MOBILE RADIO

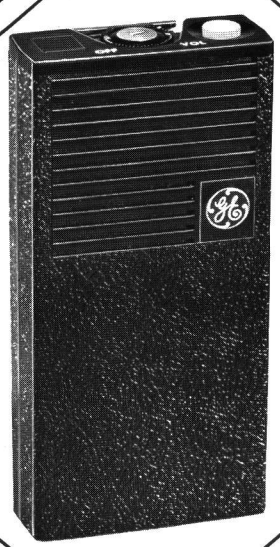
450-470 MHz

personal pager

DF-1099

LBI-4221B

MAINTENANCE MANUAL



GENERAL ELECTRIC

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SPECIFICATIONS *

Type Number	ER-55-A
Frequency Range	450 - 470 MHz
Modulation Acceptance	±7 KHz
Channel Spacing	25 KHz
Selectivity	
EIA Method	-50 dB at ±25 KHz
20 dB Quieting	-65 dB at ±25 KHz
Chassis Sensitivity	
12 dB SINAD (EIA Method)	0.50 µV
20 dB Quieting Method	0.75 µV
Paging	0.25 µV
Radiated Sensitivity	
12 dB SINAD	30 µV/Meter
20 dB Quieting	45 µV/Meter
Paging	15 µV/Meter
Spurious Response	-40 dB
Frequency Stability	.0005% (-10° C to +50° C)
Battery Drain (at 3.7 volts)	
Squelched	11.5 milliamperes
Unsquelched	90 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)

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

COMBINATION NOMENCLATURE

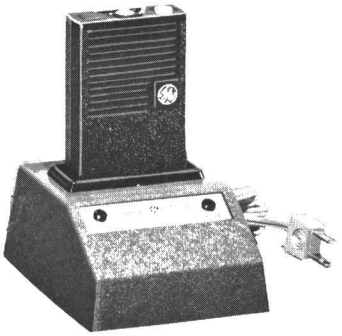
1st & 2nd Digits	3rd Digit	4th Digit	5th Digit	6th Digit	7th Digit	8th & 9th Digits
PRODUCT LINE	RF POWER	CHANNEL SPACING	MODE OF OPERATION	ALERT TONE	OPTIONS	FREQUENCY RANGE
PC	**O**	**5**	**A**	**W**	**L**	**88**
Personal Pager	Receive Only	25 kHz	Tone & Voice (Automatic Reset)	Fixed Output	Type 99 Decoder	450 - 470 MHz
			B Tone & Voice (Push-To-Reset)	**V** Adjustable Output	**S** Noise Squelch	
			C Tone & Voice (Push-To-Listen)	**U** Noise Squelch		
			D Tone Only (Push-To-Silence)			
			E (Noise Squelch)			

ACCESSORIES

DESK CHARGER
MODEL 4EP67A11 (Option 5406)

-INDOOR ANTENNA
(Option 5406)

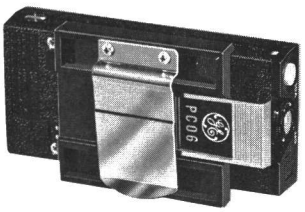
DESK CHARGER
MODEL 4EP67A10 (Option 5405)



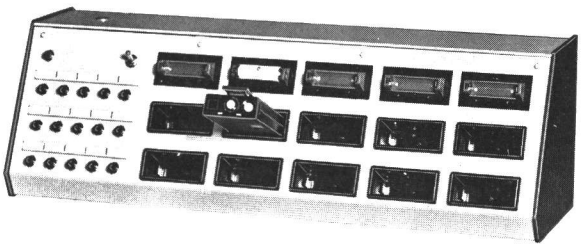
MOBILE CHARGER
MODEL 4EP75A10 (Option 5413)

5-WATT SPEAKER
MODEL 4EZ18A13 (Option 5422)

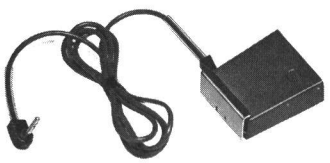
BELT-MOUNTING CLIP
(Option 5417)



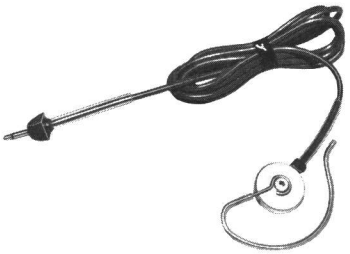
MULTI-CHARGERS
MODELS 4EP74A10-13 (Options 5407-5410)



LAPEL SPEAKER
& CORD SET
(Option 5420)



EARPHONE
(Option 5421)

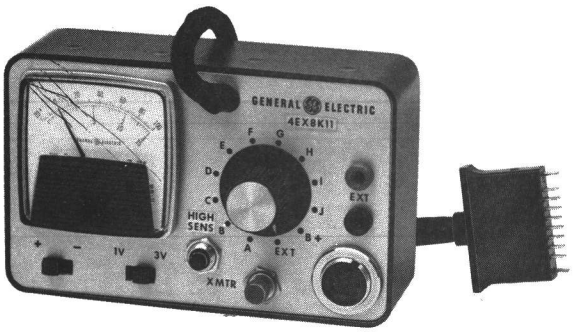


LEATHER
CASE
(Option 5415)

TEST EQUIPMENT

TEST SET
MODEL 4EX3A10 (TM-11 & TM-12)

TEST KIT
MODEL 4EX8K11



IF GENERATOR
MODEL 4EX9A10 (Option 4381)

For setting the receiver on frequency and for troubleshooting

TEST FIXTURE
MODEL 4EX17A10 (Option 5425)

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

For receiver front end and IF gain measurements

VOLTAGE CALIBRATOR
MODEL 4EX10A10 (Option 4383)

For setting voltages on Personal Pager Battery Chargers

DESCRIPTION

General Electric Personal Paging receivers Type ER-55-A are extremely compact, high performance FM receivers for tone and voice paging in the 450-470 MHz range. The Personal Pagers are available for three different types of operation. The three types are:

- Voice and Type 99 tone signaling
- Type 99 tone signaling only
- Voice only (noise squelch)

The receiver is housed in a ruggedly-constructed, weatherproof and dustproof Lexan® case with a self-contained speaker, antenna and battery. All operating controls are conveniently mounted on the top of the case. An accessory jack on the top of the radio is provided for an external speaker or earphone. Directions for opening the accessory jack cover are contained in Figure 1.

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, depending on the battery charger used.

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

A belt-mounting clip supplied with the Pager permits the radio to be attached to a belt in a horizontal position. The Spring 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 Personal Pager is shipped from the factory equipped for one of five 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. The operating modes and controls for the different paging combinations are shown in the following chart.

5th Digit of Combination Number	Mode of Operation	Controls
A	Tone and Voice (With Automatic Reset)	Push-to-Reset and OFF - VOLUME
B	Tone and Voice	Push-to-Reset and OFF - VOLUME
C	Tone and Voice	Push-to-Listen and OFF - VOLUME
D	Tone only	Push-to-Silence and OFF - VOLUME
E	Voice only	Squelch and OFF - VOLUME

TONE & VOICE RECEIVERS

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. Next, press down and release the Push-to-Reset button to cut off the hissing sound. The Personal 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 button 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 button may be pressed as soon as the message is completed to reset the receiver.

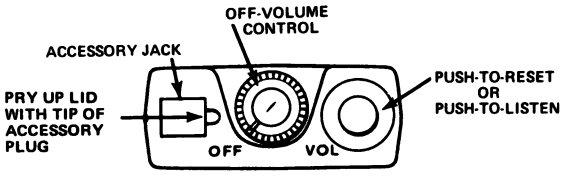


Figure 1 - Tone & Voice Receiver

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 button to hear the voice message. Release the button as soon as the message is complete.

TONE ONLY RECEIVERS

Turn the receiver on by turning the OFF-VOLUME Control halfway to the right (see Figure 2). A short burst of tone will be heard. The receiver is now ready to receive a short alerting tone---no voice message will be received. The tone may be silenced by pressing the Push-to-Silence button at any time before the tone ends.

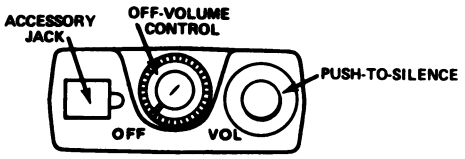


Figure 2 - Tone Only Receiver

VOICE ONLY RECEIVER

Turn the receiver on by turning the OFF-VOLUME Control halfway to the right (see Figure 3). Next, turn the SQUELCH control to the right until a continuous hissing noise is heard. Then slowly turn the SQUELCH control to the left until the hissing sould just fades out. The radio is now ready to receive voice messages.

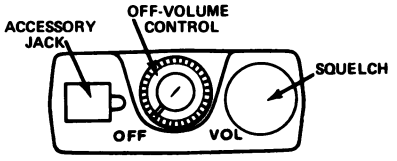


Figure 3 - Voice Only Receiver

BATTERY INFORMATION

The Personal 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	Pager Battery Life
Rechargeable	19A116252P1		12 hrs.
Mercury	19A116387-P2 (package of 12)	Mallory TR133 Eveready E133	90 hrs.
Alkaline	19A116448P2 (package of 10)	Mallory PX21	50 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 in one of the Personal Pager chargers.

BATTERY INSTALLATION OR REPLACEMENT

To replace the battery:

1. Turn the radio OFF.
2. Turn the captive screw to the left as far as it will go (see Figure 4).
3. Place a fingernail in the slot shown and pull down in the direction of the arrow. This will flip open the hinged battery compartment cover.
4. Replace the battery with the (+) end pointing toward the battery compartment opening (away from spring).

WARNING

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

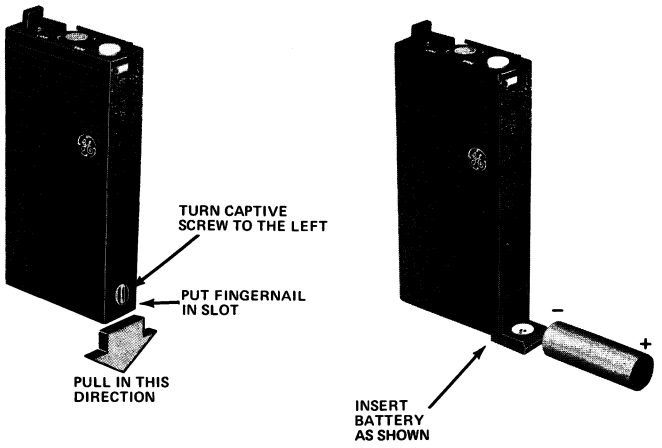


Figure 4 - Battery Replacement

BATTERY CHARGERS

Three different type chargers are available for recharging the nickel-cadmium batteries used in the Personal Pager. The chargers include a desk charger, a multi-unit charger and a mobile charger. All of the chargers will fully recharge the battery in 14 hours.

A fully charged battery will operate the Pager for approximately 12 hours. In addition, an eight-hour charge will provide a sufficient charge to operate the Pager for one day (8 hours).

NOTE

Due to the temperature characteristics of nickel-cadmium batteries, the batteries will not accept a full charge at temperature extremes. For maximum capacity, recharge the battery at a room temperature of from 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 safely be left on trickle charge for as long as desired.

Refer to the applicable Maintenance Manual for complete instructions.

WARNING

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

DESK CHARGER

Two desk chargers are available for recharging the nickel-cadmium battery from a 117-volt, 50/60 Hz source. Charger Model 4EP67A10 will recharge one battery in the radio, and charger Model 4EP67A11 will recharge one radio and one battery.

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.

Charger Model 4EP67A11 is also equipped with an antenna jack for connecting the Pager to an external antenna. Placing the Pager into the charging insert with the speaker facing the front of the charger automatically connects the Pager to the external antenna. The Pager may be turned ON to monitor the channel and receive messages while in the charger. The battery can be charged up to approximately 50% of capacity with the Pager turned ON.

An optional indoor antenna is available for use with the 4EP67A11.

MULTI-CHARGER

Four multichargers are available for recharging up to 15 radios, 15 batteries, or a combination of radios and batteries.

To use the multicharger, plug the power cable into a 117-volt, 50/60 Hz source. Then turn the OFF-ON switch to the ON position. Next, 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.

MOBILE CHARGER

The mobile charger recharges one radio from the vehicle battery, and is shipped with an external antenna. To use the charger, turn the Pager OFF and make sure that the charger is ON. Due to the low battery drain, it is not necessary to turn the charger off unless the charger will not be used for long periods of time. Next, press open the belt clip on the Pager and place the radio into the charging insert with the speaker towards the front of the insert. Press the Pager into the Charger until the belt clip catches into the retaining slot.

The radio can be turned ON and used to monitor the channel and receive messages while in the charger. The battery can be charged up to approximately 50% of capacity with the Pager turned on.

An optional 5-watt speaker is available for use with the mobile charger. The charger ON-OFF switch also turns the 5-watt speaker on and off.

INITIAL ADJUSTMENT

The initial adjustment for the Personal 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 as 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 the receiver, tone and squelch boards. 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.

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

CIRCUIT ANALYSIS

General Electric Personal Paging receivers Type ER-55-A are double-conversion, superheterodyne receivers for tone and voice paging in the 450 to 470 MHz range. The circuit boards used in the different receiver applications are shown in the following chart.

APPLICATION	RECEIVER BOARD	TYPE 99 DECODER BOARD	SQUELCH BOARD
Tone & Voice	19D413407-G1	19C317029-G1	
Tone Only	19D413407-G2	19C317029-G1	
Voice Only	19D413407-G1		19C317187-G1

References to symbol numbers mentioned in the following text are found in the Outline Diagram, Schematic Diagram and Parts List (see Table of Contents).

RECEIVER BOARD

ANTENNA & RF AMP

RF from the belt-clip antenna is coupled through the antenna circuit to the base of RF Amplifier Q312. The antenna circuit consists of L317 and capacitors C368 and C370. The circuit is tuned by C368.

The output of Q312 is connected by RF cable W301 to helical resonators L301 and L302. The output of L302 is applied to the base of first mixer Q301.

1ST OSCILLATOR & MIXER

1st Oscillator Q302 is a third mode oscillator that operates in the 47 to 50 MHz range. The crystal is connected in the oscillator feedback path to permit oscillator at the crystal frequency only. L304, C304, and C305 make up the mode-selective resonant circuit. Tuneable coil L304 permits the oscillator frequency to be shifted slightly for setting the receiver on the system operating frequency.

