

GE MOBILE RADIO

MASTR TM *Personal Series*
PROGRESS LINE

PE HIGH SENSITIVITY MODELS

150.8-174 MHz, RECEIVER MODELS 4ER59B11 & 4ER59B13

(Includes Options 4228 and 4229)



SPECIFICATIONS *

Type Number	ER-59-B	
Audio Output (EIA)	500 milliwatts at less than 5% distortion	
Channel Spacing	30 kHz	
Sensitivity		
12-dB SINAD (EIA Method)	0.25 μ V	
20-dB Quieting Method	0.35 μ V	
Selectivity		
EIA Two-Signal	-75 dB at ± 30 kHz	
20-dB Quieting Method	-110 dB at ± 30 kHz	
Spurious Response	-70 dB	
Intermodulation (EIA)	-60 dB	
Audio Response	Within +2 and -10 dB of a standard 6-dB per octave de-emphasis curve from 300 to 3000 Hz (1000 Hz reference)	
Modulation Acceptance	± 7.5 kHz	
Squelch Sensitivity		
Critical Squelch	0.15 μ V	
Maximum Squelch	Greater than 20-dB Quieting	
Maximum Frequency Spread (MHz)	<u>Full Performance</u>	<u>1dB Degradation in sensitivity</u>
	0.60 MHz	1.20 MHz

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

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WARNING

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

DESCRIPTION

Receiver Models 4ER59B11 and 13 are high sensitivity single conversion, superheterodyne FM receivers for one through eight frequency operation on the 150.8-174 MHz bands. The complete receiver mounts on a single printed wiring board, and utilizes both discrete components and Integrated Circuit modules. The application of each model receiver is shown in the following chart:

Model No.	Option No.	Freq Range	Number of Freq	Tone Option
4ER59B11	4228	150.8-174 MHz	3 to 8	
4ER59B13	4229	150.8-174 MHz	3 to 8	Channel Guard

References to symbol numbers mentioned in the following text are found on the Schematic Diagram, Outline Diagram and Parts List (see Table of Contents). The typical circuit diagrams used in the text are representative of the circuits used in the Integrated Circuit modules. A block diagram of the receiver is shown in Figure 1.

Supply voltage for the receiver includes a continuous regulated 5.4 Volts for the compensator module, a continuous 7.5 Volts for the squelch module, and a switched 7.5 Volts for the remaining receiver stages.

MHz) consists of a crystal-controlled Colpitts oscillator similar to the Oscillator module used in the transmitter (see Figure 2). The entire oscillator is contained in a metal can with the receiver operating frequency printed on the top. The crystal frequency ranges from 14.53 to 17.11 MHz, and the crystal frequency is multiplied 9 times.

The oscillator frequency is temperature compensated to provide instant frequency compensation, with a frequency stability of $\pm 0.0002\%$ from 0°C to $+55^{\circ}\text{C}$ and $\pm 0.0005\%$ from -30°C to $+60^{\circ}\text{C}$. The temperature compensation network is contained in Compensation Module A313.

In multi-frequency receivers, additional oscillator modules are mounted on the receiver board. The single-frequency supply jumper is removed, and the proper

CIRCUIT ANALYSIS

OSCILLATOR MODULES

Oscillator Model 4EG28A11 (150.8-174

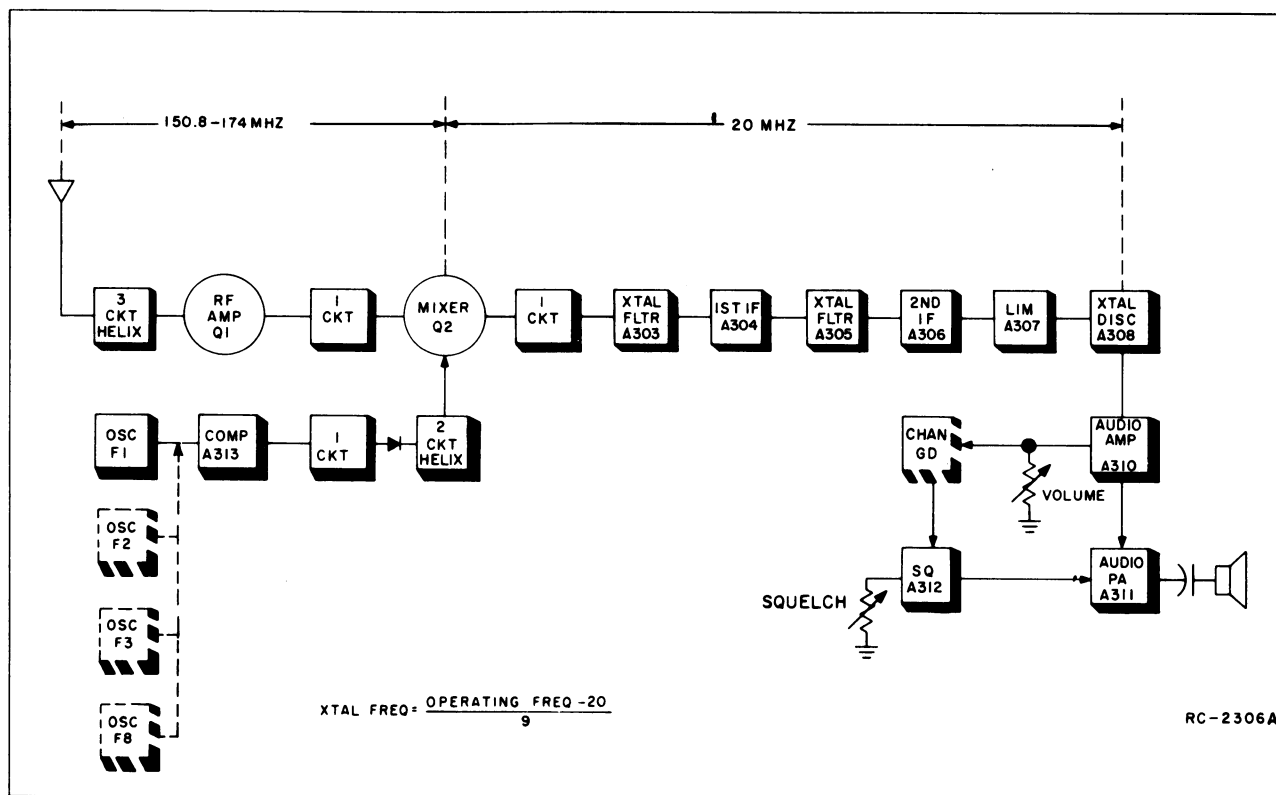


Figure 1 - Receiver Block Diagram

frequency is selected by connecting the 5.4 Volts to the selected oscillator module through frequency selector switch S1 on the control unit.

NOTE

All oscillator modules are individually compensated at the factory and cannot be repaired in the field. Any attempt to remove the oscillator cover will void the warranty.

COMPENSATOR A313

Compensator module A313 contains a buffer-amplifier stage, and the temperature compensation network for the oscillator (see Figure 3).

RF from the oscillator is coupled through a DC blocking capacitor to the base of Q1. The output of Q1 connects to multiplier coil L1 on the Multiplier assembly.

In the compensation network, the regulated 5.4 Volts at Pin 2 is applied to a thermistor-compensated voltage divider. The output at Pin 3 (2.35 Volts measured with a VTVM) is applied to Pin 3 and to the varactor in the Oscillator module. At temperatures below -10°C , the compensated voltage increases to maintain the proper

voltage on the oscillator voltage-variable capacitor.

SERVICE NOTE

An abnormally low VTVM reading (or no reading) at Pin 3 may indicate a short or leakage path in the oscillator. This can be checked by unsoldering Pin 3, raising it off of the printed board and taking another reading. If this reading is normal, the problem is in the Oscillator module. If the reading remains low (or zero), the problem is in the Compensator.

FRONT END A302

The receiver Front End consists of three tuned helical resonators and an RF amplifier stage. The RF signal from the antenna is coupled through RF cable W301 to a tap on L6. The tap is positioned to provide the proper impedance match to the antenna. RF energy is coupled to the third coil (L8) through openings in the sides of the cans. RF is then coupled from a tap on L8 through D1 to the base of RF amplifier Q1. The output of Q1 is developed across tuned circuit C2/L1 and is applied to the base of the mixer.

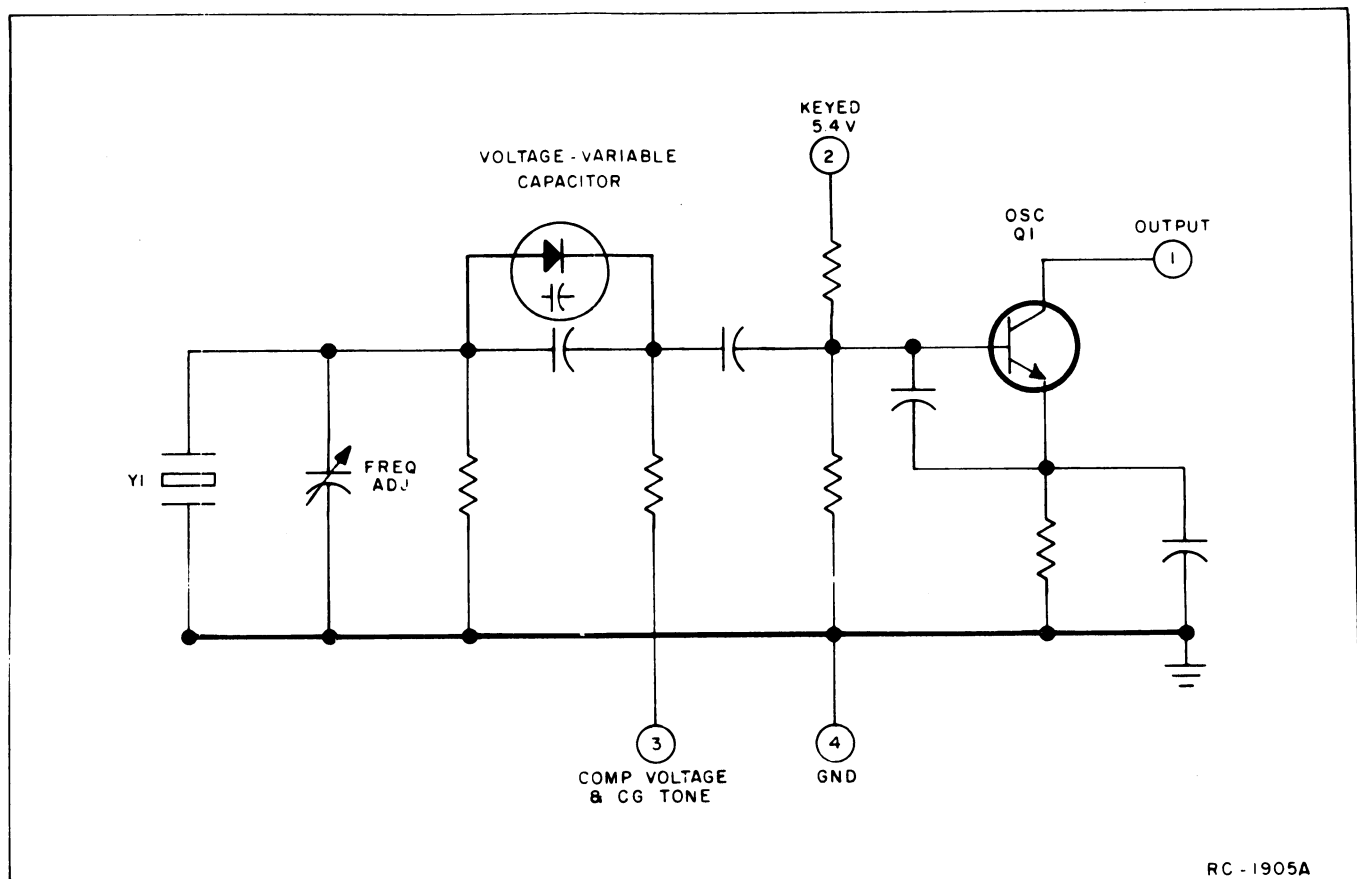


Figure 2 - Typical Oscillator Circuit

IF AMPL A304 & A306

An IF Amplifier module follows each of the crystal filters, and contain the resistor-matching networks for the filters. A typical IF amplifier circuit is shown in Figure 4.

Each of the IF Amplifier modules consists of three R-C coupled amplifier stages that are DC series-connected for reduced drain. The two IF modules provide a total gain of approximately 85 dB.

LIMITER A307 & DISCRIMINATOR A308

Limiter A307 consists of three R-C coupled limiter stages that are DC series connected for reduced drain. The Limiter module also provides some gain. The output of the Limiter is applied to the discriminator. A typical Limiter circuit is shown in Figure 5.

The receiver uses a 20 MHz, fixed-tuned crystal discriminator (A308) to recover the audio from the IF signal. The Discriminator output is applied to the Audio Amplifier module.

AUDIO AMPLIFIER A310

Audio and noise from the discriminator is applied to Audio Amplifier module A310. A typical audio amplifier circuit is shown in Figure 6.

