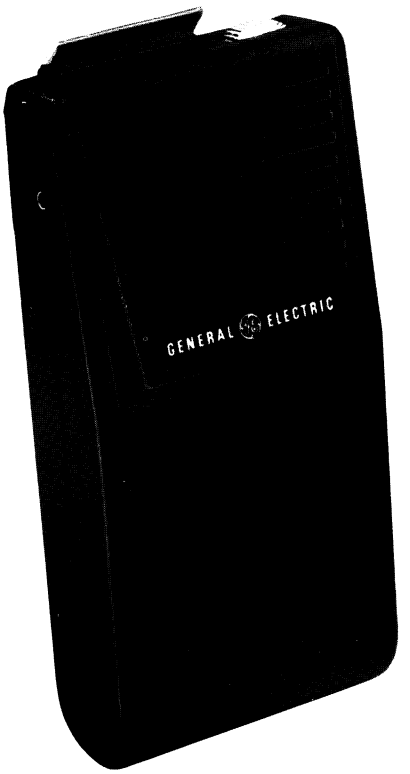
MOBILE RADIO

150.8–174 MHz

Executive Pager

MAINTENANCE MANUAL

TONE AND VOICE AND TONE ONLY



LBI-30252B

OF-1114

GENERAL ELECTRIC

TABLE OF CONTENTS

WARNING

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

SPECIFICATIONS*

Type Number	ER-94-A
Frequency Range	150.8-174 MHz
Modulation Acceptance	±7 kHz
Channel Spacing	30 kHz
Selectivity	
EIA Method	-60 dB at ±30 kHz
20 dB Quieting	-65 dB at ±30 kHz
Chassis Sensitivity	
12 dB SINAD (EIA Method)	0.25 uV
20 dB Quieting Method	0.35 uV
Paging	0.15 uV
Spurious Response	-50 dB
Frequency Stability	.001% (-10°C to +50°C)
Battery Drain (at 3.75 Volts)	
Squelched	3 milliamperes
Unsquelched	111 milliamperes
Audio Power Output	150 milliwatts
Alert Tone Output	200 milliwatts
Audio Distortion	Less than 10% at rated power output
Frequency Response	+2 dB and -10 dB of a standard 6 dB per octave de-emphasis curve from 300 to 3000 Hz (1000 Hz reference)

COMBINATION NOMENCLATURE

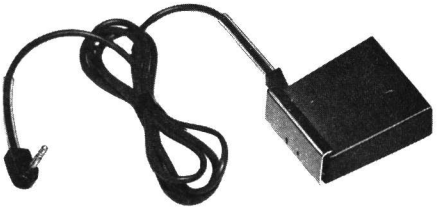
1st & 2nd Digits	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th & 9th Digits
Product Line	RF Power	Channel Spacing	Mode of Operation	Alert Tones	Options	Frequency Range
AH Personal Pager	**O** Receive Only	**6** 30 kHz	**A** Individual Call Tone & Voice (Automatic Reset)	**W** Fixed Output	**L** Type 99 Decoder	**66** 150.8-174 MHz
			B Individual Call Tone & Voice (Push-to-Reset)	**V** Adjustable Output		
			C Individual Call Tone & Voice (Push-to-Listen)			
			D Individual Call Tone Only (Push-to-Silence)			
			F Group Call Tone & Voice (Push-to-Reset)			
			G Group Call Tone & Voice (Push-to-Listen)			
			H Group Call Tone Only (Push-to-Silence)			
			J Group Call Tone & Voice (With Automatic Reset)			

ACCESSORIES

EARPHONE
4033570G5
(Option 1402)

DESK CHARGER
MODEL 4EP67A10
(Option 5405)

LAPEL SPEAKER 19A122060G14
& CORD SET 5495088P19
(Option 1401)



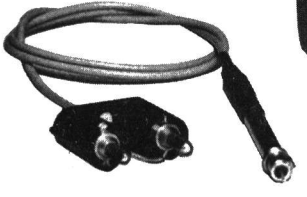
LEATHER
CASE
(Option 1403)

TEST EQUIPMENT

IF GENERATOR
MODEL 4EX9A10
(Option 4381)

For setting the receiver on frequency
and for troubleshooting

TEST AMPLIFIER
MODEL 4EX16A10 &
RF PROBE 19C311370-G1
(Option 4382)



For receiver front end and
IF gain measurements

DESCRIPTION

General Electric Executive Pagers are compact, high performance FM receivers for operation in the 150.8-174 MHz range. The Executive Pagers are available for two types of operation. The two types are:

- Voice and Type 99 tone signaling
- Type 99 tone signaling only

The receiver is housed in a ruggedly-constructed, Lexan case, with all operating controls conveniently mounted on the top of the case. An accessory jack on the side of the radio, is provided for an external earphone.

Power for the Personal Pager is normally supplied by a single rechargeable nickel-cadmium battery that fits in a separate battery compartment in the bottom section of the case. The battery can be recharged either in or out of the receiver.

If desired, the Pager can also be operated by either a mercury battery or alkaline battery. However, these batteries are not rechargeable.

The spring clip on the Pager may be used to clip the radio to a pocket or belt. The Pager may also be carried on a belt in an optional leather case.

OPERATION

The Executive Pager is shipped from the factory equipped for one of eight different modes of operation. The operating mode of the receiver can be determined by noting the 5th digit of the combination number printed on the nameplate on the bottom of the case.

Operating modes and controls for the different paging combinations are shown in the following chart.

5th Digit of Combination Number	Modes of Operation	Controls
A	Individual Call Tone and Voice (With Automatic Reset)	Push-to-Reset and OFF - VOLUME
B	Individual Call Tone and Voice Push-to-Reset	Push-to-Reset and OFF - VOLUME
C	Individual Call Tone and Voice Push-to-Listen	Push-to-Listen and OFF - VOLUME
D	Individual Call Tone Only Push-to-Silence	Push-to-Silence and OFF - VOLUME
F	Group Call Tone and Voice Push-to-Reset	Push-to-Reset and OFF - VOLUME
G	Group Call Tone and Voice Push-to-Listen	Push-to-Reset and OFF - VOLUME
H	Group Call Tone Only Push-to-Silence	Push-to-Silence and OFF - VOLUME
J	Group Call Tone and Voice (with Automatic Reset)	Push-to-Reset and OFF - VOLUME

TONE AND VOICE RECEIVER

Push-to-Reset

Turn the receiver on by turning the OFF-VOLUME control halfway to the right (see Figure 1). A short burst of tone and a continuous hissing sound should be heard from the speaker. Press down and release the Push-to-Reset bar to cut off the hissing sound. The Executive Pager is now ready to receive messages.

Before a message is received, a short burst of tone will be heard, followed by the voice message. As soon as the message is completed, press the Push-to-Reset bar to reset the receiver.

NOTE

In receivers equipped with the automatic reset option, the receiver will reset itself automatically within 30 seconds. However, the Push-to-Reset bar may be pressed as soon as the message is completed to reset the receiver.

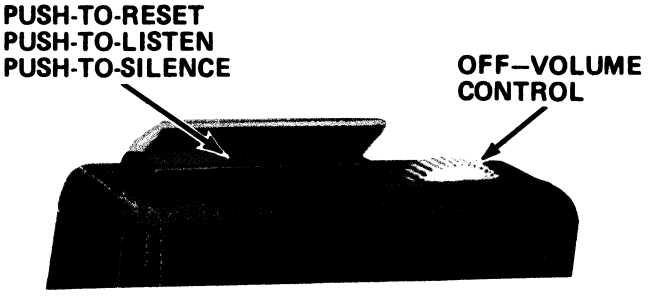


Figure 1 - Tone & Voice or Tone Only Receiver

Push-to-Listen

Turn the receiver on by turning the OFF-VOLUME control halfway to the right (see Figure 1). A short burst of tone should be heard from the speaker.

Before a message is received, an alerting tone will be heard. As soon as the tone is heard, hold down the Push-to-Listen bar to hear the voice message. Release the bar as soon as the message is complete.

TONE ONLY RECEIVER

Turn the receiver on by turning the OFF-VOLUME control halfway to the right (see Figure 1). A short burst of tone will be heard.

The receiver is now ready to receive an alert tone - no voice message will be received. The tone may be silenced by pressing the Push-to-Silence bar at any time before the tone ends.

BATTERY CHARGERS

Two different type chargers are available for recharging the nickel-cadmium batteries used in the Executive Pager. The chargers include a desk charger and multi-charger capable of fully recharging a battery in 14 hours.

NOTE

Temperature characteristics of nickel-cadmium batteries prevent a full charge at temperature extremes. For maximum capacity, recharge the battery at a room temperature between 65° to 85° Fahrenheit whenever possible.

The chargers are designed to prevent the battery from being overcharged. Whenever the battery is charged to approximately 70% of capacity, the charging circuit applies a trickle charge for the remainder of the charging cycle. The battery may be safely left on trickle charge for as long as desired.

Refer to the applicable Maintenance Manual for complete instructions.

WARNING

Do not attempt to recharge Mercury batteries. To do so may cause the batteries to explode.

Desk Charger

Desk Charger Combination 391L1B1X is available for recharging the nickel-cadmium battery from a 121 VAC, 50/60 Hz source. The charger will recharge one battery in a radio inserted in the charging insert and a single battery inserted in the battery charging clip. A fully discharged nickel-cadmium battery will recharge 100% in 14 hours.

To use the desk charger, turn the Pager OFF. Then place the radio into the charging insert, or the battery into the battery charging clip. The red charge light(s) will glow brightly at the beginning of the charge cycle and will gradually become dimmer until it goes out, indicating that the charger is on trickle charge. The charge will fully recharge the battery in an additional 6 hours.

Multi-Charger

Multi-Charger model 4EP74A11 is available for recharging up to 10 radios and 5 batteries or a combination of radio and batteries.

To use the multi-charger, plug the power cable into a 12-Volt, 50/60 Hz source. Then turn the OFF-ON switch to the ON position. Place the radios into the battery charging clips. The green charge light will glow brightly at the start of the charging cycle, and will gradually become dimmer until it goes out, indicating that the charger is on trickle charge. The charger will fully recharge the batteries in an additional 6 hours.

BATTERY INFORMATION

The Executive Pager is shipped from the factory ready for immediate operation upon installation of the battery. The part number as well as battery life for each of the batteries is shown in the following chart.

Battery Type	GE Part Number	Equivalent	Battery Life with Battery Saver
Rechargeable	19A116252P1 (150 mAh)		44 Hrs.
Mercury	19A116387P2 (package of 12)	Mallory TR133 Eveready T133	320 Hrs.

The rechargeable battery is shipped from the factory in a fully charged condition--ready for immediate use. If the radio has been stored for over 30 days, the battery should be fully recharged before using. When it is necessary to store the unit for over 30 days, it is recommended that the battery be kept on charge in the Executive Pager charger.

BATTERY INSTALLATION OR REPLACEMENT

To replace the battery:

1. Turn the radio OFF.
2. Turn the cap to the left as far as it will go and remove (see Figure 2).
3. Replace the battery with the (+) end pointing in.

WARNING

Do not incinerate either the Mercury or the rechargeable battery. To do so may cause a battery to explode.

NOTE

There is no way to dispose of mercury batteries without possible pollution except by returning them to the manufacturer for recycling.

Mallory Battery Company will buy all used mercury batteries at the current market price. Batteries are to be shipped prepaid, enclosing a packing slip indicating who is to receive payment for the batteries to:

Mallory Battery Company
Plant #2
Lexington, North Carolina 27292

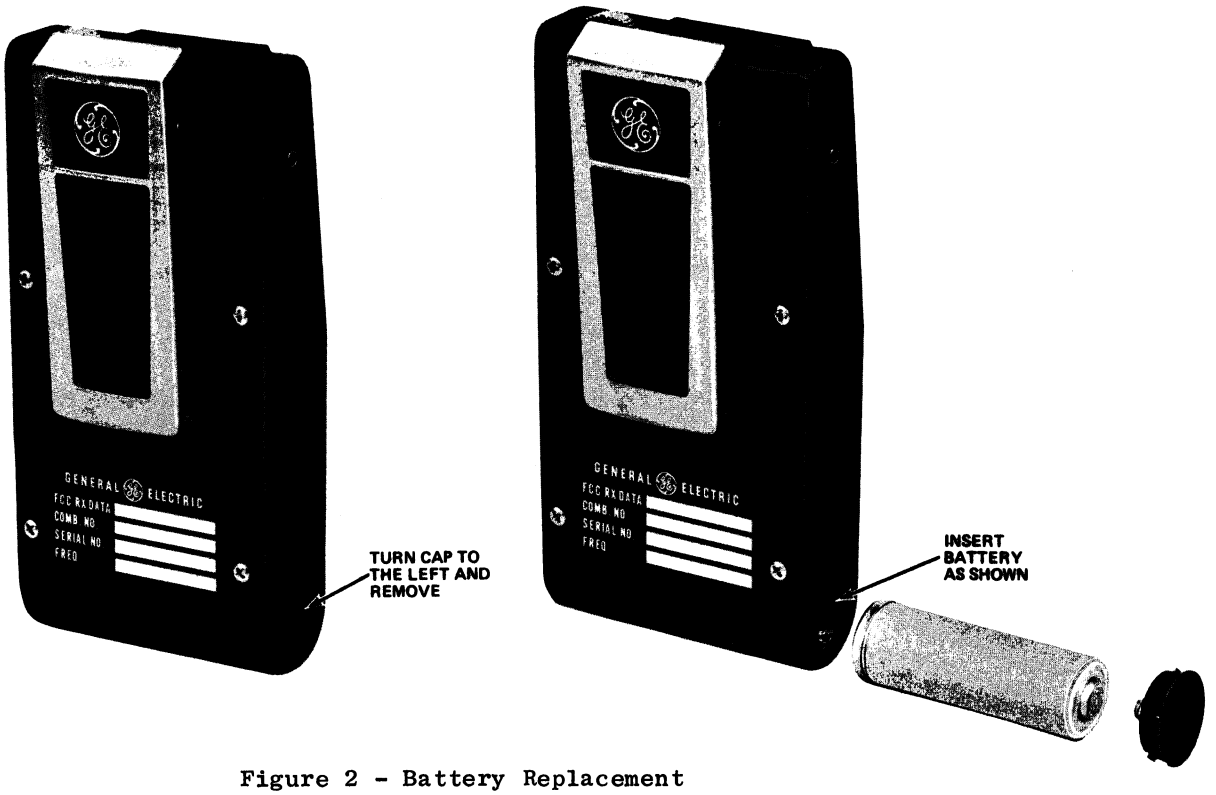


Figure 2 - Battery Replacement

INITIAL ADJUSTMENT

The initial adjustment for the Executive Pager includes zeroing the receiver to the system operating frequency and tuning the antenna circuit and front end coils. Refer to the FRONT END ALIGNMENT in the ALIGNMENT PROCEDURE listed in the Table of Contents.

