MOTOROLA
Mobile Products Division

MaxTrac Two–Way FM Radio

Note: Revisions WMR-0447, WMR-0462, FMR-1626-1, and FMR-1725-1 have been incorporated.

Contents

THIS MANUAL HAS BEEN
DISCONTINUED

technical publication services
5555 North Beach Street, Fort Worth, Texas 76137
68P80102W84–O
5/21/90

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.

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.

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.

Model Chart for Front Panel For *MaxTrac* Radios

CODE:

● = ONE ITEM SUPPLIED

ITEM	DESCRIPTION	HCN1048A	HCN3293A	HCN1049A	HCN3292A	HCN1043A	HCN3217A
	MODEL						
	DESCRIPTION	FRONT PANEL, 2 FREQUENCY	FRONT PANEL, 2 FREQUENCY	FRONT PANEL, 6 FREQUENCY	FRONT PANEL, 6 FREQUENCY	FRONT PANEL, 16 FREQUENCY	FRONT PANEL, 32 FREQUENCY
HLN5174A	DISPLAY BOARD, 2 FREQUENCY	●	●				
HLN5175A	DISPLAY BOARD, 6/16/32 FREQUENCY			●	●	●	●
HLN5184A	SWITCH BOARD	●	●	●	●	●	●
HLN5273A	FRONT PANEL HARDWARE, 2 FREQUENCY	●					
HLN9731A	FRONT PANEL HARDWARE, 2 FREQUENCY		●				
HLN5311A	FRONT PANEL HARDWARE, 6 FREQUENCY			●			
HLN9730A	FRONT PANEL HARDWARE, 6 FREQUENCY				●		
HLN5186A	FRONT PANEL HARDWARE, 16 FREQUENCY					●	
HLN9584A	FRONT PANEL HARDWARE, 32 FREQUENCY						●

Model Chart for *MaxTrac* Low Band Mobile Radio 60 Watt RF Power 29.7–50 MHz

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D51MJA93A5AK	D51MJA97A3AK	D51MJA9DA5AK	D51MGA93A5AK	
DESCRIPTION	*MAXTRAC* 100 2 FREQUENCY	*MAXTRAC* 300 6 FREQUENCY	*MAXTRAC* 300 16 FREQUENCY	*MAXTRAC* 300 32 FREQUENCY	
ITEM					DESCRIPTION
	∅	∅	∅	∅	SUPER UNIFIED CHASSIS
HCN1048A	∅				FRONT PANEL 2 FREQUENCY
OR HCN3293A	∅				FRONT PANEL 2 FREQUENCY
HCN1049A		∅			FRONT PANEL 6 FREQUENCY
OR HCN3292A		∅			FRONT PANEL 6 FREQUENCY
HCN1043A			∅		FRONT PANEL 16 FREQUENCY
HLN3217A				∅	FRONT PANEL 32 FREQUENCY
HHN4029A	●	●	●	●	HOUSING
HKN4191B	●	●	●	●	POWER CABLE KIT
HLN5283A	●				NAMEPLATE 100
HLN5284A		●	●	●	NAMEPLATE 300
HLN5289A	●				ESCUTCHEON 2 FREQUENCY
HLN9063A		●			ESCUTCHEON 6 FREQUENCY
HLN5191A			●	●	ESCUTCHEON 16 FREQUENCY
HLN9073A	●	●	●	●	MICROPHONE HANG–UP CLIP
HLN9333A	●	●	●		ROM KIT
HLN9333B				●	ROM KIT 32 CHANNEL
HLN9404A	●	●	●	●	INSTALLATION KIT
HLN9583A	●	●	●	●	HP SHIELD KIT
HMN1056C	●	●	●	●	MICROPHONE
HLN1245A	●	●	●	●	MICROPHONE (ELECTRICAL)
HLN5307A	●	●	●	●	MICROPHONE HOUSING
HLN5308B	●	●	●	●	RADIUS MICROPHONE WITH LIGHT KIT
HLN9559A	●	●	●	●	COMPACT MICROPHONE COIL CORD
HLN9563A	●	●	●	●	INSTALLATION HARDWARE
HAB9405A	●	●	●	●	ANTENNA 1/4 WAVE 29.7–36.0 MHz
HAB9406A	●	●	●	●	ANTENNA 1/4 WAVE 36.0–42.0 MHz
HAB9407A	●	●	●	●	ANTENNA 1/4 WAVE 42.0–50.0 MHz
HBN9403A	●	●	●	●	PACKING KIT

Model Chart for *MaxTrac* Low Band Mobile Radio 60 Watt RF Power Unified Chassis 29.7–50 MHz

CODE:

● = ONE ITEM SUPPLIED

MODEL	HUB3170A	HUB3171A	HUB3172A	HUB3173A	HUB3174A	HUB3175A
DESCRIPTION	UNIFIED CHASSIS (SUPER) 29.7–36.0 MHz	UNIFIED CHASSIS (SUPER) 36.0–42.0 MHz	UNIFIED CHASSIS (SUPER) 42.0–50.0 MHz	UNIFIED CHASSIS (SUPER) 29.7–36.0 MHz	UNIFIED CHASSIS (SUPER) 36.0–42.0 MHz	UNIFIED CHASSIS (SUPER) 42.0–50.0 MHz
HUB1093A	●					
HUB1096A				●		
HUB1094A		●				
HUB1097A					●	
HUB1095A			●			
HUB1098A						●
HLN5172A	●	●	●			
HLN9313A				●	●	●
HLN9436A	●	●	●	●	●	●
HLB4099A	●			●		
HLB4100A		●			●	
HLB4101A			●			●
HLB3048A	●			●		
HLB3049A		●			●	
HLB3050A			●			●
HLB4105A	●			●		
HLB4106A		●			●	
HLB4107A			●			●
HLN9302A	●	●		●	●	
HLN9304A			●			●
HLN9411A	●	●	●	●	●	●

ITEM	DESCRIPTION
HUB1093A	UNIFIED CHASSIS 29.7–36.0 MHz
HUB1096A	UNIFIED CHASSIS 29.7–36.0 MHz
HUB1094A	UNIFIED CHASSIS 36.0–42.0 MHz
HUB1097A	UNIFIED CHASSIS 36.0–42.0 MHz
HUB1095A	UNIFIED CHASSIS 42.0–50.0 MHz
HUB1098A	UNIFIED CHASSIS 42.0–50.0 MHz
HLN5172A	LOGIC BOARD
HLN9313A	LOGIC BOARD, OPTIONS CONNECTOR 16 PIN
HLN9436A	CHASSIS HARDWARE
HLB4099A	RF BOARD
HLB4100A	RF BOARD
HLB4101A	RF BOARD
HLB3048A	PA TANAPA
HLB3049A	PA TANAPA
HLB3050A	PA TANAPA
HLB4105A	PA BOARD
HLB4106A	PA BOARD
HLB4107A	PA BOARD
HLN9302A	PA BOARD HARDWARE
HLN9304A	PA BOARD HARDWARE
HLN9411A	PA HARDWARE

Model Chart for VHF *MaxTrac* LPI Mobile Radio 2 Watts RF Power 146–174 MHz

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D03MJA7304AK	D03MJA77A3AK	D03MJA7DA5AK	D03MJA7JA5AK		ITEM	DESCRIPTION
DESCRIPTION	*MAXTRAC* LPI–50, 2 FREQUENCY	*MAXTRAC* LPI–300, 6 FREQUENCY	*MAXTRAC* LPI–300, 16 FREQUENCY	*MAXTRAC* LPI–300, 32 FREQUENCY			
	∅	∅	∅			HUD3198A	UNIFIED CHASSIS
				∅		HUD3204A	UNIFIED CHASSIS, EXPANDED OPTION CONNECTOR 16 PIN
	∅					HCN1048A	FRONT PANEL, 2 FREQUENCY
	∅					OR HCN3293A	FRONT PANEL, 2 FREQUENCY
		∅				HCN1049A	FRONT PANEL, 6 FREQUENCY
		∅				OR HCN3292A	FRONT PANEL, 6 FREQUENCY
			∅			HCN1043A	FRONT PANEL, 16 FREQUENCY
			∅	∅		OR HCN3217A	FRONT PANEL, 32 FREQUENCY
	●	●				HHN9370A	HOUSING, TWO LAYER
			●	●		HHN4029A	HOUSING
	●	●	●	●		HKN4137A	MOBILE POWER CABLE
	●	●	●	●		HLN5189A	INSTALLATION KIT
	●					HLN5289A	ESCUTCHEON, 2 FREQUENCY
		●				HLN9063A	ESCUTCHEON, 6 FREQUENCY
			●	●		HLN5191A	ESCUTCHEON, 16/32 FREQUENCY
	●	●	●	●		HLN9073A	HANG–UP CLIP
	●	●	●	●		HLN9277A	ROM KIT
				●		HLN9333B	ROM KIT, 32 CHANNEL
	●					HLN9521A	NAMEPLATE, LPI–50
		●	●	●		HLN9522A	NAMEPLATE, LPI–300
	●	●	●	●		HMN1056C	MICROPHONE
	●	●	●	●		HLN1245A	MICROPHONE (ELECTRICAL)
	●	●	●	●		HLN5307A	MICROPHONE HOUSING
	●	●	●	●		HLN5306B	RADIUS MICROPHONE WITH LIGHT KIT
	●	●	●	●		HLN9559A	COMPACT MICROPHONE COIL CORD
	●	●	●	●		HLN9563A	INSTALLATION HARDWARE
	●	●	●	●		HAD4007A	ANTENNA, ROOF TOP (144–150.8 MHz)
	●	●	●	●		HAD4008A	ANTENNA, ROOF TOP (150.8–162 MHz)
	●	●	●	●		HAD4009A	ANTENNA, ROOF TOP (162–176 MHz)
	●	●	●	●		HBN4040A	PACKING KIT
				●		HAD4006A	ANTENNA, ROOF TOP (136–144.0 MHz)

Model Chart for VHF *MaxTrac* LPI Mobile Radio Unified Chassis 2 Watt RF Power 146–174 MHz

CODE:

● = ONE ITEM SUPPLIED

MODEL		DESCRIPTION
HUD3198A	HUD3204A	
		UNIFIED CHASSIS
		UNIFIED CHASSIS, EXPANDED OPTION CONNECTOR
●	●	HLD3195A PA TANAPA
●	●	HLD9523A PA BOARD
●	●	HLN9524A PA HARDWARE
●	●	HLN9105A CHASSIS HARDWARE
●	●	HLD4322B RF BOARD, 30 KHz
●		HLN5173B LOGIC BOARD, CONVENTIONAL TRUNKING
	●	HLN9313A LOGIC BOARD, OPTIONS CONNECTOR 16 PIN

Model Chart for *MaxTrac* VHF Mobile Radio 25–Watt RF Power 136–174 MHz

CODE:

● = ONE ITEM SUPPLIED
⊗ = BREAKDOWN IN SEPERATE CHART

MODEL	D33MJA1304BK	D33MJA7304BK	D33MJA73A5CK	D33MJA77A3CK	D33MJA7DA5CK	D33MJA7JA5AK
DESCRIPTION	*MAXTRAC 50* 2 FREQUENCY (CSQ)	*MAXTRAC 50* 2 FREQUENCY (PL/DPL/CSQ)	*MAXTRAC 100* 2 FREQUENCY	*MAXTRAC 300* 6 FREQUENCY	*MAXTRAC 300* 16 FREQUENCY	*MAXTRAC 300* 32 FREQUENCY
ITEM	DESCRIPTION					
	UNIFIED CHASSIS	⊗	⊗	⊗	⊗	⊗
HCN1048A	FRONT PANEL 2 FREQUENCY	⊗	⊗	⊗		
OR HCN3293A	FRONT PANEL 2 FREQUENCY	⊗	⊗	⊗		
HCN1049A	FRONT PANEL 6 FREQUENCY				⊗	
OR HCN3292A	FRONT PANEL 6 FREQUENCY				⊗	
HCN1043A	FRONT PANEL 16 FREQUENCY					⊗
OR HCN3217A	FRONT PANEL 32 FREQUENCY					⊗ ⊗
HHN4029A	HOUSING				●	●
HHN9370A	HOUSING	●	●	●	●	
HKN4137A	POWER CABLE KIT	●	●	●	●	● ●
HLN9138A	NAMEPLATE 50	●	●			
HLN5283A	NAMEPLATE 100			●		
HLN5284A	NAMEPLATE 300				●	● ●
HLN5289A	ESCUTCHEON 2 FREQUENCY	●	●	●		
HLN9063A	ESCUTCHEON 6 FREQUENCY				●	
HLN5191A	ESCUTCHEON 16 FREQUENCY					● ●
HLN9073A	MICROPHONE HANG–UP CLIP	●	●	●	●	● ●
HLN5189A	INSTALLATION	●	●	●	●	● ●
HMN1056C	MICROPHONE	●	●	●	●	● ●
HLN1245A	MICROPHONE (ELECTRICAL)	●	●	●	●	● ●
HLN5307A	MICROPHONE HOUSING	●	●	●	●	● ●
HLN5306B	RADIUS MICROPHONE WITH LIGHT KIT	●	●	●	●	● ●
HLN9559A	COMPACT MICROPHONE COIL CORD	●	●	●	●	● ●
HLN9563A	INSTALLATION HARDWARE	●	●	●	●	● ●
HAD4006A	ANTENNA, ROOF TOP 136–144 MHz	●	●	●	●	● ●
HAD4007A	ANTENNA, ROOF TOP 144–150.8 MHz	●	●	●	●	● ●
HAD4008A	ANTENNA, ROOF TOP 150.8–162 MHz	●	●	●	●	● ●
HAD4009A	ANTENNA, ROOF TOP 162–174 MHz	●	●	●	●	● ●
HBN4040A	PACKING KIT	●	●	●	●	● ●
HLN9277A	ROM KIT					●
HLN9333B	ROM KIT, 32 CHANNEL					●

Model Chart for *MaxTrac* VHF Mobile Radio 25–Watt RF Power Unified Chassis 136–162 MHz (Range 1) 146–174 MHz (Range 2)

CODE:

● = ONE ITEM SUPPLIED

MODEL	HUD1703A	HUD1706B	HUD1712A	HUD1705B	HUD1704A
DESCRIPTION	UNIFIED CHASSIS, 146–174 MHz	UNIFIED CHASSIS, 146–174 MHz	UNIFIED CHASSIS, 136–162 MHz (B310 OPTION)	UNIFIED CHASSIS, 136–172 MHz (B310 OPTION)	UNIFIED CHASSIS, 146–174 MHz
HLN9123A LOGIC BOARD (MASKED)	●		●		
HLN5173B LOGIC BOARD (EXPANDED)		●		●	
HLN9313A LOGIC BOARD, OPTIONS CONNECTOR					●
HLN9105A CHASSIS HARDWARE	●	●	●	●	
HLN5188A MAIN BOARD HARDWARE					●
HLD4322B RF BOARD 146–174 MHz	●	●			●
HLD4321B RF BOARD 136–162 MHz			●	●	
HLD3009A PA TANAPA 146–174 MHz	●	●			●
HLD1615A PA TANAPA 136–162 MHz			●	●	
HLD4324A PA BOARD 146–174 MHz	●	●			
HLD4323A PA BOARD 136–162 MHz			●	●	
HLN5183A PA BOARD HARDWARE	●	●	●	●	

Model Chart for *MaxTrac* VHF Mobile Radio 40–50 Watt RF Power 146–174 MHz

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D43MJA7304BK	D43MJA73A5CK	D43MJA77A3CK	D43MJA7DA5CK	D43MJA7JA5AK
DESCRIPTION	*MAXTRAC* 50 2 FREQUENCY, 40 WATT	*MAXTRAC* 100 2 FREQUENCY, 40 WATT	*MAXTRAC* 300 6 FREQUENCY, 40 WATT	*MAXTRAC* 300 16 FREQUENCY, 50 WATT	*MAXTRAC* 300 32 FREQUENCY, 45 WATT

ITEM	DESCRIPTION	D43MJA7304BK	D43MJA73A5CK	D43MJA77A3CK	D43MJA7DA5CK	D43MJA7JA5AK
	UNIFIED CHASSIS	∅	∅	∅	∅	∅
HCN1048A	FRONT PANEL 2 FREQUENCY	∅	∅			
OR HCN3293A	FRONT PANEL 2 FREQUENCY	∅	∅			
HCN1049A	FRONT PANEL 6 FREQUENCY			∅		
OR HCN3292A	FRONT PANEL 6 FREQUENCY			∅		
HCN1043A	FRONT PANEL 16 FREQUENCY				∅	
HCN3217A	FRONT PANEL 32 FREQUENCY				∅	∅
HHN4029A	HOUSING				●	●
HHN9370A	HOUSING	●	●	●		
HKN4137A	POWER CABLE KIT	●	●	●	●	●
HLN9138A	NAMEPLATE 50	●				
HLN5283A	NAMEPLATE 100		●			
HLN5284A	NAMEPLATE 300			●	●	●
HLN5289A	ESCUTCHEON 2 FREQUENCY	●	●			
HLN9063A	ESCUTCHEON 6 FREQUENCY			●		
HLN5191A	ESCUTCHEON 16 FREQUENCY				●	●
HLN9073A	MICROPHONE HANG–UP CLIP	●	●	●	●	●
HLN5189A	INSTALLATION HARDWARE	●	●	●	●	●
HMN1056C	MICROPHONE	●	●	●	●	●
HLN1245A	MICROPHONE (ELECTRICAL)	●	●	●	●	●
HLN5307A	MICROPHONE HOUSING	●	●	●	●	●
HLN5306B	RADIUS MICROPHONE WITH LIGHT KIT	●	●	●	●	●
HLN9559A	COMPACT MICROPHONE COIL CORD	●	●	●	●	●
HLN9563A	INSTALLATION HARDWARE	●	●	●	●	●
HAD4006A	ANTENNA, ROOF TOP 136–144 MHz		●	●	●	●
HAD4007A	ANTENNA, ROOF TOP 144–150.8 MHz	●	●	●	●	●
HAD4008A	ANTENNA, ROOF TOP 150.8–162 MHz	●	●	●	●	●
HAD4009A	ANTENNA, ROOF TOP 162–174 MHz	●	●	●	●	●
HBN4040A	PACKING KIT	●	●	●	●	●
HLN9277A	ROM KIT				●	
HLN9333B	ROM KIT 32 CHANNEL					●

Model Chart for *MaxTrac* VHF Mobile Radio 40–50 Watt RF Power Unified Chassis 146–174 MHz

CODE:

● = ONE ITEM SUPPLIED

MODEL						DESCRIPTION
HUD1707A	HUD1710B	HUD3053B				UNIFIED CHASSIS, 40 WATT
	●					UNIFIED CHASSIS, 50 WATT
		●				UNIFIED CHASSIS, 45 WATT
●	●					HLN9105A CHASSIS HARDWARE
		●				HLN5188A MAIN BOARD HARDWARE
●						HLN9123A LOGIC BOARD (MASKED)
	●					HLN5173B LOGIC BOARD (EXPANDED)
		●				HLN9313A LOGIC BOARD, OPTIONS CONNECTOR
●	●	●				HLD4322B RF BOARD
●	●	●				HLD3010A PA TANAPA
●	●	●				HLD4326A PA BOARD
●	●	●				HLN9071A PA BOARD HARDWARE

Model Chart for UHF *MaxTrac* LPI Mobile Radio 2 Watts RF Power 449–470 MHz

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D04MJA7304AK	D04MJA7304BK	D04MJA77A3AK	D04MJA77A3BK	D04MJA7DA5AK	D04MJA7DA5BK	D04MJA7JA5AK					
DESCRIPTION	*MAXTRAC* LPI–50, 2 FREQUENCY	*MAXTRAC* LPI–50, 2 FREQUENCY	*MAXTRAC* LPI–300, 6 FREQUENCY	*MAXTRAC* LPI–300, 6 FREQUENCY	*MAXTRAC* LPI–300, 16 FREQUENCY	*MAXTRAC* LPI–300, 16 FREQUENCY	*MAXTRAC* LPI–300, 32 FREQUENCY					
ITEM	DESCRIPTION											
HUE3197A	∅		∅		∅							
HUE3197B		∅		∅		∅						
HUE3203B							∅					
HCN1048A	∅	∅										
OR HCN3293A	∅	∅										
HCN1049A			∅	∅								
OR HCN3292A			∅	∅								
HCN1043A					∅		∅					
OR HCN3217A						∅	∅					
HKN4137A	●	●	●	●	●	●	●					
HLN5189A	●	●	●	●	●	●	●					
HAE4003A	●	●	●	●	●	●	●					
HBN4040A	●	●	●	●	●	●	●					
HHN4029A					●	●	●					
HHN9370A	●	●	●	●								
HLN5289A	●	●										
HLN9063A			●	●								
HLN5191A					●	●	●					
HLN9073A	●	●	●	●	●	●	●					
HMN1056C	●	●	●	●	●	●	●					
HLN1245A	●	●	●	●	●	●	●					
HLN5307A	●	●	●	●	●	●	●					
HLN5308B	●	●	●	●	●	●	●					
HLN9563A	●	●	●	●	●	●	●					
HLN9559A	●	●	●	●	●	●	●					
HLN9521A	●	●										
HLN9522A			●	●	●	●	●					
HLN9277A	●	●	●	●	●	●						
HLN9333B							●					

Model Chart for *MaxTrac* UHF LPI Mobile Radio 2 Watt RF Power Unified Chassis 449–470 MHz

CODE:

● = ONE ITEM SUPPLIED

MODEL	HUE3197A	HUE3197B	HUE3203B			ITEM	DESCRIPTION
DESCRIPTION	UNIFIED CHASSIS	UNIFIED CHASSIS	UNIFIED CHASSIS, EXPANDED				
	●	●	●			HLE3192A	PA ASSEMBLY
	●	●	●			HLE9502A	PA BOARD
	●	●	●			HLN9501A	PA HARDWARE
	●					HLE9310A	RF BOARD
		●	●			HLE9310B	RF BOARD
	●	●				HLN5173B	LOGIC BOARD, CONVENTIONAL TRUNKED
	●	●	●			HLN5188A	MAIN BOARD HARDWARE
			●			HLN9313A	LOGIC BOARD OPTIONS CONNECTOR

Model Chart for *MaxTrac* UHF Mobile Radio 25 Watt RF Power 449–470 MHz

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D34MJA1304BK	D34MJA1304CK	D34MJA7304BK	D34MJA7304CK	D34MJA73A5CK	D34MJA73A5DK	D34MJA77A3CK	D34MJA77A3DK	D34MJA7DA5CK	D34MJA7DA5DK	D34MJA75A5AK
DESCRIPTION	*MAXTRAC* 50 2 FREQUENCY	*MAXTRAC* 50 2 FREQUENCY	*MAXTRAC* 50 2 FREQUENCY	*MAXTRAC* 50 2 FREQUENCY	*MAXTRAC* 100 2 FREQUENCY	*MAXTRAC* 100 2 FREQUENCY	*MAXTRAC* 300 6 FREQUENCY	*MAXTRAC* 300 6 FREQUENCY	*MAXTRAC* 300 16 FREQUENCY	*MAXTRAC* 300 16 FREQUENCY	*MAXTRAC* 300 32 FREQUENCY
UNIFIED CHASSIS	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅	∅
HCN1048A FRONT PANEL 2 FREQUENCY	∅	∅	∅	∅	∅	∅					
OR HCN3293A FRONT PANEL, 2 FREQUENCY	∅	∅	∅	∅	∅	∅					
HCN1049A FRONT PANEL 6 FREQUENCY							∅	∅			
OR HCN3292A FRONT PANEL, 6 FREQUENCY							∅	∅			
HCN1043A FRONT PANEL 16 FREQUENCY									∅	∅	
OR HCN3217A FRONT PANEL 32 FREQUENCY									∅	∅	∅
HHN4029A HOUSING									●	●	●
HHN9370A HOUSING	●	●	●	●	●	●	●	●			
HKN4137A POWER CABLE KIT	●	●	●	●	●	●	●	●	●	●	●
HLN9138A NAMEPLATE 50	●	●	●	●							
HLN5283A NAMEPLATE 100					●	●					
HLN5284A NAMEPLATE 300							●	●	●	●	●
HLN5289A ESCUTCHEON 2 FREQUENCY	●	●	●	●	●	●					
HLN9063A ESCUTCHEON 6 FREQUENCY							●	●			
HLN5191A ESCUTCHEON 16/32 FREQUENCY									●	●	●
HLN9073A MICROPHONE HANG–UP CLIP	●	●	●	●	●	●	●	●	●	●	●
HLN5189A INSTALLATION HARDWARE	●	●	●	●	●	●	●	●	●	●	●
HMN1056C MICROPHONE	●	●	●	●	●	●	●	●	●	●	●
HLN1245A MICROPHONE (ELECTRICAL)	●	●	●	●	●	●	●	●	●	●	●
HLN5307A MICROPHONE HOUSING	●	●	●	●	●	●	●	●	●	●	●
HLN5306B RADIUS MICROPHONE WITH LIGHT KIT	●	●	●	●	●	●	●	●	●	●	●
HLN9559A COMPACT MICROPHONE COIL CORD	●	●	●	●	●	●	●	●	●	●	●
HLN9563A INSTALLATION HARDWARE	●	●	●	●	●	●	●	●	●	●	●
HAE4003A ANTENNA, ROOF TOP 450–470 MHz	●	●	●	●	●	●	●	●	●	●	●
HBN4040A PACKING KIT	●	●	●	●	●	●	●	●	●	●	●
HLN9277A ROM KIT									●		
HLN9333B ROM KIT 32 CHANNEL										●	●

Model Chart for *MaxTrac* UHF Mobile Radio Unified Chassis 25 Watt RF Power 449–470 MHz

CODE:

● = ONE ITEM SUPPLIED

MODEL	HUE2065A	HUE2065B	HUE2060B	HUE2069B	HUE2060C
DESCRIPTION	UNIFIED CHASSIS	UNIFIED CHASSIS	UNIFIED CHASSIS	UNIFIED CHASSIS	UNIFIED CHASSIS
ITEM	DESCRIPTION				
HLE1687A	PA TANAPA	●	●	●	●	●
HLE4431A	PA BOARD	●	●	●	●	●
HLN5182A	PA HARDWARE	●	●	●	●	●
HLE4425B	RF BOARD	●		●		
HLE9310A	RF BOARD		●		●	
HLE9310B	RF BOARD					●
HLN9123A	LOGIC BOARD (MASKED)	●	●			
HLN5173B	LOGIC BOARD (EXPANDED)			●		●
HLN9313A	LOGIC BOARD OPTIONS CONNECTOR				●	
HLN9212A	MAIN BOARD HARDWARE	●		●		
HLN5188A	MAIN BOARD HARDWARE		●		●	●

Model Chart for UHF Mobile Radio 40 Watt RF Power 403–430 MHz 449–470 MHz

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D44MJA7340BK	D44MJA7340CK	D44MJA73A5CK	D44MJA73A5DK	D44MJA77A3CK	D44MJA77A3DK	D44MJA7DA5CK	D44MJA7DA5DK	D44MJA7JA5AK
DESCRIPTION	*MAXTRAC* 50 2 FREQUENCY	*MAXTRAC* 50 2 FREQUENCY	*MAXTRAC* 100 2 FREQUENCY	*MAXTRAC* 100 2 FREQUENCY	*MAXTRAC* 300 6 FREQUENCY	*MAXTRAC* 300 6 FREQUENCY	*MAXTRAC* 300 16 FREQUENCY	*MAXTRAC* 300 16 FREQUENCY	*MAXTRAC* 300 32 FREQUENCY
ITEM									
	DESCRIPTION								
	UNIFIED CHASSIS	∅	∅	∅	∅	∅	∅	∅	∅	∅
HCN1048A	FRONT PANEL 2 FREQUENCY	∅	∅	∅	∅					
OR HCN3293A	FRONT PANEL 2 FREQUENCY	∅	∅	∅	∅					
HCN1049A	FRONT PANEL 6 FREQUENCY					∅	∅			
OR HCN3292A	FRONT PANEL 6 FREQUENCY					∅	∅			
HCN1043A	FRONT PANEL 16 FREQUENCY							∅	∅	
OR HCN3217A	FRONT PANEL 32 FREQUENCY							∅	∅	∅
HHN4029A	HOUSING							●	●	●
HHN9370A	HOUSING	●	●	●	●	●	●			
HKN4137A	POWER CABLE KIT	●	●	●	●	●	●	●	●	●
HLN9138A	NAMEPLATE 50	●	●							
HLN5283A	NAMEPLATE 100			●	●					
HLN5284A	NAMEPLATE 300					●	●	●	●	●
HLN5289A	ESCUTCHEON 2 FREQUENCY	●	●	●	●					
HLN9063A	ESCUTCHEON 6 FREQUENCY					●	●			
HLN5191A	ESCUTCHEON 16 FREQUENCY						●	●	●	●
HLN9073A	MICROPHONE HANG–UP CLIP	●	●	●	●	●	●	●	●	●
HLN5189A	INSTALLATION	●	●	●	●	●	●	●	●	●
HMN1056C	MICROPHONE	●	●	●	●	●	●	●	●	●
HLN1245A	MICROPHONE (ELECTRICAL)	●	●	●	●	●	●	●	●	●
HLN5307A	MICROPHONE HOUSING	●	●	●	●	●	●	●	●	●
HLN5306B	RADIUS MICROPHONE WITH LIGHT KIT	●	●	●	●	●	●	●	●	●
HLN9559A	COMPACT MICROPHONE COIL CORD	●	●	●	●	●	●	●	●	●
HLN9563A	INSTALLATION HARDWARE			●	●	●	●	●	●	●
HAE4002A	ANTENNA, ROOF TOP 403–430 MHz	●	●	●	●	●	●	●	●	●
HAE4003A	ANTENNA, ROOF TOP 450–470 MHz	●	●	●	●	●	●	●	●	●
HBN4040A	PACKING KIT							●	●	
HLN9333B	ROM KIT 32 CHANNEL						●			
HLN9277A	ROM KIT									

Model Chart for *MaxTrac* UHF Mobile Radio 40 Watt RF Power Unified Chassis 403–430 MHz

CODE:

● = ONE ITEM SUPPLIED

ITEM	DESCRIPTION	HUE2063A	HUE2063B	HUE2066A	HUE2066B	HUE2064B	HUE2064C	HUE2068A	HUE2068B	HUE3052C
	MODEL									
	DESCRIPTION	UNIFIED CHASSIS UHF 25 KHz 40 WATT LIMITED	UNIFIED CHASSIS UHF 25 KHz 40 WATT LIMITED	UNIFIED CHASSIS UHF 35 WATT PL/DPL	UNIFIED CHASSIS UHF 40 WATT	UNIFIED CHASSIS UHF 25 KHz 40 WATT	UNIFIED CHASSIS UHF 25 KHz 40 WATT	UNIFIED CHASSIS UHF 25 KHz 40 WATT EXPANDED	UNIFIED CHASSIS UHF 25 KHz 40 WATT EXPANDED	UNIFIED CHASSIS UHF 40 WATT
HLE3025A	PA UHF 40 WATT	●	●					●	●	
HLE3011A	PA UHF 40 WATT			●	●	●	●			●
HLE4430A	PA BOARD	●	●					●	●	
HLE4432A	PA BOARD			●	●	●	●			●
HLN5274A	PA HARDWARE			●	●	●	●			●
HLN9153A	PA HARDWARE	●	●					●	●	
HLE4424A	RF BOARD	●	●					●	●	
HLE4425B	RF BOARD			●		●				
HLE9310A	RF BOARD				●					●
HLE9310B	RF BOARD						●			
HLN5173B	LOGIC BOARD (MASKED)	●	●			●	●			
HLN9123A	LOGIC BOARD (EXPANDED)			●	●					
HLN5188A	MAIN BOARD HARDWARE	●	●		●		●	●	●	●
HLN9212A	MAIN BOARD HARDWARE			●		●				
HLN9313A	LOGIC BOARD OPTIONS CONNECTOR							●	●	●

Model Chart for *MaxTrac* 800 MHz Mobile Radio 15 Watt RF Power RX: 851–870 MHz TX: 806–825 MHz TX: 806–825 or 851–870 MHz (T/A Models)

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D35MJA73A5CK	D35MJA73A6AK	D35MJA73A6BK	D35MJA77A4AK	D35MJA7DA6AK	D35MJA75A6AK
DESCRIPTION	*MaxTrac* 100 2 FREQUENCY	*MaxTrac* 100 6 FREQUENCY	*MaxTrac* 100 6 FREQUENCY	*MaxTrac* 300 6 FREQUENCY	*MaxTrac* 300 16 FREQUENCY	*MaxTrac* 300 32 FREQUENCY
ITEM	DESCRIPTION					
HUF1036A	UNIFIED CHASSIS 806–870 MHz	∅					
HUF3090A	UNIFIED CHASSIS TALKAROUND		∅		∅		
HUF3054A	UNIFIED CHASSIS TALKAROUND			∅			
HUF3024A	UNIFIED CHASSIS TALKAROUND 806–870 MHz				∅		
HUF3137A	UNIFIED CHASSIS TALKAROUND SIGNALLING						∅
HCN1048A	FRONT PANEL 2 FREQUENCY	∅	∅	∅			
OR HCN3293A	FRONT PANEL 2 FREQUENCY	∅	∅	∅			
HCN1049A	FRONT PANEL 6 FREQUENCY				∅		
OR HCN3292A	FRONT PANEL 6 FREQUENCY				∅		
HCN1043A	FRONT PANEL 16 FREQUENCY					∅	∅
HHN4029A	HOUSING					●	●
HHN9370A	HOUSING	●	●	●	●		
HKN4137A	POWER CABLE KIT	●	●	●	●	●	●
HLN5283A	NAMEPLATE 100	●	●	●			
HLN5284A	NAMEPLATE 300				●	●	●
HLN5289A	ESCUTCHEON 2 FREQUENCY	●	●	●			
HLN9063A	ESCUTCHEON 6 FREQUENCY				●		
HLN5191A	ESCUTCHEON 16 FREQUENCY					●	●
HLN9073A	MICROPHONE HANG–UP CLIP	●	●		●	●	●
HLN4606A	MICROPHONE HANG–UP CLIP			●			
HLN5189A	INSTALLATION HARDWARE	●	●	●	●	●	●
HMN1056C	MICROPHONE	●	●		●	●	●
HLN1245A	MICROPHONE (ELECTRICAL)	●	●		●	●	●
HLN5307A	MICROPHONE HOUSING	●	●		●	●	●
HLN5306B	RADIUS MICROPHONE WITH LIGHT KIT	●	●		●	●	●
HLN9559A	COMPACT MICROPHONE COIL CORD	●	●		●	●	●
HLN9563A	INSTALLATION HARDWARE	●	●		●	●	●
HMN1035A	MICROPHONE			●			
HMN5238A	MICROPHONE BOARD			●			
HLN5239A	MICROPHONE C/F HARDWARE			●			
HAF4002A	ANTENNA, ROOF TOP UNITY 800	●	●	●	●	●	●
HBN4040A	PACKING KIT	●	●	●	●	●	●
HLN9277A	ROM KIT				●	●	
HLN9333B	ROM KIT 32 CHANNEL						●

Model Chart for *MaxTrac* 800 MHz Mobile Radio Unified Chassis 15 Watt RF Power RX: 851–870 MHz TX: 806–825 MHz TX: 806–825 or 851–870 MHz (T/A Models)

CODE:

● = ONE ITEM SUPPLIED

ITEM	DESCRIPTION	HUF1036A	HUF3090A	HUF3054A	HUF3024A	HUF3137A
	MODEL					
	DESCRIPTION	UNIFIED CHASSIS 806–870 MHz	UNIFIED CHASSIS TALKAROUND	UNIFIED CHASSIS TALKAROUND	UNIFIED CHASSIS TALKAROUND 806–870 MHz	UNIFIED CHASSIS TALKAROUND SIGNALLING
HLF1038A	PA TANAPA	●	●	●	●	●
HLF4097A	PA BOARD SIMPLEX	●	●	●	●	●
HLN5293A	PA HARDWARE SIMPLEX	●	●	●	●	●
HLF4095B	RF BOARD	●				
HLF9122A	RF BOARD TALKAROUND		●	●	●	
HLN9123A	LOGIC BOARD (MASKED)	●	●	●		
HLN5173B	LOGIC BOARD (EXPANDED)				●	
HLN9313A	LOGIC BOARD OPTIONS CONNECTOR					●
HLN5188A	MAIN BOARD HARDWARE	●	●	●	●	●

Model Chart for *MaxTrac* 800 MHz Trunked Mobile Radio 15 Watt RF Power

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D35MQA5GB1AK	D35MQA5GB1BK	D35MQA5GB3AK	D35MQA5GB4AK	D35MQA5GB5BK	D35MWA5GB6AK	D35MWA5GB7AK	ITEM	DESCRIPTION
DESCRIPTION	*MaxTrac* 800 MHz TRUNKED	*MaxTrac* 800 MHz TRUNKED	*MaxTrac* 800 MHz TRUNKED	*MaxTrac* 800 MHz TRUNKED	*MaxTrac* 800 MHz TRUNKED	*MaxTrac* 800 MHz TRUNKED	*MaxTrac* 800 MHz TRUNKED		
	∅	∅	∅		∅			HUF1041A	UNIFIED CHASSIS, CONVENTIONAL LTD
				∅		∅	∅	HUF3037A	UNIFIED CHASSIS, CONVENTIONAL LPD
	∅	∅	∅	∅	∅			HCN1048A	FRONT PANEL, 2 FREQUENCY
	∅	∅	∅	∅	∅			OR HCN3293A	FRONT PANEL, 2 FREQUENCY
						∅	∅	HCN1043A	FRONT PANEL, 16 FREQUENCY
						∅	∅	OR HCN3217A	FRONT PANEL, 32 FREQUENCY
	●	●	●	●	●	●	●	HHN4029A	HOUSING
	●	●	●	●	●	●	●	HKN4137A	POWER CABLE KIT
	●	●	●	●	●	●	●	HLN5189A	INSTALLATION HARDWARE KIT
	●	●	●	●	●	●	●	HLN5286A	NAMEPLATE, 800
	●	●			●			HLN5319A	ESCUTCHEON, 820
			●					HLN5320A	ESCUTCHEON, T200
				●				HLN9251A	ESCUTCHEON, 820 B4
						●		HLN9252A	ESCUTCHEON, 840 B4
							●	HLN9253A	ESCUTCHEON, 840 B7
	●	●		●	●	●	●	HLN9073A	HANG–UP CLIP
		●		●	●	●	●	HMN1056C	MICROPHONE, COMPACT
		●		●	●	●	●	HLN1245A	MICROPHONE
		●		●	●	●	●	HLN5307A	MICROPHONE HOUSING
		●		●	●	●	●	HLN5306B	MICROPHONE WITH LIGHT KIT
		●		●	●	●	●	HLN9563A	INSTALLATION HARDWARE
		●		●	●	●	●	HLN9559A	COILED CORD
	●							HMN1035A	MICROPHONE, FULL SIZE
	●							HLN5238A	MICROPHONE BOARD
	●							HLN5239A	INSTALLATION HARDWARE
			●					HMN3013A	MICROPHONE DTMF TRUNKED
	●	●	●	●	●	●	●	HAF9067A	ANTENNA, 3dB GAIN 800 ROOF
						●	●	OR RRA4914B	ANTENNA
	●	●	●	●	●	●	●	HBN4040A	PACKING KIT
	●	●	●	●	●	●	●	HLN9260C	ROM KIT

Model Chart for *MaxTrac* 800 MHz Trunked Mobile Radio 15 Watt Unified Chassis RF Power

CODE:

● = ONE ITEM SUPPLIED

MODEL		DESCRIPTION	
HUF1041A	HUF3037A	ITEM	DESCRIPTION
			UNIFIED CHASSIS CONVENTIONAL LIMITED
●		HLF4095B	RF BOARD
	●	HLF9122A	RF BOARD
●	●	HLN5172A	LOGIC BOARD
●	●	HLN5188A	UNIFIED CHASSIS HARDWARE
●	●	HLF1038A	PA TANAPA
			UNIFIED CHASSIS CONVENTIONAL
●	●	HLF4097A	PA BOARD SIMPLEX
●	●	HLN5293A	PA HARDWARE SIMPLEX

Model Chart for *MaxTrac* 800 MHz Mobile Radio 35 Watt RF Power with Talkaround TX: 806–825 or 851–870 MHz RX: 851–870 MHz

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL							
DESCRIPTION	D45MJA73A6AK	D45MJA77A4AK	D45MJA7DA6AK	D45MJA75J6AK			
	MaxTrac 100 2 FREQUENCY	*MaxTrac* 300 6 FREQUENCY	*MaxTrac* 300 16 FREQUENCY	*MaxTrac* 300 32 FREQUENCY			
ITEM							DESCRIPTION
HUF3188A	∅	∅					SUPER UNIFIED CHASSIS MASKED
HUF3191A			∅				SUPER UNIFIED CHASSIS EXPANDED
HUF3189A				∅			SUPER UNIFIED CHASSIS
HCN1048A	∅						FRONT PANEL 2 FREQUENCY
OR HCN3293A	∅						FRONT PANEL 2 FREQUENCY
HCN1049A		∅					FRONT PANEL 6 FREQUENCY
OR HCN3292A		∅					FRONT PANEL 6 FREQUENCY
HCN1043A			∅				FRONT PANEL 16 FREQUENCY
HCN3217A				∅			FRONT PANEL 32 FREQUENCY
HHN4029A			●	●			HOUSING
HHN9370A	●	●					HOUSING
HKN4191B	●	●	●	●			POWER CABLE KIT
HLN5283A	●						NAMEPLATE 100
HLN5284A		●	●	●			NAMEPLATE 300
HLN5289A	●						ESCUTCHEON 2 FREQUENCY
HLN9063A		●					ESCUTCHEON 6 FREQUENCY
HLN5191A			●	●			ESCUTCHEON 16 FREQUENCY
HLN9073A	●	●	●	●			MICROPHONE HANG-UP CLIP
HLN9404A	●	●	●	●			INSTALLATION HARDWARE
HMN1056C	●	●	●	●			MICROPHONE
HLN1245A	●	●	●	●			MICROPHONE (ELECTRICAL)
HLN5307A	●	●	●	●			MICROPHONE HOUSING
HLN5306B	●	●	●	●			RADIUS MICROPHONE WITH LIGHT KIT
HLN9559A	●	●	●	●			COMPACT MICROPHONE COIL CORD
HLN9563A	●	●	●	●			INSTALLATION HARDWARE
HAF4002A	●	●	●	●			ANTENNA, ROOF TOP UNITY
HBN9403A	●	●	●	●			PACKING KIT
HLN9277A		●	●				ROM KIT
HLN9333B				●			ROM KIT 32 CHANNEL

Model Chart for *MaxTrac* 800 MHz Mobile Radio Unified Chassis 35 Watt RF Power with Talkaround TX: 806–825 or 851–870 MHz RX: 851–870 MHz

MODEL	DESCRIPTION
HUF3188A	SUPER UNIFIED CHASSIS MASKED
HUF3191A	SUPER UNIFIED CHASSIS EXPANDED
HUF3189A	SUPER UNIFIED CHASSIS SIGNAL

CODE:

● = ONE ITEM SUPPLIED

HUF3188A	HUF3191A	HUF3189A			ITEM	DESCRIPTION
●					HUF1038A	UNIFIED CHASSIS SIMPLEX EXPANDED
	●				HUF1034A	UNIFIED CHASSIS SIMPLEX LIMITED
		●			HUF1042A	UNIFIED CHASSIS CONVENTIONAL LIMITED
●	●	●			HLF9122A	RF BOARD TALKAROUND
●					HLN9123A	LOGIC BOARD (MASKED)
	●				HLN5173B	LOGIC BOARD (EXPANDED)
		●			HLN9313A	LOGIC BOARD OPTIONS CONNECTOR
●	●	●			HLN9436A	UNIFIED CHASSIS HARDWARE
●	●	●			HLF3030A	PA TANAPA
●	●	●			HLF4098A	PA BOARD
●	●	●			HLN9305A	PA HARDWARE
●	●	●			HLN9411A	SUPER UNIFIED CHASSIS HARDWARE

Model Chart for *MaxTrac* 800 Series 800 MHz Trunked Mobile Radio 35 Watt RF Power RX: 851–870 MHz TX: 806–825 MHz TX: 806–825 or 851–870 MHz (T/A Models)

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

ITEM	DESCRIPTION	D45MQA5GB1AK *MaxTrac* 820 1/1	D45MQA5GB3AK *MaxTrac* 820 2/1, DTMF MIC	D45MQA5GB5AK *MaxTrac* 820 2/2	D45MQA5GB4AK *MaxTrac* 820 1/1, 1 CONV, T/A	D45MWA5GB6AK *MaxTrac* 840 6/6, 2 CONV, T/A	D45MWA5GB7AK *MaxTrac* 840 10/10, 10 CONV, T/A	D45MWA5GC3AK *MaxTrac* 840 8/8, 8 CONV, T/A	D45MWA5GC5AK *MaxTrac* 840 8/8, 8 CONV, T/A
HUF3190A	SUPER UNIFIED CHASSIS TRUNKED	∅	∅	∅	∅	∅	∅		
HUF3189A	SUPER UNIFIED CHASSIS SIGNAL							∅	∅
HCN1048A	FRONT PANEL 2 FREQUENCY	∅	∅	∅	∅				
OR HCN3293A	FRONT PANEL 2 FREQUENCY	∅	∅	∅	∅				
HCN1043A	FRONT PANEL 16 FREQUENCY					∅	∅	∅	∅
OR HCN3217A	FRONT PANEL 16/32 FREQUENCY					∅	∅		
HHN4029A	HOUSING	●	●	●	●	●	●	●	●
HKN4191B	POWER CABLE KIT	●	●	●	●	●	●	●	●
HLN5286A	NAMEPLATE 800	●	●	●	●	●	●		
HLN9387A	NAMEPLATE *SMARTNET*							●	●
HLN5319A	ESCUTCHEON 820	●		●					
HLN5320A	ESCUTCHEON T200		●						
HLN9251A	ESCUTCHEON 820 B4				●				
HLN9252A	ESCUTCHEON 840 B4					●			
HLN9386A	ESCUTCHEON *SMARTNET* C3							●	
HLN9384A	ESCUTCHEON *SMARTNET* SCAN								●
HLN9253A	ESCUTCHEON 840 B7						●		
HLN9073A	MICROPHONE HANG–UP CLIP	●		●	●	●	●	●	●
HLN9404A	INSTALLATION	●	●	●	●	●	●	●	●
HMN1056C	MICROPHONE	●		●	●	●	●	●	●
HLN1245A	MICROPHONE (ELECTRICAL)	●		●	●	●	●	●	●
HLN5307A	MICROPHONE HOUSING	●		●	●	●	●	●	●
HLN5306B	RADIUS MICROPHONE WITH LIGHT KIT	●		●	●	●	●	●	●
HLN9559A	COMPACT MICROPHONE COIL CORD	●		●	●	●	●	●	●
HLN9563A	INSTALLATION HARDWARE	●		●	●	●	●	●	●
HMN3013A	DTMF TRUNKED MICROPHONE		●						
HAF9067A	ANTENNA, 3 dB GAIN	●	●	●	●	●	●	●	●
OR RRA4914B	ANTENNA	●	●	●	●	●	●	●	●
HBN9403A	PACKING KIT	●	●	●	●	●	●	●	●
HLN9260C	ROM KIT	●	●	●	●	●	●	●	●
HLN9383A	ROM KIT *SMARTNET*							●	●

