

**TL MICROWAVE RADIO
TRANSMITTER TESTS
COMPONENT AND SUBASSEMBLY REPLACEMENT**

This section is reissued to remove equipment tests common to both the transmitter and receiver and to change the format to provide separate charts for each test. Table A which gives the procedures for removing and restoring service is also added. Since this reissue covers a general revision, marginal arrows ordinarily used to indicate changes have been omitted.

This section describes the procedures for replacing the transmitter klystron XMTR KLY, the J99262J transmitter baseband amplifier, and the KS-16412 diode in 53A detectors DET 1 and DET 2. The necessity for replacement of any of the above shall be determined from tests outlined in other sections of this series.

Caution: Service Interruption — *Removing the transmitter klystron or the transmitter baseband amplifier will interrupt service on a working channel. Before removing either of these items, the transmitter shall be removed from service in accordance with Table A. Since the procedures that remove the above items require circuits which are common to the receiver on the same panel to be opened, the receiver must also be removed from service.*

The diodes in the 53A detectors may be replaced while the equipment is in service. Care shall be taken to avoid disturbing the working equipment.

CHART	PAGE
1 — Replacing the Transmitter Klystron Tube	1
2 — Replacing the J99262J Transmitter Baseband Amplifier	4
3 — Replacing the KS-16412 Diode in 53A Detectors DET 1 and DET 2	5

CHART 1

REPLACING THE TRANSMITTER KLYSTRON TUBE

APPARATUS:

- KS-6854 Screwdriver
- 3414 Spintite 7/16-inch Hexagon Socket Wrench, or equivalent
- Heat-Resistant Gloves

CHART 1 (Cont)

Warning: Regarding High Temperatures Inside the P-43H343 Cover Assembly — Portions of the vapor phase cooler, the shells of the klystrons, and the P-43H345 clamp assembly are normally too hot to handle with bare hands. Gloves, a folded wiping cloth, or a handkerchief shall be used to protect personnel when handling any of these items.

External surfaces of the klystron and its assembly are at ground potential.

Note: If it is necessary to replace a transmitter klystron because of low filament activity at the same time that the KS-16412 diode is replaced in the 53A detector DET 1, the KS-16412 diode shall be replaced first so that the detector circuit may be recalibrated in accordance with Step 7 in Chart 3.

STEP	PROCEDURE
1	Remove the transmitter and receiver from service in accordance with Table A.
2	Turn the selector switch on the transmitter-receiver meter and control panel to -400.
3	Remove the KLYSTRON FUSE from the front of the power supply.
4	Observe that the voltmeter indication on the meter and control panel drops to zero.
5	Remove the P-43H343 cover assembly. (See Fig. 1.)
6	Release the flange of the flexible waveguide on the rear of the klystron on the right by pulling the two slides approximately 1/4 inch toward the right. (See Fig. 2.)
7	Using a Spintite 7/16-inch hexagon wrench, or equivalent, loosen the P-43H345 clamp assembly by turning the 1/4-20 slotted-hexagon-head bolt clockwise until both klystrons are loose with respect to the boiler. <i>Do not overloosen.</i>
8	While holding the tube socket of the klystron on the right in one hand, lift the P-43H345 clamp assembly (use gloves or a folded cloth to protect hand from the heat) approximately 3/16 inch until the clamp is free of positioning-pin holes and remove the clamp assembly.
9	Disengage the klystron from the waveguide flange of the flexible waveguide by pulling the klystron forward and remove the klystron from the tube socket. Note the reading of the indicator on top of the klystron so that the new klystron to be installed may be set to approximately the same frequency before power is applied.
10	Using a dry rag, wipe the accumulated dirt from: <ol style="list-style-type: none"> <li>(a) The right vertical surface of the boiler. <li>(b) The contact surface of the flange on the flexible waveguide. (Take care not to introduce foreign matter into the opening of the flexible waveguide.) <li>(c) The surface of the klystron which will butt against the boiler. <li>(d) The surface of the new klystron and the waveguide window which will mate with the flexible waveguide.

