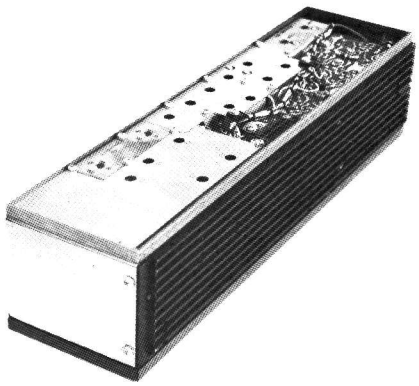
COMMUNICATIONS

MASTR Progress Line

132-174 MHz RECEIVER MODELS 4ER41A28-33 & 4ER41A40-45

(WITH NOISE BLANKER and CHANNEL GUARD)



SPECIFICATIONS *

FCC Filing Designation	ER-41-A
Frequency Range	132-174 MHz
Audio Output	2 watts at less than 10% distortion
Sensitivity	
12-db SINAD (EIA Method)	0.35 μv
20-db Quieting Method	0.5 μv
Selectivity	
EIA Two-Signal Method	-85 db (adjacent channel, 30 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 2 μv)
Intermodulation (EIA)	-65 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.

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-41-A is a double conversion, superheterodyne FM receiver designed for operation on the 132-174 megahertz band.

The receiver is of single-unit construction and is 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 and the Noise Blanker board. The bottom portion of the casting contains the audio squelch board and the Channel Guard board.

CIRCUIT ANALYSIS

The unit is completely transistorized. 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, for ease of alignment and servicing. The Test Set meters the oscillator, multiplier, and limiter stages as well as the discriminator, audio PA, voice coil and regulated 10 volts.

1st RF AMPLIFIER (A323/A324)

The 1st RF Amplifier A323 (132-150.8 MHz) or A324 (150.8-174 MHz) consists of three tuned helical resonators and an RF amplifier stage (Q2). The RF signal from the antenna is coupled by RF cable W441 to a tap on L301/L304. The tap is positioned to insure the proper impedance match to the antenna. RF energy is coupled through the three coils by openings in the shield walls, to the base of RF amplifier Q2. The output of Q2 is coupled through C8 to helical resonators L307/L309 and L308/L310, and then to the 2nd RF Amplifier (A303/A304).

2nd RF AMPLIFIER (A303/A304)

The RF signal from the 2nd RF Amplifier is coupled through transformer T1/T2 to helical resonator L312/L313, and then to the base of the 1st Mixer (A334-Q1).

1st OSCILLATOR AND MULT-1 (A308-A313)

The receiver 1st oscillator is a transistorized Colpitts oscillator. The oscillator crystal operates in a fundamental mode at a frequency of approximately 13 to 18 megahertz. The crystal is cut to provide temperature compensation at the high end of the temperature range and is thermistor compensated at low temperatures. This provides

instant warm-up with a frequency stability of .0005% without crystal ovens or warmers.

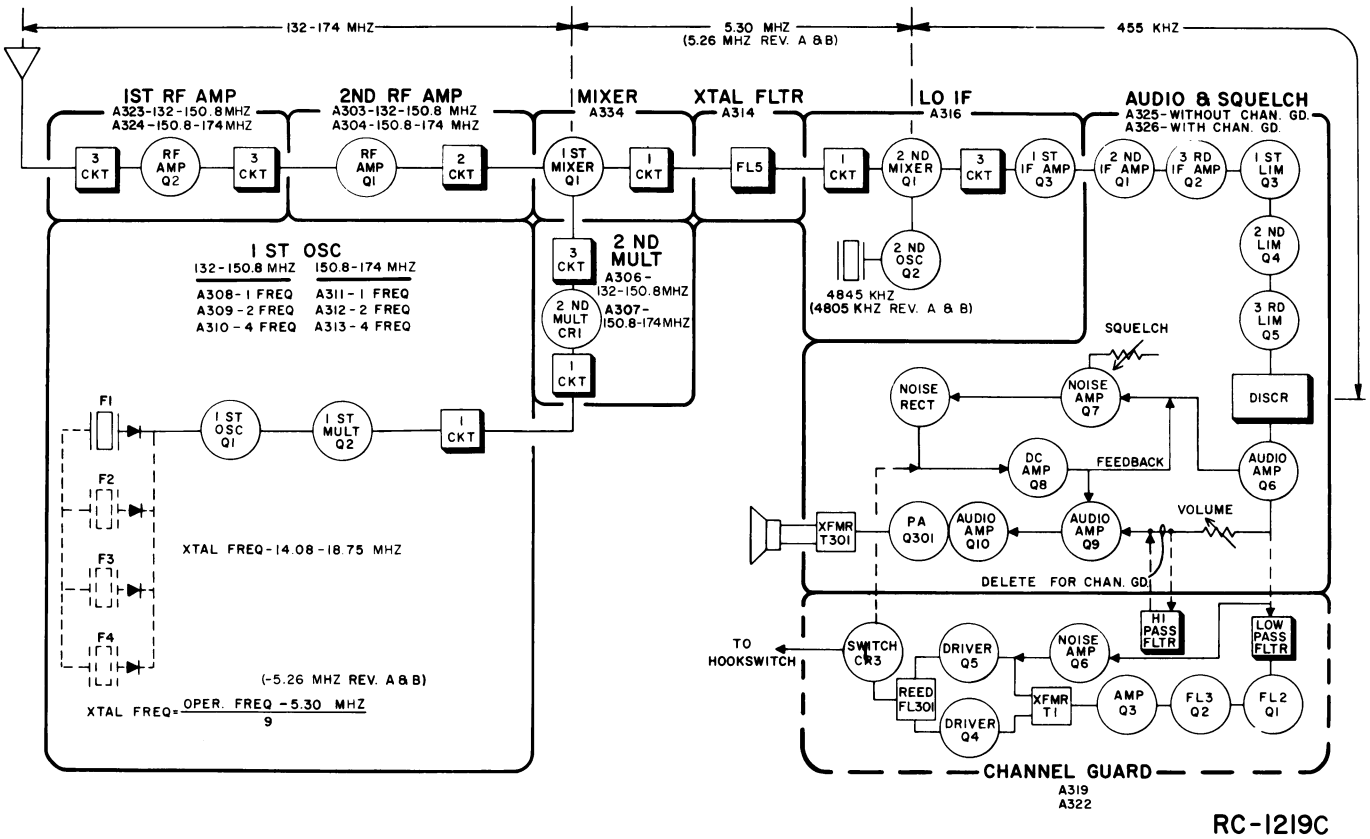


Figure 1 — Receiver Block Diagram

In single frequency receivers, bias for the oscillator transistor is obtained by a jumper from C311 to P304.

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. Feed back for the oscillator is developed across C21. The output is coupled to the base of 1st multiplier Q2.

The output of the 1st multiplier (tripler Q2) is transformer-coupled (T1/T2) to the 2nd multiplier assembly. The 1st multiplier tank is tuned to three times the crystal frequency. This stage is metered at centralized metering jack J442-4 through metering network CR5, R16, R303 and C32.

2ND MULTIPLIER (A306/A307)

Coupling from the 1st multiplier tank is through A306-T1/T2 to the anode of multiplier diode A306-CR1. Three resonant LC circuits (T3/T4, T5/T6 and T7/T8) follow CR1 and are tuned to nine times the crystal frequency. The 2nd multiplier output is fed through C13 to the base of the first mixer.

1ST MIXER (A334) AND CRYSTAL FILTER (A314)

The RF signal from the RF Amplifier and the low-side injection voltage from the 2nd multiplier are applied to the base of 1st mixer A334-Q1. The mixer collector tank (L1 and C3) is tuned to 5.3 megahertz (5.26 megahertz in Revision A and B receivers), and provides impedance matching to the high IF filter.

The highly selective, crystal filter following the 1st mixer provides the major selectivity for the receiver. The output of the filter is fed through impedance matching transformer A316-T1 to the base of the 2nd mixer.

2ND OSCILLATOR, 2ND MIXER AND 1ST IF AMP (A316)

2nd oscillator A316-Q2 operates in a Colpitts oscillator circuit, with feedback supplied through C2. The oscillator frequency is 4845 KHz (4805 KHz in Revisions A and B receivers), with the low side injection voltage fed to the base of the 2nd mixer.

The Hi IF signal from the filter is fed to the base of 2nd mixer A316 (Q1) with the 2nd oscillator output. The 455 KHz 2nd mixer output is fed to three tuned Low IF circuits (L1, L2, L3). L1, L2 and L3 are required for shaping the nose of the IF waveform and provide some additional selectivity.

The low IF signal is coupled through C14 to the base of the 1st low IF amplifier A316-Q3. The output of A316-Q3 is RC coupled to the base of the 2nd IF amplifier.

2ND IF AMPS AND LIMITERS (part of A326)

Following A316-Q3 are two additional RC coupled low IF amplifiers (A326-Q1 and -Q2). The 2nd IF amplifier stage is metered at J442-2 through metering network C8, CR1 and R12.

After the IF amplifiers are three RC coupled limiter stages (A326-Q3, -Q4 and -Q5). The 1st limiter is metered at J442-3 through metering network C13, CR2, R18 and C15.

DISCRIMINATOR (part of A326)

The receiver utilizes a Foster-Seely type discriminator. The output of the 3rd limiter is connected to a tap on the primary tuned

circuit of discriminator T1. This allows the discriminator to operate at a higher level. Diodes CR5 and CR6 are for rectifying the 455 KHz IF signals to recover the audio. The stage is metered at J442-10 through metering network R27 and C22.

1ST AUDIO AMPLIFIER (part of A326)

The output of the discriminator is fed to the 1st audio amplifier (Q6). This stage operates as an emitter-follower to match the impedance of the discriminator to the noise amplifier stage and VOLUME control. Q6 also provides some power gain.

AUDIO AMPLIFIERS (part of A326)

When audio is present in the incoming signal, it is taken off the emitter of Q6 and connected to the VOLUME control through A326-J9. The VOLUME control arm connects to A326-J8 which feeds the audio signal to the base of the 2nd audio amplifier, Q9. De-emphasis is provided by C34, C53, C37 and L4. Potentiometer R47 is used to adjust the collector current to 650 milliamps indicated by a reading of 0.65 volts at metering jack J442-1. This adjustment should be made with the VOLUME control fully counterclockwise. Thermistor RT1 keeps the output current constant over wide variations in temperature after R47 has been set.

Following Q9 is a Darlington circuit, which consists of compound-connected transistors Q10 and Q301. The Darlington circuit provides a higher input impedance than is normally encountered in transistor amplifiers. Also, this circuit has a more linear operation, with less distortion at maximum power output.

The output of the amplifier stage is coupled by audio transformer T301 to the loudspeaker. Audio high and low are present at the centralized metering jack (J442). When the General Electric Test Set is connected to J442, these leads are connected to the black and green jacks for sensitivity, frequency response, distortion, power output and other measurements.

SQUELCH

Noise from audio amp Q6 is used to operate the squelch circuit. When no carrier is present in the receiver, noise is coupled to the base of noise amplifier Q7. The gain of the noise amplifier is determined by the SQUELCH control, which varies the bias on the base of Q7.

The noise amplifier output is fed through a high-pass filter which attenuates frequencies below 3 KHz. Thermistor RT2 keeps the critical squelch constant over wide variations in temperature.

Noise from the high-pass filter is rectified by CR3 and CR4, and the negative DC output of the noise rectifiers is fed to the base of DC amplifier Q8.

DC amplifier Q8 acts as a squelch switch. A negative output from the noise rectifiers cuts off the DC amplifier. When turned off, the collector potential is at the +10 volt supply. This positive voltage is fed to the base of Q9, a PNP transistor, cutting it off. As audio stages Q9, Q10 and Q301 are DC coupled, all of them are cut off. The positive voltage from the collector circuit of the DC amplifier is used as feedback to the base of noise amplifier Q7, causing it to conduct more heavily. The feedback helps to cut Q8 off sharply, resulting in sharp, quick-acting switching.

When the receiver is quieted by a signal, noise voltage from the noise rectifiers is reduced; and the DC amplifier conducts. When conducting, the collector potential of Q8 is negative; and negative feedback to the base of noise amplifier Q7 causes it to conduct less.

The negative voltage is applied to the base of PNP transistor Q9 and causes it to conduct. Now, all the audio stages are turned on and sound is heard at the loudspeaker.

With the receiver squelched, the final audio amplifiers are cut off; and the receiver drain is less than 50 milliamps.

It should be noted that the feedback through R68 in the Noise Amplifier circuit results in a hysteresis effect in the squelch circuit and, as a result, the squelch does not operate in the same manner as other conventional squelch circuits. The circuit is designed so that a weak signal will open the squelch. The signal may be reduced by 3 to 5 db without the squelch closing. This limits squelch "flutter" or "picket fence" operation.

CHANNEL GUARD (A319/A322)

General Electric Channel Guard Decoder 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.

Operation

Audio, tone and noise is picked up in the emitter circuit of Audio Amplifier A326-Q6 and is fed through A326-J9 to the VOLUME control and then to a high-pass filter (C20, C21, C22, C23 and L1) on the Channel Guard board through A326-J8, decoupling resistor R61 and A326-J12. The high-pass filter removes the tone from the audio signal, and the audio is then fed through A326-J13 to the base of Audio Amplifier A326-Q9.

To operate the Channel Guard Decoder, audio, tone and noise is picked up in the emitter circuit of A326-Q6 and is fed through A326-J18 to the base of the first low-pass filter stage (Q1) through a 250-Hz band pass filter consisting of R1, R2, R3, C1, C2 and C3. Following Q1 is a second low-pass filter stage, Q2. The filter output is amplified by Q3 and coupled to the push-pull driver stage (Q4 and Q5) through T1. Q4 and Q5 drive the reed decoder, FL301. Noise Amplifier Q6 picks up and amplifies any high frequency (in the 5 KHz range) and feeds it back to the driver stage to decrease the sensitivity of the reed and prevent noise pulsing.

FL301 is resonant at the correct tone frequency and the reed contacts open and close at the tone frequency. When the CHANNEL GUARD-OFF switch is in the CHANNEL GUARD position, the opening and closing of the reed contacts charges capacitor C19, which applies a limited current to the base of DC Amplifier A326-Q8. The receiver noise squelch circuit continues to operate normally until a carrier quiets the receiver.

Placing the CHANNEL GUARD-OFF switch in the OFF position (or removing the microphone from its hanger in hookswitch options) opens the circuit to A319/A322-J5, which forward biases diode CR3. This causes current to flow in the circuit, bypassing the decoder reed (FL301). However, the receiver noise squelch circuit will operate until a carrier is received.

NOISE BLANKER (A320/A321)

An RF signal and noise pulse from the antenna is coupled simultaneously to the Noise Blanker RF Amplifier and the Receiver RF Amplifier sections through T1/T2 and L314 (see Figure 2). The noise blanker amplifier stages (Q1, Q2 and Q3) raise the level of the noise pulse which is coupled through T9/T10 and L13 to the base of the pulse detector Q4. A metering network consisting of R13, C21, C22, and CR2 permits the blanker to be metered at centralized metering jack J442-11.

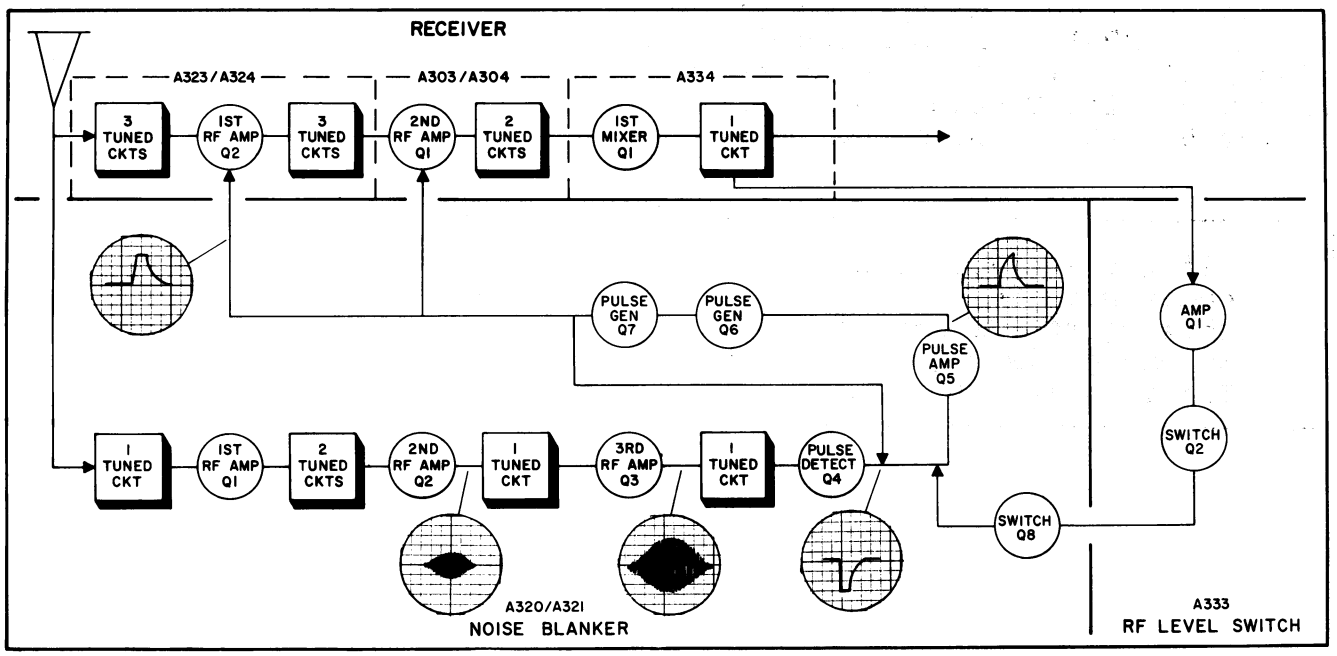
Operation

Base bias for the pulse detector is established by R12 and CR1. CR1 is normally conducting, which keeps Q4 in a barely conducting state. A noise pulse applied to the base of Q4 causes it to conduct heavily. This results in a negative pulse at the output (collector) of Q4. Following Q4 is a low-pass RF filter consisting of C23 and L14.

