

**1A RADIO DIGITAL TERMINAL (1A-RDT)  
TRANSMITTER TESTS  
DIGITAL TRANSMISSION TERMINALS FOR ANALOG FACILITIES  
ANALOG MULTIPLEX TERMINAL EQUIPMENT**

This section contains the procedures to be followed during initial lineup and trouble-locating of the 1A Radio Digital Terminal (1A-RDT) transmitter processor shelf. Similar procedures for the receiver processor are contained in Section 356-454-502.

This section is reissued to add reference to the FLUKE 8920A RMS voltmeter and the 122J Power Unit (installed in the J68435AC DC/DC CONVERTER SHELF ASSEMBLY). Due to additional technical data and format changes, no revision arrows are used to indicate changes. ***Equipment Test Lists are not affected.***

This section is presented in chart and flowchart form. In the charts, all tests and procedures are fully explained. In the flowcharts, a logical sequence of tests is presented in abbreviated form with steps in the associated chart referenced beside the instruction or information blocks. Either of the presentations may be used; however, it is suggested that only the chart presentation be used until operating and maintenance personnel are familiar with the equipment and gain experience in conducting the tests. As experience is gained in conducting the tests, the flowcharts may be used and the charts referred to when additional information or instruction is needed.

In using the charts, the tests are arranged in a sequence which assumes that all requirements are met. When a particular test fails to meet a requirement, the tester is directed to the appropriate troubleshooting sequence; otherwise, the regular sequence should be continued. This arrangement should allow experienced personnel to proceed more rapidly with testing since they do not need all of the detailed information contained in the steps which tell how the test is to be performed. When either the flowchart or detailed procedure is used, the same requirements apply. It is expected that initially all steps will be performed until the person performing the tests becomes familiar enough with the section to use the flowchart step description. In either case, ***follow the directions*** given in each step in the text. Observe all cautions and notes.

The power tests contained in Chart 1 and Fig. 1 consist of the tests necessary to verify the proper dc input to the transmitting circuits. The 1A-RDT terminal containing the transmitter processor may be equipped with either the J87378 DC/DC CONVERTER (manufacture discontinued) or the 122J POWER UNIT (installed in the J68435AC DC/DC CONVERTER SHELF ASSEMBLY). Initial turnon tests in Chart 2 and Fig. 5 consist of the tests and adjustments necessary to fully evaluate the performance of the transmitter. The figures should be entered at the upper left-hand corner and followed in sequence to completion. Trouble-locating procedures are contained in Chart 3 and Fig. 6. Figure 6 is entered at the left edge and the sequence indicated is followed until a point in the flow path is reached where the alarm indication(s) can be reset or retired satisfactorily and all other test conditions have been met.

Audible and visual office alarms activated during these procedures should be retired by operating the appropriate alarm cutoff key. ***Bay alarm indications other than those specified in a particular step may be activated, but should be disregarded unless a part of the requirement.***

**NOTICE**

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**SECTION 356-454-501**

When it is necessary to replace plug-in circuit packs (or boards), care should be exercised to prevent damage to connectors, etc. **To remove a plug-in circuit pack**, loosen the screws holding the lock and designation strip above the circuit pack and slide the strip to the right until the slots in the strip are aligned with the slots in the shelf. The circuit pack may then be pulled forward for removal. **To insert a plug-in circuit pack into its designated mounting slot**, the procedure is reversed. Each circuit pack is mechanically keyed to prevent insertion into the wrong connector. If a circuit pack does not readily fit into the connector, verify that the circuit pack is the correct one for that particular slot. **DO NOT FORCE.**

When replacement of a circuit pack has no apparent effect, the original circuit pack should be reinstalled in the mounting slot and other possibilities investigated to satisfy alarm conditions. The procedures of all charts assume that all circuit packs used as replacements are in proper working order. During these tests, it may be necessary to remove hairpin plugs for test access to jacks in Chart 2. Unless otherwise directed in the test, the hairpin should be replaced as soon as test access to the jack is no longer required.

After the regular and protection terminal digital processors have been tested, the spare transmitting access panel tests of Chart 4 should be conducted. This test will use the protection terminal output as a signal source.

These tests are applicable to either the regular or the protection transmitting terminal processors. Where a difference exists, it is so noted in the charts and figures.

The tests in this section assume that test personnel are familiar with the operation of the test equipment to be used. If not, the applicable BSPs and/or manufacturer instructions should be referred to for operating procedures.

Patching procedures and switching operations are covered in Section 356-454-300. System transmission performance tests are covered in Sections 356-454-510 (initial) and 356-454-520 (routine).

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**APPARATUS:**

- 1 --Dummy Plug
- 1 --Error Rate Test Set (ERTS), BOWMAR Model 271B
- 1 --Digital Multimeter DATA PRECISION Model 245, KS-20538, L1 or equivalent
- 1 --Oscilloscope, TEKTRONIX 465-Type or Hewlett-Packard 182-Type E W/1801A & 1820C Plug-In Units, or equivalent
- 1 --RMS Voltmeter, Fluke 8920A or Hewlett-Packard 3400A, with 75-ohm option

**Note:** When using either RMS voltmeter, one of the following is required:

Feed-thru termination, TEKTRONIX 011-0055-00 or BNC TEE Adapter with 75-ohm termination

If it is necessary to use a Hewlett-Packard 3400A RMS voltmeter with a 600-ohm option, add +9.0 dB to all meter readings where the 600-ohm meter is used.

- 1 --75-ohm terminating plug coded 46650 Amphenol
- 4 --W1BF Cords (8 inches long)
- 3 --W1BG Cords (5 inches long)

**Note:** When using W1BF or W1BG cords, the contact side of the probe must be to the left when inserted into the test point.

- 1 --P3K Cord (9 feet long with 310 plug on each end)
- 1 --JFD PRODUCTION TOOL 7104-5 (nonmetallic screwdriver)
- 1 --Extender Board, ED-52254-30, G1
- 1 --Piece Part No. 840956619 (KS-7133 cable, 12 inches long with 310 plug on one end and alligator clips on the other)
- 1 --Piece Part No. 840956486 (ED-52118,GC Transformer)
- 1 --Piece Part No. 840956494 (BNC plug on one end and 440A plug on other)
- 1 --Piece Part No. 840956627 (BNC plug on one end and pin plugs on other)
- 1 --100-Ohm Termination plug, KS-20616 on a 310 plug

Miscellaneous Patch Cords, as required.

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## CHART 1

## DC POWER TESTS

This test verifies the proper dc input to all the transmitting circuitry and may be conducted while the transmitter is in service.

This test should be conducted with all circuit packs in place.

This test covers both the J87378 DC/DC CONVERTER (manufacture discontinued) and the 122J POWER UNIT (installed in the J68435AC DC/DC CONVERTER SHELF ASSEMBLY). The steps in this chart accompany the flowchart in Fig. 1.

STEP	PROCEDURE
<b>DC/DC CONVERTER TESTS AND LINE AMPLIFIER VOLTAGE MEASUREMENT</b>	
1	Verify that fuses for the converter are installed and are not blown. If <i>blown</i> , check for defective wiring or unit.
2	Measure the dc input to the converter at the (-) and RTN (GRD) terminals of TB1 located at the rear of the unit.  <b>Requirement:</b> The voltage shall be between -21.0 and -28.0 Vdc.  If the requirement is <i>not</i> met, check the office battery supply, fuses, etc.
3	Measure the voltage between terminals E6 and E5 (GRD), and E3 and E4 (GRD) adjacent to connector J1 (located at the rear of the regular TRANSMITTING ACCESS PANEL).  <b>Requirement:</b> -18.0 ±1.0 Vdc.  If either or both measurements do <i>not</i> meet the requirement, replace the zener diode regulators located adjacent to J1. (Refer to SD-51357).
4	Measure the voltage between terminal 6 and RTN (terminal 5) test points on the J68435AC DC/DC CONVERTER SHELF ASSEMBLY faceplate. (Measure the voltage between +12V and RTN on the J87378 DC/DC CONVERTER faceplate).  <b>Requirement:</b> +12.1 ±0.6 Vdc.
5	Measure the voltage between terminal 4 and RTN (terminal 5) test points on the J68435AC DC/DC CONVERTER SHELF ASSEMBLY faceplate. (Measure between -12V and RTN on the J87378 DC/DC CONVERTER faceplate).  <b>Requirement:</b> -12.1 ±0.6 Vdc.

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**CHART 1 (Contd)**


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STEP	PROCEDURE
6	<p>Measure the voltage between terminal 1 and RTN (terminal 2) test points on the J68435AC DC/DC CONVERTER SHELF ASSEMBLY faceplate. (Measure the voltage between -5V and RTN on the J87378 DC/DC CONVERTER faceplate).</p> <p><b>Requirement:</b> <math>-5.5 \pm 0.15</math> Vdc.</p> <p><b>STATUS VOLTAGE MEASUREMENT (Alarm Relay Voltage)</b></p>
7	<p>Using the digital voltmeter and <b>WIBG</b> cords, measure the voltage between TP7 (GRD) and TP8 (-24V) on the STATUS IND circuit pack TR4 faceplate.</p> <p><b>Requirement:</b> -21.0 to -28.0 Vdc.</p> <p>If the requirement is <b>not</b> met, refer to SD-51357, troubleshoot, and repair.</p>

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**CHART 2****INITIAL TURNON TESTS**

This chart is an out-of-service procedure to be used during initial turnon and lineup of the transmitter prior to its being placed in service initially or after repairs. The steps in this chart accompany the flowchart in Fig. 5. This test assumes that all plug-in circuit packs have been installed in their proper slots and that all hairpin plugs have been installed, as required. Hairpin plugs should **not** be installed in the EQL OUT—LINE IN jacks during initial tests.

