

**TD-3 MICROWAVE RADIO**  
**J68386G AND J68386H TRANSMITTER-RECEIVER BAYS**  
**RECEIVER TESTS USING KRUSE 52011 IF/RF TEST SET**  
**TRANSMISSION**

This appendix supplements Section 411-504-501.

It is reissued to add information for bays equipped with Hot Standby or Hot Standby/Space Diversity switching and J68387AB IF main amplifiers.

It contains procedures for measuring and adjusting gain and amplitude response of the radio receivers in the J68386G and J68386H radio bays using the Kruse 52011 IF/RF Test Set.

The in-service checks in Section 411-500-501 should be performed prior to the tests in this section.

The results may then be used as a guide to possible sources of trouble. The preliminary checks in Section 411-502-500 must be completed before performing the tests in this section when required by the Equipment Test List. The IF return loss tests in Section 411-504-502 must be completed when replacing units in the receiver with spares.

For location of components in the bay, refer to Fig. 1 in main section.

*Caution 1: These tests are performed on an out-of-service basis. Obtain a release from the designated control office and remove the channel from service as directed by local practice.*

*Caution 2: When removing and replacing waveguide units, care should be taken to prevent foreign matter from entering the waveguide. Handle waveguide sections with care to prevent damage to flange mating surfaces. All open waveguide sections should be capped.*

**CHART A**  
**OVERALL TRANSMISSION TEST**

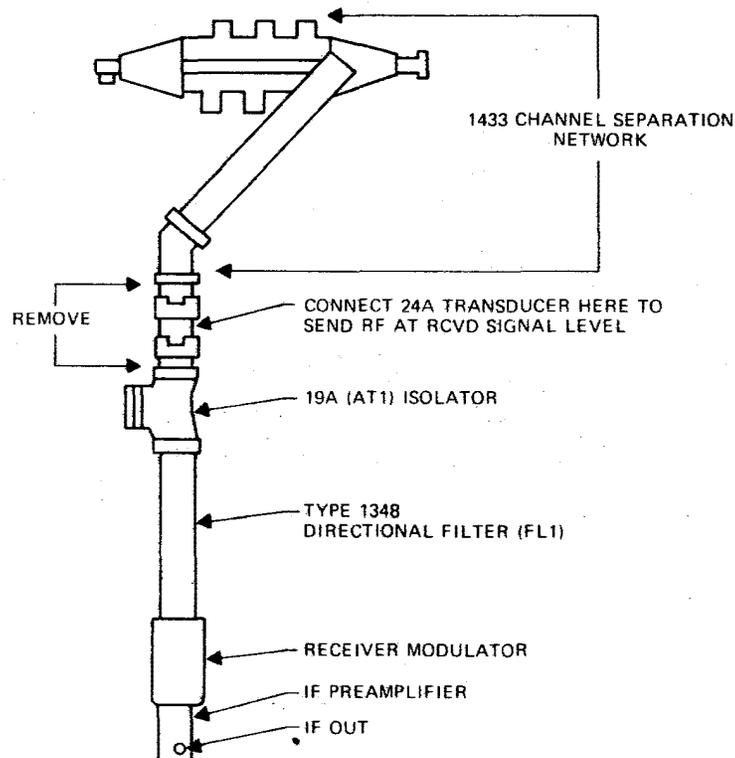
**APPARATUS:**

1—Kruse 52011 IF/RF Test Set

<b>STEP</b>	<b>PROCEDURE</b>
	The following comprises a check of the overall receiver transmission performance.

CHART A (Cont)

STEP	PROCEDURE
	<p><i>Note:</i> It is necessary to know the actual or calculated value of received carrier power at the drop arm of the channel dropping network. The typical nonfaded received carrier power will be in the range from -28 dBm to -22 dBm. Powers greater than -22 dBm should not be encountered since SD-50575-01 specifies the use of waveguide pads to prevent the power from exceeding -22 dBm. In the event that neither the calculated nor measured value is available, a reasonable value to use for these tests is -26 dBm.</p> <p><i>Caution 1:</i> If any of the requirements in this chart are not met, go directly to Step 19. Do not attempt adjustments while performing the steps of this chart to bring the transmission response within requirements. Charts B and C provide the proper sequence of steps for making adjustments on the receiver modulator and IF preamplifier and the IF main amplifier.</p> <p><i>Caution 2:</i> If the bay is equipped with Hot Standby/Space Diversity switching, it has no frequency allocated for protection. Precautions should be taken not to interrupt service. Force-switch the system to the receiver that is not to be maintained as directed in Section 415-600-500.</p>
1	<p>Remove the 3-inch piece of the flexible waveguide from the receiver. Connect a shorting plate to the exposed port of the drop arm of the 1433( ) receiver channel network. Connect a 24A transducer to the exposed port going to the 19A isolator. (See Fig. 1.)</p>
2	<p>Check that MAN-AGC switch is in AGC position.</p>



