



MAINTENANCE MANUAL

GE STAR ENCODER 19C330119G1-3

SPECIFICATIONS *

Primary Power	13.8 VDC $\pm 20\%$
Current Drain	5 mA Standby 100 mA Transmit
PTT Input	Closure to System Negative
Emergency Input	Closure to System Negative
Identifications	#0001 to #2047
Key Output	Common to PTT Input 175 mA maximum
Data Output	1.4 V p-p nominal
Temperature	30°C to +70°C
Humidity	0% to 90% non-condensing
Board Size	6.3"L x 1.7"W x 0.8"D

*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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MOBILE GE-STAR ENCODERS

DESCRIPTION

The Mobile GE-STAR Encoders provide a burst of digital information containing a unique identification code each time the microphone press-to-talk (PTT) switch is operated. In addition, a second message containing the identification code and unique message information is transmitted upon momentary closure of an external switch.

The 19C330119G1 GE-STAR Encoder is mounted in a small metal chassis with cover for fire-wall mounting, and contains a cable with mating connector for connection to the control unit. The Emergency and EM ground wires are separate from the cable to permit connecting to an external momentary switch. Mounting hardware is supplied with the unit.

The 19C330119G2 Mobile GE-STAR Encoder is contained on a printed wire board which mounts in the vertical option board slot in the C500 Control Unit. Interconnections are made via pushpins directly to the C500 control unit printed wire board. The Emergency and EM ground wires connect to an optional momentary switch in the control unit.

OPERATION

Press-To-Talk Message

With each operation of the PTT switch, a digital message is transmitted containing the mobile identification number. The PTT switch need only be closed momentarily to send the complete message. This allows the use of the PTT switch as a non-verbal acknowledgement of receipt of message.

Emergency Message

An external switch can be connected to the unit via the Emergency and EM ground wires provided. A momentary closure to system negative causes a second unique message to be transmitted. This message is normally decoded as an "Emergency" condition by the GE-STAR Decoder-Display.

Attack Delay

Prior to sending digital information, the transmitter is keyed for a sufficient time to assure all system delays (transmitter and repeater turn-on) are passed. The attack delay is normally set to 300 milliseconds.

Transmission Method

The encoders utilize a coherent phase-shift-keyed signalling technique. Reliability is increased by redundant information in the digital burst. Four redundant

IDs and three data segments are transmitted providing three successive opportunities for decoding. Digital output is introduced into the mobile transmitter at the microphone audio input. Voice audio is inhibited during digital transmission to prevent data contamination.

DATA MESSAGE FORMAT

Single Message

The single message format is shown in Figure 1 as a 32-bit message divided into four words, Sync, ID, Data and Error Detection Code (EDC). The first half-message (SYNC) combines the sync and ID words and the second half-message (DATA), of equal length, combines the Data and EDC words.

Multiple Message

The total multiple message transmitted is also shown in Figure 1. The first 40 milliseconds are occupied by a preamble of alternating ones and zeros. This is followed by SYNC and DATA half-messages. Four SYNC and three DATA half-messages are transmitted. On alternate messages, most of the SYNC half-message is inverted while DATA half-messages are always non-inverted. The first three bits of SYNC are always "011" when SYNC is true. The last two bits of SYNC are inverted with the ID alternately.

Code Structure

The data half-message is encoded with PTT or Emergency message information depending on the input to the board. The code for PTT has "1" in the last bit position of the DATA field in Figure 1. The EDC field then contains a different error detecting code corresponding to the Emergency message.

CIRCUIT ANALYSIS

Sequence Start

For purposes of this description, the PTT message will be used in all examples. The PTT line (green) is attached to the radio PTT line on the control unit board. Prior to depression of the PTT switch, the voltage on inputs to U1A is essentially 13.8 V and there is no charge on capacitor C1. When PTT is depressed, the voltage at the inputs of U1A falls as C1 charges through R1. R1 and C1 perform a time delay function to protect against multiple transmission due to contact bounce on release of the PTT.

When PTT is depressed, the input voltage to U1A falls low. When the input is sufficiently low the output (U1A-3) switches high. That transition is coupled to the

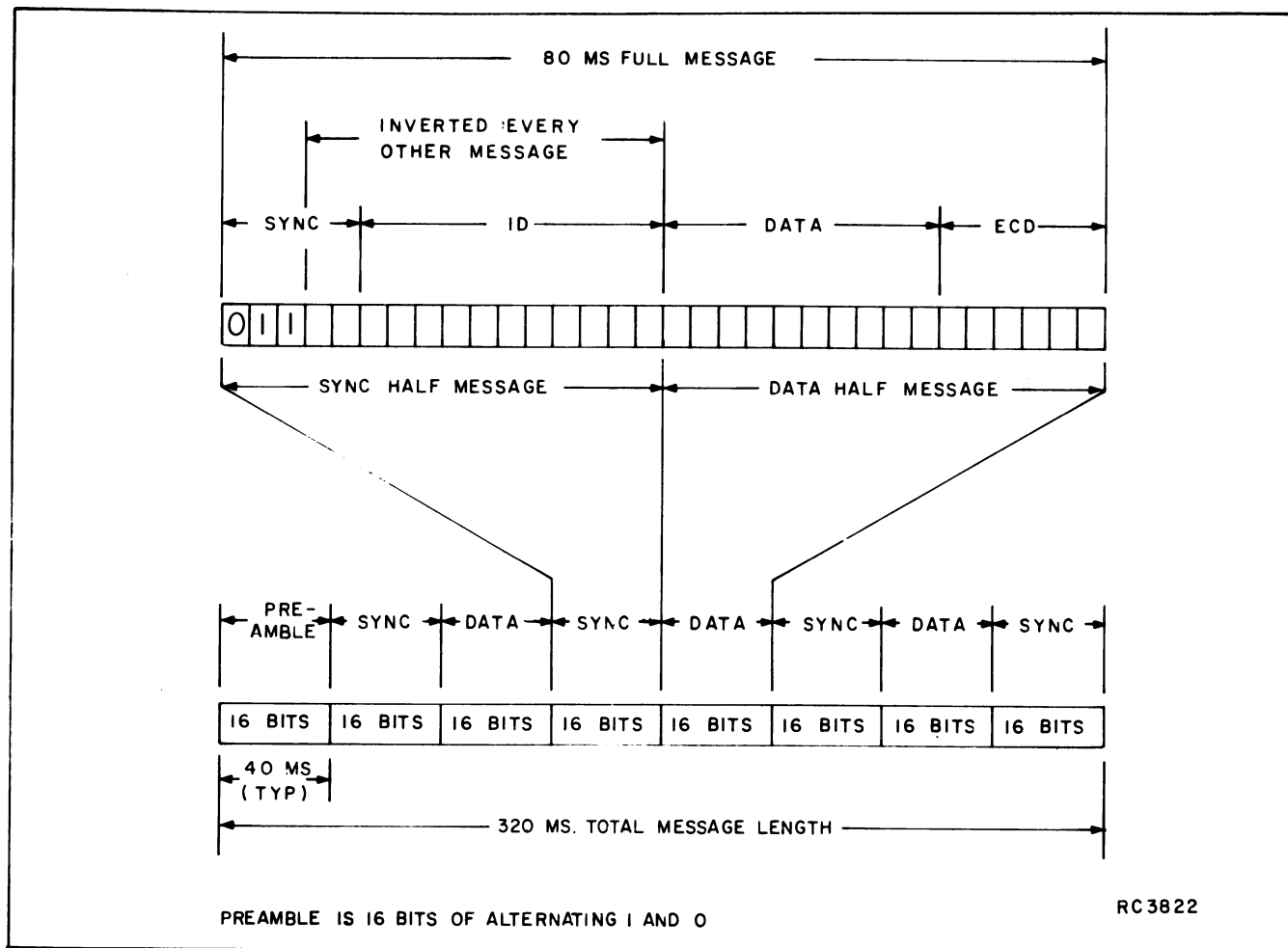


Figure 1 - Message Data Format

set input of a bistable latch formed by two NOR gates U1B and U1C. The output of U1B then goes low turning on transistors Q5 and Q6. Q6 provides regulated 5.0 V (V_{CC}) to the remainder of the circuits. At the end of the transmit sequence, Q5, Q6 and therefore V_{CC} are turned off to reduce standby current drain.

