

---

**TD-3 MICROWAVE RADIO**  
**J68386G AND J68386H TRANSMITTER-RECEIVER BAYS**  
**RECEIVER TESTS**  
**TESTING AND REPLACING THE 295A IF SWITCH**

---

This section contains the procedures for performing a check of the IF switch to determine which channel is maintaining service when trouble is suspected, for performing a bypass of the IF switch, and for performing insertion loss and frequency response tests on the IF switch. The IF switch is used when TD-3 is equipped for Hot Standby/Space Diversity Switching.

This issue affects the Equipment Test List.

*Caution 1: When performing the procedure in Chart 2, local and remote alarms will be activated. Notify the alarm center that this procedure is to be performed and request that the alarms be turned over to local control.*

*Caution 2: If the IF switch fails and service is lost on both the regular and standby channels, it is imperative to restore service as quickly as possible. Restoration procedures must be in accordance with local practices until either a spare IF switch can be installed or the switch can be bypassed.*

---

CHART	PAGE
1—In-Service Check . . . . .	1
2—Bypassing and Replacing 295A IF Switch . . . . .	3
3—Insertion Loss and Frequency Response Tests Using J68428A Test Set . . . . .	7
4—Insertion Loss and Frequency Response Tests Using J68392A Test Set . . . . .	8

---

**CHART 1**

**IN-SERVICE CHECK**

---

**APPARATUS:**

- 1—J68392A or J68428A Test Set

## CHART 1 (Cont)

---

STEP	PROCEDURE
------	-----------

---

**Note:** This test is performed to determine which channel (STBY or REG) is maintaining service through the IF switch.

**Caution:** At a repeater station, a separate SWITCH CONTROL unit is provided to protect each direction of transmission. Precautions should be taken to ensure that the appropriate SWITCH CONTROL unit is operated.

- 1 Disconnect the 442A terminating plug from the BO jack on the 295A IF switch and connect an IF power meter to the jack.
- 2 Force switch the IF switch to the regular receiver by simultaneously depressing the MSTR and REG pushbuttons on the RCVR portion of the SWITCH CONTROL unit.

**Requirement 1:** The REG IN SERVICE lamp on the RCVR portion of the SWITCH CONTROL unit should begin flashing.

**Requirement 2:** The power meter indication should show the presence of a signal (approximately +7 dBm for receivers equipped with J68387AB IF amplifier or -2.5 dBm for receivers equipped with J68387S IF amplifier).

If Requirements 1 and 2 are met, perform Step 3.

If Requirement 1 is not met, the wiring to the switch may be defective.

If Requirement 2 is not met, the IF switch may be defective. **Perform Chart 2.**

- 3 Force switch the IF switch to the standby receiver by simultaneously depressing the MSTR and STBY pushbuttons on the RCVR portion of the SWITCH CONTROL unit.

**Requirement 1:** The STBY IN SERVICE lamp on the RCVR portion of the SWITCH CONTROL unit should begin flashing.

**Requirement 2:** The power meter should indicate the absence of an IF signal.

If Requirements 1 and 2 are met, proceed to Step 4.

If Requirement 1 is not met, the wiring to the switch may be defective.

If Requirement 2 is not met, the IF switch may be defective. **Perform Chart 2.**

- 4 If the requirements in Steps 2 and 3 are met, replace the 442A terminating plug in the BO jack on the IF switch and return the system to AUTO by simultaneously depressing the MSTR and AUTO pushbuttons on the RCVR portion of the SWITCH CONTROL unit. Return to Section 411-600-501 (when referred from that section).

## CHART 2

## BYPASSING AND REPLACING 295A IF SWITCH

## APPARATUS:

2—187A Adapters

2—188A Adapters

## STEP

## PROCEDURE

**Caution 1:** *The procedures given in this chart are not applicable to main station receivers equipped with the IF access feature (receivers provided with the J68387AB IF amplifier). To bypass the IF switch for this type of installation, it is necessary to temporarily reroute service using local restoration procedures.*

**Caution 2:** *At a repeater station, a separate SWITCH CONTROL unit is provided to protect each direction of transmission. Precautions should be taken to ensure that the appropriate SWITCH CONTROL unit is operated.*

- 1 In order to bypass the IF switch without interrupting service, the receiver maintaining service must be known. If the requirement of Chart 1, Step 2, is not met, the standby receiver is maintaining service. If it is met, the regular receiver is maintaining service.
- 2 If the regular receiver is maintaining service, proceed to Step 3. If the standby receiver is maintaining service, proceed to Step 24.
- 3 **At a repeater station,** force switch the transmitter to the regular channel by momentarily depressing the MSTR and REG pushbuttons on the TRMTR portion of the SWITCH CONTROL unit. The REG IN SERVICE lamp on the TRMTR portion of the SWITCH CONTROL unit will begin flashing. **At a main station,** force switch the 300A or 401B receiving switch to CHAN A.
- 4 Disconnect the cords at IF switch jack B and J3 on the hybrid. **At a repeater station,** the RPTR and TRMTR OUT alarm lamps will light in the standby bay.

