DESCRIPTION AND MAINTENANCE

66—88 MHz RECEIVER

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DESCRIPTION

MASTR® II, 66 to 88 megahertz receivers are single conversion, superheterodyne FM receivers designed for one- through eight frequency operation. The solid state receiver utilizes integrated circuits (ICs), monolithic crystal filters and discrete components with each of the crystal filters located between gain stages to provide 100 dB selectivity and maximum protection from de-sensitization and intermodulation.

The receiver consists of the following modules:

- RF Assembly
- Mixer/IF (MIF)
- Oscillator/Multiplier (Osc/Mult)
- IF/Audio and Squelch (IFAS)

Audio, supply voltages and control functions are connected to the system board through P903 on the Osc/Mult board, and P904 on the IFAS board. The regulated +10 Volts is used for all receiver stages except the audio PA stage which operates from the A+ system supply.

Centralized metering jack J601 on the IFAS board is provided for use with GE Test Set 4EX3A11 or Test Kit 4EXK12. The test set meters the oscillator, multiplier, discriminator and IF amplifier stages. Speaker high and low are metered on the system board metering jack.

A block diagram of the complete receiver is shown in Figure 1.

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

MAINTENANCE

DISASSEMBLY

To service the Receiver from the top (see Mechanical Parts Breakdown):

1. Pull the locking handle down, then pry up the top cover at the front notch and lift off the cover.

To service the Receiver from the bottom:

1. Pull the locking handle down and pull the radio out of the mounting frame.
2. Remove the top cover, then loosen the two bottom cover retaining screws and remove the bottom cover (see Figure 2).
3. To gain access to the bottom of the Osc/Mult and IFAS board, remove the six screws (A) holding the receiver bottom cover (see Figure 3.

NOTE

Refer to Figure 4 for receiver module location.

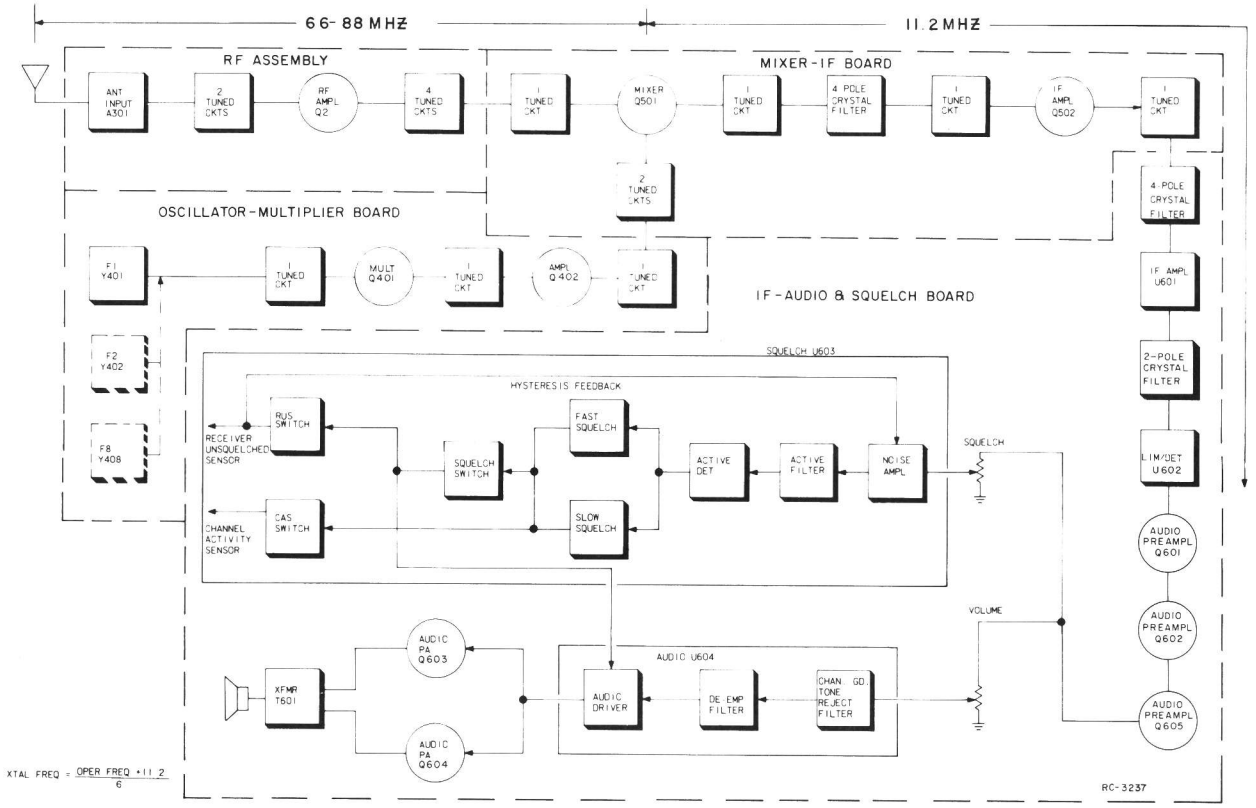


Figure 1 - Receiver Block Diagram

To remove the OSC/Mult board from the radio:

1. Remove the six screws (A) holding the receiver bottom ocer, and the three screws (B) holding the board.
2. Remove the six screws (E) holding the MIF bottom cover.
3. Press straight down on the plug-in Osc/Mult board from the top to avoid bending the pins when unplugging the board from the system board jack.

