MOBILE RADIO

MASTR® Progress Line

132—174 MHZ RECEIVER MODELS 4ER41C10—21, 34—45 & 4ER41E10—21, 34—45 (Includes Options 7341—7344)

Maintenance Manual LBI-3867P

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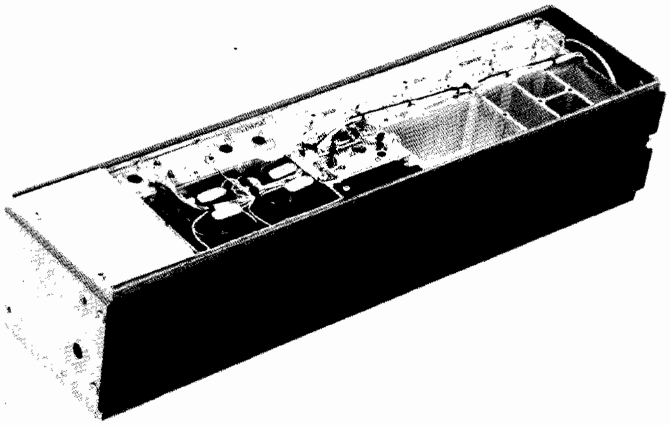


ER-41-C & E

SPECIFICATIONS *

FCC Filing Designation	**ER-41-C & E**	
Frequency Range	132—174 MHz	
Audio Output	5 watts at less than 5% distortion	
Sensitivity	Standard Receivers	Ultra-High Sensitivity Receivers
12-dB SINAD (EIA Method)	0.35 µV	0.175 µV
20-dB Quieting Method	0.5 µV	0.25 µV
Selectivity		
EIA Two-Signal Method	-90 dB (adjacent channel, 30 kHz channels)	
20-dB Quieting Method	-100 dB at ±15 kHz	
Spurious Response		
Standard Receiver	-100 dB	
UHS Receiver	-94 dB	
First Oscillator Stability		
Type ER-41-C	±.0005% (-30°C to +60°C)	
Type ER-41-E	±.0002% (-30°C to +60°C)	
Modulation Acceptance	±7 kHz (narrow-band)	
Squelch Sensitivity		
Critical Squelch		
Standard Receiver	0.2 µV	
UHS Receiver	0.1 µV	
Maximum Squelch	Greater than 20-dB quieting (less than 1.5 µV)	
Intermodulation (EIA)		
Standard Receiver	-80 dB	
UHS Receiver	-75 dB	
Maximum Frequency Separation	0.4%	
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.

TABLE OF CONTENTS

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 Receiver Types ER-41-C and ER-41-E are double conversion, superheterodyne FM receivers designed for operation on the 132-174 megahertz band. The Type ER-41-C receivers contain a standard crystal oscillator board with a frequency stability of ±0.0005%. The Type ER-41-E receivers contain an optional Integrated Circuit Oscillator Module (ICOM) with a frequency stability of ±0.0002%. Standard and ultra-high sensitivity (UHS) versions are available for both types.

The receiver is of single-unit construction and is completely housed in an aluminum casting for maximum shielding and rigidity. The top compartment of the casting contains the RF, oscillator, converter, and 1st amplifier stages. The bottom portion of the casting contains the IF audio and squelch board, and the optional Channel Guard encode-decode 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 4EX8K10, 11 for ease of alignment and servicing. The Test Set meters the oscillator, multiplier, and limiter stages as well as the discriminator, and regulated 10 Volts.

RF PREAMPLIFIER (A321)

RF Preamplifier A321 is used only in ultra-high sensitivity (UHS) receivers and consists of RF Amplifier Q1.

The preamplifier uses a dual gate MOS FET as the active device. The MOS FET may be considered a semiconductor current path (or channel) whose resistance is varied by a voltage applied between the "gate" and "source" terminals.

RF from the antenna is coupled through C1 to Gate 3 terminal of MOS FET Q1. Q1 operates as a grounded-gate amplifier.

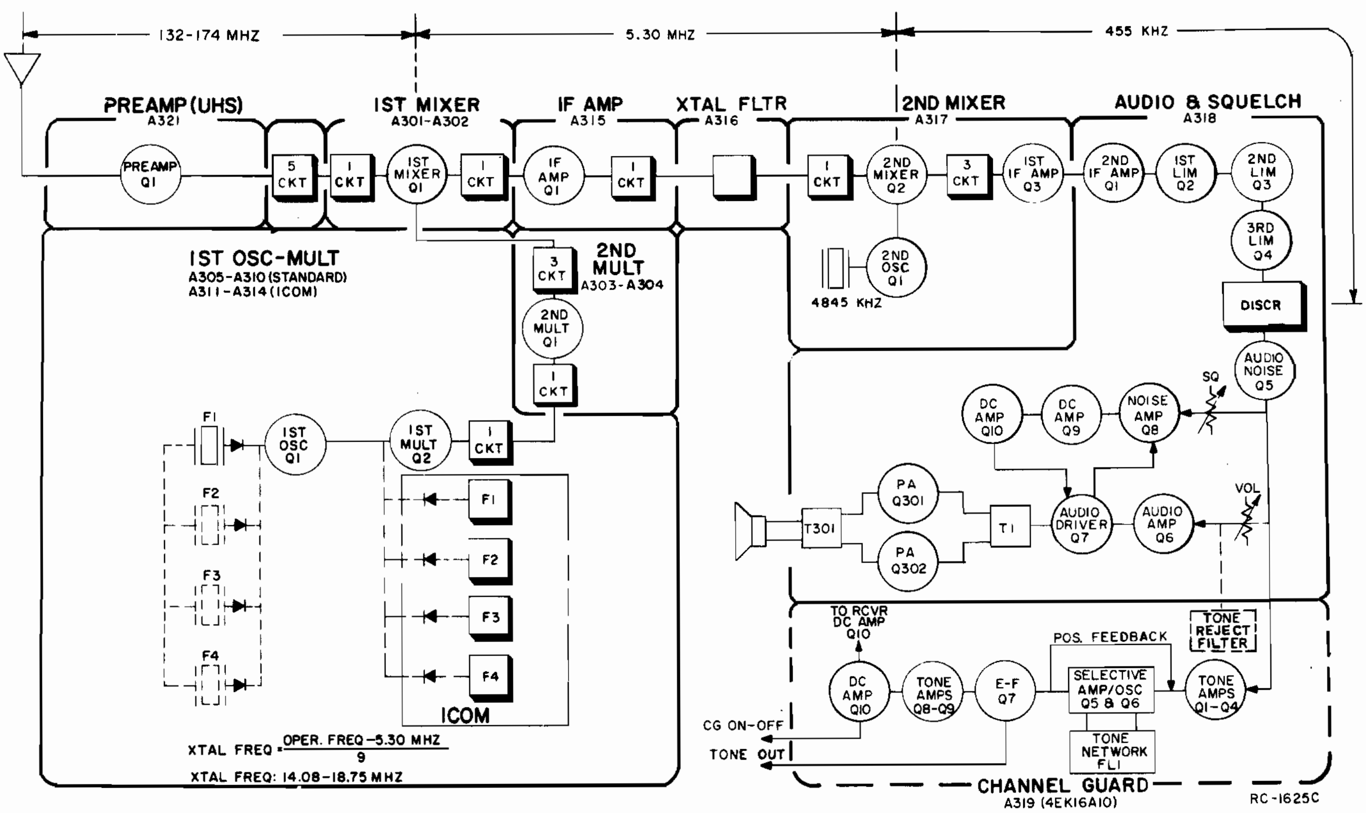


Figure 1 - Receiver Block Diagram

This method of operation provides a low impedance input to the amplifier. The amplified output is taken from the "drain" terminal and coupled through C6 to the input of five helical resonators.

HELICAL RESONATORS

In standard receivers, five helical resonators (L301/L302 through L309/L310) provide the RF selectivity in the front end. RF cable W441 connects the RF signal from the antenna to a tap on L301/L302. In UHS receivers, the five helical resonators provide additional RF selectivity of the signal from the amplifier.

The tap on L301/L302 is positioned to provide the proper impedance match to the antenna or preamplifier. The output of the helical resonators is coupled through C3 to the 1st Mixer Assembly.

STANDARD OSCILLATOR/MULTIPLIER (A305-A310)

The receiver 1st oscillator operates in a transistorized Colpitts oscillator circuit. The oscillator crystal operates in a fundamental mode at a frequency of approximately 13 to 18 megahertz. The crystal is cut to provide temperature compensation at the high end of the temperature range and is thermistor compensated at low temperatures. This provides ±.0005% frequency stability as soon as the receiver is energized--without the warm-up time required by crystal ovens or warmers.

In single frequency receivers, bias for the oscillator transistor is obtained by a jumper from H1 to H2 on the oscillator board.

In multi-frequency receivers, a diode is connected in series with the crystal, and up to three addition crystal circuits can be added. The 10-Volt jumper is removed and the proper frequency is selected by switching the desired crystal circuit to +10 Volts by means of a frequency selector switch on the control unit.

Switching the +10 Volts to the crystal circuit forward biases the diode and reduces its impedance. This applies the crystal frequency to the base of oscillator transistor Q1. Feedback for the oscillator is developed across C21. The output is coupled to the base of 1st multiplier Q2.

The output of the 1st multiplier (tripler Q2) is transformer-coupled (T1/T2) to the 2nd multiplier assembly. The 1st multiplier tank is tuned to three times the crystal frequency, and is metered at centralized metering jack J442-4 through metering network CR5, R16, R5 and C33.

OSCILLATOR/MULTIPLIER BOARD WITH ICOM (Options 7341 - 7344)

Oscillator/Multiplier Boards A311 thru A314 use ICOM Module Model 4EG26A11. See the chart below:

OSCILLATOR BOARD	OPTION NUMBER	NUMBER OF FREQUENCIES
A311	7341	1
A312	7342	2
A313	7343	3
A314	7344	4

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.

In single-frequency receivers, +10 Volts for operating the ICOM is obtained by a jumper from H1 to H2. With the ICOM operating, diode CR1 is forward biased and the oscillator output is applied to 1st multiplier Q2.

The output of the 1st multiplier (tripler Q2) is transformer-coupled (T1/T2) to the 2nd multiplier assembly. The 1st multiplier tank is tuned to three times the crystal frequency, and is metered at centralized metering jack J442-4 through metering network CR5, R16, R5 and C33.

In multi-frequency receivers, up to three additional ICOM modules can be plugged into the board. The 10-Volt jumper is removed and the proper frequency is selected by switching the desired ICOM to +10 Volts by means of a frequency selector switch on the control unit.

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.

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

GENERAL ELECTRIC*
U.S.A.

2ND MULTIPLIER (A303/A304)

The 1st multiplier output is transformer-coupled through A303-T1/T2 to the base of 2nd multiplier A303-Q1. Following the 2nd multiplier are two resonant L-C circuits and a helical resonator tuned to nine times the crystal frequency. The output is taken from a tap on L311/L312 and applied to the 1st mixer.

1ST MIXER (A301/A302)

The 1st mixer uses a Field-Effect Transistor (FET) as the active device. (Fig. 2).

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).

In mixer A301/A302, RF from the helical resonators is applied to the gate of Q1, and injection voltage from the 2nd multiplier is applied to the source. The mixer output is taken from the drain with the output tuned to the 5.3 MHz high IF frequency.

The FET has voltage-controlled characteristics, and may be compared to a vacuum tube in operation (see Figure 2B).

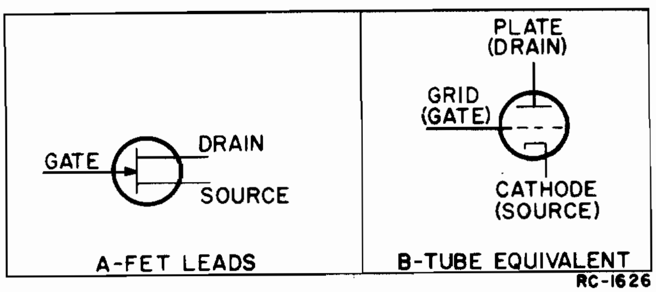


Figure 2 - FET Nomenclature

HI IF AMPLIFIER (A315) and CRYSTAL FILTER (A316)

A series-resonant circuit (A301-L3 and A315-C1) couples the mixer output to the emitter of the high IF amplifier A315-Q1. The transistor is connected as a grounded-base amplifier which provides a low impedance for the mixer input. The amplifier output is coupled through a transformer T1 to the crystal filter.

The highly selective crystal filter (A316) provides the major selectivity for the receiver. The output of the filter is coupled through impedance-matching transformer A317-T1 to the base of the 2nd mixer.

2ND OSCILLATOR, 2ND MIXER AND 1ST LO IF AMPLIFIER (A317)

A317-Q2 operates in a Colpitts oscillator circuit, with feedback supplied through C4. The oscillator low-side injection voltage (4845 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 Q317-Q3. The output of A317-Q3 is R-C coupled to the base of the 2nd low IF amplifier.

2ND LO IF AMPLIFIER AND LIMITERS (A318)

Additional amplification of the low IF signal going to the limiter stages is provided by 2nd low IF amplifier A318-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 (A316-Q2, -Q3 and -Q4). The 1st limiter is metered at J442-3 through metering network C20, CR4 and R26.

DISCRIMINATOR (A318)

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 C16 and R23.

AUDIO - NOISE AMPLIFIER (A318)

The discriminator output is coupled through a low-pass filter (C16, C18, R21 and R22) 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 control, SQUELCH control, and Channel Guard input. The stage also provides power gain.

AUDIO AMPLIFIERS (A318)

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, C24, 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.

Q301 and Q302 operate as a push-pull, Class AB audio PA stage. The PA output is coupled through audio transformer T301 to the loudspeaker. The yellow and white tertiary windings of T301 supply balanced feedback to the collector of Q7 to minimize distortion.

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 Q301 and Q302 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 (A318)

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 C30, C31 and R45, as well as C34 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 (unsquelches), 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 R53 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 R53 ~~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 R53 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

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 (A319)

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 (A319)

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 A318-Q5 and is fed through A319-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 A318-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 A318-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 (A318-Q10). The receiver noise squelch circuit continues to operate until a carrier quiets the receiver.

A tone rejection filter connected in parallel with A318-J12 (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 (A320) that is identical to the filter described above is available for use in two-way radios with transmitter Channel Guard only.

