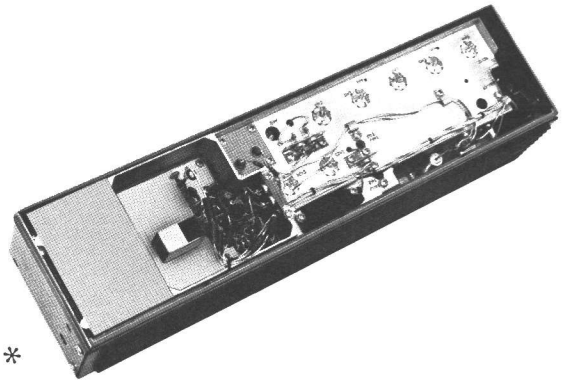
MOBILE RADIO

MASTR Progress Line

450–470 MHz, RECEIVER MODELS 4ER42H11 & 4ER42H17 (FOR USE IN 960-MHz STATION APPLICATIONS)

Maintenance Manual LBI-4085B

DF-108



ER-42-H

SPECIFICATIONS *

FCC Filing Designation	**ER-42-H**
Frequency Range	450—470 MHz
Audio Output	5 watts at less than 5% distortion
Sensitivity	
12-dB SINAD (EIA Method)	0.35 μV
20-dB Quieting Method	0.50 μV
Intermodulation (EIA)	-75 dB
Selectivity	
EIA Two-Signal Method	-85 dB (adjacent channel, 50 kHz channels)
20-dB Quieting Method	-100 dB at ±35 kHz
Spurious Response	-100 dB
First Oscillator Stability	±.0002% (-30°C to +60°C)
Modulation Acceptance	±19 kHz
Squelch Sensitivity	
Critical Squelch	0.2 μV
Maximum Squelch	Greater than 20 dB quieting (less than 1.5 μV)
Frequency Response	+1 and -8 dB of a standard 6-dB per octave de-emphasis curve from 300 to 3000 Hz (1000-Hz reference)

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

GENERAL ELECTRIC

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ILLUSTRATIONS

WARNING

No one should be permitted to handle any portion of the equipment that is supplied with high voltage; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

DESCRIPTION

General Electric MASTR Progress Line Receivers Models 4ER42H11 & 17 are superhetrodyne FM receivers which are tuneable between 450 and 470 megahertz. They are used in conjunction with a 960 to 450 Megahertz Converter Panel to receive signals in the 952-960 megahertz range. An Integrated Circuit Oscillator Module (ICOM) provides a frequency stability of ±0.0002%

The receivers are of single-unit construction and are completely housed in an aluminum casting for maximum shielding and rigidity. The top part of the casting contains the front end through the lst low IF amplifier stages. The bottom portion of the casting contains the audio squelch board and, in Model 4ER42H17 receivers the Channel Guard encoder-decoder board.

CIRCUIT ANALYSIS

The MASTR Progress Line Receiver is completely transistorized, using silicon transistors throughout for added reliability. Input leads to the receiver are individually filtered by the 20-pin feed-through by-pass connector J443. A regulated +10 volts is used for all receiver stages except the audio PA stage which operates from the 12-volt system supply.

Centralized metering jack J442 is provided for use with General Electric Test Set Models 4EX3A10 or 4EX8K11, for ease of

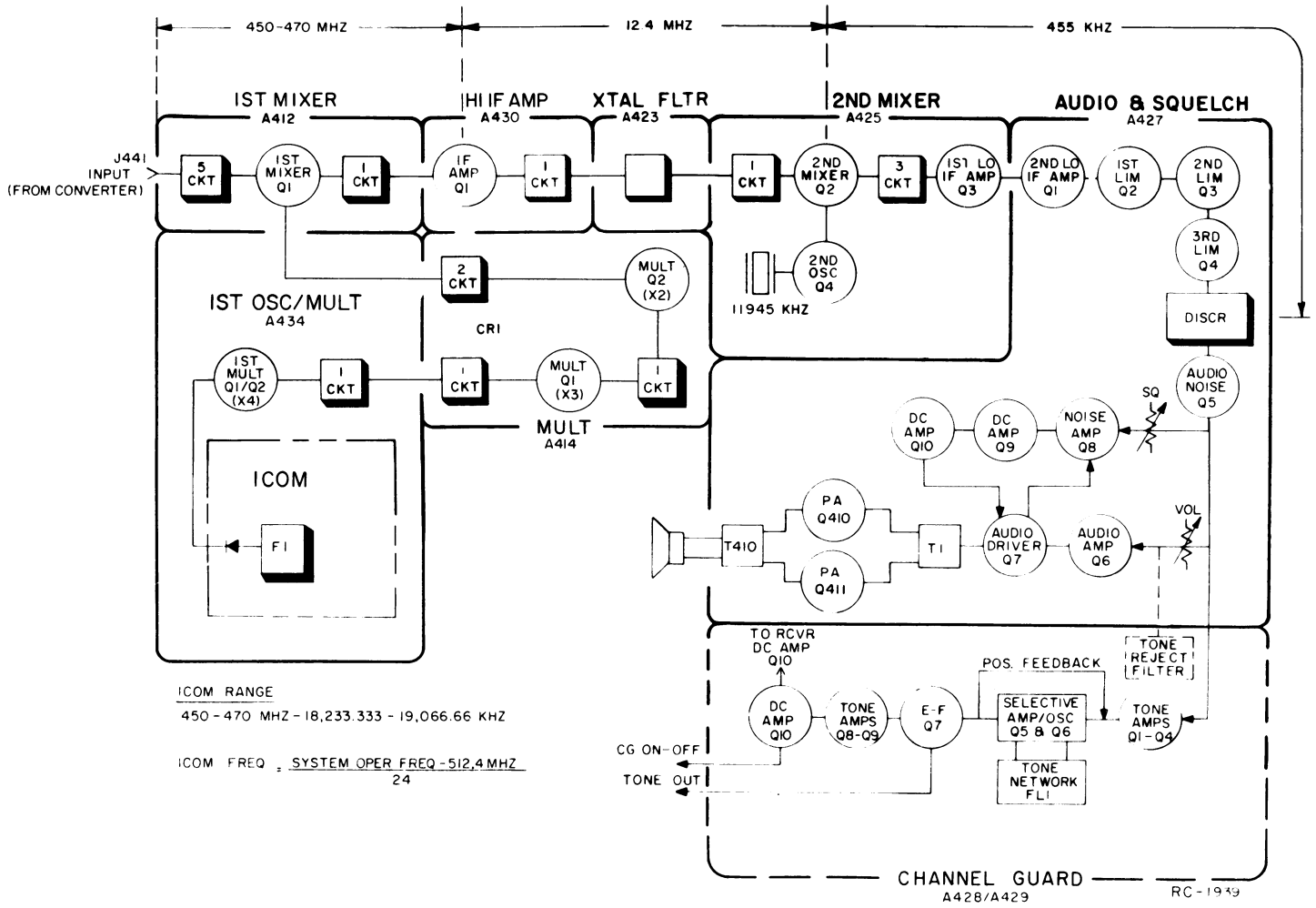


Figure 1 - Receiver Block Diagram

alignment and servicing. The Test Set meters the oscillator, multiplier, and limiter stages as well as the discriminator, and regulated 10 volts.

HELICAL RESONATORS

Five tuned helical resonators L419-L423 provide RF selectivity in the receiver front end. The 450 MHz signal from the converter panel is connected through J441 and W441 to a tap on L419. The tap is positioned to provide the proper impedance match to the converter panel. The output of L423 is coupled through capacitor C1 to the 1st mixer assembly.

1ST OSCILLATOR AND MULTIPLIER

The Oscillator/Multiplier uses ICOM Module Model 4EG26A15. The ICOM module consists of a crystal-controlled Colpitts oscillator, a voltage regulator, and a buffer output stage. The entire module (including crystal) is enclosed in a dust-proof aluminum can, with the ICOM frequency and the receiver operating frequency printed on the top. Access to the oscillator trimmer is obtained by prying off the plastic GE decal on the top of the can.

The oscillator frequency is temperature-compensated at both ends of the temperature range to provide instant frequency compensation, with a frequency stability of ±0.0002% without crystal ovens or warmers.

A jumper between H1 and H2 connects the ICOM to +10 volts. With the ICOM operating, diode CR1 is forward biased and the oscillator output is applied to the 1st multiplier Q1.

The 1st multiplier output is coupled through T2 to multiplier board A414. T2 is tuned to four times the ICOM frequency. The 1st multiplier stage is metered at J442-4 through metering network C4, CR5, R5 and R6.

CAUTION

All ICOM modules are individually compensated at the factory, and cannot be repaired in the field. Any attempt to remove the ICOM cover will void the warranty.

MULTIPLIER BOARD (A414)

Following the oscillator board are two multiplier stages. A414-Q1 operates as a tripler, and Q2 operates as a doubler. Q2 is metered at J442-1 across metering resistor R6.

The output of Q2 is coupled through two helical resonator circuits to the source terminal of the 1st mixer. The helical resonators are tuned to six times the 1st multiplier output for a total multiplication of 24 times the crystal frequency.

1ST MIXER (A412)

The 1st mixer uses a Field-Effect Transistor (FET) as the active device. The FET may be considered a semiconductor current path (or channel) whose resistance is varied by a voltage applied to the control element (gate). Lead identification for the FET is shown in Figure 2A.

The FET has several advantages over a conventional transistor, including a high input impedance, high power gain, and an output that is relatively free of harmonics (low in intermodulation products). The FET also has voltage-controlled characteristics, and may be compared to a vacuum tube in operation (see Figure 2B).

RF from the helical resonators is applied to the gate of Q1, and injection voltage from the multiplier is applied to the source. The mixer output is taken from the drain with the output tuned to the 12.4 MHz high IF frequency.

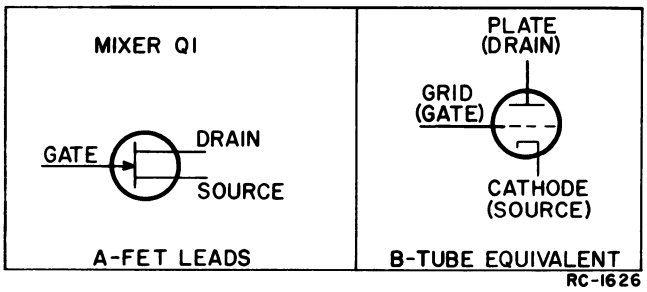


Figure 2 - FET Nomenclature

HI IF AMPLIFIER (A430) AND CRYSTAL FILTER (A423)

A series-resonant circuit (A430-L2 and -C3) couples the mixer output to the emitter of the high IF amplifier A430. The transistor is connected as a grounded-base amplifier which provides a low impedance for the mixer input. The amplifier output is coupled through transformer T1 to the crystal filter.

Highly-selective crystal filter A423 provides the major selectivity for the receiver. The output of the filter is coupled through impedance-matching transformer A425-T2 to the base of the 2nd mixer.