Attack Delay

At the time V_{CC} is turned on, the unit is prevented from starting a transmission sequence for the period of the system attack delay. The delay is generated by the circuit feeding the clear input of IC U3.

V_{CC} is low until the PTT switch is pressed. C5 is therefore initially uncharged and the input of U4A is low. When V_{CC} is turned on, the input to U4A remains low and the output is low since U4A is a non-inverting buffer. U2D inverts the low input and provides a high to the clear input of U3, a 14-stage binary counter. This

high level holds the counter in a reset condition until C5 charges through R8 to a logic high level. U2D then inverts that high and allows M3 to begin counting. The digital message sequence then begins. The attack time is determined by the time constant of R8 and C5.

Message Generation

The entire message format is stored in U6. This IC is a Read Only Memory (ROM) organized into 32 words, each 8-bits long for a total of 256 bits. Since each message is 128 bits long, two such messages are stored in the ROM. The outputs Q4 through Q8 of U3 select an eight bit ROM word. The proper bit within the ROM word is selected by the binary number of the A, B and C inputs of the multiplexer U7.

Note that the outputs of U3 that feed the ROM are buffered by U4B through U4F. The remainder of the discussion is presented as if these "amplifiers" were not in the circuit. This can be done since the

outputs of U4B through U4F are logically identical to their respective inputs.

The generation of the data message begins when the CLR input of U3-11 goes low. The counter is reset at that time and all outputs are low. The selected ROM word is at ROM address "00000". Since U3-12 and U3-14 are also low and U7-9 is held high during a PTT input, the bit number selected is binary "100" (bit 4). Initially the data output of the multiplexer U7-3 is Bit 4 of ROM word "00000". This is the first bit of the message Preamble.

The clock oscillator U5 runs at 3200 Hz. This is 8 times the data bit rate. The clock output is counted by U3. After 8 clock pulses U3-7 goes high. The binary word address is then 00001. Since U7-11, 10 and 9 did not change, bit 4 of word 00001 appears at U7-3. Bit 4 of each successive word is selected and presented at U7-3 through 32 words at a 400 bit per second rate. After 32 bits, U3-12 goes high and U3-7, 5, 4, 6 and 13 go low and bit 5 of word 00000 is selected and presented at U7-3. The process continues through bit 5 of the 32 words, then bits 6 and 7 are selected for a total of 128 bits. After 128 bits U3-15 goes high. Previously U3-15 was low holding Q2 off. When U3-15 goes high, Q2 turns on forcing the latch formed by U1B and U1C to reset. The reset turns off Q5 and Q6 which turns off V_{CC} and the transmit sequence stops.

During the time the digital message is being generated, U7-3 and a 1600 Hz square wave from U3-9 are combined in the exclusive OR U2C. The output of U2C is 400 bits per second, 4 cycle per bit, synchronous phase shift keyed digital information.

Emergency Message

The emergency message is stored in the ROM in bits 0 through 3 of each of the 32 words. When the SPTT line is pulled low U7-9 is pulled low to allow selection of ROM word bits 0 through 3. C7 and R15 hold low for a period of time sufficient to assure transmission of the emergency message. Diode CR1 prevents U7-9 from going low on PTT.

Data Output and Radio Keying

When V_{CC} goes high, Q1 is turned on to maintain radio keying for the duration of the digital message. V_{CC} also turns on Q3 which provides a low impedance path for any voice on the microphone audio line. The microphone high is clamped at approximately 1.4 volts above ground via the forward voltage drop of diode CR8 and CR9. The data output is fed to Q4 which turns on when U2-10 is high and off when U2-10 is low. The output is thereby limited to 1.4 volts p-p. At the end of the digital

message V_{CC} goes low turning off Q3 and allowing voice information to reach the radio audio input.

Power-Up

When power is applied to the Encoder it is necessary to prevent the possibility of sending a digital message. This is accomplished by coupling 13.8 V (V_{bb}) through C3 to the latch that controls the data transmit cycle. When power is applied U1-9 is forced high until C3 is charged. This forces the latch U1B-U1C into a reset condition at power-up.

Diode CR3 provides reverse polarity protection for the circuit. Chokes L1 and L2 and capacitor C4 filter noise transients from other electrical circuits in the vehicle. CR10 prevents application of damaging voltages to the emergency switch circuit.

Diode CR4 provides a fast discharge path for C5. This insures a full attack delay each time the unit is turned on. CR6 and CR12 are used to provide isolation when a shorter message duration is desired. Two complete messages can be sent by attaching jumpers from W1 to Terminal A, and W2 to Terminal B. One message can be sent by attaching a jumper from W1 to Terminal B. The Mobile GE-STAR Encoders are normally supplied with three complete messages via connection of a jumper from W2 to terminal C.

ATTACK DELAY ADJUSTMENT

The attack delay of the Encoders can be varied by selecting different values for R8. Nominal values of R8 for several attack delay times are shown below.

Attack Delay Milliseconds	R8 Meg Ohms
100	0.47
200	1.0
400	2.2
600	3.3

These values will vary somewhat from unit to unit due to factory adjustment. Attack delay is factory adjusted to within 10% of nominal value at 25°C and 13. volts.

MAINTENANCE

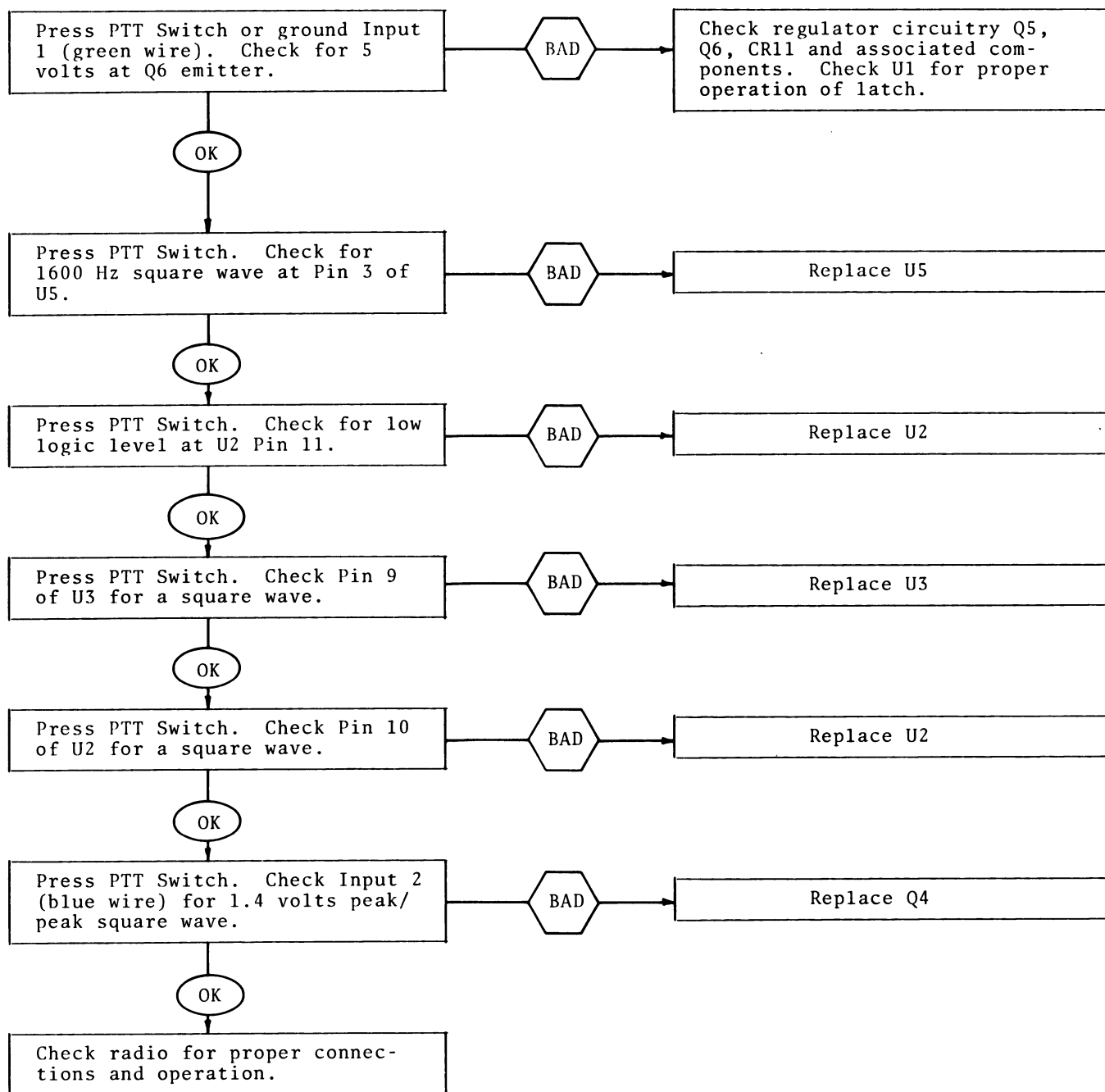
Should the GE-STAR Encoder fail to operate properly, the service technician should follow the test methods provided. Analysis of the four most probable failure modes are detailed in step-by-step flow charts. Charts are labeled Chart I - No Modulation; Chart II - Transmits PTT only; Chart III- Transmits EM Only; Chart IV - Continuous Transmit.

