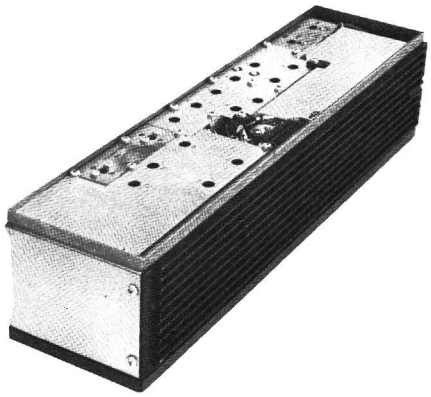
MOBILE RADIO

MASTR Progress Line

25—50 MHz RECEIVER MODELS 4ER39C10—27



SPECIFICATIONS *

FCC Filing Designation	**ER-39-C**
Frequency Range	25— 50 MHz
Audio Output	5 watts at less than 5% distortion
Sensitivity	
12-dB SINAD (EIA Method)	0.25 μV
20-dB Quieting Method	0.35 μV
Selectivity	
EIA Two-Signal Method	-85 dB (adjacent channel, 20 kHz channels)
20-dB Quieting Method	-100 dB at ±15 kHz
Spurious Response	-100 dB
First Oscillator Stability	±.0005% (-30°C to +60°C)
Modulation Acceptance	±7 kHz (narrow-band)
Squelch Sensitivity	
Critical Squelch	0.15 μV
Maximum Squelch	Greater than 20 dB quieting (less than 1.5 μV)
Intermodulation (EIA)	-60 dB
Maximum Frequency Separation	0.4%
Frequency Response	+1 and -8 dB of a standard 6-dB per octave de-emphasis curve from 300 to 3000 Hz (1000-Hz reference)

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

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GENERAL ELECTRIC

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ILLUSTRATIONS

WARNING

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

DESCRIPTION

General Electric MASTR Progress Line Receiver Type ER-39-C is a double conversion, superheterodyne FM receiver designed for operation on the 25-50 megahertz band.

The receiver is of single-unit construction and is completely housed in a copper-plated aluminum casting for maximum shielding and rigidity. The top compartment of the casting contains the RF, oscillator, converter, and 1st IF amplifier stages. The bottom portion of the casting contains the IF-audio and squelch board, and the optional Channel Guard 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 Model 4EX3A10 or 4EX8K10, 11 for ease of alignment and servicing. The Test Set meters the oscillator, multiplier, and limiter stages as well as the discriminator and regulated 10 volts.

RF AMPLIFIER (A341)

RF Amplifier (A341) consists of two high-Q helical resonators and an RF amplifier stage (Q1). The RF signal from the antenna is coupled by RF cable W441 to a tap on L341/L343/L345. The tap is positioned to

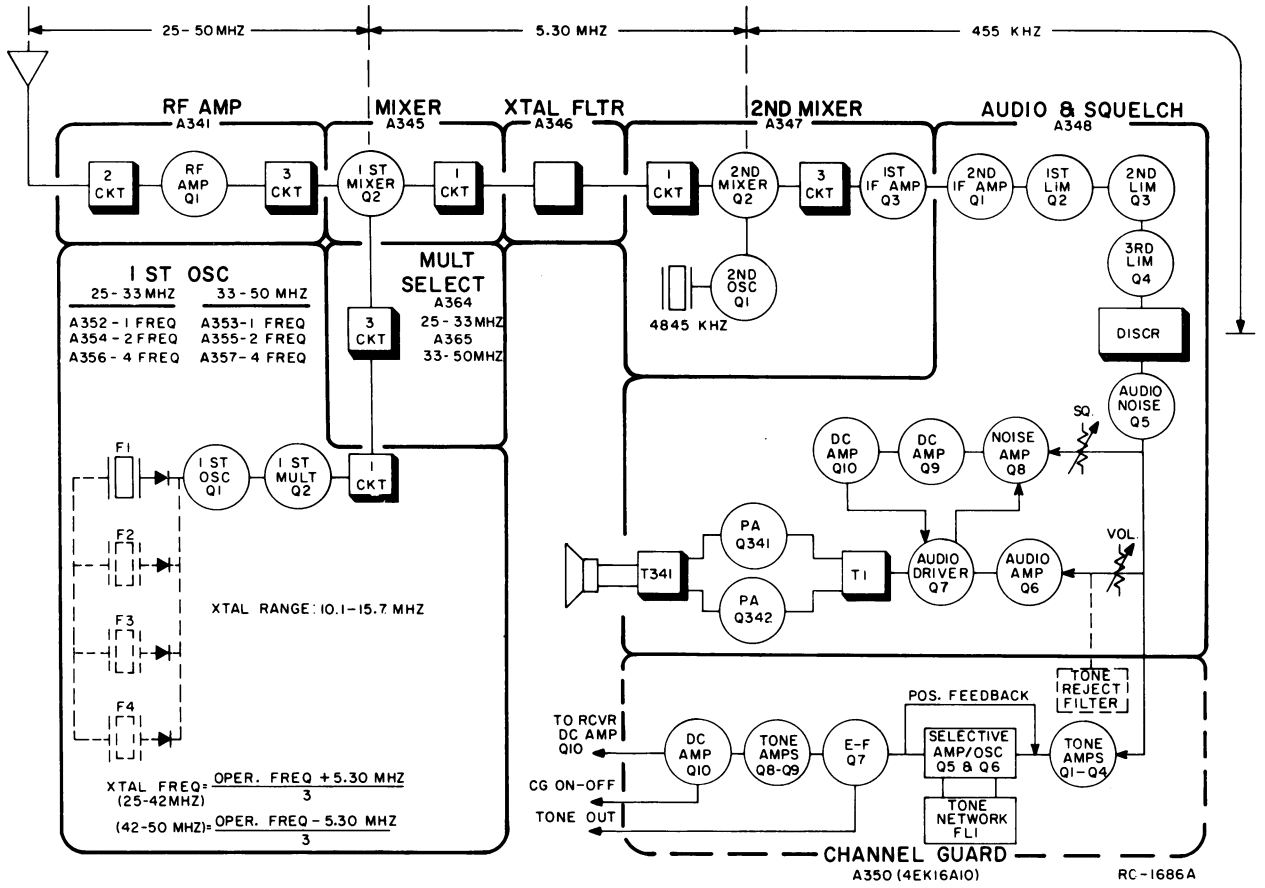


Figure 1 - Receiver Block Diagram

insure the proper impedance match to the antenna. RF energy is coupled through the two coils by an opening in the shield wall to the base of RF Amplifier Q1. The coils are tuned to the incoming frequency by air trimmer capacitors C341 and C342. The output of Q1 is coupled through three tuned circuits to the base of the first mixer.

1ST OSCILLATOR AND MULTIPLIER (A352-A357)

The receiver 1st oscillator operates in a transistorized Colpitts oscillator circuit. The oscillator crystal operates in a fundamental mode at a frequency of approximately 10 to 15 megahertz. The crystal is cut to provide temperature compensation at the high end of the temperature range and is thermistor compensated at low temperatures. This provides ±.0005% frequency stability as soon as the receiver is energized—without the warm-up time required by crystal ovens or warmers.

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

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

Switching the +10 volts to the crystal circuit forward biases the diode and reduces its impedance. This applies the crystal frequency to the base of oscillator transistor Q1. Feedback for the oscillator is developed across C21/C22. The output is coupled to the base of 1st multiplier Q2.

The output of the 1st multiplier is transformer-coupled (T3/T4) to multiplier selectivity assembly A364/A365. The 1st multiplier tank is tuned to three times the crystal frequency and is metered at centralized metering jack J442-4 through metering network CR1, R1, C7 and C8.

MULTIPLIER SELECTIVITY ASSEMBLY (A364/A365)

Following the 1st multiplier tank (T3/T4) are three additional L-C tuned circuits (A364/A365-L1 -L2 and -L3). Capacitor C12/C16 couples the multiplier selectivity output to the base of the first mixer.

1ST MIXER (A345) AND CRYSTAL FILTER (A346)

The RF signal from the RF amplifier and the injection voltage from the 1st multiplier are applied to the base of 1st mixer A345-Q2. The mixer collector tank (L2 and C3) is tuned to 5.3 megahertz and provides impedance matching to the high IF crystal filter.

A highly selective crystal filter (A346) following the 1st mixer provides the major selectivity for the receiver. The output of the filter is fed through impedance matching transformer A347-T1 to the base of the 2nd mixer.

2ND OSCILLATOR, 2ND MIXER AND 1ST LO IF AMPLIFIER (A347)

A347-Q2 operates in a Colpitts oscillator circuit, with feedback supplied through C4. The oscillator low-side injection voltage (4845 kHz) is applied to the base of the 2nd mixer.

The High IF signal from the filter and the injection voltage from the 2nd oscillator is applied to the base of 2nd mixer Q2. The 455-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 A347-Q3. The output of A347-Q3 is R-C coupled to the base of the 2nd low IF amplifier.

2ND LO IF AMPLIFIER AND LIMITERS (A348)

Additional amplification of the low IF signal going to the limiter stages is provided by 2nd low IF amplifier A348-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 (A348-Q2, -Q3 and -Q4). The 1st limiter is metered at J442-3 through metering network C20, CR4 and R26.

DISCRIMINATOR (A348)

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 (A348)

The discriminator output is coupled through a low-pass filter (C16, C18, R21 and R22) to the base of audio-noise amplifier Q5. The filter removes any 455-kHz signal remaining in the discriminator output. Q5 operates as a emitter-follower to match the discriminator impedance to the VOLUME control, SQUELCH control, and Channel Guard input. The stage also provides power gain.

AUDIO AMPLIFIERS (A348)

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.

Q341 and Q342 operate as a push-pull, class AB audio PA stage. The PA output is coupled through audio transformer T341 to the loudspeaker. The yellow and white tertiary windings of T341 supply balanced feedback to the collector of Q7. The feedback winding minimizes distortion and prevents the pick-up of external electrical noise.

The PA stage provides a 5-watt output at less than 5% distortion into a 3.5-ohm load at the receiver output terminals (3.2-ohms at the Control Unit). 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 Q341 and Q342 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 Test Procedure.

SQUELCH (A348)

Noise from the audio-noise amplifier operates the squelch circuit. With no carrier present in the receiver, this noise is coupled to the base of noise amplifier Q8 through a high-pass filter which attenuates frequencies below 3 kHz. The filter consists of C30, C31 and R45, as well as C34 and L3 in the collector circuit of Q8. The gain of Q8 is determined by the Squelch control, which varies the bias on the base of Q8. Thermistor RT2 keeps the critical squelch constant over wide variations in temperature.

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

When the receiver is quieted by a signal (unsquelches), the noise in the receiver is reduced, turning DC amplifier Q9 on and DC amplifier Q10 off. This allows the audio stages to conduct so that sound is heard in the speaker. A network composed of C38, CR7 and R62 slows down the switching action of Q10, preventing an obnoxious "thump" from being heard in the speaker.

Resistor R53 connects from the emitter of audio driver Q7 to the emitter of noise amplifier Q8, providing a hysteresis loop in the squelch circuit. When a weak signal opens the squelch, the signal level may be reduced ty 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. This turns off DC amplifier Q9 and turns on Q10, muting the receiver.

CHANNEL GUARD

Channel Guard Board Model 4EK16A10 is a fully transistorized encoder-decoder for use with 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 (A350)

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, 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 the transmitter.

Decoder (A350)

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 Q348-Q5 and is fed through A350-J1 to four tone amplifier and bandpass filter circuits. The filters remove the audio and high-frequency noise from the signal, and the tone amplifiers provide sufficient gain to insure clipping by limiter diodes CR1 and CR2. The clipping action eliminates variation in the squelch performance due to changes in tone deviation. The signal is then applied to selective amplifiers Q5 and Q6 which amplify only the tone determined by the tone network.

