DESCRIPTION AND MAINTENANCE

138—174 MHz DUAL FRONT END (WITH NOISE BLANKER)

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DESCRIPTION

Dual Front End

MASTR®II, 138 to 174 MHz Dual Front Ends (DFEs) are used with MASTR II Receivers to allow wide channel spaced operation, and most cross-band or cross-split combinations. A total of eight frequencies can be accommodated between the DFE and the Receiver channel.

The DFE consists of the following modules:

- RF Steering Switch
- RF Assembly (standard RF assembly)
- Mixer/IF/Noise Blanker Assembly (MIF/NB Bd.)
- Oscillator/Multiplier (OSC/MULT); modified standard OSC/MULT assembly
- Mixer/IF Switch (MIF Switch); used with matching IF frequencies
- Mixer/IF Switch/2nd Converter (MIF Switch/2nd Converter); used with non-matching IF frequencies

The DFE utilizes the same Lexan® casting which is employed in a standard Receiver, and is mounted in the hinged lower assembly of "E" Series Combinations. The modules (board assemblies) utilized by the DFE occupy the same positions as those in a standard Receiver, except the MIF Switch/2nd Converter board is used in place of the standard IFAS board.

Centralized Metering Jack J2301, located on the MIF Switch or MIF Switch/2nd Converter board, is provided for use with GE Test Set 4EX3A11 or Test Kit 4EX8K12. The Test Set meters the MULT 1 and MULT 2 test points of the OSC/Mult board and the Noise Blanker metering point (J2301-7).

A RF Steering Switch connects the antenna to either the Receiver or the DFE, depending upon the channel selected by the operator. The IF output of the DFE channel and the IF output of the Receiver channel are combined at the input of the Receiver IFAS board. Normally, the IF frequency of the DFE (11.2 MHz) matches that of the Receiver (11.2 MHz), therefore, no IF frequency conversion is required (see Figure 1).

In certain instances of cross-band or cross-split combinations the IF frequency of the DFE (11.2 MHz) does not match that of the Receiver (9.4 MHz), therefore a different MIF Switch is utilized (MIF Switch/2nd Converter) to convert the IF frequency of the DFE to the frequency required by the IFAS board (9.4 MHz) in the Receiver channel (see Figure 2).

Supply voltages, control functions and metering points are connected from the standard receiver (P903 of the System Board) to the DFE modules by cable harness

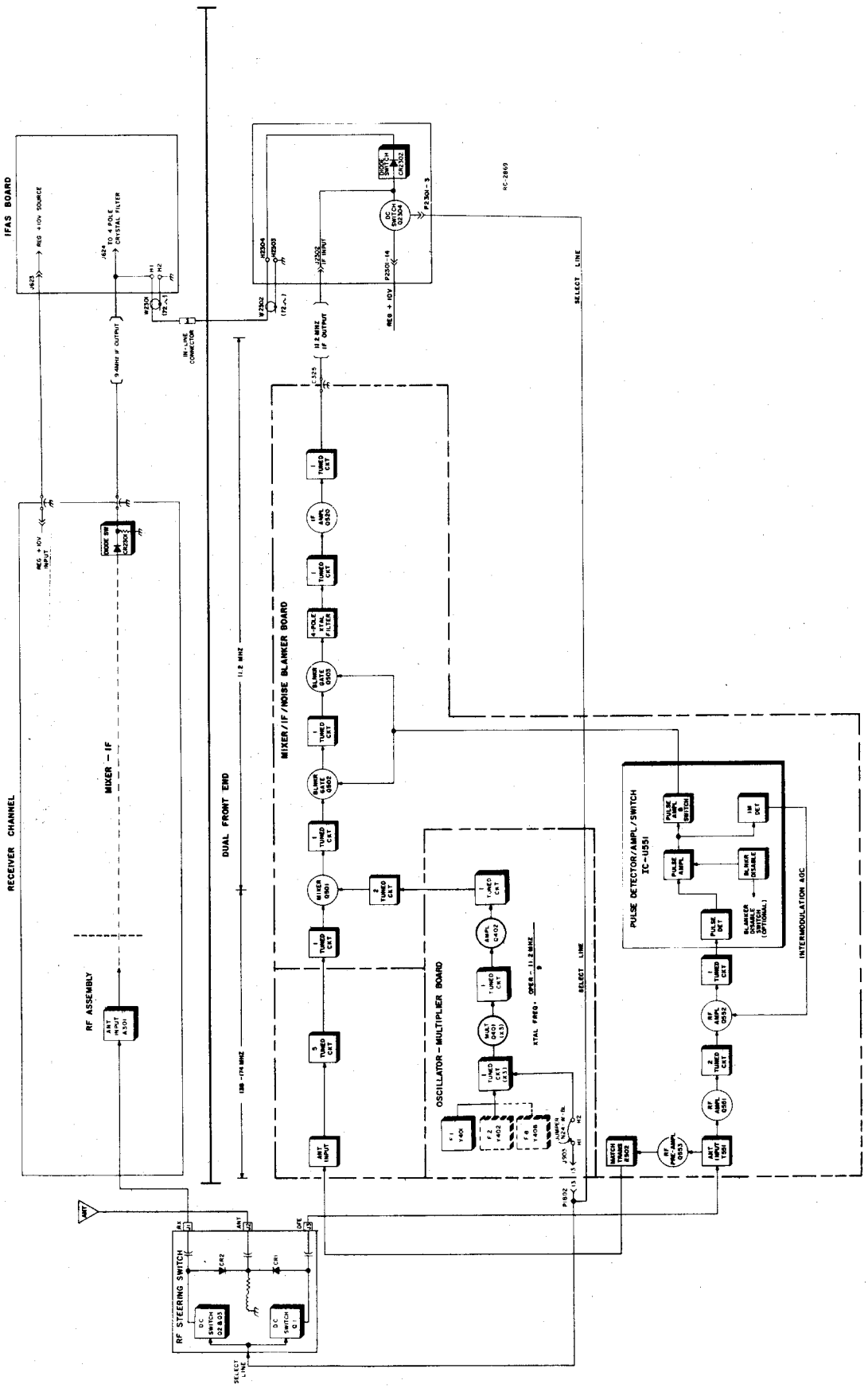

Figure 1 - DFE Block Diagram (Matching IF Frequency)

