
DIGITAL TRANSMISSION SYSTEMS
T1 DIGITAL LINE
INSTALLATION AND REPLACEMENT OF OFFICE REPEATERS

The purpose of this section is to provide procedures for installation and replacement of office repeaters in the office repeater bays (201 ORB, 206 ORB, and T1C/T1 ORB).

This section is reissued to include the 231- and 236-type repeaters and to revise Table A. Changes are indicated by arrows. This reissue does not affect the Equipment Test List.

Table A is a summary of the office and bridging repeaters and features applicable to each repeater. The EXCP and some bridging repeaters must be used with a DSX-1. All others (except bridging) may be used with or without a DSX-1.

◆The intermixing of low power (60 mA) and standard power (140 mA) repeaters will cause maintenance and service problems. Therefore, it is recommended that these repeaters never be intermixed in the same span line, apparatus case, or office repeater shelf pair. Also the intermixing of integrated and nonintegrated circuit repeaters will cause maintenance problems.◆

Procedures are provided in this section for testing bridging repeaters after installation or replacement. All other office repeaters are tested as a part of the digital line.

Note: T1 digital lines must have a bipolar signal applied to prevent oscillation in the event that they are equipped with nonintegrated circuit-type repeaters.

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APPARATUS:

♦**Note:** The following apparatus is required for testing bridging repeaters only.♦

2—P3BH Cords

1—386B Plug (135-ohm termination)

1—J98725AD Fault-Locating Test Set (25AD FLTS) or J98710F Fault Locating Set (10F FLS)

1—J98725AC Office Bipolar Violation Detector (OBVD) or J98710G Error Detecting Set (EDS)

STEP	PROCEDURE
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A. Installation of 201B or 201E Repeater in a 201 ORB

- 1 Select a 201B or 201E repeater and provide for the loop power option by tightening the L screws and removing the T screws.

STEP

PROCEDURE

- 2 Insert the proper 836-type LBO networks in side 1 and side 2 of the repeater as required by the span line record card. Securely tighten the screws in each network to provide a good electrical connection.

Note: If repeaters are checked for continuity, it must be done after the power option is provided and the 836-type networks are in place as outlined in Section 365-221-500.

- 3 Insert the repeater into the repeater opening of the proper position in the span terminating assembly (STA) as determined from the span line record card.

B. Replacement of 201B or 201E Repeater in a 201 ORB

Caution: To prevent interruption of service when performing this task, service must be patched off per Section 365-226-500.

- 1 Turn down power on the faulty repeater (see Fig. 1).

Note: Power for the office repeaters in a 201 ORB can be turned down in only two ways, depending upon how the repeater is powered.

- (a) Powered Separately: To turn down power, remove the office repeater OFF REP fuse from the control unit located directly below the faulty repeater.
- (b) Powered in Series With Line: To turn down power, remove the two upper fuses associated with line 1 from the control unit directly below the faulty repeater.

Caution: Removal of the fuses from the wrong control unit will interrupt service on one or more working lines associated with other T1 digital lines.

- 2 Remove the faulty repeater from the STA.
- 3 Select a new 201B or 201E repeater; provide L power option by tightening the L screws and removing the T screws.
- 4 Remove the 836-type LBO network from side 1 of the faulty repeater and insert it into side 1 of the replacement repeater. Similarly, insert the 836-type network in side 2 of the replacement repeater. Securely tighten the screws on each network to provide a good electrical connection.
- 5 Verify the 836-type network assignments with the span line record card before the repeater is placed in the STA.

Note: If repeaters are checked for continuity, it must be done after the power option is provided and the 836-type networks are in place as outlined in Section 365-221-500.

- 6 Insert the replacement repeater into the proper position in the STA.
- 7 Restore power on the line by replacing the proper fuses removed in Step 1.

STEP	PROCEDURE
8	Notify the office at the other end of the span that the repeater has been replaced and the line is ready for test.
	C. Installation of 201K Repeater in a 201 ORB
1	Select a 201K repeater.
2	Insert the 201K repeater into the repeater opening of the proper position in the STA as determined from the span line record card.
	D. Replacement of a Repeater in a 201 ORB With a 201K Repeater
	Caution: <i>To prevent interruption of service when performing this task, service must be patched off per Section 365-226-500.</i>
1	Turn down power on the faulty repeater (see Fig. 1).
	Note: Power for the office repeaters in a 201 ORB can be turned down in two ways, depending upon how the repeater is powered.
	(a) Powered Separately: To turn down power, remove the office repeater OFF REP fuse from the control unit located directly below the faulty repeater.
	(b) Powered in Series With Line: To turn down power, remove the two upper fuses associated with line 1 from the control unit directly below the faulty repeater.
	Caution: <i>Removal of the fuses from the wrong control unit will interrupt service on one or more working lines associated with other T1 digital lines.</i>
2	Remove the faulty repeater from the STA.
3	Select a 201K and insert it into the repeater opening of the STA.
4	Restore power on the line by replacing the proper fuses removed in Step 1.
5	Notify the office at the other end of the span that the repeater has been replaced and the line is ready for test.
	E. Installation of a 208D or 208AB Repeater in a 201 ORB
1	Select a 208D or 208AB repeater and a 215A adapter.
2	If repeater being installed is a 208AB, provide loop powering by setting powering option to L.
3	Insert the 215A adapter into the repeater opening of the proper position in the STA as determined from the span line record card.

STEP

PROCEDURE

4 Insert the 208D or 208AB repeater into the 215A adapter.

F. Replacement of a Repeater in a 201 ORB With a 208D or 208AB Repeater

Caution: To prevent interruption of service when performing this task, service must be patched off per Section 365-226-500.

1 Turn down power on the faulty repeater (see Fig. 1).

Note: Power for the office repeaters can be turned down in only two ways, depending upon how the repeater is powered.

(a) Powered Separately: To turn down power, remove the office repeater OFF REP fuse from the control unit located directly below the faulty repeater.

(b) Powered in Series With Line: To turn down power, remove the two upper fuses associated with line 1 from the control unit directly below the faulty repeater.

Caution: Removal of the fuses from the wrong control unit will interrupt service on one or more working lines associated with other T1 digital lines.

2 Remove the faulty repeater from the STA.

3 If the faulty repeater is a 201B, 201E, or 201K, select a 215A adapter and insert it into the repeater opening of the STA.

4 Select a 208D or 208AB repeater.

5 If the repeater being installed is a 208AB, provide loop powering by setting powering option to L.

6 Insert the 208D or 208AB repeater into the 215A adapter.

7 Restore power on the line by replacing the proper fuses removed in Step 1.

8 Notify the office at the other end of the span that the repeater has been replaced and the line is ready for test.

G. Installation and Testing 201-Type Bridging Repeater

1 Select a 201-type bridging repeater.

Note: The power option for these repeaters is provided internally. No LBO network is required.

2 Insert the repeater into the repeater opening of the proper position in the STA as determined from the span line record card.

STEP

PROCEDURE

-
- 3 Insert the proper fuse in the office repeater OFF REP fuse holder on the control unit located directly below the bridging repeater (Fig. 1).
- 4 The repeater may now be tested to ensure proper operation.
- 5 Plug the -48V cord of the 10F FLS or 25AD FLTS into one of the -48V TST jacks on the jack mounting panel.
- 6 Plug the -48V cord of the EDS or OBVD into another of the -48V TST jacks on the jack mounting panel.
- 7 Connect a P3BH cord from the TEST jack of the 10F FLS or the GEN MON jack of the 25AD FLTS to the IN 1 jack on the proper position of the STA.
- Note:** No plug should be in the GEN OUT jack of the 10F FLS, since this disables the TEST jack output.
- 8 If the 25AD FLTS is used, set the CLOCK RATE switch to T1.
- Note:** The T1 indicator lights, indicating that the T1 clock in the FLTS has been selected and the FLTS is powered.
- 9 Set the FUNCTION switch on the 10F FLS to BIPOLAR SIGNAL or the 25AD FLTS to BI-POLAR SIGNAL and the PULSE PERIOD (10F FLS) to REF or PULSE DENSITY (25AD FLTS) switch to 11 REF.
- 10 If the bridging repeater is not connected to a spare line, terminate the OUT 1 jack with a 386B plug.
- 11 Connect a P3BH cord from the IN jack of the EDS or the SIG IN jack of the OBVD to the MON (side 1 or 2) jack of the repeater under test.
- 12 If the EDS is used, continue with Step 13. If the OBVD is used, proceed to Step 17.
- Note:** If any of the following requirements are not met, replace the bridging repeater. If the requirements are still not met, refer to SD-97080-01.♦
- 13 Set the PULSES-ERRORS switch on the EDS to PULSES.
- Requirement:** The lamp on the EDS is lighted, indicating proper regeneration of pulses by the repeater.
- Note:** The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.
- 14 Set the PULSES-ERRORS switch to ERRORS.
- Requirement:** The lamp is extinguished, indicating error-free operation of the repeater.

STEP

PROCEDURE

- Note:** The lamp must be completely extinguished. It must not flash occasionally.
- 15 Set the FUNCTION switch on the 10F FLS to MEAS 3 or the 25AD FLTS to MEAS 3 SIGNAL.
- Requirement:** The lamp on the EDS is lighted, indicating errors.
- Note:** The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.
- 16 Proceed to Step 19.
- 17 Set the MODE switch on the OBVD to BV, the TIMER switch to BEGIN, and depress the START/RESET pushbutton.
- Requirement:** The counter sets to all zeros, the UNDER TEST light is lighted, and all other lamps are extinguished.
- 18 Set the FUNCTION switch on the 10F FLS to MEAS 3 or the 25AD FLTS to MEAS 3 SIGNAL.
- Requirement:** The BIPOLAR VIOLATIONS lamp on the OBVD is lighted and the counter indicates errors.
- 19 Repeat Steps 15 through 18 to test side 2 of the bridging repeater.
- 20 When the requirements are met for sides 1 and 2, remove all plugs and test connections.

