VOICEBAND MULTIPORT SPLIT BRIDGE WITH GAIN, EQUALIZATION, AND TEST ACCESS— DESCRIPTION

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1. GENERAL

1.01 This section provides the description of the ED-2C029-30 Voiceband Multiport Split Bridge With Gain, Equalization, and Test Access. This bridge assembly provides gain, equalization, and test access for 4-wire multipoint private line (PL) data service.

1.02 This section is reissued to:

- Show where the collection and distribution bridges are located in Figure 1.
- Add Part 5 (PRECAUTIONS), which includes changes to Table A and adds Figures 8 through 12.
- Specify adjustable TLP values when cascading bridges.

1.03 Figure 1 shows a simplified functional block diagram of the split data bridge assembly used in multipoint data service. The bridge assembly consists of separate distribution and collection bridges (that is, a split bridge). The primary purpose of the bridge assembly is for polling applications for 4-wire data services that require electrical independence between the distribution and collection functions. The loss of the resistive networks used for each bridge is 23 dB. The impedance looking into each port of a properly terminated bridge is 600 ohms.

1.04 The bridge assembly is a single self-contained unit that is intended to be located in a central office (CO) or in special service areas designated for multipoint service. The bridge assembly will minimize the number of cross connections required, and will reduce the effort required to maintain multipoint PL data services.

1.05 The bridge is normally supplied as a dual 6-port bridge by the factory. It may be easily converted to a single 12-port bridge in the field.

1.06 The bridge assembly provides the following functions:

(a) Test access to each 2-wire line, amplifier, and resistive bridge.

(b) A balanced in-service monitor test point for each leg.

(c) Aid in locating a faulty circuit leg.

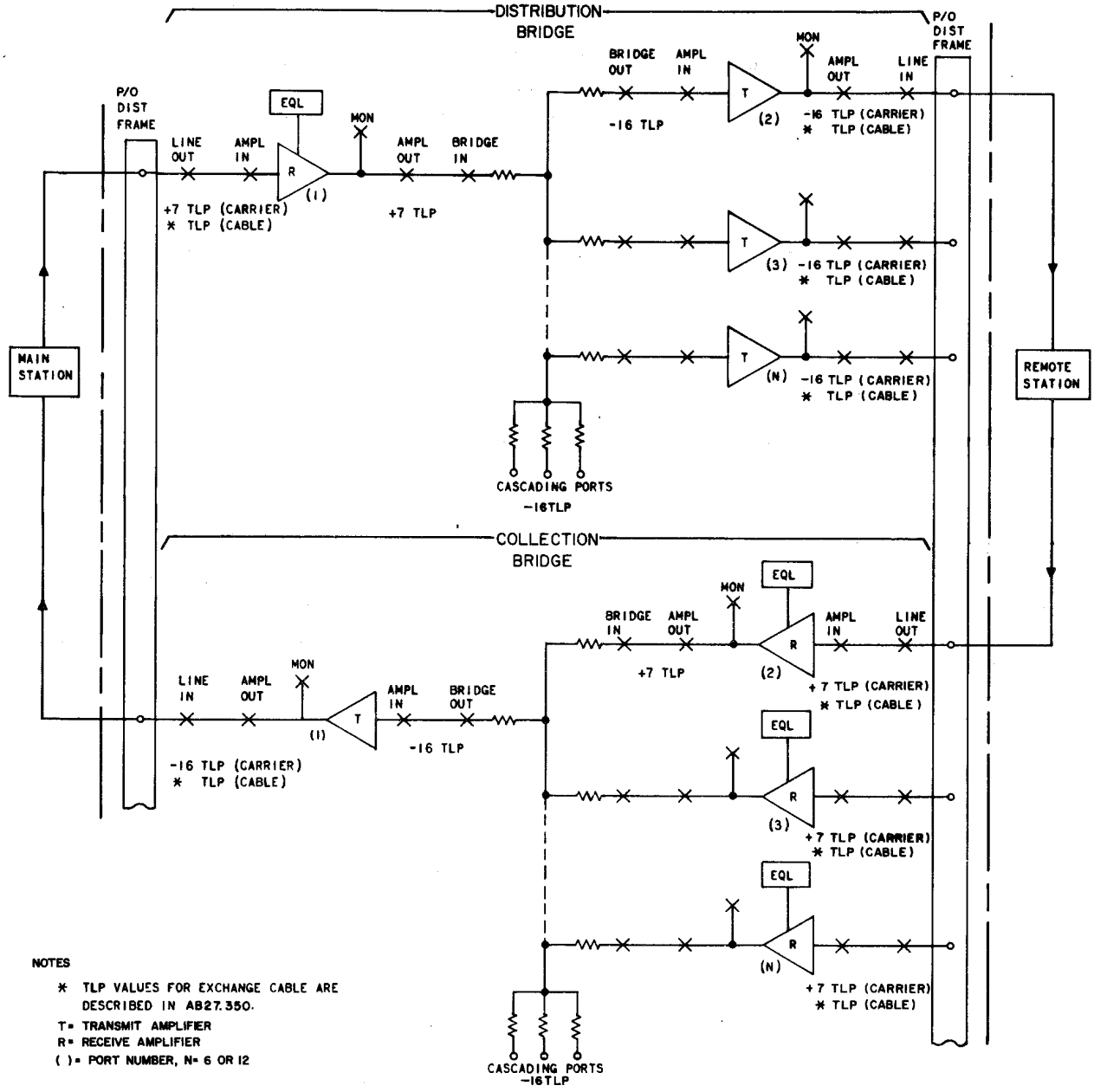


Fig. 1—Functional Diagram of Split Data Bridge Assembly Used in Multipoint Data Service

(d) Ability to remove and access a circuit leg, and properly terminate the bridge.

(e) Means for operating dc-controlled loop-back at the customer stations having DAS 828A or similar station arrangement.

(f) Means of accomplishing equal level loop-back at the bridge assembly without requiring circuit rearrangement.

(g) Means to convert the bridge assembly from a dual 6-port arrangement into a single 12-port arrangement before or after installation.

(h) Capability for circuit growth by cascading to other bridge assemblies.

