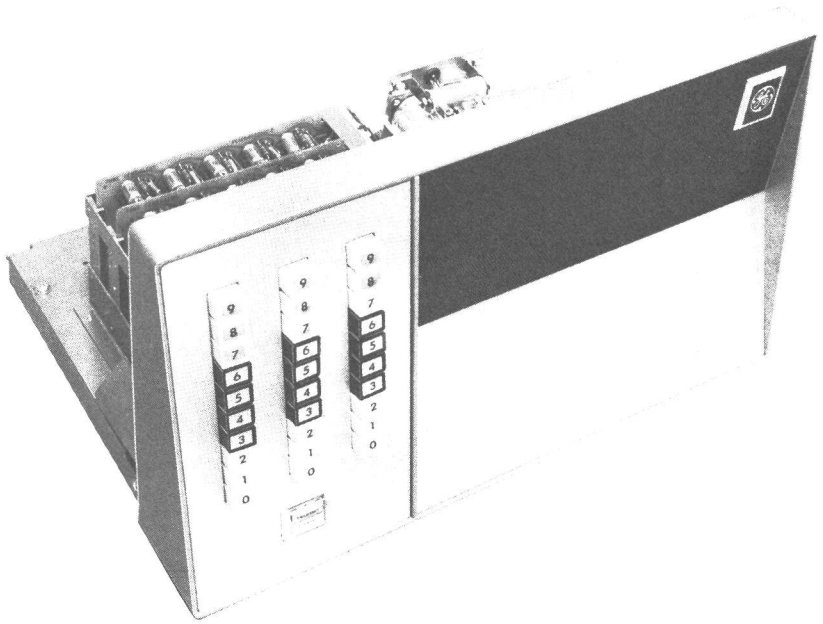
MOBILE RADIO

MAINTENANCE MANUAL

TYPE 99 TONE ENCODER

MODELS 4EH19A10 – 18



SPECIFICATIONS *

Encoder Console Call Capacity	
Model 4EH19A10, 13, 16	100 Call
Model 4EH19A11, 14, 17	400 Call
Model 4EH19A12, 15, 18	900 Call
Tone Frequencies	517.5 to 967.5 Hz
Tone Output Level	Adjustable from 0 to 25 millivolts rms (minimum)
Input Voltage Requirements	117 VAC
Temperature Range	-30°C to +60°C (22°F to 144°F)

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

EH-19-A

GENERAL ELECTRIC

TABLE OF CONTENTS

Table I - Encoder Application Chart

Model Number	Number of Calls	Used With:
4EH19A10	100	Blank Right Panel
4EH19A11	400	Blank Right Panel
4EH19A12	900	Blank Right Panel
4EH19A13	100	Single-Channel Voting Control Panel
4EH19A14	400	Single-Channel Voting Control Panel
4EH19A15	900	Single-Channel Voting Control Panel
4EH19A16	100	Two-Channel Voting Control Panel
4EH19A17	400	Two-Channel Voting Control Panel
4EH19A18	900	Two-Channel Voting Control Panel

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

The General Electric Type 99 Tone Encoders Models 4EH19A10-18 are designed for use in the turret right-section of a Command Control Center. Electrical components are mounted on a 19-inch drawer-type chassis which can be easily removed from the turret for maintenance and servicing. The encoders use sequential tone signaling to permit INDIVIDUAL CALL, GROUP CALL and ALL CALL operation within a single communication system that is equipped with appropriate decoders. The application of the different Model Encoders is shown in Table I.

NOTE

A suggested method of assigning GROUP CALL and ALL CALL tone codes in Type 99 tone systems is provided in Data File Bulletin 5000-3.

Encoder Models 4EH19A10, 13, 16 provide up to 100 different combinations of two sequential tones. Models 4EH19A11, 14, 17 provide up to 400 tone combinations, and Models 4EH19A12, 15, 18 provide up to 900 tone combinations. The station transmitter is automatically keyed for a pre-determined period during tone signaling operation.

Each encoder has a self contained power supply that operates from a 117-VAC power source.

ADJUSTMENT

Before the tone encoder is placed in operation, the following adjustments must be made. Be sure that the station transmitter has been adjusted for full limiting at 4.5 kHz (narrow band) or 13 kHz (wide band) as called for in the transmitter instructions.

Tone Level

1. Release all pushbutton selector switches on the encoder.
2. Select the highest tone frequency in the system by following the steps given on the Encoder Outline Diagram.
3. After the highest tone frequency is selected, operate the desired TEST Switch (S1203 or S1207). TEST Switch S1203 by-passes the timing circuits and permits transmission of the first tone continuously, while TEST Switch S1207 permits the transmission of the second tone continuously. The TEST Switch keys the station transmitter so it should be operated in accordance with the rated duty cycle of the transmitter.
4. Adjust the master level potentiometer (R1210) on the encoder to produce a deviation of 3 kHz (narrow band) or 6 kHz (wide band) as measured with a modulation monitor at the transmitter. Do not exceed this deviation.

NOTE

The encoders are supplied with an "L" pad (R1246 and R1247) in the tone output circuit. This pad limits the tone to approximately 25 millivolts. R1246 may be clipped out of the circuit if more output is required.

5. Release the selected tone and TEST Switches.

Timing

1. Set the tone "ON" time for the first tone to approximately 1 second by adjusting R1202.
2. Set the tone "ON" time for the second tone to approximately 1-1/2 seconds by adjusting R1211.

OPERATION

The encoder has vertical rows of Tone Select push buttons and a TRANSMIT/STANDBY switch on the front panel. One Tone Select push button in each row must be pressed for each call to obtain the two required sequential tones.

To signal a desired unit:

1. Be sure that the tone encoder is supplied with power (STANDBY light ON).
2. Select the proper combination of push buttons as indicated by the assigned codes for your particular system. (One button must be selected from each vertical row of switches).
3. Momentarily press the TRANSMIT switch. The transmit lamp will light and the sequential tones will be automatically transmitted.

NOTE

Once the TRANSMIT switch is pressed, the timing circuit takes over the tone transmission. The STANDBY lamp lights when the transmission is completed.

CIRCUIT ANALYSIS

Each tone encoder includes a power supply, tone generator circuits, a tone amplifier and a timer network. Tone selection is accomplished from vertical rows of pushbutton switches on the front of the tone panel. Two rows of tone select switches are provided for the 100-call encoder while three rows of switches are provided with 400- and 900-call encoders.

Power Supply

The power supply operates from 117-VAC and is fused at 3/8 ampere by F1201 for circuit protection. Power transformer T1201 connects to bridge rectifier CR1202-CR1205 which provides an output to the filter (C1201, C1202 & R1201) and regulator (CR1206) circuits. The regulated output (+11 volts) is used for the tone generator, amplifier and timer circuits.

Tone Generator Board (19D402214-G2)

Up to three tone generator boards are utilized in the encoders. A tone generator board contains ten tone oscillators, each being resonate to a different tone frequency. Each tone oscillator consists of a transistorized circuit controlled by a vibrating-reed tone governing device that provides the frequency-selective component of the circuit and also provides feedback for proper oscillator operation.

Energy is coupled from the collector of the transistor to terminals 1 and 2 of the tone governor where transformer action between the two coils returns the energy to the base of the transistor. The vibrating reed responds only to the specific frequency to which it is resonant; therefore, only the desired frequency appears at the output.

The tone generators are operated continuously when power is applied to the encoder. Two tones are selected sequentially for each code, with a total of ninety individual tone codes available from a single tone generator board. Adding a Diagonal Tone Board 19D402285-G2, permits a possible total of one hundred codes from a single tone generator board. Three tone generator boards plus the diagonal tone board provide a total of nine hundred codes. The pushbutton selector switches are interlocked so that only two tone frequencies may be selected at one time.

Diagonal Tone Board (PL-19D402285-G2)

Diagonal Tone Board A1201 contains a single tone oscillator which is identical to the oscillators on the tone generator board. This oscillator provides the first tone when two selector switches, which normally select the same oscillator on a tone generator board, are pressed for the call function. The switch configurations that require the diagonal tone are explained on the Encoder Outline Diagram.

