TD-3 MICROWAVE RADIO
TRANSMITTER-RECEIVER BAY
TRANSMITTER TESTS
J68387E IF DRIVER AMPLIFIER—TRANSMITTER MODULATOR

This section contains the procedures to be followed in checking the J68387E IF driver amplifier—transmitter modulator (see Fig. 1). The table below lists the particular charts of this section to be used when the requirements of Section 411-406-501 cannot be met.

This Section is reissued to add a 10-dB pad to Fig. 2 and to correct the requirement in Chart 1, Step 9.

Caution: Before performing these tests, check that the transmitter is not in service.

REQUIREMENT IN SECTION 411-406-501 WHICH IS NOT MET	CHART SEQUENCE USED IN TROUBLESHOOTING UNIT
Single-Frequency Power Output Level	Chart 1 — Diode Holder Adjustment, Power Output Test, Beat Oscillator (BO) Suppression Test Chart 2 — IF Driver Amplifier Gain and Amplitude Response Tests (if necessary) Chart 3 — Diode Replacement (if necessary)
Transmission Flatness	Chart 1 — Diode Holder Adjustment, Power Output Test, Beat Oscillator (BO) Suppression Test Chart 2 — IF Driver Amplifier Gain and Amplitude Response Tests (if necessary) Chart 3 — Diode Replacement (if necessary)
Diode Current (Unit meets single-frequency power output level and transmission flatness requirements.)	Chart 4 — Diode Voltage Indication

