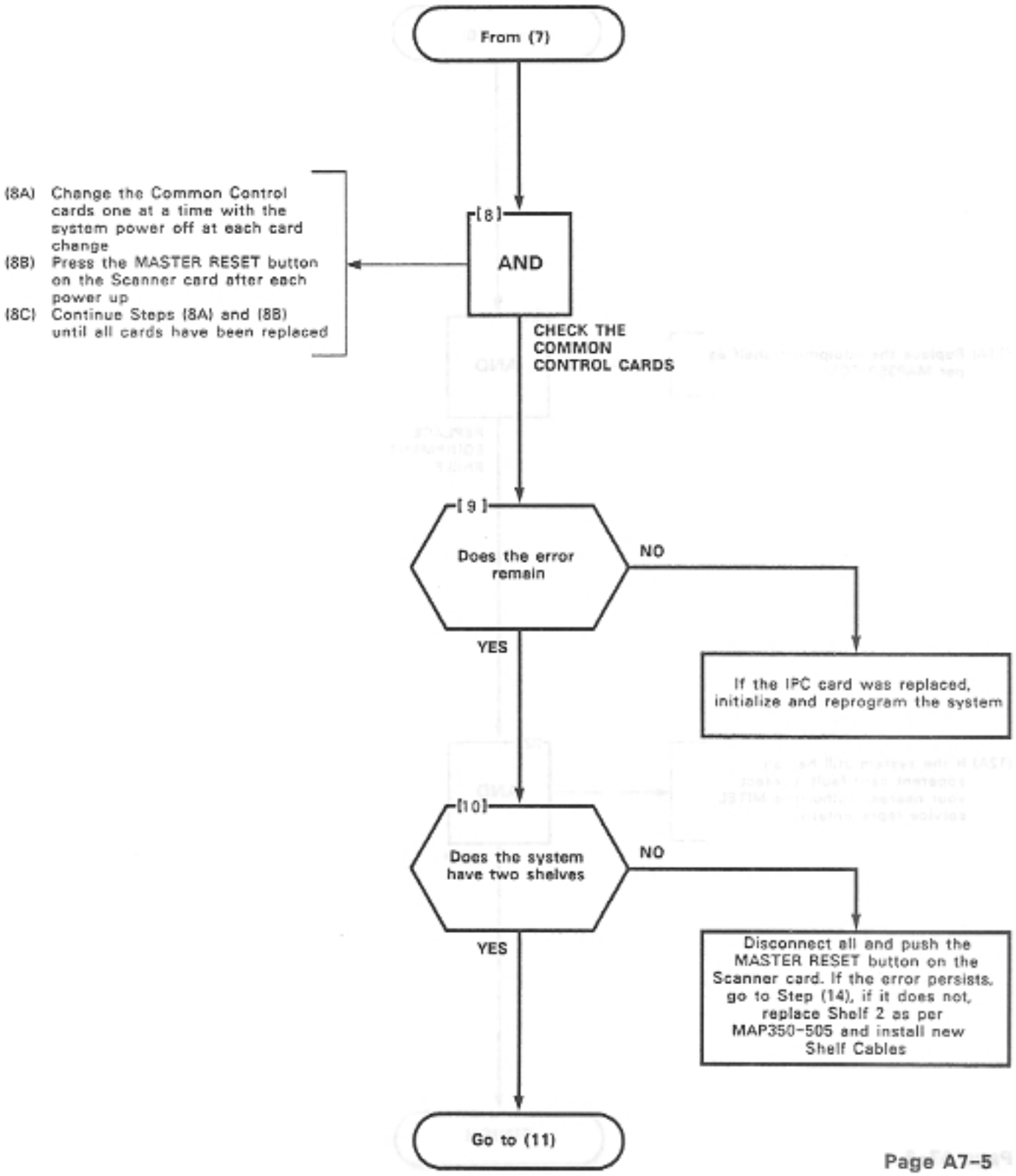
COMMON CONTROL TEST
MAP350-701
Issue 1, December 1982
Sheet 1 of 4



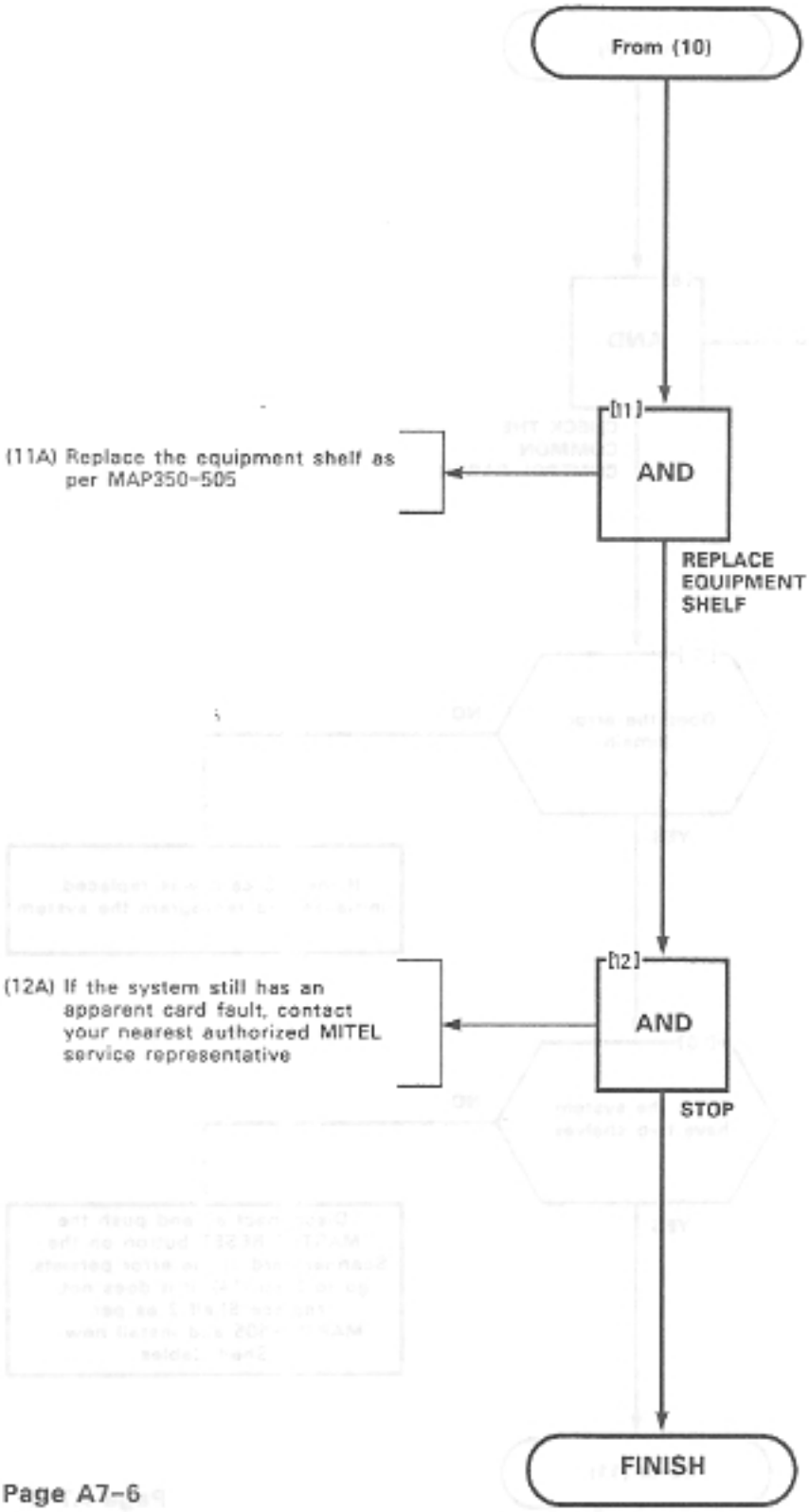
COMMON CONTROL TEST
MAP350- 701
Issue 1, December 1982
Sheet 2 of 4



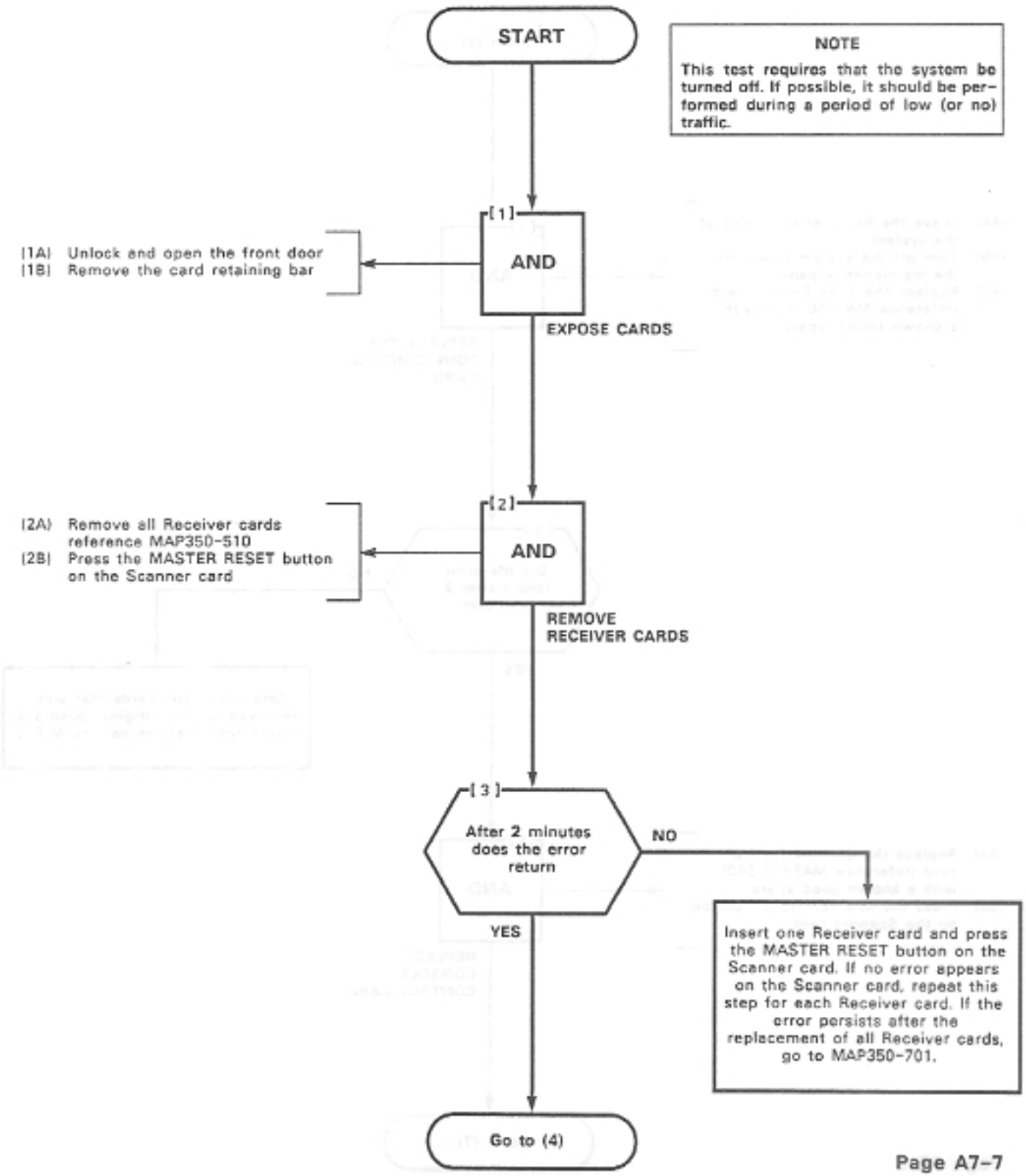
COMMON CONTROL TEST
MAP350-701
Issue 1, December 1982
Sheet 3 of 4