2ND OSCILLATOR, 2ND MIXER AND 1ST LO IF AMPLIFIER (A425)

A425-Q4 operates in a Colpitts oscillator circuit, with feedback supplied through

C18. The oscillator low-side injection voltage (11,945 kHz) is applied to the base of the 2nd mixer.

The High IF signal from the filter and the injection voltage from the 2nd oscillator is applied to the base of 2nd mixer Q2. The 445-kHz mixer output is applied to three tuned low IF circuits, L1, L2 and L3. These tuned circuits are required for shaping the nose of the IF waveform, and for rejecting any undesired output frequencies from the 2nd mixer.

The low IF signal is applied to the base of 1st low IF amplifier Q3. The output of Q3 is R-C coupled to the base of the 2nd low IF amplifier.

2ND LO IF AMPLIFIER AND LIMITERS (A427)

Additional amplification of the low IF signal going to the limiter stages is provided by 2nd low IF amplifier A427-Q1. This stage is metered at J442-2 through a metering network consisting of C19, CR3 and R25.

Following the 2nd low IF amplifier are three R-C coupled limiter stages (A427-Q2, -Q3 and -Q4). The 1st limiter is metered at J442-3 through metering metwork C20, CR4 and R26.

DISCRIMINATOR (A427)

The limiter output is applied to a Foster-Seely type discriminator, where diodes CR1 and CR2 rectify the 455-kHz signal to recover the audio. The discriminator is metered at J442-10 through metering network C44 and R23.

AUDIO - NOISE AMPLIFIER (A427)

The discriminator output is coupled through a low-pass filter (C44, C45, R68 and R69) to the base of audio-noise amplifier Q5. The filter removes any 455-kHz signal remaining in the discriminator output. Q5 operates as a emitter-follower to match the discriminator impedance to the VOLUME and SQUELCH control. The stage also provides power gain.

AUDIO AMPLIFIERS (A427)

Any audio present in the incoming signal is coupled from the emitter of Q5 through the VOLUME control and a de-emphasis network to the base of audio amplifier Q6. The de-emphasis network consists of C22, C23, R30 and R31.

Audio driver Q7 follows the audio amplifier. The output of Q7 is coupled through transformer T1 to provide phase inversion for the push-pull audio PA stage.

Q410 and Q411 operate as a push-pull Class AB audio PA stage. The PA output is coupled through audio transformer T410 to the loudspeaker. The yellow and white tertiary windings of T410 supply balanced feedback to the collector of Q7. The feedback winding minimizes distortion and prevents the pick-up of external electrical noise.

Base bias for the PA stage and the elimination of crossover distortion is controlled by bias adjust potentiometer R43. The potentiometer is set at the factory as shown in STEP 1 of the receiver Test Procedure.

NOTE

Do not adjust bias adjust potentiometer R43 unless PA transistors Q410 and Q411 have been replaced.

Audio high and low are also present at centralized metering jack J442, and can be used as shown in STEP 1 of the receiver Test Procedure. The output stage provides 5 watts at less than 5% distortion into a 3.5-ohm load at the receiver output terminals (3.2-ohm load at the Control Unit).

SQUELCH (A426)

Noise from the audio-noise amplifier operates the squelch circuit. With no carrier present in the receiver, this noise is coupled to the base of noise amplifier Q8 through a high-pass filter which attenuates frequencies below 3 kHz. The filter consists of C47, C48 and R71, as well as C46 and L3 in the collector circuit of Q8. The gain of Q8 is determined by the Squelch control, which varies the bias on the base of Q8. Thermistor RT2 keeps the critical squelch constant over wide variations in temperature.

The output of noise amplifier Q8 is rectified by diodes CR5 and CR6, and filtered by C36 and C37 to produce a negative DC voltage. This DC voltage is applied to the base of DC amplifier Q9, turning it off. When turned off, the collector voltage of Q9 rises to approximately 8 volts, turning on DC amplifier Q10. When conducting, the collector voltage of Q10 drops to almost ground potential, which removes the base bias to audio amplifier Q6 and audio driver Q7, turning them off.

When the receiver is quieted by a signal (unsquelched), the noise in the receiver is reduced, turning DC amplifier Q9 on and DC amplifier Q10 off. This allows the audio stages to conduct so that sound is heard in the speaker. A network composed of C38, CR7 and R62 slows down the

switching action of Q10, preventing an obnoxious "thump" from being heard in the speaker.

Resistor R73 connects from the emitter of audio driver Q7 to the emitter of noise amplifier Q8, providing a hysteresis loop in the squelch circuit. When a weak signal opens the squelch, the signal level may be reduced by 4 to 6 dB without the squelch closing. This limits squelch "flutter" or "picket-fence" operation.

With audio driver Q7 conducting, a positive voltage through R73 helps to reduce the gain of noise amplifier Q8. This positive feedback provides a quick, positive switching action in the squelch circuit. When the receiver squelches, audio driver Q7 turns off and its emitter potential drops to zero. This reduces the DC feedback through R73 to the emitter of noise amplifier Q8. Reducing the feedback causes Q8 to conduct harder, turning the audio stages off quickly.

Keying the transmitter removes the +10 volts from J19, turning off DC amplifier Q9 and turning on Q10 to mute the receiver.

CHANNEL GUARD (A428/A429)

Channel Guard Board Model 4EK16A10 is a fully transistorized encoder-decoder for use in the MASTR Professional Series mobile and station combinations. The tone frequencies are controlled by plug-in tone networks that are made with precision components for excellent stability and reliability. The tone frequencies range from 71.9 to 203.5 Hz.

Encoder (A428)

Keying the transmitter removes the receiver mute +10 volts, and forward biases feedback control diode CR5, causing it to conduct. When conducting, the diode shunts R39 which reduces the impedance of the positive feedback loop (R39, R35 and C19). This provides the necessary gain to the base of Q5 to permit oscillation.

The encoder tone is provided by selective amp-oscillator transistors Q5 and Q6 which oscillate at a frequency determined by the tone network. Negative feedback applied through the tone network to the base of Q5 prevents any gain in the stage except at the desired encode frequency.

Starting network R45, C21, C22 and CR6 provide an extremely fast starting time for the encoder tone. Keying the transmitter removes the receiver mute +10 volts, causing a pulse to be applied to the base of Q6 to quickly start the oscillator. Thermistor-resistor combination R32 and RT1 provides temperature compensation for the oscillator output. Limiter diodes CR3 and CR4 keep the tone amplitude constant.

Emitter-follower Q7 follows the oscillator circuit. The encoder tone is taken from the emitter of Q7 and applied to an active low-pass filter (G101) on the transmitter.

Decoder (A428)

The decoder function is designed to eliminate all calls that are not tone coded for the Channel Guard frequency. As long as the CHANNEL GUARD-OFF switch on the control unit is left in the CHANNEL GUARD position, all signals are locked out except those from transmitters that are continuously tone coded for positive identification by the receiver.

Placing the CHANNEL GUARD-OFF switch in the OFF position instantly disables the Channel Guard operation so that all calls on the channel can be heard. When the hookswitch option is used, lifting the microphone from its hanger disables the Channel Guard Circuit.

Audio, tone and noise are taken from the emitter of the receiver audio-noise amplifier A426-Q5 and is fed through A428-J1 to four tone amplifier and bandpass filter circuits. The filters remove the audio and high-frequency noise from the signal, and the tone amplifiers provide sufficient gain to insure clipping by limiter diodes CR1 and CR2. The clipping action eliminates variation in the squelch performance due to changes in tone deviation. The signal is then applied to selective amplifiers Q5 and Q6 which amplify only the tone determined by the tone network.

The output of the selective amplifier is applied through emitter-follower Q7 to the high gain, broad-band tone amplifiers Q8 and Q9. The output of Q9 is rectified by detector diodes CR7 and CR8, and the resulting negative DC voltage controls the squelch gate. Q8 is normally biased for low gain. When the tone is detected by CR7 and CR8, feedback is provided through R54 to quickly change the bias on Q8 for full gain. This ensures a more positive "unsquelching" action.

Squelch gate diode CR9 is normally forward biased by a positive DC voltage (approximately 1.5 volts) fed through R58. The forward bias causes CR9 to conduct, feeding a DC voltage to the base of DC amplifier A426-Q10 in the receiver. This removes the bias on the receiver audio stages and holds them off.

When the proper tone is applied to the decoder, the negative DC voltage from the detector diodes back-biases squelch gate diode CR9 and cuts off the positive bias to the receiver DC amplifier A426-Q10. However, the receiver noise squelch circuit continues to operate until a carrier quiets the receiver.

Placing the CHANNEL GUARD - OFF switch in the OFF position (or removing the microphone from its hookswitch) removes the ground to the base of the decoder DC switch (Q10), causing it to conduct. This back-biases squelch control diode CR9 and cuts off the positive bias to the receiver DC amplifier (A426-Q10). The receiver noise squelch circuit continues to operate until a carrier quiets the receiver.

A tone rejection filter connected in parallel with A426-J2 (in the receiver) bypasses any incoming tone to ground. This attenuates the tone level reaching the receiver audio circuits. The filter is composed of C26, C27, C28, C29, L1 and R59.

An optional tone reject filter (A429) that is identical to the filter described above is available for use in two-way radios with transmitter Channel Guard only.

MAINTENANCE

Test Procedures and Troubleshooting Procedures are included in this manual to help the serviceman quickly isolate and correct any problem that may arise (refer to the Table of Contents).

