

**TRANSMITTER-RECEIVER BAY**  
**OVERALL RECEIVER TESTS USING J68392A TEST SET**  
**TD-3D MICROWAVE RADIO**

This section contains the procedures for measuring and adjusting the gain and amplitude response of the TD-3D microwave radio receiver in the J68386L and J68386M transmitter-receiver bays primarily used in both main and repeater stations with earlier TD-3 equipment. The tests performed in this section are designed for use with the J68392A transmitter-receiver test set only.

This section is reissued to add Charts 8, 10, and 12 including test procedures for 45-Mb/s digital operation. Also, Table F has been changed. Revision arrows are used to emphasize changes. The Equipment Test List is affected.

Charts 1 and 3 are in-service checks of the bay which may be made at any time. Chart 2 lists the various modes of operation and the charts and steps that need to be performed for each mode. All other charts in this section are to be performed on an out-of-service basis. A release must be obtained from the designated control office and the channel removed from service as directed by local practice.

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**NOTICE**

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CHART 1

IN-SERVICE CHECKS

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| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

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- Caution:** Since hot standby/space diversity (HS/SD) has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.
- Rotate the selector switch on the meter and control panel so that the meter indicates, one at a time, the circuits designated for the RCVR. Compare the meter indications with the requirement for each function in Table A.

**Note:** New values are recorded in the space provided on the selector switch only when routine maintenance (out-of-service) tests are performed or when trouble conditions necessitate changing a unit which, in turn, affects previously recorded values. The values recorded on the panel should not be changed when only in-service checks are performed.

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TABLE A

| SWITCH        | NOMINAL        | TOLERANCE | IF REQUIREMENT IS NOT MET<br>REFER AS DIRECTED |
|---------------|----------------|-----------|--|
| RCVR<br>-19V  | 70             | ±2        | Adjust VOLTS ADJ on the 92B unit.              |
| RCVR MOD BIAS | Recorded Value | ±2        | This section, Chart 7                          |
| RCVD CARR PWR | 80             | ±4        | *†   |
| BO LEV        | Recorded Value | ±15%      | This section, Chart 4                          |

\* The RCVD CARR PWR changes during fading conditions. For each dB of input signal change, the meter indication will change approximately two units. Observe the meter indication to determine if a fading condition exists. The RCVD CARR PWR is also dependent upon the transmitted power of the previous transmitter.

† For lineups equipped with a properly operating 652A RF preamplifier, the RCVD CARR PWR nominal value will be 80 meter units, which is the normal indication when the preamplifier is providing gain. Conversely, a preamplifier that is not providing gain will cause the meter reading to be about 40 units. This lower reading occurs because a failed preamplifier inserts up to 13 dB of loss instead of 10-dB gain for a total change of 23 dB. Check the RCVD CARR PWR of each bay in the lineup. If all bays are low, this indicates either a failure of the 652A preamplifier or its -24V power supply. Refer to Section 420-802-100 for further checks, replacement procedures, and a description of the 652A RF preamplifier.

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**CHART 2**
**PRELIMINARY AND FINAL PROCEDURES TO BE  
USED WITH THE VARIOUS MODES OF OPERATION**


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This chart contains the procedures necessary to ensure that the proper steps are taken when testing a bay. Note that the chart outlines steps to be performed prior to testing the bay, and steps for use after the bay has been tested. It is important that the procedures be performed exactly as outlined with the steps in the order shown.

If the receiver is being used in the hot-standby-only mode, perform Steps 3 through 6. When the hot standby equipped with squelch mode is used, perform Steps 7, 8, and 9. If the receiver is being used in the hot standby/space diversity mode, perform Steps 10 through 18 or Steps 19 through 27 when the hot standby/space diversity equipped with squelch is used. If the receiver is being used in a frequency diversity mode, perform Steps 28 through 31. When frequency diversity with space diversity is used, perform Steps 32 through 35.

**Note:** When IF access mode is used, always treat the bay as if it were a hot standby/space diversity arrangement or a hot standby/space diversity equipped with squelch arrangement.

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## CHART 2 (Contd)

## APPARATUS:

1 --840543953 Cable Assembly

## STEP

## PROCEDURE

- | STEP | PROCEDURE   |
|------|---|
| 1    | <b>Caution: Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.</b> |
| 2    | <b>Caution: The AGC-MAN switch should not be put in the MAN position unless the IF main amplifier in the bay to be tested has been disconnected from the hybrid in the standby bay. Failure to do so will cause channel degradation.</b>                                |
|      | <b>A. Hot Standby Only</b>  |
| 3    | Force-switch the system to the receiver that is not to be maintained. Refer to Section 415-600-500 for switching information.   |
| 4    | For hot-standby-only systems, proceed with Charts 3 through 7, 9, and 13, but omit Steps 3 through 17 of Chart 13.  |
| 5    | On the IF main amplifier, turn the HS/SD TRIP control completely counterclockwise.  |
| 6    | When all testing is completed, return the system to the AUTO mode.  |
|      | <b>B. Hot Standby Equipped With Squelch</b>   |
| 7    | Force-switch the system to the receiver that is not to be maintained. Refer to Section 415-600-500 for switching information.   |
| 8    | Proceed with Charts 3 through 7 and 9. Perform Steps 21 through 34 of Chart 11 and only Step 2 of Chart 13.   |
| 9    | When all testing is completed, return the system to the AUTO mode.  |
|      | <b>C. Hot Standby/Space Diversity</b>   |
| 10   | <b>Caution: The AGC-MAN switch should not be placed in the MAN position unless the IF main amplifier in the bay to be tested has been disconnected from the hybrid in the standby bay. Failure to do so will cause channel degradation.</b>                             |
|      | Force-switch the system to the receiver that is not to be maintained. Refer to Section 415-600-500 for switching information.   |

## CHART 2 (Contd)

| STEP | PROCEDURE  |
|------|--|
| 11   | Remove the appropriate cable from the hybrid's REG IN jack when testing the regular bay or from the STBY IN jack when testing the standby bay. Terminate the jack with a 75-ohm termination plug.<br><br><b>Note:</b> The hybrid is located in the standby bay.  |
| 12   | Disconnect the dc power connector, jack J9, from the IF main amplifier in the bay to be tested. Insert the 840543953 cable assembly between the connector and the IF main amplifier.   |
| 13   | Proceed with the tests in Charts 3 through 7, 9, and 13.   |
| 14   | <b>Caution:</b> <i>Failure to remove the cable assembly as indicated below will render the automatic switching system inoperative.</i><br><br>When the tests have been completed, remove the 840543953 cable assembly and connect the power connector to the IF main amplifier.  |
| 15   | Check that the AGC-MAN switch on the IF main amplifier is in the AGC position.   |
| 16   | Check that the bay has been restored to normal condition.<br><br><b>Note:</b> To verify that the output of the squelch gate is muted, the output of the IF main amplifier should be -50 dB or lower.   |
| 17   | Restore the cable connection to the hybrid in the standby bay which was removed in Step 11.  |
| 18   | Return the system to the AUTO mode.<br><br><b>D. Hot Standby/Space Diversity Equipped With Squelch</b>   |
| 19   | <b>Caution:</b> <i>The AGC-MAN switch should not be put in the MAN position unless the IF main amplifier in the bay to be tested has been disconnected from the hybrid in the standby bay. Failure to do so will cause channel degradation.</i><br><br>Force-switch the system to the receiver that is not to be maintained. Refer to Section 415-600-500 for switching information. |
| 20   | Remove the appropriate cable from the hybrid's REG IN jack when testing the regular bay or from the STBY IN jack when testing the standby bay. Terminate the jack with a 75-ohm termination plug.<br><br><b>Note:</b> The hybrid is located in the standby bay.  |
| 21   | Disconnect the dc power connector, jack J9, from the squelch circuit in the bay to be tested. Insert the 840543953 cable assembly between the connector and the squelch circuit.   |

## CHART 2 (Contd)

## STEP

## PROCEDURE

- 22 Proceed with the tests in Charts 3 through 7 and 9. Perform Steps 21 through 34 of Chart 11. Then perform all steps in Chart 13.
- 23 ***Caution: Failure to remove the cable assembly as indicated below will render the automatic switching system inoperative.***
- When the tests have been completed, remove the 840543953 cable assembly and connect the power connector to the squelch circuit.
- 24 Check that the AGC-MAN switch on the IF main amplifier is in the AGC position.
- 25 Check that the bay has been restored to the normal condition.
- 26 Restore the cable connection to the hybrid in the standby bay which was removed in Step 20.
- 27 Return the system to the AUTO mode.
- E. Frequency Diversity**
- 28 Obtain a release from the designated control office, and have the service switched to the protection channel as directed by local operating procedures.
- 29 Proceed with the tests in Charts 3 through 7, 9, and 11.
- 30 Remove all test equipment from the bay and the shorting plates from the monitor-shutter assemblies. Restore all bay connections to normal, and operate the MAN-AGC switch on the IF amplifier to AGC.
- 31 Notify the control office, and have the service switched to the regular channel as directed by local procedures.
- F. Frequency Diversity With Space Diversity**
- 32 Obtain a release from the control office, and have the service switched to the protection channel as directed by local operating procedures.
- 33 Proceed with the tests in Charts 3 through 7, 9, 11, and 14.
- 34 Remove all test equipment from the bay and the shorting plates from the monitor-shutter and 409B switch assemblies. Restore all bay connections to normal and operate the MAN-AGC switch on the IF amplifier to AGC. On the Electromagnetic Science (EMS) diversity switch, operate the switch to the OPERATE position. On the 409B switch diversity control, operate the switch to the preferred antenna position.
- 35 Notify the control office and have the service switched to the regular channel as directed by local procedures.

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**CHART 2 (Contd)**


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| STEP   | PROCEDURE   |
|--|---|
| <b>G. Bay Equipped For 45-Mb/s Digital Signal Transmission</b> |   |
| 36   | ◆Obtain a release from the designated control office, and have the service switched to the protection channel as directed by local operating procedures.  |
| 37   | Proceed with the tests in Charts 3 through 6, 8, 10, and 12.  |
| 38   | Remove all test equipment from the bay and the shorting plates from the monitor-shutter assemblies. Restore all bay connections to normal, and operate the MAN-AGC switch on the IF amplifier to AGC. |
| 39   | Restore the DISABLE switch on the ADP1 DYN SLP EQL to normal.   |
| 40   | Notify the control office and have the service switched to the regular channel as directed by local procedures.◆  |

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**CHART 3****MICROWAVE GENERATOR FREQUENCY CHECK**


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The following is a check of the frequency of the microwave generator. Repeater station bays use a single generator for both the transmitter and receiver. Main station bays provide separate generators for the transmitter and receiver. For location of the microwave generators, see Fig. 1 and 2.

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**APPARATUS:**

- 1 —J68392A Transmitter-Receiver Test Set
  - 1 —P-48Q352 Adjusting Tool
- 

| STEP | PROCEDURE   |
|------|---|
| 1    | <b>Caution: Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be</b> |

## CHART 3 (Contd)

## STEP

## PROCEDURE

*force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.*

- 2 **Caution:** *Operating the microwave generator without the front cover of the bay may change the temperature of the generator and, therefore, its output frequency. The cover must be replaced as soon as the frequency check is completed.*
- 3 Prepare for testing in accordance with Fig. 3, option (X).
- 4 Adjust the IF AMPL GAIN control on the test set until the power meter indicates 0 dBm.
- 5 Change connections to option (Y) and measure the frequency on the counter.

**Requirement:** Within the limits shown in Table B or C, depending upon whether the receiver is in a main station or a repeater station.

If the requirement is not met, adjust the FREQ ADJ control to bring the frequency to within 10 Hz of the nominal.

If unable to meet the requirement by adjustment, refer to Section 415-410-500.

**Note:** The P-48Q352 adjusting tool has a slight detuning effect on the oscillator frequency. Adjust the control to within  $\pm 10$  Hz of the oscillator output frequency with the tool inserted in the control. Remove the tool and note the frequency shift. Readjust, taking the shift into account, so that the  $\pm 10$  Hz requirement is met when the tool is removed.

- 6 Disconnect the cable from the FREQ MON jack.