Tone Amplifier

Tones are fed from the selector switches, through timing relays, to the input of Tone Amplifier Q1201. The output of Q1201 is connected to a filter (consisting of C1205-C1210, L1201 and L1202) which provides harmonic suppression. Signals from the filter are connected through master level control R1210 to transmitter jack J1221.

Timing Circuit

Once the tone transmission is initiated by closing the momentary contacts of TRANSMIT/STANDBY Switch S1202, a timing circuit controls the duration of the transmission regardless of how long S1202 is held down.

Timing capacitor C1211 is normally charged by the regulated +11 volts from the power supply through contacts 11 and 12 of K1203, normally closed (NC) contacts of S1202, and R1208. When TRANSMIT Switch S1202 is operated, the positive charge on C1211 is connected through R1202 to the base of Q1202, turning it on. Q1202 operates K1201 and keeps it energized until C1211 is discharged. R1202 provides adjustment of the circuit time constant.

When K1201 operates, the following events take place:

(a) The regulated +11 volts is connected through contacts K1201-5 and -6, R1251 and R1250 to the base of Q1204. The transistor turns ON and operates K1203.

(b) The first tone is connected through contacts K1201-7 and -8 to the tone amplifier.

(c) C1212 is charged through contacts K1201-13 and -14 and R1212 by the +11 volts from the power supply. The return circuit is completed through contacts S1203-1 and -2.

When K1201 releases, the charge on C1212 is connected through contacts K1201-12 and -13 and R1249 to charge C1247. In approximately 150 milliseconds, C1247 has sufficient charge to turn on Q1203 which operates K1202.

When K1202 operates, the following events take place:

(a) The second tone is connected through contacts K1202-6 and -7 to the tone amplifier.

(b) The +11 volts is connected through K1202-5 and -6 to the base of Q1204. The transistor keeps K1203 energized.

NOTE

C1246, in the base circuit of Q1204, keeps Q1204 conducting and prevents K1203 from de-energizing during the 150 millisecond interval between the releasing of K1201 and the operation of K1202.

(c) The charge on capacitor C1248 is connected to the base of Q1203 through contacts K1202-13 and -14 and R1211 (timing adjustment potentiometer). This provides additional ON time for K1202.

When K1203 is operated, the following events take place:

(a) A ground is connected through contacts K1203-6 and -7 to key the radio transmitter.

(b) Contacts K1203-8, -9 and -10 switch the panel lights from white to red, indicating that tone is being transmitted.

(c) The timing cycle is "locked-in" and the TRANSMIT Switch (S1202) is disconnected through contacts K1203-11, -12 and -13 so that the timing of the transmission will not be affected by the manual operation of the TRANSMIT Switch.

MAINTENANCE

REMOVING TONE ENCODER FROM TURRET

Remove the tone encoder from the console turret in the following manner:

1. Grasp the tone encoder frame and pull the panel forward until the stop is reached.

2. To completely remove the encoder from the turret, lift the panel to clear the stop and pull forward. No electrical disconnections are required to set the panel on the desk top.

TRANSMIT INDICATOR LAMP REPLACEMENT

Replace defective push-button switch lamp as follows:

1. Grasp the switch lens (nameplate) and pull forward to remove the indicator assembly and gain access to the indicator lamps.

2. Remove the defective indicator lamp from its socket by pressing on the bulb end, and install the new lamp.

3. Reinstall the indicator assembly. The assembly must be in the extended configuration shown in Figure 1 before it can be reinstalled in the panel.

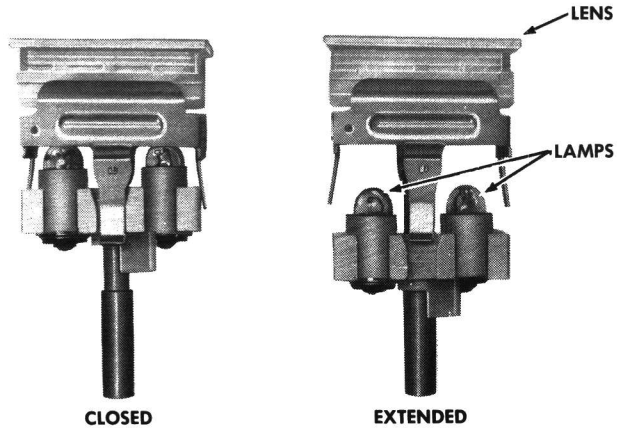


Figure 1 - Switch Indicator Assembly

MODEL 4EH19A10 (100-CALL)

TO DETERMINE ACTUAL FREQUENCIES OF TONE 1 & TONE 2:

1. "TENS" BUTTONS
   THESE BUTTONS SELECT THE FIRST TONE TO BE TRANSMITTED. THE BUTTON NUMBER CORRESPONDS TO THE "TONE NO." IN TABLE 1 EXCEPT IN 3 BELOW.
2. "UNITS" BUTTONS
   THESE BUTTONS SELECT THE SECOND TONE TO BE TRANSMITTED. THE BUTTON NUMBER CORRESPONDS TO THE "TONE NO" IN TABLE 1.
3. EXCEPTION
   IF THE SAME NUMBER IS DEPRESSED IN BOTH "TENS" AND "UNITS" ROWS, THE FIRST TONE WILL BE THE DIAGONAL TONE, AND THE SECOND TONE WILL BE DETERMINED AS BEFORE IN 2 ABOVE.

MODELS 4EH19A11 & 12 (400- AND 900-CALL)

TO DETERMINE ACTUAL FREQUENCIES OF TONE 1 & TONE 2:

1. "HUNDREDS" BUTTONS (TONE GROUP SELECTION)
   THE FIRST AND SECOND TONES ARE SELECTED FROM TONE GROUPS AS SHOWN IN TABLE 2, DEPENDING UPON WHICH HUNDREDS BUTTON IS DEPRESSED.
2. "TENS" BUTTONS (FIRST TONE SELECTION)
   THE TONE NUMBER, WITHIN THE FIRST TONE GROUP SELECTED, CORRESPONDS TO THE NUMBER OF THE BUTTON DEPRESSED IN THE "TENS" ROW. (SEE TABLE 1).
3. "UNITS" BUTTONS (SECOND TONE SELECTION)
   THE TONE NUMBER, WITHIN THE SECOND TONE GROUP, CORRESPONDS TO THE NUMBER OF THE BUTTON DEPRESSED IN THE "UNITS" ROW. (SEE TABLE 1).
4. EXCEPTION
   WHEN 0, 2, OR 4 IS DEPRESSED IN THE HUNDREDS ROW AND THE TENS AND UNITS DIGITS ARE THE SAME, THE FOLLOWING APPLIES:
   TONE 1 WILL ALWAYS BE 742.5 CPS. (DIAGONAL TONE)
   TONE 2 WILL BE DETERMINED AS ABOVE.

TABLE 1

TONE GENERATOR CHART

TONE GROUP	TONE NO.	LOCATION	FREQUENCY (CPS)
A	A0	A1202-FL40	682.5
	A1	FL49	599.5
	A2	FL48	747.5
	A3	FL43	809.5
	A4	FL44	847.5
	A5	FL45	892.5
	A6	FL46	937.5
	A7	FL47	967.5
	A8	FL48	727.5
	A9	A1202-FL49	637.5
B	B0	A1203-FL40	652.5
	B1	FL41	607.5
	B2	FL42	787.5
	B3	FL43	832.5
	B4	FL44	877.5
	B5	FL45	922.5
	B6	FL46	967.5
	B7	FL47	517.5
	B8	FL48	562.5
	B9	A1203-FL49	697.5
C	C0	A1204-FL40	667.5
	C1	FL41	712.5
	C2	FL42	772.5
	C3	FL43	817.5
	C4	FL44	862.5
	C5	FL45	907.5
	C6	FL46	952.5
	C7	FL47	532.5
	C8	FL48	577.5
	C9	A1204-FL49	622.5
DIAGONAL TONE		A1201	742.5

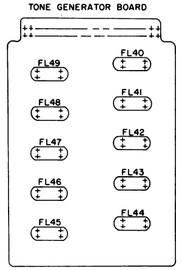
TABLE 2

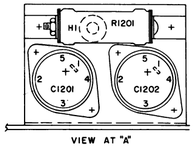
TONE BOARDS SELECTED BY 100'S BUTTONS ON 400-& 900-CALL ENCODERS

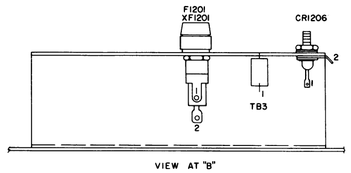
100'S BUTTON PRESSED	TONE GENERATOR BOARD SELECTED FOR 1ST TONE	TONE GENERATOR BOARD SELECTED FOR 2ND TONE
0	A	A
1	B	A
2	B	B
3	A	B
4	C	C
5	C	A
6	C	B
7	A	C
8	B	C
9	THIS BUTTON IS NOT USED IN EITHER 400-OR 900-CALL TONE ENCODERS.	