**Note:** *At a receiving main station,* the input at jack B is from the standby receiver and the output from J3 is to the 4A FM receiver for CHAN X. **At a repeater station,** the input at jack B is the same as at a receiving main station and the output from J3 is to the IF driver-amplifier for the standby transmitter. Refer to Fig. 1 for the connections to the IF switch.

- 5 Connect the cord removed from jack B together with the cords removed from J3 using a 187A adapter plugged into a 188A adapter. **At a repeater station,** alarm lamps will be extinguished in the standby bay.

## CHART 2 (Cont)

STEP	PROCEDURE
6	<p><i>At a repeater station</i>, verify that the STBY transmitter has RF output by observing the TRMTR OUT meter indication. <i>At a main station</i>, verify that there is no pilot failure on CHAN X.</p> <p><b>Caution: Do not proceed unless the requirement of Step 6 is met.</b></p>
7	<p><i>At a repeater station</i>, with the STBY transmitter functioning properly, force switch the transmitter to STBY by momentarily depressing the MSTR and STBY pushbuttons on the TRMTR portion of the SWITCH CONTROL unit. The STBY IN SERVICE lamp on the TRMTR portion of the SWITCH CONTROL unit will begin flashing. <i>At a main station</i>, force switch the 300A or 401B receiving switch to CHAN X.</p>
8	<p>Disconnect the cords at jack A of the IF switch and J2 on the hybrid. <i>At a repeater station</i>, the RPTR and TRMTR alarm panel lamps will light in the regular bay.</p> <p><b>Note: At a receiving main station</b>, the input at jack A is from the regular receiver and the output from J2 is to the 4A FM receiver for CHAN A. <i>At a repeater station</i>, the input to jack A is the same as at a receiving main station and the output from J2 is to the IF LIM-CRS for the regular transmitter. Refer to Fig. 1 for connections to the IF switch and hybrid.</p>
9	<p><i>At a repeater station</i>, momentarily depress the ACO pushbutton on the alarm panel in the regular bay. This will silence the audible alarm.</p>
10	<p>Connect the cord removed from jack A together with the cord removed from J2 using a 187A adapter plugged into a 188A adapter. <i>At a repeater station</i>, alarm lamps on the alarm panel in the regular bay will be extinguished.</p>
11	<p><i>At a repeater station</i>, verify that the REG transmitter has RF output by observing the TRMTR OUT meter indication. <i>At a main station</i>, verify that there is no pilot failure on CHAN A.</p>
12	<p><i>At a repeater station</i>, to protect against transmitter power failure, momentarily depress the MSTR and AUTO pushbuttons on the TRMTR portion of the SWITCH CONTROL unit. <i>At a main station</i>, restore the 300A receiving switch to the AUTO mode or the 401B receiving switch to the RST mode. The IF switch can now be tested and/or replaced. <b>Perform Chart 3 or 4</b> (depending upon available test set).</p>
13	<p>After testing and/or replacing the IF switch, force switch the transmitter <i>at a repeater station</i> to regular by momentarily depressing the MSTR and REG pushbuttons on the SWITCH CONTROL unit. The REG IN SERVICE lamp on the TRMTR portion of the SWITCH CONTROL unit will begin flashing. <i>At a main station</i>, force switch the 300A or 401B receiving switch to CHAN A. Force switch the receiver to STBY by momentarily depressing the MSTR and STBY pushbuttons on the RCVR portion of the SWITCH CONTROL unit. The STBY IN SERVICE lamp on the RCVR portion of the SWITCH CONTROL unit should begin flashing.</p>