The output of the filter is fed to the base of pulse amplifier Q5. This stage is biased by CR3, R16, and R18 so that it is just conducting. The negative-going pulse from the pulse detector cuts CR3 off, which biases Q5 on, and a positive pulse appears at the output of pulse amplifier Q5.

Q6 and Q7 form part of the one-shot multivibrator circuit. Bias voltage through R24 keeps Q6 normally turned on. The positive voltage at the collector of Q6 keeps Q7 turned off. The amplified positive-going pulse from the pulse amplifier (Q5) is fed to the base of Q6, cutting the stage off. As Q6 cuts off, Q7 is turned on; and the output

is a positive-going blanking pulse. The positive blanking pulse is simultaneously fed to the emitters of A323/A324-Q1 and A303/A304-Q1, cutting off both stages for the duration of the noise pulse.



RC-1133B

Figure 2 — Noise Blanker Block Diagram

The positive blanking pulse, which is fed to the emitter of 2nd RF amplifier A303/A304-Q1, is controlled by RF level shut-off switch A333. The output of the lst mixer is connected through a low-pass filter network in the RF level switch circuit to the base of high IF level amplifier Q1. When the antenna signal input level exceeds 500 microvolts, the high IF level output of Q1 is sufficient to turn on level switch Q2. The output of Q2 is filtered through C7, L2 and C8 and turns on noise blanker (A320/A321) switch Q8. The conduction of Q8 changes the bias of pulse amplifier Q5 and shorts the blanking pulse to ground.

When the antenna signal input is below 500 microvolts, the high IF level output of Q1 is not sufficient to turn on Q2. In this case, noise blanker switch Q8 does not operate and the positive blanking pulse is fed to the emitter of the 2nd RF amplifier (A303/A304-Q1).

The blanking pulse width is determined by R24 and C34. Diode CR6 keeps the output pulse a square wave. CR5 prevents oscillation at temperature extremes.

At the same time the blanking pulse is fed to the receiver, samples of the pulse are fed to the automatic repetition rate switch consisting of C29, C33, CR4, R17, R18, and R21. The pulse sample is coupled through C33 and rectified by CR4. This voltage charges C29, and then discharges through R17 and R18, turning off pulse amplifier Q7. The time constant

of C29, R17, and R18 are selected so that output pulses from Q7 will never exceed two kilohertz. This prevents blanking the receiver for a long enough time to keep the desired signal from being heard.

As the noise signal from the antenna is applied to the Noise Blanker, the RF signal is applied to the receiver RF amplifiers (A323/A324 and A303/A304). The six tuned circuits in the receiver front end provide a time delay for the RF signal, which enables the blanking pulse from the Noise Blanker to cut off both of the RF amplifiers in the receiver before the noise pulse can get there.

NOTE

If the Two-Way Radio is mounted on its side, rotate the decoder reed 90° in its mounting bracket so that the label showing the GE Part Number is facing the receiver heat sink. No change is required if the unit is mounted vertically. See Figure 4 for the location of the decoder reed.

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 and pull radio out of mounting frame.
2. Remove the screws in bottom cover and pry up cover at back of receiver.
3. Slide cover back and lift off.

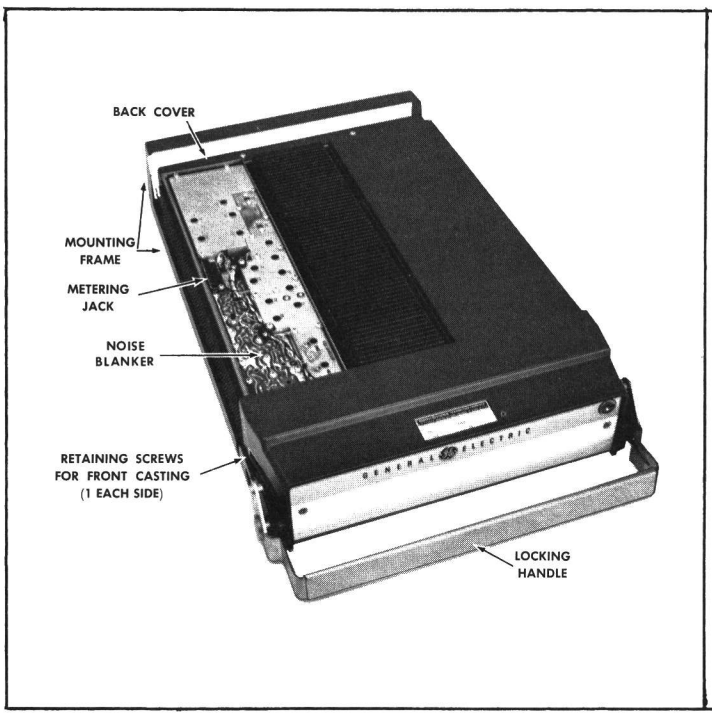


Figure 3 — Top Cover Removed

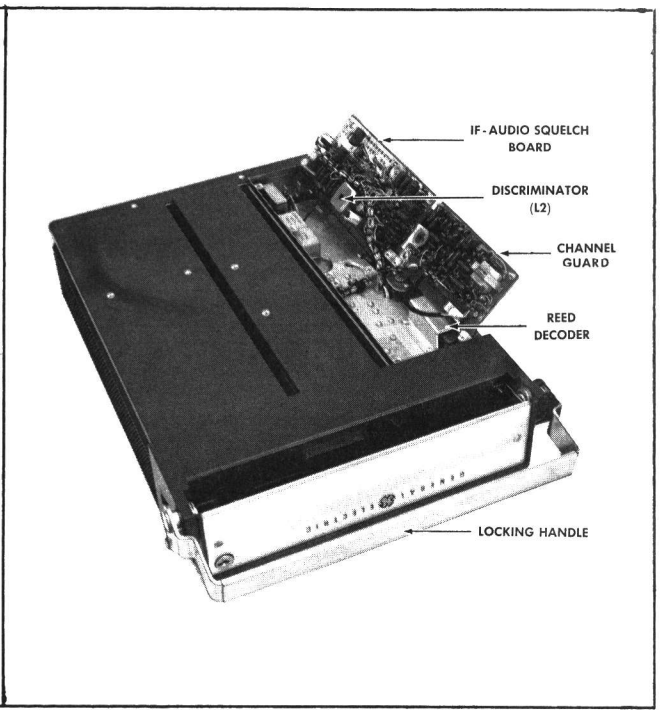


Figure 4 — Bottom Cover Removed

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.

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A10 (or 20,000 ohms-per-volt multimeter).
2. A 132-174 MHz signal source. Connect a one-inch piece of insulated wire no larger than .065 inch to generator output probe.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. Connect Test Set Model 4EX3A10 to receiver centralized metering jack J442 and set meter sensitivity switch to the TEST 1 position.
2. With VOLUME control full counterclockwise and SQUELCH control fully clockwise (receiver unsquelched) and Test Set in position G, adjust R47 on IF-AUDIO & SQUELCH BOARD for reading of 0.55 volts. If using Multimeter, connect leads to J442-1 (AUDIO-PA) and J442-8 (System Negative).

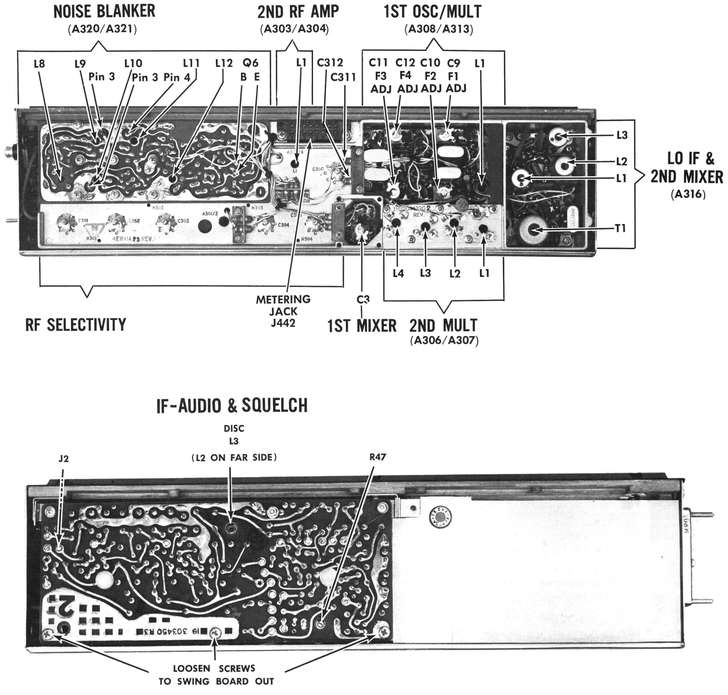
NOTE

The adjustment of R47 should be made within 20 seconds after power is applied to the receiver. This results in a reading of approximately 0.65 volts after the unit is fully warmed up.

3. With Test Set in position J, check for regulated +10 volts. If using Multimeter, measure from C311 to C312.
4. If using Multimeter, connect the positive lead to J442-16 (ground).
5. Disable the Channel Guard.

ALIGNMENT PROCEDURE

STEP	METERING POSITION 4EX3A10	METERING POSITION Multimeter - at J442	TUNING CONTROL	METER READING	PROCEDURE
			OSCILLATOR AND MULTIPLIERS		
1.	D (MULT-1)	Pin 4	L1 (on 1st OSC/MULT) and L1 (on 2nd MULT)	See Procedure	Tune L1 (1st OSC/MULT) for maximum meter reading. Then tune L1 (2nd MULT) for minimum meter reading.
2.	E (MULT-2)	Pin 5	L1 (on 1st OSC/MULT) and L1 (on 2nd MULT)	Maximum	Tune L1 (1st OSC/MULT) and L1 (2nd MULT) for maximum meter reading.
3.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal into Hole 304. Adjust the signal generator for discriminator zero.
4.	B (2nd IF AMP)	Pin 2	L2, L3 and L4 (on 2nd MULT)	Maximum	Apply an on-frequency signal as above. Tune L2, L3 and L4 for maximum meter reading, keeping signal below saturation.
			RF AMPLIFIER		
5.	B (2nd IF AMP)	Pin 2	C301, C302, C303, C304 and C305	Maximum	Apply an on-frequency signal to the antenna jack. Tune C301 through C305 for maximum meter reading, keeping signal below saturation.
			FREQUENCY ADJUSTMENT		
6.	A (DISC)	Pin 10	C9 on 1st OSC/MULT (C10, C11 and C12 for multi-frequency	Zero	Apply an on-frequency signal to the antenna jack. Tune C9 for zero discriminator reading. In multi-frequency units, tune C10, C11 and C12 as required. — NOTE — For proper frequency control of the receiver, it is recommended that all frequency adjustments be made when the equipment is at a temperature of approximately 75°F. In no case should frequency adjustments be made when the equipment is outside the temperature range of 50° to 90°F.



COMPLETE RECEIVER & NOISE BLANKER ALIGNMENT

EQUIPMENT REQUIRED

1. GE Test Set Model 4EX3A10 (or 20,000 ohms-per-volt multimeter).
2. A 455 kHz (GE Test Set 4EX3A10 or equivalent) and 132-174 kHz signal source. Connect a one-inch piece of insulated wire no largur than .065 inch to generator output probe.
3. Two 33,000-ohm resistors for tuning low IF coils.*

PRELIMINARY CHECK AND ADJUSTMENTS

1. Connect Test Set Model 4EX3A10 to receiver centralized metering jack J442 and set meter sensitivity switch to the TEST 1 position.
2. Set crystal trimmer C9 on 1ST OSC/MULT Board to mid-capacity. In multi-frequency receivers, set C10, C11 or C12 to mid-capacity as required.
3. In multi-frequency receivers where the maximum frequency spacing is less than 200 KC, align the unit on channel F1. If the frequency spacing is greater than 200 KC, align the receiver on the center frequency.
4. Adjust all slugs on Noise Blanker (A320/A321) to bottom of coil (closest to printed wiring board).
5. With VOLUME control fully counterclockwise and SQUELCH control fully clockwise (receiver unsquelched) and Test Set in position G, adjust R47 on IF-AUDIO & SQUELCH Board for reading of 0.55 volts. If using multimeter, connect leads to J442-1 AUDIO-PA) and J442-8 (System Negative).

NOTE

The adjustment of R47 should be made within 20 seconds after power is applied to the receiver. This results in a reading of approximately 0.65 volts after the unit is fully warmed up.

6. With Test Set in position J, check for regulated -10 volts. If using multimeter, measure from C311 to C312.
7. If using multimeter, connect the positive lead to J442-16 (ground).
8. Disable the Channel Guard.
9. After alignment is completed, refer to Noise Blanker Troubleshooting sheet for noise blanker performance check.

ALIGNMENT PROCEDURE

STEP	METERING POSITION 4EX3A10	METERING POSITION Multimeter - at J442	TUNING CONTROL	METER READING	PROCEDURE
			DISCRIMINATOR		
1.	A (DISC)	Pin 10	L3 (Bottom slug on IF-AUDIO & SQUELCH Board)	Zero	Apply a 455-kHz signal to A317/A318-J2 and adjust L3 (disc secondary) for zero meter reading.
2.	A (DISC)	Pin 10	L2 (top) and L3 (bottom slug on IF-AUDIO & SQUELCH Board)	1.7 v (2.1 v max)	Switch Test Set to TEST 3 position. Then alternately apply a 455-kHz and 465-kHz signal while adjusting L2 and L3 for readings of at least 1.7 volts, but not more than 2.1 volts. Both readings must be within 0.1 volt.
			OSCILLATOR AND MULTIPLIERS		
3.	D (MULT-1)	Pin 4	L1 (1ST OSC/MULT) and L1 (2ND MULT)	See Procedure	Tune L1 on 1ST OSC/MULT for maximum meter reading. Then tune L1 on 2ND MULT for minimum meter reading.
4.	E (MULT-2)	Pin 5	L1 (1ST OSC/MULT) and L1 (2ND MULT)	Maximum	Tune L1 on LST OSC/MULT and L1 on 2ND MULT for maximum meter reading.
5.	A (DISC)	Pin 10		Zero	Apply an on-frequency signal to Hole 304. Adjust the signal generator for discriminator zero.
6.	B (2ND IF AMP)	Pin 2	L2, L3 and L4 (2ND MULT)	Maximum	Apply signal as above. Tune L2, L3, and L4 for maximum meter reading, keeping signal below saturation.
			RF AMPLIFIER & SELECTIVITY		
7.	B (2ND IF AMP)	Pin 2	L1 (2ND RF AMP) C301, C302, C303, C304, C305 and C306 (RF SELECTIVITY)	Maximum	Apply an on-frequency through RF probe and tune circuits as shown below, keeping signal below saturation. Apply Signal Generator Probe To: / Tune: Hole 304 — C306, L1 (2ND RF AMP) and C305 Hole 303 — C304 Hole 302 — C303 Hole 301 — C302, C301
8.	B (2ND IF AMP)	Pin 2	C301 through C306 L1 (2ND RF AMP)	Maximum	Apply an on-frequency signal to antenna jack J441. Tune C301 through C306 and L1 (2ND RF AMP) for maximum meter reading, keeping signal below saturation.
			MIXERS & LO IF*		
9.	B (2ND IF AMP)	Pin 2	C3 (1ST MIXER)	Maximum	Apply signal as above, and tune C3 for maximum meter reading, keeping signal below saturation.
10.	"	"	T1 (2ND MIXER)	Maximum	Apply signal as above, and tune T1 for maximum meter reading, keeping signal below saturation.
11.	B (2ND IF AMP)	Pin 2	L1, L2 and L3 (LO IF MIXER)	Maximum	With one end of the 33,000-ohm resistors to ground, load and peak as follows: Load L2 at point B -- Peak L1 and L3. Load L1 and L3 at points A and C -- Peak L2.
12.	H (BLANKER)	Pin 11 (-) and Pin 16 (+)	L8, L9, L10 and L12 (on NOISE BLANKER)	Maximum	Connect a probe to a signal generator and touch probe to pin 4 of L11. Adjust generator frequency to 10 MHz above receiver operating frequency in the 130.8-148 MHz and 150 — 164 MHz receiver frequency ranges, 12 MHz below receiver operating frequency in the 148-150 MHz range, and arbitrarily to 154 MHz in the 164-174 MHz receiver frequency range. Peak all circuits as follows: Apply Signal Generator Probe To: / Tune: Pin 4 of L11 — L12 (2nd Peak) Pin 3 of L10 — L11 (1st Peak) Pin 3 of L9 — L10 (1st Peak) Antenna Jack J441 — L9 and L8 (1st Peak)
13.	"	"	"	"	Apply signal as above to antenna jack J442. Retune L8 through L12 for maximum meter reading.
14.	"	"	"	.05 v	Apply a 1,000-microvolt signal on blanker frequency to antenna jack J441. Reading should be approximately .05 volt.
			FREQUENCY ADJUSTMENT		
15.	A	Pin 10	C9 (on 1st OSC/MULT) C10, C11 and C12 for multi-frequency	Zero	Apply an on-frequency signal to antenna jack J442. 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.

* NOTE -- The low IF coils have been aligned at the factory and will normally require no futher adjustment. If alignment is necessary, refer to the RECEIVER OUTLINE DIAGRAM for location of resistor loading points A, B and C.

