

**TD-3 AND TD-3A MICROWAVE RADIO
ANTENNA DUPLEXING
TEMPORARY SINGLE ANTENNA OPERATION
FOR EMERGENCY USE**

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1. GENERAL

1.01 This section describes a method for restoring service on TD-3 and TD-3A microwave radios whenever service has been interrupted due to failure of an antenna waveguide system. The procedure may be used when either the transmitting or receiving antenna waveguide system remains serviceable. However, this procedure will substantially degrade the system's performance and therefore the procedure given in Section 411-802-302 should be used when the ED-52011-30 antenna duplexing equipment is available.

2. PROCEDURES

2.01 The procedures described rearrange the waveguide connections so that one antenna

is used for both transmitting and receiving. In order to reduce interference, the transmitters and receivers are modified as follows:

- (a) The transmitter power outputs are reduced to 16 dB (Chart 1).
- (b) IF bandpass filters are added in the transmitters and receivers operating on channels 1, 2, 8, and 9 (Chart 1 and Chart 2).
- (c) 13-dB pads are added in the receiving waveguide run (Chart 2).
- (d) Both the transmitter and receiver are modified to operate on the same antenna (Chart 3).

2.02 If the ED-52011-30 antenna duplexing equipment becomes available while the system is operating as described above, rearrangements should be made which will considerably improve system performance. The modifications are as follows:

- (a) The 52E pads which were inserted in the receiving waveguide runs are replaced with microwave filter networks (Chart 4).
- (b) The pads and filters which were added in Chart 1 are changed (Chart 5).
- (c) The bandpass filters which were added in Chart 2 to the receivers are removed (Chart 5).

2.03 After the antenna waveguide system has been repaired, the system is returned to normal by following the procedure given in Chart 6.

3. TEST SETUP

CHART 1
TRANSMITTER MODIFICATION

APPARATUS:

- 1—19A Pad, 19 dB (1 each for transmitters operating on channels 3 through 7, 10, 11, and 12)
- 1—19A Pad, 6 dB (1 each for transmitters operating on channels, 1, 2, 8, and 9)
- 1—F50988 IF Bandpass Filter (1 each for transmitters operating on channels 1, 2, 8, and 9)
- 1—J68392A or J68428A Test Set or Equivalent
- 1—187A Adapter (For each TD-3A Transmitter)
- 1—190A Adapter (For each TD-3A Transmitter)

STEP	PROCEDURE
	<p>Note: The transmitters, which will operate on a common antenna, require modifications which will reduce interference to receivers operating on adjacent channels. The power output of the transmitters are reduced approximately 16 dB and bandpass filters are added in transmitters operating on channels 1, 2, 8, and 9. After modifications, a low microwave output power alarm will be activated.</p>
1	Remove service from a transmitter operating on channels 3 through 7, 10, 11, or 12.
2	Connect a 19-dB pad to the IF IN jack on the IF driver amplifier as shown in Fig. 1A for TD-3 or Fig. 1B for TD-3A.
3	Operate the ACO pushbutton on the transmitter control panel to silence the audible alarm.
4	Establish the test connections as shown in Fig. 2A for TD-3 and Fig. 2B for TD-3A and measure the transmitter output power.
	<p>Requirement: 16 \pm 2 dB below normal (The output power is determined by adding the loss stamped on the directional coupler to the power meter indication.)</p> <p>If the requirement is not met, adjust the attenuator which sets the input power to the TWT to meet the requirement.</p>
5	Restore service on the transmitter selected in Step 1.
6	Repeat Steps 1 through 5 for each transmitter operating on channels 3 through 7, 10, 11, or 12.