Alarm circuit tests are conducted by performing various functions to cause the alarm circuits to sense a failure and give the appropriate alarm indications. Light emitting diodes (LEDs), located on the status indicator (STATUS IND) circuit pack TR4, light to indicate the alarm condition. These LEDs are designated TROUBLE TYPE (TT) 1, 2, 3, 4, and PRV RATE (arbitrarily designated TT5). All indicators **except** TT5, must be reset by momentarily operating the the IND RESET pushbutton key on TR4. Some of the alarm indications are delayed by internal circuitry in the monitoring system.

If a trouble is found while conducting these tests and the condition is not eliminated during the tests, the trouble-locating tests of Fig. 6 and/or Chart 3 should be referred to. After effecting repairs, the entire test, including the power tests of Chart 1 and/or Fig. 1, should be reconducted. During initial installation tests of the first regular terminal(s) and the protection terminal, regular terminal A should be tested first; then the protection terminal; then terminals B, C, D, etc. When all terminals have been tested, the spare access panel should be tested according to Chart 4.

## CHART 2 (Contd)

STEP	PROCEDURE
1	Conduct DC Power Tests of Chart 1.
2	Using ERTS, inject a Quasi-Random DS-1 signal into the 1A-RDT IN jack (for the transmitter under test) at the DSX-1 location.
3	Using piece part number 840956619 and the oscilloscope connected as shown in Fig. 2A, verify that the DS-1 signal at the PAD OUT jack on the regular TRANSMITTING ACCESS PANEL is of the proper level and shape as depicted in Fig. 2B. Leave the oscilloscope connected through Step 5. If the level and/or shape is incorrect, check for defective wiring and improper operation or termination of the switching matrix.
4	Establish a head-end bridge to the regular terminal used in the test or under test. (Switching procedures are covered in Section 356-454-300).
5	With the oscilloscope connected as in Step 3, verify that the DS-1 signal amplitude and general shape remain basically the same when the head-end bridge was established in Step 4. <ul style="list-style-type: none"><li data-bbox="310 995 1430 1054">(a) If a change in the level or shape occurs, check for defective wiring and/or improper operation or termination in the switching matrix.</li><li data-bbox="310 1089 1430 1115">(b) If no change occurred, disconnect the oscilloscope and release the head-end bridge.</li></ul>
6	Is terminal X under test? <ul style="list-style-type: none"><li data-bbox="310 1209 675 1234">(a) If YES, proceed to Step 7.</li><li data-bbox="310 1270 675 1295">(b) If NO, proceed to Step 9.</li></ul>
7	Switch the regular terminal used in the test to protection terminal X.
8	Terminate the oscilloscope into 100 ohms and, using piece part number 840956619 for access, verify the level and shape of the DS-1 signal at the TERMINAL X TRANSMITTING SW OUT jack on the SWITCH STATUS AND CONTROL Panel. (See Fig. 2.) <ul style="list-style-type: none"><li data-bbox="310 1520 1430 1545">(a) If the DS-1 signal is <b>correct</b>, disconnect the oscilloscope and proceed to Step 9.</li><li data-bbox="310 1581 1430 1640">(b) If the signal is <b>not correct</b>, check for faulty wiring and/or improper operation or termination of the switching matrix.</li></ul>
9	Using <b>WIBF</b> cords, strap between TP9 and TP10 and between TP11 and TP12 on the STATUS IND circuit pack TR4. This procedure keeps a steady alarm indication present. Operate the ACO key to silence the audible alarm.

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 CHART 2 (Contd)
 

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STEP	PROCEDURE
10	<p>Read all of Step 10 before proceeding. Using a <b>WIBF</b> cord, momentarily strap between TP1 and TP2 on TR4, TP1 and TP3, TP1 and TP4, TP1 and TP5, and TP1 and TP6, respectively. See <b>Note</b>.</p> <p>(a) Operate the IND RESET key after the cord is removed from each test point.</p> <p><b>Requirement:</b> As the test probe is inserted into each set of test points, in turn, TT5, TT4, TT3, TT2, and TT1, respectively, shall light and shall remain lighted upon removal of the cord until the IND RESET key is operated—<b>except</b> TT5, which should extinguish as the probes are removed.</p> <p>(b) If the requirement is <b>not</b> met, replace TR4 and reconduct Steps 9 and 10.</p>
11	<p><b>Note:</b> There may be an existing alarm indication when this step is begun. If so, the indicating LED should extinguish momentarily as the IND RESET key is operated. If this is the case, continue with the steps of this chart until the LED extinguishes and remains OFF. (For example, if TT4 is ON as this step is begun, it should be capable of being extinguished as Step 43 is conducted.)</p> <p>Depress the IND RESET pushbutton. Is TT1 OFF?</p> <p>(a) If YES, proceed to Step 12.</p> <p>(b) If NO, use the TT1 trouble-locating procedure of Chart 3 and/or Fig. 6 to isolate the condition.</p>
12	<p>While observing the TT1 indicator, remove the DS-1 signal at the DSX-1 location <b>or</b> insert a dummy plug into the <b>normally through</b> DIG PROC IN jack, as appropriate, for the unit under test.</p> <p><b>Requirement:</b> TT1 should light after approximately 10 seconds.</p> <p>(a) If TT1 lights, proceed to Step 13.</p> <p>(b) If TT1 does <b>not</b> light, replace the STORE MONITOR circuit pack T8. If TT1 <b>still does not</b> light, replace the STATUS IND TR4 and repeat Steps 9 and 10. Reset the alarms and if TT1 is <b>still not</b> lighted, use the applicable schematic drawing (SD) and Fig. 7 to aid in isolating and repairing the trouble condition.</p>
13	Restore the DS-1 signal.
14	<p>Depress the IND RESET pushbutton. Is TT1 OFF?</p> <p>(a) If YES, proceed to Step 15.</p> <p>(b) If NO, use the TT1 trouble-locating routine of Chart 3 and/or Fig. 6.</p>

## CHART 2 (Contd)

- | STEP | PROCEDURE  |
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| 15   | Using <b>WIBG</b> cords and the test setup of Fig. 3A, adjust the oscilloscope, as required, to obtain an indication similar to Fig. 3B.<br><br>(a) If the indication does <b>not</b> closely resemble Fig. 3B <b>or</b> if the pulses are jittered as in Fig. 3C, replace the TRMTR TIMING circuit pack T9 and reconduct Step 15.<br><br>(b) Upon completion of this step remove the test connections.                                |
| 16   | Depress the IND RESET pushbutton. Is TT3 OFF?<br><br>(a) If YES, proceed to Step 17.<br><br>(b) If NO, use the TT3 trouble-locating routine of Chart 3 and/or Fig. 6.  |
| 17   | While observing the TT3 indicator, using a <b>WIBF</b> cord, strap between TP1 and TP2 on the STORE MEMORY circuit pack T7.  |
| 18   | Is TT3 ON after approximately 15 seconds?<br><br>(a) If YES, proceed to Step 19.<br><br>(b) If NO, replace the STORE MONITOR T8 and repeat Steps 12 through 14. If <b>still not</b> lighted, replace the STATUS IND TR4 and repeat Step 10. Reset the alarms and if TT3 is <b>still not</b> lighted, use the applicable schematic drawing and Fig. 7 to isolate and repair the trouble condition. When TT3 lights, proceed to Step 19. |
| 19   | Remove the strap at T7.  |
| 20   | Depress the IND RESET pushbutton. Is TT3 OFF?<br><br>(a) If YES, proceed to Step 21.<br><br>(b) If NO, use the TT3 trouble-locating routine of Chart 3 and/or Fig. 6.  |
| 21   | Adjust timing of DIGITAL CMPRTR TR3.<br><br>(a) Using 2 <b>WIBG</b> cords for test point access, connect the digital voltmeter between TP2 and TP1 (GRD) on the DIGITAL CMPRTR circuit pack TR3.<br><br>(b) Using a <b>WIBF</b> cord, strap between TP7 (GRD) and TP8 of TR3. Observe the voltmeter indication.  |

**Requirement:** The voltmeter shall indicate  $-0.5$  to  $-0.9$  Vdc.

If the requirement is **not** met, replace the DIGITAL CMPRTR circuit pack TR3 and repeat this step.

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**CHART 2 (Contd)**


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STEP	PROCEDURE
	<p>(c) Read (d) and (e) before proceeding. Using a <b>WIBF</b> cord, strap between TP1 and TP2 on the STATUS IND circuit pack TR4.</p> <p>(d) Momentarily remove and reinsert the probe in TP8 of TR3 and observe the voltmeter.</p> <p><b>Requirement:</b> The voltmeter shall indicate <math>-1.4</math> to <math>-1.8</math> Vdc. The PRV RATE LED on TR4 (TT5) should light, if not already lighted.</p> <p>(e) With a stopwatch, or clock that indicates seconds, observe the time while also observing the voltmeter for a logic 1 (<math>-0.5</math> to <math>-0.9</math> Vdc) indication to reappear.</p> <p><b>Requirement:</b> The elapsed time between the voltmeter indication of <math>-1.4</math> to <math>-1.8</math> Vdc and returning indication of <math>-0.5</math> to <math>-0.9</math> Vdc shall be <math>25 \pm 5</math> seconds.</p> <p>(f) If the requirement is met, remove the test connections and proceed to Step 22.</p> <p>(g) If the requirement is <b>not</b> met, adjust the TIMER SET adjustment on TR3 (CW=increase time) and reconduct (b) through (e) until the requirement is met. If the adjustment has no appreciable control, replace TR3 and repeat Step 21.</p>
22	<p>Is TT5 OFF?</p> <p>(a) If YES, proceed to Step 23.</p> <p>(b) If NO, use the TT5 trouble-locating routine of Chart 3 and/or Fig. 6.</p>
23	<p>Depress the IND RESET pushbutton. Is TT2 OFF?</p> <p>(a) If YES, proceed to Step 24.</p> <p>(b) If NO, use the TT2 trouble-locating routine of Chart 3 and/or Fig. 6.</p>
24	<p>While observing the TT2 indicator, using a <b>WIBF</b> cord, strap between TP4 and TP2 on the SCRAMBLER circuit pack T1 (or T1A).</p>
25	<p>Is TT2 ON after approximately 10 seconds?</p> <p>(a) If YES, proceed to Step 26.</p> <p>(b) If NO, replace the STATUS IND circuit pack TR4 and reconduct Steps 10, 12 through 14, and 17 through 20, respectively. Reset the alarms. If TT2 <b>still does not</b> light after the delay, replace the DIGITAL CMPRTR (TR3) and reconduct Step 21. Reset the alarms and if TT2 <b>still does not</b> light after the delay, use the applicable schematic drawing and Fig. 7 to isolate and repair the trouble condition. When TT2 lights, proceed to Step 26.</p>

