

1. Theory Of Operation

The Logic Board consists of 5 segments:

- Microprocessor
- Voltage regulation
- Receive audio circuitry
- Transmit audio circuitry
- Power control circuitry

1.1 MICROPROCESSOR

1.1.1 Description

MaxTrac radios use the Motorola 68HC11A8 microprocessor U802, which consists of:

- 8 MHz Clock rate
- Multiplexed 8 bit address/data lines
- 16 bit addressing
- Internal watchdog circuitry
- Analog to digital input ports.

The control logic surrounding U802 consists of:

- (1) Custom Gate Array U803. This device expands the Input/Output capabilities of the control logic. U802 and U803 exchange information which tells the mieroprocessor the input port status and the desired state of the output ports.
- (2) NOVRAM U805. This is a Non-Volatile Random Access Memory device which consists of a static RAM with a built in lithium battery to maintain it's memory after removing power. The NOVRAM acts as the radio's code plug, storing any operating information pertinent to a particular radio. This information includes operating frequencies, control channels, time out timer, and other special functions.

- (3) EPROM U804. This is an Erasable Programmable Read Only Memory. U804's function is to store the Microcomputer's operating program.
- (4) Static Random Access Memory U806. This RAM is used for scratch pad operations in the trunked MaxTrac.
- (5) *Digital–to–Analog IC U801*. This IC is used to generate precision analog voltages.

1.1.2 Operation

When the radio is connected to the battery, UNSW B+ is applied via J7–5 and to zener diode VR402 and R410. The voltage produced from zener diode VR402 is +5 volts and is labeled RAM 5V. RAM 5V is sent to the microprocessor U802 and is used to maintain the radio's current operating conditions (scan list, current mode, etc.). This voltage will be present as long as the battery voltage is present to the radio.

1.1.3 Power Up/Low-Line Reset

When the radio is turned on, the +5V DC is turned on. This will charge up C858 through R893. The time constant established by C858 and R893 will be of long enough duration for C858's charge to pass the +3.2V DC reference voltage on U807A's negative input. RESET line is held low while this is taking place and enough time elapses so that the microcomputers clock and all other voltages stabilize before the internal program starts running. When C858's charge goes above +3.2V DC, RESET goes inactive where it will remain during normal operation.

If SWB+ should decrease in voltage, the decrease will be sensed on the positive input to U807B. The decreased output from U807B will go to the positive input to U807A. This voltage will be compared to the +3.2 reference voltage. If this voltage should decrease below +3.2V DC, RESET will go low and reset the Custom Gate Array U803 and Microcomputer U802. The *MaxTrac* 800 series has the Power Up/Low line RESET circuitry built into the +5V DC regulator U402.

1.1.4 Microcomputer Start-Up Routine

The microcomputer is stabilized and operational after the RESET line is released to an inactive state. Y801, the crystal oscillator, should be stable at this point. The frequency of

Y801 is divided by four with circuitry internal to U802. The resultant frequency is called the "E CLOCK" and can be seen at U802–5. This frequency is used by the Microcomputer and Custom Gate Array as an internal data clock.

The Microcomputer will then do a self test of the control logic. If any failure is detected, an error tone will sound. Refer to the ERROR TONES tables for more information.

1.1.5 Microcomputer Normal Operation

A successful self test of the control logic will activate the multiplexed address/data bus. The Microcomputer comes equipped with an eight bit address/data bus and an eight bit address only bus. These bus lines are connected to the Custom Gate Array for I/O port information and the external memory IC's to send and receive data.

The Custom Gate Array must de-multiplex the lower order address byte from the address/data bus (AD0-AD7) in order to address a particular function or memory location.

The Microcomputer puts the address information on AD0–7 and the information is then passed to U803. The Address Strobe "AS" is pulsed low and the byte is latched. The de–multiplexed address byte A0–7 is then available on U803. The bus is now ready for the transmission of data. The higher order address byte A8–A15 is not multiplexed and is readily available at the Microcomputer U802.

1.1.6 Reading Or Writing In Memory

The specified memory IC must first be enabled before a read/write operation can take place. Each memory IC has it's own "chip select" line. SRAM SEL originates at U803–15, NOVRAM SEL at U803–14, and EPROM SEL at U803–13. These lines will all remain logic level high until one is pulsed low to select the IC chosen.

The R/W line which originates from U803–16, tells the system what operation is being performed. If a read condition exists, the R/W line will go logic level high. If a write condition exists, R/W line goes low. In the case of EPROM U804, it is a read only memory and does not require a R/W input.

The Output Enable line "OE" will enable the tri-state output gates to pass the contents of the desired address out onto the A/D, analog to digital, bus. This line is active when pulsed low.

1.2 VOLTAGE REGULATION

The source for B+ is taken off the ignition sense jumper JU801. It is then passed to the switch PCB via J8–6 and is routed to one side of the on/off switch. The output, SWB+, comes back into the logic board via J8–5.

U402, on the logic board, is the +5 volt regulator. SWB+ is applied to U402 and the +5V DC output is sent out to the logic board, RF board, and display boards.

When SWB+ is applied to U401A-8, the +9.6V DC regulator will turn on and produce a positive voltage input. This output is divided by CR402, R404, and R405. The voltage drop across R405 is then sent into the negative input of U401A. Zener diode VR401 will produce a +5.03 reference voltage for the positive input. The 9.6 volt sample is compared to the reference and an error voltage inversely proportional to the status of the +9.6 volt rail is generated at U401A-1. This error voltage will turn on and control the conduction of Q402. The higher the drive voltage, the harder Q402 conducts. Q402 controls the amount of conduction through Q401. The harder Q401 conducts, the higher the +9.6 volt line will go.

If the +9.6 volt line should increase, the voltage at U402–2 would rise causing the voltage at U402–1 to decrease. Q401 will now source less current and reduce the +9.6 volt line drops.

Diode CR401 is used to protect Q401 in the event that the 9.6 volt line should be grounded. When this happens, Q402's base can only be .7V DC maximum and Q401 will turn off.

The +4.8V DC is formed by the divider network of R408 and R409. This voltage is fed into the unity gain op amp U401B. Isolation and current amplification take place at U401B.

1.3 RECEIVE AUDIO FILTER

The detected audio is applied to the receiver audio filter on the logic board via J6-3. The filter consists of a 3 kHz low pass filter U551, a 300 Hz high-pass filter U552, a de-emphasis circuit U553A and audio mute gate circuit consisting of Q551 and Q552. U553B sums the detected audio signal with the alert tone generated by the microprocessor U802. The 3 kHz low pass filter U551, is necessary to filter any unwanted high frequency noise from reaching the speaker. The 300 Hz high pass filter U552 restricts PL/DPL tones from reaching the speaker. The receiver audio mute gate, Q551, and Q552, operates by switching out the detected audio signal from the audio power amplifier. The microprocessor controls the "RX Mute" line out of U803-6. This line goes high during unmuted mode causing Q551 and Q552 to turn on. PL/DPL along with the squelch setting will cause the microprocessor to switch "RX Mute" line. The filtered audio is then routed to the audio power amplifier via U553B and the volume control pot.

1.3.1 Audio Power Amplifier

The audio power amplifier is a Class A–B amplifier with a differential input stage. Input to this stage comes from the volume control potentiometer wiper which is connected to J8–2.

The audio signal is routed through C501. C501, C502, and R501 are used to form an active filter with a 12 dB/octave roll off below 300 Hz to help attenuate the PL tones.

Capacitors C503, C505, C506, C511, C512, and C513 are used to prevent high level RF from causing the small signal diode junction to degrade audio amplifier performance.

Capacitor C507 and resistor R507 set the power amplifiers closed loop AC gain to 27 dB. The amplifier is a non-inverting type whose AC gain is determined by the equation:

V out =
$$\frac{(R508 + R507)}{R507}$$
 (V in)

Transistors Q501 and Q502 are a small signal differential pair. The half supply voltage reference for Q501 is set by R502 and R503. C504 is used to remove any alternator whine from the half supply reference voltage. Q502 receives 100 per cent DC feedback from the output via R508. R504 and R508 are the same value to help maintain the best differential offset so that the DC output voltage is exactly half—supply voltage as set by the reference voltage at Q501.

Q503 is a Class A driver that causes the output stage to swing within one volt of supply and ground reference. To fully saturate the upper complimentary output pair Q506 and Q504, C509 is used to allow the junction of R509, R510, and C509 to swing about 3 volts higher than supply voltage. C510 from the collector to base of Q503 is a Miller effect capacitance causing the open loop gain to roll off at above 3 kHz and guarantee the amplifier's stability under all closed loop operating conditions.

The pre-drivers Q504 and Q505 are Class A and help prevent low level crossover distortion. At high level signals, crossover will be caused by Class B amplifiers Q506 and Q507. The large amount of negative feedback relative to the close loop gain keeps distortion low. The open loop gain is approximately 80 dB and the close loop gain or operating AC gain is 27 dB. There is about 53 dB of negative feedback to help reduce distortion of the output from Q506 and Q507.

The output stage of the audio power amplifier consists of complimentary Darlington pairs in a push-pull configuration. The upper pair consists of the PNP power device Q506 and small signal NPN driver Q504. Together they work like an NPN power device. The compliment of Q506, Q504 is made up of NPN power device Q507 and PNP small signal device Q505. Together this pair works like an PNP power device. Q506 and Q507 are biased at .2 volts base to emitter and are turned off at DC or small signal AC drive levels. At high AC signal levels,Q506 and Q507 turn on. The pre-drivers Q504 and Q505 are biased on by CR501 and CR502. The bias current is stabilized by emitter feedback resistors R513 and R514. Diodes CR501 and CR502 are placed near transistors Q504, Q505, Q506, and Q507. They help the output stages from turning on to large DC currents as the output stages become hot.

Q508 and Q509 are low current switches controlled by the PA MUTE line from the microprocessor. The audio amplifier can be turned on or off by PA MUTE in about 5 milliseconds. PA MUTE is affected by the PL/DPL and squelch circuitry.

C514 couples the output signal from the audio power amplifier to the speaker. It also provides DC blocking to the speaker and couples the AC signal down to 80 Hz in frequency.

1.3.2 Low-Speed Data Filter

This circuit filters the signal higher than 300 Hz from the detected audio with a low pass filter (U602B and U603A). The PL tone between 67–257 Hz or DPL signal between 10–140 Hz is covered. The signal is then pulse shaped to 5V p/p by U603B and Q601. The PL/DPL signal is then routed to the microprocessor U802–33 via R839 (DLO RX). U602A is a PL/DPL cancellation circuit for duplex radios so that the receiver does not decode its own PL/DPL signal modulating the reference oscillator. In duplex radios, the receiver and transmitter VCO are in operation simultaneously. A reference modulation signal will be seen in both the receiver injection and transmitter output. The receiver will detect this reference modulation and without the cancellation effect provided by U602A, will be given a PL decoding error.

1.3.3 High Speed Data Filter

U601A contains the circuitry for the High Speed Data filter. Data sent to this circuit can be information such as the MDC data found in certain special options or the different handshakes found in the trunking signaling scheme for trunked radios. U601A's output is a 5V p/p pulse which is routed and processed by the microprocessor.

1.4 TRANSMIT AUDIO

The microphone signal is made available to the emitter of Q651 and allowed to pass by turning Q652 on via the MIC EN during the transmit mode. The MIC signal gets pre-emphasized, amplified and limited by U651A. The output is then fed into summation amplifier U652A and voltage control attenuator U653A. The VCA controls the signal level fed to the transmitter VCO for modulation. Voltage changes at U653–3 change the attenuation of the MIC signal. This controlled signal is filtered by the splatter filter U652 to get rid of high frequency signals. The output of U652B goes to P6–10 as VCO Modulation. The Reference Modulation is routed from U651A to P6–13.

1.4.1 High-Speed Transmit Data

High–Speed Transmit Data from the microprocessor is applied to U701A. The output of U701A is routed to the summation amplifier U652A.

1.4.2 Low–Speed Transmit Data

The PL and DPL data from the microprocessor is applied to U701B. U701B takes the PL and DPL data and transforms it into a four step stair—step waveform. This stair—step waveform is applied to U651B where it is turned into a PL tone or the analog representation of the DPL code. The output of U651B is applied to the summation amplifier U652A.

1.5 POWER CONTROL CIRCUIT

The power control circuitry used to control the RF power amplifier is explained in detail in the Power Amplifier section of this manual.

2. Troubleshooting Guide

2.1 MICROPROCESSOR SECTION

The *MaxTrac* radio uses a microprocessor U802, along with support IC's. U803, the Custom Gate Array, U804 the EPROM, and U805 the NOVRAM.

Most of the problems encountered in this section will be difficult to localize to one particular device. All the devices interact with each other by passing information back and forth on the bus lines.

A very common problem encountered is the Code Plug Error. This is characterized by a 163 Hz tone for a 5 second duration. The ERROR TONE charts will help the servicer in isolating to the Logic Board but will not give the exact IC at fault. The Code Plug information is contained not only in the microprocessor but the NOVRAM as well.

Replacement of the Logic Board is the safest way to make sure the problem is fixed. Before replacing the board, the servicer can attempt to reprogram the radio code plug. Stepping through the Radio Service Software's service menu will sometimes clear the fault if the microprocessor is not the problem. The RF Board Level Replacement procedures can also be followed step by step. Sometimes a system fault can be cleared this way. If these procedures do not clear the problem, board replacement and re–calibration must be done.

Other error tones will point to problems that can be traced back to defective IC's or components not actually in the

shielded area of the Logic Board. By observing the logic voltage levels and waveforms on the schematics, the fault can be found.

2.2 RECEIVE AUDIO

Troubleshoot the Receive Audio path by observing voltage and waveforms on the schematics. Troubleshooting chart "BAD SQUELCH OR PL/DPL" will help isolate to a specific section. Review the theory of operation before attempting to find the faulty component.

2.3 TRANSMIT AUDIO

The Transmit Audio path is also serviceable by using the "BAD TX MODULATION" troubleshooting chart and schematics. By inserting a tone from an external oscillator and by passing the microphone, the servicer can keep a consistent tone and amplitude as he troubleshoots through the different stages.

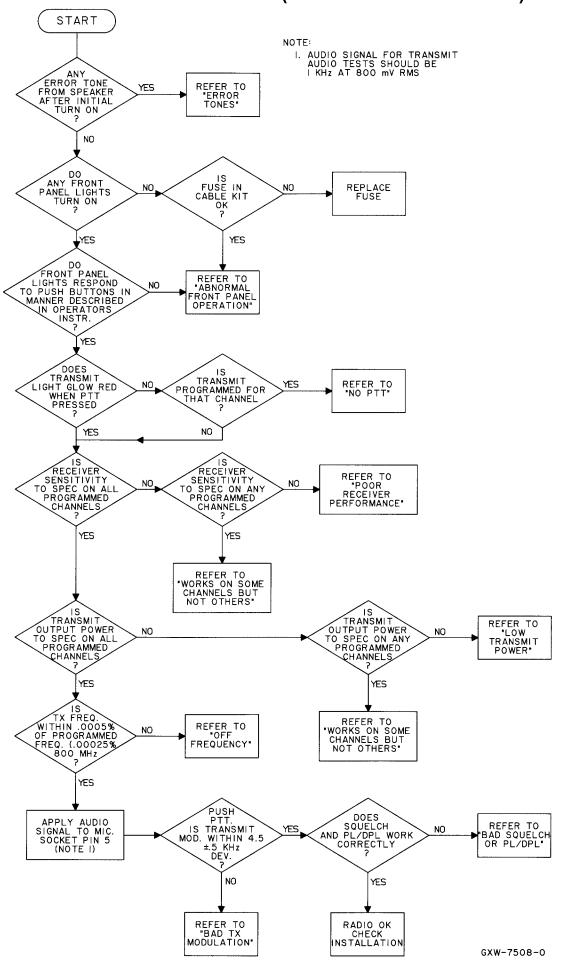
2.4 AUDIO POWER AMPLIFIER

Troubleshoot the Receive Audio Power Amplifier using the "NO/LOW AUDIO" chart and the schematics and theory of operation. To help isolate which stage the problem is in under full power out conditions, use a dummy load instead of a speaker and monitor the voltage on the load.