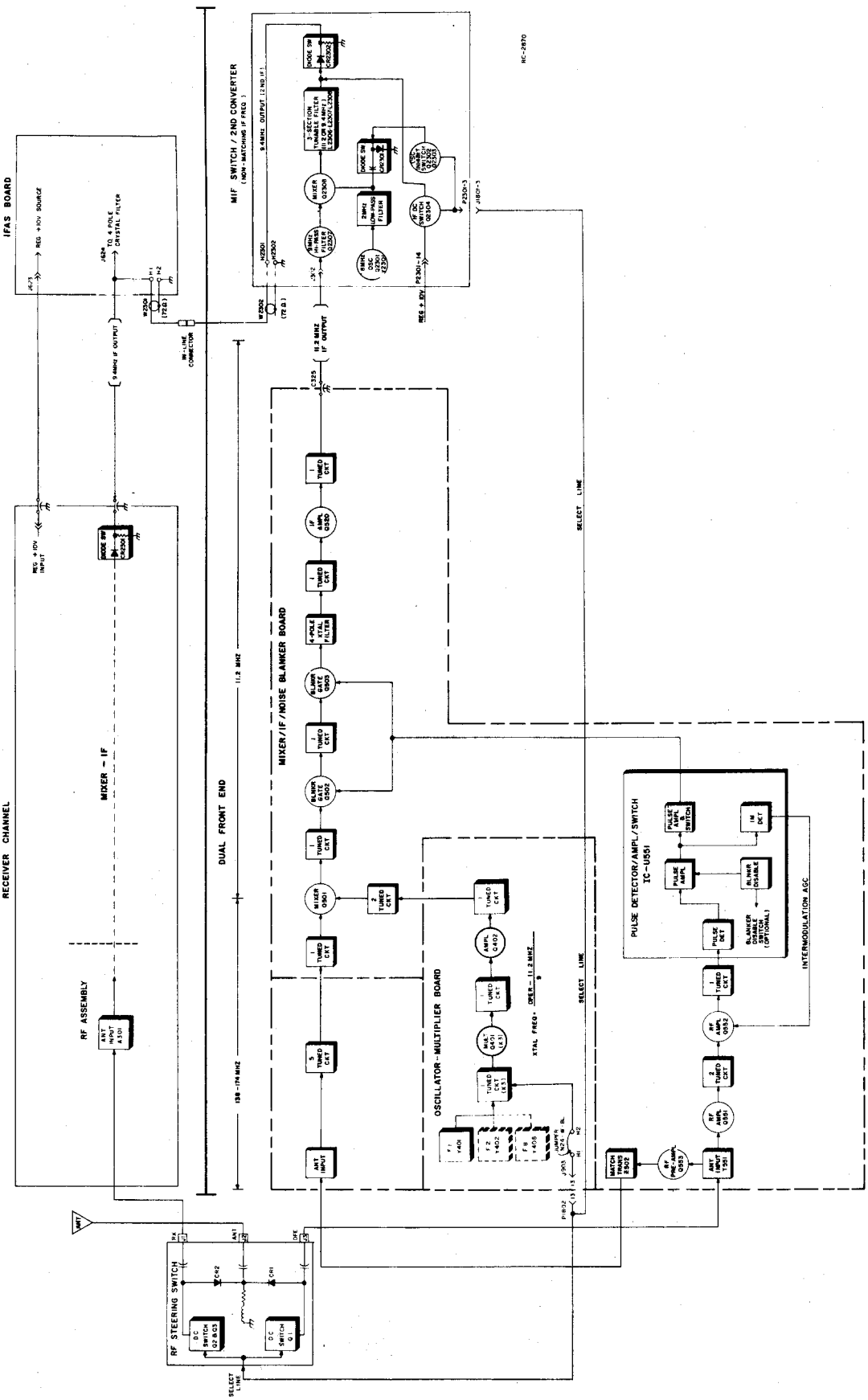

Figure 2 - DFE Block Diagram (Non-Matching IF Frequency)

19B219980. RF signal connections to and from the RF Steering Switch are made through 50 ohm RF cable assemblies equipped with phono plugs. IF signal connections (W2301 and W2302) are made from the MIF Switch board to the IFAS board of the Receiver channel using 72 ohm coaxial cable.

A block diagram of the DFE receiver is shown in Figures 1 and 2.

Refer to the appropriate Maintenance Manual for complete details on each receiver module listed in the Table of Contents.

RECEIVER MODIFICATIONS

The following modification is required in the MASTR II (138 to 174 MHz) Receiver whenever the Receiver is used with a Dual Front End Option. The necessary parts required are supplied in Modification Kit 19A129750G1. Modified Units are identified by a RED dot located in the area of the unit assembly number.

MODIFICATION TO MIXER/IF BOARD 19D416662, STANDARD RECEIVER

1. Replace R523 (47 ohm) with R2302 680 ohm).
2. Replace C529 with CR2301 (PIN diode).
3. Add R2301 (22 K ohm) between holes H9 and H10.

MODIFICATION TO IFAS BOARD 19D417707, STANDARD RECEIVER

1. Connect 72 ohm coaxial cable (equipped with an in-line connector) to holes H1 (center conductor) and H2 (shield).

To adapt a standard Receiver to operate as a Dual Front End, the following modification must be performed. All necessary parts required are supplied in Modification Kit 19A129750G2. Units should be identified as containing this modification by placing a RED dot near the unit assembly number after performing the modification.

MODIFICATION TO OSCILLATOR-MULTIPLIER BOARD 19D423241, DUAL FRONT END

1. Add jumper (N24-W-BL) between holes H1 and H2.
2. Replace C43.

MAINTENANCE

DISASSEMBLY

To service the DFE:

1. Pull the locking handle down and pull the radio out of the mounting frame, and turn the radio over.
2. Loosen the two bottom cover retaining screws and remove the bottom cover. All major modules and tuning adjustments in the DFE are now accessible for servicing.
3. To service the bottom of the DFE, loosen the screw in the retaining latch and slide the latch open. The bottom section will now swing open.
4. Removal of the modules or board assemblies from the DFE is essentially the same as for a standard Receiver. Refer to Figure 3 for receiver module location and to the standard Receiver Maintenance Manuals for removal procedures.

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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DUAL FRONT END