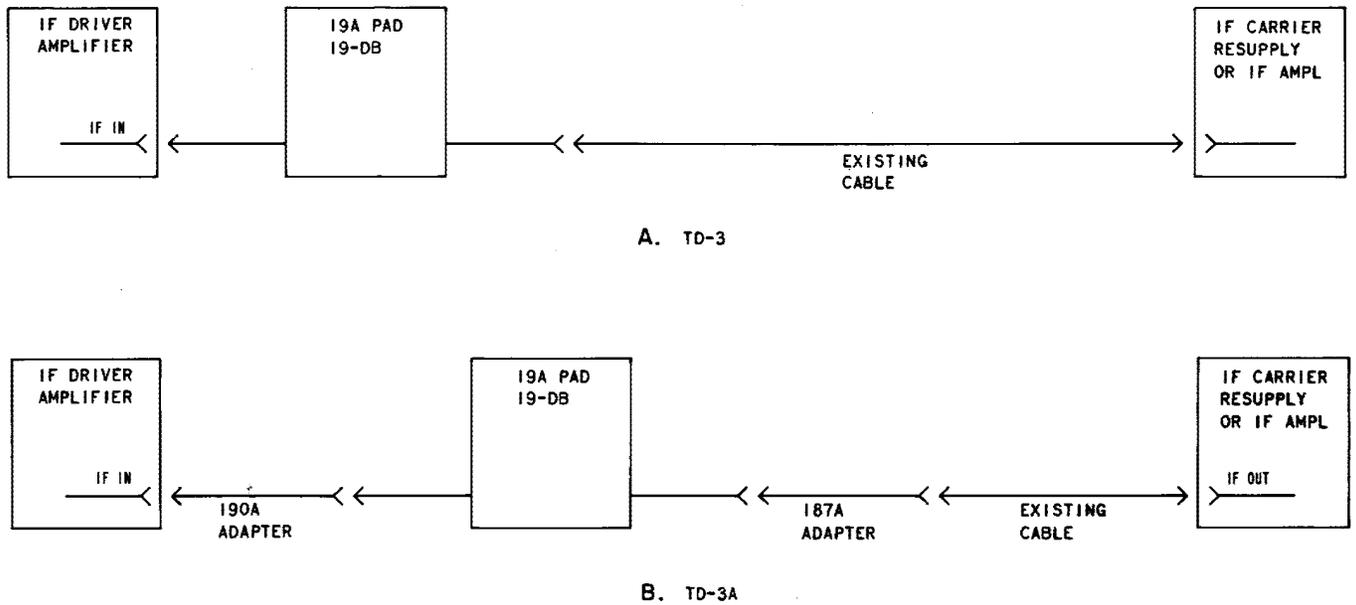


Fig. 1—TD-3 and TD-3A Transmitter Modification, Channels 3 Through 7, 10, 11, and 12

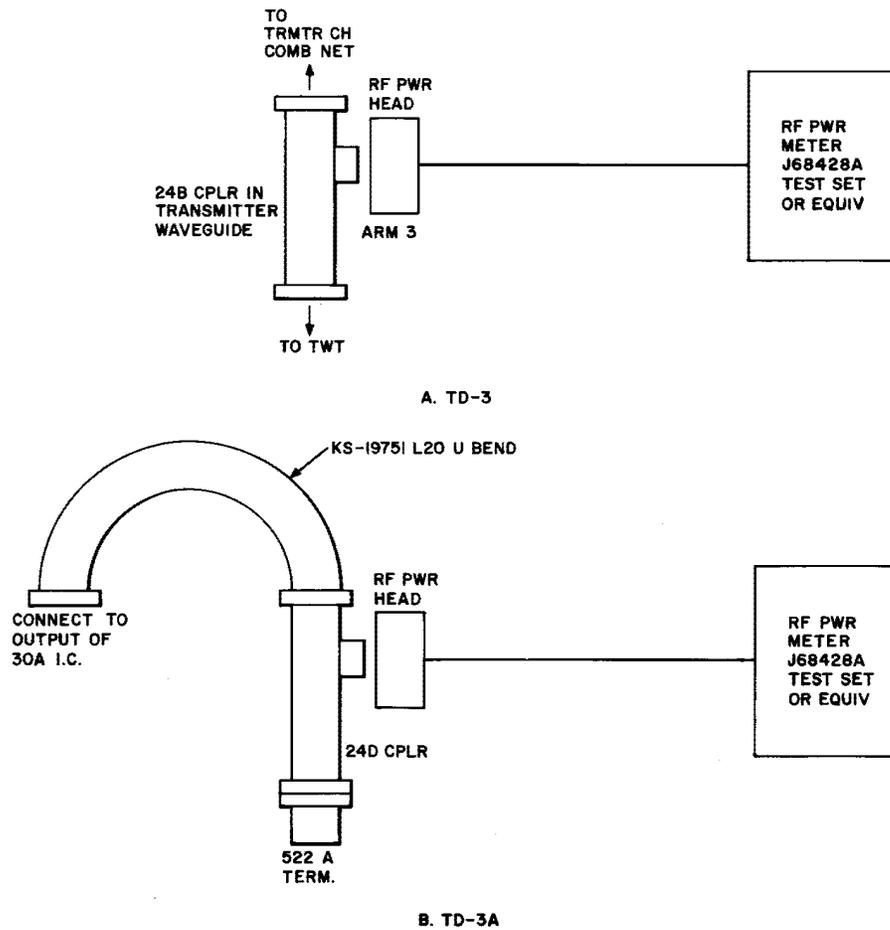
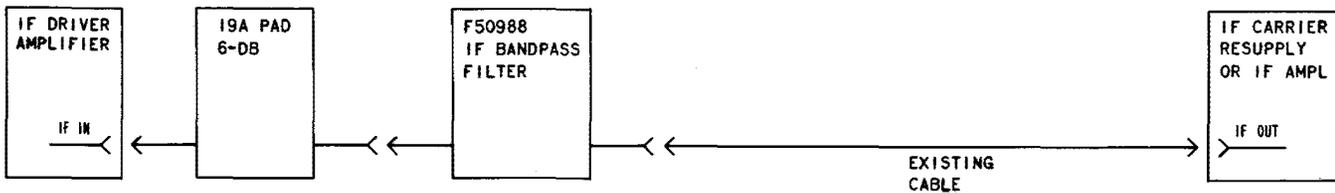
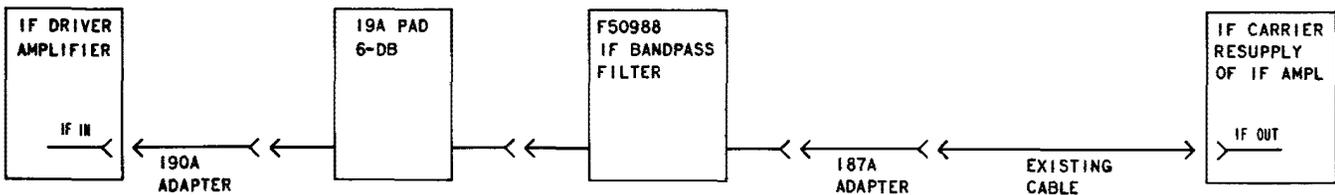


Fig. 2—TD-3 and TD-3A Transmitter Power Measurement

CHART 1 (Cont)	
STEP	PROCEDURE
7	Remove service from the transmitter operating on channel 1, 2, 8, or 9.
8	At the IF IN jack (J2) of the transmitter modulator, insert a 6-dB pad and an F50988 IF bandpass filter as shown in Fig. 3A for TD-3 or Fig. 3B for TD-3A.



