MAINTENANCE MANUAL

GENERAL ELECTRIC PACER TWO-WAY FM RADIO

LBI–3202

150 - 174 Megacycle / 15 Watt
12 - Volt Mobile Combination

GENERAL ELECTRIC

communications

MAINTENANCE MANUAL

GENERAL ELECTRIC PACER

150-174 Megacycle

15-Watt, Narrow Band

12-Volt Mobile Combination

(Transmitter-Receiver Type ES-27-A)

LBI-3202E

15033

COMMUNICATION PRODUCTS DEPARTMENT

GENERAL ELECTRIC

LYNCHBURG, VIRGINIA

PRINTED IN U.S.A.

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* Note: LBI-3233 and EBI-4851 are not included in this manual.

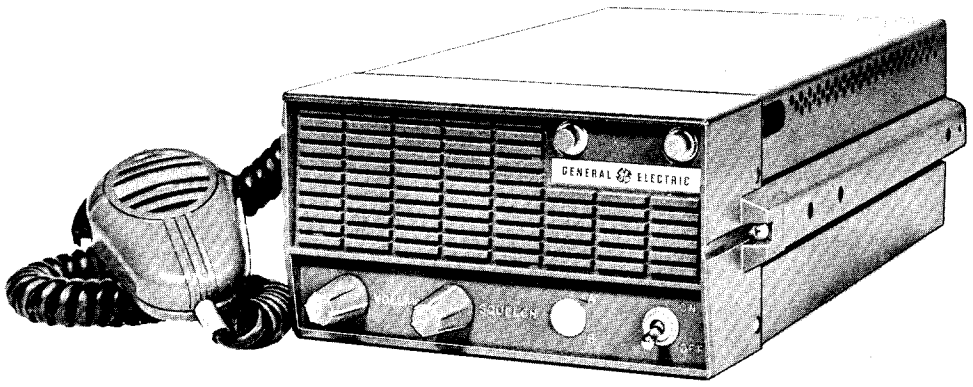
EQUIPMENT INDEX

150-174 MEGACYCLE, 15 WATT
GENERAL ELECTRIC PACER MOBILE COMBINATION

EQUIPMENT	MODEL OR PL NUMBER
1. Two-Way FM Radio Type ES-27-A	
Transmitter Board	Model 4EF20A10
Front End/Oscillator Board	
Single Frequency	Model 4EG15A10
Two Frequency	Model 4EG15A11
IF/Audio Board	Model 4EL12A10
Control Unit/Power Supply	Model 4EC38A10
Low Pass Filter	PL-5492951-G1
2. Case	PL-5496265-G1
3. Microphone	Model 4EM21A10
Microphone Bracket	PL-4035467-G1
4. Fuse Assembly	PL-5492966-G1
5. Mounting Hardware	PL-4034829-G1
6. Antenna	Model 4EY12C10
7. Antenna Cable	B-5491689-P23
8. Alignment Tool	A-4038831-P2

OPTIONAL EQUIPMENT	MODEL OR PL NUMBER
1. Channel Guard Option 4561	Model 4NS13A11
2. Two-Frequency Control Kit	PL-4035301-G1

GENERAL ELECTRIC PACER TWO-WAY FM RADIO



General Electric Pacer Two-Way FM Radios are extremely compact units especially designed for mobile service. The entire unit, including the built-in speaker, weighs only ten pounds, and is 4-1/2 inches high, 7-3/4 inches wide and 12-1/4 inches long. The small size of the unit, plus its light weight, makes it ideally suited for front-mount installations.

For circuit simplification and ease of maintenance, the Two-Way Radio utilizes printed wiring circuits throughout. These circuits are free of wiring errors, leads can be easily seen, and components are easily accessible. The tubes employed in the Two-Way Radio are highly efficient, long life tubes, specifically selected to meet the requirements of Two-Way Mobile Radio.

The use of transistors in the power supply provides several distinct advantages over the typical vibrator power supply. The resulting longer life and increased efficiency provides:

1. Reduced maintenance costs
2. Greater reliability
3. Lower battery drain
4. More compact construction

SPECIFI

GENERAL

Frequency Range	150-174 megacycles
Battery Voltage	13.8 VDC ±10% (will operate over range of ±20%, per EIA standards)
Battery Drain **	
Standby	4.2 amperes at 13.8 VDC
Transmit	7.5 amperes at 13.6 VDC
Dimensions (H x W x D)	4-1/4" x 7-3/4" x 12-1/2"
Weight	10 pounds
Duty Cycle	Transmit 20% (one minute transmit out of each five)
Operable Temp. Range	-30° C to +60° C
Number of Tubes	15 (one additional tube for 2-freq.)
Number of Transistors	2
Frequency Stability	Within ±.0005% of assigned center frequency over specified temperature range (reference 25° C) with crystal oven
Max. Recommended Freq. Spacing for 2-Freq. Operation	0.4% of operating frequency

TRANSMITTER

Power Output	15 watts
FCC Filing Designation	ES-27-A
Crystal Multiplication Factor	12
Spurious and Harmonic Radiation	At least 60 db below maximum radiation at operating frequency and rated power output

CATIONS *

Modulation	Adjustable from 0 to ±7-KC swing with instantaneous modulation limiting
Audio Frequency Characteristics	Within +1 db and -3 db of a 6-db/octave pre-emphasis curve from 300 to 3000 cps (1000-cps reference). Post-limiter filter per FCC and EIA requirements.

RECEIVER

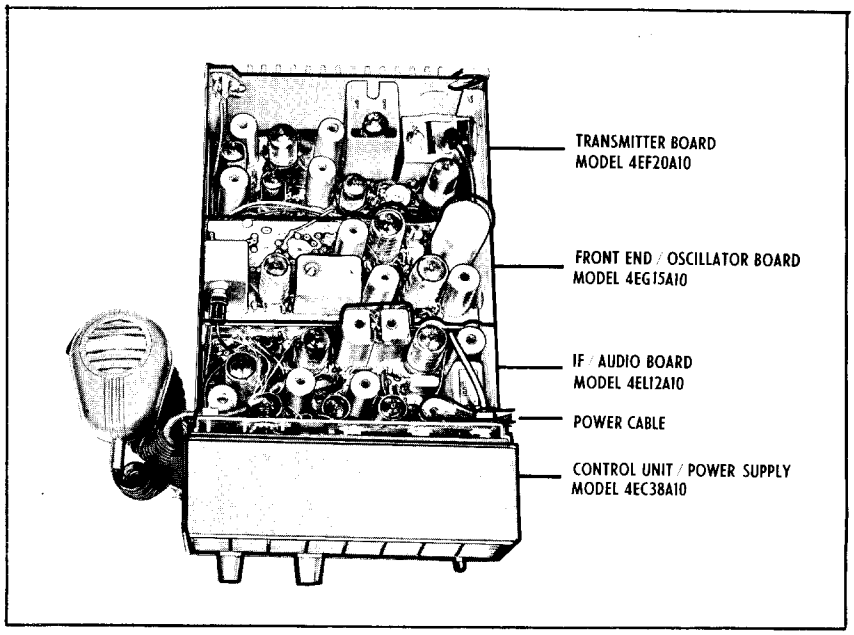
Sensitivity	0.7 microvolt for 20-db quieting 0.5 microvolt for 12-db SINAD
Selectivity (30-KC Channels)	
EIA Method ***	80 db down at ±30 KC (adjacent narrow-band channel)
20-db Quieting Method	100 db down at ±20 KC
Spurious Responses	80 db down
Modulation Acceptance	±6 KC (narrow band only)
Intermodulation (EIA Method)	70 db down at usable sensitivity
Squelch Sensitivity	Adjustable; will open at less than 0.25 microvolt at critical setting
Audio Characteristics (EIA Method)	Within +1 db and -8 db of a standard 6-db/octave de-emphasis curve from 300 to 3000 cps (1000-cps reference)
Audio Output	1.0 watt with less than 10% distortion 1.5 watts maximum

* Specifications are subject to change without advance notice.

** Add 150 ma for single frequency, 300 ma for 2-frequency.

*** Measured in accordance with industry-approved EIA Standard RS-204. The 20-db quieting method is not approved by either EIA or IRE.

The Two-Way Radio consists of a transmitter, receiver, and a combined control power supply. The transmitter and receiver printed wiring boards are assembled on a frame which is attached to the control housing. This permits the entire unit to slide out of the case as shown in figure 1.



As all metering points and tuning controls are located on the printed wiring boards, the "slide-out" feature of the General Electric Pacer insures easy accessibility for servicing. In addition, the printed wiring boards can be quickly removed or replaced, greatly reducing the number of spare units required.

Figure 1 - Module Layout

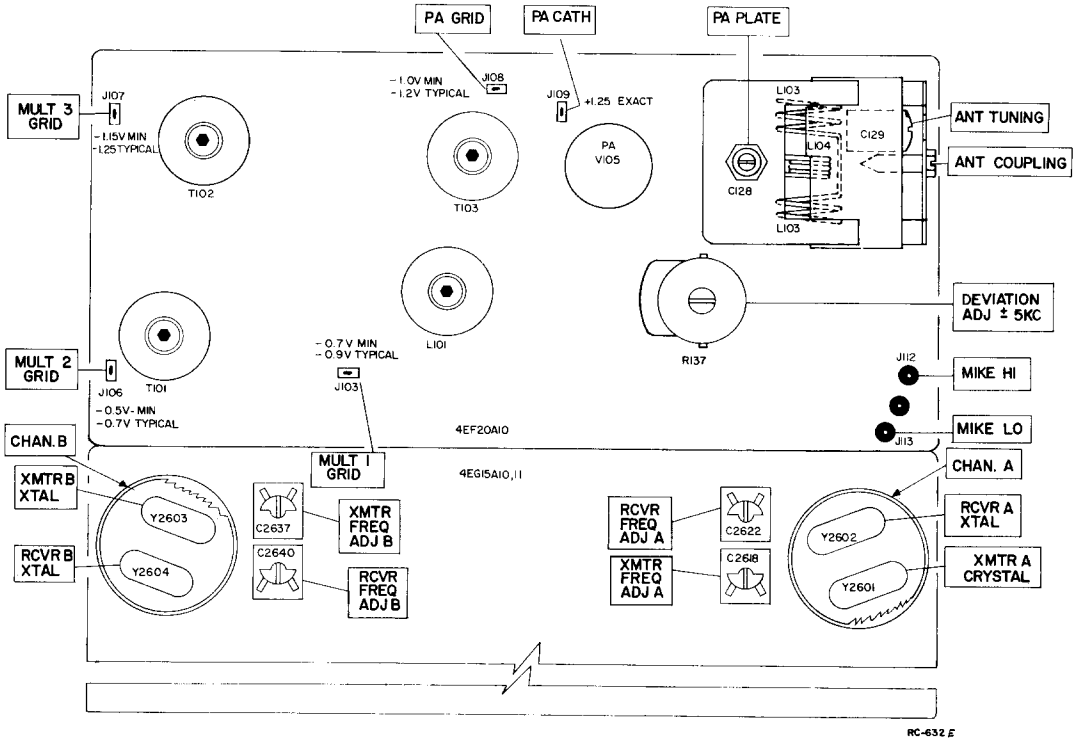


Figure 2 - Transmitter Adjustment Diagram

ADJUSTMENT

After the General Electric Pacer Two-Way Radio has been installed (as described in the Installation Manual), make sure that a RADIO TRANSMITTER IDENTIFICATION form (FCC Form 452-C or General Electric Form ECR-82) has been filled out and attached to the transmitter.

Each unit has been aligned to the specified frequency before shipment. However, several adjustments are necessary before placing the Two-Way Radio in operation. These adjustments must be made by an electronic technician who holds a First or Second Class FCC Radiotelephone Operators license.

Equipment required for the preliminary adjustment includes a screwdriver, a tuning tool, a 20,000-ohm-per-volt meter with a 0-3 volt scale, and a transmitter signal on the system frequency for adjusting the receiver.

TRANSMITTER ADJUSTMENT

The adjustment for the transmitter includes tuning and loading the power amplifier and checking the transmitter frequency and modulation. (Refer to Fig. 2.) Connect the antenna to the Antenna Jack J2152. Make sure that a crystal of the proper frequency is in the crystal oven located on the Front End/Oscillator Board. Adjust the antenna coupling to minimum by moving the slider (L104) away from PA Tube as far as possible. Then turn the set ON and allow three minutes for warmup.

1. Plug the negative probe into PA GRID Jack (J108). While keying the transmitter, alternately tune the top and bottom cores of T103 for maximum PA GRID reading (J108). Start with the top core all the way up (away from board), and bottom core all the way down (towards the board). Use the first meter peak as the cores move toward the center of the transformer.

2. Plug positive probe into PA CATH Jack (J109). While keying the transmitter, tune PA PLATE (C128) for minimum meter reading at PA CATH (J109).

3. Repeat Steps 1 and 2.

4. With meter in PA CATH (J109), increase ANT COUPLING by moving slider (L104) toward PA tube until meter reading begins to increase. Then adjust ANTENNA TUNING (C129) for maximum meter reading. DO NOT retune PA PLATE after loading the transmitter.

5. Increase coupling by moving slider (L104) until meter reading is 1.25 volts at PA CATH (J109).

6. When necessary, the transmitter can be netted to the system operating frequency by means of crystal trimmer C2618 on Front End/ Oscillator Board.

RECEIVER ADJUSTMENT

The adjustment for the receiver includes netting the receiver to the system operating frequency and matching the Antenna Transformer to the antenna. (Refer to RC-636) Make sure that the antenna is connected for the following adjustments:

1. Plug negative probe into LIM GRID Jack (J303).

2. While receiving a weak unmodulated signal (below limiting) on the system frequency, peak the antenna transformer (Z2601) trimmers C3 and C4.

3. Now, plug the negative probe into the DISC Jack (J304).

4. While receiving a strong unmodulated signal on the exact system frequency, note the meter reading. If the discriminator meter reads more than ±0.2 volt and the transmitter is known to be on frequency, adjust crystal trimmer C2622 on the Front End/Oscillator Board for zero discriminator reading. (Repeat for C2640 on CHAN B for 2-frequency units.)

5. Under no-carrier conditions, rotate the SQUELCH control on the Control Unit clockwise until noise is heard in the loud-speaker, and then counterclockwise until the noise just disappears. (For general use, turn the control past the point where the noise disappears.)

6. While monitoring a modulated signal, adjust the VOLUME control on the Control Unit for the desired listening level.

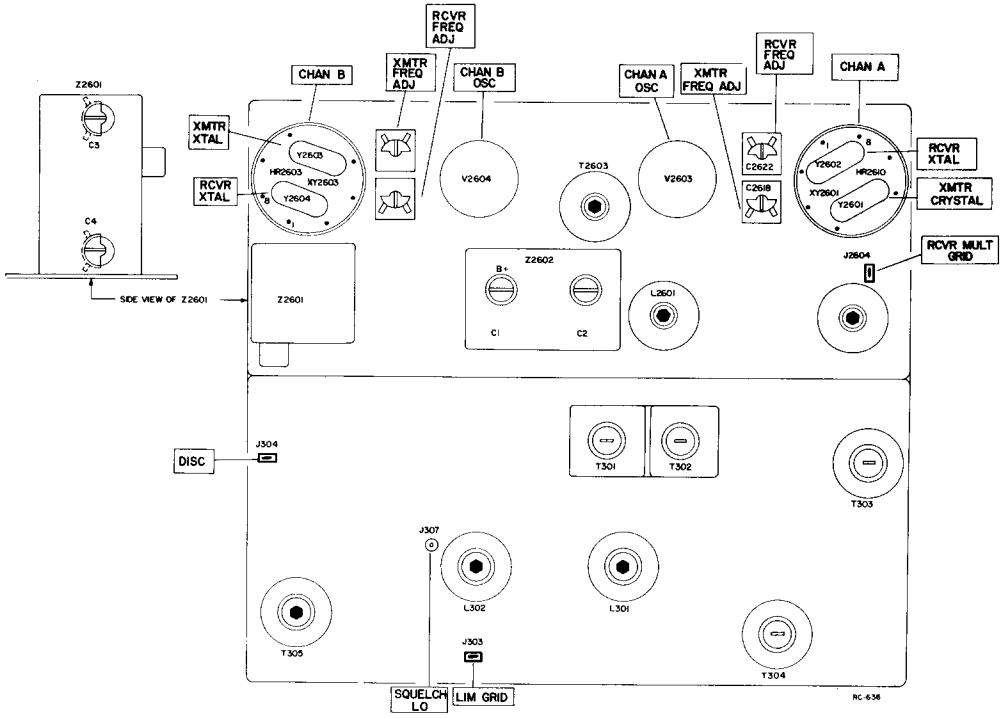


Figure 3 - Receiver Alignment Diagram

OPERATION

Power is applied to the Mobile Transmitter-Receiver by switching the Toggle Switch "ON". The green pilot light on the Control Unit will be illuminated while the equipment is operating, indicating the standby condition. The red pilot light will be turned on when the transmitter is on the air. Depressing the push-to-talk button on the microphone applies plate voltage to the transmitter. The red pilot light glows, the transmitter carrier is radiated, and the loudspeaker is muted. Upon release of the PTT button, the receiver becomes operative again and the red pilot light goes off. The two adjustable controls marked VOLUME and SQUELCH should be adjusted upon installation. The VOLUME control raises or lowers the sound level as heard from the loudspeaker. The SQUELCH control setting is an important adjustment for efficient operation. Essentially, its function is to mute the loudspeaker while no signals are being received.

MICROPHONE TECHNIQUE

Misuse of the microphone is probably the greatest single reason for so-called "poor transmitter performance." Some attention should, therefore, be given to the proper use of the microphone. When talking, the microphone should be held so that the operator talks directly across it, and the voice should be kept at a normal speaking level. If the operator speaks distinctly, in a normal voice, the message can be easily understood. It is to the operator's advantage to try a few calls and, through practice and constructive criticism at the receiving end, develop a microphone technique that is best suited to his characteristics of speech.

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CIRCUIT ANALYSIS

TRANSMITTER

The transmitter for the General Electric Pacer Two-Way FM Radio is a crystal-controlled, phase modulated transmitter, designed for operation on fixed frequencies within the 150-174 megacycle band.

Crystal frequencies for the transmitter range from 12.5 to 14.5 megacycles. The multiplier stages multiply the crystal frequency 12 times.

The complete transmitter (except for the oscillator) is assembled on Transmitter Board Model 4EF20A10, and uses six tubes to provide a nominal output of 13 watts. The tube line-up is as follows:

SYMBOL	TYPE	FUNCTION
V101	6AB4/6664	Phase Modulator
V102	6CB6/6676	1st Multiplier (tripler)
V103	6AK6	2nd Multiplier (doubler)
V104	7701	3rd Multiplier & Driver
V105	6360	Power Amplifier
V106	7716	Audio Amplifier & Modulation Limiter

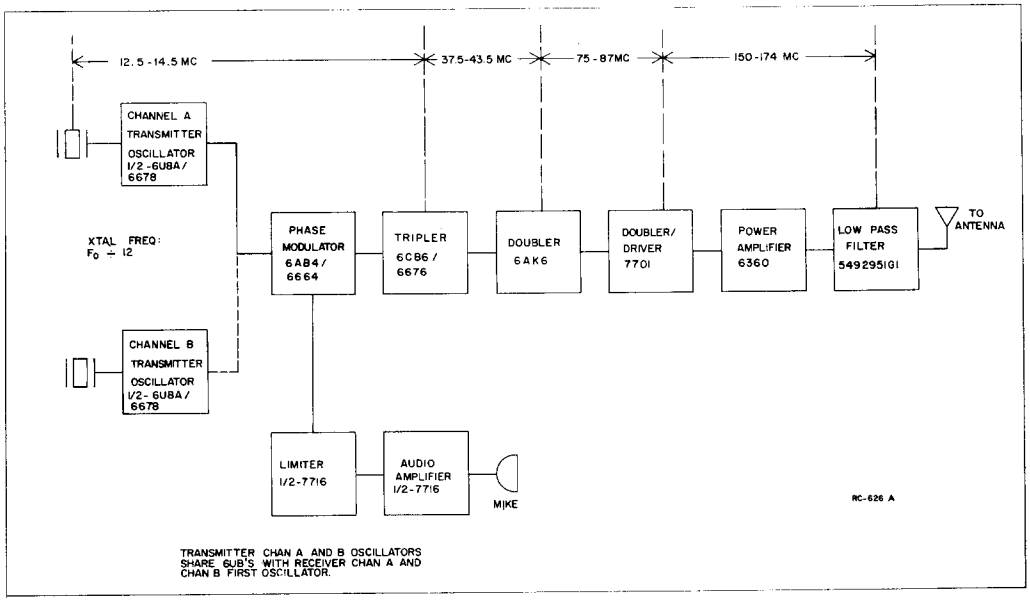


FIG. 4 - TRANSMITTER BLOCK DIAGRAM

Oscillator (Part of Front End/Oscillator Board)

The transmitter oscillator V2603-B consists of the triode half of a 6U8A in a crystal-controlled Colpitts circuit. A crystal oven main-

tains the crystal temperature at 85°C (185°F), providing a frequency stability of .0005%. The oscillator frequency can be adjusted by crystal trimmer C2618.

