MOTOROLA

*Mobile Products Division*

# *MaraTrac*

## Low Band FM Two–Way Radio
## Range 1, 29.7 – 36 MHz
## Range 2, 36 – 42 MHz
## Range 3, 42 – 50 MHz
## 110 Watts

THIS MANUAL HAS BEEN
DISCONTINUED

# Instruction Manual

68P80102W95–O

MOTOROLA
Mobile Products Division

# *MaraTrac*

## Low Band FM Two–Way Radio
## Range 1, 29.7 – 36 MHz
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## 110 Watts

Note: The pages preceded by "*" are not included, due to irrelevancy.

# Contents



# Diagrams






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Note: This manual has been scanned in "full-page" format, with all long foldout pages each scanned in one image. To print portions of these long pages on a printer that uses 8.5 by 11" paper, simply use the Adobe "Snapshot Tool" to select and and print any portion. To obtain a duplicate of this manual, take the PDF file on a CD-ROM or memory stick to any commercial graphics house that has an 11" roll-feed document printer.

# Safe Handling of CMOS Integrated–Circuit Devices

Many of the integrated–circuit devices used in communications equipment are of the CMOS (Complementary Metal Oxide Semiconductor) type. Because of their high open–circuit impedance, CMOS IC's are vulnerable to damage from static charges. Everyone involved in handling, shipping, and servicing them must be extremely careful not to expose them to such damage.

CMOS IC's do have internal protection, but it is effective only against overvoltages in the hundreds of volts, such as those that could occur during normal operations. Overvoltages from static discharge can be in the thousands of volts.

When a CMOS IC is installed in a system, the system's circuit elements distribute static charges and load the CMOS circuits. This decreases the vulnerability of the IC's to static discharge, but improper handling will probably cause static damage even when the IC's are so installed.

To avoid damaging CMOS IC's, take the following precautions when handling, shipping, and servicing them.

1. Before touching a circuit module, particularly after having moved around in the service area, touch both hands to a bare metal earth–grounded surface. This discharges any static charge you may have accumulated.

**Note**

Wear a conductive wrist strap (Motorola Part No. RSX–4015A) to minimize the buildup of static charges on your person while you are servicing CMOS equipment.

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**WARNING**

When wearing a conductive wrist strap, be careful near sources of high voltage. By grounding you thoroughly, the wrist strap also increases the danger of lethal shock from accidental contact with such a source.

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2. Whenever possible, avoid touching any electrically conductive parts of the circuit module with your hands.

3. Check the INSTALLATION and MAINTENANCE sections of the service manual and the notes on the schematic to find out whether or not you can insert or remove circuit modules with power applied to the unit, and act accordingly.

4. When servicing a circuit module, avoid carpeted areas, dry environments, and the wearing of static–generating clothing.

5. Be sure that all electrically powered test equipment is grounded. Attach the ground lead from the test equipment to the circuit module before connecting the test probe. Similarly, disconnect the test probe before removing the ground lead.

6. When you remove a circuit module from the system, lay it on a sheet of aluminum foil or other conductive surface connected to ground through 100,000 ohms of resistance.

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**WARNING**

If the aluminum foil is connected directly to ground, you may get a shock if you touch it and another electrical circuit at the same time.

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7. When soldering, be sure the soldering iron is grounded.

8. Before connecting jumpers, replacing circuit components, or touching CMOS pins (if this becomes necessary during the replacement of an integrated–circuit device), be sure to discharge any static buildup on your person (see Procedure 1, above). Because you can have a voltage difference across your body, you should use only one hand if you must touch the board wiring or any of the pins on the CMOS device.

9. When replacing a CMOS integrated–circuit device, leave the device in its metal rail container or conductive foam until you are ready to insert it into the pronged circuit module.

10. Connect any low–impedance test equipment such as a pulse generator to CMOS device inputs after you have applied power to the CMOS circuitry. Similarly, disconnect such low–impedance equipment before turning off the power.

11. Wrap CMOS modules in conductive material when transporting them from one area to another, even within the same room. Use wrapping material similar to that in which replacement modules are wrapped when they arrive from the factory. (You can also use aluminum foil.) Never use nonconductive material for packaging these modules.

# Performance Specifications for Conventional Low Band *MaraTrac* Radio

## GENERAL

| | | | |
|---|---|---|---|
| Channel Capability | 8 Modes (A3 Model) | 16 Modes (A2 Model) | 99 Modes (A5 & A7 Model) |
| Primary Power | 12 VDC *negative ground only* | | |
| Dimensions | 10.0" H x 14.5" W x 2.5" L | | |
| Weight | 16 lb. (7.26 kg) | | |
| Metering | All adjustments and alignments are performed electronically using an IBM Personal Computer, a Radio Interface Box (RIB) and Field Maintenance Software. | | |
| Environmental | Meets MIL–STD 810D environmental specifications for vibration, shock, rain, dust, and salt fog. | | |

| Model | Frequency (MHz) Range1 | Range2 | Range3 | Minimum RF Power Output | Maximum Battery Current Drain: Off @ 13.8V | Standby @ 13.8V | Receiver @ 13.8V | Transmit @ Rated Power |
|---|---|---|---|---|---|---|---|---|
| T81XTA7DA2–K | 29.7–36 | 36–42 | 42–50 | 110 watts | 60mA | .7 A | 3.0 A | 27 A |
| T81XTA7DA3–K | 29.7–36 | 36–42 | 42–50 | 110 watts | 60mA | .7 A | 3.0 A | 27 A |
| T81XTA7TA5–K | 29.7–36 | 36–42 | 42–50 | 110 watts | 60mA | .7 A | 3.0 A | 27 A |
| T81XTA7TA7–K | 29.7–36 | 36–42 | 42–50 | 110 watts | 60mA | .7 A | 3.0 A | 27 A |

## TRANSMITTER

| | |
|---|---|
| Output Impedance | 50 ohms |
| Spurious and Harmonic Emissions | More than 70 dB below carrier (for EIA spec. RS152B) except Fc ± 14.4 MHz @ FCC |
| Frequency Stability | ±.0005% of assigned center frequency |
| Modulation | 0 to ±5 kHz |
| Audio Sensitivity | 0.080 V ±4 dB for 60% maximum deviation @ 1000 Hz |
| Audio Response | EIA |
| Audio Distortion | Less than 3% @ 1000 Hz, 60% maximum deviation |
| Maximum Freq. Separation (MHz) | Range1–6.3; Range2–6; Range3–8 |
| FM Hum and Noise: EIA Method | –45 dB |

## RECEIVER

| | |
|---|---|
| Channel Spacing | 20 kHz |
| Sensitivity: 12 dB EIA SINAD | (per EIA spec. RS204C) .30 uV |
| Selectivity: EIA SINAD | –80 dB |
| Spurious & Image Rejection | –80 dB |
| Intermodulation: EIA SINAD | –80 dB |
| Input Impedance | 50 ohms |
| Audio Output | 10 watts @ less than 5% distortion (into 3.2 ohm load @ 1000 Hz) |
| Maximum Freq. Separation (MHz) | Range1–6.3; Range2–6; Range3–8 |
| Frequency Stability | ±.0005% of assigned center frequency |

## SPEAKER

| | |
|---|---|
| Dimensions | 5.5" x 2.5" (Excluding Mounting Bracket) |
| Weight | 1.5 lbs. (0.7 kg) |

## CONTROL HEAD

| | |
|---|---|
| Dimensions (Excluding Mounting Bracket) | Handheld—2.3" H x 4.8" W x 1.5" L; Basic—5.2" H x 3.7" W x 1.8" L; Basic Plus—6.5" H x 3.4" W x 1.7" L |
| Weight | .75 lb (0.4 kg) |

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

## FCC TRANSCEIVER DESIGNATION

ABZ89FT1619

# Model Chart for Low Band *MaraTrac* Radio 29.7–36, 36–42, 42–50 MHz 110 Watt

**CODE:**

● = ONE ITEM SUPPLIED

∅ = INDICATES BREAKDOWN IN SEPARATE CHART

| MODEL | T81XTA7TA5BK | T81XTA7DA3BK | T81XTA7DA2BK | T81XTA7TA7BK | ITEM | DESCRIPTION |
|---|---|---|---|---|---|---|
| DESCRIPTION | HHCH 99–FREQUENCY | BASIC 8–FREQUENCY W/SCAN | BASIC 16–FREQUENCY | ADVANCED 99–FREQUENCY | | |
| | ∅ | ∅ | ∅ | ∅ | | UNIFIED CHASSIS |
| | | ● | | | HCN4033A | BASIC CONTROL HEAD, 8–MODE W/SCAN |
| | | | ● | | HCN4034A | BASIC CONTROL HEAD, 16–MODE |
| | ● | | | | HCN1051A | HANDHELD CONTROL HEAD (HHCH), 99–MODE |
| | ● | ● | ● | ● | RAB4002ARA | ANTENNA 29.7–36 MHZ OR |
| | | | | | RAB4003ARA | 36–42 MHZ, OR |
| | | | | | RAB4004ARA | 42–50 MHZ |
| | | | | | TAB6071A | 25–28 MHZ |
| | | ● | ● | | HKN4017A | POWER CABLE AND FUSE, BASIC CONTROL HEAD |
| | ● | | | | HKN4319A | POWER CABLE AND FUSE, HHCH |
| | ● | ● | ● | ● | HKN4051A | RED FUSED LEAD |
| | | ● | ● | | HLN4024B | MICROPHONE HANGUP BOX |
| | ● | | | | HLN4830A | HHCH HANGUP BOX |
| | ● | ● | ● | ● | HLN5372A | SOFTWARE KIT |
| | ● | ● | ● | ● | HLN4022C | INSTALLATION KIT |
| | ● | ● | ● | ● | HLN4023A | TUNING TOOL KIT |
| | ● | ● | ● | ● | HHN4032A | TOP COVER |
| | ● | ● | ● | ● | HLN4034C | MOUNTING TRAY |
| | | ● | ● | | HMN1015A | MICROPHONE |
| | | ● | ● | | HSN4020A | SPEAKER |
| | ● | | | ● | HSN4021A | SPEAKER |
| | ● | ● | ● | | HKN4007A | ORANGE CABLE |
| | ● | ● | ● | ● | HLN5371A | NAMEPLATE |
| | ● | | | | HLN5381A | ESCUTCHEON W/O "DIR" |
| | | | | ● | HCN1052B | ADVANCED CONTROL HEAD 99–MODE |
| | | | | ● | HLN5404A | CONTROL HEAD HARDWARE |
| | | | | ● | HLN5406B | ADVANCED CONTROL HEAD BOARDS |
| | | | | ● | HKN4321A | POWER CABLE AND FUSE, ADVANCED |
| | | | | ● | HLN5064A | ADVANCED TOOL |
| | | | | ● | HLN5383A | ADVANCED BUTTON PLUG |
| | | | | ● | HMN1061A | MICROPHONE |
| | | | | ● | HLN4921A | TRUNNION |
| | ● | | | | HKN4324A | FUSE KIT |

# Model Chart for 29.7–36, 36–42, 42–50 MHz Unified Chassis Low Band *MaraTrac* Radio 110 Watts

**CODE:**

● = ONE ITEM SUPPLIED

| MODEL | | | | | | | ITEM | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| HUB1114A | HUB1115A | HUB1116A | | | | | | |
| UNIFIED CHASSIS, 29.7–36 MHz | UNIFIED CHASSIS, 36–42 MHz | UNIFIED CHASSIS, 42–50 MHz | | | | | | |
| ● | | | | | | | HLB4099B | RF BOARD 29.7–35.999 MHz |
| | ● | | | | | | HLB4100A | RF BOARD 36–41.999 MHz |
| | | ● | | | | | HLB4101B | RF BOARD 42–50 MHz |
| ● | ● | ● | | | | | HLN5402A | LOGIC BOARD |
| ● | ● | ● | | | | | HLN5342C | AUDIO/SQUELCH BOARD |
| ● | ● | ● | | | | | HLN5343B | INTERCONNECT BOARD |
| ● | ● | ● | | | | | HLN5443A | FEED THRU PLATE |
| ● | ● | ● | | | | | HLN4047A | BLACK/RED POWER CABLE |
| ● | ● | ● | | | | | HLN5541A | BOTTOM COVER |
| ● | ● | ● | | | | | HLB4116A | EXCITER AND POWER CONTROL BOARD 29.7–50 MHZ |
| ● | ● | ● | | | | | HLN5426A | ANTENNA RELAY |
| ● | ● | ● | | | | | HLN5544A | HARDWARE KIT |
| ● | | | | | | | HLB4117A | PA BOARD (R1) 29.7–36 MHz |
| | ● | | | | | | HLB4118A | PA BOARD (R2) 36–42 MHz |
| | | ● | | | | | HLB4115A | PA BOARD (R3) 42–50 MHZ |
| ● | ● | ● | | | | | HLB4077A | POWER TRANSISTOR 29.7 –50 MHZ |

# *MaraTrac* Low Band Two–Way Radio Options Chart

| Option | Description | Kit Added | Kit Deleted |
|---|---|---|---|
| B20 | DTMF Microphone | HMN1022A | HMN1015A<br>HMN1061A |
| B42 | PL Scan | Plant Programming | — |
| B70 | Omit Antenna | — | RAB400XARA<br>(x = 2, 3, or 4)<br>TAB6071A |
| B71 | Omit Microphone | — | HMN1015A<br>HMN1061A |
| B87 | Omit Speaker | — | HSN4020A or<br>HSN4021A |
| B90 | Omit Accessories | — | Control Head<br>Power Cable<br>Fused Lead<br>Hang–Up Box<br>Microphone<br>Speaker<br>Antenna |
| B109 | Handset | TLN4698A<br>TMN6067A | HLN4024A<br>HMN1015A |
| B116 | External Alarms<br>A7 Only | | |
| B161 | Omit Main Radio Cable | — | Fused Power Cable<br>Fused Red Lead<br>Orange Cable |
| B206 | Service Manual | 6880102W39 (AK Models)<br>6880102W95 (BK Models) | — |
| B239 | Noise Cancelling Microphone | TMN6116A | HMN1015A<br>HMN1061A |
| B269 | Siren/PA | By Model | — |
| B561 | *Quik–Call II* | 6880102W58<br>6880102W60<br>Plant Programming | — |
| B566 | *Single Tone* | HLN5455A<br>HLN5472A<br>HLN4341A<br>HLN5476A<br>6880102W58<br>6880102W60 | — |
| B833 | Stat Alert Decode | 6880102W58<br>6880102W60<br>Plant Programming | — |
| B835 | DTMF Decoder | HLN5472A<br>HKN4341A<br>HLN5455A<br>6880102W58<br>6880102W60 | — |
| B995 | Zone Mode | Field Programmable Requires<br>Radio Firmware 4.01 | — |
| XT7600A | Spare Accy A2 | — | — |
| XT7603A | Spare Accy A3 | — | — |
| XT7604A | Spare Accy A5 | — | — |
| XT7605A | Spare Accy A7 | — | — |

# *MaraTrac* Radio Service Aids

The following service aids are available through Motorola Communications Parts Division to facilitate servicing and programming the *MaraTrac* Mobile Radio. Please contact 1–800–422–4210 for price and delivery.

| Model No. | Description |
|---|---|
| | **TEST CABLES AND ADAPTERS** |
| 01–855414 | TEST CABLE—BNC to BNC cable (4 ft) used with the 58–855270 adapter to connect the *MaraTrac* mobile radio to the RF test instruments. |
| 01–80355A09 | TEST ADAPTER—Attaches to the Program/Test cable in place of the RIB; used to manually key the radio and to inject a tone for troubleshooting purposes. |
| 30–80093P01 | TEST CABLE—14 pin ribbon cable used to extend the RF board for servicing. |
| 30–80373B41 | VCO TEST CABLE—Provides the interface between the mobile's RF board and the test equipment for troubleshooting. |
| 58–855270 | TEST ADAPTER—BNC Female to UHF Male adapter used with the 01–855414 Test Cable to connect the *MaraTrac* mobile radio to RF test instruments. |
| | **SERVICE MANUALS** |
| 68–80102W39 | *MaraTrac* Low Band Radio Instruction Manual (AK Models) |
| 68–80102W95 | *MaraTrac* Low Band Radio Instruction Manual (BK Models) (THIS MANUAL) |
| 68–80102W18 | *MaraTrac* VHF Radio Instruction Manual (AK Models) |
| 68–80102W94 | *MaraTrac* VHF Radio Instruction Manual (BK Models) |
| 68–80102W21 | *MaraTrac* UHF Radio Instruction Manual (AK Models) |
| 68–80102W87 | *MaraTrac* UHF Radio Instruction Manual (BK Models) |
| 68–80102W58 | *MaraTrac* Radio Signalling Options and Retrofits Instruction Manual |
| | **OPERATOR CARDS** |
| 68–80102W22 | *MaraTrac* A2 and A3 Basic Model Radio |
| 68–80102W19 | *MaraTrac* A5 Handheld Control Head Model Radio |
| 68–80102W20 | *MaraTrac* A7 Advanced Control Head Model Radio |
| 68–80102W60 | *MaraTrac* Radio Signalling Options–Decoder |
| | **PROGRAMMING DEVICES** |
| RPX–4719 | RADIO SERVICE SOFTWARE LICENSING AND INFORMATION PACKAGE—Provides the necessary software licensing information required to purchase Radio Service Software listed below. |
| RVN–4023 | RADIO SERVICE SOFTWARE ON 5–1/4 INCH DISK—Operates on the IBM PC, XT, AT, or PS/2 family of computers for programming and servicing of *MaraTrac* mobile radios. IBM DOS 3.0 or higher, an RS–232 Asynchronous Serial Communications Adapter and RAM memory of 512K bytes minimum are necessary for the programmer. (Includes users manual 68–80102W24.) |
| RVN–4024 | RADIO SERVICE SOFTWARE ON 3–1/2 INCH DISK—Same as RVN4023 description. |
| 01–80353A74 | RADIO INTERFACE BOX (RIB)—Voltage level shifter to enable communications between the radio and the computer's RS–232 Asynchronous Serial Communications Adapter. Requires the Wall Mount Power Supply (01–80357A57). |
| 01–80357A57 | WALL MOUNT POWER SUPPLY—Used to supply power to the RIB. For 120 VAC use only. |
| 30–80070N01 | PROGRAM/TEST CABLE—Provides the electrical interconnection from the programming receptacle inside the radio to the RIB (01–80353A74) for programming the *MaraTrac* mobile radio. |
| 30–80369B71 | COMPUTER INTERFACE CABLE—Used to connect the IBM PC, PC–XT, or PS/2 computer's Asynchronous Serial Communications Adapter to the RIB (01–80353A74). The previously offered 01–80357A74 Computer Interface Cable will provide the proper connections. |
| 30–80369B72 | COMPUTER INTERFACE CABLE—Used to connect the IBM PC–AT computer's Asynchronous Serial Communications Adapter to the RIB (01–80353A74). The previously offered 01–80357A64 Computer Interface Cable will provide the proper connections. |

## 1. Introduction

The *MaraTrac* radio is a fully synthesized, microprocessor–controlled transceiver. All standard features are performed by software in the radio control processor.

## 2. Radio Features

### 2.1 INTERNAL STANDARD FEATURES

The *MaraTrac* radio has the following standard features:

- Remote mount configuration
- High RF power
- Wide bandwidth
- 8, 16, and 99–mode models
- Microprocessor controlled
- Fully synthesized
- *MDC–1200* DOS, Unit ID, Radio Check, and Emergency
- 10–watt audio
- Field programmable EEPROM

### 2.2 CONTROL HEADS

The following control heads are available with the *MaraTrac* radio:

#### 2.2.1 Basic "Clamshell" Control Head

The clamshell control head is available for use with either an 8 or 16 mode *MaraTrac* radio. This allows either 16 separate modes, or 8 modes and mode–programmable scan. An optional TalkAround switch is available for the control head.

#### 2.2.2 Handheld Control Head (HHCH)

A HHCH is available for the *MaraTrac* radio. This unit allows selection of up to 99 modes. Single priority scan is standard with either mode–programmable or operator–select scan lists.

#### 2.2.3 Advanced Control Head

An advanced control head is available for the *MaraTrac* radio. This unit allows selection of up to 99 modes. Single priority scan is standard with either mode–programmable or operator–select scan list. A RCL button "recalls" the scan list for reviewing and a HOME button allows for a pre–programmed "home" mode. Also, the MPL button allows multiple PL access. This control head utilizes an electronic volume attenuator to control radio volume.

## 3. Electrical Characteristics

### 3.1 CIRCUIT BLOCKS

The radio is grouped into the following physical blocks:

- Interface board
- Squelch/Audio PA board
- Transceiver RF board
- Transceiver Controller board
- Transmitter Exciter board
- Transmitter PA

### 3.2 FUNCTIONAL DESCRIPTION (SEE FIGURE 1, BLOCK DIAGRAM)

#### 3.2.1 Microcomputer

The *MaraTrac* radio uses the Motorola 68HC11A8 Microcomputer operating in an expanded bus mode to perform all basic radio control functions. The processor is located on the transceiver controller board and operates with a 7.776 MHz clock. User information is stored in both the internal EEPROM and in a separate lithium–battery backed–up RAM IC.

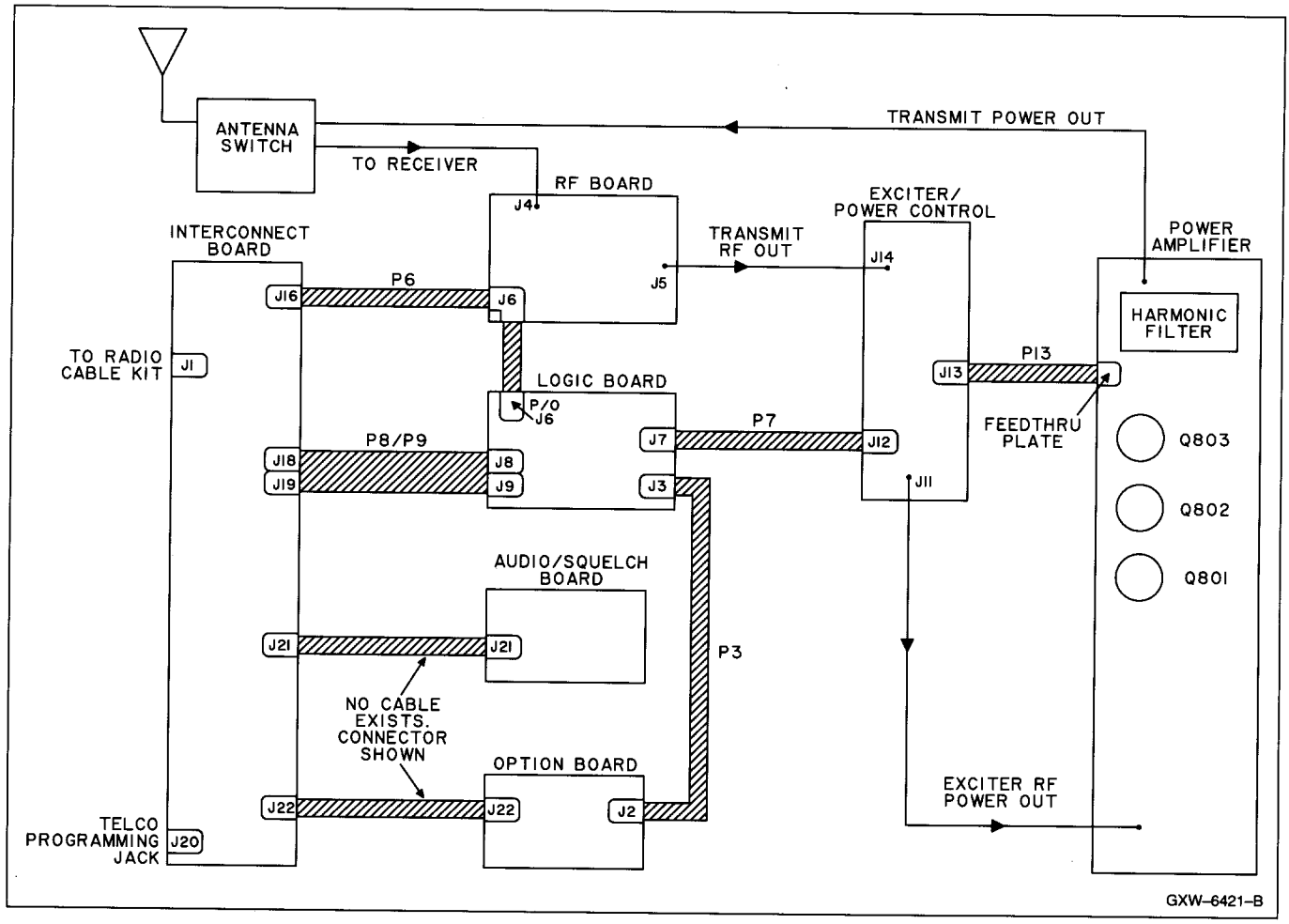



*Figure 1. Low Band Radio Block Diagram*

### 3.2.2 Frequency Synthesizer

The frequency synthesizer uses a phase–locked loop (PLL) that consists of a reference oscillator, a voltage controlled oscillator (VCO), a single chip synthesizer (which contains a programmable divider and a phase detector), a charge pump, and a fixed loop filter. The frequency information, carried to the synthesizer IC via the serial clock and data line, is strobed by the synthesizer latch enable line. The reference oscillator is a discrete crystal–controlled oscillator that uses the radio processor to monitor and compensate for temperature variations.

### 3.2.3 Receiver

Incoming RF signals, directed by the antenna relay, pass into a 4–pole bandpass filter. From that filter, the RF signal passes through one stage of RF amplification, Q1, then into a second 4–pole bandpass filter. The filtered signal then enters the first mixer stage. Meanwhile, the synthesizer output is fed to the first mixer as a high side local oscillator. The mixer produces a 10.7 MHz first IF signal which is amplified before it passes through the IF delay line used for the extender, IF blanking switches Q52 and Q53, followed by another stage of amplification, Q54. Then the RF signal passes through a 4–pole crystal filter. Another stage of amplification occurs before the RF signal passes into the receiver subsystem IC, U51, where the 10.7 MHz signal is mixed with 10.245 MHz to produce a 455 kHz second IF signal. The second IF signal is then amplified, filtered by Y51A and Y51B, limited in U51, and finally detected by a quadrature detector, L64. Detected Audio leaves the receiver IC on pin 5.

### 3.2.4 Extender

After the first mixer stage CR1, the RF signal passes through post mixer filtering comprised of bandpass selectivity circuits surrounding L51, L52, and L53. First IF amplification is provided by Q51. The IF signal divides at the base of Q51. The extender pulse detector and blanker circuits are fed by one path while the first IF amplifier Q51 is driven by the other.

The first IF amplifier Q51 amplifies the signal where it couples into the IF delay line section comprised of circuits associated with L55 and L56. After the signal passes through the delay line the signal can be blanked with the appropriated signal applied to Q52 and Q53. Post blanker isolation is provided by Q54. The signal then passes into the first 4 pole filtering section of the 10.7 MHz IF.

The Extender samples RF from the base of Q51 and drives the extender isolation amplifier Q351. Q351 in turn amplifies the signal and pulse which is then applied to the gain block U351. Q352 detects the output of U351 for further processing. Pulse shaping and amplification are accomplished by Q353, and Q354. Q355 is driven to toggle Q52 and Q53 in the IF to blank the noise pulse as it exits the IF delay line. The output of Q354 also drives a three stage AGC detector comprised of Q356, Q357, and Q358 which reduces the gain of U351 under large signal and high pulse repetition rate conditions.

3.2.5 Transmitter

The frequency synthesizer generates an RF signal at the required transmit frequency. This signal is buffered and fed to the RF exciter board for additional amplification. From the exciter board, which also contains drive and temperature limiting circuitry, the RF signal is fed to the RF PA compartment where it is amplified up to 110 watts. Finally, the antenna relay directs the RF PA output to the antenna connector.

## 4. Primary Power Source

The *MaraTrac* radio is designed to operate from a negative ground 12–volt DC source. The negative lead is internally connected to the radio chassis.

## 5. Physical Characteristics

The *MaraTrac* radio's rugged low–profile housing encloses its electronic circuitry. The front end of the radio houses the antenna connector, a mounting tray lock, the main cable connector, and the handle. On the back end are heatsink fins for cooling the RF PA amplifier. Inside the radio, partitions and shielding covers isolate the various radio circuits from each other. The top cover snaps on and off; four screws secure the bottom cover in place. A mounting tray is supplied with the radio.

The radio's electronic circuits are on printed circuit boards that plug together. Test points on the boards allow access to various metering points.

The radio, less control head, occupies 363 cubic inches and weighs 16 pounds (approximate values).

## 6. Operating Instructions

**Note**

Refer to the operator card supplied with each radio for information on the general use of the radio.

### 6.1 RADIO SELF–CHECK

When the radio is first turned on, the software executes a series of internal self–tests to check digital hardware. The following devices are tested in this order: internal RAM, external RAM, external ROM, external EEPROM, and internal EEPROM. The following audible diagnostic tones sound when a device fails:

| | |
|---|---|
| 6 beeps | Internal RAM Failure |
| 5 beeps | External RAM Failure |
| 4 beeps | External ROM Failure |
| 3 beeps | External EEPROM Failure |
| 2 beeps | Internal EEPROM Failure |

If one of the EEPROM areas has failed, the radio will sound five groups of error tones and then automatically enter "bootloader" mode to allow radio reprogramming. ROM and RAM failures are treated as critical errors and will not allow radio operation of any kind; the failure tones will be repeated indefinitely.

### 6.2 *CHANNEL SCAN*

The *Channel Scan* feature allows you to scan a previously defined list of valid channels (modes) for activity. One scan list mode can be assigned as the priority mode and the rest are assigned non–priority modes. The radio can be programmed such that, while scanning, if you take the microphone off–hook, the radio will either continue to scan in carrier squelch mode or it will stop scanning and revert to the selected mode. When the Monitor button is activated, the radio will scan in carrier squelch mode. When you press the PTT to talk, the transmission will take place on the selected mode.

### 6.3 BASIC CONTROL HEAD SCAN

Activate and deactivate the Basic Control Head Scan by switching the rotary knob to the ON or OFF position. When activity is detected, the BUSY indicator lights solid to indicate the activity is from a non–priority mode, or flashes if the activity is from a priority mode. (A priority alert tone can be field programmed.) The basic control head model supports only a Mode–Slaved Scan list, meaning, the scan list is pre–programmed and requires a field programmer to modify it. The priority mode will always be equal to the selected mode. Also, there is no provision for operator review of the scan list.

### 6.4 HHCH AND ADVANCED SCAN

Activate and deactivate Scan by momentarily pressing the Scan rocker. The Scan indicator light is on when Scan is activated. If no activity is detected by *Channel Scan*, the radio displays the selected mode. When activity is detected, the BUSY indicator lights solid to indicate the activity is from a non–priority mode, the active mode number is displayed, and the radio unmutes. If activity is detected on the priority channel, the BUSY indicator comes on, the PRI indicator flashes, the priority mode is displayed, and the radio unmutes. (A priority alert tone can be field programmed.) Using a field programmer, the scan list members (priority and non–priority) can be independently designated as either Mode–Slaved or Operator–Selectable. If designated as mode–slaved, the Scan list modes can only be reviewed by the operator. If designated as operator–selectable, the list can be reviewed and modified by entering the Scan Programming Mode as described below.

## 6.5 SCAN PROGRAMMING/CONFIGURATION MODE

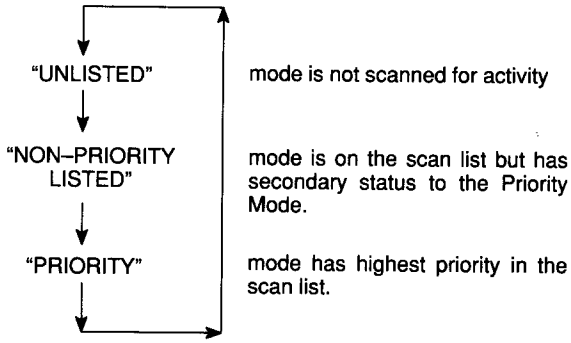
Operator–Selectable Scan lists can be reviewed and modified. Press and hold the SCAN button; an alert tone (if programmed) sounds and the SCAN indicator blinks to enunciate entry into the Scan configuration mode. Use the mode control to scroll to the desired mode. Press SEL to add the displayed mode to the list. Confirming the selection and defining the mode's "non–priority" status in the list, (1) on the handheld control head, the PRI indicator lights, or (2) on the advanced control head, the Non–Pri indicator lights. Raise the mode's status to "priority" by pressing SEL again; the PRI indicator flashes on either control head.

**Note**

If a different mode was previously selected as "Priority," the above procedure will affect that mode in one of two ways:

- If the non–priority scan list is programmed "operator–selectable," the mode is removed from the "priority" scan list and placed on the "non–priority" scan list.
- If the non–priority scan list is programmed "mode–slaved," the mode is no longer on any scan list.

The SEL button controls an endless loop program—that is, each press of the button changes its status, from:




While in the Scan Programming mode, the radio will sound a "bad–chirp" (if programmed) when one of the following situations occur:

- You try to change the Scan status of a mode–slaved mode (priority or non–priority).
- You try to add a new mode to a non–priority scan list that is full (16 members maximum).

Exit the scan programming mode by momentarily pressing the SCAN button. The radio resumes normal operation. If Scan was activated before entering the configuration mode, the radio will resume scanning.

# 7. Detailed Theory of Operation

## 7.1 EXCITER

### 7.1.1 RF Circuits.

The synthesizer on the RF Board (J5) produces a low–level modulated RF signal at the carrier frequency when the microphone is keyed. The RF output level of minimum 13dBm (typically 17dBm) is fed to J14 on the Exciter/Power Control board. There is about 13dB resistive pad at the input of the first buffer stage (Q1601). This stage takes 0dBm signal and amplifies it to 12.5dBm. The signal goes through another resistive pad of 8dB before it gets to the second buffer stage (Q1701). This stage takes the 4.5dBm signal and amplifies it to 22.5dBm. This signal is fed to controlled stage (Q1801) and is amplified to 34dBm when controlled B+ is 11 volts. The output drive from J11 is applied to the Low Band RF Power Amplifier (RFPA) deck. The RFPA amplifies the signal up to rated power.

### 7.1.2 Timing Circuits.

The transmit sequence is as follows: between 4 and 21 milliseconds after the PTT is pressed, the logic board sends frequency information to the RF board and the antenna relay energizes (9.6T). Between 34 and 51 milliseconds after the relay energizes, the synthesizer locks on frequency, and the DAC voltage to U451A–3 rises and brings up controlled B+ to Q1801, driving the RFPA deck and producing output power. When PTT is released, 9.6T and controlled B+ drop off, reducing output power to zero. The antenna relay drops out shortly thereafter, routing the antenna back to the receiver circuit.

### 7.1.3 Power Control.

As part of the tune–up procedure, the radio transmitter is adjusted for rated output power at 16 points distributed across the band. This process determines the proper DAC voltage versus carrier frequency to apply to U451A–3, in order to obtain rated power. At a given frequency, output power is controlled by maintaining a fixed current to the final amplifiers (Q802, Q803). Current to the finals is monitored from the voltage drop across R813. U451B causes Q454 to conduct a small current which is proportional to the finals current. Q454 maintains a voltage drop across R902 and R911 that is identical to the voltage drop across R813 on the RFPA. U451A compares the output of Q454 to the reference from the DAC (U801). U451 drives Q453, Q452, and Q451 to produce controlled B+ which supplies Q1801 and controls its gain in order to control RF drive to the RFPA stages. Controlled B+ fixes the amount of current that flows to the finals, resulting in a controlled amount of output power.

### 7.1.4 R.F. Power Trim Potentiometer R911

Normally, potentiometer R911 is left at mid–rotation after TRANSMITTER POWER ALIGNMENT. However, potentiometer R911 may be used to trim transmitter power while the radio is in the vehicle. Antenna loading may require adjustment of R911 to achieve rated power output. Adjust potentiometer R911 clockwise to increase power output and

counter clockwise to decrease power output. Monitor all adjustments with a "thru–line" style wattmeter to measure forward and reflected power flow. If the output power requires adjustment more than ± 10% to achieve rated output power, check the antenna VSWR.

7.1.5 Protection Circuits.

To prevent damage to the RFPA, the temperature of the RFPA and the drive level to the finals are monitored. Temperature is sensed by thermistor RT801 near the final transistors. Its resistance drops to about 4.2K at 104° C. The voltage rises to 3.5 volts at J13, pin 7 when RT801 drops to 4.2K. This causes Q901 to conduct, dropping the voltage on the current sense low line to the logic board power control circuit. This makes it appear as if the RFPA deck is drawing too much current, and causes the power control circuit to reduce controlled B+. This reduces the drive to the RFPA deck, which reduces output power enough in extremely hot environments to prevent overheating and damage.

Operation of the drive sense circuit is similar to temperature sense. For high VSWRs at certain phase angles, less current flows through shunt resistor R813. Controlled B+ rises to a high level in an attempt to produce rated power from the finals, causing an abnormally high level of RF drive to be produced by Q801, and possibly damaging the final transistors. Shunt resistor R822, transistor Q800, and associated circuitry monitors the current drawn by driver Q801 and hence the drive to finals Q802 and Q803. As this current increases, the RF drive sense line voltage rises, causing Q901 to conduct, and reducing the drive to a safe level without reducing output power significantly.

Finally, a software controlled form of RF drive protection exists. Controlled B+ voltage is monitored by U802–45, an A/D input. When controlled B+ rises above 10.5 volts, the microprocessor reduces the DAC voltage for the duration of the transmission, dropping the controlled B+ voltage from over 10.5 VDC down to about 2 to 4 VDC after about 1/2 second. This prevents Q1801 from overheating when the radio is operating at low line voltages or into high VSWRs.

## 7.2 AUDIO/SQUELCH CIRCUITS

### 7.2.1 Audio and Squelch

The FM detector output is routed through a low pass filter, a high pass filter, de–emphasis circuitry, and then to the control head for application to the volume control. The adjustable output of this voltage divider is then routed to the audio/squelch board for application to the respective audio circuits.

The bridge audio power amplifier circuit provides a highly efficient audio output. The circuit uses two differential power amplifiers that provide a balanced push–pull output to the speaker.

Audio is applied from the audio buffer amplifier, U1102C, to the non–inverting input of U501. The output of U501 is applied to one side of the speaker and to U500. R504 and R505 form a voltage divider that attenuates the high level output of U501 before it is applied to the inverting input of U502. The output of U502 is equal in amplitude to the output of U501 but 180 degrees out of phase.

Squelch muting is controlled at two points: at series–connected transistor Q551 and at transistor Q550. Q551 is used for squelch muting as well as for muting in the priority *Channel Scan* mode while the priority channel is being sampled. When AUDIO PA MUTE is low, Q500 turns on, discharging C523 and forward biases CR500 and CR501. This allows internal bias of U501 and U502 to increase and turn off the audio power devices. By turning off the audio power devices, current in standby mode is substantially reduced.

### 7.2.2 Squelch Operation

The output from the FM detector, a combination of noise and recovered audio, is shaped and amplified by the squelch circuitry. These stages consist of a noise amplifier U1102A, squelch control pot R1132, noise filtering/detection/integration quad operational amplifier U1101, and associated variable squelch–tail–control circuitry. This circuitry has good squelch characteristics because of the following:

- A high–pass filter ahead of the second amplifier, to attenuate the audio frequencies to a specific level;
- Capacitors C1103 and C1104, which attenuate noise at frequencies above 22 kHz, to leave the noise band susceptible to detection;
- An input network to the detector, which further attenuates audio and any harmonics generated audio, to limit at the output of the third amplifier/limiter.

The filtered noise is routed to a positive–peak detector, which adds negative–going spikes at its output. These spikes are forwarded to the integrator and the variable squelch–tail–control circuitry. The integrator compares the average DC level of the detector's output with a reference level and generates a fast–responding output signal, Vo, as follows: Vo is greater than 4.5 V for squelched, and less than 4.5 V for unsquelched.

The detector's output also goes to Q1102 via a dual–time–constant network consisting of R1116, CR1103, and R1117. If the signal is weak, or in the absence of a signal, the noise spike rate becomes high enough to keep C1110 discharged below the turn–on voltage of Q1102. The collector of Q1102 therefore has a potential of +9.6 V. When the signal level increases, Q1102 turns on and its collector voltage, Vo, begins to decrease. With a strong signal, the collector voltage reaches a minimum level of approximately 4 V. For a given level at the integrator output, the voltage across C1111 varies directly with Vo of Q1102.

Q1105 generates an output signal (SQUELCH DECISION) that is a delayed version of the integrator output. The microcomputer mutes the audio when the SQUELCH DECISION signal goes high (4.5 V) and unmutes the audio when the signal goes low (0 V). The Q1103 turn–on voltage at the node between R1118 and R1122 is approximately 4.5 V. This voltage is determined by the 9.6 V supply, R1120, C1111, and the dual–time–constant network comprised of R1118, R1119, and CR1104.

With loss of signal, the greater the voltage across C1111, the longer it takes the node voltage (R1118 and R1122) to increase above 4.5 V, and thus the longer the SQUELCH DECISION signal remains high after loss of signal. Since C1111 charges through R1119 and CR1104, the SQUELCH DECISION detect time is very short. The integrator output is inverted by Q1104 and supplied as a CHANNEL ACTIVITY signal. This is a fast responding output signal that is used only in *Channel Scan* operation.

### 7.3 INTERCONNECT BOARD

The interconnect board contains seven connectors that connect the logic board/RF board subassembly to the audio board, front connector, programming jack, and the internal option board. Connectors labeled J18 and J19 are combined into one cable assembly.

The serial data signal is logically ANDed with the DISPLAY ENABLE signal. Therefore, data out is always low unless DISPLAY ENABLE is high. The line labeled DATA OUT is used to send serial display data to the control head. Switch data is clocked from the control head and is received on the DATA IN line.

### 7.4 CONTROL HEAD

*MaraTrac* radios use three types of control heads. The basic model, a non–display control head, uses rotary knobs to control VOLUME, MODE, and ZONE or SCAN selections. Mode selection is indicated by numbers (and zone letters, on some models) on the knob(s). The handheld model, a display–type control head, uses two seven–segment displays to indicate selected mode; it also contains the microphone circuitry. The advanced model, a display type control head, uses two seven segment displays to indicate selected mode.

All control heads use the CLOCK, DISPLAY ENABLE, and DATA IN lines to control data transmissions between the control head and the radio. Additionally, the handheld and advanced control heads use the DATA OUT line to receive display data from the radio. Both display data and switch/button data is shifted on the positive clock edge. The DISPLAY ENABLE line is used to control the state of the parallel/serial shift register in the control head. When DISPLAY ENABLE is low, the shift register operates in a parallel mode, reading the switch/button condition. When DISPLAY ENABLE goes high, the shift register latches the current switch condition and allows the data to be shifted serially to the radio.

## 8. Extender Field Test

The purpose of this test is to give field technicians the ability to verify extender functionality without using a pulse generator box (such as the TEK–47A or TEK–21). This test does not take the place of factory testing of the extender.

### 8.1 TEST EQUIPMENT

R2001D Motorola Communication System Analyzer or Equivalent.

### 8.2 TEST PROCEDURE

(1) Ensure that the radio is turned off; then connect the RF generator output to the antenna port of the radio. Tune the RF generator to the receive (RX) frequency of the radio mode to be tested.

(2) Adjust the RF output level from the R2001D to –47 dBm (1 millivolt).

(3) Modulate the RF signal with 100% AM modulation at a frequency of 10 kHz. Use either tone A or B modulation from the R2001D with AM limit (RF Section) set to Minimum.

(4) Locate the VAGC Test Point (see Figure 2) in the extender section of the RF board. Short the test point pad to ground using a small piece of wire soldered from the pad to the coil can (L352/L353) nearby.

(5) Turn the radio on. The extender is in the "ON" state when the radio is turned on.

(6) Observe the Extender Test Point (see Figure 2) with a 10:1 oscilloscope probe. Pulses at the repetition rate of 10 kHz should be seen.

(7) Turn the extender off by depressing the monitor button on the control head for 3 to 4 seconds; listen for the three low–pitched tones. There should be no pulses at the test point. Turn the extender on again by depressing the monitor button on the control head for 3 to 4 seconds; listen for three high–pitched "beeps." The pulses should be seen at the test point.

(8) Turn the radio off and remove the wire used in Step 4. This concludes the extender functionality test.

**Note**

If the Extender does not function as described above, replace the Low Band RF board.