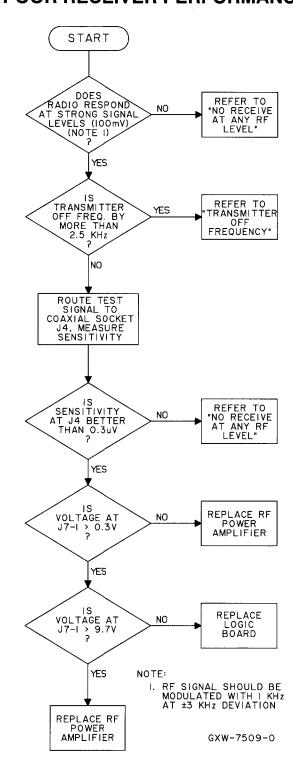
2.5 POWER CONTROL CIRCUITRY

Refer to the Transmitter Troubleshooting section to isolate problems in the Power Control Circuitry part of the Logic Board. This power control loop is very difficult to troubleshoot without breaking the loop and inserting a fixed voltage to certain parts of the circuit. Follow the schematic and theory of operation carefully. Voltages on each device are noted and can be used for comparison.

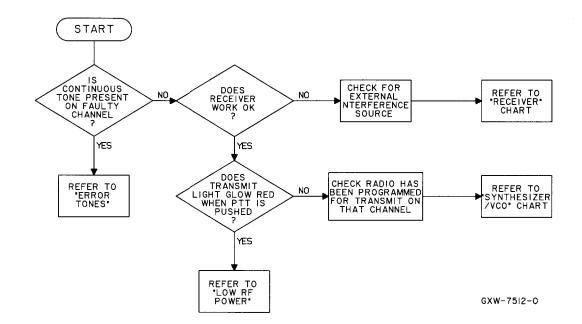
BASIC TROUBLESHOOTING (START WITH THIS CHART)



POOR RECEIVER PERFORMANCE



RADIO WORKS ON SOME CHANNELS BUT NOT OTHERS

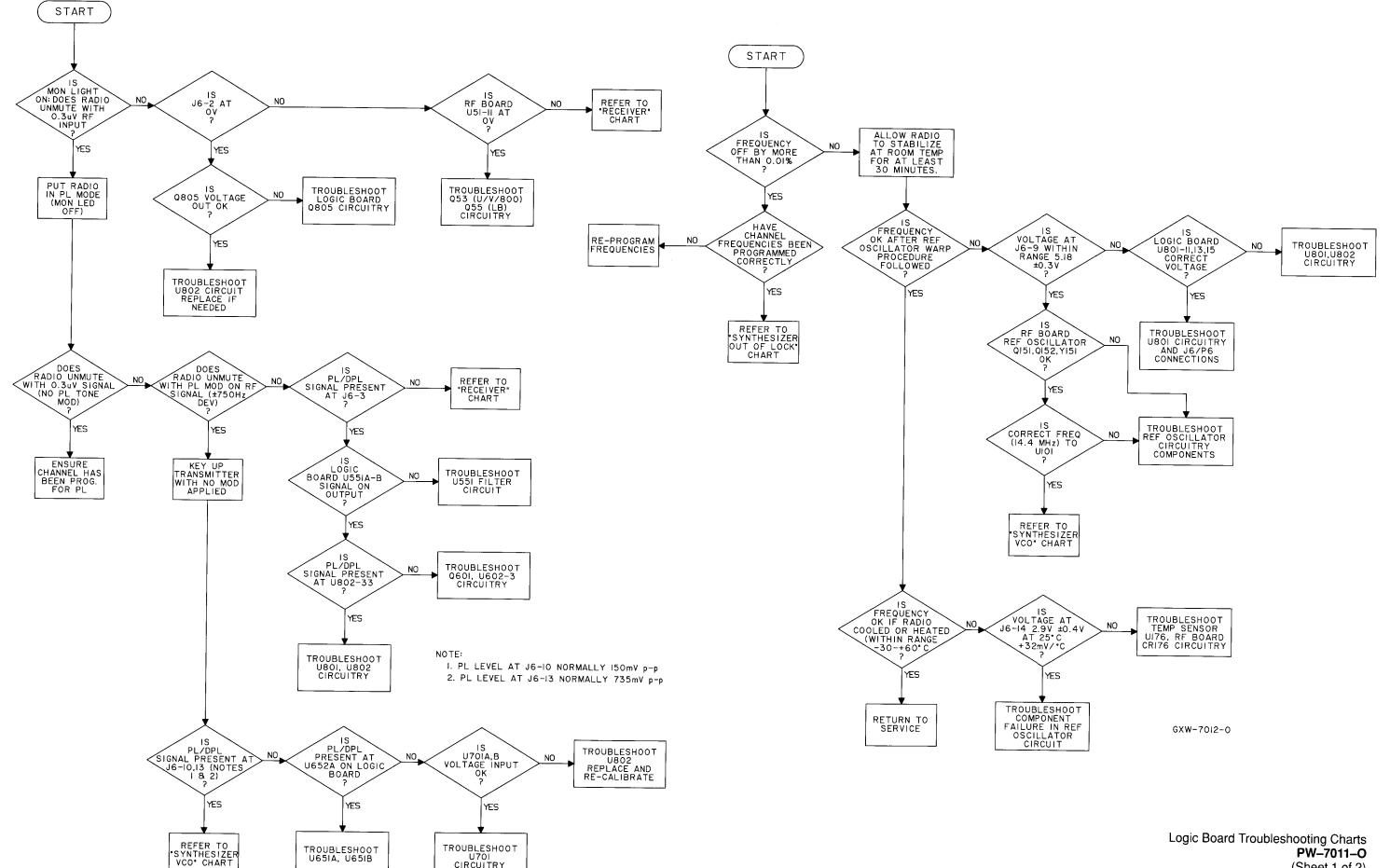


IMPORTANT

IF THE RF BOARD, LOGIC BOARD, OR RF POWER AMPLIFIER ARE REPLACED, RECALIBRATION OF THE RADIO MUST BE PERFORMED.

BAD SQUELCH OR PL/DPL

TRANSMITTER OFF FREQUENCY



U701 CIRCUITRY

GXW-7013-0

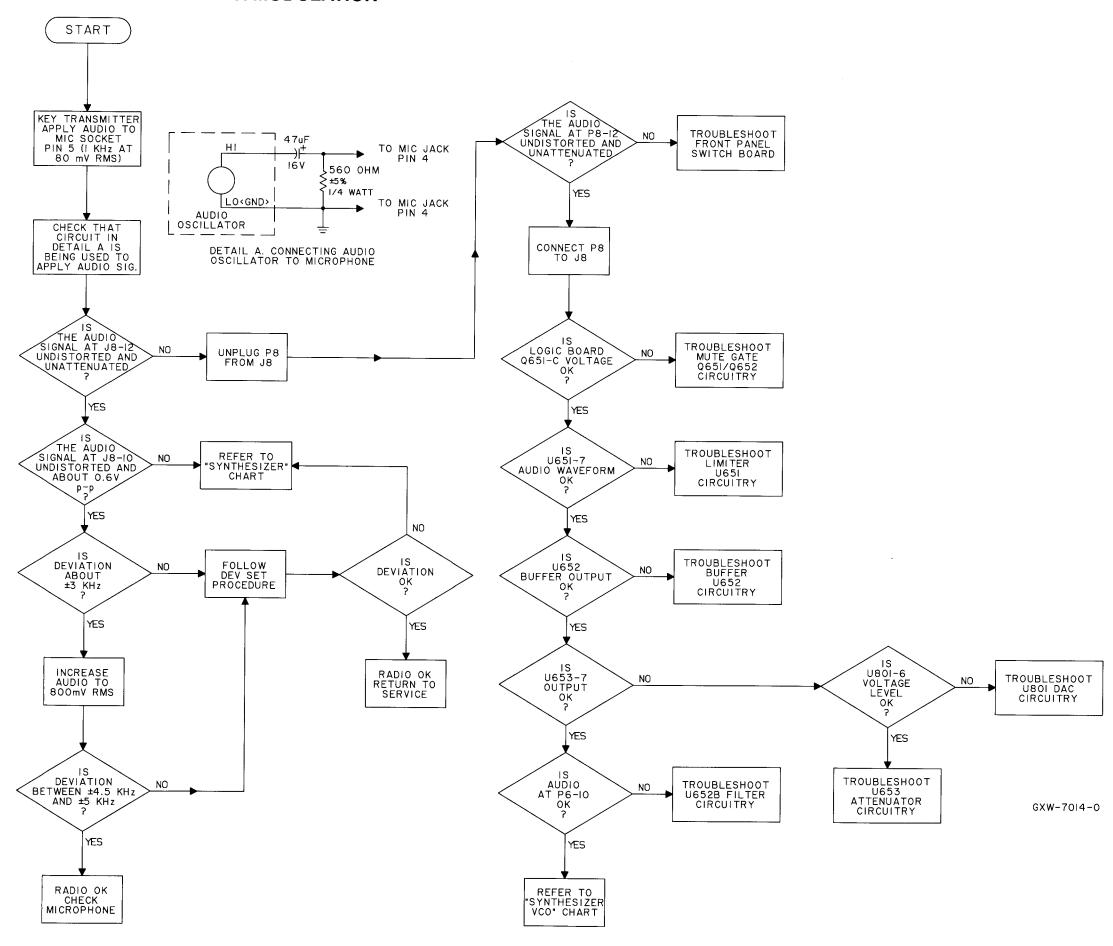
PW-7011-0 (Sheet 1 of 2) 2/28/90

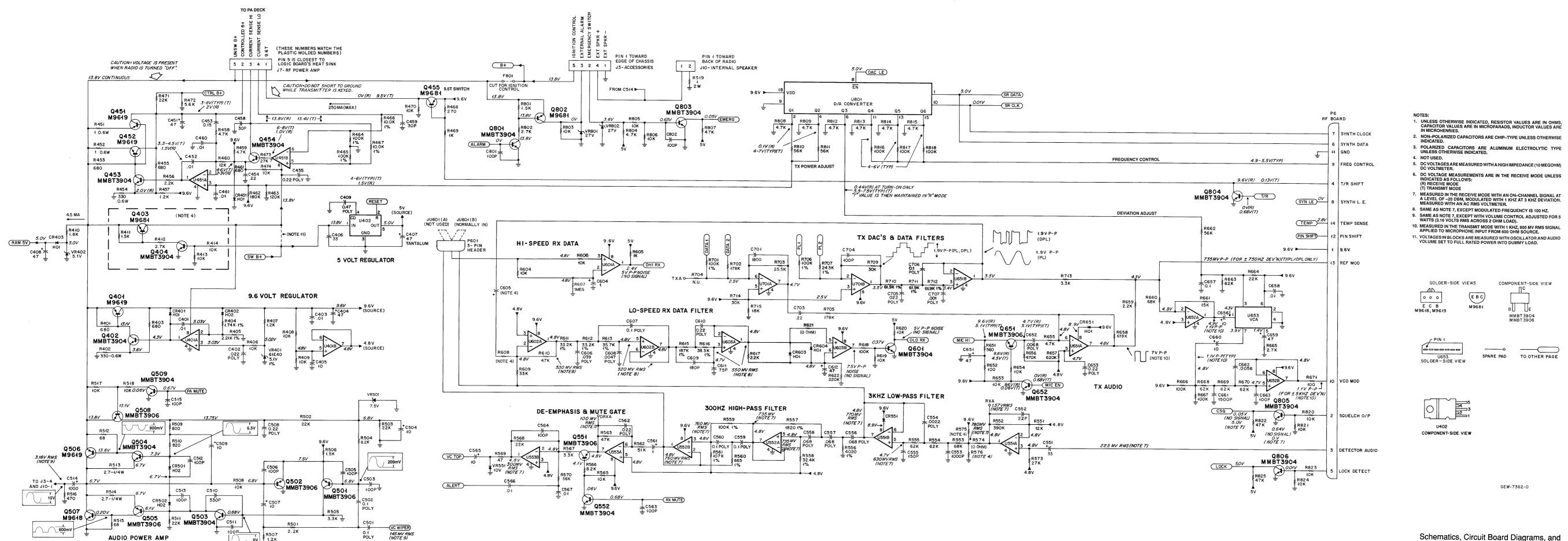
NO/LOW AUDIO

START ImV RMS AT 3KHz DEVIATION AT ANTENNA PORT IS VOLUME REFER TO RECEIVER CHART CONTROL WIPER 145mV RMS J8-2 YES IS 200mV p-p SINEWAVE AT Q501-B TROUBLESHOOT C501/C502 YES 6 V p-p SINEWAVE AT Q503-B TROUBLESHOOT Q501/Q502 CIRCUITRY YES IS 800mV p-p SINEWAVE AT TROUBLESHOOT Q504/Q505 CIRCUITRY Q504-C Q505-C YES IS IO V p-p SINEWAVE AT C514 ? TROUBLESHOOT Q506/Q507 PA FINALS YES DOES SPEAKER REPLACE SPEAKER MEASURE 4 OHMS YES AUDIO PATH OK: RETURN TO SERVICE GXW-7015-0

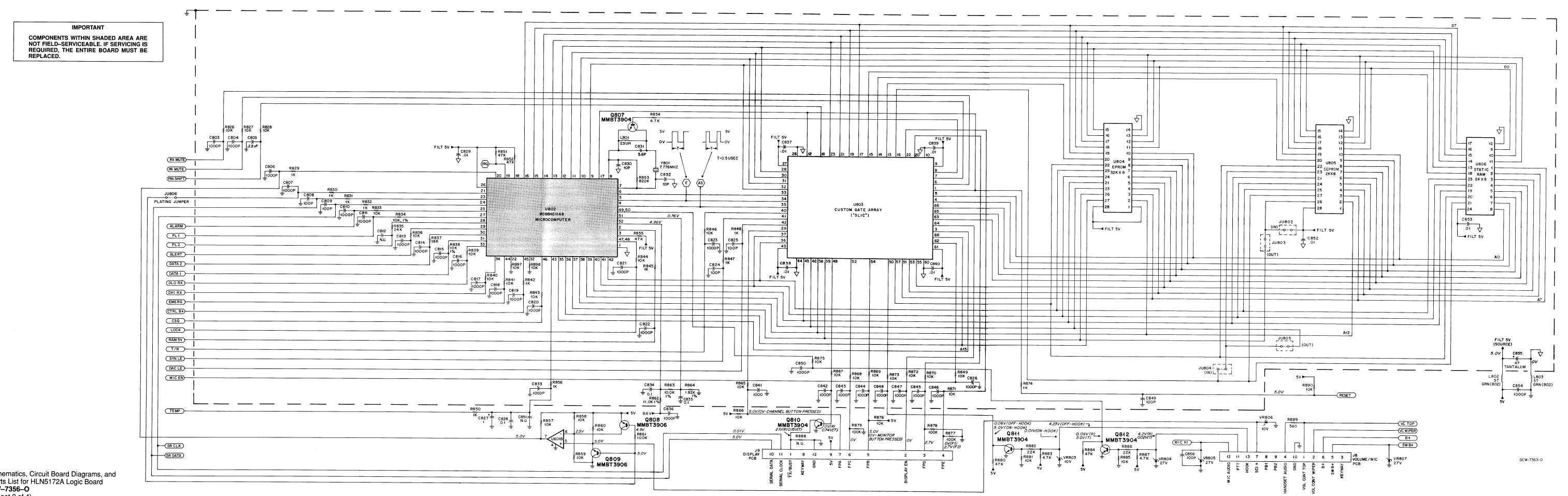
Logic Board Troubleshooting Charts **PW-7011-O** (Sheet 2 of 2) 2/28/90