## CHART 2 (Contd)

STEP	PROCEDURE
26	Remove the strap on the SCRAMBLER T1 (or T1A).
27	Depress the IND RESET pushbutton. Is TT2 OFF?  (a) If YES, proceed to Step 28.  (b) If NO, use the TT2 trouble-locating procedures of Chart 3 and/or Fig. 6.
28	While observing the TT2 indicator, using a <b>WIBF</b> cord, strap TP1 to TP2 on BNY TO ML CONV T5.
29	Is TT2 ON after approximately 10 seconds?  (a) If YES, proceed to Step 30.  (b) If NO, replace the DIGITAL CMPRTR TR3 and reconduct Step 21. If TT2 <b>still does not</b> light, refer to the applicable schematic drawing and Fig. 7 to isolate and repair the trouble condition. If TT2 <b>does</b> light, remove the strap at T5 and reconduct Steps 24 through 27. When TT2 lights, proceed to Step 30.
30	Is TT5 ON?  (a) If YES, proceed to Step 31.  (b) If NO, replace the VIOLATION DETECTOR TR2. If TT5 is <b>still not</b> lighted, replace the STATUS IND TR4 and reconduct Steps 10, 12 through 14, 17 through 20, and 24 through 27, respectively. If TT5 is <b>still not</b> lighted, use the applicable schematic drawing and Fig. 7 to isolate and repair the trouble condition. When TT5 lights, proceed to Step 31.
31	Remove the strap at T5.
32	Depress the IND RESET pushbutton. Is TT2 OFF?  (a) If YES, proceed to Step 33.  (b) If NO, use the TT2 trouble-locating routine of Chart 3 and/or Fig. 6.
33	Using piece part number 840956494 and the RMS voltmeter (in LOW RANGE ENABLE, and DBM REF 75Ω), measure the data signal power level at the DIG PROC OUT jack (terminated measurement) for the transmitter under test. Record the level measured for later use.  <b>Requirement:</b> -9.0 dBm ±1.0 dB.  (a) If the requirement is met, replace the hairpin plug and proceed to Step 34.

## CHART 2 (Contd)

STEP	PROCEDURE
	<p>(b) If the requirement is <i>not</i> met, replace the BNY TO ML CONV T5 and reconduct this step. If the requirement is <i>still not met</i>, replace the ML SIG &amp; PLT MON T6 and reconduct this step. If the requirement <i>still cannot</i> be met, refer to the applicable schematic drawing and Fig. 7 to isolate and repair the trouble condition.</p>
34	<p>Connect the RMS voltmeter to the FLT IN MULT jack (unterminated) and measure the data signal power level. Leave the meter connected.</p> <p><b>Requirement:</b> <math>-9.0 \text{ dBm} \pm 1.0 \text{ dB}</math>. There should be no appreciable change in this level measured and that recorded in Step 33.</p>
35	<p>Remove the hairpin plug between the DIG PROC OUT jack and the SW IN jack of the terminal under test, observe the voltmeter indication, then reinsert the hairpin plug.</p> <p><b>Requirement:</b> The meter shall indicate loss of signal (less than <math>-50.0 \text{ dBm}</math>) while the plug is removed.</p>
36	<p>Remove the hairpin plug from the FLT OUT and EQL IN jack, move the RMS voltmeter connection to the FLT OUT jack, and measure the signal level (terminated). Record the level measured.</p> <p><b>Requirement:</b> <math>-16.5 \text{ dBm} \pm 1.5 \text{ dB}</math>.</p> <p>(a) If the requirement is met, replace the hairpin plug and proceed to Step 37.</p> <p>(b) If the requirement is not met, check the common equipment between FLT IN and FLT OUT jacks.</p>
37	<p>Connect the RMS voltmeter to the FLT OUT MULT jack (unterminated) and measure the data signal power.</p> <p><b>Requirement:</b> <math>-16.5 \text{ dBm} \pm 1.5 \text{ dB}</math>.</p> <p>(a) If the requirement is met, proceed to Step 38.</p> <p>(b) If the requirement is not met, check the common equipment between FLT IN and FLT OUT jacks.</p>
38	<p>Using piece part number 840956486, a 124-ohm balanced cable, and the RMS voltmeter terminated (8920A in LOW RANGE ENABLE), connect the voltmeter to the EQL OUT jack. Adjust the <b>LEV ADJ</b> control on the LINE AMPL (REDUNDANT) for an indication of <math>-11.0 \text{ dBm}</math>.</p>
39	<p>Using the RMS voltmeter and an 840956627 cable assembly, measure the level (unterminated) between TPA and GRD, and TPB and GRD on the LINE AMPLIFIER (REDUNDANT) faceplate.</p>

## CHART 2 (Contd)

STEP	PROCEDURE
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**Requirement:** There shall be no more than 3.0 dB difference in the two indications. If the requirement is not met, replace the amplifier and repeat Step 39.

- 40 With the RMS voltmeter connected as in Step 38, use a **WIBF** cord to strap between TP4 and TP2 on the SCRAMBLER T1 (or T1A) and measure the level received.

**Requirement:** The level shall be 18.0 dB below the data signal measured in Step 38.

- (a) If the requirement *is* met, disconnect the RMS voltmeter and remove the strap on SCRAMBLER T1 (or T1A), then proceed to Step 41.
- (b) If the requirement is not met, remove the BNY TO ML CONV T5, place it into an extender board, and insert the extender board into the T5 mounting slot. Adjust the potentiometer R18 to meet the requirement. When the requirement is met, reinstall BNY TO ML CONV T5 into its mounting slot and remove the strap on SCRAMBLER T1 (or T1A). Disconnect the RMS voltmeter and proceed to Step 41.
- (c) If the requirement is not met by adjustment in (b), replace BNY to ML CONV T5. Remove the strap on SCRAMBLER T1 (or T1A). Reconduct Steps 38 and 40. If the requirement still cannot be met, replace TRMTR TIMING T9 and reconduct Steps 38 and 40.

- 41 Using the digital voltmeter and **WIBG** cords, connect the common probe of the voltmeter to TP7(GRD) and the voltage probe to TP11 on the ML SIG & PLT MON circuit pack T6. Adjust the PILOT LEV ADJ (or PLT DET as applicable to the designation on the T6 installed) control on T6 for an indication of  $-3.0$  Vdc.

- (a) If the adjustment can be made, disconnect the meter and proceed to Step 42.
- (b) If the adjustment cannot be made, replace T6 and repeat Steps 38 and 41.

- 42 Calibrate the multilevel detector.

- (a) Using **WIBG** cords for test point access, connect the common probe of the digital voltmeter to TP1(GRD) of the ML SIG & PLT MON circuit pack T6 and the voltage probe to TP4.
- (b) Measure and record the voltage indicated (typically  $-0.7$  Vdc).
- (c) Using a **WIBF** cord, strap TP1 to TP3 of the BNY TO ML CONV circuit pack T5 and measure the voltage measured between TP1 and TP4 on T6. Record the voltage measurement.
- (d) Remove the probe from TP4 on T6 and insert it into TP6.
- (e) Adjust the ML DET 1 control on T6 to approximately midway between the voltage recorded in (b) and (c).

## CHART 2 (Contd)

STEP	PROCEDURE
	<p>(f) Remove the strap on BNY TO ML CONV T5.</p> <p>(g) Remove the voltmeter probe from TP6 on ML SIG &amp; PLT MON T6 and reinsert it into TP4.</p> <p>(h) Measure and record the voltage indicated.</p> <p>(i) With a <b>WIBF</b> cord, strap between TP1 and TP2 of the BNY TO ML CONV T5 and measure and record the voltage indicated on the voltmeter.</p> <p>(j) Remove the meter probe from TP4 and insert it into TP2 of ML SIG &amp; PLT MON T6.</p> <p>(k) Adjust the ML DET 2 control on T6 to approximately midway between the voltages recorded in (h) and (i).</p> <p>(l) If any of the adjustments <b>cannot</b> be satisfactorily made, replace the ML SIG &amp; PLT MON circuit pack T6 and reconduct Steps 38, 41, and 42. When the adjustments <b>can</b> be satisfactorily made, proceed to Step 43. <b>Remove all test connections made in this step.</b></p>
43	Depress the IND RESET pushbutton. Is TT4 OFF?
	<p>(a) If YES, proceed to Step 44.</p> <p>(b) If NO, use the TT4 trouble-locating routine of Chart 3 and/or Fig. 6 to isolate and repair the trouble condition.</p>
44	Read Step 45, then using a <b>WIBF</b> cord, strap between TP1 and TP2 on TRMTR TIMING T9.
45	Is TT4 ON after approximately 10 seconds?
	<p>(a) If YES, proceed to Step 46.</p> <p>(b) If NO, replace the STATUS IND circuit pack TR4 and repeat Steps 10, 12 through 14, 17 through 20, and 24 through 27, respectively. Reset the alarms and if TT4 does <b>not</b> light after a delay, replace the ML SIG &amp; PLT MON circuit pack T6 and reconduct Step 38 and Steps 41 through 43. If TT4 <b>still does not</b> light after a delay, use the applicable schematic drawing and Fig. 7 to isolate and repair the cause of improper TT4 operation. When TT4 lights properly, proceed to Step 46.</p>
46	Remove the strap on TRMTR TIMING T9.
47	Depress the IND RESET pushbutton. Is TT4 OFF?
	<p>(a) If YES, proceed to Step 48.</p> <p>(b) If NO, use the TT4 trouble-locating routine of Chart 3 and/or Fig. 6.</p>

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**CHART 2 (Contd)**


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STEP	PROCEDURE
48	While observing the TT4 indicator, using a <i>WIBF</i> cord, strap TP2 to TP1 on T5.
49	Is TT4 ON after approximately 10 seconds? (a) If YES, proceed to Step 50. (b) If NO, replace the ML SIG & PLT MON T6 and reconduct Step 38, and Steps 41 through 43.
50	Remove the strap made in Step 48 (or Step 52).
51	Depress the IND RESET pushbutton. Is TT4 OFF? (a) If YES, proceed to Step 52. (b) If NO, use the trouble-locating routine of Chart 3 and/or Fig. 6.
52	Using a <i>WIBF</i> cord, strap TP3 to TP1 on BNY TO ML CONV T5 and repeat Steps 49 through 51. When TT4 goes OFF, proceed to Step 53.
53	Remove all test equipment and test connections. Restore the terminal to service.