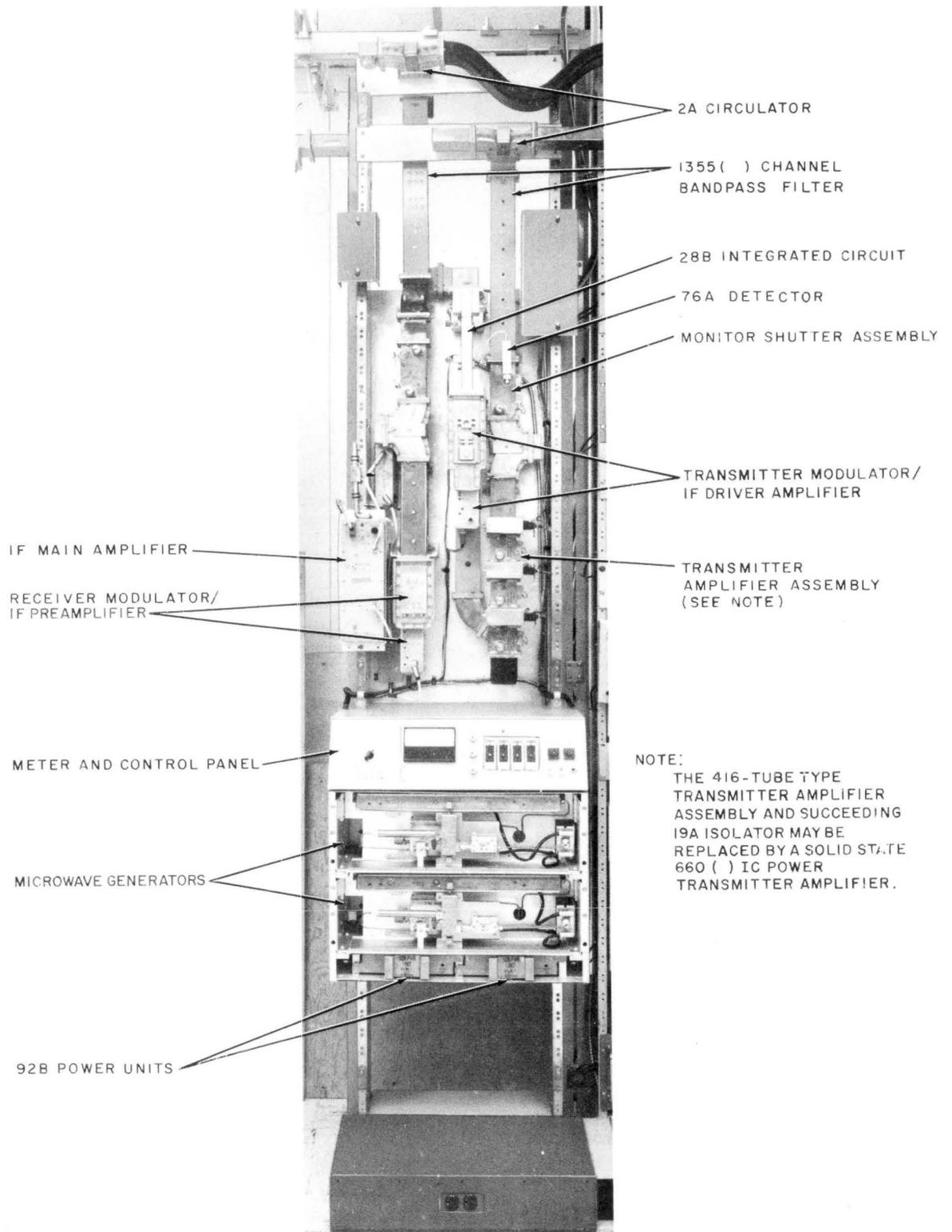


Fig. 1—TD-3D Transmitter-Receiver Bay, Main Station

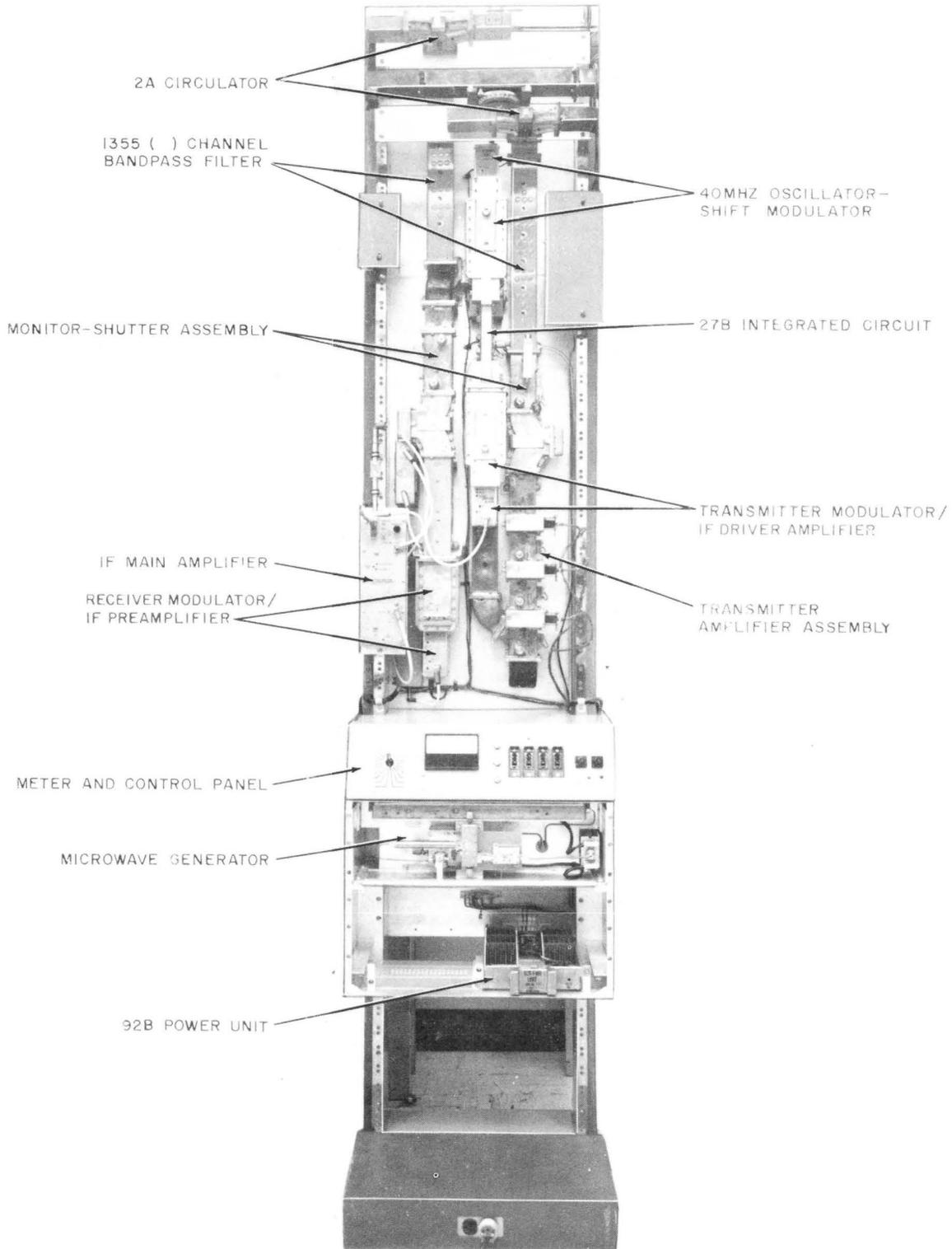
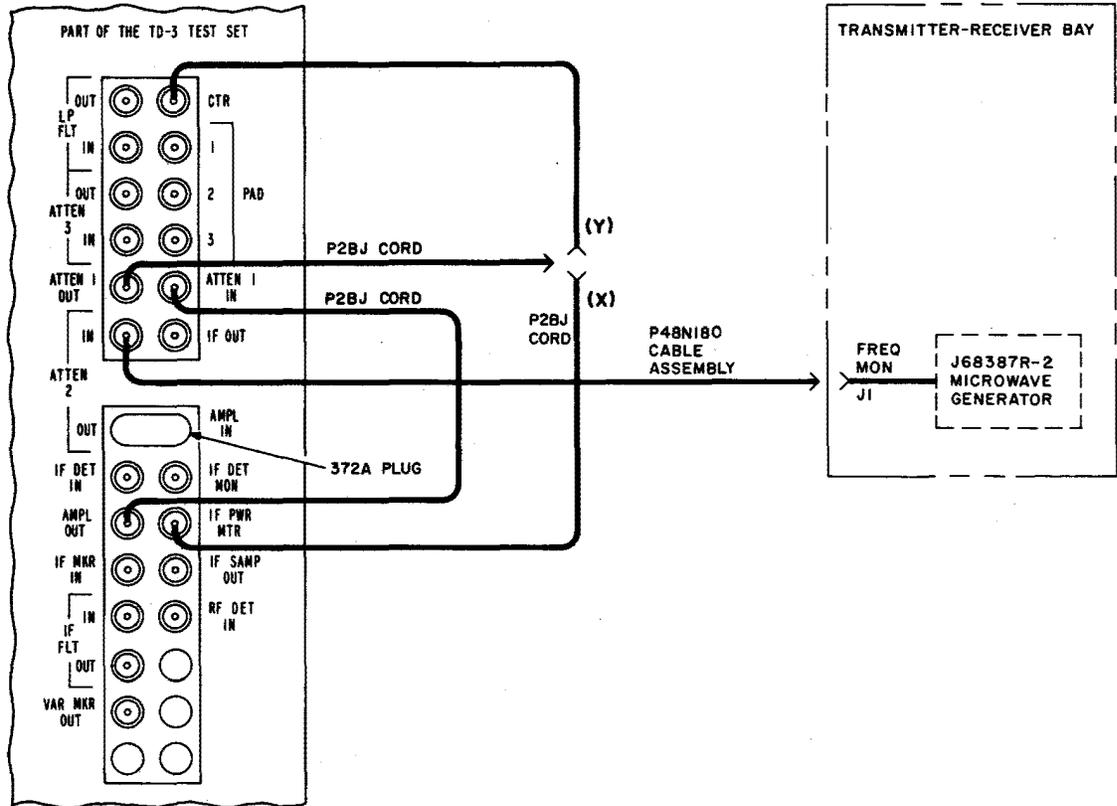


Fig. 2—TD-3D Transmitter-Receiver Bay, Repeater Station



**PREPARATION FOR TEST  
(FIG. 3)**

1. Operate the test set controls to the following positions:

| UNIT          | CONTROL         | POSITION  |
|---------------|-----------------|-----------|
| Control Panel | ATTEN 1         | 5 dB      |
|               | CTR             | EXT       |
|               | ATTEN 2         | 20 dB     |
| Power Meter   | INPUT CHANNEL   | IF        |
|               | POWER RANGE DBM | -25       |
| Counter       | FUNCTION        | FREQUENCY |

2. With no input connected to the power meter, adjust the METER ZERO control for a ZERO meter indication.
3. Set the POWER RANGE DBM control to 0.

**Fig. 3—Microwave Generator Frequency Test**

TABLE B

| MAIN STATION RECEIVER |         | MAIN STATION MICROWAVE GENERATOR LOW-FREQUENCY OSCILLATOR |                         |
|-----------------------|---------|---|-------------------------|
| FREQUENCY (MHz)       | CHANNEL | NOMINAL FREQUENCY (MHz)                                   | LIMITS (MHz)            |
| 3730                  | 1A      | 118.7500  | 118.749400 — 118.750600 |
| 3770                  | 1B      | 120.0000  | 119.999400 — 120.000600 |
| 3810                  | 2A      | 121.2500  | 121.249400 — 121.250600 |
| 3850                  | 2B      | 122.5000  | 122.499400 — 122.500600 |
| 3890                  | 3A      | 119.3750  | 119.374400 — 119.375600 |
| 3930                  | 3B      | 120.6250  | 120.624400 — 120.625600 |
| 3970                  | 4A      | 121.8750  | 121.874400 — 121.875600 |
| 4010                  | 4B      | 123.1250  | 123.124400 — 123.125600 |
| 4050                  | 5A      | 124.3750  | 124.374400 — 124.375600 |
| 4090                  | 5B      | 125.6250  | 125.624400 — 125.625600 |
| 4130                  | 6A      | 126.8750  | 126.874400 — 126.875600 |
| 4170                  | 6B      | 128.1250  | 128.124400 — 128.125600 |
| 3710                  | 7A      | 118.1250  | 118.124400 — 118.125600 |
| 3750                  | 7B      | 119.3750  | 119.374400 — 119.375600 |
| 3790                  | 8A      | 120.6250  | 120.624400 — 120.625600 |
| 3830                  | 8B      | 121.8750  | 121.874400 — 121.875600 |
| 3870                  | 9A      | 118.7500  | 118.749400 — 118.750600 |
| 3910                  | 9B      | 120.0000  | 119.999400 — 120.000600 |
| 3950                  | 10A     | 121.2500  | 121.249400 — 121.250600 |
| 3990                  | 10B     | 122.5000  | 122.499400 — 122.500600 |
| 4030                  | 11A     | 123.7500  | 123.749400 — 123.750600 |
| 4070                  | 11B     | 125.0000  | 124.999400 — 125.000600 |
| 4110                  | 12A     | 126.2500  | 126.249400 — 126.250600 |
| 4150                  | 12B     | 127.5000  | 127.499400 — 127.500600 |

TABLE C

| REPEATER STATION<br>RECEIVER |         | REPEATER STATION<br>MICROWAVE GENERATOR<br>LOW-FREQUENCY OSCILLATOR |                         |
|------------------------------|---------|---|-------------------------|
| FREQUENCY (MHz)              | CHANNEL | NOMINAL<br>FREQUENCY (MHz)  | LIMITS (MHz)            |
| 3730                         | 1A      | 120.0000  | 119.999400 — 120.000600 |
| 3770                         | 1B      | 118.7500  | 118.749400 — 118.750600 |
| 3810                         | 2A      | 122.5000  | 122.499400 — 122.500600 |
| 3850                         | 2B      | 121.2500  | 121.249400 — 121.250600 |
| 3890                         | 3A      | 120.6250  | 120.624400 — 120.625600 |
| 3930                         | 3B      | 119.3750  | 119.374400 — 119.375600 |
| 3970                         | 4A      | 123.1250  | 123.124400 — 123.125600 |
| 4010                         | 4B      | 121.8750  | 121.874400 — 121.875600 |
| 4050                         | 5A      | 125.6250  | 125.624400 — 125.625600 |
| 4090                         | 5B      | 124.3750  | 124.374400 — 124.375600 |
| 4130                         | 6A      | 128.1250  | 128.124400 — 128.125600 |
| 4170                         | 6B      | 126.8750  | 126.874400 — 126.875600 |
| 3710                         | 7A      | 119.3750  | 119.374400 — 119.375600 |
| 3750                         | 7B      | 118.1250  | 118.124400 — 118.125600 |
| 3790                         | 8A      | 121.8750  | 121.874400 — 121.875600 |
| 3830                         | 8B      | 120.6250  | 120.624400 — 120.625600 |
| 3870                         | 9A      | 120.0000  | 119.999400 — 120.000600 |
| 3910                         | 9B      | 118.7500  | 118.749400 — 118.750600 |
| 3950                         | 10A     | 122.5000  | 122.499400 — 122.500600 |
| 3990                         | 10B     | 121.2500  | 121.249400 — 121.250600 |
| 4030                         | 11A     | 125.0000  | 124.999400 — 125.000600 |
| 4070                         | 11B     | 123.7500  | 123.749400 — 123.750600 |
| 4110                         | 12A     | 127.5000  | 127.499400 — 127.500600 |
| 4150                         | 12B     | 126.2500  | 126.249400 — 126.250600 |

## CHART 4

## MICROWAVE GENERATOR OUTPUT POWER CHECK

## APPARATUS:

- 1 — P-48Q352 Adjusting Tool
- 1 — 388A Tool (wrench to loosen locknuts on  $\times 4$  multiplier)

## STEP

## PROCEDURE

**Note:** When checking a main station receiver bay equipped with the J68387P receiver modulator—IF preamplifier, perform Steps 2 through 4. When checking a main station receiver equipped with the J68387AD receiver modulator—IF preamplifier, perform Steps 3 and 4. When checking a repeater station bay, perform Steps 5 through 8.

- 1 **Caution:** *Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.*

**A. Main Station Receiver Microwave Generator**

- 2 Set the control panel selector switch to RCVR MOD BIAS and observe the meter indication.

**Requirement:** Recorded value

If the requirement is not met, adjust the DIODE BIAS control on the IF preamplifier for the recorded value.

- 3 Set the control panel selector switch to BO LEV and observe the meter indication.

**Requirement:** Recorded value

- 4 **Caution:** *To maintain the correct power level and to prevent RF leakage, under no circumstances should the control be left in a loose condition.*

If the requirement is not met, adjust attenuator ATT 2 on the 28B integrated circuit until the meter indicates the requirement.

**Note 1:** If it is necessary to recalibrate the BO LEV meter indication, refer to Section 415-410-502, Chart 5.

**Note 2:** The nut associated with the control of ATT 2 should exert some drag when the control is being adjusted. When the nut is properly adjusted, it should be possible to adjust the con-

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**CHART 4 (Contd)**


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**STEP****PROCEDURE**

trol with the fingers of one hand while the nut remains stationary. It is not necessary to lock the nut after making the adjustment.

If the requirement still cannot be met, proceed to Section 415-410-500 and realign the microwave generator. After realignment, repeat this chart.

**B. Repeater Station Bay Microwave Generator**

- 5 On the meter panel, set the selector switch to MWV GEN OUT.

**Requirement:** The meter indicates  $70 \pm 10$

If the requirement is met, proceed with Step 6. If the requirement is not met, proceed to Section 415-410-500 and realign the generator; then proceed with Step 6.