OUTLINE DIAGRAM

TYPE 99 TONE ENCODER
MODELS 4EH19A10—18







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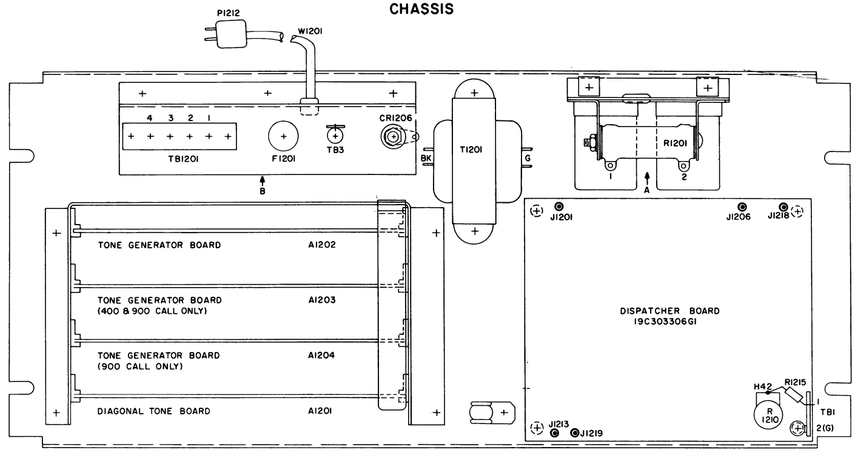
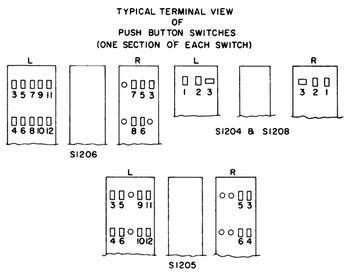
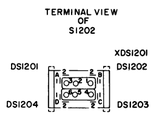
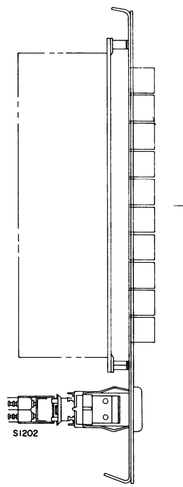
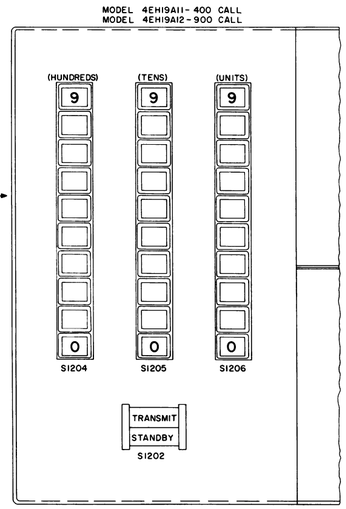


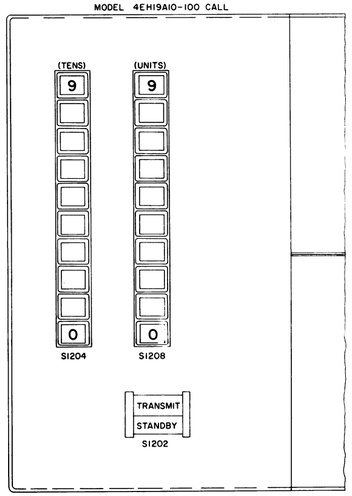






FRONT PANEL





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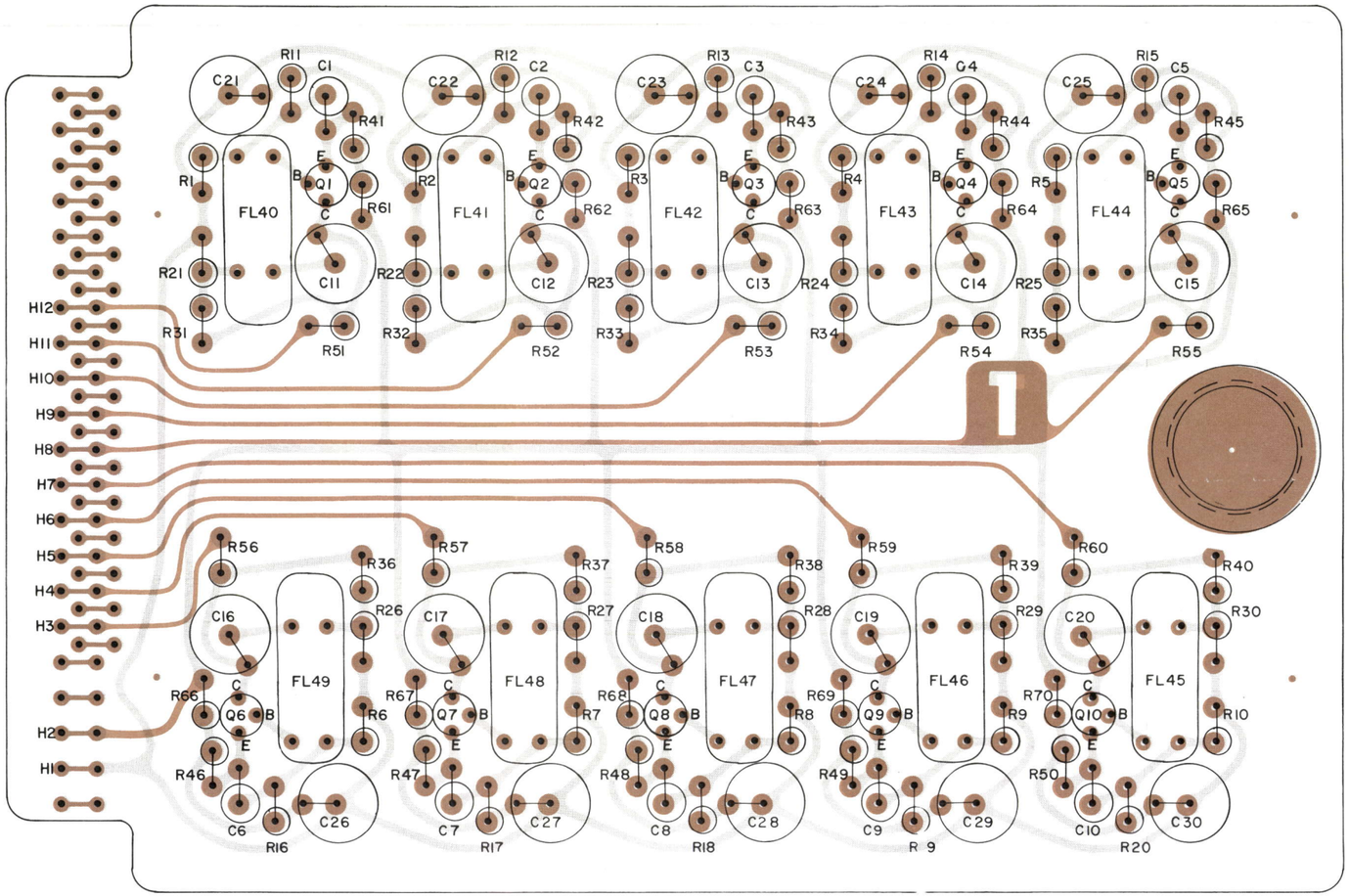
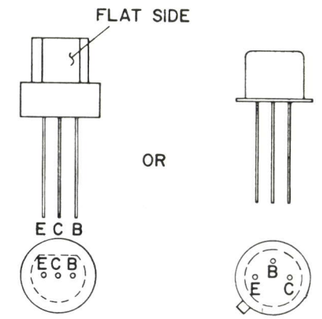
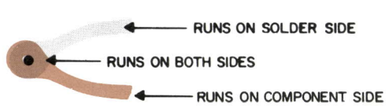