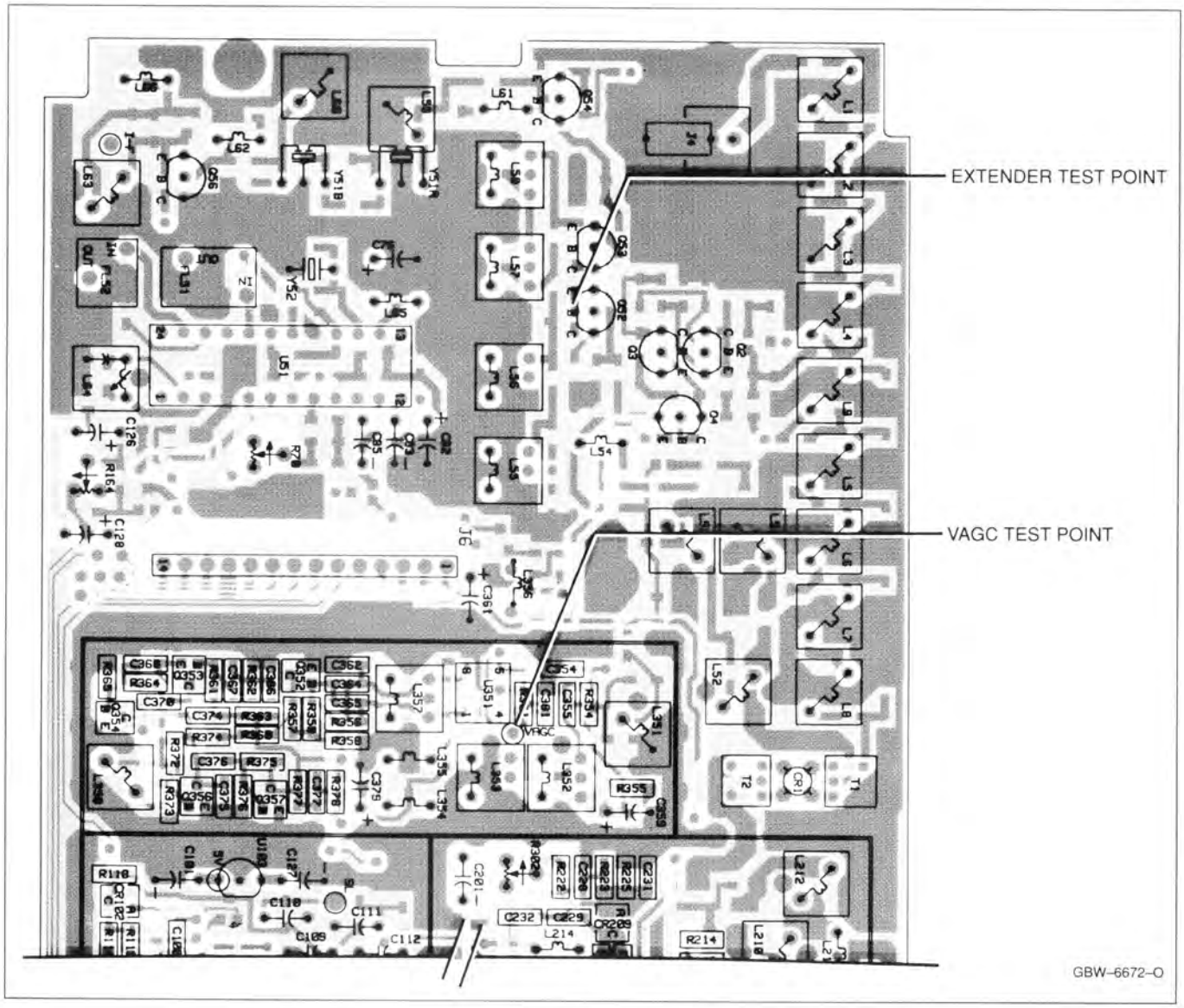
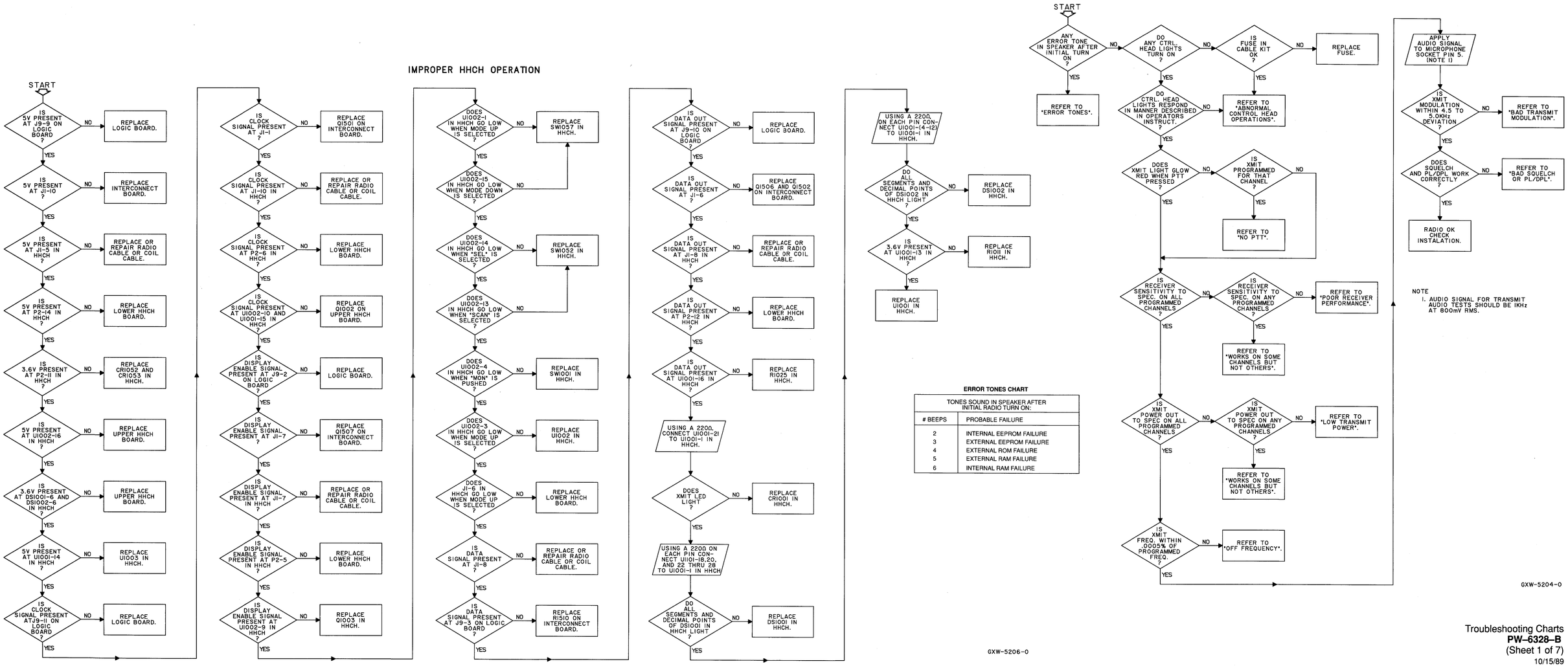



*Figure 2. Extender Test Points*

# RADIO SYSTEM TROUBLESHOOTING CHART
## (START ALL TROUBLESHOOTING HERE)



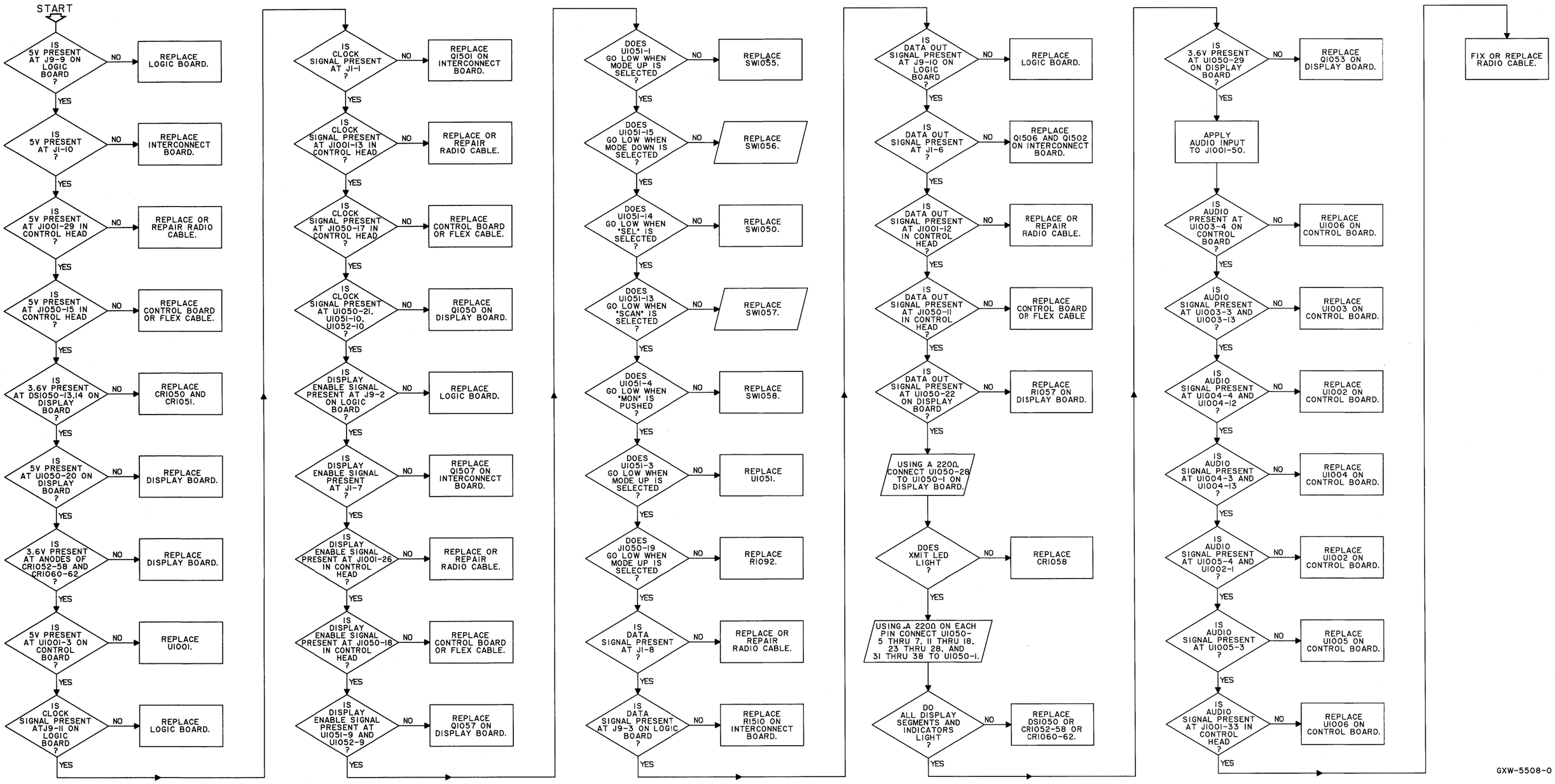

## IMPROPER HHCH OPERATION




**ERROR TONES CHART**

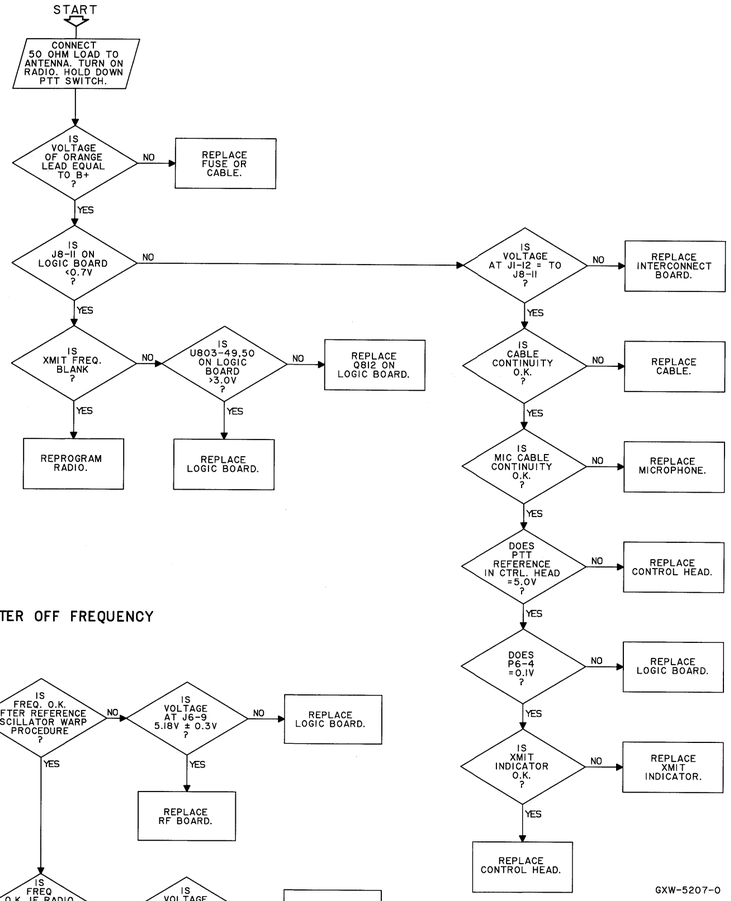
| TONES SOUND IN SPEAKER AFTER INITIAL RADIO TURN ON: | |
|---|---|
| # BEEPS | PROBABLE FAILURE |
| 2 | INTERNAL EEPROM FAILURE |
| 3 | EXTERNAL EEPROM FAILURE |
| 4 | EXTERNAL ROM FAILURE |
| 5 | EXTERNAL RAM FAILURE |
| 6 | INTERNAL RAM FAILURE |

# IMPROPER ADVANCED CONTROL HEAD OPERATION



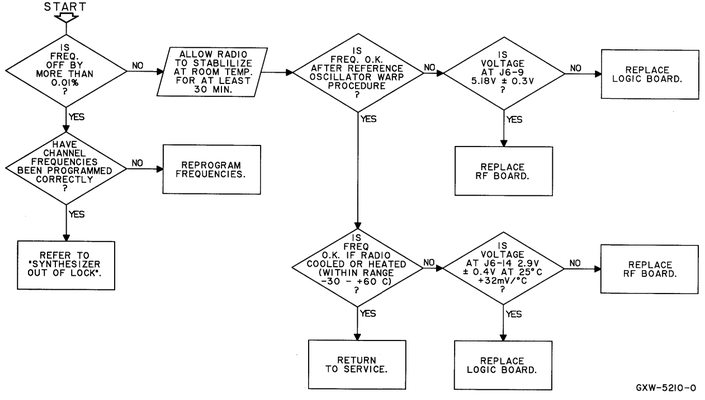

GXW-5508-0

## NO PTT



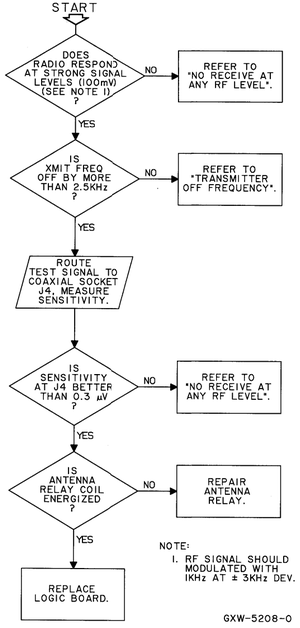

GXW-5207-0

## TRANSMITTER OFF FREQUENCY




GXW-5210-0

## POOR RECEIVER PERFORMANCE

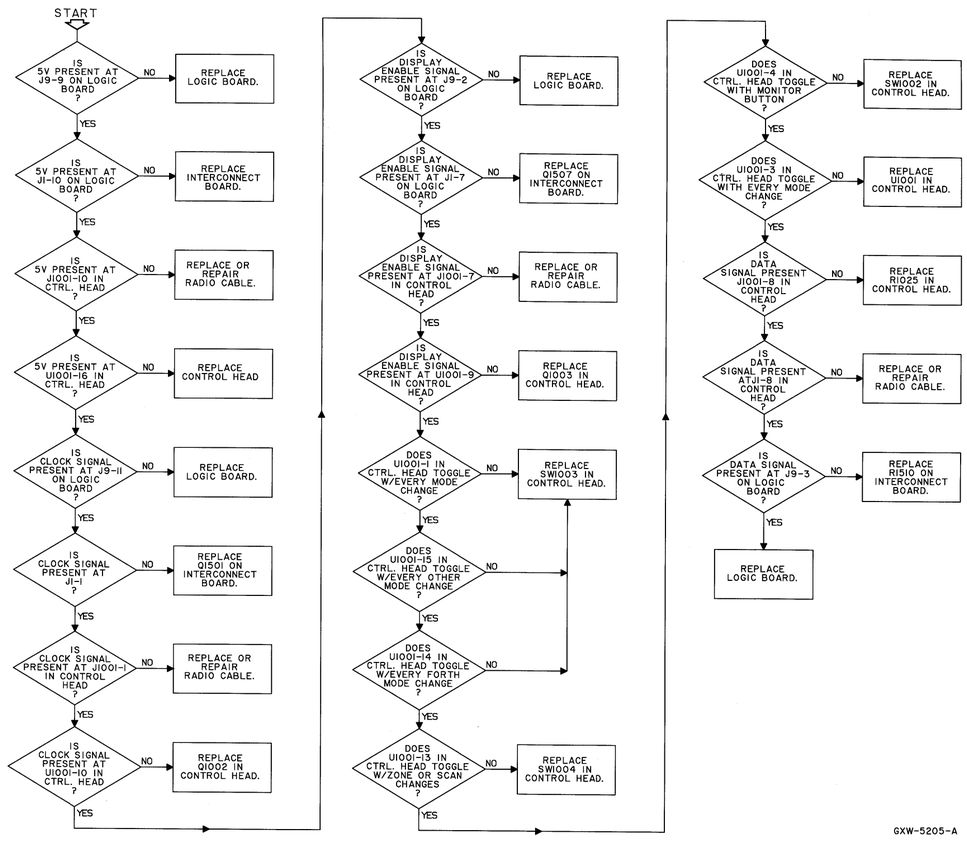



NOTE:
1. RF SIGNAL SHOULD MODULATED WITH 1KHz AT ± 3KHz DEV.

GXW-5208-0

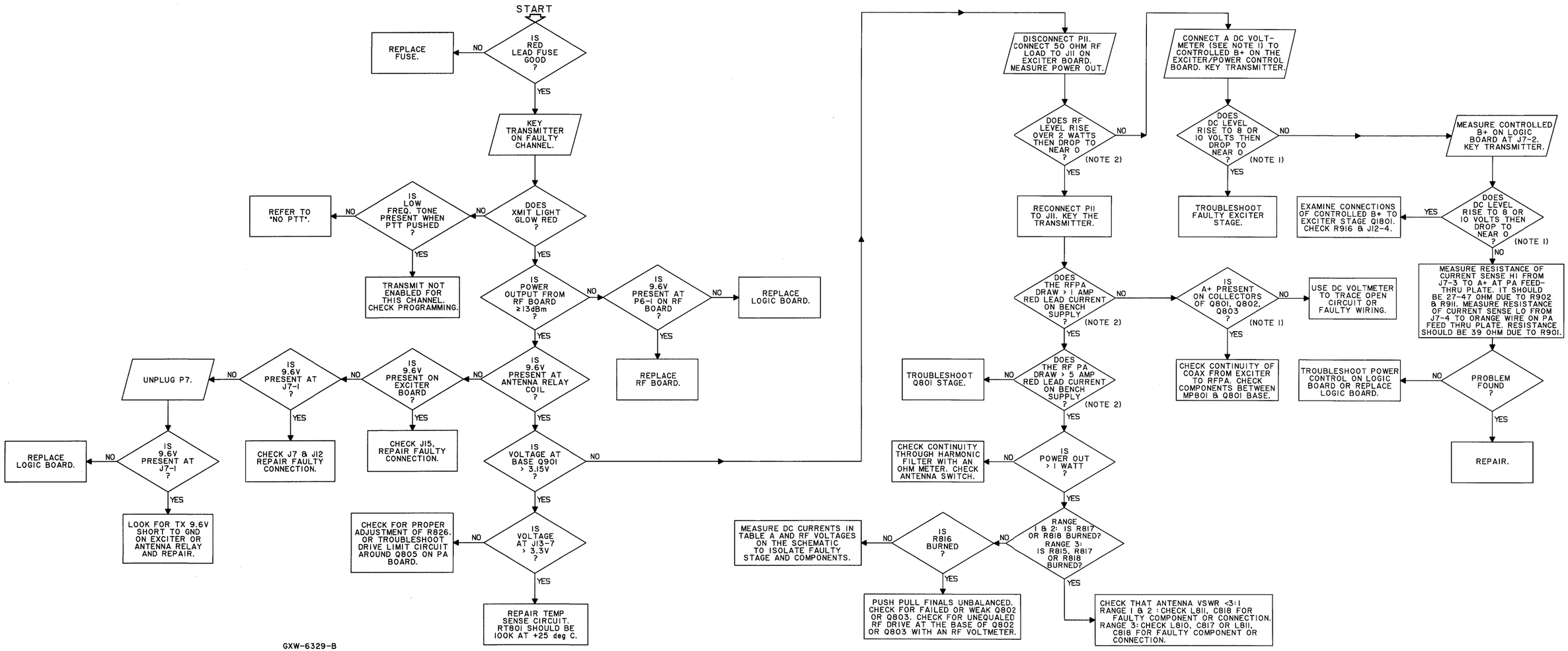
## ABNORMAL CONTROL HEAD OPERATION

BASIC CONTROL-SEE SEPERATE CHART FOR HHCH OR ADVANCED CONTROL HEAD




GXW-5205-A

# LOW TRANSMIT POWER



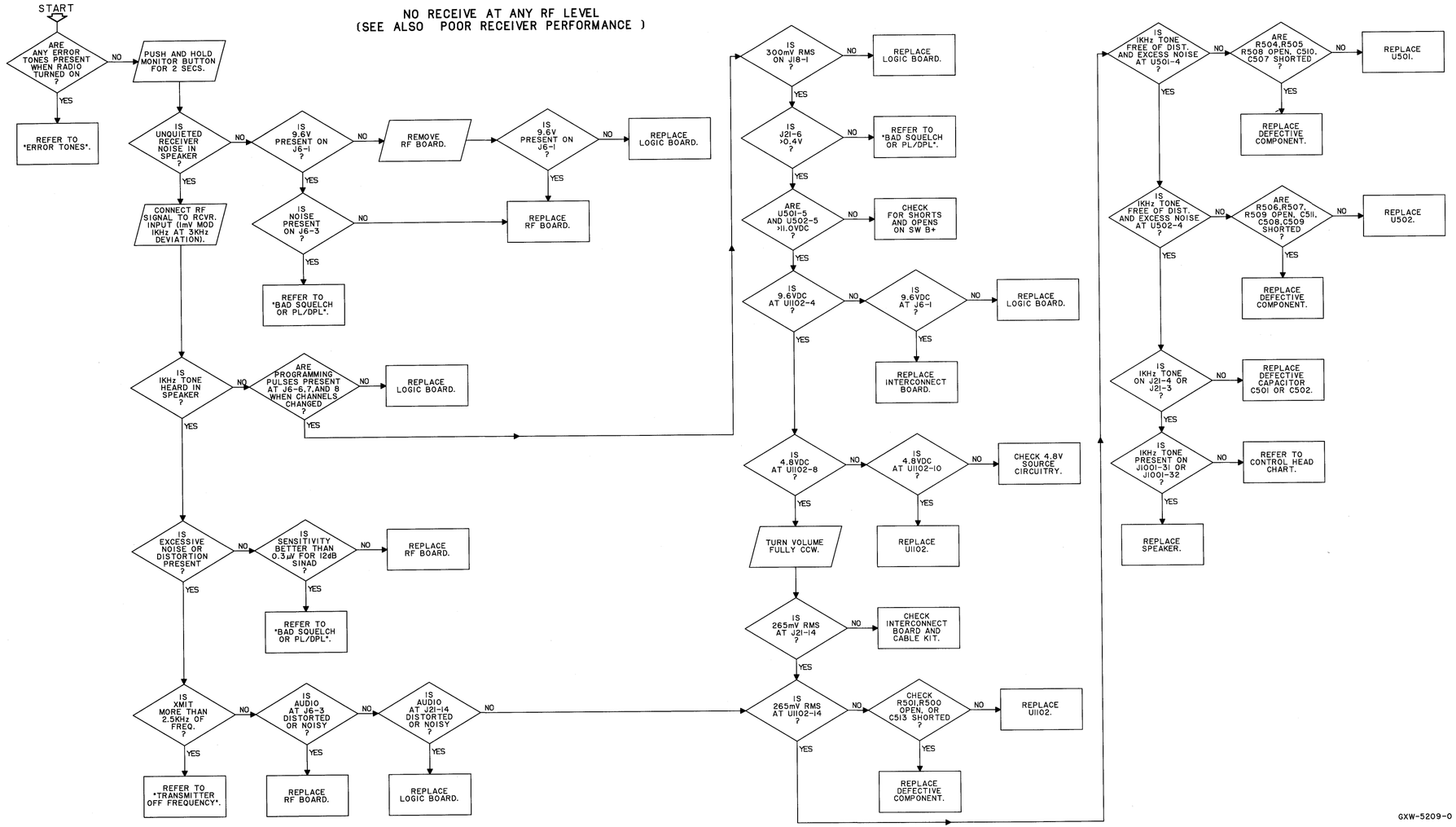

GXW-6329-B

TABLE A
DC CURRENT DRAW -- PA STAGES (SEE NOTE 2)

| STAGE | CONNECT AMMETER IN SERIES WITH: | TYPICAL CURRENT DRAW (AMPS) AT 120 WATTS OUTPUT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | RANGE 1 | | | RANGE 2 | | | RANGE 3 | | |
| | | 29.7 MHz | 33 MHz | 36 MHz | 36 MHz | 39 MHz | 42 MHz | 42 MHz | 46 MHz | 50 MHz |
| Q801<br>Q802, Q803 | L802 AND R812<br>R813 | 2.0<br>16-19 | 1.9<br>15-19 | 1.8<br>16-19 | 2.4<br>15-18 | 2.2<br>15-19 | 2.2<br>16-20 | 2.9<br>17-21 | 2.3<br>17-21 | 1.7<br>17-19 |

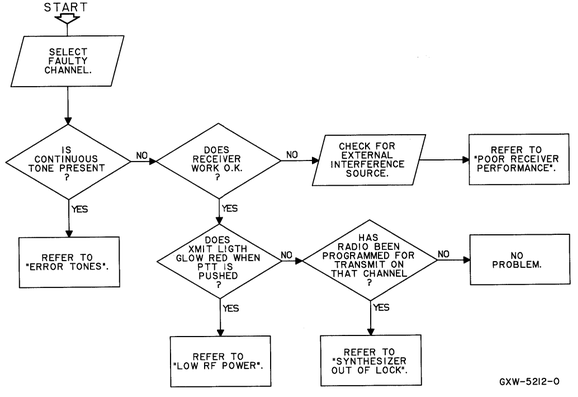
NOTES:
1. USE SIMPSON MODEL 260 OR EQUIVALENT. SOME DVM'S MAY GIVE ERRONEOUS DISPLAY IN THE PRESENCE OF HIGH POWER RF.
2. IF MEASUREMENT CANNOT BE TAKEN BEFORE CONTROLLED B+ DROPS TO NEAR ZERO, DISCONNECT J12-4 AND SUPPLY 6 VOLTS TO THE EXCITER BOARD AT J12-4.

## NO RECEIVE AT ANY RF LEVEL
## (SEE ALSO POOR RECEIVER PERFORMANCE )




GXW-5209-0

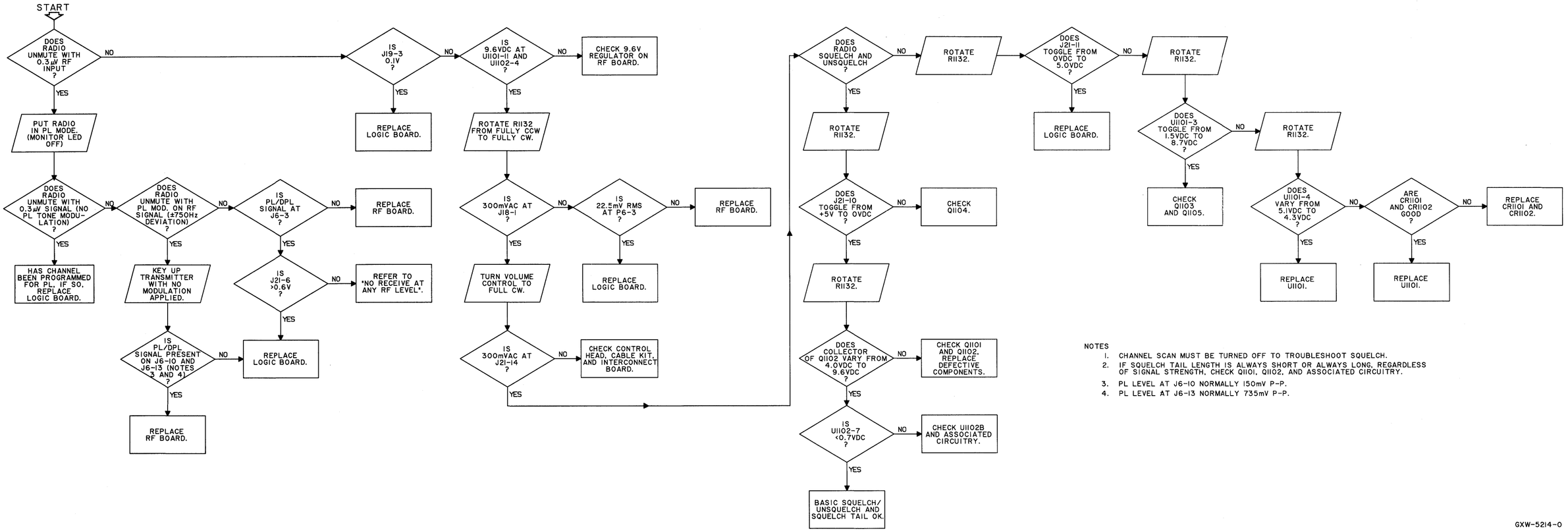
## RADIO WORKS ON SOME CHANNELS BUT NOT OTHERS




GXW-5212-0

# BAD SQUELCH OR PL/DPL

SEE NOTES 1 AND 2.

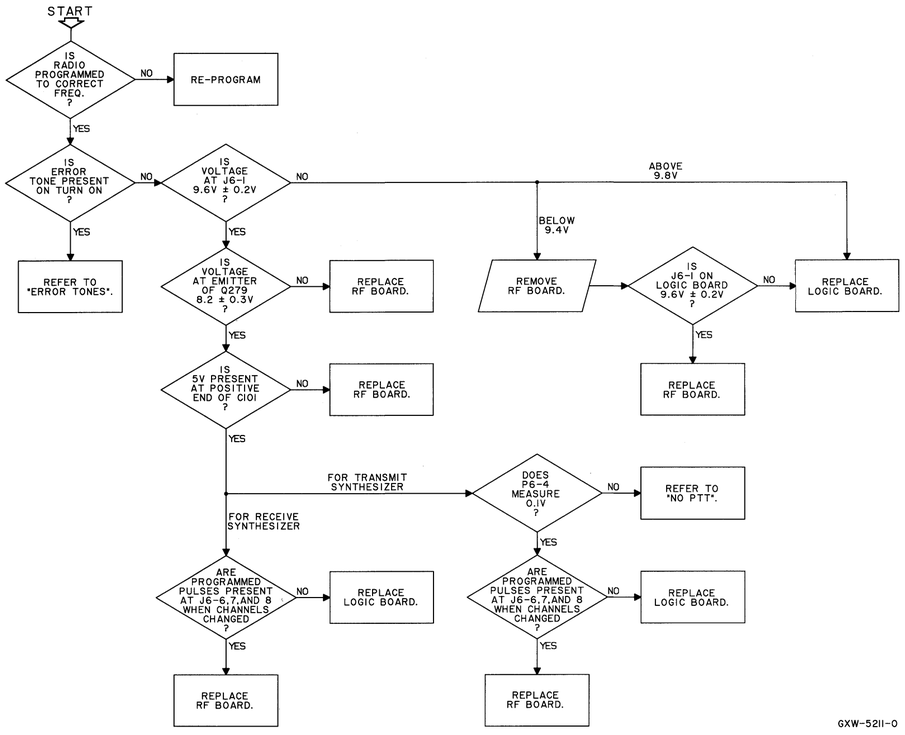



NOTES

1. CHANNEL SCAN MUST BE TURNED OFF TO TROUBLESHOOT SQUELCH.
2. IF SQUELCH TAIL LENGTH IS ALWAYS SHORT OR ALWAYS LONG, REGARDLESS OF SIGNAL STRENGTH, CHECK Q1101, Q1102, AND ASSOCIATED CIRCUITRY.
3. PL LEVEL AT J6-10 NORMALLY 150mV P-P.
4. PL LEVEL AT J6-13 NORMALLY 735mV P-P.

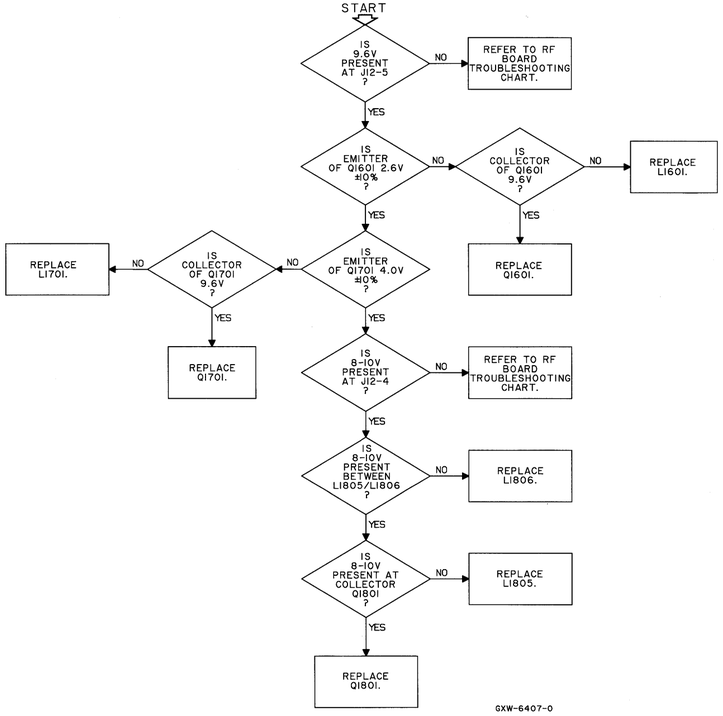
GXW-5214-0

## SYNTHESIZER OUT OF LOCK



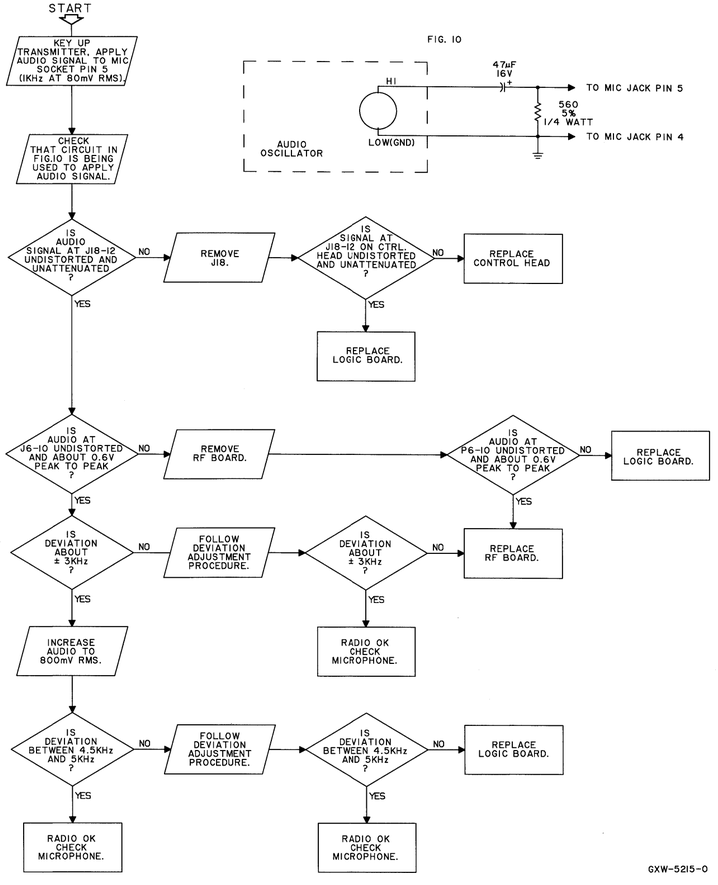

GXW-5211-0

## EXCITER PROBLEMS

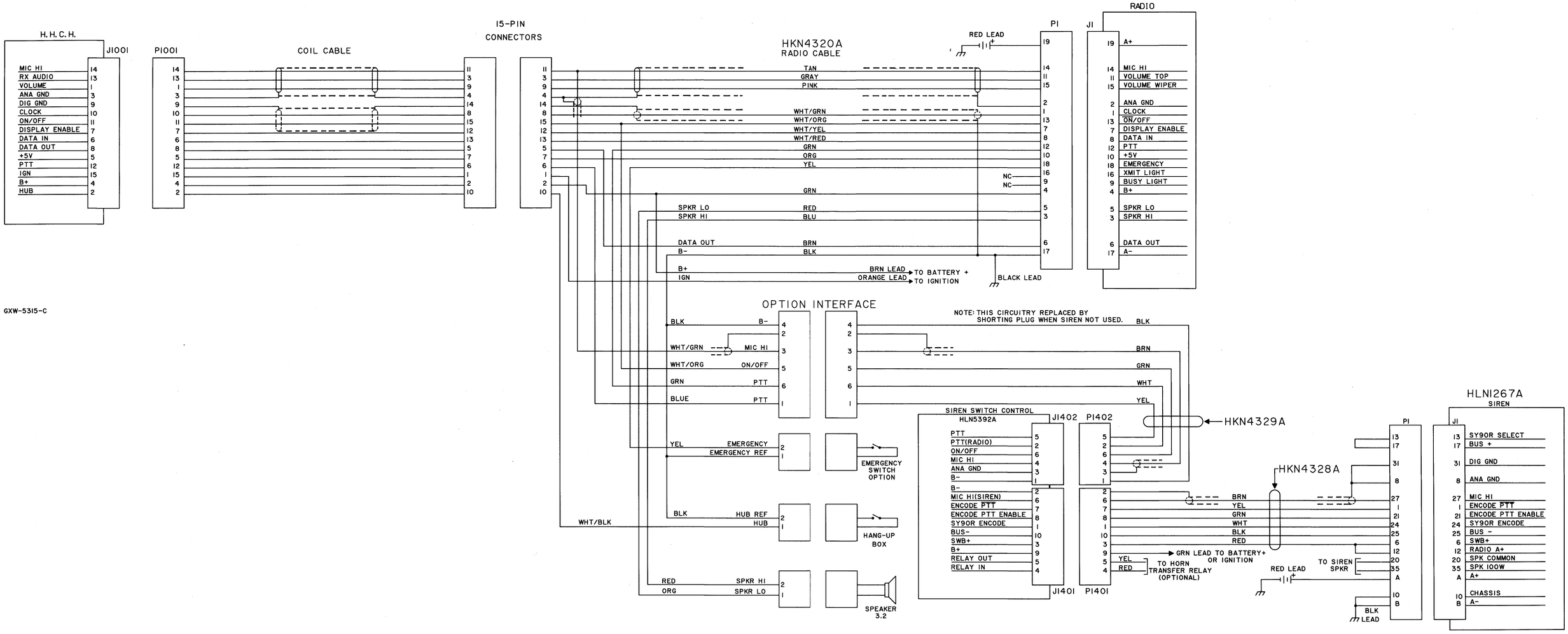



GXW-6407-0

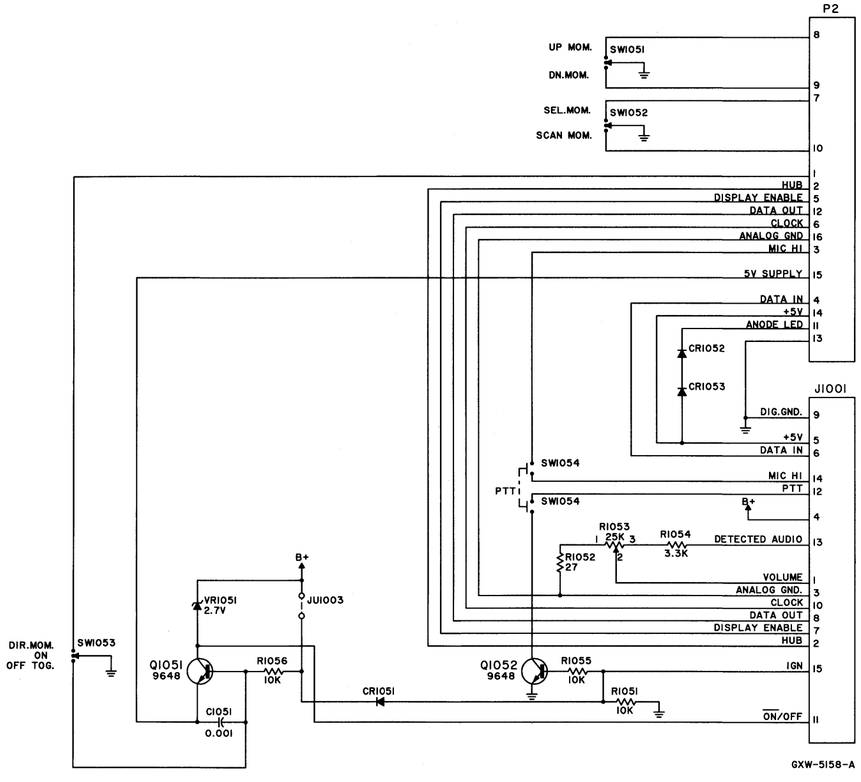
## BAD TRANSMIT MODULATION

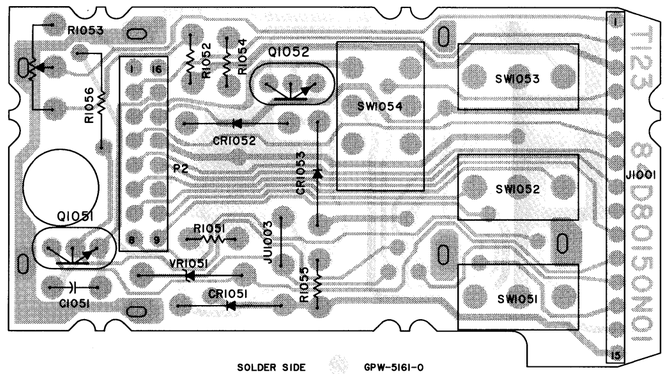



GXW-5215-0




Schematics, Circuit Boards Diagrams,
and Parts List for HCN1051A Control Head
(Handheld) Lower/Upper Boards
**PW–5272–C**
(Sheet 1 of 3)
8/31/89




Schematics, Circuit Boards Diagrams, and Parts List for HCN1051A Control Head (Handheld) Lower/Upper Boards
**PW-5272-C**
(Sheet 2 of 3)
8/31/89

## parts list

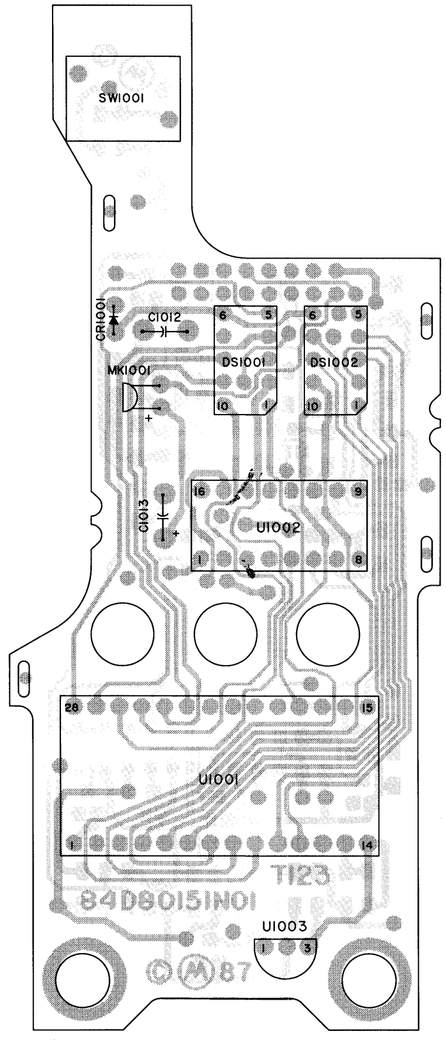
HCN1051A Handheld Control Head (99F) MXW-5160-B

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, uF, ±10%, 50V** (unless otherwise stated) | | |
| C1001–1007 | 21–13741N69 | .100 |
| C1008,1009 | 21–13741N21 | .001 |
| C1010 | 21–13741N69 | .100 |
| C1011 | 21–13741N21 | .001 |
| C1012 | 23–84538G05 | 10, 25V, tantalum |
| C1013 | 23–84538G03 | .1, ±20%, 35V, tantalum |
| C1014–1017 | 21–13741N21 | .001 |
| C1018,1019 | 21–13741N69 | .100 |
| C1051 | 08–11051A01 | .001, ±5%, 63V |
| **diode** (see note) | | |
| CR1001 | 48–05504C01 | LED |
| CR1051 | 48–11034A01 | silicon |
| CR1052,1053 | 48–82466H18 | silicon |
| **indicator** | | |
| DS1001,1002 | 48–80187G05 | LED, 7 segment |
| **connector receptacle** | | |
| J1 | 28–80195N01 | male, 15-pin right angle |
| J2 | 09–80196N01 | male, 16-pin |
| MK1001 | 50–80258E04 | mic cartridge |
| **jumper** | | |
| JU1003 | 06–11009F23 | o ohm resistor |
| **connector plug** | | |
| P2 | 28–80085E32 | male, 16-pin |
| **transistor** (see note) | | |
| Q1001–1003 | 48–80141L04 | NPN |
| Q1051,1052 | 48–11043C07 | NPN |
| **resistor, fixed, ohm, ±5%, 1/8 watt** (unless otherwise stated) | | |
| R1001–1010 | 06–11077A98 | 10k |
| R1011 | 06–11077A90 | 4.7k |
| R1012–1013 | 06–11077A98 | 10k |
| R1014 | 06–11077A90 | 4.7k |
| R1015,1016 | 06–11077A74 | 1k |
| R1017 | 06–11077A90 | 4.7k |
| R1018 | 06–11077A98 | 10k |
| R1019 | 06–11077A90 | 4.7k |
| R1020 | 06–11077A74 | 1k |
| R1021 | 06–11077A82 | 2.2k |
| R1022 | 06–11077A74 | 1k |
| R1023 | 06–11077B23 | 100k |
| R1024 | 06–11077A38 | 33 |
| R1025 | 06–11077A74 | 1k |
| R1051 | 06–11009E73 | 10k |
| R1052 | 06–11009E11 | 27 |
| R1054 | 06–11009E61 | 3.3k |
| R1055,1056 | 06–11009E73 | 10k |
| **switch** | | |
| SW1001 | 40–80067H01 | push button |
| SW1051,1052 | 40–80123H01 | toggle |
| SW1053 | 40–80123H06 | toggle |
| SW1054 | 40–80065E01 | push button |
| **integrated circuit** (see note) | | |
| U1001 | 51–80135C08 | LED display driver |
| U1002 | 51–84887K36 | shift register, 8 BIT static |
| U1003 | 51–84621K27 | regulator, 5V |
| **voltage regulator** (see note) | | |
| VR1001–1007 | 48–80140L06 | 5.1V zener |
| VR1008 | 48–80140L07 | 5.6V zener |
| VR1009,1011 | 48–80140L06 | 5.1V zener |
| VR1012 | 48–80140L17 | 12V zener |
| VR1051 | 48–11034A23 | 2.7V zener |

