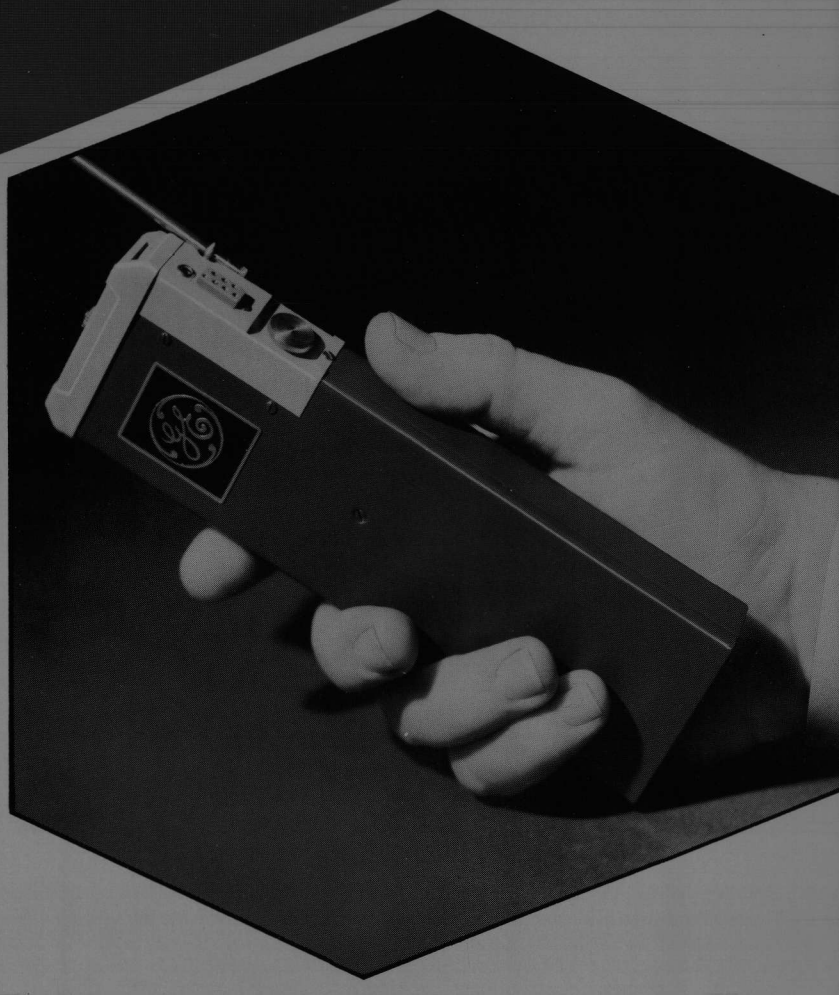
COMMUNICATIONS

MAINTENANCE MANUAL



148-174 MHz, 1-WATT

POCKET MATE

Personal

TWO-WAY FM RADIO

LBI-3835A

TABLE OF CONTENTS

ILLUSTRATIONS

SPECIFICATIONS *

GENERAL

FCC Filing Designation:	ES-33-A
Frequency Range:	148-174 MHz
Battery Drain (at 14.5 VDC):	
Receiver Squelched	5 milliamps
Receiver Rated Audio	20 milliamps
Transmit	175 milliamps
Duty Cycle (EIA):	
Standby	80%
Receive	10%
Transmit	10%
Battery Life:	
Rechargeable Battery	One 8-hour day
Dry Battery	Five 8-hour days
Temperature Range:	-10° C to +60° C (+14° F to +140° F)
Maximum Frequency Spacing:	0.4%

TRANSMITTER

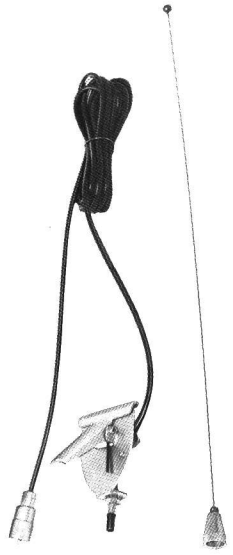
RF Power Output:	1 watt minimum at 135 VDC
Spurious and Harmonic Emission:	-45 db
Modulation Deviation:	0 to ±5 kHz
Frequency Stability:	±0.0025% from -30° C to +60° C, +25° C Reference
Audio Response:	Within +1 and -3 db of 6 db/octave pre-emphasis, 300 to 3000 Hz
Transmitter Audio Compression:	Controlled linear compression range of 35 db.

RECEIVER

Channel Spacing:	30 kHz
Sensitivity:	
EIA 12-db SINAD	0.30 µv
20-db Quieting	0.35 µv
Noise Squelch	0.20 µv
Selectivity: EIA 2-Signal (30-KC channels)	-70 db
Frequency Stability:	±0.0025% from -30° C to +60° C, +25° C Reference
Modulation Acceptance:	±5 kHz
Spurious and Image Rejection:	-70 db
Audio Response	Within +2 and -8 db of 6 db/octave de-emphasis, 300 to 3000 Hz
Audio Output:	100 mw at less than 10% distortion

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

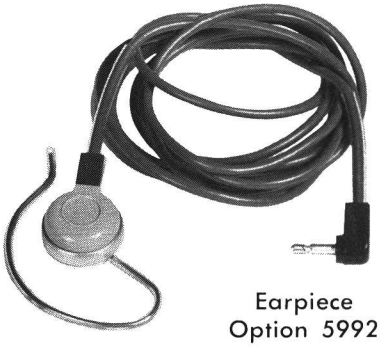
OPTIONS



Gutter Mount Antenna
Option 5982

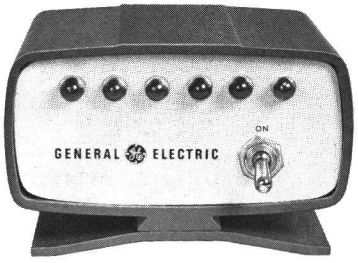
Lapel Speaker
Option 5994

Leather Carrying Case
Option 5991
(Option 5980 with Tone)

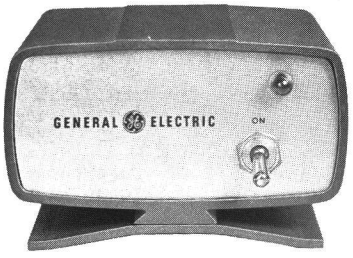


Earpiece
Option 5992

Flexible Wire Antenna
Option 5996



Six-Unit Charger
Option 5987



Single-Unit Charger
Option 5986

Battery Charging Rack
Option 5979

DESCRIPTION

The General Electric Pocket Mate Personal transmitter-receiver is a compact, high performance two-way FM radio designed for operation in the 148 to 174 megahertz range. The audio section of the transmitter contains an automatic gain control circuit (AGC) to assure proper operation over a wide range of voice input levels. In the receiver, maximum protection against interference is provided by a high IF crystal filter. Both the transmitter and receiver are transistorized for added reliability and low battery drain. Power for the radio is supplied by two rechargeable nickel-cadmium batteries or two easily-replaceable mercury batteries.

The Pocket Mate is housed in a one-piece, stainless steel case for maximum protection. All operating controls are conveniently located on the top of side of the radio. The collapsible 18-inch antenna swings down along the side of the case for ease of carrying, for short range communications, or for operating the radio with an external antenna.

Auxiliary jacks are provided for an earphone, lapel speaker, external antenna, battery charger and other accessories.

OPERATION

Before operating the radio, check to see that the batteries have been correctly installed. When using the collapsible antenna, make sure that the antenna is in an upright, fully extended position for maximum range.

TO RECEIVE A MESSAGE

1. Turn the SQUELCH (SQCH) control so that the white dot is visiable.
2. Turn the VOLUME-OFF control clockwise until a hissing sound is heard in the speaker.
3. Turn the SQUELCH control clockwise until a hissing sound just fades out.

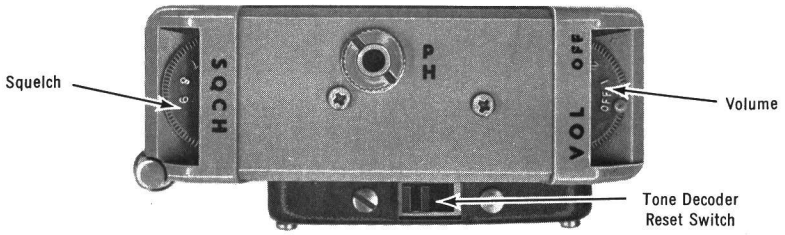


Figure 1 - Control Panel

4. In radios equipped with a Frequency Selector switch (F1-F2), select the proper frequency. You are now ready to receive messages from other radios in your system.

TO SEND A MESSAGE

1. Turn the radio on as described in TO RECEIVE A MESSAGE.

2. In two-frequency radio, select the proper frequency.

3. Holding the radio so that the antenna is vertical, press the Push-To-Talk button to put your transmitter on the air. Identify the unit you are calling and identify yourself. Release the Push-To-Talk button as soon as you stop talking so that you can receive an answer to your call. Your receiver will operate only with the button released. After you receive an answer, complete your message.

FOR POCKET MATES WITH THE TONE DECODER OPTION:

- To disable the decoder, move the Reset Switch to the right (away from antenna). This enables you to hear all calls on your channel, and permits you to monitor the channel before sending a message. Always disable the decoder when sending and receiving messages, and when adjusting the VOLUME and SQUELCH controls.

- To activate the decoder, move the Reset Switch to the left (towards antenna). This keeps your receiver silent until your tone code is transmitted.

NOTE

The audio compressor circuit in the Pocket Mate maintains the proper voice level whether you hold the microphone an inch away from your mouth or an arm's length away. However, the closer you hold the microphone, the less background noise will be picked up. In noisy locations, therefore, hold the microphone about an inch away from your mouth. Always speak in a normal tone of voice.

To turn the radio off, turn the VOLUME-OFF control counterclockwise until it clicks.

OPERATING TIPS

The following conditions will tend to reduce the effective range of the Pocket Mate when sending and receiving messages, and should be avoided whenever possible.

1. Operating the unit in low areas of the terrain.

2. Standing under power lines or bridges.

3. Operating the unit inside of steel buildings, ships, or buildings constructed with steel frames.

4. Obstructions such as mountains or buildings between the person sending and the person receiving the messages.

In areas where the transmission or reception is poor, firch check to see if the antenna is fully extended. Then hold the unit so that the antenna is vertical. If this doesn't help, move to a new location - preferably to a higher area containing less obstructions. This provides a clearer path for the radio waves to follow.

When poor reception is the result of extreme distance, the reception may be improved by turning the SQUELCH control to the left (counterclockwise). However, more noise may be heard.

MAINTENANCE

SERVICING THE UNIT

If the Pocket Mate should begin to operate improperly, the first thing to suspect is run-down batteries. If a new set of mercury batteries or freshly recharged nickel-cadmium batteries does not restore the radio to its normal operating condition, the radio should be returned to the factory for servicing. Instructions for returning the unit are contained in the Pocket Mate Warranty (ECP-213) shipped with the radio.

BATTERY INFORMATION

The Pocket Mate can be operated with either of the following types of batteries:

Battery Type	GE Part Number	Equivalent
Rechargeable nickel-cadmium	19B201713-P2	
8-volt mercury	19B201709-P1	Mallory TR-136R, Eveready E-136N or Burgess H136R

The radio should be placed into operation as soon as possible after receiving shipment. If the unit has to be stored for several months, remove the batteries and store them separately in a cool, dry place. Both the mercury and nickel-cadmium batteries may be stored for long periods without damage. However, nickel-cadmium batteries stored for over 30 days should be fully recharged before using.

When the radio is stored, the switches should be operated and the controls rotated every three months to keep contacts free from dust and corrosion.

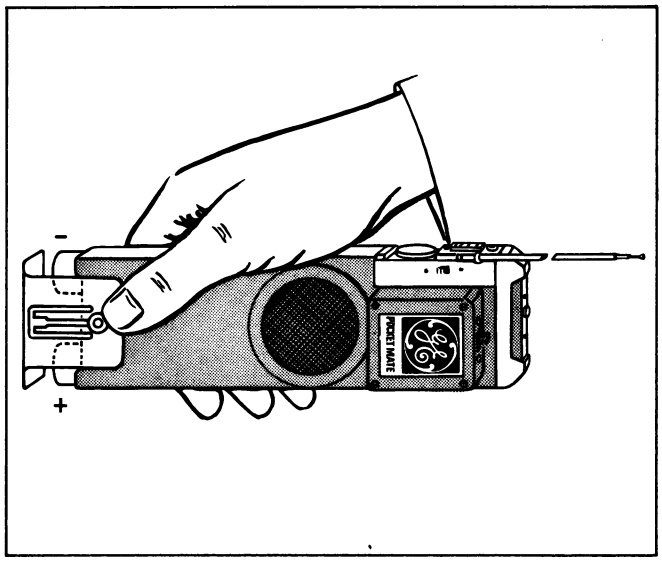


Figure 2 - Changing the Batteries

To Change the Batteries (Fig. 1)

1. Press down on the bottom cover clip spring as shown in Fig. 1 and slide cover out.

2. Replace the batteries being careful to observe the proper battery polarity. The battery polarities are marked on the bottom cover.

