MAINTENANCE DATA TRANSMITTER
TROUBLE LOCATING PROCEDURE
NO. 5 CROSSBAR

CONTENTS PAGE

1. GENERAL

1.01 This section provides procedures for diagnosing and clearing malfunctions in the maintenance data transmitter (MDT). Detailed procedures for clearing trouble in the programmable scanner distributor are given in Section 190-107-301.

1.02 This section is reissued for the following reasons:

(a) To add table of contents

(b) To add paragraphs on trouble identification, trouble isolation, MDT interaction with the marker group, and MDT initialization.

2. TROUBLE IDENTIFICATION

2.01 MDT trouble indications are indicated to maintenance personnel in the following ways:

(a) Trouble message printouts at the end office keyboard printer and at the automatic trouble analysis (ATA) administration terminal

(b) LED displays at the PSD control panel

(c) Fuse alarm LED

(d) Audible major alarms

(e) Symptoms indicating that ATA is not functioning correctly for a particular end office but no other trouble indicators are present.

Trouble indications a and d are covered in Section 190-107-301 which contains flowcharts to aid in trouble locating and correcting hard faults for these trouble categories. Trouble indications b, c, and e are covered in this section.

Typical symptoms of trouble indication e include excessive garbage cards, punching nonexpress cards when the MDT mode is set for transmit only for nonexpress cards, missing time line printouts, and inability to get a response from central when using the keyboard printer to request information.

2.02 No. 5 crossbar trouble location and correction requires some knowledge of circuit operation, some indications of what circuit is failing, where in the sequence of operation it is failing, and some means for testing that circuit to reproduce the trouble.

2.03 There are three areas of MDT operation for which additional trouble locating procedures are provided in this section. The first area is

isolating the problem to the end office, data link, or ATA central. The second area is the external interfacing between the central office and the MDT. The third area is locating a hard fault in the MDT when circuit pack replacement does not correct the problem.◀

3. TROUBLE CLEARING

3.01 MDT trouble clearing consists of trouble message, initialization, and fatal error procedures.

3.02 Insert a busy plug in the MDTMB jack at the master test frame connector (MTFC) before starting trouble clearing procedures. Remove the plug after the trouble is cleared.

3.03 Block the LMJ relay nonoperated before performing trouble clearing procedures in Section 190-107-301. Remove blocking tool after trouble is cleared.

3.04 If the FA LED on the control panel is lighted, replace the blown fuse. If the fuse blows again, refer to Section 190-107-301. There are two fuses at the base of the frame for the 132H converter and the interface unit.

3.05 If a trouble message has been received at the printer, proceed to Fig. 1. If no trouble message is present, observe the LEDs on the control panel and proceed to Fig. 2.

3.06 The trouble clearing procedures are presented in flowchart form.

4. ▶TROUBLE ISOLATION

4.01 Trouble could result from problems in the MDT/central office, the data link, or the central computer.

A. Switching Control Center (SCC) Keyboard Printer

4.02 Verify that the data link is good in both directions between the central office and computer.

B. SCC

4.03 Verify that the logger, TTY, and queue are turned on by using the interrogate command. If any of the three are off, use the restore command to turn them on.

4.04 Set the data set at the end office to test mode. This causes messages from the computer to be looped back through the end office data set and returned to the computer.

4.05 Use the **mdt:smode** command to change the MDT mode. The **mdt:sitename.smode;punch all;xmit all!** command is sent to the data link and looped back to central. After central receives the message, it compares the new mode with the previous mode. A verification is then printed at the SCC keyboard printer. If no response is printed, there is a problem with the computer or data link. No response could also indicate that the computer did not send the message, the data link was bad in either direction, or the computer did not receive the looped back response.

C. Central Computer

4.06 Connect a keyboard printer to the DJ11 or DH11 line for the end office with a null modem cable. The keyboard printer simulates an end office and can then transmit and receive messages to and from the central computer. Type an ! and the central computer responds with an invalid keyword.

4.07 If the ATA system is working correctly, a RUTR message sent to central from the simulated site appears at the SCC keyboard printer as an MDT status change. The RUTR message format from the simulated end office would be **(CNTR-A) F @ @ C A (CR)**.

D. Central Office

4.08 A keyboard printer can be used to simulate the ATA central at an MDT end office. The data link cable is removed from I/O port 0 or 1 and a keyboard printer is connected through a null modem cable to I/O port 0 or 1.

4.09 If a spare keyboard printer is used to simulate an ATA central, the regular keyboard printer remains connected to I/O port 2. The two keyboard printers are used to send and receive information.

4.10 If a spare keyboard printer is not available, remove the regular keyboard printer from

I/O port 2 and connect to I/O port 0 or 1 to simulate the ATA central. The simulated ATA central cannot verify the ability to transmit messages to I/O port 2 but can be used to set or clear distribute points, change MDT mode, etc.

5. MDT INTERACTION WITH THE MARKER GROUP

5.01 The basic circuitry necessary for the MDT to obtain trouble record information is shown in Fig. 3. Fig. 4 is a flowchart that can be used to locate troubles and correct hard faults.

5.02 When a circuit requesting a trouble record gets preference in the MTFC, the connector grounds the STR lead (nonexpress service type troubles) or the STRA lead (express test circuit type troubles). If the MDT is in service to trouble record cards (MB relay normal), the STR or STRA scan point (SP) will recognize this ground. The MDT determines what the mode is for that particular type of request. The mode indicates if the trouble record is to be transmitted to the ATA central, to be punched at the trouble recorder, or both.

5.03 If the trouble record is to be transmitted to ATA central, the MDT does a prescan of the MTFC scanning relays. It prescans by operating the S8, SA8, R8, and RA8 scan relays first. It reads the information passed through these relays to the trouble recorder on the BW(000-119) and BWX(0-4) leads. The S8, SA8, R8, and RA8 relays are released. The S7, SA7, R7, and RA7 relays are then operated and the next line of information is read from the BW000-119 leads. This action continues until the S0 row has been read. The S0 relays are then released. The MDT determines if the mode requires a card to be punched on site. If a card is required to be punched, the MDT grounds its STR or STRA distribute point (DP) to operate the STR1 or STR2 relay in the trouble recorder. The trouble recorder causes a card to be perforated. The prescan starts with S8 and scans down to S0 but the trouble recorder perforates by starting with S0 and scanning up to S8.

5.04 If the trouble record is not required to be perforated, the MDT grounds its TRC DP. This grounds the TRC lead to the trouble recorder. This lead multiples the TRC contact in the trouble recorder and causes the TRC relay in the MTFC to operate and release the call. The STR or STRA lead is opened, removing the ground start to the MDT. The MDT recognizes the removal and releases its TRC DP. It is then ready for the next trouble record.

5.05 If a trouble record was perforated, the trouble recorder operates its TRC relay. The operation of the TRC relay causes the MTFC to remove ground from the STR or STRA start leads. The MDT recognizes the removal and subsequently releases its STR or STRA DP and releases the STR1 or STR2 relay in the trouble recorder. This restores the trouble recorder to normal.

5.06 The typical troubles that can occur in the MDT are shown in Table A with the probable cause.

5.07 MDT detected troubles are transmitted to the computer in the form of trouble messages. The trouble messages are shown in Table B with the probable cause.

5.08 The MDT distribute points, STR, STRA, TRC, S(0-8), are connected to the central office through contacts of the MB relay. Any crosses on those contacts can result in trouble messages being printed.

5.09 A cross between STRA and S8 leads results in mutilated trouble record information because the S8 relay is held operated for the whole prescan cycle and through the punch cycle if a card is to be punched.

6. INITIALIZATION

6.01 Figure 5 shows the flowchart for initialization. When the MDT power is turned on or the initialization switch is operated, the MDT will initialize. A pulse is generated internally on the reset lead which causes the procon to restart the read only memory (ROM) program. The operation of the LMJ relay in the MDT will also force the procon to reinitialize.

6.02 When a trouble is encountered during initialization, the sanity timer times out and causes the LMJ relay to operate. This starts the initialization routine again to release the LMJ relay. This action results in the LMJ relay pulsing. If the LMJ relay is operated continuously (not pulsing), it indicates that the automatic reinitialization feature is failing. Possible causes are open or grounded

RST/$\overline{\text{RST}}$ leads or a bad trouble indication (TBI) circuit pack (FB597). The reset lead could also be open between the MDT and the procon. If operation of the INIT switch causes the procon to reinitialize, then the trouble is between the LMJ relay contact and the INIT switch contacts. If a momentary ground placed on the reset lead (pin 206) of the TBI circuit pack causes the procon to reinitialize, then the problem is between the TBI circuit pack and the LMJ relay.

6.03 The flowchart (Fig. 5) indicates which lamp indications are set when a failure is encountered. There is a possibility that when the LMJ relay is not causing reinitialization, the lamp display is random. The reinitialization problem must be cleared first.

