



1. Description

The microcomputer system controls most of the major functional blocks of the *SYNTOR X* radio. This system also performs the functions that give the radio the PL/DPL encode/decode, *Channel Scan*, and time-out timer options. A single-chip, eight-bit, 40-pin microcomputer is the heart of the system.

The system's circuits are on the personality board that also has the receive audio circuits of the radio. Instructions for disassembling the personality board, the memory module, and the I/O board are in the Maintenance and Troubleshooting Section of this manual.

2. Theory of Operation

2.1 INTRODUCTION

The microcomputer (U8) requires two major inputs in order to operate: a +5V input voltage (Vcc at U8-40) and a clock source (CLOCK at U8-1 and U8-2). L2, C10, and C11 filter the +5V input voltage. On Lowband radios, a jumper bypasses L2. The clock source is a 3.600 MHz, fundamental-mode, parallel resonant quartz crystal that connects, via U8-1 and U8-2, to the internal oscillator circuitry of the microcomputer. This arrangement permits a 2V peak-to-peak (approximately) sinusoidal waveform to be generated at U8-2.

2.2 MEMORY MODULE

The microcomputer gets the information it needs to define operational characteristics of the radio from the memory module. This module contains an EEPROM (Electrically Erasable Programmable Read-Only Memory) that is programmed at the factory in accordance with the customer's specifications. The mode label on the cover of the transmitter power amplifier shows how the module has been programmed.

The microcomputer accesses the memory module whenever it requires new programming information to control its operation. For example, this information may have to do with a status change generated when the mode selector switch on the control head is set to a different position, or with the command to continue performing an internal program such as a *Channel Scan*.

The memory module activates when the $\overline{\text{ENABLE}}$ signal at J99-21 goes low, and stays active as long as the signal is low. However, the microcomputer's access to the memory module is inhibited when the $\overline{\text{ENABLE}}$ signal switches to a high state. The memory module addresses (A0 through A9) route via pins 16, 15, 14, 13, 12, 11, 10, 9, 2, and 1 of J99, whereas the data signals (D0 through D7) go via pins 20, 19, 18, 17, 5, 6, 7, and 8 of J99.

2.3 EEPROM MEMORY MODULE

The EEPROM memory module (HLN1125) is a replacement for the HLN1089A, 1088A, and 1087A fusible-link PROM's for *SYNTOR X* radios. It can store 64 modes and can be completely reprogrammed through an R1801A programmer with Version C software (RTL4801C), or a Motorola Y1069 EEPROM programmer. Because this EEPROM is pin-for-pin compatible with the HLN1089A, *SYNTOR X* radios can use it without modification. The HLN1125 EEPROM memory module is easily identified by the orange label indicating the direction on the top of the module housing. Fusible-link memory modules have white direction labels.

L1800 and C1800 protect the +5V supply to the module from noise, and HY1800, a 3.5 kilohm resistor network, pulls address lines A0 to A7 high when the radio is in standby. The output-enable line (P99-3) is grounded on the personality board. Q1800 acts as an inverter to keep the write-enable ($\overline{\text{WE}}$) pin high during radio operation to prevent initiation of a false write cycle to the EEPROM. During reprogramming, OE goes high, thereby activating $\overline{\text{WE}}$. Positioning JU2 selects the upper or lower half of memory in the EEPROM. In the power strobed version, Q1801 is switch to enable power to the EEPROM only when $\overline{\text{CE}}$ is active (low). For further information, see the schematic and parts list in this section.

Note

See the instruction manual for the location of the memory module. Programming information is found in the manuals that accompany the programmers.

2.4 MULTIPLEXER OUTPUT DATA LATCH (U2)

The additional input and output lines that the microcomputer requires come from the multiplexer output data latch (U2) and the input multiplexer (U3). U2, a CMOS device, supplies the audio control data and transmit power control. The address lines of U2 come out at U8-3, U8-4, and U8-5, whereas the programming data for U2 comes out at U8-6. An active low latching pulse (OUTPUT LATCH WRITE) comes out at U8-33 and goes to U2-4.

U2 sends the following signals: (a) ALERT TONE (U2-11); (b) PL/DPL FILTER SELECT (U2-12), that goes to the I/O board to determine the filter input characteristics; (c) XMIT POWER CONTROL (U2-13), that when held high, is a low-power output, (d) PRIORITY SAMPLE MUTE (U2-14), to control the priority sample mute switch that gives fast response times during *Channel Scan* operation; and (e) MUTE (U2-15), to controls the standard audio mute shunt switch.

2.5 INPUT MULTIPLEXER (U3)

U3 is an 8-bit-to-1-bit programmable data selector that comprises the second portion of the microcomputer's I/O expander circuitry. Three address lines (A0, A1, and A2) controls U3. These address lines go to U3-11, U3-12, and U3-13 from U8-3, U8-4, and U8-5, respectively. U3 has a single data output (U3-14) that applies to pin 38 of the microcomputer [MUX INPUT DATA (INTERRUPT)].

U3 receives both internal and external signals as inputs. The external control signals come from the control cable. The 10 kilohm resistors that form part of the hybrid-one (HY1) circuit protect these signals. The input signals consist of: (a) SYN SYNC (synthesizer synchronism) line (U3-1); (b) SQUELCH TAIL line (U3-3) from the squelch circuitry, protected by pull-down resistor R22; (c) fast-responding, active-high CHANNEL ACTIVITY line (U3-4) from the squelch circuit, protected by pull-up resistor R21; (d) CHANNEL SCAN ENABLE line from the control head at J1-31, applied to U3-5; (e) PL/DPL DISABLE line from J1-32, applied to U3-6; and (f) DISPLAY ENABLE line from J1-33, applied to U3-7.

2.6 PTT LINE

The remaining signals brought in from the control cable to permit the radio to operate are the PTT line and the mode switch contents. The PTT line goes to a dual opto-isolator (U1) via J1-4. U1 combines the PTT signal with the ignition battery line (PTT REF at J1-5) to send an ISOLATED PTT

signal to U8-26. This active-low signal occurs only when both the PTT and ignition lines are active. In the absence of transmission, this signal is pulled to regulated 9.6V by 47 kilohm resistor R4. This circuit is also compatible with positive-ground operation.

2.7 MODE SWITCHING

The mode switch setting inputs go to the microcomputer via four integrated devices (U4, U5, U6, and U7) wired to form 12 microcomputer controlled bidirectional lines. These 12 bidirectional lines are arranged into two microcomputer-controlled arrays, one of four lines and the other of eight lines. The four-line array connects to mode lines 9, 10, 11, and 12. The eight-line array connects to mode lines 1 through 8. U4 and U6 buffer the signals from the control head.

U4 and U6 each have one three-state control line for four of six buffers and a different three-state control line for the remaining two buffers. These CMOS buffers are of the non-inverting type. The U4 and U6 inputs are protected by 10 kilohm resistors when they connect to mode lines 1 through 12. These protective resistors form part of hybrid circuits 2 through 4 (HY2 through HY4). U4 buffers mode lines 1, 2, 3, 4, 9, and 10 whereas U6 buffers mode lines 5, 6, 7, 8, 11, and 12.

U5 and U7 allow mode lines 1 through 12 to drive the microcomputer to write data into latches in the control head. U5 and U7 (which are non-inverting, tristable hex buffer TTL devices) are arranged so four of the buffers are controlled by one three-state line and the two remaining buffers are controlled by a different three-state line.

U5 controls mode lines 1, 2, 3, 4, 9, and 10. U7 controls mode lines 5, 6, 7, 8, 11, and 12. Buffered mode lines 1 through 8 connect to pins 8 through 15 of the microcomputer, whereas buffered mode lines 9 through 12 connect to pins 22 through 25 of the microcomputer.

The three-state control lines for U4, U5, U6, and U7 are at pins 34, 35, 36, and 37 of U8. The signal at U8-34 controls the input sections of U4 and U6 buffering mode lines 9 through 12; the signal U8-36 controls the input sections of U4 and U6 buffering mode lines 1 through 8; the signal at U8-35 controls the output sections of U5 and U7 buffering mode lines 9 through 12; the signal at U8-37 controls the output section of U5 and U7 buffering mode lines 1 through 8. The signal at U8-35 is also buffered by Q1, R2, and R3 and goes via J1-1 as a CONTROL HEAD STROBE signal to the control head.

Mode lines 9 through 12 of the bidirectional bus form an address system when the CONTROL HEAD STROBE signal is acting as chip enable and mode lines 1 through 8 are acting as bidirectional data bus.

2.8 FREQUENCY SYNTHESIZER

The microcomputer programs the synthesizer divider (U602) to generate the correct operating carrier frequency for the radio. U602 connects three address lines between pins 12, 13, and 14 of the microcomputer and pins 7, 8, and 5 of P602 (SYN A0, SYN A1, and SYN A2). An active-low line (STROBE) from U8-7 goes to the synthesizer via P601-4 to furnish a latching pulse for each programming data word to the synthesizer. This line is then inverted by Q7, R19, and R20 to become an active-high synthesizer strobe (SYN STROBE) line (at P601-4). There is a wired logic between the collector of Q7 and U8-31. Consequently, a high logic output occurs whenever the signal at U8-7 (STROBE) is low and the signal at U8-31 (SYNTHESIZER ENABLE) is high. The SYN STROBE signal is sent to the synthesizer whenever it is being refreshed by the microcomputer system. This signal is also routed to the activity monitor circuit of the microcomputer.

2.9 MICROCOMPUTER ACTIVITY MONITOR

The microcomputer activity monitor circuit consists of U9 (a dual CMOS resettable monostable device) and associated resistors (R24 through R29), capacitors (C12 through C14), and diodes (CR3 through CR5). The SYN STROBE signal is applied to U9A-4 at intervals of not more than 10 milliseconds, thus resetting the monostable and keeping it reset. As long as the monostable is reset within its 33 millisecond time constant, its output at U9A-7 remains low, allowing the microcomputer to operate.

If the strobe pulse is missed and the 33 millisecond time constant runs out, the monostable output switches to a high state, causing the second monostable (U9B) to enter into an oscillatory mode. Under such conditions, U9B generates an output that is high for approximately 34.5 milliseconds and low for approximately 4.7 milliseconds. This signal, generated at U9B-9, goes to U8-39, where as an active-low RESET line, it causes the microcomputer to reset and to start its operation all over again. The following RC pairs control the time constants: (a) R25/C12, 33 ms; (b) R28/C14, 4.7 ms; and (c) R27/R29/C13, 34.5 ms.

2.10 TRANSMITTER

The microcomputer gives the transmitter two control lines: KEYED 9.4V ENABLE (U8-30) and XMIT PA ENABLE (U8-32). The keyed 9.4V enable signal is activated when it switches to a low state. This signal is applied to the keyed 9.4 V switch circuit, which inverts the signal and applies a KEYED 9.4V signal to P601-1 and J401-8. The 9.4V switch circuit is a quasi Darlington circuit comprised of Q4 and Q3 and associated components.

The XMIT PA ENABLE signal is generated at U8-32, buffered by the PA enable switch (Q5 and Q6 and associated components), and sent as an active-low signal (PA ENABLE) to the power control circuitry in the common circuits board via J401-10. If the synthesizer is in the adapt mode, or the output of the microcomputer activity monitor circuit at U9-7 is high, R26, R14, and R15 buffer the signals from either device, thus causing the output of Q5 to go low and inhibit the PA ENABLE signal.

2.11 I/O BOARD

The I/O board performs the analog-to-digital and digital-to-analog signal conversion for the microcomputer system.

The analog-to-digital section consists of a low-pass filter that acts on the detected audio (DET AUDIO) signal it receives from P51-4. This low-pass filter is controlled by the PL/DPL SELECT line that is routed via P51-1. In the PL state, the filter is a five-pole, half-dB ripple Chebyshev filter with a 245 Hz cut off. In the DPL condition, it behaves like a three-pole Butterworth filter with a 140 Hz cutoff. The output of the low-pass filter is applied to the limiter circuit (U54 and associated components). The limiter circuit supplies a 0 to 5V digital signal (REC PL/DPL) to pin 27 of the microcomputer via P51-2.

The digital-to-analog section consists of a resistive lattice network that receives four digital signals from the microcomputer via P51-5, P51-6, P51-10, and P51-9 (PL3, PL2, PL1, and PL0, respectively). The digital-to-analog circuit sends its output to a three-pole Butterworth low-pass filter with a 300 Hz cutoff. The filter's output (XMIT PL/DPL) is forwarded to the IDC on the common circuits board via P51-11 and J401-3.

3. Troubleshooting Procedure

3.1 INTRODUCTION

The troubleshooting procedures presented in this section of the manual consist of the following:

- Muting circuitry troubleshooting procedure
- Microcomputer system troubleshooting procedure
- Microcomputer (U8) troubleshooting procedure
- Mode information troubleshooting guide (paragraph 3.5)
- Diagnostic aid mode procedure.

3.2 REQUIRED TEST EQUIPMENT

The following test equipment is necessary:

- Oscilloscope
- RF signal generator
- Voltmeter
- Test memory module.

See the list of recommended test equipment in the Maintenance and Troubleshooting Section in the manual.

3.3 MICROCOMPUTER SYSTEM TROUBLESHOOTING GUIDE

See the microcomputer system troubleshooting guide located at the end of this section. This chart contains the following four procedures:

- No receive audio
- Radio does not squelch
- No PL/DPL modulation output
- No (or low) RF output power.

These four procedures refer to the following troubleshooting charts:

- Synthesizer troubleshooting chart— this chart is located in the Synthesizer Section of this manual.
- Squelch troubleshooting chart— this chart is located in the Receiver Section of this manual.
- Audio troubleshooting— see the voltages and waveforms on the audio schematic diagram located in the Microcomputer System Section of this manual.
- Microcomputer (U8) troubleshooting chart— this is included in the microcomputer system troubleshooting procedure.
- IDC troubleshooting— see the IDC portion of the synthesizer troubleshooting chart.
- Power control troubleshooting chart— this chart is located in the Transmitter Section of this manual.
- Mode information troubleshooting guide— this guide is located in this section of the manual.

It is assumed that you have been referred to the microcomputer system troubleshooting procedure via the general system troubleshooting guide located in the

Maintenance and Troubleshooting Section in this manual. In the general system troubleshooting guide, the following symptoms lead you to the microcomputer system troubleshooting guide.

- (1) No receive audio
- (2) Radio does not squelch
- (3) Radio does not unsquelch
- (4) No PL/DPL encode
- (5) No RF power output

For symptoms 1 and 3, see the "No Receive Audio" procedure of the microcomputer system troubleshooting guide. For symptom 2, see the "Radio Does Not Squelch" procedure. For symptom 4, see the "No PL/DPL Modulation Output" procedure, and for symptom 5, see the "No (or low) RF Power Output" procedure.

3.4 MICROCOMPUTER (U8) TROUBLESHOOTING GUIDE

This procedure is normally arrived at via one of the four procedures associated with the microcomputer system troubleshooting guide. The microcomputer (U8) troubleshooting chart forms part of the microcomputer system troubleshooting procedure, located at the end of this section.

This procedure, in turn, makes reference to the following procedures:

- Regulator troubleshooting procedure— in the Common Circuits Board Section of the manual.
- Synthesizer troubleshooting chart— in the Synthesizer Section of this manual.
- Mode information troubleshooting procedure— in this section (see below).
- Diagnostic aid mode chart— at the end of this section.

Before starting the microcomputer (U8) troubleshooting procedure, verify that the memory module serial number (excluding the suffixes) matches the radio serial number. Symptoms of incorrect memory module information include the following:

- (1) Synthesizer does not lock on one or more modes: the red LED indicator on the RF board stays lit and the audio fails to unmute.
- (2) Synthesizer locks on an RF frequency, but the audio does not unmute because of wrong PL or DPL information.

Note

If the radio is in a *Channel Scan* mode and does not detect channel activity, the LED indicator on the RF board appears to remain lit. If the synthesizer is operating properly, you can turn off the lock indicator by unscquelching the radio.

3.5 MODE INFORMATION TROUBLESHOOTING GUIDE

3.5.1 Introduction

The troubleshooting guide for either the general system, the microcomputer system, or the microcomputer (U8) can lead you to this troubleshooting procedure. By this point, you have established that the radio is receiving properly, but that the microcomputer is apparently accessing the wrong block of mode information in the memory module. This would also result in an incorrect receive frequency unless the two blocks of mode information are programmed for the same receive frequency.

The problems may be caused by any one of the following conditions, listed in their order of priority:

- (1) Faulty cable interface IC's (U4, U5, U6, and U7).
- (2) Faulty cable wiring or faulty control head operation, causing incorrect reading of the mode switch by the microcomputer.
- (3) Use of the wrong memory module.
- (4) Faulty memory module.

3.5.2 Faulty Cable Interface IC's

Check the cable interface IC's (U4, U5, U6, and U7) by using the diagnostic aid mode procedure at the end of this section.

Note

This procedure assumes that the control group is the one described in 3.5.3 below.

3.5.3 Faulty Cable Wiring or Faulty Control Head Operation

In the following situations, the mode information supplied to the microcomputer is presented to the cable-reading IC's (U4 and U6).

Case 1—The control group consists of (a) a rotary mode select or (b) a one-mode, two-mode, eight-mode, or single-mode-with-talkaround alternate control module.

Case 2—The control group consists of an alternate control module with or without talkaround, but with the five-mode or eight-mode pushbutton operator mode-select option.

Case 3—The control group has a mode-select with scan lights option (all on a single printed circuit board).

Case 4—The control group is a rotary mode-select with 16 or more modes.

For Case 1, the mode information is presented to the radio when one and only one of the cable's 12 mode lines, connected to pins 13, 17, 24, 25, 12, 16, 23, 29, 16, 19, 30, and 11 (Modes 1 through 12, respectively) of the radio front plug (J1), is grounded.

For Cases 2, 3, and 4, the mode information is represented to the radio in binary-encoded format on the lower six mode lines of the cable (pins 13, 17, 24, 25, 12, and 16 of the radio front plug) with mode lines 7 and 8 (J1-23 and J-29) grounded.

In all cases, if the ordered options require the transmission of data, the mode information is placed on the twelve mode lines only when the microcomputer requests mode information by generating low-level voltage (approximately 0.2 V) on U8-34, thus turning Q1 off and driving the CONTROL HEAD STROBE line high (approximately 2.2V) at J1-1. Data transmission required by options includes: (a) lights in formation other than mode, (b) switch banks addresses, and (c) data reading from options such as an operator-select coded squelch switch closure or an operator-select *Channel Scan* switch closure.

3.5.4 Wrong Memory Module

Check the serial number of the memory module against the serial number of the radio.

Note

If *Systems 90'S* options are purchased some time later than the *SYNTOR X* mobile radio, a new memory module may be required. The new module has a new suffix letter on its serial number. Versions of the memory module with earlier suffixes may no longer be usable once the newly purchased options have been wired into the system. The memory module shipped with the radio is coded for the proper operation of all the options that were ordered with the radio.

3.5.5 Faulty Memory Module

Buy a replacement memory module from an authorized Motorola representative. Since Motorola maintains a record of the information in all the memory modules sold, the company can supply a correctly programmed replacement

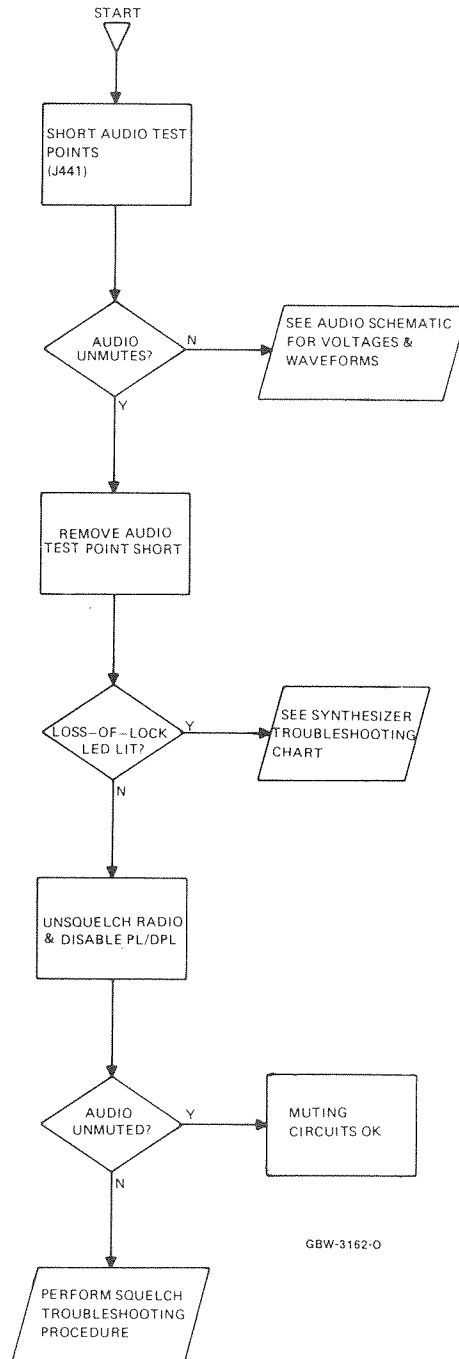
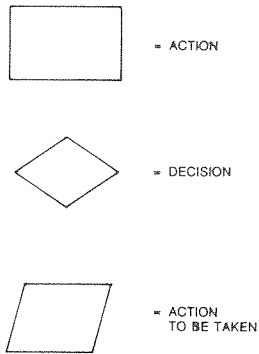
memory module even if the customer cannot locate the original order information sheet. However, be sure to check conditions (1) and (2) of above, before assuming that the memory module is faulty. See Faulty Cable Interface IC's and Faulty Cable Wiring or Faulty Control Head Option.

3.6 DIAGNOSTIC AID MODE PROCEDURE

The flow chart for the diagnostic aid mode is at the end of this section. The microcomputer (U8) troubleshooting chart and the faulty cable interface IC's procedure call for its use.