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

Squelch gate diode CR9 is normally forward biased by a positive DC voltage (approximately 1.5 volts) fed through R58. The forward bias causes CR9 to conduct, feeding a DC voltage to the base of DC amplifier A348-Q10 in the receiver. This removes the bias on the receiver audio stages and holds them off.

When the proper tone is applied to the decoder, the negative DC voltage from the detector diodes back-biases squelch gate diode CR9 and cuts off the positive bias to the receiver DC amplifier A348-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 (A348-Q10). The receiver noise squelch circuit continues to operate until a carrier quiets the receiver.

A tone rejection filter connected in parallel with A348-J12 (in the receiver) bypasses any incoming tone to ground. This attenuates the tone level reaching the receiver audio circuits. The filter is composed of C26, C27, C28, C29, L1 and R59.

An optional tone reject filter (A402) that is identical to the filter described above is available for use in two-way radios with transmitter Channel Guard only.

MAINTENANCE

DISASSEMBLY

To service the receiver from the top--

1. Pull locking handle down and pull radio about one inch out of mounting frame.
2. Pry up cover at rear of receiver.
3. Slide cover back and lift off.

To service the receiver from the bottom--

1. Pull locking handle down. Pull radio out of mounting frame.
2. Remove screws in bottom cover. Pry up cover at back of receiver.
3. Slide cover back and lift off.

To remove the receiver from the system frame--

1. Loosen the two Phillips-head retaining screws in from casting (see Figure 2), 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.

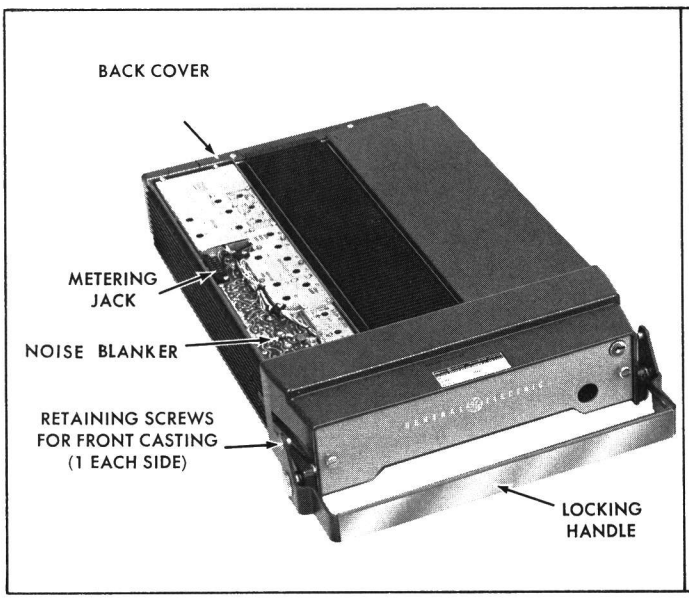


Figure 2 - Removing Top Cover

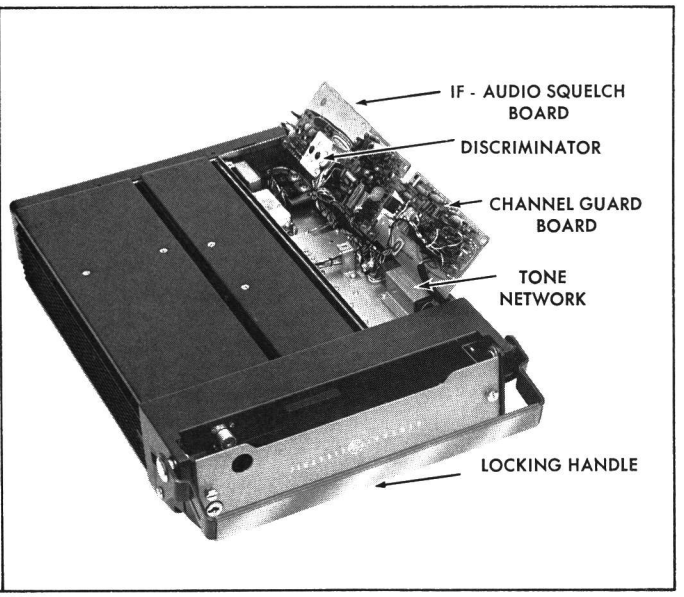


Figure 3 - Removing Bottom Cover

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

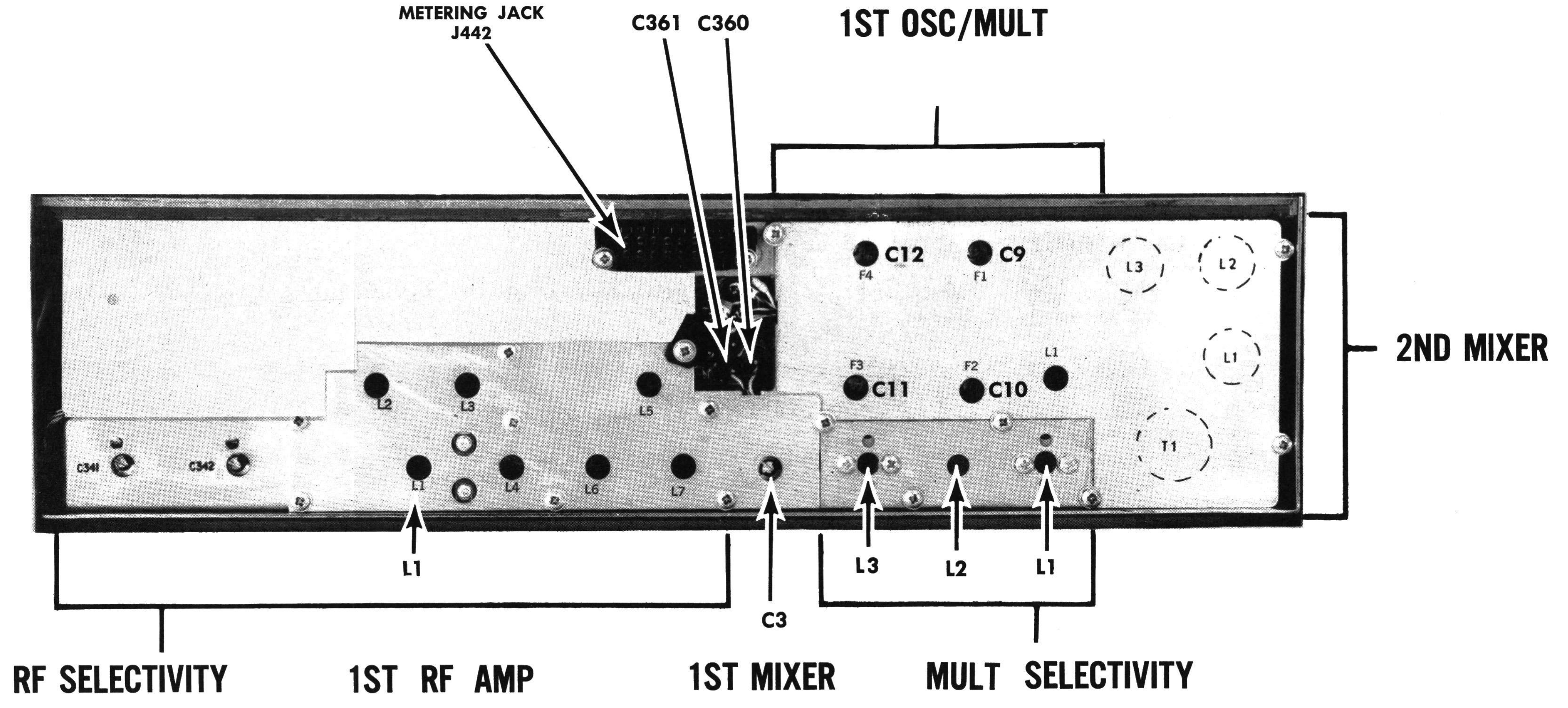
1. GE Test Set Models 4EX3A10, 4EX8K10, 11 (or 20,000 ohms-per-volt Multimeter with a 1-volt scale).
2. A 455 kHz and 25-50 MHz signal source. Connect a one-inch piece of insulated wire no larger than .065-inch diameter to generator output probe.

PRILIMINARY CHECKS AND ADJUSTMENTS

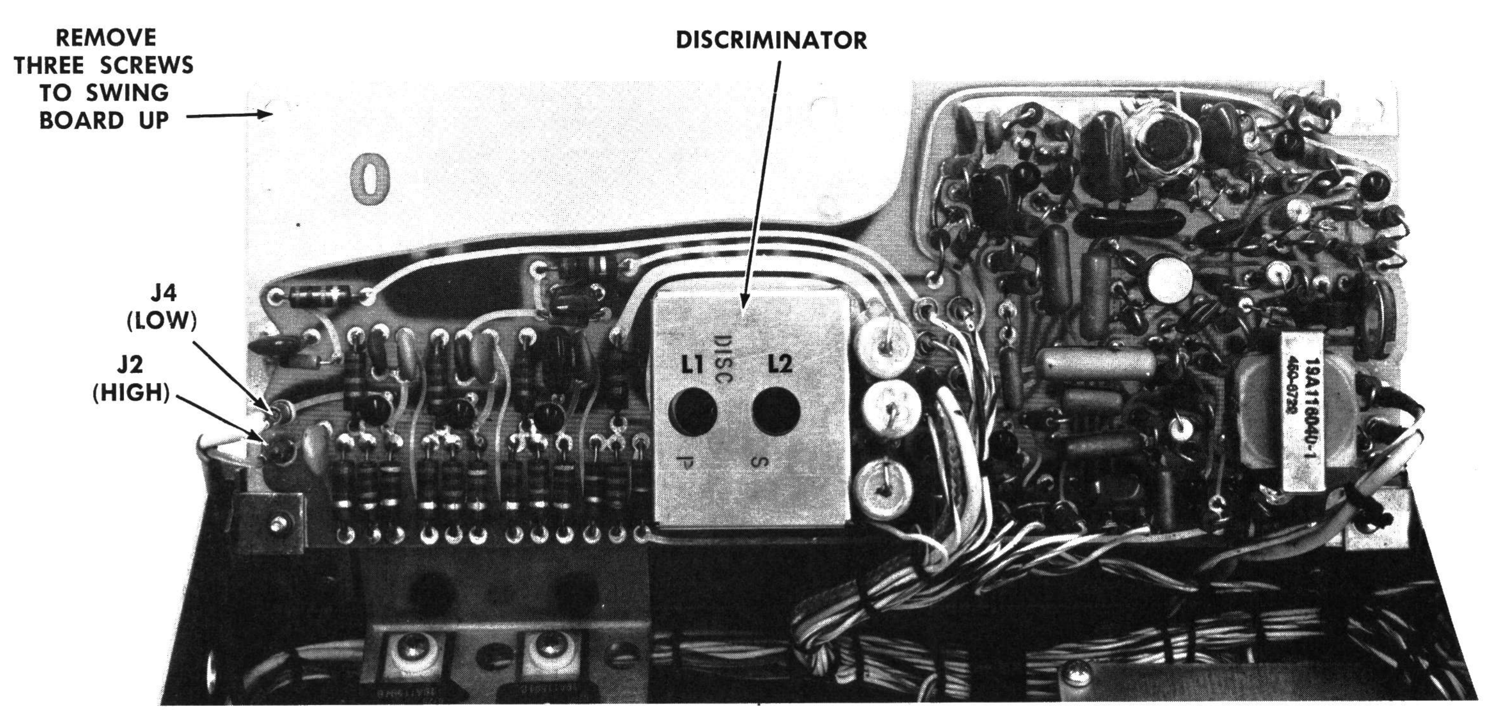
1. Connect Test Set to Receiver Centralized Metering Jack J442 and set meter sensitivity switch to the TEST 1 position (or 1-volt position on 4EX8K10, 11).
2. With Test Set in Position J, check for regulated +10 volts. If using Multimeter, measure from C360 to C361.
3. If using Multimeter, connect the positive lead to J442-16 (Ground).
4. Disable Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION GE Test Set	METERING POSITION Multimeter - at J442	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR/MULTIPLIER		
1.	D (MULT-1)	Pin 4	L4 (on 1st OSC/MULT) and L1, L2 (on MULT SELECTIVITY)	See Procedure	Tune L4 on 1st OSC/MULT and L1 on MULT SELECTIVITY for maximum meter reading. Then tune L2 for minimum meter reading. Change voltage scale if necessary. Repeat this step.
			RF AMPLIFIER & SELECTIVITY		
2.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal adjacent to L7. Adjust the signal generator for discriminator zero.
3.	B (2nd IF Amp)	Pin 2	L1 (1st RF Amp), L6, L7, C341 and C342 (RF SELECTIVITY)	Maximum	Apply an on-frequency signal to the antenna jack, keeping below saturation. Tune L1, L6, L7, C341, and C342 for maximum meter reading.
4.	"	"	L4 (1st OSC/MULT) L1, L2 and L3 (MULT SELECTIVITY)	Maximum	Apply an on-frequency signal as above, keeping below saturation. Tune L4 on 1st OSC/MULT and L1, L2 and L3 on MULT SELECTIVITY for maximum meter reading.
			FREQUENCY ADJUSTMENT		
5.	A (DISC)	Pin 10	C9 on 1st OSC (C10, C11 or C12 for multi-frequency)	Zero	Apply an on-frequency signal to the antenna jack. Tune C9 for zero discriminator reading. In multi-frequency units, tune C10, C11 or C12 as required. —— NOTE —— For proper frequency control of the receiver, it is recommended that all frequency adjustments be made 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.