## CHART 2 (Cont)

STEP	PROCEDURE
14	Disconnect the cords that were patched together in Step 5. <i>At a repeater station</i> , the RPTR and TRMTR OUT lamps on the alarm panel in the standby bay will light.
15	<i>At a repeater station</i> , momentarily depress the ACO pushbutton on the alarm panel in the standby bay.
16	Connect the appropriate cords to jack B on the IF switch and J3 on the hybrid. Refer to Fig. 1 for the correct connections. The standby bay alarm panel TRMTR OUT lamp will extinguish.
17	<i>At a repeater station</i> , verify that the STBY transmitter has an output by observing the OUTPUT meter indication. <i>At a main station</i> , verify that there is no pilot failure on CHAN X.
18	<i>At a repeater station</i> , force switch the transmitter to STBY by momentarily depressing the MSTR and STBY pushbuttons on the TRMTR portion of the SWITCH CONTROL unit. The STBY IN SERVICE lamp on the TRMTR portion of the SWITCH CONTROL unit will begin flashing. <i>At a main station</i> , force switch the 300A or 401B receiving switch to CHAN X.
19	Disconnect the cords that were patched together in Step 10. <i>At a repeater station</i> , the RPTR and TRMTR OUT lamps on the alarm panel in the regular bay will light.
20	<i>At a repeater station</i> , momentarily depress the ACO pushbutton on the alarm panel in the regular bay.
21	Connect the appropriate cords to jack A on the IF switch and J3 on the hybrid. Refer to Fig. 1 for the correct connections. The regular bay alarm panel TRMTR OUT lamp will extinguish.
22	<i>At a repeater station</i> , verify that the REG transmitter has an output by observing the OUTPUT meter indication. <i>At a main station</i> , verify that there is no pilot failure on CHAN X.
23	<i>At a repeater station</i> , the transmitter and receiver can now be restored to the AUTO mode. Momentarily depress the MSTR and AUTO pushbuttons on the TRMTR and RCVR portions of the SWITCH CONTROL unit. The REG IN SERVICE lamps on the TRMTR and RCVR portions of the SWITCH CONTROL unit will light. Verify that no CHANNEL FAIL lamps are lighted. <i>At a main station</i> , restore the 300A receiving switch to the AUTO mode or the 401B receiving switch to the RST mode. <b>Repeat Chart 1.</b>
24	If the standby receiver is maintaining service, perform the following steps. <i>At a repeater station</i> , force switch the transmitter to the standby channel by momentarily depressing the MSTR and STBY pushbuttons on the TRMTR portion of the SWITCH CONTROL unit. The STBY IN SERVICE lamp on the TRMTR portion of the SWITCH CONTROL unit will

## CHART 2 (Cont)

STEP	PROCEDURE
	begin flashing. <i>At a main station</i> , force switch the 300A or 401B receiving switch to CHAN X.
25	Disconnect the cords at jack A on the IF switch and J2 on the hybrid. <i>At a repeater station</i> , the RPTR and TRMTR OUT lamps on the alarm panel in the regular bay will light.  <i>Note: At a receiving main station</i> , the input at jack A is from the regular receiver; and the output at J2 is to the 4A FM receiver for CHAN A. <i>At a repeater station, or receiving main station equipped for IF access</i> , the input at jack A is the same as at a receiving main station; and the output at J2 is to the IF driver-amplifier for the regular transmitter. Refer to Fig. 1 for the connections to the IF switch.
26	Connect the cord removed from jack A together with the cord removed from J2 using a 187A adapter plugged into a 188A adapter. <i>At a repeater station</i> , alarm lamps on the alarm panel in the regular bay will be extinguished.
27	<i>At a repeater station</i> , verify that the REG transmitter has RF output by observing the OUTPUT meter indication. <i>At a main station</i> , verify that there is no pilot failure on CHAN A.  <i>Caution: Do not proceed to Step 28 unless the requirement of this step is met.</i>
28	<i>At a repeater station</i> , with the REG transmitter functioning properly, force switch the transmitter to REG by momentarily depressing the MSTR and REG pushbuttons on the TRMTR portion of the SWITCH CONTROL unit. The REG IN SERVICE lamp on the TRMTR portion of the SWITCH CONTROL unit will begin flashing. <i>At a main station</i> , force switch the 300A or 401B receiving switch to CHAN A.
29	Disconnect the cords at jack B on the IF switch and J3 on the hybrid. <i>At a repeater station</i> , lamps on the alarm panel in the standby bay will light.  <i>Note: At a receiving main station</i> , the input at jack B is from the standby receiver; and the output J3 is to the 4A FM receiver for CHAN X. <i>At a repeater station</i> , the input at jack B is the same as at a receiving main station; and the output from J3 is to the IF driver-amplifier for the standby transmitter. Refer to Fig. 1 for connections to the IF switch and hybrid.
30	<i>At a repeater station</i> , momentarily depress the ACO pushbutton on the alarm panel in the standby bay. This will silence the audible alarm.
31	Connect the cord removed from jack B together with the cord removed from J3 using a 187A adapter plugged into a 188A adapter. <i>At a repeater station</i> , lamps on the alarm panel in the standby bay will extinguish.

---

**CHART 2 (Cont)**


---

STEP	PROCEDURE
32	<i>At a repeater station</i> , verify that the STBY transmitter has RF output by observing the OUTPUT meter indication. <i>At a main station</i> , verify that there is no pilot failure on CHAN X.
33	<i>At a repeater station</i> , to protect against transmitter power failure, momentarily depress the MSTR and AUTO pushbuttons on the TRMTR portion of the SWITCH CONTROL unit. <i>At a main station</i> , restore the 300A receiving switch to the AUTO mode or the 401B receiving switch to the RST mode. The IF switch can now be tested and/or replaced. <i>Perform Chart 3 or 4</i> (depending upon the available test set).
34	After testing and/or replacing the IF switch, perform Steps 13 through 23 in this chart.

