MOBILE RADIO

series 2500
COMMAND CONTROL CENTER

ENCODERS & SWITCH MODULES

Maintenance Manual LBI-30306
DP-4107

H8, U8 & W8 Encoders; X8, Y8 Switch Modules

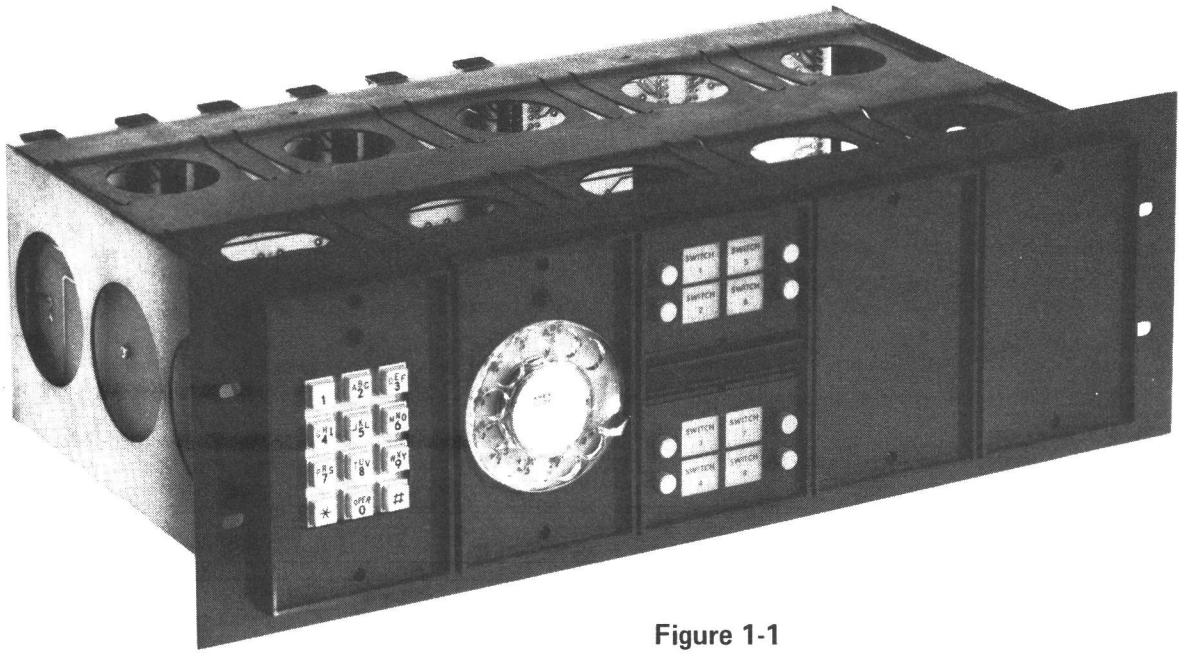

Figure 1-1

SPECIFICATIONS*

AUXILIARY SWITCH MODULE:

Switch Ratings	AC, 0.2 Amp. 250 Volts, 0.5 Amp. 100 Volts, DC, 1.0 Amp. 25 Volts

DIAL ENCODER MODULE:

Operating Frequencies	2805 Hz or 1500 Hz
Output Impedance	40 ohms, 600 ohms or 120 ohms
Tone Output Levels	153 mV w/load = 100 ohms, 650 mV w/load = 1 Kohm
Pulse Train	Break pulses 62% of total time at 10 pulses/second nominal
Delay Time	3 to 3.5 seconds, nominal, before tone drop
Power	+13.5 Volts, DC
Operating Temperature	-30°C to + 60°C

DTMF ENCODER MODULE:

Refer to inside front cover for DTMF Encoder Module specifications.

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

DTMF ENCODER MODULE SPECIFICATIONS

FORMAT. . . . . Standard 2-of-7 DTMF

ELECTRICAL

Side Tone Output . . . . . Adjustable from 0 to 50 mW nominal into 4- or 8-ohm load.

Transmit Audio Output . . . . . Balanced & DC blocked to 25 VDC, open circuit on standby.

Level . . . . . Adjustable 0 to 1.5 Vrms into 600-ohm load

Tone Level Differential (Twist). . . . . 2.0 dB maximum, typically < 1.0 dB.

Frequency Stability . . . . . 0.25% @ -40°C to +85°C

Harmonic Suppression . . . . . 20 dB minimum

Total Distortion . . . . . 4% maximum @ 1 Vrms across 600 ohms (each tone).

Amplitude Stability . . . . . ±1 db @ ambient (within 3 dB @ -40°C to +85°C).

Tone Duration Timer (Strapping Option) . . . . . Factory set at 90 mS ±10 mS (Push-button switch override optional).

Initiate Delay Timer . . . . . 150 mS to 2.5 Sec., adjustable

Interdigit Time. . . . . Fixed 2.0 seconds nominal

POWER REQUIREMENTS

Voltage . . . . . 414 - 13.8 VDC ±20% (10.9 to 16.3 VDC).
402 - As above.

Current

Standby. . . . . 50 mA maximum @ 13.6 VDC
60 mA maximum @ 13.6 VDC with Tone Duration Timer disabled.

Operate . . . . . 145 mA maximum @ 13.6 VDC (at full rated outputs exclusive of keying loads).

90 mA maximum @ 13.6 VDC (without side tone or keying loads).

Keying Circuits . . . . . Transistor collector outputs capable of sinking 500 mA maximum, or sourcing 100 mA at input voltage level. Sinking circuit open collector voltage not to exceed input power supply. Sinking saturation voltage typically less than 1.5 for 200 mA load. External transient clamping diode required for inductive loads.

ENVIRONMENTAL

Temperature

Storage . . . . . -65°C to +105°C.

Operate . . . . . -40°C to +85°C.

Humidity . . . . . 0 - 95%, non-condensing.

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.

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DESCRIPTION

This manual supplements the basic maintenance manual for the Series 2500 console, LBI-30300, when the console includes a Switch/Encoder Section.

Optional card cage assembly SEC/53366-001 may be installed in any of the uncommitted turret ports of a Series 2500 Command Control Center, to provide for special switch functions, and to provide for tone signaling using keypad-operated or dial-operated encoders. A Section with switch modules and both types of encoder modules is shown in Figure 1-1.

A Switch/Encoder Section may include one encoder and four switch modules, two encoders and three switch modules, or up to five switch modules. The module configurations and Section port locations are shown in Figures 1 and 2. These Combination Nomenclature tables are the basis for module model numbers.

SEC/53365-001, -006

AUXILIARY SWITCH MODULE

An Auxiliary Switch Module may include either four or eight 4-pole, 2-throw switches, of either momentary or alternate operation:

SEC/53365 Dash No.	NUMBER OF SWITCHES	TYPE OF SWITCH
-001	4	alternate
-002	8	alternate
-003	4	momentary
-004	8	momentary
-005	8	4 momentary, 4 alternate, momentary right, alternate left
-006	8	4 momentary, 4 alternate, momentary left, alternate right

SEC/53363-001, -002

DIAL ENCODER MODULE

The essential elements of the Dial Encoder Module are a tone oscillator and keying circuit, which, together, provide for single-tone selective keying. Any dispatcher or automatic control device equipped for single-tone signaling may be selected with the Dial Encoder. The standard operating frequencies are 2805 Hz (SEC/53363-001) and 1500 Hz (SEC/53363-002).

SEC/53362-001

DTMF (KEYBOARD) ENCODER MODULE

The SPEEDCALL keypad-operated encoder is designed to generate standard DTMF signals for use in radio and wireline applications. Internal circuitry provides for the strappable use of 90-millisecond output bursts with required delays in interdigit timing circuits for keypad-controlled transmitter keying. A separate side tone output affords audible indication of transmitted tones when connected to an external loud speaker. A visual indication of transmitter keying is provided by an LED lamp. The 600-ohm audio output may be conencted directly across microphone leads, and presents an open circuit to the transmitter system when the encoder is not keyed. The Model 414 is designed for mobile use while the 402 is for base station operation.

