T1WB5 DATA-VOICE MULTIPLEXER LOCAL END OFFICE BAY
INITIAL INSTALLATION AND TESTS
DIGITAL DATA SYSTEM

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1. GENERAL

1.01 This section provides procedures for installation and preservice testing of the T1WB5 data-voice multiplexer local office bay. Procedures are included for installing and testing added channels to an in-service T1WB5 bay. The T1WB5 bay is

shop-wired and normally will not require checking in the field except by means of initial testing.

1.02 This section is reissued for the following reasons:

(a) To correct Steps 3, 61, 62, and 63 of the initial installation test procedure

(b) To eliminate the mixed procedure formats by reformatting the section

(c) To incorporate changes that were listed in a previous addendum

(d) To add cable distances to Table A.

This reissue does not affect the equipment test list. Revision arrows are used to indicate the significant changes.

▶2. TEST PROCEDURES

2.01 This part contains three test procedures. The first test procedure is made at initial installation of the T1WB5 bay. The two remaining test procedures are made when channels are added to a T1WB5 after it has been in service. These two test procedures are divided into data (independent or chained) and combined data-voice categories.

2.02 In the following test procedures, all references to the HL74 circuit pack (CP) may be applied to the HL74B CP, except as noted in specific procedures.◀

2.03 After the initial installation test procedure, an overall channel transmission test may be made. End-to-end tests are not required if both end terminals meet the requirements of the single-end tests.

INITIAL INSTALLATION (CHART 1)

2.04 This test procedure is used for an acceptance test after initial installation only.

▶2.05 The apparatus required for the initial installation test procedure is listed below:◀

1— KS-16979-L1 volt-ohm-milliammeter (VOM) or equivalent

1— W1BF cord, 8 inches long

2— 3P6A cords

2— P-11H966 terminal assemblies

1— KS-20908 data test set (DTS) (digital receiver)

1— KS-20909 DTS (digital transmitter)

1— KS-6320 orange stick.

STEP	PROCEDURE
	A. Preparation
1	Ensure that no input (DS-0) or output (DS-1) lines are connected to the T1WB5.
2	Inspect the connectors in the mounting shelves from the front and the rear to ensure that the contacts are not bent or misaligned.
3	Install the appropriate equalizers, pads, or straps on the equalizer panel, located at the rear of the T1WB5, per Fig. 1 and Table A. ▶***Note:*** If straps are installed between E1 and E3, E2 and E11 at terminal strip (TS) 1, or if equalizers or pads are unavailable, connect a 100-ohm resistor between terminals E1 and E2 on TS1.◀
4	Verify that the bay clock, power and alarms (BCPA) shelf has been fused and is operational.

STEP	PROCEDURE

B. Circuit Pack Installation

Note: Office audible alarms are actuated each time an alarm is initiated in this test. These alarms can be silenced by momentarily depressing the alarm cutoff (ACO) switch on the alarm relays (ALR) CP HL50 in the BCPA shelf. They can also be disabled by blocking the appropriate relays on the power distribution panel, if desired.

5 Verify that the appropriate power units (71C or 71C1 for −48 Vdc office battery or 76C or 76C1 for −24 Vdc office battery) are installed in the power supply shelf (PSS) of the 3-shelf office channel unit (OCU) assembly.

6 Using a KS-16979-L1 VOM, measure the following voltages on the terminal strip pins at the back of the T1WB5.

ON TS3 MEASURE BETWEEN PIN 13 (SG) AND	REQUIREMENT
Pin 14 on TS4	+4.5 — +5.5V
Pin 12 on TS4	-11.5 — -13.2V
Pin 15 on TS3	-20.0 — -28.0V or -42.0 — -52.8V

7 If the requirements in Step 6 are not met, troubleshoot the OCU power converter shelf according to Section 314-910-300.

8 Remove the protector from each circuit board and insert the following CPs. Refer to Fig. 2 for CP locations.

CIRCUIT PACK	CODE	NUMBER REQUIRED
Clock	HL71	2
Test	HL78	1

STEP	PROCEDURE

9 If the installation of a CP causes a fuse on the BCPA shelf to blow, the trouble must be cleared according to Section 314-915-510 before proceeding.

10 Verify that the CPs in the BCPA shelf have been installed and tested.

Note: Installation and testing of the T1WB5 cannot be continued until this step has been completed.

11 Remove the protector from each circuit board and insert the following CPs. Refer to Fig. 2 for CP locations.

CIRCUIT PACK	CODE	NUMBER REQUIRED
Transmitter/Receiver	HL70 or HL70B†	4
Protection Switch 1	HL79	1
Alarm Control*	HL74	1

*Set the CHAINED OP and LOOP CONT switches on HL74 CP to the off position.

†An HL70B CP is required in the transmitter regular and spare slots when the T1WB5 connects to a T1DM at the distant end.

12 If the installation of a CP causes a fuse on the BCPA shelf to blow, the trouble must be cleared according to Section 314-915-510 before proceeding.

13 On each channel unit (HL73) to be installed, set channel unit selection switches S1 through S6 to the HI position.

14 Record the channel number in the space provided on the channel unit.

15 Remove the protector from the circuit board and insert the channel unit into the desired channel equipment location of shelf B (Fig. 2).

16 Repeat Steps 13 through 15 for the remaining channel units to be installed.

Note: The 126A apparatus blanks may be installed in the unused channel equipment locations if the T1WB5 is not equipped with all 24 channel units.

STEP	PROCEDURE

17 If a byte-framing generator CP (HL77) is required and is installed in the T1WB5, remove this CP.

18 Insert a W1BF cord between test point (TP) 9 and TP24 on the local clock CP (HL71) in shelf location 5 of shelf A.

Note: The contact side of the plug inserted into TP9 must face the right-hand edge of the CP and the contact side of the plug inserted into TP24 must face the left-hand edge.

19 Set the IND OP switch on the protection switch II CP (HL76) to the ON position.

20 Set the power option screw switch (S2) on the HL76 CP as follows:

- If 71C or 71C1 power units (−48 Vdc office battery) are provided, open switch S2.
- If 76C or 76C1 power units (−24 Vdc office battery) are provided, close switch S2.

21 Remove the protector from the circuit board and insert the HL76 CP into the shelf location shown in Fig. 2.

Requirement: The IND OP and RCV IN FAIL or REG RCVR FAIL and SPARE RCVR FAIL indicators on the alarm control unit CP (HL74) and the MJ alarm indicator on the BCPA shelf are lighted.

Note: Other light-emitting diodes (LEDs) on the HL74 CP may light momentarily and then extinguish.

22 If the requirement in Step 21 is not met, refer to Fig. 3 for troubleshooting procedures.

C. Synchronization Recovery

23 Insert a 3P6A cord between the TRMTR SPARE OUT jack and the RCVR SPARE IN jack on the test CP (HL78).

Requirement 1: The RCV IN FAIL indicator on the HL74 CP and the MJ alarm indicator on the BCPA shelf are extinguished.

Requirement 2: The RCVR FAIL REG and IND OP indicators on the HL74 CP and the MN alarm indicator on the BCPA shelf are lighted.

24 If the requirements in Step 23 are not met, refer to Fig. 4 for troubleshooting procedures.

25 Using a 3P6A cord, insert between the TRMTR REG OUT jack and the RCVR REG IN jack on the HL78 CP.

Requirement: The RCVR FAIL REG indicator on the HL74 CP and the MN alarm indicator on the BCPA shelf are extinguished.

26 If the requirement in Step 25 is not met, refer to Fig. 5 for troubleshooting procedures.

STEP	PROCEDURE
27	Remove one end of both patch cords from the HL78 CP simultaneously.
28	Remove the HL76 CP and set the IND OP switch to the OFF position.
29	Reinsert the HL76 CP and remove and reinsert the HL74 CP. ◆***Note:*** Do not remove and reinsert the HL74B CP, if equipped.◆ ***Requirement:*** The TRMT IN FAIL and RCV IN FAIL indicators on the HL74 CP and the MJ alarm indicator on the BCPA shelf are lighted.
30	If the requirement in Step 29 is not met, replace the HL74 CP.
31	Set the LOOP CONT RCV IN switch on the HL74 CP to the ON position. ***Requirement 1:*** The LOOP CONT RCV IN, TRMT IN FAIL, and RCV IN FAIL indicators on the HL74 CP are lighted. ***Requirement 2:*** On the BCPA shelf, the MJ alarm indicator is extinguished and the MN alarm indicator is lighted.
32	If the requirements in Step 31 are not met, refer to Fig. 6 for troubleshooting procedures.
33	Set the LOOP CONT TRMT IN switch on the HL74 CP to the ON position. ***Requirement:*** The LOOP CONT TRMT IN indicator on the HL74 CP is lighted, the MN alarm indicator on the BCPA shelf is extinguished, and other alarms remain the same.
34	If the requirement in Step 33 is not met, refer to Fig. 7 for troubleshooting procedures.
35	Insert a 3P6A cord between the TRMTR REG OUT jack and the TRMTR SPARE IN jack on the HL78 CP. ***Requirement:*** The TRMT IN FAIL indicator on the HL74 CP is extinguished.
36	If the requirement in Step 35 is not met, replace the spare transmitter CP (HL70) located in shelf location 28.
37	Remove the patch cord from the HL78 CP.
38	Set the LOOP CONT TRMT IN and LOOP CONT RCV IN switches on the HL74 CP to the OFF position. ***Requirement:*** The LOOP CONT TRMT IN and LOOP CONT RCV IN indicators are extinguished.
39	Interchange the regular and spare transmitter CPs, and then remove and reinsert the HL76 CP. ***Requirement:*** The TRMT IN FAIL and RCV IN FAIL indicators on the HL74 CP and the MJ alarm indicator on the BCPA shelf are lighted.

STEP	PROCEDURE

40 If the requirement in Step 39 is not met, replace the HL74 CP.

41 Repeat Steps 31 through 38 for the transmitter CPs interchanged in Step 39 and then proceed to next step.

D. Transparent Alarms

42 Using 3P6A cords, make the following connections on the HL78 CP:

- TRMTR REG OUT jack to RCVR SPARE IN jack
- RCVR SPARE OUT jack to RCVR REG IN jack.

Requirement: On the HL74 CP, the RCVR FAIL REG and TRMT IN FAIL indicators are lighted and the RCV IN FAIL indicator is extinguished; and the MN alarm indicator on the BCPA shelf is lighted.

43 If the requirement in Step 42 is not met, check the patch cord arrangement and verify that the LOOP CONT switches on the HL74 CP are in the OFF position.

44 Using two P-11H966 terminal assemblies and setting the VOM to DCV 1.5, measure the voltages with respect to ground [TP9 on the clock (HL71) and channel unit CPs] at TP13 and TP15 on the spare receiver CP in location slot 34. The contact side of each terminal assembly must face the right-hand edge of the circuit pack when inserted into TP9 and the left-hand edge when inserted into TP13 or TP15.

Requirement: +0.0 to +0.4 volts inclusive is present at both TP13 and TP15.

45 If the requirement in Step 44 is not met, refer to Fig. 8 for troubleshooting procedures.

46 Rearrange the patch cords on the HL78 CP as follows:

- TRMTR REG OUT jack to RCVR REG IN jack
- RCVR REG OUT jack to RCVR SPARE IN jack.

Requirement: On the HL74 CP, the RCVR FAIL REG indicator is extinguished and the RCVR FAIL SPARE and TRMT IN FAIL indicators are lighted; and the MN alarm indicator on the BCPA shelf is lighted.

47 If the requirement in Step 46 is not met, verify that the patch cords are properly arranged.

48 Measure the voltages at TP13 and TP15 on the regular receiver CP as in Step 44.

Requirement: +0.0 to +0.4 volts inclusive is present at both TP13 and TP15.

49 If the requirement in Step 48 is not met, refer to Fig. 8 for troubleshooting procedures.

50 Rearrange the patch cords on the HL78 CP as follows:

STEP	PROCEDURE

- TRMTR REG OUT jack to RCVR SPARE IN jack
- RCVR SPARE OUT jack to RCVR REG IN jack.

51 Remove the HL74 CP, set the CHAINED OP switch to the ON position, and reinsert the HL74 CP.

Requirement: The TRMT IN FAIL and CHAINED OP indicators on the HL74 CP and the MJ alarm indicator on the BCPA shelf are lighted. (If an HL74B is being used and the TRMTR FAIL REG and SPARE lights and/or the RCVR FAIL REG and SPARE lights are on, remove the HL76, set the IND OP switch to the ON position, and reinsert the HL76. If the lights are extinguished, remove the HL76, set the IND OP switch to the OFF position, and reinsert the HL76. This requirement should now be met.)

52 If the requirement in Step 51 is not met, replace the HL74 CP.

53 With the VOM set to DCV 30, measure the voltages at TP13 and TP15 on the spare receiver CP as in Step 44.

Requirement: +3.0 to +5.5 volts inclusive is present at both TP13 and TP15.

54 If the requirement in Step 53 is not met, refer to Fig. 8 for troubleshooting procedures.

55 Rearrange the patch cords as follows, ***removing the plug from the RCVR REG IN jack first:***

- TRMTR REG OUT jack to RCVR REG IN jack
- RCVR REG OUT jack to RCVR SPARE IN jack.

Requirement: On the HL74 CP, the TRMT IN FAIL and CHAINED OP indicators are lighted; and the MJ alarm indicator on the BCPA shelf is lighted.

56 If the requirement in Step 55 is not met, check the patch cord arrangement on the HL78 CP. If the plug in the RCVR REG IN jack was ***not*** removed first when the patch cords were rearranged, repeat Steps 50 through 55.

57 Measure the voltages at TP13 and TP15 on the regular receiver CP as in Step 44.

Requirement: +3.0 to +5.5 volts inclusive are present at TP13 and TP15.