ALIGNMENT PROCEDURE

132 — 174 MHZ, MASTR RECEIVER
MODELS 4ER41A22-33 &
MODELS 4ER41A40-45

TEST PROCEDURES

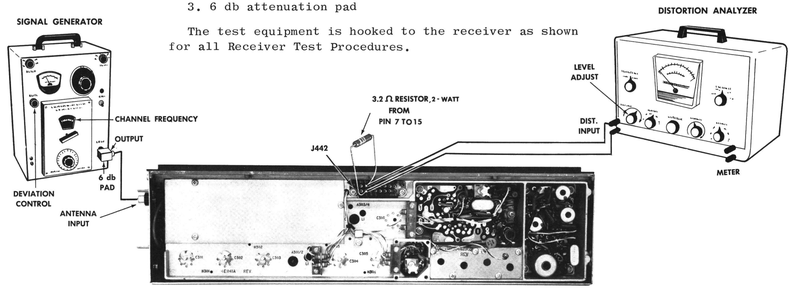
These Test Procedures are designed to help you to service a receiver that is operating---but not properly. The problems encountered could be low power, poor sensitivity, distortion, limiter not operating properly, and low gain. By following the sequence of test steps starting with Step 1, the defect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

TEST EQUIPMENT REQUIRED

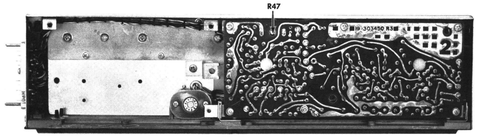
for test hookup shown:

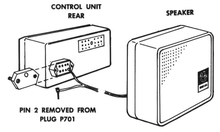
1. Distortion Analyzer similar to: Heath #1M-12
2. Signal Generator similar to: Measurements #M-560
3. 6 db attenuation pad

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



COMPONENT TOP VIEW





COMPONENT BOARD WIRING VIEW

STEP 1

AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

1. Connect a 1,000-microvolt test signal modulated by 1,000 hertz ±3.3 kHz deviation to the antenna jack J441.
2. Two-Watt Speaker:
   When speaker is used, disconnect speaker lead pin from J701-2 (on rear of Control Unit). Hook up a 3.2-ohm load resistor from J442-15 to J442-7

   OR

   Handset:
   When handset is used, lift handset off of hookswitch.
3. Two-Watt Speaker:
   Connect Distortion Analyzer input across the 3.2-ohm resistor as shown

   OR

   Handset:
   Connect Distortion Analyzer input from J442-15 to J442-7.
4. Two-Watt speaker--set volume control for two-watt output (2.53 VRMS):

VOLTMETER SCALE ON DISTORTION ANALYZER

5. Make distortion measurements according to manufacturer's instructions. Reading should be less than 10% (5% is typical).

SERVICE CHECK

If the distortion is more than 10%, or maximum audio output is less than two watts (for two-watt speaker) make the following checks:

1. Battery and regulator voltage---low voltage will cause distortion. (Refer to Receiver Schematic Diagram for voltages.)
2. Audio Bias Adjust (R47)---should be adjusted for 0.65 volts. (Refer to Receiver Alignment on reverse side of page.)
3. Audio Gain (Refer to Receiver Troubleshooting Procedure.)
4. 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:

1. Be sure Test Step 1 checks out properly.
2. Reduce the Signal Generator output from setting in Test Step 1.
3. Adjust Distortion Analyzer LEVEL control for a +2 db reading.
4. Set CONTROL from LEVEL to DISTORTION reading. Repeat Steps 1, 2 and 3 until difference in reading is 12 db (+2 db to -10 db).
5. The 12-db difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. Reading should be less than 0.35 microvolts with audio output at least one watt (1.83-volts RMS across the 3.2-ohm receiver load).

SERVICE CHECK

If the sensitivity level is more than 0.35 microvolts, make the following checks:

1. Alignment of RF stages (Refer to RF Alignment in Receiver Alignment on reverse side of page.)
2. Gain measurements as shown on the Receiver Troubleshooting Procedure.

STEP 3

MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

TEST PROCEDURE

1. Be sure Test Steps 1 and 2 check out properly.
2. Set Signal Generator output for twice the microvolt reading obtained in Test Step 2 - 4.
3. Increase Signal Generator frequency deviation.
4. Adjust LEVEL Control for +2 db.

DB SCALE ON DISTORTION ANALYZER

5. Set CONTROL from LEVEL to DISTORTION reading. Repeat Steps 3, 4 and 5 until difference between readings becomes 12 db (from +2 db to -10 db).

LEVEL DISTORTION ON DISTORTION ANALYZER

6. 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

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 2ND LIM READING	Check supply voltages and then check oscillator reading at J442-4 as shown in STEP 2. Make SIMPLIFIED VTVM GAIN CHECKS from 2nd Mixer through 2nd Limiter stages as shown in STEP 2.
LOW OSCILLATOR READING	Check alignment of Oscillator (Refer to Front End Alignment Procedure). Check voltage and resistance reading 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 voltage and resistance readings of RF Amp and 1st and 2nd Mixers. Make SIMPLIFIED GAIN CHECKS (STEP 2).
LOW AUDIO	Check Audio PA (Q301) output current at J442-1. If reading is low-- a. Refer to Receiver Alignment Prodedure for Bias ADJ (R47). b. Check Q301. Check unsquelched voltage readings in Audio section (Refer to Receiver Schematic Diagram). Check voltage and resistance readings on Channel Guard receiver.
IMPROPER SQUELCH OPERATION	Check voltage and resistance readings of Squelch circuit (Refer to Receiver Schematic Diagram).
DISCRIMINATOR IDLING TOO FAR OFF ZERO	See if descriminator zero is on 455 kHz.

STEP 3- VOLTAGE RATIO READINGS

EQUIPMENT REQUIRED:

1. RF VOLTMETER (SIMILIAR TO BOONTON MODEL 91-CA OR MILLIVAC TYPE MV-18 C.
2. SIGNAL ON RECEIVER FREQUENCY (BELOW SATURATION). CORRECT FREQUENCY CAN BE DETERMINED BY ZEROING THE DISCRIMINATOR. USE 1,000 HERTZ SIGNAL WITH 3.3 kHz DEVIATION FOR AUDIO STAGE.

PROCEDURE:

1. APPLY 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*). REPEAK 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.

* NOTE: ON 1ST MIXER, REMOVE CRYSTAL BEFORE MEASURING BASE VOLTAGE. REPLACE CRYSTAL TO MEASURE COLLECTOR VOLTAGE.
ON 2ND MIXER, INCREASE SIGNAL INPUT TO APPROX. 0.3 V TO OVERRIDE INJECTION VOLTAGE.

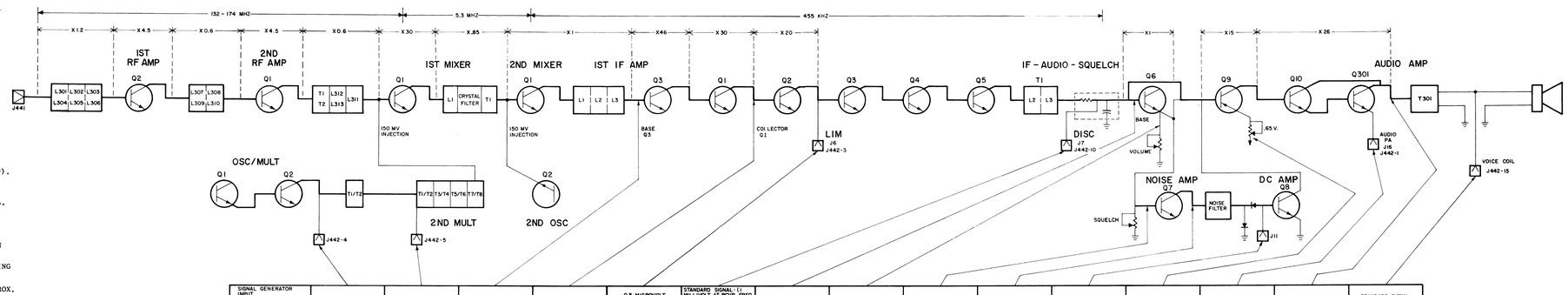
STEP 2- SIMPLIFIED VTVM GAIN CHECKS

EQUIPMENT REQUIRED:

1. VTVM-AC & DC
2. SIGNAL GENERATOR (MEASUREMENTS M560 EQUIV.)

PRELIMINARY STEPS:

1. SET VOLUME CONTROL FULLY CLOCKWISE.
2. SET SQUELCH CONTROL FULLY COUNTERCLOCKWISE.
3. RECEIVER SHOULD BE PROPERLY ALIGNED.
4. CONNECT SIGNAL GENERATOR TO ANTENNA JACK.
5. VTVM CONNECTS BETWEEN GROUND AND POINTS INDICATED BY ARROWS.

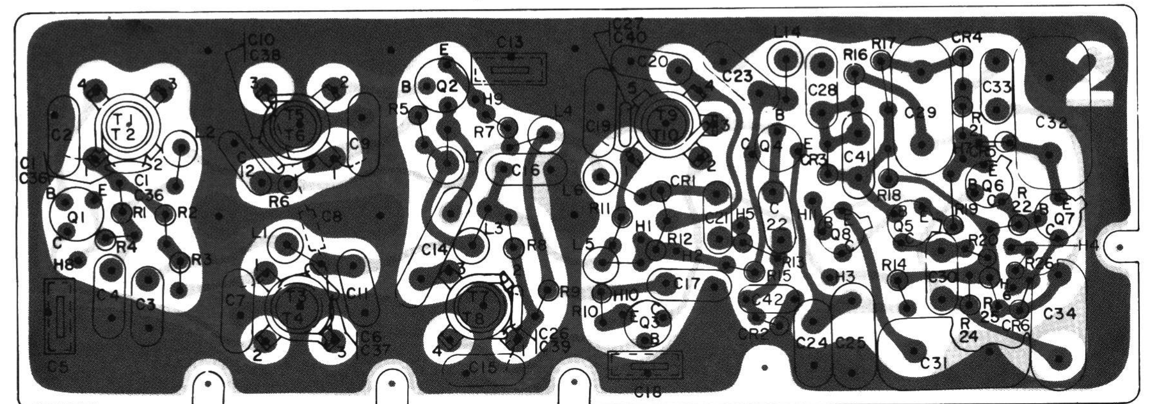


SIGNAL GENERATOR INPUT. MAINTAIN SETTING AT DISCRIMINATOR ZERO			UNMODULATED	UNMODULATED	0.5 MICROVOLT UNMODULATED	STANDARD SIGNAL-(1 MILLIVOLT AT RCVR FREQ. MODULATED BY KHZ WITH 3.3KHZ DEVIATION)	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL	NO SIGNAL	NO SIGNAL	NO SIGNAL	STANDARD SIGNAL	STANDARD SIGNAL
PROCEDURE			INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES BY 5% DC	INCREASE SIGNAL GENERATOR OUTPUT FROM ZERO UNTIL VTVM READING DECREASES TO MINIMUM DC								VOLUME CONTROL IN FULL COUNTER-CLOCKWISE POSITION			ADJUST VOLUME CONTROL FOR RATED 2 WATT OUTPUT ACROSS 3.2 OHM LOAD
READING	1.0 VDC	0.4 VDC	GENERATOR OUTPUT SHOULD BE APPROX 150 MICROVOLTS	GENERATOR OUTPUT SHOULD BE APPROX 30 MICROVOLTS	2.5 VDC	0.1 VAC	0.5 VAC	0.5 VAC	0.07 VAC	2.5 VDC	2.0 VDC	ADJUST FOR 0.65VDC (SEE ALIGNMENT PROCEDURE)	0.65 VDC (SEE ALIGNMENT PROCEDURE)	8.5 VAC	2.53 VAC

RC-1330C

NOISE BLANKER

A320 (132-150.8 MHZ)
A321 (150.8-174 MHZ)

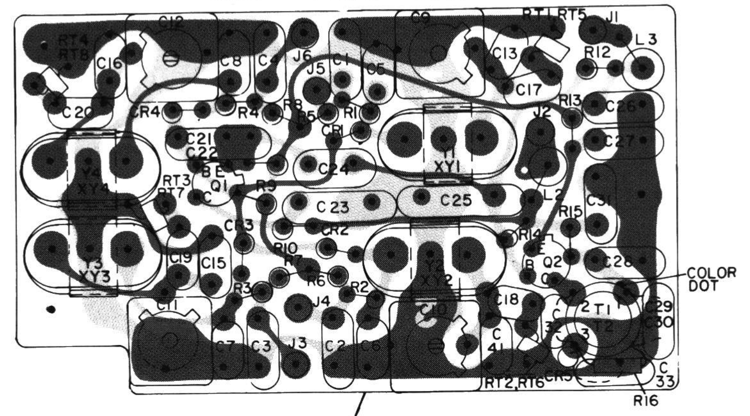


(19B204405, Sh. 1, Rev. 2)
(19B204405, Sh. 2, Rev. 2)

TRANSISTOR A320/321	EMITTER		BASE		COLLECTOR	
	—	+	—	+	—	+
Q1	200Ω	360Ω	1.6K	360Ω	360Ω	500Ω
Q2	100Ω	360Ω	1.5K	65Ω	30Ω	30Ω
Q3	200Ω	360Ω	1.6K	360Ω	360Ω	500Ω
Q4	100Ω	100Ω	11K	2.6K	5K	6K
Q5	1K	1K	3.3K	75K	3.3K	3.3K
Q6	0	0	3K	16.5K	330Ω	600Ω
Q7	41Ω	260Ω	330Ω	600Ω	370Ω	200Ω

1ST OSCILLATOR/MULTIPLIER

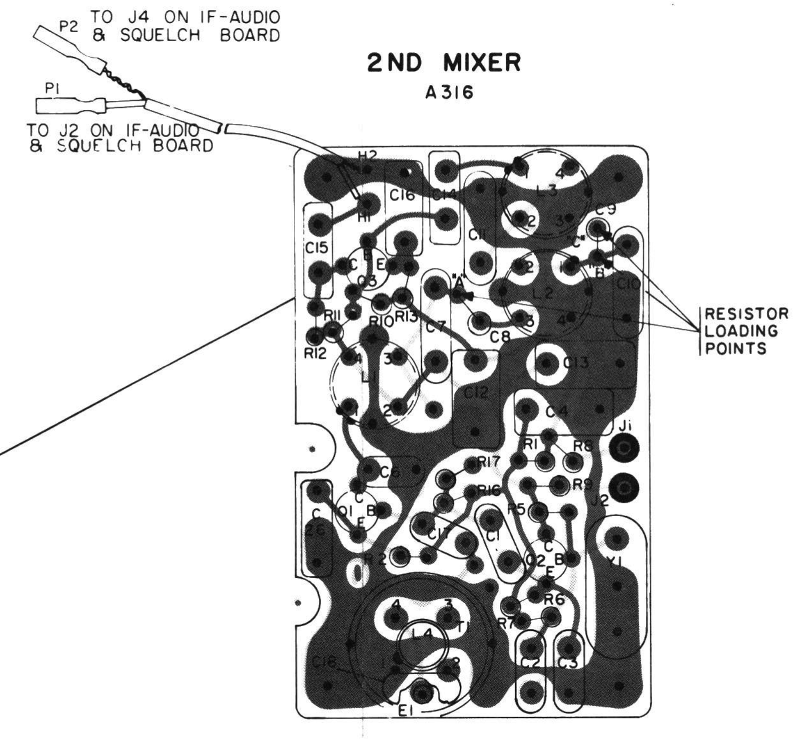
132-150.8 MHZ 150.8-174 MHZ
A308 — 1 FREQ — A311
A309 — 2 FREQ — A312
A310 — 4 FREQ — A313



(19B204412, Sh. 1, Rev. 2)
(19B204412, Sh. 2, Rev. 2)

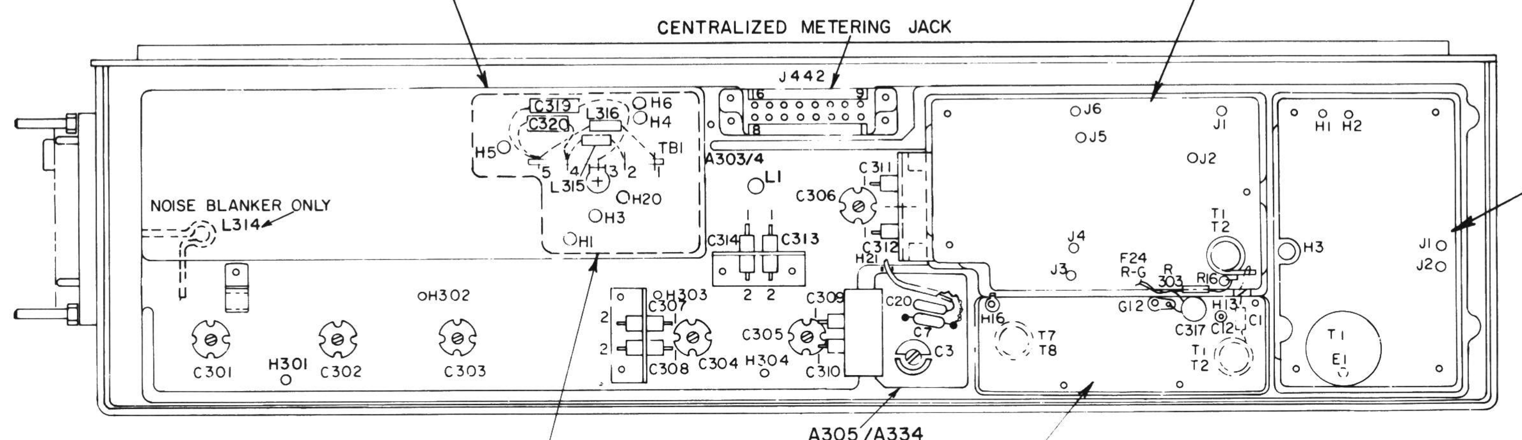
2ND MIXER

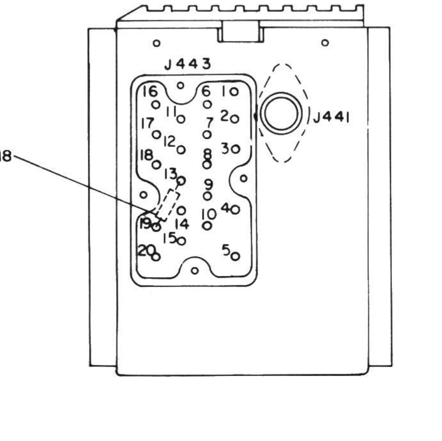
A316

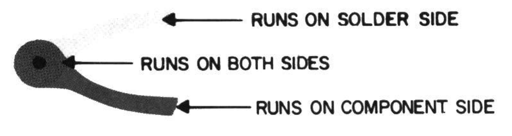


(19B205441, Sh. 1, Rev. 0)
(19B205441, Sh. 2, Rev. 0)

