

**“SLC*”-96 SUBSCRIBER LOOP CARRIER SYSTEM
DIGITAL LINE FAULT-LOCATING TESTS AND PROCEDURES
USING ACTIVE (1114- OR 1115-TYPE) FILTERS**

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1. GENERAL

1.01 This section contains procedures for testing SLC-96 digital lines where active fault-locating filters are used. Section 365-200-160 contains a description of the active fault-locating (FL) system.

1.02 This section is reissued to revise the Initial Fault-Locating Form (IFLT) and the Fault-Locating Record (FLR) form. Since this reissue is a general revision, arrows ordinarily used to denote changes have been omitted. This section affects the Equipment Test List (ETL).†

1.03 The procedures of this section are summarized in Fig. 1, and then will be used to test all new and rearranged SLC-96 digital lines assigned active FL filters and FL lines. These procedures will also be used to locate trouble on SLC-96 fault-locating equipped lines after the lines have been placed in service.

1.04 Several SLC-96 systems using the same route may share the same FL pair. The FL pair must always be terminated. This is accomplished by maintaining a 262C plug in the FL jack of the remote terminal (RT) most distant from the central office terminal (COT).

1.05 If the FL pair is bridged to more than one RT, the FL pairs **will** be terminated with 262C plugs (900 ohms) at each RT. If 1115-type filters are used, the FL line **may** be terminated in the last apparatus case in some installations (Fig. 17).

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†This ETL has not been issued as of this date. Consult future indices to determine when this section becomes available.

NOTICE

Not for use or disclosure outside the Bell System except under written agreement

2. APPARATUS

2.01 To perform the tests of this section, the following types of test equipment are required.

1—Fault-Locating Set (FLS) such as:

- Sierra 315B or 415A-2 T1 Span and Repeater Test Set (315B) (Fig. 2) or (415A) (Fig. 3)

Note: If a **315A** is used, the 25 dB pad on the FL panel may be required when testing filters close to the office if returned signal levels are larger than the test set is capable of handling.

- J98725AD T1C/T1 Fault-Locate Test Set (25AD) (Fig. 4) (Section 103-494-106)

1—Noise Measuring Set, such as:

- J94003A (3A) Noise Measuring Set (NMS) (Section 103-611-100)
- J94003C (3C) Noise Measuring Set (NMS) (Section 103-611-101)

1—Fault-Locate and Order Wire Panel (J1C141AC-L1) (Fig. 5) or (J1C141AC-L1, L2) (Fig. 6)

1—Monitoring Headphone

1—KS-14510 Volt-Ohm-Milliammeter (VOM) (Section 100-520-101)

1—ED-3C841—LIU Test Cord (Fig. 18)

1—Cord, 3P13A, for 3A/NMS (double-jack ended)

1—Cord, 3P17A, for 3C/NMS (single-jack ended)

2—P3-Type Patch Cords, equipped with 310 plugs. P3BH cords are recommended.

1—262C Terminating Plug (900-ohm)

1—J98725AB T1C/T1 Bipolar Violation Detector (25AB) (Fig. 7) (Section 103-494-101), or equivalent (used at the repeater apparatus cases)

3. FAULT-LOCATING CABLE PAIR AND SYSTEM TESTS

3.01 The cable pair used for the FL line must be tested **before** the pair is approved for fault-locating SLC-96 digital lines. The tests of Section 363-202-216 must be performed to ensure that the FL line and system are properly installed. Once the FL pair has been selected and placed in service, the tests of Section 363-202-216 may be performed periodically or when the line is suspected of causing improper fault-locating results.

3.02 When performing the initial FL line and system tests of Section 363-202-216, an Initial Fault Line Test (IFLT) form (Fig. 9) is completed and retained in the SLC-96 office records. Upon completion of the initial fault-locating tests of Section 363-202-216, the fault-locating tests of this section should be performed on each SLC-96 system that is monitored by the FL line.

3.03 If the tests being performed are initial fault-locating tests or SLC-96 new digital line tests, the Fault-Locating Record (FLR) form (Fig. 10) must be completed during the tests. The IFLT and FLR forms provide a permanent record of the initial operation and condition of the fault-locating system and each SLC-96 system monitored by the FL line.

3.04 If the tests being performed are trouble-locating tests on SLC-96 digital lines which have been in service, a noise measurement test must be performed on the FL line before the line may be used for fault-locating the SLC-96 digital line. Chart 1 provides the procedures for testing the FL line.

4. FAULT-LOCATING TESTS

4.01 Fault-locating tests provide a method for locating faulty repeaters or cable sections that may be causing excessive errors on the system or total signal failure. If 1114-type filters are used, then the fault-locating tests can be performed in the transmit direction only; therefore, all of the repeaters must be set to the STD option and fault-locating tests must be made from the COT or from the RT depending on which direction of transmission has the fault. If 1115-type filters are used, both sides of the line can be tested from the COT. A signal source will not be required at the RT; however, all of the repeaters must be set to the OS option and the signal must be looped

at the RT. The digital line can be looped at the RT from the COT by placing a pin plug into the F END LP jack on the LIU unit.

4.02 When 1115-type filters are used, fault-locating is not done from the RT. Chart 2 provides fault-locating procedures from the COT and RT (if 1114-type filters are used).

4.03 The fault-locating results are recorded on the FLR form (Fig. 10). The results are analyzed using the procedures of this section to locate the trouble on the digital line. The FLR form may be reproduced locally.

4.04 The results of the fault-locating tests are compared with the values recorded on the initial FLR form (if available). This form provides a means of comparing the trouble test fault-locating results with the results obtained when the line was known to be good.

5. ISOLATING TROUBLE TO A DIGITAL LINE SECTION OR REPEATER

5.01 After using the procedures of the charts to determine which section of the line may be causing a particular problem, it will be necessary to perform tests at the repeater locations to identify the particular repeater or cable section at fault. These tests will require the use of the J98725AB (25AB) Bipolar Violation (BPV) Detector or equivalent. These sets can only be used at apparatus case locations.

5.02 Central office or RT personnel must be contacted before any repeaters are pulled or any tests are made at the repeater location. This will help prevent disruption of service that could be caused by pulling the wrong repeater. Tests at the repeater location will be made with the coordination of central office or RT personnel. The procedures of Chart 3 are provided to coordinate activities between the COT or RT and the repeater location.

6. OBSCURE DIGITAL LINE TROUBLES

6.01 In some cases where excessive errors occur on new systems or a working system will not hold on one particular line, a concentrated effort will be necessary to locate the cause of the problem. Something other than a repeater may be at fault.

6.02 Careful comparisons of voltage measurements of the digital lines may indicate design or cable problems. A comparison of fault-locate records should also be made.

6.03 Following is a checklist that may be helpful in locating obscure troubles associated with SLC-96 digital lines and FL pairs.

- (a) Check for malfunctioning test equipment.
- (b) Check main frame connections and jumpers.
- (c) Check carbons at MDF. Replace pitted carbons. Check that heat coils and carbons are in place.
- (d) Check carrier line connections at SLC-96 bay.
- (e) Check for proper termination of the FL line.
- (f) Check for improper or incomplete digital line cable pair preparation, such as:
 - (1) bridge taps left on
 - (2) load coil left on
 - (3) split pairs or transposed pairs
 - (4) carbons at repeater cases not replaced with gas-tube protectors
 - (5) build-out capacitors left on.
- (g) If difficulty is experienced with fault-locating, check for improperly wired fault-locating filters, wrong filter codes or defective apparatus case filter switch (located behind the filter).
- (h) Check for poor repeater contact in the apparatus cases or repeaters not held securely with retaining bars.
- (i) Check for proper repeater options (STD for 1114 filters, OS for 1115 filters).
- (j) Check for improperly wired test jacks.

7. FLOW DIAGRAM AND OPERATION

7.01 The SLC-96 Fault-Locating Sequence Chart (Fig. 1) should be used in performing the procedures of this section. All tasks of the Sequence Chart must be performed in order and the requirements of the applicable charts must be satisfied before continuing to the next procedure. Some procedures for certain tasks may be contained in other sections (eg, Fault-Locate Panel Turnup); however, most of the charts are contained in this section.

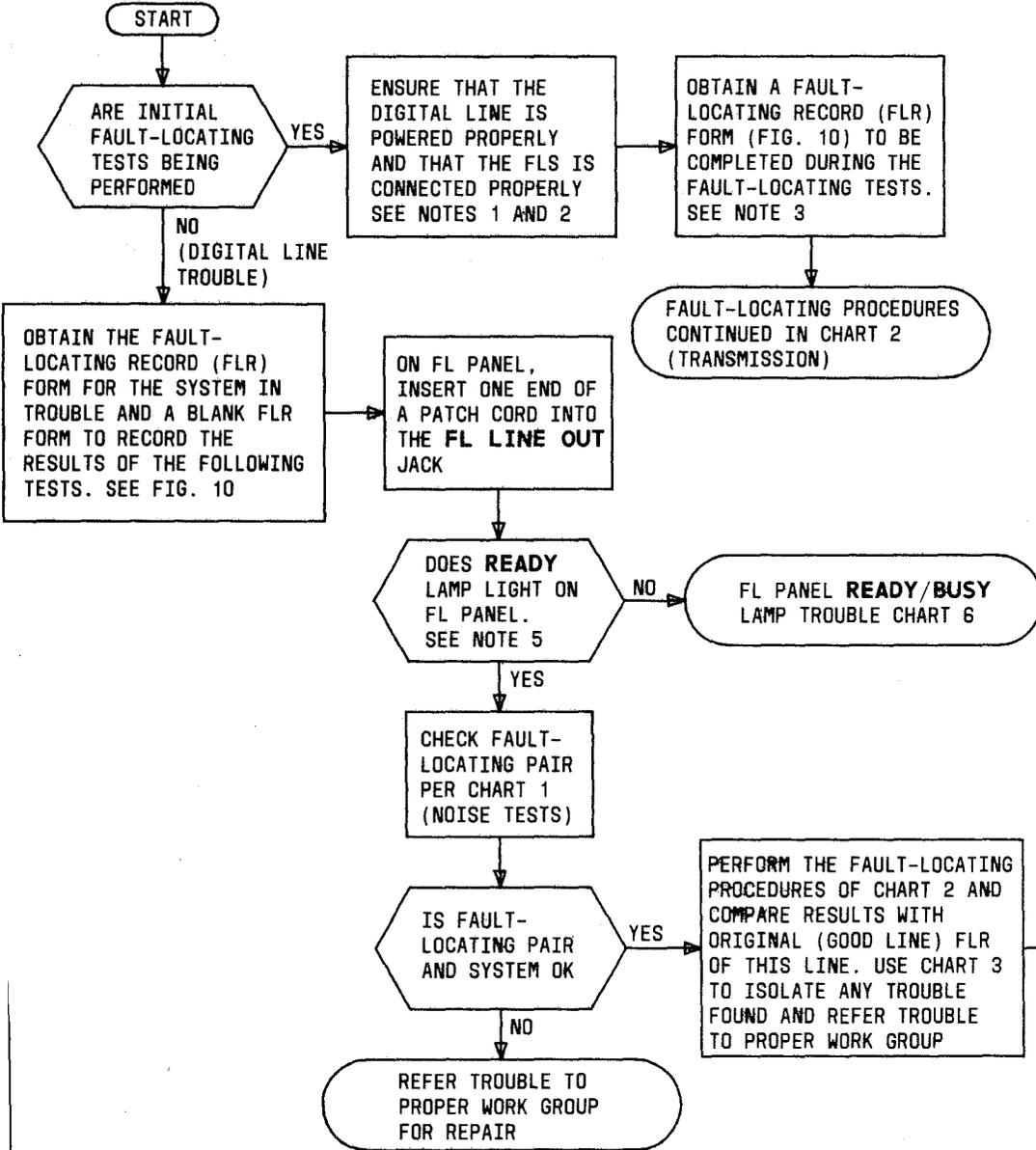
7.02 Chart 1 of this section is used to perform noise tests on the FL pair to ensure the

pair is approved for fault-locating SLC-96 digital lines.

7.03 When performing initial tests of the FL system (Section 363-202-216) and digital lines (Section 363-202-215), the results of the tests of this section should be recorded on the FLR form. The results of these tests will be used for future comparison with fault-locating results obtained during actual fault-locating of the digital lines.

7.04 The SLC-96 Fault-Locating Sequence Chart is shown in Fig. 1.

-96 FAULT-LOCATING SEQUENCE CHART



NOTES:

1. THE PROCEDURES OF SECTION 363-202-216 MUST HAVE BEEN PERFORMED PRIOR TO ENTERING THIS SECTION.
2. THE CONNECTIONS MADE DURING THESE TESTS MUST BE MAINTAINED FOR FAULT-LOCATING TESTS UNLESS OTHERWISE STATED
3. THE IFLT (FIG. 9) AND FLR (FIG. 10) FORMS MUST BE COMPLETED AND MAINTAINED FOR FUTURE REFERENCE
4. THE PROCEDURES OF SECTION 363-202-400 OR 363-202-401 MUST HAVE BEEN PERFORMED PRIOR TO ENTERING THIS SECTION
5. THE **BUSY** MAY PREVENT THE **READY** FOR SEVERAL SECONDS BECAUSE ANY SPURIOUS VOLTAGE MUST BE DISCHARGED PRIOR TO ACHIEVING THE **READY** LAMP

Fig. 1—SLC-96 Fault-Locating Sequence Chart

CHART 1
NOISE TESTS

Note: These tests are performed to ensure that the FL pair can be used to successfully fault-locate the SLC-96 digital lines.