- 6 Adjust the LEV ADJ control on the 500-MHz generator circuit of the microwave generator for an indication of 70 on the meter.
- 7 Loosen the locknuts on the  $\times 4$  multiplier and adjust for a peak indication; then readjust the LEV ADJ control for an indication of 70.
- 8 After all adjustments have been made, record the meter indications in the spaces provided on the meter panel and relock the nuts on the  $\times 4$  multiplier.
- 

**CHART 5****40-MHZ OSCILLATOR AND SHIFT MODULATOR CHECK****APPARATUS:**

- 1 —J68392A Transmitter-Receiver Test Set
- 1 —P-48Q352 Adjusting Tool
-

CHART 5 (Contd)

| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

**Note 1:** This chart applies only to a repeater station bay. Main station bays do not contain 40-MHz oscillators and shift modulators.

**Note 2:** The checks in Charts 1, 3, and 4 must be completed before proceeding with this chart.

- 1 **Caution:** Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.
- 2 Make the test connections shown in Fig. 4.

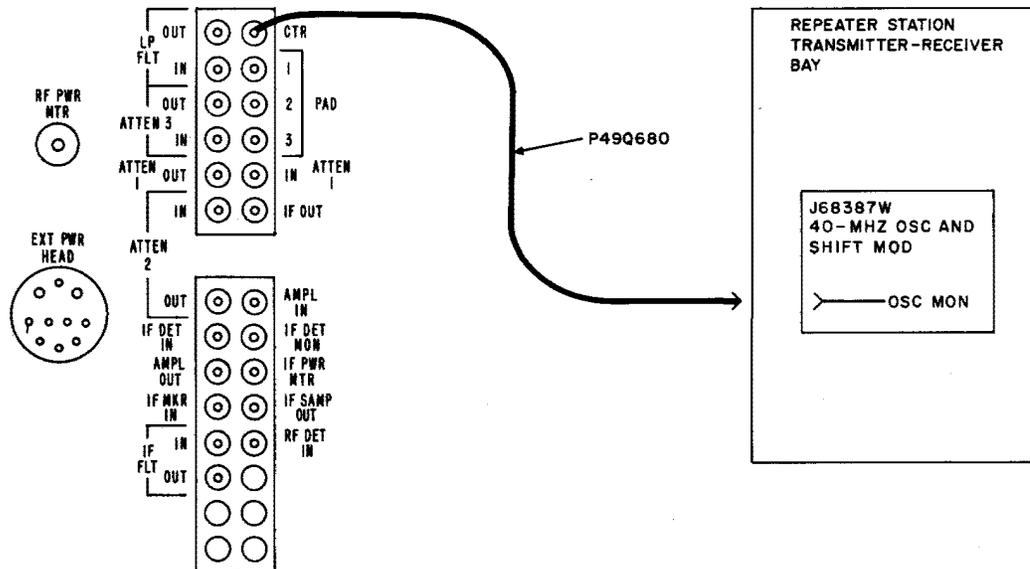


Fig. 4—40-MHz Oscillator Test

- 3 Set the CTR switch to the EXT position.

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**CHART 5 (Contd)**


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| STEP | PROCEDURE  |
|------|--|
| 4    | Observe the frequency indicated by the counter.<br><br><b>Requirement:</b> 40 MHz $\pm$ 400 Hz (limits: 39,999,600 to 40,000,400 Hz)<br><br>If the requirement is not met, adjust the <b>FREQ</b> control for 40 MHz $\pm$ 50 Hz (limits: 39,999,950 to 40,000,050 Hz).  |
| 5    | Remove the test cable from the <b>OSC MON</b> jack.<br><br><b>Note:</b> If the receiver is equipped with the <b>J68387P</b> receiver modulator— <b>IF</b> preamplifier, proceed with Steps 6 and 7. If the receiver is equipped with the <b>J68387AD</b> receiver modulator— <b>IF</b> preamplifier, proceed to Step 7.    |
| 6    | Set the selector switch on the meter panel to <b>RCVR MOD BIAS</b> and observe the meter indication.<br><br><b>Requirement:</b> Recorded value<br><br>If the requirement is not met, adjust the <b>DIODE BIAS</b> control on the <b>IF</b> preamplifier for the recorded value.  |
| 7    | Select <b>BO LEV</b> on the meter panel switch and read the meter.<br><br><b>Requirement:</b> Recorded value<br><br>If the requirement is not met, adjust the <b>PWR ADJ</b> control on the 40-MHz oscillator until the requirement is met.<br><br>If any of the requirements cannot be met, refer to Section 415-410-501. |

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**CHART 6**
**OVERALL RF-TO-IF TRANSMISSION TEST**


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**APPARATUS:**

1 —J68392A Transmitter-Receiver Test Set

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## CHART 6 (Contd)

## STEP

## PROCEDURE

**Note 1:** It is necessary to know the actual or calculated value of received carrier power at the input to the receiver. The typical nonfaded received carrier power will be in the range from  $-28$  dBm through  $-22$  dBm if no waveguide preamplifier is equipped, but may go as high as  $-14$  dBm if the waveguide preamplifier is used. If the received carrier power is less than  $-28$  dBm, use  $-28$  dBm for these tests.

**Note 2:** Some main station receivers are equipped with a 747A low-pass filter at the output of the IF main amplifier. For these receivers, the output of the IF main amplifier is considered to be the IF OUT jack on the 747A filter. All power and transmission measurements should be made at this point.

**Note 3:** Some main station receivers are equipped with a J68330Y IF amplitude equalizer-amplifier which has unity gain. This equalizer-amplifier must be removed from the receiver path before making gain-frequency response measurements and restored to normal upon completion of tests.

- 1 **Caution: Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.**
- 2 **Caution: No adjustments should be made while performing the steps in this chart to bring the transmission response within requirements.**
- 3 **Caution: If any of the requirements in this chart are not met, Charts 7 and 9 or 8 and 10 must be performed to provide the proper sequence of steps for making adjustments on the receiver modulator and IF preamplifier and the IF main amplifier.**
- 4 Complete the Preparation for Test in Fig. 11. Do not perform the oscilloscope calibration at this time.
- 5 Make the connections to the receiver as shown in Fig. 11. Remove the coverplate from the monitor-shutter assembly and insert shorting plates in the two slots nearest the receiver. Remove the plug from port A and insert the ED-51567-30 probe assembly.
- 6 Make the test connections as shown in options (X), (R), and (V).
- 7 On the IF main amplifier, set the MAN-AGC switch to the AGC position.
- 8 Measure the frequency.

**Requirement:** 70 MHz  $\pm 0.5$  MHz

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**CHART 6 (Contd)**


---

| STEP | PROCEDURE   |
|------|---|
|      | If the requirement is not met, adjust the frequency of the RF oscillator until the requirement is met.  |
| 9    | Change the connections from option (V) to option (Y).   |
| 10   | Measure the power.<br><br><b>Requirement:</b> 0 dBm $\pm$ 0.75 dB   |
| 11   | Set the selector switch on the control panel to RCVD CARR PWR and observe the meter. Note for later use.<br><br><b>Requirement:</b> 80 $\pm$ 4  |
| 12   | Remove connector P1 from the IF OUT jack on the IF preamplifier and insert either 41 dB of IF loss (without RF combiner) or 36 dB of IF loss (with RF combiner) between the IF OUT jack and connector P1.   |
| 13   | Measure the power.<br><br><b>Requirement:</b> Within 2 dB of the power measured in Step 10.   |
| 14   | Remove the IF pads and reconnect P1 to the IF preamplifier IF OUT jack.   |
| 15   | Operate the MAN-AGC switch on the IF main amplifier to the MAN position and note the meter indication for RCVD CARR PWR.<br><br><b>Requirement:</b> Same as noted in Step 11.<br><br>If the requirement is not met, adjust the MAN GAIN control on the IF main amplifier to obtain the requirement. |
| 16   | Measure the power.<br><br><b>Requirement:</b> 0 dBm $\pm$ 1 dB  |
| 17   | If the bay is equipped for 45-Mb/s digital operation, proceed to Step 21, otherwise proceed to Step 19.   |
| 18   | Change the connections from option (X) to option (W) and measure the output of the RF oscillator. Adjust the RF oscillator output control to drop the output by 5 dB. On the test set, set ATTEN 2 to 12 dB.  |
| 19   | Change the connections from option (W) back to option (X).  |

---

**CHART 6 (Contd)**


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| STEP | PROCEDURE  |
|------|--|
| 20   | On the RF oscillator, set the FUNCTION-SWEEP SELECTOR or the MODE switch (whichever applies) to produce a swept signal.  |
| 21   | Perform the oscilloscope calibration in Fig. 11.   |
| 22   | Measure the amplitude response as shown by the test trace on the oscilloscope.<br><br><b>Requirement:</b> The trace shall indicate a flat response to within 0.30 dB over the 62- through 78-MHz band and to within 0.60 dB over the 60- through 80-MHz band.  |
| 23   | If the requirements in Step 22 are met, remove the test connectors from the IF OUT jack of the IF main amplifier and restore the bay connection to that jack.<br><br>If the requirements in Steps 4 through 22 cannot be met, it will be necessary to align the receiver modulator—IF preamplifier and the IF main amplifier as directed in Charts 7 or 8 and 9 or 10. After performing Charts 7 or 8 and 9 or 10 repeat Chart 6 (this chart), Steps 4 through 22. |
| 24   | If the requirements in Steps 4 through 22 still cannot be met, check for defective cables or a defective 1042A filter.<br><br><b>Note:</b> The insertion loss of the 1042A filter at 70 MHz should be between 6.5 and 7.5 dB. Its amplitude response should be flat to within 0.15 dB between 62 and 78 MHz and to within 0.35 dB between 60 and 80 MHz.   |
| 25   | If all requirements are met, remove the test equipment. Restore all bay connections to normal.   |
| 26   | Operate the MAN-AGC switch on the IF main amplifier to AGC.  |

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**CHART 7**
**RECEIVER MODULATOR AND IF PREAMPLIFIER  
ANALOG FM OPERATION**


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**APPARATUS:**

- 1 — J68392A Transmitter-Receiver Test Set
  - 1 — KS-20114, L2 Adjusting Tool
  - 1 — KS-20116, L1 Adjusting Tool
-

## CHART 7 (Contd)

| STEP | PROCEDURE   |
|------|---|
|      | <p><b>Note 1:</b> If the receiver is equipped with a J68387P receiver modulator—IF preamplifier, perform Steps 2 through 10. If the receiver is equipped with the J68387AD receiver modulator—IF preamplifier, perform Steps 11 through 34.</p> <p><b>Note 2:</b> Some main station receivers are equipped with a J68330Y IF amplitude equalizer-amplifier. This equalizer-amplifier must be removed from the receiver path before making gain-frequency response measurements and restored to normal upon completion of tests.</p> |
| 1    | <p><b>Caution:</b> <i>Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.</i></p> <p><b>A. J68387P Receiver Modulator—IF Preamplifier</b></p>   |
| 2    | Set the selector switch on the meter panel to the RCVR MOD BIAS position.   |
| 3    | Note the frequency of the receiver and the REF BIAS value stamped on the modulator; then refer to Table E.  |
|      | <p><b>Example:</b> Assume the receiver frequency is 3790 and the REF BIAS value stamped on the unit is 3.6, then 10 times 3.6 plus 3 (as indicated in the table) would be 39.</p> <p><b>Requirement:</b> The RCVR MOD BIAS indication shall be the same as calculated for the appropriate receiver frequency. Make any necessary adjustments with the DIODE BIAS control on the IF preamplifier. Record the RCVR MOD BIAS indication on the meter panel.</p>  |
| 4    | Make the test connection as shown in Fig. 11, option (W).   |
| 5    | Make the connections using options (X), (Y), and (Z).   |
| 6    | On the test set, set ATTEN 2 to 7 dB.   |
| 7    | On the RF oscillator, set the FUNCTION-SWEEP SELECTOR or MODE switch to CW.   |
| 8    | Adjust the LEVEL control on the IF preamplifier for an IF power indication as shown in Table D.   |

## CHART 7 (Contd)

STEP

PROCEDURE

TABLE D

| RF PREAMPLIFIER | RCP (NOTE)                         | WITHOUT RF COMBINER | WITH RF COMBINER |
|-----------------|------------------------------------|---------------------|------------------|
| Without 652A    | RCP equal to or lower than -17 dBm | -7 dBm              | -7 dBm           |
|                 | RCP higher than -17 dBm            | -4 dBm              | -7 dBm           |
| With 652A       |                                    | -4 dBm              | -7 dBm           |

**Note:** RCP is received carrier power.

- 9 On the RF oscillator, change the FUNCTION-SWEEP SELECTOR or MODE switch to  $\Delta F$ .
- 10 Change the test connections to options (X), (U), and (Z) and measure the transmission as shown by the test trace.

**Requirement:** The trace shall be flat to within  $\pm 0.1$  dB over the 60- through 80-MHz band.

If the requirement is not met, adjust the SHAPE and SLOPE controls while keeping the test and reference traces coincident at 70 MHz with the LEVEL control. If any of the requirements cannot be met, refer to Section 415-410-502.

**B. J68387AD Receiver Modulator—IF Preamplifier**

- 11 Connect the test setup as shown in Fig. 11 using options (W), (U), and (Z).
- 12 Determine the RF center frequency of the channel under test. Refer to Table F and determine the associated image frequency of the channel.
- 13 Perform the Preparation for Test procedures for Fig. 11, setting the RF oscillator CW control (Step 3 of the procedure) to the image frequency of the channel that was determined in Step 12. Do not perform the oscilloscope calibration at this time.
- 14 Change option (W) to option (X) and set ATTEN 2 to 10 dB.
- 15 On the preamplifier, adjust the SLOPE control fully clockwise and then 15 turns counterclockwise.
- 16 Adjust the GAIN control fully clockwise and then five turns counterclockwise.
- 17 Verify that the beat oscillator (BO) power at the output of the 1338( ) filter is +4 dBm (if necessary, refer to Section 415-410-502).