6.04 Most initialization problems occur because of a bad TBI circuit pack, an MB scan point problem, or I/O 0 or 1 data port not operational.◀

→TABLE A←

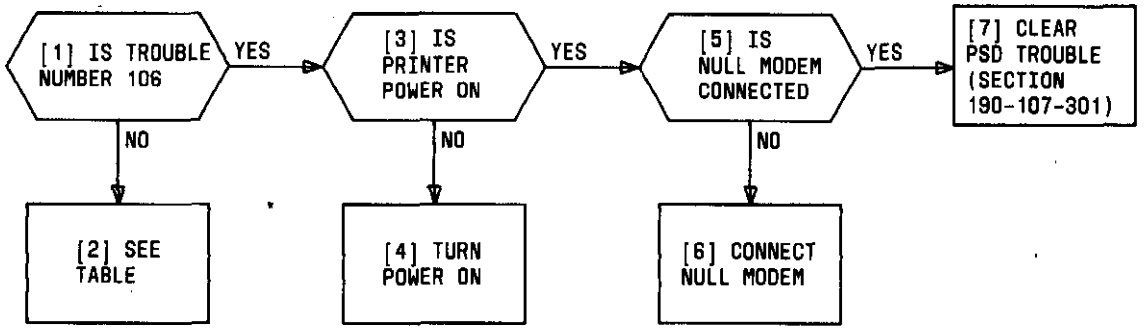
TROUBLES AND CAUSES

TROUBLE	POSSIBLE CAUSE
1. Service troubles punched on site when the MDT mode is set for transmit only.	STR and STRA leads reversed.
2. No trouble record is taken and the requesting circuit times out.	STR or STRA lead open.
3. Trouble information is scanned in an incorrect sequence. The resulting information causes the central to bin the trouble records incorrectly or go to the garbage bin.	S0-S8 leads reversed or crossed.
4. S(0-8) relay does not operate, resulting in missing information.	S(0-8) lead open or missing DP ground.
5. Falsely binned cards.	S0-S8 relays out of adjustment (longer than 32 ms to operate).
6. Mutilated data is read and transmitted to central.	S(0-8)relay releases slowly (eg, 40 ms).
7. Scan relay does not operate in time to be read.	The mercury relay contacts of the A1074 circuit pack stick or become sluggish.
8. Scan relay does not release in time so that two scan relays are read.	The mercury relay contacts of the A1074 circuit pack stick or become sluggish.
9. The second row or more of a trouble record is mutilated.	The S0 relay is held operated too long.
10. Missing information or mutilated information. A scan point verification test can be made and the resulting printout can verify that only the correct BW leads were grounded.	BW(000-119) leads open, crossed, or reversed.

→TABLE B←

TROUBLE MESSAGES

MESSAGE	POSSIBLE CAUSE
142	The STR or STRA ground is not removed by the MTF within 3 seconds.
	False grounds for 5 or more seconds on the STR or STRA leads.
143	The STR or STRA start signal disappears while the MDT is prescanning to obtain the information before transmitting it to central.
144	False ground on the TRC lead from the trouble recorder or MTF connector.
	Falsely operated TRC distribute point.
	Mercury relay sticking in the operated position on the A1074 circuit pack.
145	The STR or STRA signal disappears while the trouble recorder is perforating the trouble record.



TBL NO.	MEANING	PROBABLE CAUSE
100	CARRIER HIT (CARRIER LOSS LESS THAN 60 MS)	DATA LINK
101	OVERWRITE ERROR (NEW CHARACTER WAS TRANSFERRED TO THE RECEIVED HOLD REGISTER BEFORE PREVIOUS CHARACTER UNLOADED)	DATA LINK
102	FRAMING ERROR (RECEIVED CHARACTER HAS NO STOP BIT)	DATA LINK
103	PARITY ERROR (RECEIVED CHARACTER NOT EVEN PARITY)	DATA LINK
104	START OF HEADER (SOH) OR END OF MESSAGE (EOM) RECEIVED OUT OF SEQUENCE	OATA LINK OR ATA CENTRAL
105	INVALID MESSAGE CLASS OR MESSAGE ID RECEIVED	DATA LINK OR ATA CENTRAL
106	BUFFER OVERFLOW (TERMINAL OFF)	DATA LINK OR ATA CENTRAL
107	MORE OR LESS THAN THREE DATA CHARACTERS RECEIVED	ATA CENTRAL OR DATA LINK
141	TRC FAILURE	MDT OR CENTRAL OFFICE
142	START SCAN RELEASE FAILURE	MDT OR CENTRAL OFFICE
143	PRESCAN ABORT	MDT OR CENTRAL OFFICE
144	FALSE TRC	MDT OR CENTRAL OFFICE
145	CALL ABANDONING PUNCHING	MDT OR CENTRAL OFFICE
150	INVALID OPERATION CODE RECEIVED	ATA CENTRAL OR DATA LINK

Fig. 1—Clear Trouble Message

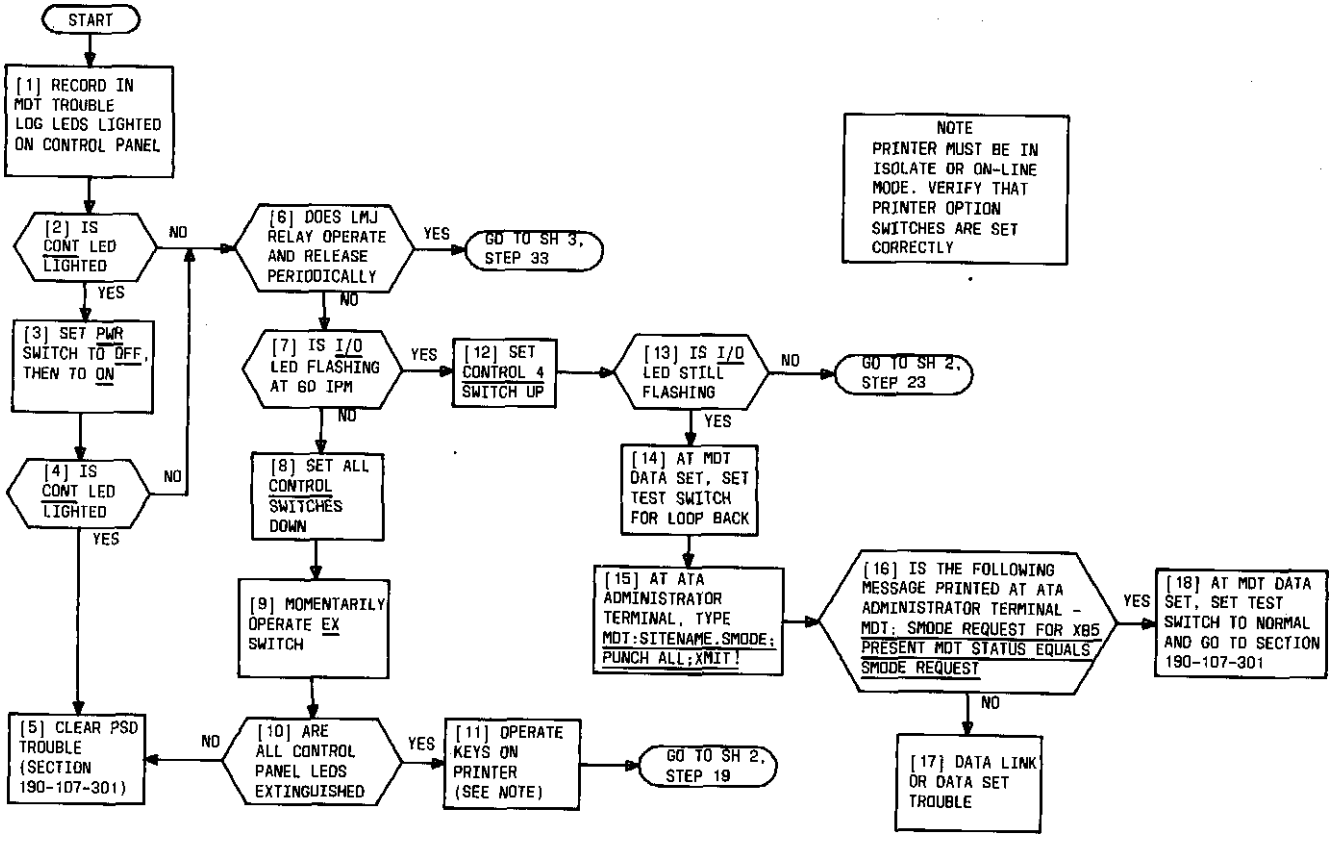
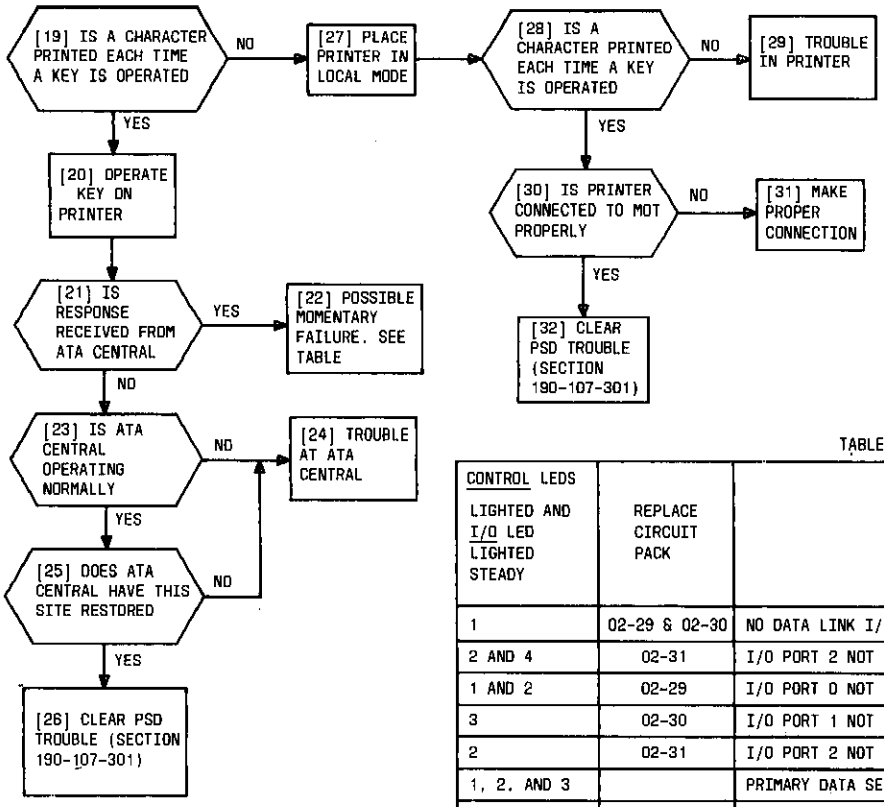