CAUTION

When DTMF encoder PC boards are exposed, handle with special care to prevent damage to CMOS integrated circuits through discharge of static electricity with or without power applied. This condition usually exists in dry atmosphere and especially around nylon or wool carpets and clothing. Take special care NOT to brush fingers or clothing across keypad to tone encoder connections found on the top rear side of the keypad.

SEC/53277-001

MOTHER BOARD

The Switch/Encoder Mother board includes access points for the Switch Module switches. These connection points and a Mother board assembly diagram are shown in Figure 3-1.

1ST DIGIT	2ND DIGIT	3RD DIGIT	4TH DIGIT	5TH DIGIT	6TH DIGIT	7TH DIGIT	8TH DIGIT	9TH DIGIT	10TH DIGIT
SWITCHES PER MODULE	MODULE	LEFT-HAND ROW SWITCH TYPE	RIGHT-HAND* ROW SWITCH TYPE	OPTION	OPTION	OPTION	SYSTEM	PORT LOCATION	SLOT LOCATION
X 4 Switches (1 Row of 4 Each)	**8** Standard	**R** Momentary Action	**V*** None	**K** Standard	**A** Standard	**K** Standard	**8** Standard	**2** Port 2	**1** Slot 1
Y 8 Switches (2 Rows of 4 Each)	**9** Custom	**T** Alternate Action	**R*** Momentary Action				**9** Special	**3** Port 3	**2** Slot 2
			T* Alternate Action					**4** Port 4	**3** Slot 3
								5 Port 5	**4** Slot 4
								6 Port 6	**5** Slot 5
								9 Spare	**9** Spare

*Modules with 4 switches have no right-hand row switches. Fourth digit for 4-switch module is "V."

Figure 1-2 COMBINATION NOMENCLATURE, AUXILIARY SWITCH MODULE

1ST DIGIT	2ND DIGIT	3RD DIGIT	4TH DIGIT	5TH DIGIT	6TH DIGIT	7TH DIGIT	8TH DIGIT	9TH DIGIT	10TH DIGIT
ENCODER TYPE	MODULE MARKING	OPTION	OPTION	OPTION	OPTION	OPTION	SYSTEM	PORT LOCATION	SLOT LOCATION
H DTMF Encoder	**8** Standard	**R** Standard	**R** Standard	**K** Standard	**A** Standard	**K** Standard	**8** Standard	**2** Port 2	**1** Slot 1
U 1500 Hz Digital Encoder							**9** Special	**3** Port 3	**2** Slot 2
W 2805 Hz Digital Encoder								**4** Port 4	**3** Slot 3
								5 Port 5	**4** Slot 4
								6 Port 6	**5** Slot 5
								9 Spare	**9** Spare 6

Figure 1-3 COMBINATION NOMENCLATURE, ENCODER MODULES

NOTE:

Module model numbers based on this table are applicable only to basic consoles which have a 5th, 6th, 7th or 8th model number digit of "3". See Figure 1-4, Combination Nomenclature table, Maintenance Manual LBI-30300. Use the 4th digit column of Figure 1-4, LBI-30300, to apply an encoder module to port 1 of the console.

OPERATION & CIRCUIT ANALYSIS

SEC/53365-001 – -006
AUXILIARY SWITCH MODULE

A Switch Module PC board and a table of switch pin functions are shown in Figure 3-2. The Module face assembly is shown in Figure 3-3. Operation is straight forward. Switch current ratings are set forth in the Specification table on the cover.

SEC/53363-001, -002
DIAL ENCODER MODULE

Rotation of the encoder dial from the home position causes a tone to be generated, and relay contact closure. The tone is encoded when the dial is released, as the rotation causes tone interruption by the action of pulsing contacts in the dial. The relay closure provides a keying output to the console. Both the tone and keying output remain for about 3 seconds after the dial has completed its rotation.

In the detailed analysis which follows, the component symbols are referenced in Figure 3-5, Dial Encoder Circuit Schematic. A parts list and assembly diagram are included in Figure 3-4.

Integrated circuit U1 is an NE555 timer that controls the delay time of the oscillator. Power is supplied to pins 4 and 2 of U1 as soon as the dial is rotated off normal. This causes C1 to charge. Pin 3 goes low energizing relay K1. K1 applies holding power to the IC timer, and V_{CC} to the oscillator circuit, Q1 and associated components. The timer will keep the relay energized until approximately three seconds after the off-normal contacts, pins 1 and 2, are open again.

One set of relay K1 contacts conduct the PTT signal to the console. Another set applies power to CR6, a red LED (Light Emitting Diode). When the console receives a PTT signal, it returns a logic low signal, $\overline{T1 + T2}$, which lasts about 200 milliseconds. $\overline{T1 + T2}$ turns on Q2, which effectively switches the cathode of CR6 to ground, and causes CR6 to conduct. The resulting red light signals the operator that the tone sequence is completed in tone keying systems.

Resistors R2 and R3 divide V_{CC} to provide the proper base voltage for the oscillator transistor, Q1. Collector current is supplied through T1 taps 6, 5. The 7, 5 taps provide positive feedback to Q1 via C2. R4 and varistor CR5 constitute a limiting circuit that smooths out the negative-going cycle of the sine wave. C4 suppresses oscillations that may occur in the standby mode. R1 is a level-adjust resistor, while R7 and R8 provide output impedance options.

When the dial is rotated and released, the dial pulse contacts interrupt the tone output a number of times that corresponds to the number dialed.

When the dial returns to the normal position, the off-normal contacts open, and C1 begins to discharge through R9. After about three seconds — the time constant established by C1-R9 — the output of the timer goes high. This de-energizes K1, and removes V_{CC} from the oscillator circuit.

SEC/53362-001
DTMF ENCODER MODULE

OPERATING PROCEDURE

Enter first digit of sequence to be sent by pressing appropriate button keypad. Continue pressing the first digit until the LED lights, or the side tone becomes audible, indicating that the radio transmitter power up time has been accounted for, and the DTMF sequence has now begun. Release the keypad button and press the second button on the series. Each succeeding number must be entered within 2 seconds of the last in order to maintain continuous transmitter keying between digit entries. Most decoders have a 2-½ second interdigit timer which will cause the decoder to reset to the first digit in the event an incomplete code is received. If the transmit indication is extinguished due to extended pauses between address entry digits, wait at least 3 seconds and start the entry procedure again.