58 If the requirement in Step 57 is not met, refer to Fig. 8 for troubleshooting procedures.

59 Remove the patch cords from the HL78 CP and the terminal assemblies from the HL70 CP, but do ***not*** remove the patch cord between TP9 and TP24 on the HL71 CP.

60 Remove the HL74 CP, set the CHAINED OP switch to the OFF position, and reinsert the HL74 CP.

STEP	PROCEDURE

E. Looped Terminal Transmission Test

61 ***Caution: This test (Steps 62 through 75) is for initial installation only. Use Chart 2 or Chart 3 for transmission tests after the T1WB5 has been placed in service.***

62 Condition the KS-20909 DTS as follows:

(a) Connect the power cord to a 117-volt ac outlet.

(b) Momentarily depress the POWER switch and verify that the ON indicator is lighted.

(c) Momentarily depress the RESET switch and verify that the LOOPBACK TEST indicators are extinguished.

(d) Connect the clock cord to the TST1 jack on the BCPA shelf. Verify that the CLOCK indicator is lighted.

(e) Set the switches as follows:

- MODE to REPEAT
- FUNCTION to TESTWORD 2047
- DATA RATE to 56
- OUTPUT to BIPOLAR.

Note: The remaining switches on the transmitter DTS are not used in this test.

63 Condition the KS-20908 DTS as follows:

(a) Connect the power cord to a 117-volt ac outlet.

(b) Momentarily depress the POWER switch and verify that the ON indicator is lighted.

(c) Connect the clock cord to the TST2 jack on the BCPA shelf. Verify that the CLOCK indicator is lighted.

(d) Set the switches as follows:

- INPUT to BIPOLAR
- DATA RATE to 56
- COUNTER MODE to COUNT
- TESTWORD to 2047
- COUNTER to BIT ERRORS.

STEP	PROCEDURE
64	Connect the receiver DTS signal cord plug to the SIGNAL jack on the transmitter DTS and if the receiver DTS is equipped with a TERMINATE key, depress this key. ***Requirement:*** Receiver DTS TERMINATED indicator lighted.
65	Momentarily operate the receiver DTS COUNTER MODE switch to RESET and observe a 000 error count on the counter display.
66	Depress and hold the ALL 1s switch on the transmitter DTS. ***Requirement:*** All BYTE PATTERN indicators lighted, the counter display runs freely, and the OVERFLOW indicator lights when the counter exceeds 999.
67	Release the ALL 1s switch and remove the receiver DTS signal cord plug from the SIGNAL jack on the transmitter DTS.
68	Remove the HL76 CP, set the IND OP switch to the ON position, and reinsert the HL76 CP.
69	Using 3P6A cords, make the following connections on the HL78 CP: • TRMTR REG OUT jack to RCVR REG IN jack • TRMTR SPARE OUT jack to RCVR SPARE IN jack. ***Requirement:*** On the HL74 CP, the IND OP indication is lighted and all other indications are extinguished.
70	Equip the signal cords of the transmitter and receiver DTS with the test point adapters provided with the test sets.
71	Connect the transmitter test point adapter between TP4 and TP5 on the channel unit CP (HL73) under test. ***Note:*** The contact side of each test point adapter must face the right-hand edge of HL73 CP.
72	Connect the receiver test point adapter between TP6 and TP7 on the same HL73 CP with the ground lead connected to TP9 and if the receiver DTS is equipped with a TERMINATE key, depress this key. ***Requirement:*** Receiver DTS TERMINATED indicator lighted.
73	Momentarily operate the COUNTER MODE switch on the receiver DTS to the RESET position and then return it to the COUNT position. ***Requirement:*** The counter display on the receiver DTS registers 000 and all BYTE PATTERN indicators are flickering except number 8, which is lighted.
74	If the requirement in Step 73 is not met, refer to Fig. 9 for troubleshooting procedures.

STEP	PROCEDURE
75	Repeat Steps 71 through 74 for each HL73 CP installed in the T1WB5.
	F. Protection Switching Tests
76	Determine whether a spare power unit is installed in the power shelf of the 3-shelf OCU assembly in the bay. ***If no spare power unit is installed, proceed to Step 82.***
77	In the BCPA shelf, remove the FA2 fuse first, then the F2 fuse if both are installed for the LOAD 2 power unit and observe the receiver DTS counter display. ***Requirement 1:*** The counter registers errors during the transfer to the spare power unit and then stops counting. ***Requirement 2:*** The MN alarm indicator on the BCPA shelf is lighted.
78	If the requirements in Step 77 are not met, refer to Fig. 10 for troubleshooting procedures.
79	Reset the counter on the receiver DTS and observe a 000 error count.
80	Reinsert the F2 fuse first, then the F2A fuse is used into the LOAD 2 power unit, depress the ALARM RESET switch on the power unit, and observe the counter display on the receiver DTS. ***Requirement 1:*** It is normal for the receiver DTS to display no errors at all, or to display errors only during switching from the spare to the LOAD 2 power unit. ***Requirement 2:*** The MN alarm indicator on the BCPA shelf is extinguished.
81	If the requirements in Step 80 are not met, refer to Fig. 11 for troubleshooting procedures.
82	Reset the counter on the receiver DTS and observe a 000 error count.
83	Insert a W1BF cord, between TP9 and TP24 on the spare clock CP (HL71) in shelf location 22 of shelf A. ***Note:*** The contact side of the plug inserted into TP9 must face the right-hand side of the circuit pack, and the contact side of the plug inserted into TP24 must face the left-hand side.
84	Disengage the regular clock CP in shelf location 5 of shelf A, and observe the counter display on the receiver DTS. ***Requirement 1:*** The counter registers errors during the transfer to the spare clock CP and then stops counting. ***Requirement 2:*** The CLOCK FAIL REG indication on the HL74 CP, the ALM indication on the HL49 or HL49B CP (in BCPA shelf position 2), and the MN alarm indicator on the BCPA shelf are lighted.
85	If the requirements in Step 84 are not met, refer to Fig. 12 for troubleshooting procedures.

STEP	PROCEDURE
86	Reset the counter on the receiver DTS and observe a 000 error count.
◗87	Remove patch cord from TP9 and TP24 on the spare clock CP (HL71) in shelf A location 22.◖
88	Reinsert the regular clock CP and observe the counter display on the receiver DTS. ◗***Note:*** Ensure that test cord between TP9 and TP24 is intact on regular clock CP.◖ ***Requirement 1:*** The counter registers errors during the restoral to the regular clock CP and then stops counting. ***Requirement 2:*** The CLOCK FAIL REG indicator on the HL74 CP, the ALM indicator on the HL49 or HL49B CP (in BCPA shelf position 2), and the MN alarm indicator on the BCPA shelf are extinguished.
89	If the requirements in Step 88 are not met, refer to Fig. 13 for troubleshooting procedures.
90	Reset the counter on the receiver DTS and observe a 000 error count.
91	Disengage the spare clock CP in shelf A location 22 and observe the counter display on the receiver DTS. ***Requirement 1:*** The counter registers errors during the transfer to the regular clock CP. ***Requirement 2:*** The CLOCK FAIL SPARE indicator on the HL74 CP, the ALM indicator on the HL49 or HL49B CP (in BCPA shelf position 5), and the MN alarm indicator on the BCPA shelf are lighted.
92	Reinsert the spare clock CP and observe the counter display on the receiver DTS. ***Requirement 1:*** The counter registers errors during the transfer to the regular clock CP and then stops counting. ***Requirement 2:*** The CLOCK FAIL SPARE indicator on the HL74 CP, the ALM indicator on the HL49 or HL49B CP (in BCPA shelf position 5), and the MN alarm indicator on the BCPA shelf are extinguished.
93	Disengage the regular transmitter CP from shelf location 11 of shelf A and observe the counter display on the receiver DTS. ***Requirement 1:*** The counter registers errors during the transfer to the spare transmitter CP and then stops counting. ***Requirement 2:*** The TRMTR FAIL REG and RCVR FAIL REG indicators on the HL74 CP and the MN alarm indicator on the BCPA shelf are lighted.
94	If the requirements in Step 93 are not met, refer to Fig. 14 for troubleshooting procedures.
95	Reset the counter on the receiver DTS and observe a 000 error count.

STEP	PROCEDURE
96	Reinsert the regular transmitter CP and observe the counter display on the receiver DTS. ***Requirement 1:*** The counter registers errors during the restoral to the regular transmitter CP and then stops counting. ***Requirement 2:*** The TRMTR FAIL REG and RCVR FAIL REG indicators on the HL74 CP and the MN alarm indicator on the BCPA shelf are extinguished.
97	If the requirements in Step 96 are not met, refer to Fig. 15 for troubleshooting procedures.
98	Reset the counter on the receiver DTS and observe a 000 error count.
99	Remove the patch cords from the HL78 CP.
100	Insert a 3P6A cord, between the TRMTR REG OUT jack and the RCVR SPARE IN jack on the HL78 CP.
101	Remove the HL76 CP, set the IND OP switch to the OFF position, and reinsert the HL76 CP.
102	Remove the HL74 CP and reinsert it. ***Requirement 1:*** The counter registers errors initially and then stops counting. ***Requirement 2:*** The TRMT IN FAIL and RCVR FAIL REG indicators on the HL74 CP and the MN alarm indicator on the BCPA shelf are lighted.
103	If the requirements in Step 102 are not met, refer to Fig. 16 for troubleshooting procedures.
104	Reset the counter on the receiver DTS and observe a 000 error count.
	G. Control Code Test ***Note:*** When performing this test, disregard the receiver DTS counter display.
105	Remove the HL76 CP and the patch cord from the HL78 CP.
106	Using 3P6A cords, make the following patches on the HL78 CP: • TRMTR REG OUT jack to RCVR REG IN jack • TRMTR SPARE OUT jack to RCVR SPARE IN jack.
107	Set the IND OP switch on the HL76 CP to the ON position.
108	Reinsert the HL76 CP into its shelf location. ***Requirement:*** The IND OP indication on the HL74 CP is lighted.
109	Remove the transmitter DTS test point adapter from TP4 and TP5 on the HL73 CP under test.

STEP	PROCEDURE

Requirement: The receiver DTS UASGN MUX CHAN indicator is lighted.

110 If the requirement in Step 109 is not met, refer to Fig. 17 for troubleshooting procedures.

111 Disengage the regular transmitter CP and observe the CONTROL CODE display on the receiver DTS.

Requirement: The UASGN MUX CHAN indicator is lighted.

Note: If this requirement is not met, replace the spare transmitter CP.

112 Reinsert the regular transmitter CP.

113 Disengage the HL76 CP.

114 Remove the patch cords from the HL78 CP.

115 Reinsert the HL76 CP and observe the CONTROL CODE display on the receiver DTS.

Requirement: The MUX OUT OF SYNC indicator is lighted.

116 If the requirement in Step 115 is not met, replace the regular receiver CP.

117 Remove the receiver DTS test point adapter from TP6 and TP7 on the HL73 CP under test.

118 Remove the patch cord from the HL71 CP in shelf location 22 of shelf A.

H. Byte Framing Generator Test

119 If the T1WB5 connects to a T1 data multiplexer (T1DM), a byte framing generator CP (HL77) must be installed in the T1WB5 and tested. If the T1WB5 does not connect to a T1DM, disregard Steps 120 through 142 and proceed to Step 143.

120 Remove the channel unit CP if installed in shelf location 39 of shelf B.

121 Select a channel unit CP and set its selection switches as follows:

CHANNEL SELECTION SWITCH SETTING

S1	S2	S3	S4	S5	S6
HI	LO	HI	HI	LO	HI

STEP	PROCEDURE
122	Install the channel unit CP in shelf location 39 of shelf B.
123	Using 3P6A cords, make the following patches on the HL78 CP: • TRMTR REG OUT jack to RCVR REG IN jack • TRMTR SPARE OUT jack to RCVR SPARE IN jack.
124	Remove the HL76 CP from its shelf location.
125	Set the IND OP switch on the HL76 CP to the ON position.
126	Reinsert the HL76 CP into its shelf location.
127	If the transmitter and receiver DTSs have not been conditioned, perform Steps 62 through 67 before proceeding.
128	Set the transmitter DTS switches as follows: • MODE to REPEAT • FUNCTION to BYTE ENCODER • DATA RATE to 56 • OUTPUT to BIPOLAR • BYTE ENCODER to 11111111.
129	Set the receiver DTS switches as follows: • INPUT to BIPOLAR • DATA RATE to 56 • TESTWORD to LOOPED • COUNTER to EXTERNAL PULSES • COUNTER MODE to COUNT.
130	Insert the receiver DTS signal cord, equipped with the test point adapter, into TP6 and TP7 on the channel unit CP in shelf location 39 and connect the ground lead to TP9. If the receiver DTS is equipped with a TERMINATE key, depress this key. ***Requirement:*** Receiver DTS TERMINATED indicator lighted.
131	Remove the HL74 CP and set the CHAINED OP switch to the OFF position.

STEP	PROCEDURE

132 Reinsert the HL74 CP into its shelf location.

133 Verify that the transmitter and receiver DTSs POWER ON indicators are lighted.

134 Insert the transmitter DTS test cord, equipped with the test point adapter, into TP4 and TP5 on the channel unit CP in shelf location 39.

Requirement: All receiver DTS BYTE PATTERN indicators are lighted.

Note: Ignore the counter display and the OVERFLOW indicator during the remainder of this test.

135 If the requirement in Step 134 is not met, select another channel unit CP, set the channel selection switches according to Step 121, and install the channel unit CP in shelf location 39.

136 Install a byte framing generator CP (HL77) in shelf location 68 of shelf B.

Requirement: Receiver DTS BYTE PATTERN indicators 1, 3, 4, 5, 6, and 7 are lighted; indicators 2 and 8 are extinguished.