IF-AUDIO & SQUELCH



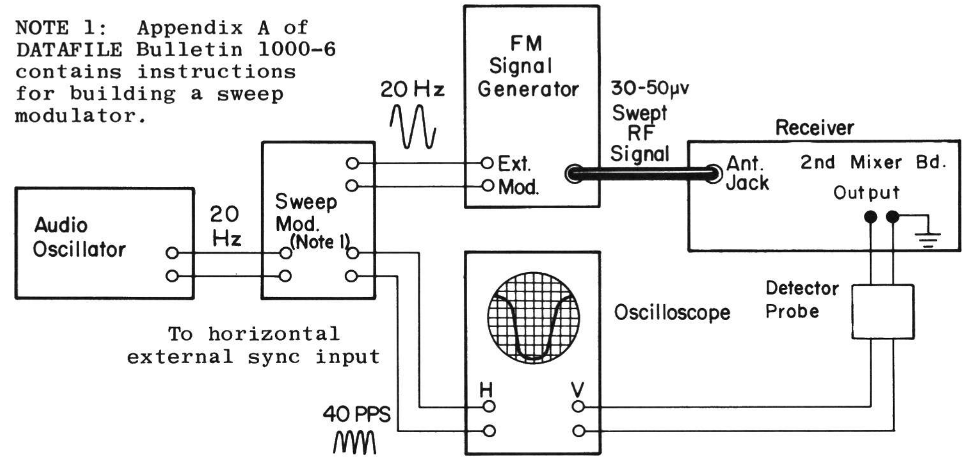


Figure 4 - Test Setup for 20-Hz Double-Trace Sweep Alignment

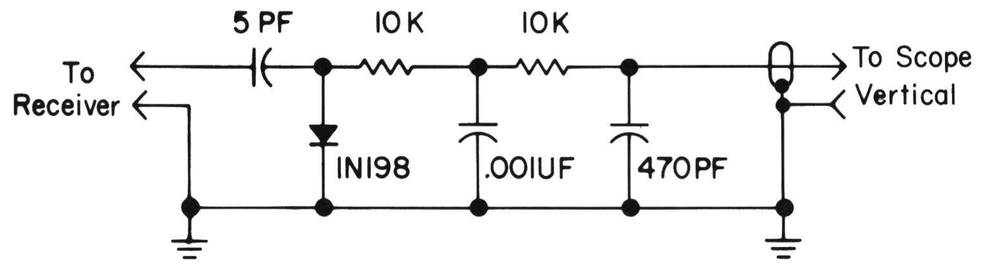


Figure 5 - Detector Probe for Sweep Alignment

COMPLETE RECEIVER ALIGNMENT

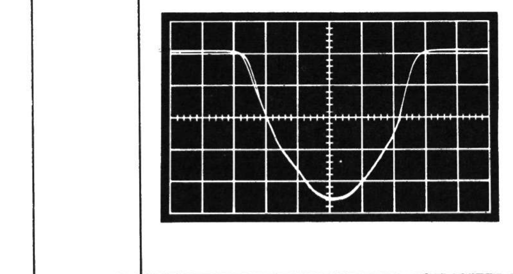
EQUIPMENT REQUIRED

1. GE Test Set Models 4EX3A10, 4EX8K10, 11 (or 20,000 ohms-per-volt Multimeter with a 1-volt scale).
2. A 455-kHz signal source (GE Test Set Model 4EX7A10) and 25-50 MHz signal source. Connect a one-inch piece of insulated wire no larger than .065-inch diameter to generator output prove.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect Test Set to Receiver Centralized Metering Jack J442, and set meter sensitivity switch to the TEST 1 position (or 1-volt position on 4EX8K10, 11).
2. Set crystal trimmer C9 to mid-capacity. In multi-frequency receivers, set C10, C11 or C12 to mid-capacity as required. Where the maximum frequency spacing is less than 100 kHz, align the unit on channel F1. If the frequency spacing is greater than 100 kHz, align the receiver on the center frequency.
3. With Test Set in Position J, check for regulated +10 volts. If using Multimeter, measure from C360 to C361.
4. If using Multimeter, connect the positive lead to J442-16 (Ground).
5. Disable the Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION GE Test Set	METERING POSITION Multimeter - at J442	TUNING CONTROL	METER READING	PROCEDURE
			DISCRIMINATOR & OSCILLATOR		
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 readings any closer than .05 volt.
3.	D (MULT-1)	Pin 4	L4 (on 1st OSC/MULT) and L1, L2 & L3 (on MULT SELECTIVITY)	See Procedure	Tune L4 on 1st OSC/MULT and L1 on MULT SELECTIVITY for maximum meter reading. Tune L2 for minimum meter reading. Change voltage scale if necessary. Then tune L3 for maximum meter reading. Repeat step 3.
			RF AMPLIFIER & SELECTIVITY		
4.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal adjacent to L7. Adjust the signal generator for discriminator zero.
5.	B (2nd IF AMP)	Pin 2	L7 and L6 (RF SELECTIVITY)	Maximum	Apply an on-frequency signal and tune for maximum meter reading as shown below, keeping signal below saturation. Apply Signal Generator Probe to: L6 — Tune: L7 Apply Signal Generator Probe to: L1 — Tune: L6
6.	"	"	C341, C342 and L1 (1st RF Amp)	Maximum	Apply an on-frequency signal to the antenna jack. Tune C341, C342, and L1 for maximum meter reading, keeping signal below saturation.
7.	"	"	L1 (1st RF Amp) L6, L7, C341, and C342 (RF SELECTIVITY)	Maximum	Apply an on-frequency signal as above, keeping below saturation. Tune L1, L6, L7, C341 and C342 for maximum meter reading.
8.	"	"	L3 (MULT SELECTIVITY)	Maximum	Apply on-frequency signal as above, keeping below saturation. Tune L2 & L3 (on MULT SELECTIVITY) for maximum meter reading.
			2ND MIXER & LO IF		
The 1st and 2nd mixer, and low IF circuits have been aligned at the factory and will normally require no further adjustment. If adjustment is necessary, use the procedure outlined in STEPS 9, 10, and 11. C3 (on 1st mixer) does not peak, but provides impedance matching for the crystal filter input and should only be tuned when observing IF trace on oscilloscope. —— NOTE —— Refer to DATAFILE BULLETIN 1000-6 (IF Alignment of Two-Way Radio FM Receivers) for helpful suggestions on how to determine when IF Alignment is required.					
9.	B (2nd IF AMP)	Pin 2	A 347-L3, L2, L1, T1 (2nd Mixer)	Maximum	Apply on-frequency, unmodulated signal and tune A347-L3, L2, L1, and T1 for maximum meter reading, keeping signal below saturation.
10.			A347-L3, L2, L1, T1 (2nd Mixer) 		Connect scope, signal generator, and detector as shown in Figure 4, Set signal generator level for 30-50 µv and modulate with 10 kHz at 20 Hz. With detector at the collector of A347-Q3 (2nd mixer board output), tune L3, L2, L1, T1 (2nd Mixer) and C3 (1st Mixer) for double trace as shown on scope pattern.
11.	A (DISC)	Pin 10		See Procedure	Check to see that discriminator idling voltage is within ±.05 volt of zero with no signal applied. Check to see that modulation acceptance bandwidth is between ±7 and 9 kHz.
			FREQUENCY ADJUSTMENT		
12.	A (DISC)	Pin 10	C9 on 1st OSC (C10, C11 or C12 for multi-frequency)	Zero	Apply an on-frequency signal to the antenna jack. Tune C9 for zero discriminator reading. In multi-frequency units, tune C10, C11 or C12 as required. —— NOTE —— For proper frequency control of the receiver, it is recommended that all frequency adjustments be made 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.

TEST PROCEDURES

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

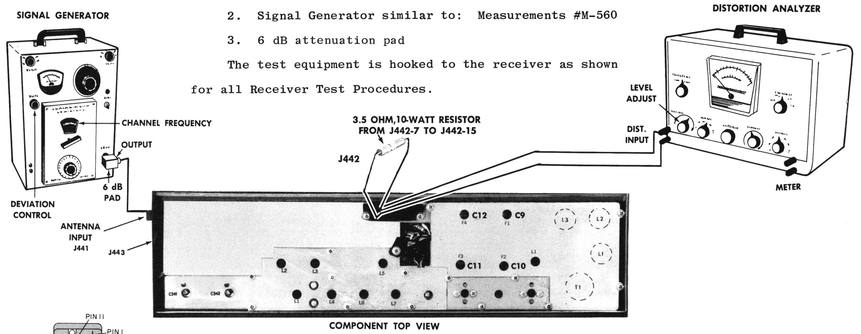
Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

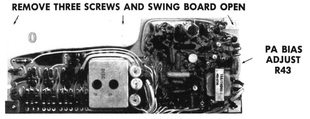
TEST EQUIPMENT REQUIRED

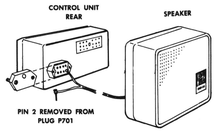
for test hookup shown:

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

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







STEP 1

AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

A. Connect a 1,000-microvolt test signal modulated by 1,000 hertz ±3.3 kHz deviation to the 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.

VOLTMETER SCALE ON DISTORTION ANALYZER

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

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

SERVICE CHECK

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

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

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

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

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

STEP 2

USABLE SENSITIVITY (12 dB SINAD)

TEST PROCEDURE

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

A. Be sure Test Step 1 checks out properly.

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

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

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

E. The 12-dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is "usable" sensitivity level. Reading should be less than 0.25 microvolts with audio output at least 2.5 watts (2.9 volts RMS across the 3.5-ohm receiver load).

SERVICE CHECK

If the sensitivity level is more than 0.25 microvolts, make the following checks:

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

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

STEP 3

MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

TEST PROCEDURE

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

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

C. Increase Signal Generator frequency deviation.

D. Adjust LEVEL Control for +2 dB.

DB SCALE ON DISTORTION ANALYZER

LEVEL DISTORTION ON DISTORTION ANALYZER

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

F. Deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±7 kHz (but less than ±9 kHz).

SERVICE CHECK

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

STEP 1 - QUICK CHECKS

TEST SET CHECKS

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

Metering Position	Reading With No Signal In	Reading with 1 Microvolt Unmodulated
A (Disc Idling)	Less then ±.05 VDC	
B (2nd IF)	.03 VDC	0.2 VDC
C (1st Lim)	0.5 VDC	0.8 VDC
D (Mult-1)	0.6 VDC	
J (Reg. +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 1st Mixer, HI IF Amp and 2nd Mixer. • Make SIMPLIFIED GAIN CHECKS (STEP 2A).
LOW AUDIO	• Check Audio PA (Q341 & Q342) 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).
DISTORTION IDLING TOO FAR OFF ZERO	• See if discriminator zero is in center of IF bandpass.