To remove the IFAS board from the radio:

1. Remove the six screws (A) holding the bottom cover, and the one screw holding the board.
2. Remove the two screws (D) holding the audio PA heatsink to the right side rail.
3. Press straight down on the plug-in IFAS board from the top to avoid bending the pins when unplugging the board from the system board jack.

To remove the MIF board from the radio:

1. Remove the six screws (E) holding the MIF bottom cover.
2. Remove the four screws (F) holding the MIF top cover.

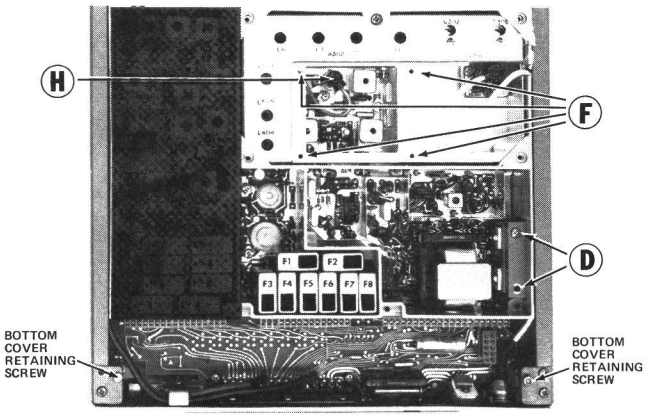


Figure 2 - Disassembly Procedure (Top View)

3. Remove the three screws (G) and the Connector (H), and carefully push down on the top of the board to avoid damaging the feedthrough capacitors.

To remove the RF pre-selector board in the RF Assembly:

1. Remove the MIF board as instructed.
2. Remove the eight screws (J) holding the RF assembly bottom cover.

3. Carefully unsolder the lead to the preselector board from the helical resonator cavity.

4. Remove the five screws holding the preselector board, and lift the board out.

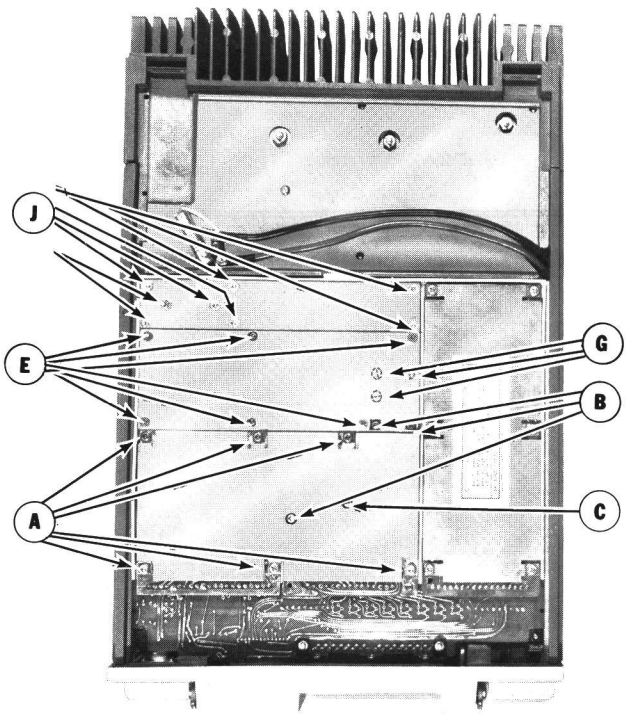


Figure 3 - Disassembly Procedure (Bottom View)