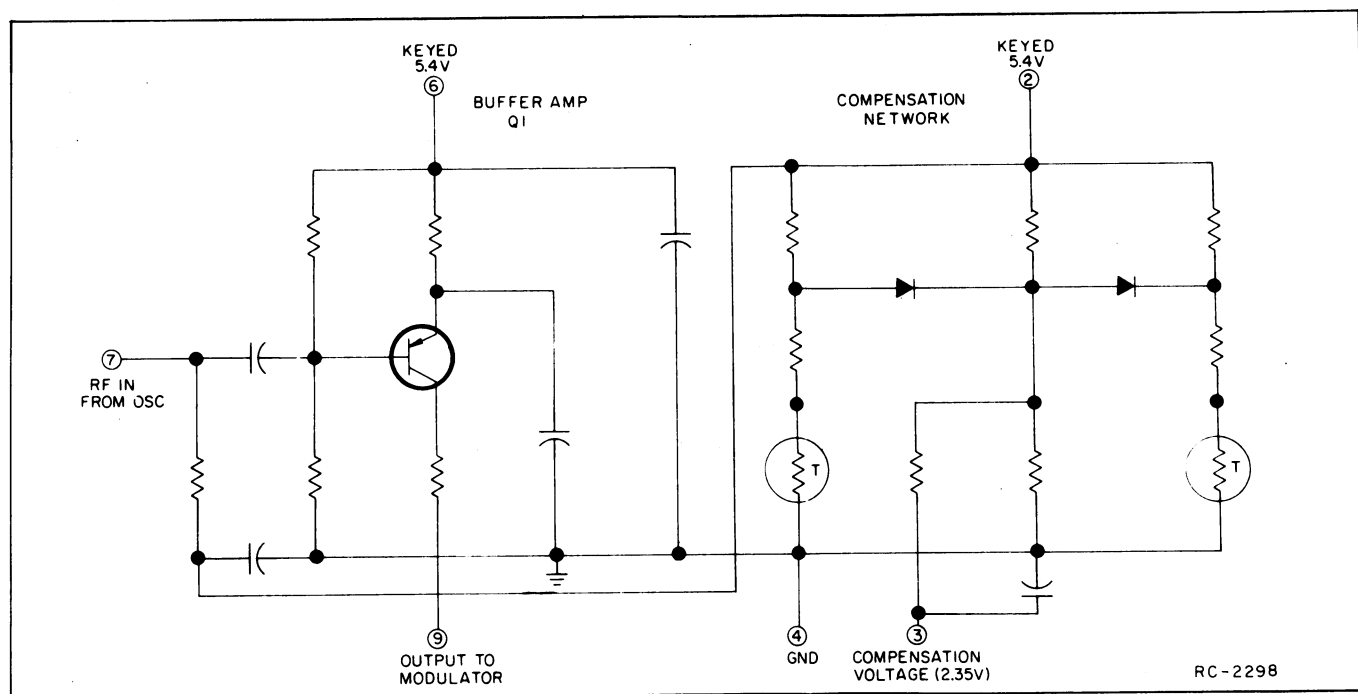


Figure 3 - Typical Compensator Circuit

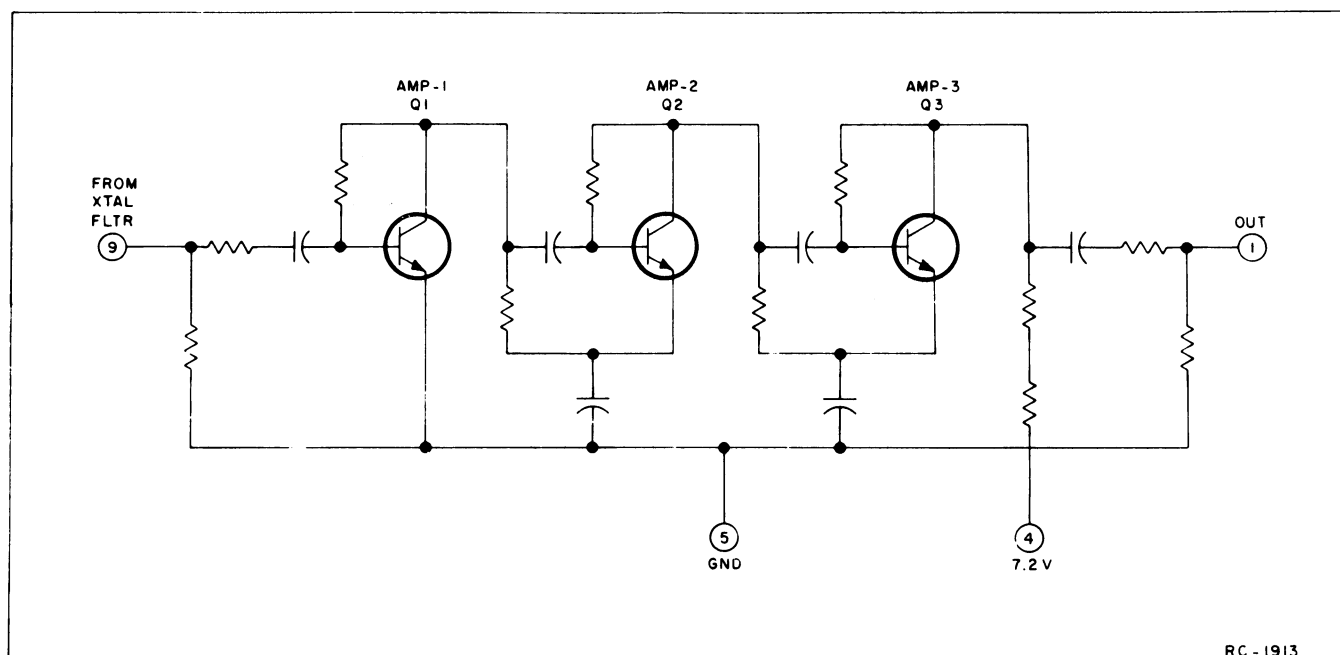


Figure 4 - Typical IF Amplifier Circuit

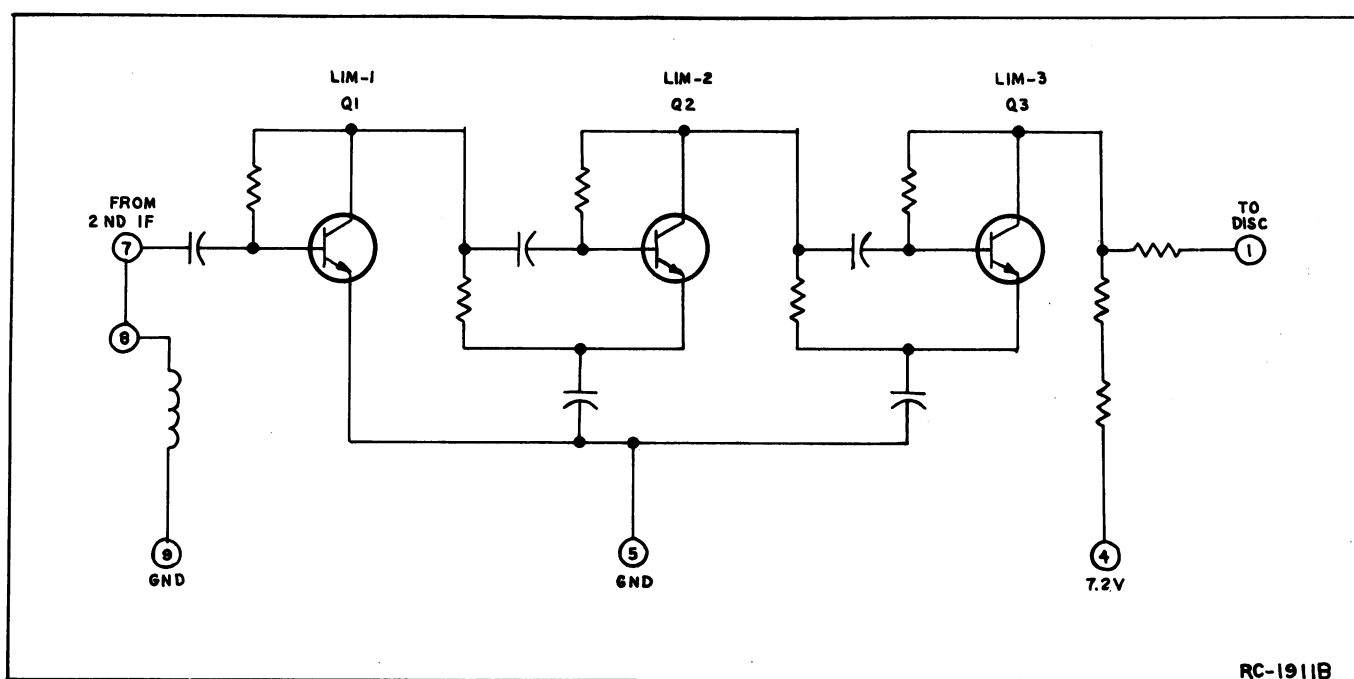


Figure 5 - Typical Limiter Circuit

Audio and noise is applied to the base of Q1. This stage operates as an emitter-follower for matching the impedance of the discriminator to the amplifier stage (Q2) and the VOLUME control. The output of Q1 connects from Pin 2 to the base of amplifier Q2 (Pin 4) through the VOLUME control. The output of Q1 is also applied to the input of the Squelch module.

Following amplifier Q2 is an active low-pass filter (Q3). Audio from the filter is connected from Pin 9 to the Audio PA module. In Audio Amplifier module A323, an active high-pass filter is added in series with the low-pass filter to provide the required tone frequency roll-off.

AUDIO PA A311

When the receiver is quieted by a signal, audio from the active filter is connected to Pin 1 of Audio PA module A311, and then to the base of amplifier Q1. Q1 feeds the audio signal to the base of Q2, which drives PA transistors Q4 and Q5. A typical audio PA circuit is shown in Figure 7.

PA transistors Q4 and Q5 operate as complementary emitter-followers, providing a 500 milliwatt output into an 8-ohm load. Audio from Pin 9 is coupled through capacitor C302 on the receiver board to the loudspeaker.

SQUELCH A312

Noise from Audio Amplifier A309/A310 operates the squelch circuit. A typical squelch circuit is shown in Figure 8.

When no carrier is present in the receiver, the noise output of the active high-pass filter Q1 is coupled to the base of noise amplifier Q2 through SQUELCH control R708. R708 controls the gain of the noise amplifier.

The output of noise amplifier Q2 is detected by diodes CR1 and CR2, and the resultant positive voltage turns off the PNP squelch switch Q3. In standard radios, the emitter of Q3 is connected to +7 Volts by means of a jumper from H1 to H2. When noise turns off Q3, its collector drops to ground potential. As the collector of Q3 is connected to the base of amplifier Q1 in the audio PA module, turning off Q3 also turns off Q1, keeping the audio PA turned off.

When the receiver is quieted by a signal squelch switch Q3 turns on. This applies +7 Volts to the base of amplifier Q1 in the Audio PA module, turning the Audio PA circuit on so that sound is heard at the speaker.

In tone decoder applications, the 7-Volt jumper from H1 to H2 is removed. The emitter of squelch switch Q3 is connected to 7.5 Volts by a DC switch on the decoder board.

