DIGITAL TRANSMISSION SYSTEMS
T1 AUTOMATIC STANDBY UNIT
TROUBLE LOCATION AND MAINTENANCE

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1. GENERAL

1.01 This section contains the troubleshooting chart (Fig. 1) for locating troubles which were indicated at terminals protected by the T1 automatic standby unit (T1ASU) and which were shown to be on the line side. The procedure for clearing a major alarm is also given in the chart, but the procedure for clearing a minor alarm is given separately. The maintenance procedure in this section is used to check the operation of the T1ASU.

1.02 This section affects Equipment Test Lists.

1.03 There are two routine maintenance tests for the T1 automatic standby. One does not introduce hits and the other does. The test not introducing hits checks that the T1 line monitors are operating properly. In the other test, hits are introduced by patching the service around the switch so that the switch can be tested. This test increases the probability that the line switching circuit will operate as required. It is also used to isolate trouble when it is shown to be in the T1ASU.

2. APPARATUS

2.01 The following apparatus is required for the tests in this section:

APPARATUS:

1—J98710F Fault Locating Set or equivalent (capable of producing bipolar violations)

1—J98710G Error Detecting Set or equivalent

1—KS-21144, L1 Lamp Extraction Tool

5—P3BH Cords

1—258-Type Dummy Plug

1—386B Terminating Plug.

2.02 The bipolar output (with and without errors) of the J98710F fault-locating set or equivalent should be tested with the J98710G error detecting set before proceeding by connecting the TEST jack of the J98710F test set to the IN jack of the J98710G test set. Any lamp on the alarm unit or T1 line monitor panel, except the BIPOLAR and ABSENCE VIOLATIONS lamps, not lighting when required should be removed using the KS-21144, L1 lamp extractor. Replace with a GL128 lamp which may be obtained from Precision Lamp Engineers, San Francisco, California.

3. MINOR ALARM CLEARANCE

3.01 A minor alarm (lighted MN ALM on alarm unit) occurs when the line switch automatically goes to the good standby line, when the standby

line fails, or when a fuse blows in the automatic standby equipment. None of these conditions interfere with service but they do show the need for the following repairs.

Caution: Since lamps in the T1ASU may be burned out, confirm the condition of the incoming signal on the regular and standby lines with the J98710G error detecting set before replacing the alarm unit which would release an operated line switch.

STEP	PROCEDURE
1	Silence the office alarm by depressing the ACO button on the ED-3C412-30 alarm unit. ***Note:*** Office alarms associated with the fuse alarm circuitry cannot be silenced by the ACO button.
2	Interpret the lamp indications on the T1ASU according to Table A.

TABLE A

LIGHTED LAMP	TROUBLE
ON ALARM UNIT	
LOCAL FUSE	Blown Fuse (Step 3)
EXT FUSE	Blown Fuse (Step 5)
ON LINE MONITOR	
FA	Blown Fuse (Step 7)
DETR lighted but BIPOLAR or ABSENCE VIOLATIONS not lighted	Unless VIOLATIONS lamp burned out, unnecessary detector relay operation (Step 12)
BIPOLAR or ABSENCE VIOLATIONS and DETR	Incoming line or VIOLATION DETECTOR failure (Step 18)

3	Replace the fuse in the alarm unit. Replace the alarm unit if the fuse blows again (see caution in 3.01).
4	Proceed to Step 23.
5	Check line terminating units and T1 line monitors for blown fuse.
6a	If the line terminating unit fuse is blown, replace it and proceed to Step 23.
6b	If the T1 line monitor fuse is blown, proceed to Step 7.
7	Disengage the plug-in boards from the monitor.