H. Installation of 206-Type Office Repeater

- 1 Select the 206-type repeater shown on the span line record card.
- 2 Provide the proper power option by turning down the option screws in accordance with Section 365-223-500 and the span line record card. Turn back all unused option screws two complete turns counterclockwise (Fig. 2, 3, or 4).
- 3 Record options selected and repeater type on Form E-5416, Office Repeater Record Card (Fig. 5).
- 4 If the repeater is a nonintegrated circuit type, select the 836-type LBO network shown on the span line record card. If the selected repeater is an integrated circuit type, proceed to Step 6 because no LBO is required; otherwise, continue with Step 5.
- 5 Insert the selected network into the repeater. Securely tighten the screws in the network to provide a good electrical connection. Proceed to Step 10.
- 6 If the repeater is an EXCP type (Table A), continue with Step 7; otherwise, proceed to Step 10.

STEP	PROCEDURE
7	Select a 983-type equalizer according to span line record card and Table B for installation in the repeater.
8	Connect the pigtailed wires on the equalizer to the points on the repeater as shown in Fig. 4.
9	Install the equalizer in the repeater (Fig. 6) and insert the correct color plug button into the hole in the faceplate of the repeater. <i>Note:</i> To restrict the use of 206-type repeater positions to the correct type of repeater, keys are provided in each connector on the repeater shelves. These keys are normally provided in jack contact 8 of the connector.
10	Note the required keying listed in Table C for the 206-type repeater being installed.
11	If necessary, relocate the key to the proper jack contact.
12	Insert the repeater into the assigned shelf position in the repeater bay per the span line record card.
13	◆Verify that the span number office repeater type and powering, power loop voltage and current, and repeater powering options are recorded on Form E-5416, Office Repeater Record Card (Fig. 5).◆

1. Replacement of 206-Type Office Repeater

Caution: *To prevent interruption of service when performing this task, service must be patched off per Section 365-226-500.*

- 1 Remove the faulty repeater from the repeater bay.
- 2 Select a 206 replacement repeater.
- 3 Refer to Form E-5416 (Fig. 5) and apply the same power options (Fig. 2, 3, or 4) as those used on the faulty repeater. Turn back all unused option screws two complete turns counterclockwise.

Warning: *A fire hazard exists if ground option P in the 206B or 206F repeater is improperly applied for 178- or 260-volt line powering. Refer to Section 365-223-500 for instructions before replacing the repeater.*

- 4 ◆Verify that the replacement repeater has the same type fuses installed in the front panel as those in the faulty repeater.◆
- 5 If the repeater being replaced is an integrated circuit type, proceed to Step 8; otherwise, continue with Step 6.

STEP	PROCEDURE
6	Remove the 836-type LBO network from the faulty repeater and insert the network in the mounting location on the replacement repeater. Securely tighten the screws on the network to provide a good electrical connection.
7	Verify the 836-type network assignment with the span line record card before the new repeater is placed in the repeater bay. Proceed to Step 12.
8	If the repeater is an EXCP type (Table A), continue with Step 9; otherwise, proceed to Step 12.
9	Remove the 983-type equalizer and the plug button from the faulty repeater.
10	Connect the pigtailed wires on the equalizer to the points on the replacement repeater as shown in Fig. 4.
11	Install the equalizer in the repeater (Fig. 6) and insert the plug button into the hole in the faceplate of the repeater.
12	Insert the replacement repeater into the assigned shelf position in the repeater bay.
13	Notify the office at the other end of the span that the repeater has been replaced and that the line is ready for test.
	<p>◆Note: If the replacement repeater is an EXCP type and the problem is still not cleared, there is a remote possibility that the 983-type equalizer is faulty. Therefore, replace the 983-type equalizer with a known-good equalizer and repeat Step 13.◆</p>

J. Installation and Testing of 206-Type Bridging Repeater

- 1 Select a 206-type bridging repeater.
- Note:** The power option for this repeater is provided internally. No line build-out network is required.
- 2 Insert the repeater into the proper shelf (position 26) in the repeater bay as determined from the span line record card.
 - 3 The repeater may now be tested to ensure proper operation.
 - 4 Plug the -48V cord of the 10F FLS or 25AD FLTS into one of the -48V TST jacks on the repeater bay jack field or the DSX-1 maintenance panel.
 - 5 Plug the -48V cord of the EDS or OBVD into the -48V TST jack on the repeater bay jack field or the DSX-1 maintenance panel.◆
 - 6 Connect a P3BH cord from the TEST jack of the 10F FLS or the GEN MON jack of the 25AD FLTS to the B IN jack on the repeater front panel or the IN jack at position 25 of the DSX-1 panel for the repeater under test.

STEP

PROCEDURE

Note: No plug should be in the GEN OUT jack of the 10F FLS, since this disables the TEST jack output.

- 7 If the 25AD FLTS is used, set the CLOCK RATE switch to T1.

Note: The T1 indicator lights, indicating that the T1 clock in the FLTS has been selected and that the FLTS is powered.

- 8 Set the FUNCTION switch on the 10F FLS to BIPOLAR SIGNAL or the 25AD FLTS to BI-POLAR SIGNAL and the PULSE PERIOD (10F FLS) to REF or PULSE DENSITY (25AD FLTS) switch to 11 REF.

- 9 Terminate the R OUT jack (if equipped) on the repeater with a 386B plug.

- 10 Connect a P3BH cord from the IN jack of the EDS or the SIG IN jack of the OBVD to the MON jack on the repeater or the BR MON jack on the DSX-1 maintenance panel.

- 11 If the EDS is used, continue with Step 12. If the OBVD is used, proceed to Step 16.

Note: If the following requirements are not met, replace the bridging repeater. If the requirements are still not met, refer to SD-97080-02.

- 12 Set the PULSES-ERRORS switch on the EDS to PULSES.

Requirement: The lamp on the EDS is lighted, indicating proper regeneration of pulses by the repeater.

Note: The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.

- 13 Set the PULSES-ERRORS switch to ERRORS.

Requirement: The lamp on the EDS is extinguished, indicating error-free operation of the repeater.

Note: The lamp must be completely extinguished. It must not flash occasionally.

- 14 Set the FUNCTION switch on the 10F FLS to MEAS 3 or the 25AD FLTS to MEAS 3 SIGNAL.

Requirement: The lamp on the EDS is lighted, indicating errors.

Note: The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.

- 15 Proceed to Step 18.

- 16 Set the MODE switch on the OBVD to BV, the timer switch to BEGIN, and depress the START/RESET pushbutton.

STEP

PROCEDURE

Requirement: The counter sets to all zeros, the UNDER TEST light is lighted, and all other lamps are extinguished.

- 17 Set the FUNCTION switch on the 10F FLS to MEAS 3 or the 25AD FLTS to MEAS 3 SIGNAL.

Requirement: The BIPOLAR VIOLATIONS lamp on the 0BVD is lighted and the counter indicates errors.

- 18 Remove all plugs and test connections.

K. Installation of 221-Type Office Repeater

- 1 ♦Refer to Table D and verify that the correct ED-3C585-30 or ED-3C744-30-type equalizer is installed in the repeater shelf being equipped.♦
- 2 Select the 221-type repeater shown on the span line record card.
- 3 Provide the proper power options in accordance with Section 365-223-500 and the span line record card. Turn back any unused option screws two complete turns counterclockwise (Fig. 7).
- 4 Insert the repeater into the assigned shelf position in the repeater bay per the span line record card.
- 5 ♦Verify that the span number, office repeater type and powering, power loop voltage and current, and repeater powering options are recorded on Form E-5416, Office Repeater Bay Record Card (Fig. 5).♦

L. Replacement of 221-Type Office Repeater

Caution: To prevent interruption of service when performing this task, service must be patched off per Section 365-226-500.

- 1 Remove the faulty repeater from the repeater bay.
- 2 Select a 221 replacement repeater.
- 3 Refer to Form E-5416 (Fig. 5) and apply the same options (Fig. 7) that were used on the faulty repeater. Turn back any unused option screws two complete turns counterclockwise.
- 4 Insert the replacement repeater into the assigned shelf position in the repeater bay.
- 5 Notify the office at the other end of the span that the repeater has been replaced and the line is ready for test.

M. Installation and Testing of 221-Type Bridging Repeater

- 1 Select a 221-type bridging repeater.

STEP	PROCEDURE
	<p>Note: The power option for this repeater is provided internally.</p>
2	Insert the repeater into the proper shelf (position 26) in the repeater bay as determined from the span line record card.
3	The repeater may now be tested to ensure proper operation.
4	Plug the -48V cord of the 10F FLS or 25AD FLTS into one of the -48V TST jacks on the repeater bay jack field or the DSX-1 maintenance panel.
5	Plug the -48V cord of the EDS or OBVD into one of the -48V TST jacks on the repeater bay jack field or the DSX-1 maintenance panel.
6	Connect a P3BH cord from the TEST jack of the 10F FLS or the GEN MON jack of the 25AD FLTS to the B IN jack on the jack field or the IN jack at position 25 of the DSX-1 panel.
	<p>◆Note: No plug should be in the GEN OUT jack of the 10F FLS, since this disables the TEST jack output◆</p>
7	If the 25AD FLTS is used, set the CLOCK RATE switch to T1.
	<p>Note: The T1 indicator lights, indicating that the T1 clock in the FLTS has been selected and that the FLTS is powered.</p>
8	Set the FUNCTION switch on the 10F FLS to BIPOLAR SIGNAL or the 25AD FLTS to BI-POLAR SIGNAL and the PULSE PERIOD (10F FLS) to REF or PULSE DENSITY (25AD FLTS) switch to 11 REF.
9	Connect a P3BH cord from the IN jack of the EDS or the SIG IN jack of the OBVD to the BR MON jack on the DSX-1 maintenance panel or the MON jack on the jack field.
10	If the EDS is used, continue with Step 11. If the OBVD is used, proceed to Step 15.
	<p>◆Note: If the following requirements are not met, replace the bridging repeater. If the requirements are still not met, refer to SD-3C252-01.◆</p>
11	Set the PULSES-ERRORS switch on the EDS to PULSES.
	<p>Requirement: The lamp on the EDS is lighted, indicating proper regeneration of pulses by the repeater.</p>
	<p>Note: The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.</p>
12	Set the PULSES-ERRORS switch to ERRORS.
	<p>Requirement: The lamp on the EDS is extinguished, indicating error-free operation of the repeater.</p>

STEP

PROCEDURE

Note: The lamp must be completely extinguished. It must not flash occasionally.

- 13 Set the FUNCTION switch on the 10F FLS to MEAS 3 or the 25AD FLTS to MEAS 3 SIGNAL.

