Maintenance Manual

MASTR® II
BASE STATION
25-50 MHz RECEIVER

TABLE OF CONTENTS

RF Amplifier, Mixer/IF Assembly LBI-4989 (DF1107)
Oscillator/Multiplier Board LBI-4993 (DF1106)
IF Audio and Squelch Board LBI-38507

ERICSSON

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TABLE OF CONTENTS

	Page
SPECIFICATIONS	1
DESCRIPTION	2
MAINTENANCE	2
FRONT END ALIGNMENT	4
ICOM FREQUENCY ADJUSTMENT	5
COMPLETE RECEIVER ALIGNMENT	6
TEST PROCEDURES	7
AUDIO POWER OUTPUT AND DISTORTION	7
USABLE SENSITIVITY (12 dB SINAD)	7
MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)	7
TROUBLESHOOTING PROCEDURES	8

ILLUSTRATIONS

Figure 1 - Disassembly Procedure (Top View)	2
Figure 2 - Receiver Block Diagram	2
Figure 3 - Disassembly Procedure (Bottom View)	3
Figure 4 - Receiver Module Location Diagram	3
Figure 5 - Test Points And Alignment Controls	4
Figure 6 - Test Setup For 20 Hz Double-Trace Sweep Alignment	4
Figure 7 - Frequency Characteristics Vs. Temperature	5

NOTICE

This manual covers Ericsson and General Electric products manufactured and sold by Ericsson Inc.

NOTICE

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

NOTICE

SPECIFICATIONS*

Receiver Type	ER-63-A	
Audio Output (to 8-ohm Speaker)	1 Watt at less than 3% distortion	
Sensitivity		
12 dB SINAD (EIA Method)	0.25 µV	
20 dB Quieting Method	0.35 µV	
SELECTIVITY		
EIA Two-Signal Method	-100 dB (adjacent channel, 20 kHz Channels)	
Spurious Response	-100 dB	
Frequency Stability		
5C-ICOM with EC-ICOM	±0.0005% (-40°C to +70°C)	
Modulation Acceptance	±6.5 kHz (narrow-band)	
Squelch Sensitivity		
Critical Squelch	0.18 µV	
Maximum Squelch	Greater than 12 dB SINAD (less than 1.0 µV)	
Intermodulation (EIA)	-80 dB	
Maximum Frequency Separation	Full Specifications	3 dB Degradation
25-36 MHz	.120 MHz	.340 MHz
36-42 MHz	.160 MHz	.400 MHz
42-50 MHz	.360 MHz	.640 MHz
Frequency Response	Within +2 and -8 dB of a standard 6 dB per octave de-emphasis curve from 300 to 3000 Hz (1000 Hz reference)	
RF Input Impedance	50 ohms	

* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

WARNING

Although the highest DC voltage in MASTR II receiver is +12 DC, high current may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits!

High-level RF energy in the transmitter Power Amplifier assembly can cause RF burns upon contact. Keep away from these circuits when the transmitter is energized!

DESCRIPTION

MASTR II Base Station, 25 to 50 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 Test Set 4EX3A11 or Test Kit 4EX8K12. 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 2.

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 1).
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.

To remove the OSC/Mult board from the radio:

1. Remove the six screws (A) holding the receiver bottom cover, 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 (C) holding the board.
2. Press straight down on the plug-in IFAS board from the top to avoid bending pins when unplugging the board from the system board jack.

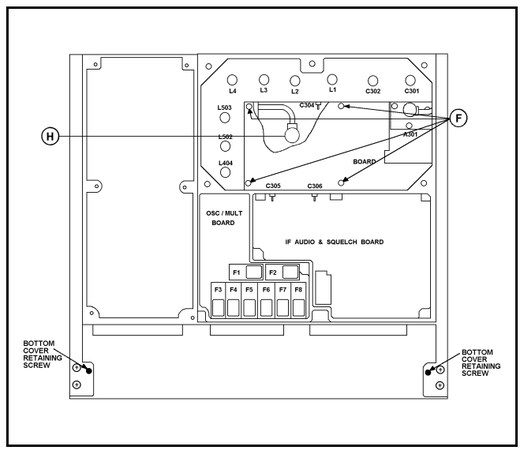


Figure 1 - Disassembly Procedure (Top View)