STEP	PROCEDURE
8	Replace the 70A fuse.
9	Reinsert the violation detector and then the violation rate alarm to determine which has the short circuit.
10	Replace the defective unit, if any.
11	Proceed to Step 23.
12	Depress the RESET button on the violation rate alarm unit of the T1 line monitor. ***Requirement:*** The DETR lamp extinguishes and remains extinguished. ***Note:*** If the requirement is met, proceed to Step 23. If the requirement is not met and any other lamps light, return to Step 2. If the requirement is not met, but no other lamps light, proceed to Step 13.
13	Place the ACO key on the T1 line monitor which is affected to the horizontal position.
14	Replace the violation rate alarm unit.
15	Return the ACO key to the vertical position.
16	If the trouble does not clear, repeat Steps 13 through 15, except replace the violation detector unit.
17a	If the trouble still does not clear, proceed to Step 18.
17b	If the trouble clears, proceed to Step 23.
18	Test the incoming line associated with the malfunctioning T1 line monitor using the J98710G error detecting set.
19a	If the line has failed, proceed to Step 21.
19b	If the line tests good, proceed to Step 20a.
20a	If the suspect line monitor is the REG MON, patch from REGULAR OUT to COMMON IN (bypassing the monitor); patch from INPUT of the STBY MON to REGULAR MON (to monitor the working line); and test the monitor per Section 103-493-107.
20b	If the suspect line monitor is the STBY MON, test per Section 103-493-107.
21	Have the transmitting end verify that the MAIN and CKT fuses on the line terminating unit have been replaced by dummy fuses.
22	If the trouble still exists, restore the failed route by patching in spare lines per Section 365-226-500 in order to retain the switching capability. After the faulty sections are repaired, restore service to the original line(s).

STEP	PROCEDURE
23	If any test equipment was connected, disconnect it.

4. TROUBLE LOCATING

4.01 The flow chart (Fig. 1) shows how to locate trouble on the line side of the terminal protected by the T1ASU.

4.02 The lamps on the ASU give the following indications when lighted:

T1 line monitor lamps:

LAMP	INDICATION
FA	Blown Fuse
DETR	Excessive violations triggered detector relay
SW	Line switching relay operated
ACO	Alarm connection cut off
BIPOLAR VIOLATIONS	This condition exists on line
ABSENCE VIOLATIONS	This condition exists on line

Alarm unit lamps:

LOCAL FUSE	Blown alarm unit fuse
EXT FUSE	Blown fuse in line monitor or line terminating unit
MJ ALM	Major alarm
MJ ACO	Major office alarm cutoff
MN ALM	Minor alarm
MN ACO	Minor office alarm cutoff

Line Terminating Unit lamps:

FUSE	Blown fuse

5. ROUTINE MAINTENANCE (Not Causing Hits)

5.01 This procedure tests the plug-in units for the regular and standby line monitors and tests the unused transmission switch in the standby line monitor. To prevent the operation of the line switch in the regular line monitor the violation rate alarm unit is removed while the ACO key on the line monitor is temporarily put in the horizontal position.

Caution: Since lamps in the T1ASU may be burned out, confirm the condition of the incoming regular and standby line with the J98710G error detecting set before replacing the alarm unit which would release an operated line switch.

STEP	PROCEDURE
1	Observe the lamps on the ED-3C412-30 alarm unit (see caution in 5.01). Any trouble indicated by lighted lamps should be cleared per Part 3 or 4.
2	Place the ACO key on the regular line monitor to the horizontal position and remove the violation rate alarm unit.
3	Place a dummy plug in the INPUT jack of the REG MON.

STEP	PROCEDURE

Requirement: The ABSENCE VIOLATIONS lamp lights.

Note: If the requirement is not met, replace the violation detector unit and repeat Step 3.

4 Remove the dummy plug.

5 Patch a source of bipolar violations to the INPUT jack of the REG MON. If the J98710F fault-locating set is used, place the FUNCTION switch to MEAS 3 and patch a P3BH cord to the TEST jack.

Requirement: The BIPOLAR VIOLATIONS lamp lights.

Note: If the requirement is not met, replace the violation detector and repeat Step 5.