TOP VIEW

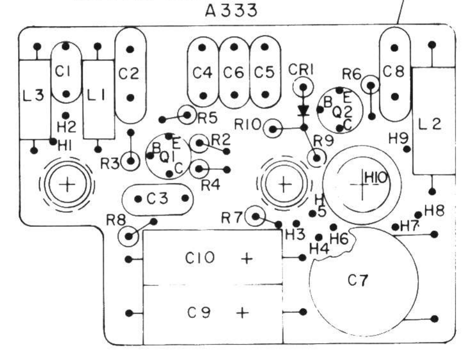






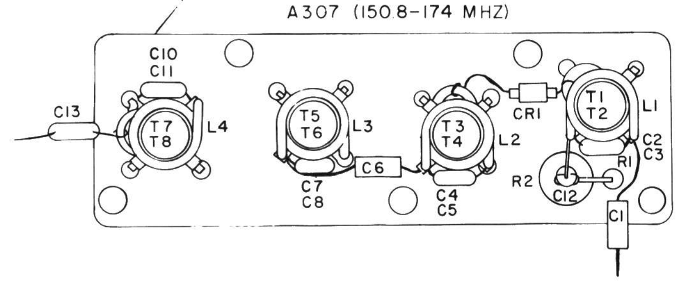
LEVEL SHUT OFF SWITCH

A333



2ND MULTIPLIER

A306 (132-150.8 MHZ)
A307 (150.8-174 MHZ)



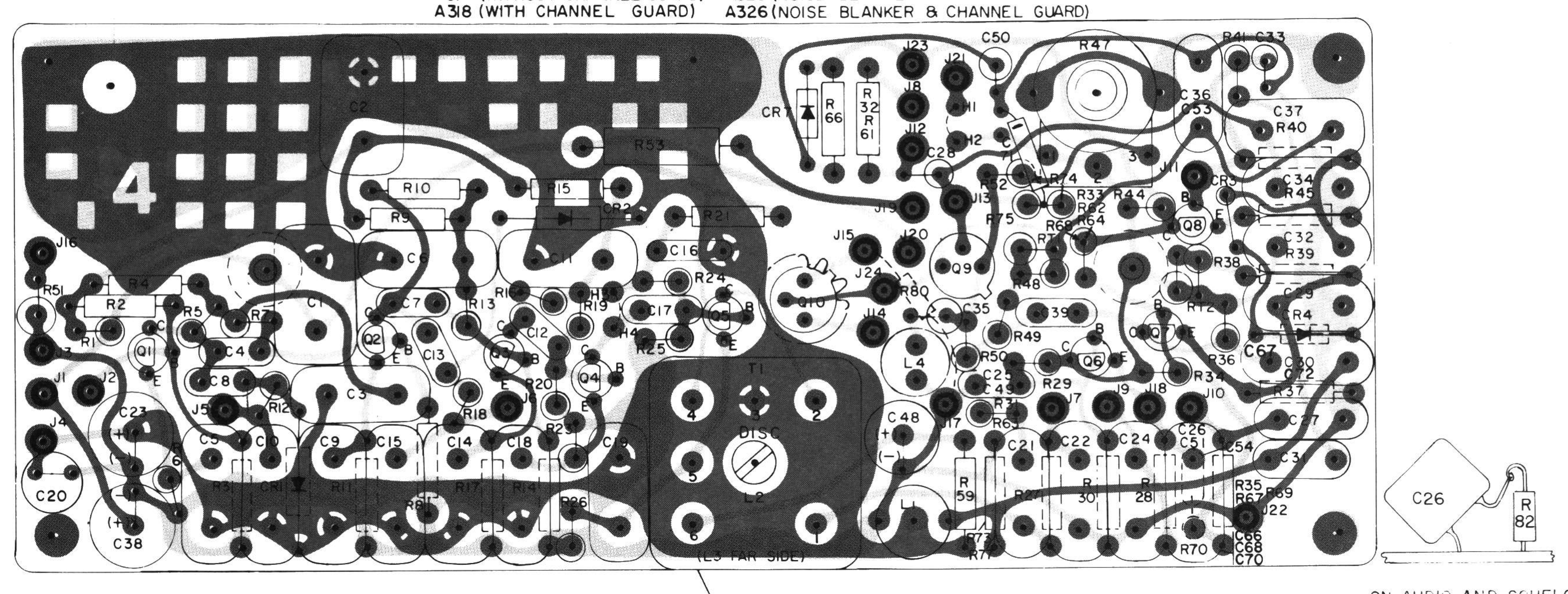
OUTLINE DIAGRAM

132 — 174 MHZ RECEIVER
MODELS 4ER41A28-33 &
MODELS 4ER41A40-45

(19R620737, Rev. 21)

IF-AUDIO & SQUELCH BOARD

A317 (WITHOUT CHANNEL GUARD) A325 (NOISE BLANKER)
A318 (WITH CHANNEL GUARD) A326 (NOISE BLANKER & CHANNEL GUARD)



ON AUDIO AND SQUELCH BOARD A317 & A318, C26 & R82 ARE CONNECTED AS SHOWN.

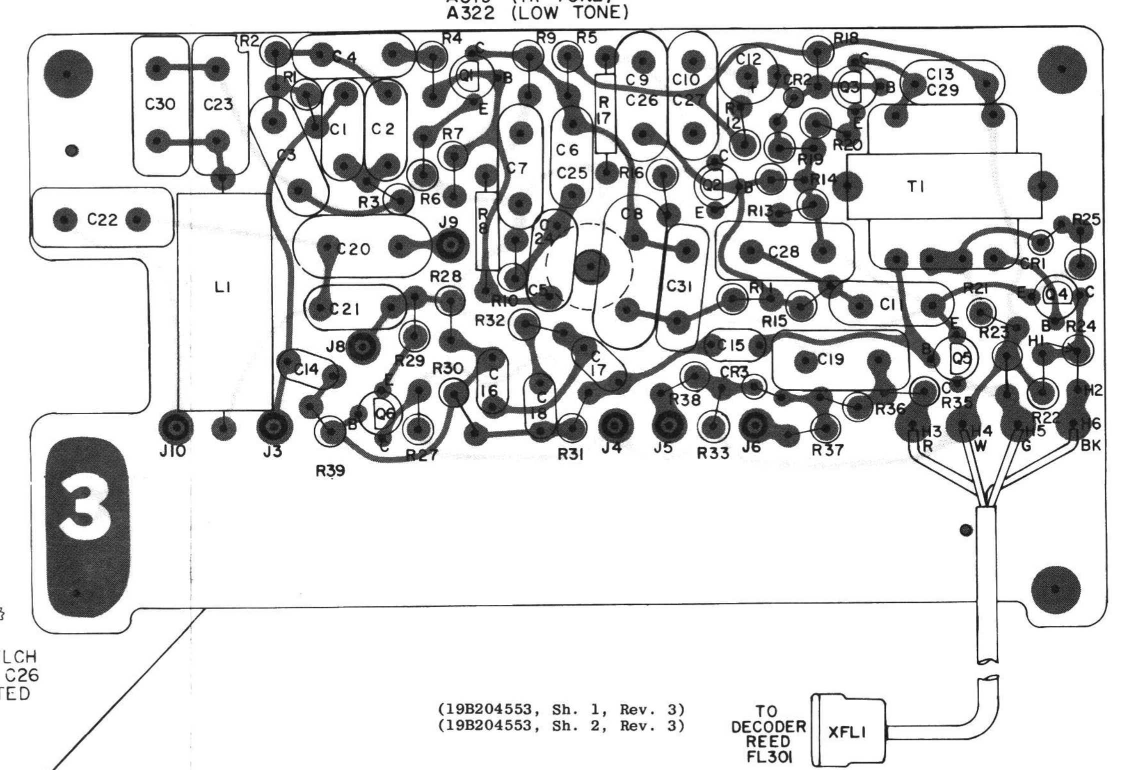
(19C303451, Sh. 1, Rev. 4)
(19C303451, Sh. 2, Rev. 4)

TRANSISTOR	EMITTER		BASE		COLLECTOR	
	—	+	—	+	—	+
A308/313-Q1	1K	1K	6.5K	2.8K	100Ω	100Ω
A308/313-Q2	70Ω	150Ω	1K	160Ω	100Ω	100Ω
A334-Q1	2.7K	2.7K	7.5K	3.8K	1.6K	1.6K
{A301/302-Q1 A323/324-Q1}	290Ω	270Ω	240Ω	240Ω	100Ω	100Ω
A316-Q1	3.8K	5.3K	8.5K	2.9K	200Ω	200Ω
A316-Q2	2.7K	6.8K	5.5K	2.7K	200Ω	200Ω
A316-Q3	2.2K	2.3K	2.3K	2.2K	2.7K	3.2K
A317-Q1	2.1K	2K	13.5K	4.1K	4.1K	5.2K
A317-Q2	2.1K	2K	13.5K	4.1K	4.1K	5.2K
A317-Q3	2.1K	2K	13.5K	4.1K	4.1K	5.2K
A317-Q4	2.1K	2K	13.5K	4.1K	4.1K	5.2K
A317-Q5	1.0K	1.0K	13.5K	2.8K	350Ω	350Ω
A317-Q6	*3.2K	*2 MEG	36.0K	2.5K	0	0
A317-Q7	1.7K	1.7K	11.0K	4.0K	7.0K	16K
A317-Q8	180Ω	180Ω	100K	2.8K	11.0K	14K
A317-Q9	2.2K	2.2K	4.1K	45K	2.3K	2.3K
A317-Q10	40Ω	35Ω	2.3K	2.3K	40Ω	36Ω
A301/323-Q301	1Ω	1Ω	40Ω	35Ω	40Ω	36Ω

* READINGS MAY VARY DUE TO DIFFERENCES IN TRANSISTORS.

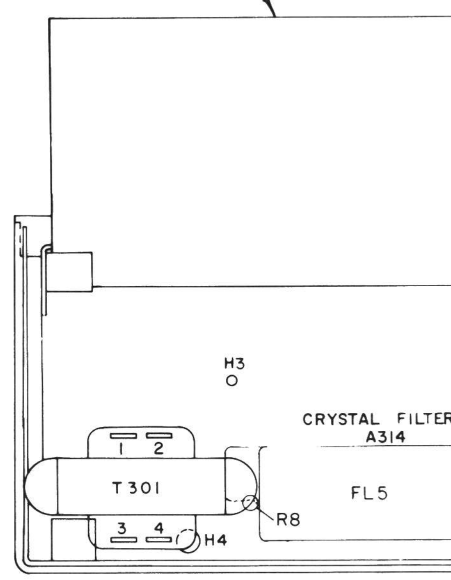
CHANNEL GUARD

A319 (HI TONE)
A322 (LOW TONE)



(19B204553, Sh. 1, Rev. 3)
(19B204553, Sh. 2, Rev. 3)

BOTTOM VIEW



TRANSISTOR A319/322	EMITTER		BASE		COLLECTOR	
	—	+	—	+	—	+
Q1	56Ω	56Ω	8.3K	145Ω	6.5K	8.3K
Q2	270Ω	270Ω	8K	500Ω	5K	5.5K
Q3	1K	1K	75K	3K	1K	1K
Q4	0	0	14K	45Ω	1K	1K
Q5	0	0	14K	45Ω	1K	1K
Q6	20Ω	20Ω	4.5K	85Ω	2K	2K

RESISTANCE READINGS

ALL READINGS ARE TYPICAL READINGS MEASURED WITH A 20,000 OHM-PER-VOLT METER, AND WITH CONTROL CABLE DISCONNECTED (OR IN STATIONS, PLUG TO J443 DISCONNECTED). READINGS ARE MADE WITH A SHORTING JUMPER CONNECTED FROM C311-1 (+12V) TO C312-1 (—12), AND ARE MEASURED FROM TRANSISTOR PINS TO C311-1. + OR — SIGNS SHOW METER LEAD TO C311-1.

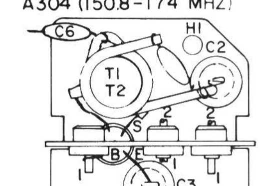
CAUTION

ALWAYS REMOVE THE SHORTING JUMPER AFTER MAKING RESISTANCE READINGS. APPLYING POWER WITH THE SHORTING JUMPER CONNECTED MAY DAMAGE THE UNIT

FOR READINGS OF:	USE SCALE:
1-100Ω	X 1
100-1K Ω	X 10
1K-50K Ω	X 1,000
50K Ω	X 100,000

2ND RF AMPLIFIER

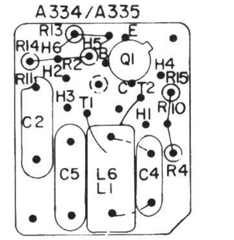
A303 (132-150.8 MHZ)
A304 (150.8-174 MHZ)



NOISE BLANKER ONLY

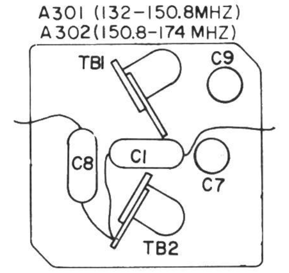
1ST MIXER

A334/A335



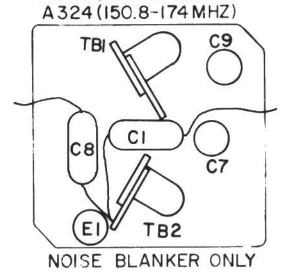
1ST RF AMPLIFIER

A301 (132-150.8MHZ)
A302 (150.8-174 MHZ)

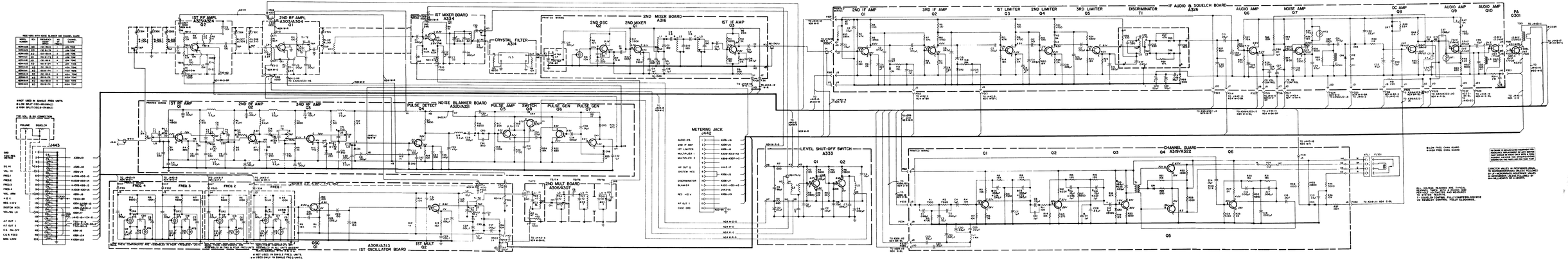


1ST RF AMPLIFIER

A323 (132-150.8MHZ)
A324 (150.8-174 MHZ)



NOISE BLANKER ONLY



(19E620711, Rev. 4)

SCHEMATIC DIAGRAM

132 — 174 MHZ MASTR RECEIVER
MODELS 4ER41A28-33 AND 40-45

PARTS LIST

LBI-3596

LBI-3583C

133-174 MHz RECEIVER
(WITH NOISE BLANKER AND CHANNEL GUARD)

MODELS 4EH41A28-33 (19B500810 G10-24) REV XD
MODELS 4EH41A40-45 (19B500810 G31-36) REV XD

SYMBOL	G-E PART NO.	DESCRIPTION
		RF AMPLIFIER ASSEMBLY
A301* and A302*		19C303414-G5
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	7489162-P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C2	5493392-P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen Bradley Type FASC.
C8	7489162-P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C9	5493392-P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen Bradley Type FASC.
		- - - - - - - - - - DIODES AND RECTIFIERS - - - - - - - - - -
CR1	4038642-P1	Germanium.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2	7488079-P7	Choke, RF: 1.0 uh ±10%, 0.5 ohms DC res max; sim to Jeffers 4421-102.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2	19A115342-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R5	3R152-P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R6	3R152-P511J	Composition: 5100 ohms ±5%, 1/4 w.
R7	3R152-P751J	Composition: 750 ohms ±5%, 1/4 w.
R8	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R9	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - - -
TB1 and TB2	7487424-P15	Miniature, phen: 2 terminals.
		In Models 4EH41A28-33 of Rev K and earlier; In Models 4EH41A40-45 of Rev J and earlier:
A301* and A302*		RF AMPLIFIER ASSEMBLY A301 19C303414-G4 A302 19C303421-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	7489162-P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C2 and C3	5493392-P107	Ceramic, stand-off: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type SSSA.
		- - - - - - - - - - DIODES AND RECTIFIERS - - - - - - - - - -
CR1	4038642-P1	Germanium.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115342-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R2	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R3	3R152-P471J	Composition: 470 ohms ±5%, 1/4 w.
R4	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19A121076-G1 T2 19A121076-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C4	5496218-P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C5	5496218-P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C6	5496218-P239	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A121078-G1	Coil. Includes tuning slug 5491798-P5.
		- - - - - - - - - - TERMINAL BOARDS - - - - - - - - - -
TB1	7487424-P15	Miniature, phen: 2 terminals.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XQ1	5490277-P5	Transistor, phen: 3 contacts rated 1 amp at 400 VRMS; sim to Alcon 12131LS.
A303 and A304		RF AMPLIFIER ASSEMBLY A303 19C303412-G2 (4EH41A28, 30, 33, 40, 42, 44) A304 19C303413-G2 (4EH41A28, 30, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	7489162-P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C2 and C3	5493392-P107	Ceramic, stand-off: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type SSSA.
C7*	19C301266-P1	Variable, ceramic dielectric: approx 2-8 pf, temp coef 0 PPM, 350 VDCW; sim to Erie Style 538. (Deleted by Rev K in Models 4EH41A40-45). (Deleted by Rev L in Models 4EH41A28-33).
		- - - - - - - - - - DIODES AND RECTIFIERS - - - - - - - - - -
CR1	4038056-P1	Germanium.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115342-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P622J	Composition: 6200 ohms ±5%, 1/4 w.
R2	3R152-P223J	Composition: 2200 ohms ±5%, 1/4 w.
R3	3R152-P470K	Composition: 47 ohms ±10%, 1/4 w.
R4	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
R5*	3R152-P200J	Composition: 20 ohms ±5%, 1/4 w. (Added by Rev F). (Deleted by Rev K in Models 4EH41A40-45). (Deleted by Rev L in Models 4EH41A28-33).
R6*	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w. (Added by Rev F). (Deleted by Rev K in Models 4EH41A40-45). (Deleted by Rev L in Models 4EH41A28-33).
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19A121087-G1 T2 19A121087-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C4	5496218-P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C5	5496218-P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C6	5496218-P238	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW, temp coef -0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A121086-P1	Coil. Includes tuning slug 5491798-P5.

