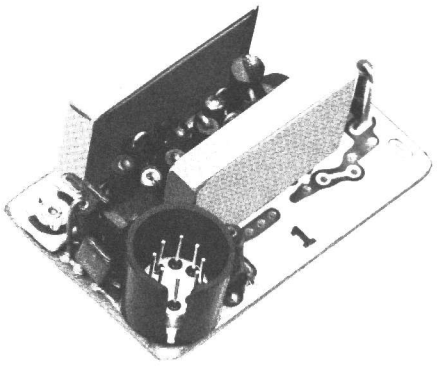
MOBILE RADIO

VEHICULAR REPEATER

TYPE 90 ENCODE/DECODE MODEL 4EK18A13

Maintenance Manual LBI30814 A
DATAFILE FOLDER – DF5051



SPECIFICATIONS *

Used With	Vehicular Repeater
Tone Frequencies	1050 Hz to 3000 Hz
Frequency Stability	±0.3%
Transmit Drain	3.6 Milliamperes
Temperature Range	-30°C to +60°C (-22°F to +140°F)
Nominal Input Voltage Requirements	+8.5 VDC +5.4 VDC

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

ENCODE/DECODE MODEL 4EK18A13

GENERAL ELECTRIC

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NOTE

Although the highest DC voltage in the Type 90 Decoder is supplied by a vehicular battery, high currents may be drawn under short circuit conditions. These currents can possibly heat metal objects such as tools, rings, watchbands, etc., enough to cause burns. Be careful when working near energized circuits!

DESCRIPTION

Type 90 Encoder/Decoder Model 4EK18A13 is a tone encoder/decoder assembly for operating on standard Type 90 tone frequencies of 1000 to 3000 Hz. The encoder/decoder assembly generates and detects the Type 90 tone frequencies used to establish and control the priorities of the vehicular repeaters as they arrive and depart the operational area. The assembly uses three Integrated Circuit modules consisting of Input Amplifier A601, Limiter-Switch A602, and Selective Amplifier A603. A typical diagram of the Limiter Switch is shown in Figure 1 and a typical diagram of the Input Amplifier is shown in Figure 2.

CIRCUIT ANALYSIS

The Type 90 encode circuit is switched "on" or "off" by Q8 on the System board under control of the TYPE 90 ENCODE ENABLE signal. This signal is generated on the Logic board. When the Type 90 ENCODE ENABLE signal is present (logic "0"), 8.5 Volts is applied to pin 7 of the Input Amplifier module. This turns on Q4, turning off Q3. Q3 removes the ground on the emitter of Q2, allowing Q2 to turn on. Tone from the Selective Amplifier module is applied to pin 5 of the Input Amplifier and is coupled through Q2 to Pin 4 where it is capacitively coupled through C601 to amplifier Q5. The amplifier output is applied to pin 2 of the Limiter Switch module where it activates tone switch (Q4).

The encode tone output is applied to the transmitter through pin 8 of the Input Amplifier to J601-8 on the System board where it is amplified and applied to the MIC HI input lead.

Inserting the PE radio into the Vehicular Charger or releasing the REPEATER ENABLED switch on the Vehicular Charger causes the logic board to generate a Type 90 Encode Enable signal which removes 8.5 volts from pin 7 of the Input Amplifier module, turning off Q4. When Q4 turns off, Q3 turns on. With Q3 turned on, Q2 is held off thereby