STEP 3-VOLTAGE RATIO READINGS

EQUIPMENT REQUIRED:

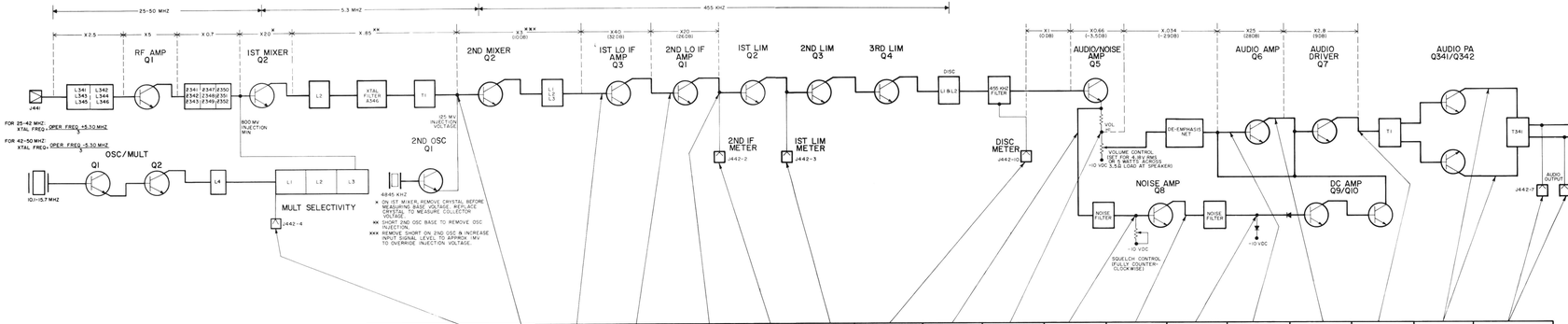
1. RF Voltmeter (similar to Boonton Model 91-CA or Millivac Type MV-18 C.
2. Signal on receiver frequency (below saturation). Correct frequency can be determined by zeroing the discriminator. Use 1,000 hertz signal with 3.3 kHz deviation.

PROCEDURE:

1. Apply probe to input of stage (for example, base of RF amp). Peak resonant circuit of stage being measured and take voltage reading (E_1).
2. Move probe to input of following stage (1st mixer*). Re-peak first resonant circuit then peak circuit being measured and 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 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 VTVM between system negative and points indicated by arrow.

SIGNAL GENERATOR INPUT AT J446 MAINTAIN SETTING AT DISCRIMINATOR ZERO		UNMODULATED	UNMODULATED	UNMODULATED	UNMODULATED	1 MICROVOLT UNMODULATED	NO SIGNAL INPUT	STANDARD SIGNAL-1 MILLIVOLT AT 455KHZ FREQ MODULATED BY 1KHZ WITH 3.3 KHZ DEVIATION	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL
PROCEDURE		INCREASE GENERATOR OUTPUT UNTIL VTVM READING ON 1.5 V SCALE INCREASES BY 50 MV	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5%												CONNECT VTVM OR SCOPE PROBE AT J442-5. 50Ω J442-5 TO SPEAKER DISCONNECTED
READING	2.4 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:

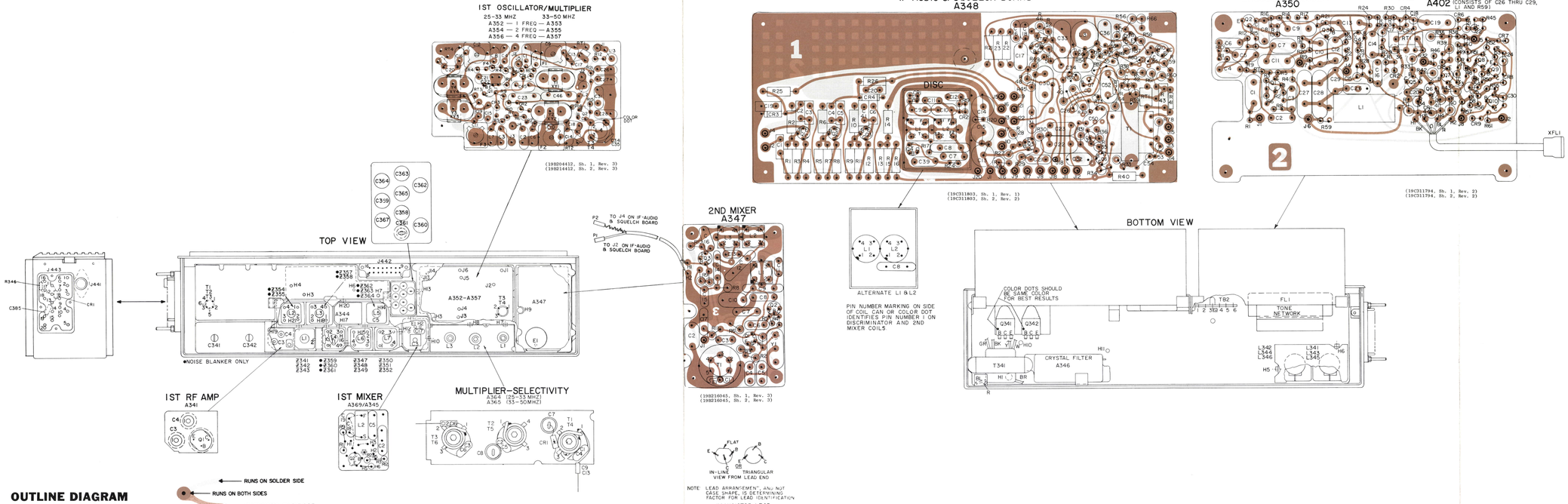
1. Set VOLUME control for 4.18 volts across 3.5-ohm load. If this cannot be obtained, set to approx. 70% of max. rotation.
2. Set SQUELCH control fully counterclockwise.
3. Receiver should be properly aligned.
4. Connect oscilloscope between system negative and points indicated by arrow.

SCOPE SETTING		0.5 MS/DIV 1 VOLT/DIV 2 V P-P	0.5 MS/DIV 1 VOLT/DIV 1.4 V P-P	0.5 MS/DIV 1 VOLT/DIV 1 V P-P (NOISE)	0.5 MS/DIV 2 VOLTS/DIV 5.7 V P-P (NOISE)	0.5 MS/DIV 0.5 VOLTS/DIV 3 V P-P (NOISE)	0.5 MS/DIV 50 MILLIVOLTS/DIV 0.1 V P-P	0.5 MS/DIV 1 VOLT/DIV 1.9 V P-P	0.5 MS/DIV 2 VOLTS/DIV 4 V P-P	0.5 MS/DIV 10 VOLTS/DIV 30 V P-P	0.5 MS/DIV 5 VOLTS/DIV 12 V P-P
STANDARD SIGNAL (1 MILLIVOLT AT RECEIVER FREQ MODULATED BY 1 KHZ WITH 3.3 KHZ DEVIATION)											
NOISE WAVE FORM (NO SIGNAL INPUT)											

(BC-1687A)