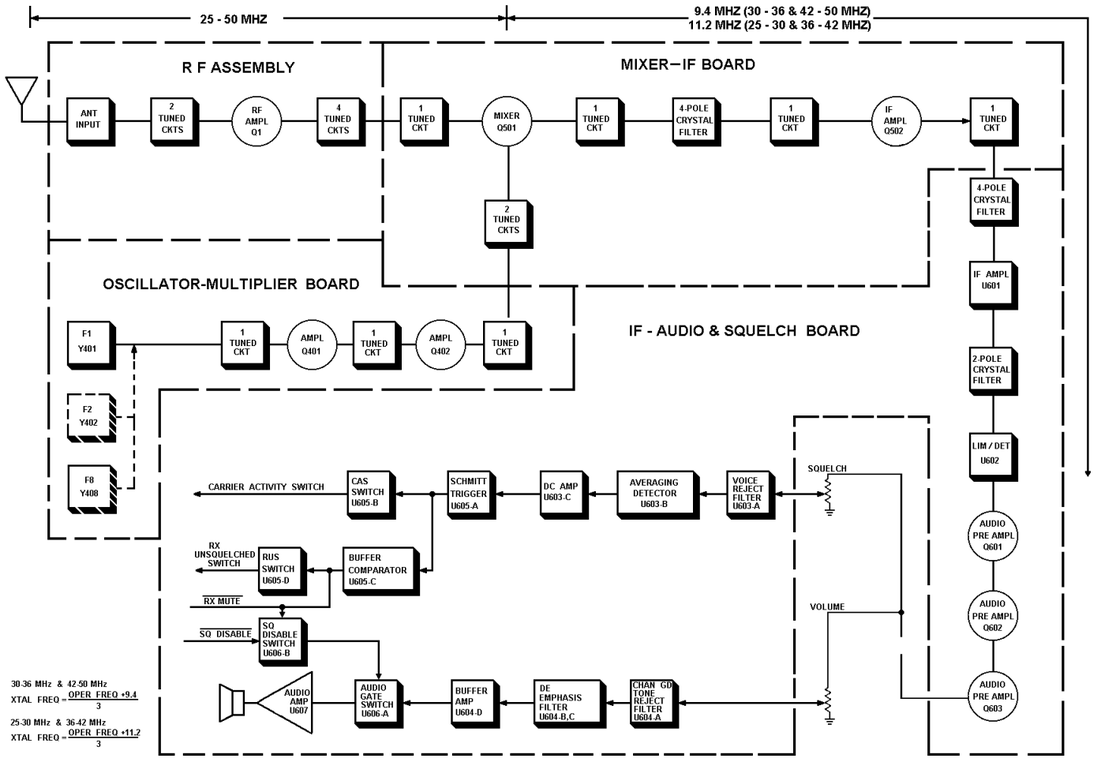


Figure 2 - Receiver Block Diagram

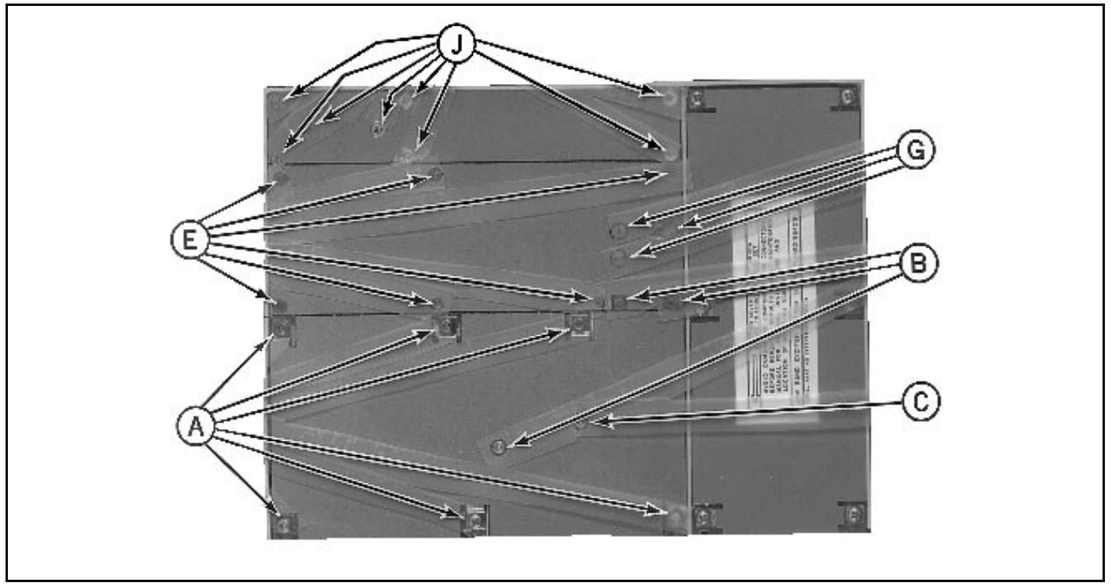


Figure 3 - Disassembly Procedure
(Bottom View)

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.
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 pre-selector board from the helical resonator cavity.
4. Remove the five screws holding the pre-selector board, and lift the board out.