MAINTENANCE

SERVICING THE RECEIVER

If the radio should begin to operate improperly, the first thing to suspect is a discharged battery. If a freshly recharged battery or a new mercury or alkaline battery fails to restore the radio to its normal operating condition, refer to the Troubleshooting Procedure for help in isolating and correcting the problem.

A complete procedure is provided in this manual for disassembling the radio for servicing. Refer to the DISASSEMBLY PROCEDURE as listed in the Table of Contents.

TEST AND TROUBLESHOOTING PROCEDURES

Whenever difficult servicing problems occur the Test Procedure for the receiver can be used by the serviceman to compare the actual performance of the unit to the specifications met by the Pager when shipped from the factory.

In addition, a Troubleshooting Procedure is available. For best results, the Test Procedure should be used in conjunction with the Troubleshooting Procedure when servicing the radio (see Table of Contents).

RECEIVER MODIFICATIONS

The Personal Pager can be easily modified in the field for the following modes of operation.

- Setting the alerting tone output level by means of the VOLUME control in all receivers with Tone.
- Changing from Push-to-Reset to Push-to-Listen in Tone and Voice Receivers.
- Changing from Push-to-Listen to Push-to-Reset in Tone and Voice Receivers.
- Changing from Tone and Voice to Tone Only.

Instructions for these changes are contained on the applicable Schematic Diagram and Modification Instructions listed in the Table of Contents.

CIRCUIT ANALYSIS

RECEIVER

General Electric Paging receiver Type ER-94-A is a double-conversion,

superheterodyne receiver for tone and voice paging in the 150.8-174 MHz range. The same circuit board is used in both tone and voice and tone only applications and consists of both discrete components and Thick Film Integrated Circuit Modules.

References to symbol numbers mentioned in the following text are found in the Outline Diagram, Schematic Diagram and Parts List (see Table of Contents). The typical circuit diagrams used in the text are representative of the circuits used in the Integrated Circuit Modules. A block diagram of the receiver is shown in Figure 3.

Antenna & RF Amplifier

The antenna circuit consists of ferrite rod E301 and capacitor C301. The circuit is tuned by C301. An RF signal from the antenna is coupled by RF Cable W301 to a matching network (L301 and C303) providing the proper impedance match to the base of RF Amplifier Q301.

The output of Q301 is coupled through C305 to helical resonators L4 and L2. The output of L2 is applied to the base of first mixer A301-Q1.

1st Oscillator & Mixer

1st Oscillator A302-Q1 is a third mode oscillator that operates in the 43 to 51 MHz range. Crystal Y303 is connected in the oscillator feedback path to permit oscillation at the crystal frequency only. A302-L1, C1 and C2 make up the mode-selective resonant circuit. Tuneable coil L1 permits the oscillator frequency to be shifted slightly for setting the receiver on the system operating frequency.

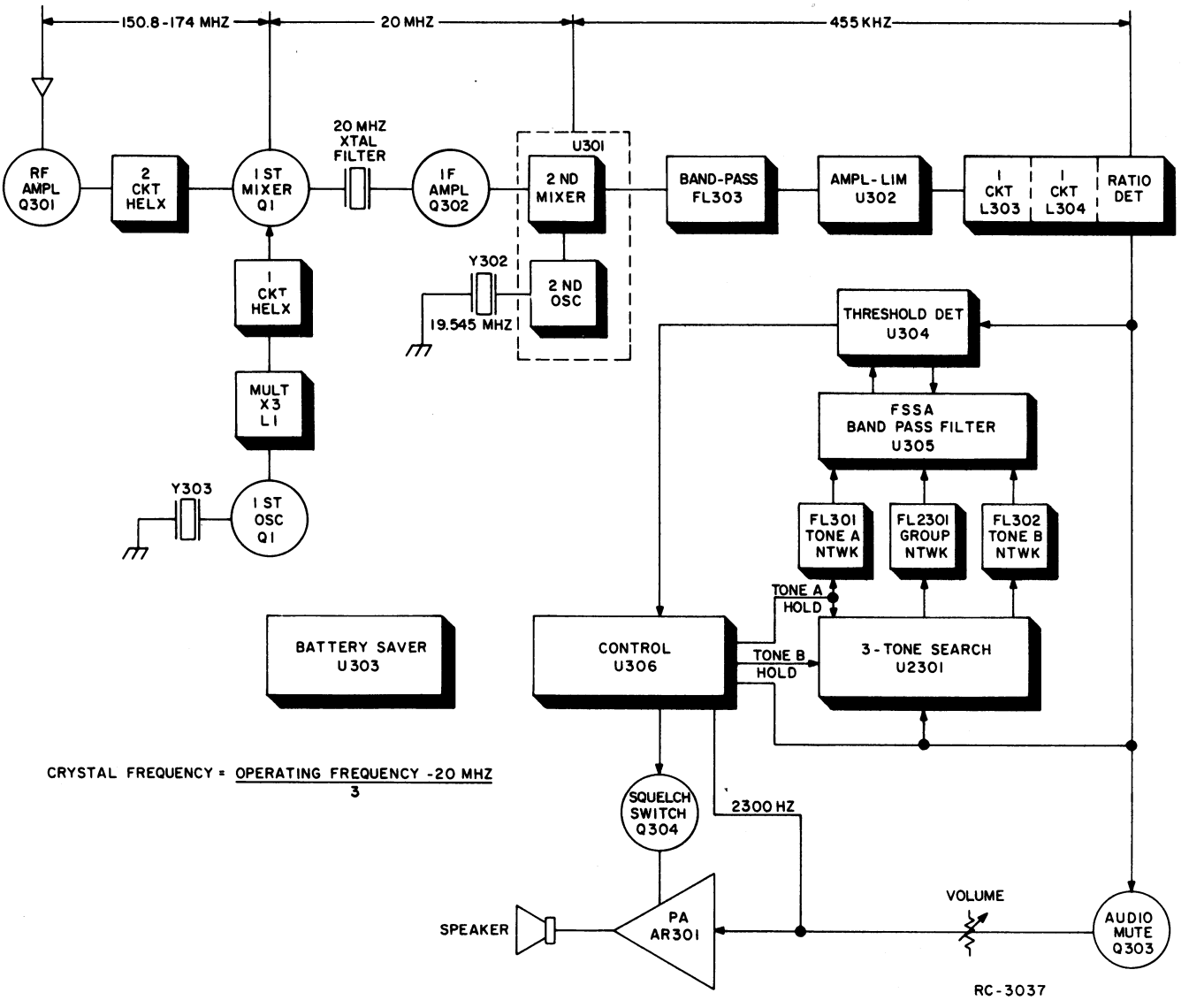


Figure 3 - Tone and Voice Receiver Block Diagram

The oscillator output is transformer-coupled through A303-L1, C5 and helical resonator L2 to the emitter of First Mixer A301-Q1. A303-L1 is tuned to three times the crystal frequency. The oscillator is metered at TP3.

RF from the helical resonators L4 and L2, is applied to the base of 1st Mixer A301-Q1. The injection frequency from the oscillator and multiplier is applied to the emitter of the 1st Mixer A301-Q1. The 20-megahertz high IF output is coupled through high IF crystal filter Y301, providing High-IF selectivity to the base of the High-IF Amplifier Q302.

2nd Oscillator & Mixer

The 20 megahertz signal coupled to the 2nd Mixer and Oscillator Module U301-3 is coupled to the base of 2nd Mixer transistor Q2. Also coupled to the base of Q2 is a 19.545 megahertz low side injection frequency from Colpitts oscillator Q1. The 20 megahertz High-IF signal and 19.545 megahertz low side injection frequency, produce a 455 kilohertz Low-IF output at U301-4. A typical 2nd mixer and oscillator circuit is shown in Figure 4.

The 455 Kilohertz Low-IF from 2nd Mixer and Oscillator Module U301-4 is coupled through Low-IF band-pass filter FL303. FL303 provides additional selectivity for the receiver. The output from FL303 is metered at TP1 and coupled to Amplifier/Limiter Module U302-1.

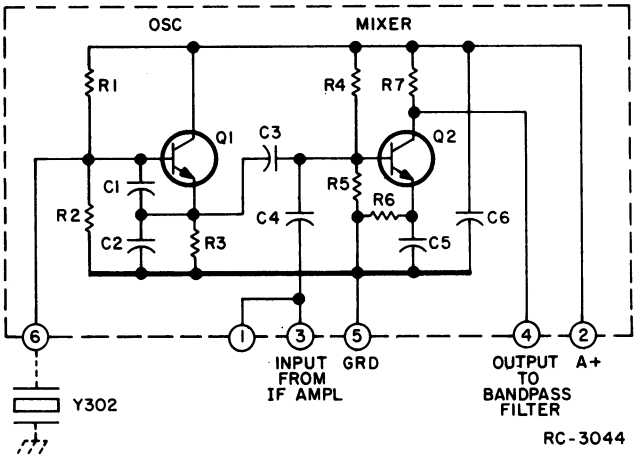


Figure 4 - Typical 2nd Mixer and Oscillator Circuit

Amplifier/Limiter

The 455 kilohertz Low-IF coupled to Amplifier/Limiter Module A302-1 is applied to the base of amplifier transistor Q1. A typical Amplifier/Limiter circuit is shown in Figure 5. Further amplification is

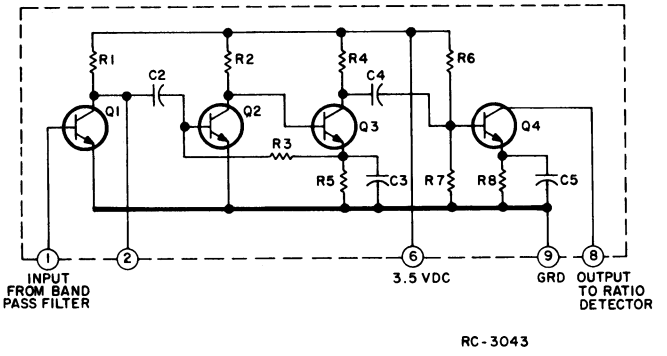


Figure 5 - Typical Amplifier/Limiter Circuit

obtained through Q2, Q3 and Q4. The output of Q4 at A302-8 is coupled to L303 and L304 of the ratio detector circuit.

Ratio Detector

Diodes CR301 and CR302 in the ratio detector circuit rectify the Low IF and voltages, the sum of which always remains constant, develop across R316 and R317. Audio is developed as a result of the varying ratio of the voltages across R316 and R317. Capacitor C321 stabilizes the detector circuit and keeps the sum of the voltages across R316 and R317 constant. The recovered audio is metered at TP2.

Audio Mute and PA

The output of the ratio detector is coupled to the base of Audio Mute transistor Q303 and to Pin 7 of Threshold Detector module U304 in the decoder circuit. For tone and voice operation the proper sequential tones applied to the receiver activates the decoder circuitry and audio PA module AR301 causing a 2300 Hz tone to be heard at speaker LS1.

After the alerting tone is completed, the audio output of Q303 is coupled through VOLUME control R323 to Pin 7 of Audio PA AR301.

For tone only operation the audio output of Q303 is not coupled to the volume control. Applying the proper sequential tones to the receiver activates the decoder circuitry and Audio PA module AR301. A 2300 Hz alerting tone from the decoder is applied to Pin 7 of AR301.

TYPE 99 DECODER

Executive Pager Type 99 Decoder is an individual and group call, two sequential tone decoder, operating on Type 99 tone frequencies of 288.5 Hz to 1433.4 Hz. The

decoder circuitry consists of Threshold Detector Module U304, Frequency Switchable Selective Amplifier (FSSA) U305, Control Module U306, Optional 3-Tone Search Module U2301 for group Call and three plug-in Versatone Networks FL301, FL302 and for group Call FL2301.

Calls will not be heard from the receiver until the proper sequential tones have been applied to the Decoder. The first tone causes the Decoder to switch to accept the second tone after the first tone ends. An alert tone will sound when the second tone is recognized by the Decoder and will continue to sound as long as the second tone is transmitted. Receiver audio is muted during the alert tone. After the alert tone, the receiver remains open to receive calls until the Decoder is manually reset by reset bar S302.

Frequency Switchable Selective Amplifier (FSSA) U305 is a highly stable active bandpass filter for the 288.5 Hz to 1433.4 Hz frequency range. The selectivity of the filter is shifted across the bandpass frequency range by switching Versatone Networks in the filter circuit. See Figure 6.

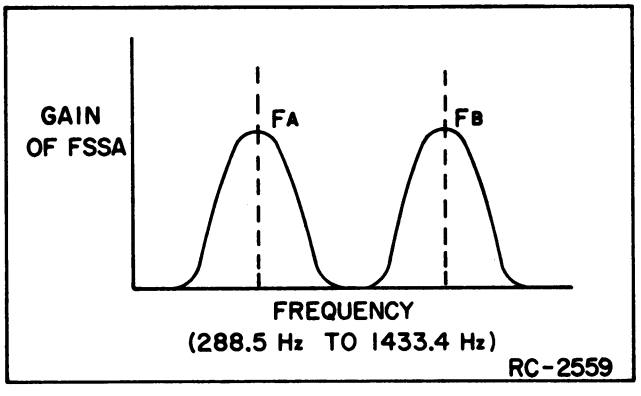


Figure 6 - Gain VS Frequency

In Figure 6 the gain of the FSSA is shown as a function of the tone frequency. The Tone Frequency is determined by the Tone network connected in the FSSA circuit. When Tone network A is in the Circuit, the maximum gain occurs at F_A. When tone network B is in the Circuit, the maximum gain occurs at F_B.

Tone Networks

Versatone Networks FL301, FL302 and FL2301 are parallel connected, precision resistor networks with associated switching transistors. A typical Versatone network is shown in Figure 7. Pin 5 of the network is connected to ground. When a positive signal is applied to Pin 3, Q1 will conduct disabling amplifier Q2 and feedback resistors R1, R2 and R3, effectively removing the network from the FSSA circuit.

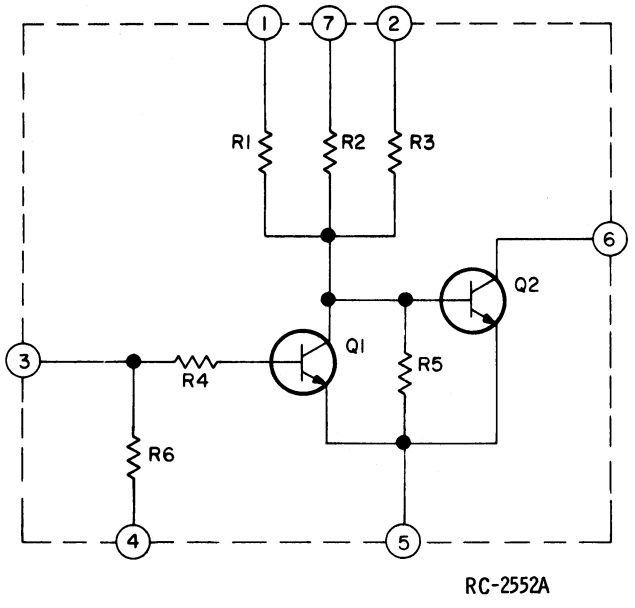


Figure 7 - Typical Versatone Network

Limiter and FSSA

Receiver audio is applied to Pin 7 of Threshold Detector Module U304 (See Figure 8). Limiter Q4 sets the input level to the FSSA at 42 millivolts Peak to Peak. The output of the Limiter is taken from J304-5 and connected to FSSA, U305-12.