---

**CHART 3**

**INSERTION LOSS AND  
FREQUENCY RESPONSE TESTS USING  
J68428A TEST SET**

---

**APPARATUS:**

1—J68428A Test Set

---

**Caution:** *These tests are performed on an out-of-service basis and involve the operation of the SWITCH CONTROL unit. Refer to Section 411-600-500 for operating instructions of the SWITCH CONTROL unit. The maintenance personnel must ensure that only the receiver portion of the SWITCH CONTROL unit is operated. At a repeater station, a separate SWITCH CONTROL unit is provided to protect each direction of transmission. Ensure that the appropriate SWITCH CONTROL unit is operated.*

**Note 1:** The 295A IF switch must be bypassed using the procedure given in Chart 2 before performing these tests.

**Note 2:** If any of the requirements of this chart cannot be met, replace the 295A IF switch with a spare unit and repeat the tests in this chart. Refer to Chart 2 for the replacement procedure.

---

STEP	PROCEDURE
1	Prepare the test set as described in Fig. 2.

## CHART 3 (Cont)

STEP	PROCEDURE
2	Establish the test connections given in Fig. 3, options (X) and (Y).
3	Force switch the receiver to the REG receiver by simultaneously operating the MSTR and REG pushbuttons on the RCVR portion of the SWITCH CONTROL unit.
4	Measure the output power at the AB jack on the 295A IF switch.  <i>Requirement:</i> $-2 \pm 0.4$ dBm.
5	Establish the test connections given in Fig. 3, options (Y) and (R). Position the IF MODE control to $\Delta F$ . Measure the transmission characteristics over the $70 \pm 10$ -MHz band.  <i>Requirement:</i> The transmission deviation shall not be greater than 0.15 dB between 60 and 80 MHz.
6	Establish the test connections given in Fig. 3, options (Z) and (X) and position the IF MODE switch to CW.
7	Force switch the receiver to the STBY receiver by simultaneously operating the MSTR and STBY pushbuttons on the RCVR portion of the SWITCH CONTROL unit.
8	Measure the output power at the AB jack on the 295A IF switch.  <i>Requirement:</i> $-2 \pm 0.4$ dBm.
9	Establish the test connections given in Fig. 3, options (R) and (Z). Position the IF MODE switch to $\Delta F$ . Measure the transmission characteristics over the $70 \pm 10$ -MHz band.  <i>Requirement:</i> The transmission deviation shall not be greater than 0.15 dB between 60 and 80 MHz.
10	At the completion of the tests in this chart, replace the IF switch back in service. Follow the procedure given in Chart 2.

## CHART 4

INSERTION LOSS AND  
FREQUENCY RESPONSE TESTS USING  
J68392A TEST SET

## APPARATUS:

1—J68392A Test Set

---

**CHART 4 (Cont)**


---

**Caution:** These tests are performed on an out-of-service basis and involve the operation of the SWITCH CONTROL unit. Refer to Section 411-600-500 for operating instructions of the SWITCH CONTROL unit. The maintenance personnel must ensure that only the receiver portion of the SWITCH CONTROL unit is operated. At a repeater station, a separate SWITCH CONTROL unit is provided to protect each direction of transmission. Ensure that the appropriate SWITCH CONTROL unit is operated.

**Note 1:** The 295A IF switch must be bypassed using the procedure given in Chart 2 before performing these tests.

**Note 2:** If any of the requirements of this chart cannot be met, replace the 295A IF switch with a spare unit and repeat the tests in this chart. Refer to Chart 2 for the replacement procedure.

---

STEP	PROCEDURE
1	Follow the directions given in Fig. 4.
2	Force switch the IF switch to the REG position by simultaneously operating the MSTR and REG pushbuttons on the RCVR portion of the SWITCH CONTROL unit.
3	Remove attenuation from ATTEN 2 until the test and reference traces coincide. The amount of attenuation required to coincide the traces represents the insertion loss.
	<b>Requirement:</b> $1 \pm 0.4$ dB.
4	Measure the transmission characteristics over the $70 \pm 10$ -MHz band.
	<b>Requirement:</b> The transmission deviation shall not be greater than 0.15 dB between 60 and 80 MHz.
5	Remove the cord from the IF switch A jack and plug it into the B jack.
6	Force switch the IF switch to the STBY position by simultaneously operating the MSTR and STBY pushbuttons on the RCVR portion of the SWITCH CONTROL unit.
7	Repeat Steps 3 and 4.
8	At the completion of the tests in this chart, place the IF switch back into service. Follow the procedure given in Chart 2.

