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Foreword

1. Scope of Manual

This manual is intended for the use of experienced technicians familiar with this general type of equipment. In it you should be able to find all the information you will need for installing and servicing the equipment it covers. It is current as of the publication date, and incorporates changes that have occurred since then in the form of instruction manual revisions (WMR's). (WMR's that cover production or engineering changes to the circuitry usually include corrected schematics and circuit board diagrams.)

2. Model and Kit Identification

Each Motorola product has an identifying model number stamped on its nameplate. In most cases, assemblies and kits that make up the product also have identifying kit numbers stamped on them. Schematics and circuit board diagrams for such kits show this same identifying number prominently in the lower left-hand or right-hand corner.

3. Service

Motorola's national service organization maintains one of the finest nation-wide installation and maintenance programs available to users of communication equipment. The administrative staff of this organization consists of national, area, and district service managers, all of whom are Motorola employees dedicated to giving our customers the best possible service. The organization has about 900 authorized Motorola Service Stations (MSS's) throughout the United States, each manned by one or more trained, FCC-licensed technicians.

Motorola selected each one of these independently owned and operated MSS's to service its customers. They offer Motorola maintenance either by the job (priced by time and material), or on a service contract at a fixed periodic fee. To buy a service contract for your Motorola equipment, contact your Motorola Service Representative or write to:

National Service Manager
Motorola Communications and Electronics, Inc.
1303 E. Algonquin Road
Schaumburg, Illinois 60196

4. Ordering Replacement Parts

When ordering replacement parts (components, kits, or chassis) or equipment information, include the complete identification number. If the component part number is not known, include in your order the number of the chassis or kit of which it is a part, and enough component description to identify the desired part.

In orders for crystal and channel elements, specify the crystal or channel element type number, crystal and carrier frequency, and the model number of the radio in which the part is used.

In orders for active filters, *Vibrasender* and *Vibrasponder* resonant reeds, specify type number and frequency, and identify the owner/operator of the communications system in which these items are to be used; also include any serial numbers stamped on the components being replaced.

Replacement Parts Ordering

MAIL ORDERS

Send written orders to the following addresses;

Replacement Parts, Test
Equipment, Crystal Service Items:

Motorola, Inc.
Communications Parts Division
Attention: Order Processing
1313 E. Algonquin Road
Schaumburg, IL 60196

International Orders:

Motorola, Inc.
Communications Parts Division
Attention: International Order Processing
1313 E. Algonquin Road
Schaumburg, IL 60196

Federal Government Orders:

Motorola, Inc. Communications Parts Division
Attention: Order Processing
1701 McCormick Drive
Landover, MD 20785

TELEPHONE ORDERS

Replacement Parts/Test Equipment :

call: 1-800-422-4210
or Federal Government orders,
1-800-826-1913

Crystal Service Items :

call: 1-800-422-4210

TELEX/FAX ORDERS

Replacement Parts/Test Equipment/Crystal Service Items:

Telex: 280127
FAX: 312-576-6285

Federal Government orders:

FAX: 301-925-2473 or 301-925-2474

Customer Service

Replacement Parts/Test Equipment
call: 1-800-537-7007

Crystals
call: 1-800-323-0234
or Illinois residents
1-800-537-7007

Parts Identification
call: 312-576-7418

National Data Services

1711 West 17th Street, Tempe, AZ 85281

call: 602-994-6472
TWX: 910-951-1334

Model Chart for Touch-Code Encoder Palm Microphone

CODE:

● = ONE ITEM SUPPLIED

MODEL	DESCRIPTION	ITEM	DESCRIPTION
HMN1010B	MOSTAR TRUNKED 800 MHZ	●	HLN4530A KEYPAD
HMN1011B	MOSTAR UHF/VHF, CARRIER SQUELCH	●	HLN1120B LOGIC AND BEEPER BOARD ASSEMBLY
HMN1024B	MOSTAR UHF/VHF, PRIVATE-LINE	●	HLN3023A LOGIC AND BEEPER BOARD ASSEMBLY
HMN1014B	SYNTOR TRUNKED	●	HLN4522B LOGIC BOARD
HMN1022B	SYNTOR NON-TRUNKED	●	HLN4523C BEEPER BOARD
HMN1032B	SYNTOR X 9000, PRIVATE-LINE	●	HLN9112A BEEPER BOARD
HMN1018B	MITREK/MOTREK	●	HLN4556B MICROPHONE HARDWARE
HMN1020B	MAXAR/MOXY	●	HLN4678B MICROPHONE HARDWARE
HMN1033A	MAXAR 50 UHF/VHF, PRIVATE-LINE	●	HLN4677B MICROPHONE HARDWARE
HMN1034A	MAXAR 50 UHF/VHF, CARRIER SQUELCH	●	HLN4590B MICROPHONE HARDWARE
HMN1021B	MAXAR 80	●	HLN4638B MICROPHONE HARDWARE
HMN3013A	MAXTRAC 800	●	HLN4996A MICROPHONE HARDWARE
HMN1025B	MCX-100, CARRIER SQUELCH REMOTE	●	HLN4634B MICROPHONE HARDWARE
HMN1037A	MAXTRAC	●	HLN4636B MICROPHONE HARDWARE
HMN1053A	SPECTRA	●	HLN5007A MICROPHONE HARDWARE
			HLN5006A MICROPHONE HARDWARE
			HLN4637B MICROPHONE HARDWARE
			HLN9086A MICROPHONE HARDWARE
			HLN4679B MICROPHONE HARDWARE
			HLN5272A MICROPHONE HARDWARE
			HLN6045A MICROPHONE HARDWARE
			30-80223J06 MICROPHONE CABLE (ITEM 7F, EXPLODED VIEW)
			30-80146D01 MICROPHONE CABLE (ITEM 7, EXPLODED VIEW)
			30-80147H02 MICROPHONE CABLE (ITEM 7A, EXPLODED VIEW)
			30-80223J02 MICROPHONE CABLE (ITEM 7F, EXPLODED VIEW)
			30-80199G01 MICROPHONE CABLE (ITEM 7B, EXPLODED VIEW)
			30-80018G03 MICROPHONE CABLE (ITEM 7E, EXPLODED VIEW)
			30-80198G01 MICROPHONE CABLE (ITEM 7C, EXPLODED VIEW)
			30-80222G01 MICROPHONE CABLE (ITEM 7D, EXPLODED VIEW)
			30-80152H09 MICROPHONE CABLE (ITEM 7G, EXPLODED VIEW)
			01-80738T96 MICROPHONE HANGUP CLIP
			01-80743T05 MICROPHONE HANGUP CLIP, PRIVATE-LINE

Performance Specifications

GENERAL

Operating Temperature Range	-30° to + 70° C
Standby Voltage	5.5V ± 1V
Operating Voltage (PTT pressed)	5.5V ± 2.5V
Microphone Output	215 mV ± 4.5 dB @ 1 kHz @ 104 dB sound pressure level

Touch-Code PERFORMANCE

Operating Voltage (key pressed)	5.0V ± 1.0V
Auto-PTT On Voltage (key pressed)	Less than 0.6V (HMN1018B, HMN1020B, HMN1021B, HMN1037A, HMN3013A, HMN1014B) Less than 0.7V (HMN1033A, HMN1034A) Less than 0.8V (HMN1010B) Less than 2.5V (HMN1022B, HMN1032B)
Frequency Stability	± 1% (-30°C to + 70°C, + 25°C reference)
Maximum Output Level	225 mV minimum @ 941 Hz
Tone Distortion	Less than 5% @ 160 mV
Beeper Output	Greater than 75 dB sound pressure level
Beeper Frequency	3450 Hz ± 600 Hz
Auto PTT Hold Time	1.4 sec. (2.5 sec. optional) ± 20%
*, # Timing	0.5 sec. (1.25 sec. optional) ± 20% (HMN1010B, HMN1014B)
Digit Timing	110 msec. ± 25 msec. (HMN1010B, HMN1014B, HMN3013A)
First Digit Delay	500 msec. ± 250 msec. (HMN1010B, HMN1014B, HMN3013A)



1. Description

The *Touch-Code* Encoder Palm Microphone allows transmission of dual-tone, multi-frequency (DTMF) signals that are used for remote signalling application and mobile telephone operations. The models covered in this manual and the units each model is used with are listed in the Model Chart. Each microphone is used in place of the standard palm microphone supplied with the radio. No radio modifications are required.

Normal voice transmission is accomplished by pressing the push-to-talk (PTT) button and speaking into the small opening in the keypad. Pressing any keypad button will generate either continuous or timed (jumper selectable) DTMF tones. At the same time a keypad button is pressed, the automatic push-to-talk circuitry in the microphone is enabled, keying the radio transmitter. A single-frequency beep tone (sidetone) is also generated. This tone provides feedback to indicate the required time a keypad button must be held down for proper system timing when the microphone is operated in the timed DTMF mode.

During DTMF tone transmission, the microphone is disabled to eliminate background noise from interfering with the signalling tones.

2. Installation

The *Touch-Code* Encoder Palm Microphone is a direct replacement for the existing radio palm microphone. For most radios, the microphone plugs into the mating receptacle on the radio or on the control head. *Maxar* and *Moxy* radios, however, have no external microphone connectors. To install a Model HMN1020B (*Maxar/Moxy*) microphone, open the radio and replace each lead of the original microphone cord with the same color lead from the *Touch-Code* encoder palm microphone cord.

During installation, check the *Touch-Code* encoder deviation (preset at the factory). See the Maintenance Section of this manual for details.

3. Operation

3.1 MICROPHONE MODE

Operate the DTMF microphone in the normal manner. Hold the microphone about two inches from your lips. Press the PTT button and speak clearly into the opening on the keypad. Release the PTT button to listen.

3.2 TOUCH-CODE MODE

The models used on trunking products (HMN1010B, HMN3013A, and HMN1014B) operate in the timed tone mode. All other models operate in the continuous tone mode. *Systems 90* decoders in non-trunked radio systems do not require field modification since the associated models are preset to the continuous tone mode.

3.2.1 Timed Tones Operation (JU3 Installed in Position B; See Schematics and Circuit Board Diagrams)

Select DTMF signal digits by pressing one keypad button at a time. Hold the keypad button down for each digit until the sidetone beep stops. Holding the keypad button down for a longer time does not increase the DTMF tone duration, but releasing it before the sidetone beep stops produces a shortened DTMF signal and may prevent proper digit recognition by the system decoder.

Note

DO NOT press the microphone PTT button since the auto-PTT circuitry within the microphone enables whenever a keypad button is pressed. Pressing the microphone PTT button and a keypad button at the same time prevents DTMF tone generation.