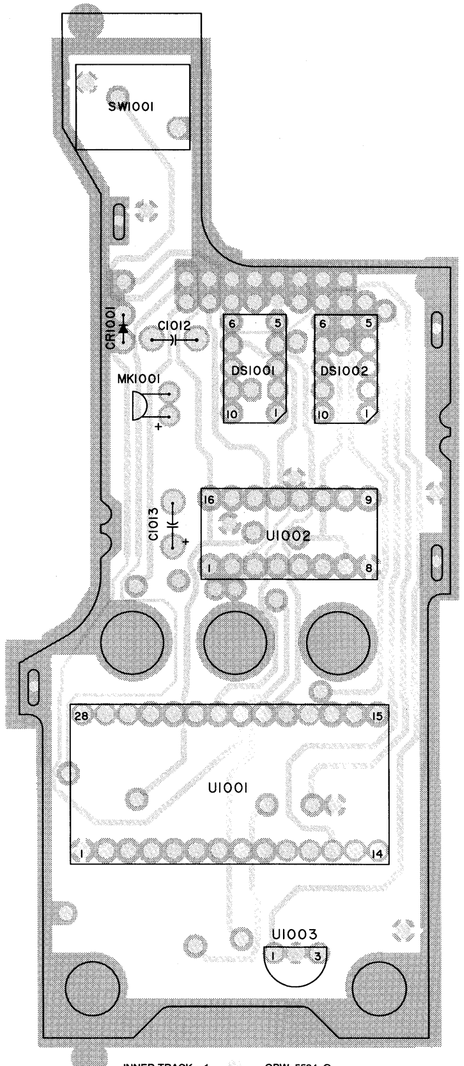
6/30/89

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

## UPPER BOARD



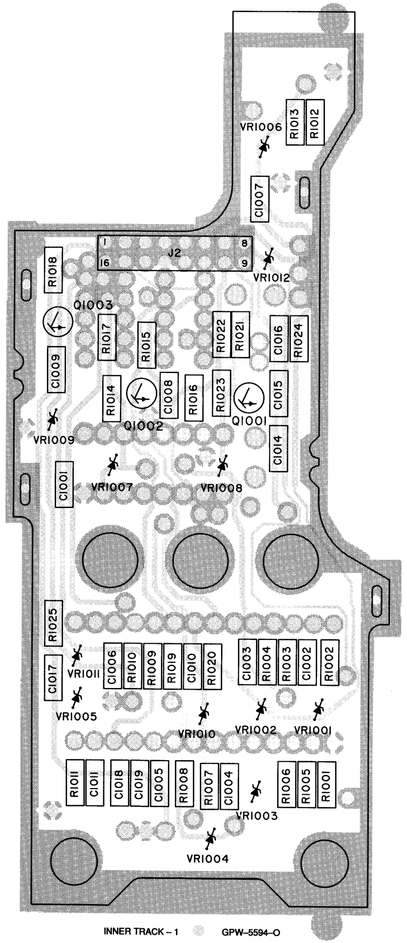

COMPONENT SIDE




COMPONENT SIDE

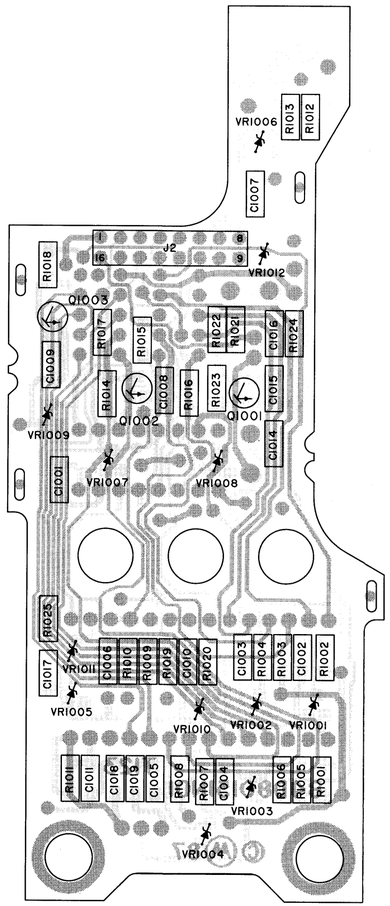
LOWER BOARD

## UPPER BOARD



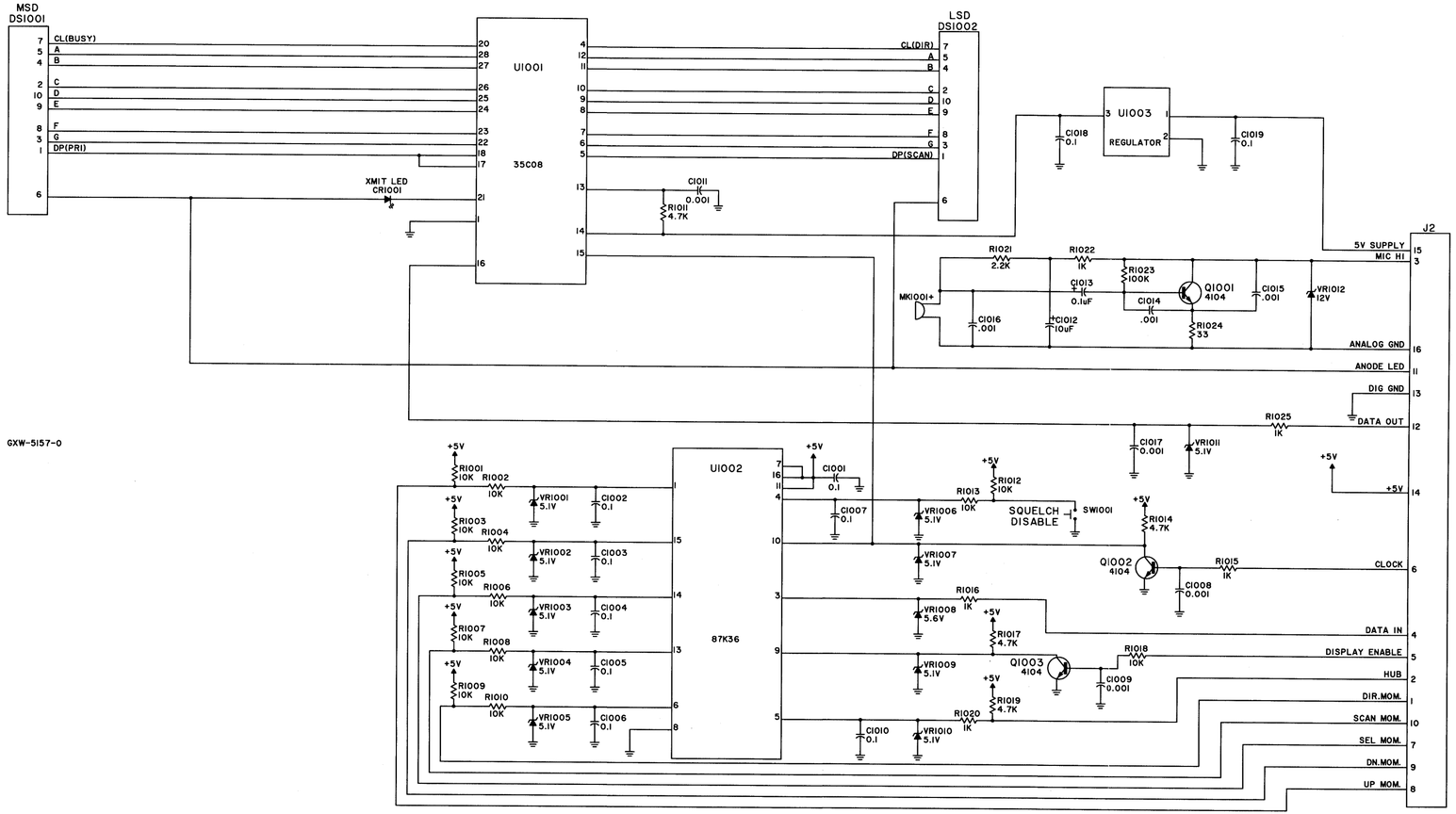

INNER TRACK – 1 GPW-5594-O
INNER TRACK – GND GPW-5595-O
OVERLAY GXW-5166W02-O

**SOLDER SIDE**




SOLDER SIDE GPW-5164-O
COMPONENT SIDE GPW-5165-O
OVERLAY GXW-5166W02-O

**SOLDER SIDE**




GXW-5157-0

Schematics, Circuit Boards Diagrams,
and Parts List for HCN1051A Control Head
(Handheld) Lower/Upper Boards
**PW-5272-C**
(Sheet 3 of 3)
8/31/89

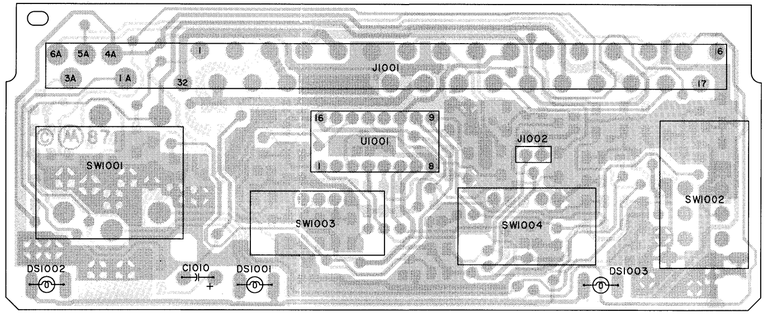
# parts list

HCN4037A Basic Control Head w/Talkaround (16F)
HCN4038A Basic Control Head w/Scan & Talkaround (8F)
HCN4033A Basic Control Head w/Scan (8F)
HCN4034A Basic Control Head (16F) MXW–5150–C

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, uF ±10% 50V** (unless otherwise stated) | | |
| C1003–1009 | 21–13741N69 | .100 |
| C1010 | 23–11019A20 | 10, ±20%, 25V electrolytic |
| C1011 | 21–13741N69 | .100 |
| C1012,1013 | 21–13741N21 | .001 |
| C1014,1015 | 21–13741N69 | .100 |
| **indicator** | | |
| DS1001–1003 | 65–80284N01 | incandescent lamp |
| **connector receptacle** | | |
| J104–106 | 09–80051B01 | female, 2–contact, lamp socket |
| J1002 | 28–84324M01 | male, 2–pin |
| **jumper** | | |
| JU1001,1003 | 06–11077A01 | 0 ohm |
| **transistor** (see note) | | |
| Q1001–1006 | 48–80141L04 | NPN |
| **resistor, fixed, ohm, ± 5%, 1/8 watt** (unless otherwise stated) | | |
| R1002 | 06–11077A86 | 3.3k |
| R1003–1004 | 06–11077A98 | 10k |
| R1005 | 06–11077A90 | 4.7k |
| R1006 | 06–11077A74 | 1k |
| R1007,1008 | 06–11077A98 | 10k |
| R1009 | 06–11077A36 | 27 |
| R1010 | 06–11077A90 | 4.7k |
| R1011–1020 | 06–11077A98 | 10k |
| R1021 | 06–11077A74 | 1k |
| R1022 | 06–11077A98 | 10k |
| R1023 | 06–11077A74 | 1k |
| R1024 | 06–11077A98 | 10k |
| R1025,1026 | 06–11077A74 | 1k |
| R1027 | 06–11077A90 | 4.7k |
| R1028 | 06–11077A98 | 10k |
| R1029 | 06–11077A60 | 270 |
| R1030,1031 | 06–11077A98 | 10k |
| **switch** | | |
| SW1001 | 18–80126A03 | potentiometer, 25k, ±30%, .16W |
| SW1002 | 40–80127A03 | push button |
| SW1003 | 40–80166N01 | rotary 8 potition |
| SW1004 | 40–80166N02 | rotary 2 position |
| **integrated circuit** (see note) | | |
| U1001 | 51–84887K36 | 8 bit shift register |
| **voltage regulator** (see note) | | |
| VR1001 | 48–80140L06 | 1.5V zemer |
| VR1002 | 48–80140L07 | 5.6V zener |
| VR1003–1010 | 48–80140L06 | 5.1V zene |

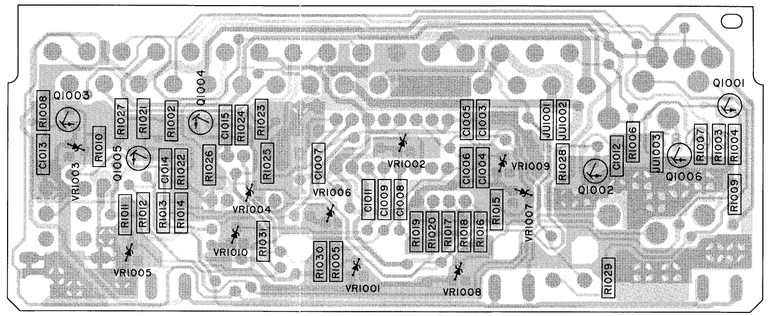
6/30/89

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



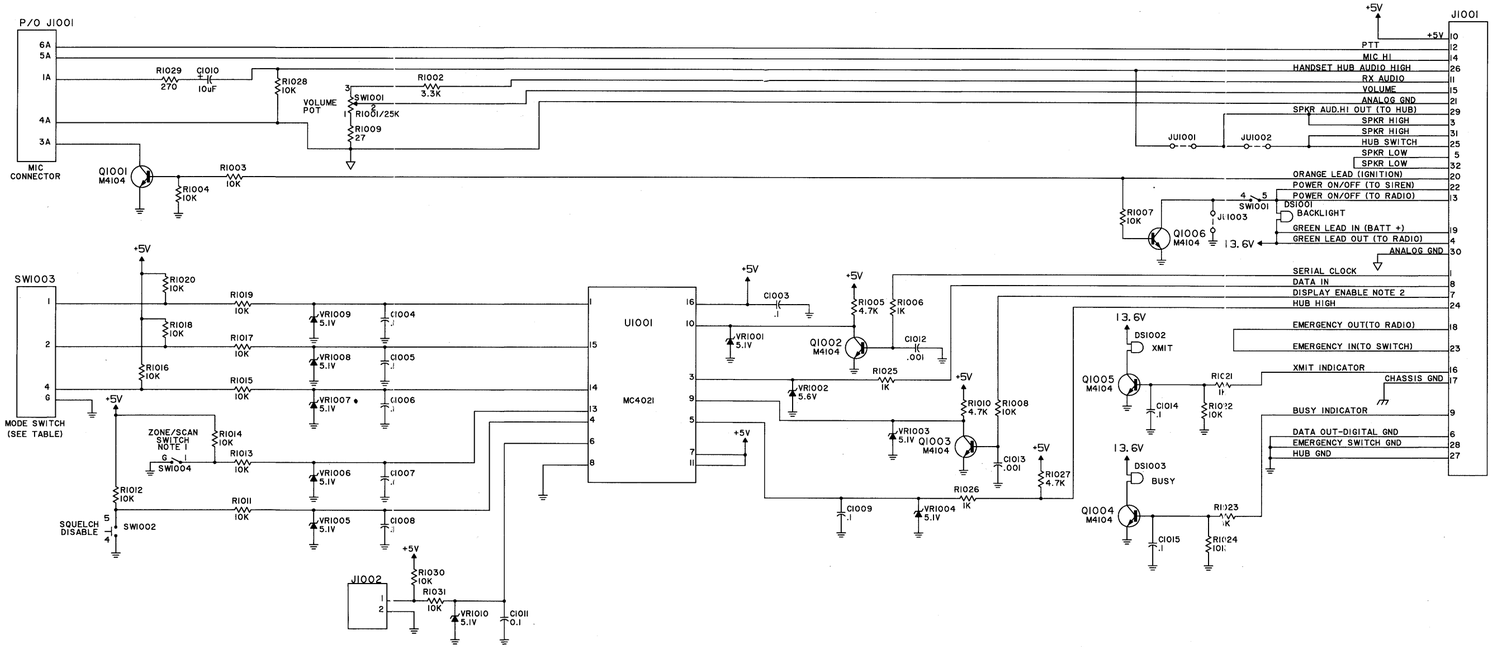

SOLDER SIDE GPW–5154–O
COMPONENT SIDE GPW–5155–O
OVERLAY GXW–5156W01–O

## COMPONENT SIDE




SOLDER SIDE GPW–5154–O
COMPONENT SIDE GPW–5155–O
OVERLAY GXW–5156W02–O

## SOLDER SIDE




JUMPER TABLE

| JU1001 | JU1002 | JU1003 | SYSTEM OPERATION |
|---|---|---|---|
| IN | IN | * | RECEIVE AUDIO IS ROUTED TO BOTH EXTERNAL SPEAKERS AND HANDSET. |
| IN | OUT | * | RECEIVE AUDIO IS ROUTED TO HANDSET AND AUDIO TO EXTERNAL SPEAKER IS SWITCHED VIA HANG UP BOX. |
| OUT | IN | * | RECEIVE AUDIO IS ROUTED TO EXTERNAL SPEAKER AND AUDIO TO HANDSET IS SWITCHED VIA HANG UP BOX. |
| OUT | OUT | * | RECEIVE AUDIO IS SWITCHED BETWEEN EXTERNAL SPEAKER AND HANDSET VIA HANG UP BOX. |
| * | * | OUT | IGNITION LEAD IS ENABLED AND CONTROLS BOTH RX AND TX. |
| * | * | IN | IGNITION LEAD ONLY CONTROLS TX. |

* = DON'T CARE

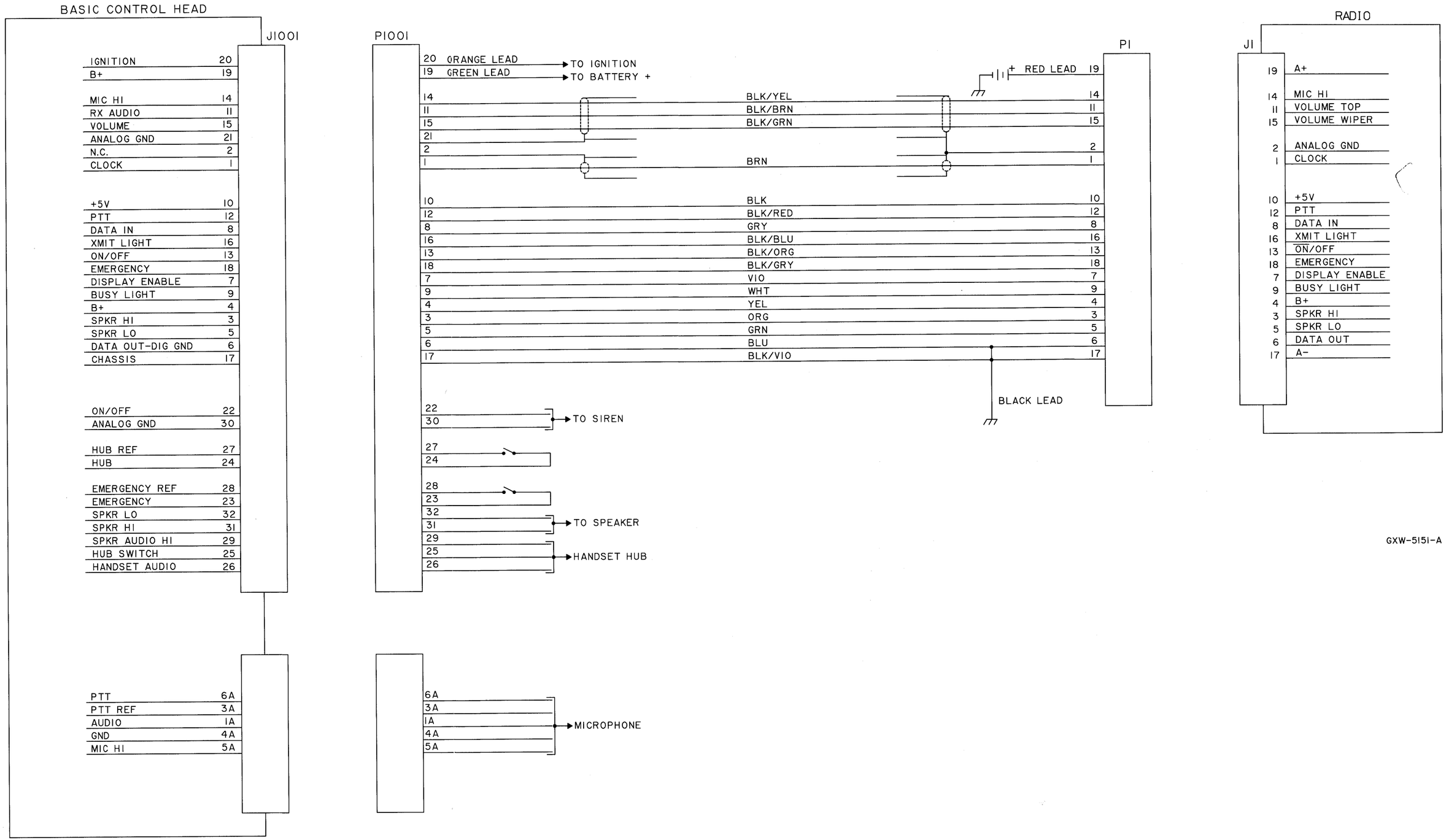
SW1003

| MODE SWITCH POSITION | U1001 PIN 1 | PIN 15 | PIN 14 |
|---|---|---|---|
| 1 | 5V | 5V | 5V |
| 2 | 0V | 5V | 5V |
| 3 | 5V | 0V | 5V |
| 4 | 0V | 0V | 5V |
| 5 | 5V | 5V | 0V |
| 6 | 0V | 5V | 0V |
| 7 | 5V | 0V | 0V |
| 8 | 0V | 0V | 0V |

NOTES:
1. THE ZONE SWITCH IS USED FOR SCAN ON/OFF ON THE SCAN CONTROL HEAD.
2. WHEN DISPLAY ENABLE (PIN 7 OF J1001) IS HIGH (>3.5V) THEN U1001 OPERATES AS A SHIFT REGISTER AND THE LATCHED DATA IS SHIFTED ON THE POSITIVE EDGES AT PIN 10 OF U1001.
   WHEN DISPLAY ENABLE IS LOW, U1001 READS THE CURRENT SWITCH POSITIONS.
3. UNLESS OTHERWISE INDICATED CAPACITOR VALUES ARE EXPRESSED IN uF: RESISTOR VALUES ARE EXPRESSED IN OHMS.

GXW–5149–O

Schematic, Circuit Board Diagram, and Parts List for HCN4033A, HCN4034A, HCN4037A, HCN4038A for Control Head (Clam Shell)
**PW–5271–C**
(Sheet 1 of 2)
6/30/89




GXW-5151-A

Schematic, Circuit Board Diagram, and Parts List for
HCN4033A, HCN4034A, HCN4037A, HCN4038A for
Control Head (Clam Shell)
**PW–5271–C**
(Sheet 2 of 2)
6/30/89

# parts list

HLN5406B Advanced Control Head, 99F (Control Board) MXW–5584–C

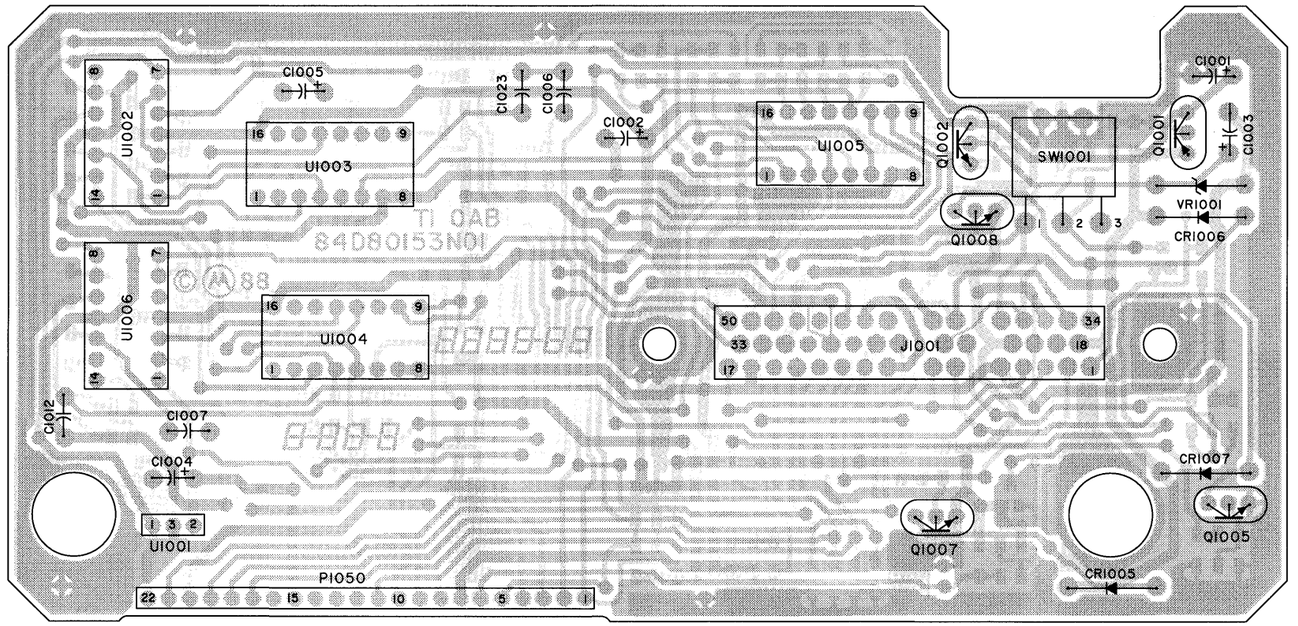
| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, uF, ±5%, 50V** (unless otherwise stated) | | |
| C1001 | 23–11048C11 | 10, ±20%, 35V, electrolytic |
| C1003–1005 | 23–11048C11 | 10, ±20%, 35V, electrolytic |
| C1006,1007 | 08–11051A17 | 0.47, 63V |
| C1008–1011 | 21–13740B57 | 220 pF |
| C1012 | 08–11051A17 | 0.47, 63V |
| C1013,1014 | 21–13741N21 | .001 |
| C1015–1021 | 21–13741N45 | 0.01, ±10% |
| C1022 | 21–13741N21 | .001 |
| C1023 | 08–11051A11 | 0.047, 63V |
| C1024 | 21–11032A09 | .001 |
| C1025–1028 | 21–11031A47 | 220 |
| C1029–1045 | 21–11032A21 | 0.01, ±10% |
| **diode** (see note) | | |
| CR1001,1002 | 48–80236E08 | rectifier, silicon |
| CR1004 | 48–80236E08 | rectifier, silicon |
| CR1005–1007 | 48–82466H18 | rectifier, silicon |
| CR1010 | 48–80060M01 | rectifier, silicon |
| **connector receptacle** | | |
| J1001 | 28–80228J01 | connector, 50 position |
| **jumper** | | |
| JU1003 | 06–11077A01 | 0–ohm resistor |
| JU1005 | 06–11077A01 | 0–ohm resistor |
| **transistor** (see note) | | |
| Q1001 | 48–11043C08 | PNP |
| Q1002 | 48–11043C07 | NPN |
| Q1004 | 48–80141L03 | PNP, type 41L03 |
| Q1005 | 48–11043C07 | NPN |
| Q1006 | 48–80141L04 | NPN, type 41L04 |
| Q1007,1008 | 48–11043C07 | NPN |
| Q1009 | 48–80141L04 | NPN |
| **resistor, fixed, ohm, ±5%, 1/8 watt** (unless otherwise stated) | | |
| R1001 | 06–11077A98 | 10k |
| R1002 | 06–11077A90 | 4.7k |
| R1003 | 06–11077A74 | 1k |
| R1004,1005 | 06–11077A98 | 10k |
| R1006–1012 | 06–11077B11 | 33k |
| R1013 | 06–11077A98 | 10k |
| R1014,1015 | 06–11077A98 | 10k |
| R1017 | 06–11077B07 | 22k |
| R1018 | 06–11077A82 | 2.2k |
| R1019 | 06–11077A62 | 330 |
| R1020 | 06–11077A42 | 47 |
| R1021 | 06–11077A82 | 2.2k |
| R1022 | 06–11077A86 | 3.3k |
| R1023 | 06–11077A74 | 1k |
| R1024 | 06–11077A54 | 150 |
| R1025,1026 | 06–11077A78 | 1.5k |
| R1027 | 06–11077A74 | 1k |
| R1028 | 06–11077A70 | 680 |
| R1029 | 06–11077A74 | 1k |
| R1030 | 06–11077A68 | 560 |
| R1031,1032 | 06–11077A74 | 1k |
| R1033 | 06–11077A58 | 220 |
| R1034 | 06–11077A98 | 10k |
| R1035 | 06–11077A62 | 330 |
| R1036–1038 | 06–11077A98 | 10k |
| R1039 | 06–11077A28 | 12 |
| R1040 | 06–11077A74 | 1k |
| R1041 | 06–11077A82 | 2.2k |
| R1042 | 06–11077A74 | 1k |
| R1043 | 06–11077A62 | 330 |
| R1044 | 06–11077A86 | 3.3k |
| R1045,1046 | 06–11077A74 | 1k |
| R1047 | 06–11077A68 | 560 |
| R1048 | 06–11077A58 | 220 |
| R1049 | 06–11077A68 | 560 |
| R1050 | 06–11077B07 | 22k |
| R1051 | 06–11077A58 | 220 |
| R1052 | 06–11077A28 | 12 |
| R1053 | 06–11077A58 | 220 |
| R1054 | 06–11077A98 | 10k |
| R1101 | 06–11027A98 | 10k |
| R1102 | 06–11077B07 | 22k |
| **switch** | | |
| SW1001 | 40–80033K01 | toggle |
| **integrated circuit** (see note) | | |
| U1001 | 51–84621K27 | voltage regulator |
| U1002 | 51–84621K32 | quad op amp |
| U1003,1004 | 51–80073C06 | analog multiplexer, CMOS |
| U1005 | 51–84887K26 | analog multiplexer/demultiplexer |
| U1006 | 51–84621K32 | quad op amp |
| **voltage regulator** (see note) | | |
| VR1001 | 48–11034A19 | zener, 10V, 25 mA |
| VR1002,1003 | 48–80140L15 | zener, 10V, 5 mA |

6/30/89

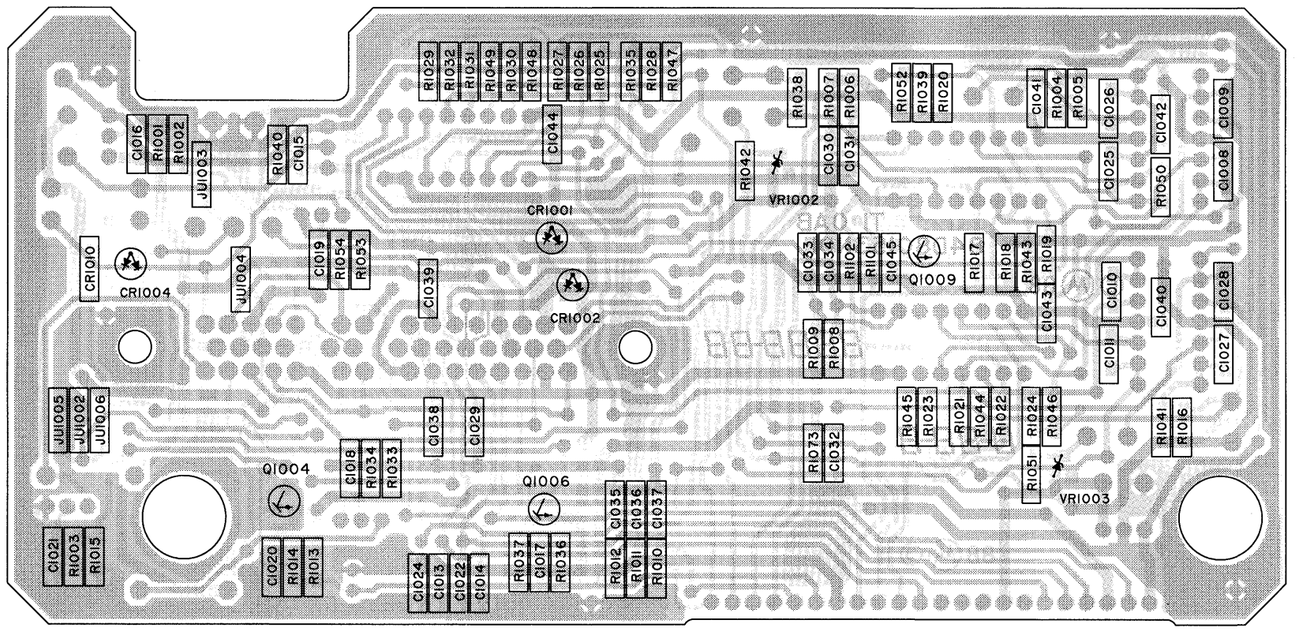
**note:** For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

Schematics, Circuit Boards Diagrams, and Parts Lists for HCN1052B Advanced Control Head
**PW–5583–C**
(Sheet 1 of 4)
6/30/89

# CONTROL BOARD




**COMPONENT SIDE**

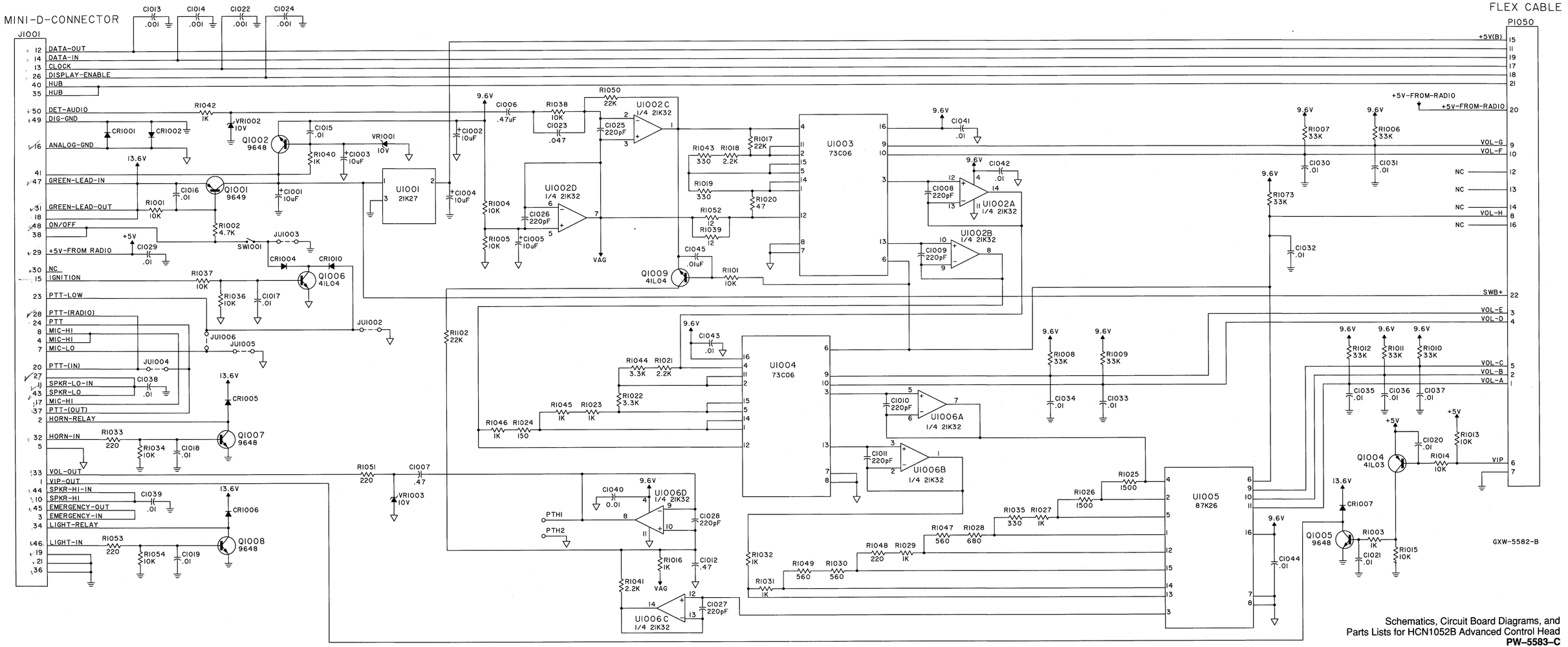



**SOLDER SIDE**

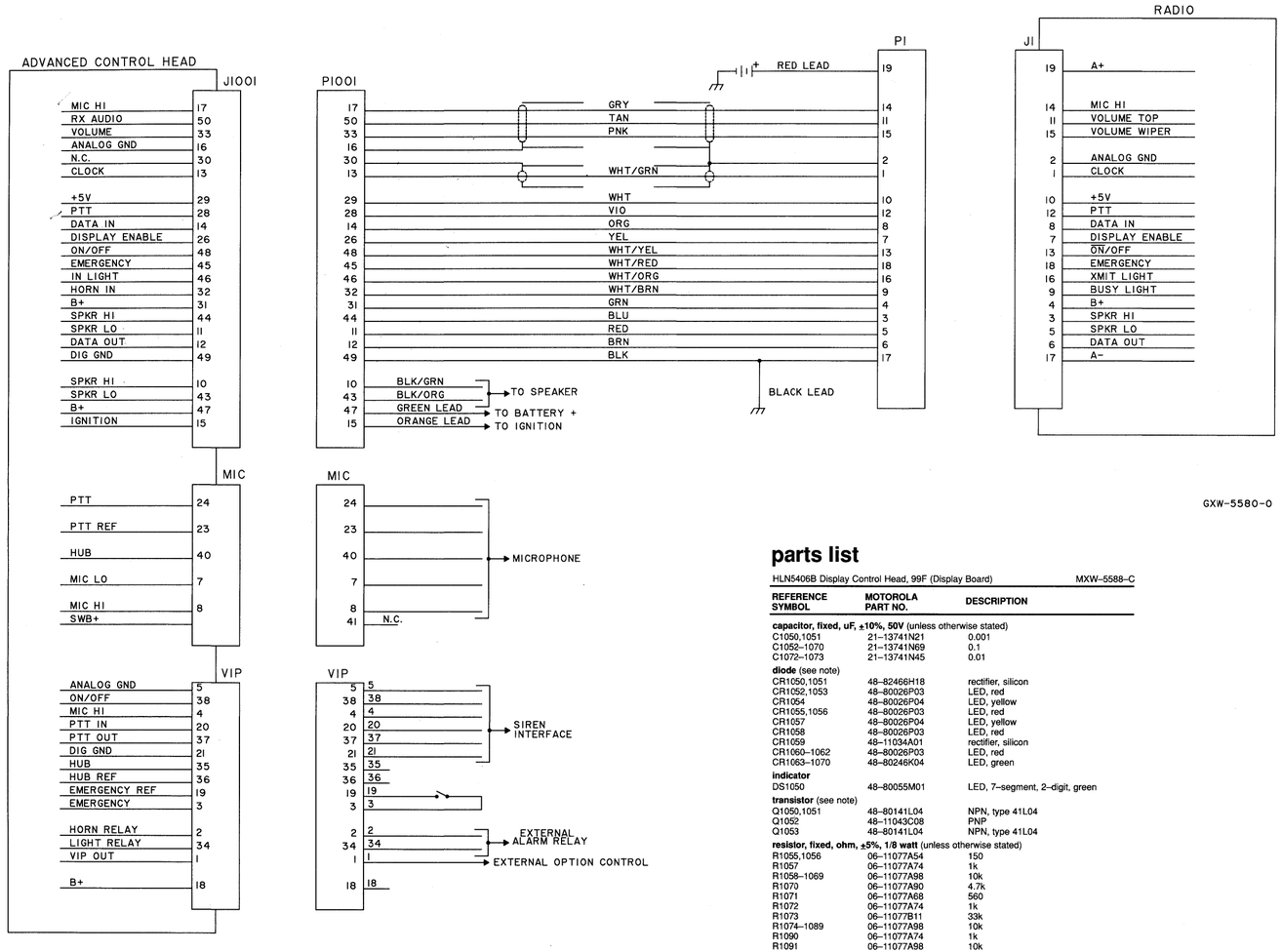
| JUMPER CONFIGURATION | |
|---|---|
| **JUMPER** | **FUNCTION** |
| CR1010 | CONNECTS PTT LOW TO IGNITION SENSE WHICH PREVENTS TRANSMITTING WHEN IGNITION IS OFF. |
| JU1002 | CONNECTS PTT LOW TO ANALOG GROUND TO ALLOW TRANSMITTING REGARDLESS OF IGNITION SENSE. |
| JU1003 | CONNECTS ON/OFF SWITCH TO DIGITAL GROUND ALLOWING RECEIVER OPERATION REGARDLESS OF IGNITION SENSE. |
| JU1004 | CONNECTS PTT TO PTT IN WHICH ALLOWS REMOVAL OF EXTERNAL VIP JUMPER PLUG. |
| JU1005 | CONNECTS MIC LO TO ANALOG GROUND WHEN HANDSET IS NOT USED. |
| JU1006 | CONNECTS MIC LO TO PTT LOW WHEN HANDSET IS USED. |

NORMALLY, THE FOLLOWING JUMPERS ARE INSTALLED, JU1001, JU1003, AND JU1005.

# CONTROL BOARD




Schematics, Circuit Board Diagrams, and
Parts Lists for HCN1052B Advanced Control Head
**PW–5583–C**
(Sheet 2 of 4)
6/30/89




GXW-5580-O

Schematics, Circuit Boards Diagrams, and
Parts Lists for HCN1052B Advanced Control Head
**PW–5583–C**
(Sheet 3 of 4)
6/30/89

## parts list

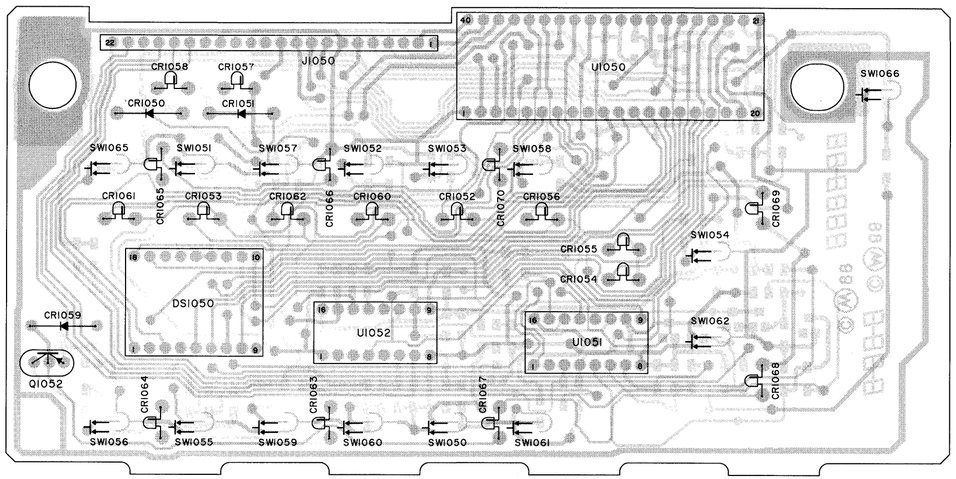
HLN5406B Display Control Head, 99F (Display Board) MXW–5588–C

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, uF, ±10%, 50V** (unless otherwise stated) | | |
| C1050,1051 | 21–13741N21 | 0.001 |
| C1052–1070 | 21–13741N69 | 0.1 |
| C1072–1073 | 21–13741N45 | 0.01 |
| **diode** (see note) | | |
| CR1050,1051 | 48–82466H18 | rectifier, silicon |
| CR1052,1053 | 48–80026P03 | LED, red |
| CR1054 | 48–80026P04 | LED, yellow |
| CR1055,1056 | 48–80026P03 | LED, red |
| CR1057 | 48–80026P04 | LED, yellow |
| CR1058 | 48–80026P03 | LED, red |
| CR1059 | 48–11034A01 | rectifier, silicon |
| CR1060–1062 | 48–80026P03 | LED, red |
| CR1063–1070 | 48–80246K04 | LED, green |
| **indicator** | | |
| DS1050 | 48–80055M01 | LED, 7–segment, 2–digit, green |
| **transistor** (see note) | | |
| Q1050,1051 | 48–80141L04 | NPN, type 41L04 |
| Q1052 | 48–11043C08 | PNP |
| Q1053 | 48–80141L04 | NPN, type 41L04 |
| **resistor, fixed, ohm, ±5%, 1/8 watt** (unless otherwise stated) | | |
| R1055,1056 | 06–11077A54 | 150 |
| R1057 | 06–11077A74 | 1k |
| R1058–1069 | 06–11077A98 | 10k |
| R1070 | 06–11077A80 | 4.7k |
| R1071 | 06–11077A68 | 560 |
| R1072 | 06–11077A74 | 1k |
| R1073 | 06–11077B11 | 33k |
| R1074–1089 | 06–11077A98 | 10k |
| R1090 | 06–11077A74 | 1k |
| R1091 | 06–11077A98 | 10k |
| R1092 | 06–11077A74 | 1k |
| R1093–1100 | 06–11077A98 | 10k |
| **integrated circuit** (see note) | | |
| U1050 | 51–80236C01 | driver, LED display |
| U1051,1052 | 51–84887K36 | shift register, CMOS |
| **voltage regulator** (see note) | | |
| VR1051,1052 | 48–80140L06 | zener, 5.1V |
| VR1053 | 48–80140L07 | zener, 5.6V |
| VR1054 | 48–80140L06 | zener, 5.1V |
| VR1058 | 48–80140L06 | zener, 5.1V |

6/30/89

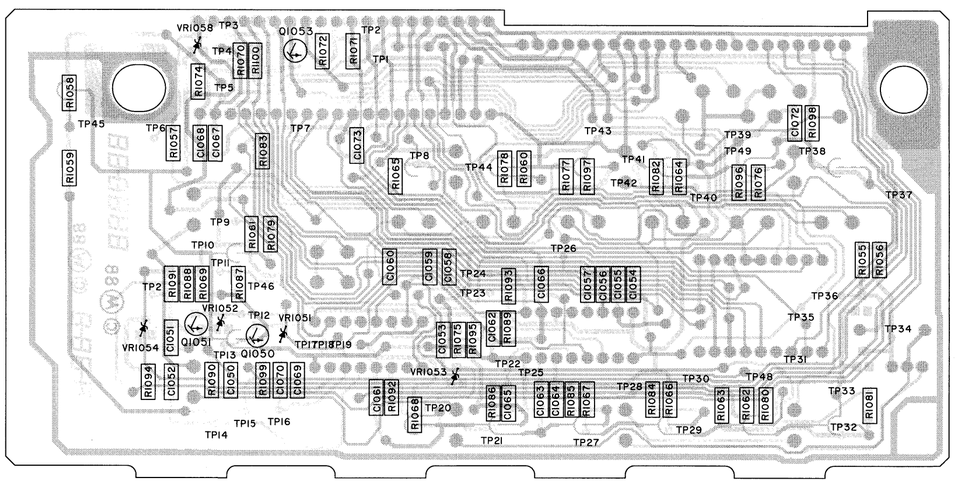
**note:** For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

