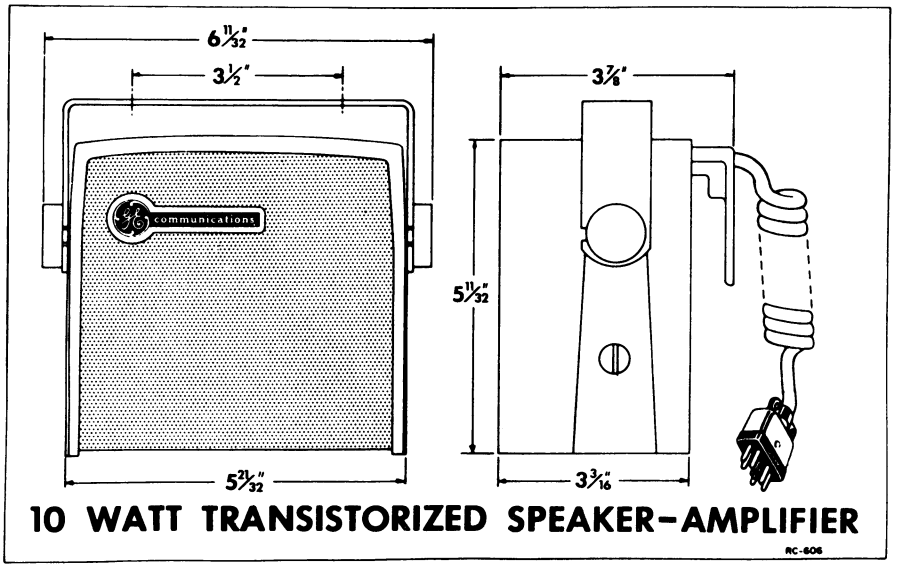
MAINTENANCE MANUAL FOR 10-WATT TRANSISTORIZED SPEAKER/AMPLIFIER



SPECIFICATIONS

Audio Power Output	10 watts
Audio Input	.001 watt
Rated Voltage	13.8 volts DC
Power Drain	.150 amp squelched .840 amp (average) unsquelched
Output Impedance	3.2 ohms
Input Impedance	Variable
Frequency Response	300-3000 cycles - less than 10% distortion
Transistor Complement	3
Used With	Transistorized Progress Line Mobile Combinations
Weight	3 lbs. 8 oz.

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GENERAL ELECTRIC

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ILLUSTRATIONS

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, the matter should be referred to the nearest General Electric District Sales Office.

GENERAL ELECTRIC
TRANSISTORIZED PROGRESS LINE
10-WATT SPEAKER MODEL 4EZ11A10

DESCRIPTION

This speaker is designed to provide an audio output of 10 watts when used with a Transistorized Progress Line Receiver. The speaker is intended for use with the TPL mobile radio unit when audibility is desired in high noise areas and/or when the operator must be at a distance from the mobile unit.

The speaker may be detached from its mounting bracket by loosening the knurled type screw on each side of the housing. The window hanging bracket is an integral part of the molded case and is stepped to insure a snug fit on either a plain window or a window with metal trim. In exposed locations or areas of high humidity, mount the Speaker-Amplifier so that moisture will not accumulate in the speaker cone.

CONNECTIONS

The speaker is provided with a 4 conductor coiled cord which plugs into the Speaker jack J703 on the front section of the two-way mobile radio.

ADJUSTMENTS

For proper operation of Speaker Model 4EZ11A10, Revision A through C, R1 should be adjusted for a reading of 1.25 volts DC between J1 and J2. R1, J1 and J2 are located on the bottom of the speaker and are accessible from the outside of the case.

Speaker Model 4EZ11A10, Revision D thru G, needs no adjustment, as it has a bias control circuit consisting of Transistor Q5, and resistors R7, R8, R9 and R10.

CIRCUIT ANALYSIS

The audio signal (unsquelched) from the receiver is coupled through P1-3 to the base of the Class A audio amplifier transistor Q2. Thermistor RT2 compensates Q2 against variations in temperature.