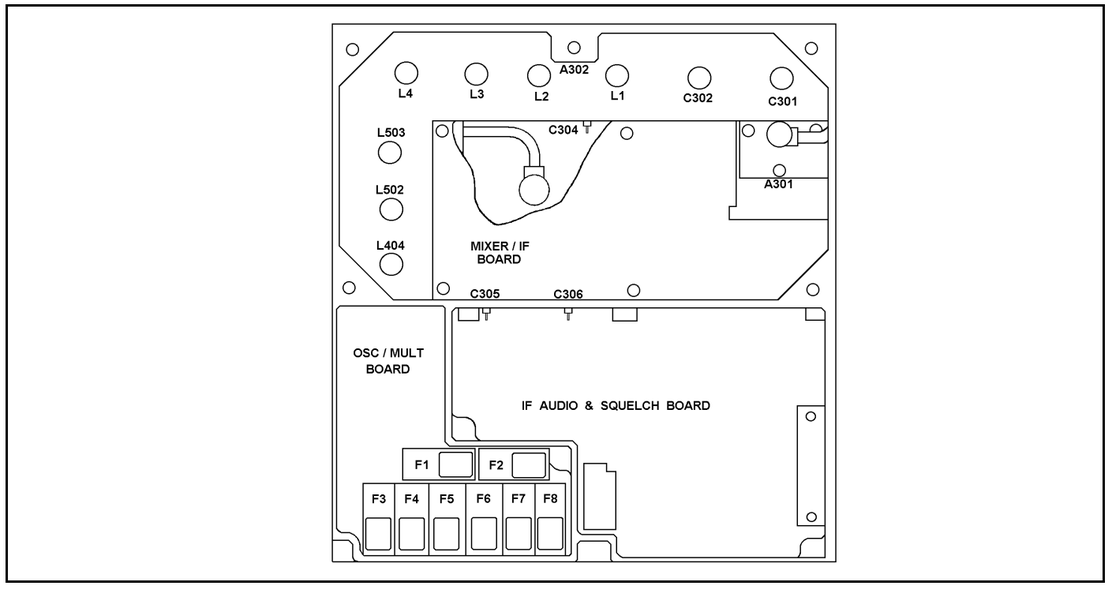


Figure 4 - Receiver Module Location Diagram

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

1. Test Set Models 4EX3A11, 4EX8K12, or 20,000 ohms-per-Volt multimeter with a 1 Volt or 3 Volt scale.

2. A 25-50 MHz signal source. Connect a one-inch piece of insulated 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 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 0.060 MHz for frequency range of 25-36 MHz, 0.080 MHz for frequency range of 36-42 MHz at 0.180 MHz for frequency range of 42-50 MHz, align the receiver on the channel nearest center frequency.

ALIGNMENT PROCEDURE

For multi-frequency receivers with a frequency spacing exceeding the above but no greater than 0.120 MHz for frequency range of 25-36 MHz, .160 MHz for frequency range of 36-42 MHz, or .360 MHz for frequency range of 42-50 MHz, align the receiver using a center frequency tune-up ICOM. These limits can be extended to .340 MHz, .400 MHz and .640 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 J601-9 (A-1).

5. Disable Channel Guard.

STEP	METERING POSITION			TUNING CONTROL	METER READING	PROCEDURE
	TEST SET	INTERNAL METERING	MULTIMETER -AT J601-9			
1.	C (MULT-1)	3 (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)	4 (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 L502 for maximum meter reading and L503 for a dip in meter reading. Do NOT readjust L404, L502 and L503.
RF AMPLIFIER & SELECTIVITY NOTE: IF AMP meter range is 0-700 mVDC with a high impedance DC voltmeter.						
3.	B (IF AMP)	2 (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)	2 (IF AMP)	Pin 1	L4, L3	Maximum	Apply an on-frequency signal adjacent to L2 keeping the signal below saturation. Then tne 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 C302, L4, L3, L2, L1, C301 and C302 for best quieting sensitivity.