Initially Network FL301 (Tone A) is in the FSSA circuit. When Tone A is applied to the input of FSSA it will appear at U305-1 at a higher signal level than other signals. U305-1 is connected to Threshold Detector Module U304-1.

Threshold Detector

Amplifier U304-Q1 amplifies the tone before it is coupled to the base of Threshold Detector Q2. If the tone is the correct one, the signal amplitude will be sufficient for Q2 to conduct. Q2 conducting causes DC switch Q3 to conduct forward biasing diodes CR303 through CR306 and causing a 2.4 volt reference voltage at U304-6. U304-6 is connected to Control Module U306-2.

3-Tone Search

The 3-Tone Search Module, U2301, switches Versatone Network FL302 and FL2301 into the FSSA circuit. FL302 is tone B for individual Call and FL2301 is tone B for group Call. A typical 3-Tone Search Circuit is shown in Figure 9.

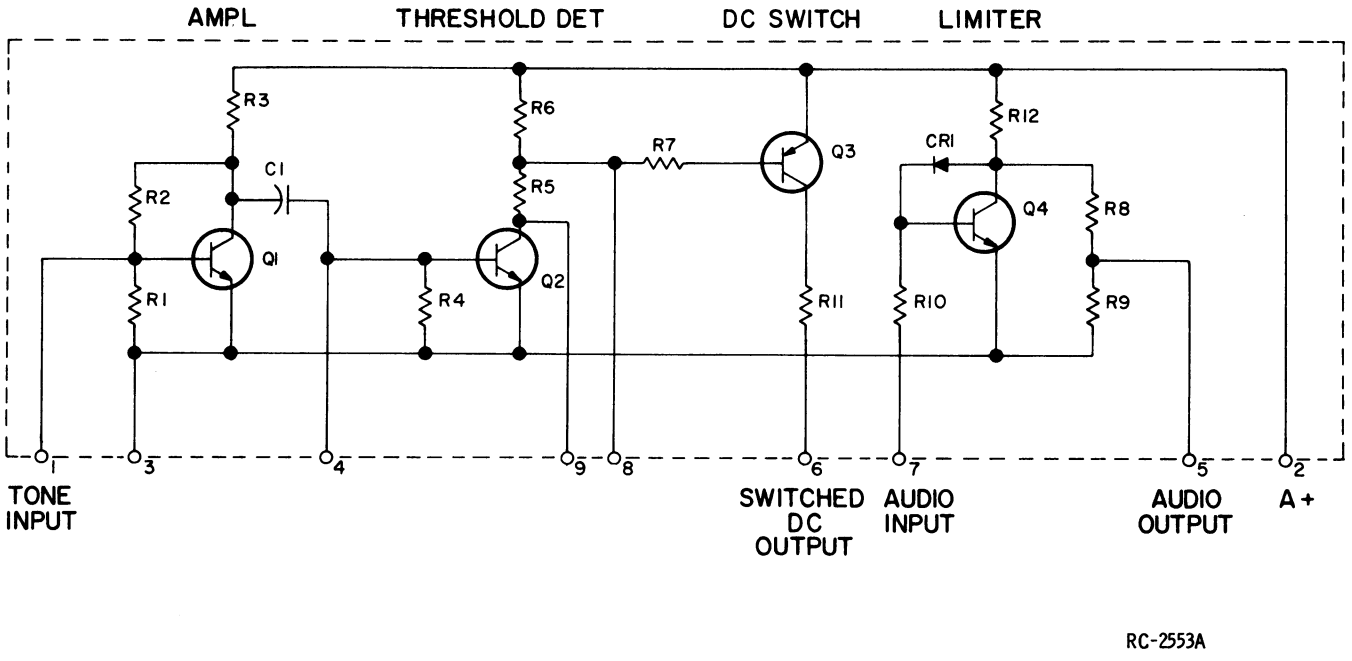


Figure 8 - Typical Threshold Detector Circuit

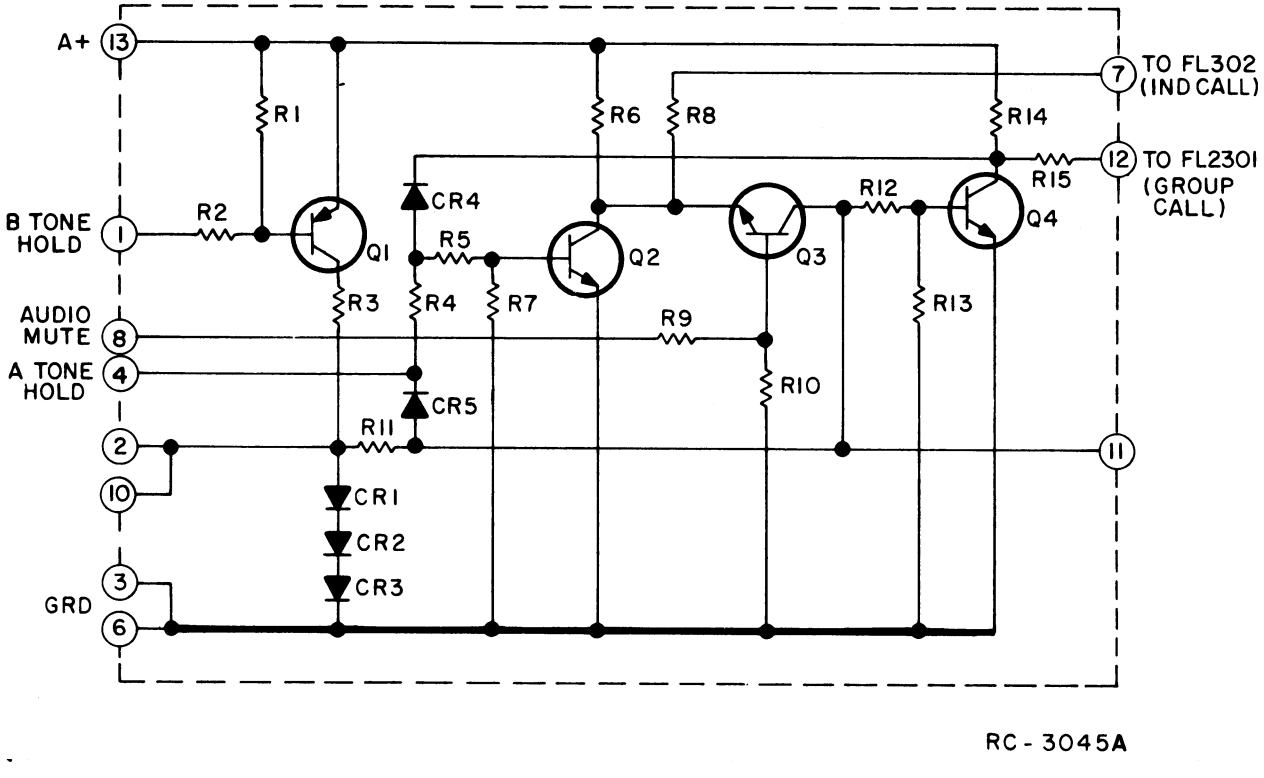


Figure 9 - Typical 3-Tone Search Circuit

When Control Module U306 switches to receive Tone B, the B Tone Hold from U306-7, connected to U2301-1, goes low and the A Tone Hold from U306-5, connected to U2301-4, goes high. With B Tone Hold at U2301-7 low, transistor Q1 conducts and timing capacitor C2302 starts to charge. With a Tone Hold at U2301-4 high, transistor Q2 conducts causing the output at U2301-7 to be low. The low output at U2301-7, connected to Versatone FL302-3, switches FL302 into the FSSA Circuit. When capacitor C2302 charges, transistor Q4 conducts causing Q2 to turn off. With Q2 off the output at U2301-7 is high and FL302 is removed from the FSSA circuit. With Q4 conducting the output at U2301-12 is low. The low output at U2301-12, connected to Versatone FL2301-3, switches FL2301 into the FSSA Circuit.

When B Tone FL302 is received, the Audio Mute on U306-12, connected to U2301-8, causes transistor Q3 to conduct. Transistor Q3 conducting discharges C2302 through transistor Q2 and stops the switch to FL2301.

Control Module

The 2.4 Volts DC applied to U306-2 causes Fast Clamp transistor Q2 to clamp DC Amplifier Q3 Off, and allow Timing Capacitor C343/C2303 to charge. A typical Control Circuit is shown in Figure 10. When 2.4 Volts is removed from Pin 2, Q2 turns off. Capacitor C343/C2304, in a charged state, causes DC Amplifier Q3 to conduct. Q3 conducting, releases the B Tone Hold to Pin 1 of 3-Tone Search Module U2301 switching Versatone Network FL302 or FL2301 (Tone B) into the FSSA circuit and turns "A" Tone Hold Transistor Q4 OFF. Q4 turning OFF switches Versatone Network FL301 (Tone A) out of the FSSA Circuit. "A" Tone Hold transistor Q4 also turns "B" Time Hold transistor Q1 On. Turning Q1 On holds Fast Clamp transistor Q2 Off.

If Tone "B" is not received within one second, timing capacitor C343/C2303 will discharge and automatically reset the circuit to receive Tone "A".

If Tone B is received, 2.4 Volts DC is applied to the base of Decode Gate Q5. With the emitter of Q5 held low by Q3, the 2.4 Volts causes Q5 to conduct. Q5 conducting causes Audio Mute transistor Q8 to conduct stopping 3-Tone Search Module U306 from searching, turning on Alarm Oscillator Q9 and muting the receiver audio so only the Alarm Tone is heard while Tone B is transmitted.

Q5 conducting also causes Audio Latch transistors Q6 and Q7 to conduct, activating Audio Switch Q10. Q10 turns On Audio PA, AR301, by turning On Squelch Switch transistor Q304.

