

DIGITAL 56-KB/S REPEATER

TEST PROCEDURES

DIGITAL DATA SYSTEM

1. GENERAL

1.01 This section describes the test procedures to be followed when investigating trouble conditions associated with 56-kb/s repeaters with or without the automatic bypass function.

1.02 This section is reissued to provide additional testing instructions in Part 6. The equipment test lists (ETL) are not affected. Revision arrows are used to emphasize the more significant changes.

1.03 Before proceeding with any test, verify that the installation tests specified in Section 807-610-191 have been performed.

1.04 The Serving Test Center (STC) has the capability of causing a loopback at various points in the local distribution system in order to isolate the problem area.

2. TOOLS AND APPARATUS

2.01 Obtain the following tools and apparatus:

- KS-16363, L3 wire-wrap tool (or equivalent)
- KS-14510, L1 volt ohm-milliammeter and appropriate leads (or equivalent)
- KS-20909 (or equivalent) data test set (DTS).♦

3. CP REMOVAL AND REPLACEMENT PROCEDURES

3.01 Removal [Central Office (CO) Repeater]: Procedures for CP removal of the CO repeater are given below.

- (a) Gain access to repeater as required.
- (b) Raise door on front of repeater.
- (c) Rotate and hold the appropriate printed wiring board lock in its open position.

(d) Remove circuit pack (CP) (LA1, LA2, or LA3) and properly tag.

3.02 Replacement (CO Repeater): Procedures for CP replacement of the CO repeater are given below.

- (a) Verify that replacement CP is the correct code.
- (b) Rotate and hold the printed wiring board lock in its open position.
- (c) Position replacement CP in printed wiring board guides, and firmly push it into the connector.
- (d) Return bad CP(s) to Western Electric Company for repair.
- (e) Lower door on front of repeater.
- (f) Restore service as required.

4. SHELF REMOVAL AND REPLACEMENT PROCEDURES

4.01 Removal (CO Repeater, List 1 or 2): Procedures for removing the CO repeater shelf are given below.

- (a) Remove all three CPs one at a time, per paragraph 3.01.
- (b) Using proper wire-wrap tools, remove and tag the shelf wiring.
- (c) Remove the shelf from the miscellaneous bay.

4.02 Replacement (CO Repeater, List 1 or 2): Procedures for replacing the CO repeater shelf are given below.

- (a) Replace shelf in miscellaneous bay.

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- (b) Reconnect the shelf wiring.
- (c) Replace all three CPs one at a time, per paragraph 3.02.
- (d) Restore service with aid of STC.

4.03 Replacement of a defective CP 1 (current regulators and alarm relay CP) can be accomplished by removal and replacement of the List 1 repeater shelf as outlined in paragraphs 4.01 and 4.02 above.

4.04 Replacement of a defective CP 2 (current regulator, automatic bypass, and alarm relay) can be accomplished by removing the six mounting screws and removing the plug from the CP 2 connector. To replace CP 2, insert and tighten six mounting screws and reinsert plug into connector.

4.05 Removal and Replacement [Outside Plant (OP) Repeater]: Removal and replacement procedures for the OP repeater CP are described in Section 640-251-107.

5. REMOTE TEST (FAULT SECTIONALIZATION BY STC)

A. CO Repeater

5.01 This test is performed by the STC in order to isolate the problem area. The STC tests are limited to loopback and error runs, and the perfor-

mance of these tests is specified in Section 314-901-500. One-man dc (with repeater in bypass condition) tests are performed from the office channel unit (OCU) location. Some ac tests are performed from the OCU location and some are performed on a loop segment basis. These tests are specified in Section 314-410-510.

B. OP Repeater

5.02 The remote test of the OP repeater is performed by the STC as specified in Section 640-251-107.

6. LOCAL TEST (CENTRAL OFFICE REPEATER)

6.01 This test checks the operation of the CO repeater by visual observation and by use of test equipment at the repeater itself. A KS-14510, L1 (or equivalent) volt-ohm-milliammeter (VOM), with test probes equipped with pin-type tips, is required.

A. Fuse and Power Verification

6.02 Verify that the -48 and +130 or the -130 volt indicating fuses are good by observing the fuse indicators on top of the fuses and the F ALM lamp (Fig. 1). If either indicator bead is protruding or the F ALM lamp is lit, replace the blown fuse. After replacement, observe that the fuse indicator bead is recessed and the F ALM lamp is extinguished.