Fig. 2—Clear Initialization and Fatal Error Trouble (Sheet 1 of 3)



TABLE

CONTROL LEDS LIGHTED AND I/O LED LIGHTED STEADY	REPLACE CIRCUIT PACK	REASON FOR FAILURE
1	02-29 & 02-30	NO DATA LINK I/O PORTS OPERATIVE DURING MDT INITIALIZATION
2 AND 4	02-31	I/O PORT 2 NOT OPERATIONAL DURING MDT INITIALIZATION
1 AND 2	02-29	I/O PORT 0 NOT OPERATIONAL
3	02-30	I/O PORT 1 NOT OPERATIONAL
2	02-31	I/O PORT 2 NOT OPERATIONAL
1, 2, AND 3		PRIMARY DATA SET FAILURE
4		BACK-UP DATA SET FAILURE
1 AND 3		PRIMARY DATA LINK CARRIER FAILURE
2 AND 3		BACK-UP DATA LINK CARRIER FAILURE
I/O FLASHING 60 IPM		SYSTEM RESPONSE TIMING WAITING FOR NUL CHARACTER FROM CENTRAL
I/O FLASHING 120 IPM		NO CARRIER ON I/O PORTS 0 AND 1
1, S/D STEADY, AND I/O NOT LIGHTED		MB SCAN POINT FAILURE

Fig. 2—Clear Initialization and Fatal Error Trouble (Sheet 2 of 3)

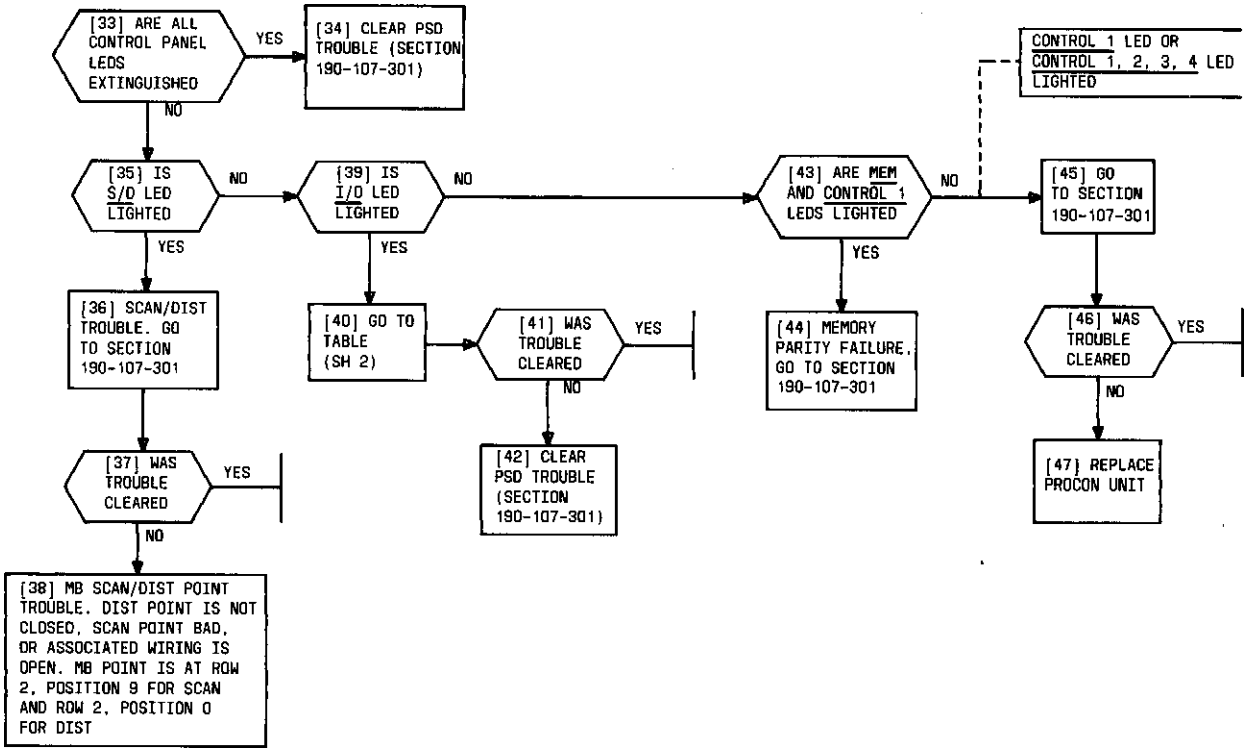


Fig. 2—Clear Initialization and Fatal Error Trouble (Sheet 3 of 3)