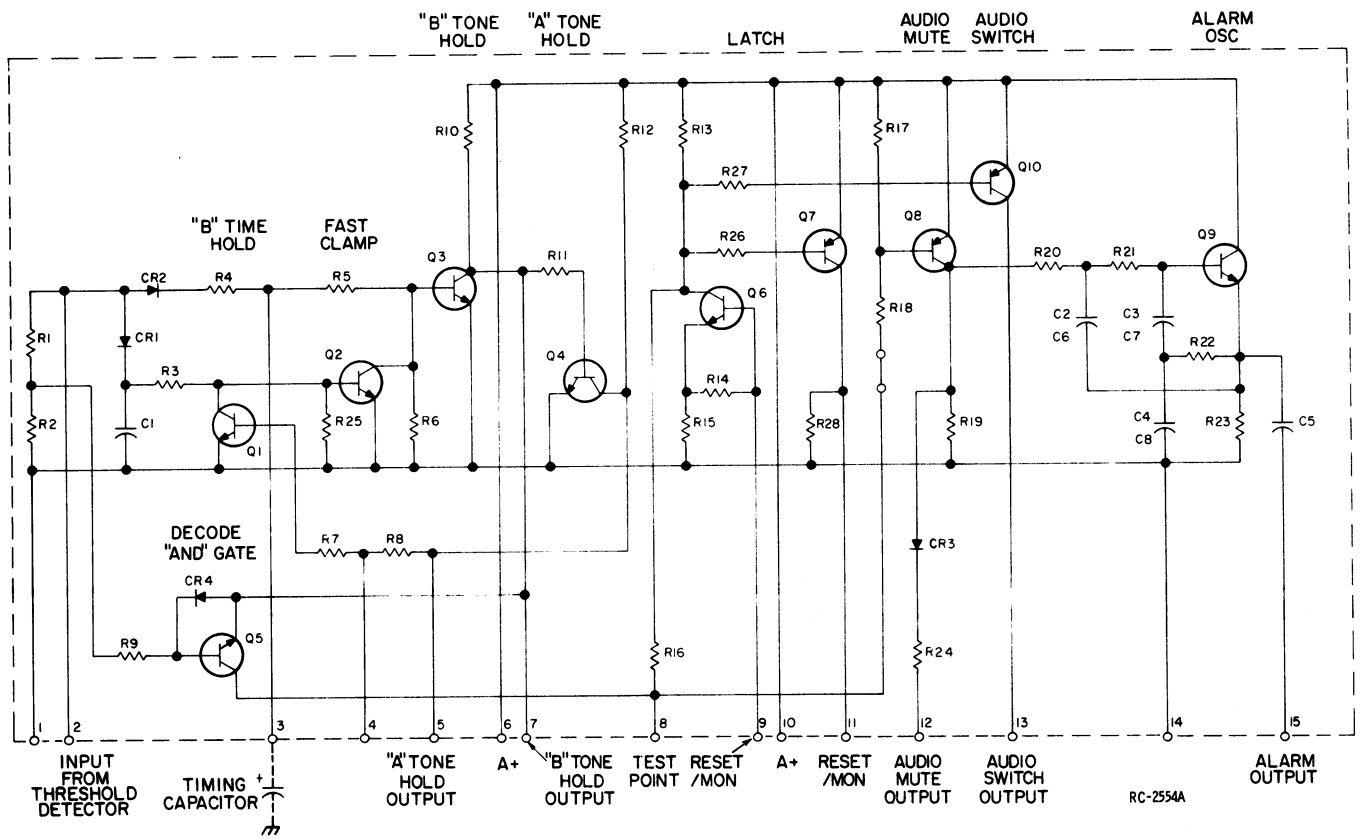


Figure 10 - Typical Control Circuit

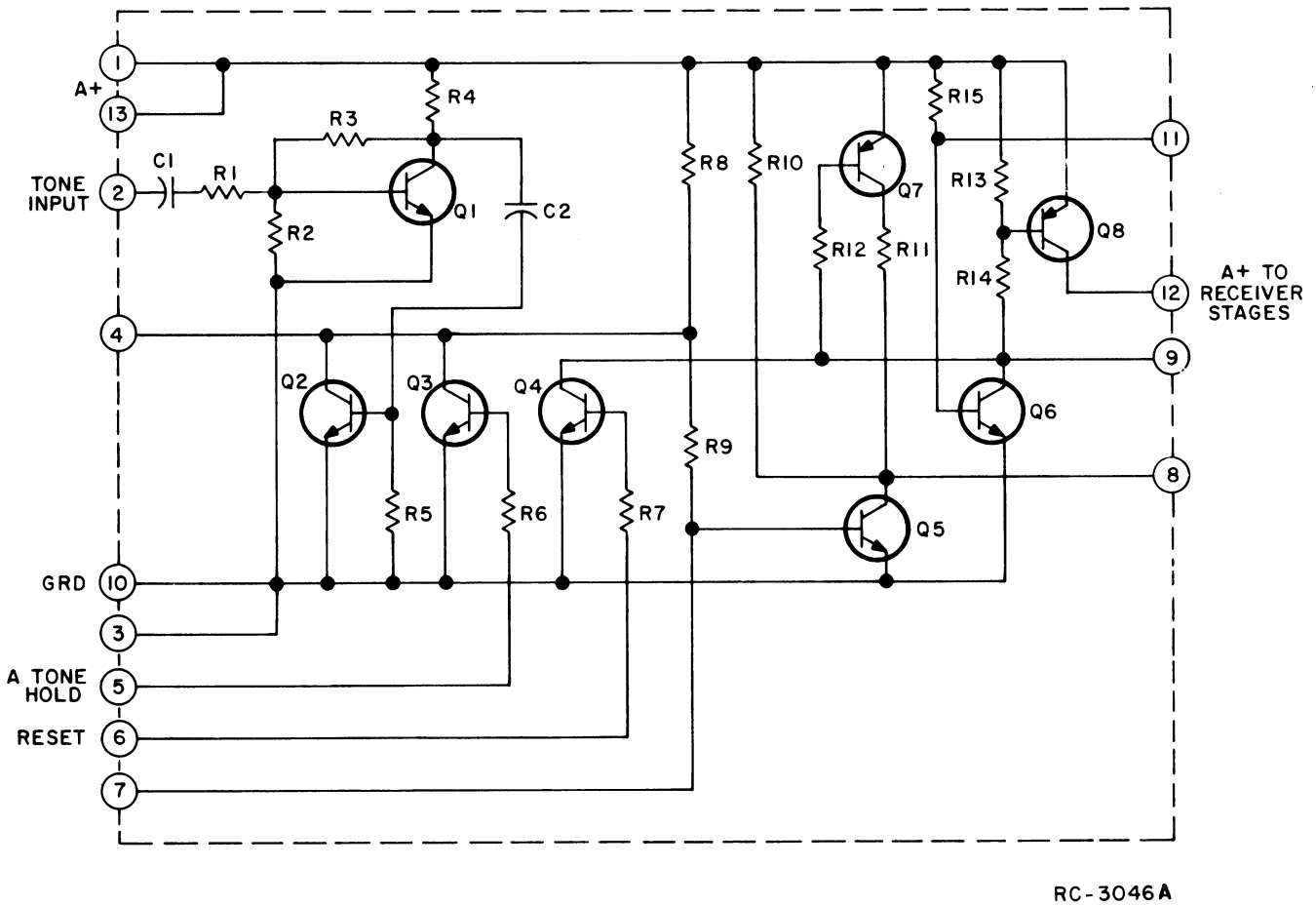


Figure 11 - Typical Battery Saver Circuit

The receiver audio will remain On until Audio Latch transistors Q6 and Q7 are reset by reset by bar switch S302.

BATTERY SAVER

Battery saver U303 reduces the average current by alternately turning power off and on to the receiver stages (see Figure 11).

Multivibrator transistors Q5 and Q6 cause transistor switch Q8 to apply voltage to receiver stages at a 9 to 1 rate (540 msec/60 msec). When an A tone is received by the receiver and applied to Pin 2 of U303, threshold detector circuit Q1 turns on transistor Q2. Transistor Q2 turning on stops multivibrator Q5 and Q6 for the duration of the A tone. When the A tone is no longer received and control module U306 has switched to receive a B tone, an A TONE HOLD voltage is applied to U303-5. With the A TONE HOLD voltage on U303-5 and a B tone is received, transistor Q3 is turned on and the multi-vibrator circuit is held off until the receiver is reset. Resetting the receiver removes the signal from the latch circuit in control module U306 to U303-6 turning transistor Q4 off and restarting the multivibrator circuit.

DETERMINATION OF TONE FREQUENCIES

Tables I and II enable the technician to determine the tone frequencies without opening the radio to examine the Versatone networks.

For example, assume the paging number to be 123. The first digit of the paging number is a 1. Look in Table I, and read down the column labeled "100's Digit" to a 1. Read horizontally across to the column labeled "10's Digit". The tone group is B. The second digit of the paging number is a 2. The tone number is B2. Look in Table II and down the column labeled "Tone Designator" to find B2. Read horizontally across to the column labeled "Tone Frequency". The first tone frequency is 787.5 Hz.

To determine the second tone frequency look in Table I and as before, find the first digit of the paging number 1. Read horizontally across to the column labeled "1's Digit".

The second tone group is A. The third digit of the paging number is a 3 and the Tone Designator is A3. In Table II read down the column labeled "Tone Designator" and find A3. Read horizontally across the column labeled "Tone Frequency". The second tone frequency is 802.5 Hz.

For different paging numbers, locate the first digit in the "100's Digit" column and determine the tone frequencies as described in the example. For a complete description of tone applications see DATAFILE BULLETIN DF-5000-3A. Also, refer to worksheets ECX-672 thru -682 and complete as directed in SFM:P7703.

TABLE I - Tone Groups

100's Digit	10's Digit	1's Digit
	For 1st	For 2nd
0	A	A
1	B	A
2	B	B
3	A	B
4	C	C
5	C	A
6	C	B
7	A	C
8	B	C
9	Not Used	

TABLE II - Tone Generator Frequencies

TONE GROUP	TONE DESIGNATOR	TONE FREQUENCY
A	A0	682.5 Hz
	A1	592.5 Hz
	A2	757.5 Hz
	A3	802.5 Hz
	A4	847.5 Hz
	A5	892.5 Hz
	A6	937.5 Hz
	A7	547.5 Hz
	A8	727.5 Hz
	A9	637.5 Hz
B	B0	652.5 Hz
	B1	607.5 Hz
	B2	787.5 Hz
	B3	832.5 Hz
	B4	877.5 Hz
	B5	922.5 Hz
	B6	967.5 Hz
	B7	517.5 Hz
	B8	562.5 Hz
	B9	697.5 Hz
C	C0	667.5 Hz
	C1	712.5 Hz
	C2	772.5 Hz
	C3	817.5 Hz
	C4	862.5 Hz
	C5	907.5 Hz
	C6	952.5 Hz
	C7	532.5 Hz
	C8	577.5 Hz
	C9	622.5 Hz
Diagonal Tone		742.5 Hz

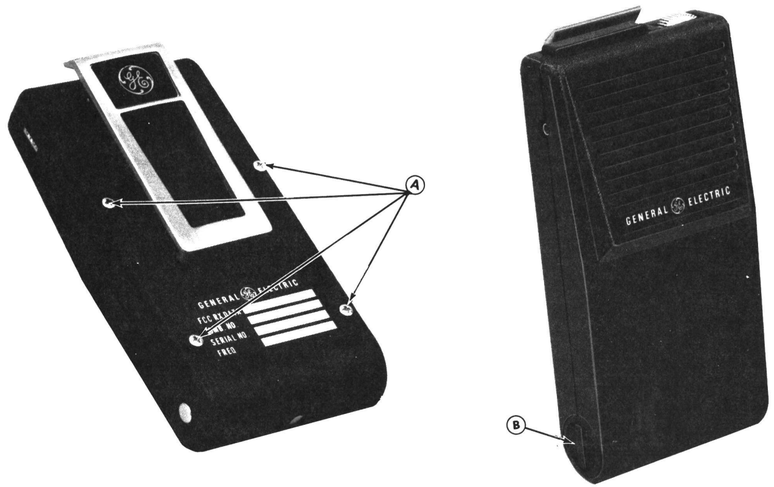
DISASSEMBLY PROCEDURE

Equipment required:

To disassemble a general Electric Executive Pager, the only equipment required is a small Phillips-head screwdriver.

To gain access to the receiver:

1. Turn the radio OFF.
2. Loosen the four captive screws (A).
3. Turn the radio on its back and carefully lift up the front cover by the end nearest the battery compartment (B). Then, carefully lift off the cover.

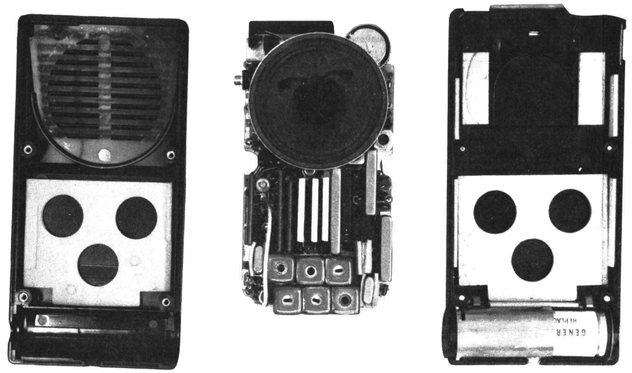


CAUTION

When replacing the front cover, place the edge of the front cover into the groove at the top of the case and close the cover.

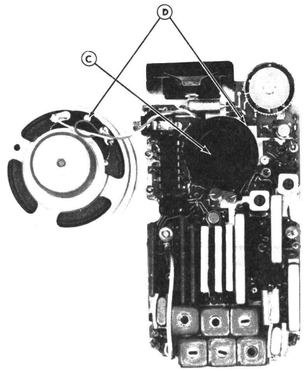
To remove the receiver board:

1. Remove the front cover as directed above.
2. Lift up the receiver board and remove from the case as shown.



To replace the speaker:

1. Carefully remove the speaker from mounting cup (C).
2. Unsolder leads from speaker.



3. When replacing the speaker in the mounting cup, align the two points (D). Route the speaker leads counterclockwise around the cup

REPLACEMENT PROCEDURE

Equipment required:

- A pencil-type, 40-to 60-watt soldering iron
- A de-soldering tool such as a SOLDA PULLT (R)
- A pair of longnose pliers

Procedure:

1. Clip out and remove the defective component (when possible) so that the leads can be removed individually.
2. Hold the soldering iron against the bottom of the printed circuit board to melt the solder holding the component or module lead.
3. Remove the melted solder from the lead(s) with the de-soldering tool.
4. When the solder has sufficiently been removed from the lead(s), the longnose pliers may be used to break loose any residual solder and remove the component from the board.
5. Solder in the new component on the bottom side of the board using the small pencil tip on the soldering iron.

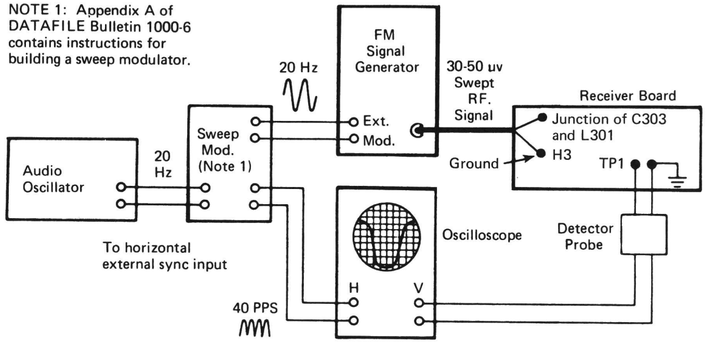


Figure 13 - Test Setup for 20-Hz Double-Trace Sweep Alignment

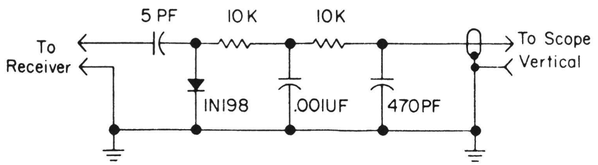
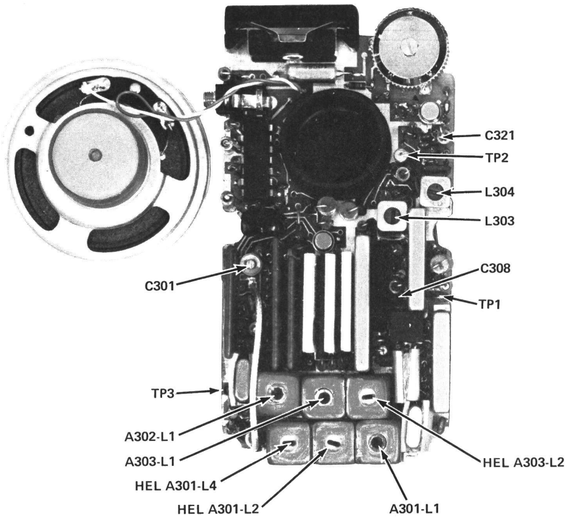


Figure 14 - Detector Probe for Sweep Alignment



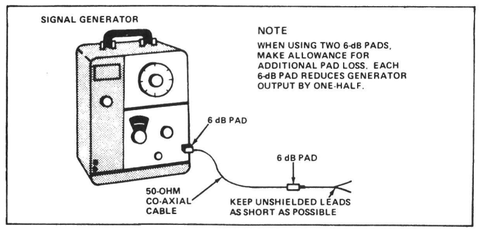


Figure 12 - Signal Generator Setup

COMPLETE RECEIVER ALIGNMENT

EQUIPMENT REQUIRED

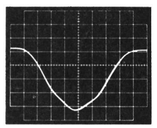
1. GE Test Set Models 4EX3A11 (TM11 or TM12) or 4EX8K11, or 20,000 ohms-per-volt multimeter.
2. A 455 kHz signal source (IF Generator Model 4EX7A10 or equivalent), and a 150.8 - 174 MHz signal source (M800 Signal Generator or equivalent).
3. Test Amplifier Model 4EX16A10 and RF Probe 19C311370-G1. Connect the Test Amplifier to the GE Test Set.

PRELIMINARY CHECKS & ADJUSTMENTS

1. Install a freshly-charged nickel cadmium battery or a new mercury or alkaline battery.
2. In tone and voice receivers, turn the receiver on and set the VOLUME control to minimum. For Push-To-Reset combinations press the Push-To-Reset bar.

   In tone only receivers, connect a 2.2 µf capacitor between H8 and emitter of Q303. This will allow normal receiver noise to be heard in the speaker. Refer to the receiver Outline Diagram for hole locations.
3. Connect the signal generator as recommended in Figure 12.