SYMBOL	G-E PART NO	DESCRIPTION
A305*		FIRST MIXER ASSEMBLY 19B204430-G1 Deleted by Rev W.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5494481-P14	Ceramic disc: .002 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C2	5494481-P114	Ceramic disc: .002 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C3	5491271-P103	Variable, subminiature: approx 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-8-5.
C4	5496218-P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C5	5494481-P114	Ceramic disc: .002 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C6	5494481-P12	Ceramic disc: .001 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C7	5496219-P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1	4038104-P1	Lug: solder dipped brass.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	PL-19A121083-G1	Toroidal coil.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115342-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2	3R152-P822J	Composition: 8200 ohms ±5%, 1/4 w.
R3*	3R152-P203J	Composition: 2000 ohms ±5%, 1/4 w. (Deleted by Rev W in Models 4EH41A28-33). (Deleted by Rev L in Models 4EH41A40-45).
R4	3R152-P103J	Composition: 1000 ohms ±5%, 1/4 w.
R10*	3R152-P243J	Composition: 24,000 ohms ±5%, 1/4 w. In Models 4EH41A28-33 of Rev L or earlier; In Models 4EH41A40-45 of Rev K or earlier: Composition: 15,000 ohms ±10%, 1/4 w.
R11*	3R152-P622J	Composition: 6200 ohms ±5%, 1/4 w. (Added by Rev W in Models 4EH41A28-33). (Added by Rev L in Models 4EH41A40-45).
A306 and A307		MULTIPLIER ASSEMBLY A306 19B204423-G1 (4EH41A28, 30, 32, 40, 42, 44) A307 19B204423-G2 (4EH41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5491601-P130	Tubular: 1 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C6	5491601-P107	Tubular: 0.27 pf ±5%, 500 VDCW; sim to Quality Components Type MC.
C12	5493392-P7	Ceramic, feed-thru: .001 pf +100% -0%, 500 VDCW; sim to Allen-Bradley Type FASC.
C13	5496218-P24	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - DIODES AND RECTIFIERS - - - - - - - - - -
CR1	19A122650-P1	Silicon.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P471J	Composition: 470 ohms ±5%, 1/4 w.
R2	3R152-P100J	Composition: 10 ohms ±5%, 1/4 w.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19A121100-G1 T2 19A121100-G2

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C2	5496218-P255	Ceramic disc: 47 pf ±5%, 500 VDCW, temp coef -80 PPM.
C3	5496218-P252	Ceramic disc: 36 pf ±5%, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A121108-P1	Coil. Includes tuning slug 5491798-P5.
T3 and T4		COIL ASSEMBLY T3 19A121095-G1 T4 19A121095-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C4	5496218-P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C5	5496218-P238	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2	19A121094-P1	Coil. Includes tuning slug 5491798-P5.
T5 and T6		COIL ASSEMBLY T5 19A121097-G1 T6 19A121097-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C7	5496218-P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C8	5496218-P238	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L3	19A121096-P1	Coil. Includes tuning slug 5491798-P5.
T7 and T8		COIL ASSEMBLY T7 19A121111-G1 T8 19A121111-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C10	5496218-P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C11	5496218-P238	Ceramic disc: 7 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L4	19A121110-P1	Coil. Includes tuning slug 5491798-P5.
A308 thru A313		FIRST OSCILLATOR ASSEMBLY A308 PL-19B204419-G1 (4EH41A28, 40) A309 PL-19B204419-G2 (4EH41A30, 42) A310 PL-19B204419-G3 (4EH41A32, 44) A311 PL-19B204419-G4 (4EH41A29, 41) A312 PL-19B204419-G5 (4EH41A31, 43) A313 PL-19B204419-G6 (4EH41A33, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C4	5494481-P112	Ceramic disc: .001 pf ±10%, 500 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 1.98-12.4 pf, 750 v peak; sim to EF Johnson 189-8-5.
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.

SYMBOL	G-E PART NO	DESCRIPTION
C21	5496219-P771	Ceramic disc: 220 pf ±5%, 500 VDCW, temp coef -750 PPM.
C23	5494481-P114	Ceramic disc: .002 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C24	5490008-P31	Silver mica: 150 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C25	5496219-P467	Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -220 PPM.
C26 thru C28	5494481-P112	Ceramic disc: .001 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C29	5494481-P112	Ceramic disc: .001 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
		- - - - - - - - - - DIODES AND RECTIFIERS - - - - - - - - - -
CR1*	19A115348-P1	Silicon. (Deleted by Rev N in Models 4EH41A40, 41). (Deleted by Rev J in Models 4EH41A28, 29).
CR2 thru CR4	19A115348-P1	Silicon.
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - - - - - - -
J1 thru J6	4033513-P4	Contact, electrical: sim to Bead Chain L83-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2	7488079-P16	Choke, RF: 10 uh ±10%, 0.6 ohm DC res; sim to Jeffers 4421-7.
L3		
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 and Q2	19A115330-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 thru R4	3R152-P562J	Composition: 5600 ohms ±5%, 1/4 w.
R5*	3R152-P104K	Composition: 0.1 megohm ±10%, 1/4 w. (Deleted by Rev N in Models 4EH41A40, 41). (Deleted by Rev J in Models 4EH41A28, 29).
R6 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.
R11 and R12	3R152-P103J	Composition: 1000 ohms ±5%, 1/4 w.
R13	3R152-P151J	Composition: 150 ohms ±5%, 1/4 w.
R14	3R152-P101K	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. (Added by Rev N in Models 4EH41A40, 41). (Added by Rev J in Models 4EH41A28, 29).
		- - - - - - - - - - THERMISTORS - - - - - - - - - -
RT1 thru RT4	19B209284-P5	Disc: 43 ohms res nominal at 25°C, color code green.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19B204421-G1 T2 19B204421-G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C29	5496218-P253	Ceramic disc: 39 pf ±5%, 500 VDCW, temp coef -80 PPM.
C30	5496218-P250	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef -80 PPM.

SYMBOL	G-E PART NO	DESCRIPTION
C32	5496218-P34	Ceramic disc: 3 pf ±0.25 pf, 500 VDCW, temp coef 0 PPM.
C33	5494481-P12	Ceramic disc: .001 pf ±10%, 500 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR5	19A115350-P1	Silicon.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A121093-P1	Coil. Includes tuning slug 5491798-P5.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R16	3R153-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XY1 thru XY4		Refer to Mechanical Parts (RC-1167).
R1	3R152-P432K	Composition: 4300 ohms ±10%, 1/4 w.
R2	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
A314*		CRYSTAL FILTER ASSEMBLY 19B204418-G1 Used in Units of Rev XA for Models 4EH41A28-33, Used in Units of Rev M for Models 4EH41A40-45. For earlier Units see below.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL5*	19B206692-G1	Bandpass filter. In Models 4EH41A28-33 of Rev W and earlier: In Models 4EH41A40-45 of Rev V and earlier: Bandpass filter.
C6	5496219-P47	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef 0 PPM.
C7*	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef 150 PPM. In Models 4EH41A28-33 of Rev P; In Models 4EH41A40-45 of Rev N:
FL6*	19C304094-G4	Bandpass filter. Ceramic disc: 150 pf ±5%, 500 VDCW, temp coef -30 PPM. In Models 4EH41A28-33 of Rev N and earlier: In Models 4EH41A40-45 of Rev M and earlier:
	5496219-P666	Ceramic disc: 130 pf ±5%, 500 VDCW, temp coef -470 PPM.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2*	3R153-P102K	Composition: 1000 ohms ±10%, 1/4 w. Deleted in Models 4EH41A28-33 by Rev XA. Deleted in Models 4EH41A40-45 by Rev N.
R5	3R152-P622J	Composition: 6200 ohms ±5%, 1/4 w.
R8	3R153-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
A314*		CRYSTAL FILTER ASSEMBLY 19B204418-G3 Used in units of Rev C, Units of Rev B or earlier used Crystal Filter Assembly, 19B204418-G1.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL5*	19B206692-G1	Bandpass filter. In Models 4EH41A28-33 of Rev X and earlier: In Models 4EH41A40-45 of Rev V and earlier: Bandpass filter.
FL6*	19C304094-G4	Bandpass filter. Deleted in Models 4EH41A28-33 by Rev XA. Deleted in Models 4EH41A40-45 by Rev V.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1*	3R152-P432K	Composition: 4300 ohms ±10%, 1/4 w. Deleted in Models 4EH41A28-33 by Rev XA. Deleted in Models 4EH41A40-45 by Rev V.
R2*	3R153-P102K	Composition: 1000 ohms ±10%, 1/4 w. Deleted in Models 4EH41A28-33 by Rev XA. Deleted in Models 4EH41A40-45 by Rev N.

SYMBOL	G-E PART NO	DESCRIPTION
R7*	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w. Added in Models 4EH41A28-33 by Rev XA. Added in Models 4EH41A40-45 by Rev V.
R8*	3R153-P103K	Composition: 10,000 ohms ±10%, 1/4 w. Added in Models 4EH41A28-33 by Rev XA. Added in Models 4EH41A40-45 by Rev V.
A314*		CRYSTAL FILTER ASSEMBLY 19B204418-G1 In Models of Rev M or earlier.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL1 and FL2	PL-19C304094-G1	Bandpass.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P432K	Composition: 4300 ohms ±10%, 1/4 w.
R2	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
A316		SECOND MIXER ASSEMBLY 19B204438-G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5490008-P9	Silver mica: 18 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C2 and C3	5490008-P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C4*	19B209243-P4	Polyester: 0.1 pf ±20%, 60 VDCW. In Models 4EH41A28-33 of Rev P and earlier: In Models 4EH41A40-45 of Rev N and earlier:
	5491189-P106	Polyester: 0.1 pf ±20%, 50 VDCW.
C5*	19B209243-P4	Polyester: .033 pf ±20%, 60 VDCW. Used in Units of Rev XA for Models 4EH41A28-33, Used in Units of Rev M for Models 4EH41A40-45. For earlier Units see below.
	5491189-P103	Polyester: .033 pf ±20%, 50 VDCW.
C6	5496219-P47	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef 0 PPM.
C7*	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef 150 PPM. In Models 4EH41A28-33 of Rev P; In Models 4EH41A40-45 of Rev N:
	5496219-P666	Ceramic disc: 130 pf ±5%, 500 VDCW, temp coef -470 PPM. In Models 4EH41A28-33 of Rev N and earlier: In Models 4EH41A40-45 of Rev M and earlier:
	5496219-P666	Ceramic disc: 130 pf ±5%, 500 VDCW, temp coef -470 PPM.
	5491601-P140	Tubular: 3.6 pf ±5%, 500 VDCW.
C8* and C9*		In Models 4EH41A28-33 of Rev P and earlier: In Models 4EH41A40-45 of Rev N and earlier:
	5491601-P28	Tubular: 2.7 pf ±10%, 500 VDCW.
C10* and C11*	5496219-P369	Ceramic disc: 180 pf ±5%, 500 VDCW, temp coef 150 PPM. In Models 4EH41A28-33 of Rev P; In Models 4EH41A40-45 of Rev N:
	5496219-P666	Ceramic disc: 130 pf ±5%, 500 VDCW, temp coef -470 PPM. In Models 4EH41A28-33 of Rev N and earlier: In Models 4EH41A40-45 of Rev M and earlier:
	5496219-P666	Ceramic disc: 130 pf ±5%, 500 VDCW, temp coef -470 PPM.
C12* and C13*	19B209243-P7	Polyester: 0.1 pf ±20%, 40 VDCW. In Models 4EH41A28-33 of Rev P and earlier: In Models 4EH41A40-45 of Rev N and earlier:
	5491189-P106	Polyester: .01 pf ±20%, 50 VDCW.
C14* and C15*	19B209243-P1	Polyester: 0.01 pf ±20%, 40 VDCW. In Models 4EH41A28-33 of Rev P and earlier: In Models 4EH41A40-45 of Rev N and earlier:
	5491189-P101	Polyester: .01 pf ±20%, 50 VDCW.
C16*	19B209243-P5	Polyester: .047 pf ±20%, 40 VDCW. In Models 4EH41A28-33 of Rev P and earlier: In Models 4EH41A40-45 of Rev N and earlier:
	5491189-P104	Polyester: .047 pf ±20%, 50 VDCW.
C17	5494481-P112	Ceramic disc: .001 pf ±10%, 500 VDCW.

SYMBOL	G-E PART NO	DESCRIPTION
C26*	19B209243-P1	Polyester: 0.01 pf ±20%, 40 VDCW. In Models 4EH41A28-33 of Rev Y and earlier: In Models 4EH41A40-45 of Rev X and earlier:
	19A115028-P104	Polyester: .0047 pf ±20%, 200 VDCW.
		- - - - - - - - - - TERMINALS - - - - - - - - - -
E1	4038104-P1	Lug: solder dipped brass.
		- - - - - - - - - - JACKS AND RECEPTACLES - - - - - - - - - -
J1 and J2	4033513-P4	Contact, electrical: sim to Bead Chain L83-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1*	19C311181-G5	Coil. Includes tuning slug 7160519-P2. In Models 4EH41A28-33 of Rev P and earlier: In Models 4EH41A40-45 of Rev N and earlier:
	19C303464-G3	Coil. Includes tuning slug 7160519-P2.
L2*	19C311181-G6	Coil. Includes tuning slug 7160519-P2. In Models 4EH41A28-33 of Rev P and earlier: In Models 4EH41A40-45 of Rev N and earlier:
	19C303464-G2	Coil. Includes tuning slug 7160519-P2.
L3*	19C311181-G7	Coil. Includes tuning slug 7160519-P2. In Models 4EH41A28-33 of Rev P and earlier: In Models 4EH41A40-45 of Rev N and earlier:
	19C303464-G3	Coil. Includes tuning slug 7160519-P2.
L4*		(Part of L3). Deleted in Models 4EH41A28-33 by Rev R. Deleted in Models 4EH41A40-45 by Rev P.
L5*		(Part of T1). Changed in Models 4EH41A28-33 by Rev R to: Changed in Models 4EH41A40-45 by Rev P to: (Part of T1).
L6		
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P2	4029840-P1	Contact, electrical: sim to Amp 41854.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115343-P1	Silicon, NPN.
Q2	19A115488-P1	Silicon, NPN; sim to Type 2N2712.
Q3	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P152K	Composition: 1500 ohms ±10%, 1/4 w.
R2	3R152-P392K	Composition: 3900 ohms ±10%, 1/4 w.
R3*	3R153-P103K	Composition: 10,000 ohms ±10%, 1/4 w. Deleted by Rev R.
R4*	3R152-P333K	Composition: 33,000 ohms ±10%, 1/4 w. Deleted by Rev E.
R5 and R6	3R152-P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R7	3R153-P512J	Composition: 5100 ohms ±5%, 1/4 w.
R8 and R9	3R152-P201J	Composition: 200 ohms ±5%, 1/4 w.
R10	3R152-P302J	Composition: 3000 ohms ±5%, 1/4 w.
R11	3R153-P432J	Composition: 4300 ohms ±5%, 1/4 w.
R12	3R152-P302J	Composition: 3000 ohms ±5%, 1/4 w.
R13	3R152-P203J	Composition: 3000 ohms ±5%, 1/4 w.
R15*	3R152-P153K	Composition: 15,000 ohms ±10%, 1/4 w. Added by Rev E. Deleted in Models 4EH41A28-33 by Rev XA. Deleted in Models 4EH41A40-45 by Rev T.
R16*	3R152-P104K	Composition: 0.1 megohm ±10%, 1/4 w. Added by Rev E.
R17*	3R152-P394K	Composition: 0.39 megohm ±10%, 1/4 w. Added by Rev E.

TROUBLESHOOTING PROCEDURE

Before starting the Noise Blanker troubleshooting procedure, make sure the receiver is operating properly. Align the Noise Blanker as described on the ALIGNMENT PROCEDURE Sheet. Then make the following Troubleshooting checks:

STEP 1—PERFORMANCE CHECK

Equipment Required:

RF Signal Generator coupled through a 6 db pad.

Pulse Generator with repetition rate and level controls (similar to General Electric Model 4EX4A10)

AC VTVM

Procedure:

1. Connect Pulse Generator and RF Signal Generator to receiver antenna jack through a T-connector and connect VTVM to receiver output as shown in Figure 1.

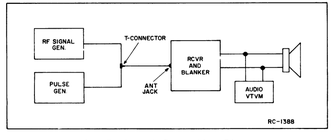


Figure 1 - Equipment Connection Diagram

2. Apply an unmodulated RF Signal and check the 20 db quieting sensitivity of the receiver. (Measure with Model 4EX4A10 Pulse Generator connected but turned off).
3. Disable pulse section of the noise blanker by shorting Q4 base to emitter. (A yellow dot is located between the base and emitter connections on solder side of the noise blanker board).
4. Set the pulse generator (Model 4EX4A10) repetition rate to 1500 Hz and adjust the output level control on pulse generator until receiver sensitivity is degraded as much as possible (approximately 25 db).
5. Remove base-emitter short from Q4. The receiver sensitivity should restore to within 5 db of 20 db quieting level obtained in step 2 above.