The oscillator output is transformer-coupled through L305 and C302 to the base of Multiplier Q311. L305 is tuned to three times the crystal frequency. The oscillator stage is metered at TP1.

RF from the helical resonators and the injection frequency from the multiplier (tripler) are applied to the base of 1st Mixer Q301. The 19-megahertz high IF output is coupled through a three-coil torroidal filter (L306 and C311, L307 and C314, L308 and C317) which provides the High-IF selectivity.

2ND OSCILLATOR & MIXER

Q303 operates as a Colpitts oscillator with a crystal frequency of 18.545 megahertz. The High-IF signal from the 1st mixer and the low side injection frequency from the 2nd oscillator is applied to the base of 2nd mixer Q304 producing the 455-kilohertz Low-IF output. The 2nd Mixer Stage is metered at TP4.

Following the 2nd Mixer is a six coil Low-IF filter (L309 through L314) that provides the main receiver selectivity.

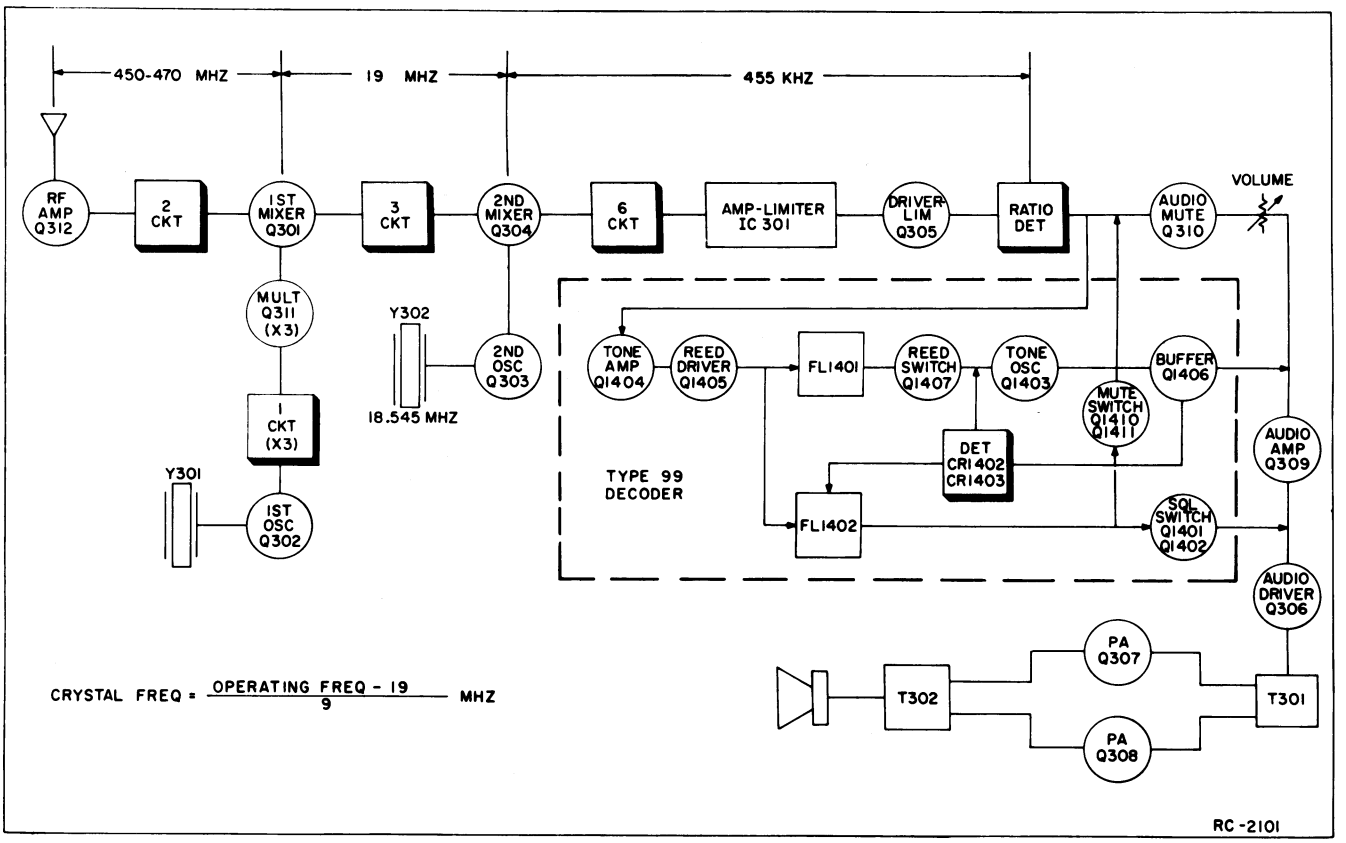


Figure 5 - Tone and Voice Receiver Block Diagram

AMP-LIMITER & DRIVE-LIMITER

The Low IF filter output is applied to Pin 10 of the integrated circuit Amplifier-Limiter (IC301). The IC amplifies the Low IF signal and provides some limiting at high signal levels.

The IC output at Pin 5 is coupled through C342 to the base of Driver-Limiter transistor Q305. The output of Q305 is applied directly to the radio detector.

RATIO DETECTOR

A ratio detector is used to demodulate the 455 kHz IF signal. This type of detector provides a high degree of AM rejection. The recovered audio, tone and noise is obtained from the tertiary winding of L315. The ratio detector is metered at TP2.

AUDIO STAGES

Tone and Voice Receiver

The ratio detector output is applied to both the base of Audio Mute transistor Q310 and to the Decoder Board input. Applying the proper sequential tones to the receiver activates the Decoder circuitry and the audio stages causing a 2800 Hz tone to be heard at the speaker.

After the alerting tone is completed, the output of Q310 is coupled through VOLUME control R388 to the base of Audio Amp Q309.

Audio Driver Q306 follows the audio amp stage. The output of Q306 is transformer-coupled through T301 to provide phase inversion for the push-pull audio PA stage.

Q307 and Q308 operate as a class B, push-pull audio PA. The PA output is coupled through audio transformer T302 to the loudspeaker. C360, R331 and R346 provide a negative feedback loop from the output of T302 to the base of Q306 for added stability of the PA stage.

Voice Only Receiver

The ratio detector output is applied to both the base of Audio Mute transistor Q310 and to the Squelch Board input. Q310 operates as an emitter-follower in Voice Only receivers.

Applying a carrier to the receiver unsquelches the unit and activates the audio stage. The output of Q310 is coupled through VOLUME control R388 to the base of Audio Amp Q309.

Audio Driver Q306 follows the audio amp stage. The output of Q306 is transformer-coupled through T301 to provide phase inversion for the push-pull audio PA stage.

Q307 and Q308 operate as a class B, push-pull audio PA. The PA output is coupled through audio transformer T302 to the loudspeaker.

C360, R331 and R346 provide a negative feedback loop from the output of T302 to the base of Q306 for added stability of the audio PA

Tone Only Receiver

In tone only receivers, the audio stages consist of Audio Driver Q306 and Audio PA Q307-Q308. The ratio detector output is applied to the Decoder Board.

Applying the proper sequential tone to the receiver activates the Decoder circuitry and Audio Driver Q306.

A 2800 Hz alerting tone from the decoder is applied to the base of Q306. The output of Q306 is transformer-coupled through T301 to provide phase inversion for the push-pull audio PA stage.

Q307 and Q308 operate as a class B, push-pull audio PA. The PA output is coupled through audio transformer T302 to the loudspeaker.

TYPE 99 DECODER

Type 99 Decoder Board A303/A307 is a two-reed, sequential tone decoder for operation with any two-tone sequential encoder in individual call applications. The two reeds plug into pins mounted on the decoder board, and are available for operation on tone frequencies in the 517.5 to 997.5 Hertz range.

The decoder board is used in tone and voice and tone only receivers. Timing waveforms for the decoder are shown in Figure 6. It is recommended that these waveforms be studied in conjunction with circuit analysis for a better understanding of the decoder operation.

TONE AMP & REED DRIVER

The ratio detector output is amplified by Tone Amp Q1404/Q1415 and then applied to the base of Reed Driver Q1405/Q1416. Capacitor C1410 provides 455 kHz and high frequency audio roll-off. The square-wave output of Q1405/Q1416 drives the reeds.

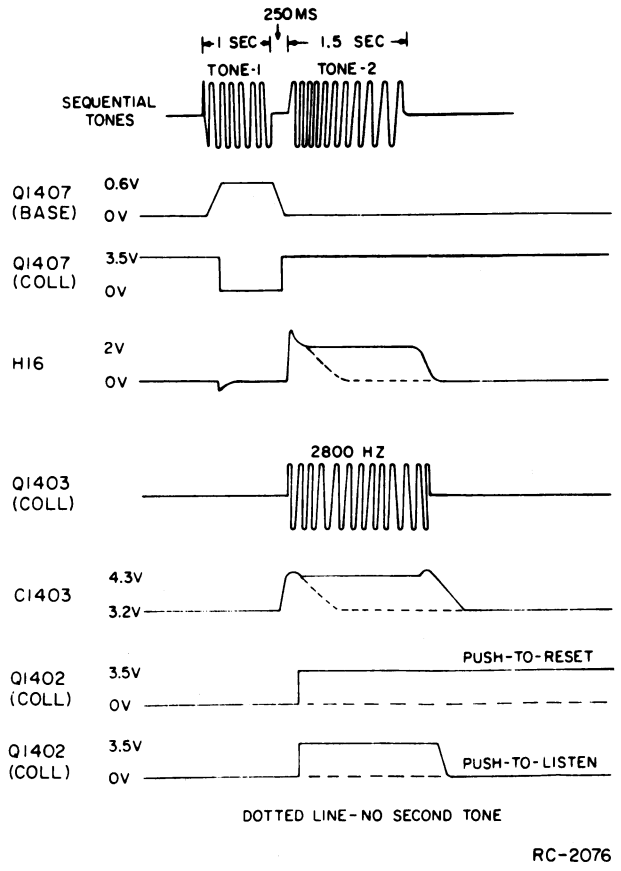


Figure 6 - Decoder Timing Waveforms

REED SWITCH

The reeds are selected to respond to one combination of sequential tones. When the first tone of a two-tone sequential call is received, the contacts of FL1401 close. This applies the battery voltage to the base of Reed Switch Q1407/Q1418, turning it on.

When turned on, the collector potential of Q1407/Q1418 drops to ground for the duration of the tone discharging C1405 (see Figure 6). As soon as the first tone stops, Q1407/Q1418 turns off and C1405 starts charging through R1406.

The charging current also flows through R1408 and R1409, developing a positive potential of approximately +2 Volts at H16.

The +2 Volts at H16 is applied to the base of PNP transistor Q311 on the receiver board, turning the transistor off. Q311 remains off while the sequential tones are being applied so that only the alerting tone will be heard from the speaker.

TONE ALERT OSCILLATOR & BUFFER

The voltage developed across divider network R1408 and R1409 turns on Tone Alert Oscillator Q1403/Q1414.

Q1403/Q1414 operates as a 2800 Hertz oscillator with a "twin-T" feedback loop consisting of C1413, C1414 and R1410, and R1412 and C1415.

Buffer Q1406/Q1417 follows the oscillator. The Buffer tone output is applied to a voltage doubler (CR1402 and CR1403) where the rectified output charges C1403.

The buffer tone output is also applied to the base of Audio Amp Q309 on the receiver board. The Audio Amp is turned off until the second sequential tone activates the decoder logic circuitry.

If the second tone is not applied to the decoder, the voltage at H16 drops to ground and C1403 stops charging (see Figure 6).

MUTE & SQUELCH SWITCHES

The Mute and Squelch switches are activated by the second sequential tone. When the second tone is received, the contacts of FL1402 close. This applies a positive trigger pulse from the charge in C1403 to the emitter of Q1410/Q1421 and to the base of Q1401/Q1412.

Mute Switch

Mute Switch transistors Q1410/Q1411 and Q1411/Q1422 are normally off. Applying the trigger pulse to the emitter of Q1410/Q1411 turns it on, which turns on Q1411/Q1422. The emitter of Q1411/Q1422 connects to the cathode of CR1401 in the base circuit of Tone Alert Oscillator Q1403/Q1414. Turning on Q1411/Q1422 applies the bias voltage to the base of Q1403/Q1414, keeping the oscillator running and charging C1409. The bias voltage is also applied to the base of Audio Mute transistor Q311, keeping the transistor turned off. The positive voltage is applied to the base of Q311 and Q1403/Q1414 for the duration of the sequential tone.

Squelch Switch

In the Squelch Switch, transistor Q1401 is normally on and Q1402/Q1413 is normally off (reset). The collector of Q1402/Q1413 is connected to the collector of Audio Amp Q309 and to the base of Audio Driver Q306 on the receiver board. When Q1402/Q1413 is turned off, its collector is at ground potential, keeping Q309 and Q306 turned off.

Applying the trigger pulse turns off Q1401/Q1412 and turns on Q1402/Q1413. Turning on Q1402/Q1413 applies the battery voltage to the audio transistors, turning them on so that sound can be heard from the speaker.

In Pagers connected for Push-to-Reset, turning the radio on causes Q1402/Q1413 to conduct. This causes a short burst of tone and then noise to be heard from the speaker. Q1402/Q1413 will conduct until the Push-to-Reset button is pressed, grounding the base of Q1401/Q1412 and turning it on. Turning on Q1401/Q1412 turns off Q1402/Q1413, resetting the Squelch Switch. A simplified Push-to-Reset circuit is shown in Figure 7.

In Pagers with the automatic reset option, transistors Q1408/Q1419, Q1409/Q1420 and associated circuitry are mounted on the Decoder Board. The two transistors operate as a momentary switch for automatically resetting the Squelch Switch (Q1401 and Q1402).

The emitter of Q1408/Q1419 is connected to the collector circuit of Q1402/Q1413 and the collector of Q1409/Q1420 is connected to the base circuit of Q1401/Q1412. When the proper tones turn on Q1402/Q1413, the battery voltage is applied to the emitter circuit of Q1408/Q1419 and capacitor C1417.