(i) Capability for proper operation of the bridge assembly without a full complement of plug-ins.

1.07 The bridge assembly is comprised of standard components arranged in an integrated configuration. These include standard V4 repeater plug-in shelves and a jack panel assembly designed for ease of craft usage.

1.08 The data bridge is furnished without plug-ins such as 227-type amplifiers, 849-type networks, or 359-type equalizers. The proper plug-ins for a specific application are given on the circuit layout record (CLR). Requirements for the various PL circuit parameters are given in Section 314-410-500.

2. PHYSICAL DESCRIPTION

2.01 Front views of the bridge assembly arranged for a dual 6-port configuration and a single 12-port configuration are shown in Fig. 2 and 3, respectively. As shown, the bridge assembly consists of three standard V4 repeater plug-in component shelves and a test access panel with circuit graphics. The upper two plug-in component shelves are 227-type amplifier shelves each housing 12 amplifiers or 849-type networks. The lower plug-in component shelf is a 359-type equalizer shelf for housing 12 equalizers. The plug-in components will be specified on the CLR and provided after the bridge assembly has been assigned to a specific circuit.

2.02 The test access panel (ED-2C108-30 G1) consists of an upper and lower section. The upper section contains the distribution and collection bridge circuit graphics that are printed on a reversible faceplate. The faceplate is a 1/16-inch anodized aluminum panel containing the circuit graphics for the two configurations on opposite sides of the panel. The faceplate also has holes to accommodate the access jacks and slots for three key switches.

2.03 Space for bridge and circuit identification is provided on each side of the test access panel and for leg identification between the distribution and collection bridge graphics. Blank labels with adhesive backing are provided to facilitate circuit and leg identification. Telephone company personnel should apply the labels after typing or writing the subscriber identification on them when the bridge circuits are placed in service. The extra labels supplied should be stored in a safe place for future use. The labels are designated 840875769 (1.2 inches by 0.5 inch) and 840875777 (0.8 inch by 0.5 inch).

2.04 The lower portion of the test access panel contains 12 lighted pushbutton switches for remote loop-back control for each of the 12 ports. Four 23-dB pads are also provided in this panel and are accessible via the 23-dB jacks for out-of-service testing.

2.05 A rear view of the data bridge showing the printed wiring boards, terminal blocks, and fanning strips is shown in Fig. 4. The complete assembly consists of four separate units that are assembled on a mounting bar. The bridge assembly can be mounted in 23-inch bulb angle or unequal flange duct-type bays on 1-3/4 inch or 2-inch mounting centers.

2.06 The dimensions of the bridge assembly are 12-1/4 inches high, 23 inches wide, and 10 inches deep. The unit weighs approximately 35 pounds without the plug-in assemblies installed. With all plug-ins installed, the unit weighs approximately 58 pounds.

3. FUNCTIONAL DESCRIPTION

3.01 This part describes the conversion and cascading functions of the data bridge assembly.

3.02 The circuit of the bridge assembly is shown functionally in Fig. 5. The circuit, as shown, is arranged for 12-port operation and also includes 3 cascade leg circuits. This is equivalent to fifteen 600-ohm ports. The loss on a circuit from the input of the resistive bridge to the output of the resistive bridge is 23 dB. In the dual 6-port configuration, a second set of 3 cascade legs must be provided for the second 6-port bridge. This is shown in Fig. 6. In addition, a second 6-port bridge balance load is provided for each 6-port bridge to make it electrically equivalent to 15 ports. This is accomplished automatically by the rotation of the bridge key switches at the time of conversion.

A. Conversion

3.03 The conversion features of the bridge assembly are used to accommodate subscriber circuit growth or changes in customer service needs. For example, the PL customer may require additional bridge capacity because of an increase in the number of stations on the network. This can be