BAD TX MODULATION

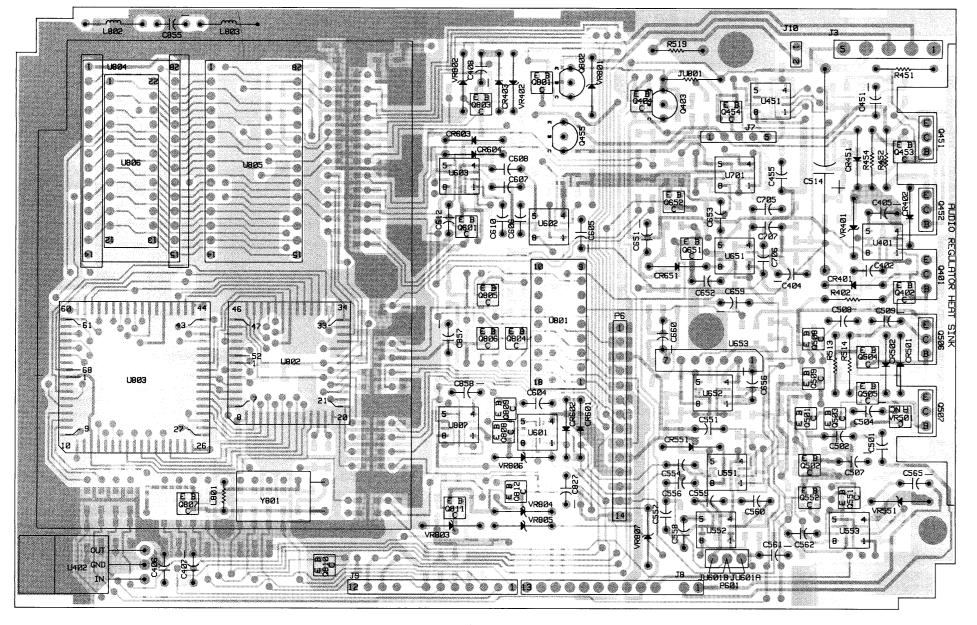




AUDIO POWER AMP



Schematics, Circuit Board Diagrams, and Parts List for HLN5172A Logic Board PW-7356-O (Sheet 2 of 4) 2/28/90



SOLDER SIDE GCW-7359-O
COMPONENT SIDE VIEW

SOLDER SIDE GCW-7359-O
OVERLAY GCW-7358-O
OVERLAY GCW-7360-O

INNER LAYER 1 GCW-7521-O
INNER LAYER 2 GCW-7522-O
OVERLAY GCW-7523-O

COMPONENT SIDE VIEW

CB54

COMPONENT SIDE GCW-7358-O

SOLDER SIDE VIEW

parts list

CR603,604

48-83654H01

HLN5172A Logic Board (Trunking)

MXW-7357-O

REFERENCE MOTOROLA DESCRIPTION SYMBOL PART NO. capacitor, fixed, uF, +5%, 50V (unless otherwise stated) 21-13741B45 0.01.+10% C402 08-11051A09 .022, 63V C402 C403 C404 C405 C406 C407 21-13741B45 0.01.+10% 23-11048B19 23-11048B13 47, ±20%, 16V, electrolytic 10, +20, 16V, electrolytic 23-11048A1 33, ±20%, 25V, electrolytic 23-13749A44 47. +20%, 6V C408 C409 C451 C452 23-11048B19 47, ±20%, 16V, electrolytic 08-11051A17 47 63V 23-11048B19 47, ±20%, 16V, electrolytic 0.01, ±10% .15, +80 -20% .22, +80 -20% .22, 63V 21-13741B45 C453 C454 21-11032B14 21-11032B15 08-11051A15 C458.459 30 pF 0.01 ±10% 21-13740B36 C460,461 C501,502 21-13741B45 .1, 63V 100 pF 08-11051A13 21-13740B49 10, ±20%, 16V, electrolytic 100 pF C504 23-11048B13 C505,506 C507 21-13740B49 23-13749C39 08-11051A15 10, ±10%, 20V .22, 63V C509 23-11048B13 10, ±20%, 16V, electrolytic C510 C511–513 C514 21-13740B61 330 pF 21-13740B49 23-02308M01 1000, +20%, 16V, electrolytic C515 C551 C552 C553 C554 C555 21-13740B49 23-11048A17 100 pF 33, +20, 25V, electrolytic 21-13740B33 1000 pF 21-13740B73 08-11051A03 21-13740B53 .0022, 63V 150 pF C556-558 C559,560 08-11051A12 .068, 63V 08-11051A13 1 63V C561 C562 23-11048B05 1, ±20%, electrolytic 08-11051A09 .022, 63V C563,564 21-13740B49 100 pF C565 10, ±20%, 16V, electrolytic 0.01, ±10% 23-11048B13 C566,567 C604 21-13741B45 23-11048B05 1, ±20%, electrolytic 0.039, 63V C606 C607 C608 C609 C610 08-11051A22 08-11051A13 .1, 63V .0047, 63V 08-11051A05 180 pF .22, 63V 75 pF 47, ±20%, 16V, electrolytic 21-13740B55 08-11051A15 21-13740B46 C611 C612 C651 C652 C653 C656 C657 C658 C659 C660 C661 C662 C663 C701 C703 C704 C705 C706 23-11048B19 23_110//8R10 08-11051A06 .0068, 63V 08-11051A15 23-11048B13 10. +20%, 16V, electrolytic 21-13741B69 21-13741B45 0.1, +80 -20% 0.01 +10% 23-13749A44 23-11048B13 10, +20%, 16V, electrolytic 21-13740B76 21-13741B39 0056 21-13740B49 100 pF 21-13740B78 1800 pF .22, +80, -20% 100 pF .022, 63V 21-13740B49 .1, 63V .001, 63V 100 pF 1000 pF 08-11051A13 C707 C801,802 21-13740B49 C803,804 21-13740B73 .22, +80 -20% 1000 pF C805 21-11032R15 21-13740B73 100 pF 1000 pF C808,809 21-13740B49 C810,811 21-13740B73 C813-823 21-13740B73 1000 pF 100 pF 21-13740B49 C826 C827 C828 C829 C830 C831 C832 C833 21–13740B73 23–11048B05 1000 pF 1, ±20%, electrolytic 0.1, +80 -20% 21-13741B69 21-13741B45 0.01, ±10% 10 pF, ±.5 pF 5.6 pF, ±.5 pF 10 pF, ±.5 pF 1000 pF 21-13740B25 21-11031F10 21-13740B25 21-13740B73 C834,835 C836 21-13741B69 0.1, +80 -20% 21-13740B73 1000 pF C837-840 C841-848 21-13741B45 0.01, ±10% 1000 pF 100 pF 21-13740B73 C849 21-13740B49 C850 1000 pF 21-13740B73 C852,853 21-13741B45 0.01, ±10% C854 21-13740B73 1000 pF C855 23-11054A09 47, ±20%, 6V, tantalum C856 21-13740B49 100 pF diode (see note) CR401 48-83654H01 silicon CR402 48-83654H02 silicon silicon silicon CR403 48_83654H01 CR403 CR451 CR501,502 CR551 48-83654H01 48-83654H02 06-11009B23 iumper resistor

MXW-7357-O (2) REFERENCE MOTOROL A DESCRIPTION PART NO. SYMBOL CR651 48-83654H01 silicon fuse F801 65-05214E06 1 A 28-80129M01 5-pin 28-80128M01 5-pin J8,9 28-80126M01 23-pin J10 28-80128M02 jumpe JU601 09-84181L01 2-contact push-on JU802 06-11077A01 0-ohm resistor 0-ohm resistor JU804 06-11077A01 coil, RF L801 L802.803 24-82723H35 23 uH. red 24-83961B02 28-80127M02 14-pin, RF board P601 28-80002R03 3-pin, for JU601 transistor (see not Q401 48-00869619 0402 48-80214G02 NPN PNP NPN PNP PNP NPN PNP NPN PNP NPN PNP Q451.452 48-00869619 Q453,454 Q455 48-11043C10 Q501,502 Q503.504 48-80214G02 48-05128M16 Q506 48-00869619 Q507 Q508 48-00869618 48-05128M16 Q509 Q551 48-80214G02 48-05128M16 Q552 48-80214G02 NPN PNP NPN Q601 Q651 48-80214G02 48-05128M16 Q652 48-80214G02 Q801 Q802 NPN PNP NPN PNP 48-80214G02 48-11043C10 Q803-807 48-80214G02 Q808.809 48-05128M16 Q810-812 48-80214G02 NPN resistor, fixe +5%, 1/8 watt (ur otherwise stated) R401 06-11077A70 680 R402 330, .6 watt, metal film R403 680 1.74k, <u>+</u>1% 06-11077A70 R404 R405 06-11077F28 2.21k, ±1% R406 10k 1.2k R407 06-11077A76 R408,409 06-11077A98 1.8k 1, .6 Watt, metal film R410 06-11077A80 06-02369M01 R453 06-11077A70 06-02369M31 330. .6 watt. metal film 680 2.2k 1.2k 4.7k 12k 680 180k 120k 06-11077A70 06-11077A82 R455 R456 R457 06-11077A76 R458,459 06-11077A90 R460 06-11077B01 06-11077A70 R462 06-11077B29 R463 06-11077B25 R464,465 R466,467 06-11077G88 100k, ±1% 06-11077F91 10k, ±1% 270 R468 R469 06-11077A74 1k 10k 22k 5.6k 27k 10k 2.2k 8.2k 8.2k 3.3k 1.5k 1.2k 10k 820 22k 68 R470 R471 06-11077B07 R472 R473 06-11077B09 R474 R501 06-11077A82 R502,503 R504 06-11077A96 R505 R506 06-11077A78 R507 06-11077A76 R508 06-11077A98 R509,510 06-11077A72 R511 06-11077R07 06-11077A46 R513.514 06-11009B26 2.7, 1/4 Watt 06-11077A46 R516 06-11077A66 470 06--11077A98

R519

R552

R553

R556

R557 R558

R559 R560

R561

R554.555

06-80185M0

06-11077B01

06-11077B37

06-11077B19

06-11077B18

06-11077F53

06-11077F20

06-11077G41

06-11077E77

1 ohm, ±10%, 2W, metal plate

12k

68k 62k 4.02k, ±1% 1.82k, ±1%

32.4k, ±1%

100k, ±1%

665, ±1% 107k, ±1%

MXW--7357-O (3) REFERENCE DESCRIPTION SYMBOL PART NO. 06-11077B16 R562 06-11077B15 R565 06-11077A98 10k 8.2k 3.3k 22k 47 56k 27k R566 R567 06-11077A96 06-11077A86 R569 06-11077A42 06-11077B17 B573 06-11077B09 06-11077A01 0-ohm 10k R604 06-11077A98 R605 R606 R607 06-11077A74 06-11077A98 06-11077B47 1 meg 06-11077B11 06-11077B15 R609 33k 47k R610 R611.612 06-11077G42 06-11077G45 35.7k, ±1% 187k, ±1% 06-11077H15 06-11077G48 B615 R616 38.3k, +1% 06-11077A82 06-11077B23 R617 100k 10k 0 ohm R619.620 06-11077A98 06-11077A01 R621 220k 560 100 10k 4.7k R622 06-11077B31 R651 06-11077A68 R652 R653.654 06-11077A98 06-11077A90 R656 06-11077B39 470k 620k R657 R658 06-11077B42 06-11077H65 619k, ±1% 06-11077A82 2.2k 2.2k 68k 15k 56k 62k 22k 2.7k 100k 62k 100 100k, ±1% R660 06-11077R10 R661 06-11077B03 R662 06-11077B17 06-11077B18 R664 06-11077B07 R665 06-11077A84 B666 667 06-11077B23 06-11077B18 06-11077A50 06-11077G88 R701 R702 R703 06-11077H13 06-11077G31 25.5k. +1% R705 R706 06-11077H13 178k, ±1% 06-11077G88 100k +1% R707 243k, ±1% R709 30k 61.9k, ±1% 06-11077B10 R710-712 R713 06-11077A86 3.3k R714 30k 18k 1.5k 2.7k 10k 4.7k 10k, 47k 4.7k 56k 4.7k R715 06-11077B05 R801 R802 06-11077A84 06-11077A90 06-11077A98 R804 R807 06-11077B15 06-11077A90 R810.811 06-11077B17 06-11077A90 R812-815 B816-818 06-11077B23 100k 10k 47k 10k 47k 10k 1k 10k R820,821 06-11077A98 06-11077B15 06-11077A98 R823,824 06-11077B15 06-11077A98 R825 R826-828 R829-832 06-11077A74 06-11077A98 R833 R834 R835 06-11077F91 06-11077B08 R836 R837 06-11077A98 06-11077B05 R838 06-11077F91 R839-841 06-11077A98 R842 R843,844 06-11077A74 06-11077A98 1k 10k 06-11077A98 R847,848 1k 10k R849 06-11077A98 06-11077A74 1k 47k 820k 4.7k 47k R851.852 06-11077B15 06-11077B45 R854 06-11077490 06--11077B15 R856 06-11077A74 R857-860 06-11077A98 06-11077B23 100k 06-11077E25 11K. +1% 06-11077F91 06-11077F20 10k, ±1% 1.82k, ±1% R863 06-11077A98 06-11077A74 R865-873