APPARATUS:

- 1—Sierra 315B, 415A-2 T1 Span and Repeater Test Set (315B), (415A) or J98725AD T1C/T1 Fault-Locating Set (25AD) (Section 103-494-106).
 - 1—J94003A (3A) or J94003C (3C) Noise Measuring Set (NMS) (Section 103-611-100 or 103-611-101).
 - 2—P3BH Patch Cords equipped with 310 plugs.
 - 1—ED-3C841—LIU Test Cord (Fig. 18).
-

STEP

PROCEDURE

Broadband Noise Test

- 1 Determine the following from office records:
 - (a) The filter type (1114/1115) used on the FL line monitoring the SLC-96 system to be tested.
 - (b) The FL LINE designation (1, 2, 3, 4, 5, or 6) on the FL panel that will access the FL line.
- 2 Verify that the FL pair is properly terminated with a 262C plug (900-ohms) at the last RT.

Note: If the FL pair is bridged to more than one RT, verify that the FL pairs are properly terminated with 262C plugs (900-ohms) at each RT (Fig. 17).
- 3 At the COT, connect the 3-type NMS IN jack to the FL jack serving the FL pair being tested. Use the proper cord for the type NMS being used.
- 4 Set the NMS controls as follows:
 - DBRN *to* 10
 - FUNCTION *to* NM900
 - DAMP/NORM *to* NORM

CHART 1 (Contd)

STEP	PROCEDURE
	WTG to C MESSAGE (497A Network).
5	<p>Measure the noise level of the FL pair.</p> <p>Requirement: 16 dBrnc or less. Record this reading on the IFLT form (if used) in NOISE block labeled BROADBAND. Also record this reading on the FLR form in space marked BROADBAND NOISE. If the requirement is met, proceed to Step 6.</p> <p>Note: If the requirement is not met, open the pair at the MDF and repeat the measurement at the MDF on the outside pair. If the requirement is still not met, refer the trouble to the outside plant repair forces. If the requirement is met at the MDF, check protection units and office and bay wiring.</p> <p>Narrowband Noise Tests Using the 315B</p> <p>Caution: To prevent service interruptions, insert patch cord or dummy plug into receiving MONITOR jack and then connect the ED-3C841 LIU test cord to the jack panel before connecting the other end to the LIU plug-in unit. Remove connections in reverse order.</p>
6	Using the LIU test cord, connect between an LIU location on the COT jack panel first and the LIU plug-in unit associated with the digital line to be tested.
7	Using P3BH patch cords, connect the 315B as follows: <p>From: 315B FAULT LOC LINE IN jack</p> <p>To: FL Panel FL LINE OUT jack</p> <p>From: 315 GEN XMT jack</p> <p>To: TRMTG LINE jack on the COT jack panel</p> <p>Monitoring headphone to: 315B PHONE jack</p>
8	Connect the 315B power cord to a 117-Vac utility outlet and set the 315B controls as follows: <p>POWER/OFF switch to POWER</p> <p>FUNCTION to QRW GEN</p> <p>NORM to NORM</p>
9	Set the 315B LINE FILTER switch to the first filter code (A) and adjust the 315B REC LEVEL control knob for an on-scale reading.

CHART 1 (Contd)

STEP	PROCEDURE
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Requirement: Less than -90 dBm (0 dBm). Record the meter indication on the FLR form in the space marked TRANSMISSION TEST, NB NOISE, BIPOLAR (see Fig. 13).

Note: If the requirement is not met, perform the procedures of Chart 7.

- 10 Repeat Step 9 for all filter codes (A through M).
- 11 If the requirements of this chart are met, perform the fault-locating procedures of Chart 2. If the requirements are not met, the trouble on the FL pair will have to be corrected before the pair can be used to fault locate the digital line.

Narrowband Noise Tests Using the 25AD

Caution: To prevent service interruptions insert patch cord or dummy plug into receiving MONITOR jack and then connect the ED-3C841 LIU test cord to the jack panel before connecting the other end to the LIU plug-in unit. Remove connections in reverse order.

- 12 Using the LIU test cord, connect between an LIU location on the COT jack panel **first** and the LIU plug-in unit associated with the digital line to be tested.
- 13 Using P3BH cords, connect the 25AD as follows:
- From:** 25AD GEN SPAN LINE jack
- To:** TRMTG LINE jack on the COT jack panel
- From:** 25AD RCV FL LINE jack
- To:** FL LINE OUT jack on the FL panel
- Monitoring headphone **to:** 25AD RCV MON jack
- 14 Connect the 25AD -48V cord to the -48V test jack on the COT jack panel.
- 15 Set the 25AD controls as follows:

CONTROL	POSITION
CLOCK RATE	T1
FUNCTION	BIPOLAR
PULSE DENSITY	11 REF
RECEIVER SENSITIVITY	-80

CHART 1 (Contd)

STEP	PROCEDURE
16	Set the FILTER switch to the code letter of the filter to be tested. Start with the first filter out from the COT. <i>Note:</i> If the filter sequence is not listed on the IFLT form under the FL FILTER SEQ column or on the FLR form, the filter codes may be obtained from the work order or span line record card.
17	Read the 25AD meter indication on the DBM scale and add to the RECEIVER SENSITIVITY setting. <i>Requirement:</i> Less than -90 dBm (0 dBm). Record the meter indication on the FLR form in the space marked TRANSMISSION TEST, NB NOISE, BIPOLAR. <i>Note:</i> If the requirement is not met, perform the procedures of Chart 7.
18	Repeat Steps 16 and 17 for all filter codes (A through M) on this fault line.
19	If the requirements of this chart are met, perform the fault-locating procedures (transmission) of Chart 2. If the requirements are not met, the trouble on the fault-locate pair will have to be corrected before the pair can be used to fault locate a digital line.

CHART 2
FAULT-LOCATING PROCEDURES
TRANSMISSION
(SHEET 1 OF 3)

Note: This chart contains procedures to be performed when trouble-locating procedures are being performed on the digital line **or** initial tests are being performed on the FL system and new digital line.

APPARATUS:

- 1—Sierra 315B, 415A-2 T1 Span and Repeater Test Set (315B), (415A) or J98725AD T1C/T1 Fault-Locating Set (25AD) (Section 103-494-106).
- 2—P3BH Patch Cords equipped with 310 plugs.
- 1—ED-3C841—LIU Test Cord (Fig. 18).

STEP	PROCEDURE
	<p>Prerequisite: The FL line and all branches must be tested and terminated per Chart 1.</p>
1	<p>Determine or obtain the following information:</p> <ul style="list-style-type: none"> (a) The direction of transmission to be tested. <p>Note 1: If the transmission direction indicating a fault is unknown or if initial tests are being performed, transmission from the COT of the line should be tested first, then transmission from the RT.</p> <ul style="list-style-type: none"> (b) The filter type installed on the FL line (determined in Chart 1). (c) The FLR form for the system in trouble (if available). <p>Note 2: If initial tests are being performed, the FLR form will be completed during these tests.</p> <ul style="list-style-type: none"> (d) The applicable FL LINE panel designation card (Fig. 14) (if available). (e) The FL LINE designation (1, 2, 3, 4, 5, or 6) on the FL panel that will access the FL line (determined in Chart 1). (f) The location of the authorized tip and ring reversal on the FL pair if 1114-type filters are used. (See System Layout Record Card or the work order.)

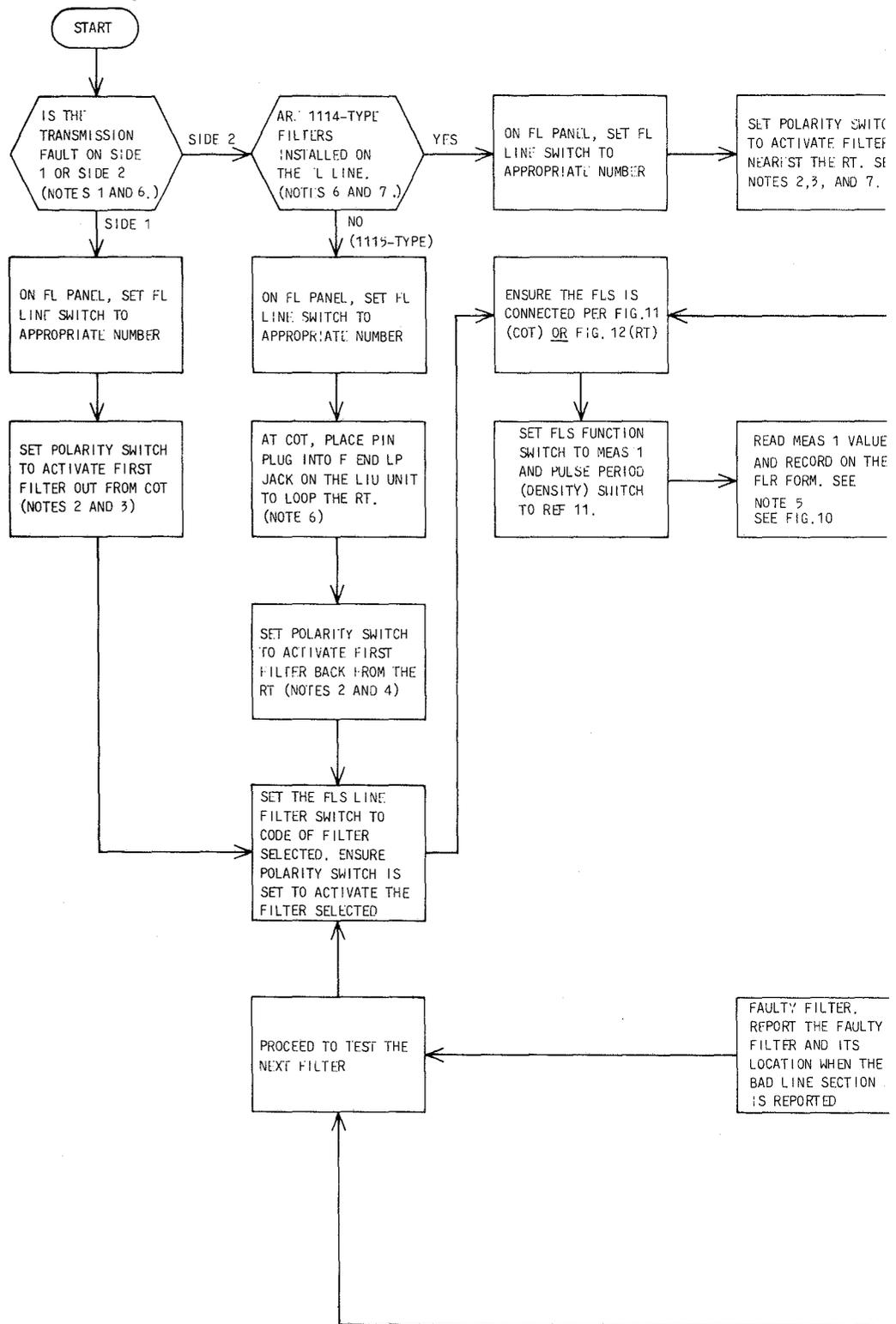
CHART 2 (Contd)

STEP

PROCEDURE

Note 3: The tip and ring reversal location is used to determine which POLARITY switch setting will activate the filter being tested.

2 Perform the procedures of the following flowchart.



NOTES:

1. IF FAULT SIDE IS UNKNOWN OR IF YOU ARE DOING INITIAL FAULT-LOCATING TESTS, FOLLOW SIDE 1 PATH FIRST, THEN SIDE 2 PATH.
2. FOR ISOLATION, THIS PROCEDURE USES THE MOST DIRECT APPROACH BY TESTING EACH FILTER DOWN THE TRANSMISSION PATH.
3. IF 1115 FILTERS ARE USED, POLARITY 1 SHOULD ACTIVATE THE FILTERS CONNECTED TO SIDE 1 OUT FROM COT. IF 1114 FILTERS ARE USED, POLARITY 2 SHOULD ACTIVATE THE FILTERS CLOSEST TO THE CENTRAL OFFICE AND POLARITY 1 SHOULD ACTIVATE THE FILTERS BETWEEN THE AUTHORIZED TIP AND RING REVERSAL AND THE RT.
4. THE 1115 FILTERS CONNECTED TO SIDE 2 FROM THE RT SHOULD BE ACTIVATED BY POLARITY 2 SWITCH SETTING.
5. IF INITIAL FAULT-LOCATING TESTS ARE BEING PERFORMED, THIS MEAS 1 VALUE IS THE SAME VALUE AS RECORDED EARLIER IN THE FAULT-LOCATE SIGNAL TESTS OF SECTION 363-202-216. THE METER INDICATION MUST BE GREATER THAN -74DBM (16DBRN).
6. IF 1114-TYPE FILTERS ARE INSTALLED, THE SIGNAL MUST NOT BE LOOPED AT THE RT. IF 1115-TYPE FILTERS ARE USED, THE SIGNAL MUST BE LOOPED AT THE RT.
7. IF 1114 FILTERS ARE INSTALLED AND SIDE 2 LINE FAULT IS SUSPECTED (OR INITIAL TESTS ON SIDE 2 ARE BEING PERFORMED), FAULT LOCATING TESTS ARE MADE FROM THE RT. THE TEST WILL START WITH THE APPARATUS CASE FILTER NEAREST THE RT AND WORK TOWARD THE COT. TEST CONNECTIONS WILL BE MADE AT THE RT PER FIG. 12.