Model Chart for *MaxTrac* 800 Series 800 MHz Trunked Mobile Radio Unified Chassis, 35 Watt RF Power RX: 851–870 MHz TX: 806–825 MHz TX: 806–825 or 851–870 MHz (T/A Models)

CODE:

● = ONE ITEM SUPPLIED

MODEL / DESCRIPTION	HUF3190A SUPER UNIFIED CHASSIS TRUNKED	HUF3189A SUPER UNIFIED CHASSIS SIGNAL	ITEM	DESCRIPTION
	●		HUF1043A	UNIFIED CHASSIS CONVENTIONAL 15 WATT EXPANDED
		●	HUF1042A	UNIFIED CHASSIS CONVENTIONAL 35 WATT LIMITED
	●	●	HLF9122A	RF BOARD TALKAROUND
	●		HLN5172A	LOGIC BOARD
		●	HLN9313A	LOGIC BOARD OPTIONS CONNECTOR
	●	●	HLN9436A	UNIFIED CHASSIS HARDWARE
	●	●	HLF3030A	PA TANAPA
	●	●	HLF4098A	PA BOARD
	●	●	HLN9305A	PA HARDWARE
	●	●	HLN9411A	SUPER UNIFIED CHASSIS HARDWARE

Model Chart for *MaxTrac SMARTNET* 800 MHz Trunked Mobile Radio 15 Watt RF Power

CODE:

● = ONE ITEM SUPPLIED
∅ = BREAKDOWN IN A SEPARATE CHART

MODEL	D35MWA5GC0AK	D35MWA5GC3AK	D35MWA5GC5AK	D35MWA5GC6AK
DESCRIPTION	*MaxTrac SMARTNET* 800 MHz TRUNKED	*MaxTrac SMARTNET* 800 MHz TRUNKED	*MaxTrac SMARTNET* 800 MHz TRUNKED	*MaxTrac SMARTNET* 800 MHz TRUNKED

ITEM	DESCRIPTION	D35MWA5GC0AK	D35MWA5GC3AK	D35MWA5GC5AK	D35MWA5GC6AK
HUF3137A	UNIFIED CHASSIS, 800 T/A SIGNALLING		∅	∅	∅
HUF3037A	UNIFIED CHASSIS, 800 MHz CONVENTIONAL LPD	∅			
HCN1043A	FRONT PANEL, 16 FREQUENCY	∅	∅	∅	∅
OR HCN3217A	FRONT PANEL, 16 FREQUENCY	∅			
HHN4029A	HOUSING	●	●	●	●
HKN4137A	POWER CABLE KIT	●	●	●	●
HLN5189A	INSTALLATION HARDWARE KIT	●	●	●	●
HLN4606A	HANG–UP CLIP	●			
HLN9073A	HANG–UP CLIP		●	●	●
HLN9383A	ROM KIT		●	●	
HLN9383B	ROM KIT				●
HLN9386A	ESCUTCHEON, C3		●		
HLN9384A	ESCUTCHEON, SCAN			●	
HLN9536A	ESCUTCHEON				●
HLN9144A	ESCUTCHEON	●			
HLN9387A	NAMEPLATE		●	●	●
HLN5286A	NAMEPLATE	●			
HLN9166A	EMERGENCY PUSH SWITCH ATM HARDWARE	●			
HMN1056C	MICROPHONE, COMPACT		●	●	●
HLN1245A	MICROPHONE		●	●	●
HLN5307A	MICROPHONE HOUSING		●	●	●
HLN5306B	MICROPHONE WITH LIGHT KIT		●	●	●
HLN9563A	INSTALLATION HARDWARE		●	●	●
HLN9559A	COILED CORD		●	●	●
HMN1035A	MICROPHONE, FULL SIZE	●			
HLN5238A	MICROPHONE BOARD	●			
HLN5239A	INSTALLATION HARDWARE	●			
HAF9067A	ANTENNA, 3dB GAIN 800 ROOF	●	●	●	●
OR RRA4914B	ANTENNA				
HBN4040A	PACKING KIT	●	●	●	●

Model Chart for *MaxTrac SMARTNET* 800 MHz Trunked Mobile Radio 15 Watt RF Power Unified Chassis

CODE:

● = ONE ITEM SUPPLIED

MODEL		DESCRIPTION						
		HUF3137A	HUF3037A					
		UNIFIED CHASSIS, 800 T/A SIGNALLING	UNIFIED CHASSIS, 800 MHz CONVENTIONAL LPD					
ITEM	DESCRIPTION							
HLF9122A	RF BOARD, TALKAROUND	●	●					
HLN5172A	LOGIC BOARD		●					
HLN9313A	LOGIC BOARD, OPTIONS CONNECTOR	●						
HLN5188A	MAIN BOARD HARDWARE	●	●					
HLF1038A	PA TANAPA	●	●					
HLF4097A	PA BOARD SIMPLEX	●	●					
HLN5293A	PA HARDWARE SIMPLEX	●	●					

CoveragePLUS MaxTrac 800 MHz Trunked Mobile Radio 15/35 Watt RF Power

MODEL DESCRIPTION	D35AHA5GB1AK 15 WATT *COVERAGEPLUS MAXTRAC*	D45AHA5GB1AK 35 WATT *COVERAGEPLUS MAXTRAC*	ITEM	DESCRIPTION
	●		HUF3137A	UNIFIED CHASSIS KIT (15W)
	●		HLF1038A	PA TANAPA, 15 WATT (See Note 1)
		●	HUF3189A	UNIFIED CHASSIS KIT (35W)
		●	HLF3030A	PA TANAPA, 35 WATT (See Note 1)
		●	HLN9583A	SHIELD KIT (35W)
	●	●	HCN3217A	FRONT PANEL
	●	●	HLN9386A	ESCUTCHEON, C3
	●		HKN4372A	POWER CABLE KIT (15W)
		●	HKN9498A	POWER CABLE KIT (35W)
			HMN3013A	MICROPHONE KIT (NON–BACKLIT) (See Note 2)
	●	●	TDN8310A	MICROPHONE KIT (BACKLIT)
	●	●	HHN4029A	COVER KIT
	●		HLN5189A	INSTALLATION HARDWARE KIT (15W)
		●	HLN9404A	INSTALLATION HARDWARE KIT (35W)
	●	●	RAF4031ARM	ANTENNA KIT
	●		HBN4040A	PACKING KIT (15W)
		●	HBN9403A	PACKING KIT (35W)
	●	●	HLN9569A	LABEL, *COVERAGEPLUS MAXTRAC*
	●	●	HLN9597A	ROM KIT

ITEM	DESCRIPTION	HLF1038A	HLF4097A	HLN5293A	HLF3030A	HLF4096A	HLN9305A	HUF1042A	HLF9122A	HLN5188A	HLN9313A	HLN9436A	HLN9411A	HLN5175A	HLN5184A	HLN9584A
HUF3137A	UNIFIED CHASSIS KIT (15W)	●							●	●	●					
HLF1038A	PA TANAPA, 15 WATT (See Note 1)		●	●												
HUF3189A	UNIFIED CHASSIS KIT (35W)				●			●	●		●	●	●			
HLF3030A	PA TANAPA, 35 WATT (See Note 1)					●	●									
HLN9583A	SHIELD KIT (35W)															
HCN3217A	FRONT PANEL													●	●	●
HLN9386A	ESCUTCHEON, C3															
HKN4372A	POWER CABLE KIT (15W)															
HKN9498A	POWER CABLE KIT (35W)															
HMN3013A	MICROPHONE KIT (NON–BACKLIT) (See Note 2)															
TDN8310A	MICROPHONE KIT (BACKLIT)															
HHN4029A	COVER KIT															
HLN5189A	INSTALLATION HARDWARE KIT (15W)															
HLN9404A	INSTALLATION HARDWARE KIT (35W)															
RAF4031ARM	ANTENNA KIT															
HBN4040A	PACKING KIT (15W)															
HBN9403A	PACKING KIT (35W)															
HLN9569A	LABEL, *COVERAGEPLUS MAXTRAC*															
HLN9597A	ROM KIT															

NOTES:

1. HLF1038A IS PART OF HUF3137A AND HLF3030A IS PART OF HUF3189A.
2. THE BACKLIT DTMF MICROPHONE (TDN8310A) COMES STANDARD WITH THE *COVERAGEPLUS* RADIO.

Performance Specifications for *MaxTrac* Low Band Mobile Radios

GENERAL

Model Series:	D51MJA, D51MGA
Typical RF Output:	60 Watts
Frequency (MHz):	29.7–36, 36–42, 42–50
Dimensions (H x W x L):	2" x 7" x 9.9" (50.8 x 178 x 251mm)
Primary Voltage Input:	13.8 Volts DC
Weight:	76 oz. (2.16 kg)
Typical Current Drain	
Receive (5W):	1.6 Amps
Transmit:	17 Amps
Standby:	500 milliAmps
Channel Capability:	2 channel, 6 channels, 16 channels, 32 channels
Squelch Capability:	*Private–Line, Digital Private–Line,* coded squelch and/or carrier squelch
External Speaker (Option):	5 Watts
FCC Designation:	ABZ89FT1620

TRANSMITTER

Spurious & Harmonic Emissions:	–61 dB
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)
Modulation:	16K0F3E, 16K0F1D, 15K0F2D
Max Frequency Separation	
29.7–36 MHz:	6.3 MHz
36–42 MHz:	6.0 MHz
42–50 MHz:	8.0 MHz
Audio Distortion:	5% measured per EIA
Output Impedance:	50 Ohms
Modulation Sensitivity:	80 mV rms for 60% max. deviation @ 1 kHz

RECEIVER

Channel Spacing:	20 kHz
Sensitivity 12 dB SINAD:	0.30 uV −117.5dBm
Intermodulation EIA SINAD:	–80 dB
Spurious & Image Rejection:	–80 dB
Selectivity EIA SINAD:	–80 dB
Audio Output:	3 Watts (5 Watts with external speaker) at less than 5% distortion
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation	
29.7–36 MHz:	6.3 MHz
36–42 MHz:	6.0 MHz
42–50 MHz:	8.0 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE

Performance Specifications for *MaxTrac* LPI VHF Mobile Radio

GENERAL

Band:	VHF
Model Series:	D03MJA
Typical RF Output:	2 Watts
Frequency:	146–174 MHz
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198mm)
Primary Voltage Input:	13.8 Volts DC
Weight:	61 oz. (1.73 kg)
Typical Current Drain	
Receive (5W):	1.5 Amps
Transmit:	2.5 Amps
Standby:	400 milliAmps
Channel Capability	
MaxTrac LPI 50:	2 channels
MaxTrac LPI 300:	6 or 16 channels
Squelch Capability:	*Private–Line, Digital Private–Line,* coded squelch and/or carrier squelch
External Speaker (Option):	5 Watts

TRANSMITTER

Spurious & Harmonic Emissions:	–46 dBc
Frequency Stability (–30°C to +60°C, 25°C ref.):	±0.0005%
Modulation:	16K0F1D, 16K0F3E, 15K0F2D
Max. Frequency Separation	
MaxTrac LPI 50:	12 MHz
MaxTrac LPI 300:	28 MHz
Audio Distortion:	5% measured per EIA
Output Impedance:	50 Ohms
Modulation Sensitivity:	80 mV rms for 60% max. deviation @ 1kHz

RECEIVER

Channel Spacing:	30 kHz
Sensitivity 12 dB SINAD:	0.30 uV
Intermodulation EIA SINAD	
MaxTrac LPI 50:	–75 dB
MaxTrac LPI 300:	–78 dB
Spurious & Image Rejection	
MaxTrac LPI 50:	–75 dB
MaxTrac LPI 300:	–80 dB
Selectivity EIA SINAD	
MaxTrac LPI 50:	–75 dB
MaxTrac LPI 300:	–80 dB
Audio Output:	3 Watts (5 Watts with optional external speaker) at less than 5% distortion
Frequency Stability (–30°C to +60°C, 25°C ref.):	±0.0005%
Max. Frequency Separation	
MaxTrac LPI 50:	12 MHz
MaxTrac LPI 300:	28 MHz
Output Impedance:	50 Ohms

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Performance Specifications for *MaxTrac 50* VHF Mobile Radios

GENERAL

Model Series:	D33MJA	D34MJA
Typical RF Output:	25 Watts	45 Watts
Frequency (MHz):	146–174	
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198 mm)	
Primary Voltage Input:	13.8 Volts DC	
Weight:	61 oz. (1.73 kg)	
Typical Current Drain Receive (5W): Transmit: Standby:	 1.5 Amps 9.5 Amps 400 milliAmps	 1.5 Amps 15.0 Amps 400 milliAmps
Channel Capability:	2 channels	
Squelch Capability:	*Private–Line, Digital Private–Line,* coded squelch and/or carrier squelch	
External Speaker (Option):	5 Watts	
FCC Designation:	ABZ89FT3712	ABZ89FT3730

TRANSMITTER

Spurious & Harmonic Emissions:	–57 dB	–60 dB
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)	
Modulation:	16K0F3E, 16K0F1D, 15K0F2D	
Max Frequency Separation	11.2 MHz	
Audio Distortion:	5% measured per EIA	
Output Impedance:	50 Ohms	
Modulation Sensitivity:	80 mV rms for 60% max. deviation @ 1 kHz	

RECEIVER

Channel Spacing:	30 kHz
Sensitivity 12 dB SINAD:	0.30 uV
Intermodulation EIA SINAD:	–75 dB
Spurious & Image Rejection:	–75 dB
Audio Output:	3 Watts (5 Watts with optional speaker) at less than 5% distortion
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation	11.2 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE

Performance Specifications for *MaxTrac* 100/300 VHF Mobile Radios

GENERAL

Model Series:	D33MJA	D43MJA
Typical RF Output:	25 Watts	45 Watts
Frequency (MHz):	136–162	146–174
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198 mm)	
Primary Voltage Input:	13.8 Volts DC	
Weight:	54 oz. (1.51 kg)	
Typical Current Drain Receive (5W): Transmit: Standby:	 1.5 Amps 9.5 Amps 400 milliAmps	 1.5 Amps 15.0 Amps 400 milliAmps
Channel Capability: *MaxTrac 100:* *MaxTrac 300:*	 2 channels 6, 16, or 32 channels	
Squelch Capability:	*Private–Line, Digital Private–Line,* coded squelch and/or carrier squelch	
External Speaker (Option):	5 Watts	
FCC Designation:	ABZ89FT3712	ABZ89FT3730

TRANSMITTER

Spurious & Harmonic Emissions:	–57 dB	–60 dB
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)	
Modulation:	16K0F3E, 16K0F1D, 15K0F2D	
Max Frequency Separation 136–172 MHz: 146–174 MHz:	 26 MHz 28 MHz	
Audio Distortion:	5% measured per EIA	
Output Impedance:	50 Ohms	
Modulation Sensitivity:	80 mV rms for 60% max. deviation @ 1 kHz	

RECEIVER

Channel Spacing:	30 kHz
Sensitivity 12 dB SINAD:	0.30 uV
Intermodulation EIA SINAD:	–78 dB
Spurious & Image Rejection:	–80 dB
Selectivity EIA SINAD:	–80 dB
Audio Output:	3 Watts (5 Watts with optional speaker) at less than 5% distortion
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation 136–172 MHz: 146–174 MHz:	 26 MHz 28 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE

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Performance Specifications for *MaxTrac* LPI UHF Mobile Radio

GENERAL

Band:	UHF
Model Series:	D04MJA
Typical RF Output:	2 Watts
Frequency:	449–470 MHz
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198mm)
Primary Voltage Input:	13.8 Volts DC
Weight:	61 oz. (1.73 kg)
Typical Current Drain	
Receive (5W):	1.5 Amps
Transmit:	2.5 Amps
Standby:	400 milliAmps
Channel Capability	
MaxTrac LPI 50:	2 channels
MaxTrac LPI 300:	6, 16, or 32 channels
Squelch Capability:	*Private–Line, Digital Private–Line,* coded squelch and/or carrier squelch
External Speaker (Option):	5 Watts

TRANSMITTER

Spurious & Harmonic Emissions:	–46 dBc
Frequency Stability (–30°C to +60°C, 25°C ref.):	±0.0005%
Modulation:	16K0F1D, 16K0F3E, 15K0F2D
Max. Frequency Separation	
MaxTrac LPI 50:	10 MHz
MaxTrac LPI 300:	21 MHz
Audio Distortion:	5% measured per EIA
Output Impedance:	50 Ohms
Modulation Sensitivity:	80 mV rms for 60% max. deviation @ 1kHz

RECEIVER

Channel Spacing:	25 kHz
Sensitivity 12 dB SINAD:	0.30 uV
Intermodulation EIA SINAD	
MaxTrac LPI 50:	–70 dB
MaxTrac LPI 300:	–75 dB
Spurious & Image Rejection	
MaxTrac LPI 50:	–70 dB
MaxTrac LPI 300:	–75 dB
Selectivity EIA SINAD	
MaxTrac LPI 50:	–70 dB
MaxTrac LPI 300:	–75 dB
Audio Output:	3 Watts (5 Watts with optional external speaker) at less than 5% distortion
Frequency Stability (–30°C to +60°C, 25°C ref.):	±0.0005%
Max. Frequency Separation	
MaxTrac LPI 50:	10 MHz
MaxTrac LPI 300:	21 MHz
Output Impedance:	50 Ohms

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Performance Specifications for *MaxTrac 50* UHF Mobile Radios

GENERAL

Model Series:	D34MJA	D44MJA
Typical RF Output:	25 Watts	40 Watts
Frequency (MHz):	449–470	
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198 mm)	
Primary Voltage Input:	13.8 Volts DC	
Weight:	61 oz. (1.73 kg)	
Typical Current Drain Receive (5W): Transmit: Standby:	 1.5 Amps 9.5 Amps 400 milliAmps	 1.5 Amps 12.5 Amps 400 milliAmps
Channel Capability:	2, 6, 16, or 32 channels	
Squelch Capability:	*Private–Line, Digital Private–Line,* coded squelch and/or carrier squelch	
External Speaker (Option):	5 Watts	
FCC Designation:	ABZ89FT4713	ABZ89FT4725

TRANSMITTER

Spurious & Harmonic Emissions:	–57 dB	–60 dB
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)	
Modulation:	16K0F3E, 16K0F1D, 15K0F2D	
Max Frequency Separation	21 MHz	
Audio Distortion:	5% measured per EIA	
Output Impedance:	50 Ohms	
Modulation Sensitivity:	80 mV rms for 60% max. deviation @ 1 kHz	

RECEIVER

Channel Spacing:	25 kHz
Sensitivity 12 dB SINAD:	0.30 uV
Intermodulation EIA SINAD:	–70 dB
Spurious & Image Rejection:	–70 dB
Audio Output:	3 Watts (5 Watts with optional speaker) at less than 5% distortion
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation	21 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE

Performance Specifications for *MaxTrac* 100/300 UHF Mobile Radios

GENERAL

Model Series:	D43MJA	D44MJA
Typical RF Output:	25 Watts	40 Watts
Frequency (MHz):	449–470 MHz	403–430 MHz; 449–470 MHz
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198 mm)	
Primary Voltage Input:	13.8 Volts DC	
Weight:	61 oz. (1.73 kg)	
Typical Current Drain Receive (5W): Transmit: Standby:	 1.5 Amps 9.5 Amps 400 milliAmps	 1.5 Amps 12.5 Amps 400 milliAmps
Channel Capability: MaxTrac 100: MaxTrac 300:	 2 channels 6, 16, or 32 channels	
Squelch Capability:	*Private–Line, Digital Private–Line,* coded squelch and/or carrier squelch	
External Speaker (Option):	5 Watts	
FCC Designation:	ABZ89FT4713	ABZ89FT4741 (403–430 MHz) ABZ89FT4725 (449–470 MHz)

TRANSMITTER

Spurious & Harmonic Emissions:	–57 dB	–60 dB
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)	
Modulation:	16K0F3E, 16K0F1D, 15K0F2D	
Max Frequency Separation 403–430 MHz 449–470 MHz	 27 MHz 21 MHz	
Audio Distortion:	5% measured per EIA	
Output Impedance:	50 Ohms	
Modulation Sensitivity:	80 mV rms for 60% max. deviation @ 1 kHz	

RECEIVER

Channel Spacing:	25 kHz
Sensitivity 12 dB SINAD:	0.30 uV
Intermodulation EIA SINAD:	–75 dB
Spurious & Image Rejection:	–75 dB
Selectivity EIA SINAD	–75 dB
Audio Output:	3 Watts (5 Watts with optional speaker) at less than 5% distortion
Frequency Stability:	+0.0005% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation 403–430 MHz 449–470 MHz	 27 MHz 21 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE

Performance Specifications for *MaxTrac* 100/300/800 MHz Mobile Radios

GENERAL

Model Series:	D35MJA	D45MJA
Typical RF Output:	15 Watts *	35 Watts *
Frequency (MHz):	TX: 806–825 MHz; 851–870 MHz: T/A RX: 851–870 MHz	
Dimensions (H x W x L):	2" x 7" x 9.9" (50.8 x 178 x 251mm)	
Primary Voltage Input:	13.8 Volts DC	
Weight:	76 oz. (2.16 kg)	
Typical Current Drain Receive (5W): Transmit: Standby:	 1.5 Amps 7.5 Amps 400 milliAmps	 1.5 Amps 15.0 Amps 400 milliAmps
Channel Capability *MaxTrac 100:* *MaxTrac 300:*	 2 channels 6, 16, or 32 channels	
Squelch Capability:	*Private–Line, Digital Private–Line,* coded squelch and/or carrier squelch	
External Speaker (Option):	5 Watts	
FCC Designation:	ABZ89FT5672 ABZ89FT5677 (Talkaround)	ABZ89FT5709

TRANSMITTER

Spurious & Harmonic Emissions:	–55 dB	–59 dB
Frequency Stability:	+0.00025% (–30°C to +60°C, 25°C ref.)	
Modulation:	16K0F3E, 16K0F1D, 15K0F2D	
Max Frequency Separation:	19 MHz	
Audio Distortion:	5% measured per EIA	
Output Impedance:	50 Ohms	
Modulation Sensitivity:	80 mV rms for 60% max. deviation @ 1 kHz	

RECEIVER

Channel Spacing:	25 kHz
Sensitivity 12 dB SINAD:	0.40 uV
Intermodulation EIA SINAD:	–68 dB
Spurious & Image Rejection:	–70 dB
Selectivity EIA SINAD:	–68 dB
Audio Output:	3 Watts (5 Watts with external speaker) at less than 5% distortion
Frequency Stability:	+0.00025% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation:	19 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE
* 12 Watt in Talkaround
* 20 Watt in Talkaround

Performance Specifications for *MaxTrac 820* Trunked Mobile Radios

GENERAL

Model Series:	D35MQA	D45MQA
Typical RF Output:	15 Watts *	35 Watts *
Frequency (MHz):	TX: 806–825 MHz; 851–870 MHz: T/A RX: 851–870 MHz	
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198mm)	2" x 7" x 9.9" (50.8 x 178 x 251mm)
Primary Voltage Input:	13.8 Volts DC, Negative ground	
Weight:	61 oz. (1.73 kg)	76 oz. (2.16 kg)
Typical Current Drain Receive (5W): Transmit: Standby:	 1.5 Amps 7.5 Amps 400 milliAmps	 1.5 Amps 15.0 Amps 400 milliAmps
Channel Capability:	20 Trunked channels	
Metering:	Adjustments and alignments are performed electronically using an IBM PC, a Radio Interface Box (RIB), and field maintenance software.	
External Speaker (Option):	5 Watts	
FCC Designation:	ABZ89FT5672 ABZ89FT5677 (Talkaround)	ABZ89FT5709

TRANSMITTER

Spurious & Harmonic Emissions:	–55 dB	–59 dB
Frequency Stability:	+0.00025% (–30°C to +60°C, 25°C ref.)	
Modulation:	16K0F3E, 16K0F1D, 15K0F2D	
Max Frequency Separation:	19 MHz	
Audio Distortion:	5% measured per EIA	
Output Impedance:	50 Ohms	
Audio Frequency Response:	+1 to –3 dB from 6 dB per octave pre–emphasis characteristic from 300 to 3000 Hz	
FM Hum and Noise (EIA method):	–40 dB	

RECEIVER

Channel Spacing:	25 kHz
Sensitivity 12 dB SINAD:	0.40 uV
Intermodulation EIA SINAD:	–68 dB
Spurious & Image Rejection:	–70 dB
Selectivity EIA SINAD:	–68 dB
Audio Output:	3 Watts (5 Watts with external speaker) at less than 5% distortion
Frequency Stability:	+0.00025% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation:	19 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE
* 12 Watt in Talkaround
* 20 Watt in Talkaround

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Performance Specifications for *MaxTrac 840* Trunked Mobile Radios

GENERAL

Model Series:	D35MWA	D45MWA
Typical RF Output:	15 Watts *	35 Watts *
Frequency (MHz):	TX: 806–825 MHz; 851–870 MHz: T/A RX: 851–870 MHz	
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198mm)	2" x 7" x 9.9" (50.8 x 178 x 251mm)
Primary Voltage Input:	13.8 Volts DC, Negative ground	
Weight:	61 oz. (1.73 kg)	76 oz. (2.16 kg)
Typical Current Drain Receive (5W): Transmit: Standby:	 1.5 Amps 7.5 Amps 400 milliAmps	 1.5 Amps 15.0 Amps 400 milliAmps
Channel Capability:	20 Trunked/10 Conventional	
Metering:	Adjustments and alignments are performed electronically using an IBM PC, a Radio Interface Box (RIB), and field maintenance software.	
External Speaker (Option):	5 Watts	
FCC Designation:	ABZ89FT5677	ABZ89FT5709

TRANSMITTER

Spurious & Harmonic Emissions:	–55 dB	–59 dB
Frequency Stability:	+0.00025% (–30°C to +60°C, 25°C ref.)	
Modulation:	16K0F3E, 16K0F1D, 15K0F2D	
Max Frequency Separation:	19 MHz	
Audio Distortion:	5% measured per EIA	
Output Impedance:	50 Ohms	
Audio Frequency Response:	+1 to –3 dB from 6 dB per octave pre–emphasis characteristic from 300 to 3000 Hz	
FM Hum and Noise (EIA method):	–40 dB	

RECEIVER

Channel Spacing:	25 kHz
Sensitivity 12 dB SINAD:	0.40 uV
Intermodulation EIA SINAD:	–68 dB
Spurious & Image Rejection:	–70 dB
Selectivity EIA SINAD:	–68 dB
Audio Output:	3 Watts (5 Watts with external speaker) at less than 5% distortion
Frequency Stability:	+0.00025% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation:	19 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE
* 12 Watt in Talkaround
* 20 Watt in Talkaround

Performance Specifications for *SMARTNET MaxTrac* Trunked Mobile Radios

GENERAL

Model Series:	D35MWA	D45MWA
Typical RF Output:	15 Watts *	35 Watts *
Frequency (MHz):	TX: 806–825 MHz; 851–870 MHz: T/A RX: 851–870 MHz	
Dimensions (H x W x L):	2" x 7" x 7–3/4" (50.8 x 178 x 198mm)	2" x 7" x 9.9" (50.8 x 178 x 251mm)
Primary Voltage Input:	13.8 Volts DC, Negative ground	
Weight:	61 oz. (1.73 kg)	76 oz. (2.16 kg)
Typical Current Drain Receive (5W): Transmit: Standby:	 1.5 Amps 7.5 Amps 400 milliAmps	 1.5 Amps 15.0 Amps 400 milliAmps
Channel Capability:	20 Trunked/8 Conventional	
Metering:	Adjustments and alignments are performed electronically using an IBM PC, a Radio Interface Box (RIB), and field maintenance software.	
External Speaker (Option):	5 Watts	
FCC Designation:	ABZ89FT5672	ABZ89FT5702

TRANSMITTER

Spurious & Harmonic Emissions:	–55 dB / –59 dB
Frequency Stability:	+0.00025% (–30°C to +60°C, 25°C ref.)
Modulation:	16K0F3E, 16K0F1D, 15K0F2D
Max Frequency Separation:	19 MHz
Audio Distortion:	5% measured per EIA
Output Impedance:	50 Ohms
Audio Frequency Response:	+1 to –3 dB from 6 dB per octave pre–emphasis characteristic from 300 to 3000 Hz
FM Hum and Noise (EIA method):	–40 dB

RECEIVER

Channel Spacing:	25 kHz
Sensitivity 12 dB SINAD:	0.40 uV
Intermodulation EIA SINAD:	–68 dB
Spurious & Image Rejection:	–70 dB
Selectivity EIA SINAD:	–68 dB
Audio Output:	3 Watts (5 Watts with external speaker) at less than 5% distortion
Frequency Stability:	+0.00025% (–30°C to +60°C, 25°C ref.)
Max Frequency Separation:	19 MHz
Output Impedance:	50 Ohms

SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE
* 12 Watt in Talkaround
* 20 Watt in Talkaround

MaxTrac FM Two–Way Radio Options

Option	Description	Adds	Deletes
B109	Handset	Handset Kit & Accessories	Compact Microphone & Hang–Up Kit
B113	Ignition Switch Cable	Cable Kit	
B18	5–Watt External Speaker	External Speaker & Mtg Hardware	Internal Radio Speaker
B20	DTMF Microphone	Touch Code Microphone	Compact Microphone
B221	External Alarms Relay/Cable/Switch Kit *MaxTrac 300*	Relay Kit Cable & Switch	
B239	Noise Cancelling Microphone	Noise–Cancelling Microphone	Compact Microphone
B308	Expanded Options Connector		
B382	Full Size Microphone	Full Size Microphone	Compact Microphone
B470	Emergency Footswitch	Footswitch	
B663	Extra Stability Mount	3–Point Mounting Bracket & Hardware	
B665	Control Station Operation	Power Supply Desk Microphone Mounting Tray	Compact Microphone & Hang–Up Kit
B674	External Alarms Relay/Cable/Switch Kit *MaxTrac 100*	Relay Kit Cable & Switch	
B688	Emergency Pushbutton	External Mount Pushbutton Switch	
B81	Keylock Mounting Trunnion	Keylock Mtg Installation Kit	Standard Installation Kit
Antenna Options:			
B124	UHF 5 dB Gain Trunk Lip Mount		
B172	UHF 5 dB Gain Roof Mount		
B542	VHF/800 MHz 3 dB Gain Trunk Lip Mount		
B542	UHF 3.5 dB Gain Trunk Lip Mount		
B652	29.7–50 MHz Broad–Band		
B925	VHF/UHF 1/4 Wave Trunk Lip Mount		
B925	800 MHz Unity Gain Trunk Lip Mount		
B926	VHF/800 MHz 3 dB Gain Roof Mount		
B926	UHF 3.5 dB Gain Roof Mount		

MaxTrac Mobile Radio Service Aids, Tools, & Programming Devices

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

SERVICE AIDS

01–80352A01	TEST CABLE – Mini UHF to BNC cable (3 ft.) used for connecting the *MaxTrac* mobile 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.
30–80373B41	VCO TEST CABLE – Provides the interface between the mobile's RF board and the test equipment for troubleshooting.
30–80373B42	TEST CABLE – Mini UHF to N–type RF coax (low loss) cable (14 inch) used for connecting the *MaxTrac* mobile to the RF test instruments.
RLN4137A	External Keying Plug – Used to place the radio in test mode and key the radio.

SERVICE TOOLS

66–80388A26	CRIMPING TOOL – For customer installations requiring crimping of mini UHF RF connector (28–84606M01) onto antenna cable.
66–80947W01	EXTRACTION TOOL – Provides the ability to remove the terminal pins (29–84249N01) from the 16 pin Expanded Options Connector housing (15–80922V01).

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–4019	RADIO SERVICE SOFTWARE ON 5 1/4 IN. DISK – Operates on the IBM PC, XT, AT, or PERSONAL SYSTEM/2 family of computers for programming and servicing of the *MaxTrac* 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. This software provides the capability of changing the radio frequencies, squelch codes, and other radio parameters.
RVN–4020	RADIO SERVICE SOFTWARE ON 3 1/2 IN. DISK – Same as RVN–4019 descriptions.
RVN–4043	*SMARTNET* RADIO SERVICE SOFTWARE ON 5 1/4 IN. DISK – Operates on the IBM PC, XT, AT or PERSONAL SYSTEM/2 family of computers for programming and servicing of the *SMARTNET MaxTrac* 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. This software provides the capability of changing the radio frequencies, squelch codes and other radio parameters.
RVN–4044	*SMARTNET* RADIO SERVICE SOFTWARE ON 3 1/2 IN. DISK – Same as RVN–4043 description.
RLN–4008	RADIO INTERFACE BOX (RIB) – Voltage level shifter to enable the communications between the radio and the computers 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.
01–80359A29	*MAXTRAC* DUPLEX PROGRAMMING ADAPTER – Used on all T25CPA series models. The 01–80359A29 adapter must be used in conjunction with the 30–80070N01 Program/Test Cable and the RLN–4008 Radio Interface Box to program the radio.
30–80070N01	PROGRAM/TEST CABLE – Provides the electrical interconnection from the programming receptacle inside the radio to the RIB (RLN–4008) programming the *SMARTNET MaxTrac* mobile radio.
30–80369B71	COMPUTER INTERFACE CABLE – Used to connect the IBM PC, XT, PC CONVERTIBLE or PERSONAL SYSTEM/2 computer's Asychronous Serial Communications Adapter to the RIB (01–80353A72). The previously offered 01–80357A44 Computer Interface Cable will provide the proper connections.
30–80369B72	COMPUTER INTERFACE CABLE – Used to connect the IBM AT computer's Asychronous Serial Communications Adapter to the RIB (01–80353A74.) The previously offered 01–80357A64 Computer Interface Cable will provide the proper connections.

SERVICE MANUALS/OPERATING INFORMATION

Service manuals for:

Conventional *MaxTrac* 68–80101W76
800 Trunked *MaxTrac* 68–80900Z01
900 Trunked *MaxTrac* 68–02977G10
MaxTrac Detailed Service Information Manual 68–80102W84
Direct Entry Keyboard 68–80103W09
CoveragePlus Mobile System Installation and Service Guide 68–80103W08

Operators cards for:

MaxTrac 50 ..... 68–80900Z17
MaxTrac 50/100 ..... 68–80900Z99
MaxTrac 100 ..... 68–80101W68
MaxTrac 300 (6 Channel) 68–80101W96
MaxTrac 300 (16 Channel) 68–80900Z46
MaxTrac 300 (16 Channel w/MDC–1200 Signalling) . 68–80900Z26
MaxTrac 300 (16 Channel w/Selective Signalling) ... 68–80901Z01
Privacy Plus 820 *MaxTrac* (B1,B3,B5) Trunked 68–80101W92
Privacy Plus 820 *MaxTrac* (B4) Dual Mode 68–80900Z50
Privacy Plus 840 *MaxTrac* (B6) Dual Mode without Scan 68–80900Z51
Privacy Plus 840 MaxTrac (B7) Dual Mode with Scan 68–80900Z52
SMARTNET 800 *MaxTrac* (C3) 68–80900Z74
SMARTNET 800 *MaxTrac* (C5,C6) Dual Mode with Scan 68–80900Z75
SMARTNET 800 (C5,C6) Dual Mode with Search ... 68–80900Z76
CoveragePlus MaxTrac 68–80103W07
Privacy Plus 900 *MaxTrac* (B2,B3) 68–02977G11
Privacy Plus 900 *MaxTrac* (B6,B7) 68–02977G12
SMARTNET 900 *MaxTrac* 68–02979G91
SMARTNET 900 *MaxTrac* (C5) with Scan 68–02979G92
SMARTNET 900 *MaxTrac* (C5) with Search 68–02979G93

Operator's manuals for:

MaxTrac 50 ..... 68–80900Z18
MaxTrac 100/300 ..... 68–80900Z04
Privacy Plus 820 *MaxTrac* (B1,B3,B5) Trunked 68–80900Z54
Privacy Plus 820 *MaxTrac* (B4) Dual Mode 68–80900Z54
Privacy Plus 840 *MaxTrac* (B6) Dual Mode without Scan 68–80900Z54
Privacy Plus 840 *MaxTrac* (B7) Dual Mode with Scan 68–80900Z54
SMARTNET 800 *MaxTrac* (C3) 68–80102W37
SMARTNET 800 *MaxTrac* (C5,C6) Dual Mode with Scan 68–80102W37
SMARTNET 800 (C5,C6) Dual Mode with Search .. 68–80102W37
CoveragePlus MaxTrac 68–80103W07
Privacy Plus 900 *MaxTrac* (B2,B3) 68–02977G15
Privacy Plus 900 *MaxTrac* (B6,B7) 68–02977G15
SMARTNET 900 *MaxTrac* 68–02979G75
SMARTNET 900 *MaxTrac* (C5) with Scan 68–02979G75
SMARTNET 900 *MaxTrac* (C5) with Search 68–02979G75
MaxTrac 888 ..... 68–80102W98

MXW–7855–O
4/28/90

1. Description

This section of the manual includes a general system troubleshooting guide and a basic troubleshooting chart to assist in isolating radio problems to board level.

The other sections of this manual troubleshoot down to component level. A number of parts in the *MaxTrac* radio, which are not field serviceable, are identified in the schematics in shaded areas. Field replacement of these parts will affect the factory calibrated numbers on the tuning label. If any of these parts are found to be defective, board replacement is the only acceptable means of repair.

Replacement of the Logic Board, RF Board, or Power Amplifier requires that recalibration be performed using the Motorola Radio Service Software. Therefore, it is strongly advised that the servicer become familiar with the programming techniques applicable to the *MaxTrac* Radios.

A personal computer capable of running the *MaxTrac* RADIO SERVICE SOFTWARE package (RVN4019C for 5.25 inch drives and RVN4020C for 3.5 inch drives) is required in addition to the items listed in the Recommended Test Equipment Section. Refer to *MaxTrac* Mobile Radio Service Aids, Tools, and Programming Devices for more information on equipment requirements.

Failure to perform the required calibration procedure will affect performance of the Reference Oscillator, RF Power Leveling and Protection, and Transmitter Modulation over frequency and temperature. An uncalibrated radio may not comply with FCC rules and may be unreliable at temperature extremes.

2. Recommended Test Equipment

The following is a list of recommended equipment, with which the servicer of *MaxTrac* radios can be as flexible and effective as possible.

(1) *R2001D Communications System Analyzer.* This analyzer utilizes a microprocessor to control more than 16 different functions associated with performing tests and analyzing problems on the *MaxTrac* radios. The R2001D can be upgraded to a R2021D Trunking Systems Analyzer by adding a Trunking Systems Option Board (RPX4392A).

(2) *R2021D Trunking Systems Analyzer.* This analyzer includes all the functions of the R2001D plus a trunking service option which allows the servicer to "final test" a *MaxTrac* mobile in a simulated trunking system. The R2021D will provide the necessary signalling to change frequencies and allow "handshaking" between the *MaxTrac* mobile and a simulated system controller.

(3) *R2200 Communications Service Monitor.* This unit contains all the features necessary to service *MaxTrac* radios. The R2200 cannot be upgraded to a trunking system analyzer.

(4) *DC Multimeter/Milliohmmeter.* This is a general purpose instrument for troubleshooting. Recommended equipment is the Motorola R–1047/1048 Digital Multimeter.

(5) *High Current Power Supply.* This power supply must be capable of handling at least 10–15 amps. Recommended equipment is the Motorola R–1011 Power Supply.

(6) *RF Millivoltmeter.* This device is used for measuring the RF sections of the *MaxTrac*. Recommended equipment is the Motorola S1339A RF Millivoltmeter.

3. Recommended Repair Equipment

The following is a list of repair equipment recommended for the repair of the *MaxTrac* printed circuit boards.

(1) *RSX4057A Repair Station.* This device is recommended for replacing leadless chip carriers on *MaxTrac* radio boards. With it, desoldering and soldering is accomplished by controlling the flow of hot air through accessory precision heat focus heads. A spring loaded mechanism automatically senses solder melt and removes the component from the printed circuit board.

(2) *Miniature Digital Readout Soldering Station.* Motorola Part Number 01–80386A81.

(3) *Leadless Component Extractor.* Motorola Part Number 66–80387A59. A desoldering device for safe removal of leadless components.

Table 1. Conventional Radio Error Tones

TONE	PROBLEM
High–pitch beep (900 Hz 119 ms) on turn on or when key pressed.	Normal operation — no error.
Low–pitched tone (163 Hz) for 5 seconds following turn on.	Code plug error. For all code plug errors, try to re–program radio. If this does not clear the fault or if problem recurs, replace the logic board.
Low frequency (163 Hz) continuous tone present whenever radio is on.	Logic board failure. Refer to Logic Board Section for troubleshooting.
Low pitch beep (300 Hz 200 ms) when a button is pressed.	Do not press that button in the current operating condition. Change operating condition (select another mode, etc.).
Low frequency (150 Hz or 112.5 Hz) continuous tone while PTT is held.	Transmit is not allowed. If it was time–out–timer, you may release PTT then continue your call.

Table 2. Trunking Radio Error Tones

TONE	PROBLEM
Low pitched tone (163 Hz) for 5 seconds after turn on.	Try to re–program tuning codeplug. If this does not clear the fault or of the problem recurs, replace the logic board.
Volume set tone (450 Hz) for 1 second, followed by illegal function tone after turn on.	Re–program or replace the trunking codeplug.
Continuous pattern of one beep (1000 Hz) followed by a pause after turn on.	Microprocessor RAM failure. Replace logic board.
Continuous pattern of two beeps (1000 Hz) followed by a pause after turn on.	External RAM failure. Replace logic board.
Continuous pattern of three beeps (1000 Hz) followed by a pause after turn on.	Watchdog error. Re–program the microprocessor CONFIG register. If the error still exists, replace the logic board.
Continuous pattern of five beeps (1000 Hz) followed by a pause after turn on.	External ROM checksum failure. Re–program or replace external ROM.

(4) *Power Desoldering System.* Motorola Part Number 01–80333B61. An excellent power solder removal system, complete with temperature controlled hollow tip iron. Aids in cleaning plated through holes of solder.

4. General Troubleshooting

The *MaxTrac* radio consists of five major sections:

- Front Panel
- Logic Board
- RF Board
- Power Amplifier
- Unified Chassis.

Each radio section is covered by theory of operation, troubleshooting information, schematics, board overlays, and parts lists. The troubleshooting section includes troubleshooting flow charts, tables, and descriptive text. The schematics show voltage levels and waveforms as needed.

5. Preliminary Checks

The *MaxTrac* radio goes through a self check of the control logic section upon initial turn on. If the radio passes the self test, a single high–pitched, short–duration beep (900 Hz) sounds. If other types of tones or tone sequences are heard, the self test has failed. Refer to Table 1 for conventional radio error tones and Table 2 for trunked radio error tones.

The error tone tables will help direct the servicer to the appropriate section(s) of the manual for troubleshooting information.

6. Trunked FM Radio Test Mode Routine

6.1 GENERAL

In normal field operation, the microcomputer in the radio controls RF channel selection, transmitter key–up, and receiver muting functions. However, when the unit is on the bench and is out of its normal operating environment, the microcomputer does not key the PA or unmute the receiver, and this prevents use of normal test procedures. To solve this problem, a special test routine has been incorporated into the radio.

6.2 INITIAL SETUP

To enter the TEST mode, short across VR806 on the Logic Board prior to turning the radio on. This grounds the Serial Data Input (SERIAL BUS +). To exit the TEST mode, turn the radio off, remove the short, then turn the radio back on.

There are seven TEST frequencies: three fixed TEST mode frequencies (see Table 3), and four control channel frequencies of the system selected when the TEST mode was entered.

Table 3. Fixed Test Mode Frequencies

TEST MODE CHANNEL	RECEIVE FREQUENCY	TRANSMIT FREQUENCY
1	851.0125 MHz	806.0125 MHz
2	869.9875 MHz	824.9875 MHz
3	860.5125 MHz	815.5125 MHz

Operation of the radio in TEST mode is described in the following paragraphs and is the same whether using the customer code plug frequencies or the internal plug test frequencies.

6.3 CHANNEL SELECTION AND RECEIVE MODE

(1) Short across VR806 (as described above). Apply power to the radio. A single 450 Hz beep in the speaker indicates operation on test mode Channel 1 (CH1), after which the receiver unmutes.

(2) Step the radio to the next channel by tapping the microphone PTT button (push the PTT and release it within 200 milliseconds). Two beeps in the speaker indicate CH2, after which the receiver unmutes. Repeat this procedure to step the receiver from CH1 through CH7 with the number of beeps indicating the chosen test channel. (CH1 through CH3 are fixed test mode frequencies.)

Note

The test mode cycles, which means that the radio reverts back to the first frequency (CH1) after the last possible test mode frequency.

6.4 TRANSMITTER ALIGNMENT MODES OF OPERATION

Four transmit modes are used for various transmitter checks and adjustments.

(1) Transmit Mode 1: Silent Carrier

On a given test channel, when the microphone PTT button is pressed once and held, the microcomputer keys the PA without data modulation, and MIC audio is enabled. In this mode, the transmitter frequency, hum and noise, and voice deviation can be checked and adjusted.

When the PTT button is released, the PA is de–keyed and the receiver unmutes.

(2) Transmit Mode 2: Sub–audible Connect Tone Plus Voice (Low–Speed Mode)

If the microphone PTT button is pressed and held the second time, the power amplifier is keyed with low–speed sub–audible tone modulation, and a pulsed 150 Hz tone is heard at the speaker. This 150 Hz tone is the BUSY tone. This procedure is used to adjust the maximum voice plus sub–audible tone deviation. Deviation levels are shown below.

- 3.7 kHz deviation for voice
- 1 kHz deviation for sub–audible connect tone
- 4.7 kHz deviation total

When the PTT button is released, the PA is de–keyed and the receiver unmutes.

Note

The low–speed sub–audible tone may be 76.60 Hz, 83.72 Hz, 90.00 Hz, 97.30 Hz, 105.88 Hz, 116.13 Hz, 128.57 Hz, or 138.46 Hz. The specific tone is coded in the codeplug, and is a specific tone for a specific system.

(3) Transmit Mode 3: High–Speed Acknowledge Tone (High–Speed Mode)

If the microphone PTT button is pressed and held for the third time, the PA is keyed with 1800 Hz tone modulation. The MIC audio is disabled and a 900 Hz alert tone is heard at the speaker. This tone is known as talk permit. This step is used to check high–speed data deviation. The deviation level should be 2.4 kHz to 3.1 kHz.

When the PTT button is released, the PA is de–keyed and the receiver remains muted.

(4) Transmit Mode 4: DTMF Transmit Mode

If the microphone PTT button is pressed and held for the fourth time, the PA is keyed and modulated with DTMF for the # button (combination of a 1477 Hz and a 973 Hz tone).

The MIC audio is disabled and a unique tone is heard at the speaker. This tone is known as the Dynamic Regrouping tone. This step is used to check the DTMF deviation (for the DTMF generated by the auto–dial feature). The deviation level should be 3 kHz to 4.5 kHz.

When the PTT button is released, the PA is de–keyed and the receiver remains muted.