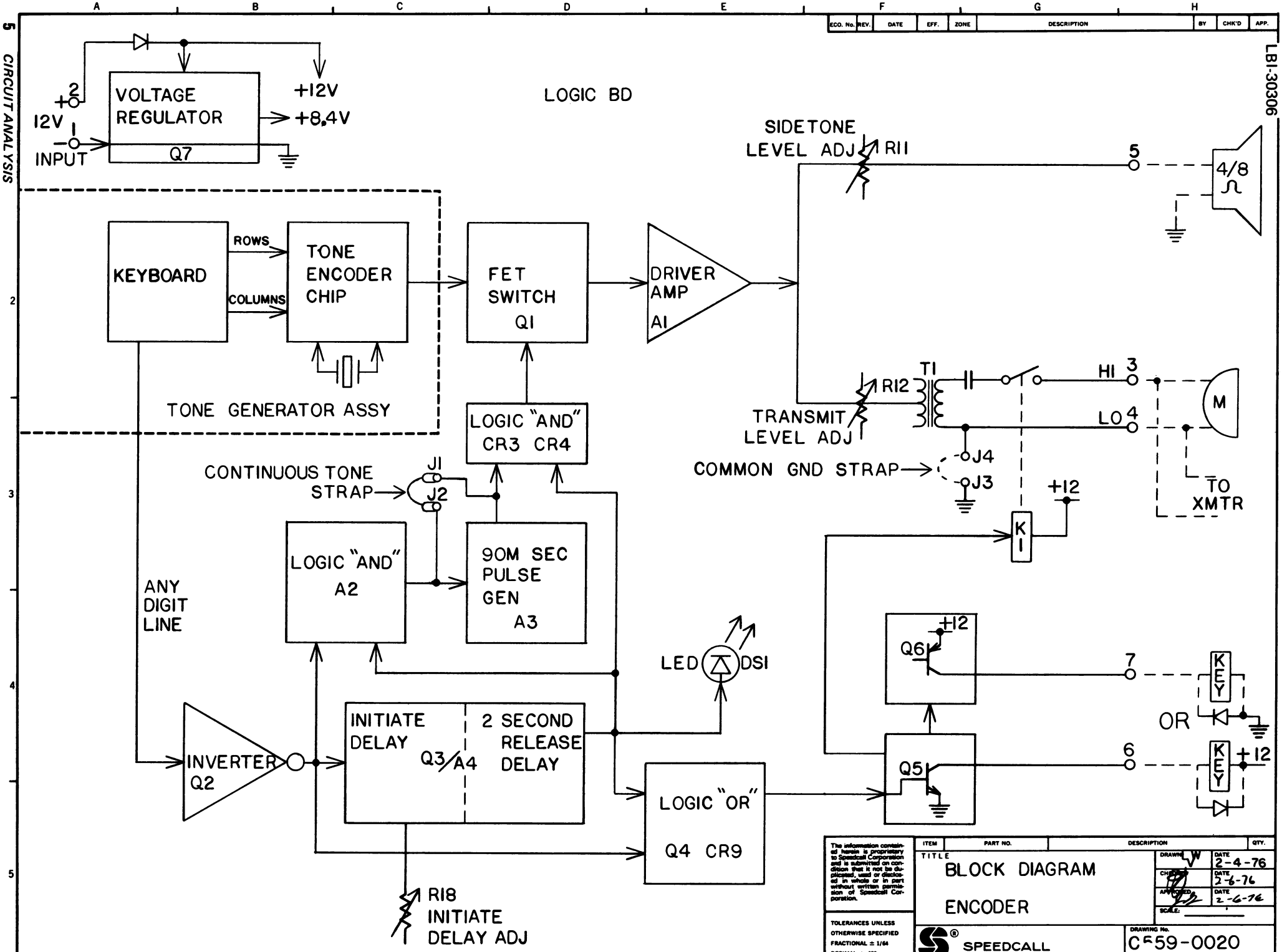


Figure 2-1 **F Encoder Block Diagram**

DTMF CODE

Depressing each button causes the emission of a pair of tones, one column and one row, as shown. Most systems respond to 90 – milli second tone bursts.

	1209 Hz	1336 Hz	1477 Hz
697 Hz	1	2	3
770 Hz	4	5	6
852 Hz	7	8	9
941 Hz	*	0	#

CIRCUIT ANALYSIS

The SPEEDCALL Model 402 or 414 Encoder consists of a manually operated, keypad controlled, DTMF audio source with logic and timer circuits for the keying of associated transmitter equipment. Additional circuitry is included for visual indication and audio side tone output. Refer to Figures 2-1 and 3-8.

The keypad switches select appropriate row and column keying lines in the tone encoder IC and also produce a common, any-digit signal for timing and control purposes. The tone encoder frequencies are synthesized from a 1-MHz crystal standard depending on the row and column keyed. Output of the DTMF signal is gated by Q1 FET switch and amplified by A1. The low impedance output of the driver amplifier produces direct drive for an external side tone speaker which is level adjusted by R11. The 600-ohm audio output for transmitting is independently level adjusted by R12, and impedance matched by T-1. The relay contacts of K1 present an open circuit condition to prevent overloading external transmitting microphone circuits during encoder idle time.

LOGIC, TIMING AND CONTROL SECTION

The any-digit signal from the keypad is inverted and amplified in Q2 for driving the initiate delay (Q3) and other gating logic. Initial, undelayed push-to-talk (PTT) keying is accomplished from the any-digit keypad signal through Q2, via the logic "OR" containing CR9 to Q5 for energizing K1 and for PTT — (sinking) output or via Q5 to Q6 for PTT + (sourcing) output to external transmitter keying circuits. Following an initial delay in Q3 the A4 timer fires, producing an output through Q4 "OR" gate to continue the transmitter keying for 2 seconds after the end of the any-digit signal. Control of Q1 FET switch is determined by the logical "AND" gating provided by A2, CR3 and CR4 when both the any-digit and outputs from A3 and A4 are present. 90-millisecond single shot pulsing of the Q1 audio switch is provided by A3 at the beginning of each digit. The addition of a strap from J1 to J2 will prevent the pulsing function and result in a continuous tone output for as long as any keypad switch is depressed.

INSTALLATION INSTRUCTIONS

SEC/53365-001 – -006
AUXILIARY SWITCH MODULE

There are no special installation or adjustment procedures for the AUX SW module, the unit simply plugs into the Section Mother board. Switch contact points are available at the Mother board. Refer to Figure 3-1.

SEC/53363-001, -002
DIAL ENCODER MODULE

Note: The output impedance of the Dial Encoder module should be set to the value which is best for the system:

OUTPUT OPTION	USE R7	R8	IMPEDANCE
Maximum Out	short	remove	40 ohms
Match 600 ohms	as shipped	remove	600 ohms
For 150 mV, shipped as standard	as shipped	as shipped	120 ohms

1. Place the Dial Encoder module on a test extender board, and insert the assembled units into the console. Turn the dial and hold it to provide a continuous tone at the output. Measure and set the frequency by adjusting the transformer coil. Adjust the output to the desired level with potentiometer R6.

2. The keying signal from the dialer is connected to $\overline{ETx}$ on encoder connector J4 on the Center Section Mother board, SEC/53268-001, AUDIO HI and AUDIO LO are connected to either the Tone No. 1 or Tone No. 2 input on J4.

SEC/53362-001
DTMF ENCODER MODULE

The SPEEDCALL Model 402/414 Encoder is supplied with a jumper between J1 and J2 for standard keypad-controlled tone duration operation. If it is desired to use the 90-millisecond tone duration feature, disconnect the jumper between pins marked J1 and J2. This results in timed tone output each time any single keypad switch button is depressed.

CAUTION: The tone duration pot (R13) has been factory set for 90 milliseconds and should not be changed.

INITIATE DELAY

The initiate delay (R18) should be adjusted so that the initial burst of tones is sent following the radio system start-up period. The exact delay is dependent on each particular radio system type.

TRANSMIT LEVEL

The transmit level (R12) should be adjusted to produce not more than 2/3 full scale deviation of the FM radio transmitter carrier frequency as measured on a calibrated deviation meter. This is necessary to prevent peak clipping which causes distortion of the DTMF signal and possible failure to decode on the receiving end of the communication system.

SIDE TONE VOLUME

If side tone is used, R11 provides a means to control the speaker volume independent of the transmit path.