A. TD-3



B. TD-3A

Fig. 3—TD-3 and TD-3A Transmitter Modification, Channels 1, 2, 8, and 9

CHART 1 (Cont)	
STEP	PROCEDURE
9	Operate the ACO pushbutton on the transmitter control panel to silence the audible alarm.
10	Measure the transmitter output power using the procedure given in Step 4.
11	Restore service on the transmitter selected in Step 7.
12	Repeat Steps 7 through 11 for transmitters operating on channels 1, 2, 8, and 9.
CHART 2	
RECEIVER MODIFICATIONS	
APPARATUS:	
1—574A Bandpass Filter (1 each required for receivers operating on channels 1, 2, 8, and 9)	
1—P2BJ Cord, 4 Feet Long (1 each required for receivers operating on channels 1, 2, 8, and 9)	
STEP	PROCEDURE
	Note: IF bandpass filters have to be added to receivers operating on channels 1, 2, 8, and 9 to reduce adjacent channel interference.
1	Remove service from a receiver operating on channel 1, 2, 8, or 9.
2	Insert a 574A filter at the output of the IF preamplifier as shown in Fig. 4. Note: This filter will be added in addition to any other filters already installed.
3	Restore service to the receiver selected in Step 1.
4	Repeat Steps 1 through 3 for receivers operating on channels 1, 2, 8, and 9.

CHART 2 (Cont)

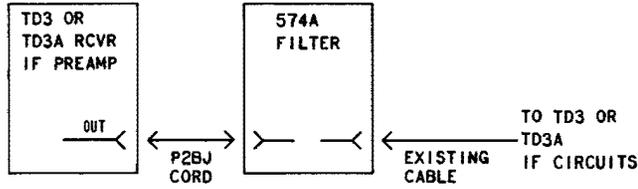


Fig. 4—Receiver Modifications

CHART 3

WAVEGUIDE REARRANGEMENTS

APPARATUS:

- 2—52E Pads, 13 dB
- 2—Coaxial Cables, 20 Ft Long, e/w Type N Connector
- 2—Coaxial Cables, 5 Ft Long, e/w Type N Connector
- 4—Transducers, Type 24A or 24B

STEP	PROCEDURE
	<p>Note: After the modifications of the transmitters and receivers (Chart 1 and 2), the waveguide arrangements can be made. During this procedure the input to the first channel separating network in the receiver line-up is hot patched from the receiving antenna to the last channel combining network in the transmitter lineup. A 13-dB pad is used in the equipment setup to reduce interference. When the procedure is completed, the receivers will be operating on the transmitting antenna. If it becomes necessary, a hot patch can be made from the transmitting to the receiving antenna.</p>
1	Remove the termination from arm 1 of the last channel combining network in the horizontal transmitter lineup. (If a TD auxiliary channel is connected to this port, remove the termination from the unused port of the circulator in the auxiliary channel transmitter antenna circuit.)
2	Connect the 20-foot coaxial cable and 24B transducer to the arm 1 port.
3	Connect the other end of the 20-foot cable to the 52E pad and 24B transducer as shown in Fig. 5, option (X).

CHART 3 (Cont)	
STEP	PROCEDURE
4	<p>Establish an order-wire circuit to the IF switching equipment associated with the radio system under test.</p> <p>Note: Monitor for alarms which may occur when performing Step 5. If any alarms occur which do not clear in 2 seconds, the connections being made shall be restored to normal and previous circuit arrangements checked.</p>
5	<p>Disconnect option (Y) and establish option (Z), Fig. 5.</p> <p>Note: This hot patch can only be made where a rigid waveguide section mates with a flexible waveguide section as shown in Fig. 6.</p> <p>Caution: The receiver must be connected to the transmitters operating on the same polarization.</p>
6	<p>Repeat Steps 1 through 5 for the transmitters and receivers operating on the vertical polarization. (After Steps 1 through 5 have been completed for both polarizations, the receivers will be operating on the transmitting antenna.)</p>
7	<p>Perform Steps 8, 9, and 10 if it becomes necessary to hot patch the horizontal receivers and transmitters to the horizontal receiving antenna.</p>
8	<p>Connect option (T) to option (Y), Fig. 5.</p>
9	<p>Connect option (W) and disconnect option (V) as shown in Fig. 7.</p> <p>Caution: An RF radiation hazard may exist (See Sections 010-150-001 and 010-150-002).</p>
10	<p>Repeat Steps 8 and 9 for the vertical polarization if necessary.</p>
11	<p>The transmitters and receivers are now operating on the same antenna. If the system is unserviceable, it is possible that one-half of the channels can be made serviceable by removing channels 1 through 6, or 7 through 12 from service and locking these channels out at the IF protection switching system, and removing the IF input to the IF driver amplifier.</p>

CHART 4

INSTALLATION OF MICROWAVE NETWORKS

APPARATUS:

1—ED-52011-30 Equipment for Antenna Duplexing (See SD-51353-01, Fig. 1)

