MOBILE RADIO

MASTR® Progress Line

406–470 MHz, RECEIVER MODELS 4ER42E10-33 & 4ER42G10-33

Maintenance Manual LBI3999K
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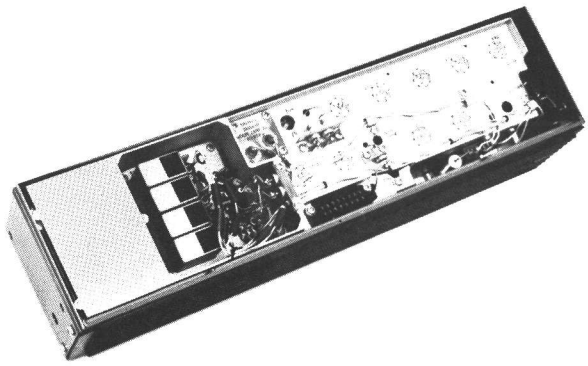

SPECIFICATIONS *

	ER-42-E & G	
FCC Filing Designation		
Frequency Range	406—420 & 450—470 MHz	
Audio Output	5 watts at less than 5% distortion	
Sensitivity	Standard Receiver	Ultra-High Sensitivity Receiver
12-dB SINAD (EIA Method)	0.35 μV	0.20 μV
20-dB Quieting Method	0.50 μV	0.25 μV
Intermodulation (EIA)	-75 dB	-70 dB
Selectivity		
EIA Two-Signal Method	-85 dB (adjacent channel, 25 kHz channels)	
20-dB Quieting Method	-100 dB at ±20 kHz	
Spurious Response	-100 dB	
First Oscillator Stability		
Type ER-42-E Receivers	±.0005% (-30°C to +60°C)	
Type ER-42-G Receivers	+.0002% (-30°C to +60°C)	
Modulation Acceptance	±7.5 kHz	
Squelch Sensitivity		
Critical Squelch		
Standard Receiver	0.2 μV	
UHS Receiver	0.15 μV	
Maximum Squelch	Greater than 20 dB quieting (less than 1.5 μV)	
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.

ER-42-E & G

GENERAL ELECTRIC

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WARNING

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

DESCRIPTION

General Electric MASTR Progress Line Receivers Types ER-42-E & G are double-conversion, superheterodyne FM receivers designed for operation in the 406-420 and 450-470 megahertz bands. The Type ER-42-E Receivers contain a standard oscillator with a frequency stability of ±0.0005%, while the Type ER-42-G Receivers contain an 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 receivers are of single-unit construction and are completely housed in an aluminum casting for maximum shielding and rigidity. The top part of the casting contains the front end through the 1st low IF amplifier stages. The bottom portion of the casting contains the audio squelch board and the optional Channel Guard encoder-decoder board.

CIRCUIT ANALYSIS

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

Centralized metering jack J442 is provided for use with General Electric Test Set Models 4EX3A10 or 4EX8K11, for ease of alignment and servicing. The Test Set meters the oscillator, multiplier and limiter stages as well as the discriminator, and regulated 10 Volts.

RF AMPLIFIER (A410)

RF Amplifier A410 is used only in ultra-high sensitivity (UHS) receivers and consists of two tuned helical resonators and an RF amplifier (Q1).

RF from the antenna is coupled through cable W444 to a tap on L410/L412. The tap is positioned to provide the proper impedance match to the antenna. RF energy is coupled to L411/L413 through an opening in the shield wall, and then to the base of Q1. The amplified output is coupled from the collector of Q1 through cable W445 to the input of five helical resonators.

HELICAL RESONATORS

In receivers without the UHS option, the front end RF selectivity is provided by five tuned helical resonators (L414/L419

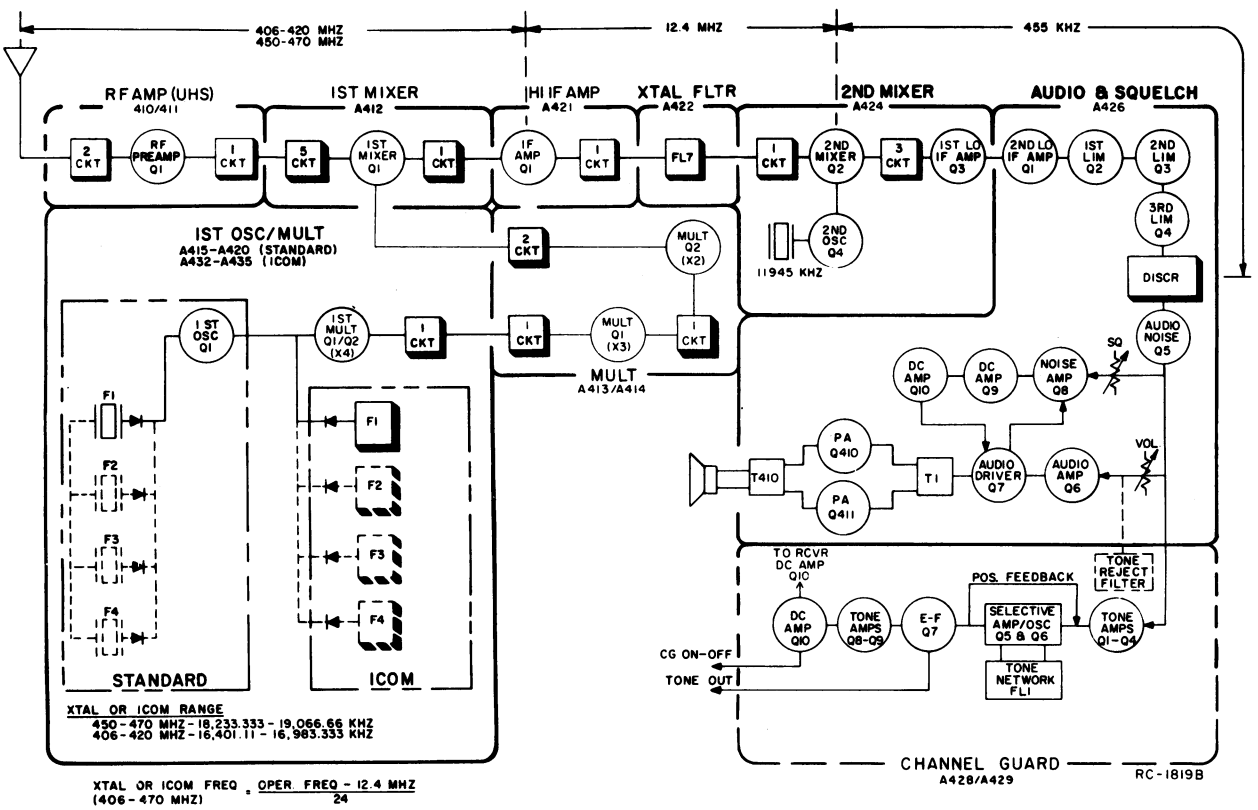


Figure 1 - Receiver Block Diagram

through L418/L423). RF cable W441 connects the RF signal from the antenna to a tap on L414/L419. The tap is positioned to provide the proper impedance match to the antenna. The output of L418/L423 is coupled through capacitor C1 to the 1st Mixer assembly.

1ST OSCILLATOR AND MULTIPLIER

Receiver Models 4ER42E10-33 are equipped with standard Oscillator/Multiplier Boards A415-A420. Receiver Models 4ER42G10-33 are equipped with Oscillator/Multiplier Boards which use the Integrated Circuit Oscillator Module (ICOM).

Standard Oscillator/Multiplier Board (A415-A420)

The oscillator in the standard Oscillator/Multiplier Board is a transistorized Colpitts oscillator. The oscillator crystal operates in a fundamental mode at a frequency of approximately 16 to 19 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 instant warm-up with a frequency stability of ±0.0005% without crystal ovens or warmers.

In single-frequency receivers, a jumper from H1 to H2 connects regulated +10 Volts to the crystal circuit. Feedback for the oscillator is developed across C47.

In multi-frequency receivers, a diode is connected in series with the crystal and up to three additional 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 in series with the desired crystal, and the crystal frequency is applied to the base of oscillator transistor Q1. The oscillator output is coupled through C45 to the base of 1st Multiplier Q2.

The 1st multiplier output is coupled through T1/T2 to Multiplier Board A413/A414. T1/T2 is tuned to four times the crystal frequency. The 1st multiplier stage is metered at J442-4 through metering network C38, CR6, R17 and R18.

Oscillator/Multiplier Board With ICOM (A432-A435)

Oscillator/Multiplier Boards A432-A435 uses ICOM Module Model 4EG26A10. 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 top. Access to the oscillator trimmer is obtained by pring 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 oven 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 the 1st multiplier Q1.

The 1st multiplier output is coupled through T1/T2 to multiplier board A413/A414. T1/T2 is tuned to four times the ICOM frequency. The 1st multiplier stage is metered at J442-4 through metering network C4, CR5, R5 and R6.

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.

MULTIPLIER BOARD (A413/A414)

Following the oscillator board are two multiplier stages. A413-Q1 operates as a tripler, and Q2 operates as a doubler. Q2 is metered at J442-1 across metering resistor R6.

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

1ST MIXER (A412)

The 1st Mixer uses a Field-Effect Transistor (FET) as the active device. A FET may be considered a semiconductor current path (or channel) whose resistance is varied by a voltage applied between the "gate" and "source" terminals. Lead identification

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

The FET mixer has several advantages over a conventional transistor mixer, including a high input impedance and an output that is relatively free of harmonics (low in intermodulation products).

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

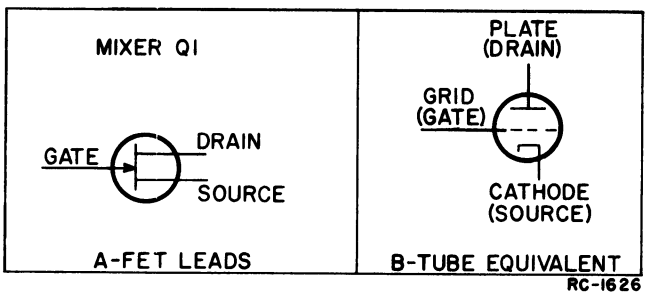


Figure 2 - FET Nomenclature

HI IF AMPLIFIER (A421) AND CRYSTAL FILTER (A422)

A series-resonant circuit (A412-L2 and -C3) couples the mixer output to the emitter of the high IF amplifier A421. The transistor is connected as a grounded-base amplifier which provides a low impedance for the mixer input. The amplifier output is coupled through transformer T1 to the crystal filter.

Highly-selective crystal filter A422 provides the major selectivity for the receiver. The output of the filter is coupled through impedance-matching transformer A424-T2 to the base of the 2nd mixer.

2ND OSCILLATOR, 2ND MIXER AND 1ST LO IF AMPLIFIER (A424)

A424-Q4 operates in a Colpitts Oscillator circuit, with feedback supplied through C18. The oscillator low-side injection voltage (11,945 kHz) is applied to the base of the 2nd mixer.

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

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

2ND LO IF AMPLIFIER AND LIMITERS (A426)

Additional amplification of the low IF signal going to the limiter stages is provided by 2nd low IF amplifier A426-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 (A426-Q2, -Q3 and -Q4). The 1st limiter is metered at J442-3 through metering network C20, CR4 and R26.

DISCRIMINATOR (A426)

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 (A426)

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 an 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 (A426)

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

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

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

Base bias for the PA stage and the elimination of crossover distortion is

controlled by bias adjust potentiometer R43. The potentiometer is set at the factory as shown in STEP 1 of the receiver Test Procedure.

NOTE

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

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

SQUELCH (A426)

Noise from the audio-noise amplifier operates the squelch circuit. With no carrier present in the receiver, this noise is coupled to the base of noise amplifier Q8 through a high-pass filter which attenuates frequencies below 3 kHz. The filter consists of 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 (unsquelched), the noise in the receiver is reduced, turning DC amplifier Q9 on and DC amplifier Q10 off. This allows the audio stages to conduct so that sound is heard in the speaker.

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 (A428/A429)

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

Encoder (A428)

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

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

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

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

Decoder (A428)

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

transmitters that are continuously tone coded for positive identification by the receiver.

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

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

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

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

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

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

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

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

MAINTENANCE

DISASSEMBLY

To service the receiver from the top--

1. Pull locking handle down and pull radio about one inch out of mounting frame. (see Figure 3).
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. (See Figure 4).
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.