The RF output of the oscillator is applied to the grid of the Phase Modulator (V101) located on the Transmitter Board.

For two frequency operation, Front End/Oscillator Board Model 4EG15A11 is used. This board is similar to the 4EG15A10 except that a second oscillator stage (Channel B) is added. The proper channel is selected by switching the cathode of the desired oscillator to ground. The Channel B frequency can be adjusted by C2637.

RF Amplifier and Modulation Limiter

The audio amplifier and modulation limiter consists of a triode-pentode V106. The triode section (V106-B) is the audio amplifier and the pentode section (V106-A) is the limiter.

Audio from the microphone is applied directly to the grid of the audio amplifier V106-B. The pre-emphasis network C132 and R128 follows the amplifier stage and provides approximately 6 db-per-octave pre-emphasis.

The modulation limiter (V106-A) is essentially a voltage limiter which fixes the maximum peak voltage applied to the post-limiter filter and de-emphasis network. The limiter is biased so that positive audio peaks above a certain level drive the plate into saturation and limiting results. Negative peaks above a certain level drive the tube to cut-off, and limiting results. When the signal isn't strong enough to cause limiting. the limiter acts as a simple audio amplifier.

The combined de-emphasis network and post-limiter filter are required to reduce unwanted side-band energy developed as a result of limiting.

The de-emphasis network consists of R134, R135 and R136 in conjunction with C138 and provides approximately 6 db-per-octave roll-off. The post-limiter filter requirements are met by R134 and R135 in conjunction with C136 and C137.

Maximum frequency deviation is adjusted by R137.

Phase Modulator

Keying the transmitter applies B-plus voltage to the oscillator and RF stages of the transmitter. The RF output of the oscillator stage is applied to the grid of the phase modulator V101. When an audio modulating voltage from the de-emphasis network and post-limiter filter is coupled to the grid of the phase modulator, the resulting output is a phase modulated RF signal (indirect FM). The output of the phase modulator is R-C coupled to the grid of the first multiplier.

RECEIVER CIRCUIT ANALYSIS

Multipliers

The first multiplier (V102) is a frequency tripler, with the tank circuit tuned to three times the crystal frequency. The output of V102 is coupled to the grid of the second multiplier through a double-tuned transformer T101. The oscillator and modulator stages are metered at J103, MULT-1 GRID.

The second multiplier (V103) is a frequency doubler, whose tank circuit is tuned to six times the crystal frequency. The output of the multiplier is coupled by a double-tuned transformer T102 to the grid of the third multiplier. The MULT-2 GRID jack J106 is used in tuning T101.

V104 is a doubler-driver, providing drive for the power amplifier. The plate circuit is tuned to 12 times the crystal frequency. A double-tuned transformer couples the plate of the doubler-driver to the push-pull grids of the power amplifier. MULT-3 GRID jack J107 is used in tuning T102.

Power Amplifier

The transmitter uses a 6360 tube (V105) operating as a Class C, push-pull, self-neutralized power amplifier to obtain a RF power output of 13 watts. To avoid high voltage metering, the PA plate current is metered at J109 (PA CATH). The PA grid is metered at J108 (PA GRID).

Capacitor C128 tunes the plate tank circuit of the PA. High B-plus is supplied through choke L102. The screen grid dropping resistor is R125.

Transmitter loading is accomplished by varying the coupling between L103 and L104. The antenna circuit is tuned by C129.

RF output from the antenna coil is fed through the low-pass filter located on the frame under the Front End/Oscillator Board. The antenna switching relay (K701) is part of the Control Unit/Power Supply.

RECEIVER

The receiver for the General Electric Pacer Two-Way FM Radio employs a dual-conversion superhetrodyne circuit for operation on fixed frequencies in the 150-174 megacycle band. The receiver consists of the following assemblies:

1) Front End/Oscillator Board - Model 4EG15A10 (single frequency)

Model 4EG15A11 (two frequency)

2) IF/Audio Board - Model 4EL12A10 (150-174 Mc)

The receiver uses a total of nine tubes to provide an audio output of 1 watt. The tube line-up is as follows:

SYMBOL	TYPE	FUNCTION
4EG15A10		
V2601	7717/6CY5	RF Amplifier
V2602	6679/12AT7	1st Mixer & Multiplier
V2603A	6678/6U8A	1st Oscillator-CHAN A
V2604A	6678/6U8A	1st Oscillator-CHAN B
4EL12A10		
V301	6679/12AT7	2nd Oscillator & Mixer
V302	6676/6CB6	1st Low IF
V303	6661/6BH6	2nd Low IF
V304	6661/6BH6	Limiter
V305	7724/14GT8	Discriminator & Audio Amplifier
V306	7716	Noise Amplifier & Audio Amplifier

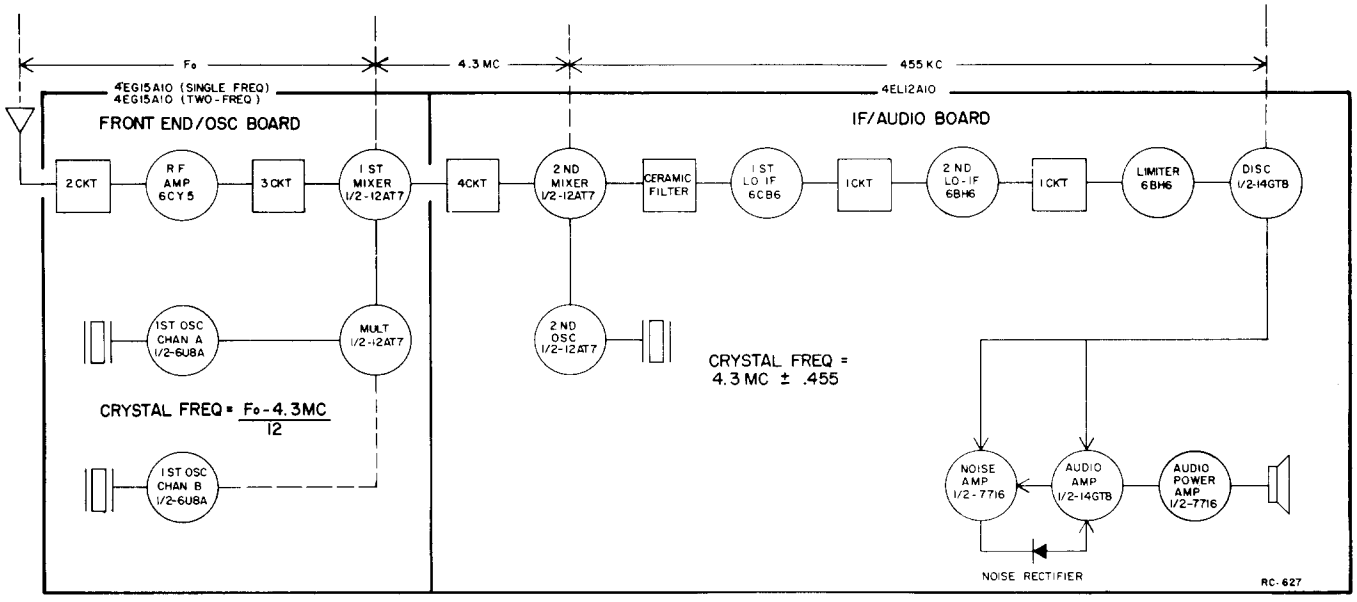


FIG. 5 - RECEIVER BLOCK DIAGRAM

Front End/Oscillator Board

RF Amplifier

RF signals from the antenna are coupled to the grid of the RF Amplifier V2601 through double-tuned transformer Z2601. This is an impedance matching transformer that also steps up the input voltage to the RF Amplifier. V2601, in conjunction with three tuned circuits (Z2601 and Z2602) provides the required selectivity and optimum signal-to-noise ratio. The output of V2601 is fed to the grid of the first mixer.

First Oscillator and Multiplier

First oscillator V2603A is a grounded plate Colpitts utilizing 1/2 of a 6U8A. The oscillator frequency can be adjusted slightly by trimmer C2622. For two-frequency operation, Front End/Oscillator Board Model 4EG15A11 is used. The oscillator plate tank is tuned to four times the crystal frequency. The output of the oscillator is coupled by Z2603, a double-tuned transformer, to the grid of the multiplier.

The plate tank of multiplier V2602B is tuned to twelve times the crystal frequency. This voltage is coupled to the cathode of the first mixer.

First Mixer

The first mixer V2602A heterodynes the signal from the RF Amplifier with the injection voltage from the oscillator to produce the first IF frequency of 4.3 megacycles.

IF/Audio Board

Additional selectivity is provided by feeding the output of the first mixer through IF Transformers T301 and T302 to the second mixer.

Second Mixer and Oscillator

The 4.3 megacycle output of the first mixer is applied to the grid of the second mixer V301. At the same time, the output of the second oscillator, a resistance-coupled Pierce, is applied to the grid of the second mixer, producing the Low IF frequency of 455 Kc.

Low IF Amplifiers

The output of the second mixer is applied to the Low IF Amplifier V302 through impedance matching transformer T303 to a ceramic filter Z301. The ceramic filter determines the bandwidth of the receiver by greatly attenuating the signal outside its pass band. T304 matches the low impedance filter to the high impedance input of V302, the First Low-IF amplifier.

Low IF Amplifiers V302 and V303 are high gain amplifiers and provide the gain required to saturate the limiter stage. V302 operates as a Class A amplifier at all times. The second Low IF Amplifier V303 operates as a Class A amplifier for weak to medium signal strengths and provides limiting action for strong signal amplitudes. Potentiometer R320, located in the cathode circuit, permits the IF gain to be set to the correct level for proper squelch operation. Plate tank coils L301 and L302 offer the proper resistance for maximum gain in the Low IF stages.

Limiter and Discriminator

Limiter V304 clips the positive and negative peaks of incoming signals to eliminate noise peaks in the form of amplitude modulation. The stage is metered at J303 (LIM GRID). Grid voltage from the limiter is filtered by R327 and C330 to provide a negative voltage for the grid of the noise amplifier.

The limiter output is coupled through discriminator coil T305 to the discriminator V305A. The Foster Seely type discriminator recovers audio voltage from the FM Signal. The output is metered at J304 (DISC).

Audio Circuit

The rectified audio voltage from the discriminator is filtered by C326, R323 and C327 and coupled through a de-emphasis network R325 and C328 to the grid of Audio Amplifier V305B. The output of V305B is R-C coupled to the audio output stage (V306B) which drives the output transformer and speaker.

Squelch Circuit

Under no-signal conditions, noise voltage is fed through a high-pass filter (C329 in conjunction with Squelch Potentiometer R702) to the grid of Noise Amplifier V306A. The output of V306A is rectified by CR301 and filtered by C333, R333 and C334. The resulting negative voltage is applied to the grid of Audio Amplifier V305B. This negative voltage acts as cut-off bias on the Audio Amplifier in the absence of an incoming signal.

The cathodes of the Noise Amplifier and Audio Amplifier V305B are tied to a common cathode resistor. As a result of the common cathode circuit, a small negative voltage from the rectified noise signal reduces the audio amplifier plate current, which in turn increases the bias and gain of the Noise Amplifier. The rectified noise voltage then goes more negative and the audio amplifier current is reduced until the audio stage is completely cut off.

When a signal is received, the reduced noise voltage causes a less negative voltage to appear at the audio amplifier grid, resulting in an increase in the plate current of the Audio Amplifier. The positive voltage on the common cathode increases until the Noise Amplifier is cut off.

Squelch Circuit (Cont'd)

When a signal is received, squelch clipping is prevented by supplying a negative voltage from the limiter grid to the noise amplifier grid, cutting the tube off.

CONTROL UNIT/POWER SUPPLY

Control Unit/Power Supply Model 4EC38A10 is designed for use with the General Electric Pacer Mobile Combination.

Control Unit

The cast aluminum Control Head contains the speaker, output and power transformers, indicator lights, volume and squelch controls, and the power transistors. The control head serves as a heat sink for the power transistors.

The frame portion of the unit is connected to the control head and has the Transmitter, Front End/Oscillator and IF/Audio Boards mounted on it. Also mounted on the frame is the low pass filter, the rear heat sink, antenna jack, mike jack, and power supply board.

All connections to the printed wiring boards are made by clip-on connectors on wires from the Control Unit/Power Supply. The power cable is soldered to the power supply board and is terminated in a 6-pin connector for connection to the Fuse Assembly.

Power Supply

The Power Supply may be used in vehicles having either a positive-grounded or negative-grounded battery system. The Fuse Assembly is shipped for negative-grounded systems but can be quickly adapted for positive-ground by interchanging the power leads between TB501-1 and TB501-3.

The Power Supply employs transistors in an inductively-coupled multivibrator circuit. The two transistors act as switches, with one conducting while the other is off. The multivibrator circuit is essentially a square wave generator, whose output is stepped up by a power transformer, then rectified and filtered to provide B-plus voltages for the transmitter and receiver.

Multivibrator Circuit (Figure 6)

The base bias divider network consists of an incandescent lamp I703 and resistor R702. When power is applied to the transistorized power supply circuit, the filament of I703 presents a very low resistance when cold. This establishes a heavy forward bias for cold starting. Immediately upon starting, the lamp filament warms up and increases in resistance to provide normal running bias for the transistors. Due to inherent differences in the transistors, one will start conducting before the other and will draw a heavier current through one-half of primary windings 1,2, and 3 of T701.

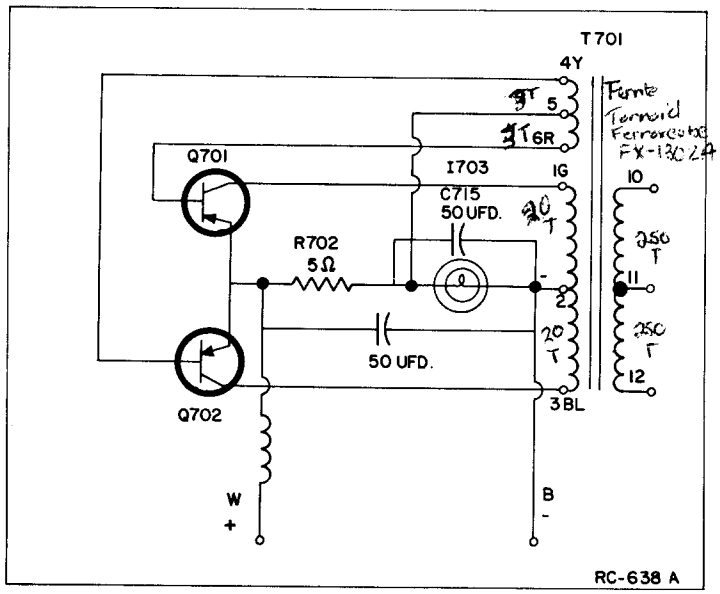


FIG. 6 - MULTIVIBRATOR CIRCUIT

Assume that Q701 starts to conduct first, causing a current to flow through primary winding 1-2. This current flow induces a voltage in all windings of the transformer. A negative voltage is induced in feedback winding 5-6 providing more forward bias to Q701, causing it to conduct more heavily. The positive voltage appearing on terminal 4 of the feedback winding acts to cut off Q702.

The current through primary winding 1-2 rapidly saturates the core of the transformer, which stops the magnetic field (flux) from increasing. With no change in the magnetic field, no voltages are induced in the windings. Therefore, the magnetic field starts to collapse, sending a current through transformer T701 in the opposite direction. This reverses the polarity of the induced voltage in the windings, which cuts off Q701 and provides forward bias to Q702, causing it to begin to conduct. The frequency of the a-c supply is approximately 750-850 cycles per second.

Rectifier and Filter Circuits (Figure 7)

The power supply provides two DC output voltages for transmitter and receiver B-plus. Filament voltage is taken directly from the vehicle battery.

The AC voltage developed across high voltage windings 10-11-12 is rectified by a full wave bridge rectifier consisting of silicon diodes CR701, 2, 3, and 4. The output is filtered by a simple capacitor input filter section C702.

Low B-plus is obtained from center-tap winding 11 and is rectified by full wave rectifier CR702 and CR703. The output filter consists of two L sections R701-C701-G and R705-C701-R.

A simplified diagram of these circuits is shown in figure 5.

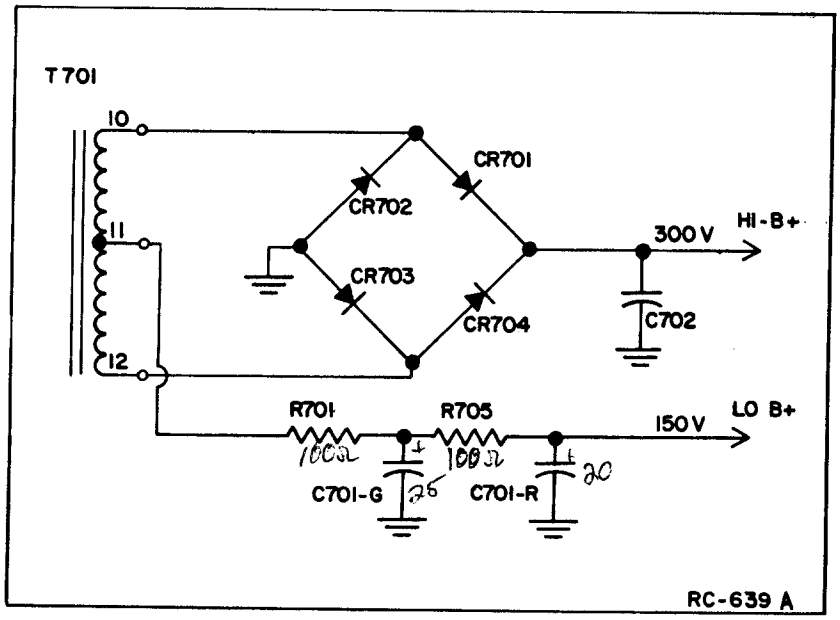


FIG. 7 - RECTIFIER AND FILTER CIRCUITS

Transmitter B-Plus

Keying the transmitter energizes Relay K701, which applies low B-plus to the oscillator, phase modulator and multipliers, and high B-plus to the PA Plate. A constant low B-plus voltage is supplied to the Driver and Audio Amplifier and Modulation Limiter.

Receiver B-Plus

When the transmitter is unkeyed, low B-plus is applied to the receiver and high B-plus to the Second Audio Amplifier. The First Audio Amplifier has a constant low B-plus supply.

SYSTEM RELAY

K701 is the system switching relay. Keying the transmitter (by pressing the mike button) energizes the relay, providing both antenna switching and power distribution functions. Figure 6 is a simplified diagram showing antenna switching and power distribution for the transmitter and receiver.

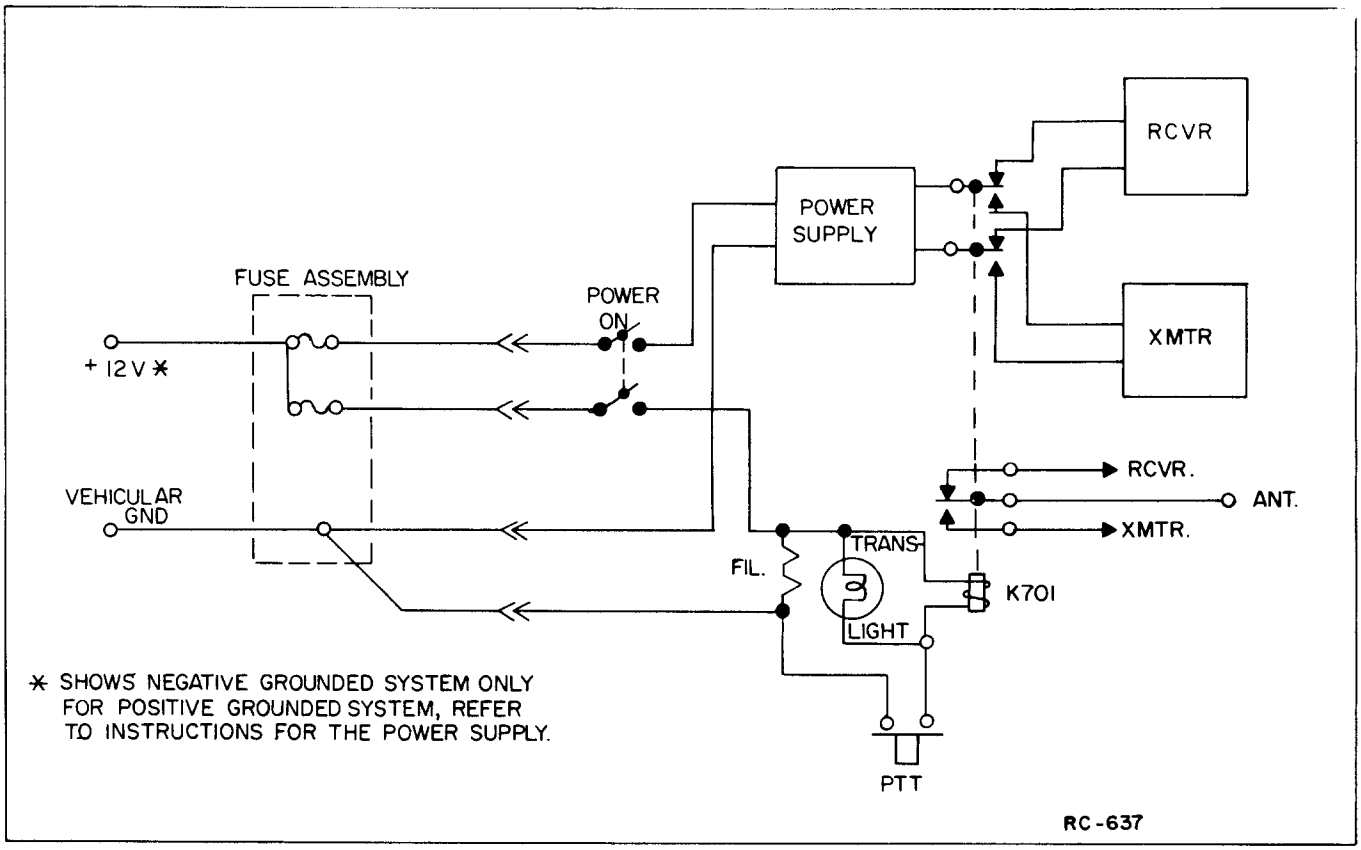


FIG. 8-ANTENNA SWITCHING AND POWER DISTRIBUTION DIAGRAM.