STEP	PROCEDURE
1	<p>Note: The procedure in this chart should be performed if the ED-52011-30 antenna duplexing equipment becomes available. This procedure replaces the 13-dB pads added in the receiver waveguide runs, with microwave networks.</p> <p>Verify that the correct filters are installed in the microwave networks by opening the filter cases and checking the stamping on each filter (See SD-51353-01, Fig. 1, Note 101).</p> <p>Note: The networks which will be used to replace the pad in the vertical waveguide run shall contain a bandstop filter at the frequency of each vertically polarized transmitter, and a terminated bandpass filter at the frequency of each horizontally polarized transmitter. The networks which will be used to replace the pad in the horizontal waveguide run shall contain bandstop filters at the frequency of each horizontally polarized transmitter and terminated bandpass filters at the frequency of each vertically polarized transmitter. If an auxiliary channel transmitter is operating on the common antenna, a bandstop filter at the frequency of the auxiliary channel transmitter is required in series with the networks which will be placed in the waveguide run to which the auxiliary channel receiver is connected.</p>
2	<p>Connect the network and transducer assemblies as shown in Fig. 8. Use the special clamp, provided with the ED-52011-30 as shown in Fig. 9 to fasten the two transducers together so that the flanges are separated about 6 inches.</p> <p>Caution: <i>Do not make the connection to the receiver waveguide run at this time.</i></p>
3	<p>Establish an order-wire circuit to the IF switching equipment associated with the radio system under test.</p> <p>Note: Monitor for alarms which may occur when performing Step 4. If any alarms occur which do not clear in 2 seconds, the connections being made shall be restored to normal and previous circuit arrangements checked.</p> <p>Caution: <i>When performing Step 4, an RF radiation hazard may exist (See Sections 010-150-001 and 010-150-002).</i></p>

CHART 4 (Cont)	
STEP	PROCEDURE
4	<p>Hot patch the proper microwave networks into the vertical receiving waveguide run in place of the 52E pad (Fig. 8).</p> <p><i>Note:</i> The pad shall be removed by sliding it out the wide side of the waveguide. After the pad has been removed, slide the transducers in from the wide side of the waveguide. While this is being done, the two open ends of the waveguide must be kept facing each other.</p> <p><i>Caution:</i> <i>The transducer connected to the input of the network must be connected to the waveguide to the antenna; the transducer connected to the output of the networks must be connected to the receiver inputs (Fig. 8).</i></p>
5	Repeat Steps 3 and 4 for the horizontal polarization.
CHART 5 TRANSMITTER AND RECEIVER REARRANGEMENTS	
<p>APPARATUS:</p> <p>1—ED-52011-30, Antenna Duplexing Equipment</p> <p>1—J68428A Test Set or Equivalent</p> <p>1—KS-14510 Volt-Ohm-Milliameter (VOM)</p>	
STEP	PROCEDURE
	<p><i>Note:</i> After the installation of the microwave networks, the transmitters and receivers are rearranged. The pads added to the transmitters in Chart 1 are removed, and IF bandpass filters are added to all the transmitters. The bandpass filters added to the receivers in Chart 2 are removed. DC amplifiers are added in the alarm circuits to restore the low microwave output alarm.</p>
1	Connect the two dc power supplies (part of ED-52011-30), to a convenient ac outlet. Using the power distribution box, connect the 6-volt output of each power supply to six dc amplifiers as shown in Fig. 10.
2	Measure the 6-volt output of each power supply with the KS-14510 VOM.
	Requirement: 6 ± 1.0 volts

CHART 5 (Cont)

STEP	PROCEDURE
3	Remove a transmitter from service which is operating on the common antenna.
4	Install a filter and pad as shown in Fig. 11A for TD-3 and Fig. 11B for TD-3A and remove the pads installed in Chart 1.
5	<p>Establish the connections given in Fig. 3 and determine the output power by adding the loss stamped on the output monitor to the power meter indication.</p> <p>Requirement: 10 dB below the rated output of the transmitter.</p> <p>If the requirement is not met, adjust the attenuator which sets the input to the TWT to meet the requirement.</p>
6	Remove the connections established in Step 5.
7	Connect a dc amplifier in the alarm circuit as shown in Fig. 10.
8	Operate the transmitter control panel switch to the TRMTR OUT position and adjust the DC amplifier gain control for the TRMTR OUT indication posted on the control panel.
9	Restore the transmitter to service.
10	Repeat Steps 3 through 8 for each transmitter operating on the common antenna.
11	Remove a receiver from service which is operating on channel 1, 2, 8, or 9.
12	Remove the IF bandpass filter added in Chart 2.
13	Restore the receiver to service.
14	Repeat Steps 12 and 13 for receivers operating on channels 1, 2, 8, and 9.

CHART 6

RESTORATION TO THE TWO-ANTENNA ARRANGEMENT

APPARATUS:

None

CHART 6 (Cont)