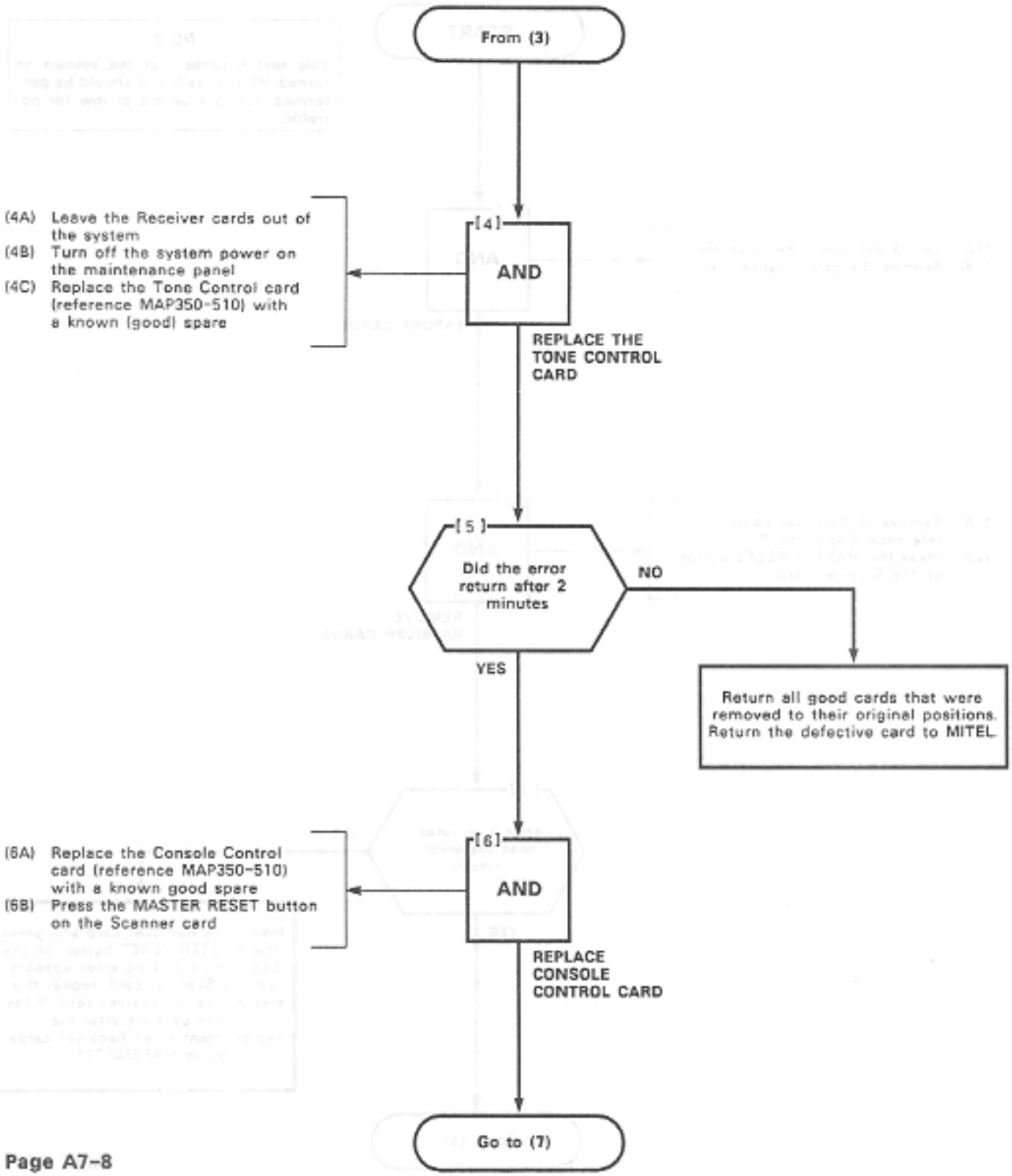
COMMON CONTROL TEST
MAP350- 701
Issue 1, December 1982
Sheet 4 of 4



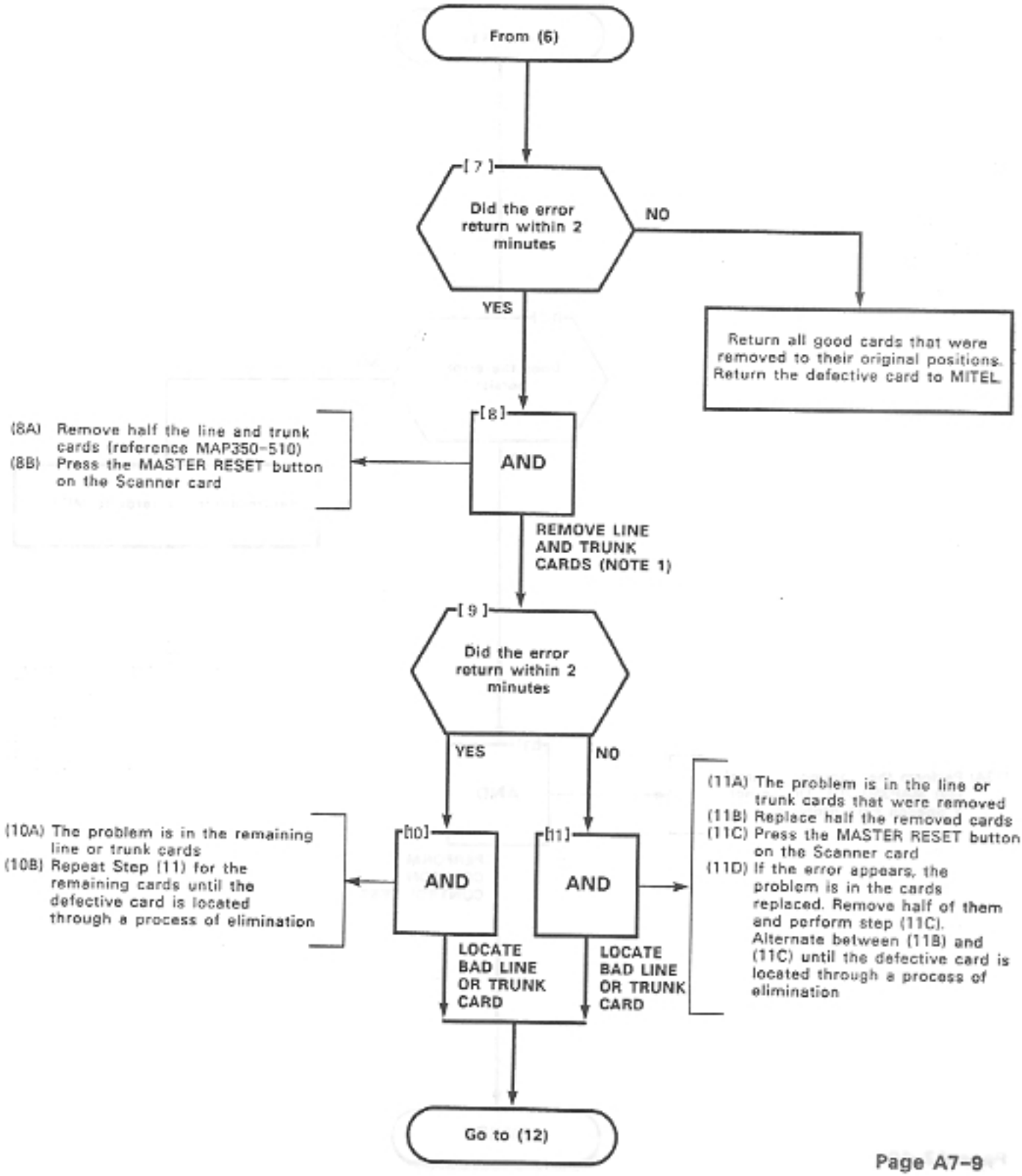
SPEECH PATH TEST
MAP350-702
Issue 1, December 1982
Sheet 1 of 4