TABLE E

| RECEIVER<br>FREQUENCY<br>MHz | RCVR MOD BIAS<br>INDICATION |
|------------------------------|-----------------------------|
|                              | 10 TIMES THE REF BIAS       |
| 3710                         | +5                          |
| 3730                         | +4                          |
| 3870                         |                             |
| 3750                         | +4                          |
| 3890                         |                             |
| 3770                         | +3                          |
| 3910                         |                             |
| 3790                         | +3                          |
| 3930                         |                             |
| 3810                         | +2                          |
| 3950                         |                             |
| 3830                         | +2                          |
| 3970                         |                             |
| 3850                         | +1                          |
| 3990                         |                             |
| 4010                         | +0                          |
| 4030                         | -1                          |
| 4050                         | -2                          |
| 4070                         | -2                          |
| 4090                         | -3                          |
| 4110                         | -4                          |
| 4130                         | -4                          |
| 4150                         | -5                          |
| 4170                         | -6                          |

♦TABLE F♦

| RECEIVER<br>FREQUENCY<br>MHz | RCVR MOD BIAS<br>INDICATION | IMAGE<br>FREQUENCY<br>MHz |
|------------------------------|-----------------------------|---------------------------|
| 3710                         | 50                          | 3850                      |
| 3730                         | 50                          | 3870                      |
| 3870                         | 80                          | 3730                      |
| 3750                         | 50                          | 3890                      |
| 3890                         | 80                          | 3750                      |
| 3770                         | 50                          | 3910                      |
| 3910                         | 80                          | 3770                      |
| 3790                         | 50                          | 3930                      |
| 3930                         | 80                          | 3790                      |
| 3810                         | 50                          | 3950                      |
| 3950                         | 80                          | 3810                      |
| 3830                         | 50                          | 3970                      |
| 3970                         | 80                          | 3830                      |
| 3850                         | 50                          | 3990                      |
| 3990                         | 80                          | 3850                      |
| 4010                         | 80                          | 3870                      |
| 4030                         | 80                          | 3890                      |
| 4050                         | 80                          | 3910                      |
| 4070                         | 80                          | 3930                      |
| 4090                         | 80                          | 3950                      |
| 4110                         | 80                          | 3970                      |
| 4130                         | 80                          | 3990                      |
| 4150                         | 80                          | 4010                      |
| 4170                         | 80                          | 4030                      |

## CHART 7 (Contd)

| STEP | PROCEDURE  |
|------|--|
| 18   | Determine the proper receiver modulator bias indication for the channel from Table F. Adjust the DIODE BIAS control for a RCVR MOD BIAS indication of that value.                              |
| 19   | Adjust the TEST TRACE controls to center the test trace on the oscilloscope.   |
| 20   | Adjust the SWEEP TIME (VERNIER) and POSITION controls on the oscilloscope TIME BASE unit for approximately 10 centimeters horizontal deflection on the oscilloscope.                           |
| 21   | Adjust the IF MARKER FREQ control on the control panel for a $70 \pm 0.1$ MHz indication on the counter; then set the RF SWEEP SELECTOR to the $\Delta F$ -AUTO or MODE switch to $\Delta F$ . |
| 22   | Adjust the SENSITIVITY and POSITION controls on the oscilloscope DIFFERENTIAL AMPLIFIER to position and center the trace on the oscilloscope. The trace should be similar to Fig. 5.           |

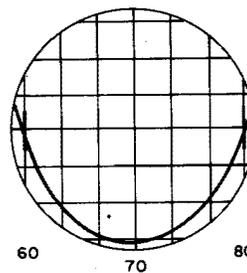


Fig. 5—Image Frequency Portion of Response Trace

- 23 Loosen the locking collar on the FILTER TUNE control on the receiver modulator and adjust the FILTER TUNE control for maximum rejection (minimum output) at the sweep center frequency. The trace will be similar to the trace in Fig. 5. Tighten the locking collar while maintaining maximum rejection at the sweep center frequency.

**Note:** The response trace may not be symmetrical. The lowest point on the trace must be at the sweep center frequency which corresponds to the image frequency of the channel.

- 24 Change the test set connections to option (W), (V), and (Z). Perform the Preparation for Test procedures for Fig. 11, adjusting the RF oscillator to the channel center frequency. Do not perform the oscilloscope calibration at this time.
- 25 Change the test connection from option (W) to option (X) and measure the frequency.

## CHART 7 (Contd)

## STEP

## PROCEDURE

**Requirement:** 70 MHz  $\pm$ 0.5 MHz

If the requirement is not met, adjust the frequency of the RF oscillator until the requirement is met.

- 26 Change from option (V) to option (Y) and adjust the DIODE BIAS control on the IF preamplifier for maximum power at 70 MHz as indicated by the power meter.
- 27 Set the INPUT CHANNEL switch on the power meter to the IF position. Determine that no input is connected; then zero the power meter by setting the POWER RANGE DBM switch to the -25 position and adjusting the ZERO METER control for an indication of ZERO on the meter.
- 28 On the test set, set ATTEN 2 to 7 dB and the POWER RANGE DBM switch to -10 position. Establish option (Y).
- 29 Adjust the GAIN control on the IF preamplifier for an IF power indication as shown in Table G.

TABLE G

| RF PREAMPLIFIER | RCP (NOTE)                         | WITHOUT RF COMBINER | WITH RF COMBINER |
|-----------------|------------------------------------|---------------------|------------------|
| Without 652A    | RCP equal to or lower than -17 dBm | -7 dBm              | -7 dBm           |
|                 | RCP higher than -17 dBm            | -4 dBm              | -7 dBm           |
| With 652A       |                                    | -4 dBm              | -7 dBm           |

**Note:** RCP is received carrier power.

- 30 On the RF oscillator, set the FUNCTION-SWEEP SELECTOR or MODE switch to  $\Delta F$ .
- 31 Change the test set connections to options (X), (U), and (Z) and perform the oscilloscope calibration procedures given in Fig. 11.
- 32 Measure the transmission response as shown by the test trace.

**Requirement:** The trace shall be flat to within 0.1 dB over the 60- through 80-MHz band.

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**CHART 7 (Contd)**


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| STEP | PROCEDURE  |
|------|--|
|      | If the requirement is not met, adjust the SLOPE control while keeping the test trace and reference trace coincident at 70 MHz with the GAIN control. If any of the requirements cannot be met, refer to Section 415-410-502. |
| 33   | Operate the bay meter to the BO LEV position and adjust the BO LEV MTR ADJ control on the IF preamplifier for a meter indication of 20. Record the indication on the bay meter panel.  |
| 34   | Operate the bay meter to the RCVR MOD BIAS position and record the meter indication in the space provided on the bay meter panel. Proceed with Chart 9.  |

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**▶CHART 8**
**RECEIVER MODULATOR AND IF PREAMPLIFIER  
45-MB/S DIGITAL OPERATION**


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**APPARATUS:**

- 1 — J68392A Transmitter-Receiver Test Set
  - 1 — KS-20114, L2 Adjusting Tool
  - 1 — KS-20116, L1 Adjusting Tool
- 

| STEP | PROCEDURE  |
|------|--|
|      | <b>Note 1:</b> If the receiver is equipped with a J68387P receiver modulator—IF preamplifier, perform Steps 2 through 10. If the receiver is equipped with the J68387AD receiver modulator—IF preamplifier, perform Steps 11 through 34.                                     |
|      | <b>Note 2:</b> Some main station receivers are equipped with a J68330Y IF amplitude equalizer-amplifier. This equalizer-amplifier must be removed from the receiver path before making gain-frequency response measurements and restored to normal upon completion of tests. |
| 1    | <b>Caution:</b> Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.      |

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**CHART 8 (Contd)**


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**STEP****PROCEDURE****A. J68387P Receiver Modulator—IF Preamplicifier**

- 2 Set the selector switch on the meter panel to the RCVR MOD BIAS position.
- 3 Note the frequency of the receiver and the REF BIAS value stamped on the modulator; then refer to Table H.

**Example:** Assume the receiver frequency is 3790 and the REF BIAS value stamped on the unit is 3.6, then 10 times 3.6 plus 3 (as indicated in the table) would be 39.

**Requirement:** The RCVR MOD BIAS indication shall be the same as calculated for the appropriate receiver frequency. Make any necessary adjustments with the DIODE BIAS control on the IF preamplicifier. Record the RCVR MOD BIAS indication on the meter panel.

- 4 Make the test connection as shown in Fig. 11, option (W).
- 5 Make the connections using options (X), (Y), and (Z).
- 6 On the test set, set ATTEN 2 to 1 dB.
- 7 On the RF oscillator, set the FUNCTION-SWEEP SELECTOR or MODE switch to CW.
- 8 Adjust the LEVEL control on the IF preamplicifier for an IF power indication of  $-7$  dBm.
- 9 On the RF oscillator, change the FUNCTION-SWEEP SELECTOR or MODE switch to  $\Delta F$ .
- 10 Change the test connections to options (X), (U), and (Z) and measure the transmission as shown by the test trace.

**Requirement:** The trace shall be flat to within 0.1 dB over the 60- through 80-MHz band.

If the requirement is not met, adjust the SHAPE and SLOPE controls while keeping the test and reference traces coincident at 70 MHz with the LEVEL control. If any of the requirements cannot be met, refer to Section 415-410-502.

**B. J68387AD Receiver Modulator—IF Preamplicifier**

- 11 Connect the test setup as shown in Fig. 11 using options (W), (U), and (Z).
- 12 Determine the RF center frequency of the channel under test. Refer to Table I and determine the associated image frequency of the channel.
- 13 Perform the Preparation for Test procedures for Fig. 11, setting the RF oscillator CW control (Step 3 of the procedure) to the image frequency of the channel that was determined in Step 12. Do not perform the oscilloscope calibration at this time.

▶TABLE H◀

| RECEIVER<br>FREQUENCY<br>MHz | RCVR MOD BIAS<br>INDICATION |
|------------------------------|-----------------------------|
|                              | 10 TIMES THE REF BIAS       |
| 3710                         | +5                          |
| 3730                         | +4                          |
| 3870                         |                             |
| 3750                         | +4                          |
| 3890                         |                             |
| 3770                         | +3                          |
| 3910                         |                             |
| 3790                         | +3                          |
| 3930                         |                             |
| 3810                         | +2                          |
| 3950                         |                             |
| 3830                         | +2                          |
| 3970                         |                             |
| 3850                         | +1                          |
| 3990                         |                             |
| 4010                         | +0                          |
| 4030                         | -1                          |
| 4050                         | -2                          |
| 4070                         | -2                          |
| 4090                         | -3                          |
| 4110                         | -4                          |
| 4130                         | -4                          |
| 4150                         | -5                          |
| 4170                         | -6                          |

♦TABLE I♦

| RECEIVER<br>FREQUENCY<br>MHz | RCVR MOD BIAS<br>INDICATION | IMAGE<br>FREQUENCY<br>MHz |
|------------------------------|-----------------------------|---------------------------|
| 3710                         | 50                          | 3850                      |
| 3730                         | 50                          | 3870                      |
| 3870                         | 80                          | 3730                      |
| 3750                         | 50                          | 3890                      |
| 3890                         | 80                          | 3750                      |
| 3770                         | 50                          | 3910                      |
| 3910                         | 80                          | 3770                      |
| 3790                         | 50                          | 3930                      |
| 3930                         | 80                          | 3790                      |
| 3810                         | 50                          | 3950                      |
| 3950                         | 80                          | 3810                      |
| 3830                         | 50                          | 3970                      |
| 3970                         | 80                          | 3830                      |
| 3850                         | 50                          | 3990                      |
| 3990                         | 80                          | 3850                      |
| 4010                         | 80                          | 3870                      |
| 4030                         | 80                          | 3890                      |
| 4050                         | 80                          | 3910                      |
| 4070                         | 80                          | 3930                      |
| 4090                         | 80                          | 3950                      |
| 4110                         | 80                          | 3970                      |
| 4130                         | 80                          | 3990                      |
| 4150                         | 80                          | 4010                      |
| 4170                         | 80                          | 4030                      |

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**▶CHART 8 (Contd)**


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| STEP | PROCEDURE   |
|------|---|
| 14   | Change option (W) to option (X) and set ATTEN 2 to 4 dB.  |
| 15   | On the preamplifier, adjust the SLOPE control fully clockwise and then 15 turns counterclockwise.   |
| 16   | Adjust the GAIN control fully clockwise and then five turns counterclockwise.   |
| 17   | Verify that the BO power at the output of the 1338( ) filter is +4 dBm (if necessary, refer to Section 415-410-502).  |
| 18   | Determine the proper receiver modulator bias indication for the channel from Table I. Adjust the DIODE BIAS control for a RCVR MOD BIAS indication of that value.   |
| 19   | Adjust the TEST TRACE controls to center the test trace on the oscilloscope.  |
| 20   | Adjust the SWEEP TIME (VERNIER) and POSITION controls on the oscilloscope TIME BASE unit for approximately 10 centimeters horizontal deflection on the oscilloscope.  |
| 21   | Adjust the IF MARKER FREQ control on the control panel for a $70 \pm 0.1$ MHz indication on the counter; then set the RF SWEEP SELECTOR to the $\Delta F$ -AUTO or MODE switch to $\Delta F$ .  |
| 22   | Adjust the SENSITIVITY and POSITION controls on the oscilloscope DIFFERENTIAL AMPLIFIER to position and center the trace on the oscilloscope. The trace should be similar to Fig. 5.  |
| 23   | Loosen the locking collar on the FILTER TUNE control on the receiver modulator and adjust the FILTER TUNE control for maximum rejection (minimum output) at the sweep center frequency. The trace will be similar to the trace in Fig. 5. Tighten the locking collar while maintaining maximum rejection at the sweep center frequency. |
|      | <b>Note:</b> The response trace may not be symmetrical. The lowest point on the trace must be at the sweep center frequency which corresponds to the image frequency of the channel.  |
| 24   | Change the test set connections to option (W), (V), and (Z). Perform the Preparation for Test procedures for Fig. 11, adjusting the RF oscillator to the channel center frequency. Do not perform the oscilloscope calibration at this time.  |
| 25   | Change the test connection from option (W) to option (X) and measure the frequency.   |
|      | <b>Requirement:</b> 70 MHz $\pm 0.5$ MHz  |
|      | If the requirement is not met, adjust the frequency of the RF oscillator until the requirement is met.  |
| 26   | Change from option (V) to option (Y) and adjust the DIODE BIAS control on the IF preamplifier for maximum power at 70 MHz as indicated by the power meter.  |

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**CHART 8 (Contd)**


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**STEP****PROCEDURE**

- 
- |    |  |
|----|--|
| 27 | Set the INPUT CHANNEL switch on the power meter to the IF position. Determine that no input is connected; then zero the power meter by setting the POWER RANGE DBM switch to the -25 position and adjusting the ZERO METER control for an indication of ZERO on the meter. |
| 28 | On the test set, set ATTEN 2 to 1 dB and the POWER RANGE DBM switch to -10 position. Establish option (Y).   |
| 29 | Adjust the GAIN control on the IF preamplifier for an IF power indication of -7 dBm.   |
| 30 | On the RF oscillator, set the FUNCTION-SWEEP SELECTOR or MODE switch to $\Delta F$ .   |
| 31 | Change the test set connections to options (X), (U), and (Z) and perform the oscilloscope calibration procedures given in Fig. 11.   |
| 32 | Measure the transmission response as shown by the test trace.  |

**Requirement:** The trace shall be flat to within 0.1 dB over the 60- through 80-MHz band.

If the requirement is not met, adjust the SLOPE control while keeping the test trace and reference trace coincident at 70 MHz with the GAIN control. If any of the requirements cannot be met, refer to Section 415-410-502.