Requirement: The lamp on the EDS is lighted, indicating errors.

Note: The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.

- 14 Proceed to Step 17.

- 15 Set the MODE switch on the OBVD to BV and depress the START/RESET pushbutton.

Requirement: The counter sets to all zeros and no lamps are lighted.

- 16 Set the FUNCTION switch on the 10F FLS to MEAS 3 or the 25AD FLTS to MEAS 3 SIGNAL.

Requirement: The BIPOLAR VIOLATIONS lamp on the OBVD is lighted and the counter indicates errors.

- 17 Remove all test connections and plugs.

◆N. Installation of 231-Type Office Repeaters

- 1 Refer to Table D and verify that the correct ED-3C585-30 or ED-3C744-30-type equalizer is installed in the repeater shelf being equipped.
- 2 Select the 231-type repeater shown on the span line record card.
- 3 Provide the proper power options in accordance with Section 365-223-500 and the span line record card. Turn back any unused option screws two complete turns counterclockwise (Fig. 8).
- 4 Verify that the span number, office repeater type and powering, power loop voltage and current, and repeater powering options are recorded on Form E-5416, Office Repeater Bay Record Card (Fig. 5).
- 5 Insert the repeater into the assigned shelf position in the repeater bay per span line record card.

O. Replacement of 231-Type Office Repeater

Caution: To prevent interruption of service when performing this task, service must be patched off per Section 365-226-500.

- 1 Remove the faulty repeater from the repeater bay.

STEP	PROCEDURE
2	Select a 231 replacement repeater.
3	Refer to Form E-5416 (Fig. 5) and apply the same options (Fig. 8) that were used on the faulty repeater. Turn back any unused option screws two complete turns counterclockwise.
4	Insert the replacement repeater into the assigned shelf position in the repeater bay.
5	Notify the office at the other end of the span that the repeater has been replaced and the line is ready for test.
P. Installation and Testing of 231-Type Bridging Repeater	
1	Select a 231-type bridging repeater.
2	Insert the repeater into the proper shelf (position 26) in the repeater bay as determined from the span line record card.
Note: The repeater may now be tested to ensure proper operation.	
3	Plug the -48V cord of the 10F FLS or 25AD FLTS into one of the -48V TST jacks on the repeater bay jack field or the DSX-1 maintenance panel.
4	Plug the -48V cord of the EDS or OBVD into one of the -48V jacks on the repeater bay jack field or the DSX-1 maintenance panel.
5	Connect a P3BH cord from the TEST jack on the 10F FLS or the GEN MON jack on the 25AD FLTS to the B IN jack on the jack field on the IN jack at position 25 of the DSX-1 panel.
Note: No plug should be in the GEN OUT jack of the 10F FLS, since this disables the TEST jack output.	
6	If the 25AD FLTS is used, set the CLOCK RATE switch to T1.
Note: The T1 indicator lights, indicating that the T1 clock in the FLTS has been selected and that the FLTS is powered.	
7	Set the FUNCTION switch on the FLS to BIPOLAR SIGNAL or on the FLTS to BI-POLAR SIGNAL and the PULSE PERIOD (10F FLS) to REF or PULSE DENSITY (25AD FLTS) switch to 11 REF.
8	Connect a P3BH cord from the IN jack of the EDS or the SIG IN jack of the OBVD to the BR MON jack on the DSX-1 maintenance panel or the MON jack on the jack field for the repeater under test.
Note: If any of the following requirements are not met, replace the bridging repeater. If the requirements are still not met, refer to SD-3C252-02.	
9	If the EDS is used, continue with Step 10; if the OBVD is used proceed to Step 14.

STEP	PROCEDURE
10	Set the PULSES-ERRORS switch on the EDS to PULSES. Requirement: The lamp on the EDS is lighted, indicating proper regeneration of pulses by the repeater. Note: The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.
11	Set the PULSES-ERRORS switch to ERRORS. Requirement: The lamp on the EDS is extinguished, indicating error-free operation of the repeater. Note: The lamp must be completely extinguished. It must not flash occasionally.
12	Set the FUNCTION switch on the FLS to MEAS 3 or on the FLTS to MEAS 3 SIGNAL. Requirement: The lamp on the EDS is lighted, indicating errors. Note: The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.
13	Proceed to Step 16.
14	Set the MODE switch on the OBVD to BV and depress the START/RESET pushbutton. Requirement: The counter resets to all zeros and no lamps are lighted.
15	Set the FUNCTION switch on the FLS to MEAS 3 or the FLTS to MEAS 3 SIGNAL. Requirement: The BIPOLAR VIOLATIONS lamp on the OBVD is lighted and the counter indicates errors.
16	Remove all plugs and test connections.
Q. Installation of 236-Type Office Repeater	
1	Select the 236-type repeater shown on the span line record card.
2	Provide the proper power options by turning down the option screws and setting the switches in accordance with Section 365-223-500 and the span line record card. Turn back all unused option screws two complete turns counterclockwise (Fig. 8).
3	If the repeater is an EXCP type (Table A), continue with Step 4; otherwise, proceed to Step 7.
4	Select a 983-type equalizer according to the span line record card and Table B for installation in the repeater.

STEP	PROCEDURE
5	Connect the pigtailed wires on the equalizer to the points on the repeater as shown in Fig. 10.
6	Install the equalizer in the repeater (Fig. 11) and insert the correct color plug button into the hole in the faceplate of the repeater. <i>Note:</i> To restrict the use of 236-type repeater positions to the correct type of repeater, keys are provided in each connector on the repeater shelves. These keys are normally provided in jack contact number 8 of the connector.
7	Refer to Table E for the required keying for the 236-type repeater being installed.
8	If necessary, relocate the key to the proper jack contact.
9	Insert the repeater into the assigned shelf position in the repeater bay per the span line record card.
10	Verify that the span number, office repeater type and powering, power loop voltage and current, and repeater powering options are recorded on Form E-5416, Office Repeater Record Card (Fig. 5).
R. Replacement of 236-Type Office Repeater	
Caution: <i>To prevent interruption of service when performing this task, service must be patched off per Section 365-226-500.</i>	
1	Remove the faulty repeater from the repeater bay.
2	Select a 236-type replacement repeater.
3	Refer to Form E-5416 (Fig. 5) and apply the same power options (Fig. 9) that were used in the faulty repeater. Turn back all unused option screws two complete turns counterclockwise.
4	Set switch S203 to X for 140-mA line current or to W for 60-mA line current (Fig. 9).
5	Verify that the replacement repeater has the same type fuses installed in the faceplate as those in the faulty repeater.
6	If the replacement repeater is an EXCP type (Table A), continue with Step 7; otherwise, proceed to Step 10.
7	Remove the 983-type equalizer and plug from the faulty repeater.
8	Connect the pigtailed leads on the equalizer to the points on the replacement repeater as shown in Fig. 10.
9	Install the equalizer into the repeater (Fig. 11) and insert the plug button into the hole in the faceplate of the replacement repeater.

STEP	PROCEDURE
10	Insert the replacement repeater into the assigned shelf position in the repeater bay.
11	Notify the office at the other end of the span that the repeater has been replaced and that the line is ready for test.
	Note: If the replacement repeater is an EXCP type and the problem is still not cleared, there is a remote possibility that the 983-type equalizer is faulty. Therefore, replace the 983-type equalizer with a known-good equalizer and repeat Step 11.♦
	S. Installation and Testing of 236-Type Bridging Repeater
1	Select a 236-type bridging repeater.
2	Set the LOCAL/DSX option to DSX if the office is equipped with a DSX-1; otherwise, set this option to the LOCAL position.
3	Insert the repeater into the proper shelf (position 26) in the repeater bay as determined from the span line record card.
4	The repeater may now be tested to ensure proper operation.
5	Plug the -48V cord of the FLTS or FLS into one of the -48V TST jacks on the repeater bay jack field or the DSX-1 maintenance panel.
6	Plug the -48V cord of the EDS or OBVD into a -48V TST jack on the jack field or the DSX-1 maintenance panel.
7	Connect a P3BH cord from the TEST jack (10F FLS) or the GEN MON jack (25AD FLTS) to the B IN jack on the faceplate of the repeater or the IN jack at position 25 of the DSX-1 panel for the repeater under test.
	Note: No plug should be in the GEN OUT jack of the 10F FLS, since this would disable the test signal.
8	If the 25AD FLTS is used, set the CLOCK RATE switch to T1.
	Note: The T1 indicator lights, indicating that the T1 clock in the FLTS has been selected and that the FLTS is powered.
9	Set the FUNCTION switch on the FLS to BIPOLAR SIGNAL or on the FLTS to BI-POLAR SIGNAL and the PULSE PERIOD (10F FLS) to REF or PULSE DENSITY (25AD FLTS) switch to 11 REF.
10	Terminate the R OUT jack (if equipped) on the repeater with a 386B plug.
11	Connect a P3BH cord from the IN jack of the EDS or the SIG IN jack of the OBVD to the MON jack on the repeater or the BR MON jack on the DSX-1 maintenance panel.
12	If the EDS is used, continue with Step 13; if the OBVD is used, proceed to Step 17.