MAJOR ASSEMBLIES PARTS LISTS

QUANTITY	GE PART NO.	DESCRIPTION
----------	SEC/53366-001 -----	AUXILIARY SWITCH/ENCODER CARD CAGE------
1	SEC/53146-001	Assembly, card cage
1	SEC/53277-001	Mother board, AUX SW/Encoder
1	SEC/53455-004	Power Cable
5	SEC/53162-001	Blank module panel
2	SEC/53173-001	Bracket
10	SEC/53149-001	Bracket, module mounting

QUANTITY						PART NO.	DESCRIPTION
-001	-002	-003	-004	-005	-006		
----------						SEC/53365-001-006----	AUXILIARY SWITCH MODULE----------
2	–	2	–	–	–	SEC/53225-003	Assembly, Lamp PC board
–	2	–	2	2	2	SEC/53225-004	Assembly, Lamp PC board
1	1	1	1	1	1	SEC/53226-001	Assembly, fuse PC board
1	1	1	1	1	1	SEC/53275-001	PC board, AUX SW (left)
–	1	–	1	1	1	SEC/53275-002	PC board, AUX SW (right)
1	1	1	1	1	1	–	Legend, handle
1	–	1	–	–	–	SEC/53358-002	Panel, front
–	1	–	1	1	1	SEC/53358-003	Panel, front
1	–	1	–	–	–	SEC/53350-001	PC board, right
4	–	4	–	–	–	SEC/53166-001	Plug, button
–	–	4	8	4	4	SEC/51315-004	Switch, 4-pole, 2-throw, momentary
4	8	–	–	4	4	SEC/51316-004	Switch, 4-pole, 2-throw
4	8	4	8	8	8	SEC/51317-008	Switch button

QUANTITY	PART NO.	DESCRIPTION
----------	SEC/53363-001 -----	DIAL ENCODER MODULE ASSEMBLY----------
1	SEC/53532-001	Assembly, cable
1	SEC/53276-001	Assembly, rotary encoder
1	SEC/53280-001	Bracket, mounting f/ITT dial
1	SEC/53282-001	Bracket, support
1	SEC/53287-001	Carrier Board, dial/touch-key
1	SEC/20871-001	Dial, rotary
1	–	Insert, dial
2	SEC/50503-001	Fuse clip
1	SEC/14820-015	Fuse, 3 AG, ½ amp
1	SEC/51233-002	LED, red w/mounting ring
1	SEC/53281-001	Panel, rotary dial mounting
3	SEC/25511-008	Standoff, snap-in, ¼"

QUANTITY	PART NO.	DESCRIPTION
----------	SEC/53362-001 -----	DTMF ENCODER MODULE ASSEMBLY----------
1	SEC/53532-001	Assembly, cable
1	SEC/50553-001	Assembly, DTMF encoder
1	SEC/53279-001	Bracket, mounting, f/GTE touch key-pad
1	SEC/53282-001	Bracket, support
1	SEC/53287-201	Connector, dial/touch-key, PC board
2	SEC/50503-001	Fuse clip
1	SEC/14820-015	Fuse, 3 AG, ½ amp
1	SEC/51233-002	LED, red w/mounting ring
1	SEC/53283-001	Panel, touch-key mounting
3	SEC/25511-008	Standoff, snap-in, ¼"

MAINTENANCE & TROUBLESHOOTING

The SPEEDCALL Model 402 and 414 Encoders are designed for stable, trouble-free operation over long periods. No periodic alignment, level or timing adjustment is necessary once the encoder has been set up with a particular transmitting system. However, if reconnected to a different transmitter, the installation adjustment procedure should be followed.

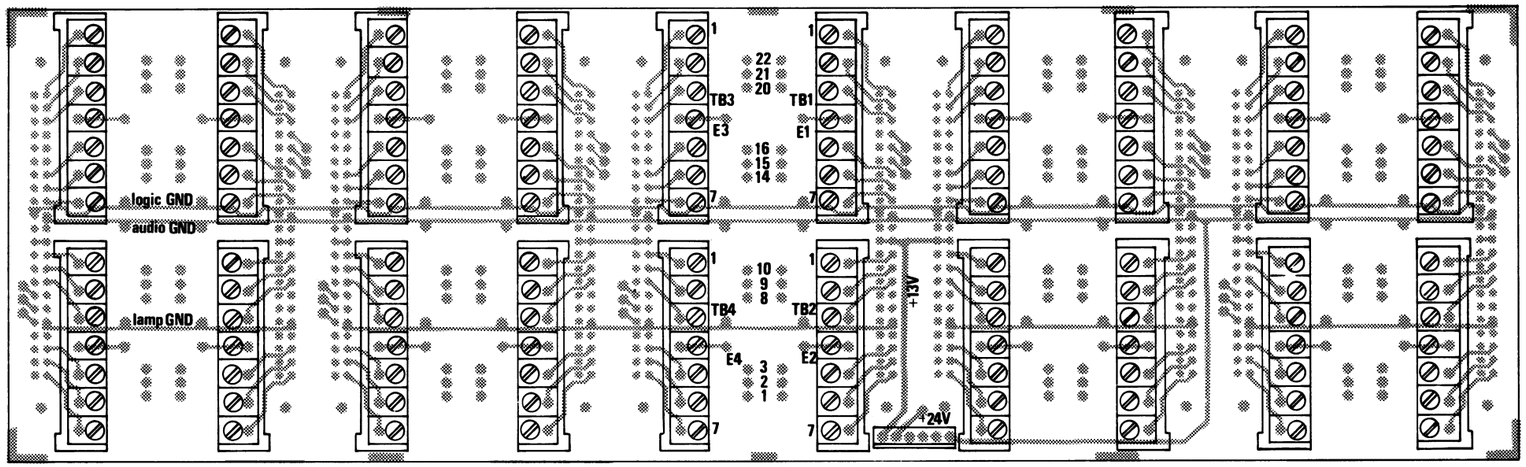
Make sure that the radio transmitting equipment is working properly. It is very important that the transmitter and receivers be on frequency (netted). It is also important that the transmitter deviation or modulation be measured at 1/2 and 2/3 of normal high level when being modulated by the encoder DTMF signal. This may be done by adjustment of R12 (transmit level) on the encoder board. Distortion in the communications system can cause DTMF decoding problems.

SYMPTOM	PROCEDURE
Transmitter does not key but LED lights and side tone operates.	Check the operation of Q4, Q5 and Q6.
No side tone or audio output, but LED and keying operates.	Check A1 (LM386), Q1 (2N4343) and the tone input on the encoder board for the presence of audio using a scope. If no audio on tone input pin, check A1 (MC14410) on the tone generator board. If audio is not being switched on in Q1 (FET switch), then check to see that Q1 gate bias is low during keydown. If gate of Q1 stays high, check A2 and A3.
Transmitter is keyed and side tone operates but no audio is being transmitted.	Check T-1, relay K-1 and connections to console.
No keying output and no side tone or LED indication.	Check timer A4, initiate delay Q3 and Q2. Also check to see if CR2/Q7 voltage regulator circuit is operating. If no input voltage to the regulator, check CR1 for open.
No tone pulsing.	Check to be sure strap between J1 and J2 is removed. Check A2, A3 and C3. Note that R13 has been factory adjusted for a 90-millisecond tone duration. If A3 is replaced, the pulse width should be checked using a scope.

SWITCH CONTACT	FUNCTION	MOTHER BOARD ACCESS POINT	SWITCH CONTACT	FUNCTION	MOTHER BOARD ACCESS POINT
S1-1	NC	TB1-1	S2-1	NC	TB1-5
S1-2	Common	TB1-2	S2-2	Common	TB1-6
S1-3	NO	TB1-3	S2-3	NO	TB1-7
S1-4	NC	pad 22, right	S2-4	NC	pad 16, right
S1-5	Common	pad 21, right	S2-5	Common	pad 15, right
S1-6	NO	pad 20, right	S2-6	NO	pad 14, right
SWITCH CONTACT	**FUNCTION**	**MOTHER BOARD ACCESS POINT**	**SWITCH CONTACT**	**FUNCTION**	**MOTHER BOARD ACCESS POINT**
S3-1	NC	TB2-1	S4-1	NC	TB2-5
S3-2	Common	TB2-2	S4-2	Common	TB2-6
S3-3	NO	TB2-3	S4-3	NO	TB2-7
S3-4	NC	pad 10, right	S4-4	NC	pad 3, right
S3-5	Common	pad 9, right	S4-5	Common	pad 2, right
S3-6	NO	pad 8, right	S4-6	NO	pad 1, right
SWITCH CONTACT	**FUNCTION**	**MOTHER BOARD ACCESS POINT**	**SWITCH CONTACT**	**FUNCTION**	**MOTHER BOARD ACCESS POINT**
S5-1	NC	TB3-1	S6-1	NC	TB3-5
S5-2	Common	TB3-2	S6-2	Common	TB3-6
S5-3	NO	TB3-3	S6-3	NO	TB3-7
S5-4	NC	pad 22, left	S6-4	NC	pad 16, left
S5-5	Common	pad 21, left	S6-5	Common	pad 15, left
S5-6	NO	pad 20, left	S6-6	NO	pad 14, left
SWITCH CONTACT	**FUNCTION**	**MOTHER BOARD ACCESS POINT**	**SWITCH CONTACT**	**FUNCTION**	**MOTHER BOARD ACCESS POINT**
S7-1	NC	TB4-1	S8-1	NC	TB4-5
S7-2	Common	TB4-2	S8-2	Common	TB4-6
S7-3	NO	TB4-3	S8-3	NO	TB4-7
S7-4	NC	pad 10, left	S8-4	NC	pad 3, left
S7-5	Common	pad 9, left	S8-5	Common	pad 2, left
S7-6	NO	pad 8, left	S8-6	NO	pad 1, left