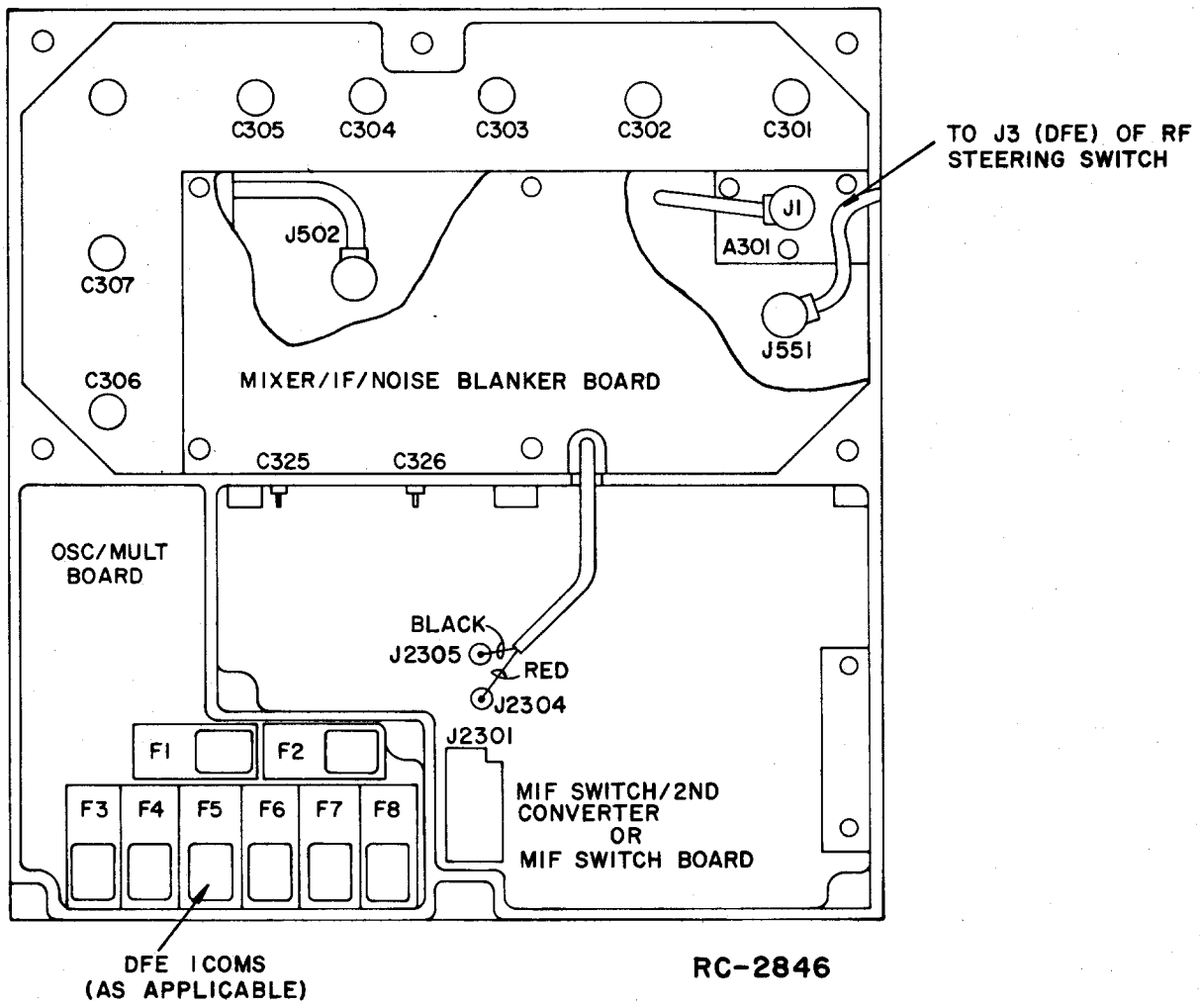

Figure 3 - Receiver Module Location

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FRONT END ALIGNMENT

EQUIPMENT

1. GE Test Set Models 4EX3A11, 4EX8K12, or 20,000 ohms-per-Volt multimeter with a 1-Volt scale.
2. A 138-174 MHz signal source.

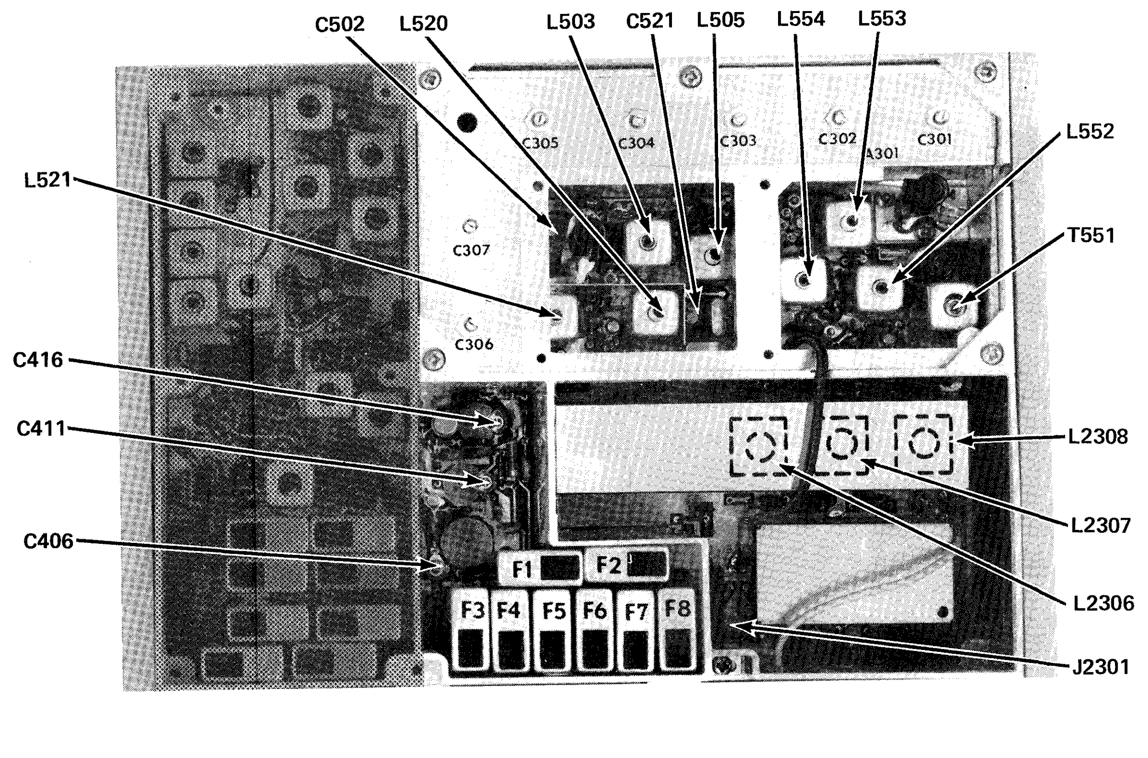
PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect black plug from Test Set to DFE Centralized Metering Jack J2301, and red plug to system board metering jack J905. Set range selector switch to the TEST 1 position (or 1-Volt position on 4EX8K12).
2. For multi-frequency receivers with a frequency spacing up to 0.450 MHz for frequency range of 138-155 MHz, or 0.500 MHz for frequency range of 150.8-174 MHz, align the receiver on the channel nearest center frequency.