MAINTENANCE

PREVENTIVE MAINTENANCE

To insure high operating efficiency and to prevent mechanical and electrical failures from interrupting system operations, routine checks should be made of all mechanical and electrical parts at regular intervals. This preventive maintenance should include the maintenance checks listed below:

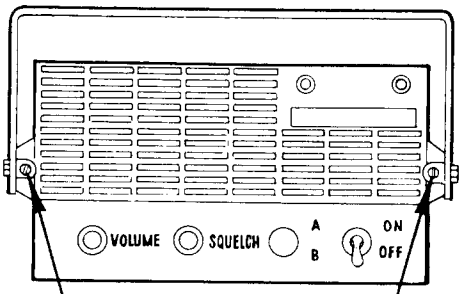
MAINTENANCE CHECK	INTERVAL		
	1 month	2 months	As Required
CONNECTIONS - Ground connections and connections to the voltage source should be periodically checked for tightness. Loose or poor connections to the power source will cause excessive voltage drops and faulty operation may ensue.	X		
GENERATOR AND REGULATOR - The generator and generator regulator should be maintained regularly to keep the generating system within safe and economical operating limits. The vehicle regulator should automatically limit the charging circuit from exceeding pre-determined values. If generator voltage is excessive, tubes, lights, etc., may burn out prematurely. This condition is indicated when the battery loses water rapidly. Usage of 1 or 2 ounces of water per cell per week is acceptable for batteries in continuous operation.			X
CLEANING CHASSIS - Dust that has collected inside the case should be removed with a vacuum hose, and any deposit of corrosion, grease or extraneous matter should be removed by an appropriate solvent.			X

MAINTENANCE CHECK	INTERVAL		
	1 month	2 months	As Required
MECHANICAL INSPECTION - Since mobile units are subject to constant shock and vibration, it is advisable to check for loose plugs, nuts, screws, and parts to make sure that nothing is working loose.	X		
RELAY CONTACTS - Examine the contacts of the relays. Where relay contacts carry little or no current, the contacts do not clean themselves and an insulating coating is apt to form. When contacts become coated, remove the film with a suitable solvent applied with a non-metallic brush, such as a toothbrush. Current-carrying contacts are subject to pitting and should be burnished from time to time. Dust and particles should be removed by a clean, dry, non-metallic brush.		X	
ANTENNA - The antenna, antenna base and all contacts should be kept clean and free from dirt or corrosion. If the antenna or its base is coated or is poorly grounded, loss of radiation and a weak signal will result.		X	
FREQUENCY CHECK - Check transmitter frequency and deviation as required by FCC.			X

DISASSEMBLY

To gain access to the transmitter and receiver boards for alignment or servicing, simply loosen the two screws shown in figure 7 and slide the chassis out of the case.

To service the power supply, remove the two screws on each side of the control unit, and remove the control knobs. Then pull the control unit away from the frame.



To Open Two-Way Radio, Loosen Screws (2) And Slide Chassis Forward Out of Case

Figure 9

PRINTED WIRING CIRCUITS

Printed circuits have definite advantages in servicing and troubleshooting. All components and metering points are accessible, and leads can be easily seen. Readings can be taken directly at the socket pins and at most component leads on either the top or bottom of the printed boards.

Replacing Components

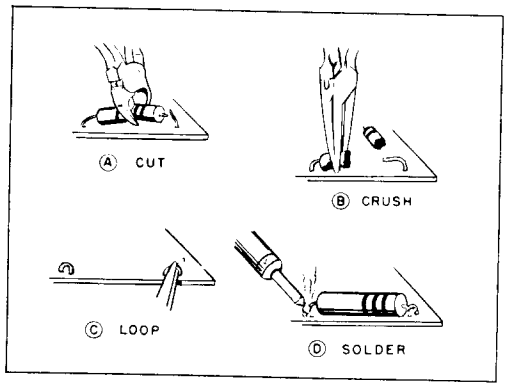
Replacing components on printed boards is relatively simple. Damage can be done to the printed board, however, by either excessive heat applied during soldering or in replacing a component. Overheating can cause the bond between the board and the copper foil to break. Use a low wattage soldering iron to prevent this damage. Make certain any splashes of solder are removed to prevent shorts.

Capacitors and Resistors

There are two methods recommended for replacing capacitors and resistors in printed boards. Method 1 can be used to replace a component without removing the board from its mounting.

Method 1 - Follow steps A, B, C & D shown in Fig. 8 below:

Figure 10

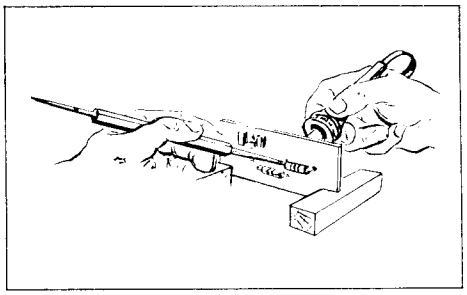


An easy way to replace a component without exposing the board to excessive heat.

Capacitors and Resistors (Cont'd)

Method 2 - Cut the leads on the old component as close as possible to the printed board. Heat the solder joint at the bottom side of the board and pull the remainder of the old leads through the bottom. Clean the holes and insert the new component. Bend the leads over the bottom of the board and clip the excess. Solder the joints.

Figure 11



Replacement of a component using a jig made of two small slotted wooden blocks. This jig prevents broken connections which might result from bending or flexing the board.

Coils, Sockets, Shields, Printed Sub-Assemblies and Controls

While applying the soldering iron to each individual lug, brush off any molten solder with a small brush. Take care not to spread solder in order to avoid shorts. When lugs and holes are clean, straighten lugs (while solder is melted) and free the lugs from the board. When all lugs are free, the component can be lifted out.

Repairing Printed Boards

In the event that the copper foil has been damaged, the break can be repaired by flowing solder across the gap, or if the gap is too large, it can be bridged by soldering a piece of hook-up wire across the gap.

If the copper foil becomes raised from the board, clip off the raised portion and replace it with a section of wire.

Small "hairline" breaks in the continuity of printed wiring can normally be found by visual examination or with the aid of a magnifying glass. Through the use of printed circuits, the possibility of intermittents occurring has been greatly reduced. When encountered, however, probing of component leads should be used to locate the point, rather than flexing of the board.

TRANSISTOR CIRCUITS

Transistor circuits require the same approach for trouble-shooting as does conventional equipment. Gain and output checks are made in the same familiar way as for tube type equipment.

Transistor Replacement

A transistor suspected to be defective can either be checked by the substitution method or by the use of a suitable transistor checker.

The Power Supply transistors are soldered directly to terminals and require special treatment. Care must be taken to avoid overheating the transistor while soldering. Even other transistors near the one being soldered can be damaged.

Always check the circuit for defects which could damage the new transistor being placed into the circuit.

A heavy duty soldering iron should not be used. Make certain that the iron to be used does not have current leakage. An isolation transformer can be used to prevent current leakage.

A transistor should never be removed or replaced while power is on, as a surge of current may damage the transistor.

If the leads from a transistor are disconnected, make sure that each wire is reconnected to the proper place. Otherwise, voltages of reversed polarity may be applied across a transistor which may damage it before a fuse can blow.

Heat Sink Servicing -

Since the metal envelopes of the transistors are at collector potential, they must be electrically isolated from ground. However, there must be a good path for heat from the transistors to reach the cast aluminum radiator ("heat sink") in which they are mounted, so that the heat will be dissipated by the "heat sink." The anodized aluminum spacers used between the transistors and their mounting plate not only isolate the transistors electrically, but also provide a good conductor to conduct heat away from them.

Silicone grease is used between the metal parts in the heat sink to improve the thermal contact between them and allow the heat to be transferred more readily.

Reinstallation

If the Two-Way Radio is ever moved to a different vehicle, be sure to check the battery polarity of the new system and, if necessary, interchange the leads on the Fuse Assembly as indicated on the Service Sheet.

NOISE SUPPRESSION

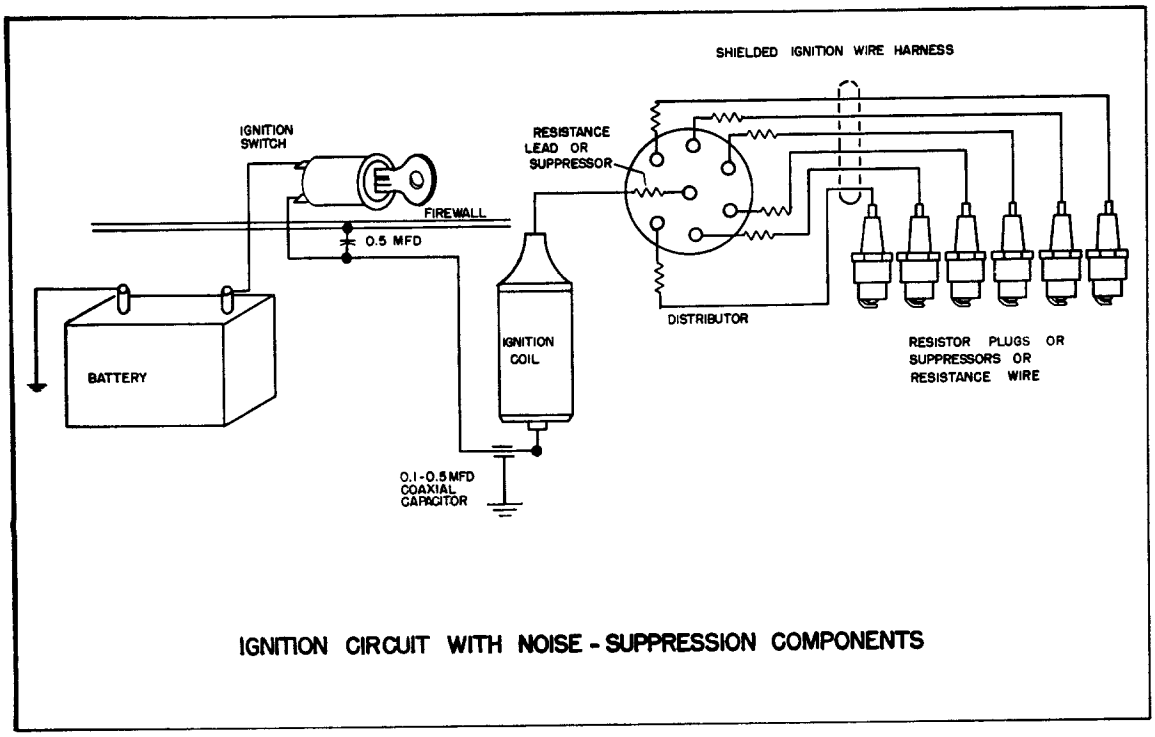
Due, in large, to its ability to suppress interfering noise while receiving an on-frequency signal, the FM receiver has found widespread application in two-way mobile radio systems. The extent to which an FM receiver is able to suppress noise depends upon:

1. whether the receiver is properly tuned.
2. the strength of the signal being received, and
3. the strength of the interfering noise.

After completing the initial adjustment of the Transmitter and Receiver, the Electronics Technician should determine whether additional noise suppression is required. The following information on noise suppression should assist the Technician in identifying and eliminating undesirable noise interference.

Ignition Noise

Ignition noise sounds like a "popping" sound in the speaker, whose frequency varies with engine speed while a weak signal is being received. This type of interference is generated by the spark plugs, distributor and any poor connections in the high-voltage system which might cause arcing. Ignition noise can be identified by noting that it disappears as soon as the ignition switch is turned off.



IGNITION CIRCUIT WITH NOISE-SUPPRESSION COMPONENTS

FIG. 12 (RC-547A)

1. If the vehicle does not have a resistance lead from the coil to the center of the distributor cap, disconnect the lead at the distributor and cut the lead so that a Cable-Type Suppressor may be inserted in it close to the distributor. Screw the cut ends of the lead into the suppressor.

NOTE

A resistance lead operates as a very effective noise suppressor as long as there are no breaks anywhere along its length. Never cut the lead to insert a suppressor. A loose knot is often tied in the lead to prevent excess flexing, which might break the conductor.

2. Check to see that:

---the distributor points and condenser are in good condition.

---the high-voltage leads from the distributor are not broken and are making good contact at each end.

---the spark plugs have clean, dry insulators and their electrodes are clean and properly adjusted.

---the timing has been properly adjusted.

3. Use a 0.5-mfd by-pass capacitor to by-pass the battery lead to the ignition coil. Mount the capacitor under a screw which will provide a good ground and connect the capacitor lead to the terminal of the coil which is connected to the ignition switch.

4. Remove the ignition coil and its mounting bracket. Clean paint from the coil (where the bracket mounts), from the bracket and from the engine block. Remount the coil so as to obtain a good ground for the coil case.

5. If the vehicle has been driven 30,000 or 40,000 miles or more, the cap and rotor of the distributor will probably need replacing. This will not only reduce ignition noise, but also improve the overall performance of the engine.

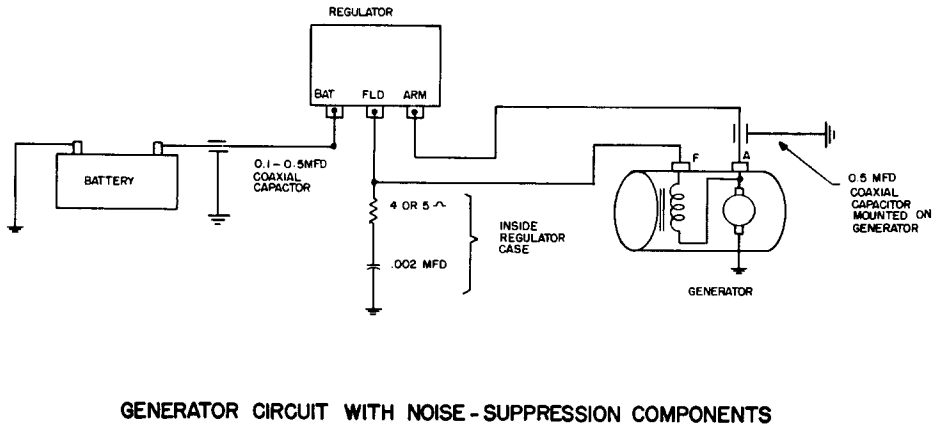
6. High-voltage ignition wires can become capacitively coupled to the low-voltage systems, causing ignition noise to appear in the low-voltage system. This coupling can be minimized by separating the high- and low-voltage leads or, if necessary, separately shielding the leads.

7. If one of the ignition leads happens to have the critical length for radiating at the receiver's frequency, the noise can be reduced by changing the length of the lead. A noise source of this type is not common and can only be found by using a noise meter or by trial and error.

8. If the preceding steps fail to reduce ignition noise to a satisfactory level, it may be necessary to install resistance-type spark plugs, individual suppressors on each spark plug, or a shielded ignition wire harness.

Generator Noise

Generator noise shows up as a high-pitched "whine", the pitch of which varies with engine speed. To check for this type of noise, run the engine at a moderate speed and then shut off the engine, while listening to the noise on the receiver. Generator noise will continue as long as the engine turns, lowering in pitch as the engine slows down.



GENERATOR CIRCUIT WITH NOISE-SUPPRESSION COMPONENTS

FIG. 13 (RC-548A)

By-pass the armature terminal on the generator to ground with a 0.5-mfd 40 or 50-amp coaxial capacitor. Be sure to scrape the area where the capacitor is to be mounted, so that its case will be well grounded.

CAUTION

Do not by-pass the field terminal (F), as this will damage the voltage regulator contacts.

Generator Regulator Noise

Generator regulator noise shows up as a "raspy" sound which is generated by the contacts in the regulator and radiated by the leads coming out of the regulator. If suppression of regulator noise is necessary, connect a 5-ohm resistor in series with a .002-mfd capacitor from the field terminal (F) of the regulator to ground. If possible, these components should be mounted inside the regulator case. The battery terminal (BAT) and armature terminal (ARM) can be by-passed to ground with 0.5-mfd capacitors.

CAUTION

If the regulator is opened to install the capacitor or resistor, remember that one wrong connection or shorted wire can damage the regulator or generator.

Gauge Noise

Gauge noise produces a "hissing" or "crackling" sound. Tapping the face of each gauge while the engine is running usually shows up which gauge is at fault. By-Pass the gauge lead to ground with a 0.5-mfd capacitor, connected close to the sensing element.

Static and Arcing Noise

The following suggestions may help to cure other unusual types of interference.

1. Use bonding braid to electrically bond the hood and each corner of the engine block to the vehicle's frame. Scrape paint and dirt from bonding points to obtain a good ground.

2. Treat noisy tires with anti-static powder.

3. Use front-wheel static collectors for irregular "popping" noise which disappears when the brakes are applied.

4. Use heavily-graphited penetrating oil on the exhaust pipe and muffler supports if they are producing noise.

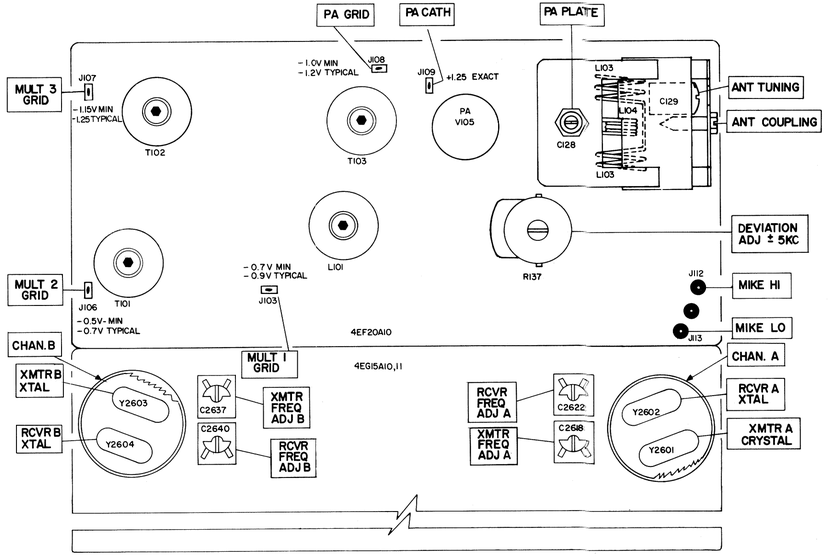
TRANSMITTER ALIGNMENT

PRELIMINARY PROCEDURE

1. Insert crystal of proper frequency between pins 4 and 6 of crystal socket on Front End Board.
2. Remove PA tube V105 from its socket.
3. Connect the Antenna or a 50 ohm load to antenna jack J2152 located on back of heat sink.
4. Turn power ON and allow one minute for warmup.
5. Use a 20,000 ohm-per-volt meter with the 0-3 volt scale for metering.