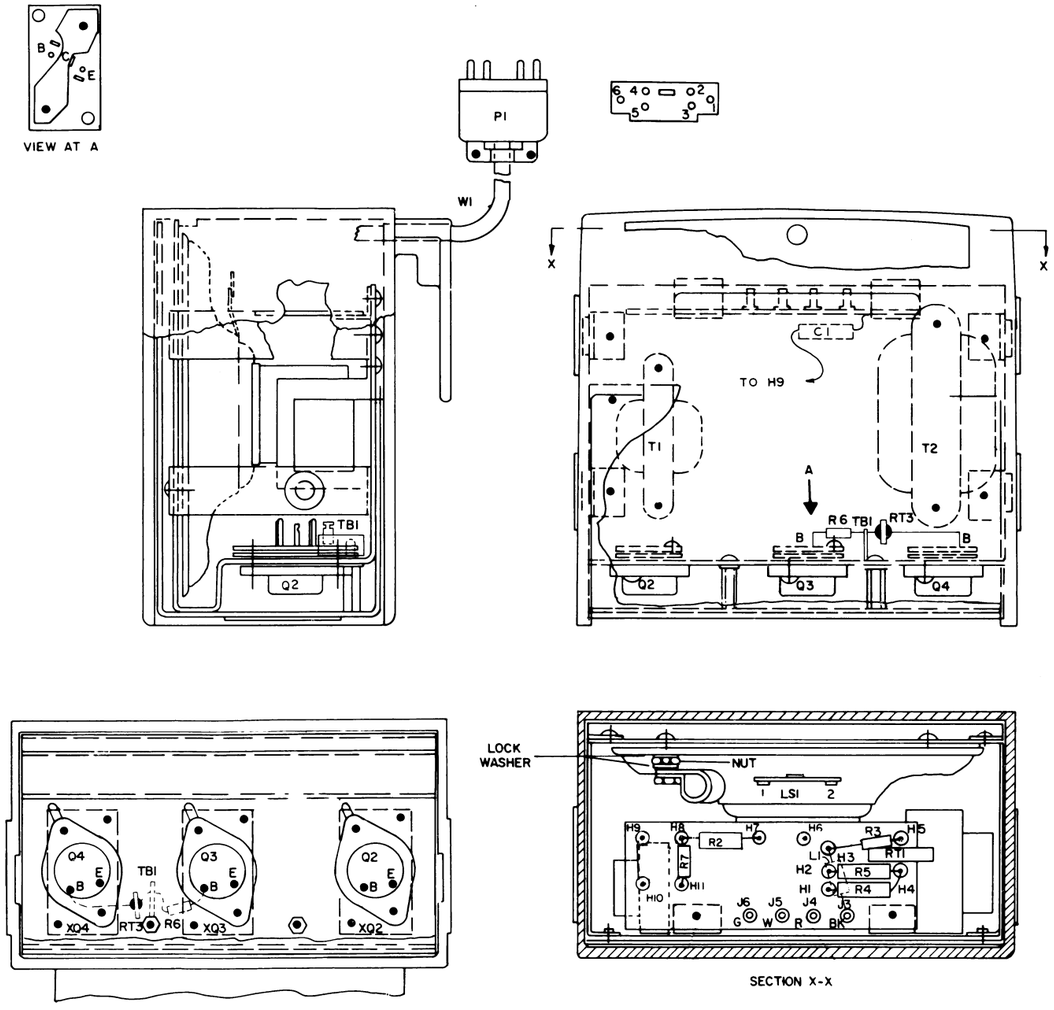
The output of Q2 is coupled to the second stage through audio transformer T1. The secondary of T1 is connected to the base of Q3 and Q4, which operate as a Common-emitter, class B, push-pull amplifier. The base bias is provided by voltage divider network RT1 and R3. Thermistor RT1 also stabilizes the current to the emitters of Q3 and Q4 under varying temperature conditions. R4 and R5 form the common emitter bias of transistors Q3 and Q4. Output from Q3 and Q4 is fed to loudspeaker LS1 through impedance matching transformer T2.

When the signal from the receiver is squelched, the speaker draws .150 (average) for battery saving.