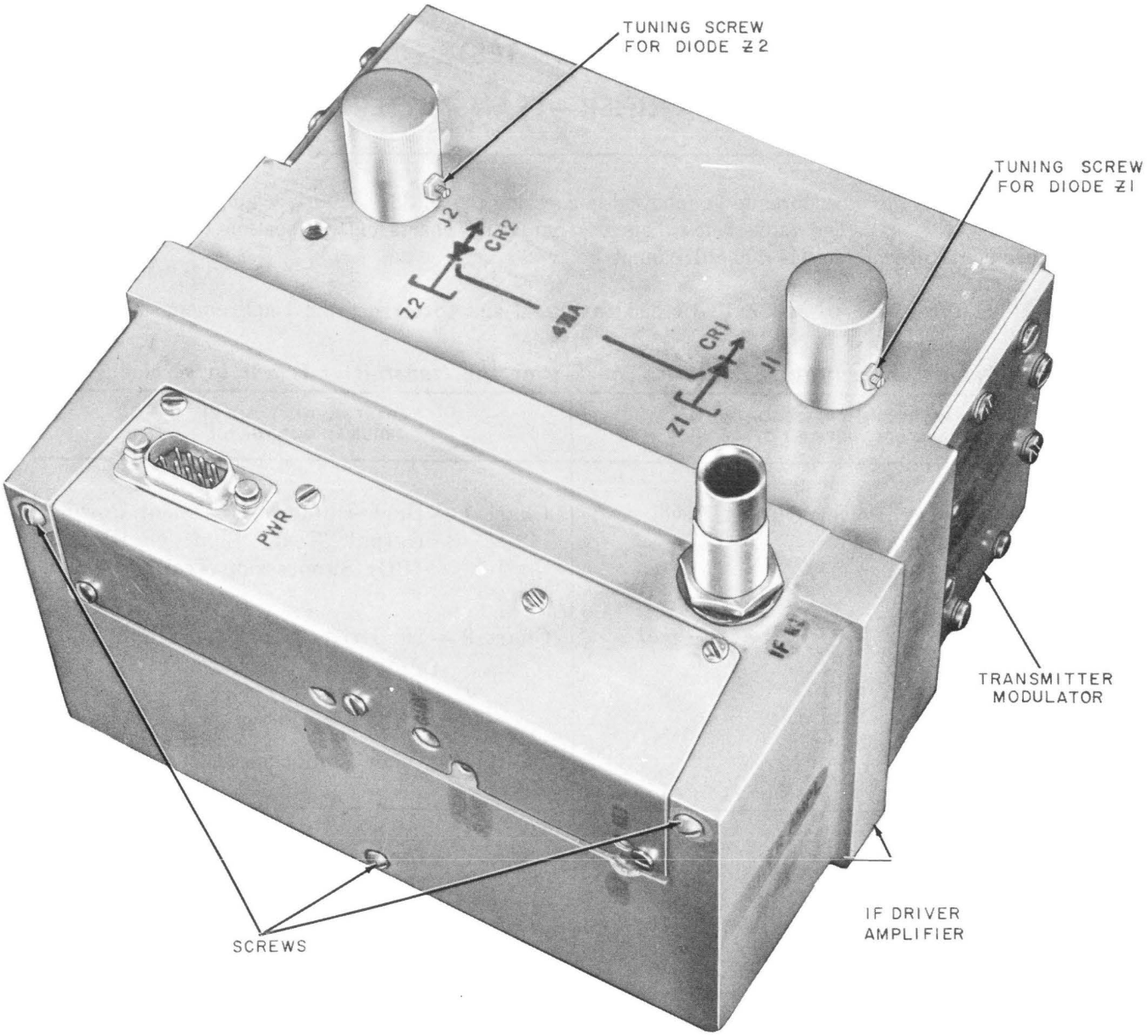


Fig. 1—J68387E IF Driver Amplifier—Transmitter Modulator

The following sections may be used as additional information if required:

General Test Information—411-400-500

Transmitter-Receiver Bay Level Diagrams—411-400-502

Transmitter Tests, Gain and Amplitude Response—411-406-501

J68392A Transmitter-Receiver Test Set—Operation—104-415-300.

CHART 1

DIODE HOLDER ADJUSTMENT
POWER OUTPUT TEST
BEAT OSCILLATOR (BO) SUPPRESSION TEST

APPARATUS:

1—J68392A Transmitter-Receiver Test Set

STEP	PROCEDURE
1	If these tests are to be made at a repeater station, disconnect and remove isolator A6 and the flexible waveguide. If these tests are to be made at a main station, remove isolator A7 and the flexible waveguide.
2	Make connections in accordance with Fig. 2, option (V).
3	Adjust the ATTEN 2 control on the test set for an indication of –7 dBm on the IF power meter.
4	Change to option (U), adjust the IF SWEEP WIDTH control to maximum counterclockwise position, and adjust the IF CENTER FREQ control for a 70-MHz indication on the counter (counter switch on EXT).