Note

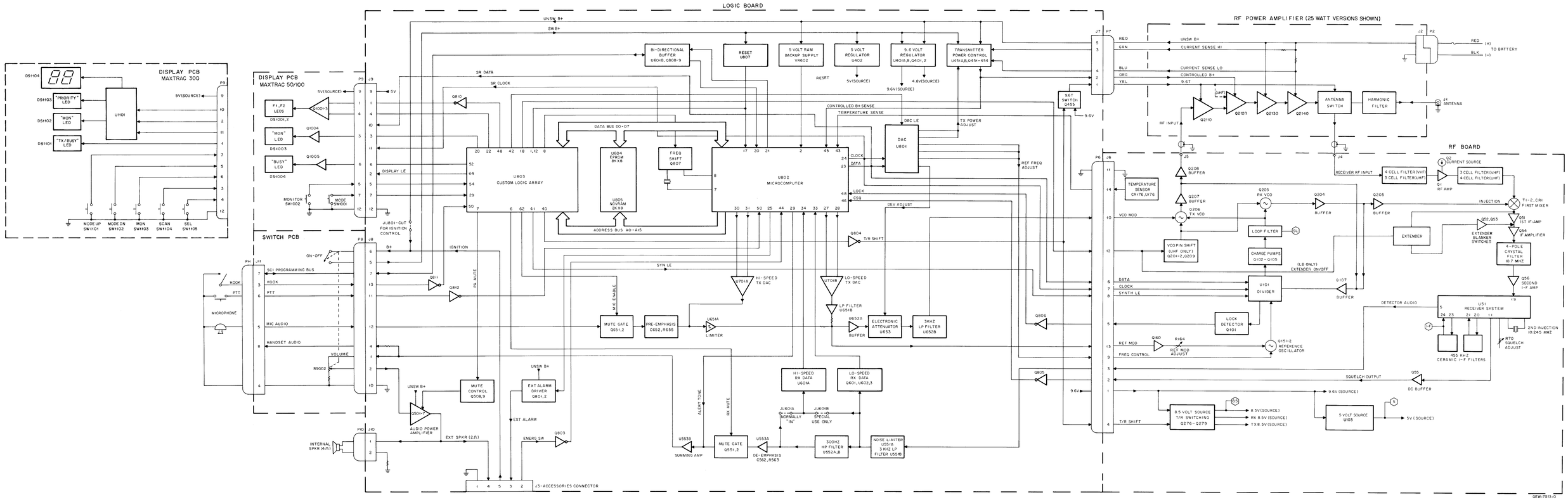
Repeated pressing and releasing the PTT button cycles the radio through the four modes described above.

Note

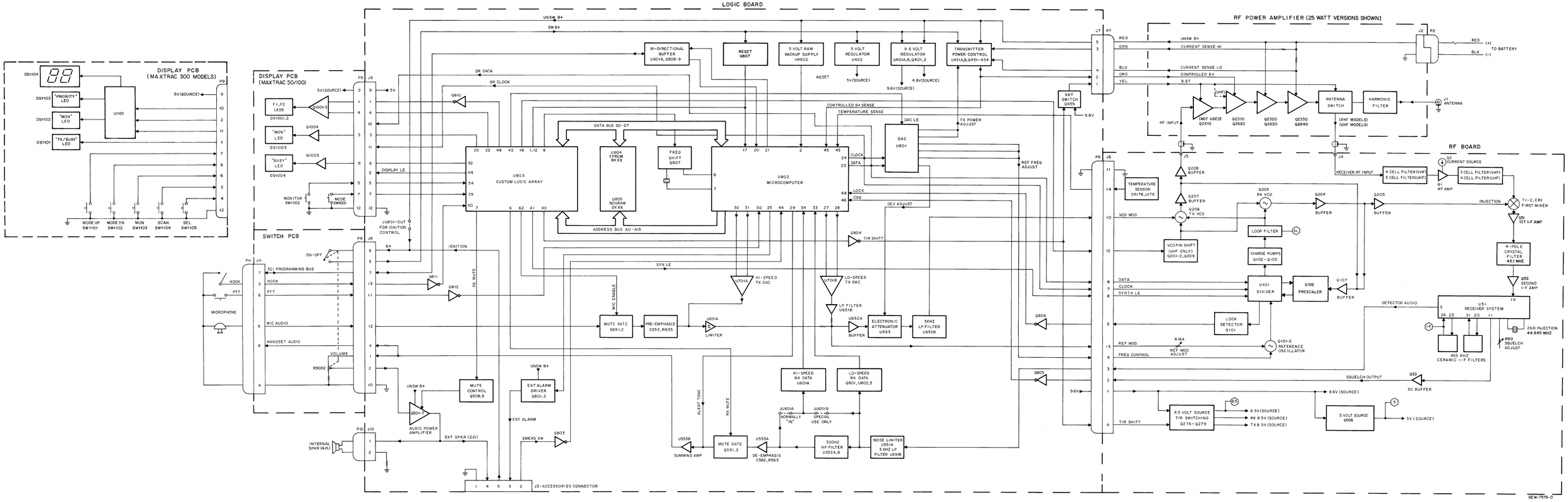
If any of the above tests indicate that adjustment of the transmitter deviation is necessary, refer to the *MaxTrac* RADIO SERVICE SOFTWARE package for procedures.

Table 4. General System Troubleshooting Guide

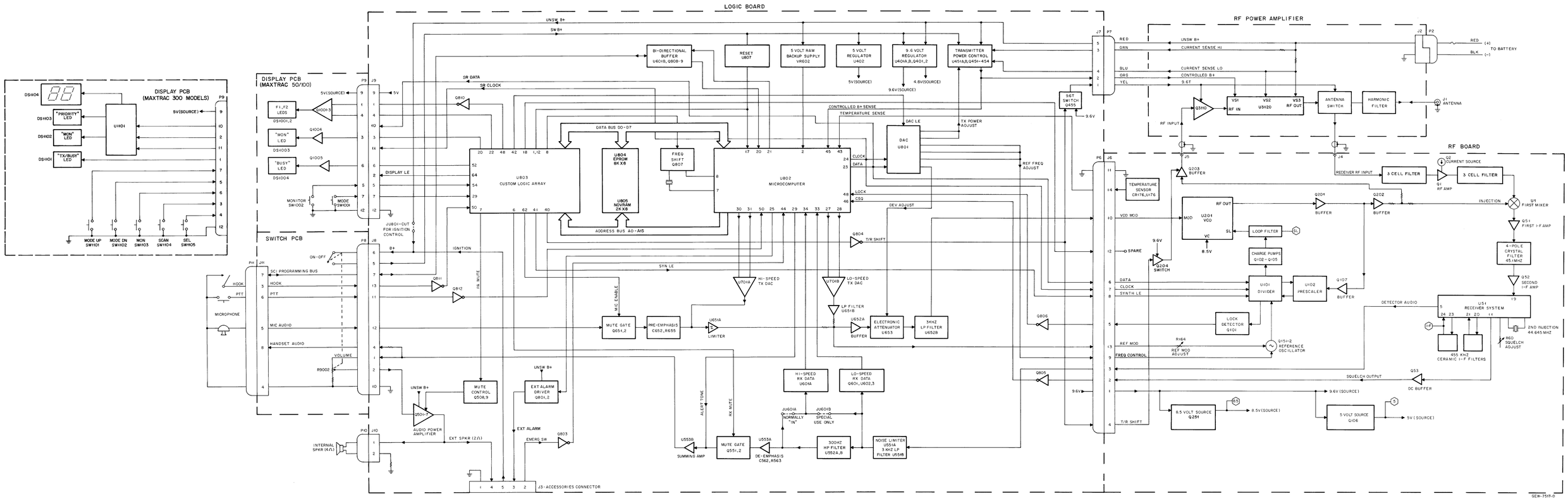
SYMPTOM	POSSIBLE TROUBLE SOURCE	REFER TO CHART OR DIAGRAM
No Receive Audio.	Red Lead Fuse. Audio PA. Squelch. Synthesizer Out of Lock. Receiver Front End. Receiver Back End.	None, check fuse. "NO/LOW AUDIO" Chart. "BAD SQUELCH or PL/DPL" Chart. "SYNTHESIZER/VCO" Chart. "RECEIVER" Chart. "RECEIVER" Chart.
Distorted Audio.	Audio PA. QUAD Detector. IF Amplifiers.	"NO/LOW AUDIO" Chart. "RECEIVER" Chart. "RECEIVER" Chart.
Failure to Squelch.	Squelch Circuit. Audio Mute Gate. Microcomputer.	"BAD SQUELCH or PL/DPL" Chart. Logic Board Schematic. Logic Board Schematic.
Failure to Unsquelch.	Microcomputer.	Logic Board Schematic.
Absence of PL/DPL ENCODE/DECODE.	Microcomputer. Logic Board Audio Circuitry.	Logic Board Schematic. Logic Board Schematic.
Poor Receiver Sensitivity.	RF Amplifier. First Mixer. First IF Amplifier. QUAD Detector. Second IF Amplifier.	"RECEIVER" Chart and Receiver Schematic.
Synthesizer Fails to Lock.	Synthesizer. VCO. Microcomputer.	"SYNTHESIZER/VCO" Chart. "SYNTHESIZER/VCO" Chart. Logic Board Schematic.
Absence of RF Power Output.	Power Control Circuitry. Keyed 9.6 Voltage. Synthesizer. Transmit VCO. PA Transistors.	Logic Board Schematic. "NO PTT" Chart. "SYNTHESIZER/VCO" Chart. "SYNTHESIZER/VCO" Chart. PA Schematic.
Absence of Power Control.	Power Control Circuitry. Microcomputer.	Logic Board Schematic. Logic Board Schematic.
Absence of Transmitter Modulation.	Logic Board Transmit Audio. VCO. Microcomputer.	"BAD TX MODULATION" Chart. "SYNTHESIZER/VCO" Chart. Logic Board Schematic.
Improper Microphone Sensitivity.	Logic Board Transmit Audio. Microcomputer. VCO.	"BAD TX MODULATION" Chart. Logic Board Schematic. "SYNTHESIZER/VCO" Chart.
Alternator Whine.	Excessive Whine in Vehicle.	Manual 68P81109E33.



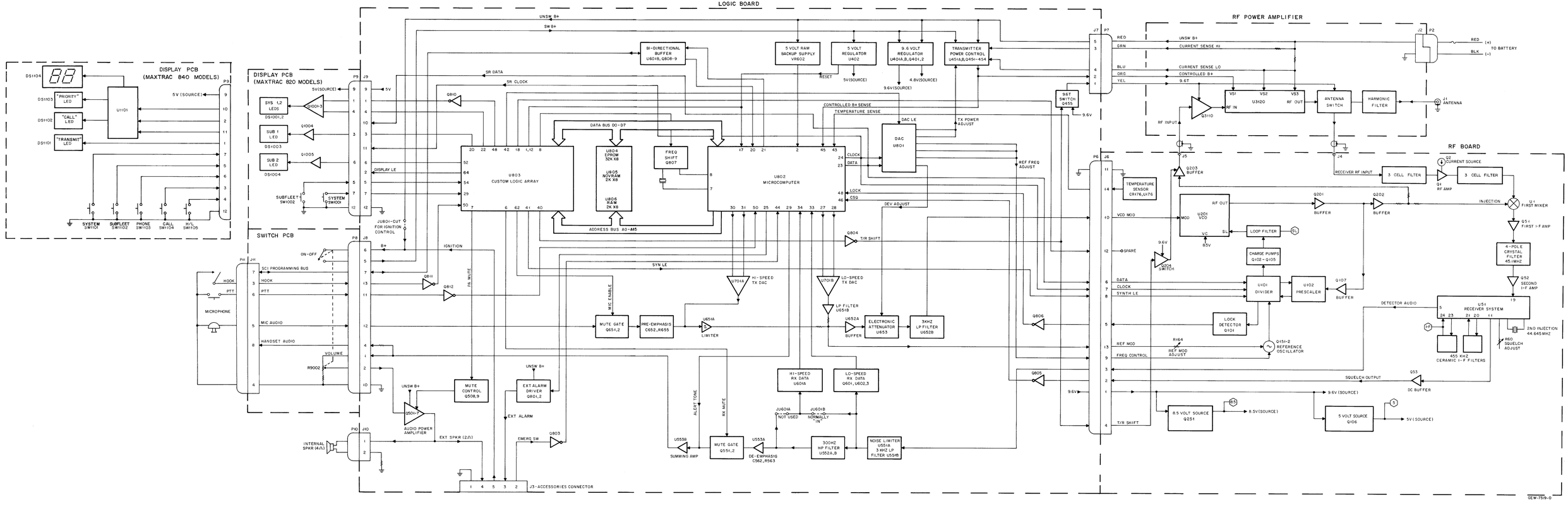
MaxTrac Lowband
Functional Block Diagram
PW–7514–O
2/28/90



MaxTrac VHF/UHF
Functional Block Diagram
PW–7516–O
2/28/90



MaxTrac 800 MHz
Functional Block Diagram
PW–7518–O
2/28/90



MaxTrac 820/840 MHz
Functional Block Diagram
PW–7520–O
2/28/90

1. Theory Of Operation

The *MaxTrac* Radio has two different front panels. *MaxTrac* Models 50, 100, and 820 use the Dual Mode front panel. The *MaxTrac* Models 300 and 840 use the 6/16/32 Mode front panel. Each Front panel assembly consists of a display board and a switch board. The switch board is common to all *MaxTrac* Models.

1.1 DUAL MODE DISPLAY BOARD

1.1.1 Description

The *MaxTrac* Models 50, 100, and 820 use the Dual Mode Display Board. The difference between trunking and conventional models is the way the controls and indicators are labeled.

1.1.2 Operation

To select a particular system or Channel LED, the microprocessor (U802) changes the state of P9–4 (CH1/CH2). When Channel One is selected, P9–4 is a logic level low and Q1003 is in cut off. This action places an open on the cathode of DS1002, and allows +5V DC to be applied to the base of Q1001 via R1005 and R1006. Q1001 enables DS1001 by placing a ground on its cathode. If Channel Two is selected, +2.7V DC is seen on P9–4, causing Q1003 to conduct and Q1001 to cut off. This action places a ground on the cathode of DS1002 while removing the ground from DS1001.

To select the color of the System/Channel LED, the microprocessor changes the state of P9–1 (TX/RX). In receive, this line is +2.1V DC, causing the green side of the selected dual LED to illuminate. At the same time, Q1002 is being saturated, grounding the red anodes and preventing them from turning on. In transmit, P9–1 is grounded, which turns off the green LED and Q1002. Via R1004, Q1002 removes the ground from, and applies +5V DC to, the red anodes.

P9–3 and P9–6 control the illuminating of DS1003 and DS1004 respectively. DS1003 acts as the Monitor or Subfleet A Indicator. DS1004 acts as the Busy or Subfleet B Indicator. To illuminate the LED, the microprocessor must raise the respective control line to +2.7V DC. This turns on Q1004 or Q1005 which provides a ground path for the LED.

SW1001 (Mode/System) and SW1002 (Monitor/Subfleet) are connected to P9–7 and P9–5. Normally, these lines are +5V DC. When the associated button is pressed, it places a ground on the line being read by the microprocessor.

1.2 6/16/32 MODE DISPLAY PANEL

1.2.1 Description

The 6/16/32 Mode Display board consists of three separate LED's (DS1101–3), five normally open switches (SW1101–5), a dual 7–segment LED display (DS1104), and a Display Driver (U1101).

1.2.2 Operation

After power up, the microprocessor (U802) loads U1101 with information using SERIAL DATA (P9–10), SERIAL CLOCK (P9–11), and DISPLAY ENABLE (P9–2). This data tells U1101 which segments and LED's to illuminate. Note that DS1101 is controlled directly by the logic board via P9–1.

U1101 is a Shift Register Latch. When a ground appears on a particular output, the associated LED illuminates. When the LED is to remain off, the O/P from U1101 will be an open. It is important to note that the LED's cathode will be +3.15V DC when on and +3.5V DC when off.

DS1104 is the Display Unit LED. Note that the decimal points are not connected and the common anodes are tied directly to +5V DC. To illuminate a segment, U1101 pulls the segments cathode line to ground.

SW1101 through SW1105 are normally–open momentary pushbutton switches. SW1101 and SW1102 are the Mode up/down switches; SW1103–SW1105 are Option Select buttons.

1.3 SWITCH BOARD

The Switch Board, common to all *MaxTrac* Models, consists of:

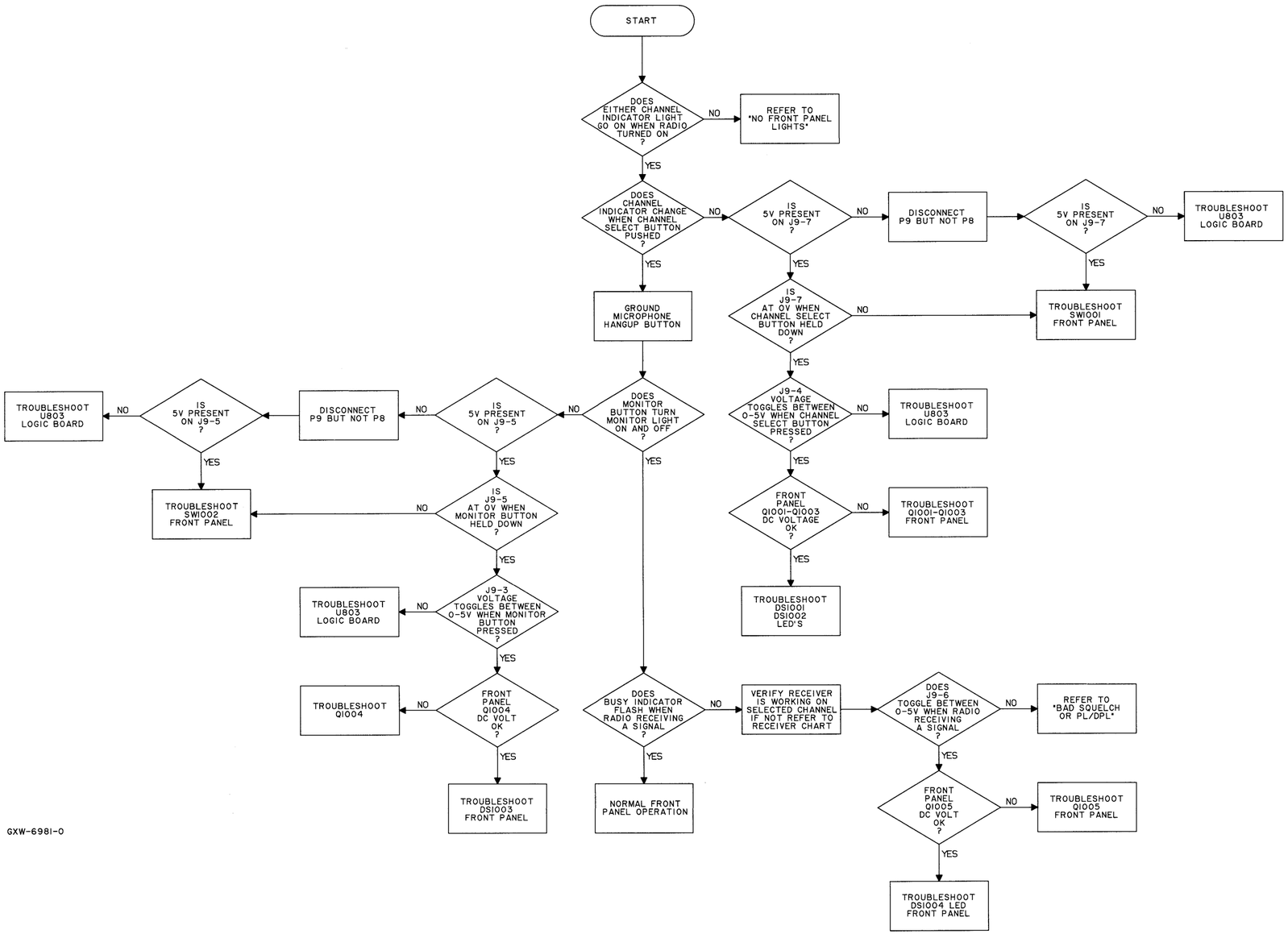
- R9001 – Fixed Resistor
- R9002 – ON/OFF Volume Control
- J11 – Microphone Jack
- Printed Circuit Board

Use continuity checks and ohmic measurements to verify proper operation of the switch board.

2. Troubleshooting and Repair

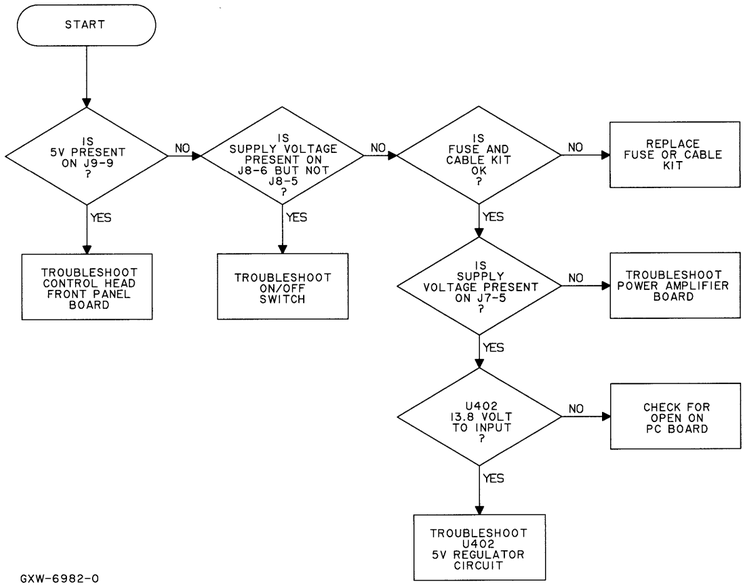
The troubleshooting diagrams on the following pages will help you diagnose problems which may occur on the front panel boards. Use these diagrams, and the schematics, circuit board diagrams, and parts lists to locate failed components and remedy the problem.

ABNORMAL FRONT PANEL OPERATION (*MaxTrac* 50/100)



GXW-6981-O

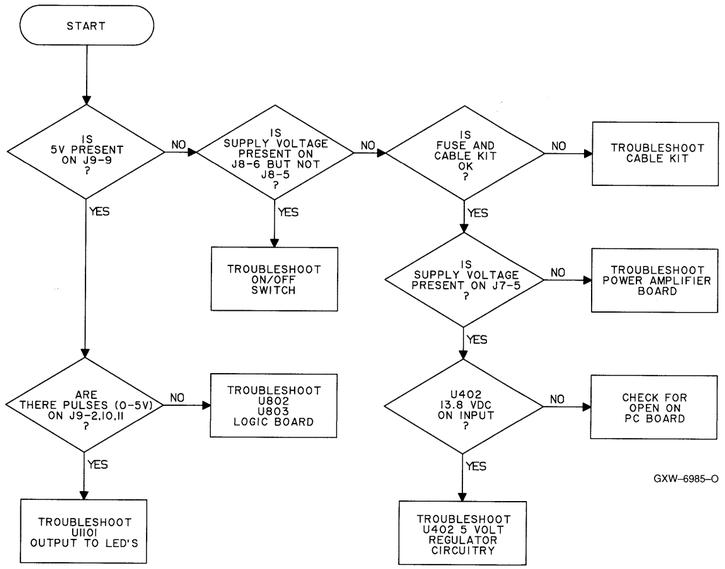
NO FRONT PANEL LIGHTS (*MaxTrac* 50/100)



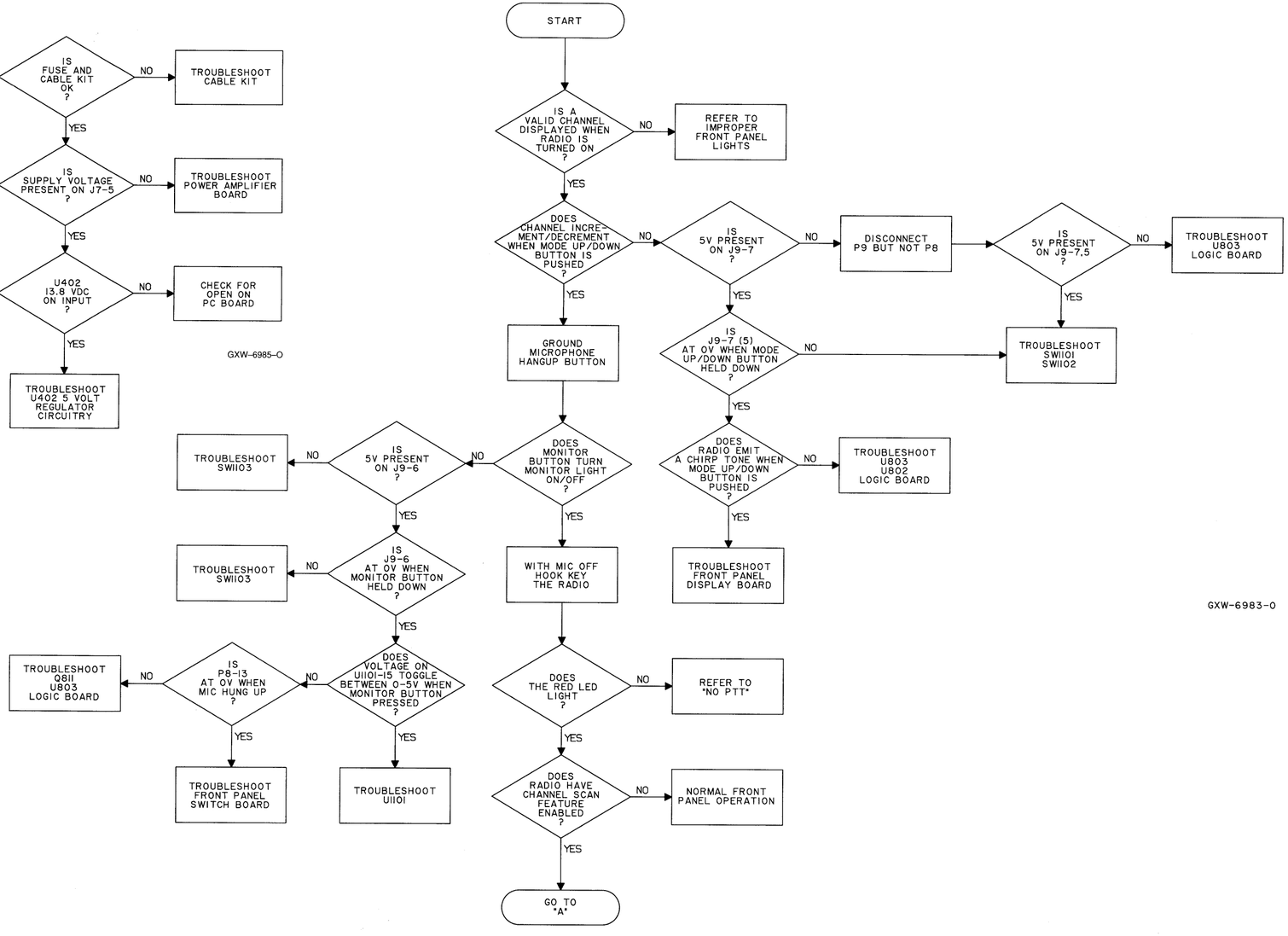
GXW-6982-O

Front Panel Troubleshooting Charts
PW–6980–O
(Sheet 1 of 2)
2/28/90

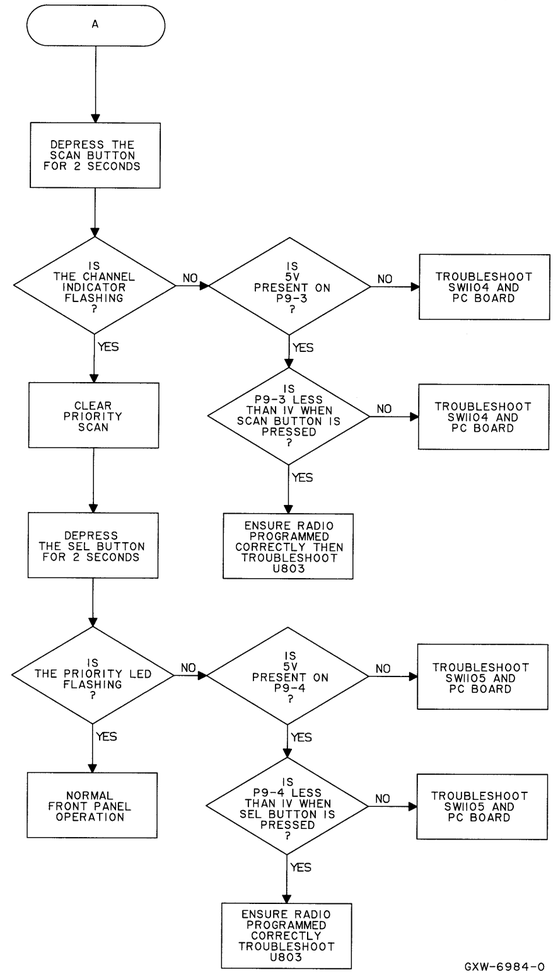
IMPROPER FRONT PANEL LIGHTS (*MaxTrac 300*)

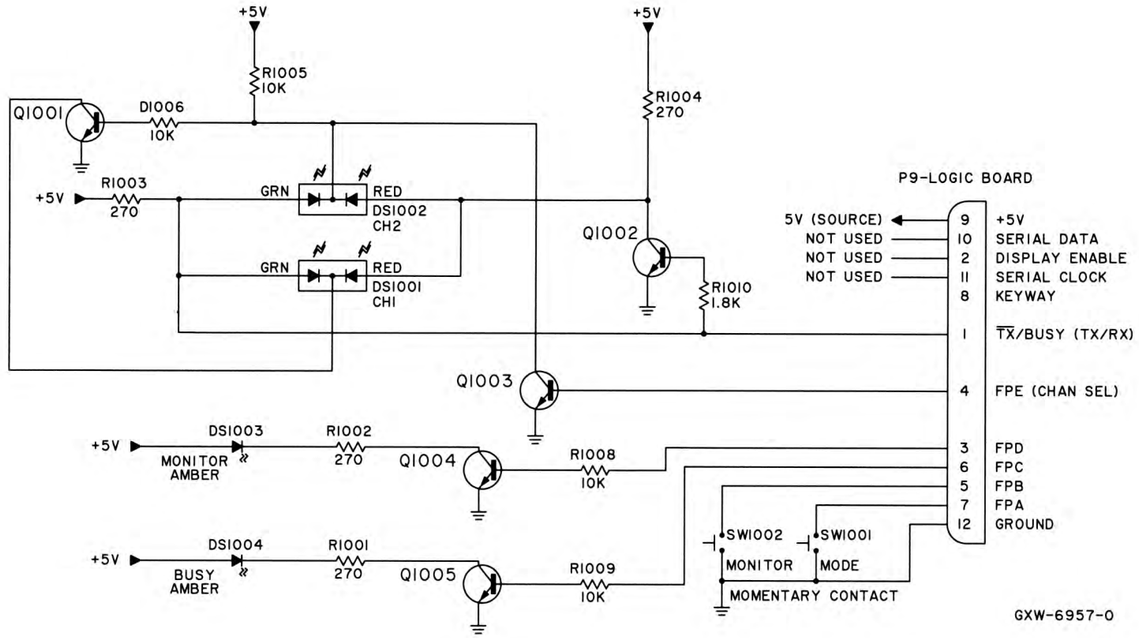


ABNORMAL FRONT PANEL OPERATION (*MaxTrac 300*)



ABNORMAL FRONT PANEL OPERATION CONT'D
(FOR RADIOS WITH *Channel Scan* FEATURES)





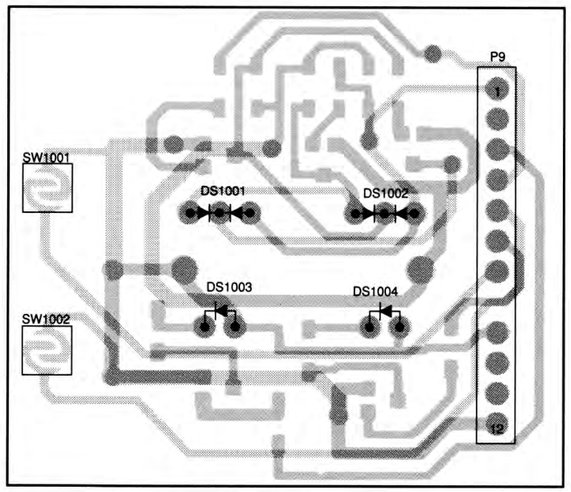
parts list

HLN5174A Front Panel Display Board (2 Frequency) MXW–6958–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
display, LED		
DS1001,1002	48–80051M07	green–red
DS1003,1004	48–80051M06	amber
transistor (see note)		
Q1001–1005	48–80124G02	NPN
resistor, fixed, chip, ±5%, 1/8 watt (unless otherwise stated)		
R1001–1004	06–11077A60	270
R1005–1009	06–11077A98	10k
R1010	06–11077A80	1.8k
	non–referenced parts	
M1001	84–80184L02	display circuit board
M1002	43–80279L01	LED spacer
M1006	01–80747T11	cable assembly (includes P9)
	42–80052N01	ground strap

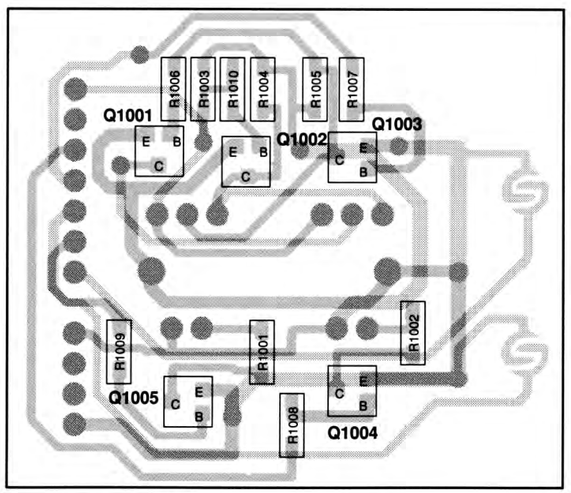
2/28/90

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



SOLDER SIDE
COMPONENT SIDE — GPW–6960–O
OVERLAY — GPW–6961–O

COMPONENT SIDE VIEW



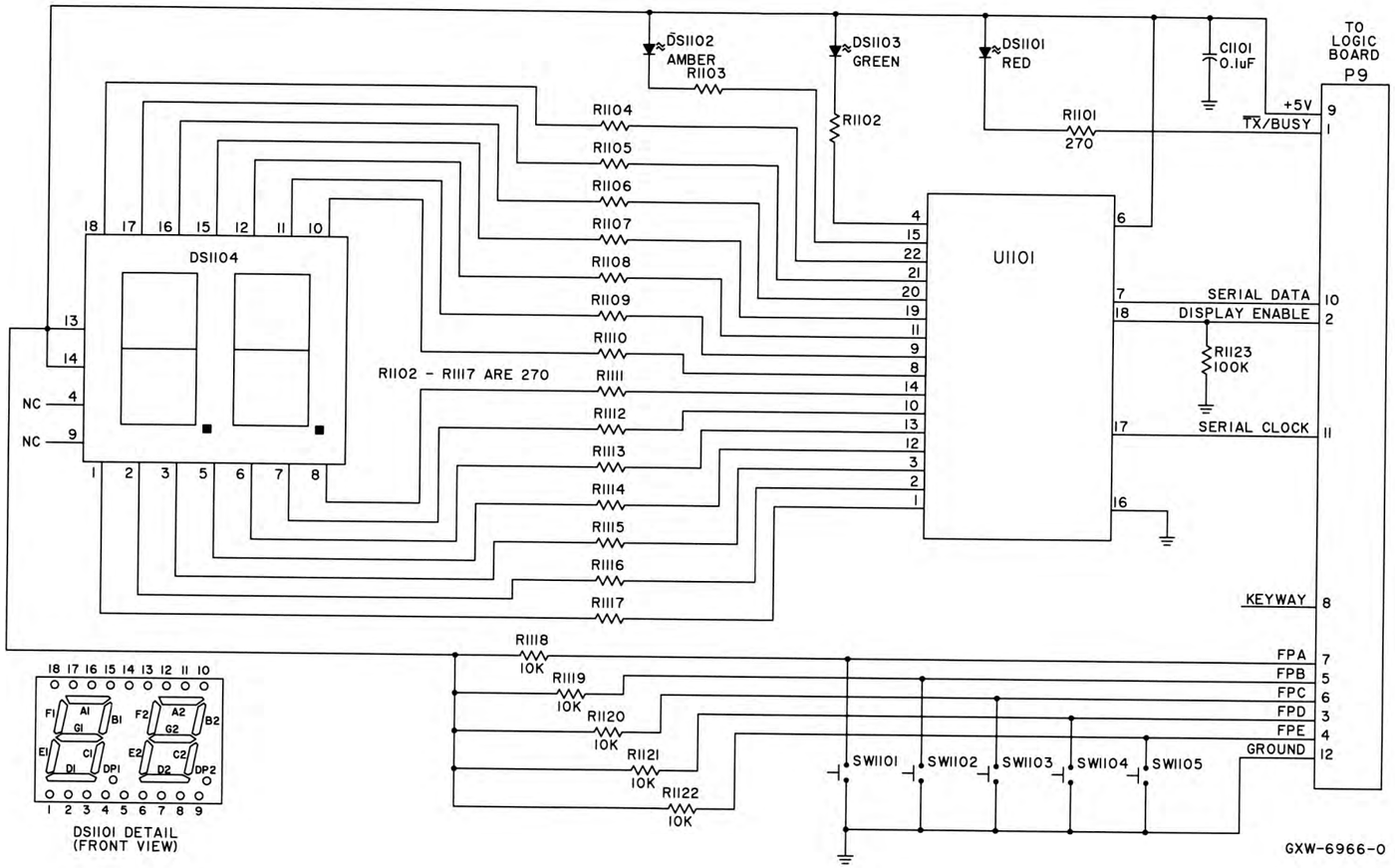
SOLDER SIDE
COMPONENT SIDE — GPW–6960–O
OVERLAY — GPW–6962–O

SOLDER SIDE VIEW

Schematic, Circuit Board Diagrams, and Parts List
for *MaxTrac* HLN5174A Display Board
PW–6956–O
2/28/90

DS1104 PIN ASSIGNMENTS

PIN	ASSIGNMENT
1	Cathode e1
2	Cathode d1
3	Cathode c1
4	Cathode dp1
5	Cathode e2
6	Cathode d2
7	Cathode g2
8	Cathode c2
9	Cathode dp2
10	Cathode b2
11	Cathode a2
12	Cathode f2
13	anode digit 2
14	anode digit 1
15	Cathode b1
16	Cathode a1
17	Cathode g1
F1	Cathode f1



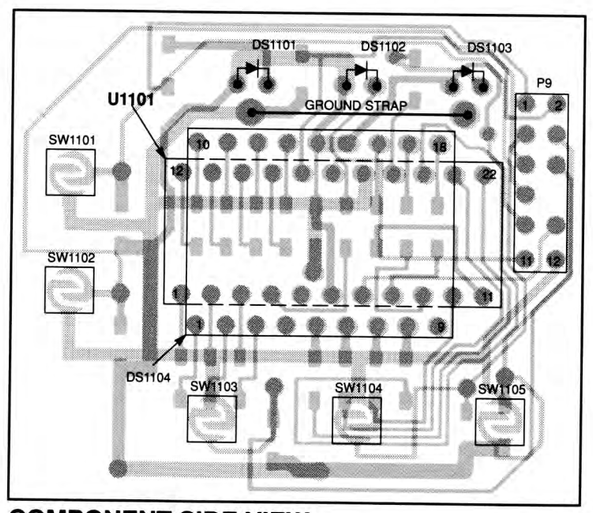
parts list

HLN5175A Front Panel Display Board (6/16 Frequency) MXW–6967–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF, ±5%, 50V (unless otherwise stated)		
C1101	21–13741B96	0.1
display, LED		
DS1101	48–80051M01	red
DS1102	48–80051M03	amber
DS1103	48–80051M02	green
DS1103	48–80055M01	dual, 7 segment
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R1101–1117	06–11077A60	270
R1118–1122	06–11077A98	10k
R1123	06–11077B23	100k
integrated circuit (see note)		
U1101	51–84437N25	driver, serial to parallel
	non–referenced parts	
	01–80747T11	cable assembly (includes P9)
	42–80053N01	ground strap
M1102	43–80280L01	spacer, LED
M1103	43–80278L01	spacer, LED display
	84–80155L02	display circuit board

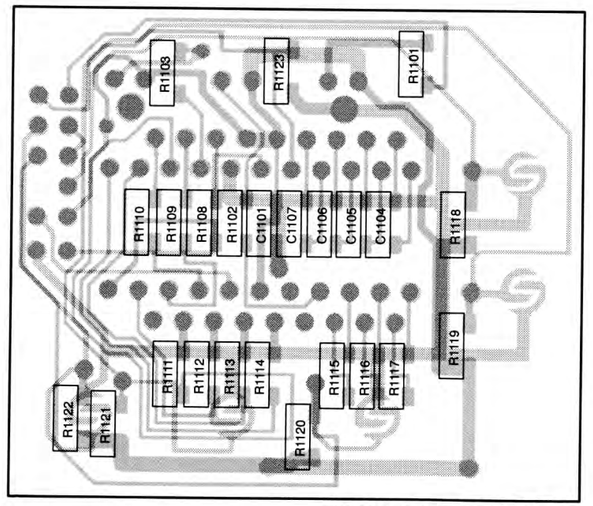
2/28/90

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



COMPONENT SIDE VIEW

SOLDER SIDE
COMPONENT SIDE — GPW–6968–O
OVERLAY — GPW–6970–O



SOLDER SIDE VIEW

SOLDER SIDE
COMPONENT SIDE — GPW–6968–O
OVERLAY — GPW–6971–O

Schematic, Circuit Board Diagrams, and Parts List
for *MaxTrac* HLN5175A Display Board
PW–6965–O
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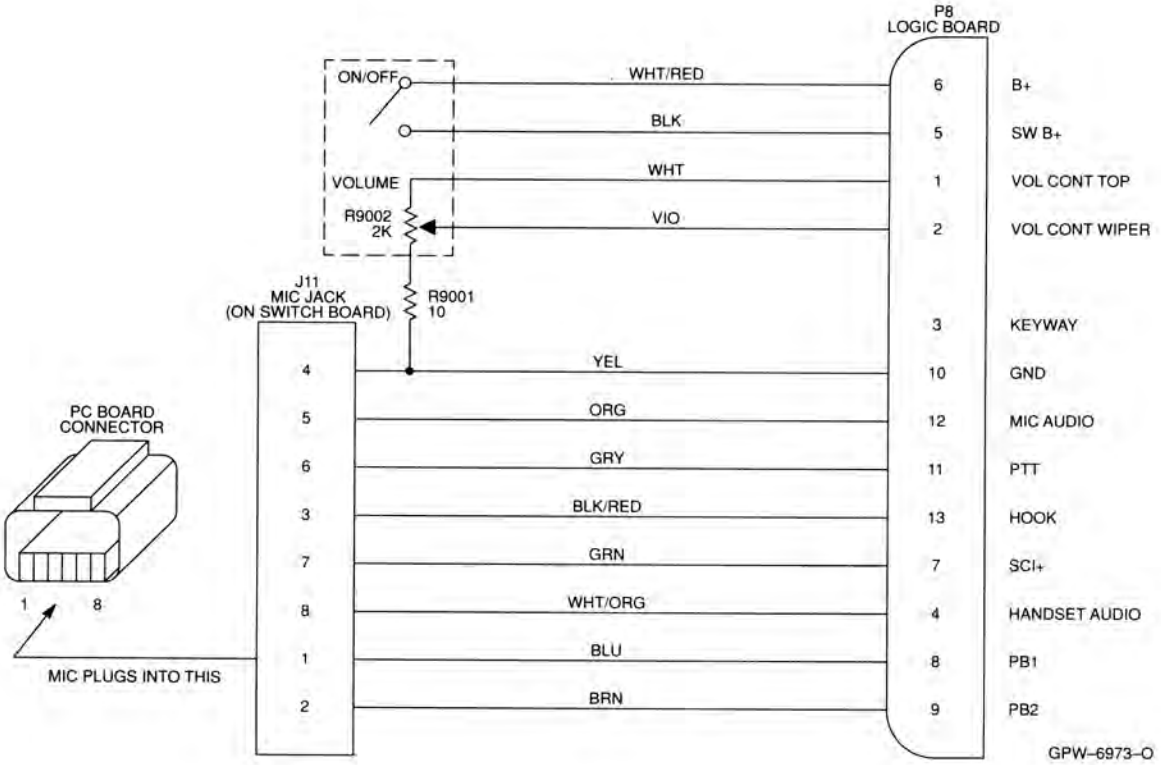
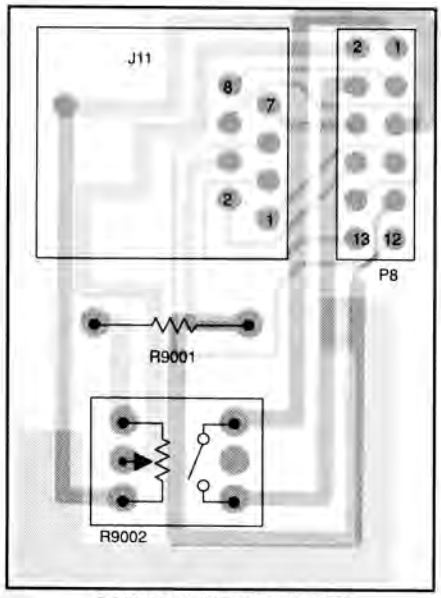




COMPONENT SIDE VIEW

SOLDER SIDE
COMPONENT SIDE — GPW–6975–O
OVERLAY — GPW–6977–O

parts list

HLN5184A Front Panel Switch Board — MXW–6974–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
receptacle, jack		
J11	09–80132M01	telephone type, 8 contact 3.15
resistor, fixed, ohm, ±5%, 1/4 watt (unless otherwise stated)		
R9001	06–11009A01	10
R9002	18–80140M01	2k, VOLUME potentiometer with switch
	non–referenced parts	
M9001	84–80185L02	switch circuit board
	01–80747T12	cable assembly (includes P8)

2/28/90

Schematic, Circuit Board Diagram, and Parts List
for HLN5184A Front Panel Switch Board
PW–6972–O
2/28/90

END OF PART 1 OF 4

1. Theory Of Operation

The Logic Board consists of 5 segments:

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

1.1 MICROPROCESSOR

1.1.1 Description

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

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

The control logic surrounding U802 consists of:

(1) *Custom Gate Array U803.* This device expands the Input/Output capabilities of the control logic. U802 and U803 exchange information which tells the mieroprocessor the input port status and the desired state of the output ports.

(2) *NOVRAM U805.* This is a Non–Volatile Random Access Memory device which consists of a static RAM with a built in lithium battery to maintain it's memory after removing power. The NOVRAM acts as the radio's code plug, storing any operating information pertinent to a particular radio. This information includes operating frequencies, control channels, time out timer, and other special functions.

(3) *EPROM U804.* This is an Erasable Programmable Read Only Memory. U804's function is to store the Microcomputer's operating program.

(4) *Static Random Access Memory U806.* This RAM is used for scratch pad operations in the trunked *MaxTrac.*

(5) *Digital–to–Analog IC U801.* This IC is used to generate precision analog voltages.