3. After replacing the batteries, firmly press the bottom cover against the bottom of the chassis until the clip spring clicks.

WARNING

Do not attempt to operate the Pocket Mate with one mercury battery and one nickel-cadmium battery installed; and do not dispose of either battery by burning. To do so may cause a battery to explode.

To Charge the Batteries

Use only the optional GE single-unit or 6-unit charger for recharging the nickel-cadmium batteries while in the radio. To use the unit chargers:

1. Turn the radio OFF. Then check the radio to see that nickel-cadmium batteries are properly installed.

2. Plug the charger power cable into a 117-volt AC source. Then insert the charging plug into the Option Jack located above the radio Push-To-Talk button.

3. Turn the charger ON. The charge light(s) will glow when the batteries are charging properly. Charge the batteries for 16 hours.

An optional battery holder rack is available for charging up to six pairs of nickel-cadmium batteries when they are removed from the Pocket Mate. The battery rack plugs into either of the unit chargers, and will charge the batteries in 16 hours.

WARNING

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

CIRCUIT ANALYSIS

TRANSMITTER

The Pocket Mate transmitter is a crystal-controlled, frequency modulated transmitter with a minimum RF output of one watt. The crystals used have a range of 18.5 to 21.75 megahertz, and the crystal frequency is multiplied eight times. The complete transmitter consists of five modules. The modules include:

- Audio Board
- Oscillator-Multiplier Board
- Power Amplifier Board
- Output Filter B
- Output Filter A (part of Antenna Block)

References to symbol numbers mentioned in the following text are found on the Schematic Diagram, Outline Diagram and Parts List (see Table of Contents). A block diagram of the transmitter is shown in Figure 2.

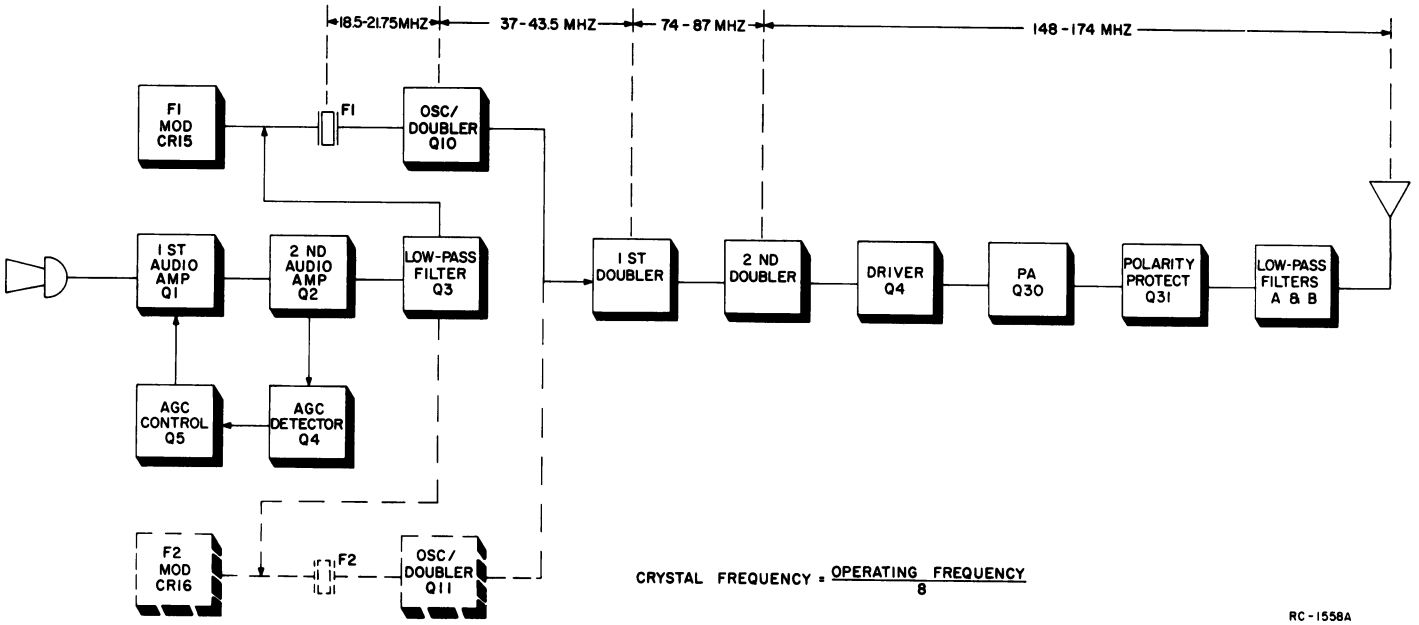


Figure 3 - Transmitter Block Diagram

AUDIO BOARD

Audio from the speaker-microphone is amplified by audio amplifiers Q1 and Q2, and is applied to an active low-pass filter (Q3, R11 and C7).

The speaker-microphone, in conjunction with C3 and R4, provides approximately 6-db audio pre-emphasis. The output of the filter is applied to the Oscillator-Multiplier Board.

Audio peaks are coupled through T1 to the base of AGC detector Q4. Peaks of sufficient amplitude to cause overmodulation turn on Q4, causing it to conduct for the duration of the peak. When turned on, the emitter of Q4 goes positive and turns on AGC control Q5. Turning on Q5 reduces the gain of Q1.

Turning on Q4 also forward biases diode CR1 and applies a positive voltage to the emitter of amplifier Q2, reducing the gain of that amplifier stage. The beginning of voice peaks that might overmodulate the transmitter are limited by diode CR2 until the AGC circuit turns on.

With the gain of the two amplifier stages controlled by the AGC circuit, the audio output level will vary less than 6 db over a wide range of voice input levels.

OSCILLATOR-MULTIPLIER BOARD

The output of the Audio Board is applied to the Oscillator-Modulator Board through Deviation Control resistor R34. The value of R34 is selected at the factory to provide 4.5-kHz deviation.

Transistor Q10 operates in a Colpitts oscillator circuit with feedback developed across C22. A regulated 7-volt supply for the oscillator and modulator varactor CR15 is derived from the 14.5-volt supply by zener diode CR11. Adjusting T5 in series with the varactor changes the series resonance of the crystal circuit for rubbering the oscillator frequency. Drive control potentiometer R24 controls the oscillator gain.

In two-frequency transmitters, a second oscillator stage identical to the F1 oscillator stage is added. The proper frequency is selected by grounding the emitter of the desired oscillator by means of frequency selector switch S2 mounted on the Antenna Block.

Audio from the low-pass filter varies the capacitance of varactor CR15 at an audio rate. As CR15 is in series with the crystal, the variations frequency-modulate the crystal frequency. The oscillator tank (T7) is tuned to twice the crystal frequency.

Following the oscillator-multiplier, the RF signal undergoes two stages of multiplication by two class C doubler stages (Q12 and Q13). The collector tank of Q12 is tuned to four times the crystal frequency, and the collector tank of Q13 is tuned to eight times the crystal frequency.

Driver Q14 amplifies the second doubler output with the driver tank (T10) tuned to the operating frequency.

POWER AMPLIFIER

Transistor Q30 operates as a class C power amplifier. The output of PA tank L10 is coupled through DC blocking capacitor C54 and applied to two low-pass output filters (Filter B and Filter A) to attenuate

any harmonics. The output of Filter A connects through relay K1 (on the Antenna Block) to the antenna.

Transistor Q31 provides reverse voltage protection for the transmitter. Keying the transmitter energizes relay K1 which switches the antenna to the transmitter output and applies the battery voltage to the emitter of Q31. A positive voltage causes Q31 to conduct, and the collector voltage supplies the PA stage while the base voltage supplies the Audio and Oscillator-Multiplier stages. A negative voltage applied to the emitter of Q31 will not turn the transistor on, so no voltage will be supplied to the transmitter stages.

RECEIVER

The Pocket Mate receiver is a double-conversion, superheterodyne receiver for operation on fixed frequencies in the 148 to 174 megahertz range. The complete receiver consists of four modules. The modules include:

- Oscillator-Multiplier Board
- Hi IF Crystal Filter
- Lo IF Amplifier and Discriminator Board
- Audio-Squelch Board

References to symbol numbers mentioned in the text are found on the Schematic Diagram, Outline Diagram and Parts List (see Table of Contents). A block diagram of the receiver is shown in Figure 3.

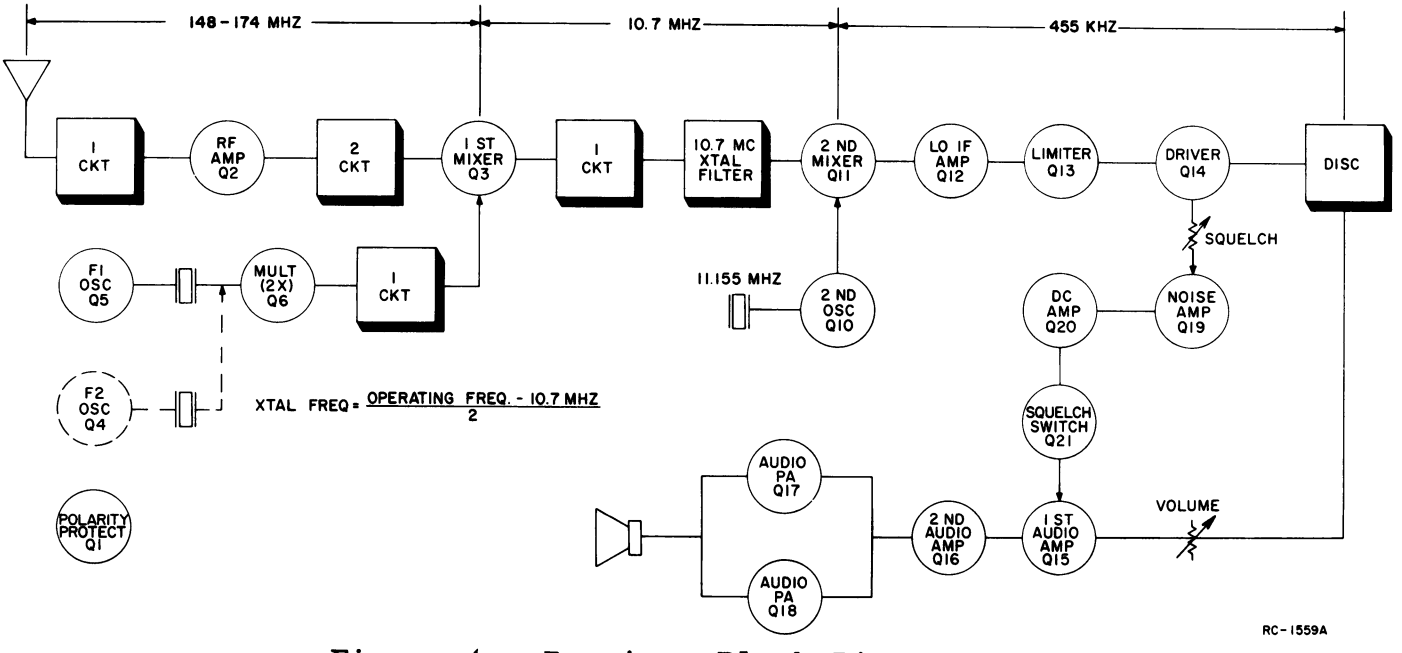


Figure 4 - Receiver Block Diagram

OSCILLATOR-MULTIPLIER BOARD

RF from the antenna and DC volts from the battery are applied to the receiver input. The DC volts are coupled through L1 to the emitter of voltage protection transistor Q1, causing it to conduct. When conducting, the base voltage of Q1 supplies the Oscillator-Multiplier Board, and the collector voltage supplies the Lo IF & Discriminator and Audio-Squelch Boards. Applying a negative voltage to Q1 will not turn the stage on. This protects the receiver stages against a supply voltage of the wrong polarity.

The RF signal is coupled through DC blocking capacitor C2 and a tuned circuit (L2) to the base of RF amplifier Q2. The output of Q2 is coupled through two tuned circuits to the base of first mixer Q3.

The 1st oscillator used a mode crystal so that the fifth mode is in the 68.6 to 81.6 megahertz region. Feedback for oscillator Q5 is developed across C14. The oscillator will have no output unless oscillator tank coil L10 is tuned to the fifth mode frequency.