   For multi-frequency receivers with a frequency spacing exceeding the above but no greater than .900 MHz for frequency range of 138-155 MHz, or 1.00 MHz for frequency range of 150.8-174 MHz, align the receiver using a center frequency tune-up ICOM. These limits can be extended to 1.60 MHz, and 1.80 MHz respectively, with 3 dB degradation in standard receiver specifications.
3. With Test Set in Position J, check for regulated +10 Volts. If using multimeter, measure between J905-3 (+) and J905-9 (-).
4. If using multimeter, connect the negative lead to J2301-9 (A-).
5. Disable Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE Test Set	METERING POSITION: Multimeter - at J2301-9	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR/MULTIPLIER		
1.	C (MULT-1)	Pin 3	C406	Maximum	Tune C406 for maximum meter reading.
2.			C411, C416, C306, C307	See Procedure	Preset C411 and C416 to a position similar to C406. Next, preset C306 and C307 fully counterclockwise (minimum capacity).
3.	D (MULT-2)	Pin 4	C411, C416, C406	See Procedure	Tune C411 and C416 for maximum meter reading. Next, retune C406, C411 and C416 for maximum meter reading. Then carefully dip C306 and tune C307 for maximum meter reading. Do NOT readjust C306 and C307.
			RF SELECTIVITY		
4.	B (IF AMP)	Pin 1	C502, C301 thru C305 and top slug of T551 (L555)	Maximum	Apply an on-frequency signal to the DFE antenna jack. Keeping the signal generator output below saturation, tune C502 and C301 through C305 and T551 (top slug of L555) for maximum meter reading.
5.	B (IF AMP)	Pin 1	C502, C301 thru C305, C306 and C307, and tap slug of T551 (L555)	Maximum	Apply an on-frequency signal to the antenna jack and slightly tune C502, C301 through C305 and T551 (top slug of L555) for best quieting sensitivity. C306 and C307 also may be tuned slightly (not to exceed 1/4 turn).



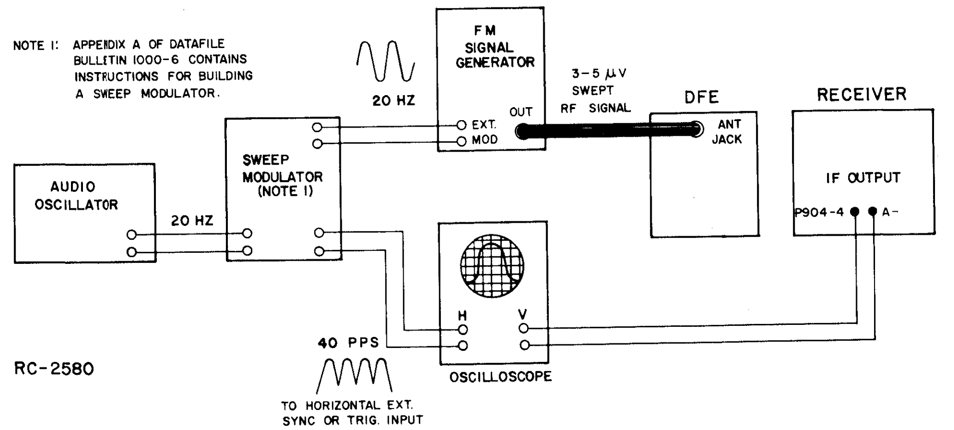


Figure 4 - Test Setup for 20-Hz Double-Trace Sweep Alignment

ICOM FREQUENCY ADJUSTMENT

First check the frequency to determine if any adjustment is required. The frequency measurement requires equipment with an absolute accuracy which is 5 to 10 times better than the tolerance to be maintained. When performing frequency measurement, the entire radio should be as near as possible to an ambient temperature of 26.5°C (79.8°F).

MASTR II ICOMs should be reset only when the measured frequency error exceed the following limits:

A. ±0.5 PPM, when the radio is at 26.5°C (79.8°F).

B. ±2 PPM at any other temperature within the range -5°C to +55°C (+23°F to +131°F).

C. The specifications limits (±2 PPM or +5 PPM) at any temperature within the ranges -40°C to -5°C (-40°F to +23°F) or +55°C to +70°C (+131°F to +158°F).

If frequency adjustment is required, lift up the cover on the top of the ICOM to expose the adjustment trimmer. Depending upon the type of frequency measuring equipment that is available, any of the following procedures may be used:

A. DIRECT MEASUREMENT IN THE INJECTION CHAIN

1. WITH A FREQUENCY COUNTER. "Count" the frequency at the junction of C416 and L403 on the Oscillator/Multiplier Board. The frequency measured at this point is 3 times the ICOM frequency. NOTE: The output from the ICOM itself is not sufficiently sinusoidal for reliable operation with most frequency counters.

2. WITH A COMMUNICATION MONITOR (for example: Cushman Model CE-3). "Monitor" frequency at the junction of C416 and L403 on the Oscillator/Multiplier Board. The frequency monitored at this point is 3 times the ICOM frequency. NOTE: This frequency will not always fall within an available measuring rante of all monitors at all receiver operating frequencies.

B. STANDARD "ON FREQUENCY" SIGNAL AT THE RECEIVER INPUT (Generated from a COMMUNICATION MONITOR, for example: Cushman Model CE-3).

1. WITH A FREQUENCY COUNTER. "COUNT" the developed IF frequency at the tap of Z602-R2 on the IFAS board. The deviation from the nominal IF frequency (11.2 MHz) in Hz is compared to the receiver operating frequency (also in Hz) to calculate error in PPM.

2. WITH AN 11.2 MHz IF FREQUENCY STANDARD (for example: General Electric Model 4EX9A10). Loosely couple the IF frequency standard to the IF signal path to create a heterodyne with the developed IF frequency. The resultant "beat frequency" can be monitored by either of the following methods:

NOTE

To Set ICOM frequency using "beat frequency" method, the temperature should be at 26.5°C (79.8°F). If the temperature is not 26.5'C, then offset the "ON FREQUENCY" signal (at the receivers input), as a function of actual temperature, by the frequency ERROR FACTOR (in PPM) shown in Figure 5.

a. Audible "beat frequency" from the receiver speaker (this requires careful frequency adjustment of the frequency standard).

b. Observe "beat frequency" at P904-4 with an Oscilloscope.

c. With GE TEST SET (Meter Position B) connected to J601 on the IFAS Board, visually observe the "beat frequency" indicated by meter movement.

The frequency of the "beat" is the frequency error, related to the IF frequency. This deviation, in Hz, is compared to the receiver operating frequency, also in Hz, to calculate the error in PPM.

NOTE

The FM Detector output (meter position A of the test set) has a dc voltage of .35 to .50 volt at the assigned frequency and is provided for routine test and measurement only. The resolution of this reading (approximately .025 V per kHz as read on a GE Test Set in meter position A, or 0.1 V per kHz as measured with a VTVM at P904-3 or J601-2 on the IFAS board) is inadequate for oscillator frequency setting.

If the radio is at an ambient temperature of 26.5°C (79.8°F), set the oscillator for the correct mixer frequency (ICOM FREQ. x 3).

If the radio is not at an ambient temperature of 26.5°C, setting errors can be minimized as follows:

A. To hold setting error to ±0.6 PPM (which is considered reasonable for 5 PPM ICOMs):

1. Maintain the radio at 26.5°C (±5°C) and set the oscillator to required mixer injection frequency, or

2. Maintain the radio at 26.5°C (±10°C) and offset the oscillator, as a function actual temperature, by the frequency error factor shown in Figure 5.

B. To hold setting error to ±0.35 PPM (which is considered reasonable for 2 PPM ICOMs): Maintain the unit at 26.5°C (±5°C) and offset the oscillator, as a function of actual temperature, by the frequency error factor shown in Figure 5.