TROUBLESHOOTING PROCEDURE

25—50 MHZ, MASTR
RECEIVER MODELS 4ER39C10-27



OUTLINE DIAGRAM

25—50 MHZ, MASTR
RECEIVER MODELS 4ER39C10-27

PARTS LIST

LBI-3914C

25-50 MHz RECEIVER
MODELS 4ER39C10 - 4ER39C27

SYMBOL	GE PART NO.	DESCRIPTION
A341		RF AMPLIFIER ASSEMBLY 19B204772-G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5494481-P12	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2	5494481-P14	Ceramic disc: .002 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C3 and C4	5493392-P7	Ceramic, feed-thru: .001 µf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115342-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P123K	Composition: 12,000 ohms ±10%, 1/4 w.
R2	3R152-P302J	Composition: 3000 ohms ±5%, 1/4 w.
R3	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R4	3R152-P391K	Composition: 390 ohms ±10%, 1/4 w.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XQ1	5490277-P1	Transistor: 4 contacts rated at 1 amp at 400 VRMS; sim to Elco 3303.
A345		FIRST MIXER ASSEMBLY 19B204430-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	5494481-P114	Ceramic disc: .002 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C3	5491271-P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189-6-5.
C5	5494481-P114	Ceramic disc: .002 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C6	5494481-P12	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C18	5496218-P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1	4038104-P1	Lug.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2	19A121082-G2	Toroidal coil.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2	19A115245-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P563J	Composition: 56,000 ohms ±5%, 1/4 w.
R2	3R152-P822J	Composition: 8200 ohms ±5%, 1/4 w.
R3	3R152-P202J	Composition: 2000 ohms ±5%, 1/4 w.
R5	3R152-P390J	Composition: 39 ohms ±5%, 1/4 w.
R9	3R152-P471K	Composition: 470 ohms ±10%, 1/4 w.
A346		CRYSTAL FILTER 19B204616-G3
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL5	19B206692-G1	Bandpass.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R7	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R8	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
A347		SECOND MIXER 19B216119-G1 REV A
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1		(Part of T1).
C2	19B209243-P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C3	5494481-P112	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C4 and C5	5490008-P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C6	5490008-P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C7 and C8	19B209243-P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C9	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C10	19B209243-P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C11	5496219-P40	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C12	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150 PPM.
C13	5496219-P40	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C14	5496219-P471	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -220 PPM.
C15	7491395-P109	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JL.
C16	19B209243-P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C17*	19B209243-P1	Polyester: 0.01 µf ±20%, 50 VDCW. Added by Rev A.
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - - - - - - -
J1	4033513-P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1 thru L3	19C311181-G3	Coil. Includes tuning slug 4038368-P1.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P2	4029840-P1	Contact, electrical: sim to AMP 41854.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115889-P1	Silicon, NPN.
Q2	19A115245-P1	Silicon, NPN.
Q3	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R3	3R77-P512J	Composition: 5100 ohms ±5%, 1/2 w.
R4	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w.
R5	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R6	3R77-P332K	Composition: 3300 ohms ±10%, 1/2 w.
R7	3R77-P123K	Composition: 12,000 ohms ±10%, 1/2 w.
R8	3R77-P622J	Composition: 6200 ohms ±5%, 1/2 w.
R9	3R77-P302J	Composition: 3000 ohms ±5%, 1/2 w.
R10	3R77-P202J	Composition: 2000 ohms ±5%, 1/2 w.
R11	3R77-P201J	Composition: 200 ohms ±5%, 1/2 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1		COIL ASSEMBLY 19B216120-G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19C301540-P261	Ceramic disc: 82 pf ±5%, 200 VDCW, temp coef -80 PPM.
	5491798-P3	Tuning slug.
		- - - - - - - - - - CRYSTALS - - - - - - - - - -
Y1	19A110192-P3	Quartz: freq 4845 KHz ±100 Hz at 25°C, temp range -30°C to +75°C.
A348		IF AUDIO AND SQUELCH 19D413129-G1 REV C
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C2	5496219-P717	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef -750 PPM.
C3	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4	5496219-P717	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef -750 PPM.
C5 and C6	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C7	19B209243-P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C8	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef -150.
C9 and C10	5490008-P37	Silver mica: 270 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C11	5496219-P656	Ceramic disc: 51 pf ±5%, 500 VDCW, temp coef -470 PPM.
C12	5494481-P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C13	19A115680-P107	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C14 and C15	19A115680-P104	Electrolytic: 50 µf +150% -10%, 25 VDCW; sim to Mallory Type TT.
C16	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C17	19B209243-P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C18	5494481-P108	Ceramic disc: 470 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C19 and C20	19B209243-P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C21*	19B209243-P3 19B209243-P1	Polyester: 0.022 µf ±20%, 50 VDCW. Earlier than REV A. Polyester: 0.01 µf ±20%, 50 VDCW.
C22	19B209243-P116	Polyester: 0.15 µf ±10%, 50 VDCW.
C23	19B209243-P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C24*	19B209243-P106	Polyester: .068 µf ±10%, 50 VDCW. Deleted by REV A.
C25	5496267-P6	Tantalum: 33 µf ±20%, 10 VDCW; sim to Sprague Type 150D.
C26*	5496267-P28 19B209243-P14	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 150D. Earlier than REV A. Polyester: 0.33 µf ±20%, 50 VDCW.
C27*	5496267-P2 5496267-P6	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D. Earlier than REV C: Tantalum: 33 µf ±20%, 10 VDCW; sim to Sprague Type 150D.
C28*	5496267-P229	Tantalum: 0.68 µf ±10%, 35 VDCW; sim to Sprague Type 150D. Deleted by REV A.
C29*	5496267-P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D. Deleted by REV A.
C30	19B209243-P16	Polyester: 0.15 µf ±20%, 50 VDCW.
C31	19B209243-P102	Polyester: 0.015 µf ±20%, 50 VDCW.
C32	19B209243-P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C33	19B209243-P17	Polyester: 0.22 µf ±20%, 50 VDCW.
C34	4029003-P207	Silver mica: 1830 pf ±2%, 500 VDCW; sim to Electro Motive Type DM-20.
C35	19B209243-P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C36*	19B209243-P17 19B209243-P7	Polyester: 0.22 µf ±20%, 50 VDCW. Earlier than REV C: Polyester: 0.1 µf ±20%, 50 VDCW.
C37*	5496267-P28 5496267-P17	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 150D. Earlier than REV A: Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C38*	5496267-P10 5496267-P14	Tantalum: 22 µf ±20%, 15 VDCW; sim to Sprague Type 150D. Deleted by REV C. Earlier than REV A. Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C39	19B209243-P1	Polyester: 0.01 µf ±20%, 50 VDCW.
C40*	5496267-P28 19B209243-P117	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 150D. Earlier than REV A: Polyester: 0.22 µf ±10%, 50 VDCW.
C41	5490008-P129	Silver mica: 120 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C42*	19B209243-P4	Polyester: 0.033 µf ±20%, 50 VDCW. Deleted by REV A.
C43*	5496267-P213	Tantalum: 2.2 µf ±10%, 20 VDCW; sim to Sprague Type 150D. Deleted by REV A.
C49*	5496267-P9	Tantalum: 3.3 µf ±15%, VDCW; sim to Sprague Type 150D. Added by REV A. Deleted by REV C.
C50*	19B209243-P7	Polyester: 0.1 µf ±20%, 50 VDCW. Added by REVA.
C51*	5494481-P127	Ceramic disc: 2700 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap. Added by REV. A.
C52*	19B209243-P117	Polyester: 0.22 µf ±10%, 50 VDCW. Added by REV. A.
C53* and C54*	5496267-P213	Tantalum: 2.2 µf ±10%, 20 VDCW; sim to Sprague Type 150D. Added by REV A.
C55*	5496267-P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D. Added by REV C.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	19A115250-P1	Silicon.
CR3 and CR4	4038056-P1	Germanium.
CR5 and CR6	19A115250-P1	Silicon.
CR7*	19A115250-P1	Silicon. Deleted by REV C.
CR8*	19A115250-P1	Silicon. Added by REV A. Deleted by REV C.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1 thru J22	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19C311181-G1	Coil.
L2	19C311181-G2	Coil. Includes tuning slug 4038368-P1.
L3	19A127134-G1	Choke. Includes tuning slug 7486872-P7.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q6	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q7	19A115300-P4	Silicon, NPN; sim to Type 2N3053.
Q8	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q9	19A115362-P1	Silicon, NPN; sim to Type 2N2925.
Q10	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.
R2	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R3	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R4	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w.
R5	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.
R6	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R7	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R8	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w.
R9	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.
R10	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R11	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R12	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w.
R13	3R77-P272K	Composition: 2700 ohms ±10%, 1/2 w.
R14	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R15	3R77-P333J	Composition: 33,000 ohms ±5%, 1/2 w.
R16	3R77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R17	3R152-P471J	Composition: 470 ohms ±5%, 1/4 w.
R18 and R19	3R152-P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R20	3R152-P472K	Composition: 4700 ohms ±10%, 1/4 w.
R21 and R22	3R77-P362J	Composition: 3600 ohms ±5%, 1/2 w.
R23	3R77-P104K	Composition: 0.1 megohm ±10%, 1/2 w.
R24	3R152-P102J	Composition: 1000 ohms ±5%, 1/4 w.
R25 and R26	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R27 and R28	3R77-P753J	Composition: 75,000 ohms ±5%, 1/2 w.
R29	3R77-P182J	Composition: 1800 ohms ±5%, 1/2 w.
R30	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R31	3R77-P821J	Composition: 820 ohms ±5%, 1/2 w.
R32*	3R77-P752J	Composition: 7500 ohms ±5%, 1/2 w. Deleted by REV A.
R33*	3R77-P912J 3R77-P203J	Composition: 9100 ohms ±5%, 1/2 w. Earlier than REV A. Composition: 20,000 ohms ±5%, 1/2 w.
R34	3R77-P332K	Composition: 3300 ohms ±10%, 1/2 w.
R35	3R77-P330K	Composition: 33 ohms ±10%, 1/2 w.
R36	3R77-P681J	Composition: 680 ohms ±5%, 1/2 w.
R37*	3R77-P822J	Composition: 8200 ohms ±5%, 1/2 w. Deleted by REV A.
R38*	3R77-P752J 3R77-P622J	Composition: 7500 ohms ±5%, 1/2 w. Earlier than REV A. Composition: 6200 ohms ±5%, 1/2 w.
R39*	3R77-P820J 3R77-P131J	Composition: 8200 ohms ±5%, 1/2 w. Earlier than REV A. Composition: 130 ohms ±5%, 1/2 w.
R40	3R77-P241J	Composition: 240 ohms ±5%, 1/2 w.
R41*	3R152-P240J 3R77-P300J	Composition: 24 ohms ±5%, 1/2 w. Earlier than REV A: Composition: 30 ohms ±5%, 1/2 w.
R42*	3R77-P200J 3R77-P160J	Composition: 20 ohms ±5%, 1/2 w. Earlier than REV A: Composition: 16 ohms ±5%, 1/2 w.
R43	19B209358-P101	Variable, carbon film: approx 25 to 250 ohms ±10%, 0.2 w; sim to CTS Type X-201.
R44	19B209022-P101	Wirewound: .27 ohms ±10%, 2 w; sim to IRC Type BWH.
R45	3R77-P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R46	3R77-P913J	Composition: 91,000 ohms ±5%, 1/2 w.
R48*	19A116278-P249 3R77-P302J 3R77-P332J	Metal film: 3160 ohms ±2%, 1/2 w. Earlier than REV B: Composition: 3000 ohms ±5%, 1/2 w. Earlier than REV A: Composition: 3300 ohms ±5%, 1/2 w.
R49	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R50	3R77-P222J	Composition: 2200 ohms ±5%, 1/2 w.
R51	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R52	3R77-P682J	Composition: 6800 ohms ±5%, 1/2 w.
R53*	3R77-P303J 3R77-P473J 3R77-P303J	Composition: 30,000 ohms ±5%, 1/2 w. Earlier than REV C: Composition: 47,000 ohms ±5%, 1/2 w. Earlier than REV A: Composition: 30,000 ohms ±5%, 1/2 w.
R54	3R77-P822J	Composition: 8200 ohms ±5%, 1/2 w.
R55	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R56	3R77-P224J	Composition: 0.22 megohms ±5%, 1/2 w.
R57	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R58	3R77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R59	3R77-P393K	Composition: 39,000 ohms ±10%, 1/2 w.
R60 and R61	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R62*	3R77-P103K 3R77-P223K	Composition: 10,000 ohms ±10%, 1/2 w. Earlier than REV A: Deleted by REV C. Composition: 22,000 ohms ±10%, 1/2 w.
R63*	3R77-P432J	Composition: 4300 ohms ±5%, 1/2 w. Deleted by REV A.
R64*	3R77-P120J 3R77-P180J	Composition: 12 ohms ±5%, 1/2 w. Earlier than REV C: Composition: 18 ohms ±5%, 1/2 w.
R65*	3R77-P154K	Composition: 0.15 megohm ±10%, 1/2 w. Deleted by REV A.
R66	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w.
R75*	3R77-P473J	Composition: 47,000 ohms ±5%, 1/2 w. Added by REV A. Deleted by REV C.
R76*	3R152-P912J	Composition: 9100 ohms ±5%, 1/4 w. Added by REV A. Deleted by REV C.
R77*	3R152-P153J 3R152-P652J	Composition: 15,000 ohms ±5%, 1/4 w. Earlier than REV C: Composition: 5600 ohms ±5%, 1/4 w. Added by REV A.
R78*	3R77-P100J	Composition: 10 ohms ±5%, 1/2 w. Added by REV A.
R79*	3R152-P393J	Composition: 39,000 ohms ±5%, 1/4 w. Added by REV A.
R80*	3R152-P432J	Composition: 4300 ohms ±5%, 1/4 w. Added by REV C.
R81*	3R152-P472J	Composition: 4700 ohms ±5%, 1/4 w. Added by REV C.
R82*	3R77-P273J	Composition: 27,000 ohms ±5%, 1/2 w. Added by REV C.
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1	5490828-P41	Thermistor: 30 ohms ±10%, color code black, white; sim to Globar Type B1211H-4.
RT2	5490828-P9	Thermistor: 10,000 ohms ±10%, color code yellow; sim to Globar Type 551H8.
RT3*	5490828-P9	Thermistor: 10,000 ohms ±10%, color code yellow; sim to Globar Type 551H8. Added by REV. A.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1	19A116040-P1	Audio: Pri: 19.3 ohms ±10% DC res, Sec: 23.5 ohms ±10% DC res.
A350		ENCODER/DECODER 4EK16A10 19C311797-G1 REV C
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1*	19A116080-P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C2* and C3*	19A116080-P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C4*	19A116080-P207	Polyester: 0.1 µf ±5%, 50 VDCW.
C5*	19A116080-P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C6*	19A116080-P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C7*	19A116080-P207	Polyester: 0.1 µf ±5%, 50 VDCW.
C8*	19A116080-P205	Polyester: 0.047 µf ±5%, 50 VDCW.
C9*	19A116080-P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C10*	19A116080-P207	Polyester: 0.1 µf ±5%, 50 VDCW.
C11*	19A116080-P109	Polyester: 0.22 µf ±10%, 250 VDCW.
C12*	19A116080-P207	Polyester: 0.1 µf ±5%, 50 VDCW.
C13*	19A116080-P9	Polyester: 0.22 µf ±20%, 50 VDCW.
C14*	19A116080-P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C15	5496267-P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C16*	19A116080-P5	Polyester: 0.047 µf ±20%, 50 VDCW.
C17	5496267-P417	Tantalum: 1.0 µf ±5%, 35 VDCW; sim to Sprague Type 150D.
C18	5496267-P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C19*	19A116080-P109	Polyester: 0.22 µf ±10%, 50 VDCW.
C20	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C21	5496267-P9	Tantalum: 3.3 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C22	5496267-P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C23	5496267-P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C24	5496267-P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C25	5496267-P18	Tantalum: 6.8 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C26*	19A116080-P206	Polyester: 0.068 µf ±5%, 50 VDCW.
C27* and C28*	19A116080-P210	Polyester: 0.33 µf ±5%, 50 VDCW.
C29*	19A116080-P205 19B209243-P107	Polyester: 0.047 µf ±5%, 50 VDCW. Earlier than REV C: Polyester: 0.1 µf ±10%, 50 VDCW.
C30	5496267-P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	19A115250-P1	Silicon.
CR3 and CR4	5494922-P1	Silicon.
CR5	19A115250-P1	Silicon.
CR6	4036887-P3	Silicon, Zener.
CR7 thru CR9	19A115250-P1	Silicon.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL1		TONE FREQUENCY NETWORK 19B205280
	19B205280-G1	71.9 Hz
	19B205280-G2	77.0 Hz
	19B205280-G3	82.5 Hz
	19B205280-G4	88.5 Hz
	19B205280-G5	94.8 Hz
	19B205280-G6	100.0 Hz
	19B205280-G7	103.5 Hz
	19B205280-G8	107.2 Hz
	19B205280-G9	110.9 Hz
	19B205280-G10	114.8 Hz
	19B205280-G11	118.8 Hz
	19B205280-G12	123.0 Hz
	19B205280-G13	127.3 Hz
	19B205280-G14	131.8 Hz
	19B205280-G15	136.5 Hz
	19B205280-G16	141.3 Hz
	19B205280-G17	146.2 Hz
	19B205280-G18	151.4 Hz
	19B205280-G19	156.7 Hz
	19B205280-G20	162.2 Hz
	19B205280-G21	167.9 Hz
	19B205280-G22	173.8 Hz
	19B205280-G23	179.9 Hz
	19B205280-G24	186.2 Hz
	19B205280-G25	192.8 Hz
	19B205280-G26	203.5 Hz
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1 thru J8	4033513-P4	Contact, electrical sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A115690-P1	Coil, RF: 880 MH ±5%, sim to Artted AC5672.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q2	19A115362-P1	Silicon, NPN; sim to Type 2N2925.
Q3 and Q4	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q5 thru Q8	19A115362-P1	Silicon, NPN; sim to Type 2N2925.
Q9 and Q10	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P682K	Composition: 6800 ohms ±10%, 1/4 w.
R2	3R152-P683J	Composition: 68,000 ohms ±5%, 1/4 w.
R3	3R152-P822J	Composition: 8200 ohms ±5%, 1/4 w.
R4	3R152-P152J	Composition: 1500 ohms ±5%, 1/4 w.
R5	3R152-P682K	Composition: 6800 ohms ±10%, 1/4 w.
R6	3R152-P201J	Composition: 200 ohms ±5%, 1/4 w.
R7	3R152-P113J	Composition: 11,000 ohms ±5%, 1/4 w.
R8*	3R152-P562J 3R152-P622J 3R152-P512J	Composition: 5600 ohms ±5%, 1/4 w. Earlier than REV B: Composition: 6200 ohms ±5%, 1/4 w. Earlier than REV A: Composition: 5100 ohms ±5%, 1/4 w.
R9	3R152-P113J	Composition: 11,000 ohms ±5%, 1/4 w.
R10	3R152-P512J	Composition: 5100 ohms ±5%, 1/4 w.
R11	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R12	3R152-P822J	Composition: 8200 ohms ±5%, 1/4 w.
R13	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R14	3R152-P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R15	3R152-P510J	Composition: 51 ohms ±5%, 1/4 w.
R16	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R17	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R18	3R152-P622J	Composition: 6200 ohms ±5%, 1/4 w.
R19	3R152-P123J	Composition: 12,000 ohms ±5%, 1/4 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