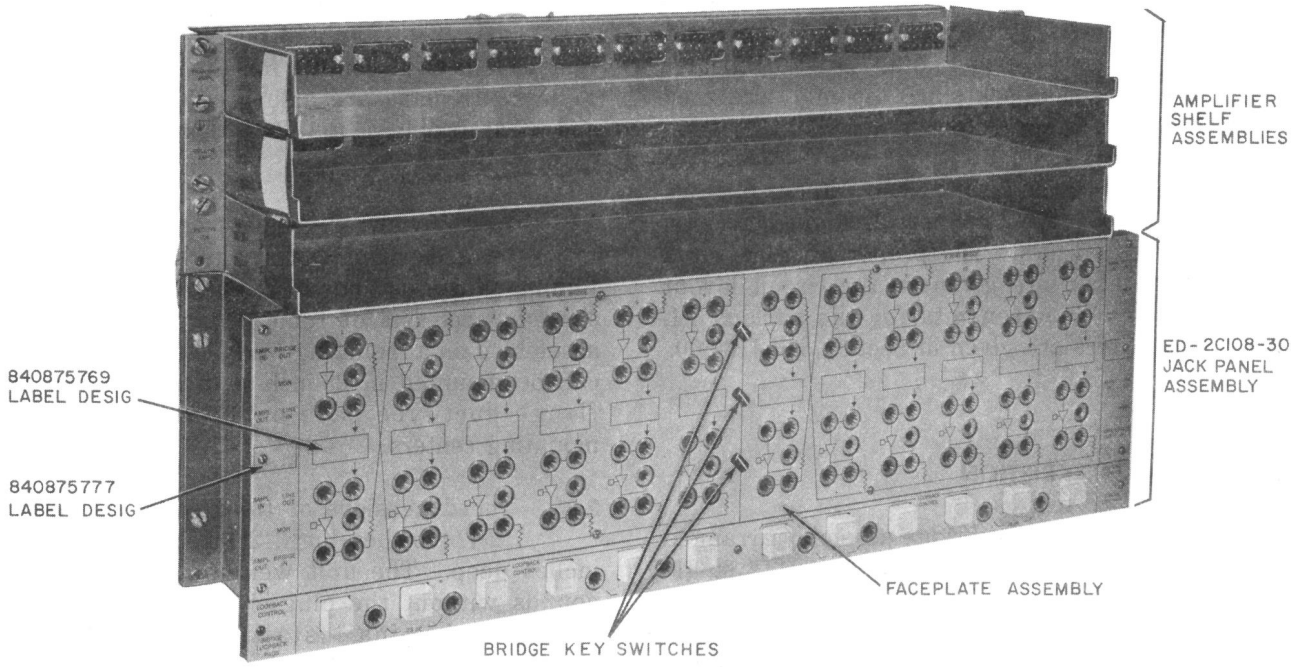


Fig. 2—Front View of Dual 6-Port Arrangement of Bridge Assembly

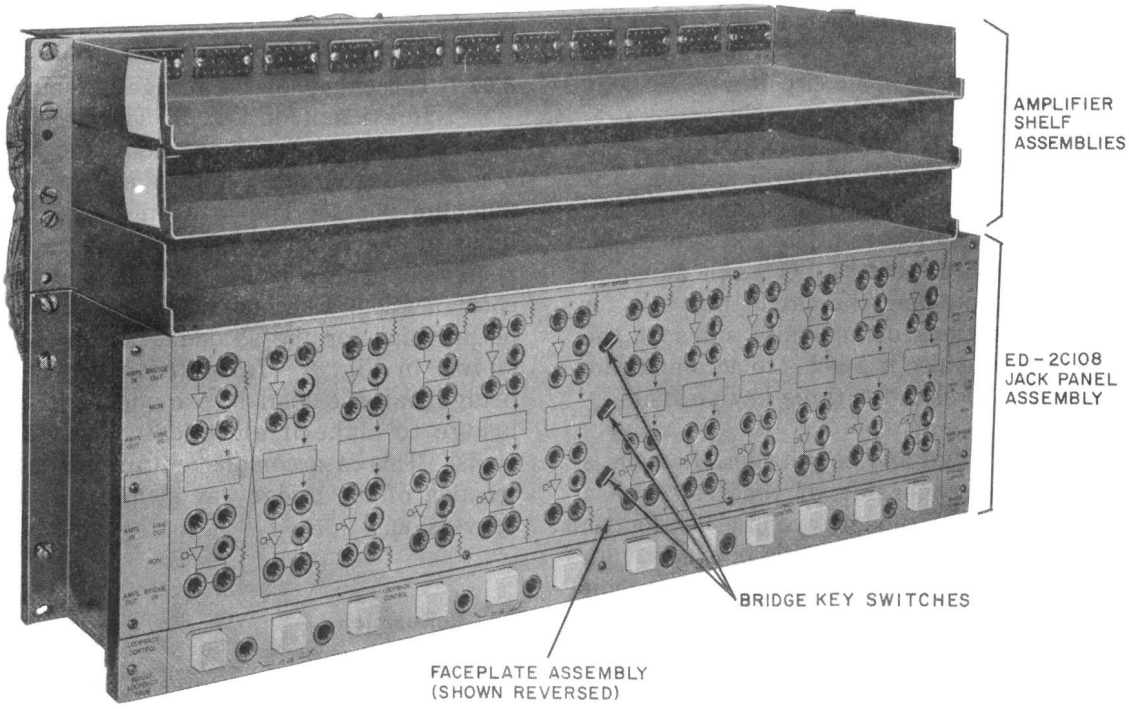


Fig. 3—Front View of Single 12-Port Arrangement of Bridge Assembly

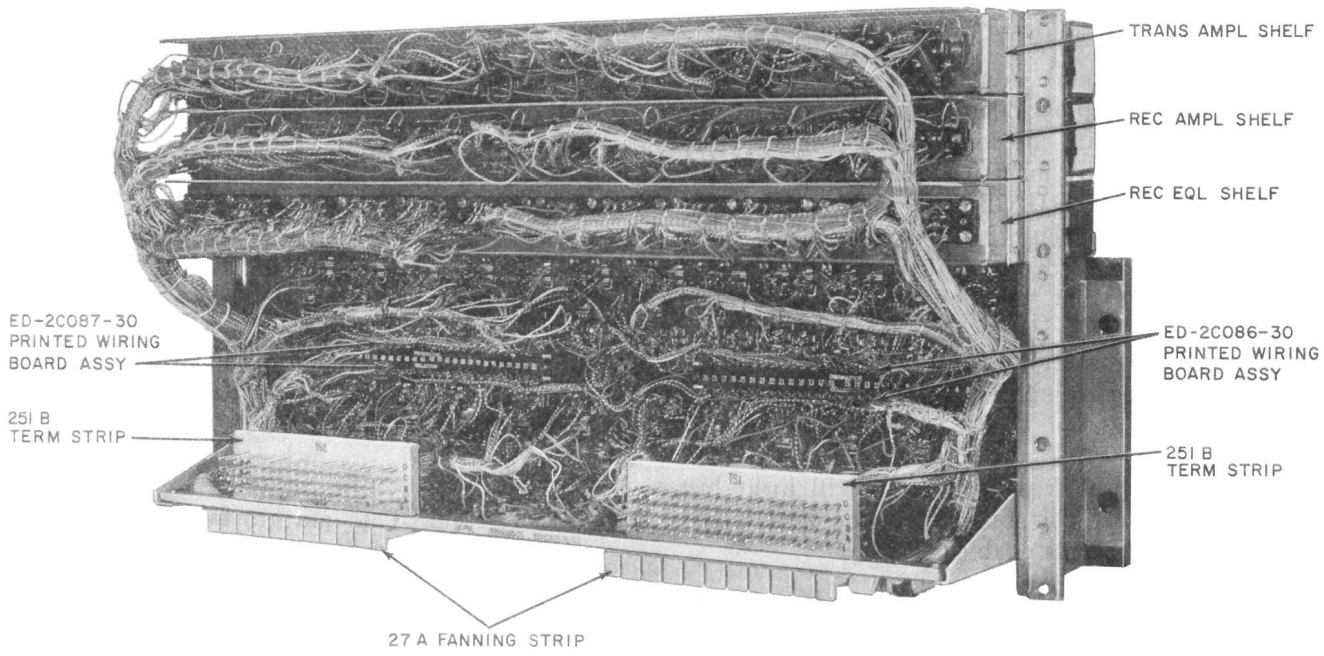


Fig. 4—Rear View of Bridge Assembly

accomplished in some cases by simply converting a dual 6-port bridge into a single 12-port bridge.