- |    |   |
|----|---|
| 33 | Operate the bay meter to the BO LEV position and adjust the BO LEV MTR ADJ control on the IF preamplifier for a meter indication of 20. Record the indication on the bay meter panel. |
| 34 | Operate the bay meter to the RCVR MOD BIAS position and record the meter indication in the space provided on the bay meter panel. Proceed with Chart 10.♦                             |
- 

**CHART 9**
**IF MAIN AMPLIFIER  
ANALOG FM OPERATION**


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**APPARATUS:**

- 1 — KS-20114, L2 Adjusting Tool
-

## CHART 9 (Contd)

| STEP | PROCEDURE  |
|------|--|
| 1    | <b>Caution:</b> <i>Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.</i> |
| 2    | Prepare the test set in accordance with Fig. 12.   |
| 3    | Observe the test trace for slope between 60 and 80 MHz. Record the slope for use later in this chart.  |
| 4    | Increase the attenuation of ATTEN 2 by 2 dB.   |
| 5    | Change the connections to options (W) and (Z) ♦(using an 8-dB and 3-dB 19A-type pads).♦  |
| 6    | Set the MAN-AGC switch on the IF main amplifier to AGC.  |
| 7    | Measure the power.<br><br><b>Requirement:</b> -1 dBm (This corresponds to +10 dBm at the output of the IF main amplifier.)<br><br>If the requirement is not met, adjust the OUTPUT PWR control on the IF main amplifier to meet the requirement.                               |
| 8    | Insert 40 dB more attenuation ahead of the <i>input</i> of the IF main amplifier. (Use ATTEN 2 and/or 19A pads.)   |
| 9    | Measure the power.<br><br><b>Requirement:</b> Within 2 dB of the power measured in Step 7.   |
| 10   | Remove the 40 dB of attenuation inserted in Step 8.  |
| 11   | Set the meter panel selector switch to RCVD CARR PWR and note the meter indication.<br><br><b>Requirement:</b> 80 ±4   |
| 12   | Set the MAN-AGC switch to the MAN position.  |
| 13   | Adjust the MAN GAIN control to obtain the same meter indication as shown in Step 11.   |
| 14   | Insert an additional 5 dB of attenuation in ATTEN 2.   |

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**CHART 9 (Contd)**


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| STEP | PROCEDURE   |
|------|---|
| 15   | Measure the power.<br><br><b>Requirement:</b> -6 dBm $\pm$ 1 dB   |
| 16   | Change the test connections to options (Y) and (Z).   |
| 17   | Observe the linearity of the slope.<br><br><b>Requirement:</b> Within 0.25 dB between 60 and 80 MHz.  |
| 18   | If the requirements in this chart are met, repeat Steps 4 through 26 of Chart 6. If the requirements cannot be met, the input and output return-loss tests listed in Section 415-410-520 should be performed. If the requirements still cannot be met, replace the unit and repeat the steps in this chart. |

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**CHART 10**
**IF MAIN AMPLIFIER  
45-MB/S DIGITAL OPERATION**


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**APPARATUS:**

1 — KS-20114, L2 Adjusting Tool

---

| STEP | PROCEDURE   |
|------|---|
| 1    | <b>Caution:</b> Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500. |
| 2    | Prepare the test set in accordance with Fig. 12.  |
| 3    | Observe the test trace for slope between 60 and 30 MHz. Record the slope for use later in this chart.   |
| 4    | Increase the attenuation of ATTEN 2 by 8 dB.  |

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**CHART 10 (Contd)**


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| STEP | PROCEDURE  |
|------|--|
| 5    | Change the connections to options (W) and (Z) (using a 5-dB 19A-type pad).   |
| 6    | Set the MAN-AGC switch on the IF main amplifier to AGC.  |
| 7    | Measure the power.<br><br><b>Requirement:</b> -1 dBm (This corresponds to +4 dBm at the output of the IF main amplifier.)<br><br>If the requirement is not met, adjust the OUTPUT PWR control on the IF main amplifier to meet the requirement.  |
| 8    | Insert 40 dB more attenuation ahead of the input of the IF main amplifier. (Use ATTEN 2 and/or 19A pads.)  |
| 9    | Measure the power.<br><br><b>Requirement:</b> Within 2 dB of the power measured in Step 7.   |
| 10   | Remove the 40 dB of attenuation inserted in Step 8.  |
| 11   | Set the meter panel selector switch to RCVD CARR PWR and note the meter indication.<br><br><b>Requirement:</b> 80 ±4   |
| 12   | Set the MAN-AGC switch to the MAN position.  |
| 13   | Adjust the MAN GAIN control to obtain the same meter indication as shown in Step 11.   |
| 14   | Change the test connections to options (Y) and (Z).  |
| 15   | Observe the linearity of the slope.<br><br><b>Requirement:</b> Within 0.25 dB between 60 and 80 MHz.<br><br>If the requirements in this chart are met, repeat Steps 4 through 26 of Chart 6.<br><br>If the requirements cannot be met, the input and output return-loss tests listed in Section 415-410-520 should be performed. If the requirements still cannot be met, replace the unit and repeat the steps in this chart. |
| 16   | Connect the cable between the main amplifier OUT jack and the IF IN jack on the ADP1 unit.   |
| 17   | Connect the input of the IF power meter directly to the IF OUT A jack on the ADP1 unit.  |
| 18   | Set the DISABLE switch on the ADP1 to DISABLE.   |

---

**CHART 10 (Contd)**


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| STEP | PROCEDURE   |
|------|---|
| 19   | Adjust the IF OUT A ADJ control for a 0 dBm indication on the power meter.            |
| 20   | Transfer the cable from IF OUT A jack to the IF OUT C jack.                           |
|      | <b>Requirement:</b> Power meter should indicate $-3.2 \text{ dBm} \pm 0.1 \text{ dB}$ |

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**CHART 11**
**IF MAIN AMPLIFIER—IF CARRIER RESUPPLY  
ANALOG FM OPERATION**


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**APPARATUS:**

- 1 —KS-20114, L2 Adjusting Tool
- 

| STEP | PROCEDURE   |
|------|---|
| 1    | <b>Caution:</b> Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500. |
|      | <b>A. Carrier Power</b>   |
| 2    | Make the connections as shown in Fig. 6, option (X).  |
| 3    | Set the MAN-AGC switch on the IF main amplifier to AGC.   |
| 4    | Remove the IF cable from the IF IN jack on the IF main amplifier.   |
| 5    | Adjust the CRS DEV TUNE control for maximum power.  |
|      | <b>Requirement:</b> $-3$ to $+1$ dBm (at IF main amplifier output) or $-3.6$ to $+0.4$ dBm (at 747A filter output).   |
|      | <b>B. Carrier Frequency</b>   |
| 6    | Make the connections in Fig. 6, option (Y).   |

## CHART 11 (Contd)

| STEP | PROCEDURE  |
|------|--|
| 7    | Measure the frequency and note for later use.<br><br><b>Requirement:</b> $70 \pm 0.004$ MHz  |
|      | <b>C. Sideband Power</b>   |
|      | <b>Note 1:</b> Using the J68392A test set, Steps 8 through 15 set the effective sideband power 35 dB below the carrier power for units equipped with option (Y) and 40 dB for units equipped with option (Z). An alternate procedure for measuring the sideband power and frequency, using a 3A or 4A FM receiver and a selective voltmeter, is provided in Steps 16 through 20. |
|      | <b>Note 2:</b> Option (Z) equips the unit with an 8.8864-MHz pilot oscillator for use with the TDAS Protection Switching System. Option (Y) equips the unit with a 9.0-MHz pilot oscillator for use with the 100A and 400A Protection Switching Systems.   |
| 8    | If the J68387AB IF main amplifier-carrier resupply is equipped with option (Y), set ATTEN 2 for 58.8-dB attenuation. If the unit is equipped with option (Z), set ATTEN 2 for 63.8-dB attenuation.   |
| 9    | Make the connections in Fig. 7, option (X).  |
| 10   | Adjust the AMPL GAIN control on the test set control panel so that the power meter indicates 0 dBm.  |
| 11   | Make connections in Fig. 7, option (Y).  |
| 12   | Set ATTEN 2 for 20-dB attenuation.   |
| 13   | Measure the power.<br><br><b>Requirement:</b> $0 \text{ dBm} \pm 0.5 \text{ dB}$   |
|      | If the requirement is not met, adjust the CRS PLT PWR control on the IF main amplifier to meet the requirement.  |
|      | <b>D. Sideband Frequency</b>   |
| 14   | Make the test connections in Fig. 8.   |
| 15   | Measure the frequency.<br><br><b>Requirement:</b> The difference between the measured frequency and the frequency noted in Step 7 shall be $9.0 \pm 0.0001$ MHz for the Y option amplifier and $8.8864 \pm 0.0001$ MHz for the Z option amplifier.   |

## CHART 11 (Contd)

| STEP | PROCEDURE   |
|------|---|
|      | If the requirement is not met, adjust the CRS PLT FREQ control to meet the requirement.   |
|      | <b>E. Alternate Procedure for Adjusting the 9-MHz Sideband Power and Frequency Using an FM Receiver and a Selective Voltmeter</b>   |
|      | <b>Note:</b> The gain of the FM receiver used in this test must have been properly adjusted in accordance with Section 420-211-503 (for 3A-type) or Section 420-215-503 (for 4A-type).            |
| 16   | Connect the test setup as shown in Fig. 9, option (W).  |
| 17   | If the J68387AB IF main amplifier is equipped with option (Y), tune the selective voltmeter to 9.0 MHz. If the amplifier is equipped with option (Z), tune the selective voltmeter to 8.8864 MHz. |
|      | <b>Requirement:</b> The selective voltmeter shall indicate $-18 \pm 0.5$ dBm for amplifiers equipped with option (Y) or $-23 \pm 0.5$ dBm for amplifiers equipped with option (Z).                |
|      | If the requirement is not met, adjust the CRS PLT PWR control on the IF main amplifier to meet the requirement.   |
| 18   | Connect the test setup as shown in Fig. 9, options (X) and (Y).   |
| 19   | Adjust the test set amplifier gain control for a power meter indication of 0 dB.  |
| 20   | Change the test set connection from option (Y) to option (Z) and measure the frequency.   |
|      | <b>Requirement:</b> The frequency counter shall indicate $9.0 \pm 0.0001$ MHz for amplifiers equipped with option (Y) or $8.8864 \pm 0.0001$ MHz for amplifiers equipped with option (Z).         |
|      | If the requirement is not met, adjust the CRS PLT FREQ control on the IF main amplifier to meet the requirement.  |
|      | <b>F. Carrier Resupply Trip</b>   |
| 21   | Prepare the test arrangement to supply an RF signal to the receiver input. Refer to Chart 6.  |
| 22   | Set the FUNCTION-SWEEP SELECTOR or MODE switch to CW.   |
| 23   | Make the test connections as shown in Fig. 10, option (X).  |
| 24   | With ATTEN 2 set at 0-dB attenuation, adjust the RF input to the receiver (adjust the POWER LEVEL control on the RF oscillator) until the power meter indicates 0 dBm.                            |
| 25   | Set ATTEN 2 for 18-dB attenuation.  |
| 26   | Set the MAN-AGC switch on the IF main amplifier to MAN.   |

## CHART 11 (Contd)

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| STEP | PROCEDURE   |
|------|---|
| 27   | Turn the MAN GAIN control fully counterclockwise.   |
| 28   | Change the test connections in Fig. 10 to options (Y) and (Z).  |
| 29   | Adjust the MAN GAIN control to obtain 0 dBm on the power meter (0 dBm at the output of the IF main amplifier).  |
| 30   | Adjust the CRS TRIP control clockwise until the TRIP lamp is extinguished.  |
| 31   | Slowly turn the CRS TRIP control counterclockwise until the TRIP lamp just lights.  |
| 32   | Turn the MAN GAIN control clockwise to the point where the lamp is extinguished.  |
| 33   | Slowly turn the MAN GAIN control counterclockwise until the lamp just lights.   |
| 34   | Measure the power at the IF OUT jack of the IF main amplifier, options (Y) and (Z).<br><b>Requirement:</b> 0 dBm $\pm$ 1 dB   |
|      | <b>Note:</b> It may be necessary to repeat Steps 29 through 34 several times to meet this requirement.  |
| 35   | If any of the requirements of this chart are not met, replace the unit and repeat Steps 4 through 26 of Chart 6. If the requirements are met, refer to Chart 2 in this section to determine the remaining charts and steps that are required. |

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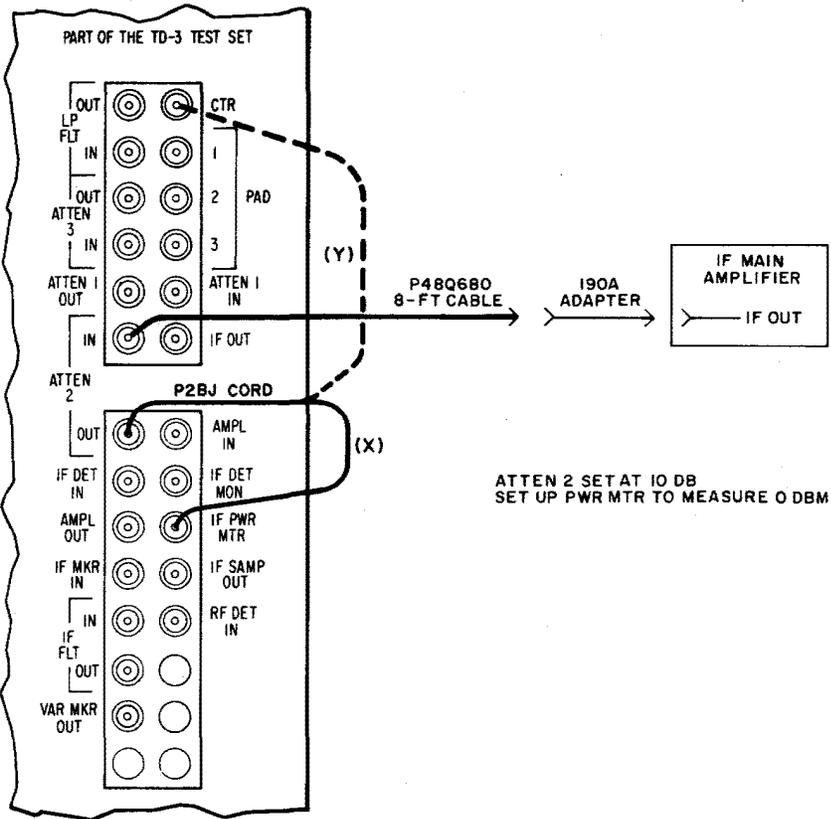