In approximately 30 seconds, the charge on C1417 is sufficient to momentarily turn on Q1408/Q1419, which momentarily turns on Q1409/Q1420. When turned on, the collector of Q1409/Q1420 drops to ground, applying a momentary ground to the base of Q1401/Q1412, turning it on. Turning on Q1401/Q1412 turns off Q1402/Q1413, resetting the Squelch Switch.

Pressing the Push-To-Reset button turns Q1401/Q1412 on and Q1402/Q1413 off. The Squelch Switch will remain in this state until the radio is turned off and on again, or until the circuit is triggered by the proper sequential tones.

In Pagers connected for Push-To-Listen, turning the radio on causes Q1402/Q1413 to conduct until C1404 charges up, allowing a short burst of tone to be heard from the speaker. When C1404 charges, Q1401 turns on and Q1402 turns off. A simplified Push-to-Listen circuit is shown in Figure 8.

When the circuit is triggered, Q1401/Q1412 is turned off and Q1402/Q1413 is turned on until C1404 charges up, allowing the alerting tone to be heard. When C1404 charges Q1401/Q1412 turns on and Q1402/Q1413 turns off. Pressing the Push-To-Listen button turns on Q1402/Q1413. The transistor will remain on as long as the button is held down.

Determination of Tone Frequencies

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

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

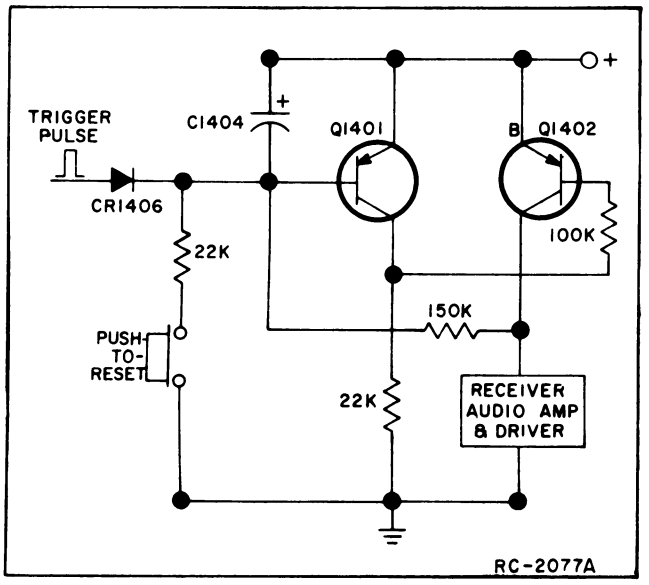


Figure 7 - Push-To-Reset Circuit

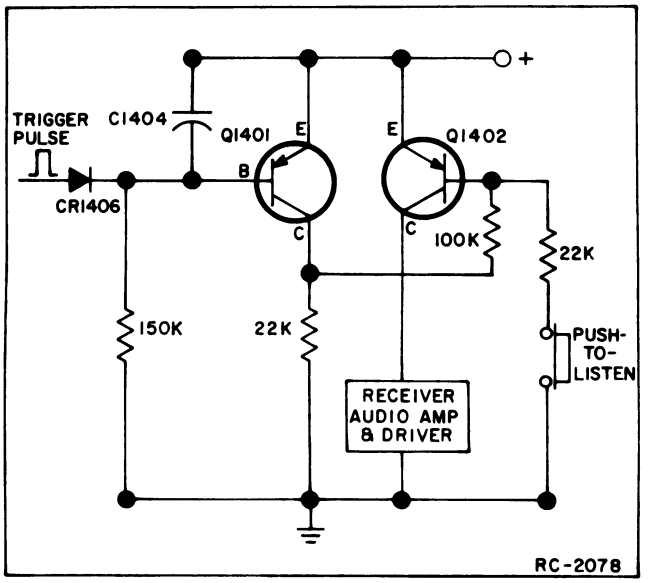


Figure 8 - Push-To-Listen Circuit

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 to 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.

Table I - Tone Groups

100's Digit	10's Digit	1's Digit
	For 1st Tone	For 2nd Tone
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

SQUELCH BOARD

Squelch Board A302 is used in voice only receivers. The Squelch Board consists of 1st Noise Amp Q654, Active Filter Q651, 2nd Noise Amp Q652 and Squelch Switch Q653.

Noise from the ratio detector operates the squelch circuit. With no carrier applied to the receiver, noise is coupled through SQUELCH control R655 to the base of 1st Noise Amp Q654. R655 determines the gain of the Noise Amplifier by varying the bias to the base of Q654.

The output of Q654 is applied to an active, high-pass filter that attenuates frequencies below 3 kHz. The filter consists of C651, C652, C653, R651, R652 and Q651.

Following the high-pass filter is 2nd Noise Amp Q652. The output of Q652 is rectified by CR651 and CR652, and filtered by R659 and C656 to produce a positive DC voltage. The positive voltage is applied to the base of PNP Squelch Switch Q653, turning it off.

The collector of Q653 is tied to the collector of Audio Amp Q304 and the base of Audio Driver Q306 on the receiver board. Turning off Q653 removes the supply voltage to the audio transistors, turning them off.

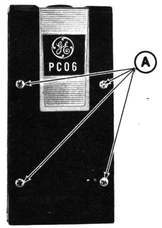
When the receiver is quieted by a carrier, the receiver noise is reduced. This removes the positive voltage on the base of Squelch Switch Q653, turning it on. Turning on Q653 applies the battery voltage to Q309 and Q306, allowing the audio stages to conduct so that sound is heard from the speaker. Capacitor C657 in the collector of Q653 slows down the switching action of the transistor to provide a more positive switching action. Resistor R662 connects from the collector of Q653 to the base of Q652, providing a hysteresis loop in the squelch circuit. When a weak signal opens the squelch, the signal level may be reduced by approximately 3 dB without the squelch closing.

DISASSEMBLY PROCEDURE

Equipment required:

- Small Phillips-head screwdriver for loosening the front cover retaining screws.
- Small metal pick or scribe for prying up the tone or squelch board.
- Sharp knife for removing the speaker.

To gain access to the receiver:

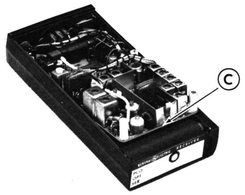


1. Turn the radio OFF.
2. Loosen the four captive screws (A) .
3. Turn the radio on its back and carefully lift up the front cover by the end nearest the battery compartment (B) . Then, carefully lift off the cover.
4. If the GE Test Fixture is not used, place a block under the front cover to prevent any wires from pulling loose.

NOTE

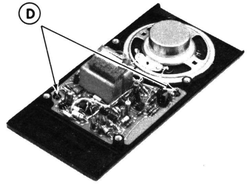
When replacing the front cover, place the edge of the front cover into the groove at the top of the case and close the cover. In Pagers with Type 99 Tone Decoder board, it may be necessary to gently push the reeds aside with a screwdriver so that the reeds will clear the receiver shielding.

To remove the receiver board:



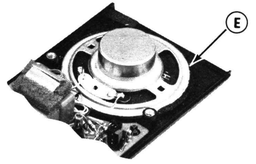
1. Remove the front cover as directed above.
2. Lift up the receiver chassis by the end nearest the battery compartment (C) and lift out the receiver.

To remove the tone or squelch board:



1. Carefully pry up one side of the board until it slips over the plastic retaining clip. (D)
2. Then pry up the other side of the board until it slips over the retaining clip.

To replace the speaker:



1. Cut around the outside edge of the speaker to separate the weatherproof seal, and pry up the speaker at (E) .
2. Unsolder the two speaker leads and lift the speaker out of its mounting hole.
3. Remove any of the old sealant remaining in the speaker mounting hole.
4. Run a bead of RTV 102 (GE Part No. 19A115153-P3) around the edge of the speaker mounting hole, and insert the new speaker with the terminals located as shown (E) .

REPLACEMENT PROCEDURE

The Personal Pager uses a special type of epoxy-coated printed circuit board. When replacing a component or module, care is required to avoid pulling the plated-through holes out of the board. Replace the components as follows:

Equipment Required:

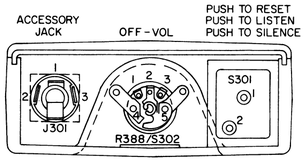
- A pencil-type, 40-to 60-watt soldering iron with the following tips:
  - A medium chisel tip for unsoldering individual component lead.
  - A large chisel tip for simultaneously unsoldering all leads of a module or component.
  - A small pencil tip for soldering in the new components.
- A round, wooden toothpick for cleaning solder out of mounting holes.

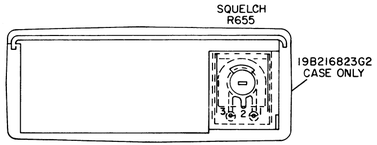
Procedure:

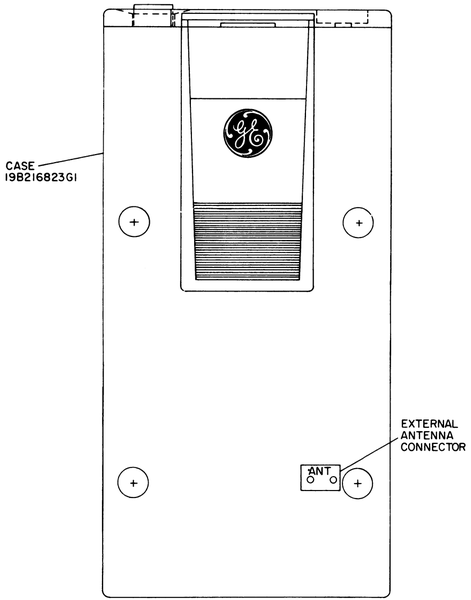
1. Clip out and remove the defective component (when possible) so that the leads can be removed individually.
2. Collect a puddle of melted solder on the flat side of the chisel tip.
3. Hold the melted solder against the bottom of the printed circuit board to melt the solder holding the component or module leads.
4. Carefully remove the lead(s), and clean out the mounting hole(s).
5. Solder in the new component on the bottom side of the board using the small pencil tip on the soldering iron.

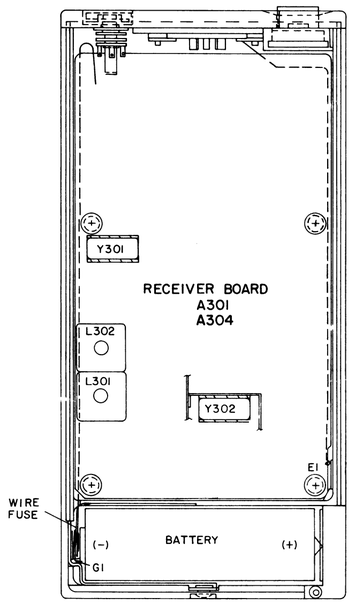
IMPORTANT! If the plated-through hole is accidentally pulled out of the printed circuit board, replace the component as follows:

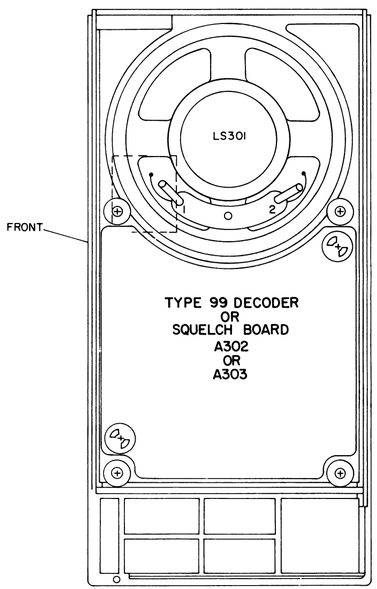
1. Carefully scrape off the epoxy coating to expose the copper run. This step must be done to both the top and bottom of the board if the hole connected two runs.
2. Coat the copper run(s) with solder (top and bottom if required).
3. Insert the component into the hole and solder the component to the coated area (top and bottom if required).











MODULE LAYOUT DIAGRAM

(19D413968, Rev. 1)

PERSONAL PAGER
TYPE ER-55-A

COMPLETE RECEIVER ALIGNMENT

EQUIPMENT REQUIRED:

1. GE Test Set Models 4EX3A10 (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 450-470 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.
4. Test Fixture Model 4EX17A10.

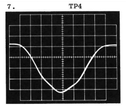
PRELIMINARY CHECKS & ADJUSTMENTS

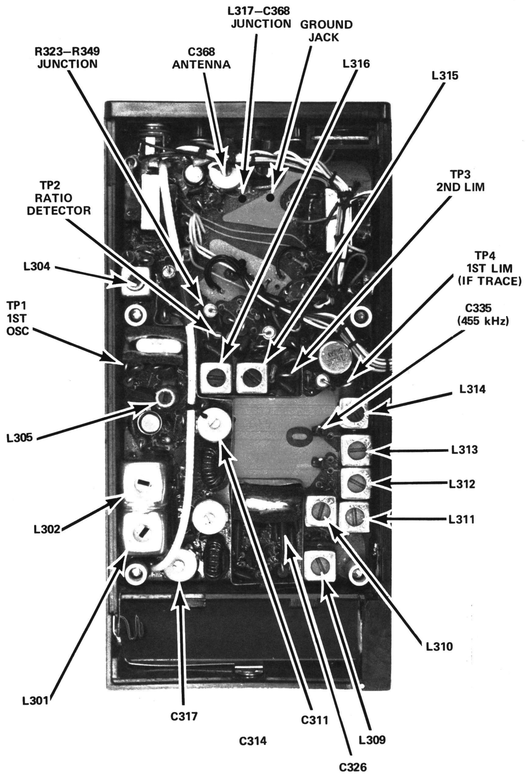
1. If Test Fixture Model 4EX17A10 or an external 3.7-volt supply is not used, install a freshly-charged nickel-cadmium battery or a new mercury of alkaline battery.
2. In voice only receivers, turn the receiver ON and set the SQUELCH control fully counterclockwise and the VOLUME control to minimum.

   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 button.

   In tone only receivers, connect a jumper between H21 (near C336) and H33 (near Q310). Connect another jumper between H8 (near R339) and the 3.7-volt supply. This will allow normal receiver noise to be heard in the speaker. Refer to the receiver Outline Diagram for hole locations.
3. If C311, C314 or C317 have been de-tuned, set the capacitors to mid-capacity. Otherwise, do not pre-set these capacitors.
4. Disconnect the lead of C370 from E2 (see Figure 9). The recommended signal generator setup is shown in Figure 10.