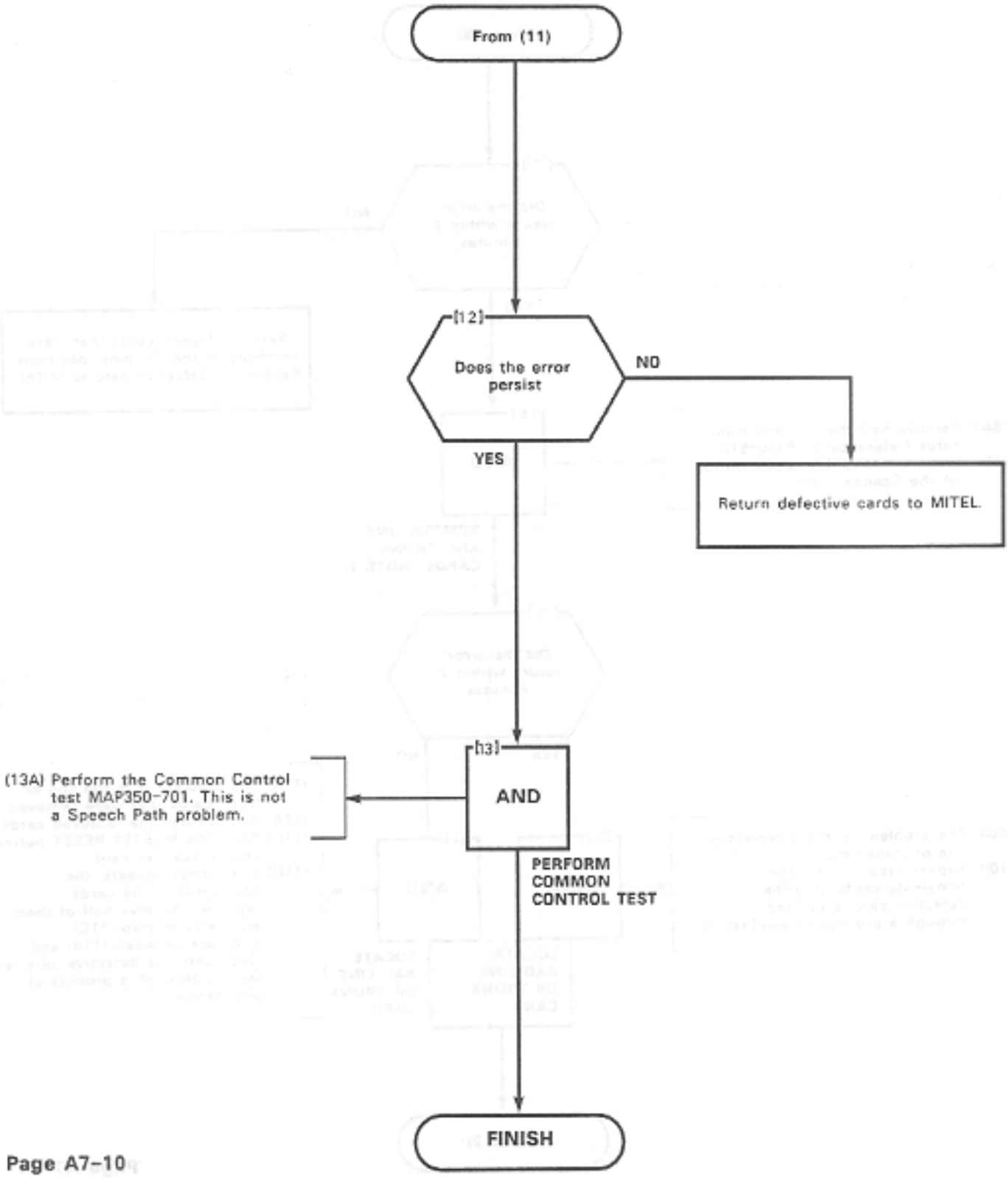
SPEECH PATH TEST
MAP350- 702
Issue 1, December 1982
Sheet 2 of 4



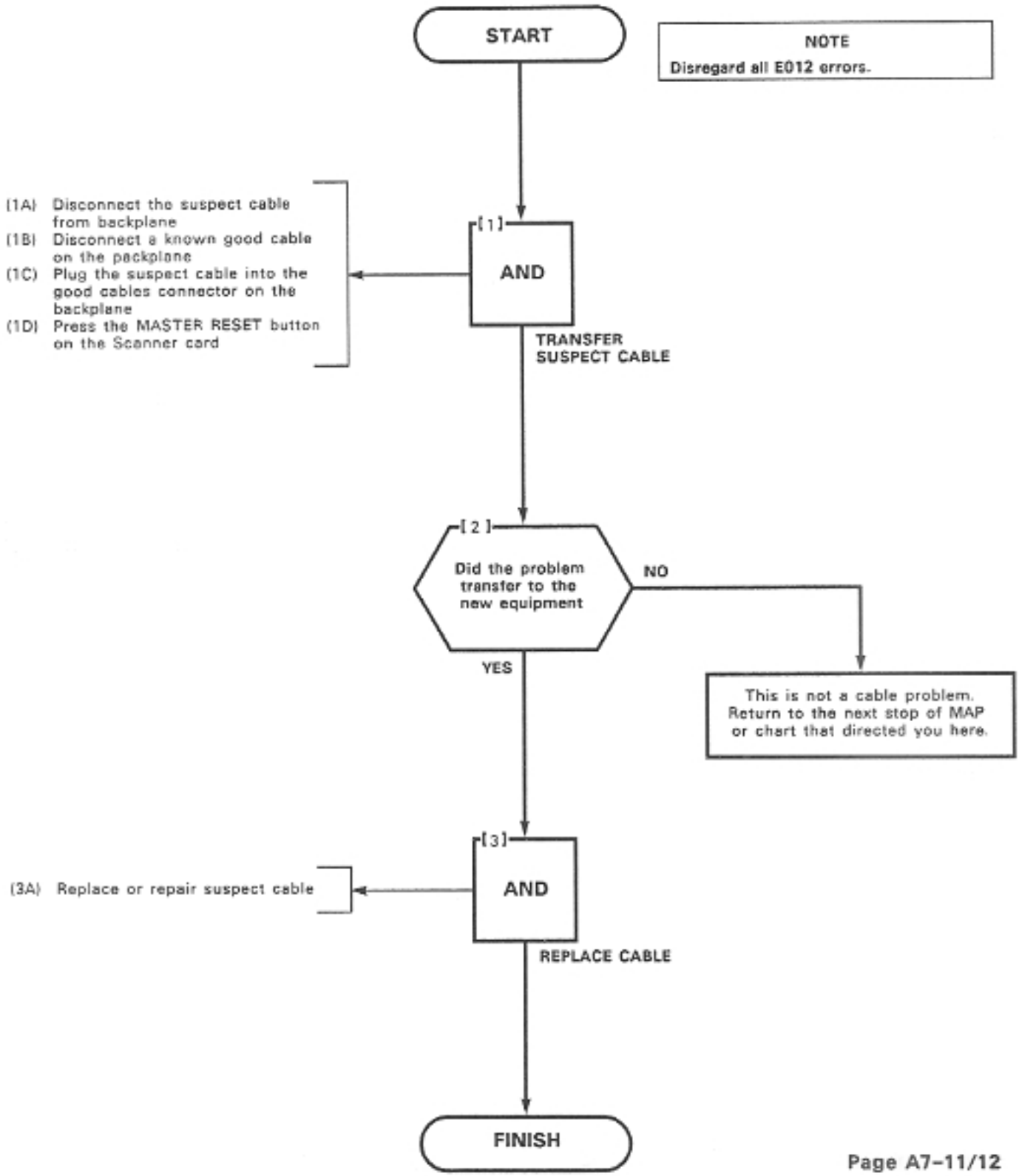
SPEECH PATH TEST
MAP350- 702
Issue 1, December 1982
Sheet 3 of 4