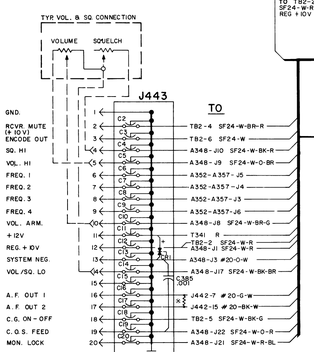
MODEL NO	FREQ RANGE	NO FREQ	CHAN GUARD
4ER39C50	25-33 MHZ	1	
4ER39C51	33-42 MHZ	1	
4ER39C52	42-50 MHZ	1	
4ER39C53	25-33 MHZ	2	
4ER39C54	33-42 MHZ	2	
4ER39C55	42-50 MHZ	2	
4ER39C56	25-33 MHZ	4	
4ER39C57	33-42 MHZ	4	
4ER39C58	42-50 MHZ	4	
4ER39C59	25-33 MHZ	1	X
4ER39C60	33-42 MHZ	1	X
4ER39C61	42-50 MHZ	1	X
4ER39C62	25-33 MHZ	2	X
4ER39C63	33-42 MHZ	2	X
4ER39C64	42-50 MHZ	2	X
4ER39C65	25-33 MHZ	4	X
4ER39C66	33-42 MHZ	4	X
4ER39C67	42-50 MHZ	4	X

VOLTAGE READINGS

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

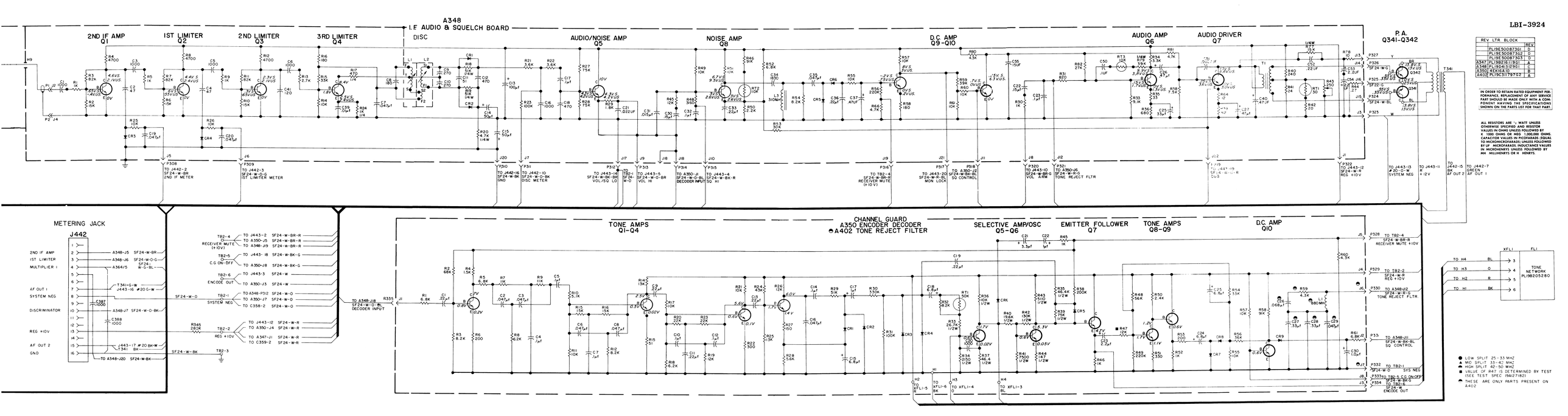
S= NO SIGNAL IN WITH SQUELCH CONTROL FULLY COUNTERCLOCKWISE (MAXIMUM SQUELCH).

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



SCHEMATIC DIAGRAM

25—50 MHz RECEIVER
MODELS 4ER39C10-27



REV LTR BLOCK	REV
PL19E500873G1	D
PL19E500873G2	D
PL19E500873G3	D
A347 PL19B216113G1	A
A348 PL19B431295G1	C
A350 4EK16A1G	B
A402 PL19C317972G2	A

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 ¼ WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K 1000 OHMS OR MEG 1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH MILLIHENRYS OR H HENRYS.

● LOW SPLIT 25-33 MHZ
▲ MID SPLIT 33-42 MHZ
■ HIGH SPLIT 42-50 MHZ
◆ VALUE OF R47 IS DETERMINED BY TEST (SEE TEST SPEC 19A277821)
◓ THESE ARE ONLY PARTS PRESENT ON A402

(198621227, Rev. 14)

SCHEMATIC DIAGRAM

25—50 MHz RECEIVER
MODELS 4ER39C10-27

SYMBOL	GE PART NO.	DESCRIPTION
R20	3R152-P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R21	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R22	3R152-P301J	Composition: 300 ohms ±5%, 1/4 w.
R23	3R152-P223J	Composition: 22,000 ohms ±5%, 1/4 w.
R24	3R152-P433J	Composition: 43,000 ohms ±5%, 1/4 w.
R25	3R152-P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R26	3R152-P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R27	3R152-P151J	Composition: 150 ohms ±5%, 1/4 w.
R28	3R152-P562J	Composition: 5600 ohms ±5%, 1/4 w.
R29	3R152-P513J	Composition: 51,000 ohms ±5%, 1/4 w.
R30	3R152-P334J	Composition: 0.33 megohms ±5%, 1/4 w.
R31	3R152-P104J	Composition: 0.1 megohms ±5%, 1/4 w.
R32	3R152-P822J	Composition: 8200 ohms ±5%, 1/4 w.
R33	19A116278-P342	Metal film: 26,700 ohms ±2%, 1/2 w.
R34	19A116278-P233	Metal film: 2150 ohms ±2%, 1/2 w.
R35	19A116278-P365	Metal film: 46,400 ohms ±2%, 1/2 w.
R36	19A116278-P301	Metal film: 10,000 ohms ±2%, 1/2 w.
R37	19A116278-P65	Metal film: 46.4 ohms ±2%, 1/2 w.
R38	3R152-P204J	Composition: 0.2 megohm ±5%, 1/4 w.
R39	19A116278-P385	Metal film: 75,000 ohms ±2%, 1/2 w.
R40	19A116278-P329	Metal film: 19,000 ohms ±2%, 1/2 w.
R41	19A116278-P285	Metal film: 7500 ohms ±2%, 1/2 w.
R42	19A116278-P412	Metal film: 130,000 ohms ±2%, 1/2 w.
R43	19A116278-P269	Metal film: 5110 ohms ±2%, 1/2 w.
R44	19A116278-P117	Metal film: 147 ohms ±2%, 1/2 w.
R45 and R46	3R152-P102J	Composition: 1000 ohms ±5%, 1/4 w.
		NOTE The value of Resistor R47 must be obtained from the component, then find corresponding value in parts list for the correct part number.
R47A	3R152-P822J	Composition: 8200 ohms ±5%, 1/4 w.
R47B	3R152-P912J	Composition: 9100 ohms ±5%, 1/4 w.
R47C	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R47D	3R152-P113J	Composition: 11,000 ohms ±5%, 1/4 w.
R47E	3R152-P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R47F	3R152-P133J	Composition: 13,000 ohms ±5%, 1/4 w.
R47G	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R47H	3R152-P752J	Composition: 7500 ohms ±5%, 1/4 w.
R48	3R152-P563J	Composition: 56,000 ohms ±5%, 1/4 w.
R49	3R152-P224J	Composition: 0.22 megohms ±5%, 1/4 w.
R50	3R152-P242J	Composition: 2400 ohms ±5%, 1/4 w.
R51	3R152-P331J	Composition: 330 ohms ±5%, 1/4 w.
R52	3R152-P102J	Composition: 1000 ohms ±5%, 1/4 w.
R53	3R152-P201J	Composition: 200 ohms ±5%, 1/4 w.
R54	3R152-P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R55	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R56	3R152-P363J	Composition: 36,000 ohms ±5%, 1/4 w.
R57	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R58	3R152-P913J	Composition: 91,000 ohms ±5%, 1/4 w.
R59 and R60	3R152-P432J	Composition: 4300 ohms ±5%, 1/4 w.
R61	3R152-P682K	Composition: 6800 ohms ±10%, 1/4 w.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1	5490828-P22	Thermistor: 50,000 ohms ±10%, color code yellow; sim to Globar Type 763H.
		- - - - - - - - - - - SOCKETS - - - - - - - - - -
XFL1	19A121920-G3	Reed, mica-filled phen: 7 pins rated at 1 amp at 500 VRMS with 4-1/2 inches of cable.
A352 thru A357		FIRST OSCILLATOR ASSEMBLY A352 19B204419-G13 (4ER39A10, 19) A353 19B204419-G16 (4ER39C11, 12, 20, 21) A354 19B204419-G14 (4ER39C13, 22) A355 19B204419-G17 (4ER39C14, 15, 23, 24) A356 19B204419-G15 (4ER39C16, 25) A357 19B204419-G18 (4ER39C17, 18, 26, 27)
		- - - - - - - - - CAPACITORS - - - - - - - -
C1 thru C4	5494481-P112	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C5 thru C8	5496219-P751	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -750 PPM.
C9 thru C12	5491271-P106	Variable, subminiature: approx 2.1-12.7 pf, 750 v peak; sim to EF Johnson 189-6-5.
C13 thru C16	5496219-P40	Ceramic disc: 9 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C17 thru C20	19C300685-P93	Ceramic disc: 5 pf ±0.1 pf, 500 VDCW, temp coef 0 PPM.
C21	5496219-P771	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -750 PPM.
C22	5496219-P773	Ceramic disc: 270 pf ±5%, 500 VDCW, temp coef -750 PPM.
C23	5494481-P114	Ceramic disc: .002 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C26 thru C28	5494481-P112	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C31	5494481-P112	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C45	5490008-P35	Silver mica: 220 pf ±5%, 500 VDCW.
C46	5496219-P563	Ceramic disc: 100 pf ±5%, 500 VDCW, temp coef -330 PPM.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1 thru CR3	19A115348-P1	Silicon.
		- - - - - - JACKS AND RECEPTACLES - - - - - -
J1 thru J6	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L2 and L3	7488079-P16	Choke, RF: 10 µh ±10% ind at 640 ma, 0.6 ohm DC res; sim to Jeffers 4421-7.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q1 and Q2	19A115330-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1 thru R4	3R152-P562J	Composition: 5600 ohms ±5%, 1/4 w.
R5 thru R8	3R152-P104K	Composition: 0.1 megohm ±10%, 1/4 w.
R9	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R10	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.