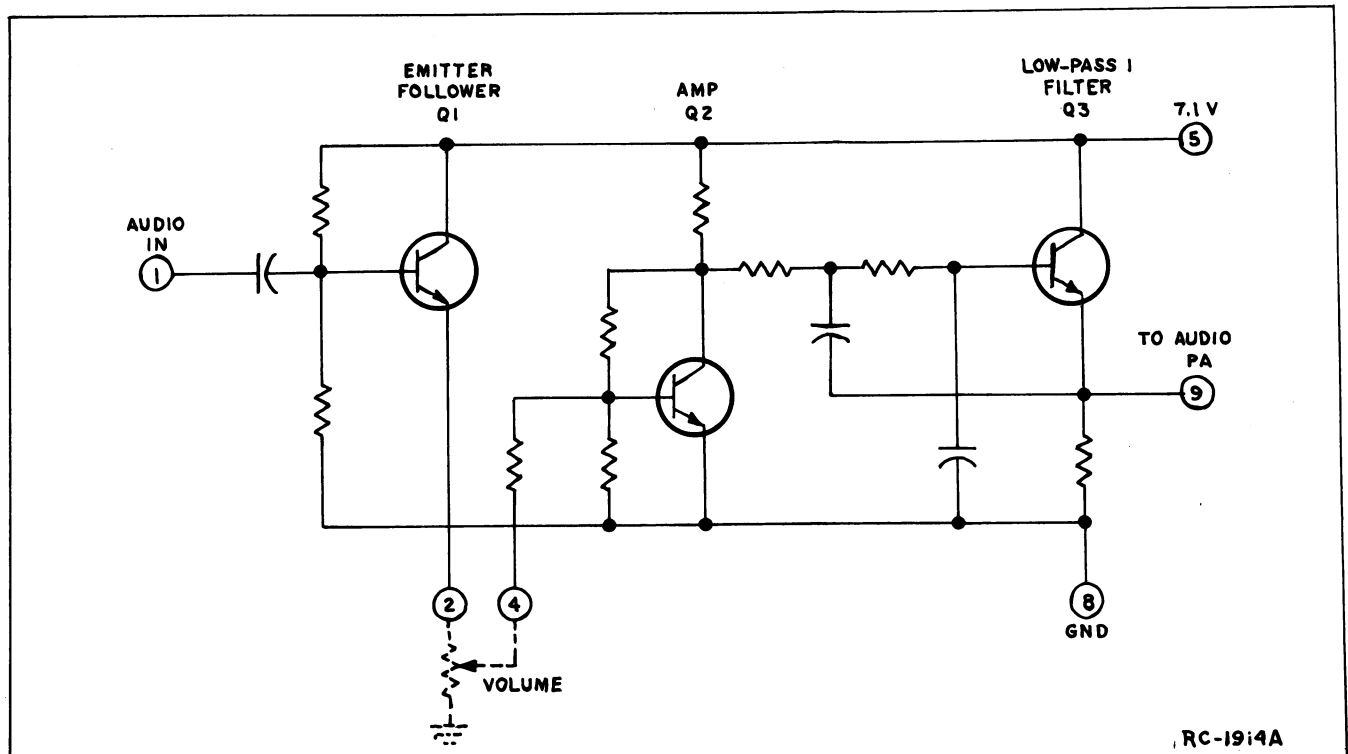


Figure 6 - Typical Audio Amplifier

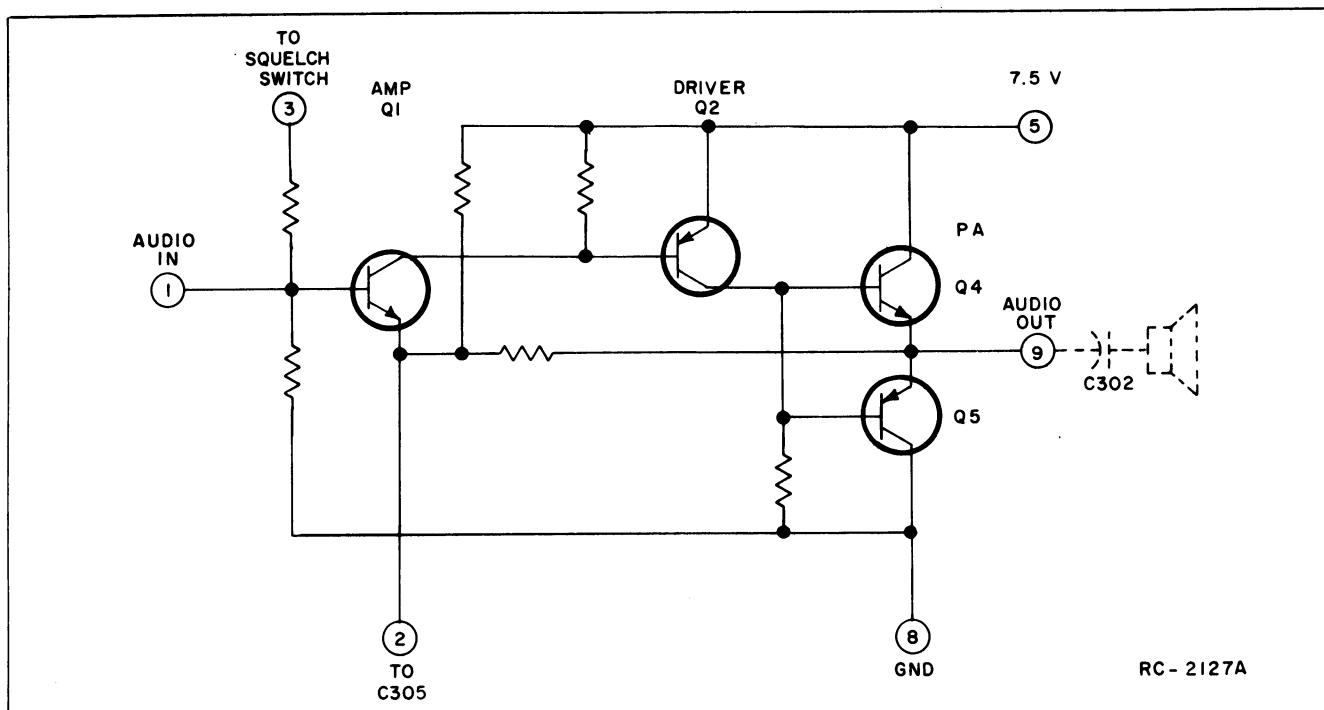


Figure 7 - Typical Audio PA Circuit

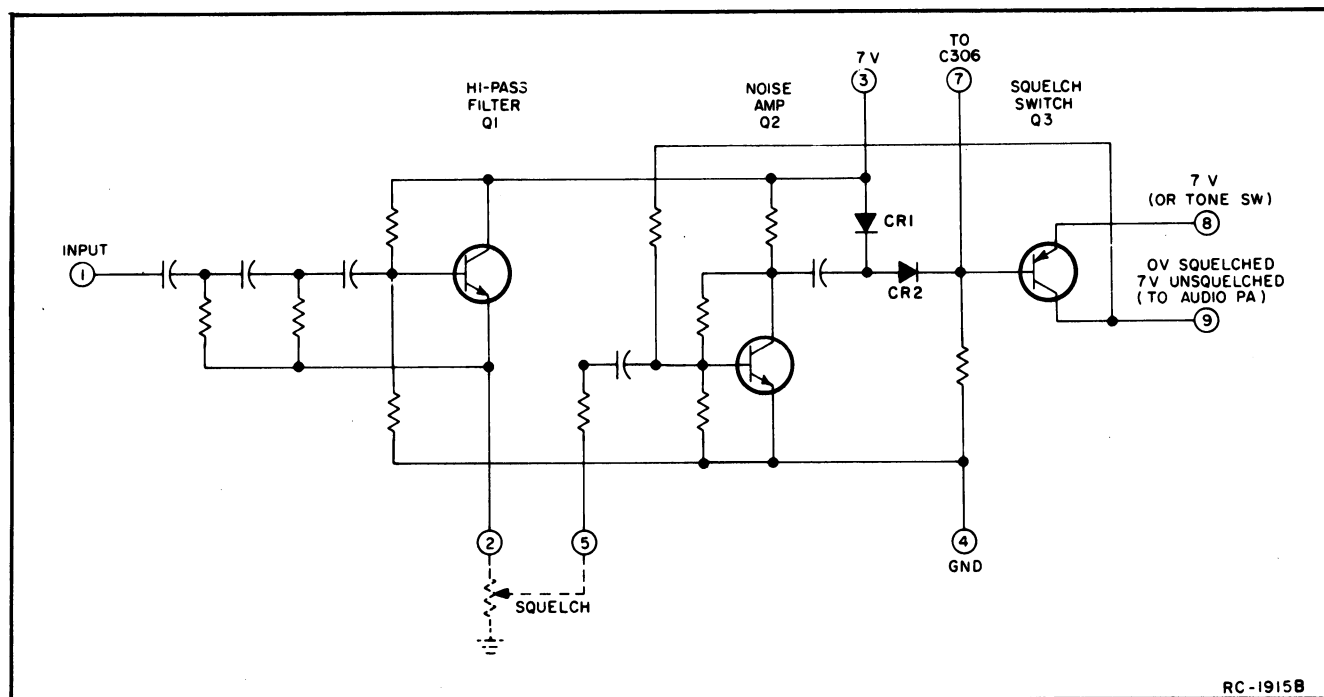


Figure 8 - Typical Squelch Circuit

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

GENERAL ELECTRIC
U.S.A.

EQUIPMENT REQUIRED

1. A 20-MHz signal source (GE IF Generator Model 4EX9A10 or equivalent) and a 150.8-174 MHz source connected to Antenna Switch J702 by Receiver Test Cable 19C317633G1.
2. GE Test Set Model 4EX3A10 or 4EX8K11 or voltmeter with equivalent sensitivity.
3. GE Test Amplifier Model 4EX16A10 and RF probe 19C311370G1, or equivalent RF voltmeter.
4. Distortion Analyzer or AC-VTVM.

PRELIMINARY CHECKS AND ADJUSTMENTS

1. In multi-frequency receivers where the maximum frequency spacing is less than one MHz, align the receiver of the F1 channel. Where the frequency spacing is more than one MHz, align the receiver on the highest frequency.
2. Set the slugs in Z6 thru Z10 to the bottom of the coil form for frequencies in the low end of the band. Set the slugs near the top of the coil form for frequencies near the high end of the band.
3. Set the slug in RF AMP L1 to the top of the coil form for frequencies in the low end of the band, and near the bottom of the coil form for frequencies near the high end of the band.
4. Connect the negative lead of the DC Test Set to the Mult Test Point (H8), and the positive lead to ground. Connect the AC-VTVM across the speaker leads.

ALIGNMENT PROCEDURE

Step No.	Tuning Control	Procedure
1.	MULT L2	Adjust L2 for maximum meter reading.
2.	Z9 and Z10	Adjust Z9 and then Z10 for a slight change in meter reading.
3.	Z6 thru Z8 and RF Amp L1	Apply an on-frequency signal to J702 and adjust Z6, Z7, Z8, and L1 for best quieting sensitivity.
4.	Mixer L2	Apply an on-frequency signal as above. With the RF probe on Pin 9 of IF Amp A304, tune L2 for maximum meter reading.
5.	MULT L2, Z9 and Z10	De-tune L2. Next, increase the on-frequency input signal and tune Z9 and Z10 for best quieting sensitivity. Now re-adjust L2 for maximum meter reading. Where the frequency spread is more than one MHz, de-tune L2 one-eighth turn counterclockwise.
FREQUENCY ADJUSTMENT		
6.		While applying an on-frequency signal to J702, loosely couple a 20-MHz signal to the Mixer. Adjust the Oscillator trimmer(s) for a zero beat frequency between the two signals. Alternate Method: Apply a strong 20 MHz signal to the Mixer. Measure the output of the Discriminator with a DC-VTVM at Pin 1 of A309/A310. Note the reading. Next, remove the 20-MHz signal and apply a strong on-frequency signal to J702. Then tune the oscillator trimmer(s) for the meter reading obtained at Pin 1 of A309/A310.