For example: Assume the ambient temperature of the radio is 18.5°C (65.4°F). At that temperature, the curve shows a correction factor of 0.3 PPM. (At 25 MHz, 1 PPM is 25 Hz. At 50 MHz, 1 PPM is 50 Hz).

With a mixer injection frequency of 150 MHz, adjust the oscillator for a corrected mixer injection frequency 15 Hz (0.3 x 45 Hz) higher. If a negative correction factor is obtained (at temperatures above 26.5°C), set the oscillator for the indicated PPM lower than the calculated mixer injection frequency.

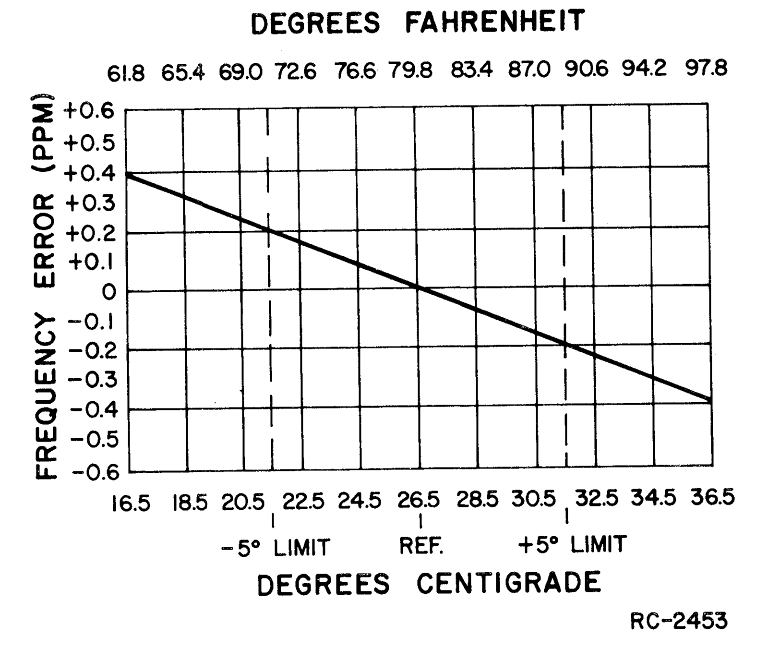


Figure 5 - Frequency Characteristics Vs. Temperature

COMPLETE DFE ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Models 4EX3A11, 4EX8K12 (or 20,000 ohms-per-Volt) multimeter with a 1-Volt scale.
2. An 11.2 MHz signal source, also a 138-174 MHz signal source with a one-inch piece of insulated wire no larger than .065 inch diameter connected to generator probe.
3 Voltmeter

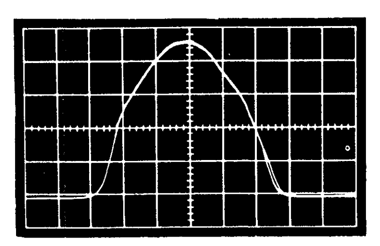
PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect the black plug from the Test Set DFE Centralized Metering Jack J2301, and the red plug to system board metering jack J905. Set the range selector switch to the Test 1 (or 1-Volt position on the 4EX8K12).
2. For multi-frequency receivers with a frequency spacing up to 0.450 MHz for frequency range of 138-155 MHz, or 0.500 MHz for frequency range of 150.8-174 MHz, align the receiver on the channel nearest center frequency.

   For multi-frequency receivers with a frequency spacing exceeding the above but no greater than .900 MHz for frequency range of 138-155 MHz, or 1.00 MHz for frequency range of 150.8-174 MHz, align the receiver using a center frequency tune-up ICOM. These limits can be extended to 1.60 MHz, and 1.80 MHz respectively, with 3 dB degradation in standard receiver specifications.
3. With the Test Set in Position J, check for regulated +10 Volts. With multimeter, measure from J905-3 to J905-9.
4. If using multimeter, connect the negative lead to J601-9 (A-).
5. Disable the Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE Test Set	METERING POSITION: Multimeter - at J2301-9	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR/MULTIPLIER		
1.	C (MULT-1)	Pin 3	C406	Maximum	Tune C406 for maximum meter reading.
2.			C411, C416, C306, C307	See Procedure	Preset C411 and C416 to a position similar to C406. Next, preset C306 and C307 fully counterclockwise (minimum capacity).
3.	D (MULT-2)	Pin 4	C411, C416, C406	See Procedure	Tune C411 and C416 for maximum meter reading. Next, retune C406, C411 and C416 for maximum meter reading, then, carefully dip C306 and tune C307 for maximum meter reading. Do NOT readjust C306 and C307.
			RF SELECTIVITY		
4.	B (IF AMP)	Pin 1	C502	Maximum	Connect black plug from Test Set to J601 on IFAS board. Apply an on-frequency signal in the hole adjacent to C305 and tune C502 for maximum meter reading.
5.	B (IF AMP)	Pin 1	C305	Maximum	Apply an on-frequency signal in the hole adjacent to C304, keeping the signal below saturation. Then tune C305 for maximum meter reading.
6.	B (IF AMP)	Pin 1	C304	Maximum	Apply an on-frequency signal in the hole adjacent to C303, keeping the signal below saturation. Then tune C304 for maximum meter reading.
7.	B (IF AMP)	Pin 1	C303	Maximum	Apply an on-frequency signal in the hole adjacent to C302, keeping the signal below saturation. Then tune C303 for maximum meter reading.
8.	B (IF AMP)	Pin 1	C302 and C301	Maximum	Apply an on-frequency signal to the DFE antenna jack (J551), keeping the signal below saturation. Then tune C302 and C301 for maximum meter reading.
9.	B (IF AMP)	Pin 1	C502, C301 thru C305 & T551 (Top Slug-L555)	Maximum	Apply an on-frequency signal to the antenna jack (J551), keeping the signal below saturation. Then tune C502 and C301 through C305 and the top slug (L555) of T551 for maximum meter reading.
10.	B (IF AMP)	Pin 1	C502, C301 thru C305, C306, C307, and T551 (Top Slug-L555)	Maximum	Apply an on-frequency signal to the antenna jack (J551) and slightly tune C502, C301 through C305 and T551 (top slug of L555) for best quieting sensitivity. C306 and C307 also may be tuned slightly (not to exceed 1/4 turn).