CHART 1 (Cont)	
STEP	PROCEDURE
11	Install the tube socket on the lower end of the new klystron.
12	<p>Connect the klystron to the flexible waveguide by :</p> <p>(a) Registering the alignment pins.</p> <p>(b) Butting the klystron to the waveguide flange.</p> <p>(c) Pushing the two slides on the flange toward the left.</p> <p>Avoid overstressing the flexible waveguide by holding the klystron reasonably close to its installed position. (See Fig. 2.)</p>
13	Position the klystron so that it butts against the right side of the boiler. Position the receiver klystron on the left so that it butts against the left side of the boiler. Seat both klystrons against the lips of the aluminum support which project from under the boiler.
14	Install the clamp assembly making sure that the positioning pins are in place and that both klystrons are seated against the boiler. Turn the 1/4-20 slotted-hexagon-head bolt counterclockwise until the bolt is at least one full turn beyond the point where it begins to turn freely.
15	Using the tuning screw on the klystron, adjust the klystron until the indicator on the top surface of the klystron reads approximately the same as on the klystron which was removed in Step 9.
16	Replace the P-43H343 cover assembly.
17	Turn the meter selector switch on the meter and control panel to -400.
18	<p>Replace the KLYSTRON FUSE in the front panel of the power supply.</p> <p><i>Note:</i> When service conditions permit the transmitter and the receiver to be out of service for a 30-minute warmup period, omit Steps 19 through 22. In nondiversity systems or in other cases where it is important to restore service quickly, include Steps 19 through 22.</p>
19	Retune the transmitter klystron in accordance with Sections 409-304-501 and 409-304-502.
20	Return the transmitter and receiver to service in accordance with Table A.
21	For a minimum of 30 minutes, while the transmitter is in service and the klystrons are warming up, "ride" the transmitter klystron frequency in accordance with the in-service frequency check procedure in Section 409-304-501.
22	When service conditions permit interruption of service on the transmitter and receiver, remove the transmitter and receiver from service in accordance with Table A. Omit the 30-minute waiting period and proceed with Steps 23 and 24.

CHART 1 (Cont)	
STEP	PROCEDURE
23	Allow a 30-minute warmup period, and then retune the transmitter klystron in accordance with Sections 409-304-501 and 409-304-502.
24	Check the tuning of the receiver klystron in accordance with Section 409-306-502. Return the transmitter and receiver to service in accordance with Table A.
CHART 2	
REPLACING THE J99262J TRANSMITTER BASEBAND AMPLIFIER	
APPARATUS:	
None required.	
STEP	PROCEDURE
1	Remove the transmitter and receiver from service in accordance with Table A.
2	Remove the KLYSTRON FUSE and the IF AMPL BB FUSE from the front of the power supply and observe that the voltmeter indication has dropped to zero when the meter selector switch on the transmitter-receiver meter and control panel is set at -400 .
3	Remove the meter and control panel. Unlock the Camloc fastener at each of the four corners of the meter and control panel by turning it approximately one-half turn counter-clockwise. Using the two handles, pull the meter and control panel from its housing. Store the panel in a position so that the long dimension of the panel is approximately vertical. <i>Note:</i> The meter and control panel contains a 276-type relay. This relay contains a mercury-wetted reed-type switch. If the relay is turned on its side, the switch contacts will be immersed in an excess amount of mercury which may not drain off the contacts when the relay is returned to its vertical position. However, if the relay is accidentally turned over on its side, return the relay to its vertical position and tap the side of the relay several times to remove the excess mercury.
4	Remove the coaxial cable from the IN jack of the transmitter baseband amplifier. (See Fig. 1.) Disengage the pin connector from the OUT jack of the transmitter baseband amplifier and remove the $-20V$ and GRD leads from the terminal block. (See Fig. 3.) Note the color code of the leads.
5	Release the mounting screws in the three keyhole slots on the left side of the housing for the meter and control panel and remove the transmitter baseband amplifier.