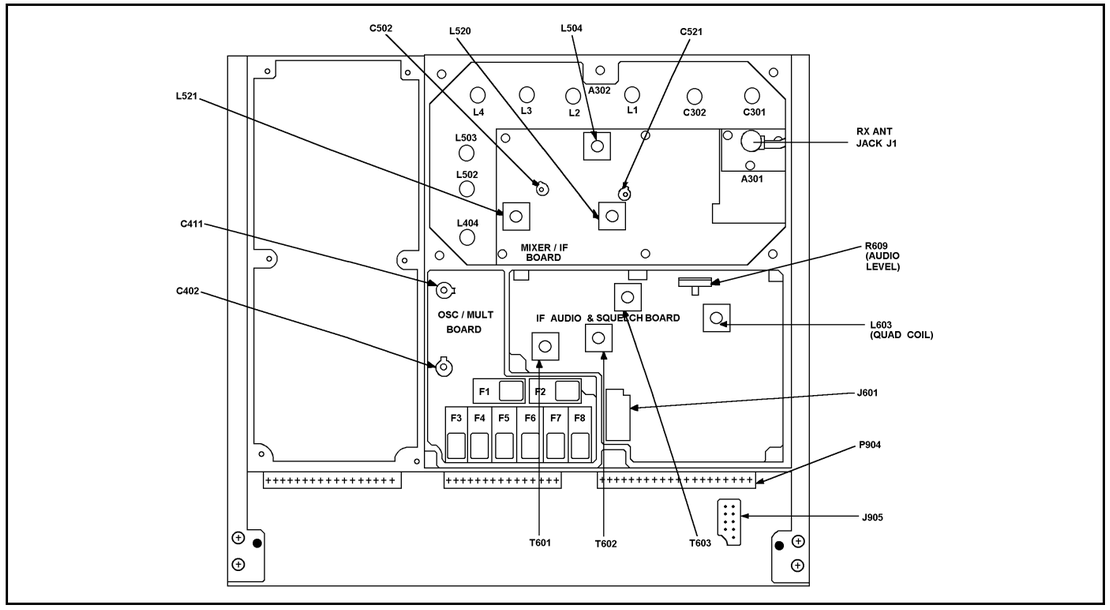


Figure 5 - Test Points And Alignment Controls

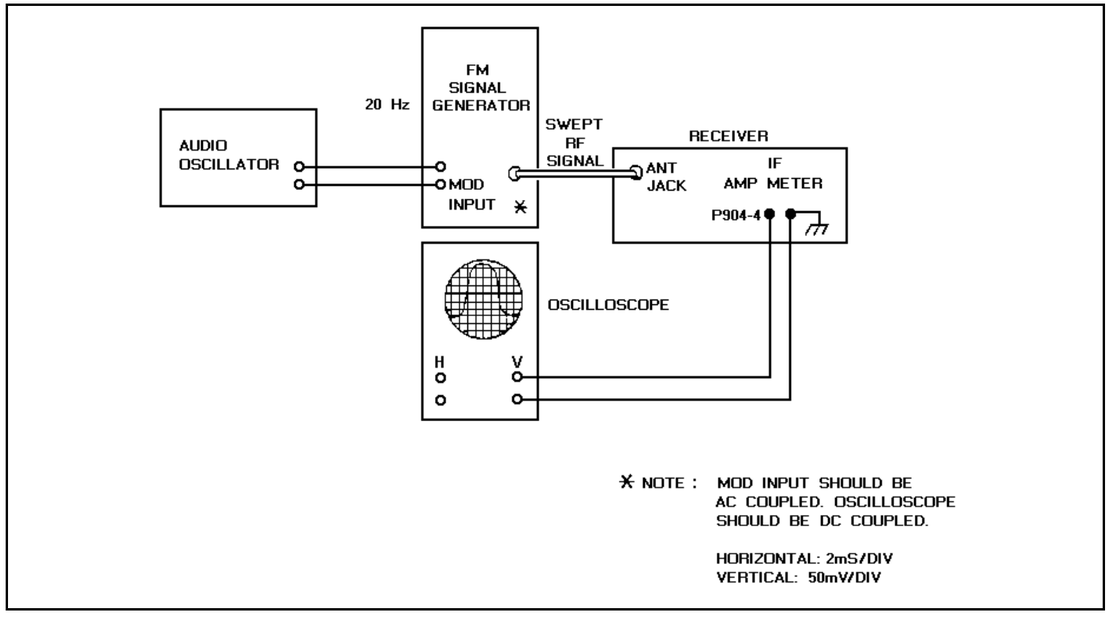


Figure 6 - Test Setup for 20 Hz Double-Trace Sweep Alignment

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 temperature within the range -5°C to +55°C (+131°F).

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

If frequency adjustment is required, lift up the cover on the top of the ICOM (where present) 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: Model 4EX9A10). Loosely couple the IF frequency standard to the IF signal path to create a heterodyne with the developed IF frequency.

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 7.

The resultant "beat frequency" can be monitored by either of the following methods:

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 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 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 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 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 7.

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 7.

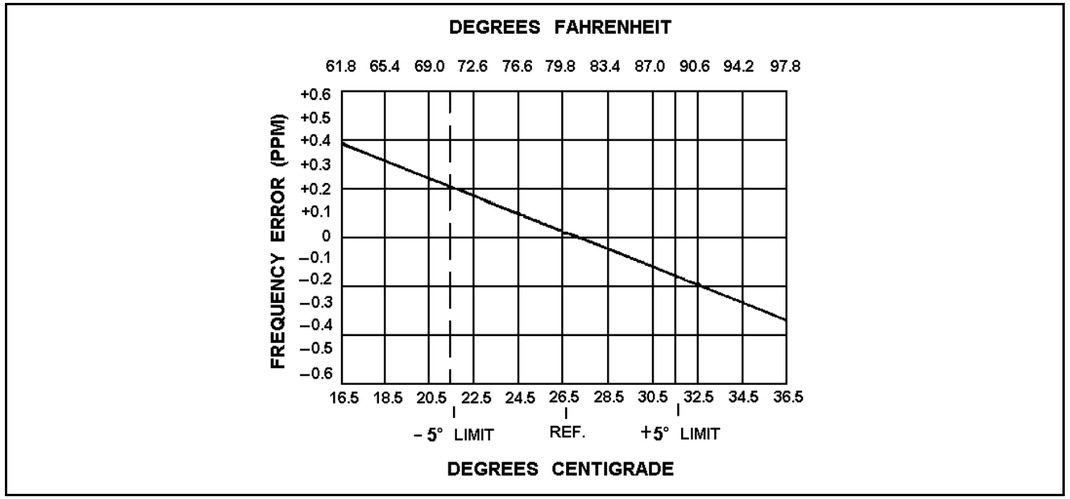


Figure 7 - Frequency Characteristics Vs. Temperature

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 of 50 MHz, adjust the oscillator for a corrected mixer injection frequency 15 Hz (0.3 X 50 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.