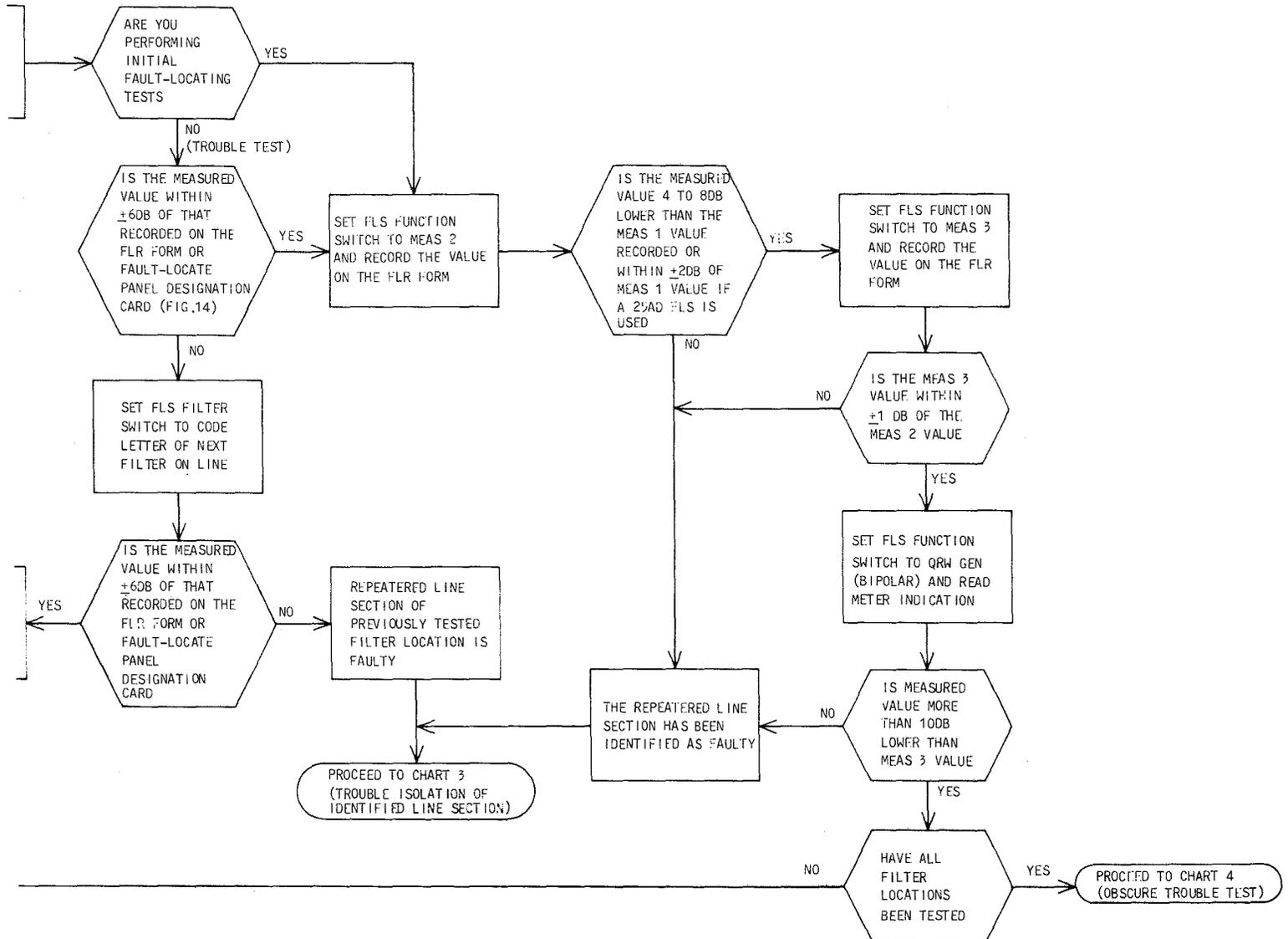
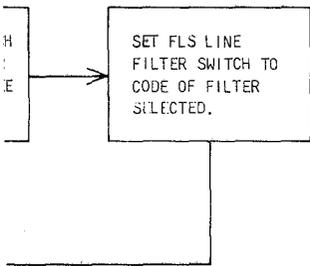


Chart 2—Fault-Locating Procedures—Transmission (Sheet 3 of 3)

CHART 3

ISOLATING TROUBLE TO A DIGITAL LINE SECTION
OR REPEATER

Note: This chart is provided to coordinate activities between the personnel at the repeater apparatus case location and the COT and RT locations. The actual tests at the repeater location will be performed in accordance with Section 640-527-225 using the J98725AB BPV Detector (25AB) (Fig. 7).

APPARATUS:

- 1—Sierra 315B, 415A-2 T1 Span and Repeater Test Set (315B), (415A) or J98725AD T1C/T1 Fault-Locate Test Set (25AD) (See Section 103-494-106).
- 2—P3BH Patch Cords equipped with 310 plugs.
- 1—ED-3C841—LIU Test Cord (Fig. 18).
- 1—J98725AB T1C/T1 Bipolar Violation Detector (25AB) (Fig. 7).

STEP**PROCEDURE**

Prerequisite: The digital line(s) must have been tested per Chart 2.

- 1 Inform personnel who will be performing tests at the repeater location as to which location is to be tested first and the type repeater at that location, and instruct them to call in on the order wire before attempting any repeater tests. Ensure they have the proper equipment.
- 2 Verify that the digital line to be tested is properly powered and that fault-locating equipment is connected per Fig. 11 or 12.
- 3 After a talk circuit has been established between the repeater location and the testing location (COT or RT), direct the tester at the repeater location to the proper slot in the apparatus case and the side of the repeater to be tested.
- 4 Verify that the fault-locating equipment is set up to test the filter associated with the repeater to be tested. Select correct fault line and polarity on the FL panel.
- 5 Have the tester at the repeater location remove the repeater, insert the 25AB into the vacated slot, and then insert the repeater into the 25AB.
- 6 Set the fault-locating set to send bipolar signals (25AD) or QRW GEN (315B) and have the tester at the repeater location test the repeater for signals and errors with the 25AB including the 100-ohm termination.

CHART 3 (Contd)

STEP	PROCEDURE
7	If the repeater tests OK, send errors on the line (XMT ERRORS on the 315B or MEAS 3 on the 25AD). The repeater tester will see errors verifying that the proper repeater is being tested.
8	If the repeater tester sees errors when bipolar signals are sent, replace the repeater and repeat the tests. If the repeater tester still sees errors, select the next repeater location toward the testing terminal and repeat the tests. Continue in this manner until the faulty repeater or cable section is found.
Note: When a repeater is replaced, the fault-locating tests of this section and Section 363-202-216 must be performed on the new repeater. Indicate in the notes column (of form being used) when any particular repeater is replaced.	

CHART 4
FAULT-LOCATING PROCEDURES
OBSCURE TROUBLE TEST
(SHEET 1 OF 3)

Note: Upon completion of Chart 2, the procedures of this chart are performed if no trouble was found **or** if initial fault-locating tests are being performed. The data from all the repeaters must first be gathered; then an evaluation will be conducted to identify the section which contains the obscure (marginal) trouble.

STEP	PROCEDURE
-------------	------------------

Note: The repeaters will again be tested (as in Chart 2) consecutively in the direction of transmission.

- | | |
|---|--|
| 1 | Determine the following: <ul style="list-style-type: none">(a) The FL LINE designation (1, 2, 3, 4, 5, or 6) to access the FL line being used for testing.(b) The filter code of the first and thereafter the next in line for each successive test.(c) The POLARITY switch setting to activate the first and thereafter the next filter in line for each successive test. |
| 2 | Proceed to Sheet 2 of this chart. |
-

SHEET 2

START

IS THE FLS
BEING USED
A 315B

NO

YES

FAULT-LOCATING PROCEDURE
CONTINUED USING 315B
SEE SHEET 3, THIS CHART

SET THE 25AD CONTROLS
AS FOLLOWS:
CLOCK RATE TO T1
FUNCTION TO MEAS 1
PULSE DENSITY TO 10
FILTER TO CODE LETTER
OF FILTER BEING TESTED

SEE NOTES.
READ METER
INDICATION

SET THE PULSE DENSITY
SWITCH TO NEXT LOWER
SETTING (9, 8, 7,
ETC.) AND MAKE
A MEASUREMENT

RECORD VALUE ON
FLR FORM IN SPACE
MARKED PULSE
PERIOD (10, 9 ETC.)
(SEE FIG. 10)

CONTINUE
TESTING THE
SAME FILTER

NO

WAS LAST
MEASUREMENT
MADE AT PULSE
DENSITY 4.

YES

HAVE ALL
FILTER
LOCATIONS
BEEN TESTED

YES

PROCEED TO
TEST THE
NEXT FILTER

NO

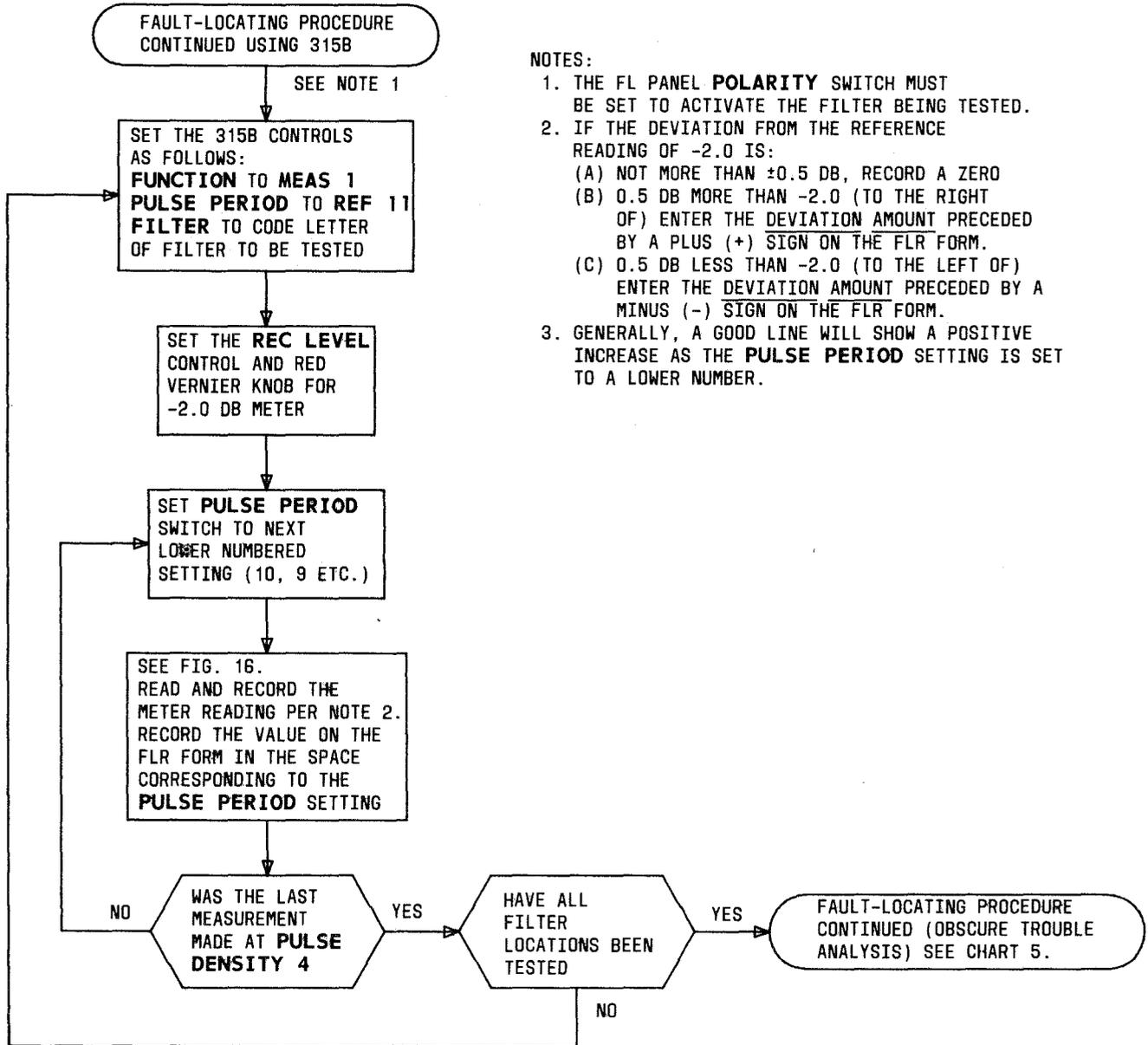
NOTES:

1. THE FL PANEL POLARITY SWITCH MUST BE SET TO CORRECT POLARITY TO ACTIVATE THE FILTER BEING TESTED.
2. GENERALLY, A GOOD DIGITAL LINE WILL SHOW AN ALMOST FLAT RESPONSE AS THE PULSE PERIOD SETTING IS CHANGED. THE DEVIATION OR SHIFT FROM PULSE PERIOD 10 TO 4 SHOULD BE NO MORE THAN 1dB.