In two frequency receivers, a second oscillator stage identical to the F1 oscillator stage is added. The proper frequency is selected by grounding the base of the desired oscillator by means of frequency selector switch S2 on the Antenna Block.

The oscillator is followed by doubler Q6, with the output tank tuned to resonance in the 137 to 163 megahertz range. The doubler output is applied to the emitter of 1st mixer Q3 where it is mixed with the RF amplifier output to provide the 10.7-megahertz high IF frequency.

A 6-crystal, 10.7 megahertz filter follows the 1st mixer. This highly-selective filter provides more than -70 db selectivity for the receiver (EIA two-signal method with 30-kHz channels).

LOW IF AMPLIFIER & DISCRIMINATOR BOARD

A tuned circuit L15 and C31 provides impedance-matching for the output of the crystal filter to the base of 2nd mixer Q11.

The 11.155-megahertz 2nd oscillator injection frequency from Q10 is mixed with the 10.7 megahertz high IF frequency at 2nd mixer Q11 to provide the 455-kHz low IF frequency. The mixer output is amplified by Q12, and fed to a limiter (Q13) and driver stage (Q14).

The driver output connects to a tap on discriminator transformer T3. Diodes CR4 and CR5 rectify the 455-kHz signal to recover the audio. The discriminator output is fed to the Audio-Squelch Board.

AUDIO-SQUELCH BOARD

Audio in theincoming signal connects through VOLUME control R50 to the two class B audio amplifiers (Q15 and Q16). The volume control

determines the gain of the amplifiers by varying the bias to the base of Q15. The output of Q16 is DC-coupled to a complementary push-pull audio PA stage (Q17 and Q18). The PA output is applied through C65 to the speaker-microphone.

Noise from the emitter of driver Q14 operates the squelch circuit. A filter consisting of C44, R34 and C48 removes any audio from the noise output. Noise is coupled through SQUELCH control R57 to the class B noise amplifiers (Q19 and Q20). The SQUELCH control determines the gain of the amplifiers by controlling the bias to the base of Q19. The amplified noise signal from the emitter of Q20 turns on squelch switch Q21, and its emitter voltage drops to ground potential. This ground is applied to the DC connected audio amplifier stages, switching them off and squelching the receiver. With the receiver squelched and the audio stages cut off, the receiver drain is only 5 milliamps.

When the receiver is quieted by an input signal, there is no output from the noise amplifiers and squelch switch Q21 does not turn on. The positive supply voltage turns on the audio amplifier stages and sound is heard at the speaker-microphone. A feedback loop consisting of C60, C63, R48 and R49 provides improved frequency stability.

DECODER OPTION

Selective Calling Option 5989 is a transistorized sequential tone decoder for operation with any encoder providing two-tone sequential signaling. This includes the GE Encoders (100-, 400-, and 900-call), and Dial Page Terminals. Tone frequencies range from 517.5 Hz to 967.5 Hz.

The decoder mounts in an option housing on the side of the Pocket Mate, above the speaker-microphone. Supply voltage, ground, input and output connections are made to the receiver audio-squelch board.

Tone from the receiver audio circuit is applied to direct-coupled amplifiers Q1 and Q2 on the decoder board. The first tone of the two-tone sequential call is applied to FL1-P. If the tone is at the resonant frequency of FL1, a tone voltage is applied to the base of Q3. The positive half cycles of the tone cause Q3 to conduct, which partially discharges capacitor C4 through R9. R8 and R9 prevent C4 from recharging until the tone cycly is completed.

If the second tone is at the resonant frequency of FL2, a tone voltage is applied to the base of Q4. The negative half cycles of the tone voltage turn on PNP transistor Q4. With Q4 conducting, C5 discharges which turns on Q5.

Q5 and Q6 are connected as a bistable multivibrator (flip-flop), and turning on Q5 turns off Q6. The collector of Q6 is connected through Reset Switch S1 to the supply voltage path of the receiver audio stages (junction of R46, R61 and C71 on the audio-squelch board). When Q6 conducts, its collector drops to ground potential. This removes the supply voltage to the receiver audio stages, keeping the stages turned off. When the proper tone sequence switches the flip-

flop (turns Q5 on and Q6 off), the supply voltage is re-applied to the receiver audio stages and sound is heard at the speaker.

Moving the Reset switch (see Figure 1) to the left position (toward the antenna) activates the decoder circuit so that no sound will be heard at the speaker until the proper tone code is applied to the decoder. Moving the Reset switch to the right (away from the antenna) disables the decoder circuit so that all calls on the channel can be heard. The decoder circuit should be disabled before sending a message so that the channel can be monitored. The circuit should also be disabled when sending and receiving messages.

When the SQUELCH control is adjusted for critical squelch and the Reset switch in the left position, the decoder will automatically reset itself after each message received. If automatic resetting is not desired, leave the SQUELCH control in the off position (unsquelched). With the radio unsquelched, the decoder must be reset after each message by slowly moving the Reset switch to the right position and then back to the left position.

CHANNEL GUARD ENCODER

Channel Guard Encoder Option 5990 consists of a transistorized tone encoder that is contained in an option housing mounted on the side of the Pocket Mate. The encoder tones are generated by a tone oscillator -- no electromechanical devices are used. The tone frequencies range from 71.9 Hz to 203.5 Hz. Connections for supply voltage, ground and tone output are made to the transmitter oscillator-multiplier board.

Keying the transmitter applies 14.5 volts to the 10-volt regulator (Q1, Q2 and Q3). The regulator output is taken from the collector of Q1, and provides a closely-controlled supply voltage for the tone oscillator. Zener diode CR1 provides a reference voltage for the regulator.

The tone oscillator (Q4 and Q5) is a free-funning (astable) multivibrator that operates as long as supply voltage is applied. The oscillator frequency range is determined by the R-C time constant of R11-C3 and R12-C4.

Potentiometer R9 is provided for setting the oscillator on frequency. A frequency counter may be connected to the yellow test lead in the encoder wiring harness, and R9 adjusted for the tone frequency (±0.1 Hz). Access to the test lead is obtained by removing the speaker.

The tone oscillator square-wave output is applied to emitter-follower Q6, and then to the base of Q7. Q7 and Q8 (and associated circuitry) convert the tone oscillator square-wave output to a sine wave. R18, R19, R21 and R22 are selected for waveshaping at the different frequencies. The tone output is coupled from the emitter of Q8 through R24 to the transmitter modulation input (junction of R21, R23 and C24 on the oscillator-multiplier board). The value of R24 is selected at the factory to provide 0.75 kHz tone deviation.

BATTERY CHARGERS

Two optional battery chargers and an optional battery charging rack are available for fully recharging the Pocket Mate's nickel-cadmium batteries within 16 hours from a 117-volt AC source. The single-unit charger (Option 5986) and the 6-unit charger (Option 5987) are used to recharge the batteries while they are in the Pocket Mate. The battery charging rack (Option 5979) plugs into either charger for recharging up to six pairs of additional batteries while the Pocket Mate(s) are being recharged. Operating instructions for the chargers are contained in the Battery Information section or listed in the Table of Contents.

WARNING

Do not attempt to charge mercury batteries. To do so may cause them to explode.

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

UNIT CHARGERS

Both the single-unit and 6-unit chargers are full-wave, tapered current chargers designed to provide a 20 milliamp charging circuit for the rechargeable batteries. Turning switch S1 to the ON position applies power to the charger. The 117 volts is stepped down by transformer T1 and rectified by diodes CR1 and CR2. In single-unit chargers, the rectified output is coupled through indicator light I1 and current-shunting resistor R1 to the charging cable. The 7-pin plug on the charging cable connects to the option jack on the Pocket Mate. The indicator light glows when the batteries are charging properly. However, the indicator light will become dimmer as the battery charge increases.

The 6-unit charger uses the same transformer and rectifiers, and has six charging circuits that are identical to the charging circuit in the single unit charger.

CAUTION

Do not connect either unit charger to the Pocket Mate unless batteries have been installed. To do so may damage the radio.

BATTERY CHARGING RACK

The battery charging rack will recharge from one to six pairs of nickel-cadmium batteries when power is supplied by either of the unit chargers.

Connecting plug P1 to charging jack J1 on the unit charger applies the rectified charger output to the six charging circuits. Each circuit consists of an indicator light (I1 through I6) and a current-shunting resistor (R1 through R6).

Placing a pair of batteries into the charger completes the charging circuit, causing the indicator lights to glow. This shows that the batteries are charging properly. However, the indicator lights will become dimmer as the battery charge increases.

DISASSEMBLY

Before starting the disassembly, turn the power OFF by turning the VOLUME-OFF switch counterclockwise until it clicks. Then refer to the Disassembly Diagram (Figure 4) and proceed with the following steps:

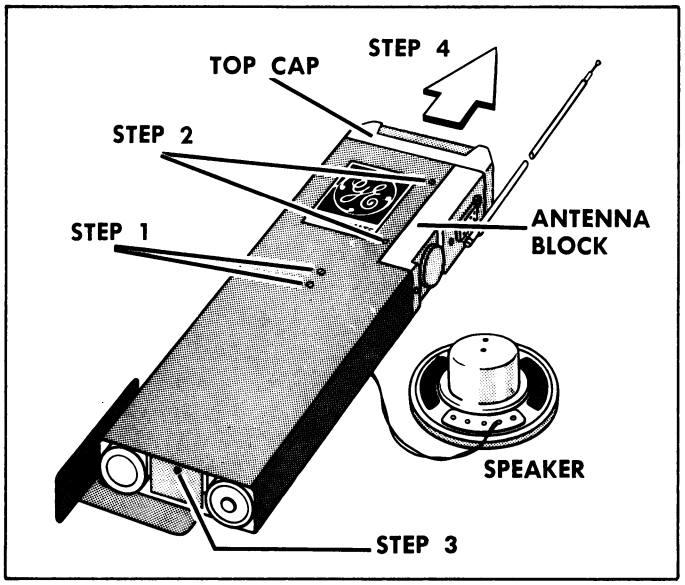
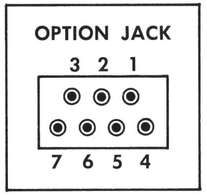
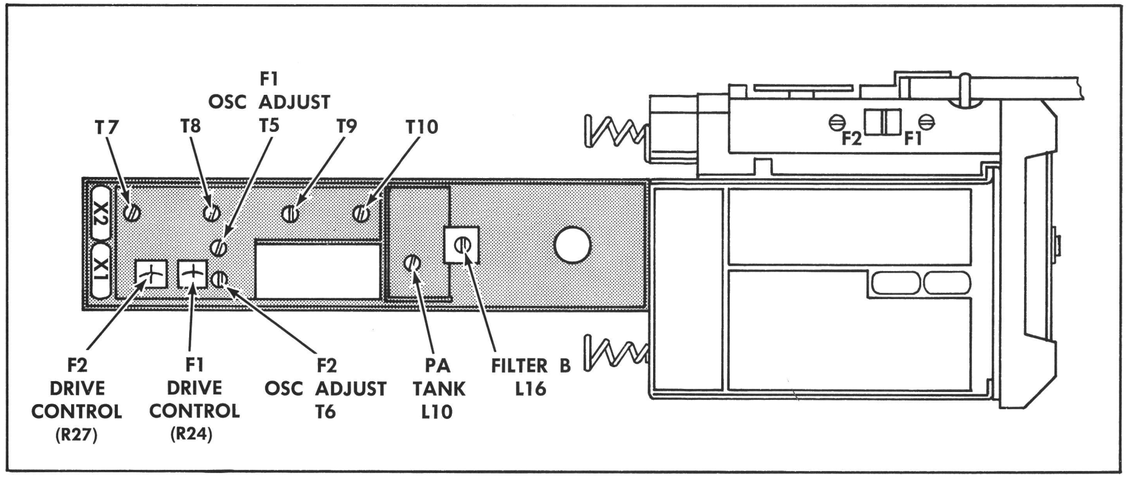


Figure 5 - Disassembly Diagram

1. Place the radio speaker down on a flat surface and remove the speaker retaining screw. Carefully lift out the speaker and disconnect the speaker leads.
2. Remove the four screws (two each side) near the edge of the Antenna Block.
3. Open the bottom cover and remove the screw shown.
4. Slide the chassis out of the case by pulling gently on the top cap. Then reconnect the speaker leads.