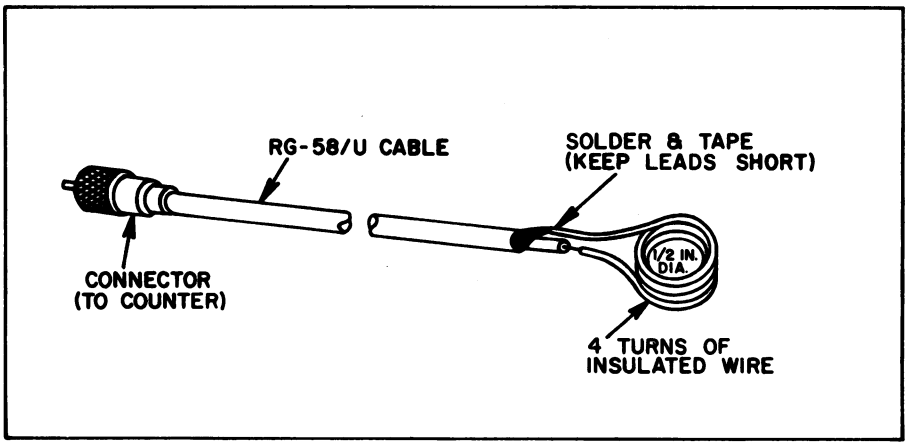


Figure 3 - Coaxial Cable and Test Loop

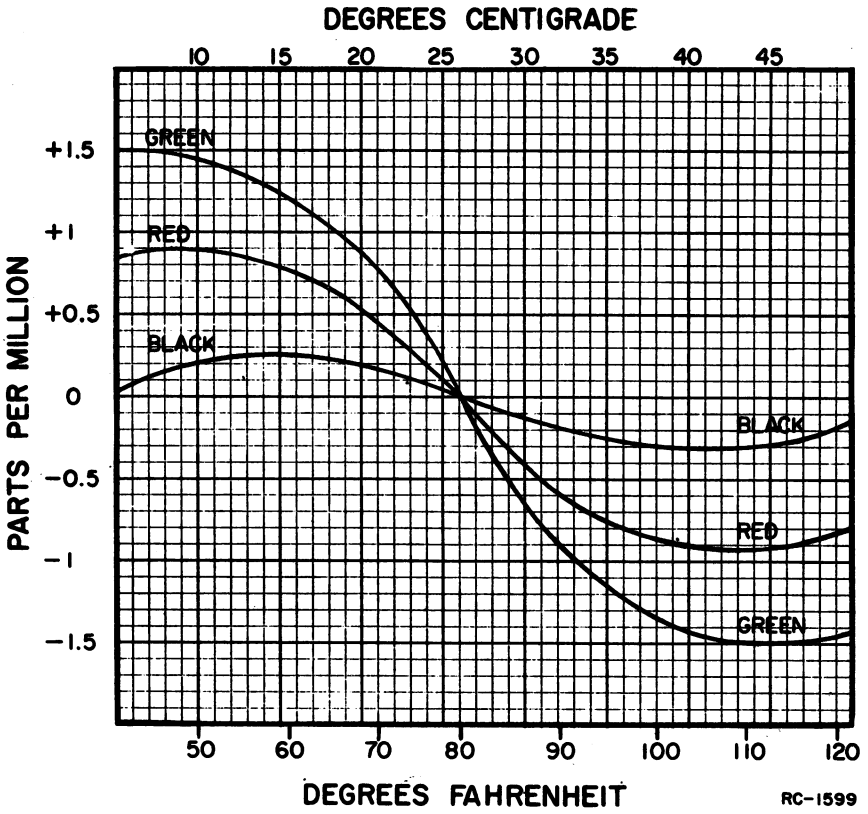


Figure 4 - ICOM Correction Curves

ALIGNMENT PROCEDURE

450—470 MHz MASTR RECEIVER
MODELS 4ER42H11 & 17

ICOM ADJUSTMENT

Due to the high stability of the ICOM module, it is not recommended that zero discriminator be used as the indication for setting the oscillator frequency. Instead, measure the ICOM frequency as described in the following procedure.

EQUIPMENT REQUIRED:

1. Frequency Counter capable of measuring the 70-80 MHz frequency range. (The counter should have an accuracy of 0.4 part-per-million.)
2. Coaxial cable with test loop as described in Figure 3.
3. Mercury thermometer.

PROCEDURE:

1. Check the ICOM temperature by taping the mercury thermometer to the side of the ICOM.
2. Connect the frequency counter to L5 (on the 1st Osc/Mult) using the 4-turn test loop and cable shown in Figure 3.
3. If the ICOM temperature is 80°F (±4°F) or 26.5°C (±2°C), the frequency indication on the counter should be 4 times the frequency stenciled on the ICOM case. Adjust the ICOM trimmer (if necessary) to obtain this frequency.
4. If the temperature is not within the 80°F (±4°F) or 26.5°C (±2°C) range, use the correction curves of Figure 4 for setting the ICOM frequency as follows:
   a. Check the color dot beneath the GE emblem and select the matching curve to determine the correction factor in parts-per-million (PPM).
   b. Multiply the frequency stenciled on the ICOM by 4 and then multiply this figure by the correction factor (from Figure 4) observing the sign (±) given to the correction factor.
   c. The frequency measured at L5 should be 4 times the ICOM frequency ± the correction factor. Adjust the ICOM trimmer (if required) to obtain this frequency.

FOR EXAMPLE

ICOM Frequency	-	18.233333 MHz
ICOM Color Dot	-	Green
Ambient Temperature	-	35°C (95°F)
Correction Factor (From Figure 4)	-	-1.15 PPM

Multiply ICOM Frequency by 4:
(18.233333 MHz x 4 = 72.933332 MHz)

Multiply preceding figure by correction factor:
(72.933 MHz x -1.15 PPM = 83.87 hertz (or -84 hertz)

Set the frequency measured at L5 for 72.933248 MHz;

72.933332 MHz
- .000084 MHz
79.933248 MHz

(DF-1086)

COMPLETE RECEIVER ALIGNMENT

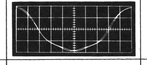
EQUIPMENT REQUIRED

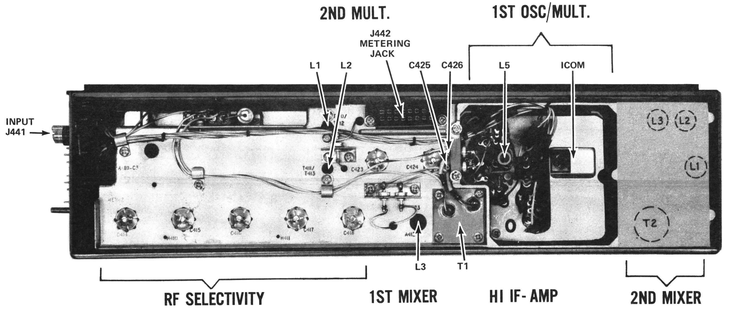
1. GE Test Set Models 4EX3A10, 4EX8K11, station test meter panel, or 20,000 ohms-per-volt multimeter.
2. A 450 to 460 kHz source (GE Test Set Model 4EX7A10), and 450-470 MHz signal source. Connect a one-inch piece of insulated wire no larger than .065 inch to generator output probe.

PRELIMINARY CHECKS AND ADJUSTMENTS

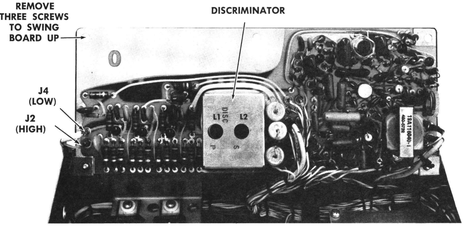
1. Connect Test Set to receiver centralized metering jack J442, and set meter sensitivity switch to the TEST 1 or 1-volt position.
2. With Test Set in position J, check for regulated +10 volts. If using Multimeter, measure from C425 to C426.
3. If using Multimeter, connect the positive lead to J442-16 (ground).

ALIGNMENT PROCEDURE

STEP	METER POSITION: GE Test Set or Meter Panel	METER POSITION: Multimeter - at J442	TUNING CONTROL	METER READING	PROCEDURE
			DISCRIMINATOR		
1.	A (DISC)	Pin 10	L1 and L2 (on IF-AUDIO SQUELCH board)	Zero	Remove three screws and swing open the IF-AUDIO & SQUELCH board. Adjust L1 (disc primary) 1/2 turn counterclockwise from the bottom of coil. Next, apply a 455-kHz signal to J2 and J4 and adjust L2 (disc secondary) for zero meter reading.
2.	A (DISC)	Pin 10		See Procedure	Alternately apply a 450-kHz and 460-kHz signal and check for readings of at least 0.3 volt, but not more than 0.5 volt on GE Test Set. Both readings must be within .05 volt. Do not attempt to balance reading any closer than 0.05 volt.
			OSCILLATOR AND MULTIPLIERS		
3.	D (MULT-1)	Pin 4	L5 (1st OSC/MULT) and L1 (2nd MULT)	See Procedure	Tune L5 for maximum meter reading. Then tune L1 for minimum meter reading.
4.	G (MULT-1)	Pin 4	L5 (1st OSC/MULT) and L1 and L2 (2nd MULT)	Maximum	Tune L5, L1 and L2 for maximum meter reading. If two peaks occur while tuning L1 and L2, use the peak with the slug nearest the top of the coil.
5.	G (MULT-2)	Pin 4	C423	See Procedure	Adjust C423 for a small dip in meter reading.
6.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal into Hole 411. Adjust the signal generator for discriminator zero.
7.	B (2nd IF AMP)	Pin 2	C423 and C424	Maximum	Apply an on-frequency signal as above. Tune C423 and C424 for maximum meter reading, keeping signal below saturation.
			RF SELECTIVITY		
8.	B (2nd IF AMP)	Pin 2	L3 (1st Mixer)	Maximum	Apply an on-frequency signal in Hole 411 and tune L3 for maximum meter reading. If two peaks occur, use the peak with the slug nearest the bottom of the coil.
9.	B (2nd IF AMP)	Pin 2	C415 thru C418	Maximum	Apply an on-frequency signal in Hole shown below, keeping the signal below saturation. Tune C415 thru C418 for maximum meter reading as shown below: Insert Generator Probe In: / Peak 1. Hole 411 / C417 thru C418 2. Hole 410 / C415,C416 thru C417
10.	B (2nd IF AMP)	Pin 2	C414 thru C418 & L3 (on 1st Mixer)	See Procedure	Apply an on-frequency signal to the receiver input jack (J441). Tune C414 for maximum meter reading, and tune C415 thru C418 and L3 for maximum quieting.
			2ND MIXER & HI IF		
The 2nd mixer, and high 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 11, 12 and 13.					
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.					
11.	B (2nd IF AMP)	Pin 2	L3, L2, L1, T2 (2nd Mixer) and T1 (Hi IF AMP)	Maximum	Apply an on-frequency, unmodulated signal and tune L3, L2, L1, T2 (2nd mixer) and T1 (Hi IF AMP) for maximum meter reading, keeping signal below saturation.
12.			L3, L2, L1, T2 (2nd Mixer) and T1 (Hi IF AMP) 		Connect scope, signal generator, and detector as shown in Figure 5. Set signal generator level for 30-50 µv and modulate with 20 kHz at 20 Hz. With detector at the collector of Q3 (2nd mixer board output), tune for double trace as shown on scope pattern. NOTE: When using an M-560 signal generator, sufficient deviation may be obtained by setting the band switch on a lower scale.
13.	A (DISC)	Pin 10		See Procedure	Check to see that discriminator idling voltage is within 0.1 volt of zero with no signal applied. Check to see that modulation acceptance bandwidth is between 19 and 23 kHz.
			FREQUENCY ADJUSTMENT		
14.	Refer to the adjustment procedure for the ICOM.				



IF-AUDIO & SQUELCH



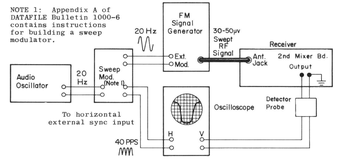


Figure 5 - Test Setup for 20-Hz Double-Trace Sweep Alignment

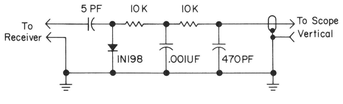


Figure 6 - Detector Probe for Sweep Alignment

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A10, 4EX8K11 station test meter panel or 20,000 ohms-per-volt multimeter.
2. A 450-470 MHz signal source. Connect a one-inch piece of insulated wire no larger than 0.065 inch to generator output probe.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect Test Set to receiver centralized metering jack J442 and set meter sensitivity switch to the TEST 1 (or 1-volt position on 4EX8K11).
2. With Test Set in position J, check for regulated +10 volts. If using Multimeter, measure from C425 to C426.
3. If using Multimeter, connect the positive lead to J442-16 (ground).