ALIGNMENT PROCEDURE

STEP	METERING POINT	TUNING CONTROL	PROCEDURE
		RATIO DETECTOR	
1.	TP3 & TP2	L316	Loosely couple the 455 kHz signal to C335 and adjust the generator output for maximum meter reading at TP3. Then adjust L316 for zero meter reading at TP2.
2.	Junction of R323 & R349	L315	Set the generator output for a level below limiting at the junction of R323 and R349 (approximately 1.3 VDC). Then adjust L315 for maximum meter reading.
3.	TP3 & TP2	L316	Set the generator output for maximum meter reading at TP3. Then adjust L316 for zero meter reading at TP2.
4.	Junction of R323 & R349, and TP2	L315 and L316	Repeat STEPS 2 and 3 until the maximum output at the junction of R323 and R349 coincides with a zero reading at TP2.
		1ST OSCILLATOR	
5.	TP1	L304 & L305	Adjust L304 for maximum meter reading. Then adjust L305 for a very small dip at TP1.
		HI & LO IF FILTER	
			The IF circuits have been aligned at the factory and will normally require no further adjustment. Should adjustment become necessary, use the procedure outlined in Steps 6 and 7.
6.		See Procedure	Connect the scope, signal generator and detector as shown in Figures 11 and 12. 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 insulated body of C326 and adjust RF level of signal generator to 20 dB quieting level.
7.	TP4  Horizontal: 1 ms/cm Vertical: .01 Volt/cm	L314, L313, L312, L311, L310, L309, C317, C314 and C311	With the signal applied, adjust L314, L313, L312, L311, L310, and L309 for minimum ripple. This should be near maximum amplitude. Then adjust C317, C314 and C311 for maximum amplitude on scope as shown on the scope waveform, keeping signal below saturation.
		FRONT END	
8.		C368, L301, L302 and L305	Apply an on-frequency signal as above and tune C368, L301, L302 and L305 for maximum quieting.
		1ST OSCILLATOR	
9.		L304	Apply an on-frequency signal as above. Loosely couple 455 kHz to the receiver and adjust L304 for zero beat at the speaker.
		RATIO DETECTOR	
10.		L315	With no RF signal applied to the radio, adjust L315 for maximum noise at the output of the receiver. Do not readjust L316 for zero after adjusting L315.
		ANTENNA CIRCUIT	
11.		C368	Re-connect C370 to E2 (see Figure 9). Then apply a radiated, on-frequency signal to the receiver antenna and adjust C368 for best quieting (maximum reading).



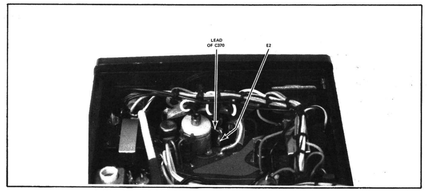


Figure 9 - Signal Generator Connections

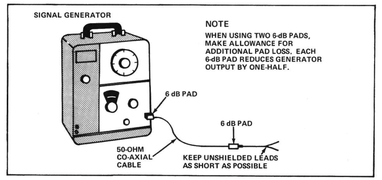


Figure 10 - Signal Generator Setup

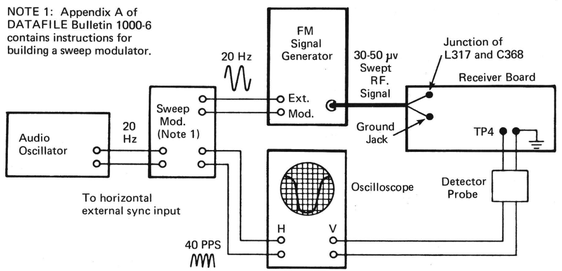


Figure 11 - Test Setup for 20-Hz Double-Trace Sweep Alignment

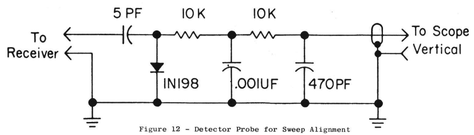


Figure 12 - Detector Probe for Sweep Alignment

FRONT END ALIGNMENT

EQUIPMENT REQUIRED

1. A 450-470 MHz signal source (M800 Signal generator or equivalent).
2. GE Test Set Models 4EX3A10, 4EX8K11, or a 20,000 ohm-per-volt meter. Test Fixture Model 4EX17A10 is also recommended.

PRELIMINARY CHECKS & ADJUSTMENTS

1. If Test Fixture Model 4EX17A10 or an external 3.7-volt supply is not used, install a freshly-charged nickel-cadmium battery or a new mercury or alkaline battery.
2. In voice only receivers, turn the receiver ON, and set the SQUELCH control fully counterclockwise and the VOLUME control to minimum.

   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 button.

   In tone only receivers, connect a jumper between H21 (near C336) and H33 (near Q310). Connect another jumper between H8 (near R339 and the 3.7-volt supply. This will allow normal receiver noise to be heard in the speaker. Refer to the receiver Outline Diagram for hole locations.
3. If Test Fixture Model 4EX17A10 is used, connect the signal generator to the Test Fixture antenna connector. If the Test Fixture is not used, connect the signal generator high to the junction of L317-C368 and the printed board, and the ground jacks. The recommended signal generator set-up is shown in Figure 10.

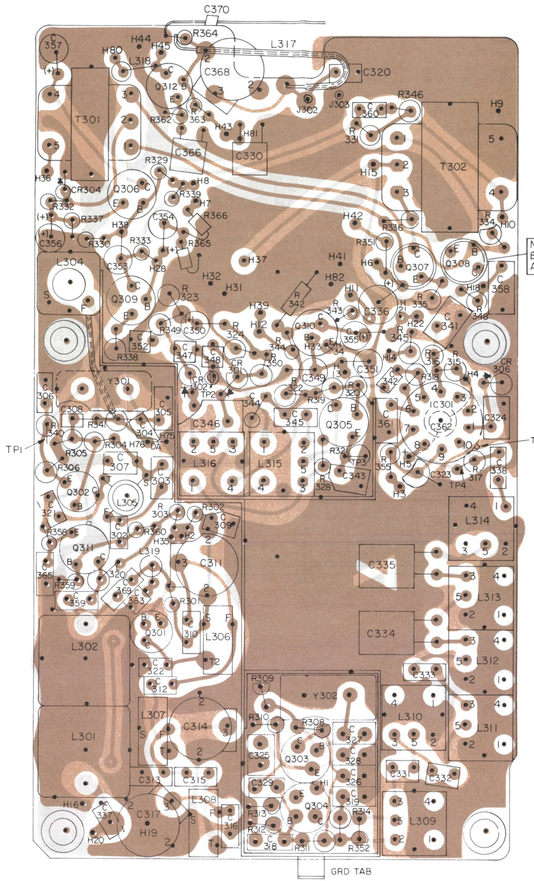
ALIGNMENT PROCEDURE

STEP	METERING POINT	TUNING CONTROL	PROCEDURE
		FRONT END	
1		C368, L301, L302 and L305	Apply an on-frequency signal as above and tune C368, L301, L302 and L305 for maximum quieting.
		1ST OSCILLATOR	
2		L304	Apply an on-frequency signal as above. Loosely couple 455 kHz to the receiver and adjust L304 for zero beat at the speaker.
		ANTENNA CIRCUIT	
3	TP3 or TP4	C368	Apply a radiated, on-frequency signal to the receiver antenna and adjust C368 for best quieting.

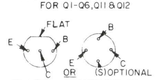
ALIGNMENT PROCEDURE

450-470 MHZ
PERSONAL PAGER
TYPE ER-55-A

COMPONENT SIDE



LEAD IDENTIFICATION FOR Q1-Q6, Q11 & Q12

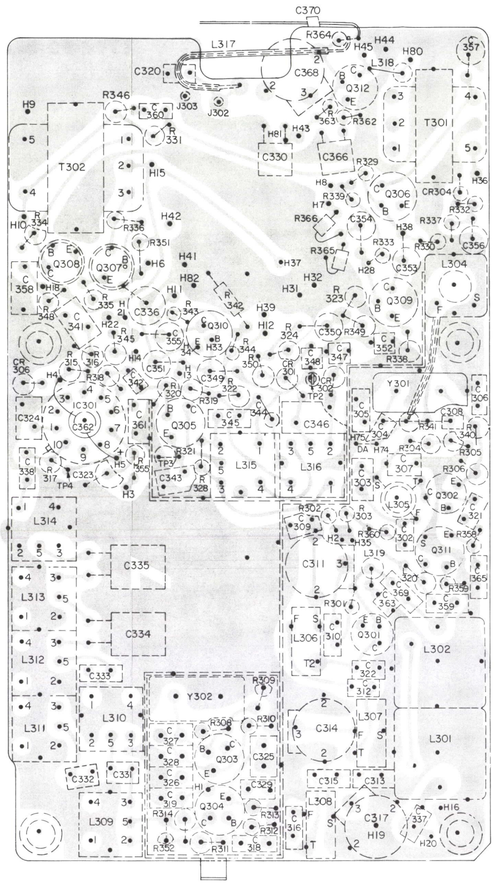


NOTE: LEAD ARRANGEMENT, AND NOT CASE SHAPE, IS DETERMINING FACTOR FOR LEAD IDENTIFICATION

LEAD IDENTIFICATION FOR Q310

(19D416078, Rev. 7)
(19D413353, Sh. 1, Rev. 7)
(19D413353, Sh. 2, Rev. 7)

SOLDER SIDE



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

OUTLINE DIAGRAM

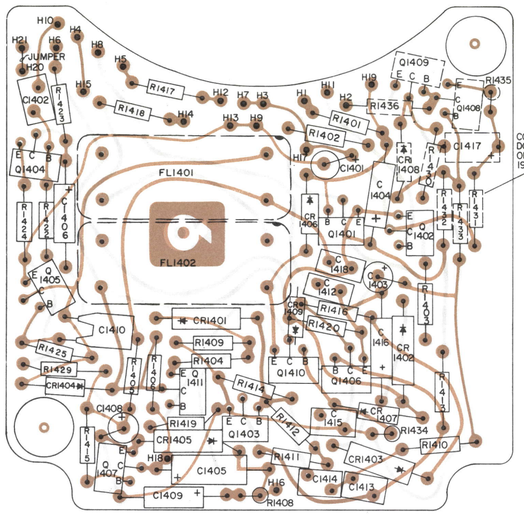
RECEIVER BOARD
TYPE ER-55-A

(DF-1099)

TYPE 99 DECODER BOARD 19C317029G1

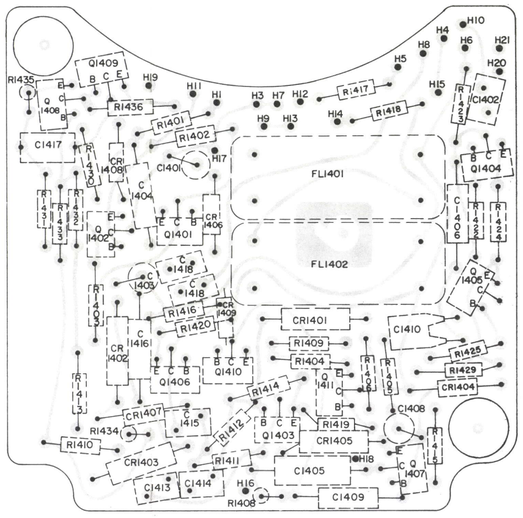
(19C317813, Rev. 2)
(19C317174, Sh. 1, Rev. 6)
(19C317174, Sh. 2, Rev. 6)

COMPONENT SIDE

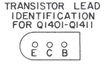


(19C317813, Rev. 2)
(19C317174, Sh. 2, Rev. 6)

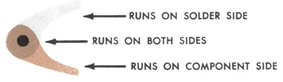
SOLDER SIDE



TRANSISTOR LEAD IDENTIFICATION FOR Q1401-Q1411



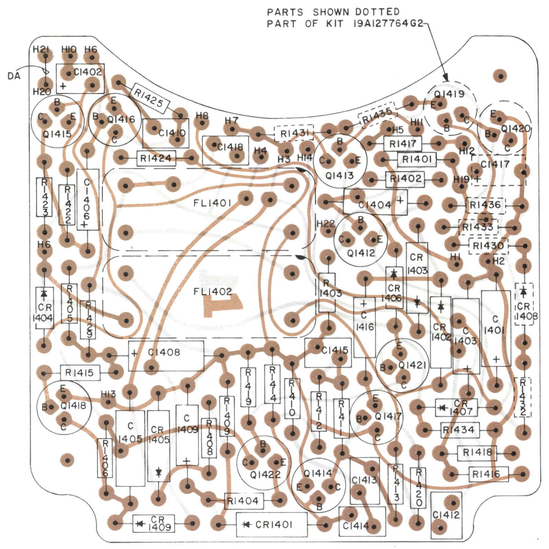
NOTE:
INSTALL REEDS WITH COLOR DOTS AS SHOWN.



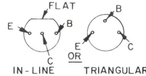
TYPE 99 DECODER BOARD 19C317029G2

(19C320385, Rev. 2)
(19C320384, Sh. 1, Rev. 1)
(19C320384, Sh. 2, Rev. 1)

COMPONENT SIDE



LEAD IDENTIFICATION FOR Q1412-Q1418, Q1421 & Q1422



LEAD IDENTIFICATION FOR Q1419 & Q1420

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

(19C320385, Rev. 2)
(19C320384, Sh. 2, Rev. 1)

SOLDER SIDE

NOTE:
INSTALL REEDS WITH COLOR DOTS AS SHOWN.