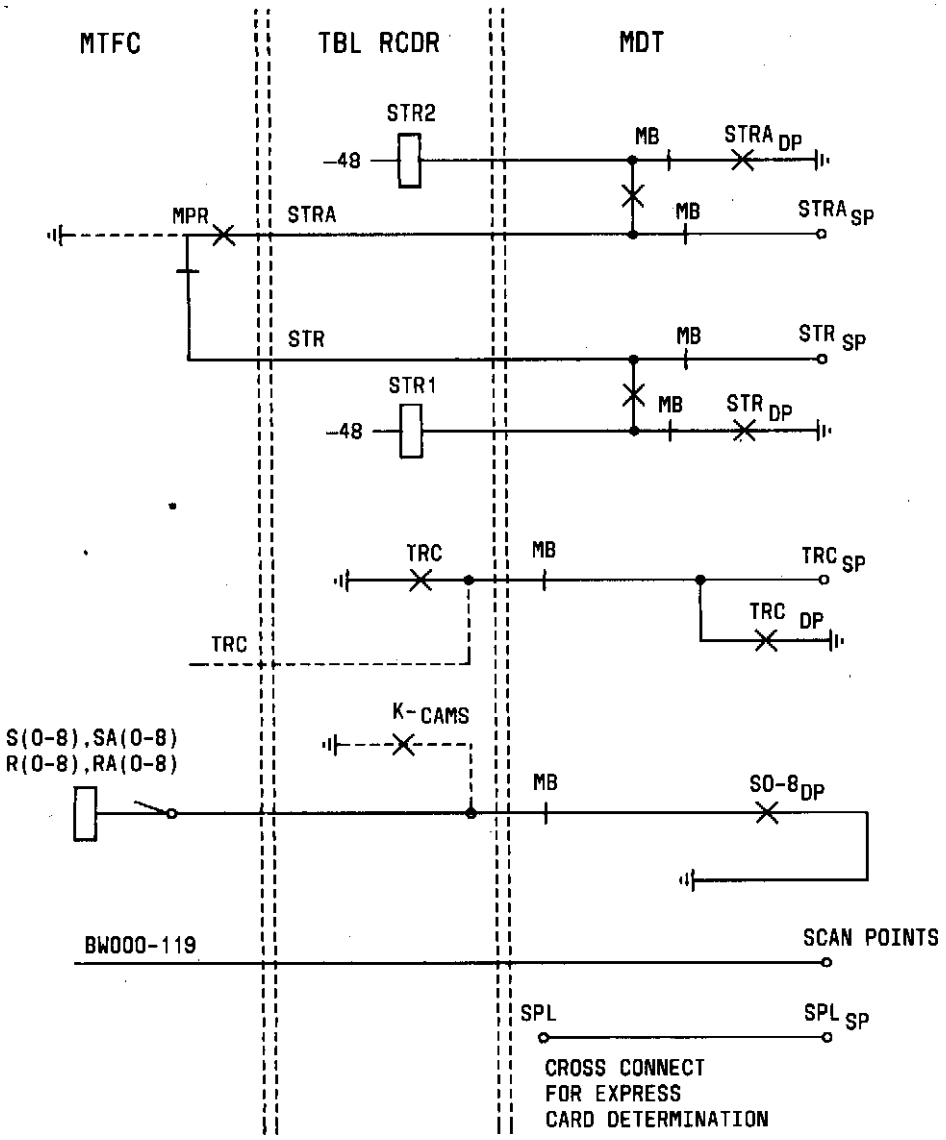


Fig. 3—Trouble Record Circuitry

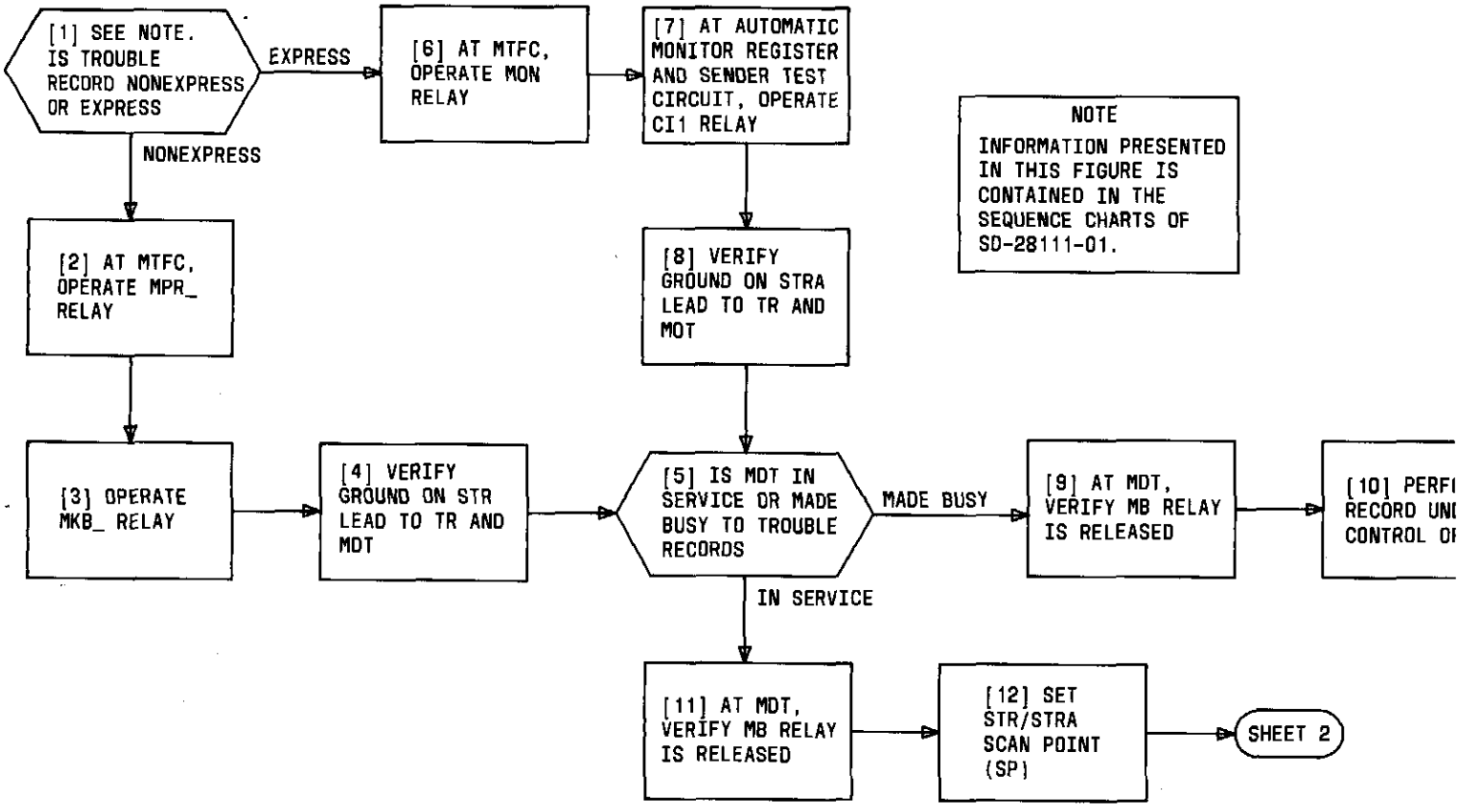


Fig. 4—MDT Interaction with Marker Group (1 of 5)

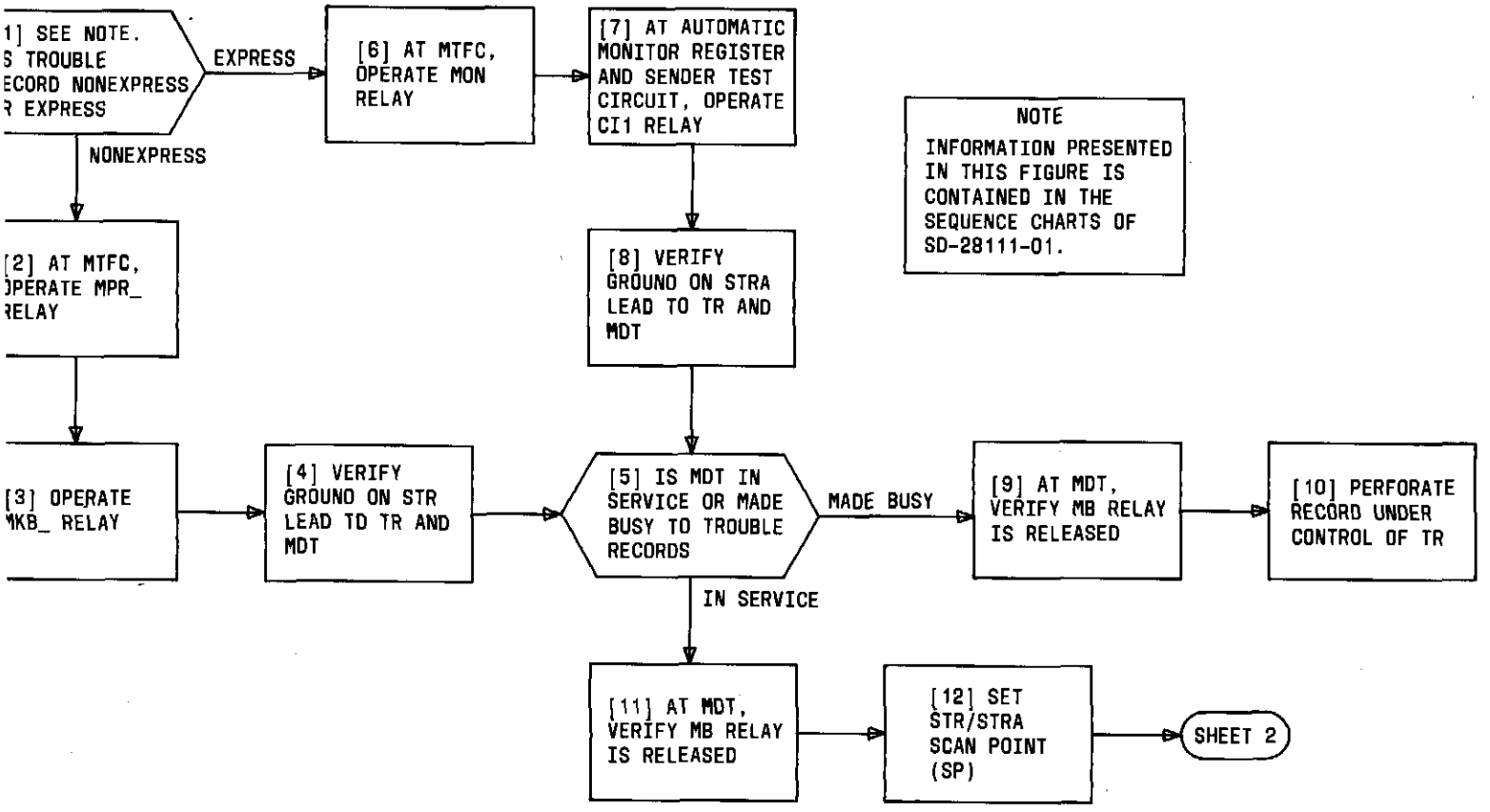
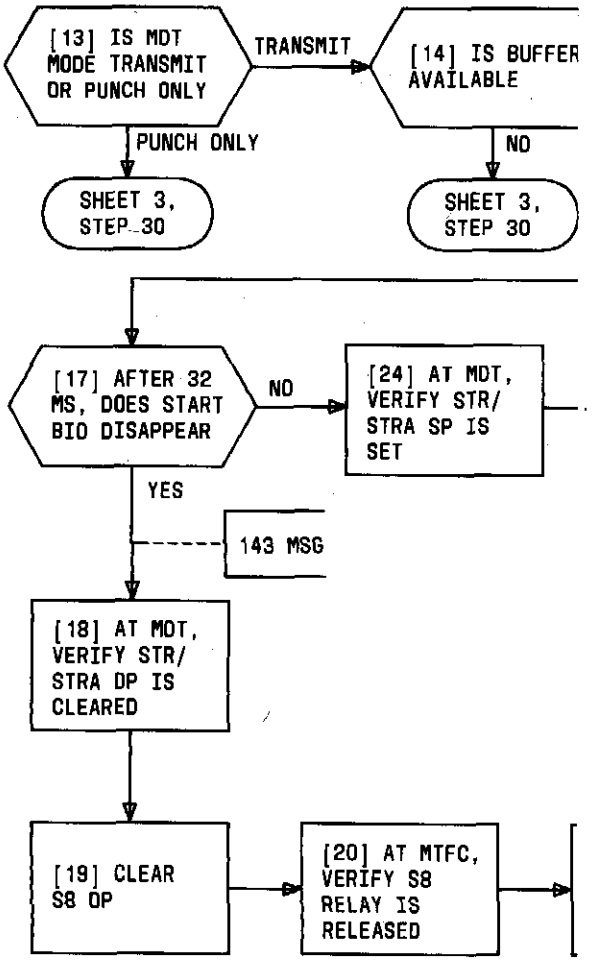


Fig. 4—MDT Interaction with Marker Group (Sheet 1 of 5)


[13] IS MDT MODE TRANSMIT OR PUNCH ONLY
TRANSMIT
[14] IS BUFFER AVAILABLE
PUNCH ONLY
NO
SHEET 3, STEP 30
SHEET 3, STEP 30
[17] AFTER 32 MS, DOES START BID DISAPPEAR
NO
[24] AT MDT, VERIFY STR/ STRA SP IS SET
YES
143 MSG
[18] AT MDT, VERIFY STR/ STRA DP IS CLEARED
[19] CLEAR S8 OP
[20] AT MTFC, VERIFY S8 RELAY IS RELEASED