6 Remove the patch cord but do not return the violation rate alarm unit to the vacant slot.

7 Place a dummy plug in the INPUT jack of the STBY MON and press the MON ACO button on the ED-3C412-30 alarm unit after the minor alarm sounds.

Requirement 1: The ABSENCE VIOLATIONS lamp lights.

Requirement 2: The DETR and LSW lamps on the STBY MON light.

Requirement 3: The MN ALM on the alarm unit lights.

Requirement 4: The MN ACO on the alarm unit lights and office alarm ceases.

Note: If Requirement 1 is not met, replace the violation detector and repeat Step 7. If Requirement 2 is not met, replace the violation rate alarm unit and repeat Step 7. If Requirements 3 or 4 are not met, replace the alarm unit (see caution in 5.01).

8 Remove the dummy plug and press the RESET button on the violation rate alarm unit.

9 Patch a source of bipolar violations to the INPUT jack of the STBY MON and press the MN ACO button on the ED-3C412-30 alarm unit.

Requirement 1: The BIPOLAR VIOLATIONS lamp lights.

Requirement 2: The DETR and LSW lamps on the STBY MON light.

Requirement 3: The MN ALM on the alarm unit lights.

Requirement 4: The MN ACO on the alarm unit lights and the office alarm ceases.

Note: If any requirement is not met, replace the violation detector and repeat Step 9.

10 Remove the patch cord and press the RESET button on the violation rate alarm unit.

STEP	PROCEDURE
11	Substitute the unit removed in Step 2 for the one in the STBY MON and repeat Steps 7 through 10.
12	Return the violation rate alarm units to the original slots. Turn the ACO key on the regular line monitor to the vertical position.

6. ROUTINE MAINTENANCE (Causing Hits)

6.01 This procedure ensures that the line switching circuit in the automatic standby is operative. The relay contacts are cleaned somewhat by operating the relays in this procedure. This procedure is performed on a routine basis and whenever the automatic standby is shown to be malfunctioning by the trouble location chart of Fig. 1.

Caution: Since lamps in the T1ASU may be burned out, confirm the condition of the incoming regular and standby lines with the J98710G error detecting set before patching the standby line to the terminal or replacing the alarm unit which would release an operated line switch.

STEP	PROCEDURE
1	Unless the line monitors have recently been tested, use the J98710G error detecting set to establish that the lines are in good condition (see caution in 6.01). Any trouble indicated by lighted lamps on the T1ASU must be cleared per Parts 3 and 4.
2	Plug a P3BH cord in the OUT jack associated with the incoming standby line (STANDBY OUT) and then over to the IN jack of the common line to the terminal (patch A in Fig. 2). Plug the 386B terminating plug into the OUT jack associated with the output of the line switching circuit (COMMON OUT) and press the ACO button on the alarm unit immediately after the alarm sounds. ***Requirement 1:*** The ABSENCE VIOLATIONS lamp on the STBY MON lights. ***Requirement 2:*** The DETR and LSW lamps on the STBY MON light. ***Requirement 3:*** The MN ALM lamp on the alarm unit lights. ***Requirement 4:*** The MN ACO lamp on the alarm unit lights and the office alarm ceases. ***Note:*** If Requirement 1 is not met, put the ACO key on the STBY MON to the horizontal position; replace the violation detector, and return the ACO key to vertical. If Requirement 2 is not met, replace the pattern detector using the ACO key. If Requirement 3 or 4 is not met, replace the alarm unit (see caution in 6.01).
3	Patch from the OUT jack associated with the regular line (REGULAR OUT) to the IN jack associated with the incoming standby line (STANDBY IN) and press the ACO button on the alarm unit immediately after an alarm sounds (see patch B in Fig. 2).

STEP	PROCEDURE

Requirement 1: The ABSENCE VIOLATION lamp on REG MON lights.

Requirement 2: The DETR lamp lights.

Requirement 3: The major office alarm sounds.

Requirement 4: The ABSENCE VIOLATIONS lamp on the STBY MON extinguishes.