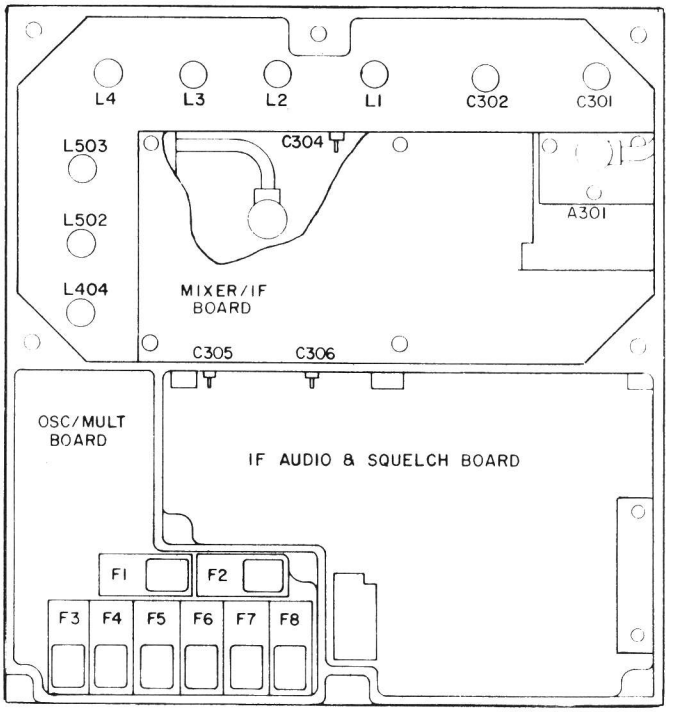


Figure 4 - Receiver Module Location Diagram

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Models 4EX3A11, 4EX8K12, or 20,000 ohms-per-Volt multimeter with a 1-Volt and 3- Volt scale.
2. A 66-88 MHz signal source. Connect a one-inch piece of insultated wire no larger than .065-inch diameter to generator output probe.

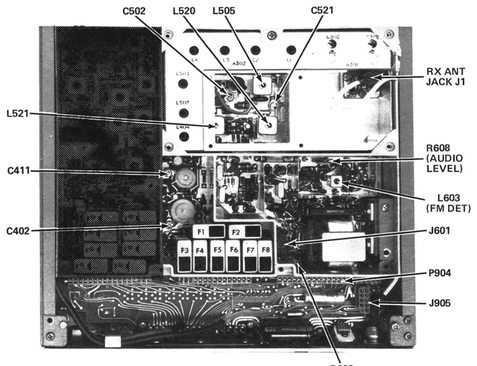
PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect black plug from Test Set to Receiver Centralized Metering Jack J601, and red plug to system board metering jack J905. Set range selector switch to the TEST 3 position (or 3-Volt position on 4EX8K12).
2. For multi-frequency receivers with a frequency spacing up to 0.25 MHz for frequency range of 66-78 MHz, 0.29 MHz for frequency range of 77-88 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 0.50 MHz for frequency range of 66-78 MHz, 0.58 MHz for frequency range of 77-88 MHz, align the receiver using a center frequency tune-up ICOM. These limits can be extended to 1.0 MHz, 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 J601-9 (A-1).
5. Disable Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION GE Test Set	METERING POSITION Multimeter - at J601-9	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR/MULTIPLIER		
1.	C (MULT-1)	Pin 3	L404, L502, L503, C402	See Procedure	Set the range selector switch to the Test 3 position on the 3-Volt scale. Adjust the slugs in L404, L502, and L503 to top of coil. Adjust C402 for maximum meter reading.
2.	D (MULT-2)	Pin 4	C411, C402 L404, L502, and L503	See Procedure	Adjust C411 and C402 for maximum meter reading. Carefully tune L404 for a dip in meter reading. Then adjust L503 for maximum meter reading and L503 for a dip in meter reading. Do NOT readjust L404, L502, and L503.
			RF AMPLIFIER & SELECTIVITY		
3.	B (IF AMP)	Pin 1	L4		Apply an on-frequency signal adjacent to L4. Set the range selector switch to Test 1 position on the 1 Volt scale and tune L4 for maximum meter reading.
4.	B (IF AMP)	Pin 1	L4, L3	Maximum	Apply an on-frequency signal adjacent to L2 keeping the signal below saturation. Then tune L4 and L3 for maximum meter reading.
5.	B (IF AMP)	Pin 1	L1, L2, L3, L4, C301, C302 and C502	Maximum	Apply an on-frequency signal to the antenna jack, keeping the signal below saturation. Then tune L1, L2, L3, L4, C301, C302 and C502 for maximum meter reading.
6.	B (IF AMP)	Pin 1	C502, L4, L3, L2, L1 C301 and C302	See Procedure	Apply an on-frequency signal as in Step 5 and slightly tune C502, L4, L3, L2, L1, C301 and C302 for best quieting sensitivity.
7.			C302, C301, L1, L2, L3 and L4	See Procedure	In multi-frequency receivers with a wide frequency spread, apply an on-frequency signal as in Step 5. De-tune C302 for minimum quieting sensitivity and then tune C301 for maximum quieting sensitivity. Next, tune C302, L1, L2, L3 and L4 for best quieting sensitivity.



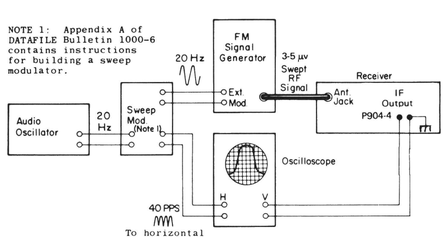


Figure 5 - Test Setup for 20-Hz Double-Trace Sweep Alignment

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 exceeds 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 specification limit (±2 PPM or ± 5 PPM) at any temperature with 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 C411 and L402 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 C411 and L402 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 range 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 4EX8A10). 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 6.

   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 +0.35 to 0.5-Volts with an ON-FREQUENCY signal or under NO-SIGNAL conditions and is provided for routine test and measurement only. The resolution of this reading (approximately .025 Y per kHz as read on a GE Test Set in meter position A, or 0.1 Y 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 (15°C) and set the oscillator to require mixer injection frequency, or
   2. Maintain the radio at 26.5°C (10°C) and offset the oscillator, as a function of actual temperature, by the frequency error factor shown in Figure 6.