STEP 2—QUICK CHECKS

Equipment Required:

Audio Voltmeter (VTVM)
Audio Oscillator (sine wave)

SYMPTOMS	PROCEDURE
No regulated 10-volts	Check the 12-volt supply. Then check regulator circuit. (Refer to troubleshooting procedure for power supply.)
No blanking	Check waveforms (STEP 3) and voltage ratios (STEP 4).
Partial or no blanking	a. Check RF attenuation as follows: Connect signal generator to J441. Adjust the output of the signal generator for 0.2 volts on the 2nd IF amplifier (position B on test set) and note the signal generator reading. Short the Q6 base to emitter pattern (identified by red ink dot) and increase the signal generator output until the same 2nd IF amplifier reading is obtained. Signal level must increase 60 db or more.
	b. Check repetition rate switch. Connect a 6-kHz sine wave signal from audio oscillator through a 0.33 µf capacitor to point "A" located on the noise blanker board. Adjust the output of the audio oscillator for 2-volts, peak-to-peak. Observe the output of the pulse generator (on noise blanker) with an oscilloscope. The repetition rate of the pulse generator should not increase over 2 kHz or decrease under 1 kHz. (This is true for sine wave inputs like intermodulation in the blanker channel, but not for strong impulse noise from antenna.)
	c. Check vehicle ignition system. Worn-out points, bad spark plugs, or breaks in ignition wiring can cause a "dirty" ignition pulse to be generated causing the blanker to operate incorrectly.

STEP 4—VOLTAGE RATIO READINGS

Equipment Required:

RF Voltmeter (similar to Boonton Model 91-CA or Millivac Type MV-18 C)

Procedure:

1. Apply probe to input of stage (for example, base of 1st RF Amp). Peak resonant circuit of stage being measured and take voltage reading (E_1).
2. Move probe to input of following stage (2nd RF Amp). Repeak 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 for each stage.

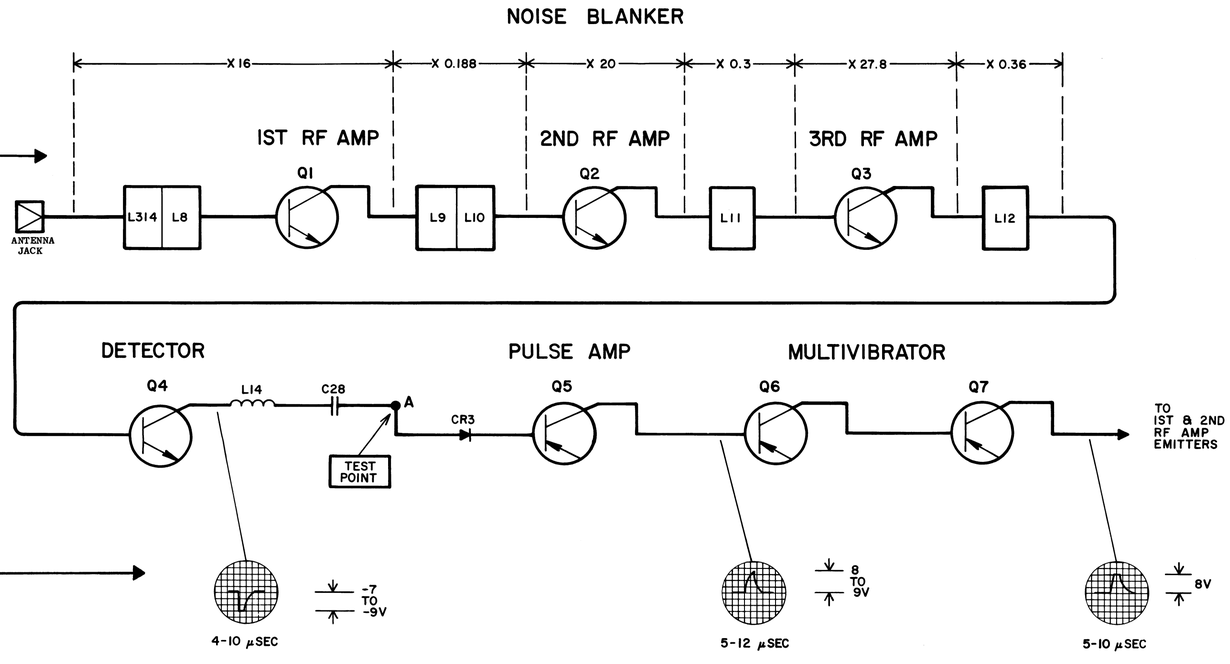
STEP 3—WAVE FORMS

Equipment Required:

Oscilloscope
Noise Generator

Procedure:

Adjust noise generator for maximum output level and observe waveforms on oscilloscope at the indicated points.



RC-1273

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1		COIL ASSEMBLY 19B204414-G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C18	19C301540-P261	Ceramic disc: 82 pf ±5%, 500 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° to +75°C. In Models of Rev B or earlier:
	19A110192-P1	Quartz: freq 4805 KHz ±100 Hz at 25°C, temp range -30° to +75°C.
A319		CHANNEL GUARD 19C303550-G1 (Used in Models 4ER41A28-33)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	5491459-P104	Polyester: .068 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C3	5491459-P102	Polyester: 0.15 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C4	5491459-P105	Polyester: 0.1 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C5 and C6	5491459-P104	Polyester: .068 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C7	5491459-P105	Polyester: 0.1 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C8*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
	5491459-P109	In Models 4ER41A28-33 of Rev T and earlier: Polyester: 0.33 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C9 and C10	5491459-P102	Polyester: 0.15 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C11*	5491459-P105	Polyester: 0.1 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
	5491459-P109	In Models 4ER41A28-33 of Rev T and earlier: Polyester: 0.33 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C12	5495670-P14	Tubular: 5 pf +75% -10%, 25 VDCW; sim to Sprague 30B179A1.
C13	5491459-P104	Polyester: .068 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C14 and C15	5491459-P106	Polyester: .01 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C16 and C17	5491459-P110	Polyester: .0015 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C18	5491459-P111	Polyester: .0033 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C19*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
	5491459-P109	In Models 4ER41A28-33 of Rev T and earlier: Polyester: 0.33 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C20	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C21*	5491459-P108	Polyester: .047 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
	5491459-P104	In Models 4ER41A28-33 of Rev L and earlier: Polyester: .068 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C22	5491459-P109	Polyester: 0.33 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C23*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE. In Models 4ER41A28-33 of Rev T and earlier:
	5491459-P112	Polyester: 0.47 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.

SYMBOL	G-E PART NO	DESCRIPTION
C28*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE. Added by Rev U.
C30*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE. Added by Rev U.
C31*	5491459-P105	Polyester: 0.1 µf ±10%, 50 VDCW; sim to Good-All Type 601PE. Added by Rev U.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	4038056-P1	Germanium.
CR3	19A115250-P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J3 thru J6	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
J8 thru J10	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1*	19A115690-P2	Coil.
	PL-19B204554-G1	In Models of Rev T and earlier: Coil.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q5	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	3R77-P752J	Composition: 7500 ohms ±5%, 1/2 w.
R3	3R77-P472J	Composition: 4700 ohms ±5%, 1/2 w.
R4 and R5	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R6	3R77-P560J	Composition: 56 ohms ±5%, 1/2 w.
R7	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R8 and R9	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R10	3R77-P752J	Composition: 7500 ohms ±5%, 1/2 w.
R11	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R12	3R77-P622J	Composition: 6200 ohms ±5%, 1/2 w.
R13	3R77-P271J	Composition: 270 ohms ±5%, 1/2 w.
R14	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R15 and R16	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R17	3R77-P822J	Composition: 8200 ohms ±5%, 1/2 w.
R18	3R77-P823J	Composition: 82,000 ohms ±5%, 1/2 w.
R19	3R77-P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R20	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R21	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R22 and R23	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R24*	3R77-P331J	Composition: 330 ohms ±5%, 1/2 w.
	3R77-P511J	In Models of Rev F and earlier: Composition: 510 ohms ±5%, 1/2 w.
R25	3R77-P201J	Composition: 200 ohms ±5%, 1/2 w.
R26*	3R77-P203J	Composition: 20,000 ohms ±5%, 1/2 w. Deleted by Rev G.
	3R77-P512J	In Models of Rev C and earlier: Composition: 5100 ohms ±5%, 1/2 w.
R27	3R77-P202J	Composition: 2000 ohms ±5%, 1/2 w.

SYMBOL	G-E PART NO	DESCRIPTION
R28	3R77-P512J	Composition: 5100 ohms ±5%, 1/2 w.
R29	3R77-P200J	Composition: 20 ohms ±5%, 1/2 w.
R30 and R31	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R32 and R33	3R77-P682J	Composition: 6800 ohms ±5%, 1/2 w.
R35	3R77-P302J	Composition: 3000 ohms ±5%, 1/2 w.
R36	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R37	3R77-P184J	Composition: 180,000 ohms ±5%, 1/2 w.
R38	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R39*	3R77-P512J	Composition: 5100 ohms ±5%, 1/2 w. Added to Models 4ER41A28-33 by Rev G.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	5490525-P2	Audio freq: freq range 100-10,000 Hz, Pri: 35,000 ohms ±10% imp, 1200 ohms ±15% DC res, Sec 1: 2000 ohms imp, 250 ohms ±10% DC res, Sec 2: 2000 ohms imp, 250 ohms ±10% DC res.
		- - - - - - - - - SOCKETS - - - - - - - - - -
XFL1	PL-19A121920-G2	Bead, mica-filled phen: 7 pins rated 1 amp at 500 VRMS with 3-11/32 inches of cable.
A320 and A321		NOISE BLANKER
	A320 19C303408-G1 (4ER41A28, 30, 32, 40, 42, 44) A321 19C303408-G2 (4ER41A29, 31, 33, 41, 43, 45)	
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C3 and C4	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C5	5492056-P3	Uncased silver mica: 250 pf ±10%, 500 VDCW; sim to Underwood Type J-1-HF.
C8	5491601-P23	Tubular: 1.5 pf ±10%, 500 VDCW; sim to Quality Components Type MC.
C11 and C12	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C13	5492056-P3	Uncased silver mica: 250 pf ±10%, 500 VDCW; sim to Underwood Type J-1-HF.
C14	5496219-P21	Ceramic disc: 100 pf ±10%, 500 VDCW, temp coef 0 PPM.
C16 and C17	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C18	5492056-P3	Uncased silver mica: 250 pf ±10%, 500 VDCW; sim to Underwood Type J-1-HF.
C20 thru C22	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C23	5496219-P17	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef 0 PPM.
C24	5490008-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C25	5491189-P104	Polyester: .047 µf ±20%, 50 VDCW; sim to Good-All Type 601PE.
C28	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C29	5491189-P108	Polyester: 0.22 µf ±20%, 50 VDCW; sim to Good-All Type 601PE.
C30	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C31 and C32	19A115028-P114	Polyester: 0.1 µf ±20%, 200 VDCW.
C33	5491189-P101	Polyester: .01 µf ±20%, 50 VDCW; sim to Good-All Type 601PE.
C34	4029003-P4	Silver mica: 680 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-20.
C41	5490008-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C42	5496219-P237	Ceramic disc: 6 pf ±5%, 500 VDCW, temp coef -80 PPM.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1*	19A115250-P1	Silicon. In Models 4ER41A28-33 of Rev K and earlier: In Models 4ER41A40-45 of Rev J and earlier:
	5491705-P2	Silicon.
CR2* thru CR4*	4038056-P1	Germanium. In Models 4ER41A28-33 of Rev K and earlier: In Models 4ER41A40-45 of Rev J and earlier:
	7777146-P3	Germanium; sim to Type 1N90.
CR5*	19A115250-P1	Silicon. In Models 4ER41A28-33 of Rev K and earlier: In Models 4ER41A40-45 of Rev J and earlier:
	5491705-P2	Silicon.
CR6*	4038056-P1	Germanium. In Models 4ER41A28-33 of Rev K and earlier: In Models 4ER41A40-45 of Rev J and earlier:
	7777146-P3	Germanium; sim to Type 1N90.
		- - - - - - - - - INDUCTORS - - - - - - - - -
L1 thru L7	7488079-P8	Choke, RF: 2.2 µh ±10%, 1 ohm DC res; sim to Jeffers 4411-12.
L14	7488079-P8	Choke, RF: 2.2 µh ±10%, 1 ohm DC res; sim to Jeffers 4411-12.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q4	19A115342-P1	Silicon, NPN.
Q5 thru Q7	19A115393-P1	Silicon, NPN.
Q8*	19A115706-P1	Silicon, PNP; sim to Type 2N3638. Added in Models 4ER41A28-33 by Rev W. Added in Models 4ER41A40-45 by Rev V.
		- - - - - - - - - RESISTORS - - - - - - - - -
R1	3R152-P202K	Composition: 2000 ohms ±10%, 1/4 w.
R2	3R152-P682K	Composition: 6800 ohms ±10%, 1/4 w.
R3	3R152-P511K	Composition: 510 ohms ±10%, 1/4 w.
R4	3R152-P391K	Composition: 390 ohms ±10%, 1/4 w.
R5	3R152-P682K	Composition: 6800 ohms ±10%, 1/4 w.
R6	3R152-P202K	Composition: 2000 ohms ±10%, 1/4 w.
R7	3R152-P391K	Composition: 390 ohms ±10%, 1/4 w.
R8	3R152-P682K	Composition: 6800 ohms ±10%, 1/4 w.
R9	3R152-P202K	Composition: 2000 ohms ±10%, 1/4 w.
R10	3R152-P391K	Composition: 390 ohms ±10%, 1/4 w.
R11	3R152-P511K	Composition: 510 ohms ±10%, 1/4 w.
R12	3R152-P123K	Composition: 12,000 ohms ±10%, 1/4 w.
R13	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R14	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
R15	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R16	3R152-P822K	Composition: 8200 ohms ±10%, 1/4 w.
R17	3R152-P203K	Composition: 20,000 ohms ±10%, 1/4 w.
R18	3R152-P104K	Composition: 0.1 megohm ±10%, 1/4 w.
R19	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R20	3R152-P332K	Composition: 3300 ohms ±10%, 1/4 w.
R21	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R22	3R152-P681K	Composition: 680 ohms ±10%, 1/4 w.
R24	3R152-P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R25*	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w. In Models 4ER41A28-33 of Rev K or earlier: In Models 4ER41A40-45 of Rev J or earlier:
	3R152-P471K	Composition: 470 ohms ±10%, 1/4 w.
R26*	3R152-P471K	Composition: 470 ohms ±10%, 1/4 w. Added by Rev L in Models 4ER41A28-33. Added by Rev K in Models 4ER41A40-45.

SYMBOL	G-E PART NO	DESCRIPTION
S1*	7481654-P7	- - - - - - - - - SWITCHES - - - - - - - - - Pushbutton: single pole, normally closed, 1/10 amp at 115 VAC; sim to Grayhill 30-2. Deleted by Rev K in Models 4ER41A40-45. Deleted by Rev L in Models 4ER41A28-33.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1 and T2		COIL ASSEMBLY
T1	19B204424-G1	(4ER41A28, 30, 32, 40, 42, 44)
T2	19B204424-G2	(4ER41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496218-P50	Ceramic disc: 30 pf ±5%, 500 VDCW, temp coef 0 PPM.
C2	7489162-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C36	5496218-P46	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L8	19A121099-P1	Coil. Includes tuning slug 5491798-P5.
T3 and T4		COIL ASSEMBLY
T3	19B204425-G1	(4ER41A28, 30, 32, 40, 42, 44)
T4	19B204425-G2	(4ER41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C5	5496218-P48	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM.
C7	7489162-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C37	5496218-P44	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L9	19A121100-P1	Coil. Includes tuning slug 5491798-P5.
T5 and T6		COIL ASSEMBLY
T5	19B204426-G1	(4ER41A28, 30, 32, 40, 42, 44)
T6	19B204426-G2	(4ER41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C9	7489162-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C10	5496218-P48	Ceramic disc: 24 pf ±5%, 500 VDCW, temp coef 0 PPM.
C38	5496218-P45	Ceramic disc: 18 pf ±5%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L10	19A121100-P1	Coil. Includes tuning slug 5491798-P5.
T7 and T8		COIL ASSEMBLY
T7	19B204427-G1	(4ER41A28, 30, 32, 40, 42, 44)
T8	19B204427-G2	(4ER41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C15	7489162-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C26	5496218-P46	Ceramic disc: 20 pf ±5%, 500 VDCW, temp coef 0 PPM.
C39	5496218-P44	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L11	19A121102-P1	Coil. Includes tuning slug 5491798-P5.

SYMBOL	G-E PART NO	DESCRIPTION
T9 and T10		COIL ASSEMBLY
T9	19B204428-G1	(4ER41A28, 30, 32, 40, 42, 44)
T10	19B204428-G2	(4ER41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C19	7489162-P39	Silver mica: 330 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C27	5496218-P47	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef 0 PPM.
C40	5496218-P44	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L12	19A121103-P1	Coil. Includes tuning slug 5491798-P5.
L13	19A121104-P1	Coil. Includes tuning slug 5491798-P5.
A322		CHANNEL GUARD 19C303550-G2 (Used in Models 4ER41A40-45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	5491459-P104	Polyester: .068 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C3	5491459-P102	Polyester: 0.15 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C4	5491459-P105	Polyester: 0.1 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C7	5491459-P105	Polyester: 0.1 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C8*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
	5491459-P109	In Models of Rev T and earlier: Polyester: 0.33 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C12	5495670-P14	Tubular: 5 pf +75% -10%, 25 VDCW; sim to Sprague 30B.
C14 and C15	5491459-P106	Polyester: .01 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C16 and C17	5491459-P110	Polyester: .0015 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C18	5491459-P111	Polyester: .0033 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C19*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
	5491459-P109	In Models of Rev T and earlier: Polyester: 0.33 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C20	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C21*	5491459-P108	Polyester: .047 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
	5491459-P104	In Models of Rev T and earlier: Polyester: .068 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C22	5491459-P109	Polyester: 0.33 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C23*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE. In Models of Rev T and earlier:
	5491459-P112	Polyester: 0.47 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C24 and C25	5491459-P108	Polyester: .047 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C26 and C27	5491459-P105	Polyester: 0.1 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C28	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.
C29	5491459-P101	Polyester: .033 µf ±10%, 50 VDCW; sim to Good-All Type 601PE.