NOTE: Switch contacts 7 through 12 terminate at solder pads on the AUX SW PC board. See Figure 3-2.

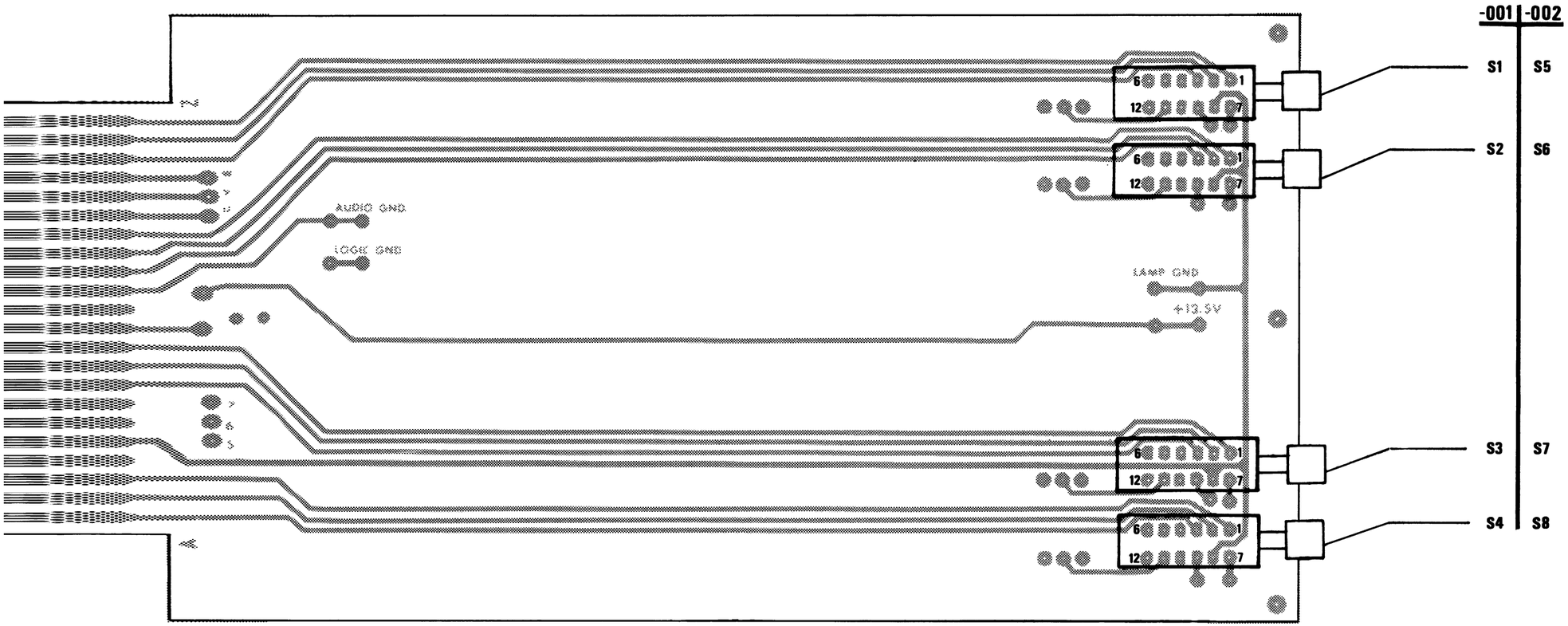
DESIGNATIONS SHOWN ON NO. 3 SLOT ARE TYPICAL OF ALL FIVE MODULE SLOTS.



QUANTITY	PART NO.	DESCRIPTION
----------	SEC/53277-001 ------	MOTHER BOARD (Auxiliary Switch/Encoder)--------
10	SEC/50432-044	PC connector
1	SEC/50426-006	Connector, 6-pin
20	SEC/50542-007	Connector, 7-pin
20	SEC/50666-001	Keying tabs

SEC/53277-001
MOTHER BOARD

FIGURE 3-1



-001	-002
S1	S5
S2	S6
S3	S7
S4	S8

RH ASSEMBLY SHOWN.
SWITCHES ARE MOUNTED ON FAR SIDE FOR LH ASSEMBLY (-001).

SWITCH PIN NO.*	FUNCTION*	SWITCH PIN NO.	FUNCTION
1	NC	7	NC
2	Common	8	Common
3	NO	9	NO
4	NC	10	NC
5	Common	11	Common
6	NO	12	NO

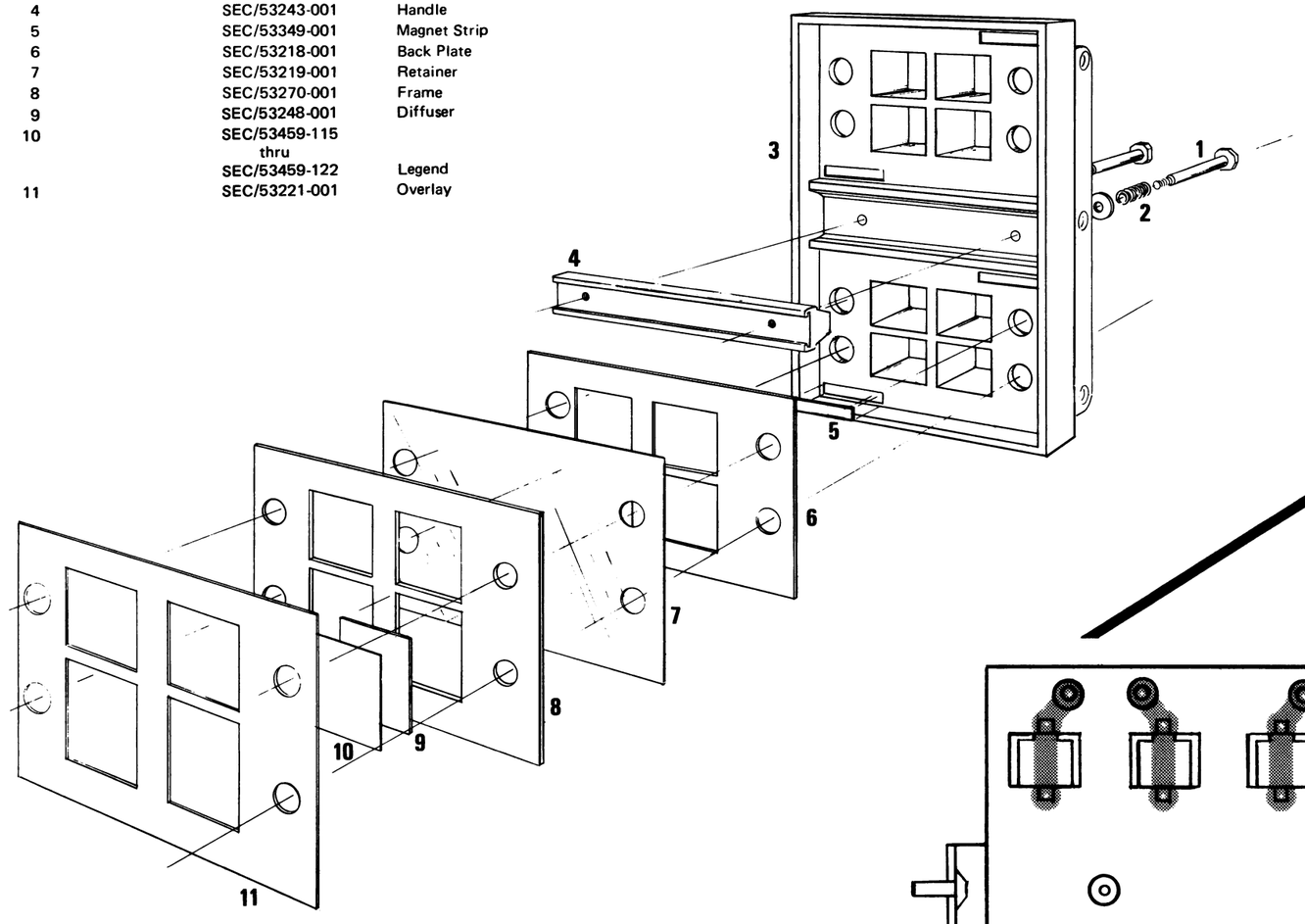
*Pins 1 through 6 connect to contact points on the Auxiliary/Switch Mother Board. See Figure 3-1.