Preparing Receiver For Test  
Fig. 1

CHART A (Cont)	
STEP	PROCEDURE
3	Connect test setup and perform the preparation for test in accordance with Exhibit 1.
4	Disconnect cable from IF OUT jack of IF main amplifier. Connect option (Y) and (A).
5	Depress power meter DBM 75 ohm key and adjust sweeper MARKER 2-FC for a counter reading of 70 MHz. Observe power level.  <i>Requirement:</i> $+1.0 \pm 0.5$ dBm. (Power meter reading of $-19 \pm 0.5$ dBm.)
6	Select RCVD CARR PWR on the meter panel and note the meter indication.  <i>Requirement:</i> $80 \pm 3$ .
7	Remove connector P1 from the IF OUT jack on the IF preamplifier and insert option (Z) between the IF OUT jack and connector P1.
8	Measure power.  <i>Requirement:</i> Within 2 dB of the power measured in Step 5.
9	Remove option (Z) and connect P1 to the IF preamplifier IF OUT jack.  Operate MAN-AGC switch to the IF main amplifier to MAN position and note meter indication for RCVD CARR PWR.  <i>Requirement:</i> Same as that for Step 6.  If the requirement is not met, adjust MAN GAIN control to obtain the same indication.
10	Measure power.  <i>Requirement:</i> $+1.0 \pm 1$ dBm (power meter reading of $-19.0 \pm 1$ dBm).
11	Measure the amplitude response as shown by the test trace.  <i>Requirement:</i> The trace shall be flat to within 0.45 dB over 60- to 80-MHz band.  <i>Note:</i> For receivers equipped with J68387AB IF amplifiers, an additional 0.2 dB of linear slope over the 60- through 80-MHz band is allowed.
12	Remove the test cable from the IF OUT jack of the IF main amplifier and restore the bay connection to that jack. For HS or HS/SD bays, omit Steps 13 and 14.
13	Connect the test cable to the output connector of the DADE cable (P12 for a repeater station receiver and J3 for a main station receiver). Use the appropriate adapter to make the connections.
14	Set sweeper MODE control to CW. Measure the power.  <i>Requirement:</i> $-7.0$ dBm $\pm 2$ dB.

CHART A (Cont)	
STEP	PROCEDURE
15	If unable to meet the requirements in Steps 1 through 12, it will be necessary to align the receiver modulator-IF preamplifier and the IF main amplifier as directed in Charts B and C. After performing Charts B and C, repeat Chart A, Steps 1 through 12.
16	If still unable to meet the requirements in Steps 1 through 12, check for defective cables or a defective 1042A filter.  <i>Note:</i> 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.
17	If unable to meet the requirement in Step 14, check for defective or incorrect DADE cable, 63E pad or equalizer, if used.
18	If all requirements are met, remove test equipment. Restore all bay connections to normal.
19	Operate MAN-AGC switch on the IF main amplifier to the AGC position.
20	If further tests or alignments are not scheduled, restore the channel to service as directed by local practice.

**CHART B**  
**RECEIVER MODULATOR AND IF PREAMPLIFIER ADJUSTMENT**

**APPARATUS:**

1—Kruse 52011 IF/RF Test Set  
 1—KS-20114, L2 Adjusting Tool

STEP	PROCEDURE
	<i>Caution: If the bay is equipped with Hot Standby/Space Diversity switching, it has no frequency allocated for protection. Precautions should be taken not to interrupt service. Force-switch the system to the receiver that is not to be maintained as directed in Section 411-600-500.</i>
1	Note the REF BIAS value stamped on the modulator. Operate RCVR MOD BIAS push-button on the meter panel.
2	Note frequency of the receiver.  <i>Requirement:</i> The RCVR MOD BIAS indication shall equal the bias value determined from Table A from the appropriate receiver frequency and REF BIAS. Make any necessary adjustment with the DIODE BIAS control on the IF preamplifier. Record the RCVR MOD BIAS indication on the meter panel pushbutton.

CHART B (Cont)

STEP

PROCEDURE

3

Connect test setup and perform preparation for test in accordance with Exhibit 1.