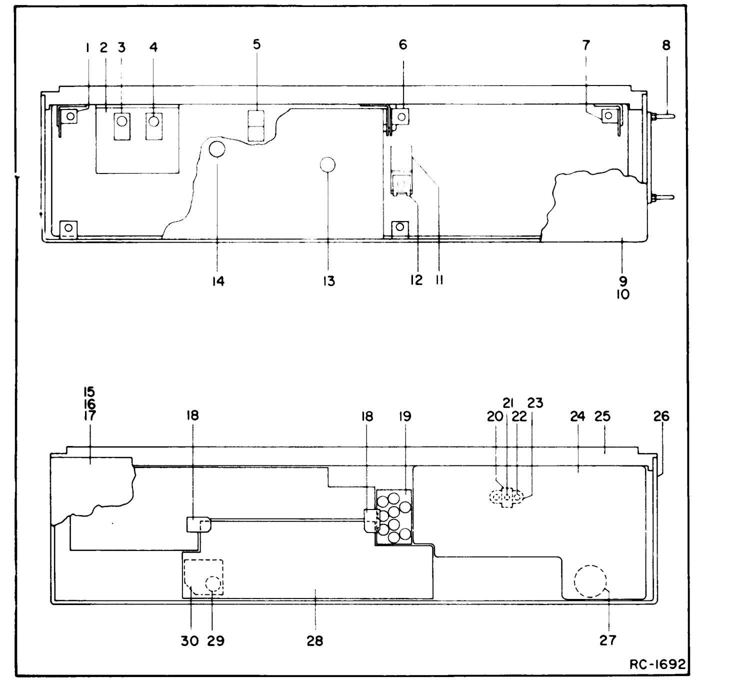
SYMBOL	G-E PART NO	DESCRIPTION
R11 and R12	3R152-P102J	Composition: 1000 ohms ±5%, 1/4 w.
R14	3R152-P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R15	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
R19	3R152-P360J	Composition: 36 ohms ±5%, 1/4 w.
R21	3R152-P750J	Composition: 75 ohms ±5%, 1/4 w.
		- - - - - - - - - - THERMISTORS - - - - - - - - -
RT1 thru RT4	19B209284-P5	Disc: 43 ohms res nominal at 25°C, color code green.
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T3 and T4		COIL ASSEMBLY T3 19B205416-G1 T4 19B205416-G2
		- - - - - - - - - CAPACITORS - - - - - - - -
C34	5496218-P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C35	5496218-P249	Ceramic disc: 27 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L4	19A121464-P1	Coil. Includes tuning slug 5491798-P5.
		- - - - - - - - - - - SOCKETS - - - - - - - - -
XY1 thru XY4		Refer to Mechanical Parts (RC-1692).
		- - - - - - - - - - - CRYSTALS - - - - - - - - -
		When reordering give GE Part No. and specify exact freq needed.
		25-42 MHz crystal freq = (OF +5.30 MHz) ÷ 3.
		42-50 MHz crystal freq = (OF -5.30 MHz) ÷ 3.
Y1 thru Y4	19B206576-P1	Quartz: freq range 10086.666 to 12766.666 KHz, temp range -30°C to +85°C. (25-33 MHz).
Y1 thru Y4	19B206576-P2	Quartz: freq range 12766.667 to 15766.666 KHz, temp range -30°C to +85°C. (33-42 MHz).
Y1 thru Y4	19B206576-P3	Quartz: freq range 12233.333 to 16233.333 KHz, temp range -30°C to +85°C. (42-54 MHz).
A364 and A365		MULTIPLIER SELECTIVITY ASSEMBLY A364 19B205326-G1 (4ER39A10, 13, 16, 19, 22, 25) A365 19B205326-G2 (4ER39A11, 12, 14, 15, 17, 18, 20, 21, 23, 24, 26, 27)
		- - - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	5496218-P252	Ceramic disc: 36 µf ±5%, 500 VDCW, temp coef -80 PPM.
C3	5496218-P251	Ceramic disc: 33 pf ±5%, 500 VDCW, temp coef -80 PPM.
C4 and C5	5496218-P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
C6	5496218-P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C7 and C8	5493392-P107	Ceramic feed-thru: 470 pf +100% - 0%, 500 VDCW.
C9	5491601-P123	Tubular: 1.5 pf ±5%, 500 VDCW.
C10	5491601-P117	Tubular: 0.68 pf ±5%, 500 VDCW.
C11	5491601-P118	Tubular: 0.75 pf ±5%, 500 VDCW.
C12	5491601-P132	Tubular: 4.7 pf ±5%, 500 VDCW.

SYMBOL	GE PART NO.	DESCRIPTION
C13	5491601-P137	Tubular: 0.91 pf ±5%, 500 VDCW.
C14	5491601-P114	Tubular: 0.51 pf ±5%, 500 VDCW.
C15	5491601-P115	Tubular: 0.56 pf ±5%, 500 VDCW.
C16	5491601-P130	Tubular: 3.3 pf ±5%, 500 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	4038056-P1	Germanium.
		- - - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P473K	Composition: 47,000 ohms ±10%, 1/4 w.
		- - - - - - - - - - - TRANSFORMERS - - - - - - - -
T1	19B205325-G2	Coil, includes tuning slug 5491798-P4.
T2 and T3	19B205325-G1	Coil, includes tuning slug 5491798-P4.
T4	19B205325-G2	Coil, includes tuning slug 5491798-P4.
T5 and T6	19B205325-G1	Coil, includes tuning slug 5491798-P4.
A402		TONE REJECT FILTER 19C311797-G2 REV A
		- - - - - - - - - - CAPACITORS - - - - - - - - - - -
C26	19A116080-P206	Polyester: 0.068 µf ±5%, 50 VDCW.
C27 and C28	19A116080-P210	Polyester: 0.33 µf ±5%, 50 VDCW.
C29*	19A116080-P205	Polyester: 0.047 µf ±5%, 50 VDCW. Earlier than REV A:
	19B209243-P107	Polyester: 0.1 µf ±10%, 50 VDCW.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J6 and J7	4033513-P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A115690-P1	Coil, RF: 880 mh ±5%, sim to Artted AC5672.
		- - - - - - - - - - - RESISTORS - - - - - - - - -
R59	3R152-P432J	Composition: 4300 ohms ±5%, 1/4 w.
		CHASSIS AND RF ASSEMBLY 19E500873-G1 thru G3 REV B
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C349	5491601-P114	Tubular: 0.51 pf ±5%, 500 VDCW.
C350 and C351	5491601-P110	Tubular: 0.36 pf ±5%, 500 VDCW.
C358 thru C363	5493392-P7	Ceramic feed-thru: .001 µf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FA5C.
C385	7774750-P4	Ceramic disc: .001 µf +100% -0%, 500 VDCW.
C387 and C388	5494481-P12	Ceramic disc: .001 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1	19A116062-P2	Thyrector.
		- - - - - - JACKS AND RECEPTACLES - - - - - - -
J442	19B205689-G2	Connector: 18 contacts rated at 5 amps min at 1000 VDC max.
J443	19C303426-G1	Connector: 20 pin contacts.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L341 thru L346		COIL ASSEMBLY L341 19B204820-G5 (4ER39C10, 13, 16, 19,22,25) L342 19B204820-G6 (4ER39C10, 13, 16, 19,22,25) L343 19B204820-G1 (4ER39C11, 14, 17, 20,23,26) L344 19B204820-G2 (4ER39C11, 14, 17, 20,23,26) L345 19B204820-G3 (4ER39C12, 15, 18, 21,24,27) L346 19B204820-G4 (4ER39C12, 15, 18, 21, 24,27)
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C341	19B209159-P3	Variable, subminiature: approx 1.70-6.9 pf, 750 v peak; sim to EF Johnson 189-3-59. (Used in L341, L343 and L345).
C342	19B209159-P3	Variable, subminiature: approx 1.70-6.9 pf, 750 v peak; sim to EF Johnson 189-3-59. (Used in L342, L344 and L346).
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS301	19B209067-P1	Lamp, glow: 0.3 ma; sim to GE NE-2T.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P301 thru P313	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P315 thru P317	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P319 and P320	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P322	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P323	4029840-P1	Contact, electrical; sim to Amp 41854.
P324	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P325	4029840-P1	Contact, electrical; sim to Amp 41854.
P326	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P327	4029840-P1	Contact, electrical; sim to Amp 41854.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q341* and Q342*	19A116203-P2	Silicon, NPN. Earlier than REV B:
	19A115948-P1	Silicon, NPN.
		- - - - - - - - - - - - RESISTORS - - - - - - - - - -
R343 and R344	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
R345*	5495948-P444	Deposited carbon: 280,000 ohms ±1%, 1/2 w; sim to Texas Instrument CD1/2MR. Added by REV B.
R346*	3R78-P390K	Composition: 39 ohms ±10%, 1 w. Added by REV B.
		- - - - - - - - - - TRANSFORMERS - - - - - - - -
T341	19A116041-P1	Audio freq: 300 to 4000 Hz, Pri: 1.00 ohms ±15% DC res, Sec 1: .23 ohm ±10% DC res, Sec 2: 10.5 ohms ±15% DC res.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	7487424-P26	Miniature, phen: 6 terminals.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W442	19B205634-G6	Coaxial: approx 5 inches long.
W443	19B205634-G3	Coaxial: approx 5 inches long.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - TUNED CIRCUITS - - - - - - - - -
Z341 thru Z343		COIL ASSEMBLY Z341 19B204786-G1 Z342 19B204786-G2 Z343 19B204786-G3
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	5496218-P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C2	5496218-P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C3	5496218-P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
C4	5494481-P14	Ceramic disc: .002 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	5491798-P1	Tuning slug. (Used in Z341).
	5491798-P4	Tuning slug. (Used in Z342).
	5491798-P5	Tuning slug. (Used in Z343).
Z347 thru Z349		COIL ASSEMBLY Z347 19B204767-G1 Z348 19B204767-G2 Z349 19B204767-G3
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	5496218-P254	Ceramic disc: 43 pf ±5%, 500 VDCW, temp coef -80 PPM.
C2	5496218-P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.
C3	5496218-P245	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - MISCELLANEOUS - - - - - - - -
	5491798-P1	Tuning slug. (Used in Z347).
	5491798-P4	Tuning slug. (Used in Z348).
	5491798-P5	Tuning slug. (Used in Z349).
Z350 thru Z352		COIL ASSEMBLY Z350 19B204784-G4 Z351 19B204784-G5 Z352 19B204784-G6
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C7 and C8	5496218-P248	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef -80 PPM.
C9	5496218-P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C10	5494481-P7	Ceramic disc: 470 pf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	5491798-P1	Tuning slug. (Used in Z350).
	5491798-P4	Tuning slug. (Used in Z351).
	5491798-P5	Tuning slug. (Used in Z352).
		CHANNEL GUARD MODIFICATION KIT 19A127178-G1 (Used with A350)
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19B216176-G1	Harness (Encoder/Decoder). Includes:
P314	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P318	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P321	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P328 thru P335	4029840-P2	Contact, electrical; sim to Amp 42827-2.