MUTING CIRCUITRY TROUBLESHOOTING CHART
(NO AUDIO)

SYMBOLS AND ABBREVIATIONS
USED IN CHART



GBW-3162-0

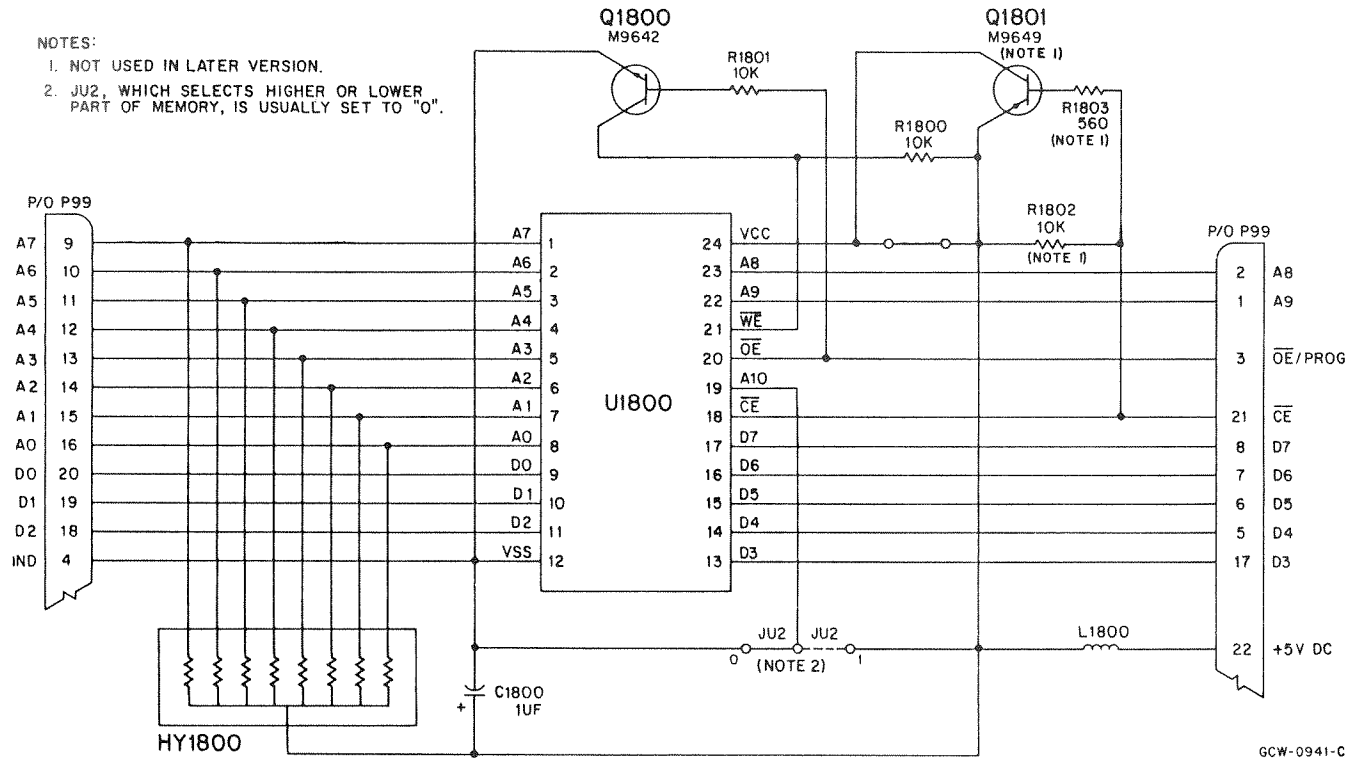
1. ALL REFERENCES TO, AND TEST PROCEDURES FOR, SQUELCH OPERATION ARE NOT APPLICABLE TO TRUNKED RADIOS.

(EARLY VERSION)

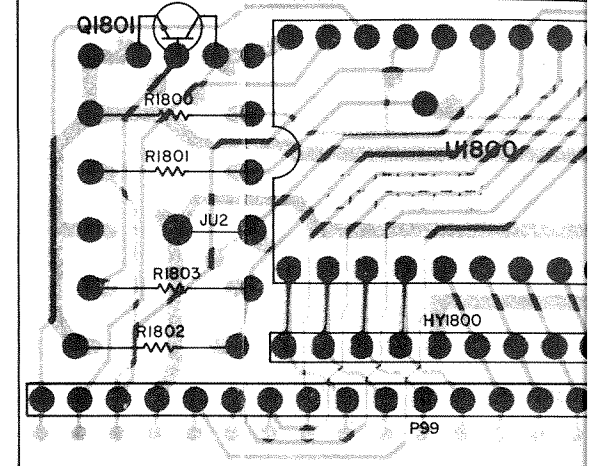
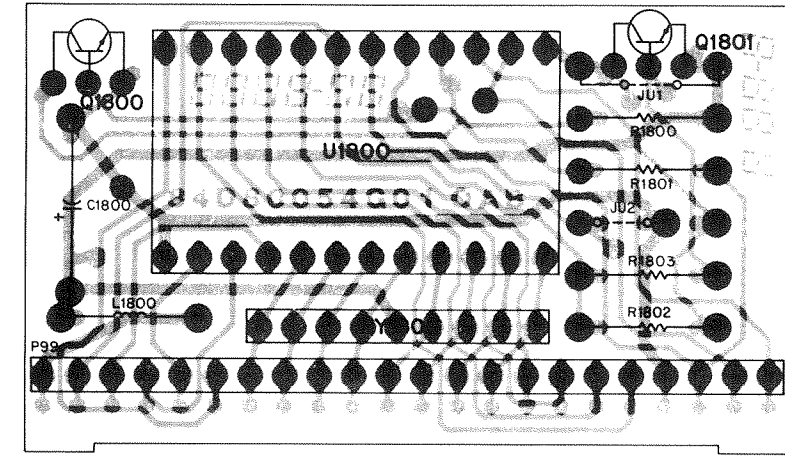
(LATER VERSION)

SOLDER SIDE VIEW

COMPONENT SIDE VIEW



NOTES:
 1. NOT USED IN LATER VERSION.
 2. JU2, WHICH SELECTS HIGHER OR LOWER PART OF MEMORY, IS USUALLY SET TO "0".



⊙ ALTERNATE CONNECTION FOR JU2
 SOLDER SIDE ⊕ GCW-0938-0
 COMPONENT SIDE ⊕ GCW-0939-0
 OVERLAY — GCW-0940-0

⊙ ALTERNATE CONNECTION FOR JU2
 SOLDER SIDE ⊕ GCW-5981-0
 COMPONENT SIDE ⊕ GCW-5982-0
 OVERLAY — GCW-5983-0

parts list

HLN1125A EEPROM Memory Module (Early Version) MXW-0918-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, pF, ± 10%, 100V (unless otherwise stated)		
C1800	23-82783B26	1 uF, 35V
hybrid (see note)		
HY1800	51-82142K09	3.5k ± 2% resistor network
connector receptacle		
J1800	09-80269B02	24-pin socket
jumper		
JU1	06-11009D23	resistor jumper
coil, RF		
L1800	24-80036A01	ferrite bead inductor
connector plug		
P99	09-82846L02	22-pin female connector
transistor (see note)		
Q1800	48-80182D08	NPN, type M9642
Q1801	48-80182D12	PNP, type M9649
resistor, fixed, ohm, ± 5%, 1/4 watt (unless otherwise stated)		
R1800-1802	06-11009C73	10k
R1803	06-11009C43	560
integrated circuit (see note)		
U1800	51-97014B01	EEPROM, 24 pin

10/25/88
 note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

parts list

HLN1125A EEPROM Memory Module (Later Version)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, pF, ± 10%, 100V (unless otherwise stated)		
C1800	23-82783B26	1 uF, 35V
hybrid (see note)		
HY1800	51-82142K09	3.5k ± 2% resistor network
connector receptacle		
J1800	09-80269B02	24-pin socket
jumper		
JU1	06-11009D23	resistor jumper
coil, RF		
L1800	24-80036A01	ferrite bead inductor
connector plug		
P99	09-82846L02	22-pin female connector
transistor (see note)		
Q1800	48-11043C05	NPN
resistor, fixed, ohm, ± 5%, 1/4 watt (unless otherwise stated)		
R1800,1801	06-11009A73	10k
integrated circuit (see note)		
U1800	51-97014B01	EEPROM, 24 pin
mechanical parts		
	15-83494M01	PROM housing
	15-83819M02	PROM back housing
	54-84392M02	label direction

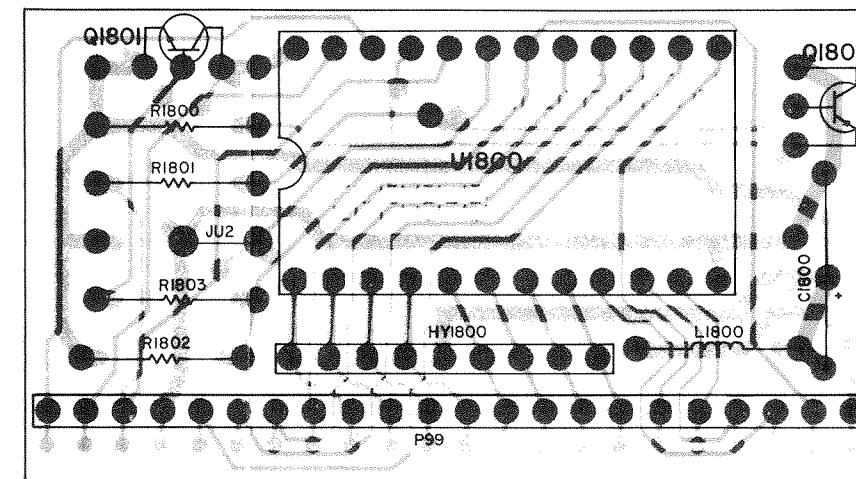
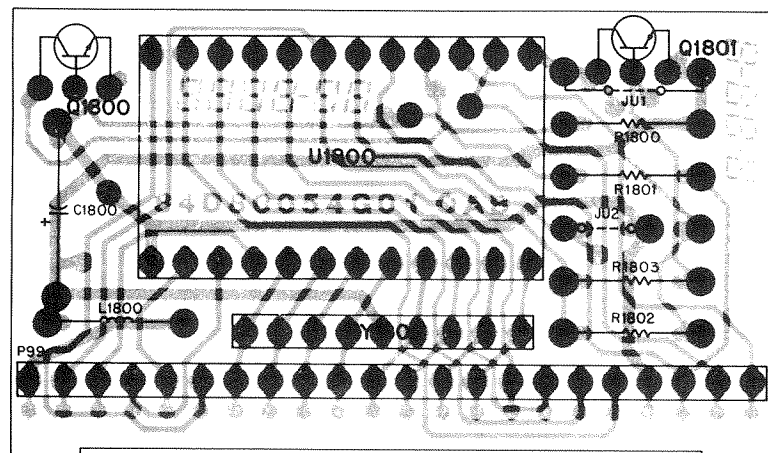
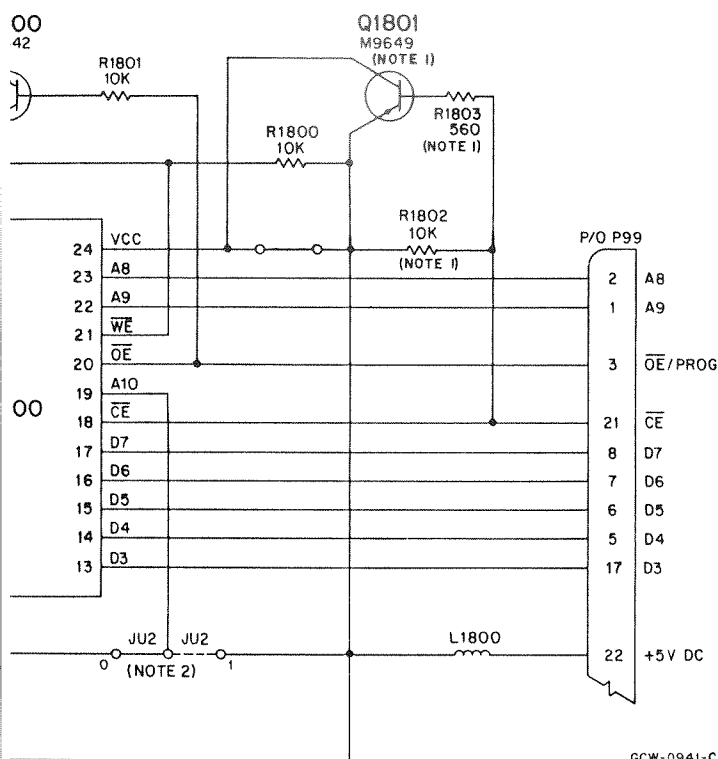
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

(EARLY VERSION)

(LATER VERSION)

SOLDER SIDE VIEW

COMPONENT SIDE VIEW



⊙ ALTERNATE CONNECTION FOR JU2
SOLDER SIDE ⊕ GCW-0938-0
COMPONENT SIDE ⊕ GCW-0939-0
OVERLAY — GCW-0940-0

⊙ ALTERNATE CONNECTION FOR JU2
SOLDER SIDE ⊕ GCW-5981-0
COMPONENT SIDE ⊕ GCW-5982-0
OVERLAY — GCW-5983-0

parts list

HLN1125A EEPROM Memory Module (Early Version) MXW-0918-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, pF, ± 10%, 100V (unless otherwise stated)		
C1800	23-82783B26	1 uF, 35V
hybrid (see note)		
HY1800	51-82142K09	3.5k ± 2% resistor network
connector receptacle		
J1800	09-80269B02	24-pin socket
jumper		
JU1	06-11009D23	resistor jumper
coil, RF		
L1800	24-80036A01	ferrite bead inductor
connector plug		
P99	09-82846L02	22-pin female connector
transistor (see note)		
Q1800	48-80182D08	NPN, type M9642
Q1801	48-80182D12	PNP, type M9649
resistor, fixed, ohm, ± 5%, 1/4 watt (unless otherwise stated)		
R1800-1802	06-11009C73	10k
R1803	06-11009C43	560
integrated circuit (see note)		
U1800	51-97014B01	EEPROM, 24 pin

10/25/88
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

parts list

HLN1125A EEPROM Memory Module (Later Version) MXW-5984-O

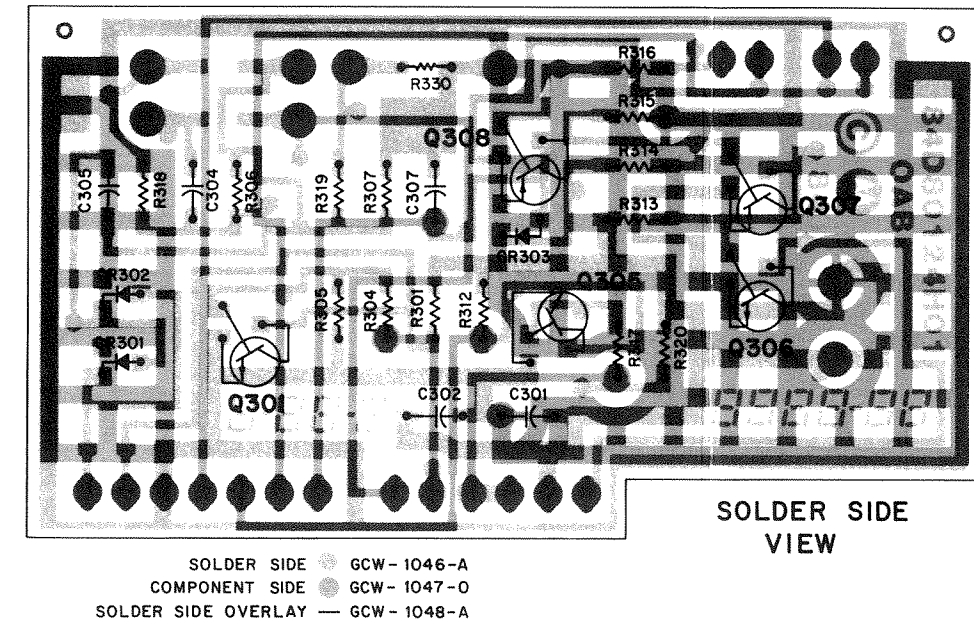
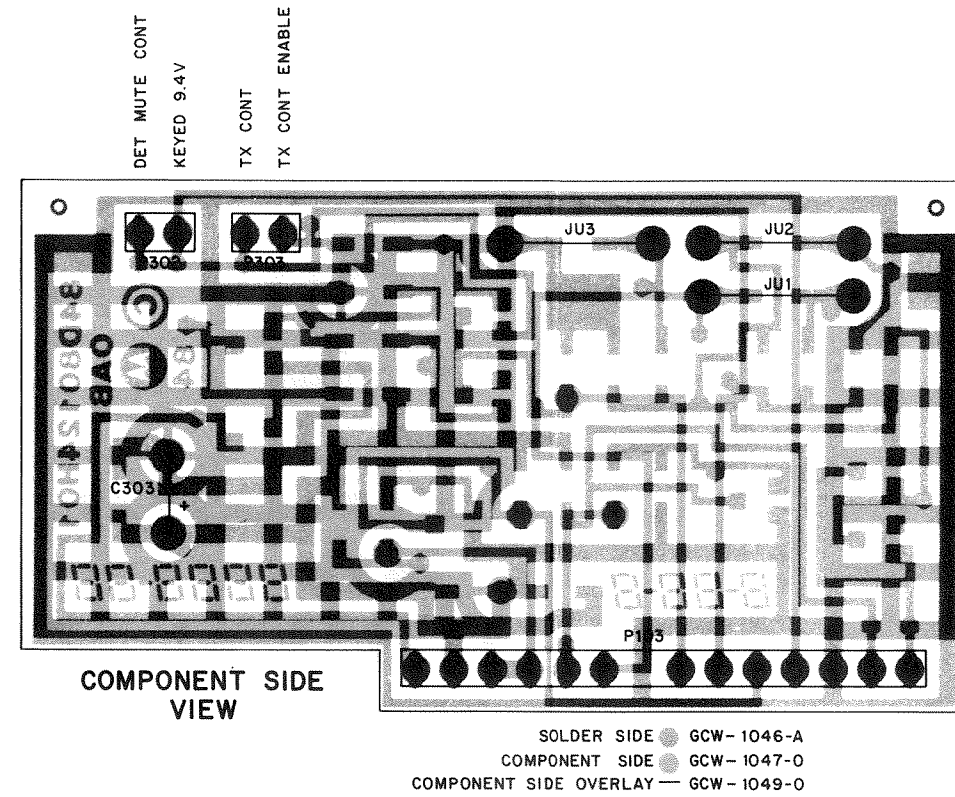
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, pF, ± 10%, 100V (unless otherwise stated)		
C1800	23-82783B26	1 uF, 35V
hybrid (see note)		
HY1800	51-82142K09	3.5k ± 2% resistor network
connector receptacle		
J1800	09-80269B02	24-pin socket
jumper		
JU1	06-11009D23	resistor jumper
coil, RF		
L1800	24-80036A01	ferrite bead inductor
connector plug		
P99	09-82846L02	22-pin female connector
transistor (see note)		
Q1800	48-11043C05	NPN
resistor, fixed, ohm, ± 5%, 1/4 watt (unless otherwise stated)		
R1800,1801	06-11009A73	10k
integrated circuit (see note)		
U1800	51-97014B01	EEPROM, 24 pin

mechanical parts

15-83494M01	PROM housing
15-83819M02	PROM back housing
54-84392M02	label direction

10/25/88
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

HLN5008A INTERFACE BOARD



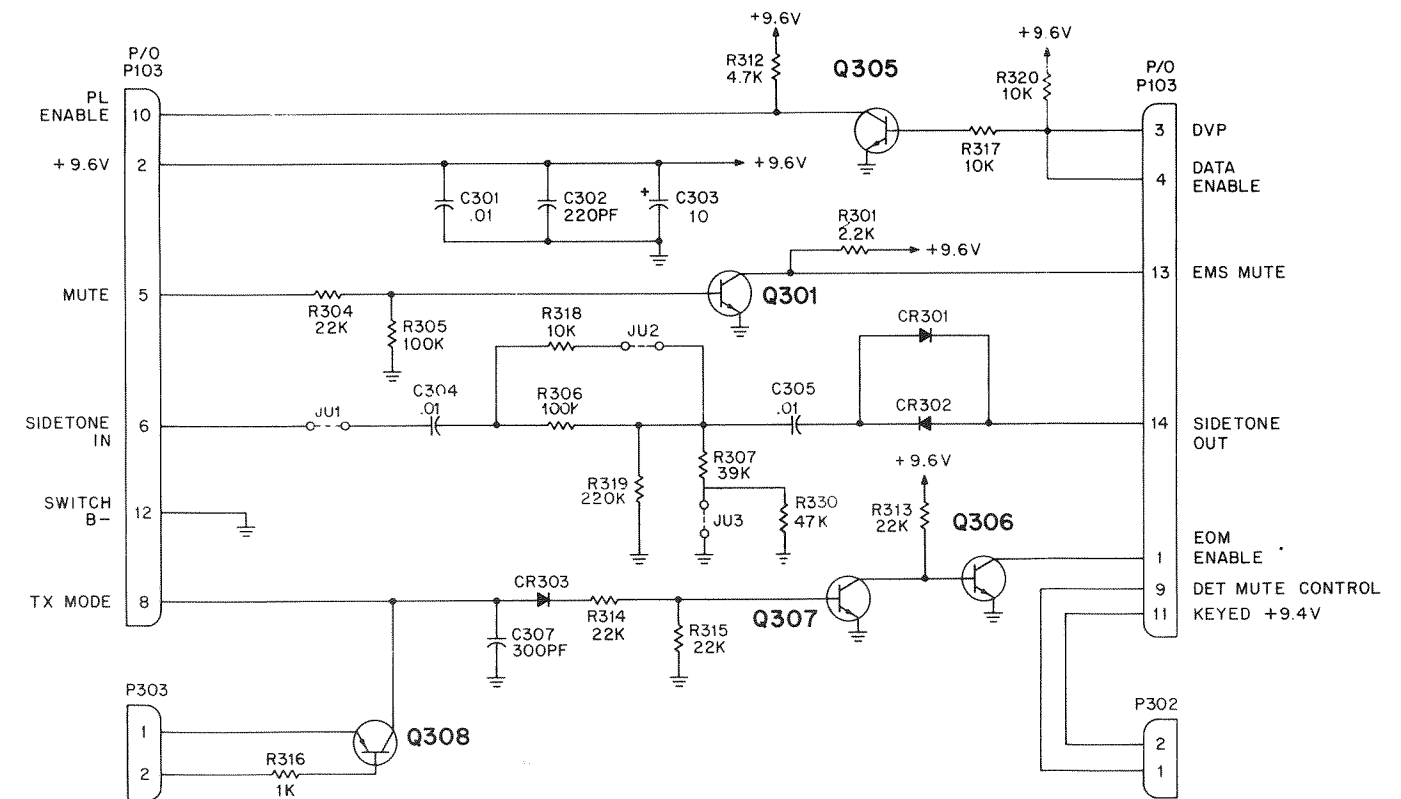
parts list

HLN5008A Interface Board MXW-2802-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF, ±10%, 50V (unless otherwise stated)		
C301	21-11032B07	.01, +80, -20%
C302	21-13740B57	220 pF, ±5%
C303	23-11013E57	10, ±20%, 25V, tantalum
C304,305	21-11032B13	.1, +80, -20%
C307	21-13740B60	300 pF, ±5%
diode (see note)		
CR301,302	48-80236E08	silicon rectifier
CR306	48-80236E08	silicon rectifier
connector plug		
P103	28-80085E14	male header
P302,303	28-84318M06	2-pin plug
transistor (see note)		
Q301	48-80141L02	NPN, type M3313
Q305-307	48-80141L02	NPN, type M3313
Q308	48-80141L01	PNP, type M3314
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R301	06-11077A82	2.2k
R304	06-11077B07	22k
R305,306	06-11077B23	100k
R307	06-11077B13	39k
R312	06-11077A90	4.7k
R313-315	06-11077B07	22k
R316	06-11077A74	1k
R317,318	06-11077A98	10k
R319	06-11077B31	220k
R320	06-11077A98	10k
R330	06-11077B15	47k