STEP NO.	METERING JACKS +	METERING JACKS -	TUNING CONTROL	METER READING	PROCEDURE
1.	CHASSIS GND (behind front panel)	MULT-1 GRID (J103)	L101	Maximum 0.75-1.0VDC	While keying the transmitter, tune L101 for maximum meter reading on first peak as core moves down from top of coil.
2.	"	MULT-2 GRID (J106)	T101	Maximum 0.5-0.9VDC	While keying the transmitter, tune top and bottom cores of T101 for maximum meter reading. *
3.	"	MULT-3 GRID (J107)	T102	Maximum 1.15-1.50VDC	While keying the transmitter, tune top and bottom cores of T102 for maximum meter reading. *
4.					Place PA tube (V105) in its socket.
5.			C129	See Procedure	Rotate Antenna Tuning (C129) for minimum capacitance (capacitor plates completely unmeshed as observed through access hole in the end of PA tank can).
6.			L104	See Procedure	Adjust Antenna Coupling (L104) to minimum by moving slider on top of PA can as far as possible away from PA tube.
7.	GND	PA GRID (J108)	T103	Maximum 1.0-1.4VDC	While keying the transmitter, tune the top and bottom cores or T103 for maximum meter reading.*
8.	PA CATH (J109)	GND	C128 PA PLATE	Minimum (Dip) 1.6 VDC	While keying the transmitter, tune PA PLATE (C128) for minimum meter reading.
9.					Repeat steps 7 and 8.
10.	"	"	L104 & C129	See Procedure	Increase coupling by moving slider (L104) toward PA tube until meter reading begins to increase. Then adjust Antenna Tuning (C129) for maximum meter reading.
11.	"	"	L104	1.25 volts	Increase coupling until meter reading is 1.25 volts. Do not retune PA PLATE after loading the transmitter.
12.			C2618		Check the transmitter frequency. When necessary, the transmitter can be set on a known correct frequency by means of CHAN A crystal trimmer C2618 on the Front End/Oscillator board. For CHAN B, use C2637.

* To tune transformers T101, T102 and T103, start with the top core all the way up (away from the board), and bottom core all the way down (towards the board). Use first meter peak as the core moves toward the center of the transformer. Alternately tune top and bottom cores for a maximum meter reading. The top and bottom cores of T101, T102, T103 & L104 can be tuned from the top of the coil.



MODULATION LEVEL ADJUSTMENT

The modulation level control, R137, was adjusted to the proper setting before shipment and should not normally require re-adjustment. The limiter instantaneously limits the amplitude of the audio waveform, preventing overmodulation, but preserving the intelligibility of the transmission.

TEST EQUIPMENT

1. An audio oscillator.
2. A frequency modulation monitor.
3. An output meter or a VTVM.

PROCEDURE

1. Connect the audio oscillator and the meter across J112 (Mike Hi) and J113 (Mike Lo) of the microphone receptacle on the transmitter board.

2. Apply a 0.5 volt signal at 1000 cps across J112 and J113.

3. Set R137, the DEVIATION ADJ, for a 5-kilocycle swing with the deviation polarity + or - (whichever gives the highest reading) as indicated on the frequency modulation monitor.

If no audio oscillator is available, the modulation level control can be set by connecting a microphone to the transmitter, whistling a loud, clear tone into the microphone, and setting the MOD control (R137) for a 5-kilocycle swing, as indicated on the modulation monitor.

Fig. 14 - Alignment Procedure

150-174 MC, 15-WATT
TRANSMITTER (ES-27-A AND ES-30-A)

(RC-632E)

TRANSMITTER SERVICING

(1) INSPECT FOR---

- LIGHTED FILAMENTS
- POWER SUPPLY CONNECTIONS
- BURNT COMPONENTS
- COMPONENT MOUNTINGS

(2) CHECK FOR FOLLOWING SYMPTOMS---

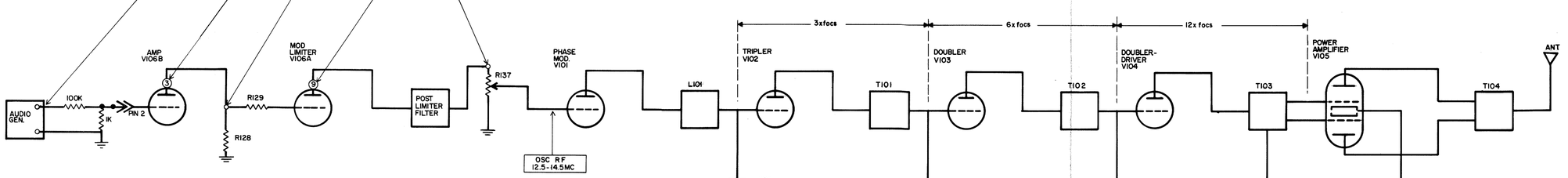
SYMPTOM:	IF PRESENT, PROCEED AS FOLLOWS:
No filament or B-plus voltage.	Check fuses and power cable connection to fuse assembly. (See SERVICE SHEET for Control Unit/Power Supply.)
Low filament or B-plus voltage.	Check for defect in B-plus or filament circuits causing excessive current drain. Also check connections to Power Supply.
	Retune PA (Refer to TRANSMITTER ALIGNMENT on reverse side of page).
No grid voltage at MULT-1 GRID jack J103.	Test oscillator tube V2603 (on Front End Board).
	Check crystal by replacement with one known to be good. Also, see that crystal is not plugged into wrong socket.
	Test modulator tube V101.
	Check for faulty relay contacts.
Low grid voltage in multiplier or power amplifier stages.	Test the tube used in preceding stage and in stage under test (See SERVICE SHEET for Transmitter Board).
	Retune preceding stage; check tuning of coils with a wavemeter.
Power amplifier fails to load properly.	Check power amplifier tube.
Low grid voltage on power amplifier tube.	Check tuning of multiplier stage. (See TRANSMITTER ALIGNMENT on reverse side of page.)
	Check B-plus voltage. (See SERVICE SHEET for Transmitter Board.)
Low Power Amplifier Output.	Check antenna connections and antenna relay.
	Check low-pass filter for short circuit.
	Try new power amplifier tube.
	Check for excessive drive to grid of power amplifier. If present, tune T103 (Refer to TRANSMITTER ALIGNMENT on reverse side of page).
Transmitter operating without modulation or with low modulation.	Check position of DEV ADJ (R137).
	Check microphone, microphone cable and plug for open or short circuit.
	Check control cable for open or short in microphone leads.
	Test audio amplifier, modulation limiter tube.
	Check tuning of L101 (Refer to TRANSMITTER ALIGNMENT on reverse side of page.
Excessive swing.	Reset DEV ADJ using FM monitor. (See DEV ADJ on reverse side of page.)
	De-emphasis capacitor C138 open.
Transmitter fails to key properly.	Check relay K701 (See SERVICE SHEET for Control Unit/Power Supply).
	Check contacts on relay.

(3) CHECK AUDIO STAGES---

EQUIPMENT REQUIRED

- HIGH IMPEDANCE VTVM
- AUDIO GENERATOR WITH 3 VOLT OUTPUT
- VOLTAGE DIVIDER (SHOWN BELOW.)

VTVM-AC	VTVM-AC	VTVM-AC	VTVM-AC	VTVM-AC
INJECT A 30 MILLIVOLT, IKC SIGNAL IN AT PIN 2 OF MIKE JACK.				
ADJUST AUDIO GEN FOR OUTPUT OF 3 VOLTS RMS.	READING AT PIN 3 OF V106B SHOULD BE APPROX 1.7 VAC	READING AT R129 SHOULD BE APPROX 0.5 VAC	READING AT PIN 9 OF V106A SHOULD BE APPROX 18 VAC	READING AT DEV ADJ R137 SHOULD BE APPROX 2.6 VAC



(4) CHECK TYPICAL VOLTAGES ---

EQUIPMENT REQUIRED

- 20,000 OHM-PER VOLT METER WITH 0-3 VOLT SCALE

V-DC	V-DC	V-DC	V-DC	V-DC
WITH TRANSMITTER KEYED READING AT J103 (MULT-1-GRID) SHOULD BE APPROX -0.9 VDC	WITH TRANSMITTER KEYED READING AT J106 (MULT-2-GRID) SHOULD BE APPROX -0.7 VDC	WITH TRANSMITTER KEYED READING AT J107 (MULT-3-GRID) SHOULD BE APPROX -1.25 VDC	WITH TRANSMITTER KEYED READING AT J108 (PA. GRID) SHOULD BE APPROX -1.2 VDC	WITH TRANSMITTER KEYED READING AT J109 (PA CATH SHOULD BE +1.25 VDC

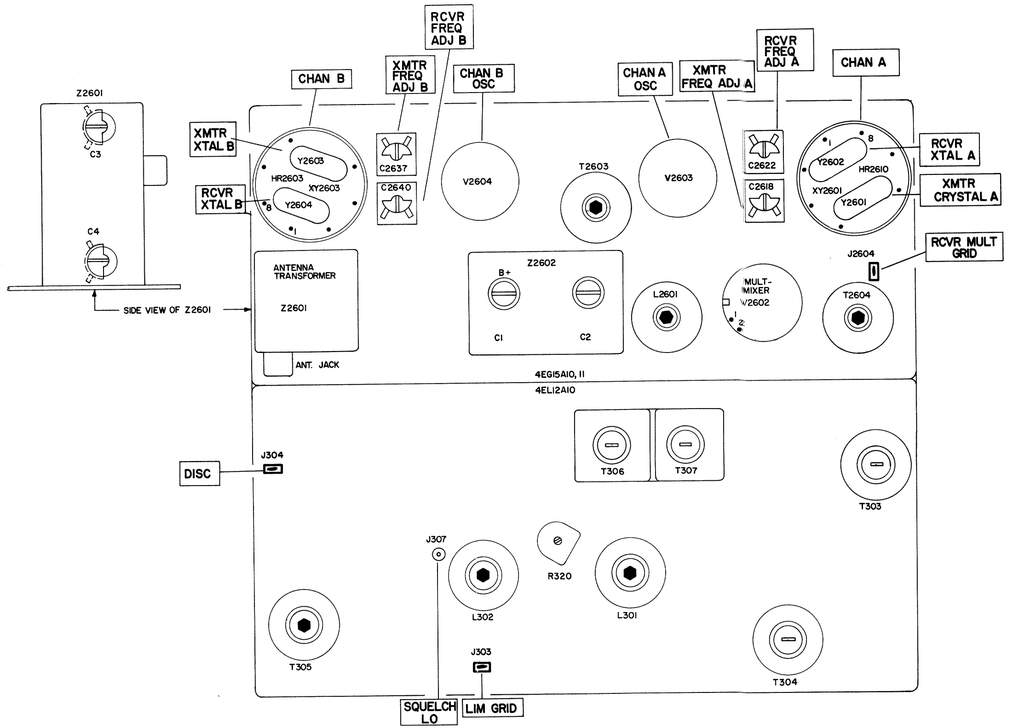
FRONT END ALIGNMENT

These instructions are for tuning the oscillator and RF stage of the receiver, and are for use when changing the frequency or crystal. When necessary to realign the entire receiver, refer to the COMPLETE RECEIVER ALIGNMENT.

PROCEDURE

1. Insert a crystal of the proper frequency between pins 2 and 8 in the crystal socket on the Front End/Oscillator board.
2. Connect a signal generator to Receiver Antenna jack J2606.
3. Turn power ON and allow three minutes for warm-up.
4. Use a 20,000 ohm-per-volt meter having a 0-3 volt scale for metering.

STEP NO.	METERING JACKS +	METERING JACKS -	TUNING CONTROL	METER READING	PROCEDURE
1.	GND	RX-MULT GRID (J2604)	T2603	Maximum	Peak top and bottom slugs of T2603. Start with both slugs at minimum inductance (both slugs out of coil), and use first peak as slugs are moved into coil. Alternately peaked until a maximum is reached. (at least 2 volts).
2.	"	DISC (J304 on IF/AUDIO BOARD)	Adjust frequency of signal generator	0	While applying a strong signal of the proper receiver frequency to Receiver Antenna Jack J2606, adjust the generator frequency for zero discriminator reading.
3.	"	LIM GRID (J303 on IF/AUDIO BOARD	T2604	Maximum	Reduce signal input to prevent saturation. Peak T2604 using first peak as slug is moved into coil.
4.	GND	LIM GRID (J303 on IF/AUDIO BOARD)	L2601	Maximum	Reduce Signal input to prevent saturation, and peak L2601 using first peak obtained.
5.	"	"	Z2601-C3 & C4 and Z2602-C1 & C2	Maximum	Reduce signal input to prevent saturation and peak Z2601-C3 and C4; then peak Z2602-C1 and C2.
6.			C2622		When necessary, the receiver can be set on a known correct frequency by means of CHAN A crystal trimmer C2622 on the Front End/Oscillator board. For CHAN B, use crystal trimmer C2640.



COMPLETE RECEIVER ALIGNMENT

These instructions cover the procedure for completely aligning the receiver and are for use when the receiver has been misaligned or modified.

PROCEDURE

1. Insert a crystal of the proper frequency between pins 2 and 8 of crystal socket on the Front End/Oscillator.
2. Turn the power ON and allow three minutes for warmup.
3. Use a high impedance VTVM for metering.

STEP NO.	METERING JACKS +	METERING JACKS -	TUNING CONTROL	METER READING	PROCEDURE
			FRONT END/OSCILLATOR		
1.	MULT GRID (J2604)	GND	T2603 (top and bottom slugs)	Maximum	Peak top and bottom slugs of T2603. Starting with both slugs out of coil, use first peak as slugs are moved into coil. Alternately peak until a maximum is reached (at least 3 volts).
2.	"	"	T2604 and L2601	Maximum	Connect VTVM through a 470K resistor to pin 2 of V2602 (1ST MIXER) and peak T2604 and L2601. Meter reading should be at least 1 volt.
			IF/AUDIO		
3.	GND	SQUELCH LOW (J307)	T306 & T307 (top and bottom slugs)	Maximum	Apply a signal of the proper receiver frequency having ±30KC deviation modulated by a low audio frequency (60-400 cycles) through a 5 mmf capacitor to pin 2 of V2602 (on Front End/Oscillator Board). Then peak top & bottom slugs of T306 & T307. Start with both slugs at minimum inductance (both slugs out of coil).
4.	GND	LIM GRID (J303)	L301 & L302	Maximum	Peak L301 and L302 using first peak as slug is moved into coil.
5.	GND	LIM GRID (J303)	T303 & T304	Maximum	Peak T303 & T304.
6.					Repeat steps 3, 4, & 5.
7.	GND	LIM GRID (J303)	Determine mid band frequency	See Procedure	Switch modulation off and adjust signal generator frequency for maximum LIM reading, keeping the signal level below saturation. Increase the frequency until LIM reading drops to one half of maximum reading (-6 db). Mark this frequency. Then decrease the frequency until LIM reading again drops to one half of maximum reading (-6 db). The mid band frequency is mid way between the two frequencies determined by the above procedure.
8.	GND	DISC J304	T305 (top & bottom slugs)	See Procedure	Apply a signal of the frequency determined above and adjust the top slug in T305 to zero discriminator reading. Remove signal generator, and adjust the bottom slug of T305 for maximum noise audio output.
			FRONT END		
9.	GND	LIM GRID (J303)	Z2601-C3 & C4 Z2602-C1 & C2, and L2601	Maximum	Apply a signal of the proper receiver frequency to Antenna Jack J2606 and peak Z2601-C3 and C4, Z2602-C1, C2 and L2601.
10.	GND	Pin 1 of V304	R320	-10V	Apply a 1 microvolt unmodulated signal of the proper receiver frequency to Antenna Jack J2606. Adjust R320 for a meter reading of -10 volts or until maximum resistance is reached.

Fig. 15 - Alignment Procedure

150-174 MC RECEIVER
(ES-27-A and ES-30-A)

(RC-636F)

RECEIVER SERVICING

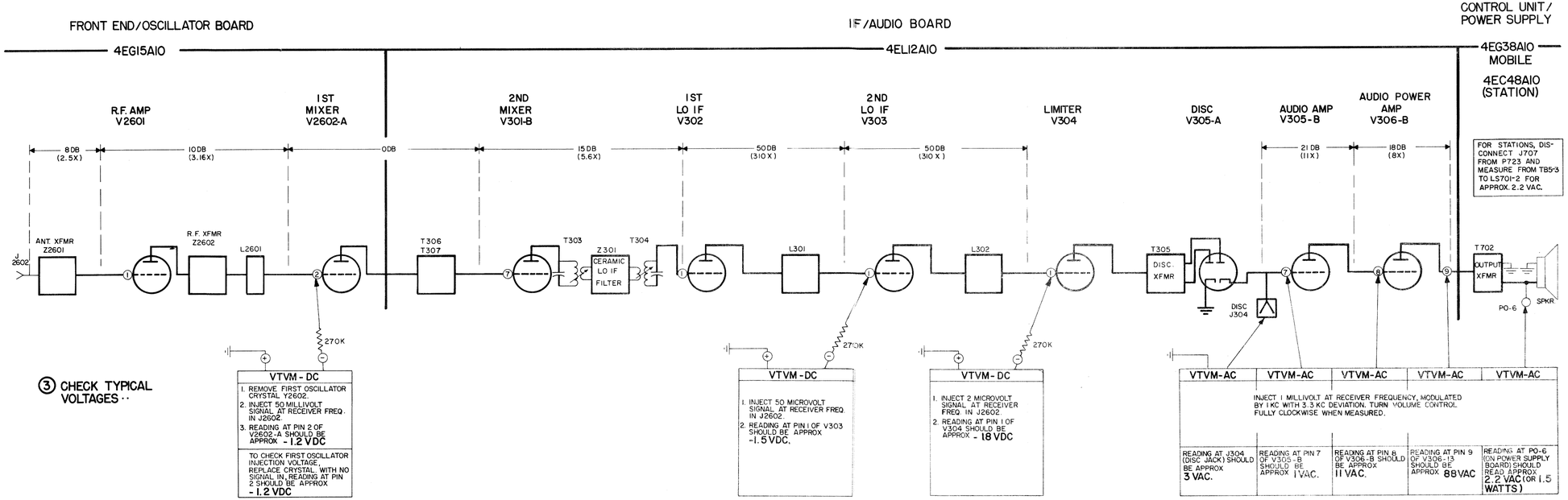
① INSPECT FOR:

LIGHTED FILAMENTS
POWER SUPPLY CONNECTIONS
BURNT COMPONENTS
COMPONENT MOUNTING

② CHECK FOR FOLLOWING SYMPTOMS:

SYMPTOM:	IF PRESENT, PROCEED AS FOLLOWS:
No filament or B-plus voltage.	Check connections of power cable to fuse assembly. (See SERVICE SHEET for the Control Unit/Power Supply.)
Low filament or B-plus voltage.	Check for defect in B-plus or filament circuit causing excess current drain. Check connections to Power Supply.
Low LIM reading.	Check B-plus voltages.
	Check tubes in IF and RF stages.
Low MULT reading at MULT GRID jack J2604.	Tune T2603 (see FRONT END ALIGNMENT on reverse side of page).
	Check oscillator tube V2603.
	Check plate voltages on V2603A and V2602B (see SERVICE SHEET for Front End/ Oscillator Board).
No crystal oscillator output indicated by low meter reading at Pin 2 of V2602.	Tune T2604 (see FRONT END ALIGNMENT on reverse side of page).
	Check B-plus voltage.
	Test V2603 and V2602 oscillator tubes.
Low sensitivity, but normal readings at LIM GRID jack J303.	Check external antenna circuit.
	Tune Z2601, Z2602, and L2601 (see FRONT END ALIGNMENT on reverse side of page).
No audio.	Disable squelch by grounding J317. If audio breaks through, an unbalance exists in the squelch circuit.
	Short V306-B cathode (Pin 6) momentarily to ground. If loud click is not heard in speaker, look for defect in output transformer or voice coil leads. If loud click is heard, short V305-B (Pin 9) momentarily to ground. If a loud click is not heard, check coupling capacitor and B-plus voltage.
Squelch will not close.	Check Diode CR301 and Noise Amplifier V306A.
	Check tube voltages (see SERVICE SHEET for IF/AUDIO BOARD).
	Check setting of R320 (see FRONT END ALIGNMENT on reverse side of page).

③ CHECK TYPICAL VOLTAGES··



④ CHECK GAIN-PER-STAGE

EQUIPMENT REQUIRED

- RF VOLTMETER (SIMILIAR TO BOONTON MODEL 91-C-A OR MILLIVAC TYPE MV-18C.
- SIGNAL ON RECEIVER FREQUENCY (BELOW SATURATION). CORRECT FREQUENCY CAN BE DETERMINED BY ZEROING THE DISCRIMINATOR.

PROCEDURE FOR MEASURING EACH STAGE

- APPLY PROBE TO INPUT OF STAGE (FOR EXAMPLE, GRID OF RF AMP) PEAK RESONANT CIRCUIT OF STAGE BEING MEASURED (Z2601-C4) AND TAKE VOLTAGE READING (E_1)
- MOVE PROBE TO INPUT OF FOLLOWING STAGE (1ST MIXER *) REPEAK FIRST RESONANT CIRCUIT (Z2601-C4). THEN PEAK CIRCUIT BEING MEASURED (L2601) AND TAKE READING (E_2).
- CONVERT READINGS BY SUBTRACTING ON THE DB SCALE OF RF VOLTMETER, OR BY MEANS OF THE FOLLOWING FORMULA.

$$\text{AMP FACTOR } \frac{E_2}{E_1}$$

- CHECK RESULTS WITH TYPICAL GAINS SHOWN ON DIAGRAM BELOW.
- USE PROCEDURE LISTED ABOVE TO FIND GAIN OF EACH STAGE.

* NOTE WHEN MEASURING MIXER STAGES, REMOVE CRYSTAL BEFORE MEASURING TO ELIMINATE INJECTION VOLTAGE.

