

EQUALIZING REPEATER LOCATION

TESTS

REPEATERS

L4 CARRIER

In the L4 coaxial cable system, routine tests and trouble isolation tests are performed at a main station. Maintenance at a line repeater location is limited to measurement of the 11.648-MHz line pilot power, determination of repeater gain, adjustment of the monitoring oscillator signal power, and replacement of defective equipment units.

This section is reissued to add **Warnings** to prevent damage to the equipment, to correct errors, and to include information for manual A equalizer J68877EJ. Arrows are used to indicate significant changes. **Equipment Test Lists are not affected.**

♦Read and **observe** each **DANGER** and **Warning** in this section to avoid personal injury and to prevent damage to the equipment.♦

CHART	PAGE
1 — Actions at Main Station	2
2 — Actions at Equalizing Repeater Location	2

APPARATUS:

Pilot Test Set J68898A, L2 or J68898B, L1 (Section 103-456-000)

or

Transmission Measuring Set (TMS)

Frequency: 11.648 MHz

Power: -28 through -55 dBm

Impedance: 75 ohms unbalanced

Type: Wandel-Goltermann AT463 (W&G AT463) (Section 103-406-000)

L4 High-Voltage Isolation Test Probe ED-51073-30 (for use with AT463)

NOTICE

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

SECTION 359-205-503

APPARATUS (Contd):

185A Adapter (for extending the monitoring oscillator assembly)

452A Plug (for bypassing an L4 repeater)

566A Jack (for discharging an L4 repeater)

Extractor KS-20141, L1 (for inserting and removing the 51A pad)

Equipment, as listed in Section 640-440-205, necessary to open and close line repeater apparatus cases

Replacement equipment units which have been selected, prepared, and tested for the particular equalizing repeater location.

CHART 1

ACTIONS AT MAIN STATION

STEP	PROCEDURE
1	Select, prepare, and test all equipment units to be installed at the equalizing repeater location. Note: ♦ Sections 359-205-511 and 359-205-512 prescribe the procedures.♦
2	Place equipment units in a protective container for transportation to the equalizing repeater location. Warning: ♦ <i>Remove an equipment unit from the protective container only when the unit is to be placed in an apparatus case.</i>
3	Check that the L4 line is removed from service, if required.
4	Ensure that all persons concerned have been notified that line maintenance is to be performed.

CHART 2

ACTIONS AT EQUALIZING REPEATER LOCATION

Equalizing repeater stations are entered through a small above-ground storage building over the entrance to the underground room.

Section 620-140-501 prescribes procedures for opening and closing an L4 line repeater station.

DANGER: ♦ *Before entering the underground room, ventilate the equalizing repeater location.*

CHART 2 (Contd)

Note: A squeegee will be useful for removing condensed moisture from the ceiling of the underground room.

Section 640-440-205 prescribes procedures for opening and closing an L4 line repeater apparatus case.

⚠DANGER: ⚠ *Exercise extreme care because hazardous voltages, as high as 1800 volts, are present in L4 line repeaters.*

An equalizing repeater location also contains an apparatus case for the voice-frequency repeaters which serve the order wires and the status reporting and control system.

Section 640-440-204 prescribes procedures for opening and closing the 470B2 apparatus case which houses the voice-frequency repeaters.

STEP	PROCEDURE
A. Preliminary Steps	
1	Establish communication with the main station.
2	Check with the main station attendant that neither group of monitoring oscillators, powered by the equalizing repeater to be maintained, is turned on.
3	Follow the procedure in Section 640-440-205 to open the appropriate apparatus case for access to the equipment units.
Note: ⚠ An equalizing repeater that includes a stepped A equalizer consists of eight plug-in equipment units housed in two connected apparatus cases (Fig. 1). An equalizing repeater that includes a manual A equalizer occupies one apparatus case.⚠	
4	Proceed to Part B or Part C, as applicable.
B. Measurements and Adjustments	
Warning: <i>Remove patch cord from the 51A pad first.</i>	
5	Remove the patch cord that connects the monitoring oscillator assembly to the 51A pad (Fig. 1).
6	Remove the 51A pad from the repeater IN jack using extractor KS-20141, L1.
7	Perform Steps 8 through 24 (W&G TMS) or 25 through 33 (pilot test set), as applicable.