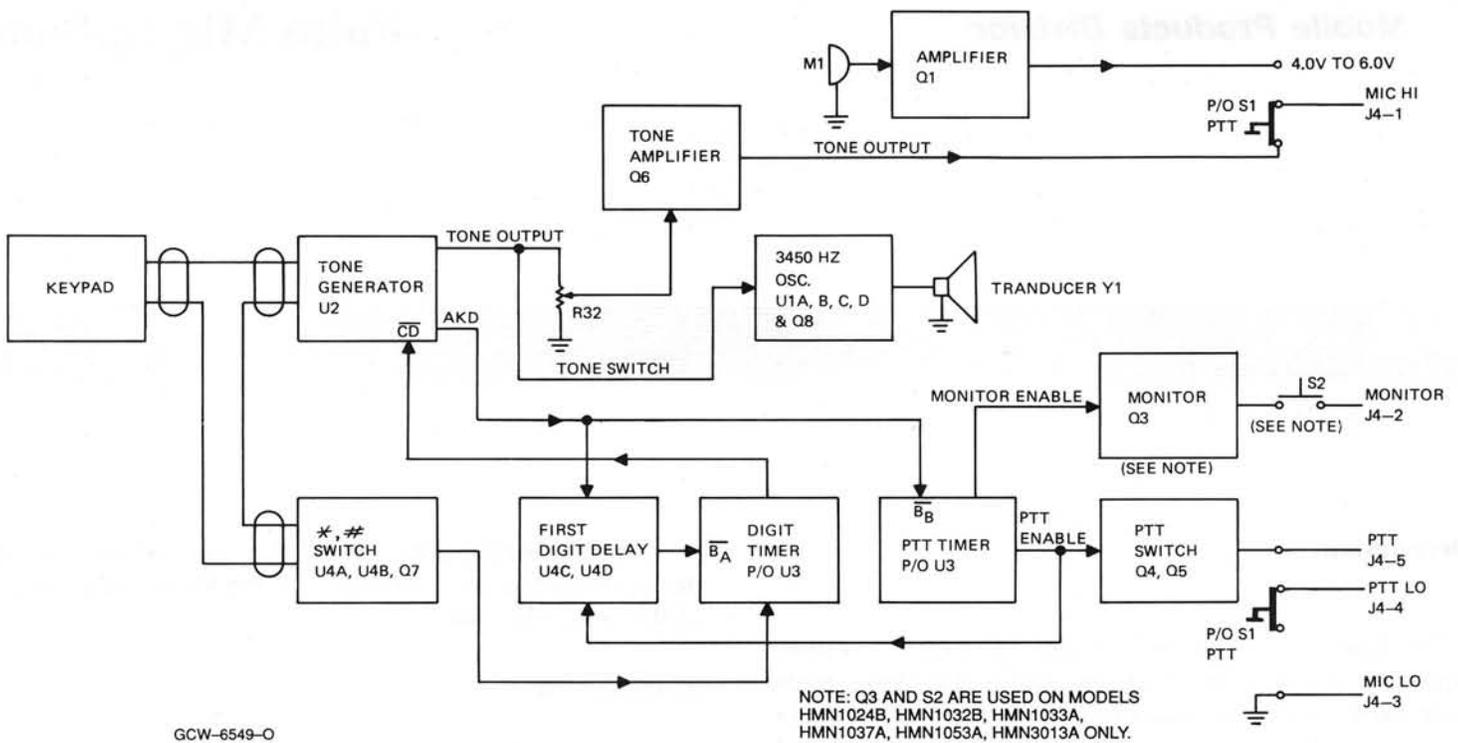


Figure 1. Functional Block Diagram

3.2.2 Continuous Tones Operation (JU3 Installed in Position A.)

The keypad and auto-PTT functions are the same as timed-tone operations, but in this mode, the DTMF signal and sidetone beep are generated continuously (as long as the keypad button is held down) and for as long as the auto-PTT timer in the microphone is active. The minimum time a keypad button must be held down depends on the decoder or telephone interconnect used at the receiving end of the system. Once the auto-PTT timer times out, the radio transmitter dekeys, and the continued attempts to generate the remaining DTMF signal tones are meaningless.

4. Detailed Circuit Description

Operating voltage for the microphone circuits is applied to the microphone from the MIC HI line, J4-1. In the *Touch-Code* mode, the microphone circuits disable, and the tone generating circuits receive operating voltage through PTT switch S1. See the Functional Block Diagram (Figure 1) and the appropriate schematic diagram at the back of this manual.

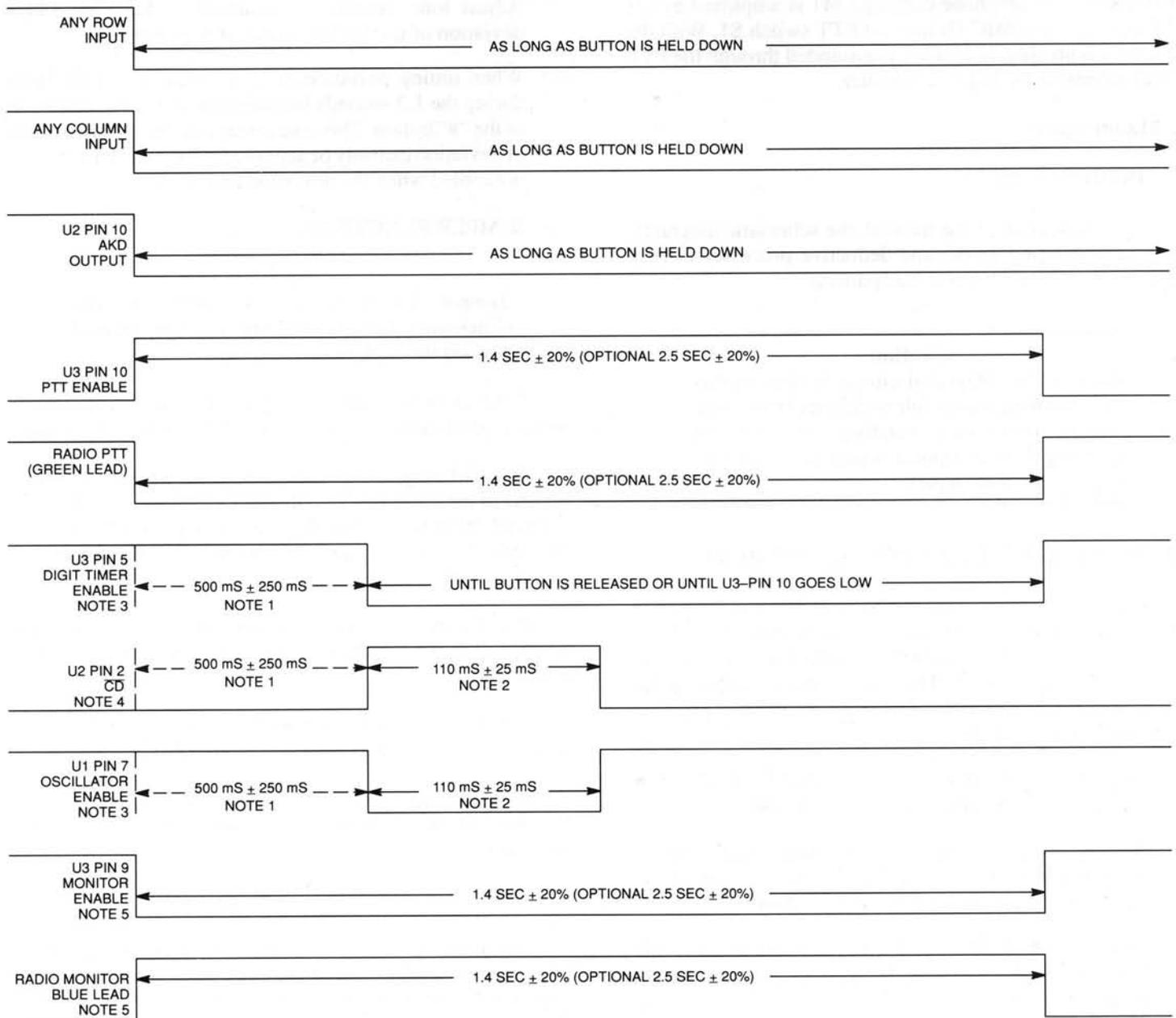
When a keypad entry is made, both the row and column inputs associated with that key are grounded. See the Timing Waveforms (Figure 2) and the logic board schematic at the back of this manual. The AKD line (U2 at Pin 10) goes low and triggers PTT timer U3 at Pin 11. Timer output (U3 at Pin 10) goes high (PTT ENABLE), and turns on transistors Q4 and Q5 (located on the microphone and beeper board). These devices, in turn, ground J4-5 and enable radio push-to-talk.

The time duration of the PTT timer (U3B) is determined by R29, R30, C20, and JU4.

Tone Monitor line (U3 at Pin 9) goes low during auto-PTT, and turns off Q3 through CR2 and CR3. This allows the Monitor line (J4-2) to go high, and puts the radio into the Monitor mode. This is required on radios that inhibit push-to-talk while not in a Monitor mode. Only radios with *Private-Line* or *Digital Private-Line* squelch (and with no external hang-up box) use this circuit.

The low on U2 at Pin 10 (AKD) is also applied to AKD inverter U4D. The output of U4D at Pin 11 goes high, and is applied to the First Digit Delay gate U4C at Pin 8. The high on PTT timer U3 at Pin 10 is coupled to First Digit Delay gate U4C at Pin 9 through delay circuit R39 and C25. This causes a 500-millisecond delay before U4C at Pin 10 goes low. This delay occurs only if the auto-PTT function is not enabled at the time the keypad button is pressed. This 500-millisecond delay ensures that an RF path is established before the DTMF signalling tones are generated.

After the 500-millisecond delay occurs, the low on U4C at Pin 10 enables Digit Timer U3A at Pin 5. The timer output (U3A at Pin 6) goes high and enables U2 at Pin 2 (CD). The digit timer duration for digits 0 to 9 is determined by R26 and C19. Gates U4A and U4B detect if the pressed key is a "*" or "#" key. If a "*" or "#" key function is detected, U4 at Pins 3 and 4 go high, and turn off transistor Q7 through CR7, CR6, and R27. Turning off Q7 changes the digit timing on the "*" and "#" buttons by adding R37 or R38 (via jumper JU5) to timing resistor R26.



NOTES:

1. If U3 Pin 10 is high when any button is pressed, the pulse starts at dashed line. If U3 Pin 10 is low, pulse follows solid line.
2. This pulse duration is 0.50 seconds \pm 20% when the * or # button is pressed. Pulse duration may be increased to 1.25 seconds \pm 20% by changing position of JU5. See schematic diagram for logic board HLN4522B.
3. This waveform applies to models using timed tone operation (JU3 in Position B).
4. *Touch-Code* tones are present on Mic Hi line (J4-1) anytime CD (U2-2) is high and any keypad button is pressed.
5. This waveform applies to models with *Private-Line* only.