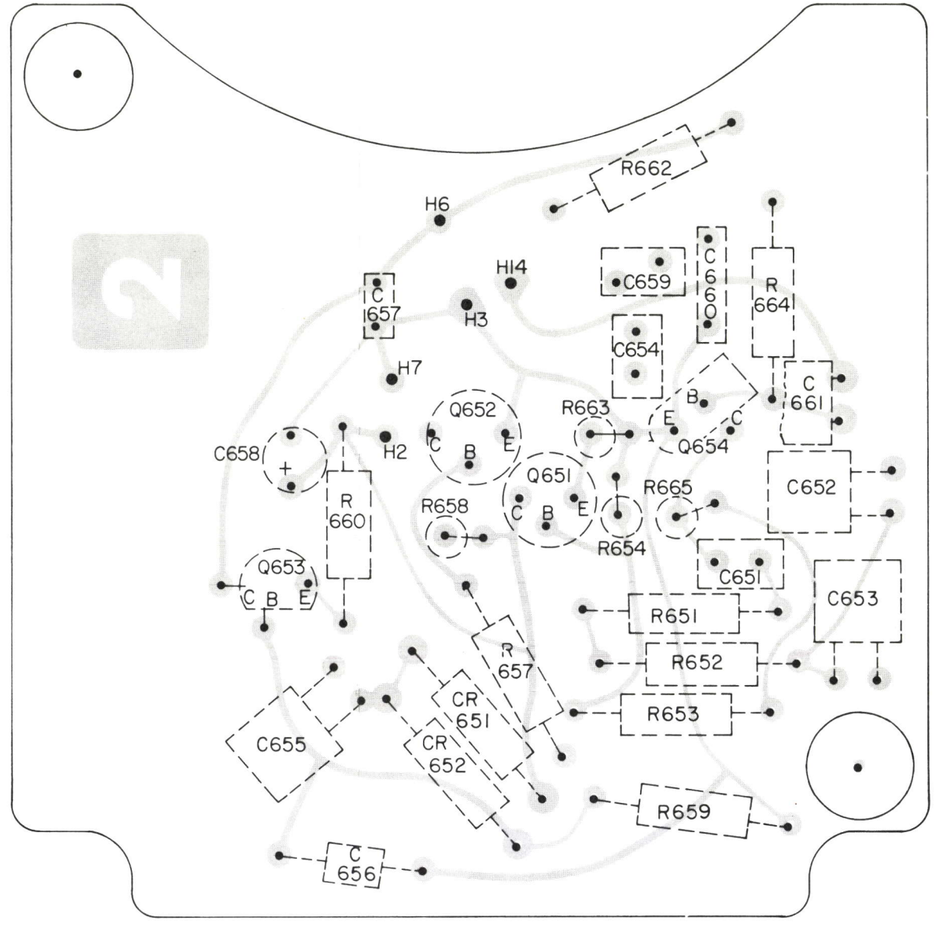
OUTLINE DIAGRAM

TYPE 99 DECODER
BOARD A303

(19C317815, Rev. 1)
(19C317173, Sh. 1, Rev. 2)
(19C317173, Sh. 2, Rev. 2)

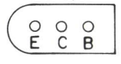
COMPONENT SIDE

SOLDER SIDE



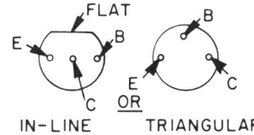
RUNS ON SOLDER SIDE
RUNS ON BOTH SIDES
RUNS ON COMPONENT SIDE

TRANSISTOR LEAD IDENTIFICATION FOR Q654



NOTE LEAD ARRANGEMENT BEFORE REPLACING Q654

LEAD IDENTIFICATION FOR Q651–Q654

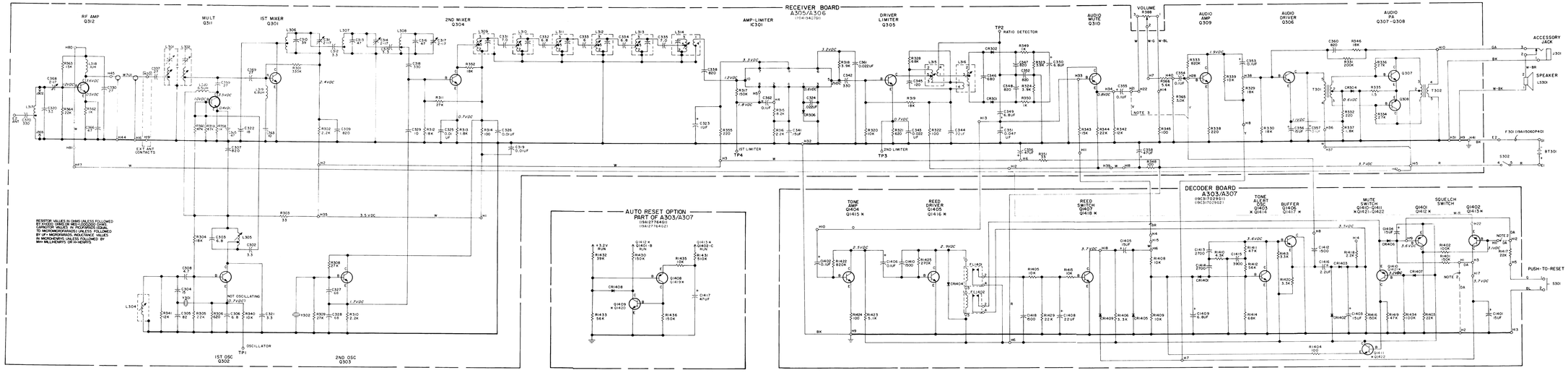


IN-LINE TRIANGULAR
VIEW FROM LEAD END

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

OUTLINE DIAGRAM

NOISE SQUELCH
BOARD A302



SCHEMATIC DIAGRAM

VOICE AND TONE RECEIVER
TYPE ER-55-A

PARTS LIST

LBI-4224B

450-470 MHz PERSONAL PAGER
TYPE ER-55-A

SYMBOL	GE PART NO.	DESCRIPTION
A305 and A306		**RECEIVER BOARD** A305 19D413407G2 TONE AND VOICE A306 19D413407G2 TONE
		- - - - - - - - - - **CAPACITORS** - - - - - - - - - -
C301*	19A116192P27	Ceramic: 330 pf ±20%, 50 VDCW; sim to Erie 8101-050-X5R-681K. Deleted by REV C.
C302	19A116221P8	Ceramic: 3.3 pf ±5%, 75 VDCW; temp coef 0 ±30 PPM.
C303	19A116221P9	Ceramic: 6.8 pf ±5%, 75 VDCW; temp coef -150 ±60 PPM.
C304	19A116114P3036	Ceramic: 15 pf ±5%, 100 VDCW; temp coef -150 PPM.
C305	19A116288P11	Ceramic: 82 pf ±5%, 100 VDCW; sim to Erie 8121-100-COG-820J.
C306	19A116221P9	Ceramic: 6.8 pf ±5%, 75 VDCW; temp coef -150 ±60 PPM.
C307	19A116192P9	Ceramic: 820 pf ±20%, 50 VDCW; sim to Erie 8111-050-X5R-821K.
C308	19A116114P16	Ceramic: 4.7 pf ±5%, 100 VDCW; temp coef 0 PPM.
C309	19A116192P9	Ceramic: 820 pf ±20%, 50 VDCW; sim to Erie 8111-050-X5R-821K.
C310	19A116221P7	Ceramic: 39 pf ±5%, 75 VDCW; temp coef -150 ±60 PPM.
C311	19A116867P4	Variable: approx 4.5 to 20 pf, 160 VDCW; sim to 7-5-781E0-02.
C312	19A116221P8	Ceramic: 3.3 pf ±5%, 75 VDCW; temp coef 0 ±30 PPM.
C313	19A116221P10	Ceramic: 47 pf ±5%, 75 VDCW; temp coef -150 ±60 PPM.
C314	19A116867P4	Variable: approx 4.5 to 20 pf, 160 VDCW; sim to 7-5-781E0-02.
C315	19A116221P8	Ceramic: 3.3 pf ±5%, 75 VDCW; temp coef 0 ±30 PPM.
C316	19A116221P10	Ceramic: 47 pf ±5%, 75 VDCW; temp coef -150 ±60 PPM.
C317	19A116867P4	Variable: approx 4.5 to 20 pf, 160 VDCW; sim to 7-5-781E0-02.
C318*	19A116192P27	Ceramic: 330 pf ±20%, 50 VDCW; sim to Erie 8101-050-X5R.
	5495323P13	In REV B and earlier: Ceramic: .002 µf +100% -20%, 75 VDCW.
C319*	19A116192P21	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121-050-X5R.
	5495323P15	In REV G and earlier: Ceramic: .01 µf +100% -20%, 75 VDCW.
C320*	19A116221P8	Ceramic: 3.3 pf ±5%, 75 VDCW; temp coef 0 ±30 PPM. Added by REV C.
C321	19A116221P8	Ceramic: 3.3 pf ±5%, 75 VDCW; temp coef 0 ±30 PPM.
C322	19A116221P4	Ceramic: 18 pf ±5%, 75 VDCW; temp coef 0 ±30 PPM.
C323	5496267P17	Tantalum: 1.0 µF ±20%, 35 VDCW; sim to Sprague Type 150D.
C324	19A116264P2	Ceramic: 0.022 µf ±20%, 50 VDCW.
C325* and C326*	19A116192P21	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121-050-X5R. In REV G and earlier: Ceramic: .01 µf +100% -20%, 75 VDCW.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	GE PART NO.	DESCRIPTION
C327* and C328*	19A116114P4059	Ceramic: 68 pf ±5%, 100 VDCW; temp coef -220 PPM. In REV B and earlier: Ceramic: 56 pf ±5%, 100 VDCW; sim to Erie 8131-100-P2G-560J.
C329	19A116114P1031	Ceramic: 10 pf ±10%, 100 VDCW; temp coef -3300 PPM.
C330*	19A116114P2043	Ceramic: 27 pf ±10%, 100 VDCW; temp coef -80 PPM. Added by REV C.
C331	19A116114P24	Ceramic: 7 pf ±5%, 100 VDCW; temp coef 0 PPM.
C332	19A116114P22	Ceramic: 6.8 pf ±5%, 100 VDCW; temp coef 0 PPM.
C333	19A116114P20	Ceramic: 6 pf ±5%, 100 VDCW; temp coef 0 PPM.
C334	19A116114P22	Ceramic: 6.8 pf ±5%, 100 VDCW; temp coef 0 PPM.
C335	19A116114P24	Ceramic: 7 pf ±5%, 100 VDCW; temp coef 0 PPM.
C336	5491674P42	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C337*	19A116114P2043	Ceramic: 27 pf ±10%, 100 VDCW; temp coef -80 PPM. Added by REV C.
C338	19A116192P9	Ceramic: 820 pf ±20%, 50 VDCW; sim to Erie 8111-050-X5R.
C339*	19A116114P20	Ceramic: 6 pf ±5%, 100 VDCW; temp coef 0 PPM. Added by REV C. Deleted by REV E.
C340*	19A116114P14	Ceramic: 4 pf ±5%, 100 VDCW; temp coef 0 PPM. Added by REV C. Deleted by REV E.
C341	19A116264P4	Ceramic: 0.15 µf ±20%, 50 VDCW.
C342	19A116192P7	Ceramic: 330 pf ±20%, 50 VDCW; sim to Erie 8101-050-X5R.
		- - - - - - - - - - **INDUCTORS** - - - - - - - - - -
C343	19A116264P2	Ceramic: 0.022 µf ±20%, 50 VDCW.
C344*	5491674P35	Tantalum: 22 µf 20, 4 VDCW; sim to Sprague Type 162D.
		In REV C and earlier:
	19A116264P2	Ceramic: 0.022 µf ±20%, 50 VDCW.
C345	19A116288P9	Ceramic: 120 pf ±5%, 100 VDCW; sim to Erie 8121-100-U2J.
C346	19A116288P10	Ceramic: 680 pf ±5%, 100 VDCW; sim to Erie 8131-050-S2B.
C347 and C348	19A116192P9	Ceramic: 820 pf ±20%, 50 VDCW; sim to Erie 8111-050-X5R.
C349 and C350	5496267P1	Tantalum: 6.8 µF ±20%, 6 VDCW; sim to Sprague Type 150D.
C351	5496267P23	Tantalum: 0.047 µF ±20%, 35 VDCW; sim to Sprague Type 150D.
C352	19A116192P9	Ceramic: 820 pf ±20%, 50 VDCW; sim to Erie 8111-050-X5R.
C353 thru C355	5496267P24	Tantalum: 0.1 µF ±20%, 35 VDCW; sim to Sprague Type 150D.
C356	5491674P34	Tantalum: 15 µF ±20%, 6 VDCW; sim to Sprague Type 162D.
C357*	5496267P24	Tantalum: 0.1 µF ±20%, 35 VDCW; sim to Sprague Type 150D.
		In REV B and earlier:
	5496267P23	Tantalum: 0.047 µF ±20%, 35 VDCW; sim to Sprague Type 150D.
C358	19C307103P5	Tantalum: 47 µf ±20%, 6 VDCW; sim to Components Inc 3475R.
C359*	19A116114P2043	Ceramic: 27 pf ±10%, 100 VDCW; temp coef -80 PPM. Added by REV E.
C360	19A116192P9	Ceramic: 820 pf ±20%, 50 VDCW; sim to Erie 8111-050-X5R.
C361	19A116264P2	Ceramic: 0.022 µf ±20%, 50 VDCW.
C362	19C307102P16	Tantalum: 0.1 µf +40 -20%, 20 VDCW; sim to Sprague Type 150SP1.
C363*	19A116114P1031	Ceramic: 10 pf ±10%, 100 VDCW; temp coef -30 PPM. Added by REV C.
C365	19A116221P10	Ceramic: 47 pf ±5%, 75 VDCW; temp coef -150 ±60 PPM.