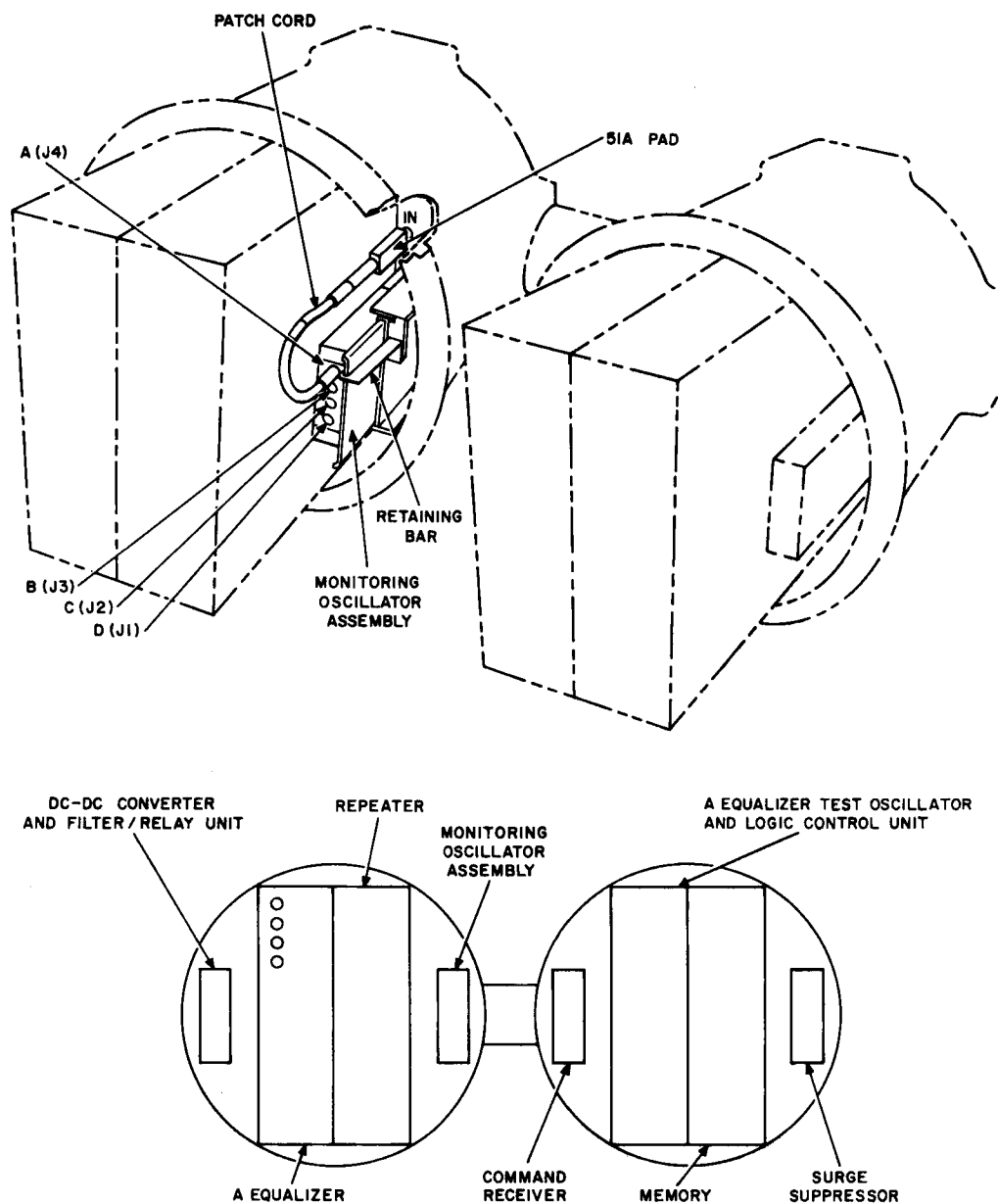


Fig. 1—Equalizing Repeater Equipment Arrangement

CHART 2 (Contd)

STEP**PROCEDURE***Using the TMS*

Warning: Connect the test probe first to the IN jack and then to the TMS. This sequence prevents a voltage surge from damaging the TMS.

- 8 Connect the L4 high-voltage isolation test probe to the repeater IN jack.
- 9 Connect the test probe to the TMS.
- 10 Measure and record the 11.648-MHz pilot power at the repeater IN jack (nominal = -55 dBm).