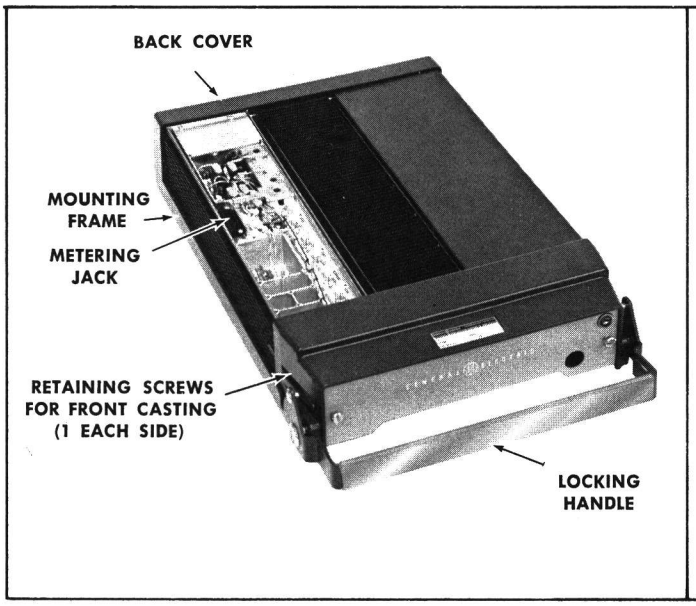


Figure 3 - Removing Top Cover

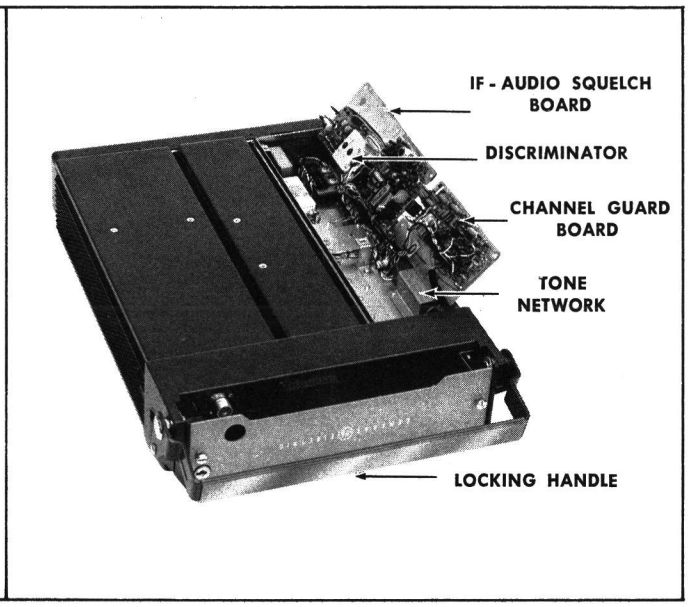


Figure 4 - Removing Bottom Cover

COMPLETE RECEIVER ALIGNMENT

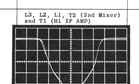
EQUIPMENT REQUIRED

1. GE Test Set Models 4EX3A10, 4EX8K11, station test meter panel, or 20,000 ohms-per-volt multimeter.
2. A 450 to 460 kHz source (GE Test Set Model 4EX7A10), and 406-470 MHz signal source. Connect a one-inch piece of insulated wire no larger than .065 inch to generator output probe.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect Test Set to receiver centralized metering jack J442, and set meter sensitivity switch to the TEST 1 or 1-volt position.
2. For a large change in frequency or a badly mis-aligned receiver, set crystal trimmer C9 on 1st OSC/MULT board (ER-42-E 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 500 kHz, align the unit on channel F1. If the frequency spacing is greater than 500 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 C425 to C426.
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 AND MULTIPLIERS		
3.	D (MULT-1)	Pin 4	L5 (1st OSC/MULT) and L1 (2nd MULT)	See Procedure	Tune L5 for maximum meter reading. Then tune L1 for minimum meter
4.	G (MULT-1)	Pin 4	L5 (1st OSC/MULT) and L1 and L2 (2nd MULT)	Maximum	Tune L5, L1 and L2 for maximum meter reading. If two peaks occur while tuning L1 and L2, use the peak with the slug nearest the top of the coil.
5.	G (MULT-2)	Pin 4	C423	See Procedure	Adjust C423 for a small dip in meter reading.
6.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal into Hole 411. Adjust the signal generator for discriminator zero.
7.	B (2nd IF AMP)	Pin 2	C423 and C424	Maximum	Apply an on-frequency signal as above. Tune C423 and C424 for maximum meter reading, keeping signal below saturation.
			RF SELECTIVITY		
8.	B (2nd IF AMP)	Pin 2	L3 (1st Mixer)	Maximum	Apply an on-frequency signal in Hole 411 and tune L2 for maximum meter reading. If two peaks occur, use the peak with the slug nearest the bottom of the coil.
9.	B (2nd IF AMP)	Pin 2	C415 thru C418	Maximum	Apply an on-frequency signal in the Hole shown below, keeping the signal below saturation. Tune C415 thru C418 for maximum meter reading as shown below. Insert Generator Probe In: / Peak 1. Hole 411 / C418 thru C417 2. Hole 410 / C415, C416 thru C417
10.	B (2nd IF AMP)	Pin 2	C414 thru C418, L3 (on 1st Mixer) and C410, and C411 (on UHS receivers)	See Procedure	Apply an on-frequency signal to the receiver antenna jack. Tune C410, and C441 on UHS receivers for maximum meter reading. On all receivers, tune C414 for maximum meter reading, and tune C415 thru C418 and L3 for maximum quieting.
			2ND MIXER & HI IF		
The 2nd mixer, and high IF circuits have been aligned at the factory and will normally require no further adjustment. If adjustment is necessary use the procedure outlined in STEPS 11, 12 and 13.					
			NOTE Refer to DATAFILE BULLETIN 1000-6 IF Alignment of Two-Way Radio FM Receivers for helpful suggestions on how to determine when IF alignment is required.		
11.	B (2nd IF AMP)	Pin 2	L3, L2, L1, T2 (2nd Mixer) and T1 (Hi IF AMP)	Maximum	Apply on-frequency, unmodulated signal and tune L3, L2, L1, T2 (2nd Mixer) and T1 (Hi IF AMP) for maximum meter reading, keeping signal below saturation.
12.			L3, L2, L1, T2 (2nd Mixer) and T1 (Hi IF AMP) 		Connect scope, signal generator, and detector as shown in Figure 7. Set signal generator level for 30-50 µv and modulate with 10 kHz at 20 Hz. With detector at the collector of Q2 (2nd mixer board output), tune for double trace as shown on scope pattern.
13.	A (DISC)	Pin 10		See Procedure	Check to see that discriminator idling voltage is within ±.06 volt of zero with no signal applied. Check to see that modulation acceptance bandwidth is between 27.5 and 9 kHz.
			FREQUENCY ADJUSTMENT		
14.	Refer to the appropriate adjustment procedure for the ICOM or Standard Oscillator.				

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

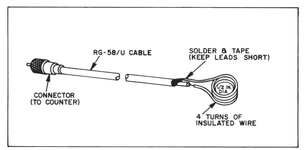
1. GE Test Set Model 4EX3A10, 4EX8K11 station test meter panel or 20,000 ohms-per-volt multimeter.
2. A 406-470 MHz signal source. Connect a one-inch piece of insulated wire no larger than 0.065 inch to generator output probe.

PRELIMINARY CHECKS AND ADJUSTMENTS

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

ALIGNMENT PROCEDURE

STEP	METERING POSITION: GE Test Set or Meter Pane	METERING POSITION: Multimeter - at J442	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR AND MULTIPLIERS		
1.	D (MULT-1)	Pin 4	L5 (1st OSC/MULT) and L1 (2nd MULT)	See Procedure	Tune L5 for maximum meter reading. Then tune L1 for minimum meter reading.
2.	G (MULT-2)	Pin 4	L5 (1st OSC/MULT) and L1 and L2 (2nd MULT)	Maximum	Tune L5, L1 and L2 for maximum meter reading. If two peaks occur while tuning L1 and L2, use the peak with the slug nearest the top of the coil.
3.	G (MULT-2)	Pin 4	C423	See Procedure	Adjust C423 for a small dip in meter reading.
4.	A (DISC)	Pin 10		Zero	Apply on on-frequency signal into Hole 411. Adjust the signal generator for discriminator zero.
5.	B (2nd IF AMP)	Pin 2	C423 and C424	Maximum	Apply an on-frequency signal as above. Tune C423 and C424 for maximum meter reading, keeping signal below saturation.
			RF SELECTIVITY		
6.	B (2nd IF AMP)	Pin 2	L3, C415-C418	Maximum	Apply an on-frequency signal in Hole 411 and tune L3 and C415 thru C418 for maximum meter reading, keeping the signal below saturation. If two peaks occur when tuning L3, use the peak with the slug nearest bottom of the coil.
7.	B (2nd IF AMP)	Pin 2	C414 thru C418, L3 (on 1st Mixer) and C410, and C411 (on UHS receivers)	See Procedure	Apply on on-frequency signal to the receiver antenna jack. Tune C410, and C411 on UHS receivers for maximum meter reading. On all receivers, tune C414 for maximum meter reading, and then tune C415 thru C418 and L3 for maximum quieting.
			FREQUENCY ADJUSTMENT		
8.	Refer to the appropriate adjustment procedure for the ICOM or Standard Oscillator.				



RC-1600

Figure 5 - Coaxial Cable and Test Loop

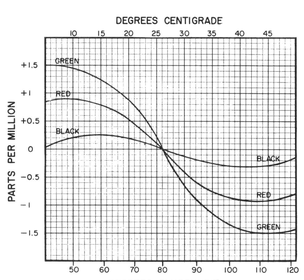
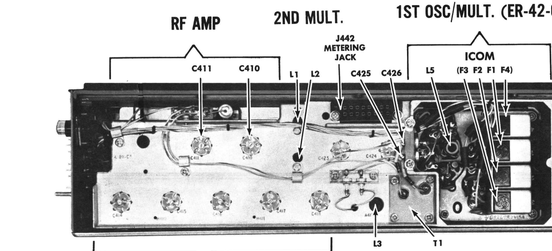
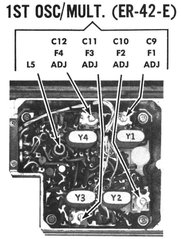


Figure 6 - ICOM Correction Curves





IF-AUDIO & SQUELCH

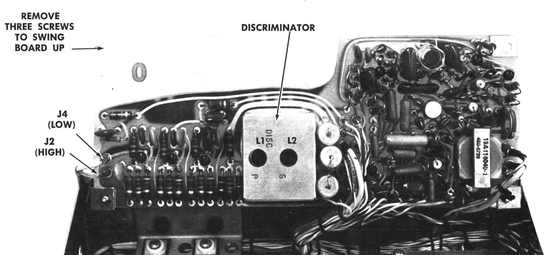


Figure 8 - Detector Probe for Sweep Alignment

FREQUENCY ADJUSTMENT

LBI-3999

STANDARD OSCILLATOR

METERING POSITION: GE Test Set or Meter Panel 4EX3A10	METERING POSITION: Multimeter -at J442	TUNING CONTROL	METER READING	PROCEDURE
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 crystal trimmer 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 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.

ICOM MODULE

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

EQUIPMENT REQUIRED:

1. Frequency Counter capable of measuring the 70-80 MHz frequency range. (The counter should have an accuracy of 0.4 part-per million.)
2. Coaxial cable with test loop as described in Figure 5.
3. Mercury thermometer.

PROCEDURE:

1. Check the ICOM temperature by taping the mercury thermometer to the side of the ICOM.
2. Connect the frequency counter to L5 (on the 1st Osc/Mult) using the 4-turn test loop and cable shown in Figure 5.
3. If the ICOM temperature is 80°F (74°F) or 26.5°C (22°C), the frequency indication on the counter should be 4 times the frequency stenciled on the ICOM case. Adjust the ICOM trimmer (if necessary) to obtain this frequency.
4. If the temperature is not within the 80°F (74°F) or 26.5°C (22°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 4 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 L5 should be 4 times the ICOM frequency ± the correction factor. Adjust the ICOM trimmer (if required) to obtain this frequency.

FOR EXAMPLE

ICOM Frequency	-	18.233333 MHz
ICOM Color Dot	-	Green
Ambient Temperature	-	35°C (95°F)
Correction Factor	-	-1.15 PPM
(From Figure 6)		

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

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

Set the frequency measured at L5 for 72.933248 MHz:

72.933332 MHz
-.000084 MHz
72.933248 MHz

NOTE 1: Appendix A of DATAFILE Bulletin 1000-6 contains instructions for building a sweep modulator.