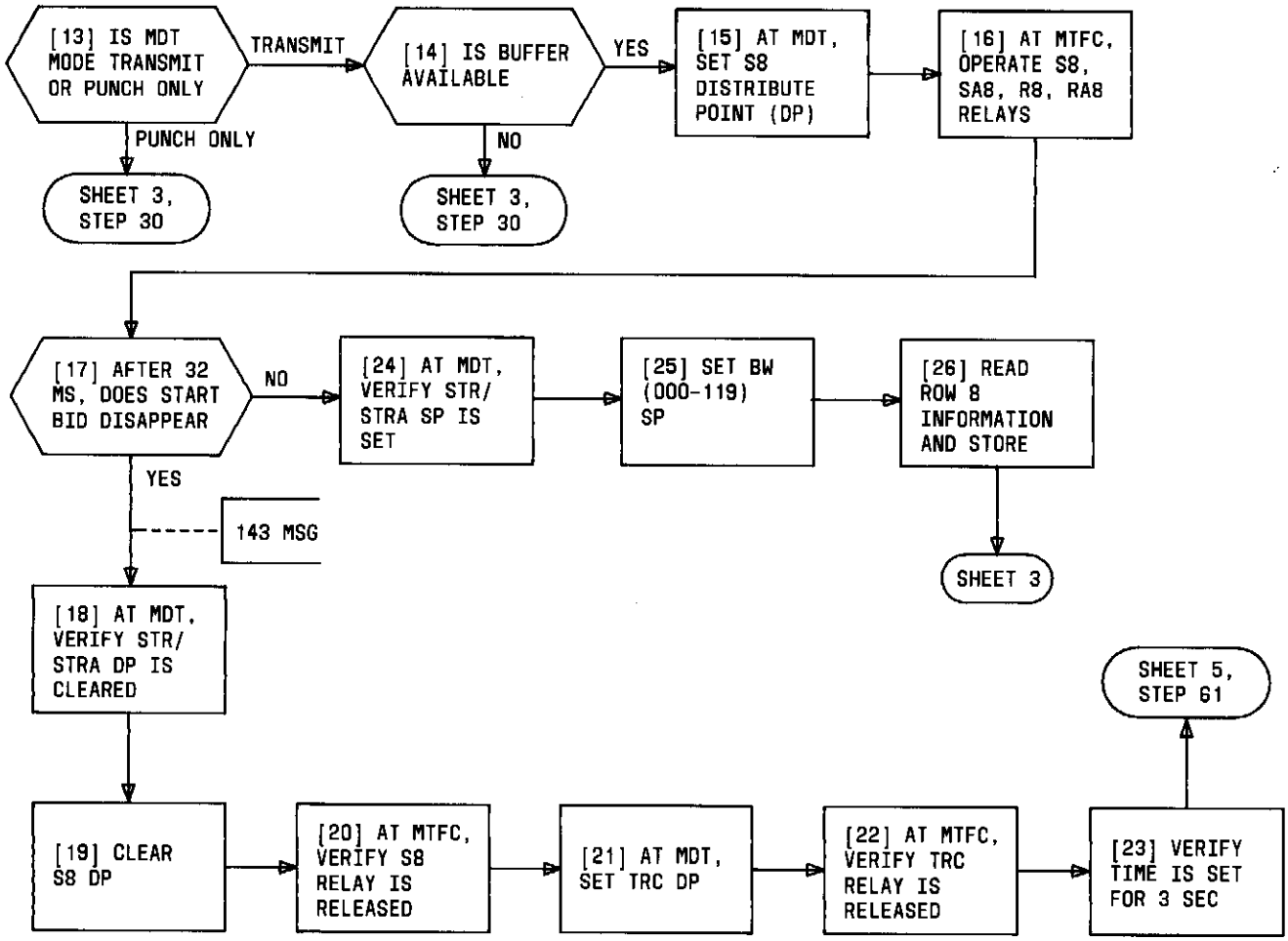
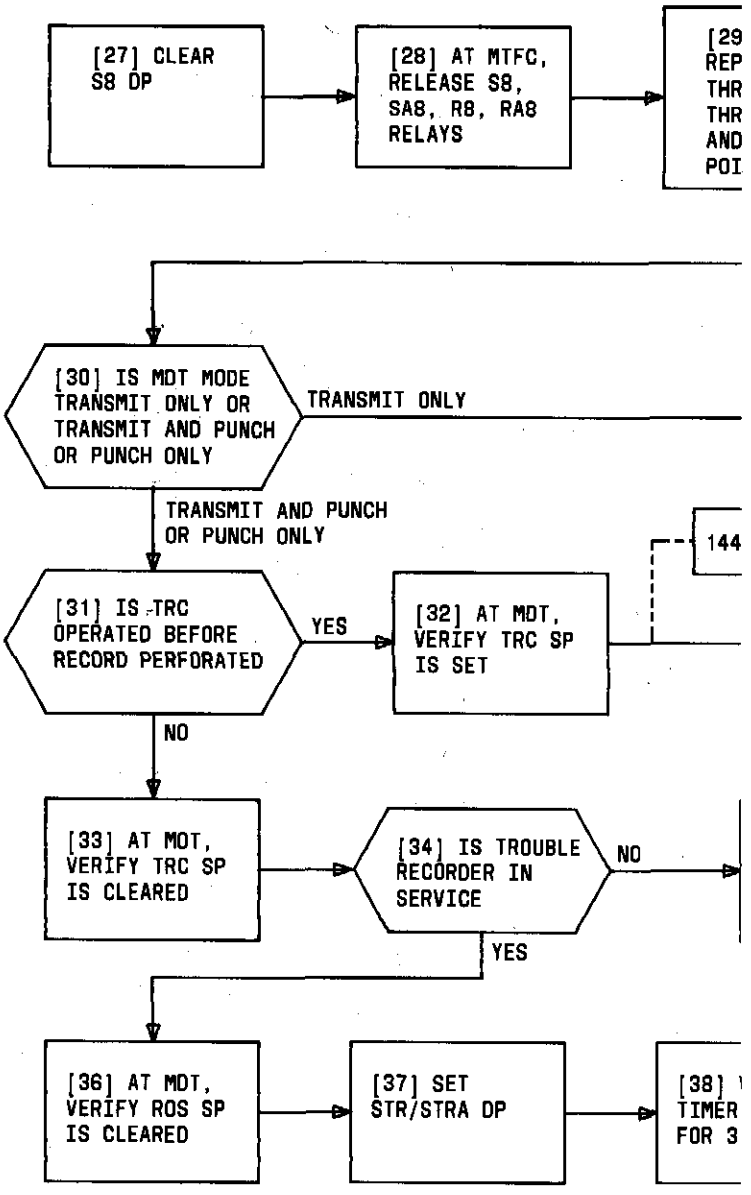


Fig. 4—MDT Interaction with Marker Group (Sheet 2 of 5)


[27] CLEAR S8 DP
[28] AT MTFC, RELEASE S8, SA8, R8, RA8 RELAYS
[29 REP THR THR AND POI
[30] IS MDT MODE TRANSMIT ONLY OR TRANSMIT AND PUNCH OR PUNCH ONLY
TRANSMIT ONLY
TRANSMIT AND PUNCH OR PUNCH ONLY
144
[31] IS TRC OPERATED BEFORE RECORD PERFORATED
YES
[32] AT MDT, VERIFY TRC SP IS SET
NO
[33] AT MDT, VERIFY TRC SP IS CLEARED
[34] IS TROUBLE RECORDER IN SERVICE
NO
YES
[36] AT MDT, VERIFY ROS SP IS CLEARED
[37] SET STR/STRA DP
[38] TIMER FOR 3

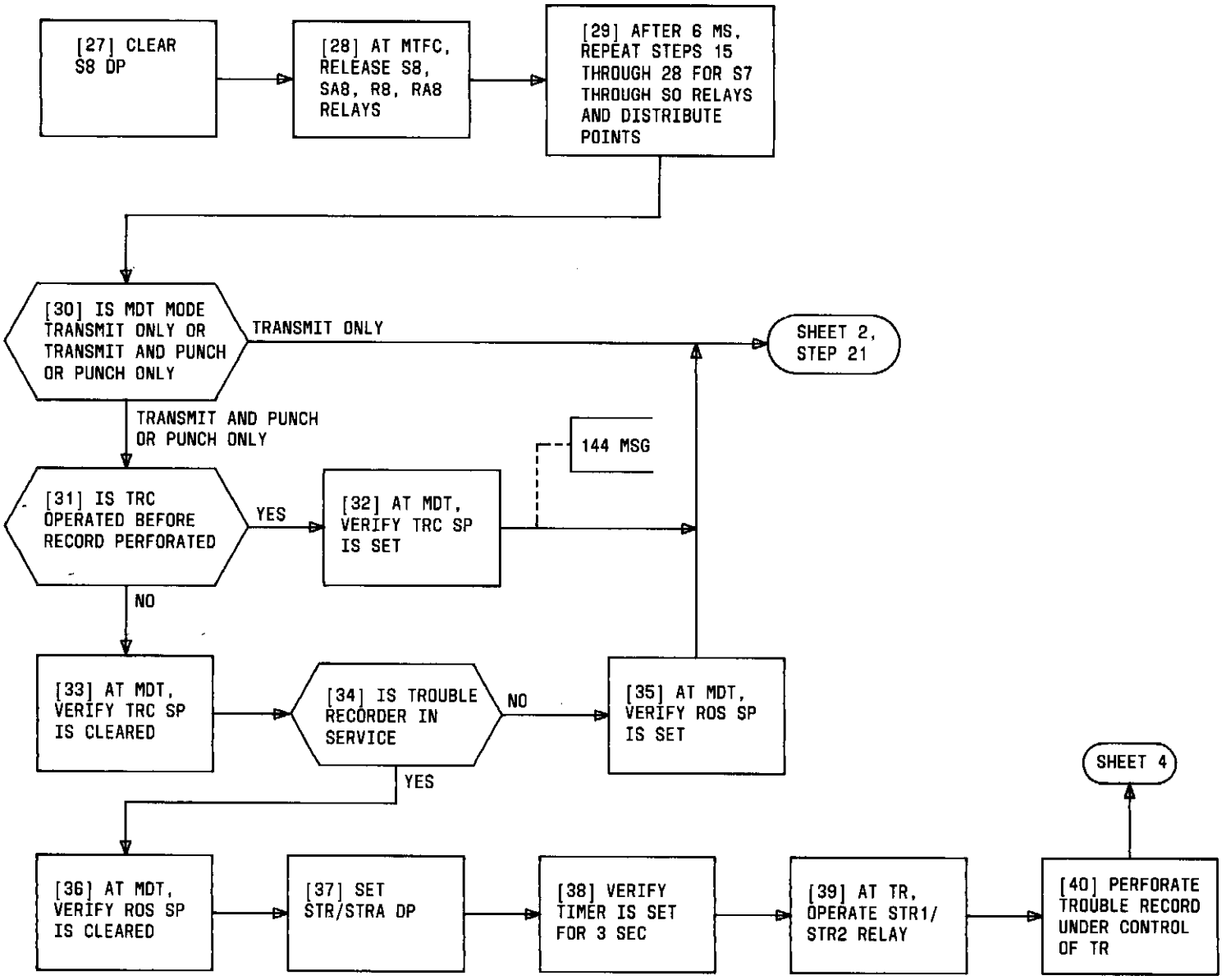
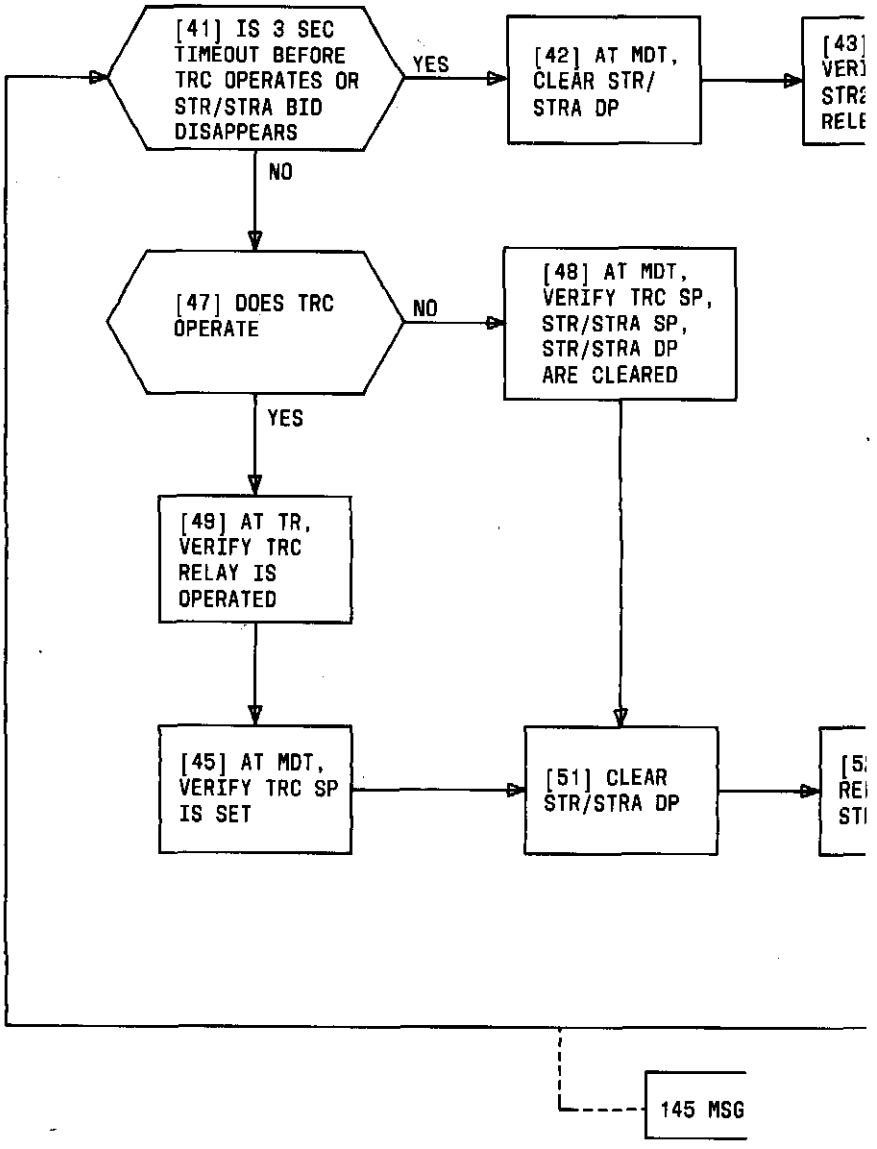