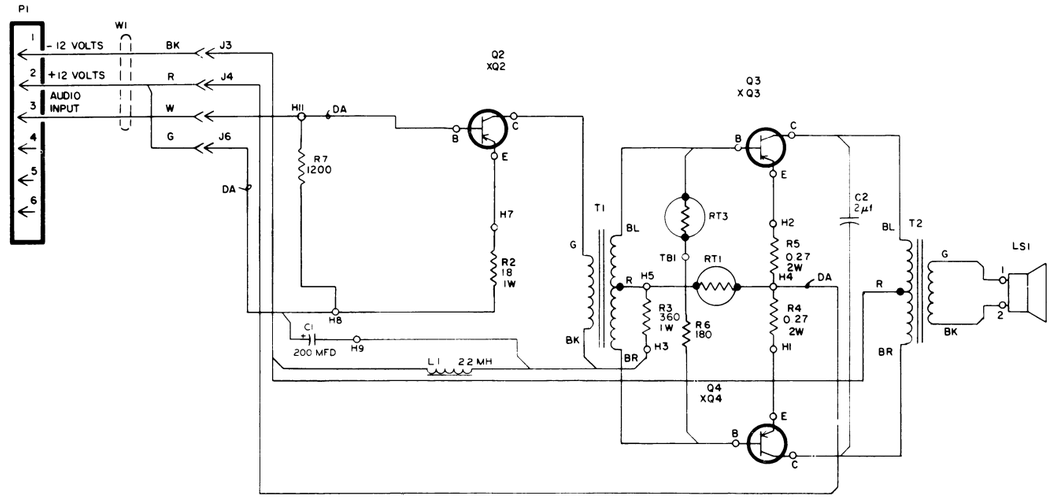
MAINTENANCE

DISASSEMBLY

1. Remove the plug from the control unit.
2. Remove the knurled knob screw and the Phillips head screw from each side of the speaker housing.
3. Lift off the speaker housing.
4. Remove the two Phillips head screws from the rear of the speaker grill.
5. Remove the speaker grill.
6. The circuit components are now accessible for servicing.
7. Refer to the Outline Diagram, Elementary Diagram and Parts List, in this instruction, for electrical maintenance of the Speaker.
8. For aid in servicing transistor circuits refer to Service Hints (listed in the main Table of Contents).



(C-5496347, Rev. 9)



SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.	
THIS ELEM DIAG APPLIES TO	
MODEL NO 4EZ11A10	REV LETTER K

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

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

(C-5495852, Rev. 17)

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Fig. 1 - Service Sheet

10-WATT TRANSISTORIZED SPEAKER/ AMPLIFIER MODEL 4EZ11A10; REV. K

(RC-614L)