## DISPLAY BOARD




SOLDER SIDE GPW–5560–O
COMPONENT SIDE GPW–5561–O
OVERLAY GXW–5557W01–A

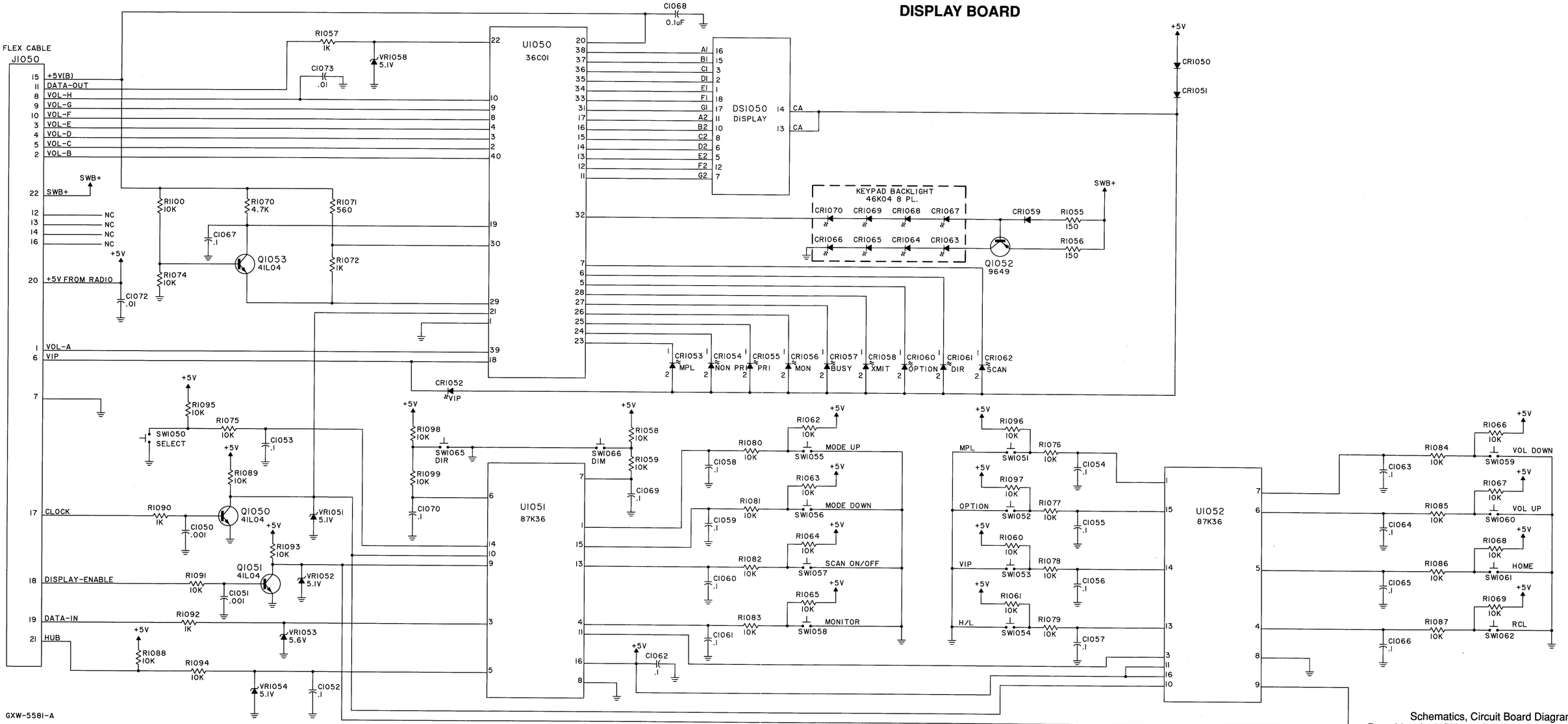
**COMPONENT SIDE**



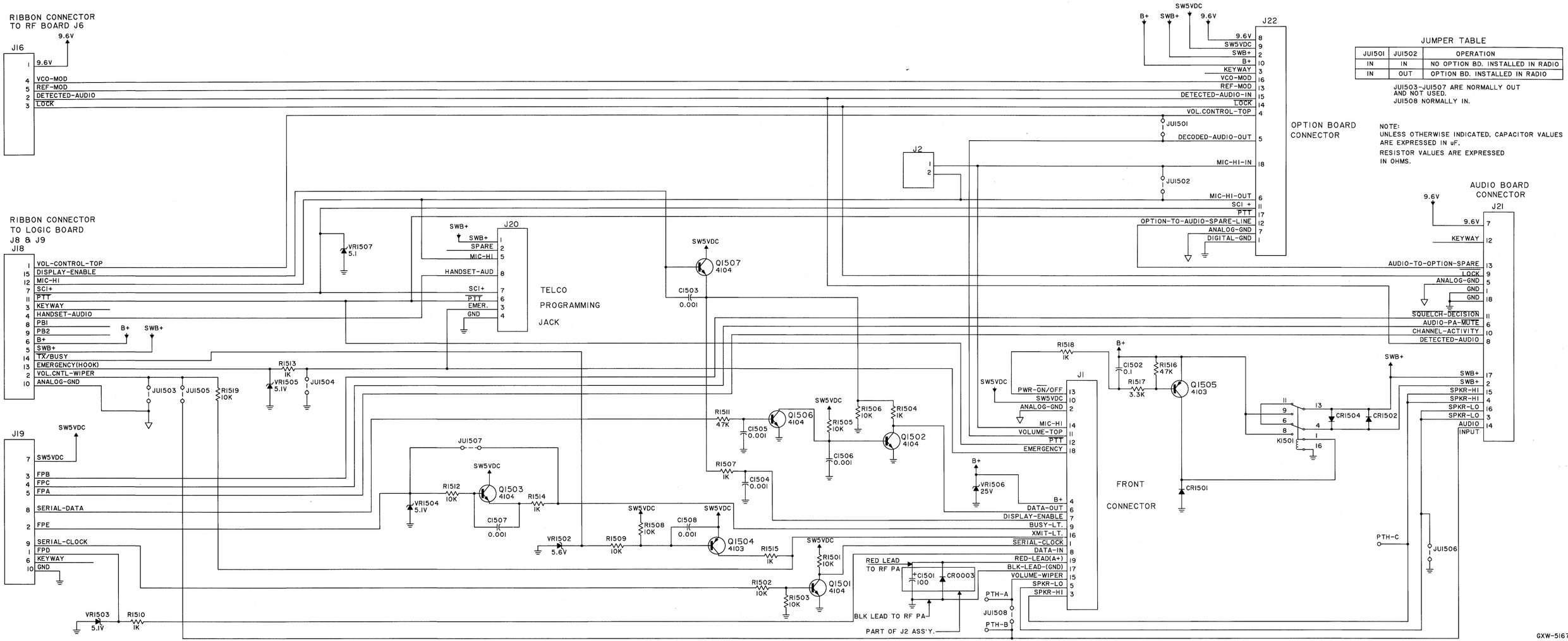

SOLDER SIDE GPW–5560–O
COMPONENT SIDE GPW–5561–O
OVERLAY GXW–5557W02–A

**SOLDER SIDE**

# DISPLAY BOARD




Schematics, Circuit Board Diagrams, and
Parts Lists for HCN1052B Advanced Control Head
**PW–5583–C**
(Sheet 4 of 4)
6/30/89



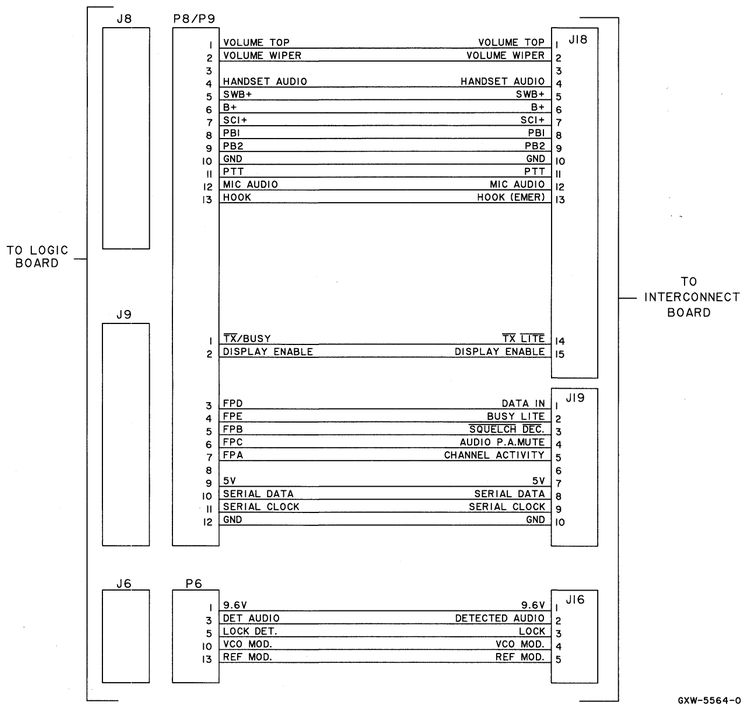

JUMPER TABLE

| JUI501 | JUI502 | OPERATION |
|---|---|---|
| IN | IN | NO OPTION BD. INSTALLED IN RADIO |
| IN | OUT | OPTION BD. INSTALLED IN RADIO |

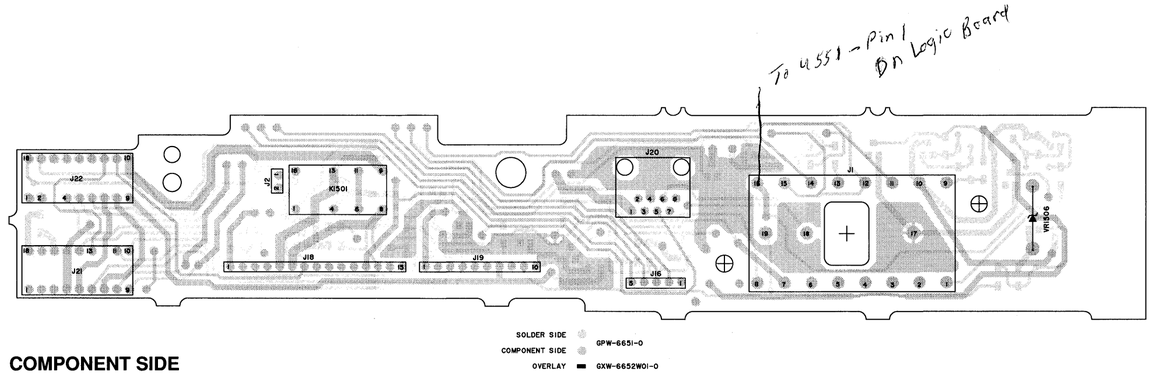
JUI503-JUI507 ARE NORMALLY OUT AND NOT USED.
JUI508 NORMALLY IN.

NOTE:
UNLESS OTHERWISE INDICATED, CAPACITOR VALUES ARE EXPRESSED IN uF,
RESISTOR VALUES ARE EXPRESSED IN OHMS.

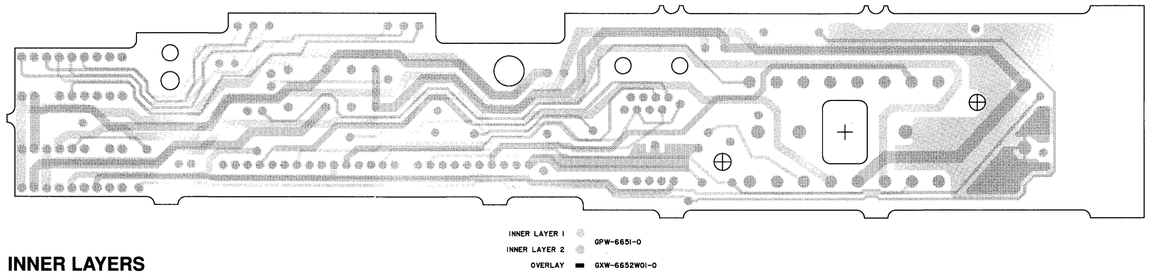
Schematic, Circuit Board Diagram, and
Parts List for HLN5343B Interconnect Board
**PW–5273–D**
(Sheet 1 of 2)
3/31/90



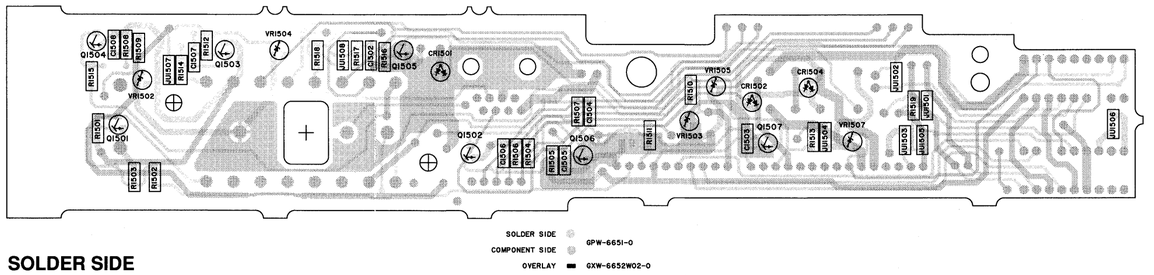

**INTERCONNECT RIBBON DIAGRAM**




**COMPONENT SIDE**




**INNER LAYERS**




**SOLDER SIDE**

## parts list

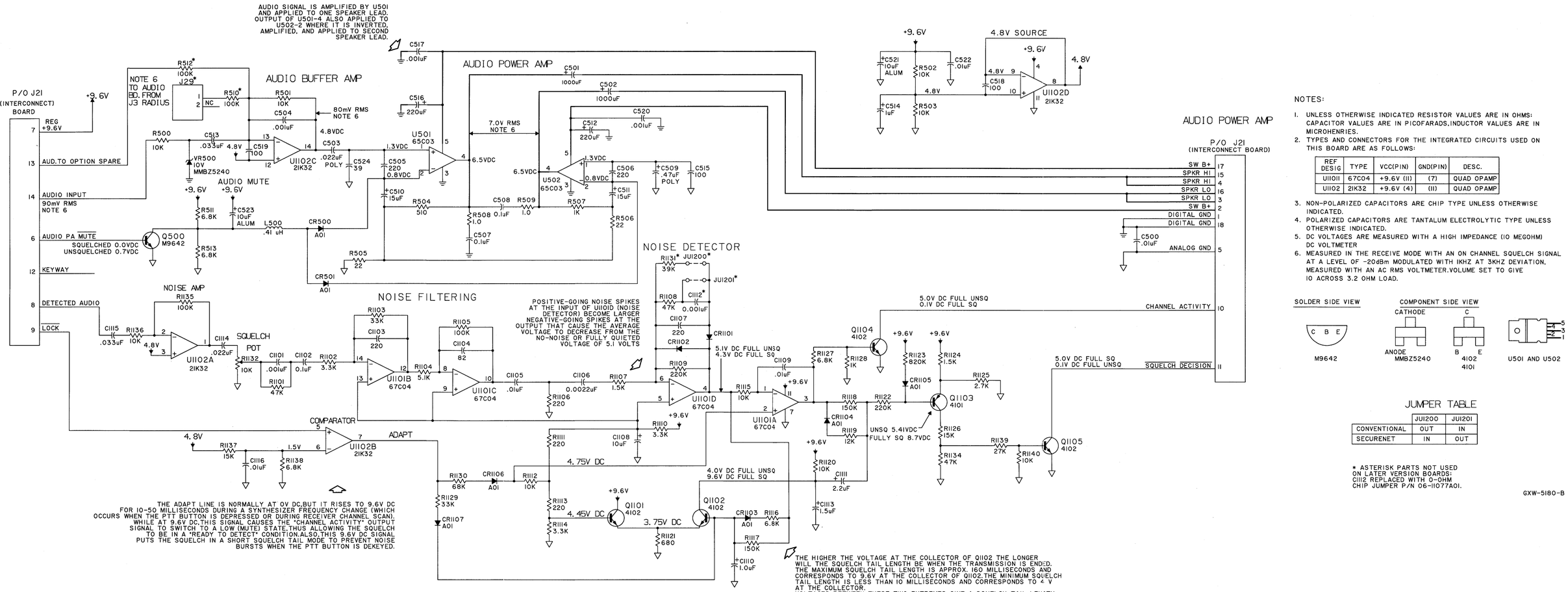
HLN5343B *MaraTrac* Interconnect Board — MXW-6593-A

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, pF, ±10%, 50V (unless otherwise stated)** | | |
| C11–28 | 21–84874K01 | 470 pF, ±20%, 250V |
| C1501 | 23–80167C03 | 1000 uF, ±20%, 25V, electrolytic |
| C1502 | 21–13741N69 | 0.1 |
| C1503–1508 | 21–13741N21 | 0.001 |
| **diode (see note)** | | |
| CR3 | 48–80153A01 | silicon |
| CR1501,1502 | 48–80236E08 | silicon |
| CR1504 | 48–80236E08 | silicon |
| **connector receptacle** | | |
| J1 | 28–80011A01 | male, 19–pin |
| J20 | 09–80132M01 | telco, 8–pin |
| J21,22 | 09–80103M05 | female, 18–contact |
| **jumper** | | |
| JU1501,1502 | 06–11077A01 | 0–ohm resistor |
| JU1508 | 06–11077A01 | 0–ohm resistor |
| **relay** | | |
| K1501 | 80–80075G03 | 220V, 2 amps |
| transistor (see note) | | |
| Q1501–1503 | 48–80141L04 | NPN |
| Q1504,1505 | 48–80141L03 | PNP |
| Q1506,1507 | 48–80141L04 | NPN |
| **resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)** | | |
| R1501–1503 | 06–11077A98 | 10k |
| R1504 | 06–11077A74 | 1k |
| R1505,1506 | 06–11077A98 | 10k |
| R1507 | 06–11077A74 | 1k |
| R1508,1509 | 06–11077A98 | 10k |
| R1510 | 06–11077A74 | 1k |
| R1511 | 06–11077B15 | 47k |
| R1512 | 06–11077A98 | 10k |
| R1513–1515 | 06–11077A74 | 1k |
| R1516 | 06–11077B15 | 47k |
| R1517 | 06–11077A86 | 3.3k |
| R1518 | 06–11077A74 | 1k |
| **voltage regulator (see note)** | | |
| VR1502 | 48–80140L07 | zener, 5.6V |
| VR1503–1505 | 48–80140L06 | zener, 5.1V |
| VR1506 | 48–80236E07 | zener, 28V |
| VR1507 | 48–80140L06 | zener, 5.1V |
| **non–referenced parts** | | |
| | 26–80191P01 | heatsink (2 used) |
| MP101 | 64–80264A01 | cable plug |
| | 03–10904A02 | screw, machine M3.5 x 0.6 x 6 (2 used) |

3/31/90

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

Schematic, Circuit Board Diagram, and Parts List for HLN5343B Interconnect Board
**PW–5273–D**
(Sheet 2 of 2)
3/31/90




NOTES:

1. UNLESS OTHERWISE INDICATED RESISTOR VALUES ARE IN OHMS: CAPACITOR VALUES ARE IN PICOFARADS,INDUCTOR VALUES ARE IN MICROHENRIES.
2. TYPES AND CONNECTORS FOR THE INTEGRATED CIRCUITS USED ON THIS BOARD ARE AS FOLLOWS:

| REF DESIG | TYPE | VCC(PIN) | GND(PIN) | DESC. |
|---|---|---|---|---|
| U1101I | 67C04 | +9.6V (II) | (7) | QUAD OPAMP |
| U1102 | 21K32 | +9.6V (4) | (11) | QUAD OPAMP |

3. NON-POLARIZED CAPACITORS ARE CHIP TYPE UNLESS OTHERWISE INDICATED.
4. POLARIZED CAPACITORS ARE TANTALUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER
6. MEASURED IN THE RECEIVE MODE WITH AN ON CHANNEL SQUELCH SIGNAL AT A LEVEL OF -20dBm MODULATED WITH 1KHZ AT 3KHZ DEVIATION, MEASURED WITH AN AC RMS VOLTMETER.VOLUME SET TO GIVE 10 ACROSS 3.2 OHM LOAD.

SOLDER SIDE VIEW




M9642

COMPONENT SIDE VIEW




MMBZ5240 4102 4101




U501 AND U502

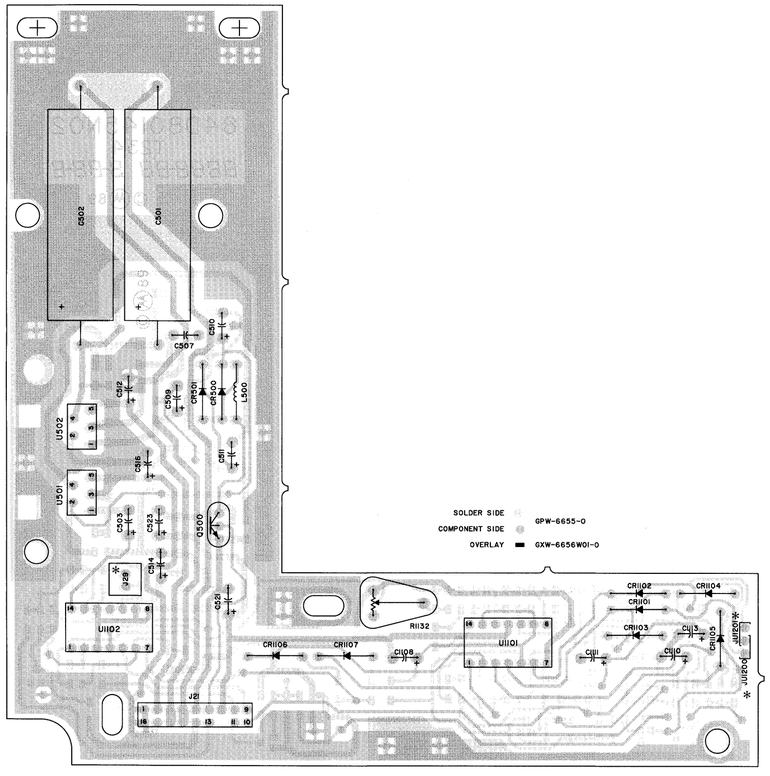
JUMPER TABLE

| | JUI200 | JUI201 |
|---|---|---|
| CONVENTIONAL | OUT | IN |
| SECURENET | IN | OUT |

* ASTERISK PARTS NOT USED ON LATER VERSION BOARDS: C1112 REPLACED WITH 0-OHM CHIP JUMPER P/N 06-11077A01.

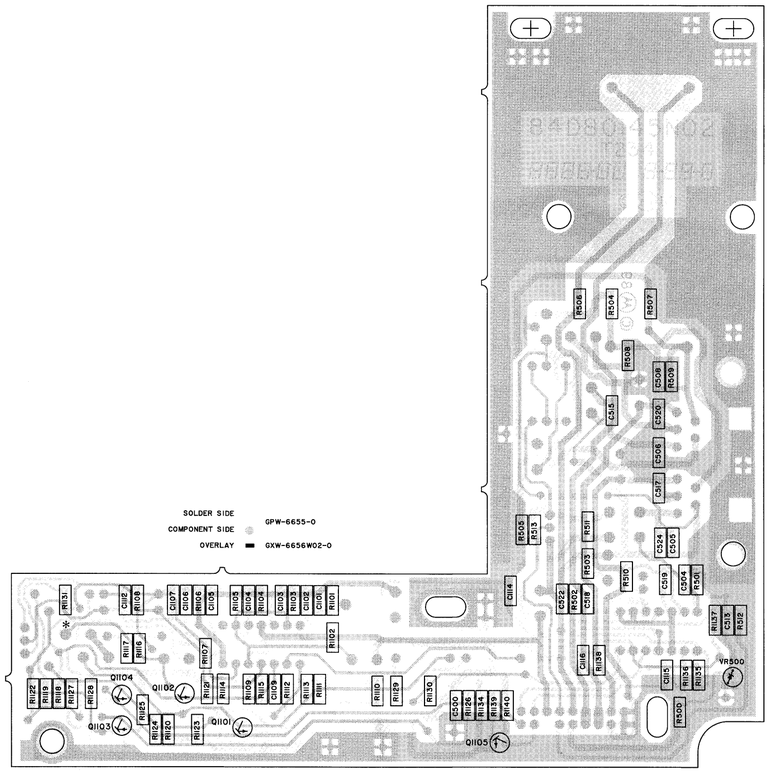
GXW-5180-B

Schematic, Circuit Board Diagram, and
Parts List for HLN5342B/C Audio Squelch Board
**PW-5275-D**
(Sheet 1 of 2)
3/31/90




* NOT USED

**COMPONENT SIDE**




**SOLDER SIDE**

# parts list

HLN5342B/C *MaraTrac* Audio Squelch Board — MXW–6653–A

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, uF, ±10%, 50V** (unless otherwise stated) | | |
| C500 | 21–13741N45 | 0.01 |
| C501,502 | 23–80167C02 | 1000, ±20%, 35V, electrolytic |
| C503 | 08–11051A09 | 0.022, ±5%, 63V |
| C504 | 21–13741N21 | 0.001 |
| C505,506 | 21–13740B57 | 220 pF, ±5% |
| C507 | 08–11051A13 | 0.1, ±5%, 63V |
| C508 | 21–13741N69 | 0.1 |
| C509 | 08–11051A17 | 0.47, ±5%, 63V |
| C510,511 | 23–13749L27 | 15, tantalum |
| C512 | 23–84665F06 | 220, –10+150%, 25V, electrolytic |
| C513 | 21–13741N57 | 0.033 |
| C514 | 23–13749D51 | 1, 35V, tantalum |
| C515 | 21–13740B49 | 100 pF, ±5% |
| C516 | 23–84665F06 | 220, –10+150%, 25V, electrolytic |
| C517 | 21–13741N21 | 0.001 |
| C518,519 | 21–13740B49 | 100 pF, ±5% |
| C520 | 21–13741N21 | 0.001 |
| C521 | 23–11048C11 | 10, ±20%, 44V, electrolytic |
| C522 | 21–13741N45 | 0.01 |
| C523 | 23–11048C11 | 10, ±20%, 44V, electrolytic |
| C524 | 21–13740B39 | 39 pF, ±5% |
| C1101 | 21–13741N21 | 0.001 |
| C1102 | 21–13741N69 | 0.1 |
| C1103 | 21–13740B57 | 220 pF, ±5% |
| C1104 | 21–13740B47 | 82 pF, ±5% |
| C1105 | 21–13741N45 | 0.01 |
| C1106 | 21–13741N29 | 0.0022 |
| C1107 | 21–13740B57 | 220 pF, ±5% |
| C1108 | 23–13749L23 | 10, 25V, tantalum |
| C1109 | 21–13741N45 | 0.01 |
| C1110 | 23–13749D51 | 1, 35V, tantalum |
| C1111 | 23–13749M35 | 2.2, tantalum |
| C1112 | 06–11077A01 | 0–ohm jumper resistor |
| C1113 | 23–13749M31 | 1.5, 35V, tantalum |
| C1114 | 21–13741N53 | 0.022 |
| C1115 | 21–13741N57 | 0.033 |
| C1116 | 21–13741N45 | 0.01 |
| **diode** (see note) | | |
| CR500,501 | 48–11034A01 | silicon |
| CR1101–1107 | 48–11034A01 | silicon |
| **connector, receptacle** | | |
| J21 | 28–80085E31 | male, 12 pin |
| **coil, RF** | | |
| L500 | 24–82723H36 | 0.41 uH |
| **transistor** (see note) | | |
| Q500 | 48–11043C05 | NPN |
| Q1101,1102 | 48–80141L02 | NPN |
| Q1103 | 48–80141L01 | PNP |
| Q1104,1105 | 48–80141L02 | NPN |
| **resistor, fixed, ohm, ±5%, 1/8 watt** (unless otherwise stated) | | |
| R500–503 | 06–11077A98 | 10k |
| R504 | 06–11077A67 | 510 |
| R505,506 | 06–11077A34 | 22 |
| R507 | 06–11077A74 | 1k |
| R508,509 | 06–11077A02 | 1.0 |
| R511 | 06–11077A94 | 6.8k |
| R513 | 06–11077A94 | 6.8k |
| R1101 | 06–11077B15 | 47k |
| R1102 | 06–11077A86 | 3.3k |
| R1103 | 06–11077B11 | 33k |
| R1104 | 06–11077A91 | 5.1k |
| R1105 | 06–11077B23 | 100k |
| R1106 | 06–11077A58 | 220 |
| R1107 | 06–11077A78 | 1.5k |
| R1108 | 06–11077B15 | 47k |
| R1109 | 06–11077B31 | 220k |
| R1110 | 06–11077A86 | 3.3k |
| R1111 | 06–11077A58 | 220 |
| R1112 | 06–11077A98 | 10k |
| R1113 | 06–11077A58 | 220 |
| R1114 | 06–11077A86 | 3.3k |
| R1115 | 06–11077A98 | 10k |
| R1116 | 06–11077A94 | 6.8k |
| R1117,1118 | 06–11077B27 | 150k |
| R1119 | 06–11077B01 | 12k |
| R1120 | 06–11077A98 | 10k |
| R1121 | 06–11077A70 | 680 |
| R1122 | 06–11077B31 | 220k |
| R1123 | 06–11077B45 | 820k |
| R1124 | 06–11077A78 | 1.5k |
| R1125 | 06–11077A84 | 2.7k |
| R1126 | 06–11077B03 | 15k |
| R1127 | 06–11077A94 | 6.8k |
| R1128 | 06–11077A74 | 1k |
| R1129 | 06–11077B11 | 33k |
| R1130 | 06–11077B19 | 68k |
| R1132 | 18–84944C03 | variable, 10k, ±20%, .10W |
| R1134 | 06–11077B15 | 47k |
| R1135 | 06–11077B23 | 100k |
| R1136 | 06–11077A98 | 10k |
| R1137 | 06–11077B03 | 15k |
| R1138 | 06–11077A94 | 6.8k |
| R1139 | 06–11077B09 | 27k |
| R1140 | 06–11077A98 | 10k |
| **integrated circuit** (see note) | | |
| U501,502 | 51–80065C03 | audio PA |
| U1101 | 51–80067C04 | quad op–amp |

MXW–6653–A (2)

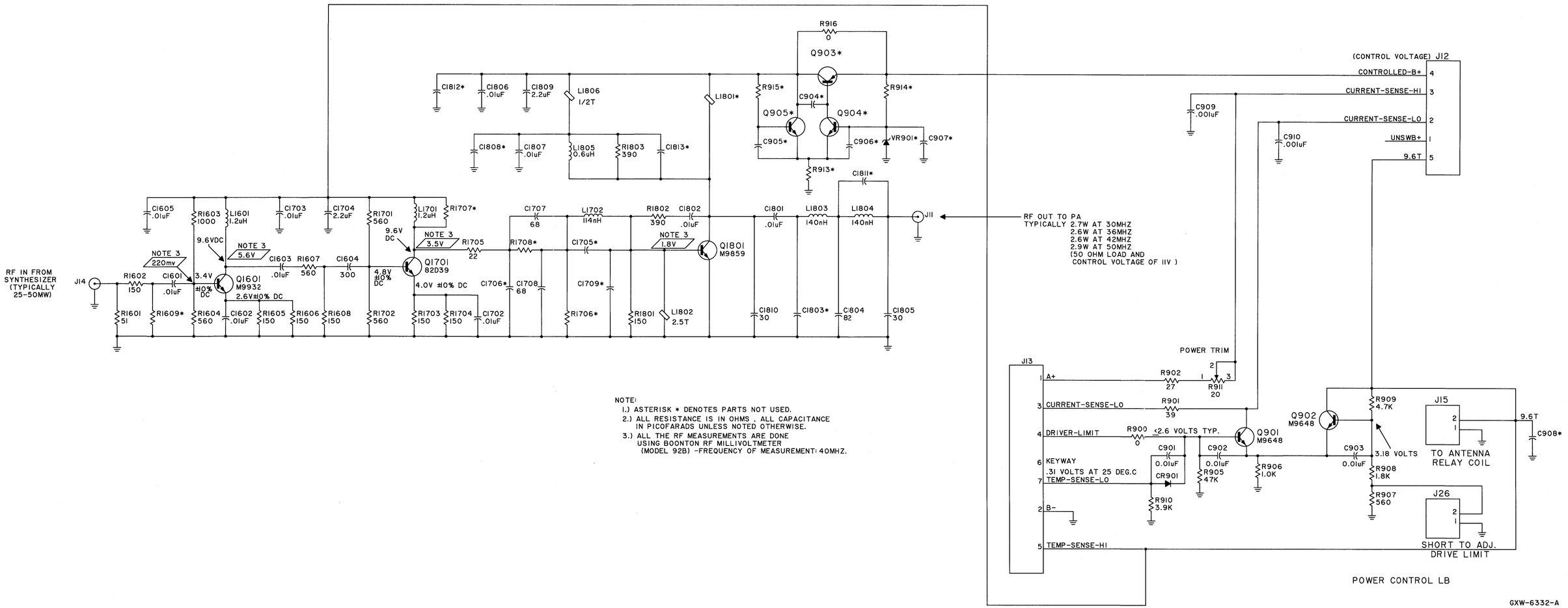
| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| U1102 | 51–84621K32 | quad op–amp |
| **voltage regulator** (see note) | | |
| VR500 | 48–80140L15 | zener, 10V |
| **non–referenced parts** | | |
| | 26–80129P01 | heatsink, audio final (HLN5342C only) |
| | 03–10908A18 | M3 x .5 x .6 (2 used) (HLN5342C only) |

3/31/90

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

Schematic, Circuit Board Diagram, and
Parts List for HLN5342B/C Audio Squelch Board
**PW–5275–D**
(Sheet 2 of 2)
3/31/90

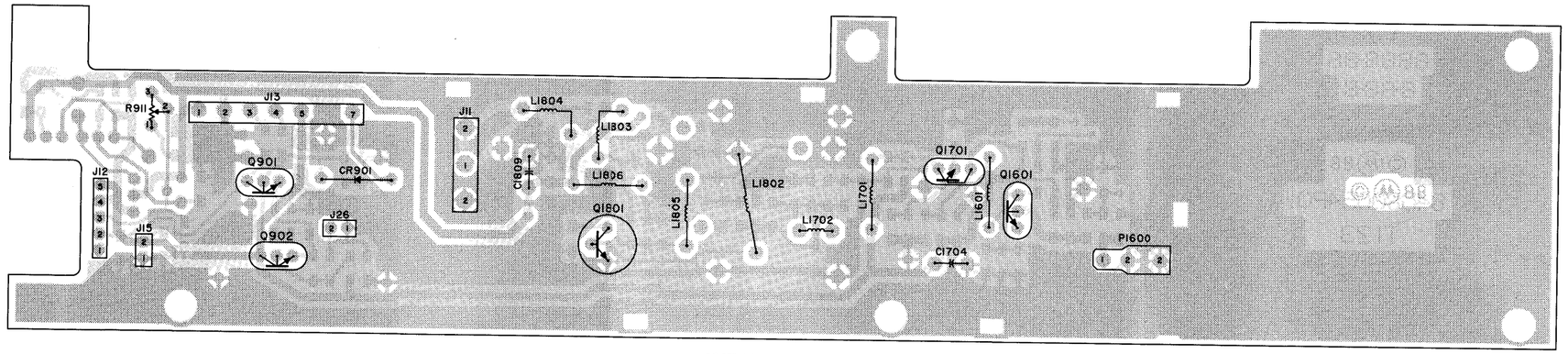
# LOW BAND EXCITER BOARD SCHEMATIC




NOTE:
1.) ASTERISK * DENOTES PARTS NOT USED.
2.) ALL RESISTANCE IS IN OHMS , ALL CAPACITANCE IN PICOFARADS UNLESS NOTED OTHERWISE.
3.) ALL THE RF MEASUREMENTS ARE DONE USING BOONTON RF MILLIVOLTMETER (MODEL 92B) -FREQUENCY OF MEASUREMENT: 40MHZ.

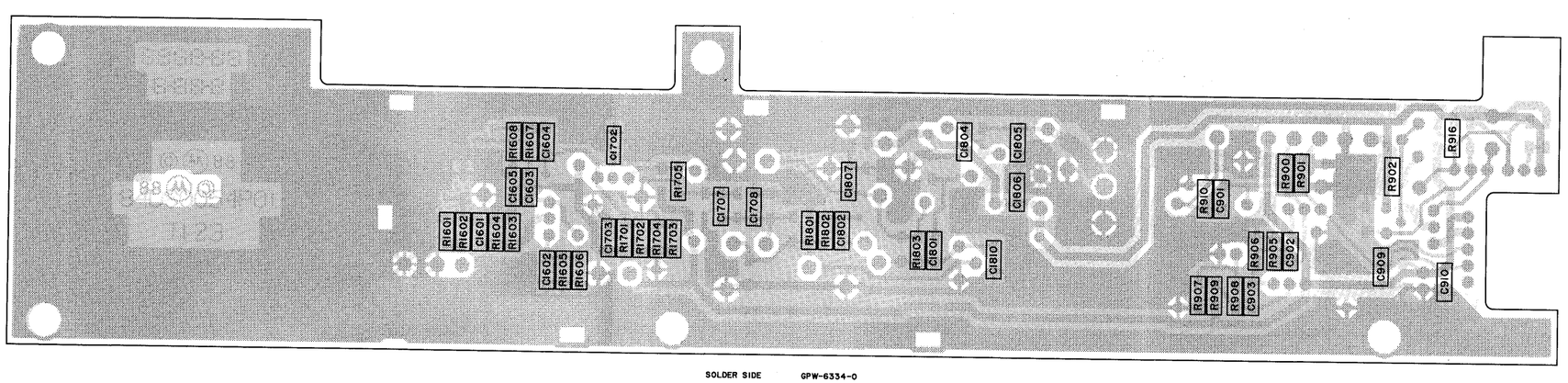
Schematic, Circuit Board Diagrams, and Parts List
for HLB4116A Low Band Exciter/Power Control Board
**PW–6331–A**
(Sheet 1 of 2)
6/30/89

# EXCITER/POWER CONTROL BOARD




SOLDER SIDE GPW-6334-O
COMPONENT SIDE GPW-6335-O
OVERLAY GXW-6336W01-O

**COMPONENT SIDE**




SOLDER SIDE GPW-6334-O
COMPONENT SIDE GPW-6335-O
OVERLAY GXW-6336W02-O

**SOLDER SIDE**

# parts list

HLB4116A *MaraTrac* Low Band Exciter/Power Control Board MXW–6333–A

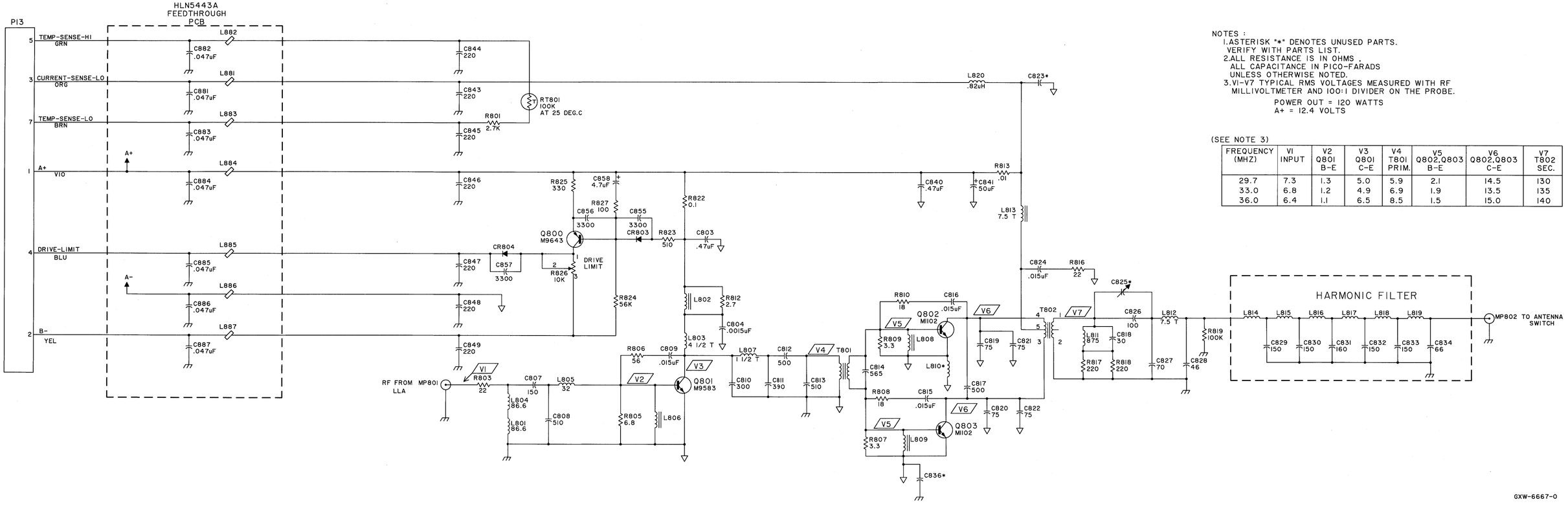
| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, uF, ±10%, 50V** (unless otherwise stated) | | |
| C901–903 | 21–13741N45 | 0.01 |
| C909,910 | 21–13741N21 | 1 pF |
| C1601–1603 | 21–13741N45 | 0.01 |
| C1604 | 21–13740B60 | 300 pF |
| C1605 | 21–13741N45 | 0.01 |
| C1702,1703 | 21–13741N45 | 0.01 |
| C1704 | 23–11054M01 | 2.0, 35V, tantalum |
| C1707,1708 | 21–13740B45 | 68 pF |
| C1801,1802 | 21–13741N45 | 0.01 |
| C1804 | 21–13740B47 | 82 pF |
| C1805 | 21–13740B36 | 30 pF |
| C1806,1807 | 21–13741N45 | 0.01 |
| C1809 | 23–11054M01 | 2.2, 35V, tantalum |
| C1810 | 21–13740B36 | 30 pF |
| **diode** (see note) | | |
| CR901 | 48–11034A01 | silicon |
| **connector receptacle** | | |
| J11 | 09–80001F01 | jack, phono |
| J12 | 28–80164N01 | header, 5 pin |
| J13 | 28–80071H01 | circuit board, 7 contact |
| J15 | 28–84324M01 | 2 contact |
| J26 | 28–84318M06 | circuit board, 2 pin |
| **coil, RF** | | |
| L1601 | 24–83397L12 | 1.2 uH |
| L1701 | 24–83397L12 | 1.2 uH |
| L1702 | 24–11030B15 | 114 nH |
| L1802 | 24–83977B02 | choke, 2–1/2 turns |
| L1803,1804 | 24–84411B04 | 140 nH |
| L1805 | 24–82835G32 | 640 nH |
| L1806 | 24–80036A01 | ferrite bead |
| **connector plug** | | |
| P1600 | 29–80014A01 | clip, coax terminal |
| **transistor** (see note) | | |
| Q901,902 | 48–11043C07 | NPN |
| Q1601 | 48–11043C16 | NPN |
| Q1701 | 48–11043C49 | NPN |
| Q1801 | 48–00869859 | NPN |
| **resistor, fixed, ohm, ±5%, 1/8 watt** (unless otherwise stated) | | |
| R900 | 06–11077A01 | jumper |
| R901 | 06–11077A40 | 39 |
| R902 | 06–11077A36 | 27 |
| R905 | 06–11077B15 | 47k |
| R906 | 06–11077A74 | 1k |
| R907 | 06–11077A68 | 560 |
| R908 | 06–11077A80 | 1.8k |
| R909 | 06–11077A90 | 4.7k |
| R910 | 06–11077A88 | 3.9k |
| R911 | 18–80205N02 | 20, ±10%, 1/2W, potentiometer |
| R916 | 06–11077A01 | jumper |
| R1601 | 06–11077A43 | 51 |
| R1602 | 06–11077A54 | 150 |
| R1603 | 06–11077A74 | 1k |
| R1604 | 06–11077A68 | 560 |
| R1605,1606 | 06–11077A54 | 150 |
| R1607 | 06–11077A68 | 560 |
| R1608 | 06–11077A54 | 150 |
| R1701,1702 | 06–11077A68 | 560 |
| R1703,1704 | 06–11077A54 | 150 |
| R1705 | 06–11077A34 | 22 |
| R1801 | 06–11077A54 | 150 |
| R1802,1803 | 06–11077A64 | 390 |
| **mechanical parts** | | |
| | 09–80265N01 | coax (2 used) |
| | 14–80001C01 | insulator, transistor |
| | 26–80006M01 | shield, second VCO (4 used) |
| | 29–80146B01 | terminal |

6/30/89

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

Schematic, Circuit Board Diagram, and Parts List for
HLB4116A Low Band Exciter/Power Control Board
**PW–6331–A**
(Sheet 2 of 2)
6/30/89

# RANGE 1 LOW BAND POWER AMPLIFIER SCHEMATIC




NOTES :
1. ASTERISK "*" DENOTES UNUSED PARTS. VERIFY WITH PARTS LIST.
2. ALL RESISTANCE IS IN OHMS , ALL CAPACITANCE IN PICO-FARADS UNLESS OTHERWISE NOTED.
3. V1-V7 TYPICAL RMS VOLTAGES MEASURED WITH RF MILLIVOLTMETER AND 100:1 DIVIDER ON THE PROBE.