9/28/88

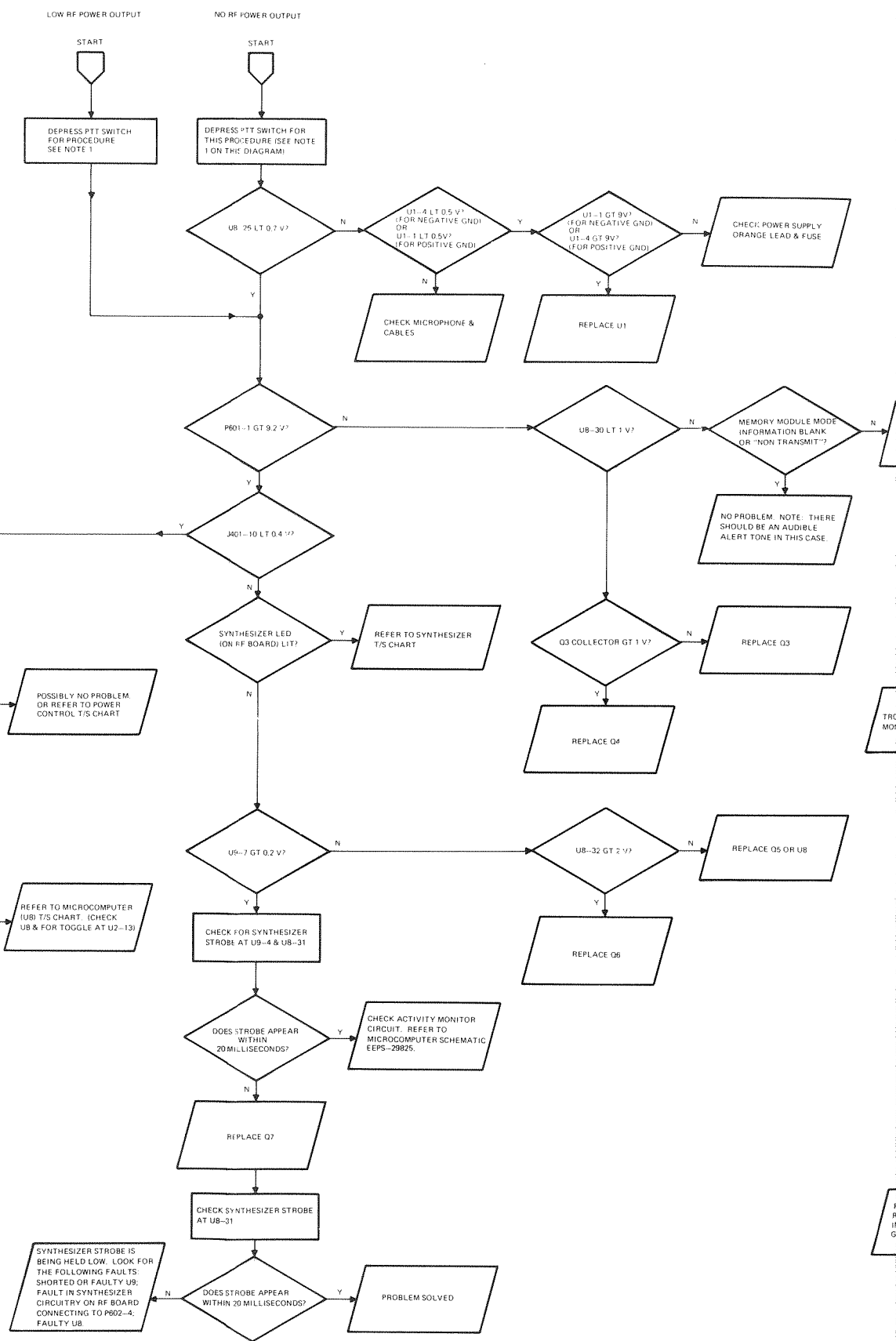
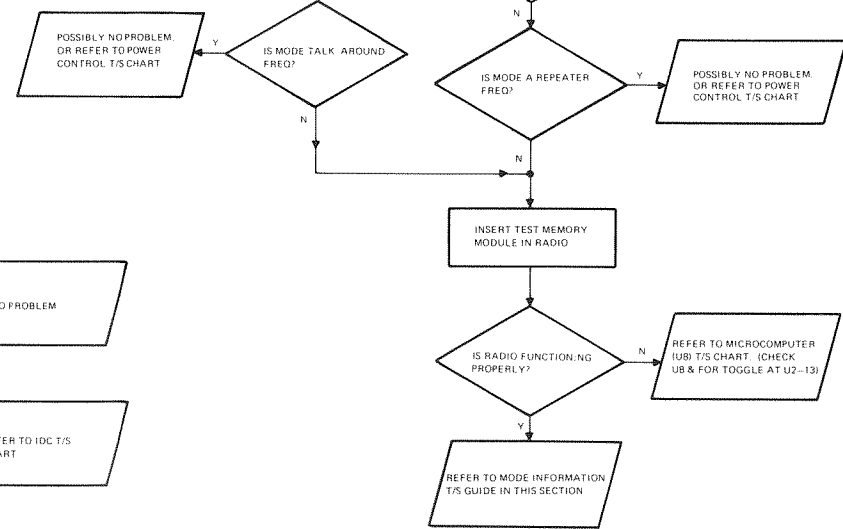
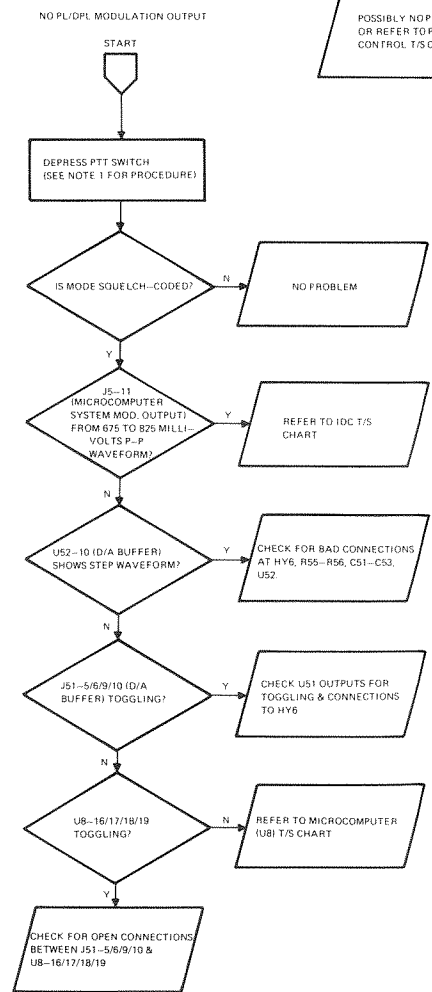
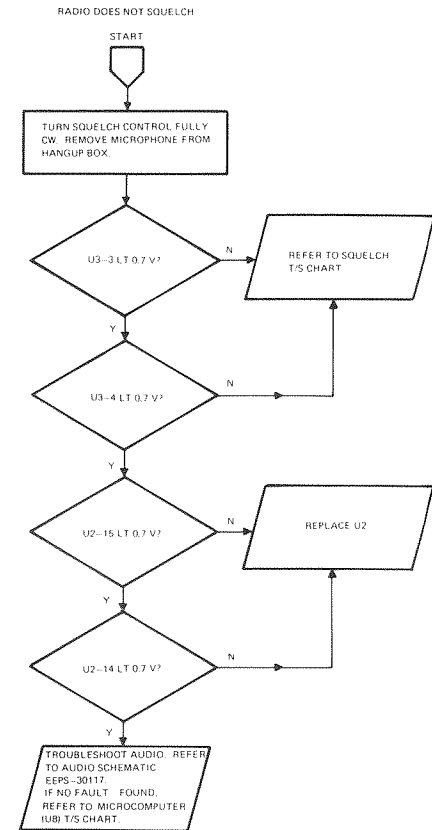
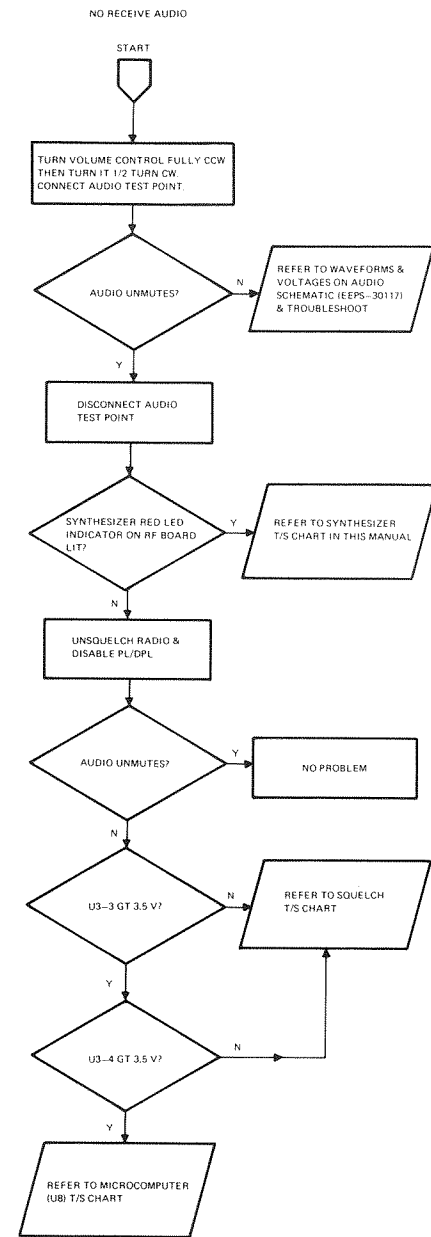
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.



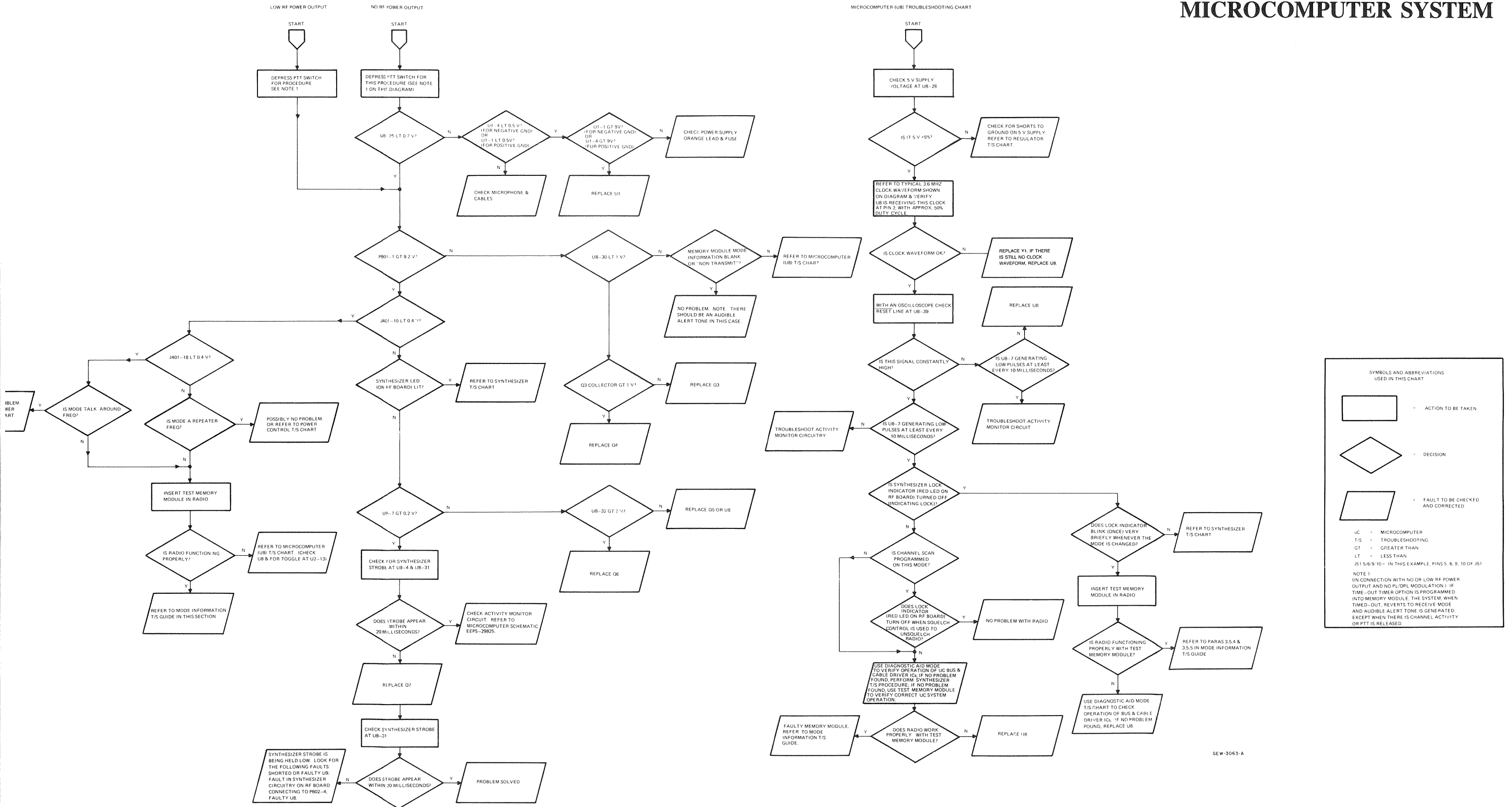
NOTE:

UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS, AND ALL CAPACITOR VALUES ARE IN MICROFARADS.

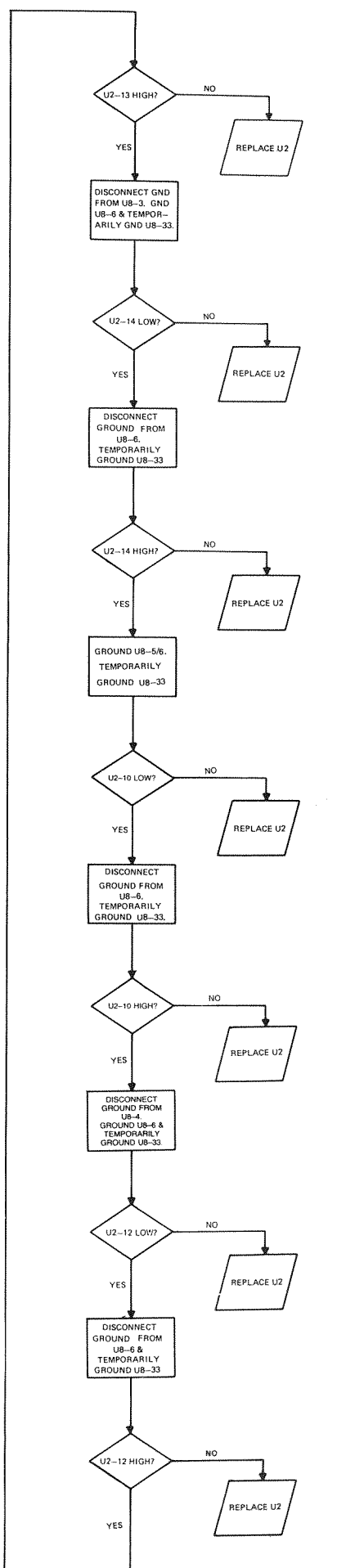
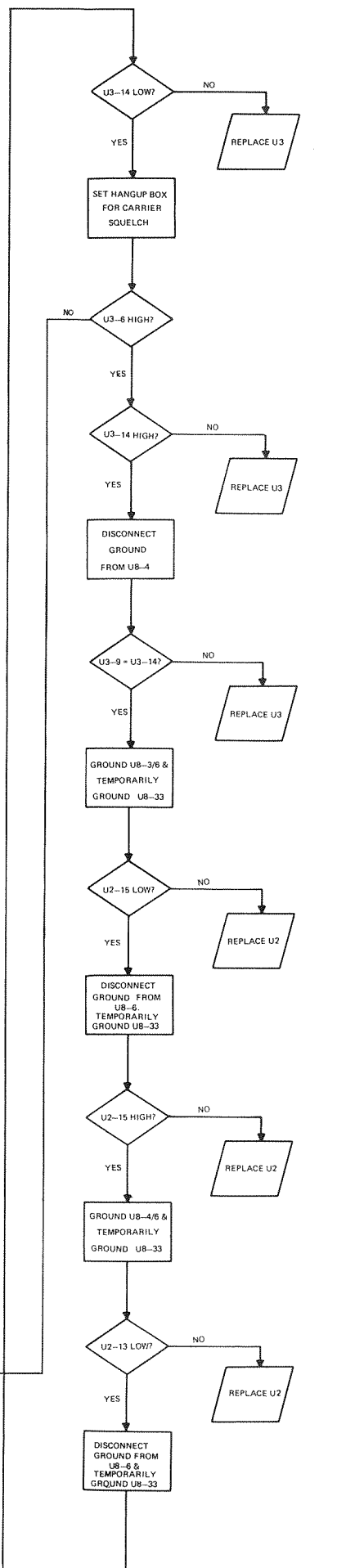
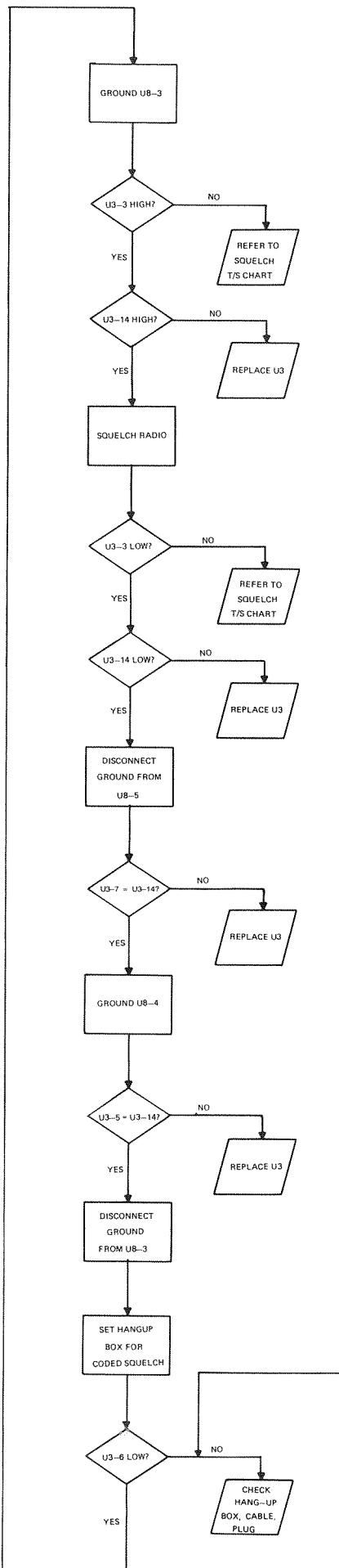
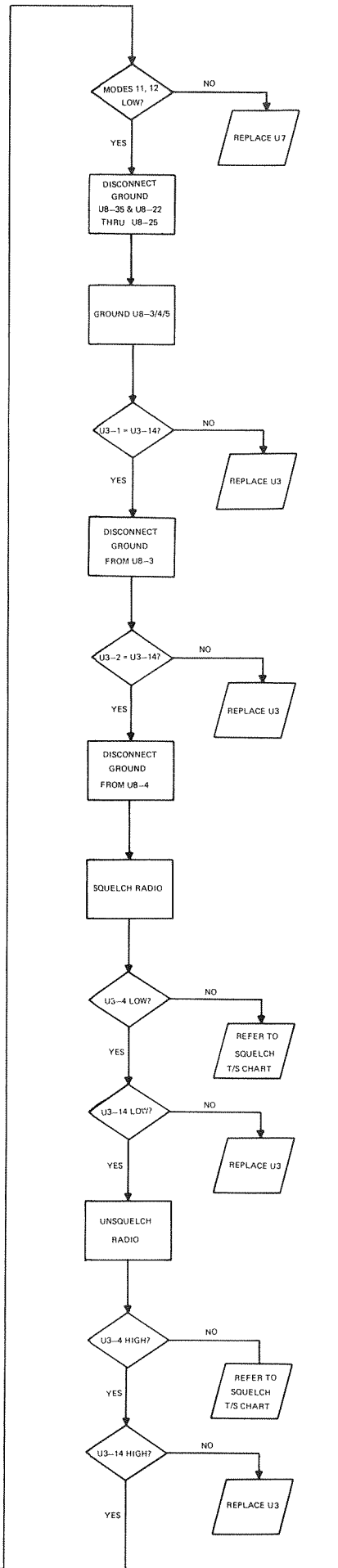
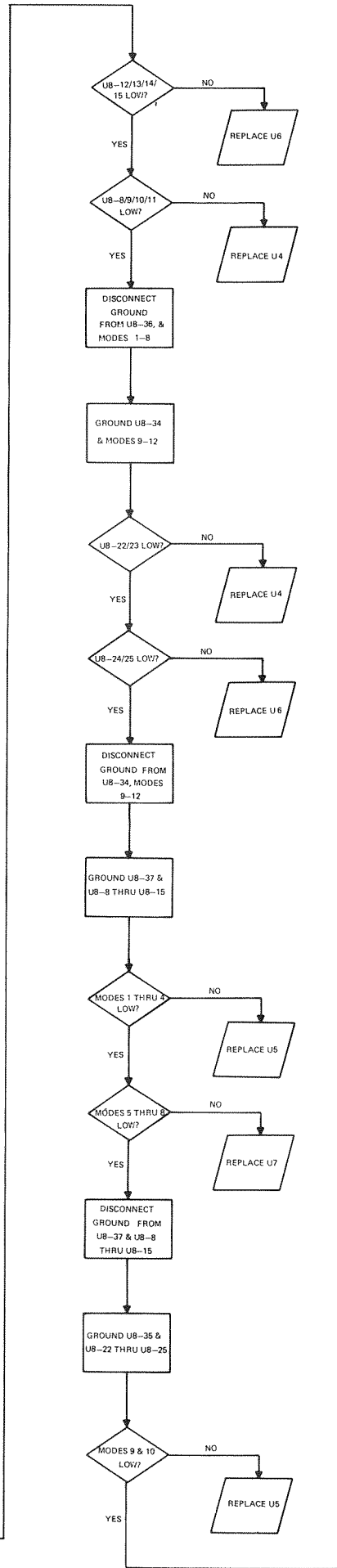
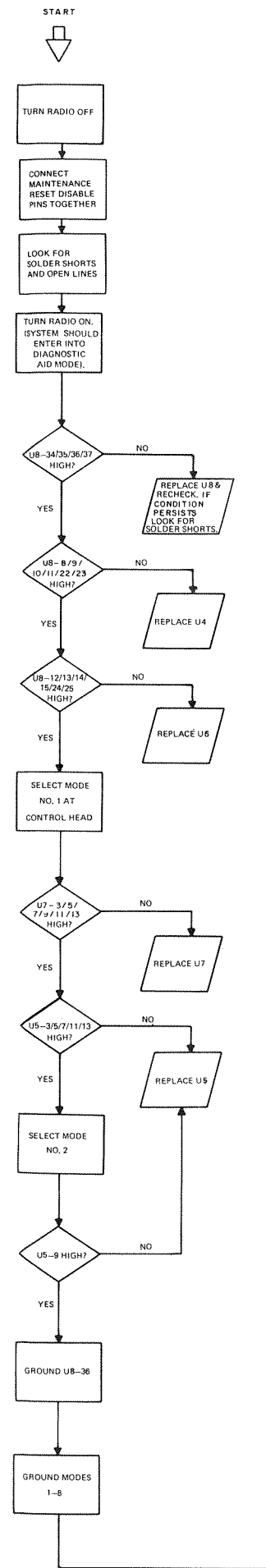
JUMPER	STATUS	REMARKS
JU1	IN	OUT FOR SIDETONE
JU2	OUT	NONE
JU3	IN	OUT FOR SINGLETONE