CHART 2 (Cont)	
STEP	PROCEDURE
6	Install the replacing transmitter baseband amplifier in the keyhole slots and tighten the three mounting screws.
7	Reconnect the connections to the OUT jack and the -20V and GRD terminals taking care to use the wires with the same color codes as removed in Step 4. Redress the leads away from the body of the coupling capacitor. (See Fig. 3.)
8	Reinstall the meter and control panel. (Insert the meter and control panel into the housing and feel the connectors into place. Lock the Camloc fasteners at each of the four corners of the meter and control panel by seating the fasteners against their spring action and turning them approximately one-half turn clockwise.) (See note in Step 3.)
9	Turn the meter selector switch on the meter and control panel to -400.
10	Replace the KLYSTRON FUSE and the IF AMPL BB FUSE on the front of the power supply.
11	Adjust the transmitter deviation in accordance with Section 409-304-502.
12	Reconnect the coaxial cable to the IN jack of the transmitter baseband amplifier.
13	Return the transmitter and receiver to service in accordance with Table A.
CHART 3	
REPLACING THE KS-16412 DIODE IN 53A DETECTORS DET 1 AND DET 2	
APPARATUS:	
Right-angle Screwdriver	
<i>Caution: The diodes in the 53A detectors may be replaced while the transmitter and receiver are in service. Care shall be taken not to disturb the in-service equipment.</i>	
STEP	PROCEDURE
1	Remove the coaxial cable from the jack on 53A detector DET 1 or DET 2 containing the diode which is to be replaced. (See Fig. 4.)
2	Remove the top collar assembly of the detector by removing the four round head machine screws and withdrawing the top collar assembly from the body of the detector. (If the collar assembly is not free when the four screws are removed, turn the collar clockwise only with respect to the body of the detector in any attempts to free the collar.)

CHART 3 (Cont)	
STEP	PROCEDURE
3	Remove the KS-16412 diode by turning the body of the diode counterclockwise with respect to the top collar assembly.
4	Install the replacing KS-16412 varistor diode by turning the body of the diode clockwise with respect to the top collar assembly until the diode is finger tight in the assembly. <i>Caution: Do not handle the diode by its probe. Handle the diode so that the fingers are always in contact with the outer shell of the diode case.</i>
5	Reinstall the top collar assembly using care to feel the probe of the diode back into place. (If it is necessary to turn the collar assembly, it must be turned clockwise only with respect to the body of the detector. Do not turn the collar assembly any more than necessary to feel-in the diode and align the screw holes in the top collar assembly.)
6	Reinstall the coaxial cable assembly.
7	Recalibrate the circuits associated with the particular 53A detector, DET 1 or DET 2, worked on above. For DET 1, adjust R35 on the transmitter-receiver meter and control panel for the same decibels reading on the lower meter (meter selector switch to be set at XMTR RF PWR position) as the last previous normal reading recorded on the station log. <i>Note:</i> The transmitter klystron supplying RF power when adjusting R35 must be the same as the transmitter klystron supplying RF power when the last previous normal reading was made and recorded in the station log. If the transmitter klystron is not the same as that which supplied RF power when the last previous normal reading was made, it will be necessary to calibrate the meter panel in accordance with the procedures in Section 409-304-505. For DET 2, push the arm of the 26A attenuator AT2 firmly against its stop, and adjust the BIAS control on the front of the meter and control panel so that the upper meter has a zero center indication when its associated toggle switch is set at XMTR. Release the arm of the 26A attenuator AT2 and adjust the SENS control on the front of the meter and control panel so that the upper meter now indicates between 25 and 40 micro-amperes.