PARTS LIST

10-WATT TRANSISTORIZED SPEAKER
MODEL 4EZ11A10
REV. K

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITOR - - - - - - - - - -
C1*	7489483-P20	Electrolytic: (Miniature for 85°C operation): hermetically sealed in aluminum tube, 200-µf +100% -10%, 15-VDCW. Sim to Sprague Electric 30D174A1. (Added by Rev. A).
C2*	7491930-P14	Mylar®, dielectric: 2 µf ±20%, 100 VDCW; sim to G-E 61F.
	7488462-P1	In Models of Rev. H: Dry electrolytic (non-polarized): 5 µf +100% -10% 25 VDCW.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - - - -
J1*	4029486-P1	Jack, Test Point: (Long headed, nylon, stake in); molded nylon body, beryllium copper contact, max operating voltage 600-vrms, max operating temp 105°C. Sim to Alden Products 110BCL1 - Black (Deleted by Rev. D).
J2*	4029486-P2	Jack, Test Point: (Long headed, nylon, stake in): molded nylon body, beryllium copper contact, max operating voltage 600 vrms, max operating temp 105°C. Sim to Alden Products 110BCL1-Red. (Deleted by Rev. D).
J3 thru J6	4033513-P4	Pin, Contact: Brass: cadmium plated, 0.435 inches x 0.093 inches diameter. Sim to Bead Chain L93-3. (Included in Component Board Assembly, G-E Part No. PL-4031147-G1).
		- - - - - - - - - - INDUCTOR - - - - - - - - - -
L1*	7492281-P2	Molded or encapsulated, insulated; ind 20,000 µh min, DC res 30-ohms max, DC current 130 ma max. (Added by Rev. C).
		- - - - - - - - - -LOUDSPEAKER - - - - - - - - - -
LS1	5491260-P1	Speaker: 5-inch pin cushion; voice coil imp 3.20 ohms ±10%; sim to Jensen P5VA. Specification No. C6207 with 1.47 ounce magnet.
		- - - - - - - - - - PLUG - - - - - - - - - -
P1	5495345-P14	Connector, Plug: Insulated, black phenolic, 6 male contacts (brass), max rating 1,000 VDC (contact to contact), max current 5-amps. Sim to Component Mfg 6601-M6A. (Included in W1).
		- - - - - - - - - -TRANSISTORS - - - - - - - - - -
Q1*	5496667-P2	Germanium: PNP; hermetically sealed in metallic case with glass seal. Sim to 2N188A. (Deleted by Rev. H).
Q2*	5496663-P1	Germanium: PNP.
	5496663-P2	In Models of Rev. J and earlier: Germanium: PNP.
	5496663-P1	In Models of Rev. G and earlier: Germanium: PNP.
Q3* and Q4*	5496663-P3	Germanium: PNP.
	5490654-P1	In Models of Rev. J and earlier: Germanium: PNP.
	19C300128-P4	In Models of Rev. A and earlier: Sim to Type 2N257.
Q5*	5496666-P5	Germanium: PNP; hermetically sealed in metallic case with glass seal. Sim to 2N324. (Added by Rev. D).
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1*	2R73-P9	Potentiometer, Composition: (Linear taper): screwdriver slot, 1,500 ohms ±20%, 2.25-w. Sim to Allen Bradley J. (Deleted by Rev. D).
R2*	3R78-P180J	Fixed composition: 18 ohms ±5%, 1 w.
	3R78-P220J	In Models of Rev. E or earlier: Fixed composition: 22 ohms ±5%, 1 w.
R3*	3R78-P361J	Fixed composition: 360 ohms ±5%, 1 w.
	3R78-P511J	In Models of Rev. B thru G: Fixed composition: 510 ohms ±5%, 1 w.
	3R78-P301J	In Models of Rev. A or earlier: Fixed composition: 300 ohms ±5%, 1 w.
R4* and R5*	3R18-P43	Wire-wound: Insulated, 0.27 ohms ±5%, 1/2 w. Sim to IRC BW.
	3R18-P49	In Models of Rev. E or earlier: Wire-wound: Insulated: 0.47 ohms ±5%, 1/2 w. Sim to IRC BW.
R6*	3R77-P181K	Fixed composition: 180 ohms ±10%, 1/2 w.
	3R77-P750J	In Models of Rev. G: Fixed composition: 75 ohms ±5%, 1/2 w. (Added by Rev. G).
R7*	3R77-P122J	- - - - - - - - RESISTORS (Cont'd) - - - - - - - - Fixed composition: 1,200 ohms ±5%, 1/2-w.
	3R77-P392J	In Models of Rev D and E. Fixed composition: 3,900 ohms ±5%, 1/2-w. (Added by Rev D).
R8*	3R77-P392J	Fixed composition: 3,900 ohms ±5%, 1/2-w. (Added by Rev D).(Deleted by Rev. H).
R9*	3R77-P391J	Fixed composition: 390 ohms ±5%, 1/2-w.
	3R77-P241J	In Models of Rev D and E. Fixed composition: 240 ohms ±5%, 1/2-w. (Deleted by Rev. H)
R10*	3R77-P271J	Fixed composition: 270 ohms ±5%, 1/2-w. (Added by Rev D).deleted by Rev. H).
		- - - - - - - - - THERMISTOR - - - - - - - - -
RT1	5490828-P7	Thermal resistor: glyptol dipped body 5 ohms at 25°C ±10% res, max input 3.0-w at 40°C, temp coefficient 2,700°C ±5%. Sim to Globar Division 343H - Black.
RT2*	5490828-P17	Disc: 40 ohms ±10% at 25 C, temp coef 3400 ±5%; sim to Globar C1605H-1. (Added by Rev F; deleted by Rev. J).