STEP	PROCEDURE
1	<p>Establish an order-wire circuit to the IF switching equipment associated with the radio system under test.</p>
	<p>Note: Monitor for alarms which may occur when performing Step 2. If any alarms occur which do not clear in 2 seconds, the connections being made shall be restored to normal and previous circuit arrangements checked.</p>
2	<p>If the transmitters and receivers were connected to the receiving antenna (Chart 3, Step 7 through 10), connect option (V) of Fig. 5 and disconnect option (W) of Fig. 7.</p>
3	<p>Repeat Step 2 for the horizontal polarization.</p>
4	<p>Disconnect option (T) of Fig. 5.</p>
5	<p>Hot patch the vertically polarized receivers to the vertically polarized receiving antenna by connecting option (Y) of Fig. 5 and disconnect option (Z), Fig. 6.</p>
6	<p>Repeat Step 5 for the horizontally polarized receivers connecting them to the horizontally polarized antenna.</p>
7	<p>Disconnect option (X) and replace the termination removed in Chart 3, Step 1.</p>
8	<p>Remove any 574A filters added to the receiver. (This is accomplished by removing the receiver from service, restoring the IF connections to normal, and returning the receiver to service.)</p>
9	<p>Restore the transmitters to normal. (This is accomplished by removing a transmitter from service, removing the added pads and filters, and restoring the IF connections to normal.)</p>
	<p>Note: The attenuator adjustment for the TWT input shall be readjusted for normal operation prior to restoring the transmitter to service.</p>