GPW-6550-O

Figure 2. Timing Waveforms for Timed-Tone Models

Note

When the continuous tone mode is selected (JU3 to Position A), AKD inverter output (U4D at Pin 11) is routed to U2 at Pin 2 (\overline{CD}). This immediately enables tone output and does not make use of the Digit Timer or First Digit Delay circuits. The high transition on U2 at Pin 2 (\overline{CD}) enables DTMF tone output from U2 at Pin 16. The tones pass through deviation potentiometer R32 and are then amplified by Q6. DTMF tones are next applied to the MIC HI line J4-1 via J3, P3-5, and through PTT switch S1.

When DTMF tones are present on U2 at Pin 16, the DC level at this point shifts to 1.2 volts. This voltage shift turns on transistor Q2 (on the microphone and beeper board) through resistor R5, that in turn grounds U1 at Pin 7 and enables beeper oscillator U1A, U1B, and U1C. Beeper oscillator frequency is determined by R6, R7, R8, and C7. The oscillator output is buffered by U1D and amplified by Q8. The oscillator signal is then applied to piezo transducer Y1 to produce a 3450-Hz sidetone.

Pressing the PTT switch S1 removes all power from the tone generator circuits and energizes microphone circuit Q1.

The output of microphone cartridge M1 is amplified by Q1 and applied to the MIC HI line via PTT switch S1. With the PTT switch pressed, radio PTT is grounded through the PTT switch to enable the radio transmitter.

5. Maintenance

5.1 INTRODUCTION

Use this section of the manual, the schematic diagrams, the troubleshooting guide, and deductive processes to help isolate and replace defective components.

Caution

Many of the integrated circuit devices in this equipment are vulnerable to damage from static charges. Take care in handling, shipping, and servicing these components and the assemblies of which they are a part.

5.2 TOUCH-CODE DEVIATION ADJUSTMENT

The *Touch-Code* feature of the microphone and radio has been adjusted at the factory for proper deviation. Re-adjustment may be required if either the radio transmitter or the microphone are serviced. The radio must be adjusted for proper Instantaneous Deviation Control (IDC) prior to checking *Touch-Code* deviation.

- (1) Adjust a service monitor (Motorola Part No. R1200A or equivalent) to the radio transmitter frequency.
- (2) Prior to checking *Touch-Code* deviation, disable all other sources of modulation, such as *Private-Line*, *Digital Private-Line*, or *Low-Speed Data*.
- (3) Press the “#” button on the keypad and observe the *Touch-Code* deviation on the service monitor. Correct deviation is 3 kHz.
- (4) An access hole for the tone deviation potentiometer (R32) is located on the rear housing to the right of the nameplate. A long tuning tool (Motorola Part No. 66-84974L01) is required.

- (5) Adjust tone deviation potentiometer R32 for 3 kHz deviation of the DTMF signal, if required.
- (6) When setting deviation, it is important to set the level during the 1.2 seconds immediately following actuation of the “#” button. This is necessary since accurate setting of deviation can only be achieved if the auto-PTT feature is enabled when the deviation level is set.

5.3 JUMPER FUNCTIONS

Note

Jumper locations are indicated on the schematics and circuit board diagrams located toward the back of this manual.

JU1 may or may not be installed at the factory, depending on the type of radio with which the microphone is to be used.

For inhibiting DTMF tone generation when two keypad buttons in the same row or column are pressed, JU2 must be removed. With JU2 installed, pressing two keypad buttons in the same row or column generates a single DTMF tone for that row or column.

If JU3 is installed in Position A, continuous tone mode is selected. If JU3 is installed in Position B, timed tone mode is selected.

If JU4 is installed in Position C, the auto-PTT hold time is 1.4 seconds (or 2.5 seconds if JU4 is installed in Position D).

If JU5 is installed in Position F, the “*” or “#” time duration is 0.5 seconds (or 1.25 seconds if JU5 is installed in Position G).

5.4 TROUBLESHOOTING (See Table 1)

The *Touch-Code* Microphone Troubleshooting Guide lists possible trouble indications and solutions. To use the table, locate the indicated trouble in the left-hand column. Beside each trouble indication is a number of possible problem areas that are listed in order of most probable to least likely. Simply perform the steps in numerical sequence. By using the information and procedures provided, faulty circuitry may be rapidly located and repaired.

Table 1. Touch-Code Microphone Troubleshooting Guide

TROUBLE INDICATION	POSSIBLE PROBLEM AREA
No DTMF Tones	<ol style="list-style-type: none"> 1. Verify power applied at: J4-1 and Q6 collector = 5.6V; Q6 emitter = 4.6V. Locate defective power distribution area. 2. Verify AKD output at U2 Pin 10. Output should be 3.7V with no button pressed; <0.5V with any keypad button pressed. 3. Verify that only one row input (U2-11 thru 14) and one column input U2-3,4, or 5) are pulled low by the keypad for each button pressed. (For example, Pins 3 and 14 go low when "1" is pressed.) 4. Check for proper placement of C16-Y2 pair, and for any solder shorts, etc. No U2 output results if oscillator does not run. 5. If Step 3 checks okay, and Step 2 does not, U2 or C16-Y2 is defective. If Step 3 does not check okay, keypad or connectors may be defective. 6. Verify that U2-2 receives a pulse when any keypad button is pressed. The pulse on U2-2 must be high to generate tones. See timing diagram for pulse duration. If no pulse, see the digit timer malfunction in this table. 7. Check for DTMF tones on U2-16. If no tones, and Steps 2 thru 6 are okay, then U2 or C16-Y2 is defective. 8. Check for DTMF tones on Q6 base and collector. If no tones, check tone amplifier circuitry for defective components, shorts, etc.
Digit Timing Malfunction	<ol style="list-style-type: none"> 1. Verify proper operation of auto-PTT timer. 2. Check Steps 1 thru 5 under "No DTMF Tones." 3. Verify that U4 pins 11 and 8 go high when any keypad button is pressed; if not, check for 4.6V at U4-14; check U4 solder connections. 4. Check that U4-9 goes high approximately 500 msec. after U3-10 goes high. If U4-9 does not go high, check R39, C25, and check solder connections. 5. Verify that U3-5 goes low when any keypad button is pressed and that U3-10 is high. If U3-5 does not go low, check U4 solder connections. 6. Check U3-6 for 110 msec. pulse (high) when 0 thru 9 buttons are pressed. If no pulse, check R26 and C19 connections. Check that Q7 collector is 4.6V; if not check timing of "*", "#" buttons and proceed with following trouble indication if not correct.
"*, #" Button Timing Incorrect	<ol style="list-style-type: none"> 1. Verify U4 Pins 1, 2, 5, & 6 are high with no keypad pressed. If not, check keypad assembly for short between pins. 2. Verify that U4 Pins 3 & 4 go high when "*" or #" button is pressed. If not, check for 4.6V at U4-14; check U4 solder connections. 3. Measure directly across Q7 base-emitter for 0V when "*" or #" is pressed. (Base-emitter of Q7 should measure 0.6V with no keypad button pressed.) 4. Check R37 and R38 for opens or shorts; check JU5.
Auto-PTT Malfunction	<ol style="list-style-type: none"> 1. Verify that U3-11 goes low when any keypad button is pressed. If not, see "No DTMF Tones" above. 2. Check that U3-10 goes high for 1.4 to 2.5 seconds (depending on JU4's position). If not check R29, R30, C20, and JU4. Check solder connections on U3. 3. Verify that Q4 base goes to 1.4V when U3-10 goes high. If not, check J3/P3 connection and R14. 4. Check that collector of Q5 goes low when Q4 base goes to 1.4V. If not, verify proper use of JU1 and R18 (See notes on schematic for microphone and beeper board).
No Sidetone	<ol style="list-style-type: none"> 1. Press any keypad button and verify that DTMF tones are present on U2-16. If not, see "No DTMF Tones" above. 2. Check that U2-16 goes to 1.2V during digit timer pulse. 3. Verify that Q2 base goes to 0.6V during digit timer pulse. If not, check P3/J3 connector and R5. 4. Verify that U1-7 goes low during digit timer pulse. If not, check Q2 and solder connections of U1. 5. Check waveform at C14 as shown on microphone and beeper board schematic. If no waveform, check R6, R7, R8, C7, and U1 solder connections. 6. Check waveform on Q8 collector; if no waveform, check Q8, L1, and R11. 7. If Steps 2 thru 6 are okay, Y1 is defective.
No Microphone Audio, but DTMF Tones are Transmitted	<ol style="list-style-type: none"> 1. Check for 3.5V to 5.5V on Q1 collector with microphone PTT button pressed. 2. Check Q1 base and emitter voltages per schematic diagram. 3. Check for poor solder connections, shorts, etc.

Table 1. Touch-Code Microphone Troubleshooting Guide (Cont'd)

TROUBLE INDICATION	POSSIBLE PROBLEM AREA
Monitor Switch Malfunction (Private-Line Models Only)	<ol style="list-style-type: none"> 1. Verify proper operation of auto-PTT timer. 2. Check that U3-9 goes low for 1.4 to 2.5 seconds (depending on JU4's position). 3. Check that Q3 base is 0.7V in standby mode and 0.2V when auto-PTT is enabled. If not, check J3/P3 connector, CR2, CR3, and R10 for opens or shorts. 4. With microphone in hang-up box, check Q3 collector for low in standby mode and high when auto-PTT is enabled. This collector voltage is supplied by the radio.
Some Buttons Work; Others Do Not	<ol style="list-style-type: none"> 1. Try to determine if problem is row or column related. 2. Check corresponding pin at U2 for defective row or column. See Step 3 under "No DTMF Tones" above. 3. Most likely problem areas are shorts between pins on keypad assembly, or keyboard printed circuit foil runners are defective. 4. U2 may produce a single tone or no tones if more than one row or column input is grounded.
Tones Off Frequency	<ol style="list-style-type: none"> 1. Y2-C16 defective. 2. Foreign material or solder short in Y2-C16 or U2 area. 3. U2 defective (unlikely).

parts list

DTMF Microphone Hardware Kits:
 HLN4556B *Mostar* Trunked 800 MHz
 HLN4678B *Mostar* U/V Carrier Squelch
 HLN4590B *SYNTOR* Trunked
 HLN4638B *SYNTOR* Non-Trunked
 HLN5006A *Maxar 50* U/V Carrier Squelch
 HLN4637B *Maxar 80*
 HLN4636B *Maxar/Moxy*
 HLN4634B *Mitre/Motrek*
 HLN4679B *MCX-100*