ALIGNMENT PROCEDURE

STEP	METERING POINT	TUNING CONTROL	PROCEDURE
			RATIO DETECTOR
1.	Positive End of C321	L303	Connect a 455 kHz signal between the insulated body of C308 and ground. Maintaining the generator level below limiting, adjust L303 for maximum output at C321.
2.	TP2	L304	Adjust L304 for zero output at TP2.
3.	Positive end of C321 and TP2	L303 & L304	Repeat Steps 1 and 2 until the maximum output at the positive end of C321 coincides with a zero reading at TP2. Disconnect the 455 kHz generator.
			1ST OSCILLATOR
4.	TP3	A302-L1 & A303-L1	Adjust A302-L1 for a maximum meter reading at TP3. Tune A303-L1 for a very small dip at TP3.
			HI & LO IF FILTER
5.		See Procedure	Connect the scope, signal generator and detector as shown in Figures 13 and 14. Apply an on-frequency signal using the lowest possible input level to avoid limiting. Modulate the generator with 20 Hz at 10 to 16 kHz deviation. NOTE An on-frequency signal is easily determined by zero beating the channel signal with the 455 kHz marker generator signal. Loosely couple the 455 kHz generator to the case of Q302 and adjust the RF level of the RF signal generator to 20 dB quieting level.
6.	TP1	A301-L1	Tune A301-L1 for maximum amplitude and best shape on scope as shown on scope waveform, keeping the signal below saturation.  Horizontal: 1 ms/cm Vertical: .01 Volt/cm
			FRONT END
7.		Helicals A301-L4& L2 and A303-L2	Apply an on-frequency signal as above and tune helicals A301-L4 & L2, A303-L2 and C301 for maximum quieting. NOTE Do NOT tune Mixer Coil A301-L1
			1ST OSCILLATOR
8.		A302-L1	Apply an on-frequency signal as above. Loosely couple 455 kHz to the receiver and adjust A302-L1 for zero beat to the speaker.
			ANTENNA CIRCUIT
9.	TP1	C301	Apply radiated, on-frequency signal to the receiver antenna and adjust C301 for best quieting.

TEST PROCEDURES

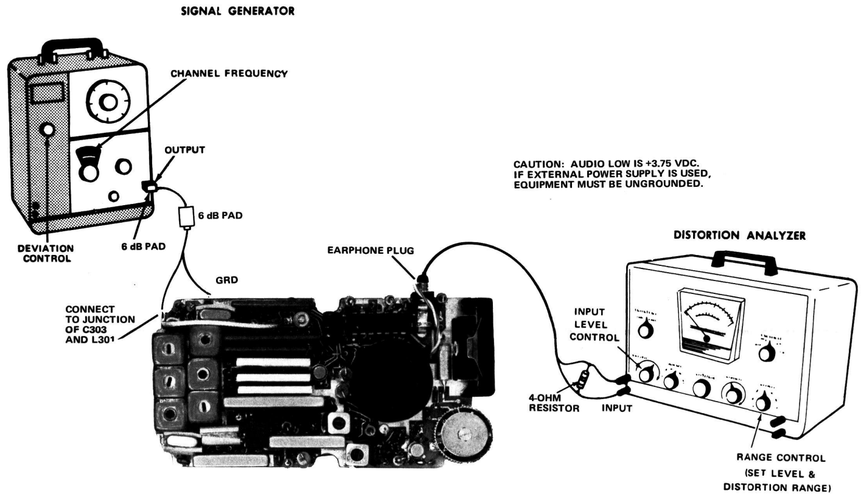
These Test Procedures are designed for checking receiver specifications, and for helping service a receiver that is operating--but not properly. The problems encountered could be low power, poor sensitivity, distortion, ration detector not operating properly, and low gain. By following the sequence of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

TEST EQUIPMENT REQUIRED

- Distortion Analyzer similar to: Heath IM-12
- Signal Generator similar to: Measurements M-800
- 6-dB attenuation pad, and 4-ohm resistor

PRELIMINARY ADJUSTMENTS

1. Connect an external 3.75-Volt supply to the receiver or install a freshly-charged or new battery.
2. Connect the test equipment to the receiver as shown for all steps of the Test Procedure.
3. Connect the signal generator high to the lead of C303 as shown in Figure 12.
4. Turn on all of the equipment and let it warm up for 20 minutes



STEP 1
AUDIO POWER OUTPUT AND DISTORTION

TEST PROCEDURE

Measure Audio Power Output as follows:

A. Apply a 1000 microvolt, on-frequency test signal modulated by 1,000 hertz with ±3.0 kHz deviation to the receiver.

B. Connect a 4-ohm load resistor across the Distortion Analyzer input as shown.

C. Connect a standard earphone plug to the receiver accessory jack, and connect the receiver output across the 4-ohm resistor as shown.

D. Adjust the VOLUME control for 150-milliwatts output (.78 volts RMS using the Distortion Analyzer as a VTVM).

E. Make distortion measurements according to manufacturer's instructions. Reading should be less than 10%.
If the receiver sensitivity is to be measured, leave all controls and equipment as they are.

SERVICE CHECK

If the distortion is more than 10%, or maximum audio output is less than 150 milliwatts, make the following checks:

F. Battery or external supply voltage -- low voltage will cause distortion.

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

H. Ratio Detector Alignment (Refer to Receiver Alignment Procedure on reverse side of page).

J. Audio output set too high -- output voltage over .78 volt, Re-check Step D.

STEP 2
USABLE SENSITIVITY (12-dB SINAD)

If STEP 1 checks out properly, measure the receiver sensitivity as follows:

A. Apply a 1000-microvolt, on-frequency signal modulated by 1000 Hz with a 3.0-kHz deviation to the receiver.

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

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

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

E. The 12-dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. The sensitivity should be less than or equal to rated 12 dB SINAD specification with an audio output of at least 75 milliwatts (.55 volt RMS across the 4-ohm receiver load using the Distortion Analyzer as a VTVM).

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

SERVICE CHECK

If the sensitivity level is more than rated 12 dB SINAD, make the following checks:

G. Check the alignment of the RF stages as directed in the Alignment Procedure, and make the gain measurements as shown on the Troubleshooting Procedure.

STEP 3
MODULATION ACCEPTANCE BANDWIDTH (IF BANDWIDTH)

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

A. Set the Signal Generator output for twice the microvolt reading obtained in the 12-dB SINAD measurement and reduce audio volume control to 10% rated output.

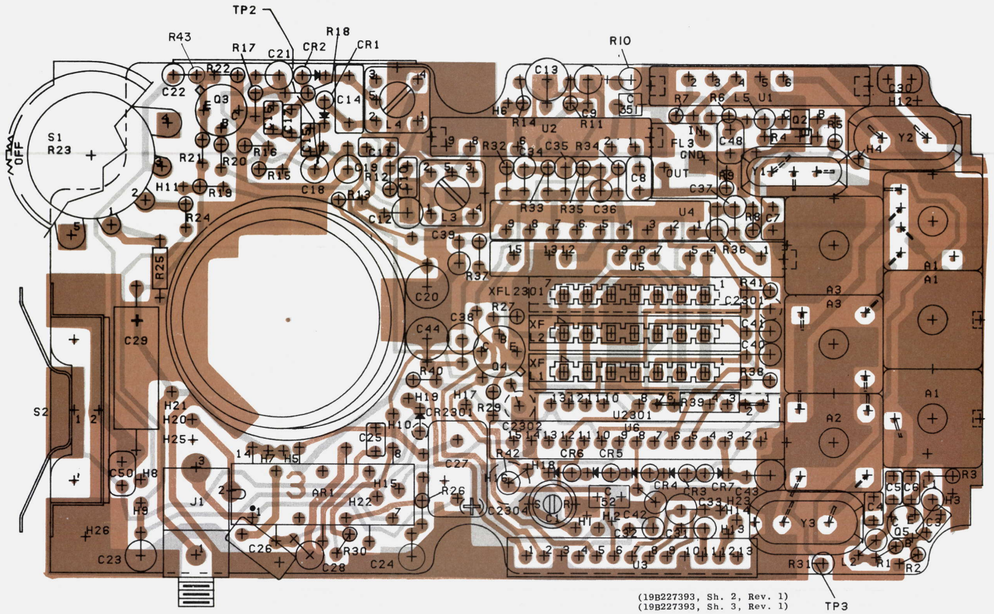
B. Set the RANGE control on the Distortion Analyzer in the SET LEVEL position (1000-Hz filter out of the circuit), and adjust the input LEVEL control for a +2 dB reading on the 30% range.

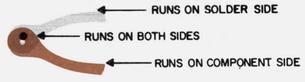
C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12-dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).

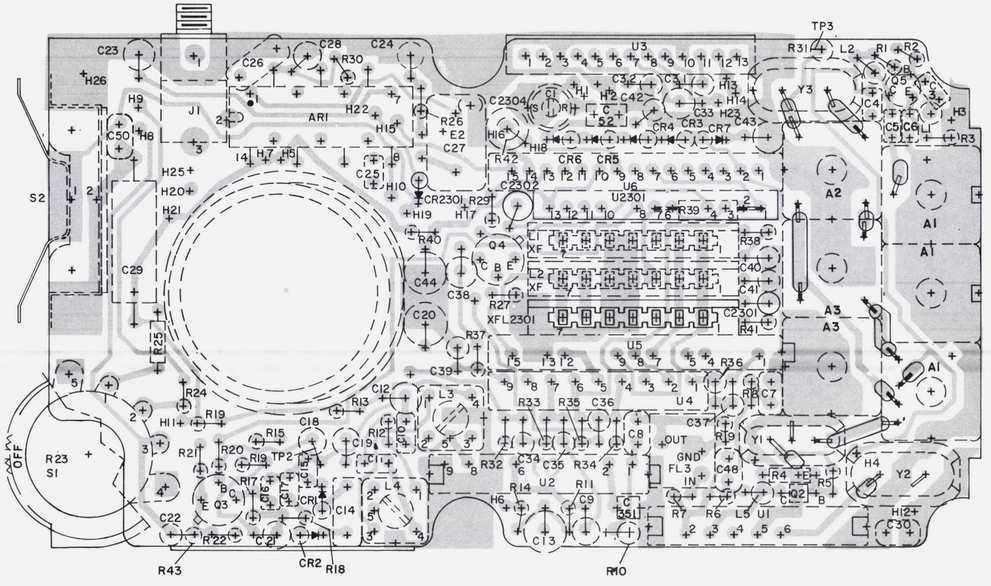
D. The deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ±7 kHz.

SERVICE CHECK

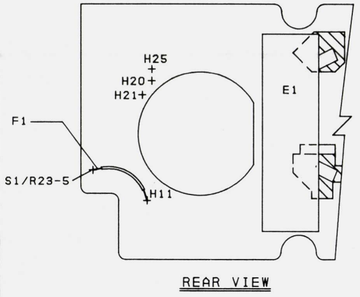
If the Modulation Acceptance Bandwidth test does not indicate the proper width, re-align A302-L1 (1st Mixer) (Refer to the Receiver-Alignment Procedure).

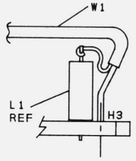


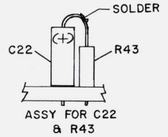


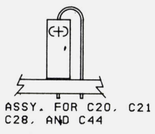


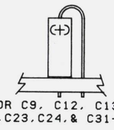
(19B227393, Sh. 2, Rev. 1)



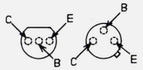








LEAD IDENTIFICATION
FOR Q3 THRU Q5



IN-LINE OR TRIANGULAR
TOP VIEW

NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATION PREFIX WITH 300 SERIES.
EXAMPLE: C1-C301, R1-R301, ETC..

(19D424138, Rev. 10)

OUTLINE DIAGRAM

150.8—174 MHz EXECUTIVE PAGER
TYPE ER-94-A

ANY CHANGES TO THIS DIAGRAM MAY AFFECT 19R622261 WIRING DIAG.

MODEL NO.	REV LETTER
PL19D417994G1	G

ALL RESISTORS ARE 1/8 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 WIRES SFT 28 UNLESS OTHERWISE NOTED.
2. THE SQUELCH SWITCH IS SHOWN CONNECTED FOR PUSH-TO-RESET OPERATION (JUMPER CONNECTED FROM H17 TO H19 AND R342 FROM H16 TO H18) FOR PUSH-TO-LISTEN OPERATION MOVE DM WIRE BETWEEN H17 & H19 TO H19 & H10 AND REMOVE R342. ALSO ADD CR2301 AND T28-0 BETWEEN H22 & H23.
3. FOR VOLUME CONTROL OF ALERT TONE MOVE VIOLET WIRE FROM H9 TO H8.
4. VOLTAGE MEASUREMENTS TAKEN AT NO SIGNAL CONDITION WITH AUDIO ON AT MINIMUM VOLUME.
5. FOR TONE ONLY FEATURE REMOVE COMPONENTS MARKED WITH ✱ AND EXCHANGE C343 WITH C2303. ADD T28-G WIRE BETWEEN C2303 (+) & H19. IF GROUP CALL IS USED DO NOT CHANGE C343.
6. USE DM WIRE AND SLEEVE WITH [illegible].
7. FOR AUTO RESET FEATURE REMOVE R342 BETWEEN H16 AND H18 AND INSTALL C23[illegible].