PARTS LIST
TRANSMITTER BOARD
MODEL 4EF20A10, REV. C

PL-5496222-G1

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
	CAPACITORS	
C101	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0047 µf +100% -0%, 500 VDCW.	C-5495751-P11
C102	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 27 pf ±10%, 500 VDCW, -150 temp coef.	C-5496219-P314
C103	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.01 µf +100% -0%, 500 VDCW.	C-5495751-P13
C104	Capacitor: (Fixed), (Moulded); dielectric, moulded phenolic, 2.0 pf ±0.10 pf, 500 VDCW. Jeffers Type JMS/32, 0° temp coef.	K-7130348-P6
C105	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 27 pf ±10%, 500 VDCW, -150 temp coef.	C-5496219-P314
C106	Capacitor: Disc type, (insulated, high dielectric) ceramic, 0.005 µf +80% -20%, 50 VDCW. Sprague Electric Co Cat. No. 40C141.	B-7491827-P1
C107 thru C111	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.0047 µf +100% -0%, 500 VDCW.	C-5495751-P11
C112	Capacitor: Disc type, (insulated, high dielectric) ceramic, 0.005 µf +80% -20%, 50 VDCW. Sprague Electric Co Cat. No. 40C141;	B-7491827-P1
C113 and C114	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.0015 µf +100% -0%, 500 VDCW.	C-5495751-P8
C115 thru C119	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.001 µf +100% -0%, 500 VDCW.	C-5495751-P7
C121	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.001 µf +100% -0%, 500 VDCW.	B-5495751-P7
C122 and C123	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.0047 µf +100% -0%, 500 VDCW.	B-5495751-P11
C124 thru C126	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.001 µf +100% -0%, 500 VDCW.	B-5495751-P7
C127	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0047 pf +100% -0%, 500 VDCW.	B-5495751-P11
C128	Capacitor: Variable air; butterfly type, 31-33 plates, 2.97-9.72 pf, 1250 peak voltage, (2-stator terminals at bottom). EF Johnson Co Cat. No. 160-211-43. (This component is similar to G-E Dwg and Part No. M-7481115-P8). (Included in PA Can, G-E Dwg and Group No. PL-5492566-G1).	A-4034189-P1
C129	Capacitor: Variable, sub-miniature; (supplied with 2-mounting tabs, unassembled), 14-plates, 1.98-12.4 pf, 850 peak voltage. EF Johnson Co Cat. No. 189-6. (Included in PA Can, G-E Dwg. and Group No. PL-5492566-G1).	B-5491271-P6
C130	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 330 pf +100% -0%, 500 VDCW.	C-5495751-P4
C131	Capacitor: Mylar ®, dielectric; 0.0047 µf ±20%, 100 VDCW. Good-All Electric Mfg Co Type 663-W.	B-7491930-P3

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
C132	Capacitor: Fixed, silver mica, (DM15-dipped phenolic insulation); 330 pf ±10%, 500 VDCW. Electromotive Mfg Co Type DM-15.	C-5490008-P139
C133*	Capacitor: Fixed ceramic disc, (insulated high dielectric); 0.01 uf +100 -0%, 500 VDCW.	C-5495751-P13
	In models earlier than Rev. A: Capacitor: Mylar dielectric: dipped epoxy coating, insulated, 0.10 uf ±20%, 50 VDCW. Good-All Electric Mfg. Co. Type 601PE.	B-5491189-P106
C134 and C135	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.01 µf +100% -0%, 500 VDCW.	C-5495751-P13
C136*	Capacitor: Fixed ceramic disc, (insulated temp compensating); 390 pf ±10%, 500 VDCW, -3300 temp coef. (Deleted by Rev. B,)	C-5496372-P161
C137*	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 180 pf ±10%, 500 VDCW, -3300 temp coef. (Deleted by Rev. B,)	C-5496372-P145
C138*	Mylar®, dielectric; 3300 pf ±20%, 200 VDCW In Models of Rev. A or earlier: Fixed silver mica, 3300 pf ±10%, 500 VDCW; Sim to Electromotive DM20.	19A115028-P103
		A-4029003-P120
C139 thru C141	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.001 µf +100% -0%, 500 VDCW.	C-5495751-P7
C143 and C144	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.001 µf +100% -0%, 500 VDCW.	C-5495751-P7
C145 thru C147	Capacitors: Disc type, (insulated, high dielectric); ceramic, 0.005 µf +80% -20%, 50 VDCW. Sprague Electric Co Cat. No. 40C141.	B-7491827-P1
C148	Capacitor: (Fixed), (Moulded); dielectric, moulded phenolic, 2.0 pf ±0.10 pf, 500 VDCW. Jeffers Type JMS/32, 0° temp coef.	K-7130348-P6
C149	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.001 µf +100% -0%, 500 VDCW	C-5495751-P7
	JACKS AND RECEPTACLES	
J101 and J102	Pins: Contact; brass, cadmium plated finish. Bead Chain Mfg Co Cat. No. L93-3.	A-4033513-P4
J103	Terminal: Brass; tin-plated. Alden Products Co Cat. No. 654T (or equiv).	A-4031537-P1
J104 and J105	Pins: Contact; brass, cadmium plated finish. Bead Chain Mfg Co Cat. No. L93-3.	A-4033513-P4
J106 thru J109	Terminals: Brass; tin-plated. Alden Products Co Cat. No. 654T (or equiv).	A-4031537-P1
J110	Jack: Phono-type; mica-filled phenolic or ceramic and XXXP phenolic insulation, brass shell, brass spring contact, 350 vrms, 500 vdc. Cinch Mfg Co Cat. No. 14H12699. (Included in PA Can, G-E Dwg and Group No. PL-5492566-G1).	A-7104941-P4
J111 thru J115	Pins: Contact; brass, cadmium plated finish. Bead Chain Mfg Co Cat. No. L93-3.	A-4033513-P4
	INDUCTORS	
L101	Coil Assembly. Includes the following component with L101 prefix:	PL-5492527-G1
L101-C1	Capacitor: Fixed ceramic disc, (insulated-temp compensating); 10 pf ±1.0 pf, 500 VDCW, -1,500 ±250 temp coef.	B-5491238-P5
L102	Coil: RF choke; insulated, moulded in thermo setting compound, inductance 2.20 µh ±20%, 0.50 amps, 1/3 w, phenolic core. Jeffers Electronic Division Cat. No. 10100-24. (Red-red). (Included in PA Can, G-E Dwg and Group No. PL-5492566-G1).	B-7488079-P8
L103	Coil: Insulated; 5-1/2 right hand turns, (6-3.4 turns per in.). (Included in PA Can, G-E Dwg. and Group No. PL-5492566-G1).	A-4034291-P1
L104	Coil: Insulated; 4-left hand turns (close wound). (Included in PA Can, G-E Dwg and Group No. PL-5492566-G1).	A-4034290-P1

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
	RESISTORS	
R101	Resistor: Composition, 1,500 ohms ±10%, 1/2 w.	C-3R77-P152K
R102	Resistor: Composition, 0.10 megohm ±10%, 1/2 w.	C-3R77-P104K
R103	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R104	Resistor: Composition, 3,900 ohms ±5%, 1/2 w.	C-3R77-P392J
R105	Resistor: Composition, 0.10 megohm ±10%, 1/2 w.	C-3R77-P104K
R106	Resistor: Composition, 10,000 ohms ±10%, 1/2 w.	C-3R77-P103K
R107	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R108	Resistor: Composition, 120 ohms ±10%, 1/2 w.	C-3R77-P121K
R109	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R111	Resistor: Composition, 56,000 ohms ±10%, 1/2 w.	C-3R77-P563K
R112 and R113	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R114	Resistor: Composition, 330 ohms ±10%, 1/2 w.	C-3R77-P331K
R115	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R116	Resistor: Composition, 47,000 ohms ±10%, 1/2 w.	C-3R77-P473K
R117	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R118	Resistor: Composition, 5,600 ohms ±10%, 1/2 w.	C-3R77-P562K
R119	Resistor: Composition, 330 ohms ±10%, 1/2 w.	C-3R79-P331K
R121	Resistor: Composition, 220 ohms ±10%, 1/2 w.	C-3R77-P221K
R123	Resistor: Composition, 200 ohms ±5%, 1/2 w.	C-3R77-P201J
R124	Resistor: Composition, 10 ohms ±10%, 1/2 w.	C-3R77-P100K
R125	Resistor: Composition, 15,000 ohms ±10%, 1/2 w.	C-3R79-P153K
R126	Resistor: Composition, 10 megohm ±10%, 1/2 w.	C-3R77-P106K
R127	Resistor: Composition, 0.18 megohm ±10%, 1/2 w.	C-3R77-P184K
R128	Resistor: Composition, 0.15 megohm ±5%, 1/2 w.	C-3R77-P154J
R129	Resistor: Composition, 1.2 megohms ±10%, 1/2 w.	C-3R77-P125K
R131	Resistor: Composition, 0.22 megohm ±10%, 1/2 w.	C-3R77-P224K
R132#	Resistor: Composition, 2,700 ohms ±10%, 1/2 w.	C-3R77-P272K
	In models earlier than Rev. A: Resistor: Composition, 3,900 ohms ±10%, 1/2 w.	C-3R77-P392K
R133	Resistor: Composition, 1.2 megohms ±10%, 1/2 w.	C-3R77-P125K
R134 * and R135 *	Resistors: Composition, 0.12 megohm ±5%, 1/2 w. (Deleted by Rev, B).	C-3R77-P124J
R136	Resistor: Composition, 47,000 ohms ±5%, 1/2 w. (Deleted by Rev, B).	C-3R77-P473J
R137	Potentiometer: (Carbon film), (for printed circuits); res 250,000 ohms ±20%, 0.1 w. Chicago Telephone Supply Corp Type UPE-70.	B-7491365-P9
R138*	Resistor: Composition, 20,000 ohms ±5%, 1/2 w. In models earlier than Rev. C: Resistor: Composition, 10,000 ohms ±10%, 1/2 w.	C-3R77-P203J C-3R77-P103K
	TRANSFORMERS	
T101	Tripler Plate Transformer Assembly.	PL-5492528-G1
T102	Doubler Plate Transformer Assembly.	PL-5492529-G1
T103	Doubler-Driver Transformer Assembly; Includes the following components with T103 prefix:	PL-5492530-G1
T103-C1	Capacitor: Ceramic disc (insulated high dielectric): 0.001 µf +100% -0%, 500 VDCW.	B-5493196-P1
T103-R1	Resistor: Composition, 6,800 ohms ±10%, 1/2 w.	C-3R77-P682K
	TUBES	
V101	Tube. Type 6664/6AH4.	
V102	Tube. Type 6676/6CB6.	

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
V103	Tube. Type 6AK6.	
V104	Tube. Type 7701.	
V105	Tube. Type 6360.	
V106	Tube. Type 7716.	
	SOCKETS	
XV101 thru XV103	Sockets: Tube, 7-pin miniature, PW; mica-filled phenolic insulation, phosphor-bronze contact, brass center shield, rated current 1 amp.	B-7489442-P2
XV104 thru XV106	Sockets: Tube, 9-pin miniature, PW; mica-filled phenolic insulation, phosphor-bronze contact, brass center shield, rated current 1 amp.	B-7489470-P2
	SUB-ASSEMBLY	
	PA Can Includes the following components: C128 and C129 J110 L102 thru L104	PL-5492566-G1
Z101*	Post Limiter Filter	19E201770-P1
	MISCELLANEOUS	
	Printed Wiring Board: Tan phenolic, copper clad.	D-5498832-P1

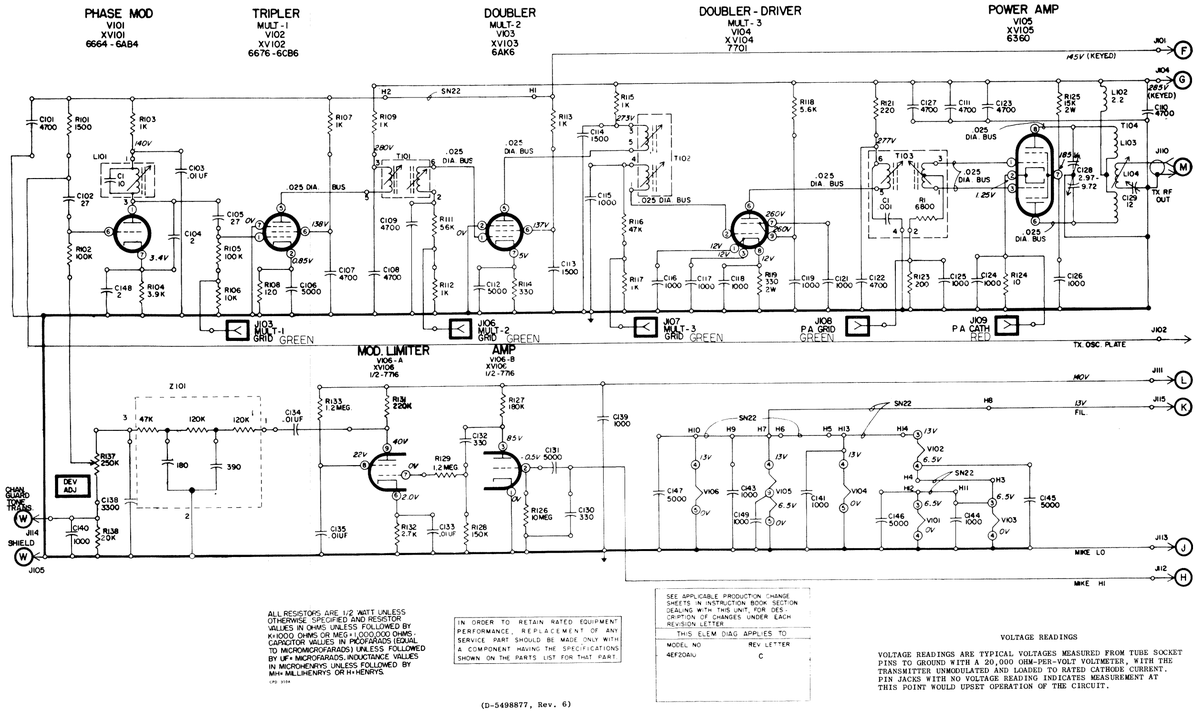
PRODUCTION CHANGES

(Refer to Parts List for description of parts affected by these revisions).

REV. A - To improve modulation symmetry and increase audio system gain. C132 and R132 changed.

REV. B - To facilitate assembly. C136 changed, and R134, R135, R136, C136 and C137 replaced by encapsulated assembly Z101.

REV. C - So Transmitter will work with new design channel guard, changed R138.



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

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

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

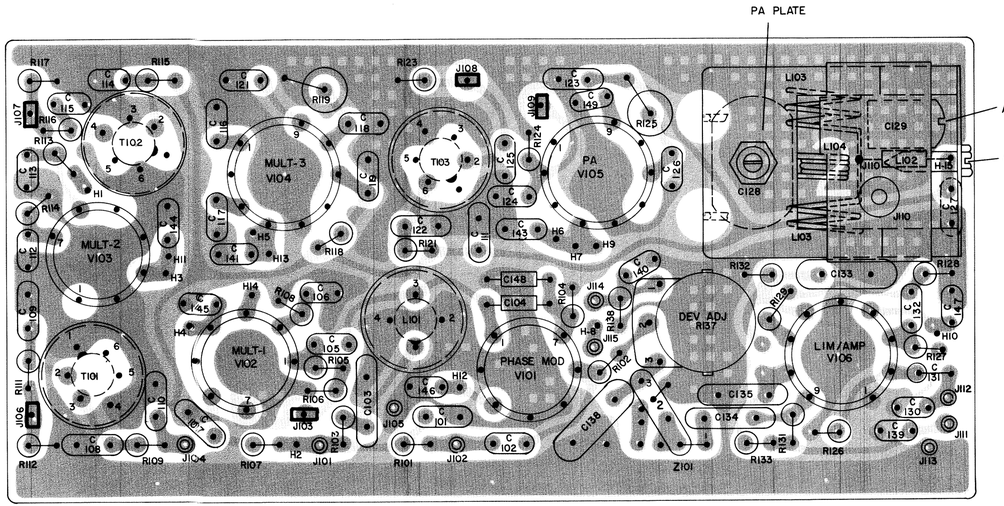
THIS ELEM DIAG APPLIES TO:

MODEL NO	REV LETTER
4EF20A10	C

(D-5498877, Rev. 6)

VOLTAGE READINGS

VOLTAGE READINGS ARE TYPICAL VOLTAGES MEASURED FROM TUBE SOCKET PINS TO GROUND WITH A 20,000 OHM-PER-VOLT VOLTMETER, WITH THE TRANSMITTER UNMODULATED AND LOADED TO RATED CATHODE CURRENT. PIN JACKS WITH NO VOLTAGE READING INDICATES MEASUREMENT AT THIS POINT WOULD UPSET OPERATION OF THE CIRCUIT.



(D-5499535, Rev. 1)
(C-5496209, Sh. 1, Rev. 2)
(C-5496209, Sh. 2, Rev. 2)

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

SYMBOL AND TUBE TYPE	1	2	3	4	5	6	7	8	9
V101 6AB4/6664	1K	0	FIL.	0	0	* 370K	3.9K		
V102 6CB6/6676	110K	120Ω	FIL.	FIL.	1K	1K	0		
V103 6AK6	57K	0	5Ω	0	1K	1K	330Ω		
V104 7701	330	48K	330Ω	FIL.	0	220	5.6K	330Ω	5.6K
V105 6360	7K	10Ω	7K	FIL.	0	1Ω	15K	1Ω	FIL.
V106 7716	0	10M	180K	FIL.	0	3.9K	1.3M	1.3M	220K

RESISTANCE READINGS

RESISTANCE READINGS ARE TYPICAL RESISTANCES MEASURED FROM TUBE SOCKET PIN TO GROUND WITH ALL POWER REMOVED FROM THE CHASSIS, AND ALL B+ SUPPLY VOLTAGES SHORTED TO GROUND.

NOTE:
* Measured with deviation adjustment (R137) turned fully clockwise.