MXW-2777-A

ITEM No.	MOTOROLA PART NO.	DESCRIPTION
1	15-80185F01	housing, front
2	38-80144D03	microphone button
3-6	—	keypad assy (see MXW-6526)
6A	—	logic board (see MXW-6518)
7	—	microphone cable (see model chart)
8	42-80188G01	retainer, O-ring
9	43-80187F01	spacer, PC board
10	50-80121L01	transducer
	01-80725T82	mic cet
11	32-80119G01	gasket, mic cartridge
12	43-80006G02	spacer, mic cartridge
12A	50-80258E09	electret, mic cartridge
15	—	switch, S1 (see MXW-2778)
16	—	connector, P3 (see MXW-2778)
17	—	microphone & beeper board (see MXW-2778)
	01-80730T23	mic housing, rear
18	15-80186F02	housing, mic rear
19	04-80093E01	washer, flat
20	46-80297N01	stud, mic hang-up
21	46-80281G01	weight, mic
25	—	connector, J1, J2 (see MXW-6518)
27	—	connector, J3 (see MXW-2778)
28	03-90076E07	screw, metric HI-LO
29	03-90076E05	screw, metric HI-LO
30	—	connector, P4 (see MXW-2778)

non-referenced items

01-80738T96	mic hang-up clip
01-80743T91	spring & bracket eyelet
03-12002A01	screw, self drilling, 6-20 x 1/2
03-12002C01	screw, self drilling, 6-20 x 1/2
07-80257N01	bracket, back-up plate
06-11009A71	resistor, 8.2k (R18, <i>SYNTOR</i> Trunked only)
14-84360C01	insulator, switch
35-80089D02	baffle, felt
42-83894F02	clip, mic cord (<i>MCX-100</i> only)

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parts list

DTMF Microphone Hardware Kits:
 HLN4677B *Mostar U/V Private-Line*
 HLN4996A *SYNTOR X 9000 Private-Line*
 HLN5007A *Maxar 50 U/V Private-Line*
 HLN5272A *MaxTrac*
 HLN6045A *Spectra*
 HLN9086A *MaxTrac 800*

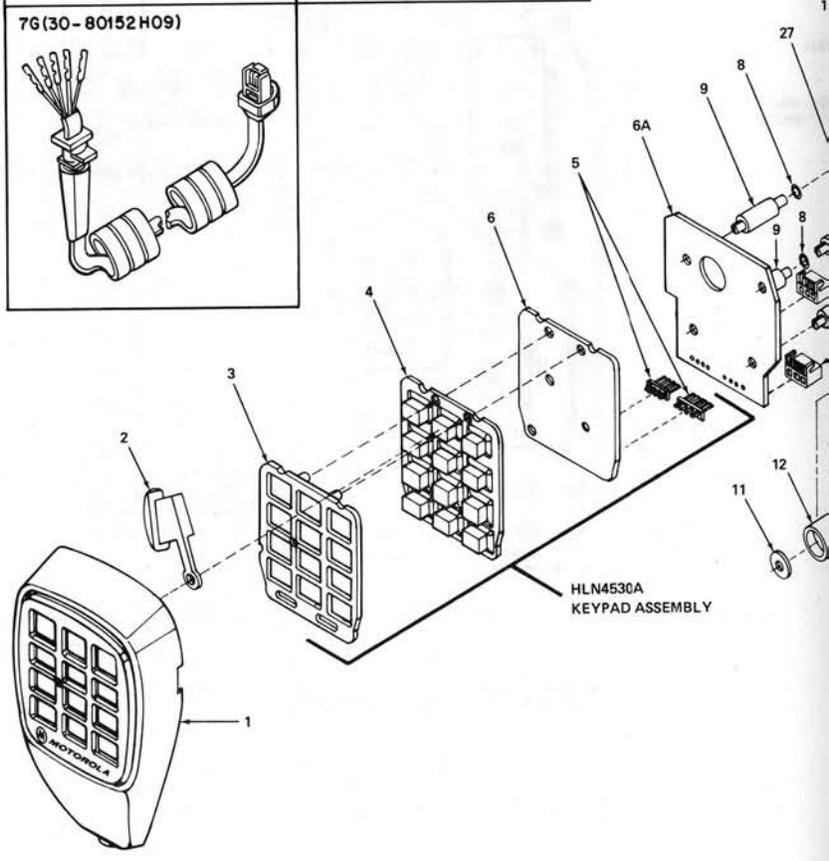
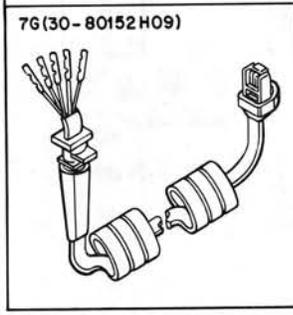
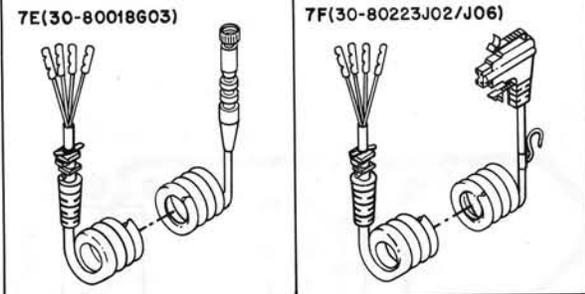
MXW-6548-O

ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
1	15-80185F01	housing, front
2	38-80144D03	microphone button
3-6	—	keypad assy (see MXW-6526)
6A	—	logic board (see MXW-6518)
7	—	microphone cable (see model chart)
8	42-80188G01	retainer, O-ring
9	43-80187F01	spacer, PC board
10	50-80121L01	transducer
	01-80725T82	mic cet
11	32-80119G01	gasket, mic cartridge
12	43-80006G02	spacer, mic cartridge
12A	50-80258E09	electret, mic cartridge
13	—	switch, S2 (see MXW-2778)
14	40-80252E02	button, switch contact
15	—	switch, S1 (see MXW-2778)
16	—	connector, P3 (see MXW-2778)
17	—	microphone & beeper board (see MXW-2778)
	01-80730T59	mic housing, rear
18	15-80186F02	housing, mic rear
19	04-80093E01	washer, flat
20	46-80086E06	stud, mic hang-up
21	46-80281G01	weight, mic
22	45-80113D02	plunger, actuator
23	41-80096E02	spring, plunger
24	42-80166E01	ring, retaining
25	—	connector, J1, J2 (see MXW-6518)
26	32-80253E02	gasket, switch plate
27	—	connector, J3 (see MXW-2778)
28	03-90076E07	screw, metric HI-LO
29	03-90076E05	screw, metric HI-LO
30	—	connector, P4 (see MXW-2778)

non-referenced items

01-80743T05	mic hang-up clip
01-80743T91	spring & bracket eyelet
03-12002A01	screw, self drilling, 6-20 x 1/2
03-12002C01	screw, self drilling, 6-20 x 1/2
07-80257N01	bracket, back-up plate
03-10943M09	screw, tapping (<i>MaxTrac 800</i> only)
06-11009B23	resistor jumper, 0 ohm (<i>MaxTrac 800</i> only)
09-80218J01	mic receptacle (<i>Spectra</i> only)
14-84360C01	insulator, switch
35-80089D02	baffle, felt

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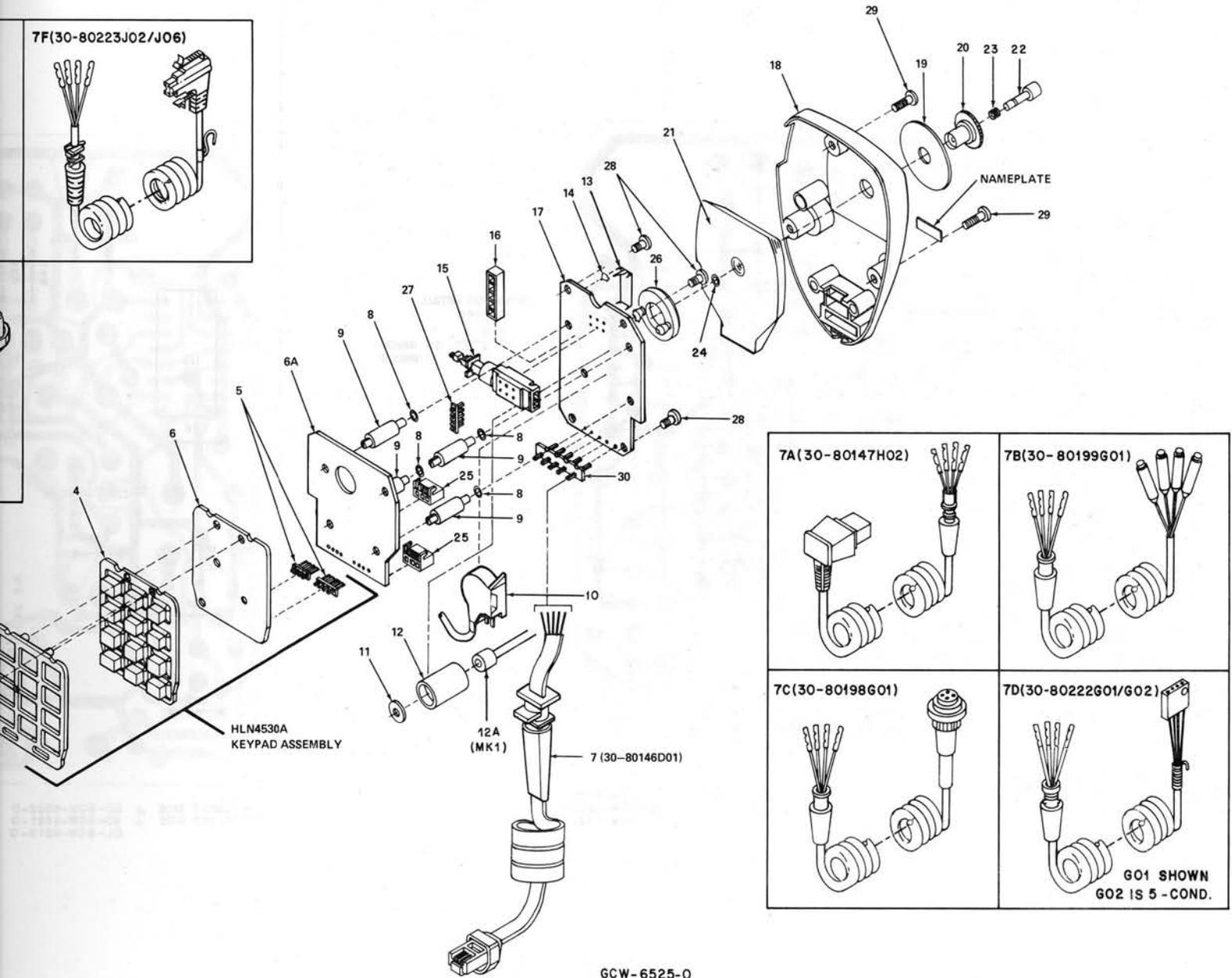
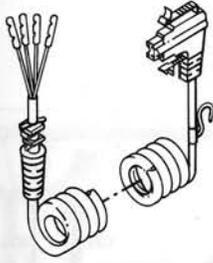
HLN4530A Keypad