1.1.2 Operation

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

1.1.3 Power Up/Low–Line Reset

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

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

1.1.4 Microcomputer Start–Up Routine

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

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

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

1.1.5 Microcomputer Normal Operation

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

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

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

1.1.6 Reading Or Writing In Memory

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

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

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

1.2 VOLTAGE REGULATION

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

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

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

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

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

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

1.3 RECEIVE AUDIO FILTER

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

1.3.1 Audio Power Amplifier

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

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

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

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

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

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

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

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

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

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

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

1.3.2 Low–Speed Data Filter

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

1.3.3 High Speed Data Filter

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

1.4 TRANSMIT AUDIO

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

1.4.1 High–Speed Transmit Data

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

1.4.2 Low–Speed Transmit Data

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

1.5 POWER CONTROL CIRCUIT

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

2. Troubleshooting Guide

2.1 MICROPROCESSOR SECTION

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

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

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

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

Other error tones will point to problems that can be traced back to defective IC's or components not actually in the shielded area of the Logic Board. By observing the logic voltage levels and waveforms on the schematics, the fault can be found.

2.2 RECEIVE AUDIO

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

2.3 TRANSMIT AUDIO

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

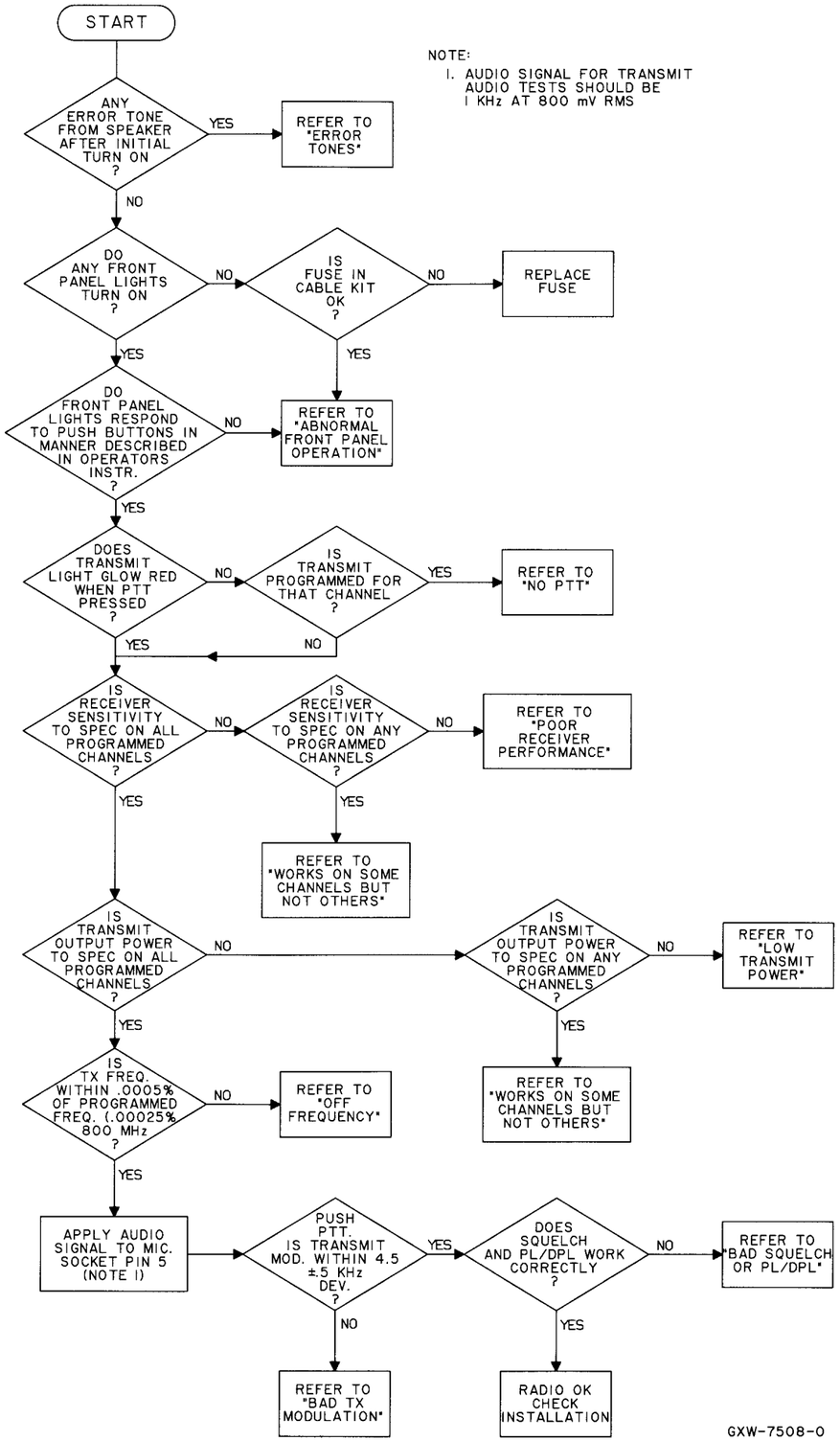
2.4 AUDIO POWER AMPLIFIER

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

2.5 POWER CONTROL CIRCUITRY

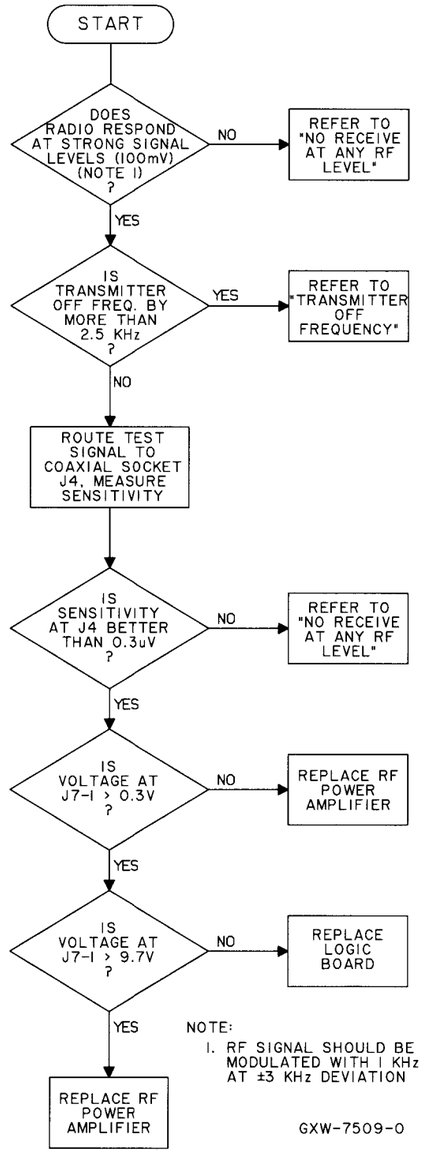
Refer to the Transmitter Troubleshooting section to isolate problems in the Power Control Circuitry part of the Logic Board. This power control loop is very difficult to troubleshoot without breaking the loop and inserting a fixed voltage to certain parts of the circuit. Follow the schematic and theory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

BASIC TROUBLESHOOTING (START WITH THIS CHART)



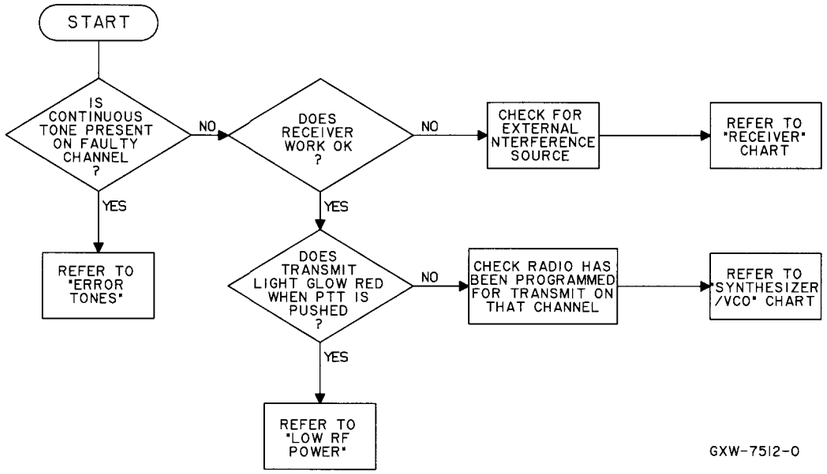
GXW-7508-0

POOR RECEIVER PERFORMANCE



GXW-7509-0

RADIO WORKS ON SOME CHANNELS BUT NOT OTHERS

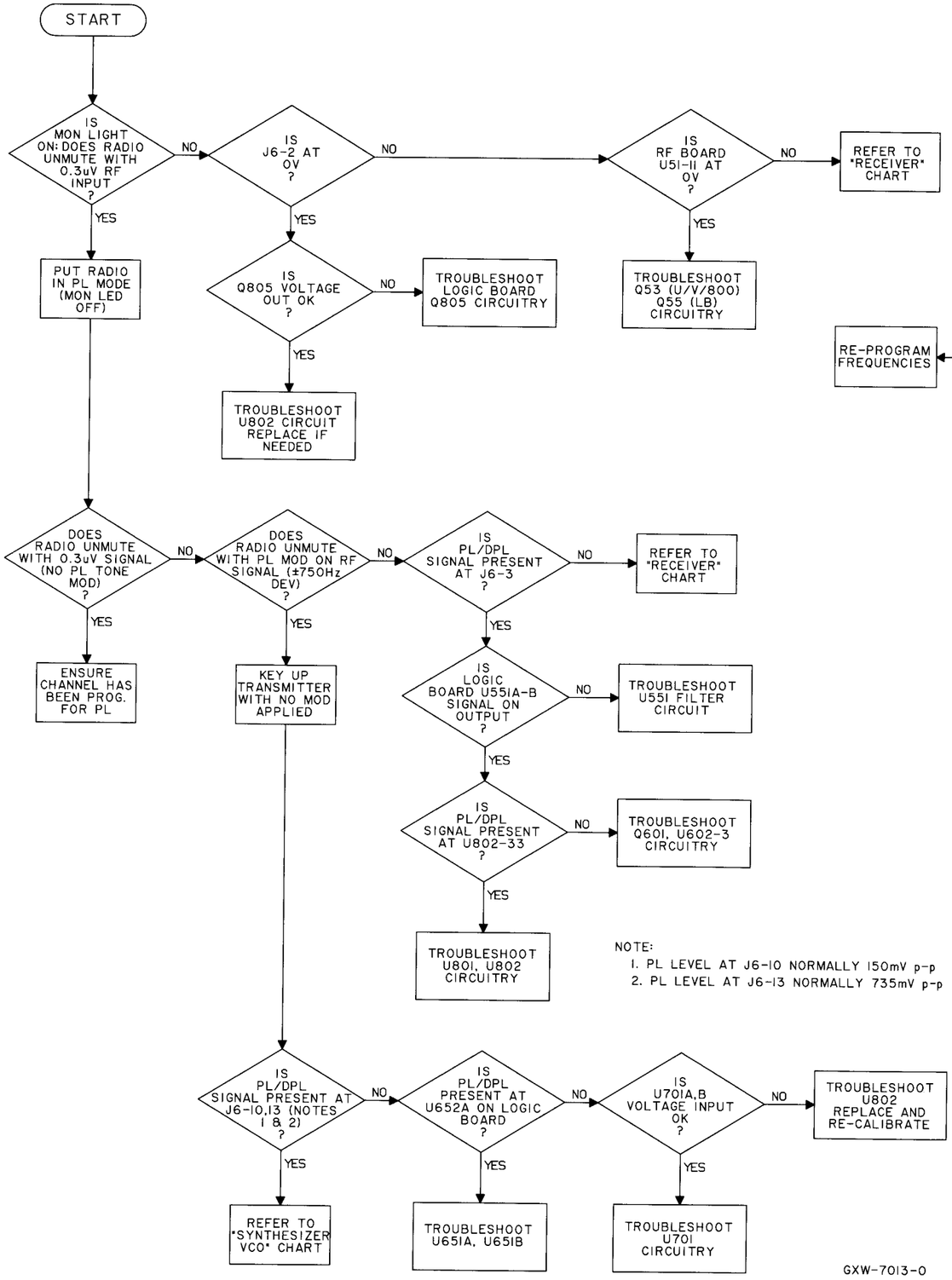


GXW-7512-0

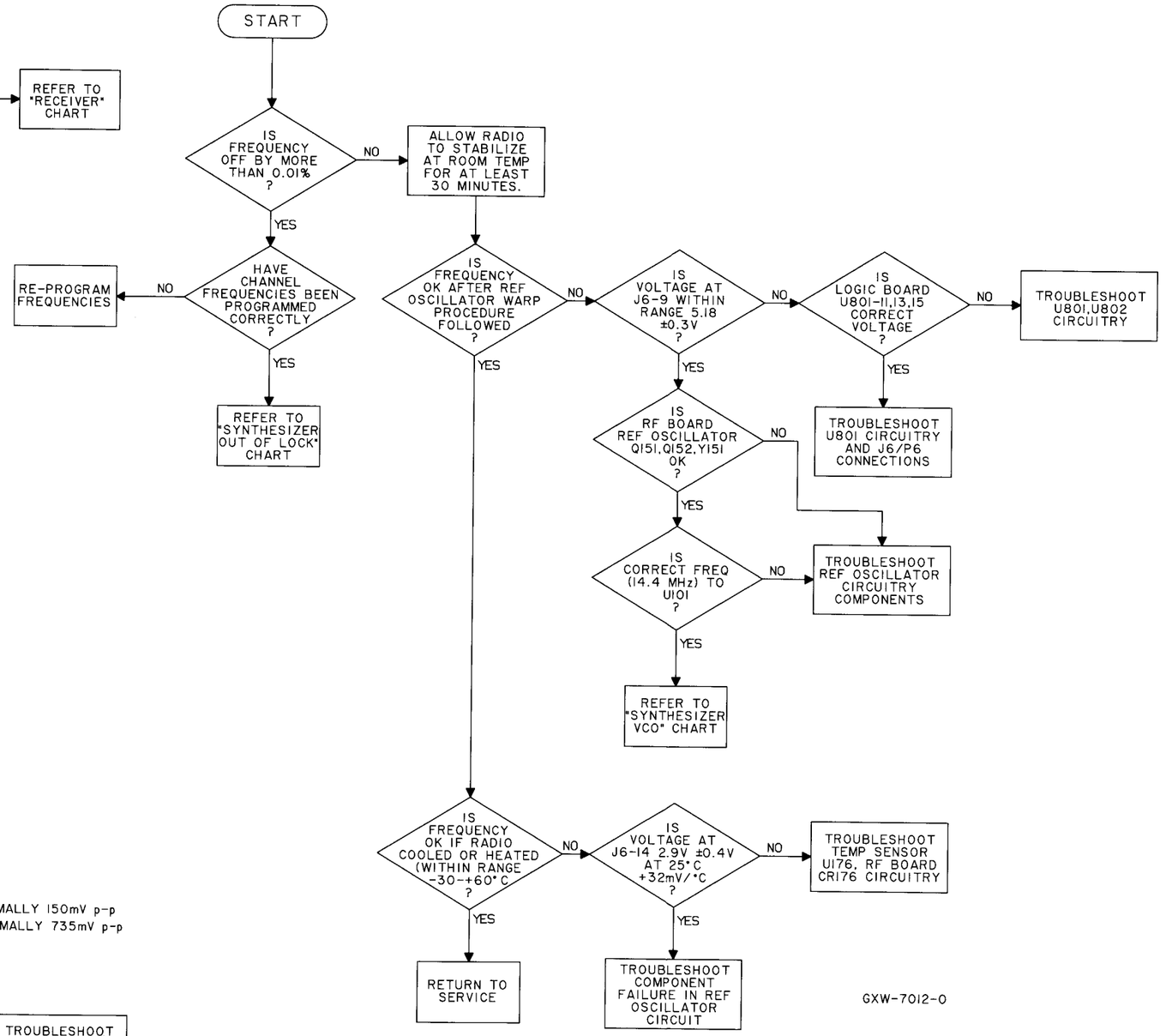
IMPORTANT

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

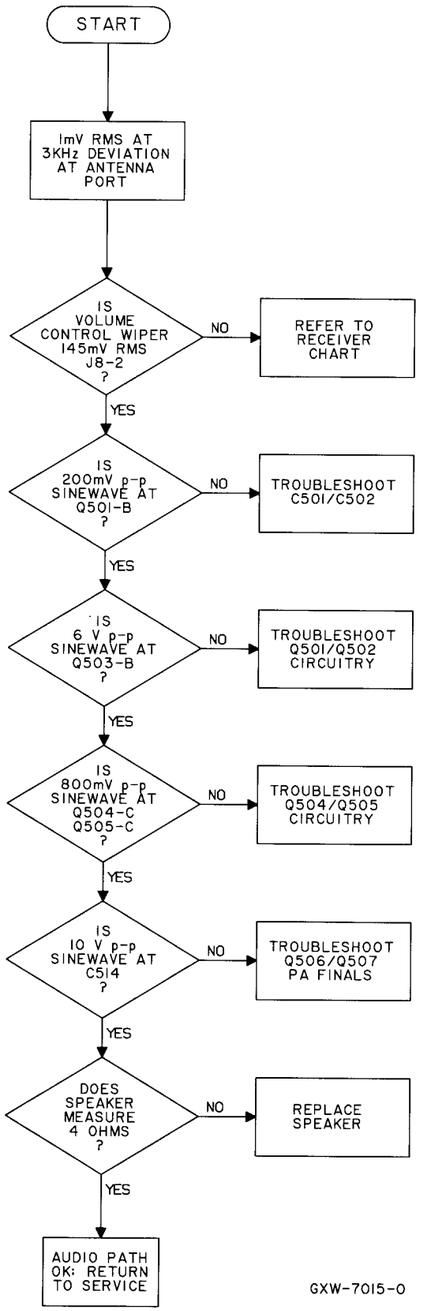
BAD SQUELCH OR PL/DPL



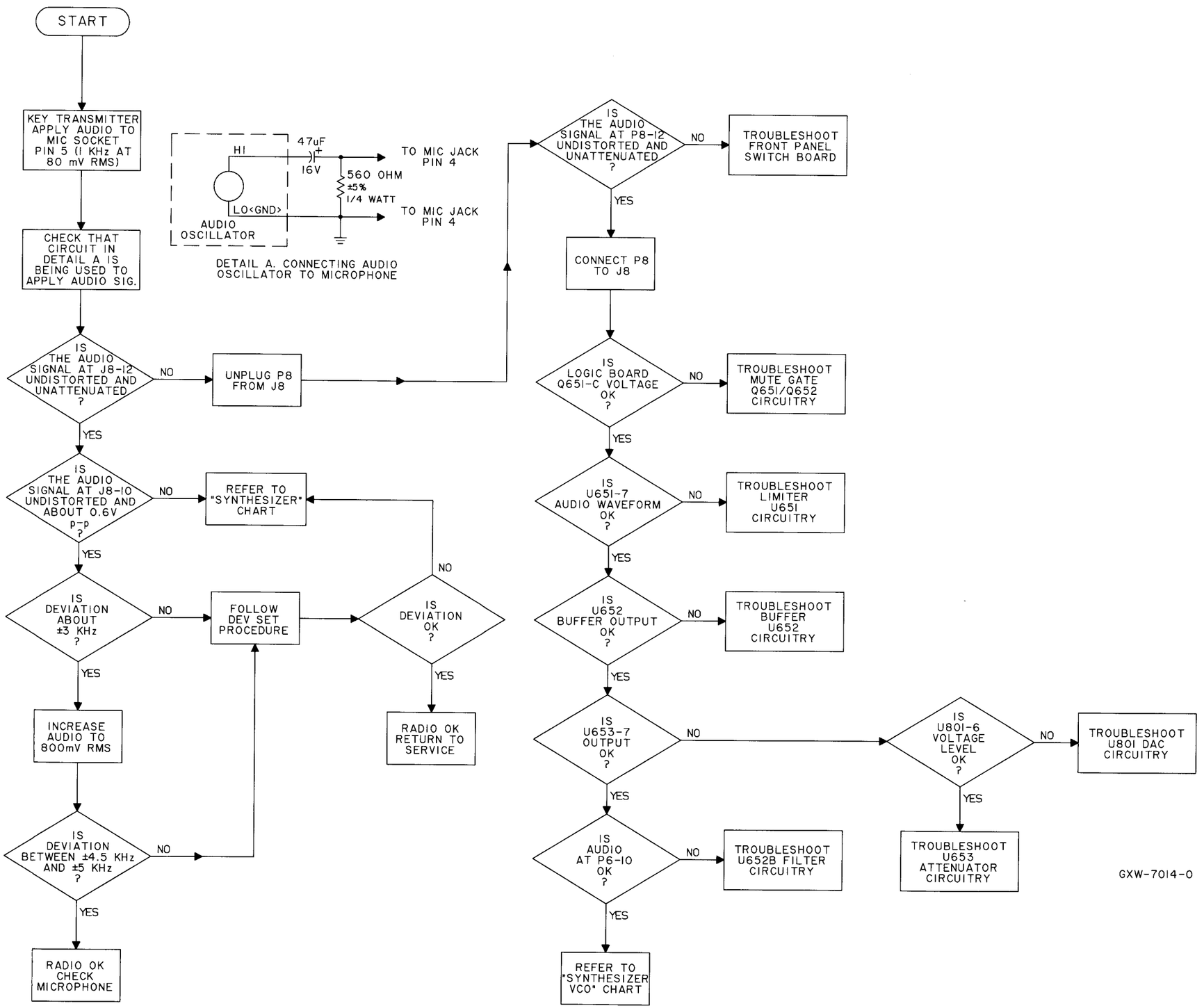
TRANSMITTER OFF FREQUENCY



NO/LOW AUDIO



BAD TX MODULATION



Logic Board Troubleshooting Charts
PW–7011–O
(Sheet 2 of 2)
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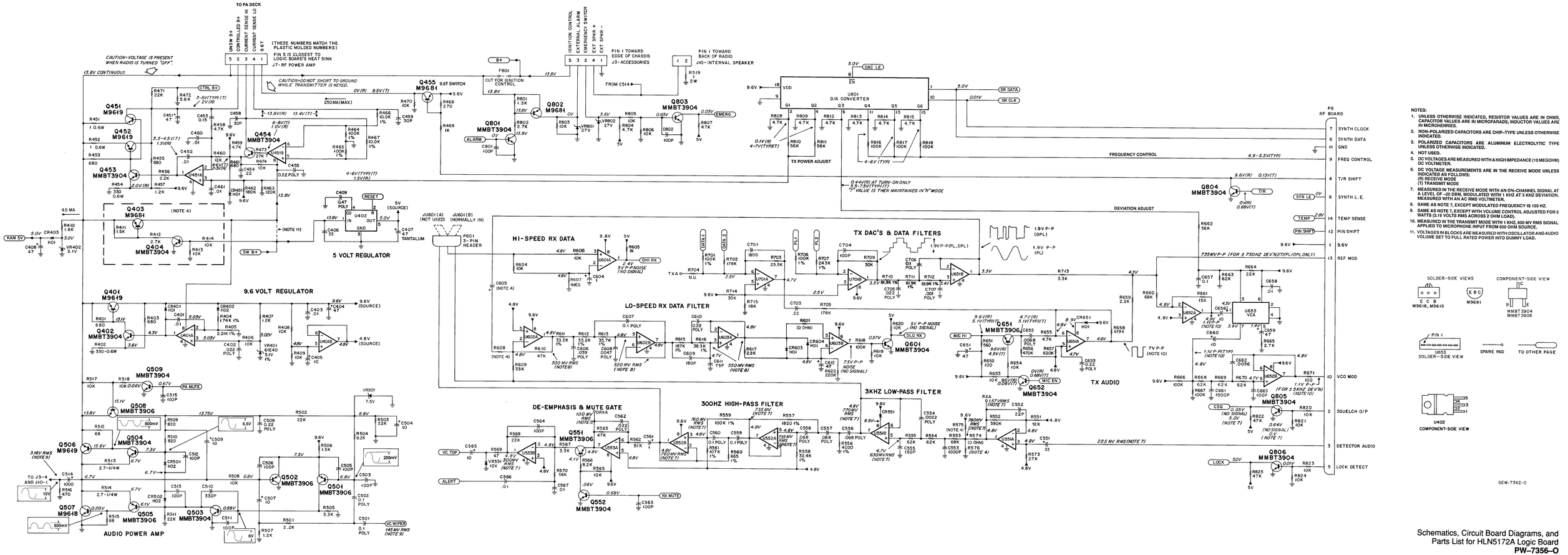


NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. NOT USED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
6. DC VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
8. SAME AS NOTE 7, EXCEPT MODULATED FREQUENCY IS 100 HZ.
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 800 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
11. VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.

GEW-7362-O

Schematics, Circuit Board Diagrams, and Parts List for HLN5172A Logic Board

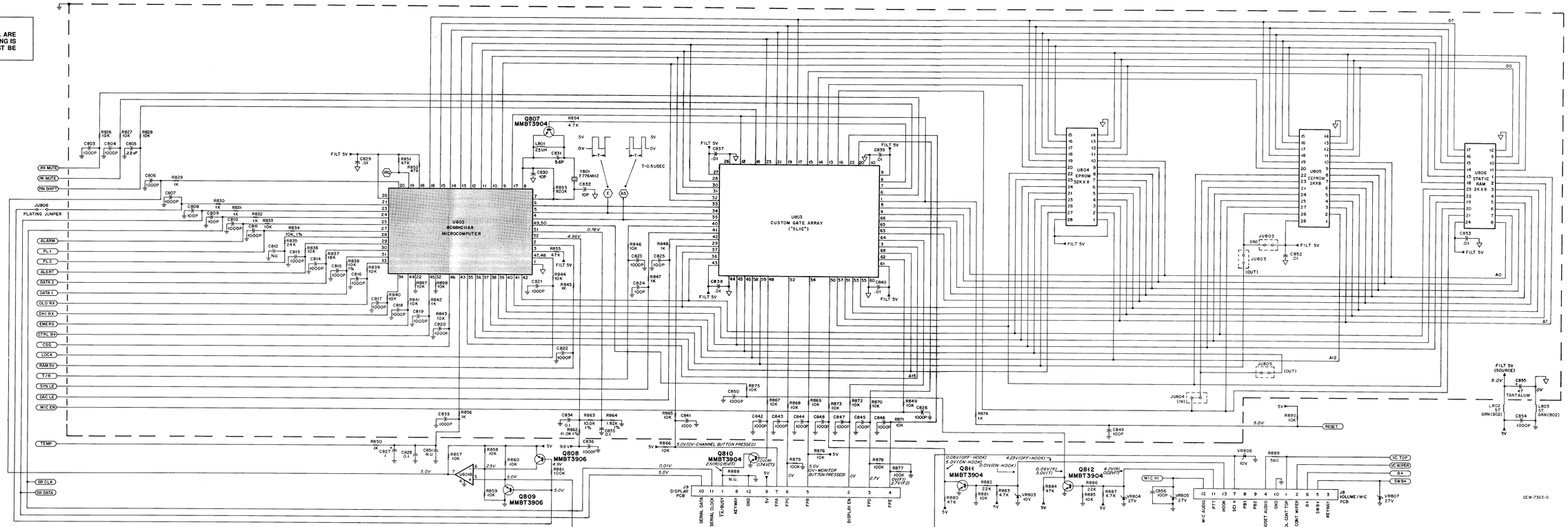
PW-7356-O

(Sheet 1 of 4)

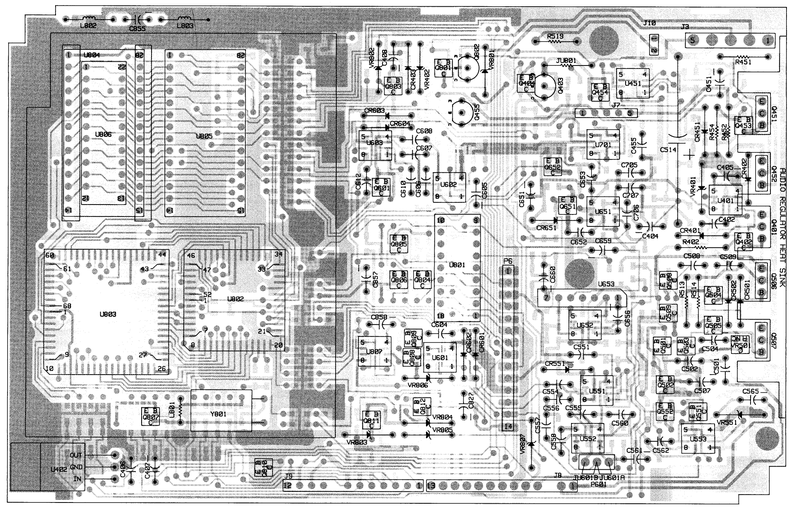
2/28/90

IMPORTANT

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

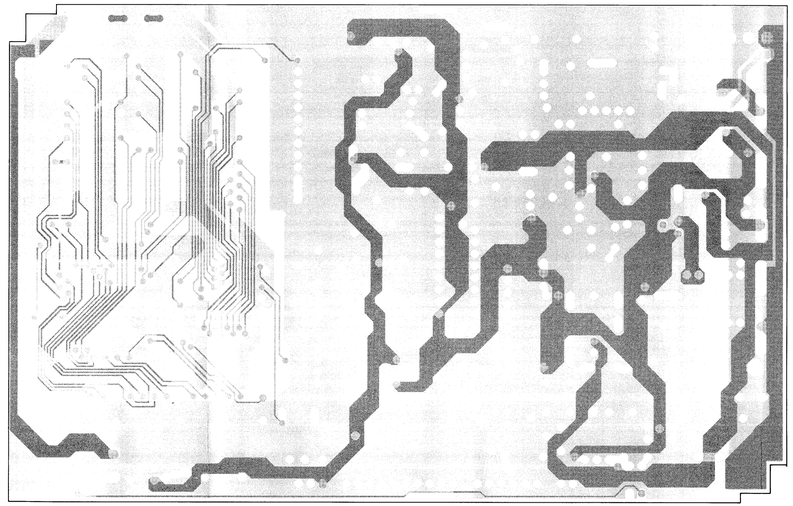


Schematics, Circuit Board Diagrams, and Parts List for HLN5172A Logic Board
PW–7356–O
(Sheet 2 of 4)
2/28/90



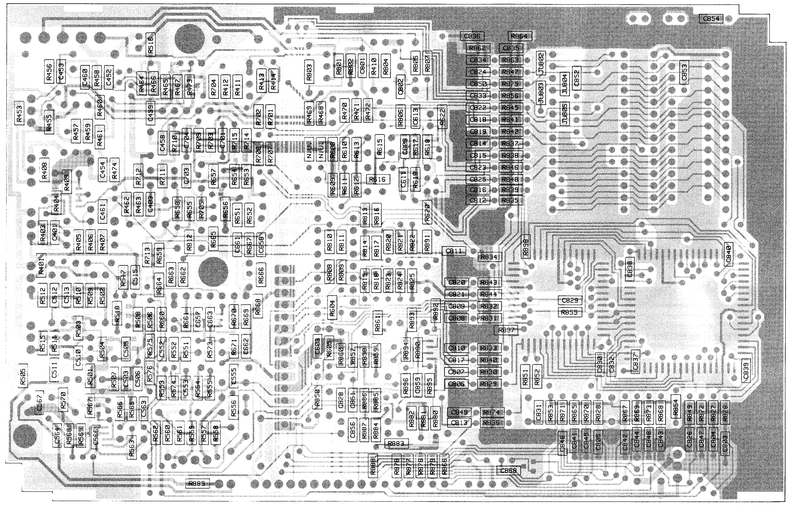
SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7358-O
OVERLAY GCW-7360-O

COMPONENT SIDE VIEW



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

COMPONENT SIDE VIEW



SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7358-O
OVERLAY GCW-7361-O

SOLDER SIDE VIEW

Schematics, Circuit Board Diagrams, and
Parts List for HLN5172A Logic Board
PW-7356-O
(Sheet 3 of 4)
2/28/90

parts list

HLN5172A Logic Board (Trunking) — MXW–7357–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF, ±5%, 50V (unless otherwise stated)		
C401	21–13741B45	0.01,±10%
C402	08–11051A09	.022, 63V
C403	21–13741B45	0.01,±10%
C404	23–11048B19	47, ±20%, 16V, electrolytic
C405	23–11048B13	10, ±20, 16V, electrolytic
C406	23–11048A17	33, ±20%, 25V, electrolytic
C407	23–13749A44	47, ±20%, 6V
C408	23–11048B19	47, ±20%, 16V, electrolytic
C409	08–11051A17	.47, 63V
C451	23–11048B19	47, ±20%, 16V, electrolytic
C452	21–13741B45	0.01, ±10%
C453	21–11032B14	.15, +80 –20%
C454	21–11032B15	.22, +80 –20%
C455	08–11051A15	.22, 63V
C458,459	21–13740B36	30 pF
C460,461	21–13741B45	0.01 ±10%
C501,502	08–11051A13	.1, 63V
C503	21–13740B49	100 pF
C504	23–11048B13	10, ±20%, 16V, electrolytic
C505,506	21–13740B49	100 pF
C507	23–13749C39	10, ±10%, 20V
C508	08–11051A15	.22, 63V
C509	23–11048B13	10, ±20%, 16V, electrolytic
C510	21–13740B61	330 pF
C511–513	21–13740B49	100 pF
C514	23–02308M01	1000, ±20%, 16V, electrolytic
C515	21–13740B49	100 pF
C551	23–11048A17	33, ±20, 25V, electrolytic
C552	21–13740B33	22 pF
C553	21–13740B73	1000 pF
C554	08–11051A03	.0022, 63V
C555	21–13740B53	150 pF
C556–558	08–11051A12	.068, 63V
C559,560	08–11051A13	.1, 63V
C561	23–11048B05	1, ±20%, electrolytic
C562	08–11051A09	.022, 63V
C563,564	21–13740B49	100 pF
C565	23–11048B13	10, ±20%, 16V, electrolytic
C566,567	21–13741B45	0.01, ±10%
C604	23–11048B05	1, ±20%, electrolytic
C606	08–11051A22	0.039, 63V
C607	08–11051A13	.1, 63V
C608	08–11051A05	.0047, 63V
C609	21–13740B55	180 pF
C610	08–11051A15	.22, 63V
C611	21–13740B46	75 pF
C612	23–11048B19	47, ±20%, 16V, electrolytic
C651	23–11048B19	47, ±20%, 16V, electrolytic
C652	08–11051A06	.0068, 63V
C653	08–11051A15	.22, 63V
C656	23–11048B13	10, ±20%, 16V, electrolytic
C657	21–13741B69	0.1, +80 –20%
C658	21–13741B45	0.01, ±10%
C659	23–13749A44	47, ±20%, 6V, tantalum
C660	23–11048B13	10, ±20%, 16V, electrolytic
C661	21–13740B76	1500 pF
C662	21–13741B39	.0056
C663	21–13740B49	100 pF
C701	21–13740B78	1800 pF
C703	21–11032B15	.22, +80, –20%
C704	21–13740B49	100 pF
C705	08–11051A09	.022, 63V
C706	08–11051A13	.1, 63V
C707	08–11051A01	.001, 63V
C801,802	21–13740B49	100 pF
C803,804	21–13740B73	1000 pF
C805	21–11032B15	.22, +80 –20%
C806,807	21–13740B73	1000 pF
C808,809	21–13740B49	100 pF
C810,811	21–13740B73	1000 pF
C813–823	21–13740B73	1000 pF
C824,825	21–13740B49	100 pF
C826	21–13740B73	1000 pF
C827	23–11048B05	1, ±20%, electrolytic
C828	21–13741B69	0.1, +80 –20%
C829	21–13741B45	0.01, ±10%
C830	21–13740B25	10 pF, ±.5 pF
C831	21–11031F10	5.6 pF, ±.5 pF
C832	21–13740B25	10 pF, ±.5 pF
C833	21–13740B73	1000 pF
C834,835	21–13741B69	0.1, +80 –20%
C836	21–13740B73	1000 pF
C837–840	21–13741B45	0.01, ±10%
C841–848	21–13740B73	1000 pF
C849	21–13740B49	100 pF
C850	21–13740B73	1000 pF
C852,853	21–13741B45	0.01, ±10%
C854	21–13740B73	1000 pF
C855	23–11054A09	47, ±20%, 6V, tantalum
C856	21–13740B49	100 pF
diode (see note)		
CR401	48–83654H01	silicon
CR402	48–83654H02	silicon
CR403	48–83654H01	silicon
CR451	48–83654H01	silicon
CR501,502	48–83654H02	silicon
CR551	06–11009B23	jumper resistor
CR603,604	48–83654H01	silicon

MXW–7357–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR651	48–83654H01	silicon
fuse		
F801	65–05214E06	1 A
connector receptacle		
J3	28–80129M01	5–pin
J7	28–80128M01	5–pin
J8,9	28–80126M01	23–pin
J10	28–80128M02	2–pin
jumper		
JU601	09–84181L01	2–contact push–on
JU802	06–11077A01	0–ohm resistor
JU804	06–11077A01	0–ohm resistor
coil, RF		
L801	24–82723H35	23 uH, red
L802,803	24–83961B02	5 turns, green
connector plug		
P6	28–80127M02	14–pin, RF board
P601	28–80002R03	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 stated)		
R401	06–11077A70	680
R402	06–02369M31	330, .6 watt, 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, .6 Watt, metal film
R453	06–11077A70	680
R454	06–02369M31	330, .6 watt, 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	06–11077A82	2.2k
R502,503	06–11077B07	22k
R504	06–11077A96	8.2k
R505	06–11077A86	3.3k
R506	06–11077A78	1.5k
R507	06–11077A76	1.2k
R508	06–11077A98	10k
R509,510	06–11077A72	820
R511	06–11077B07	22k
R512	06–11077A46	68
R513,514	06–11009B26	2.7, 1/4 Watt
R515	06–11077A46	68
R516	06–11077A66	470
R517,518	06–11077A98	10k
R519	06–80185M01	1 ohm, ±10%, 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%

MXW–7357–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R562	06–11077B16	51k
R563	06–11077B15	47k
R565	06–11077A98	10k
R566	06–11077A96	8.2k
R567	06–11077A86	3.3k
R568	06–11077B07	22k
R569	06–11077A42	47
R570	06–11077B17	56k
R573	06–11077B09	27k
R574	06–11077A01	0–ohm
R604	06–11077A98	10k
R605	06–11077A74	1k
R606	06–11077A98	10k
R607	06–11077B47	1 meg
R609	06–11077B11	33k
R610	06–11077B15	47k
R611,612	06–11077G42	33.2k, ±1%
R613	06–11077G45	35.7k, ±1%
R615	06–11077H15	187k, ±1%
R616	06–11077G48	38.3k, ±1%
R617	06–11077A82	2.2k
R618	06–11077B23	100k
R619,620	06–11077A98	10k
R621	06–11077A01	0 ohm
R622	06–11077B31	220k
R651	06–11077A68	560
R652	06–11077A50	100
R653,654	06–11077A98	10k
R655	06–11077A90	4.7k
R656	06–11077B39	470k
R657	06–11077B42	620k
R658	06–11077H65	619k, ±1%
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	178, ±1%
R703	06–11077G31	25.5k, ±1%
R705	06–11077H13	178k, ±1%
R706	06–11077G88	100k, ±1%
R707	06–11077H26	243k, ±1%
R709	06–11077B10	30k
R710–712	06–11077G68	61.9k, ±1%
R713	06–11077A86	3.3k
R714	06–11077B10	30k
R715	06–11077B05	18k
R801	06–11077A78	1.5k
R802	06–11077A84	2.7k
R803	06–11077A98	10k
R804	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

MXW–7357–O (4)

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

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

Schematics, Circuit Board Diagrams, and Parts List for HLN5172A Logic Board
PW–7356–O
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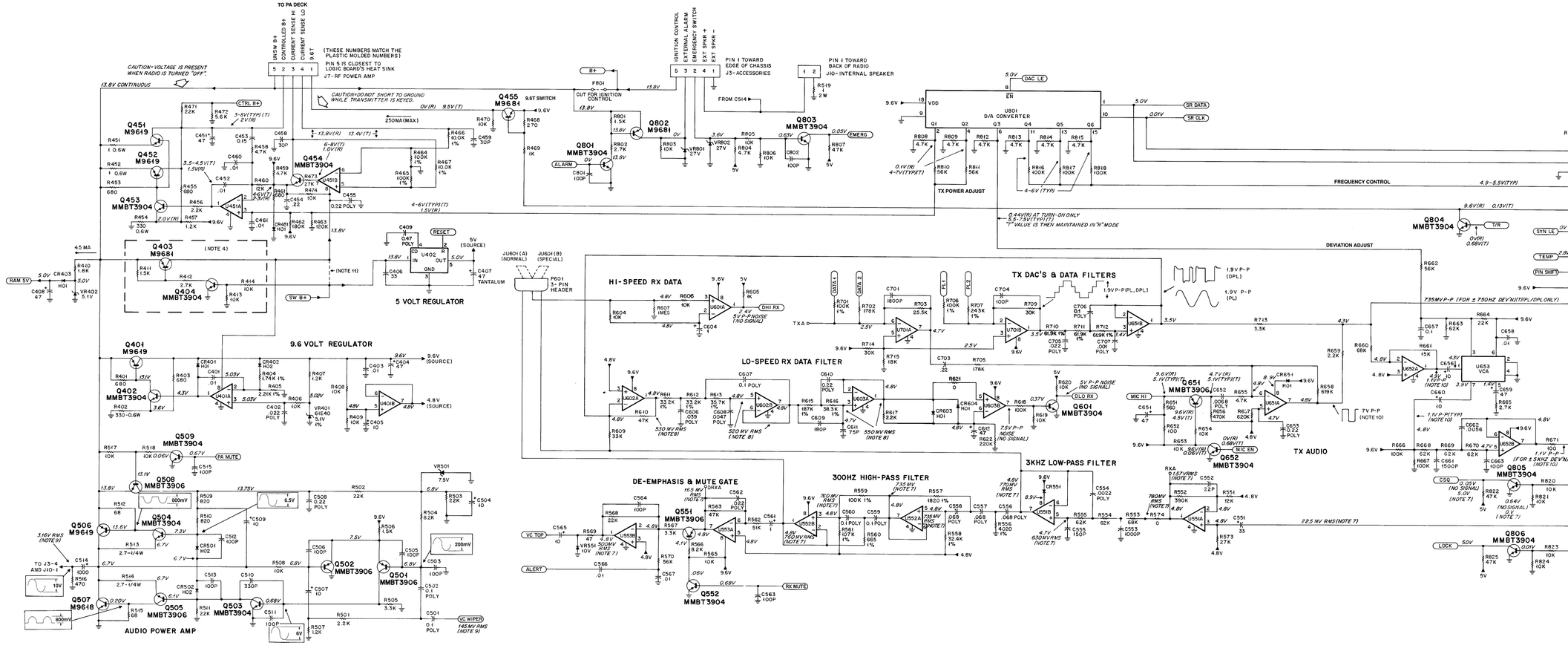

NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. NOT USED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
6. DC VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
8. SAME AS NOTE 7, EXCEPT MODULATED FREQUENCY IS 100 HZ.
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 600 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
11. VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.