Fig. 6—IF Main Amplifier—Carrier Resupply Power and Frequency Measurement

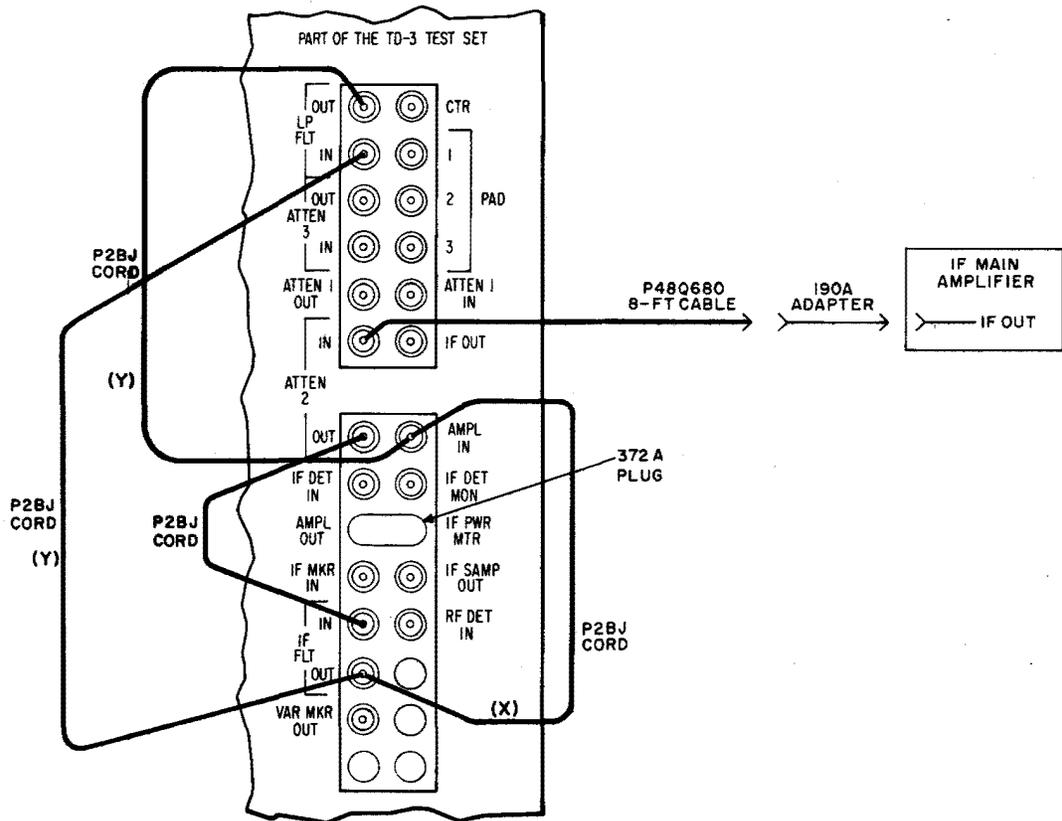


Fig. 7—Sideband Power Measurement

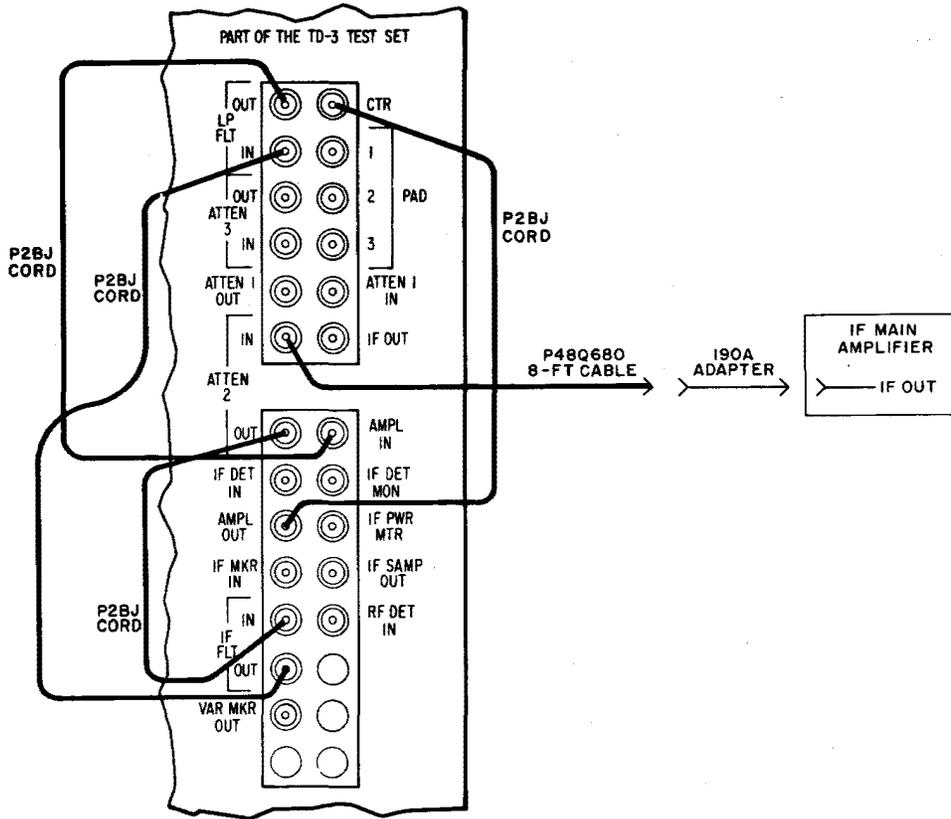


Fig. 8—Sideband Frequency Measurement

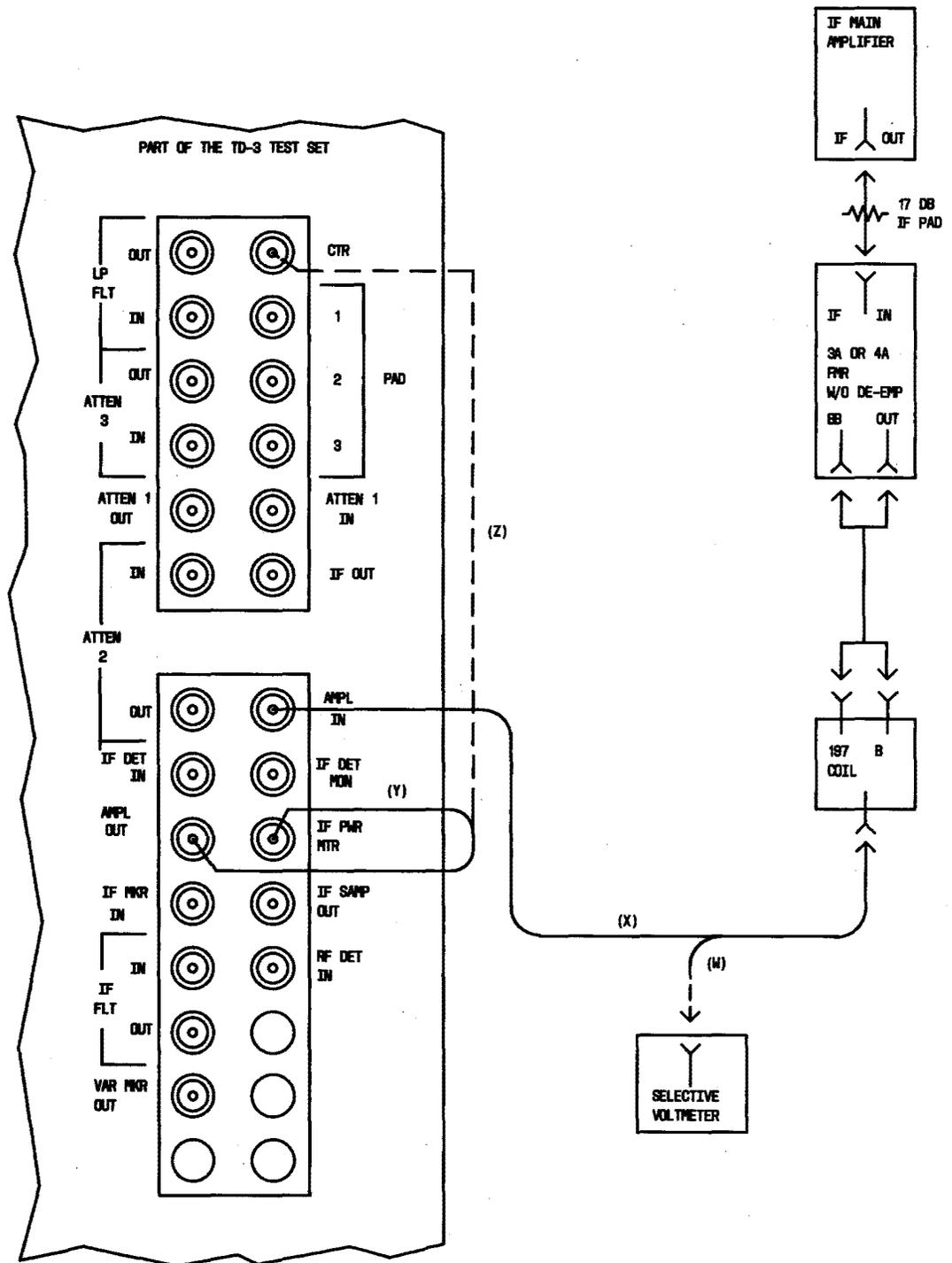


Fig. 9—9-MHz Sideband Power and Frequency Measurement

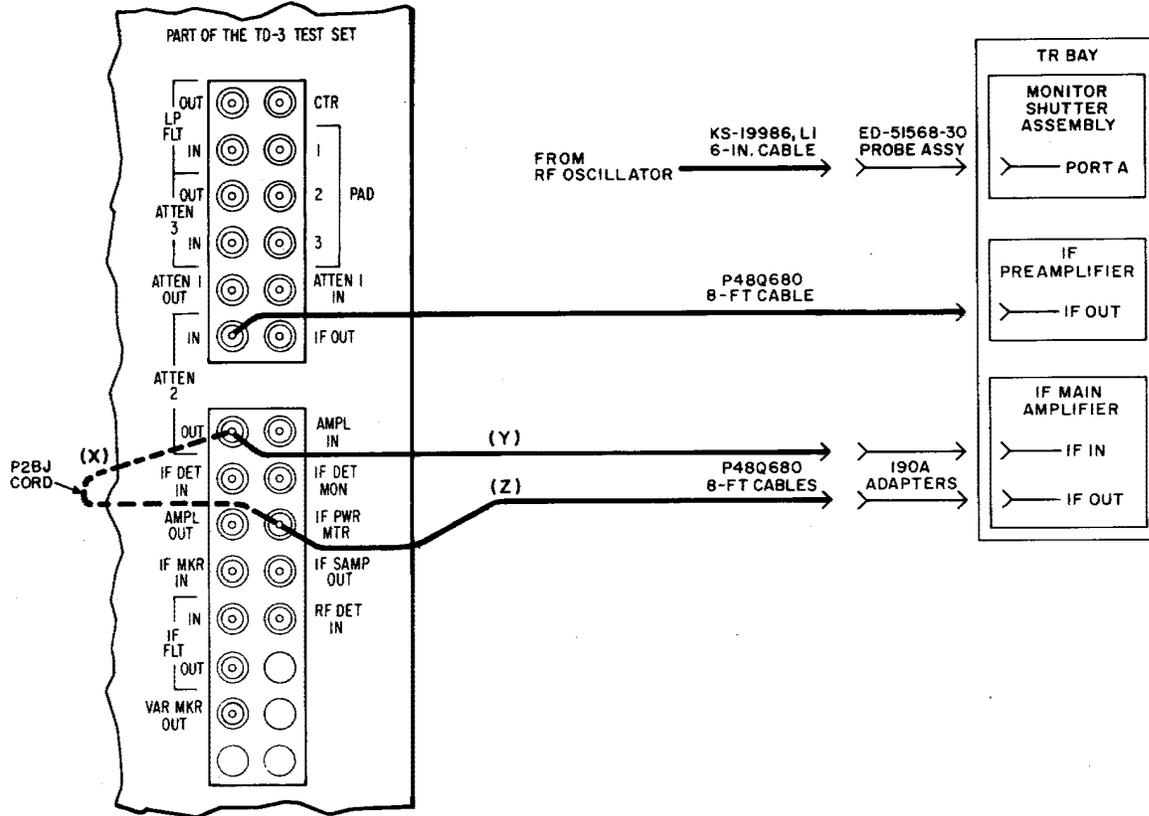


Fig. 10—Carrier Resupply and HS/SD Trip Test Setup

CHART 12

IF MAIN AMPLIFIER—IF CARRIER RESUPPLY  
45-MB/S DIGITAL OPERATION

APPARATUS:

- 1 —KS-20114, L2 Adjusting Tool

STEP

PROCEDURE

- 1 **Caution:** Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be

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**CHART 12 (Contd)**


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| STEP | PROCEDURE |
|------|-----------|
|------|-----------|

---

*force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.*

**A. Carrier Power**

- 2 Make the connections as shown in Fig. 6, option (X).
- 3 Set the MAN-AGC switch on the IF main amplifier to AGC.
- 4 Remove the IF cable from the IF IN jack on the IF main amplifier.
- 5 Adjust the CRS DEV TUNE control for maximum power.

**Requirement:**  $-3$  to  $+1$  dBm (at IF main amplifier output) or  $-3.6$  to  $+0.4$  dBm (at 747A filter output).

**B. Carrier Frequency**

- 6 Make the connections in Fig. 6, option (Y).
- 7 Measure the frequency and note for later use.

**Requirement:**  $70 \pm 0.004$  MHz

**C. Sideband Power**

**Note 1:** Using the J68392A test set, Steps 8 through 15 set the effective sideband power 35 dB below the carrier power for units equipped with option (Y) and 40 dB for units equipped with option (Z). An alternate procedure for measuring the sideband power and frequency, using a 3A or 4A FM receiver and a selective voltmeter, is provided in Steps 16 through 20.

**Note 2:** Option (Z) equips the unit with an 8.8864-MHz pilot oscillator for use with the TDAS Protection Switching System. Option (Y) equips the unit with a 9.0-MHz pilot oscillator for use with the 100A and 400A Protection Switching Systems.

- 8 If the J68387AB IF main amplifier-carrier resupply is equipped with option (Y), set ATTEN 2 for 58.8-dB attenuation. If the unit is equipped with option (Z), set ATTEN 2 for 63.8-dB attenuation.
- 9 Make the connections in Fig. 7, option (X).
- 10 Adjust the AMPL GAIN control on the test set control panel so that the power meter indicates 0 dBm.
- 11 Make connections in Fig. 7, option (Y).

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 CHART 12 (Contd)
 

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## STEP

## PROCEDURE

12 Set ATTEN 2 for 20-dB attenuation.

13 Measure the power.

**Requirement:** 0 dBm  $\pm$ 0.5 dB

If the requirement is not met, adjust the CRS PLT PWR control on the IF main amplifier to meet the requirement.

**D. Sideband Frequency**

14 Make the test connections in Fig. 8.

15 Measure the frequency.

**Requirement:** The difference between the measured frequency and the frequency noted in Step 7 shall be 9.0  $\pm$ 0.0001 MHz for the Y option amplifier and 8.8864  $\pm$ 0.0001 MHz for the Z option amplifier.

If the requirement is not met, adjust the CRS PLT FREQ control to meet the requirement.

**E. Alternate Procedure for Adjusting the 9-MHz Sideband Power and Frequency Using an FM Receiver and a Selective Voltmeter**

**Note:** The gain of the FM receiver used in this test must have been properly adjusted in accordance with Section 420-211-503 (for 3A-type) or Section 420-215-503 (for 4A-type).