STEP	PROCEDURE
	<p>Note: If the following requirements are not met, replace the bridging repeater. If the requirements are still not met, refer to SD-97080-02.</p>
13	<p>Set the PULSES-ERRORS switch on the EDS to PULSES.</p> <p>Requirement: The lamp on the EDS is lighted, indicating proper regeneration of pulses by the repeater.</p> <p>Note: The lamp may light continuously or flicker slightly. Either of these conditions meets the requirement.</p>
14	<p>Set the PULSES-ERRORS switch to ERRORS.</p> <p>Requirement: The lamp on the EDS is extinguished, indicating error-free operation of the repeater.</p> <p>Note: The lamp must remain extinguished. It must not flash occasionally.</p>
15	<p>Set the FUNCTION switch on the FLTS to MEAS 3 SIGNAL or on the FLS to MEAS 3.</p> <p>Requirement: The lamp on the EDS is lighted, indicating errors.</p> <p>Note: The lamp may light continuously or flicker slightly. Either condition meets the requirement.</p>
16	<p>Proceed to Step 19.</p>
17	<p>Set the MODE switch on the OBVD to BV, the TIMER switch to BEGIN, and depress the START/RESET pushbutton.</p> <p>Requirement: The counter sets to all zeros, the UNDER TEST lamp is lighted, and all other lamps are extinguished.</p>
18	<p>Set the FUNCTION switch on the FLS to MEAS 3 or on the FLTS to MEAS 3 SIGNAL.</p> <p>Requirement: The BIPOLAR VIOLATIONS lamp on the OBVD is lighted and the counter indicates errors.</p>
19	<p>Remove all plugs and test connections.◀</p>

TABLE A#
OFFICE AND BRIDGING REPEATER
(SEE NOTE 1)

CODE	INTEGRATED CIRCUIT	TYPE	REPLACE-MENT	OPTIONS	MOUNTING	LINE POWERING	REGULATOR CURRENT	REGENERATOR CURRENT	LINE MATCHING	EXCP	NOTES
201B	NO	OFFICE/LINE	201E 201K	T/L POWERING	STA	LOOP	NONE	140 mA	836 LBO	NO	2
201C	NO	BRIDGING	201F 201L	NONE	STA	NONE	NONE	140 mA	NONE	NO	2
201E	NO	OFFICE/LINE	201K 208D	T/L POWERING	STA	LOOP	NONE	140 mA	836 LBO	NO	2
201F	NO	BRIDGING	201L	NONE	STA	NONE	NONE	140 mA	NONE	NO	2
201K	YES	OFFICE/LINE	208D	NONE	STA	LOOP	NONE	140 mA	836 LBO	NO	2, 3
201L	YES	BRIDGING	-	NONE	STA	NONE	NONE	140 mA	NONE	NO	2
206A	NO	OFFICE	206H	LINE POWERING	206 ORB/LTU/STM	48V	140 mA	140 mA	836 LBO/7.5 dB ART LINE	NO	2
206B	NO	OFFICE	206J	LINE POWERING/GRD	206 ORB/LTU/STM	130V	140 mA	140 mA	836 LBO/7.5 dB ART LINE	NO	2
206C	NO	BRIDGING	206R	NONE	206 ORB/LTU/STM	NONE	NONE	140 mA	NONE	NO	2
206D	NO	OFFICE	206K	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	140 mA	836 LBO/7.5 dB ART LINE	NO	2
206E	NO	OFFICE	206L	LINE POWERING	206 ORB/LTU/STM	48V	140 mA	140 mA	836 LBO/3 dB PAD	NO	2
206F	NO	OFFICE	206M	LINE POWERING	206 ORB/LTU/STM	140 mA	140 mA	140 mA	836 LBO/3 dB PAD	NO	2
206G	NO	OFFICE	206N	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	140 mA	836 LBO/3 dB PAD	NO	2
206H	YES	OFFICE	236AA	LINE POWERING	206 ORB/LTU/STM	48V	140 mA	140 mA	ALBO/7.5 dB ART LINE	NO	-
206J	YES	OFFICE	236AA	LINE POWERING/GRD	206 ORB/LTU/STM	130V	140 mA	140 mA	ALBO/7.5 dB ART LINE	NO	-
206K	YES	OFFICE	236AB	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	140 mA	ALBO/7.5 dB ART LINE	NO	-
206L	YES	OFFICE	236AC	LINE POWERING	206 ORB/LTU/STM	48V	140 mA	140 mA	ALBO/3 dB PAD	NO	-
206M	YES	OFFICE	236AC	LINE POWERING/GRD	206 ORB/LTU/STM	130V	140 mA	140 mA	ALBO/3 dB PAD	NO	-
206N	YES	OFFICE	236AD	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	140 mA	ALBO/3 dB PAD	NO	-
206P	NO	BRIDGING-DSX	206S	NONE	206 ORB/LTU/STM	NONE	NONE	140 mA	NONE	NO	2
206R	YES	BRIDGING	236P	NONE	206 ORB/LTU/STM	NONE	NONE	140 mA	NONE	NO	-

TABLE A (Cont)#
OFFICE AND BRIDGING REPEATERS
(SEE NOTE 1)

CODE	INTEGRATED CIRCUIT	TYPE	REPLACE-MENT	OPTIONS	MOUNTING	LINE POWERING	REGULATOR CURRENT	REGENERATOR CURRENT	LINE MATCHING	EXCP	NOTES
206S	YES	BRIDGING-DSX	236P	NONE	206 ORB/LTU/STM	NONE	NONE	140 mA	NONE	NO	-
206T	YES	OFFICE	236E	LINE POWERING/CURRENT	206 ORB/LTU/STM	48V	60/140 mA	140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	4
206U	YES	OFFICE	236E	LINE POWERING/CURRENT/GRD	206 ORB/LTU/STM	130V	60/140 mA	140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	4
206W	YES	OFFICE	236F	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	4
206Y	YES	OFFICE	236G	LINE POWERING/CURRENT	206 ORB/LTU/STM	48V	60/140 mA	140 mA	ALBO/3 & 0.5 dB PAD	YES	4
206AA	YES	OFFICE	236G	LINE POWERING/CURRENT/GRD	206 ORB/LTU/STM	130V	60/140 mA	140 mA	ALBO/3 & 0.5 dB PAD	YES	4
206AB	YES	OFFICE	236H	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	140 mA	ALBO/3 & 0.5 dB PAD	YES	4
208D	YES	OFFICE/LINE	208AB	NONE	STA	LOOP	NONE	140 mA	ALBO	NO	3
221A	YES	OFFICE	231A	LINE POWERING/VOLTAGE/GRD	TIC/T1 ORB	48/130V	60/140 mA	140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	5
221B	YES	OFFICE	231B	LINE POWERING	TIC/T1 ORB	LOOP	NONE	140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	5
221C	YES	BRIDGING	231C	NONE	TIC/T1 ORB	NONE	NONE	140 mA	NONE	YES	5
231A	YES	OFFICE	NONE	LINE POWERING/CURRENT/GRD/VOLTAGE	TIC/T1 ORB	48/130V	60/140 mA	60/140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	5
231B	YES	OFFICE	NONE	LINE POWERING	TIC/T1 ORB	LOOP	NONE	60/140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	5
231C	YES	BRIDGING	NONE	NONE	TIC/T1 ORB	NONE	NONE	60/140 mA	NONE	YES	5
231D	YES	OFFICE	NONE	LINE POWERING/GRD/VOLTAGE	TIC/T1 ORB	48/130V	60 mA	60 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	5, 7
231E	YES	OFFICE	NONE	LINE POWERING	TIC/T1 ORB	LOOP	60 mA	60 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	5, 7
236A	YES	OFFICE	236AA	LINE POWERING/GRD/VOLTAGE	206 ORB/LTU/STM	48/130V	60 mA	60 mA	ALBO/7.5 dB ART LINE	NO	-
236B	YES	OFFICE	236AB	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	60 mA	ALBO/7.5 dB ART LINE	NO	-
236C	YES	OFFICE	236AC	LINE POWERING/GRD/VOLTAGE	206 ORB/LTU/STM	48/130V	60 mA	60 mA	ALBO/3 dB PAD	NO	-
236D	YES	OFFICE	236AD	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	60 mA	ALBO/3 dB PAD	NO	-

TABLE A (Cont)#
OFFICE AND BRIDGING REPEATERS
(SEE NOTE 1)

CODE	INTEGRATED CIRCUIT	TYPE	REPLACE-MENT	OPTIONS	MOUNTING	LINE POWERING	REGULATOR CURRENT	REGENERATOR CURRENT	LINE MATCHING	EXCP	NOTES
236E	YES	OFFICE	NONE	LINE POWERING/CURRENT/GRD/VOLTAGE	206 ORB/LTU/STM	48/130V	60/140 mA	60/140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	4
236F	YES	OFFICE	NONE	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	60/140 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	4
236G	YES	OFFICE	NONE	LINE POWERING/CURRENT/GRD/VOLTAGE	206 ORB/LTU/STM	48/130V	60/140 mA	60/140 mA	ALBO/3 & 0.5 dB PAD	YES	4
236H	YES	OFFICE	NONE	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	60/140 mA	ALBO/3 & 0.5 dB PAD	YES	4
236J	YES	OFFICE	NONE	LINE POWERING/GRD/VOLTAGE	206 ORB/LTU/STM	48/130V	60 mA	60 mA	ALBO/7.5 dB ART LINE	NO	7
236K	YES	OFFICE	NONE	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	60 mA	ALBO/7.5 dB ART LINE	NO	7
236L	YES	OFFICE	NONE	LINE POWERING/GRD/VOLTAGE	206 ORB/LTU/STM	48/130V	60 mA	60 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	4, 7
236M	YES	OFFICE	NONE	LINE POWERING	206 ORB/LTU/STM	LOOP	NONE	60 mA	ALBO/7.5 & 4.5 dB ART LINE	YES	4, 7
236P	YES	BRIDGING	NONE	DSX/LOCAL	206 ORB/LTU/STM	NONE	NONE	60/140 mA	NONE	NO	6

Notes:

- Abbreviations used are as follows:
 STA = J98710 Span Terminating Assembly
 STM = J98728AA, AB, or AC Span Terminating Module
 LTU = J98713F Line Terminating Unit
 EXCP = Extended Cross-Connect Package (requires 983, ED-3C585-30-, or ED-3C765-30-type equalizer)
 206 ORB = J98710J, K, or L Office Repeater Bay
 TIC/T1 ORB = J98725A, B, C, or D Office Repeater Bay
 ALBO = Automatic Line Buildout
 LBO = Line Buildout
- Manufacture discontinued.
- The 208-type repeater must be equipped with a 215A adapter.
- Repeater must be equipped with a 983-type equalizer (see Table B).
- ORB must be equipped with ED-3C585-30- or ED-3C765-30-type equalizer (see Table D).
- Can be used with or without a digital cross-connect by use of DSX/LOCAL option.
- Use with MAT cable.

TABLE B

983-TYPE EQUALIZER SELECTION DATA

CABLE LENGTH TO BE EQUALIZED*	USE TYPE	PLUG BUTTON COLOR
0 to 220 feet	A	Red
220 to 440 feet	B	Blue
440 to 655 feet	C	Green

* Cable length specified is for ABAM cable.