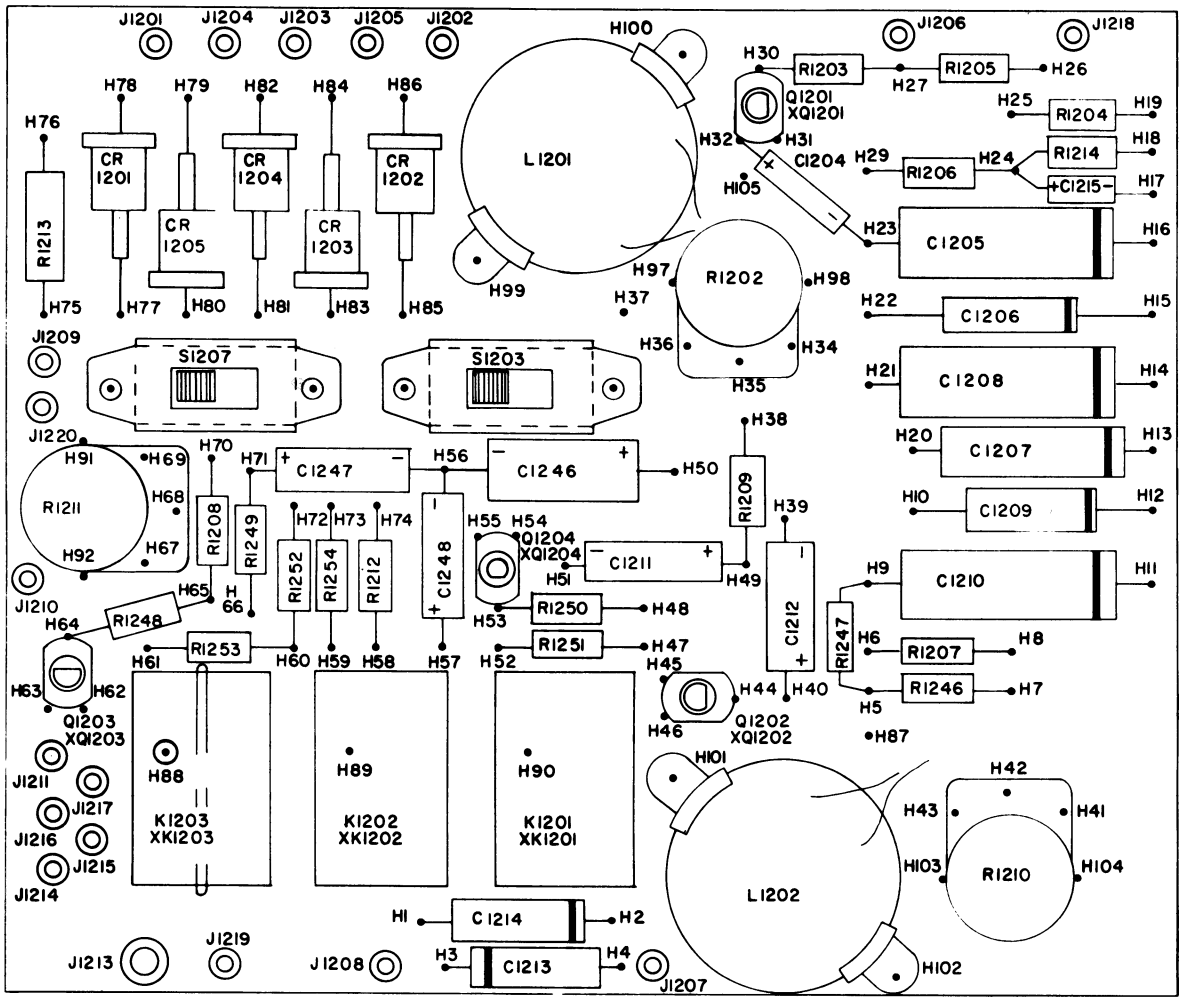
LEAD IDENTIFICATION
FOR Q1 - Q10



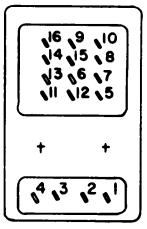
(19D402904, Rev. 0)
(19C303360, Sh. 1, Rev. 1)
(19C303360, Sh. 2, Rev. 1)

OUTLINE DIAGRAM

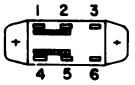
TONE GENERATOR BOARD
PL-19D402214-G2



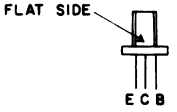
TONE DISPATCHER BOARD PL-19C303306-G1



BOTTOM VIEW OF XK1201-2-3



BOTTOM VIEW OF S1203 & 7



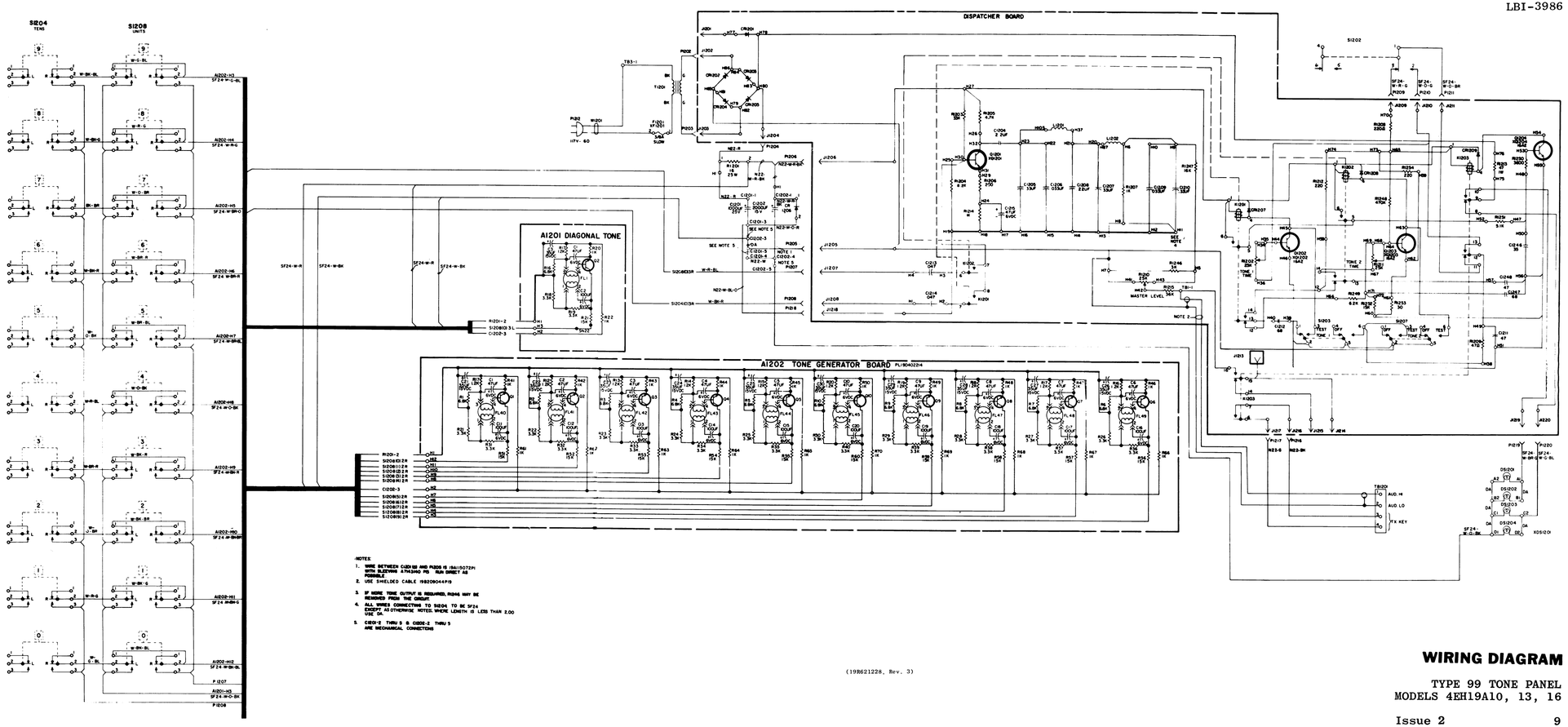
LEAD IDENTIFICATION FOR Q1201 - Q1204

TYP SOCKET FOR XQ1201 - XQ1204

(19D413048, Rev. 0)