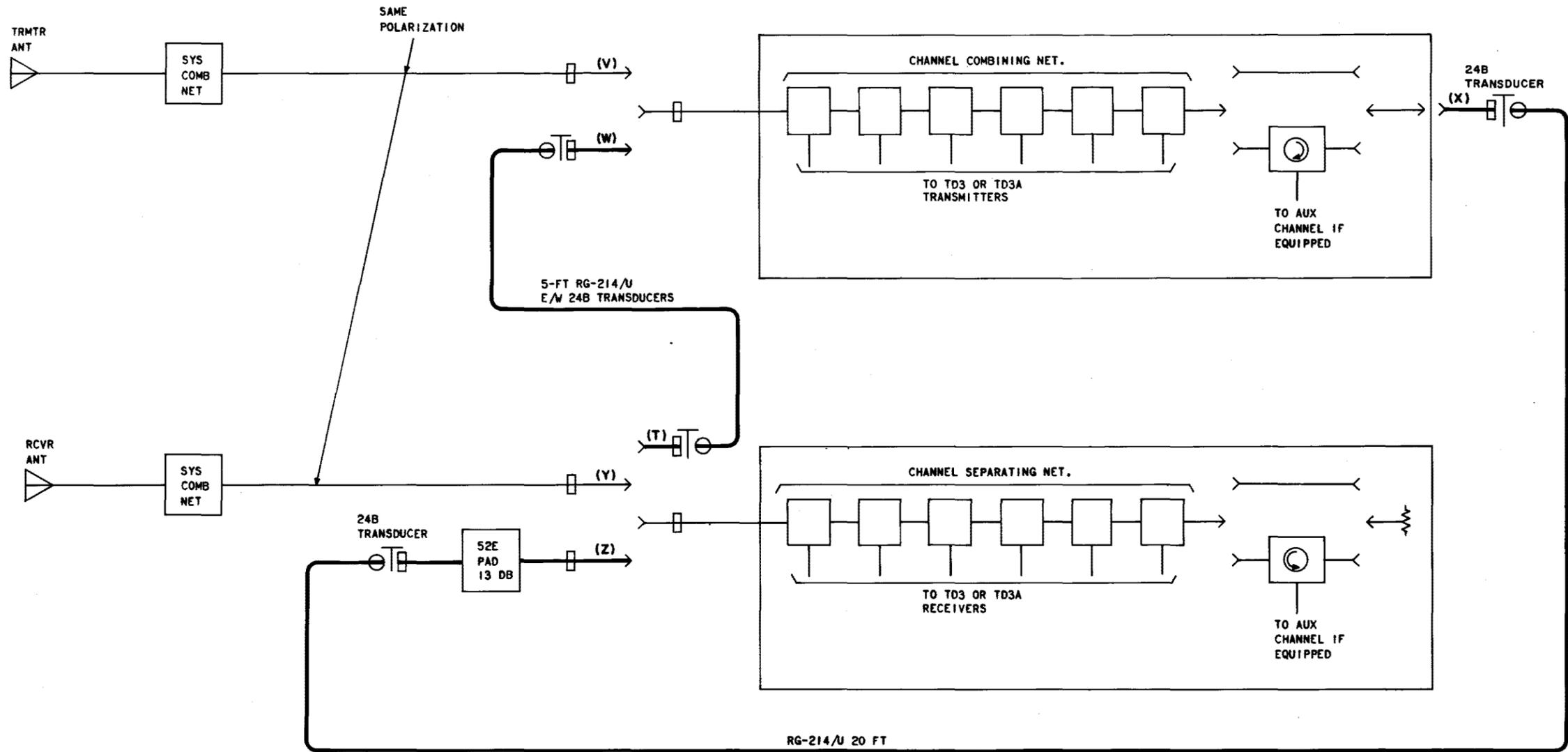


Fig. 5—Waveguide Rearrangement

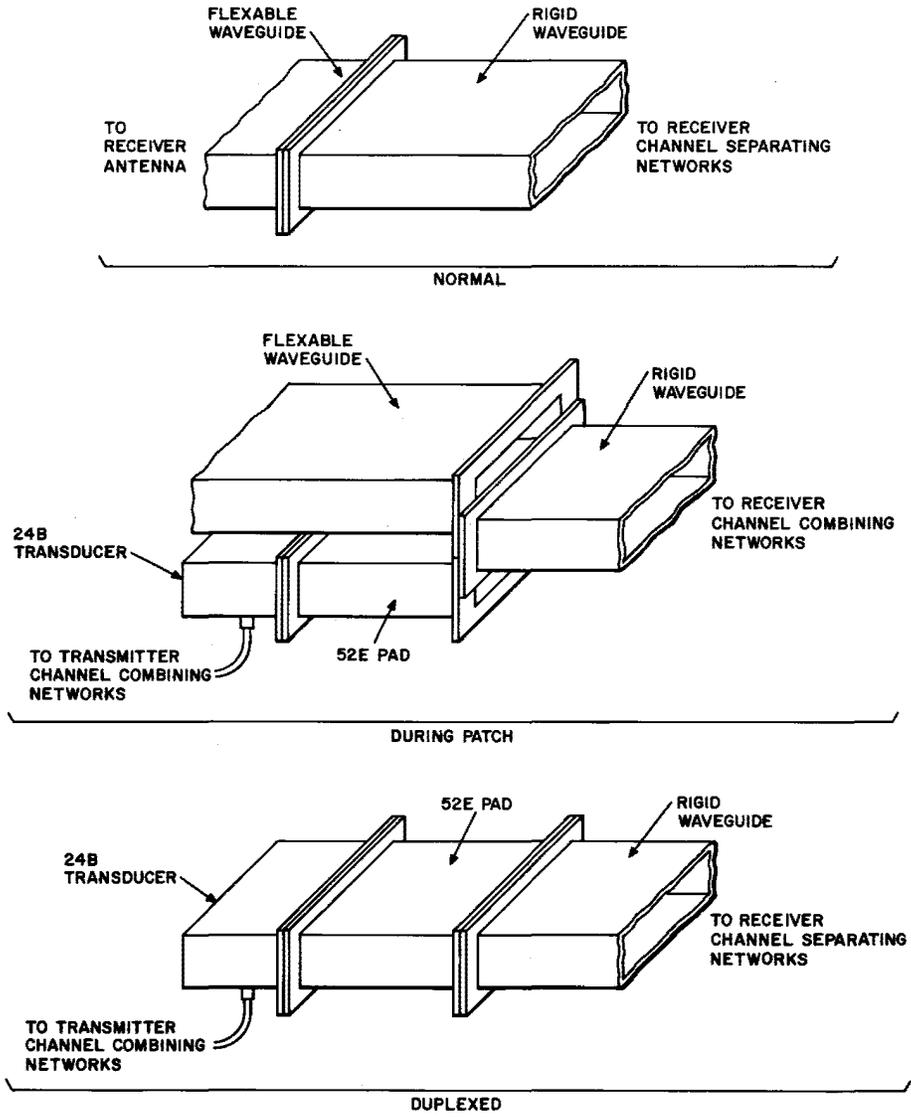


Fig. 6—Hot Patch to Transmitter Antenna

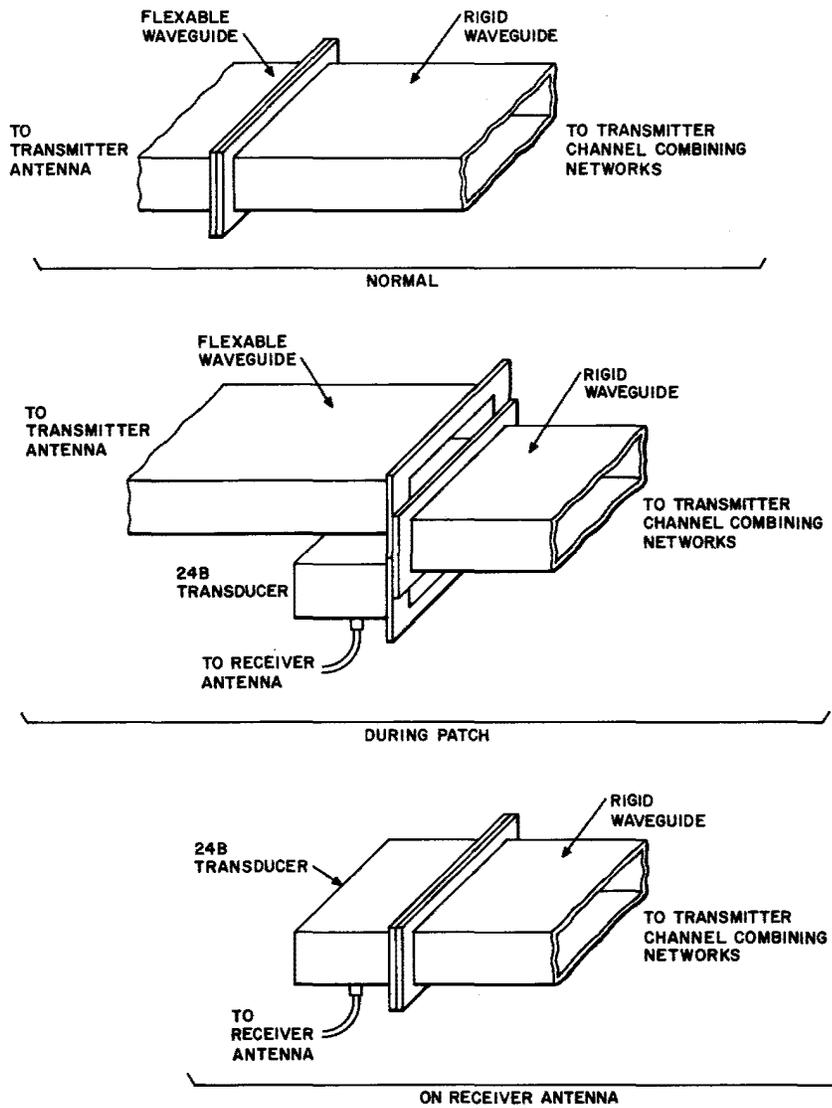