3.04 To convert the bridge assembly to the 12-port configuration, the three key switches shown in Fig. 2 and 3 are operated.

> ***Note:*** The faceplate assembly of the test access panel ***must*** be removed before the conversion switches can be rotated.

This converts the bridge assembly into a single, functional 12-port 4-wire bridge as shown in Fig. 5.

B. Cascading

3.05 Subscriber circuit growth beyond the capacity of a single bridge can be accommodated by cascading between data bridge assemblies located in the same CO. This is accomplished by connecting a second data bridge, arranged for either 12-port or 6-port operation, to a cascade leg of the first bridge circuit at the distribution frame. (Cascading can also be done in different COs as discussed in 3.07.) An example of cascading the bridge assembly in the same office is shown in Fig. 7.

3.06 The cascade process can be repeated for each of the remaining cascade legs on the bridge. For example, by using four 12-port bridge assemblies, 44 legs can be provided from a single backbone circuit with no more than three amplifiers in series at the data bridge location.

3.07 In order to cascade between data bridges located in different CO buildings, a working leg, instead of a cascade leg, of the first bridge circuit must be used to feed the backbone leg of the second bridge circuit. This arrangement is required because of loss encountered between bridges. Also, it permits the second bridge and the associated trunk to be isolated at the first bridge during maintenance and trouble periods.

C. Power Requirements

3.08 This part provides information on current drain and size of fuses required for each data bridge.

3.09 The −48 volt power is supplied to the bridge assembly from a separate fuse and alarm panel in the CO. Three separately fused voltages are required for each bridge assembly as shown in Table A.

D. Remote DC Loop-Back Control

3.10 The loop-back control keys are used to operate loop-back located at a station. For loop-back to occur, the loop-back control switch must be enabled by inserting 262B plugs into the BRIDGE IN and BRIDGE OUT jacks, completing the dc interlock circuit for that respective port. The keys are located on the lower section of the test access panel and, when operated in conjunction with the BRIDGE IN and BRIDGE OUT jack contacts, apply battery voltage and ground to the transmit and receive simplex leads.

3.11 The loop-back switch lamp will light but the switch will not initiate loop-back unless the interlock circuit is enabled.

4. TRANSMISSION LEVELS

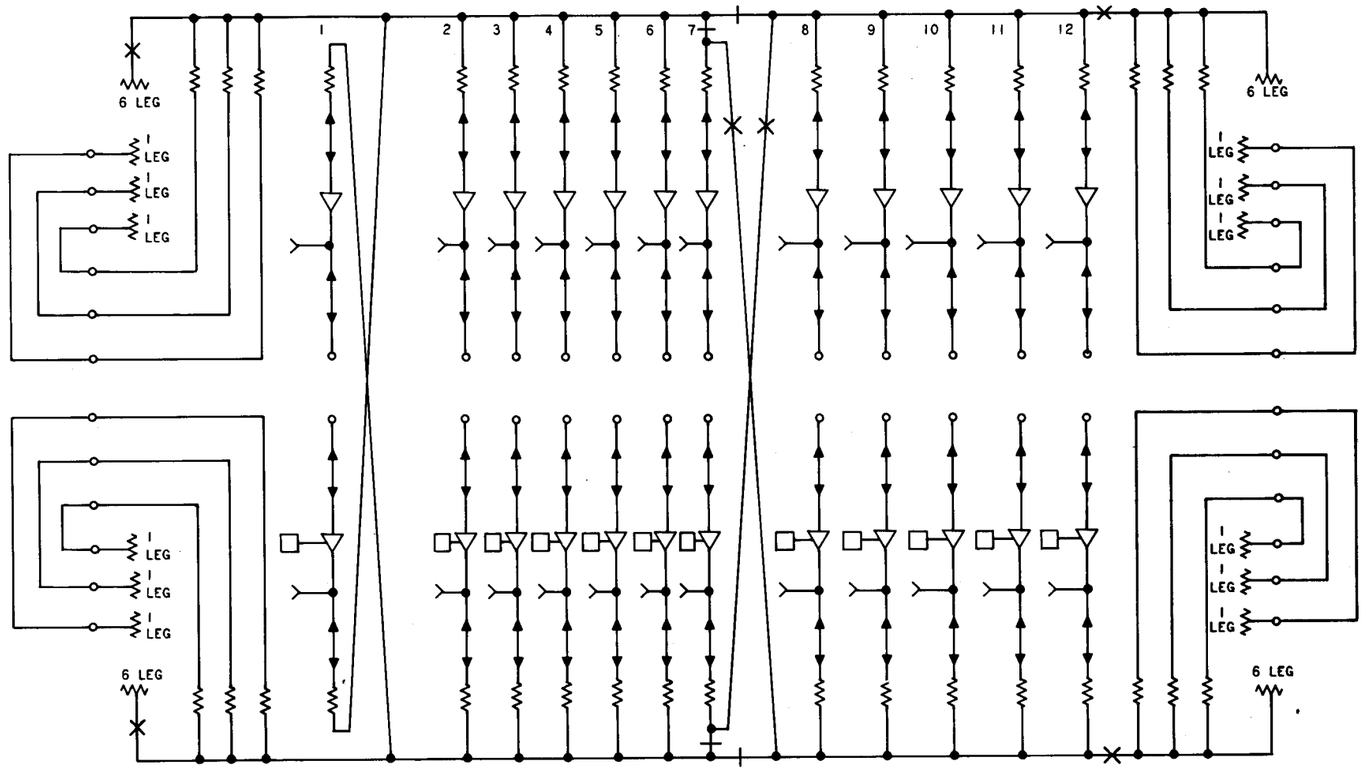
4.01 This part gives the transmission level points (TLPs) used in this bridge assembly and other circuit considerations.

A. Transmission Level Points (TLPs)

4.02 Transmission levels of the bridge assembly are as follows:

(a) The signal level into the bridge assembly should be +7 TLP for carrier circuits. For cable circuits, input TLPs are described in AB27.350.

(b) A +7 TLP is maintained at all receive amplifier outputs.