1k 10k 100k

47k 10k 22k 4.7k

06-11077A98

06-11077B23

06-11077B15

06-11077A98

06-11077A90

R875 876

R877-879

R881

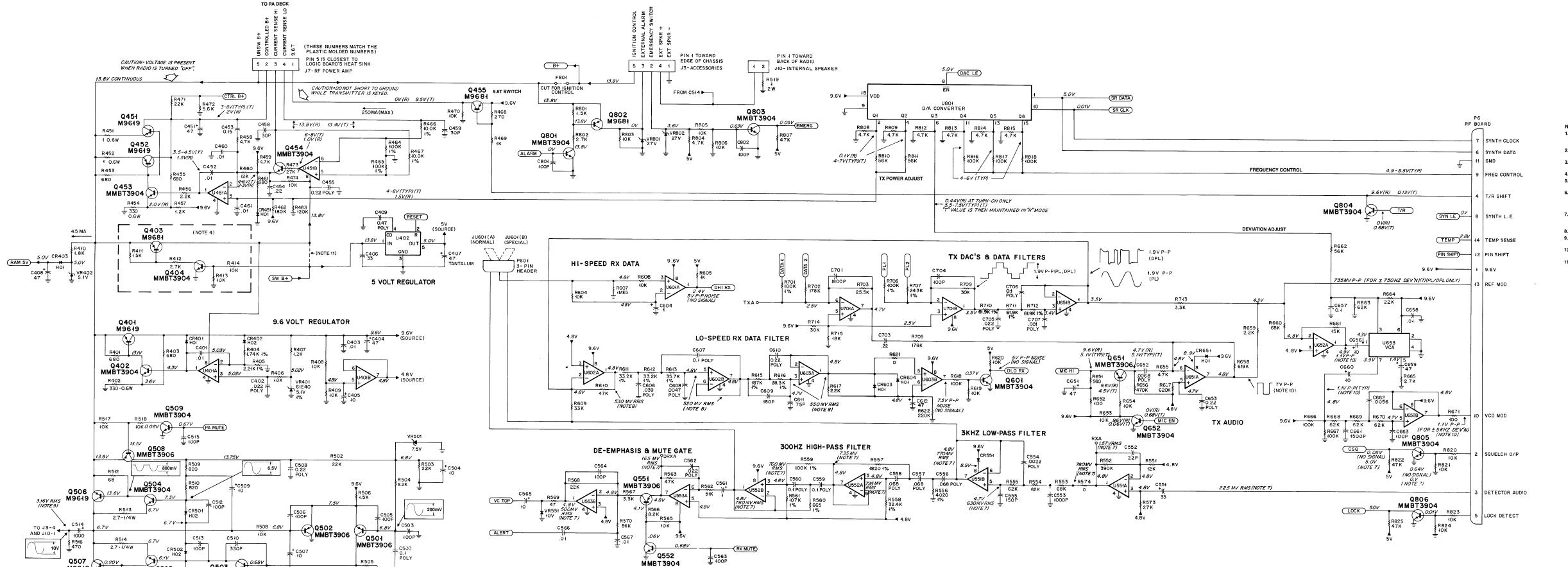
R882

R883

REFERENCE	MOTOROLA	DESCRIPTION
SYMBOL	PART NO.	
R884	06-11077B15	47k
R885	06-11077A98	10k
R886	0611077B07	22k
R887	06-11077A90	4.7k
R889	06-11077A68	560
R890	06-11077 A 98	10k
R897,898	06-11077A98	10k
integrated circuit		
U401	51-02198J22	dual op-amp
U402	51-80942T01	voltage regulator 5V
U451	51-02198J22	dual op-amp
U551-553	51-02198J22	dual op-amp
U601	51-02198J23	dual comparator
U602,603	51-02198J22	dual op-amp
U651,652	51-02198J22	dual opamp
U653	51-80059M01	voltage-controlled attenuator
U701	51-02198J22	dual op-amp
U801	51-80135C10	D/A converter
U802	51-80960T01	microprocessor
U803	51-82862N09	logic array
U804	HLN9722A	ROM kit
U805	51-80901W01	EEPROM, 2KX8
U806	51-80914V01	static RAM
U807	51-02198J23	dual comparator
voltage regulator	(see note)	·
VR401	48-83461E40	zener, 5.1V
VR402	48-82256C15	zener, 5.1V
VR501	48-80140L11	zener, 7.5V
VR551	48-82256C11	zener, 10V
VR801.802	48-82256C20	zener, 27V
VR803	48-82256C11	zener, 10V
VR804,805	48-82256C20	zener, 27V
VR806	48-82256C11	zener, 10V
VR807	48-82256C20	zener, 10V zener. 27V
		201101, 27 V
crystal (see note) Y801	48-80173D09	7.776 MHz
		erenced parts
M406-410	14-83820M05	
M406–410 M413		insulator
M413 M414	14-80145M01	insulator, accessory connector
	26-80123M01	logic shield
M415,416	09-82071K09	14-pin socket
	03-10943M04	tapping screws (5 used)
	04-00131974	flat washer (4 used)
	07-80925T01	bracket, audio regulator
	14-82392E13	cover insulator
	26-80125L02	heat sink, audio regulator
	42-80940T01	ring, retaining (2 used)
	84-80199M02	circuit board

note: For best performance, order diodes, transistors, and integrated circuit devices by

Schematics, Circuit Board Diagrams, and Parts List for HLN5172A Logic Board PW-7356-O (Sheet 4 of 4) 2/28/90



Q505 MMBT3906

AUDIO POWER AMP

Q503

145 MV RMS (NOTE 9)

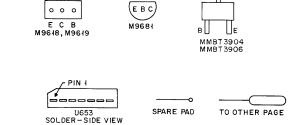
- UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE
- NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWIS INDICATED.

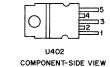
- 4. NOT USED. 5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOI IM) DC VOLTMETER.
- 6. DC VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:

 (R) RECEIVE MODE

 (T) TRANSMIT MODE
- 7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
- 8. SAME AS NOTE 7, EXCEPT MODULATED FREQUENCY IS 100 HZ.
- SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 8 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
- 10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 800 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
- 11. VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.

SOLDER-SIDE VIEWS

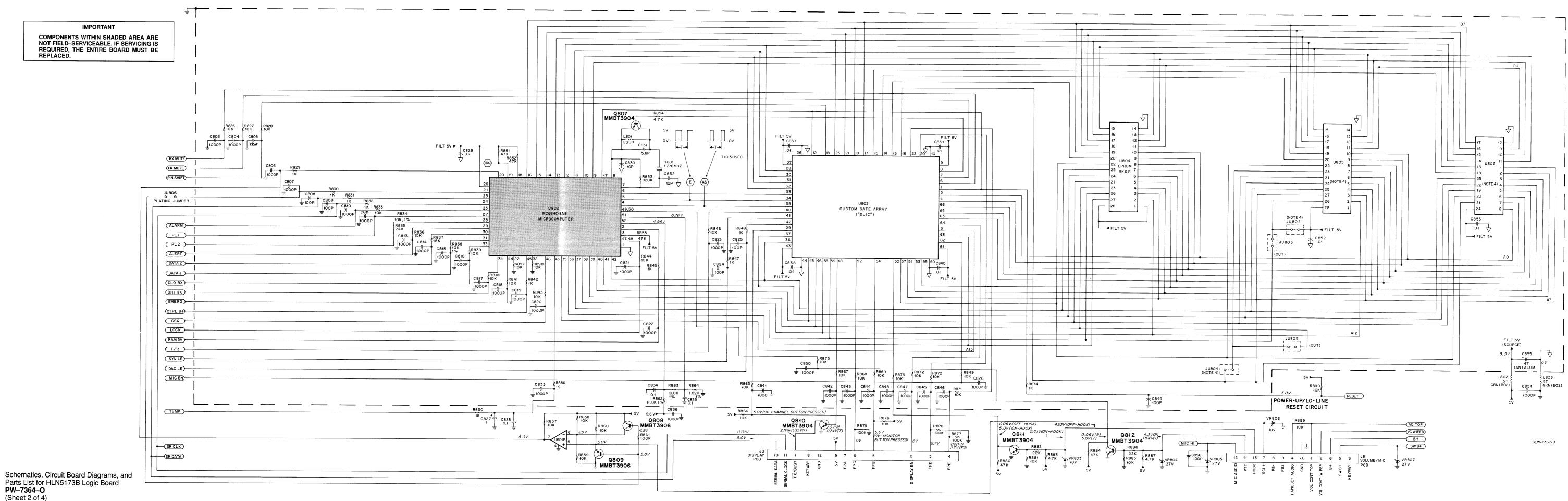




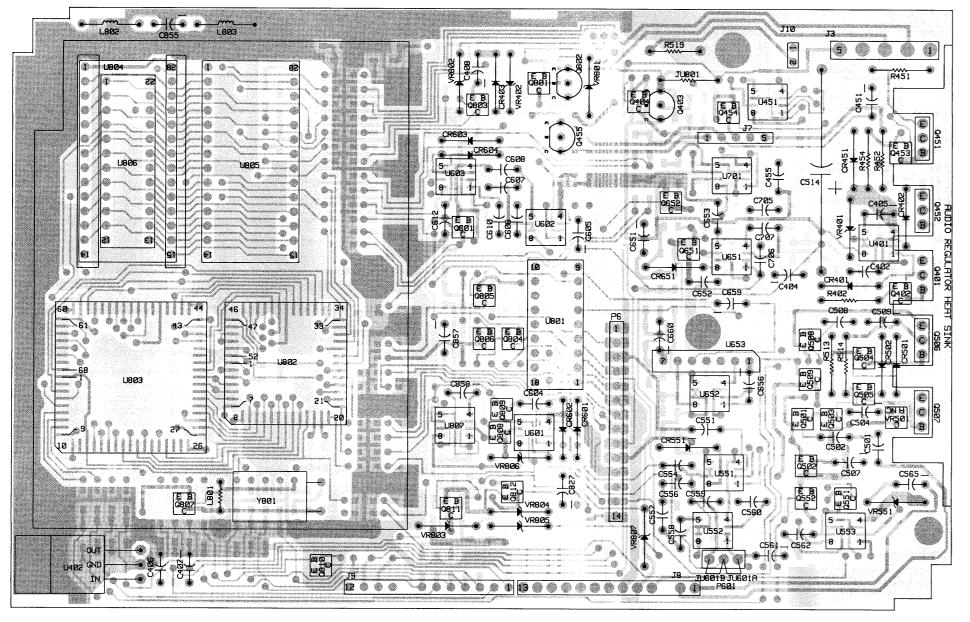
GEW-7366-0

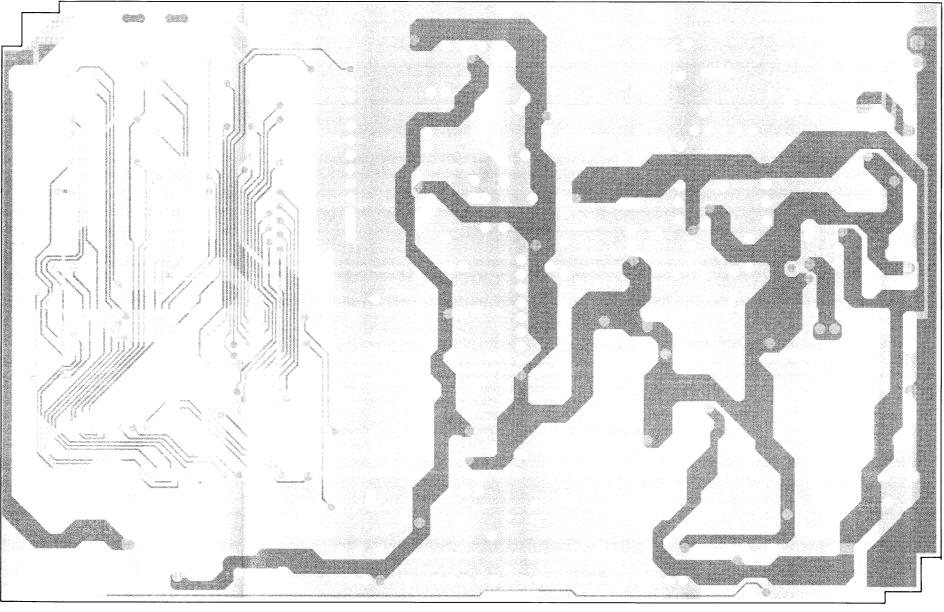
COMPONENT-SIDE VIEW

Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board PW-7364-0 (Sheet 1 of 4)



PW-7364-O (Sheet 2 of 4) 2/28/90





 SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7359-O
COMPONENT SIDE GCW-7359-O
COMPONENT SIDE GCW-7359-O
COMPONENT SIDE GCW-7359-O

OVERLAY • GCW-7361-O

SOLDER SIDE VIEW

COMPONENT SIDE VIEW

COMPONENT SIDE VIEW

Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board PW-7364-O (Sheet 3 of 4) 2/28/90

C854

parts list MXW-7365-O HLN5173B Logic Board (Conventional) REFERENCE REFERENCE MOTOROLA DESCRIPTION SYMBOL $\textbf{capacitor, fixed, uF, $\underline{\textbf{+}}5\%$, 50V (unless otherwise stated)}$ fuse F801 C401 21-13741B45 0.01. +10% 08-11051A09 C402 C403 C404 C405 C406 C407 C408 C409 C451 C452 C453 C454 C455 21-13741B45 0.01, ±10% J3 J7 47, ±20%, 16V, electrolytic 23-11048B13 10 +20 16V electrolytic J8,9 J10 23-11048A17 33, ±20%, 25V, electrolytic 23-13749A44 47, +20%, 6V jumpei JU601 47, ±20%, 16V, electrolytic 08-11051A17 .47. 63V 23-11048B19 47, ±20%, 16V, electrolytic coil. RF 0.01, ±10% .15, +80 –20% 21-13741B45 L801 21-11032B14 L802, 803 .22, +80 -20% .22, 63V 21-11032B15 connector plug 08-11051A15 C458, 459 C460, 461 C501, 502 C503 P6 P601 30 pF 0.01 ±10% 21-13740B36 21-13741B45 08-11051A13 transistor (see note 21-13740B49 100 pF Q401 C504 C505, 506 23-11048B13 21-13740B49 10, ±20%, 16V, electrolytic Q402 Q451, 452 C507 C508 23-13749C39 10, ±10%, 20V Q453, 454 08-11051A15 .22, 63V Q455 C509 C510 23-11048B13 21-13740B61 10, ±20%, 16V, electrolytic Q501, 502 330 pF Q503, 504 21-13740B49 Q505 1000. +20%, 16V, electrolytic Q506 Q507 C514 23-02308M01 C515 C551 C552 21-13740B49 23-11048A17 33. +20. 25V. electrolytic Q508 Q509 21-13740B33 C553 C554 C555 C556–558 1000 pF Q551 Q552 21-13740B73 08-11051A03 .0022, 63V 21-13740B53 150 pF Q601 Q651 .068, 63V C559, 560 C561 08-11051A13 1 63V Q652 Q801 1, ±20%, electrolytic C562 C563, 564 08-11051A09 022 63V Q802 21-13740B49 100 pF Q803-807 10, ±20%, 16V, electrolytic 0.01, ±10% 1, ±20%, electrolytic C565 C566, 567 C604 C606 23-11048B13 Q808, 809 21–13741B45 Q810-812 23-11048B05 resistor, fixed 08-11051A22 0.039, 63V R401 C607 C608 C609 C610 08-11051A13 .1. 63V 08-11051A05 .0047, 63V R403 21-13740B55 08-11051A15 180 pF .22, 63V R404 R405 R406 21-13740B46 23-11048B19 75 pF 47, ±20%, 16V, electrolytic C611 C612 C651 C652 C653 C656 C657 C659 C660 C661 C662 C663 C701 C703 C704 C705 C706 C706 R407 23-11048B19 08-11051A06 47, ±20%, 16V, electrolytic .0068, 63V R408, 409 R410 R451, 452 08-11051A15 23-11048B13 .22, 63V 10, +20%, 16V, electrolytic R453 21-13741B69 0.1, +80 -20% R454 0.01, ±10% 47, ±20%, 6V 10, ±20%, 16V, electrolytic 21-13741B45 R455 R456 23-13749A44 23-11048B13

21-13740B76 21-13741B39

21-13740B49

21-13740B78

21-13740B49

08-11051A09

08-11051A13

08-11051A01

21-13740B49

21-11032B15

21-13740B73

21-13740B73

21-13740B49

21-13740B73

21-13740B73

21-13740B49

21-13740B73 23-11048B05

21-13741B69 21-13741B45

21-13740B25 21-11031F10

21-13740B25

21-13740B73

21-13741B69 21-13740B73

21-13741B45

21-13740B73

21-13740B49

21-13740B73

21-13741B45

21-13740B73

21-13740B49

48-83654H01

48-83654H0

48-83654H0

48-83654H02

06-11009B23

48-83654H0

48-83654H01

48-83654H02

C801, 802

C803-804

C806, 807

C808, 809

C810, 811

C813-823 C824, 825

C826 C827 C828 C829

C830 C831

C832 C833

C836

C849 C850

C854

C856

CR401 CR402

CR403 CR451

CR551

CR501, 502

CR603, 604 CR651

C834, 835

C841-848

C805

.0056

1800 pF

100 pF

1 63V

100 pF

100 pF

1000 pF

1000 pF

1000 pF

1, ±20%, electrolytic

0.1, +80 -20% 0.01, ±10%

5.6 pF. +.5 pF

0.1, +80 -20%

1000 pF

1000 pF

1000 pF

1000 pF

1000 pF

100 pF

silicon

silicon

silicon

silicon

silicon

silicon silicon

jumper resistor

0.01, ±10%

0.01, ±10%

47, ±10%, 6V

.022, 63V

.001, 63V

.22, +80 -20%

.22, +80, -20%

65-05214E06 connector recepta 28-80129M01 5-pin 5–pin 23–pin 28-80128M01 28-80126M01 28-80128M02 09-84181L01 24-82723H35