MXW-6526-O

ITEM NO.	MOTOROLA PART NO.	DESCRIPTION
3	07-80188F02	frame, keypad
4	45-80192F01	actuator, keypad
5	28-80085E09	header, male (P1, P2)
6	84-80189F01	PC board, keypad

6/15/89

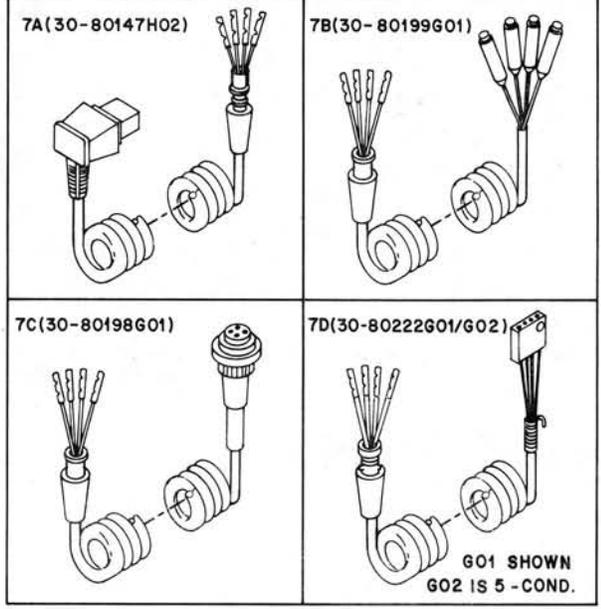
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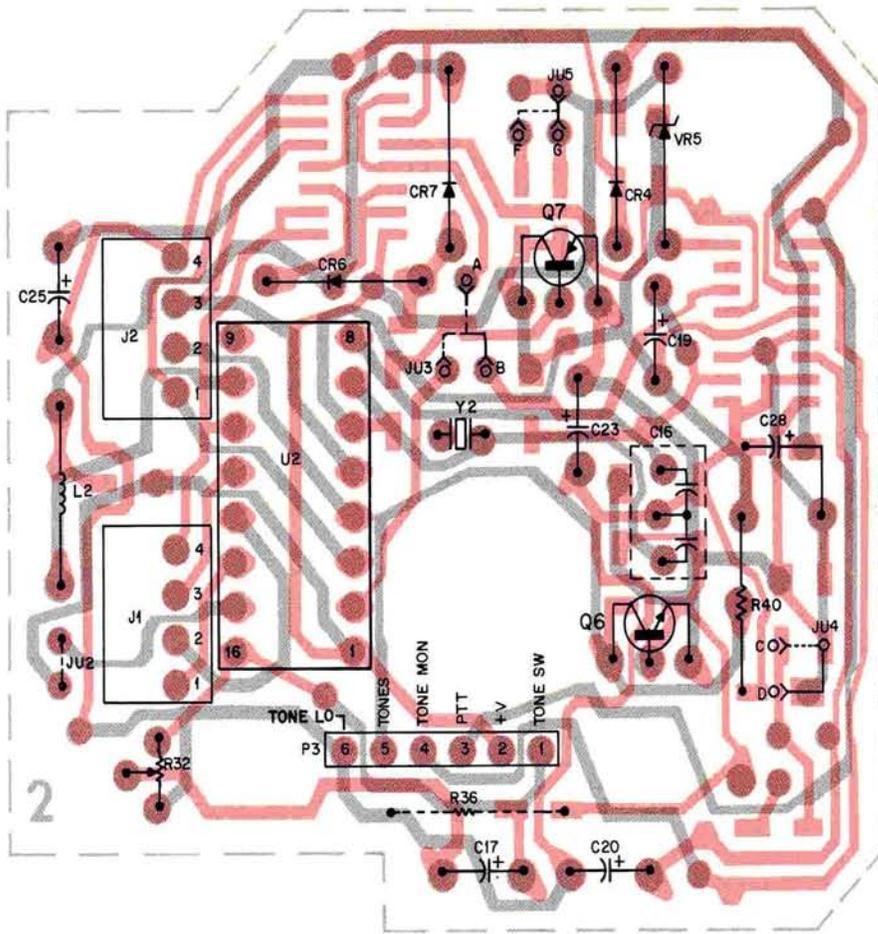


HLN4530A
KEYPAD ASSEMBLY

12 A
(MK 1)

GCW-6525-0





TRANSISTOR DETAIL
TOP VIEW



Q6 - M8208
Q7 - M8209

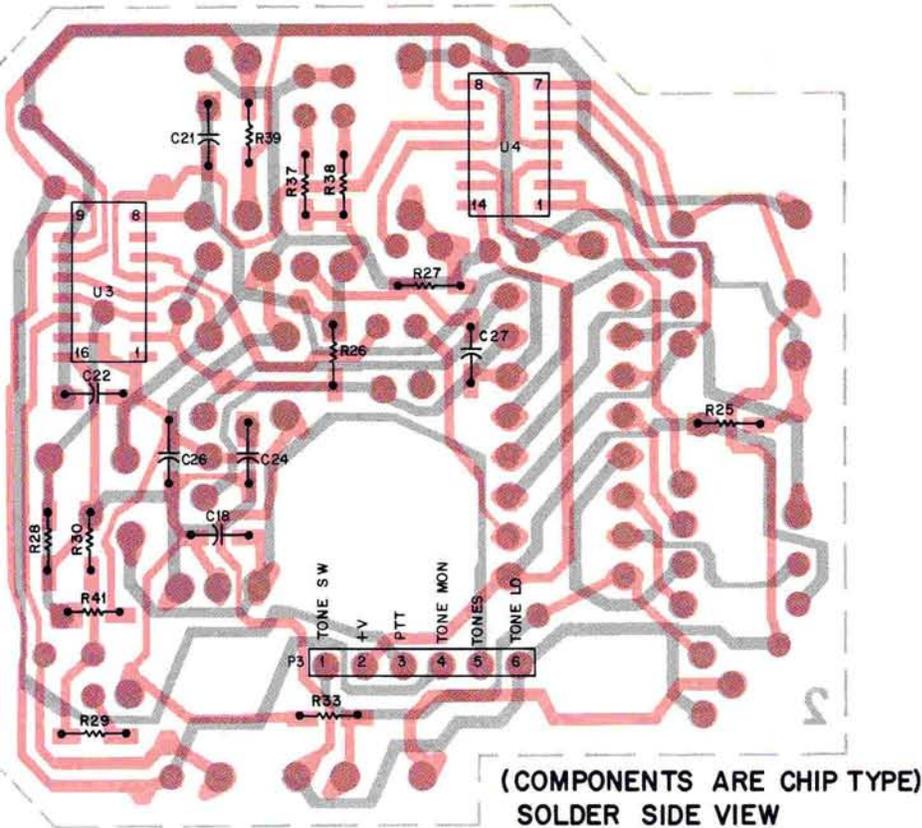
COMPONENT SIDE VIEW

COMPONENT SIDE ● BD-GCW-6522-0
SOLDER SIDE ● BD-GCW-6521-0
- OL-GCW-6520-0

parts list

HLN4522B Tone and Logic Board

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF, ±10%, 50V (unless otherwise stated)		
C17	23-11013F57	1, ±20%, 35V, tantalum
C18	21-11032A21	0.01
C19,20	23-11013D05	2.2, 20V, tantalum
C21,22	21-11032A09	0.001
C23	23-11013D15	15 uF, 20V, tantalum
C24	21-11032A09	0.001
C25	23-11013D05	2.2, 20V, tantalum
C26,27	21-11032A09	0.001
C28	23-11013F57	1, ±20%, 35V, tantalum
diode (see note)		
CR4	48-11034A01	silicon
CR6,7	48-11034A01	silicon
connector plug		
J1,2	09-80238F01	4 pin circuit board
coil, RF		
L2	24-82723H27	1.2 uH
connector receptacle		
P3	28-80085E08	header, male
transistor (see note)		
Q6	48-80182D08	NPN, type M82D08
Q7	48-80182D09	PNP, type M82D09
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R25	06-11024A97	100k
R26	06-11024A89	47k
R27	06-11024A97	100k
R28	06-11024B02	150k
R29	06-11024B14	470k
R30	06-11024B16	560k
R32	18-80261F01	10k, ±10%, 1/2W, potentiometer
R33	06-11024A63	3.9k
R37	06-11024B15	510k
R38	06-11024B04	180k
R39	06-11024B08	270k
R40	06-11009A65	4.7k, 1/4W
R41	06-11024B20	820k
integrated circuit (see note)		
U2	51-80065C11	tone generator
U3	51-80073C09	dual monostable
U4	51-80073C08	quad NAND gate
varactor (see note)		
VR5	48-80007E08	silicon
crystal (see note)		
Y2	48-80173D03	resonator, ceramic