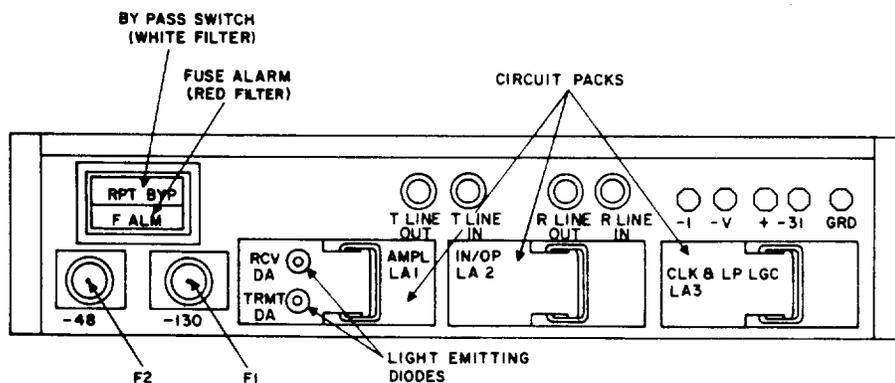


Fig. 1—Office Configuration of 56-kb/s Repeater, List 2

6.03 Verify dc power by making the following voltage measurements with respect to frame ground:

- (1) List 1 and 2 repeater shelves

Voltage	Terminal Strip and Pin
+105 to +145 Vdc	TS3-1 (Y and Z option only; not used with X option)
-41 to -54 Vdc	TS3-8

- (2) List 2 repeater shelf

Voltage	Terminal Strip and Pin
-105 to -145 Vdc	TS3-8 (Y and Z option only; not used with X option)

Restore those voltages not present.

B. -48 Vdc Current Regulator Test

6.04 Measure -31.5 ± 3.2 Vdc at pin jack J8 (-31V) with respect to pin jack J9 (GRD). **◆These voltages will be present only if LA1 and LA3 CPs are installed.◆ If the measurements cannot be met, replace the following CPs one at a time in the order given:**

- (1) LA3
- (2) LA1
- (3) CP 1 (requires shelf replacement if list 1)
- (4) CP 2 (if repeater shelf is a list 2).

After each CP replacement, repeat the above test to verify that the correct voltage measurements have been obtained.

C. -130 Vdc Simplex Current Regulator Test (When the CO Repeater Provides no Power to Another Repeater—X Option)

6.05 Operate the repeater bypass switch (RPT BYP) and observe that the white lamp is illuminated. Connect a milliammeter across pin jacks J5(-I) and J6(-V). Measure 9.0 to 24.0 mA flowing from J5(-I) into J6(-V). If the test fails, replace the following CPs one at a time in the order given:

- (1) LA2

- (2) CP 1 (requires shelf replacement if list 1).

- (3) CP 2 (if repeater shelf is a list 2).

After each CP replacement, repeat the above test to verify that the trouble has been located and cleared. When the trouble is cleared, release the repeater bypass circuitry by depressing the RPT BYP switch again and observe that the lamp is extinguished.

D. -130 Vdc Simplex Current Regulator Test (When the CO Repeater Provides Power to Another Repeater—Y or Z Option).

6.06 Operate the RPT BYP switch and observe that the white lamp is illuminated. Connect a milliammeter across pin jacks J5(-I) and J6(-V). Measure 112.5 to 126.5 mA flowing from J5(-I) into J6(-V). If the test fails, replace the following CPs one at a time in the order given:

- (1) LA2
- (2) CP 1 (requires shelf replacement if list 1)
- (3) CP 2 (if repeater shelf is a list 2).

After each replacement, repeat the above test to verify that the trouble has been located and cleared. When the trouble is cleared, release the repeater bypass circuitry by depressing the RPT BYP switch and observe that the lamp is extinguished.

E. Simplex Power and Reversal Test (Through CO Repeater or Simplex Power Unit)

6.07 ◆Before performing the following procedures, ensure that all CPs have been installed to ensure accurate measurements.◆

6.08 Place the repeater in the normal operating mode (no loopback in progress, not in bypass state). Measure the potential at pin jack J5 (-I) with respect to J6 (-V). The potential should be +1.5 to +140.0 Vdc.

6.09 Have the STC or a tester with the KS-20909 data test set (DTS) at the OCU location perform channel loopback. (See Note.) Check that the potential at pin jack J5 (-I) with respect to pin jack J6 (-V) is now -1.5 to -140.0 Vdc.

Note: If the LA1 and LA3 CPs are installed in the shelf under test, have tester depress the "all 1s" button while transmitting the channel loopback code.