FAULT-LOCATING
PROCEDURES CONTINUED
(OBSCURE TROUBLE
ANALYSIS) SEE CHART 5

Chart 4—Fault-Locating Procedures—Obscure Trouble Test (Sheet 2 of 3)

SHEET 3



NOTES:

1. THE FL PANEL **POLARITY** SWITCH MUST BE SET TO ACTIVATE THE FILTER BEING TESTED.
2. IF THE DEVIATION FROM THE REFERENCE READING OF -2.0 IS:
 - (A) NOT MORE THAN ± 0.5 DB, RECORD A ZERO
 - (B) 0.5 DB MORE THAN -2.0 (TO THE RIGHT OF) ENTER THE DEVIATION AMOUNT PRECEDED BY A PLUS (+) SIGN ON THE FLR FORM.
 - (C) 0.5 DB LESS THAN -2.0 (TO THE LEFT OF) ENTER THE DEVIATION AMOUNT PRECEDED BY A MINUS (-) SIGN ON THE FLR FORM.
3. GENERALLY, A GOOD LINE WILL SHOW A POSITIVE INCREASE AS THE **PULSE PERIOD** SETTING IS SET TO A LOWER NUMBER.

Chart 4—Fault-Locating Procedures—Obscure Trouble Test (Sheet 3 of 3)

CHART 5

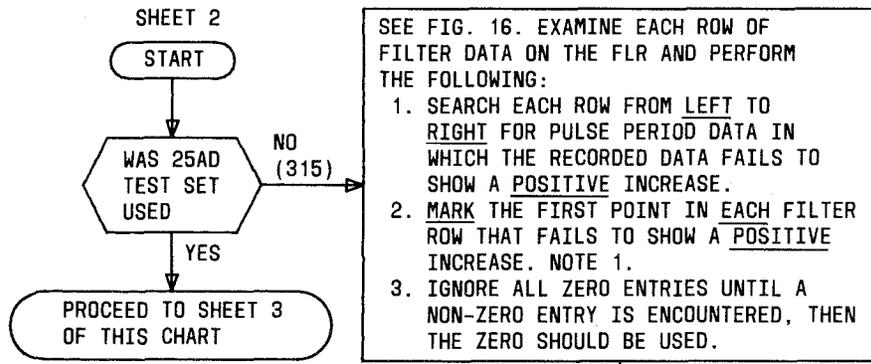
OBSCURE TROUBLE ANALYSIS
(SHEET 1 OF 3)

Note: The evaluation involves determining the PULSE PERIOD setting at which the performance of each line section declines. This setting can be thought of as the stress point which causes the declined performance. The stress points for adjacent line sections are then compared to identify the greatest increase in stress point. The greatest increase in stress point between adjacent line sections indicates a source of trouble.

STEP

PROCEDURE

- | STEP | PROCEDURE |
|------|---|
| 1 | Begin the procedures of this chart on Sheet 2 if the 315B is being used, or begin on Sheet 3 if the 25AD is being used. |
-



- NOTES:
1. ON FIG. 16, FOR FILTER CODE B, THE FIRST POINT IN THE ROW THAT FAILS TO SHOW A POSITIVE INCREASE IS AT PULSE PERIOD 4 AS MARKED. FOR FILTER CODE E, THE FIRST POINT IS AT PULSE PERIOD 7. ONLY ONE MARK SHOULD APPEAR IN EACH ROW.
 2. ON FIG. 16, NOTE THAT BETWEEN FILTER CODE G AND FILTER CODE H THE PULSE PERIOD SETTING INCREASED FROM 6 TO 10 (AN INCREASE OF 4), RESPECTIVELY, MAKING THE TROUBLED SECTION AT FILTER H. BETWEEN FILTER CODES D AND E, THE INCREASE WAS FROM PULSE PERIOD 4 TO 7 (AN INCREASE OF 3), MAKING A LIKELY 2ND CANDIDATE AT FILTER CODE E. ALSO NOTICE THAT BETWEEN FILTER CODE F AND G, THE PULSE PERIOD SETTING SHOWED A NEGATIVE INCREASE AND IS NOT CONSIDERED.

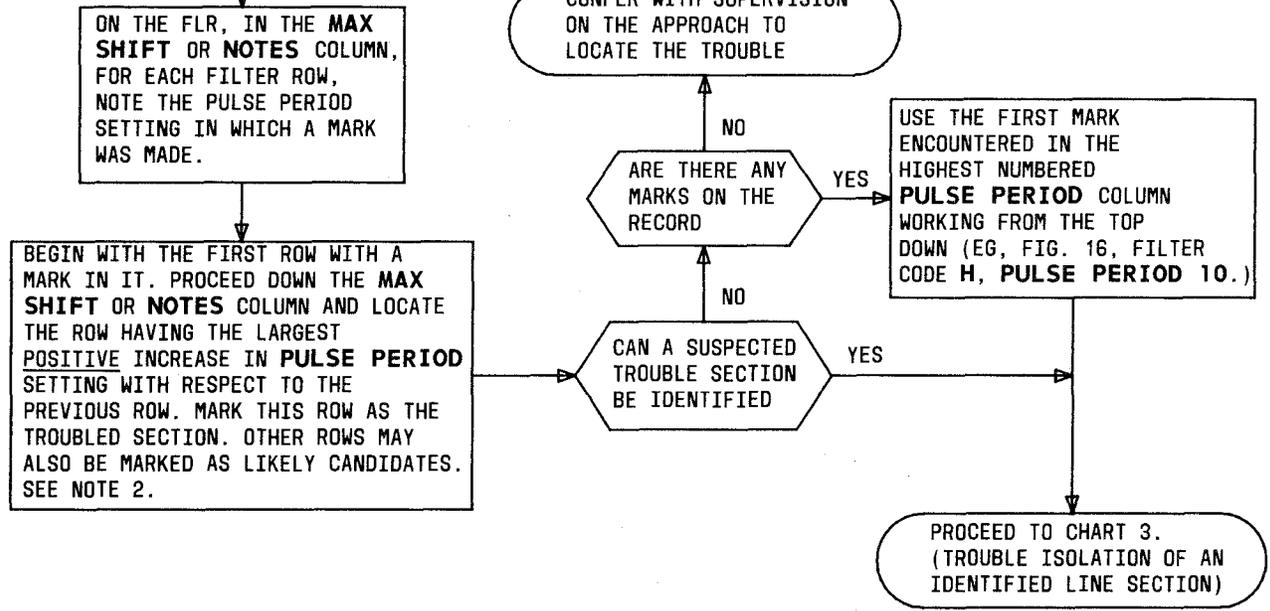


Chart 5—Obscure Trouble Analysis (Sheet 2 of 3)

SHEET 3

START

25AD

SEE FIG. 15. EXAMINE EACH ROW OF FILTER DATA ON THE FLR FORM AND PERFORM THE FOLLOWING:

1. DETERMINE THE LOWEST AND HIGHEST READING FOR **PULSE PERIOD** SETTING 10 THROUGH 4.
2. CALCULATE THE DIFFERENCE BETWEEN THE TWO READINGS
3. RECORD THE DIFFERENCE IN THE **MAX SHIFT** COLUMN ON THE FLR FORM

NOTE:

ON FIG. 15, NOTICE THAT IN FILTER ROW E THE **MAX SHIFT** VALUE RECORDED IS 1.7. THIS VALUE IS THE DIFFERENCE BETWEEN **PULSE PERIOD 4** READING (35.5) AND **PULSE PERIOD 7** READING (37.2)

ON THE FLR FORM, IN THE **MAX SHIFT** COLUMN, NOTE IF THERE IS ANY VALUE RECORDED GREATER THAN 1 dB. SEE NOTE.

ARE THERE ANY VALUES RECORDED GREATER THAN 1dB

YES

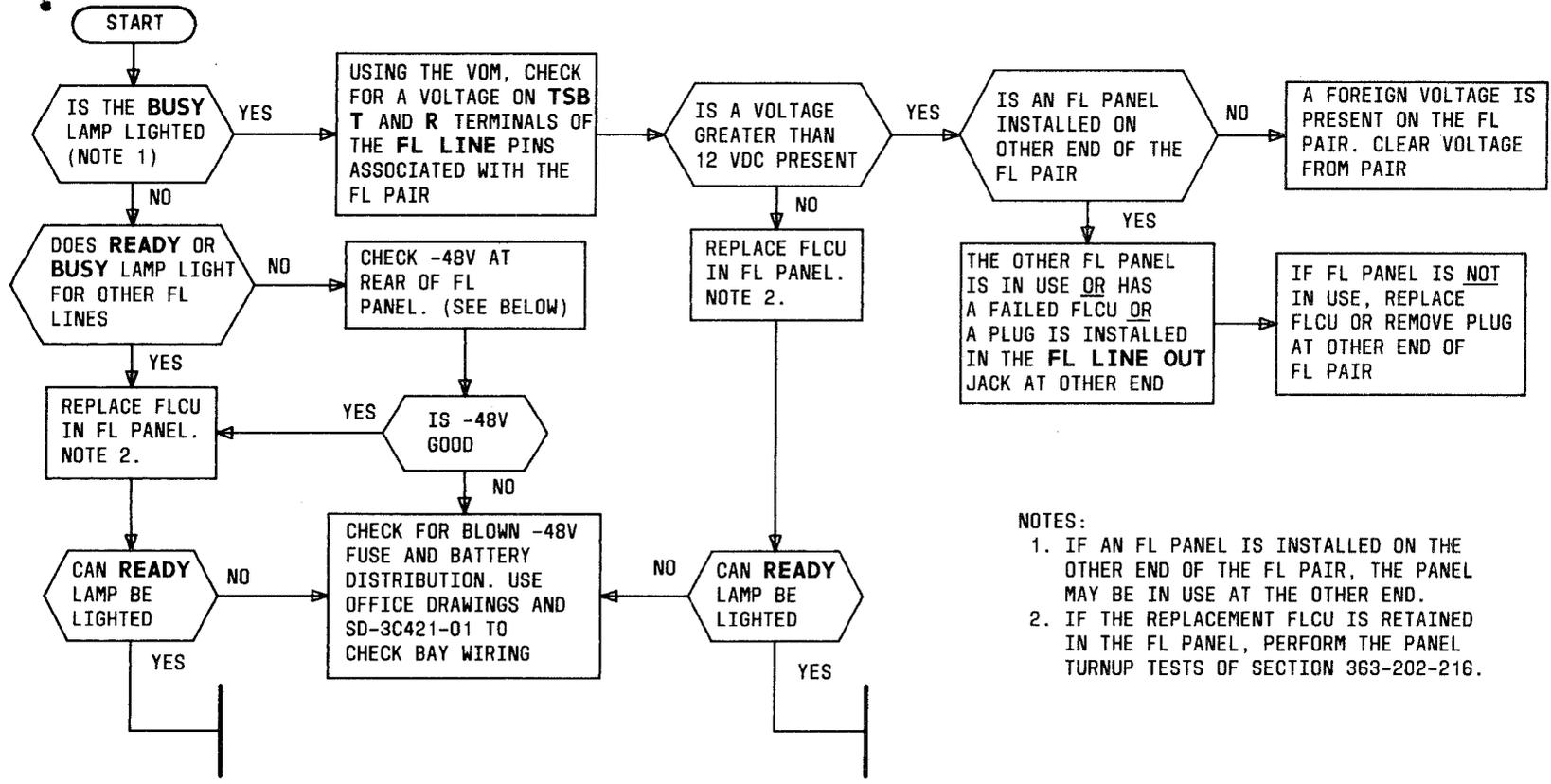
MARK THE ROW WITH THE GREATER THAN 1dB VALUE AS THE TROUBLED SECTION

NO

TROUBLED LINE SECTION UNIDENTIFIED. CONSULT WITH SUPERVISION ON APPROACH TO LOCATE THE TROUBLE

PROCEED TO CHART 3. (TROUBLE ISOLATION OF AN IDENTIFIED LINE SECTION)

Chart 5—Obscure Trouble Analysis (Sheet 3 of 3)



- NOTES:
1. IF AN FL PANEL IS INSTALLED ON THE OTHER END OF THE FL PAIR, THE PANEL MAY BE IN USE AT THE OTHER END.
 2. IF THE REPLACEMENT FLCU IS RETAINED IN THE FL PANEL, PERFORM THE PANEL TURNUP TESTS OF SECTION 363-202-216.