MAINTENANCE

DISASSEMBLY

To service the receiver from the top—

1. Pull locking handle down and pull radio about one inch out of mounting frame.

2. Pry up cover at rear of receiver.

3. Slide cover back and lift off.

To service the receiver from the bottom—

1. Pull locking handle down. Pull radio out of mounting frame.

2. Remove screws in bottom cover. Pry up cover at back of receiver.

3. Slide cover back and lift off.

To remove the receiver from the system frame—

1. Loosen the two Phillips-head retaining screws in front casting (see Figure 3), and pull casting away from system frame.

2. Remove the four screws in the back cover.

3. Remove the two screws holding the receiver at each end of the system frame.

4. Disconnect the antenna jack and the 20-pin connector from the front of the receiver, and slide the unit out of the system frame.

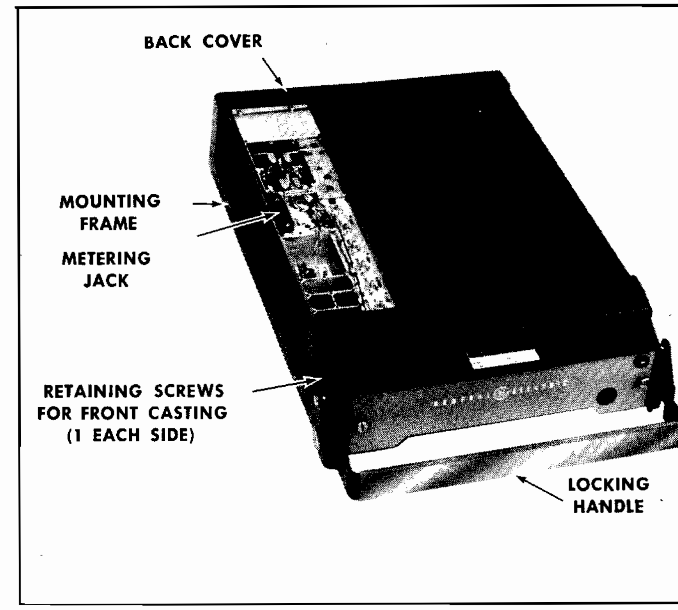


Figure 3 - Removing Top Cover

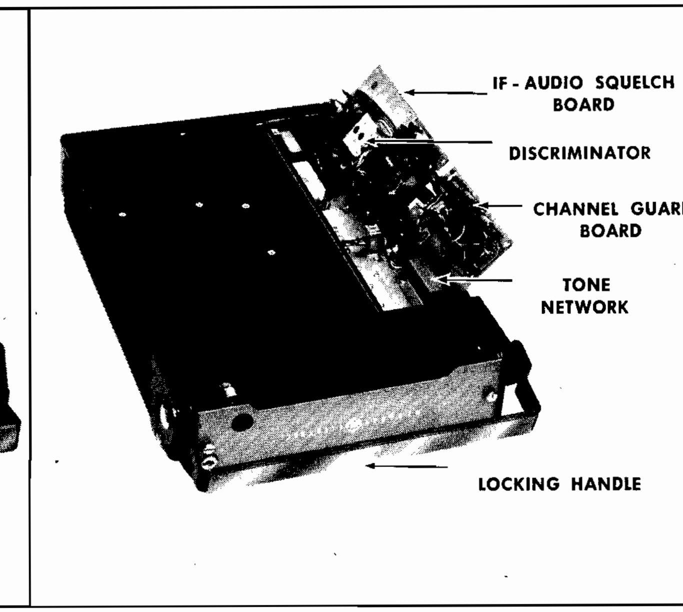
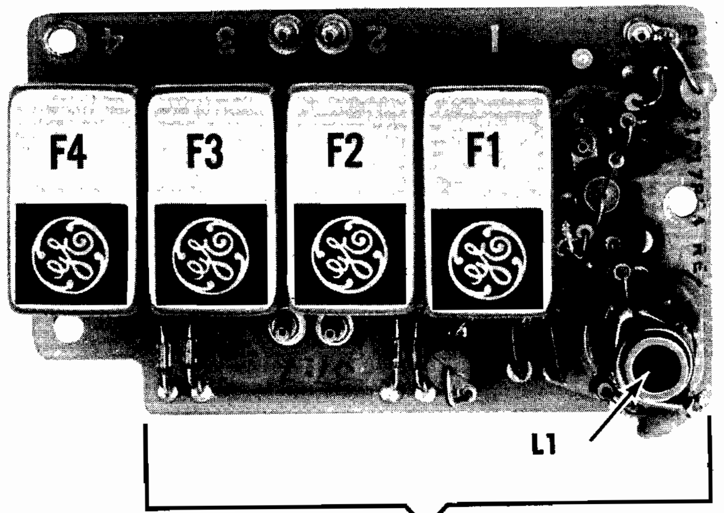


Figure 4 - Removing Bottom Cover



ICOM FREQUENCY 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 42 to 56.25 MHz frequency range. The counter should have an accuracy of 0.4 part-per million (PPM).
2. Coaxial cable with test loop as described in Figure 15.
3. Mercury thermometer.

PROCEDURE:

1. Check ICOM temperature by taping the mercury thermometer to the side of the ICOM.
2. Connect the coaxial cable to the frequency counter. Then place the 4-turn test loop over L1 on the 1st OSC/MULT board.
3. If the ICOM temperature is 80°F (±4°F) or 26.5°C (±2°C), the frequency indication on the counter should be 3 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 6 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 3 and then multiply this figure by the correction factor (from Figure 6) observing the sign (±) given to the correction factor.
   c. The frequency measured at L1 should be 3 times the ICOM frequency ± the correction factor. Adjust the ICOM trimmer (if required) to obtain this frequency.

EXAMPLE

ICOM Frequency	-	16.948,148 MHz
ICOM Color Dot	-	Green
Ambient Temperature	-	35°C (95°F)
Correction Factor	-	-1.15 PPM

Multiply ICOM Frequency by 3; (16.948,148 MHz x 3 = 50.844,444 MHz)

Multiply preceding figure by correction factor; (50.844 MHz x -1.15 PPM = -58.47 hertz (or -58 hertz)

Set the frequency measured at L1 for 50.844,386 MHz;

50.844,444
\- 58
50.844,386

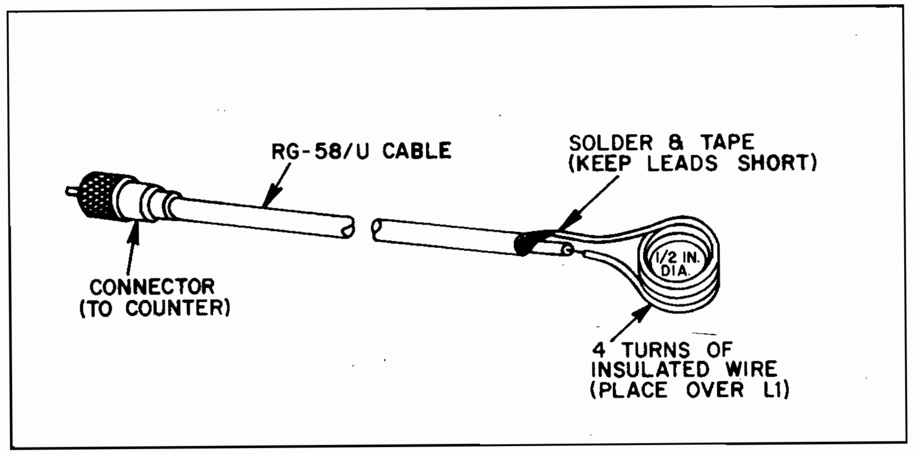


Figure 5 - Coaxial Cable and Test Loop

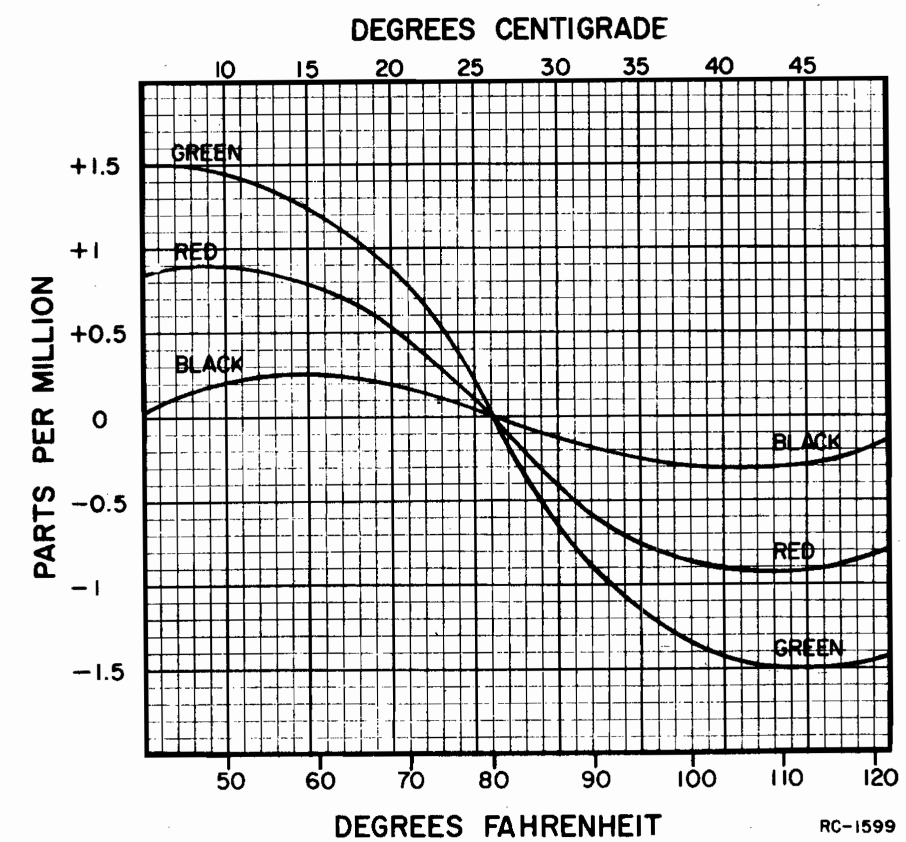


Figure 6 - ICOM Correction Curves

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A10, 4EX8K10, 11, station test meter panel or 20,000 ohms-per-Volt multimeter.
2. A 132-174 MHz signal source. Connect a one-inch piece of insulated wire no larger than 0.065 inch to generator output probe.

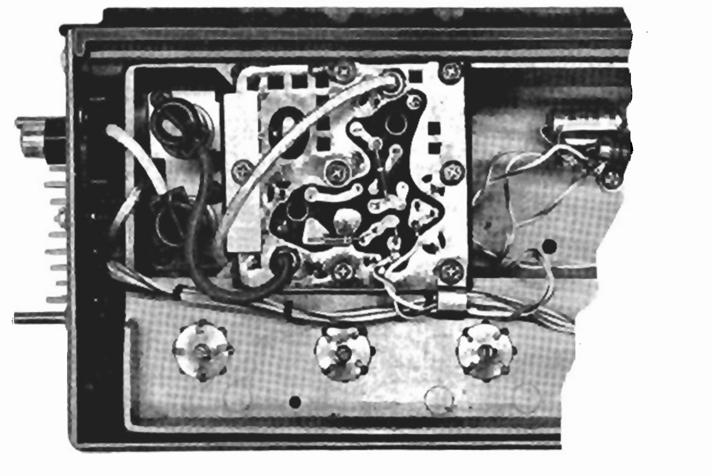
PRELIMINARY CHECKS AND ADJUSTMENTS

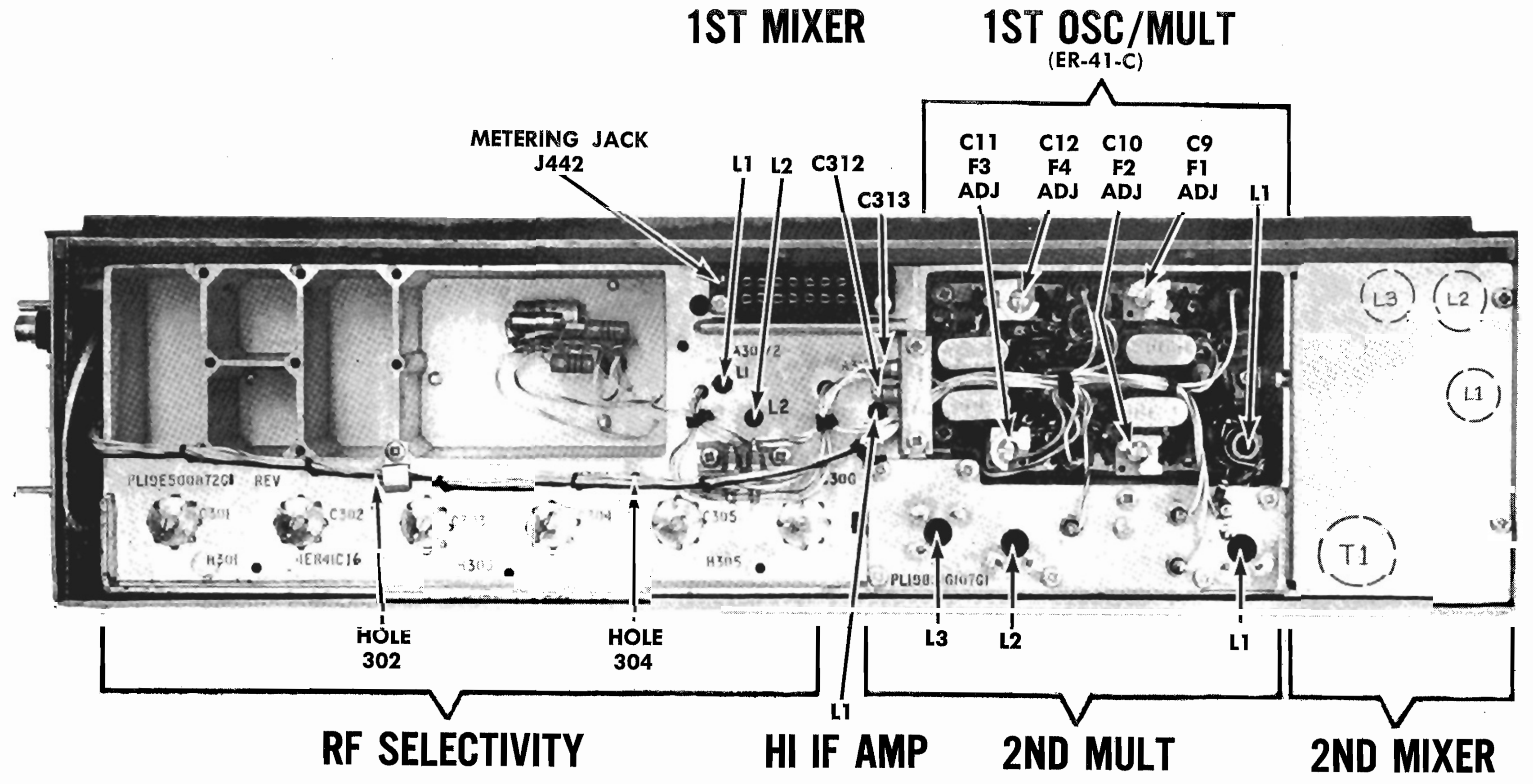
1. Connect Test Set to receiver centralized metering jack J442 and set meter sensitivity switch to the TEST 1 or 1-Volt position.
2. With Test Set in position J, check for regulated +10 Volts. If using Multimeter, measure from C312 to C313.
3. If using Multimeter, connect the positive lead to J442-16 (ground).
4. Disable the Channel Guard.