B. To hold setting error to ±0.35 PPM (which is considered reasonable for 2 PPM ICOMS): Maintain the unit at 26.5°C (15°C) and offset the oscillator, as a function of actual temperature, by the frequency error factor shown in Figure 6.

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 88 MHz, 1 PPM is 88 Hz). At 88 MHz, 1 PPM is 88 Hz).

With a mixer injection frequency of 88 MHz, adjust the oscillator for a corrected mixer injection frequency 26 Hz (0.3 X 88 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.

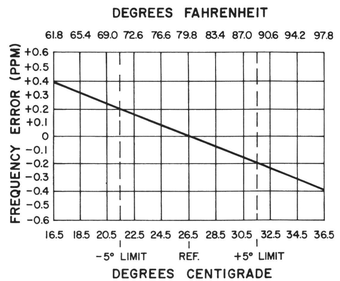


Figure 6 - Frequency Characteristics Vs. Temperature

COMPLETE RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Models 4EX3A11, 4EX8K12 (or 20,000 ohms-per-Volt and 3-Volt scale.
2. A 11.2 MHz signal source (GE Test Set Model 4EX9A10). Also a 66-88 MHz signal source with a one-inch piece of insulated wire no larger than .065 inch diameter connected to generator probe.
3. VTVM
4. Distortion Analyzer

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect the black plug from the Test Set to receiver metering jack J601, and the red plug to system board metering jack J905. Set the meter sensitivity switch to the Test 1 (or 1-Volt position on the 4EX8K12).
2. For multi-frequency receivers with a frequency spacing up to 0.25 MHz for frequency range of 66-78 MHz or 0.29 MHz for frequency range of 77-88 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 0.50 MHz for frequency range of 66-78 MHz 0.58 MHz for frequency range of 77-88 MHz, align the receiver using a center frequency tune-up ICOM. These limits can be extended to 1.0 MHz, 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 J601-9	TUNING CONTROL	METER READING	PROCEDURE
			FM DETECTOR		
1.	A (FM DET)	Pin 2	L603	0.38 Volt	With no signal applied, adjust L603 for a meter reading of approximately 0.38 volt.
			OSCILLATOR/MULTIPLIER		
2.	C (MULT-1)	Pin 3	L404, L502 L503, C402	See Procedure	Set the range selector switch to the Test 3 position on the 3-Volt scale. Adjust the slugs in L404, L502, and L503 to top of coil. Adjust C402 for maximum meter reading.
3.	D (MULT-2)	Pin 4	C411, C402, L404, L502, and L503	See Procedure	Adjust C411 and C402 for maximum meter reading. Carefully tune L404 for a dip in meter reading. Then adjust L503 for maximum meter reading and L503 for a dip in meter reading. Do NOT readjust L404, L502 and L503.
			RF AMP & SELECTIVITY		
4.	B (IF AMP)	Pin 1	L4		Apply an on frequency signal adjacent to L4. Set the range selector switch to Test 1 position on the 1 Volt scale and tune L4 for maximum meter reading.
5.	B (IF AMP)	Pin 1	L4, L3	Maximum	Apply an on-frequency signal adjacent to L2 keeping the signal below saturation. Then tune L4 and L3 for maximum meter reading.
6.	B (IF AMP)	Pin 1	L1, L2, L3, L4, C301, C302 and C502	Maximum	Apply an on-frequency signal to the antenna jack, keeping the signal below saturation. Then tune L1, L2, L3, L4, C301, C302 and C502 for maximum meter reading.
7.	B (IF AMP)	Pin 1	C502, L4, L3, L2, L1 C301 and C302	See Procedure	Apply an on-frequency signal as in Step 6 and slightly tune C502, L4, L3, L2, L1 C301 and C302 for best quieting sensitivity.
8.			C302, C301, L1, L2, L3 and L4	See Procedure	In multi-frequency receivers with a wide frequency spread, apply an on-frequency signal as in Step 6. De-tune C302 for minimum quieting sensitivity and then tune C301 for maximum quieting sensitivity. Next, tune C302, L1, L2, L3 and L4 for best quieting sensitivity.
9.			L603, R608	See Procedure	Remove the Test set metering plug from J601. Apply a 1000 microvolt signal with 1 kHz modulation and 3.0 kHz deviation to the antenna jack. Tune L603 for maximum voltage at 1 kHz and adjust R608 for 1 Volt rms measured with a VTVM at P904-11 (VOL/SQ H1) and P904-17 (A-).
			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 10 and 11.					
			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.		
10.			L505, L520, L521, and C521		Connect scope, signal generator, and probe as shown in Figure 5. Set signal generator level for 3 to 5 uV and modulate with 10 kHz at 20 Hz. With probe between P904-4 (or J601-1) and A-, tune L505, L520, L521, and C521, for double trace as shown on scope pattern.
11.				See Procedure	Check to see that modulation acceptance bandwidth is greater than ±7 kHz.
			SQUELCH ADJUST		
12.			R622		Squelch adjust control R622 (if present) is preset at the factory. If further adjustment is required, adjust R622 on the IFAS board for best squelch operation. NOTE. Maximum squelch decreases with increasing resistance.