137 If the requirement in Step 136 is not met, remove the HL77 CP; select another one; ensure that all patch cords are installed in the T1WB5; ensure that all test cords of the transmitter and receiver DTSs are correctly and firmly inserted; and repeat Steps 136 and 137.

138 Remove the HL74 CP and set the CHAINED OP switch to the ON position.

139 Reinsert the HL74 CP.

Requirement: Receiver DTS BYTE PATTERN indicators 1, 3, 4, 5, and 7 are lighted; indicators 2, 6, and 8 are extinguished.

140 Remove the transmitter and receiver DTSs test point adapters from the HL73 CP in shelf location 39.

141 Remove the HL73 CP from shelf location 39.

Note: If shelf location 39 (channel 14) is to be an active channel, set all the channel selection switches of the HL73 CP shelf location 39 to the HI position and reinsert the HL73 CP.

142 Remove the patch cords from the HL78 CP and the HL71 CP.

I. Final Installation

143 Set the IND OP switch on the HL76 CP and the CHAINED OP switch on the HL74 CP as follows:

- ***Combined Data-Voice Operation:*** Set both switches to the OFF position.
- ***Independent Data Operation:*** Set the IND OP switch to the ON position and the CHAINED OP switch to the OFF position.

STEP	PROCEDURE
	• ***Chained Data Operation:*** At end terminals, set the IND OP switch to the ON position and the CHAINED OP switch to the OFF position. At intermediate terminals, set the IND OP switch to the OFF position and the CHAINED OP switch to the ON position.
144	Insert a 126A apparatus blank into shelf location 68 of shelf A.
145	Remove the 100-ohm resistor (if installed in Step 3) from terminals ⧫E1 and E2.⧫
146	Install the appropriate equalizers, pads, or straps (if not installed in Step 3) on the equalizer panel at the rear of the T1WB5 (Fig. 1 and Table A). ***Note:*** If the T1WB5 is set for combined data-voice operation, remove the factory-installed 100-ohm resistor between terminals 10 and 11 of TS 1; if the T1WB5 is set for chained data operation, remove the resistor at each intermediate terminal.
147	Ensure that all connections from TS1 (located on the rear of the T1WB5) to the cross-connect, repeater bay, or bank terminating assembly and the D-type bank are made with shielded cable (ABAM or 750A), which should be grounded as shown on SD-73087-01.
148	Verify that the distant T1WB4, T1WB5, or T1DM has been installed, tested, and connected to the local T1WB5 through a T1 repeatered line. ***Requirement:*** All alarm indications on the HL74 CP are extinguished.
149	Using an orange stick, momentarily depress the BUFFER SET switch on the HL78 CP.
150	If any alarm relays on the power distribution panel were blocked during the tests in this chart, restore them to normal operation.

ADD CHANNELS WHEN PARTIALLY EQUIPPED T1WB5 IS IN DATA MODE (CHART 2)

2.06 This procedure is used when additional channels are installed into an in-service T1WB5 used for data only that was only partially equipped during a prior installation. Personnel performing this procedure must remain constantly alert to ensure that service on active channels is not interrupted.

2.07 When set for independent data or chained data operation, the T1WB5 at a local end office or chain office connects to a T1DM at the hub office. The addition and testing of a 64-kb/s channel on a T1 line between a T1WB5 and a T1DM is a 2-man operation requiring data test sets at both ends. The T1WB5 end, designated the ***local office*** in this procedure, must perform the steps indicated and verify test results at the hub office, designated ***hub office*** in this procedure. The local office must then monitor the test initiated by the hub office and verify the results. The PROCEDURE column applies primarily to the local end office unless otherwise indicated.

2.08 The apparatus required for this procedure consists of one KS-20908 DTS (digital receiver) and one KS-20909 DTS (digital transmitter). Both locations must be equipped with the test equipment.

STEP	PROCEDURE
1	Establish communications between the hub office and the local end office, and verify the number of the channel to be added.
2	Ask hub office personnel to set up the test equipment and test procedures for the T1DM according to Section 314-912-500.
3	Set channel unit selection switches S1 through S6, on the channel unit CP to be installed, to the HI position.
4	Verify that the HL18 CP at the hub office and the HL73 CP at the end office are not already assigned.
5	Record the channel number in the space provided on the channel unit CP.
6	Remove the protector from the circuit board and insert the channel unit CP into the equipment location desired (see Table B and Fig. 2).
7	Condition the transmitter and receiver DTSs according to Steps 42 through 47 of the initial installation test procedure.
8	Connect the receiver DTS signal cord, equipped with a test point adapter, to TP6 and TP7 on the channel unit CP under test. ***Note:*** The contact side of the test point adapter must face the right-hand edge of the CP.
9	Connect the receiver DTS test point adapter ground terminal to TP9 on the channel unit CP under test and if the receiver DTS is equipped with a TERMINATE key, depress this key. ***Requirement:*** Receiver DTS TERMINATED indicator is lighted.
10	Request the hub office to transmit the 2047-bit test word toward the local end office.
11	Momentarily operate the receiver DTS COUNTER MODE switch to RESET. ***Requirement:*** The receiver DTS counter display registers 000, BYTE PATTERN indicators 1 through 7 are lighted dimly, and 8 is lighted.
12	If the requirement in Step 11 is not met, remove the HL73 CP under test, select another HL73 CP, and repeat Steps 1 through 10. If errors continue, have the hub office clear the HL18 port CP problem and repeat Steps 1 through 11.
13	Ask the hub office personnel to connect the transmitter DTS signal cord equipped with the test point adapter, to the IN TPs on the appropriate HL18 CP.
14	Ask the hub office personnel to connect the receiver DTS signal cord, equipped with the test point adapter, to the OUT TPs on the appropriate HL18 port. ***Note:*** Ensure that the receiver DTS test point adapter ground lead is connected and that the receiver DTS is properly terminated.

STEP	PROCEDURE
15	Connect the transmitter DTS signal cord, equipped with the test point adapter, to TP4 and TP5 on the channel unit CP under test.
16	Transmit the 2047-bit test word toward the hub office.
17	Ask the hub office personnel to verify that the receiver DTS counter display registers 000, BYTE PATTERN indicators 1 through 7 are lighted dimly, and 8 is lighted.
18	If the hub office did not meet the verification in Step 17, install another HL73 CP and repeat Steps 14 through 16.
19	If errors are still being counted by the receiver DTS at the hub office, clear the HL18 port CP problem and repeat Steps 14 and 16.
20	Remove test connections from channel unit or port CP at both locations.
21	Repeat Steps 3 through 20 for each channel to be added.
22	Remove all test connections and restore all equipment to their normal mode.

ADD CHANNELS WHEN PARTIALLY EQUIPPED T1WB5 IS IN DATA-VOICE SHARING MODE (CHART 3)

2.09 This procedure is used when additional channels are installed into an in-service T1WB5 used for data-voice sharing that was only partially equipped during a prior installation.

2.10 When set for combined data-voice operation, the T1WB5 local end office bay connects to a T1WB4 at the hub office end. A D1D, D2, or D3 channel bank is used to connect encoded voice information to the T1WB4 and T1WB5. It is ***imperative*** that no operating voice or data communication channels be disturbed when data channels are added. Table B shows the relationships between T1WB5 equipment locations and byte positions in the T1 frame and D channel bank channel positions in the T1 frame.

2.11 Adding and testing a data channel requires two people, one each at the local end office (T1WB5) and the hub office (T1WB4). This procedure gives the actions and verifications for the end office.

2.12 The apparatus required for this procedure consists of one KS-20908 DTS (digital receiver) and one KS-20909 DTS (digital transmitter). Both locations must be equipped with the test equipment.

STEP	PROCEDURE
1	Establish communications with the hub office and verify the number of the channel to be added.
2	Ask the hub office personnel to set up the test equipment for the T1WB4 according to Section

STEP	PROCEDURE
	314-915-300.
3	Select a channel unit CP (HL73) and set all the channel unit selection switches to the HI position.
4	Ask hub office personnel to set the channel unit selection switches for the appropriate channel according to Section 314-915-300.
5	Record the channel number in the space provided on the channel unit CP.
6	Ask hub office personnel to record the channel number in the space provided on the channel unit CP.
7	Remove the protector from the circuit board and insert the channel unit CP into the appropriate shelf location (Fig. 2).
8	Ask hub office personnel to remove the protector from the circuit board and insert the channel unit CP into the appropriate shelf location.
9	Connect the receiver DTS signal cord, equipped with the test point adapter, to TP6 and TP7 on the channel unit CP under test. ***Note:*** The contact side of the test point adapter must face the right-hand edge of the CP.
10	Ask hub office personnel to condition the transmitter and receiver DTSs according to Section 314-915-300.
11	Insert the test point adapter ground terminal into TP9 on the channel unit CP under test; and if the receiver DTS is equipped with a TERMINATE key, depress this key. ***Requirement:*** Receiver DTS TERMINATED indicator is lighted.
12	Request the hub office to transmit the 2047-bit test word.
13	Momentarily operate the receiver DTS COUNTER MODE switch to RESET. ***Requirement:*** The receiver DTS counter registers 000, BYTE PATTERN indicators 1 through 7 are lighted dimly, and 8 is lighted.
14	If the requirement in Step 13 is not met, select a spare HL73 CP and repeat Steps 3 through 13. If errors continue, ask the hub office to replace its channel unit CP and repeat Steps 3 through 13.
15	Ask hub office personnel to connect the transmitter DTS signal cord, equipped with the test point adapter, to TP4 and TP5 on the channel unit CP under test. ***Note:*** If errors are determined to be caused by the T1WB4 channel unit, replace it and repeat Steps 1 through 14.

STEP	PROCEDURE
16	Connect the transmitter DTS signal cord, equipped with a test point adapter, to TP4 and TP5 on the channel unit CP under test.
17	Ask hub office personnel to connect the receiver DTS signal cord, equipped with the test point adapter, to TP6 and TP7 on the channel unit CP under test; connect the ground terminal to TP9 on the channel unit CP; and if the receiver DTS is equipped with a TERMINATE key, depress this key.
18	Ask the hub office personnel to verify that the receiver DTS TERMINATED indicator lights, the counter display registers 000, BYTE PATTERN indicators 1 through 7 are lighted dimly, and 8 is lighted.
19	If the hub office did not meet the verification in Step 18, install another HL73 CP and repeat Steps 13 through 17.
20	Remove test connections from the channel unit CP at both locations. If errors are still being counted by the receiver DTS at the hub office, select another HL73 CP, set its channel unit selection switches, install it, and repeat Steps 13 through 17.
21	Repeat Steps 3 through 20 for each channel unit CP to be added.

TABLE A

SELECTION OF PAD OR EQUALIZER

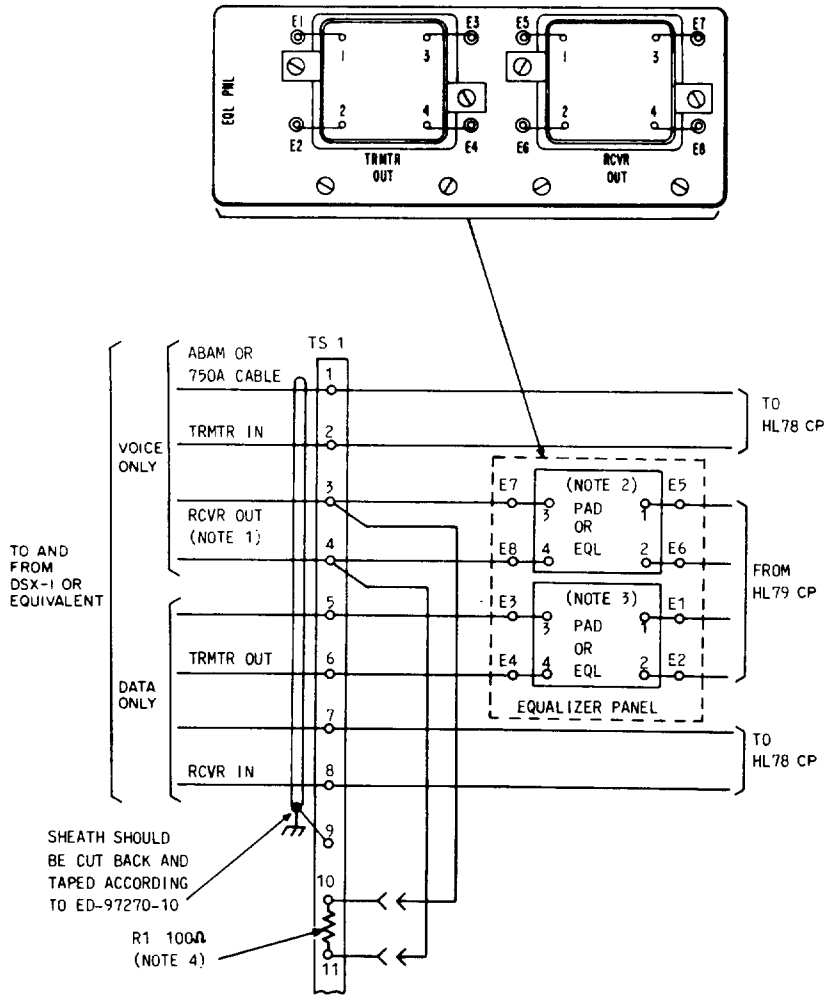
CABLE TYPE AND DISTANCE IN FEET (NOTE)				
ABAM		750A		
TO DSX-1	DIRECT TO TERM. RPTR	TO DSX-1	DIRECT TO TERM. RPTR	USE
0 to 60	0 to 150	0 to 43	0 to 108	ED-97079-30, G6 Pad
60 to 360	150 to 450	43 to 260	180 to 325	358D Equalizer
360 to 660	450 to 750	260 to 477	325 to 542	358E Equalizer

Note: The cable distances shown are for total wire lengths, including cross-connect jumpers and any additional wiring such as for automatic switching units.