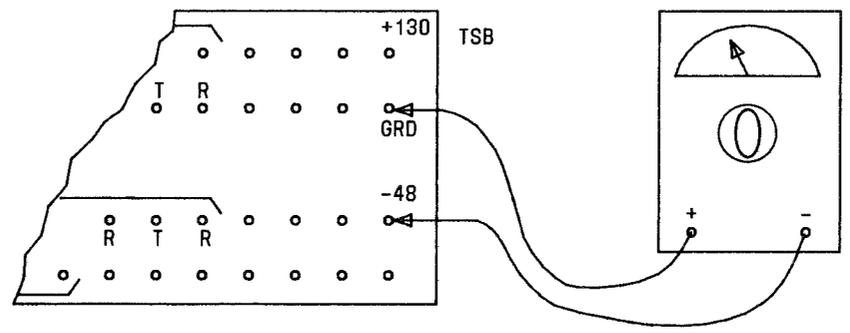
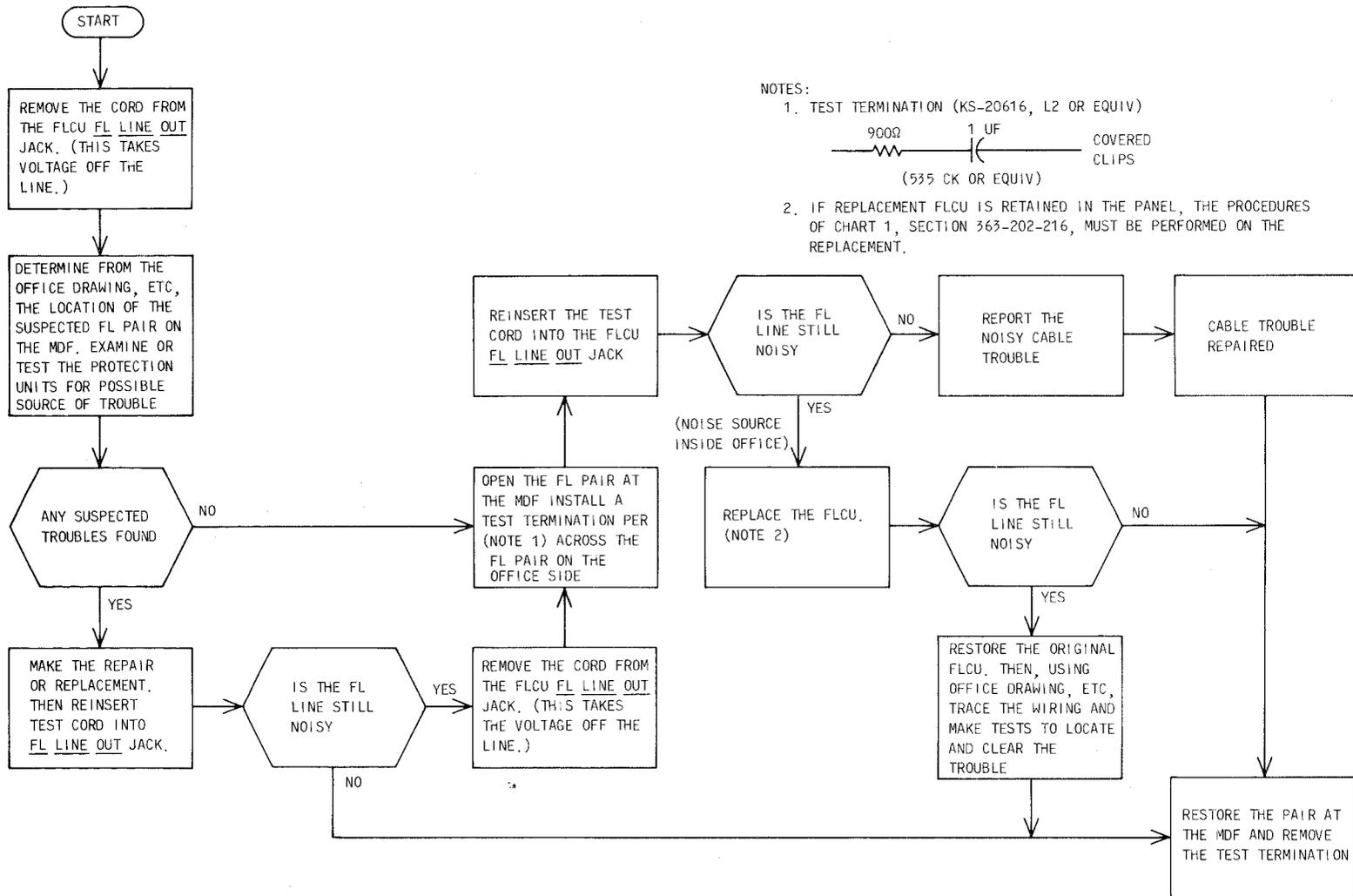
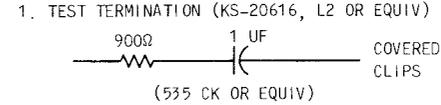


Chart 6—FL Panel READY/BUSY Lamp Trouble



NOTES:



2. IF REPLACEMENT FLCU IS RETAINED IN THE PANEL, THE PROCEDURES OF CHART 1, SECTION 363-202-216, MUST BE PERFORMED ON THE REPLACEMENT.

Chart 7—Noisy FL Pair Trouble

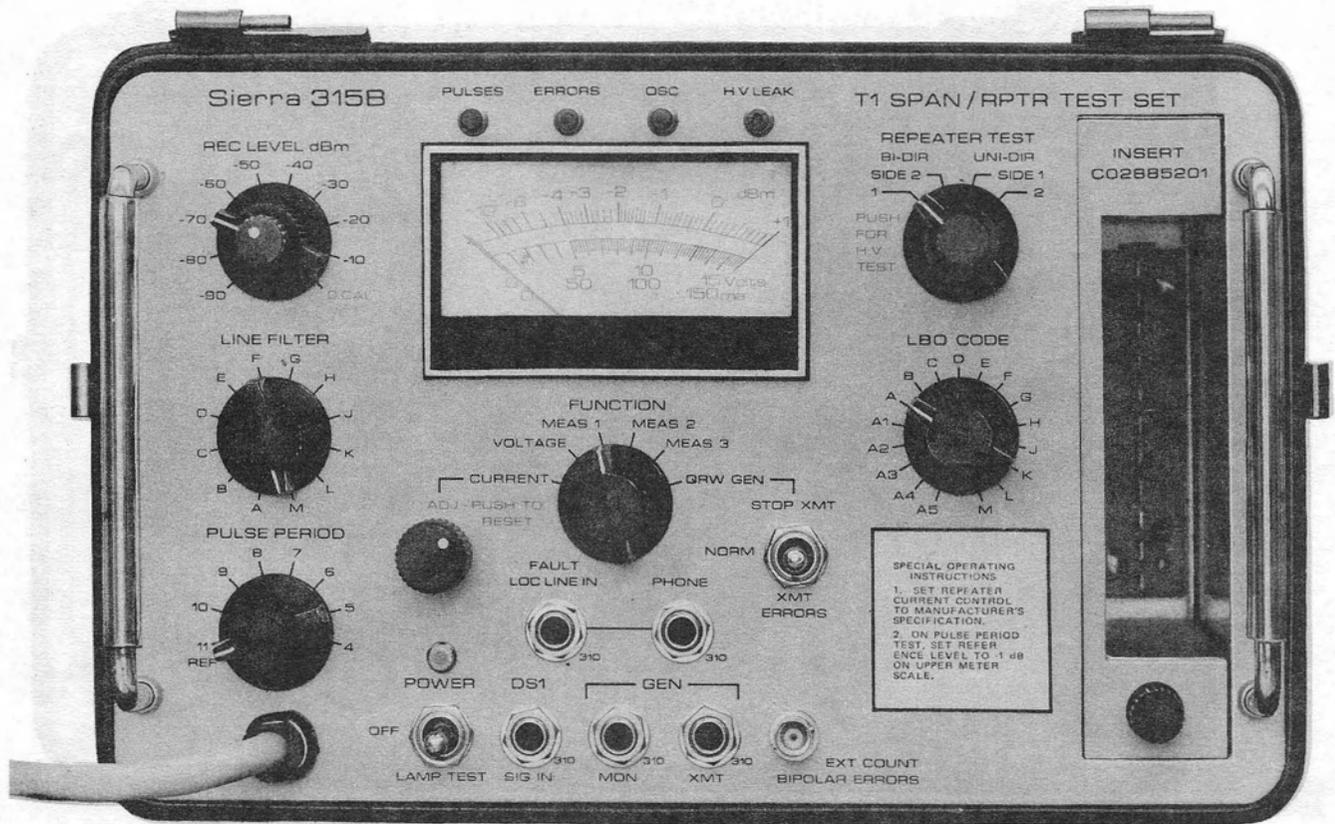


Fig. 2—Sierra 315B T1 Span and Repeater Test Set

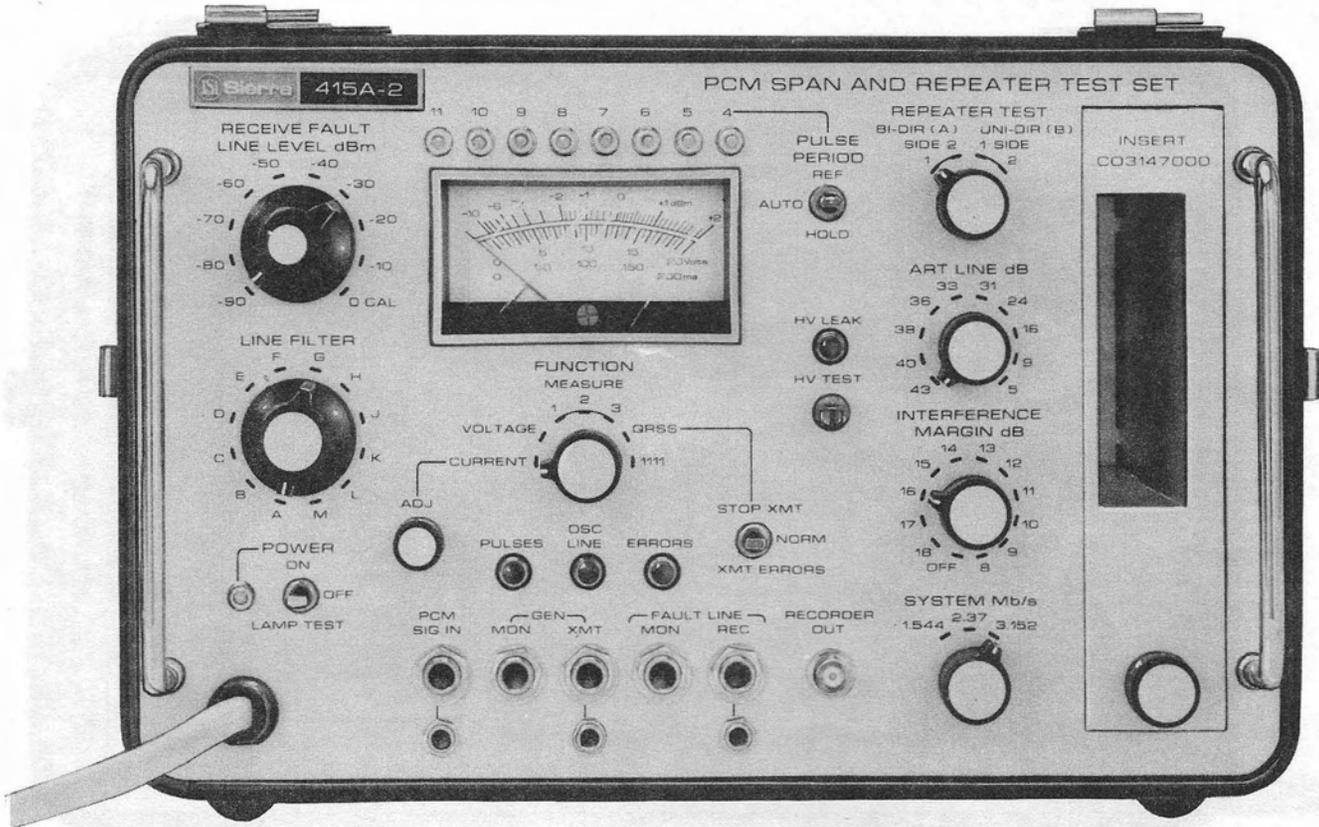


Fig. 3—Sierra 415A-2 PCM Span and Repeater Test Set



Fig. 4—J98725AD TIC/TI Fault-Locate Test Set

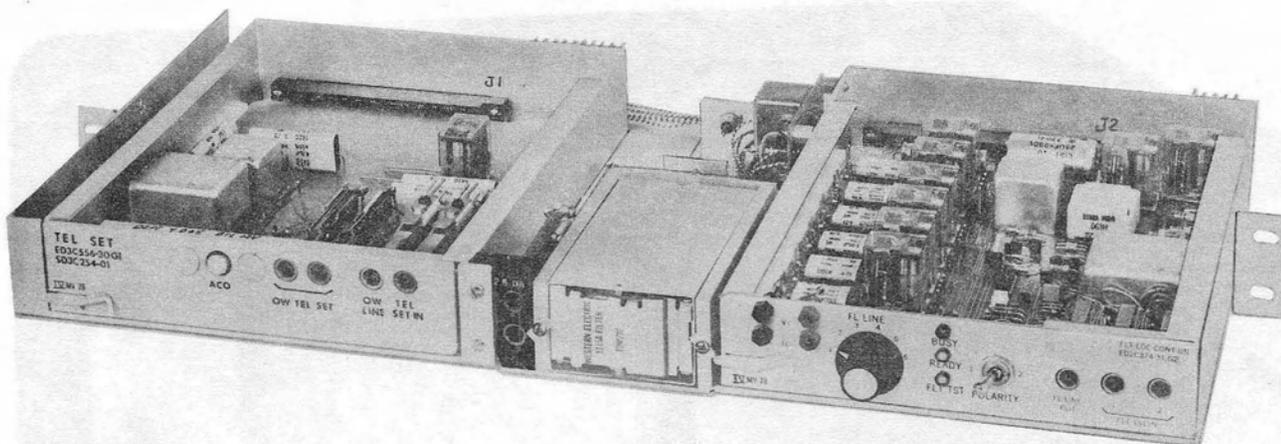


Fig. 5—SLC-96 Fault-Locate and Order Wire Panel (J1C141AC-L1)