STEP	METERING POSITION: GE Test Set	METERING POSITION: Multimeter - at J2301-9	TUNING CONTROL	METER READING	PROCEDURE
			NOISE BLANKER		
11.	F (BLANKER)	J2301-Pin 7	L554, L553, L552 & L551	Maximum	Connect the black plug or the Test Set to DFE Metering Jack J2301. Set generator output to maximum. Connect generator to DFE antenna jack J551 and adjust generator frequency in accordance with the following table: RF Range (MHz) / Tuneable Range of Noise Blanker (MHz) / Align Noise Blanker to: 138-155 / 128-148 / DFE freq. -10 MHz 150.8-174 / 128-148 / 130 MHz Tune L554, L553, L552 and L551 (Bottom slug of Z502) in the order given, reducing the generator output as necessary to keep the noise blanker metering point out of saturation. NOTE In some instances the noise blanker circuit may be tuned to a specific frequency in order to minimize interference. The noise blanker must never be tuned closer than 8 MHz to the operating frequency of the DFE.
12.	F (BLANKER)	J2301-Pin 7		Greater than VDC 0.07	Apply a 1000-microvolt signal on blanker frequency to DFE antenna jack J551. The meter reading should be greater than 0.07 VDC.
			MIXER & IF		
					The mixer and IF circuits have been aligned at the factory and will normally require no further adjustment. If adjustment is necessary, use the procedure outlined in STEPS 14 and 15. NOTE Refer to DATAFILE BULLETIN 1000-6 (IF Alignment of Two-Way Radio FM Receivers) for helpful suggestions on how to determine when IF Alignment is required.
13.			L503, L505, L520, L521 & C521 		Connect scope, signal generator, and probe as shown in Figure 4. Set signal generator level for 3 to 5 uV and modulate with 20 Hz at 10 kHz deviation. With probe between P904-4 (or J601-1) and A- tune L503, L505, L520, L529 and C521 for double trace as shown on scope pattern.
14.			L521, L2306, L2307 & L2308		NON-MATCHING IF FREQUENCY With tuning slugs of L2306, L2307 and L2308 preset to bottom of coils (nearest printed wire board), tune L2306, L2307 and L2308 for maximum noise as indicated on scope. Tune L2306 and L2307 for maximum IF response on scope, then tune L521 and L2308 for optimum IF response as indicated on scope pattern (Step 14).

TEST PROCEDURES

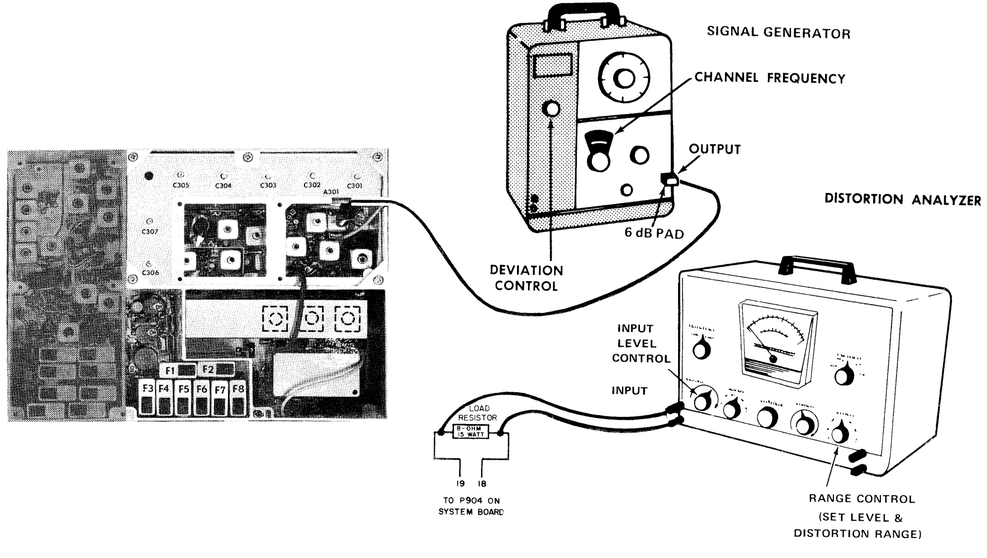
These Test Procedures are designed to help you to service a DFE that is operating ---but not properly. A typical problem encountered could be poor sensitivity. Any problems relating to audio distortion, low audio, poor limiter operation or squelch trouble should be localized using the standard receiver channel, since the IFAS board is common to both the Receiver and the DFE. Refer to appropriate Receiver Maintenance Manual for servicing procedures. By following the sequence of test steps starting with Step 1, the defect can be quickly localized.
After the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

- Distortion Analyzer
- Signal Generator
- 6-dB attenuation pad, and 8.0-ohm, 15-Watt resistor

PRELIMINARY ADJUSTMENTS

1. Connect the test equipment to the receiver as shown for all steps of the Test Procedure.
2. Turn the SQUELCH control fully clockwise for all steps of the Test Procedure.



STEP 1
USABLE SENSITIVITY (12-dB SINAD)

Measure receiver sensitivity as follows:

A. Apply a 1000-microvolt, on-frequency signal modulated by 1000 Hz with 3.0-kHz deviation to A301-J1.

B. With 15-Watt Speaker (MOBILE) 5-Watt (STATION)

Disconnect speaker lead pin from System Plug P701-11 (on rear of Control Unit).

Connect an 8.0-ohm, 15-Watt load resistor from P904-19 to P904-18 or from P701-4 to P701-17 (SPEAKER Hi) on the System Plug. Connect the Distortion Analyzer input across the resistor.

OR

With Handset:

Lift the handset off of the hookswitch. Connect the Distortion Analyzer input from P904-19 to P904-18.

C. Adjust the VOLUME control for 12-Watt output 9.8 VRMS (Mobile) or 6.3 VRMS (5-Watt Station) using the Distortion Analyzer as a Voltmeter.

D. Place the RANGE switch on the Distortion Analyzer in the 200 to 2000-Hz distortion range position (1000-Hz filter in the circuit). Tune the filter for minimum reading or null on the lowest possible scale (100%, 30%, etc.)

E. Place the RANGE switch to the SET LEVEL position (filter out of the circuit) and adjust the input LEVEL control for a +2 dB reading on a mid range (30%).

F. While reducing the signal generator output, switch the RANGE control from SET LEVEL to the distortion range until a 12-dB difference (+2 dB to -10 dB) is obtained between the SET LEVEL and distortion range positions (filter out and filter in).

G. The 12-dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. The sensitivity should be less than rated 12 dB SINAD specifications with an audio output of at least 6.0 Watts (6.9 Volts RMS across the 8.0-ohm receiver load using the Distortion Analyzer as a Voltmeter.

H. Leave all controls as they are and all equipment connected if the Modulation Acceptance Bandwidth test is to be performed.

SERVICE CHECK

If the sensitivity level is more than rated 12 dB SINAD specifications check the alignment of the RF stages as directed in the Alignment Procedure, and make the gain measurements as shown on the Troubleshooting Procedure.

STEP 2
MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

If STEP 1 checks out properly, measure the IF bandwidth as follows:

A. Set the Signal Generator output for twice the microvolt reading obtained in the 12-dB SINAD measurement.

B. Set the RANGE control on the Distortion Analyzer in the SET LEVEL position (1000-Hz filter out of the circuit), and adjust the input LEVEL control for a +2 dB reading on the 30% range.

C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12-dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

D. The deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±7 kHz.

SERVICE CHECK

If the Modulation Acceptance Bandwidth test does not indicate the proper width, make gain measurements as shown on the DFE Troubleshooting Procedure.