SYMBOL	GE PART NO.	DESCRIPTION
C366*	19A116221P10	Ceramic: 47 pf ±5%, 75 VDCW; temp coef -150 ±60 PPM. In REV D and earlier: Ceramic: 27 pf ±10%, 100 VDCW; temp coef -80 PPM.
C368	19A116163P3	Variable: approx 3 to 17 pf, 50 VDCW; sim to Amperex HT10EA/21B.
C369*	19A116114P2043	Ceramic: 27 pf ±10%, 100 VDCW; temp coef -80 PPM. Added by REV C.
	19A116221P10	In KEY C and D. Ceramic: 47 pf ±5%, 75 VDCW; temp coef -150 ±60 PPM.
C370	19A116192P7	In KEY B and earlier: Ceramic: 330 pf ±20%, 50 VDCW; sim to Erie 8101-050-X5R.
		- - - - - - - - **DIODES AND RECTIFIERS** - - - - - - - -
CR301 and CR302	4033292P1	Germanium: sim to Hughes 1N198.
CR304	19A115250P1	Silicon.
CR306	19A115250P1	Silicon.
		- - - - - - - - **INTEGRATED CIRCUITS** - - - - - - - -
IC301	19A116208P1	Monolithic, linear.
		- - - - - - - - - - **INDUCTORS** - - - - - - - - - -
L301 and L302	19B216826G2	Coil, Quantity (2).
L304	19B219288G1	Coil. Includes tuning slug 19B209436P1.
L305	19B216591G2	Coil. Includes powdered iron tuning slug 19B209436P1. NOTE: L305 may require brass tuning slug 19B209436P2 for alignment Kit 19A127807G1 for 165-174 MHz operation.
L306	19B216761G1	Coil.
L307 and L308	19B216761G2	Coil.
L309 thru L313	19A116309P1	IF Transformer.
L314	19A116309P2	IF Transformer.
L315	19A116308P1	IF Transformer.
L316	19A116308P2	IF Transformer.
L317	19A127880G1	Coil.
L318*	19B209420P1	Coil, RF: 0.10 µh ±5%, 0.08 ohms DC res max; sim to Jeffers 4416-1. Added by REV C.
L319*	19B209420P123	Coil, RF: 0.80 µh ±10%, 1.80 ohms DC res max; sim to Jeffers 4446-2. Added by REV C.
L320*	19B209420P123	Coil, RF: 0.80 µh ±10%, 180 ohms DC res max; sim to Jeffers 4446-2. Added by REV E.
		- - - - - - - - - - **TRANSISTORS** - - - - - - - - - -
Q301	19A116159P1	Silicon, NPN.
Q302	19A115991P1	Silicon, NPN.
Q303 and Q304	19A115245P1	Silicon, NPN.
Q305	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q306	19A115362P1	Silicon, NPN; sim to Type 2N2925.
Q307 and Q308	19A115552P1	Silicon, NPN; sim to Type 2N2714.
Q309	19A115362P1	Silicon, NPN; sim to Type 2N2925.

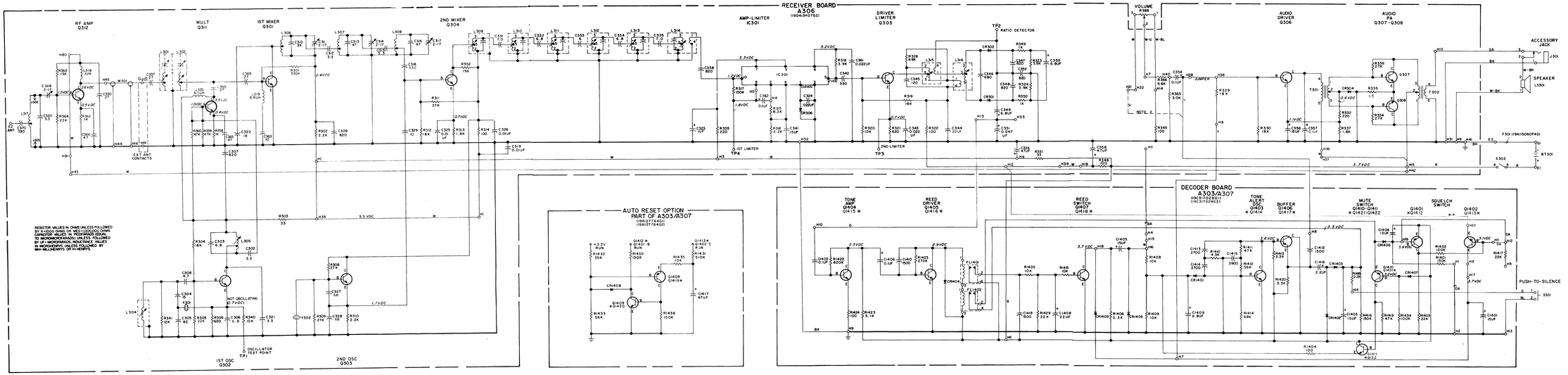
SYMBOL	GE PART NO.	DESCRIPTION
Q310*	19A129187P1	Silicon, PNP. In REV G and earlier: Silicon, PNP; sim to Type 2N4290.
Q311*	19A116145D1 19A115991P1	Silicon, NPN. In REV D and earlier: Germanium, PNP.
Q312*	19A116159P1	Silicon, NPN. In REV C, D, E and F: Silicon, NPN.
	19A116351P1	In REV B and earlier: Germanium, PNP.
		- - - - - - - - - - **RESISTORS** - - - - - - - - - -
R301	3R151P334K	Composition: 0.33 megohm ±5%, 1/8 w.
R302	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R303	3R152P330K	Composition: 33 ohms ±10%, 1/4 w.
R304	3R152P183J	Composition: 18,000 ohms ±5%, 1/4 w.
R305*	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w. In REV E and earlier:
	3R152P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R306	3R152P621J	Composition: 620 ohms ±5%, 1/4 w.
R308	3R151P273K	Composition: 27,000 ohms ±10%, 1/8 w.
R309	3R151P273J	Composition: 27,000 ohms ±5%, 1/8 w.
R310	3R151P222J	Composition: 2200 ohms ±5%, 1/8 w.
R311*	3R151P273K	Composition: 27,000 ±10%, 1/8 w. In REV G and earlier:
	3R152P273K	Composition: 27,000 ±10%, 1/4 w.
R312	3R151P183J	Composition: 18,000 ohms ±5%, 1/8 w.
R313	3R151P182J	Composition: 1800 ohms ±5%, 1/8 w.
R314*	3R151P101K	Composition: 100 ohms ±10%, 1/8 w. In REV G and earlier:
	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R315	3R152P822K	Composition: 8200 ohms ±10%, 1/4 w.
R316	3R152P222K	Composition: 2200 ohms ±10%, 1/4 w.
R317	3R152P154K	Composition: 0.15 megohm ±10%, 1/4 w.
R318	3R152P392K	Composition: 3900 ohms ±10%, 1/4 w.
R319	3R152P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R320	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R321	3R152P621J	Composition: 620 ohms ±5%, 1/4 w.
R322	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R323 and R324	3R152P392J	Composition: 3900 ohms ±5%, 1/4 w.
R328	3R151P683K	Composition: 68,000 ohms ±5%, 1/8 w.
R329 and R330	3R152P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R331	3R152P204J	Composition: 0.20 megohm ±5%, 1/4 w.
R332	3R151P221J	Composition: 220 ohms ±5%, 1/8 w.
R333	3R151P824K	Composition: 0.82 megohm ±10%, 1/8 w.
R334	3R152P273J	Composition: 27,000 ohms ±5%, 1/4 w.
R335	3HA116216P185X	Deposited carbon: 1.5 ohms ±10%, 1/4 w.
R336	3R151P273J	Composition: 27,000 ohms ±5%, 1/8 w.
R337	3R152P182K	Composition: 1800 ohms ±10%, 1/4 w.
R338	3R152P221K	Composition: 220 ohms ±10%, 1/4 w.
R339 and R340	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R341	3R151P123K	Composition: 12,000 ohms ±10%, 1/8 w.
R342	3R151P123J	Composition: 12,000 ohms ±5%, 1/8 w.
R343	3R151P153J	Composition: 15,000 ohms ±5%, 1/8 w.
R344	3R151P223J	Composition: 22,000 ohms ±5%, 1/8 w.
R345	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R346	3R152P183K	Composition: 18,000 ohms ±10%, 1/4 w.
R348	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R349 and R350	3R152P102J	Composition: 1000 ohms ±5%, 1/4 w.
R351	3R151P330K	Composition: 33 ohms ±10%, 1/8 w.
R352	3R151P183J	Composition: 18,000 ohms ±5%, 1/8 w.
R355	3R152P221K	Composition: 220 ohms ±10%, 1/4 w.
R358	3R151P102J	Composition: 1000 ohms ±5%, 1/8 w.
R359*	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w. In REV E:
	3R151P473J	Composition: 4700 ohms ±5%, 1/8 w. In REV D and earlier:
	3R152P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R360*	3R152P473J	Composition: 47,000 ohms ±5%, 1/4 w. In REV E and earlier:
	3R152P103J	Composition: 10,000 ohms ±5%, 1/4 w.
R362*	3R151P102J	Composition: 1000 ohms ±5%, 1/8 w. In REV D, E, and F:
	3R151P331J	Composition: 330 ohms ±5%, 1/8 w. In REV C:
	3R151P101J	Composition: 100 ohms ±5%, 1/8 w. In REV B and earlier:
	3R152P681J	Composition: 680 ohms ±5%, 1/4 w.
R363*	3R151P153J	Composition: 15,000 ohms ±5%, 1/8 w. In REV E and F:
	3R151P473J	Composition: 47,000 ohms ±5%, 1/8 w. In REV D:
	3R151P472J	Composition: 4700 ohms ±5%, 1/8 w. In REV C:
	3R151P912J	Composition: 9100 ohms ±5%, 1/8 w. In REV B and earlier:
	3R152P752J	Composition: 7500 ohms ±5%, 1/4 w.
R364*	3R152P223J	Composition: 22,000 ohms ±5%, 1/4 w. In REV E and F:
	3R152P243J	Composition: 24,000 ohms ±5%, 1/4 w. In REV E and D:
	3R152P242J	Composition: 2400 ohms ±5%, 1/4 w. In REV B and earlier:
	3R152P123J	Composition: 12,000 ohms ±5%, 1/4 w.
R365*	3R151P302J	Composition: 3000 ohms ±5%, 1/8 w. Added by REV A.
R366*	3R151P562J	Composition: 5600 ohms ±5%, 1/8 w. Added by REV A.
		- - - - - - - - **TRANSFORMERS** - - - - - - - -
T301	19A116213P1	Audio freq: 400-3000 Hz, Pri: 600 ohms DC res, Sec: 120 ohms DC res.
T302*	19A116709P1	Audio freq: 400-3000 Hz, Pri: 9 ohms DC res, Sec: 0.67 ohms DC res.
	19A116212P1	In REV D and earlier: Audio freq: 400-3000 Hz, Pri: 9 ohms DC res, Sec: 0.67 ohms DC res.

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - **TEST POINTS** - - - - - - - - -
TP2	9503P3008C13	Includes: Cotter pin.
	4038593P22	Sleeving, 1 inch.
		- - - - - - - - - - **CABLES** - - - - - - - - - -
W301	19A127715G2	Cable: approx 5 inches long.
		- - - - - - - - - - **CRYSTALS** - - - - - - - - - -
		NOTE: When reordering give GE Part Number and specify exact frequency needed. Crystal Freq = (Operating Freq -10.2) ÷ 9.
Y301	19B206890P4	Quartz: frequency range 42-55 MHz, temp range -30°C to +85°C.
Y302	19B206357P21	Quartz: 18.345 MHz, temp range -30°C to +85°C.
A302		**SQUELCH BOARD** 19C337178G1
		- - - - - - - - - - **CAPACITORS** - - - - - - - - - -
C651 thru C653	19A116192P10	Ceramic: 1500 pf ±20%, 50 VDCW; sim to Erie 8121-050-X5R.
C654 and C655	19A116192P4	Ceramic: 2700 pf ±20%, 50 VDCW; sim to Erie 8121-050-X5R.
C656	5491674P24	Tantalum: 0.47 uf -30-20%, 10 VDCW; sim to Sprague Type 162D.
C657	19C307102P12	Tantalum: 2.2 µf 20%, 10 VDCW; sim to Components Inc T2232.
C658	19C307102P15	Tantalum: 22 µf ±20%, 6 VDCW; sim to Components Inc T2283.
C659	19A116193P5	Ceramic: 3900 pf ±20%, 50 VDCW; sim to Erie 8121-050-X5R.
C660	5495323P14	Ceramic: .005 µf +100% -20%, 75 VDCW.
C661	19A116192P9	Ceramic: 820 pf ±20%, 50 VDCW; sim to Erie 8111-050-X5R.
		- - - - - - - **DIODES AND RECTIFIERS** - - - - - - -
CR651 and CR652	19A115250P1	Silicon.
		- - - - - - - - - **TRANSISTORS** - - - - - - - - -
Q651* and Q652*	19A116774P1	Silicon, NPN; sim to Type 2N5210. Earlier than REV A:
	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q653	19A115768P1	Silicon, PNP; sim to Type 2N3702.
Q654	19A116114P1	Silicon, NPN; sim to Type 2N4286.
		- - - - - - - - - **RESISTORS** - - - - - - - - -
R651 and R652	3R152P153J	Composition: 15,000 ohms ±5%, 1/4 w.
R653	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R654	3R152P823K	Composition: 82,000 ohms ±10%, 1/4 w.
R657	3R152P154J	Composition: 0.15 megohm ±5%, 1/4 w.
R658	3R152P512K	Composition: 5100 ohms ±10%, 1/4 w.
R659	3R152P104K	Composition: 0.10 megohm ±10%, 1/4 w.
R660	3R152P101K	Composition: 100 ohms ±10%, 1/4 w.
R662	3R152P684J	Composition: 0.68 megohm ±5%, 1/4 w.
R663	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.
R664	3R152P824K	Composition: 0.82 megohm ±10%, 1/4 w.
R665	3R152P103K	Composition: 10,000 ohms ±10%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
A303		**TYPE 99 DECODER** 19C317029G1, G2 Includes:
	9503P3008C13	Cotter pin.
	4038593P22	Sleeving, 1 inch.
C1401	5491674P34	Tantalum: 15 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C1402	19A116264P5	Ceramic: 0.1 µf ±20%, 50 VDCW.
C1403	5491674P34	Tantalum: 15 µF ±20%, 6 VDCW; sim to Sprague Type 162D.
C1404	5491674P10	Tantalum: 15 µf ±20%, 6 VDCW; sim to Sprague Type 162D.
C1405	5491674P24	Tantalum: 15 µF ±20%, 6 VDCW; sim to Sprague Type 162D.
C1406	5491674P43	Tantalum: 0.1 µf ±20%, 35 VDCW; sim to Sprague Type 162D.
C1408	5491674P35	Tantalum: 22 µf ±20%, 4 VDCW; sim to Sprague Type 162D.
C1409	5491674P33	Tantalum: 6.8 µf ±20%, 4 VDCW; sim to Sprague Type 162D.
C1410	19A116192P10	Ceramic: 1500 pf ±20%, 50 VDCW; sim to Erie 8121-050-X5R.
C1412	19A116192P10	Ceramic: 1500 pf ±20%, 50 VDCW; sim to Erie 8121-050-X5R.
C1413 and C1414	19A116192P4	Ceramic: 2700 pf ±20%, 50 VDCW; sim to Erie 8121-050-X5R.
C1415	19A116193P5	Ceramic: 3900 pf ±20%, 50 VDCW; sim to Erie 8121-050-X5R.
C1416	5491674P44	Tantalum: 2.2 µf ±20%, 15 VDCW; sim to Sprague Type 162D.
C1418	19A116192P10	Ceramic: 1500 pf ±20%, 50 VDCW; sim to Erie 8121-050-152K.
		- - - - - - **DIODES AND RECTIFIERS** - - - - - -
CR1401 thru CR1403	4038056P1	Germanium.
CR1404	19A115250P1	Silicon.
CR1405	4038056P1	Germanium.
CR1406 and CR1407	19A115250P1	Silicon.
CR1409	19A115250P1	Silicon.
		- - - - - - - - - - **FILTERS** - - - - - - - - - -
FL1401 and FL1402	19C300580	Band. (Check group numbers for desired frequency).
	G1	317.5 Hz
	G2	349.2 Hz
	G3	387.9 Hz
	G4	426.7 Hz
	G5	477.3 Hz
	G6	525.3 Hz
	G7	582.5 Hz
	G8	642.0 Hz
	G9	697.5 Hz
	G10	752.5 Hz
	G11	807.5 Hz
	G12	862.5 Hz
	G13	917.5 Hz
	G14	972.5 Hz
	G15	727.5 Hz
	G16	742.5 Hz
	G17	757.5 Hz
	G18	772.5 Hz
	G19	787.5 Hz
	G20	802.5 Hz
	G21	817.5 Hz
	G22	832.5 Hz
	G23	847.5 Hz
	G24	862.5 Hz
	G25	877.5 Hz
	G26	892.5 Hz
	G27	907.5 Hz
	G28	922.5 Hz
	G29	937.5 Hz
	G30	952.5 Hz
	G31	967.5 Hz