COMPLETE RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

1. Test Set Models 4EX3A11, 4EX8K12, or 20,000 ohms-per Volt multimeter with a 1 Volt and 3 Volt scale.
2. A 9.4 MHz signal source for 30-36 and 42-50 MHz receivers, or 11.2 MHz signal source for 25-30 and 36-42 MHz receiver (GE Test Set Model 4EX9A10). Also a 25-50 MHz signal source (Measurements 803) with a one-inch piece of insulated wire no larger than .065 inch diameter connected to the generator probe.
3. DVM
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 0.060 MHz for frequency range of 25-36 MHz, 0.080 MHz for frequency range of 36-42 MHz or 0.180 MHz for frequency range of 42-50 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 0.120 MHz for frequency range of 25-36 MHz, .160 MHz for frequency range of 36-42 MHz, or .360 MHz for frequency range of 42-50 MHz, align the receiver using a center frequency tuneup ICOM. These limits can be extended to .340 MHz, .400 MHz and .640 MHz respectively, with a 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			TUNING CONTROL	METER READING	PROCEDURE
	TEST SET	INTERNAL METERING	MULTIMETER -AT J601-9			
			FM DETECTOR			
1.	A (FM DET)	1 (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)	3 (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)	4 (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 L502 for maximum meter reading and L503 for a dip in meter reading. Do NOT readjust L404, L502 and L503.

ALIGNMENT PROCEDURE (Cont'd.)

STEP	METERING POSITION			TUNING CONTROL	METER READING	PROCEDURE
	TEST SET	INTERNAL METERING	MULTIMETER -AT J601-9			
			RF AMP & SELECTIVITY			
	NOTE: IF AMP meter range is 0-700 mVdc with a high impedance DC voltmeter.					
4.	B (IF AMP)	2 (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)	2 (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)	2 (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 L2, L2, L3, L4, C301, C302 and C502 for maximum meter reading.
7.	B (IF AMP)	2 (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.				L603, R609	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 R609 for 1 Volt RMS measured with a DVM at P904-11 (VOL/SQ HI) 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 STEP 9.					
	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.					
9.		L504, L520, L521, C521, T601, T602 and T603				Connect scope, signal generator, and probe a sshown in Figure 6. Set signal generator level for 3 to 5 µV and modulate with 20 Hz at 12 kHz deviation. With probe between P904-4 (or J601-1) and A-, tune L504, L520, L521, C521, T601, T602 and T603 for double trace as shown on scope pattern. Preset T601-T603 to top of coil form before tuning.
10.					See Procedure	Check to see that modulation acceptance bandwidth is greater than ±6.5 kHz.

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.

TEST EQUIPMENT REQUIRED

- Distortion Analyzer similar to: HP331A, or an equivalent average response meter
- Signal Generator similar to: HP8640B
- 6 dB attenuation pad, and 8.0 ohm, 2 Watt resistor

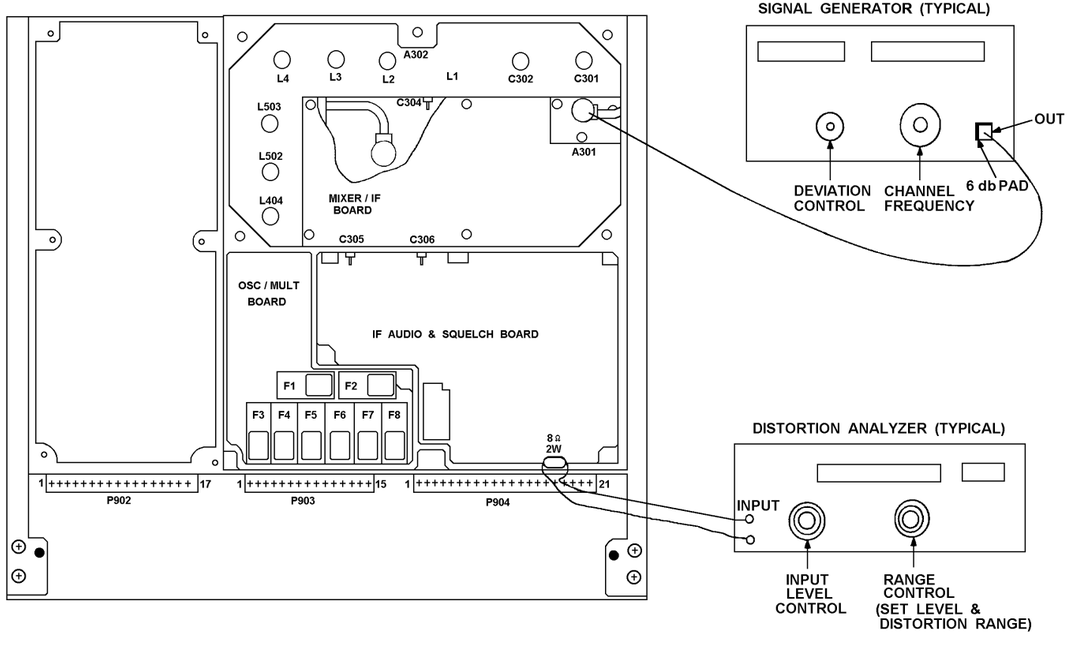
Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