MOTOROLA

DESCRIPTION

1, .6 Watt, metal film

24-83961B02 5 turns, green 28-80127M01 14-pin, RF board 28-80002R03 3-pin, for JU60 48-00869619 PNP

MXW-7365-O (2)

NPN PNP NPN PNP PNP NPN PNP PNP 48-80214G02 48-00869619 48-11043C10 48-05128M1 48-80214G02 48-05128M16 48-00869619

48-00869618 NPN PNP NPN PNP 48-05128M16 48-80214G02 48-05128M16 NPN NPN PNP 48-80214G02 48-80214G02 48-05128M16 NPN NPN PNP 48-80214G02 48-80214G02

48-11043C10 48-80214G02 NPN PNP 48-05128M16 48-80214G02 ±5%, 1/8 watt (unless otherwise stated) 06-11077A70 06-02369M31

06-11077A70 06-11077F18 06-11077F28 2.21k, ±1% 10k 1.2k 10k 06-11077A98 06-11077A76 06-11077A80 06-02369M01 06-11077A70 06-02369M31

R457 R458, 459

R462 R463 R464, 465 R466, 467

R460 R461

R468 R469

R470

R471

R472 R473

R501

R506

R507

R508

R511

R512

R515

R516

B519

R551

R552

R553

R556

R557

R558

R559

R560

R561

R562

R563

R565

R568

R513, 514

R517, 518

R554, 555

R502, 503 R504

330, .6 watt, metal film 06-11077A70 680 06-11077A82 06-11077A76 06-11077A90 1.2k 4.7k 12k 680 180k 06-11077B01 06-11077A70 06-11077B29 180k 120k 100k, ±1% 10k, ±1% 270 1k 06-11077B25 06-11077G88 06-11077F91

06-11077A60 06-11077A74 06-11077A98 06-11077B07 06-11077A92 06-11077B09 06-11077A98 06-11077A82 06-11077A96

1k 10k 22k 5.6k 27k 10k 2.2k 22k 8.2k 3.3k 1.5k 1.2k 10k 820 22k 68 2.7, 1/4 Watt 06-11077A78 06-11077A98 06-11077B07 06-11077A46 06-11009B26 68 470 06-11077A66 06-11077A98

06-11077A86

06-80185M0 1 ohm. +10%, 2W, metal plate 06-11077B01 06-11077B37 390k 06-11077B19 06-11077B18 62k 06-11077F53 06-11077F20 06-11077G41

06-11077G88 06-11077E77 06-11077G91 06-11077B16 51k 06-11077B15 47k 06-11077A98 10k 06-11077A96

06-11077B07

4.02k, ±1% 1.82k, ±1% 32.4k, ±1% 100k, ±1% 665, ±1% 107k, ±1% 22k

R850

R853

R854

R855

R862

R864

R874

R881

R882

R883

R884 R885 R886 R887

R863

B851 852

R857-860

R865-873

R877-879

06-11077A74

06-11077B15

06-11077B45

06-11077A90

06-11077B15

06-11077A74

06-11077A98

06-11077B23

06-11077F95

06-11077F91

06-11077F20

06-11077A98

06-11077A74

06-11077B23

06-11077A98

06-11077A90

06-11077A98

06-11077A90

47k

820k

4.7k 47k

100k

10k 100k

47k 10k

22k 4.7k

22k 4.7k

11K. +1%

10k, ±1% 1.82k, +1%

REFERENCE	MOTOROLA	MXW-7365-O
SYMBOL	PART NO.	DESCRIPTION
R567	06-11077A86	3.3k
R569 R570	06-11077A42 06-11077B17	47 56k
R573	06-11077B09	27k
R574	06-11077A01	0-ohm
R604	06-11077A98	10k
R605	06-11077A74	1k
R606	06-11077A98	10k
R607	06-11077B47	1 meg
R609	06-11077B11	33k 47k
R610 R611, 612	06-11077B15 06-11077G42	33.2k, ±1%
R613	06-11077G45	35.7k, ±1%
R615	06-11077H15	187k, ±1%
R616	06-11077G48	38.3k, ±1%
R617	06-11077A82	2.2k
R618	06-11077B23	100k
R619, 620	06-11077A98	10k
R621 R622	06-11077A01 06-11077B31	0–ohm 220k
R651	06-11077A68	560
R652	06-11077A50	100
R653, 654	06-11077A98	10k
R655	06-11077A90	4.7k
R656	06-11077B39	470k
R657	06-11077B42	620k
R658	06-11077H65	619k, ±1% 2.2k
R659 R660	06-11077A82 06-11077B19	68k
R661	06-11077B03	15k
R662	06-11077B17	56k
R663	06-11077B18	62k
R664	06-11077B07	22k
R665	06-11077A84	2.7k
R666, 667	06-11077B23	100k 62k
R668–670 R671	06-11077B18 06-11077A50	100
R701	06-11077G88	100k, ±1%
R702	06-11077H13	178k, ±1%
R703	06-11077G31	25.5k, ±1%
R705	06-11077H13	178k, <u>±</u> 1%
R706	06-11077G88	100k, ±1%
R707	06-11077H26	243k, ±1%
R709 R710–712	06-11077B10 06-11077G68	30k 61.9k, ±1%
R713	06-11077A86	3.3k
R714	06-11077B10	30k
R715	06-11077B05	18k
R801	06-11077A78	1.5k
R802	06-11077A84	2.7k
R803	06-11077A98	10k
R804 R805, 806	06-11077A90 06-11077A98	4.7k 10k
R807	06-11077B15	47k
R808, 809	06-11077A90	4.7k
R810, 811	06-11077B17	56k
R812-815	06-11077A90	4.7k
R816-818	06-11077B23	100k
R820, 821	06-11077A98	10k 47k
R822 R823, 824	06-11077B15 06-11077A98	10k
R825	06-11077B15	47k
R826-828	0611077A98	10k
R829-832	06-11077A74	1k
R833	06-11077A98	10k
R834	06-11077F91	10K, ±1%
R835	06-11077B08	24k
R836	06-11077A98	10k
R837 R838	06-11077B05 06-11077F91	18k 10k, ±1%
R839–841	06-11077F91 06-11077A98	10k, ±1% 10k
R842	06-11077A36	1k
R843, 844	06-11077A98	10k
R845	06-11077A74	1k
R846	06-11077A98	10k
R847, 848	06-11077A74	1k
R849	06-11077A98	10k

06-11077A68 06-11077A98 R897, 898 06-11077A98 integrated circuit (see note) 51-02198J22 dual op-amp 51-80942T02 voltage regulator 5V 51-02198J22 dual op-amp U551-553 51-02198J22 dual op-amp 51-02198J23 dual comparator

DESCRIPTION

U601 U602, 603 U651, 652 51-02198J22 dual op-amp 51-02198J22 dual op-amp U653 U701 U801 U802 51-80059M01 voltage-controlled attenuate 51-02198J22 dual op-amp 51-80135C10 51-80960T01 microcomputer U804 HLN9277A U803 51-82862N09 logic array U807 dual comparator

voltage regulate see note) VR401 48-83461E40 zener, 5.1V VR402 48-82256C15 zener, 5.1V VR501 48--80140L11 zener, 7.5V VR551 48-82256C1 zener, 10V zener, 27V VR801, 802 48-82256C20 VR803 48-82256C1 zener, 27V VR804, 805 48-82256C20 48-82256C11 48-82256C20 zener, 10V zener, 27V VR806 VR807 crystal (see note)

MOTOROLA PART NO.

REFERENCE

SYMBOL R889

U401

U402

U451

48-80173D09 7.776 MHz Y801 non-referenced parts bag M401-404 03-10943M04 tapping screw M406-410 14-83820M05 M412 84-80199M02 circuit board M413 insulator accessory connector M414 26-80123M01 logic shield 14-pin socket 14-82392F13 cover insulator 42-80940T0 retaining ring tapping screw flat washer 03-10943M04 04-00131974 07-80925T0 bracket, audio regulator

2/28/90

MXW-7365-O (4)

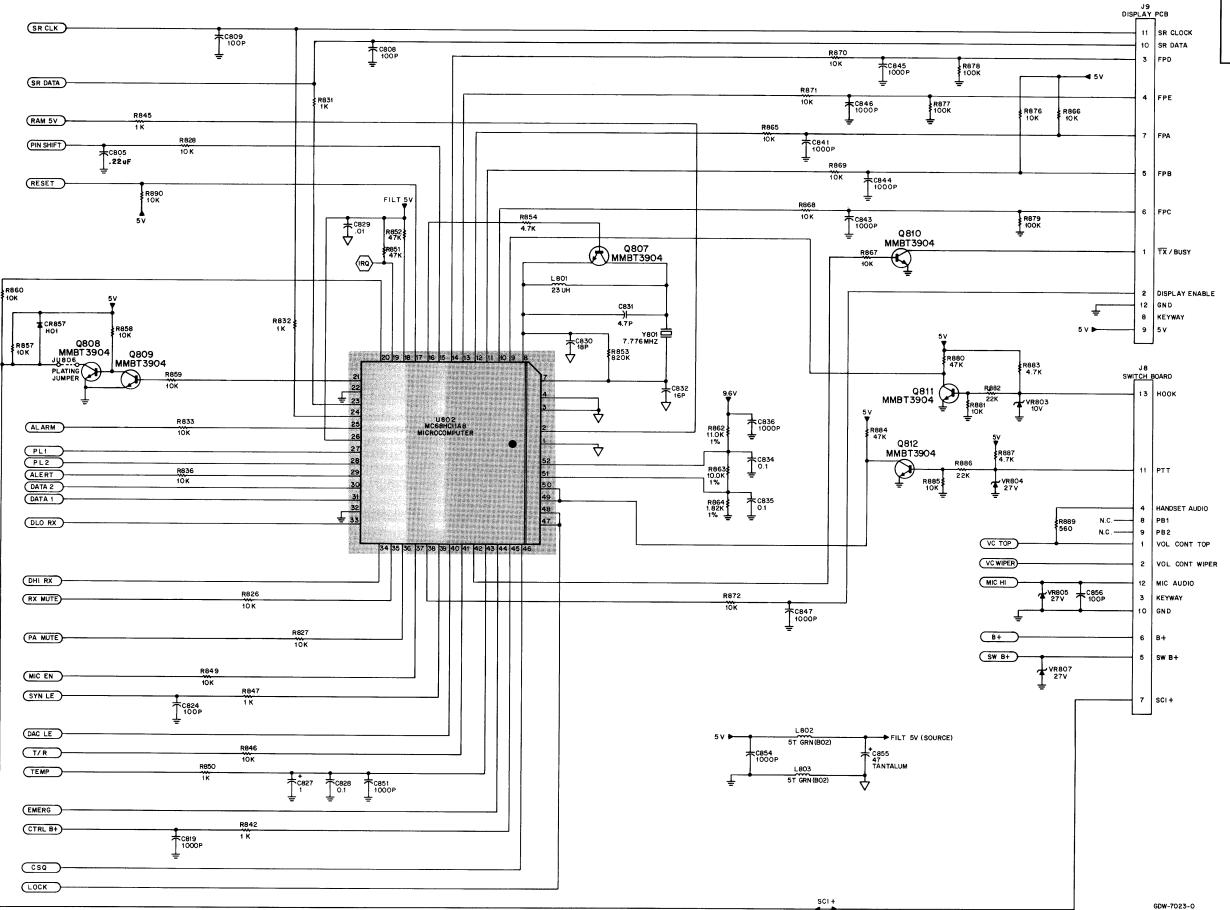
note: For best performance, order diodes, transistors, and integrated circuit devices by

heat sink, audio regulato

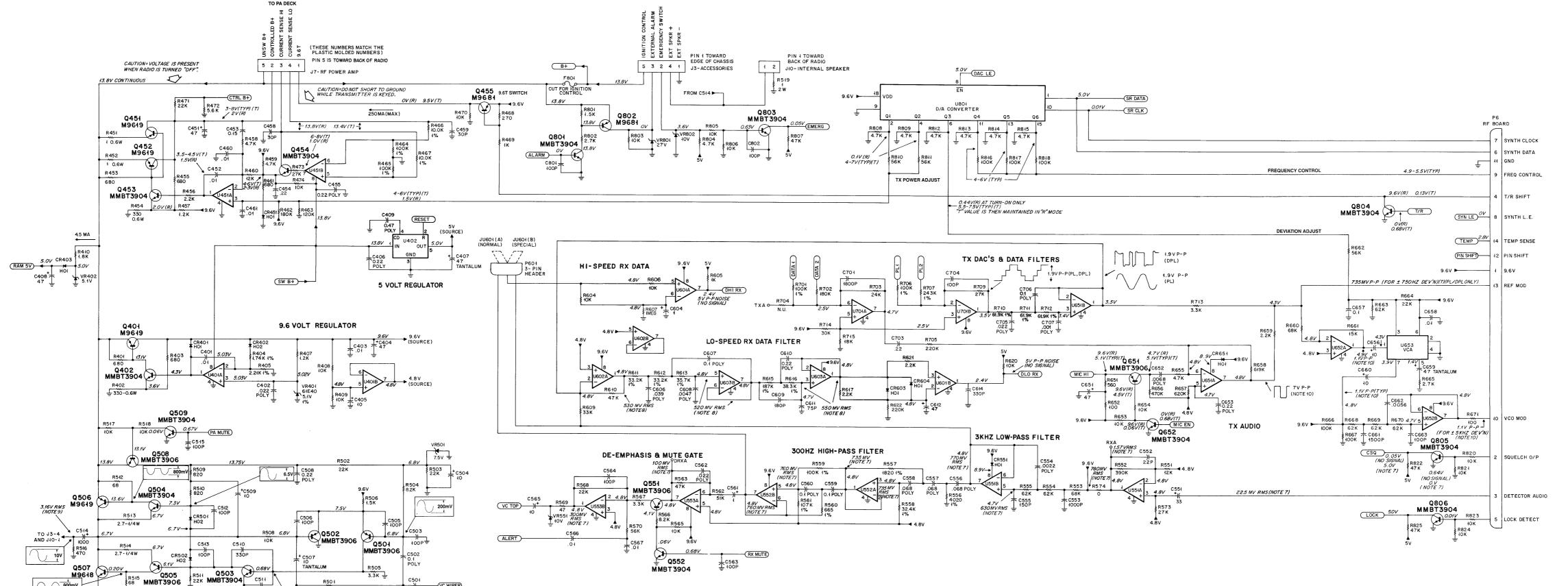
Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board PW-7364-O (Sheet 4 of 4) 2/28/90

IMPORTANT

COMPONENTS WITHIN SHADED AREAS ARE NOT FIELD-SERVICEABLE. IF SERVICING IS REQUIRED, THE ENTIRE BOARD MUST BE REPLACED



Schematics, Circuit Board Diagrams, and Parts List for HLN9123A Logic Board PW-7020-0 (Short 1 of 4)



Schematics, Circuit Board Diagrams, and Parts List for HLN9123A Logic Board PW-7020-O (Sheet 2 of 4) 2/28/90

Q503

AUDIO POWER AMP

VC WIPER) 145 MV RMS (NOTE 9)

 UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENIES. 2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED. 4. NOT USED.

5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.