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - **TRANSISTORS** - - - - - - - - -
Q1401 and Q1402	19A116145P1	Silicon, PNP; sim to 2N4290.
Q1403 thru Q1405	19A116144P1	Silicon, NPN; sim to 2N4286.
Q1406	19A116145P1	Silicon, PNP; sim to 2N4290.
Q1407	19A116144P1	Silicon, NPN; sim to 2N4286.
Q1410	19A116145P1	Silicon, PNP; sim to 2N4290.
Q1411	19A116144P1	Silicon, NPN; sim to 2N4286.
Q1412 and Q1413	19A129187P1	Silicon, PNP.
Q1414 thru Q1416	19A129184P1	Silicon, NPN.
Q1417	19A129187P1	Silicon, PNP.
Q1418	19A129184P1	Silicon, NPN.
Q1421	19A129187P1	Silicon, PNP.
Q1422	19A129184P1	Silicon, NPN.
		- - - - - - - - - **RESISTORS** - - - - - - - - -
R1401	3R151P154J	Composition: 0.15 megohm ±5%, 1/8 w.
R1402	3R151P104J	Composition: 0.10 megohm ±5%, 1/8 w.
R1403	3R151P223J	Composition: 22,000 ohms ±5%, 1/8 w.
R1404	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R1405	3R151P103J	Composition: 10,000 ohms ±5%, 1/8 w.
R1406	3R151P333J	Composition: 3300 ohms ±5%, 1/8 w.
R1408 and R1409	3R151P103J	Composition: 10,000 ohms ±5%, 1/8 w.
R1410	3R151P433J	Composition: 4300 ohms ±5%, 1/8 w.
R1411	3R151P473J	Composition: 47,000 ohms ±5%, 1/8 w.
R1412	3R151P563J	Composition: 56,000 ohms ±5%, 1/8 w.
R1413	3R151P333J	Composition: 3300 ohms ±5%, 1/8 w.
R1414	3R151P683J	Composition: 68,000 ohms ±5%, 1/8 w.
R1415	3R151P103J	Composition: 10,000 ohms ±5%, 1/8 w.
R1416	3R151P154J	Composition: 0.15 megohm ±5%, 1/8 w.
R1417	3R151P223J	Composition: 22,000 ohms ±5%, 1/8 w.
R1418	3R151P223J	Composition: 2200 ohms ±5%, 1/8 w.
R1419	3R151P473J	Composition: 47,000 ohms ±5%, 1/8 w.
R1420	3R151P333J	Composition: 3300 ohms ±5%, 1/8 w.
R1422	3R151P824K	Composition: 0.82 megohm ±10%, 1/8 w.
R1423	3R151P513J	Composition: 5100 ohms ±5%, 1/8 w.
R1424	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R1425	3R151P274K	Composition: 0.27 megohm ±10%, 1/8 w.
R1429	3R151P223J	Composition: 22,000 ohms ±5%, 1/8 w.
R1434	3R151P104J	Composition: 0.10 megohm ±5%, 1/8 w.
		- - - - - - - - - **BATTERIES** - - - - - - - - -
BT301	19A116252P1	Nickel-Cadmium: Rechargeable, 3.75 v, 150 MAH; sim to GE 41B902CD1G.
		AUTOMATIC RESET MODIFICATION 19A127704G1
		- - - - - - - - - - **CAPACITORS** - - - - - - - - - -
C1417	19C307102P18	Tantalum: 47 µf ±10%, 6 VDCW; sim to Components Inc 3478R.
		- - - - - - **DIODES AND RECTIFIERS** - - - - - -
CR1408	19A115250P1	Silicon.



NOTES
1. ALL WIRES SFT28 UNLESS OTHERWISE NOTED.
2. FOR VOLUME CONTROL OF ALERT TONE, CONNECT VIOLET WIRE FROM J-SIDE OF C354 TO J4(21) ON RECEIVER BOARD.
3. VOLTAGE MEASUREMENTS TAKEN AT NO SIGNAL CONDITION WITH AUDIO ON AT MINIMUM VOLUME.
4. COMPONENTS MARKED WITH # ARE FOR PLI9C310D2962 ONLY.

SEE 19TH CABLE PRODUCTION CHANGE RECORD FOR EFFECTIVE SECTION DETAILS WITH THIS UNIT. FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.
THIS SCHEM DIAG APPLIES TO:

MODEL NO.	REV LETTER
PLI9D413D2152	#
PLI9C310D2962	A

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

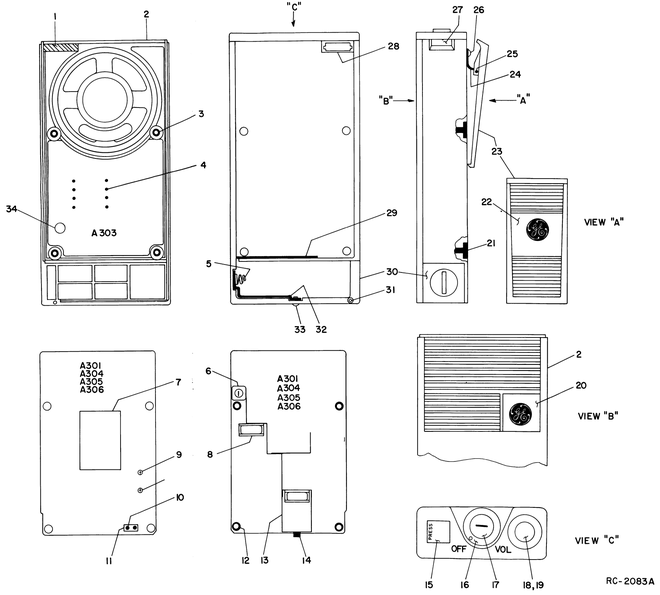
(19D421333, Rev. 19)

SCHEMATIC DIAGRAM

TONE ONLY RECEIVER
TYPE ER-55-A

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - TRANSISTORS - - - - - - - -
Q1408	19A116142P1	Silicon, PNP; sim to Type 2N4284.
Q1409	19A116144P1	Silicon, NPN; sim to Type 2N4280.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R1430	3R151P154J	Composition: 0.15 megohm ±5%, 1/8 w.
R1431	3R151P514J	Composition: 0.51 megohm ±5%, 1/8 w.
R1432	3R151P393J	Composition: 39,000 ohms ±5%, 1/8 w.
R1433	3R151P563J	Composition: 56,000 ohms ±5%, 1/8 w.
R1435	3R151P103J	Composition: 10,000 ohms ±5%, 1/8 w.
R1436	3R151P154J	Composition: 0.15 megohm ±5%, 1/8 w.
		CASE ASSEMBLY 19B216423G1 TONE 19B216423G2 NOISE SQUELCH
		- - - - - - - - - - TERMINALS - - - - - - - - -
E1	19A116287P1	Contact, electrical: sim to Oak 13076-003.
		- - - - - - - - - - - FUSES - - - - - - - - - - -
F301	19A115060P40	Bus, wire; No. 36.
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J301	19A116134P2	Jack, telephone: sim to WTP310.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R388		(Part of S302).
R655	19B216998G1	Variable, carbon film: 22,000 ohms ±20%, 0.05 w; sim to Amprex 2232-410-000-08.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S301	19A127540G1	Contact.
S302	19A116437P1	Resistor/switch: includes Resistor, 10,000 ohms ±20%, 0.05 w. Switch, rotary, DPDT, 0.1 amp at 12 v; sim to Tenbame (TBM) Type RV16 Model 161-S2.
		COVER ASSEMBLY 19B216822G1
		- - - - - - - - - LOUDSPEAKERS - - - - - - - - -
LS301	19A116090P1	Permanent magnet: 2.00 inch, 8 ohms ±10% imp, frequency range 400 to 3000 Hz.
		MISCELLANEOUS
	19A127884G1	Fuse Kit.
	19A127725G1	Belt clip.
	403353092	Alignment Tool. (Metal tip).
	403383193	Alignment Tool. (Screw driver tip).
	403883194	Alignment Tool. (Fork tip).
		MECHANICAL PARTS (SEE MC-2083)
1	4032591P64	Tape, pressure sensitive.
2	19D413296P1	Cover. (Does not include LS301, items 1, 3, and 20. If complete assembly is desired order 19B216822G1).
3	19B201806P1	Insert, screw thread: sim to Phelps Mfg Div Bell-Coil Corp 70013-04.
4	403604091	Pin, terminal.
5	19B216401P3	Battery spring.
6	19A127712P2	Can. (Used with L304).
7	19A127820G1	Shield.
8	19A127841P1	Protective pad. (Used with Y301 and Y302).

SYMBOL	GE PART NO.	DESCRIPTION
9	19A127110P1	Screw: No. 1-64 x .156. (Secures coil forms for L301 and L302).
10	19A127536P1	Stud. (External Antenna connection).
11	19A127709P1	Gasket. (Used with External Antenna connection).
12	19A127537P1	Spacer.
13	19C317345G1	Shield.
14	19A127706P1	Grounding tab.
15	19C317344P1	Cover. (Used with External Speaker).
16	19C317182P1	Knob. (ON/OFF- VOLUME).
17	19C317433P1	Insert. (Secures Knob, item 16).
18	19A127539P1	Button. (Push to Reset-Push to Listen).
19	19B216996G1	Knob. (Used with Squelch pot).
20	NP258024	Nameplate, etched aluminum.
21	19A127538P1	Screw. (Secures cover).
22	NP258023A	Nameplate, etched aluminum.
23	19D413314P1	Spring clip.
24	19B216804G1	Spring.
25	NS10P814C	Pin.
26	19B200525P128	Rivet, tubular.
27	19A127576P1	Cover. (Used with call number).
28	19C317384P1	Holder. (Used with Push to Reset/Push to Listen Switch and Squelch Switch).
29	19A115941P1	Tape, pressure sensitive: sim to Permacel ES3990. (Connects fuse to ground clip).
30	19B216749G1	Battery cap.
31	19A127707P1	Pin. (Secures battery cap).
32	19C317186P1	Contact. (Secures battery spring).
33	19B200525P126	Rivet, tubular. (Charging contact).
34	4033306P17	Insulator, fiber. (Used with Q1412-Q1418, Q1421, Q1422).



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 will indicate the latest revision applicable to the Parts List for descriptions of parts affected by these revisions.

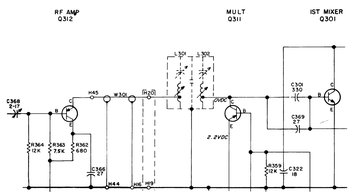
Receiver Board A305, A306 - 19D413490G1, G2

Rev. A - To stabilize the audio at maximum volume control setting. Added R365 and R366.

Rev. B - Not used.

Rev. C - To improve sensitivity and stabilize audio. Added C320, C330, C337, C339, C340, C363, L318, and L319. Changed C301, C302, C307, C317, C369, Q312, R362, R365, and R366. Deleted C315.

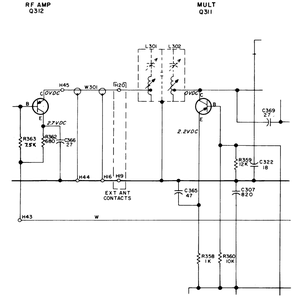
Schematic Diagram Was:



Rev. D - To improve sensitivity. Changed C344, R362, and R363.

Rev. E - To replace transistor no longer available. Changed C366, C369, Q311, R359, R363, R364 and T302. Added C359 and L320. Deleted C339 and C340.

Schematic Diagram Was:



PRODUCTION CHANGES CONT'D.

REV. F - To increase first oscillator and multiplier output. Changed R305, R360, and R359.

REV. G - To prevent oscillation with mercury battery Added White and Red wire from R12 to the emitter of Q1402. Changed Q312, R362, R363, and R364.