75-001, -002
RY SWITCH PC BOARD
LY DIAGRAM

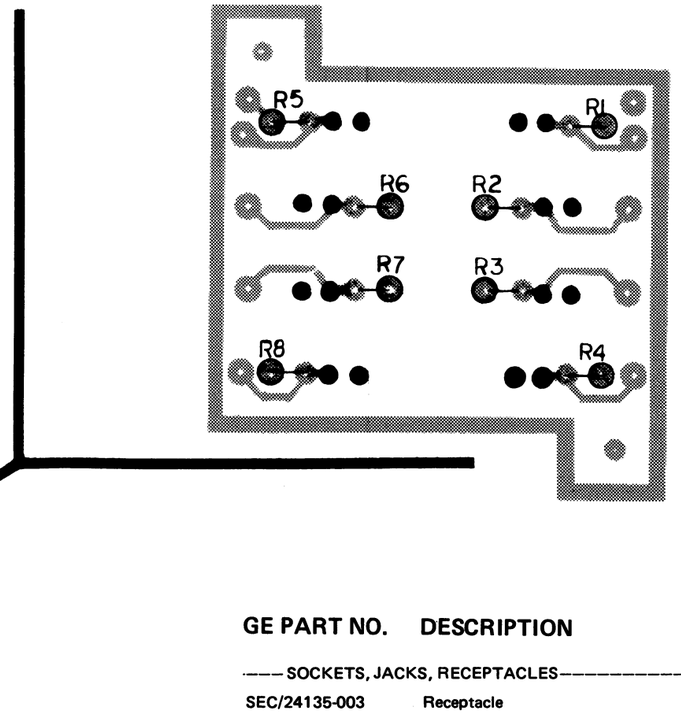
3-2

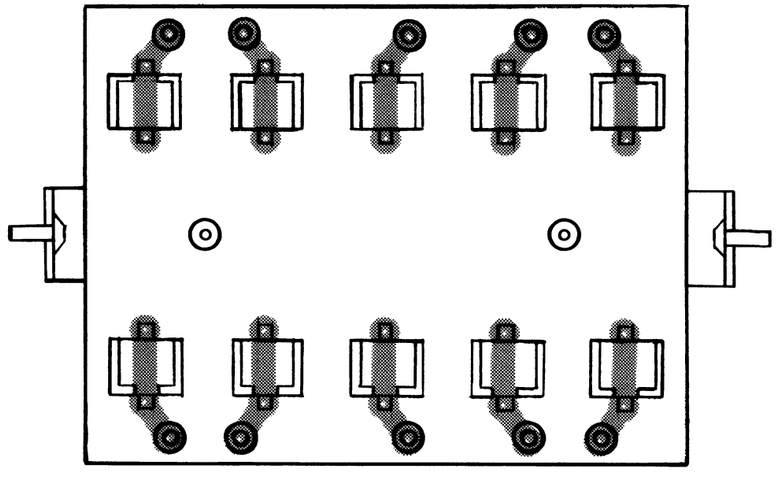
ET

ITEM	GE PART NO.	DESCRIPTION
1	SEC/53241-001	Stud, Handle
2	SEC/53244-001	Spring, Handle
3	SEC/53162-001	Module Face
4	SEC/53243-001	Handle
5	SEC/53349-001	Magnet Strip
6	SEC/53218-001	Back Plate
7	SEC/53219-001	Retainer
8	SEC/53270-001	Frame
9	SEC/53248-001	Diffuser
10	SEC/53459-115 thru	
	SEC/53459-122	Legend
11	SEC/53221-001	Overlay



SYMBOL	GE PART NO.	DESCRIPTION
	RESISTORS	
R1–R8	SEC/51016-202	2 Kohms, ¼W, 5% Carbon composition
	SOCKETS, JACKS, RECEPTACLES	
–	SEC/25569-003	Socket, Pin
	MISCELLANEOUS	
–	SEC/50507-020	Lamp, T-1 ¾, straight lead
–	SEC/50551-003	Color Filter, Amber Lens Cap
–	SEC/50551-002	Color Filter, red, Lens Cap