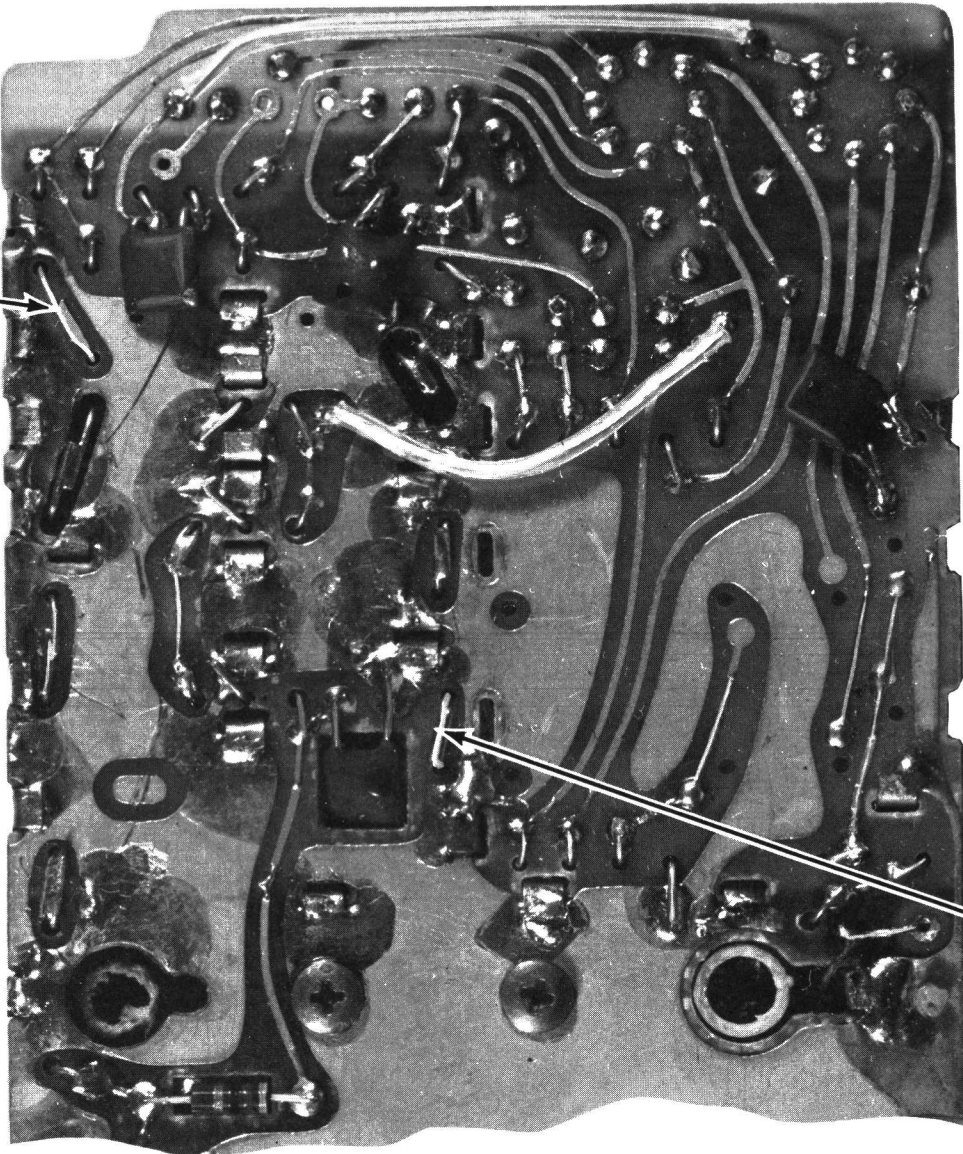
ALIGNMENT PROCEDURE

150.8—174 MHz RECEIVER
MODELS 4ER59B11 & B13

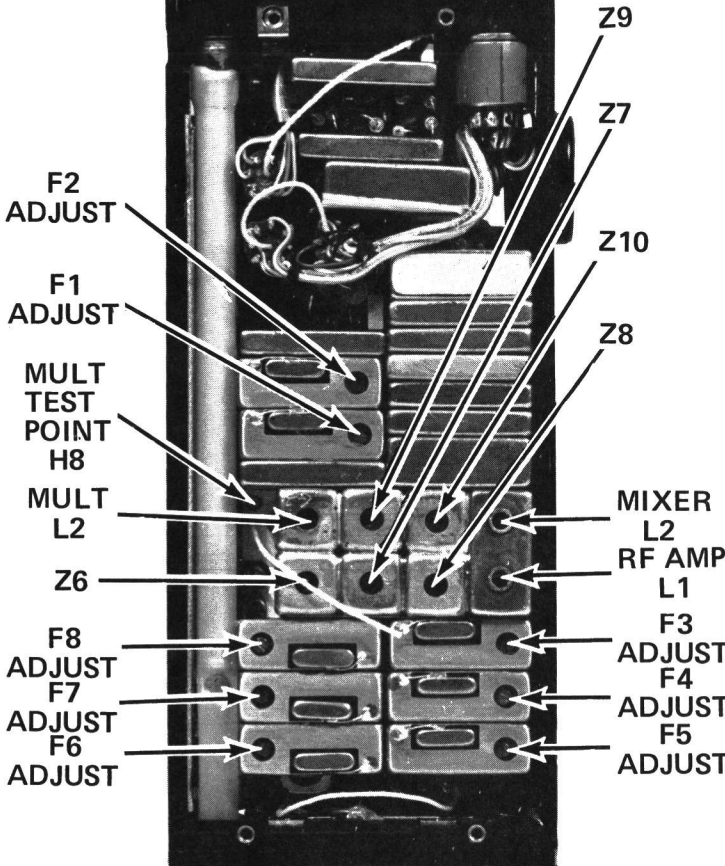
SOLDER SIDE

COMPONENT SIDE

PIN 1 OF
AUDIO AMP
A309
(DISC OUTPUT)



PIN 9 OF
IF AMP A304
(FILTER OUTPUT)



TEST PROCEDURES

These Test Procedures are designed to help you to service a receiver that is operating --- but not properly. The problems encountered could be low power, poor sensitivity, distortion, and low gain. By following the sequence of test steps starting with Step 1, the defect can be quickly localized.

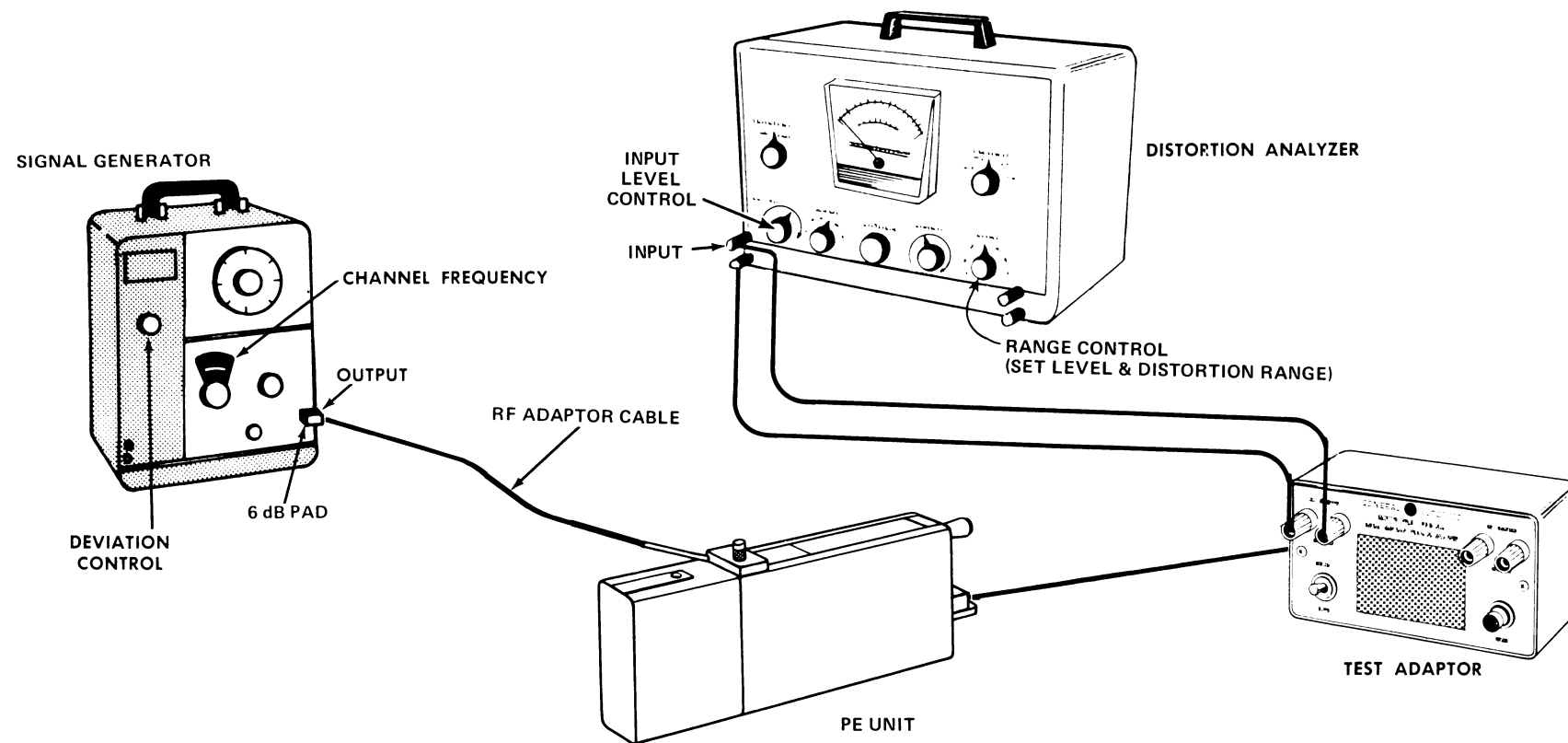
Once the defective stage is pin-pointed, refer to the "Service Check" listed to correct the problem. Additional corrective measures are included in the Troubleshooting Procedure. Before starting with the Receiver Test Procedures, be sure the receiver is tuned and aligned to the proper operating frequency.

TEST EQUIPMENT REQUIRED

- Distortion Analyzer similar to: Heath IM-12
- Signal Generator similar to: Measurements M-800
- 6-dB attenuation pad
- Test Adaptor Model 4EX12A10
- RF Adaptor Cable 19C317633G1

PRELIMINARY ADJUSTMENTS

1. Connect the test equipment to the receiver as shown for all steps of the receiver Test Procedure.
2. Turn the SQUELCH control fully clockwise for all steps of the Test Procedure.
3. Turn on all of the equipment and let it warm up for 20 minutes.



STEP 1

AUDIO POWER OUTPUT AND DISTORTION TEST PROCEDURE

Measure Audio Power output as follows:

- A. Connect a 1,000-microvolt test signal modulated by 1,000 hertz \pm 3.0 kHz deviation to the Antenna Switch J702.
- B. Set the Volume Control for a 500 milliwatt output (2 volts RMS).
- C. Make distortion measurements according to manufacturer's instructions. Reading should be less than 10% (5% is typical). If the receiver sensitivity is to be measured, leave all controls and equipment as they are.

SERVICE CHECK

If the distortion is more than 5%, or maximum audio output is less than 0.5 watt, make the following checks:

- D. Battery voltage----low voltage will cause distortion. (Refer to Receiver Schematic Diagram for voltages.)
- E. Audio Gain (Refer to Receiver Trouble-shooting Procedure).

STEP 2

USABLE SENSITIVITY (12 dB SINAD)

TEST PROCEDURE

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

- A. Apply a 1000-microvolt, on-frequency signal modulated by 1000 Hz with 3.0-kHz deviation to J702.
- B. Place the RANGE switch on the Distortion Analyzer in the 200 to 2000-Hz distortion range position (1000-Hz filter in the circuit). Tune the filter for minimum reading or null on the lowest possible scale (100%, 30%, etc.)
- C. Place the RANGE switch to the SET LEVEL position (filter out of the circuit) and adjust the input LEVEL control for a +2 dB reading on a mid range (30%).
- D. While reducing the signal generator output, switch the RANGE control from SET LEVEL to the distortion range until a 12-dB difference (+2 dB to -10 dB) is obtained between the SET LEVEL and distortion range positions (filter out and filter in).

- E. The 12-dB difference (Signal plus Noise and Distortion to noise plus distortion ratio) is the "usable" sensitivity level. The sensitivity should be less than rated 12 dB SINAD specification with an audio output of at least 250 milliwatts.
- F. Leave all controls as they are and all equipment connected if the Modulation Acceptance Bandwidth test is to be performed.

SERVICE CHECK

If the sensitivity level is more than rated 12 dB SINAD, check the alignment of the RF stages as directed in the Alignment Procedure, and make the gain measurements as shown on the Troubleshooting Procedure.

STEP 3

**MODULATION ACCEPTANCE BANDWIDTH
(IF BANDWIDTH)**

TEST PROCEDURE

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

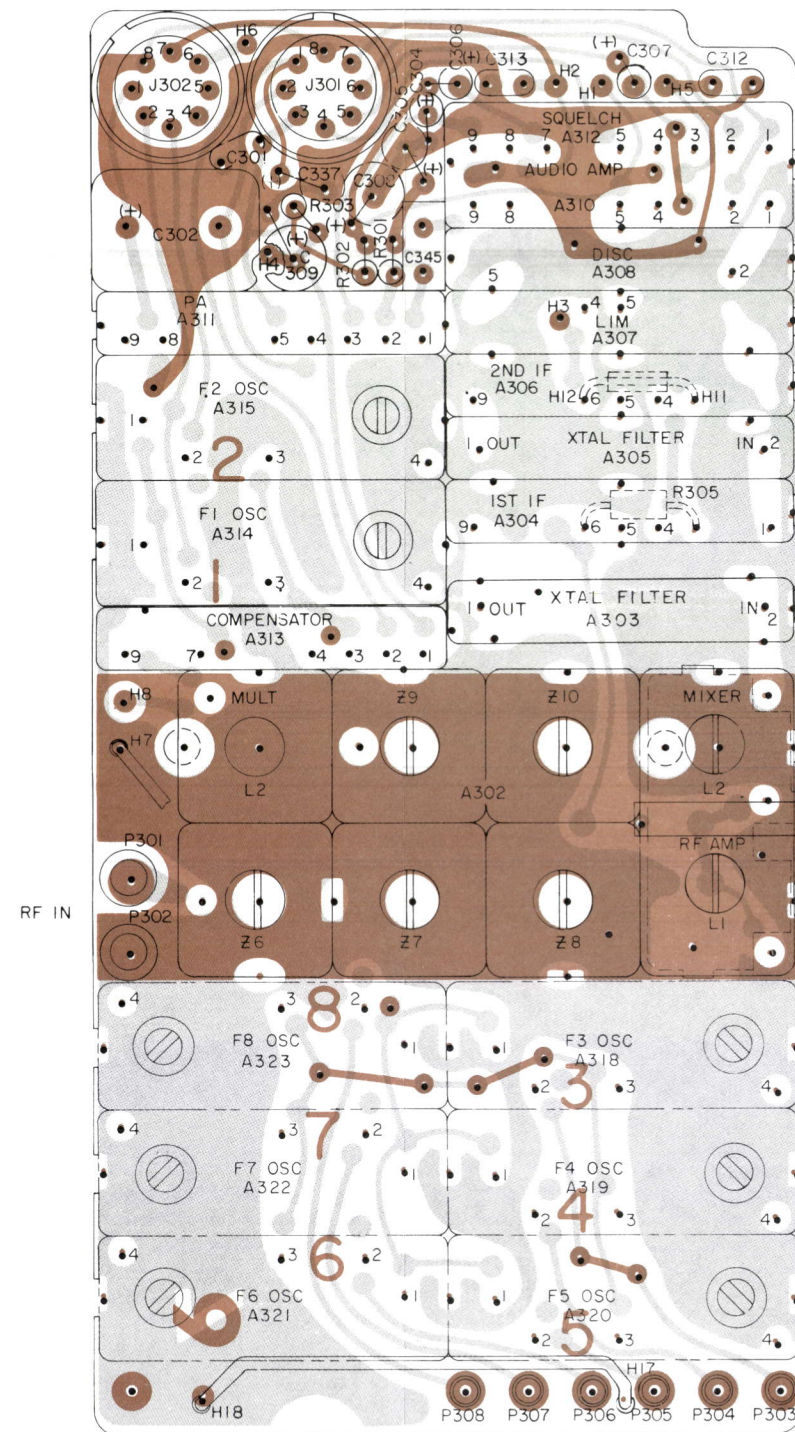
- A. Set the Signal Generator output for twice the microvolt reading obtained in the 12-dB SINAD measurement.
- B. Set the RANGE control on the Distortion Analyzer in the SET LEVEL position (1000-Hz filter out of the circuit), and adjust the input LEVEL control for a +2 dB reading on the 30% range.
- C. While increasing the deviation of the Signal Generator, switch the RANGE control from SET LEVEL to distortion range until a 12-dB difference is obtained between the SET LEVEL and distortion range readings (from +2 dB to -10 dB).
- D. The deviation control reading for the 12-dB difference is the Modulation Acceptance Bandwidth of the receiver. It should be more than ± 7 kHz (but less than ± 9 kHz).