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE Test Set or Meter Panel	METERING POSITION: Multimeter - at J442	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR AND MULTIPLIERS		
1.	D (MULT-1)	Pin 4	L5 (1st OSC/MULT) and L1 (2nd MULT)	See Procedure	Tune L5 for maximum meter reading. Then tune L1 for minimum meter reading.
2.	G (MULT-2)	Pin 4	L5 (1st OSC/MULT) and L1 and L2 (2nd MULT)	Maximum	Tune L5, L1 and L2 for maximum meter reading. If two peaks occur while tuning L1 and L2, use the peak with the slug nearest the top of the coil.
3.	G (MULT-2)	Pin 4	C423	See Procedure	Adjust C423 for a small dip in meter reading.
4.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal into Hole 411. Adjust the signal generator for discriminator zero.
5.	B (2nd IF AMP)	Pin 2	C423 and C424	Maximum	Apply an on-frequency signal as above. Tune C423 and C424 for maximum meter reading, keeping signal below saturation.
			RF SELECTIVITY		
6.	B (2nd IF AMP)	Pin 2	L3, C415-C418	Maximum	Apply an on-frequency signal in Hole 411 and tune L3 and C415 thru C418 for maximum meter reading, keeping the signal below saturation. If two peaks occur when tuning L3, use the peak with the slug nearest the bottom of the coil.
7.	B (2nd IF AMP)	Pin 2	C414 thru C418, & L3 (on 1st Mixer)	See Procedure	Apply an on-frequency signal to the receiver input jack. Tune C414 for maximum meter reading, and then tune C415 thru C418 and L3 for maximum quieting.
			FREQUENCY ADJUSTMENT		
8.	Refer to the adjustment procedure for the ICOM.				

ALIGNMENT PROCEDURE

450—470 MHz MASTR RECEIVER
MODELS 4ER42H11 & 17

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.

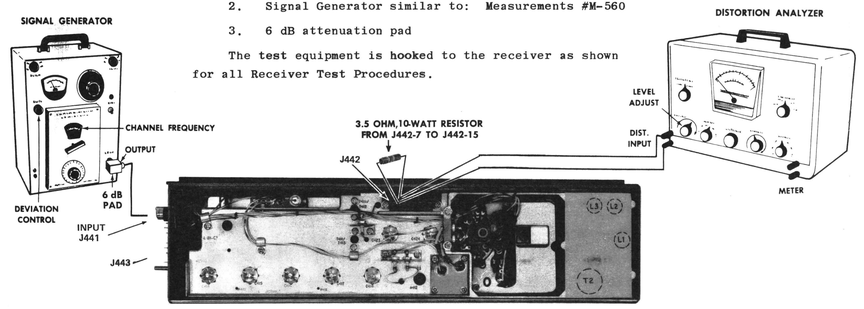
Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

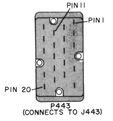
for test hookup shown:

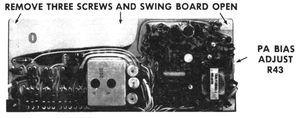
1. Distortion Analyzer similar to: Heath #IM-12
2. Signal Generator similar to: Measurements #M-560
3. 6 dB attenuation pad

The test equipment is hooked to the receiver as shown for all Receiver Test Procedures.

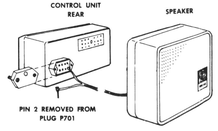


COMPONENT TOP VIEW





IF-AUDIO & SQUELCH BOARD (COMPONENT VIEW)



STEP 1

AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

A. Connect a 1,000-microvolt test signal modulated by 1,000 hertz ±10 kHz deviation to the input jack J441.

B. With Five-Watt Speaker:

Disconnect speaker lead pin from J701-2 (on rear of Control Unit).

Connect a 3.5-ohm load resistor from J442-15 to J442-7. 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 J442-15 to J442-7.

VOLTMETER SCALE ON DISTORTION ANALYZER

C. Set the VOLUME control for five-watt output (4.18 VRMS).

D. Make distortion measurements according to manufacturer's instructions. Reading should be less than 5%.

SERVICE CHECK

If the distortion is more than 5%, or maximum audio output is less than five watts, make the following checks:

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

F. P.A. Bias Adjust (R43)--Turn the SQUELCH control fully counterclockwise. Then connect a milliammeter in series with the +12-volt lead at P443-11. With no signal in, adjust R43 for a reading of approximately 20 milliamps. This adjustment should not be necessary unless an output transistor has been replaced.

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

H. Discriminator Alignment (Refer to Receiver Alignment on reverse side of page).

STEP 2

USABLE SENSITIVITY (12 dB SINAD)

TEST PROCEDURE

Measure sensitivity of the receiver modulated at the standard test modulation as follows:

A. Be sure Test Step 1 checks out properly.

B. Reduce the Signal Generator output from setting in Test Step 1A.

C. Adjust Distortion Analyzer LEVEL control for a +2 dB reading.

D. Set CONTROL from LEVEL to DISTORTION reading. Repeat Steps 2B and 2C until difference in reading is 12 dB (+2 dB to -10 dB).

E. The 12-dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is "usable" sensitivity level. Reading should be less than the rated 12 dB SINAD specifications with audio output at least 2.5 watts (2.9 volts RMS across the 3.5-ohm receiver load).

SERVICE CHECK

If the sensitivity level is not within rated specifications, make the following checks:

F. Alignment of RF stages (Refer to RF Alignment in Receiver Alignment on reverse side of page).

G. Gain measurements as shown on the Receiver Troubleshooting Procedure.

STEP 3

MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

TEST PROCEDURE

A. Be sure Test Steps 1 and 2 check out properly.

B. Set Signal Generator output for twice the microvolt reading obtained in Test Step 2D.

C. Increase Signal Generator frequency deviation.

D. Adjust LEVEL Control for +2 dB.

DB SCALE ON DISTORTION ANALYZER

E. Set CONTROL from LEVEL to DISTORTION reading. Repeat Steps 3C, 3D and 3E until difference between readings becomes 12 dB (from +2 dB to -10 dB).

LEVEL DISTORTION ON DISTORTION ANALYZER

F. Deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±19 kHz (but less than ±23 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 I - QUICK CHECKS

TEST SET CHECKS

These checks are typical voltage readings measured with GE Test Set Model 4EX3A10 in the Test 1 position, or Model 4EX8K11 in the 1-volt position.

Metering Position	Reading with No Signal in	Reading with 1 µv unmodulated input
A Disc idling	Less than ±0.1 VDC	
B 2nd IF	.05 VDC	0.2 VDC
C 1st Lim	0.6 VDC	0.8 VDC
D Mult 1	0.9 VDC	
G Mult 2	0.3 VDC	
J Regulated +10 Volts	10 VDC	

SYMPTOM CHECKS

SYMPTOM	PROCEDURE
NO SUPPLY VOLTAGE	• Check power connections and continuity of supply leads, and check fuse in power supply. If fuse is blown, check receiver for short circuits.
NO REGULATED 10-VOLTS	• Check the 12-volt supply. Then check regulator circuit (See Troubleshooting Procedure for Power Supply).
LOW 1ST LIM READING	• Check supply voltages and then check oscillator reading at J442-4 & 5 as shown in STEP 2A. • Make SIMPLIFIED VTVM GAIN CHECKS from 2nd Mixer through 1st Limiter stages as shown in STEP 2A.
LOW OSCILLATOR/MULTIPLIER READINGS	• Check alignment of Oscillator (Refer to Front End Alignment Procedure). • Check voltage readings of 1st Oscillator/Multiplier Q1/Q2.
LOW RECEIVER SENSITIVITY	• Check Front End Alignment (Refer to Receiver Alignment Procedure. • Check antenna connections, cable and relay. • Check 1st and 2nd Oscillator injection voltage. • Check voltage readings of RF Amp, 1st Mixer and HI IF Amp. • Make SIMPLIFIED GAIN CHECKS (STEP 2A).
LOW AUDIO	• Check Audio PA (Q410 & Q411) voltage readings on schematic diagram. • Make simplified gain and waveform checks of audio and squelch stages (Steps 2A and 2B). • Make unsquelched voltage readings in Audio section (Refer to Receiver Schematic Diagram).
HIGH DISTORTION AT LOW AUDIO LEVELS (50 MW)	• Set PA bias adjust R43 as specified under Service checks in STEP 1 of TEST PROCEDURES.
IMPROPER SQUELCH OPERATION	• Check voltage readings of Squelch circuit (Refer to Receiver Schematic Diagram). • Make gain and waveform checks of audio and squelch stages (Steps 2A and 2B).
DISCRIMINATOR IDLING TOO FAR OFF ZERO	• See if discriminator zero is in center of IF bandpass.

STEP 3-VOLTAGE RATIO READINGS

EQUIPMENT REQUIRED:

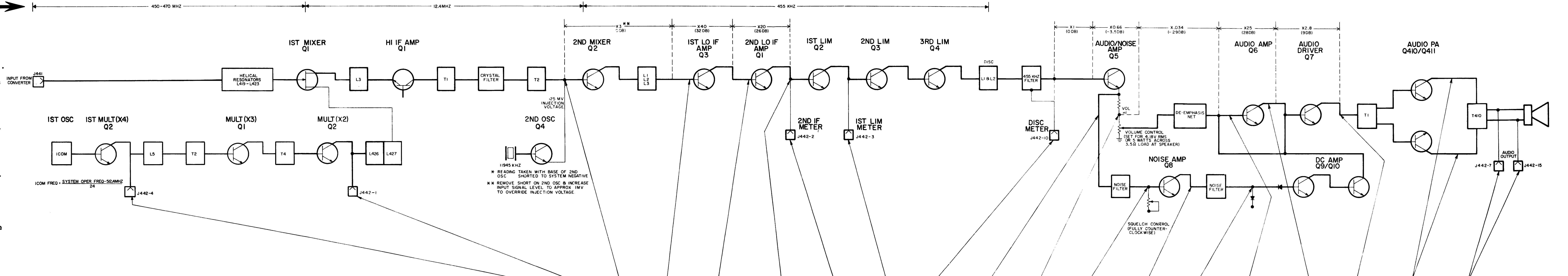
1. RF Voltmeter (Similar to Boonton Model 91-CA or Millivac Type MV-18 C).
2. Signal on receiver frequency (below saturation). Correct frequency can be determined by zeroing the discriminator. Use 1,000 Hertz signal with 10 kHz deviation for audio stage.

PROCEDURE

1. Apply probes to input of stage and system negative (-10 VDC). Take voltage reading (E_1).
2. Move probes to input of following stage and system negative. Take reading (E_2).
3. Convert readings by means of the following formula:

$$\text{Voltage Ratio} = \frac{E_2}{E_1}$$

4. Check results with typical voltage ratios shown on diagram.



STEP 2A-SIMPLIFIED VTVM GAIN CHECKS

EQUIPMENT REQUIRED:

1. VTVM-AC & DC
2. Signal Generator (measurements M560 or equiv.)

PRELIMINARY STEPS:

1. Set VOLUME control for 4.18 volts across 3.5-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 VTVM between system negative and points indicated by arrow (except for 1st MULT which references chassis ground).