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	L1 (on 1st OSC/MULT) and L1 (on 2nd MULT)	See Procedure	Tune L1 (1st OSC/MULT) for maximum meter reading. Then tune L1 (2nd MULT) for minimum meter reading.
2.	E (MULT-2)	Pin 5	L1 (on 1st OSC/MULT) and L1, L2 and L3 (on 2nd MULT)	See Procedure	Tune L1 (1st OSC/MULT) and L1 and L2 (2nd MULT) for maximum meter reading. Then tune L3 (2nd MULT) for minimum meter reading.
3.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal into Hole 305. Adjust the signal generator for discriminator zero.
4.	B (2nd IF AMP)	Pin 2	L2 and L3 (on 2nd MULT) and C306 (on RF selectivity)	Maximum	Apply an on-frequency signal as above. Tune L2, L3 and C306 for maximum meter reading, keeping signal below saturation.
			FREQUENCY ADJUSTMENT		
5.	A (DISC)	Pin 10	C9 on 1st OSC/MULT (C10, C11 and C12) for multi-frequency	Zero	Apply an on-frequency signal to the antenna jack. Tune C9 for zero discriminator reading. In multi-frequency units, tune C10, C11 and C12 as required. —— NOTE —— For proper frequency control of the receiver, it is recommended that all frequency adjustments be made when the equipment is at a temperature of approximately 75°F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 50° to 90°F.

PRE-AMP (UHS REC)





IF-AUDIO & SQUELCH

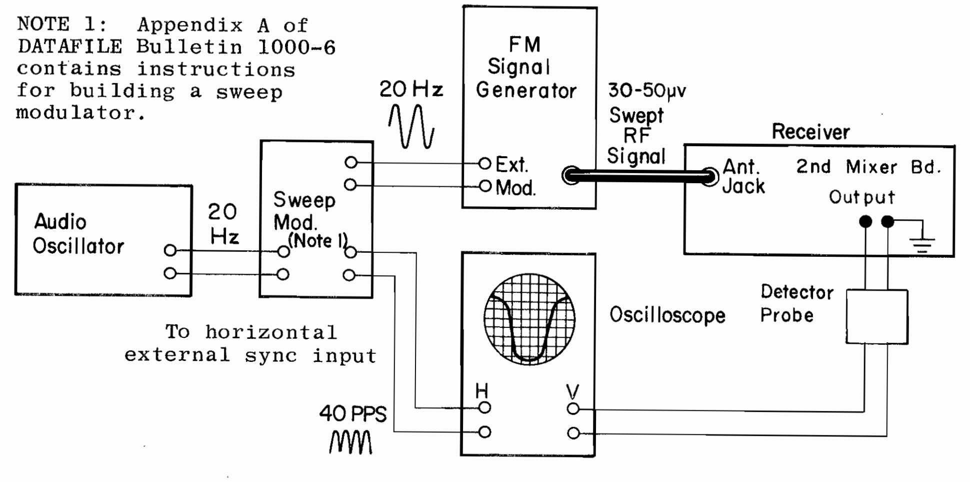


Figure 7 - Test Setup for 20-Hz Double-Trace Sweep Alignment

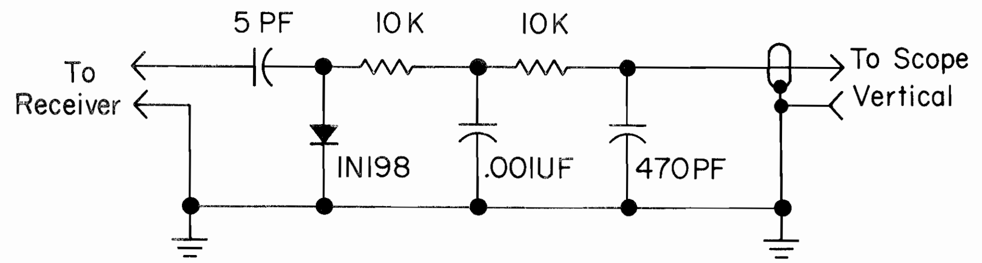


Figure 8 - Detector Probe for Sweep Alignment

COMPLETE RECEIVER ALIGNMENT

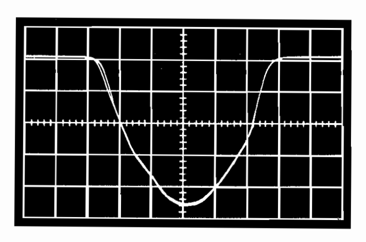
EQUIPMENT REQUIRED

1. GE Test Set Models 4EX3A10, 4EX8K10, or -11, station test meter panel, or 20,000 ohms-per-Volt multimeter.
2. A 450 to 460 kHz source (GE Test Set Model 4EX7A10), and 132-174 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. For a large change in frequency or a badly mis-aligned receiver, set crystal trimmer C9 on 1st OSC/MULT board (A305-A310 only) to mid-capacity. In multi-frequency receivers set C10, C11 or C12 to mid-capacity as required.
3. In multi-frequency receivers where the maximum frequency spacing is less than 200 kHz, align the unit on channel F1. If the frequency spacing is greater than 200 kHz, align the receiver on the center frequency.
4. With Test Set in position J, check for regulated +10 Volts. If using Multimeter, measure from C312 to C313.
5. If using Multimeter, connect the positive lead to J442-16 (ground).
6. Disable the Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE Test Set or Meter Panel	METERING 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, MULTIPLIERS & 1ST MIXER		
3.	D (MULT-1)	Pin 4	L1 (on 1st OSC/MULT) and L1 (on 2nd MULT)	See Procedure	Tune L1 (1st OSC/MULT) for maximum meter reading. Then tune L1 (2nd MULT) for minimum meter reading.
4.	E (MULT-2)	Pin 5	L1 (on 1st OSC/MULT) and L1, L2 and L3 (on 2nd MULT)	See Procedure	Tune L1 (1st OSC/MULT) for L1 and L2 (2nd MULT) for maximum meter reading. Then tune L3 (2nd MULT) for minimum meter reading.
5.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal into Hole 305. Adjust the signal generator for discriminator zero.
6.	B (2nd IF AMP)	Pin 2	L2 and L3 (on 2nd MULT) and C306 (on RF SELECTIVITY)	Maximum	Apply an on-frequency signal as above. Tune L2, L3 and C306 for maximum meter reading, keeping signal below saturation.
7.	B (2nd IF AMP)	Pin 2	L2 and L1 (on 1st MIXER A301/A302)	Maximum	Apply an on-frequency signal into Hole 304, and tune L2 and L1 for maximum meter reading, keeping signal below saturation.
			RF SELECTIVITY		
8.	B (2nd IF AMP)	Pin 2	C305, C304, C303 and C302	Maximum	Apply an on-frequency signal in the Hole shown below, keeping the signal below saturation. Tune C302 through C305 for maximum meter reading as shown below: Insert Generator Probe In: — Tune 1. Hole 304 — C305 2. Hole 303 — C304 3. Hole 302 — C303 4. Hole 301 — C302
			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 9, 10, and 11. — NOTE — Refer to DATAFILE BULLETIN 1000-6 IF Alignment of Two-Way Radio FM Receivers for helpful suggestions on how to determine when IF alignment is required.		
9.	B (2nd IF AMP)	Pin 2	L3, L2, L1, T1 (2nd Mixer) and L1 (Hi IF AMP)	Maximum	Apply on-frequency, unmodulated signal and tune L3, L2, L1, T1 (2nd mixer) and L1 (Hi IF AMP) for maximum meter reading, keeping signal below saturation.
10.			L3, L2, L1, T1 (2nd Mixer) and L1 (Hi IF AMP) 		Connect scope, signal generator, and detector as shown in Figure 7. Set signal generator level for 30-50 μv and modulate with 10 kHz at 20 Hz. With detector at the collector of Q3 (2nd Mixer board output), tune for double trace as shown on scope pattern.
11.	A (DISC)	Pin 10		See Procedure	Check to see that discriminator idling voltage is within ±.05 Volt of zero with no signal applied. Check to see that modulation acceptance bandwidth is between ±7 and 9 kHz.
			FREQUENCY ADJUSTMENT		
12.	A (DISC)	Pin 10	C9 (on 1st OSC/MULT) C10, C11 and C12 for multi-frequency	Zero	Apply an on-frequency signal to the antenna jack. Tune C9 for zero discriminator reading. In multi-frequency units tune C10, C11 or C12 as required. — NOTE — For proper frequency control of the receiver, it is recommended that all frequency adjustments be made with the equipment at a temperature of approximately 75°F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 50° to 90°F.

ALIGNMENT PROCEDURE

132—174 MHz MASTR RECEIVER
MODELS 4ER41C10-45 &
4ER41E10-45

TEST PROCEDURES

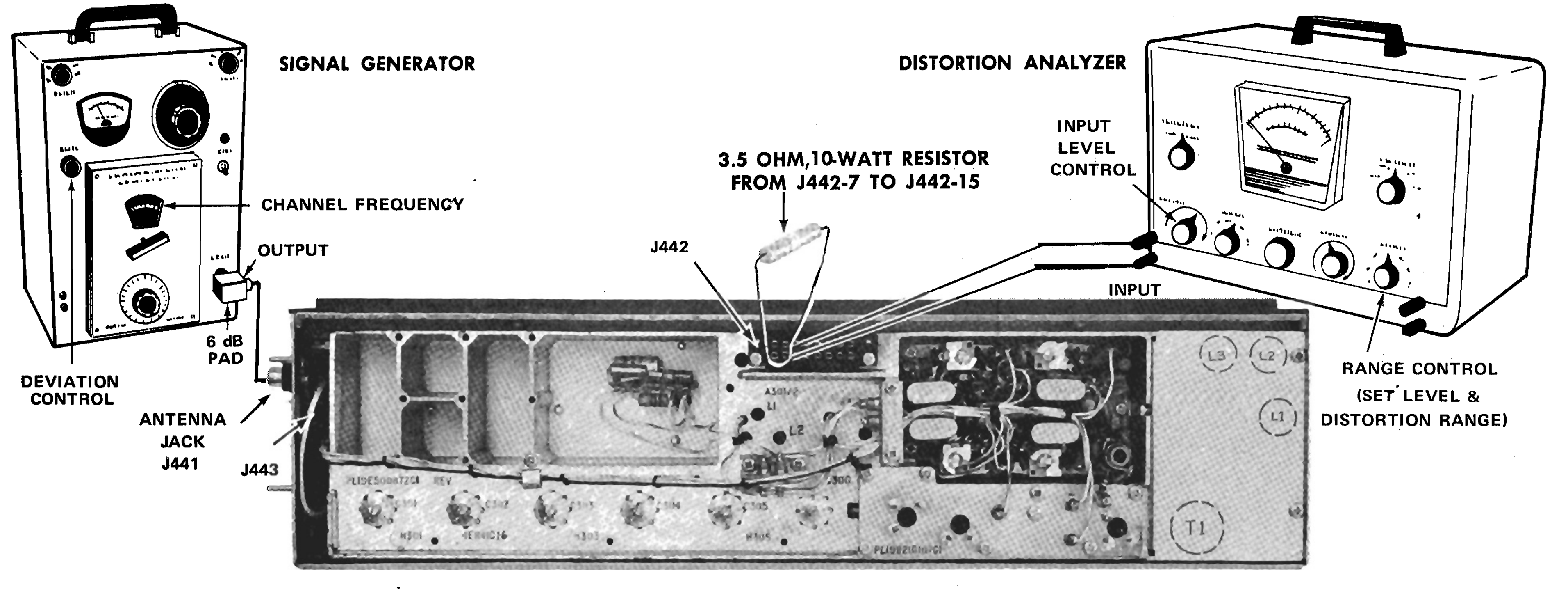
These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, limiter not operating properly, and low gain. By following the sequence of test steps starting with Step 1, the defect can be quickly localized. Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

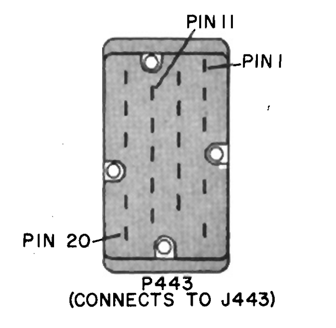
- Distortion Analyzer similar to: Heath IM-12
- Signal Generator similar to: Measurements M-560
- 6-dB attenuation pad, and 3.5-ohm, 10-watt resistor

PRELIMINARY ADJUSTMENTS

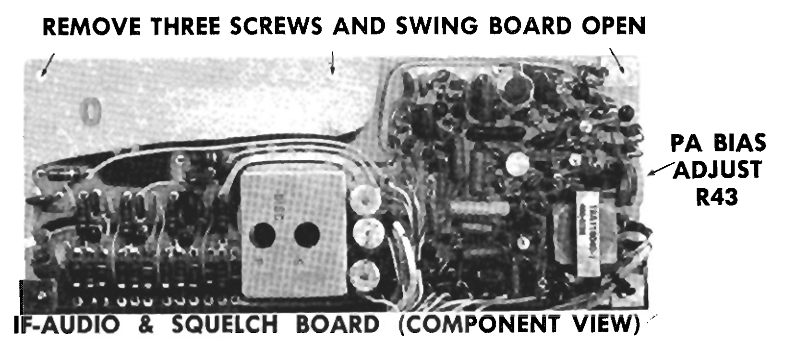
1. Connect the test equipment to the receiver as shown for all steps of the receiver Test Procedure.
2. Turn the SQUELCH control fully clockwise for all steps of the Test Procedure.
3. Turn on all of the equipment and let it warm up for 20 minutes.