(COMPONENTS ARE CHIP TYPE)
SOLDER SIDE VIEW

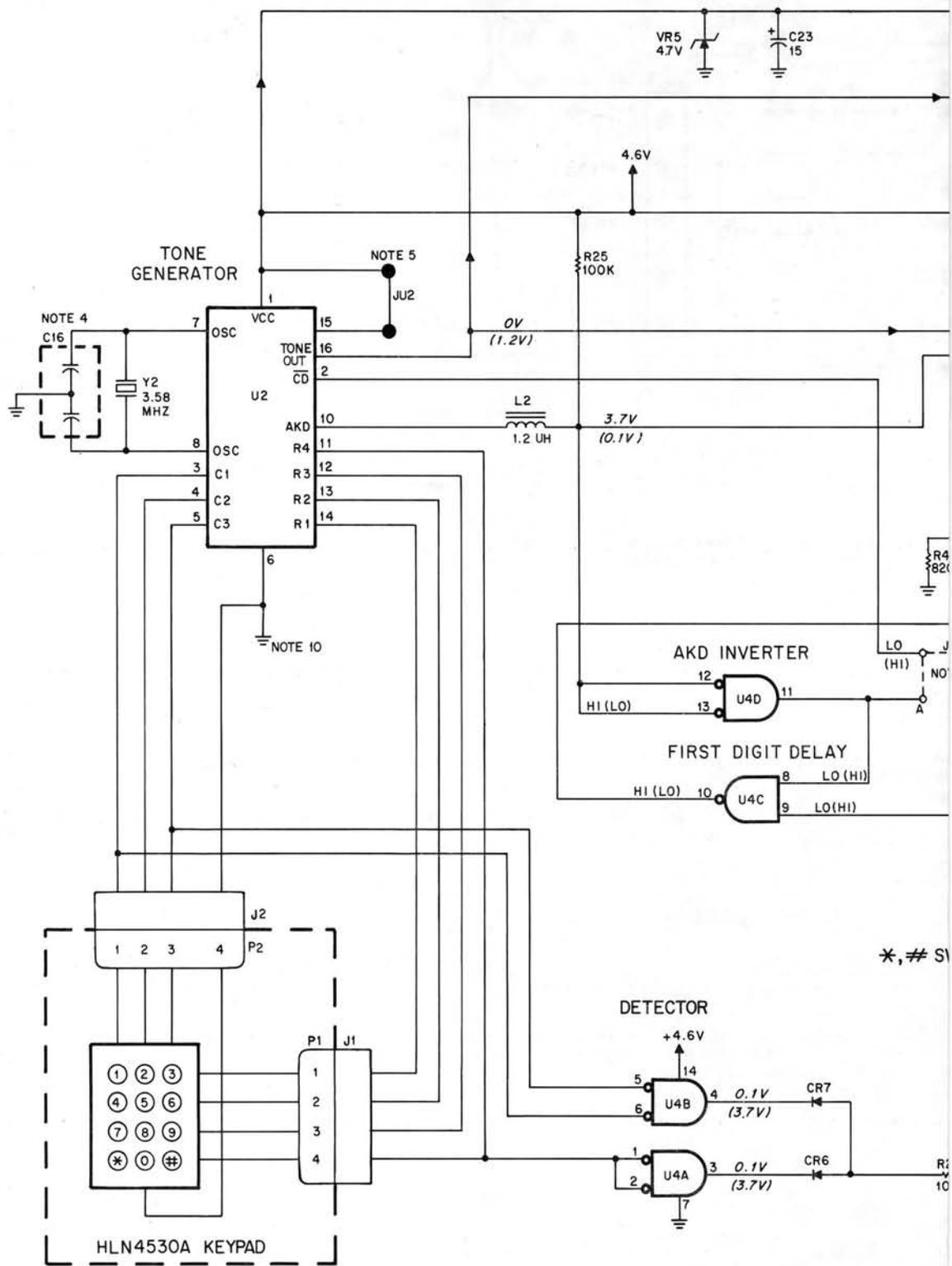
COMPONENT SIDE ● BD-6CW-6522-0
SOLDER SIDE ● BD-6CW-6521-0
● OL-6CW-6519-0

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number.

MOTOROLA PART NO.	DESCRIPTION
10%, 50V (unless otherwise stated)	
23-11013F57	1, $\pm 20\%$, 35V, tantalum
21-11032A21	0.01
23-11013D05	2.2, 20V, tantalum
21-11032A09	0.001
23-11013D15	15 μ F, 20V, tantalum
21-11032A09	0.001
23-11013D05	2.2, 20V, tantalum
21-11032A09	0.001
23-11013F57	1, $\pm 20\%$, 35V, tantalum
48-11034A01	silicon
48-11034A01	silicon
09-80238F01	4 pin circuit board
24-82723H27	1.2 μ H
28-80085E08	header, male
48-80182D08	NPN, type M82D08
48-80182D09	PNP, type M82D09
5%, 1/8 watt (unless otherwise stated)	
06-11024A97	100k
06-11024A89	47k
06-11024A97	100k
06-11024B02	150k
06-11024B14	470k
06-11024B16	560k
18-80261F01	10k, $\pm 10\%$, 1/2W, potentiometer
06-11024A63	3.9k
06-11024B15	510k
06-11024B04	180k
06-11024B08	270k
06-11009A65	4.7k, 1/4W
06-11024B20	820k
note)	
51-80065C11	tone generator
51-80073C09	dual monostable
51-80073C08	quad NAND gate
48-80007E08	silicon
48-80173D03	resonator, ceramic

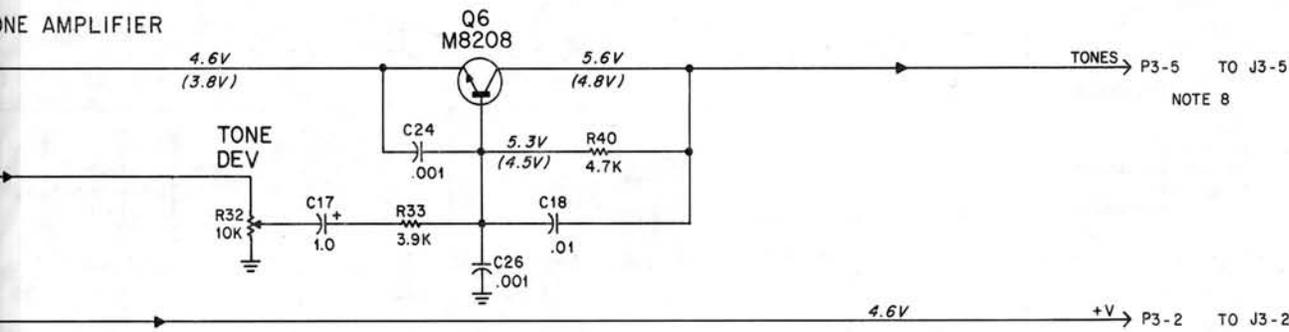
6/15/89

ance, order diodes, transistors, and integrated circuit devices by



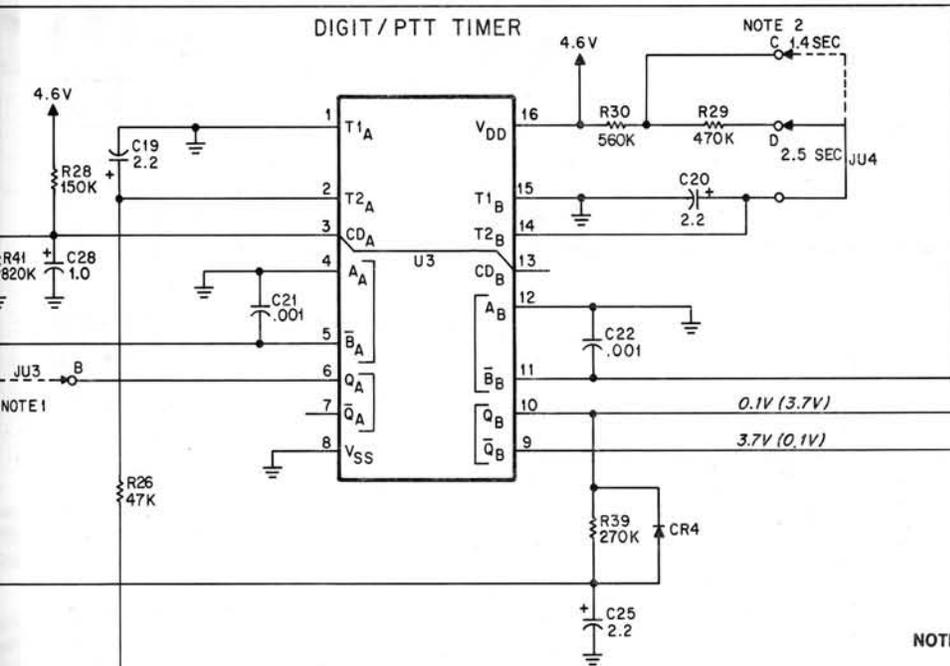
*, # SW

TONE AMPLIFIER



NOTE 8

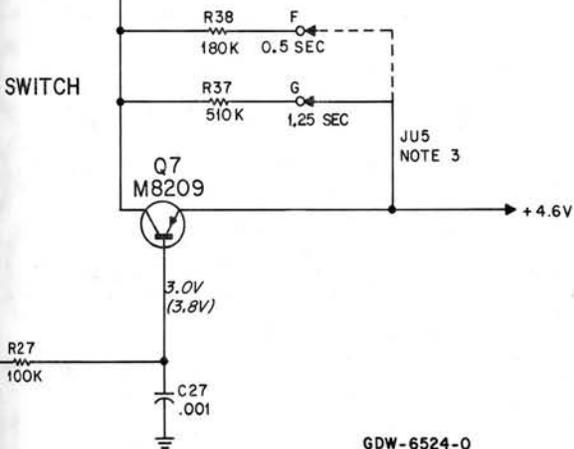
TONE SW → P3-1 TO J3-1



NOTE 2

NOTE 1

SWITCH



GDW-6524-0

NOTES:

1. Placing JU3 in Position A defeats timed tone operation. In Position A, tone duration lasts as long as touch-pad key is pressed. In Position B, tone duration is controlled by timer U3.
2. Placing JU4 in Position C selects a PTT hold time of 1.4 seconds. Placing JU4 in Position D selects a PTT hold time of 2.5 seconds.
3. Placing JU5 in Position F selects a *, # time of .5 second. Placing JU5 in Position G selects a *, # time of 1.25 seconds.
4. Y2 and C16 are a matched set and must be replaced as a pair. See parts list.
5. Pressing two keypad buttons in the same row or column will generate the single tone for that row or column. Removing jumper JU2 will inhibit any tone generation if more than one keypad button is pressed.
6. Voltages indicated as (0.1V) are active voltages (when either PTT or keypad buttons are depressed). Standby voltages are shown without parenthesis.
8. P3 connects to J3 on HLN4523C or HLN9112A.
9. Unless otherwise indicated, resistor values are in ohms, and capacitor values are in microfarads.
10. The ground symbol on this diagram is actually referenced to mic lo, not radio set ground.

parts list

HLN4523C Microphone and Beeper Board
HLN9112A Microphone and Beeper Board

MXW-2778-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF, ±5%, 50V (unless otherwise stated)		
C1	21-13741B21	0.001
C2	08-11051A07	0.01, 63V
C3	21-13740B57	220 pF
C4	23-11013D13	10, ±10%, 20V, tantalum
C5	21-13741B21	0.001
C6	21-13740B35	27 pF
C7	08-11051A05	0.0047, 63V
C8	23-11013D13	10, ±10%, 20V, tantalum
C9	23-11013F57	1, ±20%, 35V
C10	23-11013C12	27, ±10%, 15V, tantalum
C11	21-13741B21	0.001
C12	21-13741B45	0.01
C13	08-11051A11	0.047, 63V
C14	23-11013F57	1, ±20%, 35V
C15	21-13741B45	0.01
C16,17	21-13740B57	220 pF
diode (see note)		
CR2,3	48-11034A01	silicon (monitor units only)
connector, plug		
J3	09-80237F01	socket, 6 pin
jumper		
JU1	06-11009F23	0-ohm resistor (see tables on schematic)
coil		
L1	24-80108G02	110 mH audio choke
connector, receptacle		
P4	28-80085E03	header, 5 contact
transistor (see note)		
Q1	48-80182D23	NPN
Q2	48-80182D08	NPN
Q3	48-80182D08	NPN (monitor units only)
Q4	48-80182D08	NPN
Q5	48-80182D32	NPN
Q8	48-80182D08	NPN
resistor, fixed, ohm, ±5%, 1/8W (unless otherwise stated)		
R1	06-11009E19	56, 1/4W
R2	06-11077B35	330k
R3	06-11077A74	1k
R4	06-11077A82	2.2k
R5	06-11077B11	33k
R6	06-11077B03	15k
R7	06-11077A76	1.2k
R8	06-11077B09	27k
R9	06-11077A58	220k
R10	06-11077B11	33k (monitor units only)
R11	06-11077A86	3.3k
R12	06-11077B03	15k
R13	06-11077B39	470k
R14	06-11077B03	15k
R18	06-11009E46 or 06-11009A47	750, 1/4W (see tables on schematic) 8.2k, 1/4W (see tables on schematic)
R19	06-11009B08	270k (see tables on schematic)
switch		
S1	40-80065E02	momentary, pushbutton
S2	40-80252E01	contact switch (monitor units only)
integrated circuit (see note)		
U1	51-80073C08	quad NAND gate
voltage regulator (see note)		
VR1,2	48-80007E07	zener, 12V