TABLE B

RELATIONSHIP OF T1WB5 AND D-CHANNEL BANK CHANNEL UNITS TO THEIR BYTE POSITION IN T1 FRAME

BYTE POSITION IN T1 FRAME	CHANNEL UNIT ASSIGNMENT				
	T1WB5		D CHANNEL BANK (CHANNEL UNIT NUMBER)		
	NUMBER	SHELF LOCATION	D3	D2	D1D
1	1	2	1	12	1
2	2	5	2	13	13
3	3	8	3	1	2
4	4	11	4	17	14
5	5	14	5	5	3
6	6	17	6	21	15
7	7	19	7	9	4
8	8	22	8	15	16
9	9	25	9	3	5
10	10	28	10	19	17
11	11	31	11	7	6
12	12	34	12	23	18
13	13	36	13	11	7
14	14	39	14	14	19
15	15	42	15	2	8
16	16	45	16	18	20
17	17	48	17	6	9
18	18	51	18	22	21
19	19	53	19	10	10
20	20	56	20	16	22
21	21	59	21	4	11
22	22	62	22	20	23
23	23	65	23	8	12
24	24	68	24	24	24



NOTES:

1. IF THE T1WB5 IS IN THE COMBINED DATA-VOICE MODE, REMOVE THE 100-OHM RESISTOR BETWEEN TERMINALS 10 AND 11 OF TS 1; IF THE T1WB5 IS IN THE CHAINED DATA MODE, REMOVE THE RESISTOR AT EACH INTERMEDIATE TERMINAL.
2. INSTALL WIRE STRAPS BETWEEN E5 AND E7 AND BETWEEN E6 AND E8 AT END TERMINALS IN THE INDEPENDENT DATA OR CHAINED DATA MODE WITH RCVR OUT TERMINALS 10 AND 11 TERMINATED IN 100 OHMS. THESE STRAPS MUST BE INSTALLED AND RCVR OUT TERMINALS UNTERMINATED WHEN THE T1WB5 IS CONNECTED TO BANK OR SPAN TERMINATING ASSEMBLIES THAT PROVIDE THE REQUIRED EQUALIZATION.
3. INSTALL WIRE STRAPS BETWEEN E1 AND E3 AND BETWEEN E2 AND E4 WHEN THE T1WB5 IS CONNECTED TO BANK OR SPAN TERMINATING ASSEMBLIES THAT PROVIDE THE REQUIRED EQUALIZATION.
4. RESISTOR R1 IS SHOP MOUNTED ON TS 1.

Fig. 1—Equalizer, Pad, or Wire Strap Connections

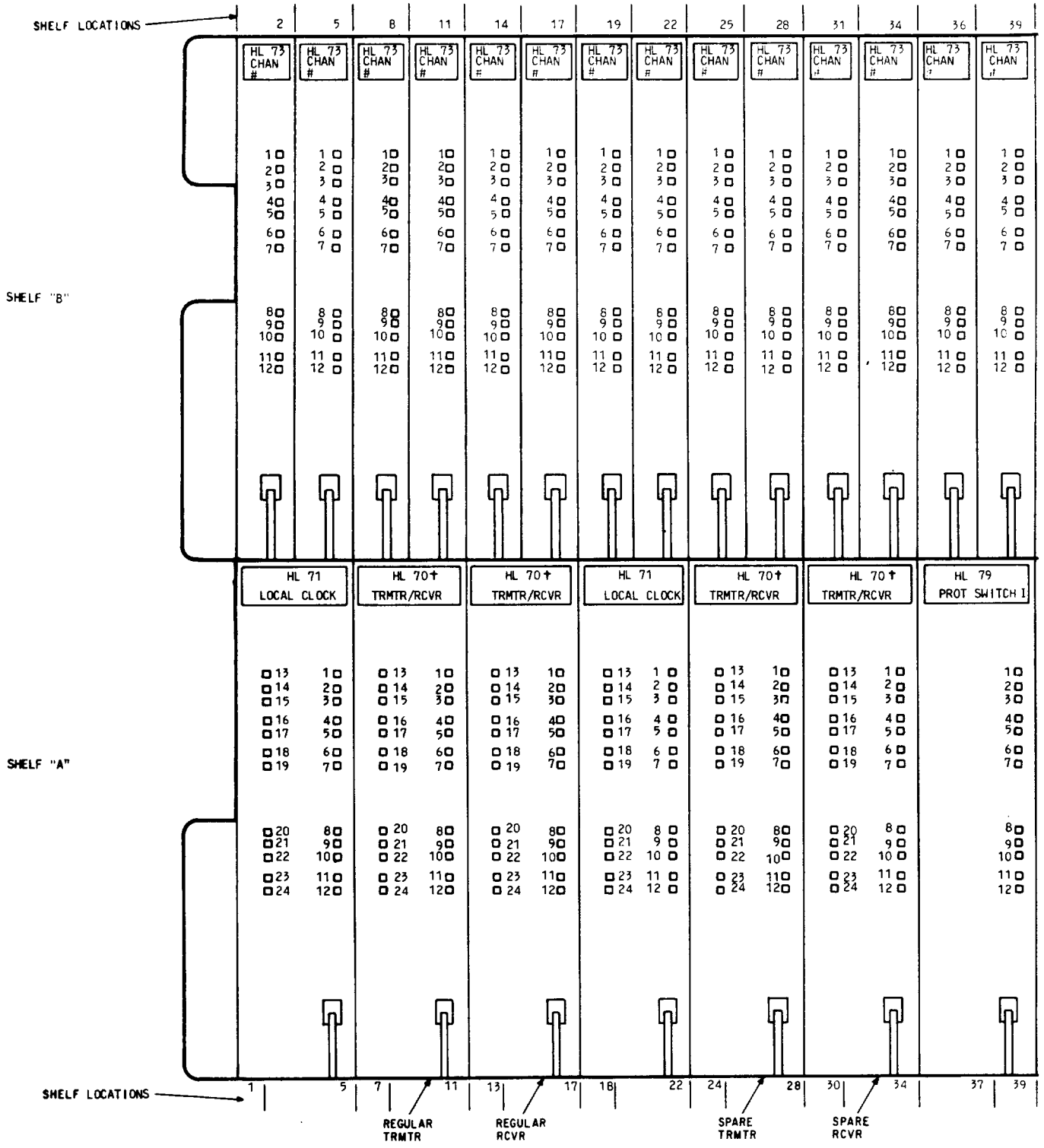
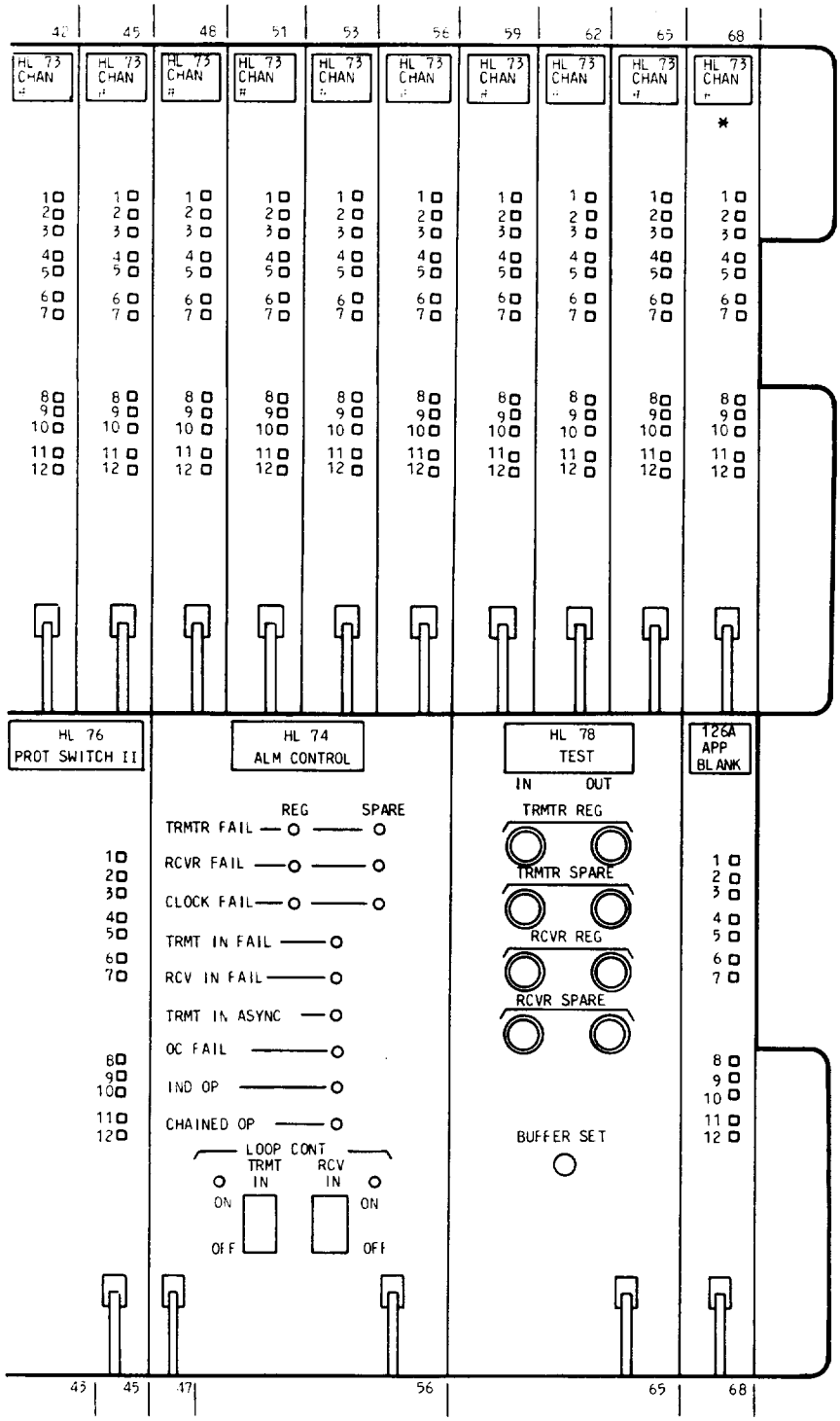


Fig. 2—T1WB5 Circuit Pack Locations (Sheet 1 of 2)



* WHEN THE T1WB5 CONNECTS TO A T1DM, AN HL77 IS USED IN EQUIPMENT LOCATION 68 IN PLACE OF THE CHANNEL UNIT.

† THE HL70B CP CAN BE USED TO REPLACE THE HL70 CP IN ALL CASES BUT THE HL70B CP IS REQUIRED IN THE TRANSMITTER REGULAR AND SPARE SLOTS WHEN A T1DM IS LOCATED AT THE DISTANT END.

Fig. 2—T1WB5 Circuit Pack Locations (Sheet 2 of 2)

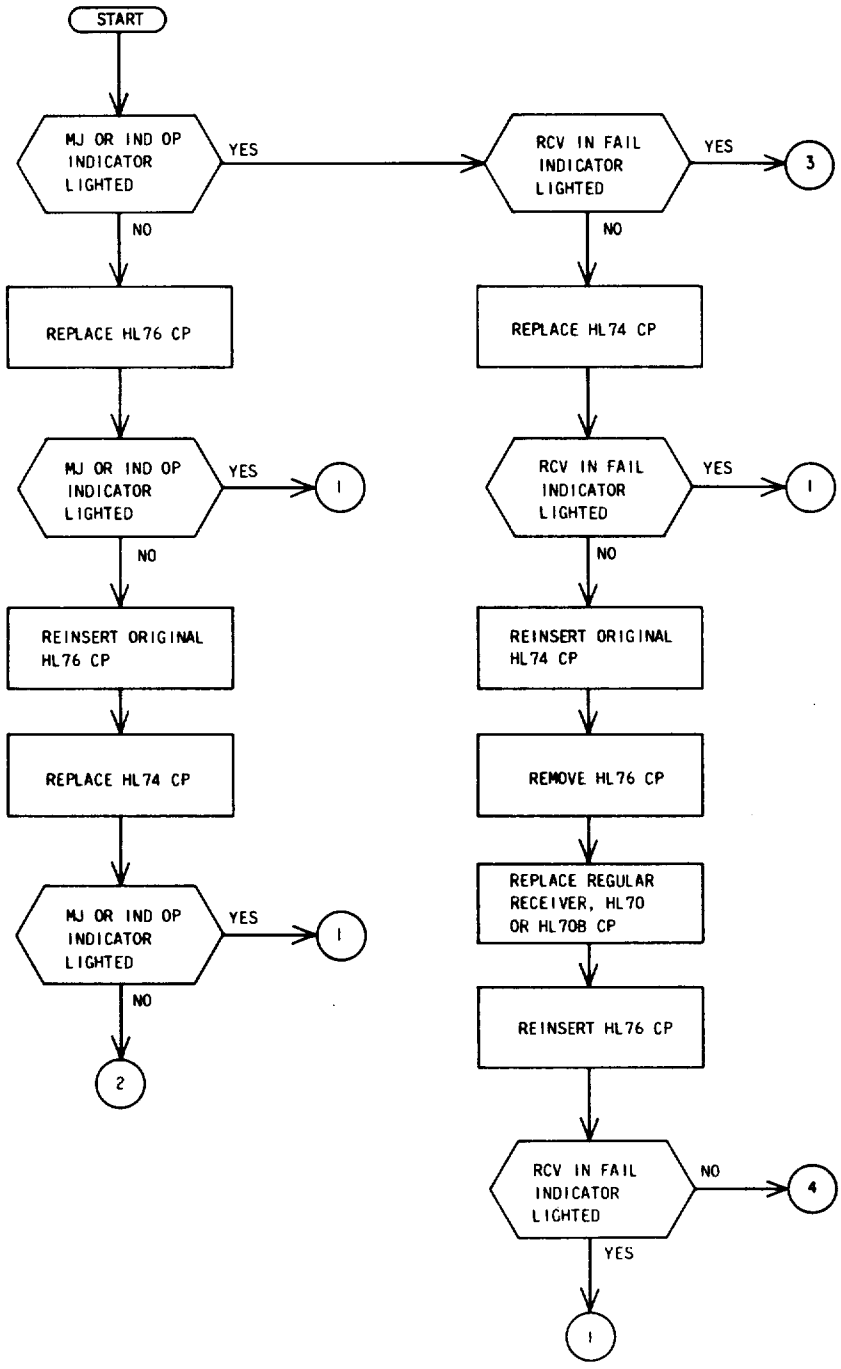


Fig. 3—Circuit Pack Trouble-Locating Procedure (Sheet 1 of 2)