Fig. 4—MDT Interaction with Marker Group (Sheet 3 of 5)


[41] IS 3 SEC TIMEOUT BEFORE TRC OPERATES OR STR/STRA BID DISAPPEARS
YES
[42] AT MDT, CLEAR STR/ STRA DP
NO
[47] DOES TRC OPERATE
NO
[48] AT MDT, VERIFY TRC SP, STR/STRA SP, STR/STRA DP ARE CLEARED
YES
[49] AT TR, VERIFY TRC RELAY IS OPERATED
[45] AT MDT, VERIFY TRC SP IS SET
[51] CLEAR STR/STRA DP
145 MSG

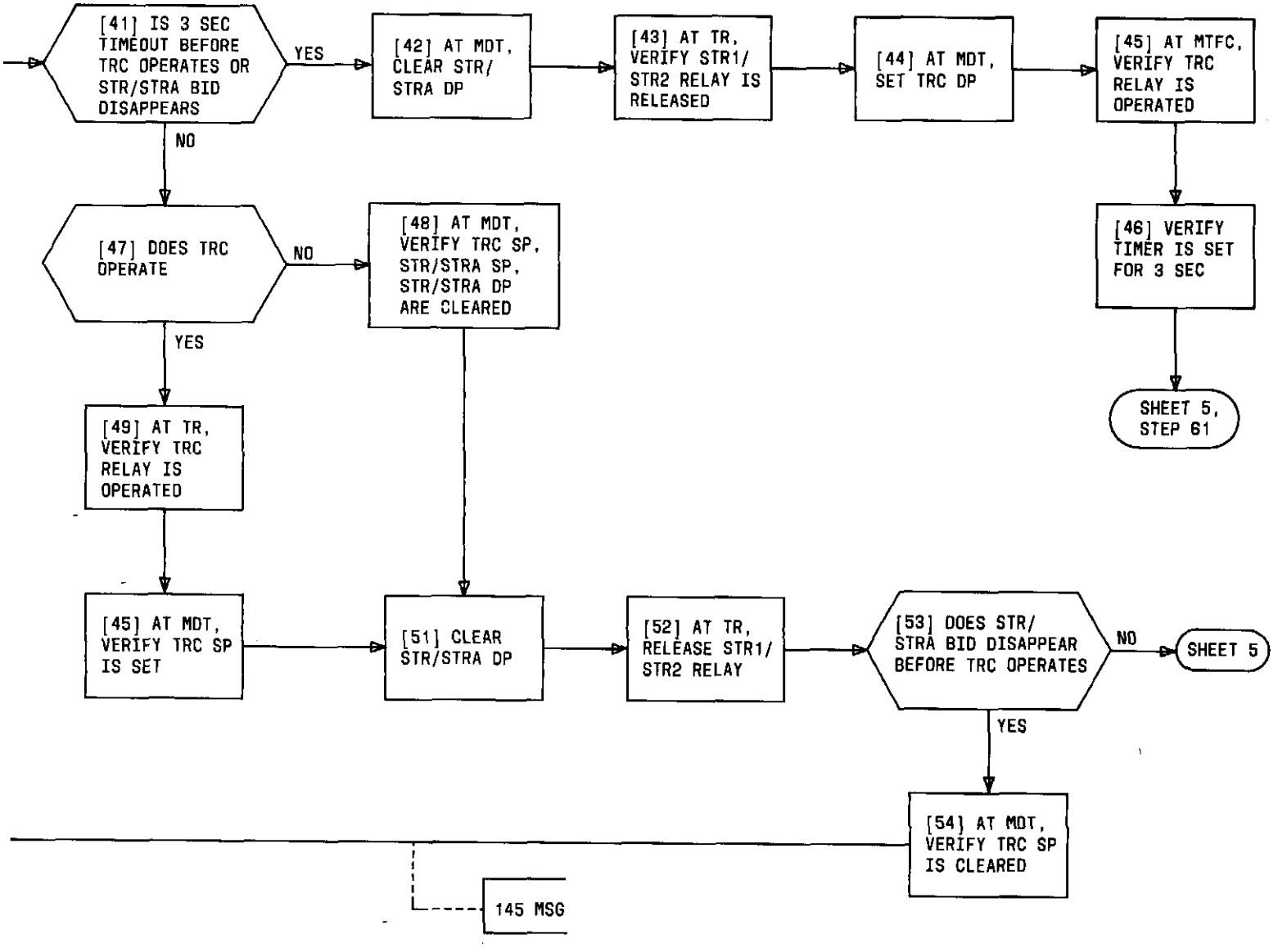
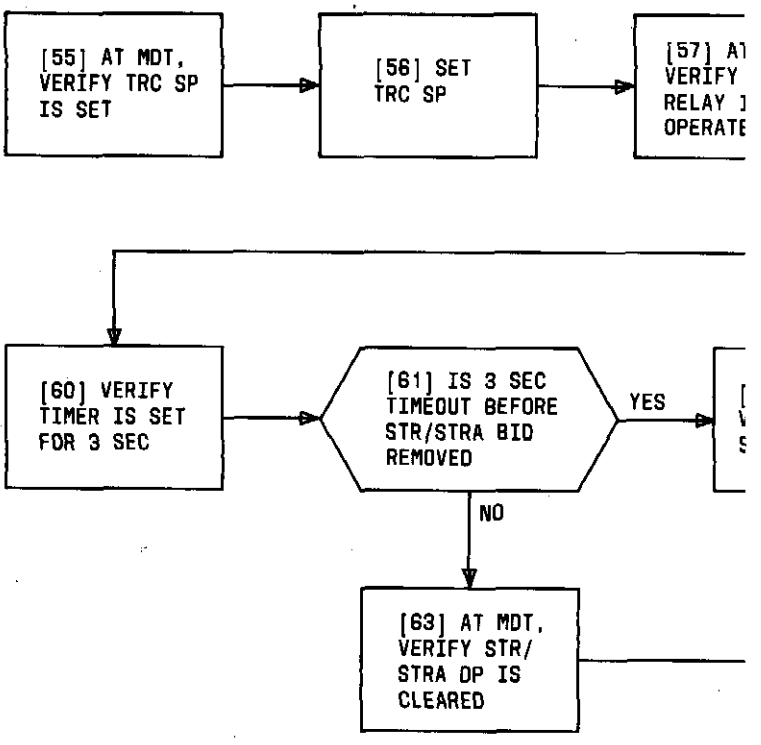