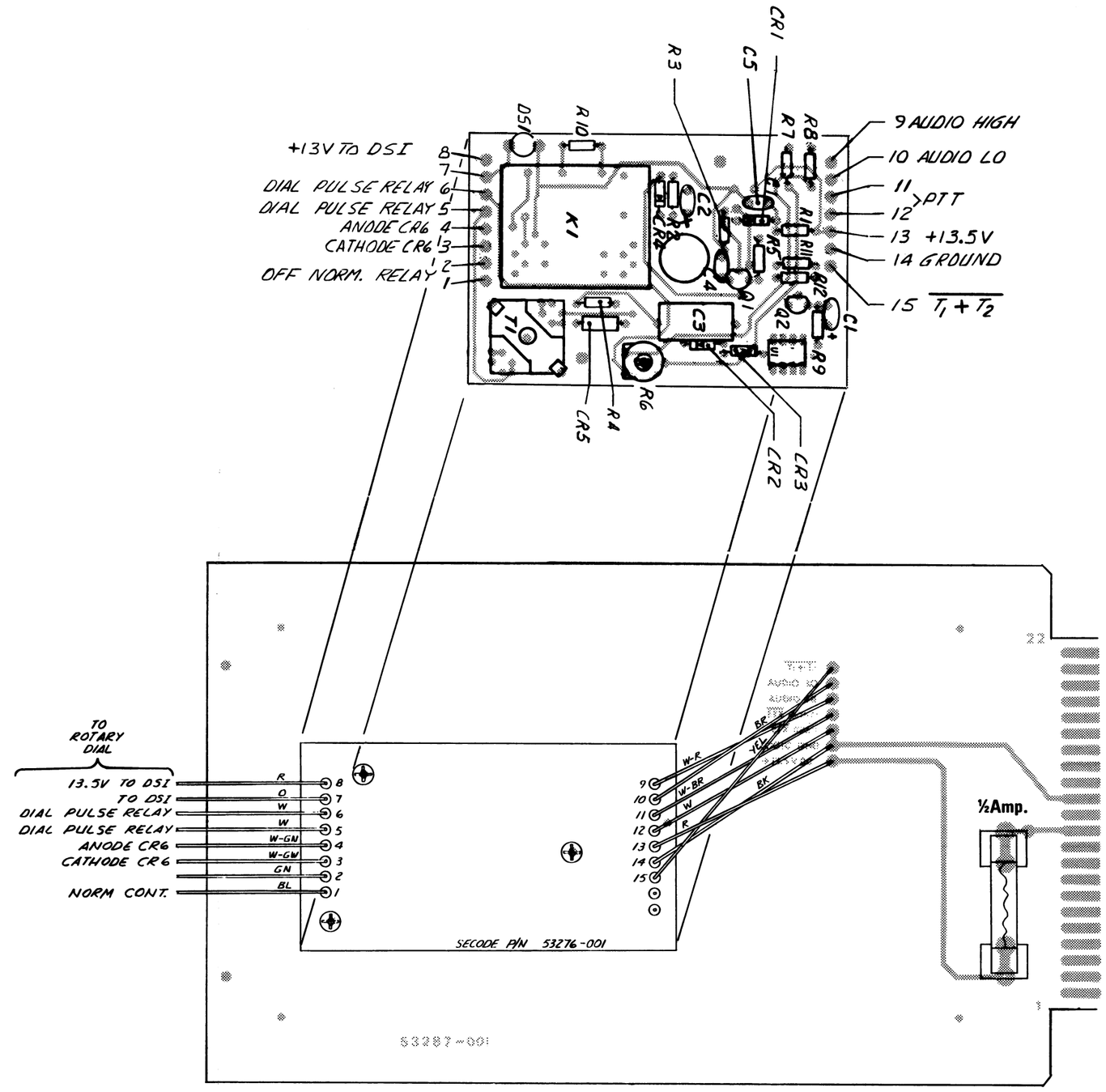
GE PART NO.	DESCRIPTION
	SOCKETS, JACKS, RECEPTACLES
SEC/24135-003	Receptacle
	MISCELLANEOUS
SEC/14820-011	Fuse, 1/4A Fast Blow, (24v, +150v, –150v)
SEC/14820-017	Fuse, 1A Fast Blow, (V_{CC}, Lamp Supply)
SEC/50503-001	Fuse Clip

SEC/53365-001 – -006
AUXILIARY SWITCH MODULE
FACE ASSEMBLY

FIGURE 3-3

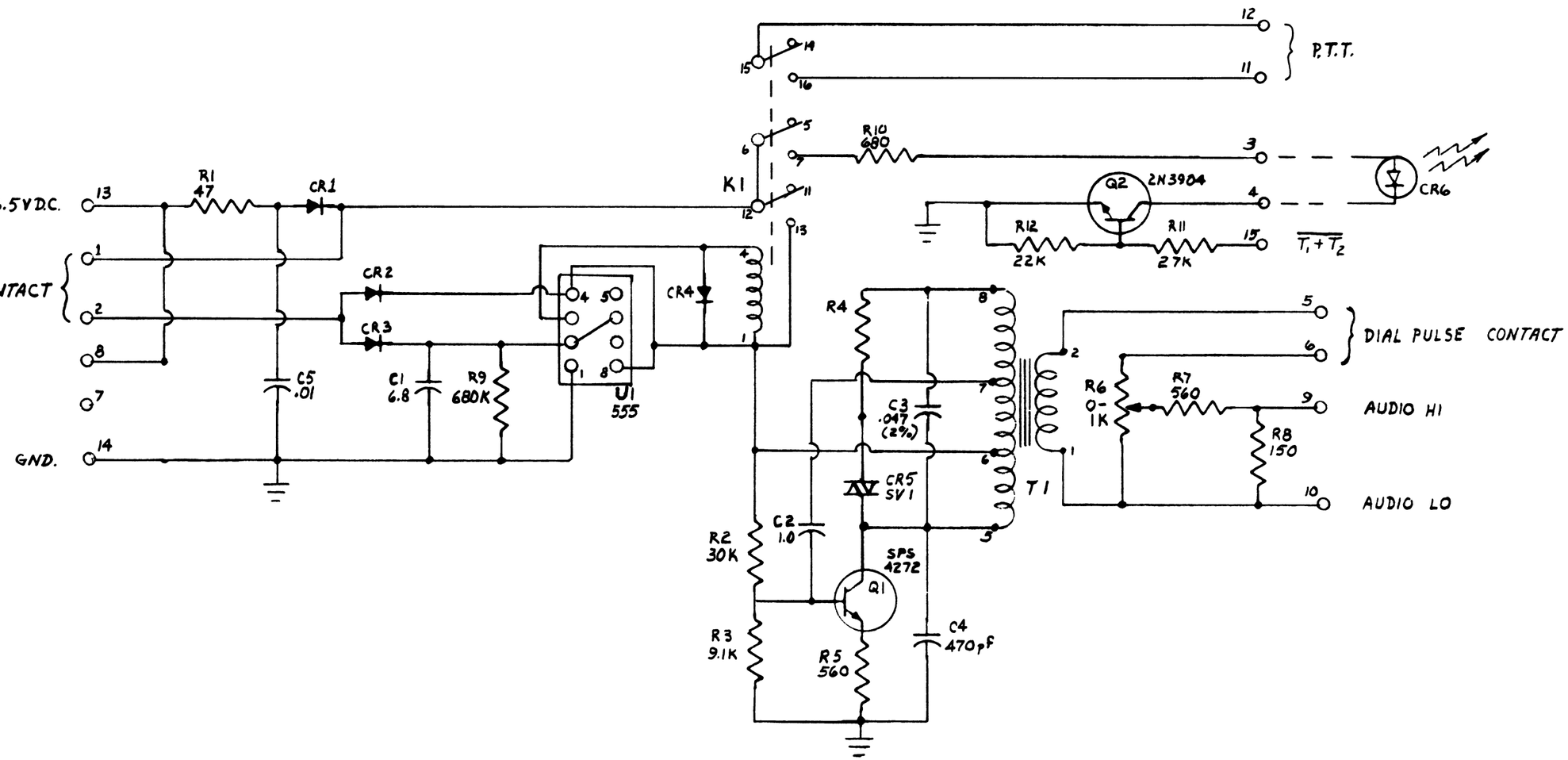
SYMBOL	GE PART NO	DESCRIPTION
		CAPACITORS
C1	SEC/25076-685	Capacitor, 6.8 uF, 35 V
C2	SEC/25076-105	Capacitor, 1 uF, 35 V
C3	SEC/23216-473	Capacitor, .047 uF, 2%, 200 WVDC
C4	SEC/25774-471	Capacitor, 470 pF
C5	SEC/25853-008	Capacitor, .01 uF, disc
		DIODES/RECTIFIERS
CR1-CR4	SEC/15104-011	Diode, 1N4148
		DIODES, VOLTAGE REGULATOR
CR5	SEC/51231-001	SV1 (varistor)
		INDUCTORS, TRANSFORMERS
K1	SEC/50910-012	Coil (relay, 12 V, 4 PDT
T1*	SEC/51423-001*	Transformer, oscillator, 2805 hz
T1**	SEC/51423-002**	Transformer, oscillator, 1500 hz
		INTEGRATED CIRCUITS
U1	SEC/50701-001	Integrated circuit, NE555V
		POTENTIOMETERS
R6	SEC/51163-102	Potentiometer, 1 Kohm
		RESISTORS
		(Resistors are ¼W, 5%, carbon composition)
R1	SEC/51016-470	47 ohms
R2	SEC/51016-303	30 Kohms
R3, R4	SEC/51016-912	9.1 Kohms
R5, R7	SEC/51016-561	560 ohms
R8	SEC/51016-151	150 ohms
R9	SEC/51016-684	680 Kohms
R10	SEC/51016-681	680 ohms
R11	SEC/51016-273	27 Kohms
R12	SEC/51016-223	22 Kohms
		SOCKETS, JACKS, RECEPTACLES
XDS1	SEC/24666-004	Socket, midget, groove base
		TRANSISTORS
Q1	SEC/24079-210	Transistor, SPS4272, NPN
Q2	SEC/51205-3904	Transistor, 2N3904, NPN