COMPONENT-SIDE VIEW

SOLDER-SIDE VIEWS

0 0 0 E C B M9618, M9619

COMPONENT-SIDE VIEW

SPARE PAD TO OTHER PAGE

6. DC VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
(R) RECEIVE MODE
(T) TRANSMIT MODE

(1) TRANSMIT MODE

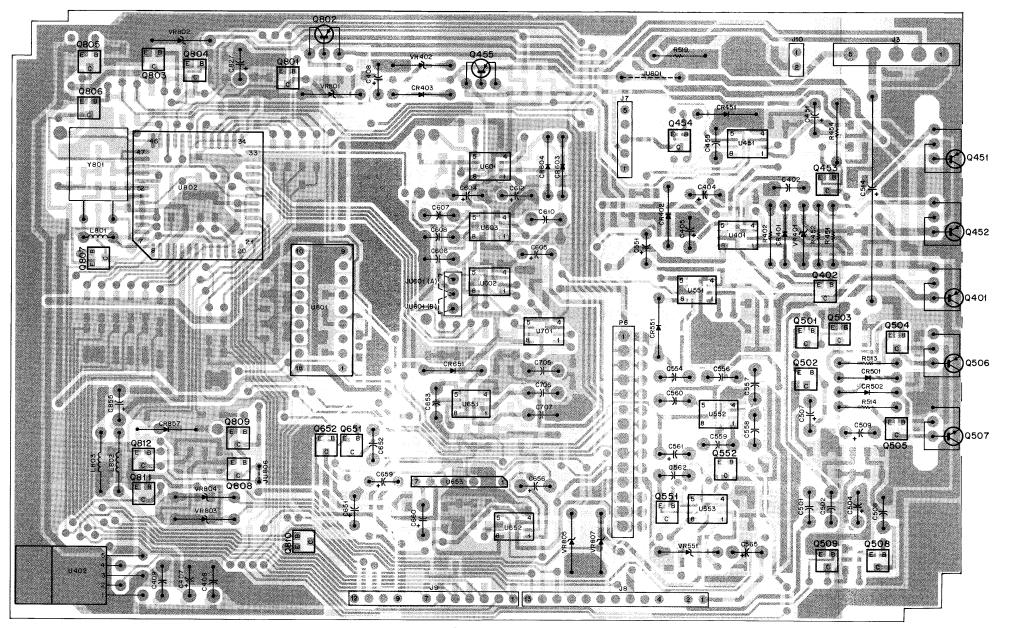
MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.

8. SAME AS NOTE 7, EXCEPT MODULATED FREQUENCY IS 100 HZ.

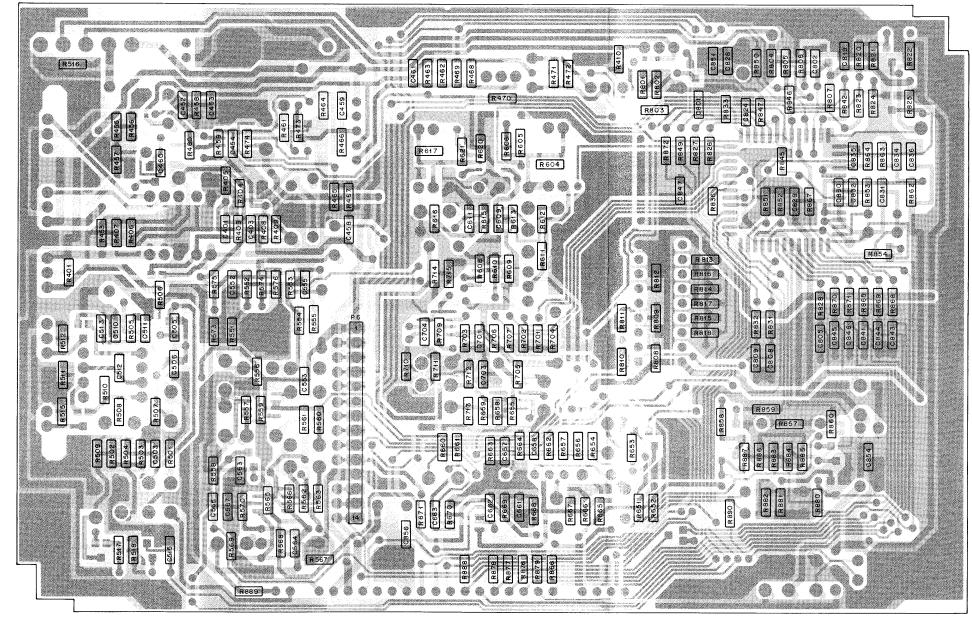
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).

10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 800 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.

11. VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.



SHOWN FROM COMPONENT SIDE



SOLDER SIDE

COMPONENT SIDE

OVERLAY

GDW-7022-0

GDW-7021-0

GDW-7456-0

SHOWN FROM SOLDER SIDE

Schematics, Circuit Board Diagrams, and Parts List for HLN9123A Logic Board **PW-7020-O** (Sheet 3 of 4) 2/28/90

parts list

Schematics, Circuit Board Diagrams, and Parts List for HLN9123A Logic Board PW-7020-0

(Sheet 4 of 4)

2/28/90

MXW-7019-O (3) MXW-7019-O (4) MXW-7019-O MXW-7019-O (2) HLN9123A Logic Board, Masked

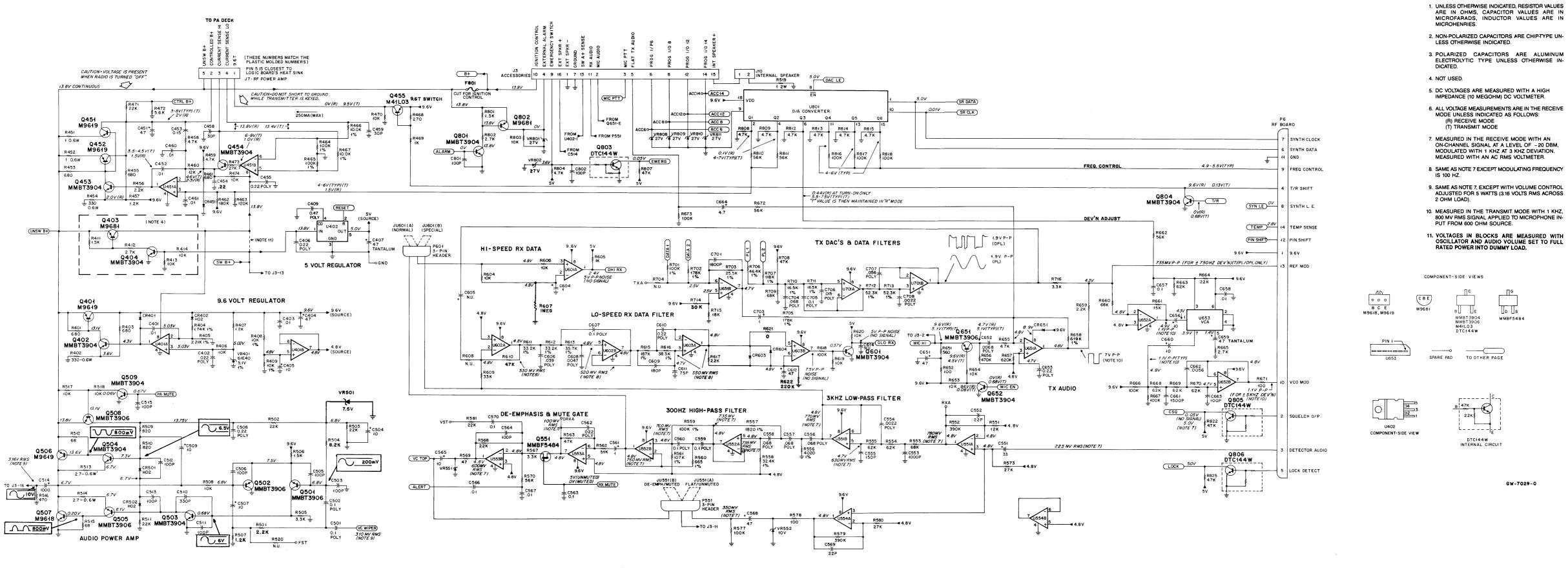
HLN9123A Logic Board	d, Masked		MXW-7019-0
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION	
capacitor, fixed uF, ±5			
C401 C402	21-13741B45 08-11051A09	.01, ±10% .022, 63V	
C403	21-13741B45	.01, ±10%	
C404	23-11048B19	47, ±20%, 16V, electrolytic	
C405 C406	23-11048B13 08-11051A15	10, <u>+</u> 20, 16V, electrolytic .22, 63V	
C407	23-11013A56	47, ±20%, 6V, tantalum	
C408	23-11048B19	47, ±20%, 16V, electrolytic .47, 63V	
C409 C451	08-11051A17 23-11048B19	47, ±20%, 16V, electrolytic	
C452	21-13741B45	.01, ±10%	
C453 C454	21-11032B14 21-11032B15	.15, +80/–20% .22, +80/–20%	
C455	08-11051A15	.22, 63V	
C458, 459	21-13740B36	30 pF	
C460, 461 C501, 502	21-13741B45 08-11051A13	.01, ±10% .1, 63V	
C503	21-13740B49	100 pF	
C504	23-11048B13	10, ±20%, 16V	
C505, 506 C507	21-13740B49 23-11013D13	100 pF 10, ±10%, 20V, tantalum	
C508	08-11051A15	.22, 63V	
C509	23-11048B13	10, ±20%, 16V, electrolytic	
C510 C511–513	21-13740B61 21-13740B49	330 pF 100 pF	
C514	23-02308M01	1000 uF, ±20%, 16V, elect	rolytic
C515	21-13740B49	100 pF	•
C551	23-11048A17 21-13740B33	33, ±20, 25V, electrolytic	
C552 C553	21–13740B33 21–13740B73	22 pF 1000 pF	
C554	08-11051A03	.0022, 63V	
C555	21-13740B53	150 pF .068, 63V	
C556–558 C559, 560	08-11051A12 08-11051A13	.1, 63V	
C561	23-11048B05	1, ±20%, electrolytic	
C562	08-11051A09 21-13740B49	.022, 63V 100 pF	
C563, 564 C565	23-11048B13	10, ±20%, 16V, electrolytic	:
C566, 567	21-13741B45	0.01, ±10%	
C604 C606	23-11048B05 08-11051A22	1, ±20%, electrolytic 0.039, 63V	
C607	08-11051A13	.1, 63V	
C608	08-11051A05	.0047, 63V	
C609 C610	21-13740B55 08-11051A15	180 pF .22, 63V	
C611	21-13740B46	75 pF	
C612	23-11048B19	47, ±20%, 16V, electrolytic	:
C614 C651	21–13740B61 23–11048B19	330 pF 47, ±20%, 16V, electrolytic	;
C652	08-11051A06	.0068, 63V	
C653	08-11051A15	.22, 63V	
C656 C657	23-11048B13 21-13741B69	10, ±20%, 16V, electrolytic 0.1, +80 –20%	•
C658	21-13741B45	0.01, ±10%	
C659 C660	23-11013A56 23-11048B13	47, ±20%, 6V, tantalum 10, ±20%, 16V, electrolytic	
C661	21-13740B76	1500 pF	
C662	21-13741B39	.0056, ±10%	
C663 C701	21-13740B49 21-13740B78	100 pF 1800 pF	
C703	21-11032B15	.22, +80, -20%	
C704	21-13740B49 08-11051A09	100 pF	
C705 C706	08-11051A13	.022, 63V .1, 63V	
C707	08-11051A01	.001, 63V	
C801, 802	21-13740B49	100 pF	
C805 C808, 809	21-11032B15 21-13740B49	.22, +80 –20% 100 pF	
C819	21-13740B73	1000 pF	
C824	21-13740B49	100 pF	
C827 C828	23-11048B05 21-13741B69	1, ±20%, electrolytic 0.1, +80 –20%	
C829	21-13741B45	0.01, ±10%	
C830	21-13740B31 21-13740B17	18 pF	
C831 C832	21–13740B17 21–13740B30	4.7, <u>±</u> .25 pF 16 pF	
C834, 835	21-13741B69	0.1, +80 -20%	
C836	21–13740B73	1000 pF	
C841 C843–847	21-13740B73 21-13740B73	1000 pF 1000 pF	
C851	21-13740B73	1000 pF	
C854	21-13740B73	1000 pF	
C855 C856	23-11013A56 21-13740B49	47, <u>+</u> 20%, 6V, tantalum 100 pF	
diode (see note)		•	
CR401	48-83654H01	silicon	
CR402	48-83654H02	silicon	
CR403 CR451	48-83654H01 48-83654H01	silicon silicon	
CR501, 502	48-83654H02	silicon	
CR551	06-11009B23	jumper resistor	
CR603, 604 CR651	48-83654H01 48-83654H01	silicon silicon	
CR857	48-83654H01	silicon	
fuse			
F801	65-05214E06	1 A	
connector receptacle		5-pin, accessories	
J3	28-80129M01	pin, accessories	

		MXW-7019-O (2)
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
J7	28-80128M01	5-pin, RF power amplifier
J8/9 J10	28-80126M01 28-80128M02	23-pin 2-pin, internal speaker jumper
umper	00 94191101	2 contact push-on
JU601 coil, RF	09-84181L01	2-contact push-on
_801	24-82723H35	23 uH, red
_802, 803	24-83961B02	5 turns, green
connector plug P6	28-80127M01	14-pin, RF board
P601	28-80002R03	3-pin, for JU601
transistor (see note) Q401	48-00869916	PNP
Q402	48-80214G02	NPN
Q451, 452 Q453, 454	48-00869916 48-80214G02	PNP NPN
Q455, 454 Q455	48-00869681	PNP
Q501, 502	48-05128M16	PNP NPN
Q503, 504 Q505	48-80214G02 48-05128M16	PNP
Q506 0507	48-00869619	PNP
Q507 Q508	48-00869618 48-05128M16	NPN PNP
Q509	48-80214G02	NPN
Q551 Q552	48-05128M16 48-80214G02	PNP NPN
Q651	48-05128M16	PNP
Q652 Q801	48-80214G02 48-80214G02	NPN NPN
Q802	48-00869681	PNP
Q803–812 resistor, fixed, ohm,	48-80214G02 +5% 1/8 watt (unles	NPN ss otherwise stated)
resistor, fixed, offin, R401	06-11077A70	680
R402	06-02369M31	330, .6 watt, metal film
R403 R404	06-11077A70 06-11077F18	680 1.74k, ±1%
R405	06-11077F28	2.21k, ±1%
R407 R408, 409	06-11077A76 06-11077A98	1.2k 10k
R410	06-11077A80	1.8k
R451, 452 R453	06-02369M01 06-11077A70	1, .6 Watt, metal film 680
R454	06-02369M31	330, .6 watt, metal film
R455 R456	06-11077A70 06-11077A82	680 2.2k
R457	06-11077A76	1.2k
R458, 459 R460	06-11077A90 06-11077B01	4.7k 12k
R461	06-11077A70	680
R462 R463	06-11077B29 06-11077B25	180k 120k
R464, 465	06-11077G88	100k, ±1%
R466, 467 R468	06-11077F91 06-11077A60	10k, ±1% 270
R469	06-11077A74	1k
R470 R471	06-11077A98 06-11077B07	10k 22k
R472	06-11077A92	5.6k
R473 R474	06-11077B09 06-11077A98	27k 10k
R501	06-11077A82	2.2k
R502, 503 R504	06-11077B07 06-11077A96	22k 8.2k
R505	06-11077A86	3.3k
R506 R507	06-11077A78 06-11077A76	1.5k 1.2k
R508	06-11077A98	10k
R509, 510 R511	06-11077A72 06-11077B07	820 22k
R512	06-11077A46	68
R513, 514 R515	06-11009B26 06-11077A46	2.7, 1/4 Watt 68
R516	06-11077A66	470
R517, 518 R519	06-11077A98 06-80185M01	10k 1 ohm, +10%, 2W, metal plate
R551	06-11077B01	12k
R552 R553	06-11077B37 06-11077B19	390k 68k
R554, 555	06-11077B18	62k
R556 R557	06-11077F53 06-11077F20	4.02k, ±1% 1.82k, ±1%
R558	06-11077G41	32.4k, <u>+</u> 1%
R559 R560	06-11077G88 06-11077E77	100k, ±1% 665, ±1%
R561	06-11077G91	107k, ±1%
R562 R563	06-11077B16 06-11077B15	51k 47k
R565	06-11077A98	10k
R566 R567	06-11077A96 06-11077A86	8.2k 3.3k
R568	06-11077807	22k
R569 R570	06-11077A42 06-11077B17	47 56k
R573	06-11077B09	27k
R574 R604	06-11077A01 06-11077A98	0–ohm 10k
R605 R606	06-11077A74 06-11077A98	1k 10k