♦ Fig. 5—Simplified Schematic of Single 12-Port Bridge With Balance Loads ♦

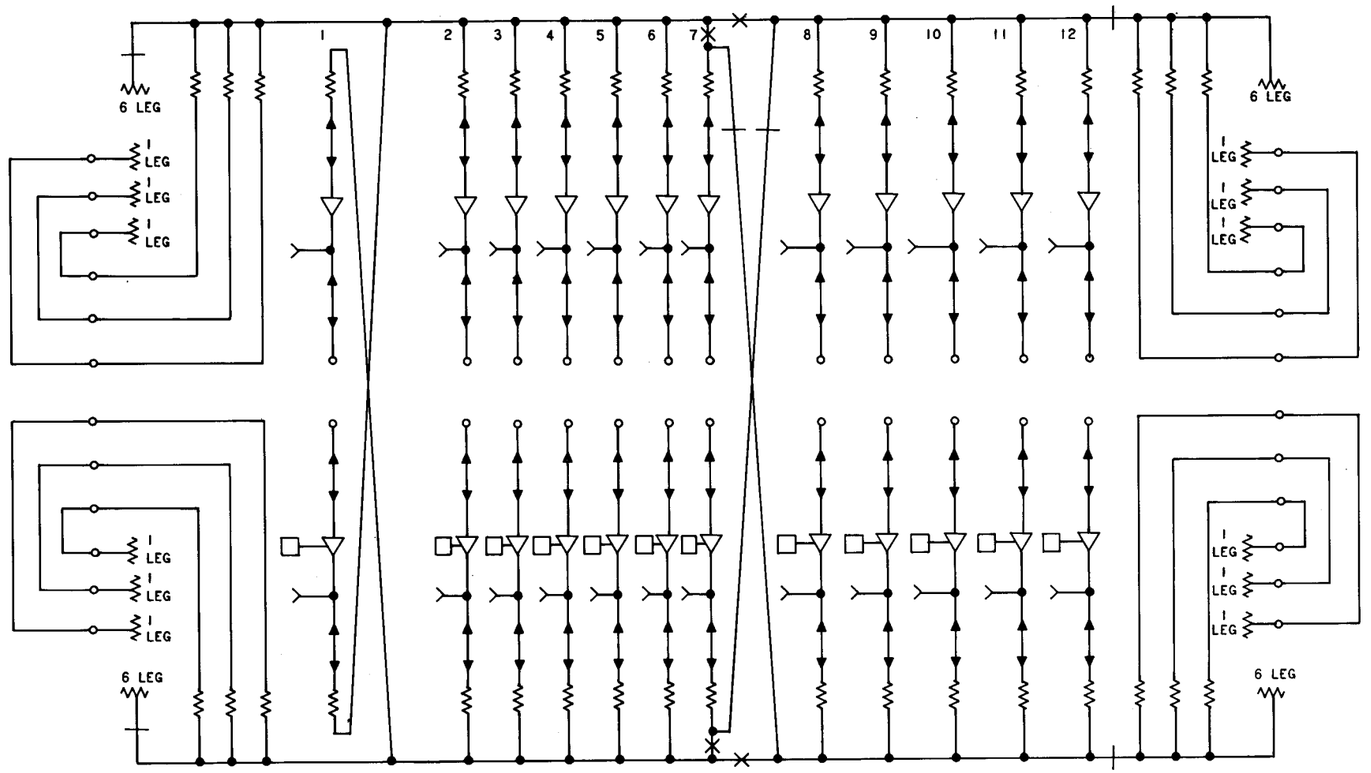


Fig. 6—Simplified Schematic of Dual 6-Port Bridge With Balance Loads

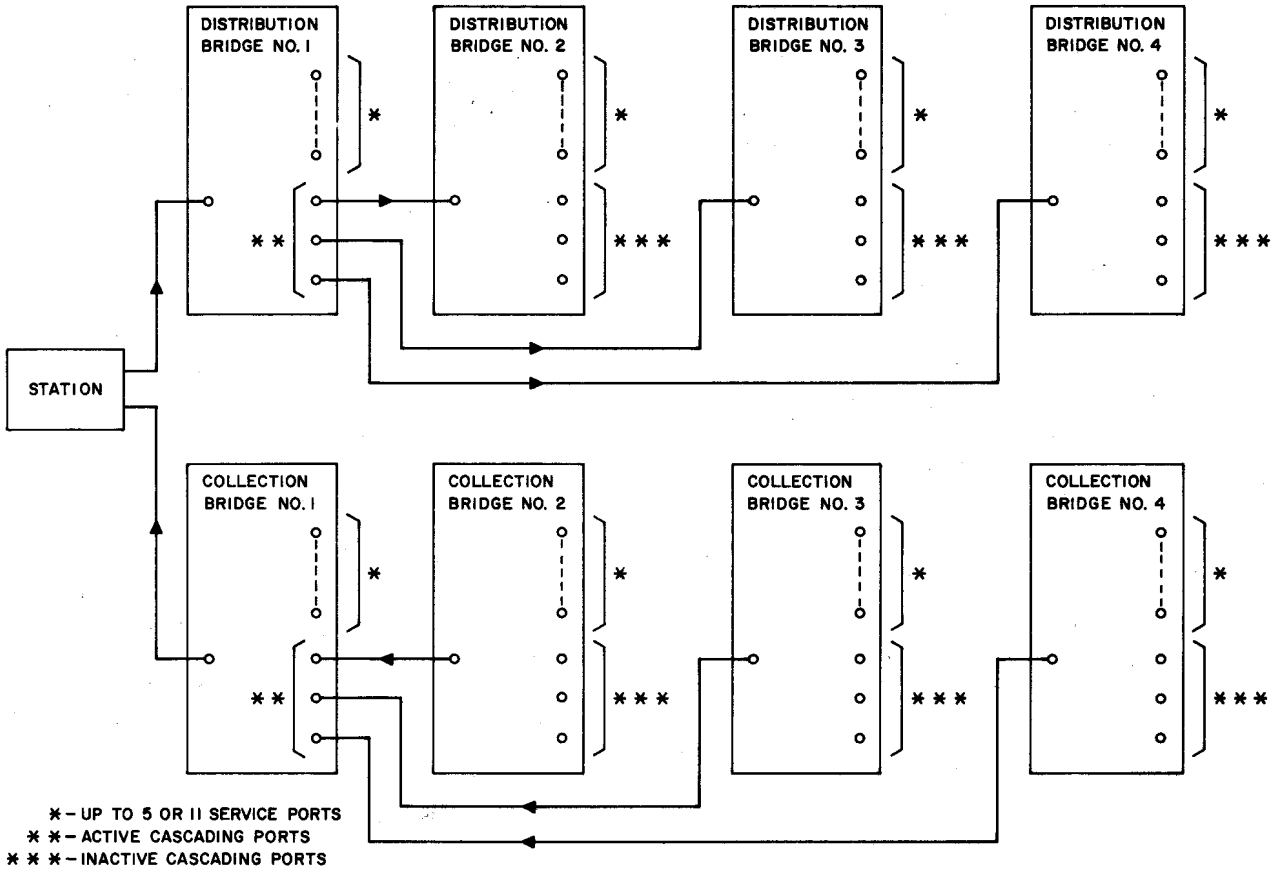


Fig. 7—Example Showing Cascading of Bridge Assemblies

TABLE A
BRIDGE ASSEMBLY FUSE REQUIREMENTS

FUSE DESIG	FUSE AMP	MAXIMUM EXPECTED DRAIN	USE
A	1.33	240 mA	1st 6-Port Bridge or 1/2 of 12-Port Bridge
B	1.33	240 mA	2nd 6-Port Bridge or 1/2 of 12-Port Bridge
C	1.33	1.3 amp	Loop-Back Control

(c) A −16 TLP is maintained at all transmit amplifier inputs.

(d) The signal level out of the bridge assembly should be −16 TLP for carrier circuits. For cable circuits, output TLPs are described in AB27.350.

4.03 The bridge assembly allows use of standard 227-type amplifiers, or 849-type networks if loss or zero gain is required. Impedance matching is accomplished by using 359-type equalizers that select either the 600-ohm or 1200-ohm windings of the amplifier or loss network.

4.04 In the case where carrier is used, involving +7 TLP output from the carrier and −16 TLP input to the carrier, the 849-type networks could be used for both receive and transmit amplifier positions since zero gain would be required in both. In the case where an exchange cable is used at the interface, a 227-type amplifier will be required in both paths.

4.05 When cascading the bridge assembly using the cascade legs per 3.05, the standard levels given in 4.02 will still be met except for the cascaded legs. In this case, as shown in Fig. 8,

the input to the second distribution bridge-receive amplifier will be at −16 TLP, and the amplifier must be adjusted to provide an output of +7 TLP. Similarly, the input to the second collection bridge transmit amplifier will also be at −16 TLP, and the amplifier must be adjusted to provide an output of +7 TLP.◀