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**CHART 3****TROUBLE-LOCATING TESTS**


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This chart contains the procedures for trouble-locating in the transmitting digital processor. The procedures apply to the regular terminal or to the protection terminal. The tests of this chart are *out-of-service* tests. It is assumed that before maintenance personnel enter the chart that switching or other actions have been completed. When personnel have been referred to this chart from other charts, the referring chart should be returned to after repairs have been completed. Each of the routines in this chart (TT1, TT2, TT3, TT4, or TT5) should be followed in sequence until the LED (lamp) is extinguished or until the routine does not satisfy the alarm; then the applicable schematic drawing and the functional chart of Fig. 7 should be referred to and a check of bay and/or equipment wiring made. Where multiple alarms occur, each alarm should be individually serviced starting with the lowest numbered alarm (TT1 first, then TT2, etc). When certain circuit packs are replaced during this routine, reference to steps in other charts may be included. The steps in this chart accompany the flowcharts in Fig. 6. These steps should be conducted as instructed and this chart continued until the alarm condition is satisfied.

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## CHART 3 (Contd)

STEP	PROCEDURE
<b>A. Trouble Type 1 (TT1) Alarm ON</b>	
1	Depress the IND RESET pushbutton. Is TT1 OFF?  (a) If YES, restore the terminal to service.  (b) If NO, proceed to Step 2.
2	If the alarm condition occurs while a regular terminal is in service, switch the service carried to the protection terminal. If only the protection terminal contains the alarm indication, proceed to Step 4.
3	Does the protection terminal have the same alarm indications?  (a) If YES, a failure in the DS-1 signal input is indicated. Repair, as required, and restore the terminal to service.  (b) If NO, proceed to Step 4.
4	Replace the STORE MONITOR T8.
5	Depress the IND RESET pushbutton. Is TT1 OFF?  (a) If YES, restore the terminal to service.  (b) If NO, proceed to Step 6.
6	Replace the STATUS IND TR4 and conduct Step 10 of Chart 2, then proceed to Step 7.
7	Depress the IND RESET pushbutton. Is TT1 OFF?  (a) If YES, restore the terminal to service.  (b) If NO, proceed to Step 8.
8	Replace T8 <b>and</b> TR4 again. Conduct Step 10 of Chart 2. When the alarm indication can be reset satisfactorily, restore the terminal to service.
<b>B. Trouble Type 2 (TT2) Alarm ON</b>	
9	Depress the IND RESET pushbutton. Is TT2 OFF?  (a) If YES, restore the terminal to service.  (b) If NO, proceed to Step 10 for regular terminal failures or to Step 11 if the alarm indication is in the protection terminal only.

## CHART 3 (Contd)

STEP	PROCEDURE
10	If the alarm indication is in an in-service regular terminal, switch the service to the protection terminal. Then proceed with Step 11.
11	Is TT5 flashing or ON? (a) If YES, use routine for TT5 first. (b) If NO, proceed to Step 12.
12	Replace the SCRAMBLER T1 (or T1A).
13	Depress the IND RESET pushbutton. Is TT2 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 14.
14	Replace the DESCRAMBLER TR1.
15	Depress the IND RESET pushbutton. Is TT2 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 16.
16	Replace the ENCODER T3.
17	Depress the IND RESET pushbutton. Is TT2 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 18.
18	Replace the DIGITAL CMPRTR TR3 and conduct the timing tests of Step 21 of Chart 2, then proceed to Step 19.
19	Depress the IND RESET pushbutton. Is TT2 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 20.
20	Replace the CMPRTR INPUT T4.

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**CHART 3 (Contd)**

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<b>STEP</b>	<b>PROCEDURE</b>
21	Depress the IND RESET pushbutton. Is TT2 OFF?  (a) If YES, restore the terminal to service.  (b) If NO, proceed to Step 22.
22	Replace the STATUS IND TR4 and conduct Step 10 of Chart 2.
23	Depress the IND RESET pushbutton. Is TT2 OFF?  (a) If YES, restore the terminal to service.  (b) If NO, proceed to Step 24.
24	Repeat the TT2 procedure until the alarm can be reset satisfactorily, then restore the terminal to service.
	<b>C. Trouble Type 3 (TT3) Alarm ON</b>
25	Depress the IND RESET pushbutton. Is TT3 OFF?  (a) If YES, restore the terminal to service.  (b) If NO, proceed to Step 26.
26	If the alarm indication is in an in-service regular terminal, switch the service to the protection terminal, then proceed with Step 27. If the alarm indication is in the protection terminal only, proceed directly to Step 27.
27	Is TT1 ON?  (a) If YES, use TT1 routine first.  (b) If NO, proceed to Step 28.
28	Replace the STORE MEMORY T7.
29	Depress the IND RESET pushbutton. Is TT3 OFF?  (a) If YES, restore the terminal to service.  (b) If NO, proceed to Step 30.
30	Replace the STORE MONITOR T8.

## CHART 3 (Contd)

STEP	PROCEDURE
31	Depress the IND RESET pushbutton. Is TT3 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 32.
32	Replace the STATUS IND TR4 and conduct Step 10 of Chart 2.
33	Depress the IND RESET pushbutton. Is TT3 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 34.
34	Repeat the TT3 procedure until the alarm can be reset satisfactorily, then restore the terminal to service.
<b>D. Trouble Type 4 (TT4) Alarm ON</b>	
35	Depress the IND RESET pushbutton. Is TT4 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 36.
36	If the alarm indication is in an in-service regular terminal, switch the service to the protection terminal and proceed to Step 37. If the alarm indication is in the protection terminal only, proceed directly to Step 37.
37	Replace the BNY TO ML CONV T5 and conduct Step 38 of Chart 2.
38	Depress the IND RESET pushbutton. Is TT4 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 39.
39	Replace the ML SIG & PLT MON T6 and conduct Steps 41 and 42 of Chart 2.
40	Depress the IND RESET pushbutton. Is TT4 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 41.
41	Replace the TRMTR TIMING T9.

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**CHART 3 (Contd)**


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<b>STEP</b>	<b>PROCEDURE</b>
42	Depress the IND RESET pushbutton. Is TT4 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 43.
43	Replace the STATUS IND TR4 and conduct Step 10 of Chart 2.
44	Depress the IND RESET pushbutton. Is TT4 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 45.
45	Repeat the TT4 procedure until the alarm can be reset satisfactorily, then restore the terminal to service.
<b>E. PRV RATE (TT5) ON or Flashing</b>	
46	Are any other alarms ON? (a) If YES, use the routine for the other alarms first unless entering this procedure from another procedure. (b) If NO, proceed to Step 47.
47	If the alarm indication is in an in-service regular terminal, switch the service to the protection terminal and proceed to Step 48. If the alarm indication is in the protection terminal, proceed directly to Step 48.
48	Replace the ENCODER T3.
49	Depress the IND RESET pushbutton. Is TT5 OFF?
	<b>Note:</b> TT5 does not require resetting but other alarms that may have been activated while replacing a circuit pack do. If an alarm condition other than TT5 persists after replacing a circuit pack during this procedure, replace the circuit pack again and continue with Step 49.
	(a) If YES, restore the terminal to service. (b) If NO, proceed to Step 50.
50	Replace the VIOLATION DETECTOR TR2.

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**CHART 3 (Contd)**


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STEP	PROCEDURE
51	Depress the IND RESET pushbutton. Is TT5 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed with Step 52.
52	Replace the STATUS IND TR4 and conduct Step 10 of Chart 2.
53	Depress the IND RESET pushbutton. Is TT5 OFF? (a) If YES, restore the terminal to service. (b) If NO, proceed to Step 54.
54	Repeat the TT5 procedure until the alarm can be reset satisfactorily, then restore the terminal to service.

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**CHART 4****SPARE TRANSMITTING ACCESS PANEL TESTS**

This chart is an out-of-service procedure to be used during initial turnon and alignment tests or during trouble-locating. The steps in this chart accompany the flowchart in Fig. 4. This test is also applicable to regular terminal transmitting access panel tests, when required. If a requirement is not met during this test, refer to Fig. 7 and the applicable schematic drawing to check common equipment (passive components) in the access panel. Patching procedures not covered in this test are presented in Section 356-454-300.

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STEP	PROCEDURE
<b>LINE AMPLIFIER VOLTAGE MEASUREMENT</b>	
1	With the digital voltmeter, measure the voltage between terminals E6 and E5 (GRD), and E3 and E4 (GRD) adjacent to connector J1 (located at the rear of the <i>spare</i> TRANSMITTING ACCESS PANEL).  <b>Requirement:</b> $-18.0 \pm 1.0$ Vdc.  If either or both measurements do <i>not</i> meet the requirement, replace the zener diode regulators located adjacent to J1. (Refer to SD-51357).