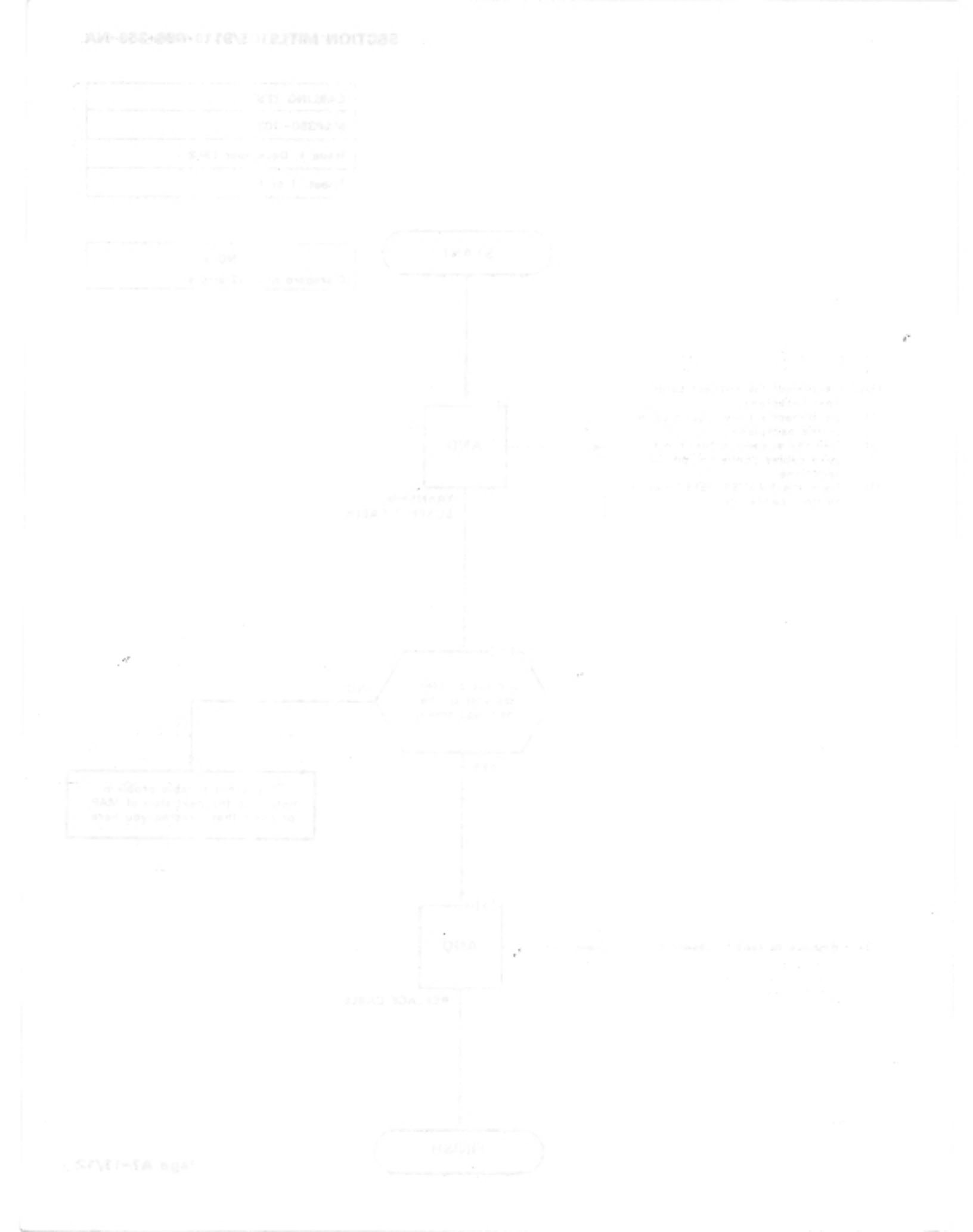


SPEECH PATH TEST
MAP350- 702
Issue 1, December 1982
Sheet 4 of 4

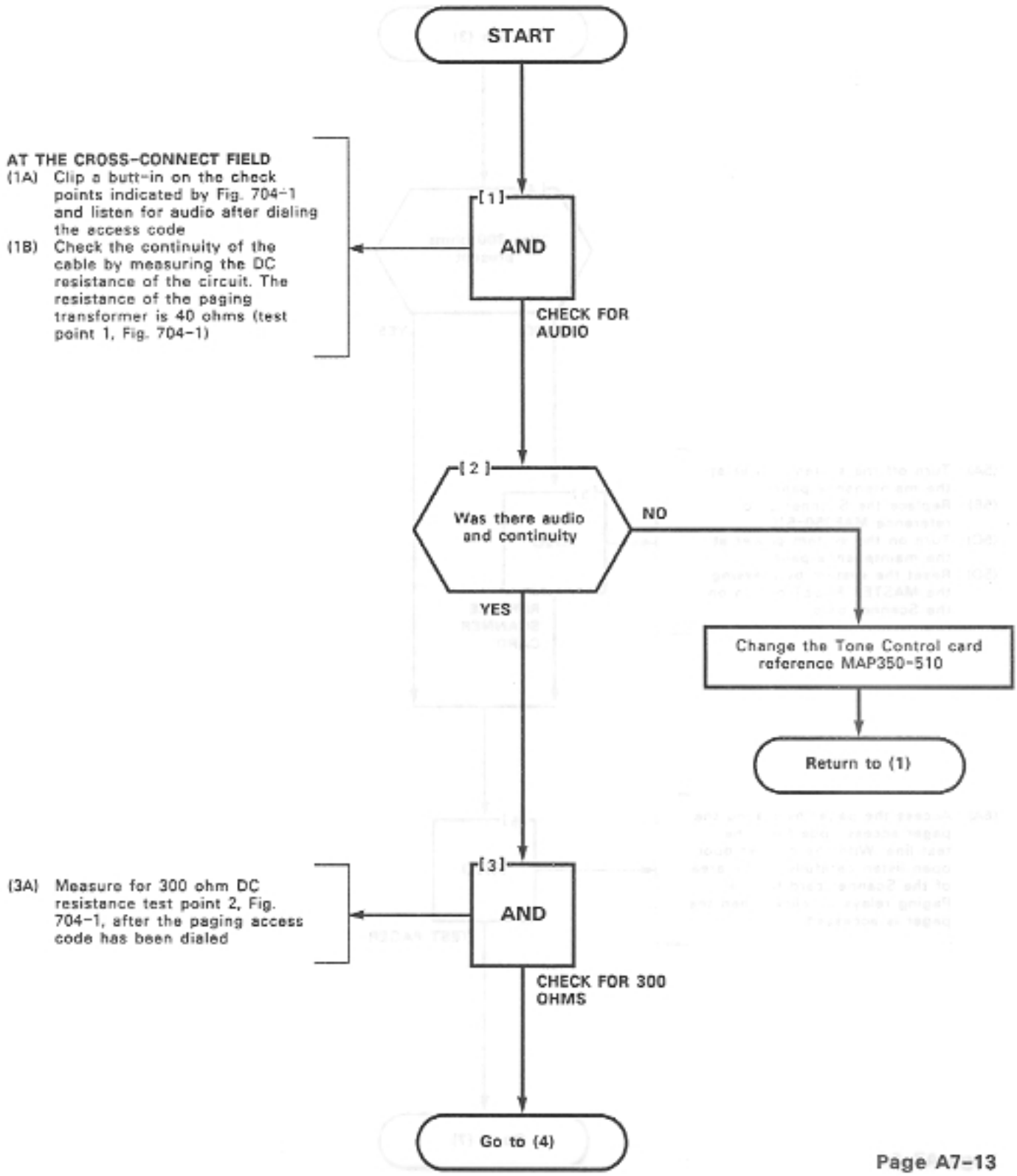


CABLING TEST
MAP350- 703
Issue 1, December 1982
Sheet 1 of 1

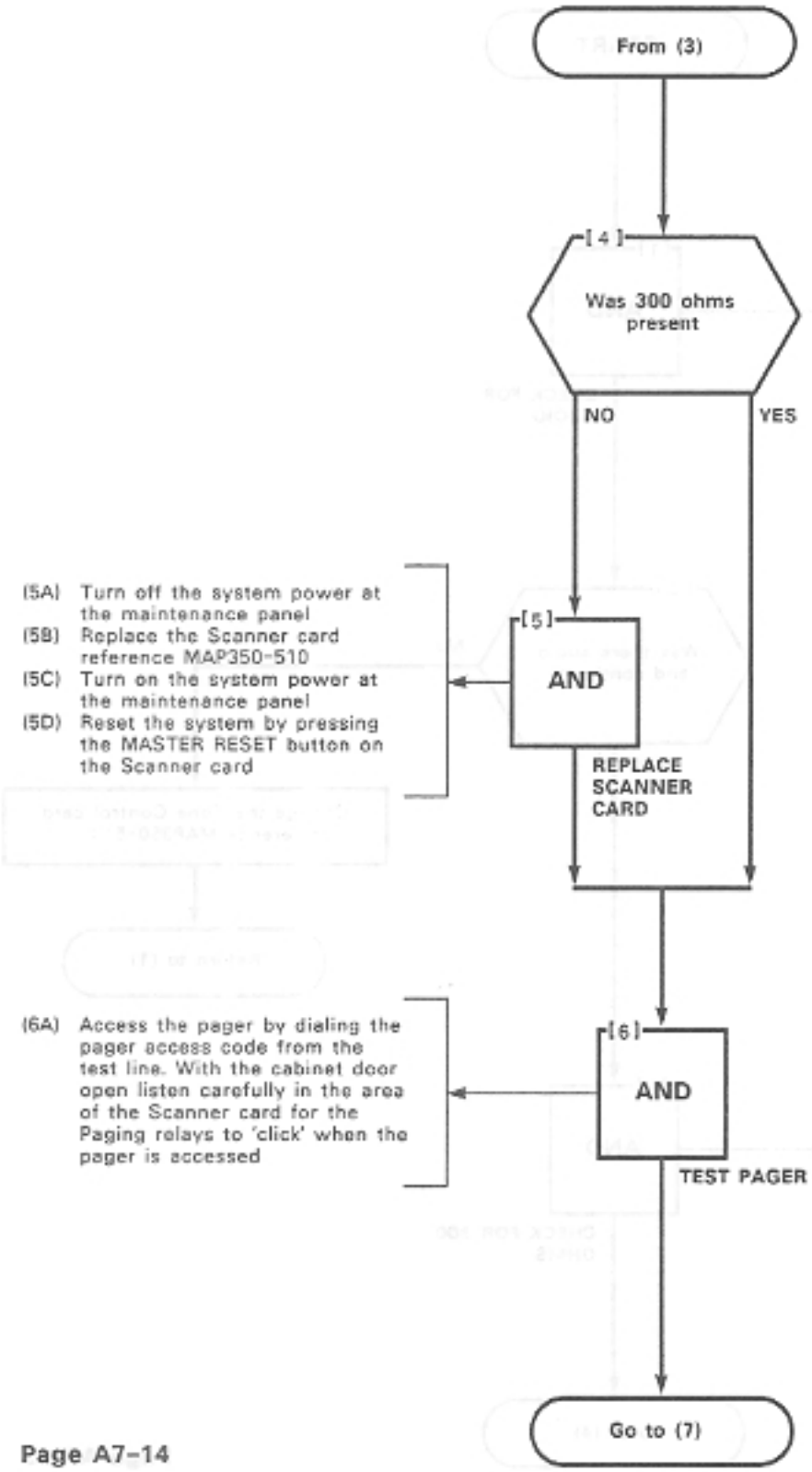




PAGING TEST
MAP350-704
Issue 1, December 1982
Sheet 1 of 5



PAGING TEST
MAP350- 704
Issue 1, December 1982