RT3	5490828-P17	Thermistor: 40 ohms ±10% at 25°C, temp coef 3400 ±5%; Sim to Globar C1605H-1. (Added by Rev G).
		- - - - - - - - - TRANSFORMERS - - - - - - - - -
T1	5491926-P1	Audio: (Driver); open core and coil construction, DC operating voltage 13.60 volts at 150-MADC: Pri 1: 100 ohms ±10% Sec 1: 200 ohms (CT).
T2*	19B201569-P1	Transformer, Audio: Pri imp: 16 ohms ±10% CT, res 1 ohm: Sec imp: 3.2 ohms ±10%, res 0.39 ohms.
	5491925-P1	In Models of Rev E or earlier: Transformer, Audio: Pri imp: 21 ohms CT ±10%: Sec imp: 3.2 ohms.
		- - - - - - - - - - CABLE - - - - - - - - - -
W1	PL-5491934-G1	Cable Assembly Includes the following components: Connector: (P1)
	5491940-P1	Cord, Coiled: Insulated, rubber; Neoprene jacket, 4-conductor No. 23 AWG stranded copper wire, 84-inches long (approximately). Sim to Koiled Kords 4020N.
	5495345-P21	Hood and Liner Assembly Includes the following components: Hood, Metal: Nickel-plated; 1.125 inches long, 1.20 inches tall, 0.50 inches wide.
	5495345-P22	Liner, Insulated: Black phenolic. Pin, Metal: 0.50 inches long, 0.06 inches in diameter, (for assembling hood to plug).
	5495345-P23	Retainer, Spring: Steel. Sim to Component Mfg Service P-35.
	PL-4033271-G1	Cable Clamp Assembly Includes the following components:
	4033271-P2	Hook: Metal; 0.54 inches between turns (each end)
	4033271-P3	Collar: Metal; 0.230 inches inner diameter, 0.321 inches outer diameter.
	4029840-P1	Terminal: (Plug receptacle for 0.093 inch long pin); 0.56 inches long, 0.115 inches diameter. 1-contact. Sim to AMP Inc 41854.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XQ1*	5490277-P1	Transistor: Low-loss mica-filled phenolic insulation; 4-contacts, 1,000 megohms min insulation res. contact res 0.03 ohms max, max current 1-amp, working voltage 400-VRMS Sim to Elco Corp 3303. (Used with mounting ring. Sim to Elco Corp 757). (Included in Component Board Assembly, G-E Part No. PL-4031147-G1). (Deleted by Rev. H).
XQ2 thru XQ4	5491888-P1	Power Transistor: Grade XP natural colored laminated phenolic body, phosphor bronze contact or brass contact. Sim to Cinch 133-92-10-034.
XQ5*	5490277-P1	Transistor: Low-loss mica-filled phenolic insulation; 4-contacts 1,000 megohms min insulation res. contact res 0.03 ohms max. max current 1-amp, working voltage 400-VRMS. Sim to Elco 3303. (Used with mounting ring. Sim to Elco 757). (Added by Rev D). deleted by Rev. H).
	PL-4031147-G1	- - - - - - - - - SUB ASSEMBLY - - - - - - - - - Component Board Assembly Includes the following components: Jacks: (J3 thru J6) Sockets: (XQ1 and XQ5)
	5491898-P2	Board: Laminated phenolic; 3.70 inches x 1.38 inches x 0.062 inches diameter.
	4033902-P1	Bracket, Angle: Spring steel; 0.625 inches x 0.406 inches x 0.390 inches diameter. Sim to Tinnerman Products C8599-6Z-67.
	7162414-P1	Ring, Mounting: (For transistor socket); brass, cadmium plated. (To mate with Elco 3300 Series). Sim to Elco 757.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	5498586-P1	Housing: Steel; gray, 5.31 inches x 5.25 inches diameter.
	5495375-P1	Chassis: Aluminum; 5.28 inches x 5.06 inches x 2.56 inches diameter.
	PL-4033890-G1	Bracket Assembly Includes the following components:
	4033890-P2	Bracket: Steel; 2.56 inches x 0.625 inches x 0.05 inches diameter.
	7160523-P6	Nut, Weld: Steel. No. 1/4-20.
	5495585-P1	Grille: Steel; 5.28 inches x 5.08 inches x 2.81 inches diameter.
	5491292-P2	Bracket: Steel; 5.68 inches x 1.24 inches x 0.090 inches diameter.
	4032459-P1	Screw, Thumb: Steel; abrasive polished, 0.74 inches long.
	4032591-P2	Pad: Molded sponge rubber; 3.00 inches x 0.50 inches x 0.25 inches diameter.
	4032591-P4	Pad: Molded sponge rubber; 1.00 inches x 0.50 inches x 0.250 inches diameter.
	4031291-P2	Insulator: Anodized aluminum; 1.187 inches x 1.15 inches x 0.02 inches diameter.
		Grease, Silicone: Sim to Dow-Corning 4 Compound.
	5491480-P2	Clip, Cable: Insulated. Sim to Adel Precision 754.
	4035439-P1	Sink, Heat: Transistor; aluminum alloy, red anodize. Sim to Birtcher 3AL-635-2R. (Used with Q1).
	7487424-P2*	Terminal Board: 1 insulated terminal. Added by Rev C.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