SOLDER-SIDE VIEWS

M9648, M9619

M9681

COMPONENT-SIDE VIEW

MMBT3904
MMBT3906

U653 SOLDER-SIDE VIEW

SPARE PAD

TO OTHER PAGE

U402 COMPONENT-SIDE VIEW

GEW-7366-O

Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board

PW-7364-O

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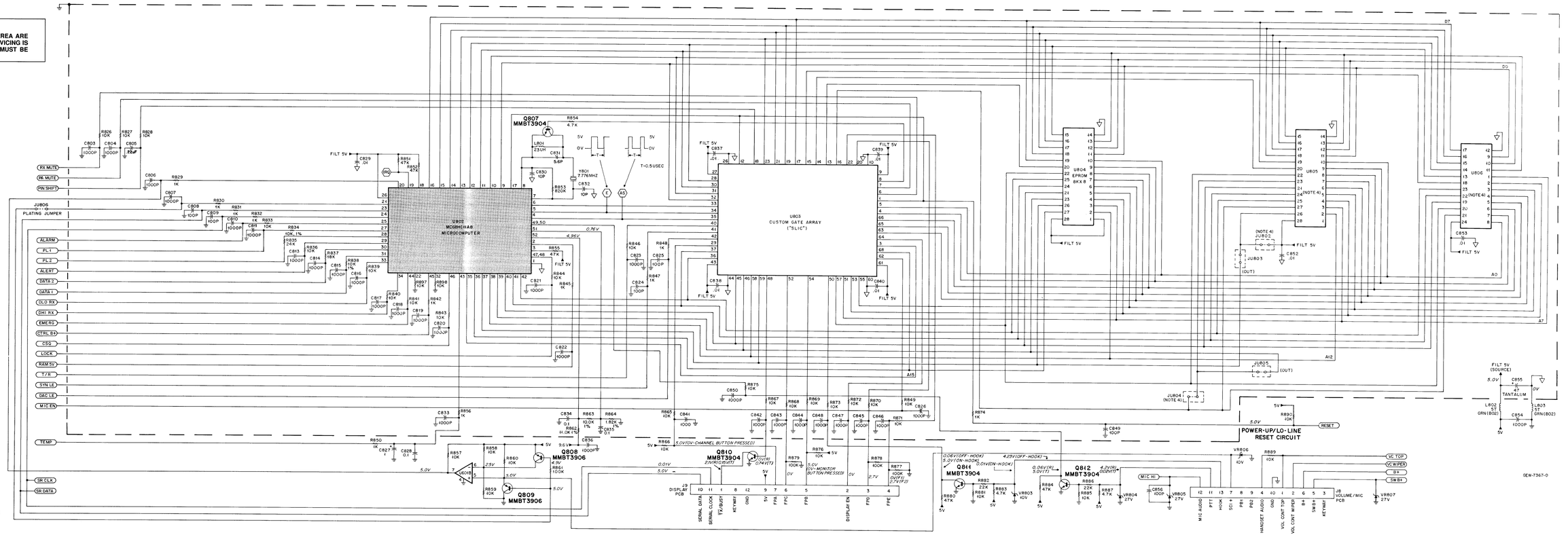
IMPORTANT

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



Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board
PW-7364-O
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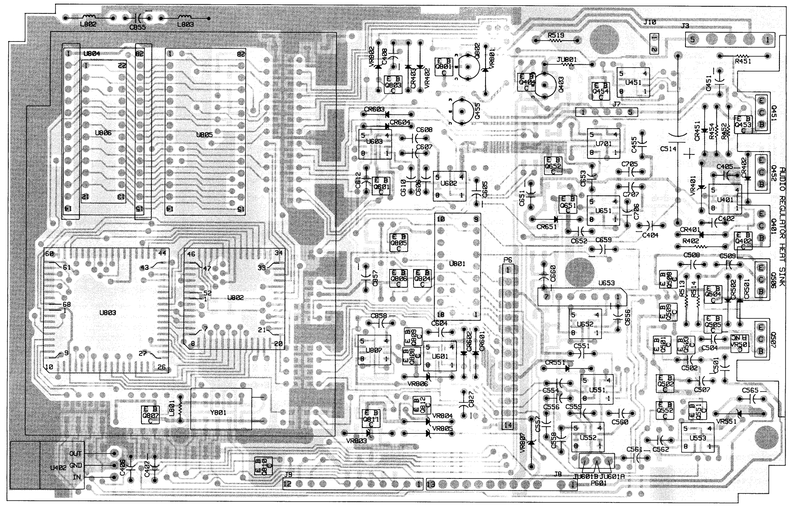
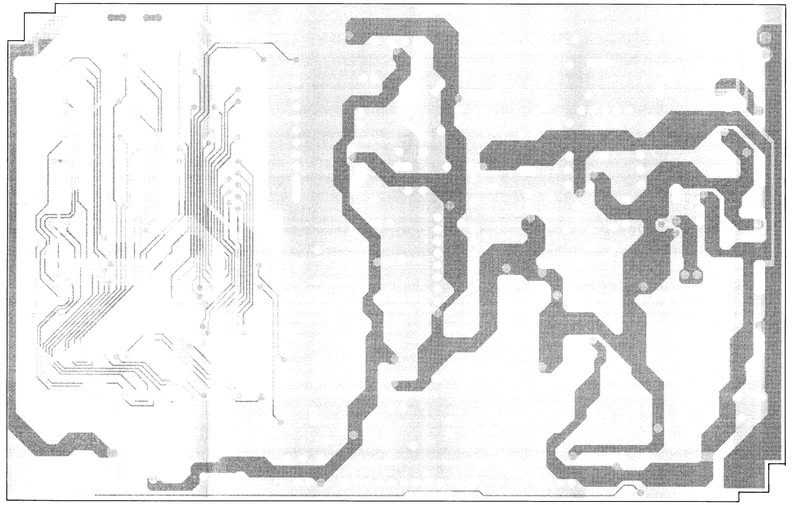


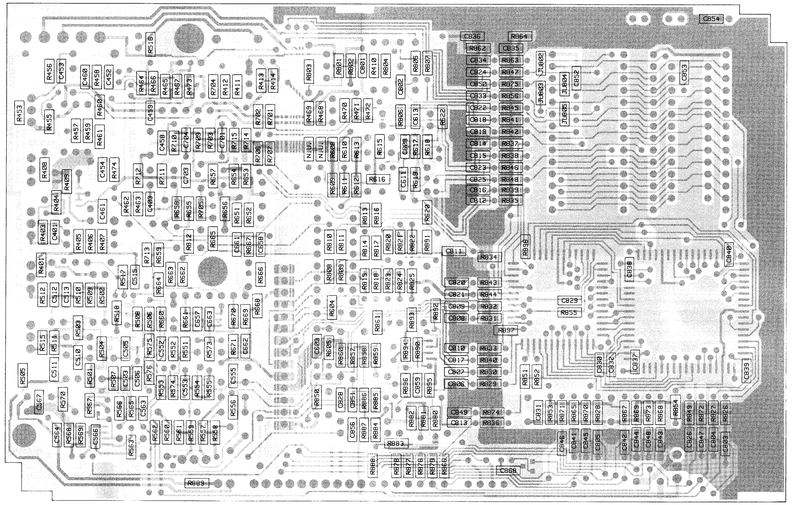
SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7358-O
OVERLAY GCW-7360-O

COMPONENT SIDE VIEW



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

COMPONENT SIDE VIEW



SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7358-O
OVERLAY GCW-7361-O

SOLDER SIDE VIEW

Schematics, Circuit Board Diagrams, and
Parts List for HLN5173B Logic Board
PW-7364-O
(Sheet 3 of 4)
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parts list

HLN5173B Logic Board (Conventional) — MXW–7365–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF, ±5%, 50V (unless otherwise stated)		
C401	21–13741B45	0.01, ±10%
C402	08–11051A09	.022, 63V
C403	21–13741B45	0.01, ±10%
C404	23–11048B19	47, ±20%, 16V, electrolytic
C405	23–11048B13	10, ±20, 16V, electrolytic
C406	23–11048A17	33, ±20%, 25V, electrolytic
C407	23–13749A44	47, ±20%, 6V
C408	23–11048B19	47, ±20%, 16V, electrolytic
C409	08–11051A17	.47, 63V
C451	23–11048B19	47, ±20%, 16V, electrolytic
C452	21–13741B45	0.01, ±10%
C453	21–11032B14	.15, +80 –20%
C454	21–11032B15	.22, +80 –20%
C455	08–11051A15	.22, 63V
C458, 459	21–13740B36	30 pF
C460, 461	21–13741B45	0.01 ±10%
C501, 502	08–11051A13	.1, 63V
C503	21–13740B49	100 pF
C504	23–11048B13	10, ±20%, 16V, electrolytic
C505, 506	21–13740B49	100 pF
C507	23–13749C39	10, ±10%, 20V
C508	08–11051A15	.22, 63V
C509	23–11048B13	10, ±20%, 16V, electrolytic
C510	21–13740B61	330 pF
C511–513	21–13740B49	100 pF
C514	23–02308M01	1000, ±20%, 16V, electrolytic
C515	21–13740B49	100 pF
C551	23–11048A17	33, ±20, 25V, electrolytic
C552	21–13740B33	22 pF
C553	21–13740B73	1000 pF
C554	08–11051A03	.0022, 63V
C555	21–13740B53	150 pF
C556–558	08–11051A12	.068, 63V
C559, 560	08–11051A13	.1, 63V
C561	23–11048B05	1, ±20%, electrolytic
C562	08–11051A09	.022, 63V
C563, 564	21–13740B49	100 pF
C565	23–11048B13	10, ±20%, 16V, electrolytic
C566, 567	21–13741B45	0.01, ±10%
C604	23–11048B05	1, ±20%, electrolytic
C606	08–11051A22	0.039, 63V
C607	08–11051A13	.1, 63V
C608	08–11051A05	.0047, 63V
C609	21–13740B55	180 pF
C610	08–11051A15	.22, 63V
C611	21–13740B46	75 pF
C612	23–11048B19	47, ±20%, 16V, electrolytic
C651	23–11048B19	47, ±20%, 16V, electrolytic
C652	08–11051A06	.0068, 63V
C653	08–11051A15	.22, 63V
C656	23–11048B13	10, ±20%, 16V, electrolytic
C657	21–13741B69	0.1, +80 –20%
C658	21–13741B45	0.01, ±10%
C659	23–13749A44	47, ±20%, 6V
C660	23–11048B13	10, ±20%, 16V, electrolytic
C661	21–13740B76	1500 pF
C662	21–13741B39	.0056
C663	21–13740B49	100 pF
C701	21–13740B78	1800 pF
C703	21–11032B15	.22, +80, –20%
C704	21–13740B49	100 pF
C705	08–11051A09	.022, 63V
C706	08–11051A13	.1, 63V
C707	08–11051A01	.001, 63V
C801, 802	21–13740B49	100 pF
C803–804	21–13740B73	1000 pF
C805	21–11032B15	.22, +80 –20%
C806, 807	21–13740B73	1000 pF
C808, 809	21–13740B49	100 pF
C810, 811	21–13740B73	1000 pF
C813–823	21–13740B73	1000 pF
C824, 825	21–13740B49	100 pF
C826	21–13740B73	1000 pF
C827	23–11048B05	1, ±20%, electrolytic
C828	21–13741B69	0.1, +80 –20%
C829	21–13741B45	0.01, ±10%
C830	21–13740B25	10 pF, ±.5 pF
C831	21–11031F10	5.6 pF, ±.5 pF
C832	21–13740B25	10 pF, ±.5 pF
C833	21–13740B73	1000 pF
C834, 835	21–13741B69	0.1, +80 –20%
C836	21–13740B73	1000 pF
C837–840	21–13741B45	0.01, ±10%
C841–848	21–13740B73	1000 pF
C849	21–13740B49	100 pF
C850	21–13740B73	1000 pF
C852, 853	21–13741B45	0.01, ±10%
C854	21–13740B73	1000 pF
C855	23–13749J23	47, ±10%, 6V
C856	21–13740B49	100 pF
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, 604	48–83654H01	silicon
CR651	48–83654H01	silicon

MXW–7365–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
fuse		
F801	65–05214E06	1 A
connector receptacle		
J3	28–80129M01	5–pin
J7	28–80128M01	5–pin
J8,9	28–80126M01	23–pin
J10	28–80128M02	2–pin
jumper		
JU601	09–84181L01	2–contact push–on
coil, RF		
L801	24–82723H35	23 uH, red
L802, 803	24–83961B02	5 turns, green
connector plug		
P6	28–80127M01	14–pin, RF board
P601	28–80002R03	3–pin, for JU601
transistor (see note)		
Q401	48–00869619	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 stated)		
R401	06–11077A70	680
R402	06–02369M31	330, .6 watt, 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, .6 Watt, metal film
R453	06–11077A70	680
R454	06–02369M31	330, .6 watt, 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	06–11077A82	2.2k
R502, 503	06–11077B07	22k
R504	06–11077A96	8.2k
R505	06–11077A86	3.3k
R506	06–11077A78	1.5k
R507	06–11077A76	1.2k
R508	06–11077A98	10k
R509, 510	06–11077A72	820
R511	06–11077B07	22k
R512	06–11077A46	68
R513, 514	06–11009B26	2.7, 1/4 Watt
R515	06–11077A46	68
R516	06–11077A66	470
R517, 518	06–11077A98	10k
R519	06–80185M01	1 ohm, ±10%, 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	06–11077B16	51k
R563	06–11077B15	47k
R565	06–11077A98	10k
R566	06–11077A96	8.2k
R568	06–11077B07	22k

MXW–7365–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R567	06–11077A86	3.3k
R569	06–11077A42	47
R570	06–11077B17	56k
R573	06–11077B09	27k
R574	06–11077A01	0–ohm
R604	06–11077A98	10k
R605	06–11077A74	1k
R606	06–11077A98	10k
R607	06–11077B47	1 meg
R609	06–11077B11	33k
R610	06–11077B15	47k
R611, 612	06–11077G42	33.2k, ±1%
R613	06–11077G45	35.7k, ±1%
R615	06–11077H15	187k, ±1%
R616	06–11077G48	38.3k, ±1%
R617	06–11077A82	2.2k
R618	06–11077B23	100k
R619, 620	06–11077A98	10k
R621	06–11077A01	0–ohm
R622	06–11077B31	220k
R651	06–11077A68	560
R652	06–11077A50	100
R653, 654	06–11077A98	10k
R655	06–11077A90	4.7k
R656	06–11077B39	470k
R657	06–11077B42	620k
R658	06–11077H65	619k, ±1%
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, ±1%
R703	06–11077G31	25.5k, ±1%
R705	06–11077H13	178k, ±1%
R706	06–11077G88	100k, ±1%
R707	06–11077H26	243k, ±1%
R709	06–11077B10	30k
R710–712	06–11077G68	61.9k, ±1%
R713	06–11077A86	3.3k
R714	06–11077B10	30k
R715	06–11077B05	18k
R801	06–11077A78	1.5k
R802	06–11077A84	2.7k
R803	06–11077A98	10k
R804	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

MXW–7365–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R889	06–11077A68	560
R890	06–11077A98	10k
R897, 898	06–11077A98	10k
integrated circuit (see note)		
U401	51–02198J22	dual op–amp
U402	51–80942T02	voltage regulator 5V
U451	51–02198J22	dual op–amp
U551–553	51–02198J22	dual op–amp
U601	51–02198J23	dual comparator
U602, 603	51–02198J22	dual op–amp
U651, 652	51–02198J22	dual op–amp
U653	51–80059M01	voltage–controlled attenuator
U701	51–02198J22	dual op–amp
U801	51–80135C10	D/A converter
U802	51–80960T01	microcomputer
U804	HLN9277A	ROM kit
U803	51–82862N09	logic array
U807	51–02198J23	dual comparator
voltage regulator (see note)		
VR401	48–83461E40	zener, 5.1V
VR402	48–82256C15	zener, 5.1V
VR501	48–80140L11	zener, 7.5V
VR551	48–82256C11	zener, 10V
VR801, 802	48–82256C20	zener, 27V
VR803	48–82256C11	zener, 10V
VR804, 805	48–82256C20	zener, 27V
VR806	48–82256C11	zener, 10V
VR807	48–82256C20	zener, 27V
crystal (see note)		
Y801	48–80173D09	7.776 MHz
non–referenced parts		
B1	56–83350K05	bag
M401–404	03–10943M04	tapping screw
M406–410	14–83820M05	insulator
M412	84–80199M02	circuit board
M413	14–80145M01	insulator accessory connector
M414	26–80123M01	logic shield
M415, 416	09–82071K09	14–pin socket
	14–82392E13	cover insulator
	42–80940T01	retaining ring
	03–10943M04	tapping screw
	04–00131974	flat washer
	07–80925T01	bracket, audio regulator
	26–80125L02	heat sink, audio regulator

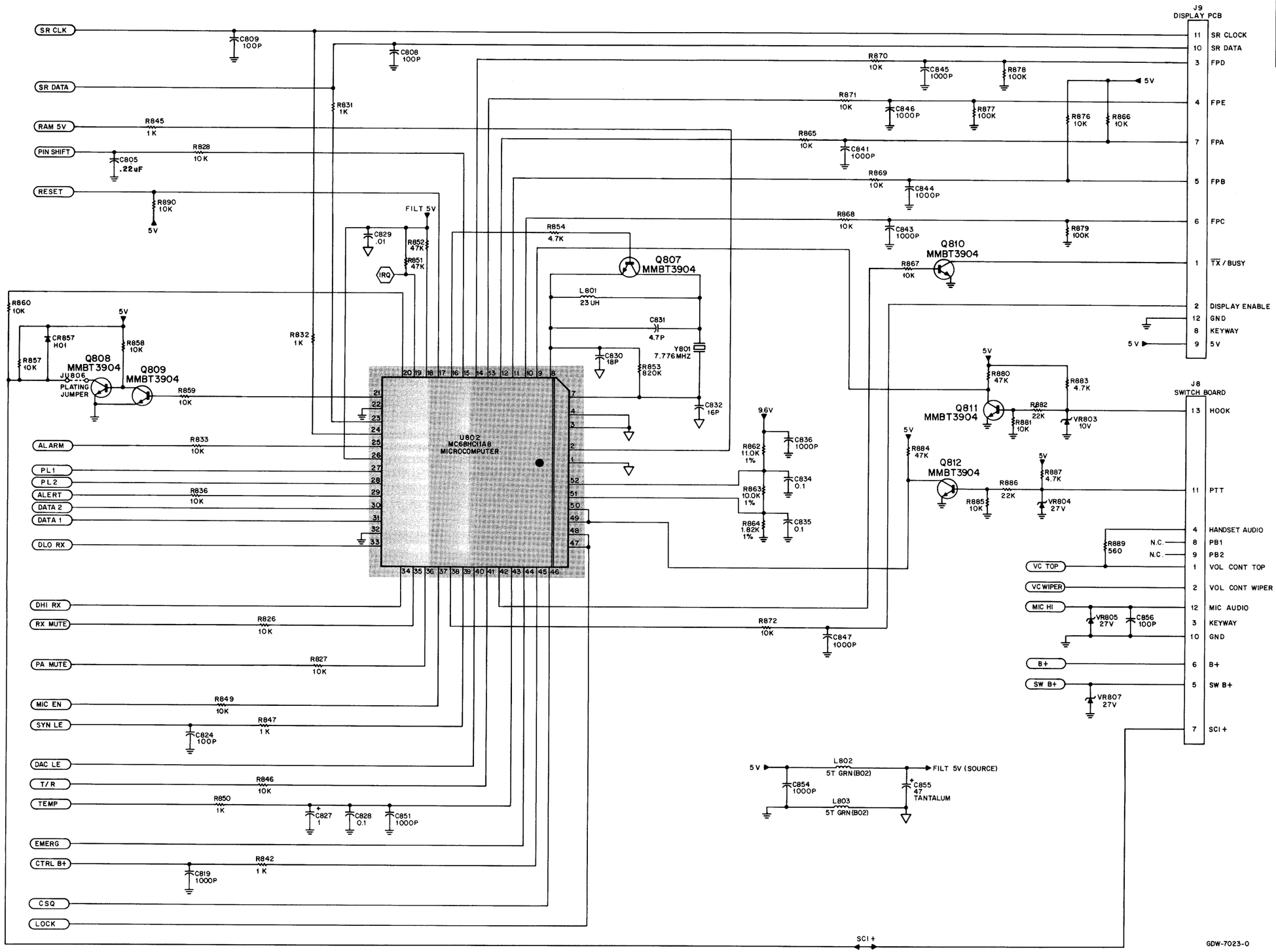
2/28/90

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

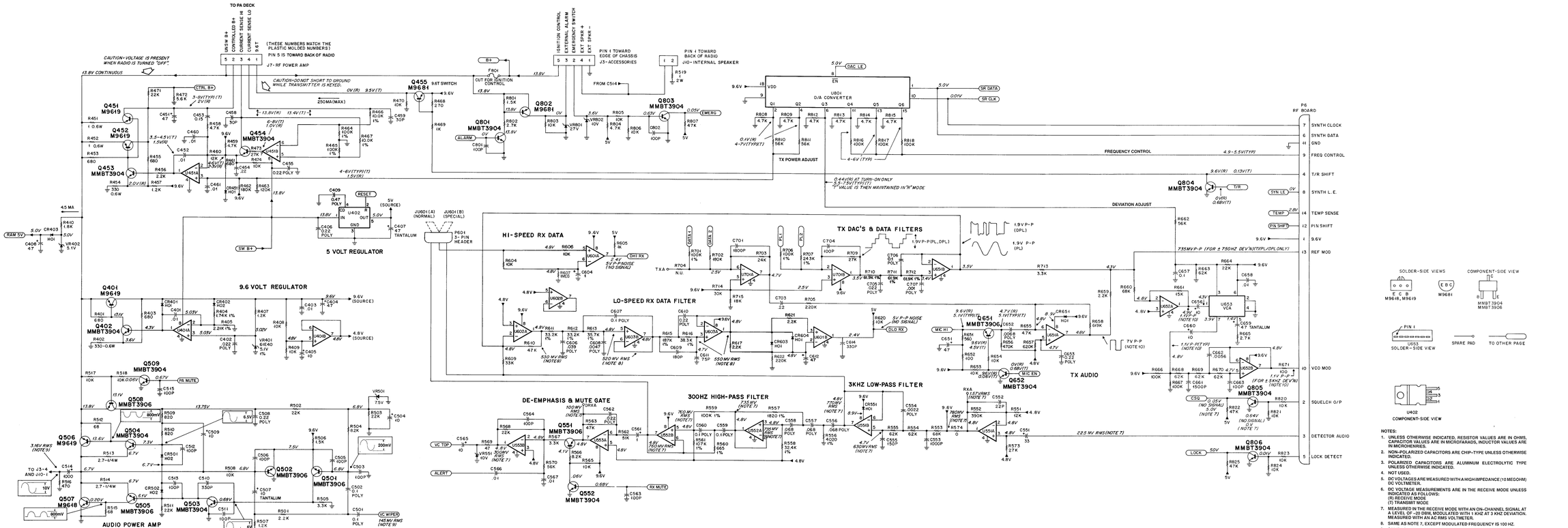
Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board
PW–7364–O
(Sheet 4 of 4)
2/28/90

IMPORTANT

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



Schematics, Circuit Board Diagrams, and
Parts List for HLN9123A Logic Board
PW–7020–O
(Sheet 1 of 4)
2/28/90

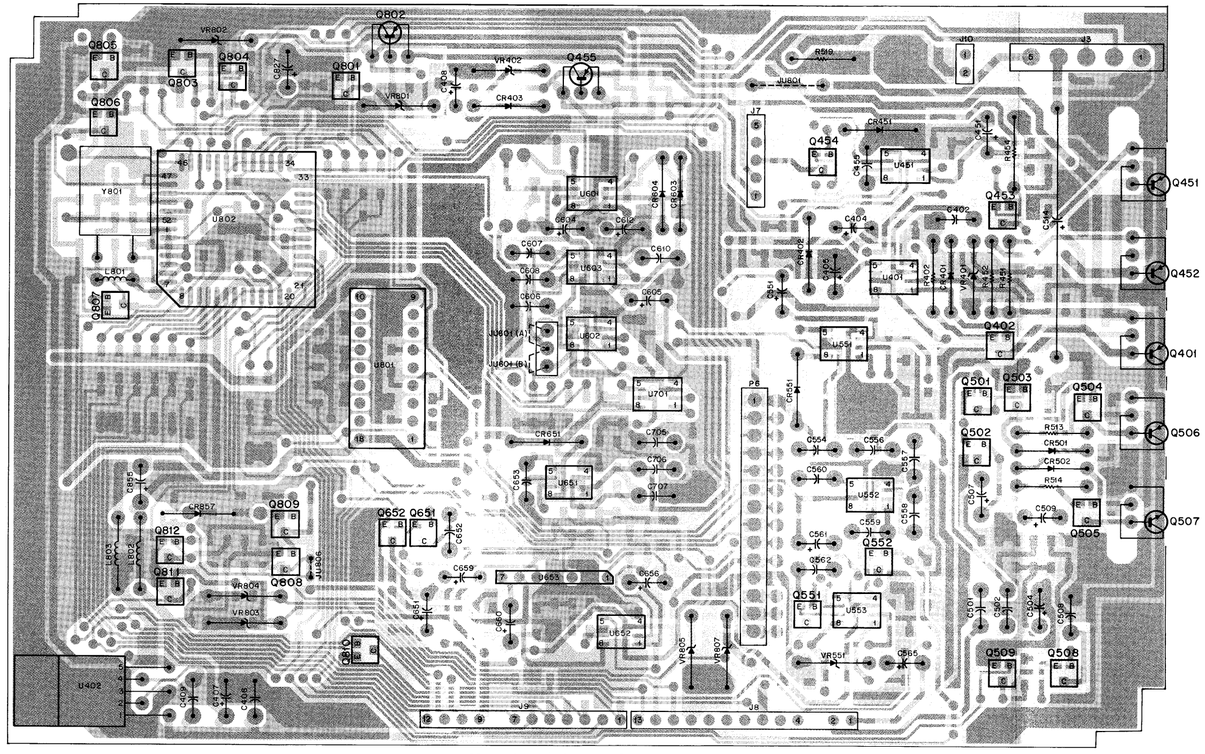


Schematics, Circuit Board Diagrams, and Parts List for HLN9123A Logic Board
PW–7020–O
(Sheet 2 of 4)
2/28/90

NOTES:

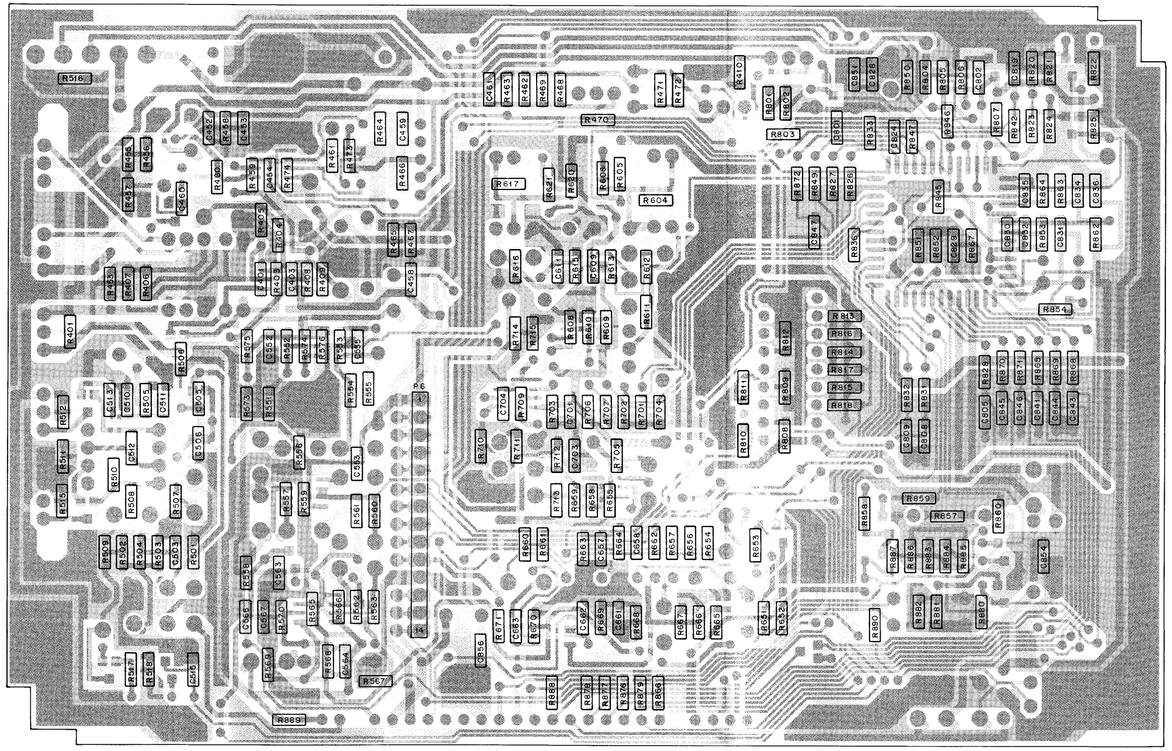
1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. NOT USED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
6. DC VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF –20 DBM, MODULATED WITH ± KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
8. SAME AS NOTE 7, EXCEPT MODULATED FREQUENCY IS 100 HZ.
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 600 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
11. VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.

GEW-7024-O



SOLDER SIDE GDW–7022–O
COMPONENT SIDE GDW–7021–O
OVERLAY GDW–7455–O

SHOWN FROM COMPONENT SIDE



SOLDER SIDE GDW–7022–O
COMPONENT SIDE GDW–7021–O
OVERLAY GDW–7456–O

SHOWN FROM SOLDER SIDE

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

parts list

HLN9123A Logic Board, Masked — MXW–7019–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed uF, ±5%, 50V (unless otherwise stated)		
C401	21–13741B45	.01, ±10%
C402	08–11051A09	.022, 63V
C403	21–13741B45	.01, ±10%
C404	23–11048B19	47, ±20%, 16V, electrolytic
C405	23–11048B13	10, ±20, 16V, electrolytic
C406	08–11051A15	.22, 63V
C407	23–11013A56	47, ±20%, 6V, tantalum
C408	23–11048B19	47, ±20%, 16V, electrolytic
C409	08–11051A17	.47, 63V
C451	23–11048B19	47, ±20%, 16V, electrolytic
C452	21–13741B45	.01, ±10%
C453	21–11032B14	.15, +80/–20%
C454	21–11032B15	.22, +80/–20%
C455	08–11051A15	.22, 63V
C458, 459	21–13740B36	30 pF
C460, 461	21–13741B45	.01, ±10%
C501, 502	08–11051A13	.1, 63V
C503	21–13740B49	100 pF
C504	23–11048B13	10, ±20%, 16V
C505, 506	21–13740B49	100 pF
C507	23–11013D13	10, ±10%, 20V, tantalum
C508	08–11051A15	.22, 63V
C509	23–11048B13	10, ±20%, 16V, electrolytic
C510	21–13740B61	330 pF
C511–513	21–13740B49	100 pF
C514	23–02308M01	1000 uF, ±20%, 16V, electrolytic
C515	21–13740B49	100 pF
C551	23–11048A17	33, ±20, 25V, electrolytic
C552	21–13740B33	22 pF
C553	21–13740B73	1000 pF
C554	08–11051A03	.0022, 63V
C555	21–13740B53	150 pF
C556–558	08–11051A12	.068, 63V
C559, 560	08–11051A13	.1, 63V
C561	23–11048B05	1, ±20%, electrolytic
C562	08–11051A09	.022, 63V
C563, 564	21–13740B49	100 pF
C565	23–11048B13	10, ±20%, 16V, electrolytic
C566, 567	21–13741B45	0.01, ±10%
C604	23–11048B05	1, ±20%, electrolytic
C606	08–11051A22	0.039, 63V
C607	08–11051A13	.1, 63V
C608	08–11051A05	.0047, 63V
C609	21–13740B55	180 pF
C610	08–11051A15	.22, 63V
C611	21–13740B46	75 pF
C612	23–11048B19	47, ±20%, 16V, electrolytic
C614	21–13740B61	330 pF
C651	23–11048B19	47, ±20%, 16V, electrolytic
C652	08–11051A06	.0068, 63V
C653	08–11051A15	.22, 63V
C656	23–11048B13	10, ±20%, 16V, electrolytic
C657	21–13741B69	0.1, +80 –20%
C658	21–13741B45	0.01, ±10%
C659	23–11013A56	47, ±20%, 6V, tantalum
C660	23–11048B13	10, ±20%, 16V, electrolytic
C661	21–13740B76	1500 pF
C662	21–13741B39	.0056, ±10%
C663	21–13740B49	100 pF
C701	21–13740B78	1800 pF
C703	21–11032B15	.22, +80, –20%
C704	21–13740B49	100 pF
C705	08–11051A09	.022, 63V
C706	08–11051A13	.1, 63V
C707	08–11051A01	.001, 63V
C801, 802	21–13740B49	100 pF
C805	21–11032B15	.22, +80 –20%
C808, 809	21–13740B49	100 pF
C819	21–13740B73	1000 pF
C824	21–13740B49	100 pF
C827	23–11048B05	1, ±20%, electrolytic
C828	21–13741B69	0.1, +80 –20%
C829	21–13741B45	0.01, ±10%
C830	21–13740B31	18 pF
C831	21–13740B17	4.7, ±.25 pF
C832	21–13740B30	16 pF
C834, 835	21–13741B69	0.1, +80 –20%
C836	21–13740B73	1000 pF
C841	21–13740B73	1000 pF
C843–847	21–13740B73	1000 pF
C851	21–13740B73	1000 pF
C854	21–13740B73	1000 pF
C855	23–11013A56	47, ±20%, 6V, tantalum
C856	21–13740B49	100 pF
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, 604	48–83654H01	silicon
CR651	48–83654H01	silicon
CR857	48–83654H01	silicon
fuse		
F801	65–05214E06	1 A
connector receptacle		
J3	28–80129M01	5–pin, accessories

MXW–7019–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
J7	28–80128M01	5–pin, RF power amplifier
J8/9	28–80126M01	23–pin
J10	28–80128M02	2–pin, internal speaker jumper
jumper		
JU601	09–84181L01	2–contact push–on
coil, RF		
L801	24–82723H35	23 uH, red
L802, 803	24–83961B02	5 turns, green
connector plug		
P6	28–80127M01	14–pin, RF board
P601	28–80002R03	3–pin, for JU601
transistor (see note)		
Q401	48–00869916	PNP
Q402	48–80214G02	NPN
Q451, 452	48–00869916	PNP
Q453, 454	48–80214G02	NPN
Q455	48–00869681	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
Q651	48–05128M16	PNP
Q652	48–80214G02	NPN
Q801	48–80214G02	NPN
Q802	48–00869681	PNP
Q803–812	48–80214G02	NPN
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R401	06–11077A70	680
R402	06–02369M31	330, .6 watt, metal film
R403	06–11077A70	680
R404	06–11077F18	1.74k, ±1%
R405	06–11077F28	2.21k, ±1%
R407	06–11077A76	1.2k
R408, 409	06–11077A98	10k
R410	06–11077A80	1.8k
R451, 452	06–02369M01	1, .6 Watt, metal film
R453	06–11077A70	680
R454	06–02369M31	330, .6 watt, 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	06–11077A82	2.2k
R502, 503	06–11077B07	22k
R504	06–11077A96	8.2k
R505	06–11077A86	3.3k
R506	06–11077A78	1.5k
R507	06–11077A76	1.2k
R508	06–11077A98	10k
R509, 510	06–11077A72	820
R511	06–11077B07	22k
R512	06–11077A46	68
R513, 514	06–11009B26	2.7, 1/4 Watt
R515	06–11077A46	68
R516	06–11077A66	470
R517, 518	06–11077A98	10k
R519	06–80185M01	1 ohm, ±10%, 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	06–11077B16	51k
R563	06–11077B15	47k
R565	06–11077A98	10k
R566	06–11077A96	8.2k
R567	06–11077A86	3.3k
R568	06–11077B07	22k
R569	06–11077A42	47
R570	06–11077B17	56k
R573	06–11077B09	27k
R574	06–11077A01	0–ohm
R604	06–11077A98	10k
R605	06–11077A74	1k
R606	06–11077A98	10k

MXW–7019–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R607	06–11077B47	1 meg
R609	06–11077B11	33k
R610	06–11077B15	47k
R611, 612	06–11077G42	33.2k, ±1%
R613	06–11077G45	35.7k, ±1%
R615	06–11077H15	187k, ±1%
R616	06–11077G48	38.3k, ±1%
R617	06–11077A82	2.2k
R620	06–11077A98	10k
R621	06–11077A82	2.2k
R622	06–11077B31	220k
R651	06–11077A68	560
R652	06–11077A50	100
R653, 654	06–11077A98	10k
R655	06–11077A90	4.7k
R656	06–11077B39	470k
R657	06–11077B42	620k
R658	06–11077H65	619k, ±1%
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	06–11077B29	180k
R703	06–11077B08	24k
R705	06–11077B31	220k
R706	06–11077G88	100k, ±1%
R707	06–11077H26	243k, ±1%
R709	06–11077B09	27k
R710–712	06–11077G68	61.9k, ±1%
R713	06–11077A86	3.3k
R714	06–11077B10	30k
R715	06–11077B05	18k
R801	06–11077A78	1.5k
R802	06–11077A84	2.7k
R803	06–11077A98	10k
R804	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
R831, 832	06–11077A74	1k
R833	06–11077A98	10k
R836	06–11077A98	10k
R842	06–11077A74	1k
R845	06–11077A74	1k
R846	06–11077A98	10k
R847	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
R857–860	06–11077A98	10k
R862	06–11077F95	11K, ±1%
R863	06–11077F91	10k, ±1%
R864	06–11077F20	1.82k, ±1%
R865–872	06–11077A98	10k
R876	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	06–11077A68	560
R890	06–11077A98	10k
integrated circuit (see note)		
U401	51–02198J22	dual op–amp
U402	51–80942T01	voltage regulator 5V
U451	51–02198J22	dual op–amp
U551–553	51–02198J22	dual op–amp
U601	51–02198J23	dual comparator
U602, 603	51–02198J22	dual op–amp
U651, 652	51–02198J22	dual op–amp
U653	51–80059M01	voltage–controlled attenuator
U701	51–02198J22	dual op–amp
U801	51–80135C10	D/A converter
U802	51–80960T01	microcomputer
voltage regulator (see note)		
VR401	48–83461E40	zener, 5.1V
VR402	48–82256C15	zener, 5.1V
VR551	48–82256C11	zener, 10V
VR801	48–82256C20	zener, 27V

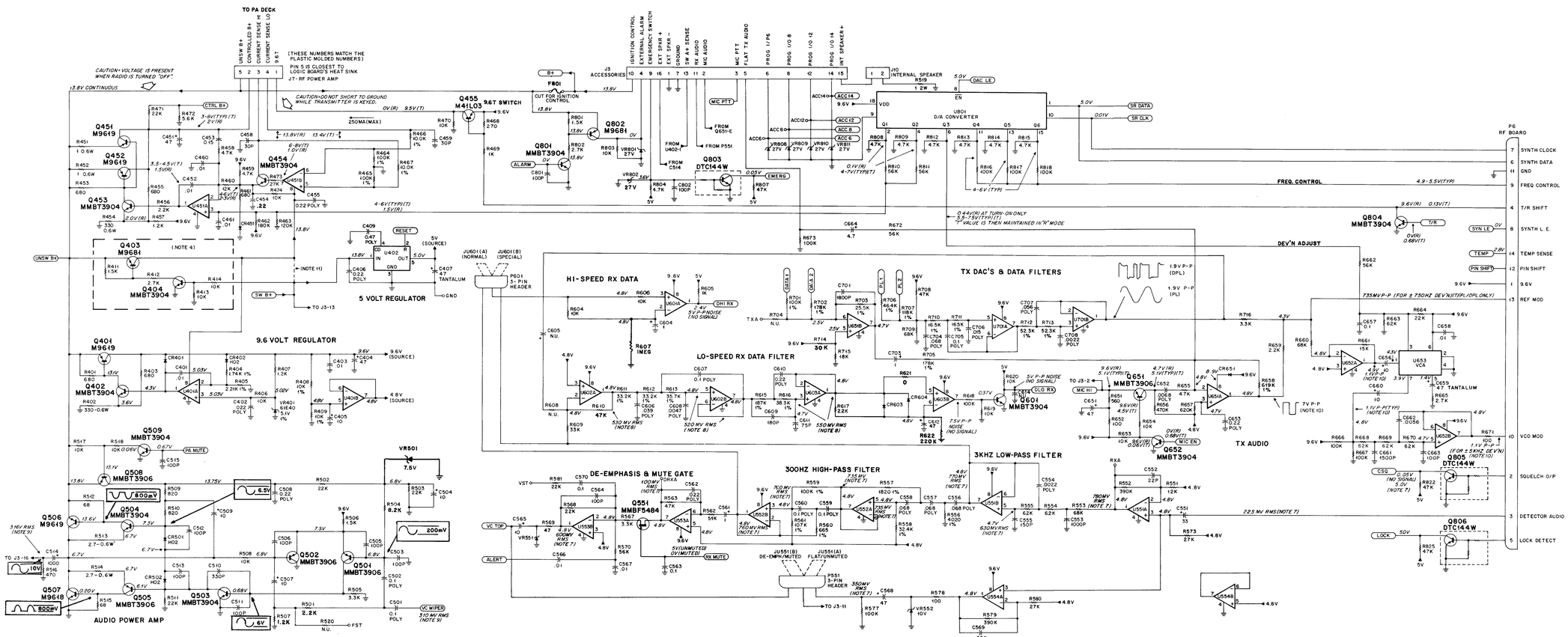
MXW–7019–O (4)

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

2/28/90

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

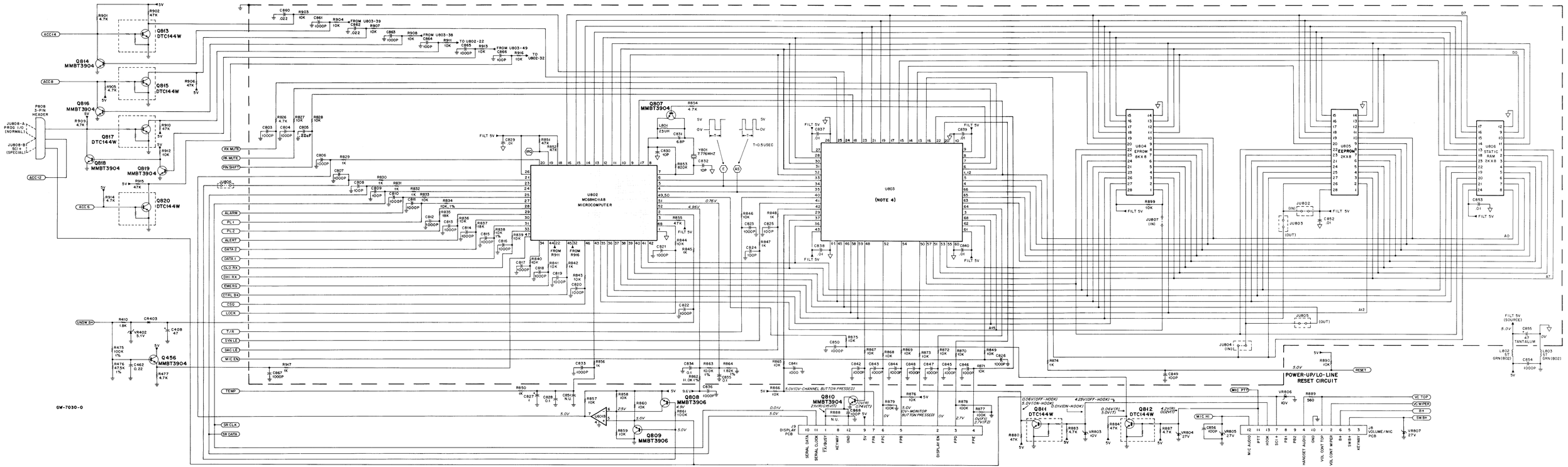
Schematics, Circuit Board Diagrams, and Parts List for HLN9123A Logic Board
PW–7020–O
(Sheet 4 of 4)
2/28/90



NOTES:

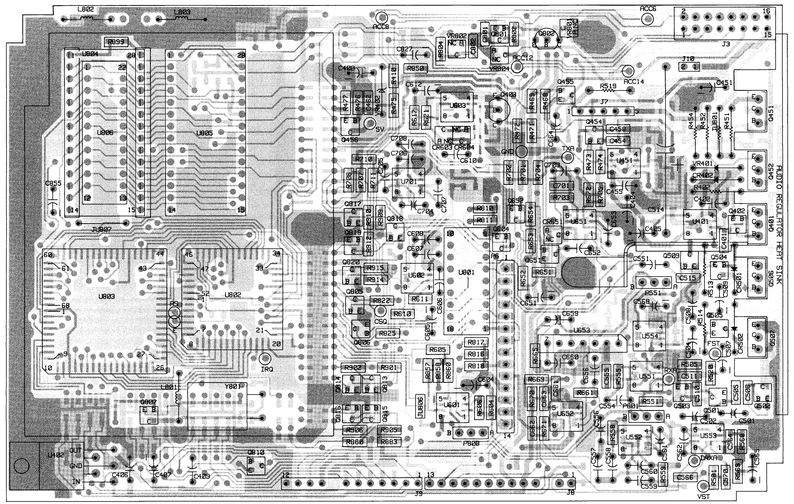
1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. NOT USED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
6. ALL VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF –20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
8. SAME AS NOTE 7 EXCEPT MODULATING FREQUENCY IS 100 HZ.
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 800 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
11. **VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.**

Schematics, Circuit Board Diagrams, and Parts List for HLN9313A Logic Board
PW–7026–O
(Sheet 1 of 4)
2/28/90



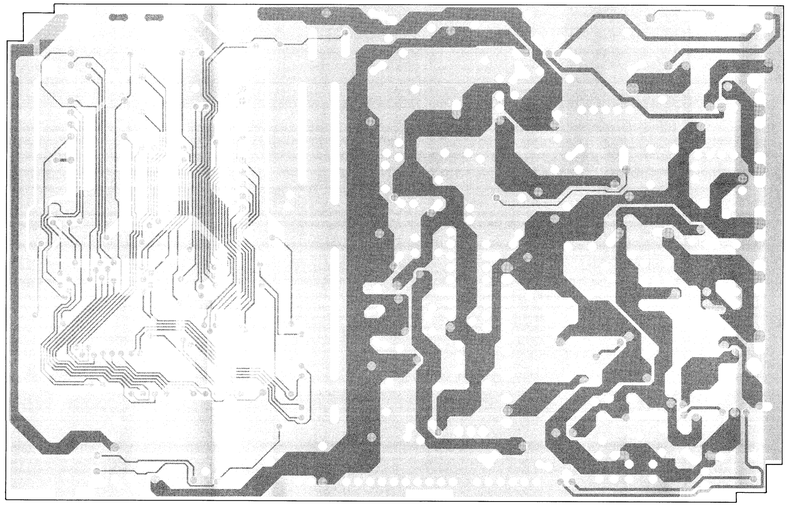
IMPORTANT
COMPONENTS WITHIN SHADED AREA ARE NOT FIELD-SERVICEABLE. IF SERVICING IS REQUIRED, THE ENTIRE BOARD MUST BE REPLACED. REFER TO SECTION 6.