Fig. 7—Hot Patch to Receiver Antenna

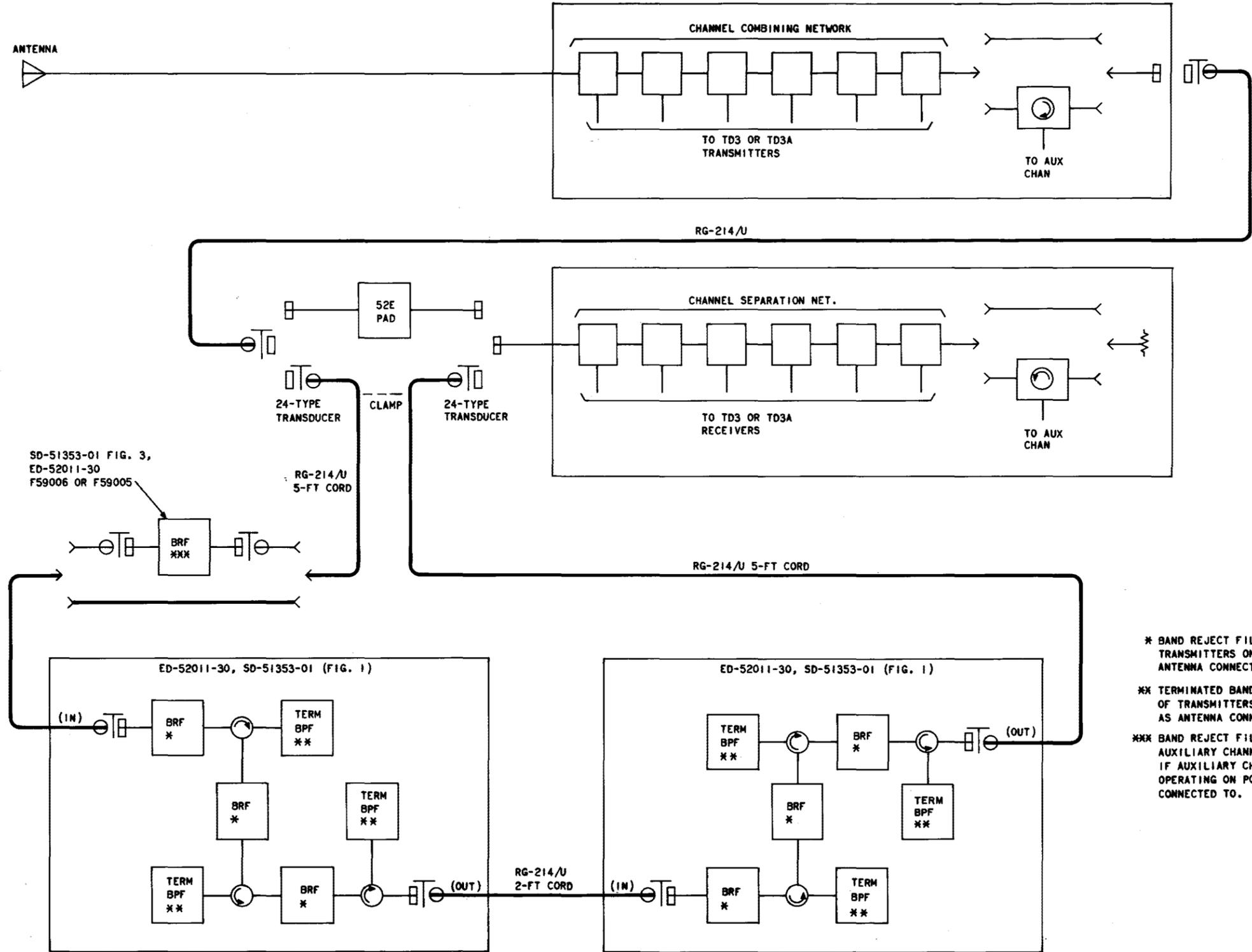


Fig. 8—Installation of Microwave Network

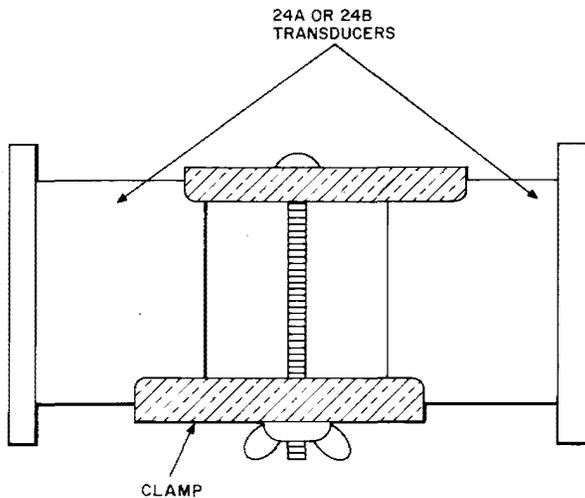


Fig. 9—Transducer Clamp Assembly

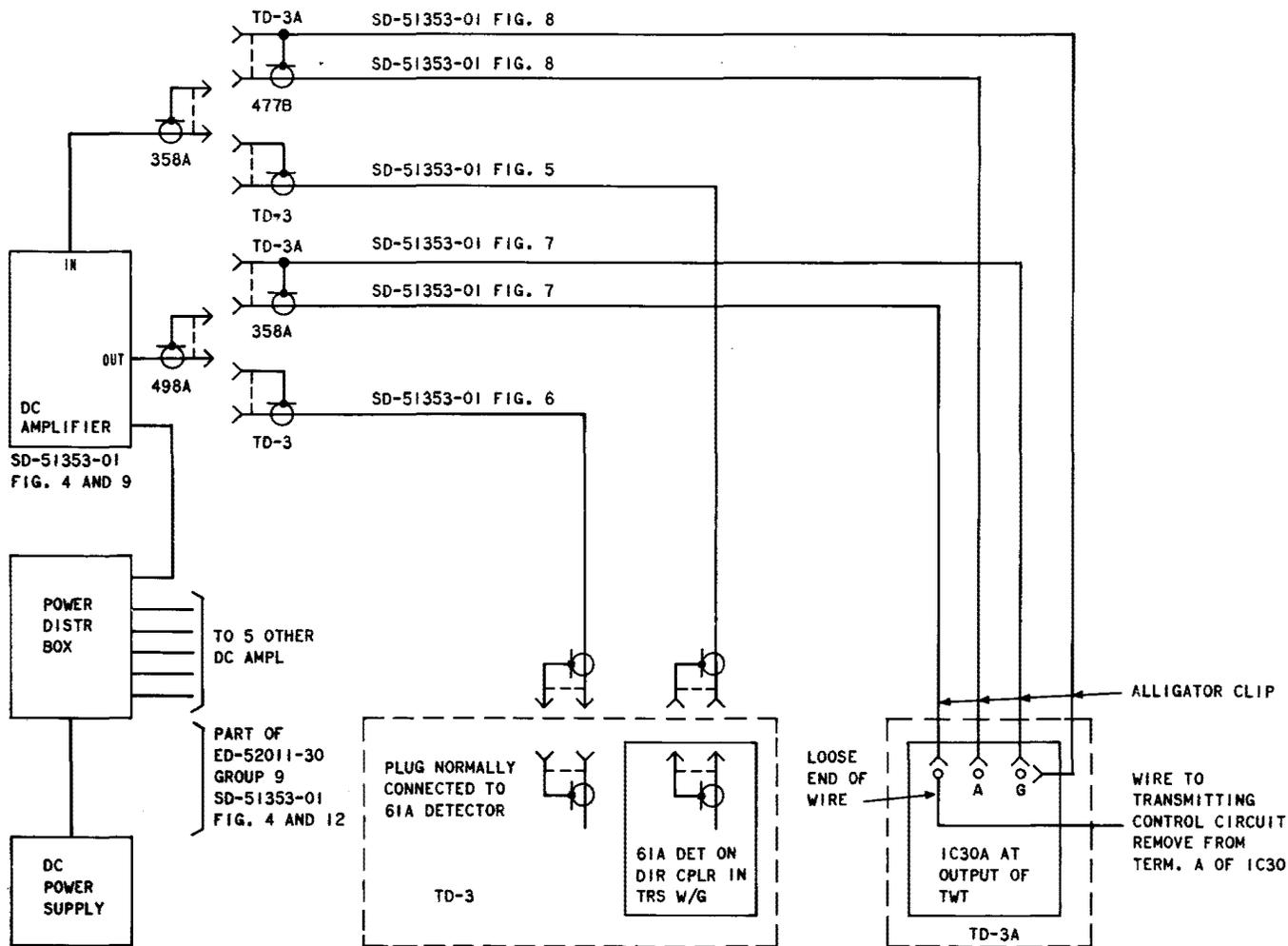