OUTLINE DIAGRAM

TONE DISPATCHER BOARD
PL-19C303306-G1



WIRING DIAGRAM

TYPE 99 TONE PANEL
MODELS 4EH19A10, 13, 16

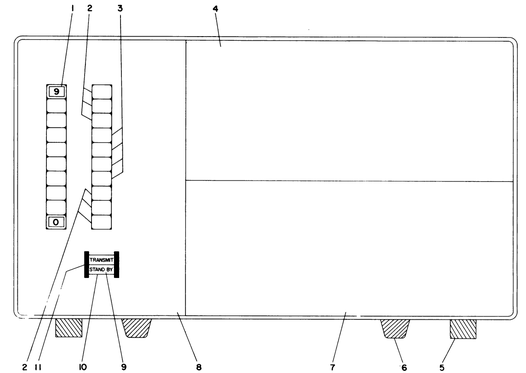
PARTS LIST

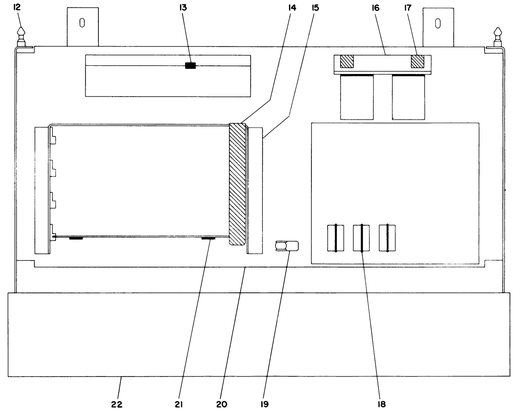
LBI-3988A

TYPE 99 TONE ENCODER
MODEL 4EH19A10, 13, 16

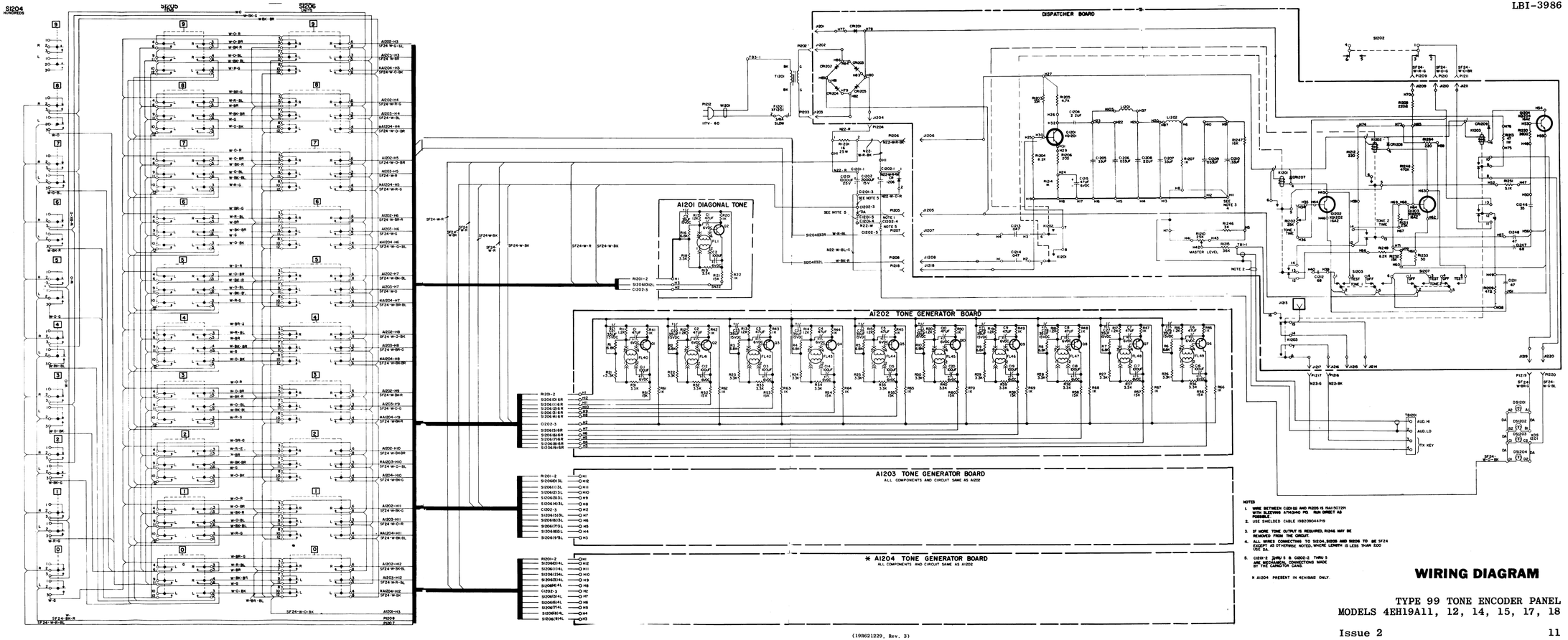
SYMBOL	GE PART NO.	DESCRIPTION
A1201		COMPONENT BOARD 19D402285G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	549626?P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C2	549567?P7	Electrolytic: 100 µf +75% -10%, 6 VDCW; sim to Sprague Type 30D.
C3	549567?P9	Electrolytic: 35 µf +75% -10%, 15 VDCW; sim to Sprague Type 30D.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL1	19C300590G16	Tone governor, 742.5 Hz.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R16	3R77P682J	Composition: 6800 ohms ±5%, 1/2 w.
R17	3R77P122J	Composition: 1200 ohms ±5%, 1/2 w.
R18 and R19	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R20	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R21	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R22	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	4036040P1	Contact pin. (Used to mount FL1).
	19B219090G2	Retainer. (Used with FL1).
A1202		TONE GENERATOR BOARD 19D402214G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C10	549626?P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C11 thru C30	549567?P7	Electrolytic: 100 µf +75% -10%, 6 VDCW; sim to Sprague Type 30D.
C31 thru C50	549567?P9	Electrolytic: 35 µf +75% -10%, 15 VDCW; sim to Sprague Type 30D.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL40 thru FL49		TONE GENERATOR 19C300590
	19C300590G1	517.5 Hz
	19C300590G2	532.5 Hz
	19C300590G3	547.5 Hz
	19C300590G4	562.5 Hz
	19C300590G5	577.5 Hz
	19C300590G6	592.5 Hz
	19C300590G7	607.5 Hz
	19C300590G8	622.5 Hz
	19C300590G9	637.5 Hz
	19C300590G10	652.5 Hz
	19C300590G11	667.5 Hz
	19C300590G12	682.5 Hz
	19C300590G13	697.5 Hz
	19C300590G14	712.5 Hz
	19C300590G15	727.5 Hz
	19C300590G16	742.5 Hz
	19C300590G17	757.5 Hz
	19C300590G18	772.5 Hz
	19C300590G19	787.5 Hz
	19C300590G20	802.5 Hz
	19C300590G21	817.5 Hz
	19C300590G22	832.5 Hz
	19C300590G23	847.5 Hz
	19C300590G24	862.5 Hz
	19C300590G25	877.5 Hz
	19C300590G26	892.5 Hz
	19C300590G27	907.5 Hz
	19C300590G28	922.5 Hz
	19C300590G29	937.5 Hz
	19C300590G30	952.5 Hz
	19C300590G31	967.5 Hz
	19C300590G32	982.5 Hz
	19C300590G33	997.5 Hz
Q1 thru Q10	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 thru R10	3R77P682J	Composition: 6800 ohms ±5%, 1/2 w.
R11 thru R20	3R77P122J	Composition: 1200 ohms ±5%, 1/2 w.
R21 thru R40	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R41 thru R50	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R51 thru R60	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R61 thru R70	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	4036040P1	Contact pin. (Used with FL40-FL49).
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1201	7476442P12	Electrolytic: 1000 µf +250% -10%, 25 VDCW; sim to Mallory WP059.
C1202	7770994P11	Electrolytic: 2000 µf +250% -10%, 15 VDCW; sim to Mallory WP.
		- - - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1206	5495912P2	Silicon, Zener.
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1201 thru DS1204	19C307037P9	Lamp, incandescent: 14 v; sim to GE 330.
		- - - - - - - - - - FUSES - - - - - - - - - -
F1201	7487942P2	Slow blowing: 3/8 amp at 250 v; sim to Bussman MDL-3/8.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1202 and P1203	4029840P1	Contact, electrical; sim to Amp 41854.
P1204	4029840P2	Contact, electrical; sim to Amp 42827-2.
P1205	4029840P1	Contact, electrical; sim to Amp 41854.
P1206 thru P1211	4029840P2	Contact, electrical; sim to Amp 42827-2.
P1213 thru P1220	4029840P2	Contact, electrical; sim to Amp 42827-2.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1201	2R14P113	Wirewound: 16 ohms ±5%, 25 w; sim to Ward Leonard K41383-3.
R1215	3R77P363J	Composition: 36,000 ohms ±5%, 1/2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1202	19C307029P26	Push, lighted: 2 circuits, SPDT each, momentary action, 5 amps at 250 VAC; sim to Micro Switch 2D139.
S1204	19C300108P5	Pushbutton: 10 button frame, double side, 2 form C contacts each button (non-shorting); sim to Oak 80.
S1208	19C300108P5	Pushbutton: 10 button frame, double side, 2 form C contacts each button (non-shorting); sim to Oak 80.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1201	5493743P1	Power, filament, single phase: Pri: 117 v, 50/60 Hz. Sec: 12.6 v ±3%, 2 amps.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7775500P4	Phen: 2 terminals.
TB3	7775500P44	Phen: 2 terminals.
TB1201	7117710P4	Phen: 4 terminals.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1201	4036441P1	Power: Includes molded plastic plug (P1212), approx 6 feet; sim to GE 2073-1.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1201	19C307029P17	Lamp: 4 sockets.
XF1201	19B209005P1	Fuseholder, post, phen: 15 amps at 250 v; sim to Littelfuse 342012.