Service Sheet

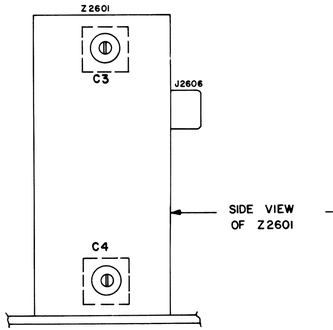
TRANSMITTER BOARD
MODEL 4EF20A10; REV. C

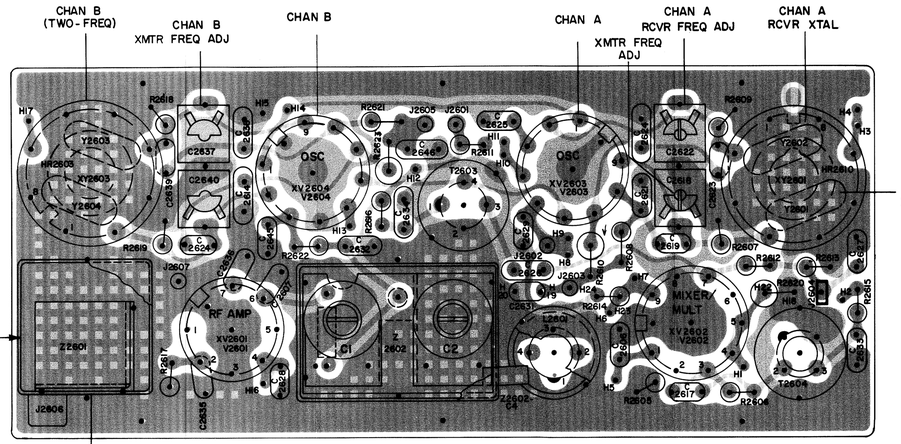
(RC-629D)

PARTS LIST
FRONT END/OSCILLATOR BOARD
MODELS 4EG15A10, 11

PL-5496246-G1 (SINGLE-FREQUENCY)
PL-5496246-G2 (TWO-FREQUENCY)

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
	CAPACITORS	
C2606	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 18 pf ±10%, 500 VDCW, 0 temp coef.	C-5496219-P12
C2607	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.001 uf +100% -0%, 500 VDCW. Sprague Electric Co Cat. No. 1219C4.	B-7491393-P1
C2616	Capacitor: Fixed ceramic disc, (insulated temp compensating); 12. pf ±0.25 pf ±5%, 500 VDCW, -80 temp coef.	C-7774846-P242
C2617	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0047 uf +100% -0%, 500 VDCW.	C-5495751-P117
C2618	Capacitor: Variable, sub-miniature; (supplied with 2-mounting tabs, unassembled), screw-driver slot, 14-plates, 1.98-12.4 pf, 850 peak voltage. EF Johnson Co Cat. No. 189-6.	B-5491271-P6
C2619	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 18 pf ±5%, 500 VDCW, -750 temp. coef.	C-5496219-P745
C2621	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 33 pf ±5%, 500 VDCW, -750 temp. coef.	C-5496219-P751
C2622	Capacitor: Variable, sub-miniature; (supplied with 2-mounting tabs, unassembled), screw-driver slot, 14-plates, 1.98-12.4 pf, 850 peak voltage. EF Johnson Co Cat. No. 189-6.	B-5491271-P6
C2623	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 13 pf ±5%, 500 VDCW, -750 temp coef.	C-5496219-P743
C2624	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 36 pf ±5%, 500 VDCW, -750 temp coef.	C-5496219-P752
C2625	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0022 uf +100%, -0%, 500 VDCW.	C-5495751-P9
C2626	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 33 pf ±5%, 500 VDCW.	C-5496219-P51
C2627	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0022 uf +100% -0%, 500 VDCW.	C-5495751-P9
C2628 and C2629	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.001 uf +100%, -0%, 500 VDCW.	C-5495751-P7
C2631	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0047 uf +100% -0%, 500 VDCW. (Used with two-frequency only).	C-5495751-P11
C2632 and C2633	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.0022 uf +100% -0%, 500 VDCW.	C-5495751-P9
C2634	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0047 uf +100% -0%, 500 VDCW.	C-5495751-P11
C2635 and C2636	Capacitors: Fixed ceramic disc, (insulated, high dielectric); 0.001 uf +100% -0%, 500 VDCW. Sprague Electric Co Cat. No. 1219C4.	B-7491393-P1
C2637	Capacitor: Variable, sub-miniature; (supplied with 2-mounting tabs, un-assembled), screw-driver slot, 14-plates, 1.98-12.4 pf, 850 peak voltage. EF Johnson Co Cat. No.189-6. (Used with two-frequency only).	B-5491271-P6
C2638	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 33 pf ±5%, 500 VDCW, -750 temp coef. (Use with two-frequency only).	C-5496219-P751
C2639	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 18 pf ±5%, 500 VDCW, -750 temp coef. (Use with two-frequency only).	C-5496219-P745
C2640	Capacitor: Variable, sub-miniature; (supplied with 2-mounting tabs, un-assembled), screw-driver slot, 14-plates, 1.98-12.4 pf, 850 peak voltage. EF Johnson Co Cat. No. 189-6. (Use with two-frequency only).	B-5491271-P6
C2641	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 36 pf ±5%, 500 VDCW, -750 temp coef. (Use with two-frequency only).	C-5496219-P752
C2642	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 13 pf ±5%, 500 VDCW, -750 temp coef. (Use with two-frequency only).	C-5496219-P743
C2645	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0022 uf +100% -0%, 500 VDCW. (Use with two-frequency only).	C-5495751-P9
C2646	Capacitor: Fixed ceramic disc, (insulated, high dielectric); 0.0047 uf +100% -0%, 500 VDCW. (Use with two-frequency only).	C-5495751-P11
	HEATERS	
HR2601	Oven: Crystal; aluminum cap, insulated, 8-pins, snap action thermostat, silver contacts, ambient temp range of -30° to 85°C, must accomodate 2-crystals, 13 v nom voltage.	B-5491357-P5
HR2603	Oven: Crystal; aluminum cap, insulated, 8-pins, snap action thermostat, silver contacts, ambient temp range -30° to 85° C, must accomodate 2-crystals, 13 v nom voltage. (Use with two-frequency only).	B-5491357-P5
	JACKS AND RECEPTACLES	
J2601 thru J2603	Pins: Contact; brass, cadmium plated finish. Bead Chain Mfg Co Cat. No. L93-3.	A-4033513-P4
J2604	Terminal: Brass; tin-plated. Alden Products Co Cat. No. 654T (or equiv).	A-4031537-P1
J2605	Pin: Contact; brass, cadmium plated finish. Bead Chain Mfg Co Cat. No. L93-3.	A-4033513-P4
J2606	Jack: (Part of Z2601).	A-7104941-P4
J2607	Pin: Contact; brass, cadmium plated finish. Bead Chain Mfg Co Cat. No. L93-3.	A-4033513-P4
	INDUCTORS	
L2601	Coil Assembly. Includes the following component with L2601 prefix:	PL-5492532-G1
L2601-C1	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 4 pf ±0.5 pf, 500 VDCW, -80 temp coef.	B-5491238-P4
	PLUGS	
P2601 and P2602	Terminals: (Plug receptacle for 0.093 in. lg pin); tin-plated brass, 1-contact. Amp Mfg Co Inc Cat. No. 41854. Hand Tool Amp Mfg Co Cat. No. 47745.	A-4029840-P1
	RESISTORS	
R2602	Resistor: Composition, 47,000 ohms ±10%, 1/2 w.	C-3R77-P473K
R2605	Resistor: Composition, 0.47 megohm ±10%, 1/2 w.	C-3R77-P474K
R2606	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R2607	Resistor: Composition, 0.10 megohm ±10%, 1/2 w.	C-3R77-P104K
R2608	Resistor: Composition, 560 ohms ±10%, 1/2 w.	C-3R77-P561K
R2609	Resistor: Composition, 0.10 megohm ±10%, 1/2 w.	C-3R77-P104K
R2610	Resistor: Composition, 1,200 ohms ±10%, 1/2 w.	C-3R77-P122K
R2611	Resistor: Composition, 56,000 ohms ±10%, 1/2 w.	C-3R77-P563K
R2612 and R2613	Resistors: Composition, 0.10 megohm ±10%, 1/2 w.	C-3R77-P104K
R2614	Resistor: Composition, 120 ohms ±10%, 1/2 w. (Used with single-frequency only).	C-3R77-P121K
R2615 and R2616	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R2617	Resistor: Composition, 330 ohms ±10%, 1/2 w.	C-3R77-P331K
R2618 and R2619	Resistors: Composition, 0.10 megohm ±10%, 1/2 w. (Used with two-frequency only).	C-3R77-P104K
R2620	Resistor: Composition, 62 ohms ±5%, 1 w. (Used with two-frequency only).	C-3R78-P620J
R2621	Resistor: Composition, 560 ohms ±10%, 1/2 w. (Used with two-frequency only).	C-3R77-P561K
R2622	Resistor: Composition, 56,000 ohms ±10%, 1/2 w. (Used with two-frequency only).	C-3R77-P563K
R2623	Resistor: Composition, 1,200 ohms ±10%, 1/2 w. (Used with two-frequency only).	C-3R77-P122K
	TRANSFORMERS	
T2603	Transformer Assembly. Includes the following components with T2603 prefix:	PL-5492531-G1
T2603-C1 and T2603-C2	Capacitors: Fixed ceramic disc, (insulated, temp compensating); 33 pf ±10%, 500 VDCW, -330 temp coef.	C-5496218-P515
T2604	Transformer Assembly. Includes the following component with T2604 prefix:	PL-5492526-G1
T2604-C1	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 5.0 pf ±10%, ±0.5 pf, 500 VDCW, -80 temp coef.	C-5496218-P205
	TUBES	
V2601	Tube. Type 7717/6CY5.	
V2602	Tube. Type 6679/12AT7.	
V2603	Tube. Type 6678/6U8A.	
V2604	Tube. Type 6678/6U8A. (Used with two-frequency only).	
	SOCKETS	
XV2601	Socket: Tube, 7-pin miniature, PW; mica-filled phenolic insulation, phosphor-bronze contact, brass center shield, rated current 1 amp.	B-7489442-P2
XV2602 and XV2603	Sockets: Tube, 9-pin miniature, PW; mica-filled phenolic insulation, phosphor-bronze contact, brass center shield, rated current 1 amp.	B-7489470-P2
XV2604	Socket: Tube, 9-pin miniature, PW; mica-filled phenolic insulation, phosphor-bronze contact, brass center shield, rated current 1 amp. (Used with two-frequency only).	B-7489470-P2
XY2601	Socket: Octal; 8-pin, mica-filled phenolic body, phosphor-bronze contacts, rated current 1 amp.	A-7162446-P1
XY2603	Socket: Octal; 8-pin, mica-filled phenolic body, phosphor-bronze contacts, rated current 1 amp. (Used with two-frequency only).	A-7162446-P1
	CRYSTALS	
	When reordering crystals give G-E Dwg and Part No. and specify exact frequency needed.	
Y2601	Crystal: Oscillator; quartz, anti-resonant, freq range 10-15 MC, load capacitance 30 pf. Crystal frequency = (Operating frequency) ÷ 12.	A-4034643-P1
Y2602	Crystal: Oscillator; quartz, anti-resonant, freq range 10-15 MC, load capacitance 30 pf. Crystal frequency = (Operating frequency -4.3 MC) ÷ 12.	A-4034643-P2
Y2603	Crystal: Oscillator; quartz, anti-resonant, freq range 10-15 MC, load capacitance 30 pf. Crystal frequency = (Operating frequency) ÷ 12. (Used with two-frequency only).	A-4034643-P1
Y2604	Crystal: Oscillator; quartz, anti-resonant, freq range 10-15 MC, load capacitance 30 pf. Crystal frequency = (Operating frequency -4.3 MC) ÷ 12. (Used with two-frequency only).	A-4034643-P2
	SUB-ASSEMBLIES	
Z2601	Antenna Transformer Assembly. Includes the following components with Z2601 prefix:	PL-5493011-G1
Z2601-C1	Capacitor: (Fixed), (Moulded); dielectric, moulded phenolic, 2.0 pf ±0.10 pf, 500 VDCW, 0° temp coef. Jeffers Type JM5/32.	K-7130348-P6
Z2601-C2	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 22 pf ±5%, 500 VDCW, -80 temp coef.	C-5496218-P247
Z2601-C3 and Z2601-C4	Capacitors: Variable, sub-miniature; (supplied with 2-mounting tabs, unassembled), screw-driver slot, 14-plates, 1.98-12.4 pf, 850 peak voltage. EF Johnson Co Cat. No. 189-6.	B-5491271-P6
Z2601-C5	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 7 pf ±0.5 pf ±10%, 500 VDCW, -80 temp coef.	C-7774846-P207
Z2601-C6 and Z2601-C7	Capacitors: Fixed ceramic disc, (insulated, temp compensating); 5 pf ±0.5 pf ±10%, 500 VDCW, -80 temp coef.	C-7774846-P205
Z2601-J2606	Jack: Phono-type; mica-filled phenolic or ceramic and XXXP phenolic insulation, brass shell, brass spring contact, max operating voltage 350 vrms, 500 vdc. Cinch Mfg Co Cat. No. 14H12699.	A-7104941-P4
Z2601-L1	Coil: Copper wire; 2-1/2 turns at 10-turns per in., left-hand wound.	A-4034609-P1
Z2601-L2	Coil: Copper wire; 2-1/2 turns at 10-turns per in., left-hand wound.	A-4034609-P2
Z2601-R1	Resistor: Composition, 0.47 megohm ±10%, 1/2 w.	C-3R77-P474K
Z2602	RF Intermediate Transformer Assembly. Includes the following components with Z2602 prefix:	PL-5492974-G1
Z2602-C1 and Z2602-C2	Capacitors: Variable, (Ceramic); 3-12 pf -100% +50%, 500 VDCW, 0° temp coef. Erie Resistor Corp Type TS2A-NPO.	M-7484389-P2
Z2602-C3	Capacitor: Feed thru; 1,000 pf +100% -0%, 500 VDCW. Maida Development Co Style 277A.	A-7160807-P1
Z2602-C4	Capacitor: (Fixed), (Moulded); dielectric, moulded phenolic, 0.75 pf ±0.05 pf, 500 VDCW, 0° temp coef. Jeffers Type JM5/32.	K-7130348-P2
Z2602-C5	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 7 pf ±0.5 pf ±10%, 500 VDCW, -80 temp coef.	C-7774846-P207
Z2602-C6	Capacitor: Fixed ceramic disc, (insulated, temp compensating); 5 pf ±10%, 500 VDCW, -80 temp coef.	C-7774846-P205
Z2602-L1	Coil: Copper wire; 2-turns at 10-turns per in., left hand wound.	A-4034573-P1
Z2602-L2	Coil: Copper wire; 3-turns at 10-turns per in., left-hand wound.	A-4034574-P1
Z2602-R1	Resistor: Composition, 1,000 ohms ±5%, 1/2 w.	C-3R77-P102J
	MISCELLANEOUS	
	Printed Wiring Board: Tan phenolic, copper clad.	D-5498833-P1
	Strap: Tube shield ground; brass, 1.12 in. lg, 0.125 in. wide, tapers at end.	B-7489442-P3





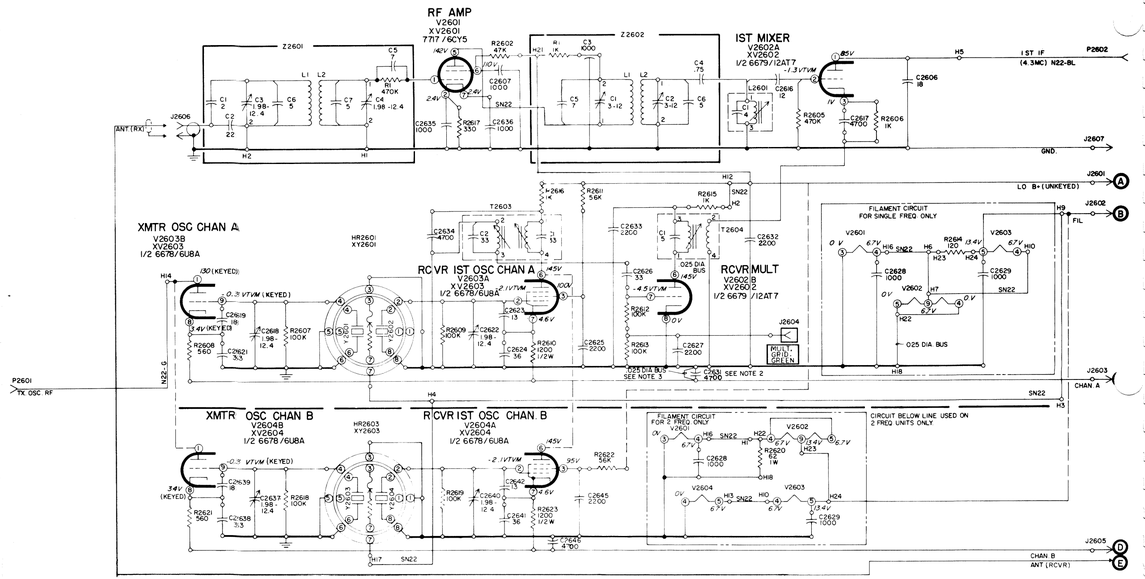
(D-5499541, Rev. 0)
(C-5496210, Sh.1, Rev. 0)
(C-5496230, Sh.2, Rev. 1)

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

SYMBOL AND TUBE TYPE	1	2	3	4	5	6	7	8	9
V2601 6CY5	470K	330Ω	0	FIL.	1000	47K	330		
V2602 12AT7	0	470K	1000	FIL.	FIL.	1000	200K	0	FIL.
V2603 6U8	0	100K	56K	FIL.	FIL.	1000	1200	560	100K
V2604 6U8	0	100K	56K	FIL.	FIL.	1000	1200	560	100K

RESISTANCE READINGS

RESISTANCE READINGS ARE TYPICAL RESISTANCES MEASURED FROM TUBE SOCKET PIN TO GROUND WITH ALL POWER REMOVED FROM THE CHASSIS, AND ALL FILAMENT AND B+ SUPPLY VOLTAGES SHORTED TO GROUND.



(D-5498653, Rev. 5)

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

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

NOTES:
1. ALL CIRCUITS ARE PRINTED WIRING EXCEPT AS SHOWN.
2. FOR 2 FREQ OPERATION ONLY.
3. FOR SINGLE FREQ OPERATION ONLY.

VOLTAGE READINGS

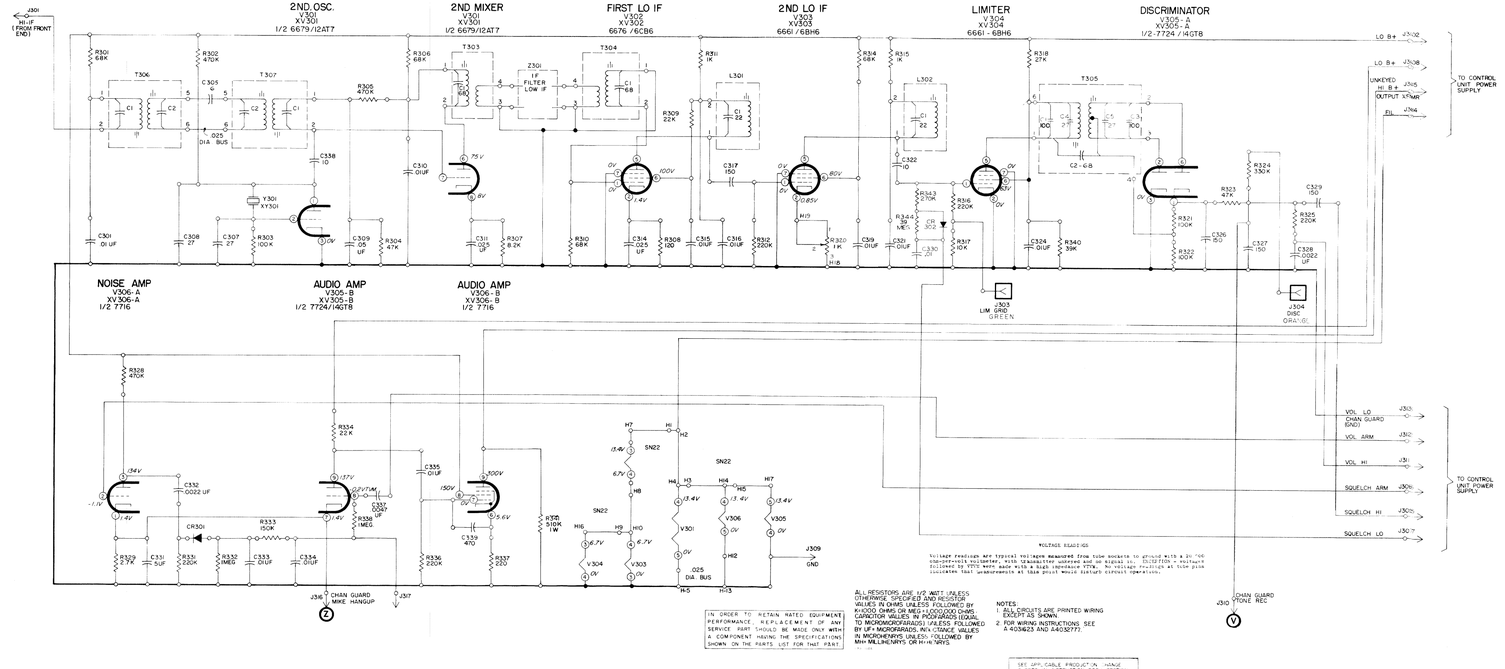
Voltage readings are typical voltages measured from tube sockets to ground with a 20,000 ohm-per-volt voltmeter, with transmitter unkeyed and no signal in. EXCEPTION - voltages followed by KEYD were made with a high impedance VTVM using a 470K series resistor. No voltage readings at tube pins indicates that measurements at this point would disturb circuit operation.

Service Sheet

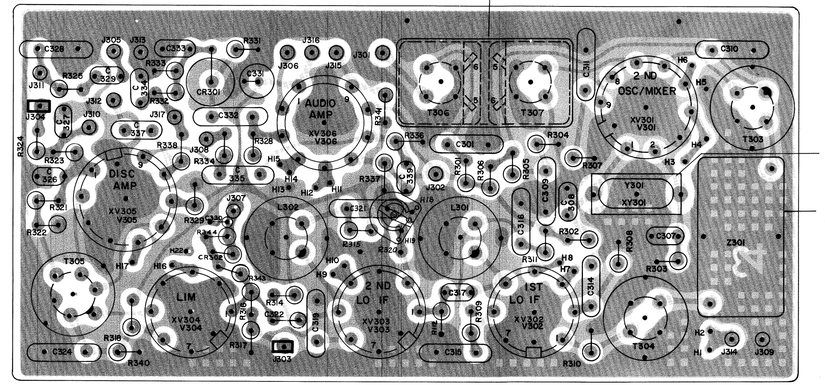
FRONT END/OSCILLATOR BOARD
MODEL 4EG15A10, 11

(RC-630C)

150B3



(DD-5497219, Rev. 13)



(D-5499042, Rev. 4)
(C-5496211, Sh. 1, Rev. 2)
(C-5496211, Sh. 2, Rev. 4)

RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

SYMBOL AND TUBE TYPE	1	2	3	4	5	6	7	8	9
V301 12AT7	470K	100K	0	FIL.	FIL.	62K	47K	8.2K	FIL.
V302 6CB6	17Ω	120Ω	FIL.	FIL.	1000	23K	0		
V303 6BH6	220K	220Ω	FIL.	FIL.	1000	14K	0		
V304 6BH6	180K	0	FIL.	FIL.	16K	16K	0		
V305 14GT8	160K	90K	0	FIL.	FIL.	90K	2.7K	2 MEG	22K
V306 7716	2.7K	290K	470K	FIL.	FIL.	220Ω	220K	0	0

RESISTANCE READINGS

RESISTANCE READINGS ARE TYPICAL RESISTANCES MEASURED FROM TUBE SOCKET PIN TO GROUND WITH ALL POWER REMOVED FROM THE CHASSIS, AND ALL FILAMENT AND B+ SUPPLY VOLTAGES SHORTED TO GROUND.