■ REMOVE FOR GROUP CALL

▲ ADD FOR GROUP CALL

SCHEMATIC DIAGRAM

150.8—174 MHz EXECUTIVE PAGER TYPE ER-94-A

(19B622123, Rev. 14)

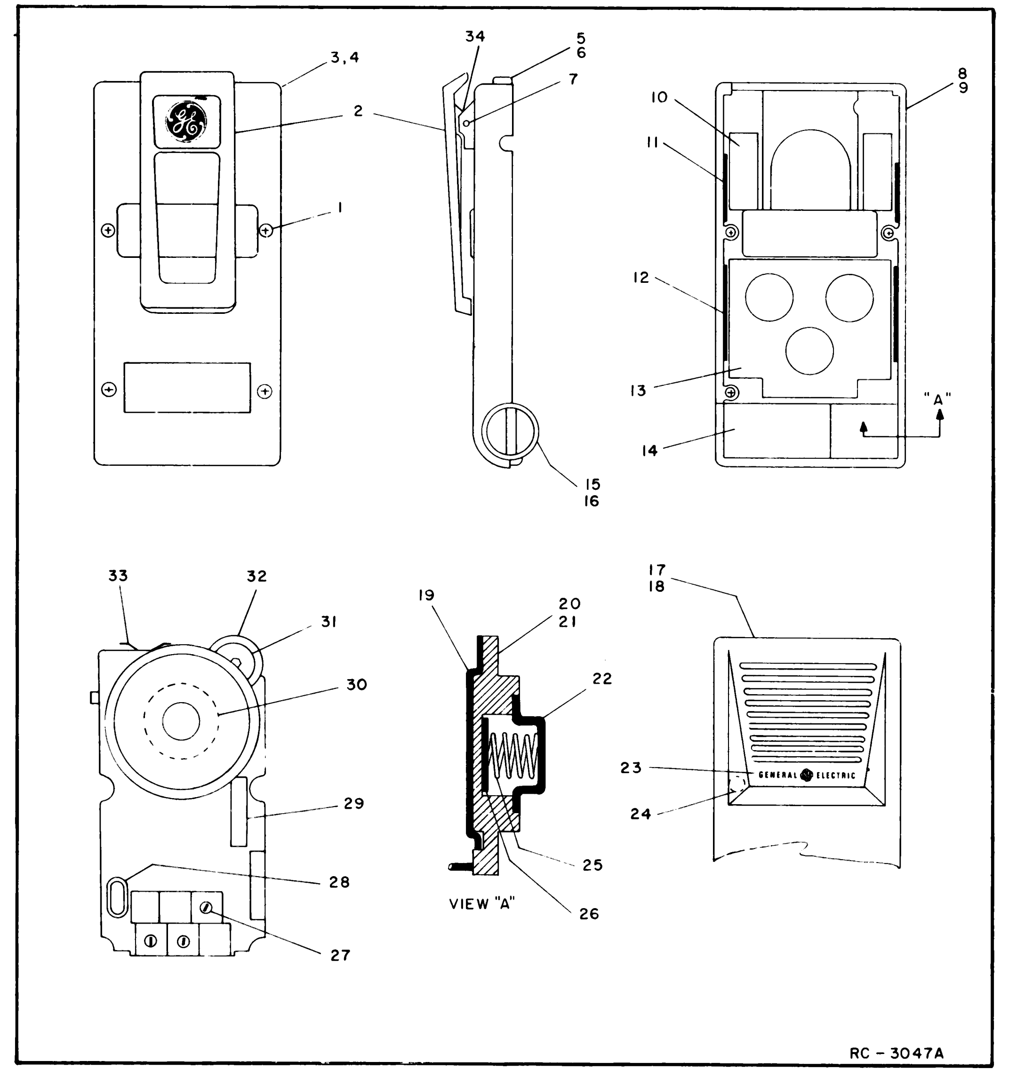
PARTS LIST

LBI30251B

150.8-174 MHz PERSONAL PAGER
ER-94-A

SYMBOL	GE PART NO.	DESCRIPTION
		RECEIVER BOARD 19D417994G1
A301		FRONT END 19B226099G2
A1		FIRST MIXER BOARD 19C320724G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1 and C2	19A116114P4059	Ceramic: 68 pf ±5%, 100 VDCW; temp coef -220 PPM.
C3 and C4	5495323P12	Ceramic: 0.001 µf +100% -20%, 75 VDCW.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B216948G1	Coil.
		- - - - - - - - - - TRANSISTORS - - - - - - -
Q1	19A116159P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R151P330J	Composition: 33 ohms ±5%, 1/8 w.
R2	3R151P562J	Composition: 5.6K ohms ±5%, 1/8 w.
R3	3R151P204J	Composition: 200K ohms ±5%, 1/8 w.
R4	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R5	3R151P103J	Composition: 10K ohms ±5%, 1/8 w.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L2	19B216441G12	Helical resonator. (Part of Z2). Includes:
	19C311727P1	Tuning slug.
L4	19B216441G2	Helical resonator. (Part of Z4). Includes:
	19C311727P1	Tuning slug.
		- - - - - - - - HELICAL RESONATORS - - - - - - -
Z2		Consists of L2 and 19D413132G3 can.
Z4		Consists of L4 and 19D413132G32 can.
A302		FIRST OSCILLATOR 19C320739G1
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C1	19A116114P3036	Ceramic: 15 pf ±5%, 100 VDCW; temp coef -150 PPM.
C2	19A116288P11	Ceramic: 82 pf ±5%, 100 VDCW; sim to Erie 8121-100-COG-820J.
C3	19A116114P16	Ceramic: 4.7 pf ±5%, 100 VDCW; temp coef 0 PPM.
C4	19A116114P3022	Ceramic: 6.8 pf ±5%, 100 VDCW; temp coef -150 PPM.
C5	19A116114P12	Ceramic: 3.3 pf ±5%, 100 VDCW; temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B219288G1	Coil. Includes:
	19B209436P1	Tuning slug.
		- - - - - - - - - - TRANSISTORS - - - - - - -
Q1	19A116159P1	Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1	3R151P123J	Composition: 12K ohms ±5%, 1/8 w.
R2	3R151P223J	Composition: 22K ohms ±5%, 1/8 w.
R3	3R151P183J	Composition: 18K ohms ±5%, 1/8 w.
R4*	3R151P681J	Composition: 680 ohms ±5%, 1/8 w.
		In REV A and earlier:
	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
A303		MULTIPLIER 19B226100G2
A2		MULTIPLIER BOARD 19D417361G2
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C5 and C6	19A116114P12	Ceramic: 3.3 pf ±5%, 100 VDCW; temp coef 0 PPM.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L1	19B216591G2	Coil. Includes powdered iron tuning slug 19B209436P1. NOTE: L1 may require brass tuning slug (Modification Kit 19A127807G1) for 165-174 MHz operation.
		- - - - - - - - - - INDUCTORS - - - - - - - - -
L2	19B216441G4	Helical resonator. Including tuning slug 19C311727P1.
		- - - - - - - - - - NETWORKS - - - - - - - - - -
Z2		Includes L2 and 19D413132P30 can.
AR301	19A134361P1	Integrated circuit, linear: sim to SGS-ATES TBA-820.
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C301	19A116149P4	Variable: 2 to 5 pf, 63 VDCW, temp coef -33 PPM.
C303 and C304	19A116114P10073	Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM.
C305 and C306	19A116192P13	Ceramic: 1000 pf ±10%, 50 VDCW; sim to Erie 8121-A050-W5R-102K.
C307	19A116244P5	Ceramic: 0.1 µf ±20%, 50 VDCW.
C308	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C309	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C310 and C311	19A116288P9	Ceramic: 120 pf ±5%, 100 VDCW; sim to Erie 8121-A100-U2J-121J.
C312	5491674P35	Tantalum: 22 µf +20%, 4 VDCW; sim to Sprague Type 162D.
C313	5491674P42	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C314	19A116288P10	Ceramic: 680 pf ±5%, 50 VDCW; sim to Erie 8131-M050-S2H-681J.
C315 thru C317	19A116192P9	Ceramic: 920 pf ±20%, 50 VDCW; sim to Erie 8111-A050-W5R-821K.
C318*	5491674P39	Tantalum: 6.8 µf ±20%, 15 VDCW; sim to Sprague Type 162D.
		Earlier than REV A:
	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C319	5496267P23	Tantalum: 0.047 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C320	5491674P42	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C321	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C322	5491674P44	Tantalum: 2.2 µf ±20%, 15 VDCW; sim to Sprague Type 162D.
C323	5496267P23	Tantalum: 0.047 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C324*	5491674P45	Tantalum: 4.7 µf ±10%, 6 VDCW; sim to Sprague Type 162D.
		In REV E & F:
	5491674P34	Tantalum: 15 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
		In REV D:
	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
		In REV C & earlier:
	5491674P34	Tantalum: 15 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C325	19A116192P9	Ceramic: 820 pf ±10%, 50 VDCW; sim to Erie 8111-A050-W5R-821K.
C326*	19A116244P7	Ceramic: 0.33 µf ±20%, 50 VDCW.
		Earlier than REV A:
	5491674P44	Tantalum: 2.2 µf 20%, 15 VDCW; sim to Sprague Type 162D.
C327	19A116178P7	Tantalum: 220 µf ±20%, 6 VDCW.
C328	5496267P1	Tantalum: 6.8 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C329	19B200240P19	Tantalum: 100 µf ±20%, 6 VDCW.
C330	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C331	5491674P45	Tantalum: 4.7 µf ±10%, 6 VDCW; sim to Sprague Type 162D.
C332	5491674P27	Tantalum: .47 µf ±20%, 35 VDCW; sim to Sprague Type 162D.
C333	5496267P17	Tantalum: 1.0 µf ±20%, 35 VDCW; sim to Sprague Type 150D.
C334 and C335	5491674P43	Tantalum: 0.1 µf ±20%, 35 VDCW; sim to Sprague Type 162D.
C336	5491674P46	Tantalum: 0.33 µf ±20%, 35 VDCW; sim to Sprague Type 162D.
C337	5491674P43	Tantalum: 0.1 µf ±20%, 35 VDCW; sim to Sprague Type 162D.
C338	5491674P37	Tantalum: 10 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C339	5491674P27	Tantalum: .47 µf ±20%, 35 VDCW; sim to Sprague Type 162D.
C340 and C341	5491674P28	Tantalum: 1.0 µf ±20%, 25 VDCW; sim to Sprague Type 162D.
C342	5491674P44	Tantalum: 2.2 µf ±20%, 15 VDCW; sim to Sprague Type 162D.
C343	5491674P34	Tantalum: 15 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C344	5491674P42	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C348	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C350	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C351*	19A116192P7	Ceramic: 330 µf ±10%, 50 VDCW; sim to Erie 8101-A050-W5R-331K. Added by REV B.
C352*	19A116244P4	Ceramic: 0.15 µf ±20%, 50 VDCW. Added by REV D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR301 thru CR307	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - - ANTENNAS - - - - - - - - - -
E301	19C327270G1	Antenna.
		- - - - - - - - - - - FUSES - - - - - - - - - -
F301	19A127884G1	Fuse Kit.
		- - - - - - - - - TONE NETWORKS - - - - - - - -
		NOTE: When reordering give GE Part number and specify exact frequency needed.
FL301 and FL302	19C320291G2	Hybrid: 517.5-997.5 Hz.
FL303	19A134199P1	Filter, bandpass: 20 KHz at 6 db., 40 KHz at 40 db; sim to Murata Corp. Of America CFU-455D-1.
FL2301	19C320291G2	Hybrid. 517.5-997.5 Hz.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J301	19A134359P1	Jack, telephone: sim to NTT 310 ENC PC.
		- - - - - - - - - - INDUCTOR - - - - - - - - - -
L301	19B209420P103	Coil, RF: 0.15 µh ±10%, 0.10 ohms DC res max; sim to Jeffers 4416-3K.
L302	19B209420P1	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-1J.
L303	19A116308P1	IF Transformer: sim to TOKO LSN 4816VE2.
L304	19A116308P2	IF Transformer: sim to TOKO LSN 4817YM2.
L305	19B209420P125	Coil, RF: 10.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 4446-4K.
		- - - - - - - - - - TRANSISTORS - - - - - - - -
Q302	19A116159P1	Silicon, NPN.
Q303	19A129187P1	Silicon, PNP.
Q304	19A129184P1	Silicon, NPN.
Q305	19A116860P1	Silicon, NPN; sim to Type 2N4996.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R301	3R151P103J	Composition: 10K ohms ±5%, 1/8 w.
R302	3R151P223J	Composition: 22K ohms ±5%, 1/8 w.
R303	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
R304	3R151P104J	Composition: 100K ohms ±5%, 1/8 w.
R305	3R151P471J	Composition: 470 ohms ±5%, 1/8 w.
R306	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
R307	3R151P152J	Composition: 1.5K ohms ±5%, 1/8 w.
R308	3R151P101K	Composition: 100 ohms ±10%, 1/8 w.
R309	3R151P362J	Composition: 3.6K ohms ±5%, 1/8 w.
R310	3R152P154K	Composition: 150K ohms ±10%, 1/4 w.
R311	3R151P221J	Composition: 220 ohms ±5%, 1/8 w.
R312	3R151P683K	Composition: 68K ohms ±10%, 1/8 w.
R313	3R151P101K	Composition: 100 ohms ±10%, 1/8 w.
R314	3R151P330K	Composition: 33 ohms ±10%, 1/8 w.
R315	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
R316 and R317	3R151P392J	Composition: 3.9K ohms ±5%, 1/8 w.
R318	3R151P102J	Composition: 1K ohms ±5%, 1/8 w.
R319	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R320*	19A134231P103J	Deposited carbon: 10K ohms ±5%, 1/8 w; sim to Mepco/Electra Type CR16.
		Earlier than REV A:
	3R151P153J	Composition: 15K ohms ±5%, 1/8 w.
R321	19A134231P223J	Deposited carbon: 22K ohms ±5%, 1/8 w.
R322	19A134231P153J	Deposited carbon: 15K ohms ±5%, 1/8 w.
R323		(Part of S301).
R324	3R151P472J	Composition: 4.7K ohms ±5%, 1/8 w.
R325	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R326*	3R151P820J	Composition: 82 ohms ±5%, 1/8 w.
		In REV E & F:
	3R151P330J	Composition: 33 ohms ±5%, 1/8 w.
		In REV D:
	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
		In REV C & earlier:
	3R151P330K	Composition: 33 ohms ±10%, 1/8 w.
R327	3R151P104J	Composition: 100K ohms ±5%, 1/8 w.
R328*	3R151P473J	Composition: 47K ohms ±5%, 1/8 w. Deleted by REV F.
R329	3R151P682J	Composition: 6.8K ohms ±5%, 1/8 w.
R330	3R151P333J	Composition: 33K ohms ±5%, 1/8 w.
R331	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R332	19A134231P223J	Deposited carbon: 22K ohms ±5%, 1/8 w.
R333	3R151P103J	Composition: 10K ohms ±5%, 1/8 w.
R334	3R151P185K	Composition: 1.8 megohm ±10%, 1/8 w.
R335	3R151P104J	Composition: 100K ohms ±5%, 1/8 w.
R336	19C314256P21692	Metal film: 16.9K ohms ±1%, 1/4 w.
R337	3R151P683J	Composition: 68K ohms ±5%, 1/8 w.
R338	3R151P753J	Composition: 75K ohms ±5%, 1/8 w.
R339	3R152P513J	Composition: 51K ohms ±5%, 1/4 w.
R340	3R151P470J	Composition: 47 ohms ±5%, 1/8 w.
R341	3R151P684J	Composition: 680K ohms ±5%, 1/8 w.
R342	3R152P101J	Composition: 100 ohms ±5%, 1/4 w.
R343*	3R151P222J	Composition: 2.2K ohms ±5%, 1/8 w.
		In REV E & F:
	3R151P682J	Composition: 6.8K ohms ±5%, 1/8 w. Added by REV E.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S301	19A134358P1	Switch/resistor: includes Resistor (R323), 10K ohms ±20%, .05 w max; Switch, rotary, SPST; 0.1 amp at 12 volts; sim to Tsubame (TBM) Type RV-12 Model 121-S2.
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U301	19C321359G2	2nd Oscillator, Mixer.
U302	19C321351G1	455 Limiter.
U303	19C327247G1	Saver Battery.
U304	19C320539G2	Detector Limiter.
U305	19D417092G1	Selective Amplifier.
U306	19D417098G3	Control.
		- - - - - - - - - - - CABLES - - - - - - - - - -
W301	19A136734G1	Cable, RF: approx 1 foot long.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XFL301 and XFL302		Includes:
	19D416714P1	Shell.
	19B219681P1	Contact, electrical.
		- - - - - - - - - - CRYSTALS - - - - - - - - -
Y301	19B219824G14	Crystal, freq: Resonator A & B: 19,996.300±0.300 KHz.
Y302	19B206357G7	Quartz: freq. range 19.545 Mhz, temp range -30°C to +85°C.
		NOTE: When reordering Y303 give GE Part Number and specify exact frequency needed. Crystal Freq= $\frac{\text{Operating Freq} - 20.0\ \text{MHz}}{3}$
Y303	19B206890P7	Quartz: freq. range 42-55 MHz, temp range -30°C to +85°C.
		MODIFICATION KIT 19A136728G1 GROUP CALL 19A136728G2 TONE ONLY 19A136728G3 AUTOMATIC RESET 19A136728G4 PUSH TO LISTEN
		- - - - - - - - - - CAPACITORS - - - - - - - -
C2301	5491674P28	Tantalum: 1.0 µf ±20%, 25 VDCW; sim to Sprague Type 162D.
C2302	5491674P34	Tantalum: 15 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C2303	5491674P37	Tantalum: 10 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C2304	5491674P30	Tantalum: 39 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR2301	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL2301	19C320291G2	Hybrid: 517.5-997.5 Hz.
		- - - - - - - INTEGRATED CIRCUITS - - - - - - - -
U2301	19C327157G1	3 Tone Search.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XFL2301		Includes:
	19D416714P1	Shell.
	19B219681P1	Contact, electrical.
		MISCELLANEOUS
		- - - - - - - - - - BATTERIES - - - - - - - - -
BT1	19A116252P1	Nickel-Cadmium: Rechargeable, 3.75 v, 150 MAH; sim to GE 41B902CD09.
	19A116387P2	Mercury. (OPTIONAL).
		- - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS1	19A116090P2	Permanent magnet: 2.00 inch, 4 ohms ±10% voice coil imp, 450 Hz ±112 Hz resonant; freq range 400 to 3000 Hz.
	19A122060G4	Lapel speaker. (OPTIONAL).
	4033570G5	Ear speaker. (OPTIONAL).
	5495088P19	Cord Set. (USED WITH LAPEL SPEAKER).
	19B219676P1	Alignment tool. (Hollow tip one end).
	4038831P5	Alignment tool. (Screw driver tip both ends).
		MECHANICAL PARTS (SEE RC3047)
1	19A134352P1	Machine screw: No. 2-56 x 5/8.
2	19B227431G1	Clip.
3	19B227572G1	Housing (Black).
4	19B227572G2	Housing (White).
5	19C327174P1	Reset button. (Black).
6	19C327174P2	Reset button. (White).
7	19A134351P1	Pin, grooved.
8	19A127576P1	Window. (Located over Sel-Call number).
9	19A127640P1	Label. (Sel-Call number).
10	19B227477P4	Pad.
11	19B227477P1	Pad.
12	19B227477P2	Pad.
13	19B227420P1	Pad.
14	19C327255G1	Contact, electrical.
15	19B227474G1	Battery door. (Black).
16	19B227474G2	Battery door. (White).
17	19C327265G1	Cover. (Black).
18	19C327265G2	Cover. (White).
19	19C327254G1	Contact, electrical.
20	19C327205P1	Contact support. (Black).
21	19C327205P2	Contact support. (White).
22	19B227426P1	Charging contact.
23	NP280187	Nameplate. (GE monogram).
24	19A116719P1	Threaded insert.
25	19A127850P1	Spring.
26	19C327209P2	Battery contact.
27	19A116477P1	Machine screw: No. 5/32.
28	19B227477P3	Pad.
29	19A129811P2	Insulator.
30	19C327169P1	Mounting cup.
31	19A136665P1	Insulator.
32	19C327198P1	Knob.
33	19C327266G1	Contact, electrical. (Used with S2).
34	19B227412P1	Clip spring.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