REFERENCE SYMBOL R607 R609 R610 R611, 612 R613 R615 R616 R617 R620 R621 R621 R621 R622 R651 R652 R653, 654 R655 R656 R657 R658 R660 R667 R660 R661 R661 R661 R662 R663 R664 R665	MOTOROLA PART NO. 06-11077B47 06-11077B11 06-11077G45 06-11077G45 06-11077G45 06-11077G48 06-11077A92 06-11077A92 06-11077A92 06-11077A93 06-11077A93 06-11077A93 06-11077A93 06-11077A94 06-11077A90 06-11077A90 06-11077A90 06-11077B19 06-11077B19	1 meg 33k 47k 33.2k, ±1% 35.7k, ±1% 187k, ±1% 38.3k, ±11% 2.2k 10k 2.2k 220k 560 100 10k 4.7k 470k 620k 619k, ±1% 2.2k 68k
R609 R609 R611, 612 R613 R615 R616 R617 R620 R621 R621 R651 R655 R656 R657 R656 R657 R658 R659 R660 R661 R662 R663 R664	06-11077B11 06-11077G15 06-11077G45 06-11077G45 06-11077H15 06-11077A82 06-11077A82 06-11077A82 06-11077A82 06-11077A83 06-11077A98 06-11077A90 06-11077A90 06-11077B39 06-11077B39 06-11077B39 06-11077B42 06-11077B42 06-11077B19 06-11077B19	33/k 47k 33.2k, ±1% 35.7k, ±1% 187k, ±1% 187k, ±1% 2.2k 10k 2.2k 220k 560 100 10k 4.7k 4.70k 620k 619k, ±1% 2.2k
R610 R611, 612 R613 R615 R616 R617 R620 R621 R622 R651 R652 R653, 654 R655 R656 R657 R658 R659 R660 R661 R661 R662 R663 R663 R664	06-11077B15 06-11077G42 06-11077G45 06-11077G48 06-11077G48 06-11077A82 06-11077A82 06-11077A82 06-11077A83 06-11077A90 06-11077A90 06-11077B39 06-11077B39 06-11077B42 06-11077B42 06-11077B45 06-11077B15 06-11077B19	47k 33.2k, ±1% 35.7k, ±1% 187k, ±1% 38.3k, ±1% 2.2k 10k 2.2k 220k 560 100 10k 4.7k 4.70k 620k 619k, ±1% 2.2k 668k
R611, 612 R613 R615 R616 R617 R620 R621 R622 R651 R652, 654 R653, 654 R655 R656 R656 R656 R656 R657 R658 R660 R661	06-11077G42 06-11077G45 06-11077G45 06-11077H15 06-11077A82 06-11077A98 06-11077A92 06-11077A93 06-11077A90 06-11077A90 06-11077A90 06-11077A90 06-11077A90 06-11077H25 06-11077H25 06-11077H25 06-11077H25 06-11077H27	33.2k, ±1% 35.7k, ±1% 187k, ±1% 38.3k, ±1% 2.2k 10k 2.2k 220k 560 100 10k 4.7k 4.7k 4.70k 620k 619k, ±1% 2.2k 66k
R615 R616 R617 R620 R621 R622 R651 R653 R653 R656 R657 R658 R659 R660 R661 R661 R662 R663 R663	06-11077H15 06-11077G48 06-11077A92 06-11077A98 06-11077A92 06-11077A93 06-11077A98 06-11077A98 06-11077A98 06-11077A99 06-11077B39 06-11077B39 06-11077B39 06-11077B39 06-11077B39 06-11077B39 06-11077B39 06-11077B39	187k, ±1% 38.3k, ±1% 2.2k 10k 2.2k 220k 560 100 10k 4.7k 4.70k 620k 619k, ±1% 2.2k 68k
R616 R617 R620 R621 R621 R652 R653, 654 R655 R656 R657 R658 R659 R660 R661 R661 R663 R663	06-11077G48 06-11077A98 06-11077A98 06-11077A98 06-11077A98 06-11077A90 06-11077A90 06-11077A90 06-11077A90 06-11077H95 06-11077H95 06-11077H95 06-11077B19 06-11077B19	38.3k, ±1% 2.2k 10k 2.2k 220k 560 100 10k 4.7k 4.70k 620k 619k, ±1% 2.2k 68k
R617 R620 R621 R621 R651 R652 R653, 654 R656 R657 R658 R659 R660 R661 R661 R662 R663 R663	06-11077A82 06-11077A98 06-11077A98 06-11077A93 06-11077A68 06-11077A98 06-11077A99 06-11077B39 06-11077B42 06-11077B42 06-11077B45 06-11077B19 06-11077B19 06-11077B19	2.2k 10k 2.2k 220k 560 100 10k 4.7k 4.70k 620k 619k, ±1% 2.2k
R621 R651 R653 R653, 654 R655, 654 R656 R657 R658 R669 R660 R661 R662 R663	06-11077A82 06-11077A83 06-11077A68 06-11077A50 06-11077A98 06-11077A99 06-11077B42 06-11077H45 06-11077H65 06-11077B19 06-11077B19 06-11077B17	2.2k 220k 560 100 10k 4.7k 470k 620k 619k, ±1% 2.2k 68k
R622 R651 R652 R653, 654 R655 R656 R657 R658 R659 R660 R661 R662 R663 R663	06-11077B31 06-11077A68 06-11077A50 06-11077A98 06-11077A99 06-11077B39 06-11077B42 06-11077H65 06-11077A82 06-11077B19 06-11077B13 06-11077B13	220k 560 100 10k 4.7k 4.70k 620k 619k, ±1% 2.2k 68k
R651 R652, 654 R653, 654 R655 R656 R657 R658 R659 R660 R661 R662 R663 R663	06-11077A68 06-11077A50 06-11077A98 06-11077A90 06-11077B39 06-11077B42 06-11077H65 06-11077B19 06-11077B19 06-11077B17	560 100 10k 4.7k 470k 620k 619k, ±1% 2.2k 68k
R653, 654 R655 R656 R657 R658 R659 R660 R661 R662 R663 R663	06-11077A98 06-11077A90 06-11077B39 06-11077B42 06-11077H65 06-11077B19 06-11077B19 06-11077B17	10k 4.7k 4.70k 620k 619k, ±1% 2.2k 68k
R655 R656 R657 R658 R659 R660 R661 R662 R663 R663	06-11077A90 06-11077B39 06-11077B42 06-11077H65 06-11077A82 06-11077B19 06-11077B03 06-11077B17	4.7k 470k 620k 619k, ±1% 2.2k 68k
R657 R658 R659 R660 R661 R662 R663	06-11077B42 06-11077H65 06-11077A82 06-11077B19 06-11077B03 06-11077B17	620k 619k, ±1% 2.2k 68k
R658 R659 R660 R661 R662 R663 R664	06-11077H65 06-11077A82 06-11077B19 06-11077B03 06-11077B17	619k, ±1% 2.2k 68k
R659 R660 R661 R662 R663 R664	06-11077A82 06-11077B19 06-11077B03 06-11077B17	2.2k 68k
R661 R662 R663 R664	06-11077B03 06-11077B17	
R662 R663 R664	06-11077B17	
R663 R664		15k 56k
	0611077B18	62k
Hbb5	06-11077B07	22k
R666, 667	06-11077A84 06-11077B23	2.7k 100k
R668–670	06-11077B18	62k
R671	06-11077A50	100
R701 R702	06-11077G88 06-11077B29	100k, ±1% 180k
R703	06-11077B08	24k
R705	06-11077B31 06-11077G88	220k 100k, ±1%
R706 R707	06-11077H26	243k, ±1%
R709	06-11077B09	27k
R710-712	06-11077G68	61.9k, ±1% 3.3k
R713 R714	06-11077A86 06-11077B10	3.3k 30k
R715	06-11077B05	18k
R801 R802	0611077A78 0611077A84	1.5k 2.7k
R803	06-11077A98	10k
R804	06-11077A90	4.7k
R805, 806 R807	06-11077A98 06-11077B15	10k 47k
R808, 809	06-11077A90	4.7k
R810, 811	06-11077B17	56k
R812–815 R816–818	06-11077A90 06-11077B23	4.7k 100k
R820, 821	06-11077A98	10k
R822	06-11077B15 06-11077A98	47k 10k
R823, 824 R825	06-11077B15	47k
R826-828	06-11077A98	10k
R831, 832 R833	06-11077A74 06-11077A98	1k 10k
R836	06-11077A98	10k
R842	06-11077A74	1k
R845 R846	06-11077A74 06-11077A98	1k 10k
R847	06-11077A74	1k
R849	0611077A98	10k
R850 R851, 852	06-11077A74 06-11077B15	1k 47k
R853	06-11077B45	820k
R854	06-11077A90	4.7k
R857–860 R862	06-11077A98 06-11077F95	10k 11K, ±1%
R863	06-11077F91	10k, ±1%
R864 R865_872	06-11077F20	1.82k, <u>±</u> 1% 10k
R865–872 R876	06-11077A98 06-11077A98	10k 10k
R877-879	06-11077B23	100k
R880 R881	06-11077B15 06-11077A98	47k 10k
H881 R882	06-11077B07	22k
R883	06-11077A90	4.7k
R884 R885	06-11077B15 06-11077A98	47k 10k
R886	06-11077B07	22k
R887	06-11077A90	4.7k
R889 R890	06-11077A68 06-11077A98	560 10k
integrated circuit (s		
U401	51–02198J22	dual op-amp
U402	51-80942T01	voltage regulator 5V
U451 U551–553	51-02198J22 51-02198J22	dual op-amp dual op-amp
U601	51-02198J23	dual comparator
U602, 603	51-02198J22	dual op-amp
U651, 652 U653	51-02198J22 51-80059M01	dual op-amp voltage-controlled attenuator
U701	51-00059M01	dual op-amp
U801	51-80135C10	D/A converter
U802	51-80960T01	microcomputer
voltage regulator (s VR401	see note) 48-83461E40	zener, 5.1V
VR402	48-82256C15	zener, 5.1V zener, 5.1V
VR551 VR801	48-82256C11 48-82256C20	zener, 10V zener, 27V

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
VR802, 803	48-82256C11	zener, 10V
VR804, 805	48-82256C20	zener, 27V
VR807	48-82256C20	zener, 27V
crystal (see note)		
Y801	48-80173D09	7.776 MHz
	non-ref	erenced parts
	14-80145M01	insulator accessory connector
	03-10943M04	screw M2.5x8 (5 used)
	42-80940T01	retaining ring
	07-80925T01	bracket, heat sink
	14-83820M05	insulator T0-118 (5 used)
	26-80125L02	heat sink, audio/regulator
	04-00131974	flat washer (4 used)

2/28/90 **note:** For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

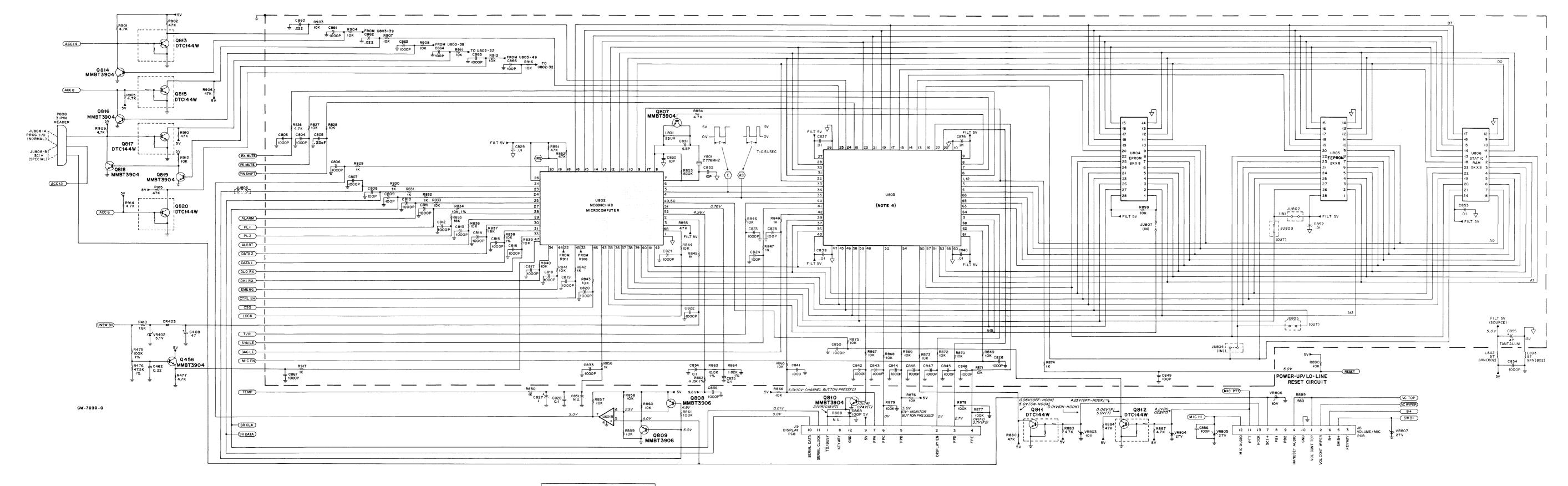


M41L03 DTC144W

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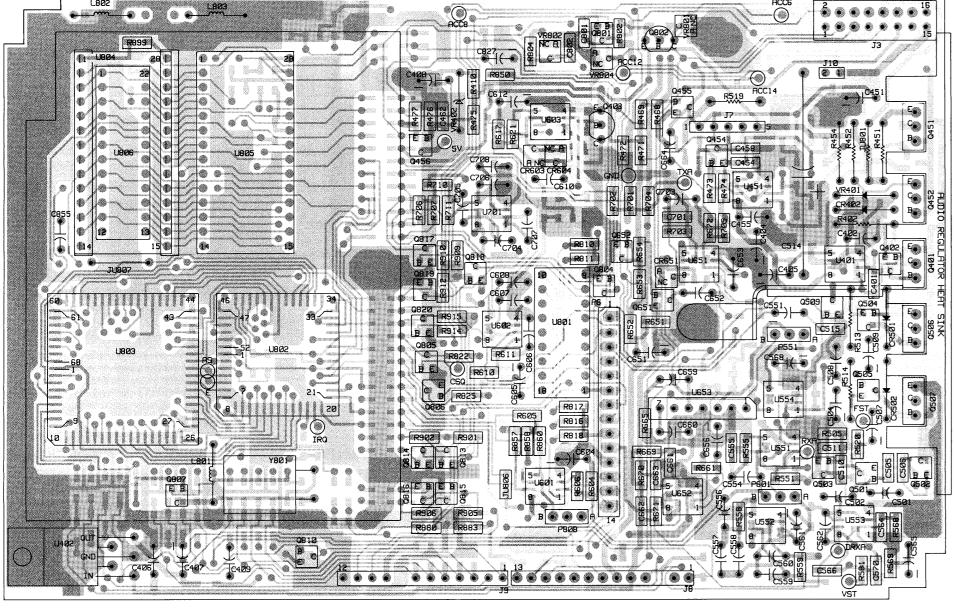
DTC144W INTERNAL CIRCUIT

GW-7029-0



IMPORTANT

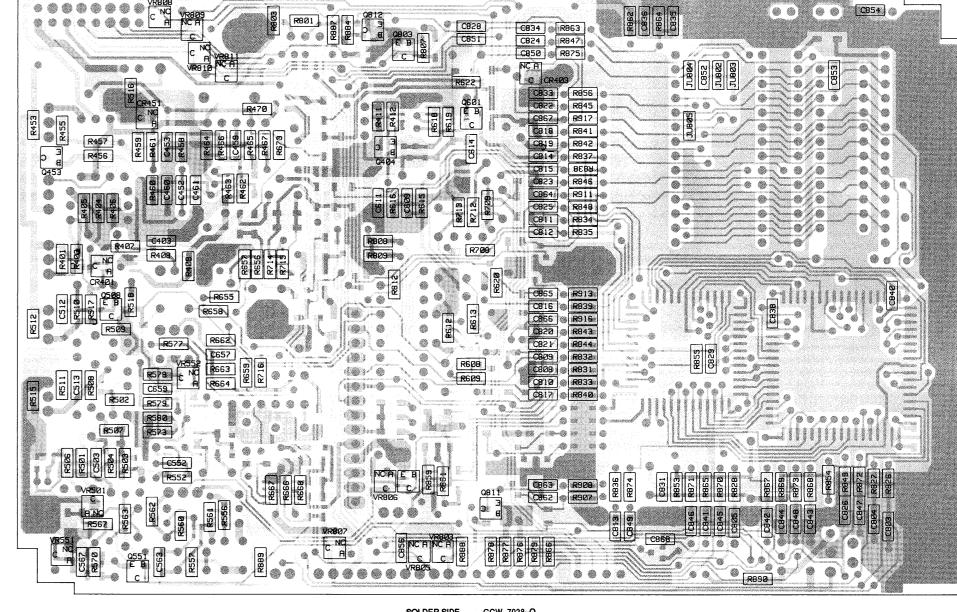
COMPONENTS WITHIN SHADED AREA ARE NOT FIELD-SERVICEABLE. IF SERVICING IS REQUIRED, THE ENTIRE BOARD MUST BE REPLACED. REFER TO SECTION 6.