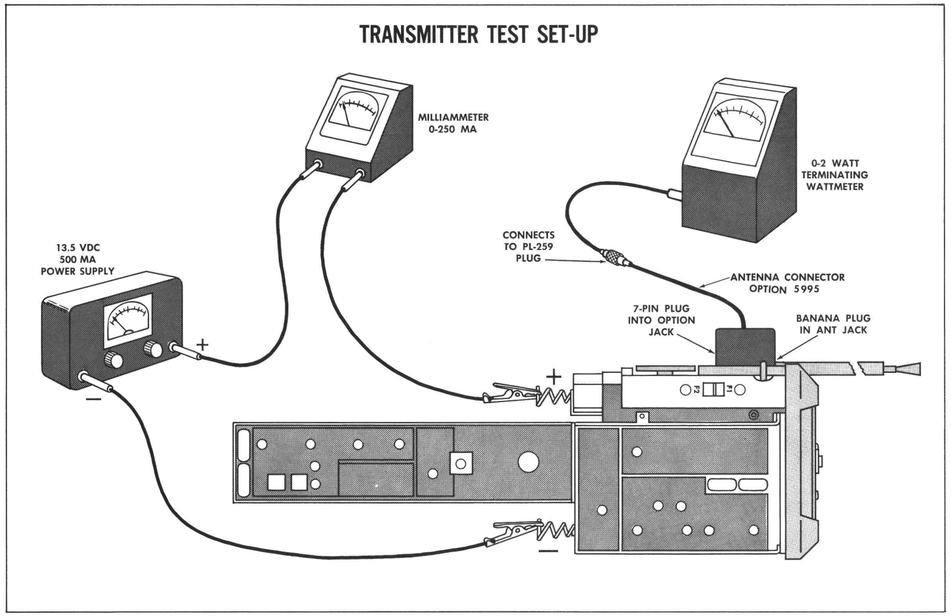
MODULATION LEVEL CHECKS

EQUIPMENT REQUIRED

1. Audio signal generator (Model 4EX6A10 or equivalent).
2. Frequency modulation monitor.
3. Adaptor Cable (Option 5995) connected to wattmeter and power supply connected to radio as shown in Test Setup.

PROCEDURE

1. Loosely couple the Pocket Mate output to the deviation monitor using 6 to 8 turns of wire around the connector on the Adaptor Cable option. Adjust the monitor to the channel frequency.
2. Remove the top cap on the 7-pin option plug and apply a 30-millivolt, 1000-Hz signal to pin 1 (audio high) and pin 7 (ground).
3. Key the transmitter and check for 4.5 kHz deviation. In two-frequency units, check both frequencies.



TRANSMITTER ALIGNMENT

EQUIPMENT REQUIRED

1. 13.5-volt DC, 500-milliamp power supply
2. Terminating wattmeter (0 to 2 watts)
3. Milliamp meter (0 - 300 ma)
4. RF Frequency counter
5. Antenna connector, Option 5995 - mates with PL-259 coax plug

PRELIMINARY STEPS

1. Remove the chassis from the case as shown in the Disassembly Procedure (see page 10). Replace the four screws in the Antenna Block and tighten securely. Then place the shielded side of the chassis on a metallic surface (ground).
2. Connect the test equipment as shown in the Setup Procedure.
3. Adjust the power supply for 13.5-volts DC.
4. Turn the radio on. In two-frequency units, set the Frequency Selector switch in the F1 position.
5. Pre-set R24 (and R27 in two-frequency units) to the mid-range position.

NOTE

All adjustments are made with the transmitter keyed., To protect the transistors, do not key the transmitter over 10 seconds during each adjustment until the alignment is complete.

ALIGNMENT PROCEDURE

STEP	TUNING CONTROL	METER READING	PROCEDURE
1.	T7, T8, T9 and T10	Maximum ma	Adjust T7, T8, T9 and T10 for maximum milliammeter reading.
2.	F1 DRIVE (R24)	100 ma	Adjust F1 Drive for a reading of 100 milliamps.
3.		See procedure	Repeat Steps 1 and 2.
4.	L10 (PA Tank)	Minimum ma	Adjust L10 for minimum milliammeter reading.
5.	L16 (Filter B)	Maximum	Adjust L16 for maximum milliammeter and wattmeter readings.
6.		See procedure	Repeat Steps 4 and 5.
7.	T7, T8, T9, T10 and L16	Maximum	Adjust T7, T8, T9, T10 and L16 for maximum wattmeter reading.
8.	F1 DRIVE (R24)	175 ma	Adjust F1 Drive for a reading of 175 milliamps.
9.		See procedure	Repeat Steps 4 and 5. Power output should be a minimum of 1-watt at 175 milliamps or less.
10.	F2 DRIVE (R27)	175 ma	Move the Frequency Selector switch to the F2 position. Adjust F2 Drive for 175 milliamps.
	FREQUENCY ADJUSTMENT		
11.	T5 (and T6 in 2-freq. units)	See procedure	Move the frequency selector switch to the F1 position. Loosely couple the frequency counter to the transmitter output and adjust T5 for the proper output. For two-frequency units, switch to F2 and adjust T6 for the proper output.

ALIGNMENT PROCEDURE

148—174 MHZ TRANSMITTER
TYPE ES-33-A

RECEIVER ALIGNMENT

This procedure is used for setting the receiver on frequency, and for changing frequency or crystals.

EQUIPMENT REQUIRED

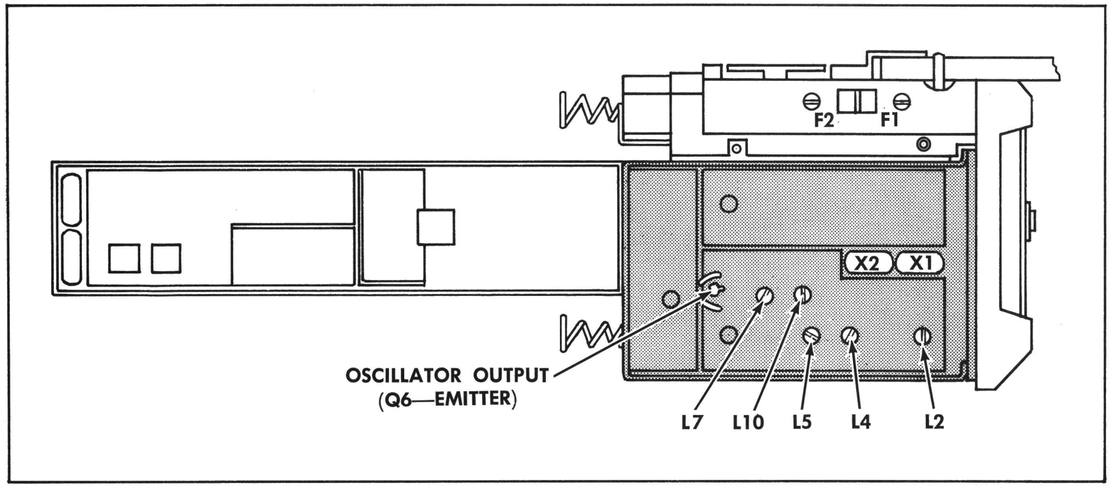
1. 13.5-volt DC, 50 milliamp power supply
2. RF signal generator
3. RF frequency counter
4. Antenna connector (Option 5995)
5. Earphone cable (5495088-P10)
6. 20,000 ohm-per-volt meter with 0-3 volt scale.
7. AC-VTVM

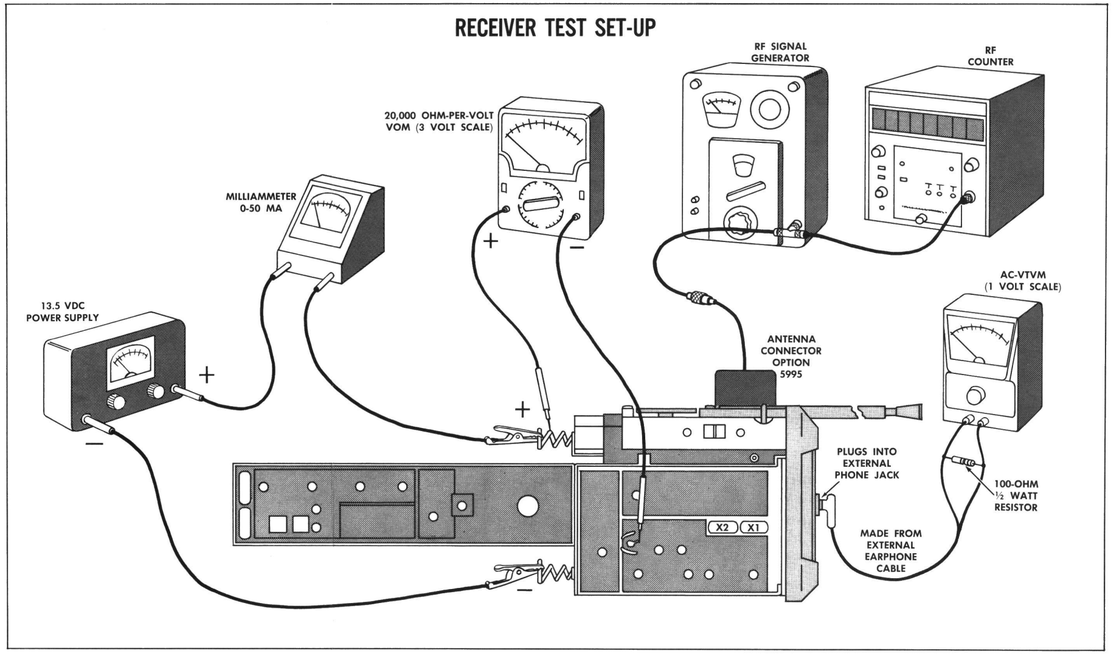
PRELIMINARY STEPS

1. Remove the chassis from the case as shown in the Disassembly Procedure (see page 10). Replace the four screws in the Antenna Block and tighten securely.
2. Connect the test equipment as shown in the Test Setup. Switch the VOM to the 0-3-volt scale, and the AC-VTVM to the 1-volt scale.
3. Adjust the power supply for 13.5-volts DC.
4. Turn the radio on and check the milliammeter for a reading of 10 ma or less. In two-frequency units, set the Frequency Selector Switch to the F1 position.
5. Carefully set the signal generator on the F1 frequency as indicated by the frequency counter.

ALIGNMENT PROCEDURE

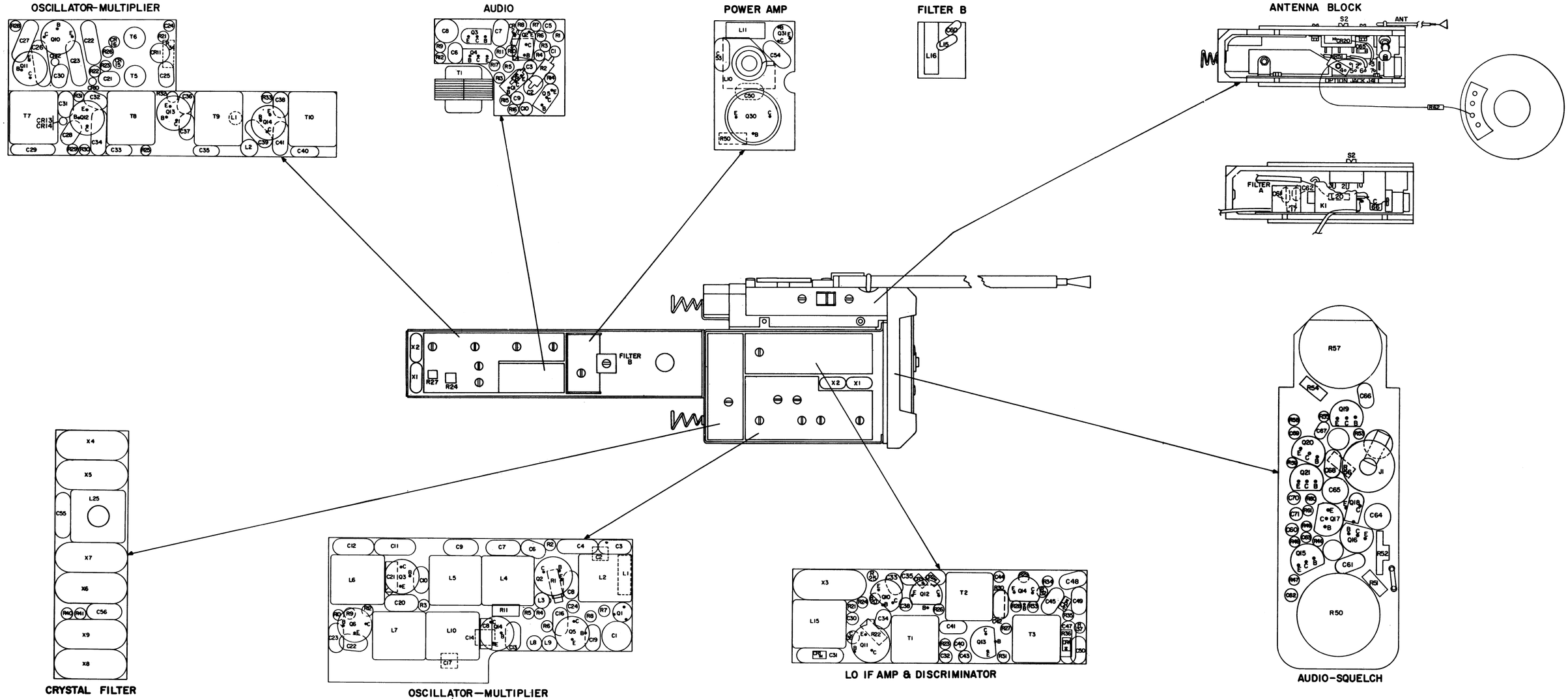
STEP	TUNING CONTROL	METER READING	PROCEDURE
		OSCILLATOR	
1.	L10	Maximum	With the negative probe of the VOM on Oscillator output printed wiring pad,(Q6 emitter) adjust L10 for maximum reading.
2.	L7	Slight Change	Adjust L7 for a slight change in VOM reading.
3.	L10	See procedure	On two-frequency units, set the Frequency Selector switch to the F2 position. If the VOM reading is not within 10% of the F1 reading, readjust L10 slightly to balance the output.
		RF CIRCUITS	
4.			Disconnect the RF counter and VOM. Set the Frequency Selector switch to the F1 position. Adjust the VOLUME control for a zero db (.707 volts) on the AC-VTVM.
5.	L2, L4 and L5	See procedure	Adjust L2, L4 and L5 for minimum meter reading. Reduce the output of the signal generator during this adjustment to maintain a -10 db reading on the AC-VTVM. Repeat this step several times to obtain maximum noise quieting.
6.			Switch the AC-VTVM to the 0.1-volt scale (20 db down from 1-volt scale). Increase the signal generator output for zero db reference on the AC-VTVM.
7.	L7, L2, L4 and L5	Maximum quieting	While keeping the signal generator output on zero db reference, adjust L7, L2, L4 and L5 for maximum quieting. Repeat the adjustments until the best 20 db quieting is obtained.