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

Connect an 8.0 ohm, 2 Watt load resistor from P904-19 (SPKR HI) to P904-18 (SPKR LO). Connect the Distortion Analyzer input across the resistor as shown.

C. Adjust the VOLUME control for one Watt output using the Distortion Analyzer as a Voltmeter.

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 1 Watt, make the following checks:

E. Power Supply 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. With Function Switch on Distortion Analyzer set to VOLTMETER position, adjust volume control for 1.0 Watt (2.83) VRMS across 8 ohm load). Again, verify that audio output is nulled when Function Switch is set to DISTORTION position.

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

D. While reducing the signal generator output, switch the FUNCTION control from SET LEVEL to DISTORTION until a 12 dB difference (+2 dB to -10 dB) is obtained between the SET LEVEL and DISTORTION 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 the rated 12 dB SINAD specification with an audio output of 1.0 Watt across the 8.0 ohm load.

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 the rated 12 dB SINAD operation, 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. Adjust output power for 0.1 Watts (894 mVRMS across 8 ohm load). Measure 12 dB SINAD.

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

C. While increasing the deviation of the Signal Generator, switch the Function Switch from SET LEVEL to DISTORTION 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 ±6.5 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 readings measured with Test Set Model 4EX3A11 or Test Kit Model 4EX8K12 in the position shown below:

METERING POSITION		READING WITH NO SIGNAL IN	READING WITH 1 MICROVOLT (UNMODULATED)	TEST POSITION
A	(FM DET)	0.35-0.5		Test 1 (or 1 Volt)
B	(IF AMP)		0.2 Vdc	Test 1 (or 1 Volt)
C	(MULT-1)	0.88 Vdc		Test 3 (or 3 Volt)
D	(MULT-2)	0.5 Vdc		Test 1 (or 1 Volt)
J	(Reg. +10 Volts at System Metering jack)	+10 Vdc		

SYMPTOM CHECKS

SYMPTOM	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 DVM 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 antenna connections, cable and antenna switch. • Check Front End Alignment. (Refer to Receiver Alignment Procedure). • Check Oscillator injection voltage. • Check voltage readings of Mixer and IF Amp. • Make SIMPLIFIED GAIN CHECKS (STEP 2).

SYMPTOM CHECKS Con't.

SYMPTOM	PROCEDURE
IMPROPER SQUELCH OPERATION	• Check voltages on Schematic Diagram. • Check voltages as shown in the table below. • Make gain and waveform checks with 6 kHz signal as shown in Step 4. • Check discrete components in the squelch circuit.
LOW OR DISTORTED AUDIO	• Check voltages on Schematic Diagram. • Make gain and waveform checks. • Check receiver alignment and FM DET output. • Check Q601 thru Q603, U604, U607 and other discrete components.

SQUELCH CHECKS

		SQUELCHED	UNSQUELCHED
NOISE SQ OUTPUT	U605-2	0.2 Vdc	9.9V
CAS	U605-1	0.1 Vdc	9.9V
$\overline{\text{RX MUTE}}$	U605-14	0.2 Vdc	9.9V
RUS	U605-13	0.2 Vdc	4.9V
SQ DISABLE SW. INPUT	U606-1	0.2 Vdc	9.9V
AUDIO GATE SW. CONTROL	U606-11	0.2 Vdc	9.9V

If External Decoder is used (CG, DCG, Type 99, etc.), $\overline{\text{RX Mute}}$ will remain low (regardless of noise squelch output), until proper response is decoded. $\overline{\text{RX Mute}}$ = Noise Sq Output Decoder Output.

In above cases, $\overline{\text{Sq Disable}}$ is assumed high (9.9V). If $\overline{\text{Sq Disable}}$ is grounded, U606-10 = 0.2 Vdc, U606-11 = 9.9 Vdc and Unit is unsquelched for all conditions.

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STEP 3 - 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.