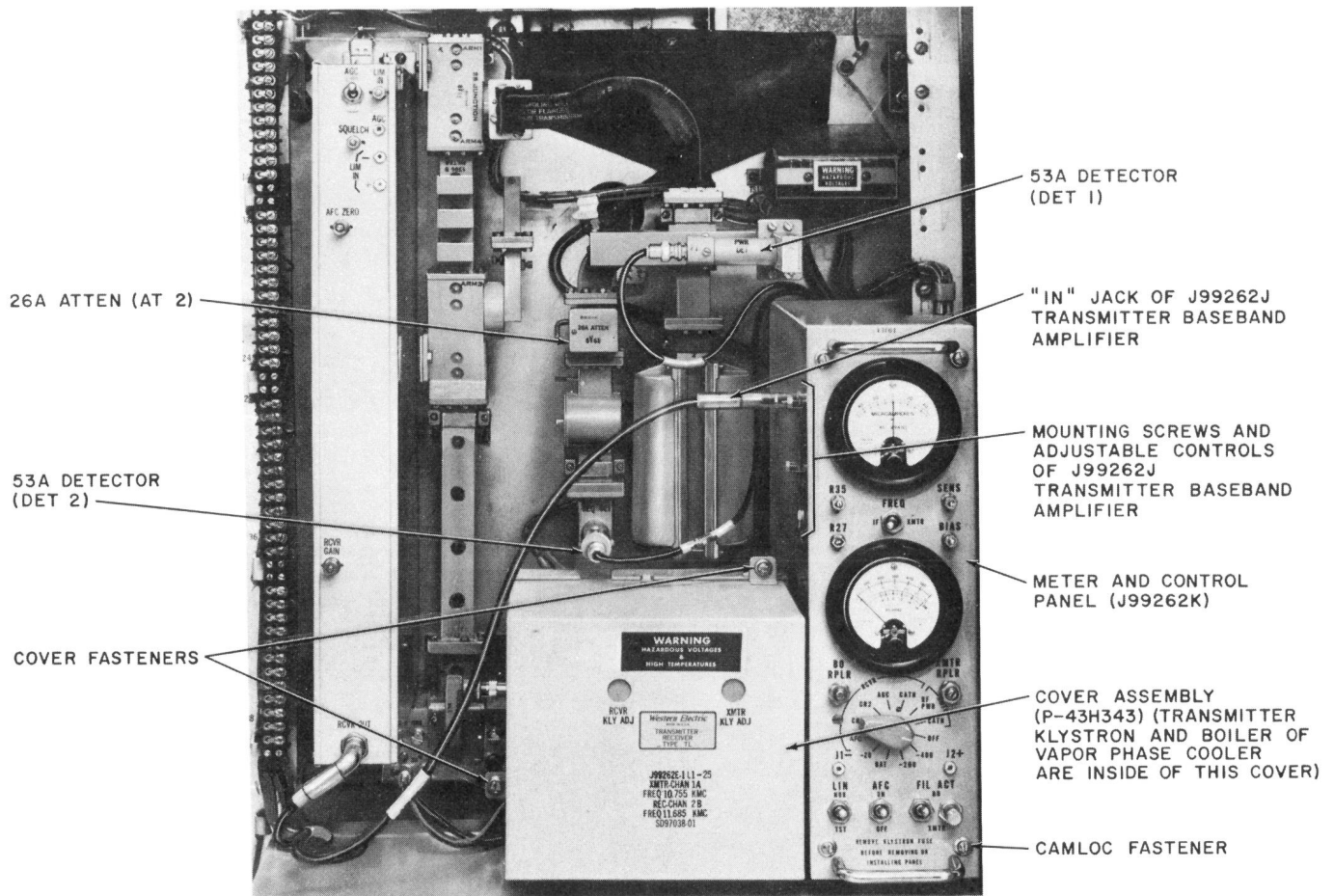


Fig. 1 — Transmitter-Receiver Panel