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 CHART 4 (Contd)
 

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STEP	PROCEDURE
<b>ACCESS PANEL TESTS</b>	
2	Make a patch between the DIG PROC OUT jack (remove hairpin) in the TERMINAL X TRANSMITTING ACCESS portion of the SWITCH STATUS AND CONTROL (SSAC) Panel and the INPUT jack in the SP TRMTG ACCESS portion.
	<b>Note:</b> The protection terminal cannot be used to protect a failed regular terminal during this test.
3	Using piece part number 840956494 and the RMS Voltmeter, measure the data signal power level at the FLT OUT jack (terminated measurement) on the <i>spare</i> TRANSMITTING ACCESS PANEL.
4	Using the RMS voltmeter, measure the level (unterminated) between TPA and GRD and TPB and GRD on the LINE AMPL (REDUNDANT) faceplate.
	<b>Requirement:</b> There shall be no more than a 3.0-dB difference in the two indications.
	(a) If the requirement is met, proceed to Step 5.
	(b) If the requirement is <i>not</i> met, replace the amplifier and repeat Step 4.
5	Using piece part number 840956486 and the RMS voltmeter, measure the data signal power at the OUTPUT jack in the SP TRMTG ACCESS portion of the SSAC Panel.
	<b>Requirement:</b> $-10.8 \text{ dBm} \pm 2.0 \text{ dB}$ .
	The actual data level at this point should be available from office records or WLEL personnel. The level may vary depending upon cable length to radio room (message/data combiner trunk).
6	Using a <i>WIBF</i> cord, strap between TP4 and TP2 on the SCRAMBLER circuit pack T1 (or T1A) in the protection terminal X transmitting digital processor. Measure the pilot level received.
	<b>Requirement:</b> The level shall be $-18.0 \text{ dB}$ below the data signal power measured in Step 5.
7	Remove all test connections. Replace all hairpins removed.

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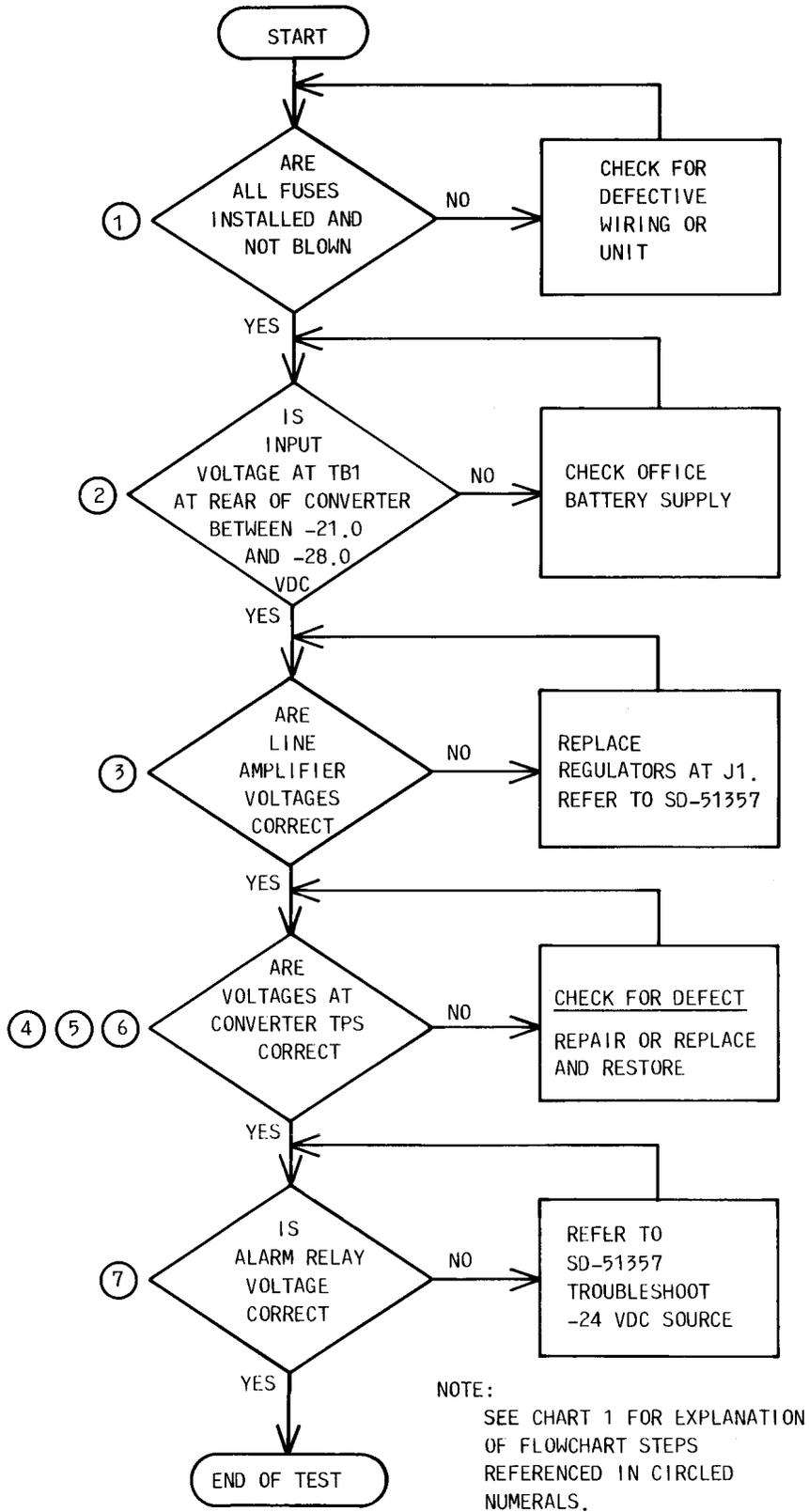
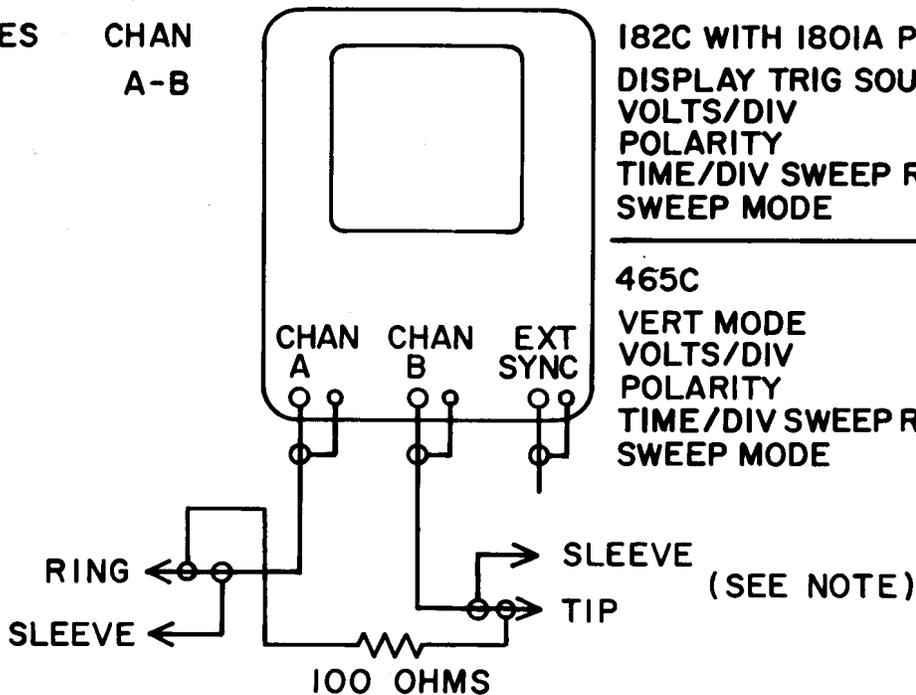


Fig. 1—1A-RDT Transmitter—Fuse and Voltage Measurements

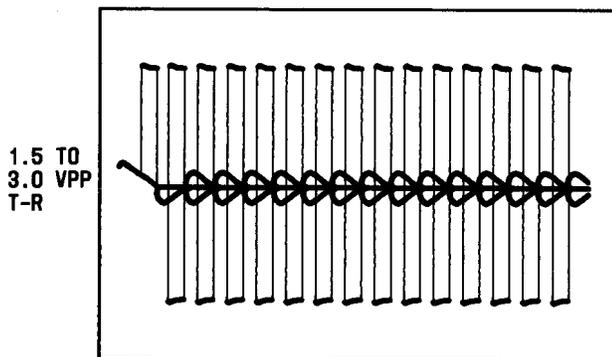
PROBES    CHAN  
X10        A-B



NOTE:

USE PIECE PART NO. 840956619 (KS-7133 CABLE 12-INCHES LONG WITH 310 PLUG ON ONE END AND CLIPS ON OTHER) FOR ACCESS TO TIP, RING, AND SLEEVE.