* -001, only
** -002, only



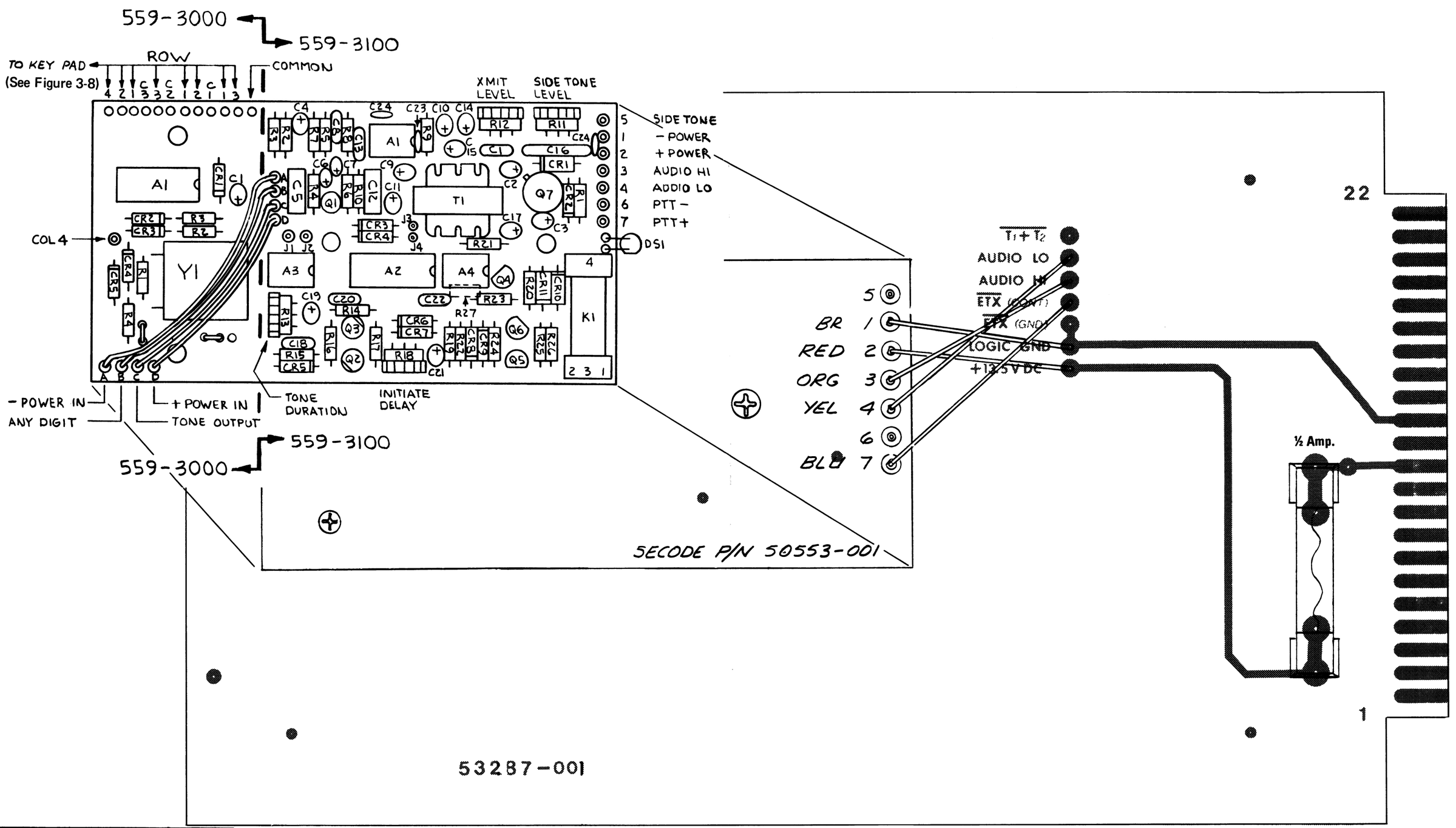
SEC/53276-001, -002
DIAL ENCODER PC BOARD & CARRIER ASSEMBLY DIAGRAM & PARTS LIST

FIGURE 3-4



SEC/53363-001, -002
DIAL ENCODER
CIRCUIT SCHEMATIC

FIGURE 3-5



SEC/50553-001
DTMF ENCODER PC BOARD
ASSEMBLY DIAGRAM

FIGURE 3-6

ORDERING SERVICE PARTS

DIAL ENCODER and SWITCH MODULES

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

DTMF ENCODER

Replaceable parts may be obtained from Speedcall Corporation, 2020 National Avenue, Hayward, California 94545

1. Speedcall part number
2. Component description
3. Model number and revision designation

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.

SPEEDCALL DTMF ENCODER WARRANTY

SPEEDCALL warrants to Purchaser that all new equipment manufactured by SPEEDCALL for delivery hereunder shall conform to the published specifications and shall be free from defects in material, workmanship, and title.

THE FOREGOING WARRANTY IS EXCLUSIVE OF ALL OTHER WARRANTIES WHETHER WRITTEN, ORAL, OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

The Warranty period is as follows: printed circuit assemblies containing both active and passive components—two years; all other items except fuses, pilot lamps, and nonrechargeable batteries, which are warranted to be operable on arrival—90 days. The warranty period shall commence upon date of shipment from factory.

If Purchaser notifies SPEEDCALL during the warranty period of a defect under this warranty, SPEEDCALL will correct any defect by (at its option) either repairing any defective part or making a repaired or replacement part available at SPEEDCALL's factory.

Purchaser shall promptly advise SPEEDCALL of such defect, and upon obtaining prior authorization of SPEEDCALL, ship the defective equipment to SPEEDCALL. Purchaser shall bear all expenses incurred in shipping such equipment to SPEEDCALL, and SPEEDCALL shall bear the expense of shipping the repaired or replaced equipment to Purchaser, within the continental United States, unless such equipment was not defective, in which case Purchaser shall bear all reasonable expenses incurred in inspecting, testing, and returning the equipment. Purchaser shall bear the risk of loss or damage during transit.

A service handling charge of $10.00 (Ten dollars) and any applicable freight costs will be billed Purchaser for each item returned as defective or inoperable that is instead found to be in good working order and in conformance with published specifications.

Unless specifically noted otherwise in writing, return of equipment constitutes Purchaser's authorization for SPEEDCALL to repair equipment and to invoice Purchaser for any and all reasonable costs of repair labor, parts, and freight on items not covered by the terms of the warranty. Such authorization includes charges for handling of returned items found not defective.

SPEEDCALL shall not be obligated to repair or replace equipment rendered defective, in whole or in part, by causes external to the equipment, such as, but not limited to, catastrophe, power failure or transients, over-voltage on interface, environmental extremes, and improper use, maintenance or application of the equipment.

Equipment and accessory items not manufactured by SPEEDCALL carry the standard warranty of the manufacturer thereof.

SPEEDCALL's liability arising from the sale or use of the equipment, whether on warranty, contract, or negligence, shall not exceed the cost of correcting defects as provided herein and all such liabilities will terminate upon expiration of the warranty period.

The foregoing constitutes Purchaser's sole and exclusive remedy for the furnishing of non-conforming or defective goods and SPEEDCALL shall not in any event be liable for the cost of any labor expended on such goods or for any special, direct, indirect or consequential damages by reason of the fact that such goods shall have been non-conforming or defective.

MAINTENANCE MANUAL

LBI-30306

DF-4107

MOBILE RADIO DEPARTMENT
GENERAL ELECTRIC COMPANY • LYNCHBURG, VIRGINIA 24502

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