---

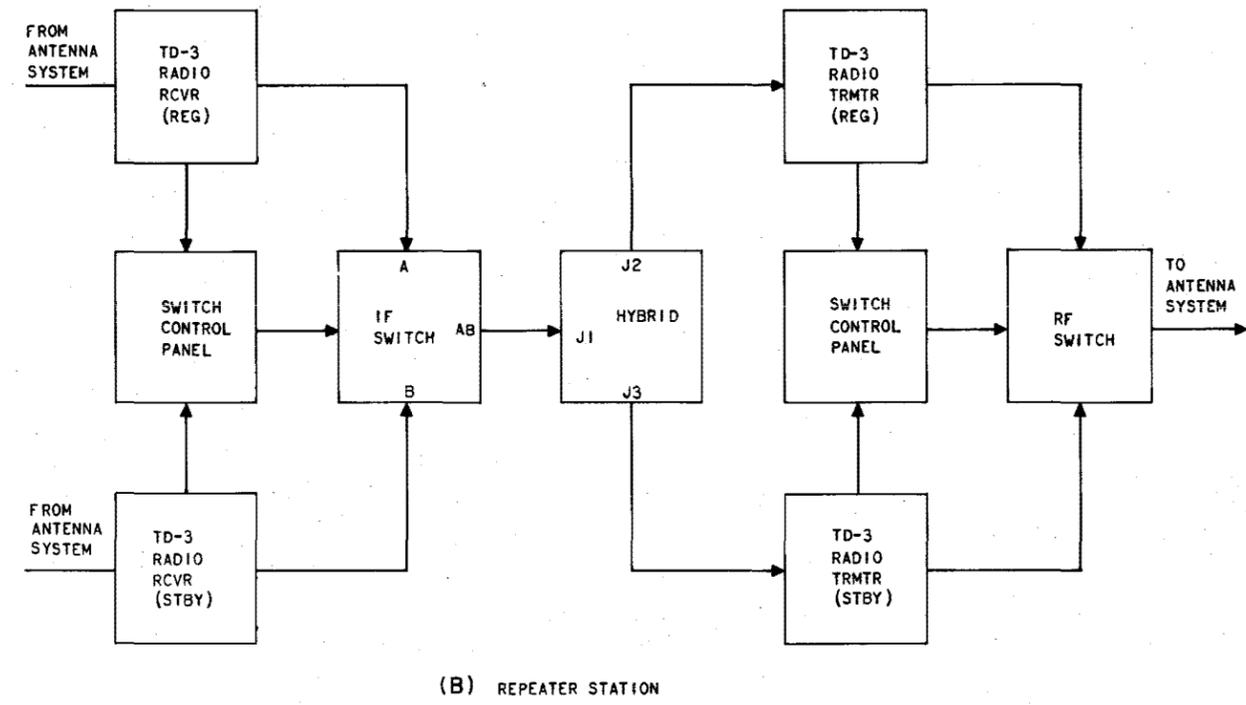
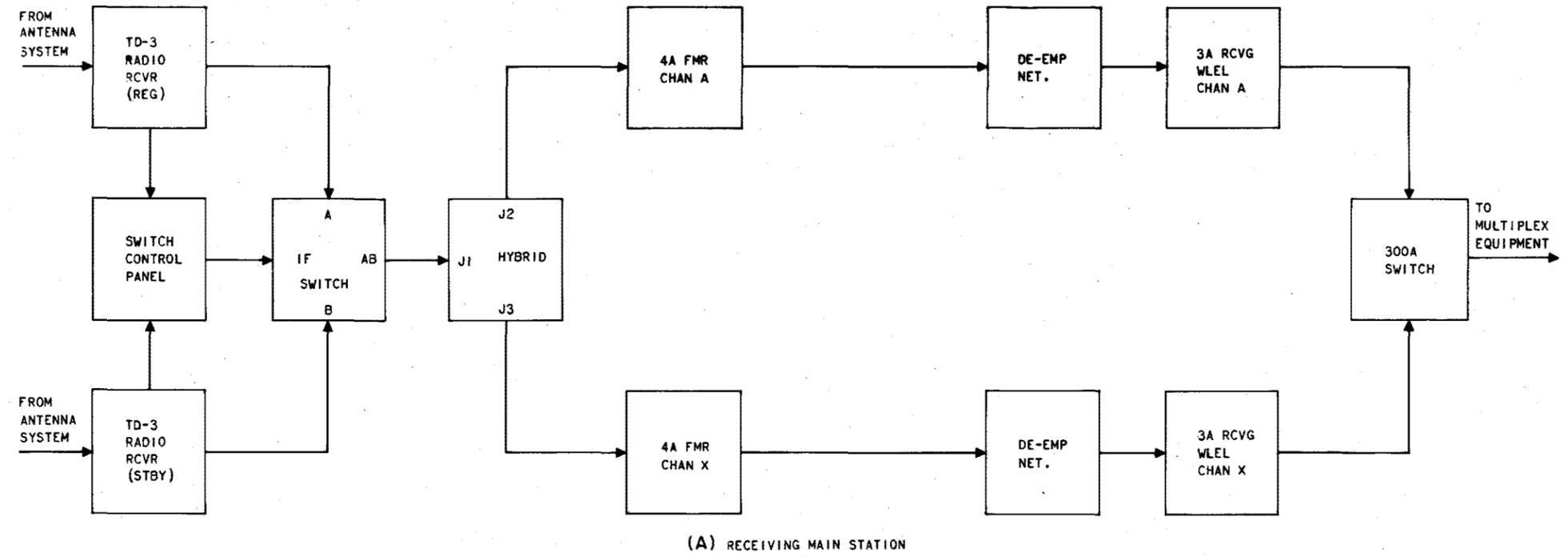