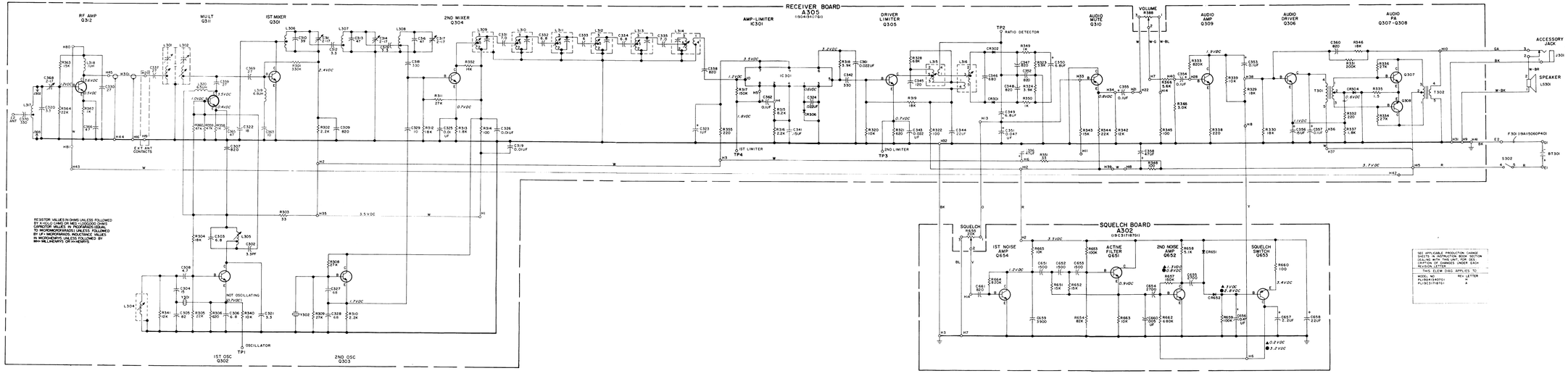
REV. H - To incorporate new transistor and capacitors. Changed Q310, C319, C325, C326, VR311, and R314. Added notch in shield 19C317345G1 for cable to pass.

REV. A - Tone Board A303 19C317089G1

To prevent oscillation with mercury battery. Added White and Red wire from emitter of Q1402 to R12 on Receiver Board 19D413390G1, 2.

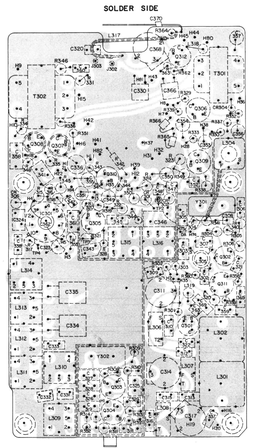
REV. A - Noise Squelch Board A305, 19C317185G1

To insure Squelch action. Changed Q651 and Q652.



SCHEMATIC DIAGRAM

VOICE ONLY RECEIVER
TYPE ER-55-A



(RC-2133)
(1D416078, Rev. 7)
(1D943332, Sh. 1, Rev. 7)

QUICKCHECKS

Before starting the procedure, check for battery voltage on the receiver chassis (H15 to ground). Also check the wire fuse.

Symptom	Procedure
No audio	1. Check earphone jack contacts. 2. Check for +3.5 volts at H8 on the receiver board after the receiver is unsquelched by a signal or tones. 3. Check DC voltages at (B) and (J).
Poor sensitivity	1. Check the coax connections to the RF Amp. 2. Check DC voltage at (A). 3. Check to see if the receiver board ground tab is making contact with the ground shield on the battery compartment. 4. Check RF gains (P) thru (T).
Receiving noise but no signal	1. Check DC voltages (B) and (D). 2. Check DC voltages (C) and (E).
Low noise and no signal	Check DC voltage at (J).

STEP 3- RF GAIN CHECKS (STEPS P THRU T)

EQUIPMENT REQUIRED:

1. RF probe and Test Amplifier Model 4EX16A10 connected to GE Test Set Model 4EX3A10, or an RF voltmeter.
2. A signal generator (M-800 or equivalent) connected to the external antenna pins (H20 and H10). Disconnect the internal antenna by removing the center conductor of the coaxial cable from H20.

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 4EX3A10. 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

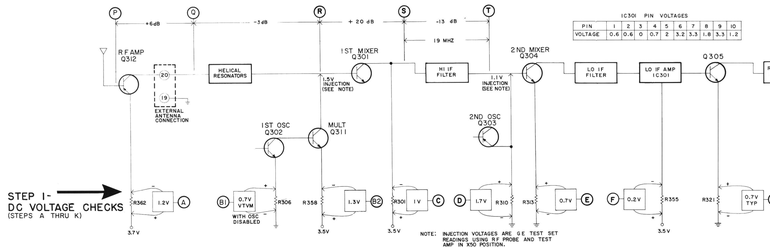
PROCEDURE FOR 2ND MIXER

1. With no signal in, connect the RF probe to the output (collector) of Q304, and set the Test Amp to the X10 position.
2. Apply a 700 microvolt signal to the receiver and check for a Test Set reading of 2 volts.

PROCEDURE FOR LO IF AMP

1. With no signal in, measure the voltage at TP4 (Pin 8 of 1C301) with GE Test Set Model 4EX3A10.
2. Next, apply a 700 microvolt signal to the receiver and check for a 0.2 volt increase in the reading at TP4.

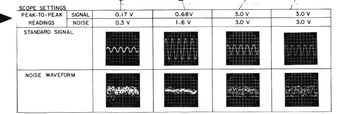
STEP 1- DC VOLTAGE CHECKS (STEPS A THRU K)



STEP 1 - DC VOLTAGE CHECKS

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.

STEP2 - AUDIO & NOISE WAVEFORMS (STEPS L THRU O)



STEP 2 - AUDIO AND NOISE WAVEFORMS

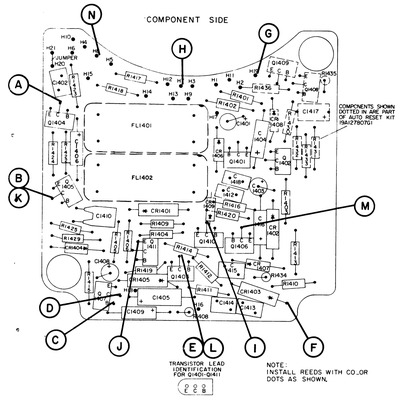
EQUIPMENT REQUIRED:

- Oscilloscope connected between the points shown and ground.
- Signal Generator (Measurements M-800 or equivalent).

PRELIMINARY STEPS:

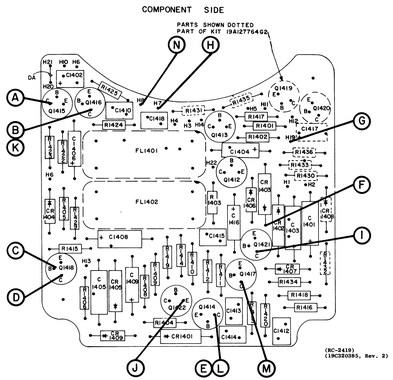
1. Apply a standard signal to the external antenna pins. A standard signal is 1000 microvolts on the receiver frequency modulated by one kHz with 3.3 kHz deviation.
2. Set the Volume control for 150 milliwatts output (1.1 volts).

TYPE 99 DECODER BOARD 19C317029G1



(RC-2113), (19C317813, Rev. 2)

TYPE 99 DECODER BOARD 19C317029G2



(RC-2419), (19C320385, Rev. 2)

Symptom	Procedure
Alert tone runs continuously (pages on 2nd tone only).	Check for open or defective C1409, or open CR1401.

STEP 3-DECODER STAGE CHECKS

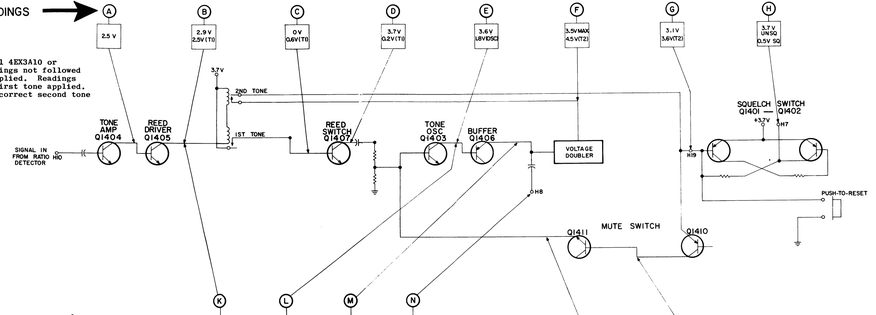
The following stage checks provide a method of checking the operation of the decoder stages for quickly isolating a service problem. Begin the checks with the receiver in the RESET or quiet condition.

To Check:	Procedure
Reed drive	Check DC reading (B) and waveform (K) with 1st tone applied.
Reed Switch and 1st reed	Check DC reading at (F) with and without 1st tone applied.
Tone Oscillator	Waveforms (J), (M) and (N) should appear momentarily when the 1st tone is removed.
Voltage doubler	Check the DC reading at (F). Next, jumper 3.7 volts to H16 to cause the tone oscillator to run continuously. Check the voltage at (F).
Squelch Switch	With 3.7 volts jumpered to H16 and to H19, the tone alert should be heard at the speaker. Reading at (H) should be 3.5 volts.
2nd Reed	Remove the 3.7 volts jumpered to H19. Apply a standard signal modulated by the 2nd tone to the receiver. The tone alert should be heard at the speaker.
Mute Switch	Apply the standard signal modulated by the second tone to the receiver. Next, disconnect the 3.7-volt jumper from H16. The tone alert should be heard until the 2nd tone is removed.

STEP 1-TYPICAL DC READINGS

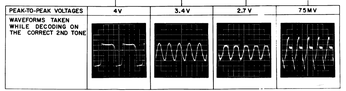
(STEPS A THRU J)

All readings are made with GE Test Set Model 4EX3A10 or equivalent 20,000 ohm-per-volt meter. Readings not followed by any symbol are taken with either tone applied. Readings followed by T1 are taken with the correct first tone applied. Readings followed by T2 are taken with the correct second tone applied.



STEP 2-TONE WAVEFORMS

(STEPS K THRU N)



- Oscilloscope connected between the points shown and ground.
- Signal Generator (Measurements M-560, Model 800 or equivalent).
- Type 99 Encoder with the correct 1st and 2nd tones.

PRELIMINARY STEP:

Apply a 1000 microvolt signal on the receiver frequency that is modulated by the correct 2nd tone with 3.3 kHz deviation.

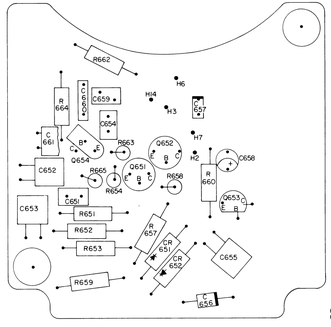
TROUBLESHOOTING PROCEDURE

PERSONAL PAGER
TYPE 99 DECODER

QUICKCHECKS

Symptom	Procedure
Receiver won't unsquelch	1. Check C659, C660, CR651 and CR652 on Squelch Board. 2. Check C351 on receiver board
Receiver won't squelch	1. Check CR651, CR652 and shorted Q653. 2. Make Audio Gain Checks.
Erratic critical squelch	1. Check C656 and R388.
Squelches on voice peaks.	1. Check the receiver frequency. 2. Check C651, C652 and C653.

COMPONENT SIDE



(RC-2112)
(19C317815, Rev. 1)

STEP 3- AUDIO GAIN CHECKS

EQUIPMENT REQUIRED:

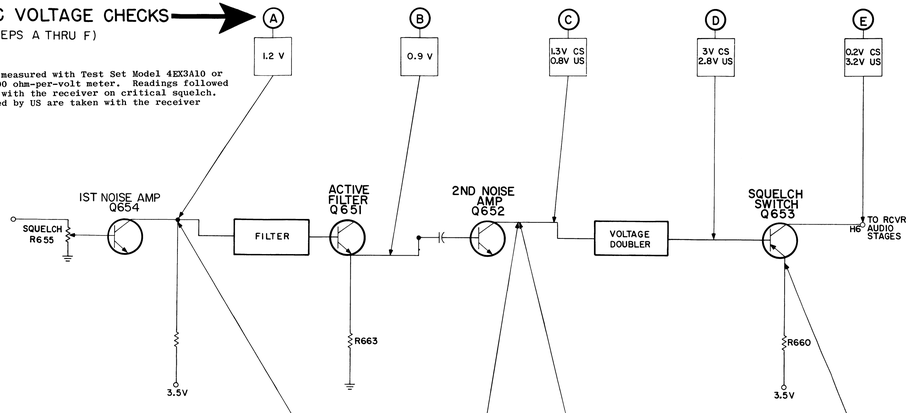
- Audio generator with 7 kHz output.
- Signal generator (M-560 or equivalent).
- Oscilloscope (5 MV to 1.2 volts).

PROCEDURE

1. Apply a 1000 microvolt, 7 kHz signal modulated by 3.3 kHz deviation to the external antenna connector.
2. Turn SQUELCH control R655 fully clockwise.
3. Scope reading at the base of 1st Noise Amp Q654 should be approximately 45 millivolts.
4. Turn R655 counterclockwise until the reading at the base of Q654 drops to 5 millivolts.
5. Check for a 140 millivolts peak-to-peak reading at the collector of Q654.
6. Check for a 100 millivolts peak-to-peak reading at the emitter of Active Filter Q651.
7. Check for a 1.2 volts peak-to-peak reading at the collector of 2nd Noise Amp Q652. The waveform should be clipped on the negative side.

STEP 1- DC VOLTAGE CHECKS
(STEPS A THRU F)

DC readings are measured with Test Set Model 4EX3A10 or equivalent 20,000 ohm-per-volt meter. Readings followed by CS are taken with the receiver on critical squelch. Readings followed by US are taken with the receiver unsquelched.



STEP 2- SQUELCH WAVEFORMS
(STEPS G THRU I)

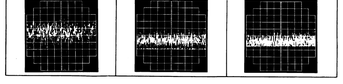
EQUIPMENT REQUIRED:

- Oscilloscope connected between the points shown and ground.
- Signal Generator (Measurements M560 or equivalent) connected to external antenna connectors.

PRELIMINARY STEPS:

1. Set R655 for critical squelch.
2. When a signal is required, apply an on-frequency signal with no modulation.

0.6 V P-P	3V P-P	2.5 V P-P
NO SIGNAL IN		SIGNAL INCREASED UNTIL SQUELCH JUST OPENS



TROUBLESHOOTING PROCEDURE

NOISE SQUELCH BOARD
PERSONAL PAGER ER-55-A

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-4221

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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PRINTED IN U.S.A.