COMPONENT SIDE VIEW

INNER LAYER 1 GCW-7473-O INNER LAYER 2 GCW-7474-O OVERLAY GCW-7475-O

COMPONENT SIDE VIEW



SOLDER SIDE GCW-7028-O COMPONENT SIDE @ GCW-7027-O OVERLAY B GBW-7458-O

SOLDER SIDE VIEW

parts list

23-13740B49

23~13741B53

23-13740B73 23-13741B53

1000 pF

C861 C862

MXW-7025-O (4) MXW-7025-O MXW-7025-O (2) MXW-7025-O (3) HLN9313A Logic Board (Options Connector) REFERENCE MOTOROLA MOTOROLA PART NO. REFERENCE MOTOROLA REFERENCE MOTOROL A REFERENCE DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION PART NO. SYMBOL SYMBOL SYMBOL 06-11077B15 C863 23-13740B73 B471 06-11077B0 R822 capacitor, fixed uF, +5%, 50V (unless otherwise stated) 21-13741B45 C864 06-11077A92 C401 C402 23-13740B49 100 pF R472 27k 10k 100k, ±1% 08-11051A09 .022, 63V C865 23-13740B73 1000 pF R473 R474 06-11077B09 06-11077A98 R826 06-11077A90 4.7k R827,828 C403 C404 C405 C406 21-13741B45 C866 23-13740B49 100 pF C867 23-13740B73 06-11077G88 B829-832 06-11077A74 47, ±20%, 16V, electrolytic 23-11048B19 R833 C868 R476 06-11077G57 47.5k. +1% 23-11048B13 10, ±20, 16V, electrolytic 23-13740B49 100 pF R477 06-11077A90 4.7k R834 R835 06-11077F91 10.0k +1% 08-11051A15 .22. 63V diode (see note) C407 C408 23-13749A44 R501 06-11077A82 2.2k 06-11077B05 48-05129M40 CR401 low profile R836 06-11077A98 10k 23-11048B19 47. +20%, 16V, electrolytic CR402 48-83654H02 silicon R837 06-11077B05 8.2k 3.3k 1.5k 1.2k C409 C451 08-11051A17 R504 06-11077A96 CR403 48-05129M40 low profile R838 R839–841 06-11077F91 10.0k ±1% R505 47, ±20%, 16V, electrolytic 23-11048B19 48-05129M40 CR451 low profile C452 C453 21-13741B45 R506 06-11077A78 CR501.502 48-83654H02 06-11077A76 06-11077A74 15. +80/-20% 21-11032B14 CR603,604 low profile 48-05129M40 R843.844 06-11077A98 10k 820 C454 21-11032B15 .22, +80/-20% R508 06-11077A98 CR651 48-05129M40 R509,510 R845 06-11077474 1k 10k C455 08-11051A15 .22, 63V 06-11077A98 fuse R846 C458,459 06-11077B07 22k F801 65-05214E06 1 A R847,848 06-11077A74 1k 10k C460 461 21-13741B45 C462 C501.502 06-11077A98 .22, +80/–20% R513 514 06-11009R26 1/4 Watt R849 connector receptacle 06-11077A74 1k 47k R515 08-11051A13 .1. 63V 28-80923V01 right angle 5-pin. RF power amplifier B851.852 06-11077B15 21-13740B49 06-11077466 470 28-80128M01 06-11077B45 820k C504 23-11048B13 10, +20, 16V, electrolytic 28-80126M01 4.7k C505,506 21-13740B49 2-pin, internal speaker iumpe 06-80185M01 1 ohm, +10%, 2W, metal plate R854 06-11077A90 J10 28-80128M02 06-11077B01 47k 10. +10%, 20V C507 C508 23-13749C39 R551 06-11077A74 08-11051A15 B552 06-11077B37 B856 JU551 09-84181101 2-contact push-on 06-11077A98 10, ±20, 16V, electrolytic 06-11077B19 C509 C510 23-11048B13 R553 JU601 09-84181L01 2-contact push-on 62k 40.2k, ±1% 21-13740B61 R554,555 06-11077B18 R861 06-11077B23 100k 330 pF JU802 JU804 06-11077A01 0-ohm resistor 06-11077F53 R862 11.0k, ±1% C511-513 C514 21-13740B49 R556 06-11077A01 0-ohm resisto R557 06-11077F20 18.2k, ±1% R863 06-11077F91 10.0k +1% 1000 uF, ±20%, 16V, electrolytic 23-02308M01 JU806 JU807 06-11077A01 0-ohm resisto 18.2k, ±1% 06-11077G41 21-13740B49 23-11048A17 C515 C551 R558 32.4k, +1% 06-11009B23 06-11077G88 06-11077E77 33, +20, 25V, electrolytic 0—ohm resistor R559 R560 100k, ±1% R865-873 06-11077A98 10k JU808 09-84181L01 2-contact push-on C552 C553 21-13740B33 665, +1% 10k 100k coil, RF 06-11077G91 107k, ±1% B875 876 06-11077A98 1000 pF 21-13740B73 R877-879 08-11051A03 21-13740B53 R562 06-11077B16 C554 C555 .0022, 63V L801 24-82723H35 23 uH. red R563 R567 06-11077B15 R880 R883 06-11077R15 47k L802.803 150 pF 24-83961B02 5 turns, green 06-11077A90 C556-558 C559,560 08-11051A12 08-11051A13 .068, 63V 06-11077A86 3.3k 22k 47 connector plug R884 R887 06-11077B15 47k 4.7k 1. 63V 28-80127M02 P6 14-pin header R569 R570 R573 C561 23-11048B05 06-11077A42 P551 28-80002R03 560 10k 10k 4.7k 56k 27k 100k 100 390k 27k 22k 10k R889 R890 06-11077468 C562 08-11051A09 .022, 63V 3-pin, for JU601 P601 28-80002R03 06-11077A98 C563 C564 21-13741B69 06-11077B09 P808 28-80002R03 R899 06-11077498 21-13740B49 06-11077A90 C565 C566.567 23-11048B13 10, ±20, 16V, electrolytic transistor (see note R578 06-11077A50 R901 48-00869619 R579 R902 R903,904 06-11077B15 47k 10k 4.7k 21-13741845 Q401 06-11077A98 C568 47. ±20%, 16V, electrolytic 48-80214G02 48-00869619 NPN R580 06-11077B09 06-11077A90 Q451,452 C569 C570 21-13740B33 22 pF 06-11077B15 47k 21-13741B69 Q453,454 48-80214G02 NPN PNP R604 R605 06-11077A98 R906 R907,908 06-11077A98 10k 4.7k 48-80141L03 06-11077A74 C604 C606 C607 C608 1 +20% electrolytic 23-11048B05 Q455 Q456 Q501,502 48-80214G02 48-05128M16 NPN PNP R606 R607 06-11077498 10k R909 06-11077A90 06-11077B15 47k 06-11077B47 1 meg 08-11051A13 1 63V NPN PNP PNP 48-80214G02 48-05128M16 06-11077B11 10k 08-11051A05 .0047. 63V Q503,504 R609 R610 R911-913 06-11077A98 06-11077A90 4.7k 47k 06-11077B15 C609 C610 C611 C612 21-13740B55 180 pF Q505 .22, 63V Q506 48-00869619 R611,612 R613 06-11077G42 33.2k, +1% R915 06-11077B15 08-11051A15 NPN 06-11077G45 06-11077A98 Q507 48-00869618 21-13740R46 35.7k. +1% 187k, ±1% 38.3k, ±1% 23-11048B19 47, ±20%, 16V, electrolytic Q508 48-05128M16 PNP NPN R615 R616 06-11077H15 R917 06-11077A74 06-11077G48 C651 C652 C653 C656 23-11048B19 47. ±20%, 16V, electrolytic Q509 48-80214G02 integrated circuit e note) 2.2k 100k .0068, 63V Q551 48-80949V01 JFET 06-11077A82 08-11051A06 U401 51-02198.122 dual on amn 08-11051A15 23-11048B13 06-11077B23 O601 48-80214G02 NPN R618 U402 51-80942T0 voltage regulator 5V 10. ±20, 16V, electrolytic Q651 48-05128M16 PNP R619,620 06-11077A98 10k dual op amp dual op amp U451 51-02198J22 06-11077A0 NPN 0-ohr 220k C657 C658 21-13741B69 Q652 48-80214G02 R621 U551-554 51-02198J22 06-11077B31 06-11077A68 NPN PNP 21-13741B45 U601 51-02198J23 51-02198J22 dual comparator 560 100 10k 4.7k C659 C660 23-13749A44 23-11048B13 47 +20% 6V tantalum Q802 48-00869681 R651 U602-604 dual op amp Q803 48-80947V01 NPN 06-11077A50 06-11077A98 10, +20, 16V, electrolytic U651.652 51-02198J22 dual op amp NPN B653.654 C661 C662 21-13740B76 1500 pF O804 48-80214G02 51-80059M01 voltage-controlled attenuator U653 NPN 06-11077A90 21-13741B39 U701 U801 51-02198J22 51-80135C10 dual op amp NPN PNP NPN 06-11077B39 470k C663 C664 21-13740B49 100 pF 4.7, +20%, 35V O807 48-80214G02 R656 D/A converter 620k 619k, +1% Q808,809 48-05128M16 06-11077B42 23-11048B09 U802 51_80960T0 microcomputer C701 C703 C704 C705 06-11077H65 21-13741B27 0810 48-80214G02 R658 51-82862N09 U803 custom gate array Q811-813 48-80947V01 06-11077A82 23-11048B05 +20%, electrolytic U804 HLN9277A BOM kit 08-11051A12 .068, 63V O814 48-80214G02 NPN R660 06-11077B19 **EEPROM** U805 51-80901W0 Q815 48-80947V01 R661 08-11051A13 .1. 63V U806 51-80914V01 static RAM C706 C707 08-11051A08 .015, 63V O816 48-80214G02 NPN R662 06-11077B17 56k 62k 22k 2.7k voltage regu Q817 48-80947V01 see note) 08-11051A23 056 63V 48-83461E40 C708 C801.802 08-11051A03 .0022, 63V O818.819 48-80214G02 NPN R664 06-11077B07 48-80947V01 R665 VR402 48-82256C15 zener, 5.1V 21-13740B49 100 pF Q820 zener, 7.5V 21-13740B73 R666 667 06-11077B23 100k resistor, fixed, ohm, +5%, 1/8 watt (un ess otherwise stated) 62k 100 VR551.552 48-80140L15 zener, 10V C805 21-11032B15 .22. +80 -20% 06-11077A70 R401 1000 pF C806,807 21-13740B73 B671 06-11077450 R402 06-02369M31 330, .6 watt, metal film R672 06-11077B17 VR803 48-80140115 zener 10V C808 809 21-13740B49 R403 06-11077A70 zener, 27V VR804,805 48-80948V0 C810-823 21-13740B73 B673 06-11077B23 100k R404 06-11077F18 17.4k, ±1% VR806 48-80140115 zener 10V 100k, ±1% C824 825 21-13740B49 100 pF R405 06-11077F28 22.1k, ±1% VR807-811 zener. 27V 23-13740B73 B702 06-11077H13 178k, ±1% 25.5k, ±1% C826 1000 pF R406 06-11077A98 R703 06-11077G31 C827 23-11048B05 1. +20%, electrolytic crystal (see note) R407 06-11077A76 C828 21-13741B69 B705 06-11077H13 178k, ±1% 48-80173D09 7.776 MHz 06-11077F91 06-11077A80 R408,409 10.0k, ±1% Y801 06-11077G56 R706 46.4k, ±1% C829 C830 21-13741B45 1.8k 1, .6 Watt, metal film R410 non-referenced parts 118k, ±1% 47k 21-13740B25 R707 R708 06-11077G95 R451,452 06-02369M01 06-11077B15 C831 C832 21-13740B21 6.8 pF. +.25 pF M415,416 09-82071K09 14 contact receptacle (2 used) R453 06-11077A70 06-11077B19 21-13740B25 26-80123M02 M414 330, .6 watt, metal filn 16.5k, ±1% R710.711 06-11077G13 23-13740B73 1000 pF M412 84-80942V03 circuit board R455 06-11077A70 23-13741B69 06-11077G6 52.3k, ±1% 15-80922V01 housing, connecto R456 06-11077A82 2.2k 06-11077B10 C836 C837-840 23-13740B73 1000 pF R714 29-84249N01 terminal (4 used) R457 06-11077A76 1.2k 4.7k 23-13741B45 06-11077B05 03-10943M04 tapping screw M2.5x8 R458,459 06-11077A90 23-13740B73 23-13740B49 03-10943M04 04-00131974 C841-848 1000 nF R716 06-11077A86 tapping screw M2.5x8 12k 680 180k 120k B460 06-11077B01 06-11077A78 1.5k 2.7k 100 pF M401-404 flat washer (4 used) 23-13740B73 R802 06-11077A84 07-80925T0 bracket, audio regulato R462 06-11077B29 06-11077A98 C852.853 23-13741B45 M406-410 insulator heat conductive (5 used) R463 06-11077B25 14-83820M05 23-13740B73 23-13749A44 C854 C855 R804 06-11077A90 26-80125L02 R464 465 06-11077G88 100k, ±1% 06-11077B15 47. ±20%. 6V, tantalum

R808 809

R810,811

B812-815

06-11077A90

06-11077A90

4.7k

R466,467

R468

R469

R470

06-11077F91

06-11077A60

06-11077A74

06-11077A98

10.0k. +1%

270

10k

END OF PART 2 OF 4

Schematics, Circuit Board Diagrams, and Parts List for HLN9313A Logic Board PW-7026-O (Sheet 4 of 4) 2/28/90

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