Note: The actual pilot power at the repeater input is approximately 30 dB greater than the indicated value, due to loss in the test probe.
- 11 Disconnect the test probe from the TMS.
- 12 Disconnect the test probe from the repeater IN jack.
- 13 Connect the test probe to the repeater OUT jack.
- 14 Connect the test probe to the TMS.
- 15 Measure and record the 11.648-MHz pilot power at the repeater OUT jack (nominal = -28 dBm).
- 16 Compute the repeater gain at 11.648 MHz by subtracting the value recorded in Step 10 from that recorded in Step 15.

Requirement: Refer to office records.

- 17 Disconnect the test probe from the TMS.
- 18 Disconnect the test probe from the repeater OUT jack.
- 19 Proceed to Step 20 if the requirement of Step 16 is met. Otherwise, proceed to Step 36.

Warning: Connect patch cord to the 51A pad last.

- 20 Insert the 51A pad into the repeater IN jack using extractor KS-20141, L1.
- 21 Connect the patch cord from jack J4 on the monitoring oscillator assembly to the 51A pad.
- 22 Ask the attendant at the downstream main station to turn on the group of monitoring oscillators (group 3 or group 5) that includes the one at this equalizing repeater.

CHART 2 (Contd)

STEP	PROCEDURE
23	Adjust the monitoring oscillator signal power, applied at the input of the equalizing repeater, to obtain the required indication at the main station. Note: This adjustment is made under direction of the main station attendant. The control is designated ADJ A and is associated with jack J4 on the monitoring oscillator assembly.
24	Proceed to Part D. Using the Pilot Test Set
	Note: Pilot test set J68898A, L1 cannot be used for testing the equalizing repeater.
25	Connect the pilot test set probes to the repeater IN and OUT jacks. Note: The test set bypasses the L4 signal and dc supply current around the repeater so that line continuity will not be interrupted if the repeater is removed in Step 38 (Part C).
26	Perform the repeater gain test as explained in Section 103-456-000. Note: Pilot test set J68898A, L2 can be used also to test for dc voltage on the coaxial line, and pilot test set J68898B can be used to indicate hits at the 11.648-MHz pilot frequency. Requirement: Refer to office records.
27	Proceed to Step 28 if the requirement is met. Otherwise, proceed to Step 37.
28	Remove the pilot test set probes from the repeater IN and OUT jacks. Warning: <i>Connect patch cord to the 51A pad last.</i>
29	Insert the 51A pad into the repeater IN jack using extractor KS-20141, L1.
30	Connect the patch cord from jack J4 on the monitoring oscillator assembly to the 51A pad.
31	Ask the attendant at the downstream main station to turn on the group of monitoring oscillators (group 3 or group 5) that includes the one at this equalizing repeater.
32	Adjust the monitoring oscillator signal power, applied at the input of the equalizing repeater, to obtain the required indication at the main station. Note: This adjustment is made under direction of the main station attendant. The control is designated ADJ A and is associated with jack J4 on the monitoring oscillator assembly.
33	Proceed to Part D.

 CHART 2 (Contd)

STEP

PROCEDURE

C. Replacing Equipment Units

Note: Only the repeater and the A equalizer are in the transmission path of an equalizing repeater. However, due to the power interconnections between equalizing repeater equipment units, the line must be taken out of service and power turned down or the equalizing repeater must be bypassed before certain equipment units can be replaced.

Repeater J68877AC and A Equalizer J68877AD or J68877EJ (Fig. 1)

Note: ♦During this procedure, dc line power will be removed from the A equalizer. Stepped A equalizer J68877AD will **reset** when dc line power is restored.♦ The downstream main station attendant should determine the gain in the A equalizer networks **before** line power is removed. When dc line power is restored, the main station attendant can easily return the A equalizer networks to original gains. This procedure is explained in Section 359-200-505. ♦The dc line power does **not** affect manual A equalizer J68877EJ.♦

♦DANGER: ♦ Line build-out (LBO) networks must not be removed from a repeater while in the repeater location. Removing LBO networks exposes parts of the repeater and LBO networks which may be charged to a high voltage. Replacement repeaters must be carried into the repeater location fully assembled with the LBO networks secured to the repeater chassis. Removed repeaters must be discharged and carried from the repeater location before any attempt is made to remove an LBO network.

Warning: Remove patch cord from the 51A pad first.

- 34 Remove the patch cord that connects the monitoring oscillator assembly to the 51A pad (Fig. 1).
- 35 Remove the 51A pad from the IN jack using extractor KS-20141, L1.
- 36 Insert the 452A plug into the repeater IN and OUT jacks.