TEST PROCEDURES

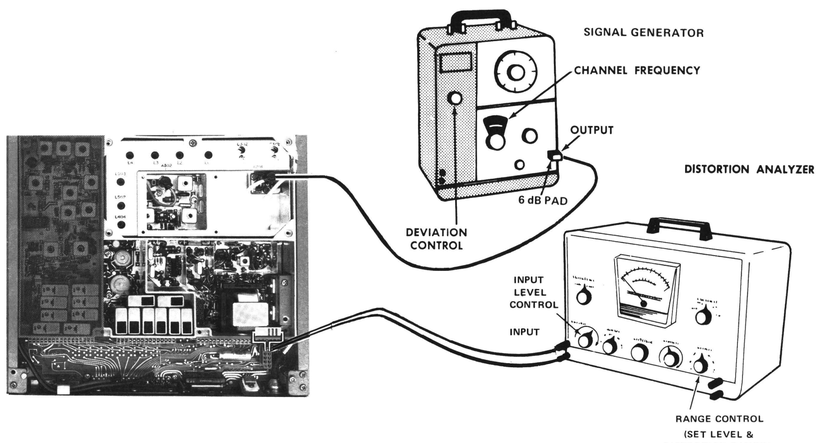
These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, limiter not operating properly, and low gain. By following the sequence of test steps starting with Step 1, the defect can be quickly localized. Once 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 Receiver 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 receiver Test Procedure.
2. Turn the SQUELCH control fully clockwise for all steps of the Test Procedure.
3. Turn on all of the equipment and let it warm up for 20 minutes.



STEP 1
AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

A. Apply a 1,000-microvolt, on-frequency test signal modulated by 1,000 hertz with ±3.0 kHz deviation to antenna jack A301-J1.

B. With 15-Watt Speaker (Mobile) or 5-Watt (Station):

Disconnect speaker lead pin from Systems 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 as shown.

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 (5-Watt Station) output 9.8 VRMS (Mobile) or 6.3 VRMS (Station) using the Distortion Analyzer as a VTVM.

D. Make distortion measurements according to manufacturer's instructions. Reading should be less than 3%. If the receiver sensitivity is to be measured, leave all controls and equipment as they are.

SERVICE CHECK

If the distortion is more than 3%, or maximum audio output is less than 12.0 Watts, make the following checks:

E. Battery and regulator voltage---low voltage will cause distortion. (Refer to Receiver Schematic Diagram for voltages.)

F. Audio Gain (Refer to Receiver Troubleshooting Procedure.)

G. FM Detector Alignment (Refer to Receiver Alignment on reverse side of page).

STEP 2
USABLE SENSITIVITY (12-dB SINAD)

If STEP 1 checks out properly, measure the 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. Place the RANGE switch on the Distortion Analyzer in the 200 to 2000-Hz distortior range position (1000-Hz filter in the circuit). Tune the filter for minimum reading or null on the lowest possible scale (100%, 30%, etc.)

C. 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%).

D. 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).

E. 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 0.25 microvolts 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 VTVM).

F. 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 0.25 microvolts, 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 3
MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

If STEPS 1 and 2 check out properly, measure the 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 Receiver Troubleshooting Procedure.

STEP 1 - QUICK CHECKS
TEST SET CHECKS

These checks are typical voltage readings measured with GE Test Set Model 4EX3A11 or Test Kit Model 4EX8K12 in the position shown below:

Metering Position	Reading With No Signal In	Reading With 3 Microvolt Unmodulated	Test Position
A (FM DET)	0.35-0.5 VDC		Test 1 (or 1-Volt
B (IF AMP)		0.1 VDC	Test 1 (or 1-Volt
C (MULT-1)	0.3 VDC		Test 1 (or 1-Volt)
D (MULT-2)	1.4 VDC		Test 3 (or 3-Volt)
J (Reg. +10 Volts at System Metering jack)	+10 VDC		