Sheet 2 of 5



PAGING TEST
MAP350- 704
Issue 1, December 1982
Sheet 3 of 5

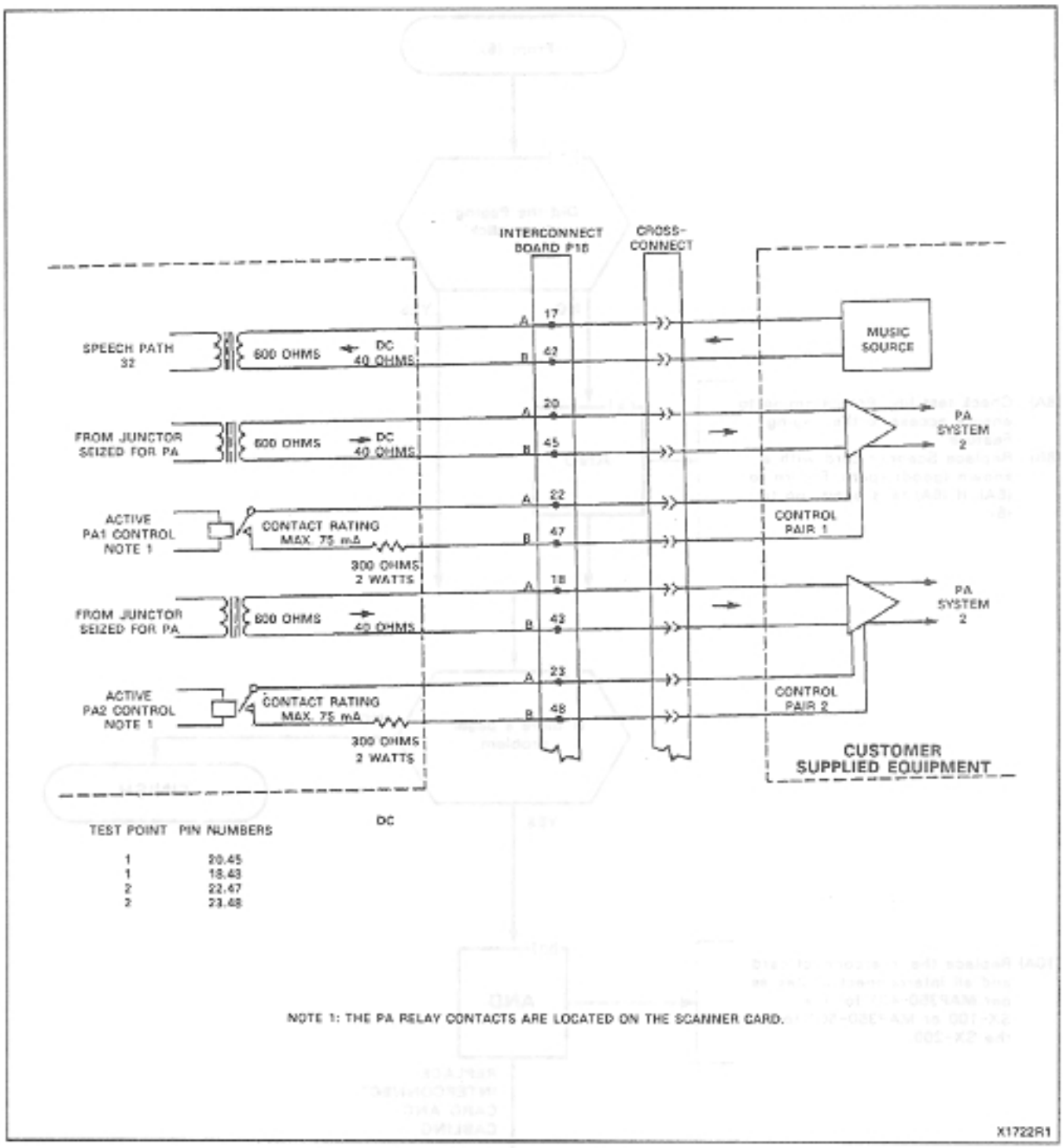


Fig. 704-1 Music and PA Connections

PAGING TEST
MAP350- 704
Issue 1, December 1982
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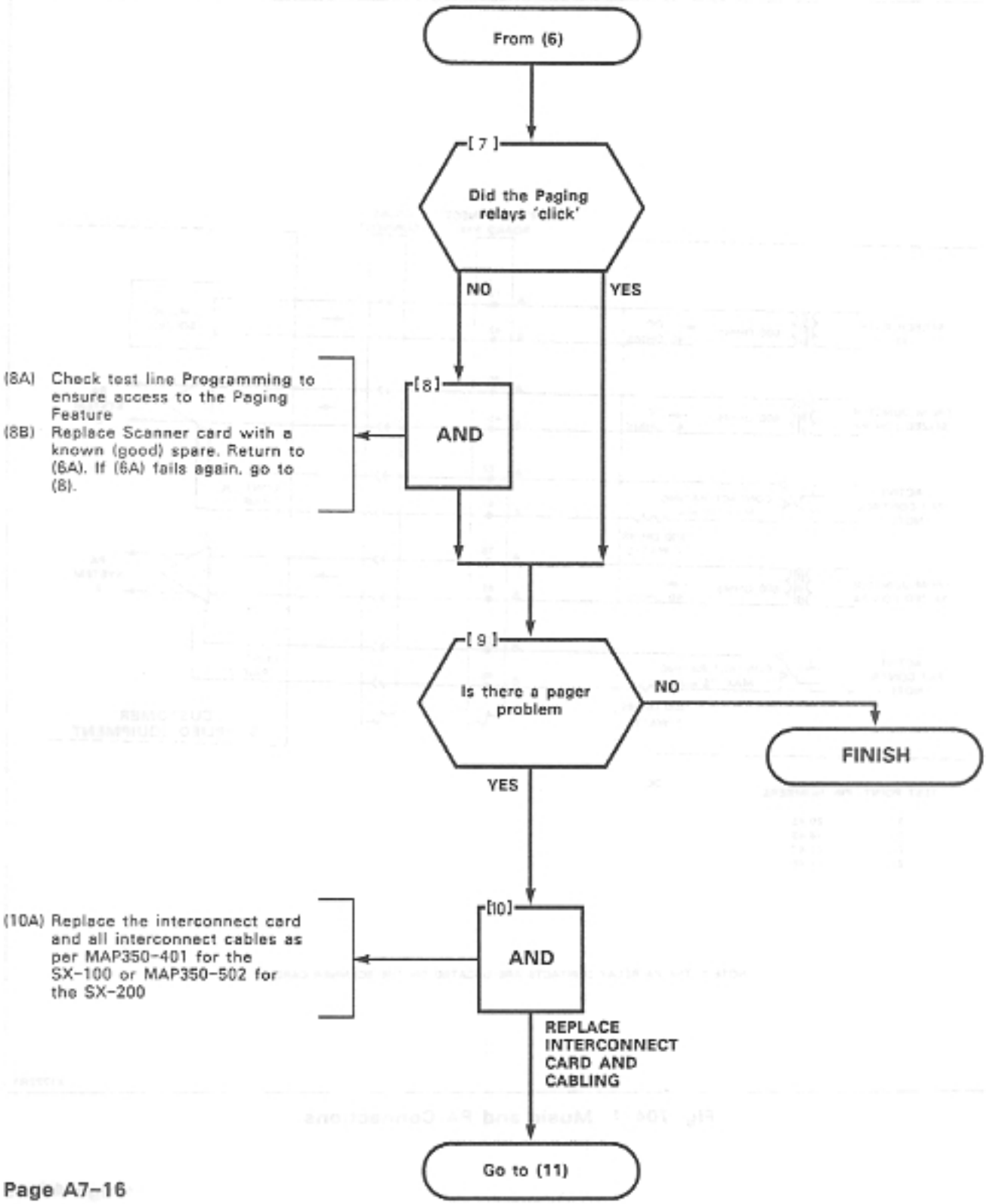
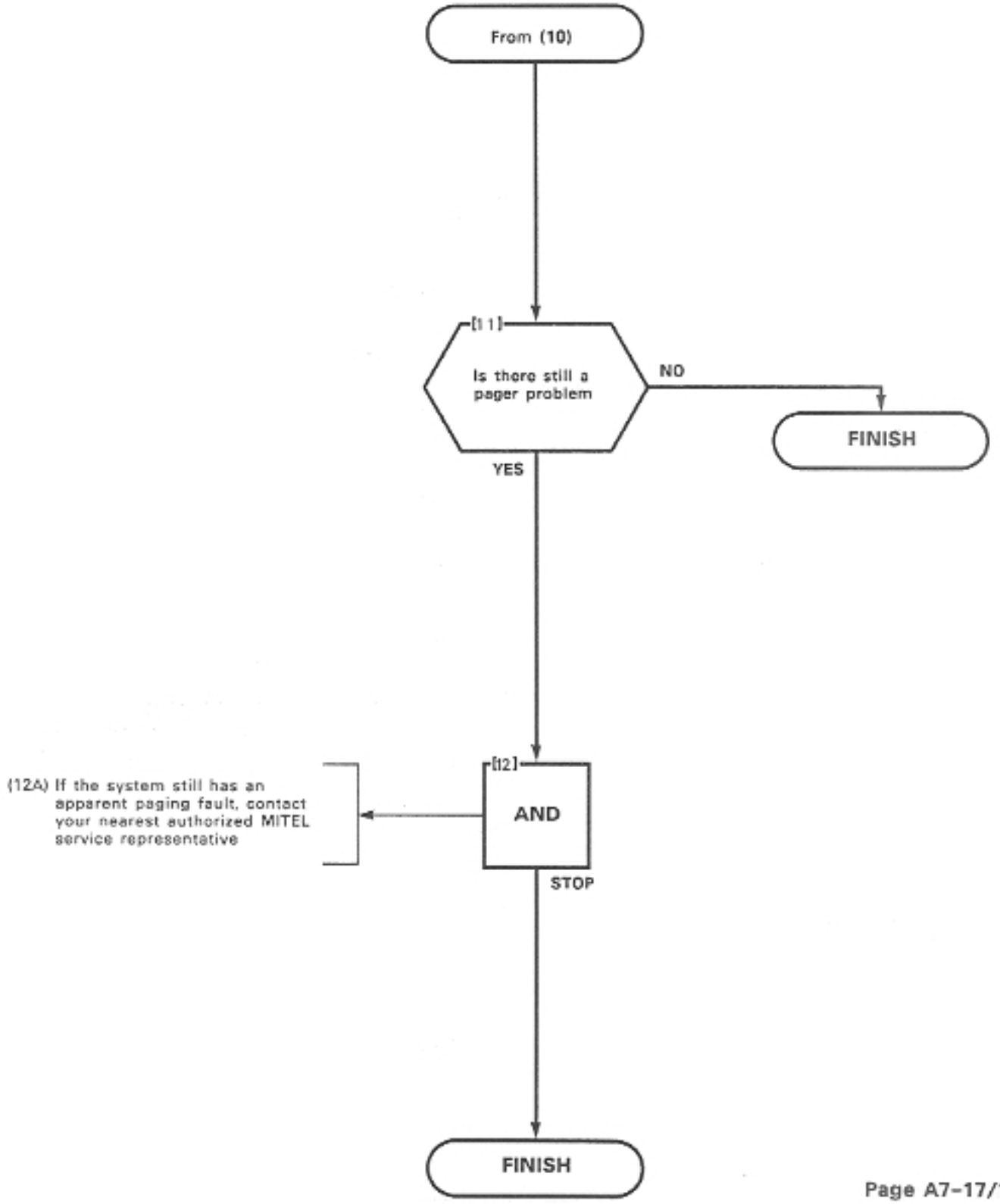
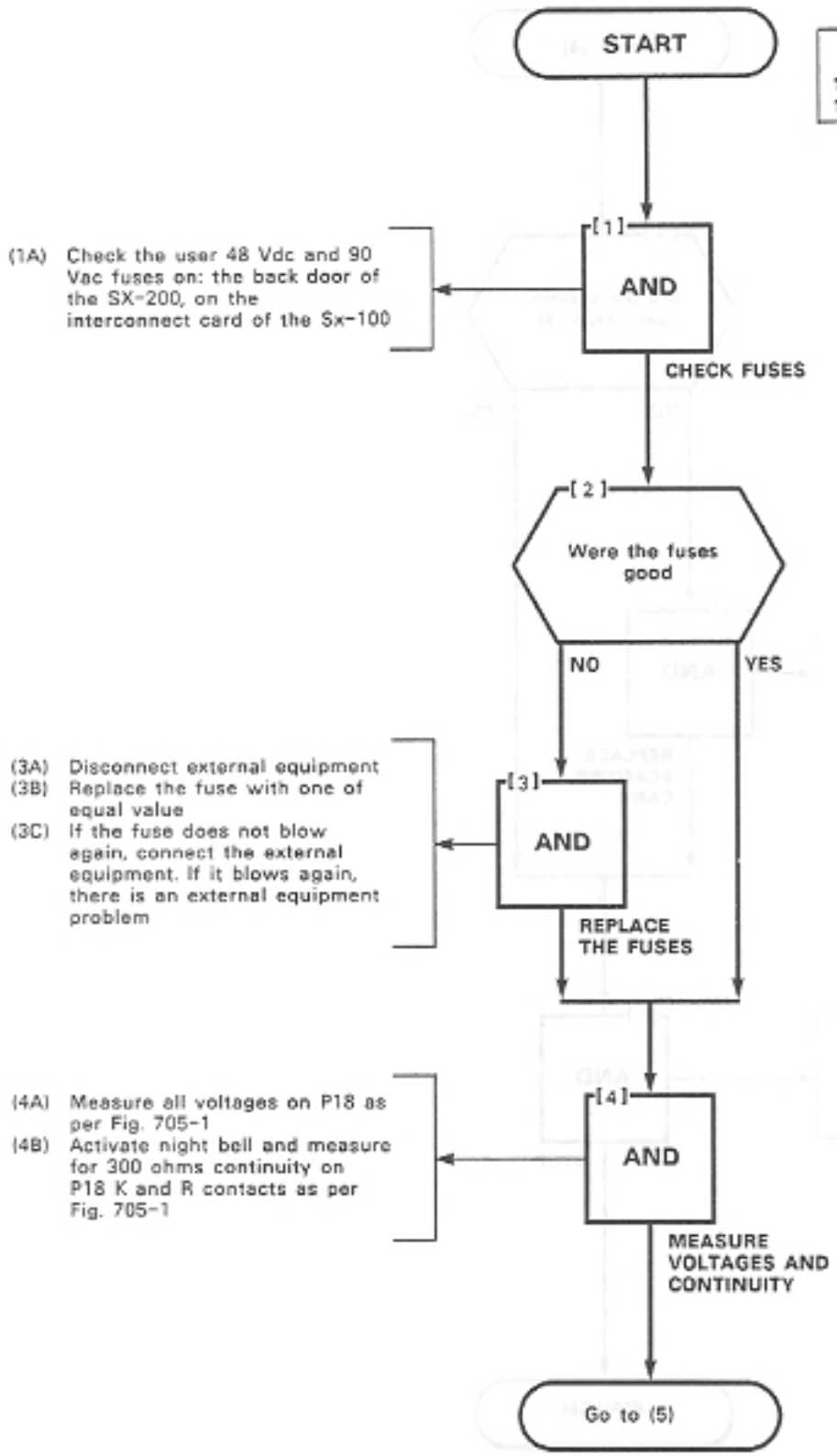