Fig. 4—MDT Interaction with Marker Group (Sheet 4 of 5)


[55] AT MDT, VERIFY TRC SP IS SET
[56] SET TRC SP
[57] AT VERIFY RELAY OPERATE
[60] VERIFY TIMER IS SET FOR 3 SEC
[61] IS 3 SEC TIMEOUT BEFORE STR/STRA BID REMOVED
YES
NO
[63] AT MDT, VERIFY STR/ STRA DP IS CLEARED

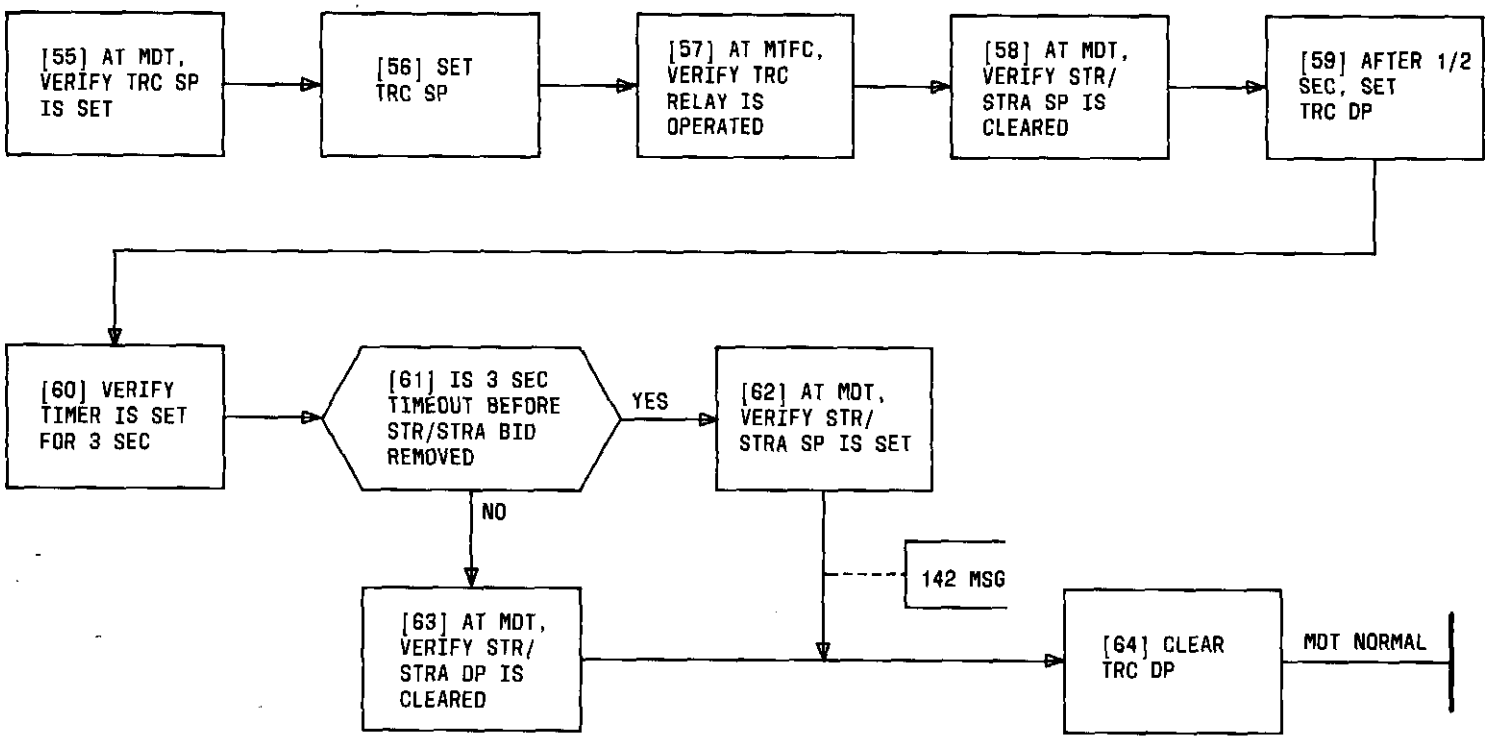
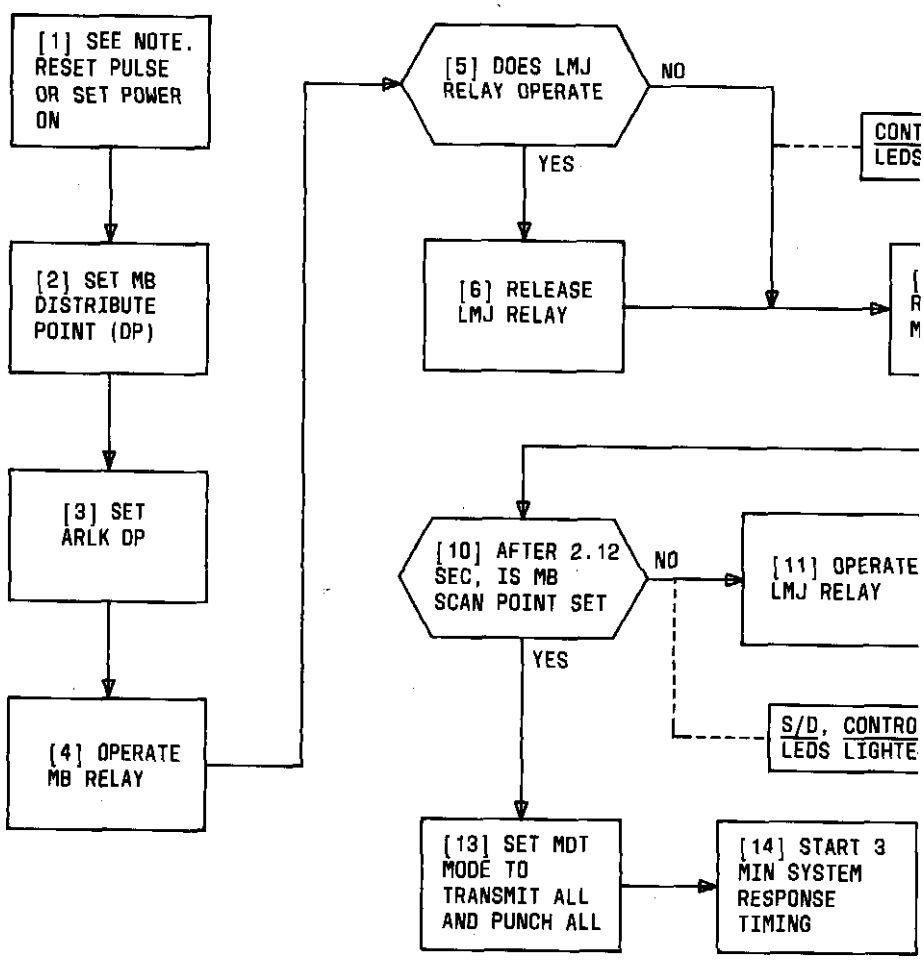


Fig. 4—MDT Interaction with Marker Group (Sheet 5 of 5)


[1] SEE NOTE. RESET PULSE OR SET POWER ON
[2] SET MB DISTRIBUTE POINT (DP)
[3] SET ARLK DP
[4] OPERATE MB RELAY
[5] DOES LMJ RELAY OPERATE
NO
YES
[6] RELEASE LMJ RELAY
[10] AFTER 2.12 SEC, IS MB SCAN POINT SET
NO
YES
[11] OPERATE LMJ RELAY
[13] SET MDT MODE TO TRANSMIT ALL AND PUNCH ALL
[14] START 3 MIN SYSTEM RESPONSE TIMING