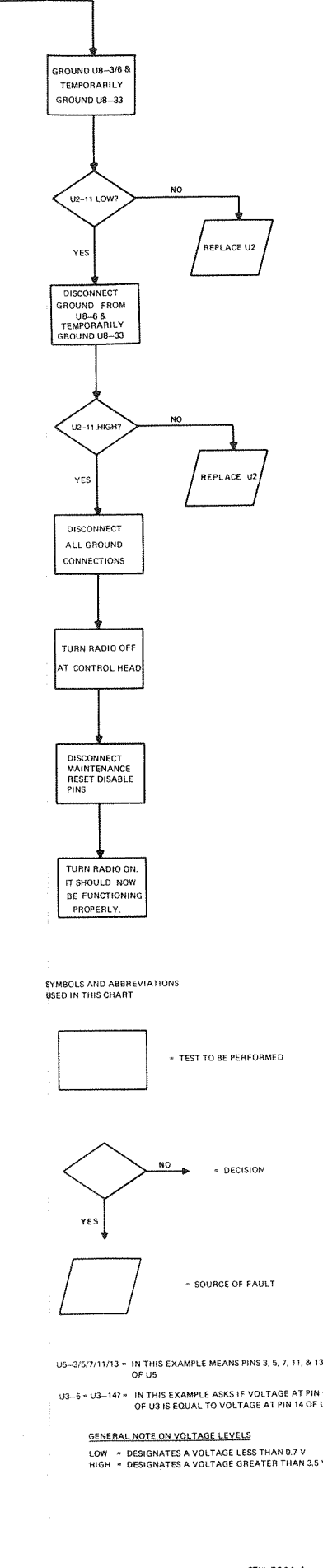
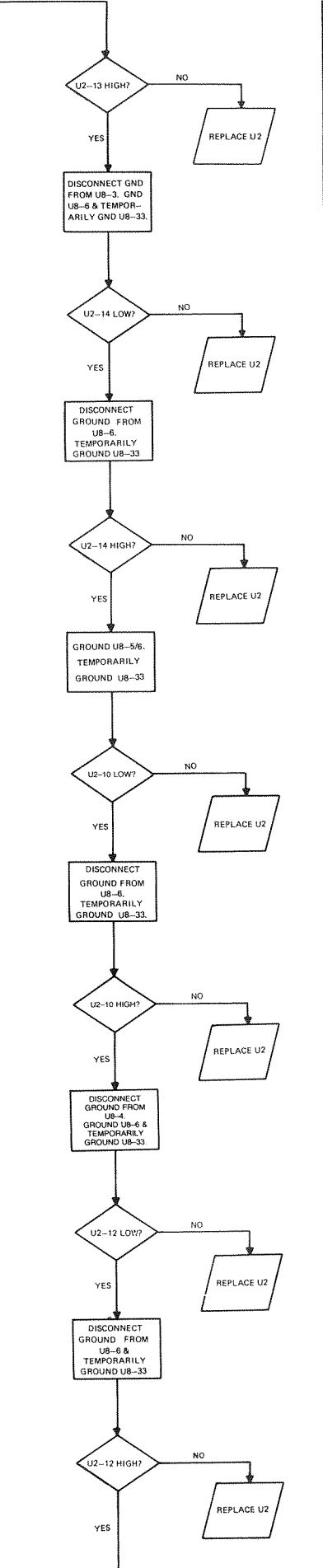
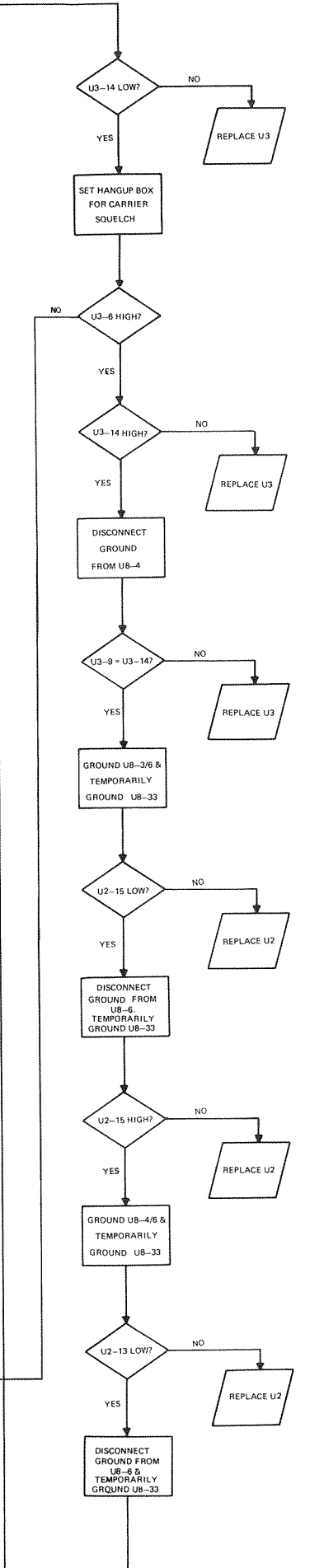
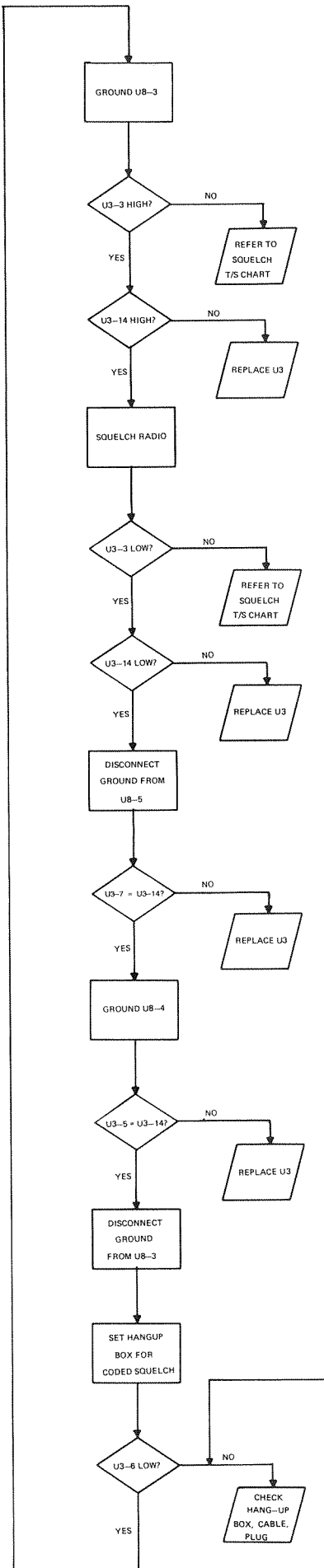
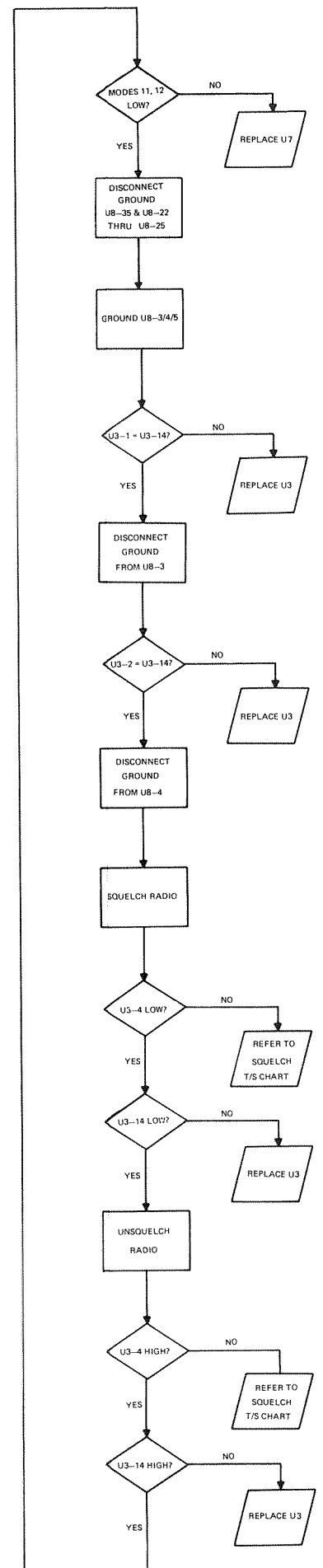
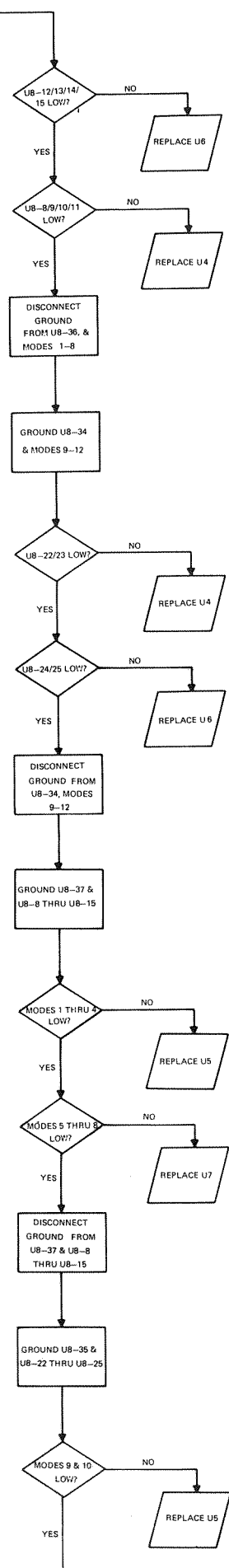


TROUBLESHOOTING CHARTS FOR THE MICROCOMPUTER SYSTEM



MICROCOMPUTER SYSTEM





SYMBOLS AND ABBREVIATIONS USED IN THIS CHART

[Rectangle] = TEST TO BE PERFORMED

[Diamond] = DECISION

[Parallelogram] = SOURCE OF FAULT

U3-3/5/7/11/13 = IN THIS EXAMPLE MEANS PINS 3, 5, 7, 11, & 13 OF U3

U3-5 + U3-14? = IN THIS EXAMPLE ASKS IF VOLTAGE AT PIN 5 OF U3 IS EQUAL TO VOLTAGE AT PIN 14 OF U3

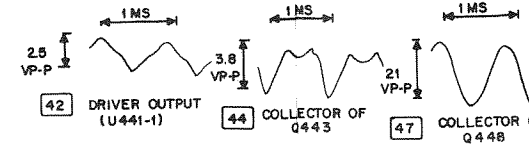
GENERAL NOTE ON VOLTAGE LEVELS

LOW = DESIGNATES A VOLTAGE LESS THAN 0.7 V

HIGH = DESIGNATES A VOLTAGE GREATER THAN 3.5 V

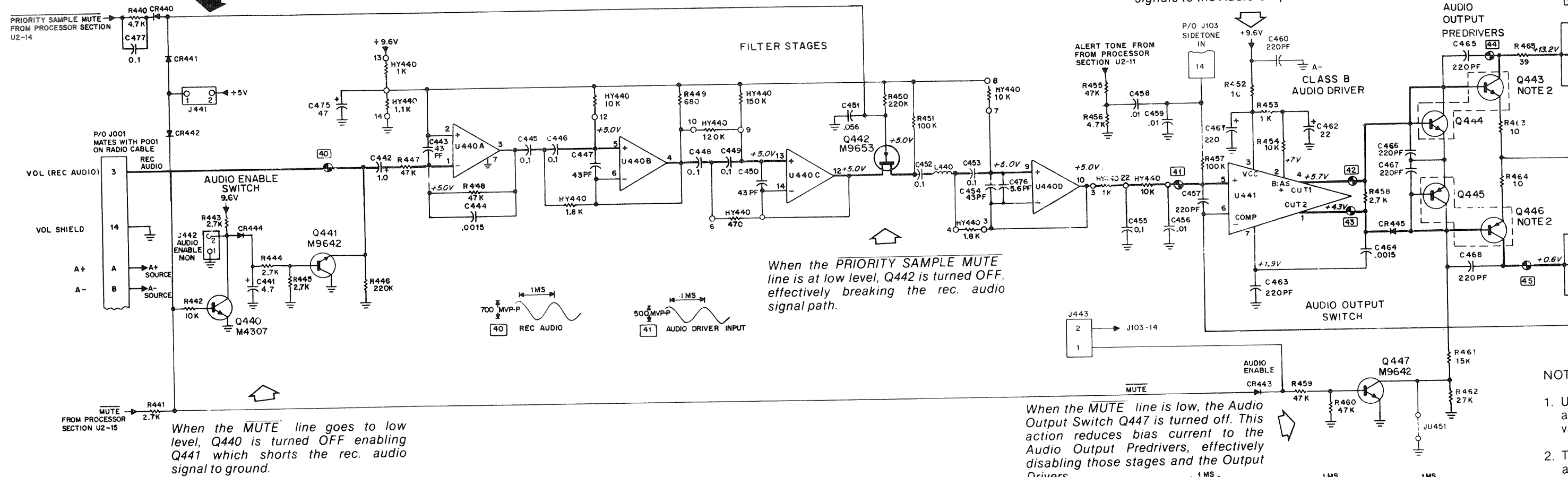
HLN4760B SCHEMATIC (AUDIO)

LEGEND	
	PRIMARY SIGNAL FLOW
	SWB (GND. REF.)
	A- (CHASSIS REF.)
	THEORY NOTE
	MAINTENANCE NOTE
	CONNECTION TO METERING SOCKET



Shorting J441-1 to J441-2 overrides muting circuits and unmutes audio.

The Class B Audio Driver U441 has two outputs and provides Class B input signals to the Audio Output Predrivers.



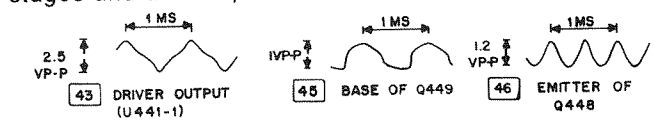
When the PRIORITY SAMPLE MUTE line is at low level, Q442 is turned OFF, effectively breaking the rec. audio signal path.

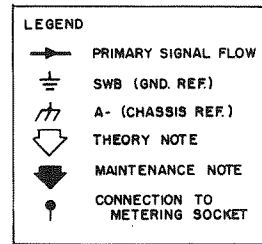
When the MUTE line goes to low level, Q440 is turned OFF enabling Q441 which shorts the rec. audio signal to ground.

When the MUTE line is low, the Audio Output Switch Q447 is turned off. This action reduces bias current to the Audio Output Predrivers, effectively disabling those stages and the Output Drivers.

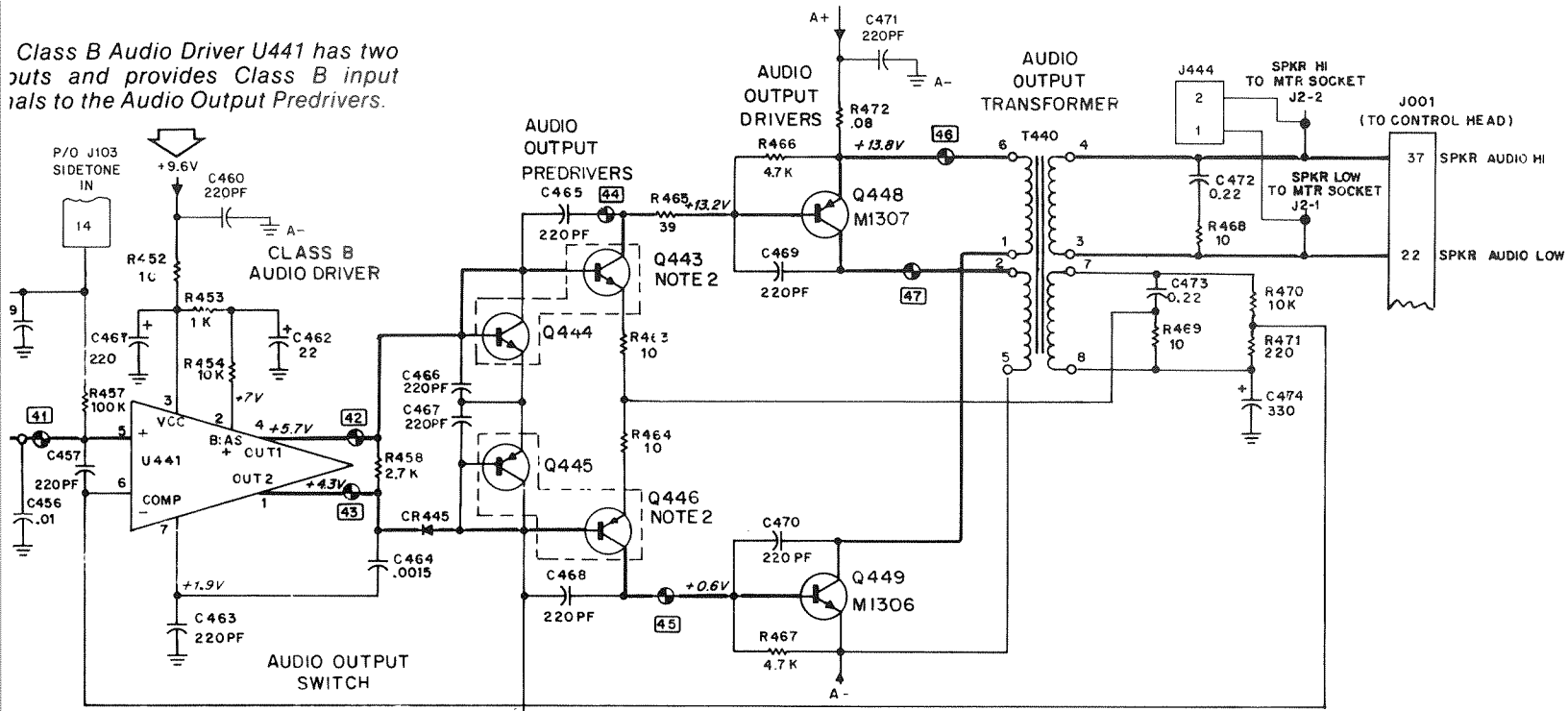
VOLTAGE NOTES

- A. DC voltages measured with 20k-ohm/volt multimeter referenced to B-. Supply voltage set for 13.8 V.
- B. 21 Indicates points at which ac voltages and waveforms are measured. Refer to circuit board detail.
- C. Receive voltages are taken with 1 mV received carrier deviated 3 kHz with a 1 kHz audio tone and VOLUME control set for 11 V across J001-32 and J001-22.

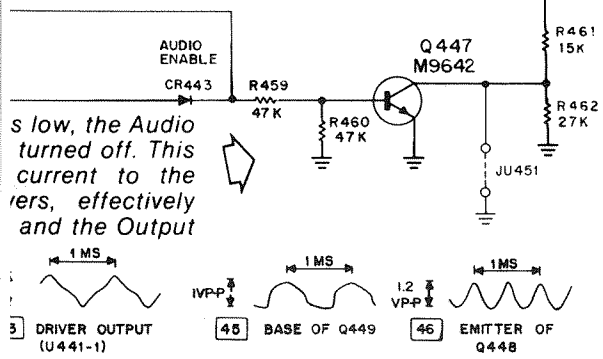




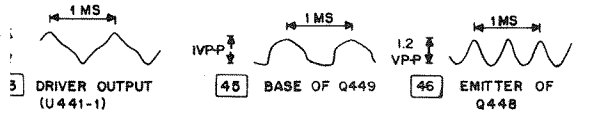
Class B Audio Driver U441 has two outputs and provides Class B input signals to the Audio Output Predrivers.



GEW-1069-A



When the Audio Enable is turned off, this current to the predrivers, effectively turning off the Output



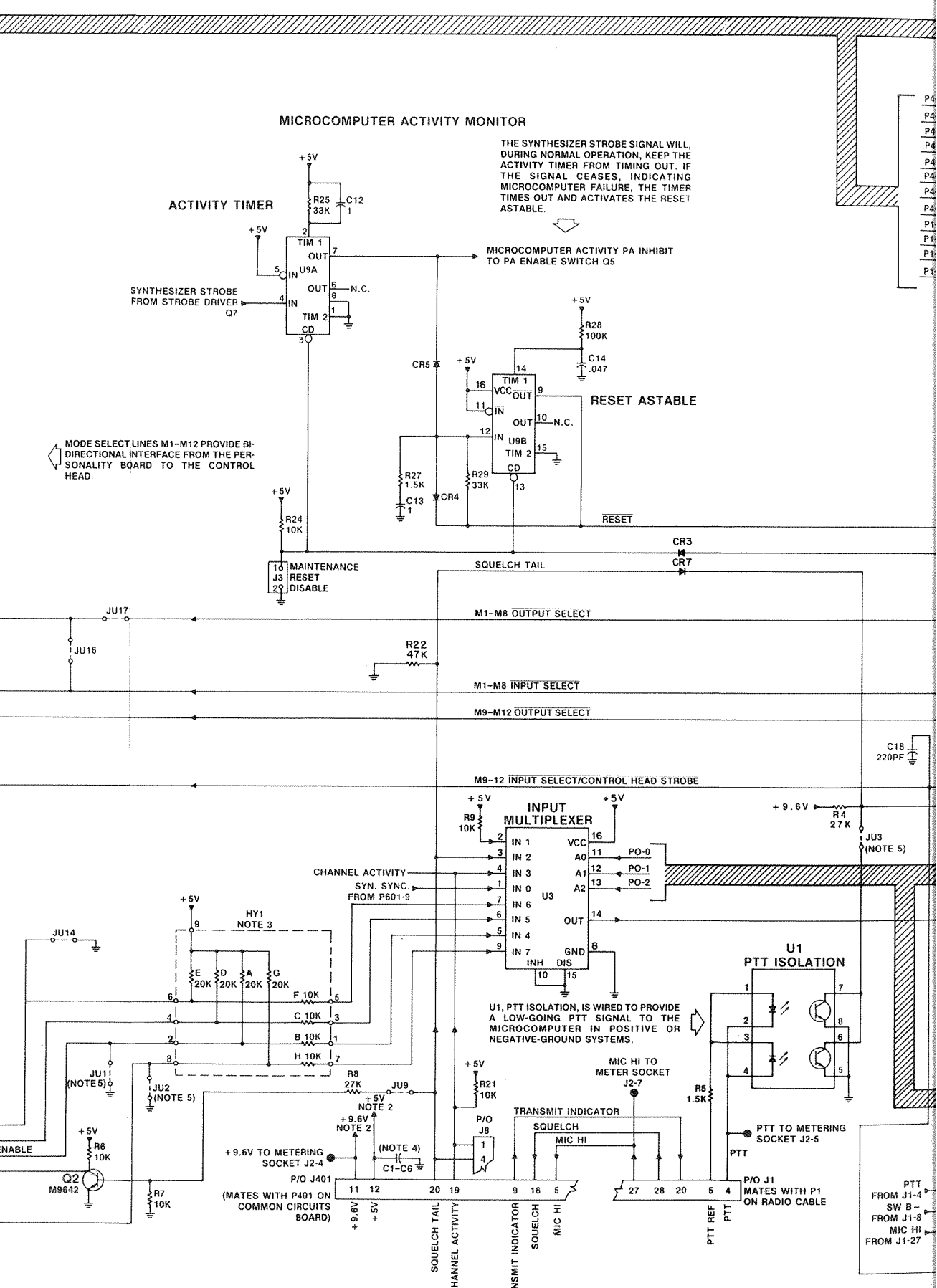
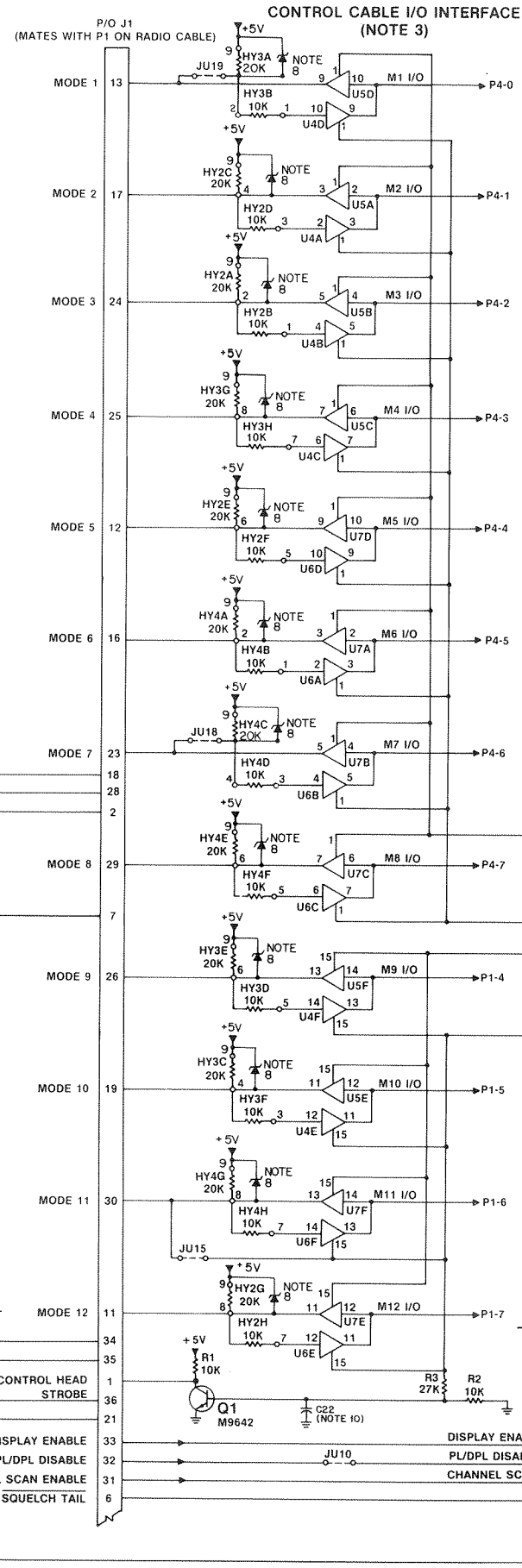
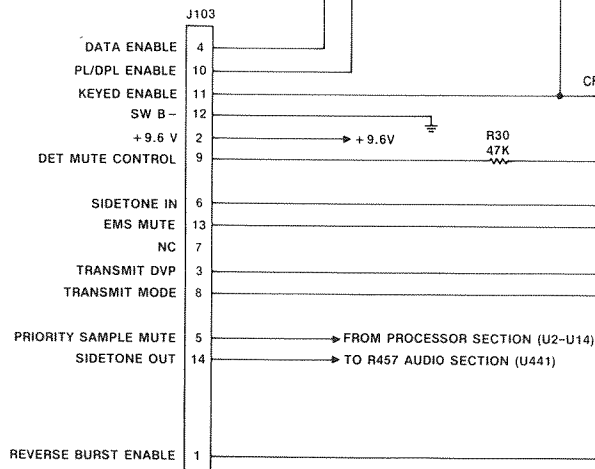
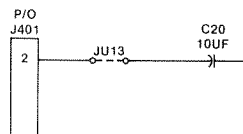
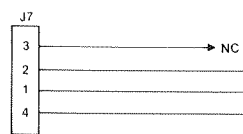
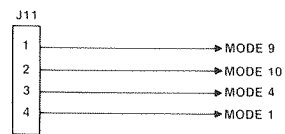
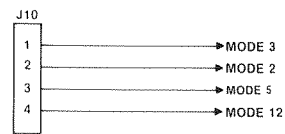
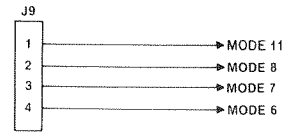
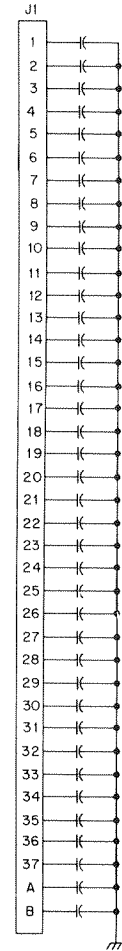
NOTES:

1. Unless otherwise stated, all resistor values are in ohms; all capacitor values are in microfarads; all inductor values are in microhenries.
2. The Audio Output Predrivers Q443/Q444 (01-80726D63) and Q445/Q446 (01-80726D64) are matched pairs. Q444 and Q445 are used as temperature compensation diodes and are attached to their associated transistors by a metal band to insure good thermal contact. These stages must be replaced intact (the transistor and its associated diode) to insure proper operation.
3. The processor section and the rec. audio output section of the Personality Board are shown on separate diagrams. All functional signals are shown on the appropriate diagram. The SW B+, SW B-, +9.6 V and +5 V input power connections are shown on the processor section diagram. The A+ and A- input power connections are shown on the rec. audio output section diagram.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF ±5% 100V (unless otherwise stated)		
C440	21-11015B05	220 pF ±10%
C441	23-11013D09	4.7, ±10%, 20V tantalum
C442	23-11013F57	1, ±20%, 35V tantalum
C443	21-11014H40	43 pF
C444	08-11051A02	.0015, 63V
C445,446	08-11051A13	.1, 63V
C447	21-11014H40	43 pF
C448,449	08-11051A13	.1, 63V
C450	21-11014H40	43 pF
C451	08-11044A13	.056, 63V
C452,453	08-11051A13	.1, 63V
C454	21-11014H40	43 pF
C455	08-11051A13	.1, 63V
C456	08-11051A07	.01, 63V
C457	21-11015B05	220 pF, ±10%
C458,459	08-11051A07	.01, 63V
C460	21-11015B05	220 pF, ±10%
C461	23-82747L06	220, ±10%, 25V, electrolytic
C462	23-11013C56	22, +20%, 15V tantalum
C463	21-11015B05	220 pF, ±10%
C464	08-11051A02	.0015, 63V
C465-471	21-11015B05	220 pF, ±10%
C472,473	08-11051A15	.22, 63V
C474	23-82747L01	330, +100,-10%, 20V, electrolytic
C475	23-84538G06	47, ±20%, 20V tantalum
C476	21-11014H19	5.6 pF
C477	08-11051A13	.1, 63V
diode (see note)		
CR440-445	48-11034A01	silicon
hybrid (see note)		
HY440	51-82142K07	resistor network
connector receptacle		
J401	28-83603M02	20 pin, male
J442	28-84318M06	2 pin, male
coil, RF		
L440	24-83961B07	choke, RF
transistor (see note)		
Q409	48-00869648	NPN
Q410	48-00869649	PNP
Q411	48-00869648	NPN
Q412	48-00869649	PNP
Q440	48-11043C07	NPN
Q441	48-11043C05	NPN
Q442	48-11043C37	NPN
Q447	48-11043C05	NPN
Q448	48-84413L07	NPN
Q449	48-84413L06	PNP
resistor, fixed, Ω ±5%, 1/4 watt (unless otherwise stated)		
R440	06-11009E45	680
R441	06-11009E59	2.7k
R442	06-11009E73	10k
R443	06-11009E59	2.7k
R444,445	06-11009A59	2.7k
R446	06-11009B06	220k
R447,448	06-11009A89	47k
R449	06-11009E45	680
R450	06-11009F06	220k
R451	06-11009E97	100k
R452	06-11009E01	10
R453	06-11009E49	1k
R454	06-11009E73	10k
R455	06-11009E89	47k
R456	06-11009E65	4.7k
R457	06-11009E97	100k
R458	06-11009E59	2.7k
R459,460	06-11009E89	47k
R461	06-11009E77	15k
R462	06-11009E83	27k
R463,464	06-11009E01	10
R465	06-11009E15	39
R466,467	06-11009E65	4.7k
R468	06-11009A01	10
R469	06-11009E01	10
R470	06-11009E73	10k
R471	06-11009E33	220
R472	17-82350A14	.08, ±20, 1W
transformer		
T440	25-84083B03	audio output
integrated circuit (see note)		
U440	51-80067C04	quad op-amp
U441	51-84621K14	audio driver
mechanical parts		
	75-80144H01	insulator (461-474), 2 each

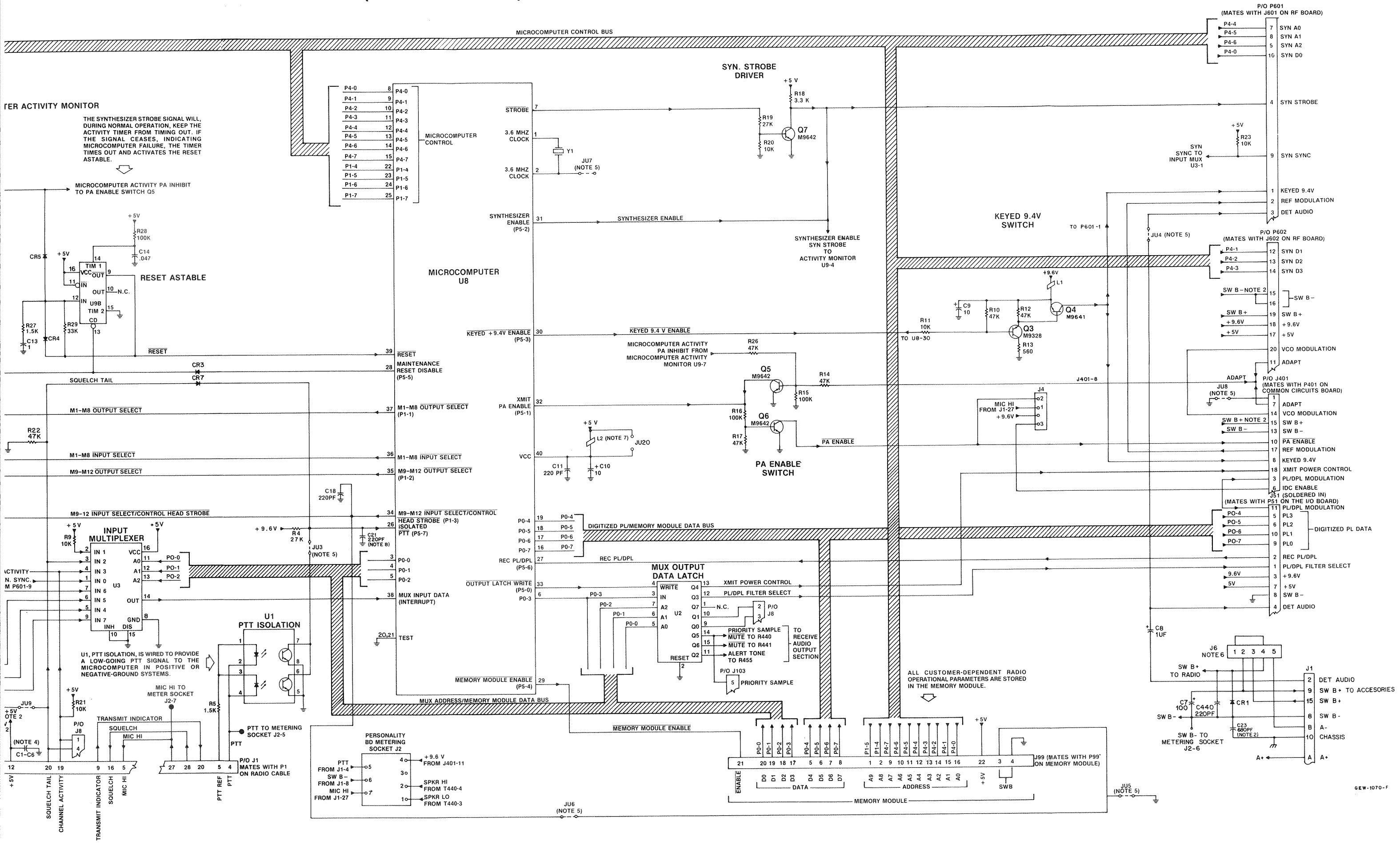
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

0180746T79
(ALL CAPACITORS
ARE 470pF CHIP)



PTT
FROM J1-4
SW B -
FROM J1-8
MIC HI
FROM J1-27

HLN4760B SCHEMATIC (MICROCOMPUTER)



PER ACTIVITY MONITOR
 THE SYNTHESIZER STROBE SIGNAL WILL, DURING NORMAL OPERATION, KEEP THE ACTIVITY TIMER FROM TIMING OUT. IF THE SIGNAL CEASES, INDICATING MICROCOMPUTER FAILURE, THE TIMER TIMES OUT AND ACTIVATES THE RESET ASTABLE.

MICROCOMPUTER ACTIVITY PA INHIBIT TO PA ENABLE SWITCH Q5

RESET ASTABLE

U1, PTT ISOLATION, IS WIRED TO PROVIDE A LOW-GOING PTT SIGNAL TO THE MICROCOMPUTER IN POSITIVE OR NEGATIVE-GROUND SYSTEMS.

U1, PTT ISOLATION, IS WIRED TO PROVIDE A LOW-GOING PTT SIGNAL TO THE MICROCOMPUTER IN POSITIVE OR NEGATIVE-GROUND SYSTEMS.

U1, PTT ISOLATION, IS WIRED TO PROVIDE A LOW-GOING PTT SIGNAL TO THE MICROCOMPUTER IN POSITIVE OR NEGATIVE-GROUND SYSTEMS.

SYN. STROBE DRIVER

KEYED 9.4V SWITCH

PA ENABLE SWITCH

MUX OUTPUT DATA LATCH

PERSONALITY BD METERING SOCKET J2

- NOTES**
- UNLESS OTHERWISE SPECIFIED, ALL COMPONENTS ARE TO BE PURCHASED FROM THE MANUFACTURER'S RECOMMENDED SOURCE.
 - THE MICROCOMPUTER IS A SEPARATE UNIT AND THE MICROCOMPUTER ACTIVITY MONITOR IS A SEPARATE UNIT.
 - RESISTORS ARE TO BE PURCHASED FROM THE MANUFACTURER'S RECOMMENDED SOURCE.
 - CAPACITORS ARE TO BE PURCHASED FROM THE MANUFACTURER'S RECOMMENDED SOURCE.
 - REFER TO THE MICROCOMPUTER ACTIVITY MONITOR SCHEMATIC FOR THE LOCATION OF THE MICROCOMPUTER ACTIVITY MONITOR.
 - NORMAL OPERATION OF THE MICROCOMPUTER ACTIVITY MONITOR IS DEPENDENT ON THE MICROCOMPUTER ACTIVITY MONITOR BEING OPERATIONAL.
 - ON LOW-BATTERY OPERATION, THE MICROCOMPUTER ACTIVITY MONITOR WILL INDICATE A LOW-BATTERY CONDITION.
 - THE MICROCOMPUTER ACTIVITY MONITOR IS A SEPARATE UNIT AND THE MICROCOMPUTER ACTIVITY MONITOR IS A SEPARATE UNIT.
 - COMPONENTS ARE TO BE PURCHASED FROM THE MANUFACTURER'S RECOMMENDED SOURCE.
 - SEE PARTS LIST FOR THE LOCATION OF THE MICROCOMPUTER ACTIVITY MONITOR.

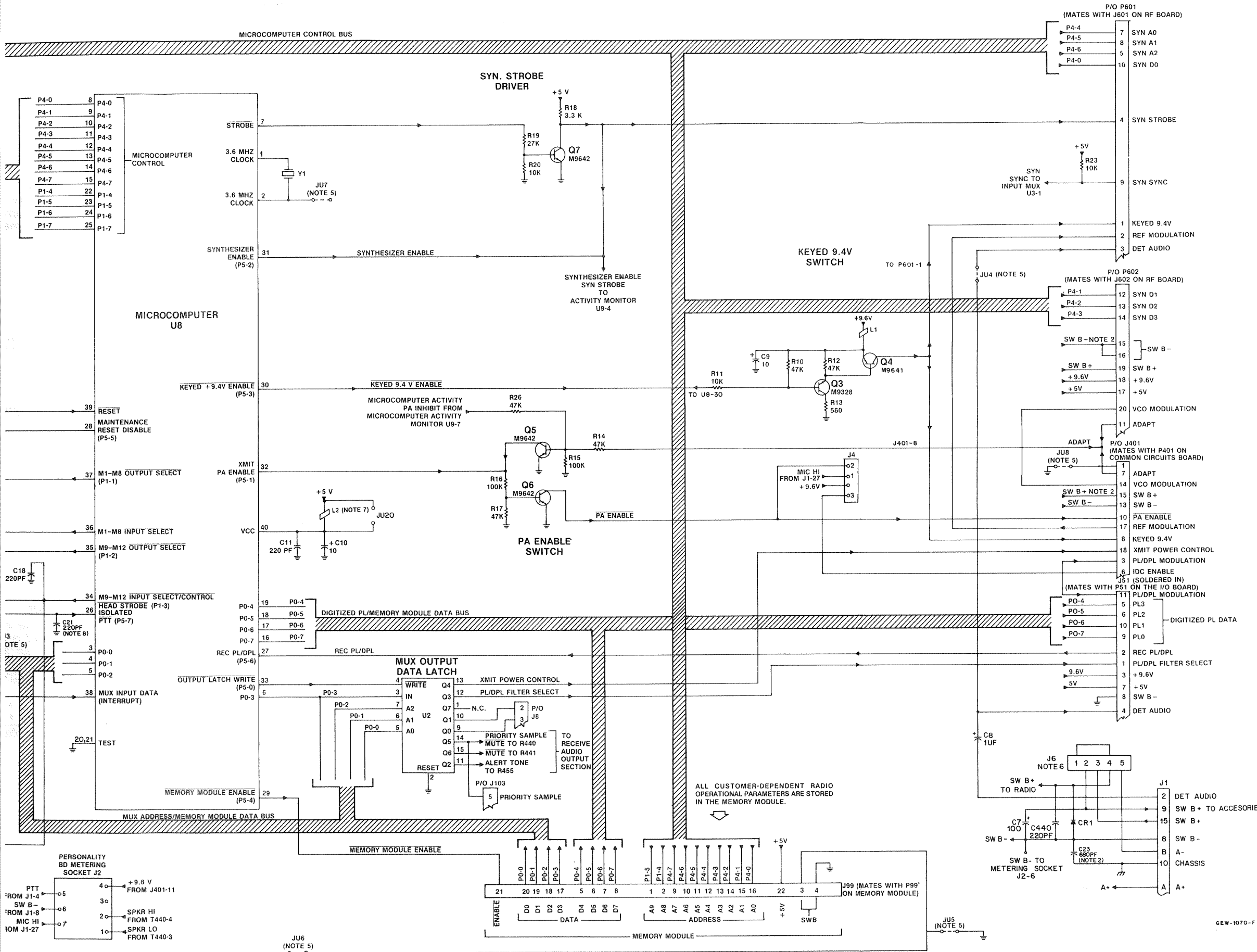
JUMPER LIST

JUMPER NUMBER	DESCRIPTION
JU1	SW B -
JU2	SW B +
JU3	SW B -
JU4	SW B +
JU5	SW B -
JU6	SW B +
JU7	SW B -
JU8	SW B +
JU9	SW B -
JU10	SW B +
JU11	SW B -
JU12	SW B +
JU13	SW B -
JU14	SW B +
JU15	SW B -
JU16	SW B +
JU17	SW B -
JU18	SW B +
JU19	SW B -
JU451	SW B +
JU20	SW B -

REF. NUMBER

REF. NUMBER	DESCRIPTION
U1	PTT ISOLATION
U2	MUX OUTPUT DATA LATCH
U3	INPUT MULTIPLEXER
U4	RESET ASTABLE
U5	ACTIVITY MONITOR
U6	PERSONALITY BD METERING SOCKET
U7	ACTIVITY MONITOR
U8	ACTIVITY MONITOR
U9	ACTIVITY MONITOR

IATIC (MICROCOMPUTER)



- NOTES:**
- UNLESS OTHERWISE STATED, ALL RESISTOR VALUES ARE IN OHMS, ALL CAPACITOR VALUES ARE IN MICROFARADS, AND ALL INDUCTOR VALUES ARE IN MICROHENRIES
 - THE MICROCOMPUTER AND RECEIVE AUDIO OUTPUT SECTIONS OF THE PERSONALITY BOARD ARE SHOWN ON SEPARATE DIAGRAMS. THE SW B+, SW B-, +9.6V SUPPLY AND THE +5V SUPPLY INPUT CONNECTIONS ARE SHOWN ON THE MICROCOMPUTER SECTION DIAGRAM AND THE A+ AND A- INPUT CONNECTIONS ARE SHOWN ON THE RECEIVE AUDIO OUTPUT SECTION DIAGRAM.
 - RESISTORS LABELED HY1-HY4 ARE PART OF FOUR HYBRID RESISTOR NETWORKS, THESE RESISTORS ARE NOT INDIVIDUALLY REPLACEABLE, THE ENTIRE HYBRID MUST BE REPLACED IF ANY RESISTOR WITHIN THE HYBRID FAILS
 - CAPACITORS C1 THROUGH C6 (.01 μ F 5%, 63V PART #08-11051A07) ARE BYPASS CAPACITORS FOR INTEGRATED CIRCUITS U2 THROUGH U7 RESPECTIVELY.
 - REFER TO JUMPER TABLE.
 - NORMAL POSITION OF JUMPER PLUGS CONNECT PIN 1 TO 2 AND PIN 3 TO 4.
 - ON LOW-BAND RADIOS, JUMPER BYPASSES L2.
 - THE DIODE PART OF HYBRID ASSEMBLIES (HY2-4) IS USED IN LATER MODELS ONLY
 - COMPONENT(S) USED ON HLN4915A ONLY
 - SEE PARTS LIST FOR VALUE OF COMPONENT

JUMPER	DESCRIPTION	TYPE	STANDARD	HHCH
JU1	SCAN ENABLE	JUMPER	IN	OUT
JU2	PL REVERSE BURST	JUMPER	IN*	IN*
JU3	SPEC CUST APP	JUMPER	IN	IN
JU4	SPEC CUST APP	JUMPER	IN	IN
JU5	OUT FOR <63 MODES	JUMPER	IN	IN
JU6	IN FOR <63 MODES	JUMPER	OUT	OUT
JU7	NOT USED	—	—	—
JU8	IDC DATA INPUT	JUMPER	IN*	IN*
JU9	SQUELCH TAIL	JUMPER	IN	IN
JU10	PL/DPL DISABLE	JUMPER	IN	IN
JU11	DET MUTE CTRL	JUMPER	OUT*	OUT*
JU12	DVP MODULATION	JUMPER	OUT*	OUT*
JU13	DVP MODULATION	JUMPER	IN	IN
JU14	DISPLAY ENABLE	JUMPER	OUT	IN
JU15	CTRL HD STROBE	PLUG	OUT	IN
JU16	INPUT STRB	PLUG	OUT	IN
JU17	OUTPUT STRB	JUMPER	IN	OUT
JU18	DISBL	JUMPER	IN	OUT
JU19	HY3 PIN 2 PULLUP	JUMPER	IN	OUT
JU20	HY4 PIN 4 PULLUP	JUMPER	IN	OUT
JU451	PA CURRENT DISABLE	JUMPER	OUT*	OUT*
JU20	LB JUMPER	PLUG	OUT	OUT

* = REVERSE FOR DVP SYSTEMS

REF. NUMBER	TYPE	DESCRIPTION	V _{CC} (+5V)	GROUND (SW B-)
U1	D74	OPTO-ISOLATOR	—	—
U2	M8473	8-BIT ADDRESSABLE LATCH	16	8
U3	M8475	8-CHANNEL DATA SELECTOR	16	8
*U4, 6	M8474	HEX BUFFER (TRI-STATE)	16	8
*U5, 7	M6177	HEX BUFFER (TRI-STATE)	16	8
U8	M0756	MICROCOMPUTER	40	20
U9	M8453	DUAL MONOSTABLE MULTIVIBRATOR	16	8

*REMOVE FOR HHCH ACCESSORIES

parts list

HLN4760B Personality Board (Microcomputer section)