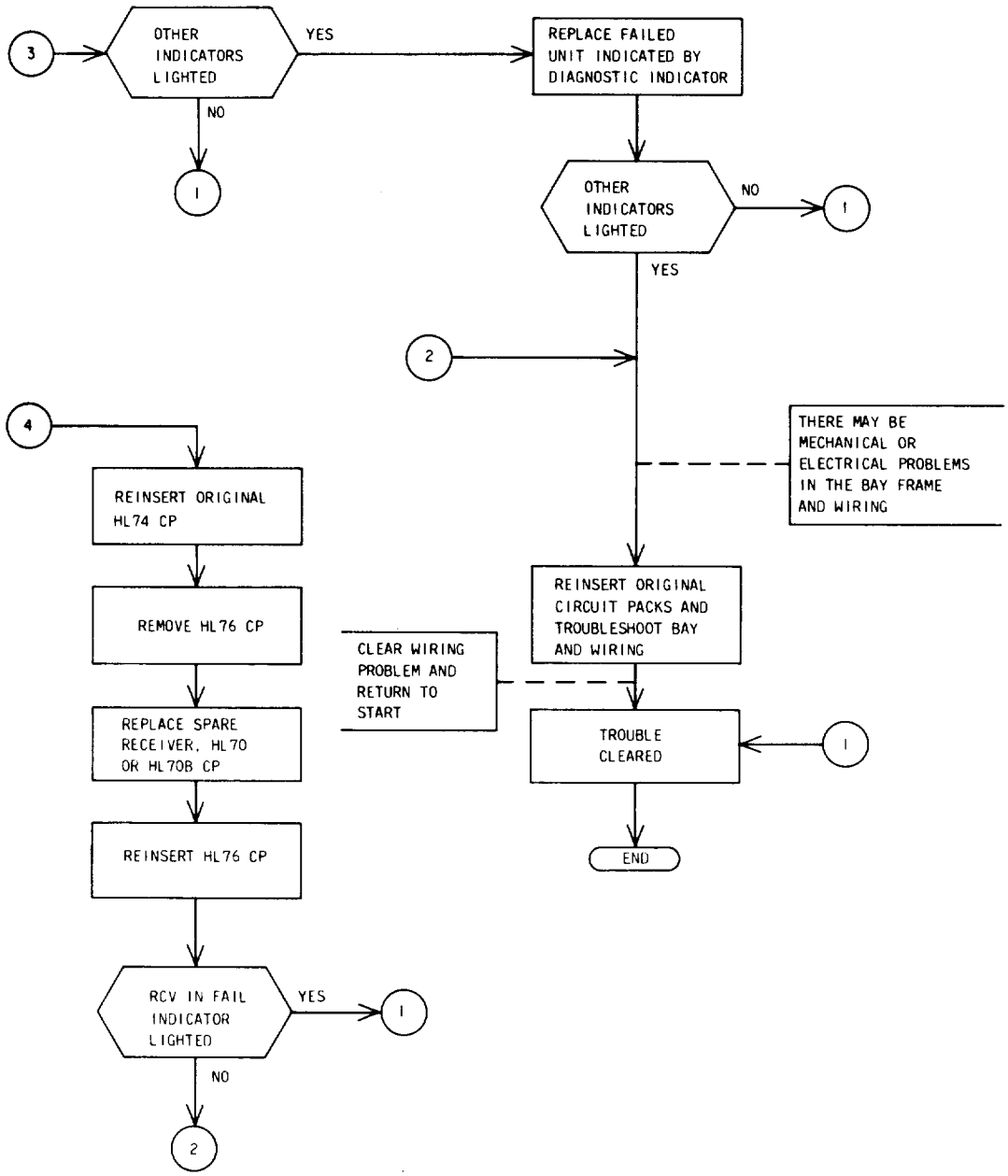


Fig. 3—Circuit Pack Trouble-Locating Procedure (Sheet 2 of 2)

