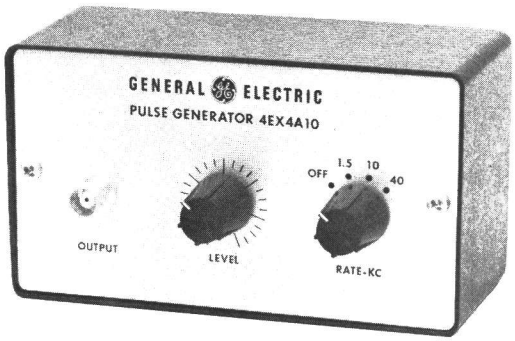
MOBILE RADIO

MAINTENANCE MANUAL

PULSE GENERATOR MODEL 4EX4A10



SPECIFICATIONS *

Combination Number (Includes Test Set & Cable)	TE-21
Dimensions (H x W x D)	3" x 5-1/2" x 2-1/2"
Input Power	0.5 milliamps at 14 volts (two 7-volt Mercury batteries)
Pulse Repetition Rate	1.5 kilohertz ±20% 10 kilohertz ±20% 40 kilohertz ±30%
Pulse Width	0.05 to 0.7 microseconds
Pulse Amplitude	0 - 3 volts (into a 50 ohm load)
Temperature Range	0°C to 60°C (+32°F to +140°F)

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

EX-4-A

GENERAL ELECTRIC

TABLE OF CONTENTS

ILLUSTRATIONS

DESCRIPTION

Pulse Generator Model 4EX4A10 is a transistorized, battery-operated device that is designed for testing and servicing General Electric Two-Way Mobile Radio Combinations equipped with Noise Blankers.

This Pulse Generator provides positive output pulses with a peak-to-peak amplitude that exceeds 3 volts when operating into a 50-ohm load. Three pulse repetition rates (1.5, 10, and 40 KC) permit a serviceman to simulate noise conditions that may be encountered during normal equipment operation.

OPERATION

GENERAL

All controls and the output jack are conveniently located on the front of the Pulse Generator. These controls consist of a RATE-KC Switch and a LEVEL control. The RATE-KC switch performs the dual function of selecting the pulse repetition rate and turning the generator on. The LEVEL control adjusts the signal level that is available at the OUTPUT jack.

A 4-foot cable is supplied for making connections between the generator and the receiver antenna jack.

APPLICATION

To test Noise Blanker operation with the Pulse Generator, proceed as follows:

1. Connect an RF signal generator (Measurements M560 or equivalent) and the Pulse Generator to the receiver antenna input as shown in Figure 1.

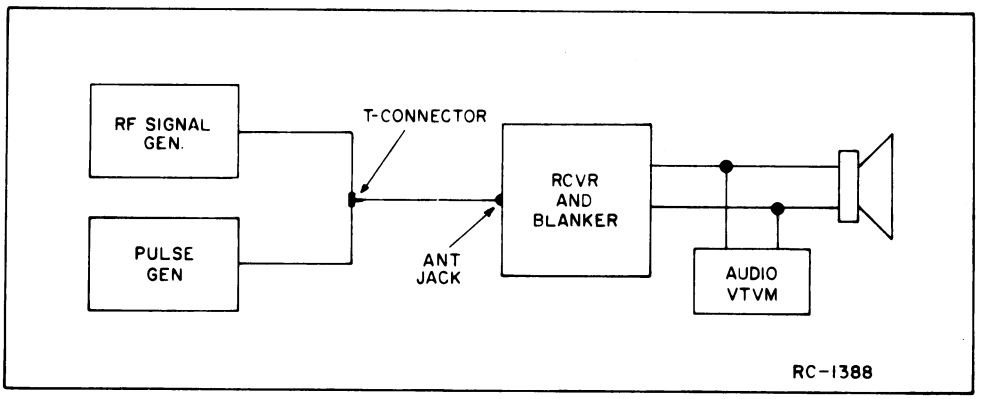


Figure 1 - Equipment Connection Diagram

2. With the Pulse Generator turned off, adjust the RF signal generator to produce 20-db receiver quieting.

3. Disable the Noise Blanker (refer to appropriate Noise Blanker Instructions) and set the RATE-KC Switch of the Pulse Generator to the position indicated by the following chart.

NOISE BLANKER	RATE-KC
MASTR Progress Line Professional and Executive Series	1.5 KC
TYPE EZ-14-A (TPL)	1.5 KC
TYPE EZ-15-A (Progress Line)	10 KC

4. Adjust the Pulse Generator LEVEL control to produce maximum degradation of receiver quieting.

5. Actuate the Noise Blanker and check for a significant improvement in receiver quieting. If a significant improvement is not obtained, the Noise Blanker is not operating properly. In this case, refer to the Maintenance Section of the applicable unit instruction for Service Check or Trouble Shooting procedure.

6. To check the automatic repetition rate switch on the Noise Blanker, set the RATE-KC Switch to 40. If the automatic switch is operating properly, then actuating or disabling the Noise Blanker should not make an appreciable improvement in receiver quieting.