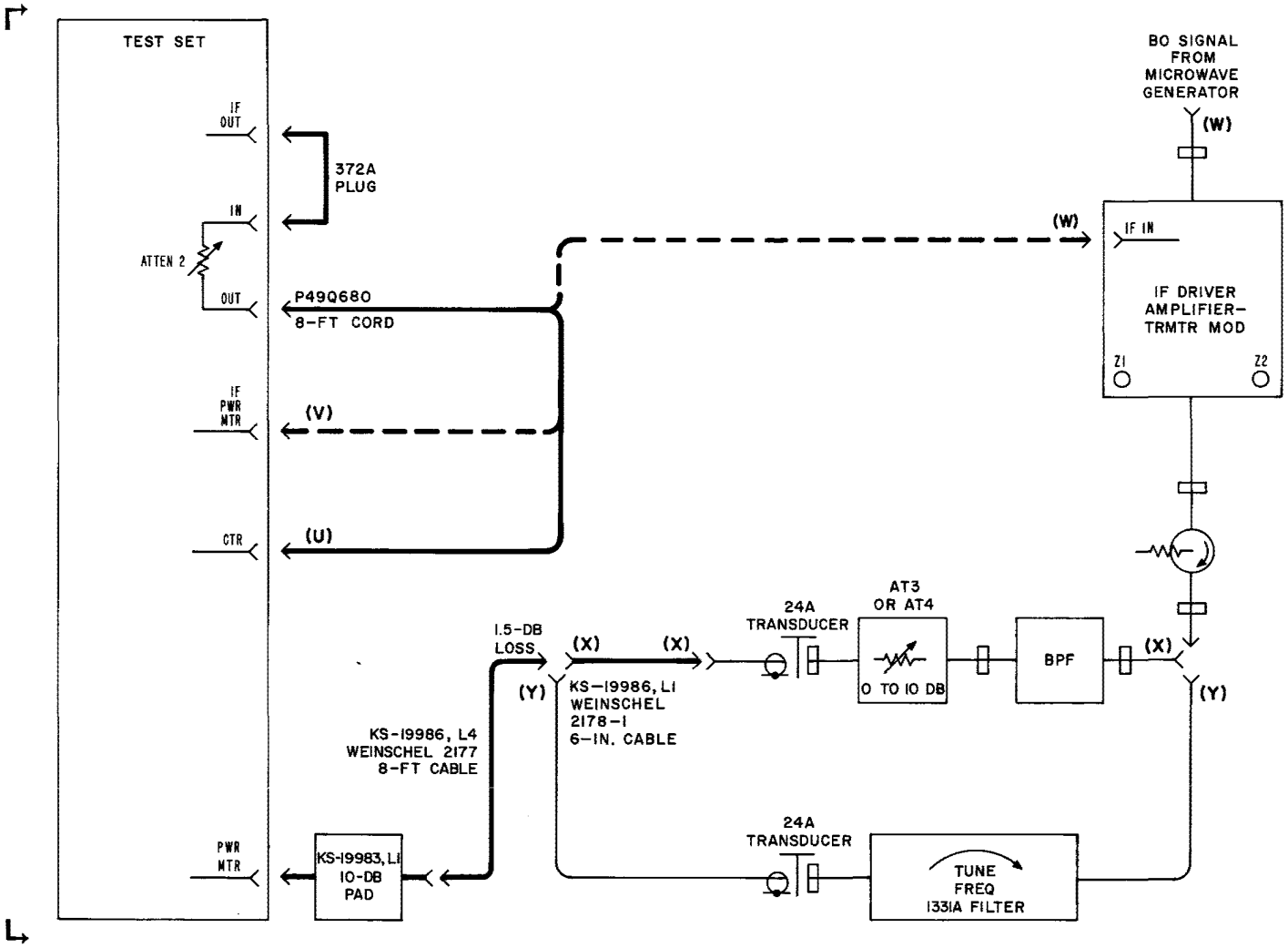


Fig. 2—Beat Oscillator Suppression Test Setup

CHART 1 (Cont)

STEP	PROCEDURE
5	Set attenuator AT3 (repeater station bay) or AT4 (main station bay) for minimum attenuation and make connections in accordance with options (W) and (X). Set the power meter INPUT CHANNEL switch to RF.
6	Adjust the tuning screws (Fig. 1) on Z1 and Z2 on the transmitter modulator for maximum output as indicated on the RF power meter. ***Requirement:*** The power meter shall indicate between -3.5 and +2.5 dBm. This corresponds to a power level of between +8 and +14 dBm at the 24A transducer. If the requirement is not met, the most probable cause of trouble is either a defective driver amplifier or defective diodes. Proceed to Chart 2 and to Chart 3 as required. One indication of a defective diode is a large change from the marked reading on the transmitter control panel. If the requirement is met, proceed to Step 7.
7	Remove the 70-MHz signal, option (W), from the IF IN jack and make connections in accordance with option (Y).
8	Tune the 1331A filter for maximum output as indicated on the RF power meter. If no signal is observed, detune the tuning screw on diode holder Z1 approximately one-half turn to obtain an unbalance and retune the 1331A filter for maximum output.
9	Reconnect the 70-MHz signal, option (W), and adjust the tuning screw on Z1 for a minimum output as indicated on the RF power meter. ***Requirement:*** The power shall be less than ▶-(15 dBm◀ + filter loss).
10	If the requirement of Step 9 is not met, the most probable cause of trouble is a defective 471A diode. Replace the diodes in pairs, in accordance with Chart 3, and repeat the procedures of this chart starting with Step 3. If the BO suppression requirement (Step 9) is met, perform the tests on the IF driver amplifier—transmitter modulator given in Section 411-406-501.