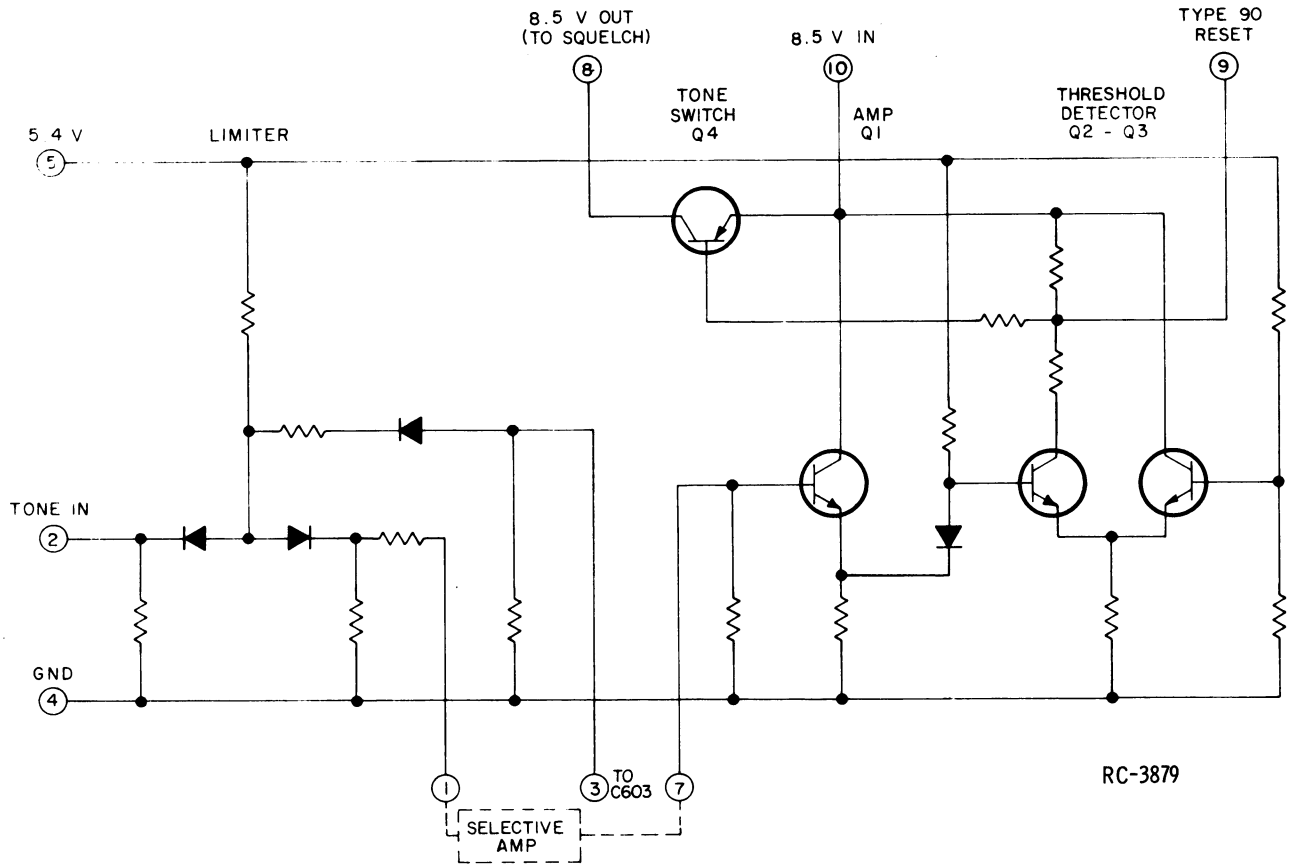

Figure 1 - Typical Limiter Switch Circuit

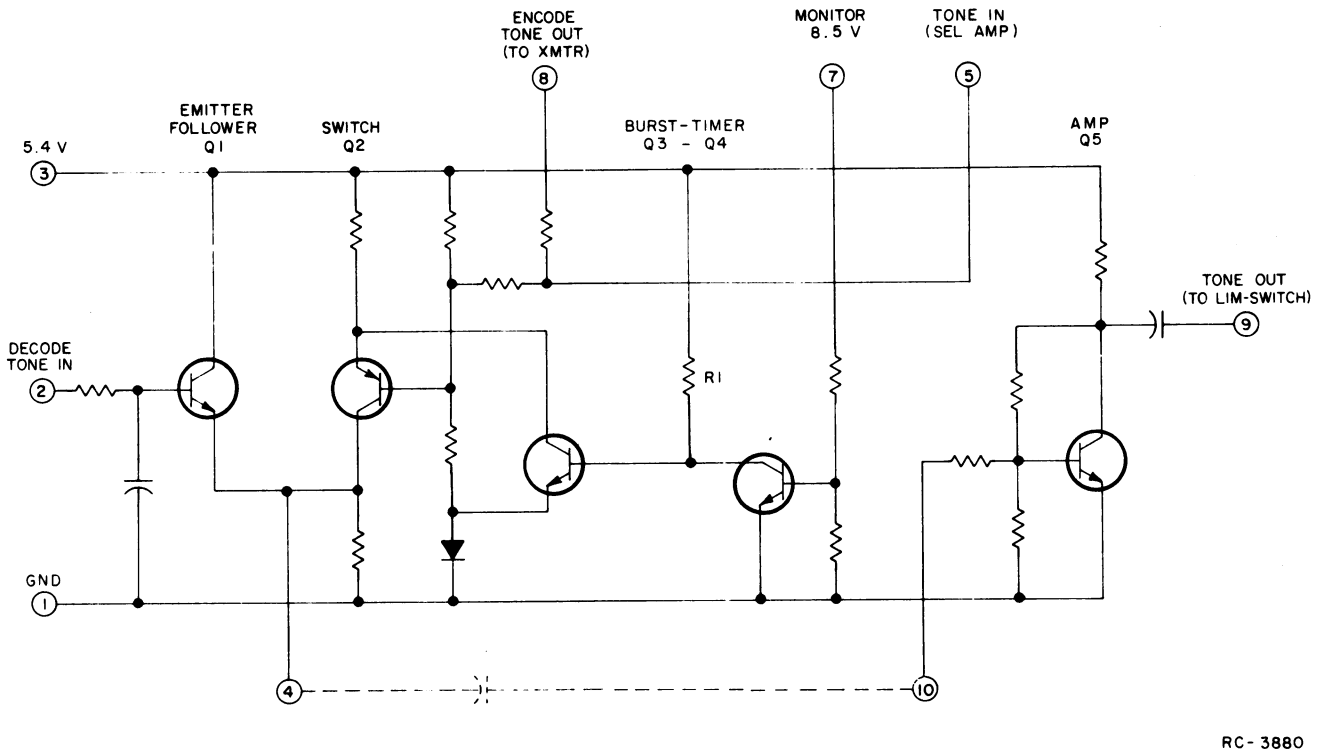

Figure 2 - Typical Input Amplifier Circuit

lowering the emitter of Q1 to near A-. This prevents any tone output to the transmitter.

Under these conditions audio from R701-3 (Volume Hi) is applied to the base of emitter-follower Q1 on the Input Amplifier module. The output of Q1 is capacity-coupled to the base of amplifier Q5. The amplifier output is applied to the limiter circuit on the Limiter-Switch module.

Any tone present in the signal is limited by diodes CR1 and CR2, and the output applied through pin 1 to the Selective Amplifier module. If the incoming tone is of the proper frequency, the output of the Selective Amplifier will be just sufficient to operate the detector circuit (Q1 thru Q3).

The positive half cycles of the Selective Amplifier output turns on Q1, which over-rides the diode and turns on Q2. Turning on Q2 causes its collector to drop to ground potential, turning on the PNP tone switch Q4. When conducting, the 8.5 Volts at the collector of Q4 is applied to the Type 90 decode circuit on the Logic board. The voltage is connected through H42 on the System board to P904-14.

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

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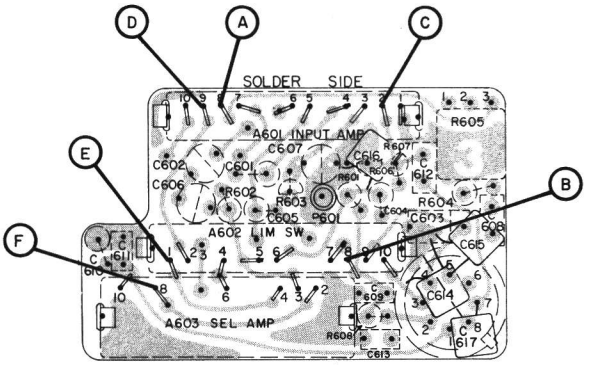
TROUBLESHOOTING

Always connect the board to ground (G11) when removed from the radio for troubleshooting.