SYMBOL	GE PART NO.	DESCRIPTION
		CHANNEL GUARD MODIFICATION KIT 19A127178-G2 (Used with A402)
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19B216177-G1	Harness (Tone Reject Filter). Includes:
P321	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P330	4029840-P2	Contact, electrical; sim to Amp 42827-2.
P332	4029840-P2	Contact, electrical; sim to Amp 42827-2.
		MECHANICAL PARTS (SEE RC-1692)
1	19B204583-G3	Hinge.
2	19B216727-P1	Support. (Used with Q341 and Q342).
3	19A116023-P2	Plate, insulated. (Used with Q341 and Q342).
4	19A116022-P1	Insulator. (Used with Q341 and Q342).
5	4029851-P6	Clip, loop.
6	19B204583-G1	Hinge.
7	19B204583-G2	Hinge.
8	19A121676-P1	Guide pin.
9	19C303396-G4	Bottom cover. (Station)
10	19C303385-G1	Bottom cover. (Mobile)
11	19A121297-P1	Angle.
12	7160861-P4	Nut. (Used to secure cover).
13	4036555-P1	Insulator disc. (Used with Q7 on A348).
14	4035267-P2	Button, plug. (Used with A348, A350 and A402).
15	19C303495-G3	Top cover. (Station, except Repeaters and VM).
16	19C303676-G2	Top cover. (Station, Repeaters and VM only).
17	19C303385-G2	Top cover. (Mobile)
18	4029851-P3	Clip, loop.
19	19A121383-P1	Support.
20	4033089-P1	Clip (Part of XY1-XY4).
21	19B200525-P9	Rivet (Part of XY1-XY4).
22	19A115793-P1	Contact. (Part of XY1-XY4).
23	19C311172-P1	Crystal socket. (Part of XY1-XY4).
24	19C303547-P1	Cover.
25	19C317344-P3	Heat sink.
26	19C303389-G1	Chassis.
27	4034252-P5	Can (Used with T1 on A347).
28	19B204672-P1	Cover.
29	7162414-P1	Retainer, transistor. (Used with Q1 on A341).
30	19B204917-P2	Support.
		* *



PRODUCTION CHANGES

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

REV. A - 2nd Mixer A347 (19B216119-G1)

To make receivers compatible with solid-state transmitters. Added C17.

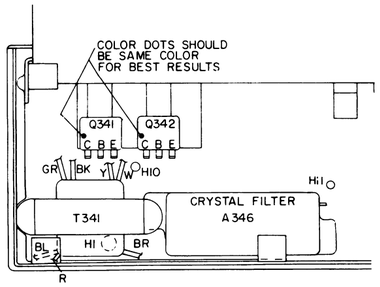
REV. A - 19E500873-G1 thru -G3 (Chassis & RF Assembly)

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

REV. B - 19E500873-G1 thru -G3 (Chassis & RF Assembly)

To incorporate new PA transistors. Changed Q341 and Q342 and added R346.

OUTLINE DIAGRAM WAS:



REV. C - 1st Osc/Mult A352 & A353
REV. A - 1st Osc/Mult A354 thru A357

These revisions incorporated into initial shipment.

REV. A - Channel Guard Encoder/Decoder A350 (Model 4EK16A10)

To obtain correct output level. Changed R8.

REV. B - Channel Guard Encoder/Decoder A350 (Model 4EK16A10)

To increase stop-band attenuation. Changed R8.

REV. C - Channel Guard Encoder/Decoder A350 (Model 4EK16A10)
REV. A - Tone Reject Filter A402 (19C311797-G2)

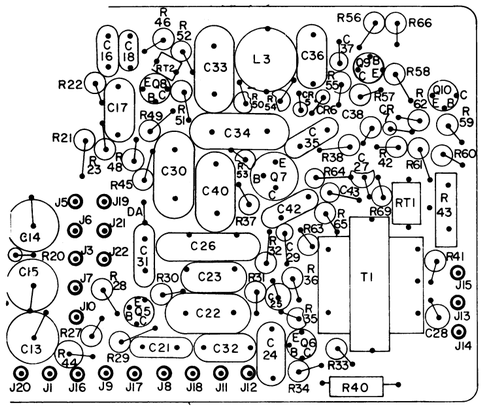
To optimize frequency response. Changed C29.

REV. A - IF Audio & Squelch Board A348 (19D413129-G1)

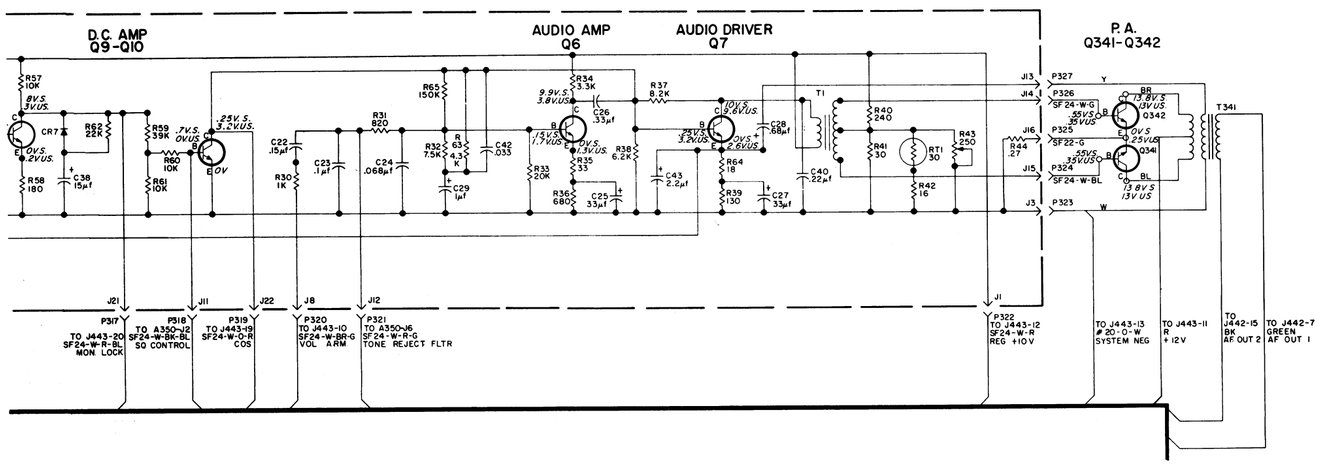
To make IF Audio & Squelch Board compatible with new PA transistors and to improve squelch operation. Added C49-C54, CR8, R75-R79, and RT3. Deleted C24, C28, C29, C42, C43, R32, R37, R63 and R65. Changed C21, C26, C37, C38, C40, R33, R38, R39, R41, R42, R48, R53 and R62.

Outline Diagram Was:

IF-AUDIO & SQUELCH BOARD
A348



Schematic Diagram Was:



PRODUCTION CHANGES

25—50 MHz MASTR RECEIVER
MODELS 4ER39C10-27

REV. C - Chassis and RF Assembly (19E500873-G1 thru -G3)

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

REV. B - IF Audio & Squelch Board A348 (19D413129-G1)

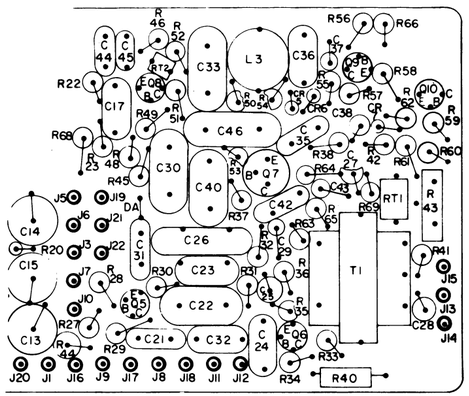
To control more closely the squelch control rotation. Changed R48.

REV. C - IF Audio & Squelch Board A348 (19D413129-G1)

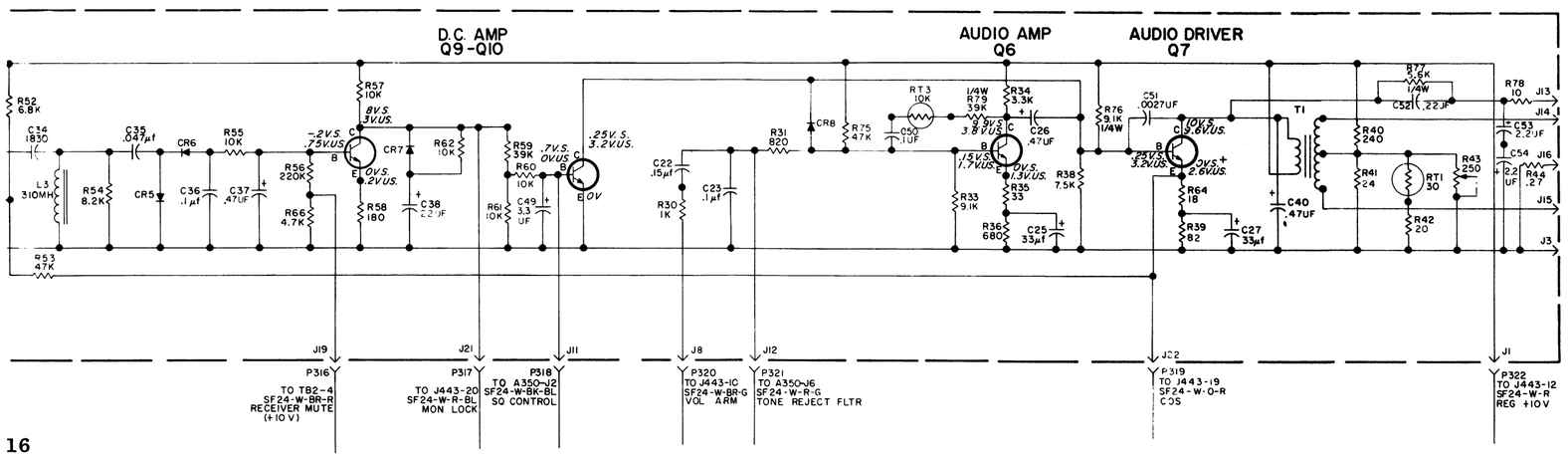
To eliminate barely audible squelch switching transients and to reduce receiver squelch tail. Deleted C38, C49, CR7, CR8, R62, R75, and R76. Added C55, R80, R81, and R82. Changed C27, C36, R53, R64, and R77.

Outline Diagram Was:

IF-AUDIO & SQUELCH BOARD



Schematic Diagram Was:



ORDERING SERVICE PARTS

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

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

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

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

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

MAINTENANCE MANUAL

LBI-3924

DF-1095

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