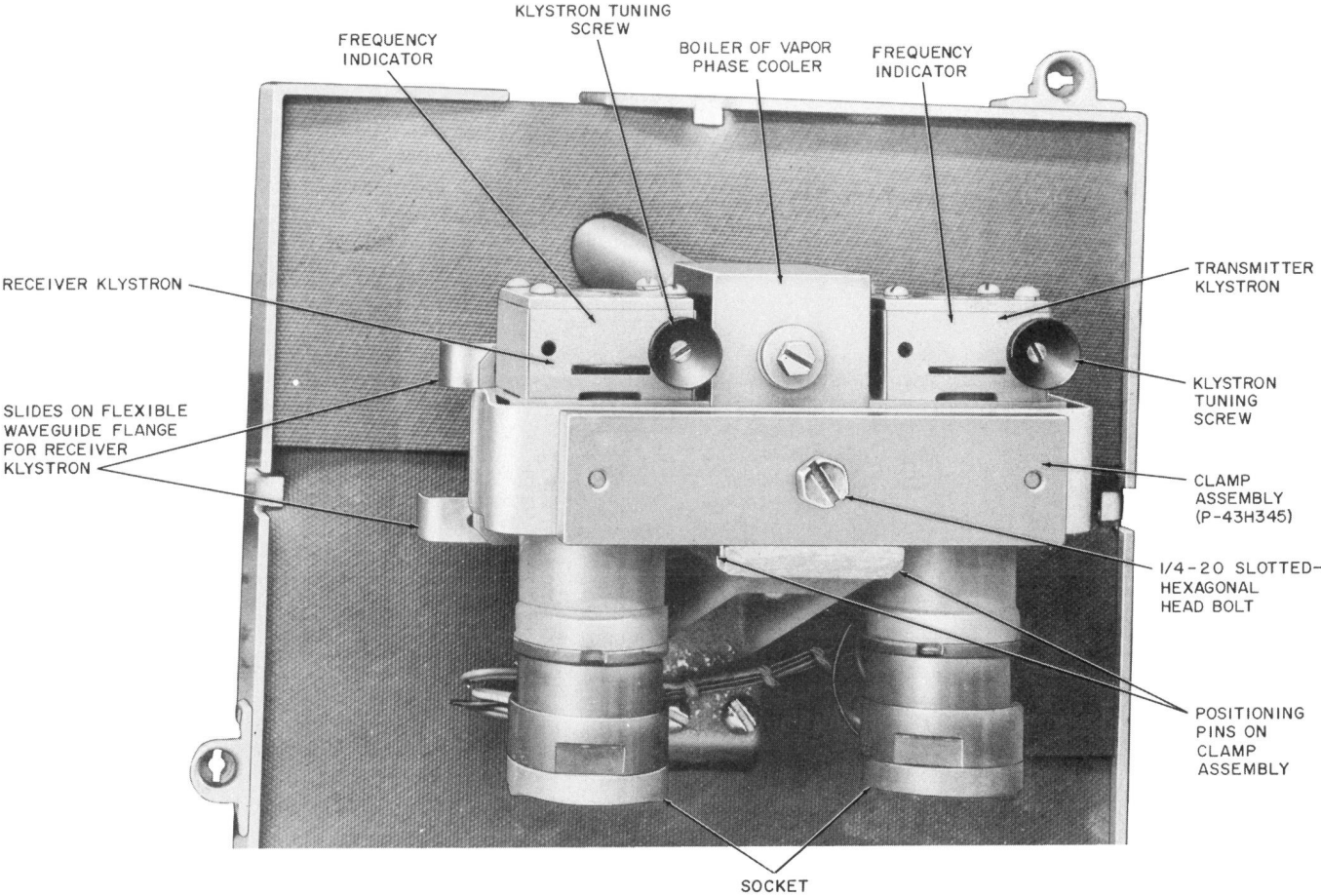


Fig. 2 — Transmitter and Receiver Klystrons and Boiler of Vapor Phase Cooler