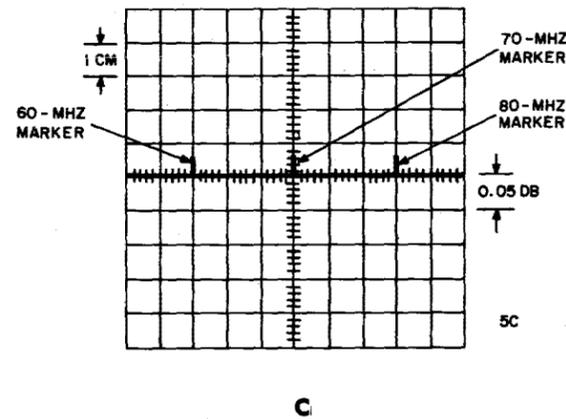
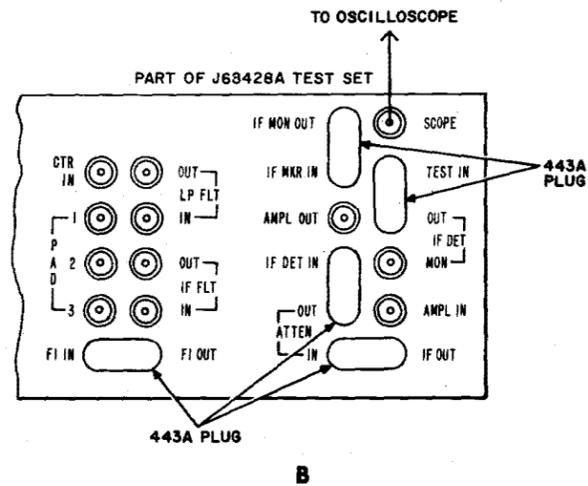
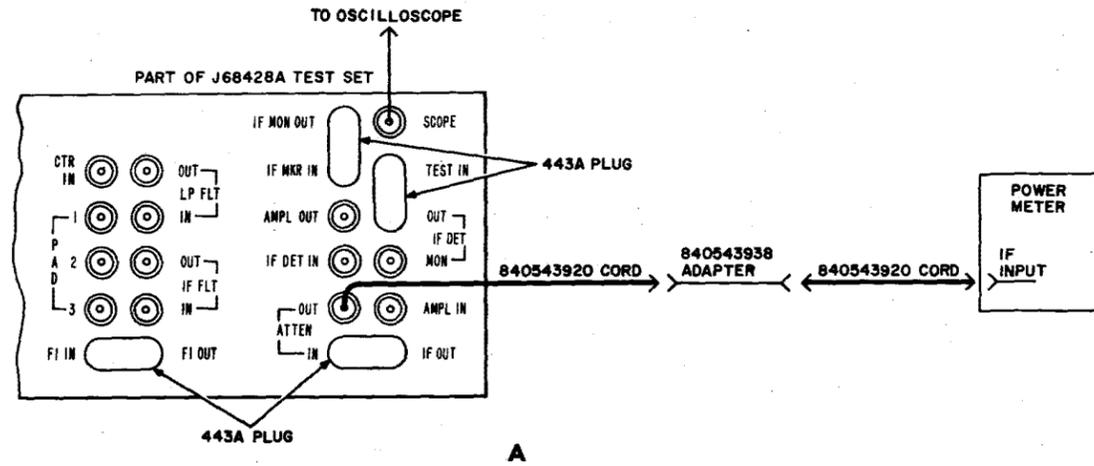