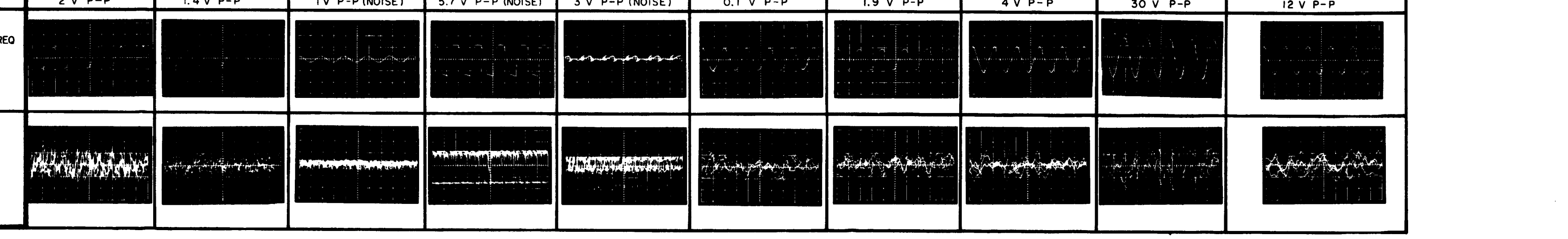
SIGNAL GENERATOR INPUT AT J441 MAINTAIN SETTING AT DISCRIMINATOR ZERO			UNMODULATED	UNMODULATED	UNMODULATED	UNMODULATED	1 MICROVOLT UNMODULATED	NO SIGNAL INPUT	STANDARD SIGNAL-(1 MILLIVOLT AT RCVR FREQ, MODULATED BY 1KHZ WITH 10 KHZ DEVIATION)
PROCEDURE			INCREASE GENERATOR OUTPUT UNTIL VTVM READING ON 1.5 V SCALE DECREASES BY 50 MV	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%			
READING	0.8 VDC	0.25 VDC	GENERATOR OUTPUT SHOULD BE APPROX 20 MILLIVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 600 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 5 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 0.3 MICROVOLTS	-0.6 VDC	- 2 VDC	0.8 VAC

SIGNAL GENERATOR INPUT AT J441 MAINTAIN SETTING AT DISCRIMINATOR ZERO	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL
PROCEDURE										CONNECT VTVM OR SCOPE ACROSS 3.5Ω LOAD BETWEEN J442-7 AND J442-15 WITH SPEAKER DISCONNECTED.
READING	0.75 VAC	0.55 VAC	0.15 VAC	2.3 VAC	0.05 VAC		0.5 VAC	1.4 VAC	10 VAC	4.18 VAC

SCOPE SETTING										
	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV	0.5 MS/DIV
	1 VOLT/DIV	1 VOLT/DIV	1 VOLT/DIV	2 VOLTS/DIV	0.5 VOLTS/DIV	50 MILLIVOLTS/DIV	1 VOLT/DIV	2 VOLTS/DIV	10 VOLTS/DIV	5 VOLTS/DIV
	2 V P-P	1.4 V P-P	1 V P-P (NOISE)	5.7 V P-P (NOISE)	3 V P-P (NOISE)	0.1 V P-P	1.9 V P-P	4 V P-P	30 V P-P	12 V P-P

STANDARD SIGNAL (1 MILLIVOLT AT RECEIVER FREQ MODULATED BY 1KHZ WITH 10 KHZ DEVIATION)

NOISE WAVE FORM (NO SIGNAL INPUT)



STEP 2B-AUDIO & SQUELCH WAVEFORMS

EQUIPMENT REQUIRED:

1. Oscilloscope.
2. Signal generator (measurements M560 to equivalent).

PRELIMINARY STEPS:

1. Set VOLUME control for 4.18 volts across 3.5-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 oscilloscope between system negative and points indicated by arrow.

(RC-1940)

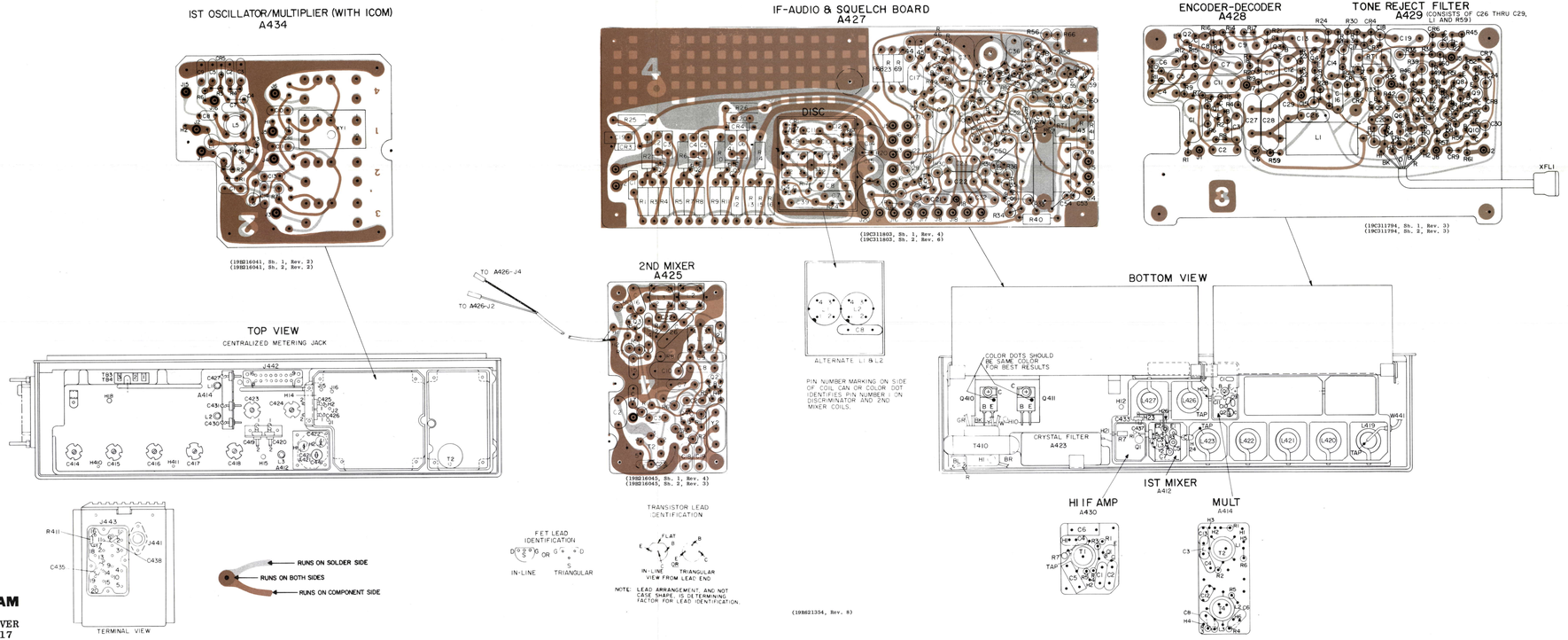
(DF-1086)