ALIGNMENT PROCEDURE

148—174 MHZ RECEIVER
TYPE ES-33-A



OUTLINE DIAGRAM

(19R621212, Rev. 1)

148—174 MHZ POCKET MATE
TRANSMITTER-RECEIVER
TYPE ES-33-A

PARTS LIST

LBI-3831A

148-174 MHZ POCKET MATE TRANSMITTER-RECEIVER TYPE ES-33-A REV. B

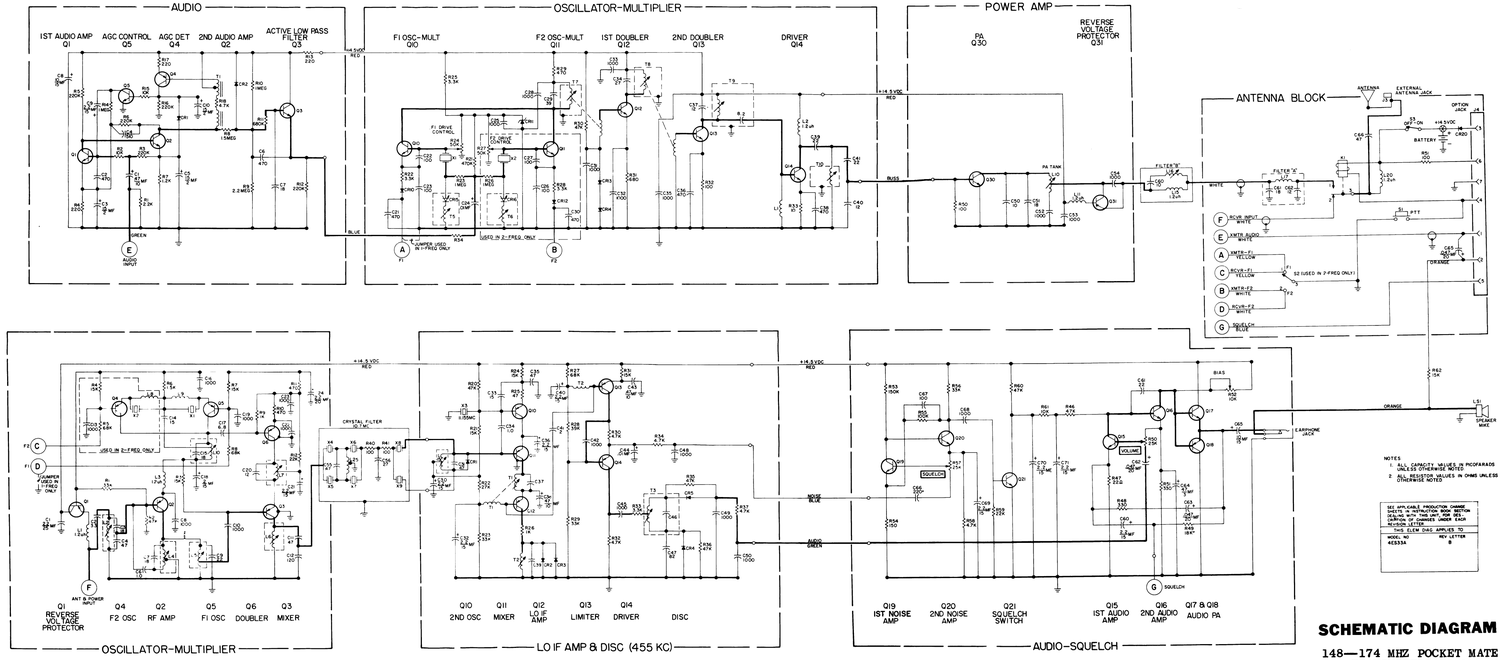
SYMBOL	G-E PART NO.	DESCRIPTION
		TRANSMITTER AUDIO BOARD 19D840723-G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	HT474A	Tantalum: 0.47 µf, 10 VDCW.
C2	8111-025-Z5F0-471M	Ceramic: 470 pf, 50 VDCW.
C3	NY156A	Tantalum: 15 µf, 2 VDCW.
C4	8111-025-Z5F0-511M	Ceramic: 510 pf, 50 VDCW.
C5	NY156A	Tantalum: 15 µf, 2 VDCW.
C6	8111-025-Z5F0-471M	Ceramic: 470 pf, 50 VDCW.
C7	8111-025-C000-180K	Ceramic: 18 pf, 50 VDCW.
C8	G106A	Tantalum: 10 µf, 15 VDCW.
C9	NY225A	Tantalum: 2.2 µf, 15 VDCW.
C10	NY156A	Tantalum: 15 µf, 2 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	TI-7	Rectifier, silicon.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q1	2N4286	Silicon. (1st Audio Amplifier).
Q2	2N4286	Silicon. (2nd Audio Amplifier).
Q3	2N4286	Silicon. (AGC Detector).
Q4	2N4288	Silicon. (AGC Detector).
Q5	2N4286	Silicon. (AGC Control).
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	BB2231	2200 ohms ±10%, 1/8 w.
R2	BB1031	10,000 ohms ±10%, 1/8 w.
R3	BB2241	0.22 megohm ±10%, 1/8 w.
R4	BB2211	220 ohms ±10%, 1/8 w.
R5 and R6	BB2241	0.22 megohm ±10%, 1/8 w.
R7	BB1221	1200 ohms ±10%, 1/8 w.
R8	BB1551	1.5 megohm ±10%, 1/8 w.
R9	BB2251	2.2 megohm ±10%, 1/8 w.
R10	BB1051	1 megohm ±10%, 1/8 w.
R11	BB6841	0.68 megohm ±10%, 1/8 w.
R12	BB2241	0.22 megohm ±10%, 1/8 w.
R13	BB2211	220 ohms ±10%, 1/8 w.
R14	BB1051	1 megohm ±10%, 1/8 w.
R15	BB1031	10,000 ohms ±10%, 1/8 w.
R16	BB2241	0.22 megohm ±10%, 1/8 w.
R17	BB2211	220 ohms ±10%, 1/8 w.
R18	BB4721	4700 ohms ±10%, 1/8 w.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	AMT-10-1	Coupling.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	G-E PART NO	DESCRIPTION
		OSCILLATOR-MULTIPLIER BOARD 19D825-160-G1 1 FREQ 19D825-160-G2 2 FREQ
		- - - - - - - - - CAPACITORS - - - - - - - - -
C21	8111-025-Z5F0-471M	Ceramic: 470 pf, 50 VDCW.
C22 and C23	DM5F101K0100-WV1CR	Mica: 100 pf, 100 VDCW.
C24	DY15	Tantalum: 0.01 µf, 20 VDCW.
C25	8111-025-Z5F0-102M	Ceramic: 1000 pf, 50 VDCW.
C26 and C27	DM5F101K0100-WV1CR	Mica: 100 pf, 100 VDCW. (2 freq).
C28	8111-025-Z5F0-102M	Ceramic: 1000 pf, 50 VDCW.
C29	DM5F470K0100-WV1CR	Mica: 39 pf, 100 VDCW.
C30	8111-025-Z5F0-471M	Ceramic: 470 pf, 50 VDCW. (2 FREQ).
C31 and C32	8111-025-Z5F0-102M	Ceramic: 1000 pf, 50 VDCW.
C33	8111-025-Z5F0-102M-RL	Ceramic: 1000 pf, 50 VDCW.
C34	8111-025-C000-220K	Mica: 22 pf, 100 VDCW.
C35	8111-025-Z5F0-102M-RL	Ceramic: 1000 pf, 50 VDCW.
C36	8111-025-Z5F0-471M	Ceramic: 470 pf, 50 VDCW.
C37	8111-025-C000-130K	Ceramic: 13 pf, 50 VDCW.
C38	8111-025-Z5F0-471M	Ceramic: 470 pf, 50 VDCW.
C39	8111-025-C000-220K	Ceramic: 22 pf, 50 VDCW.
C40	8111-025-C000-130K	Ceramic: 13 pf, 50 VDCW.
C41	8111-025-C000-220K	Ceramic: 22 pf, 50 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR10	DA-68	Rectifier, silicon.
CR11	1N957B	Zener.
CR12	DA-68	Rectifier, silicon. (2 FREQ).
CR13 and CR14	DA-68	Rectifier, silicon.
CR15		(Part of T5).
CR16		(Part of T6). (2 FREQ).
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1	EL-140	Slug tuned coil.
L2	1025-22	Choke: 1.2 µh.
		- - - - - - - - - TRANSISTORS - - - - - - - - -
Q10	2N3646	Silicon (F1 OSC. Mult).
Q11	2N3646	Silicon (F2 OSC. Mult).
Q12	2N3646	Silicon (1st Doubler).
Q13	2N3646	Silicon (2nd Doubler).
Q14	2N3646	Silicon (Driver).
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R21	BB4741	0.47 megohm ±10%, 1/8 w.
R22	BB3321	3300 ohms ±10%, 1/8 w.

(Cont'd on page 18)

TRANSMITTER



RECEIVER

(19B840723, Rev. 2)

NOTES:
1. ALL CAPACITY VALUES IN MICROFARADS UNLESS OTHERWISE NOTED.
2. ALL RESISTOR VALUES IN OHMS UNLESS OTHERWISE NOTED.

SEE ANTI-KABLE PRODUCTION CHANGE SHEETS, IN INSTRUCTION BOOK SECTION DESIGNED WITH THIS UNIT, FOR REVISIONS APPLICABLE TO UNITS EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO

MODEL NO	REV LETTER
4ES33A	B

SCHEMATIC DIAGRAM

148—174 MHZ POCKET MATE TRANSMITTER-RECEIVER TYPE ES-33-A

(Cont'd from page 17) (LBI-3831A)

SYMBOL	G-E PART NO	DESCRIPTION
R23	BB1051	1 megohm ±10%, 1/8 w.
R24	630-1-50K	Variable: carbon, 50,000 ohms.
R25	BB3321	3300 ohms ±10%, 1/8 w.
R26	BB1051	1 megohm ±10%, 1/8 w. (2 FREQ).
R27	630-1-50K	Variable: carbon, 50,000 ohms.
R28	BB3321	3300 ohms ±10%, 1/8 w.
R29	BB4731	470 ohms ±10%, 1/8 w.
R30	BB4731	47,000 ohms ±10%, 1/8 w.
R31	BB6411	680 ohms ±10%, 1/8 w.
R32	BB1011	100 ohms ±10%, 1/8 w.
R33	BB1001	10 ohms ±10%, 1/8 w.
		---------- TRANSFORMERS ----------
T5	EL-227	RF Coil.
T6	EL-227	RF Coil. (2 FREQ).
T7	EL-197	RF Coil.
T8	EL-212	RF Coil.
T9	EL-213	RF Coil.
T10	EL-210	RF Coil.
		---------- CRYSTALS ----------
		NOTE: Crystal frequency = operating freq. ± 5.
X1	19B213301-P1	18.5 - 22 MHz.
X2	19B213301-P1	18.5 - 22 MHz. (2 FREQ).
		POWER AMPLIFIER MODULE PL-C225-213-G1
		---------- CAPACITORS ----------
C50	8111-026-COGO-100K	Ceramic: 10 pf, 50 VDCW.
C51	8111-025-COGO-102K	Ceramic: 18 pf, 50 VDCW.
C52 thru C54	8111-025-COGO-102K	Ceramic: 1000 pf, 50 VDCW.
		---------- INDUCTORS ----------
L10	EL-202	Choke.
L11	CWL1.20	1.2 μh.
		---------- TRANSISTORS ----------
Q30	19A115304-P1	Silicon. (Power Amplifier).
Q31	0C59	Germanium. (Reverse Volt. Protector).
		---------- RESISTORS ----------
R50	BB1011	100 ohms ±10%, 1/8 w.
		RF FILTER B PL-B225-224-G1
		---------- CAPACITORS ----------
C60	1C10BK	Ceramic: 10 pf, ±50 VDCW.
		---------- INDUCTORS ----------
L15	CWL1.20	Choke: 1.2 μh.
L16	EL224	Tuned coil.