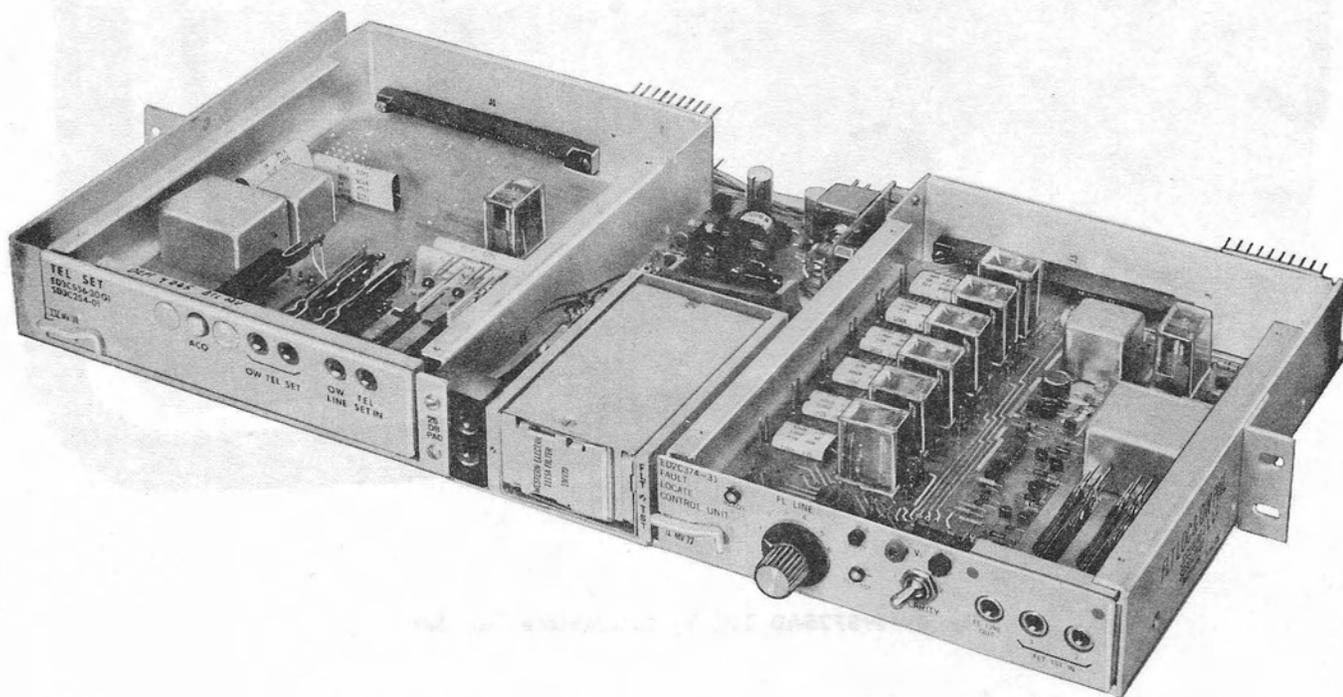


Fig. 6—SLC-96 Fault-Locate and Order Wire Panel (J1C141AC-L1, L2)

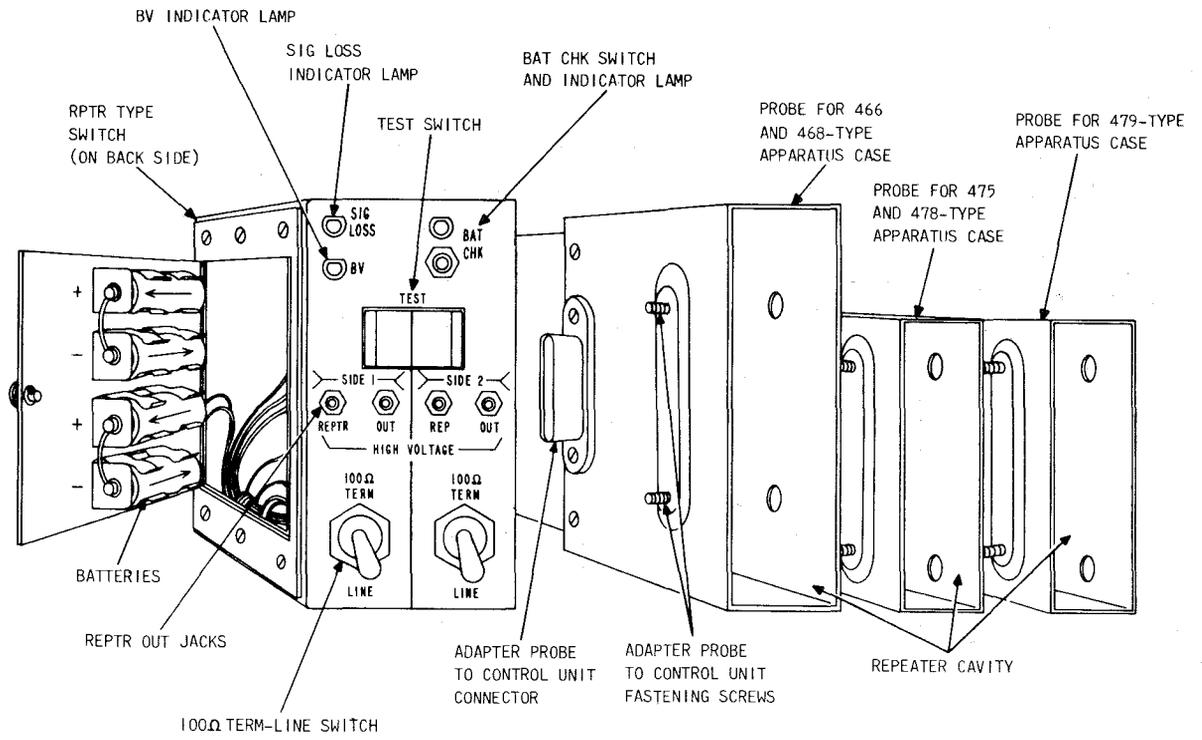


Fig. 7—J98725AB (25AB) Bipolar Violation Detector

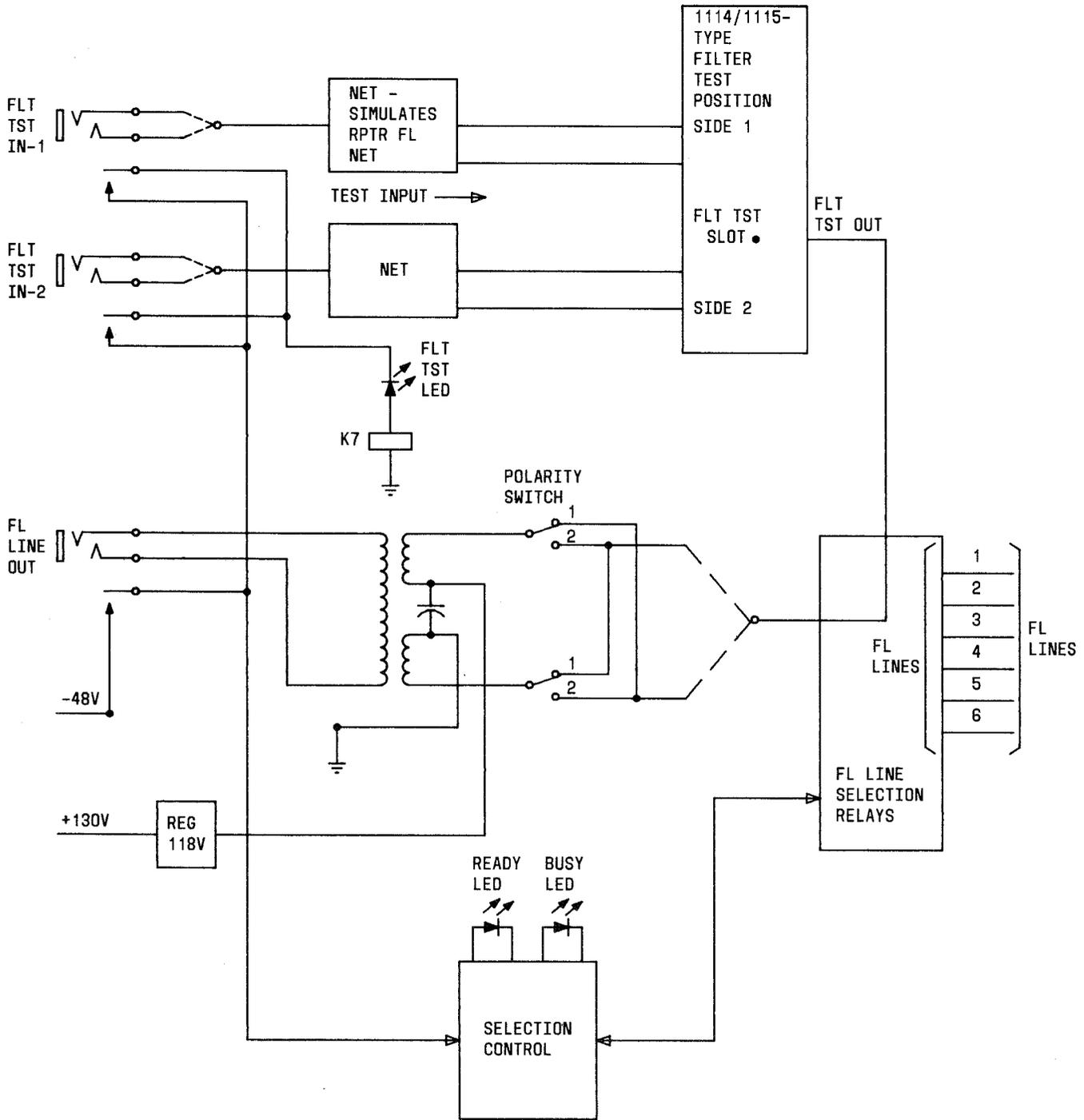
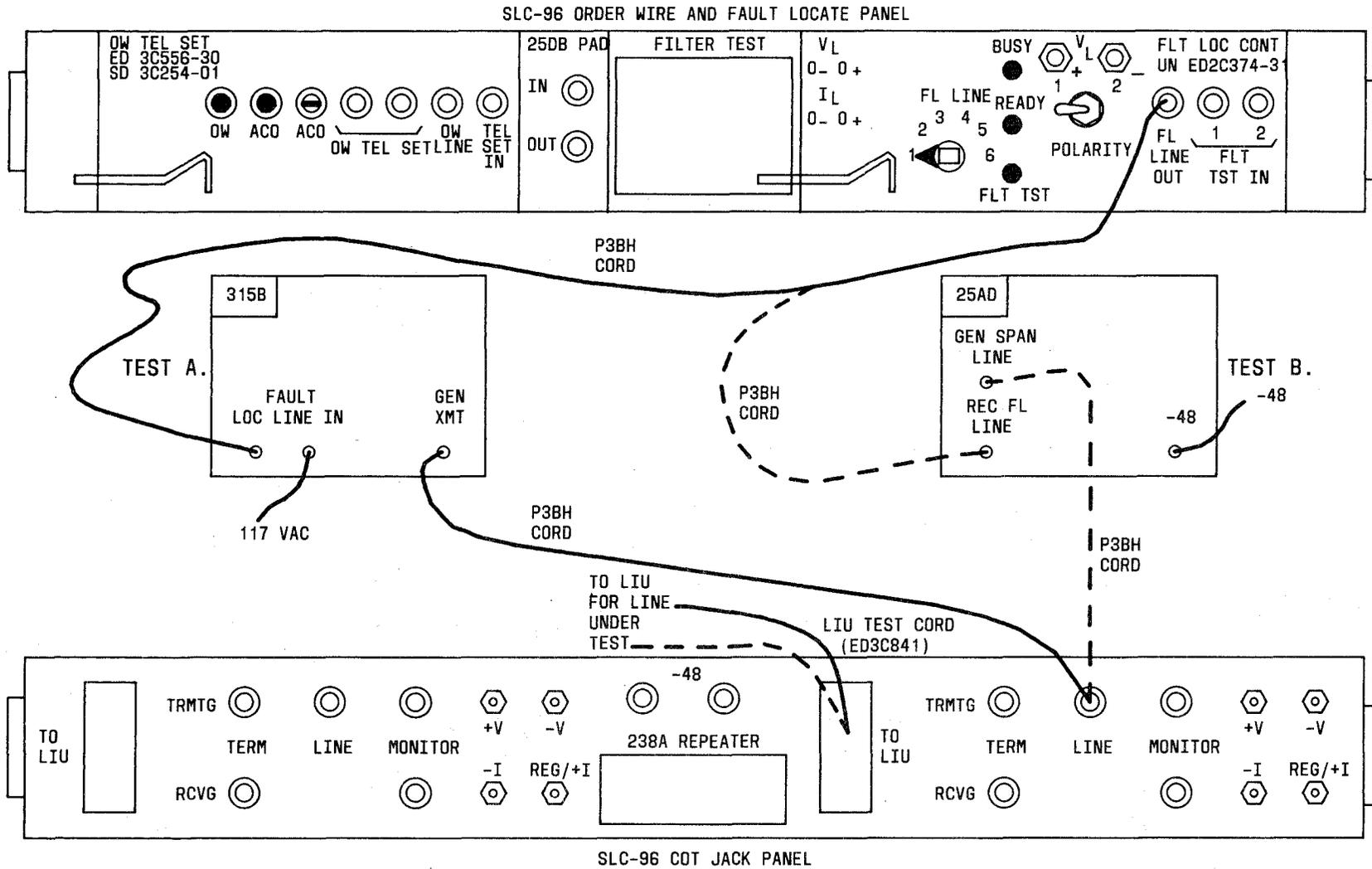