TROUBLESHOOTING PROCEDURE

450—470 MHz RECEIVER
MODELS 4ER42H11 & 17

OUTLINE DIAGRAM

450—470 MHz RECEIVER
MODELS 4ER42H11 & 17



PARTS LIST

LBI-4087B

406-470 MHz RECEIVER
4ER42H11 and H17

SYMBOL	GE PART NO.	DESCRIPTION
A412		FIRST MIXER ASSEMBLY 19C311974G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496218P312	Ceramic disc: 18 pf ±10%, 500 VDCW, temp coef -150 PPM.
C2		(Part of L3).
C3	5496218P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C4	19B209243P1	Polyester: 0.01 μf ±20%, 50 VDCW.
C5	5493392P107	Ceramic, stand-off: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type SS5D.
C6	19B209243P1	Polyester: 0.01 μf ±20%, 50 VDCW.
C7	5493392P7	Ceramic, feed-thru: 1000 pf +100%-0%, 500 VDCW; sim to Allen Bradley Type FA5C.
C8		(Part of L3).
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1 and E2	19B209055P8	Terminal, feed-thru.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A127430G1	Choke.
L2		(Part of L3).
L3	19B216440G1	Coil assembly, includes:
C2	5496218P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C8*	19A116114P12	Ceramic: 3.3 pf ±5%, 100 VDCW; temp coef 0 PPM. Added by REV K.
L2	19B209420P113	Coil, RF: 1 μh ±10%, 0.74 ohms DC res max; sim to Jeffers 4426-6.
	5491798P8	Tuning slug.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116154P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P302J	Composition: 3000 ohms ±5%, 1/4 w.
R2 and R3	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19A116632P1	Torridal core.
A414		MULTIPLIER BOARD ASSEMBLY 19B216360G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116655P12	Ceramic disc: 330 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C3		(Part of T2).
C4	5496203P149	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C6		(Part of T4).
C8		(Part of T4).
C9*	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Deleted by REV E.
C10	5496203P149	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C11	5496218P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C12	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C13	19A116655P13	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C15	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of T2).
L2		(Part of T4).
L3	19B209420P1	Coil, RF: 0.10 μh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-1.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115329P1	Silicon, NPN.
Q2	19A115991P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R2	3R152P181J	Composition: 180 ohms ±5%, 1/4 w.
R3	3R152P100K	Composition: 10 ohms ±10%, 1/4 w.
R4	3R152P471K	Composition: 470 ohms ±10%, 1/4 w.
R5	3R152P680J	Composition: 68 ohms ±5%, 1/4 w.
R6	3R152P273K	Composition: 27,000 ohms ±10%, 1/4 w.
R7	3R152P100K	Composition: 10 ohms ±10%, 1/4 w.
T2		COIL ASSEMBLY 19B216373G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C3	5496218P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B216373P5	Coil.
	5491798P7	Tuning slug.
T4		COIL ASSEMBLY 19B216374G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C6*	5496218P237	Ceramic disc: 6.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		In REV G and earlier:
	5496218P436	Ceramic disc: 5.0 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C8*	5496218P246	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.
		In REV G:
	5496218P745	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -750 PPM.
		In REV F and earlier:
	5496218P748	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -750 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2	19B216374P7	Coil.
	5491798P7	Tuning slug.
A423		CRYSTAL FILTER ASSEMBLY 19B216703G1
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL1	19C304094G5	Bandpass: 12.4 MHz.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P512J	Composition: 5100 ohms ±5%, 1/4 w.
R2	3R152P362J	Composition: 3600 ohms ±5%, 1/4 w.
A425		SECOND MIXER ASSEMBLY 19B216119G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C3	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C7 and C8	19A116080P5	Polyester: 0.047 μf ±20%, 50 VDCW.
C9	5496219P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C10	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C14	19A116656P220J2	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -220 PPM.
C15	7491395P109	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JL.
C16	19A116080P5	Polyester: 0.047 μf ±20%, 50 VDCW.
C17	19A116080P1	Polyester: 0.01 μf ±20%, 50 VDCW.
C18	5490008P25	Silver mica: 82 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C19	5490008P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C20	5490008P1	Silver mica: 5 pf ±0.5%, 500 VDCW; sim to Electro Motive Type DM-15.
C21 and C22	5496219P49	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef 0 PPM.
C23		(Part of T2).
C26	5496219P368	Ceramic disc: 160 pf ±5%, 500 VDCW, temp coef -150 PPM.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19C311181G3	Coil assembly.
L2 and L3	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg EX12670.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1	4029840P2	Contact, electrical: sim to Amp 42827-2.
P2	4029840P1	Contact, electrical: sim to AMP 41854.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2	19A115245P1	Silicon, NPN.
Q3	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q4	19A115245P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R3	3R77P512J	Composition: 5100 ohms ±5%, 1/2 w.
R4	3R152P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R5	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R6	3R77P332K	Composition: 3300 ohms ±10%, 1/2 w.
R7	3R77P123K	Composition:12,000 ohms ±10%, 1/2 w.
R8	3R77P622J	Composition: 6200 ohms ±5%, 1/2 w.
R9	3R77P302J	Composition: 3000 ohms ±5%, 1/2 w.
R10	3R77P202J	Composition: 2000 ohms ±5%, 1/2 w.
R11	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R12	3R77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T2		COIL ASSEMBLY 19B216120G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C23	5496218P258	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -80 PPM.
	5491798P3	Tuning slug.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
Y2	19A110398G1	Quartz: freq 11945.00 KHz, temp range -30°C to +75°C.
A427		IF AUDIO AND SQUELCH BOARD 19D413129G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	5496219P717	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef -750 PPM.
C3	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	5496219P717	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef -750 PPM.
C5 and C6	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C7	19A116080P5	Polyester: 0.047 μf ±20%, 50 VDCW.
C8	19A116656P180J1	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C9 and C10	5490008P37	Silver mica: 270 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C11	5496219P656	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -470 PPM.
C12	5494481P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C13	19A115680P107	Electrolytic: 100 μf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C14 and C15	19A115680P104	Electrolytic: 50 μf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C17	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C19 and C20	19A116080P5	Polyester: 0.047 μf ±20%, 50 VDCW.
C21	19A116080P3	Polyester: 0.01 μf ±20%, 50 VDCW.
C22	19A116080P108	Polyester: 0.15 μf ±10%, 50 VDCW.
C23	19A116080P107	Polyester: 0.1 μf ±10%, 50 VDCW.
C25	5496267P6	Tantalum: 33 μf ±20%, 10 VDCW; sim to Sprague Type 150D.
C26*	19A116080P109	Polyester: 0.22 μf ±10%, 50 VDCW.
		In REV D and earlier:
	5496267P28	Tantalum: .47 μf ±20%, 35 VDCW; sim to Sprague Type 150D.
C27	5496267P2	Tantalum: 47 μf ±20%, 6 VDCW; sim to Sprague Type 150D.
C32	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C33	19A116080P9	Polyester: 0.22 μf ±20%, 50 VDCW.
C35	19A116080P5	Polyester: 0.047 μf ±20%, 50 VDCW.
C36	19A116080P9	Polyester: 0.22 μf ±20%, 50 VDCW.
C37	5496267P28	Tantalum: 0.47 μf ±20%, 35 VDCW; sim to Sprague Type 150D.
C39	19A116080P1	Polyester: 0.01 μf ±20%, 50 VDCW.
C40*	5496267P29	Tantalum: 0.68 μf ±20%, 35 VDCW; sim to Sprague Type 150D.
		In REV J and earlier:
	5496267P28	Tantalum: .47 μf ±20%, 35 VDCW; sim to Sprague Type 150D.
C41	5490008P129	Silver mica: 120 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C44	5494481P124	Ceramic disc: 1500 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C45	5490008P27	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C46	4029003P108	Silver Mica: 1000 pf ± 10%, 500 VDCW; sim to Electro Motive Type DM-20.
C47	19A116080P9	Polyester: 0.22 μf ±20%, 50 VDCW.
C48	19A116080P1	Polyester: 0.01 μf ±20%, 50 VDCW.
C50	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C51	19A116655P22	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C52	19A116080P109	Polyester: 0.22 μf ±20%, 50 VDCW.
C53 and C54	5496267P213	Tantalum: 2.2 μf ±10%, 20 VDCW; sim to Sprague Type 150D.
C55	5496267P14	Tantalum: 15 μf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3* and CR4*	19A115250P1	Silicon.
		In REV E and earlier:
	4038056P1	Germanium.
CR5 and CR6	19A115250P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J22	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A115711P6	Transformer, freq: 455 KHz; sim to TOKO PEFCN-14733-CX12.
L2	19A115711P7	Transformer, freq: 455 KHz; sim to TOKO PEFCN-14734-BNL2.
L3	19A127134G1	Choke.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q6	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q7	19A115300P4	Silicon, NPN; sim to Type 2N3053.
Q8	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q9	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q10*	19A115774P1	Silicon, NPN.
		In REV F and earlier:
	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R2	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R3	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R4	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R5	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R6	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R7	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R8	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R9	3R77P102K	Composition: 1000 ohms ±10%, 1/2 w.
R10	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R11	3R77P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R12	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R13	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
R14	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R15	3R77P333J	Composition: 33,000 ohms ±5%, 1/2 w.
R16	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R17	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R20	3R152P472K	Composition: 4700 ohms ±10%, 1/4 w.
R23	3R77P104J	Composition: 0.10 megohms ±5%, 1/2 w.
R24	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R25 and R26	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R27 and R28	3R77P753J	Composition: 75,000 ohms ±5%, 1/2 w.
R29	3R77P182J	Composition: 1800 ohms ±5%, 1/2 w.
R30*	3R77P821J	Composition: 820 ohms ±5%, 1/2 w.
		In REV C and earlier:
	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R31	3R77P821J	Composition: 820 ohms ±5%, 1/2 w.
R33	3R77P912J	Composition: 9100 ohms ±5%, 1/2 w.
R34	3R77P332K	Composition: 3300 ohms ±10%, 1/2 w.
R35	3R77P330K	Composition: 33 ohms ±10%, 1/2 w.
R36	3R77P681J	Composition: 680 ohms ±5%, 1/2 w.
R38	3R77P752J	Composition: 7500 ohms ±5%, 1/2 w.
R39	3R77P820J	Composition: 8200 ohms ±5%, 1/2 w.
R40*	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
		In REV G and earlier:
	3R77P241J	Composition: 240 ohms ±5%, 1/2 w.
R41	3R152P240J	Composition: 24 ohms ±5%, 1/4 w.
R42	3R77P200J	Composition: 20 ohms ±5%, 1/2 w.
R43	19B209358P101	Variable, carbon film: approx 25 to 250 ohms ±10%, 0.2 w; sim to CTS Type X-201.
R44	19B209022P101	Wirewound: 0.27 ohms ±10%, 2 w; sim to IRC Type BWH.
R46	3R77P913J	Composition: 91,000 ohms ±5%, 1/2 w.
R47	3R152273K	Composition: 27,000 ohms ±10%, 1/4 w.
R49	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R50	3R77P222J	Composition: 2200 ohms ±5%, 1/2 w.
R51	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R52	3R77P682J	Composition: 6800 ohms ±5%, 1/2 w.
R55	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R56	3R77P224J	Composition: 0.22 megohm ±5%, 1/2 w.
R57	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R58	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R59	3R77P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R60 and R61	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R64	3R77P120J	Composition: 12 ohms ±5%, 1/2 w.
R66	3R77P472K	Composition: 4700 ohms ±10%, 1/2 w.
R67	3R152P273K	Composition: 27,000 ohms ±10%, 1/4 w.
R68	3R77P682J	Composition: 6800 ohms ±5%, 1/2 w.
R69	3R77P752J	Composition: 7500 ohms ±5%, 1/2 w.
R71	3R77P133J	Composition: 13,000 ohms ±5%, 1/2 w.
R72	3R77P362J	Composition: 3600 ohms ±5%, 1/2 w.
R73	3R77P473J	Composition: 47,000 ohms ±5%, 1/2 w.
R74	3R77P362J	Composition: 3600 ohms ±5%, 1/2 w.
R77	3R152153J	Composition: 15,000 ohms ±5%, 1/4 w.
R78*	3R77P200J	Composition: 20 ohms ±5%, 1/2 w.
		In REV C and earlier:
	3R77P100J	Composition: 10 ohms ±5%, 1/2 w.
R79	3R152P393J	Composition: 39,000 ohms ±5%, 1/4 w.
R80*	3R152P272J	Composition: 2700 ohms ±5%, 1/4 w.
		In REV K and earlier:
	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R81	3R152P472J	Composition: 4700 ohms ±5%, 1/4 w.
R82	3R77P273J	Composition: 27,000 ohms ±5%, 1/2 w.
R85*	3R152P102J	Composition: 1000 ohms ±5%, 1/2 w. Added by REV J. Deleted by REV K.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1	5490828P41	Thermistor: 30 ohms ±10%, color code black, white; sim to Globar Type B1211H-4.
RT2 and RT3	5490828P9	Thermistor: 10,000 ohms ±10%, color code yellow; sim to Globar Type 551H-8.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1	19A116040P1	Audio freq: 300 to 4000 Hz, Pri: 19.3 ohms ±10% DC res, Sec: 23.5 ohms ±10% DC res.
A428		ENCODER/DECODER 4EK16A10 19C311797G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116080P9	Polyester: 0.22 μf ±20%, 50 VDCW.
C2 and C3	19A116080P205	Polyester: 0.047 μf ±5%, 50 VDCW.
C4	19A116080P207	Polyester: 0.1 μf ±5%, 50 VDCW.
C5	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C6	19A116080P205	Polyester: 0.047 μf ±5%, 50 VDCW.
C7	19A116080P207	Polyester: 0.1 μf ±5%, 50 VDCW.
C8	19A116080P205	Polyester: 0.047 μf ±5%, 50 VDCW.
C9	19A116080P9	Polyester: 0.22 μf ±20%, 50 VDCW.
C10	19A116080P207	Polyester: 0.1 μf ±5%, 50 VDCW.
C11	19A116080P109	Polyester: 0.22 μf ±10%, 50 VDCW.
C12	19A116080P207	Polyester: 0.1 μf ±5%, 50 VDCW.
C13	19A116080P9	Polyester: 0.22 μf ±20%, 50 VDCW.
C14	19A116080P7	Polyester: 0.1 μf ±20%, 50 VDCW.
C15	5496267P1	Tantalum: 6.8 μf ±20%, 6 VDCW; sim to Sprague Type 150D.
C16	19A116080P5	Polyester: 0.047 μf ±20%, 50 VDCW.
C17	5496267P417	Tantalum: 1.0 μf ±5%, 35 VDCW; sim to Sprague Type 150D.
C18	5496267P1	Tantalum: 6.8 μf ±20%, 6 VDCW; sim to Sprague Type 150D.
C19	19A116080P109	Polyester: 0.22 μf ±10%, 50 VDCW.
C20	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C21	5496267P9	Tantalum: 3.3 μf ±20%, 15 VDCW; sim to Sprague Type 150D.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

(DF-1086)

		REV
	PL19E500881G6	M
A425	PL19B216119G2	A
A427	PL19D413129G2	L
A428	4EK16A10	D
A429	PL19C311797-G2	B
A434	PL19C311726-G3	B

ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL READINGS MEASURED TO SYSTEM NEGATIVE (J442-8) WITH TEST SET MODEL 4EX3A10 OR A 20,000 OHM-PER-VOLT METER.