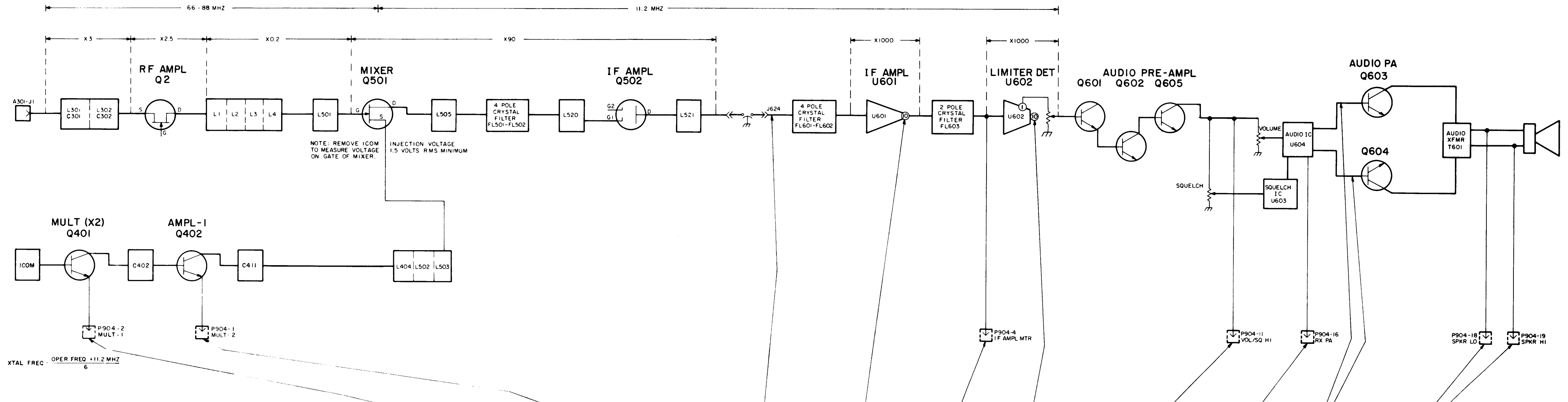
SYMPTOM CHECKS

SYMPTON	PROCEDURE
NO SUPPLY VOLTAGE	• Check power connections, continuity of supply leads, and fuse. If fuse is blown, check receiver for short circuits.
NO REGULATED 10-VOLTS	• Check the 12-Volt supply. Then check 10-Volt regulator circuit. (See Troubleshooting Procedure for 10-Volt Regulator).
LOW IF DET READING	• Check supply voltages and then check oscillator readings at P904-1 & -2 as shown in STEP 2. • Make SIMPLIFIED GAIN CHECKS from Mixer through Detector stages as shown in STEP 2.
LOW OSCILLATOR/MULTIPLIER READINGS	• Check alignment of Oscillator/Multiplier. (Refer to Front End Alignment Procedure). • Check voltage readings of Oscillator/Multiplier (Q401, Q402).
LOW RECEIVER SENSITIVITY	• Check Front End Alignment. (Refer to Receiver Alignment Procedure). • Check antenna connections, cable and antenna switch. • Check Oscillator injection voltage. • Check voltage readings of Mixer and IF Amp. • Make SIMPLIFIED GAIN CHECKS (STEP 2).
IMPROPER SQUELCH OPERATION	• Check voltages on Schematic Diagram. • Make gain and waveform checks with noise. • Make gain and waveform checks with 6 kHz signal. • Check discrete components in the squelch circuit. • Replace IC circuit U603.
LOW OR DISTORTED AUDIO	• Check voltages on Schematic Diagram. • Make gain and waveform checks. • Check receiver alignment and FM DET output. • Check Q601 thru Q605 and other discrete components. • Replace IC circuit U604.

STEP 4-VOLTAGE RATIO READINGS →

EQUIPMENT REQUIRED:
1. RF VOLTMETER
2. SIGNAL ON RECEIVER FREQUENCY (BELOW SATURATION).
   USE 1,000 HERTZ SIGNAL WITH 3.0 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.


66 - 88 MHZ
11.2 MHZ
X3
X2.5
X0.2
X90
X1000
X1000
RF AMPL Q2
MIXER Q501
IF AMPL Q502
IF AMPL U601
LIMITER DET U602
AUDIO PRE-AMPL
Q601 Q602 Q605
AUDIO PA Q603
Q604
A301-J1
L301 C301
L302 C302
L1 L2 L3 L4
L501
L505
4 POLE CRYSTAL FILTER FL501-FL502
L520
L521
J624
4 POLE CRYSTAL FILTER FL601-FL602
U601
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SQUELCH
SQUELCH IC U603
AUDIO XFMR T601
NOTE: REMOVE ICOM TO MEASURE VOLTAGE ON GATE OF MIXER.
INJECTION VOLTAGE 1.5 VOLTS RMS MINIMUM
MULT (X2) Q401
AMPL-I Q402
ICOM
C402
C411
L404 L502 L503
P904-2 MULT-1
P904-1 MULT-2
XTAL FREQ = OPER FREQ +11.2 MHZ / 6
P904-4 IF AMPL MTR
P904-11 VOL/SQ HI
P904-16 RX PA
P904-18 SPKR LO
P904-19 SPKR HI