Note: After approximately one minute, the following requirements must be met.

Requirement 5: The DETR lamp on the STBY MON extinguishes, and the LSW lamp on the REG MON lights.

Requirement 6: The MJ ALM lamp on the alarm unit extinguishes and the MN ALM lamp remains lighted.

Note: If Requirement 1 is not met, put the ACO key on the REG MON to horizontal; replace the violation detector; and return the ACO key to vertical. If Requirement 2 is not met, replace the violation rate alarm using the ACO key. If Requirement 5 is not met, replace the violation rate alarm in the STBY MON using the ACO key. If Requirement 6 is not met, the LSW relay is not operated. Replace the violation rate alarm in the REG MON using the ACO key and if necessary check that the switch enable input wiring is in place (see SD-3C157-01 and SD-3C182-01).

4 Patch from the MON jack associated with the standby line (STANDBY MON) to the INPUT jack of the STBY MON (patch C in Fig. 2).

Requirement: No violations on STBY MON.

5 Place the LSW CONT key on the REG MON to HOLD and patch from the MON jack associated with the output of the line switching circuit (COMMON OUT) to the INPUT jack of the REG MON (patch D in Fig. 2).

Requirement: ABSENCE VIOLATIONS are no longer indicated on the REG MON.

Note: If the requirement is not met, the switch relay contacts are probably defective. To eliminate other possibilities, check for pulses at the REGULAR MON jack and finally patch a bipolar signal to the STANDBY IN jack while observing the line monitor connected in Step 5. Repair or replace the line monitor if necessary.

Caution: The following operations must be done exactly as stated. If removal of any cord causes an alarm, press the ACO button on the alarm unit.

6 Remove the cord from the OUT jack associated with the regular line and the IN jack associated with the standby line (patch B in Fig. 2). Return the LSW CONT key on the REG MON to RLS.

STEP	PROCEDURE
7	Remove the 386B plug from the OUT jack associated with the output of the line switching circuit. First pull the end of the cord from the INPUT jack of the REG MON; then pull the other end (patch D in Fig. 2).
8	First pull the end of the cord from the INPUT jack of the STBY MON; then pull the other end (patch C in Fig. 2).
9	First pull the end of the cord from the IN jack of the common line to the terminal; then pull the other end (patch A in Fig. 2).
10	Verify that all alarm and ACO lamps are extinguished after about one minute or immediately after pressing the RESET buttons on the violation rate alarm units. If any lamps remain lighted, clear the alarms per Part 3 or 4 of this section.