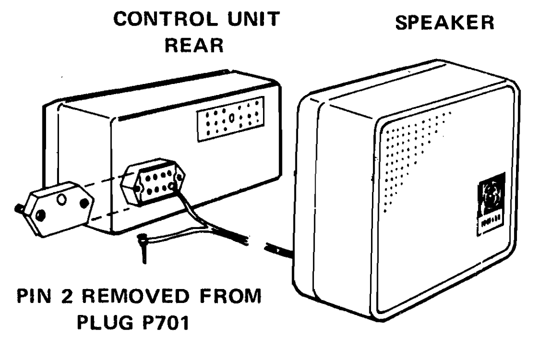
COMPONENT TOP VIEW



P443 (CONNECTS TO J443)



IF-AUDIO & SQUELCH BOARD (COMPONENT VIEW)



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 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.

C. Adjust the VOLUME control for five-watt output (4.18 VRMS using the Distortion Analyzer as a VTVM).

D. Make distortion measurements according to manufacturer's instructions. Reading should be less than 5%. If the receiver sensitivity is to be measured, leave all controls and equipment as they are.

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)

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 J441.

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

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

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

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

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

SERVICE CHECK

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

STEP 3
MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

If STEPS 1 and 2 check out properly, measure the bandwidth as follows:

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

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

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

D. The deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±7 kHz (but less than ±9 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-QUICKCHECKS

TEST SET CHECKS

These checks are typical voltage readings measured with GE Test Set Model 4EX3A10 in the Test 1 position, or Model 4EX8K10 or 11 in the 1-volt position.

Metering Position	Reading with No Signal in	Reading with 1 μv unmodulated input
A Disc idling	Less than ±.05 VDC	
B 2nd IF	.05 VDC	0.2 VDC
C 1st Lim	0.6 VDC	0.8 VDC
D Mult 1	0.7 VDC	
E Mult 2	1 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 and resistance readings of 1st Oscillator/Multiplier Q1/Q2. • Check crystal Y1.
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 and resistance readings of 1st Mixer, HI IF Amp and 2nd Mixer. • Make SIMPLIFIED GAIN CHECKS (STEP 2A).
LOW AUDIO	• Check Audio PA (Q301 & Q302) 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). • Check voltage and resistance readings on Channel Guard board.
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 and resistance 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:

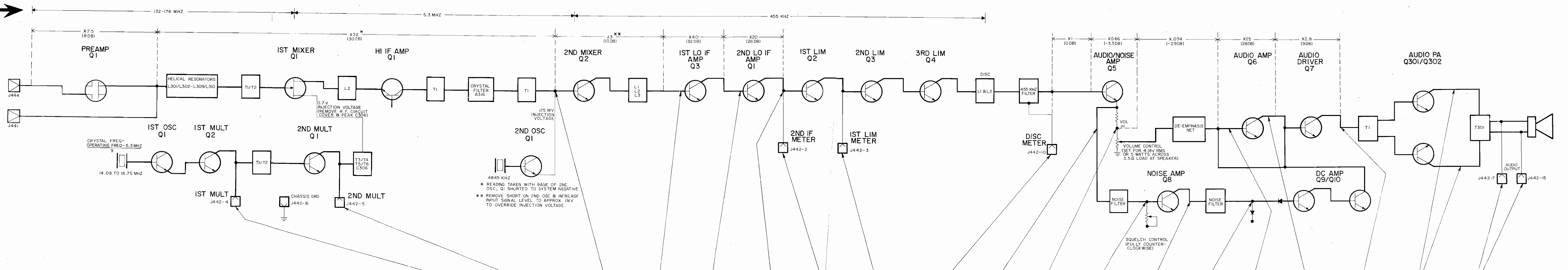
1. RF Voltmeter (Similiar to Boonton Model 91-CA or Millivac Type MV-18 C).
2. Signal on receiver frequency (below saturation). Correct frequency can be determined by zeroing the discriminator. Use 1,000 Hertz signal with 3.3 kHz deviation for audio stage.

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 and 2nd MULT which reference 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 3.3KHZ DEVIATION)	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL
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%													CONNECT VTVM OR SCOPE ACROSS 3.5Ω LOAD BETWEEN J442-7 AND J442-15 WITH SPEAKER DISCONNECTED.
READING	5 VDC GE TEST SET (POS. D. 0.7V)	2.5 VDC GE TEST SET (POS. E 1V)	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 GE TEST SET (POS B. 0.3V)	-2 VDC GE TEST SET (POS. C 0.6V)	0.8 VAC	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

STEP 2B-AUDIO & SQUELCH WAVEFORMS

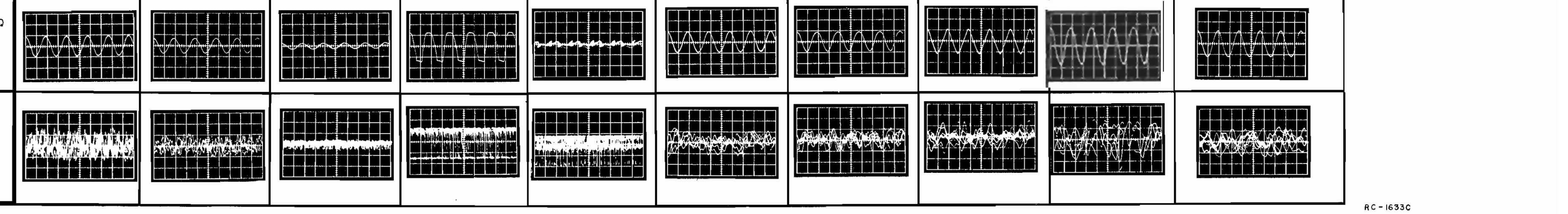
EQUIPMENT REQUIRED:

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.

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 3.3 KHZ DEVIATION)										
NOISE WAVE FORM (NO SIGNAL INPUT)										



TROUBLE SHOOTING PROCEDURE

132—174 MHz MASTR RECEIVER
MODELS 4ER41C10-45 & 4ER41E10-45

OUTLINE DIAGRAM

132—174 MHz MASTR RECEIVER
MODELS 4ER41C10-45 & 4ER41E10-45

(19R621238, Rev. 30)

Issue 15

PARTS LIST

LB13677P

132-174 MHz RECEIVER
MODELS 4ER41C10-31, 34-45
MODELS 4ER41E10,11, 14-17,20,21
34,35, 38-41,44,45

SYMBOL	GE PART NO.	DESCRIPTION
A301 and A302		FIRST RF AMPLIFIER A301 19B216077G1 132-150.8 MHz; A302 19B216077G2 150.8-174 MHz
		- - - - - - - - - CAPACITORS - - - - - - - - -
C4	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C5*	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		Earlier than REV A:
	5491189P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C6*	5490448P2	Variable, ceramic: approx 5 to 25 pf, 350 VDCW, temp coef 0 PPM; sim to Erie Style 557-38. Deleted by REV D.
C7*	7489162P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
		In Models of REV C and earlier:
	5496218P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C8	5496203P149	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C9	5491001P130	Phen: 3.3 pf ±5%, 500 VDCW.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L2*	19B216076G1	Coil.
		In Models of REV C and earlier:
	19A137115G1	Coil.
L3	7488079P8	Choke, RF: 1 µh ±10%, 0.3 ohm DC res max; sim to Jeffers 4421-4K.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1*	19A116600P1	N Type, field effect; sim to Type 3N4416.
		In 19E500872G1 of REV K and earlier: In 19E500872G2 of REV P and earlier:
	19A116134P1	N Channel, field effect.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P243J	Composition: 2.4K ohms ±5%, 1/4 w.
R2	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R3*	3R152P103K	Composition: 10K ohms ±10%, 1/4 w. Deleted by REV D.
R4	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R5*	3R77P231K	Composition: 230 ohms ±10%, 1/2 w. Added by REV G.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19B216110G1 T2 19B216110G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	5496218P235	Ceramic disc: 4.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C2*	5496218P234	Ceramic disc: 3.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		In REV G and earlier:
	5491238P13	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef -80 ±120 PPM.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
C3	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B216109P6	Coil.
R6*	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w. Added to G1 by REV B. Added to G2 by REV F.
	5491798P5	Tuning slug.
A303* and A304*		SECOND MULTIPLIER A303 19B216039G1 132-150.8 MHz; A304 19B216039G2 150.8-174 MHz (Added to 19E500872G1 by REV N) (Added to 19E500872G2 by REV P)
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	5491601P107	Phenolic: 0.27 pf ±5%, 500 VDCW.
C4	5496203P133	Ceramic disc: 100 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C5	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C6	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C7	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C9	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C14	5491601P16	Phenolic: 0.62 pf ±10%, 500 VDCW.
C15	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C17	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L4	19B209436P111	Coil, RF: 0.68 µh ±10%, 0.54 ohms DC res max; sim to Jeffers 4425-4.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115440P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R2	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R3	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19B216109G3 T2 19B216109G4
		- - - - - - - - - CAPACITORS - - - - - - - - -
C2	5496218P255	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -80 PPM.
C3	5496218P252	Ceramic disc: 36 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B216097P6	Coil.
	5491798P5	Tuning slug.
T3 and T4		COIL ASSEMBLY T3 19B216109G3 T4 19B216109G4
		- - - - - - - - - CAPACITORS - - - - - - - - -
C10	5496218P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
C11	5496218P238	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	19A115250P1	Silicon.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L2	19B216106P6	Coil.
	5491798P5	Tuning slug.
T5 and T6		COIL ASSEMBLY T5 19B216109G1 T6 19B216109G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
C12	5496218P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C13	5496218P239	Ceramic disc: 8.0 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C16	5496218P770	Ceramic disc: 200 pf ±5%, 500 VDCW, temp coef -750 PPM.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L3	19B216103P6	Coil.
	5491798P5	Tuning slug.
A305 thru A310		FIRST OSCILLATOR A305 19B204419G1 132-150.8 MHz 1 FREQ; A306 19B204419G4 132-150.8 MHz 2 FREQ; A307 19B204419G2 132-150.8 MHz 4 FREQ; A308 19B204419G3 150.8-174 MHz 1 FREQ; A309 19B204419G5 150.8-174 MHz 2 FREQ; A310 19B204419G6 150.8-174 MHz 4 FREQ
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 thru C4	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C5 thru C8	5496219P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C9 thru C12	5491271P106	Variable, subminiature: approx 2.1-10.7 pf, 750 v peak; sim to EF Johnson 189.
C13 thru C16	5496218P240	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C17 thru C20	19C300685P293	Ceramic disc: 9 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C21	5496219P771	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -750 PPM.
C23	5494481P114	Ceramic disc: 2000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C24	5490008P21	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C25	5496219P467	Ceramic disc: 130 pf ±5%, 500 VDCW, temp coef -220 PPM.
C26 thru C28	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C31	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115603P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J5	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L2 and L3	7488079P16	Choke, RF: 10 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 and Q2	19A115330P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1 thru R4	3R152P562J	Composition: 5600 ohms ±5%, 1/4 w.
R5 thru R8	3R152P104K	Composition: 0.1 megohm ±10%, 1/4 w.
R9	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R10	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R11 and R12	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R13	3R152P151J	Composition: 150 ohms ±5%, 1/4 w.
R14	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R15	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R19	3R152P360J	Composition: 36 ohms ±5%, 1/4 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1 thru RT4	19B209284P5	Disc: 43 ohms nominal, color code green.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19B204421G1 T2 19B204421G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
C29	5496218P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C30	5496218P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C32	5496218P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C33	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR5	19A115250P1	Silicon.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	19A121093P1	Coil. Includes tuning slug 5491798P5.
		- - - - - - - - - RESISTORS - - - - - - - - -
R16	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
	5491798P5	Tuning slug.
		- - - - - - - - - SOCKETS - - - - - - - - -
XY1 thru XY4		Refer to Mechanical Parts (RC-1637).
		- - - - - - - - - CRYSTALS - - - - - - - - -
		NOTE: When reordering give GE Part No. and specify exact freq needed.
		Crystal freq = $\frac{(OF - 5.30\ MHz)}{9}$
Y1 thru Y4	19B206576P4	Quartz: freq range 14077.777 to 16166.666 KHz, temp range -30°C to +85°C. (132-150.8 MHz)
Y1 thru Y4	19B206576P5	Quartz: freq range 16166.667 to 18744.444 KHz, temp range -30°C to +85°C. (150.8-174 MHz)

SYMBOL	GE PART NO.	DESCRIPTION
A311 thru A314		FIRST OSCILLATOR A311 19B216178G1 132-150.8 MHz 1 FREQ; A312 19B216178G2 132-150.8 MHz MULT-FREQ; A313 19B216178G3 150.8-174 MHz 1 FREQ; A314 19B216178G4 150.8-174 MHz MULT-FREQ
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 thru C6	5494481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR4	19A115250P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J6	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L2 and L3	7488079P16	Choke, RF: 10 µh ±10%, 0.60 ohms DC res max; sim to Jeffers 4421-7K.
L4	7488079P8	Choke, RF: 2.20 µh ±10%, 1 ohm DC res max; sim to Jeffers 4411-12K.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115330P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P272J	Composition: 2700 ohms ±5%, 1/4 w.
R2	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R3	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R4	3R152P151J	Composition: 150 ohms ±5%, 1/4 w.
R5	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19B204421G1 T2 19B204421G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
C29	5496218P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C30	5496218P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C32	5496218P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C33	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR5	19A115250P1	Silicon.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	19A121093P1	Coil. Includes tuning slug 5491798P5.
		- - - - - - - - - RESISTORS - - - - - - - - -
R16	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
	5491798P5	Tuning slug.
		- - - - - - - - - SOCKETS - - - - - - - - -
XY1 thru XY4	19B216043G1	Socket assembly. Includes:
	19D413071P1	Socket cavity.
	19A115834P2	Electrical contact.
		- - - - - - - - - OSCILLATORS - - - - - - - - -
		NOTE: When reordering, specify ICOM Frequency.
		ICOM Frequency = $\frac{(OF - 5.3\ MHz)}{9}$
Y1 thru Y4	4EG26A11	Integrated Circuit Oscillator Module (ICOM).
	19D413070P1	Cap, decorative.