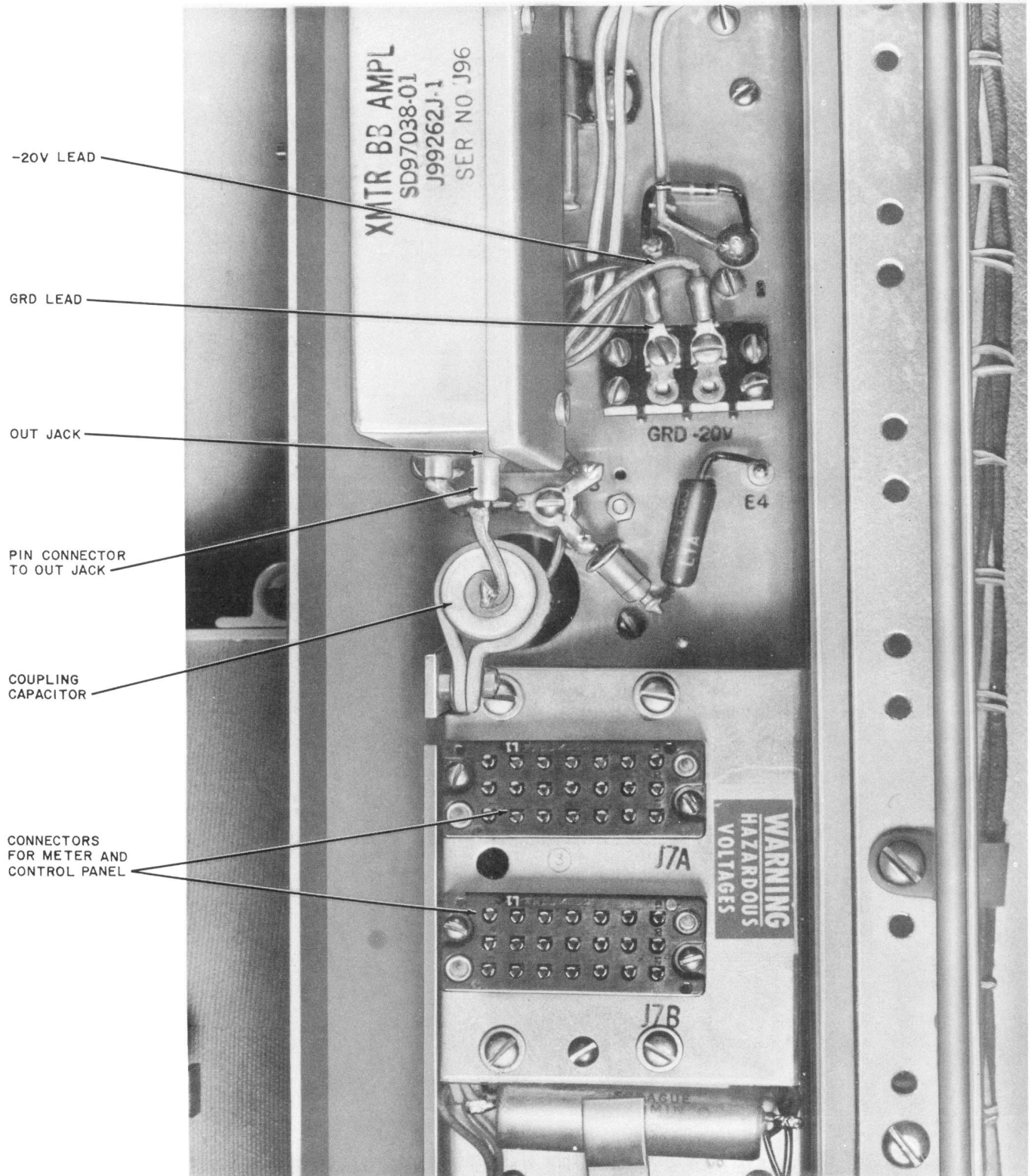
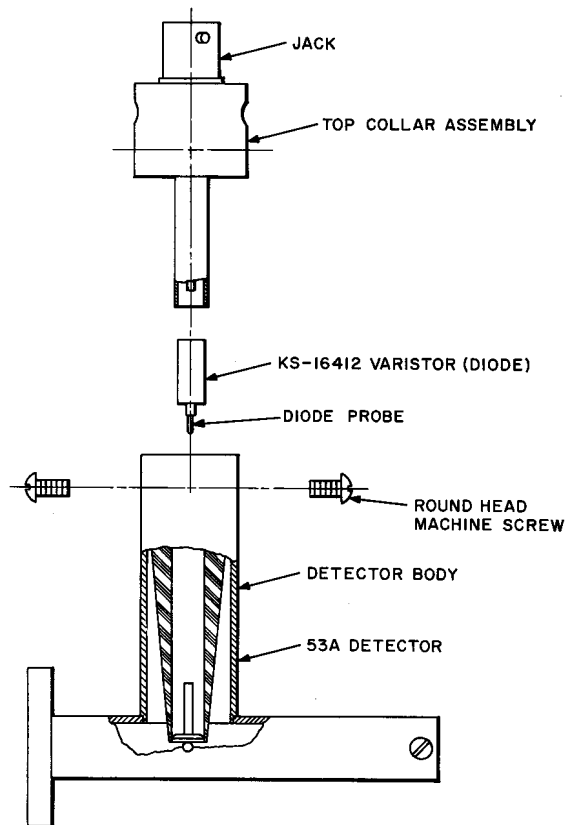