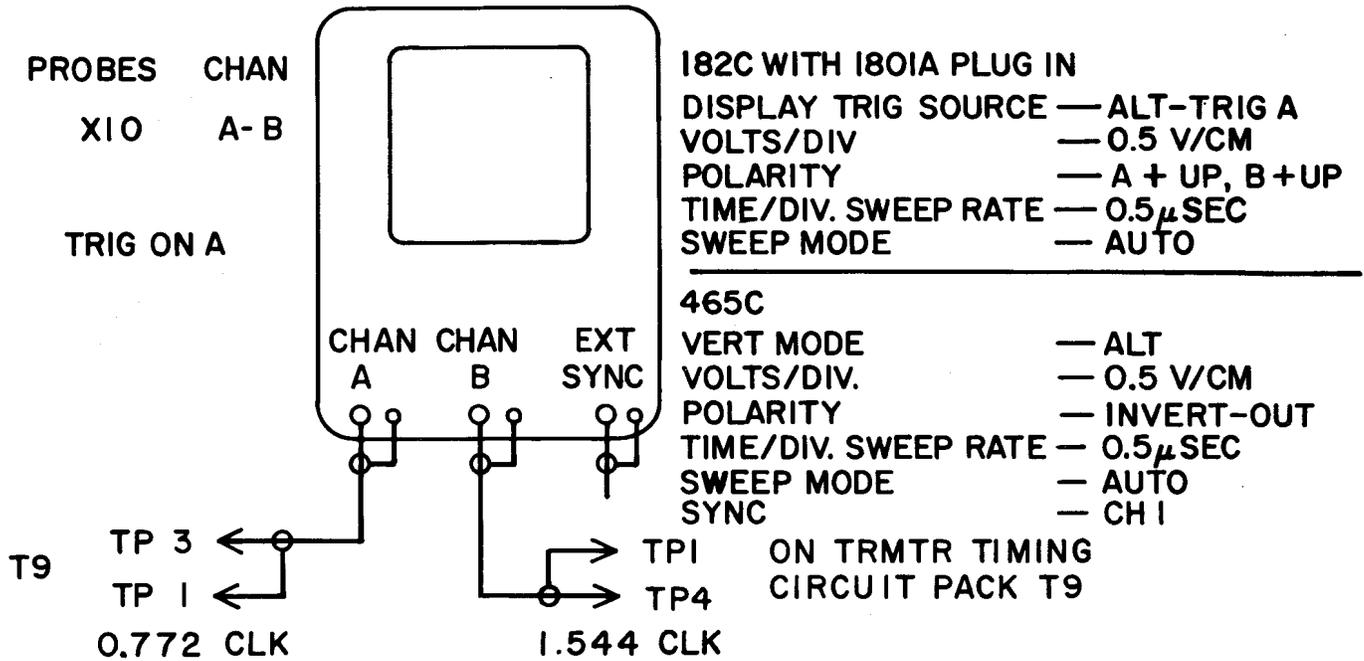
A



PAD OUT OR SW OUT JACK  
QUASI-RANDOM DS-1 SIGNAL

B

Fig. 2—Quasi-Random DS-1 Signal and Test Setup



A

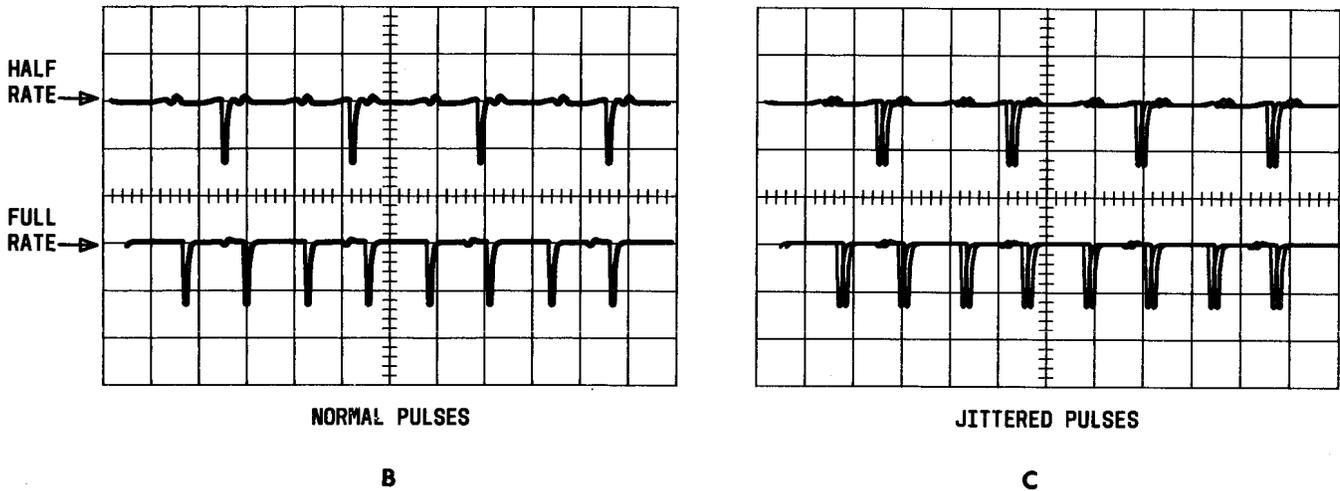


Fig. 3—1.544 and 0.772-MHz Clock Strokes and Test Setup

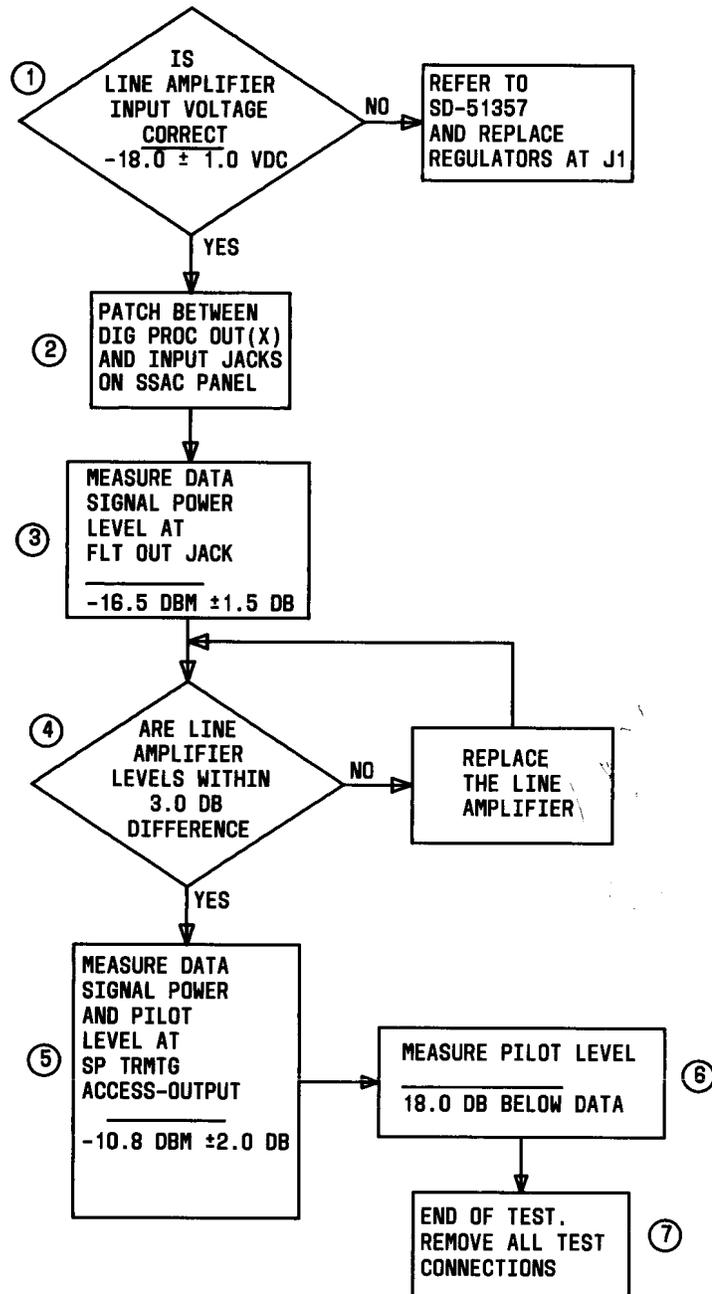
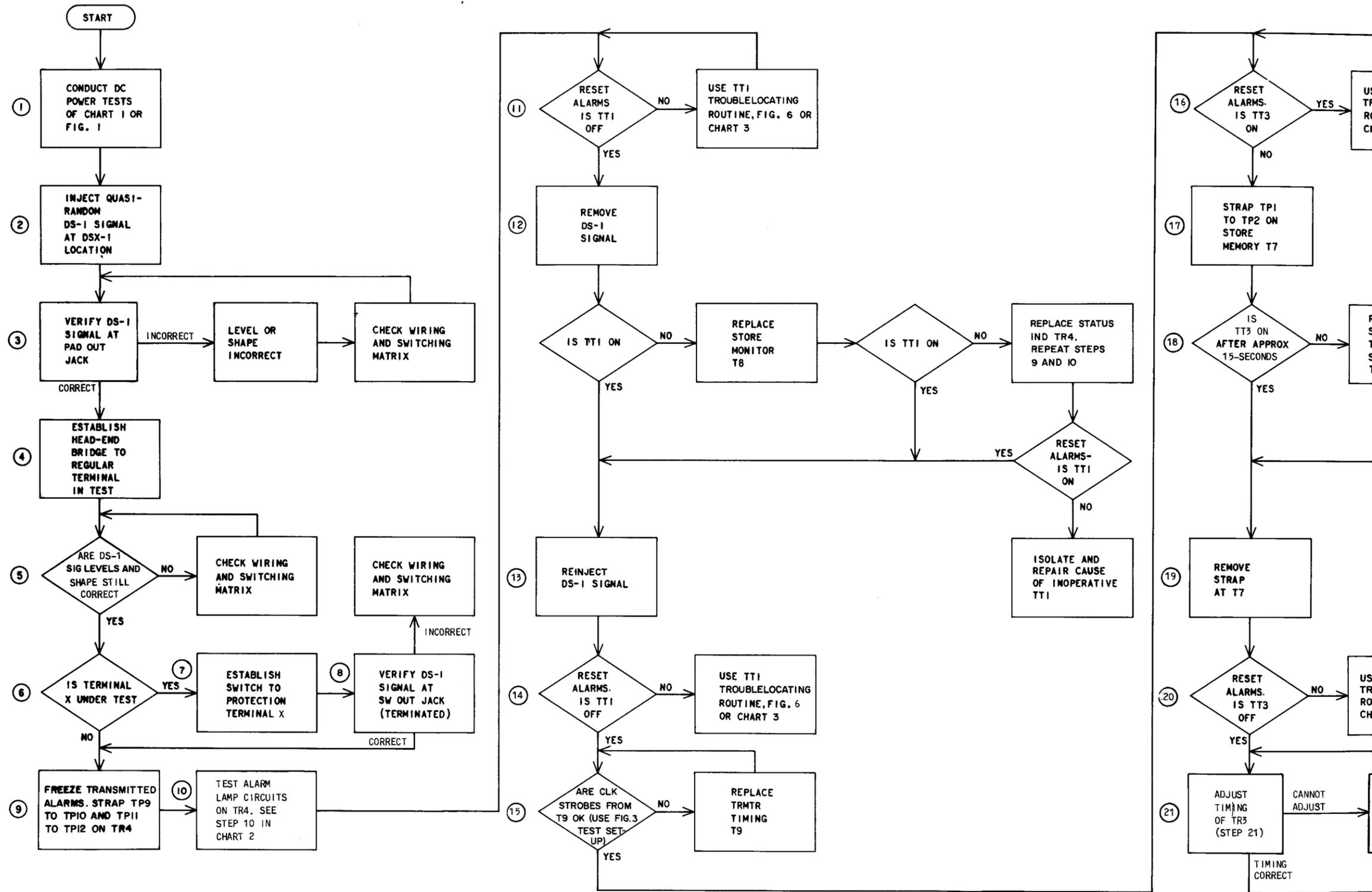