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



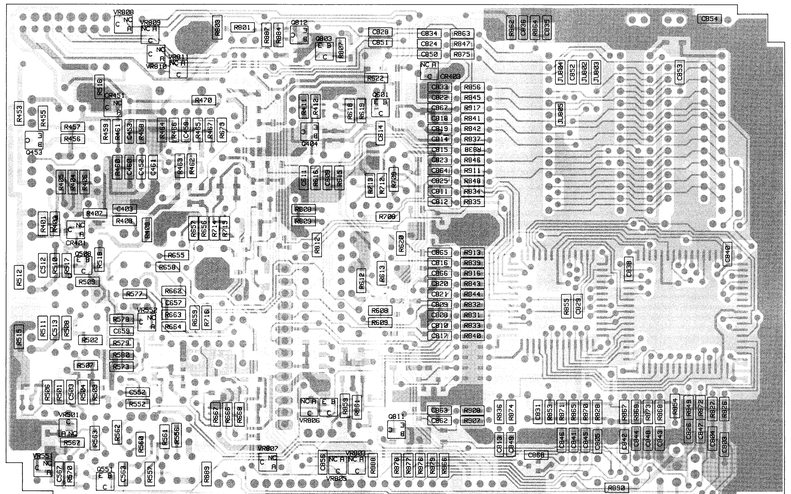
SOLDER SIDE GCW-7028-O
COMPONENT SIDE GCW-7027-O
OVERLAY GBW-7457-O

COMPONENT SIDE VIEW



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

COMPONENT SIDE VIEW



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

SOLDER SIDE VIEW

Schematics, Circuit Board Diagrams, and
Parts List for HLN9313A Logic Board
PW-7026-O
(Sheet 3 of 4)
2/28/90

parts list

HLN9313A Logic Board (Options Connector) — MXW–7025–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed uF, +5%, 50V (unless otherwise stated)		
C401	21–13741B45	.01
C402	08–11051A09	.022, 63V
C403	21–13741B45	.01
C404	23–11048B19	47, ±20%, 16V, electrolytic
C405	23–11048B13	10, ±20, 16V, electrolytic
C406	08–11051A15	.22, 63V
C407	23–13749A44	47, ±20%, 6V, tantalum
C408	23–11048B19	47, ±20%, 16V, electrolytic
C409	08–11051A17	.47, 63V
C451	23–11048B19	47, ±20%, 16V, electrolytic
C452	21–13741B45	.01
C453	21–11032B14	.15, +80/–20%
C454	21–11032B15	.22, +80/–20%
C455	08–11051A15	.22, 63V
C458,459	21–13740B36	30 pF
C460,461	21–13741B45	.01
C462	21–11032B15	.22, +80/–20%
C501,502	08–11051A13	.1, 63V
C503	21–13740B49	100 pF
C504	23–11048B13	10, ±20, 16V, electrolytic
C505,506	21–13740B49	100 pF
C507	23–13749C39	10, +10%, 20V
C508	08–11051A15	.22, 63V
C509	23–11048B13	10, ±20, 16V, electrolytic
C510	21–13740B61	330 pF
C511–513	21–13740B49	100 pF
C514	23–02308M01	1000 uF, ±20%, 16V, electrolytic
C515	21–13740B49	100 pF
C551	23–11048A17	33, ±20, 25V, electrolytic
C552	21–13740B33	22 pF
C553	21–13740B73	1000 pF
C554	08–11051A03	.0022, 63V
C555	21–13740B53	150 pF
C556–558	08–11051A12	.068, 63V
C559,560	08–11051A13	.1, 63V
C561	23–11048B05	1, ±20%, electrolytic
C562	08–11051A09	.022, 63V
C563	21–13741B69	0.1
C564	21–13740B49	100 pF
C565	23–11048B13	10, ±20, 16V, electrolytic
C566,567	21–13741B45	.01
C568	23–11048B19	47, ±20%, 16V, electrolytic
C569	21–13740B33	22 pF
C570	21–13741B69	0.1
C604	23–11048B05	1, ±20%, electrolytic
C606	08–11051A22	0.039, 63V
C607	08–11051A13	.1, 63V
C608	08–11051A05	.0047, 63V
C609	21–13740B55	180 pF
C610	08–11051A15	.22, 63V
C611	21–13740B46	75 pF
C612	23–11048B19	47, ±20%, 16V, electrolytic
C651	23–11048B19	47, ±20%, 16V, electrolytic
C652	08–11051A06	.0068, 63V
C653	08–11051A15	.22, 63V
C656	23–11048B13	10, ±20, 16V, electrolytic
C657	21–13741B69	0.1
C658	21–13741B45	.01
C659	23–13749A44	47, ±20%, 6V, tantalum
C660	23–11048B13	10, ±20, 16V, electrolytic
C661	21–13740B76	1500 pF
C662	21–13741B39	.0056
C663	21–13740B49	100 pF
C664	23–11048B09	4.7, ±20%, 35V
C701	21–13741B27	1800 pF
C703	23–11048B05	1, ±20%, electrolytic
C704	08–11051A12	.068, 63V
C705	08–11051A13	.1, 63V
C706	08–11051A08	.015, 63V
C707	08–11051A23	.056, 63V
C708	08–11051A03	.0022, 63V
C801,802	21–13740B49	100 pF
C803–804	21–13740B73	1000 pF
C805	21–11032B15	.22, +80 –20%
C806,807	21–13740B73	1000 pF
C808,809	21–13740B49	100 pF
C810–823	21–13740B73	1000 pF
C824,825	21–13740B49	100 pF
C826	23–13740B73	1000 pF
C827	23–11048B05	1, ±20%, electrolytic
C828	21–13741B69	0.1
C829	21–13741B45	.01
C830	21–13740B25	10 pF
C831	21–13740B21	6.8 pF, ±.25 pF
C832	21–13740B25	10 pF
C833	23–13740B73	1000 pF
C834,835	23–13741B69	0.1
C836	23–13740B73	1000 pF
C837–840	23–13741B45	.01
C841–848	23–13740B73	1000 pF
C849	23–13740B49	100 pF
C850	23–13740B73	1000 pF
C852,853	23–13741B45	.01
C854	23–13740B73	1000 pF
C855	23–13749A44	47, ±20%, 6V, tantalum
C856	23–13740B49	100 pF
C860	23–13741B53	.022
C861	23–13740B73	1000 pF
C862	23–13741B53	.022

MXW–7025–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C863	23–13740B73	1000 pF
C864	23–13740B49	100 pF
C865	23–13740B73	1000 pF
C866	23–13740B49	100 pF
C867	23–13740B73	1000 pF
C868	23–13740B49	100 pF
diode (see note)		
CR401	48–05129M40	low profile
CR402	48–83654H02	silicon
CR403	48–05129M40	low profile
CR451	48–05129M40	low profile
CR501,502	48–83654H02	silicon
CR603,604	48–05129M40	low profile
CR651	48–05129M40	low profile
fuse		
F801	65–05214E06	1 A
connector receptacle		
J3	28–80923V01	right angle
J7	28–80128M01	5–pin, RF power amplifier
J8,9	28–80126M01	23–pin
J10	28–80128M02	2–pin, internal speaker jumper
jumper		
JU551	09–84181L01	2–contact push–on
JU601	09–84181L01	2–contact push–on
JU802	06–11077A01	0–ohm resistor
JU804	06–11077A01	0–ohm resistor
JU806	06–11077A01	0–ohm resistor
JU807	06–11009B23	0–ohm resistor
JU808	09–84181L01	2–contact push–on
coil, RF		
L801	24–82723H35	23 uH, red
L802,803	24–83961B02	5 turns, green
connector plug		
P6	28–80127M02	14–pin, header
P551	28–80002R03	3–pin
P601	28–80002R03	3–pin, for JU601
P808	28–80002R03	3–pin
transistor (see note)		
Q401	48–00869619	PNP
Q402	48–80214G02	NPN
Q451,452	48–00869619	PNP
Q453,454	48–80214G02	NPN
Q455	48–80141L03	PNP
Q456	48–80214G02	NPN
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	48–80949V01	JFET n–channel
Q601	48–80214G02	NPN
Q651	48–05128M16	PNP
Q652	48–80214G02	NPN
Q801	48–80214G02	NPN
Q802	48–00869681	PNP
Q803	48–80947V01	NPN
Q804	48–80214G02	NPN
Q805,806	48–80947V01	NPN
Q807	48–80214G02	NPN
Q808,809	48–05128M16	PNP
Q810	48–80214G02	NPN
Q811–813	48–80947V01	NPN
Q814	48–80214G02	NPN
Q815	48–80947V01	NPN
Q816	48–80214G02	NPN
Q817	48–80947V01	NPN
Q818,819	48–80214G02	NPN
Q820	48–80947V01	NPN
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R401	06–11077A70	680
R402	06–02369M31	330, .6 watt, metal film
R403	06–11077A70	680
R404	06–11077F18	17.4k, ±1%
R405	06–11077F28	22.1k, ±1%
R406	06–11077A98	10k
R407	06–11077A76	1.2k
R408,409	06–11077F91	10.0k, ±1%
R410	06–11077A80	1.8k
R451,452	06–02369M01	1, .6 Watt, metal film
R453	06–11077A70	680
R454	06–02369M31	330, .6 watt, 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	10.0k, ±1%
R468	06–11077A60	270
R469	06–11077A74	1k
R470	06–11077A98	10k

MXW–7025–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R471	06–11077B07	22k
R472	06–11077A92	5.6k
R473	06–11077B09	27k
R474	06–11077A98	10k
R475	06–11077G88	100k, ±1%
R476	06–11077G57	47.5k, ±1%
R477	06–11077A90	4.7k
R501	06–11077A82	2.2k
R502,503	06–11077B07	22k
R504	06–11077A96	8.2k
R505	06–11077A86	3.3k
R506	06–11077A78	1.5k
R507	06–11077A76	1.2k
R508	06–11077A98	10k
R509,510	06–11077A72	820
R511	06–11077B07	22k
R512	06–11077A46	68
R513,514	06–11009B26	2.7, 1/4 Watt
R515	06–11077A46	68
R516	06–11077A66	470
R517,518	06–11077A98	10k
R519	06–80185M01	1 ohm, ±10%, 2W, metal plate
R551	06–11077B01	12k
R552	06–11077B37	390k
R553	06–11077B19	68k
R554,555	06–11077B18	62k
R556	06–11077F53	40.2k, ±1%
R557	06–11077F20	18.2k, ±1%
R558	06–11077G41	32.4k, ±1%
R559	06–11077G88	100k, ±1%
R560	06–11077E77	665, ±1%
R561	06–11077G91	107k, ±1%
R562	06–11077B16	51k
R563	06–11077B15	47k
R567	06–11077A86	3.3k
R568	06–11077B07	22k
R569	06–11077A42	47
R570	06–11077B17	56k
R573	06–11077B09	27k
R577	06–11077B23	100k
R578	06–11077A50	100
R579	06–11077B37	390k
R580	06–11077B09	27k
R581	06–11077B07	22k
R604	06–11077A98	10k
R605	06–11077A74	1k
R606	06–11077A98	10k
R607	06–11077B47	1 meg
R609	06–11077B11	33k
R610	06–11077B15	47k
R611,612	06–11077G42	33.2k, ±1%
R613	06–11077G45	35.7k, ±1%
R615	06–11077H15	187k, ±1%
R616	06–11077G48	38.3k, ±1%
R617	06–11077A82	2.2k
R618	06–11077B23	100k
R619,620	06–11077A98	10k
R621	06–11077A01	0–ohm
R622	06–11077B31	220k
R651	06–11077A68	560
R652	06–11077A50	100
R653,654	06–11077A98	10k
R655	06–11077A90	4.7k
R656	06–11077B39	470k
R657	06–11077B42	620k
R658	06–11077H65	619k, ±1%
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
R672	06–11077B17	56k
R673	06–11077B23	100k
R701	06–11077G88	100k, ±1%
R702	06–11077H13	178k, ±1%
R703	06–11077G31	25.5k, ±1%
R705	06–11077H13	178k, ±1%
R706	06–11077G56	46.4k, ±1%
R707	06–11077G95	118k, ±1%
R708	06–11077B15	47k
R709	06–11077B19	68k
R710,711	06–11077G13	16.5k, ±1%
R712,713	06–11077G61	52.3k, ±1%
R714	06–11077B10	30k
R715	06–11077B05	18k
R716	06–11077A86	3.3k
R801	06–11077A78	1.5k
R802	06–11077A84	2.7k
R803	06–11077A98	10k
R804	06–11077A90	4.7k
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

MXW–7025–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R822	06–11077B15	47k
R825	06–11077B15	47k
R826	06–11077A90	4.7k
R827,828	06–11077A98	10k
R829–832	06–11077A74	1k
R833	06–11077A98	10k
R834	06–11077F91	10.0k, ±1%
R835	06–11077B05	18k
R836	06–11077A98	10k
R837	06–11077B05	18k
R838	06–11077F91	10.0k, ±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	11.0k, ±1%
R863	06–11077F91	10.0k, ±1%
R864	06–11077F20	18.2k, ±1%
R865–873	06–11077A98	10k
R874	06–11077A74	1k
R875,876	06–11077A98	10k
R877–879	06–11077B23	100k
R880	06–11077B15	47k
R883	06–11077A90	4.7k
R884	06–11077B15	47k
R887	06–11077A90	4.7k
R889	06–11077A68	560
R890	06–11077A98	10k
R899	06–11077A98	10k
R901	06–11077A90	4.7k
R902	06–11077B15	47k
R903,904	06–11077A98	10k
R905	06–11077A90	4.7k
R906	06–11077B15	47k
R907,908	06–11077A98	10k
R909	06–11077A90	4.7k
R910	06–11077B15	47k
R911–913	06–11077A98	10k
R914	06–11077A90	4.7k
R915	06–11077B15	47k
R916	06–11077A98	10k
R917	06–11077A74	1k
integrated circuit (see note)		
U401	51–02198J22	dual op amp
U402	51–80942T01	voltage regulator 5V
U451	51–02198J22	dual op amp
U551–554	51–02198J22	dual op amp
U601	51–02198J23	dual comparator
U602–604	51–02198J22	dual op amp
U651,652	51–02198J22	dual op amp
U653	51–80059M01	voltage–controlled attenuator
U701	51–02198J22	dual op amp
U801	51–80135C10	D/A converter
U802	51–80960T01	microcomputer
U803	51–82862N09	custom gate array
U804	HLN9277A	ROM kit
U805	51–80901W01	EEPROM
U806	51–80914V01	static RAM
voltage regulator (see note)		
VR401	48–83461E40	zener, 5.1V
VR402	48–82256C15	zener, 5.1V
VR501	48–80140L11	zener, 7.5V
VR551,552	48–80140L15	zener, 10V
VR801,802	48–80948V01	zener, 27V
VR803	48–80140L15	zener, 10V
VR804,805	48–80948V01	zener, 27V
VR806	48–80140L15	zener, 10V
VR807–811	48–80948V01	zener, 27V
crystal (see note)		
Y801	48–80173D09	7.776 MHz

non–referenced parts

M415,416	09–82071K09	14 contact receptacle (2 used)
M414	26–80123M02	shield
M412	84–80942V03	circuit board
	15–80922V01	housing, connector
	29–84249N01	terminal (4 used)
	03–10943M04	tapping screw M2.5x8
	03–10943M04	tapping screw M2.5x8
M401–404	04–00131974	flat washer (4 used)
	07–80925T01	bracket, audio regulator
M406–410	14–83820M05	insulator heat conductive (5 used)
	26–80125L02	heat sink, audio regulator

2/28/90

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

END OF PART 2 OF 4

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

1. Theory Of Operation

The Logic Board consists of 5 segments:

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

1.1 MICROPROCESSOR

1.1.1 Description

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

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

The control logic surrounding U802 consists of:

(1) *Custom Gate Array U803.* This device expands the Input/Output capabilities of the control logic. U802 and U803 exchange information which tells the mieroprocessor the input port status and the desired state of the output ports.

(2) *NOVRAM U805.* This is a Non–Volatile Random Access Memory device which consists of a static RAM with a built in lithium battery to maintain it's memory after removing power. The NOVRAM acts as the radio's code plug, storing any operating information pertinent to a particular radio. This information includes operating frequencies, control channels, time out timer, and other special functions.

(3) *EPROM U804.* This is an Erasable Programmable Read Only Memory. U804's function is to store the Microcomputer's operating program.

(4) *Static Random Access Memory U806.* This RAM is used for scratch pad operations in the trunked *MaxTrac.*

(5) *Digital–to–Analog IC U801.* This IC is used to generate precision analog voltages.

1.1.2 Operation

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

1.1.3 Power Up/Low–Line Reset

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

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

1.1.4 Microcomputer Start–Up Routine

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

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

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

1.1.5 Microcomputer Normal Operation

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

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

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

1.1.6 Reading Or Writing In Memory

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

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

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

1.2 VOLTAGE REGULATION

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

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

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

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

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

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

1.3 RECEIVE AUDIO FILTER

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

1.3.1 Audio Power Amplifier

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

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

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

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

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

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

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

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

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

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

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

1.3.2 Low–Speed Data Filter

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

1.3.3 High Speed Data Filter

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

1.4 TRANSMIT AUDIO

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

1.4.1 High–Speed Transmit Data

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

1.4.2 Low–Speed Transmit Data

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

1.5 POWER CONTROL CIRCUIT

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

2. Troubleshooting Guide

2.1 MICROPROCESSOR SECTION

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

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

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

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

Other error tones will point to problems that can be traced back to defective IC's or components not actually in the shielded area of the Logic Board. By observing the logic voltage levels and waveforms on the schematics, the fault can be found.

2.2 RECEIVE AUDIO

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

2.3 TRANSMIT AUDIO

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

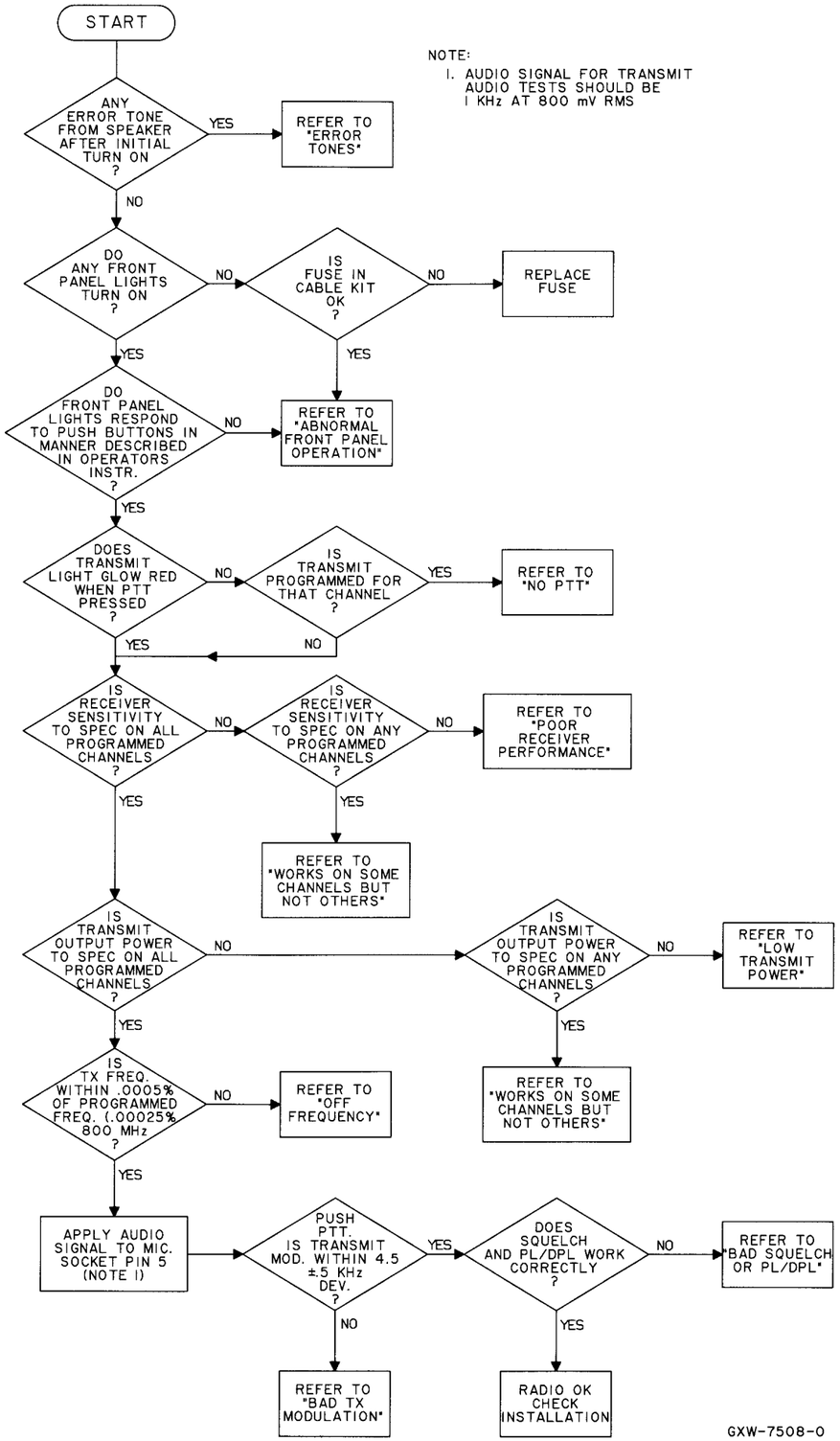
2.4 AUDIO POWER AMPLIFIER

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

2.5 POWER CONTROL CIRCUITRY

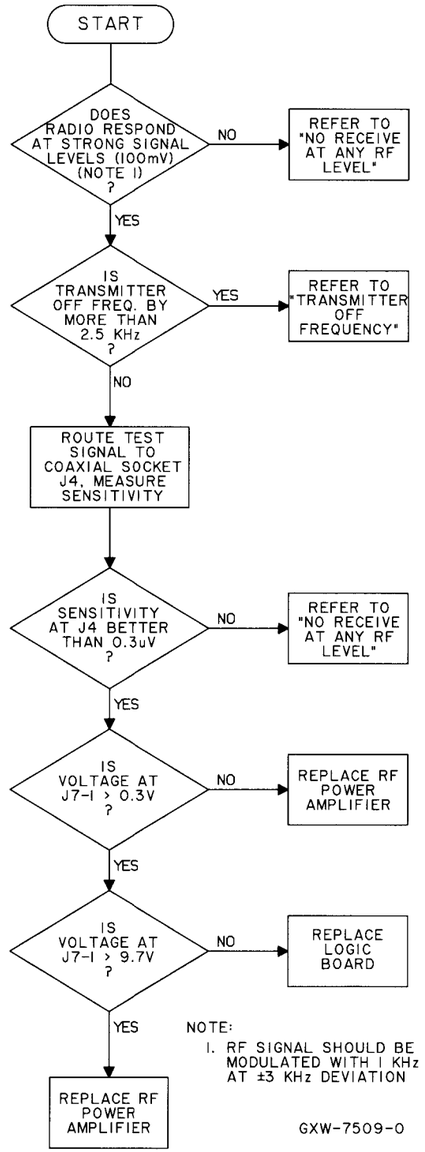
Refer to the Transmitter Troubleshooting section to isolate problems in the Power Control Circuitry part of the Logic Board. This power control loop is very difficult to troubleshoot without breaking the loop and inserting a fixed voltage to certain parts of the circuit. Follow the schematic and theory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

BASIC TROUBLESHOOTING (START WITH THIS CHART)



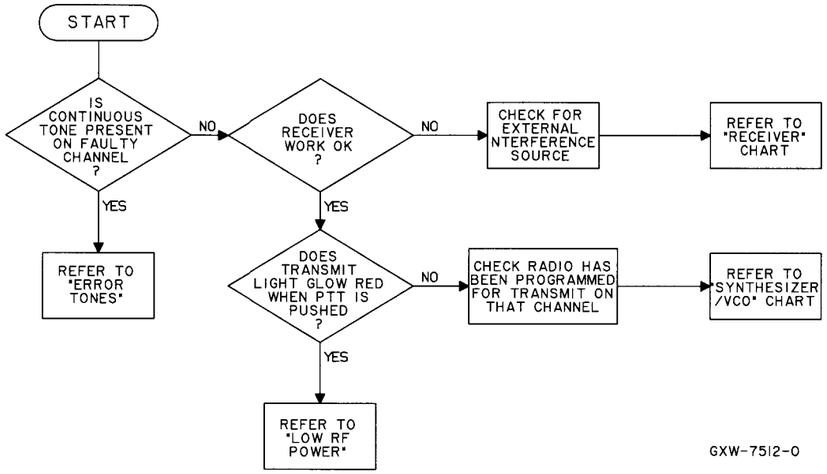
GXW-7508-0

POOR RECEIVER PERFORMANCE



GXW-7509-0

RADIO WORKS ON SOME CHANNELS BUT NOT OTHERS

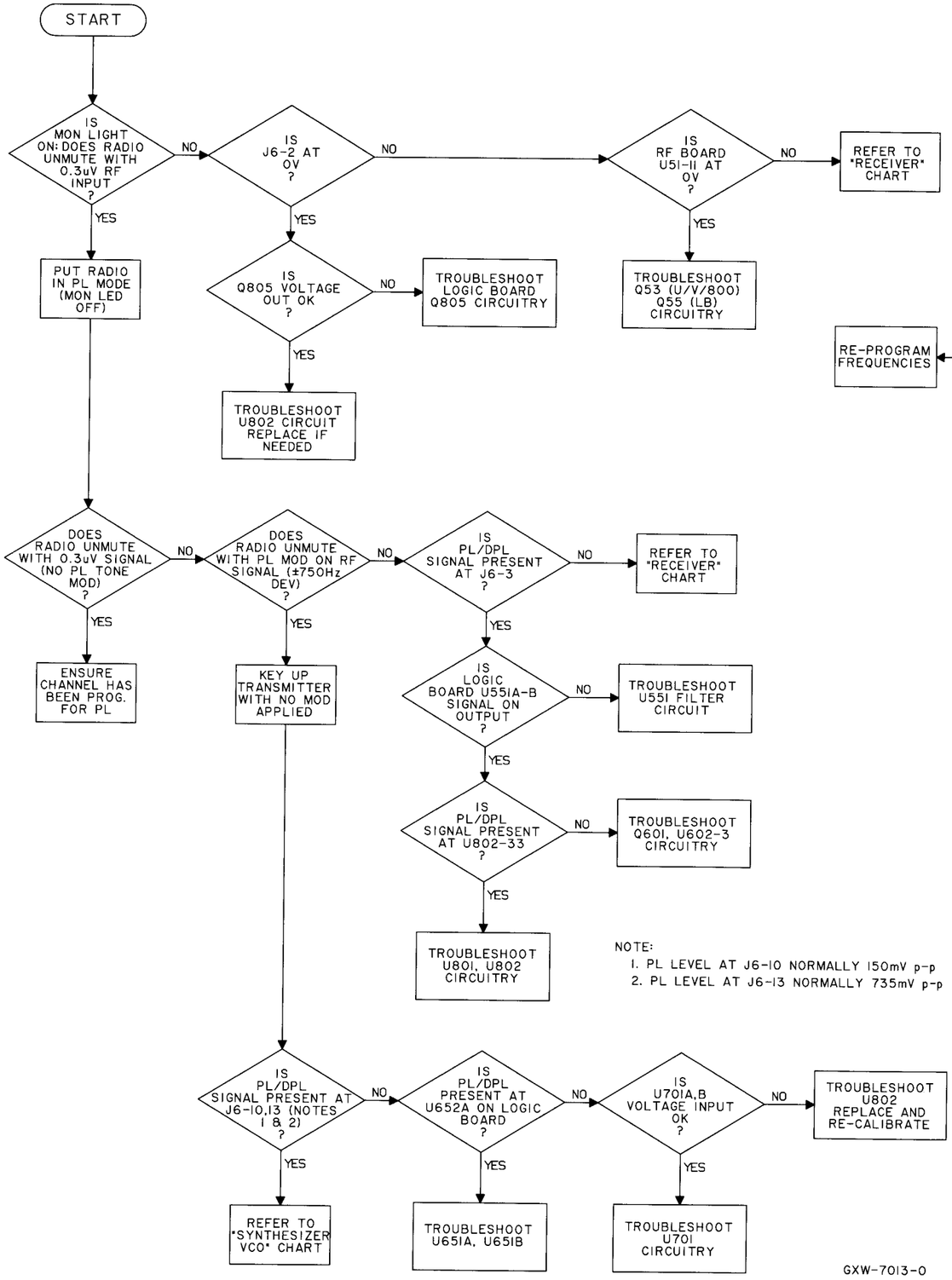


GXW-7512-0

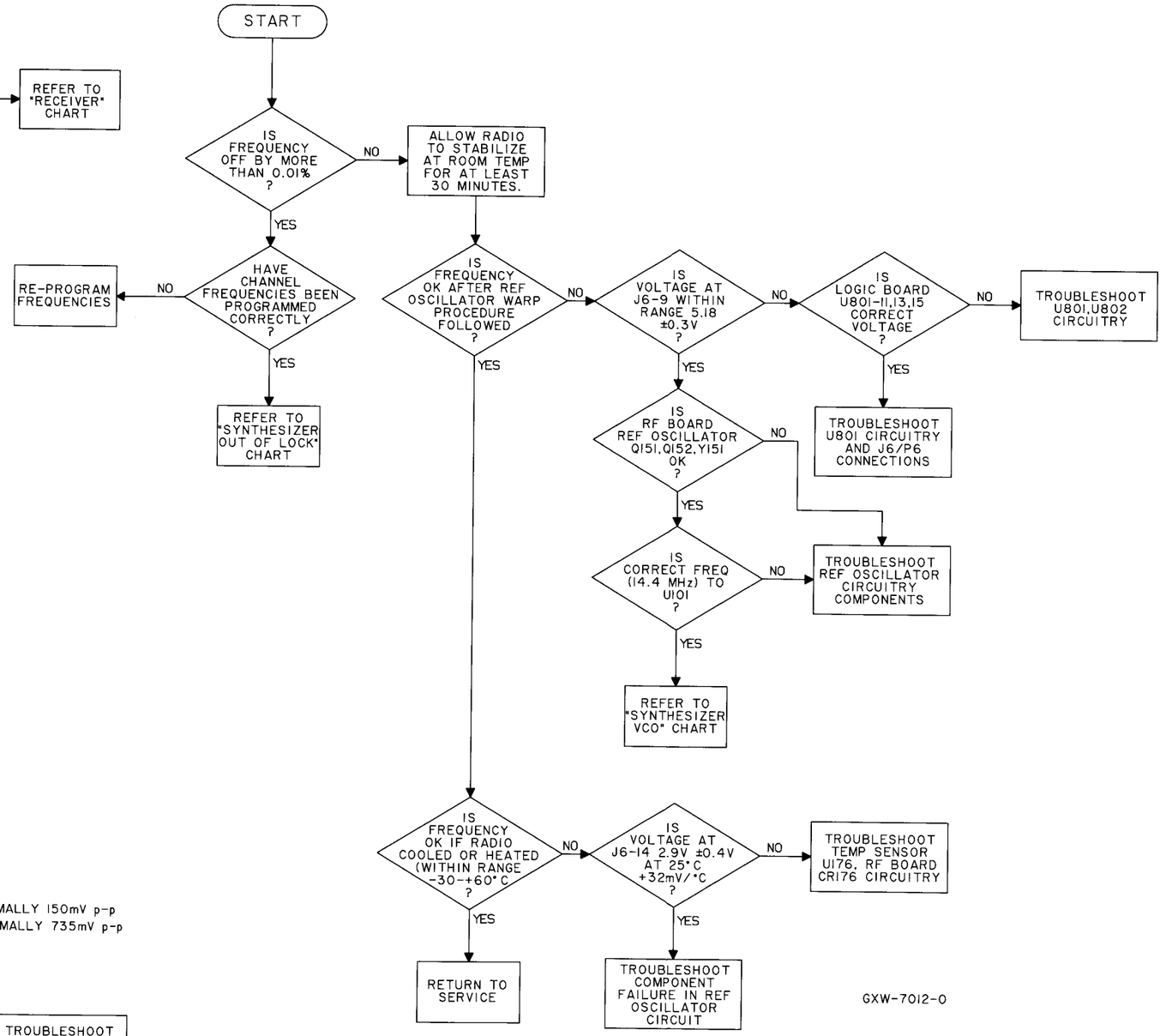
IMPORTANT

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

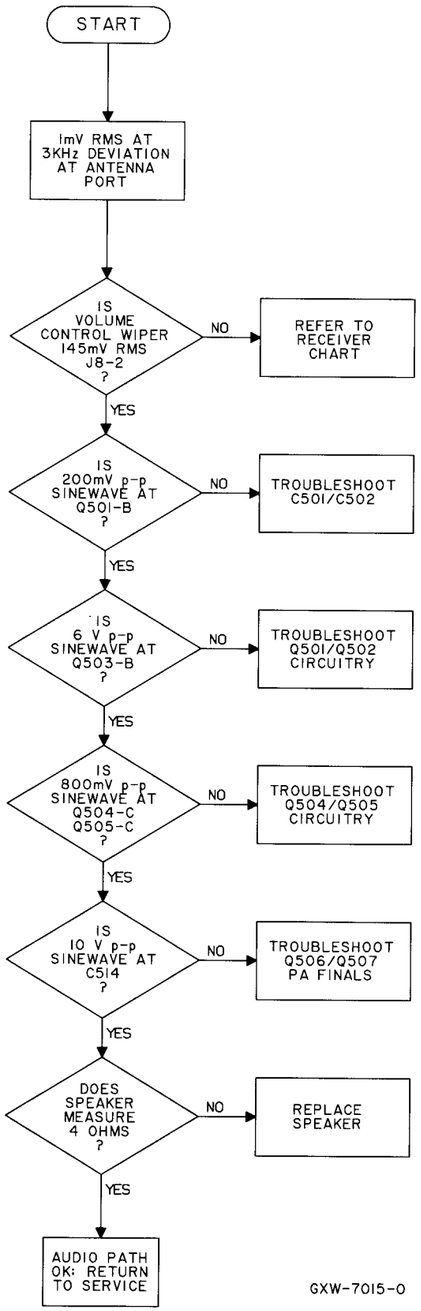
BAD SQUELCH OR PL/DPL



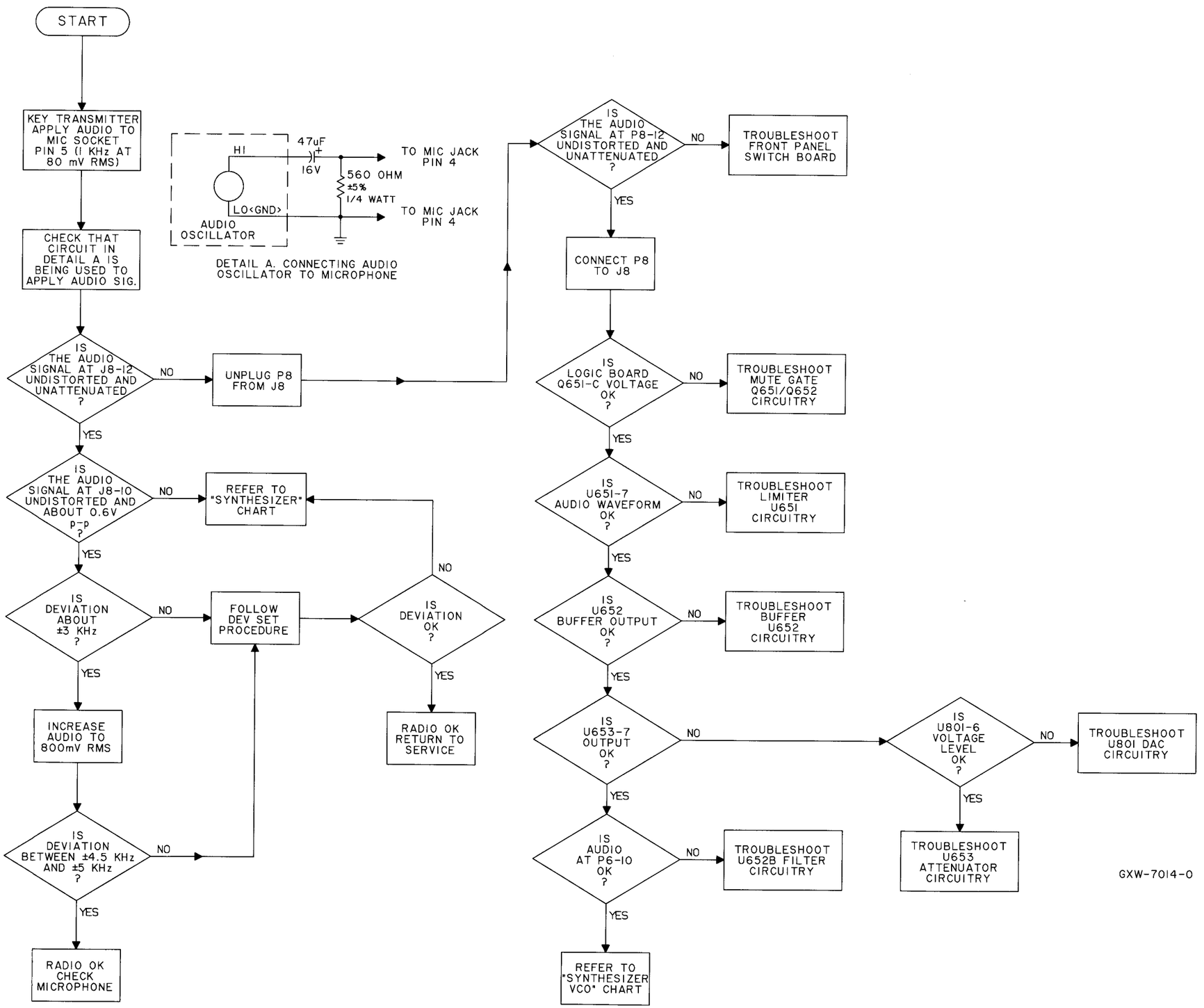
TRANSMITTER OFF FREQUENCY



NO/LOW AUDIO



BAD TX MODULATION



Logic Board Troubleshooting Charts
PW–7011–O
(Sheet 2 of 2)
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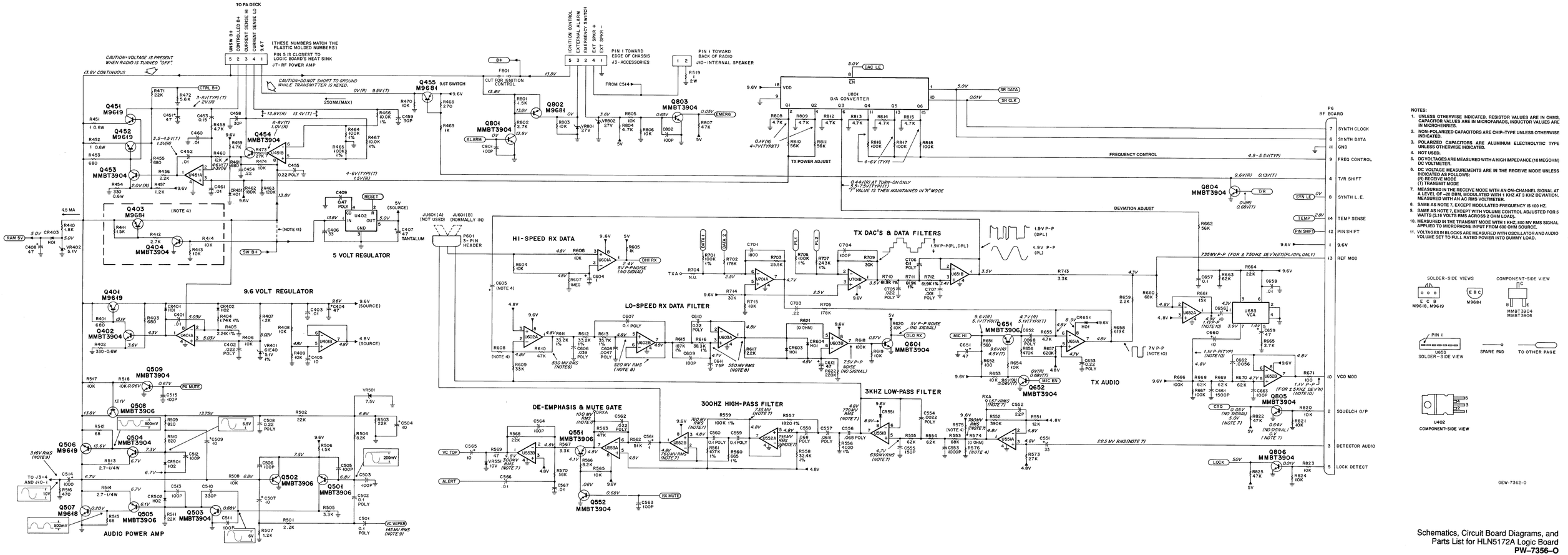


NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. NOT USED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
6. DC VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
8. SAME AS NOTE 7, EXCEPT MODULATED FREQUENCY IS 100 HZ.
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 800 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
11. VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.

GEW-7362-O

Schematics, Circuit Board Diagrams, and Parts List for HLN5172A Logic Board

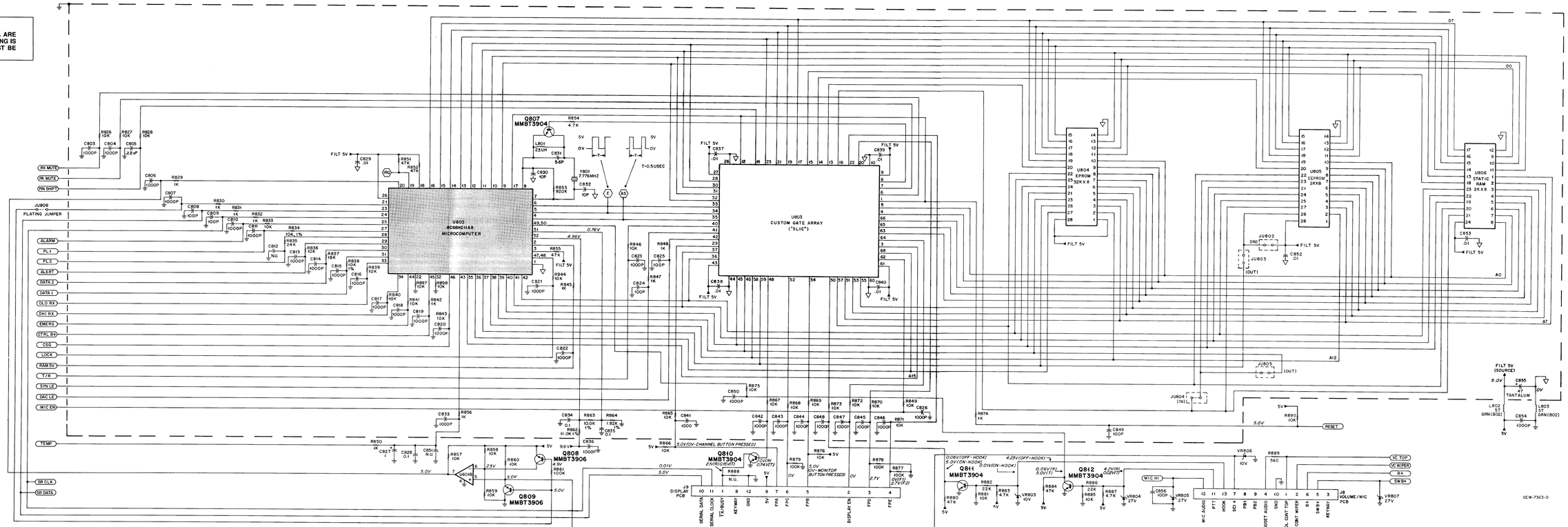
PW-7356-O

(Sheet 1 of 4)

2/28/90

IMPORTANT

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



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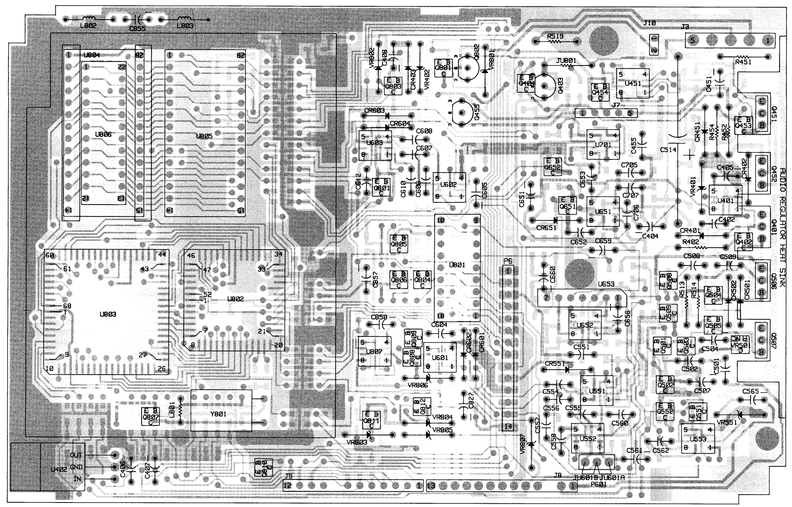
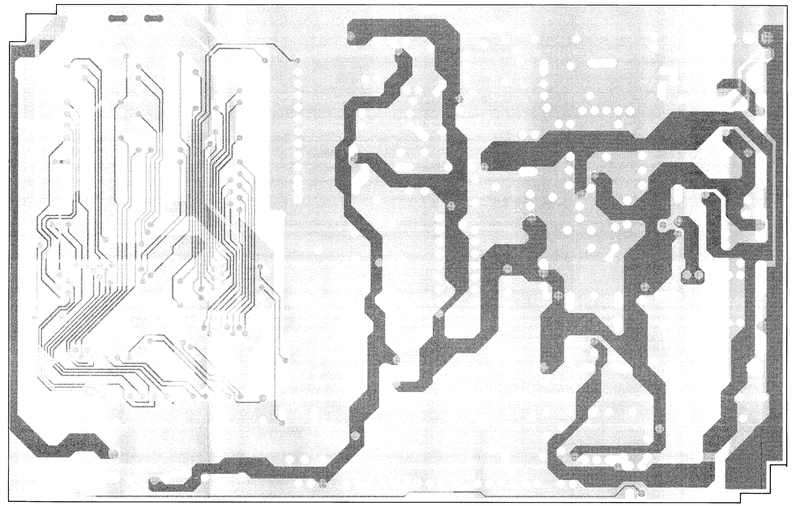


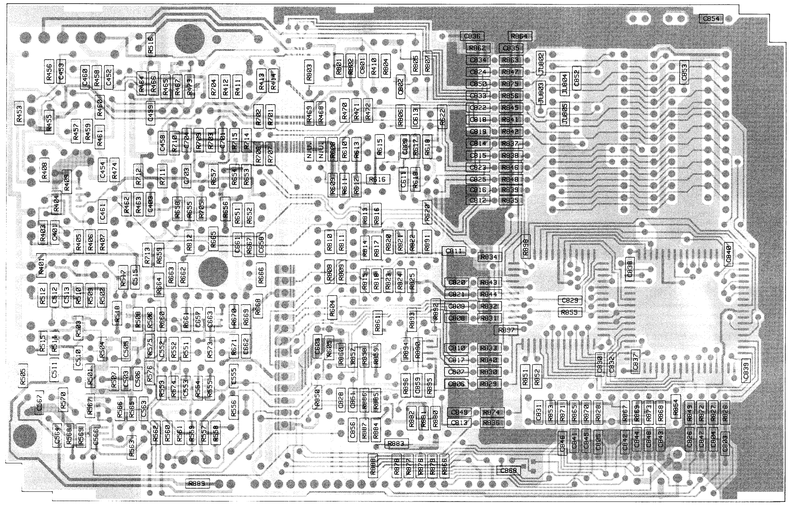
SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7358-O
OVERLAY GCW-7360-O

COMPONENT SIDE VIEW



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

COMPONENT SIDE VIEW



SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7358-O
OVERLAY GCW-7361-O

SOLDER SIDE VIEW

Schematics, Circuit Board Diagrams, and
Parts List for HLN5172A Logic Board
PW-7356-O
(Sheet 3 of 4)
2/28/90

parts list

HLN5172A Logic Board (Trunking) — MXW–7357–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF, ±5%, 50V (unless otherwise stated)		
C401	21–13741B45	0.01,±10%
C402	08–11051A09	.022, 63V
C403	21–13741B45	0.01,±10%
C404	23–11048B19	47, ±20%, 16V, electrolytic
C405	23–11048B13	10, ±20, 16V, electrolytic
C406	23–11048A17	33, ±20%, 25V, electrolytic
C407	23–13749A44	47, ±20%, 6V
C408	23–11048B19	47, ±20%, 16V, electrolytic
C409	08–11051A17	.47, 63V
C451	23–11048B19	47, ±20%, 16V, electrolytic
C452	21–13741B45	0.01, ±10%
C453	21–11032B14	.15, +80 –20%
C454	21–11032B15	.22, +80 –20%
C455	08–11051A15	.22, 63V
C458,459	21–13740B36	30 pF
C460,461	21–13741B45	0.01 ±10%
C501,502	08–11051A13	.1, 63V
C503	21–13740B49	100 pF
C504	23–11048B13	10, ±20%, 16V, electrolytic
C505,506	21–13740B49	100 pF
C507	23–13749C39	10, ±10%, 20V
C508	08–11051A15	.22, 63V
C509	23–11048B13	10, ±20%, 16V, electrolytic
C510	21–13740B61	330 pF
C511–513	21–13740B49	100 pF
C514	23–02308M01	1000, ±20%, 16V, electrolytic
C515	21–13740B49	100 pF
C551	23–11048A17	33, ±20, 25V, electrolytic
C552	21–13740B33	22 pF
C553	21–13740B73	1000 pF
C554	08–11051A03	.0022, 63V
C555	21–13740B53	150 pF
C556–558	08–11051A12	.068, 63V
C559,560	08–11051A13	.1, 63V
C561	23–11048B05	1, ±20%, electrolytic
C562	08–11051A09	.022, 63V
C563,564	21–13740B49	100 pF
C565	23–11048B13	10, ±20%, 16V, electrolytic
C566,567	21–13741B45	0.01, ±10%
C604	23–11048B05	1, ±20%, electrolytic
C606	08–11051A22	0.039, 63V
C607	08–11051A13	.1, 63V
C608	08–11051A05	.0047, 63V
C609	21–13740B55	180 pF
C610	08–11051A15	.22, 63V
C611	21–13740B46	75 pF
C612	23–11048B19	47, ±20%, 16V, electrolytic
C651	23–11048B19	47, ±20%, 16V, electrolytic
C652	08–11051A06	.0068, 63V
C653	08–11051A15	.22, 63V
C656	23–11048B13	10, ±20%, 16V, electrolytic
C657	21–13741B69	0.1, +80 –20%
C658	21–13741B45	0.01, ±10%
C659	23–13749A44	47, ±20%, 6V, tantalum
C660	23–11048B13	10, ±20%, 16V, electrolytic
C661	21–13740B76	1500 pF
C662	21–13741B39	.0056
C663	21–13740B49	100 pF
C701	21–13740B78	1800 pF
C703	21–11032B15	.22, +80, –20%
C704	21–13740B49	100 pF
C705	08–11051A09	.022, 63V
C706	08–11051A13	.1, 63V
C707	08–11051A01	.001, 63V
C801,802	21–13740B49	100 pF
C803,804	21–13740B73	1000 pF
C805	21–11032B15	.22, +80 –20%
C806,807	21–13740B73	1000 pF
C808,809	21–13740B49	100 pF
C810,811	21–13740B73	1000 pF
C813–823	21–13740B73	1000 pF
C824,825	21–13740B49	100 pF
C826	21–13740B73	1000 pF
C827	23–11048B05	1, ±20%, electrolytic
C828	21–13741B69	0.1, +80 –20%
C829	21–13741B45	0.01, ±10%
C830	21–13740B25	10 pF, ±.5 pF
C831	21–11031F10	5.6 pF, ±.5 pF
C832	21–13740B25	10 pF, ±.5 pF
C833	21–13740B73	1000 pF
C834,835	21–13741B69	0.1, +80 –20%
C836	21–13740B73	1000 pF
C837–840	21–13741B45	0.01, ±10%
C841–848	21–13740B73	1000 pF
C849	21–13740B49	100 pF
C850	21–13740B73	1000 pF
C852,853	21–13741B45	0.01, ±10%
C854	21–13740B73	1000 pF
C855	23–11054A09	47, ±20%, 6V, tantalum
C856	21–13740B49	100 pF
diode (see note)		
CR401	48–83654H01	silicon
CR402	48–83654H02	silicon
CR403	48–83654H01	silicon
CR451	48–83654H01	silicon
CR501,502	48–83654H02	silicon
CR551	06–11009B23	jumper resistor
CR603,604	48–83654H01	silicon