MXW-5118-A

MXW-5118-A (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, μF $\pm 10\%$ 100V (unless otherwise stated)		
C1-6	08-11051A07	.01, $\pm 5\%$, 63V
C7	23-84669A08	100, +150, -10%, 25V
C8-10	23-11013F57	1, .01, $\pm 20\%$, 35V tantalum
C11	21-11015B05	220 pF
C12,13	23-11013F57	1, .01, $\pm 20\%$, 35V tantalum
C14	08-11051A11	.047, $\pm 5\%$, 63V
C18	21-11015B05	220 pF
C19	08-11051A07	.01, $\pm 5\%$, 63V
C20	23-11013F57	1, .01, $\pm 20\%$, 35V tantalum
C21,22	21-11015B05	220 pF
diode (see note)		
CR1	48-80236E07	silicon
CR3	48-82921G01	germanium
CR4-7	48-11034A01	silicon
hybrid (see note)		
HY1	51-82142K10	resistor network
HY2-4	01-80738T03	ESD network
connector receptacle		
J2	09-84207B01	7 contact female
J3	28-84318M08	4 pin male
J4	28-84318M07	3 pin male
J6	28-84318M23	5 pin male
J7	28-84318M08	4 pin male
J14-16	28-84318M06	2 pin male
J20	28-84318M06	22 pin male
J22	09-80269B01	6 contact, female
J33	09-80269B01	6 contact, female
J44	09-80269B01	6 contact, female
J55	09-80269B01	6 contact, female
J66	09-80269B01	6 contact, female
J77	09-80269B01	6 contact, female
J88	09-80269B04	40 contact, female
J99	28-82622L03	22 pin, male
jumper		
JU1-3	06-11009F23	0 ohm
JU4	06-11009B23	0 ohm
JU5	06-11009F23	0 ohm
JU8	06-11009F23	0 ohm
JU9	06-11009B23	0 ohm
JU10	06-11009F23	0 ohm
JU13	06-11009B23	0 ohm
JU17-19	06-11009F23	0 ohm
coil, RF		
L1	24-80036A02	choke, .5 turn
L2	24-83977B03	orange, 2.5 turns
connector plug		
P6	09-84728L01	socket connector
P6	09-84728L01	socket connector
P14	09-84728L01	socket connector
P20	09-84728L01	socket connector
P601,602	28-82647K02	10 pin
transistor (see note)		
Q1,2	48-11043C05	NPN
Q3	48-11043C26	PNP
Q4	48-00869641	PNP
Q5-7	48-11043C05	NPN
resistor, fixed, Ω $\pm 5\%$, 1/4 watt (unless otherwise stated)		
R1,R2	06-11009E73	10k
R3	06-11009A83	27k
R4	06-11009E83	27k
R5	06-11009E53	1.5k
R6,7	06-11009A73	10k
R8	06-11009A83	27k
R9	06-11009A73	10k
R10	06-11009A89	47k
R11	06-11009A73	10k
R12	06-11009A89	47k
R13	06-11009A43	560
R14	06-11009A89	47k
R15	06-11009E97	100k
R16	06-11009A97	100k
R17	06-11009A89	47k
R18	06-11009A61	3.3k
R19	06-11009A83	27k
R20,21	06-11009A73	10k
R22	06-11009A89	47k
R23,24	06-11009A73	10k
R25	06-11009A85	33k
R26	06-11009A89	47k
R27	06-11009A53	1.5k
R28	06-11009A97	100k
R29	06-11009A85	33k
R30	06-11009A65	4.7k
R31	18-80087E08	10k, ± 20 , variable
integrated circuit (see note)		
U1	51-84621K48	dual opto-isolator
U2	51-84887K92	latch, 8 BIT
U3	51-84887K93	8-channel selector

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
U4	51-82884L74	hex non-inverting driver
U5	51-84561L77	hex non-inverting driver
U6	51-82884L74	hex non-inverting driver
U7	51-84561L77	hex non-inverting driver
U8	51-97009C03	microcomputer 4Kx8 ROM
U9	51-84887K53	multivibrator dual monostable
crystal (see note)		
Y1	48-82611M10	crystal
mechanical parts		
	75-05295B01	crystal base
	46-83821M01	stud guide, PROM (2 used)
	42-82891K01	transistor clip (2 used)
	03-10943M09	tapping screw (2 used)
	03-10911A11	machine screw (2 used)
	04-84180C01	wash should (2 used)
	14-83820M02	heat conductive insulator (2 used)
	26-83498M01	heat sink

10/25/88

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

HLN4760B PERSONALITY BOARD

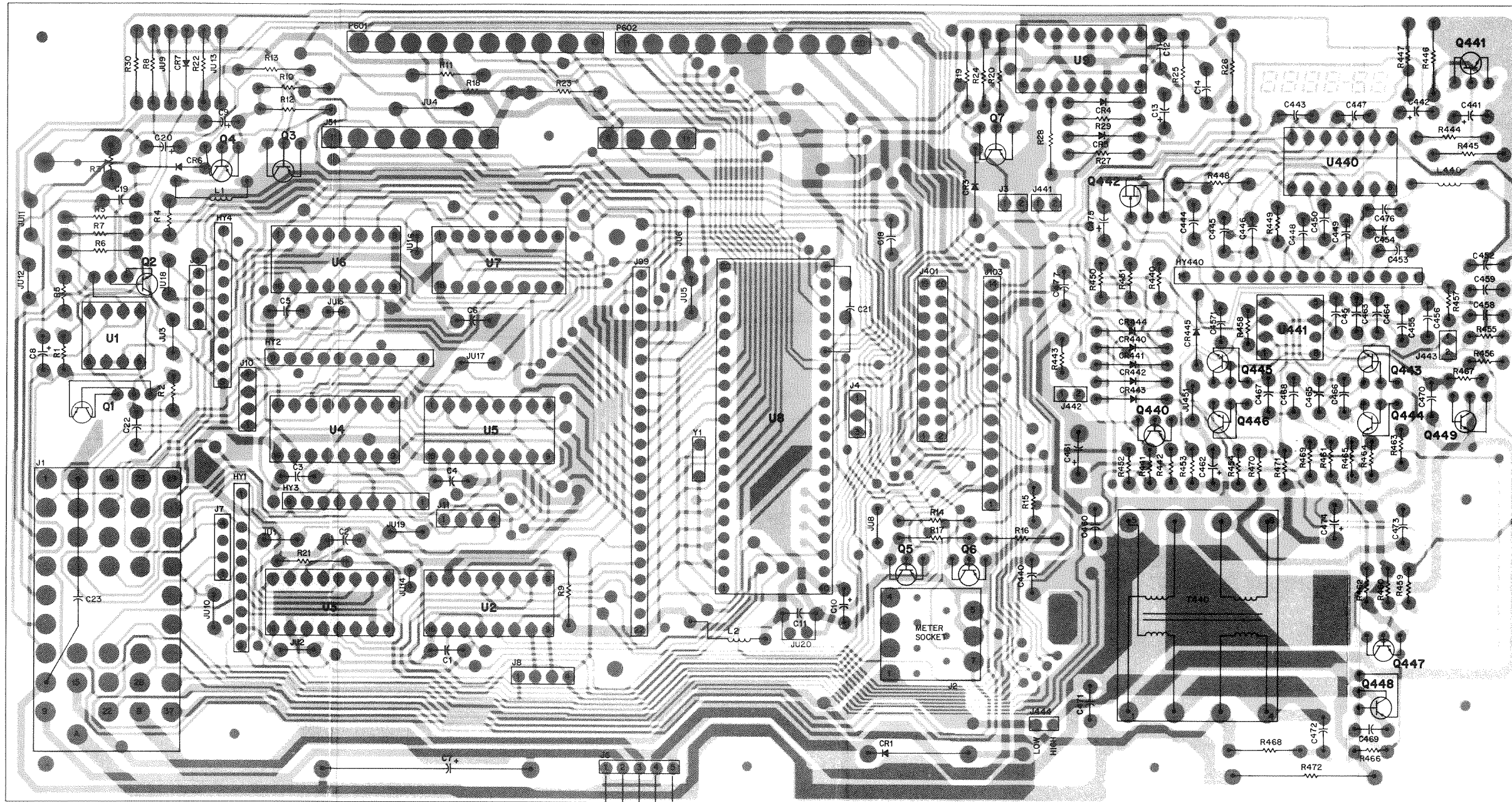
MXW-5118-A (2)

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ROM
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ated circuit devices by

KEYED 9.6V
REF OSC MOD
DET OUTPUT
SYN STROBE
A2
3.6 MHz CLOCK
A0
A1
SYNTH SYNC
D0
SYN ADAPT
D1
D2
D3
SW B-
SW B-
+5V
R 9.6V
SW B+
VCO MOD



SHOWN FROM SOLDER SIDE

SW B+ TO RADIO
SW B+ TO ACC
BATTERY HOT (GREEN)
SW B+ TO RADIO
GND

SOLDER SIDE GEW-1038-A
COMPONENT SIDE GEW-1039-A
OVERLAY GEW-1040-B

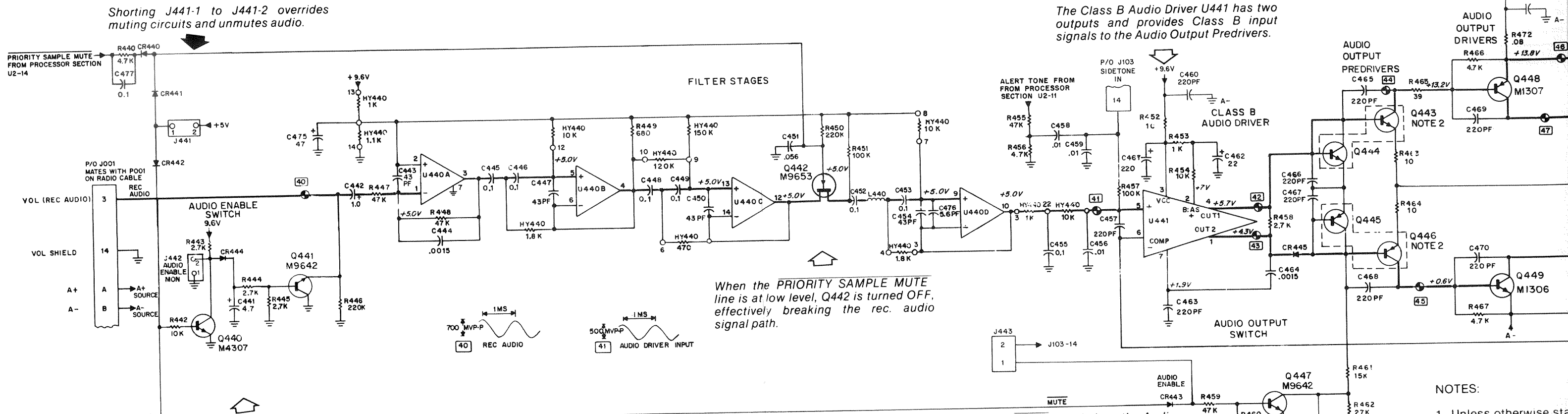
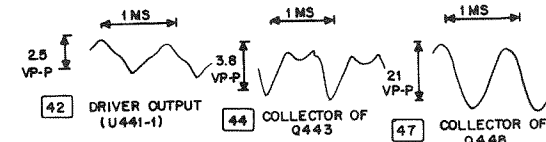
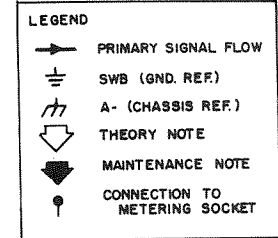
J401	
DATA DISABLE	1 11 REC 9.6 V
DATA	2 12 +5 V
PL/DPL	3 13 SW B-
	4 14 VCO MOD
MIC HI	5 15 SW B+
IDC DISABLE	6 16 SQUELCH
SYN ADAPT	7 17 REF OSC MOD
KEYED 9.6 V	8 18 XMIT PWR CTRL
XMIT IND	9 19 CHAN ACT
PA ENABLE	10 20 SQ TAIL

J99	
A9	1 12 A4
A8	2 13 A3
MEM ENABLE	3 14 A2
GND	4 15 A1
D4	5 16 A0
D5	6 17 D3
D6	7 18 D2
D7	8 19 D1
A7	9 20 D0
A6	10 21 MEM ENABLE
A5	11 22 +5 V

J1	
CTRL HEAD STROBE	1 21 SP
GATED DET AUD	2 22 SPKR LO
VOL (REC AUD)	3 23 MODE 7
PTT	4 24 MODE 3
IGN/BATT	5 25 MODE 4
BUSY IND	6 26 MODE 9 (FUTURE)
SP	7 27 MIC HI
SW B-	8 28 SQUELCH
SW B+	9 29 MODE 8
CHAS GND	10 30 MODE 11 (FUTURE)
MODE 12 (FUTURE)	11 31 CHAN SCAN
MODE 5	12 32 PL/DPL DISABLE
MODE 1	13 33 SYS 90/X
SHLD GND	14 34 SP
SW B+	15 35 SP
MODE 6	16 36 SP
MODE 2	17 37 SPKR HI
SP	18 A A+
MODE 10 (FUTURE)	19 B A-
XMIT IND	20

HLN4760C PERSONALITY BOARD

HLN4760C SCHEMATIC (AUDIO)



Shorting J441-1 to J441-2 overrides muting circuits and unmutes audio.

The Class B Audio Driver U441 has two outputs and provides Class B input signals to the Audio Output Predrivers.

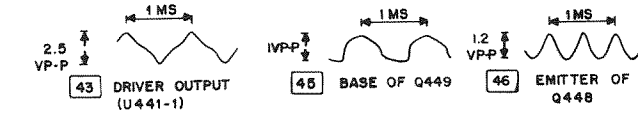
When the PRIORITY SAMPLE MUTE line is at low level, Q442 is turned OFF, effectively breaking the rec. audio signal path.

When the MUTE line is low, the Audio Output Switch Q447 is turned off. This action reduces bias current to the Audio Output Predrivers, effectively disabling those stages and the Output Drivers.

When the MUTE line goes to low level, Q440 is turned OFF enabling Q441 which shorts the rec. audio signal to ground.

VOLTAGE NOTES

- A. DC voltages measured with 20k-ohm/volt multimeter referenced to B-. Supply voltage set for 13.8 V.
- B. [21] Indicates points at which ac voltages and waveforms are measured. Refer to circuit board detail.
- C. Receive voltages are taken with 1 mV received carrier deviated 3 kHz with a 1 kHz audio tone and VOLUME control set for 11 V across J001-32 and J001-22.



NOTES:

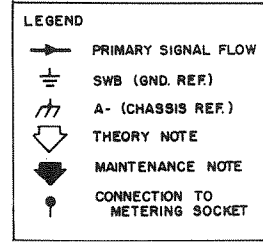
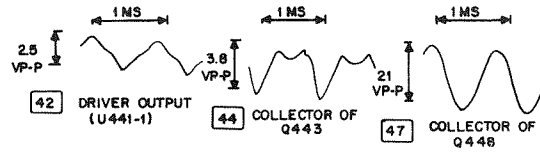
1. Unless otherwise stated all capacitor values are in microhenry.
2. The Audio Output Predrivers Q443/Q444 and Q445/Q446 (01-807) are used as diodes and are attached to the chassis by a metal band to insure proper contact. The diodes must be replaced with the same type (associated diode) to insure proper operation.
3. The processor section of the Personality Board is shown in the Processor Board diagrams. All function block diagrams are shown in the appropriate diagram. The +5 V input power connections are shown in the Processor section diagram.

HLN4760C SCHEMATIC (AUDIO)

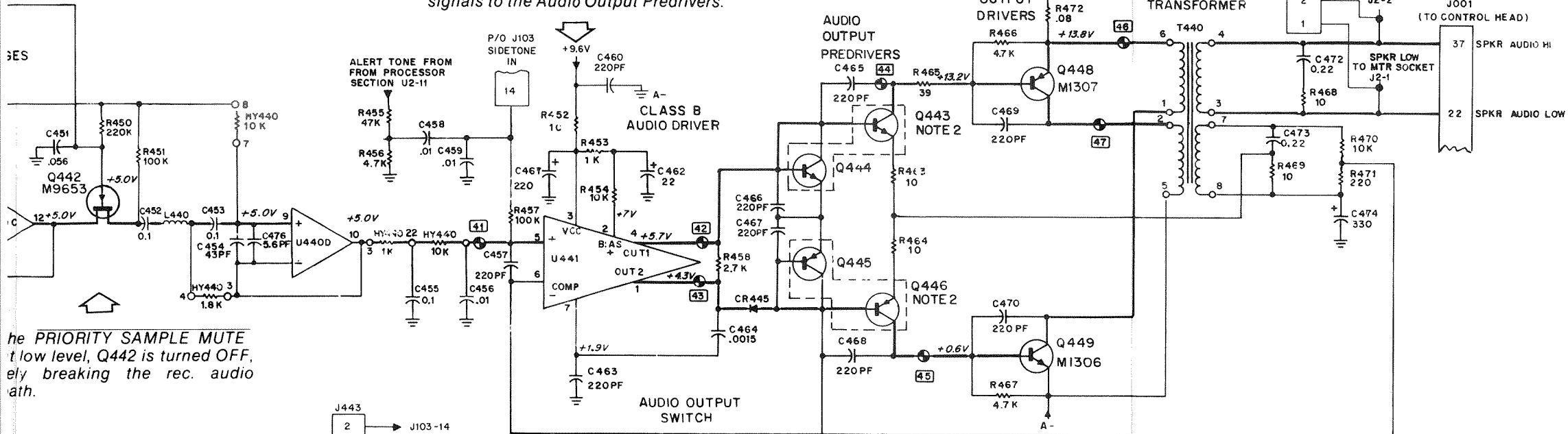
parts list

HLN4760C Personality Board (Audio Section)

MXW-5987-O

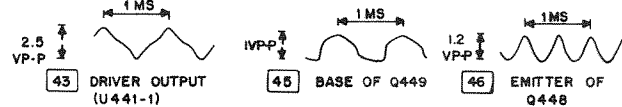


The Class B Audio Driver U441 has two outputs and provides Class B input signals to the Audio Output Predrivers.



When the PRIORITY SAMPLE MUTE is at low level, Q442 is turned OFF, thereby breaking the rec. audio path.

When the MUTE line is low, the Audio Output Switch Q447 is turned off. This action reduces bias current to the Audio Output Predrivers, effectively disabling those stages and the Output Drivers.



NOTES:

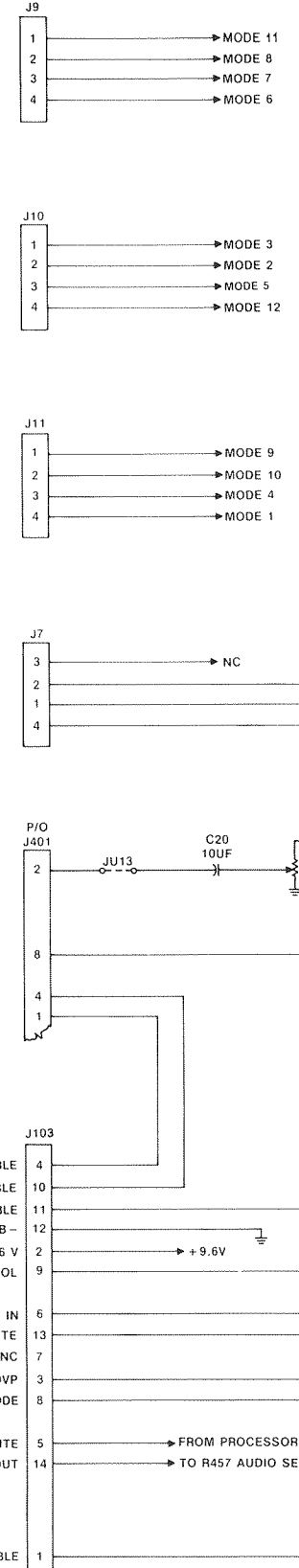
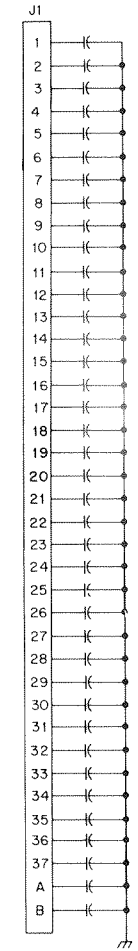
1. Unless otherwise stated, all resistor values are in ohms; all capacitor values are in microfarads; all inductor values are in microhenries.
2. The Audio Output Predrivers Q443/Q444 (01-80726D63) and Q445/Q446 (01-80726D64) are matched pairs. Q444 and Q445 are used as temperature compensation diodes and are attached to their associated transistors by a metal band to insure good thermal contact. These stages must be replaced intact (the transistor and its associated diode) to insure proper operation.
3. The processor section and the rec. audio output section of the Personality Board are shown on separate diagrams. All functional signals are shown on the appropriate diagram. The SW B+, SW B-, +9.6 V and +5 V input power connections are shown on the processor section diagram. The A+ and A- input power connections are shown on the rec. audio output section diagram.