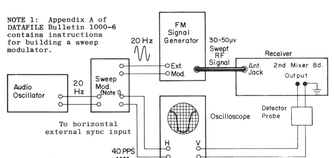
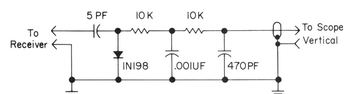


Figure 7 - Test Setup for 20-Hz Double-Trace Sweep Alignment



ALIGNMENT PROCEDURE

406—470 MHz MASTR RECEIVER
MODELS 4ER42E10-33 & 4ER42G10-33

TEST PROCEDURES

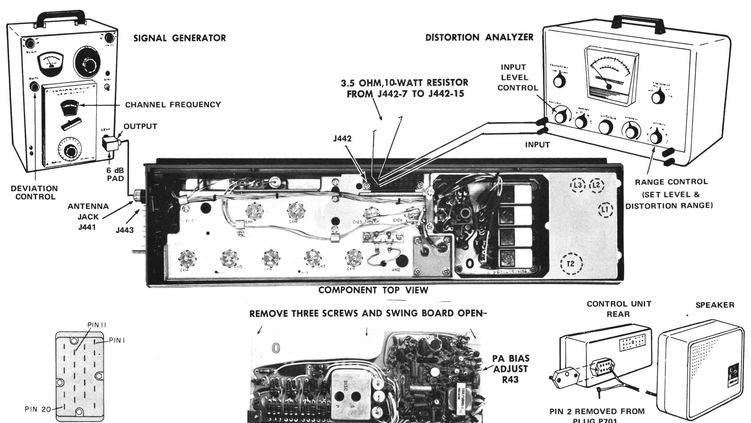
These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, limiter not operating properly, and low gain. By following the sequence of test steps starting with Step 1, the defect 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.



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 between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

D. The deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. If should be more than ±7.5 kHz (but less that ±9.5 kHz).

SERVICE CHECK

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

STEP 1-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	1.0 VDC	
G Mult 2	0.3 VDC	
J Regulated +10 Volts	10 VDC	

SYMPTOM CHECKS

SYMPTOM	PROCEDURE
NO SUPPLY VOLTAGE	• Check power connections and continuity of supply leads, and check fuse in power supply. If fuse is blown, check receiver for short circuits.
NO REGULATED 10-VOLTS	• Check the 12-volt supply. Then check regulator circuit (See Troubleshooting Procedure for Power Supply).
LOW 1ST LIM READING	• Check supply voltages and then check oscillator reading at J442-4 & 5 as shown in STEP 2A. • Make SIMPLIFIED VTVM GAIN CHECKS from 2nd Mixer through 1st Limiter stages as shown in STEP 2A.
LOW OSCILLATOR/MULTIPLIER READINGS	• Check alignment of Oscillator (Refer to Front End Alignment Procedure). • Check voltage readings of 1st Oscillator/Multiplier Q1/Q2. • 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 readings of RF Amp, 1st Mixer and HI IF Amp. • Make SIMPLIFIED GAIN CHECKS (STEP 2A).
LOW AUDIO	• Check Audio PA (Q410 & Q411) voltage readings on schematic diagram. • Make simplified gain and waveform checks of audio and squelch stages (Steps 2A and 2B). • Make unsquelched voltage readings in Audio section (Refer to Receiver Schematic Diagram). • Check voltage 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 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:

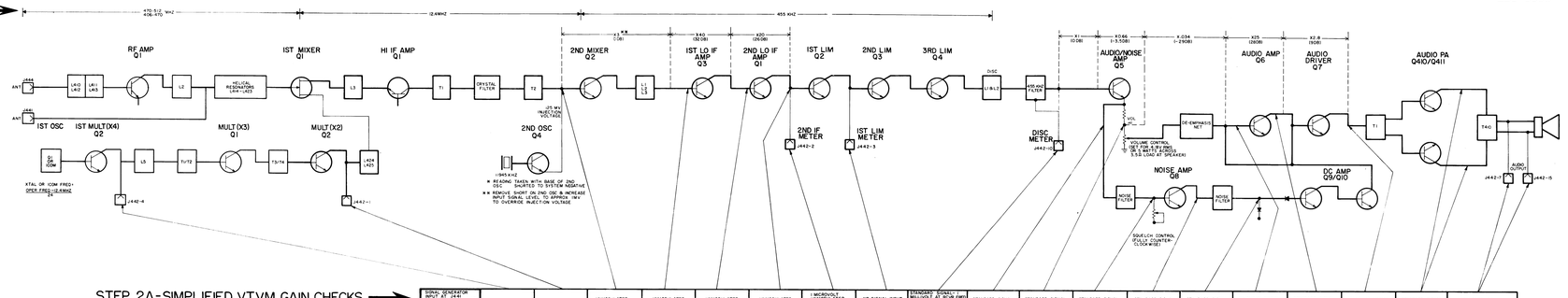
1. RF Voltmeter (Similiar to Boonton Model 91-CA or Millivac Type MV-18 C).
2. Signal on receiver frequency (below saturation). Correct frequency can be determined by zeroing the discriminator. Use 1,000 Hertz signal with 3.0 kHz deviation for audio stage.

PROCEDURE

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

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

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



STEP 2A-SIMPLIFIED VTVM GAIN CHECKS

EQUIPMENT REQUIRED:

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

PRELIMINARY STEPS:

1. Set VOLUME control for 4.18 volts across 3.5-ohm load. If this cannot be obtained, set to approx. 70% of max. rotation.
2. Set SQUELCH control fully counterclockwise.
3. Receiver should be properly aligned.
4. Connect VTVM between system negative and points indicated by arrow (except for 1st MULT which references chassis ground).

SIGNAL GENERATOR INPUT AT J442-1 MAINTAIN SETTING AT DISCRIMINATOR ZERO			UNMODULATED	UNMODULATED	UNMODULATED	UNMODULATED	1 MICROVOLT UNMODULATED	NO SIGNAL INPUT	STANDARD SIGNAL: 1 MILLIVOLT AT 90% FREQ MODULATED BY 1KHZ WITH 3.0KHZ DEVIATION (R.S.S.)	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 READS .25VDC. DECREASE 51 DB.	INCREASE SIGNAL GENERATOR OUTPUT FROM STEP 1 UNTIL VTVM READS .25VDC. DECREASE 51 DB.	INCREASE SIGNAL GENERATOR OUTPUT FROM STEP 2 UNTIL VTVM READS .25VDC. DECREASE 51 DB.	INCREASE SIGNAL GENERATOR OUTPUT FROM STEP 3 UNTIL VTVM READS .25VDC. DECREASE 51 DB.												CONNECT VTVM OR SCOPE ACROSS 3.5Ω LOAD RESISTOR AT J442-15 WITH SPEAKER DISCONNECTED.
READING	0.8 VDC	0.25 VDC	GENERATOR OUTPUT SHOULD BE APPROX 20 MILLIVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 600 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 5 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 0.3 MICROVOLTS	~0.6 VDC	~2 VDC	0.8 VAC	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:

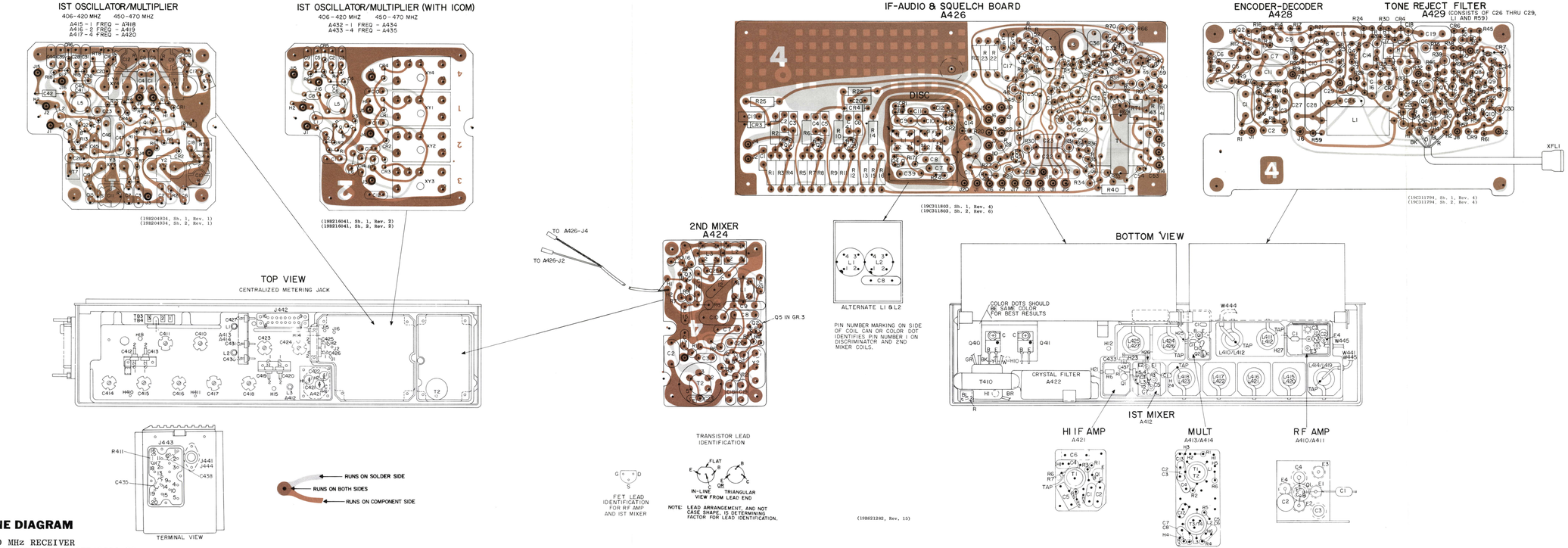
1. Set VOLUME control for 4.18 volts across 3.5-ohm load. If this cannot be obtained, set to approx. 70% of max. rotation.
2. Set SQUELCH control fully counterclockwise.
3. Receiver should be properly aligned.
4. Connect oscilloscope between system negative and points indicated by arrow.

SCOPE SETTING	HORIZONTAL	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
	VERTICAL	1 VOLT/DIV	1 VOLT/DIV	1 VOLT/DIV	2 VOLTS/DIV	5 VOLTS/DIV	50 MILLIVOLTS/DIV	2 VOLTS/DIV	10 VOLTS/DIV	10 VOLTS/DIV	5 VOLTS/DIV
PEAK TO PEAK VOLTAGE		2 V P-P	1.4 V P-P	1V 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 3.0KHZ DEVIATION (-10 KHZ WIDE BAND)											
NOISE WAVE FORM (NO SIGNAL INPUT)											