SYMBOL	GE PART NO.	DESCRIPTION
A315		HIGH IF AMPLIFIER 19B216109G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2*	5493392P107	Ceramic, stand-off: 1000 pf +100%-0%, 500 VDCW; sim to Allen-Bradley Type SS5D.
		In Models earlier than REV B:
	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C3	5493392P108	Ceramic, stand-off: 22 pf ±10%, 500 VDCW; sim to Allen Bradley Type SS5D.
C7 and C8	19A116080P105	Polyester: 0.047 µf ±10%, 50 VDCW.
		- - - - - - - - - TERMINALS - - - - - - - - -
E1 thru E3	4029309P1	Feed-thru: 750 VRMS max, 5.5 amps; sim to Sealectro FT-SM-27.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L2*	19A116632P1	Ferrite Bead. Added to 19E500872G1 by REV K. Added to 19E500872G2 by REV L.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1*	19A115440P1	Silicon, NPN.
		In 19E500872G1 REV M and earlier: In 19E500872G2 REV N and earlier:
	19A115666P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P511J	Composition: 510 ohms ±5%, 1/4 w.
R2	3R152P332K	Composition: 3.3K ohms ±10%, 1/4 w.
R3	3R152P682K	Composition: 6.8K ohms ±10%, 1/4 w.
R4	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1		COIL ASSEMBLY 19B216103G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C4	5496218P265	Ceramic disc: 120 pf ±5%, 500 VDCW, temp coef -80 PPM.
C5	5494481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C6	5494481P11	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C9	5496218P246	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - RESISTORS - - - - - - - - -
R5	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
	5491798P7	Tuning slug.
	19A115700P2	Torridal core. (Hung in wiring)
A316		CRYSTAL FILTER 19B204616G3
		- - - - - - - - - FILTERS - - - - - - - - -
FL5	19B206692G1	Bandpass.
		- - - - - - - - - RESISTORS - - - - - - - - -
R7	3R152P562K	Composition: 5.6K ohms ±10%, 1/4 w.
R8	3R152P103K	Composition: 10K ohms ±10%, 1/4 w.
A317		SECOND MIXER 19B216119G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C2	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
C3	5494481P112	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C4 and C5	5490008P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C6	5490008P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
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.
C11	5496219P40	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C12	5496219P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C13	5496219P40	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
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.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	19C311181G3	Coil. Includes:
	4038368P1	Tuning slug.
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 - - - - - - - - -
Q1	19A115889P1	Silicon, NPN.
Q2	19A115245P1	Silicon, NPN.
Q3	19A115123P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1 and R2	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R3	3R77P512J	Composition: 5.1K ohms ±5%, 1/2 w.
R4	3R152P333K	Composition: 33K ohms ±10%, 1/4 w.
R5	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R6	3R77P332K	Composition: 3.3K ohms ±10%, 1/2 w.
R7	3R77P123K	Composition: 12K ohms ±10%, 1/2 w.
R8	3R77P622J	Composition: 6.2K ohms ±5%, 1/2 w.
R9	3R77P302J	Composition: 3K ohms ±5%, 1/2 w.
R10	3R77P202J	Composition: 2K ohms ±5%, 1/2 w.
R11	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1		COIL ASSEMBLY 19B216120G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19C301540P261	Ceramic disc: 82 pf ±5%, 200 VDCW, temp coef -80 PPM.
	5491798P3	Tuning slug.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - CRYSTALS - - - - - - - - -
Y1	19A110192G3	Quartz: freq 4845 KHz ±100 Hz at 25°C, temperature range -30°C to +75°C.
A318		IF AUDIO AND SQUELCH 19D413129G1
		- - - - - - - - - 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: .001 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 TTX.
C14 and C15	19A115680P104	Electrolytic: 50 µf +150% -10%, 25 VDCW; sim to Mallory Type TTX.
C16	5494481P112	Ceramic disc: 1000 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C17	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C18	5494481P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C19 and C20	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C21*	19A116080P3	Polyester: 0.022 µf ±20%, 50 VDCW.
		Earlier than REV A:
	19B209243P1	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.
C24*	19B209243P106	Polyester: .068 µf ±10%, 50 VDCW. Deleted by REV A.
C25	5496267P6	Tantalum: 33 µf ±20%, 10 VDCW; sim to Sprague Type 150D.
C26*	19A116080P110	Polyester: 0.33 µf ±10%, 50 VDCW.
		In REV E-M:
	19A116080P109	Polyester: 0.22 µf ±10%, 50 VDCW.
		In REV D and earlier:
	5496267P28	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		Earlier than REV A:
	19B209243P14	Polyester: 0.33 µf ±20%, 250 VDCW.
C27*	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
		In REV B and earlier:
	5496267P3	Tantalum: 33 µf ±20%, 10 VDCW; sim to Sprague Type 150D.
C28*	5496267P229	Tantalum: 0.68 µf ±10%, 35 VDCW; sim to Sprague Type 150D. Deleted by REV A.
C29*	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D. Deleted by REV A.
C30	19A116080P8	Polyester: 0.15 µf ±20%, 50 VDCW.
C31	19A116080P102	Polyester: 0.015 µf ±10%, 50 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
C32	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C33	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C34	4029003P207	Silver mica: 1830 pf ±2%, 500 VDCW; sim to Electro Motive Type DM-20.
C35	19A116080P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C36*	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
		In REV B and earlier:
	19B209243P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C37*	5496267P28	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		Earlier than REV A:
	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C38*	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D. Deleted by REV C.
		Earlier than REV A:
	5496267P14	Tantalum: 15 µf ±20%, 20 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 A-K:
	5496267P28	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		Earlier than REV A:
	19B209243P117	Polyester: 0.22 µf ±10%, 50 VDCW.
C41	5490008P129	Silver mica: 120 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C42*	19B209243P4	Polyester: 0.033 µf ±20%, 50 VDCW. Deleted by REV A.
C43*	5496267P213	Tantalum: 2.2 µf ±10%, 20 VDCW; sim to Sprague Type 150D. Deleted by REV A.
C49*	5496267P9	Tantalum: 3.3 µf ±15%, VDCW; sim to Sprague Type 150D. Added by REV A. Deleted by REV C.
C50*	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW. Added by REV A.
C51*	19A116655P22	Ceramic disc: 2700 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap. Added by REV. A.
C52*	19A116080P109	Polyester: 0.22 µf ±10%, 50 VDCW. Added by REV A.
C53* and C54*	5496267P213	Tantalum: 2.2 µf ±10%, 20 VDCW; sim to Sprague Type 150D. Added by REV A.
C55*	5496267P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Added by REV C.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	19A115250P1	Silicon.
CR3* and CR4*	19A115250P1	Silicon.
		In REV F and earlier:
	4038056P1	Germanium.
CR5 and CR6	19A115250P1	Silicon.
CR7*	19A115250P1	Silicon. Deleted by REV C.
CR8*	19A115250P1	Silicon. Added by REV A. Deleted by REV C.
		- - - - - - - 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. Includes tuning slug 7486872P7.

(CONT'D ON PAGE 14)

MODEL NUMBER	FREQ RANGE	NO. FREQ	WITH CHAN GD	UHS WITH PREAMP
4ER41C10	132-150.8	1		
4ER41C11	150.8-174	1		
4ER41C12	132-150.8	2		
4ER41C13	150.8-174	2		
4ER41C14	132-150.8	4		
4ER41C15	150.8-174	4		
4ER41C16	132-150.8	1	X	
4ER41C17	150.8-174	1	X	
4ER41C18	132-150.8	2	X	
4ER41C19	150.8-174	2	X	
4ER41C20	132-150.8	4	X	
4ER41C21	150.8-174	4	X	
4ER41C34	132-150.8	1		X
4ER41C35	150.8-174	1		X
4ER41C36	132-150.8	2		X
4ER41C37	150.8-174	2		X
4ER41C38	132-150.8	4		X
4ER41C39	150.8-174	4		X
4ER41C40	132-150.8	1	X	X
4ER41C41	150.8-174	1	X	X
4ER41C42	132-150.8	2	X	X
4ER41C43	150.8-174	2	X	X
4ER41C44	132-150.8	4	X	X
4ER41C45	150.8-174	• 4	X	X
4ER41E10	132-150.8	1		
4ER41E11	150.8-174	1		
4ER41E14	132-150.8	4		
4ER41E15	150.8-174	4		
4ER41E16	132-150.8	1	X	
4ER41E17	150.8-174	1	X	
4ER41E20	132-150.8	4	X	
4ER41E21	150.8-174	4	X	
4ER41E34	132-150.8	1		X
4ER41E35	150.8-174	1		X
4ER41E38	132-150.8	4		X
4ER41E39	150.8-174	4		X
4ER41E40	132-150.8	1	X	X
4ER41E41	150.8-174	1	X	X
4ER41E44	132-150.8	4	X	X
4ER41E45	150.8-174	4	X	X

NOTE 1:

1. PRE-AMP A321 IS PRESENT ONLY IN UHS RECEIVER MODELS SHOWN IN TABLE. IN UHS RECEIVERS J2 IS THE ANTENNA INPUT JACK AND J441 CONNECTS THE PRE-AMP OUTPUT TO THE RECEIVER. IN NON UHS RECEIVERS, J441 IS THE ANTENNA INPUT JACK.

REVISION LETTER BLOCK

		REV
	PL19E500872G1	P
	PL19E500872G2	R
A317	PL19B216119G1	A
A318	PL19D413129G1	R
A319	4EK16A10	C
A320	PL19C311797G2	A
	PL19A127479G1	B
A321	PL19B226039G1	A

		REV
A311	PL19B216178G1	
A313	PL19B216178G2	
A312	PL19B216178G3	
A314	PL19B216178G4	

		REV
A305	PL19B204419G1	B
A306	PL19B204419G4	B
A307	PL19B204419G2	
A308	PL19B204419G5	
A309	PL19B204419G3	
A310	PL19B204419G6	

SCHEMATIC DIAGRAM

132—174 MHz RECEIVER
MODELS 4ER41C10-45 & 4ER41E10-45

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.

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: DC VOLTAGES FOR 1ST MIXER, MULTIPLIER, AND 1ST IF AMPLIFIER TAKEN WITH MODULES REMOVED FROM CASTING AND 10 VOLTS APPLIED TO INPUT LEADS.

- ● LOW SPLIT 132-150.8 MHZ
- ▲ HIGH SPLIT 150.8-174 MHZ
- ■ VALUE OF R47 IS DETERMINED BY TEST (SEE TEST SPEC 19A127182)
- ☗ THESE ARE ONLY PARTS PRESENT ON A320
- ✱ ✱ USED IN 4ER41C11 FOR IMTS BASE STATION ONLY

SCHEMATIC DIAGRAM

132—174 MHz RECEIVER
MODELS 4ER41C10-45 & 4ER41E10-45

(CONT'D FROM PAGE 13)

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q4	19A115123P1	Silicon, NPN.
Q5	19A115889P1	Silicon, NPN.
Q6	19A115123P1	Silicon, NPN.
Q7	19A115300P4	Silicon, NPN.
Q8	19A115123P1	Silicon, NPN.
Q9	19A115330P1	Silicon, NPN; sim to Type 2N3925.
Q10*	19A116774P1	Silicon, NPN; sim to Type 2N3310.
		In REV G and earlier:
	19A115123P1	Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77P102K	Composition: 1K ohms ±10%, 1/2 w.
R2	3R77P153J	Composition: 15K ohms ±5%, 1/2 w.
R3	3R77P823K	Composition: 82K ohms ±10%, 1/2 w.
R4	3R77P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R5	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R6	3R77P153J	Composition: 15K ohms ±5%, 1/2 w.
R7	3R77P823K	Composition: 82K ohms ±10%, 1/2 w.
R8	3R77P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R9	3R77P102K	Composition: 1K ohms ±10%, 1/2 w.
R10	3R77P153J	Composition: 15K ohms ±5%, 1/2 w.
R11	3R77P823K	Composition: 82K ohms ±10%, 1/2 w.
R12	3R77P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R13	3R77P272K	Composition: 2.7K ohms ±10%, 1/2 w.
R14	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R15	3R77P333J	Composition: 33K ohms ±5%, 1/2 w.
R16	3R77P181K	Composition: 180 ohms ±10%, 1/2 w.
R17	3R152P471J	Composition: 470 ohms ±5%, 1/4 w.
R18 and R19	3R152P513J	Composition: 51K ohms ±5%, 1/4 w.
R20	3R152P472K	Composition: 4.7K ohms ±10%, 1/4 w.
R21 and R22	3R77P392J	Composition: 3.9K ohms ±5%, 1/2 w.
R23	3R77P104K	Composition: 100K ohms ±10%, 1/2 w.
R24	3R152P102J	Composition: 1K ohm ±5%, 1/4 w.
R25 and R26	3R77P102K	Composition: 1K ohms ±10%, 1/2 w.
R27 and R28	3R77P753J	Composition: 75K ohms ±5%, 1/2 w.
R29	3R77P182J	Composition: 1.8K ohms ±5%, 1/2 w.
R30*	3R77P821J	Composition: 820 ohms ±5%, 1/2 w.
		In REV C and earlier:
	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R31	3R77P821J	Composition: 820 ohms ±5%, 1/2 w.
R32*	3R77P752J	Composition: 7.5K ohms ±5%, 1/2 w. Deleted by REV A.
R33*	3R77P913J	Composition: 9.1K ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P303J	Composition: 30K ohms ±5%, 1/2 w.
R34	3R77P332K	Composition: 3.3K ohms ±10%, 1/2 w.
R35	3R77P330K	Composition: 33 ohms ±10%, 1/2 w.
R36	3R77P681J	Composition: 680 ohms ±5%, 1/2 w.
R37*	3R77P822J	Composition: 8.2K ohms ±5%, 1/2 w. Deleted by REV A.
R38*	3R77P752J	Composition: 7.5K ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P622J	Composition: 6.2K ohms ±5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R39*	3R77P822J	Composition: 8.2K ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P131J	Composition: 130 ohms ±5%, 1/2 w.
R40*	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
		In REV B and earlier:
	3R77P241J	Composition: 240 ohms ±5%, 1/2 w.
R41*	3R152P240J	Composition: 24 ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R42*	3R77P200J	Composition: 20 ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P160J	Composition: 16 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.
R45	3R77P123J	Composition: 12K ohms ±5%, 1/2 w.
R46	3R77P913J	Composition: 91K ohms ±5%, 1/2 w.
R48*	19A116278P249	Metal film: 3.16K ohms ±2%, 1/2 w.
		In REV A:
	3R77P302J	Composition: 3K ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P332J	Composition: 3.3K ohms ±5%, 1/2 w.
R49	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R50	3R77P222J	Composition: 2.2K ohms ±5%, 1/2 w.
R51	3R77P682J	Composition: 6.8K ohms ±5%, 1/2 w.
R52	3R77P223J	Composition: 22K ohms ±5%, 1/2 w.
R53*	3R77P223J	Composition: 22K ohms ±5%, 1/2 w.
		In REV B and earlier:
	3R77P303J	Composition: 30K ohms ±5%, 1/2 w.
		In REV A and B:
	3R77P473J	Composition: 47K ohms ±5%, 1/2 w.
		Earlier than REV A:
	3R77P303J	Composition: 30K ohms ±5%, 1/2 w.
R54	3R77P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R55	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R56	3R77P224J	Composition: 220K ohms ±5%, 1/2 w.
R57	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R58	3R77P104K	Composition: 100K ohms ±10%, 1/2 w.
R59	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R60	3R77P393J	Composition: 39K ohms ±5%, 1/2 w.
R61	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R60 and R61	3R77P103J	Composition: 10K ohms ±5%, 1/2 w. Deleted by REV C.
		Earlier than REV A:
R62	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R63*	3R77P433J	Composition: 43K ohms ±5%, 1/2 w.
R64*	3R77P120J	Composition: 12 ohms ±5%, 1/2 w. by REV A.
		Earlier than REV A:
	3R77P180J	Composition: 18 ohms ±5%, 1/2 w.
R65*	3R77P154K	Composition: 150K ohms ±10%, 1/2 w. Deleted by REV A.
R66	3R77P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R75*	3R77P473J	Composition: 47K ohms ±5%, 1/2 w. Deleted by REV A.
R76*	3R152P913J	Composition: 91K ohms ±5%, 1/4 w. Added by REV A. Deleted by REV C.