CIRCUIT ANALYSIS

Pulse signals are generated by Astable Blocking Oscillator Q1001. Three different pulse rates can be obtained by changing the R-C time constant of the oscillator feedback circuit with RATE-KC Switch S1001. When a pulse rate is selected, battery power is connected to the oscillator through contacts of S1001. The output provided by the oscillator appears at OUTPUT Jack J1001 and can be adjusted by LEVEL control R1005.

The operation of the oscillator starts with the application of DC power (S1001 set to a pulse rate position). Positive battery voltage is connected to the collector of Q1001 through the primary winding of T1001, while positive base bias is established by a voltage divider network consisting of R1001 and R1002. As a result, Q1001 conducts.

As current flows in the collector circuit of Q1001, a voltage is developed across the primary winding of T1001. The induced voltage in the feedback winding of T1001 is coupled to the base of Q1001, further increasing base and collector current. Regenerative action continues until the primary of T1001 is saturated.

When saturation is reached, there is no increase of collector current and no voltage is induced in the feedback coil. The timing capacitor(s), selected by S1001, begin to discharge through the feedback coil, producing a negative-going base voltage. This causes Q1001 to conduct less and the collapsing magnetic field of T1001 induces a voltage in the feedback winding that provides degenerative feedback to the base of Q1001. As a result, the base of Q1001 is driven to cutoff. Q1001 remains cutoff for a period of time determined by the R-C time constant of the base circuit selected by S1001. Then the cycle is repeated.

MAINTENANCE

BATTERY REPLACEMENT

To replace batteries, take out the two screws holding the front plate and carefully remove the housing. Then remove the old batteries and insert the new batteries, (Eveready No. E165 or equivalent) being certain to maintain the same polarity.

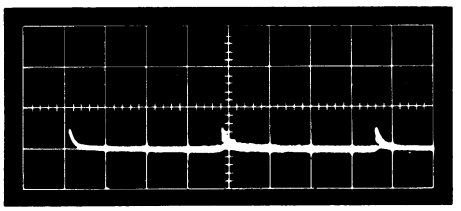
WARNING

Do not dispose of mercury batteries by burning them, since they may explode.

TROUBLESHOOTING PROCEDURE

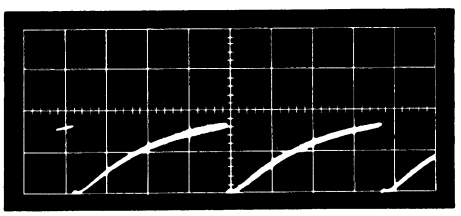
To troubleshoot the unit, check for the voltage and resistance readings indicated on the Outline and Schematic Diagrams. Also check the generator output and the operation of Q1001 by means of the typical waveforms shown.

SWEEP - 0.2 MS/CM
VERT - 2 V/DIV



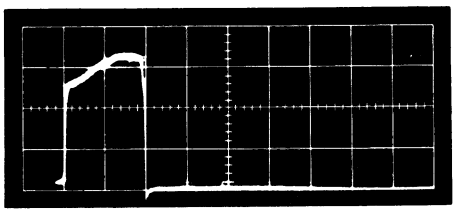
Base of Q1001

SWEEP - 0.2 MS/CM
VERT - 2 V/DIV



Emitter of Q1001

SWEEP - 0.2 μS/CM
VERT - 2 V/DIV



Output Jack (50 Ω Load)

PARTS LIST

LBI-3735B

PULSE GENERATOR
MODEL 4EX4A10

SYMBOL	G-E PART NO.	DESCRIPTION
		- - - - - - - - - - BATTERIES - - - - - - - - - -
BT1001 and BT1002	5492174-P1	Mercury: 7 v; sim to Mallory Type TR-165.
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1001	19B209243-P7	Polyester: 0.1 µf ±20%, 50 VDCW.
C1002	19A115028-P10	Polyester: .033 µf ±20%, 200 VDCW.
C1003	19A115028-P4	Polyester: .0047 µf ±20%, 200 VDCW.
C1004*	4029003-P10	Silver mica: 1200 pf ±5%, 500 VDCW; sim to Electro Motive Type DM-20.
	19A115028-P12	In units earlier than REV A: Ceramic disc: 1000 pf ±10%, 1000 VDCW; sim to RMC Type JF Discap.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1001	4038056-P1	Germanium.
		- - - - - - - JACKS AND RECEPTACLES - - - - - - -
J1001	7776570-P17	Receptacle, bulkhead: coaxial. Military Type UG-1094/U.
		- - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1001*	19A115666-P1	Silicon, NPN.
	19A115342-P1	Earlier than REV A: Silicon, NPN.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1001	3R77-P823K	Composition: 82,000 ohms ±10%, 1/2 w.
R1002	3R77-P103K	Composition: 10,000 ohms ±10%, 1/2 w.
R1003	3R77-P241K	Composition: 240 ohms ±10%, 1/2 w.
R1004	3R77-P471J	Composition: 470 ohms ±5%, 1/2 w.
R1005	5496870-P17	Variable, carbon film: 500 ohms ±20%; sim to Mallory LC(500).
R1006*	3R77-P300J	Composition: 30 ohms ±5%, 1/2 w. Added by REV B.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1001	19C307060-P4	Rotary: 2 sections, 6 poles, 4 positions, 0.75 amp at 125 VAC; sim to CTS 222-17254-2.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1001	19C311083-G1	Transformer.
		- - - - - - - - - TERMINAL BOARDS - - - - - - - - -
TB1	7775500-P18	Phenolic: 8 terminals.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XBT1001 and XBT1002	19B200019-P4	Retainer, battery: sim to Keystone Electronics 110.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	4039182-G2	Knob. (Used with R1005, S1001).
	19B205457-G1	Cable: Test, 4-feet.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