RC-1828D

TROUBLESHOOTING PROCEDURE

406—470 MHz RECEIVER
MODELS 4ER42E10-33 & 4ER42G10-33



OUTLINE DIAGRAM

406—470 MHz RECEIVER
MODELS 4ER42E10-33 & 4ER42G10-33

PARTS LIST

LBI4023K

406-470 MHz RECEIVERS
4SRA2E10-33, 4SRA3G10-33

SYMBOL	GE PART NO.	DESCRIPTION
		RF AMPLIFIER
A410* and A411*		19C320979G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	19A116814P43	Ceramic disc: 18 pf ±5%, 500 VDCW; temp coef 0 PPM.
C3	3493392P105	Ceramic, stand-off: 220 pf ±100% -0%, 500 VDCW; sim to Allen-Bradley Type B50D.
C4	3493392P5	Ceramic, feed-thru: 220 pf ±100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C5	3493392P25	Ceramic, feed-thru: 220 pf ±100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C6	3493392P107	Ceramic, stand-off: 1000 pf ±100% -0%, 500 VDCW; sim to Allen-Bradley Type B50D.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	19B209429P1	Coil, RF, 10 uh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-12.
L3 thru L5	19A116632P1	Toroidal core.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116154P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	3815ZP103J	Composition: 100 ohms ±10%, 1/4 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
		In REV F and earlier:
A410* and A411*		RF AMPLIFIER A410 19C321875G1 (406-420 MHz) A411 19C321875G2 (450-470 MHz)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	3493392P107	Ceramic, stand-off: 1000 pf ±100% -0%, 500 VDCW; sim to Allen-Bradley Type B50D.
C2	7484398P3	Silver mica: 350 pf ±10%, 500 VDCW; sim to Underwood Type J18F.
C3	3493392P7	Ceramic, feed-thru: 1000 pf ±100% -0%, 500 VDCW; sim to Allen Bradley Type FA5C.
C4	3493392P107	Ceramic, stand-off: 1000 pf ±100% -0%, 500 VDCW; sim to Allen-Bradley Type B50D.
C5	5496218P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C6	5496218P69	Phenolic: 1.8 pf ±5%, 500 VDCW.
C7	7484388P1	Variable: 1.5-7 pf, temp coef 0 PPM; sim to Erie Style 9020.
C8	5491601P122	Phenolic: 1.2 pf ±5%, 500 VDCW.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1 and E2	19B209055P8	Terminal, feed-thru: sim to Electrical Industries ABA54W88.
E3	19B209055P1	Terminal, feed-thru: sim to Electrical Industries ABA8-40W-4A.
E4	19B209055P8	Terminal, feed-thru: sim to Electrical Industries ABA54W88.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116859P1	Silicon, NPN; sim to Type 2N5032 or 2N5570.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3815ZP103J	Composition: 10K ohms ±5%, 1/4 w.
R2	3815ZP272J	Composition: 2.7K ohms ±5%, 1/4 w.
R3	3815ZP821J	Composition: 820 ohms ±5%, 1/4 w.
R4	3815ZP391J	Composition: 390 ohms ±5%, 1/4 w.
		In 19D500881G1 REV G-M: In 19D500881G4 REV G-M:
A410* and A411*		RF AMPLIFIER 19C319590G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1*	19A116314P43	Ceramic: 27 pf ±10%, 100 VDCW; temp coef 0 PPM.
		In 19D500881G1 REV G-L; In 19D500881G4 REV G-L:
C2	5496218P344	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -150 PPM.
	5496218P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C3	3493392P5	Ceramic, feed-thru: 220 pf ±100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C4 thru C6	3493392P107	Ceramic, stand-off: 1000 pf ±100% -0%, 500 VDCW; sim to Allen-Bradley Type B50D.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	19B209429P1	Coil, RF, 10 uh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-12.
L3 thru L5	19A116632P1	Toroidal core.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A116154P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	3815ZP103K	Composition: 100 ohms ±10%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
L2	19B216440G1	(Part of L3).
L3		Coil assembly, includes:
C2	5496218P249	RF AMPLIFIER A410 19C321875G1 (406-420 MHz) A411 19C321875G2 (450-470 MHz) Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
C8*	19A116114P12	Ceramic: 3.3 pf ±5%, 100 VDCW, temp coef 0 PPM; sim to Jeffers 4638-6.
L2	19B209430P113	Coil, RF, 10 uh ±10%, 0.74 ohms DC res max; sim to Jeffers 4638-6.
	5491796P8	Tuning slug.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1*	19A116960P1	Type, field effect; sim to Type 2N4416.
		In 19D500881G1 of REV M and earlier; In 19D500881G3 of REV N and earlier; In 19D500881G4 of REV P and earlier; In 19D500881G6 of REV R and earlier:
	19A116154P1	N Channel, field effect.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3815ZP302J	Composition: 3000 ohms ±5%, 1/4 w.
R2 and R3	3815ZP101K	Composition: 100 ohms ±10%, 1/4 w.
A412 and A414		MULTIPLIER BOARD ASSEMBLY A413 19B214360G1 A414 19B214360G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A116655P13	Ceramic disc: 330 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C2		(Part of T3).
C3*		(Part of T3).
C4	54962030P149	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C5		(Part of T3).
C6		(Part of T4).
C7		(Part of T3).
C8		In REV A thru G:
C9*	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Dicap. Deleted by REV H.
C10	54962030P149	Ceramic disc: 220 pf ±10%, 500 VDCW, temp coef -3300 PPM.
C11	54962189P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C12	5494481P107	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Dicap.
C13	19A116655P13	Ceramic disc: 330 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C14	54962189P548	Ceramic disc: 36 pf ±5%, 500 VDCW, temp coef -330 PPM.
C15*	5494481P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Dicap. Added by REV L.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1		(Part of T1 and T2).
L2	54962189P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -750 PPM.
L3	19B209432P1	Coil, RF, 0.10 uh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-12.
L4		(Part of T2).
L5		(Part of T3).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1*	19A116539P2	Silicon, NPN.
	19A116059P1	Earlier than REV C:
Q2	19A115399P1	Silicon, NPN.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3815ZP101K	Composition: 100 ohms ±10%, 1/4 w.
R2	3815ZP181J	Composition: 180 ohms ±5%, 1/4 w.
R3	3815ZP100K	Composition: 10 ohms ±10%, 1/4 w.
R4	3815ZP471K	Composition: 470 ohms ±10%, 1/4 w.
R5	3815ZP683J	Composition: 68 ohms ±5%, 1/4 w.
R6	3815ZP273K	Composition: 27K ohms ±10%, 1/4 w.
R7*	3815ZP100K	Composition: 10 ohms ±10%, 1/4 w. Added by REV C.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1 thru T4		COIL ASSEMBLY T1 19B214357G1 T2 19B214357G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	54962189P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -150 PPM.
C3	54962189P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19B216373P5	Coil.
L4	19B209429P1	Coil, RF, 0.10 uh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-12.
	19B209674P26	Tuning slug.
T3 and T4		COIL ASSEMBLY T3 19B214357G1 T4 19B214357G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1		Ceramic disc: 330 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C2		(Part of T3).
C3*	54962189P237	Ceramic disc: 6.0 pf ±0.25 pf, 500 VDCW, temp coef -60 PPM.
		In REV F and earlier:
	54962189P39	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C4*	54962189P237	Ceramic disc: 6.0 pf ±0.25 pf, 500 VDCW, temp coef -60 PPM.
		In REV A thru G:
	54962189P36	Ceramic disc: 5 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
		Earlier than REV A:
	54962189P37	Ceramic disc: 6 pf ±0.25 pf, 500 VDCW, temp coef -220 PPM.
C7*	54962189P746	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -750 PPM.
		In REV F and earlier:
	54962189P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -150 PPM.
C8*	54962189P266	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef -60 PPM.
		In REV A thru G:
	54962189P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
		Earlier than REV A:
	54962189P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -750 PPM.
C9 thru C11		(Part of T4).
L3	19B209432P1	Coil, RF, 0.10 uh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-12.
L4		(Part of T2).
L5		(Part of T4).
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1*	19A116059P1	Silicon, NPN.
		Earlier than REV C:
Q2	19A115399P1	Silicon, NPN.
A415 thru A420		FIRST OSCILLATOR ASSEMBLY A415 19B209419P1 A416 19B209419P20 A417 19B209419P21 A418 19B209419P22 A419 19B209419P23 A420 19B209419P24
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C4	54946481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.

SYMBOL	GE PART NO.	DESCRIPTION
C5 thru C8	54962189P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C9 thru C12	54912T1P106	Variable, subminature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189.
C13 thru C16	54962189P40	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C17 thru C20	19C380685P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C21 thru C23	54944481P114	Ceramic disc: 2000 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C24	54944481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C25	54944481P114	Ceramic disc: 2000 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C26	54944481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C27	54946181P123	Phenolic: 1.5 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C28	54944481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C40		(Part of T7).
C41		(Part of T8).
C42	54916019P130	Phenolic: 3.3 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C43	54962189P53	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef 0 PPM.
C44	54900089P135	Silver mica: 820 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C45	54900089P55	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C46	54962189P663	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -330 PPM.
C47	54962189P767	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -750 PPM.
CR1 thru CR4	19A116603P1	- - - - - - - - DIODES AND RECTIFIERS - - - - - - - - Silicon.
CR5	19A115350P1	Silicon.
J1 thru J4	4033513P4	- - - - - - - - JACKS AND RECEPTACLES - - - - - - - - Contact, electrical: sim to Bead Chain L83-3.
J15 and J16	4033513P4	Contact, electrical: sim to Bead Chain L83-3.
L2 and L3	7488078P16	- - - - - - - - INDUCTORS - - - - - - - - Choke, RF: 10 uh ±10% iad at 640 ma, 0.6 ohm DC res; sim to Jeffers 4421-7K.
L5		(Part of T7 and T8).
Q1	19A116655P19	- - - - - - - - TRANSISTORS - - - - - - - - Silicon, NPN.
Q2*	7489162P21	Silicon; min. 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
	54900089P21	In 19D500881G1, G3 of REV K and earlier; In 19D500881G2, G4 of REV J and earlier:
	54962189P650	Silver mica: 56 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
Q3	3815ZP563J	- - - - - - - - RESISTORS - - - - - - - - Composition: 5600 ohms ±5%, 1/4 w.
R1 thru R4	3815ZP104K	Composition: 0.1 megohm ±10%, 1/4 w.
R5	3815ZP153J	Composition: 15,000 ohms ±5%, 1/4 w.
R10	3815ZP101K	Composition: 100 ohms ±10%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R11 and R12	3815ZP102J	Composition: 1K ohms ±5%, 1/4 w.
R13	3815ZP151J	Composition: 150 ohms ±5%, 1/4 w.
R14	3815ZP103J	Composition: 10K ohms ±5%, 1/4 w.
R15	3815ZP101K	Composition: 100 ohms ±10%, 1/4 w.
R16	3815ZP103K	Composition: 10K ohms ±10%, 1/4 w.
R17 and R18		
R20	3815ZP270K	Composition: 27 ohms ±10%, 1/4 w.
		- - - - - - - - - - TERMISTORS - - - - - - - - - -
R25 thru R28	19B209284P7	Disc: 62 ohms res nominal at 25°C, color code violet.
R29	19B209284P8	Disc: 945 ohms res nominal at 25°C, color code gray.
A422		- - - - - - - - - - TRANSFORMERS - - - - - - - - - - CRYSTAL FILTER ASSEMBLY 19B206410G8
T7 and T8		COIL ASSEMBLY T7 19B209550G1 T8 19B209550G2
FL7	19C304358G1	- - - - - - - - FILTERS - - - - - - - - Bandpass filter.
R30	3815ZP513J	- - - - - - - - RESISTORS - - - - - - - - Composition: 51K ohms ±5%, 1/4 w.
R31	3815ZP333K	Composition: 33K ohms ±10%, 1/4 w.
A424		SECOND MIXER ASSEMBLY 19B214319G3
C2	19A116080P7	- - - - - - - - CAPACITORS - - - - - - - - Polyester: 0.1 uf ±20%, 50 VDCW.
C3	54944481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C7 and C8	19A116080P5	Polyester: 0.047 uf ±20%, 50 VDCW.
C9	54962189P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C10	19A116080P7	Polyester: 0.1 uf ±20%, 50 VDCW.
C12	54962189P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C14	19A116656P20Q2	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 uf ±20%, 50 VDCW.
C17	19A116080P1	Polyester: 0.01 uf ±20%, 50 VDCW.
C18	54900089P25	Silver mica: 82 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C19	54900089P19	Silver mica: 47 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C20	54900089P1	Silver mica: 5 pf ±0.5%, 500 VDCW; sim to Electro Motive Type DM-15.
C23		(Part of T2).
C24 and C25	54962189P43	Ceramic disc: 13 pf ±5%, 500 VDCW, temp coef 0 PPM.
J1	4033513P4	- - - - - - - - JACKS AND RECEPTACLES - - - - - - - - Contact, electrical: sim to Bead Chain L83-3.
L1	19C311181G3	- - - - - - - - INDUCTORS - - - - - - - - Coil assembly.
L2 and L3	19A115711P1	Transformer, freq: 455 KHz; sim to Automatic Mfg E212075.
Q1*	19A115400P1	- - - - - - - - TRANSISTORS - - - - - - - - Silicon, NPN.
	19A115539P1	In 19D500881G1, G3 of REV K and earlier; In 19D500881G2, G4 of REV L and earlier: Silicon, NPN.

SYMBOL	GE PART NO.	DESCRIPTION
R1	3815ZP301J	Composition: 300 ohms ±5%, 1/4 w.
R2	3815ZP101K	Composition: 100 ohms ±10%, 1/4 w.
R3*	3815ZP152J	Composition: 1.5K ohms ±5%, 1/4 w.
R3	3815ZP101K	In 19D500881G1, G3 of REV K and earlier; In 19D500881G2, G4 of REV L and earlier:
R4	3815ZP302J	Composition: 3K ohms ±5%, 1/4 w.
R5	3815ZP101K	Composition: 100 ohms ±10%, 1/4 w.
R6	3815ZP301J	Composition: 300 ohms ±5%, 1/4 w.
T1	19B214377G1	Coil assembly. Includes:
	54937B8P7	Tuning slug.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - - CRYSTAL FILTER ASSEMBLY 19B206410G8
T2		COIL ASSEMBLY 19B214359G2
C23	54962189P258	- - - - - - - - CAPACITORS - - - - - - - - Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -80 PPM.
	19B209674P23	Tuning slug.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
Y2	19A110398G1	Quartz: freq 11945.00 KHz, temp range -30°C to +75°C.
A426		IF AUDIO AND SQUELCH BOARD 19D413129G3
C1	54944481P111	- - - - - - - - CAPACITORS - - - - - - - - Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Dicap.
C2	54962189P717	Tantalum: 0.68 uf ±20%, 35 VDCW; sim to Sprague Type 150D. Deleted by REV A.
C3	54944481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JL.
C4	54962189P717	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef -750 PPM.
C5 and C6	54944481P111	Ceramic disc: 1000 pf ±20%, 1000 VDCW; sim to RMC Type JF Dicap.
C7	19A116080P5	Polyester: 0.047 uf ±20%, 50 VDCW.
C8	19A116656P18Q2	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C9 thru C10	54900089P37	Silver mica: 270 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C11	54962189P656	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -470 PPM.
C12	54944481P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C13	19A116080P107	Electrolytic: 100 uf +150% -10%, 25 VDCW; sim to Mallory Type TTA.
C14 and C15	19A115680P104	Electrolytic: 50 uf +150% -10%, 25 VDCW; sim to Mallory Type TTA.
C16	54944481P112	Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.
C17	19A116080P7	Polyester: 0.1 uf ±20%, 50 VDCW.
C18	54944481P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Dicap.