PRODUCTION CHANGES

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

REV. A - Receiver Board 19D417994G1
To improve audio stability.
Changed C326 and R320.

REV. B - To improve sensitivity. Added C351.

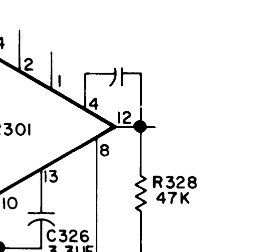
REV. C - To change battery wire size for agency approval.
Changed wire from H12 to S301-4.

REV. D - To improve operation.

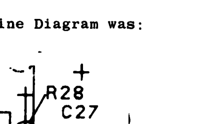
REV. E -- To improve frequency response and audio sensitivity.
Changed C324, R326 and added R343.

REV. F - To improve audio.
Deleted R328.

Schematic Diagram was:



Outline Diagram was:



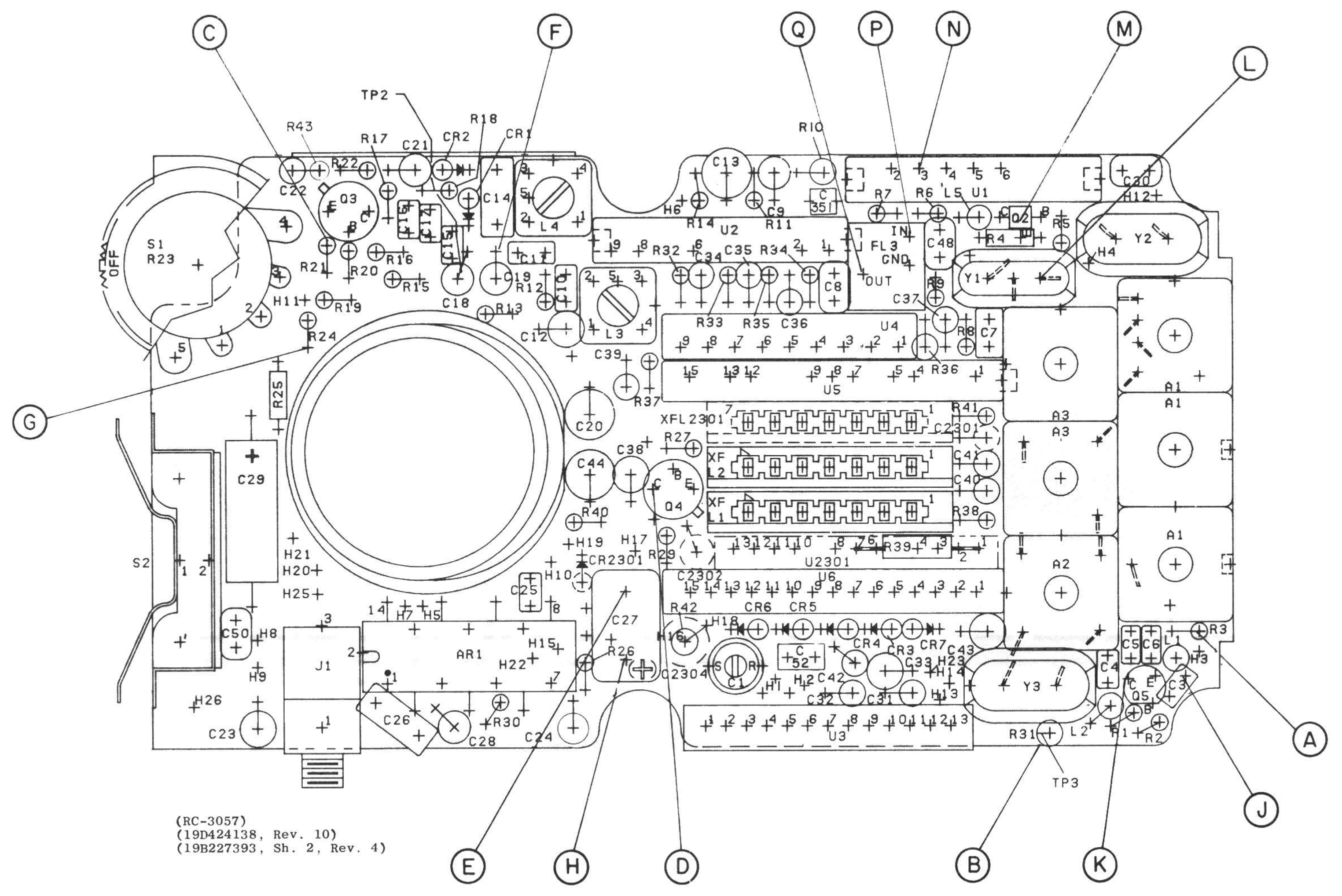
REV. G - To improve audio frequency response.
Changed C324, R326 and R343.

QUICKCHECKS

Before starting the procedure, check for battery voltage on the receiver board (H12 and ground). Also check fuse wire F301.

SYMPTOM	PROCEDURE
No audio	Check reading at (G), (D) and (E).
Low Sensitivity	1. Check Antenna and reading at (A). 2. Check gains at (J) through (Q).
Noise but no signal	1. Check first oscillator reading at (B). 2. Check second oscillator injection voltage at U301 Pin 3.

COMPONENT SIDE



(RC-3057)
(19D424138, Rev. 10)
(19B227393, Sh. 2, Rev. 4)

STEP 3 - RF GAIN CHECKS
(STEPS J THRU Q)

EQUIPMENT REQUIRED:

1. RF probe and Test Amplifier Model 4EX16A10 connected to GE Test Set Model 4EX3A11, or an RF voltmeter.
2. A signal generator (M-560 or equivalent) connected at the junction of C303 and L301. Disconnect the internal antenna by removing the center conductor of the coaxial cable from H1.

PROCEDURE FOR MIXER & 1ST IF:

1. Switch the Test Set to the Test 1 position and the Test Amplifier to the X50 position.
2. Connect the RF probe across the input of the stage to be measured as shown on the diagram. Increase the signal generator output to obtain a reference reading on Test Set 4EX3A11. Note the Test Set reading and the dB reading on the generator (dB1).
3. Connect the RF probe to the output of the stage to be measured as shown on the diagram. Decrease the generator output until the Test Set reference reading in Step 2 is obtained. Note the dB reading on the generator (dB2).
4. Subtract the dB reading from the dB2 reading and check the results with the typical gains shown on the diagram.

Example:
35 dB (dB2)
-15 dB (dB1)
20 dB gain

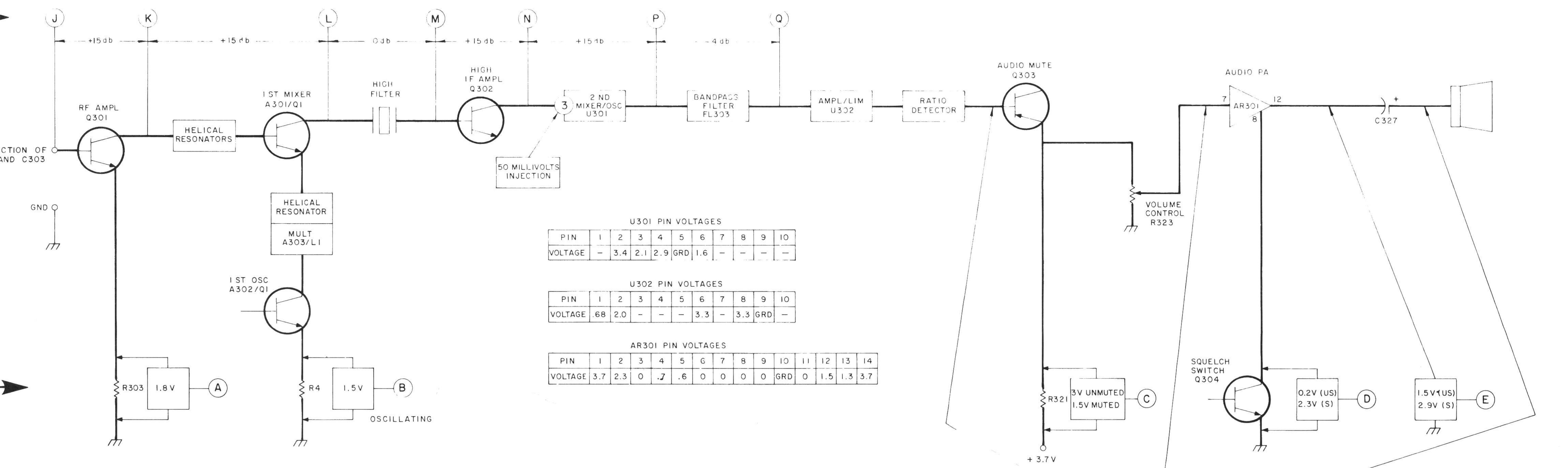
PROCEDURE FOR 2ND MIXER

1. With no signal in, connect the RF probe to the output of U302 (Pin 8) and set the Test Amp to the X10 position.
2. Apply a 200 microvolt signal to the receiver and check for a Test Set reading of 2 volts.

The DC voltage checks provide an easy method of checking the operation of the receiver stages with GE Test Set Model 4EX3A10 (or equivalent), and with no signal applied to the receiver.

STEP 3 - RF GAIN CHECKS
(STEPS J THRU Q)

STEP 1 - DC VOLTAGE CHECK
(STEPS A THRU E)



U301 PIN VOLTAGES

PIN	1	2	3	4	5	6	7	8	9	10
VOLTAGE	–	3.4	2.1	2.9	GRD	1.6	–	–	–	–

U302 PIN VOLTAGES

PIN	1	2	3	4	5	6	7	8	9	10
VOLTAGE	.68	2.0	–	–	–	3.3	–	3.3	GRD	–

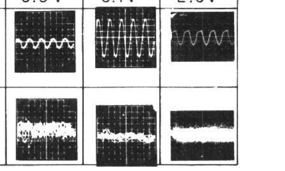
AR301 PIN VOLTAGES

PIN	1	2	3	4	5	6	7	8	9	10	11	12	13	14
VOLTAGE	3.7	2.3	0	.7	.6	0	0	0	0	GRD	0	1.5	1.3	3.7

The DC voltage checks provide an easy method of checking the operation of the receiver stages with GE Test Set Model 4EX3A10 (or equivalent), and with no signal applied to the receiver.

STEP 1 - AUDIO & NOISE WAVEFORMS
(STEPS F THRU H)

PEAK-TO-PEAK READINGS		F	G	H
	SIGNAL	0.17V	.06V	2.0V
	NOISE	0.3V	0.1V	2.5V
STANDARD SIGNAL				
NOISE WAVEFORM				



RC-3054A

EQUIPMENT REQUIRED:

- Oscilloscope connected between the points shown and ground.
- Signal Generator (Measurements M-560 or equivalent).