POWER OUT = 120 WATTS
A+ = 12.4 VOLTS

(SEE NOTE 3)

| FREQUENCY (MHZ) | V1 INPUT | V2 Q801 B-E | V3 Q801 C-E | V4 T801 PRIM. | V5 Q802,Q803 B-E | V6 Q802,Q803 C-E | V7 T802 SEC. |
|---|---|---|---|---|---|---|---|
| 29.7 | 7.3 | 1.3 | 5.0 | 5.9 | 2.1 | 14.5 | 130 |
| 33.0 | 6.8 | 1.2 | 4.9 | 6.9 | 1.9 | 13.5 | 135 |
| 36.0 | 6.4 | 1.1 | 6.5 | 8.5 | 1.5 | 15.0 | 140 |

GXW-6667-0

Schematic, Circuit Board Diagram, and
Parts Lists for Low Band Power Amplifier
Range 1, 29.7–36 MHz
**PW–6666–A**
(Sheet 1 of 2)
3/31/90

# parts list

HLB4117A *MaraTrac* PA Board, 110W Range 1 — MXW–6671–O

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, pF, ±5%** (unless otherwise stated) | | |
| C803 | 08–11051A17 | 0.47 uF, 63V |
| C804 | 08–11051A02 | 0.0015 uF, 63V |
| C807 | 21–84494B07 | 150 |
| C808 | 21–84494B20 | 510, 300V |
| C809 | 08–11051A08 | 0.015 uF, 63V |
| C810 | 21–84494B15 | 300 |
| C811 | 21–84494B18 | 390 |
| C812 | 21–84395B62 | 500, 250V |
| C813 | 21–84494B20 | 510, 300V |
| C814 | 21–84857K06 | 565, ±3% |
| C815,816 | 08–11051A08 | 0.015 uF, 63V |
| C817 | 21–84395B62 | 500, 250V |
| C818 | 21–80067A45 | 30 |
| C819–822 | 21–84494B31 | 75 |
| C824 | 08–11051A08 | 0.015 uF, 63V |
| C826 | 21–84395B02 | 100, 250V |
| C827 | 21–84395B40 | 70, 350V |
| C828 | 21–84395B44 | 46, 250V |
| C829,830 | 21–84395B06 | 150, 250V |
| C831 | 21–84395B26 | 160, ±2% |
| C832,833 | 21–84395B06 | 150, 250V |
| C834 | 21–84395B22 | 66, 250V |
| C840 | 08–11051A17 | 0.47 uF, 63V |
| C841 | 23–84669A05 | 50 uF, –10+150, 25V, electrolytic |
| C843–849 | 21–11015B05 | 220, ±10 pF, 100V |
| C855–857 | 21–11015B19 | 3300, ±10 pF, 100V |
| C858 | 23–11054H04 | 4.7 uF, ±10%, 25V, tantalum |
| **diode** (see note) | | |
| CR803,804 | 48–82466H13 | rectifier, silicon |
| **coil, RF** | | |
| L801 | 24–11030D06 | 86.6 nH |
| L802 | 24–80036A02 | 1/2 turn |
| L803 | 24–84235B04 | 4–1/2 turns, airwound |
| L804 | 24–11030D06 | 86.6 nH |
| L805 | 24–11030D03 | 32 nH |
| L806 | 24–83977B01 | choke |
| L807 | 24–80277A17 | 1–1/2 turns, airwound |
| L808,809 | 24–83977B01 | choke |
| L811 | 24–80071P13 | 897 nH |
| L812 | 24–80135J06 | 7–1/2 turns, airwound |
| L813 | 24–80110B13 | 7–1/2 turns |
| L814 | 24–80110B02 | 7–1/2 turns |
| L815 | 24–80110B03 | 8–1/2 turns |
| L816,817 | 24–80110B04 | 9–1/2 turns |
| L818 | 24–80110B03 | 8–1/2 turns |
| L819 | 24–80110B02 | 7–1/2 turns |
| L820 | 24–11047A12 | .82 uH |
| **transistor** (see note) | | |
| Q800 | 48–11043C06 | PNP |
| **thermistor** | | |
| RT801 | 06–83600K09 | 100k |
| **resistor, fixed, ohm, ±5%, 1/4 watt** (unless otherwise stated) | | |
| R801 | 06–11009A59 | 2.7k |
| R803 | 06–11086C19 | 22, 2W |
| R805 | 06–11086A09 | 6.8, 1W |
| R806 | 06–11086C29 | 56, 2W |
| R807 | 06–11086A06 | 3.3, 1W |
| R808 | 17–82036G27 | 18, 2W |
| R809 | 06–11086A06 | 3.3, 1W |
| R810 | 17–82036G27 | 18, 2W |
| R812 | 06–11045B24 | 2.7, 1/2W |
| R813 | 17–80165C02 | shunt, 0.01, ±10%, 12W |
| R816 | 06–11086C19 | 22, 2W |
| R817,818 | 06–11086C43 | 220, 2W |
| R819 | 06–11045A97 | 100k, 1/2W |
| R822 | 17–82291B24 | 0.1, 3W |
| R823 | 06–11009A42 | 510 |
| R824 | 06–11009A91 | 56k |
| R825 | 06–11009A37 | 330 |
| R826 | 18–80087E08 | potentiometer, 10k, ±20%, 1/2W |
| R827 | 06–11009A25 | 100 |
| **transformer** | | |
| T801 | 24–80099B01 | fixed RF |
| T802 | 25–80229J03 | high power |
| **mechanical parts** | | |
| MP801,802 | 29–80014A01 | clip, coax (2 used) |

6/1/89

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

HLB4077A Power Transisotr Kit — MXW–6382–O

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **transistor** (see note) | | |
| Q801 | 48–00869583 | power, NPN |
| Q802,803 | 48–84411L02 | power, NPN |

3/1/89

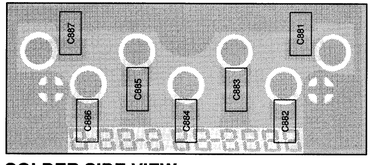
**note:** For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

HLN5443A Feedthru Plate Assembly — MXW–6381–A

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, pF, ±5%, 500V** (unless otherwise stated) | | |
| C881–887 | 21–84547A07 | .047 uF, ±20%, 100V |
| **connector** | | |
| | 28–80155K01 | male header |
| **coil, RF** | | |
| L881–887 | 76–84069B04 | ferrite bead |

3/31/90

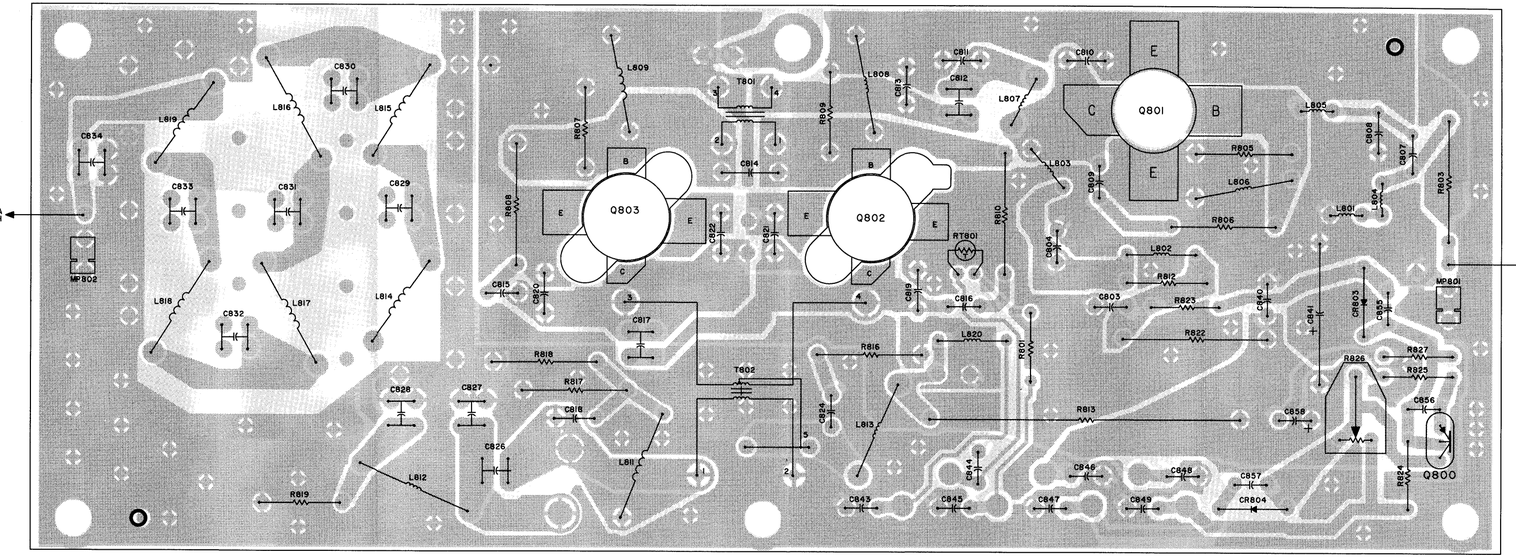
## HLN5443A FEEDTHRU PLATE




## SOLDER SIDE VIEW

SOLDER SIDE
COMPONENT SIDE — GPW–7744–O
OVERLAY — GPW–7745–O

# RANGE 1 LOW BAND POWER AMPLIFIER

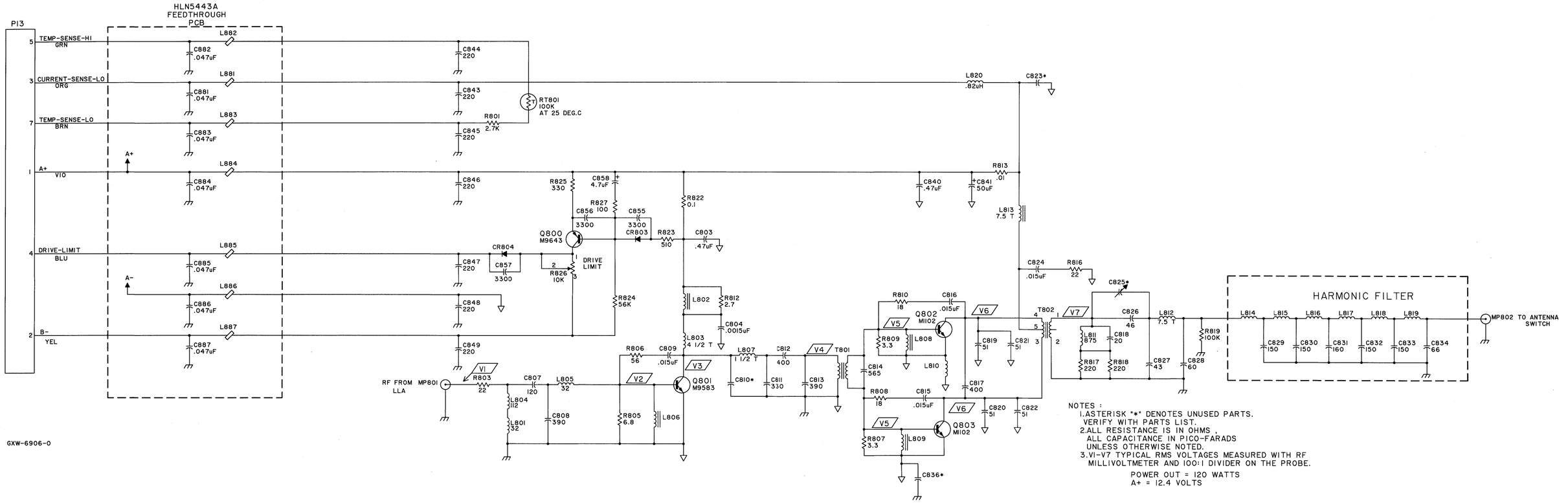



## COMPONENT SIDE VIEW

SOLDER SIDE — GPW–6668–O
COMPONENT SIDE — GPW–6669–O
OVERLAY — GXW–6670–O

Schematic, Circuit Board Diagram, and
Parts Lists for Low Band Power Amplifier
Range 1, 29.7–36 MHz
**PW–6666–A**
(Sheet 2 of 2)
3/31/90

# RANGE 2 LOW BAND POWER AMPLIFIER SCHEMATIC




GXW-6906-0

NOTES :
1. ASTERISK "*" DENOTES UNUSED PARTS. VERIFY WITH PARTS LIST.
2. ALL RESISTANCE IS IN OHMS , ALL CAPACITANCE IN PICO-FARADS UNLESS OTHERWISE NOTED.
3. V1-V7 TYPICAL RMS VOLTAGES MEASURED WITH RF MILLIVOLTMETER AND 100:1 DIVIDER ON THE PROBE.

POWER OUT = 120 WATTS
A+ = 12.4 VOLTS

(SEE NOTE 3)

| FREQUENCY (MHZ) | V1 INPUT | V2 Q801 B-E | V3 Q801 C-E | V4 T801 PRIM. | V5 Q802,Q803 B-E | V6 Q802,Q803 C-E | V7 T802 SEC. |
|---|---|---|---|---|---|---|---|
| 36.0 | 6.5 | 1.5 | 7.8 | 7.4 | 1.2-2.0 | 13.5 | 150 |
| 39.0 | 5.4 | 1.3 | 8.9 | 9.0 | 1.2-2.0 | 12.6 | 155 |
| 42.0 | 5.6 | 1.3 | 9.4 | 9.2 | 1.2-2.0 | 14.3 | 180 |

Schematic, Circuit Board Diagram, and
Parts Lists for Low Band Power Amplifier
Range 2, 36–42 MHz
**PW–6909–A**
(Sheet 1 of 2)
3/31/90

# parts lists

HLB4118A *MaraTrac* PA Board, 110W Range 2 — MXW–6905–O

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, pF, ±5%** (unless otherwise stated) | | |
| C803 | 08–11051A17 | 0.47 uF, 63V |
| C804 | 08–11051A02 | 0.0015 uF, 63V |
| C807 | 21–84494B06 | 120, 500V |
| C808 | 21–84494B18 | 390, 500V |
| C809 | 08–11051A08 | 0.015 uF, 63V |
| C811 | 21–84494B16 | 330, 500V |
| C812 | 21–84395B14 | 400, 250V |
| C813 | 21–84494B18 | 390, 500V |
| C814 | 21–84857K06 | 565, 500V, ±3% |
| C815,816 | 08–11051A08 | 0.015 uF, 63V |
| C817 | 21–84395B14 | 400, 250V |
| C818 | 21–80067A40 | 20 |
| C819–822 | 21–84494B01 | 51 |
| C824 | 08–11051A08 | 0.015 uF, 63V |
| C826 | 21–84395B44 | 46, 250V |
| C827 | 21–84395B19 | 43, 250V |
| C828 | 21–84395B07 | 60, 250V |
| C829,830 | 21–84395B06 | 150, 250V |
| C831 | 21–84395B26 | 150, 250V, ±2% |
| C832,833 | 21–84395B06 | 150, 250V |
| C834 | 21–84395B22 | 66, 250V |
| C840 | 08–11051A17 | 0.47 uF, 63V |
| C841 | 23–84669A05 | 50 uF, –10±150, 25V, electrolytic |
| C843–849 | 21–11015B05 | 220, ±10 pF, 100V |
| C855–857 | 21–11015B19 | 3300, ±10 pF, 100V |
| C858 | 23–11054H04 | 4.7 uF, ±10%, 25V, tantalum |
| **diode** (see note) | | |
| CR803,804 | 48–82466H13 | rectifier, silicon |
| **coil, RF** | | |
| L801 | 24–11030D03 | 32 nH |
| L802 | 24–80036A02 | 1/2 turn |
| L803 | 24–84235B04 | 4–1/2 turns, airwound |
| L804 | 24–11030B14 | 9–1/2 turns, airwound |
| L805 | 24–11030D03 | 32 nH |
| L806 | 24–83977B01 | choke |
| L807 | 24–80277A17 | 1–1/2 turns, airwound |
| L808,809 | 24–83977B01 | choke |
| L810 | 24–11030E01 | fixed RF |
| L811 | 24–80071P13 | 897 nH |
| L812 | 24–80135J06 | 7–1/2 turns, airwound |
| L813 | 24–80110B13 | 7–1/2 turns |
| L814 | 24–80110B02 | 7–1/2 turns |
| L815 | 24–80110B03 | 8–1/2 turns |
| L816,817 | 24–80110B04 | 9–1/2 turns |
| L818 | 24–80110B03 | 8–1/2 turns |
| L819 | 24–80110B02 | 7–1/2 turns |
| L820 | 24–11047A12 | .82 uH |
| **transistor** (see note) | | |
| Q800 | 48–11043C06 | PNP |
| **thermistor** | | |
| RT801 | 06–83600K09 | 100k |
| **resistor, fixed, ohm, ±5%, 1/4 watt** (unless otherwise stated) | | |
| R801 | 06–11009A59 | 2.7k |
| R803 | 06–11086C19 | 22, 2W |
| R805 | 06–11086A09 | 6.8, 1W |
| R806 | 06–11086C29 | 56, 2W |
| R807 | 06–11086A06 | 3.3, 1W |
| R808 | 17–82036G27 | 18, 2W |
| R809 | 06–11086A06 | 3.3, 1W |
| R810 | 17–82036G27 | 18, 2W |
| R812 | 06–11045B24 | 2.7, 1/2W |
| R813 | 17–80165C02 | shunt, 0.01, ±10%, 12W |
| R816 | 06–11086C19 | 22, 2W |
| R817,818 | 06–11086C43 | 220, 2W |
| R819 | 06–11045A97 | 100k, 1/2W |
| R822 | 17–82291B24 | 0.1, 3W |
| R823 | 06–11009A42 | 510 |
| R824 | 06–11009A91 | 56k |
| R825 | 06–11009A37 | 330 |
| R826 | 18–80087E08 | potentiometer, 10k, ±20%, 1/2W |
| R827 | 06–11009A25 | 100 |
| **transformer** | | |
| T801 | 24–80099B01 | fixed RF |
| T802 | 25–80229J03 | high power |
| **mechanical parts** | | |
| MP801,802 | 29–80014A01 | clip, coax (2 used) |

10/15/89

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

HLB4077A Power Transisotr Kit — MXW–6382–O

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **transistor** (see note) | | |
| Q801 | 48–00869583 | power, NPN |
| Q802,803 | 48–84411L02 | power, NPN |

3/1/89

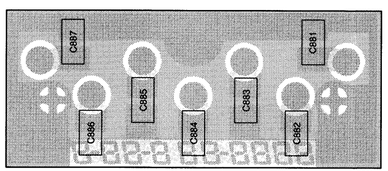
**note:** For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

HLN5443A Feedthru Plate Assembly — MXW–6381–A

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, pF, ±5%, 500V** (unless otherwise stated) | | |
| C881–887 | 21–84547A07 | .047 uF, ±20%, 100V |
| **connector** | | |
| | 28–80155K01 | male header |
| **coil, RF** | | |
| L881–887 | 76–84069B04 | ferrite bead |

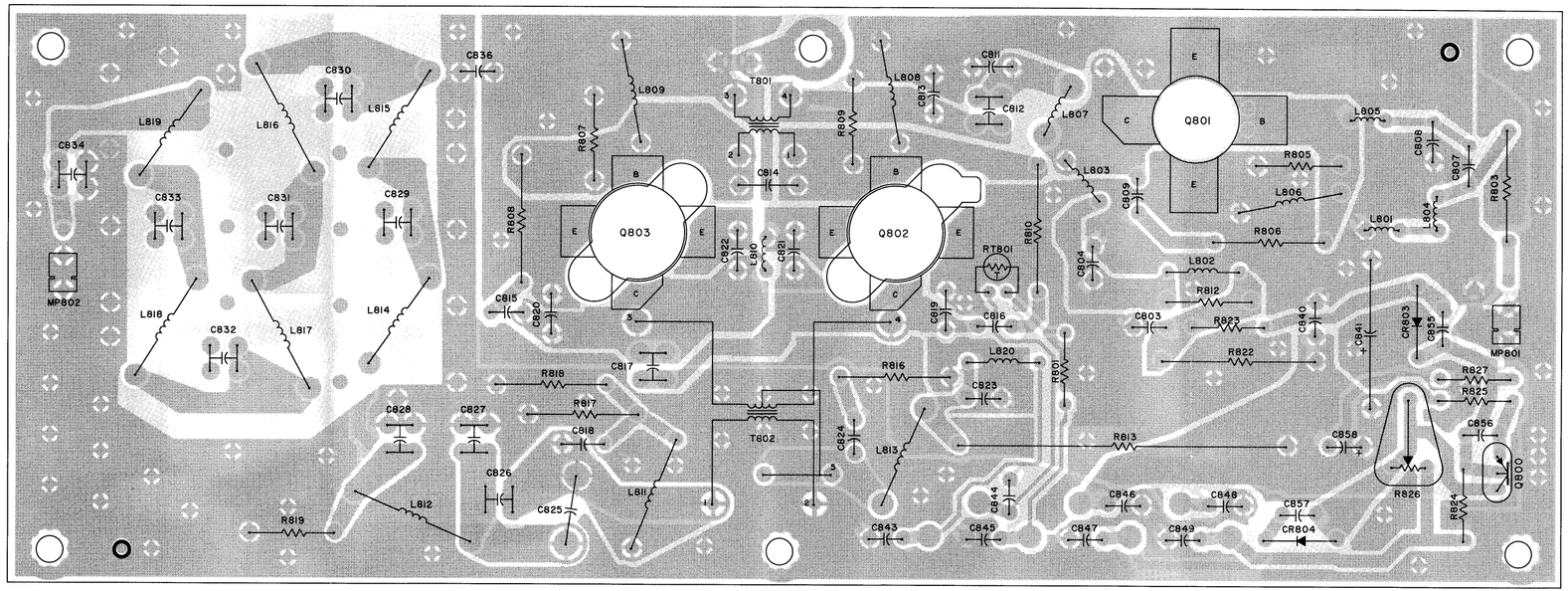
3/31/90

## HLN5443A FEEDTHRU PLATE



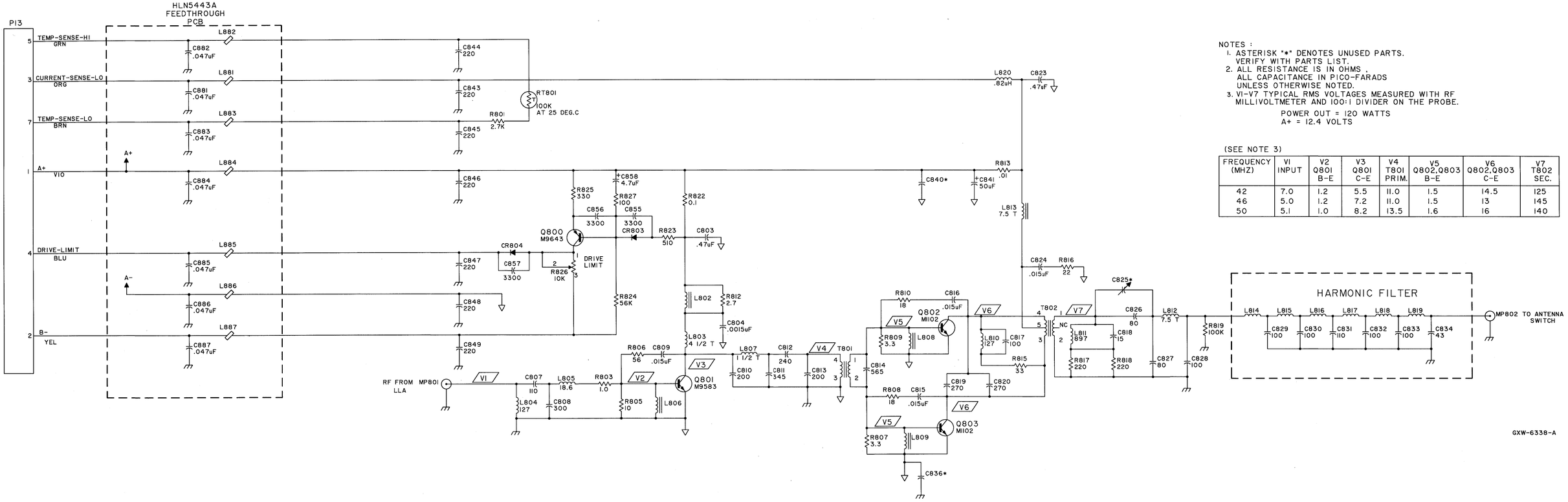

## SOLDER SIDE VIEW


# RANGE 2 LOW BAND POWER AMPLIFIER CIRCUIT BOARD




Schematic, Circuit Board Diagram, and
Parts Lists for Low Band Power Amplifier
Range 2, 36–42 MHz
**PW–6909–A**
(Sheet 2 of 2)
3/31/90

# RANGE 3 LOW BAND POWER AMPLIFIER SCHEMATIC




NOTES :
1. ASTERISK "*" DENOTES UNUSED PARTS. VERIFY WITH PARTS LIST.
2. ALL RESISTANCE IS IN OHMS , ALL CAPACITANCE IN PICO-FARADS UNLESS OTHERWISE NOTED.
3. V1-V7 TYPICAL RMS VOLTAGES MEASURED WITH RF MILLIVOLTMETER AND 100:1 DIVIDER ON THE PROBE.

POWER OUT = 120 WATTS
A+ = 12.4 VOLTS

(SEE NOTE 3)

| FREQUENCY (MHZ) | V1 INPUT | V2 Q801 B-E | V3 Q801 C-E | V4 T801 PRIM. | V5 Q802,Q803 B-E | V6 Q802,Q803 C-E | V7 T802 SEC. |
|---|---|---|---|---|---|---|---|
| 42 | 7.0 | 1.2 | 5.5 | 11.0 | 1.5 | 14.5 | 125 |
| 46 | 5.0 | 1.2 | 7.2 | 11.0 | 1.5 | 13 | 145 |
| 50 | 5.1 | 1.0 | 8.2 | 13.5 | 1.6 | 16 | 140 |

Schematic, Circuit Board Diagram, and
Parts Lists for Low Band Power Amplifier
Range 3, 42–50 MHz
**PW–6337–A**
(Sheet 1 of 2)
3/31/90

# parts lists

HLB4115A *MaraTrac* 110W PA Range 3 — MXW–6339–A

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, pF, ±5%, 500V** (unless otherwise stated) | | |
| C803 | 08–11051A17 | 0.47 uF, 63V |
| C804 | 08–11051A02 | 0.0015 uF, 63V |
| C807 | 21–84494B53 | 110 |
| C808 | 21–84494B15 | 300 |
| C809 | 08–11051A08 | 0.015 uF, 63V |
| C810 | 21–84494B11 | 200 |
| C811 | 21–00868823 | 345, ±3% |
| C812 | 21–84395B35 | 240, ±10%, 350V |
| C813 | 21–84494B11 | 200 |
| C814 | 21–84857K06 | 565, ±3% |
| C815,816 | 08–11051A08 | 0.015 uF, 63V |
| C817 | 21–84494B04 | 100 |
| C818 | 21–80067A35 | 15 |
| C819,820 | 21–84494B14 | 270 |
| C823 | 08–11051A17 | 0.47 uF, 63V |
| C824 | 08–11051A08 | 0.015 uF, 63V |
| C826,827 | 21–84395B03 | 80, 250V |
| C828–830 | 21–84395B02 | 100, 250V |
| C831 | 21–84395B20 | 110, 250V |
| C832,833 | 21–84395B02 | 100, 250V |
| C834 | 21–84395B19 | 43, 250V |
| C841 | 23–84669A05 | 50 uF, –10 +150%, 25V, electrolytic |
| C843–849 | 21–11015B05 | 220, ±10 pF, 100V |
| C855–857 | 21–11015B19 | 3300, ±10 pF, 100V |
| C858 | 23–11054H04 | 4.7 uF, 10%, 25V, tantalum |
| **diode** (see note) | | |
| CR803,804 | 48–82466H13 | rectifier, silicon |
| **coil, RF** | | |
| L802 | 24–80036A02 | 1/2 turn |
| L803 | 24–84235B04 | 4–1/2 turns, airwound |
| L804 | 24–11030B15 | 10–1/2 turns, white |
| L805 | 24–11030B05 | 2–1/2 turns, green |
| L806 | 24–83977B01 | choke |
| L807 | 24–80277A17 | 1–1/2 turns, airwound |
| L808,809 | 24–83977B01 | choke |
| L810 | 24–11030B15 | 10–1/2 turns, white |
| L811 | 24–80071P13 | 897 nH |
| L812 | 24–80135J06 | 7–1/2 turns, airwound |
| L813 | 24–80110B13 | 7–1/2 turns |
| L814 | 24–80110B06 | 7–1/2 turns |
| L815 | 24–80110B07 | 8–1/2 turns |
| L816,817 | 24–80110B08 | 9–1/2 turns |
| L818 | 24–80110B07 | 8–1/2 turns |
| L819 | 24–80110B06 | 7–1/2 turns |
| L820 | 24–11047A12 | 0.82 uH |
| **transistor** (see note) | | |
| Q800 | 48–11043C06 | PNP |
| **thermistor** | | |
| RT801 | 06–83600K09 | 100k |
| **resistor, fixed, ohm, ±5%, 1/4 watt** (unless otherwise stated) | | |
| R801 | 06–11009A59 | 2.7k |
| R803 | 06–11086A03 | 1, 1W |
| R805 | 06–11045A01 | 10, 1/2 |
| R806 | 06–11086C29 | 56, 2W |
| R807 | 06–11086A06 | 3.3, 1W |
| R808 | 17–82036G27 | 18, 2W |
| R809 | 06–11086A06 | 3.3, 1W |
| R810 | 17–82036G27 | 18, 2W |
| R812 | 06–11045B24 | 2.7, 1/2W |
| R813 | 17–80165C02 | shunt, 0.01, ±10%, 12W |
| R815 | 06–11086C23 | 33, 2W |
| R816 | 06–11086C19 | 22, 2W |
| R817,818 | 06–11086C43 | 220, 2W |
| R819 | 06–11045A97 | 100k, 1/2W |
| R822 | 17–82291B24 | 0.1, 3W |
| R823 | 06–11009A42 | 510 |
| R824 | 06–11009A91 | 56k |
| R825 | 06–11009A37 | 330 |
| R826 | 18–80087E08 | potentiometer, 10k, ±20%, 1/2W |
| R827 | 06–11009A25 | 100 |
| **transformer** | | |
| T801 | 24–80099B01 | fixed RF |
| T802 | 25–80229J02 | high power |
| **non referenced parts** | | |
| | 26–80206A02 | shield, harmonic filter |
| | 15–80205A02 | cover, harmonic filter shield |
| | 29–80014A01 | clip, coax |

6/30/89

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

HLB4077A Power Transisotr Kit — MXW–6382–O

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **transistor** (see note) | | |
| Q801 | 48–00869583 | power, NPN |
| Q802,803 | 48–84411L02 | power, NPN |

3/1/89

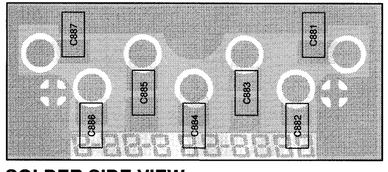
**note:** For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

HLN5443A Feedthru Plate Assembly — MXW–6381–A

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, pF, ±5%, 500V** (unless otherwise stated) | | |
| C881–887 | 21–84547A07 | .047 uF, ±20%, 100V |
| **connector** | | |
| | 28–80155K01 | male header |
| **coil, RF** | | |
| L881–887 | 76–84069B04 | ferrite bead |

3/31/90

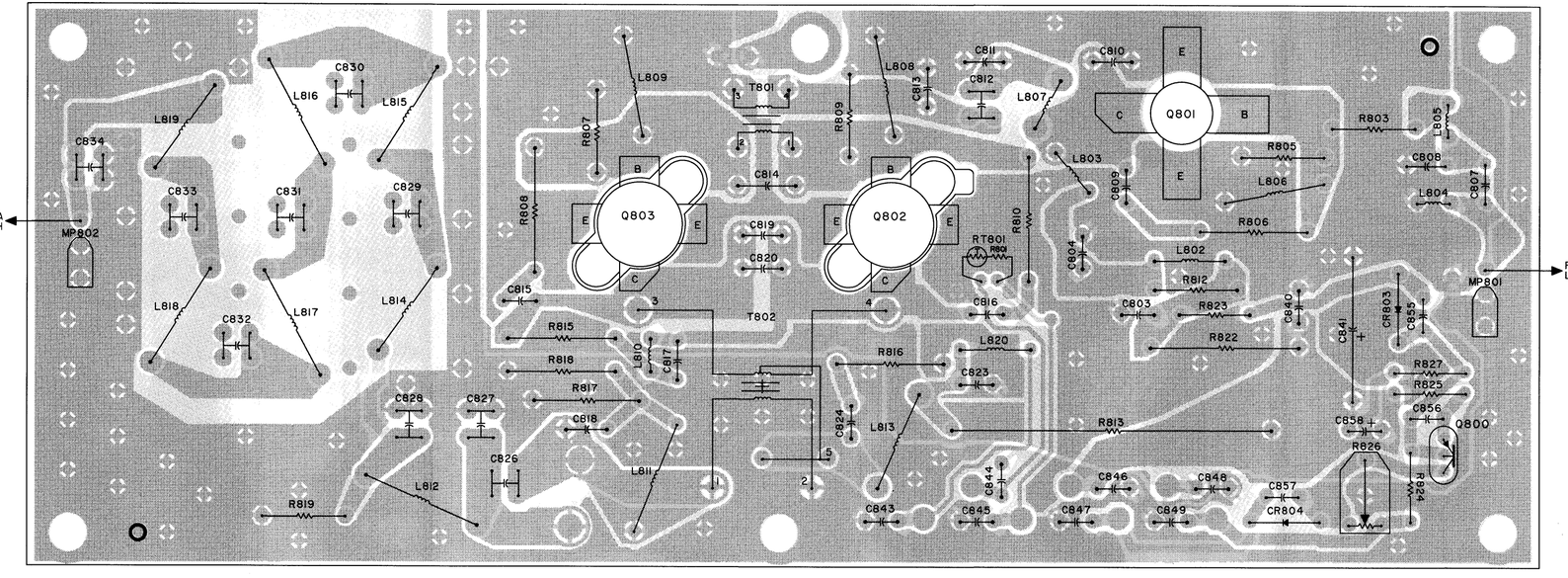
## HLN5443A FEEDTHRU PLATE




## SOLDER SIDE VIEW

SOLDER SIDE
COMPONENT SIDE — GPW–7744–O
OVERLAY — GPW–7745–O

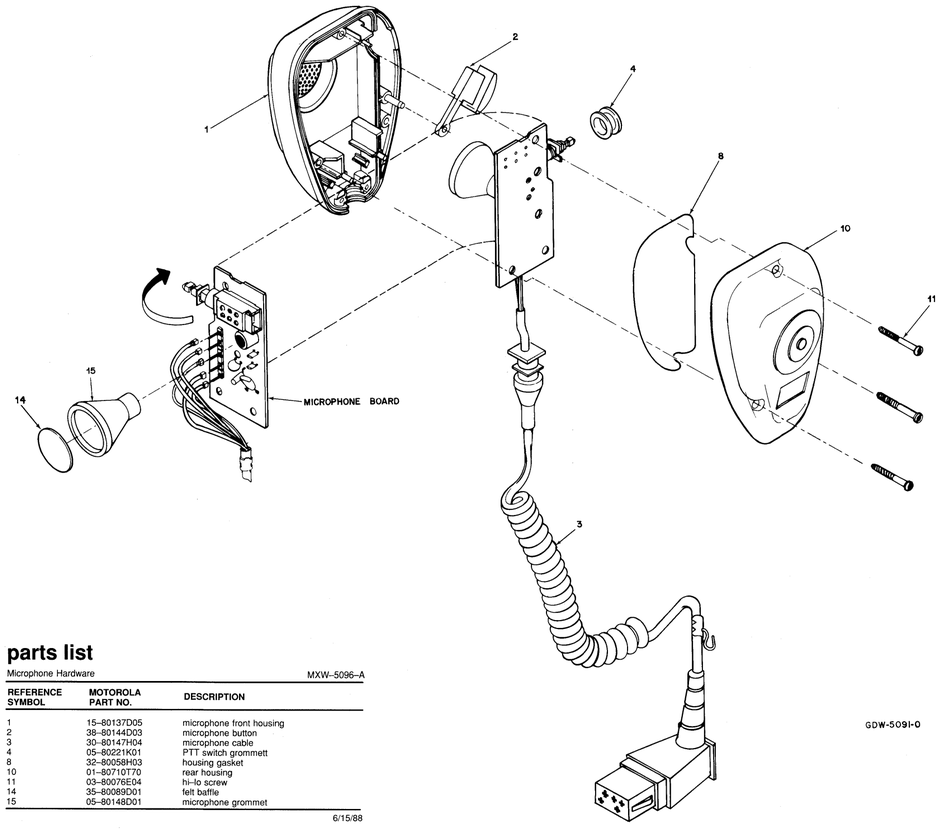
# RANGE 3 LOW BAND POWER AMPLIFIER




SOLDER SIDE — GPW–6340–O
COMPONENT SIDE — GPW–6341–O
OVERLAY — GXW–6342–A

## COMPONENT SIDE VIEW

Schematic, Circuit Board Diagram, and Parts Lists for Low Band Power Amplifier Range 3, 42–50 MHz
**PW–6337–A**
(Sheet 2 of 2)
3/30/90




## BASIC CONTROL HEAD MICROPHONE

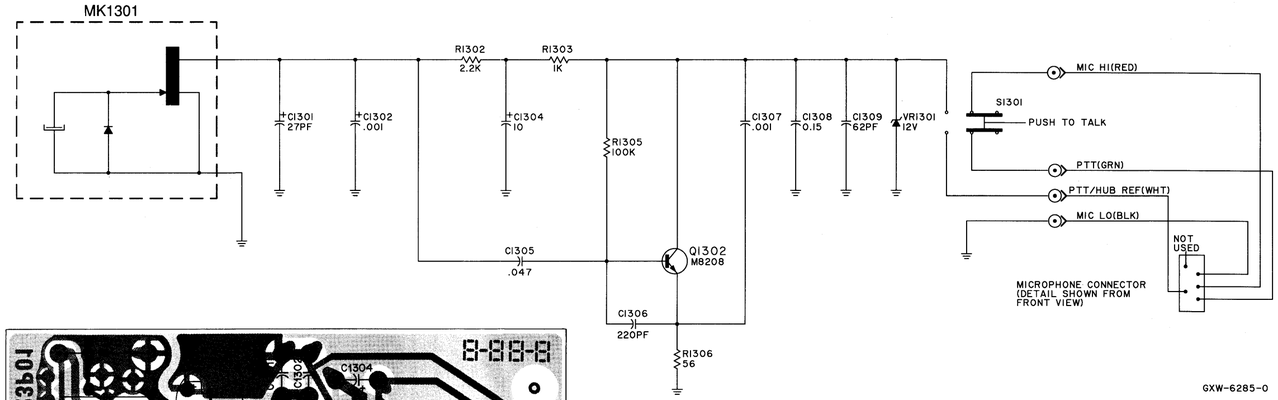
## parts list

Microphone Hardware — MXW–5096–A

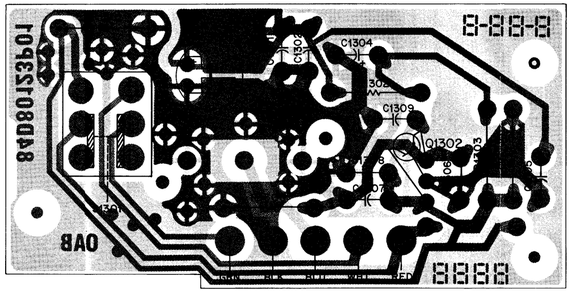
| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| 1 | 15–80137D05 | microphone front housing |
| 2 | 38–80144D03 | microphone button |
| 3 | 30–80147H04 | microphone cable |
| 4 | 05–80221K01 | PTT switch grommett |
| 8 | 32–80058H03 | housing gasket |
| 10 | 01–80710T70 | rear housing |
| 11 | 03–80076E04 | hi–lo screw |
| 14 | 35–80089D01 | felt baffle |
| 15 | 05–80148D01 | microphone grommet |

6/15/88

Schematics, Circuit Board Diagram, Exploded Views, and Parts Lists for *MaraTrac* Accessories
**PW–5220–D**
(Sheet 1 of 2)
5/15/89




## BASIC CONTROL HEAD MICROPHONE SCHEMATIC




SOLDER SIDE ● GBW–6287–O
COMPONENT SIDE ○ GBW–6288–O
OVERLAY — GBW–6289–O

## parts list

HLN5459A Microphone Circuit Board — MXW–6286–O

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed uF, ±5%, 50V** (unless otherwise stated) | | |
| C1301 | 21–11038H35 | 24 pF |
| C1302 | 21–11039B13 | .001 ±10% |
| C1304 | 23–11019A20 | 10 ±20% 25V, electrolytic |
| C1305 | 08–11051A11 | .047 |
| C1306 | 21–11038P50 | 220 pF |
| C1307 | 21–11039B13 | .001 ±10% |
| C1308 | 08–11051A14 | .15 63V |
| C1309 | 21–11014H44 | 62pF, 100V |
| **diode** (see note) | | |
| CR1301 | 48–11034A36 | 12V zener ±5% 400mW |
| **microphone** | | |
| MK1301 | 50–80258E04 | electret cartridge |
| **transistor** (see note) | | |
| Q1302 | 48–11043C05 | NPN |
| **resistor, fixed ohm, ±5%, 1/4 watt** (unless otherwise stated) | | |
| R1302 | 06–11009A57 | 2.2k |
| R1303 | 06–11009A49 | 1k |
| R1305 | 06–11009A97 | 100k |
| R1306 | 06–11009A19 | 56 |
| **switch** | | |
| S1301 | 40–80065E02 | momentary switch |
| **mechanical part** | | |
| | 14–80652E01 | switch insulator |

2/15/89

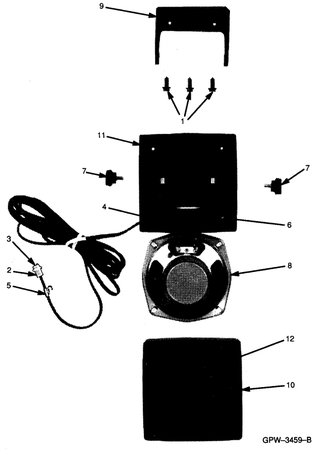
**note:** For best performance, order diodes, transistors, and integrated circuits by Motorola part number.

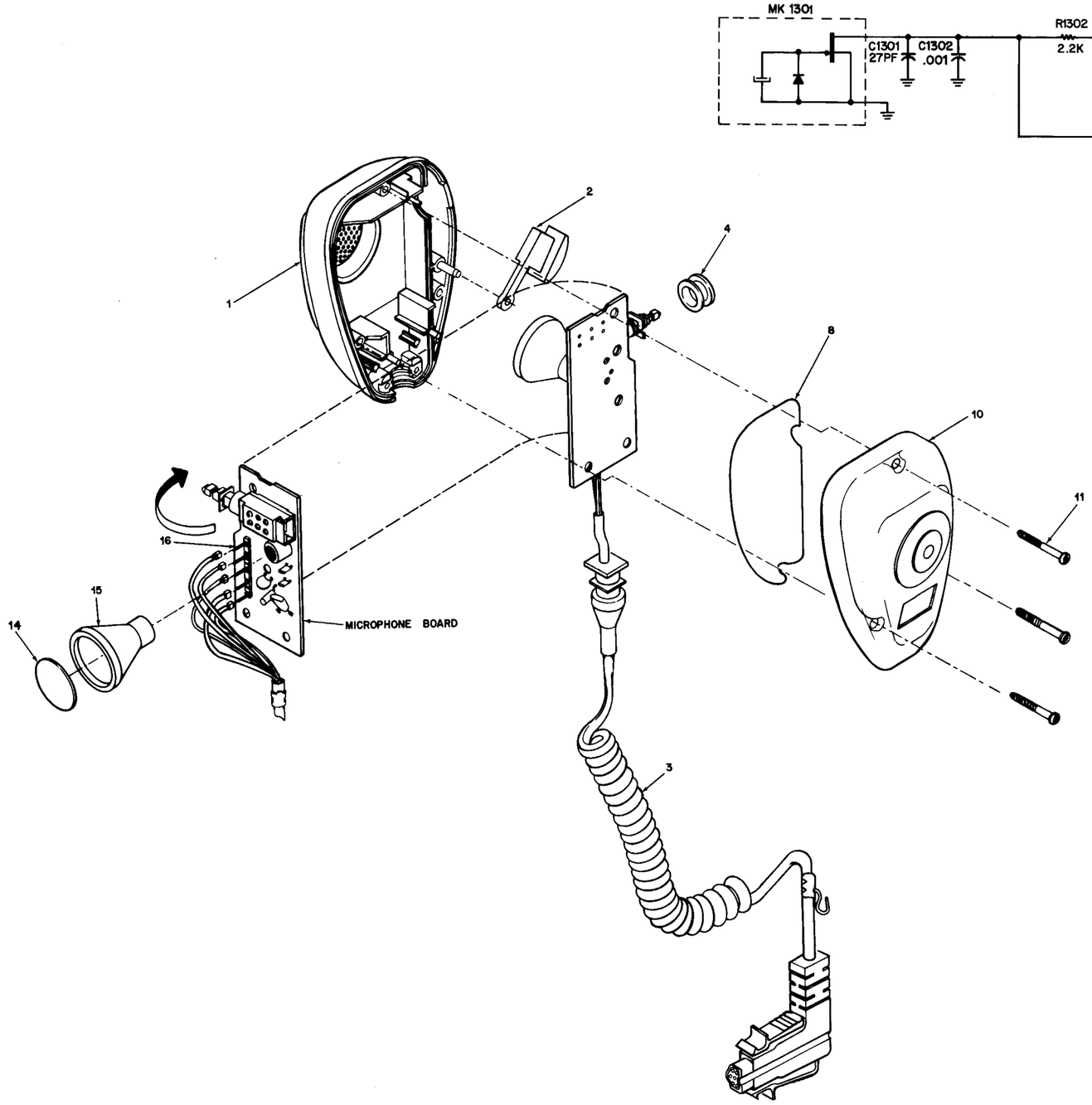
## parts list

HSN4020A External Speaker
HSN4021A External Speaker — MXW–5223–B

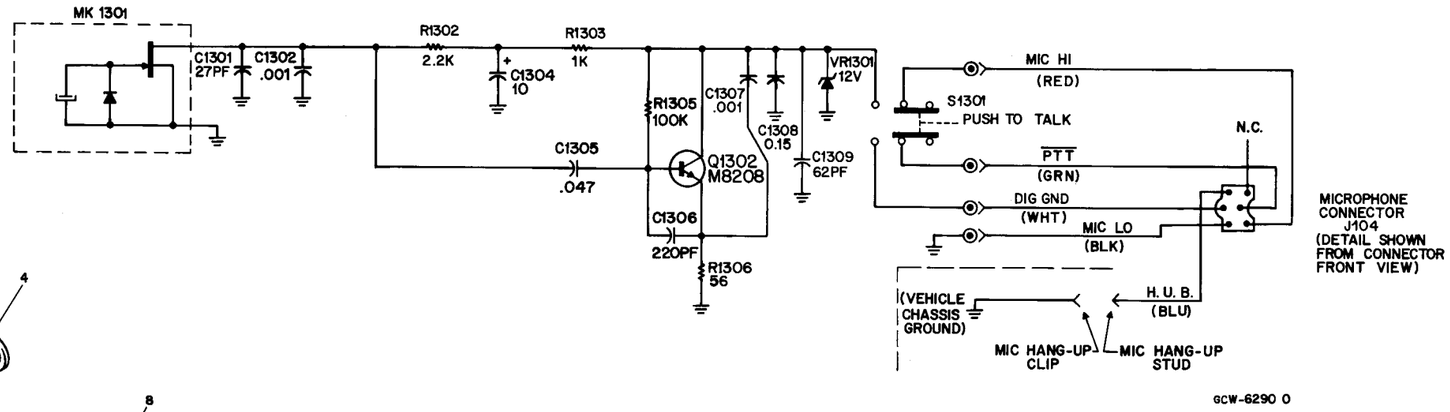
| ITEM NO. | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| 1 | 03–00136756 | tapping screw, 10–16 x 5/8 (3 used) |
| 2 | 15–10183A18 | connector housing, 2– contact |
| 3 | 39–10184A45 | contact |
| 4 | 42–82018H05 | cable retainer |
| 5 | 42–84081A03 | wire clamp |
| 6 | 03–00140001 | tapping screw 6–19 x 7/8 (4–used) |
| 7 | 03–84244C01 | wing screw (2 used) |
| 8 | 50–84561B08 | speaker, 5", 30W |
| 9 | 07–80200E02 | trunnion bracket |
| 10 | 13–82671M08 | bezel |
| 11 | 15–84981B09 | cover |
| 12 | 32–80195A01 | gasket |

5/15/89






GDW-2049-A




GCW-6290 O

## ADVANCED CONTROL HEAD MICROPHONE SCHEMATIC

## parts list

HLN5389A Microphone Hardware — MXW–5475–A

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| 1 | 15–80137D05 | front housing |
| 2 | 38–80144D03 | mic button |
| 3 | 30–80223J01 | 6 conductor cable |
| 4 | 05–80221K01 | PTT switch grommet |
| 8 | 32–80058H03 | housing gasket |
| 10 | 15–80137D03 | rear housing (p/o housing assembly) |
| 11 | 03–80076E04 | hi–lo metric screw, 3 used |
| 14 | 35–80089D01 | felt baffle |
| 15 | 05–80148D01 | mic cartridge grommet |
| 16 | 39–10184A10 | contact plug, 5 used |
| | **non referenced items** | |
| | 03–10943M09 | tapping screw (3 x 0.5 x 6) |
| | 54–84962K01 | safety tag |
| | 33–80016P01 | nameplate |
| | 04–80093E01 | flat washer (p/o housing assembly) |
| | 46–80297N01 | hang–up stud (p/o housing assembly) |
| | 46–80281G01 | mic weight (p/l housing assembly |