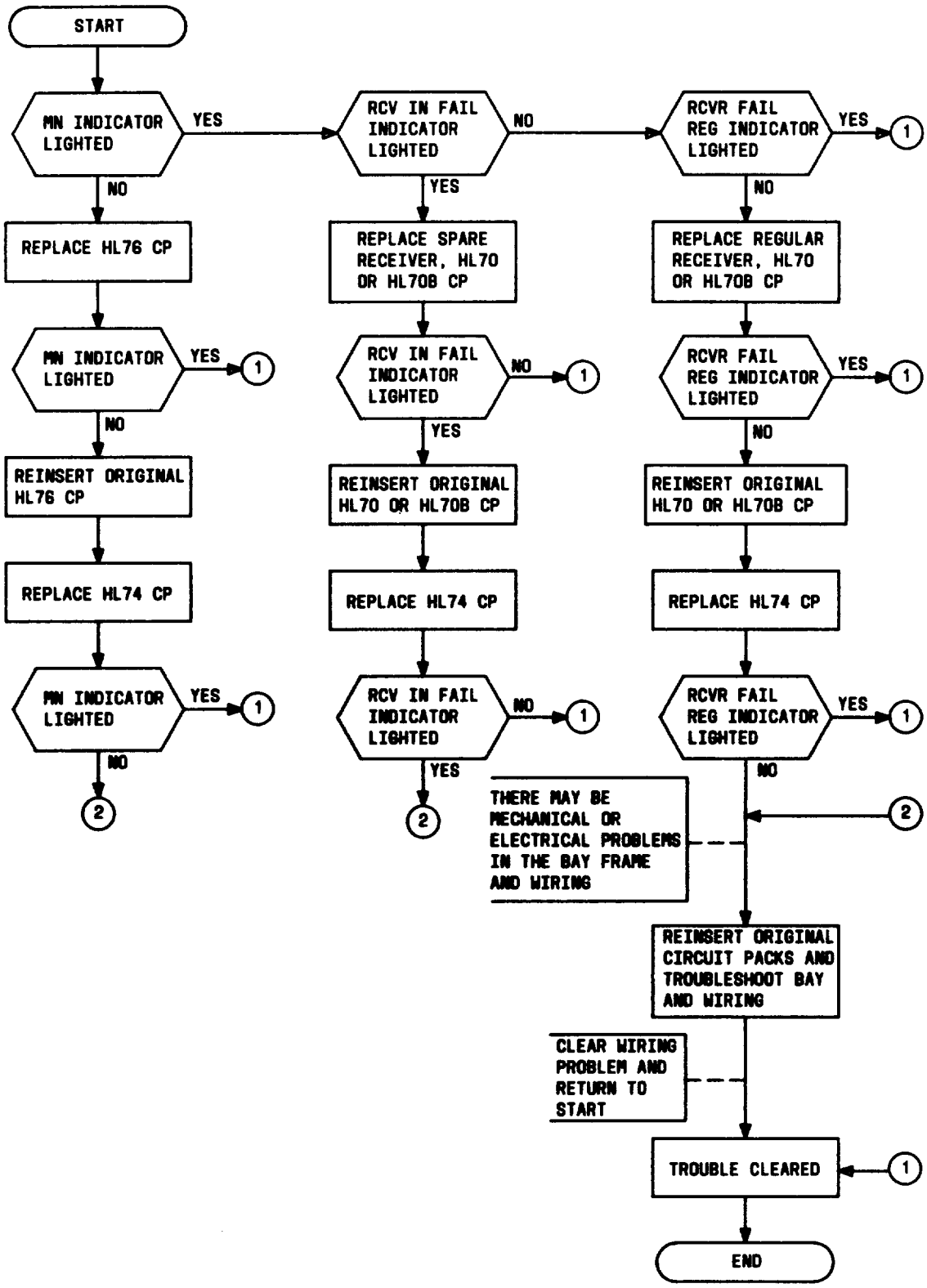


Fig. 4—Spare Synchronization Recovery Trouble-Locating Procedure

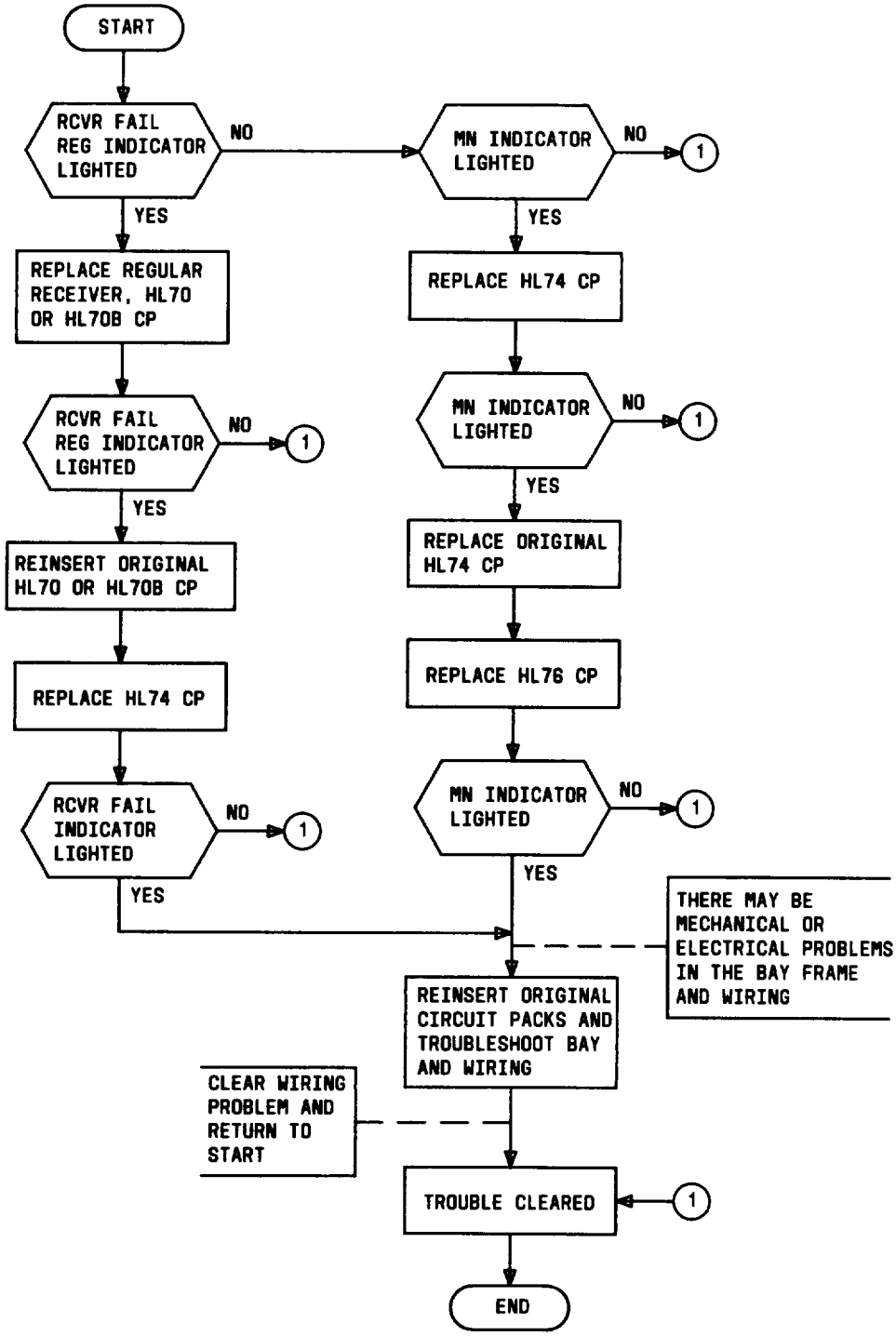


Fig. 5—Regular Synchronization Recovery Trouble-Locating Procedure

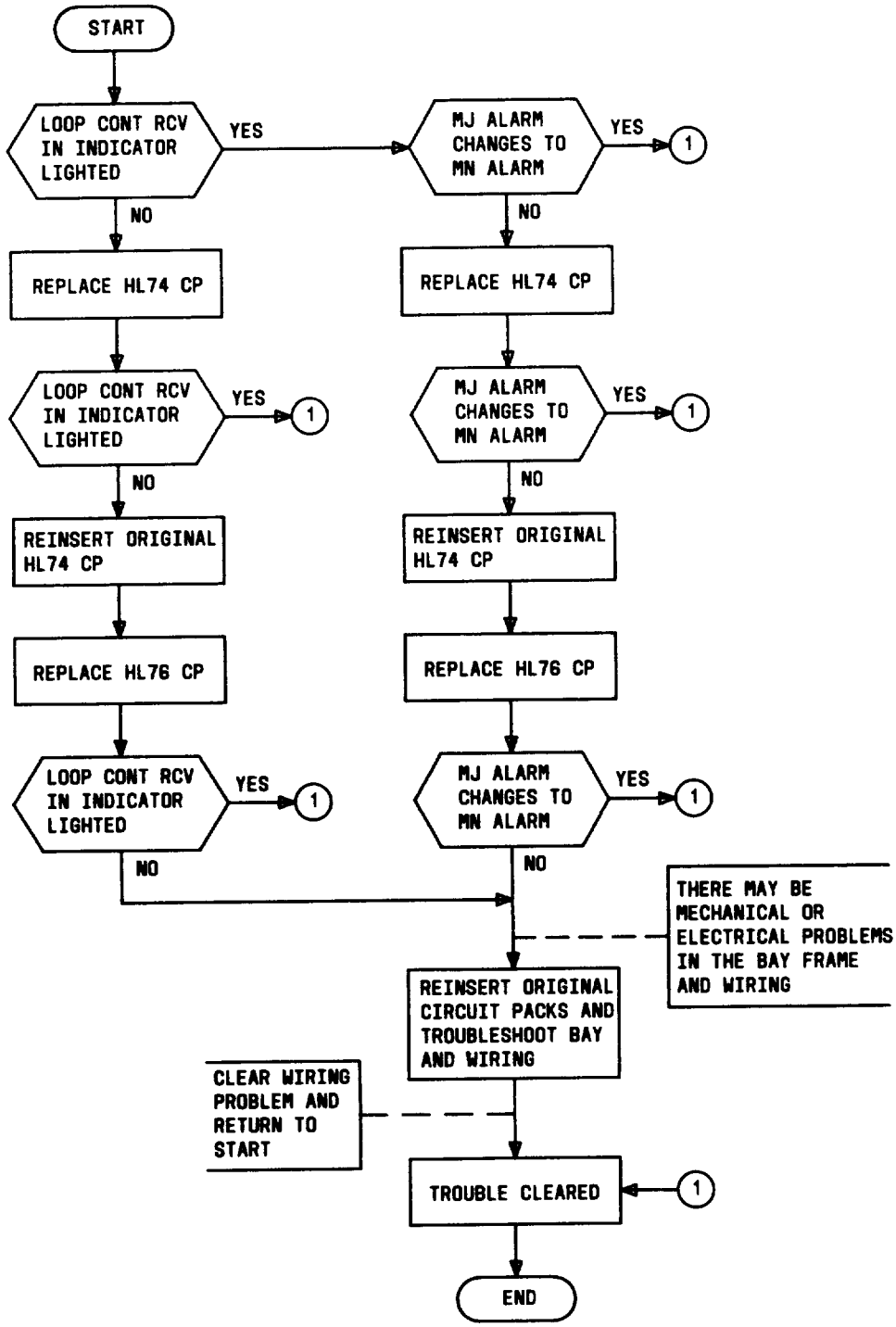


Fig. 6—Receiver Loop Control Trouble-Locating Procedure

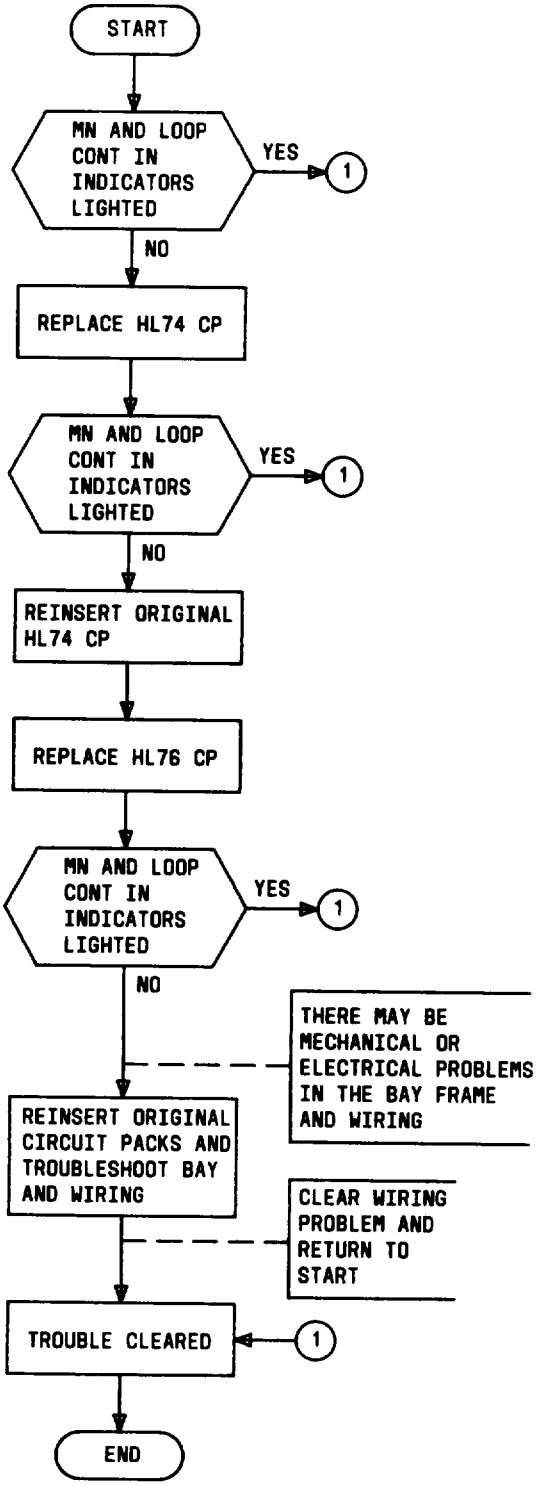


Fig. 7—Transmitter Loop Control Trouble-Locating Procedure

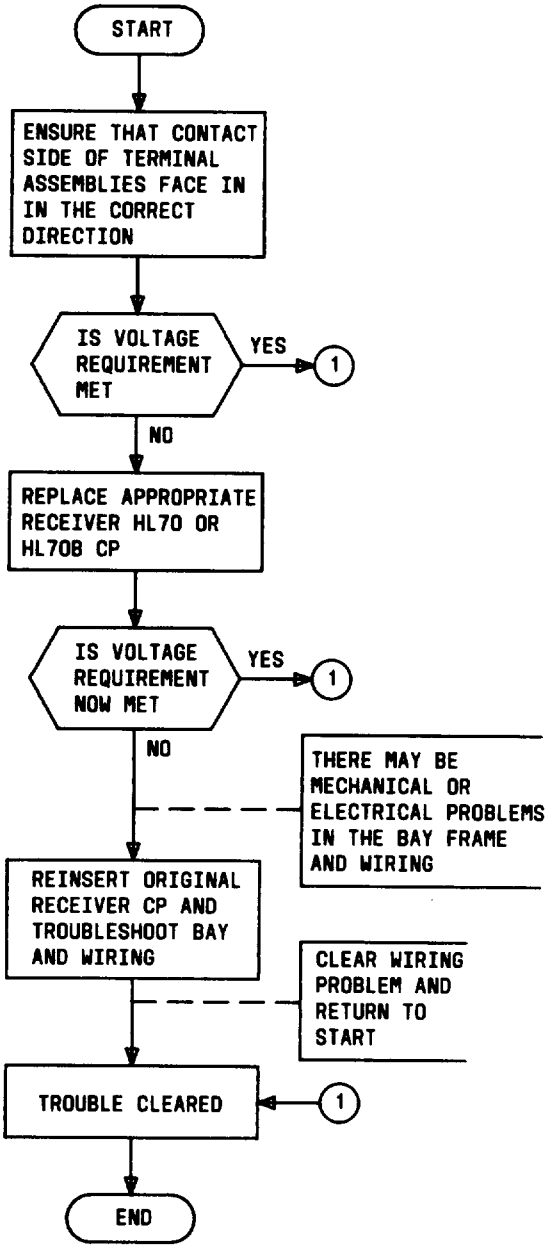