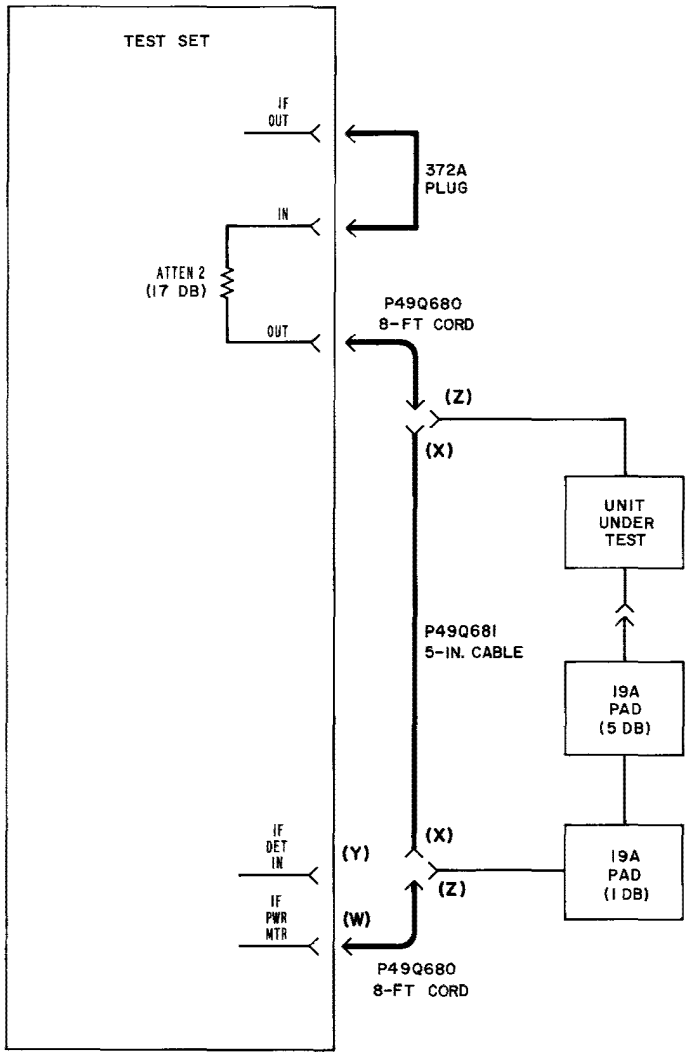
CHART 2

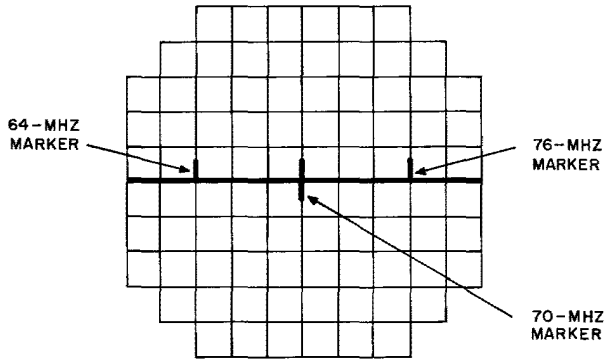
IF DRIVER AMPLIFIER GAIN AND AMPLITUDE RESPONSE TESTS

APPARATUS:

1—J68392A Transmitter-Receiver Test Set

1—P48Q348 IF Test Jig





PREPARATION FOR TEST

1. ESTABLISH TEST CONNECTIONS USING OPTIONS (W) AND (X).
2. SET THE ATTENUATOR AS INDICATED.
3. MAKE THE FOLLOWING CONTROL SETTINGS ON THE TEST SET:

UNIT	CONTROL	POSITION
CONTROL PANEL	FUNCTION IF SWEEPWIDTH IF MARKER AMPLITUDE COUNTER	IF - IF MAX CCW MIDRANGE MKR FREQ
OSCILLOSCOPE TIME BASE	POSITION MAGNIFIER SWEEP TIME VERNIER SINGLE-NORMAL	MIDRANGE X10 EXT MIDRANGE NORMAL
OSCILLOSCOPE DIFFERENTIAL AMPLIFIER	POSITION BANDWIDTH AMPLIFIER VERNIER SENSITIVITY AC-DC-OFF (+ INPUT) AC-DC-OFF (- INPUT)	MIDRANGE 4 DC MIDRANGE 2 MV/CM DC OFF
POWER METER	INPUT CHANNEL POWER RANGE DBM	IF -5

4. ADJUST ATTEN 2 FOR A -7 DBM LEVEL ON THE POWER METER.
5. CHANGE CONNECTIONS TO OPTIONS (X) AND (Y).
6. ADJUST THE TEST-TRACE CONTROLS ON THE CONTROL PANEL TO CENTER THE TRACE ON THE OSCILLOSCOPE.
7. ADJUST THE VERNIER CONTROL ON THE OSCILLOSCOPE TIME BASE UNIT FOR 10 CENTIMETERS HORIZONTAL DEFLECTION ON THE OSCILLOSCOPE.
8. ADJUST THE IF MARKER FREQ CONTROL ON THE CONTROL PANEL FOR A 70-MHZ INDICATION ON THE COUNTER.
9. ADJUST THE IF SWEEP WIDTH AND IF CENTER FREQ CONTROLS ON THE CONTROL PANEL TO OBTAIN THE OSCILLOSCOPE DISPLAY SHOWN ABOVE.
10. ADJUST THE REF TRACE CONTROLS ON THE CONTROL PANEL TO BRING THE REFERENCE TRACE INTO COINCIDENCE WITH THE TEST TRACE AT 70 MHZ.
11. INCREASE THE ATTENUATION OF ATTEN 2 BY 0.1 DB AND ADJUST THE VERNIER CONTROL ON THE OSCILLOSCOPE DIFFERENTIAL AMPLIFIER FOR 2 CENTIMETERS DEFLECTION; THEN RETURN ATTEN 2 TO ITS PREVIOUS SETTING. THIS CALIBRATES THE OSCILLOSCOPE FOR 0.05 DB PER CENTIMETER.

REQUIREMENT: THE TEST TRACE SHALL COINCIDE WITHIN 0.01 DB TO THE REFERENCE TRACE BETWEEN 60 AND 80 MHZ. IF THIS REQUIREMENT IS NOT MET, ADJUST THE IF DET SLOPE CONTROL ON THE CONTROL PANEL FOR A FLAT TRACE; THEN RECOINCIDE THE TRACES WITH THE TEST TRACE CONTROLS.

Fig. 3—IF-to-IF Transmission and Gain Test Setup

CHART 2 (Cont)