NOTE

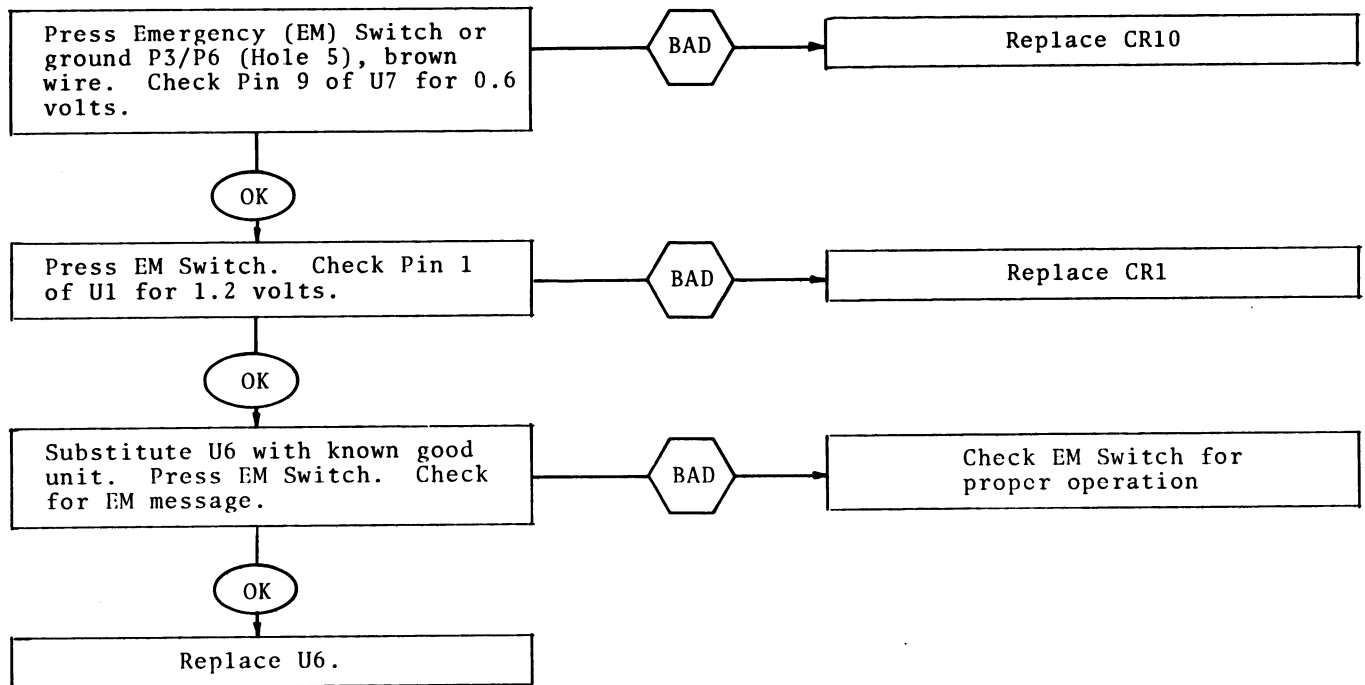
All possible failure modes cannot be anticipated. The service technician should familiarize himself with the circuits before attempting to repair an inoperative module.

REMOVING IC's (and all other soldered-in components) can be easily accomplished by using a de-soldering tool such as a SOLDA-PULLT® or equivalent. To remove an IC, heat each lead separately on the solder side and remove the old solder with the de-soldering tool.