16 Connect the test setup as shown in Fig. 9, option (W).

17 If the J68387AB IF main amplifier is equipped with option (Y), tune the selective voltmeter to 9.0 MHz. If the amplifier is equipped with option (Z), tune the selective voltmeter to 8.8864 MHz.

**Requirement:** The selective voltmeter shall indicate  $-18 \pm 0.5$  dBm for amplifiers equipped with option (Y) or  $-23 \pm 0.5$  dBm for amplifiers equipped with option (Z).

If the requirement is not met, adjust the CRS PLT PWR control on the IF main amplifier to meet the requirement.

18 Connect the test setup as shown in Fig. 9, options (X) and (Y).

19 Adjust the test set amplifier gain control for a power meter indication of 0 dB.

20 Change the test set connection from option (Y) to option (Z) and measure the frequency.

**Requirement:** The frequency counter shall indicate 9.0  $\pm$ 0.0001 MHz for amplifiers equipped with option (Y) or 8.8864  $\pm$ 0.0001 MHz for amplifiers equipped with option (Z).

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**CHART 12 (Contd)**


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| STEP | PROCEDURE  |
|------|--|
|      | If the requirement is not met, adjust the CRS PLT FREQ control on the IF main amplifier to meet the requirement.   |
|      | <b>F. Carrier Resupply Trip</b>  |
| 21   | Prepare the test arrangement to supply an RF signal to the receiver input. Refer to Chart 6.   |
| 22   | Set the FUNCTION-SWEEP SELECTOR or MODE switch to CW.  |
| 23   | Make the test connections as shown in Fig. 10, option (X).   |
| 24   | With ATTEN 2 set at 0-dB attenuation, adjust the RF input to the receiver (adjust the POWER LEVEL control on the RF oscillator) until the power meter indicates $-6$ dBm.  |
| 25   | Set ATTEN 2 for 18-dB attenuation.   |
| 26   | Set the MAN-AGC switch on the IF main amplifier to MAN.  |
| 27   | Turn the MAN GAIN control fully counterclockwise.  |
| 28   | Change the test connections in Fig. 10 to options (Y) and (Z).   |
| 29   | Adjust the MAN GAIN control to obtain $-6$ dBm on the power meter ( $-6$ dBm at the output of the IF main amplifier).  |
| 30   | Adjust the CRS TRIP control clockwise until the TRIP lamp is extinguished.   |
| 31   | Slowly turn the CRS TRIP control counterclockwise until the TRIP lamp just lights.   |
| 32   | Turn the MAN GAIN control clockwise to the point where the lamp is extinguished.   |
| 33   | Slowly turn the MAN GAIN control counterclockwise until the lamp just lights.  |
| 34   | Measure the power at the IF OUT jack of the IF main amplifier, options (Y) and (Z).<br><b>Requirement:</b> $-6$ dBm $\pm 1$ dB   |
|      | <b>Note:</b> It may be necessary to repeat Steps 29 through 34 several times to meet this requirement.   |
| 35   | If any of the requirements of this chart are not met, replace the unit and repeat Steps 4 through 26 of Chart 6. If the requirements are met, refer to Chart 2 in this section to determine the remaining charts and steps that are required.♦ |

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## CHART 13

## HOT STANDBY/SPACE DIVERSITY

## APPARATUS:

1 —KS-20114, L2 Adjusting Tool

| STEP | PROCEDURE  |
|------|--|
| 1    | <b>Caution:</b> <i>Since hot standby/space diversity switching has no frequency allocated for protection, precautions should be taken not to interrupt service. The system must be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.</i>           |
| 2    | The CRS PLT PWR control on the IF main amplifier must be in the full counterclockwise position for hot standby/space diversity or hot standby only. Check that this is true.<br><br><b>Note:</b> Refer to Chart 2 in this section to determine the remaining charts and steps that are required. |
| 3    | Terminate the IF OUT jack of the IF main amplifier with a 20-dB 19A pad and 190A adapter.  |
| 4    | Prepare the test arrangement to supply an RF signal to the receiver input. Refer to Chart 6.   |
| 5    | Make the test connections shown in Fig. 10, option (X).  |
| 6    | With ATTEN 2 set at 0 dB, adjust the RF input to the receiver (adjust the POWER LEVEL on the RF oscillator) until the power meter indicates -8 dBm.  |
| 7    | Increase the attenuation in ATTEN 2 by 35 dB.  |
| 8    | Make the test connections in Fig. 10, option (Y).  |
| 9    | Set the MAN-AGC switch to AGC.   |
| 10   | Turn the HS/SD TRIP control counterclockwise so that the TRIP lamp is extinguished.  |
| 11   | Slowly adjust the HS/SD TRIP control clockwise until the TRIP lamp just lights.  |
| 12   | Increase the RF oscillator power to a point where the TRIP lamp extinguishes.  |
| 13   | Slowly decrease the RF oscillator power until the TRIP lamp lights.  |
| 14   | Change the connections to option (X).  |
| 15   | Remove all attenuation in ATTEN 2.   |
| 16   | Measure the power.   |

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**CHART 13 (Contd)**


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**STEP****PROCEDURE**

**Requirement:** 0 dBm  $\pm$ 1 dB

- 17 With the requirement met, remove the test connections and restore the channel to normal operation.
- 

**CHART 14****SPACE DIVERSITY SWITCH POINT TEST AND ADJUSTMENT**

This chart contains the procedures for setting the receiving space diversity switch to operate with a fade of either 3 dB less than it would take to operate the IF protection switching (frequency diversity) system or 1 dB before the end of the AGC range, whichever is the smaller fade. This is an out-of-service test and the service must be switched to the protection channel before proceeding.

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**APPARATUS:**

- 1 —J68392A Transmitter-Receiver Test Set
- 

**STEP****PROCEDURE**

**Note:** If the bay is equipped with the Electromagnetic Sciences switch (EMS), perform Steps 2 through 15. If the bay is equipped with the 409B switch, perform Steps 16 through 29.

- 1 **Caution:** *Since hot standby/space diversity has no frequency allocated for protection, precautions should be taken not to interrupt service. The system should be force-switched to the receiver that is not to be maintained as directed in Section 415-600-500.*

**A. Electromagnetic Sciences Switch**

- 2 On the Electromagnetic Sciences switch, operate the OPERATE-TEST-TRIGGER switch to the TEST position.
- 3 Connect the test setup as shown in Fig. 13, and perform the Preparation for Test procedures.
- 4 Establish communications with a craftsman at the receiving switching station and have him monitor the receiving IF switch to determine when the IF switching system initiates a switch.

## CHART 14 (Contd)

| STEP | PROCEDURE  |
|------|--|
| 5    | Set the OPERATE-TEST-TRIGGER switch to the OPERATE position.   |
| 6    | While monitoring the RCVD CARR PWR meter indication, decrease the setting of the output control on the RF oscillator until a meter indication is reached which is 1 unit higher than the indication noted in the Preparation for Test. (If necessary, add a 10-dB RF pad as shown in Fig. 13.)   |
| 7    | Establish option (W) and note the power meter indication for use in Step 11.   |
| 8    | Establish option (X); then decrease the setting of the output control on the RF oscillator until the IF switching system operates. (If not added in Step 6, add a 10-dB RF pad as shown in Fig. 13.)   |
| 9    | Establish option (W) and note the power meter indication.  |
| 10   | Determine a power meter indication that is $(3 + F_{pa})$ dB higher than the indication noted in Step 9.   |
|      | <b>Note 1:</b> The 3-dB factor is included to obtain the change in RF signal level required to reach a space diversity switch threshold that is 3 dB above (i.e., before) the IF frequency diversity switch threshold.   |
|      | <b>Note 2:</b> The $F_{pa}$ factor has significance only if an RF preamplifier is equipped in the receiving waveguide run. This factor must be included to account for the difference in noise figure and carrier level between the test point at the input to the receiver modulator and the actual fading point at the input to the RF preamplifier. |
|      | G — 4.5 dB where G is the stamped gain of the RF preamplifier.   |
|      | If no RF preamplifier is equipped, $F_{pa} = 0$  |
| 11   | Determine which of the following is higher: the power noted in Step 7 or the power calculated in Step 10.  |
| 12   | Set the output control on the RF oscillator to give the higher power meter indication determined in Step 11, then establish option (X).  |
| 13   | On the IF main amplifier, adjust the HS/SD TRIP control several turns in the counterclockwise direction; then slowly adjust the control in the clockwise direction until the diversity switch just operates as indicated by the flashing of the DS1 and DS2 lamps on the switch.   |
| 14   | Adjust the output control on the RF oscillator to maximum clockwise direction; then slowly adjust the control in the counterclockwise direction until the diversity switch just operates. Establish option (W) and note the power meter indication.  |

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**CHART 14 (Contd)**


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**STEP****PROCEDURE**

**Requirement:** The power meter indication shall be within  $\pm 0.5$  dB of the indication determined higher in Step 11.

**Note:** It may be necessary to repeat Steps 11 through 14 several times to meet this requirement.

- 15 After the requirement is met, refer to Chart 2 in this section to determine the remaining charts and steps that are required.

**B. 409B Switch**

- 16 Determine which antenna is the preferred antenna. On the SPACE DIV CONTROL panel, operate the switch to the FSA position if the preferred antenna is the A antenna or to the FSB position if antenna B is the preferred antenna.
- 17 Connect the test setup as shown in Fig. 13, and perform the Preparation for Test.
- 18 Establish communications with a craftsperson at the receiving switching station and have the craftsperson monitor the receiving IF switch bay to determine when the IF switching system initiates a switch.
- 19 On the SPACE DIV CONTROL panel, operate the switch to the A position if the A antenna is the preferred antenna or to the B position if the B antenna is preferred. Note the status of the A and B lamps.
- 20 While monitoring the RCVD CARR PWR meter indication, decrease the setting of the output control on the RF oscillator until a meter indication is reached which is 1 unit higher than the indication noted in the Preparation for Test. (If necessary, add a 10-dB RF pad as shown in Fig. 13.)
- 21 Establish option (W) and note the power meter indication for use in Step 25.
- 22 Establish option (X); then decrease the setting of the output control on the RF oscillator until the IF switching system operates. (If not added in Step 20, add a 10-dB RF pad as shown in Fig. 13.)
- 23 Establish option (W) and note the power meter indication.
- 24 Determine a power meter indication that is  $(3 + F_{pa})$  dB higher than the indication noted in Step 23.

**Note:** The 3-dB factor is included to obtain the change in RF signal level required to reach a space diversity switch threshold that is 3 dB above (i.e., before) the IF frequency diversity switch threshold.

## CHART 14 (Contd)

| STEP | PROCEDURE   |
|------|---|
|      | <p><b>Note 2:</b> The <math>F_{pa}</math> factor has significance only if an RF preamplifier is equipped in the receiving waveguide run. This factor must be included to account for the difference in noise figure and carrier level between the test point at the input to the receiver modulator and the actual fading point at the input to the RF preamplifier.</p> <p><math>F_{pa} = G - 4.5</math> dB where <math>G</math> is the stamped gain of the RF preamplifier.</p> <p>If no RF preamplifier is equipped, <math>F_{pa} = 0</math></p> |
| 25   | Determine which of the following is higher: the power noted in Step 21 or the power calculated in Step 24.  |
| 26   | Set the output control on the RF oscillator to give the higher power meter indication determined in Step 25, then establish option (X).   |
| 27   | On the IF main amplifier, adjust the HS/SD TRIP control several turns in the counterclockwise direction or until the preferred antenna lamp lights; then slowly adjust the control in the clockwise direction until the diversity switch just operates as indicated by a change in the status of the A and B lamps. Note the power meter indication.  |
| 28   | Adjust the output control on the RF oscillator to maximum clockwise direction and wait 1 minute; then slowly adjust the control in the counterclockwise direction until the diversity switch just operates as indicated by a change in the A and B lamps. Establish option (W) and note the power meter indication.   |
|      | <p><b>Requirement:</b> The power meter indication shall be within <math>\pm 0.5</math> dB of the indication noted in Step 27.</p> <p><b>Note:</b> It may be necessary to repeat Steps 25 through 28 several times to meet the requirement.</p>  |
| 29   | After the requirement is met, refer to Chart 2 in this section to determine the remaining charts and steps that are required.   |

PREPARATION FOR TEST  
(FIG. 11)

- The test set shall have been checked in accordance with Section 104-415-000 to ensure proper operation.
- Operate the test set controls as follows:

| UNIT   | CONTROL  | POSITION  |
|--|--|---|
| Power Meter  | INPUT CHANNEL<br>POWER RANGE DBM   | RF<br>0   |
| RF Sweep Oscillator<br>(Alfred) KS-19974           | LINE<br>FUNCTION-SWEEP SELECTOR<br>MARKER AMPL<br>$\Delta F$                 | RF<br>CW<br>Max CCW<br>20                             |
| RF Sweep Oscillator<br>KS-20383                    | BAND SELECTOR<br>LINE<br>MODE<br>$\Delta F$                                  | 3.7-4.2 GHz<br>RF<br>CW<br>20                         |
| RF Sweep Oscillator<br>Hewlett-Packard<br>KS-19974 | LINE<br>SWEEP SELECTOR<br>FUNCTION<br>ALC<br>MARKER AMPL<br>STOP/ $\Delta F$ | RF<br>CW<br>$\Delta F$<br>PRESS (on)<br>Max CCW<br>20 |

- Set the RF oscillator CW control to the desired channel center frequency.
- Connect the RF oscillator and power meter as shown in option (W).
- Adjust the output control on the RF oscillator to obtain the predetermined input value. (The receiver test signal power may be given on the 1338 filter label or may be calculated as indicated in Section 415-100-508.)
  - Since it is desirable to measure powers in the range of 0 to -15 dBm with the power meter, use a 20-dB pad at the output of the LEV CPLR, connect the power meter and adjust the power output control for the power desired increased by 20 dB.
  - Remove the 20-dB pad and insert a 40-dB pad.
- Example:** Let the power required be -26 dBm. Using a 20-dB pad, adjust the power output control for -26 plus 20 or -6 dBm. Remove the 20-dB pad and insert a 40-dB pad. The power will then be -26 dBm.
- On the test set, set ATTEN 2 at 10 dB for normal operation, and 4 dB when equipped for 45-Mb/s digital operation.