TABLE C

**REQUIRED KEYING FOR 206 ORB EQUIPPED WITH
206-TYPE REPEATERS**

206-TYPE REPEATER CODE BEING INSTALLED	PROVIDE KEY IN JACK CONTACT
206B, F, J, M, U, AA	8
206C, P, R, S	10
206D, G, K, N, W, AB	14
206A, E, H, L, T, Y	20

◆TABLE D◆

EQUALIZERS REQUIRED IN J98725-TYPE ORB

OFFICE ARRANGEMENT	CABLE LENGTH TO BE EQUALIZED*	EQUALIZER REQUIRED
J98725A, B, or C ORB Without DSX-1	0 to 220 Feet	ED-3C585-30, GP1
J98725D ORB Without DSX-1	0 to 220 Feet	ED-3C765-30, GP1
J98725A, B, or C ORB With DSX-1	0 to 220 Feet 220 to 440 Feet 440 to 665 Feet	ED-3C585-30, GP1 ED-3C585-30, GP2 ED-3C585-30, GP3 **
J98725D ORB With DSX-1	0 to 220 Feet 220 to 440 Feet 440 to 665 Feet	ED-3C765-30, GP1 ED-3C765-30, GP2 ED-3C765-30, GP3

* Cable length specified is for ABAM cable.

** When using ED-3C585-30-type equalizers, circuit position 26 for bridging repeaters is equipped with a group 1 equalizer for all cable lengths in applications with or without a DSX-1.

◆TABLE E◆

REQUIRED KEYING FOR 206 ORB EQUIPPED WITH 236-TYPE REPEATERS

236-TYPE REPEATER CODE BEING INSTALLED	PROVIDE KEY IN JACK CONTACT
236A, C, E, G, J, L, N, AA, AC	8*
236B, D, F, H, K, M, AB, AD	14*
236P	10*

*If bay option M (SD-97080-02) has been selected, all connectors should have a key in pin 19.

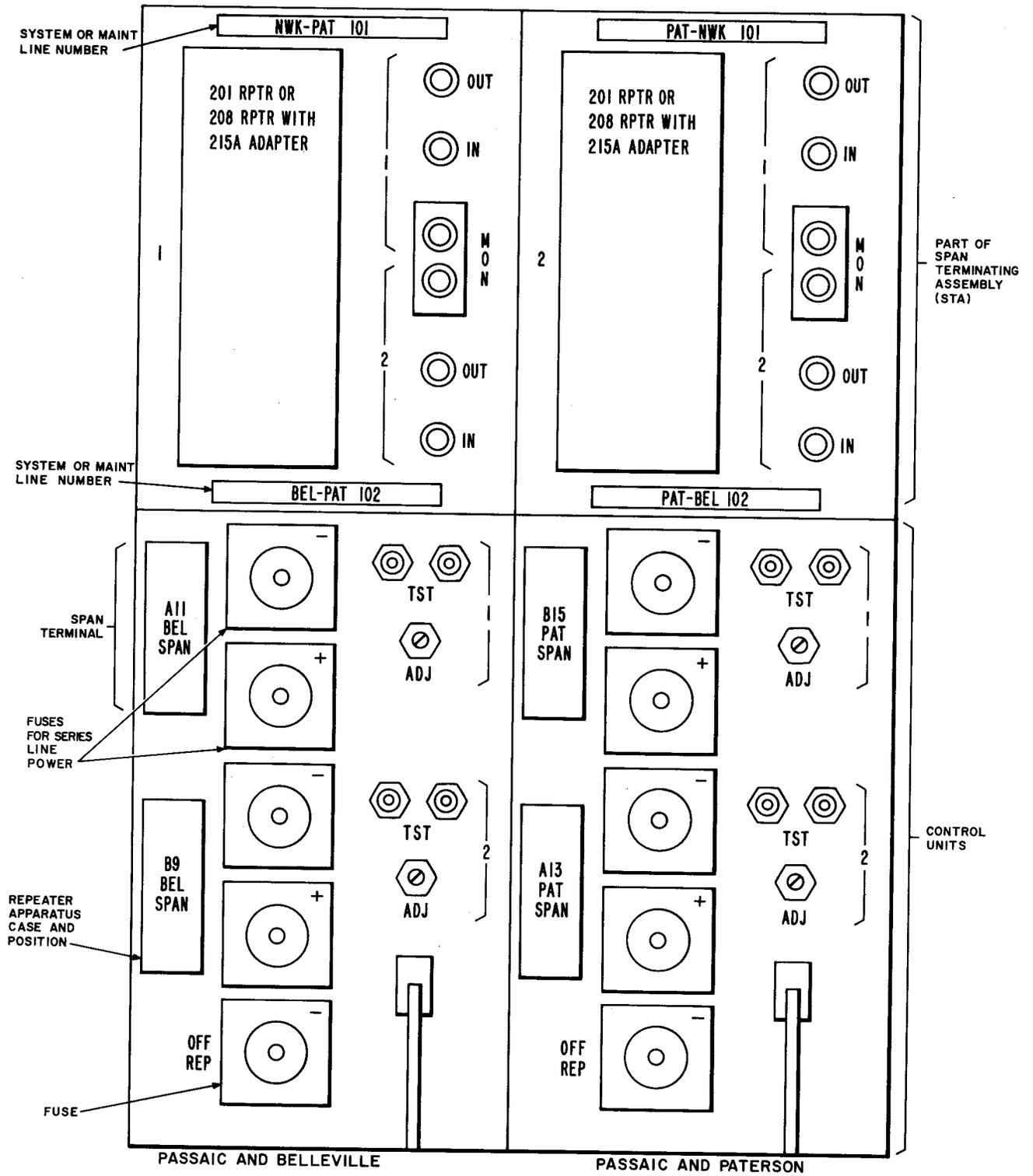


Fig. 1—Identification of Span Fuses—201 ORB

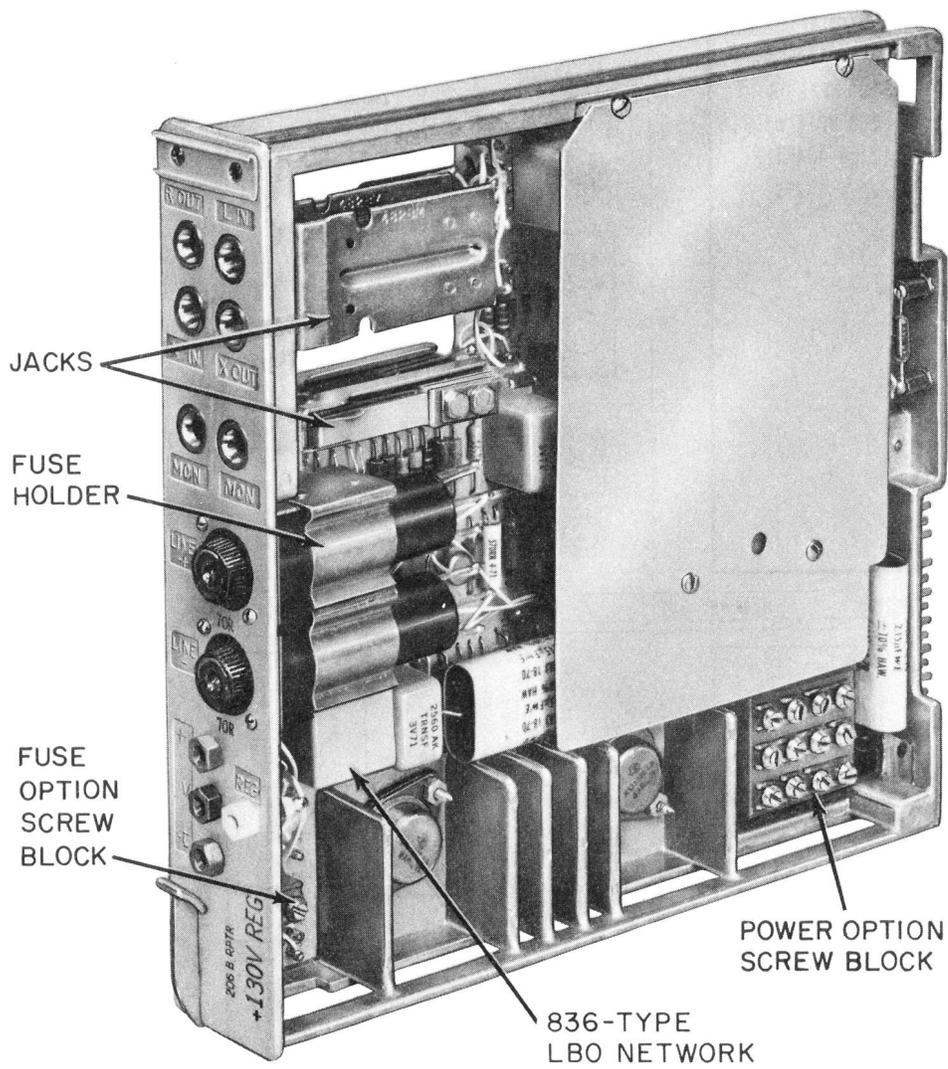


Fig. 2—206-Type Repeater (Non-Integrated Circuit)