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# parts list

Handheld Control Head Exploded View — MXW–5227–B

| ITEM NO. | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| 1 | 61–80052H07 | lens |
| 2 | 32–80059H01 | gasket, lens |
| 3 | 13–80020H09 | escutcheon (for talkaround) |
| 3 | 13–80020H10 | escutcheon (for non–talkaround) |
| 4 | 15–80047H02 | housing, front |
| 5 | 32–80061H01 | seal, microphone |
| 6 | 48–80187G05 | diode, common anode |
| 7 | 32–80063H01 | seal, switch |
| 8 | 09–80197N01 | receptacle, LED |
| 9 | 50–80258E04 | electret, microphone cartridge |
| 10 | 14–80065H01 | insulator, microphone |
| 11 | 51–80135C08 | IC display, driver MM5480 |
| 12 | 32–80058H02 | gasket, housing |
| 13 | 01–80749T73 | circuit board, upper |
| 14 | 09–80196N01 | receptacle, vertical |
| 15 | 28–80085E32 | connector, male header |
| 16 | 07–80050H01 | bracket, switch |
| 17 | 28–80195N01 | plug, right angle |
| 18 | 40–80123H06 | switch, toggle |
| 19 | 40–80123H01 | switch, toggle |
| 20 | 30–80227N01 | cable, coiled |
| 21 | 42–80253N01 | clip, coiled cord |
| 22 | 03–00140287 | screw |
| 23 | 15–80048H02 | housing, back |
| 24 | 03–80076E02 | screw, metric, hi–lo |
| 25 | 33–80025H21 | nameplate, HHCH |
| 26 | 05–00855939 | rivet |
| 27 | 04–80072H01 | washer |
| 28 | 03–80076E06 | screw, metric, hi–lo |
| 30 | 32–80060H01 | seal, PTT |
| 31 | 04–00139386 | washer, flat |
| 32 | 14–80258N01 | insulator, microphone |
| 33 | 40–80065E01 | switch, momentary PTT |
| 34 | 01–80749T68 | circuit board, lower |
| 35 | 07–80002J01 | bracket, potentiometer |
| 36 | 38–80131P01 | button, PTT |
| 37 | 36–80053H01 | knob |
| 38 | 42–84591A03 | o–ring |
| 39 | 02–80188H01 | nut, hex, machine |
| 40 | 04–00124629 | washer, flat |
| 41 | 18–80095D07 | resistor, variable, squelch |
| 42 | 40–80067H01 | switch, momentary |
| 43 | 43–80064H01 | spacer, LED |
| 44 | 48–05504C01 | LED |
| 45 | 32–80062H01 | seal, button |
| 46 | 38–80054H02 | squelch button |
| 47 | 32–80291N01 | gasket retainer |

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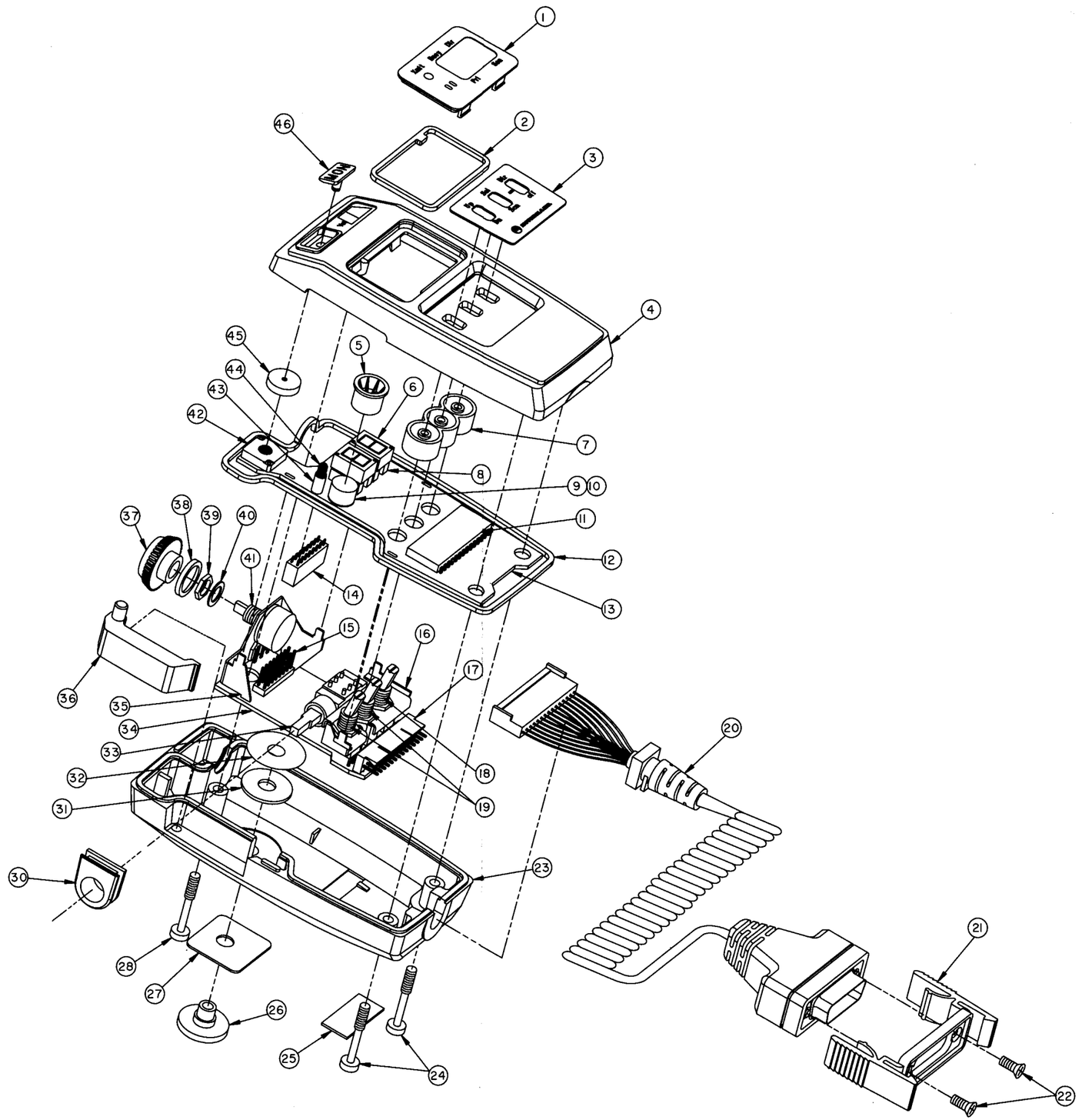
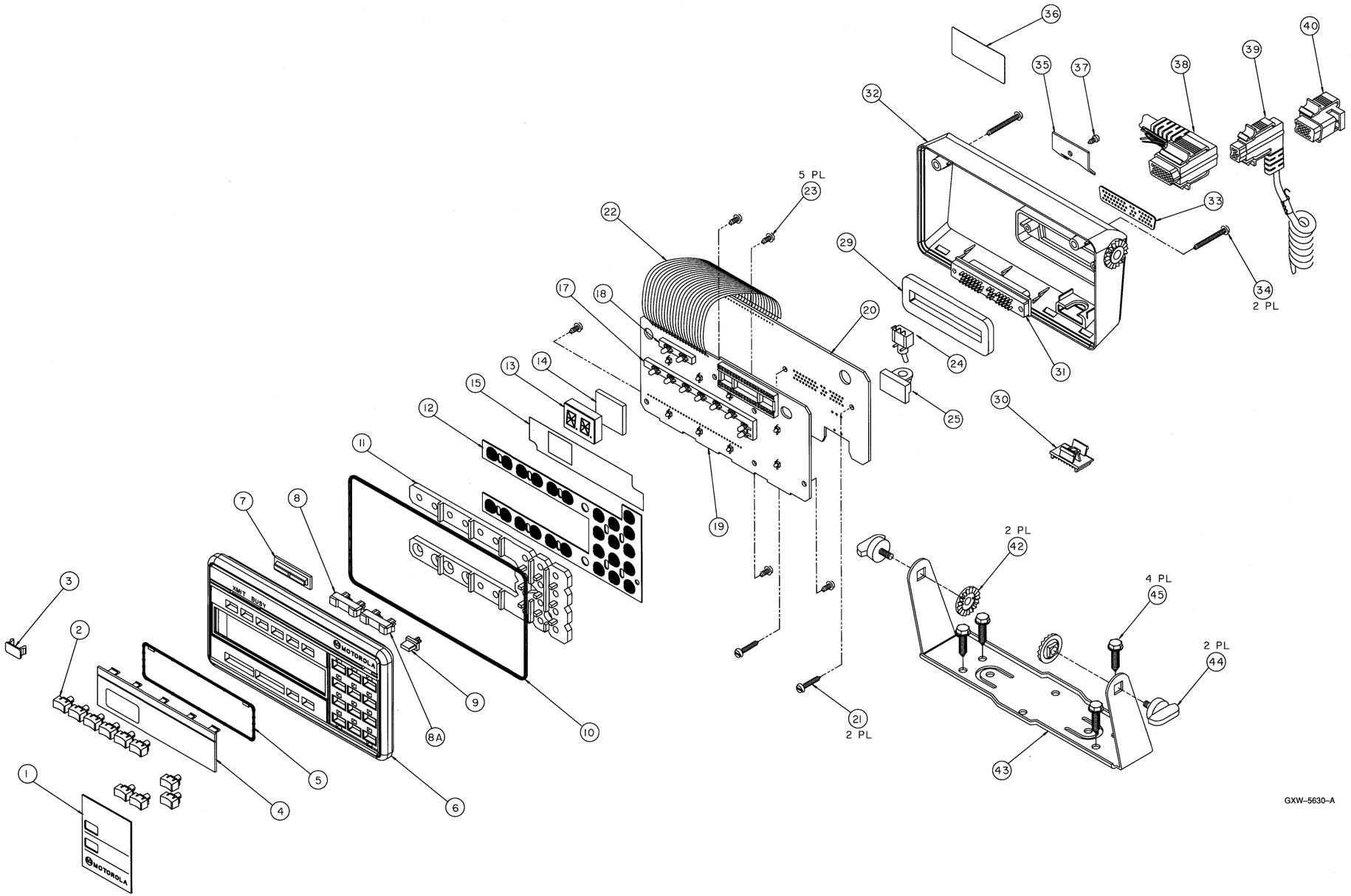
# HANDHELD CONTROL HEAD




GXW–5226–A

Exploded Views and Parts Lists
for *MaraTrac* Control Heads
**PW–5590–C**
(Sheet 1 of 3)
8/31/89

# ADVANCED CONTROL HEAD




## parts list

Advanced Control Head Hardware — MXW–5585–B

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| 1 | 13–80087J04 | escutcheon |
| 2 | 38–80197P02 | pushbutton, MPL |
| 2 | 38–80197P03 | pushbutton, SCAN |
| 2 | 38–80197P14 | pushbutton, RCL |
| 2 | 38–80197P18 | pushbutton, SEL |
| 2 | 38–80197P19 | pushbutton, MON |
| 2 | 38–80197P39 | pushbutton, HOME |
| 2 | 38–80197P10 | pushbutton, H/L |
| 3 | 38–80253K02 | plug |
| 4 | 61–80095J03 | lens, vacuum fluorescent |
| 5 | 32–80057K02 | gasket, lens |
| 6 | 15–80088J04 | housing, front |
| 7 | 61–80097J01 | lens, LED |
| 8 | 38–80195P03 | rocker button, MODE |
| 8A | 38–80195P04 | rocker button, VOL |
| 9 | 38–80092J01 | pushbutton, DIM |
| 10 | 32–80180J02 | gasket, housing |
| 11 | 61–80185J02 | light pipe, keypad |
| 12 | 75–80098J01 | keypad |
| 13 | — | LED display (see Control Heads display board) |
| 14 | 75–80184J01 | shock pad |
| 15 | 14–80240N01 | insulator |
| 16 | — | (not used) |
| 17 | 43–80011L01 | spacer, LED, 8–position |
| 18 | 43–80012L01 | spacer, LED, 2–position |
| 19 | — | display circuit board (see Control Heads) |
| 20 | — | control circuit board (see Control Heads) |
| 21 | 03–10945A14 | screw, tapping, M3.12 x 1.27 x 16 |
| 22 | 30–80034K01 | flex cable |
| 23 | 03–10945A11 | screw, tapping, M3.12 x 1.27 x 8 |
| 24 | — | toggle switch (see Control Heads control board) |
| 25 | 32–80178J01 | gasket, ON/OFF switch |
| 26–28 | — | (not used) |
| 29 | 32–80179J01 | gasket, D–connector |
| 30 | 38–80128J01 | topper, ON/OFF switch |
| 31 | — | D–connector (see Control Heads control board) |
| 32 | 15–80089J02 | housing, rear |
| 33 | 32–80181J01 | gasket, connector face |
| 34 | 03–10908A33 | screw, machine, M3.5 x 0.6 x 30 |
| 35 | 07–84323C01 | bracket, strain relief |
| 36 | 33–80178M03 | nameplate |
| 37 | 03–10908A18 | screw, machine, M3 x 0.5 x 6 |
| 38 | 30–80184N02 | radio cable |
| 39 | — | microphone cable (see Accessories Section) |
| 40 | 15–80221J01 | VIP connector |
| 42 | 43–80127J01 | spacer, trunnion |
| 43 | 07–80263L01 | bracket, trunnion |
| 44 | 03–80160E01 | screw, wing, M5.0 x .8 x 10 |
| 45 | 03–00136756 | screw, tapping, 10–16 x 5/8 |

8/31/89

# parts list

Basic Control Head Mechanical Parts — MXW–5229–A

| ITEM NO. | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| 1 | 07–80101A01 | bracket, trunnion |
| 2 | 03–00135726 | screw, trunnion (2 used) |
| 3 | 03–10908A33 | screw, machine (M3.5x0.6x30)(2 used) |
| 4 | 03–10908A29 | screw, machine housing (2 used) |
| 5 | 33–80117A01 | nameplate "MONITOR" |
| 6 | 36–80102A01 | pushbutton |
| 7 | 42–10128A22 | "O" ring |
| 8 | 04–00135784 | washer, trunnion 2–used |
| 9 | 42–10128A23 | "O" ring (3–used) |
| 10 | 15–80109A01 | housing, bottom |
| 11 | 04–80149A01 | washer, captice (6–used) |
| 12 | 84–80148N01 | printed circuit board |
| 14 | 09–80051B01 | light socket (3–used) |
| 15 | 65–80284N01 | light bulb (3–used) |
| 16 | 42–10082A14 | retainer, knob (3–used) (for Ref. vendor installed) |
| 17 | 36–80107A01 | knob, volume squelch |
| 18 | 36–80107A05 | knob, mode |
| 19 | 36–80107A06 | knob, zone<br>or |
| | 36–80107A07 | knob, scan |
| 22 | 32–80203B01 | gasket, housing |
| 23 | 61–80119A01 | lens |
| 24 | 42–10113A31 | retainer ring (6–used) |
| 25 | 15–80108A01 | housing, top (for non–talkaround) |
| 25A | 15–80221N01 | housing, top (talkaround) |
| 26 | 32–80140B03 | gasket, bezel |
| 27 | 13–80114A04 | bezel |
| 28 | 33–80116A09 | nameplate (overlay) (8–mode)<br>or |
| | 33–80116A10 | nameplate (16–mode) |
| 29 | 05–00132475 | rivet (2–used) |
| 30 | 07–80100A02 | bracket, strain relief |
| 31 | 04–00007555 | washer, flat (2–used) |
| 32 | 07–80159A01 | bracket, switch |
| 33 | 40–80127A03 | switch, pushbutton |
| 34 | 32–80038C01 | gasket, connector |
| 35 | 01–80749T24 | connector assembly |
| 36 | 40–80166N02 | switch, rotary 2–P |
| 37 | 40–80166N01 | switch, rotary 8–P |
| 38 | 18–80126A03 | potentiometer, rotary |
| 39 | 03–10913A29 | screw, machine (2–used)(M3.5x0.6x1x3) |
| | 03–00136756 | screw, tapping, 10–16 x 5/8" (3–used) (for trunnion mounting) |
| 40 | 38–80202N01 | repeat/direct button |
| 41 | 02–82653D01 | nut, spanner |
| 42 | 15–80201N01 | switch, housing (p/o 25A) |
| 43 | 32–05082E20 | o–ring |
| 44 | 40–05680K03 | toggle switch |
| 45 | 01–80749T20 | cable, talkaround |

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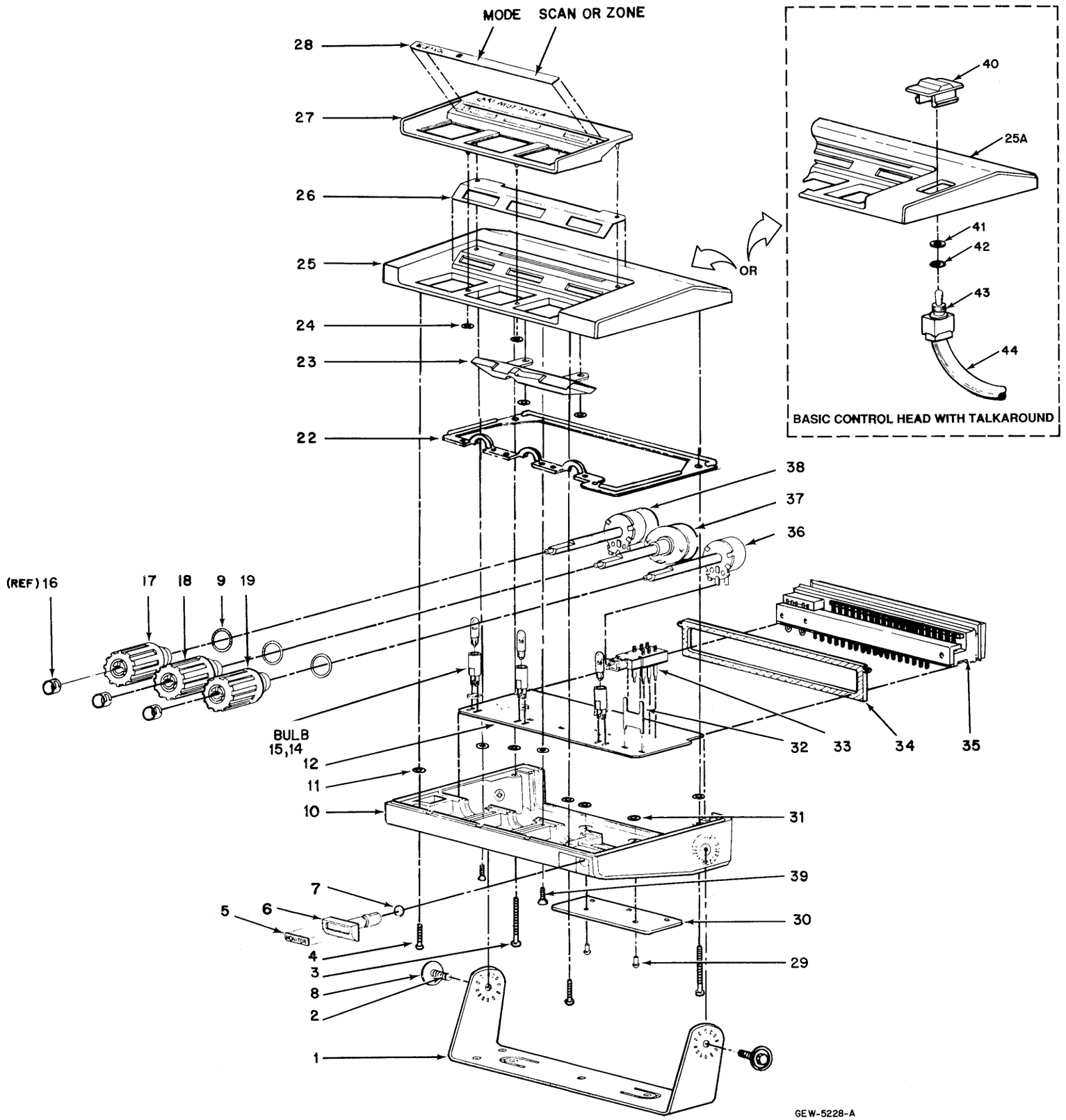
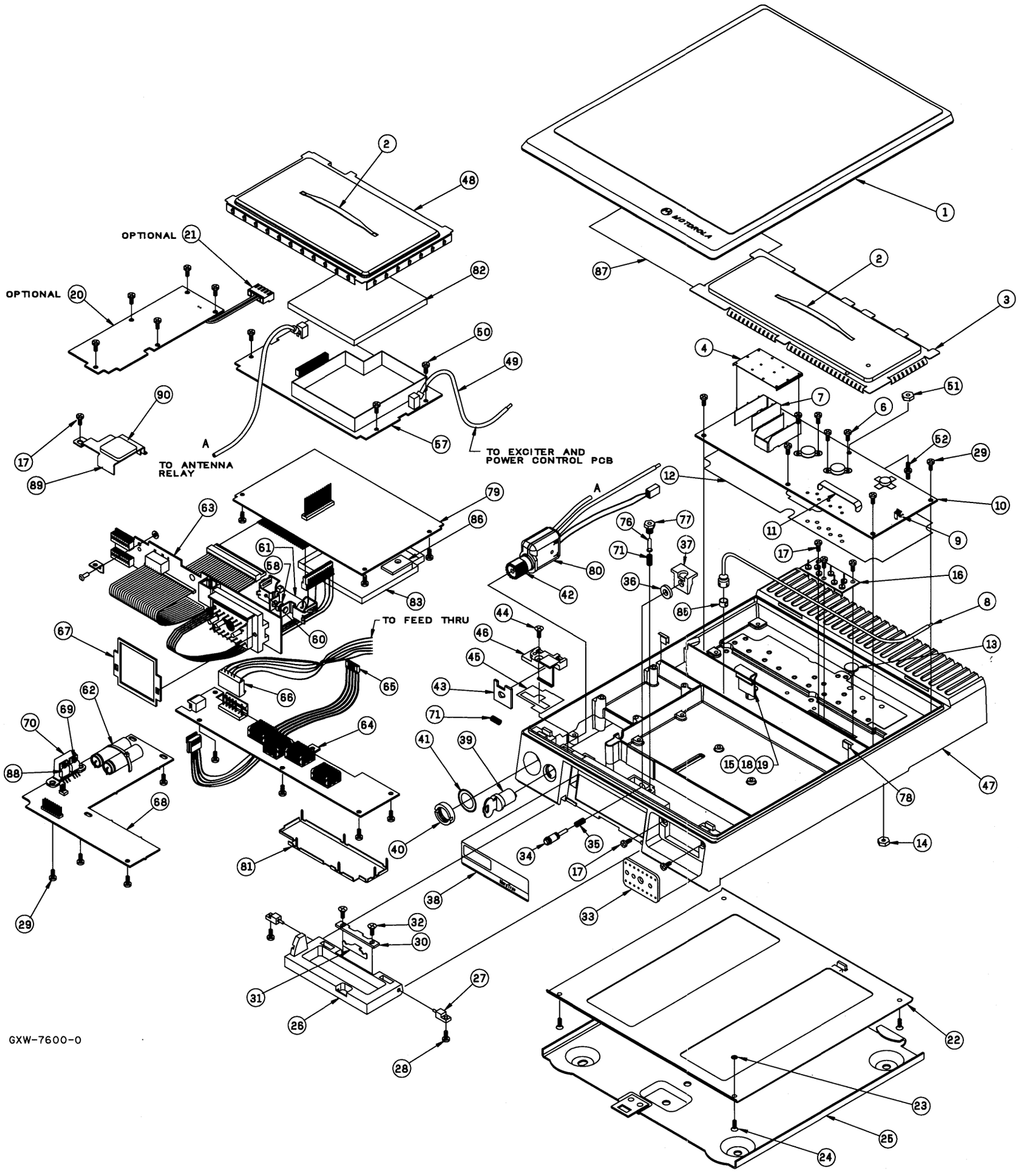
# BASIC CONTROL HEAD




Exploded Views and Parts Lists
for *MaraTrac* Control Heads
**PW–5590–C**
(Sheet 3 of 3)
8/31/89



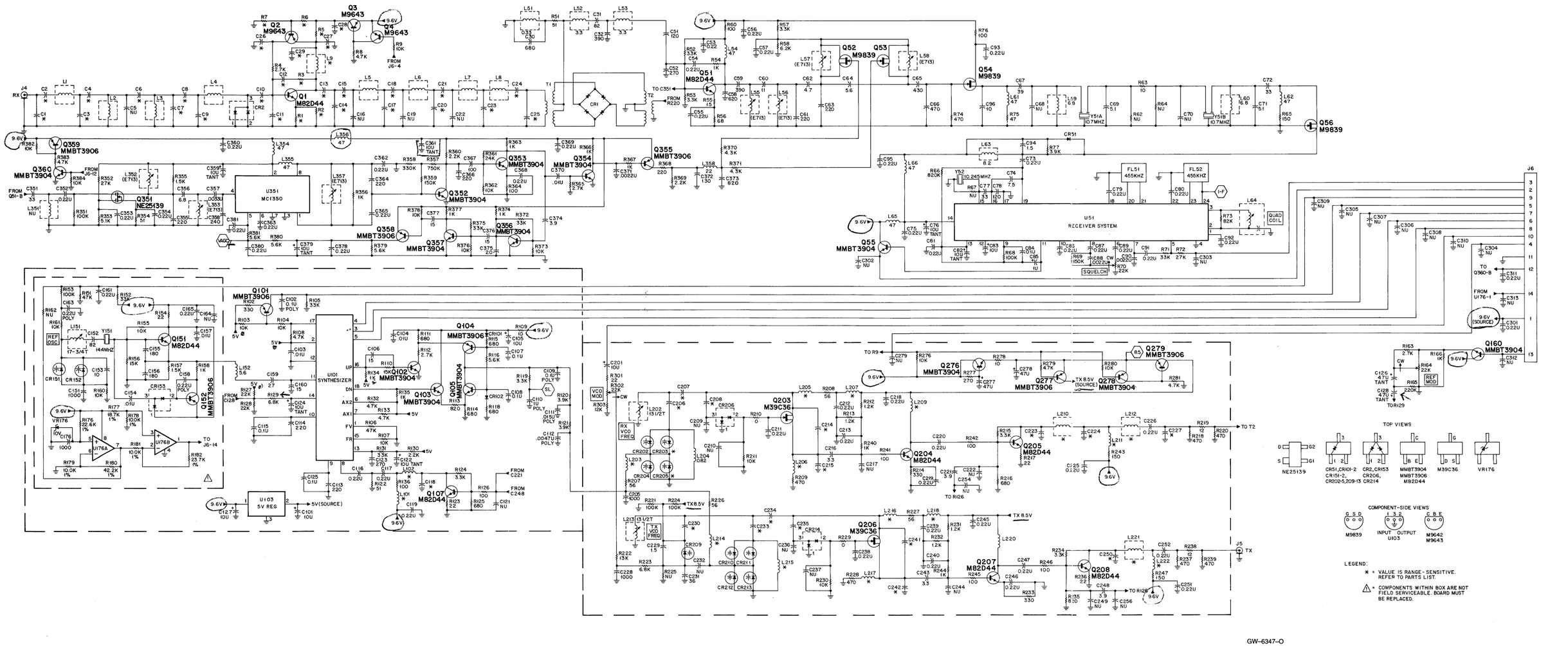

# parts list

*MaraTrac* Low Band Radio Exploded View — MXW–7671–O

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| 1 | — | top cover assembly |
| 2 | 55–84300B04 | handle, nylon (2 used) |
| 3 | 26–80070B01 | shield, PA compartment |
| 4 | 15–80205A02 | cover, RF shield (HLB4115, Range 3) |
| 5 | — | not used |
| 6 | 03–10911A11 | machine screw, 3 x 0.5 x 8 (4 used) |
| 7 | 26–80107P01 | shield, RF (2 used) (HLB4115, Range 3) |
| 8 | 01–80750T31 | coaxial cable assembly |
| 9 | 29–80014A01 | clip, coaxial terminal |
| 10 | — | 110W PA circuit board (Range 3) |
| 11 | 17–80165C02 | resistor, shunt (HLB4115, Range 3) |
| 12 | 14–80143A03 | insulator, PA |
| 13 | 32–80084A02 | gasket, stud device (2 used) |
| 14 | 02–00119913 | nut |
| 15 | 26–80254A01 | heatsink, LLA |
| 16 | — | feedthru plate assembly |
| 17 | 03–10908A26 | machine screw, 3.5 x 0.6 x 6 (6 used) |
| 18 | 02–00007005 | nut |
| 19 | 26–80238N01 | heatsink, TO5 |
| 20 | — | option circuit board |
| 21 | 30–80157N01 | cable, 2 conductor |
| 22 | — | bottom cover assembly |
| 23 | 04–80149A01 | washer, captivating (4 used) |
| 24 | 03–10913A29 | machine screw, 3.5 x 0.6 x 13 (4 used) |
| 25 | — | mounting tray assembly |
| 26 | 55–80002A01 | handle |
| 27 | 47–80176P01 | pin, pivot (2 used) |
| 28 | 03–10943R55 | tapping screw 3 x 0.5 x 8 (2 used) |
| 29 | 03–10943M16 | tapping screw 3.5 x 0.6 x 10 (19 used) |
| 30 | 64–80019A01 | plate, backup |
| 31 | 07–80113B01 | bracket, latch |
| 32 | 03–80001P01 | screw, 3.5 x 0.6 x 6 (2 used) |
| 33 | 32–80020C01 | gasket, front cable connector |
| 34 | 47–80027A01 | pushbutton |
| 35 | 41–80029A01 | spring latch |
| 36 | 32–80295C01 | gasket |
| 37 | 07–80030A01 | bracket, latch |
| 38 | 33–80028N03 | nameplate, radio |
| 39 | 55–80370A01 | lock |
| 40 | 02–80006A01 | nut, spanner |
| 41 | 04–00114522 | lockwasher |
| 42 | 32–80080A01 | gasket, antenna connector |
| 43 | 07–80016A01 | bracket, lock slide |
| 44 | 03–10936E14 | tapping screw, B3.5 x 1.27 x 13 |
| 45 | 32–80000P01 | gasekt, lock support |
| 46 | 07–80015A01 | support, lock slide |
| 47 | 27–80003P01 | chassis |
| 48 | 26–80092P01 | shield, RF |
| 49 | 30–80231N01 | cable, coaxial |
| 50 | 03–10943M10 | tapping screw, 3.5 x 0.6 x 8 (12 used) |
| 51 | 02–10971A63 | nut, hex |
| 52 | 43–80013B01 | stand off |
| 53–56 | — | not used |
| 57 | — | RF circuit board (Range 3) |
| 58 | 48–80153A01 | diode, pellet |
| 59 | — | not used |
| 60 | 26–80191P01 | heatsink (2 used) |
| 61 | 23–80167C03 | capacitor, electrolytic |
| 62 | 42–10217A14 | strap, cable harness (2 used) |
| 63 | — | interconnect circuit board |
| 64 | — | exciter/power control circuit board |
| 65 | 30–80159N01 | cable, power control |
| 66 | 30–80234N01 | cable, feedthru |
| 67 | 32–80074A02 | gasket, cable plug |
| 68 | — | audio/squelch circuit board |
| 69 | 03–10908A18 | screw, 3 x 0.5 x 6 (2 used) (HLN5342) |
| 70 | 26–80129P01 | heatsink (HLN5342) |
| 71 | 41–80022A01 | lock, spring (2 used) |
| 72–75 | — | not used |
| 76 | 46–80151A01 | stud, cover release |
| 77 | 43–80150A01 | sleeve, cover release |
| 78 | 42–80013A01 | clip, coaxial (3 used) |
| 79 | — | logic circuit board |
| 80 | — | antenna relay assembly |
| 81 | 26–80163N01 | shield, solder side |
| 82 | 15–80953T01 | cover, VCO shield |
| 83 | 15–80124M01 | cover, logic shield |
| 84 | — | not used |
| 85 | 42–84733F04 | ring, compression |
| 86 | 75–80202C01 | pad, compression |
| 87 | 54–80166K01 | label |
| 88 | 51–80065C03 | IC audio (2 used) (HLN5342) |
| 89 | 07–80126P01 | bracket, relay |
| 90 | 75–82200H01 | pad |
| **non–referenced items** | | |
| | 30–10286A06 | cable, 14 gage red |
| | 30–10286A04 | cable, 14 gage black |

03/28/90

Low Band Radio Exploded View
**PW–7678–O**
3/30/90




Schematic, Circuit Board Diagrams, and
Parts Lists for HLB4099A and HLB4101A
Low Band RF Boards
**PW–6346–C**
(Sheet 1 of 4)
3/31/90

# Range 1 Parts List

HLB4099A RF Board, 29.7–36 MHz — MXW–6563–B

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, chip, pF, ±5%, 50V** (unless otherwise indicated) | | |
| C1 | 21–13740B55 | 180 |
| C2 | 21–11032B15 | 0.22 uF, +80–20% |
| C3 | 21–13740B66 | 510 |
| C4 | 21–13740B57 | 220 |
| C6 | 21–13740B38 | 36 |
| C7 | 21–13740B19 | 5.6, ±.25 pF |
| C8 | 21–13740B55 | 180 |
| C9 | 21–13740B68 | 620 |
| C10 | 21–11032B15 | 0.22 uF, +80–20% |
| C11 | 21–13740B55 | 180 |
| C12,13 | 21–11032B15 | 0.22 uF, +80–20% |
| C14 | — | not used |
| C15 | 21–13740B46 | 75 |
| C17 | 21–13740B66 | 510 |
| C18 | 21–13740B61 | 330 |
| C19 | — | not used |
| C20 | 21–13740B71 | 820 |
| C21 | 21–13740B60 | 300 |
| C23 | 21–13740B69 | 680 |
| C24 | 21–13740B73 | 1000 |
| C25 | 21–13740B61 | 330 |
| C26–29 | 21–11032B15 | 0.22 uF, +80–20% |
| C30 | 21–13740B69 | 680 |
| C31 | 21–13740B48 | 91 |
| C32 | 21–13740B63 | 390 |
| C33 | — | not used |
| C51 | 21–13740B52 | 130 |
| C52 | 21–13740B59 | 270 |
| C53–57 | 21–11032B15 | 0.22 uF, +80–20% |
| C58 | 21–13740B68 | 620 |
| C59 | 21–13740B63 | 390 |
| C60 | 21–13740B26 | 11 |
| C61 | 21–13740B57 | 220 |
| C62 | 21–13740B17 | 4.7, ±.25 pF |
| C63 | 21–13740B57 | 220 |
| C64 | 21–13740B19 | 5.6, ±.25 pF |
| C65 | 21–13740B64 | 430 |
| C66 | 21–13740B65 | 470 |
| C67 | 21–13740B39 | 39 |
| C69 | 21–13740B18 | 5.1, ±.25 pF |
| C71 | 21–13740B18 | 5.1, ±.25 pF |
| C72 | 21–13740B37 | 33 |
| C73 | 21–11032B15 | 0.22 uF, +80–20% |
| C74 | 21–13740B22 | 7.5, ±.5 pF |
| C75 | 21–11032B15 | 0.22 uF, +80–20% |
| C76 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C77 | 21–13740B37 | 33 |
| C78 | 21–13740B51 | 120 |
| C79–81 | 21–11032B15 | 0.22 uF, +80–20% |
| C82 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C83 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C84 | 21–11032B13 | 0.1 uF, +80–20% |
| C85 | 23–11048B05 | 1 uF, ±20%, electrolytic |
| C86,87 | 21–11032B15 | 0.22 uF, +80–20% |
| C88 | 21–13741B29 | 0.0022 uF, ±10% |
| C89 | 21–11032B15 | 0.22 uF, +80–20% |
| C90 | 21–13741B29 | 0.0022 uF, ±10% |
| C91–93 | 21–11032B15 | 0.22 uF, +80–20% |
| C94 | 21–13740B05 | 1.5, ±.25 pF |
| C95 | 21–11032B15 | 0.22 uF, +80–20% |
| C96 | 21–13740B25 | 10, ±.5 pF |
| C101 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C102 | 08–11051A13 | 0.1 uF, 63V |
| C103,104 | 21–13741B45 | 0.01 uF, ±10% |
| C105 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C106 | 21–13740B47 | 82 |
| C107,108 | 21–11032B13 | 0.1 uF, +80–20% |
| C109 | 08–11051A13 | 0.1 uF, 63V |
| C110 | 08–11044A33 | 1 uF |
| C111 | 08–11051A08 | 0.015 uF, 63V |
| C112 | 08–11051A05 | 0.0047 uF, 63V |
| C113,114 | 21–13740B57 | 220 |
| C115 | 21–11032B13 | 0.1 uF, +80–20% |
| C116,117 | 21–11032B15 | 0.22 uF, +80–20% |
| C118 | 21–13740B33 | 22 |
| C119 | 21–11032B15 | 0.22 uF, +80–20% |
| C122 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C123 | 21–13740B59 | 270 |
| C124 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C125 | 21–11032B13 | 0.1 uF, +80–20% |
| C126 | 23–11013A56 | 47 uF, ±20%, 6V, tantalum |
| C127 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C128 | 23–11013A56 | 47 uF, ±20%, 6V, tantalum |
| C151 | 21–13740B73 | 1000 |
| C152 | 21–13740B47 | 82 |
| C153 | 21–13740B25 | 10, ±.5 pF |
| C154 | 21–13741B45 | 0.01 uF, ±10% |
| C155,156 | 21–13740B55 | 180 |
| C157 | 21–13741B45 | 0.01 uF, ±10% |
| C158 | 08–11051A15 | 0.22 uF, 63V |
| C159 | 21–13740B29 | 15 |
| C160 | 21–13740B41 | 47 |
| C161 | 21–11032B15 | 0.22 uF, +80–20% |
| C163 | 08–11051A15 | 0.22 uF, 63V |
| C165 | 21–11032B15 | 0.22 uF, +80–20% |
| C176 | 21–13740B73 | 1000 |
| C201 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C205 | 21–13740B73 | 1000 |
| C206,207 | 21–13740B45 | 68 |

MXW–6563–B (2)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| C208 | 21–13740B17 | 4.7, ±.25 pF |
| C211–213 | 21–11032B15 | 0.22 uF, +80–20% |
| C214,215 | 21–13740B43 | 56 |
| C216 | 21–13740B13 | 3.3, ±.25 pF |
| C218–220 | 21–11032B15 | 0.22 uF, +80–20% |
| C221 | 21–13740B15 | 3.9, ±.25 pF |
| C223 | 21–13740B25 | 10, ±.5 pF |
| C224 | 21–13740B41 | 47 |
| C225,226 | 21–11032B15 | 0.22 uF, +80–20% |
| C227 | 21–13740B41 | 47 |
| C228 | 21–13740B73 | 1000 |
| C229 | 21–13740B05 | 1.5, ±.25 pF |
| C230 | 21–13740B19 | 5.6, ±.25 pF |
| C231 | 21–13740B38 | 36 |
| C233 | 21–13740B63 | 390 |
| C234 | 21–13740B49 | 100 |
| C235 | 21–13740B17 | 4.7, ±.25 pF |
| C238–240 | 21–11032B15 | 0.22 uF, +80–20% |
| C241,242 | 21–13740B47 | 82 |
| C243 | 21–13740B13 | 3.3, ±.25 pF |
| C245–247 | 21–11032B15 | 0.22 uF, +80–20% |
| C248 | 21–13740B15 | 3.9, ±.25 pF |
| C250 | 21–13740B29 | 15 |
| C251,252 | 21–11032B15 | 0.22 uF, +80–20% |
| C277,278 | 23–11048B19 | 47 uF, ±20%, 16V |
| C301 | 21–11032B15 | 0.22 uF, +80–20% |
| C311 | 21–11032B15 | 0.22 uF, +80–20% |
| C351 | 21–13740B37 | 33 |
| C352–354 | 21–11032B15 | 0.22 uF, +80–20% |
| C355 | 21–13740B57 | 220 |
| C356 | 21–13740B21 | 6.8, ±.5 pF |
| C357 | 21–13741B33 | 0.0033 uF, ±10% |
| C358 | 21–13740B53 | 240 |
| C359 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C360 | 21–11032B15 | 0.22 uF, +80–20% |
| C361 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C362,363 | 21–11032B15 | 0.22 uF, +80–20% |
| C364 | 21–13740B57 | 220 |
| C365 | 21–11032B15 | 0.22 uF, +80–20% |
| C366 | 21–13740B57 | 220 |
| C367 | 21–13740B49 | 100 |
| C368,369 | 21–11032B15 | 0.22 uF, +80–20% |
| C370 | 21–13741B37 | 0.0047 uF, ±10% |
| C371 | 21–13741B29 | 0.0022 uF, ±10% |
| C372 | 21–13740B52 | 130 |
| C373 | 21–13740B72 | 910 |
| C374 | 21–13740B25 | 10 |
| C376,377 | 21–13740B29 | 15 |
| C378 | 21–11032B15 | 0.22 uF, +80–20% |
| C379 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C380,381 | 21–11032B15 | 0.22 uF, +80–20% |
| **diode** (see note) | | |
| CR1 | 48–80236E16 | quad Schottky, crossed |
| CR2 | 48–80154K03 | dual Schottky, SOT |
| CR51 | 48–05129M76 | silicon, SOT |
| CR101,102 | 48–05129M76 | silicon, SOT |
| CR151,152 | 48–80006E10 | silicon varactor, SOT |
| CR202 | 48–80991T01 | silicon varactor, SOT |
| CR203 | — | not used |
| CR204 | 48–80991T01 | silicon varactor, SOT |
| CR205 | — | not used |
| CR206 | 48–80154K03 | dual Schottky, SOT |
| CR209 | 48–80006E10 | silicon varactor, SOT |
| CR210–213 | 48–80991T01 | silicon varactor, SOT |
| CR214 | 48–80154K03 | dual Schottky, SOT |
| **filters** | | |
| FL51 | 91–80097D05 | 455 kHz, 6E |
| FL52 | 91–80098D05 | 455 kHz, 4E |
| **connector, receptacle** | | |
| J4,5 | 09–80135M01 | coaxial (RX, TX) |
| J6 | 09–80130M02 | 14–pin socket (logic board) |
| **coil** | | |
| L1–8 | 24–80148M21 | 9–1/2 turns (white) |
| L9 | 24–80063M04 | 0.18 uH |
| L51 | 24–80063M07 | 0.33 uH |
| L52,53 | 24–80063M19 | 3.3 uH |
| L54 | 24–80063M31 | 47 uH |
| L55–58 | 24–80164M01 | tunable, 0.7 uH |
| L59,60 | 24–80063M23 | 6.8 uH |
| L61,62 | 24–80063M31 | 47 uH |
| L63 | 24–80063M24 | 8.2 uH |
| L64 | 25–80000E01 | tunable, 455 kHz |
| L65,66 | 24–80063M31 | 47 uH |
| L101 | 24–80063M24 | 8.2 uH |
| L102 | 24–80063M11 | 0.68 uH |
| L151 | 24–80299D01 | tunable, 17–3/4 turns |
| L152 | 24–80063M22 | 5.6 uH |
| L202 | 24–80931W26 | tunable, 13–1/2 turns |
| L203 | 24–80063M23 | 6.8 uH |
| L204 | 24–80063M12 | 0.82 uH |
| L205–207 | 24–80063M23 | 6.8 uH |
| L209 | 24–80063M23 | 6.8 uH |
| L210 | 24–80063M13 | 1.0 uH |
| L211 | 24–80063M23 | 6.8 uH |
| L212 | 24–80063M07 | 0.33 uH |
| L213 | 24–80931W26 | tunable, 13–1/2 turns |
| L214 | 24–80063M24 | 8.2 uH |
| L215 | 24–80063M12 | 0.82 uH |

MXW–6563–B (3)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| L216–218 | 24–80063M24 | 8.2 uH |
| L220 | 24–80063M24 | 8.2 uH |
| L221 | 24–80063M11 | 0.68 uH |
| L222 | 24–80063M24 | 8.2 uH |
| L352,353 | 24–80164M01 | tunable, 0.7 uH |
| L354–356 | 24–80063M31 | 47 uH |
| L357 | 24–80164M01 | tunable, 0.7 uH |
| L358 | 24–80063M27 | 22 uH |
| **transistor** (see note) | | |
| Q1 | 48–80182D44 | NPN |
| Q2–4 | 48–11043C06 | PNP |
| Q51 | 48–80182D44 | NPN |
| Q52–54 | 48–11043C12 | FET |
| Q55 | 48–80214G02 | NPN |
| Q56 | 48–11043C12 | FET |
| Q101 | 48–05128M16 | PNP |
| Q102,103 | 48–80214G02 | NPN |
| Q104 | 48–05128M16 | PNP |
| Q105 | 48–80214G02 | NPN |
| Q107 | 48–80182D44 | NPN |
| Q151 | 48–80182D44 | NPN |
| Q152 | — | not used |
| Q160 | 48–80214G02 | NPN |
| Q203 | 48–80141L06 | FET |
| Q204,205 | 48–80182D44 | NPN |
| Q206 | 48–80141L06 | FET |
| Q207,208 | 48–80182D44 | NPN |
| Q276 | 48–80214G02 | NPN |
| Q277–279 | 48–05128M16 | PNP |
| Q351 | 48–80930W01 | dual gate FET |
| Q352–354 | 48–80214G02 | NPN |
| Q355 | 48–05128M16 | PNP |
| Q356,357 | 48–80214G02 | NPN |
| Q358,359 | 48–05128M16 | PNP |
| Q360 | 48–80214G02 | NPN |
| **resistor, chip, ohm, ±5%, 1/8 watt** (unless otherwise indicated) | | |
| R1 | 06–11077A26 | 10 |
| R2 | 06–11077A30 | 15 |
| R3 | 06–11077A68 | 560 |
| R4 | 06–11077A84 | 2.7k |
| R5 | 06–11077A56 | 180 |
| R6 | 06–11077A98 | 10k |
| R7 | 06–11077A94 | 6.8K |
| R8 | 06–11077A90 | 4.7k |
| R9 | 06–11077A98 | 10k |
| R51 | 06–11077A43 | 51 |
| R52,53 | 06–11077A86 | 3.3k |
| R54 | 06–11077A74 | 1k |
| R55 | 06–11077A30 | 15 |
| R56 | 06–11077A46 | 68 |
| R57 | 06–11077A86 | 3.3k |
| R58 | 06–11077A93 | 6.2k |
| R60 | 06–11077A50 | 100 |
| R63 | 06–11077A26 | 10 |
| R65 | 06–11077A54 | 150 |
| R66 | 06–11077B45 | 820k |
| R68 | 06–11077B23 | 100k |
| R69 | 06–11077B27 | 150k |
| R70 | 18–05500L08 | variable, 22k |
| R71 | 06–11077B11 | 33k |
| R72 | 06–11077B09 | 27k |
| R73 | 06–11077B21 | 82k |
| R74 | 06–11077A66 | 470 |
| R75 | 06–11077A42 | 47 |
| R76 | 06–11077A50 | 100 |
| R77 | 06–11077A88 | 3.9k |
| R102 | 06–11077A62 | 330 |
| R103,104 | 06–11077A98 | 10k |
| R105 | 06–11077B11 | 33k |
| R106 | 06–11077B15 | 47k |
| R107 | 06–11077A98 | 10k |
| R108 | 06–11077A90 | 4.7k |
| R109 | 06–11077A26 | 10 |
| R110 | 06–11077B03 | 15k |
| R111 | 06–11077A70 | 680 |
| R112 | 06–11077A84 | 2.7k |
| R113 | 06–11077A72 | 820 |
| R114,115 | 06–11077A70 | 680 |
| R116 | 06–11077A92 | 5.6k |
| R118 | 06–11077A70 | 680 |
| R119 | 06–11077A86 | 3.3k |
| R120,121 | 06–11077A88 | 3.9k |
| R122 | 06–11077A43 | 51 |
| R123 | 06–11077A34 | 22 |
| R124 | 06–11077A86 | 3.3k |
| R125 | 06–11077A70 | 680 |
| R126 | 06–11077A50 | 100 |
| R127 | 06–11077B07 | 22k |
| R128 | 06–11077B11 | 33K |
| R129 | 06–11077A94 | 6.8k |
| R130 | 06–11077A82 | 2.2k |
| R131 | 06–11077B11 | 33k |
| R132,133 | 06–11077A90 | 4.7k |
| R134,135 | 06–11077A74 | 1k |
| R136 | 06–11077A50 | 100 |
| R151 | 06–11077B15 | 47k |
| R152 | 06–11077B11 | 33k |
| R153 | 06–11077B23 | 100k |
| R154 | 06–11077A34 | 22 |