Fig. 8—Transparent Alarms Trouble-Locating Procedure

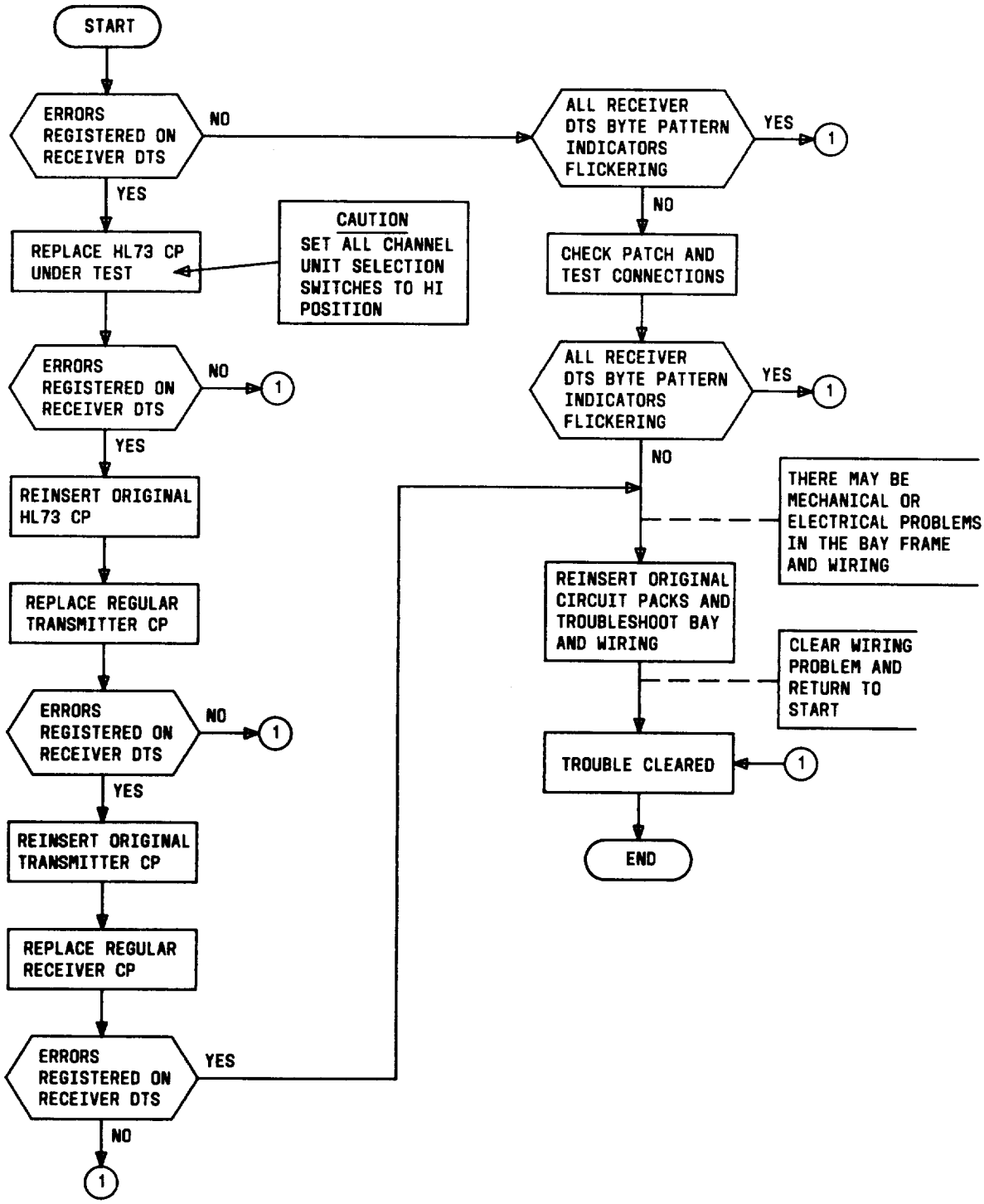


Fig. 9—Initial Transmission Trouble-Locating Procedure

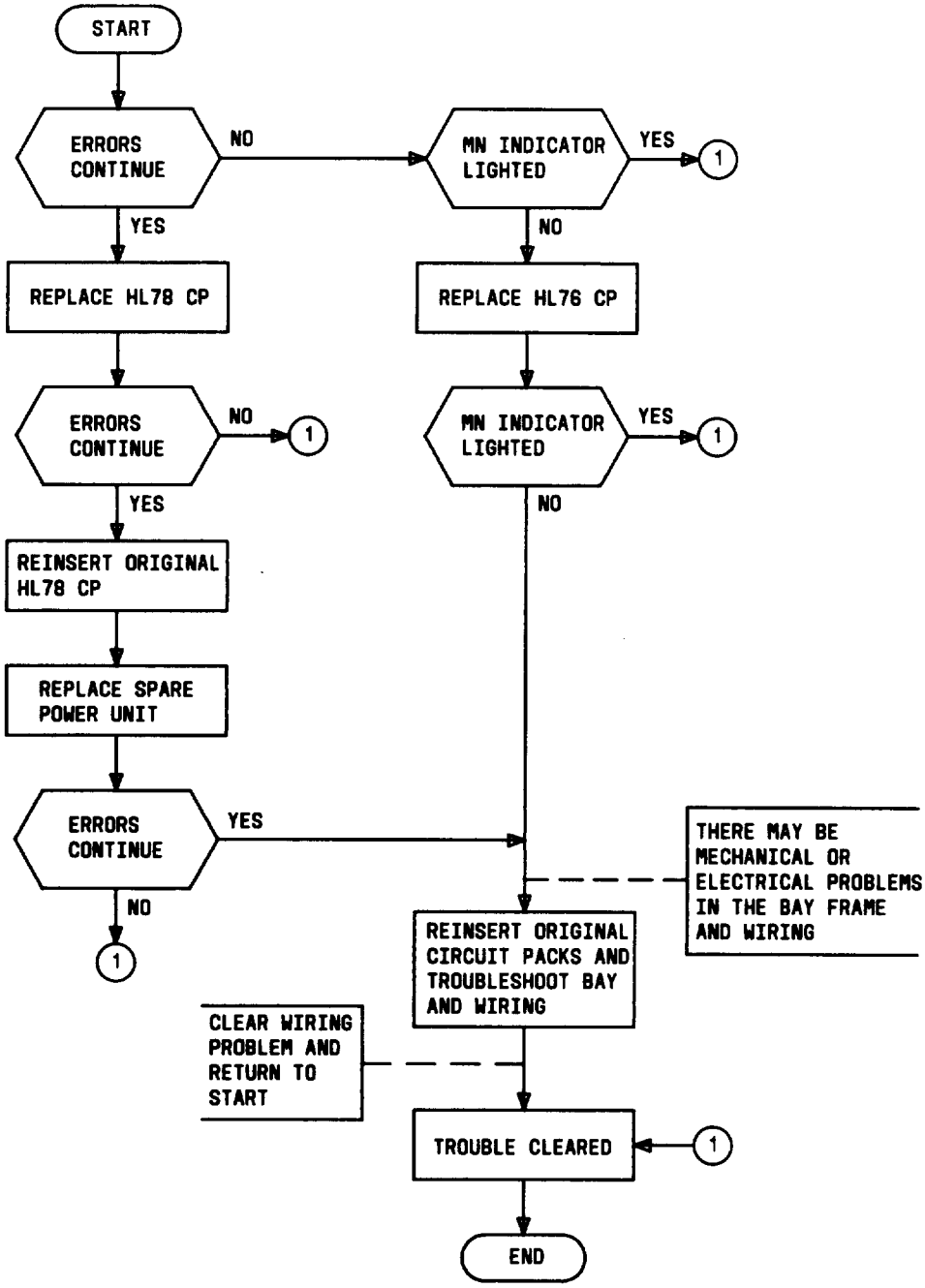


Fig. 10—Spare Power Unit Trouble-Locating Procedure

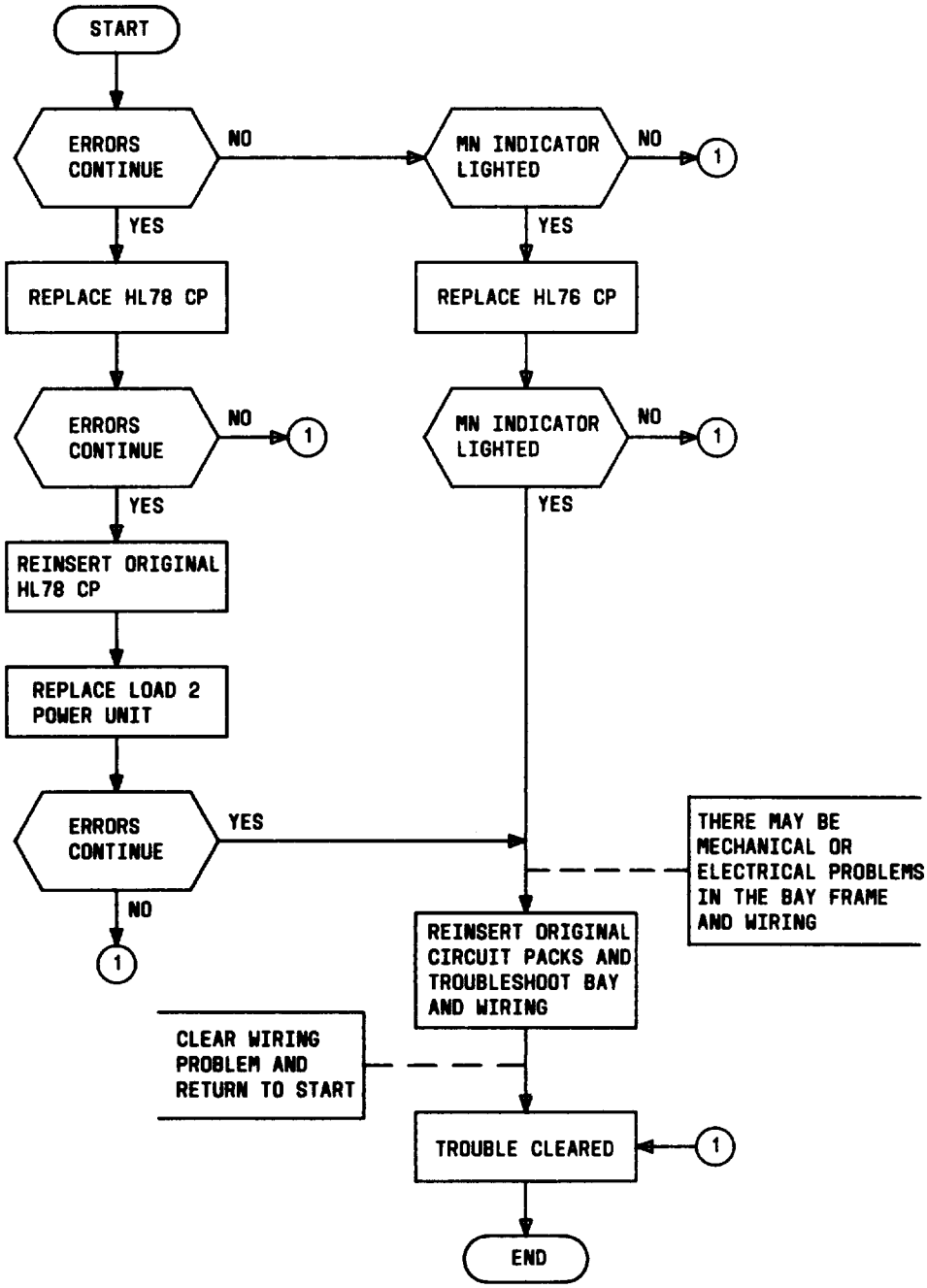


Fig. 11—Load 2 Power Unit Trouble-Locating Procedure

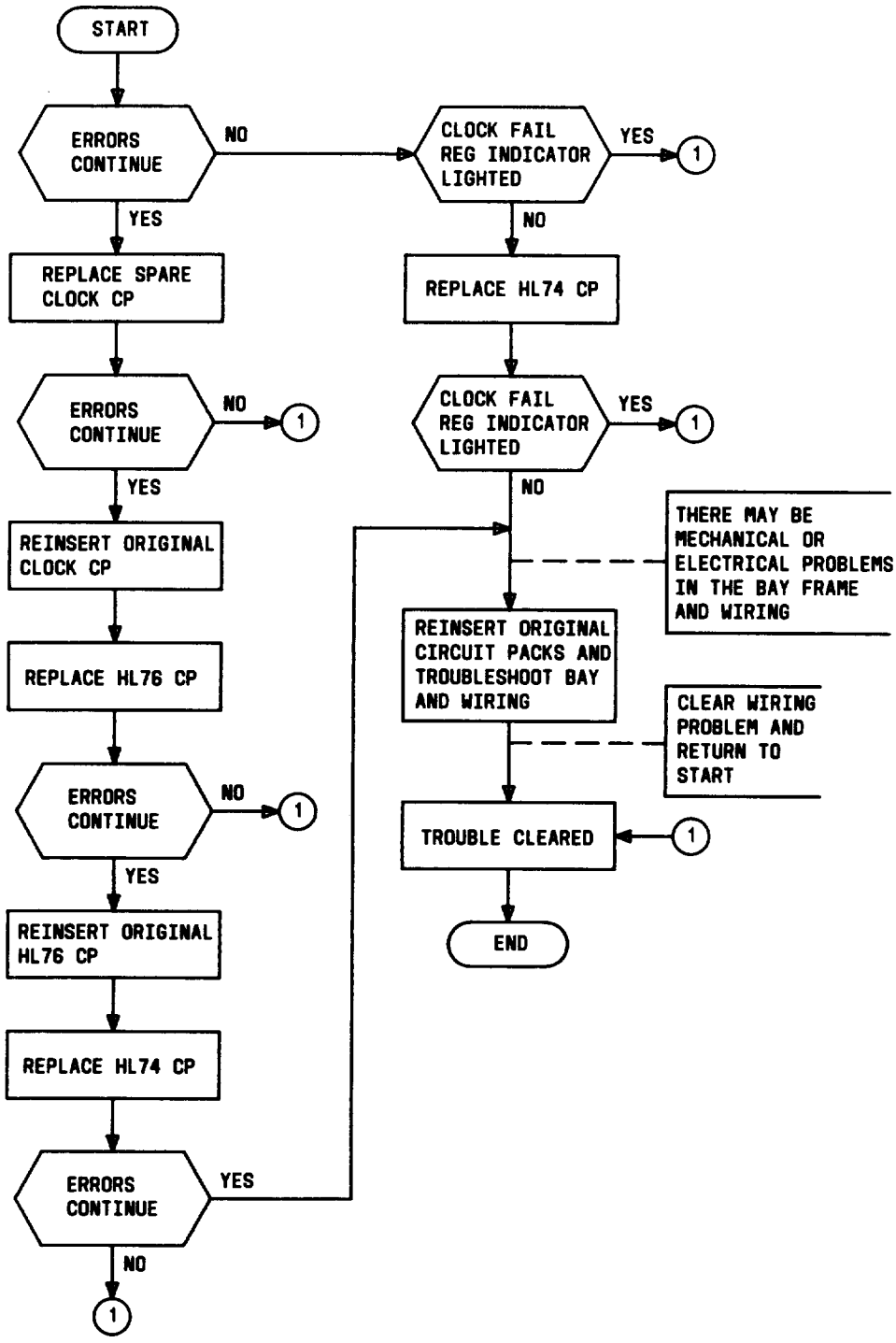


Fig. 12—Spare Clock Trouble-Locating Procedure

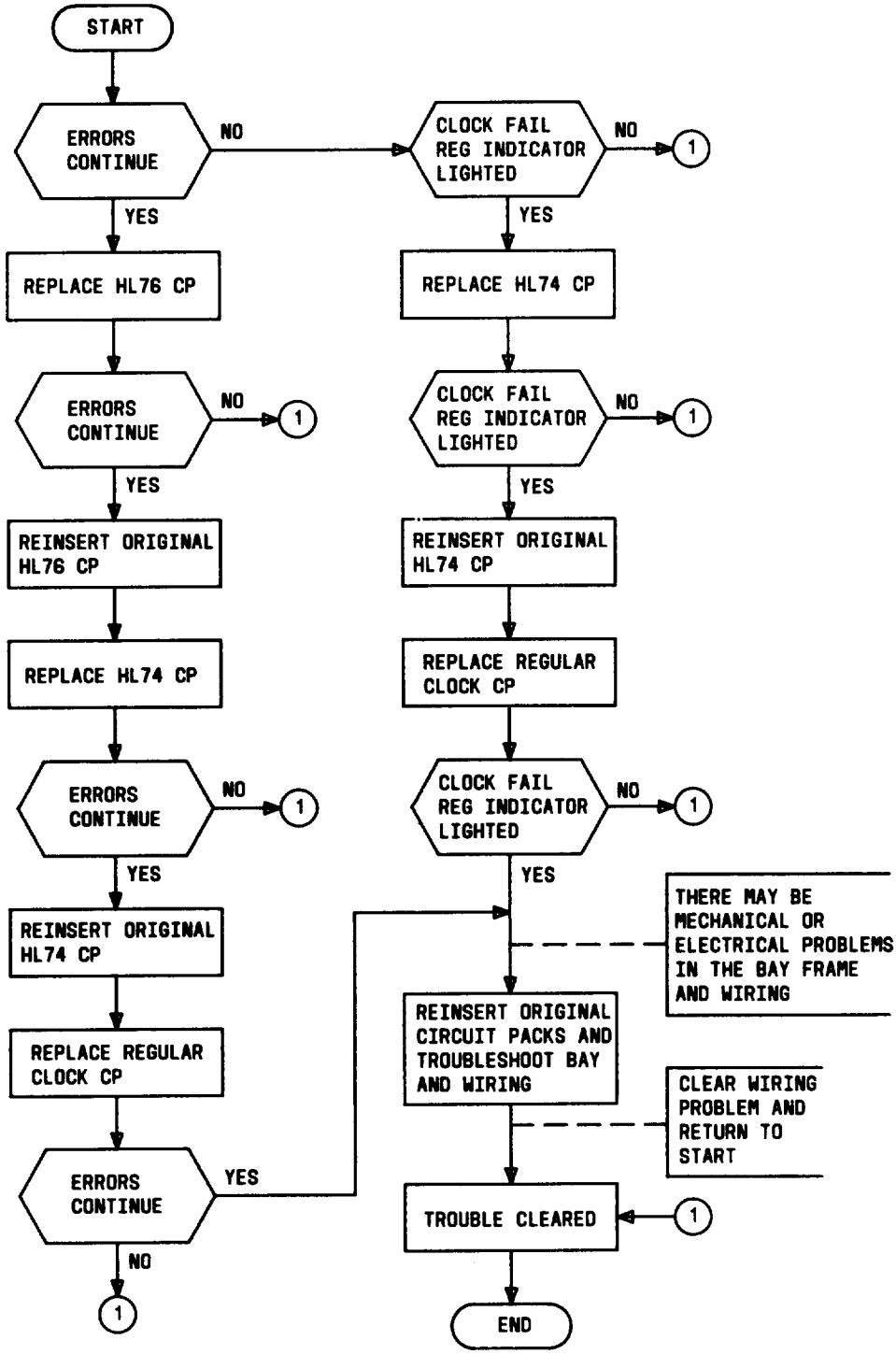