TROUBLESHOOTING PROCEDURE

Before starting the Noise Blanker troubleshooting procedure, make sure the DFE is operating properly. Align the Noise Blanker circuits as described for the ALIGNMENT PROCEDURE. Perform the following checks:

STEP 1—PERFORMANCE CHECK

Equipment Required:

1. RF Signal Generator coupled through a 6 dB pad.
2. Pulse Generator with repetition rate and level controls.
3. T-Connector.
4. AC Voltmeter or Distortion Analyzer.
5. Oscilloscope.

Procedure:

Noise Blanker Threshold Sensitivity

1. Connect Pulse Generator and RF Signal Generator to DFE antenna jack (J551) through a T-Connector, and connect AC VTVM to receive audio output (Speaker LO, P904-18, Speaker HI, P904-19) as shown in Figure 1.
2. Apply an unmodulated RF signal and check the 20 dB quieting sensitivity of the DFE. (Measure with Model 4EX4A10 Pulse Generator connected but turned OFF.) Then adjust the RF level for an additional 10 dB on the signal generator.
3. Set the pulse generator (Model 4EX4A10) for 10 kHz continuous pulses. Slowly increase the pulse output level, degrading the quieting level as measured on the AC VTVM. Prior to the sudden drop in quieting, the degradation should not exceed 20 dB quieting. The noise blanking pulse may be observed where indicated on the Troubleshooting block diagram.

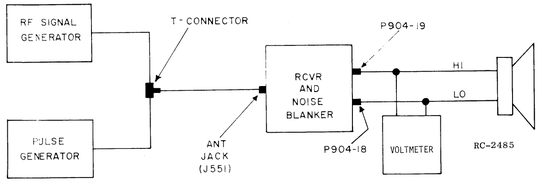


Figure 1 - Equipment Connection Diagram

IF Attenuation

1. Disable the noise blanker by connecting J2304 on MIF Switch, module or pin 5 of P904 to A-. (Use noise blanker disable switch on Control Unit if present).
2. Measure the 20 dB quieting sensitivity as in Step 2 of Threshold sensitivity measurement.
3. Adjust the RF output of the signal generator for 40 dB greater RF level than that established for 20 dB quieting sensitivity.
4. Adjust the pulse generator for a repetition rate up to 30 kHz. Adjust the pulse level until the receiver is degraded to 20 dB quieting.
5. Remove the noise blanker disabling jumper from J2304 (or if noise blanker disable switch is provided, place to operate position), and then adjust the signal generator RF level for 20 dB quieting. The DFE sensitivity should restore to within 5 dB of 20 dB quieting level obtained in Step 2.

STEP 2—QUICK CHECKS

Equipment Required:

1. RF Voltmeter.
2. RF Signal Generator.
3. AC Voltmeter or Distortion Analyzer.

SYMPTOMS	PROCEDURE
NO Blanking	Check voltage ratios (STEP 3)
Partial or no Blanking	a. Check IF attenuation of Noise Blanker Gates as follows: Connect signal generator to antenna jack (J551). Adjust the signal generator for on frequency signal and output level for 20 dB quieting sensitivity (Level A). Connect +10 VDC directly to the gates of Q502 and Q503. Increase the RF output level to achieve 20 dB quieting (Level B). The difference between "Level A" and "Level B" must be 60 dB or greater.
Intermodulation Interference (AGC action)	b. Check gain of Noise blanker RF circuit (IM/AGC ACTION) as follows: Connect signal generator to antenna Jack (J551). Adjust the frequency of the signal generator to the noise blanker channel frequency and adjust the RF level for 1 Millivolt (see Alignment Procedure, Step 11 for frequencies). Measure RF signal level at pin 6 of U551. This level should be 56 millivolts or greater. Apply +10 VDC through a 270 ohm resistor to the source pin of Q552 (or pin 13 of U551). (This applies approximately +3 VDC bias to Q552, simulating intermodulation AGC voltage). The RF voltage measured at pin 6 of U551 should be approximately 1.8 millivolts (Corresponds to approx. 30 db decrease of gain in RF amplifier Q552).

STEP 3—VOLTAGE RATIO READINGS

Equipment Required:

1. RF Voltmeter.
2. Signal generator.

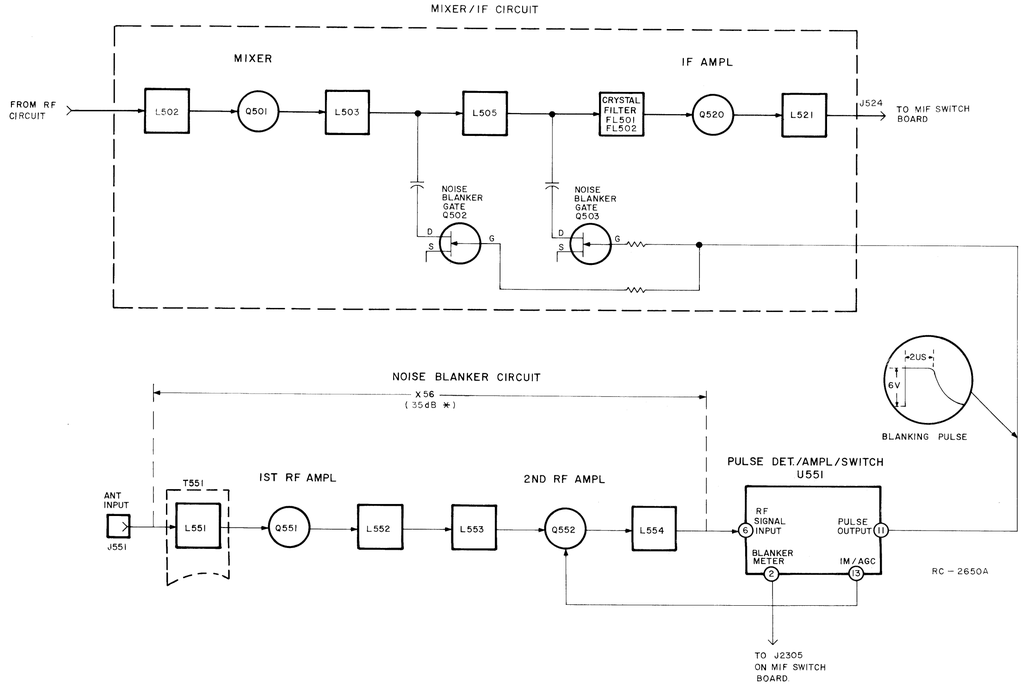
Procedure:

1. Connect signal generator to Antenna Jack (J551). Adjust the frequency of the signal generator to the channel frequency of the noise blanker (see Alignment procedure, Step 11). Adjust the RF level for 1 Millivolt output.
2. Apply probe of RF Voltmeter to Antenna Jack (J551). Peak resonant circuit L551 (Bottom Slug of Z502) and take voltage reading (E1).
3. Move probe to input of IC-U551 (pin 6). Repeak first resonant circuit L551 (Bottom Slug of Z502). Then peak resonant circuit L554 and take reading (E2).
4. Convert reading by means of the following formula:

   Voltage Ratio = $\frac{E2}{E1}$

5. Check results with the typical voltage ratio shown on diagram.

*Difference between input and output readings on dB scale of RF Voltmeter.