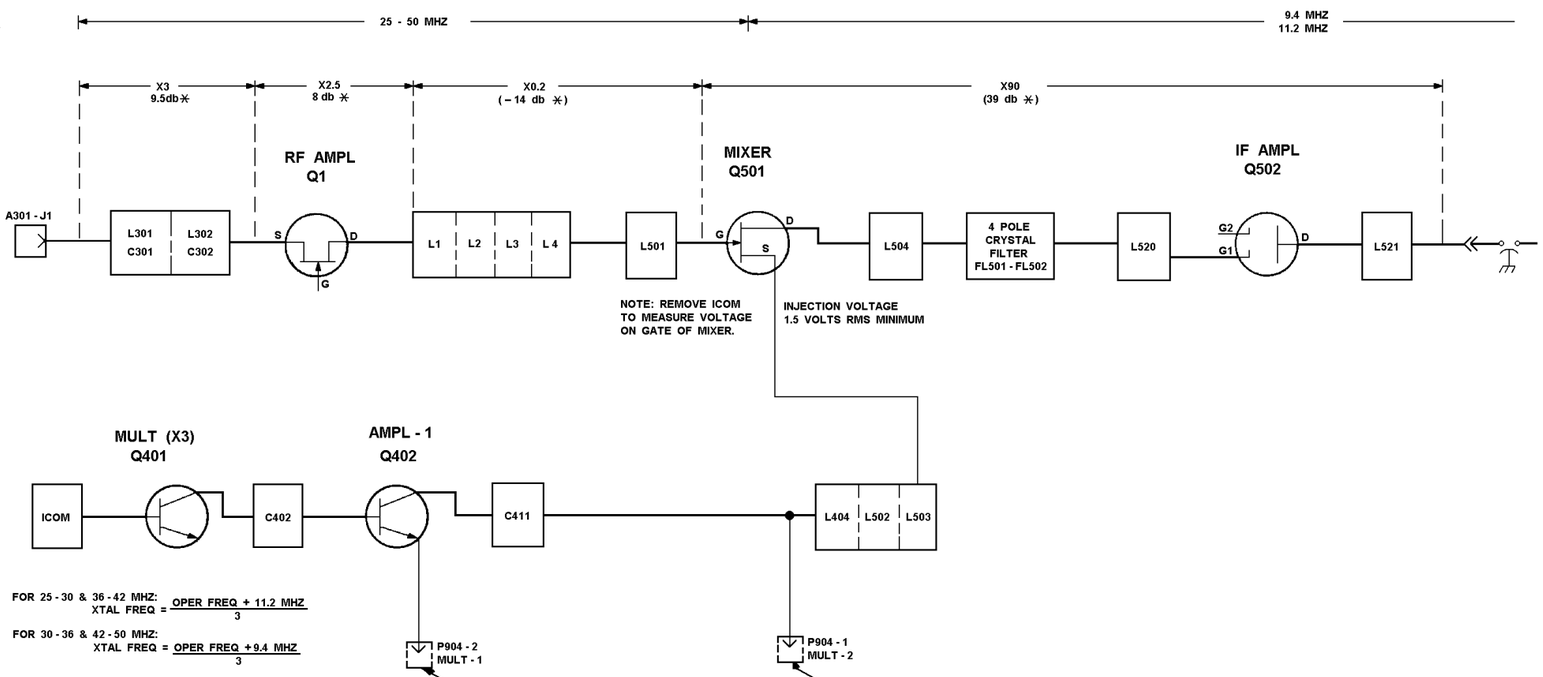
PROCEDURE:

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 READINGS (E_2).
3. CONVERT READINGS BY MEANS OF THE FOLLOWING FORMULA.