SYMBOL	GE PART NO.	DESCRIPTION
R77*	3R152P153J	Composition: 15K ohms ±5%, 1/4 w.
		In REV B:
	3R152P562J	Composition: 5.6K ohms ±5%, 1/4 w. Added by REV A.
R78*	3R77P200J	Composition: 20 ohms ±5%, 1/2 w.
		In REV C and earlier:
	3R77P100J	Composition: 10 ohms ±5%, 1/2 w. Added by REV A.
R79*	3R152P393J	Composition: 39K ohms ±5%, 1/4 w. Added by REV A.
R80*	3R152P272J	Composition: 2.7K ohms ±5%, 1/4 w.
		In REV C-L:
	3R152P432J	Composition: 4.3K ohms ±5%, 1/4 w. Added by REV C.
R81*	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w. Added by REV C.
R82*	3R77P273J	Composition: 27K ohms ±5%, 1/2 w. Added by REV C.
R85*	3R152P102J	Composition: 1K ohms ±5%, 1/4 w. Added by REV K. Deleted by REV L.
R86*	3R77P204J	Composition: 200K ohms ±5%, 1/2 w. Added to G1 by REV K.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490828P41	Thermistor: 30 ohms ±10%, color code black and white; sim to Carborundum Type 2D1113-4.
RT2	5490828P9	Thermistor: 10K ohms ±10%, color code yellow; sim to Carborundum Type 8D512-9.
RT3*	5490828P3	Thermistor: 10K ohms ±10%, color code yellow; sim to Carborundum Type 8D512-8. Added by REV A.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A116023P1	Audio: response: 300-4000 Hz, +0.5 dB - 0.75 dB at 30 ma, 300-4000 Hz, +0.5 dB - 0.9 dB at 30 ma.
A319		ENCODER/DECODER 4EK16A10 19C311796G1
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116080P205	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	19A116080P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C8	19A116080P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C9	19A116080P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C10	19A116080P107	Polyester: 0.1 µf ±5%, 50 VDCW.
C11	19A116080P105	Polyester: 0.047 µf ±20%, 50 VDCW.
C12	19A116080P107	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	5496267P17	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.
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.

SYMBOL	GE PART NO.	DESCRIPTION
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.
		- - - - - - - - - FILTERS - - - - - - - - -
FL1		TONE FREQUENCY NETWORK 19B205280
	19B205280G1	71.9 Hz
	19B205280G2	77.0 Hz
	19B205280G3	82.5 Hz
	19B205280G4	88.5 Hz
	19B205280G5	94.8 Hz
	19B205280G6	100.0 Hz
	19B205280G7	103.5 Hz
	19B205280G8	107.2 Hz
	19B205280G9	110.9 Hz
	19B205280G10	114.8 Hz
	19B205280G11	118.8 Hz
	19B205280G12	123.0 Hz
	19B205280G13	127.3 Hz
	19B205280G14	131.8 Hz
	19B205280G15	136.5 Hz
	19B205280G16	141.3 Hz
	19B205280G17	146.2 Hz
	19B205280G18	151.4 Hz
	19B205280G19	156.7 Hz
	19B205280G20	162.2 Hz
	19B205280G21	167.9 Hz
	19B205280G22	173.8 Hz
	19B205280G23	179.9 Hz
	19B205280G24	186.2 Hz
	19B205280G25	192.8 Hz
	19B205280G26	203.5 Hz
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J4	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.
Q2 and Q3	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q4	19A115123P1	Silicon, NPN.
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.

SYMBOL	GE PART NO.	DESCRIPTION
R3	3R77P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R4	3R77P152J	Composition: 1.5K ohms ±5%, 1/2 w.
R5	3R77P682K	Composition: 6.8K ohms ±10%, 1/2 w.
R6	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R7	19A116278P305	Metal film: 11K ohms ±2%, 1/2 w.
R8*	3R77P562J	Composition: 5.6K ohms ±5%, 1/2 w.
		In REV A:
	3R152P622J	Composition: 6.2K ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P512J	Composition: 5.1K ohms ±5%, 1/4 w.
R9	19A116278P305	Metal film: 11K ohms ±2%, 1/2 w.
R10	3R77P512J	Composition: 5.1K ohms ±5%, 1/2 w.
R11	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R12	3R77P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R13	3R77P153J	Composition: 15K ohms ±5%, 1/2 w.
R14	3R77P133J	Composition: 13K ohms ±5%, 1/2 w.
R15	3R77P510J	Composition: 51 ohms ±5%, 1/2 w.
R16	3R77P153J	Composition: 15K ohms ±5%, 1/2 w.
R17	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R18	3R77P622J	Composition: 6.2K ohms ±5%, 1/2 w.
R19	3R77P123J	Composition: 12K ohms ±5%, 1/2 w.
R20	3R77P223J	Composition: 22K ohms ±5%, 1/2 w.
R21	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R22	3R77P301J	Composition: 300 ohms ±5%, 1/2 w.
R23	3R77P223J	Composition: 22K ohms ±5%, 1/2 w.
R24	3R77P433J	Composition: 43K ohms ±5%, 1/2 w.
R25	3R77P133J	Composition: 13K ohms ±5%, 1/2 w.
R26	3R77P123J	Composition: 12K ohms ±5%, 1/2 w.
R27	3R77P151J	Composition: 150 ohms ±5%, 1/2 w.
R28	3R77P562J	Composition: 5.6K ohms ±5%, 1/2 w.
R29	3R77P513J	Composition: 51K ohms ±5%, 1/2 w.
R30	3R77P334J	Composition: 330K ohms ±5%, 1/2 w.
R31	3R77P104J	Composition: 100K ohms ±5%, 1/2 w.
R32	3R77P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R33	19A116278P342	Metal film: 26.70K ohms ±2%, 1/2 w.
R34	19A116278P233	Metal film: 2.15K ohms ±2%, 1/2 w.
R35	19A116278P365	Metal film: 46.40K ohms ±2%, 1/2 w.
R36	19A116278P301	Metal film: 10K ohms ±2%, 1/2 w.
R37	19A116278P65	Metal film: 46.4 ohms ±2%, 1/2 w.
R38	3R77P204J	Composition: 200K ohms ±5%, 1/2 w.
R39	19A116278P385	Metal film: 75K ohms ±2%, 1/2 w.
R40	19A116278P329	Metal film: 19K ohms ±2%, 1/2 w.
R41	19A116278P285	Metal film: 7.5K ohms ±2%, 1/2 w.
R42	19A116278P412	Metal film: 130K ohms ±2%, 1/2 w.
R43	19A116278P269	Metal film: 5.11K ohms ±2%, 1/2 w.
R44	19A116278P117	Metal film: 147 ohms ±2%, 1/2 w.
R45 and R46	3R77P102J	Composition: 1K 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: 8.2K ohms ±5%, 1/2 w.
R47B	3R77P912J	Composition: 9.1K ohms ±5%, 1/2 w.
R47C	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.

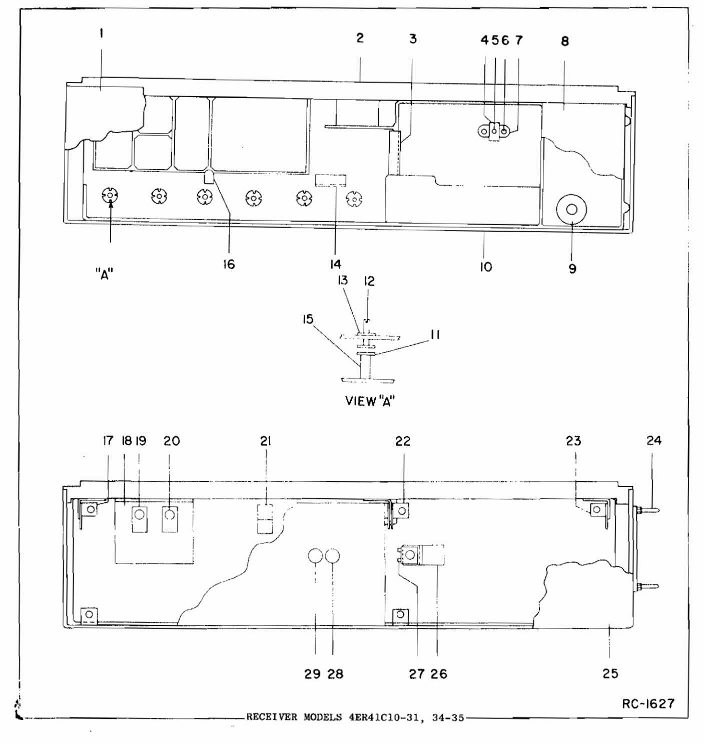
SYMBOL	GE PART NO.	DESCRIPTION
R47D	3R77P113J	Composition: 11K ohms ±5%, 1/2 w.
R47E	3R77P123J	Composition: 12K ohms ±5%, 1/2 w.
R47F	3R77P133J	Composition: 13K ohms ±5%, 1/2 w.
R47G	3R77P153J	Composition: 15K ohms ±5%, 1/2 w.
R47H	3R77P752J	Composition: 7.5K ohms ±5%, 1/2 w.
R48	3R77P563J	Composition: 56K ohms ±5%, 1/2 w.
R49	3R77P224J	Composition: 220K ohms ±5%, 1/2 w.
R50	3R77P242J	Composition: 2.4K ohms ±5%, 1/2 w.
R51	3R77P331J	Composition: 330 ohms ±5%, 1/2 w.
R52	3R77P102J	Composition: 1K ohms ±5%, 1/2 w.
R53	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R54	3R77P333J	Composition: 33K ohms ±5%, 1/2 w.
R55	3R77P103J	Composition: 10K ohms ±5%, 1/2 w.
R56	3R77P363J	Composition: 36K ohms ±5%, 1/2 w.
R57	3R77P103K	Composition: 10K ohms ±10%, 1/2 w.
R58	3R77P913J	Composition: 91K ohms ±5%, 1/2 w.
R59*	3R77P182J	Composition: 1.8K ohms ±5%, 1/2 w.
		In REV C and earlier:
	3R152P432J	Composition: 4.3K ohms ±5%, 1/4 w.
R60	3R77P432J	Composition: 4.3K ohms ±5%, 1/2 w.
R61	3R77P682K	Composition: 6.8K ohms ±10%, 1/2 w.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490828P22	Thermistor: 50K ohms ±10%, color code yellow; sim to Carborundum Type 763H-J4.
		- - - - - - - - - - - SOCKETS - - - - - - - - -
XFL1	19A121920G3	Reed, mica-filled phen: 7 pins rated at 1 amp at 500 VRMS with 4-1/2 inches of cable.
A320		TONE REJECT FILTER 19C311797G2
		- - - - - - - - - CAPACITORS - - - - - - - - -
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.
		Earlier than REV A:
	19B209243P107	Polyester: 0.1 µf ±10%, 50 VDCW.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J6 and J7	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19A115690P1	Coil, RF: 880 mh ±5%, sim to Artted AC5672.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R59*	3R77P182J	Composition: 1.8K ohms ±5%, 1/2 w.
		In REV A and earlier:
	3R152P432J	Composition: 4.3K ohms ±5%, 1/4 w.
A321*		RF PRE AMP KIT 19A127479G1 REV A PRE AMP BOARD 19B226039G1
		- - - - - - - - - - CAPACITORS - - - - - - - -
C1*	19A116656P6J0	Ceramic disc: 6 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
		Earlier than REV A:
	19A116656P7J0	Ceramic disc: 7 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C2 thru C5	19A116655P14	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.