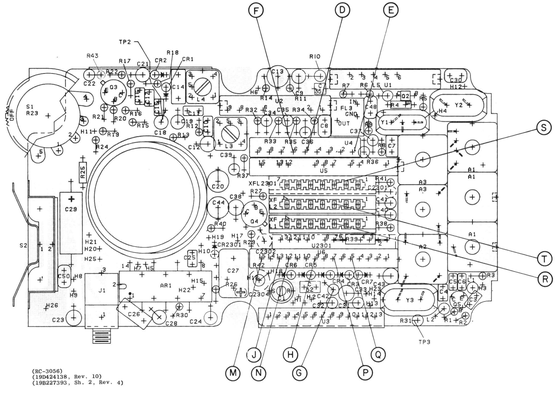
PRELIMINARY STEPS:

1. Apply a standard signal to the external antenna pins. A standard signal is 1000 microvolts on the receiver frequency modulated by one kHz with 3.0 kHz deviation.
2. Set the Volume control for 150 milliwatts output (.78 volts).

TROUBLESHOOTING PROCEDURE

150.8—174 MHz EXECUTIVE PAGER
TYPE ER-94-A

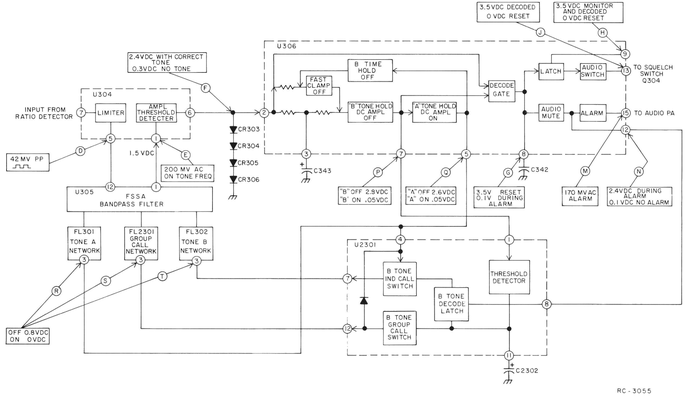
COMPONENT SIDE



TYPE 99 TONE TROUBLESHOOTING

SYMPTOM	STEP	TESTPOINT	ACTION
Unit does not decode (Note 1)	1		Apply an on channel signal modulated by the correct Type 99 Tone at 3 kHz deviation to the receiver RF input terminals
	2		Check to see if receiver works properly
	3	(F)	Check for 2.4 V at (F).
	4	(D)(E)	If (F) is incorrect, check (D) (E).
	5	(R)(S)(T)	If (E) is incorrect check Veraltone socket for proper contact and (R)(S)(T) for proper voltage.
	6	(R)(S)(T)	If 2.4 V is correct at (F), then remove A tone and check for sequencing of voltages at (R)(S)(T). When the A tone is removed (T) should turn on for 0.5 sec. and then (S) should turn on for the remainder of B Tone time or about 0.8 sec.
	7	(G)	If Step 6 is correct, check (G) during B tone. If no decode replace U306.
	8	(J)(M)(N)	Check (J)(M)(N) and replace U306 if any test fails to respond.

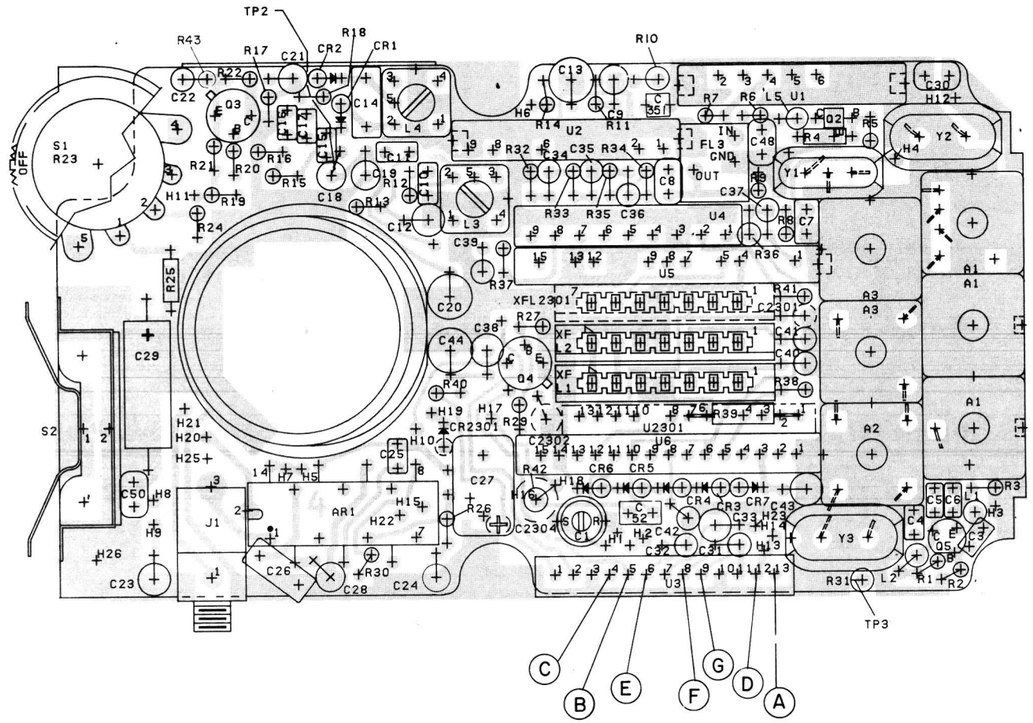
Note 1: The tone network can be checked by substitution of a known good network.



TROUBLESHOOTING PROCEDURE

150.8—174 MHz EXECUTIVE PAGER
TYPE 99 TONE

COMPONENT SIDE

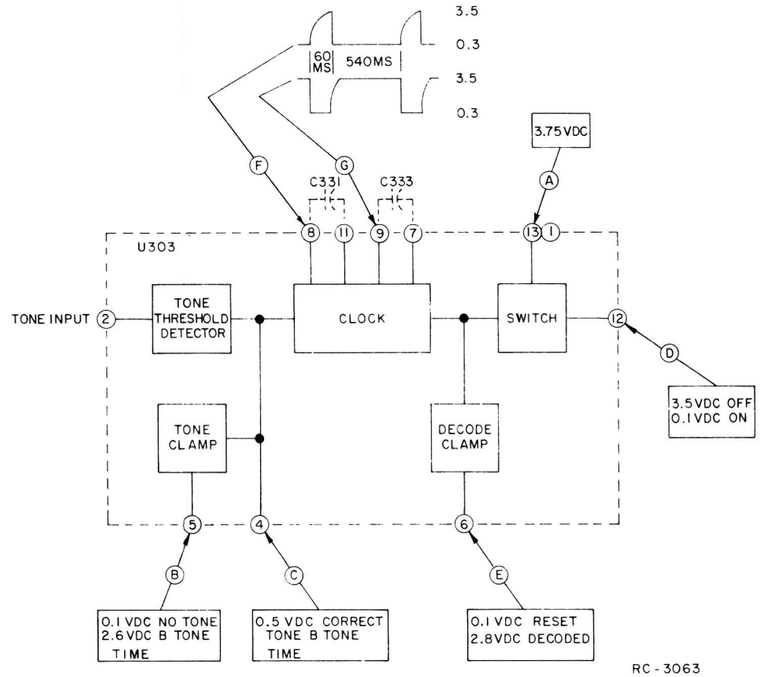


(RC3066A)
(19D424138, Rev. 10)
(19B227393, Sh. 2, Rev. 4)

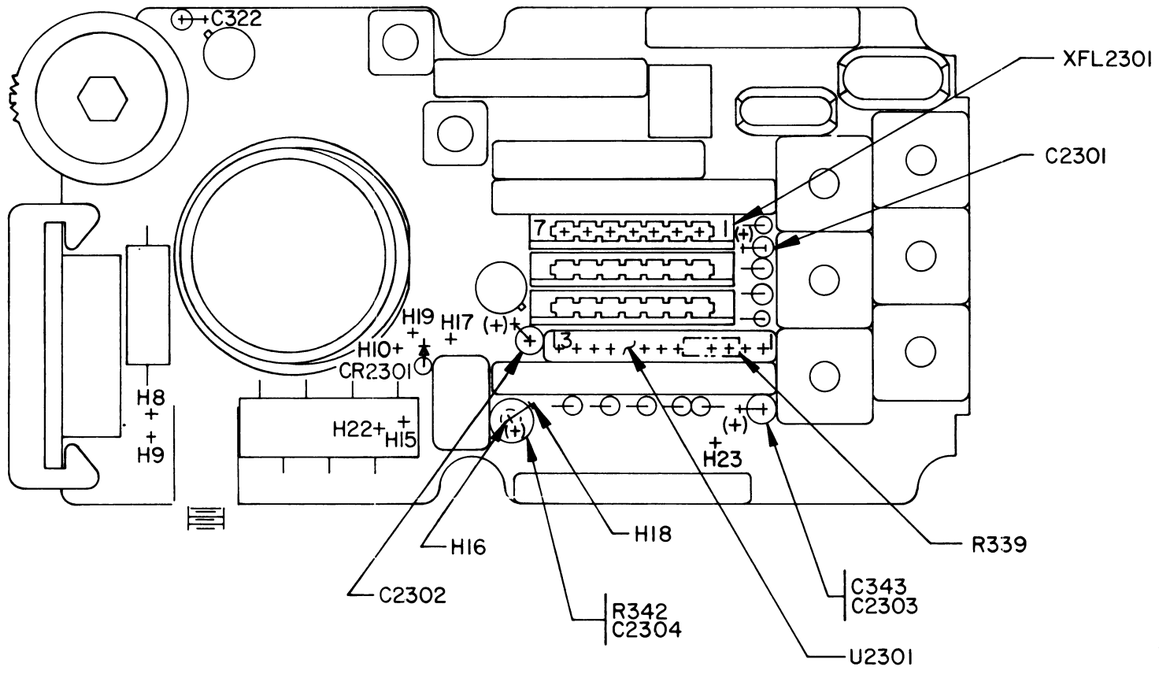
BATTERY SAVER TROUBLESHOOTING

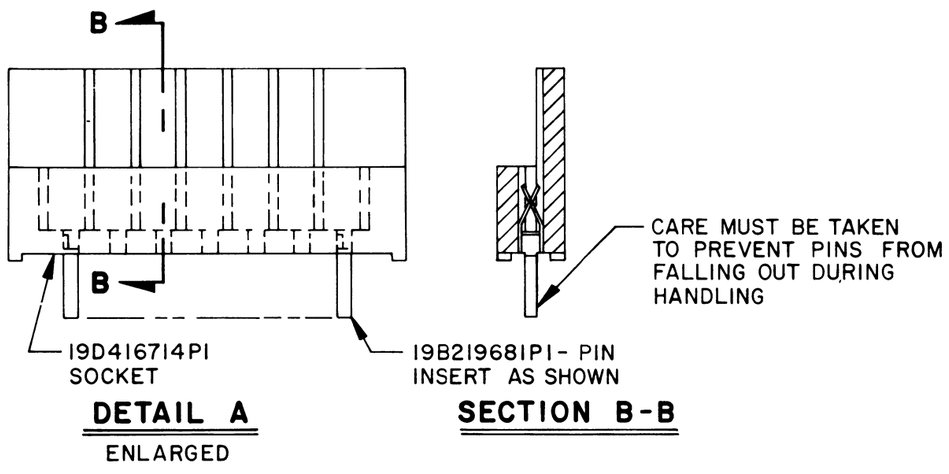
Before starting the procedure, disable the Battery Saver and make sure the receiver and Type 99 tone circuits are working correctly. To disable the Battery Saver, short together Pins 12 and 13 of U303.

STEP	TEST POINT	ACTION
1		Apply correct (A) Tone to RF input signal.
2	(A)	Check (A) for 3.75 VDC.
3	(B)(C)(D)	Check (B) and (C). Battery saver should be OFF (D).
4	(E)(D)	Open audio and check (E). Battery saver should be OFF (D).
5	(F)(G)	Check (F) and (G) for a squarewave 60 millisecond to 540 millisecond duration. If these times are incorrect, check C331 and C333.



RC-3063





MODIFICATION INSTRUCTIONS

(19C327281, Rev. 1)

EXECUTIVE PAGER TYPE ER-94-A

GROUP CALL

THESE INSTRUCTIONS COVER THE INSTALLATION OF MODIFICATION KIT PL19A136728G1 FOR APPLICATION OF "GROUP CALL" TO INDUSTRIAL/ HOSPITAL PAGER.

INSTRUCTIONS:

1. REMOVE AND DISCARD R339.
2. SOLDER C2301, C2302 & U2301 INTO POSITION AS SHOWN.
3. ASSEMBLE XFL2301 AS SHOWN IN DETAIL "A" AND SOLDER INTO POSITION SHOWN.

TONE ONLY

THESE INSTRUCTIONS COVER THE INSTALLATION OF MODIFICATION KIT PL19A136728G2 FOR APPLICATION OF "TONE ONLY" TO INDUSTRIAL/ HOSPITAL PAGER.

INSTRUCTIONS:

1. REMOVE C322, C343, R342 AND DM JUMPER BETWEEN H17 & H19 AND DISCARD.
2. SOLDER C2303 INTO POSITION WHERE C343 WAS REMOVED.
3. ADD T28-G WIRE FROM +END OF C2303 AND H19 COMPONENT SIDE.

AUTOMATIC RESET

THESE INSTRUCTIONS COVER THE INSTALLATION OF MODIFICATION KIT PL19A136728G3 FOR APPLICATION OF "AUTOMATIC RESET" TO INDUSTRIAL/HOSPITAL PAGER.

INSTRUCTIONS:

1. REMOVE R342 CONNECTING H16 & H18.
2. SOLDER C2304 BETWEEN H16 & H18 WITH POSITIVE END CONNECTED TO H16 AS SHOWN.

PUSH TO LISTEN

THESE INSTRUCTIONS COVER THE INSTALLATION OF MODIFICATION KIT PL19A136728G4 FOR APPLICATION OF "PUSH-TO-LISTEN" FEATURE TO INDUSTRIAL/HOSPITAL PAGER.

INSTRUCTIONS:

1. REMOVE R342 CONNECTING H16 & H18 AND DM JUMPER CONNECTING H17 & H19.
2. ADD CR2301 AND T28-O WIRE BETWEEN H22 & H23.
3. ADD JUMPER BETWEEN H10 & H19 BY SOLDERING DM WIRE JUMPER IN THESE HOLES.

VARIABLE ALERT TONE

THESE INSTRUCTIONS COVER THE MODIFICATION OF INDUSTRIAL/HOSPITAL PAGER FOR "VARIABLE ALERT TONE" FEATURE.

INSTRUCTIONS:

1. REMOVE T28-V JUMPER ON SOLDER SIDE FROM H9 AND SOLDER THAT END TO H8.

ORDERING SERVICE PARTS

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

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

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

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

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

MAINTENANCE MANUAL

LBI-30252

DF-1114

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY ● LYNCHBURG, VIRGINIA 24502

GENERAL ELECTRIC

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