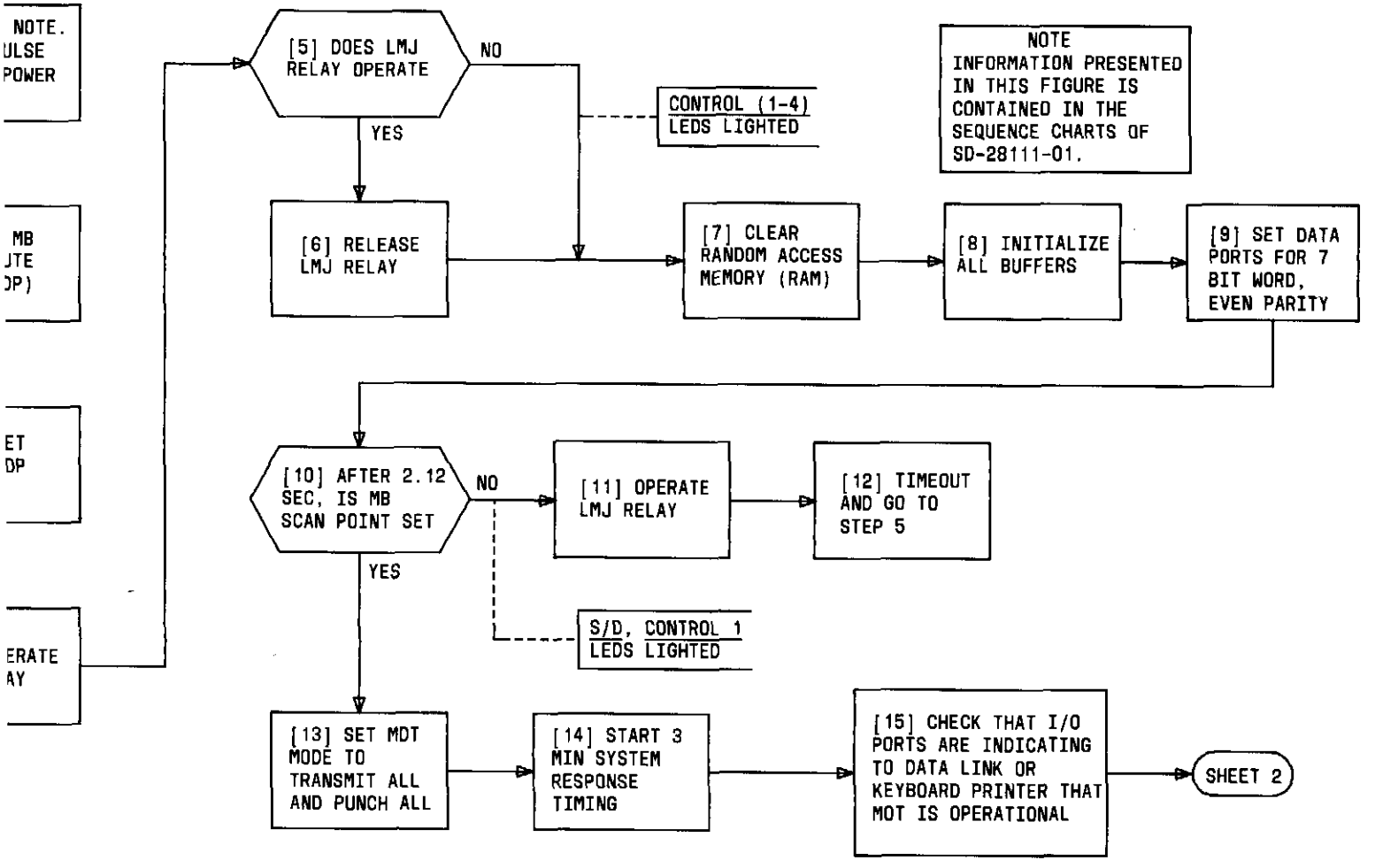
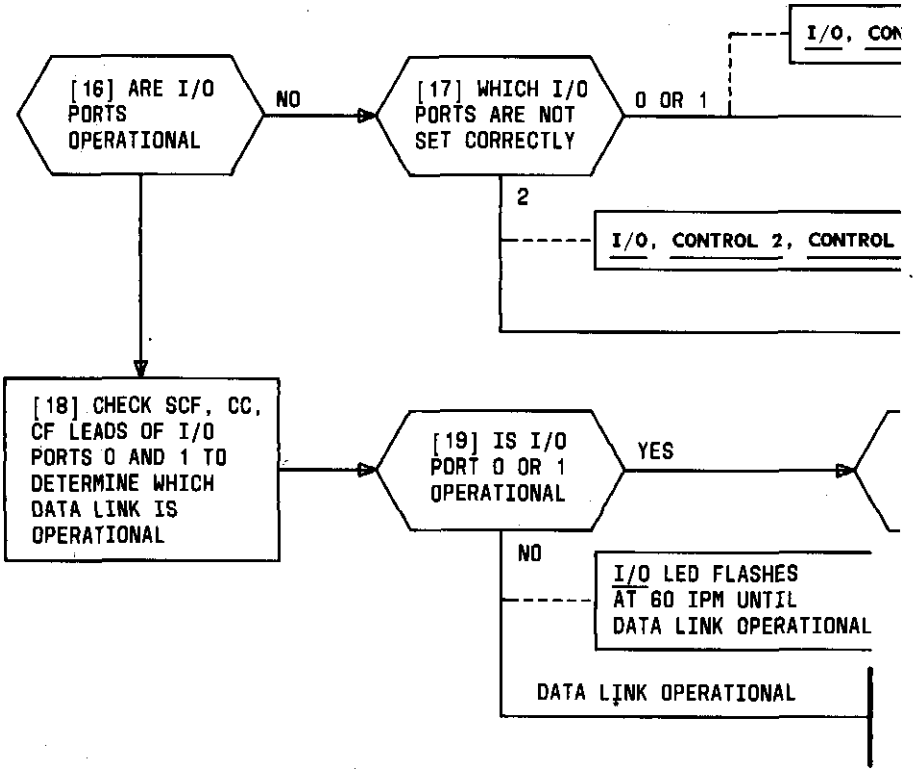
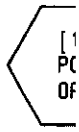
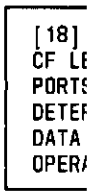


Fig. 5—MDT Initialization (Sheet 1 of 2)



[23] T
MESSAG
INDICA
(INIT)
LINK E
KEYBOA
SERVIC
MB AND


[1
PC
OF


[18]
CF LE
PORTS
DETEF
DATA
OPERA

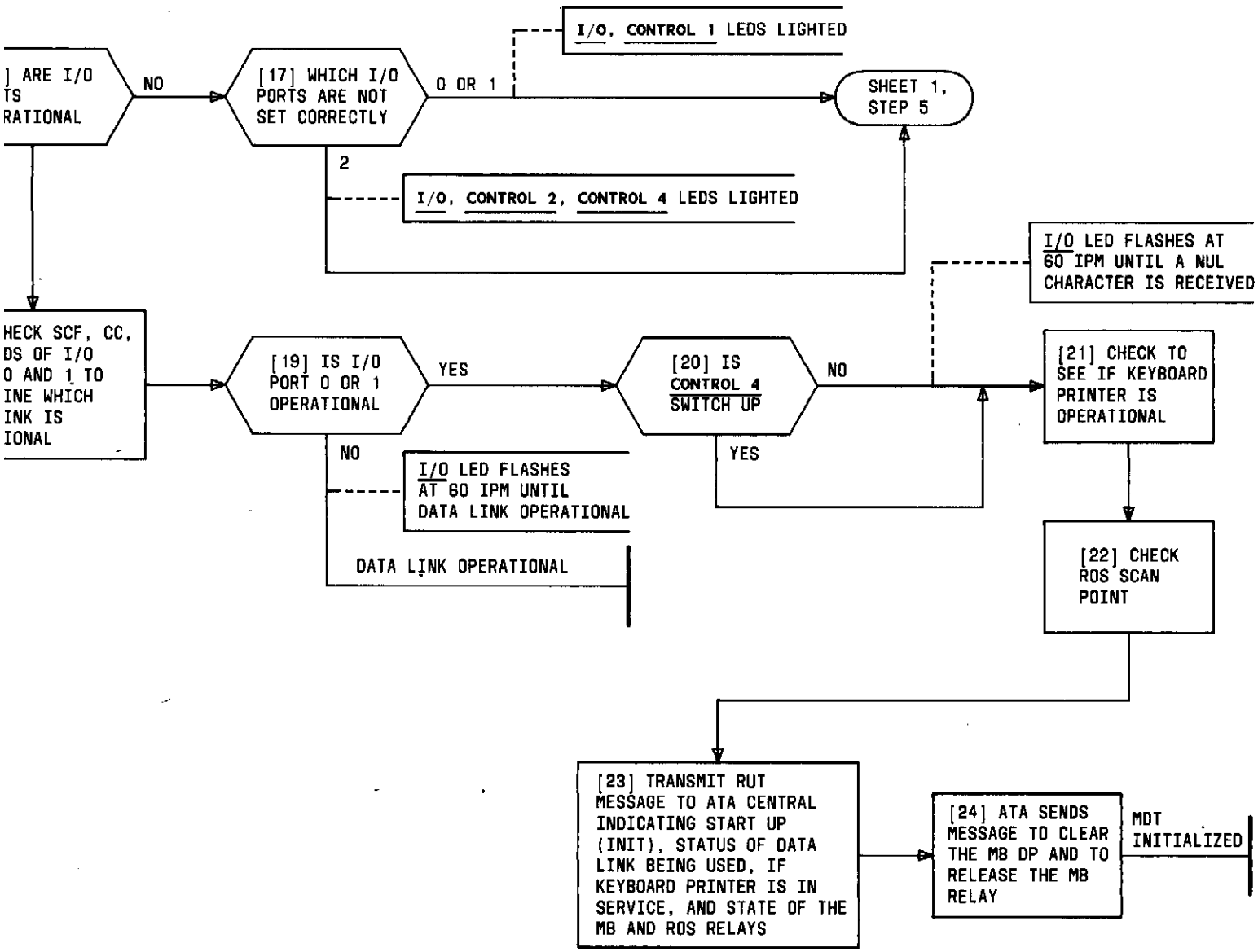


Fig. 5—MDT Initialization (Sheet 2 of 2)

MAINTENANCE DATA TRANSMITTER
TROUBLE-LOCATING PROCEDURE
NO. 5 CROSSBAR

1. GENERAL

1.001 This addendum supplements Section 190-106-301, Issue 2. Place this pink sheet ahead of Page 1 of the section.

1.002 This addendum is reissued to add a maintenance data transmitter (MDT) log (Fig. 1.1).

2. CHANGES TO SECTION

2.001 On Page 2, revise paragraph 3.05 as follows:

If a trouble message has been received at the printer, proceed to Fig. 1. If no MDT trouble message is present, observe and record the programmable scanner distributor (PSD) control panel light-emitting diodes (LEDs) on the MDT log (Fig. 1.1), then proceed to Fig. 2 for troubleshooting procedures.

MAINTENANCE DATA TRANSMITTER (MDT)
PROGRAMMABLE SCANNER DISTRIBUTOR
CONTROL AND DISPLAY PANEL

ALARM LOG

ATA SITE______________________________

STEPS

1. LOG ALL DISPLAYS ON THIS SHEET.
2. PUSH "EX" (EXTINGUISH) BUTTON.
3. IS DISPLAY DOES NOT EXTINGUISH, REFER TO FIG. 2 OF SECTION 190-106-301.
4. IF STEP 3 DOES NOT CLEAR TROUBLE, REFER TO SWITCHING CONTROL CENTER.

CONTROL AND DISPLAY PANEL LEDS									RECEIVED			CLEARED			REFERRED		
FA	MEM	CONT	I/O	S/D	1	2	3	4	DATE	TIME	BY	DATE	TIME	BY	DATE	TIME	BY

Fig. 1.1 — MDT Log