PAGING TEST
MAP350- 704
Issue 1, December 1982
Sheet 5 of 5

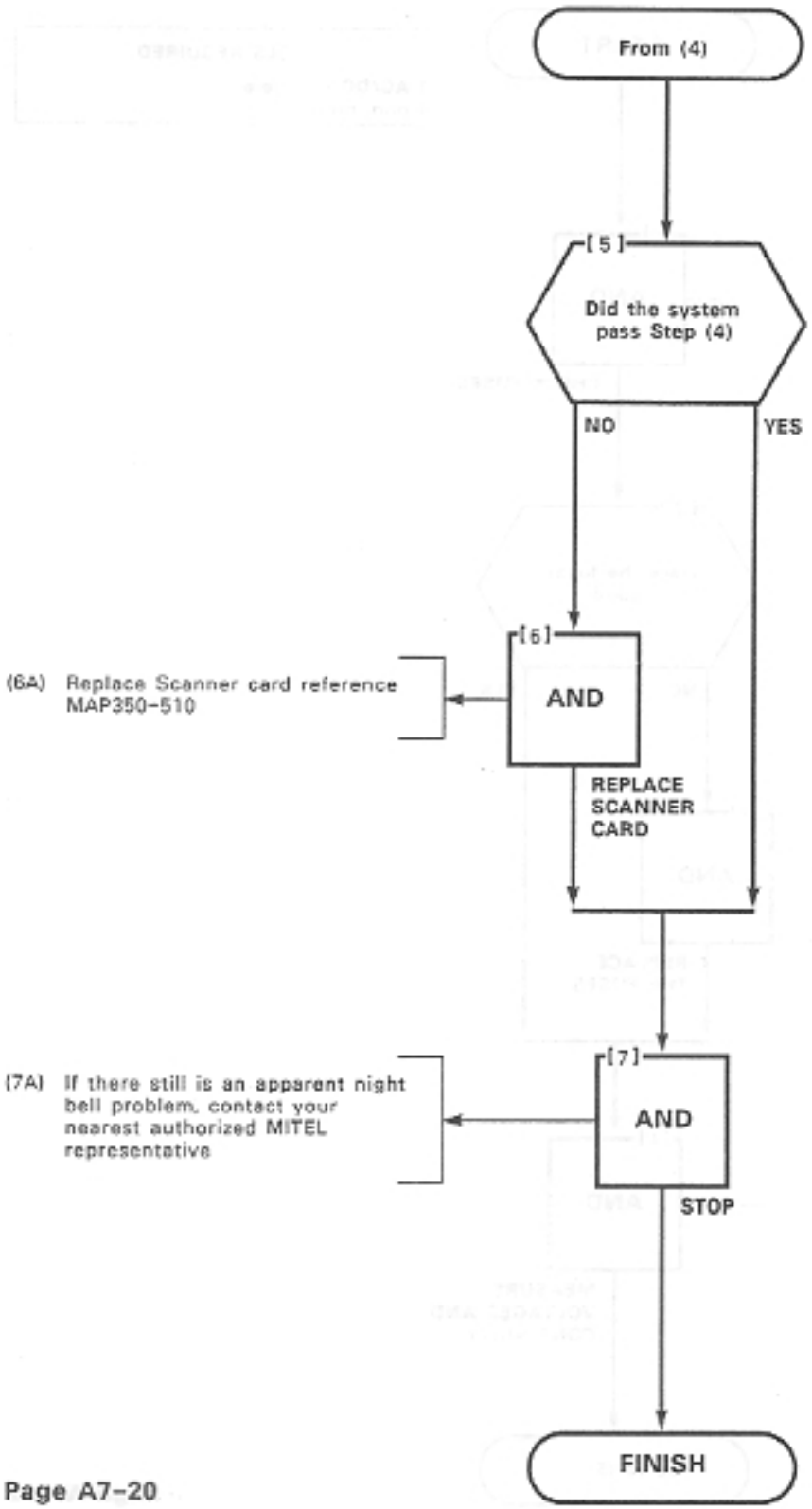


NIGHT BELL TEST
MAP350- 705
Issue 1, December 1982
Sheet 1 of 3

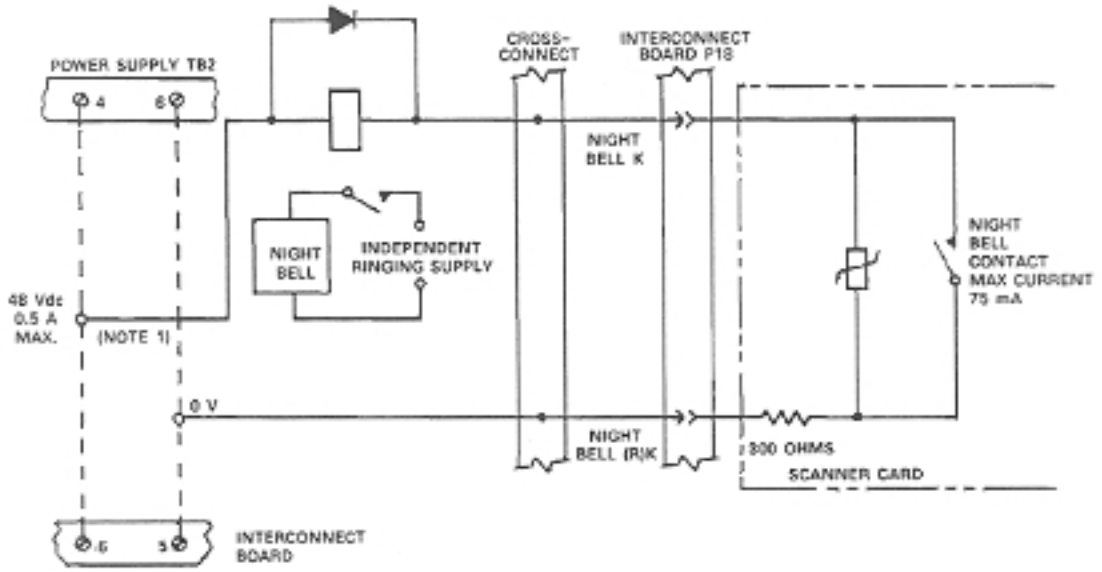
TOOLS REQUIRED
1 AC/DC Voltmeter 1 ohm meter



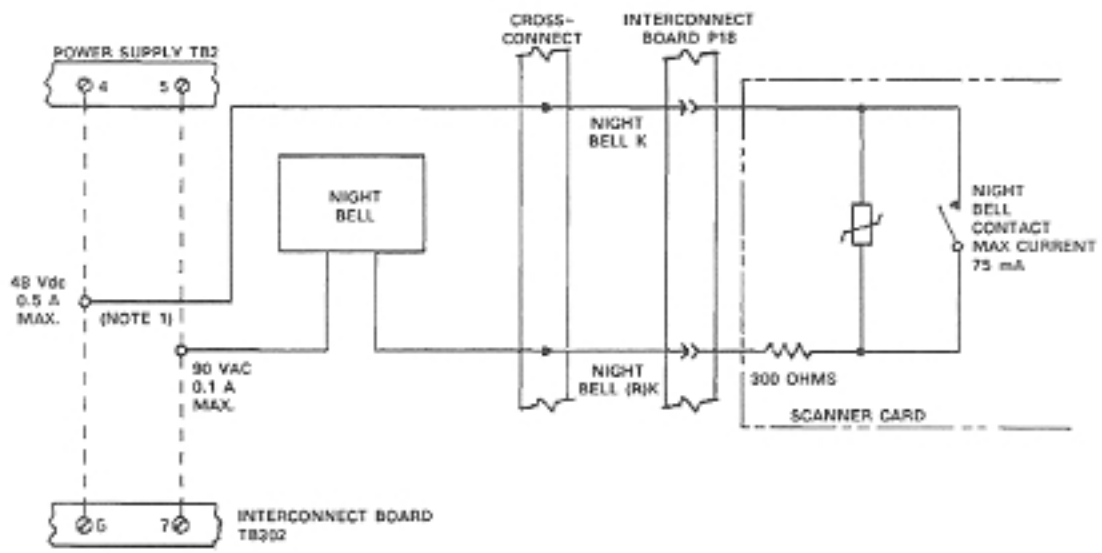
NIGHTBELL TEST
MAP350- 705
Issue 1, December 1982
Sheet 2 of 3



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)

NOTE 1: THE FACILITY IS WIRED TO EITHER THE SX-100 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 PABX IS IN NIGHT SERVICE, OR SIGNAL THE CO FOR THIS CONDITION.