SYMBOL	GE PART NO.	DESCRIPTION
Q2*	19A115245P1	- - - - - - - - TRANSISTORS - - - - - - - - Silicon, NPN. Deleted by REV A.
Q3	19A115123P1	Silicon, NPN.
Q4	19A115245P1	Silicon, NPN. Added by REV A.
Q5*	19A134474P1	Silicon, NPN. Added by REV A.
	3815ZP302J	- - - - - - - - RESISTORS - - - - - - - - Composition: 3K ohms ±5%, 1/4 w.
R1	3837ZP103E	Composition: 10K ohms ±10%, 1/2 w.
R2		
R3	3837ZP512J	Composition: 5.1K ohms ±5%, 1/2 w.
R4	3815ZP333K	Composition: 33K ohms ±10%, 1/4 w.
R5	3815ZP103J	Composition: 10K ohms ±5%, 1/4 w.
R6	3837ZP333K	Composition: 3.3K ohms ±10%, 1/2 w.
R7	3837ZP123K	Composition: 12K ohms ±10%, 1/2 w.
R8	3837ZP623J	Composition: 6.2K ohms ±5%, 1/2 w.
R9	3837ZP302J	Composition: 3K ohms ±5%, 1/2 w.
R10	3837ZP202J	Composition: 2K ohms ±5%, 1/2 w.
R11	3837ZP201J	Composition: 200 ohms ±5%, 1/2 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T2		COIL ASSEMBLY 19B214359G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C28*	54962189P258	Ceramic disc: 62 pf ±5%, 500 VDCW, temp coef -80 PPM.
C29*	54962189P717	Tantalum: 1.0 uf ±10%, 35 VDCW; sim to Sprague Type 150D. Deleted by REV A.
C30	19A116080P6	Polyester: 0.15 uf ±5%, 50 VDCW.
C31	19A116080P102	Polyester: 0.015 uf ±10%, 50 VDCW.
C32	19A116080P7	Polyester: 0.1 uf ±20%, 50 VDCW.
C33	19A116080P9	Polyester: 0.22 uf ±20%, 50 VDCW.
C34	40290033P207	Silver mica: 1820 pf ±2%, 500 VDCW; sim to Electro Motive Type DM-20.
C35	19A116080P5	Polyester: 0.047 uf ±20%, 50 VDCW.
C36*	19A116080P9	Polyester: 0.22 uf ±20%, 50 VDCW.
	19B209243P7	Earlier than REV C:
C37*	54962189P717	Polyester: 0.1 uf ±20%, 50 VDCW.
		Tantalum: 0.47 uf ±20%, 35 VDCW; sim to Sprague Type 150D. Deleted by REV B.
C38*	54962189P710	Tantalum: 22 uf ±20%, 15 VDCW; sim to Sprague Type 150D. Deleted by REV C.
	54962189P714	Earlier than REV A:
		Tantalum: 15 uf ±20%, 20 VDCW; sim to Sprague Type 150D.
C39	19A116080P1	Polyester: 0.01 uf ±20%, 50 VDCW.
C40*	54962189P729	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -470 PPM.
		In REV A-K:
	54962189P728	Tantalum: 0.47 uf ±20%, 35 VDCW; sim to Sprague Type 150D.
		Earlier than REV A:
	19B209243P117	Tantalum: 0.22 uf ±10%, 50 VDCW.
C41	54900089P129	Silver mica: 120 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C42*	19B209243P4	Polyester: 0.033 uf ±20%, 50 VDCW. Deleted by REV A.
C43*	54962189P213	Tantalum: 2.2 uf ±10%, 20 VDCW; sim to Sprague Type 150D. Deleted by REV A.

MODELS WITH DISCRETE CIRCUIT OSCILLATOR	MODELS WITH TCXO OSCILLATOR	NO. OF FREQS	FREQ RANGE 406-420 LO 450-470 HI	CHANNEL GUARD	U.H.S. RECEIVER A410/A411 PRESENT
4ER42E10	4ER42G10	1	LO	-	-
4ER42E11	4ER42G11	1	HI	-	-
4ER42E12		2	LO	-	-
4ER42E13		2	HI	-	-
4ER42E14	4ER42G14	4	LO	-	-
4ER42E15	4ER42G15	4	HI	-	-
4ER42E16	4ER42G16	1	LO	X	-
4ER42E17	4ER42G17	1	HI	X	-
4ER42E18		2	LO	X	-
4ER42E19		2	HI	X	-
4ER42E20	4ER42G20	4	LO	X	-
4ER42E21	4ER42G21	4	HI	X	-
4ER42E22	4ER42G22	1	LO	-	X
4ER42E23	4ER42G23	1	HI	-	X
4ER42E24		2	LO	-	X
4ER42E25		2	HI	-	X
4ER42E26	4ER42G26	4	LO	-	X
4ER42E27	4ER42G27	4	HI	-	X
4ER42E28	4ER42G28	1	LO	X	X
4ER42E29	4ER42G29	1	HI	X	X
4ER42E30		2	LO	X	X
4ER42E31		2	HI	X	X
4ER42E32	4ER42G32	4	LO	X	X
4ER42E33	4ER42G33	4	HI	X	X

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. RESISTANCE VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR M=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (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 (-) 442-8WITH TEST SET MODEL 4EX300 OR A 20,000 OHM-PER-VOLT METER

S-NO SIGNAL IN WITH SQUELCH CONTROL FULLY COUNTERCLOCKWISE (MAXIMUM SQUELCH).

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

GND					
RECEIVER MUTE (+0V)					
ENCODE OUT					
SQ. HI					
VOL. HI					
FREQ 1					
FREQ 2					
FREQ 3					
FREQ 4					
VOL ARM					
+12 V					
REG +10V					
SYSTEM NEG					
VOL/SQ. LO					
A.F. OUT 1					
A.F. OUT 2					
C.G. ON-OFF					
C.O.S. FEED					
MON. LOCK					

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

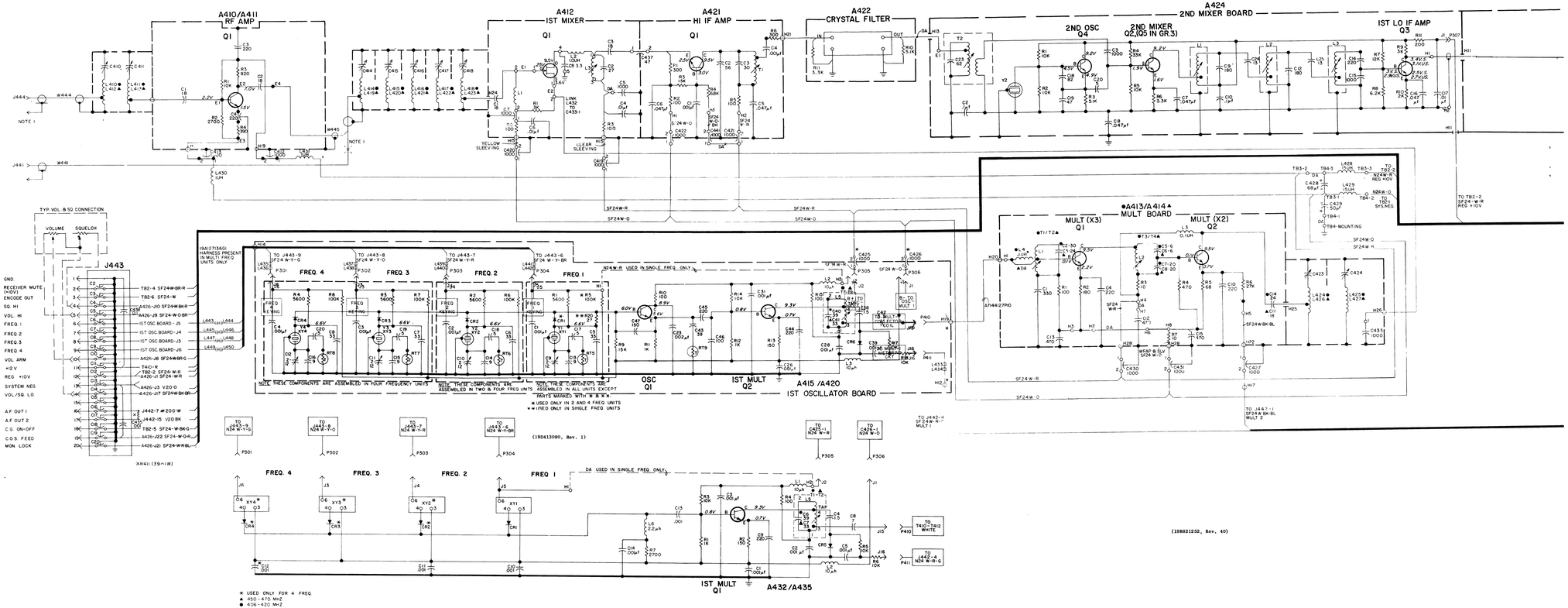
●THESE ARE ONLY PARTS PRESENT ON A429.
LOW SPLIT 406-420 MHZ
▲HIGH SPLIT 450-470 MHZ
★LEADS TO BE TERMINATED AS SHORT AS POSSIBLE
■VALUE OF A428-R47 IS DETERMINED BY TEST (SEE TEST SPEC 19A1271B2)

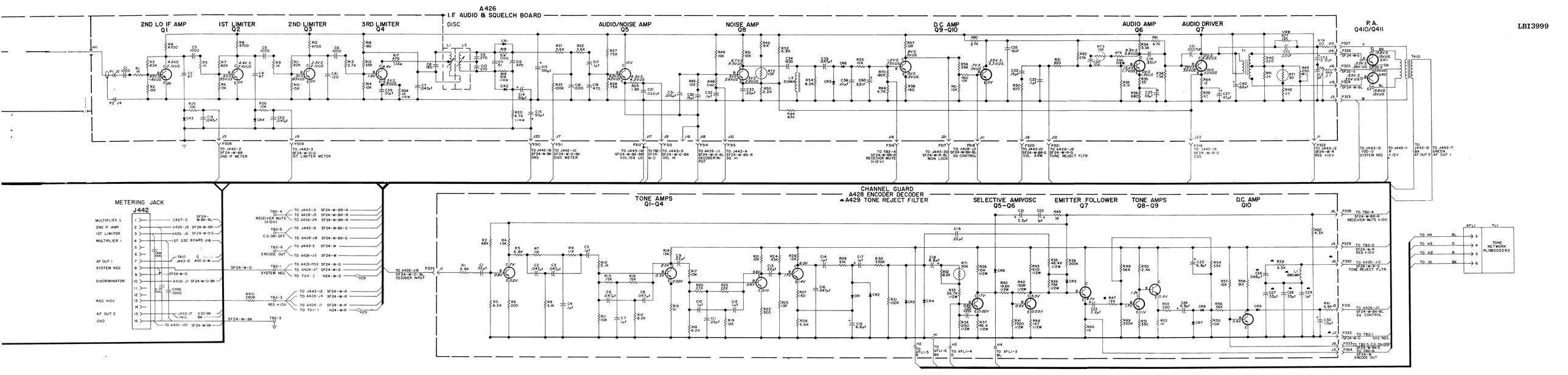
		KV
	PL19E500881G1	A
	PL19E500881G2	B
	PL19E500881G3	C
	PL19E500881G4	Y
A424	PL19B781619G3	A
A426	PL19D413129G3	M
A428	NEX/EIAD	E
A429	PL19C311797G2	

NOTE:
1. W444 AND W445 PRESENT ONLY IN U.H.S. RECEIVER
W441 PRESENT ONLY IN NON-U.H.S. RECEIVER

SCHEMATIC DIAGRAM

406—470 MHz RECEIVER
MODELS 4ER42E10-33 & 4ER42G10-33





(19B621232, Rev. 40)

SCHEMATIC DIAGRAM

406—470 MHz RECEIVER
MODELS 4ER42E10-33 & 4ER42G10-33

(Cont'd from Page 13)