Service Sheet

IF/AUDIO BOARD
MODEL 4EL12A10; REV. D

(RC-628G)

15183

PARTS LIST
IF/AUDIO BOARD
MODEL 4EL12A10 REV. D

PL-5496226-G1

SYMBOL	DESCRIPTION	G-E DRAWING & PART NO.
	CAPACITORS	
C301	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 0.01 uf +100% -0%, 500 VDCW.	C-5495751-P13
C304	Capacitor: (Fixed), (Moulded): dielectric, moulded phenolic, 1.0 pf ±0.05 pf, 500 VDCW. Jeffers Type JM-5/32. 0° temp cof.	K-7130348-P3
C307 and C308	Capacitors: Fixed, ceramic disc, (insulated, temp compensating); 27 pf ±5%, 500 VDCW, -330 temp coef.	C-5496219-P549
C309	Capacitor: Disc type, (insulated, high dielectric) ceramic, 0.05 μf +80% -20%, 50 VDCW. Sprague Electric Co Cat. No. 44C29.	B-7491827-P4
C310	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 0.01 uf +100% -0%, 500 VDCW.	C-5495751-P13
C311	Capacitor: Disc type, (insulated, high dielectric) ceramic, 0.025 uf +80%, -20%, 50 VDCW. Sprague Electric Co Cat. No. 29C187.	B-7491827-P6
C314	Capacitor: Disc type; (insulated, high dielectric); ceramic, 0.025 uf +80% -20%, 50 VDCW. Sprague Electric Co Cat. No. 29C187.	B-7491827-P6
C315 and C316	Capacitors: Fixed, ceramic disc, (insulated, high dielectric); 0.01 uf +100% -0%, 500 VDCW.	C-5495751-P13
C317	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 150 pf +100% -0%, 500 VDCW.	C-5495751-P2
C318*	Capacitor: Disc type, (insulated, high dielectric); ceramic, 0 025 uf +80% -20%, 50 VDCW. Sprague Electric Co., Cat. No. 29C187. Deleted by Rev. C.	B-7491827-P6
C319	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 0.01 uf +100% -0%, 500 VDCW.	C-5495751-P13
C321	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 0.01 uf +100% -0%, 500 VDCW.	C-5495751-P13
C322	Capacitor: Fixed, ceramic disc, (insulated, temp compensating); 10 pf ±10% ±0.5 pf, 500 VDCW.	C-5496219-P10
C324	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 0.01 uf +1005 -0%, 500 VDCW.	C-5495751-P13
C326 and C327	Capacitors: Fixed, ceramic disc, (insulated, high dielectric); 150 pf +100% -0%, 500 VDCW.	C-5495751-P2
C328	Capacitor: Fixed, ceramic disc, (insulated temp compensating); 2,200 pf ±10%, 500 VDCW, -5600 temp coef.	C-5496372-P497
C329	Capacitor: Fixed, ceramic disc, (insulated,high dielectric); 150 pf +100% -0%, 500 VDCW.	C-5495751-P2
C330	Capacitor: Mylar,® dielectric. 0.01 μf ±20%, 100 VDCW. Good - All Electric Mfg. Co Type 663-UW.	B-7491930-P105
C331	Capacitor: Electrolytic, (vertical mount type); insulated, sealed in aluminum tube, 5 μf +100% -15%, 25 VDCW. Sprague Electric Mfg Co Cat. No. 30D179A1.	C-5495670-P14
C332	Capacitor: Fixed, ceramic disc, (insulated temp compensating); 2,200 pf ±10%, 500 VDCW, -5600 temp coef.	C-5496372-P497
C333 and C334	Capacitors: Disc type, (insulated, high dielectric); 0.01 uf +80% -30%, 50 VDCW. Sprague Electric Co Cat. No. 19C180.	?-7491827-P2
C335	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 0.01 uf +100% -0%, 500 VDCW.	C-5495751-P13
C337	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 0.0047 uf +100% -0%, 500 VDCW.	C-5495751-P11
C338	Capacitor: Ceramic disc, (insulated, temp compensating); 10 pf ±0.5 pf, ±10%, 500 VDCW, -80 temp coef.	C-7774846-P210
C339	Capacitor: Fixed, ceramic disc, (insulated, high dielectric); 470 pf +100% -0%, 500 VDCW.	C-5495751-P5
	RECTIFIER	
CR301	Diode; Silicon: peak inv 60 vac, max inv current 2 ua dc at 25°C and 60 ua at 100°C; min fwd current 1 ma at 1 v. Sim to Hughes HD6225.	B-5491705-P2
CR302*	Diode; Silicon; hermetically sealed in glass envelope, max peak inv 60 vac, max inv current 2 ua dc at 25°C and 60 μa dc at 100°C, min fwd cur. 1 ma at 1v. Hughes Prod Type HD6225. (Added by Rev. A).	B-5491705-P2
	JACKS AND RECEPTACLES	
J301 and J302	Pins: Contact; brass, cadmium plated finish. Bead Chain Mfg Co Cat. No. L93-3.	A-4033513-P4
J303 and J304	Terminals: Brass - tin-plated. Alden Products Co Cat. No. 654T (or equiv.)	A-4031537-P1
J305 thru J317	Pins: Contact; brass, cadmium plated finish. Bead Chain Mfg Co Cat. No. L93-3.	A-4033513-P4
	INDUCTORS	
L301 and L302	IF Inductor Assemblies. Includes the following components with L301 and L302 prefix:	PL-5492534-G1
L301-C1 and L302-C1	Capacitors: Fixed, ceramic disc, (insulated temp compensating); 22 pf ±10%, 500 VDCW, -750 temp coef.	C-5496218-P713
	RESISTORS	
R301	Resistor: Composition, 68,000 ohms ±10%, 1/2 w.	C-3R77-P683K
R302	Resistor: Composition, 0.47 megohm ±10%, 1/2 w.	C-3R77-P474K
R303	Resistor: Composition, 0.10 megohm ±10%, 1/2 w.	C-3R77-P104K
R304	Resistor: Composition, 47,000 ohms ±10%, 1/2 w.	C-3R77-P473K
R305	Resistor: Composition, 0.47 megohm ±10%, 1/2 w.	C-3R77-P474K
R306	Resistor: Composition, 68,000 ohms ±10%, 1/2 w.	C-3R77-P683K
R307	Resistor: Composition, 8,200 ohms ±10%, 1/2 w.	C-3R77-P822K
R308	Resistor: Composition, 120 ohms ±10%, 1/2 w.	C-3R77-P121K
R309	Resistor: Composition, 22,000 ohms ±10%, 1/2 w.	C-3R77-P223K
R310	Resistor: Composition, 68,000 ohms ±10%, 1/2 w.	C-3R77-P683K
R311	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R312	Resistor: Composition, 0.22 megohm ±10%, 1/2 w.	C-3R77-P224K
R313*	Resistor: Composition, 220 ohms ±10%, 1/2 w. Deleted by Rev. C.	C-3R77-P221K
R314	Resistor: Composition, 68,000 ohms ±10%, 1/2 w.	C-3R77-P683K
R315	Resistor: Composition, 1,000 ohms ±10%, 1/2 w.	C-3R77-P102K
R316	Resistor: Composition, 0.22 megohm ±10%, 1/2 w.	C-3R77-P224K
R317	Resistor: Composition, 10,000 ohms ±10%, 1/2 w.	C-3R77-P103K
R318	Resistor: Composition, 27,000 ohms ±10%, 1/2 w.	C-3R77-P273K
R319*	Resistor: Composition, 0.51 megohm ±5%, 1/2 w. (Deleted by Rev. A).	C-3R77-P514J
R321 and R322	Resistor: Composition, 0.10 megohm ±10%, 1/2 w.	C-3R77-P104K
R323	Resistor: Composition, 47,000 ohms ±10%, 1/2 w.	C-3R77-P473K
R324	Resistor: Composition, 0.33 megohm ±10%, 1/2 w.	C-3R77-P334K
R325	Resistor: Composition, 0.22 megohm ±10%, 1/2 w.	C-3R77-P224K
R327*	Resistor: Composition, 0.47 megohm ±10%, 1/2 w. (Deleted by Rev. A).	C-3R77-P474K
R328	Resistor: Composition, 0.47 megohm ±10%, 1/2 w.	C-3R77-P474K
R329	Resistor: Composition, 2,700 ohms ±10%, 1/2 w.	C-3R77-P272K
R331	Resistor: Composition, 0.22 megohm ±10%, 1/2 w.	C-3R77-P224K
R332	Resistor: Composition, 1.0 megohm ±10%, 1/2 w.	C-3R77-P105K
R333	Resistor: Composition, 0.15 megohm ±10%, 1/2 w.	C-3R77-P154K
R334	Resistor: Composition, 22,000 ohms ±10%, 1/2 w.	C-3R77-P223K
R336	Resistor: Composition, 0.22 megohm ±10%, 1/2 w.	C-3R77-P224K
R337	Resistor: Composition, 220 ohms ±10%, 1/2 w.	C-3R77-P221K
R338	Resistor: Composition, 1.0 megohm ±10%, 1/2 w.	C-3R77-P105K
R340	Resistor: Composition, 39,000 ohms ±10%, 1/2 w.	C-3R77-P393K
R341	Resistor: Composition, 0.51 megohm ±10%, 1 w.	C-3R78-P514K
R342	Resistor: Composition, 18,000 ohms ±10%, 1/2 w.	C-3R77-P183K
R343*	Resistor: Composition, 0.27 megohm ±10%, 1/2 w. (Added by Rev. A).	C-3R77-P274K
R344*	Resistor: Fixed composition; 39 megohm ±10%, 1/2 w. (Added by Rev. A).	A-7147161-P7
R320*	Resistor: Adjustable, (Sub. miniature trimmer), 1,000 ohms ±20%, linear taper. Added by Rev. C.	19B201969-P2
	TRANSFORMERS	
T301	Transformer Assembly. (Deleted by Rev. C) Includes the following components with T301 prefix:	PL-5492533-G1
T301-C1 and T301-C2	Capacitors: Fixed, silver mica, DM15-dipped phenolic insulation; 330 pf ±5%, 500 VDCW. Electro Motive Mfg Co Type DM15.	B-7489162-P39
T302*	IF Transformer Assembly. (Deleted by Rev. C) Includes the following components with T302 prefix:	PL-5492533-G2
T302-C1 and T302-C2	Capacitors: Fixed, silver mica, DN15-dipped phenolic insulation; 330 pf ±5%, 500 VDCW. Electro Motive Mfg. Co Type DM15.	B-7489162-P39
T303 and T304	IF Transformer Assemblies. Includes the following components with T303 and T304 prefix:	PL-5492525-G1
T303-C1 and T304-C1	Capacitors: Fixed, ceramic disc, (insulated, temp compensating); 68 pf ±5%, 500 VDCW, -750 temp coef.	C-5496218-P759
T305*	Discriminator Transformer Assembly. Includes the following components with T305 prefix:	PL-5492535-G1
T305-C1*	Capacitor, fixed mica: 100 pf ±5%, 500 VDCW; sim to Electromotive Mfg. DM15.	B-7489162-P27
	In Models of Rev. B and C: Capacitor, ceramic disc, 82 pf ±5%, 500 VDCW.	B-7489162-P25
	In Models of Rev. A or earlier: Capacitor, ceramic disc, 110 pf ±5%, 500 VDCW.	B-7489162-P28
T305-C2*	Capacitor, ceramic disc, 68 pf ±5%, 500 VDCW.	B-7489162-P45
	In Models of Rev. B: Capacitor, ceramic disc; 470 pf ±5%, 500 VDCW.	B-7489162-P43
	In Models of Rev. A or earlier: Capacitor, silver mica, 1000 pf +100% -0% 500 VDCW.	B-7774750-P4
T305-C3*	Capacitor, fixed mica: 100 pf ±5%, 500 VDCW; sim to Electromotive Mfg. DM15.	B-7489162-P27
	In Models of Rev. B and C: Capacitor, ceramic disc, 82 pf ±5%, 500 VDCW.	B-7489162-P25
	In Models of Rev. A or earlier: Capacitor, ceramic disc, 110 pf ±5%, 500 VDCW.	B-7489162-P28
T305-C4* and T305-C5*	Capacitor, ceramic disc, temp compensating, 27 pf ±5%, 500 VDCW, temp coef -1500. Added by Rev. B.	C-5496218-P849
T306*	Transformer Assembly. Includes the following components with T306 prefix:	PL-5492533-G3
T306-C1 and T306-C2	Capacitors, Fixed silver mica, dipped phenolic insulation, 330 pf ±5%, 500 VDCW. Sim to Electro Motive DM15.	B-7489162-P39
T307*	Transformer Assembly. Includes the following components with T307 prefix:	PL-5492533-G4
T307-C1 and T307-C2	Capacitors, Fixed Silver mica, dipped phenolic insulation, 330 pf ±5%, 500 VDCW. Sim to Electro Motive DM15.	B-7489162-P39
	TUBES	
V301	Tube. Type 6679/12AT7.	
V302	Tube. Type 6676/6CB6.	
V303 and V304	Tubes. Type 6661/6BH6.	
V305	Tube. Type 7724/14GT8.	
V306	Tube. Type 7716.	
	SOCKETS	
XV301	Socket: Tube, 9-pin miniature PW; mica-filled phenolic insulation, phosphor-bronze contact, brass center shield, rated current 1 amp.	B-7489470-P2
XV302 thru XV304	Sockets: Tube, 7-pin miniature, PW; mica-filled phenolic insulation, phosphor-bronze contact, brass center shield, rated current 1 amp.	B-7489442-P2
XV305 and XV306	Sockets: Tube, 9-pin miniature PW; mica-filled phenolic insulation phosphor-bronze contact, brass center shield, rated current 1 amp.	B-7489470-P2
XY301	Socket: Crystal; phenolic insulation, 2-electro-tinned contacts, brass clip, brass pin, National Fabricated Products Inc Cat. No. CH-8.	A-4034429-P2
	CRYSTAL	
Y301	Crystal: Oscillator; antiresonant, finishing tol ±100 cps, freq deviation with temp -30 to +100° C (±0.003%), load capacitance 20 pf, resonance res 25 ohms, freq 4,755 KC.	A-4034644-P1
	FILTERS	
Z301	Filter: Band Pass; mid-band freq 454-456 KC/sec, imp input and output 2,700 ohms. Clevite Electronic Components Cat. No. TC613A.	B-5493102-P1
	MISCELLANEOUS	
	Printed Wiring Board: Tan phenolic, copper clad.	D-5498834-P1
	Strap: Tube shield ground; brass, 1.12 in. lg, 0.125 in. wide, tapers at end.	B-7489442-P3

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

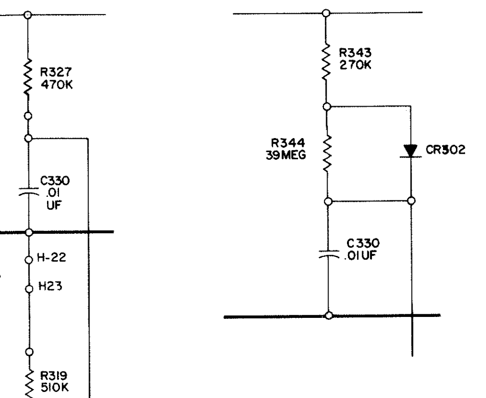
PRODUCTION CHANGES

(Refer to Parts List for description of parts affected by these changes)

REV. A - To improve squelch operation at high ambient noise levels. R319 and R327 deleted, and CR302, R343, R344 added.

Elementary Diagram Changes

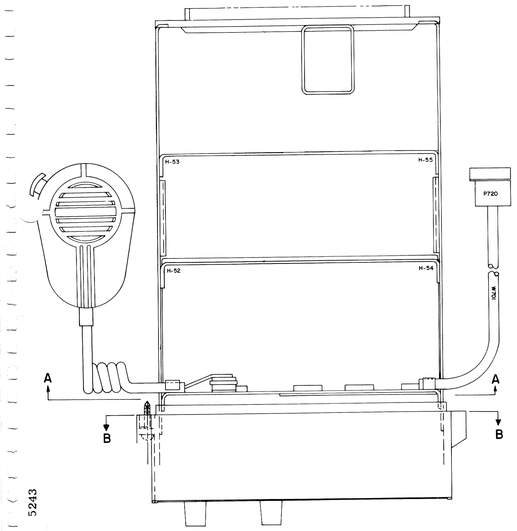
WAS CHANGED TO

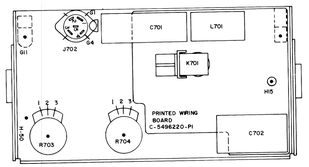


REV. B - To compensate discriminator frequency drift against temperature. Changed T305-C1, T305-C2, T305-C3, and added T305-C4 and T305-C5 in parallel with T305-C1 and T305-C3.

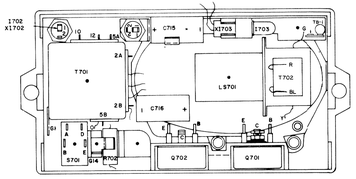
REV. C - To improve sensitivity and squelch stability, and to provide IF gain control. Replaced T301 with T306, T302 with T307, C304 with C305, R313 with R320. Also, changed T305-C2 and deleted C318.

REV. D - To bring discriminator constants closer to design center. Changed T305-C1 and T305-C3.



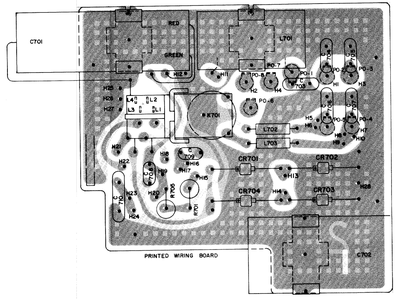


SECTION A-A



SECTION B-B

ROTATED 180°



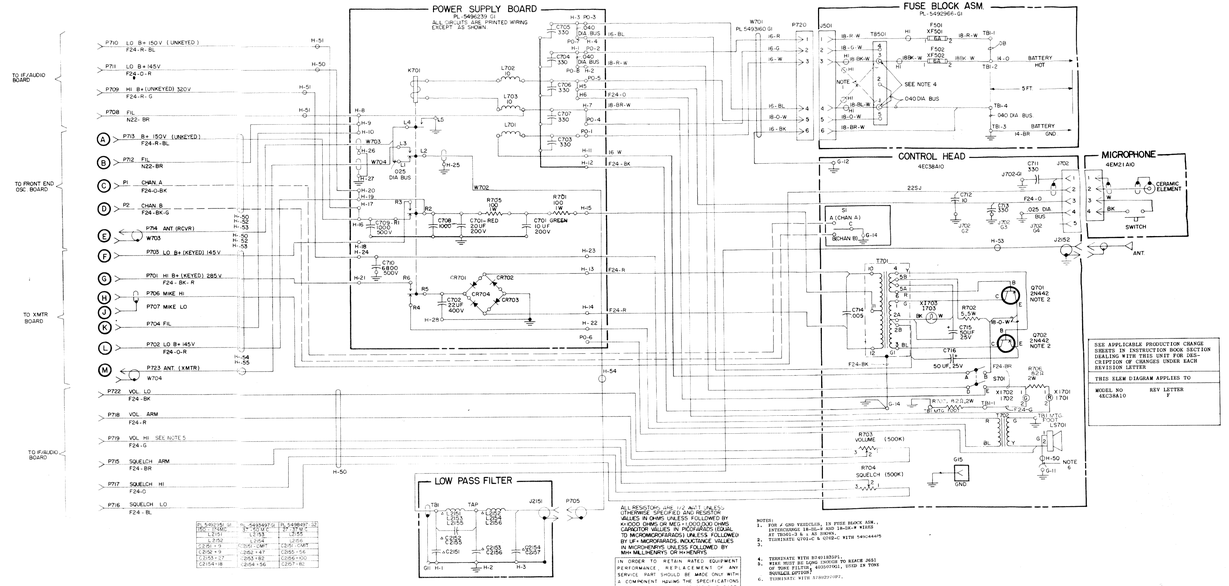
RUNS ON SOLDER SIDE

RUNS ON BOTH SIDES

RUNS ON COMPONENT SIDE

(D-5499349, Rev. 3)
(C-5496221, Sh. 1, Rev. 2)
(C-5496221, Sh. 2, Rev. 2)

PRINTED WIRING BOARD



(D-5497247, Rev. 10)

Service Sheet

CONTROL UNIT/POWER SUPPLY
MODEL 4EC38A10; REV. F

(RC-631H)