MXW–7357–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR651	48–83654H01	silicon
fuse		
F801	65–05214E06	1 A
connector receptacle		
J3	28–80129M01	5–pin
J7	28–80128M01	5–pin
J8,9	28–80126M01	23–pin
J10	28–80128M02	2–pin
jumper		
JU601	09–84181L01	2–contact push–on
JU802	06–11077A01	0–ohm resistor
JU804	06–11077A01	0–ohm resistor
coil, RF		
L801	24–82723H35	23 uH, red
L802,803	24–83961B02	5 turns, green
connector plug		
P6	28–80127M02	14–pin, RF board
P601	28–80002R03	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 stated)		
R401	06–11077A70	680
R402	06–02369M31	330, .6 watt, 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, .6 Watt, metal film
R453	06–11077A70	680
R454	06–02369M31	330, .6 watt, 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	06–11077A82	2.2k
R502,503	06–11077B07	22k
R504	06–11077A96	8.2k
R505	06–11077A86	3.3k
R506	06–11077A78	1.5k
R507	06–11077A76	1.2k
R508	06–11077A98	10k
R509,510	06–11077A72	820
R511	06–11077B07	22k
R512	06–11077A46	68
R513,514	06–11009B26	2.7, 1/4 Watt
R515	06–11077A46	68
R516	06–11077A66	470
R517,518	06–11077A98	10k
R519	06–80185M01	1 ohm, ±10%, 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%

MXW–7357–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R562	06–11077B16	51k
R563	06–11077B15	47k
R565	06–11077A98	10k
R566	06–11077A96	8.2k
R567	06–11077A86	3.3k
R568	06–11077B07	22k
R569	06–11077A42	47
R570	06–11077B17	56k
R573	06–11077B09	27k
R574	06–11077A01	0–ohm
R604	06–11077A98	10k
R605	06–11077A74	1k
R606	06–11077A98	10k
R607	06–11077B47	1 meg
R609	06–11077B11	33k
R610	06–11077B15	47k
R611,612	06–11077G42	33.2k, ±1%
R613	06–11077G45	35.7k, ±1%
R615	06–11077H15	187k, ±1%
R616	06–11077G48	38.3k, ±1%
R617	06–11077A82	2.2k
R618	06–11077B23	100k
R619,620	06–11077A98	10k
R621	06–11077A01	0 ohm
R622	06–11077B31	220k
R651	06–11077A68	560
R652	06–11077A50	100
R653,654	06–11077A98	10k
R655	06–11077A90	4.7k
R656	06–11077B39	470k
R657	06–11077B42	620k
R658	06–11077H65	619k, ±1%
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	178, ±1%
R703	06–11077G31	25.5k, ±1%
R705	06–11077H13	178k, ±1%
R706	06–11077G88	100k, ±1%
R707	06–11077H26	243k, ±1%
R709	06–11077B10	30k
R710–712	06–11077G68	61.9k, ±1%
R713	06–11077A86	3.3k
R714	06–11077B10	30k
R715	06–11077B05	18k
R801	06–11077A78	1.5k
R802	06–11077A84	2.7k
R803	06–11077A98	10k
R804	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

MXW–7357–O (4)

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

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

Schematics, Circuit Board Diagrams, and Parts List for HLN5172A Logic Board
PW–7356–O
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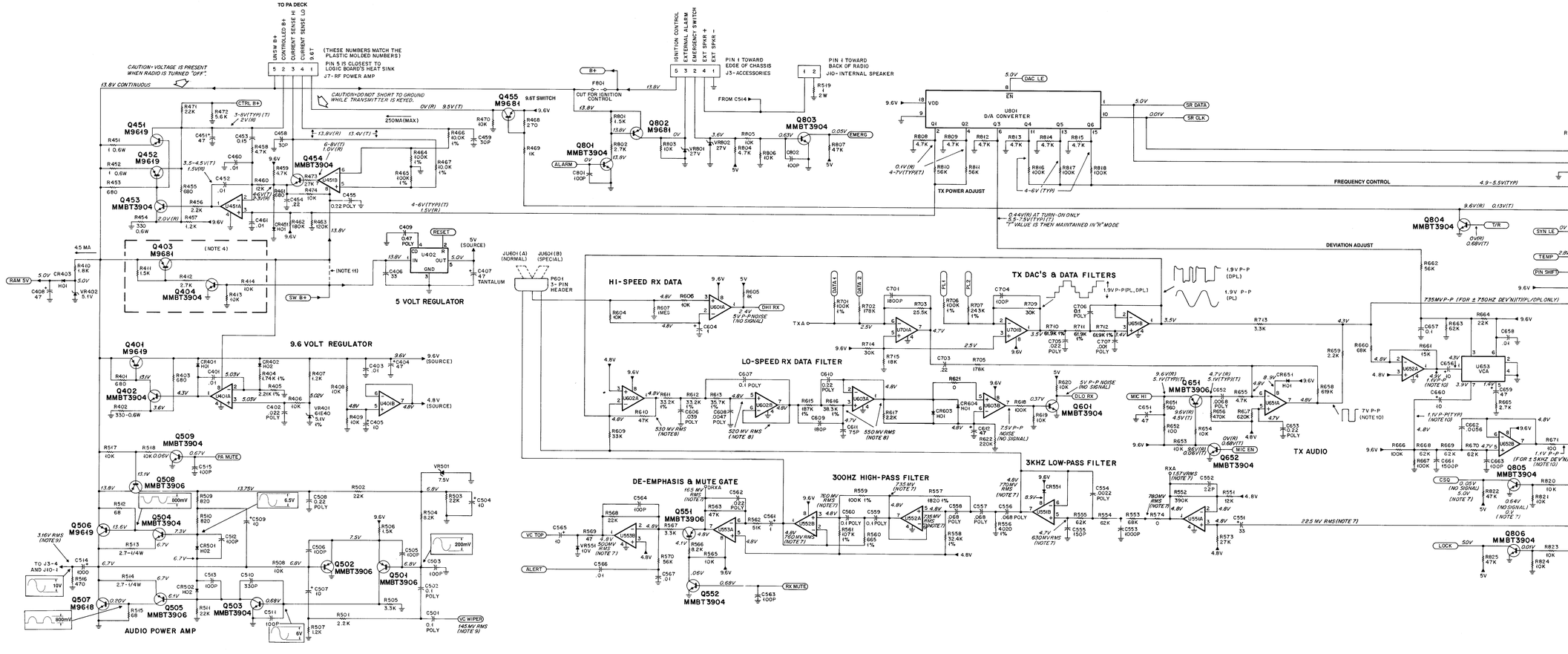

NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. NOT USED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
6. DC VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
8. SAME AS NOTE 7, EXCEPT MODULATED FREQUENCY IS 100 HZ.
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 600 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
11. VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.

SOLDER-SIDE VIEWS

M9648, M9619

M9681

COMPONENT-SIDE VIEW

MMBT3904
MMBT3906

U653 SOLDER-SIDE VIEW

SPARE PAD

TO OTHER PAGE

U402 COMPONENT-SIDE VIEW

GEW-7366-O

Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board

PW-7364-O

(Sheet 1 of 4)

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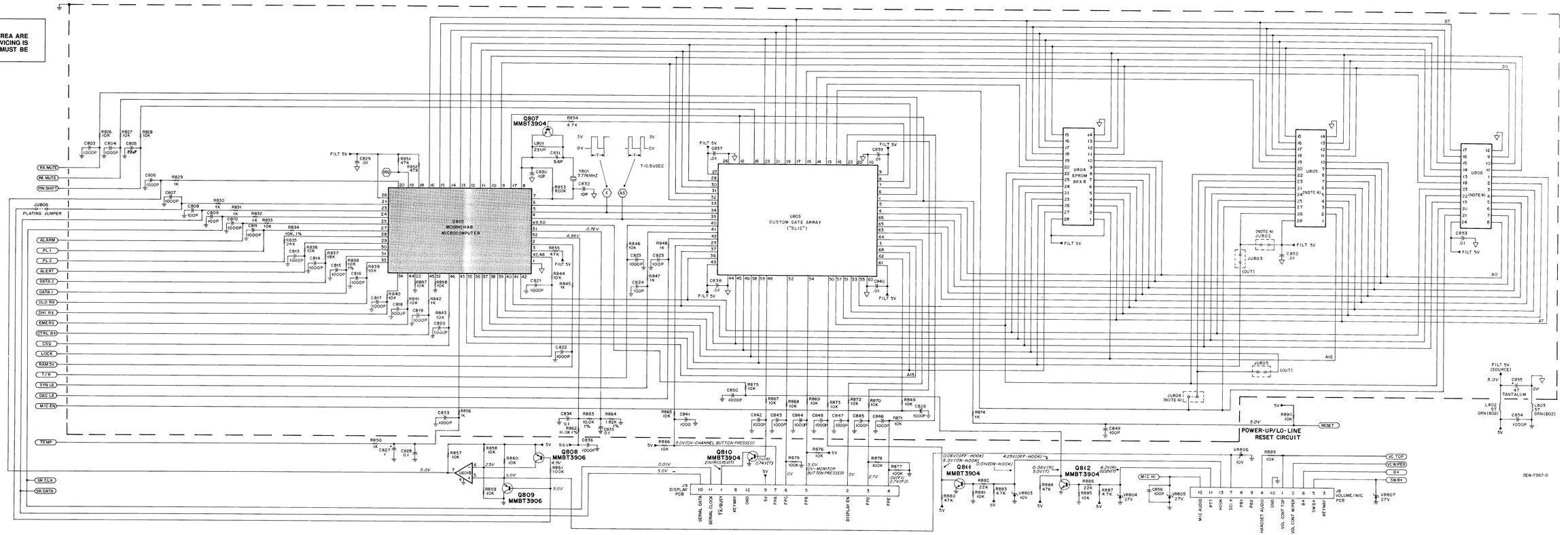
IMPORTANT

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



Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board
PW-7364-O
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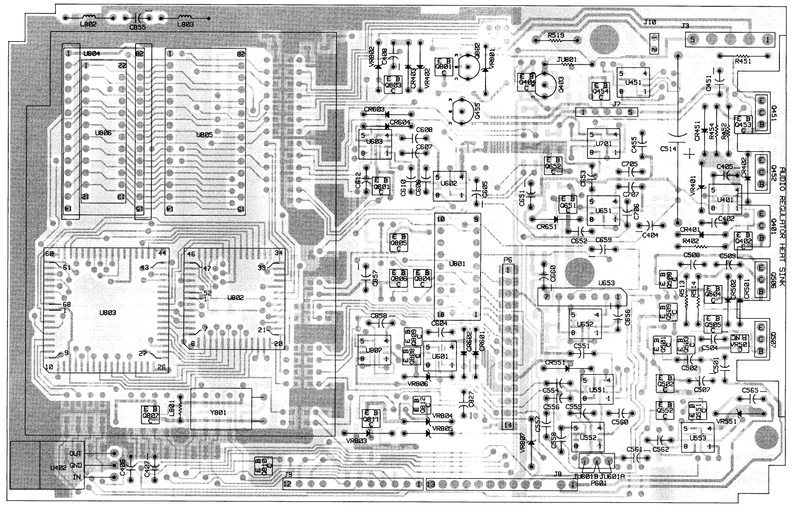
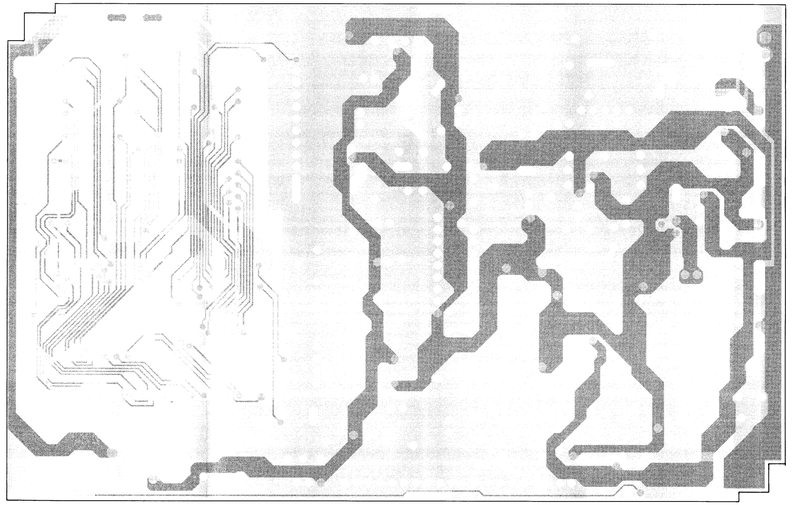


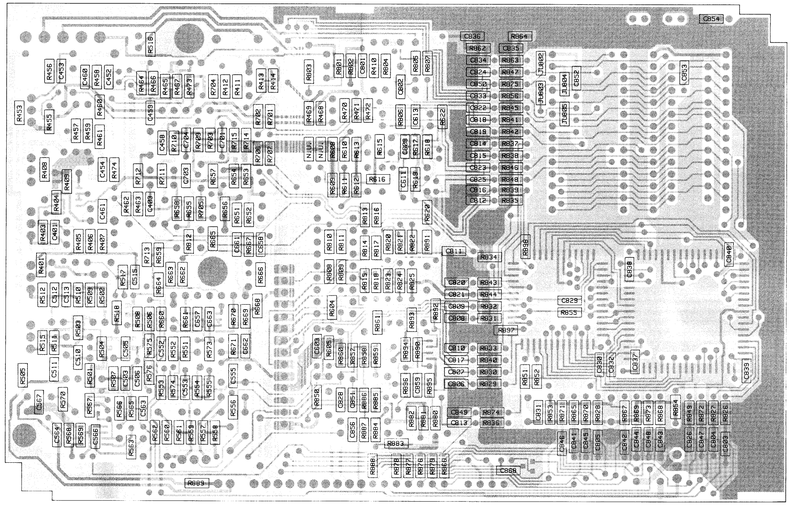
SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7358-O
OVERLAY GCW-7360-O

COMPONENT SIDE VIEW



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

COMPONENT SIDE VIEW



SOLDER SIDE GCW-7359-O
COMPONENT SIDE GCW-7358-O
OVERLAY GCW-7361-O

SOLDER SIDE VIEW

Schematics, Circuit Board Diagrams, and
Parts List for HLN5173B Logic Board
PW-7364-O
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parts list

HLN5173B Logic Board (Conventional) — MXW–7365–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed, uF, ±5%, 50V (unless otherwise stated)		
C401	21–13741B45	0.01, ±10%
C402	08–11051A09	.022, 63V
C403	21–13741B45	0.01, ±10%
C404	23–11048B19	47, ±20%, 16V, electrolytic
C405	23–11048B13	10, ±20, 16V, electrolytic
C406	23–11048A17	33, ±20%, 25V, electrolytic
C407	23–13749A44	47, ±20%, 6V
C408	23–11048B19	47, ±20%, 16V, electrolytic
C409	08–11051A17	.47, 63V
C451	23–11048B19	47, ±20%, 16V, electrolytic
C452	21–13741B45	0.01, ±10%
C453	21–11032B14	.15, +80 –20%
C454	21–11032B15	.22, +80 –20%
C455	08–11051A15	.22, 63V
C458, 459	21–13740B36	30 pF
C460, 461	21–13741B45	0.01 ±10%
C501, 502	08–11051A13	.1, 63V
C503	21–13740B49	100 pF
C504	23–11048B13	10, ±20%, 16V, electrolytic
C505, 506	21–13740B49	100 pF
C507	23–13749C39	10, ±10%, 20V
C508	08–11051A15	.22, 63V
C509	23–11048B13	10, ±20%, 16V, electrolytic
C510	21–13740B61	330 pF
C511–513	21–13740B49	100 pF
C514	23–02308M01	1000, ±20%, 16V, electrolytic
C515	21–13740B49	100 pF
C551	23–11048A17	33, ±20, 25V, electrolytic
C552	21–13740B33	22 pF
C553	21–13740B73	1000 pF
C554	08–11051A03	.0022, 63V
C555	21–13740B53	150 pF
C556–558	08–11051A12	.068, 63V
C559, 560	08–11051A13	.1, 63V
C561	23–11048B05	1, ±20%, electrolytic
C562	08–11051A09	.022, 63V
C563, 564	21–13740B49	100 pF
C565	23–11048B13	10, ±20%, 16V, electrolytic
C566, 567	21–13741B45	0.01, ±10%
C604	23–11048B05	1, ±20%, electrolytic
C606	08–11051A22	0.039, 63V
C607	08–11051A13	.1, 63V
C608	08–11051A05	.0047, 63V
C609	21–13740B55	180 pF
C610	08–11051A15	.22, 63V
C611	21–13740B46	75 pF
C612	23–11048B19	47, ±20%, 16V, electrolytic
C651	23–11048B19	47, ±20%, 16V, electrolytic
C652	08–11051A06	.0068, 63V
C653	08–11051A15	.22, 63V
C656	23–11048B13	10, ±20%, 16V, electrolytic
C657	21–13741B69	0.1, +80 –20%
C658	21–13741B45	0.01, ±10%
C659	23–13749A44	47, ±20%, 6V
C660	23–11048B13	10, ±20%, 16V, electrolytic
C661	21–13740B76	1500 pF
C662	21–13741B39	.0056
C663	21–13740B49	100 pF
C701	21–13740B78	1800 pF
C703	21–11032B15	.22, +80, –20%
C704	21–13740B49	100 pF
C705	08–11051A09	.022, 63V
C706	08–11051A13	.1, 63V
C707	08–11051A01	.001, 63V
C801, 802	21–13740B49	100 pF
C803–804	21–13740B73	1000 pF
C805	21–11032B15	.22, +80 –20%
C806, 807	21–13740B73	1000 pF
C808, 809	21–13740B49	100 pF
C810, 811	21–13740B73	1000 pF
C813–823	21–13740B73	1000 pF
C824, 825	21–13740B49	100 pF
C826	21–13740B73	1000 pF
C827	23–11048B05	1, ±20%, electrolytic
C828	21–13741B69	0.1, +80 –20%
C829	21–13741B45	0.01, ±10%
C830	21–13740B25	10 pF, ±.5 pF
C831	21–11031F10	5.6 pF, ±.5 pF
C832	21–13740B25	10 pF, ±.5 pF
C833	21–13740B73	1000 pF
C834, 835	21–13741B69	0.1, +80 –20%
C836	21–13740B73	1000 pF
C837–840	21–13741B45	0.01, ±10%
C841–848	21–13740B73	1000 pF
C849	21–13740B49	100 pF
C850	21–13740B73	1000 pF
C852, 853	21–13741B45	0.01, ±10%
C854	21–13740B73	1000 pF
C855	23–13749J23	47, ±10%, 6V
C856	21–13740B49	100 pF
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, 604	48–83654H01	silicon
CR651	48–83654H01	silicon

MXW–7365–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
fuse		
F801	65–05214E06	1 A
connector receptacle		
J3	28–80129M01	5–pin
J7	28–80128M01	5–pin
J8,9	28–80126M01	23–pin
J10	28–80128M02	2–pin
jumper		
JU601	09–84181L01	2–contact push–on
coil, RF		
L801	24–82723H35	23 uH, red
L802, 803	24–83961B02	5 turns, green
connector plug		
P6	28–80127M01	14–pin, RF board
P601	28–80002R03	3–pin, for JU601
transistor (see note)		
Q401	48–00869619	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 stated)		
R401	06–11077A70	680
R402	06–02369M31	330, .6 watt, 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, .6 Watt, metal film
R453	06–11077A70	680
R454	06–02369M31	330, .6 watt, 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	06–11077A82	2.2k
R502, 503	06–11077B07	22k
R504	06–11077A96	8.2k
R505	06–11077A86	3.3k
R506	06–11077A78	1.5k
R507	06–11077A76	1.2k
R508	06–11077A98	10k
R509, 510	06–11077A72	820
R511	06–11077B07	22k
R512	06–11077A46	68
R513, 514	06–11009B26	2.7, 1/4 Watt
R515	06–11077A46	68
R516	06–11077A66	470
R517, 518	06–11077A98	10k
R519	06–80185M01	1 ohm, ±10%, 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	06–11077B16	51k
R563	06–11077B15	47k
R565	06–11077A98	10k
R566	06–11077A96	8.2k
R568	06–11077B07	22k

MXW–7365–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R567	06–11077A86	3.3k
R569	06–11077A42	47
R570	06–11077B17	56k
R573	06–11077B09	27k
R574	06–11077A01	0–ohm
R604	06–11077A98	10k
R605	06–11077A74	1k
R606	06–11077A98	10k
R607	06–11077B47	1 meg
R609	06–11077B11	33k
R610	06–11077B15	47k
R611, 612	06–11077G42	33.2k, ±1%
R613	06–11077G45	35.7k, ±1%
R615	06–11077H15	187k, ±1%
R616	06–11077G48	38.3k, ±1%
R617	06–11077A82	2.2k
R618	06–11077B23	100k
R619, 620	06–11077A98	10k
R621	06–11077A01	0–ohm
R622	06–11077B31	220k
R651	06–11077A68	560
R652	06–11077A50	100
R653, 654	06–11077A98	10k
R655	06–11077A90	4.7k
R656	06–11077B39	470k
R657	06–11077B42	620k
R658	06–11077H65	619k, ±1%
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, ±1%
R703	06–11077G31	25.5k, ±1%
R705	06–11077H13	178k, ±1%
R706	06–11077G88	100k, ±1%
R707	06–11077H26	243k, ±1%
R709	06–11077B10	30k
R710–712	06–11077G68	61.9k, ±1%
R713	06–11077A86	3.3k
R714	06–11077B10	30k
R715	06–11077B05	18k
R801	06–11077A78	1.5k
R802	06–11077A84	2.7k
R803	06–11077A98	10k
R804	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

MXW–7365–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R889	06–11077A68	560
R890	06–11077A98	10k
R897, 898	06–11077A98	10k
integrated circuit (see note)		
U401	51–02198J22	dual op–amp
U402	51–80942T02	voltage regulator 5V
U451	51–02198J22	dual op–amp
U551–553	51–02198J22	dual op–amp
U601	51–02198J23	dual comparator
U602, 603	51–02198J22	dual op–amp
U651, 652	51–02198J22	dual op–amp
U653	51–80059M01	voltage–controlled attenuator
U701	51–02198J22	dual op–amp
U801	51–80135C10	D/A converter
U802	51–80960T01	microcomputer
U804	HLN9277A	ROM kit
U803	51–82862N09	logic array
U807	51–02198J23	dual comparator
voltage regulator (see note)		
VR401	48–83461E40	zener, 5.1V
VR402	48–82256C15	zener, 5.1V
VR501	48–80140L11	zener, 7.5V
VR551	48–82256C11	zener, 10V
VR801, 802	48–82256C20	zener, 27V
VR803	48–82256C11	zener, 10V
VR804, 805	48–82256C20	zener, 27V
VR806	48–82256C11	zener, 10V
VR807	48–82256C20	zener, 27V
crystal (see note)		
Y801	48–80173D09	7.776 MHz
non–referenced parts		
B1	56–83350K05	bag
M401–404	03–10943M04	tapping screw
M406–410	14–83820M05	insulator
M412	84–80199M02	circuit board
M413	14–80145M01	insulator accessory connector
M414	26–80123M01	logic shield
M415, 416	09–82071K09	14–pin socket
	14–82392E13	cover insulator
	42–80940T01	retaining ring
	03–10943M04	tapping screw
	04–00131974	flat washer
	07–80925T01	bracket, audio regulator
	26–80125L02	heat sink, audio regulator

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

Schematics, Circuit Board Diagrams, and Parts List for HLN5173B Logic Board
PW–7364–O
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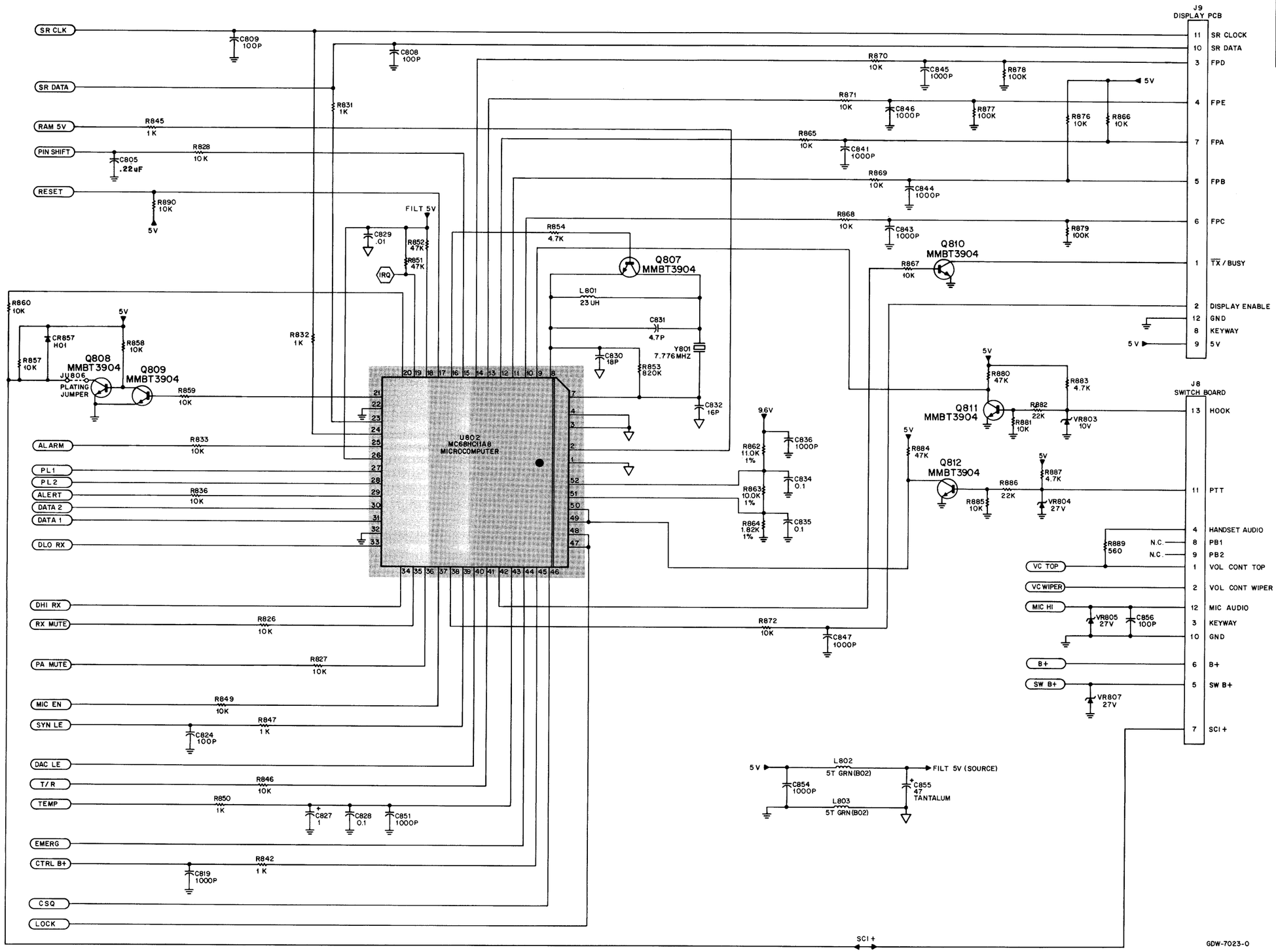
IMPORTANT

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



Schematics, Circuit Board Diagrams, and
Parts List for HLN9123A Logic Board
PW–7020–O
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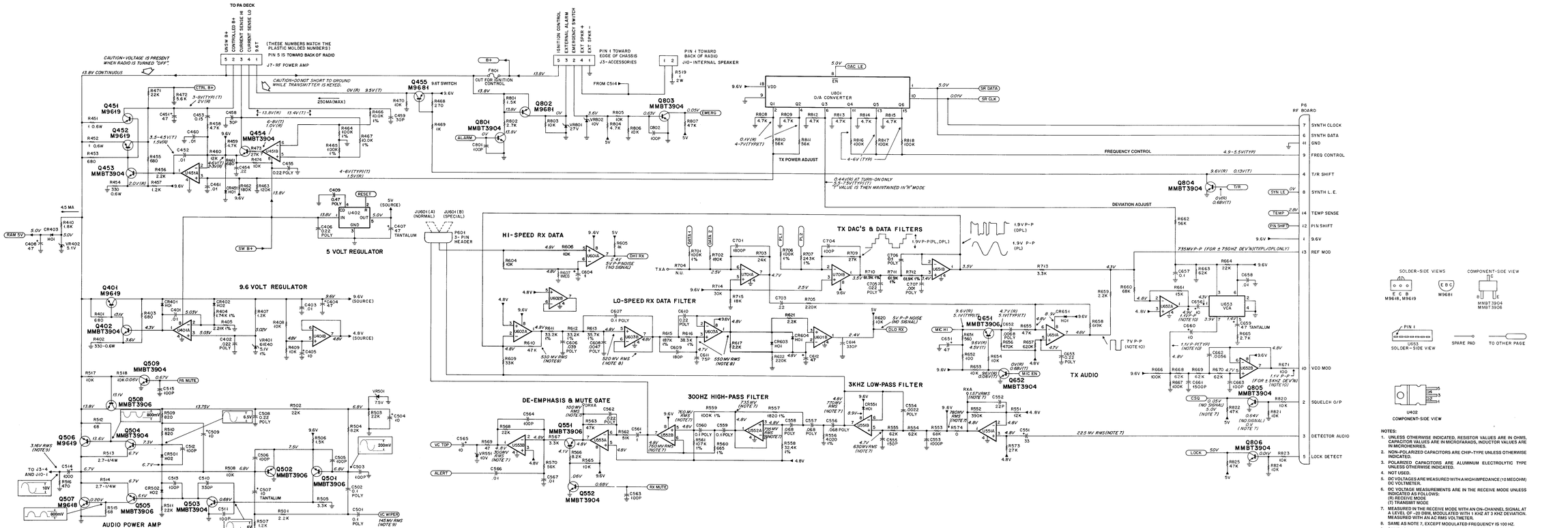

Schematics, Circuit Board Diagrams, and Parts List for HLN9123A Logic Board
PW–7020–O
(Sheet 2 of 4)
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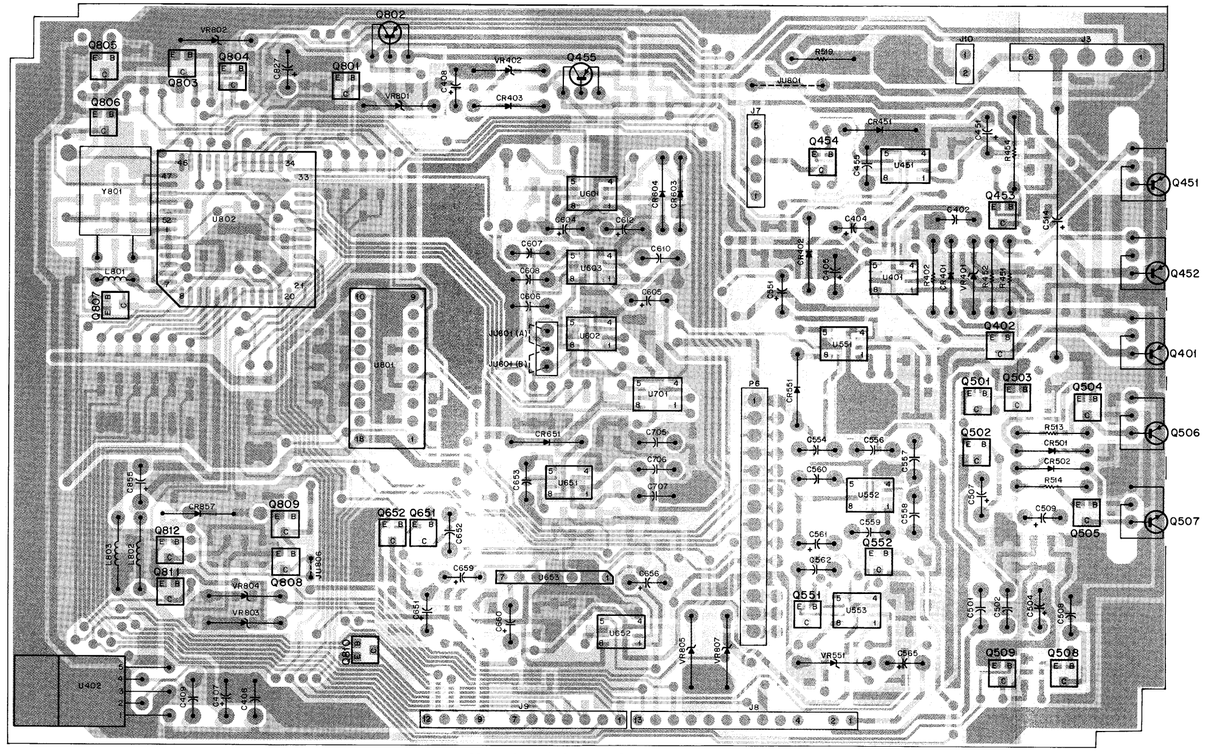
NOTES:

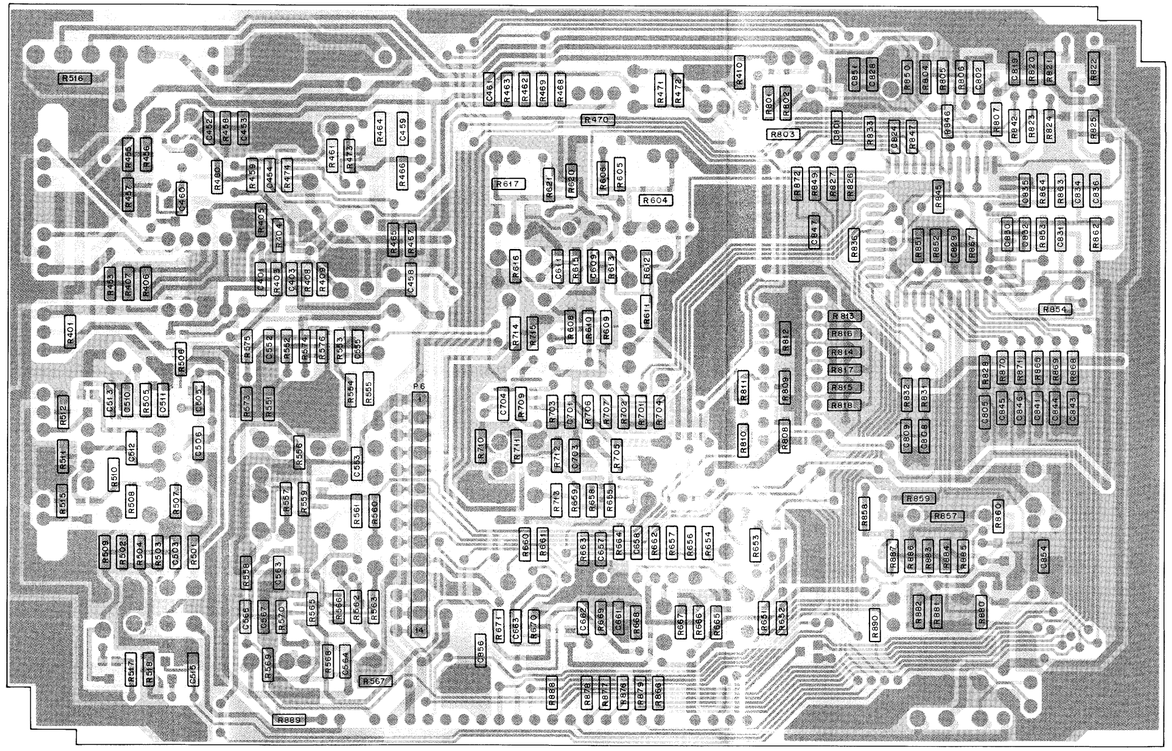
1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. NOT USED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
6. DC VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF –20 DBM, MODULATED WITH ± KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
8. SAME AS NOTE 7, EXCEPT MODULATED FREQUENCY IS 100 HZ.
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 600 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
11. VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.

GEW-7024-O



SOLDER SIDE GDW–7022–O
COMPONENT SIDE GDW–7021–O
OVERLAY GDW–7455–O

SHOWN FROM COMPONENT SIDE



SOLDER SIDE GDW–7022–O
COMPONENT SIDE GDW–7021–O
OVERLAY GDW–7456–O

SHOWN FROM SOLDER SIDE

Schematics, Circuit Board Diagrams, and
Parts List for HLN9123A Logic Board
PW–7020–O
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parts list

HLN9123A Logic Board, Masked — MXW–7019–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed uF, ±5%, 50V (unless otherwise stated)		
C401	21–13741B45	.01, ±10%
C402	08–11051A09	.022, 63V
C403	21–13741B45	.01, ±10%
C404	23–11048B19	47, ±20%, 16V, electrolytic
C405	23–11048B13	10, ±20, 16V, electrolytic
C406	08–11051A15	.22, 63V
C407	23–11013A56	47, ±20%, 6V, tantalum
C408	23–11048B19	47, ±20%, 16V, electrolytic
C409	08–11051A17	.47, 63V
C451	23–11048B19	47, ±20%, 16V, electrolytic
C452	21–13741B45	.01, ±10%
C453	21–11032B14	.15, +80/–20%
C454	21–11032B15	.22, +80/–20%
C455	08–11051A15	.22, 63V
C458, 459	21–13740B36	30 pF
C460, 461	21–13741B45	.01, ±10%
C501, 502	08–11051A13	.1, 63V
C503	21–13740B49	100 pF
C504	23–11048B13	10, ±20%, 16V
C505, 506	21–13740B49	100 pF
C507	23–11013D13	10, ±10%, 20V, tantalum
C508	08–11051A15	.22, 63V
C509	23–11048B13	10, ±20%, 16V, electrolytic
C510	21–13740B61	330 pF
C511–513	21–13740B49	100 pF
C514	23–02308M01	1000 uF, ±20%, 16V, electrolytic
C515	21–13740B49	100 pF
C551	23–11048A17	33, ±20, 25V, electrolytic
C552	21–13740B33	22 pF
C553	21–13740B73	1000 pF
C554	08–11051A03	.0022, 63V
C555	21–13740B53	150 pF
C556–558	08–11051A12	.068, 63V
C559, 560	08–11051A13	.1, 63V
C561	23–11048B05	1, ±20%, electrolytic
C562	08–11051A09	.022, 63V
C563, 564	21–13740B49	100 pF
C565	23–11048B13	10, ±20%, 16V, electrolytic
C566, 567	21–13741B45	0.01, ±10%
C604	23–11048B05	1, ±20%, electrolytic
C606	08–11051A22	0.039, 63V
C607	08–11051A13	.1, 63V
C608	08–11051A05	.0047, 63V
C609	21–13740B55	180 pF
C610	08–11051A15	.22, 63V
C611	21–13740B46	75 pF
C612	23–11048B19	47, ±20%, 16V, electrolytic
C614	21–13740B61	330 pF
C651	23–11048B19	47, ±20%, 16V, electrolytic
C652	08–11051A06	.0068, 63V
C653	08–11051A15	.22, 63V
C656	23–11048B13	10, ±20%, 16V, electrolytic
C657	21–13741B69	0.1, +80 –20%
C658	21–13741B45	0.01, ±10%
C659	23–11013A56	47, ±20%, 6V, tantalum
C660	23–11048B13	10, ±20%, 16V, electrolytic
C661	21–13740B76	1500 pF
C662	21–13741B39	.0056, ±10%
C663	21–13740B49	100 pF
C701	21–13740B78	1800 pF
C703	21–11032B15	.22, +80, –20%
C704	21–13740B49	100 pF
C705	08–11051A09	.022, 63V
C706	08–11051A13	.1, 63V
C707	08–11051A01	.001, 63V
C801, 802	21–13740B49	100 pF
C805	21–11032B15	.22, +80 –20%
C808, 809	21–13740B49	100 pF
C819	21–13740B73	1000 pF
C824	21–13740B49	100 pF
C827	23–11048B05	1, ±20%, electrolytic
C828	21–13741B69	0.1, +80 –20%
C829	21–13741B45	0.01, ±10%
C830	21–13740B31	18 pF
C831	21–13740B17	4.7, ±.25 pF
C832	21–13740B30	16 pF
C834, 835	21–13741B69	0.1, +80 –20%
C836	21–13740B73	1000 pF
C841	21–13740B73	1000 pF
C843–847	21–13740B73	1000 pF
C851	21–13740B73	1000 pF
C854	21–13740B73	1000 pF
C855	23–11013A56	47, ±20%, 6V, tantalum
C856	21–13740B49	100 pF
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, 604	48–83654H01	silicon
CR651	48–83654H01	silicon
CR857	48–83654H01	silicon
fuse		
F801	65–05214E06	1 A
connector receptacle		
J3	28–80129M01	5–pin, accessories

MXW–7019–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
J7	28–80128M01	5–pin, RF power amplifier
J8/9	28–80126M01	23–pin
J10	28–80128M02	2–pin, internal speaker jumper
jumper		
JU601	09–84181L01	2–contact push–on
coil, RF		
L801	24–82723H35	23 uH, red
L802, 803	24–83961B02	5 turns, green
connector plug		
P6	28–80127M01	14–pin, RF board
P601	28–80002R03	3–pin, for JU601
transistor (see note)		
Q401	48–00869916	PNP
Q402	48–80214G02	NPN
Q451, 452	48–00869916	PNP
Q453, 454	48–80214G02	NPN
Q455	48–00869681	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
Q651	48–05128M16	PNP
Q652	48–80214G02	NPN
Q801	48–80214G02	NPN
Q802	48–00869681	PNP
Q803–812	48–80214G02	NPN
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R401	06–11077A70	680
R402	06–02369M31	330, .6 watt, metal film
R403	06–11077A70	680
R404	06–11077F18	1.74k, ±1%
R405	06–11077F28	2.21k, ±1%
R407	06–11077A76	1.2k
R408, 409	06–11077A98	10k
R410	06–11077A80	1.8k
R451, 452	06–02369M01	1, .6 Watt, metal film
R453	06–11077A70	680
R454	06–02369M31	330, .6 watt, 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	06–11077A82	2.2k
R502, 503	06–11077B07	22k
R504	06–11077A96	8.2k
R505	06–11077A86	3.3k
R506	06–11077A78	1.5k
R507	06–11077A76	1.2k
R508	06–11077A98	10k
R509, 510	06–11077A72	820
R511	06–11077B07	22k
R512	06–11077A46	68
R513, 514	06–11009B26	2.7, 1/4 Watt
R515	06–11077A46	68
R516	06–11077A66	470
R517, 518	06–11077A98	10k
R519	06–80185M01	1 ohm, ±10%, 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	06–11077B16	51k
R563	06–11077B15	47k
R565	06–11077A98	10k
R566	06–11077A96	8.2k
R567	06–11077A86	3.3k
R568	06–11077B07	22k
R569	06–11077A42	47
R570	06–11077B17	56k
R573	06–11077B09	27k
R574	06–11077A01	0–ohm
R604	06–11077A98	10k
R605	06–11077A74	1k
R606	06–11077A98	10k

MXW–7019–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R607	06–11077B47	1 meg
R609	06–11077B11	33k
R610	06–11077B15	47k
R611, 612	06–11077G42	33.2k, ±1%
R613	06–11077G45	35.7k, ±1%
R615	06–11077H15	187k, ±1%
R616	06–11077G48	38.3k, ±1%
R617	06–11077A82	2.2k
R620	06–11077A98	10k
R621	06–11077A82	2.2k
R622	06–11077B31	220k
R651	06–11077A68	560
R652	06–11077A50	100
R653, 654	06–11077A98	10k
R655	06–11077A90	4.7k
R656	06–11077B39	470k
R657	06–11077B42	620k
R658	06–11077H65	619k, ±1%
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	06–11077B29	180k
R703	06–11077B08	24k
R705	06–11077B31	220k
R706	06–11077G88	100k, ±1%
R707	06–11077H26	243k, ±1%
R709	06–11077B09	27k
R710–712	06–11077G68	61.9k, ±1%
R713	06–11077A86	3.3k
R714	06–11077B10	30k
R715	06–11077B05	18k
R801	06–11077A78	1.5k
R802	06–11077A84	2.7k
R803	06–11077A98	10k
R804	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
R831, 832	06–11077A74	1k
R833	06–11077A98	10k
R836	06–11077A98	10k
R842	06–11077A74	1k
R845	06–11077A74	1k
R846	06–11077A98	10k
R847	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
R857–860	06–11077A98	10k
R862	06–11077F95	11K, ±1%
R863	06–11077F91	10k, ±1%
R864	06–11077F20	1.82k, ±1%
R865–872	06–11077A98	10k
R876	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	06–11077A68	560
R890	06–11077A98	10k
integrated circuit (see note)		
U401	51–02198J22	dual op–amp
U402	51–80942T01	voltage regulator 5V
U451	51–02198J22	dual op–amp
U551–553	51–02198J22	dual op–amp
U601	51–02198J23	dual comparator
U602, 603	51–02198J22	dual op–amp
U651, 652	51–02198J22	dual op–amp
U653	51–80059M01	voltage–controlled attenuator
U701	51–02198J22	dual op–amp
U801	51–80135C10	D/A converter
U802	51–80960T01	microcomputer
voltage regulator (see note)		
VR401	48–83461E40	zener, 5.1V
VR402	48–82256C15	zener, 5.1V
VR551	48–82256C11	zener, 10V
VR801	48–82256C20	zener, 27V

MXW–7019–O (4)

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

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

Schematics, Circuit Board Diagrams, and Parts List for HLN9123A Logic Board
PW–7020–O
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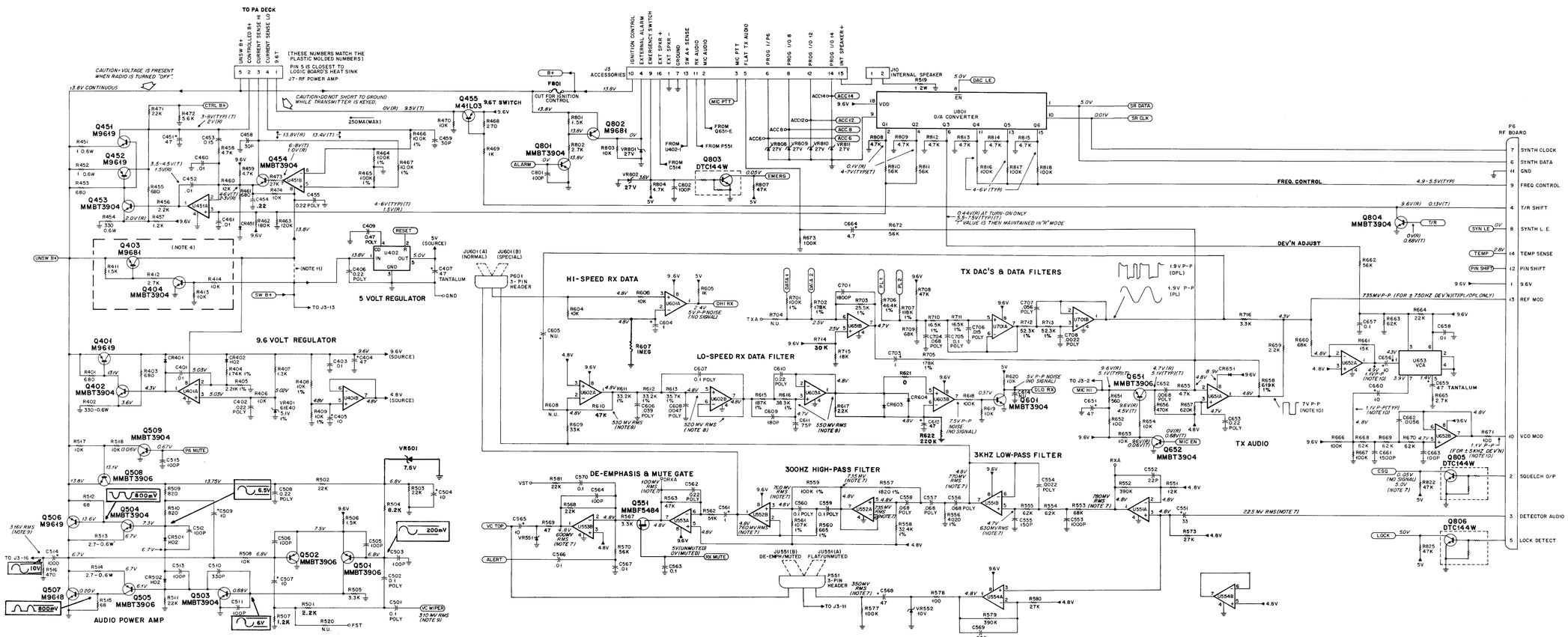

NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN MICROFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. NOT USED.
5. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
6. ALL VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF –20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
8. SAME AS NOTE 7 EXCEPT MODULATING FREQUENCY IS 100 HZ.
9. SAME AS NOTE 7, EXCEPT WITH VOLUME CONTROL ADJUSTED FOR 5 WATTS (3.16 VOLTS RMS ACROSS 2 OHM LOAD).
10. MEASURED IN THE TRANSMIT MODE WITH 1 KHZ, 800 MV RMS SIGNAL APPLIED TO MICROPHONE INPUT FROM 600 OHM SOURCE.
11. **VOLTAGES IN BLOCKS ARE MEASURED WITH OSCILLATOR AND AUDIO VOLUME SET TO FULL RATED POWER INTO DUMMY LOAD.**

Schematics, Circuit Board Diagrams, and Parts List for HLN9313A Logic Board
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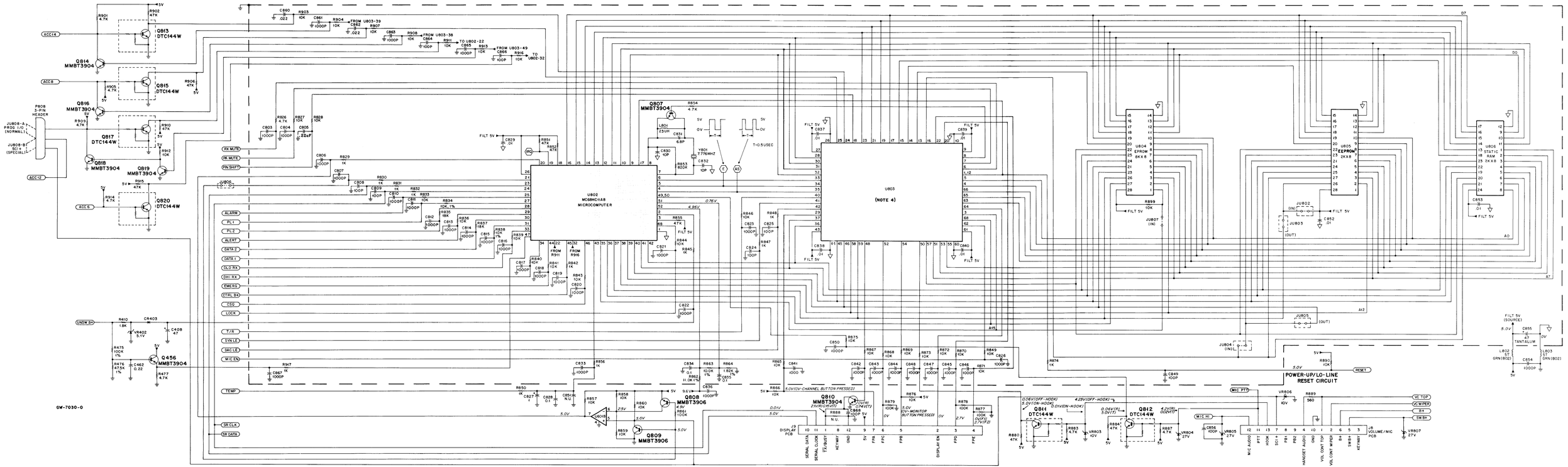

IMPORTANT
COMPONENTS WITHIN SHADED AREA ARE NOT FIELD-SERVICEABLE. IF SERVICING IS REQUIRED, THE ENTIRE BOARD MUST BE REPLACED. REFER TO SECTION 6.