SERVICE CHECK

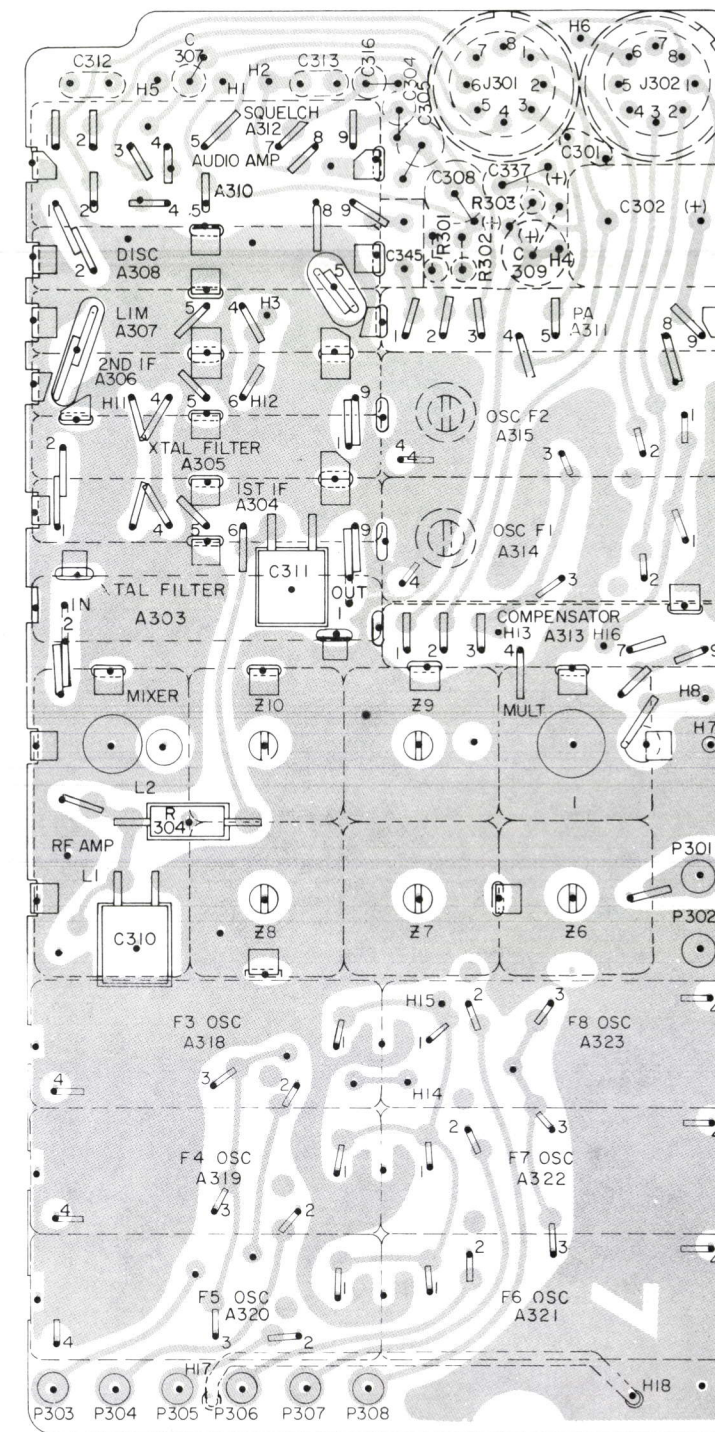
If the Modulation Acceptance Bandwidth test does not indicate the proper width, make gain measurements as shown on the Receiver Troubleshooting Procedure.

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
J301	5.4 V	AUDIO OUT	SWITCHED 7.5V	SQ ARM	VOL ARM	SQ HI	VOL HI	GND
J302		FREQ 1	FREQ 2			7.5V	tone SWITCH	GND

COMPONENT SIDE



SOLDER SIDE



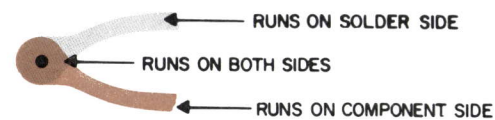
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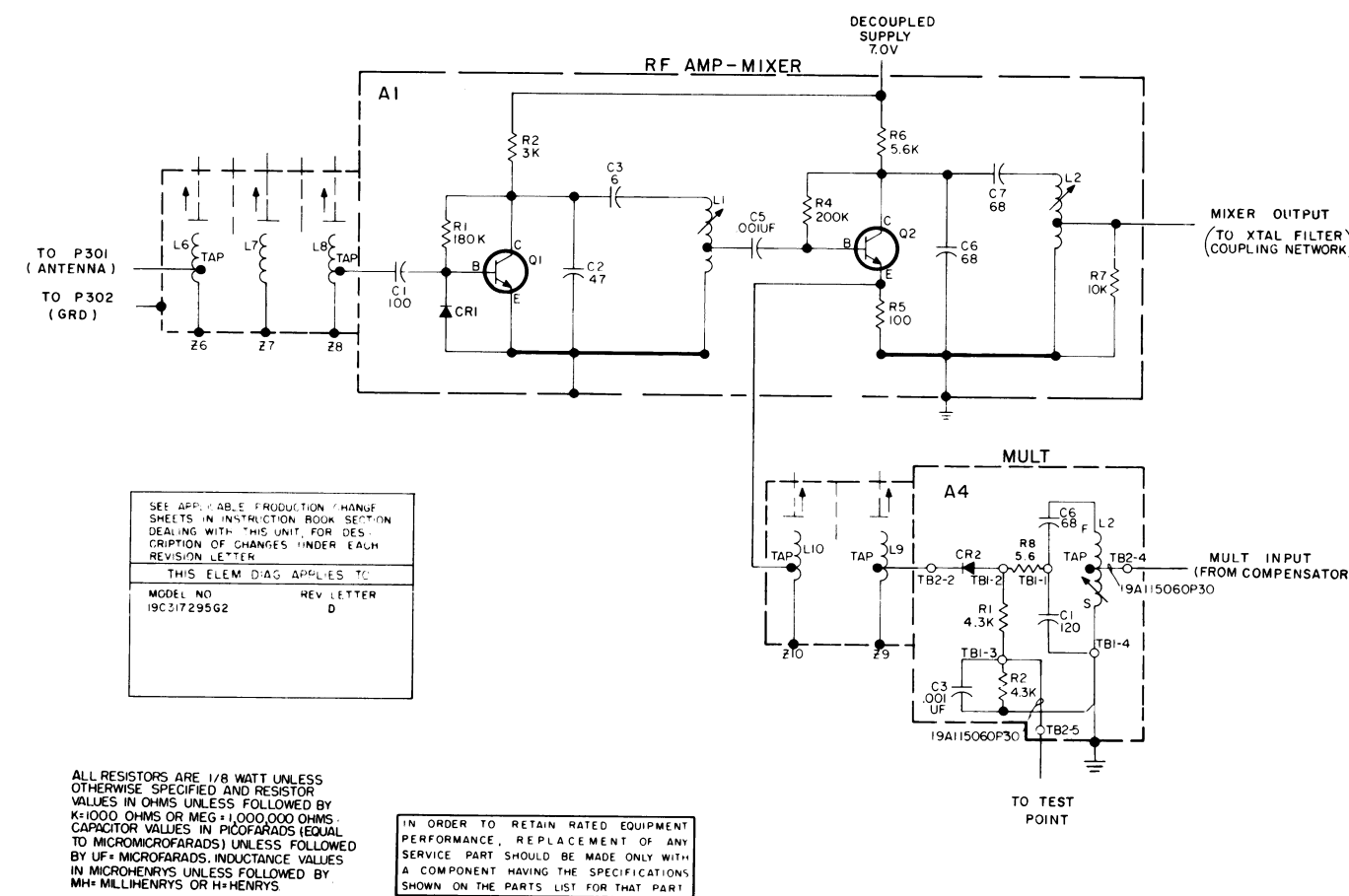
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OUTLINE DIAGRAM

150.8—174 MHz RECEIVER MODELS 4ER59B11 AND B13

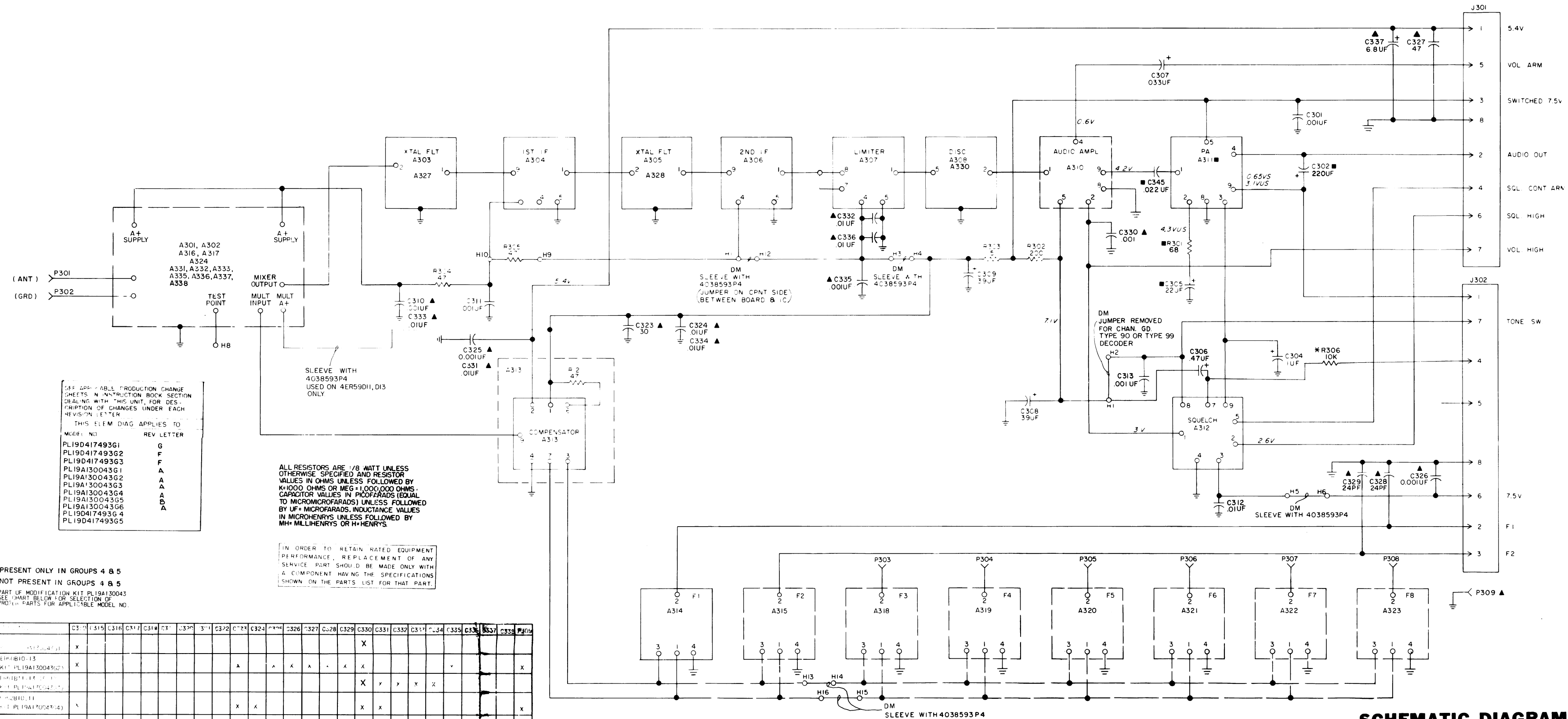




(19C320888, Rev. 6)