SYMPTOM	PROCEDURE
Unit won't encode	1. Place Type 90 switch S1301 in the Monitor (encode) position, and check for .06 volts RMS at position (A). Key the transmitter and check for the reading at (A) to drop to zero in approximately one second (pulsed tone). 2. If these readings are correct, check the transmitter audio circuit and modulation setting. 3. If the readings are not correct, isolate the defective module by checking readings (C) through (F).
- CAUTION - Do not ground Pins 2 or 8 on Selective Amplifier A603, or Pin 5 on input amplifier A601. To do so will destroy the Selective Amplifier module.	
Unit won't decode	1. Place Type 90 switch S1301 in the Reset and then in the Monitor position and check for proper operation of the receiver. 2. If the receiver operates properly, place the switch in the Reset and then the Normal position. Apply the proper Type 90 tone to the radio and check for 7.4 volts DC at position (B). Place the switch in the Reset and then the Normal position and check for zero volts at (B). 3. If the readings are not correct, isolate the defective module by checking readings (C) through (F).



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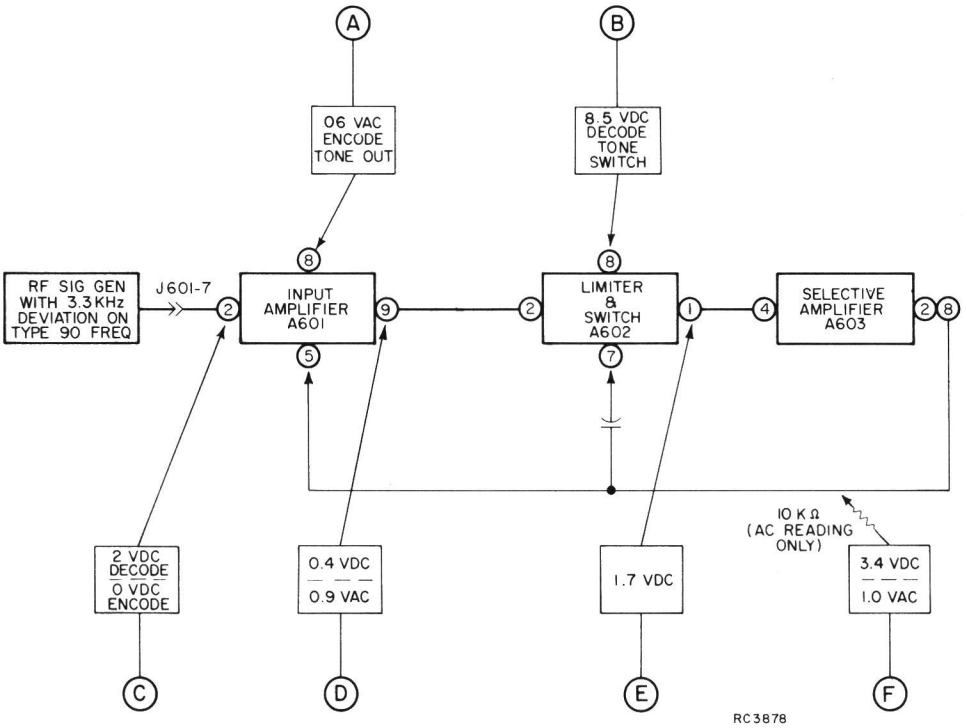
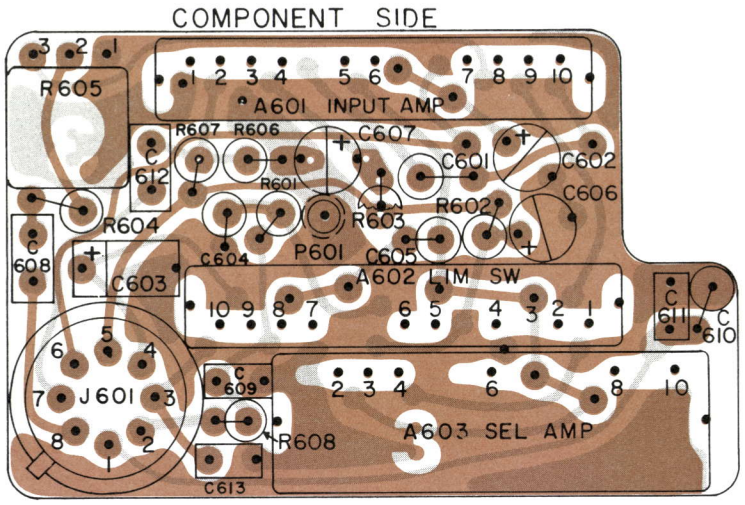
(19C317940, Rev. 2)
(19B219040, Sh. 2, Rev. 3)