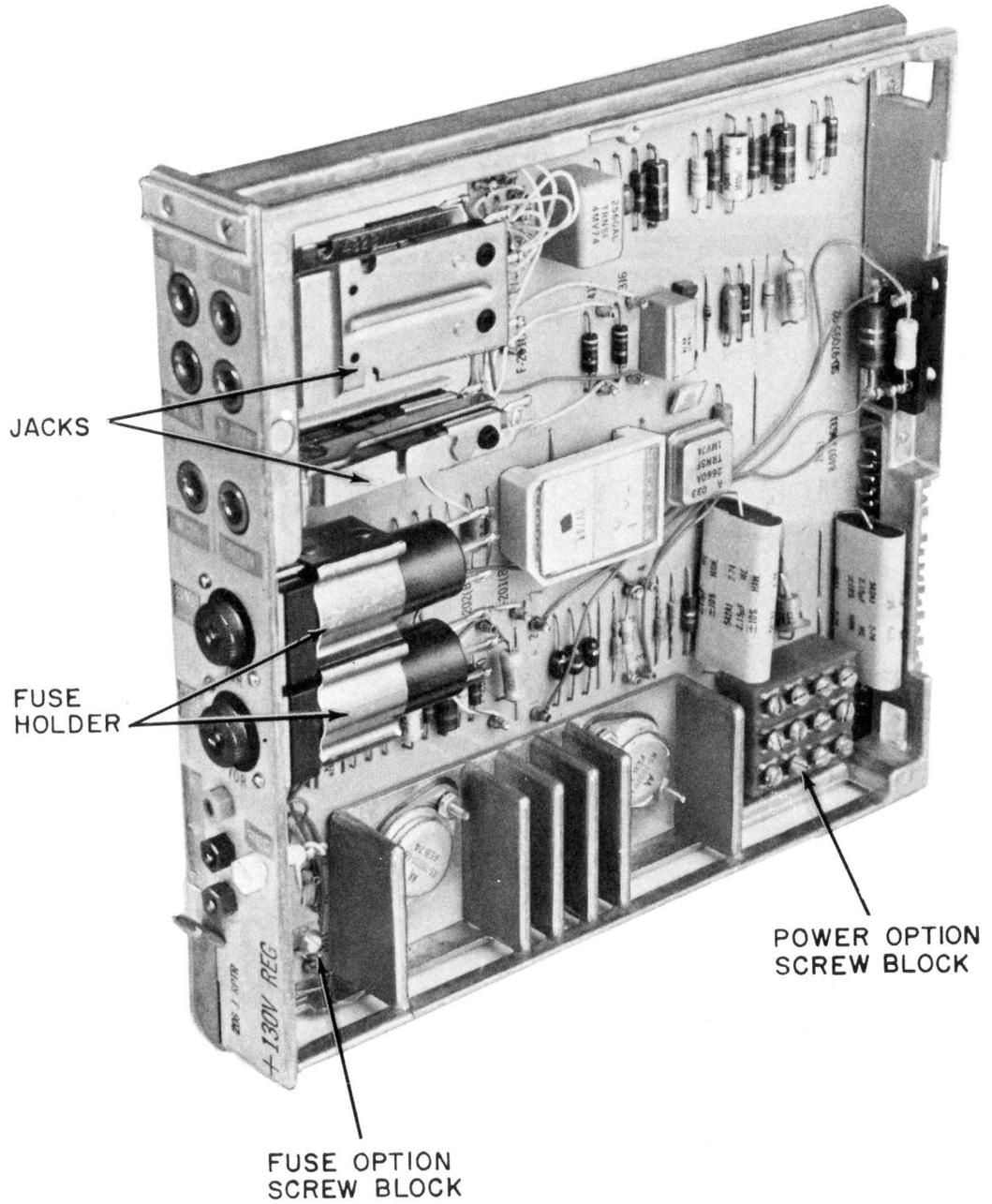


Fig. 3—206-Type Repeater (Integrated Circuit)

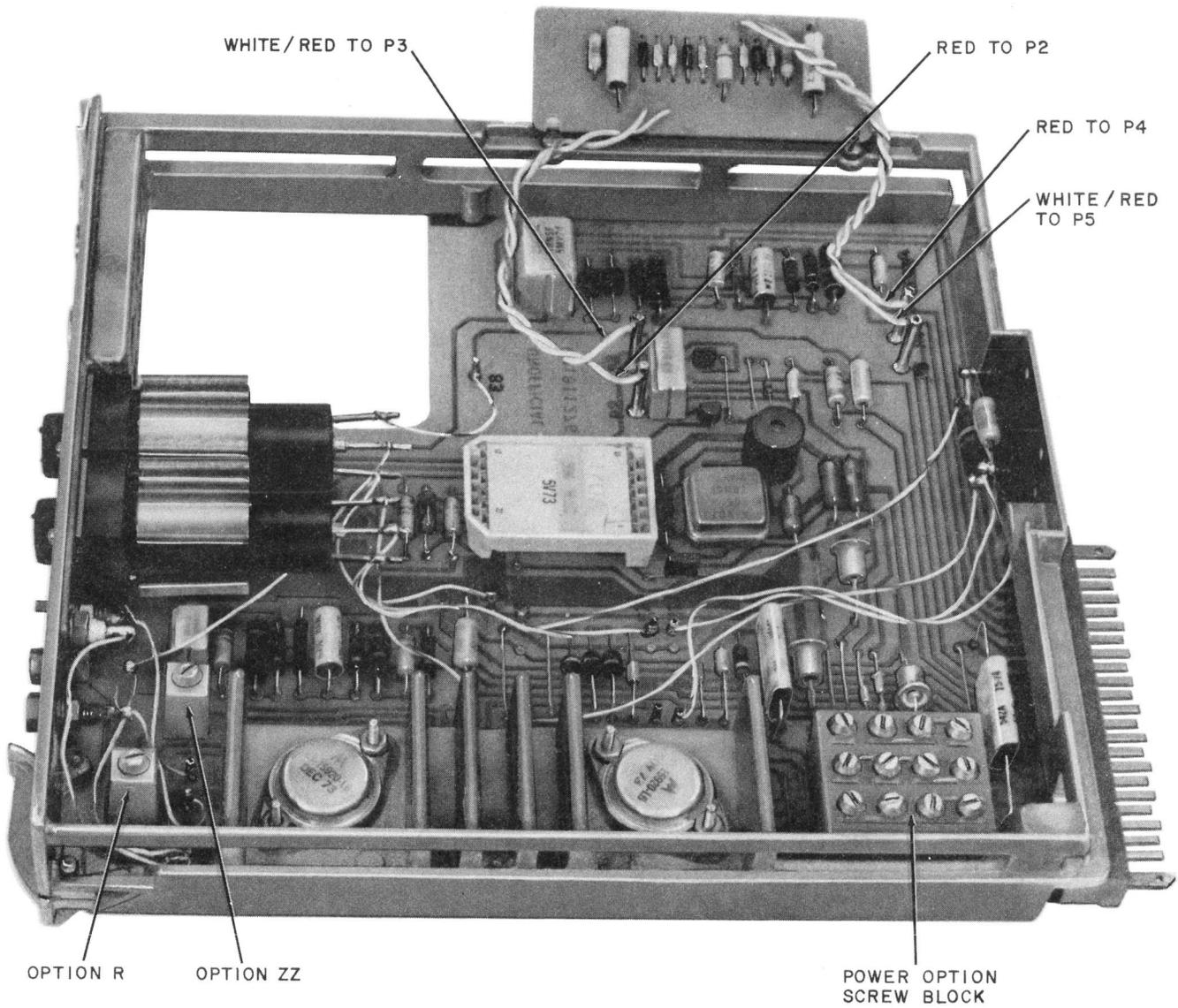


Fig. 4—206 EXCP Repeater Showing 983-Type Equalizer Connections

SPAN BENSENVILLE #7 BAY 216.08 SHELF 5		
OFF-RPTR 206J TYPE LINE CURRENT 60 120 140 <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		
POWER FEED VOLTAGE -48 +130 GRD GRD <input type="checkbox"/> <input checked="" type="checkbox"/> +130 +130 -48 -130 <input type="checkbox"/> <input type="checkbox"/> 9.4 114 REG VOLT LINE VOLT (NORM)		
RPTR PWR. OPTIONS		
CEK <input checked="" type="checkbox"/>	AGM <input type="checkbox"/>	DK <input type="checkbox"/>
BEHN <input type="checkbox"/>	AFHN <input type="checkbox"/>	HJN <input type="checkbox"/>
BDG <input type="checkbox"/>	VWZ <input type="checkbox"/>	XY <input type="checkbox"/>
WY <input type="checkbox"/>	WZ <input type="checkbox"/>	P/R <input checked="" type="checkbox"/>
T <input type="checkbox"/>	ZZ <input type="checkbox"/>	XZ <input type="checkbox"/>
CABLE 5811	COMPLEMENT 401-413	
E-5416(10-76)		