7. Set the remaining test set controls as follows:

| UNIT   | CONTROL  | POSITION  |
|--|--|---|
| Control Panel                                  | FUNCTION<br>RF MKR AM<br>IF MARKER AMPLITUDE<br>CTR  | RF-IF<br>Max CCW<br>Midrange<br>MKR FREQ                |
| Oscilloscope                                   | INTENSITY  | Midrange  |
| Oscilloscope Time<br>Base Unit                 | POSITION<br>MAGNIFIER<br>SWEEP TIME<br>VERNIER<br>SINGLE NORMAL  | Midrange<br>$\times 10$<br>EXT<br>Midrange<br>NORMAL    |
| Oscilloscope<br>Differential Amplifier<br>Unit | POSITION<br>BANDWIDTH<br>AMPLIFIER<br>VERNIER<br>SENSITIVITY<br>AC-DC-OFF (+ INPUT)<br>AC-DC-OFF (- INPUT) | Midrange<br>4<br>DC<br>Midrange<br>2 MV/CM<br>DC<br>OFF |
| Power Meter                                    | INPUT CHANNEL<br>POWER RANGE DBM   | IF *<br>+5  |

\* With the INPUT CHANNEL switch set to IF, determine that no input is connected; then zero the power meter by setting the POWER RANGE DBM switch to -25 and adjusting the METER ZERO control for an indication of ZERO on the meter. Return the POWER RANGE DBM switch to the position shown in the listing above (+5).

**Oscilloscope Calibration**

- Adjust the TEST TRACE controls on the control panel to center the trace on the oscilloscope.
- Adjust the SWEEP TIME (VERNIER) and POSITION controls on the oscilloscope TIME BASE for approximately 10 centimeters horizontal deflection on the oscilloscope.
- Adjust the IF MARKER FREQ control on the control panel for a  $70 \pm 0.1$  MHz indication on the counter and set the RF SWEEP SELECTOR to  $\Delta F$ -AUTO or the MODE switch to  $\Delta F$ .
- Adjust the CW control on the RF sweep oscillator to center the 70-MHz marker as shown.
- Adjust the  $\Delta F$  control on the RF sweep oscillator to place the 64- and 76-MHz markers as shown. Disregard any slope in the test trace.
- Adjust the REF TRACE control on the control panel to bring the reference trace into coincidence with the test trace at 70 MHz.
- Increase attenuation of ATTEN 2 by 0.1 dB. Adjust the SENSITIVITY and POSITION controls on the oscilloscope DIFFERENTIAL AMPLIFIER for 2 centimeters deflection between the test trace and the reference trace. Return ATTEN 2 to its original setting. This calibrates the oscilloscope for 0.05 dB per centimeter.

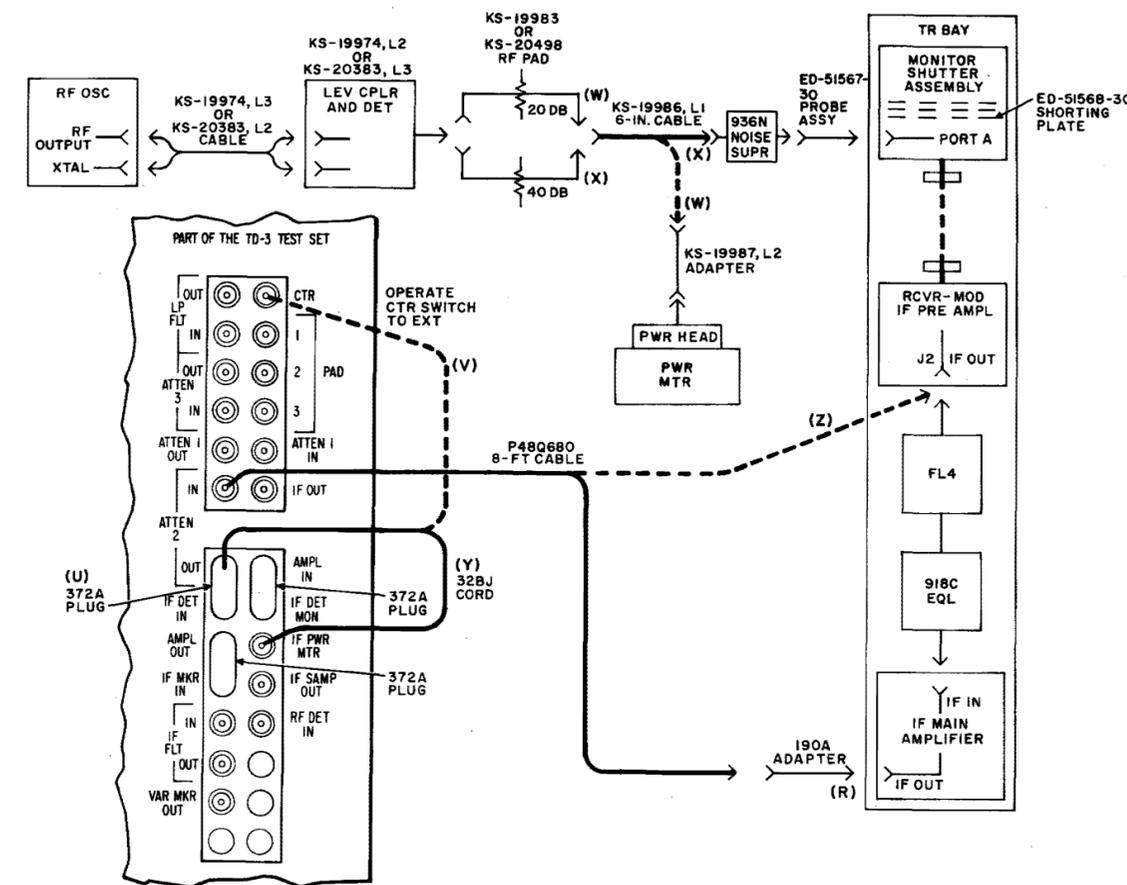


Fig. 11—Overall Receiver Transmission Test

**PREPARATION FOR TEST**  
(FIG. 12)

1. Operate the test set controls to the following positions:

| UNIT                           | CONTROL   | POSITION  |
|--------------------------------|---|---|
| Control Panel                  | FUNCTION<br>CTR   | IF — IF<br>MKR FREQ                                     |
| Oscilloscope                   | INTENSITY   | Midrange  |
| Oscilloscope Time<br>Base Unit | POSITION<br>MAGNIFIER<br>SWEEP TIME<br>VERNIER<br>SINGLE-NORMAL   | Midrange<br>×10<br>EXT<br>Midrange<br>NORMAL            |
| Differential<br>Amplifier Unit | POSITION<br>BANDWIDTH<br>AMPLIFIER<br>VERNIER<br>SENSITIVITY<br>AC-DC-OFF (+ INPUT)<br>AC-DC-OFF (-INPUT) | Midrange<br>4<br>DC<br>Midrange<br>2 MV/CM<br>DC<br>OFF |
| Power Meter                    | INPUT CHANNEL<br>POWER RANGE DBM  | IF *<br>-25 *   |

\* With the controls set as above and with no input connected to the power meter, adjust the METER ZERO control so that the power meter indicates zero; then set the POWER RANGE DBM switch to the -5 position.

- Set ATTEN 2 to 16 dB.
- Connect options (W) and (X).
- Adjust ATTEN 2 to obtain -6 dBm on the power meter.
- Connect options (X) and (Y).
- Adjust the TEST TRACE controls on the test set control panel to center the trace on the oscilloscope screen.
- Adjust the SENSITIVITY, VERNIER, and POSITION controls on the oscilloscope time base unit for approximately 10 centimeters horizontal deflection on the oscilloscope screen.
- Adjust the IF MKR FREQ control on the test set control panel for a  $70 \pm 0.1$  MHz indication on the counter.

9. Adjust the IF SWEEP WIDTH and IF CENTER FREQ controls on the test set control panel to obtain the oscilloscope display shown in the figure at the right.

**Note:** An extraneous marker appears at 89 MHz.

10. Adjust the REF TRACE controls on the control panel so that the traces are coincident at 70 MHz.

11. Adjust the IF DET SLOPE control on the control panel for a flat trace.

12. Increase the attenuation of ATTEN 2 by 0.1 dB and adjust the SENSITIVITY, VERNIER, and POSITION controls on the oscilloscope differential amplifier for 2 centimeters deflection between the traces. Return ATTEN 2 to its previous setting. This calibrates the oscilloscope for 0.05 dB per centimeter.

**Requirement:** The test trace shall be flat to within 0.01 dB between 60 and 80 MHz.

If the requirement is not met, readjust the IF DET SLOPE control on the control panel for a flat test trace; then readjust the TEST TRACE controls until the test and reference traces coincide.

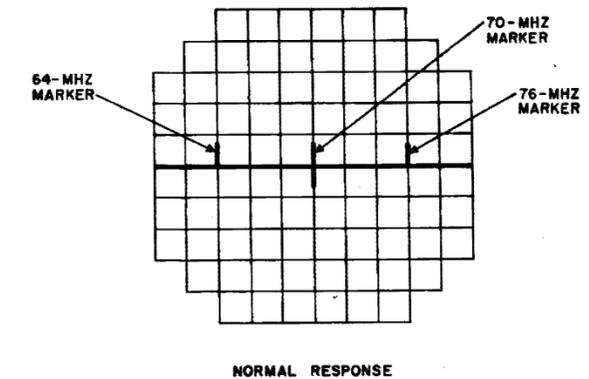
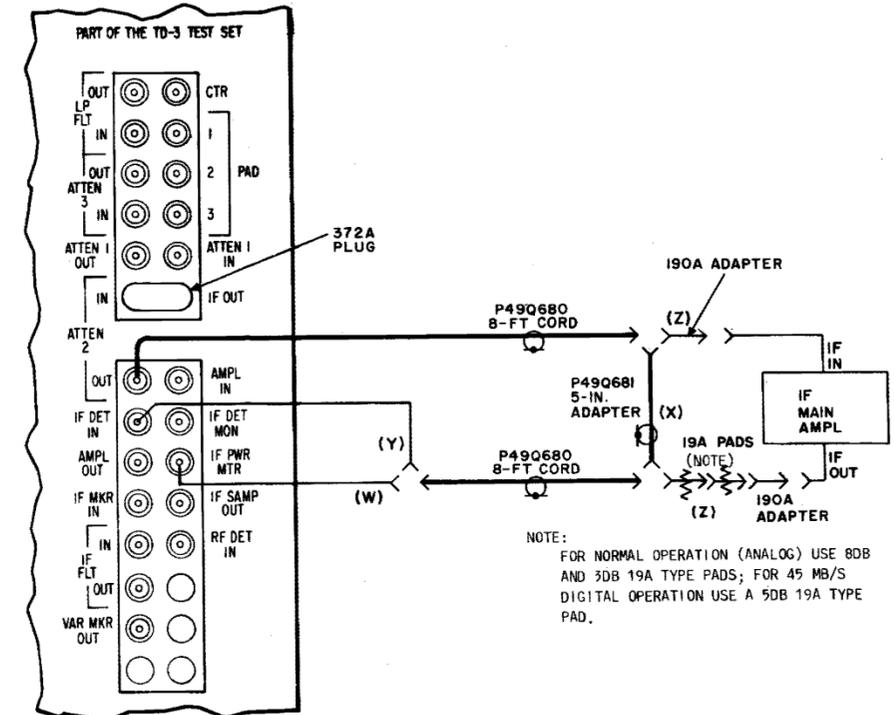


Fig. 12—IF Main Amplifier Test

**PREPARATION FOR TEST  
(FIG. 13)**

1. Operate the test set controls as follows:

| UNIT   | CONTROL  | POSITION  |
|--|--|---|
| Power Meter  | INPUT CHANNEL<br>POWER RANGE DBM                         | RF<br>0   |
| RF Sweep Oscillator<br>(Alfred) KS-19974           | LINE<br>FUNCTION-SWEEP SELECTOR<br>MARKER AMPL           | RF<br>CW<br>Max CCW                             |
| RF Sweep Oscillator<br>KS-20383                    | BAND SELECTOR<br>LINE<br>MODE                            | 3.7-4.2 GHz<br>RF<br>CW                         |
| RF Sweep Oscillator<br>Hewlett-Packard<br>KS-19974 | LINE<br>SWEEP SELECTOR<br>FUNCTION<br>ALC<br>MARKER AMPL | RF<br>CW<br>$\Delta F$<br>PRESS (on)<br>Max CCW |

- Set the RF oscillator CW control to the desired channel center frequency.
- After insertion of the ED-51568-( ) shorting plates, and before connection of the test signal, set the selector switch on the meter panel to the RCVD CARR PWR position and note the indication (approximately 0.) This is a measure of the AGC voltage at maximum gain of the IF amplifier and will be used later in the test procedure.
- Connect the RF oscillator and power meter as shown in option (X).
- Adjust the output control on the RF oscillator to the maximum clockwise position.

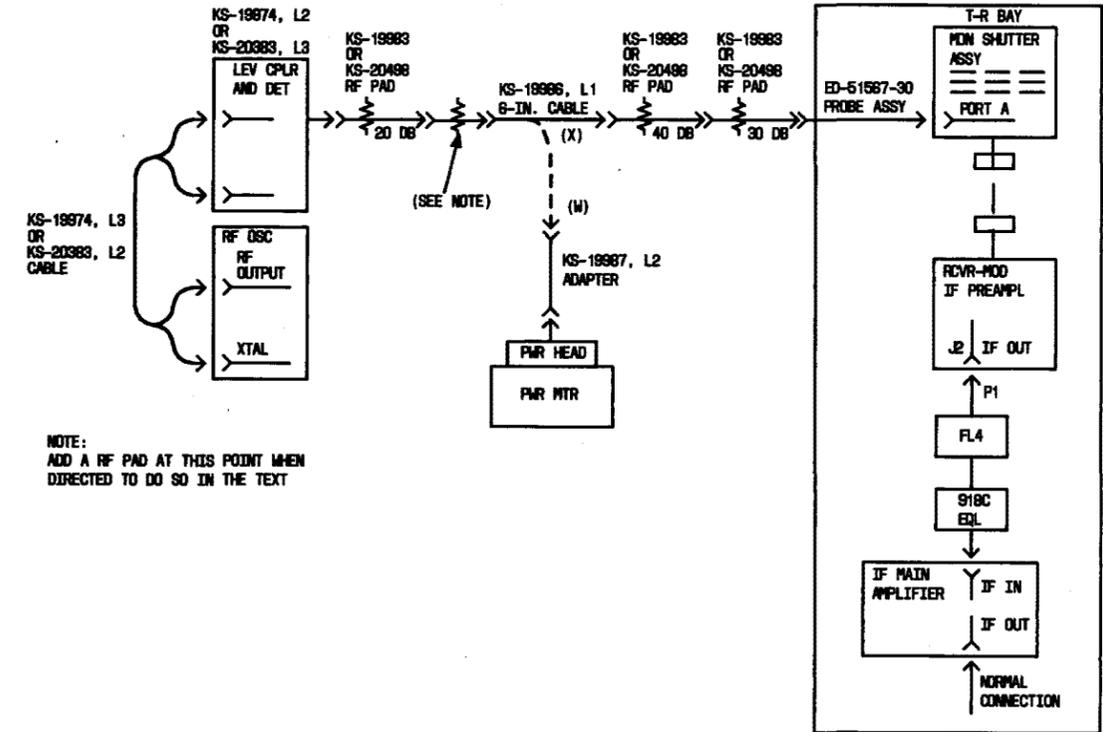


Fig. 13—Space Diversity Switch Point Check Test Setup