TROUBLESHOOTING PROCEDURE

TYPE 90 ENCODER/DECODER MODEL 4EK18A13



(19C317940, Rev. 2)
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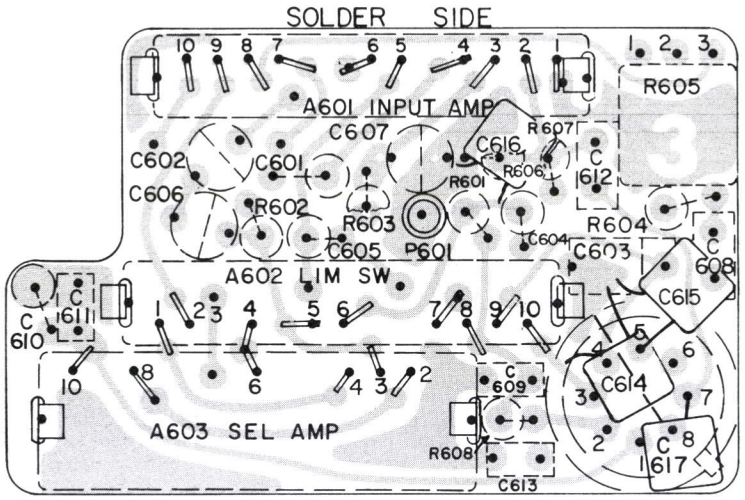
(19B219040, Sh. 2, Rev. 3)



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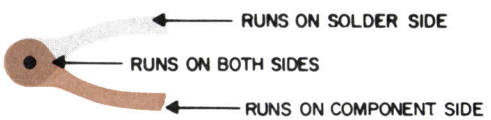
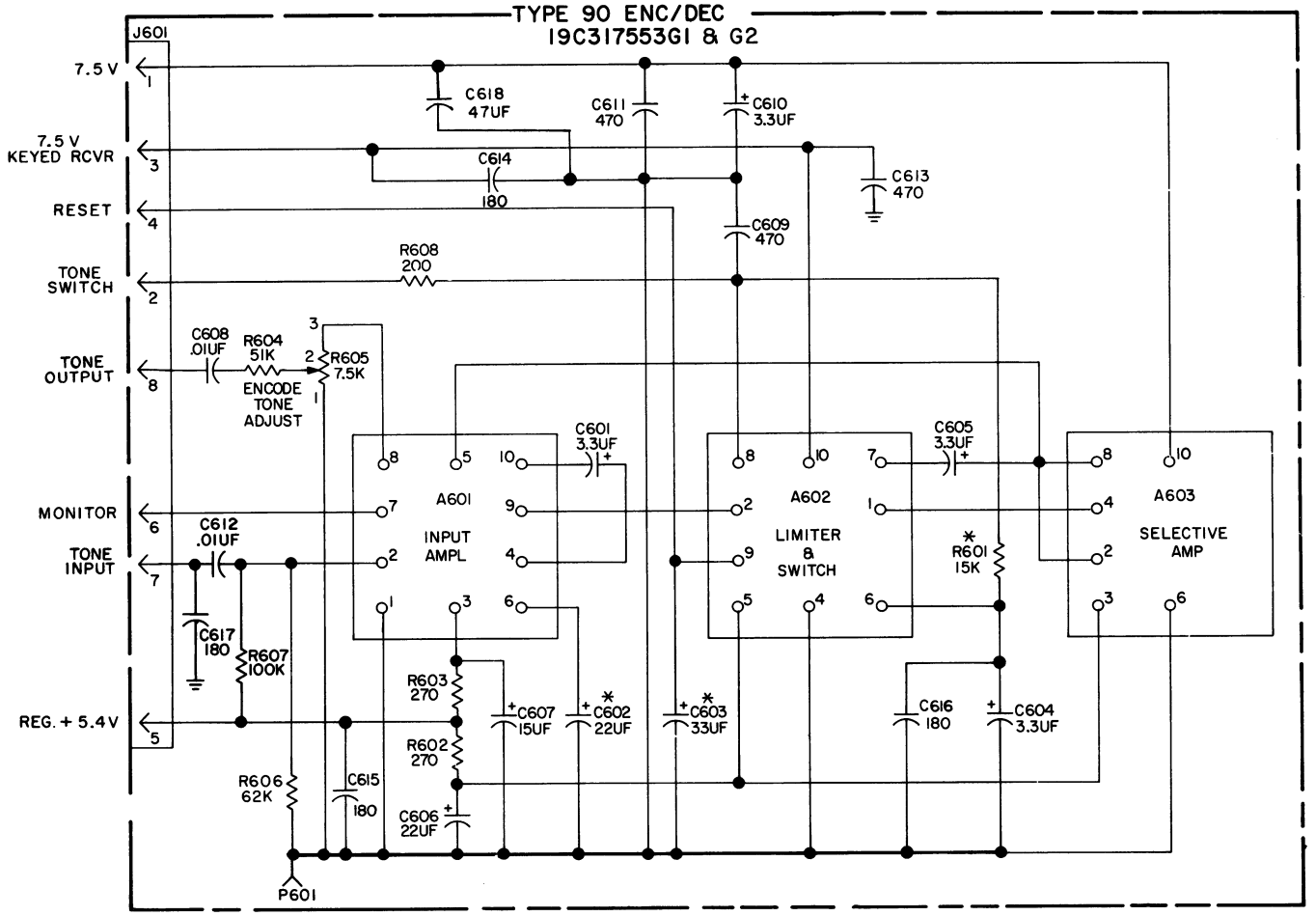
(19B219040, Sh. 2, Rev. 3)