SYMBOL	GE PART NO.	DESCRIPTION
C49*	5490267P9	Tantalum: 3.3 µF 120%, 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: 3700 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*	5490267P113	Tantalum: 2.2 µF ±10%, 20 VDCW; sim to Sprague Type 150D. Added by REV A.
C55*	5490267P14	Tantalum: 15 µF ±20%, 20 VDCW; sim to Sprague Type 150D. Added by REV C.
C60*	5490267P213	Tantalum: 2.2 µF ±10%, 20 VDCW; sim to Sprague Type 150D. Added by REV B to G3.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 thru CR2	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR3* and CR4*	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
	4038056P1	In REV F and earlier: Germanium.
CR5 and CR6	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR7*	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV. Deleted by REV C.
CR8*	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV. 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 PEFCH-14733-KC13.
L2	19A115711P7	Transformer, freq: 455 KHz; sim to TOKO PEFCH-14734-KBC2.
L3	19A127134G1	Choke.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q4	19A115123P1	Silicon, NPN.
Q5*	19A115889P1	Silicon, NPN.
	19A115123P1	In REV G and earlier: Silicon, NPN.
Q6	19A115123P1	Silicon, NPN.
Q7	19A115300P4	Silicon, NPN.
Q8	19A115123P1	Silicon, NPN.
Q9	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q10*	19A116771P1	Silicon, NPN; sim to Type 2N3320. In REV G and earlier:
	19A115123P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3877P103K	Composition: 1K ohms ±10%, 1/2 w.
R2	3877P153J	Composition: 15K ohms ±5%, 1/2 w.
R3	3877P823K	Composition: 82K ohms ±10%, 1/2 w.
R4	3877P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R5	3877P103K	Composition: 1K ohms ±10%, 1/2 w.
R6	3877P153J	Composition: 15K ohms ±5%, 1/2 w.
R7	3877P823K	Composition: 82K ohms ±10%, 1/2 w.
R8	3877P472K	Composition: 4.7K ohms ±10%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R9	3877P103K	Composition: 1K ohms ±10%, 1/2 w.
R10	3877P153J	Composition: 15K ohms ±5%, 1/2 w.
R11	3877P823K	Composition: 82K ohms ±10%, 1/2 w.
R13	3877P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R13	3877P223K	Composition: 0.22 M ohms ±10%, 1/2 w.
R14	3877P103J	Composition: 10K ohms ±5%, 1/2 w.
R15	3877P333J	Composition: 33K ohms ±5%, 1/2 w.
R16	3877P181K	Composition: 180 ohms ±10%, 1/2 w.
R17	3815297P17	Composition: 470 ohms ±5%, 1/4 w.
R18*	7815295133	Composition: 51K ohms ±1%, 1/4 w.
R20	3815297P36	Composition: 4.7K ohms ±10%, 1/4 w.
R21 and R22	3877P562J	Composition: 5.6K ohms ±5%, 1/2 w.
R23	3877P104K	Composition: 100K ohms ±10%, 1/2 w.
R24	3815297P102	Composition: 1K ohms ±5%, 1/4 w.
R25	3877P103K	Composition: 10K ohms ±10%, 1/2 w.
R26	3877P103K	Composition: 10K ohms ±10%, 1/2 w.
R27 and R28	3877P753J	Composition: 75K ohms ±5%, 1/2 w.
R29	3877P182J	Composition: 1.8K ohms ±5%, 1/2 w.
R30*	3877P821J	Composition: 820 ohms ±5%, 1/2 w. In REV C and earlier:
	3877P103J	Composition: 1K ohms ±5%, 1/2 w.
R31	3877P821J	Composition: 820 ohms ±5%, 1/2 w.
R32*	3877P753J	Composition: 75K ohms ±5%, 1/2 w. Deleted by REV C.
R33*	3877P912J	Composition: 9.1K ohms ±5%, 1/2 w. Earlier than REV A:
	3877P203J	Composition: 20K ohms ±5%, 1/2 w.
R34	3877P392K	Composition: 3.9K ohms ±10%, 1/2 w.
R35	3877P330K	Composition: 33 ohms ±10%, 1/2 w.
R36	3877P681J	Composition: 680 ohms ±5%, 1/2 w.
R37*	3877P822J	Composition: 8.2K ohms ±5%, 1/2 w. Deleted by REV A.
R38*	3877P753J	Composition: 75K ohms ±5%, 1/2 w. Earlier than REV A:
	3877P622J	Composition: 6.2K ohms ±5%, 1/2 w.
R39*	3877P820J	Composition: 82 ohms ±5%, 1/2 w. Earlier than REV C:
	3877P131J	Composition: 130 ohms ±5%, 1/2 w.
R40*	3877P221J	Composition: 220 ohms ±5%, 1/2 w. In REV H and earlier:
	3877P241J	Composition: 240 ohms ±5%, 1/2 w.
R41*	3815297402	Composition: 24 ohms ±5%, 1/4 w. Earlier than REV A:
	3877P300J	Composition: 30 ohms ±5%, 1/2 w.
R42*	3877P200J	Composition: 20 ohms ±5%, 1/2 w. Earlier than REV A:
	3877P106J	Composition: 10 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 BRN.
R45	3877P123J	Composition: 12K ohms ±5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R46	3877P913J	Composition: 91K ohms ±5%, 1/2 w.
R48*	19A116278P249	Metal film: 3.16K ohms ±2%, 1/2 w. Earlier than REV B:
	3877P300J	Composition: 30 ohms ±5%, 1/2 w.
RT1	5490628P41	Thermistor: 30 ohms ±10%, color code black, and white; sim to Global Type B13184-L.
RT2	5490628P9	Thermistor: 10K ohms ±10%, color code yellow; sim to Carborundum Type 551J-R.
RT3*	5490628P9	Thermistor: 10K ohms ±10%, color code yellow; sim to Carborundum Type 551J-R.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A116040P1	Audio freq: Response: 300 to 4000 Hz, +0.3 dB-0.75dB at 20 mw 300 to 4000 Hz, +0.5 dB-0.9 dB at 50 mw
A426		ENCODER/DECODER 48KE4A10 19C311379G1
	3877P473J	In REV A, B: Composition: 47K ohms ±5%, 1/2 w. Earlier than REV A:
	3877P303J	Composition: 30K ohms ±5%, 1/2 w.
R54	3877P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R55	3877P103K	Composition: 10K ohms ±10%, 1/2 w.
R57	3877P103K	Composition: 10K ohms ±10%, 1/2 w.
R58	3877P181K	Composition: 180 ohms ±10%, 1/2 w.
R59	3877P393K	Composition: 39K ohms ±10%, 1/2 w.
R60 thru R61	3877P103K	Composition: 10K ohms ±10%, 1/2 w.
R62*	3877P203K	Composition: 20K ohms ±10%, 1/2 w. Deleted by REV C.
	3877P223K	Earlier than REV A: Composition: 22K ohms ±10%, 1/2 w.
R63*	3877P432J	Composition: 4.3K ohms ±5%, 1/2 w. Deleted by REV A.
R64*	3877P130J	Composition: 13 ohms ±5%, 1/2 w. Earlier than REV C:
	3877P180J	Composition: 18 ohms ±5%, 1/2 w.
R65*	3877P154K	Composition: 150K ohms ±10%, 1/2 w. Deleted by REV B.
R66	3877P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R70	3877P184J	Composition: 180K ohms ±5%, 1/2 w.
R75*	3877P473J	Composition: 47K ohms ±5%, 1/2 w. Added by REV A. Deleted by REV C.
R76*	3877P912J	Composition: 9.1K ohms ±5%, 1/2 w. Added by REV A. Deleted by REV C.
R77*	3815297153J	Composition: 15K ohms ±5%, 1/4 w. Earlier than REV C:
	3815297562J	Composition: 5.6K ohms ±5%, 1/4 w. Added by REV A.
R78*	3877P200J	Composition: 20 ohms ±5%, 1/2 w. Earlier than REV A, B, and C:
	3877P106J	Composition: 10 ohms ±5%, 1/2 w.
R79*	3815297993J	Composition: 39K ohms ±5%, 1/4 w. Added by REV A.
R80*	3815297272J	Composition: 2.7K ohms ±5%, 1/4 w. In REV D-L: Composition: 4.3K ohms ±5%, 1/4 w. Added by REV C.
R81*	3815297472J	Composition: 4.7K ohms ±5%, 1/4 w. Added by REV C.
R82*	3877P273J	Composition: 27K ohms ±5%, 1/2 w. Added by REV C.
R84*	3815297473J	Composition: 47K ohms ±5%, 1/4 w. In REV K-P: Composition: 20K ohms ±5%, 1/2 w. Added by REV E.

SYMBOL	GE PART NO.	DESCRIPTION
RR5*	7815295102	Composition: 1K ohms ±5%, 1/4 w. Added by REV E. Deleted by REV L.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	5490628P41	Thermistor: 30 ohms ±10%, color code black, and white; sim to Global Type B13184-L.
RT2	5490628P9	Thermistor: 10K ohms ±10%, color code yellow; sim to Carborundum Type 551J-R.
RT3*	5490628P9	Thermistor: 10K ohms ±10%, color code yellow; sim to Carborundum Type 551J-R.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19A116040P1	Audio freq: Response: 300 to 4000 Hz, +0.3 dB-0.75dB at 20 mw 300 to 4000 Hz, +0.5 dB-0.9 dB at 50 mw
A426		ENCODER/DECODER 48KE4A10 19C311379G1
	3877P473J	In REV A, B: Composition: 47K ohms ±5%, 1/2 w. Earlier than REV A:
	3877P303J	Composition: 30K ohms ±5%, 1/2 w.
R54	3877P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R55	3877P103K	Composition: 10K ohms ±10%, 1/2 w.
R57	3877P103K	Composition: 10K ohms ±10%, 1/2 w.
R58	3877P181K	Composition: 180 ohms ±10%, 1/2 w.
R59	3877P393K	Composition: 39K ohms ±10%, 1/2 w.
R60 thru R61	3877P103K	Composition: 10K ohms ±10%, 1/2 w.
R62*	3877P203K	Composition: 20K ohms ±10%, 1/2 w. Deleted by REV C.
	3877P223K	Earlier than REV A: Composition: 22K ohms ±10%, 1/2 w.
R63*	3877P432J	Composition: 4.3K ohms ±5%, 1/2 w. Deleted by REV A.
R64*	3877P130J	Composition: 13 ohms ±5%, 1/2 w. Earlier than REV C:
	3877P180J	Composition: 18 ohms ±5%, 1/2 w.
R65*	3877P154K	Composition: 150K ohms ±10%, 1/2 w. Deleted by REV B.
R66	3877P472K	Composition: 4.7K ohms ±10%, 1/2 w.
R70	3877P184J	Composition: 180K ohms ±5%, 1/2 w.
R75*	3877P473J	Composition: 47K ohms ±5%, 1/2 w. Added by REV A. Deleted by REV C.
R76*	3877P912J	Composition: 9.1K ohms ±5%, 1/2 w. Added by REV A. Deleted by REV C.
R77*	3815297153J	Composition: 15K ohms ±5%, 1/4 w. Earlier than REV C:
	3815297562J	Composition: 5.6K ohms ±5%, 1/4 w. Added by REV A.
R78*	3877P200J	Composition: 20 ohms ±5%, 1/2 w. Earlier than REV A, B, and C:
	3877P106J	Composition: 10 ohms ±5%, 1/2 w.
R79*	3815297993J	Composition: 39K ohms ±5%, 1/4 w. Added by REV A.
R80*	3815297272J	Composition: 2.7K ohms ±5%, 1/4 w. In REV D-L: Composition: 4.3K ohms ±5%, 1/4 w. Added by REV C.
R81*	3815297472J	Composition: 4.7K ohms ±5%, 1/4 w. Added by REV C.
R82*	3877P273J	Composition: 27K ohms ±5%, 1/2 w. Added by REV C.
R84*	3815297473J	Composition: 47K ohms ±5%, 1/4 w. In REV K-P: Composition: 20K ohms ±5%, 1/2 w. Added by REV E.

SYMBOL	GE PART NO.	DESCRIPTION
CR3 and CR4	5490922P1	Silicon.
CR5	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR6	4038887P2	Silicon, Zener: 500 mW, 3.8 v. nominal.
CR7 thru CR9	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
FL1		- - - - - - - - - - FILTER - - - - - - - - - - TONE FREQUENCY NETWORK 19B209358G
	19B209358G01	71.9 Hz
	19B209358G02	74.4 Hz
	19B209358G03	77.0 Hz
	19B209358G04	88.5 Hz
	19B209358G05	85.4 Hz
	19B209358G06	100.0 Hz
	19B209358G07	91.5 Hz
	19B209358G08	107.3 Hz
	19B209358G09	110.9 Hz
	19B209358G10	114.8 Hz
	19B209358G11	118.8 Hz
	19B209358G12	123.0 Hz
	19B209358G13	127.3 Hz
	19B209358G14	131.8 Hz
	19B209358G15	136.4 Hz
	19B209358G16	141.3 Hz
	19B209358G17	146.2 Hz
	19B209358G18	151.4 Hz
	19B209358G19	156.7 Hz
	19B209358G20	162.2 Hz
	19B209358G21	167.9 Hz
	19B209358G22	173.8 Hz
	19B209358G23	179.9 Hz
	19B209358G24	186.2 Hz
	19B209358G25	192.8 Hz
	19B209358G26	200.5 Hz
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - - - - - - -
J1 thru J8	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A115689P1	Coil, RF: 880 mH ±5%, sim to Arnted AC5872.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115123P1	Silicon, NPN.
Q2	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q3 and Q4	19A115123P1	Silicon, NPN.
Q5 thru Q7	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q8	19A115123P1	Silicon, NPN.
Q9 and Q10	19A115123P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3877P682K	Composition: 6.8K ohms ±10%, 1/2 w.
R2	3877P683J	Composition: 68K ohms ±5%, 1/2 w.
R3	3877P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R4	3877P152J	Composition: 1.5K ohms ±5%, 1/2 w.
R5	3877P682K	Composition: 6.8K ohms ±10%, 1/2 w.
R6	3877P202J	Composition: 200 ohms ±5%, 1/2 w.
R7	19A116278P306	Metal film: 11K ohms ±2%, 1/2 w.
R8	3877P562J	Composition: 5.6K ohms ±5%, 1/2 w.
R9	19A116278P505	Metal film: 11K ohms ±2%, 1/2 w.
R10	3877P512J	Composition: 5.1K ohms ±5%, 1/2 w.
R11	3877P103J	Composition: 10K ohms ±5%, 1/2 w.
R12	3877P822J	Composition: 8.2K ohms ±5%, 1/2 w.
R13	3877P153J	Composition: 15K ohms ±5%, 1/2 w.
R14	3877P133J	Composition: 13K ohms ±5%, 1/2 w.
R15	3877P103J	Composition: 10K ohms ±5%, 1/2 w.
R16	3877P153J	Composition: 15K ohms ±5%, 1/2 w.
R17	3877P103J	Composition: 10K ohms ±5%, 1/2 w.
R18	3877P622J	Composition: 6.2K ohms ±5%, 1/2 w.