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF ±5% 100V (unless otherwise stated)		
C440	21-11015B05	220 pF ±10%
C441	23-11054N08	4.7, ±10%, 35V tantalum
C442	23-11054L06	1, ±20%, 35V tantalum
C443	21-11014H40	43 pF
C444	08-11051A02	.0015, 63V
C445,446	08-11051A13	.1, 63V
C447	21-11014H40	43 pF
C448,449	08-11051A13	.1, 63V
C450	21-11014H40	43 pF
C451	08-11044A13	.056, 63V
C452,453	08-11051A13	.1, 63V
C454	21-11014H40	43 pF
C455	08-11051A13	.1, 63V
C456	08-11051A07	.01, 63V
C457	21-11015B05	220 pF, ±10%
C458,459	08-11051A07	.01, 63V
C460	21-11015B05	220 pF, ±10%
C461	23-82747L06	220, ±10%, 25V, electrolytic
C462	23-11054F10	22, ±10%, 15V tantalum
C463	21-11015B05	220 pF, ±10%
C464	08-11051A02	.0015, 63V
C465-471	21-11015B05	220 pF, ±10%
C472,473	08-11051A15	.22, 63V
C474	23-82747L01	330, +100, -10%, 20V, electrolytic
C475	23-84538G06	47, ±20%, 20V tantalum
C476	21-11014H19	5.6 pF
C477	08-11051A13	.1, 63V
diode (see note)		
CR440-445	48-11034A01	silicon
hybrid (see note)		
HY440	51-82142K07	resistor network
connector receptacle		
J401	28-83603M02	20 pin, male
J442	28-84318M06	2 pin, male
coil, RF		
L440	24-83961B07	choke, RF
transistor (see note)		
Q409	48-00869648	NPN
Q410	48-00869649	PNP
Q411	48-00869648	NPN
Q412	48-00869649	PNP
Q440	48-11043C07	NPN
Q441	48-11043C05	NPN
Q442	48-11043C37	NPN
Q447	48-11043C05	NPN
Q448	48-84413L07	NPN
Q449	48-84413L06	PNP
resistor, fixed, Ω ±5%, 1/4 watt (unless otherwise stated)		
R440	06-11009E45	680
R441	06-11009E59	2.7k
R442	06-11009E73	10k
R443	06-11009E59	2.7k
R444,445	06-11009A59	2.7k
R446	06-11009B06	220k
R447,448	06-11009A89	47k
R449	06-11009E45	680
R450	06-11009F06	220k
R451	06-11009E97	100k
R452	06-11009E01	10
R453	06-11009E49	1k
R454	06-11009E73	10k
R455	06-11009E89	47k
R456	06-11009E65	4.7k
R457	06-11009E97	100k
R458	06-11009E59	2.7k
R459,460	06-11009E89	47k
R461	06-11009E77	15k
R462	06-11009E83	27k
R463,464	06-11009E01	10
R465	06-11009E15	39
R466,467	06-11009E65	4.7k
R468	06-11009A01	10
R469	06-11009E01	10
R470	06-11009E73	10k
R471	06-11009E33	220
R472	17-82350A14	.08, ±20, 1W
transformer		
T440	25-84083B03	audio output
integrated circuit (see note)		
U440	51-80067C04	quad op-amp
U441	51-84621K14	audio driver
mechanical parts		
	75-80144H01	insulator (461-474), 2 each

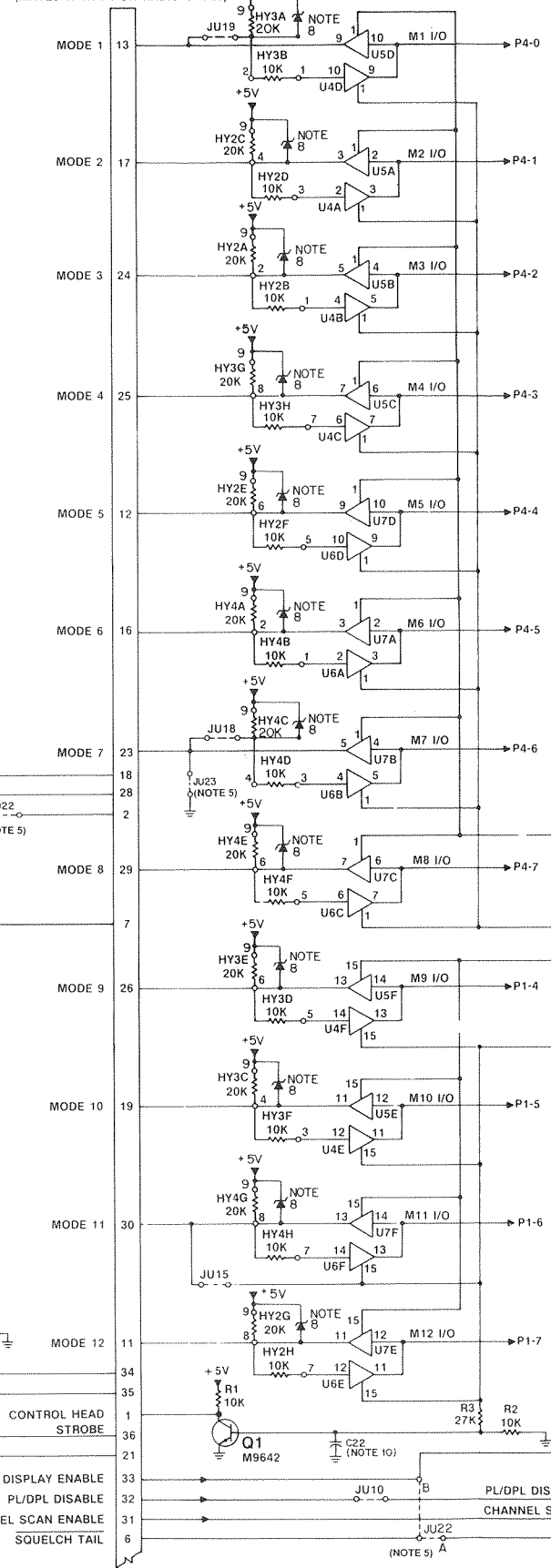
10/25/88
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

HLN4760C SCHEMATIC (MICRO)

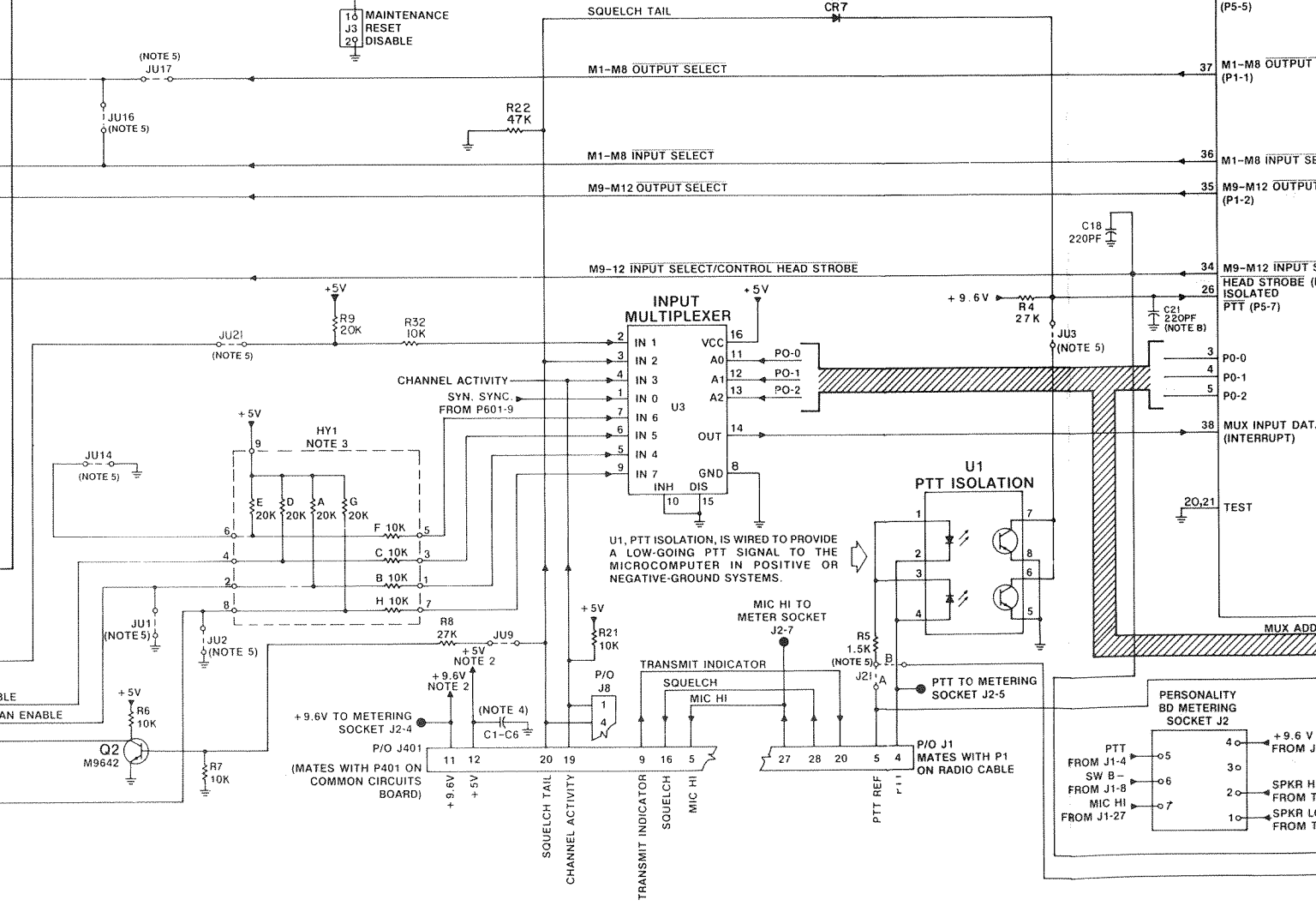
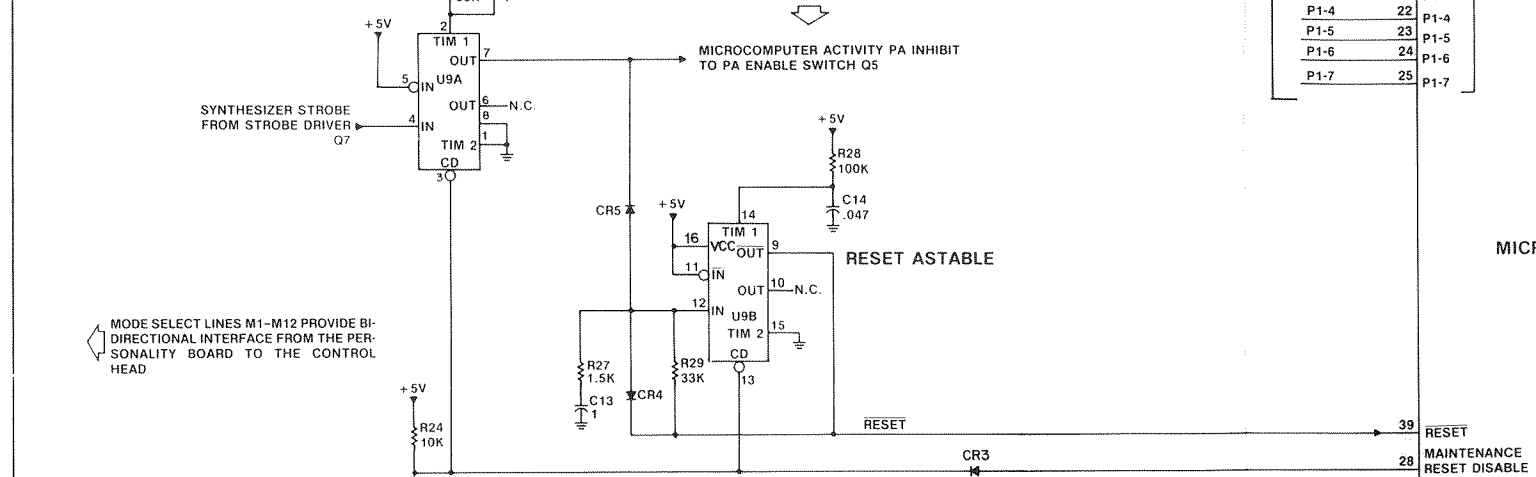
0180746T79
 (ALL CAPACITORS
 ARE 470pF CHIP)



CONTROL CABLE I/O INTERFACE (NOTE 3)



MICROCOMPUTER ACTIVITY MONITOR



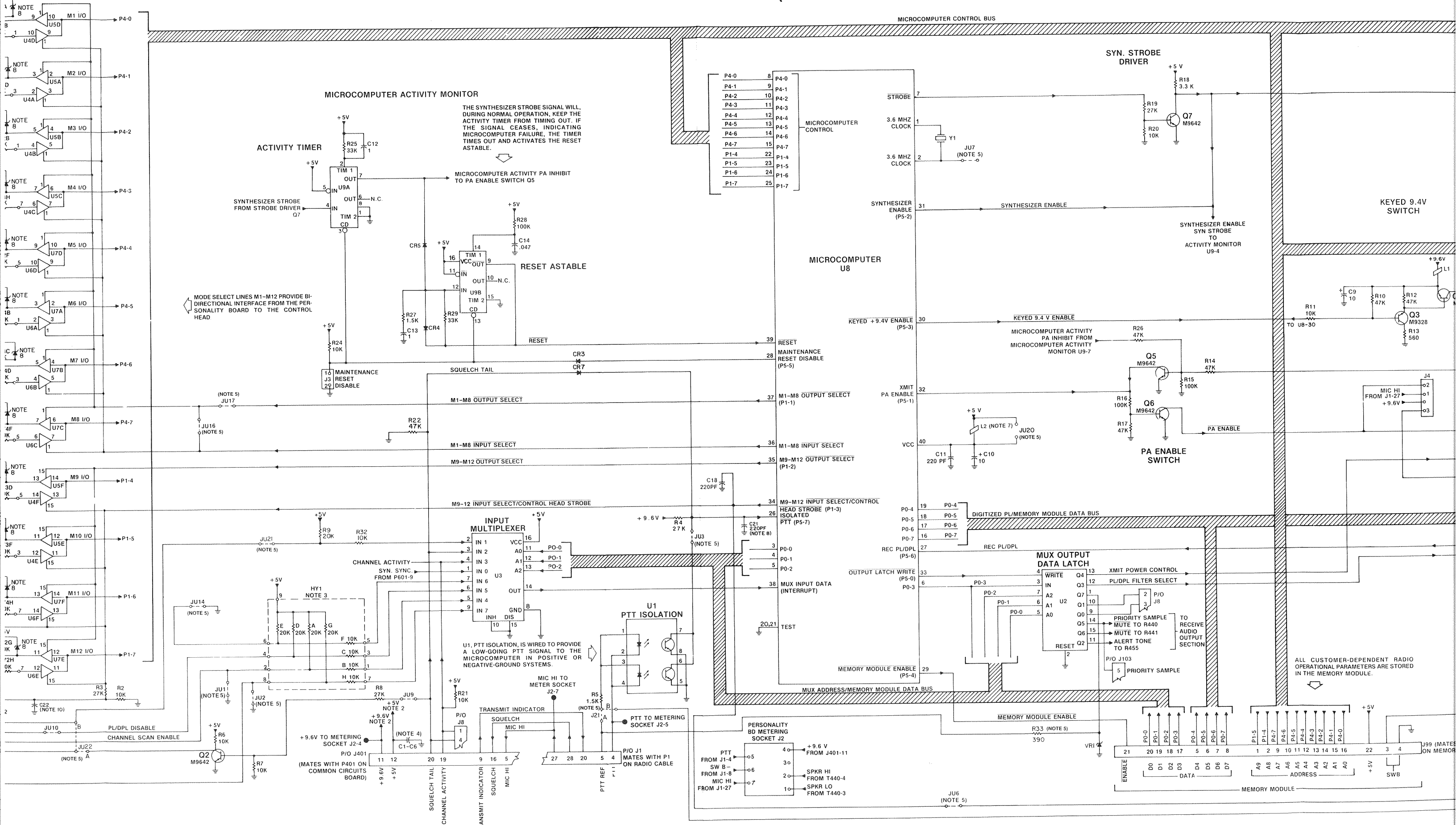
P4-0	8	P4-0
P4-1	9	P4-1
P4-2	10	P4-2
P4-3	11	P4-3
P4-4	12	P4-4
P4-5	13	P4-5
P4-6	14	P4-6
P4-7	15	P4-7
P1-4	22	P1-4
P1-5	23	P1-5
P1-6	24	P1-6
P1-7	25	P1-7

39	RESET
28	MAINTENANCE RESET DISABLE (P5-5)
37	M1-M8 OUTPUT SELECT (P1-1)
36	M1-M8 INPUT SELECT
35	M9-M12 OUTPUT SELECT (P1-2)
34	M9-M12 INPUT SELECT/CONTROL HEAD STROBE (P1-3)
26	HEAD STROBE (P1-4) ISOLATED PTT (P5-7)
3	P0-0
4	P0-1
5	P0-2
38	MUX INPUT DATA (INTERRUPT)
20,21	TEST

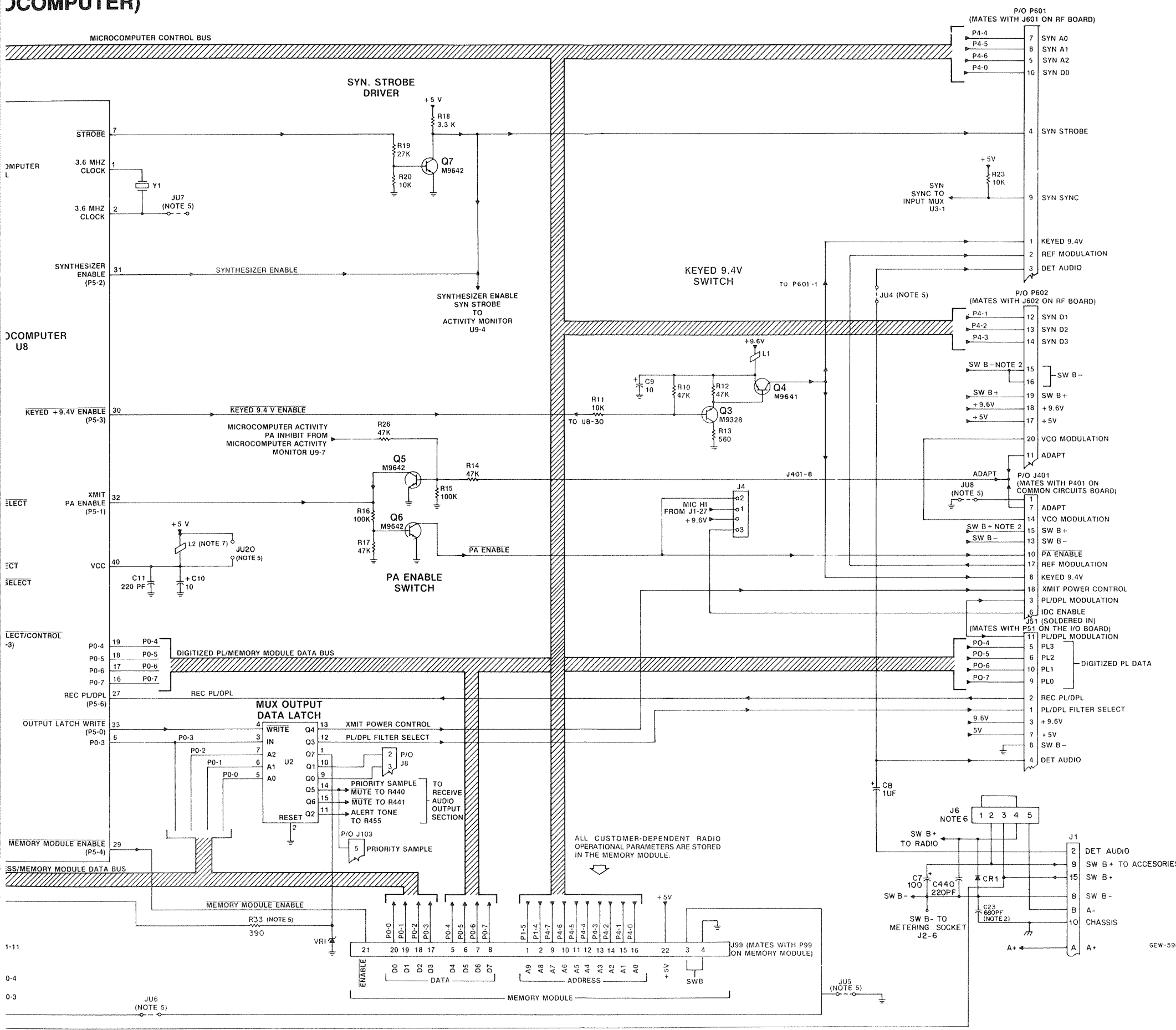
4	FROM J1-4 SW B -
3	FROM J1-8
2	FROM J1-7
1	FROM J1-27
4	FROM J401
3	FROM T44
2	FROM T44
1	FROM T44

HLN4760C SCHEMATIC (MICROCOMPUTER)

CONTROL CABLE I/O INTERFACE (NOTE 3)



ALL CUSTOMER-DEPENDENT RADIO OPERATIONAL PARAMETERS ARE STORED IN THE MEMORY MODULE.



- NOTES:
- UNLESS OTHERWISE STATED, ALL RESISTOR VALUES ARE IN OHMS, ALL CAPACITOR VALUES ARE IN MICROFARADS, AND ALL INDUCTOR VALUES ARE IN MICROHENRIES
 - THE MICROCOMPUTER AND RECEIVE AUDIO OUTPUT SECTIONS OF THE PERSONALITY BOARD ARE SHOWN ON SEPARATE DIAGRAMS. THE SW B+, SW B-, +9.6V SUPPLY AND THE +5V SUPPLY INPUT CONNECTIONS ARE SHOWN ON THE MICROCOMPUTER SECTION DIAGRAM AND THE A+ AND A- INPUT CONNECTIONS ARE SHOWN ON THE RECEIVE AUDIO OUTPUT SECTION DIAGRAM.
 - RESISTORS LABELED HY1-HY4 ARE PART OF FOUR HYBRID RESISTOR NETWORKS. THESE RESISTORS ARE NOT INDIVIDUALLY REPLACEABLE. THE ENTIRE HYBRID MUST BE REPLACED IF ANY RESISTOR WITHIN THE HYBRID FAILS
 - CAPACITORS C1 THROUGH C6 (.01 uF 5%, 63V PART #08-11051A07) ARE BYPASS CAPACITORS FOR INTEGRATED CIRCUITS U2 THROUGH U7 RESPECTIVELY.
 - REFER TO JUMPER TABLE.
 - NORMAL POSITION OF JUMPER PLUGS CONNECT PIN 1 TO 2 AND PIN 3 TO 4.
 - ON LOW-BAND RADIOS, JUMPER BYPASSES L2.
 - THE DIODE PART OF HYBRID ASSEMBLIES (HY2-4) IS USED IN LATER MODELS ONLY
 - COMPONENT(S) USED ON HLN4915A ONLY
 - SEE PARTS LIST FOR VALUE OF COMPONENT

JUMPER TABLE

JUMPER	DESCRIPTION	TYPE	STANDARD	HHCH
JU1	SCAN ENABLE	JUMPER	IN#	OUT
JU2	SCAN REVERSE BURST	JUMPER	IN#	IN#
JU3	SPEC CUST APP	JUMPER	IN	IN
JU4	SPEC CUST APP	JUMPER	IN	IN
JU5	OUT FOR -63 MODES	JUMPER	IN	IN
JU6	IN FOR -63 MODES	JUMPER	OUT	OUT
JU7	NOT USED	---	---	---
JU8	IDC DATA INPUT	JUMPER	IN#	IN#
JU9	SQUELCH TAIL	JUMPER	IN	IN
JU10	PL/DPL DISABLE	JUMPER	IN	IN
JU11	DET MUTE CTRL	JUMPER	OUT	OUT#
JU12	SECURENET MODULATION	JUMPER	OUT#	OUT#
JU13	SECURENET MODULATION	JUMPER	IN	IN
JU14	DISPLAY ENABLE	JUMPER	IN	IN
JU15	CTRL HD STROBE	PLUG	OUT	IN
JU16	INPUT STROBE ENABLE	PLUG	OUT	IN
JU17	OUTPUT STROBE DISABLE	JUMPER	IN	OUT
JU18	HY3 PIN 2 PULLUP	JUMPER	IN	OUT
JU19	HY4 PIN 4 PULLUP	JUMPER	IN	OUT
JU451	PA CURRENT DISABLE	JUMPER	OUT#	OUT#
JU20	LB JUMPER	PLUG	OUT	OUT
JU21	RX SECURENET	PLUG	OUT#	OUT#
J22	DISC AUDIO	PLUG	IN#	IN#
JU23	M7 DISABLE	PLUG	OUT	OUT
J21	PTT REF SELECT	PLUG	POS A#	POS A#
JU22	RX DVP SELECT	PLUG	POS B	POS B
J23	SQUELCH AUDIO SELECT	PLUG	POS A#	POS A#
R33		RESISTOR	OUT#	OUT#