Fig. 5—Office Repeater Bay Record Card

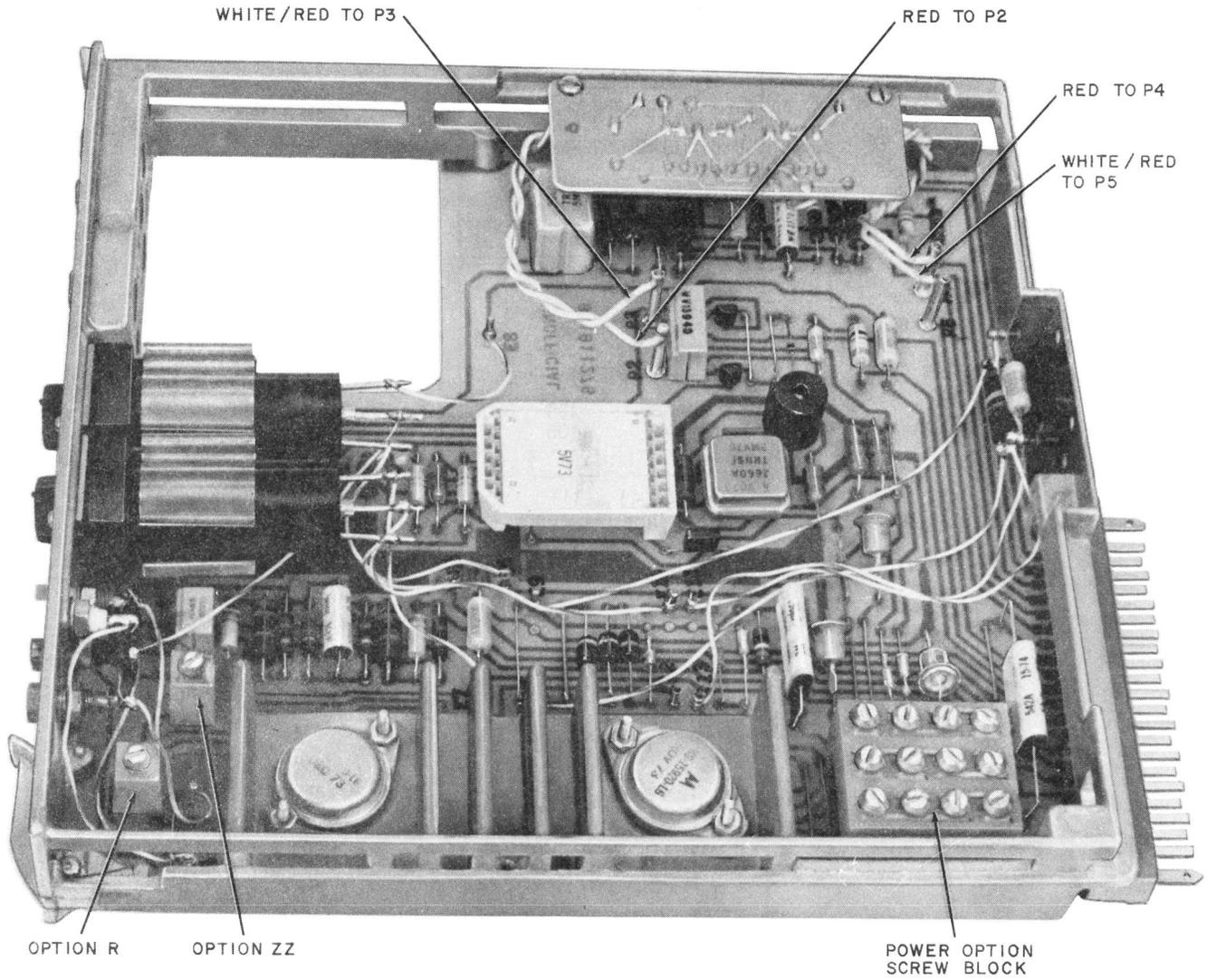


Fig. 6—206 EXCP Repeater With 983-Type Equalizer Installed

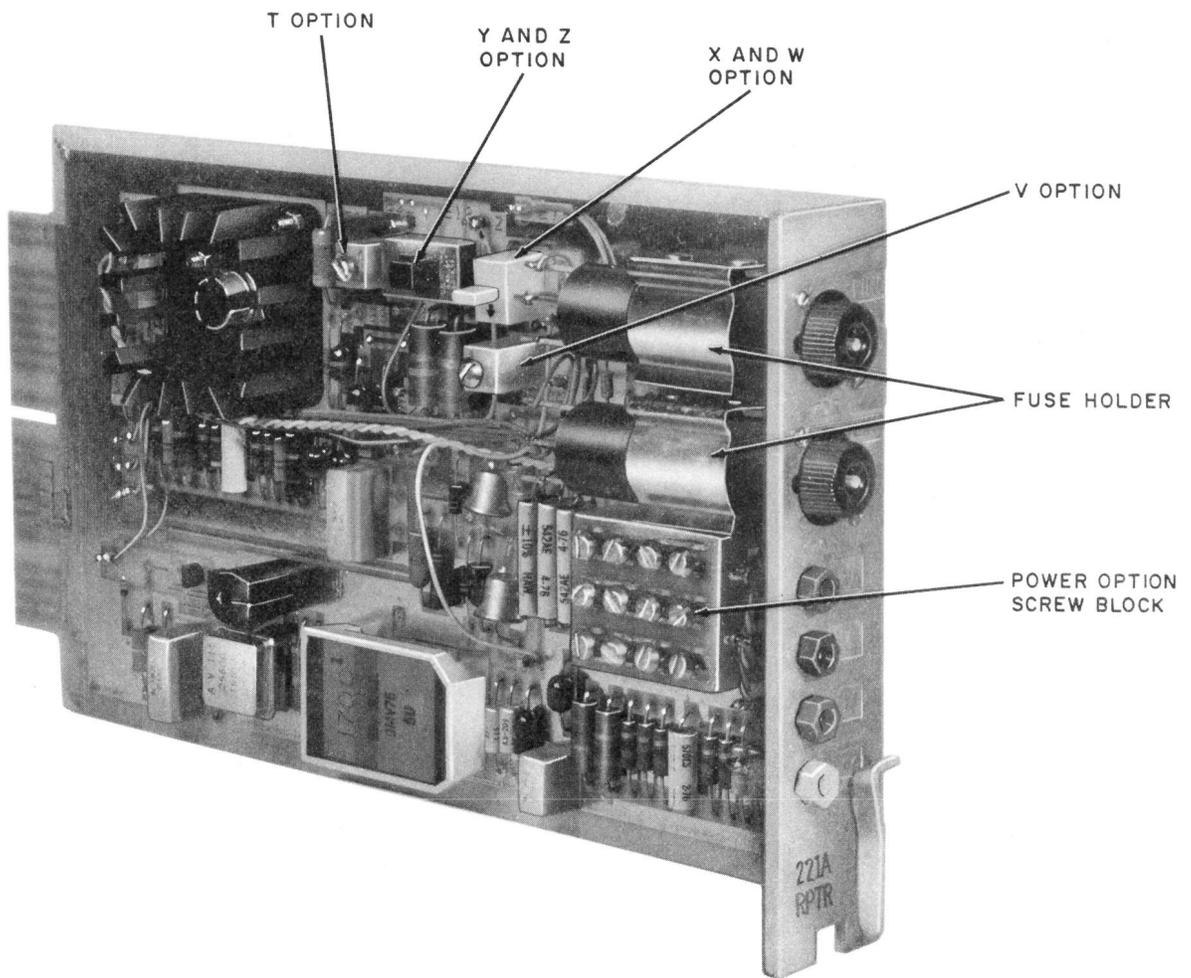


Fig. 7—221-Type Repeater

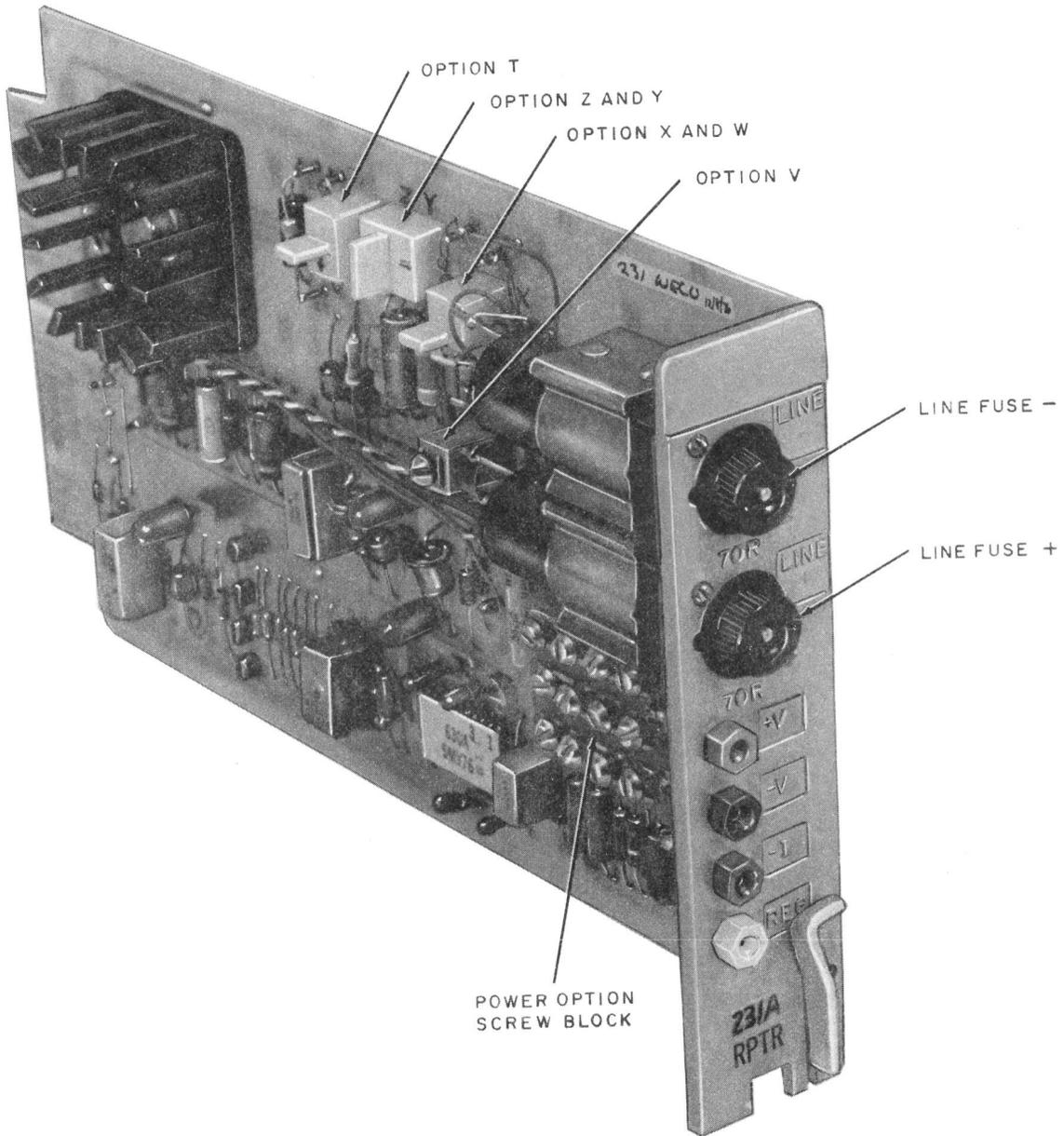


Fig. 8—231-Type Repeater