SYMBOL	GE PART NO.	DESCRIPTION
R19	3877P123J	Composition: 12K ohms ±5%, 1/2 w.
R20	3877P223J	Composition: 22K ohms ±5%, 1/2 w.
R21	3877P103J	Composition: 10K ohms ±5%, 1/2 w.
R22	3877P393J	Composition: 39K ohms ±5%, 1/2 w.
R23	3877P223J	Composition: 22K ohms ±5%, 1/2 w.
R24	3877P433J	Composition: 43K ohms ±5%, 1/2 w.
A429		TONE REJECT FILTER 19C311797G2
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.
		- - - - - - - 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 Arnted AC5872.
		- - - - - - - - - RESISTORS - - - - - - - - -
R59*	3877P183J	Composition: 18K ohms ±5%, 1/2 w. In REV A and earlier: Composition: 4300 ohms ±5%, 1/2 w.
A432 thru A435	3877P433J	OSCILLATOR/MULTIPLIER BOARD A432 19C311729G2 A433 19C311729G3 A434 19C311729G5 A435 19C311729G4
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 thru C3	5494481P113	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4	5491601P123	Phenolic: 1.5 pF ±5%, 500 VDCW; sim to Quality Components Type NC.
C5	5494481P112	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap. (Part of T1).
C6		(Part of T2).
C7		
C8	5496219P238	Ceramic disc: 7 pF ±0.25 pF, 500 VDCW; temp coef -80 PPM.
C9	5490008P135	Silver mica: 220 pF ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C10 thru C14	5494481P113	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR3 thru CR5	19A115250P1	Silicon.
		- - - - - - - - - JACKS AND RECEPTACLES - - - - - - - - -
J1 thru J3	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J15 and J16	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	7488079P16	Choke, RF: 10 µh ±10%, 0.6 ohm DC res max; sim to Jeffers 4421-7K.
L3		Choke, RF: 2.20 µh ±10%, 0.50 ohms DC res max; sim to Jeffers 4413-9K.
L4	7488079P33	(Part of T1 or T2).
L5		
L6	7488079P35	Choke, RF: 2.20 µh ±10%, 0.50 ohms DC res max; sim to Jeffers 4413-9K.
	3877P432J	Composition: 4.3K ohms ±5%, 1/2 w.
R60	3877P432J	Composition: 4.3K ohms ±5%, 1/2 w.
R61	3877P682K	Composition: 6.8K ohms ±10%, 1/2 w.

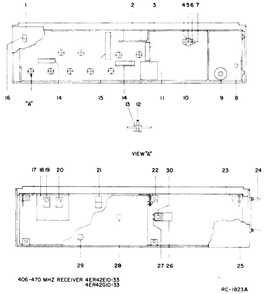
SYMBOL	GE PART NO.	DESCRIPTION
RT1	5490628P52	Thermistor: 50,000 ohms ±10%, color code yellow; sim to Global Type 7638.
		- - - - - - - - - SOCKETS - - - - - - - - -
XPL1	19A131290G3	Reed, mica-filled phen: 7 pins rated at 1 amp at 500 VRMS with 4-1/2 inches of cable.
A429		TONE REJECT FILTER 19C311797G2
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.
		- - - - - - - 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 Arnted AC5872.
		- - - - - - - - - RESISTORS - - - - - - - - -
R59*	3877P183J	Composition: 18K ohms ±5%, 1/2 w. In REV A and earlier: Composition: 4300 ohms ±5%, 1/2 w.
A432 thru A435	3877P433J	OSCILLATOR/MULTIPLIER BOARD A432 19C311729G2 A433 19C311729G3 A434 19C311729G5 A435 19C311729G4
		- - - - - - - - - CAPACITORS - - - - - - - - -
C1 thru C3	5494481P113	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4	5491601P123	Phenolic: 1.5 pF ±5%, 500 VDCW; sim to Quality Components Type NC.
C5	5494481P112	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap. (Part of T1).
C6		(Part of T2).
C7		
C8	5496219P238	Ceramic disc: 7 pF ±0.25 pF, 500 VDCW; temp coef -80 PPM.
C9	5490008P135	Silver mica: 220 pF ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C10 thru C14	5494481P113	Ceramic disc: 1000 pF ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR3 thru CR5	19A115250P1	Silicon.
		- - - - - - - - - JACKS AND RECEPTACLES - - - - - - - - -
J1 thru J3	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J15 and J16	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 and L2	7488079P16	Choke, RF: 10 µh ±10%, 0.6 ohm DC res max; sim to Jeffers 4421-7K.
L3		(Part of T1 or T2).
L4	7488079P33	Choke, RF: 2.20 µh ±10%, 0.50 ohms DC res max; sim to Jeffers 4413-9K.
L5		
L6	7488079P35	Choke, RF: 2.20 µh ±10%, 0.50 ohms DC res max; sim to Jeffers 4413-9K.

SYMBOL	GE PART NO.	DESCRIPTION
Q1*	19A115440P1	- - - - - - - - - TRANSISTORS - - - - - - - - - Silicon, NPN. In REV A and earlier: Silicon, NPN.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3815297103J	Composition: 10K ohms ±5%, 1/4 w.
R2	3815297151J	Composition: 150 ohms ±5%, 1/4 w.
R3	3815297103J	Composition: 10K ohms ±5%, 1/4 w.
R4 thru R6	3815297101E	Composition: 100 ohms ±1%, 1/4 w.
R7	3877P272K	Composition: 2.7K ohms ±10%, 1/2 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19B209350G1 T2 19B209350G2
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1	19A115690P1	Coil, RF: 880 mh ±5%, sim to Arnted AC5872.
		- - - - - - - - - CAPACITORS - - - - - - - - -
C6	5496218P253	Ceramic disc: 39 pF ±5%, 500 VDCW, temp coef -80 PPM.
C7	5496218P251	Ceramic disc: 33 pF ±5%, 500 VDCW, temp coef -80 PPM.
R59*	3877P183J	Composition: 18K ohms ±5%, 1/2 w. In REV A and earlier: Composition: 4300 ohms ±5%, 1/2 w.
L5	19A121728P1	- - - - - - - - - INDUCTORS - - - - - - - - - Coil.
	19B209474P26	Tuning slug.
		- - - - - - - - - SOCKETS - - - - - - - - -
XY1 thru XY4	19B216404G1	Socket, (ICOM).
		OSCILLATORS
		When reordering specify ICOM frequency. ICOM Freq = Operating Freq -12.4 MHz
U1 thru U4	48D28410	Integrated Circuit Oscillator Module (ICOM).
	19D413070P1	Cap, decorative.
		CHASSIS AND RF CIRCUIT 19E500881G1 thru G4
		- - - - - - - - - CAPACITORS - - - - - - - - -
C410 and C411		Refer to Mechanical Parts (RC1823).
C412 and C413	5493929P7	Ceramic, feed-thru: 1000 pF ±100%-0%, 500 VDCW; sim to Allen-Bradley Type FXSC.
C414 thru C418		Refer to Mechanical Parts (RC1823).
C419 thru C422	5493929P7	Ceramic, feed-thru: 1000 pF ±100%-0%, 500 VDCW; sim to Allen-Bradley Type FXSC.
C423 and C424		Refer to Mechanical Parts (RC1823).
C425 thru C427	5493929P7	Ceramic, feed-thru: 1000 pF ±100%-0%, 500 VDCW; sim to Allen-Bradley Type FXSC.
C428	5496267P11	Tantalum: 68 µF ±20%, 15 VDCW; sim to Sprague Type 150D.
C429	19A115688P4	Electrolytic: 50 µF +150% -10%, 25 VDCW; sim to Mallory Type TTX.
C430 and C431	5493929P7	Ceramic, feed-thru: 1000 pF ±100%-0%, 500 VDCW; sim to Allen-Bradley Type FXSC.

SYMBOL	GE PART NO.	DESCRIPTION
C433	5493929P107	Ceramic, stand-off: 1000 pF ±100%-0%, 500 VDCW; sim to Allen-Bradley Type SXSC.
C435 thru C436	777475G94	Ceramic disc: .001 µF ±100% -0%, 500 VDCW.
C437	5493929P3	Ceramic, feed-thru: 47 pF ±100% -0%, 500 VDCW; sim to Allen-Bradley Type FXSC.
C438	19A116080P7	Polyester: 0.1 µF ±20%, 50 VDCW.
C439* and C440*	5494481P11	Ceramic disc: 1000 pF ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added by REV A.
C441*	5493929P7	Ceramic, feed-thru: 1000 pF ±100%-0%, 500 VDCW; sim to Allen-Bradley Type FXSC. Added by REV P.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1*	19A116062P2	Selenium. Deleted in 19E500881G1, G3 by REV H. Deleted in 19E500881G2, G4 by REV J.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J441		(Part of W441).
J442	19B205689G2	Connector: 18 contacts rated at 5 amps min at 1000 VDC max.
J443	19C303426G1	Connector: 20 pin contacts.
J444		(Part of W444).
		- - - - - - - - - INDUCTORS - - - - - - - - -
L410	19B209493G7	Coil.
L411	19B209493G15	Coil.
L412	19B209493G8	Coil.
L413	19B209493G16	Coil.
L414	19B209493G11	Coil.
L415 thru L417	19B209493P13	Coil.
L418	19B209493G17	Coil.
L419	19B209493G12	Coil.
L420 thru L422	19B209493P14	Coil.
L423	19B209493G18	Coil.
L424	19B209493G19	Coil.
L425	19B209493P15	Coil.
L426	19B209493G20	Coil.
L427*	19B209493P16	Coil. In 19E500881G2 of REV P and earlier; in 19E500881G4 of REV M and earlier.
L428 and L429	19B209493P16	Coil.
L430 and L431	7488079P18	Choke, RF: 15 µh ±10%, 1.3 ohms DC res; sim to Jeffers 4421-8K.
L432	19A127433P1	Coil.
L433 and L434	19A115700P2	Bead, ferrite.
		- - - - - - - - - PLUGS - - - - - - - - -
P305 thru P311	4029844G02	Contact, electrical: sim to Amp 42827-2.
P312	4029844G03	Contact, electrical: sim to Amp 42101-2.
P313 thru P322	4029844G02	Contact, electrical: sim to Amp 42827-2.
P323	4029844G01	Contact, electrical: sim to Amp 41854.
P324	4029844G02	Contact, electrical: sim to Amp 42827-2.

SYMBOL	GE PART NO.	DESCRIPTION
P325	4029840P1	Contact, electrical: sim to Amp 41854.
P326	4029840P2	Contact, electrical: sim to Amp 42827-2.
P327	4029840P1	Contact, electrical: sim to Amp 41854.
P328 thru P335	4029840P2	Contact, electrical: sim to Amp 42827-2.
P410 and P411	4029840P2	Contact, electrical: sim to Amp 42827-2.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q410* and Q411*	19A116741P1	Silicon, NPN.
		In 19E500881G1, G3 of REV B-E; In 19E500881G2, G4 of REV B-L;
	19A116203P2	Silicon, NPN.
		Earlier than REV B:
	19A115948P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R410	19A116378P444	Metal film: 0.28 megohm ±2%, 1/2 w.
R411*	3B76P390E	Composition: 39 ohm ±10%, 1 w. Added by REV B.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T410	19A116041P2	Audio freq: 300 to 4000 Hz, Pri: 1.00 ohm ±15% DC res, Sec 1: 0.23 ohm ±10% DC res, Sec 2: 10.5 ohms ±15% DC res.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - - -
TB1	7487424P2	Miniature, phen: 1 terminal.
TB2	7487424P26	Miniature, phen: 6 terminals.
TB3 and TB4	7487424P24	Miniature, phen: 3 terminals.
		- - - - - - - - - - CABLES - - - - - - - - - -
W441	19B205634G3	Coaxial cable: 50 ohm, approx 5 inches long. Includes (J441) 19B209123P3 connector.
W444	19B205634G7	Coaxial cable: 50 ohm, approx 7 inches long. Includes (J444) 19B209123P4 connector.
W445	19A122550G1	RF: 50 ohm imp, approx 4 inches long.
		HARNESS ASSEMBLY 19E500881G9 (Includes C435, C436, C438-C440, J442, J443, L433, L434, P307-P313, P315-P317, P319, P320, P322-P327, P411, R410, R411, T410, TB2)
		MULTI-FREQUENCY MODIFICATION KIT 19A127096G1 and G2
	19A127136G1	Harness assembly.
P301 thru P304	4029840P2	Contact, electrical: sim to Amp 42827-2. (Part of 19A127136G1 Harness assembly).
L435 thru L442	19A115700P2	Bead, ferrite. (Part of 19A127136G1 Harness assembly).
L443 thru L450	19A115700P2	Bead, ferrite.
		MECHANICAL PARTS (SEE RC-1823)
1	19C303495G4	Bottom cover. (Station)
	19C303385G1	Bottom cover. (Mobile)
2	19C317344P3	Heat sink.