SYMBOL	GE PART NO.	DESCRIPTION
C6	19A116656P5J0	Ceramic disc: 5 pf ±0.5 pf, 500 VDCW, temp coef 0 PPM.
C7*	19A127865P1	Capacitor. Added by REV A.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1*	19B209420P103	Coil, RF: 0.15 µh ±10%, 0.10 ohms DC res max; sim to Jeffers 4416-3.
		Earlier than REV A:
	19B209420P101	Coil, RF: 0.10 µh ±10%, 0.08 ohms DC res max; sim to Jeffers 4416-1.
L2	19B209420P103	Coil, RF: 0.15 µh ±10%, 0.10 ohms DC res max; sim to Jeffers 4416-3.
L3*	19B209420P103	Coil, RF: 0.15 µh ±10%, 0.10 ohms DC res max; sim to Jeffers 4416-3. Added by REV A.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A116818P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R2	3R152P472J	Composition: 4.7K ohms ±5%, 1/4 w.
R3 and R4	R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R5*	3R152P392J	Composition: 3.9K ohms ±5%, 1/4 w.
		Earlier than REV A:
	3R152P242J	Composition: 2.4K ohms ±5%, 1/4 w.
R6*	3R152P102J	Composition: 1K ohms ±5%, 1/4 w. Added by REV B.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W2	19A129857G1	3 inches long. Includes J2.
W3	19A129856G1	5 inches long. Includes P3.
A321* and A322*		RF PRE AMP A321 19A127479G1 132-150.8 MHz A322 19A127479G2 150-8-174 MHz REV A
		- - - - - - - - - CAPACITORS - - - - - - - - -
C5 thru C7	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C8 and C9	19A116080P101	Polyester: 0.01 µf ±10%, 50 VDCW.
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1	19A116154P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152P221J	Composition: 220 ohms ±5%, 1/4 w.
R2 and R3	3R152P220J	Composition: 22 ohms ±5%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19B216479G1 T2 19B216479G2
		- - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496218P641	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
C2*	5496218P640	Ceramic disc: 9.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
		Earlier than REV A:
	5496218P638	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
	5491798P5	Tuning slug.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T3 and T4		COIL ASSEMBLY T3 19B216478G1 T4 19B216478G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C3	5496218P638	Ceramic disc: 7.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
C4	5496218P635	Ceramic disc: 4.0 pf ±0.25 pf, 500 VDCW, temp coef -470 PPM.
	5491798P5	Tuning slug.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W1	5491689P74	RF. Includes J444 connector.
W2	19B205634G2	RF. Includes J2 connector 19B209122P3.
W3	19A127476G1	RF. Includes P3 connector.
		CHASSIS AND RF CIRCUIT 19E500872G1 LOW SPLIT 19E500872G2 HIGH SPLIT
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C301 thru C306		(See Mechanical Parts RC1627).
C307	7774750P4	Ceramic disc: .001 µf +100% -0%, 500 VDCW.
C310 thru C313	19B209135P1	Ceramic, feed-thru: 1000 pf +150%-0%, 500 VDCW.
C314	5496267P10	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C315	19A115680P3	Electrolytic: 20 µf +150% -10%, 25 VDCW; sim to Mallory Type TTX.
C317 and C318	5494481P12	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1*	19A116062P2	Selenium. Added by REV C. Deleted in G1 by REV J, deleted in G2 by REV K.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J441		Connector. (Part of W441).
J442	19B205689G2	Connector: 18 contacts.
J443	19C303426G1	Connector: 20 pin contacts.
J444		Connector: (Part of A321/A322-W1).
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L301	19B216112G4	Coil.
L302	19B216112G3	Coil.
L303	19B216112G8	Coil.
L304	19B216112G7	Coil.
L305	19B216112G8	Coil.
L306	19B216112G7	Coil.
L307	19B216112G8	Coil.
L308	19B216112G7	Coil.
L309	19B216112G6	Coil.
L310	19B216112G5	Coil.
L311	19B216112G2	Coil.
L312	19B216112G1	Coil.
L313 and L314	7488079P16	Choke, RF: 10 µh ±10%, 0.6 ohm DC res max; sim to Jeffers 4421-7K.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P301 thru P311	4029840P2	Contact, electrical; sim to Amp 42827-2.
P312	4029840P3	Contact, electrical; sim to Amp 42101-2.
P313	4029840P2	Contact, electrical; sim to Amp 42827-2.
P315 thru P317	4029840P2	Contact, electrical; sim to Amp 42827-2.
P319 and P320	4029840P2	Contact, electrical; sim to Amp 42827-2.
P322	4029840P2	Contact, electrical; sim to Amp 42827-2.
P323	4029840P1	Contact, electrical; sim to Amp 41854.

SYMBOL	GE PART NO.	DESCRIPTION
P324 thru P326	4029840P2	Contact, electrical; sim to Amp 42827-2.
P327	4029840P1	Contact, electrical; sim to Amp 41854.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q301* and Q302*	19A116741P1	Silicon, NPN.
		In 19E500872G1 REV E-L: In 19E500872G2 REV E-M:
	19A116203P2	Silicon, NPN.
		In REV D and earlier:
	19A115948P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R301	3R152P331K	Composition: 330 ohms ±10%, 1/4 w. Deleted by REV G.
R302	19A116278P444	Metal film: 280K ohms ±2%, 1/2 w.
R303	3R78P390K	Composition: 39 ohms ±10%, 1 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - -
T301	19A116041P2	Audio freq: 300 to 4000 Hz, response ±0.5 dB, Pri: 23.5 ohms at 50 mA, Sec No. 1: 3.5 ohms at 1 KHz, Sec No. 2: 10.15 v, ±0.10 VRMS.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7487424P7	Miniature, phen: 4 terminals.
TB2	7487424P26	Miniature, phen: 6 terminals.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W441	19B205634G1	Coaxial: approx 5 inches long. Includes J441.
		HARNESS ASSEMBLY 19E500872G7 (Includes C307, C317, C318, J442, J443, P301-P304, P307-P313, P315-P317, P319, P320, P322-P327, R302, R303, T301, TB2)
		CHANNEL GUARD MODIFICATION KIT 19A127178G1 (Used with A319)
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19B216176G1	Harness (Encoder/Decoder). Includes:
P314	4029840P2	Contact, electrical; sim to Amp 42827-2.
P318	4029840P2	Contact, electrical; sim to Amp 42827-2.
P321	4029840P2	Contact, electrical; sim to Amp 42827-2.
P328 thru P335	4029840P2	Contact, electrical; sim to Amp 42827-2.
		CHANNEL GUARD MODIFICATION KIT 19A127178G2 (Used with A320)
		- - - - - - - - MISCELLANEOUS - - - - - - - -
	19B216177G1	Harness (Tone Reject Filter). Includes:
P321	4029840P2	Contact, electrical; sim to Amp 42827-2.
P330	4029840P2	Contact, electrical; sim to Amp 42827-2.
P332	4029840P2	Contact, electrical; sim to Amp 42827-2.
		MECHANICAL PARTS (SEE RC1627)
1	19C303495G3	Top cover. (Station, except Repeaters and VM).
	19C303676G2	Top cover. (Station, Repeater and VM only).
	19C303385P2	Top cover. (Mobile).
2	19C317344P3	Heat sink.

SYMBOL	GE PART NO.	DESCRIPTION
3	19A121222P1	Support. (Mounts C312 and C313).
4	4033089P1	Clip. (Part of XY1-XY4).
5	19B200525P9	Rivet. (Part of XY1-XY4).
6	19A115793P1	Contact. (Part of XY1-XY4).
7	4039307P1	Crystal socket. (Part of XY1-XY4).
8	19B216073P1	Cover. (Used with A317).
9	4034252P5	Can. (Used with T1 on A317).
10	19C303389G1	Chassis.
11	4036765G2	(Not Used).
12	4036765G4	Screw. (Part of C301 thru C306).
13	7137968P8	Nut, stamped: No. 6-32 thread; sim to Palnut T0632005. (Part of C301 thru C306).
14	19A121221P1	Support. (Mounts C310 and C311).
15	4036899P4	(Not Used).
16	7145451P1	Cleat.
17	19B204583G2	Hinge.
18	19B216727P1	Support. (Used with Q301 and Q302).
19	19A116023P2	Plate, insulated. (Used with Q301 and Q302).
20	19A115222P3	Insulator, bushing. (Used with Q301 and Q302).
21	4029851P6	Clip, loop: nylon; sim to Weckesser 5/16-4-128.
22	19B204583G1	Hinge.
23	19B204583G3	Hinge.
24	19A121676P1	Guide pin.
25	19C303396G4	Bottom cover. (Station)
	19C303385G1	Bottom cover. (Mobile)
26	19A121297P1	Angle.
27	7160861P4	Nut, sheet spring: sim to Tinnerman C6452-8Z-67. (Used to secure cover).
28	4035267P2	Button, plug. (Used with A318 thru A320).
29	4036555P1	Insulator, washer: nylon. (Used with Q7 on A318).



PRODUCTION CHANGES

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

REV. A - Chassis and RF Assembly 19E500872-G1 & -G2

To incorporate a better high-frequency capacitor. Changed C5 on First Mixer A301/A302.

REV. A - 2nd Mixer A317 (19B216119-G1)

To make receiver compatible with new system. Added C17.

REV. B - Chassis and RF Assembly 19E500872-G1 & -G2

To improve stability. Changed C2 on Hi IF Amp A315.

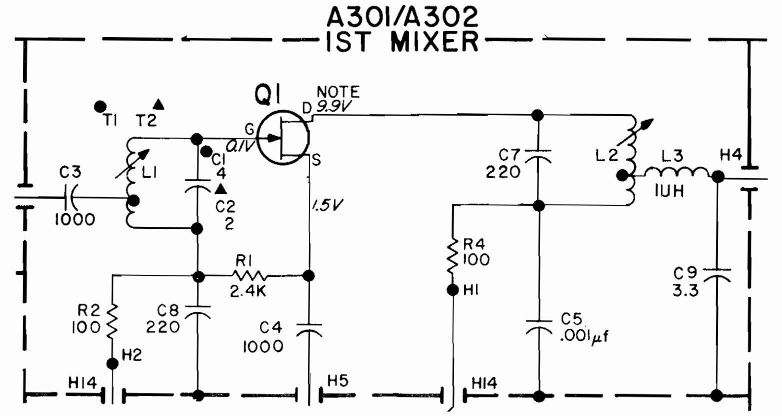
REV. C - Chassis and RF Assembly 19E500872-G1 & -G2

To protect the receiver against positive voltage transients. Added thyrector CR1 between J443-11 and -13.

REV. D - Chassis and RF Assembly 19E500872-G1 & -G2

To improve sensitivity and improve Intermodulation (EIA) performance. Deleted C6 & R3 and changed C7 & L2 on First Mixer A301/A302.

Schematic Diagram Was:



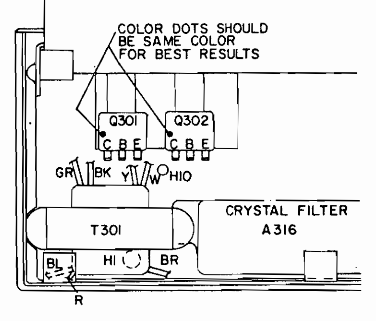
Step 7 of receiver alignment was:

7.	B (2nd IF AMP)	Pin 2	C6 and L1 (on 1st MIXER A301/A302)	Maximum	Apply an on-frequency signal into Hole 304, and tune C6 and L1 for maximum meter reading, keeping signal below saturation.

REV. E - Chassis and RF Assembly 19E500872-G1 & -G2

To incorporate new PA transistors. Changed Q301/Q302 and added R303.

Outline Diagram Was:

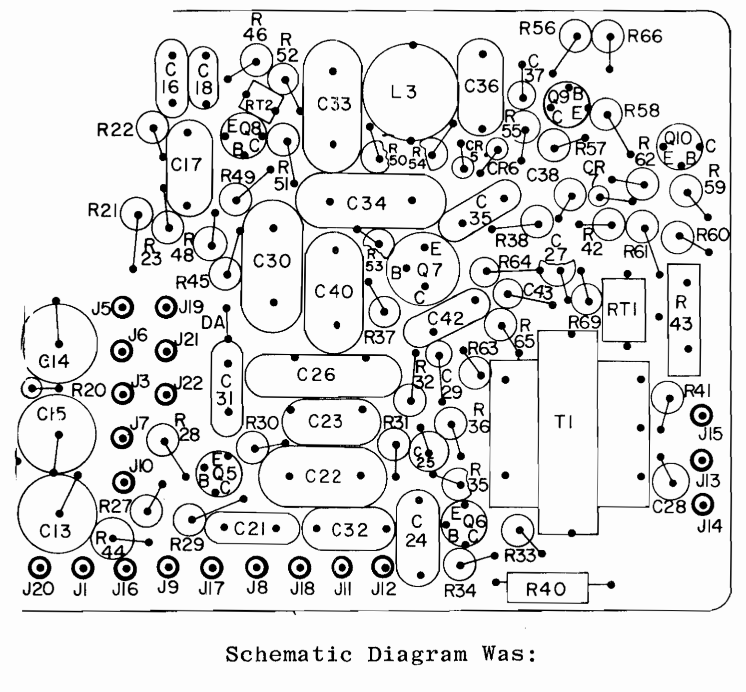


REV. A - IF Audio & Squelch Board A318 (19D413129-G1)

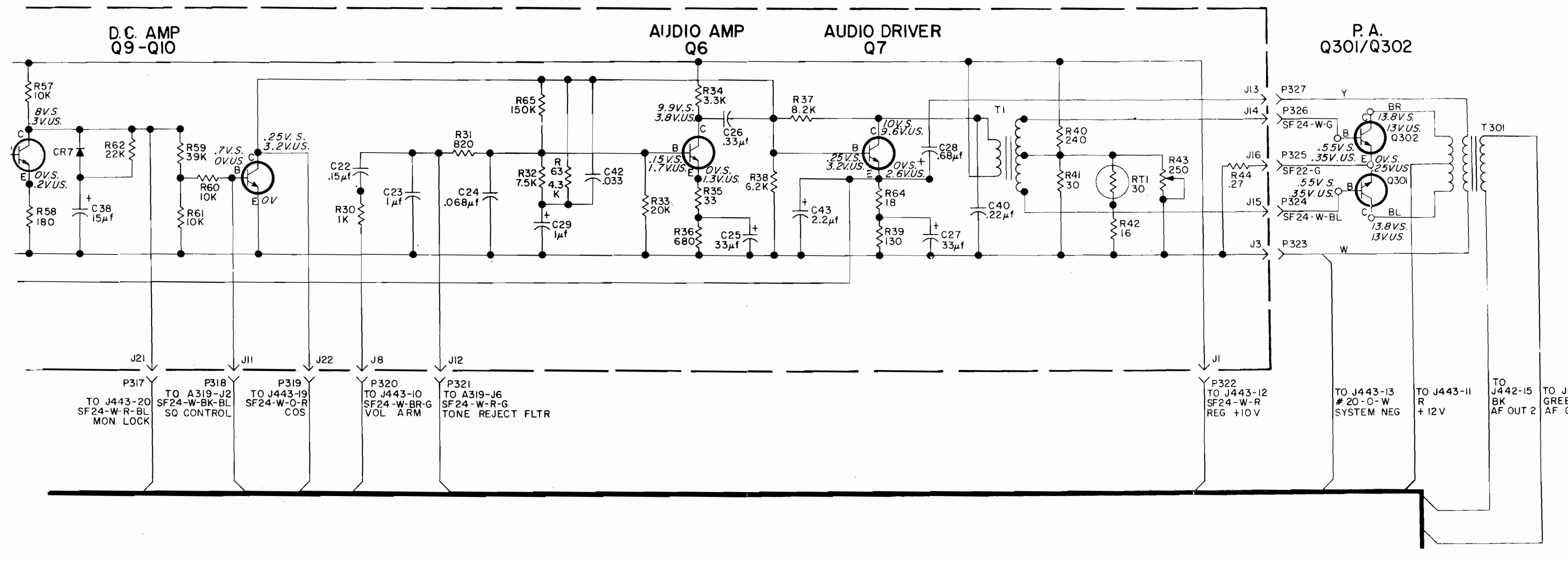
To make IF Audio & Squelch Board compatible with new PA transistors and to improve squelch operation. Added C49-C54, CR8, R75-R79, and RT3. Deleted C24, C28, C29, C42, C43, R32, R37, R63 and R65. Changed C21, C26, C37, C38, C40, R33, R38, R39, R41, R42, R48, R53 and R62.