Fig. 4—Spare Transmitting Access Panel Tests





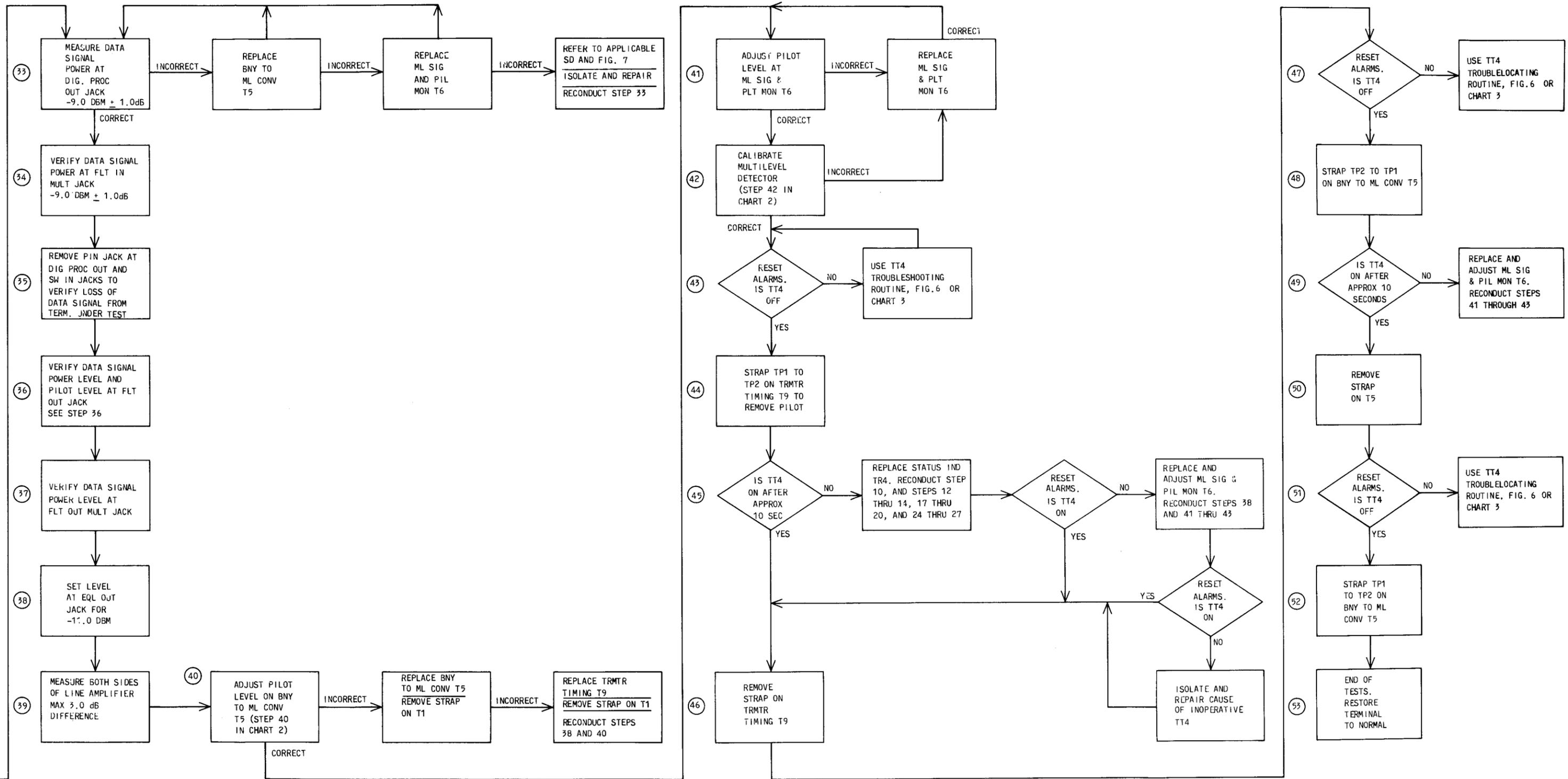
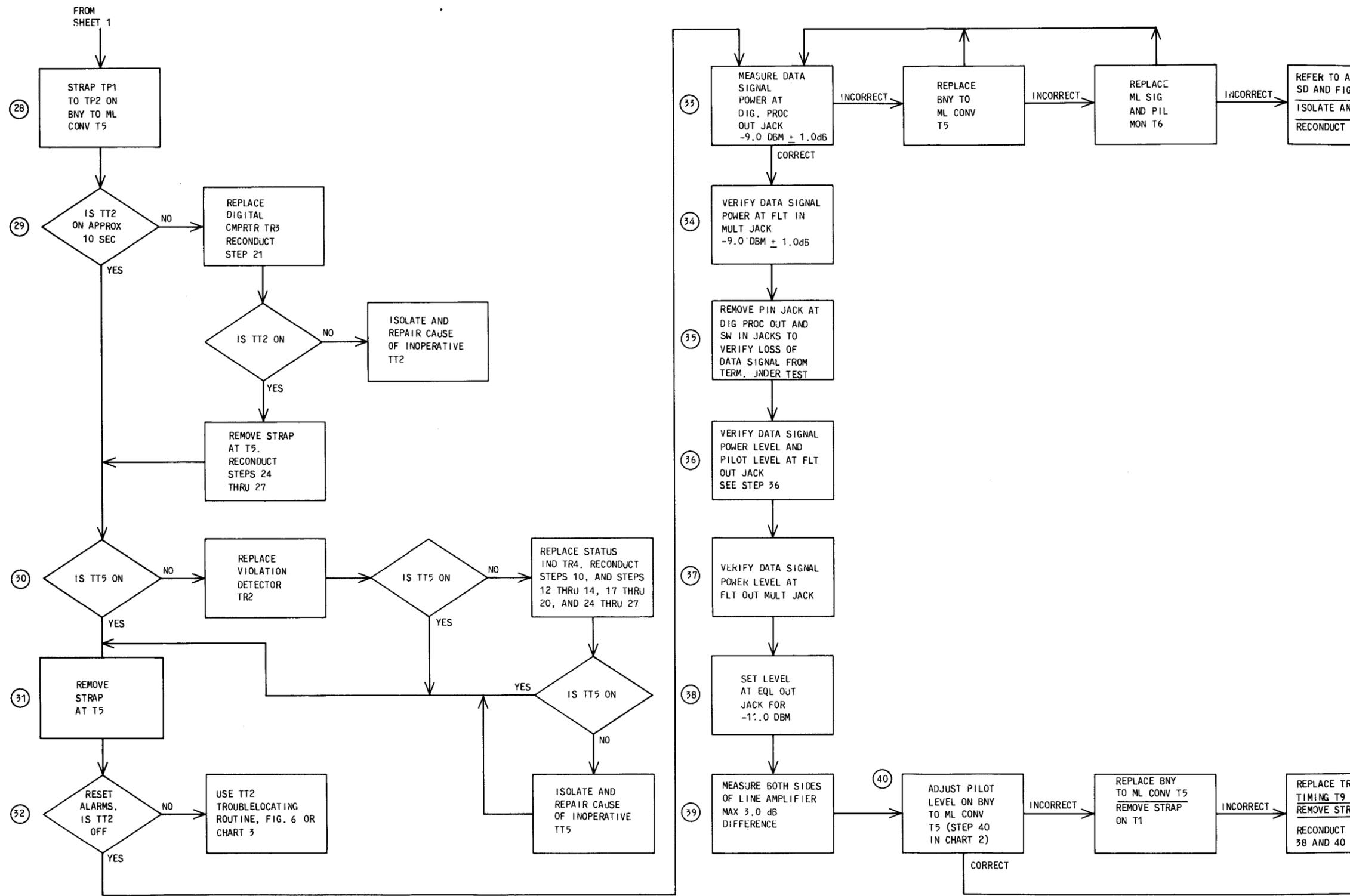


Fig. 5—Initial Turnon Tests (2 of 2)