SYMBOL	G-E PART NO	DESCRIPTION
C30*	5491459-P103	Polyester: 0.22 µf ±10%, 50 VDCW; sim to Good-All Type 601PE. Added by Rev U.
C31*	5491459-P105	Polyester: 0.1 µf ±10%, 50 VDCW; sim to Good-All Type 601PE. Added by Rev U.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1 and CR2	4038056-P1	Germanium.
CR3	19A115250-P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J3 thru J6	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
J8 thru J10	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1*	19A115690-P2	Coil.
	19B204554-G1	In Models of Rev T and earlier: Coil.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q6	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 and R2	3R77-P752J	Composition: 7500 ohms ±5%, 1/2 w.
R3	3R77-P472J	Composition: 4700 ohms ±5%, 1/2 w.
R4 and R5	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R6	3R77-P560J	Composition: 56 ohms ±5%, 1/2 w.
R7	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R8 and R9	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R10	3R77-P752J	Composition: 7500 ohms ±5%, 1/2 w.
R11	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R12	3R77-P622J	Composition: 6200 ohms ±5%, 1/2 w.
R13	3R77-P271J	Composition: 270 ohms ±5%, 1/2 w.
R14	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R15 and R16	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R17	3R77-P822J	Composition: 8200 ohms ±5%, 1/2 w.
R18	3R77-P823J	Composition: 82,000 ohms ±5%, 1/2 w.
R19	3R77-P123J	Composition: 12,000 ohms ±5%, 1/2 w.
R20	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R21	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R22 and R23	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R24*	3R77-P331J	Composition: 330 ohms ±5%, 1/2 w. Added by Rev XA.
R25	3R77-P201J	Composition: 200 ohms ±5%, 1/2 w.
R26*	3R77-P203J	Composition: 20,000 ohms ±5%, 1/2 w. Deleted by Rev XA.
R27	3R77-P202J	Composition: 2000 ohms ±5%, 1/2 w.
R28	3R77-P512J	Composition: 5100 ohms ±5%, 1/2 w.
R29	3R77-P200J	Composition: 20 ohms ±5%, 1/2 w.
R30 and R31	3R77-P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R32 and R33	3R77-P682J	Composition: 6800 ohms ±5%, 1/2 w.
R35	3R77-P302J	Composition: 3000 ohms ±5%, 1/2 w.
R36	3R77-P103J	Composition: 10,000 ohms ±5%, 1/2 w.
R37	3R77-P184J	Composition: 0.18 megohm ±5%, 1/2 w.
R38	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R39*	3R77-P512J	Composition: 5100 ohms ±5%, 1/2 w. Added by Rev XA.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	5490525-P2	Audio freq: freq range 100-10,000 Hz, Pri: 35,000 ohms ±10% imp, 1200 ohms ±15% DC res, Sec 1: 2000 ohms imp, 250 ohms ±10% DC res, Sec 2: 2000 ohms imp, 250 ohms ±10% DC res.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XFL1	PL-19A121920-G2	Reed, mica-filled phen: 7 pins rated 1 amp at 500 VRMS with 3-11/32 inches of cable.
A323* and A324*		RF AMPLIFIER ASSEMBLY 19C303414-G6
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	7489162-P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C7	5493392-P7	Ceramic, feed-thru: .001 µf +100% -0%, 500 VDCW; sim to Allen Bradley Type FA5C.
C8	7489162-P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C9	5493392-P7	Ceramic, feed-thru: .001 µf +100% -0%, 500 VDCW; sim to Allen Bradley Type FA5C.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	4038642-P1	Germanium.
CR2	4038056-P1	Germanium.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L2	7488079-P7	Choke, RF: 1.5 µh +10%, 0.5 ohms DC res max, sim to Jeffers 4411-10.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115342-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R5	3R152-P153K	Composition: 15,000 ohms ±10%, 1/4 w.
R6	3R152-P512J	Composition: 5100 ohms ±5%, 1/4 w.
R7	3R152-P751J	Composition: 750 ohms ±5%, 1/4 w.
R8	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R9	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1 and TB2	7487424-P15	Miniature, phen: 2 terminals.
		In Models 4ER41A28-33 of Rev L thru Rev R: In Models 4ER41A40-45 of Rev K thru Rev P:
A323* and A324*		RF AMPLIFIER ASSEMBLY (Added by Rev K in Models 4ER41A40-45) (Added by Rev L in Models 4ER41A28-33)
		A323 19C303414-G3 (4ER41A28, 30, 32, 40, 42, 44) A324 19C303414-G4 (4ER41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	7489162-P127	Silver mica: 100 pf ±10%, 500 VDCW; sim to Electro Motive Type DM-15.
C2 and C3	5493392-P107	Ceramic, stand-off: .001 µf +100% -0%, 500 VDCW; sim to Allen-Bradley Type SS5A.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	4038642-P1	Germanium.
CR2	4038056-P1	Germanium.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	19A115342-P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P333J	Composition: 33,000 ohms ±5%, 1/4 w.
R2	3R152-P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R3	3R152-P471J	Composition: 470 ohms ±5%, 1/4 w.
R4	3R152-P101K	Composition: 100 ohms ±10%, 1/4 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1 and T2		COIL ASSEMBLY T1 19A121076-G1 (4ER41A28, 30, 32, 40, 42, 44) T2 19A121076-G2 (4ER41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C4	5496218-P244	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef -80 PPM.
C5	5496218-P241	Ceramic disc: 10 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
C6	5496218-P239	Ceramic disc: 8 pf ±0.25 pf, 500 VDCW, temp coef -80 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A121078-G1	Coil. Includes tuning slug 5491798-P5.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7487424-P15	Miniature, phen: 2 terminals.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XQ1	5490277-P5	Transistor, phen: 3 contacts rated 1 amp at 400 VRMS; sim to Alcon 1213LL2.
A326		IF/AUDIO ASSEMBLY 19D402327-G8
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	19A115028-P116	Polyester: 0.22 µf ±20%, 200 VDCW.
C2	5491189-P108	Polyester: 0.22 µf ±20%, 50 VDCW.
C3	19A115028-P111	Polyester: .047 µf ±20%, 200 VDCW.
C4	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C5	19A115028-P109	Polyester: .022 µf ±20%, 200 VDCW.
C6	19A115028-P111	Polyester: .047 µf ±20%, 200 VDCW.
C7	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C8	5496219-P717	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef -750 PPM.
C9	19A115028-P109	Polyester: .022 µf ±20%, 200 VDCW.
C10	19A115028-P114	Polyester: 0.1 µf ±20%, 200 VDCW.
C11	19A115028-P111	Polyester: .047 µf ±20%, 200 VDCW.
C12	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C13	5496218-P717	Ceramic disc: 47 pf ±10%, 500 VDCW, temp coef -750 PPM.
C14	19A115028-P109	Polyester: .022 µf ±20%, 200 VDCW.
C15	19A115028-P114	Polyester: 0.1 µf ±20%, 200 VDCW.
C16	5496219-P421	Ceramic disc: 100 pf ±10%, 500 VDCW, temp coef -220 PPM.
C17	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.

SYMBOL	G-E PART NO	DESCRIPTION
C18 and C19	19A115028-P109	Polyester: .022 µf ±20%, 200 VDCW.
C20	5496267-P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C21	19B209243-P17	Polyester: 0.22 µf ±20%, 250 VDCW.
C22	19A115028-P107	Polyester: .01 µf ±20%, 200 VDCW.
C23	5491000-P1	Tubular: 30 µf +75% -10%, 25 VDCW; sim to Sprague S45553.
C24	19A115028-P107	Polyester: .01 µf ±20%, 200 VDCW.
C25	5494481-P112	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C27	19B209243-P7	Polyester: 0.1 µf ±20%, 40 VDCW.
C29	19B209243-P17	Polyester: 0.22 µf ±20%, 250 VDCW.
C31	19B209243-P5	Polyester: .047 µf ±20%, 40 VDCW.
C32	19B209243-P17	Polyester: 0.22 µf ±20%, 250 VDCW.
C33	5496267-P28	Tantalum: 0.47 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C34	19B209243-P17	Polyester: 0.22 µf ±20%, 250 VDCW.
C35	5496267-P6	Tantalum: 33 µf ±20%, 10 VDCW; sim to Sprague Type 150D.
C37*	19A115028-P305	Polyester: .0068 µf ±10%, 200 VDCW.
	19A115028-P303	In Models 4ER41A28-33 of Rev G or earlier: In Models 4ER41A40-45 of Rev F or earlier: Polyester: .0033 µf ±10%, 200 VDCW.
C38	19A115680-P107	Electrolytic: 100 µf +150% -10%, 15 VDCW; sim to Mallory Type TT.
C39	5490008-P143	Silver mica: 470 pf ±10%, 300 VDCW; sim to Electro Motive Type DM-15.
C48	5495670-P9	Tubular: 35 µf +75% -10%, 15 VDCW; sim to Sprague 30D.
C50	5496267-P14	Tantalum: 15 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C52*	4029003-P16	Silver mica: 2200 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-20. Deleted by Rev H in Models 4ER41A28-33. Deleted by Rev G in Models 4ER41A40-45.
C53*	19A115028-P315	Polyester: 0.15 µf ±10%, 200 VDCW.
	19B209243-P7	In Models 4ER41A28-33 of Rev G or earlier: In Models 4ER41A40-45 of Rev F or earlier: Polyester: 0.1 µf ±20%, 40 VDCW.
C54*	7491930-P3	Tubular: .0047 µf ±20%, 100 VDCW. Deleted by Rev H in Models 4ER41A28-33. Deleted by Rev G in Models 4ER41A40-45.
C66*	19A115028-P307	Polyester: .01 µf ±10%, 200 VDCW. Added by Rev H in Models 4ER41A28-33. Added by Rev G in Models 4ER41A40-45.
C67*	4029003-P205	Silver mica: .002 µf ±2%, 500 VDCW; sim to Electro Motive Type DM-20. Added by Rev H in Models 4ER41A28-33. Added by Rev G in Models 4ER41A40-45.
C71*	5496267-P28	Tantalum: 0.47 µf ±20%, 35 VDCW. Added by Rev P in Models 4ER41A28-33. Added by Rev N in Models 4ER41A40-45.
C78*	5494481-P114	Ceramic disc: 2000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap. (Added by REV XD).
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	4038056-P1	Germanium.
CR3 and CR4	19A115250-P1	Silicon.
CR7	19A115250-P1	Silicon.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1 thru J24	4033513-P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	4031476-G1	Choke.
L4	5491736-P6	Choke: 3.5 mh ±10%, 2.5 ohms DC res; sim to Aladdin 33-494.

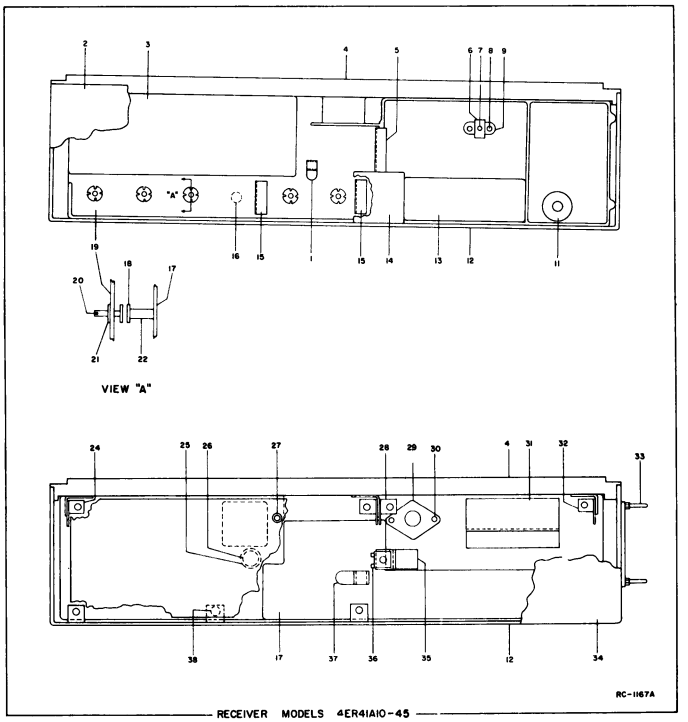
SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1 thru Q3	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q4* and Q5*	19A115552-P1	Silicon, NPN; sim to 2N2712. In Models 4ER41A28-33 of Rev N and earlier:
	19A115123-P1	In Models 4ER41A40-45 of Rev M and earlier: Silicon, NPN.
Q6	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q7	19A115889-P1	Silicon, NPN.
Q8	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
Q9	19A115247-P1	Silicon, PNP; sim to Type 2N1024.
Q10	19A115300-P1	Silicon, NPN; sim to Type 2N3053.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R77-P330K	Composition: 33 ohms ±10%, 1/2 w.
R2	3R77-P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R3	3R77-P183J	Composition: 18,000 ohms ±5%, 1/2 w.
R4	3R77-P101K	Composition: 100 ohms ±10%, 1/2 w.
R5	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w.
R6	3R77-P202J	Composition: 2000 ohms ±5%, 1/2 w.
R7	3R77-P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R8	3R77-P183J	Composition: 18,000 ohms ±5%, 1/2 w.
R9	3R77-P101K	Composition: 100 ohms ±10%, 1/2 w.
R10	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w.
R11	3R77-P202J	Composition: 2000 ohms ±5%, 1/2 w.
R12	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R13	3R77-P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R14	3R77-P183J	Composition: 18,000 ohms ±5%, 1/2 w.
R15	3R77-P101K	Composition: 100 ohms ±10%, 1/2 w.
R16	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w.
R17	3R77-P202J	Composition: 2000 ohms ±5%, 1/2 w.
R18	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R19	3R77-P473K	Composition: 47,000 ohms ±10%, 1/2 w.
R20	3R77-P183J	Composition: 18,000 ohms ±5%, 1/2 w.
R21	3R77-P472K	Composition: 4700 ohms ±10%, 1/2 w.
R23	3R77-P202J	Composition: 2000 ohms ±5%, 1/2 w.
R24	3R77-P682K	Composition: 6800 ohms ±10%, 1/2 w.
R25	3R77-P183J	Composition: 18,000 ohms ±5%, 1/2 w.
R26	3R77-P102J	Composition: 1000 ohms ±5%, 1/2 w.
R27	3R77-P683K	Composition: 68,000 ohms ±10%, 1/2 w.
R28	3R77-P222J	Composition: 2200 ohms ±5%, 1/2 w.
R29 and R30	3R77-P753J	Composition: 75,000 ohms ±5%, 1/2 w.
R31	3R77-P512J	Composition: 5100 ohms ±5%, 1/2 w.
R34	3R77-P113K	Composition: 11,000 ohms ±10%, 1/2 w.
R36	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R37	3R77-P222J	Composition: 2200 ohms ±5%, 1/2 w.
R38	3R77-P751J	Composition: 750 ohms ±5%, 1/2 w.
R39	3R77-P562J	Composition: 5600 ohms ±5%, 1/2 w.
R40	3R77-P113K	Composition: 11,000 ohms ±10%, 1/2 w.
R44	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w.
R45	3R77-P181K	Composition: 180 ohms ±10%, 1/2 w.
R46*	3R77-P333K	Composition: 33,000 ohms ±10%, 1/2 w. Deleted in Models 4ER41A28-33 by Rev P. Deleted in Models 4ER41A40-45 by Rev N.
R47	19B209115-P1	Variable, carbon film: 5000 ohms ±20%, 0.15 w; sim to CTS Type UPE-70.
R48	3R77-P222J	Composition: 2200 ohms ±5%, 1/2 w.
R49	3R77-P821K	Composition: 820 ohms ±10%, 1/2 w.
R50	3R77-P392K	Composition: 3900 ohms ±10%, 1/2 w.
R51	19B209022-P15	Wirewound: 1 ohm ±5%, 2 w; sim to IRC Type BWH.
R52	3R77-P152K	Composition: 1500 ohms ±10%, 1/2 w.
R53	5495948-P444	Deposited carbon: 0.28 megohm ±1%, 1/2 w; sim to Texas Instrument Type CD1/2MR.
R59	3R77-P512K	Composition: 5100 ohms ±10%, 1/2 w.
R61	3R77-P221K	Composition: 220 ohms ±10%, 1/2 w.
R65*	3R77-P123K	Composition: 12,000 ohms ±10%, 1/2 w. Deleted by Rev H in Models 4ER41A28-33. Deleted by Rev G in Models 4ER41A40-45).
R66	3R77-P223K	Composition: 22,000 ohms ±10%, 1/2 w.
R67*	3R77-P332J	Composition: 3300 ohms ±5%, 1/2 w. Added by Rev H in Models 4ER41A28-33. Added by Rev G in Models 4ER41A40-45.
R68	3R77-P134J	Composition: 0.13 megohm ±5%, 1/2 w.
R69*	3R77-P392J	Composition: 3900 ohms ±5%, 1/2 w. Deleted by Rev H in Models 4ER41A28-33. Deleted by Rev G in Models 4ER41A40-45.
R70*	3R77-P471J	Composition: 470 ohms ±5%, 1/2 w. Deleted by Rev H in Models 4ER41A28-33. Deleted by Rev G in Models 4ER41A40-45.
R74*	3R77-P153K	Composition: 15,000 ohms ±10%, 1/2 w. Added by Rev P in Models 4ER41A28-33. Added by Rev N in Models 4ER41A40-45.
R75*	3R77-P183K	Composition: 18,000 ohms ±10%, 1/2 w. Added by Rev P in Models 4ER41A28-33. Added by Rev N in Models 4ER41A40-45.
R80*	3R152-P511J	Composition: 510 ohms ±5%, 1/4 w. Added by Rev T in Models 4ER41A28-33. Added by Rev S in Models 4ER41A40-45.
		- - - - - - - - - THERMISTORS - - - - - - - - -
RT1	19B209143-P2	Rod: 4000 ohms ±10%, 1 w max; sim to Globar Type 789F-12.
RT2	19B209143-P3	Rod: 850 ohms ±10%, 1 w max; sim to Globar Type 789F.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1		DISCRIMINATOR ASSEMBLY 19C303612-G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C41 and C42	19B209196-P1	Ceramic disc: 280 pf ±5%, 500 VDCW, temp coef -115 ±30 PPM.
C45	7489162-P43	Silver mica: 470 pf ±5%, 300 VDCW; sim to Electro Motive Type DM-15.
C46	7489162-P35	Silver mica: 220 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-15.
C47	5491189-P4	Polyester: .047 µf ±20%, 50 VDCW; sim to Good-All Type 601PE.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR5 and CR6	19A115250-P1	Silicon.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R56	3R152-P331J	Composition: 330 ohms ±5%, 1/4 w.
R57 and R58	3R152-P473J	Composition: 47,000 ohms ±5%, 1/4 w.
A333*		HI LEVEL SHUT OFF SWITCH 19C303985-G2 Added in Models 4ER41A28-33 by Rev W. Added in Models 4ER41A40-45 by Rev V.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496219-P237	Ceramic disc: 6 pf ±5%, 500 VDCW.