Outline Diagram Was:

IF-AUDIO & SQUELCH BOARD
A318



Schematic Diagram Was:



PRODUCTION CHANGES

132—174 MHz MASTR RECEIVER
MODELS 4ER41C10-45 & 4ER41E10-45

PRODUCTION CHANGES

REV. B - Channel Guard Encoder/Decoder A319 (Model 4EK16A10)

To increase stop-band attenuation. Changed R8.

REV. C - Channel Guard Encoder/Decoder A319 (Model 4EK16A10)
REV. A - Tone Reject Filter A320 (19C311797-G2)

To optimize frequency response. Changed C29.

REV. F - Chassis and RF Assembly (19E500872-G1 & G2)

To eliminate squelch opening thump in receivers with Channel Guard. Removed White-Orange wire between J443-13 and TB2-1. Added a White-Orange wire between P312 (or J17 on IF Audio and Squelch board) and TB2-1.

REV. A - RF Pre Amp A322 (19A127479-G2)

To assure band-end tuning at 150.8 MHz. Changed C2.

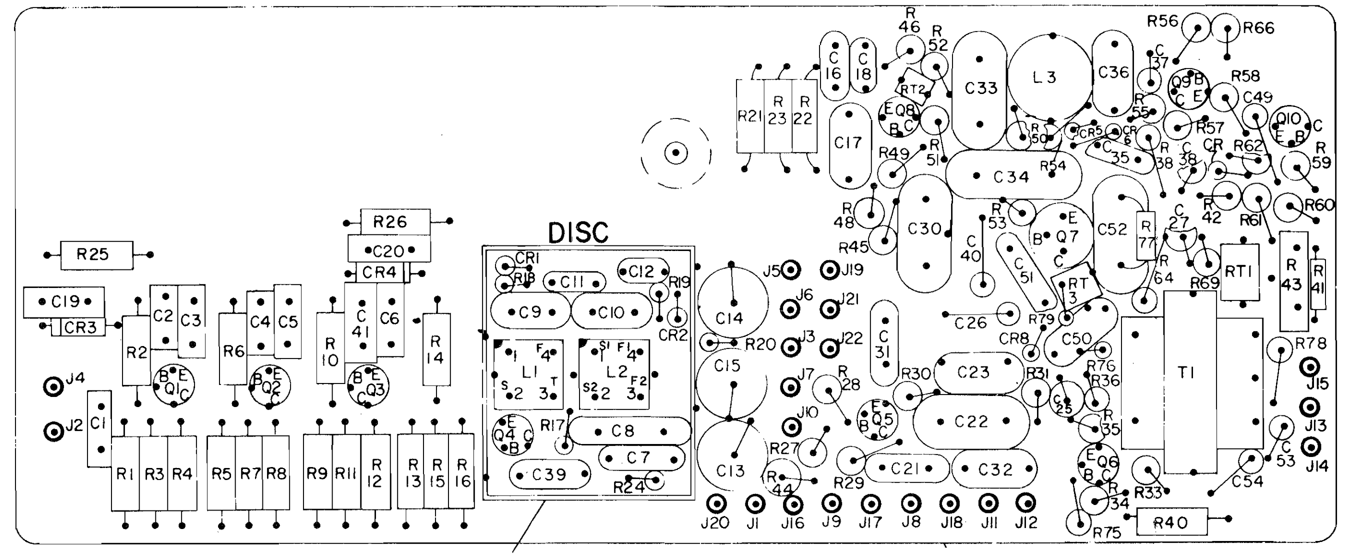
IF Audio & Squelch Board A318 (19D413129-G1)

REV. B - To control more closely the squelch control rotation. Changed R48.

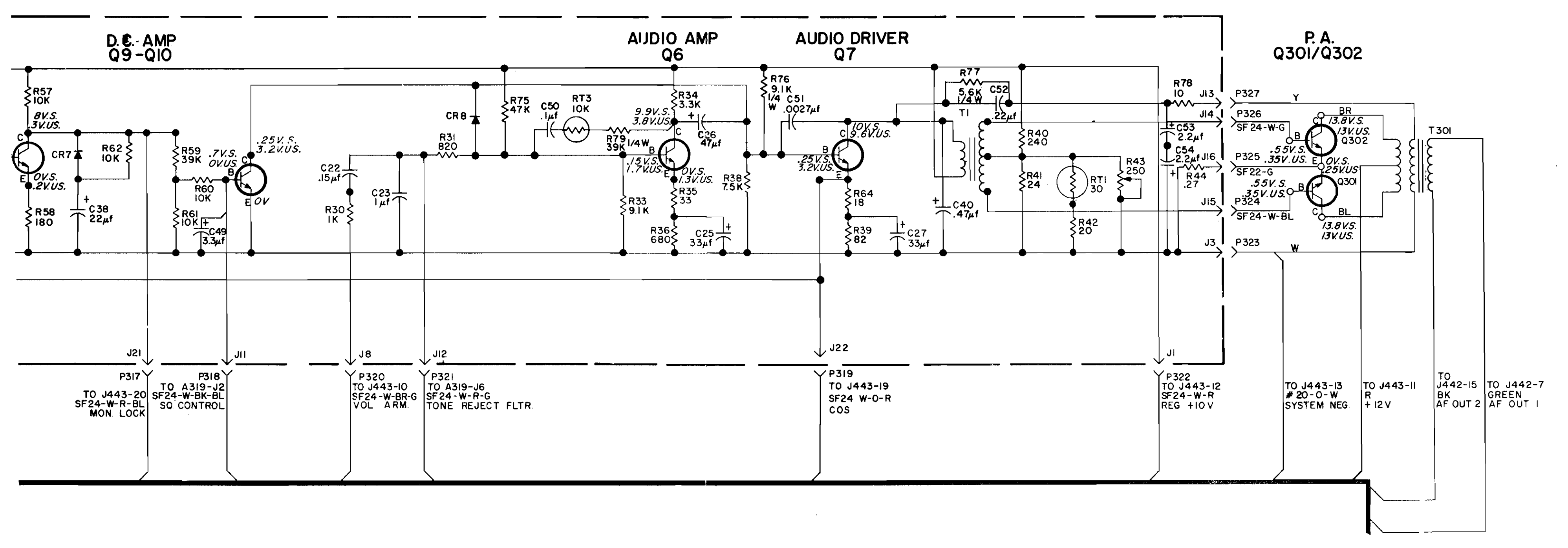
REV. C - To eliminate barely audible squelch switching transients and to reduce receiver squelch tail. Deleted C38, C49, CR7, CR8, R62, R75, and R76. Added C55, R80, R81, and R82. Changed C27, C36, R53, R64, and R77.

Outline Diagram was:

IF-AUDIO & SQUELCH BOARD
A318



Schematic Diagram Was:



REV. D - IF Audio & Squelch Board A318 (19D413129-G1)

To improve receiver frequency response. Changed R30 and R78.

REV. D - Channel Guard Encoder/Decoder A319 (Model 4EK16A10)
REV. B - Tone Reject Filter A320 (19C311797-G2)

To prevent excessive roll-off at 300 Hertz. Changed R59.

REV. E - IF Audio & Squelch Board A318 (19D413129-G1)

To compensate for vendor change. Changed C26.

REV. F - IF Audio & Squelch Board A318 (19D413129-G1

To improve squelch action. Changed R53.

REV. G - Chassis and RF Assembly (19E500872-G1 & G2)

To stabilize the 1st mixer. Deleted R301 on the 2nd Multiplier and added R5 to the 1st mixer.

REV. H - Chassis and RF Assembly (19E500872-G2)

To improve tuning of the 1st mixer. Changed C2.

REV. H - Chassis and RF Assembly (19E500872-G1)

To eliminate oscillations. Added R6.

REV. J - Chassis and RF Assembly (19E500872-G2)

To eliminate oscillations. Added R6.

REV. J - Chassis and RF Assembly (19E500872-G1)

To remove unnecessary protection. Removed CR1.

REV. K - Chassis and RF Assembly (19E500872-G2)

To remove unnecessary protection. Removed CR1.

REV. H - IF Audio and Squelch Board A318 (19D413129-G1)

To insure squelch action at -30°C. Changed Q10.

REV. K - Chassis and RF Assembly (19E500872-G1)

To eliminate oscillation in H1 IF Amplifier. Added L2 and Ferrite Bead.

REV. L - Chassis and RF Assembly (19E500872-G2)

To eliminate oscillation in H1 IF Amplifier. Added L2 and Ferrite Bead.

REV. L - Chassis and RF Assembly (19E500872-G1)

To increase injection from multiplier chain. Deleted R1 and R2. Changed Q1 and R3. Added L4.

REV. M - Chassis and RF Assembly (19E500872-G2)

To increase injection from multiplier chain. Deleted R1 and R2. Changed Q1 and R3. Added L4.

REV. M - Chassis and RF Assembly (19E500872-G1)

To incorporate a new transistor. Changed Q301 & Q302.

REV. N - To improve design
Changed Q1.

REV. N - Chassis and RF Assembly (19E500872-G2)

To incorporate a new transistor. Changed Q301 & Q302.

REV. P - To improve design
Changed Q1.

REV. J - IF Audio and Squelch Board A318 (19D413129-G1)
To improve PA bias.
Changed R40

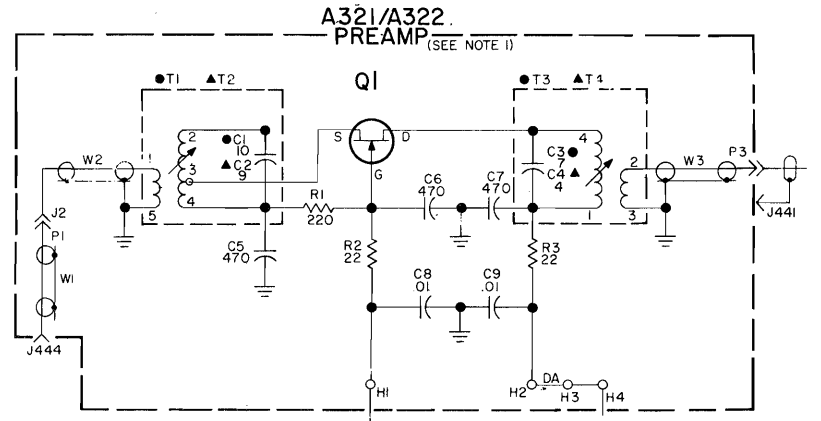
REV. K - To improve stability of audio output with no load.
Added R85

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

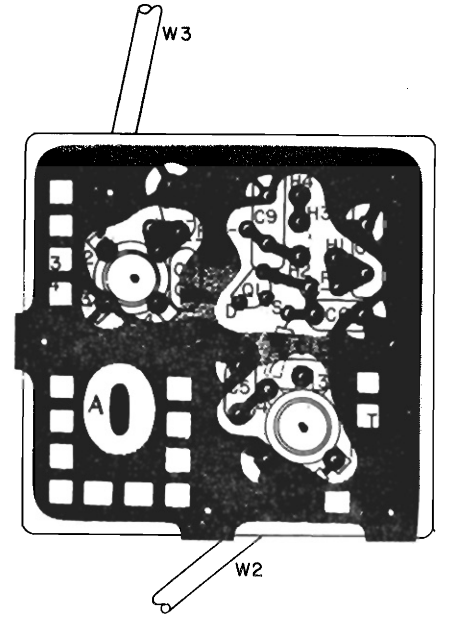
REV. A - RF Pre Amp A321 (19A127479-G1)

To incorporate improved design
Changed UHS Pre Amp Board.

Schematic Diagram was:



Outline Diagram Was:



Alignment Procedure Was:

METERING POSITION				
GE Test Set or Meter Panel	Multimeter - at J442	TUNING CONTROL	METER READING	PROCEDURE
B (2nd IF AMP)	Pin 2	C301, C302, C303, C304, C305 and C306 (all receivers), and T1/T2 and T3/T4 (UHS receivers	Maximum	Apply an on-frequency signal to the antenna jack. On UHS receivers, tune T1/T2 and T3/T4 (PREAMP) for maximum meter reading. On all receivers, tune C301 through C306 for maximum meter reading, keeping signal below saturation. Then retune C301 through C306 slightly for maximum quieting.
B (2nd IF AMP)	Pin 2	C301, C302, C303, C304, C305, and C306 (on all receivers) and T1/T2 & T3/T4 (UHS Receivers)	Maximum	Apply an on-frequency signal to the antenna jack. On UHS receivers, tune T1/T2 and T3/T4 (PREAMP) for maximum meter reading. On all receivers, tune C301 through C306 for maximum quieting.

REV. M - IF Audio & Squelch Board A318 (19D413129G1)

To improve audio quality. Changed R80.

REV. N - To improve frequency response. Changed C26.

REV. P - To improve stability. Changed Q5.

REV. P - Chassis and RF Assembly (19E500872G1)

To incorporate new transistor Q1.

REV. R - Chassis and RF Assembly (19E500872G2)

To incorporate new transistor Q1.

REV. A - RF Pre Amp (19B226039G1)

To improve operation. Changed C1, L1, and R5. Added L3 and C7.

REV. R - IF Audio & Squelch Board A348 (19D413129G1)

To improve squelch operation. Replaced R56 with R86.