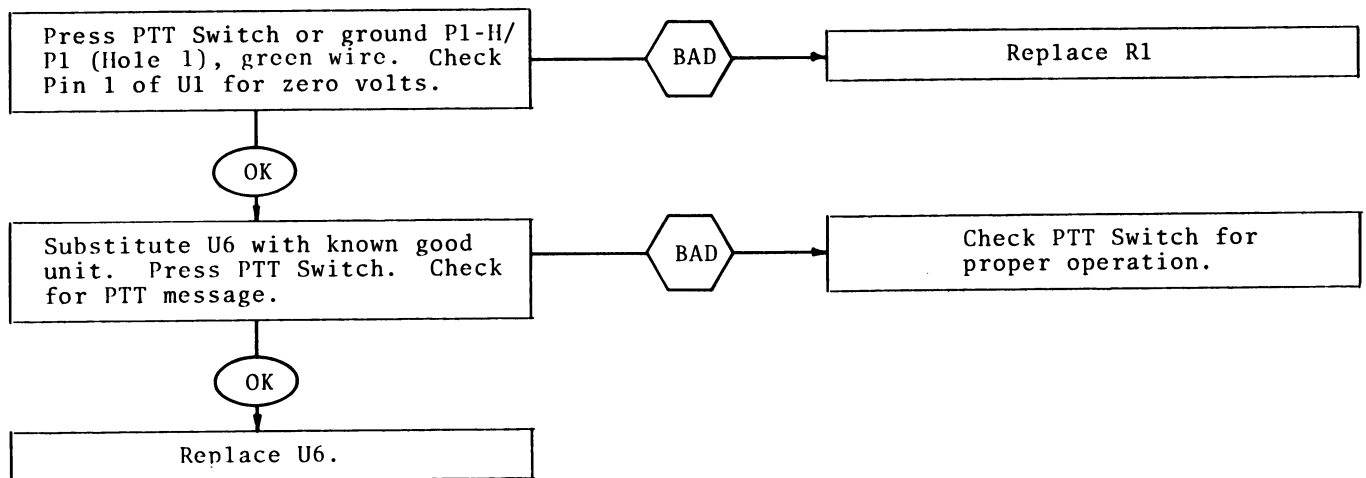
FLOW CHART I - NO MODULATION



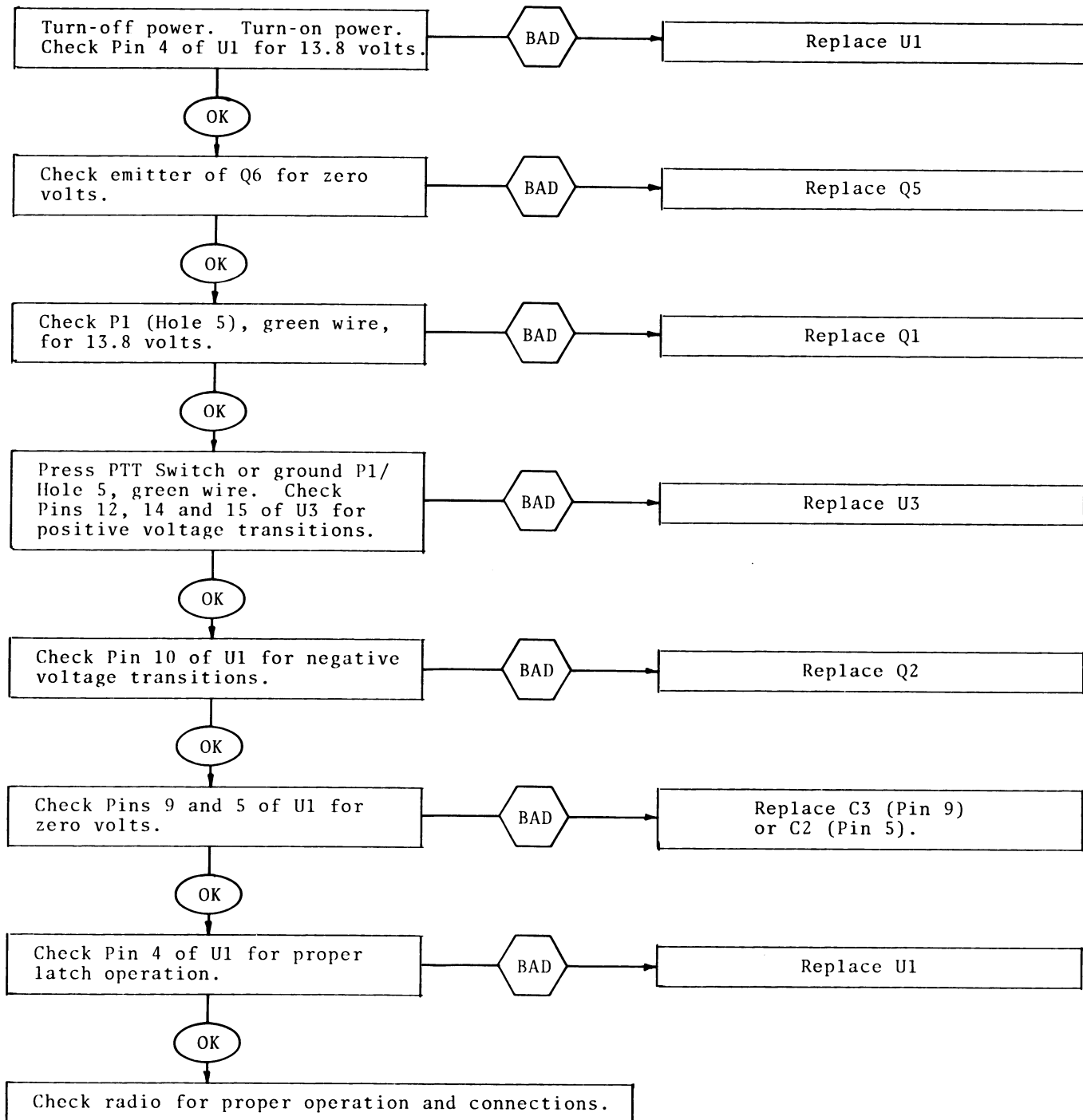
FLOW CHART II - TRANSMITS PTT ONLY



FLOW CHART III - TRANSMITS EM ONLY



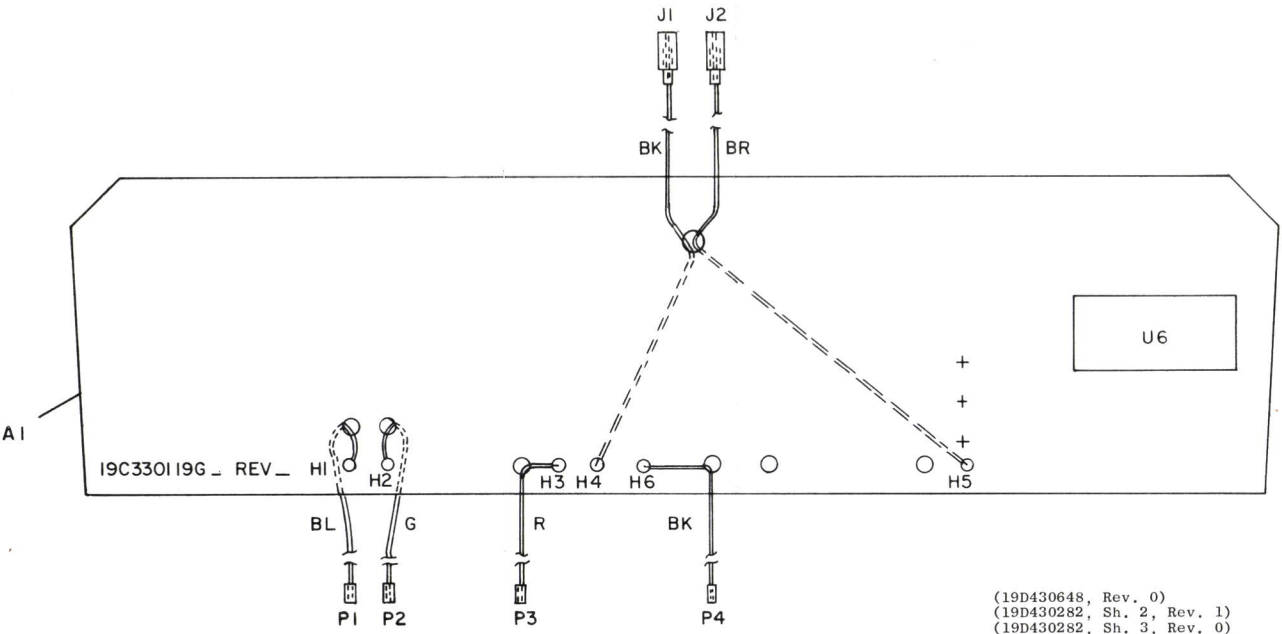
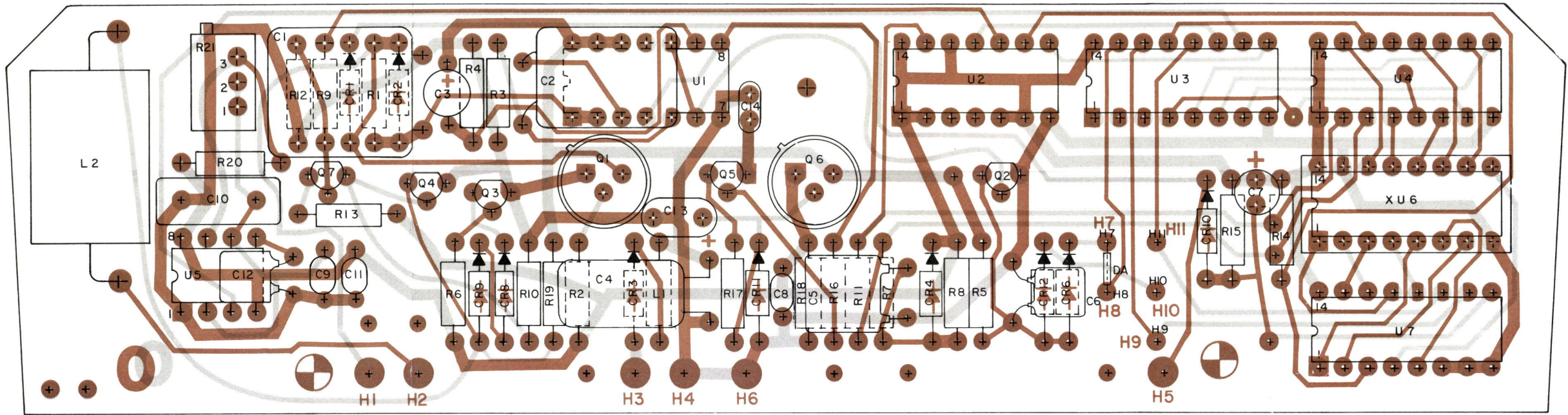
FLOW CHART IV - CONTINUOUS TRANSMIT