Note: The 452A plug bypasses the L4 signal and dc supply current around the repeater so that line continuity will not be interrupted when the repeater is removed in Step 38.

- 37 Unfasten the repeater retaining latches.
- 38 Remove the repeater by means of the handles on the two line build-out networks or remove the A equalizer, as required.

♦DANGER: ♦ Observe the following precautions to avoid electrical shock. Discharge the repeater immediately upon removal by connecting the 566A discharging jack to repeater plugs P1 and P2, in turn. Do not remove the LBO networks from the repeater while in the manhole.

CHART 2 (Contd)

STEP	PROCEDURE
39	Insert the replacement repeater or A equalizer into the apparatus case.
	Warning: ♦ <i>Use a gentle oscillatory motion to achieve correct alignment of the plugs on the unit with the connectors in the case. Make sure the connectors are fully mated.</i>
40	Fasten the repeater retaining latches.
41	Remove the 452A plug, if applicable.
42	Perform Steps 7 through 32, as applicable.
43	Notify the main station attendant that the ♦stepped A equalizer, if provided,♦ now can be adjusted to the required gain.
44	Proceed to Part D.
	Monitoring Oscillator Assembly (Fig. 2)
	Warning: <i>Remove patch cord from the 51A pad first.</i>
45	Remove the patch cord that connects the monitoring oscillator assembly to the 51A pad.
46	Loosen the fastener on the monitoring oscillator assembly retaining bar.
47	Remove the monitoring oscillator assembly from the apparatus case.
48	Insert a 185A adapter in place of the monitoring oscillator assembly (Fig. 2).
	Note: Make sure the connectors are fully mated.
49	Connect a replacement monitoring oscillator assembly to the 185A adapter.
	Note: The replacement must be the same code as the one removed in order to produce the correct frequency.
50	Connect the patch cord from jack J4 on the monitoring oscillator assembly to the 51A pad (Fig. 2).
	Warning: <i>Connect patch cord to the 51A pad last.</i>
51	Ask the attendant at the downstream main station to turn on the group of monitoring oscillators (group 3 or group 5) that includes the one at this equalizing repeater.
52	Adjust the monitoring oscillator signal power to obtain the required indication at the main station.

CHART 2 (Contd)

STEP

PROCEDURE

Note: This adjustment is made under direction of the main station attendant.

Warning: Remove patch cord from the 51A pad first.

- 53 Remove the patch cord that connects the replacement monitoring oscillator to the 51A pad.
- 54 Disconnect the replacement monitoring oscillator assembly from the 185A adapter.
- 55 Remove the 185A adapter from the apparatus case.
- 56 Insert the replacement monitoring oscillator assembly into the apparatus case.

Note: Make sure the connectors are fully mated.

Warning: Connect patch cord to the 51A pad last.

- 57 Connect the patch cord between the replacement monitoring oscillator and the 51A pad.
- 58 Tighten the fastener on the monitoring oscillator assembly retaining bar.

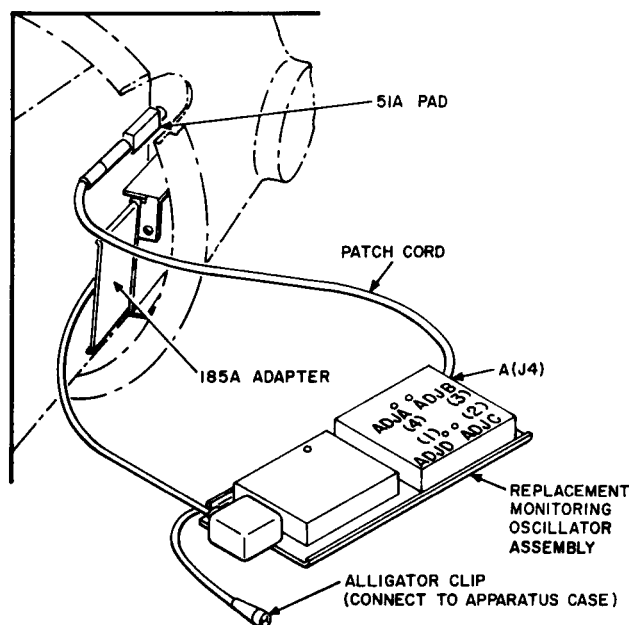


Fig. 2—Monitoring Oscillator Adjustment Arrangement at Equalizing Repeater Location