6/15/89

note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

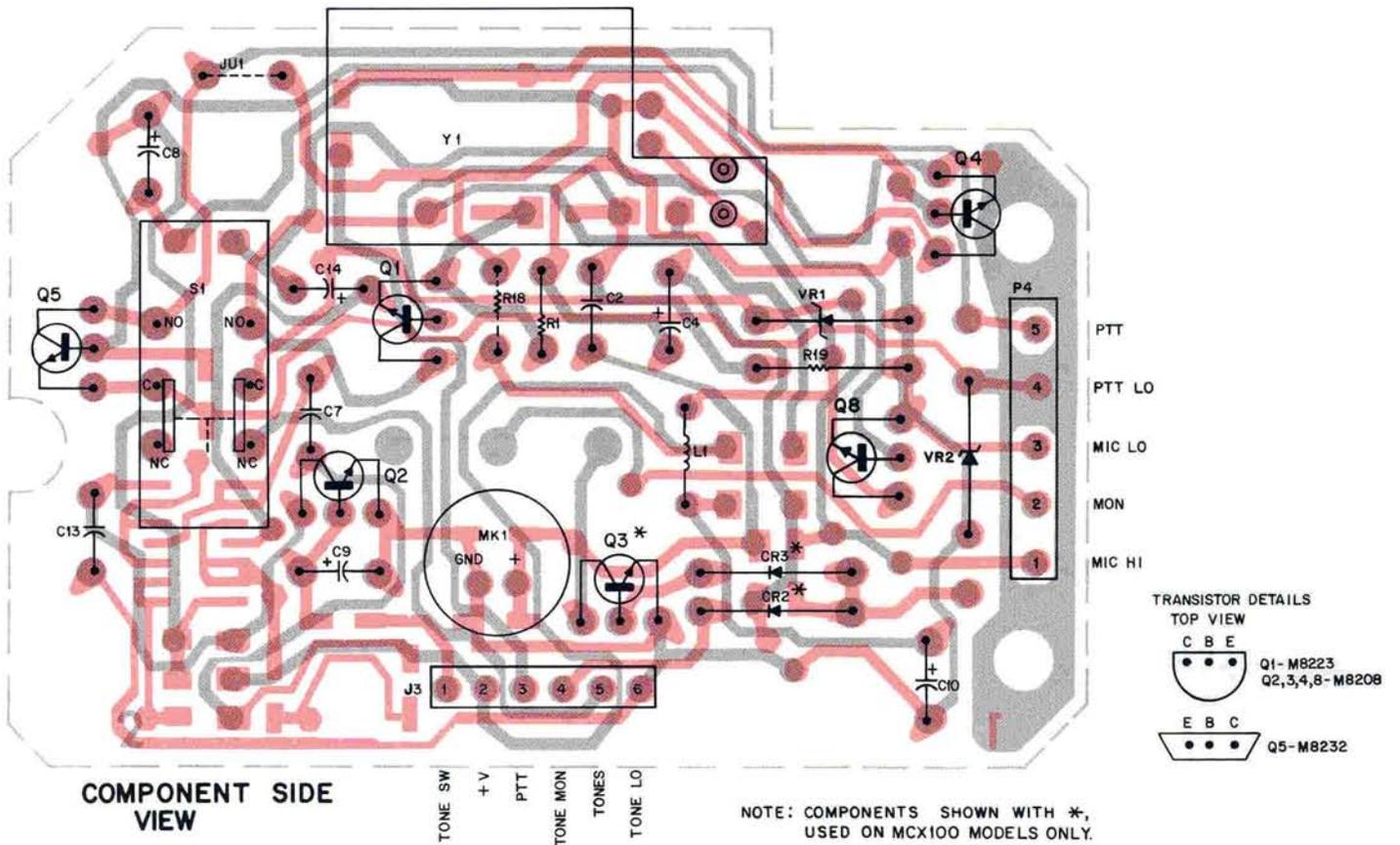
Schematic, Circuit Board Diagrams, and
Parts List for HLN4523C and HLN9112A
Microphone and Beeper Boards