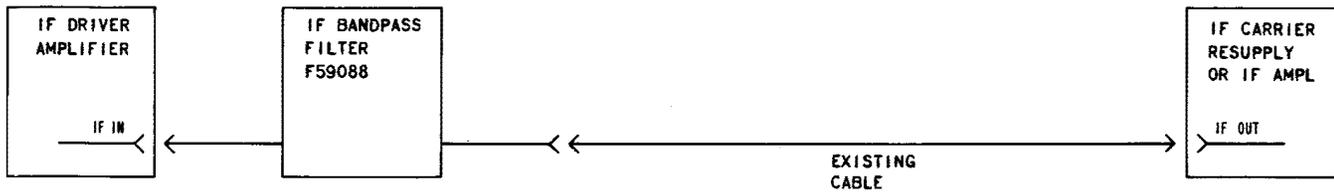
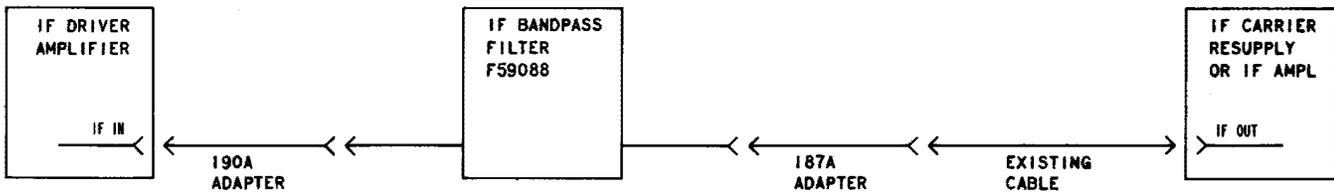


Fig. 10—Transmitter Alarm Modification



A. TD-3



B. TD-3A

Fig. 11—TD-3 and TD-3A Transmitter Modification