* = REVERSE FOR SECURENET NON-XL
= REVERSE FOR SECURENET XL

INTEGRATED CIRCUITS

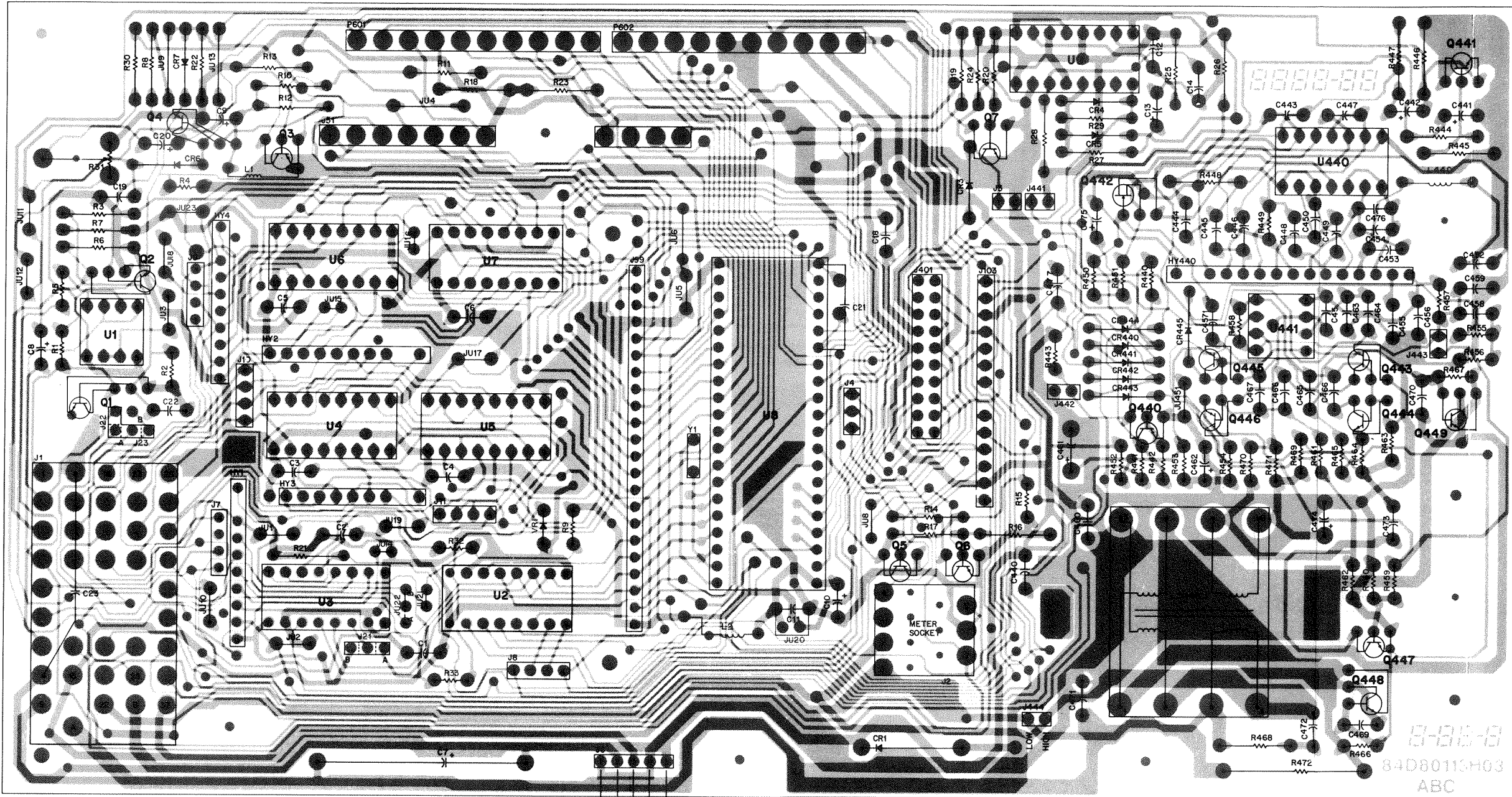
REF. NUMBER	TYPE	DESCRIPTION	V _{cc} (+5V)	GROUND (SW B-)
U1	D74	OPTO-ISOLATOR	---	---
U2	M8473	8-BIT ADDRESSABLE LATCH	16	8
U3	M8475	8-CHANNEL DATA SELECTOR	16	8
*U4, 6	M8474	HEX BUFFER (TRI-STATE)	16	8
*U5, 7	M6177	HEX BUFFER (TRI-STATE)	16	8
U8	M0756	MICROCOMPUTER	40	20
U9	M8453	DUAL MONOSTABLE MULTIVIBRATOR	16	8

*REMOVE FOR HHCH ACCESSORIES

6EW-5988-0

HLN4760C PERSONALITY BOARD

KEYED 9.6V REF OSC MOD DET OUTPUT SYN STROBE A2 3.6 MHz CLOCK AO A1 SYNTH SYNC DO SYN ADAPT D1 D2 D3 SW B- SW B- +5V R 9.6V SW B+ VCO MOD



SHOWN FROM SOLDER SIDE

SW B+ TO RADIO
SW B+ TO ACC
BATTERY HOT (GREEN)
SW B+ TO RADIO
GND

SOLDER SIDE GEW-5990-0
COMPONENT SIDE GEW-5991-0
OVERLAY GEW-5992-0

parts list

HLN4760C Personality Board (Mic

REFERENCE SYMBOL	MOTOROLA PART NO.
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capacitor, fixed, uF ±10% 100V (

C1-6	08-11051A
C7	23-84669A
C8	23-11054L
C9,10	23-11054H
C11	21-11015B
C12:13	23-11054L
C14	08-11051A
C18	21-11015B
C19	08-11051A
C20	23-11054H
C21,22	21-11015B
C51	21-13741N
C52	08-11051A
C53	21-13741B
C54	21-13741N
C55	08-11044A
C56	08-84637L
C57	21-13740B
C58	08-11044A
C59	21-13740B
C60	23-11013D
C61	08-11044A
C62	21-13740B

diode (see note)

CR1	48-80236E
CR3	48-82921G
CR4-7	48-11034A
CR51,52	48-80236E

hybrid (see note)

HY1	51-82142K
HY2-4	01-80738T
HY51	51-82142K
HY52	51-82142K

connector receptacle

J1	01-80746T
J2	09-84207B
J3	28-84318M
J4	28-84318M
J6	28-84318M
J7	28-84318M
J14-16	28-84318M
J20	28-84318M
J22	09-80269B
J23	28-84318M
J33	09-80269B
J44	09-80269B
J51	01-80749T
J55	09-80269B
J66	09-80269B
J77	09-80269B
J88	09-80269B
J99	28-82622L
J101	09-80269B

jumper

JU1-3	06-11009F2
JU4	06-11009B2
JU5	06-11009F2
JU8	06-11009F2
JU9	06-11009B2
JU10	06-11009F2
JU13	06-11009B2
JU17-19	06-11009F2
JU21,22	28-84318M
JU22	09-84728L0

coil, RF

L1	24-80036A0
L2	24-83977B0

connector plug

P6	09-84728L0
P14	09-84728L0
P20	09-84728L0
P21A,22A,23A	09-84728L0
P51	28-84797F0
P52	28-48797F0
P601,602	28-82647K0

transistor (see note)

Q1,2	48-11043C0
Q3	48-11043C2
Q4	48-0086941
Q5-7	48-11043C0
Q51,52	48-80141L0

resistor, fixed, ohm, ±5%, 1/4 watt

R1	06-11009E6
R2	06-11009E7
R3	06-11009A8
R4	06-11009E8
R5	06-11009E5
R6,7	06-11009A7
R8	06-11009A8
R9	06-11009E8
R10	06-11009A8
R11	06-11009A7
R12	06-11009A8
R13	06-11009A4

parts list

HLN4760C Personality Board (Microcomputer section)

MXW-5989-O

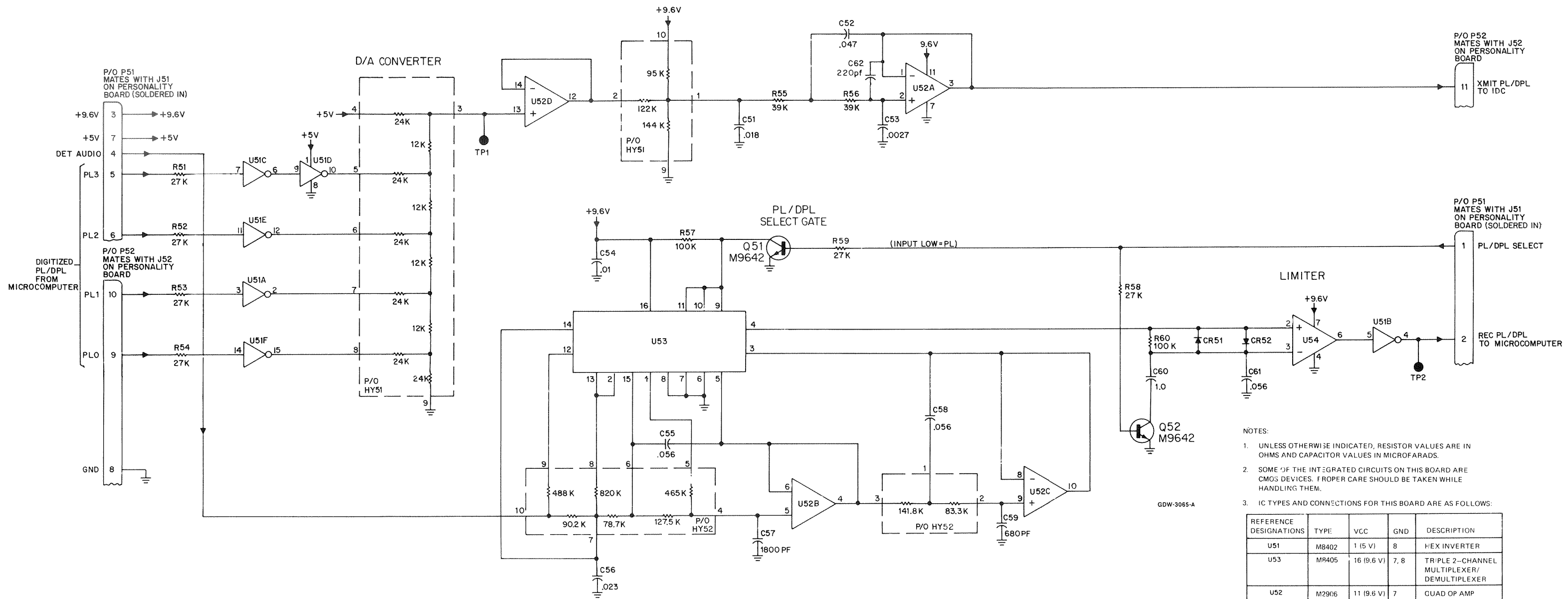
MXW-5989-O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF $\pm 10\%$ 100V (unless otherwise stated)		
C1-6	08-11051A07	.01, $\pm 5\%$, 63V
C7	23-84669A08	100, -10% , $+150\%$, 25V electrolytic
C8	23-11054L06	1, 50V tantalum
C9,10	23-11054H08	.10, 25V tantalum
C11	21-11015B05	220 pF
C12;13	23-11054L06	1, 50V tantalum
C14	08-11051A11	.047, $\pm 5\%$, 63V
C18	21-11015B05	220 pF
C19	08-11051A07	.01, $\pm 5\%$, 63V
C20	23-11054H08	.01, 25V tantalum
C21,22	21-11015B05	220 pF
C51	21-13741N51	.018, 50V
C52	08-11051A11	.047, $\pm 5\%$, 63V
C53	21-13741B11	390pF, $\pm 5\%$, 50V
C54	21-13741N45	.010, 50V
C55	08-11044A13	.056, $\pm 5\%$, 63V
C56	08-84637L09	.023, $\pm 5\%$, 63V
C57	21-13740B78	.001 uF, $\pm 5\%$, 50V
C58	08-11044A13	.056, $\pm 5\%$, 63V
C59	21-13740B69	680 pF, $\pm 5\%$, 50V
C60	23-11013D01	1, 20V
C61	08-11044A13	.056, $\pm 5\%$, 63V
C62	21-13740B57	220 pF, $\pm 5\%$, 50V
diode (see note)		
CR1	48-80236E07	silicon
CR3	48-82921G01	germanium
CR4-7	48-11034A01	silicon
CR51,52	48-80236E08	silicon
hybrid (see note)		
HY1	51-82142K10	resistor network
HY2-4	01-80738T03	ESD network
HY51	51-82142K11	resistor network
HY52	51-82142K08	resistor network
connector receptacle		
J1	01-80746T79	front connector assembly
J2	09-84207B01	7 contact female
J3	28-84318M08	4 pin male
J4	28-84318M07	3 pin male
J6	28-84318M23	5 pin male
J7	28-84318M08	4 pin male
J14-16	28-84318M06	2 pin male
J20	28-84318M06	22 pin male
J22	09-80269B01	6 contact, female
J23	28-84318M07	3 pin male
J33	09-80269B01	6 contact, female
J44	09-80269B01	6 contact, female
J51	01-80749T82	I/O board
J55	09-80269B01	6 contact, female
J66	09-80269B01	6 contact, female
J77	09-80269B01	6 contact, female
J88	09-80269B04	40 contact, female
J99	28-82622L03	22 pin, male
J101	09-80269B01	6 contact, female
jumper		
JU1-3	06-11009F23	0 ohm
JU4	06-11009B23	0 ohm
JU5	06-11009F23	0 ohm
JU8	06-11009F23	0 ohm
JU9	06-11009B23	0 ohm
JU10	06-11009F23	0 ohm
JU13	06-11009B23	0 ohm
JU17-19	06-11009F23	0 ohm
JU21,22	28-84318M06	2 pin male
JU22	09-84728L01	socket connector
coil, RF		
L1	24-80036A02	choke, .5 turn
L2	24-83977B03	orange, 2.5 turns
connector plug		
P6	09-84728L01	socket connector
P14	09-84728L01	socket connector
P20	09-84728L01	socket connector
P21A,22A,23A	09-84728L01	socket connector
P51	28-84797F09	7 pin
P52	28-84797F08	4 pin
P601,602	28-82647K02	10 pin
transistor (see note)		
Q1,2	48-11043C05	NPN
Q3	48-11043C26	PNP
Q4	48-00869641	PNP
Q5-7	48-11043C05	NPN
Q51,52	48-80141L02	NPN
resistor, fixed, ohm, $\pm 5\%$, 1/4 watt (unless otherwise stated)		
R1	06-11009E61	3.3k
R2	06-11009E73	10k
R3	06-11009A83	27k
R4	06-11009E83	27k
R5	06-11009E53	1.5k
R6,7	06-11009A73	10k
R8	06-11009A83	27k
R9	06-11009E80	20k
R10	06-11009A89	47k
R11	06-11009A73	10k
R12	06-11009A89	47k
R13	06-11009A43	560

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R14	06-11009A89	47k
R15	06-11009E97	100k
R16	06-11009A97	100k
R17	06-11009A89	47k
R18	06-11009A61	3.3k
R19	06-11009A83	27k
R20,21	06-11009A73	10k
R22	06-11009A89	47k
R23,24	06-11009A73	10k
R25	06-11009A85	33k
R26	06-11009A89	47k
R27	06-11009A53	1.5k
R28	06-11009A97	100k
R29	06-11009A85	33k
R30	06-11009A65	4.7k
R31	18-80087E08	10k, $\pm 20\%$, variable
R32	06-11009A73	10k
R33	06-11009E39	390
R51-54	06-11077B09	27K, 1/8 W
R55,56	06-11077B13	39K, 1/8 W
R57	06-11077B23	100K, 1/8 W
R58,59	06-11077B09	27K, 1/8 W
R60	06-11077B23	100K, 1/8 W
integrated circuit (see note)		
U1	51-84621K48	dual opto-isolator
U2	51-84887K92	latch, 8 BIT
U3	51-84887K93	8-channel selector
U4	51-82884L74	hex non-inverting driver
U5	51-84561L77	hex non-inverting driver
U6	51-82884L74	hex non-inverting driver
U7	51-84561L77	hex non-inverting driver
U8	51-97009C04	microcomputer 4Kx8 ROM
U9	51-84887K53	multivibrator dual monostable
U51	51-84887K01	hex buffer
U52	51-80067C04	quad operational amplifier
U53	51-84887K60	triple analog
U54	51-80067C05	Bi-Fet triple analog
voltage regulator		
VR1	48-82256C12	zener
crystal (see note)		
Y1	48-82611M10	crystal
mechanical parts		
	01-80708T20	heat sink (2 used)
	75-05295B01	crystal base
	46-83821M01	stud guide, PROM (2 used)

10/25/88

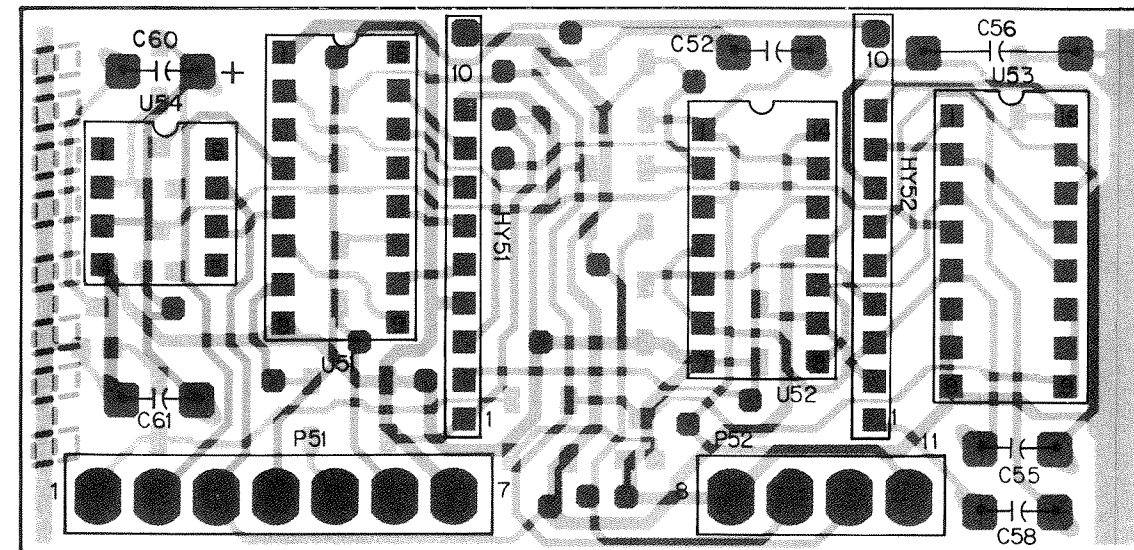
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.



GDW-3065-A

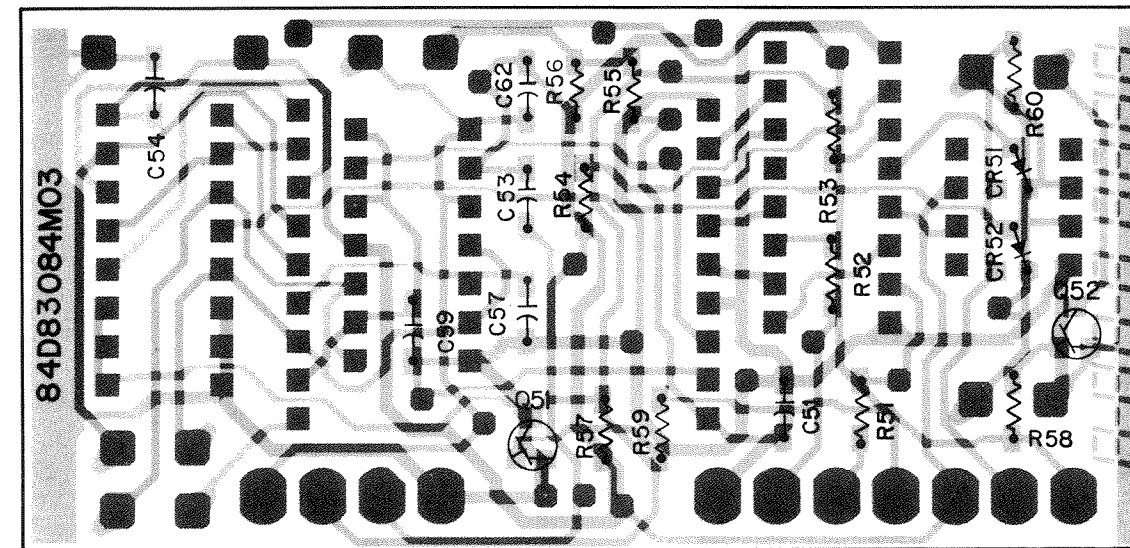
COMPONENT SIDE

HLN4760B AND HLN4760C I/O BOARD



SOLDER SIDE ● GBW-3067-B
COMPONENT SIDE ● GBW-3066-B
OVERLAY - GBW-5281-0

SOLDER SIDE



SOLDER SIDE ● GBW-3067-B
COMPONENT SIDE ● GBW-3066-B
OVERLAY - GBW-3068-D

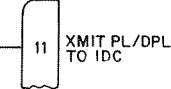
parts list

HLN4760B/C Input/Output Board MXW-5119-A

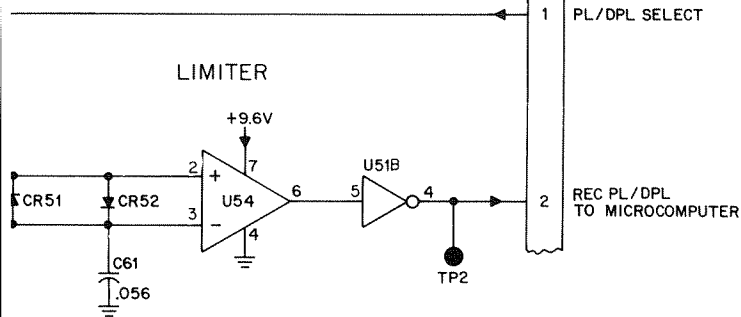
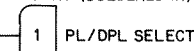
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF ±5% 50V (unless otherwise stated)		
C51	21-11032A24	.018, ±10%
C52	08-11051A11	.047, 63V
C53	21-11032A14	.0027, ±10%
C54	21-11032A21	.01, ±10%
C55	08-11044A13	.056, 63V
C56	08-84637L09	.023, 400
C57	21-11031A65	1.8k pF
C58	08-11044A13	.056, 63V
C59	21-11031A59	680 pF
C60	23-11013D01	1 ± 10%, 20V
C61	08-11044A13	.056, 63V
C62	21-11031A47	220 pF
diode (see note)		
CR51,52	48-80236E08	dual
hybrid (see note)		
HY51	51-82142K11	resistor network
HY52	51-82142K08	resistor network
connector plug		
P51	28-84797F09	7 pin, male
P52	28-84797F08	4 pin, male
transistor (see note)		
Q51,52	48-80141L02	NPN
resistor, fixed, Ω ±5%, 1/8 watt (unless otherwise stated)		
R51-54	06-11024A83	27k
R55,56	06-11024A87	39k
R57	06-11024A97	100k
R58,59	06-11024A83	27k
R60	06-11024A97	100k
transistor (see note)		
U51	51-84887K01	hex buffer
U52	51-80067C04	quad op-amp
U53	51-84887K60	2 channel multiplexar
U54	51-80067C05	bi-field effect op-amp

note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number. 10/25/88

P/O P52
MATES WITH J52
ON PERSONALITY
BOARD



P/O P51
MATES WITH J51
ON PERSONALITY
BOARD (SOLDERED IN)



NOTES:

- UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS AND CAPACITOR VALUES IN MICROFARADS.
- SOME OF THE INTEGRATED CIRCUITS ON THIS BOARD ARE CMOS DEVICES. PROPER CARE SHOULD BE TAKEN WHILE HANDLING THEM.
- IC TYPES AND CONNECTIONS FOR THIS BOARD ARE AS FOLLOWS:

REFERENCE DESIGNATIONS	TYPE	VCC	GND	DESCRIPTION
U51	M8402	1 (5 V)	8	HEX INVERTER
U53	M8405	16 (9.6 V)	7, 8	TRIPLE 2-CHANNEL MULTIPLEXER/DEMULTIPLEXER
U52	M2906	11 (9.6 V)	7	QUAD OP AMP
U54	M2907	7 (9.6 V)	4	BIPOLAR FET OP AMP