SCHEMATIC DIAGRAM

150.8 - 174 MHz RECEIVER FRONT END (A302)
MODELS 4ER59B11 & B13



SCHEMATIC DIAGRAM

150.8—174 MHz RECEIVER
MODELS 4ER59B11 & B13

Issue 6

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		C31	C31A	C31B	C31C	C31D	C31E	C31F	C31G	C31H	C31I	C31J	C31K	C31L	C31M	C31N	C31O	C31P	C31Q	C31R	C31S	C31T	C31U	C31V	C31W	C31X	C31Y	C31Z	C31AA	C31AB	C31AC	C31AD	C31AE	C31AF	C31AG	C31AH	C31AI	C31AJ	C31AK	C31AL	C31AM	C31AN	C31AO	C31AP	C31AQ	C31AR	C31AS	C31AT	C31AU	C31AV	C31AW	C31AX	C31AY	C31AZ	C31BA	C31BB	C31BC	C31BD	C31BE	C31BF	C31BG	C31BH	C31BI	C31BJ	C31BK	C31BL	C31BM	C31BN	C31BO	C31BP	C31BQ	C31BR	C31BS	C31BT	C31BU	C31BV	C31BW	C31BX	C31BY	C31BZ	C31CA	C31CB	C31CC	C31CD	C31CE	C31CF	C31CG	C31CH	C31CI	C31CJ	C31CK	C31CL	C31CM	C31CN	C31CO	C31CP	C31CQ	C31CR	C31CS	C31CT	C31CU	C31CV	C31CW	C31CX	C31CY	C31CZ	C31DA	C31DB	C31DC	C31DD	C31DE	C31DF	C31DG	C31DH	C31DI	C31DJ	C31DK	C31DL	C31DM	C31DN	C31DO	C31DP	C31DQ	C31DR	C31DS	C31DT	C31DU	C31DV	C31DW	C31DX	C31DY	C31DZ	C31EA	C31EB	C31EC	C31ED	C31EE	C31EF	C31EG	C31EH	C31EI	C31EJ	C31EK	C31EL	C31EM	C31EN	C31EO	C31EP	C31EQ	C31ER	C31ES	C31ET	C31EU	C31EV	C31EW	C31EX	C31EY	C31EZ	C31FA	C31FB	C31FC	C31FD	C31FE	C31FF	C31FG	C31FH	C31FI	C31FJ	C31FK	C31FL	C31FM	C31FN	C31FO	C31FP	C31FQ	C31FR	C31FS	C31FT	C31FU	C31FV	C31FW	C31FX	C31FY	C31FZ	C31GA	C31GB	C31GC	C31GD	C31GE	C31GF	C31GG	C31GH	C31GI	C31GJ	C31GK	C31GL	C31GM	C31GN	C31GO	C31GP	C31GQ	C31GR	C31GS	C31GT	C31GU	C31GV	C31GW	C31GX	C31GY	C31GZ	C31HA	C31HB	C31HC	C31HD	C31HE	C31HF	C31HG	C31HH	C31HI	C31HJ	C31HK	C31HL	C31HM	C31HN	C31HO	C31HP	C31HQ	C31HR	C31HS	C31HT	C31HU	C31HV	C31HW	C31HX	C31HY	C31HZ	C31IA	C31IB	C31IC	C31ID	C31IE	C31IF	C31IG	C31IH	C31II	C31IJ	C31IK	C31IL	C31IM	C31IN	C31IO	C31IP	C31IQ	C31IR	C31IS	C31IT	C31IU	C31IV	C31IW	C31IX	C31IY	C31IZ	C31JA	C31JB	C31JC	C31JD	C31JE	C31JF	C31JG	C31JH	C31JI	C31JJ	C31JK	C31JL	C31JM	C31JN	C31JO	C31JP	C31JQ	C31JR	C31JS	C31JT	C31JU	C31JV	C31JW	C31JX	C31JY	C31JZ	C31KA	C31KB	C31KC	C31KD	C31KE	C31KF	C31KG	C31KH	C31KI	C31KJ	C31KK	C31KL	C31KM	C31KN	C31KO	C31KP	C31KQ	C31KR	C31KS	C31KT	C31KU	C31KV	C31KW	C31KX	C31KY	C31KZ	C31LA	C31LB	C31LC	C31LD	C31LE	C31LF	C31LG	C31LH	C31LI	C31LJ	C31LK	C31LL	C31LM	C31LN	C31LO	C31LP	C31LQ	C31LR	C31LS	C31LT	C31LU	C31LV	C31LW	C31LX	C31LY	C31LZ	C31MA	C31MB	C31MC	C31MD	C31ME	C31MF	C31MG	C31MH	C31MI	C31MJ	C31MK	C31ML	C31MM	C31MN	C31MO	C31MP	C31MQ	C31MR	C31MS	C31MT	C31MU	C31MV	C31MW	C31MX	C31MY	C31MZ	C31NA	C31NB	C31NC	C31ND	C31NE	C31NF	C31NG	C31NH	C31NI	C31NJ	C31NK	C31NL	C31NM	C31NN	C31NO	C31NP	C31NQ	C31NR	C31NS	C31NT	C31NU	C31NV	C31NW	C31NX	C31NY	C31NZ	C31OA	C31OB	C31OC	C31OD	C31OE	C31OF	C31OG	C31OH	C31OI	C31OJ	C31OK	C31OL	C31OM	C31ON	C31OO	C31OP	C31OQ	C31OR	C31OS	C31OT	C31OU	C31OV	C31OW	C31OX	C31OY	C31OZ	C31PA	C31PB	C31PC	C31PD	C31PE	C31PF	C31PG	C31PH	C31PI	C31PJ	C31PK	C31PL	C31PM	C31PN	C31PO	C31PP	C31PQ	C31PR	C31PS	C31PT	C31PU	C31PV	C31PW	C31PX	C31PY	C31PZ	C31QA	C31QB	C31QC	C31QD	C31QE	C31QF	C31QG	C31QH	C31QI	C31QJ	C31QK	C31QL	C31QM	C31QN	C31QO	C31QP	C31QQ	C31QR	C31QS	C31QT	C31QU	C31QV	C31QW	C31QX	C31QY	C31QZ	C31RA	C31RB	C31RC	C31RD	C31RE	C31RF	C31RG	C31RH	C31RI	C31RJ	C31RK	C31RL	C31RM	C31RN	C31RO	C31RP	C31RQ	C31RR	C31RS	C31RT	C31RU	C31RV	C31RW	C31RX	C31RY	C31RZ	C31SA	C31SB	C31SC	C31SD	C31SE	C31SF	C31SG	C31SH	C31SI	C31SJ	C31SK	C31SL	C31SM	C31SN	C31SO	C31SP	C31SQ	C31SR	C31SS	C31ST	C31SU	C31SV	C31SW	C31SX	C31SY	C31SZ	C31TA	C31TB	C31TC	C31TD	C31TE	C31TF	C31TG	C31TH	C31TI	C31TJ	C31TK	C31TL	C31TM	C31TN	C31TO	C31TP	C31TQ	C31TR	C31TS	C31TT	C31TU	C31TV	C31TW	C31TX	C31TY	C31TZ	C31UA	C31UB	C31UC	C31UD	C31UE	C31UF	C31UG	C31UH	C31UI	C31UJ	C31UK	C31UL	C31UM	C31UN	C31UO	C31UP	C31UQ	C31UR	C31US	C31UT	C31UU	C31UV	C31UW	C31UX	C31UY	C31UZ	C31VA	C31VB	C31VC	C31VD	C31VE	C31VF	C31VG	C31VH	C31VI	C31VJ	C31VK	C31VL	C31VM	C31VN	C31VO	C31VP	C31VQ	C31VR	C31VS	C31VT	C31VU	C31VV	C31VW	C31VX	C31VY	C31VZ	C31WA	C31WB	C31WC	C31WD	C31WE	C31WF	C31WG	C31WH	C31WI	C31WJ	C31WK	C31WL	C31WM	C31WN	C31WO	C31WP	C31WQ	C31WR	C31WS	C31WT	C31WU	C31WV	C31WW	C31WX	C31WY	C31WZ	C31XA	C31XB	C31XC	C31XD	C31XE	C31XF	C31XG	C31XH	C31XI	C31XJ	C31XK	C31XL	C31XM	C31XN	C31XO	C31XP	C31XQ	C31XR	C31XS	C31XT	C31XU	C31XV	C31XW	C31XX	C31XY	C31XZ	C31YA	C31YB	C31YC	C31YD	C31YE	C31YF	C31YG	C31YH	C31YI	C31YJ	C31YK	C31YL	C31YM	C31YN	C31YO	C31YP	C31YQ	C31YR	C31YS	C31YT	C31YU	C31YV	C31YW	C31YX	C31YY	C31YZ	C31ZA	C31ZB	C31ZC	C31ZD	C31ZE	C31ZF	C31ZG	C31ZH	C31ZI	C31ZJ	C31ZK	C31ZL	C31ZM	C31ZN	C31ZO	C31ZP	C31ZQ	C31ZR	C31ZS	C31ZT	C31ZU	C31ZV	C31ZW	C31ZX	C31ZY	C31ZZ	C32	C32A	C32B	C32C	C32D	C32E	C32F	C32G	C32H	C32I	C32J	C32K	C32L	C32M	C32N	C32O	C32P	C32Q	C32R	C32S	C32T	C32U	C32V	C32W	C32X	C32Y	C32Z	C32AA	C32AB	C32AC	C32AD	C32AE	C32AF	C32AG	C32AH	C32AI	C32AJ	C32AK	C32AL	C32AM	C32AN	C32AO	C32AP	C32AQ	C32AR	C32AS	C32AT	C32AU	C32AV	C32AW	C32AX	C32AY	C32AZ	C32BA	C32BB	C32BC	C32BD	C32BE	C32BF	C32BG	C32BH	C32BI	C32BJ	C32BK	C32BL	C32BM	C32BN	C32BO	C32BP	C32BQ	C32BR	C32BS	C32BT	C32BU	C32BV	C32BW	C32BX	C32BY	C32BZ	C32CA	C32CB	C32CC	C32CD	C32CE	C32CF	C32CG	C32CH	C32CI	C32CJ	C32CK	C32CL	C32CM	C32CN	C32CO	C32CP	C32CQ	C32CR	C32CS	C32CT	C32CU	C32CV	C32CW	C32CX	C32CY	C32CZ	C32DA	C32DB	C32DC	C32DD	C32DE	C32DF	C32DG	C32DH	C32DI	C32DJ	C32DK	C32DL	C32DM	C32DN	C32DO	C32DP	C32DQ	C32DR	C32DS	C32DT	C32DU	C32DV	C32DW	C32DX	C32DY	C32DZ	C32EA	C32EB	C32EC	C32ED	C32EE	C32EF	C32EG	C32EH	C32EI	C32EJ	C32EK	C32EL	C32EM	C32EN	C32EO	C32EP	C32EQ	C32ER	C32ES	C32ET	C32EU	C32EV	C32EW	C32EX	C32EY	C32EZ	C32FA	C32FB	C32FC	C32FD	C32FE	C32FF	C32FG	C32FH	C32FI	C32FJ	C32FK	C32FL	C32FM	C32FN	C32FO	C32FP	C32FQ	C32FR	C32FS	C32FT	C32FU	C32FV	C32FW	C32FX	C32FY	C32FZ	C32GA	C32GB	C32GC	C32GD	C32GE	C32GF	C32GG	C32GH	C32GI	C32GJ	C32GK	C32GL	C32GM	C32GN	C32GO	C32GP	C32GQ	C32GR	C32GS	C32GT	C32GU	C32GV	C32GW	C32GX	C32GY	C32GZ	C32HA	C32HB	C32HC	C32HD	C32HE	C32HF	C32HG	C32HH	C32HI	C32HJ	C32HK	C32HL	C32HM	C32HN	C32HO	C32HP	C32HQ	C32HR	C32HS	C32HT	C32HU	C32HV	C32HW	C32HX	C32HY	C32HZ	C32IA	C32IB	C32IC	C32ID	C32IE	C32IF	C32IG	C32IH	C32II	C32IJ	C32IK	C32IL	C32IM	C32IN	C32IO	C32IP	C32IQ	C32IR	C32IS	C32IT	C32IU	C32IV	C32IW	C32IX	C32IY	C32IZ	C32JA	C32JB	C32JC	C32JD	C32JE	C32JF	C32JG	C32JH	C32JI	C32JJ	C32JK	C32JL	C32JM	C32JN	C32JO	C32JP	C32JQ	C32JR	C32JS	C32JT	C32JU	C32JV	C32JW	C32JX	C32JY	C32JZ	C32KA	C32KB	C32KC	C32KD	C32KE	C32KF	C32KG	C32KH	C32KI	C32KJ	C32KK	C32KL	C32KM	C32KN	C32KO	C32KP	C32KQ	C32KR	C32KS	C32KT	C32KU	C32KV	C32KW	C32KX	C32KY	C32KZ	C32LA	C32LB	C32LC	C32LD	C32LE	C32LF	C32LG	C32LH	C32LI	C32LJ	C32LK	C32LL	C32LM	C32LN	C32LO	C32LP	C32LQ	C32LR	C32LS	C32LT	C32LU	C32LV	C32LW	C32LX	C32LY	C32LZ	C32MA	C32MB	C32MC	C32MD	C32ME	C32MF	C32MG	C32MH	C32MI	C32MJ	C32MK	C32ML	C32MM	C32MN	C32MO	C32MP	C32MQ	C32MR	C32MS	C32MT	C32MU	C32MV	C32MW	C32MX	C32MY	C32MZ	C32NA	C32NB	C32NC	C32ND	C32NE	C32NF	C32NG	C32NH	C32NI	C32NJ	C32NK	C32NL	C32NM	C32NN	C32NO	C32NP	C32NQ	C32NR	C32NS	C32NT	C32NU	C32NV	C32NW	C32NX	C32NY	C32NZ	C32OA	C32OB	C32OC	C32OD	C32OE	C32OF	C32OG	C32OH	C32OI	C32OJ	C32OK	C32OL	C32OM	C32ON	C32OO	C32OP	C32OQ	C32OR	C32OS	C32OT	C32OU	C32OV	C32OW	C32OX	C32OY	C32OZ	C32PA	C32PB	C32PC	C32PD	C32PE	C32PF	C32PG	C32PH	C32PI	C32PJ	C32PK	C32PL	C32PM	C32PN	C32PO	C32PP	C32PQ	C32PR	C32PS	C32PT	C32PU	C32PV	C32PW	C32PX	C32PY	C32PZ	C32QA	C32QB	C32QC	C32QD	C32QE	C32QF	C32QG	C32QH	C32QI	C32QJ	C32QK	C32QL	C32QM	C32QN	C32QO	C32QP	C32QQ	C32QR	C32QS	C32QT	C32QU	C32QV	C32QW	C32QX	C32QY	C32QZ	C32RA	C32RB	C32RC	C32RD	C32RE	C32RF	C32RG	C32RH	C32RI	C32RJ	C32RK	C32RL	C32RM	C32RN	C32RO	C32RP	C32RQ	C32RR	C32RS	C32RT	C32RU	C32RV	C32RW	C32RX	C32RY	C32RZ	C32SA	C32SB	C32SC	C32SD	C32SE	C32SF	C32SG	C32SH	C32SI	C32SJ	C32SK	C32SL	C32SM	C32SN	C32SO	C32SP	C32SQ	C32SR	C32SS	C32ST	C32SU	C32SV	C32SW	C32SX	C32SY	C32SZ	C32TA	C32TB	C32TC	C32TD	C32TE	C32TF	C32TG	C32TH	C32TI	C32TJ	C32TK	C32TL	C32TM	C32TN	C32TO	C32TP	C32TQ	C32TR	C32TS	C32TT	C32TU	C32TV	C32TW	C32TX	C32TY	C32TZ	C32UA	C32UB	C32UC	C32UD	C32UE	C32UF	C32UG	C32UH	C32UI	C32UJ	C32UK	C32UL	C32UM	C32UN	C32UO	C32UP	C32UQ	C32UR	C32US	C32UT	C32UU	C32UV	C32UW	C32UX	C32UY	C32UZ	C32VA	C32VB	C32VC	C32VD	C32VE	C32VF	C32VG	C32VH	C32VI	C32VJ	C32VK	C32VL	C32VM	C32VN	C32VO	C32VP	C32VQ	C32VR	C32VS	C32VT	C32VU	C32VV	C32VW	C32VX	C32VY	C32VZ	C32WA	C32WB	C32WC	C32WD	C32WE	C32WF	C32WG	C32WH	C32WI	C32WJ	C32WK	C32WL	C32WM	C32WN	C32WO	C32WP	C32WQ	C32WR	C32WS	C32WT	C32WU	C32WV	C32WW	C32WX	C32WY	C32WZ	C32XA	C32XB	C32XC	C32XD	C32XE	C32XF	C32XG	C32XH	C32XI	C32XJ	C32XK	C32XL	C32XM	C32XN	C32XO	C32XP	C32XQ	C32XR	C32XS	C32XT	C32XU	C32XV	C32XW	C32XX	C32XY	C32XZ	C32YA	C32YB	C32YC	C32YD	C32YE	C32YF	C32YG	C32YH	C32YI	C32YJ	C32YK	C32YL	C32YM	C32YN	C32YO	C32YP	C32YQ	C32YR	C32YS	C32YT	C32YU	C32YV	C32YW	C32YX	C32YY	C32YZ	C32ZA	C32ZB	C32ZC	C32ZD	C32ZE	C32ZF	C32ZG	C32ZH	C32ZI	C32ZJ	C32ZK	C32ZL	C32ZM	C32ZN	C32ZO	C32ZP	C32ZQ	C32ZR	C32ZS	C32ZT	C32ZU	C32ZV	C32ZW	C32ZX	C32ZY	C32ZZ	C33	C33A	C33B	C33C	C33D	C33E	C33F	C33G	C33H	C33I	C33J	C33K	C33L	C33M	C33N	C33O	C33P	C33Q	C33R	C33S	C33T	C33U	C33V	C33W	C33X	C33Y	C33Z	C33AA	C33AB	C33AC	C33AD	C33AE	C33AF	C33AG	C33AH	C33AI	C33AJ	C33AK	C33AL	C33AM	C33AN	C33AO	C33AP	C33AQ	C33AR	C33AS	C33AT	C33AU	C33AV	C33AW	C33AX	C33AY	C33AZ	C33BA	C33BB	C33BC	C33BD	C33BE	C33BF	C33BG	C33BH	C33BI	C33BJ	C33BK	C33BL	C33BM	C33BN	C33BO	C33BP	C33BQ	C33BR	C33BS	C33BT	C33BU	C33BV	C33BW	C33BX	C33BY	C33BZ	C33CA	C33CB	C33CC	C33CD	C33CE	C33CF	C33CG	C33CH	C33CI	C33CJ	C33CK	C33CL	C33CM	C33CN	C33CO	C33CP	C33CQ	C33CR	C33CS	C33CT	C33CU	C33CV	C33CW	C33CX	C33CY	C33CZ	C33DA	C33DB	C33DC	C33DD	C33DE	C33DF	C33DG</
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VOLTAGE READINGS