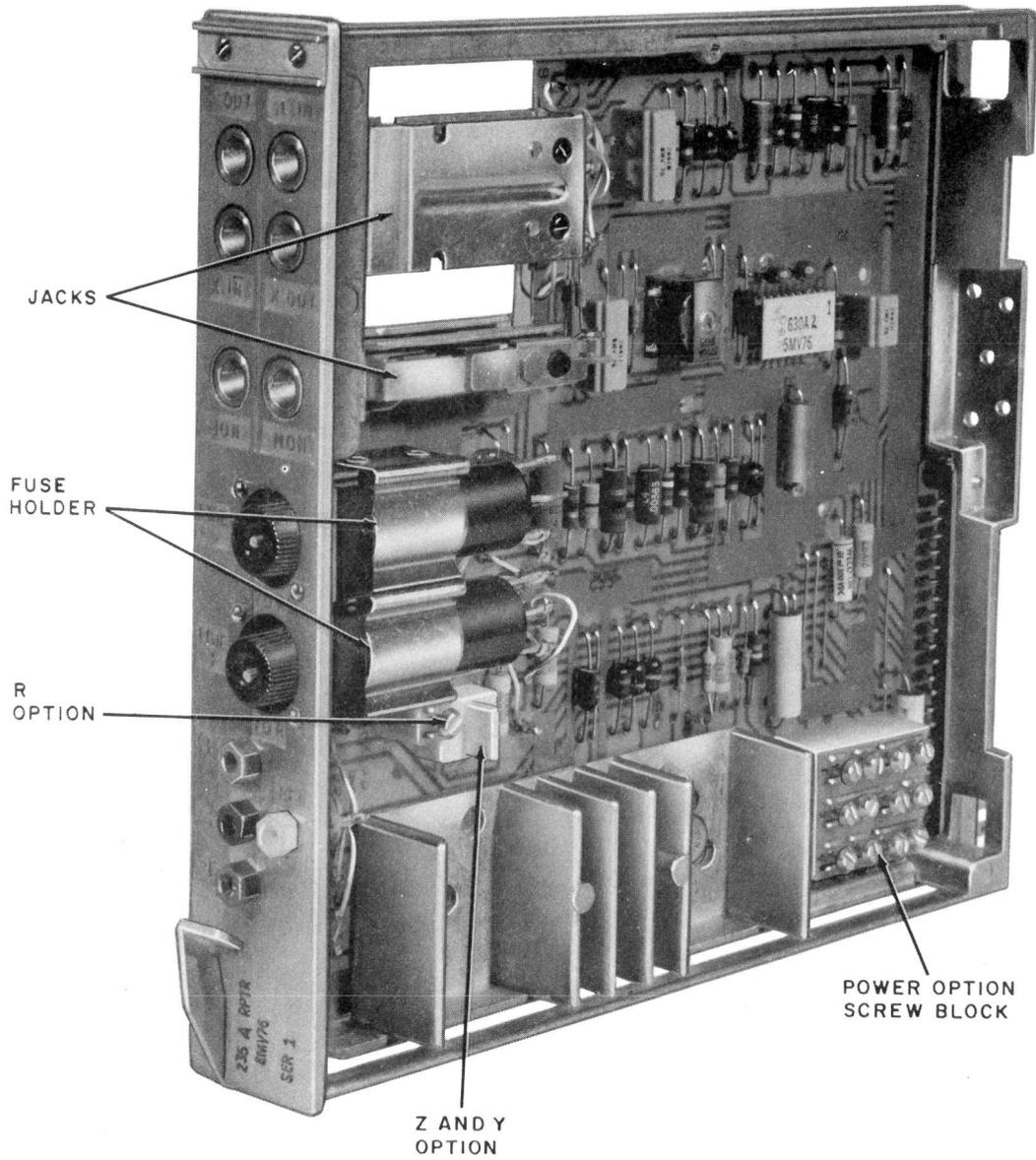


Fig. 9—236-Type Repeater

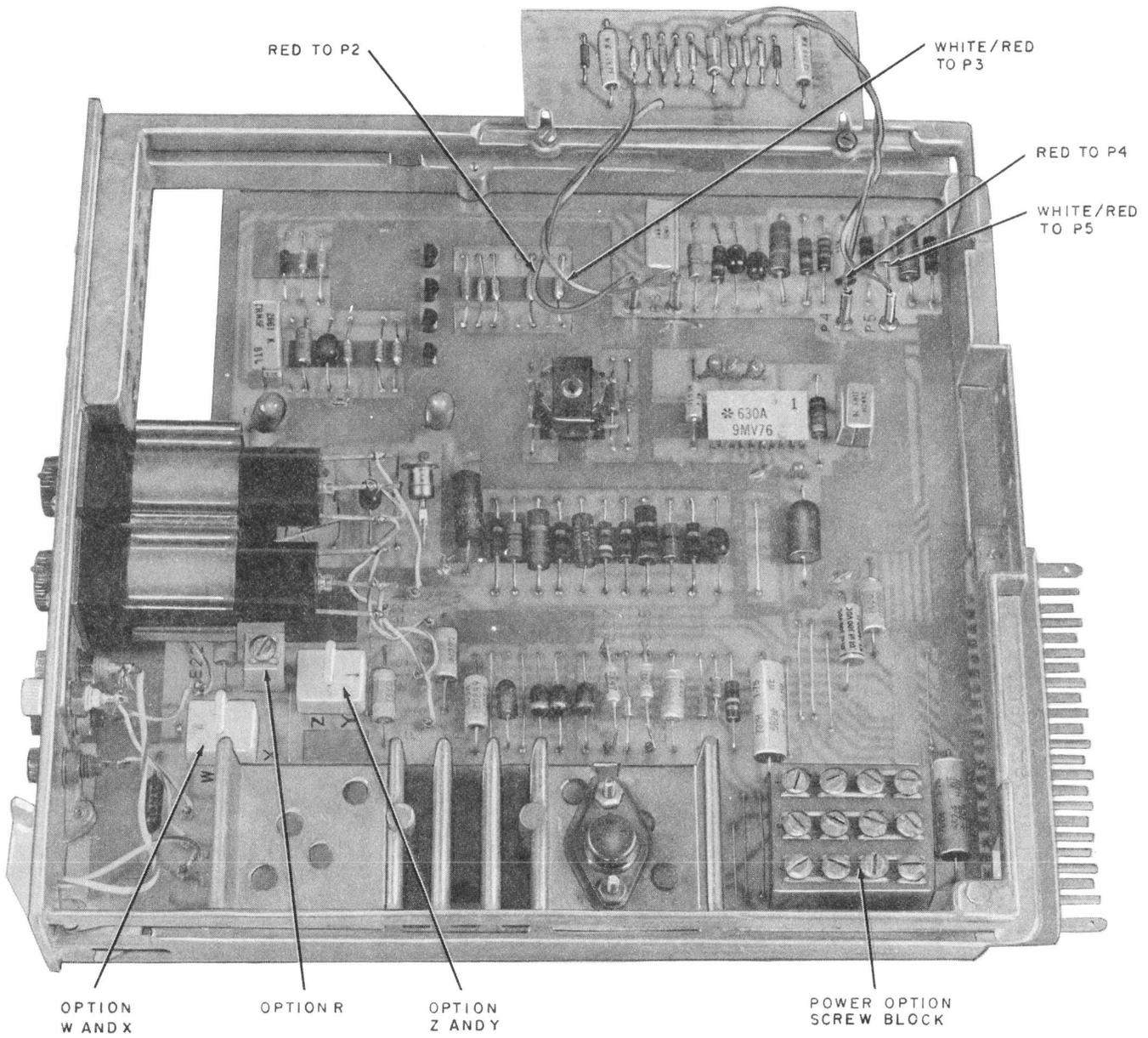


Fig. 10—236 EXCP Repeater Showing 983-Type Equalizer Connections

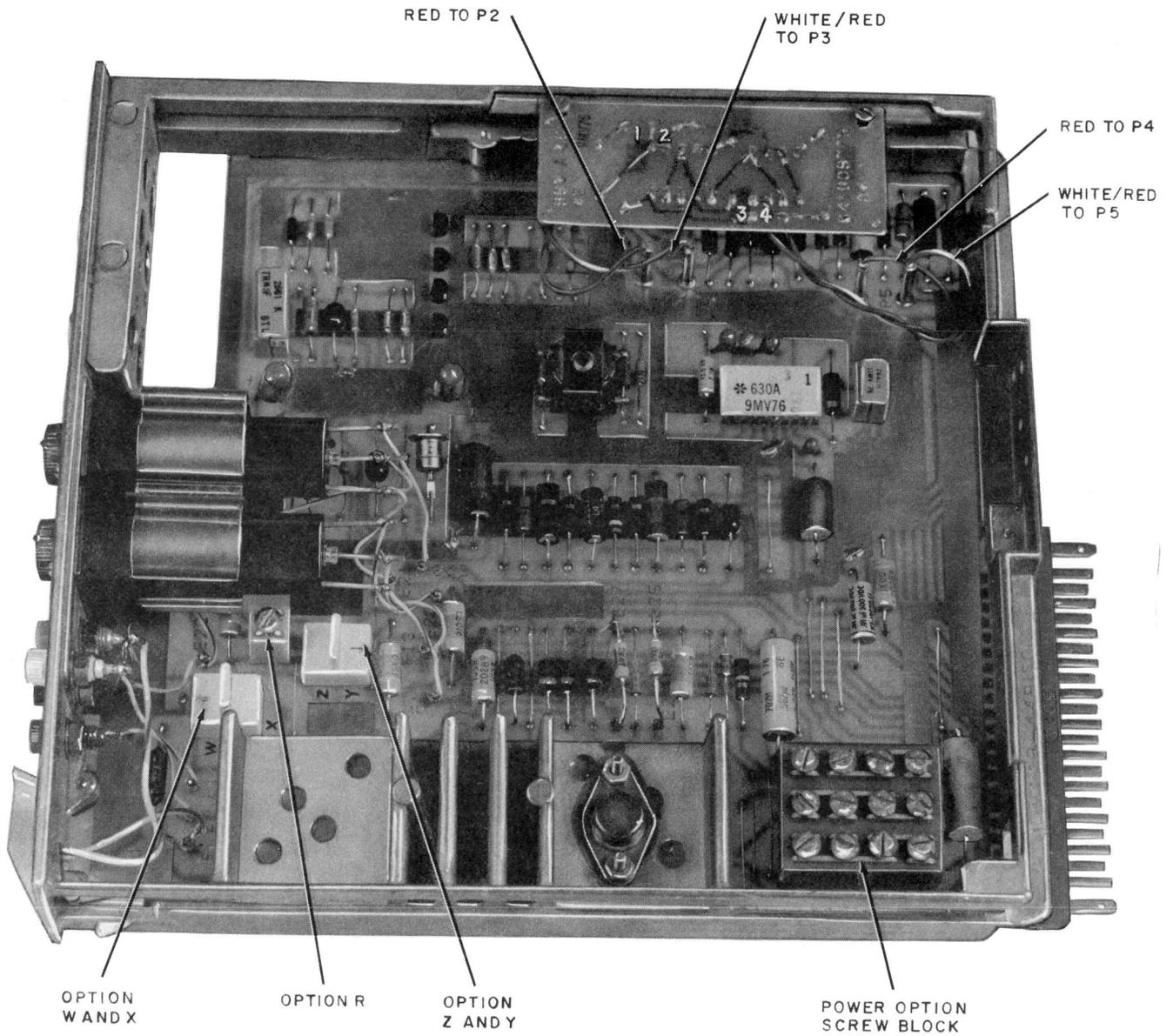


Fig. 11—236 EXCP Repeater Showing 983-Type Equalizer Installed