Fig. 1—Simplified Block Diagram Showing Connections to the IF Switch at a Receiving Main Station (A) and a Repeater Station (B)

PREPARATION FOR TEST



1. Prepare the oscilloscope by removing the input cable from the oscilloscope VERT INPUT jack and adjusting the vertical POSITION control to center the trace. Replace the input cable. Do not change the vertical POSITION control during the remainder of the test.
2. Set the INPUT switch on the power meter to the IF position. Set the MODE switch to ZERO, and adjust the ZERO control for an indication of 00.0 on the digital display. Set the MODE switch to POWER METER.
3. Establish the test connections shown in A and set ATTEN on the control unit for 11 dB.
4. Set the test set controls as follows:

UNIT	CONTROL	POSITION
Oscilloscope	VOLTS/DIV	2m
Counter	FUNCTION	135 MHz
	SAMPLE RATE	Counterclockwise*
Power Meter	INPUT	IF
	MODE	POWER METER
Control Unit	COUNTER INPUT	F1
Sweep Oscillator	IF CENTER FREQ	70
	IF MODE	CW
	IF ΔF	30

\* On some units, the power switch is combined with the SAMPLE RATE control. Make sure the power is ON.

5. Measure the output at the ATTEN OUT jack.  
*Requirement:* The power meter indicates  $-1 \pm 0.1$  dBm. If the requirement is not met, adjust ATTEN on the control unit.
6. Change to the test setup as shown in B.
7. Change the IF MODE control to ΔF. With the COUNTER INPUT on the control unit set to F1, adjust the MARKERS—F1 on the control unit for an indication of 60 MHz on the counter.
8. Set the COUNTER INPUT to F2 and adjust the MARKERS — F2 on the control unit for an indication of 80 MHz on the counter.
9. Adjust the horizontal POSITION and VERNIER controls to bring the 60- and 80-MHz markers as shown in C, and center the trace with the TEST TRACE controls on the control unit.
10. Increase the attenuation of ATTEN by 0.1 dB and observe the trace.
11. Adjust the CAL control on the oscilloscope and TEST TRACE controls on the control unit so that 0.1 dB attenuation results in a trace deflection of 2 centimeters (2 major divisions). The oscilloscope is now calibrated for 0.05 dB per centimeter. Return the ATTEN to the setting needed in Step 5.
12. Adjust the IF DET SLOPE control on the control unit for a flat test trace. Adjust the TEST TRACE control on the control unit to keep the trace centered.
13. Return the IF MODE control to CW.

Fig. 2—IF-to-IF Amplitude Response—Preparation for Test Using the J68428A Test Set

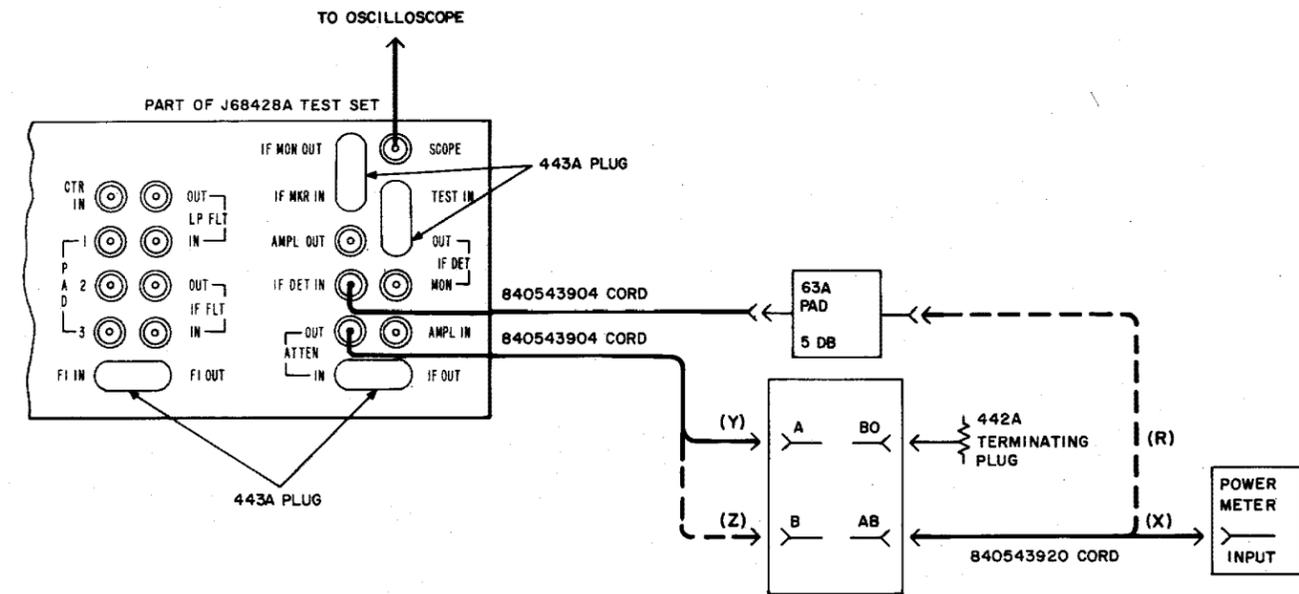
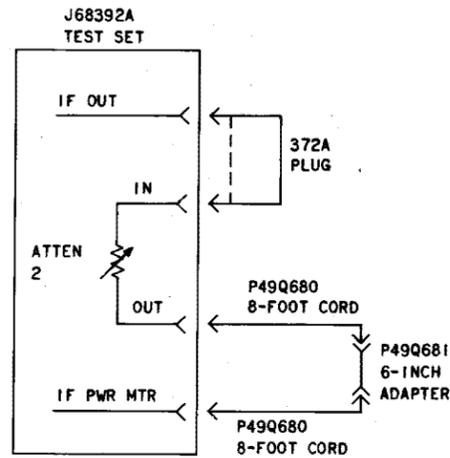