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6.10 With the repeater still receiving channel loopback, measure the potential on pin jack J7 (+) relative to pin jack J6 (-V). The potential must be +0.1 to +2.4 Vdc.

6.11 Place a plug in the T LIN IN jack and check that the potential between pin jack J7 (+) and pin jack J6 (-V) is then less than 0.1 Vdc. If this is true, the simplex current circuits of this repeater or simplex power unit are OK.

6.12 If any of the tests in paragraphs 6.08 through 6.11 fail, replace the following CPs, one at a time, in the order given:

- (1) LA3
- (2) LA1
- (3) LA2
- (4) CP 1 (requires shelf replacement if list 1)
- (5) CP 2 (if shelf is a list 2).

After each CP replacement, repeat the above test or tests which failed to verify that the trouble has been located and cleared.

F. Simplex Power and Reversal Test (Into CO Repeater or Simplex Power Unit)

6.13 Place the repeater in the normal operating mode and insert a plug into each of the T LIN OUT and the R LIN IN jacks. The potential at the tip of T LIN OUT should be -24 ± 5 Vdc or -50 ± 10 Vdc relative to the tip of R LIN IN.

6.14 Have the STC or a tester with the KS-20909 DTS at the OCU location perform channel loopback. Then, if necessary, have the tester depress the "all 1s" button several times. Measure the potential at the tip of T LIN OUT relative to the tip of R LIN IN. The potential should be $+24 \pm 5$ Vdc or $+50 \pm 10$ Vdc. If the potentials are correct, the repeater or simplex power unit is receiving the proper simplex current and reversals on the input.

6.15 If any of the tests in paragraphs 6.13 and 6.14 fail, check and repair test jack or repeater shelf wiring as necessary. After each repair, repeat the above test or tests which failed to verify that the trouble has been located and cleared.

G. Data Regenerating Test

6.16 Have the STC perform a 15-second error run. If the test fails, replace LA1, LA2, and LA3 CPs. Have the STC repeat the error run. If no improvement is found, reinstall the original CPs. If improvement was found, reinstall the original CPs one at a time while having the STC perform error runs. In this way, isolation of the defective CP is possible.

7. LOCAL TEST (OUTSIDE PLANT REPEATER)

7.01 Local tests of the OP repeater are covered in Section 640-251-107.

8. LOOP TEST FROM CENTRAL OFFICE REPEATER

8.01 If it is desirable to test the loops from the CO repeater, it can be accomplished by using the jacks mounted on the front of the repeater. A KS-14510 L1 (or equivalent) VOM, along with test leads having 810 plugs, is required.

8.02 To test the loop toward the station, plug into both jacks T LIN IN and R LIN OUT at the same time in order to isolate the loops from the repeater and to get access to the metallic pairs.

(1) Measure the potential between T, R, T1, and R1 with respect to GRD. Ground may be accessed at the pin jack labeled GRD. The potential must be less than ± 1 Vdc.

(2) Measure the resistance between T, R, T1, and R1 to GRD. The resistance must be greater than 120K ohms.

(3) Measure the resistance between T and R and between T1 and R1. With no OP repeater between tester and station, the minimum resistance should be 0.7 times the loop resistance and the maximum resistance should be the loop resistance plus 1300 ohms. With an OP repeater between tester and station, the resistance should be the loop resistance plus 5760 ohms (for each OP repeater), ± 30 percent of their total resistance.

8.03 To test the loops toward the OCU, plug into both jacks T LIN OUT and R LIN IN at the same time in order to isolate the loops from the re-

peater and to get access to the metallic pairs. Check to determine that the repeater or unit at the other end of the loop section in question is not in the looped or bypassed state.

(1) Measure the resistance between T and R and between T1 and R1. The resistance should be the loop resistance plus 35 ohms, ± 30 percent of their total resistance.

(2) Have the STC loop the unit at the other end of the loop section in question by means of the proper digital loopback signals. This disconnects the two loops from that unit except for a 15-volt bidirectional protection zener between tip and ring. Measure the potential between T, R, T1, and R1 with respect to GRD. The potential must be less than ± 1 Vdc.

(3) With the unit at the other end of the loop section still in a loopback condition, measure the resistance from T, R, T1, and R1 to GRD. The resistance must be greater than 120K ohms.



Do not use the X 10,000 scale on the KS-14510 L1 during the next step.

(4) With the unit at the other end of the loop still in a loopback condition, measure the resistance between T and R and between T1 and R1. The resistance must be greater than 120K ohms.