STEP 2-SIMPLIFIED GAIN CHECKS →

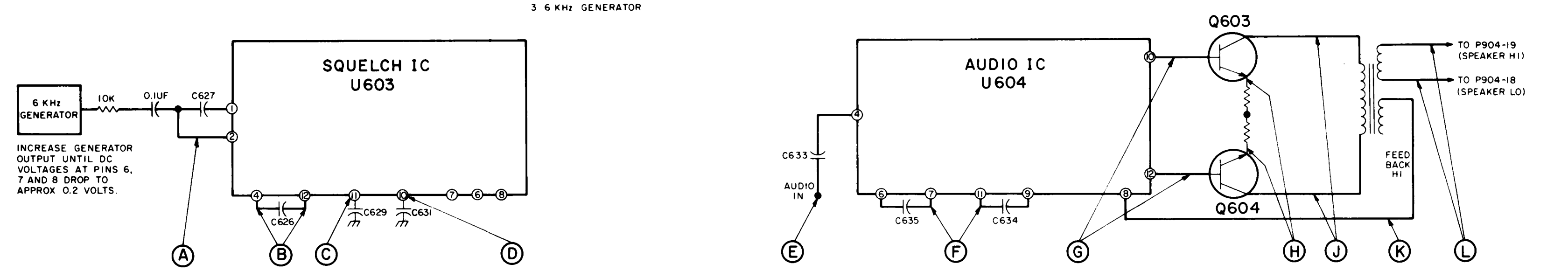
EQUIPMENT REQUIRED
1. AC VOLTMETER & DC MULTIMETER
2. SIGNAL GENERATOR
3. RF VOLTMETER

PRELIMINARY STEPS
1. SET VOLUME CONTROL FOR 9.8 VOLTS ACROSS 8.0-OHM LOAD. IF THIS CANNOT BE OBTAINED, SET TO APPROX. 70% OF MAX ROTATION.
2. SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
3. RECEIVER SHOULD BE PROPERLY ALIGNED.
4. CONNECT METER BETWEEN A- AND POINTS INDICATED BY ARROW.

SET SIGNAL GENERATOR TO CORRECT RF FREQUENCY AND APPLY TO A301 - J1			UNMODULATED	UNMODULATED	UNMODULATED	NO SIGNAL INPUT	STANDARD SIGNAL (1 MILLIVOLT AT RECEIVER FREQ MODULATED BY 1 KHz WITH 3.0 KHz DEVIATION)	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL
PROCEDURE			SET GENERATOR OUTPUT AT 1000 MICROVOLTS	INCREASE GENERATOR OUTPUT FROM ZERO UNTIL U601 SATURATES AS MEASURED WITH RF VOLTMETER	INCREASE GENERATOR OUTPUT FROM ZERO TO 30 MICROVOLTS	SHOULD BE IN SATURATION AT ALL TIMES				WITH SPEAKER DISCONNECTED, CONNECT VTVM OR SCOPE ACROSS 8-OHM LOAD CONNECTED BETWEEN P904-18 AND P904-19
READING	READING SHOULD BE APPROX 0.3 VDC (1V SCALE)	READING SHOULD BE APPROX 1.4 VDC (3V SCALE)	RF VOLTMETER READING SHOULD BE APPROX 200 MILLIVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 40 MICROVOLTS	READING SHOULD BE APPROX 0.1 VDC (1V SCALE)	RF VOLTMETER READING SHOULD BE APPROX 0.6V RMS	READING SHOULD BE APPROX 1.0 VAC	READING SHOULD BE APPROX 0.18 VAC	READING SHOULD BE APPROX 6.7 VAC	9.8VAC

STEP 3-AUDIO & SQUELCH WAVEFORMS

EQUIPMENT REQUIRED:
1. OSCILLOSCOPE CONNECTED BETWEEN A- AND POINTS INDICATED BY ARROW.
2. SIGNAL GENERATOR (MEASUREMENTS M803 OR EQUIVALENT.
3. 6 KHz GENERATOR


6 KHz GENERATOR
10K
0.1UF
C627
SQUELCH IC U603
C626
C629
C631
INCREASE GENERATOR OUTPUT UNTIL DC VOLTAGES AT PINS 6, 7 AND 8 DROP TO APPROX 0.2 VOLTS.
AUDIO IC U604
C633
AUDIO IN
C635
C634
Q603
Q604
FEED BACK HI
TO P904-19 (SPEAKER HI)
TO P904-18 (SPEAKER LO)

SQUELCH CIRCUIT CHECKS WITH 6 KHz SIGNAL:

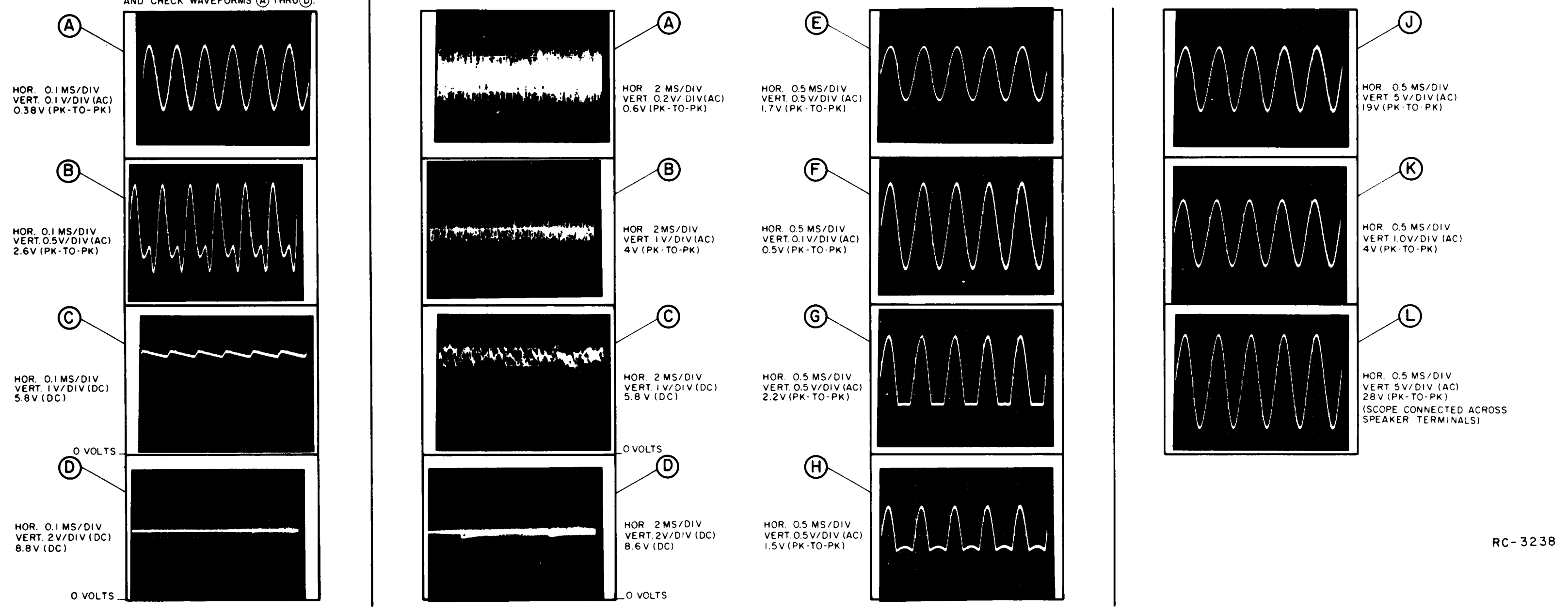
PRELIMINARY STEPS
1. QUIET RECEIVER WITH A 1000 MICROVOLT, UNMODULATED SIGNAL.
2. SET SQUELCH CONTROL TO APPROX MID-RANGE.
3. APPLY 6KHz SIGNAL TO PIN 1 AS SHOWN, AND CHECK WAVEFORMS (A) THRU (D).

SQUELCH CIRCUIT CHECK WITH NOISE:

PRELIMINARY STEPS
1. NO INPUT SIGNAL APPLIED.
2. SET SQUELCH CONTROL FOR CRITICAL SQUELCH.
3. CHECK WAVEFORMS (A) THRU (D).

AUDIO CIRCUIT CHECK WITH STANDARD SIGNAL (1000 MICROVOLTS AT RECEIVER FREQ: MODULATED BY 1 KHZ WITH 3.0 KHZ DEVIATION)

PRELIMINARY STEPS
1. SET VOLUME CONTROL FOR 9.8 VOLTS ACROSS 8-OHM, 12 WATT LOAD
2. SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
3. CHECK WAVEFORMS (E) THRU (L)


HOR. 0.1 MS/DIV
VERT. 0.1 V/DIV (AC)
0.38V (PK-TO-PK)
HOR. 0.1 MS/DIV
VERT. 0.5V/DIV (AC)
2.6V (PK-TO-PK)
HOR. 0.1 MS/DIV
VERT. 1V/DIV (DC)
5.8V (DC)
0 VOLTS
HOR. 0.1 MS/DIV
VERT. 2V/DIV (DC)
8.8V (DC)
0 VOLTS
HOR 2 MS/DIV
VERT 0.2V/DIV (AC)
0.6V (PK-TO-PK)
HOR 2 MS/DIV
VERT 1V/DIV (AC)
4V (PK-TO-PK)
HOR. 2 MS/DIV
VERT. 1V/DIV (DC)
5.8 V (DC)
0 VOLTS
HOR 2 MS/DIV
VERT. 2V/DIV (DC)
8.6 V (DC)
0 VOLTS
HOR. 0.5 MS/DIV
VERT. 0.5 V/DIV (AC)
1.7 V (PK-TO-PK)
HOR. 0.5 MS/DIV
VERT. 0.1 V/DIV (AC)
0.5V (PK-TO-PK)
HOR. 0.5 MS/DIV
VERT. 0.5 V/DIV (AC)
2.2V (PK-TO-PK)
HOR. 0.5 MS/DIV
VERT. 0.5 V/DIV (AC)
1.5V (PK-TO-PK)
HOR. 0.5 MS/DIV
VERT. 5 V/DIV (AC)
19V (PK-TO-PK)
HOR. 0.5 MS/DIV
VERT 1.0V/DIV (AC)
4V (PK-TO-PK)
HOR. 0.5 MS/DIV
VERT 5V/DIV (AC)
28V (PK-TO-PK)
(SCOPE CONNECTED ACROSS SPEAKER TERMINALS)

RC-3238