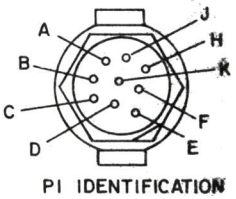
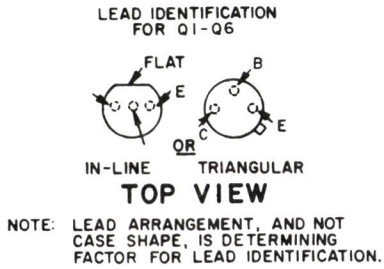
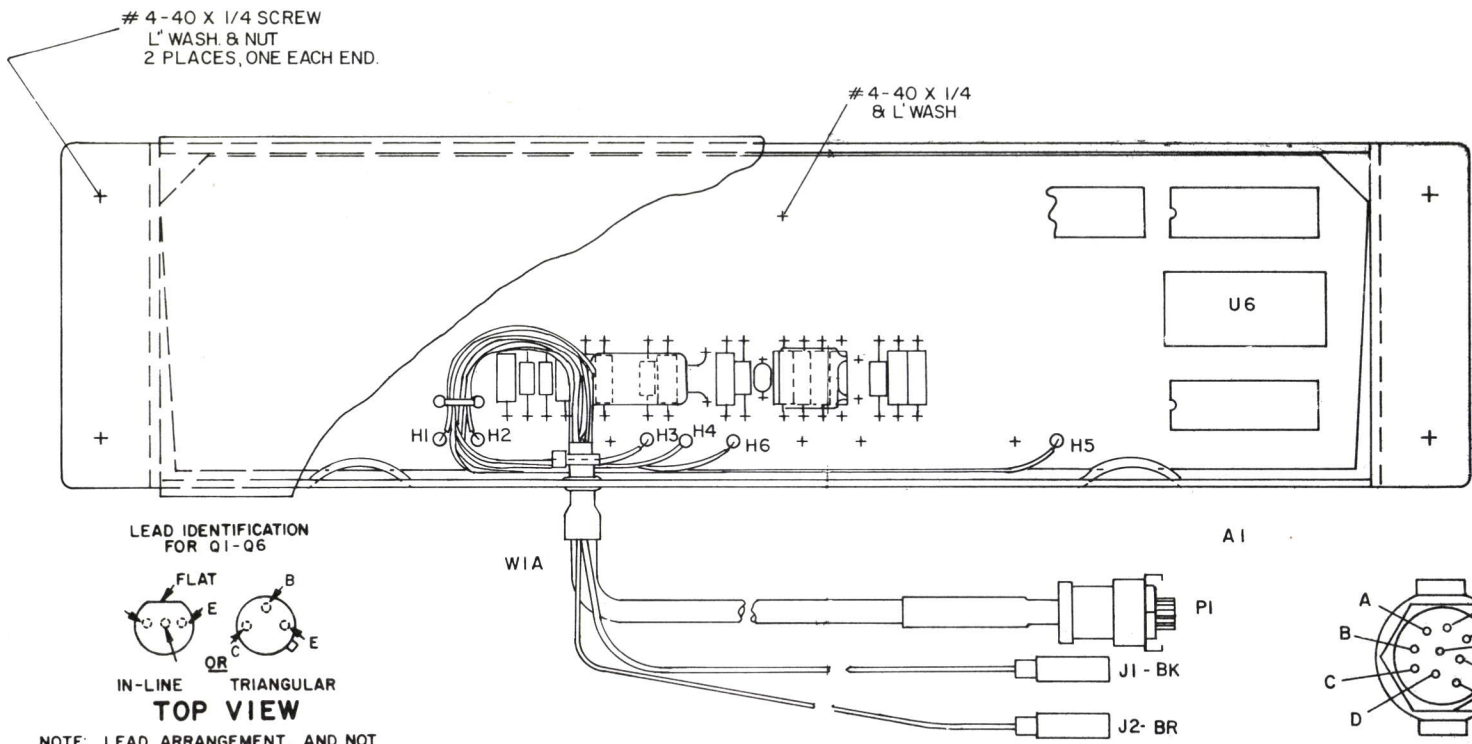
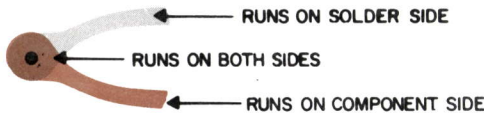
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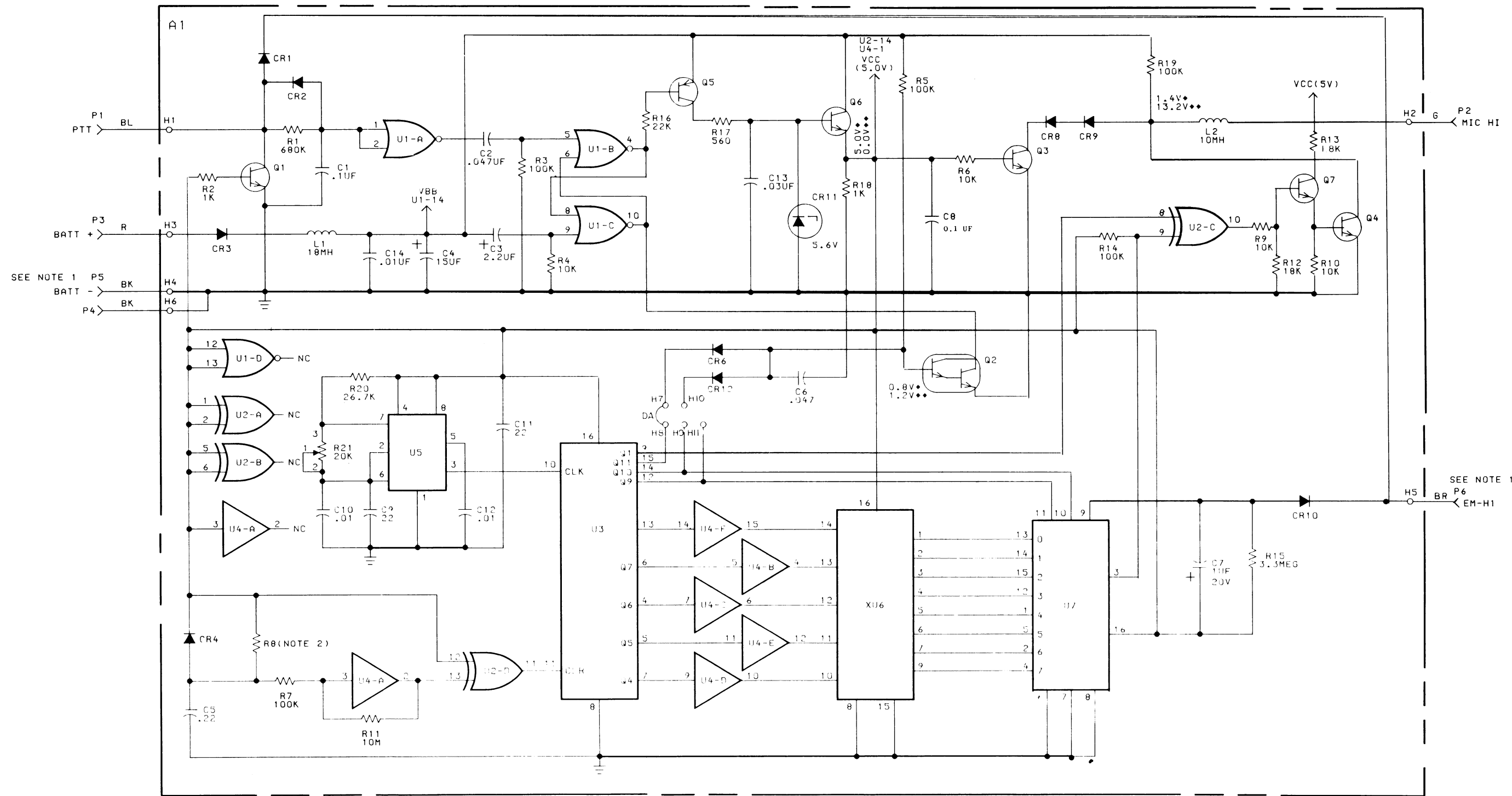


(19D430648, Rev. 0)
(19D430282, Sh. 2, Rev. 1)
(19D430282, Sh. 3, Rev. 0)