STEP	PROCEDURE
1	To check the IF driver amplifier, remove the IF driver amplifier by disconnecting the power plug and loosening the three screws which secure the amplifier to the transmitter modulator block (Fig. 1) and connect it to IF test jig P48Q348.
2	Obtain power for the IF driver amplifier by means of a P49Q685 patch cable connected to the EXT DC PWR jack on the test set.
3	Prepare the test set in accordance with Fig. 3.
4	Change to options (Y) and (Z). The output is from either of the IF jacks on the test jig. Leave the second IF jack unterminated.
5	Turn the GAIN control fully counterclockwise and adjust for flatness by adjusting the HIGH SLOPE and LOW SLOPE controls. If the flatness requirement is difficult to meet, turn the GAIN control a small amount in the clockwise direction and readjust the HIGH SLOPE and LOW SLOPE controls to meet the requirement. Note the setting of ATTEN 2, and then adjust it to coincide the traces at 70 MHz. ***Requirement:*** The amplitude response shall be flat within 0.01 dB from 64 to 76 MHz, and within 0.03 dB from 60 to 80 MHz.
6	Change connections to options (W) and (Z) and adjust ATTEN 2 to the setting noted in Step 5. Read the power meter. ***Requirement:*** The power at one output jack shall be between -0.5 and -2.0 dBm, and the power at the other output jack shall be within ±0.25 dB of the power at the first jack. If requirements are not met, replace the IF driver amplifier with a spare unit and return the defective unit to the maintenance center. Retest the IF driver amplifier—transmitter modulator as specified in Section 411-406-501.
7	If the IF driver amplifier meets the requirements, defective 471A diodes were the probable cause of failure to meet the amplitude response requirements of Section 411-406-501. Reconnect the IF driver amplifier to the modulator block and replace the 471A diodes in accordance with Chart 3.

CHART 3

DIODE REPLACEMENT

APPARATUS:

1—P48Q349 Tool

STEP	PROCEDURE
1	To replace a diode, use the diode insertion and removal tool, P48Q349. The tool consists of two parts: the clamp and the guide. The clamp is required for removing or inserting the diode into the P46Q176 outer conductor assembly. Clamping action to grip the diode is provided by either the capscrew or finger pressure. The guide is required, in addition to the clamp, for removing the diode from the fingered chuck of the modulator block.
2	If the diode remains in the block when the P46Q176 outer conductor assembly is removed, screw the guide into the block before using the clamp to remove the diode.
3	Check the chuck fingers in the block and outer conductor assembly for bent or broken contacts whenever the diodes are replaced.
4	The diodes should always be replaced as a matched pair. Observe polarity as indicated on the modulator block adjacent to each holder. The black dot on the modulator block corresponds to the red marking on the end of the diode. Check for proper polarity by observing that the meter on the transmitter control reads in the upscale direction for the TRMTR MOD 1 and TRMTR MOD 2 pushbutton positions. ***Caution: When handling the 471A diodes, care shall be taken to avoid dropping the diodes to prevent shock damage to them. Also, when removing or inserting a diode, the tool holding the diode shall be first grounded to the modulator block before the diode is inserted into the chuck in order to prevent damage due to static discharge.***
5	Repeat diode holder adjustments and tests specified in Chart 1.
6	Repeat the gain and amplitude response measurements of Section 411-406-501.

CHART 4

DIODE VOLTAGE INDICATION

APPARATUS:

1—KS-14510, List 1 Volt-Ohm-Milliammeter (VOM)

CHART 4 (Cont)	
STEP	**PROCEDURE**
1	Remove the IF driver amplifier by disconnecting the power plug and loosening the three screws which secure the amplifier to the transmitter modulator block.
2	Measure the resistance between each output pin of the driver amplifier and ground. If the resistance is 56.2 ohms, replace resistors R21, R22, R29, and R30 in accordance with option (U) on SD-50547-01-1, Issue 6AC. This charge increases the dc bias voltages of the RF diodes in the modulator, while maintaining the proper output impedance in the driver amplifier.
3	Repeat the IF input return-loss test on the driver amplifier in accordance with Chart 2 of Section 411-406-501.
4	Repeat IF driver amplifier gain amplitude response tests in accordance with Chart 2.
5	Repeat diode holder adjustments and tests in accordance with Chart 1.
6	Repeat the gain and amplitude response measurements in accordance with Section 411-406-501.