MXW–6563–B (4)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| R155 | 06–11077A98 | 10k |
| R156 | 06–11077B03 | 15k |
| R157 | 06–11077A78 | 1.5k |
| R158 | — | not used |
| R160,161 | 06–11077A98 | 10k |
| R163 | 06–11077A84 | 2.7k |
| R164 | 18–05500L08 | variable, 22k |
| R165 | 06–11077B31 | 220k |
| R166 | 06–11077A74 | 1k |
| R176 | 06–11077G26 | 22.6k, ±1% |
| R177 | 06–11077G18 | 18.7k, ±1% |
| R178,179 | 06–11077F91 | 10.0k, ±1% |
| R180 | 06–11077G52 | 42.2k, ±1% |
| R181 | 06–11077F91 | 10.0k, ±1% |
| R182 | 06–11077G28 | 23.7k, ±1% |
| R207,208 | 06–11077A44 | 56 |
| R209 | 06–11077A66 | 470 |
| R210 | 06–11077A01 | 0 |
| R211 | 06–11077A98 | 10k |
| R212,213 | 06–11077A76 | 1.2k |
| R214 | 06–11077A62 | 330 |
| R215 | 06–11077A86 | 3.3k |
| R216 | 06–11077A70 | 680 |
| R217 | 06–11077A34 | 22 |
| R218 | 06–11077A66 | 470 |
| R219 | 06–11077A28 | 12 |
| R220 | 06–11077A66 | 470 |
| R221 | 06–11077B23 | 100k |
| R222 | 06–11077B02 | 13k |
| R223 | 06–11077A94 | 6.8k |
| R224 | 06–11077B23 | 100k |
| R226,227 | 06–11077A44 | 56 |
| R228 | 06–11077A66 | 470 |
| R229 | 06–11077A01 | 0 |
| R230 | 06–11077A98 | 10k |
| R231,232 | 06–11077A76 | 1.2k |
| R233 | 06–11077A62 | 330 |
| R234 | 06–11077A86 | 3.3k |
| R235 | 06–11077A72 | 820 |
| R236 | 06–11077A34 | 22 |
| R237 | 06–11077A61 | 300 |
| R238 | 06–11077A32 | 18 |
| R239 | 06–11077A61 | 300 |
| R240 | 06–11077A74 | 1k |
| R241,242 | 06–11077A50 | 100 |
| R243 | 06–11077A54 | 150 |
| R244 | 06–11077A74 | 1k |
| R245,246 | 06–11077A50 | 100 |
| R247 | 06–11077A54 | 150 |
| R276 | 06–11077A98 | 10k |
| R277 | 06–11077A60 | 270 |
| R278 | 06–11077A26 | 10 |
| R279 | 06–11077A90 | 4.7k |
| R280 | 06–11077A98 | 10k |
| R281 | 06–11077A90 | 4.7k |
| R301 | 06–11077A34 | 22 |
| R302 | 18–05500L08 | variable, 22k |
| R303 | 06–11077B01 | 12k |
| R351 | 06–11077B23 | 100k |
| R352 | 06–11077B09 | 27k |
| R353 | 06–11077A91 | 5.1k |
| R354 | 06–11077A43 | 51 |
| R355 | 06–11077A78 | 1.5k |
| R356 | 06–11077A74 | 1k |
| R357 | 06–11077B44 | 750k |
| R358 | 06–11077B35 | 330k |
| R359 | 06–11077B27 | 150k |
| R360 | 06–11077A82 | 2.2k |
| R361 | 06–11077B08 | 24k |
| R362 | 06–11077A98 | 10k |
| R363 | 06–11077A74 | 1k |
| R364 | 06–11077A50 | 100 |
| R365 | 06–11077A84 | 2.7k |
| R366,367 | 06–11077A74 | 1k |
| R368 | 06–11077A58 | 220 |
| R369 | 06–11077A82 | 2.2k |
| R370,371 | 06–11077A89 | 4.3k |
| R372 | 06–11077A93 | 6.2k |
| R373 | 06–11077A76 | 1.2k |
| R374 | 06–11077A74 | 1k |
| R375 | 06–11077A93 | 6.2k |
| R376 | 06–11077A76 | 1.2k |
| R377 | 06–11077A74 | 1k |
| R378 | 06–11077A98 | 10k |
| R379–381 | 06–11077A92 | 5.6k |
| R382 | 06–11077A98 | 10k |
| R383 | 06–11077A90 | 4.7k |
| R384 | 06–11077A98 | 10k |
| **transformer** | | |
| T1,T2 | 25–80163M02 | balun |
| **integrated circuit** (see note) | | |
| U51 | 51–05479G05 | receiver system |
| U101 | 51–80931V01 | synthesizer |
| U103 | 51–84621K27 | regulator, 5 volt |
| U176 | 51–80932W01 | dual op–amp |
| U351 | 51–80929W01 | MC1350 |

MXW–6563–B (5)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **voltage regulator** (see note) | | |
| VR176 | 48–80140L15 | zener, 10V |
| **crystal** (see note) | | |
| Y51 | 91–80172D01 | filter, 10.7 MHz |
| Y52 | 48–80908W01 | 10.245 MHz |
| Y151 | 48–80174D05 | 14.4 MHz |
| **non–referenced items** | | |
| | 14–05160A01 | insulator, crystal (4 used) |
| | 26–80097M01 | shield, coil can (L151) |
| | 26–80098M01 | shield, coil can (10 used) |
| | 26–80228L01 | shield, can (J4, J5) |
| | 26–80916V01 | shield, VCO frame |
| | 75–05295B02 | pad, crystal (4 used) |

10/15/89

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

# Range 3 Parts List

HLB4101A RF Board, 42–50 MHz — MXW–6348–B

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, chip, pF, ±5%, 50V** (unless otherwise indicated) | | |
| C1 | 21–13740B48 | 91 |
| C2 | 21–13740B65 | 470 |
| C3 | 21–13740B59 | 270 |
| C4 | 21–13740B49 | 100 |
| C6 | 21–13740B29 | 15 |
| C8 | 21–13740B48 | 91 |
| C9 | 21–13740B64 | 430 |
| C10 | 21–13740B57 | 220 |
| C11 | 21–13740B55 | 180 |
| C12 | 21–13741B49 | 0.015 uF, ±10% |
| C13 | 21–13740B51 | 120 |
| C14 | 21–13740B62 | 360 |
| C15 | 21–13740B51 | 120 |
| C17 | 21–13740B67 | 560 |
| C18 | 21–13740B52 | 130 |
| C20 | 21–13740B67 | 560 |
| C21 | 21–13740B52 | 130 |
| C23 | 21–13740B64 | 430 |
| C24 | 21–13740B58 | 240 |
| C25 | 21–13740B56 | 200 |
| C26–29 | 21–13741B49 | 0.015 uF, ±10% |
| C30 | 21–13740B69 | 680 |
| C31 | 21–13740B47 | 82 |
| C32 | 21–13740B63 | 390 |
| C51 | 21–13740B51 | 120 |
| C52 | 21–13740B59 | 270 |
| C53–57 | 21–11032B15 | 0.22 uF, +80–20% |
| C58 | 21–13740B68 | 620 |
| C59 | 21–13740B63 | 390 |
| C60 | 21–13740B26 | 11 |
| C61 | 21–13740B57 | 220 |
| C62 | 21–13740B17 | 4.7, ±.25 pF |
| C63 | 21–13740B57 | 220 |
| C64 | 21–13740B19 | 5.6, ±.25 pF |
| C65 | 21–13740B64 | 430 |
| C66 | 21–13740B65 | 470 |
| C67 | 21–13740B39 | 39 |
| C69 | 21–13740B18 | 5.1, ±.25 pF |
| C71 | 21–13740B18 | 5.1, ±.25 pF |
| C72 | 21–13740B37 | 33 |
| C73 | 21–11032B15 | 0.22 uF, +80–20% |
| C74 | 21–13740B22 | 7.5, ±.5 pF |
| C75 | 21–11032B15 | 0.22 uF, +80–20% |
| C76 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C77 | 21–13740B37 | 33 |
| C78 | 21–13740B51 | 120 |
| C79–81 | 21–11032B15 | 0.22 uF, +80–20% |
| C82 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C83 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C84 | 21–11032B13 | 0.1 uF, +80–20% |
| C85 | 23–11048B05 | 1 uF, ±20%, electrolytic |
| C86,87 | 21–11032B15 | 0.22 uF, +80–20% |
| C88 | 21–13741B29 | 0.0022 uF, ±10% |
| C89 | 21–11032B15 | 0.22 uF, +80–20% |
| C90 | 21–13741B29 | 0.0022 uF, ±10% |
| C91–93 | 21–11032B15 | 0.22 uF, +80–20% |
| C94 | 21–13740B05 | 1.5, ±.25 pF |
| C95 | 21–11032B15 | 0.22 uF, +80–20% |
| C96 | 21–13740B25 | 10, ±.5 pF |
| C101 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C102 | 08–11051A13 | 0.1 uF, 63V |
| C103,104 | 21–13741B45 | 0.01 uF, ±10% |
| C105 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C106 | 21–13740B29 | 15 |
| C107,108 | 21–11032B13 | 0.1 uF, +80–20% |
| C109 | 08–11051A13 | 0.1 uF, 63V |
| C110 | 08–11044A33 | 1 uF |
| C111 | 08–11051A08 | 0.015 uF, 63V |
| C112 | 08–11051A05 | 0.0047 uF, 63V |
| C113,114 | 21–13740B57 | 220 |
| C115 | 21–11032B13 | 0.1 uF, +80–20% |
| C116,117 | 21–11032B15 | 0.22 uF, +80–20% |
| C118 | 21–13740B27 | 12 |
| C119 | 21–11032B15 | 0.22 uF, +80–20% |
| C122 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C123 | 21–13740B59 | 270 |
| C124 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C125 | 21–11032B13 | 0.1 uF, +80–20% |
| C126 | 23–11013A56 | 47 uF, ±20%, 6V, tantalum |
| C127 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C128 | 23–11013A56 | 47 uF, ±20%, 6V, tantalum |
| C151 | 21–13740B73 | 1000 |
| C152 | 21–13740B47 | 82 |
| C153 | 21–13740B25 | 10, ±.5 pF |
| C154 | 21–13741B45 | 0.01 uF, ±10% |
| C155,156 | 21–13740B55 | 180 |
| C157 | 21–13741B45 | 0.01 uF, ±10% |
| C158 | 08–11051A15 | 0.22 uF, 63V |
| C159 | 21–13740B35 | 27 |
| C160 | 21–13740B29 | 15 |
| C161 | 21–11032B15 | 0.22 uF, +80–20% |
| C163 | 08–11051A15 | 0.22 uF, 63V |
| C165 | 21–11032B15 | 0.22 uF, +80–20% |
| C176 | 21–13740B73 | 1000 |
| C201 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C205 | 21–13740B73 | 1000 |
| C206 | 21–13740B37 | 33 |
| C207 | 21–13740B27 | 12 |
| C208 | 21–13740B17 | 4.7, ±.25 pF |
| C211–213 | 21–11032B15 | 0.22 uF, +80–20% |

MXW–6348–B (2)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| C214,215 | 21–13740B27 | 12 |
| C216 | 21–13740B13 | 3.3, ±.25 pF |
| C218–220 | 21–11032B15 | 0.22 uF, +80–20% |
| C221 | 21–13740B15 | 3.9, ±.25 pF |
| C223 | 21–13740B21 | 6.8, ±.25 pF |
| C224 | 21–13740B39 | 39 |
| C225,226 | 21–11032B15 | 0.22 uF, +80–20% |
| C227 | 21–13740B37 | 33 |
| C228 | 21–13740B73 | 1000 |
| C229 | 21–13740B05 | 1.5, ±.25 pF |
| C230 | 21–13740B15 | 3.9, ±.25 pF |
| C231 | 21–13740B38 | 36 |
| C233 | 21–13740B49 | 100 |
| C234 | 21–13740B34 | 24 |
| C235 | 21–13740B17 | 4.7, ±.25 pF |
| C238–240 | 21–11032B15 | 0.22 uF, +80–20% |
| C241,242 | 21–13740B31 | 18 |
| C243 | 21–13740B13 | 3.3, ±.25 pF |
| C245–247 | 21–11032B15 | 0.22 uF, +80–20% |
| C248 | 21–13740B15 | 3.9, ±.25 pF |
| C250 | 21–13740B29 | 15 |
| C251,252 | 21–11032B15 | 0.22 uF, +80–20% |
| C277,278 | 23–11048B19 | 47 uF, ±20%, 16V |
| C301 | 21–11032B15 | 0.22 uF, +80–20% |
| C311 | 21–11032B15 | 0.22 uF, +80–20% |
| C351 | 21–13740B37 | 33 |
| C352–354 | 21–11032B15 | 0.22 uF, +80–20% |
| C355 | 21–13740B57 | 220 |
| C356 | 21–13740B21 | 6.8, ±.5 pF |
| C357 | 21–13741B33 | 0.0033 uF, ±10% |
| C358 | 21–13740B58 | 240 |
| C359 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C360 | 21–11032B15 | 0.22 uF, +80–20% |
| C361 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C362,363 | 21–11032B15 | 0.22 uF, +80–20% |
| C364 | 21–13740B57 | 220 |
| C365 | 21–11032B15 | 0.22 uF, +80–20% |
| C366 | 21–13740B57 | 220 |
| C367 | 21–13740B49 | 100 |
| C368,369 | 21–11032B15 | 0.22 uF, +80–20% |
| C370 | 21–13741B37 | 0.0047 uF, ±10% |
| C371 | 21–13741B29 | 0.0022 uF, ±10% |
| C372 | 21–13740B52 | 130 |
| C373 | 21–13740B72 | 910 |
| C374 | 21–13740B25 | 10 |
| C376,377 | 21–13740B29 | 15 |
| C378 | 21–11032B15 | 0.22 uF, +80–20% |
| C379 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C380,381 | 21–11032B15 | 0.22 uF, +80–20% |
| **diodes** (see note) | | |
| CR1 | 48–80236E16 | quad Schottky, crossed |
| CR2 | 48–80154K03 | dual Schottky, SOT |
| CR51 | 48–05129M76 | silicon, SOT |
| CR101,102 | 48–05129M76 | silicon, SOT |
| CR151,152 | 48–80006E10 | silicon varactor, SOT |
| CR202–205 | 48–80006E10 | silicon varactor, SOT |
| CR206 | 48–80154K03 | dual Schottky, SOT |
| CR209–213 | 48–80006E10 | silicon varactor, SOT |
| CR214 | 48–80154K03 | dual Schottky, SOT |
| **filters** | | |
| FL51 | 91–80097D05 | 455 kHz, 6E |
| FL52 | 91–80098D05 | 455 kHz, 4E |
| **connector, receptacle** | | |
| J4 | 09–80135M01 | coaxial (RX) |
| J5 | 09–80135M01 | coaxial (TX) |
| J6 | 09–80130M02 | 14–pin socket (logic board) |
| **coils** | | |
| L1–9 | 24–80148M22 | 9–1/2 turns (white) |
| L51 | 24–80063M07 | 0.33 uH |
| L52,53 | 24–80063M19 | 3.3 uH |
| L54 | 24–80063M31 | 47 uH |
| L55–58 | 24–80164M01 | tunable, 0.7 uH |
| L59,60 | 24–80063M23 | 6.8 uH |
| L61,62 | 24–80063M31 | 47 uH |
| L63 | 24–80063M24 | 8.2 uH |
| L64 | 25–80000E01 | tunable, 455 kHz |
| L65,66 | 24–80063M31 | 47 uH |
| L101 | 24–80063M23 | 6.8 uH |
| L102 | 24–80063M09 | 0.47 uH |
| L151 | 24–80299D01 | tunable, 17–3/4 turns |
| L152 | 24–80063M22 | 5.6 uH |
| L202 | 24–80931W26 | tunable, 13–1/2 turns |
| L203 | 24–80063M22 | 5.6 uH |
| L204 | 24–80063M12 | 0.82 uH |
| L205–207 | 24–80063M22 | 5.6 uH |
| L209 | 24–80063M22 | 5.6 uH |
| L210 | 24–80063M11 | 0.68 uH |
| L211 | 24–80063M22 | 5.6 uH |
| L212 | 24–80063M06 | 0.27 uH |
| L213 | 24–80931W26 | tunable, 13–1/2 turns |
| L214 | 24–80063M23 | 6.8 uH |
| L215 | 24–80063M12 | 0.82 uH |
| L216–218 | 24–80063M23 | 6.8 uH |
| L220 | 24–80063M23 | 6.8 uH |
| L221 | 24–80063M09 | 0.47 uH |
| L222 | 24–80063M23 | 6.8 uH |
| L352,353 | 24–80164M01 | tunable, 0.7 uH |
| L354–356 | 24–80063M31 | 47 uH |
| L357 | 24–80164M01 | tunable, 0.7 uH |
| L358 | 24–80063M27 | 22 uH |

MXW–6348–B (3)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **transistors** (see note) | | |
| Q1 | 48–80182D44 | NPN |
| Q2–4 | 48–11043C06 | PNP |
| Q51 | 48–80182D44 | NPN |
| Q52–54 | 48–11043C12 | FET |
| Q55 | 48–80214G02 | NPN |
| Q56 | 48–11043C12 | FET |
| Q101 | 48–05128M16 | PNP |
| Q102,103 | 48–80214G02 | NPN |
| Q104 | 48–05128M16 | PNP |
| Q105 | 48–80214G02 | NPN |
| Q107 | 48–80182D44 | NPN |
| Q151 | 48–80182D44 | NPN |
| Q152 | 48–05128M16 | PNP |
| Q160 | 48–80214G02 | NPN |
| Q203 | 48–80141L06 | FET |
| Q204,205 | 48–80182D44 | NPN |
| Q206 | 48–80141L06 | FET |
| Q207,208 | 48–80182D44 | NPN |
| Q276 | 48–80214G02 | NPN |
| Q277–279 | 48–05128M16 | PNP |
| Q351 | 48–80930W01 | dual gate FET |
| Q352–354 | 48–80214G02 | NPN |
| Q355 | 48–05128M16 | PNP |
| Q356,357 | 48–80214G02 | NPN |
| Q358,359 | 48–05128M16 | PNP |
| Q360 | 48–80214G02 | NPN |
| **resistor, chip, ohm, ±5%, 1/8 watt** (unless otherwise indicated) | | |
| R1 | 06–11077A26 | 10 |
| R2 | 06–11077A33 | 20 |
| R3 | 06–11077A66 | 470 |
| R4 | 06–11077A84 | 2.7k |
| R5 | 06–11077A46 | 68 |
| R6 | 06–11077A86 | 3.3k |
| R7 | 06–11077B03 | 15k |
| R8 | 06–11077A90 | 4.7k |
| R9 | 06–11077A98 | 10k |
| R51 | 06–11077A43 | 51 |
| R52,53 | 06–11077A86 | 3.3k |
| R54 | 06–11077A74 | 1k |
| R55 | 06–11077A30 | 15 |
| R56 | 06–11077A46 | 68 |
| R57 | 06–11077A86 | 3.3k |
| R58 | 06–11077A93 | 6.2k |
| R60 | 06–11077A50 | 100 |
| R63 | 06–11077A26 | 10 |
| R65 | 06–11077A54 | 150 |
| R66 | 06–11077B45 | 820k |
| R68 | 06–11077B23 | 100k |
| R69 | 06–11077B27 | 150k |
| R70 | 18–05500L08 | variable, 22k |
| R71 | 06–11077B11 | 33k |
| R72 | 06–11077B09 | 27k |
| R73 | 06–11077B21 | 82k |
| R74 | 06–11077A66 | 470 |
| R75 | 06–11077A42 | 47 |
| R76 | 06–11077A50 | 100 |
| R77 | 06–11077A88 | 3.9k |
| R102 | 06–11077A62 | 330 |
| R103,104 | 06–11077A98 | 10k |
| R105 | 06–11077B11 | 33k |
| R106 | 06–11077B15 | 47k |
| R107 | 06–11077A98 | 10k |
| R108 | 06–11077A90 | 4.7k |
| R109 | 06–11077A26 | 10 |
| R110 | 06–11077B03 | 15k |
| R111 | 06–11077A70 | 680 |
| R112 | 06–11077A84 | 2.7k |
| R113 | 06–11077A72 | 820 |
| R114,115 | 06–11077A70 | 680 |
| R116 | 06–11077A92 | 5.6k |
| R118 | 06–11077A70 | 680 |
| R119 | 06–11077A86 | 3.3k |
| R120,121 | 06–11077A88 | 3.9k |
| R122 | 06–11077A43 | 51 |
| R123 | 06–11077A34 | 22 |
| R124 | 06–11077A86 | 3.3k |
| R125 | 06–11077A70 | 680 |
| R126 | 06–11077A50 | 100 |
| R127,128 | 06–11077B07 | 22k |
| R129 | 06–11077A94 | 6.8k |
| R130 | 06–11077A82 | 2.2k |
| R131 | 06–11077B11 | 33k |
| R132,133 | 06–11077A90 | 4.7k |
| R134,135 | 06–11077A74 | 1k |
| R136 | 06–11077A50 | 100 |
| R151 | 06–11077B15 | 47k |
| R152 | 06–11077B11 | 33k |
| R153 | 06–11077B23 | 100k |
| R154 | 06–11077A34 | 22 |
| R155 | 06–11077A98 | 10k |
| R156 | 06–11077B03 | 15k |
| R157 | 06–11077A78 | 1.5k |
| R158 | 06–11077A74 | 1k |
| R160,161 | 06–11077A98 | 10k |
| R163 | 06–11077A84 | 2.7k |
| R164 | 18–05500L08 | variable, 22k |
| R165 | 06–11077B31 | 220k |
| R166 | 06–11077A74 | 1k |
| R176 | 06–11077G26 | 22.6k, ±1% |
| R177 | 06–11077G18 | 18.7k, ±1% |

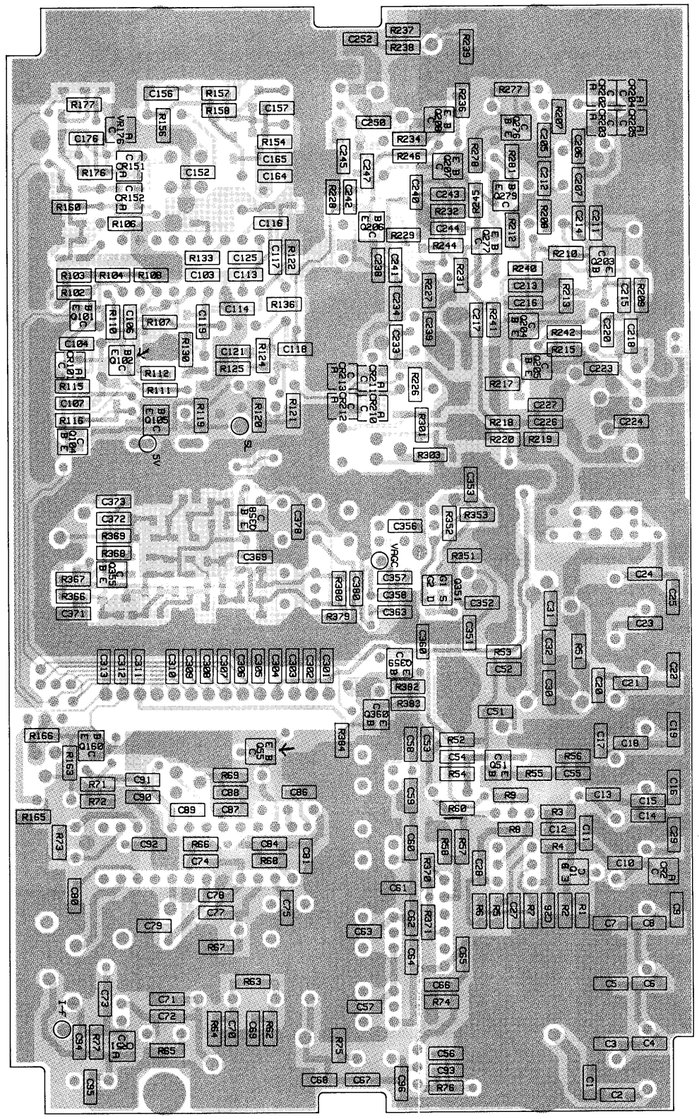
MXW–6348–B (4)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| R178,179 | 06–11077F91 | 10.0k, ±1% |
| R180 | 06–11077G52 | 42.2k, ±1% |
| R181 | 06–11077F91 | 10.0k, ±1% |
| R182 | 06–11077G28 | 23.7k, ±1% |
| R207,208 | 06–11077A44 | 56 |
| R209 | 06–11077A66 | 470 |
| R210 | 06–11077A01 | 0 |
| R211 | 06–11077A98 | 10k |
| R212,213 | 06–11077A76 | 1.2k |
| R214 | 06–11077A62 | 330 |
| R215 | 06–11077A86 | 3.3k |
| R216 | 06–11077A70 | 680 |
| R217 | 06–11077A34 | 22 |
| R218 | 06–11077A66 | 470 |
| R219 | 06–11077A28 | 12 |
| R220 | 06–11077A66 | 470 |
| R221 | 06–11077B23 | 100k |
| R222 | 06–11077B02 | 13k |
| R223 | 06–11077A94 | 6.8k |
| R224 | 06–11077B23 | 100k |
| R226,227 | 06–11077A44 | 56 |
| R228 | 06–11077A66 | 470 |
| R229 | 06–11077A01 | 0 |
| R230 | 06–11077A98 | 10k |
| R231,232 | 06–11077A76 | 1.2k |
| R233 | 06–11077A62 | 330 |
| R234 | 06–11077A86 | 3.3k |
| R235 | 06–11077A72 | 820 |
| R236 | 06–11077A34 | 22 |
| R237 | 06–11077A66 | 470 |
| R238 | 06–11077A28 | 12 |
| R239 | 06–11077A66 | 470 |
| R240 | 06–11077A74 | 1k |
| R241,242 | 06–11077A50 | 100 |
| R243 | 06–11077A54 | 150 |
| R244 | 06–11077A74 | 1k |
| R245,246 | 06–11077A50 | 100 |
| R247 | 06–11077A54 | 150 |
| R276 | 06–11077A98 | 10k |
| R277 | 06–11077A60 | 270 |
| R278 | 06–11077A26 | 10 |
| R279 | 06–11077A90 | 4.7k |
| R280 | 06–11077A98 | 10k |
| R281 | 06–11077A90 | 4.7k |
| R301 | 06–11077A34 | 22 |
| R302 | 18–05500L08 | variable, 22k |
| R303 | 06–11077B01 | 12k |
| R351 | 06–11077B23 | 100k |
| R352 | 06–11077B09 | 27k |
| R353 | 06–11077A91 | 5.1k |
| R354 | 06–11077A43 | 51 |
| R355 | 06–11077A78 | 1.5k |
| R356 | 06–11077A74 | 1k |
| R357 | 06–11077B44 | 750k |
| R358 | 06–11077B35 | 330k |
| R359 | 06–11077B27 | 150k |
| R360 | 06–11077A82 | 2.2k |
| R361 | 06–11077B08 | 24k |
| R362 | 06–11077A98 | 10k |
| R363 | 06–11077A74 | 1k |
| R364 | 06–11077A50 | 100 |
| R365 | 06–11077A84 | 2.7k |
| R366,367 | 06–11077A74 | 1k |
| R368 | 06–11077A58 | 220 |
| R369 | 06–11077A82 | 2.2k |
| R370,371 | 06–11077A89 | 4.3k |
| R372 | 06–11077A93 | 6.2k |
| R373 | 06–11077A76 | 1.2k |
| R374 | 06–11077A74 | 1k |
| R375 | 06–11077A93 | 6.2k |
| R376 | 06–11077A76 | 1.2k |
| R377 | 06–11077A74 | 1k |
| R378 | 06–11077A98 | 10k |
| R379–381 | 06–11077A92 | 5.6k |
| R382 | 06–11077A98 | 10k |
| R383 | 06–11077A90 | 4.7k |
| R384 | 06–11077A98 | 10k |
| **transformers** | | |
| T1,T2 | 25–80163M02 | balun |
| **integrated circuits** (see note) | | |
| U51 | 51–05479G05 | receiver system |
| U101 | 51–80931V01 | synthesizer |
| U103 | 51–84621K27 | regulator, 5 volt |
| U176 | 51–80932W01 | dual op–amp |
| U351 | 51–80929W01 | MC1350 |
| **voltage regulator** (see note) | | |
| VR176 | 48–80140L15 | zener, 10V |
| **crystal** (see note) | | |
| Y51 | 91–80172D01 | filter, 10.7 MHz |
| Y52 | 48–80908W01 | 10.245 MHz |
| Y151 | 48–80174D05 | 14.4 MHz |
| **non–referenced items** | | |
| | 14–05160A01 | insulator, crystal (4 used) |
| | 26–80097M01 | shield, coil can (L151) |
| | 26–80098M01 | shield, coil can (10 used) |
| | 26–80228L01 | shield, can (J4, J5) |
| | 26–80916V01 | shield, VCO frame |

10/15/89

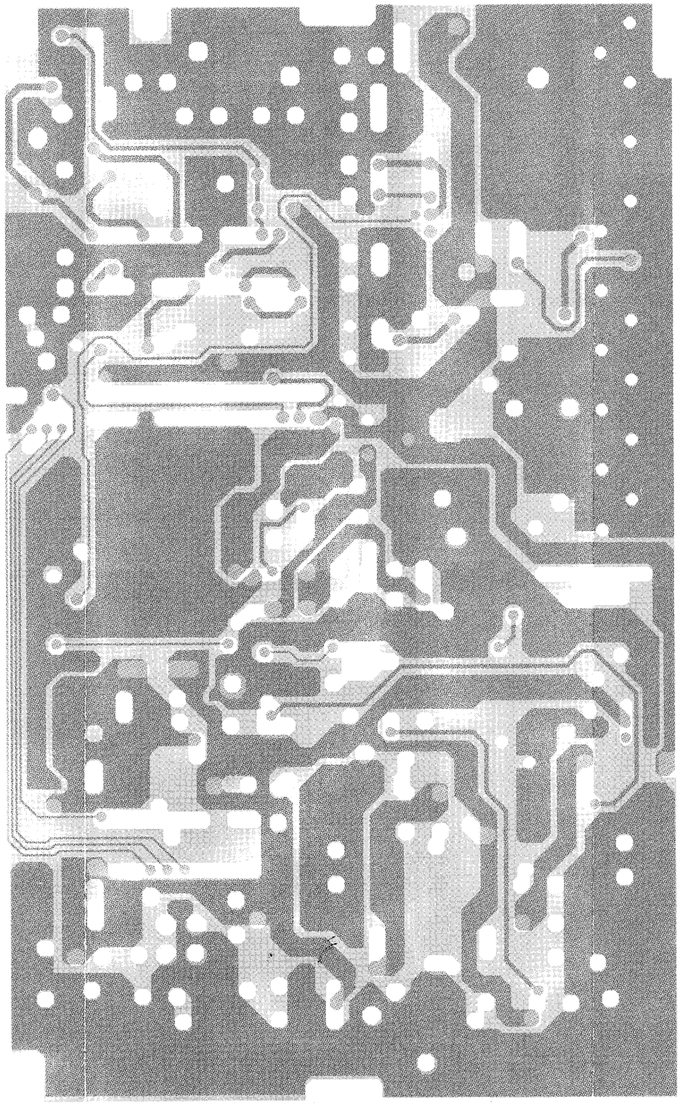
**note:** For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

Schematic, Circuit Board Diagrams, and Parts Lists for HLB4099A and HLB4101A Low Band RF Boards
**PW–6346–C**
(Sheet 3 of 4)
3/31/90



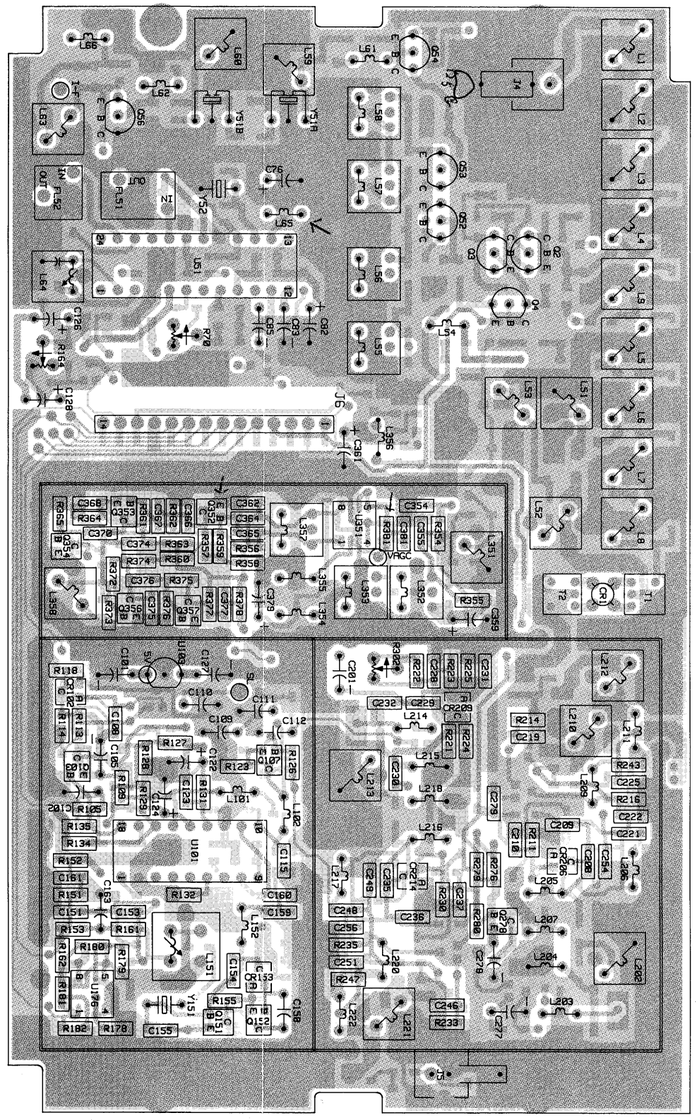
SOLDER SIDE GBW–6349–O
COMPONENT SIDE GBW–6350–O
OVERLAY GBW–6351–O

**SOLDER SIDE VIEW**



SOLDER INNER LAYER GCW–6389–O
COMPONENT INNER LAYER GCW–6390–O

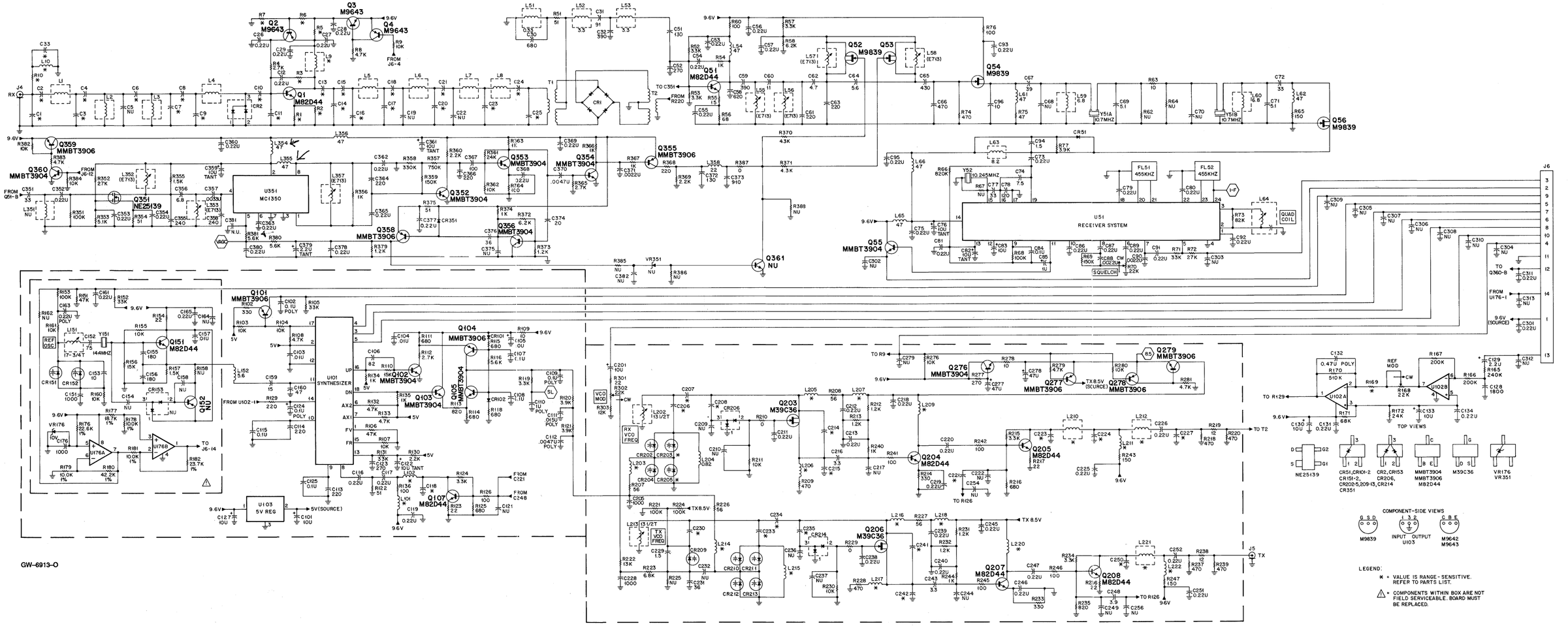
**INNER LAYERS**



SOLDER SIDE GBW–6349–O
COMPONENT SIDE GBW–6350–O
OVERLAY GBW–6391–O

**COMPONENT SIDE VIEW**

Schematic, Circuit Board Diagrams, and
Parts Lists for HLB4099A and HLB4101A
Low Band RF Boards
**PW–6346–C**
(Sheet 4 of 4)
3/31/90




Schematic, Circuit Board Diagram, and
Parts List for HLB4100A Low Band RF Board
(Early Version)
**PW–6916–A**
(Sheet 1 of 3)
3/31/90

# Range 2 Parts List

HLB4100A RF Board, 36–42 MHz — MXW–6910–O

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, chip, pF, ±5%, 50V** (unless otherwise indicated) | | |
| C1 | 21–13740B53 | 150 |
| C2 | 21–13740B74 | 1200 |
| C3 | 21–13740B63 | 390 |
| C4 | 21–13740B53 | 150 |
| C6 | 21–13740B36 | 30 |
| C8 | 21–13740B52 | 130 |
| C9 | 21–13740B65 | 470 |
| C10 | 21–13740B73 | 1000 |
| C11 | 21–13740B54 | 160 |
| C12,13 | 21–11032B15 | 0.22 uF, +80–20% |
| C15 | 21–11032B15 | 0.22 uF, +80–20% |
| C16 | 21–13740B51 | 120 |
| C17 | 21–13740B66 | 510 |
| C18 | 21–13740B55 | 180 |
| C20 | 21–13740B66 | 510 |
| C21 | 21–13740B56 | 200 |
| C23 | 21–13740B65 | 470 |
| C24 | 21–13740B61 | 330 |
| C25 | 21–13740B60 | 300 |
| C26–29 | 21–11032B15 | 0.22 uF, +80–20% |
| C30 | 21–13740B69 | 680 |
| C31 | 21–13740B48 | 91 |
| C32 | 21–13740B63 | 390 |
| C51 | 21–13740B52 | 130 |
| C52 | 21–13740B59 | 270 |
| C53–57 | 21–11032B15 | 0.22 uF, +80–20% |
| C58 | 21–13740B68 | 620 |
| C59 | 21–13740B63 | 390 |
| C60 | 21–13740B26 | 11 |
| C61 | 21–13740B57 | 220 |
| C62 | 21–13740B17 | 4.7, ±.25 pF |
| C63 | 21–13740B57 | 220 |
| C64 | 21–13740B19 | 5.6, ±.25 pF |
| C65 | 21–13740B64 | 430 |
| C66 | 21–13740B65 | 470 |
| C67 | 21–13740B39 | 39 |
| C69 | 21–13740B18 | 5.1, ±.25 pF |
| C71 | 21–13740B18 | 5.1, ±.25 pF |
| C72 | 21–13740B37 | 33 |
| C73 | 21–11032B15 | 0.22 uF, +80–20% |
| C74 | 21–13740B22 | 7.5, ±.5 pF |
| C75 | 21–11032B15 | 0.22 uF, +80–20% |
| C76 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C77 | 21–13740B37 | 33 |
| C78 | 21–13740B51 | 120 |
| C79–81 | 21–11032B15 | 0.22 uF, +80–20% |
| C82 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C83 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C84 | 21–13741B69 | 0.1 uF, ±10% |
| C85 | 23–11048B05 | 1 uF, ±20%, electrolytic |
| C86,87 | 21–11032B15 | 0.22 uF, +80–20% |
| C88 | 21–13741B29 | 0.0022 uF, ±10% |
| C89 | 21–11032B15 | 0.22 uF, +80–20% |
| C90 | 21–13741B29 | 0.0022 uF, ±10% |
| C91–93 | 21–11032B15 | 0.22 uF, +80–20% |
| C94 | 21–13740B05 | 1.5, ±.25 pF |
| C95 | 21–11032B15 | 0.22 uF, +80–20% |
| C96 | 21–13740B25 | 10, ±.5 pF |
| C101 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C102 | 08–11051A13 | 0.1 uF, 63V |
| C103,104 | 21–13741B45 | 0.01 uF, ±10% |
| C105 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C106 | 21–13740B47 | 82 |
| C107,108 | 21–13741B69 | 0.1 uF, ±10% |
| C109 | 08–11051A13 | 0.1 uF, 63V |
| C110 | 08–11044A33 | 1 uF |
| C111 | 08–11051A08 | 0.015 uF, 63V |
| C112 | 08–11051A05 | 0.0047 uF, 63V |
| C113,114 | 21–13740B57 | 220 |
| C115 | 21–13741B69 | 0.1 uF, ±10% |
| C116,117 | 21–11032B15 | 0.22 uF, +80–20% |
| C118 | 21–13740B29 | 15 |
| C119 | 21–11032B15 | 0.22 uF, +80–20% |
| C122 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C123 | 21–13740B59 | 270 |
| C124 | 08–11051A13 | 0.1 uF, 63V |
| C125 | 21–13741B69 | 0.1 uF, ±10% |
| C127 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C128 | 21–13740B78 | 1800 |
| C129 | 23–11048B06 | 2.2 uF, ±20%, electrolytic |
| C130 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C131 | 21–11032B15 | 0.22 uF, +80–20% |
| C132 | 08–11051A17 | 0.47 uF, 63V |
| C133 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C134 | 21–11032B15 | 0.22 uF, +80–20% |
| C151 | 21–13740B73 | 1000 |
| C152 | 21–13740B46 | 75 |
| C153 | 21–13740B25 | 10, ±.5 pF |
| C155,156 | 21–13740B55 | 180 |
| C157 | 21–13741B45 | 0.01 uF, ±10% |
| C159 | 21–13740B29 | 15 |
| C160 | 21–13740B41 | 47 |
| C161 | 21–11032B15 | 0.22 uF, +80–20% |
| C163 | 08–11051A15 | 0.22 uF, 63V |
| C165 | 21–11032B15 | 0.22 uF, +80–20% |
| C176 | 21–13740B73 | 1000 |
| C201 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C205 | 21–13740B73 | 1000 |
| C206 | 21–13740B38 | 36 |