CHART 2 (Contd)

STEP	PROCEDURE
59	Ask the main station attendant to check for proper operation of the monitoring oscillator.
60	Proceed to the appropriate part of this chart to remove and replace another equipment unit, or proceed to Part D of this chart. A Equalizer Memory J68877AE, A Equalizer Test Oscillator and Logic Control Unit J68877AF, Command Receiver J68877AG, and Surge Suppressor J68877AH (Fig. 1)
61	Remove the patch cord that connects the monitoring oscillator assembly to the 51A pad (Fig. 1). ⚠Warning: Choose the proper surge suppressor, as explained in the following note, to prevent serious damage to the logic control unit. Note: A List 1 surge suppressor J68877AH must be used with the List 1 through List 4 J68877AF units; a List 2 surge suppressor must be used with the List 5 and List 6 J68877AF units.⚡ Warning: Remove patch cord from the 51A pad first.
62	Remove the 51A pad from the repeater IN jack using extractor KS-20141, L1.
63	Insert the 452A plug into the repeater IN and OUT jacks. Note: This plug bypasses the L4 signal and dc supply current around the repeater. Power is removed from the repeater as a safety precaution.
64	Release the fasteners holding the unit to be replaced in the right-hand apparatus case.
65	Remove the unit from the apparatus case. ⚠Warning: Observe the Warning and Note following Step 61 if a logic control J68877AF and/or a surge suppressor J68877AH are to be replaced.⚡
66	Insert the replacement unit into the apparatus case.
67	Secure the fasteners holding the replacement unit.
68	Remove the 452A plug from the repeater IN and OUT jacks.
69	Insert the 51A pad into the repeater IN jack using extractor KS-20141, L1. Warning: Connect patch cord to the 51A pad last.
70	Connect the patch cord from jack J4 on the monitoring oscillator assembly to the 51A pad.

 CHART 2 (Contd)

STEP	PROCEDURE
71	Ask the main station attendant to check that the replacement unit is operating properly.
72	Notify the main station attendant that the A equalizer now can be adjusted to the required gain.
73	Proceed to Part D.
	Dc-Dc Converter J87290 and Filter/Relay Unit J68877AJ (Fig. 1)
	Note: In later equipment, these two units are combined in a filter/relay and dc-dc converter assembly J68877BU. The dc-dc converter is turned on by command from the main station. The converter output is 15 mA dc for powering a group of monitoring oscillators which are connected in series. The dc-dc converter and associated filter/relay unit are mounted on a shelf which must be removed in order to replace either or both of these units.
	Warning: Remove patch cord from the 51A pad first.
74	Remove the patch cord that connects the monitoring oscillator assembly to the 51A pad (Fig. 1).
75	Remove the 51A pad from the repeater IN jack using extractor KS-20141, L1.
76	Insert the 452A plug into the repeater IN and OUT jacks.
	Note: This plug bypasses the L4 signal and dc supply current around the repeater. Power is removed from the repeater as a safety precaution.
77	Release the fasteners holding the dc-dc converter to be replaced in the left-hand apparatus case.
78	Remove the converter from the apparatus case.
79	Insert the replacement dc-dc converter into the apparatus case.
80	Secure the fasteners holding the replacement converter.
81	Remove the 452A plug from the repeater IN and OUT jacks.
82	Insert the 51A pad into the repeater IN jack using extractor KS-20141, L1.
83	Connect the patch cord from jack J4 on the monitoring oscillator assembly to the 51A pad.
	Warning: Connect patch cord to the 51A pad last.
84	Notify the main station attendant that the stepped A equalizer, if provided, now can be adjusted to the required gain.
85	Ask the main station attendant to turn on a group of monitoring oscillators powered by the dc-dc converter to check for correct operation of the converter.

CHART 2 (Contd)

STEP	PROCEDURE
86	Proceed to Part D.
	D. Final Steps
87	Close the apparatus case in accordance with the procedure in Section 640-440-205. Note: Take care to avoid introducing any moisture or dirt into the apparatus case. Bleed all moisture from the hose from the nitrogen cylinder before recharging the repeater apparatus case.
88	Remove all test equipment, tools, replaced equipment units, and other items from the underground room.
89	Check that all items in the above-ground room are properly stored.
90	Take all equipment units removed from the underground room to the main station. Note: These equipment units should be tested and tagged at the main station. Send all defective units to a maintenance center for repair.