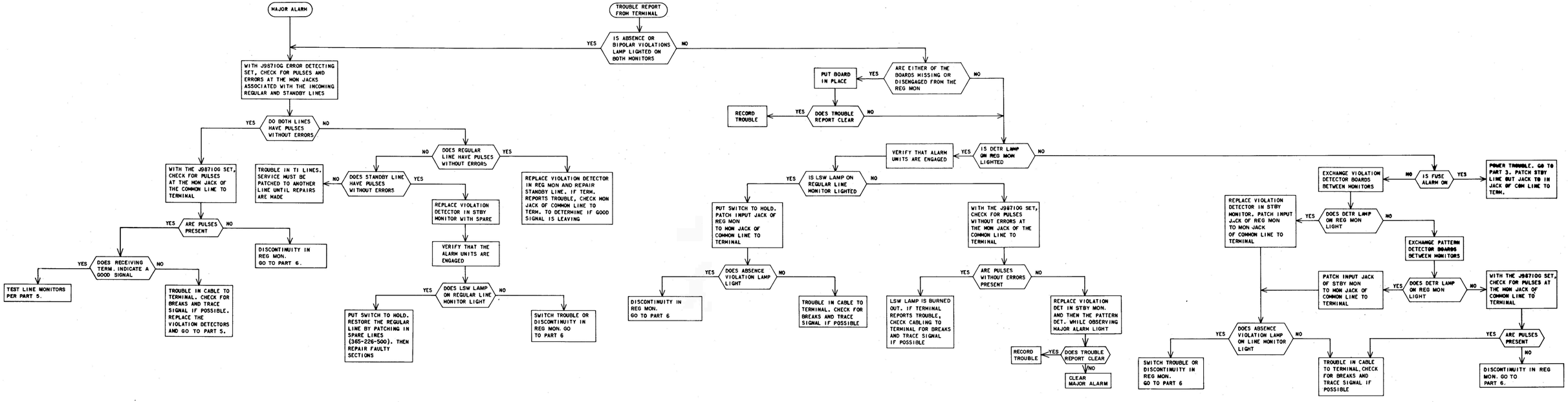
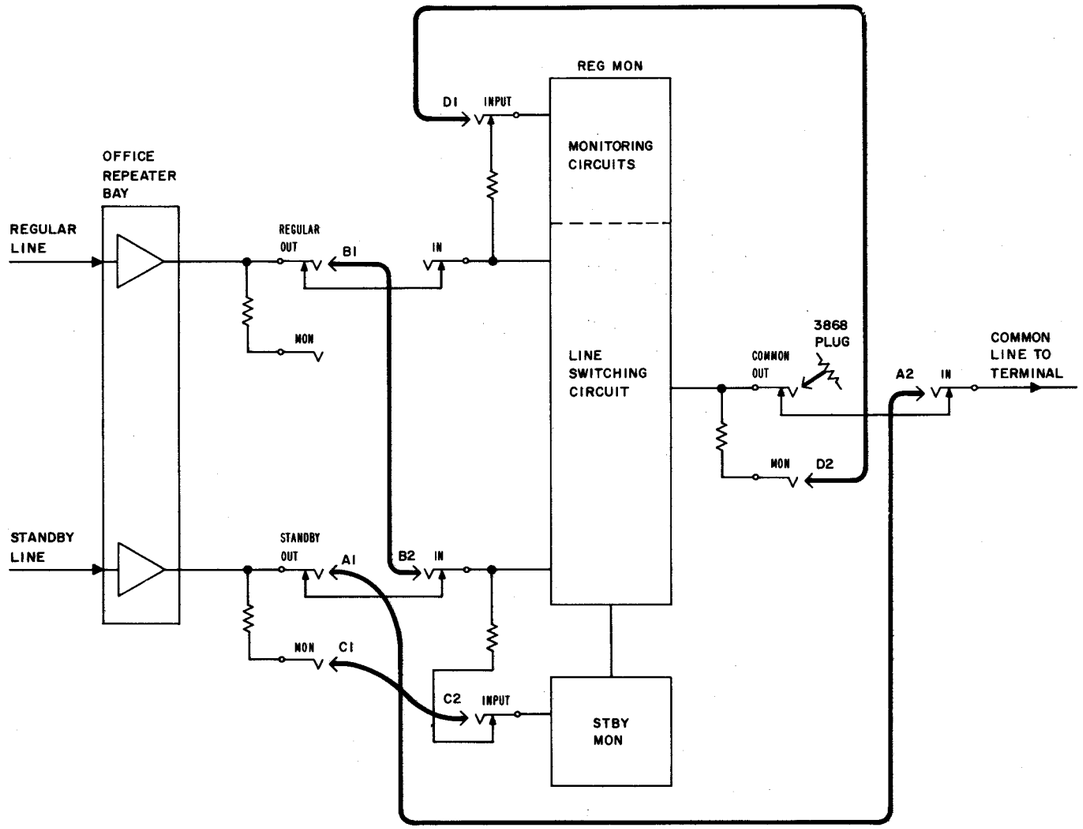


Fig. 1—Troubleshooting Chart



PATCHING SEQUENCE

ESTABLISHING	REMOVING
A1	B1
A2	B2
386B PLUG	386B PLUG
B1	D2
B2	D1
C1	C2
C2	C1
D1	A2
D2	A1

Fig. 2—Maintenance Test Setup