SYMBOL	G-E PART NO	DESCRIPTION
		RECEIVER OSCILLATOR-MULTIPLIER BOARD PL-D225-175-G1 1 FREQ PL-D225-175-G2 2 FREQ
		---------- CAPACITORS ----------
C1	CL106A	Tantalum: 2.2 μf, 25 VDCW.
C2	8101-025-COGO-039K	Ceramic: 3.3 pf, 50 VDCW.
C3	8111-025-COGO-180K	Ceramic: 18 pf, 50 VDCW.
C4	DM5S470ED100-WVICR	Ceramic: 47 pf, 50 VDCW.
C5	8101-026-COGO-103K	Ceramic: 1.0 pf, 50 VDCW.
C7	8111-025-COGO-180K	Ceramic: 18 pf, 50 VDCW.
C8	8111-025-ZSPO-103M	ceramic: 1000 pf, 50 VDCW,
C9	8111-025-COGO-220K	Ceramic: 22 pf, 50 VDCW.
C10	8111-025-ZSPO-103M	Ceramic: 1000 pf, 50 VDCW.
C11	DM5S470ED100-WVICR	Mica: 47 pf, 100 VDCW.
C12	DM5S121ED100-WVICR	Mica: 120 pf, 100 VDCW.
C13	8111-025-ZSPO-130M	Ceramic: 1000 pf, 50 VDCW. (2 freq only).
C14	8111-025-COGO-150K	Ceramic: 15 pf, 50 VDCW.
C15	8111-025-COGO-180K	(Part of L10).
C16	8111-025-ZSPO-103M	Ceramic: 1000 pf, 50 VDCW.
C17	8102-025-COGO-680K	Ceramic: 6.8 pf, 50 VDCW.
C18	HY225A	Tantalum: 2 μf, 15 VDCW.
C19	8111-025-ZSPO-103M	Ceramic: 1000 pf, 50 VDCW.
C20	8111-025-COGO-120K	Ceramic: 12 pf, 50 VDCW.
C21	8111-025-ZSPO-130M	Tantalum: 2.2 μf, 15 VDCW.
C22 and C23	8111-025-ZSPO-103M	Ceramic: 1000 pf, 50 VDCW.
C24	A225A	Tantalum: 2.2 μf, 20 VDCW.
		---------- INDUCTORS ----------
L1	CWL1.20	Choke: 1.2 μh.
L2	EL208	Tuned coil, 148-174 MHz.
L3	CWL1.20	Choke: 1.2 μh.
L4 and L5	EL207	Tuned coil, 148-174 MHz.
L6	EL204	Tuned coil, 137.3-163.3 MHz.
L7	EL205	Tuned coil, 137.3-163.3 MHz.
L8	EL209	Coil. (2 freq only).
L9	EL209	Coil.
L10	EL206	Tuned coil, 68.6-93.4 MHz. (Includes C15, 18 pf).
		---------- TRANSISTORS ----------
Q1	2N4290	Germanium. (Reverse Voltage Protector).
Q2	2N3399	Germanium. (RF Amplifier).
Q3	2N3399	Germanium. (Mixer).
Q4	2N3640	Silicon. (2 freq. Oscillator).
Q5	2N3640	Silicon. (1 freq Oscillator).
Q6	2N3399	Germanium. (Doubler).

SYMBOL	G-E PART NO	DESCRIPTION
		---------- RESISTORS ----------
R1	BB3321	33,000 ohms ±10%, 1/8 w.
R2	BB4721	47,000 ohms ±10%, 1/8 w.
R3	BB1531	15,000 ohms ±10%, 1/8 w.
R4	BB1531	15,000 ohms ±10%, 1/8 w. (2 freq only).
R5	BB6831	68,000 ohms ±10%, 1/8 w. (2 freq only).
R6	BB1521	1500 ohms ±10%, 1/8 w.
R7	BB1531	15,000 ohms ±10%, 1/8 w.
R8	BB6831	68,000 ohms ±10%, 1/8 w.
R9	BB1021	1000 ohms ±10%, 1/8 w.
R10 and R11	BB4711	470 ohms ±10%, 1/8 w.
R12	BB2321	22,000 ohms ±10%, 1/8 w.
		---------- CRYSTALS ----------
		NOTE: Crystal frequency = operating freq. -10.7 MHz ± 2.
X1	19B213197-P1	68.6 - 93.4 MHz.
X2	19B213197-P1	68.6 - 93.4 MHz. (2 freq only).
		10.7 MHz CRYSTAL FILTER PL-C225-105-G1
		---------- CAPACITORS ----------
C55	DM5S470ED100-WVICR	Mica: 0.47 pf, 100 VDCW.
C56	8121-025-COGO-270K	Ceramic: 27 pf, 50 VDCW.
		---------- INDUCTORS ----------
L25	EL214	Tuned coil: 10.7 MHz.
		---------- RESISTORS ----------
R40 and R41	BB1011	100 ohms ±10%, 1/8 w.
		---------- CRYSTALS ----------
X4	A774A	10.7 MHz.
X5	B774A	10.7 MHz.
X6	A774A	10.7 MHz.
X7	B774A	10.7 MHz.
X8	A774A	10.7 MHz.
X9	B774A	10.7 MHz.
		LO IF AMPLIFIER AND DISCRIMINATOR BOARD PL-B225-168-G1
		---------- CAPACITORS ----------
C30	HY225A	Tantalum: 2.2 μf, 15 VDCW.
C31	8121-025-COGO-470K	Ceramic: 47 pf, 50 VDCW.
C32	HY225A	Tantalum: 2.2 μf, 15 VDCW.
C33	8111-025-COGO-150K	Ceramic: 15 pf, 50 VDCW.
C34	8101-026-COGO-106K	Ceramic: 1.0 pf, 50 VDCW.
C35	DM5S470ED100-WVICR	Mica: 47 pf, 100 VDCW.
C36	HT474A	Tantalum: 0.47 pf, 10 VDCW. (Part of T1).
C37		
C38	T473A	Tantalum: 0.47 pf, 10 VDCW. (Part of T3).
C39		

SYMBOL	G-E PART NO	DESCRIPTION
C40	HY225A	Tantalum: 2.2 μf, 15 VDCW.
C41	8101-026-COGO-329K	Ceramic: 18 pf, 50 VDCW.
C42	8111-025-ZSPO-103M	Ceramic: 43 pf, 50 VDCW.
C43	HT474A	Tantalum: 0.47 pf, 10 VDCW.
C44	DY15	Tantalum: .01 pf, 20 VDCW.
C45	8111-025-ZSPO-103M	Ceramic: 1000 pf, 50 VDCW.
C46		(Part of T3).
C47	DM5F820ED100-WVICR	Mica: 82 pf, 100 VDCW.
C48 thru C50	8111-025-ZSPO-103M	Ceramic: 1000 pf, 50 VDCW.
		---------- DIODES AND RECTIFIERS ----------
CR1 thru CR5	D4-68	Rectifier, silicon.
		---------- INDUCTORS ----------
L15	EL-211	Tuned coil, 10.7 MHz.
		---------- TRANSISTORS ----------
Q10	2N4126	Silicon. (2nd Oscillator).
Q11	2N3399	Germinium. (Mixer).
Q12	2N3399	Germanium. (LO IF Amplifier).
Q13	2N4126	Silicon. (limiter).
Q14	2N4126	Silicon. (Driver).
		---------- RESISTORS ----------
R20	BB4731	47,000 ohms ±10%, 1/8 w.
R21	BB1531	15,000 ohms ±10%, 1/8 w.
R22	BB2731	27,000 ohms ±10%, 1/8 w.
R23	BB3331	33,000 ohms ±10%, 1/8 w.
R24	BB1531	15,000 ohms ±10%, 1/8 w.
R25	BB4701	47 ohms ±10%, 1/8 w.
R26	BB1021	1000 ohms ±10%, 1/8 w.
R27	BB6831	68,000 ohms ±10%, 1/8 w.
R28	BB3931	39,000 ohms ±10%, 1/8 w.
R29	BB3331	33,000 ohms ±10%, 1/8 w.
R30	BB4721	4700 ohms ±10%, 1/8 w.
R31	BB1531	15,000 ohms ±10%, 1/8 w.
R32	BB4721	4700 ohms ±10%, 1/8 w.
R33	BB3321	3300 ohms ±10%, 1/8 w.
R34	BB4731	4700 ohms ±10%, 1/8 w.
R35 and R36	BB4731	47,000 ohms ±10%, 1/8 w.
R37	BB4721	4700 ohms ±10%, 1/8 w.
		---------- TRANSFORMERS ----------
T1	X7B(X71FTA)	IF: 455 KHz.
T2	X7B(X71FTA)	IF: 455 KHz.
T3	X7T(X71FTA)	Discriminator: 455 KHz.
		---------- CRYSTALS ----------
X3	19B213199-P1	81 IF: 11.155 MHz.

SYMBOL	G-E PART NO	DESCRIPTION
		AUDIO SQUELCH BOARD PL-B225-180-G1
		---------- CAPACITORS ----------
C60	HY225A	Tantalum: 2.2 μf, 15 VDCW.
C61	8111-025-COGO-220K	Ceramic: 22 pf, 50 VDCW.
C62 and C63	T473A	Tantalum: .047 μf, 20 VDCW.
C64	G476A	Tantalum: 47 μf, 3 VDCW.
C65	G106A	Tantalum: 10 μf, 15 VDCW.
C66	8101-025-ZSPO-221K	Ceramic: 22 pf , 50 VDCW.
C67	8101-025-ZSBO-101K	Ceramic: 100 pf, 50 VDCW.
C68	8111-025-ZSPO-103K	Ceramic: 1000 pf, 50 VDCW.
C69 thru C71	HY225A	Tantalum: 2.2 μf, 15 VDCW.
		---------- JACKS AND RECEPTACLES ----------
J1	560-J	Jack, earphone.
		---------- TRANSISTORS ----------
Q15	2N2925	Silicon (1st Audio Amplifier).
Q16	2N2925	Silicon (2nd Audio Amplifier).
Q17	2N2925	Silicon (Audio PA).
Q18	2N4290	Silicon. (Audio PA).
Q19	2N2925	Silicon (1st Noise Amplifier).
Q20	2N2925	Silicon (2nd Noise Amplifier).
Q21	2N2925	Silicon (Squelch Switch).
		---------- RESISTORS ----------
R46	BB4721	47,000 ohms ±10%, 1/8 w.
R47	BB2201	22 ohms ±10%, 1/8 w.
R48	BB3311	330 ohms ±10%, 1/8 w.
R49	BB1831	18,000 ohms ±10%, 1/8 w.
R50	RK3-253-5	Carbon: 25,000 ohms. (VOLUME).
R51	BB3311	330 ohms ±10%, 1/8 w.
R52	RFB-P633A-10K	Carbon: 10,000 ohms.
R53	BB1541	0.15 megohm ±10%, 1/8 w.
R54	BB1511	150 ohms ±10%, 1/8 w.
R55	BB1041	0.10 megohm ±10%, 1/8 w.
R56	BB3331	33,000 ohms ±10%, 1/8 w.
R57	RK3-253-5	Carbon: 25,000 ohms. (SQUELCH).
R58	BB4721	4700 ohms ±10%, 1/8 w.
R59	BB2331	33,000 ohms ±10%, 1/8 w.
R60	BB4731	47,000 ohms ±10%, 1/8 w.
R61	BB1031	10,000 ohms ±10%, 1/8 w.
		ANTENNA BLOCK PL-C225-217-G1
		---------- CAPACITORS ----------
C65	T473A	Tantalum: .047 μf, 20 VDCW.
C66	DM5S470ED100-WVICR	Mica: 47 pf, 100 VDCW.
		---------- DIODES AND RECTIFIERS ----------
CR20	1N474A	Silicon. (GE 5494922-P8).