OUTLINE DIAGRAM

GE STAR ENCODER



POWER CONNECTIONS			
DEVICE	VCC(5V) PIN NO.	GND PIN NO.	(+13.5V) VBB PIN NO.
U1	14	7	14
U2	14	7	14
U4	1	8	14

MODEL NO	REV LETTER
PL19C330119G3	
PL19C330119G3	

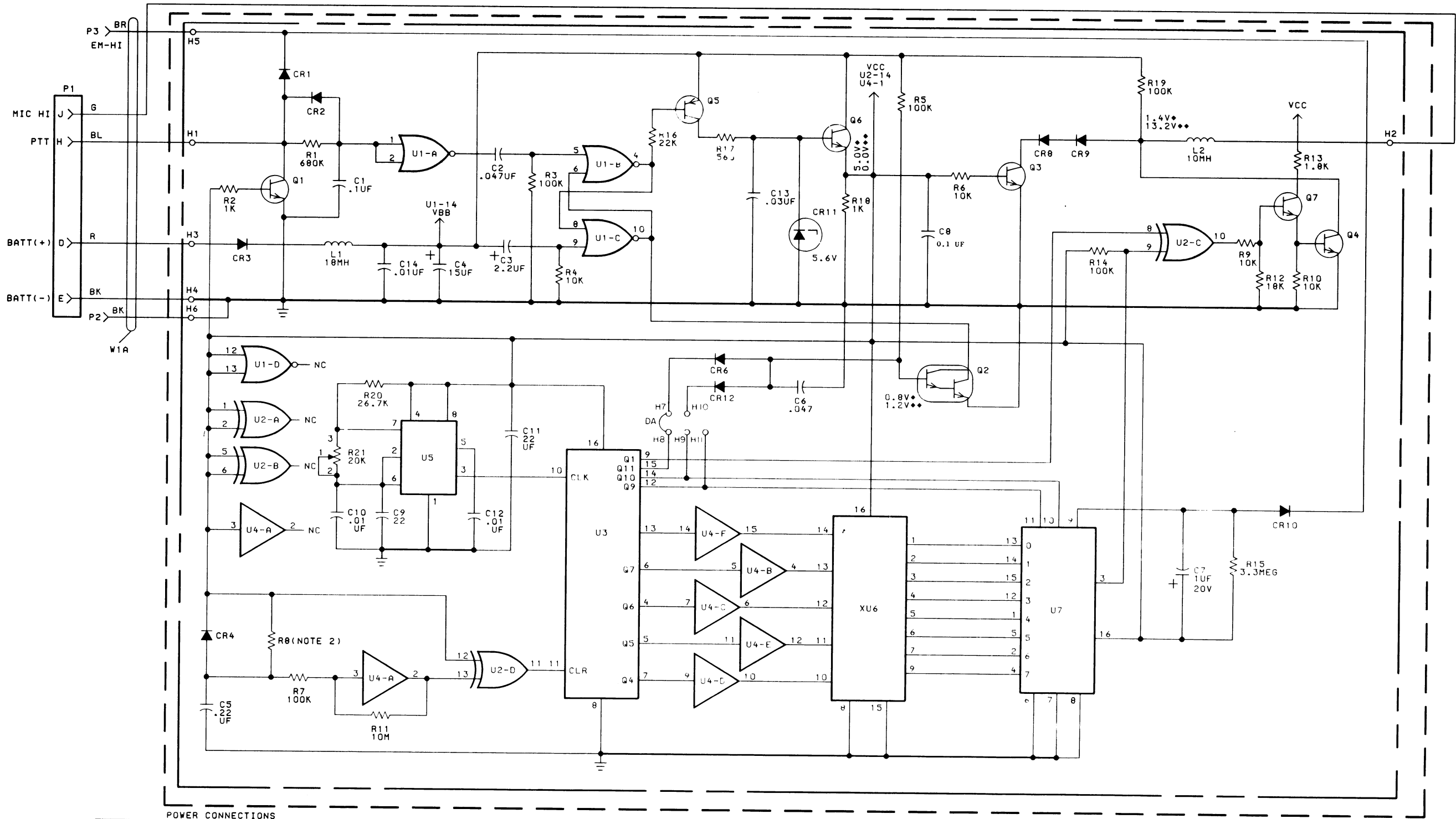
ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

- NOTES:
1. FOR 19C330119G3, P5 BECOMES P7 AND IS TERMINATED WITH 19A127042 AND P6 BECOMES P8 AND IS TERMINATED WITH 19A127042.
 2. VALUE SELECTED IN TEST TO SET ATTACK DELAY TIME.
 3. CONNECT H7 TO H8 FOR 3 1/2 MESSAGES.
- ▶ DURING MESSAGE TRANSMISSION
♦♦ UNKEYED

SCHEMATIC DIAGRAM

GE STAR ENCODER, C500 CONTROL UNIT

Issue 1



POWER CONNECTIONS			
DEVICE	VCC(5V) PIN NO.	GND PIN NO.	VBB 13.8V PIN NO.
U1	—	7	14
U2	14	7	—
U4	1	8	—

MODEL NO	REV LETTER
PL19C33011961	

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 PICO FARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

- NOTES:
1. CONNECT H7 TO H8 FOR 3 1/2 MESSAGES.
 2. VALUE SELECTED IN TEST TO SET ATTACK DELAY TIME.
- DURING MESSAGE TRANSMISSION
♦ UNKEYED

SCHEMATIC DIAGRAM

GE STAR ENCODER, FIREWALL MOUNT

PARTS LIST

GE STAR ENCODER
19C330119G1 FIREWALL MOUNT
19C330119G2 CONTROL HEAD MOUNT
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
A1		MOBILE IDENTIFIER 19D430314G3
		- - - - - CAPACITORS - - - - -
C1	19A116080P107	Polyester: 0.1 µf ±10%, 50 VDCW.
C2	19A116090P105	Polyester: 0.047 µf ±10%, 50 VDCW.
C3	19A134202P7	Tantalum: 2.2 µf ±20%, 20 VDCW.
C4	19A134202P8	Tantalum: 15 µf ±20%, 20 VDCW.
C5	19A116192P16	Ceramic: 0.22 µf ±10%, 50 VDCW; sim to Erie 8131-M050-W5R-224K.
C6	19A116192P17	Ceramic: 0.047 µf ±10%, 50 VDCW; sim to Erie 8121-M050-X5P-473K.
C7	19A134202P14	Tantalum: 1 µf ±20%, 35 VDCW.
C8	19A116192P14	Ceramic: .1 µf ±20%, 50 VDCW.
C9	19A116114P40	Ceramic: 22 pf ±10%, 100 VDCW; temp coef 0 PPM.
C10	19A116288P48	Ceramic: 10K pf ±10%, 50 VDCW; sim to Erie 8131-M50-COG-103K.
C11	19A116114P40	Ceramic: 22 pf ±10%, 100 VDCW; temp coef 0 PPM.
C12	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
C13	19A116192P11	Ceramic: 0.033 µf ±20%, 50 VDCW; sim to Erie 8131-M050-W5R-333M.
C14	19A116192P1	Ceramic: 0.01 µf ±20%, 50 VDCW; sim to Erie 8121 SPECIAL.
		- - - - - DIODES AND RECTIFIERS - - - - -
CR1 thru CR4	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR6	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR8 thru CR10	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
CR11	4036887P46	Zener: 500 mW, 5.6 v. nominal.
CR12	19A115250P1	Silicon, fast recovery, 225 mA, 50 PIV.
		- - - - - INDUCTORS - - - - -
L1	19B209420P128	Coil, RF: 18.0 µh ±10%, 3.10 ohms DC res max; sim to Jeffers 1316-3.
L2	7491382P111	Coil, RF: 10.0 mh ±10%, 70 ohms DC res max; sim to Delevan 3500 Series.
		- - - - - TRANSISTORS - - - - -
Q1	19A115300P4	Silicon, NPN.
Q2	19A116272P1	Monolithic, Linear: Darlington Amplifier; sim to 2N5305.
Q3	19A115910P1	Silicon, NPN; sim to Type 2N3904.
Q4	19A116774P1	Silicon, NPN; sim to Type 2N5210.
Q5	19A115852P1	Silicon, PNP; sim to Type 2N3906.
Q6	19A115300P2	Silicon, NPN; sim to Type 2N3053.
Q7	19A115910P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - RESISTORS - - - - -
R1	3R152P684J	Composition: 680K ohms ±5%, 1/4 w.
R2	3R152P102J	Composition: 1K ohms ±5%, 1/4 w.