B. Limiter (F-58122 Amplifier)

4.06 An F-58122 amplifier may be required in the collection bridge transmit amplifier position for some circuit applications. The F-58122 amplifier has signal limiting capability and may be required for level limiting in multipoint data service where customer-owned modems are involved and the collection backbone circuit interfaces with carrier facilities.

4.07 Optional pads (option Y) are provided in the transmit amplifier of ports 1 and 7 of the collection bridge for use with the F-58122 AGC amplifier. A pad is necessary to reduce the output power from −20 dBm, which is the lowest adjustable clamped output of the F-58122 amplifier, to the −29 dBm (−16 TLP) signal power required at the carrier input. To accomplish this function, a selectable pad is furnished with the data bridge and is located in both the left- and right-hand 6-port bridge collection circuits. These pads will furnish 10 dB of loss and are selected at the rear of the data bridge assembly by removing two straps and installing four straps. The bridge assembly is supplied with option X wired in (option Y out).

C. Bridge Loading

4.08 Circuit termination of each bridge leg is provided through auxiliary contacts of each access jack associated with the receive AMPL OUT and transmit AMPL IN jacks. These terminations maintain bridge loss when a plug is inserted into the jack.

4.09 The automatic bridge termination provides the choice of inserting a dummy plug into the transmit AMPL IN or receive AMPL OUT jack or a 600-ohm plug into the BRIDGE OUT or BRIDGE IN access jack to terminate the bridge. The dummy plug could be used to terminate and indicate an unused leg or legs in the bridge, while the 600-ohm plug could be used to indicate an out-of-service condition.

5. ▶PRECAUTIONS◀

5.01 ▶Early operating experience has revealed some precautions that should be observed