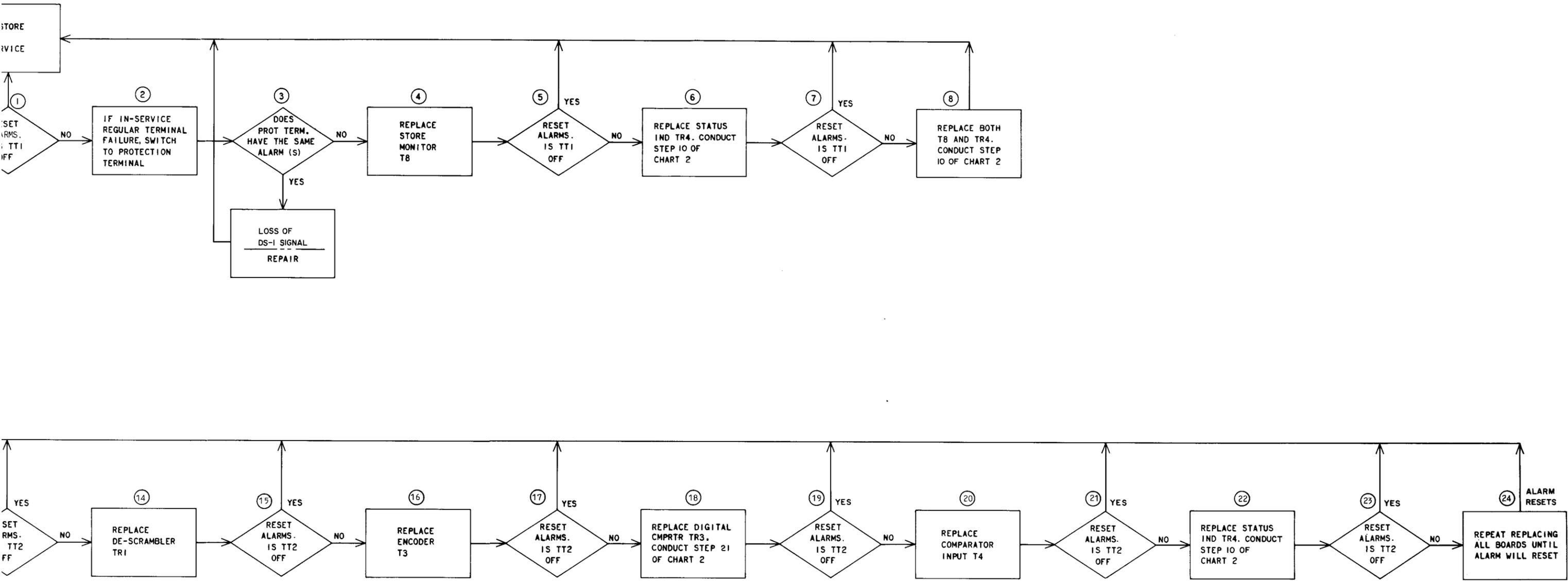
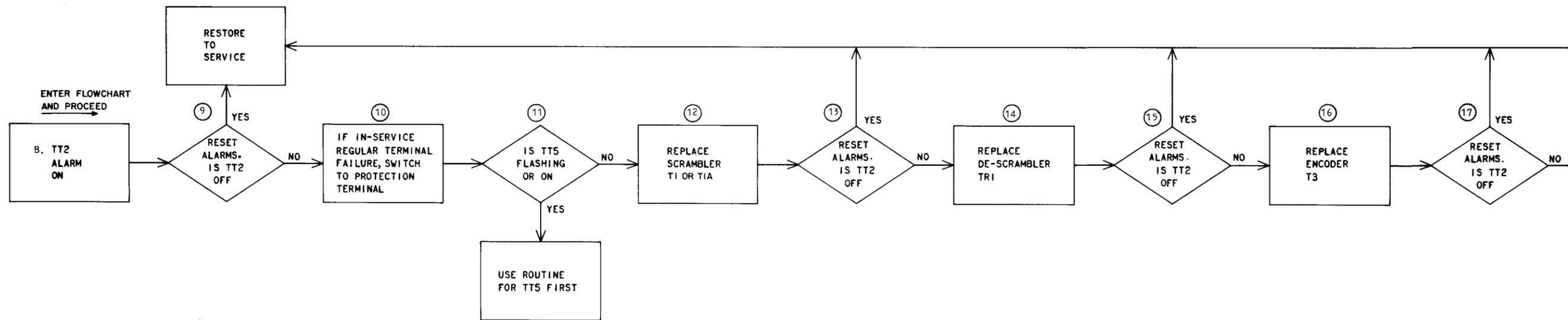
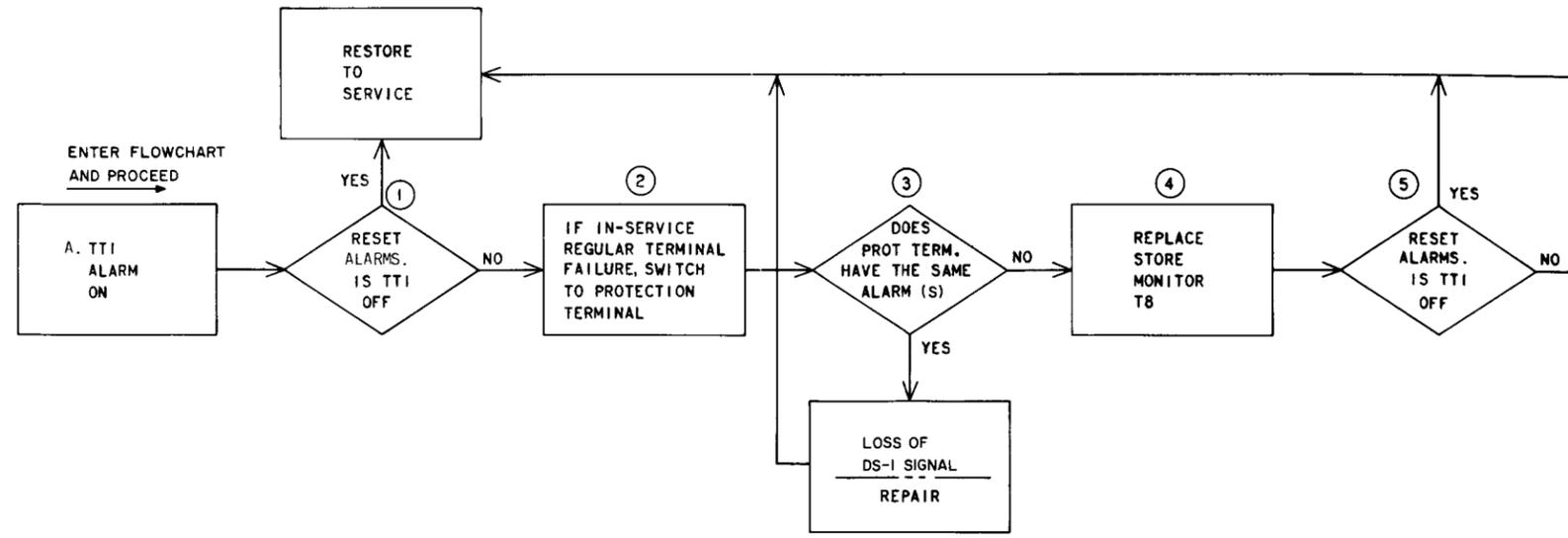


Fig. 6—Trouble-Locating Routines (1 of 2)



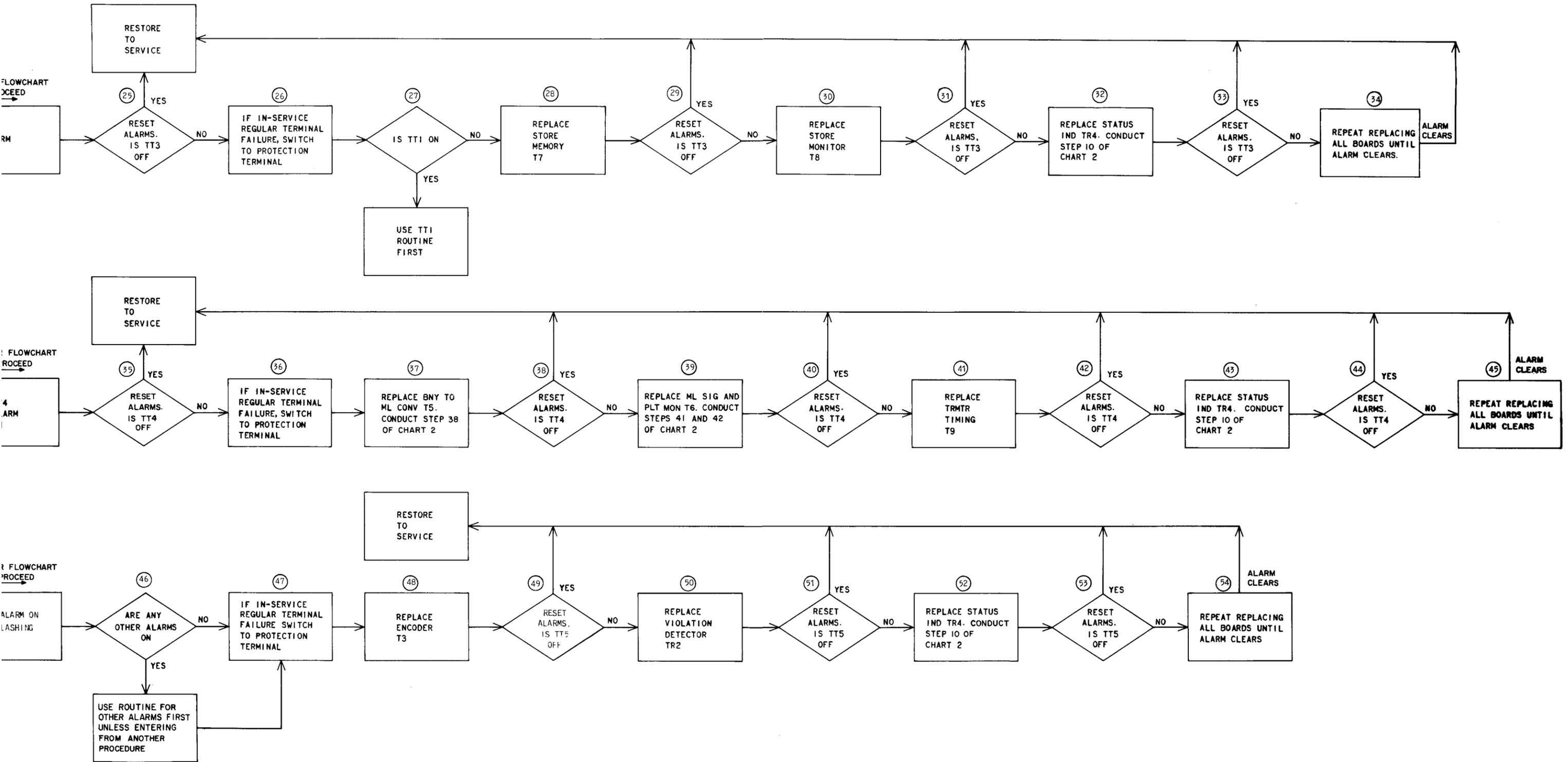


Fig. 6—Trouble-Locating Routines (2 of 2)