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 - To shift 40 Kilocycle repetition rate to design center. Changed C1004.

REV. B - To eliminate the possibility of erratic operation at maximum output level. Added R1006 and changed Q1001.

OUTLINE DIAGRAM

RESISTANCE READING AT Q1001

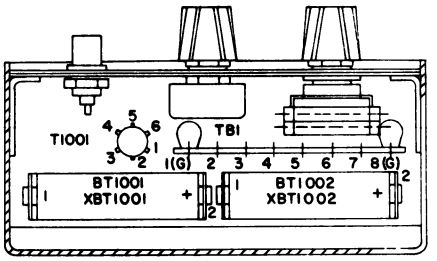
SWITCH (S1001)	EMITTER		BASE		COLLECTOR	
	+	−	+	−	+	−
OFF	250Ω	250Ω	10K	4K	16K	100K
ON	250Ω	250Ω	10K	3.5K	0	0

ALL READINGS ARE TYPICAL READINGS MEASURED FROM TRANSISTOR PINS TO TB1-1 (GND). + OR − SIGN SHOWS METER PROBE GROUNDED. READINGS ARE TAKEN WITH THE BATTERIES REMOVED AND A JUMPER BETWEEN XBT1001-1 AND XBT1002-2

CAUTION

REMOVE THE JUMPER BETWEEN XTB1001-1 & XTB1002-2 BEFORE REPLACING BATTERIES

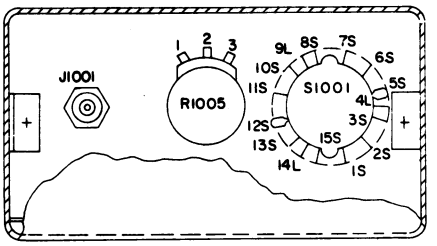
BOTTOM VIEW



LEAD IDENTIFICATION FOR Q1001

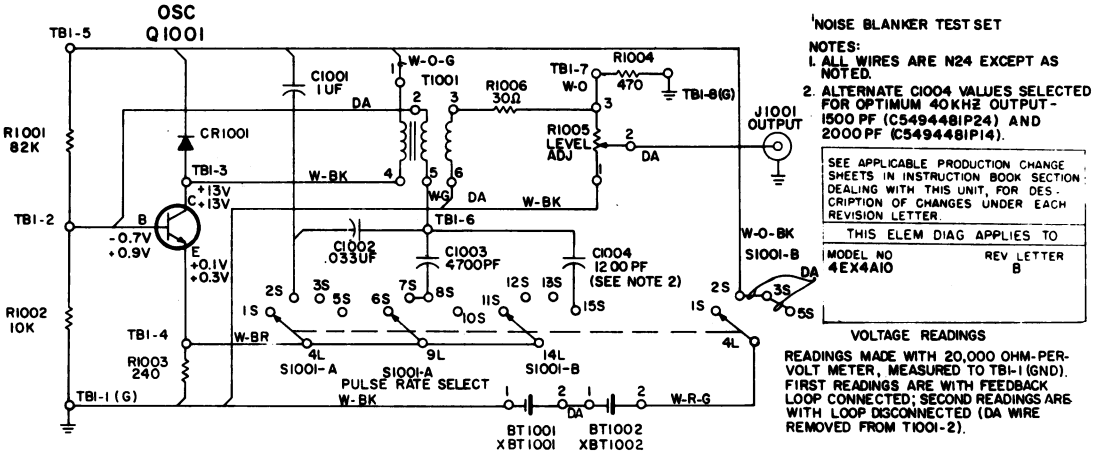
CLIP OFF TRANSISTOR CASE LEAD.

REAR VIEW



(19C311211, Rev. 2)

SCHEMATIC DIAGRAM



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.

CPD 310A

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.

(19B205489, Rev. 8)

SCHEMATIC & OUTLINE DIAGRAM

PULSE GENERATOR
MODEL 4EX4A10

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.

MAINTENANCE MANUAL

LBI-3736

DF-10008

Progress Is Our Most Important Product

GENERAL ELECTRIC

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