SYMBOL	GE PART NO.	DESCRIPTION
3	19A121723P1	Support. (Mounts C425 and C426)
4	403D689P1	Clip, spring tension. (Part of XY1-XY4).
5	19B200525P9	Rivet. (Part of XY1-XY4).
6	19A115793P1	Contact, electrical: sim to Malco 2700. (Part of XY1-XY4).
7	403930?P1	Crystal socket. (Part of XY1-XY4).
8	4035306P40	Fiber washer. (Used with Y2 on A424).
9	403425?P5	Can. (Used with Y1 on A424).
10	19C303389G1	Chassis.
11	19A121722P1	Plate.
12	405765G4	Screw 6-32. (Part of C410, C411, C414-C418, C423 and C424).
13	7137968P8	Nut, stamped: thd size No. 6-32; sim to Palnut TOM2000. (Part of C410, C411, C414-C418, C423 and C424).
14	19A121724P1	Support. (Mounts C419 and C420).
15	19A127372P1	Support. (Mounts C427, C430 and C431).
16	7145451P1	(Not Used).
17	19B204583G3	Hinge.
18	19B216727P1	Support. (Used with Q410 and Q411).
19	19A116023P2	Plate, insulated. (Used with Q410 and Q411).
20	19A115222P3	Insulator, bushing. (Used with Q410 and Q411).
21	402981?P6	Clip, loop: nylon, sim to Heckenser 5/16-4-128.
22	19B204583G1	Hinge.
23	19B204583G2	Hinge.
24	19A121676P1	Guide pin.
25	19C303495G3	Top cover. (Station, except Repeaters and VM).
	19C309676G2	Top cover. (Station, Repeater and VM only).
	19C303385G2	Top cover. (Mobile).
26	19A121297P2	Angle.
27	7160821P4	Nut, sheet spring: sim to Tinnerman C6452-8Z-6?. (Used to secure cover).
28	4036555P1	Insulator, disc. (Used with Q7 on A426).
29	4035267P2	Button, plug.
30	X115P1508C13	Screw, flathead, self tap: No. 8 x 1/2.



406-470 MHZ RECEIVER 4ER42E10-33
4ER42G10-33

RC-1823A

PRODUCTION CHANGES

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

CHANNEL GUARD ENCODER/DECODER MODEL 4EK16A10

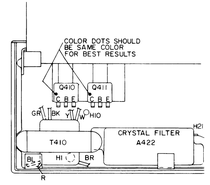
Rev. A - To obtain correct output level. Changed R8.

CHASSIS & RF ASSEMBLY 19E500881-G1 thru -G4

Rev. A - To facilitate tuning of low IF and improve critical squelch. Added C439 and C440. Changed C6 & C8 on A413/A414.

Rev. B - To incorporate new PA transistors. Changed Q410 and Q411. Added R411.

Outline Diagram Was:



Rev. C - To incorporate a new multiplier transistor and decouple supply voltage. Changed Q1. Added C15 and R7.

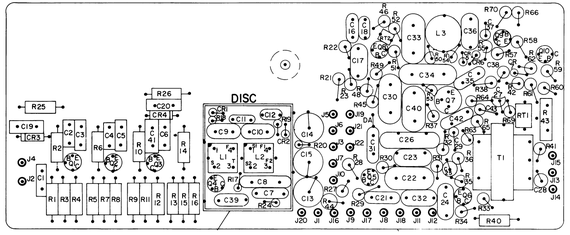
IF AUDIO & SQUELCH BOARD A426 (19D413129-G3)

LBI3999

Rev. A - To make IF Audio & Squelch board compatible with new PA transistors and to improve squelch operation. Deleted C24, C28, C29, C42, C43, R32, R37, R63 and R65. Added C49-C54, C88, R75-R79 and R73. Changed C21, C26, C37, C38, C40, R33, R38, R39, R41 R42, R48, R53 and R62.

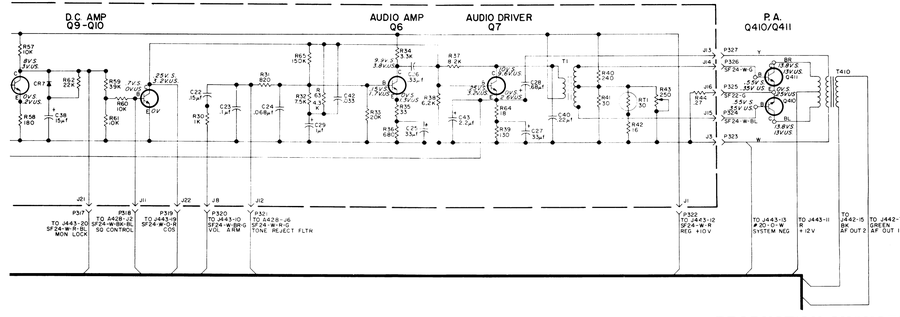
Outline Diagram Was:

IF-AUDIO & SQUELCH BOARD
A426



Schematic Diagram Was:

IF AUDIO & SQUELCH BOARD
A426



PRODUCTION CHANGES

406—470 MHz MASTR RECEIVER
MODELS 4ER42E10-33 & 4ER42G10-33

CHANNEL GUARD ENCODER/DECODER MODEL 4EK16A10

Rev. B - To increase stop-band attenuation. Changed R8.

Rev. C - To optimize frequency response. Changed C29.

TONE REJECT FILTER 19C311797-G2

Rev. A - To optimize frequency response. Changed C29.

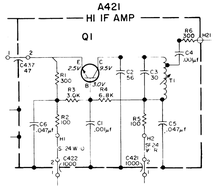
CHASSIS & RF ASSEMBLY 19E500881-G1 thru -G4

Rev. D - 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 (on J17 on IF audio and squelch board) and TB2-1.

Rev. E - To stabilize the tripler stage. Removed C9 on A413/A414.

Rev. F - To improve sensitivity when used with dual front-end. Added C441. Changed DC feed point of R4 to C441-2. Jumpered C441-1 to C421-1.

SCHEMATIC DIAGRAM WAS:



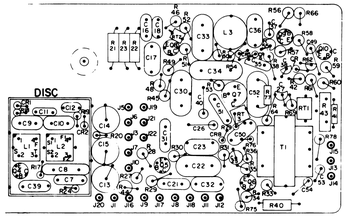
IF AUDIO & SQUELCH BOARD A426 (19D413129-G3)

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

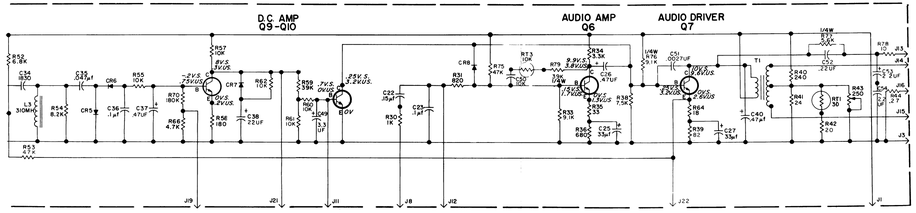
Rev. C - To eliminate barely audible squelch switching transients and to reduce receiver squelch tail. Deleted C38, C49, CR7, CR8, R62, R75 and R76. Added C55, R80, R81, and R82. Changed C27, C36, R53, R64 and R77.

OUTLINE DIAGRAM WAS:

IF-AUDIO & SQUELCH BOARD



SCHEMATIC DIAGRAM WAS:



IF AUDIO & SQUELCH BOARD A426 (19D413129-G3)

Rev. D - To improve receiver frequency response. Changed R30 and R78.

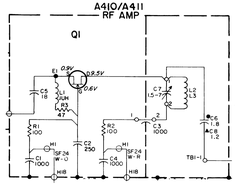
REV. D - Channel Guard Encoder/Decoder A428 (Model 4EK16A10)
REV. B - Tone Reject Filter A429 (19C311797-G2)

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

CHASSIS & RF ASSEMBLY 19E500881-G1 THRU -G4

REV. G - To stabilize the R.F. Amplifier and to improve the band-end tuning of the multiplier assembly. Changed the R.F. amplifier board. Changed C5, C7 and C8 on the multiplier assembly.

Schematic Diagram was:



IF AUDIO & SQUELCH BOARD A426 (19D413129-G3)

REV. E - To improve critical squelch action. Deleted R53 and added R84.

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

REV. G - To incorporate silicon diodes. Changed CR3 and CR4.

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

CHASSIS & RF ASSEMBLY 19E500881-G2 and G4

REV. H - To improve band-end tuning. Changed C6 and C8.

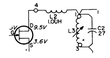
REV. J - To remove unnecessary protection. Deleted CR1.

CHASSIS & RF ASSEMBLY 19E500881-G1 and G3

REV. H - To remove unnecessary protection. Deleted CR1.

REV. J - To prevent oscillations in the high IF amplifier and mixer. Changed C2 on the IF amplifier assembly 19B216356G1 & G2. Added C8 to First Mixer assembly 19C311974G1 as part of L3.

SCHEMATIC WAS:



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

CHASSIS & RF ASSEMBLY 19E500881-G2 and G4

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

REV. M - To improve intermodulation performance. Changed Q1 and R3.

CHASSIS & RF ASSEMBLY 19E500881-G1 and G3

REV. L - To improve intermodulation performance. Changed Q1 and R3.

IF AUDIO & SQUELCH BOARD A426 (19D413129-G3)

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

IF AUDIO & SQUELCH BOARD A426 (19D413129-G3)

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

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

OSCILLATOR/MULTIPLIER BOARD A432 Through A435 (19C311726G1-G4)

REV. A - To improve Selectivity. Changed C8 and C14. Added L6.

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

CHASSIS & RF ASSEMBLY (19E500881-G3)

REV. M - To increase gain of RF amplifier. Changed C1.

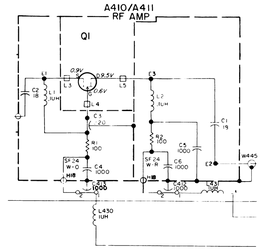
CHASSIS & RF ASSEMBLY (19E500881-G4)

REV. N - To increase gain of RF Amplifier. Changed C1.

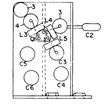
REV. N - CHASSIS & RF ASSEMBLY (19E500881-G3)
REV. P - CHASSIS & RF ASSEMBLY (19E500881-G4)

To incorporate improved design. Replaced existing RF amplifier assembly A410/A411 (19C317950G1) with a new RF Amplifier assembly (19C320697G1).

SCHEMATIC DIAGRAM WAS:



OUTLINE DIAGRAM WAS:



REV. M - CHASSIS & RF ASSEMBLY (19E500881G1)
REV. N - CHASSIS & RF ASSEMBLY (19E500881G2)
REV. P - CHASSIS & RF ASSEMBLY (19E500881G3)
REV. R - CHASSIS & RF ASSEMBLY (19E500881G4)

To improve Sensitivity. Changed C3.

IF AUDIO & SQUELCH BOARD A426 (19D413129G3)

REV. M - To improve audio quality. Changed R80.

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

REV. P - To improve stability. Changed Q5.

REV. R - To improve critical squelch operation. Deleted C37, added C56 and changed R84.

REV. N - Chassis & RF Assembly (19E500881G1)
REV. P - Chassis & RF Assembly (19E500881G2)
REV. R - Chassis & RF Assembly (19E500881G3)
REV. S - Chassis & RF Assembly (19E500881G4)

To incorporate new transistor. Changed Q1.

REV. R - Chassis & RF Assembly (19E500881G2)
REV. T - Chassis & RF Assembly (19E500881G4)

To improve operation. Changed L427.

2nd Mixer Board A424 (19B216119G3)

REV. A - To incorporate new transistor and improve stability. Deleted Q2 and added Q5.