X1720

Fig. 705-1 Night Bell Connections

MUSIC ON HOLD TEST
MAP350-706
Issue 1, December 1982
Sheet 1 of 4

TOOLS REQUIRED

1 AC/DC Voltmeter
1 ohm meter

START

NOTE

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

[1] AND

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

CHECK MUSIC SOURCE

[2] Was music present at the cross-connect field

NO

Troubleshoot customer music equipment and cables provided

Return to (1)

YES

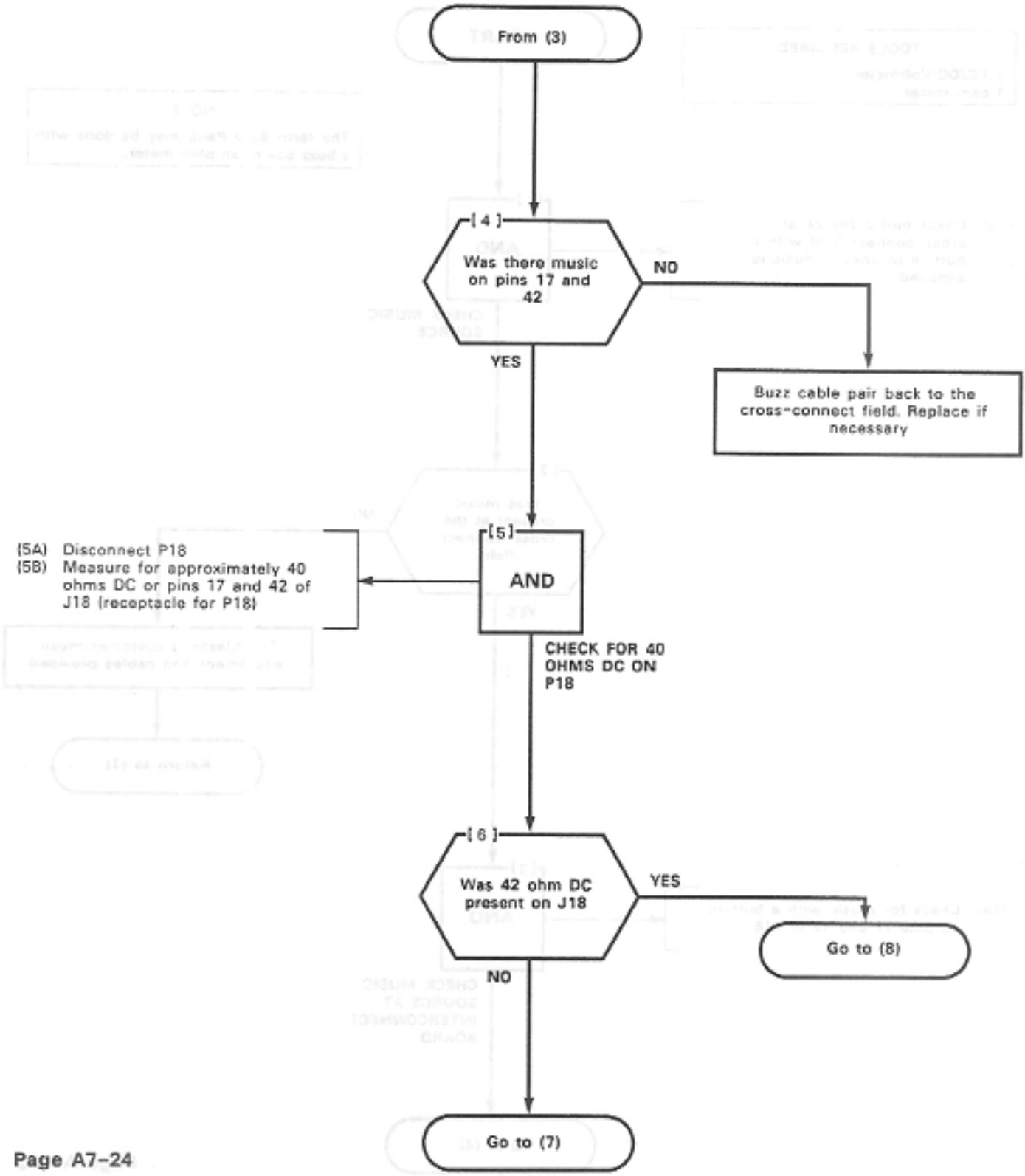
[3] AND

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

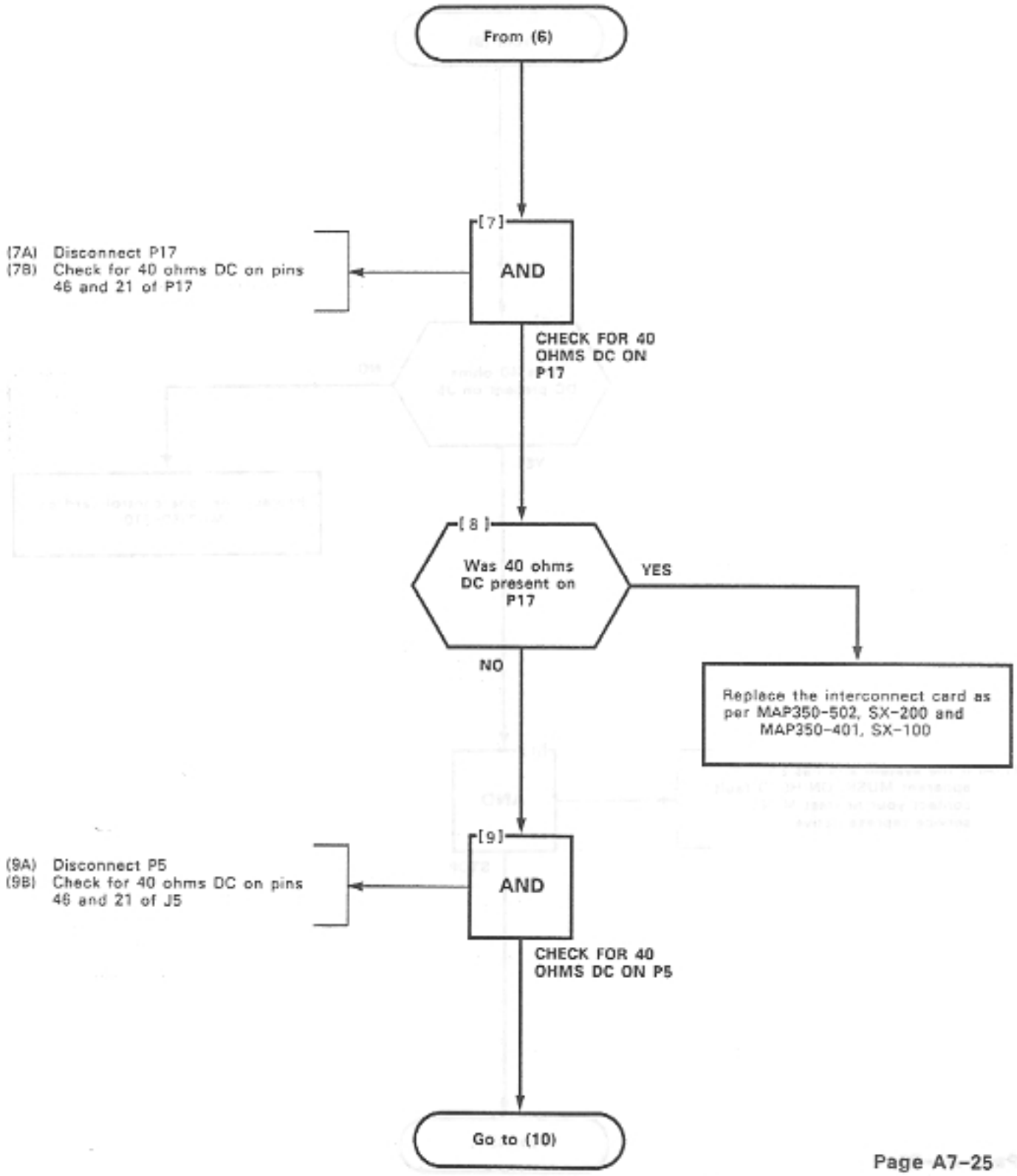
CHECK MUSIC SOURCE AT INTERCONNECT BOARD

Go to (4)

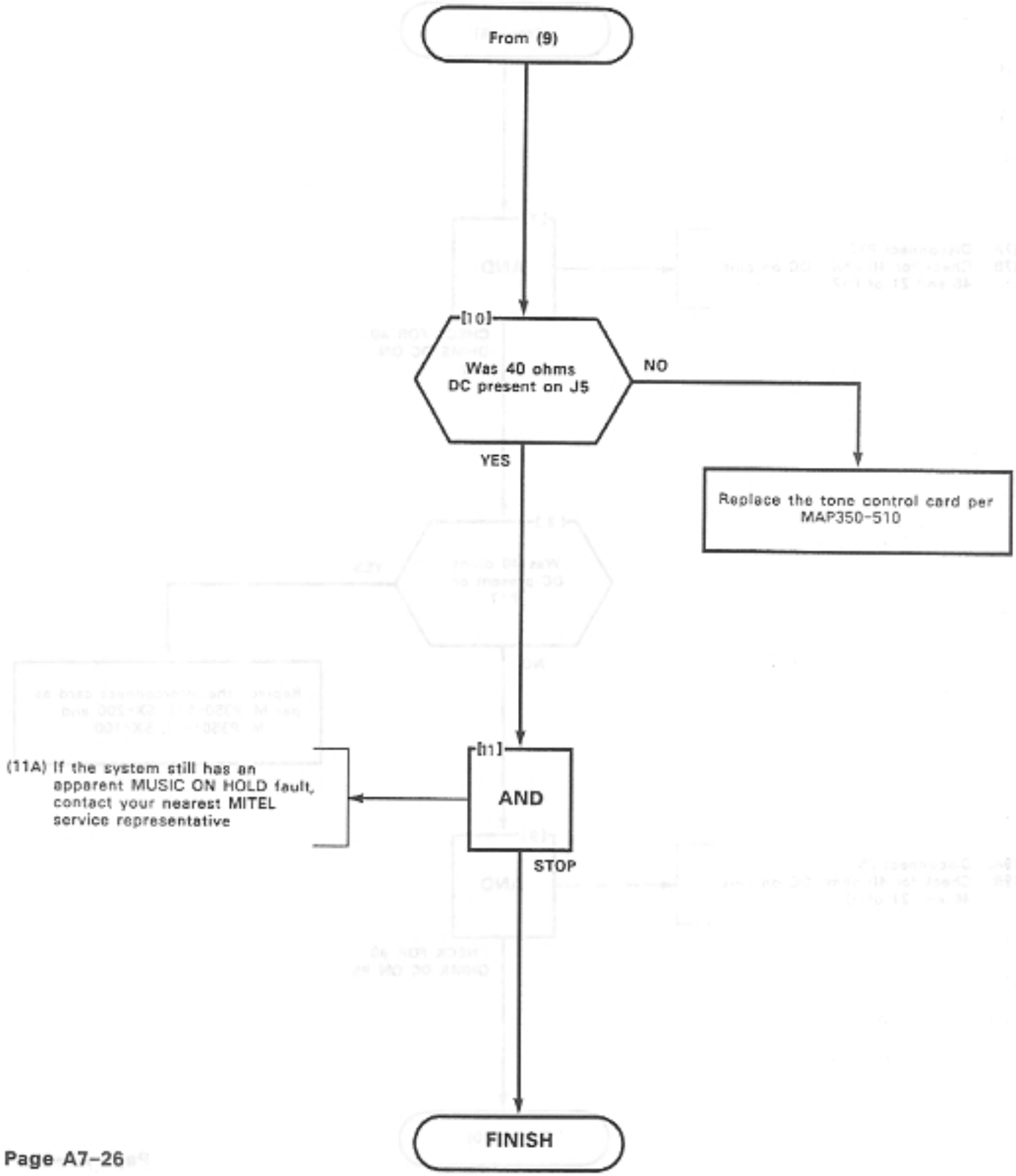
MUSIC ON HOLD TEST
MAP350- 706
Issue 1, December 1982
Sheet 2 of 4



MUSIC ON HOLD TEST
MAP350-706
Issue 1, December 1982
Sheet 3 of 4



MUSIC ON HOLD TEST
MAP350- 706
Issue 1, December 1982
Sheet 4 of 4



APPENDIX 8
SUPERSET 4

GENERAL

Introduction

A8.01 This Appendix describes the general, physical and electrical characteristics of the SUPERSET 4.