Fig. 13—Regular Clock Trouble-Locating Procedure

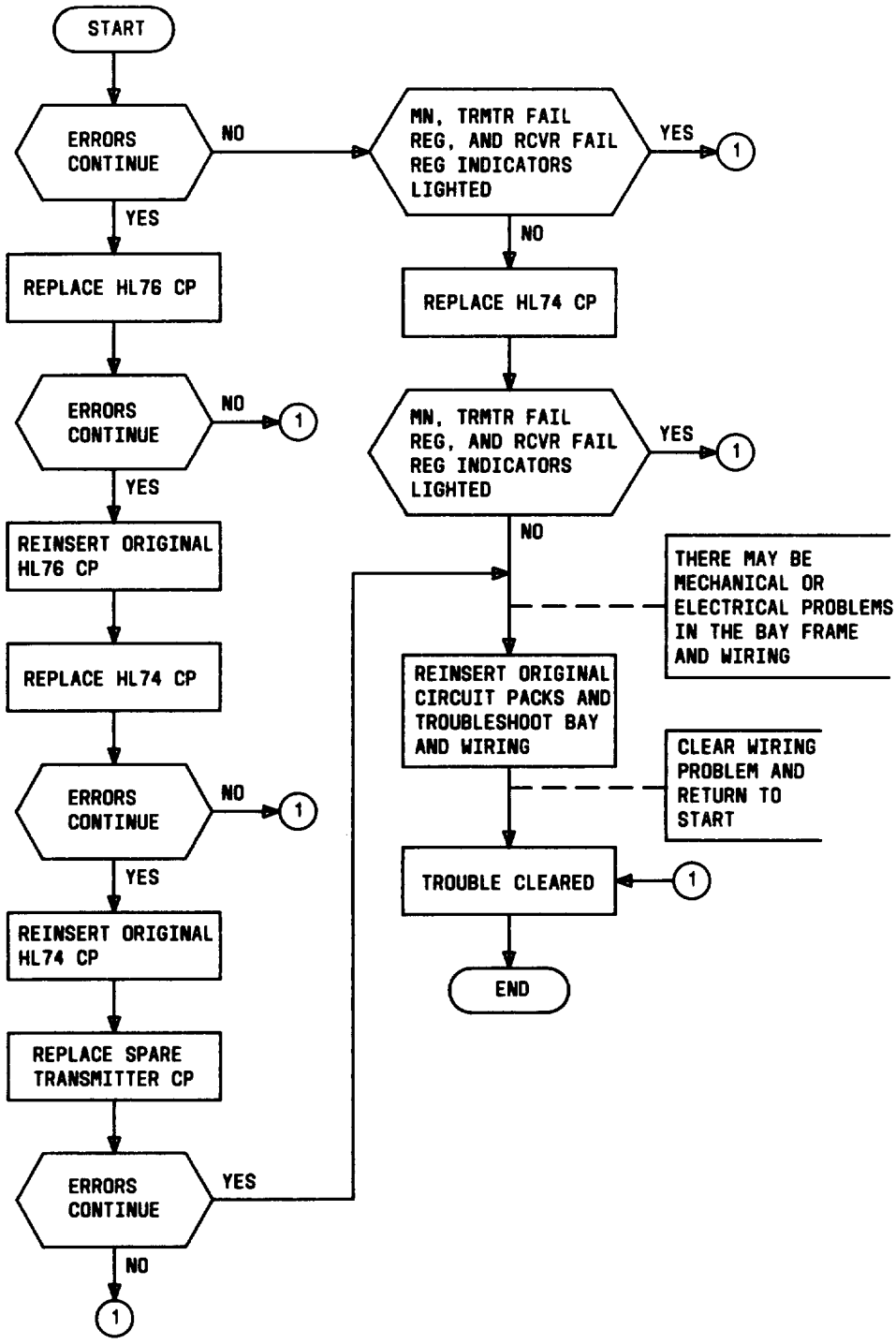


Fig. 14—Spare Transmitter Trouble-Locating Procedure

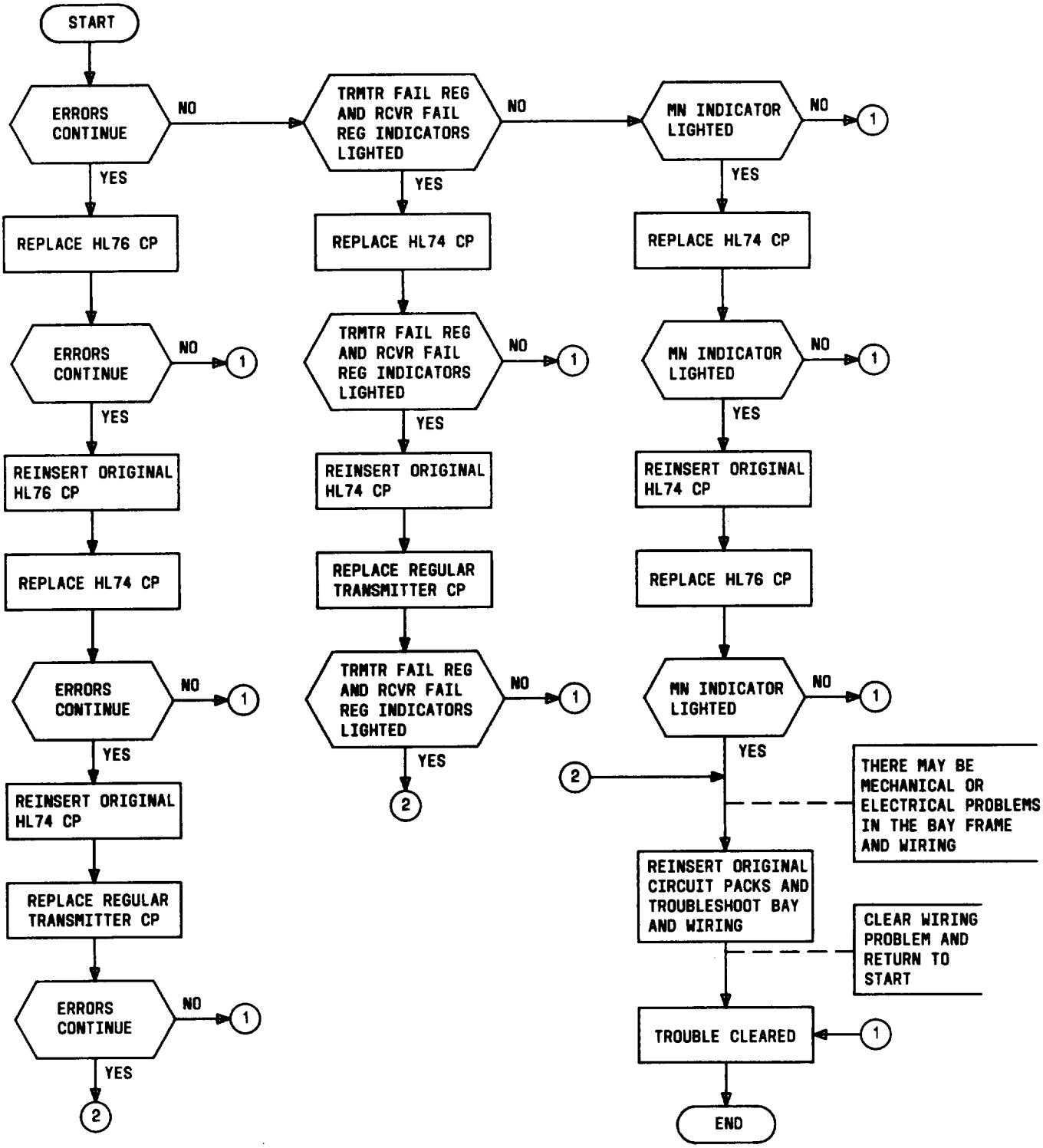


Fig. 15—Regular Transmitter Trouble-Locating Procedure

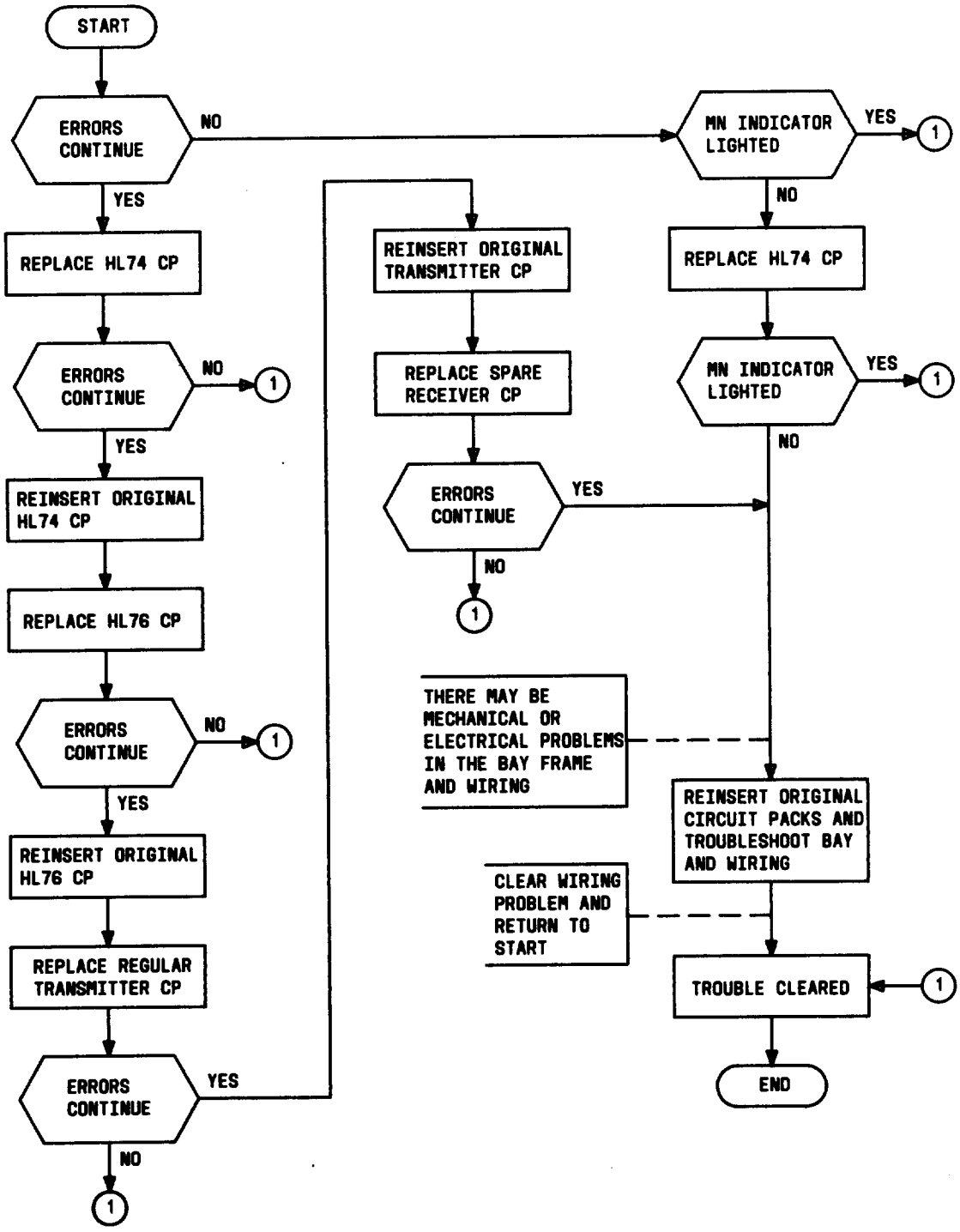


Fig. 16—Regular Transmitter and Spare Receiver Trouble-Locating Procedure

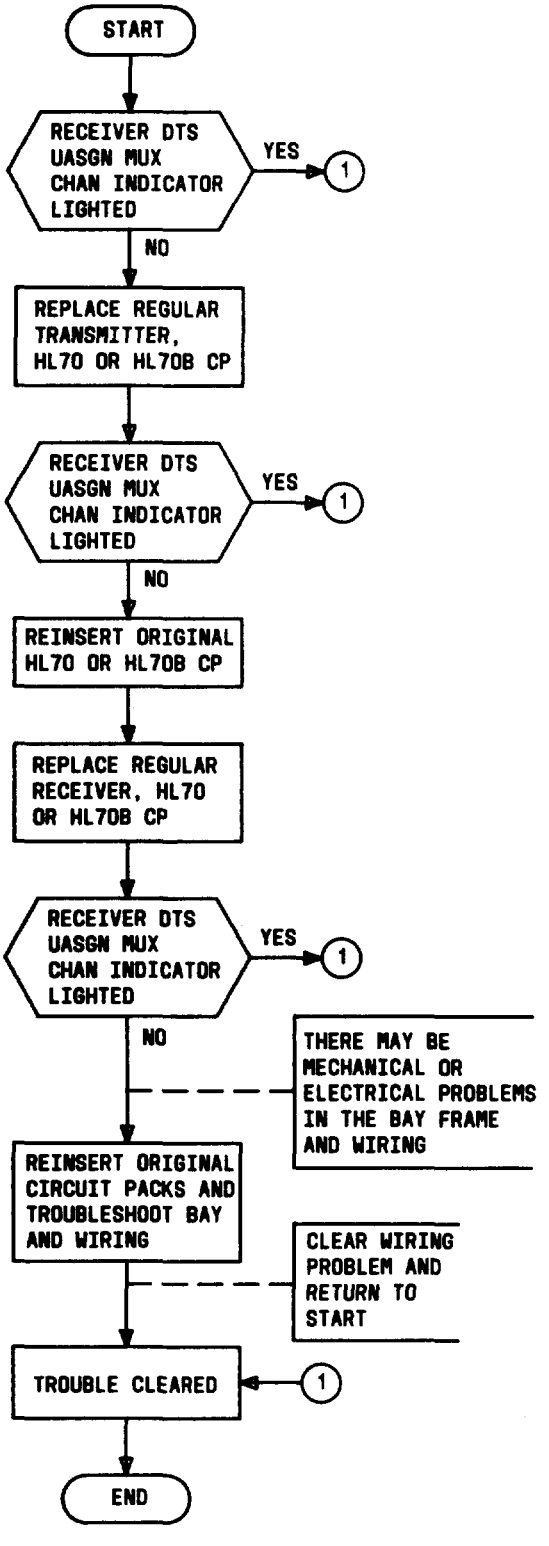


Fig. 17—Control Code Trouble-Locating Procedure