OUTLINE DIAGRAM

TYPE 90 ENCODER/DECODER
MODEL 4EK18A13



ALL RESISTORS ARE 1/4 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.

* NOT PRESENT IN GROUP 2

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	REV LETTER
4EK18A12	
4EK18A13	

(19C327066, Rev. 2)

SCHEMATIC DIAGRAM

TYPE 90 ENCODER/DECODER MODEL 4EK18A13

PARTS LIST

TYPE 90 ENCODER/DECODER
19C317553G2
ISSUE 2

SYMBOL	GE PART NO.	DESCRIPTION
A601	19C317061G2	Input Amplifier.
A602	19C317014G2	Limiter and Switch.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C601	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C604 and C605	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C606	19C307102P15	Tantalum: 22 µf ±20%, 6 VDCW; sim to Component Inc G226R.
C607	19C307102P14	Tantalum: 15 µf ±20%, 10 VDCW; sim to Component Inc G156R.
C608	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C609	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-050-W5R.
C610	5491674P36	Tantalum: 3.3 µf ±20%, 10 VDCW; sim to Sprague Type 162D.
C611	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-050-W5R.
C612	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C613	19A116192P2	Ceramic: 470 pf ±20%, 50 VDCW; sim to Erie 8111-050-W5R.
C614 thru C617	19A700229P73	Ceramic: 180 pf ±10%, 100 VDCW; temp coef -3300 PPM/°C.
		- - - - - - - JACKS AND RECEPTACLES - - - - - -
J601	19C331182P1	Terminal, feed-thru.
		- - - - - - - - - - - PLUGS - - - - - - - - - -
P601	19A115834P4	Contact, electrical: sim to Amp 2-332070-9.
		- - - - - - - - - - RESISTORS - - - - - - - - -
R602 and R603	19A700106P49	Composition: 270 ohms ±5%, 1/4 w.
R604	3R152P513J	Composition: 51K ohms ±5%, 1/4 w.
R605*	19A116412P5	Variable, cermet: 10K ohms ±10%, 1/2 w; sim to Helipot Model 62 PR.
		Earlier than REV A:
	19A116093P1	Variable, carbon film: 7.5K ohms ±20%, 0.20 w; sim to Centralab Series 3 Type 620-1.
R606	3R152P623J	Composition: 62K ohms ±5%, 1/4 w.
R607	19A700106P111	Composition: 100K ohms ±5%, 1/4 w.
R608	19A700106P46	Composition: 200 ohms ±5%, 1/4 w.
		ASSOCIATED PARTS
		NOTE: When reordering give GE Part Number and specify exact frequency needed.
A603	19D413245G5	Selective Amplifier. 847.5 Hz. (STANDARD)
	19D413245G4	Selective Amplifier. 1050-3000 Hz. (OPTIONAL)

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.