PRODUCTION CHANGES

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

10-Watt Speaker Model 4EZ11A10

REV. A - To suppress power supply noise in the speaker. Added C1 between LS1-2 and H3.

REV. B - To implement use of higher gain transistor in output circuit. Changed value of R3.

REV. C - To eliminate power supply switching noise when transmitter is operating. Add Coil L1. Remove bus wire between J3 and H3. Change transformer leads.

REV. D - To eliminate need for bias pots and metering jacks and to improve bias stability. Delete R1, J1 and J2. Add XQ5, Q5, and resistors R7, R8, R9, and R10.

REV. E - To eliminate alternator interference. Change location of C1 from between H3 and LS1-2 to between H9 and J6.

REV. F - To increase power output and decrease distortion. R2, R4, R5, R7, R9, and T2 changed, and RT2 added.

REV. G - To eliminate noise as receiver unsquelches, decrease the noise at high listening levels and increase protection for speaker. Added R6 and RT3 in series across secondary of T1. Removed black wire that connected jack J4 and speaker voice coil.

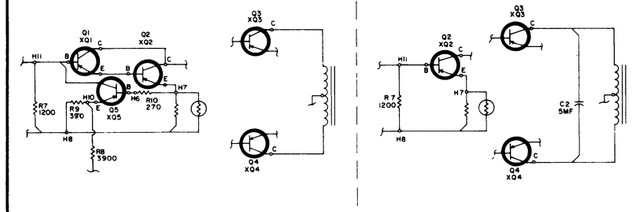
REV. H - To reduce distortion and ambient noise. R3, R6 and Q2 changed; Q1, Q5, R8, R9 and R10 deleted; C2 added.

Outline Diagram Changes

Removed Q1, Q5, R8, R9 and R10, Added C2.

Elementary Diagram Changes

Was: Changed To:



Text Changes

On page 1 of LBI-3170, paragraphs 5,6 and 7 were:

Speaker Model 4EZ11A10, Revision D or later, needs no adjustment, as it has a bias control circuit consisting of Transistor Q5, and resistors R7, R8, R9 and R10.

CIRCUIT ANALYSIS

The audio signal (unsquelched) from the receiver is coupled through P1-3 to the base of the audio amplifier transistor Q1. Q1 and Q2 are compound connected class A audio amplifiers. Compound Connected transistors have load-sharing properties. The output current is the sum of the collector currents of the two transistors. The input impedance of a compound connected circuit is higher than that normally encountered in transistor amplifiers. Such a circuit has a more linear operation and consequently less distortion at near maximum power output.

The output of the class A amplifier audio stage is coupled to the second stage through audio transformer T1. The secondary of T1 is connected to the base of Q3 and Q4, which operate as a Common-emitter, class B, push-pull amplifier. The base bias is provided by voltage divider network RT1 and R3. Thermistor RT1 also stabilizes the current to the emitters of Q3 and Q4 under varying temperature conditions. R4 and R5 form the common emitter bias of transistors Q3 and Q4. Output from A3 and Q4 is fed to loudspeaker LS1 through impedance matching transformer T2.

REV. J - To provide a more consistent frequency response. Changed C2 and deleted RT2.

REV. K - To provide transistors with smaller gain variations for improved performance. Changed Q2, Q3 and Q4.