SYMBOL	G-E PART NO	DESCRIPTION
		---------- JACKS AND RECEPTACLES ----------
J3		Internal antenna jack.
J4	A225-191	7 pin.
		---------- RELAYS ----------
K1	RP-67006	Reed.
		---------- INDUCTORS ----------
L20	CWL1.20	Choke: 1.2 μh.
L21	RP-6-32	Relay coil (for K1).
		---------- RESISTORS ----------
R62*	BB1531	15,000 ohms ±10%, 1/8 w. (Added by Rev B).
		---------- SWITCHES ----------
S1		(Push to talk).
S2	S812	SPDT (2 freq).
		RF FILTER A PL-225-205-G1
		---------- CAPACITORS ----------
C61	8111-025-COGO-180K	Ceramic: 18 pf.
C62	8111-025-COGO-120K	Ceramic: 12 pf.
		---------- INDUCTORS ----------
L17	EL223	Coil.
		---------- MISCELLANEOUS ----------
LS1	B225-124	Speaker.
	B225-2592	Speaker gasket.
	C225-207	Cover. (Audio Squelch).
	C225-128	Case.
	B225-137	Antenna assembly.
		Pashead screw: 0-80 x 1/4 Phillips SS. (Mounts Antenna Block and Audio Squelch).
		Pashead screw: 0-80 x 1/8 Phillips SS. (Mounts Audio Squelch; frame to to case).
		Flathead screw: 0-80 x 1/8 Phillips SS. (Mounts Audio Squelch).
		Flathead screw: cadmium plate, SMX.40NK x 5/16. (Mounts speaker LS1).
	RP-257667	Nameplate (Serial no.).
	RP-257677	Nameplate (GE Monogram).
	19B201713-P2	Battery: Nickel-Cadmium, 8 volts.
	19B201709-P1	Battery: Mercury, 8 volts; sub to Burgess H136S, Everady B-136S, Mallory TR-136S.
	A325-7	Spring (for battery).
	B225-211	Knob (for R50-Volume and R57-Squelch).
	19A137036-P1	Button. (Push to Talk).

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 revisions stamped on the unit includes all previous revisions. Refer to the Parts List for descriptions of parts affected by these revisions.

REV. A - Incorporated into initial shipment.

REV. B - To reduce transmitter distortion, Added R62 between Option Jack J4 and speaker-microphone L21.

PARTS LIST

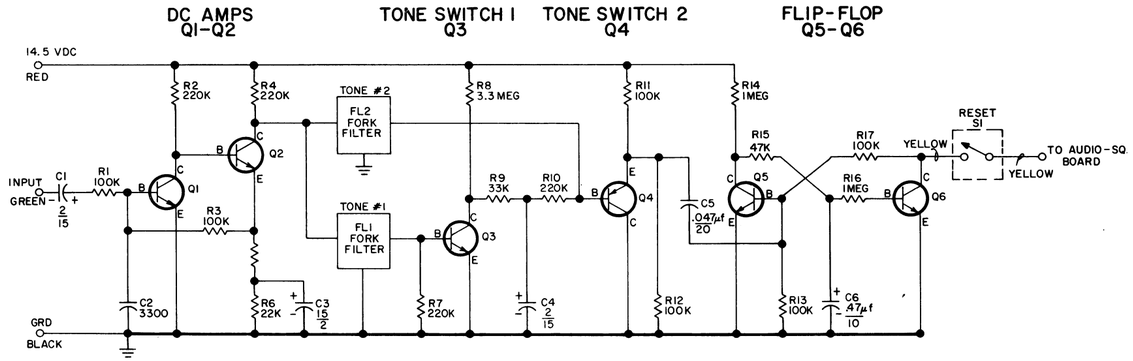
LBI-3922

SELECTIVE CALLING DECODER D225-309

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	HV225A	2 pf, 15 VDCW.
C2	1E3300RM	3300 pf, 50 VDCW.
C3	HV156A	15 pf, 2 VDCW.
C4	HV225A	2 pf, 15 VDCW.
C5	Y473A	.047 µf, 20 VDCW.
C6	HY474A	0.47 µf, 10 VDCW.
		- - - - - - - - - - FILTERS - - - - - - - - - -
		Note: When reordering, specify exact frequency needed and give drawing number in parts column.
FL1 and FL2	19A122789-P	
	5175	517.5 Hz
	5325	532.5 Hz
	5475	547.5 Hz
	5625	562.5 Hz
	5775	577.5 Hz
	5925	592.5 Hz
	6075	607.5 Hz
	6225	622.5 Hz
	6375	637.5 Hz
	6525	652.5 Hz
	6675	667.5 Hz
	6825	682.5 Hz
	6975	697.5 Hz
	7125	712.5 Hz
	7275	727.5 Hz
	7425	742.5 Hz
	7575	757.5 Hz
	7725	772.5 Hz
	7875	787.5 Hz
	8025	802.5 Hz
	8175	817.5 Hz
	8325	832.5 Hz
	8475	847.5 Hz
	8625	862.5 Hz
	8775	877.5 Hz
	8925	892.5 Hz
	9075	907.5 Hz
	9225	922.5 Hz
	9375	937.5 Hz
	9525	952.5 Hz
	9675	967.5 Hz
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q3	2N4286	Silicon.
Q4	2N4284	Silicon.
Q5 and Q6	2N4286	Silicon.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	BB1041	.10 megohms ±10%, 1/8 w.
R2	BB2241	.22 megohms ±10%, 1/8 w.
R3	BB1041	.10 megohms ±10%, 1/8 w.
R4	BB2241	.22 megohms ±10%, 1/8 w.
R5	BB2211	220 ohms ±10%, 1/8 w.
R6	BB2231	22,000 ohms ±10%, 1/8 w.
R7	BB2241	.22 megohms ±10%, 1/8 w.
R8	BB3351	3.3 megohms ±10%, 1/8 w.
R9	BB3331	33,000 ohms ±10%, 1/8 w.
R10	BB2241	.22 megohms ±10%, 1/8 w.
R11 thru R13	BB1041	.10 megohms ±10%, 1/8 w.
R14	BB1051	1 megohm ±10%, 1/8 w.
R15	BB4731	47,000 ohms ±10%, 1/8 w.
R16	BB1051	1 megohm ±10%, 1/8 w.
R17	BB1041	.10 megohms ±10%, 1/8 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	SS12	Slide, SPDT.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	PS-406-63	Socket, Reed. (Used with FL1 and FL2).
	B225-292	Tone option housing. Includes: Panhead screw: 0-80 x 3/8 Phillips SS. (2) Panhead screw: 0-80 x 1/2 Phillips SS. (2)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

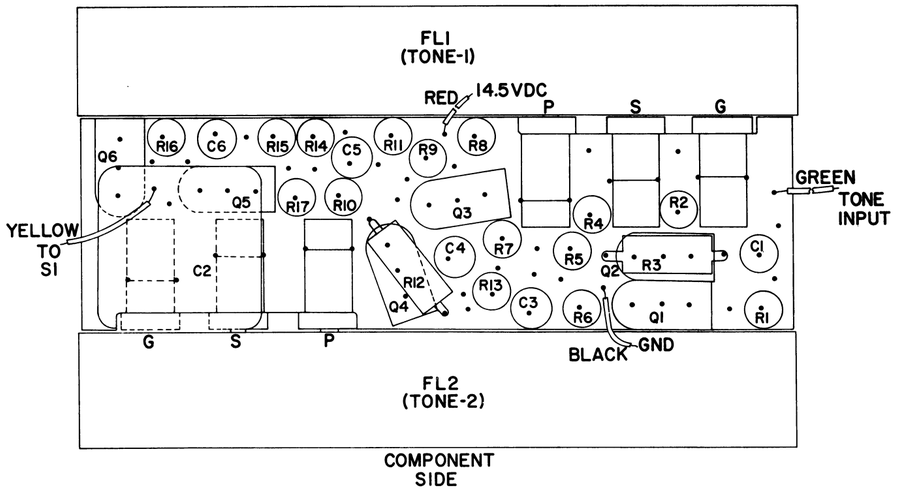
SCHEMATIC DIAGRAM



(19C311967, Rev. 0)

NOTE:
1. ALL CAPACITORS IN PICOFARADS UNLESS OTHERWISE INDICATED.

OUTLINE DIAGRAM

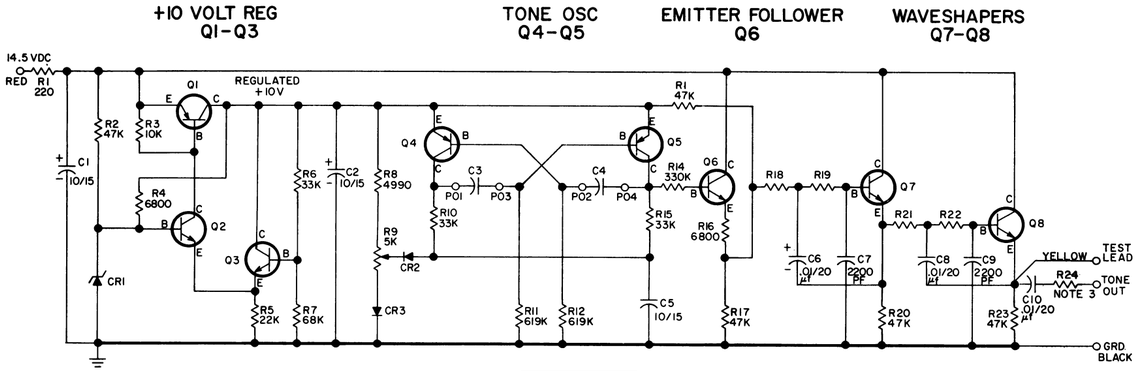


(19C311965, Rev. 0)

SCHEMATIC & OUTLINE DIAGRAMS

SELECTIVE CALLING DECODER

SCHEMATIC DIAGRAM



R11, R12	FREQ. RANGE (HZ)	C3, C4 (SELECT AT TEST)
619K	66.1-83.5	.02
	83.5-105.5	*.01, *.005
	105.5-133	*.01, *.002
	133-167	.01
	167-212	*.005, *.002, *.001
	212-270	*.005, *.001

*CONNECTED IN PARALLEL

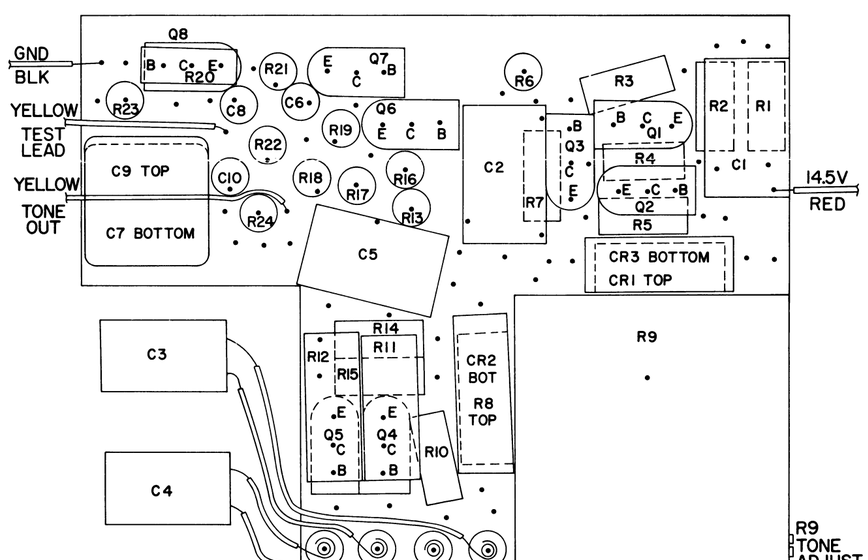
BAND	FREQ. RANGE (HZ)	SELECT AT TEST R18, R21	SELECT AT TEST R19, R22
1	67-95	150K	680K
2	95-135	100K	470K
3	135-190	68K	330K
4	190-270	47K	220K

NOTES:

1. SELECT 2N4284'S FOR B MIN. OF 40 @ 100 UAIC.
2. ALL CAPACITORS IN PICOFARADS UNLESS OTHERWISE INDICATED.
3. SELECT AT TEST (NOMINAL 3.3 MEGOHMS)

(19C311966, Rev. 0)

OUTLINE DIAGRAM



SCHEMATIC & OUTLINE DIAGRAMS

(19C311968, Rev. 0)