Fig. 3—Insertion Loss and Frequency Response Test Arrangement Using J68428A Test Set

PREPARATION FOR TEST

1. Initially, position the test set controls as given below:



UNIT	CONTROL	POSITION
RF and IF Sweep Control Unit	CTR switch FUNCTION switch	MKR FREQ IF - IF
Test Set Control Panel	IF - SWEEP WIDTH IF - CENTER FREQ IF MARKER - AMPLITUDE IF MARKER - FREQ	Midrange Midrange Midrange Midrange
Oscilloscope Time Base Unit	POSITION and POSITION - VERNIER MAGNIFIER switch SWEEP TIME switch SWEEP TIME - VERNIER SINGLE - NORMAL switch	Midrange X10 EXT Midrange NORMAL
Oscilloscope Differential Amplifier	POSITION BANDWIDTH (KC) switch AMPLIFIER switch SENSITIVITY switch SENSITIVITY - VERNIER +INPUT - AC-DC-OFF switch -INPUT - AC-DC-OFF switch	Midrange 4 DC 2 MV/CM Midrange DC OFF
Power Meter	INPUT CHANNEL switch POWER RANGE DBM switch	IF +5

2. On the test set control panel, position ATTEN 2 to 9 dB.

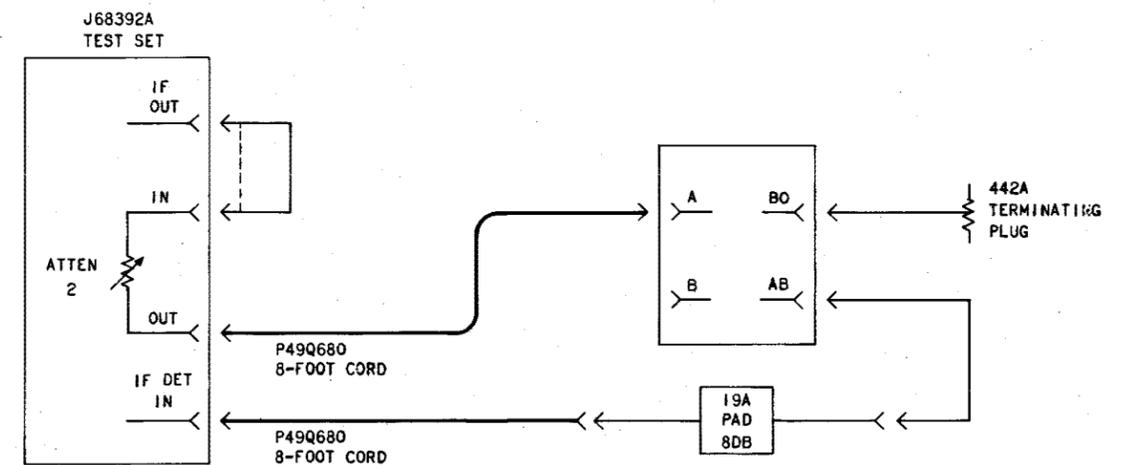
3. Connect the test set as follows:

- Adjust ATTEN 2 for 2 power meter indication of  $+1 \pm 0.1$  dB.
- Remove the cord from the IF PWR MTR jack and plug it into the jack marked IF DET IN through an 8-dB 19A pad.
- On the RF and IF control unit, adjust the test trace controls to center the trace on the oscilloscope screen.
- On the oscilloscope time base unit, adjust the SWEEP TIME - VERNIER and POSITION controls for approximately 10 centimeters horizontal deflection on the oscilloscope display.
- On the test set control panel, adjust the IF MARKER - FREQ control for a  $70 \pm 0.1$  MHz indication on the counter.
- On the test set control panel, adjust the IF - SWEEP WIDTH and IF - CENTER FREQ controls to obtain the oscilloscope display shown. Use the IF MARKER - AMPLITUDE control to adjust the markers to the desired size.

Note 1: An extraneous marker appears at 89 MHz.

Note 2: The IF MARKER - AMPLITUDE control provides a common adjustment for both the fixed and variable markers. The VAR MKR AM control can be used to independently adjust the size of the variable marker.

- On the RF and IF sweep control unit, adjust the REF TRACE control to bring the reference trace into coincidence with the test trace at 70 MHz.
- On the test set control panel, increase the ATTEN 2 setting by 0.1 dB. On the oscilloscope differential amplifier, adjust the SENSITIVITY - VERNIER control and the POSITION control for 2 centimeters vertical separation between the reference trace and test trace. Return ATTEN 2 to its original setting. This calibrates the oscilloscope for 0.05 dB per centimeter.
- Change the test arrangement as follows:



13. Return to the chart.

Fig. 4—Preparation and Test Arrangement—J68392A Test Set