		DISPATCHER BOARD 19C303306G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1204	5496267P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C1205	7491930P11	Polyester: .033 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1206	7491930P7	Polyester: .033 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1207	7491930P11	Polyester: 0.33 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1208	7491930P10	Polyester: 0.22 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1209	7491930P7	Polyester: .033 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1210	7491930P11	Polyester: 0.33 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1211	5496267P15	Tantalum: 47 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C1212	5496267P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1213 and C1214	7491930P8	Polyester: .047 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1215	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C1246	7489483P10	Electrolytic: 35 µf +75% -10%, 15 VDCW; sim to Sprague Type 30D.
C1247	5496267P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1248	5496267P15	Tantalum: 47 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - -
CR1201 thru CR1205	4037822P1	Silicon.
CR1207 thru CR1209	4037822P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - -
J1201 thru J1211	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
J1213	4037265P1	Jack, tip, stake-in: black phen body; sim to Component Mfg Service A-1128.
J1214 thru J1220	4033513P4	Contact, electrical; sim to Bead Chain L93-3.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1201 and K1202	19C307010P4	Armature: 12 VDC, 185 ohms ±10%, 2 form A, 1 form C contacts; sim to Allied Control 71545-410.
K1203	19C300957P2	Miniature, plug-in: 12 VDC, 1.5 w, 185 ohms ±10%, 4 form C contacts; sim to Allied Control 71545-316.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1201 and L1202	19C300501G356	Ferrite coil.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1201	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q1202	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q1203	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q1204	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1202	7491365P103	Variable, carbon film: 25,000 ohms ±20%, .05 w; sim to CTS UPE-70.
R1203	3R77P333J	Composition: 33,000 ohms ±5%, 1/2 w.
R1204	3R77P822J	Composition: 8200 ohms ±5%, 1/2 w.
R1205	3R77P472J	Composition: 4700 ohms ±5%, 1/2 w.
R1206	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R1207	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R1208	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R1209	3R77P470J	Composition: 47 ohms ±5%, 1/2 w.
R1210 and R1211	7491365P103	Variable, carbon film: 25,000 ohms ±20%, .05 w; sim to CTS UPE-70.
R1212	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R1213	3R78P470J	Composition: 47 ohms ±5%, 1 w.
R1214	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R1246	3R77P302J	Composition: 3000 ohms ±5%, 1/2 w.
R1247	3R77P163J	Composition: 16,000 ohms ±5%, 1/2 w.
R1248	3R77P474J	Composition: 0.47 megohm ±5%, 1/2 w.
R1249	3R77P622J	Composition: 6200 ohms ±5%, 1/2 w.
R1250	3R77P362J	Composition: 3600 ohms ±5%, 1/2 w.
R1251	3R77P512J	Composition: 5100 ohms ±5%, 1/2 w.
R1252	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R1253	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R1254	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1203	7145098P1	Slide: DPDT, 0.5 amp at 125 VDC; sim to Stackpole 53-150.
S1207	7145098P1	Slide: DPDT, 0.5 amp at 125 VDC; sim to Stackpole 53-150.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XK1201 thru XK1203	5491595P5	Relay: 16 contacts; sim to Allied Control 30054-2.
XQ1201 thru XQ1204	5490277P2	Transistor, phen: 4 contacts; sim to Elco 3305.
		MECHANICAL PARTS (SEE RC-1797)
1	NP243322	Nameplate (Numbers 0-9).
2	403923?P2	Button (White).
3	403923?P3	Button (Black).
4	19B216199G1	Grille.
5	19A115873P2	Plastic bumper (Front).
6	19A115873P1	Plastic bumper (Rear).
7	19B216197G1	Plate. (Used in 4EH19A10).
	19D413963G1	Plate. (Used in 4EH19A13).
	19D413963G2	Plate. (Used in 4EH19A16).
8	NP257766P2	Faceplate.
9	19C307029P25	Lens (Used with TRANSMIT-STAND BY switch).
10	NP249217P32	Nameplate (TRANSMIT-STAND BY).
11	19C307029P3	Retainer (Used with TRANSMIT-STAND BY switch).
12	19B205762P1	Stud.
13	7491987P6	Bushing, train relief. (Used with W1201).
14	19A122657P1	Angle.
15	19C311267G1	Guide Assembly.
16	4039244P1	Support. (Mounts R1201).
17	7160861P16	Nut (Used with R1201 support).
18	5491595P9	Retainer. (Used with K1201-K1203 on Dispatcher Board).
19	4039851P6	Clip.
20	19C311519P1	Chassis.
21	4036555P1	Insulator, washer: nylon.
22	19C311561G1	Frame. (Used in 4EH19A10).
	19C311561G2	Frame. (Used in 4EH19A13).
	19C311561G3	Frame. (Used in 4EH19A16).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES





RC-1797A



WIRING DIAGRAM

TYPE 99 TONE ENCODER PANEL
MODELS 4EH19A11, 12, 14, 15, 17, 18

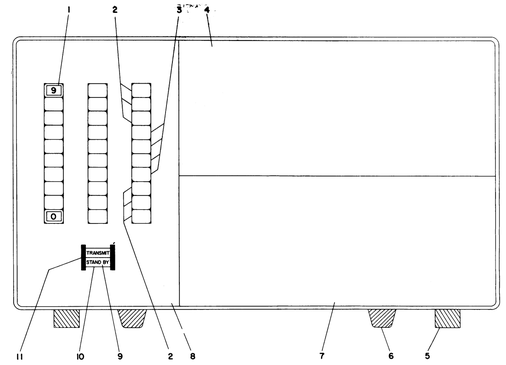
(19B621229, Rev. 3)