MXW–6910–O (2)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| C207 | 21–13740B35 | 27 |
| C208 | 21–13740B17 | 4.7, ±.25 pF |
| C211–213 | 21–11032B15 | 0.22 uF, +80–20% |
| C214,215 | 21–13740B35 | 27 |
| C216 | 21–13740B13 | 3.3, ±.25 pF |
| C218–220 | 21–11032B15 | 0.22 uF, +80–20% |
| C221 | 21–13740B09 | 2.2, ±.25 pF |
| C223 | 21–13740B23 | 8.2, ±.5 pF |
| C224 | 21–13740B39 | 39 |
| C225,226 | 21–11032B15 | 0.22 uF, +80–20% |
| C227 | 21–13740B37 | 33 |
| C228 | 21–13740B73 | 1000 |
| C229 | 21–13740B05 | 1.5, ±.25 pF |
| C230 | 21–13740B17 | 4.7, ±.25 pF |
| C231 | 21–13740B38 | 36 |
| C233 | 21–13740B49 | 100 |
| C234 | 21–13740B38 | 36 |
| C235 | 21–13740B17 | 4.7, ±.25 pF |
| C238–240 | 21–11032B15 | 0.22 uF, +80–20% |
| C241,242 | 21–13740B31 | 18 |
| C243 | 21–13740B13 | 3.3, ±.25 pF |
| C245–247 | 21–11032B15 | 0.22 uF, +80–20% |
| C248 | 21–13740B15 | 3.9, ±.25 pF |
| C250 | 21–13740B31 | 18 |
| C251,252 | 21–11032B15 | 0.22 uF, +80–20% |
| C277,278 | 23–11048B19 | 47 uF, ±20%, 16V |
| C301 | 21–11032B15 | 0.22 uF, +80–20% |
| C311 | 21–11032B15 | 0.22 uF, +80–20% |
| C351 | 21–13740B37 | 33 |
| C352–354 | 21–11032B15 | 0.22 uF, +80–20% |
| C355 | 21–13740B58 | 240 |
| C356 | 21–13740B21 | 6.8, ±.5 pF |
| C357 | 21–13741B33 | 0.0033 uF, ±10% |
| C358 | 21–13740B58 | 240 |
| C359 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C360 | 21–11032B15 | 0.22 uF, +80–20% |
| C361 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C362,363 | 21–11032B15 | 0.22 uF, +80–20% |
| C364 | 21–13740B57 | 220 |
| C365 | 21–11032B15 | 0.22 uF, +80–20% |
| C366 | 21–13740B57 | 220 |
| C367 | 21–13740B49 | 100 |
| C368,369 | 21–11032B15 | 0.22 uF, +80–20% |
| C370 | 21–13741B37 | 0.0047 uF, ±10% |
| C371 | 21–13741B29 | 0.0022 uF, ±10% |
| C372 | 21–13740B52 | 130 |
| C373 | 21–13740B72 | 910 |
| C374 | 21–13740B32 | 20 |
| C376 | 21–13740B38 | 36 |
| C377,C378 | 21–11032B15 | 0.22 uF, +80–20% |
| C379 | 23–11049A09 | 2.2 uF, ±10%, 20V, tantalum |
| C380 | 21–11032B15 | 0.22 uF, +80–20% |
| **diode** (see note) | | |
| CR1 | 48–80236E16 | quad Schottky, crossed |
| CR2 | 48–80154K03 | dual Schottky, SOT |
| CR51 | 48–05129M76 | silicon, SOT |
| CR101,102 | 48–05129M76 | silicon, SOT |
| CR151,152 | 48–80006E10 | silicon varactor, SOT |
| CR202–205 | 48–80006E10 | silicon varactor, SOT |
| CR206 | 48–80154K03 | dual Schottky, SOT |
| CR209 | 48–80006E10 | silicon varactor, SOT |
| CR210–213 | 48–80991T01 | silicon varactor, SOT |
| CR214 | 48–80154K03 | dual Schottky, SOT |
| CR351 | 48–80939T01 | barrier Schottky |
| **filters** | | |
| FL51 | 91–80097D05 | 455 kHz, 6E |
| FL52 | 91–80098D05 | 455 kHz, 4E |
| **connector, receptacle** | | |
| J4,5 | 09–80135M01 | coaxial (RX, TX) |
| J6 | 09–80130M03 | 14–pin socket (logic board) |
| **coil** | | |
| L1–8 | 24–80148M21 | 9–1/2 turns (white) |
| L9 | 24–80063M31 | 47 uH |
| L51 | 24–80063M07 | 0.33 uH |
| L52,53 | 24–80063M19 | 3.3 uH |
| L54 | 24–80063M31 | 47 uH |
| L55–58 | 24–80164M01 | tunable, 0.7 uH |
| L59,60 | 24–80063M23 | 6.8 uH |
| L61,62 | 24–80063M31 | 47 uH |
| L63 | 24–80063M24 | 8.2 uH |
| L64 | 25–80000E01 | tunable, 455 kHz |
| L65,66 | 24–80063M31 | 47 uH |
| L101 | 24–80063M24 | 8.2 uH |
| L102 | 24–80063M10 | 0.56 uH |
| L151 | 24–80299D01 | tunable, 17–3/4 turns |
| L152 | 24–80063M22 | 5.6 uH |
| L202 | 24–80931W26 | tunable, 13–1/2 turns |
| L203 | 24–80063M23 | 6.8 uH |
| L204 | 24–80063M12 | 0.82 uH |
| L205–207 | 24–80063M23 | 6.8 uH |
| L209 | 24–80063M23 | 6.8 uH |
| L210 | 24–80063M12 | 0.82 uH |
| L211 | 24–80063M23 | 6.8 uH |
| L212 | 24–80063M06 | 0.27 uH |
| L213 | 24–80931W26 | tunable, 13–1/2 turns |
| L214 | 24–80063M24 | 8.2 uH |
| L215 | 24–80063M12 | 0.82 uH |
| L216–218 | 24–80063M24 | 8.2 uH |

MXW–6910–O (3)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| L220 | 24–80063M24 | 8.2 uH |
| L221 | 24–80063M10 | 0.56 uH |
| L222 | 24–80063M24 | 8.2 uH |
| L352,353 | 24–80164M01 | tunable, 0.7 uH |
| L354–356 | 24–80063M31 | 47 uH |
| L357 | 24–80164M01 | tunable, 0.7 uH |
| L358 | 24–80063M27 | 22 uH |
| **transistor** (see note) | | |
| Q1 | 48–80182D44 | NPN |
| Q2–4 | 48–11043C06 | PNP |
| Q51 | 48–80182D44 | NPN |
| Q52–54 | 48–11043C12 | FET |
| Q55 | 48–80214G02 | NPN |
| Q56 | 48–11043C12 | FET |
| Q101 | 48–05128M16 | PNP |
| Q102,103 | 48–80214G02 | NPN |
| Q104 | 48–05128M16 | PNP |
| Q105 | 48–80214G02 | NPN |
| Q107 | 48–80182D44 | NPN |
| Q151 | 48–80182D44 | NPN |
| Q203 | 48–80141L06 | FET |
| Q204,205 | 48–80182D44 | NPN |
| Q206 | 48–80141L06 | FET |
| Q207,208 | 48–80182D44 | NPN |
| Q276 | 48–80214G02 | NPN |
| Q277–279 | 48–05128M16 | PNP |
| Q351 | 48–80930W01 | dual gate FET |
| Q352–354 | 48–80214G02 | NPN |
| Q355 | 48–05128M16 | PNP |
| Q356,357 | 48–80214G02 | NPN |
| Q358,359 | 48–05128M16 | PNP |
| Q360 | 48–80214G02 | NPN |
| **resistor, chip, ohm, ±5%, 1/8 watt** (unless otherwise indicated) | | |
| R2 | 06–11077A29 | 13 |
| R3 | 06–11077A68 | 560 |
| R4 | 06–11077A84 | 2.7k |
| R5 | 06–11077A56 | 180 |
| R6 | 06–11077A98 | 10k |
| R7 | 06–11077A94 | 6.8K |
| R8 | 06–11077A90 | 4.7k |
| R9 | 06–11077A98 | 10k |
| R51 | 06–11077A43 | 51 |
| R52,53 | 06–11077A86 | 3.3k |
| R54 | 06–11077A74 | 1k |
| R55 | 06–11077A30 | 15 |
| R56 | 06–11077A46 | 68 |
| R57 | 06–11077A86 | 3.3k |
| R58 | 06–11077A93 | 6.2k |
| R60 | 06–11077A50 | 100 |
| R63 | 06–11077A26 | 10 |
| R65 | 06–11077A54 | 150 |
| R66 | 06–11077B45 | 820k |
| R68 | 06–11077B23 | 100k |
| R69 | 06–11077B27 | 150k |
| R70 | 18–05500L08 | variable, 22k |
| R71 | 06–11077B11 | 33k |
| R72 | 06–11077B09 | 27k |
| R73 | 06–11077B21 | 82k |
| R74 | 06–11077A66 | 470 |
| R75 | 06–11077A42 | 47 |
| R76 | 06–11077A50 | 100 |
| R77 | 06–11077A88 | 3.9k |
| R102 | 06–11077A62 | 330 |
| R103,104 | 06–11077A98 | 10k |
| R105 | 06–11077B11 | 33k |
| R106 | 06–11077B15 | 47k |
| R107 | 06–11077A98 | 10k |
| R108 | 06–11077A90 | 4.7k |
| R109 | 06–11077A26 | 10 |
| R110 | 06–11077B03 | 15k |
| R111 | 06–11077A70 | 680 |
| R112 | 06–11077A84 | 2.7k |
| R113 | 06–11077A72 | 820 |
| R114,115 | 06–11077A70 | 680 |
| R116 | 06–11077A92 | 5.6k |
| R118 | 06–11077A70 | 680 |
| R119 | 06–11077A86 | 3.3k |
| R120,121 | 06–11077A88 | 3.9k |
| R122 | 06–11077A43 | 51 |
| R123 | 06–11077A34 | 22 |
| R124 | 06–11077A86 | 3.3k |
| R125 | 06–11077A70 | 680 |
| R126 | 06–11077A50 | 100 |
| R129 | 06–11077A58 | 220 |
| R130 | 06–11077A82 | 2.2k |
| R131 | 06–11077B11 | 33k |
| R132,133 | 06–11077A90 | 4.7k |
| R134,135 | 06–11077A74 | 1k |
| R136 | 06–11077A50 | 100 |
| R151 | 06–11077B15 | 47k |
| R152 | 06–11077B11 | 33k |
| R153 | 06–11077B23 | 100k |
| R154 | 06–11077A34 | 22 |
| R155 | 06–11077A98 | 10k |
| R156 | 06–11077B03 | 15k |
| R157 | 06–11077A78 | 1.5k |
| R160,161 | 06–11077A98 | 10k |
| R164 | 18–05500L08 | variable, 22k |
| R165 | 06–11077B32 | 240k |

MXW–6910–O (4)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| R166 | 06–11077B30 | 200k |
| R167 | 06–11077B30 | 200k |
| R168 | 18–05500L08 | variable, 22k |
| R169 | 06–11077B17 | 56k |
| R170 | 06–11077B40 | 510k |
| R171 | 06–11077B19 | 68k |
| R172 | 06–11077B08 | 24k |
| R176 | 06–11077G26 | 22.6k, ±1% |
| R177 | 06–11077G18 | 18.7k, ±1% |
| R178,179 | 06–11077F91 | 10.0k, ±1% |
| R180 | 06–11077G52 | 42.2k, ±1% |
| R181 | 06–11077F91 | 10.0k, ±1% |
| R182 | 06–11077G28 | 23.7k, ±1% |
| R207,208 | 06–11077A44 | 56 |
| R209 | 06–11077A66 | 470 |
| R210 | 06–11077A01 | 0 |
| R211 | 06–11077A98 | 10k |
| R212,213 | 06–11077A76 | 1.2k |
| R214 | 06–11077A62 | 330 |
| R215 | 06–11077A86 | 3.3k |
| R216 | 06–11077A70 | 680 |
| R217 | 06–11077A34 | 22 |
| R218 | 06–11077A66 | 470 |
| R219 | 06–11077A28 | 12 |
| R220 | 06–11077A66 | 470 |
| R221 | 06–11077B23 | 100k |
| R222 | 06–11077B02 | 13k |
| R223 | 06–11077A94 | 6.8k |
| R224 | 06–11077B23 | 100k |
| R226,227 | 06–11077A44 | 56 |
| R228 | 06–11077A66 | 470 |
| R229 | 06–11077A01 | 0 |
| R230 | 06–11077A98 | 10k |
| R231,232 | 06–11077A76 | 1.2k |
| R233 | 06–11077A62 | 330 |
| R234 | 06–11077A86 | 3.3k |
| R235 | 06–11077A72 | 820 |
| R236 | 06–11077A34 | 22 |
| R237 | 06–11077A66 | 470 |
| R238 | 06–11077A28 | 12 |
| R239 | 06–11077A66 | 470 |
| R240 | 06–11077A74 | 1k |
| R241,242 | 06–11077A50 | 100 |
| R243 | 06–11077A54 | 150 |
| R244 | 06–11077A74 | 1k |
| R245,246 | 06–11077A50 | 100 |
| R247 | 06–11077A54 | 150 |
| R276 | 06–11077A98 | 10k |
| R277 | 06–11077A60 | 270 |
| R278 | 06–11077A26 | 10 |
| R279 | 06–11077A90 | 4.7k |
| R280 | 06–11077A98 | 10k |
| R281 | 06–11077A90 | 4.7k |
| R301 | 06–11077A34 | 22 |
| R302 | 18–05500L08 | variable, 22k |
| R303 | 06–11077B01 | 12k |
| R351 | 06–11077B23 | 100k |
| R352 | 06–11077B09 | 27k |
| R353 | 06–11077A91 | 5.1k |
| R354 | 06–11077A43 | 51 |
| R355 | 06–11077A78 | 1.5k |
| R356 | 06–11077A74 | 1k |
| R357 | 06–11077B44 | 750k |
| R358 | 06–11077B35 | 330k |
| R359 | 06–11077B27 | 150k |
| R360 | 06–11077A82 | 2.2k |
| R361 | 06–11077B08 | 24k |
| R362 | 06–11077A98 | 10k |
| R363 | 06–11077A74 | 1k |
| R364 | 06–11077A50 | 100 |
| R365 | 06–11077A84 | 2.7k |
| R366,367 | 06–11077A74 | 1k |
| R368 | 06–11077A58 | 220 |
| R369 | 06–11077A82 | 2.2k |
| R370,371 | 06–11077A89 | 4.3k |
| R372 | 06–11077A93 | 6.2k |
| R373 | 06–11077A76 | 1.2k |
| R374 | 06–11077A74 | 1k |
| R375 | 06–11077A43 | 51 |
| R379 | 06–11077A76 | 1.2k |
| R380,R381 | 06–11077A92 | 5.6k |
| R382 | 06–11077A98 | 10k |
| R383 | 06–11077A90 | 4.7k |
| R384 | 06–11077A98 | 10k |
| R387 | 06–11077A01 | 0 |
| **transformer** | | |
| T1,T2 | 25–80163M02 | balun |
| **integrated circuit** (see note) | | |
| U51 | 51–05479G05 | receiver system |
| U101 | 51–80931V01 | synthesizer |
| U102 | 51–80056M04 | dual op–amp |
| U103 | 51–84621K27 | regulator, 5 volt |
| U176 | 51–80932W01 | dual op–amp |
| U351 | 51–80929W01 | MC1350 |
| **voltage regulator** (see note) | | |
| VR176 | 48–80140L15 | zener, 10V |

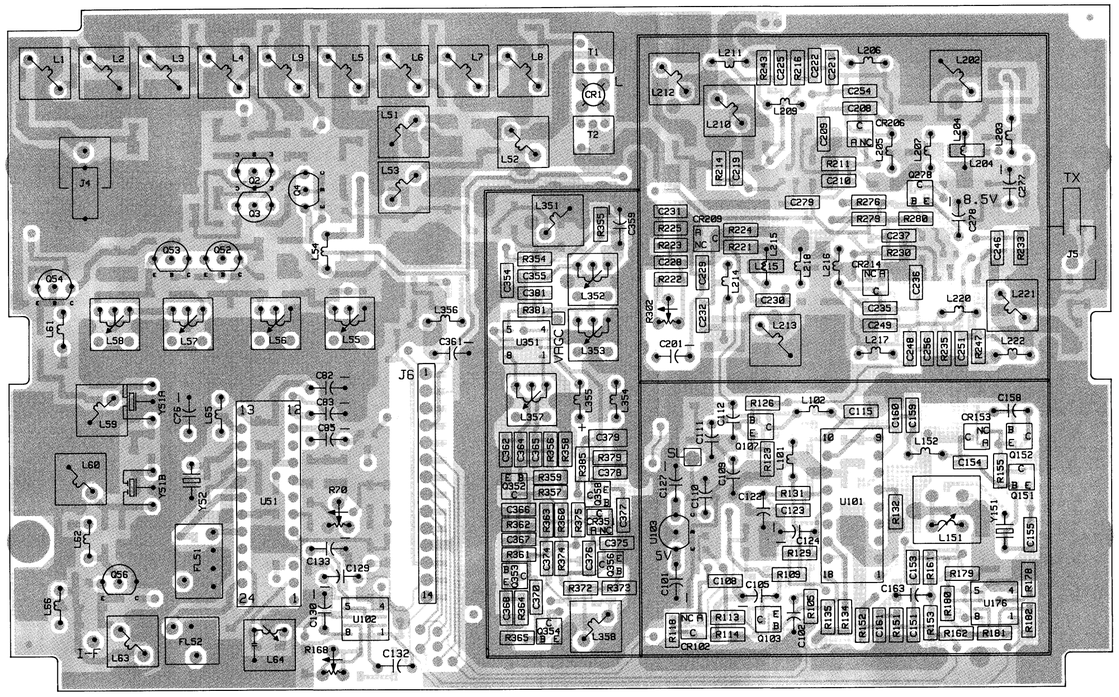
MXW–6910–O (5)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **crystal** (see note) | | |
| Y51 | 91–80172D01 | filter, 10.7 MHz |
| Y52 | 48–80908W01 | 10.245 MHz |
| Y151 | 48–80174D05 | 14.4 MHz |
| **non–referenced items** | | |
| | 14–05160A01 | insulator, crystal (4 used) |
| | 26–80097M01 | shield, coil can (L151) |
| | 26–80098M01 | shield, coil can (11 used) |
| | 26–80228L01 | shield, can (J4, J5) |
| | 26–80916V01 | shield, VCO frame |
| | 75–05295B02 | pad, crystal (4 used) |

10/15/89

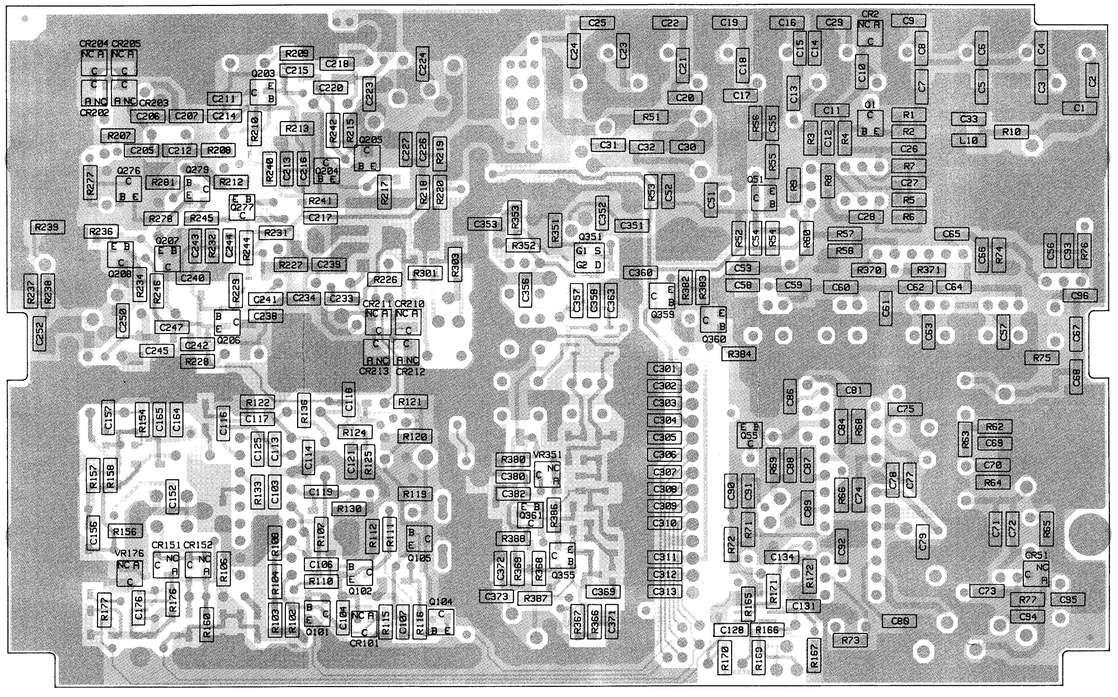
**note:** For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

Schematic, Circuit Board Diagram, and Parts List for HLB4100A Low Band RF Board (Early Version)
**PW–6916–A**
(Sheet 2 of 3)
3/31/90



COMPONENT SIDE

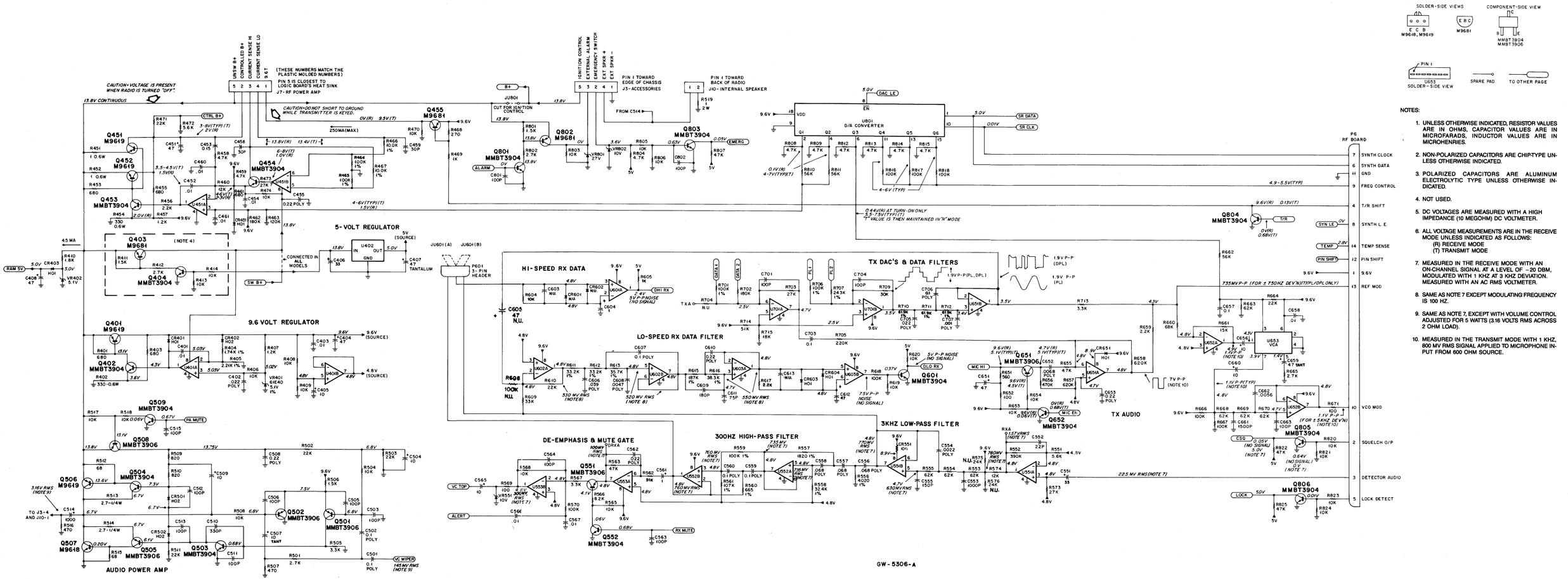
COMPONENT SIDE — GW-6915-O
SOLDER SIDE
OVERLAY — GW-6914W01-O



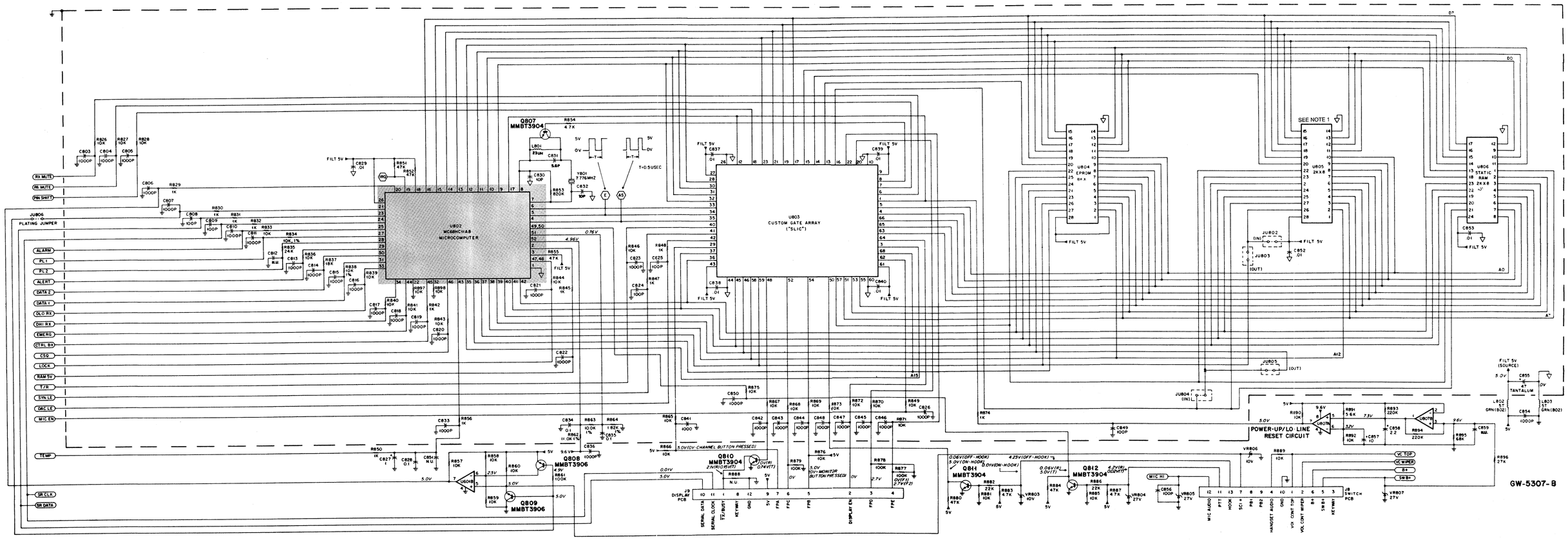
SOLDER SIDE

COMPONENT SIDE — GW-6915-O
SOLDER SIDE
OVERLAY — GW-6914W02-O

Schematic, Circuit Board Diagrams, and
Parts List for HLB4100A Low Band RF Board
(Early Version)
**PW–6916–A**
(Sheet 3 of 3)
3/31/90




Schematics, Circuit Board Diagrams, and
Parts List for Logic Board
**PW–5285–D**
(Sheet 1 of 4)
5/15/89

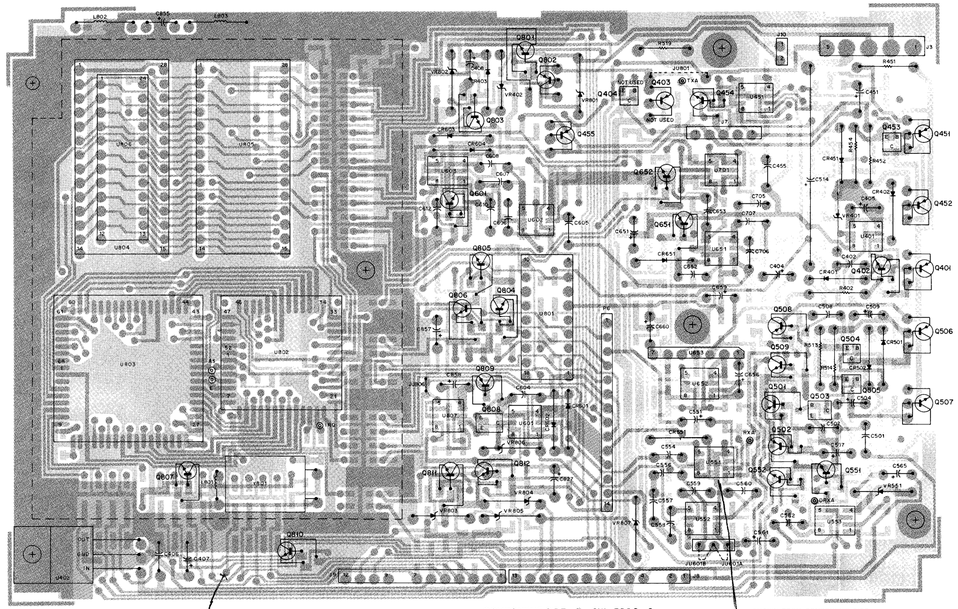



**IMPORTANT**

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

NOTE 1: EARLY MODEL USE 2KX8 NOVRAM, LATE MODELS USE 2KX8 EEPROM.

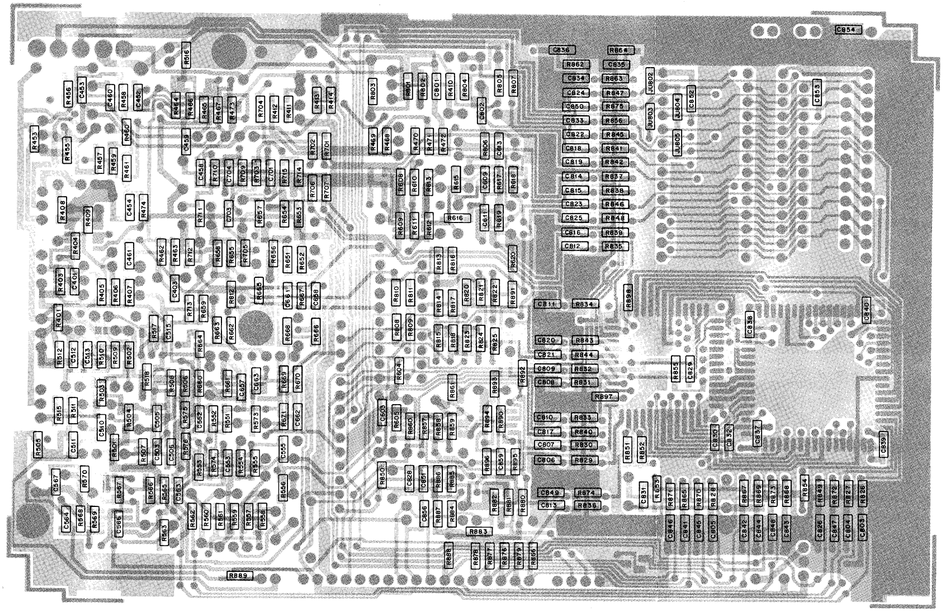
Schematics, Circuit Board Diagrams, and Parts List for Logic Board
**PW–5285–D**
(Sheet 2 of 4)
5/15/89



COMPONENT SIDE GW-5299-0
SOLDER SIDE GW-5298-0
OVERLAY — GW-5300-A

SHOWN FROM COMPONENT SIDE

U551



COMPONENT SIDE GW-5302-0
SOLDER SIDE GW-5301-0
OVERLAY — GW-5303-0

SHOWN FROM SOLDER SIDE

Schematics, Circuit Board Diagrams, and
Parts List for Logic Board
**PW–5285–D**
(Sheet 3 of 4)
5/15/89

# parts list

HLN5402A Logic Board — MXW–5310–D

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| **capacitor, fixed, pF, ±5%, 50V** (unless otherwise indicated) | | |
| C401 | 21–13741B45 | 0.01 uF, ±10% |
| C402 | 08–11051A09 | 0.022 uF, 63V |
| C403 | 21–13741B45 | 0.01 uF, ±10% |
| C404 | 23–11048B19 | 47 uF, ±20%, 16V, electrolytic |
| C405 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C406 | 23–11048A17 | 33 uF, ±20%, 16V, electrolytic |
| C407 | 23–11013A56 | 47 uF, ±20%, 6V, tantalum |
| C408 | 23–11048B19 | 47 uF, ±20%, 16V, electrolytic |
| C451 | 23–11048B19 | 47 uF, ±20%, 16V, electrolytic |
| C452 | 21–13741B45 | 0.01 uF, ±10% |
| C453 | 21–13741B69 | 0.1 uF, +80–20% |
| C454 | 21–13741B45 | 0.01 uF, ±10% |
| C455 | 08–11051A15 | 0.22 uF, 63V |
| C458,459 | 21–13740B36 | 30 |
| C460,461 | 21–13741B45 | 0.01 uF, ±10% |
| C501,502 | 08–11051A13 | 0.1 uF, 63V |
| C503 | 21–13740B49 | 100 |
| C504 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C505,506 | 21–13740B49 | 100 |
| C507 | 23–11013D13 | 10 uF, ±10%, 20V, tantalum |
| C508 | 08–11051A15 | 0.22 uF, 63V |
| C509 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C510 | 21–13740B61 | 330 |
| C511–513 | 21–13740B49 | 100 |
| C514 | 23–02308M01 | 1000 uF, ±20%, 16V, electrolytic |
| C515 | 21–13740B49 | 100 |
| C551 | 23–11048A17 | 33 uF, ±20%, 16V, electrolytic |
| C552 | 21–13740B33 | 22 |
| C553 | 21–13740B73 | 1000 |
| C554 | 08–11051A03 | 0.0022 uF, 63V |
| C555 | 21–13740B53 | 150 |
| C556–558 | 08–11051A12 | 0.068 uF, 63V |
| C559,560 | 08–11051A13 | 0.1 uF, 63V |
| C561 | 23–11048B05 | 1 uF, ±20%, electrolytic |
| C562 | 08–11051A09 | 0.022 uF, 63V |
| C563,564 | 21–13740B49 | 100 |
| C565 | 23–11048B13 | 10 uF ±20%, 16V, electrolytic |
| C566,567 | 21–13741B45 | 0.01 uF, ±10% |
| C604 | 23–11048B05 | 1 uF, ±20%, electrolytic |
| C606 | 08–11044A22 | 0.039 uF, 63V |
| C607 | 08–11051A13 | 0.1 uF, 63V |
| C608 | 08–11051A05 | 0.0047 uF, 63V |
| C609 | 21–13740B55 | 180 |
| C610 | 08–11051A15 | 0.22 uF, 63V |
| C611 | 21–13740B46 | 75 |
| C612 | 23–11048B19 | 47 uF, ±20%, 16V, electrolytic |
| C651 | 23–11048B19 | 47 uF, ±20%, 16V, electrolytic |
| C652 | 08–11051A06 | 0.0068 uF, 63V |
| C653 | 08–11051A15 | 0.22 uF, 63V |
| C656 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C657 | 21–13741B69 | 0.1 uF, +80–20% |
| C658 | 21–13741B45 | 0.01 uF, ±10% |
| C659 | 23–11013A56 | 47 uF, ±20%, 6V, tantalum |
| C660 | 23–11048B13 | 10 uF, ±20%, 16V, electrolytic |
| C661 | 21–13740B76 | 1500 |
| C662 | 21–13741B39 | 0.0056 |
| C663 | 21–13740B49 | 100 |
| C701 | 21–13740B78 | 1800 |
| C703 | 21–13741B69 | 0.1 uF, +80–20% |
| C704 | 21–13740B49 | 100 |
| C705 | 08–11051A09 | 0.022 uF, 63V |
| C706 | 08–11051A13 | 0.1 uF, 63V |
| C707 | 08–11051A01 | 0.001 uF, 63V |
| C801,802 | 21–13740B49 | 100 |
| C803–807 | 21–13740B73 | 1000 |
| C808,809 | 21–13740B49 | 100 |
| C810,811 | 21–13740B73 | 1000 |
| C813–823 | 21–13740B73 | 1000 |
| C824,825 | 21–13740B49 | 100 |
| C826 | 21–13740B73 | 1000 |
| C827 | 23–11048B05 | 1 uF, ±20%, electrolytic |
| C828 | 21–13741B69 | 0.1 uF, +80–20% |
| C829 | 21–13741B45 | 0.01 uF, ±10% |
| C830 | 21–13740B25 | 10, ±.5 pF |
| C831 | 21–11031F10 | 5.6, ±.5 pF |
| C832 | 21–13740B25 | 10, ±.5 pF |
| C833 | 21–13740B73 | 1000 |
| C834,835 | 21–13741B69 | 0.1 uF, +80–20% |
| C836 | 21–13740B73 | 1000 |
| C837–840 | 21–13741B45 | 0.01 uF, ±10% |
| C841–848 | 21–13740B73 | 1000 |
| C849 | 21–13740B49 | 100 |
| C850 | 21–13740B73 | 1000 |
| C852,853 | 21–13741B45 | 0.01 uF, ±10% |
| C854 | 21–13740B73 | 1000 |
| C855 | 23–11054A09 | 47 uF, ±20%, 6V, tantalum |
| C856 | 21–13740B49 | 100 |
| C857 | 23–11048B13 | 10 uF, +20%, 16V, electrolytic |
| C858 | 08–11051A15 | 0.22 uF, 63V |
| C868 | 21–13740B49 | 100 |
| **diode** (see note) | | |
| CR401 | 48–83654H01 | silicon |
| CR402 | 48–83654H02 | silicon |
| CR403 | 48–83654H01 | silicon |
| CR451 | 48–83654H01 | silicon |
| CR501,502 | 48–83654H02 | silicon |
| CR551 | 06–11009B23 | jumper resistor |
| CR603 | 48–83654H01 | silicon |

MXW–5310–D (2)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| CR604 | 48–83654H01 | silicon |
| CR651 | 48–83654H01 | silicon |
| **connector, receptacle** | | |
| J3 | 28–80129M01 | 5–pin, accessories |
| J7 | 28–80128M01 | 5–pin, RF power amplifier |
| J8 | 28–80126M01 | 23–pin |
| J10 | 28–80128M02 | 2–pin, internal speaker jumper |
| J601 | 09–84181L01 | 2–pin push–on |
| J801 | 06–11009B23 | 0–ohm resistor |
| J802 | 06–11024B23 | 0–ohm resistor |
| J804 | 06–11024B23 | 0–ohm resistor |
| **coil** | | |
| L801 | 24–82723H35 | 23 uH |
| L802,803 | 24–83961B02 | 5 turns, green |
| **connector, plug** | | |
| P6 | 28–80127M02 | 14–pin, RF board |
| P601 | 28–80250B02 | 3–pin, for JU601 |
| **transistor** (see note) | | |
| Q401 | 48–00869619 | PNP |
| Q402 | 48–80214G02 | NPN |
| Q451,452 | 48–00869619 | PNP |
| Q453,454 | 48–80214G02 | NPN |
| Q455 | 48–11043C10 | PNP |
| Q501,502 | 48–05128M16 | PNP |
| Q503,504 | 48–80214G02 | NPN |
| Q505 | 48–05128M16 | PNP |
| Q506 | 48–00869619 | PNP |
| Q507 | 48–00869618 | NPN |
| Q508 | 48–05128M16 | PNP |
| Q509 | 48–80214G02 | NPN |
| Q551 | 48–05128M16 | PNP |
| Q552 | 48–80214G02 | NPN |
| Q601 | 48–80214G02 | NPN |
| Q651 | 48–05128M16 | PNP |
| Q652 | 48–80214G02 | NPN |
| Q801 | 48–80214G02 | NPN |
| Q802 | 48–11043C10 | PNP |
| Q803–807 | 48–80214G02 | NPN |
| Q808,809 | 48–05128M16 | PNP |
| Q810–812 | 48–80214G02 | NPN |
| **resistor, fixed, ohm, +5%, 1/8 watt** (unless otherwise specified) | | |
| R401 | 06–11077A70 | 680 |
| R402 | 06–02369M31 | 330, 0.6W, metal film |
| R403 | 06–11077A70 | 680 |
| R404 | 06–11077F18 | 1.74k, ±1% |
| R405 | 06–11077F28 | 2.21k, ±1% |
| R406 | 06–11077A98 | 10k |
| R407 | 06–11077A76 | 1.2k |
| R408,409 | 06–11077A98 | 10k |
| R410 | 06–11077A80 | 1.8k |
| R451,452 | 06–02369M01 | 1, 0.6W, metal film |
| R453 | 06–11077A70 | 680 |
| R454 | 06–02369M31 | 330, 0.6W, metal film |
| R455 | 06–11077A70 | 680 |
| R456 | 06–11077A82 | 2.2k |
| R457 | 06–11077A76 | 1.2k |
| R458,459 | 06–11077A90 | 4.7k |
| R460 | 06–11077B01 | 12k |
| R461 | 06–11077A70 | 680 |
| R462 | 06–11077B29 | 180k |
| R463 | 06–11077B25 | 120k |
| R464,465 | 06–11077G88 | 100k, ±1% |
| R466,467 | 06–11077F91 | 10k, ±1% |
| R468 | 06–11077A60 | 270 |
| R469 | 06–11077A74 | 1k |
| R470 | 06–11077A98 | 10k |
| R471 | 06–11077B07 | 22k |
| R472 | 06–11077A92 | 5.6k |
| R473 | 06–11077B09 | 27k |
| R474 | 06–11077A98 | 10k |
| R501 | 06–11077A84 | 2.7k |
| R502,503 | 06–11077B07 | 22k |
| R504 | 06–11077A98 | 10k |
| R505 | 06–11077A86 | 3.3k |
| R506 | 06–11077A78 | 1.5k |
| R507 | 06–11077A66 | 470 |
| R508 | 06–11077A98 | 10k |
| R509,510 | 06–11077A72 | 820 |
| R511 | 06–11077B07 | 22k |
| R512 | 06–11077A46 | 68 |
| R513,514 | 06–11009B23 | 2.7, 1/4W, carbon |
| R515 | 06–11077A46 | 68 |
| R516 | 06–11077A66 | 470 |
| R517,518 | 06–11077A98 | 10k |
| R519 | 06–80185M01 | 1, 2W, metal plate |
| R551 | 06–11077B01 | 12k |
| R552 | 06–11077B37 | 390k |
| R553 | 06–11077B19 | 68k |
| R554–555 | 06–11077B18 | 62k |
| R556 | 06–11077F53 | 4.02k, ±1% |
| R557 | 06–11077F20 | 1.82k, ±1% |
| R558 | 06–11077G41 | 32.4k, ±1% |
| R559 | 06–11077G88 | 100k, ±1% |
| R560 | 06–11077E77 | 665, ±1% |
| R561 | 06–11077G91 | 107k, ±1% |
| R562 | 06–11077B11 | 33k |
| R563 | 06–11077B15 | 47k |

MXW–5310–D (3)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| R565 | 06–11077A98 | 10k |
| R566 | 06–11077A96 | 8.2k |
| R567 | 06–11077A86 | 3.3k |
| R568 | 06–11077A98 | 10k |
| R569 | 06–11077A42 | 47 |
| R570 | 06–11077B17 | 56k |
| R573 | 06–11077B09 | 27k |
| R574 | 06–11077A01 | 0 |
| R604 | 06–11077A98 | 10k |
| R605 | 06–11077A74 | 1k |
| R609 | 06–11077B11 | 33k |
| R610 | 06–11077B07 | 22k |
| R611,612 | 06–11077G42 | 33.2k, ±1% |
| R613 | 06–11077G45 | 35.7k, ±1% |
| R615 | 06–11024J15 | 187k, ±1% |
| R616 | 06–11077G48 | 38.3k, ±1% |
| R617 | 06–11077A82 | 2.2k |
| R618 | 06–11077B23 | 100k |
| R619,620 | 06–11077A98 | 10k |
| 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 |
| R659 | 06–11077A82 | 2.2k |
| R660 | 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 |
| R668–670 | 06–11077B18 | 62k |
| R671 | 06–11077A50 | 100 |
| R701 | 06–11077G88 | 100k, ±1% |
| R702 | 06–11077H13 | 178k |
| R703 | 06–11077G31 | 25.5k |
| R705 | 06–11077H13 | 178k |
| R706 | 06–11077G88 | 100k, ±1% |
| R707 | 06–11024J26 | 243k, ±1% |
| R709 | 06–11077B10 | 30k |
| R710–712 | 06–11077G68 | 61.9k, ±1% |
| R713 | 06–11077A86 | 3.3k |
| R714 | 06–11077B16 | 51k |
| R715 | 06–11077B05 | 18k |
| R801 | 06–11077A78 | 1.5k |
| R802 | 06–11077A84 | 2.7k |
| R803 | 06–11077A98 | 10k |
| R804 | 06–11077A90 | 4.7k |
| R805,806 | 06–11077A98 | 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 |
| R822 | 06–11077B15 | 47k |
| R823,824 | 06–11077A98 | 10k |
| R825 | 06–11077B15 | 47k |
| R826–828 | 06–11077A98 | 10k |
| R829–832 | 06–11077A74 | 1k |
| R833 | 06–11077A98 | 10k |
| R834 | 06–11077F91 | 10k, ±1% |
| R835 | 06–11077B08 | 24k |
| R836 | 06–11077A98 | 10k |
| R837 | 06–11077B05 | 18k |
| R838 | 06–11077F91 | 10k, ±1% |
| R839–841 | 06–11077A98 | 10k |
| R842 | 06–11077A74 | 1k |
| R843,844 | 06–11077A98 | 10k |
| R845 | 06–11077A74 | 1k |
| R846 | 06–11077A98 | 10k |
| R847,848 | 06–11077A74 | 1k |
| R849 | 06–11077A98 | 10k |
| R850 | 06–11077A74 | 1k |
| R851,852 | 06–11077B15 | 47k |
| R853 | 06–11077B45 | 820k |
| R854 | 06–11077A90 | 4.7k |
| R855 | 06–11077B15 | 47k |
| R856 | 06–11077A74 | 1k |
| R857–860 | 06–11077A98 | 10k |
| R861 | 06–11077B23 | 100k |
| R862 | 06–11077F95 | 11k, ±1% |
| R863 | 06–11077F91 | 10k, ±1% |
| R864 | 06–11077F20 | 1.82k, ±1% |
| R865–873 | 06–11077A98 | 10k |
| R874 | 06–11077A74 | 1k |
| R875,876 | 06–11077A98 | 10k |
| R877–879 | 06–11077B23 | 100k |
| R880 | 06–11077B15 | 47k |
| R881 | 06–11077A98 | 10k |
| R882 | 06–11077B07 | 22k |
| R883 | 06–11077A90 | 4.7k |
| R884 | 06–11077B15 | 47k |
| R885 | 06–11077A98 | 10k |
| R886 | 06–11077B07 | 22k |
| R887 | 06–11077A90 | 4.7k |
| R889,890 | 06–11077A98 | 10k |

MXW–5310–D (4)

| REFERENCE SYMBOL | MOTOROLA PART NO. | DESCRIPTION |
|---|---|---|
| R891 | 06–11077A92 | 5.6k |
| R892 | 06–11077A98 | 10k |
| R893,894 | 06–11077B31 | 220k |
| R895 | 06–11077B19 | 68k |
| R896 | 06–11077B09 | 27k |
| R897,898 | 06–11077A98 | 10k |
| **integrated circuit** (see note) | | |
| U401 | 51–80056M04 | dual op–amp |
| U402 | 51–80068C06 | regulator |
| U451 | 51–80056M04 | dual op–amp |
| U551–553 | 51–80056M04 | dual op–amp |
| U601 | 51–80056M01 | dual comparator |
| U602,603 | 51–80056M04 | dual op–amp |
| U651,652 | 51–80056M04 | dual op–amp |
| U653 | 51–80059M01 | voltage–controlled attenuator |
| U701 | 51–80056M04 | dual op–amp |
| U801 | 51–80135C10 | D/A converter |
| U802 | 51–80960T01 | microcomputer |
| U803 | 51–82862N09 | logic array |
| U804 | 51–99003D02 | EPROM 8KX8 |
| U805 | 51–80057M01 | NOVRAM, 2KX8, early models |
| U805 | 51–80901W01 | EEPROM, 2KX8, late models |
| U806 | 51–80914V01 | static RAM, 2KX8 |
| U807 | 51–80056M01 | dual comparator |
| **voltage regulators** (see note) | | |
| VR401 | 48–83461E40 | zener, 5.1V |
| VR402 | 48–82256C15 | zener, 5.1V |
| VR551 | 48–82256C11 | zener, 10V |
| VR801 | 48–82256C20 | zener, 27V |
| VR802,803 | 48–82256C11 | zener, 10V |
| VR804,805 | 48–82256C20 | zener, 27V |
| VR806 | 48–82256C11 | zener, 10V |
| VR807 | 48–82256C20 | zener, 27V |
| **crystal** (see nore) | | |
| Y151 | 48–80173D09 | 7.776 MHz |

**non–referenced items**

| | | |
|---|---|---|
| | 03–10943M04 | screw, M2.5 X 8 (5 used) |
| | 04–00001718 | washer (4 used) |
| | 07–80925T01 | bracket, heat sink |
| | 09–82071K09 | 14–pin socket (2 used) |
| | 14–80145M01 | insulator, accessory |
| | 14–82369E13 | insulator, accessory connector |
| | 14–83820M05 | insulator, head conductive |
| | 15–80076M01 | plastic housing |
| | 26–80123M01 | shield frame, high speed logic |
| | 26–80125L02 | heat sink, audio/regulator |
| | 42–80940T01 | ring, retaining |

5/15/89

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

Schematics, Circuit Board Diagrams, and Parts List for Logic Board
**PW–5285–D**
(Sheet 4 of 4)
5/15/89

END OF DOCUMENT