A8.02 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 A8-1.

GENERAL DESCRIPTION

A8.03 The SUPERSET 4 is an advanced microprocessor-controlled telephone set, employing digitally controlled integrated circuitry and liquid crystal displays (LCD's).

A8.04 The SUPERSET 4 is intended for use with SX-100 and SX-200 Generic 217 PABX's.

A8.05 The SUPERSET 4 provides:

(a) User confidence in handling incoming or outgoing calls, through application of visual word prompts automatically displayed on an LCD. These prompts signify all valid call-handling options at any given time.

(b) User capability to make the fullest use of all PABX features in the assigned Class of Service, by means of the visual word prompts mentioned above.

(c) Single button feature activation.

(d) Multi-line appearances (installer-programmed) of up to 15 lines including primary line (set directory number). Multi-line appearances may be a mixture of PABX lines and trunks, and may also be multi-appearances of the same line.

(e) Speed call entry at each unassigned line (not associated with PABX 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.

(h) Pushbutton selection of nonprimary line.

TABLE A8-1
RELATED MITEL PRACTICES

Section No.	Title
MITL9174-518-105-NA	Features and Services Description
MITL9174-518-180-NA	Engineering Information
MITL9174-518-200-NA	Shipping, Receiving, and Installation Procedures
MITL9174-518-290-NA	Installation Instructions
MITL9174-518-320-NA	Test Procedures

(i) Automatic ringing line selection (PABX 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 PABX and distributed through the line. Line connection by means of modular jack. Only 2-wire local area wiring required. Turn key installation. Only non-essential 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 PABX), digit echoing, speed call number, call forward destination number, timed-reminder setting, caller identification, and messages from the system.

(n) Hands-free operation, with switchable microphone.

(o) Volume controls for ringer and loudspeaker.

(p) Ringer pitch control.

PHYSICAL DESCRIPTION

General

A8.06 The SUPERSET 4 body and handset are of plastic construction. The dimensions of the SUPERSET 4, with handset on-hook, are given in Figure A8-1.

A8.07 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

A8.08 The body of the SUPERSET 4 comprises two parts - a base assembly and a cover assembly (see Figure A8-2).

Base Assembly

A8.09 The base assembly contains a microphone (for hands-free 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.

A8.10 A screwdriver slotted control for adjusting ringer pitch is user-accessible underneath the base assembly.

Cover Assembly

A8.11 The cover assembly houses a volume control assembly, a speaker assembly (for hands-free operation), a keypad module, and a line selection/repertory dial module.

Volume Control Assembly

A8.12 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

A8.13 A loudspeaker is mounted under a grille that occupies space beneath the handset.

Keypad Module

A8.14 The keypad module contains a standard 12-button keypad, six feature buttons, and four supplementary feature buttons.

Line Selection/Repertory Dial Module

A8.15 The line selection repertory dial module contains 15 line select buttons, a hold button, an LCD repertory display, and an LCD feature display.

A8.16 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 func-

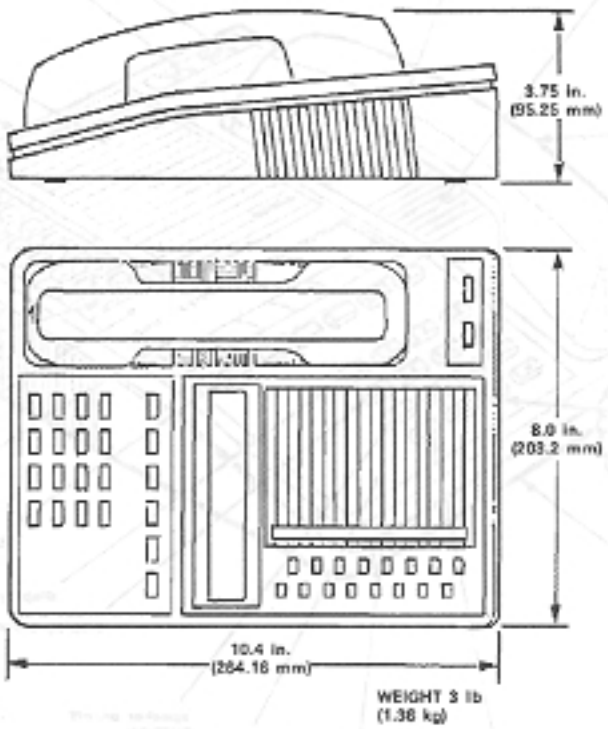


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Fig. A8-1 SUPERSET 4 Dimensions

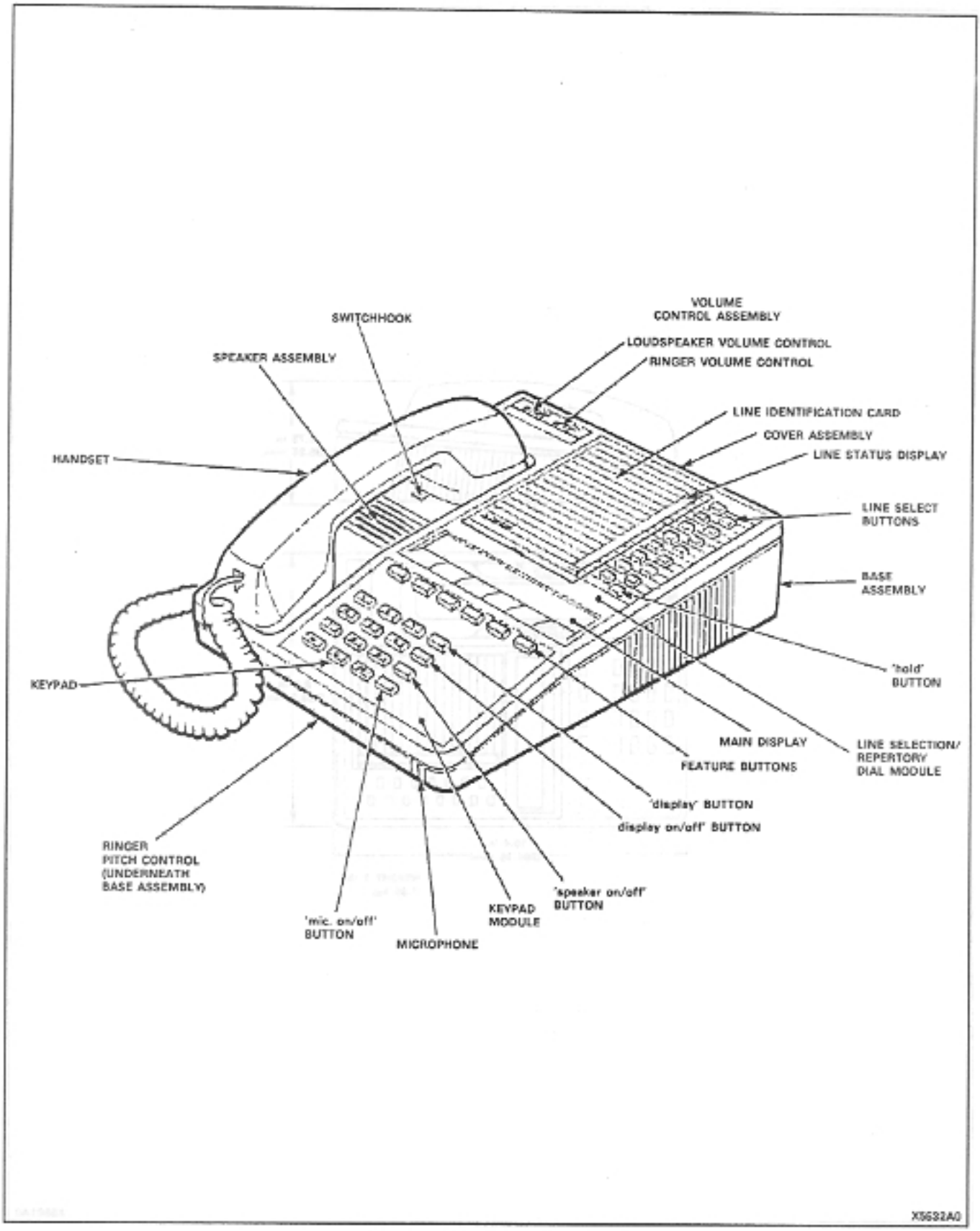

Figure A8-2 SUPERSET 4

tion 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

General

A8.17 For a description of the SUPERSET 4, see Section MITL9174-518-100-NA.

INSTALLATION AND MAINTENANCE CONSIDERATIONS

Caution: Installers should not attempt to use a butt-in on SUPERSET 4 lines, as no line verification can be made, and line card operation may be affected. A SUPERSET 4 cannot be used as a Power Fail Transfer extension.

Installation

A8.18 Installation of the SUPERSET 4 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. (For further information see MITL9174-518-320-NA.)

(f) Initialization of the SUPERSET 4 occurs automatically when power is applied to the set.

A8.19 Installation of a SUPERSET 4 into a powered-up system consists of:

- Assembly of handset, handset cord, and main body of the SUPERSET 4.
- 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

A8.20 Ambient Temperature: 32 to 122°F (0 to 50°C).

A8.21 Ambient Humidity: 10 to 90% RH, noncondensing.

Maintenance

A8.22 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.

A8.23 The installer loop test procedure is performed at the SUPERSET 4. After dialing the loop test access code, the installer can confirm correct key operation, liquid-crystal display activation, hookswitch functioning, and ringer (speaker) output. For further information see Section MITL9174-518-320-NA.