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

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

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

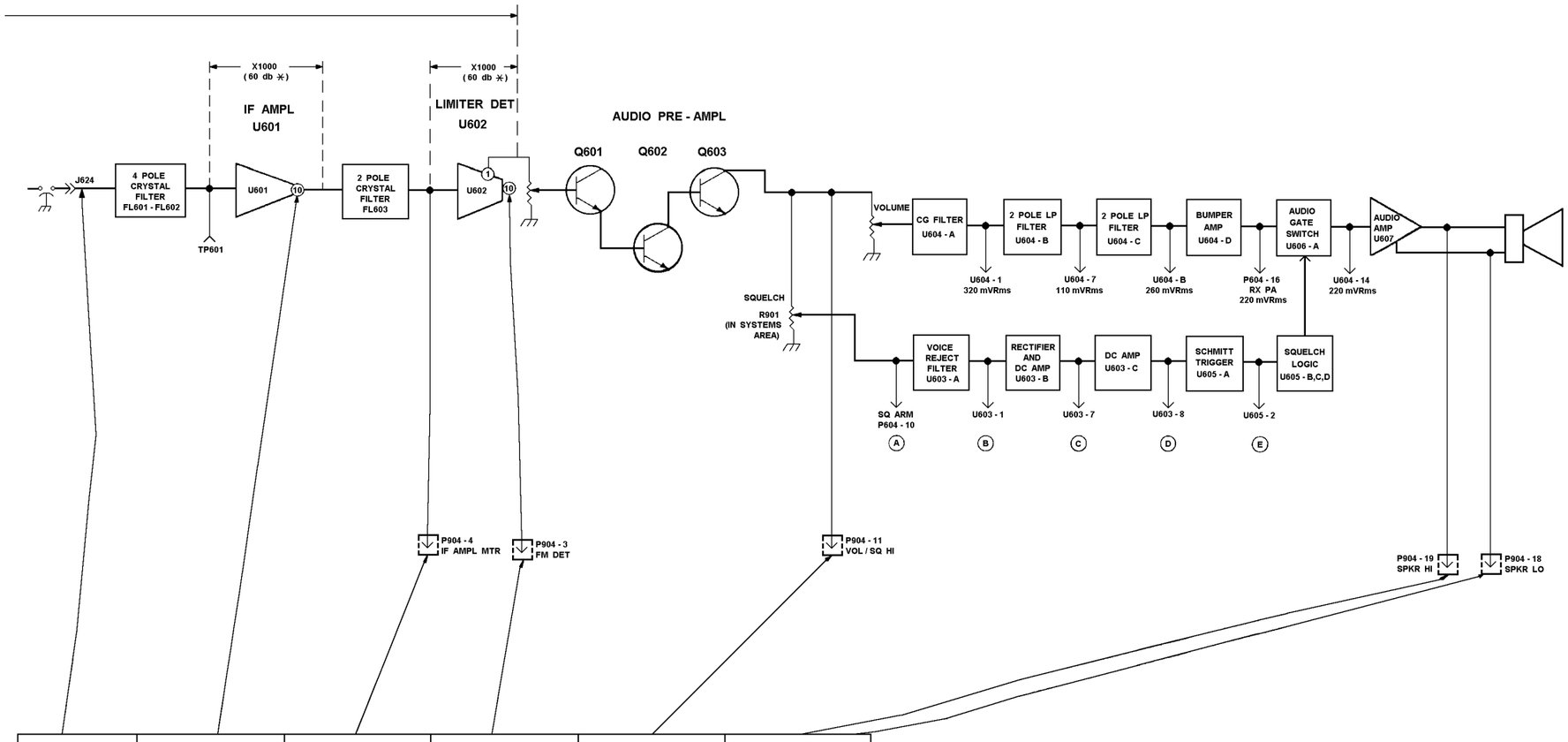


STEP 2 - SIMPLIFIED GAIN CHECKS →

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

PRELIMINARY STEPS:
1. SET VOLUME CONTROL FOR 2.83 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.

SIGNAL APPLIED TO A301 - J1	NONE	NONE	
PROCEDURE			
READING	VOLTMETER READING SHOULD BE APPROX 1.7 VDC	VOLTMETER READING SHOULD BE APPROX 0.9 VDC	

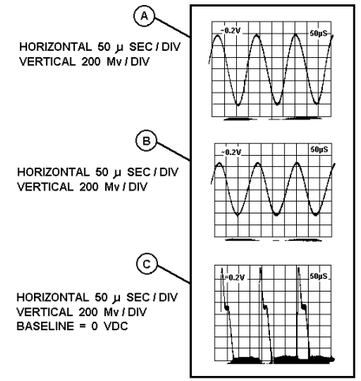


UNMODULATED	UNMODULATED	UNMODULATED	NONE	MODULATED	MODULATED
SET GENERATOR OUTPUT TO RECEIVE FREQUENCY AT 1000 MICROVOLTS	RESET GENERATOR OUTPUT TO ZERO, THEN INCREASE UNTIL U601 SATURATES AS MEASURES WITH RF VOLT-METER	INCREASE GENERATOR OUTPUT TO 40 MICROVOLTS	SHOULD BE IN SATURATION AT ALL TIMES	SET SIGNAL GENERATOR OUTPUT FOR 1000 MICRO - VOLTS WITH 1 KHZ MODULATION AND 3 KHZ DEVIATION	WITH SPEAKER DISCONNECT - ED, CONNECT VOLTMETER OR SCOPE ACROSS 8 OHM LOAD CONNECTED BETWEEN P904 - 18 AND P904 - 19
RF VOLTMETER READING SHOULD BE APPROX 200 MILLIVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 40 MICROVOLTS	VOLTMETER READING SHOULD BE APPROX 0.54 VDC	RF VOLTMETER READING SHOULD BE APPROX 0.6 V RMS	VOLTMETER READING SHOULD BE APPROX 1.0 V RMS	VOLTMETER READING SHOULD BE APPROX. 2.83 V RMS

STEP 4 - SQUELCH WAVEFORMS

PRELIMINARY STEPS

1. QUIET RECEIVER WITH 1000 µV MODULATED SIGNAL
2. SET MODULATION FREQUENCY TO 6 KHz
3. SET DEVIATION TO 3 KHz
4. ADJUST SQUELCH POT (P901 IN SYSTEMS AREA) FOR 120 mVpp AT SQ ARM (P904 - 10)
5. USE 10 M ohm PROBE



25-50 MHz MASTR II