5243

PARTS LIST

CONTROL UNIT POWER SUPPLY
MODEL 4EC38A10, REV. F

PL-5498800-G1

SYMBOL	G-E PART NO.	DESCRIPTION
		CAPACITORS
C701	5493197-P1	Two-sections; sealed in uninsulated metal tube, 2-anode leads (insulated copper) and one cathode lead, 20/10 uf +100% -10%, 200-200 VDCW. (Included in Power Supply Board Assembly, PL-5496239-G1).
	5493197-P1	In Models of Rev. A or earlier: Two-sections; sealed in uninsulated metal tube 2-anode leads (insulated copper), 20/10 uf +100% -10%, 200-200 VDCW. (Included in Power Supply Board Assembly, PL-5496239-G1).
C702	5492962-P4	One-section; sealed in uninsulated metal tube, 2-tinned leads, 22 uf +50% -10%, 400 VDCW. Sim to Sprague Electric S72215. (Included in Power Supply Board Assembly, PL-5496239-G1). In Models of Rev. A or earlier: One-section; sealed in uninsulated metal tube, 1-tinned lead, 22 uf +50% -10%, 400 VDCW. Sim to Sprague Electric S72215. (Included in Power Supply Board Assembly, PL-5496239-G1).
C702	5492962-P4	One-section; sealed in metal tube, uninsulated 1-tinned lead, 22 uf +50% -10%, 400 VDCW. Sim to Sprague Electric S72215. (Included in Power Supply Board Assembly, PL-5496239-G1).
C703 thru C707	7489162-P139	Fixed, silver mica, DM15-dipped phenolic insulation; tinned copper or brass leads, 330 pf ±10%, 500 VDCW. Sim to Electromotive DM15. (Included in Power Supply Board Assembly, PL-5496239-G1).
C708 and C709	7491393-P1	Fixed ceramic disc (insulated high dielectric); 2-tinned copper leads, 0.001 uf +100% -0%, 500 VDCW. Sim to Sprague Electric 1219C4. (Included in Power Supply Board Assembly, PL-5496239-G1).
C710#	5495751-P18	Ceramic disc: 6800 pf ±20%, 500 VDCW. In Models earlier than Rev. E:
	5494481-P117	Ceramic disc: 4000 pf ±20%, 500 VDCW.
C711	7489162-P139	Fixed, silver mica, DM15-dipped phenolic insulation; tinned copper or brass leads, 330 pf ±10% 500 VDCW. Sim to Electromotive DM15.
C712	7489162-P106	Fixed, silver mica, DM15-Dipped phenolic insulation; tinned copper or brass leads, 10 pf ±10% 500 VDCW. Sim to Electromotive DM15.
C713	7489162-P139	Fixed, silver mica, DM15-Dipped phenolic insulation; tinned copper or brass leads, 330 pf ±10% 500 VDCW. Sim to Electromotive DM15.
C714	5493745-P5	Fixed, ceramic disc, (insulated, high dielectric); 0.005 uf ±20%, 1,000 VDCW.
C715 and C716	5492962-P1	One-section; sealed in metal tube, protected by insulated cylinder, 1-tinned and 1-anode leads, 50 uf +250% -10%, 25 VDCW. Sim to Sprague Electric S72219.
		RECTIFIERS
CR701* thru CR704*	4037822-P1	Silicon. (Included in Power Supply Board Assembly PL-5496239-G1). In Models of Rev. E or earlier: Silicon, (Included in Power Supply Board Assembly, PL-5496239-G1).
		INDICATING DEVICES
I701* and I702*	19B201122-P1	Lamp: Operating voltage 6v, operating current 200 ma. Sim to G-E 1768. (Part of XI701, XI702). In Models of Rev. B or earlier: Lamp: Operating voltage 4V, operating current 400 ma. Sim to Matchless Electric 765.
I703		Lamp: incandescent; miniature bayonet base, 28 v at 0.035 amp. Sim to G-E 1819.
		JACK
J702	5493018-P1	General purpose black phenolic; cadmium plated steel saddle (Cinch 14571), 5-contacts. Sim to Cinch 18060.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	G-E PART NO	DESCRIPTION
		RELAY
K701	5495814-P2	Miniature telephone (for printed circuit); coil-96.50 ohms res, 12 VDC nom; contacts - 1-form A and 3-form C, 0.50 ohms max, 6-10 pf capacitance. Sim to Fred Goat G125-117. (Included in Power Supply Board Assembly, PL-5496239-G1).
		INDUCTORS
L701	7143944-P2	Choke: RF coil; enameled wire or insulation, molded or encapsulated, 2-tinned leads (0.625-1 in. lg), 15 VDC max battery voltage, ind. -120 uh ±10% at 1,000 cps, 0.064 ohms max de res (Included in Power Supply Board Assembly, PL-5496239-G1).
L702 and L703	7488079-P16	Chokes; RF Coil; insulated, moulded in thermo setting compound, 2-tinned copper leads, ind 10 uf ±10%, powdered iron core. Sim to Jeffers Electronic 10102-32. (brown-black). (Included in Power Supply Board Assembly PL-5496239-G1).
		LOUDSPEAKER
LS701	5496301-P1	Speaker and Transformer Assembly. Includes the Following: (1) Speaker (3 x 5 in.), treated (moisture-resistant) paper speaker cone, paper dust cap; voice coil imp. 3.20 ohms ±10%, speaker resonance 200-300 cps, input 2 w. (1) Transformer Sim to G-E 5492498-P1) (T702).
		PLUGS
P701 thru P704	4029840-P1	Terminals: (Plug receptacle for 0.093 in. lg pin) tin-plated brass, 1-contact. Sim to Amp Mfg. 41854. Sim to HandTool Amp 47745. (Included in Power Supply Board Assembly, PL-5496239-G1).
P705	7104941-P6	Phono type (short); XXXP phenolic insulation, silver finished brass shell, silver plated brass contact, 350 vrms, 500 VDC. Sim to Cinch 15H20175. (Part of W702).
P706 and P707	4029840-P1	Terminals: (Plug receptacle for 0.093 in.lg pin); tin plated brass, 1-contact. Sim to Amp Mfg 41854. Sim to Hand Tool Amp Mfg 47745.
P708 thru P713	4029840-P1	Terminals: (Plug receptacle for 0.093 in. lg pin) tin-plated brass, 1-contact, Sim to Amp 41854 Sim to Hand Tool Amp 47745. (Included in Power Supply Board Assembly PL-5496239-G1).
P714	7104941-P6	Plug: Phono type (short); XXXP phenolic insulation, silver finished brass shell, silver plated brass contact, 350 vrms, 500 VDC, Sim to Cinch 15H20175. (Part of W703).
P715 thru P719	4029840-P1	Terminals: (Plug receptacle for 0.093 in. lg pin) tin-plated brass, 1-contact. Sim to Amp 41854. Sim to Hand Tool Amp 47745.
P720	5496809-P3	Cover: Plug; 6-way, insulated, nylon. Sim to Amp No. 480086-1. (Part of W701).
P722	4029840-P1	Terminal: (Plug receptacle for 0.093 in. lg pin); tin-plated brass, 1-contact Sim to Amp 41854. Sim to Hand Tool Amp 47745.
P723	7104941-P6	Plug: Phono type (short); XXXP phenolic insulation, silver-finished brass shell, silver platted brass contact, 350 vrms, 500 VDC. Sim to Cinch 15H20175. (Part of W704).
		TRANSISTORS
Q701 and Q702	5490810-P1	Germanium, PNP Power, hermetically sealed, insulated locater pin. Type 2N442.
		RESISTORS
R701	3R78-P101K	Composition, 100 ohms ±10%, 1 w. (Included in Power Supply Board Assembly, PL-5496239-G1).
R702	5493035-P1	Wire-wound; ceramic case, 2-tinned wire-leads, 5 ohms ±5%, 1 amp, 5 w. Sim to Tru-Ohm Div X-60.
R703	5491890-P2	Potentiometer, Carbon film: (Ear mounted); mounted on metal panel (4 x 4 inches), log taper, 500,000 ohms ±20%, 0.125 w, 500 VDC. Sim to Chicago Telephone Supply 45.
R704	5491890-P1	Potentiometer, Carbon film; (Ear mounted); mounted on metal panel (4 x 4 inches), linear taper 500,000 ohms ±20%, 0.25 w, 500 VDC. Sim to Chicago Telephone Supply 45.

SYMBOL	G-E PART NO	DESCRIPTION
		RESISTORS (CONT'D)
R705	3R78-P101K	Composition, 100 ohms ±10%, 1 w.
R706* and R707*	3R79-P820J	Composition, 82 ohms ±5%, 2 w. In Models of Rev. C:
	3R79-P101J	Composition, 100 ohms ±5%, 2 w. In Models of Rev. B or earlier:
	3R78-P201J	Composition, 200 ohms ±5%, 1 w.
		Cable Assembly. Includes the following: (1) Connector. C-5496809-P3 (P720)
		SWITCH
S701	5491899-P2	Toggle; nickel or polished chrome switch sleeve and toggle, dpst, solder-lug terminals, 3 amps at 250 v and 6 amps at 125 v, 0.05 ohms max res. (Mounting hardware not supplied). Sim to Cutler-Hammer 8370K8.
		TRANSFORMERS
T701	5496377-P1	Toroid; encapsulated in metal, core and coil type Input: 13.5 VDC; Output 1: 330 VDC at 0.16 ADC; Output 2: 165 VDC at 0.14 ADC.
T702	5492498-P1	Audio; core and coil type construction; Pri imp; 5,800 ohms ±10% at 1.5 w; Sec 1 imp: 3.2 ohms ±10% at 1.5 w. (Part of LS701).
		TERMINAL BOARD
TB1	7487424-P2	Strip, terminal: (Miniature); Nema grade XXXP phenolic insulation-tan; 1-terminal (brass) Sim to Cinch Mfg. 4409); mounting bracket (brass) mounted to left of terminal, Sim to Cinch Mfg 4478). (Added by Rev. A).
		CABLES
W701	PL-5491160-G1	Cable Assembly. Includes the following; (1) Connector, (G-E Dwg and Part No. C-5496809-P3) (P720). (6) Contacts, tin-plated, brass No. 20-22 wire, insulated. Sim to Amp Inc 42641-1. (G-E Dwg and Part No. C-5496809-P18). (1) Terminal, solderless, support type insulation; annealed copper, electro-tin plated. Sim to Amp 32861. G-E 7491823-P6).
W702	5491689-P17	Cable Assembly. Includes the following: (1) Cable, RG-174/U (black) 10 in. lg, operating voltage 350 vrms, 500 VDC; max operating temp -80°C; acetate butyrate insulation Sim to Tennessee Eastman 239H3). (1) Connector, (left end), (G-E A-7104941-P6) (P705).
W703	5491689-P19	Cable Assembly. Includes the following: (1) Cable, RG-174/U (black) 9.25 in. lg, operating voltage 350 vrms, 500 VDC; max operating temp -80°C; acetate butyrate insulation Sim to Tennessee Eastman 239H3) (1) Connector, (left end), (G-E 7104941-P6) (P714).
W704	5491689-P24	Cable Assembly, Includes the following: (1) Cable: RG-174/U (black) 16 in. lg, operating voltage 350 vrms, 500 VDC; max operating temp -80°C, acetate butyrate insulation; Sim to Tennessee Eastman A-239H3. (1) Connector: (Left end), (G-E A-7104941-P6) (P723).
		SOCKETS
XI701*		Indicator Light Assembly: Includes the following: a. Socket - 7/16-32 thread.
	19B201122-P2	b. Lens, cap, red.
	19B201122-P4	c. Lamp (I701) In Models of Rev. B or earlier: Indicator Light Assembly.
	5492872-P5	Includes one each: a. Socket b. Lens, red. c. Hardware d. Lamp (I701)
XI702*		Indicator Light Assembly, Includes the following: a. Sockets, 7/16-32 thread
	19B201122-P2	b. Lens cap, green
	19B201122-P3	c. Lamp (I702) In Models of Rev. B or earlier: Indicator Light Assembly.
	5492872-P6	Includes one each: a. Socket b. Lens, green. c. Hardware d. Lamp (I701)

SYMBOL	G-E PART NO	DESCRIPTION
		SOCKETS (CONT'D)
XI703	4032220-P1	Lamp; miniature bayonet, insulating sleeve, 6-in leads. Sim to Drake N517.
		SUB-ASSEMBLIES
	PL-5496239-G1	Power Supply Board Assembly Includes the following components: C701 thru C710 CR701 thru CR704 K701 L701 thru L703 P701 thru P704, P708 thru P713 R701 and R705
		MICROPHONE ASSEMBLY
		MODEL 4EM21A10
	5493552-P1	Microphone Assembly. Consists of the following components: (1) Microphone: (Ceramic cartridge); high plastic gray-green case, high imp, output 70 to 7,000 cps. (1) Cord: 3-conductor cadmium copper with tinsel shield (extended length 5-feet at 3-lb force). (1) Button: High impact plastic-black (1) Plug: General Purpose black phenolic; 5-contacts. Sim to Cinch 16564. (G-E 5493018-P2).
		MISCELLANEOUS
	5496220-P1	Printed Wiring Board: Tan, phenolic, copper clad. (Used in Power Supply Board Assembly PL-5496239-G1)
	PL-4034696-G1	BRACKET ASSEMBLY Consists of the following components: (1) Bracket: Steel; 0.029 in thick; bent on 0.031 radius, 5.33 in. lg, 0.58 in. wide, (G-E 5493114-P1) (1) Clip: Spring steel; annealed carbon, cadmium plated with cronak, 0.45 in. dia, 0.014 in. thick. Sim to Augat Bros. 6185-1A. (G-E 4032248-P1). (1) Spring: Steel; 0.014 in. thick, bent on 0.031 radius. (G-E 4034691-P1). (2) Rivets: Tubular; brass, 0.094 in. lg, 0.098 in dia. (G-E 7480994-P101).
	4034667-P1	Clip: Cable; spring steel, 0.90 in. lg. 0.022 in. Thick. Sim to Tinnerman C240-6Z-24.
	4035186-P1	Spring Clip: Brass; nickel plated, 0.02 in. thick Sim to Zierick 446.
	7118719-P6	Clip: Mounting; steel, cadmium plated, 2-impinging legs. Sim to Prestole 500-1-1129. P and Co. (Used in Power Supply Board Assembly, PL-5496239-G1).
	7118719-P4	Clip: Mounting; steel, cadmium plated, 2-impinging legs. Sim to Prestole 500-750-1129, P and Co. (Used in Power Supply Board Assembly, PL-5496239-G1).
	4034668-P1	Fastener: Circular; spring steel. Sim to Tinnerman Products C4154-017-24.
	5498776-P1	Heat Sink: Steel; black finish, 7.4 in. lg 3.61 in. wide.
	5495256-P1	Knob: Butyrate (Tenite II); red-orange color, for use with flatted shaft. Sim to Eastman Chemical 32599.
	7478455-P2	Lug: Terminal; copper bent at 90° Angle, 0.688 in. lg, 0.25 in. wide, 0.025 in. thick. Deleted by Rev. A.
	4034190-P1	Pad: Rubber; industrial grade sponge, color-black 1.80 in. lg, 1.80 in. wide, 0.125 in. thick.
	4034817-P1	Terminal: Phosphor bronze; bend on 0.031 in. radius, 0.015 in. thick.
	7135557-P1	Terminal: Brass. Sim to Cinch 13635. (Used in Power Supply Board Assembly, PL-5496239-G1).
	7491823-P4	Terminal: Solderless, insulation, support type; annealed copper electro-tin plated, AWG wire size 22-16 (stranded. Sim to Amp 21271. (Not to be used on solid wire).
	7491825-P1	Terminal: Solderless, insulation support type; annealed copper, electro-tinplated. Sim to Amp 33766.
		LOW-PASS FILTER
		PL-5492951-G1

SYMBOL	G-E PART NO	DESCRIPTION
		CAPACITORS
C2151 and C2152	7489162-P5	Fixed, silver mica, DM15-dipped phenolic insulation; 9 pf ±5%, 500 VDCW. Sim to Electro Motive DM15.
C2153	7489162-P13	Fixed, silver mica, DM15-dipped phenolic insulation; 27 pf ±5%, 500 VDCW. Sim to Electro Motive DM15.
C2154	7489162-P9	Fixed, silver mica, DM15-dipped phenolic insulation; 18 pf ±5%, 500 VDCW. Sim to Electro Motive DM15.
		JACKS AND RECEPTACLES
J2151	7104941-P4	Phono-type; mica-filled phenolic or ceramic and XXXP phenolic insulation, brass shell, brass spring contact, max operating voltage 350 vrms, 500 VDC. Sim to Cinch 14H12699.
J2152	7104941-P5	Phono-type; ceramic and XXXP phenolic insulation. steel shell, brass spring contact, max operating voltage 350 vrms, 500 VDC. Sim to Cinch 14H18331.
		INDUCTORS
L2151 and L2152	4034548-P1	Coils: 2-1/4 turns, close wound.
		LOW-PASS FILTER
		PL-5493497-G1 and G2
		CAPACITORS
C2152	7489162-P19	Fixed, silver mica, DM15-dipped phenolic insulation; 47 pf ±5%, 500 VDCW. Sim to Electro Motive DM15. (Used in Group 1 only).
C2153	7489162-P25	Fixed, silver mica, DM15-dipped phenolic insulation; 82 pf ±5%, 500 VDCW. Sim to Electro Motive DM15. (Used in Group 1 only).
C2154	7489162-P21	Fixed, silver mica, DM15-dipped phenolic insulation; 56 pf ±5%, 500 VDCW. Sim to Electro Motive DM15. (Used in Group 1 only).
C2155	7489162-P21	Fixed, silver mica, DM15-dipped phenolic insulation; 56 pf ±5%, 500 VDCW. Sim to Electro Motive DM15. (Used in Group 2 only).
C2156	7489162-P27	Fixed, silver mica, DM15-dipped phenolic insulation; 100 pf ±5%, 500 VDCW. Sim to Electro Motive DM15. (Used in Group 2 only).
C2157	7489162-P25	Fixed, silver mica, DM15-dipped phenolic insulation; 82 pf ±5%, 500 VDCW. Sim to Electro Motive Mfg DM15. (Used in Group 2 only).
		JACKS AND RECEPTACLES
J2151	7104941-P4	Phono-type; mica-filled phenolic or ceramic and XXXP phenolic insulation, brass shell, brass spring contact, max operating voltage 350 vrms, 500 VDC, Sim to Cinch 14H12699.
J2152	7104941-P5	Phono-type; ceramic and XXXP phenolic insulation steel shell, brass spring contact, max operating voltage 350 vrms, 500 VDC. Sim to Cinch 14H18331.
		INDUCTORS
L2153 and L2154	4035215-P1	Coils: 4-1/2 turns, left-hand close wound. (Used in Group 1 only).
L2155 and L2156	4035216-P1	Coils: 5-1/2 turns, left-hand close wound. (Used in Group 2 only).
		ANTENNAS
4EY12C10	5490969-P9	ANTENNA ASSEMBLY (130-174 MC)
		Replacement Parts For Antenna
	5490969-P4	Whip only: Stainless steel, 19.75 inches long.
	5490969-P5	Whip socket and Setscrews (less whip).
	5490969-P6	Whip with Whip Socket and Setscrews.
	5491689-P23	Cable Assembly Includes the following: Cable: 15 feet long. Type RG-58/U.
	7104941-P48	Connector, Phono:
4EY5A6	PL-4033101-G3	ANTENNA ASSEMBLY (27-50-MC)

SYMBOL	G-E PART NO	DESCRIPTION
		ANTENNAS (CONT'D)
		Replacement Parts For Antenna:
	PL-7491674-P1	8-foot Antenna Rod.
	7476632-G4	Adaptor Spring.
	5491689-P23	Antenna Cable.
	7472880-G5	Antenna Base Assembly.
		FUSE BLOCK ASSEMBLY PL-5492966-G1
F501 and F502	7102673-P6	Cartridge type; quick blowing, 6 amp, 32-volts: Sim to Littelfuse 311006.
		JACKS AND RECEPTACLES
J501	5496809-P4	Receptacle: phenolic; sim to Molex 1055R6.
		TERMINAL BOARD
TB501	7117710-P5	Terminal Board; 5-terminals, Sim to Cinch 1775.
		FUSE HOLDERS
XF501	PL-7142873-G8	Fused lead.
XF502	PL-7142873-G7	Fused lead.
		MISCELLENEOUS
	5496178-P1	Bracket
	7775500-P10	Terminal strip
	5496809-P19	Spring
	7491825-P1	Terminal

PRODUCTION CHANGES

(Refer to Parts List for description of parts affected by these revisions.)

REV. A - To eliminate possibility of interference. Terminal Lug G13 replaced by TB1.

REV. B - To provide improved grounding for power supply filter capacitors. A pigtail lead from the case of C701 and C702 was soldered to a ground point on the printed board.

REV. C and D - To incorporate a more available light bulb. XI701, XI702, R706, R707, I701 and I702 changed.

REV. E - To improve audio frequency response. C710 changed.

REV. F - To incorporate smaller diodes. CR701 through CR704 changed.

END OF DOCUMENT