Fig. 8—Simplified Diagram of the Fault-Locate Test Position



— TEST A. - TEST SETUP AT COT USING 315B TEST SET
 - - - TEST B. - TEST SETUP AT COT USING 25AD TEST SET

Fig. 11—COT Fault-Locating Configuration

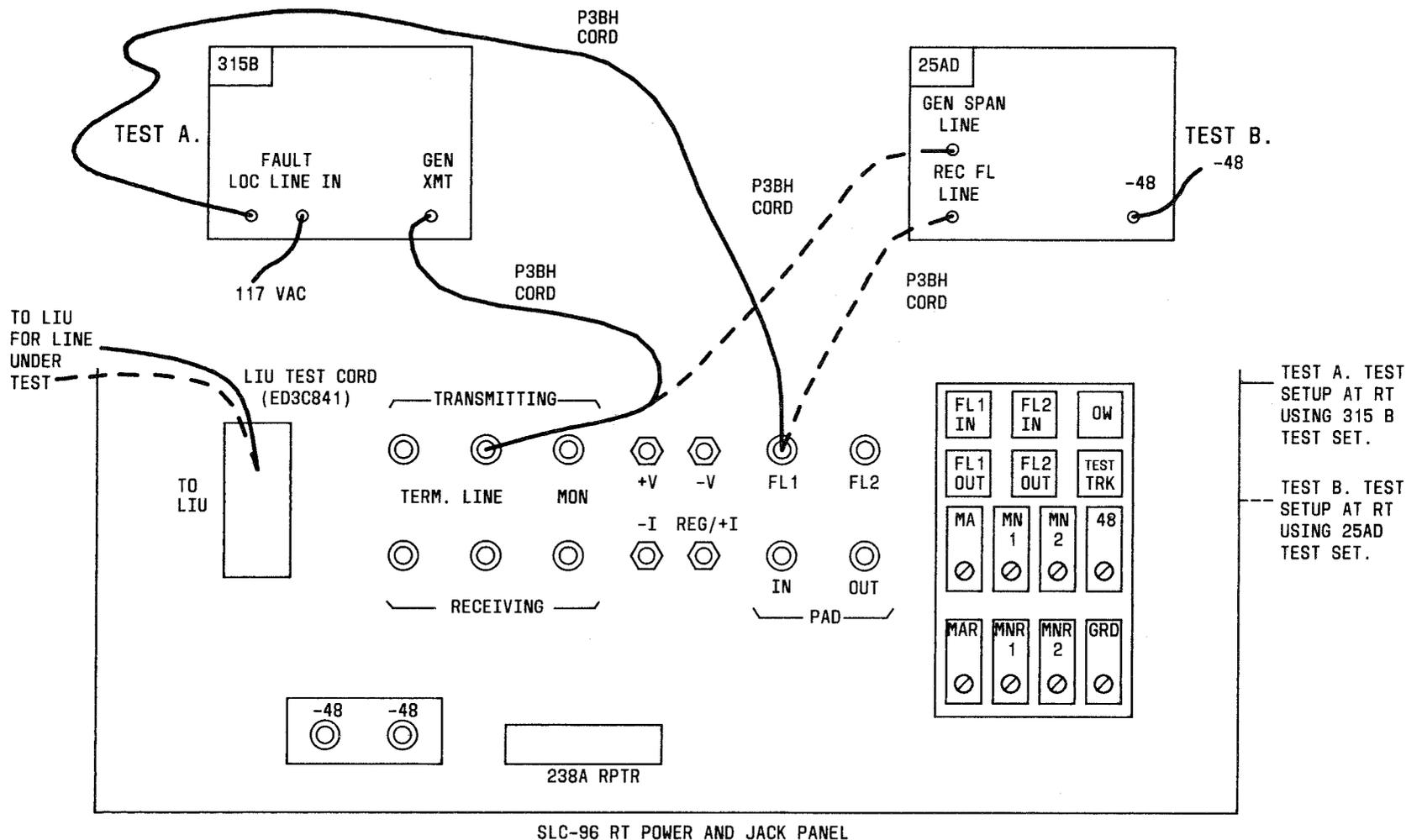


Fig. 12—RT Fault-Locating Configuration

SLC-96 FAULT-LOCATING RECORD

TEST LOCATION
 COT
 RT

FAULT-LOCATE LINE NUMBER 1

FAULT-LOCATE SET
 SIERRA 315B
 WE 25AD

ROUTE _____
 OFFICE _____
 FILTER TYPE 1115

LINE & SYSTEM #2
 TESTER K.E.B.
 DATE 3-25-80

FAULT-LOCATING PAIR TEST
 NEW SYSTEM TEST
 TROUBLE TEST

BROADBAND NOISE 5 DBRN
 RESISTANCE 2056 OHMS

POWER LOOP TESTS

COT	
+V TO -V	V
+V TO -I	V*
REG/+I TO +V	V

* .6 VOLTS EQUALS 60MA

DC TESTS FOR ACTIVE FL LINE

FL LINE VOLTAGE
11G TO 135 VDC
MEAS V_L _____
I_L _____
POLARITY 1 _____ MA
POLARITY 2 _____ MA

POWER LOOP TESTS

RT	
+V TO -V	V
+V TO -I	V*
REG/+I TO +V	V

* .6 VOLTS EQUALS 60MA

ACTIVE POLARITY SW POS 1

TEST DIRECTION SIDE 1 SIDE 2

FILTER CODE	RPTR CODE	TRANSMISSION TEST				PULSE PERIOD								MAX SHIFT	NOTES
		MEASURE			(NB NOISE) BIPOLAR	10	9	8	7	6	5	4			
A	239A	38.3	32.3	32.1	-100										
B					-98										← DEFECTIVE FILTER
C		39.4	32.3	32.5	-96										
D		39.7	34.7	34.0	-100										
E		40.3	33.8	33.2	-98										
F		41.6	36.5	36.0	-96										
G		42.0	36.2	36.1	-94										
H		42.4	36.4	37.0	-94										
J		44.4	38.3	38.0	-96										

Fig. 13—Results of a Good Digital Line With a Defective Filter

FL LINE NO. _____				
FILTER GROUP LOC. _____				
POLARITY 1		F L T	POLARITY 2	
LEV	LOC		LOC	LEV
		A		
		B		
		C		
		D		
		E		
		F		
		G		
		H		
		J		
		K		
		L		
		M		

Fig. 14—Fault-Locate Panel Designation Card

SLC-96 FAULT-LOCATING RECORD

TEST LOCATION
 COT
 RT

FAULT-LOCATE LINE NUMBER 2

FAULT-LOCATE SET
 SIERRA 315B
 WE 25AD

ROUTE _____
 OFFICE _____
 FILTER TYPE 1115

LINE & SYSTEM #1
 TESTER K.E.B.
 DATE 3-25-80

FAULT-LOCATING PAIR TEST
 NEW SYSTEM TEST
 TROUBLE TEST

BROADBAND NOISE 6 DBRN
 RESISTANCE 2150 OHMS

POWER LOOP TESTS

COT	
+V TO -V	V
+V TO -I	V*
REG/+I TO +V	V

* .6 VOLTS EQUALS 60MA

DC TESTS FOR ACTIVE FL LINE

FL LINE VOLTAGE	
11G TO 135 VDC	
MEAS V _L	_____
I _L	_____
POLARITY 1	_____ MA
POLARITY 2	_____ MA

POWER LOOP TESTS

RT	
+V TO -V	V
+V TO -I	V*
REG/+I TO +V	V

* .6 VOLTS EQUALS 60MA

ACTIVE POLARITY SW POS 1

TEST DIRECTION SIDE 1 SIDE 2

FILTER CODE	RPTR CODE	TRANSMISSION TEST				(NB NOISE) BIPOLAR	PULSE PERIOD							MAX SHIFT	NOTES
		1	2	3	10		9	8	7	6	5	4			
B	239A	27	26.5	26.5	-120	27	27	27	27	27	27	27	27	0	
C		27	26.5	26.5	-120	27	27	27	27	27	27	27	27	0	
D		27	27	27	-120	27	27	27	27	27.2	27	26.5	.7		
E		37	37.5	37	-124	37	36.5	36.5	37.2	36.5	37	35.5	1.7	← TROUBLE SECTION	
F		29.5	29	29	-120	29.5	29.5	30.0	30	30	29.5	29.5	.5		
G		31	31.5	31.5	-118	31	31	31.5	31.5	31	31	30.5	1.0		

Fig. 15—Partial Fault-Locating Record Using the 25AD

SECTION 363-202-516

SLC-96 FAULT-LOCATING RECORD		TEST LOCATION <input checked="" type="checkbox"/> COT <input type="checkbox"/> RT	FAULT-LOCATE LINE NUMBER <u>1</u>	FAULT-LOCATE SET <input checked="" type="checkbox"/> SIERRA 315B <input type="checkbox"/> WE 25AD
ROUTE _____	LINE & SYSTEM <u>#2</u>	FAULT-LOCATING PAIR TEST <input type="checkbox"/> NEW SYSTEM TEST <input checked="" type="checkbox"/> TROUBLE TEST	BROADBAND NOISE <u>5</u> DBRN	RESISTANCE <u>2056</u> OHMS
OFFICE _____	TESTER <u>K.E.B.</u>			
FILTER _____	DATE <u>3-25-80</u>			
TYPE <u>1115</u>				