CHANNEL GUARD ENCODER

PARTS LIST

LBI-3921

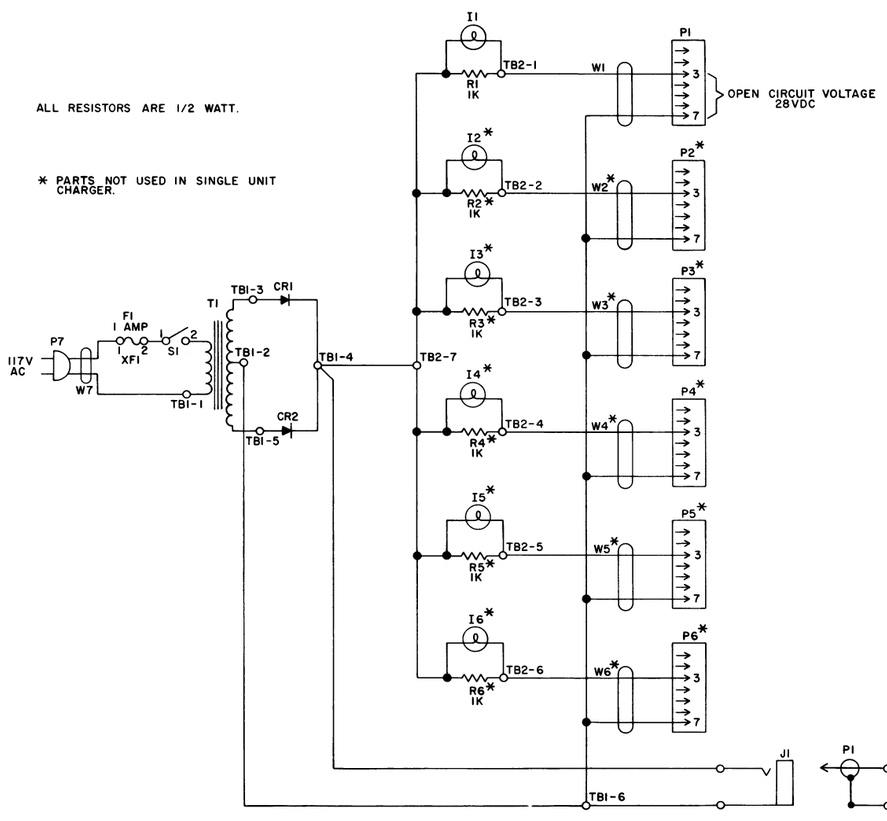
CHANNEL GUARD ENCODER
D225-249

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 and C2	G106A	10 pf, 15 VDCW.
C3	PA22	.02 µf (Used in 66.1 - 83.5 Hz range).
		.015 µf (Used in 83.5 - 105.5 Hz range). Order by PA Type .015 µf.
	PA21 and PA32	.012 µf (Used in 105.5 - 133 Hz range).
	PA21	.01 µf (Used in 133 - 167 Hz range).
		.0082 µf (Used in 167 - 212 Hz range). Order by PA Type .0082 µf.
C5	G106A	10 pf, 15 VDCW.
C6	DY15	.01 µf, 20 VDCW.
C7	1E2200RM	2200 pf, 50 VDCW.
C8	DY15	.01 µf, 20 VDCW.
C9	1E2200RM	2200 pf, 50 VDCW.
C10	DY15	.01 µf, 20 VDCW.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1	1N957A	Zener.
CR2 and CR3	1N695	Germanium.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1	2N4290	Silicon.
Q2 and Q3	2N4286	Silicon.
Q4 and Q5		Selected 2N4284 with Beta min. of 40 at 100 µaIc.
Q6 thru Q8	2N4286	Silicon.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	BB2211	220 ohms ±10%, 1/8 w.
R2	BB4731	47,000 ohms ±10%, 1/8 w.
R3	BB1031	10,000 ohms ±10%, 1/8 w.
R4	BB6821	6800 ohms ±10%, 1/8 w.
R5	BB2231	22,000 ohms ±10%, 1/8 w.
R6	BB3331	33,000 ohms ±10%, 1/8 w.
R7	BB6831	68,000 ohms ±10%, 1/8 w.
R8	CCM 4990R1	4990 ohms ±1%, 1/8 w.
R9	2901P-5K	5000 ohms.
R10	BB3331	33,000 ohms ±10%, 1/8 w.
R11 and R12	416E-6193F	619,000 ohms ±1%, 1/8 w.
R13	BB4731	47,000 ohms ±10%, 1/8 w.
R14	BB3341	330,000 ohms ±10%, 1/8 w.
R15	BB3331	33,000 ohms ±10%, 1/8 w.
R16	BB6821	6800 ohms ±10%, 1/8 w.
R17	BB4731	47,000 ohms ±10%, 1/8 w.
R18	BB1541	.15 megohm ±10%, 1/8 w. (Used in 67-95 Hz range).
	BB1041	.10 megohm ±10%, 1/8 w. (Used in 95-135 Hz range).
	BB6831	68,000 ohms ±10%, 1/8 w. (Used in 135-190 Hz range)
	BB4731	47,000 ohms ±10%, 1/8 w. (Used in 190-270 Hz range)
R19	BB6841	.68 megohm ±10%, 1/8 w. (Used in 67-95 Hz range).
	BB4741	.47 megohm ±10%, 1/8 w. (Used in 95-135 Hz range).
	BB3341	.33 megohm ±10%, 1/8 w. (Used in 135-190 Hz range).
	BB2241	.22 megohm ±10%, 1/8 w. (Used in 190-270 Hz range).
R20	BB4731	47,000 ohms ±10%, 1/8 w.
R21	BB1541	.15 megohm ±10%, 1/8 w. (Used in 67-95 Hz range).
	BB1041	.10 megohm ±10%, 1/8 w. (Used in 95-135 Hz range).
	BB6831	68,000 ohms ±10%, 1/8 w. (Used in 135-190 Hz range)
	BB4731	47,000 ohms ±10%, 1/8 w. (Used in 190-270 Hz range)
R22	BB6841	.68 megohm ±10%, 1/8 w. (Used in 67-95 Hz range).
	BB4741	.47 megohm ±10%, 1/8 w. (Used in 95-135 Hz range).
	BB3341	.33 megohm ±10%, 1/8 w. (Used in 135-190 Hz range).
	BB2241	.22 megohm ±10%, 1/8 w. (Used in 190-270 Hz range).
R23	BB4731	47,000 ohms ±10%, 1/8 w.
R24		Nominal 3.3 megohm ±10%, 1/8 w; sim to BB3351.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	B225-288	Tone option housing. Includes:
		Panhead screw: 0-80 x 3/8 Phillips SS. (2)
		Panhead screw: 0-80 x 1/2 Phillips SS. (2)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SCHEMATIC DIAGRAM

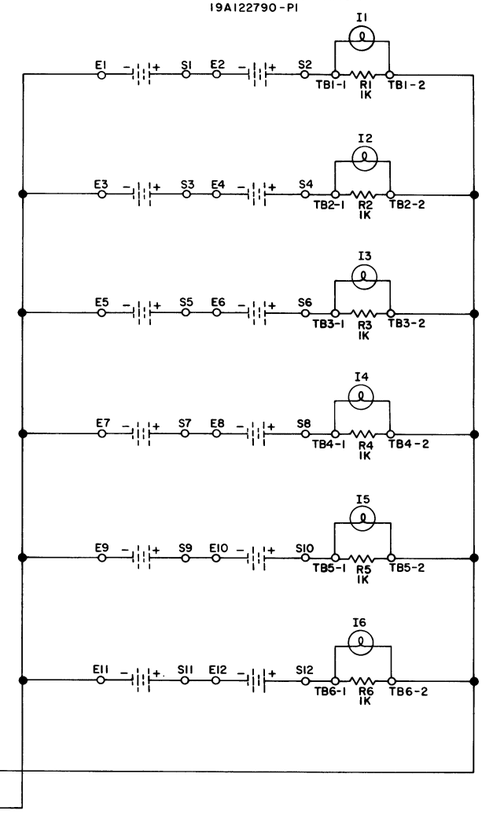
BATTERY CHARGER
19A122797-P1 (6-UNIT CHARGER)
19A122797-P2 (SINGLE-UNIT CHARGER)



(19C311771, Rev. 0)

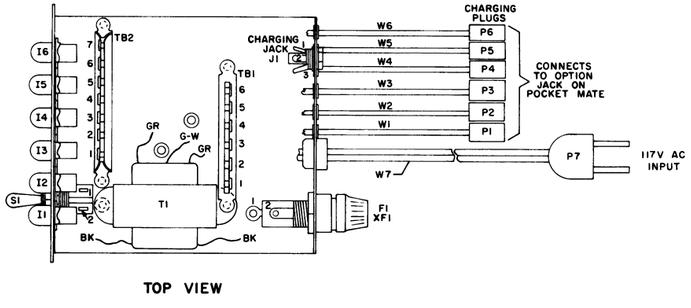
SCHEMATIC DIAGRAM

BATTERY CHARGING RACK
19A122790-P1

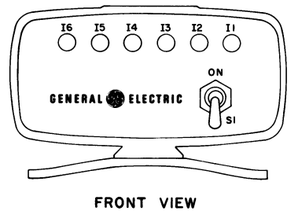


(19C311772, Rev. 0)

OUTLINE DIAGRAM



TOP VIEW

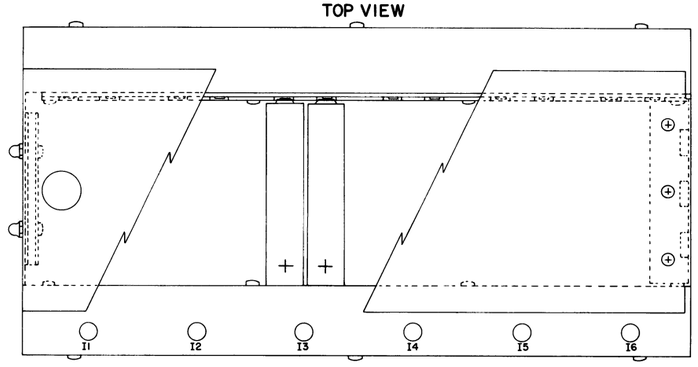


FRONT VIEW

(19C311775, Rev. 0)

OUTLINE DIAGRAM

TOP VIEW



(19C311777, Rev. 0)

SCHEMATIC & OUTLINE DIAGRAMS

UNIT CHARGERS 19A122797-P1 & 2
BATTERY CHARGING RACK 19A122970-P1

PARTS LIST

LBI-3837A

SINGLE UNIT CHARGER 19A122797-P2
6 UNIT CHARGER 19A122797-P1

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1 and CR2	4037822-P1	Silicon.
		- - - - - - - - - - - FUSES - - - - - - - - - - -
F1	1R16-P12	Quick blowing: 1/8 amp at 250 v; sim to Littelfuse 312.125 or Bussmann AGC-1/8.
		- - - - - - - - INDICATING DEVICES - - - - - - - -
I1	19A115097-P2	Light, indicator: red transparent lens, 10 volts; sim to Drake 5682.
I2 thru I6	19A115097-P2	Light, indicator: red transparent lens, 10 volts; sim to Drake 5682. (Used in 19A122797-P1 only).
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1	5494642-P1	Jack: telephone, sub-miniature; sim to Switchcraft Tini-Jax 42A.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P1 thru P6		Plug: N/C 7 pin nylon. (Part of W1-W6 cable assembly A225-611). (Used in 19A122797-P1 only).
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.
R2 thru R6	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w. (Used in 19A122797-P1 only).
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1	7478623-P1	Toggle: SPST, 3 amps at 250 VDC; sim to Arrow-Hart and Hegeman 20994-BJC.
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	19B209017-P1	Power: rectifier, single phase, Pri: 117 v, 50/60 cycles, Sec 1: 25/25 v.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7115374-P6	Phen: 6 terminals; sim to HB Jones 326-20-06-210.
TB2	7115374-P7	Phen: 7 terminals; sim to HB Jones 326-20-07-211. (Used in 19A122797-P1 only).
TB2	7775500-P52	Phen: 2 terminals. (Used in 19A122797-P2).
		- - - - - - - - - - CABLES - - - - - - - - - -
W1 thru W6	A225-611	Charging cable assembly. (Includes P1-P6).
W7	4036441-P7	Power: approx 7 feet long, with 2-contact plug; sim to GE 2073-1.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XF1	19B209005-P1	Fuseholder, post type, phen: 15 amps at 250 v; sim to Littelfuse 342012.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PARTS LIST

BATTERY HOLDER RACK
19A122790-P1

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - INDICATING DEVICES - - - - - - - -
I1 thru I6	19A115097-P2	Light, indicator: red transparent lens, 10 volts; sim to Drake 5682.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P1	5494642-P11	Plug: telephone, sub-miniature; sim to Switchcraft Tini-Plug 750.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 thru R6	3R77-P102K	Composition: 1000 ohms ±10%, 1/2 w.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

ORDERING SERVICE PARTS

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

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

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

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

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

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