S= NO SIGNAL IN WITH SQUELCH CONTROL FULLY COUNTERCLOCKWISE (MAXIUM SQUELCH)

US= SQUELCH CONTROL FULLY CLOCKWISE WITH A ONE MILLIVOLT MODULATED SIGNAL (UNSQUELCHED) AND 5 WATT AUDIO OUTPUT.

NOTE:
TO CHECK FOR PROPER OPERATION OF 1ST MIXER A412, MEASURE CURRENT 10V CIRCUIT (W-R LEAD), CURRENT WITH FIRST OSC XTAL REMOVED, SHOULD BE 0.6 TO 0.8 MA. CURRENT WITH FIRST OSC OPERATING PROPERLY, SHOULD BE 1.2 TO 1.6 MA.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

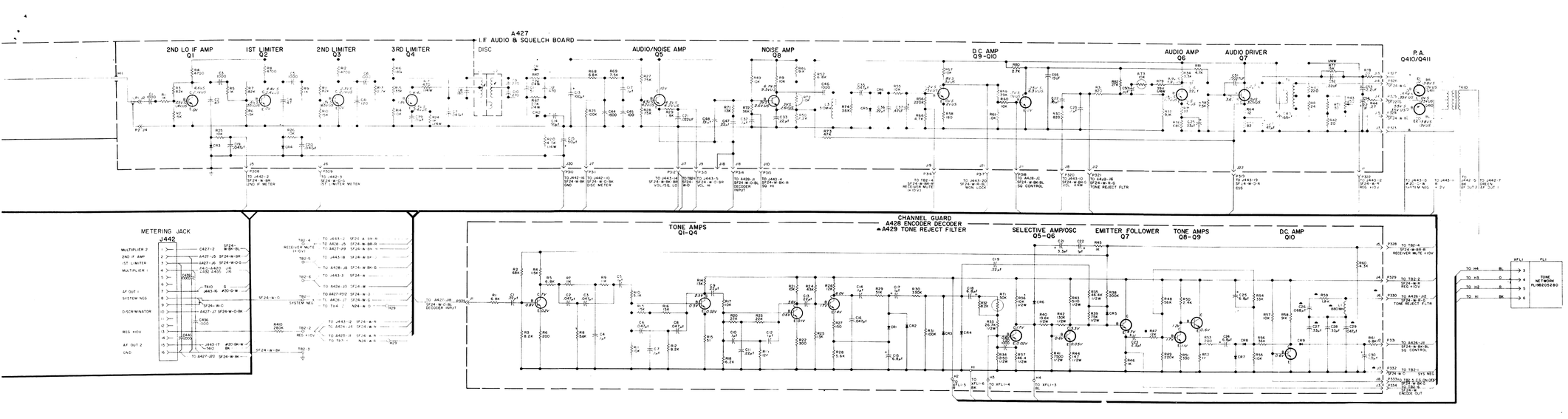
THESE MODELS ARE USED TOGETHER WITH CONVERTER PANEL PL19D413291-G1 TO TUNE THE 952-960 MHZ FREQ. RANGE

MODELS WITH ICOM OSCILLATOR	NO. OF FREQS	FREQ RANGE 450-470	CHANNEL GUARD
4ER42H11	1		
4ER42H17	1		1

SYM NO	PARTS LIST	REV LETTER
A432	PL19C311726G1	B
A433	PL19C311726G2	B
A434	PL19C311726G3	B
A435	PL19C311726G4	B

SCHEMATIC DIAGRAM

450—470 MHz RECEIVER
MODELS 4ER42H11 & 17



(198621301, Rev. 24)

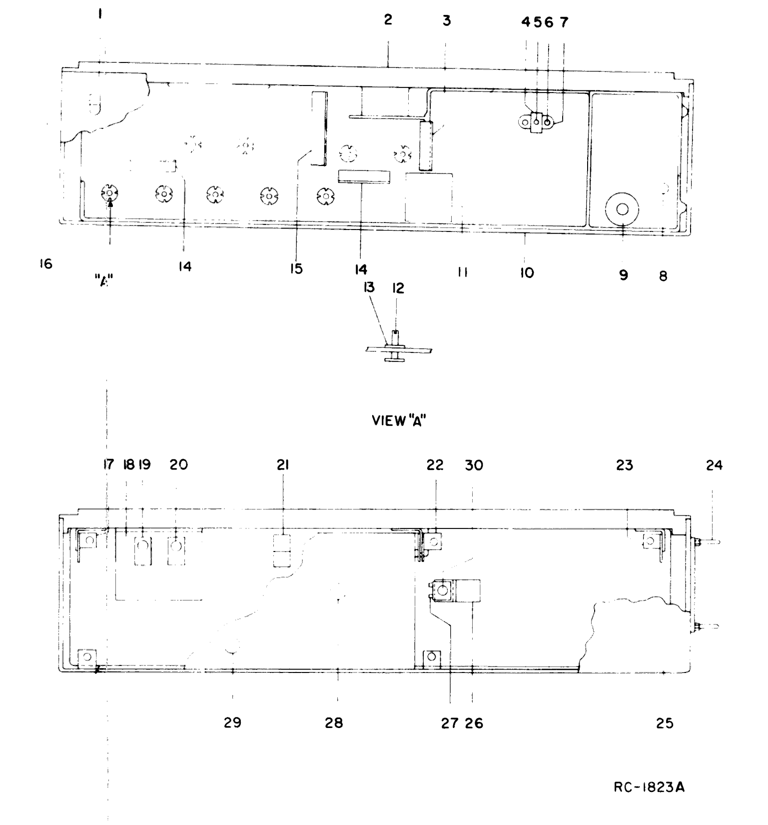
(DF-1086)

SCHEMATIC DIAGRAM

450—470 MHz RECEIVER
MODELS 4ER42H11 & 17

(Cont'd from page 11) (LBI-4087)