ALL READINGS TAKEN WITH A DC-VTVM
AND MEASURED TO GROUND. READINGS
FOLLOWED BY "S" ARE WITH THE RECEIVER
SQUELCHED. READINGS FOLLOWED BY "US"
ARE WITH THE RECEIVER UNSQUELCHED.

(19R622036, Rev. 16)

PARTS LIST

SYMBOL

GE PART NO.

DESCRIPTION

SYMBOL

GE PART NO.

DESCRIPTION

SYMBOL

GE PART NO.

DESCRIPTION

PRODUCTION CHANGES

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

REV. A - Receiver Models 4ER59B11 & 13

To improve Squelch action. Changed A312 and A305.

REV. A - Receiver Board 19D417493G1

To improve audio sensitivity. Changed R301.

REV. A - Receiver Front End 19C317295G2

To improve spurious response. Deleted R2 and R6. Added R9 and R10. Added shield.

REV. B - Receiver Board 19D417493G1

To improve critical squelch operation. Changed C312.

REV. B - Receiver Front End 19C317295G2

To add base protection for transistor Q1. Added CR1.

REV. C - To improve ease in assembly, troubleshooting and repair. Changed RF Amp/Mixer assembly.

REV. C - Receiver Board 19D417493G1

To improve producibility. Changed A303

REV. D - To improve audio sensitivity and stability. Deleted C314 and changed R301.

REV. E - To improve frequency response. Added C345.

REV. F - To improve audio quality. Changed audio PA hybrid A311.

REV. G - To eliminate non Channel Guard receiver boards. Deleted callout of A309 and circle (●) in front of A310. Deleted callout of C303 .lpfd and the (●) for C345.

Deleted notes: ● Use for non Channel Guard receivers. ● Use for Channel Guard receivers.

REV. A - Receiver Kit 19A130043G1

To improve IF filtering. Added C330.

REV. A - Receiver Kit 19A130043G2

To improve reliability. Deleted C315 through C322.

REV. D - Receiver Front End

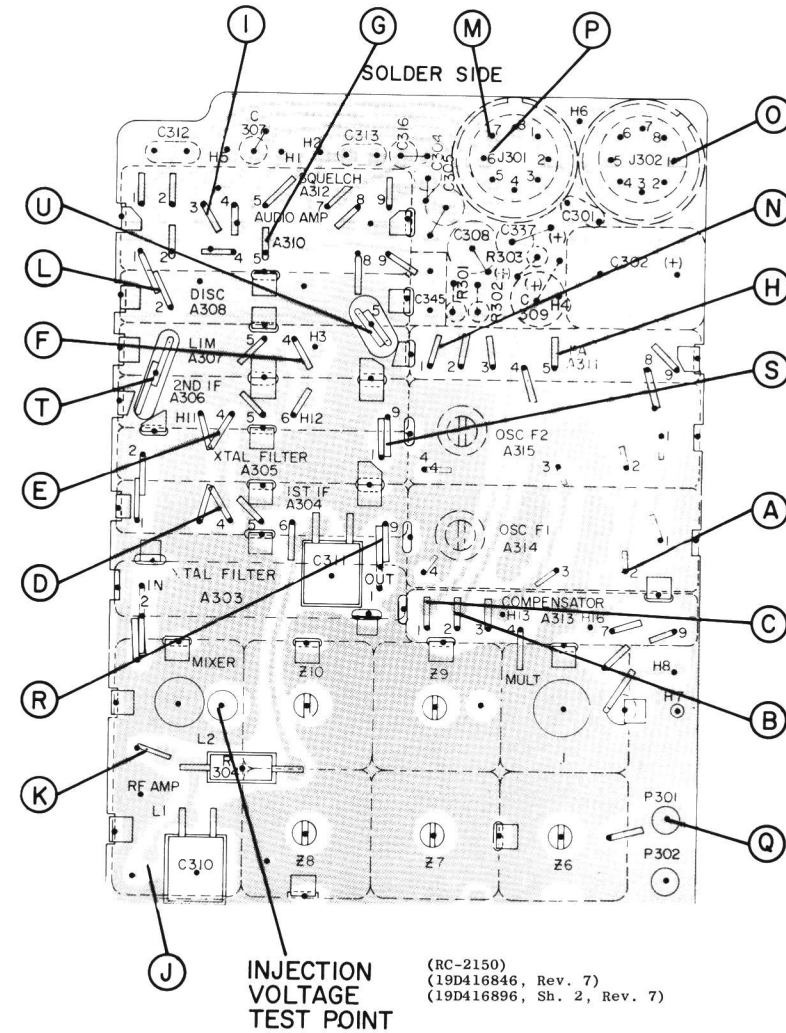
To change diode from a single source to a multi-source. Deleted CR1 and added CR2.

SYMBOL	GE PART NO.	DESCRIPTION
A302		FRONT END 19C317295G2 150.8-174 MHz
A1*		RF AMPLIFIER 19C327300G1 (Added by REV C)
C1	19A116114P11064	Ceramic: 100 pf ±10%, 100 VDCW; temp coef -4200 PPM.
C2	19A116114P8053	Ceramic: 47 pf ±5%, 100 VDCW; temp coef -1500 PPM.
C3	19A116114P2020	Ceramic: 6 pf ±5%, 100 VDCW; temp coef -80 PPM.
C5	5495323P12	Ceramic: .001 μf +100% -20%, 75 VDCW.
C6 and C7	19A116114P4059	Ceramic: 68 pf ±5%, 100 VDCW; temp coef -220 PPM.
CR1	19A116052P1	Silicon, hot carrier: Fwd. drop .350 volts max.
L1	19B216950G1	Coil.
L2	19B216948G1	Coil.
Q1 and Q2	19A116159P1	Silicon, NPN.
R1	3R151P184J	Composition: 180K ohms ±5%, 1/8 w.
R2	3R151P302J	Composition: 3K ohms ±5%, 1/8 w.
R4	3R151P204J	Composition: 200K ohms ±5%, 1/8 w.
R5	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R6	3R151P562J	Composition: 5.6K ohms ±5%, 1/8 w.
R7	3R151P103J	Composition: 10K ohms ±5%, 1/8 w.
A1*		RF AMPLIFIER 19C317445G1 (Deleted by REV C)
C1	19A116114P11064	Ceramic: 100 pf ±10%, 100 VDCW; temp coef -4200 PPM.
C2	19A116114P8053	Ceramic: 47 pf ±5%, 100 VDCW; temp coef -1500 PPM.
C3	19A116114P2020	Ceramic: 6 pf ±5%, 100 VDCW; temp coef -80 PPM.
C5	5495323P12	Ceramic: .001 μf +100% -20%, 75 VDCW.
C6 and C7	19A116114P4059	Ceramic: 68 pf ±5%, 100 VDCW; temp coef -220 PPM.
CR1*	19A116052P1	Silicon, hot carrier: Fwd drop .350 volts max. Added by REV B.
L1	19B216950G1	Coil.
L2	19B216948G1	Coil.