TABLE A

RECEIVER FREQUENCY MHz	RCVR MOD BIAS INDICATION
3710	REF BIAS +7.0
3730	REF BIAS +6.0
3870	
3750	REF BIAS +5.0
3890	
3770	REF BIAS +4.0
3910	
3790	REF BIAS +3.0
3930	
3810	REF BIAS +2.0
3950	
3830	REF BIAS +1.5
3970	
3850	REF BIAS +0.5
3990	
4010	REF BIAS +0
4030	REF BIAS -1.0
4050	REF BIAS -2.0
4070	REF BIAS -3.0
4090	REF BIAS -4.0
4110	REF BIAS -5.0
4130	REF BIAS -6.0
4150	REF BIAS -7.0
4170	REF BIAS -8.0

4

Prepare receiver for test in accordance with Fig. 1.

5

Connect the test cable, shown in Exhibit 1, option (B) to the IF OUT jack of the IF pre-amplifier. Set sweeper MODE control to CW.

CHART B (Cont)	
STEP	PROCEDURE
6	Adjust LEVEL control on the IF preamplifier to set the IF output power.  <i>Requirement:</i> -1 dBm. (Power meter reading of -21 dBm.)
7	Measure the transmission response as shown by the test trace.  <i>Requirement:</i> The trace should be flat to within 0.07 dB over the 60- to 80-MHz band. If the requirement is not met, adjust the SHAPE and SLOPE controls.  If any of the requirements cannot be met, refer to Section 411-504-503 for troubleshooting procedures.

**CHART C**  
**IF MAIN AMPLIFIER ADJUSTMENT**

**APPARATUS:**

1—Kruse 52011 IF/RF Test Set  
1—KS-20114, L2 Adjusting Tool

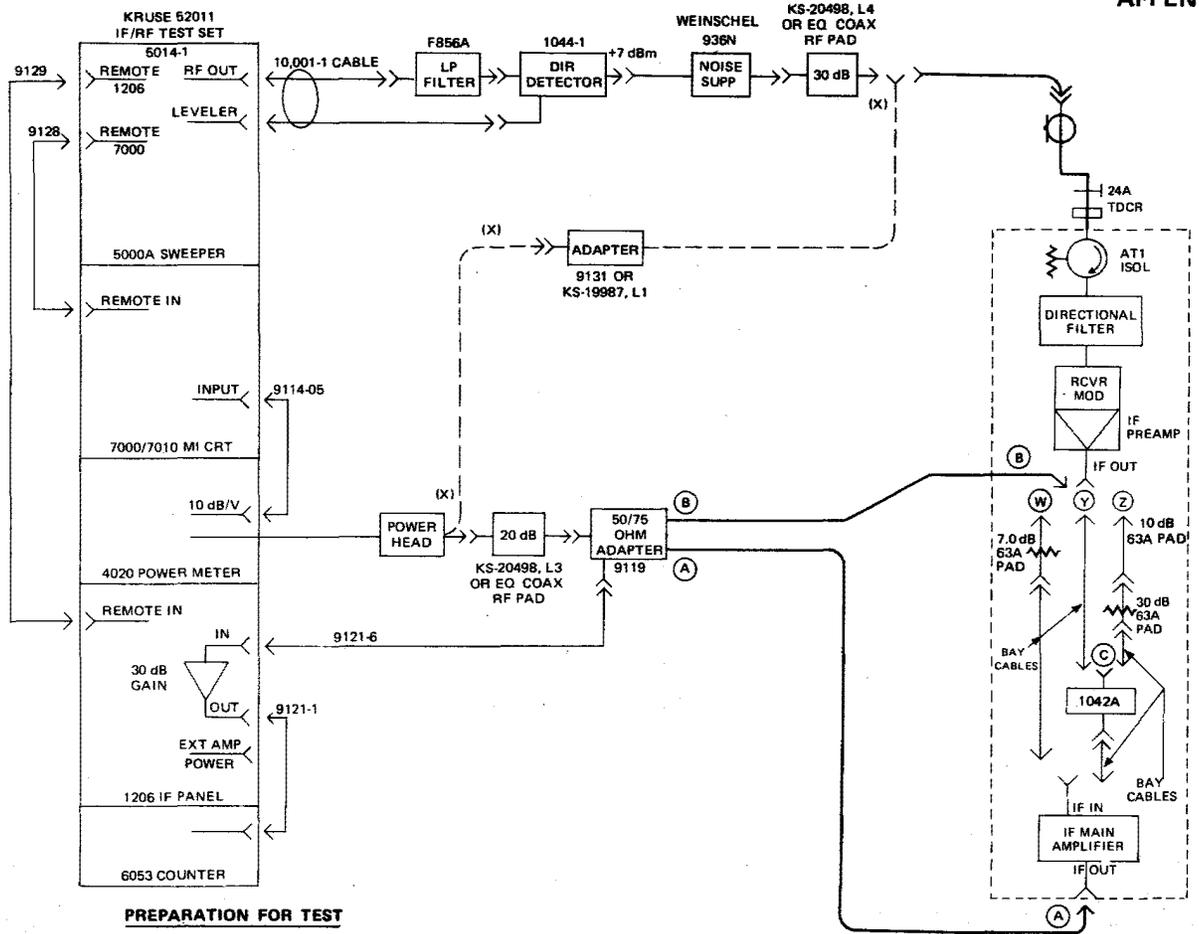
STEP	PROCEDURE
1	<p><b>A. Gain and Amplitude Response</b></p> <p>The following procedure is used for adjusting the gain and amplitude response of the IF main amplifier. The objective is to establish a gain of 9 dB with an input of -8.0 dBm and an output of +1.0 dBm. The amplitude response should be flat to within 0.03 dB over the 60- through 80-MHz band. J68387AB amplifiers will have an 18-dB gain with a -8 dBm input and a +10.0 dBm output. The amplitude response deviation will be the same, but there may be an additional 0.2-dB linear slope over the 60- through 80-MHz band.</p> <p><i>Caution: If the bay is equipped with Hot Standby/Space Diversity switching, it has no frequency allocated for protection. Precautions should be taken not to interrupt service. Force-switch the system to the receiver that is not to be maintained as directed in Section 411-600-500.</i></p> <p>Prepare receiver for test in accordance with Fig. 1.</p> <p><i>Note:</i> To make access to the J68387S amplifier connectors easier, remove the amplifier together with its mounting bracket from the bay frame by loosening the two screws that fasten the mounting bracket to the bay. Hang the assembly on the post provided on the bay frame above the amplifier by hooking the post through the hole in the bracket. The J68387AB amplifier IF IN and IF OUT jacks are accessible without removing the amplifier.</p>