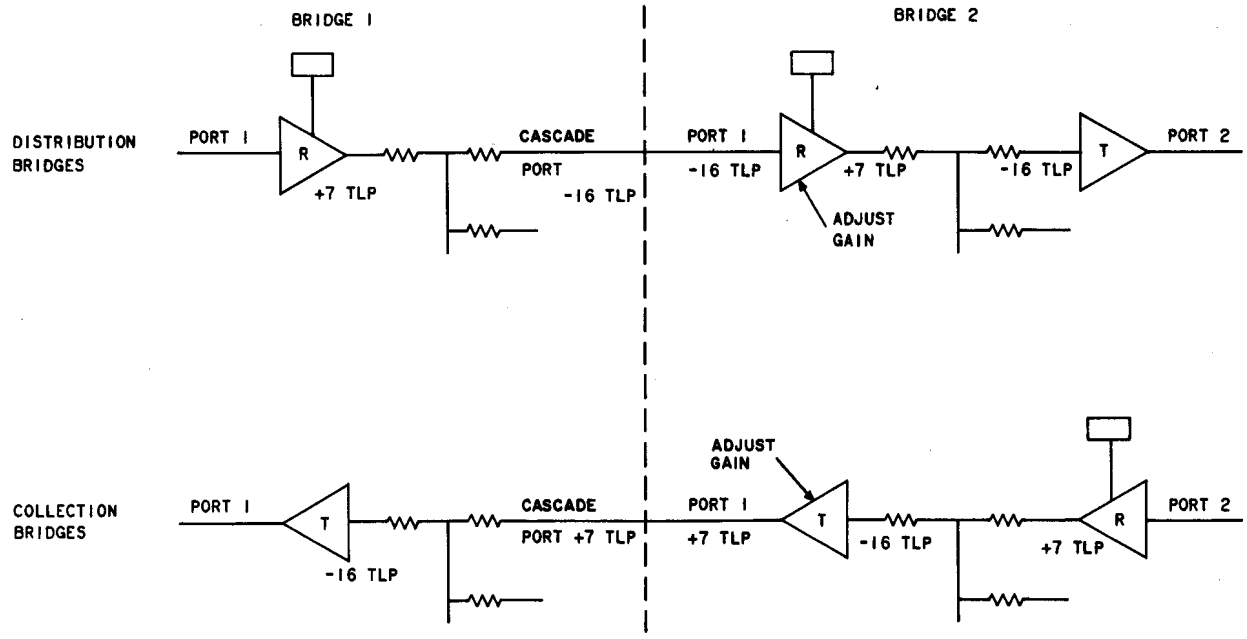


Fig. 8—▶Intra-Office Bridge Cascading◀

in the use of the bridge. These precautions will protect the plug-in 227-type amplifiers and 359-type equalizers when using dc loop-back.

(a) Replace the 5-amp loop-back supply fuse with a 1-1/3 amp fuse as shown in Table A. This will provide added protection for amplifier and equalizer transformer coils in the event of a line malfunction, such as a heat coil short to ground, without restricting the use of the loop-back feature. To ensure that the current rating of a transformer will not be exceeded, check the line to be tested for shorts to ground prior to pushing the loop-back button. Make dc resistance measurements to ground at the transmit AMPL OUT jack as shown in Fig. 9 if the line under test is equipped with an equalizer with a transformer (359B-, F-, M-, and N-types). If the line is equipped with any other type of equalizer, make dc resistance measurements to ground at the transmit LINE IN jack as shown in Fig. 10. If no short or low resistance path to ground is found, the loop-back button may then be pushed.

(b) 359B-type equalizers are not recommended for bridge use with dc loop-back. The reason is that the loop-back current could exceed the 50-mA current rating of the equalizer transformer coils even in the absence of line malfunction.

(c) When using 359M and 359N equalizers, the two screws on the faceplate must always be in the ***out*** position (fully counterclockwise). If they are turned in, an unintended path is established that can burn out amplifier and/or equalizer coils upon application of dc loop-back voltage. Use of felt washers underneath these screws is recommended. See Section 332-116-112 and 332-116-113 for more information.◀

5.02 ▶Early operating experience has also revealed two test procedures that could provide undesired results.

(a) If equalizers with transformers are in use (359B-, F-, M-, and N-types), accessing the LINE IN and LINE OUT jacks will appear to the user to be looking into the transformer primary (Fig. 11). To make dc measurements on the line, substitute a dummy equalizer (359C-, E-, or J-type) as shown in Fig. 12. Reinstall the operational equalizer upon completion of the dc tests and prior to the ac tests.

(b) If equalizers without transformers are in use (all 359-type except B, F, M, and N), do not