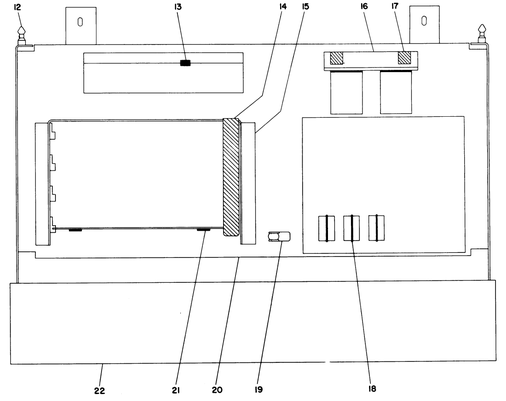
PARTS LIST

LBI-3997A

TYPE 98 TONE ENCODER
MODEL 4EH19A11, 12, 14, 15, 17, 18

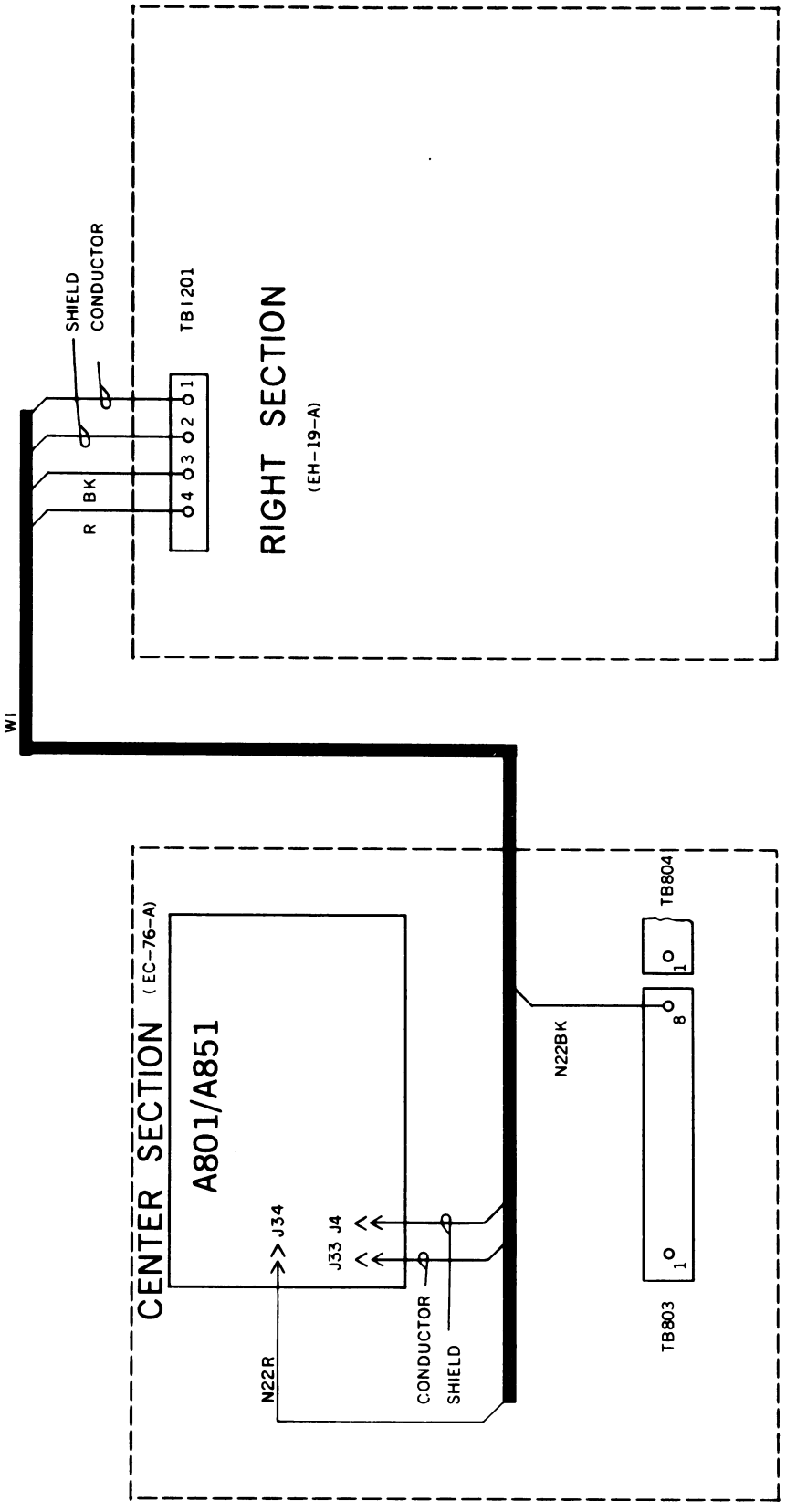
SYMBOL	GE PART NO.	DESCRIPTION
A1201		COMPONENT BOARD 19D402285G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C2	5495670P7	Electrolytic: 100 µf +75% -10%, 6 VDCW; sim to Sprague Type 30D.
C3	5495670P9	Electrolytic: 35 µf +75% -10%, 15 VDCW; sim to Sprague Type 30D.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL1	19C300590G16	Tone governor, 742.5 Hz.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q2	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R16	3R77P68J	Composition: 6800 ohms ±5%, 1/2 w.
R17	3R77P122J	Composition: 1200 ohms ±5%, 1/2 w.
R18 and R19	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R20	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R21	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R22	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	4036040P1	Contact pin. (Used to mount FL1).
	19B219090G2	Retainer. (Used with FL1).
A1202 thru A1204		TONE GENERATOR BOARD 19D402214G2
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1 thru C10	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C11 thru C20	5495670P7	Electrolytic: 100 µf +75% -10%, 6 VDCW; sim to Sprague Type 30D.
C21 thru C30	5495670P9	Electrolytic: 35 µf +75% -10%, 15 VDCW; sim to Sprague Type 30D.
		- - - - - - - - - - FILTERS - - - - - - - - - -
FL40 thru FL49		TONE GENERATOR 19C300590
	19C300590G1	517.5 Hz
	19C300590G2	532.5 Hz
	19C300590G3	547.5 Hz
	19C300590G4	562.5 Hz
	19C300590G5	577.5 Hz
	19C300590G6	592.5 Hz
	19C300590G7	607.5 Hz
	19C300590G8	622.5 Hz
	19C300590G9	637.5 Hz
	19C300590G10	652.5 Hz
	19C300590G11	667.5 Hz
	19C300590G12	682.5 Hz
	19C300590G13	697.5 Hz
	19C300590G14	712.5 Hz
	19C300590G15	727.5 Hz
	19C300590G16	742.5 Hz
	19C300590G17	757.5 Hz
	19C300590G18	772.5 Hz
	19C300590G19	787.5 Hz
	19C300590G20	802.5 Hz
	19C300590G21	817.5 Hz
	19C300590G22	832.5 Hz
	19C300590G23	847.5 Hz
	19C300590G24	862.5 Hz
	19C300590G25	877.5 Hz
	19C300590G26	892.5 Hz
	19C300590G27	907.5 Hz
	19C300590G28	922.5 Hz
	19C300590G29	937.5 Hz
	19C300590G30	952.5 Hz
	19C300590G31	967.5 Hz
	19C300590G32	982.5 Hz
	19C300590G33	997.5 Hz
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1 thru Q10	19A115123P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1 thru R10	3R77P682J	Composition: 6800 ohms ±5%, 1/2 w.
R11 thru R20	3R77P122J	Composition: 1200 ohms ±5%, 1/2 w.
R21 thru R40	3R77P332J	Composition: 3300 ohms ±5%, 1/2 w.
R41 thru R50	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R51 thru R60	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R61 thru R70	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	4036040P1	Contact pin. (Used with FL40-FL49).
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1201	7476442P12	Electrolytic: 1000 µf +250% -10%, 25 VDCW; sim to Mallory VP039.
C1202	7770994P11	Electrolytic: 2000 µf +250% -10%, 15 VDCW; sim to Mallory WP.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1206	5495912P2	Silicon, Zener.
		- - - - - - - - INDICATING DEVICES - - - - - - - -
DS1201 thru DS1204	19C307037P9	Lamp ...ndescent: 14 v; sim to GE 330.
		- - - - - - - - - - FUSES - - - - - - - - - -
F1201	7487942P2	Slow blowing: 3/8 amp at 250 v; sim to Bussman MDL-3/8.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P1202 and P1203	4029840P1	Contact, electrical; sim to Amp 41854.
P1204	4029840P2	Contact, electrical; sim to Amp 42827-2.
P1205	4029840P1	Contact, electrical; sim to Amp 41854.
P1206 thru P1211	4029840P2	Contact, electrical; sim to Amp 42827-2.
P1213 thru P1220	4029840P2	Contact, electrical; sim to Amp 42827-2.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1201	2R14P113	Wirewound: 16 ohms ±5%, 25 w; sim to Ward Leonard K41383-3.
R1215	3R77P363J	Composition: 36,000 ohms ±5%, 1/2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1202	19C307029P26	Push, lighted: 2 circuits, SPDT each, momentary action, 5 amps at 250 VAC; sim to Micro Switch 20139.
S1204	19C300108P5	Pushbutton: 10 button frame, double side, 2 form C contacts each button (non-shorting); sim to Oak 80.
S1205	7775759P4	Pushbutton: 10 button frame, double side, 6 form A contacts each button (non-shorting); sim to Oak 232188-130.
S1206	7775759P5	Pushbutton: 10 button frame, double side, 3 form C contacts each button (non-shorting); sim to Oak 232188-130.
		- - - - - - - - - - TRANSFORMERS - - - - - - - - - -
T1201	5493743P1	Power, filament, single phase: Pri: 117 v, 50/60 Hz, Sec: 12.6 v ±3%, 2 amps.
		- - - - - - - - TERMINAL BOARDS - - - - - - - -
TB1	7775500P4	Phen: 2 terminals.
TB3	7775500P44	Phen: 2 terminals.
TB1201	7117719P4	Phen: 4 terminals.
		- - - - - - - - - - CABLES - - - - - - - - - -
W1201	4036441P1	Power: Includes molded plastic plug (P1212), approx 9 feet; sim to GE 2073-1.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XDS1201	19C307029P17	Lamp: 4 sockets.
XF1201	19B209605P1	Fuseholder, post, phen: 15 amps at 250 v; sim to Littelfuse 342012.
		DISPATCHER BOARD 19C303306G1
		- - - - - - - - - - CAPACITORS - - - - - - - - - -