PW-6529-O

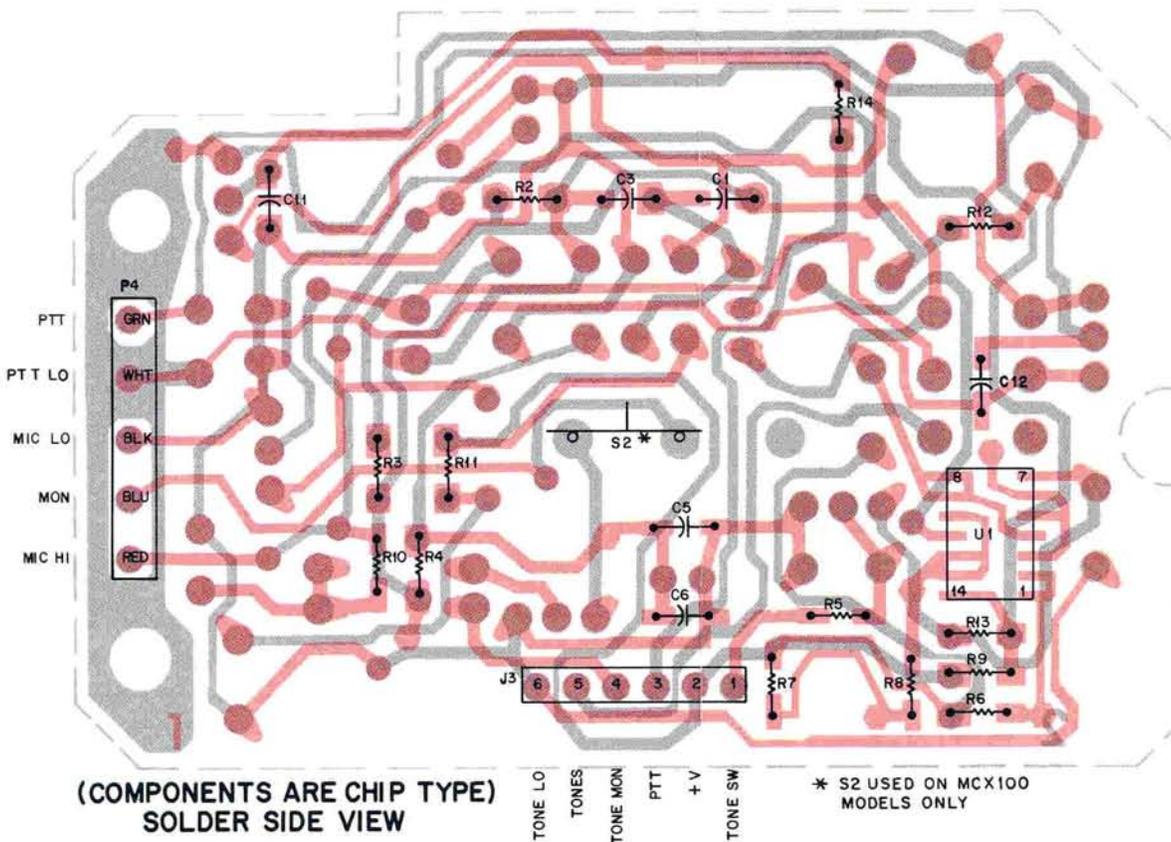
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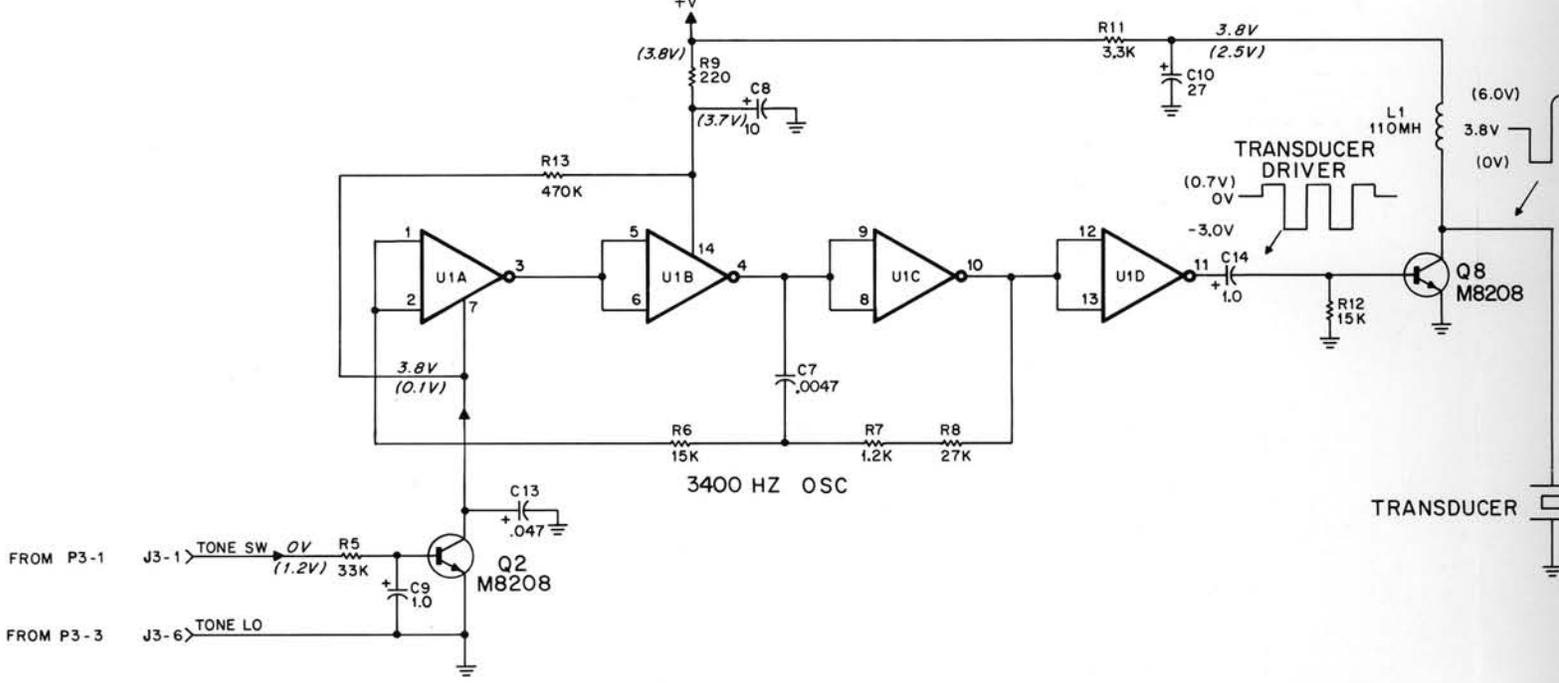
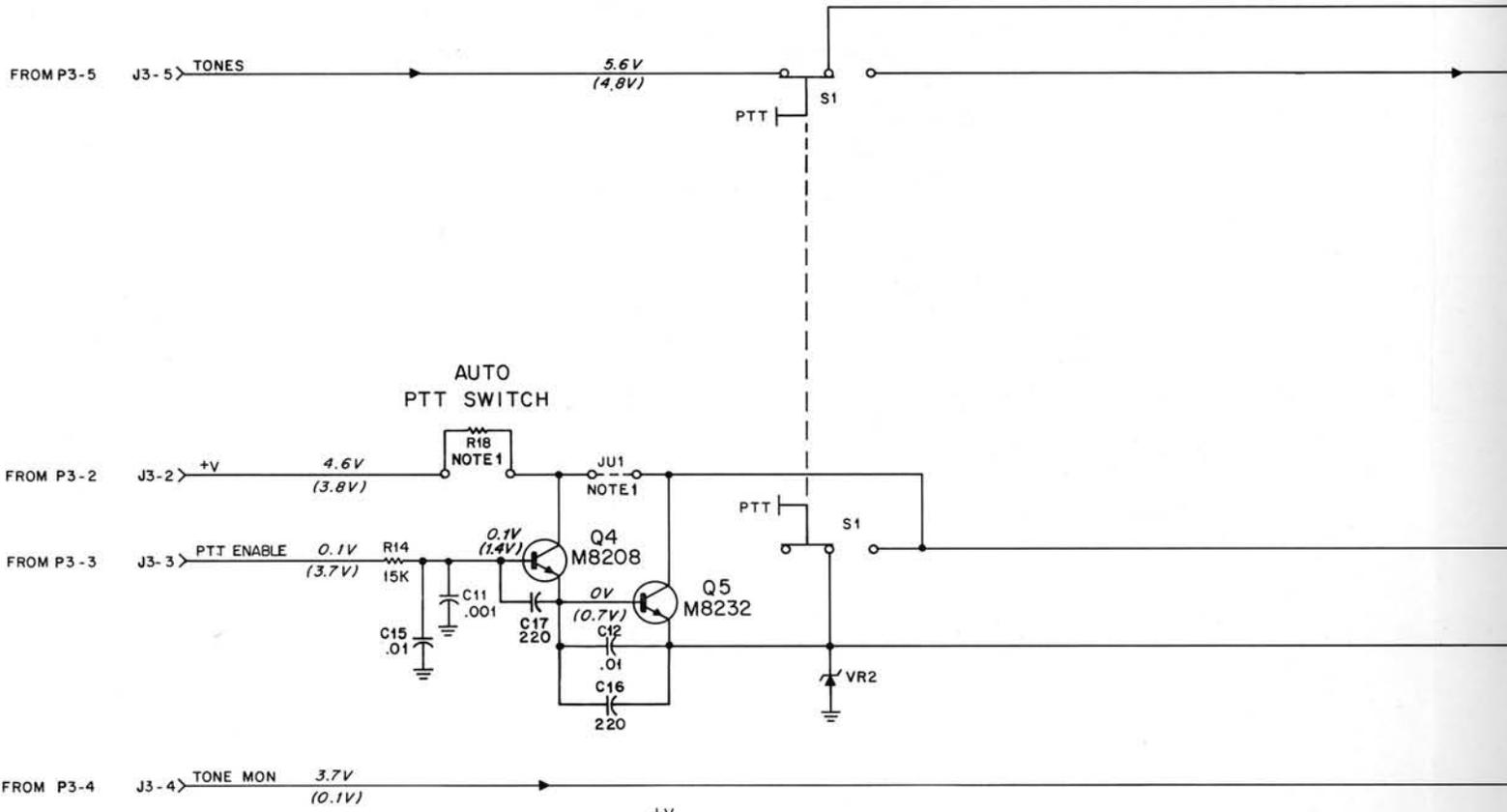
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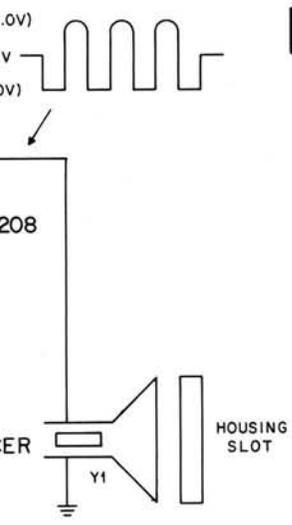
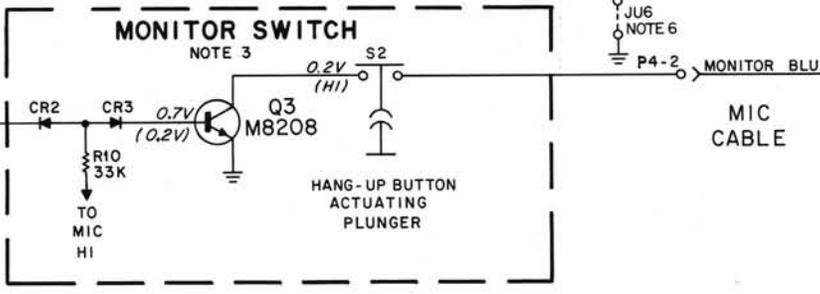
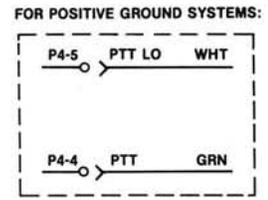
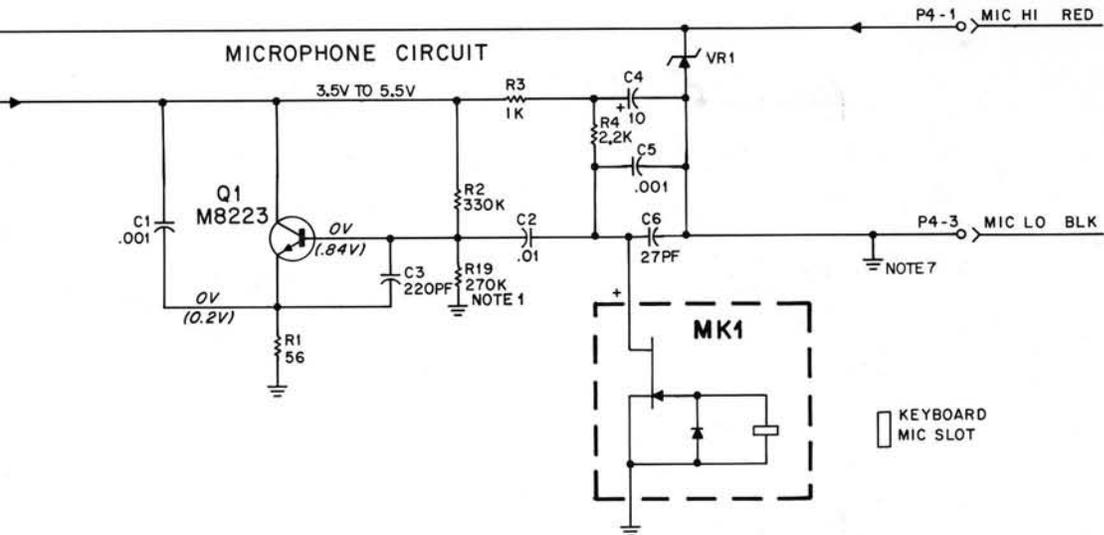


COMPONENT SIDE ● BD-GCW-6551-0
 SOLDER SIDE ● BD-GCW-6552-0
 ■ OL-GCW-6553-0



COMPONENT SIDE ● BD-GCW-6551-0
 SOLDER SIDE ● BD-GCW-6552-0
 ■ OL-GCW-6554-0





NOTES:

1. HLN4523C Microphone and Beeper Board Resistor, Diode and Jumper Table.

MODEL	R18	R19	JU1
HMN1010B	OUT	IN	IN
HMN1011B	750 OHM	OUT	OUT
HMN1014B	8.2k	IN	OUT
HMN1018B	750 OHM	OUT	OUT
HMN1020B	750 OHM	OUT	OUT
HMN1021B	750 OHM	OUT	OUT
HMN1022B	OUT	IN	IN
HMN1024B	750 OHM	OUT	OUT
HMN1025B			
HMN1032B	OUT	IN	IN
HMN1033A	750 OHM	OUT	OUT
HMN1034A	750	OUT	OUT
HMN1037A	750 OHM	OUT	OUT
HMN3013A	750 OHM	OUT	OUT
HMN1053A	OUT	IN	IN

- Monitor switch circuitry in dashed box is operational for Models HMN1024B, HMN1032B, HMN1033A, HMN1037A, HMN1053A, and HMN3013A only.
- Voltages shown in parenthesis, e.g. (0V), are active voltages when either the PTT or keypad buttons are pressed. Standby voltages are shown without parenthesis.
- Unless otherwise specified, resistor values are in ohms, and capacitor values are in microfarads.
- JU6 is not used.
- The ground symbol on this diagram is actually referenced to microphone low, not to radio ground.
- For positive ground systems:
 - connect GRN (PTT) wire to P4-4.
 - connect WHT (PTT LO) wire to P4-5.
 - JU1 must be "IN".

GDW-6523-0

Schematic, Circuit Board Diagrams, and Parts List for HLN4523C and HLN9112A Microphone and Beeper Boards
PW-6529-0
 (Sheet 2 of 2)

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- b. the product has been subject to misuse, accident, neglect, or damage;
- c. unauthorized alterations or repairs have been made, or unapproved parts used in the equipment.

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MXW-0378-A

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MXW-0379-B

**Touch-Code Encoder
Palm Microphone**

68P81114E07-C

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