POWER LOOP TESTS

COT	
+V TO -V	V
+V TO -I	V*
REG/+I TO +V	V

* .6 VOLTS EQUALS 60MA

DC TESTS FOR ACTIVE FL LINE

FL LINE VOLTAGE
11G TO 135 VDC
MEAS V_L _____
I_L _____
POLARITY 1 _____ MA
POLARITY 2 _____ MA

POWER LOOP TESTS

RT	
+V TO -V	V
+V TO -I	V*
REG/+I TO +V	V

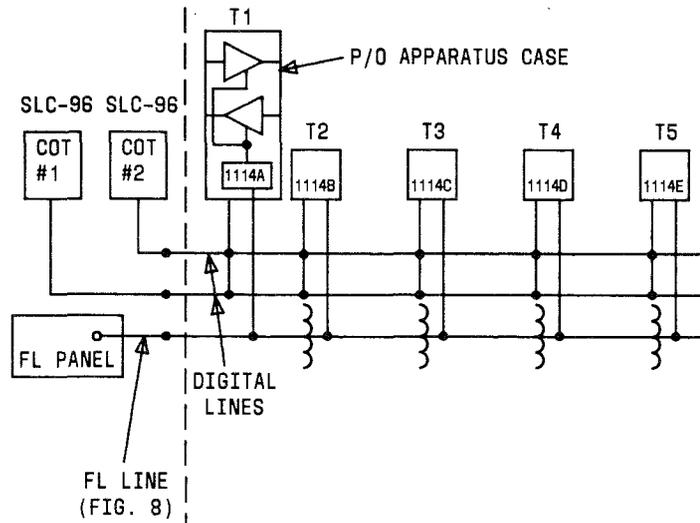
* .6 VOLTS EQUALS 60 AM

ACTIVE POLARITY SW POS 1

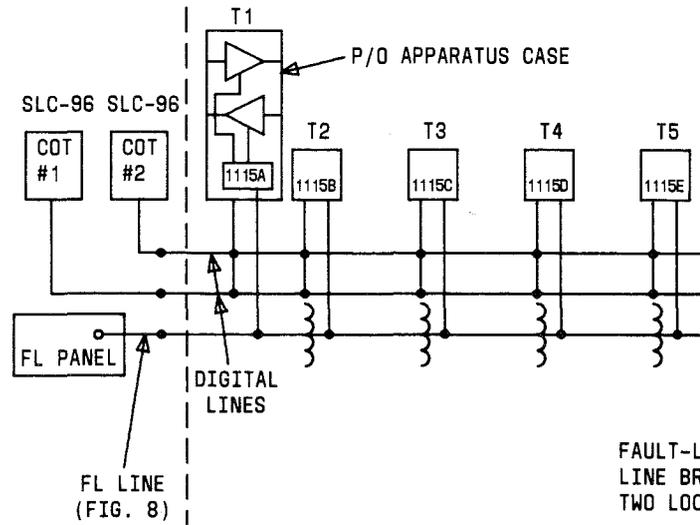
TEST DIRECTION SIDE 1 SIDE 2

FILTER CODE	RPTR CODE	TRANSMISSION TEST				PULSE PERIOD								MAX SHIFT	NOTES
		MEASURE			(NB NOISE) BIPOLAR	10	9	8	7	6	5	4			
		1	2	3											
A	239A	38.3	32.3	32.1	-100	0	0	+7	+1.0	+1.5	+1.7	+2.1			
B		38.0	32.0	31.9	-98	0	0	0	+8	+1.2	+1.9	+1.8	4		
C		39.4	32.3	32.5	-96	0	0	0	+6	+9	+1.2	+9	4		
D		39.7	34.7	34.0	-100	0	0	0	+8	+1.0	+1.1	+7	4		
E		40.3	33.8	33.2	-98	0	0	+7	+6	+1.2	+9	+3	7	2ND CANDIDATE	
F		41.6	36.5	36.0	-96	0	0	-6	0	0	-7	-9	8		
G		42.0	36.2	36.1	-94	0	+6	+9	+1.6	+7	-6	-1.3	6		
H		42.4	36.4	37.0	-94	-9	-1.3	-2.6	-3.4	-3.9	-5.6	-9.1	10	← TROUBLE SECTION	
J		44.4	38.3	38.0	-96	-1.6	-1.7	-1.9	-3.8	-4.5	-8.1	-10.1	10		

Fig. 16—Partial Fault-Locating Record Using the 315B

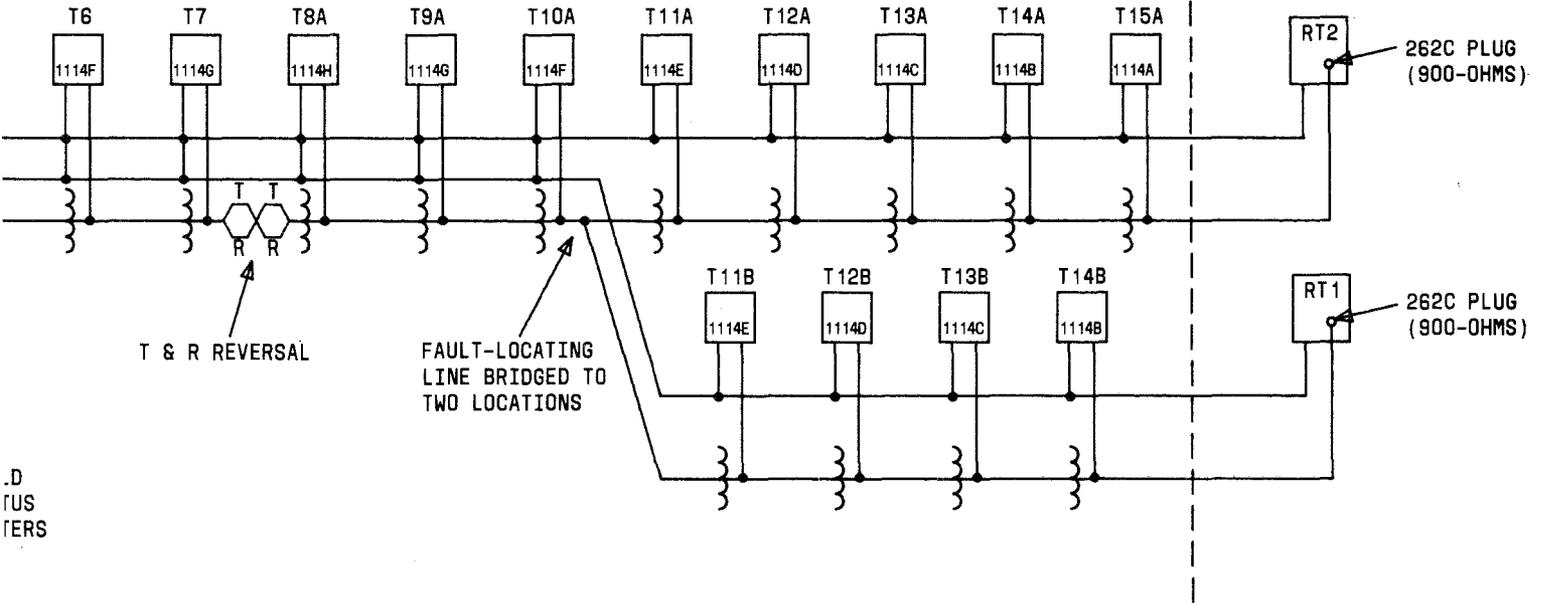


NOTE:
 FL PANEL POLARITY SWITCH SETTING 2 WOU
 ACTIVATE FILTERS A THROUGH G IN APPARA
 CASES T1 THROUGH T7. THE REMAINING FIL
 WOULD BE ACTIVATED BY POLARITY 1.



NOTES:
 1. FL PANEL POLARITY SWITCH SETTING 1 WO
 THE FILTER SIDE CONNECTED TO SIDE 1 (
 AND POLARITY 2 WOULD ACTIVATED THE FIL
 CONNECTED TO SIDE 2 (FROM RT).
 2. FOR 1115-TYPE FILTERS ONLY, THE FL LI
 TERMINATED IN THE LAST APPARATUS CASE
 INSTALLATIONS.

A. 1114-TYPE FILTERS



.D
TUS
TERS

B. 1115-TYPE FILTERS

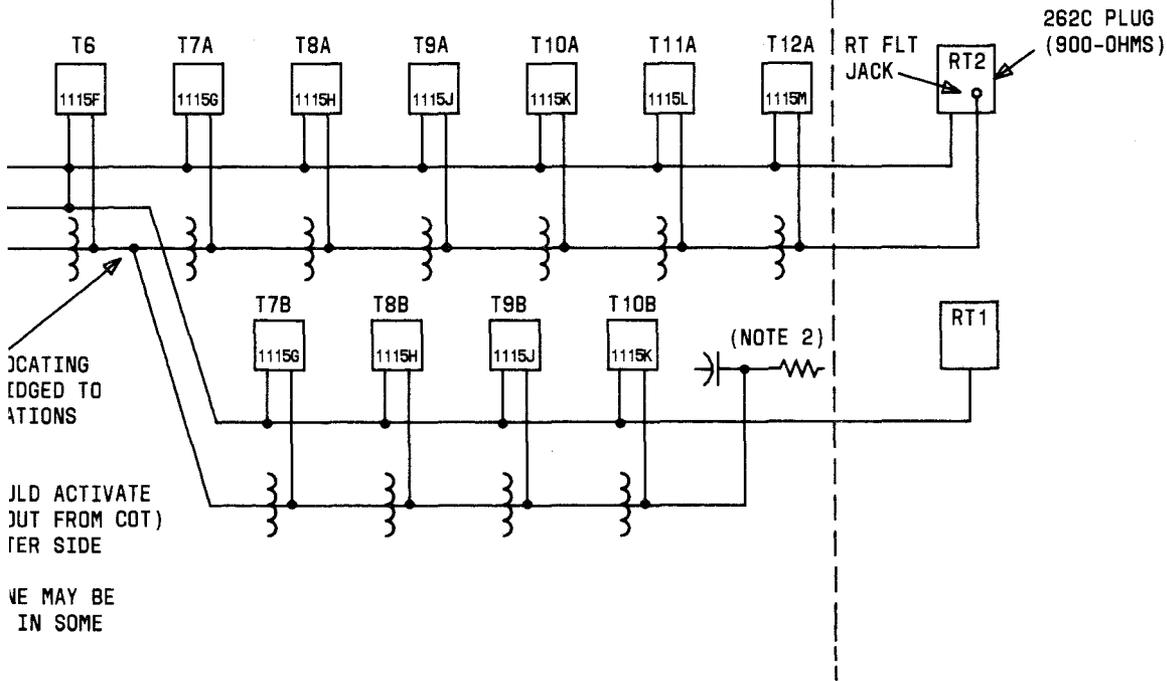


Fig. 17—Fault-Locating Line Configurations (Example)

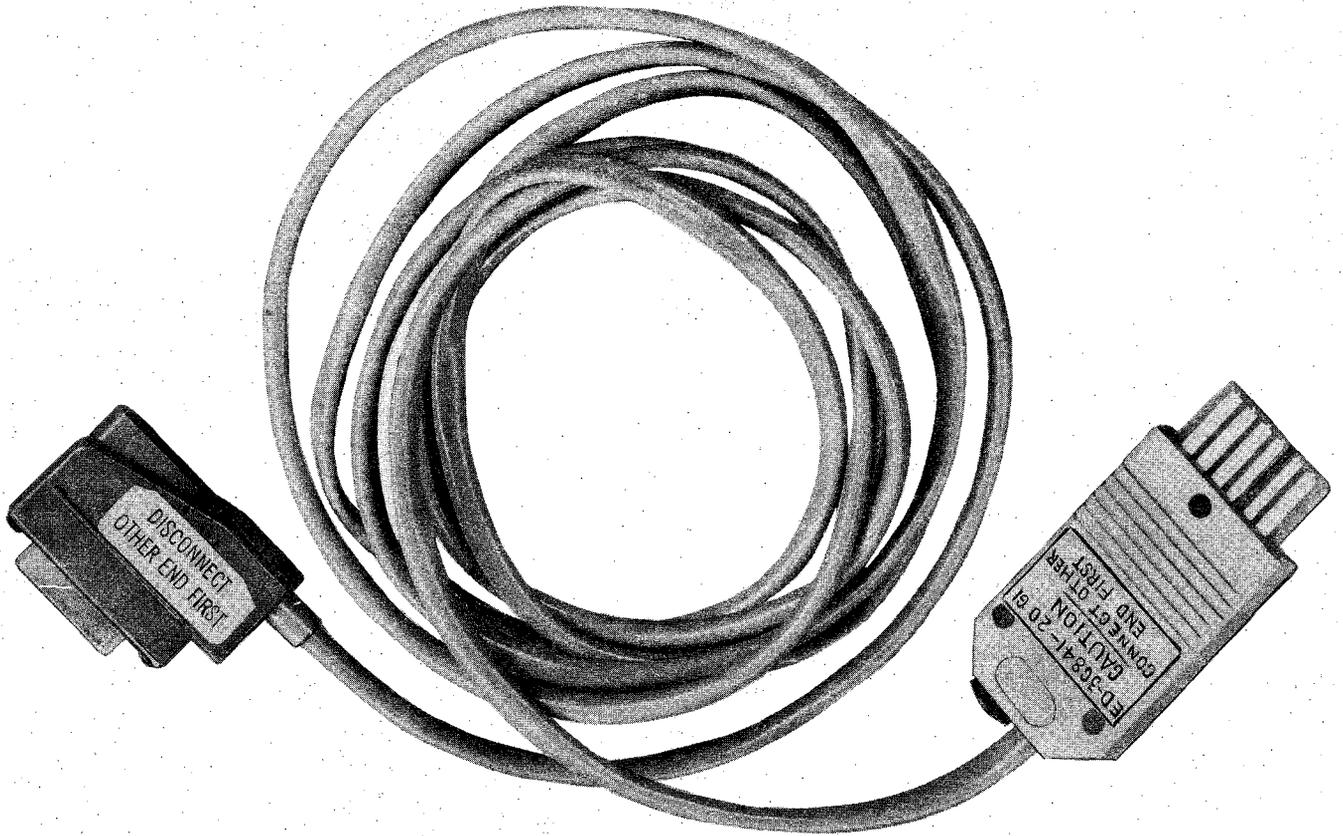


Fig. 18—ED-3C841—LIU Test Cord