Fig. 3 — Transmitter Baseband Amplifier Mounting Arrangement



**Fig. 4 — 53A Detector (DET 1 or DET 2)
Diode Replacement**

TABLE A — PROCEDURES FOR REMOVING AND RESTORING SERVICE

STEP	FUNCTION	ACTION	NOTES
DIVERSITY SYSTEM			
<p><i>Note:</i> Steps 1 through 4 cover manual switch operation, Steps 5 and 6 cover removal and restoral of transmitter, and Steps 7 and 8 cover removal and restoral of receiver.</p>			
1	Coordinate with alarm center	Obtain permission to perform manual switch at receiving station of section under test. (a) If Note 1 applies, go to Step 3. (b) If Note 2 applies, go to Step 2.	<ol style="list-style-type: none"> 1. If no diversity alarm from station under test, proceed to Step 3. 2. If diversity alarm from station under test, find which pair involved (Step 2). (a) If one of pair under test, locate and clear trouble before switching. (b) If one of another pair terminating at same station, manual switch permissible on pair under test.
2	Find source of diversity alarm	Measure dc due to pilot in each J99262L diversity switch panel in station under test until source is located: <ol style="list-style-type: none"> 1. Remove dust cover. 2. With KS-14510 VOM measure dc on PIL MON LEV jacks for each channel in turn (see Note 2). (a) Tone present if -5 to -10 volts. (b) Tone absent if -3 volts or less. 3. Close hinged panel and restore dust cover. 	<ol style="list-style-type: none"> 1. Diversity alarm conditions: (a) Tone present on both, no alarm. (b) Tone absent on both, no <i>diversity</i> alarm (but major alarm due to total absence of pilot). (c) Tone present on one, absent on other diversity alarm. 2. PIL MON LEV jacks for regular channel accessible on left side of panel behind dust cover; those for diversity channel accessible behind hinged panel on right.
3	Find active channel	With KS-14510 VOM (on 3-volt dc scale) measure from K4 jack to ground, diversity switch panel under test. (a) If no voltage, regular channel active. (b) If between -2 and -3 volts, diversity channel active.	
4	Manual switch	Operate the MAN switch from AUTO to the MAN position desired, regular or diversity.	The <i>idle</i> channel may now be removed from service for maintenance. (a) Perform Steps 5 and 6 to remove and restore transmitter from service. (b) Perform Steps 7 and 8 to remove and restore receiver from service.

Table A — Procedure for Removing and Restoring Service

TABLE A — PROCEDURES FOR REMOVING AND RESTORING SERVICE (Cont)

STEP	FUNCTION	ACTION	NOTES
DIVERSITY SYSTEM (Cont)			
5	Remove transmitter from service. <i>Caution: Steps 1 through 4 must be performed first.</i>	<ol style="list-style-type: none"> 1. Remove patch to transmitter baseband IN jack. 2. Terminate open patch at once. (See notes.) 	<ol style="list-style-type: none"> 1. Open output of diversity split pad must be terminated to minimize effects of change of level on working line. 2. A terminating jack for this purpose provided with TL test set.
6	Restore transmitter to service	<p>When maintenance complete:</p> <ol style="list-style-type: none"> 1. Remove terminating jack applied in Step 5. 2. Restore transmitter input patch to IN jack of transmitter baseband amplifier. 3. At receiving location verify that service is now being received on the idle channel. (See note.) 4. Restore the MAN switch to the AUTO position if no further maintenance required, or to other MAN position if the other channel is to be maintained. 	Determine from the alarm center that a diversity alarm is not being received from the receiving location.
7	Remove receiver from service. <i>Caution: Steps 1 through 4 must be performed first.</i>	No special action required.	
8	Restore receiver to service	<ol style="list-style-type: none"> 1. Verify that service is now being received on idle channel. (See note.) 2. Restore the MAN switch to the AUTO position if no further maintenance is required, or to other MAN position if the other channel is to be maintained. 	Determine from the alarm center that a diversity alarm is not being received from the receiving location.
NONDIVERSITY SYSTEM			
		<ol style="list-style-type: none"> 1. Secure permission from alarm and control center. 2. Perform needed maintenance. 3. Restore service. 4. Verify service restoral with alarm and control center. 	Determine from the alarm center that no alarms are present.

Table A — Procedure for Removing and Restoring Service (Cont)