SYMBOL	G-E PART NO	DESCRIPTION
C2	19B209243-P1	Polyester: .01 µf ±20%, 40 VDCW.
C3	5494481-P111	Ceramic disc: .001 µf ±20%, 1000 VDCW; sim to RMC Type JF Discap.
C4 thru C6	7491827-P2	Ceramic disc: .01 µf +80% -30%, 50 VDCW; sim to Sprague 19C180.
C7	7774750-P11	Ceramic disc: .005 µf +100% -0%, 500 VDCW.
C8	19B209243-P3	Polyester: .022 µf ±20%, 40 VDCW.
C9 and C10	5496267-P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR1	4038056-P1	Germanium.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19C307007-P3	Coil, RF:39 µh ±10%, 1.8 ohms DC res max; sim to Delevan 1537-727.
L2	7488079-P48	Choke, RF: 27 µh ±10%, 1.4 ohms DC res max; sim to Jeffers 4422-9.
L3	19C307007-P3	Coil, RF: 39 µh ±10%, 1.8 ohms DC res max; sim to Delevan 1537-727.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115245-P1	Silicon, NPN.
Q2	19A115123-P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.
R2	3R152-P123K	Composition: 12,000 ohms ±10%, 1/4 w.
R3	3R152-P392K	Composition: 3900 ohms ±10%, 1/4 w.
R4	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R5	3R152-P202J	Composition: 2000 ohms ±5%, 1/4 w.
R6	3R152-P562K	Composition: 5600 ohms ±10%, 1/4 w.
R7 and R8	3R152-P681K	Composition: 680 ohms ±10%, 1/4 w.
R9	3R152-P302J	Composition: 3000 ohms ±5%, 1/4 w.
R10	3R152-P683J	Composition: 68,000 ohms ±5%, 1/4 w.
A334*		FIRST MIXER 19B204430-G10 Added in Models 4ER41A28-33 by Rev W. Added in Models 4ER41A40-45 by Rev V.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5494481-P14	Ceramic disc: .002 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C2	5494481-P114	Ceramic disc: .002 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C3	5491271-P106	Variable: approx 1.98 to 12.4 pf, 750 v peak; sim to EF Johnson 189-6-5.
C4	5496218-P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C5	5494481-P114	Ceramic disc: .002 µf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
C6	5494481-P12	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C7	5496218-P247	Ceramic disc: 22 pf ±5%, 500 VDCW, temp coef -80 PPM.
C20	5496218-P44	Ceramic disc: 15 pf ±5%, 500 VDCW, temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	19A121082-G1	Toroidal coil.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	19A115342-P1	Silicon, NPN.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R2	3R152-P822J	Composition: 8200 ohms ±5%, 1/4 w.
R4	3R152-P102J	Composition: 1000 ohms ±5%, 1/4 w.
R10	3R152-P243J	Composition: 24,000 ohms ±5%, 1/4 w.
R11	3R152-P622J	Composition: 6200 ohms ±5%, 1/4 w.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C309	19B209135-P1	Ceramic, feed-thru: 1000 pf +150% -0%, 500 VDCW.
C310		
C315* and C316*	5496267-P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D. Deleted in Models 4ER41A28-33 by Rev W. Deleted in Models 4ER41A40-45 by Rev V.
C317	5494481-P12	Ceramic disc: .001 µf ±10%, 500 VDCW; sim to RMC Type JF Discap.
C318*	7774750-P4	Ceramic disc: .001 µf +100% -0%, 500 VDCW. Added by Rev K in Models 4ER41A28-33. Added by Rev J in Modles 4ER41A40-45.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - - - -
CR301*	4037822-P1	Silicon. (Added by REV XC).
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL301		Reed, detector: coil - 600 ohms ±10%, standard 7-pin tube socket mounting.
	19C307140-P670	67.0 Hz
	19C307140-P719	71.9 Hz
	19C307140-P770	77.0 Hz
	19C307140-P825	82.5 Hz
	19C307140-P885	88.5 Hz
	19C307140-P948	94.8 Hz
	19C307140-P1000	100.0 Hz
	19C307140-P1035	103.5 Hz
	19C307140-P1072	107.2 Hz
	19C307140-P1109	110.9 Hz
	19C307140-P1148	114.8 Hz
	19C307140-P1188	118.8 Hz
	19C307140-P1230	123.0 Hz
	19C307140-P1273	127.3 Hz
	19C307140-P1318	131.8 Hz
	19C307140-P1365	136.5 Hz
	19C307140-P1413	141.3 Hz
	19C307140-P1462	146.2 Hz
	19C307140-P1514	151.4 Hz
	19C307140-P1567	156.7 Hz
	19C307140-P1622	162.2 Hz
	19C307140-P1679	167.9 Hz
	19C307140-P1738	173.8 Hz
	19C307140-P1799	179.9 Hz
	19C307140-P1862	186.2 Hz
	19C307140-P1928	192.8 Hz
	19C307140-P2035	203.5 Hz
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J442	19B205689-G2	Connector: 18 contacts.
J443	19C303426-G1	Connector: 20 pin contacts.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P301 thru P309	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P310	4029840-P1	Contact, electrical: sim to Amp 41854.
P311 thru P320	4029840-P2	Contact, electrical: sim to Amp 42827-2.
P321	4029840-P1	Contact, electrical: sim to Amp 41854.
P322 thru P337	4029840-P2	Contact, electrical: sim to Amp 42827-2.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q301*	19A115527-P1	Silicon, NPN. In Models 4ER41A28-33 of Rev H or earlier: In Models 4ER41A40-45 of Rev G or earlier:
	19A115246-P1	Silicon, NPN; sim to Type 2N1701.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R301* and R302*	3R152-P681K	Composition: 680 ohms ±10%, 1/4 w. Deleted in Models 4ER41A28-33 by Rev W. Deleted in Models 4ER41A40-45 by Rev V.
R303	3R152-P102K	Composition: 1000 ohms ±10%, 1/4 w.

SYMBOL	G-E PART NO	DESCRIPTION
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T301*	19B209083-P2	Audio freq: Pri 1: 19 ohms ±10% imp at 3 w, 0.866 ohm DC res max, Sec 1: 3.5 ohms ±10% imp at 3 w, 0.222 ohm DC res max.
	19B209083-P1	In Models 4ER41A28-33 of Rev H or earlier: In Models 4ER41A40-45 of Rev G or earlier: Audio freq: Pri 1: 19 ohms ±10% imp at 3 w, 0.866 ohm DC res max, Sec 1: 3.5 ohms ±10% imp at 3 w, 0.222 ohm DC res max.
		- - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	7487424-P7	Miniature, phen: 4 terminals.
		RF CIRCUIT ASSEMBLY
		PL-19C303472-G3 (4ER41A28, 30, 32, 40, 42, 44) PL-19C303472-G4 (4ER41A29, 31, 33, 41, 43, 45)
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C301 thru C306		Refer to Mechanical Parts (RC-1167).
C307 thru C314	19B209135-P1	Tubular, feed-thru: .001 µf +150% -0%, 500 VDCW.
C318*	7774750-P4	Ceramic disc: .001 µf +100% -0%, 500 VDCW. Added in Models 4ER41A28-33 by Rev K. Added in Models 4ER41A40-45 by Rev J.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J441		(Part of W441).
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L307*	19B204461-G13	Coil. In Models of 4ER41A28-33 of Rev S and earlier: In Models of 4ER41A40-45 of Rev R and earlier:
	19B204461-G4	Coil.
L309*	19B204461-G14	Coil. In Models of 4ER41A28-33 of Rev S and earlier: In Models of 4ER41A40-45 of Rev R and earlier:
	19B204461-G3	Coil.
		- - - - - - - - - - CABLES - - - - - - - - - -
W441	19B209122-P1	Connector, coaxial: includes cable jack (J441), approx 5 inches long.
		MECHANICAL PARTS (SEE RC-1167)
1	7145451-P1	Cable clamp.
2	19C303495-G3	Top Cover, Station Receiver. (Except Repeaters and VM).
	19C303676-G2	Top Cover, Station Receiver. (Repeaters and VM).
	19C303385-G2	Top Cover, Mobile Receiver.
3	19B204890-P1	(Not used).
4	19C303394-G1	Heat sink.
5	19A121222-P1	Angle support. (Used with C311, 312 in RF Circuit Assembly, PL-19C303472-G3, 4).
6	4033089-P1	Clip. (Part of XY1-4 in A308-313).
7	19B200525-P9	Rivet. (Part of XY1-4 in A308-313).
8	19A115793-P1	Electrical contact. (Part of XY1-4 in A308-313).
9	19C311172-P1	Crystal socket. (Part of XY1-4 in A308-313).
10	4029739-P2	Can. (Part of L1-3 in A316).
11	4034252-P5	Can. (Part of T1 in A316).
12	PL-19C303389-G1	Chassis.
13	19B204396-P1	Support. (Used in A306, 307).
14	19A121071-P1	Plate.
15	19A121221-P1	Angle support. (Used with C307-314 in RF Circuit Assembly, PL-19C303472-G3, 4).

SYMBOL	G-E PART NO	DESCRIPTION
16	7162414-P1	Mounting ring, transistor socket: sim to Elco 757. (Used with Q1 in A301 and 302).
17	19B204397-P1	RF plate.
18	PL-4036765-G2	Screw: 6-32 threads. (Part of C301-306 in RF Circuit Assembly, PL-19C303472-G3 and 4).
19	19D402607-P1	RF chassis. (Used in RF Circuit Assembly, PL-19C303472-G3, 4).
20	PL-4036765-G4	Screw: 6-32 threads. (Part of C301-306 in RF Circuit Assembly, PL-19C303472-G3 and 4).
21	7117825-P1	Spring, washer: 6-32 threads; sim to Tinnerman C4578B-632-24. (Part of C301-305 in RF Circuit Assembly, PL-19C303472-G3 and 4).
22	4036899-P4	Ceramic insulator: sim to Centralab 3BX845C. (Part of C301-306 in RF Circuit Assembly, PL-19C303472-G3 and 4).
23	4033986-P6	(Not used).
24	PL-19B204583-G3	Hinge.
25	4035439-P1	Transistor heat sink. sim to Birtcher 3AL-635-2R. (Used with Q10 in A326).
26	4036555-P1	Washer insulator: nylon. (Used with Q9 and 10 in A326).
27	4035306-P11	Fiber washer. (Used with L1 in A326).
28	PL-19B204583-G1	Hinge.
29	19A115784-P1	Insulator. (Used with Q301).
30	19A121989-P1	Bushing. (Used with Q301).
31	PL-19A121229-G1	Angle support.
32	PL-19B204583-G2	Hinge.
33	19A121676-P1	Guide pin.
34	19C303495-G4	Bottom Cover, Station Receiver.
	19C303385-G1	Bottom Cover, Mobile Receiver.
35	19A121297-P1	Angle.
36	7160861-P4	Nut, spring clip. sim to Tinnerman C6452-8Z-157.
37	4029851-P6	Cable clamp: nylon; sim to Weckesser 5/16-4.
38	19A115461-P2	Spring washer. sim to Shakeproof 3597-04-00.



RECEIVER MODELS 4ER41A10-45

PRODUCTION CHANGES

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

REV.A - This revision was present in initial shipments.

REV.B - This revision was present in initial shipments.

REV.C - To minimize chance of interference, IF changed from 5.26 MC to 5.30 MC. Changed crystal filter A314 and crystal A316-Y1.

REV.D - To improve Channel Guard performance. Changed R26 and deleted R24 on Channel Guard Board A319/A322.

REV.E - To improve receiver performance in areas of high signal level. Deleted R3 and R4, added R15, R16, and R17 on 2nd Mixer A316.

REV.F - To stabilize blanker RF amplifier. Added R6 on 2nd RF Amplifier A303/A304.

REV.G - Models 4ER41A28-33 Only

To reduce noise falsing. Added R24, R39 and changed R26 on Channel Guard Decoder Board A319/A322.

REV.H - Models 4ER41A28-33 Only
REV.G - Models 4ER41A40-45 Only

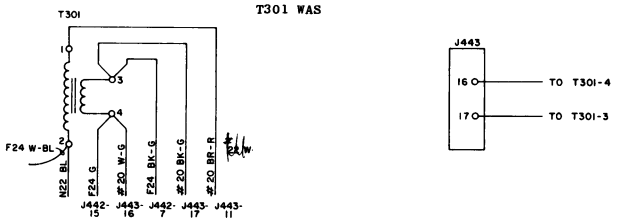
To improve audio response and raise maximum squelch sensitivity. Deleted C52, C54, R65, R69, R70; changed C37, C53; and added C66, C67, R67 on IF/Audio Board A326.

REV.J - Models 4ER41A28-33 Only
REV.H - Models 4ER41A40-45 Only

To incorporate value improvements in single-frequency receivers. Deleted CR1 and R5, added R19 on 1st Oscillator A308/A313.

To utilize improved transistor and to eliminate shorting of audio transformer terminals. Changed Q301 and T301.

T301 WAS



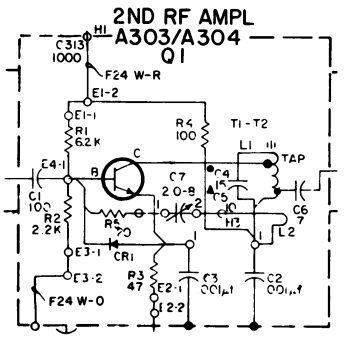
REV.K - Models 4ER41A28-33 Only
REV.J - Models 4ER41A40-45 Only

To eliminate feedback within receiver cabling. Added C318.

REV.L - Models 4ER41A28-33
REV.K - Models 4ER41A40-45

To improve noise blanker performance by applying blanking pulse to 1st and 2nd RF Amplifier stages. Added R26, removed S1, changed R25 and CR1 through CR5 on Noise Blanker board. Replaced 1st RF Amplifier A301/A302 with A323/A324. Removed L2, C7, R5, R6, changed Q1 and collector tap of L1 on 2nd RF Amplifier A303/A304.

2nd RF Amplifier Board A303/A304 was:



REV.M - Models 4ER41A28-33
REV.L - Models 4ER41A40-45

To eliminate spurious responses and to optimize the input load on the crystal filter. Deleted R3, changed R10 and Added R11 on 1st Mixer A305. Replaced R1 with R5 on Crystal Filter A314.

REV.N - Models 4ER41A28-33
REV.M - Models 4ER41A40-45

To allow for variations in audio response. Changed C21 on Channel Guard Board A319/A322.

REV.P - Models 4ER41A28-33
REV.N - Models 4ER41A40-45

To provide better temperature compensation for low IF circuitry. Changed C7, C10, and C11 on 2nd Mixer Board A316. To reduce variation in discriminator output and reduce audio rumble produced when volume control is at minimum and squelch near critical. Changed Q4 and Q5. Deleted R46, and added R74, R75, and C71 on the IF/Audio Board A326.

REV.R - Models 4ER41A28-33
REV.P - Models 4ER41A40-45

To improve temperature characteristics. Changed C4, C5, C7 through C16, L1, L2, L3, deleted L4, and changed L5 to L4 on 2nd Mixer Assembly A316.

REV.S - Models 4ER41A28-33
REV.R - Models 4ER41A40-45

To improve reliability. Changed 1st RF Amplifier Board A323/A324, and changed L307 and L309.

REV. T - Models 4ER41A28-33
REV. S - Models 4ER41A40-45

To improve circuit DC bias stability of Audio Amplifier Q10. Added R80 to A326.

REV. U - Models 4ER41A28-33
REV. T - Models 4ER41A40-45

To facilitate procurement of parts. Changed C8, C19, C23, and L1 on A319/A322. Changed C11 and added C28 to A319. Added C30 and C31 to A319/A322.

REV. V - Models 4ER41A28-33
REV. U - Models 4ER41A40-45

To reduce receiver lock-up in areas of high RF signal level. Deleted C5 and added C26 on the 2nd mixer board A316.

REV. W - Models 4ER41A28-33
REV. V - Models 4ER41A40-45

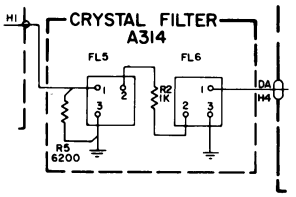
To improve performance at high signal levels. Changed 1st mixer board from A305 to A334. Added Q8 and C42 to A320/A321. Added Hi level shut-off switch A333.

REV. XA - Models 4ER41A28-33
REV. W - Models 4ER41A40-45

To improve 2nd mixer stability. Changed C26 on A316.

To improve selectivity. Changed FL5, deleted FL6 & R2 and added R8 on Crystal Filter A314.

Crystal Filter Schematic was:



REV. XA - Models 4ER41A40-45

To reduce noise falsing. Deleted R26 and added R24 & R39 to A322.

REV. XB - Models 4ER41A28-33 & 4ER41A40-45

To eliminate capacitor failures in positive ground installations. Changed C10 on A333. Changed C20 on A326.

REV. XC - To protect the audio output transistor (Q301) from negative voltage spikes. Added CR301 in the 12 volt supply line for Q301.

REV. XD - To eliminate high frequency oscillation in the receiver PA caused by the use of a higher gain PA transistor. Added C78 from the Audio Board A325-J16 to ground.

# #

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 G-E Part Number.

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

1. G-E 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-3596

DF-1085

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