STEP 1 - QUICK CHECKS

TEST SET CHECKS

These checks are typical voltage readings measured with GE Test Set Model 4EX3A11 in the Test 1 position, or Model 4EX8K12 in the 1-Volt position.

Metering Position	Reading With No Signal In
C (MULT-1)	0.45 VDC
D (MULT-2)	0.1 VDC
J (Reg. +10 Volts at System Metering jack)	+10 VDC

SYMPTOM CHECKS

SYMPTOM	PROCEDURE
NO SUPPLY VOLTAGE	• Check power connections and continuity of supply leads and check fuse. If fuse is blown, check DFE and receiver for short circuits.
NO REGULATED 10-VOLTS	• Check the 12-Volt supply. Then check 10-Volt regulator circuit. (See Receiver Troubleshooting Procedure for 10-Volt Regulator).
LOW OSCILLATOR/MULTIPLIER READINGS	• Check alignment of Oscillator/Multiplier. (Refer to Front End Alignment Procedure). • Check voltage readings of Oscillator/Multiplier (Q401 and Q402).
LOW SENSITIVITY	• Check Front End Alignment. (Refer to DFE Alignment Procedure). • Check antenna connections, cable, antenna switch, and RF Steering Switch Connections. • Check Oscillator injection voltage. • Check voltage readings of Mixer and IF amp. • Make SIMPLIFIED GAIN CHECKS (STEP 2).

STEP 3-VOLTAGE RATIO READINGS →

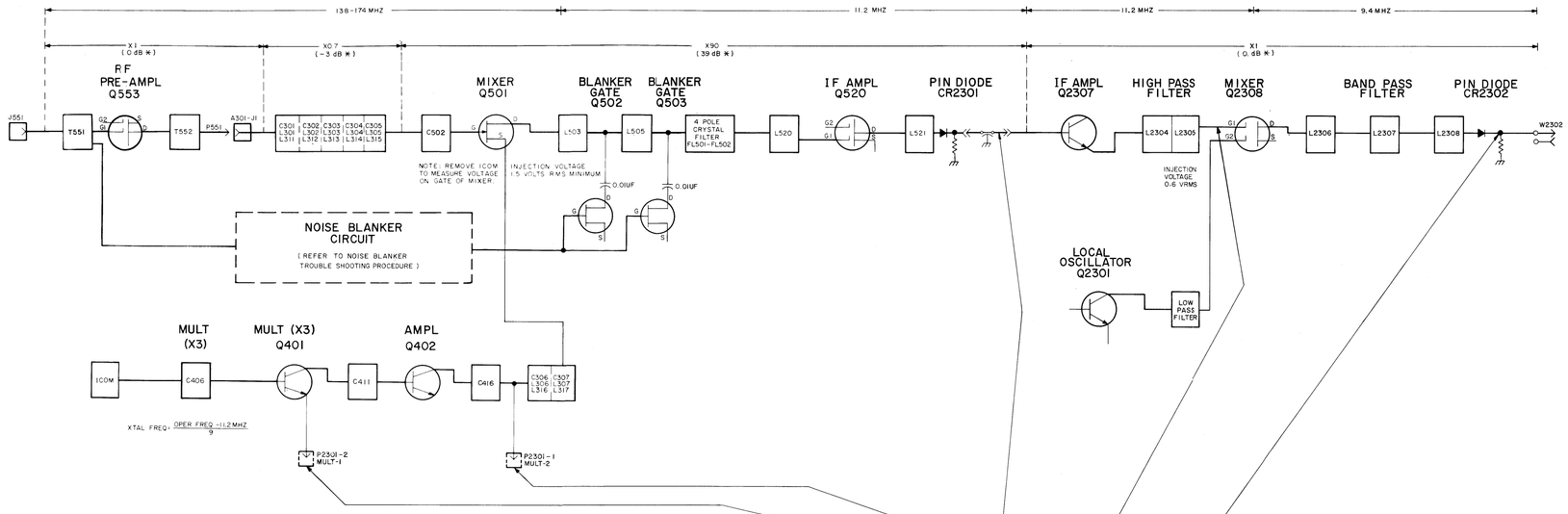
EQUIPMENT REQUIRED:
1. RF VOLTMETER
2. SIGNAL ON RECEIVER FREQUENCY (BELOW SATURATION). USE 1000Hz SIGNAL WITH 0.3 KHz DEVIATION.

PROCEDURE:
1. APPLY PROBE TO INPUT OF STAGE (FOR EXAMPLE, SOURCE OF RF AMP). PEAK RESONANT CIRCUIT OF STAGE BEING MEASURED AND TAKE VOLTAGE READING (E_1).
2. MOVE PROBE TO INPUT OF FOLLOWING STAGE (MIXER). REPEAK FIRST RESONANT CIRCUIT THEN PEAK CIRCUIT BEING MEASURED AND TAKE READING (E_2).
3. CONVERT READINGS BY MEANS OF THE FOLLOWING FORMULA.

   VOLTAGE RATIO = $\frac{E_2}{E_1}$

4. CHECK RESULTS WITH TYPICAL VOLTAGE RATIOS SHOWN ON DIAGRAM.

* DIFFERENCE BETWEEN INPUT AND OUTPUT READING ON dB SCALE OF RF VOLTMETER. NOT ACTUAL POWER GAIN.



STEP 2-SIMPLIFIED GAIN CHECKS →

EQUIPMENT REQUIRED:
1. VOLTMETER AC & DC
2. SIGNAL GENERATOR
3. RF VOLTMETER

PRELIMINARY STEPS:
1. SELECT DFE CHANNEL FOR OPERATION.
2. SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
3. RECEIVER SHOULD BE PROPERLY ALIGNED.
4. CONNECT METER BETWEEN A- AND POINTS INDICATED BY ARROW.

SIGNAL APPLIED TO J551.	NONE	NONE	UNMODULATED	UNMODULATED	UNMODULATED
PROCEDURE	VOLTMETER READING SHOULD BE APPROX. 0.5 VDC	VOLTMETER READING SHOULD BE APPROX. 0.2 VDC	SET GENERATOR OUTPUT AT 1000 MICROVOLTS	SET GENERATOR OUTPUT AT 1000 MICROVOLTS	SET GENERATOR OUTPUT AT 1000 MICROVOLTS
READING			RF VOLTMETER READING SHOULD BE APPROX 200 MILLIVOLTS	RF VOLTMETER READING SHOULD BE 170 MILLIVOLTS	RF VOLTMETER READING SHOULD BE 200 MILLIVOLTS

RC-2834A

TROUBLESHOOTING PROCEDURE

138—174 MHz MASTR II DUAL FRONT END WITH NOISE BLANKER