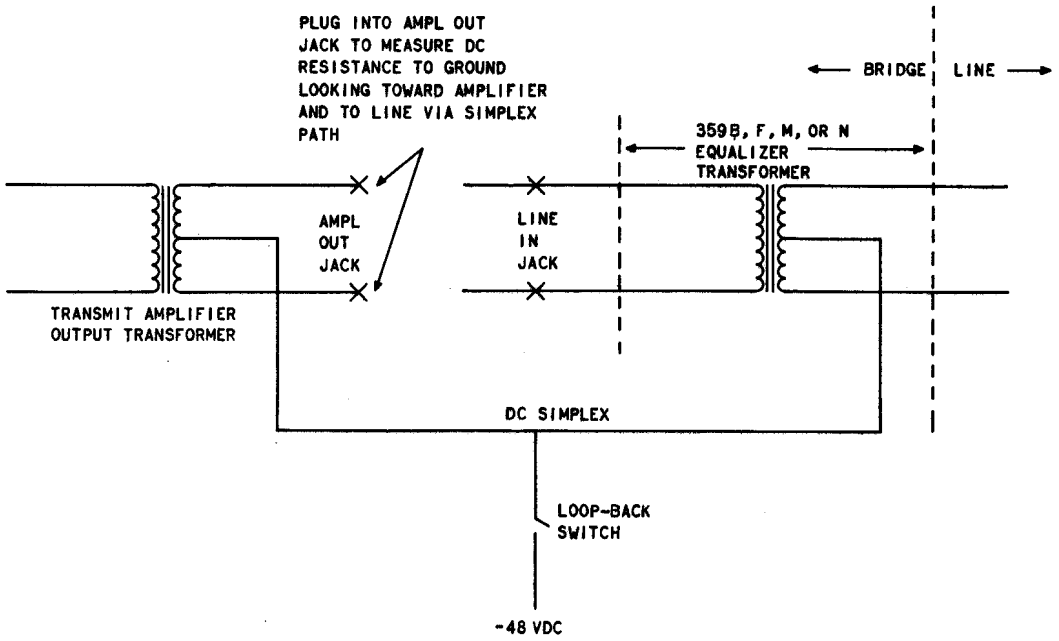


Fig. 9—▶DC Resistance to Ground Measurement From Transmit AMPL OUT Jack◀

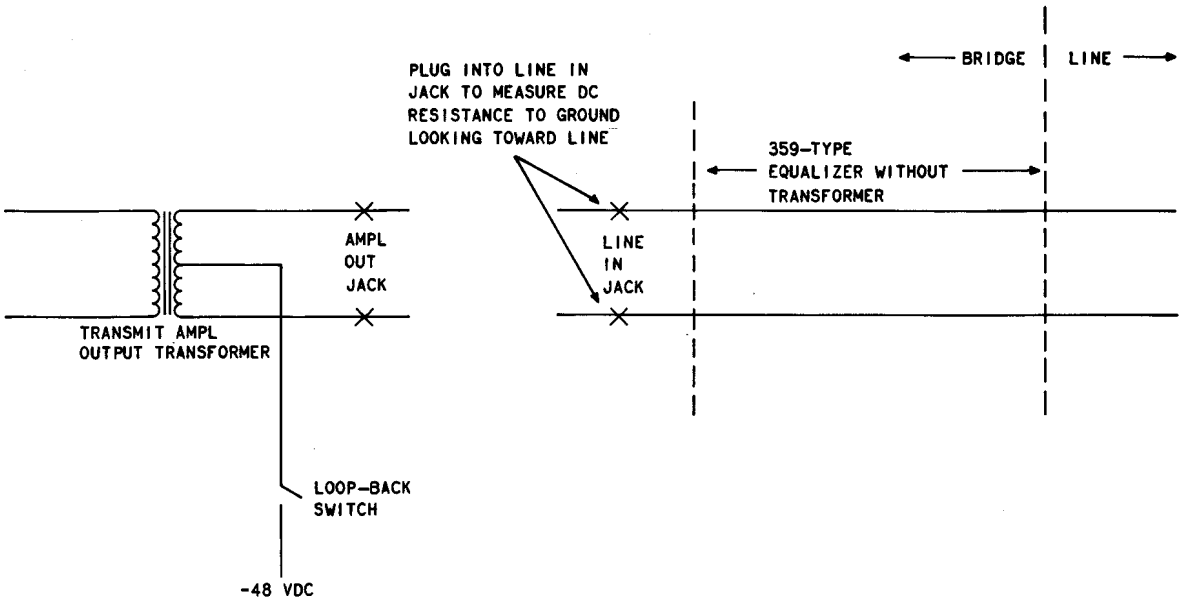


Fig. 10—DC Resistance to Ground Measurement From LINE IN Jack

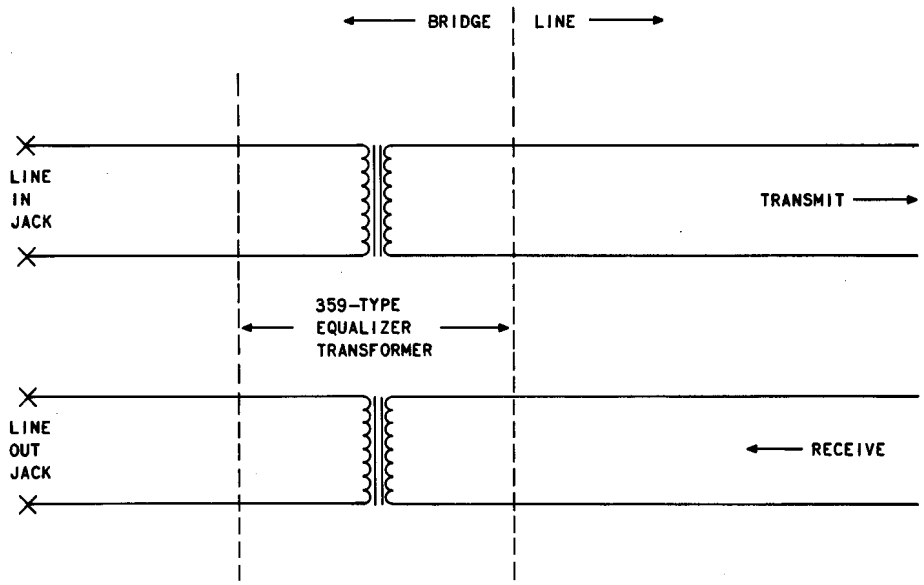


Fig. 11—AC Test Configuration With Equalizer-Containing Transformer

attempt to access the LINE IN and LINE OUT jacks while in the dc loop-back mode. This will break the loop-back circuit and cause the far-end loop-back relay to drop out (Fig. 10). To place a signal on the line, apply it through the AMPL IN jack. To measure a signal coming back from the line, measure it at the AMPL OUT jack. In both cases, the amplifier gains must be verified to determine the signal levels on the line side of the amplifiers.

6. REFERENCES

6.01 The following documents provide additional information on equipment that may be associated with the data bridge assembly.

SECTION	TITLE
314-410-500	Private Line Data Circuits—Voice Bandwidth Circuits for Data Services—Tests and Requirements
332-104-100	V4-Type Repeaters—V4 Telephone Repeater
332-115-10Z	V4-Type Repeaters—849A to G Network—Description
332-116-1ZZ	V4-Type Repeaters—359A to P Equalizer—Description
332-104-103	V4 Telephone Repeater—F-58122 AGC Amplifier—Description and Operation
852-307-100	V4 Telephone Repeaters—Engineering—General
852-307-101	V4 Telephone Repeaters—Engineering—Message Circuits
852-307-102	V4 Telephone Repeaters—Engineering—Loss and Gain Calculations

NUMBER	TITLE
AB27.350	Voice Bandwidth Circuits for Private Line Data Use—2000 Series and 3002 Channels—General Information
CD & SD-99565-01	Voiceband Multiport Split Bridge With Gain, Equalization, and Test Access

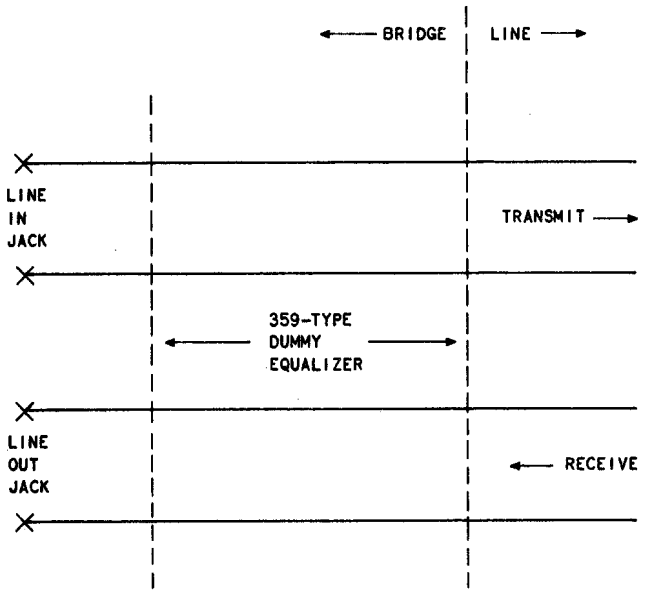


Fig. 12—DC Test Configuration Showing Replacement by Dummy Equalizer