CHART C (Cont)

STEP	PROCEDURE
2	<p>Connect options (A) and (W) in Exhibit 1 and preparation for test.</p> <p>Set MAN-AGC switch on the IF main amplifier to MAN position.</p>
3	<p>Adjust IF main amplifier MAN GAIN control for a -7 dBm. (Meter scale reading of -27 dBm.)</p> <p>If requirement cannot be met, check that IF main amplifier AGC-MAN switch is set to MAN. Remove bay fuse panel cover and check that IF main amplifier power plug is in position. Check that all setup connections are tight and have been accurately followed. Recheck output of IF preamplifier. If requirement is still not met, replace the IF main amplifier.</p>
4	<p>Measure flatness of test trace.</p> <p><i>Requirement:</i> Flat to within 0.03 dB over the 60- through 80-MHz band. For J68387AB amplifiers, an additional 0.2 dB of linear slope across the 60- through 80-MHz band is permissible.</p> <p>If the requirement is not met for J68387S amplifiers, adjust the SLOPE 1 and SLOPE 2 controls on the IF main amplifier. Maintain an indication of -18.3 dBm on the power meter with the MAN GAIN control. If the requirement is not met for J68387AB amplifiers, replace the amplifier with a good spare and repeat Steps 3 through 5.</p> <p><b>1042A FILTER LOSS CHECK</b></p>
5	<p>Connect options (C), (Y), and (A) in Exhibit 1. Set sweeper MODE control to CW.</p>
6	<p>Measure power.</p> <p><i>Requirement:</i> -7 dBm, <math>\pm 0.5</math> dBm. (Power meter reading -27 dBm, <math>\pm 0.5</math> dBm.)</p> <p>If requirement is not met, inspect filter and equalizer connections and replace units, if necessary.</p> <p><b>AGC TESTS</b></p>
7	<p>Operate MAN-AGC switch on IF main amplifier to AGC.</p>
8	<p>Adjust the IF LEV control (J68387S amplifier) or OUTPUT PWR control (J68387AB amplifier) for a -7 dBm power.</p>
9	<p>Select RCVR CARR PWR on the meter panel and observe the meter indication.</p> <p><i>Requirement:</i> 80 (J68387S amplifier) or <math>80 \pm 3</math> (J68387AB amplifier).</p> <p>If necessary, adjust the M SENS control until the requirement is met (J68387S amplifier only).</p>

CHART C (Cont)