SYMBOL	GE PART NO.	DESCRIPTION
C22	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C23	5496267P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C24	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C25	5496267P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C26	19A116080P206	Polyester: 0.068 µf ±5%, 50 VDCW.
C27 and C28	19A116080P210	Polyester: 0.33 µf ±5%, 50 VDCW.
C29*	19A116080P205	Polyester: 0.047 µf ±5%, 50 VDCW.
		In REV B and earlier:
	19B209243P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C30	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3 and CR4	5494922P1	Silicon.
CR5	19A115250P1	Silicon.
CR6	4036887P3	Silicon, Zener.
CR7 thru CR9	19A115250P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J1 thru J8	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19A115690P1	Coil, RF: 880 MH ±5%, sim to Artted AC5672.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q2	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q3 and Q4	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q5 thru Q8	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q9 and Q10	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R2	3R77P683J	Composition: 68,000 ohms ±5%, 1/2 w.
R3	3R77P822J	Composition: 8200 ohms ±5%, 1/2 w.
R4	3R77P152J	Composition: 1500 ohms ±5%, 1/2 w.
R5	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
R6	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R7	19A116278P305	Metal film: 11,000 ohms ±2%, 1/2 w.
R8*	3R152P562J	Composition: 5600 ohms ±5%, 1/4 w.
		In REV A and earlier:
	3R152P622J	Composition: 6200 ohms ±5%, 1/4 w.
R9	19A116278P305	Metal film: 11,000 ohms ±2%, 1/2 w.
R10	3R77P512J	Composition: 5100 ohms ±5%, 1/2 w.
R11	3R77P103J	Composition: 0,000 ohms ±5%, 1/2 w.
R12	3R77P822J	Composition: 8200 ohms ±5%, 1/2 w.
R13	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R14	3R77P133J	Composition: 13,000 ohms ±5%, 1/2 w.
R15	3R77P510J	Composition: 51 ohms ±5%, 1/2 w.
R16	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R17	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R18	3R77P622J	Composition: 6200 ohms ±5%, 1/2 w.
R19	3R77P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R20	3R77P223J	Composition: 22,000 ohms ±5%, 1/2 w.
R21	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R22	3R77P301J	Composition: 300 ohms ±5%, 1/2 w.
R23	3R77P223J	Composition: 22,000 ohms ±5%, 1/2 w.
R24	3R77P433J	Composition: 43,000 ohms ±5%, 1/2 w.
R25	3R77P133J	Composition: 13,000 ohms ±5%, 1/2 w.
R26	3R77P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R27	3R77P151J	Composition: 150 ohms ±5%, 1/2 w.
R28	3R77P562J	Composition: 5600 ohms ±5%, 1/2 w.
R29	3R77P513J	Composition: 51,000 ohms ±5%, 1/2 w.
R30	3R77P334J	Composition: 0.33 megohm ±5%, 1/2 w.
R31	3R77P104J	Composition: 0.1 megohms ±5%, 1/4 w.
R32	3R77P822J	Composition: 8200 ohms ±5%, 1/4 w.
R33	19A116278P342	Metal film: 26,700 ohms ±2%, 1/2 w.
R34	19A116278P233	Metal film: 2150 ohms ±2%, 1/2 w.
R35	19A116278P365	Metal film: 46,400 ohms ±2%, 1/2 w.
R36	19A116278P301	Metal film: 10,000 ohms ±2%, 1/2 w.
R37	19A116278P65	Metal film: 46.4 ohms ±2%, 1/2 w.
R38	3R77P204J	Composition: 0.2 megohm ±5%, 1/2 w.
R39	19A116278P385	Metal film: 75,000 ohms ±2%, 1/2 w.
R40	19A116278P329	Metal film: 19,000 ohms ±2%, 1/2 w.
R41	19A116278P285	Metal film: 7500 ohms ±2%, 1/2 w.
R42	19A116278P412	Metal film: 130,000 ohms ±2%, 1/2 w.
R43	19A116278P269	Metal film: 5110 ohms ±2%, 1/2 w.
R44	19A116278P117	Metal film: 147 ohms ±2%, 1/2 w.
R45 and R46	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
		NOTE: The value of Resistor R47 must be obtained from the component, then find corresponding value in parts list for the correct part number.
R47A	3R77P822J	Composition: 8200 ohms ±5%, 1/2 w.
R47B	3R77P912J	Composition: 9100 ohms ±5%, 1/2 w.
R47C	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R47D	3R77P113J	Composition: 11,000 ohms ±5%, 1/2 w.
R47E	3R77P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R47F	3R77P133J	Composition: 13,000 ohms ±5%, 1/2 w.
R47G	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R47H	3R77P752J	Composition: 7500 ohms ±5%, 1/2 w.
R48	3R77P563J	Composition: 56,000 ohms ±5%, 1/2 w.
R49	3R77P224J	Composition: 0.22 megohm ±5%, 1/2 w.
R50	3R77P242J	Composition: 2400 ohms ±5%, 1/2 w.
R51	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R52	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R53	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R54	3R77P333J	Composition: 33,000 ohms ±5%, 1/2 w.
R55	3R77P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R56	3R77P363J	Composition: 36,000 ohms ±5%, 1/2 w.
R57	3R77P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R58	3R77P913J	Composition: 91,000 ohms ±5%, 1/2 w.
R59*	3R77P182J	Composition: 1800 ohms ±5%, 1/2 w.
		In REV C and earlier:
	3R152P432J	Composition: 4300 ohms ±5%, 1/4 w.
R60	3R77P432J	Composition: 4300 ohms ±5%, 1/2 w.
R61	3R77P682K	Composition: 6800 ohms ±10%, 1/2 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490828P22	Thermistor: 50,000 ohms ±10%, color code yellow; sim to Globar Type 763H.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XFL1	19A121920G3	Reed, mica-filled phen: 7 pins rated at 1 amp at 500 VRMS with 4-1/2 inches of cable.
A430		HIGH IF AMPLIFIER 19B216356G2
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116655P19	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2*	7489162P21	Silver mica: 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
		In REV J and earlier:
	5490008P21	Silver mica: 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C3	5496218P650	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -150 PPM.
C4	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C5 and C6	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1*	19A115440P1	Silicon, NPN.
		In REV L and earlier:
	19A115328P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - -
R1	3R152P301J	Composition: 300 ohms ±5%, 1/4 w.
R2	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R3*	3R152P152J	Composition: 1500 ohms ±5%, 1/4 w.
		In REV L and earlier:
	3R152P302J	Composition: 3,000 ohms ±5%, 1/4 w.
R4	3R152P682J	Composition: 6800 ohms ±5%, 1/4 w.
R5	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R7	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T1	19B216372G1	Coil, includes tuning slug 5491798P7.
A434		OSCILLATOR/MULTIPLIER BOARD 19C311726G3
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 thru C3	5494481P112	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C4	5491601P123	Phenolic: 1.5 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C5	5494481P112	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C7		(Part of T2).
C8	5496219P238	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW; temp coef -80 PPM.
C9	5490008P135	Silver mica: 220 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C10 and C11	5494481P112	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C13 and C14	5494481P112	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
CR5	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J6	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J15 and J16	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	7488079P16	Choke, RF: 10 µh ±10%, 0.6 ohm DC res max; sim to Jeffers 4421-7K.
L5		(Part of T2).
L6	7488079P35	Choke, RF: 2.20 µh ±10%, 0.50 ohms DC res max; sim to Jeffers 4412-9K.
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1*	19A115440P1	Silicon, NPN.
		In REV A and earlier:
	19A115330P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R2	3R152P151J	Composition: 150 ohms ±5%, 1/4 w.
R3	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R4	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R5 and R6	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R7	3R77P272K	Composition: 2700 ohms ±10%, 1/2 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T2		COIL ASSEMBLY 19B204950G2
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C7	5496218P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L5	19A121728P1	Coil.
	5491798P7	Tuning slug.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY1	19B216043G1	Socket.
		- - - - - - - - - OSCILLATORS - - - - - - - - -
		NOTE: When reordering specify ICOM Frequency. ICOM Freq = Operating Freq 512.4 MHz ÷ 24.
Y1	4EG26A15	Integrated Circuit Oscillator Module (ICOM).
	19D413070P1	Cap, decorative.
		CHASSIS AND RF CIRCUIT 19E500881G6
		- - - - - - - - - CAPACITORS - - - - - - - - -
C414 thru C418		Refer to Mechanical Parts (RC-1823).
C419 thru C422	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C423 and C424		Refer to Mechanical Parts (RC-1823).
C425 thru C427	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C428	5496267P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C429	19A115680P4	Electrolytic: 50 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C430 and C431	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C433	5493392P107	Ceramic, stand-off: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type SS5D.
C435 and C436	7774750P4	Ceramic disc: .001 µf +100% -0%, 500 VDCW.
C437	5493392P3	Ceramic, feed-thru: 47 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C438	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C439 and C440	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C441*	5493392P7	Ceramic, feed-thru: 1000 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C. Added by REV F.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1*	19A116062P2	Selenium. Deleted by REV A.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J441		(Part of W441).
J442	19B205689G2	Connector: 18 contacts rated at 5 amps min at 1000 VDC max.
J443	19C303426G1	Connector: 20 pin contacts.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L419	19B204938G12	Coil.
L420 thru L422	19B204936P14	Coil.
L423	19B204938G18	Coil.
L426	19B204938G20	Coil.
L427	19B204936P16	Coil.
L428 and L429	7488079P18	Choke, RF: 15 µh ±10%, 1.2 ohms DC res; sim to Jeffers 4421-9K.
L432	19A127433P1	Coil.
L433 and L434	19A115700P2	Bead, ferrite.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P305 thru P311	4029840P2	Contact, electrical: sim to Amp 42827-2.
P312	4029840P3	Contact, electrical: sim to Amp 42101-2.
P313 thru P322	4029840P2	Contact, electrical: sim to Amp 42827-2.
P323	4029840P1	Contact, electrical: sim to Amp 41854.
P324	4029840P2	Contact, electrical: sim to Amp 42827-2.
P325	4029840P1	Contact, electrical: sim to Amp 41854.
P326	4029840P2	Contact, electrical: sim to Amp 42827-2.
P327	4029840P1	Contact, electrical: sim to Amp 41854.
P328 thru P335	4029840P2	Contact, electrical: sim to Amp 42827-2.
P410 and P411	4029840P2	Contact, electrical: sim to Amp 42827-2.
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q410* and Q411*	19A116741P1	Silicon, NPN.
		In REV K and earlier:
	19A116203P2	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R410	19A116278P444	Metal film: 0.28 megohm ±2%, 1/2 w.
R411	3R78P390K	Composition: 39 ohms ±10%, 1 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T410	19A116041P2	Audio freq: 300 to 4000 Hz, Pri: 1.00 ohm ±15% DC res, Sec 1: 0.23 ohm ±10% DC res, Sec 2: 10.5 ohms ±15% DC res.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB2	7487424P26	Miniature, phen: 6 terminals.
TB3 and TB4	7487424P24	Miniature, phen: 3 terminals.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W441	19B205634G3	Coaxial cable: 50 ohms, approx 5 inches long. Includes (J441) 19B209122P3 connector.
		HARNESS ASSEMBLY 19E500881G9 (Includes C435, C436, C438-C440, J442, J443, L433, L434, P307-P313, P315-P317, P319, P320, P322-P327, P411, R410, R411, T410, TB2)
		MULTI-FREQUENCY MODIFICATION KIT 19A127096G1
	19A127136G1	Harness assembly.
P301 thru P304	4029840P2	Contact, electrical; sim to Amp 42827-2. (Part of 19A127136G1 Harness assembly).
L435 thru L442	19A115700P2	Bead, ferrite. (Part of 19A127136G1 Harness assembly).
L443 thru L450	19A115700P2	Bead, ferrite.
		MECHANICAL PARTS (SEE RC-1823)
1	19C303396G4	Bottom cover. (Station)
	19C303385G1	Bottom cover. (Mobile)
2	19C317344P3	Heat sink.
3	19A121723P1	Support. (Mounts C425 and C426)
4	4033089P1	(Not Used).
5	19B200525P9	(Not Used).
6	19A115793P1	(Not Used).
7	19C311172P1	(Not Used).
8	4035306P40	Fiber washer. (Used with Y2 in A425).
9	4034252P5	Can. (Used with T1 on A425).
10	19C303389G1	Chassis.
11	19A121722P1	Plate.
12	4036765G4	Screw. (Part of C410, C411, C414-C418, C423 and C424).
13	7137968P8	Nut, stamped: thd size No. 6-32.
14	19A121724P1	Support. (Mounts C419 and C420).
15	19A127372P1	Support. (Mounts C427, C430 and C431).
16	7145451P1	(Not Used).
17	19B204583G3	Hinge.
18	19B216727P1	Support. (Used with Q410 and Q411).
19	19A116023P2	Plate, insulated. (Used with Q410 and Q411).
20	19A116022P1	Insulator. (Used with Q410 and Q411).
21	4029851P6	Clip, loop.
22	19B204583G1	Hinge.
23	19B204583G2	Hinge.
24	19A121676P1	Guide pin.
25	19C303495G3	Top cover. (Station, except Repeaters and VM).
	19C303676G2	Top cover. (Station, Repeater and VM only).
	19C303385P2	Top cover. (Mobile).
26	19A121297P2	Angle.
27	7160861P4	Nut, sheet spring. (Used to secure cover).
28	4036555P1	Insulator, disc. (Used with Q7 on A427).
29	4035267P2	Button, plug.



PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A THRU C - IF AUDIO AND SQUELCH BOARD 19D413129G2

REV. A THRU G - CHASSIS AND RF CIRCUIT 19E500881G6

REV. A & B - CHANNEL GUARD BOARD 4EK16A10

Incorporated into initial shipment.

IF AUDIO AND SQUELCH BOARD 19D413129G2

REV. D - To improve frequency response. Changed R30 and R78.

REV. E. - To compensate for vendor change. Changed C26.

REV. H - CHASSIS AND RF CIRCUIT 19E500881G6
Improve Bond-End Tuning in Multiplier A414(19021636OG2). Changed C6 and C8.

REV. J - CHASSIS AND RF CIRCUIT 19E500881G6
To remove unnecessary protection. Removed CR1.

REV. C - CHANNEL GUARD BOARD 4EK16A10
REV. A - Tone Reject Filter 19C311797G2
To optimize frequency response. Changed C29.

REV. D - CHANNEL GUARD BOARD 4EK16A10
REV. B - Tone Reject Filter 19C311797G2
To prevent excessive roll-off at 300 Hertz. Changed R59.

REV. K - CHASSIS AND RF CIRCUIT (19E500881G6)
To prevent oscillations in the 1st mixer assy. (A412) 19C311974G1. Added C8 as part of L3.

REV. L - To incorporate a new transistor. Changed Q410 and Q411.

REV. M - To improve intermodulation performance. Changed Q1 and R3 in A430 (19B216356G1) HI IF Amplifier assy.

REV. F - IF, AUDIO AND SQUELCH BOARD 19D413129G2
To incorporate silicon diodes. Changed CR3 and CR4.

REV. G - To ensure receiver squelch action at -30°C. Changed Q10.

REV. H - To increase PA bias current. Changed R40.

REV. J - To improve Audio output stability. Added R85.

REV. K - To improve frequency response. Deleted R85 and changed C40.

REV. C - To reduce audio distortion. Changed R80.

REV. A - OSCILLATOR/MULTIPLIER BOARD A432 through A435 (19C311726G3)

To improve selectivity. Changed C8 and C14. Added L6.

REV. B - To incorporate a new transistor. Changed Q1.

TABLE OF CONTENTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MAINTENANCE MANUAL

LBI-4085

DF-1086

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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PRINTED IN U.S.A.