C1204	5496267P13	Tantalum: 2.2 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C1205	7491930P11	Polyester: 0.33 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1206	7491930P7	Polyester: .033 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1207	7491930P11	Polyester: 0.33 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1208	7491930P10	Polyester: 0.22 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1209	7491930P7	Polyester: .033 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1210	7491930P11	Polyester: 0.33 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1211	5496267P15	Tantalum: 47 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
C1212	5496267P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1213 and C1214	7491930P8	Polyester: .047 µf ±20%, 100 VDCW; sim to GE Type 61F.
C1215	5496267P2	Tantalum: 47 µf ±20%, 6 VDCW; sim to Sprague Type 150D.
C1246	7489483P10	Electrolytic: 35 µf +75% -10%, 15 VDCW; sim to Sprague Type 30D.
C1247	5496267P11	Tantalum: 68 µf ±20%, 15 VDCW; sim to Sprague Type 150D.
C1248	5496267P15	Tantalum: 47 µf ±20%, 20 VDCW; sim to Sprague Type 150D.
		- - - - - - - DIODES AND RECTIFIERS - - - - - - -
CR1201 thru CR1203	4037822P1	Silicon.
CR1207 thru CR1209	4037822P1	Silicon.
		- - - - - - - - JACKS AND RECEPTACLES - - - - - -
J1201 thru J1211	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
J1213	4037265P1	Jack, tip, stake-in: black phen body; sim to Component Mfg Service A-1128.
J1214 thru J1220	4033513P4	Contact, electrical: sim to Bead Chain L93-3.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K1201 and K1202	19C307010P4	Armature: 12 VDC, 185 ohms ±10%, 2 form A, 1 form C contacts; sim to Allied Control T154X-410.
K1203	19C300957P2	Miniature, plug-in: 12 VDC, 1.5 w, 185 ohms ±10%, 4 form C contacts; sim to Allied Control T154X-316.
		- - - - - - - - - - INDUCTORS - - - - - - - - - -
L1201 and L1202	19C300501G356	Ferrite coil.
		- - - - - - - - - - TRANSISTORS - - - - - - - - - -
Q1201	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q1202	19A115889P1	Silicon, NPN; sim to Type 2N2712.
Q1203	19A115123P1	Silicon, NPN; sim to Type 2N2712.
Q1204	19A115889P1	Silicon, NPN; sim to Type 2N2712.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R1202	7491365P103	Variable, carbon film: 25,000 ohms ±20%, .05 w; sim to CTS UPE-70.
R1203	3R77P333J	Composition: 33,000 ohms ±5%, 1/2 w.
R1204	3R77P822J	Composition: 8200 ohms ±5%, 1/2 w.
R1205	3R77P472J	Composition: 4700 ohms ±5%, 1/2 w.
R1206	3R77P201J	Composition: 200 ohms ±5%, 1/2 w.
R1207	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R1208	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R1209	3R77P470J	Composition: 47 ohms ±5%, 1/2 w.
R1210 and R1211	7491365P103	Variable, carbon film: 25,000 ohms ±20%, .05 w; sim to CTS UPE-70.
R1212	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
R1213	3R78P470J	Composition: 47 ohms ±5%, 1 w.
R1214	3R77P102J	Composition: 1000 ohms ±5%, 1/2 w.
R1246	3R77P302J	Composition: 3000 ohms ±5%, 1/2 w.
R1247	3R77P163J	Composition: 16,000 ohms ±5%, 1/2 w.
R1248	3R77P474J	Composition: 0.47 megohm ±5%, 1/2 w.
R1249	3R77P622J	Composition: 6200 ohms ±5%, 1/2 w.
R1250	3R77P362J	Composition: 3600 ohms ±5%, 1/2 w.
R1251	3R77P512J	Composition: 5100 ohms ±5%, 1/2 w.
R1252	3R77P153J	Composition: 15,000 ohms ±5%, 1/2 w.
R1253	3R77P300J	Composition: 30 ohms ±5%, 1/2 w.
R1254	3R77P221J	Composition: 220 ohms ±5%, 1/2 w.
		- - - - - - - - - - SWITCHES - - - - - - - - - -
S1203	7145098P1	Slide: DPDT, 0.5 amp at 125 VDC; sim to Stackpole SS-150.
S1207	7145098P1	Slide: DPDT, 0.5 amp at 125 VDC; sim to Stackpole SS-150.
		- - - - - - - - - - SOCKETS - - - - - - - - - -
XK1201 thru XK1203	5491595P5	Relay: 16 contacts; sim to Allied Control 30054-2.
XQ1201 thru XQ1204	5490277P2	Transistor, phen: 4 contacts; sim to Elco 3305.
		MECHANICAL PARTS (SEE RC-1796)
1	NP243322	Nameplate (Numbers 0-9).
2	4039234P2	Button (White).
3	4039234P3	Button (Black).
4	19B216199G1	Grille.
5	19A115873P2	Plastic bumper (Front).
6	19A115873P1	Plastic bumper (Rear).
7	19B216197G1	Plate. (Used in 4EH19A11, 12).
	19D413963G1	Plate. (Used in 4EH19A14, 15).
	19D413963G2	Plate. (Used in 4EH19A17, 18).
8	NP257766P1	Faceplate.
9	19C307029P25	Lens (Used with TRANSMIT-STAND BY switch).
10	NP249217P32	Nameplate (TRANSMIT-STAND BY).
11	19C307029P3	Retainer (Used with TRANSMIT-STAND BY switch).
12	19B205762P1	Stud.
13	7491987P6	Bushing, train relief. (Used with W1201).
14	19A122657P1	Angle.
15	19C311276G1	Guide Assembly.
16	4039244P1	Support. (Mounts R1201).
17	7160861P16	Nut (Used with R1201 support).
18	5491595P9	Retainer. (Used with K1201-K1203 on Dispatcher Board).
19	4039851P6	Clip.
20	19C311519P1	Chassis.
21	4036555P1	Insulator, washer: nylon.
22	19C311561G1	Frame. (Used in 4EH19A11, 12).
	19C311561G2	Frame. (Used in 4EH19A14, 15).
	19C311561G3	Frame. (Used in 4EH19A17, 18).





RC-1796A

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES



(19C311835, Rev. 3)

INTERCONNECTION DIAGRAM

TYPE 99 TONE ENCODER PANEL
(RIGHT SECTION OF RADIO CONTROL CENTER)

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 GE Part Number.

Service parts may be obtained from Authorized GE Communication Equipment Service Stations or through any GE Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. GE 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-3986

DF-5038

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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