SYMBOL	GE PART NO.	DESCRIPTION
Q1 and Q2	19A116159P1	TRANSISTORS Silicon, NPN.
R1	3R151P184J	RESISTORS Composition: 180K ohms ±5%, 1/8 w.
R2	3R151P302J	Composition: 3K ohms ±5%, 1/8 w.
R4	3R151P204J	Composition: 200K ohms ±5%, 1/8 w.
R5	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
R6	3R151P562J	Composition: 5.6K ohms ±5%, 1/8 w.
R7	3R151P103J	Composition: 10K ohms ±5%, 1/8 w.
A4		MULTIPLIER 19C311873G5
C1	19A116114P7068	CAPACITORS Ceramic: 120 pf ±5%, 100 VDCW; temp coef -750 PPM.
C3	5495323P12	Ceramic: .001 μf +100% -20%, 75 VDCW.
C6	19A116114P4059	Ceramic: 68 pf ±5%, 100 VDCW; temp coef -220 PPM.
CR1*	19A116081P1	DIODES AND RECTIFIERS Silicon. Deleted by REV D.
CR2*	19A116809P1	Silicon. Added by REV D.
L2	19B216296P2	INDUCTORS Coil.
R1	3R151P432J	RESISTORS Composition: 4.3K ohms ±5%, 1/8 w.
R2*	3R151P432J	Composition: 4.3K ohms ±5%, 1/8 w. Deleted by REV A.
R8*	3R151P56R6J	Composition: 5.6 ohms ±5%, 1/8 w. Added by REV D.
R9*	3R151P432J	Composition: 4.3K ohms ±5%, 1/8 w. Added by REV A.
L6	19B216441G2	INDUCTORS Helical resonator. (Part of Z6). Includes: Tuning slug.
L7	19B216441G3	Helical resonator. (Part of Z7). Includes: Tuning slug.
L8	19B216441G12	Helical resonator. (Part of Z8). Includes: Tuning slug.
L9 and L10	19B216441G4	Helical resonator. (Part of Z9, Z10). Includes: Tuning slug.
Z6	19C311727P1	HELICAL RESONATORS Consists of L6 and 19D413132P16 can.
Z7	19C311727P1	Consists of L7 and 19D413132P3 can.
Z8	19C311727P1	Consists of L8 and 19D413132P17 can.
Z9	19C311727P1	Consists of L9 and 19D413132P19 can.
Z10	19C311727P1	Consists of L10 and 19D413132P20 can.
A303*	19C304824G1	Crystal Filter. In REV B & earlier:
	19C304516G3	Crystal Filter.
A304	19C311879G3	1st IF Amplifier.

A305*	19C304824G1	Crystal Filter. Earlier than REV A:
	19C304508G3	Crystal Filter.
A306	19C311879G4	2nd IF Amplifier.
A307	19C311876G4	Limiter.
A308	19C304504G3	Discriminator.
A309*	19C311878G2	Audio Amplifier. Deleted by REV G.
A310*	19C311995G4	Audio Amplifier. (Includes Tone Filter). In REV F & earlier:
	19C311995G2	Audio Amplifier. (Includes Tone Filter).
A311*	19C311877G4	PA. In REV E & earlier:
	19C311877G2	PA.
A312	19C311880G4	Squelch.
A313	19C320061G1	Compensator.
A314 and A315	4EG28A11	OSCILLATORS NOTE: when reordering, give GE Part Number and Specify exact frequency needed. Oscillator Module. 150.8-174 MHz. Fx = $F_0 - \frac{20}{9}$
A318 thru A323	4EG28A11	Oscillator Module. 150.8-174 MHz. Fx = $F_0 - \frac{20}{9}$
C301	5495323P12	RECEIVER BOARD 19D417493G1 CAPACITORS Ceramic: 0.001 μf +100% -20%, 75 VDCW.
C302	19A116178P7	Tantalum: 220 μf ±20%, 6 VDCW.
C303*	19A116089P1	Ceramic: 0.1 μf ±20%, 50 VDCW; temp range -55 to +85°C. Deleted by REV G.
C304	5491674P28	Tantalum: 1.0 μf ±20%, 25 VDCW; sim to Sprague Type 162D.
C305	5491674P35	Tantalum: 22 μf ±20%, 4 VDCW; sim to Sprague Type 162D.
C306	5491674P27	Tantalum: .47 μf ±20%, 35 VDCW; sim to Sprague Type 162D.
C307	5491674P31	Tantalum: 0.033 μf ±20%, 35 VDCW; sim to Sprague Type 162D.
C308 and C309	5491674P30	Tantalum: 39 μf ±20%, 10 VDCW; sim to Sprague Type 162D.
C311	5495323P12	Ceramic: 0.001 μf +100% -20%, 75 VDCW.
C312*	19A116192P1	Ceramic: 0.01 μf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL. In REV A & earlier:
	5495323P12	Ceramic: 0.001 μf +100% -20%, 75 VDCW.
C313	5495323P12	Ceramic: 0.001 μf +100% -20%, 75 VDCW.
C314*	5495323P12	Ceramic: 0.001 μf +100% -20%, 75 VDCW. Deleted by REV D.
C345*	19A116192P6	Ceramic: 0.022 μf ±20%, 50 VDCW; sim to Erie 8131-M050-W5R-223M. Added by REV G.

J301 and J302	19A116122P1	JACKS AND RECEPTACLES Feed-thru: sim to Warren Co 1-B-2994-4.
P301 thru P303	19A115834P4	PLUGS Contact, electrical: sim to AMP 2-332070-9.
R301*	3R151P680J	RESISTORS Composition: 68 ohms ±5%, 1/8 w. In REV A-C:
	3R151P101J	Composition: 100 ohms ±5%, 1/8 w.
	3R151P470J	Earlier than REV A:
	3R151P201J	Composition: 47 ohms ±5%, 1/8 w.
R302	3R151P150J	Composition: 200 ohms ±5%, 1/8 w.
R303	3R151P150J	Composition: 15 ohms ±5%, 1/8 w.
R304 and R305	3R151P470J	Composition: 47 ohms ±5%, 1/8 w.
C310	5495323P12	RECEIVER KIT 19A130043G1 STD 19A130043G2 CG CAPACITORS Ceramic: 0.001 μf +100% -20%, 75 VDCW.
C315* thru C322*	5495323P12	Ceramic: 0.001 μf +100% -20%, 75 VDCW. Deleted by REV A.
C323	19A116114P2045	Ceramic: 30 pf ±5%, 100 VDCW; temp coef -80 PPM.
C325 and C326	5495323P12	Ceramic: 0.001 μf +100% -20%, 75 VDCW.
C327	19A116114P8053	Ceramic: 47 pf ±5%, 100 VDCW; temp coef -1500 PPM.
C328 and C329	19A116114P2042	Ceramic: 24 pf ±5%, 100 VDCW; temp coef -80 PPM.
C330*	5495323P12	Ceramic: 0.001 μf +100% -20%, 75 VDCW. Added to G1 by REV A.
C335	5495323P12	Ceramic: 0.001 μf +100% -20%, 75 VDCW.
P309	19A115834P4	PLUGS Contact, electrical: sim to AMP 2-332070-9.



SYMPTOM	PROCEDURE
No Audio	<ol style="list-style-type: none">1. Check audio waveform at the top of the Volume Control (see Step 2).2. If audio is present, check voltage readings of Audio and Squelch modules (see Schematic Diagram).3. If audio is not present, check gain and current readings of Front End and IF modules (see Steps 1 & 3).
Poor Sensitivity	<ol style="list-style-type: none">1. Measure the injection voltage for a minimum level of 30 millivolts. If the reading is low, check the output of the Oscillator and Compensator modules with an RF voltmeter.2. Measure the gain of the Mixer stage (see Step 3). If low, measure the gain of the RF amplifier and IF modules.
Improper Squelch Operation	<ol style="list-style-type: none">1. Check the noise waveform at the input to the Squelch module and at Squelch Control high (see Step 2).2. Measure the DC voltages for the Squelch module (squelched and unsquelched).

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

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 P301 (High) and P302 (Low).

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 dB1 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 IF:

1. With no signal in, connect the RF probe to the output of the 2nd IF module. Increase the signal generator output until the Test Set reading increases by approximately 0.2 volt. Note Test Set and signal generator reading (dB2).
2. Connect the probe to the input of the 2nd IF module. Increase the signal generator until the Test Set reference reading is obtained, and note the dB reading (dB1).
3. Now subtract dB2 from dB1 to obtain the gain of the 2nd IF amplifier module.

LIMITER CHECK

The Limiter module limits on noise so that the gain of the circuit cannot be measured. The following procedure provides a check to determine if the module is limiting.

1. Switch the Test Amplifier to the X1 position and the Test Set to the Test 1 position. Then connect the RF probe to the output of the Limiter module and check for a reading of approximately 0.4 volt.
2. Increase the signal generator output. There should be no appreciable increase in the limiter output meter reading.

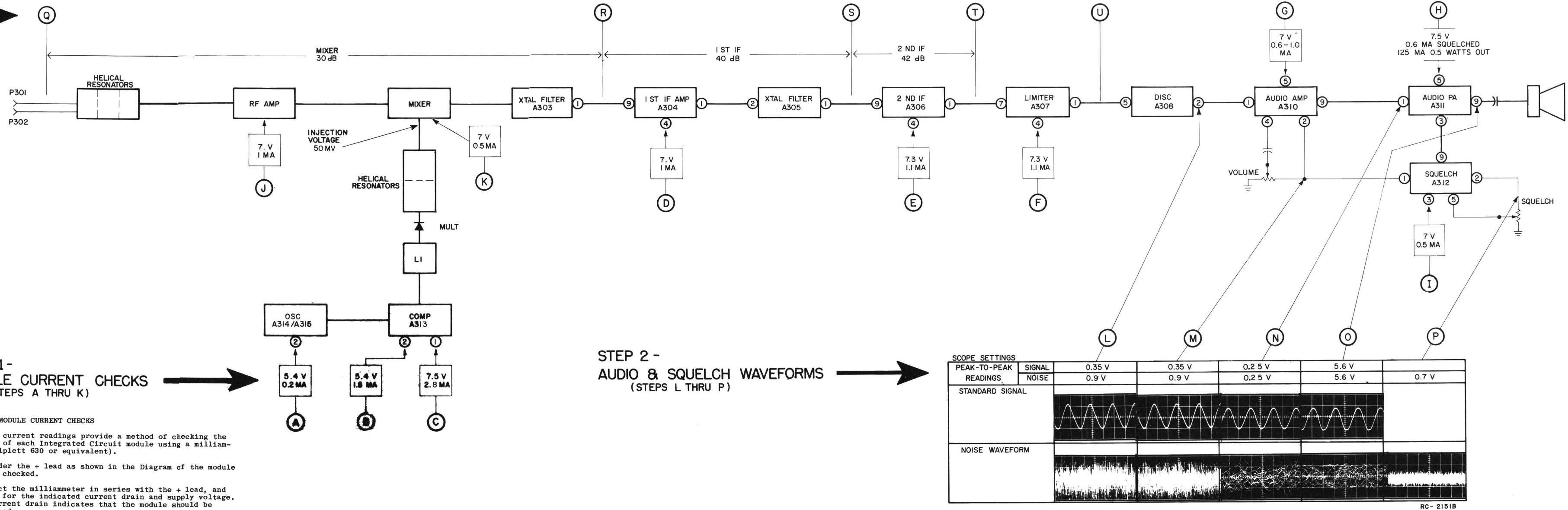
STEP 1-MODULE CURRENT CHECKS (STEPS A THRU K)

STEP 1 - MODULE CURRENT CHECKS

These current readings provide a method of checking the operation of each Integrated Circuit module using a milliammeter (Triplet 630 or equivalent).

1. Unsolder the + lead as shown in the Diagram of the module to be checked.
2. Connect the milliammeter in series with the + lead, and check for the indicated current drain and supply voltage. No current drain indicates that the module should be replaced.

CAUTION
When checking the current of Audio PA module A311, do not short Pin 4 to ground or to + (Pin 5). To do so will destroy the Audio PA module.



TROUBLESHOOTING PROCEDURE

150.8-174 MHz RECEIVER
MODELS 4ER59B11 AND B13