STEP	PROCEDURE
10	Reduce IF level by 40 dB at input of IF main amplifier by changing test setup from option (Y) to (Z) in Exhibit 1.
11	<p>Measure IF power.</p> <p><i>Requirement:</i> Between <math>-9</math> and <math>-5</math> dBm.</p> <p>If unable to meet the requirements, replace the IF main amplifier with a spare and repeat the tests in this chart.</p>
12	<p>For J68387S amplifiers in frequency diversity or HS only bays, remove the test connections and restore the normal bay connections to the IF main amplifier. For J68387S amplifiers, in HS/SD bays or J68387AB amplifiers, proceed with Step 16.</p> <p><b>B. HS/SD Trip Adjustment</b></p> <p><i>Notes:</i></p> <ol style="list-style-type: none"> <li>1. In bays equipped with J68387S amplifiers, the TRIP ADJ control is located on the right-hand side of the bay on a mounting bracket. The AGC lamp is located on the bay alarm panel.</li> <li>2. The CRS PLT PWR control on the J68387AB IF main amplifier must always be in the full counterclockwise position in order to disable the carrier resupply.</li> </ol>
13	Return the input level to $-8$ dBm, and then increase the attenuation of ATTEN 2 by 35 dB.
14	Turn the HS/SD TRIP control (J68387AB) or TRIP ADJ control (J68387S) <i>clockwise</i> until the TRIP lamp (J68387AB) or AGC lamp (J68387S) is just extinguished.
15	Slowly adjust the HS/SD TRIP control (J68387AB) or TRIP ADJ control (J68387S) <i>counterclockwise</i> until the TRIP lamp (J68387AB) or AGC lamp (J68387S) just lights.
16	Decrease the attenuation in ATTEN 2 (increase the input signal) to a point where the TRIP lamp (J68387AB) or AGC lamp (J68387S) extinguishes.
17	Slowly increase the attenuation of ATTEN 2 until the TRIP lamp (J68387AB) or AGC lamp (J68387S) lights.
18	Remove the test connections, and restore the normal bay connections to the IF main amplifier.



**PREPARATION FOR TEST**

1. Insert RF Plug-in 5014-1 M-9 and attach proper scale.
2. Position test set controls.

UNIT	CONTROL	POSITION
5000A SWEEPER	F-1 START	NOT USED
	MARKER 1	-15 MHz LOWER SCALE
	MARKER 2-Fc	DESIRED CENTER FREQUENCY
	MARKER 3	+15 MHz LOWER SCALE
	F-2 STOP	NOT USED
	VERNIER	MAX CCW
	RF LEVEL	+7 dBm
	1 KHz	OFF
	LEVELER	EXT
	RETRACE	ON
	MARKERS	OFF
	RECUR-TRIG-LINE	RECUR
	MODE	CW
	Fc ± ΔF VERNIER	MAX CW
SWEEP SECONDS	.01	
SWEEP SECONDS VERNIER	MAX CW	
EXT/INT'L SWEEP (REAR)	INT'L	
7000/7010-M1 CRT DISPLAY SCOPE	OFFSET	MIDSCALE (DO NOT READJUST)
	GAIN	X1
	POLARITY	+UP
	BW	30 KHz
	INPUT	DC
	DB/DIV AT 10 DB/V	.05 DB/DIV-5 MV/DIV
4020 POWER METER	LEVEL	10 DB/V
	GROUNDING	INT
	OFFSET	MIDSCALE
6052 COUNTER	ATTENUATOR	X1
	RESOLUTION	1K
	EXT/INT (REAR)	INT

3. Connect power meter head to CAL OUT jack. Depress DBM CAL key and adjust its control for +10.00 dBm reading. Depress ZERO key and adjust its control for 00.00 reading. Depress DBM 50 ohm key.
4. Adjust sweeper MARKER 2-FC to receiver operating frequency which is indicated on bay label attached to terminal strip cover.
5. Connect option (X).
6. Depress power meter DBM 50 ohm key.
7. Obtain value of the calculated or measured received carrier power referred to the drop arm of the 1433 ( ) receiver channel network for the bay under test.
8. Adjust RF sweep oscillator output to obtain the power obtained in Step 7.

**OSCILLOSCOPE CALIBRATION**

9. Set sweeper MODE switch to ΔFx1. Set MARKER 1 and MARKER 3 at 60 and 80 MHz. Center scope trace using power meter OFFSET and scope HORIZ and GAIN controls. Depress BEAM FINDER switch on display unit, then adjust OFFSET control on power meter.
10. Adjust sweeper FC ± ΔF VERNIER to place markers at edge of scope trace. Scope HORIZONTAL scale is now 2 MHz/div centered at 70 MHz. VERTICAL scale is .05 dB/div.

**Arrangement of Test Equipment  
Exhibit 1**