SYMBOL	GE PART NO.	DESCRIPTION
R3	3R152P104J	Composition: 100K ohms ±5%, 1/4 w.
R4	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R5	3R152P104J	Composition: 100K ohms ±5%, 1/4 w.
R6	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R7	3R152P104J	Composition: 100K ohms ±5%, 1/4 w.
R8P	3R77P125J	Composition: 1.2 megohm ±5%, 1/2 w.
R8R	3R77P135J	Composition: 1.3 megohm ±5%, 1/2 w.
R8S	3R77P155J	Composition: 1.5 megohm ±5%, 1/2 w.
R8T	3R77P165J	Composition: 1.6 megohm ±5%, 1/2 w.
R8U	3R77P185J	Composition: 1.8 megohm ±5%, 1/2 w.
R8V	3R77P205J	Composition: 2.0 megohms ±5%, 1/2 w.
R8W	3R77P225J	Composition: 2.2 megohms ±5%, 1/2 w.
R9	3R152P203J	Composition: 20K ohms ±5%, 1/4 w.
R10	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R11	3R152P106J	Composition: 10.0 megohms ±5%, 1/4 w.
R12	3R152P183J	Composition: 18K ohms ±5%, 1/4 w.
R13	3R152P182J	Composition: 1.8K ohms ±5%, 1/4 w.
R14	3R152P104J	Composition: 100K ohms ±5%, 1/4 w.
R15	3R152P335J	Composition: 3.3 megohms ±5%, 1/4 w.
R16	3R152P223J	Composition: 22K ohms ±5%, 1/4 w.
R17	3R152P561J	Composition: 560 ohms ±5%, 1/4 w.
R18	3R152P102J	Composition: 1K ohms ±5%, 1/4 w.
R19	3R152P103J	Composition: 10K ohms ±5%, 1/4 w.
R20	19C314256P22672	Metal film: 26.7K ohms ±1%, 1/4 w.
R21	19A134778P1	Variable, cermet: 20K ohms ±10%, 0.5 w; sim to Bourns 3299X-1-203.
		- - - - - INTEGRATED CIRCUITS - - - - -
U1	19A134097P2	Digital, Quad 2-Input Nor Gate: Identification No. 4001.
U2	19A134097P26	Digital, Quad Exclusive-Or Gate: Identification No. 4030.
U3	19A134097P17	Digital, 14-Stage Binary/Ripple Counter: Identification No. 4020.
U4	19A134097P42	Digital, Hex Buffer/Converter (Non-Inverting): Identification No. 4050.
U5	19A116968P1	Linear, timer: Dual In-Line 8 Pin Mini Dip Package; sim to Signetics NE555CV.
U6	19A134331P2	Programmable Read Only Memory (PROM).
U7	19A134097P43	Digital, Single 8-Channel Multiplexer: Identification No. 4051.
		- - - - - SOCKETS - - - - -
XU6	19A116384P4	Socket, integrated circuit: 16 contacts; sim to Methode M-1161.
		- - - - - JACKS AND RECEPTACLES - - - - -
J1 and J2		Connector. Includes:
		Shell.
	19B209505P201	Contact, electrical, male. (Quantity 2).
	19B209505P20	
		- - - - - PLUGS - - - - -
P1 and P2	4029840P2	Contact, electrical: sim to Amp 42827-2.
P3	19A127042P2	Terminal, solderless: sim to Malco 12093-10.
P4	4029840P2	Contact, electrical: sim to Amp 42827-2.
P5 and P6		Connector. Includes:
		Shell.
	19B209505P201	Contact, electrical, female. (Quantity 2).
	19B209505P21	

SYMBOL	GE PART NO.	DESCRIPTION
U6	19A134331P2	- - - - - INTEGRATED CIRCUITS - - - - - Programmable Read Only Memory. (PROM).
W1A		- - - - - CABLES - - - - - CABLE ASSEMBLY 19C330230G1
J1 and J2		- - - - - JACKS AND RECEPTACLES - - - - - Connector. Includes:
	19B209505P101	Shell.
	19B209505P20	Contact, electrical, male. (Quantity 2).
		- - - - - PLUGS - - - - -
P1	7489183P6	Plug: 9 contacts rated at 7.5 amps max; sim to Winchester M9P-LS-H19CS.
P2 and P3		Connector. Includes:
	19B209505P201	Shell.
	19B209505P21	Contact, electrical, female. (Quantity 2).
W1	4034669P3	- - - - - CABLES - - - - - Cable: approx 4 feet long.
		- - - - - MISCELLANEOUS - - - - -
	19B233203P1	Cover. (Used in G1).
	19B233206G1	Chassis. (Used in G1).
	19A115185P5	Retainer strap: sim to Panduit Corp. SST-1. (Used with W1A).

PARTS LIST

GE STAR ENCODER 19C330119G1 & G2

Issue 1

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

EMERGENCY PUSH TO TALK CABLE
MOUNTING KIT
19A136750G1

SYMBOL	GE PART NO.	DESCRIPTION
	4029851P1 N80P9007C6 N402P5C6 N404P11C6 7141225P2	Clamp: 1/16 inch. Machine screw: No. 4-40 x 7/16. Flatwasher: No. 4. Lockwasher, internal tooth: No. 4. Hex nut: No. 4-40.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

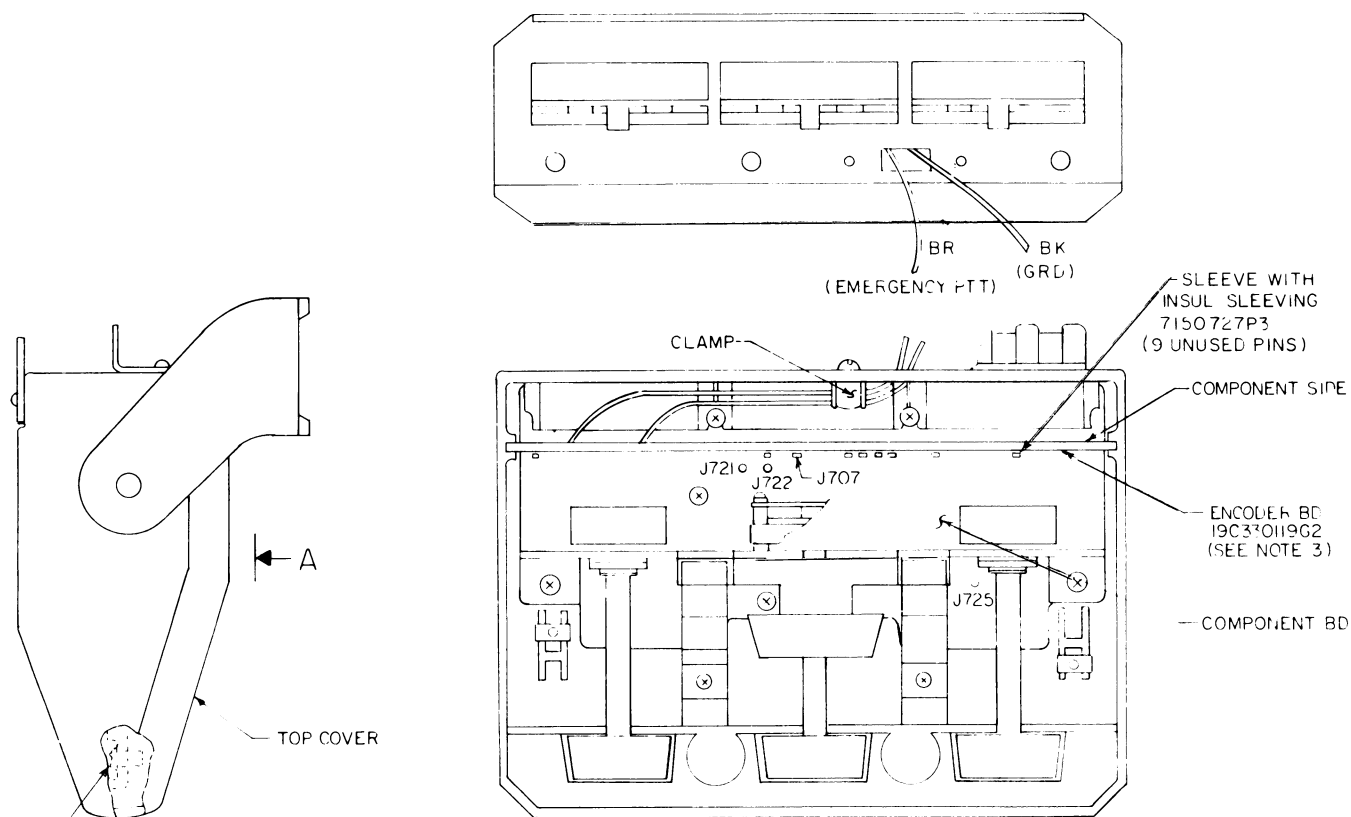
FIREWALL MOUNT HARDWARE KIT
19A136768G1

SYMBOL	GE PART NO.	DESCRIPTION
	4036000P1 N130P1212C N404P13C6	Extractor, contact. Tap screw: No. 6-20 x 3/4. Lockwasher, internal tooth: No. 6.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST

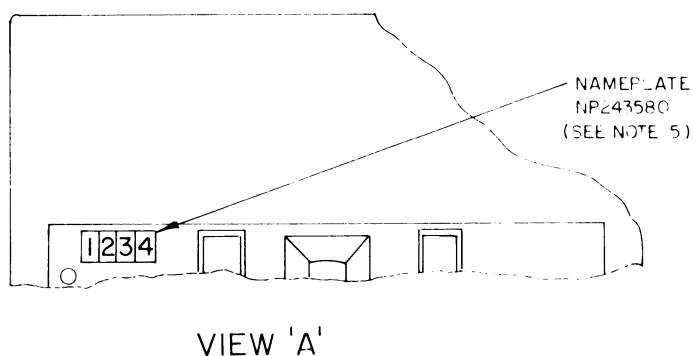
19A136750G1 & 19A136768G1



THESE INSTRUCTIONS COVER THE INSTALLATION OF THE GE-STAR MOBILE ENCODER 19C330119G2 AND 19A136750G1 INSTL. KIT IN THE C-500 CONTROL HEAD.

INSTRUCTIONS:

1. REMOVE THE (2) MOUNTING SCREWS LOCATED ON BOTTOM OF UNIT AND SAVE. THEN REMOVE TOP COVER.
2. INSTALL ENCODER BOARD AND ROUTE BLACK & BROWN WIRES THROUGH HOLE IN BACK OF UNIT AS SHOWN.
3. CONNECT GREEN WIRE TO J721 (MIC HI)
CONNECT BLUE WIRE TO J722 (PTT)
CONNECT RED WIRE TO J707 (A+)
CONNECT BLACK WIRE TO J725 (A-)
4. REPLACE COVER & RE-INSTALL MOUNTING SCREWS.
5. INSTALL NAMEPLATE ON TOP COVER AS SHOWN IN VIEW "A". APPROPRIATE IDENTIFICATION NUMBERS WILL BE CALLED FOR ON WORK SHEET SUPPLIED WITH (GREENS).



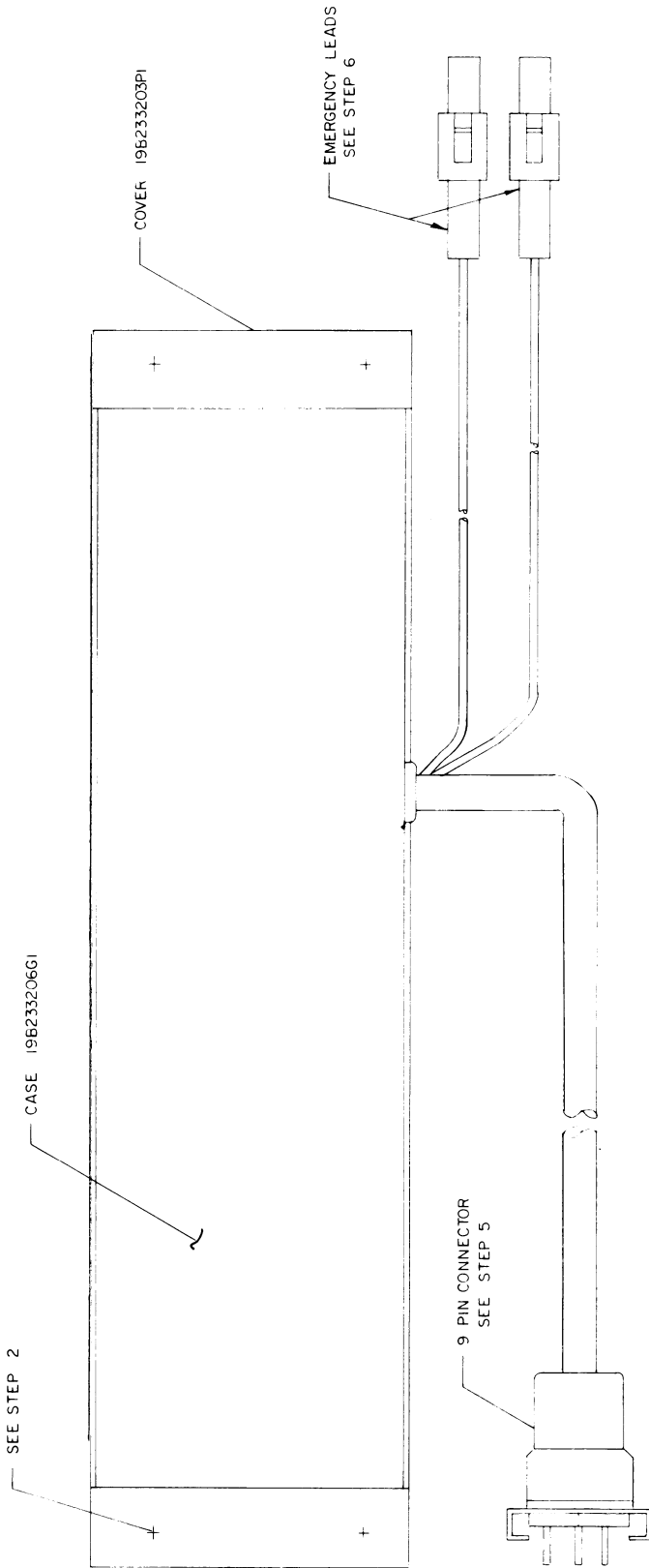
(19C327310, Rev. 4)

INSTALLATION INSTRUCTIONS

GE STAR ENCODER, C500 CONTROL UNIT

Issue 1

13



(19C327328, Rev. 1)

- THESE INSTRUCTIONS COVER THE INSTALLATION OF THE GE STAR UNIVERSAL ENCODER TO THE VEHICLE.
1. LOCATE A MOUNTING SURFACE WITHIN 3 1/2 FEET OF THE TONE ENCODER ON THE CONTROL HEAD OR RADIO.
 2. USE THE COVER OF THE 19C330119G1 AS A TEMPLATE TO MARK THE LOCATION OF THE HOLES ON THE FIREWALL OR OTHER APPROPRIATE LOCATION.
 3. DRILL FOUR 7/64- (.109) DIAMETER HOLES.
 4. ATTACH THE 19C330119G1 ENCODER SO THAT THE COVER IS AGAINST THE SUPPORTING STRUCTURE WITH FOUR N130P1212C SCREWS & N4404P1366 L'WASHERS SUPPLIED IN HARDWARE KIT 19A136768.
 5. CONNECT THE 9 PIN CONNECTOR TO THE TONE ENCODER OPTION ON THE CONTROL HEAD OR RADIO.
 6. PULL APART THE IN LINE CONNECTORS ON THE EMERGENCY LEADS. USING THE EXTRACTOR TOOL SUPPLIED IN HARDWARE KIT 19A136768 REMOVE THE CONDUCTORS WHICH DO NOT HAVE A WIRE CONNECTED TO THEM. ATTACH WIRES TO THESE CONDUCTORS BY CRIMPING TERMINALS. WIRES MUST BE SUFFICIENTLY LONG ENOUGH TO REACH A MOMENTARY SWITCH (CUSTOMER SUPPLIED). PLACE THE CONDUCTORS BACK IN THEIR INSULATED SLEEVING. RE-CONNECT THE IN LINE CONNECTORS.

INSTALLATION INSTRUCTIONS

GE STAR ENCODER, FIREWALL MOUNT