Schematics, Circuit Board Diagrams, and
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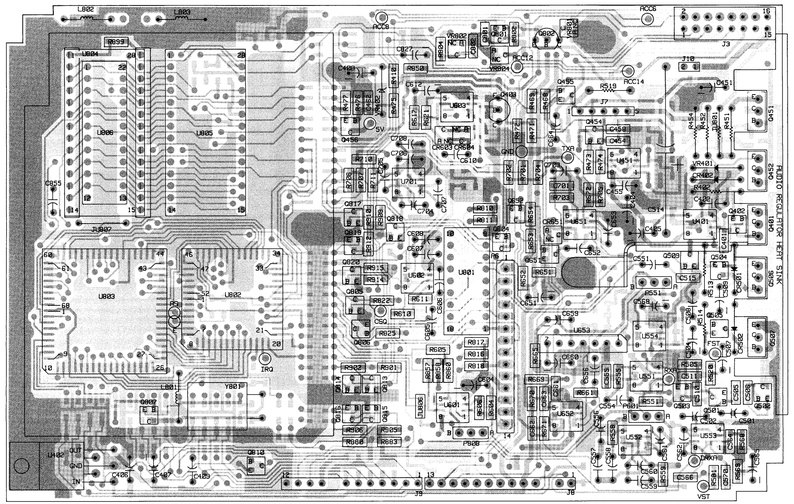
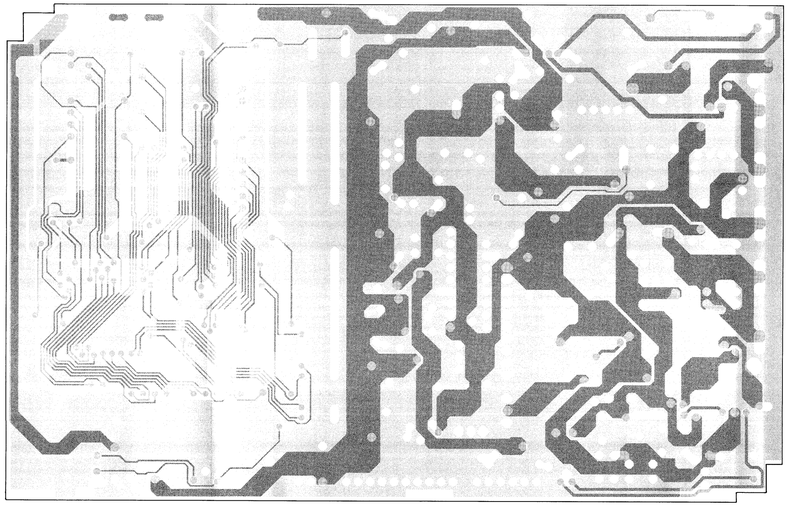


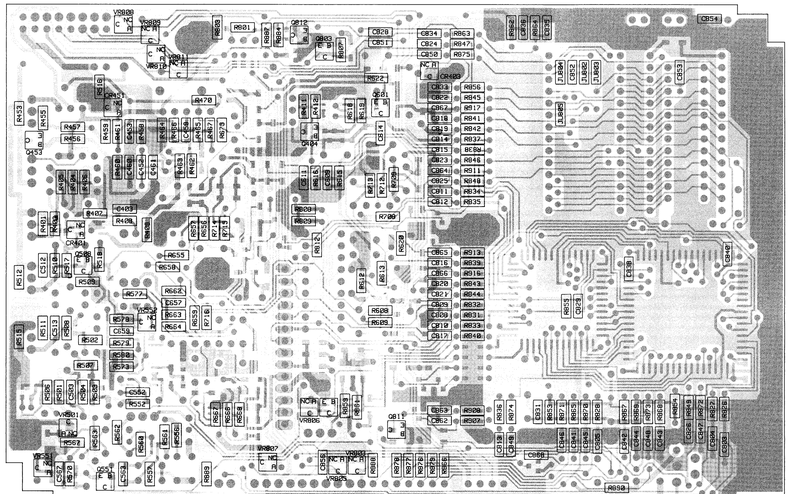
SOLDER SIDE GCW-7028-O
COMPONENT SIDE GCW-7027-O
OVERLAY GBW-7457-O

COMPONENT SIDE VIEW



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

COMPONENT SIDE VIEW



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

SOLDER SIDE VIEW

Schematics, Circuit Board Diagrams, and
Parts List for HLN9313A Logic Board
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parts list

HLN9313A Logic Board (Options Connector) — MXW–7025–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed uF, +5%, 50V (unless otherwise stated)		
C401	21–13741B45	.01
C402	08–11051A09	.022, 63V
C403	21–13741B45	.01
C404	23–11048B19	47, ±20%, 16V, electrolytic
C405	23–11048B13	10, ±20, 16V, electrolytic
C406	08–11051A15	.22, 63V
C407	23–13749A44	47, ±20%, 6V, tantalum
C408	23–11048B19	47, ±20%, 16V, electrolytic
C409	08–11051A17	.47, 63V
C451	23–11048B19	47, ±20%, 16V, electrolytic
C452	21–13741B45	.01
C453	21–11032B14	.15, +80/–20%
C454	21–11032B15	.22, +80/–20%
C455	08–11051A15	.22, 63V
C458,459	21–13740B36	30 pF
C460,461	21–13741B45	.01
C462	21–11032B15	.22, +80/–20%
C501,502	08–11051A13	.1, 63V
C503	21–13740B49	100 pF
C504	23–11048B13	10, ±20, 16V, electrolytic
C505,506	21–13740B49	100 pF
C507	23–13749C39	10, +10%, 20V
C508	08–11051A15	.22, 63V
C509	23–11048B13	10, ±20, 16V, electrolytic
C510	21–13740B61	330 pF
C511–513	21–13740B49	100 pF
C514	23–02308M01	1000 uF, ±20%, 16V, electrolytic
C515	21–13740B49	100 pF
C551	23–11048A17	33, ±20, 25V, electrolytic
C552	21–13740B33	22 pF
C553	21–13740B73	1000 pF
C554	08–11051A03	.0022, 63V
C555	21–13740B53	150 pF
C556–558	08–11051A12	.068, 63V
C559,560	08–11051A13	.1, 63V
C561	23–11048B05	1, ±20%, electrolytic
C562	08–11051A09	.022, 63V
C563	21–13741B69	0.1
C564	21–13740B49	100 pF
C565	23–11048B13	10, ±20, 16V, electrolytic
C566,567	21–13741B45	.01
C568	23–11048B19	47, ±20%, 16V, electrolytic
C569	21–13740B33	22 pF
C570	21–13741B69	0.1
C604	23–11048B05	1, ±20%, electrolytic
C606	08–11051A22	0.039, 63V
C607	08–11051A13	.1, 63V
C608	08–11051A05	.0047, 63V
C609	21–13740B55	180 pF
C610	08–11051A15	.22, 63V
C611	21–13740B46	75 pF
C612	23–11048B19	47, ±20%, 16V, electrolytic
C651	23–11048B19	47, ±20%, 16V, electrolytic
C652	08–11051A06	.0068, 63V
C653	08–11051A15	.22, 63V
C656	23–11048B13	10, ±20, 16V, electrolytic
C657	21–13741B69	0.1
C658	21–13741B45	.01
C659	23–13749A44	47, ±20%, 6V, tantalum
C660	23–11048B13	10, ±20, 16V, electrolytic
C661	21–13740B76	1500 pF
C662	21–13741B39	.0056
C663	21–13740B49	100 pF
C664	23–11048B09	4.7, ±20%, 35V
C701	21–13741B27	1800 pF
C703	23–11048B05	1, ±20%, electrolytic
C704	08–11051A12	.068, 63V
C705	08–11051A13	.1, 63V
C706	08–11051A08	.015, 63V
C707	08–11051A23	.056, 63V
C708	08–11051A03	.0022, 63V
C801,802	21–13740B49	100 pF
C803–804	21–13740B73	1000 pF
C805	21–11032B15	.22, +80 –20%
C806,807	21–13740B73	1000 pF
C808,809	21–13740B49	100 pF
C810–823	21–13740B73	1000 pF
C824,825	21–13740B49	100 pF
C826	23–13740B73	1000 pF
C827	23–11048B05	1, ±20%, electrolytic
C828	21–13741B69	0.1
C829	21–13741B45	.01
C830	21–13740B25	10 pF
C831	21–13740B21	6.8 pF, ±.25 pF
C832	21–13740B25	10 pF
C833	23–13740B73	1000 pF
C834,835	23–13741B69	0.1
C836	23–13740B73	1000 pF
C837–840	23–13741B45	.01
C841–848	23–13740B73	1000 pF
C849	23–13740B49	100 pF
C850	23–13740B73	1000 pF
C852,853	23–13741B45	.01
C854	23–13740B73	1000 pF
C855	23–13749A44	47, ±20%, 6V, tantalum
C856	23–13740B49	100 pF
C860	23–13741B53	.022
C861	23–13740B73	1000 pF
C862	23–13741B53	.022

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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C863	23–13740B73	1000 pF
C864	23–13740B49	100 pF
C865	23–13740B73	1000 pF
C866	23–13740B49	100 pF
C867	23–13740B73	1000 pF
C868	23–13740B49	100 pF
diode (see note)		
CR401	48–05129M40	low profile
CR402	48–83654H02	silicon
CR403	48–05129M40	low profile
CR451	48–05129M40	low profile
CR501,502	48–83654H02	silicon
CR603,604	48–05129M40	low profile
CR651	48–05129M40	low profile
fuse		
F801	65–05214E06	1 A
connector receptacle		
J3	28–80923V01	right angle
J7	28–80128M01	5–pin, RF power amplifier
J8,9	28–80126M01	23–pin
J10	28–80128M02	2–pin, internal speaker jumper
jumper		
JU551	09–84181L01	2–contact push–on
JU601	09–84181L01	2–contact push–on
JU802	06–11077A01	0–ohm resistor
JU804	06–11077A01	0–ohm resistor
JU806	06–11077A01	0–ohm resistor
JU807	06–11009B23	0–ohm resistor
JU808	09–84181L01	2–contact push–on
coil, RF		
L801	24–82723H35	23 uH, red
L802,803	24–83961B02	5 turns, green
connector plug		
P6	28–80127M02	14–pin, header
P551	28–80002R03	3–pin
P601	28–80002R03	3–pin, for JU601
P808	28–80002R03	3–pin
transistor (see note)		
Q401	48–00869619	PNP
Q402	48–80214G02	NPN
Q451,452	48–00869619	PNP
Q453,454	48–80214G02	NPN
Q455	48–80141L03	PNP
Q456	48–80214G02	NPN
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	48–80949V01	JFET n–channel
Q601	48–80214G02	NPN
Q651	48–05128M16	PNP
Q652	48–80214G02	NPN
Q801	48–80214G02	NPN
Q802	48–00869681	PNP
Q803	48–80947V01	NPN
Q804	48–80214G02	NPN
Q805,806	48–80947V01	NPN
Q807	48–80214G02	NPN
Q808,809	48–05128M16	PNP
Q810	48–80214G02	NPN
Q811–813	48–80947V01	NPN
Q814	48–80214G02	NPN
Q815	48–80947V01	NPN
Q816	48–80214G02	NPN
Q817	48–80947V01	NPN
Q818,819	48–80214G02	NPN
Q820	48–80947V01	NPN
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R401	06–11077A70	680
R402	06–02369M31	330, .6 watt, metal film
R403	06–11077A70	680
R404	06–11077F18	17.4k, ±1%
R405	06–11077F28	22.1k, ±1%
R406	06–11077A98	10k
R407	06–11077A76	1.2k
R408,409	06–11077F91	10.0k, ±1%
R410	06–11077A80	1.8k
R451,452	06–02369M01	1, .6 Watt, metal film
R453	06–11077A70	680
R454	06–02369M31	330, .6 watt, 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	10.0k, ±1%
R468	06–11077A60	270
R469	06–11077A74	1k
R470	06–11077A98	10k

MXW–7025–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R471	06–11077B07	22k
R472	06–11077A92	5.6k
R473	06–11077B09	27k
R474	06–11077A98	10k
R475	06–11077G88	100k, ±1%
R476	06–11077G57	47.5k, ±1%
R477	06–11077A90	4.7k
R501	06–11077A82	2.2k
R502,503	06–11077B07	22k
R504	06–11077A96	8.2k
R505	06–11077A86	3.3k
R506	06–11077A78	1.5k
R507	06–11077A76	1.2k
R508	06–11077A98	10k
R509,510	06–11077A72	820
R511	06–11077B07	22k
R512	06–11077A46	68
R513,514	06–11009B26	2.7, 1/4 Watt
R515	06–11077A46	68
R516	06–11077A66	470
R517,518	06–11077A98	10k
R519	06–80185M01	1 ohm, ±10%, 2W, metal plate
R551	06–11077B01	12k
R552	06–11077B37	390k
R553	06–11077B19	68k
R554,555	06–11077B18	62k
R556	06–11077F53	40.2k, ±1%
R557	06–11077F20	18.2k, ±1%
R558	06–11077G41	32.4k, ±1%
R559	06–11077G88	100k, ±1%
R560	06–11077E77	665, ±1%
R561	06–11077G91	107k, ±1%
R562	06–11077B16	51k
R563	06–11077B15	47k
R567	06–11077A86	3.3k
R568	06–11077B07	22k
R569	06–11077A42	47
R570	06–11077B17	56k
R573	06–11077B09	27k
R577	06–11077B23	100k
R578	06–11077A50	100
R579	06–11077B37	390k
R580	06–11077B09	27k
R581	06–11077B07	22k
R604	06–11077A98	10k
R605	06–11077A74	1k
R606	06–11077A98	10k
R607	06–11077B47	1 meg
R609	06–11077B11	33k
R610	06–11077B15	47k
R611,612	06–11077G42	33.2k, ±1%
R613	06–11077G45	35.7k, ±1%
R615	06–11077H15	187k, ±1%
R616	06–11077G48	38.3k, ±1%
R617	06–11077A82	2.2k
R618	06–11077B23	100k
R619,620	06–11077A98	10k
R621	06–11077A01	0–ohm
R622	06–11077B31	220k
R651	06–11077A68	560
R652	06–11077A50	100
R653,654	06–11077A98	10k
R655	06–11077A90	4.7k
R656	06–11077B39	470k
R657	06–11077B42	620k
R658	06–11077H65	619k, ±1%
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
R672	06–11077B17	56k
R673	06–11077B23	100k
R701	06–11077G88	100k, ±1%
R702	06–11077H13	178k, ±1%
R703	06–11077G31	25.5k, ±1%
R705	06–11077H13	178k, ±1%
R706	06–11077G56	46.4k, ±1%
R707	06–11077G95	118k, ±1%
R708	06–11077B15	47k
R709	06–11077B19	68k
R710,711	06–11077G13	16.5k, ±1%
R712,713	06–11077G61	52.3k, ±1%
R714	06–11077B10	30k
R715	06–11077B05	18k
R716	06–11077A86	3.3k
R801	06–11077A78	1.5k
R802	06–11077A84	2.7k
R803	06–11077A98	10k
R804	06–11077A90	4.7k
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

MXW–7025–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R822	06–11077B15	47k
R825	06–11077B15	47k
R826	06–11077A90	4.7k
R827,828	06–11077A98	10k
R829–832	06–11077A74	1k
R833	06–11077A98	10k
R834	06–11077F91	10.0k, ±1%
R835	06–11077B05	18k
R836	06–11077A98	10k
R837	06–11077B05	18k
R838	06–11077F91	10.0k, ±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	11.0k, ±1%
R863	06–11077F91	10.0k, ±1%
R864	06–11077F20	18.2k, ±1%
R865–873	06–11077A98	10k
R874	06–11077A74	1k
R875,876	06–11077A98	10k
R877–879	06–11077B23	100k
R880	06–11077B15	47k
R883	06–11077A90	4.7k
R884	06–11077B15	47k
R887	06–11077A90	4.7k
R889	06–11077A68	560
R890	06–11077A98	10k
R899	06–11077A98	10k
R901	06–11077A90	4.7k
R902	06–11077B15	47k
R903,904	06–11077A98	10k
R905	06–11077A90	4.7k
R906	06–11077B15	47k
R907,908	06–11077A98	10k
R909	06–11077A90	4.7k
R910	06–11077B15	47k
R911–913	06–11077A98	10k
R914	06–11077A90	4.7k
R915	06–11077B15	47k
R916	06–11077A98	10k
R917	06–11077A74	1k
integrated circuit (see note)		
U401	51–02198J22	dual op amp
U402	51–80942T01	voltage regulator 5V
U451	51–02198J22	dual op amp
U551–554	51–02198J22	dual op amp
U601	51–02198J23	dual comparator
U602–604	51–02198J22	dual op amp
U651,652	51–02198J22	dual op amp
U653	51–80059M01	voltage–controlled attenuator
U701	51–02198J22	dual op amp
U801	51–80135C10	D/A converter
U802	51–80960T01	microcomputer
U803	51–82862N09	custom gate array
U804	HLN9277A	ROM kit
U805	51–80901W01	EEPROM
U806	51–80914V01	static RAM
voltage regulator (see note)		
VR401	48–83461E40	zener, 5.1V
VR402	48–82256C15	zener, 5.1V
VR501	48–80140L11	zener, 7.5V
VR551,552	48–80140L15	zener, 10V
VR801,802	48–80948V01	zener, 27V
VR803	48–80140L15	zener, 10V
VR804,805	48–80948V01	zener, 27V
VR806	48–80140L15	zener, 10V
VR807–811	48–80948V01	zener, 27V
crystal (see note)		
Y801	48–80173D09	7.776 MHz

non–referenced parts

M415,416	09–82071K09	14 contact receptacle (2 used)
M414	26–80123M02	shield
M412	84–80942V03	circuit board
	15–80922V01	housing, connector
	29–84249N01	terminal (4 used)
	03–10943M04	tapping screw M2.5x8
	03–10943M04	tapping screw M2.5x8
M401–404	04–00131974	flat washer (4 used)
	07–80925T01	bracket, audio regulator
M406–410	14–83820M05	insulator heat conductive (5 used)
	26–80125L02	heat sink, audio regulator

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

END OF PART 2 OF 4

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

1. Theory Of Operation

1.1 LOWBAND RECEIVER

The received signal is applied to the radio's antenna input J1 and routed through the harmonic filter and antenna switch which are located on the PA deck. The signal is then routed via coax to J4 on the RF board and passes through a 4 pole bandpass filter.

The signal then passes through one stage of RF amplification Q1, which has a current source comprised of Q2, Q3, and Q4. This circuitry sets a bias current that does not vary regardless of DC Beta variations on Q1. CR2 located on the input side of Q1 is a protective diode that ensures Q1 will be protected from high level RF signals. The amplified signal then passes through a second 4 pole bandpass filter.

The amplified RF signal is then mixed with the receive VCO signal in the double balanced quad diode mixer, CR1. The desired 10.7 MHz IF signal is then amplified through Q51 and passes through a IF delay line used for extender operation. The 10.7 MHz IF signal proceeds through the extender blanker switches, Q52 and Q53. Q54 provides another stage of IF amplification to the signal.

The 10.7 MHz IF signal then passes through a 4 pole crystal filter. One more stage of amplification Q56, occurs before the IF signal is sent to the receiver subsystem IC, U51.

U51 (see Figure 1) is a complete receiver subsystem and the 10.7 MHz signal is mixed with a 10.245 MHz crystal to produce a 455 kHz second IF signal. The second IF signal is then amplified and filtered by 455 kHz ceramic filters, FL51 and FL52.

The audio detector is internal to the U51 IC. The quadrature detector detects the audio and routs it to the PL filter and carrier squelch amplifier. The carrier squelch amplifier amplifies the detected audio and routs it via U51–8 to the squelch control R70. The squelch control output is routed through a high pass filter to remove the receive audio components. The remaining noise above the audio band is detected via U51–6 by the carrier squelch detector which generates a DC voltage. This voltage controls the audio mute circuits. The detected audio is then sent to the logic board audio circuitry via U51–5 to J6–3.

1.2 EXTENDER OPERATION

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 appropriate 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.

1.3 VHF RECEIVER

The received signal is applied to the radio's antenna input and routed through the harmonic filter/ antenna switch. The output is then routed via coax to J4 on the RF board. The input at J4 is matched to a fixed tuned 4 pole filter. The 4 pole filter has a 3 dB bandwidth of 40 MHz and 1 dB bandwidth of 35 MHz centered at about 160 MHz.

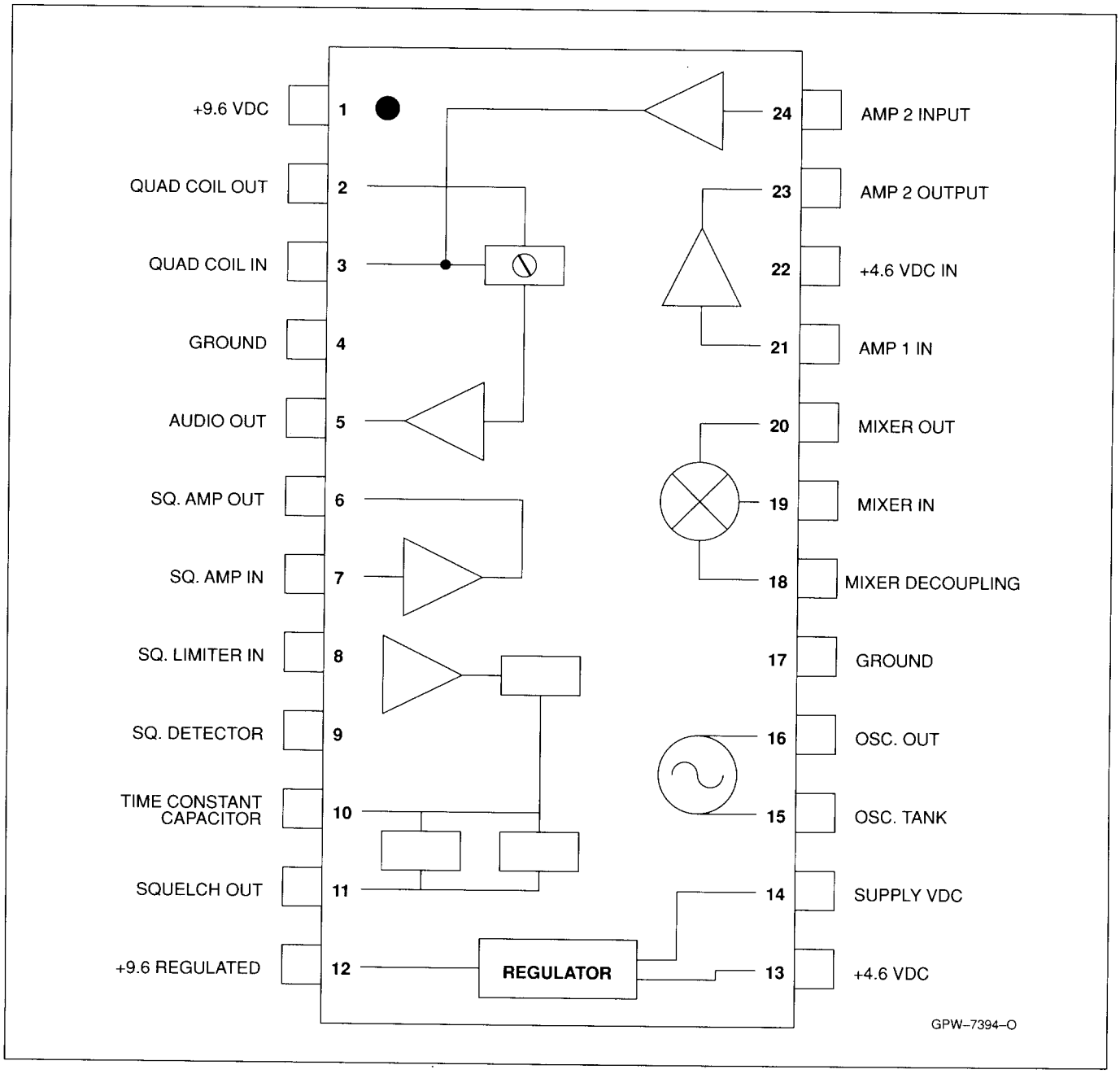


Figure 1. Receiver IC Block Diagram

The output of the filter is matched to the base of RF amplifier Q1. Q1 has a current source, Q2, to set a bias current of 16 mA regardless of DC Beta variations of Q1. The Q1 emitter resistors are used to provide voltage feedback to limit Q1's gain to about 14 dB. CR2, located on Q1's input, is a protective diode that ensures Q1 is protected from high level RF signals.

The output of Q1 is applied to a 3 pole filter centered at about 160 MHz. The first 4 pole filter, RF amplifier and the 3 pole filter provide image spur rejection.

The quad diode mixer, CR1, is a passive double balanced mixer. The output of the mixer goes to the diplexer circuit which allows the mixer to be matched to the First IF amplifier, Q51, at the IF frequency of 45.1 MHz.

Q51 amplifies the IF signal by approximately 20 dB. The output of Q51 is filtered by matched ceramic filters Y51A and Y51B. The first IF is then

amplified by Q52 by approximately 18 dB and sent to the receiver subsystem IC U51–19 (see Figure 1).

The 45.1 MHz first IF signal is applied to the second mixer section of U51. A 44.645 MHz crystal oscillator provides the low side injection signal for the second mixer via U51–19. The second mixer takes the 45.1 MHz and the 44.645 MHz and produces a 455 kHz second IF signal. The second IF

filtering is achieved by using multiple resonators, FL51 and Fl52. These filters are tuned to 455kHz.

The audio detector is internal to the U51 IC. The Quadrature detector detects the audio and routs it to the PL filter and to the carrier squelch amplifier. The carrier squelch amplifies the detected audio and routs it via U51-8 to the squelch control R60. The squelch control output is routed through a high pass filter to remove the receive audio components. The remaining noise above the audio band is detected via U51-6 by the carrier squelch detector which generates a D.C. voltage that controls the audio mute circuits. The detected audio is then sent over to the logic board via U51-5/J6-3.

1.4 UHF RECEIVER

The receiver signal is applied to the radio's antenna input and routed through the harmonic filter and antenna switch, which are located on the PA deck. The output is then routed via coax to J4 on the RF board.

The incoming signal at J4 passes through a 3 pole bandpass filter. A stage of RF amplification, Q1, amplifies the signal which passes to a 4 pole bandpass filter. The filtered signal then passes to the first mixer stage, CR1. The voltage controlled oscillator output is fed to the first mixer as a low side local oscillator. The resultant signal of 45.1 MHz is then amplified by the first IF amplifier Q51. Then amplified 45.1 MHz IF signal then passes through a 4 pole crystal filter consisting of Y51A and Y51B. Another stage of amplification, Q52, occurs before the RF signal passes into the receiver subsystem IC, U51 (see Figure 1).

The 45.1 MHz first IF signal is applied to the second mixer section of U51. A 44.645 MHz crystal oscillator provides the low side injection signal for the second mixer via U51-19. Y52 is a 44.645 MHz crystal which feeds the oscillator via U51-15. The second mixer takes the 45.1 MHz and the 44.645 MHz signal and produces a 455kHz second IF signal. The second IF filtering is achieved by using multiple resonators, FL51 and FL52. These filters are tuned to 455kHz.

The audio detector is internal to the U51 IC. The quadrature detector detects the audio and routs it to the PL filter and to the carrier squelch amplifier. The carrier squelch amplifies the detected audio and routs it via U51-8 to the squelch control R60. The squelch control output is routed through a high pass filter to remove the receive audio components. The remaining noise above the audio band is detected via U51-6 by the carrier squelch detector which generates a D.C. voltage that controls the audio mute circuits. The detected audio is then sent over to the logic board via U51-5/6-3.

1.5 800 MHz RECEIVER

The received signal is applied to the radio's antenna input and routed through the harmonic filter and antenna switch, which are located on the PA deck. The output is then routed via coax to J4 on the RF board.

The incoming signal passes through a bandpass filter, FL1 and then through one stage of RF amplification, Q1. The amplified output of Q1 is then sent through another section of filtering, FL2.

The filtered signal then passes to the first mixer, U1. The voltage controlled oscillator output is fed into the mixer and the resultant 45.1 MHz IF signal is then sent to the first IF amplifier, Q51. The amplified 45.1 MHz signal then passes through a 4 pole crystal filter consisting of Y51A and Y51B. Another stage of amplification, Q52, occurs before the signal passes into the receiver subsystem IC, U51 (see Figure 1).

The 45.1 MHZ first IF signal is applied to the second mixer section of U51. A 44.645 MHz crystal oscillator provides the low side injection signal for the second mixer via U51-19. Y52 is a 44.645 MHz crystal which feeds the oscillator via U51-15. The second mixer takes the 45.1 MHz and the 44.645 MHz signals produces a 455 kHz second IF signal. The second IF filtering is achieved by using multiple resonators, FL51 and FL52. These filters are tuned to 455kHz.

The audio detector is internal to the U51 IC. The quadrature detector detects the audio and routs it to the PL filter and to the carrier squelch amplifier. The carrier squelch amplifier amplifies the detected audio and routs it via U51-8 to the squelch control R60. The squelch control output is routed through a high pass filter to remove the receive audio components. The remaining noise above the audio band is detected via U51-6 by the carrier squelch detector which generates a D.C. voltage that controls the audio mute circuits. The detected audio is then sent over to the logic board via U51-5/J6-3.

1.6 SYNTHESIZER OPERATION

Before frequency synthesis can begin the microprocessor must load frequency divider information into the PLL IC U101 (see Figure 2). The PLL IC contains 3 programmable dividers. The program is serially loaded via a common data line U101-10. The data is loaded one bit at a time, with each low-to-high transition of the CLOCK at U101-11 latching data from shift registers into the reference divider (R), divide-by-N, or divide-by-A latches depending on the control bit. A logic of the control bit selects the reference counter latch, while a logic low selects the divide-by-N, or divide-by-A counter latch.

After the microprocessor loads data into the PLL IC, SYNTH LATCH ENABLE line goes low. The synthesizer is then ready to generate a transmit or receive first injection frequency.

As an example for the 800MHz trunk models, the latches are loaded with data to give the following:

12.5 kHz at the output of the divided-by-R counter when the reference oscillator signal is applied at U101-1.

12.5 kHz at the output of the divided-by-N counter when the VCO is operating at the desired receive injection or transmit frequency.

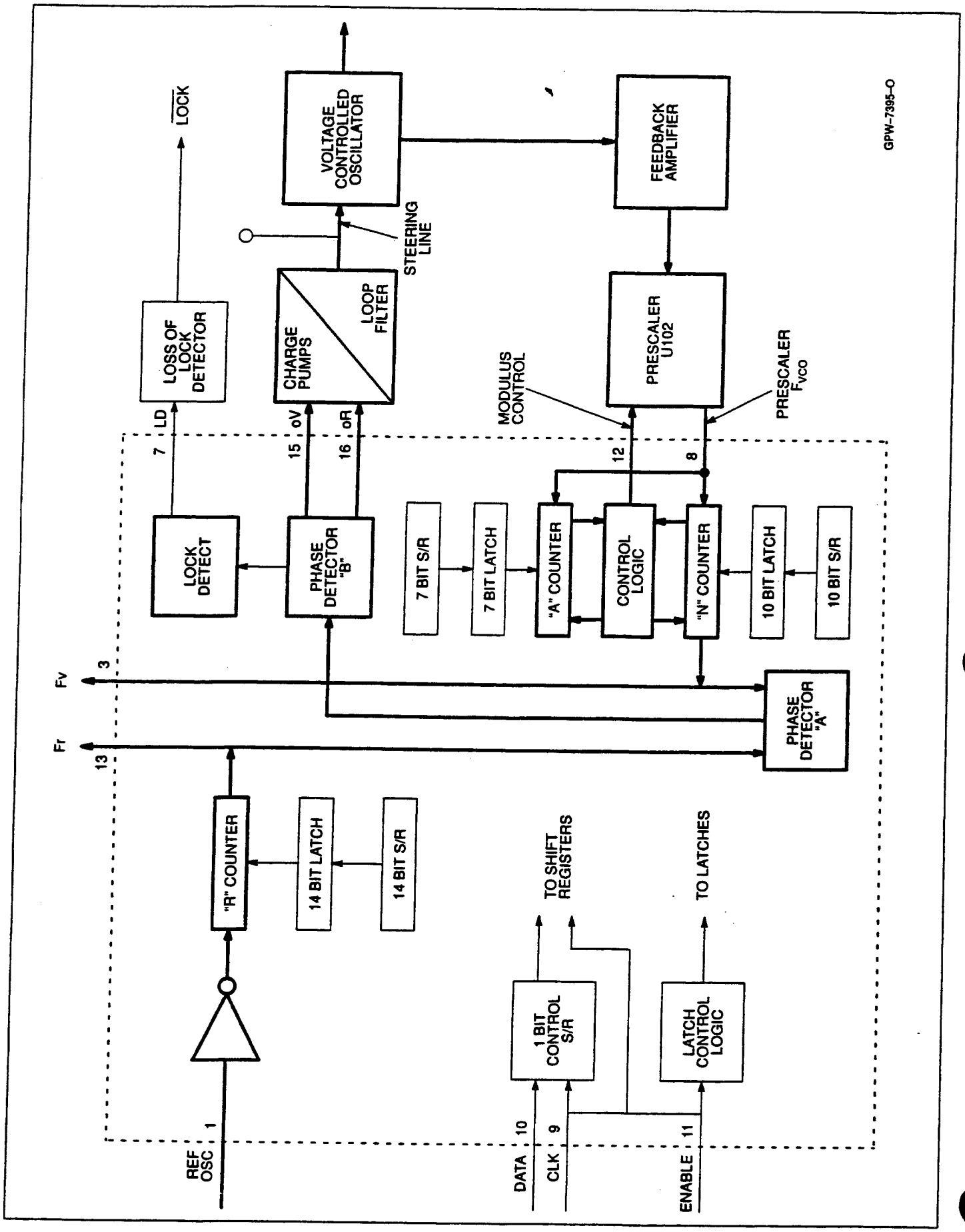


Figure 2. Synthesizer Section Block Diagram

During the frequency synthesis, the divide–by–A and divide–by–N counters begin counting down from the programmed values (A and N respectively) at the same time. The MOD CON line U101–12 is low so the divide–by–127/128 prescaler divides by 128. Therefore, the effect of the prescaler U102 is to divide the VCO output by 128 and apply it to U102–8. When the divide–by–A counter completes counting down, the control logic sets the MOD CON line high, and the divide–by–127/128 prescaler divides by 127 until the divide–by–N counter completes the programmed value on N. After the divide–by–N counter completes counting down, the counters are set back to their programmed values. The MOD CON line is set low and the counters begin counting down again. The effect of the prescaler and divide–by–A, divide–by–N counters is to divide the VCO frequency by a number, N, where:

$$N_T = 128 \times A + 127 \times (N - A)$$
$$= 127 \times N + A$$

The output of the divide–by–N counter is equal to:

$$\frac{f_{VCO}}{127 \times N + A}$$

where f_{VCO} is the output frequency of the VCO

When the phase–locked loop is locked:

$$\frac{f_{VCO}}{127 \times N + A} = 12.5 \text{ kHz} = \frac{f_{VCO}}{N^T}$$

The reference oscillator frequency is 14.4 MHz and the output of the divide–by–R must be 12.5 kHz. Therefore:

$$R = \frac{14.4 \text{ MHz}}{12.5 \text{ kHz}} = 115210 = 0100\ 1000\ 00002$$

The values of A and N are dependent on the desired VCO frequency and the VCO frequency is dependent of the transmit frequency or receive frequency as shown:

$$f_{VCO} = f_T \text{ or } (f_R - 45.1 \text{ MHz})$$

where f_T = the transmit frequency
f_R = the receive frequency

The values of A and N can be determined from the desired frequency of the VCO, where:

$$N = \text{integer part of } \frac{N_T}{127}$$

$$A = \text{remainder of } \frac{N_T}{127}$$

For example, if the receive frequency is 851.0125 MHz

$$f_{VCO} = 851.0125 \text{ MHz} - 45.1 \text{ MHz} = 805.9125 \text{ MHz}$$

$$\text{then } N_T = \frac{805.9125 \text{ MHz}}{12.5 \text{ MHz}}$$

```
     510  INTEGER PART OF QUOTIENT
127 ⌊64793
    635
    129
    127
      23 REMAINDER
```

$N = 510 = 010\ 1111\ 11102$
$A = 23 = 012\ 0111$

The 12.5 kHz outputs of the divide–by–A and divide–by–N counters are applied to phase detector A. The output of phase detector A is applied to phase detector B. There are 2 output signals for phase detector B (phase R and phase V). Signals phase R (U101–16) and phase V (U101–15) consist of pulses with a pulse width that depends on the phase error for the two signals at phase detector A. If the frequency fv is greater than fr, then error information is provided by phase V pulsing low, while phase R remains essentially high. When fv and fr are both in phase, both phase V and phase R remain high, except for a small minimum time period, and they both pulse low in phase. These pulses are applied to the charge pump and are used to correct VCO frequency.

The *MaxTrac* VHF model uses a divide–by–64/65 prescaler, while the UHF and 800 MHz models use the divide–by–127/128 prescaler. The working principles for the LOWBAND, VHF, UHF and 800 MHz models are the same.

When the synthesizer is locked, U101–7 applies a high level signal with very narrow negative going pulses to the loss–of–lock detector. The very narrow negative going pulses have a high average DC level that is not sufficient to turn on transistor Q101. This keeps the voltage across C102 low which indicates a lock condition.

When the synthesizer is out of lock, the output of U101–7 becomes a pulsating DC signal with an average DC level that varies between 0.5V and 4.4V. This turns on Q101 and charges up C102 to at least 3.0V indicating a out–of–lock condition.

1.6.1 Charge Pump

The charge pump consists of Q102–Q105. The phase V (U101–15) signal from the PLL IC is applied to Q103 while phase R (U101–16) is applied to Q102. When the synthesizer is locked, both signals consist of a pulse train with a period of 80 uSec and negative going pulses. The phase R negative pulse turns off Q102 and brings the emitter of Q104 to 9.6V which turns on Q104. The negative pulse of phase V turns Q103 off which reduces the current flow to R114 and in turn reduces the voltage across R114. This will cause Q105 to turn on and sink current from Q104. When the synthesizer reaches lock, the voltage at the steering line test point (SL) will be between 1.3V to 7.8V. When the synthesizer is reprogrammed with a new frequency, the previous SL voltage would now give a wrong frequency and will cause the phase R and phase V to have differing pulse widths. This will result in a situation whereby Q104 and Q105 turn on and off at different times resulting in a series of summed current pulses to the loop filter that charges or discharges C110 producing the new SL voltage. If the frequency of the VCO is higher than that of phase R, then C110 discharges. The reverse happens when the frequency of the VCO is lower.

1.6.2 Loop Filter

The loop filter consists of R119 and R120, capacitors C109 through C111. This loop filter is a low pass filter that attenuates noise and rejects the loop reference frequency so that these signals cannot modulate the VCO. The voltage across C110 is the steering line voltage that controls the VCO frequency.

1.6.3 Reference Oscillator

The 14.4 MHz reference oscillator is supplied from a 14.4 MHz crystal Y151. This crystal has a 8 digit temperature coefficient that needs to be keyed into the radio during unified chassis auto tune. The reference oscillator is warped into the desired range at room temperature by adjusting L151 manually (new field adjustment). The oscillator is temperature compensated by varactors CR151 and CR152. A change in DC voltage at frequency control J6–9 changes the varactor capacitance and warps the frequency of the oscillator. It is very important that this control voltage be defined when tuning L151 i.e. 5.2V +0.01V DC at J6–9. During the 7 digit code generation this control voltage is changed between 4.9V DC to 5.5V DC and the transmit frequency noted. During auto–tuning of the unified chassis, the electronic warping of the reference oscillator is performed by changing this control voltage. During temperature compensation, the radio "reads" the temperature of Y151 by sensing the forward bias across CR176 and its translation via amplifier U176 to give temp sense voltage at J6–14.

The temp sense voltage is proportional to the actual temperature measured. The reference oscillator will be warped according to the temperature of the oscillator in order to correct the drift in frequency due to heating of the crystal Y151. Analysis of this temp sense circuit centers around the DC voltage measurements of the various nodes. All the resistors associated with this circuit have a 1% tolerance, therefore any component damage or part value change will affect the translated voltage at J6–14. The diode, CR176, needs to be flush to the board to ensure an accurate temp sensing. During transmissions with PL/DPL tones, the reference oscillator will be modulated. Potentiometer R164 controls the reference modulation level.

1.7 VOLTAGE CONTROLLED OSCILLATOR

MaxTrac models for LOWBAND, VHF, and UHF use two separate VCO's, one for transmit and one for receive. The *MaxTrac* 800 MHz radio uses one VCO for transmit and receive. Switching between the transmit and receive VCO's is accomplished by the use of a switching circuit consisting of transistors Q277, Q278, and Q279. Transistor Q276 provides the 8.5 volt source to these transistors to power the VCO's. During the transmit mode, J6–4, the Transmit/Receive Shift Line, is at .1V DC . This will cause Q277 and Q278 to turn on and switch 8.5 volts to the transmit VCO. Q279 is turned off and keeps the 8.5 volts from reaching the receive VCO. During the receive mode, the voltage on J6–4 goes to 9.6 volts. This turns Q277, Q278 off and Q279 on. The 8.5 volts is applied to receive VCO and the transmit VCO is shut off.

The transmit and receive VCO's are very similar in design. The transmit VCO has a modulation circuit added and will be discussed later. The steering line D.C. voltage from the synthesizer is applied to each VCO. L213 in the transmit VCO and L202 in the receive VCO are tuned for a steering line voltage of 7.8V DC at the high end of the band. Varactors CR210–213 in the transmit VCO and CR202–205 in the receive VCO are used to change the frequency of the VCO. The steering line D.C. voltage is applied to the varactors whose capacitance changes as the voltage increases or decreases. The steering line voltage is checked for greater than 1.8 volts at the low end of the band. This is to ensure that the tuning range is made as large as possible by the synthesizer.

In the transmit mode, the modulating signal applied to J6–10 changes the varactor capacitance of CR209 and modulates the VCO. Resistors R222, R223, and R225 act as potential dividers and only a fraction of the modulating signal is seen by CR209. The resistor combination also helps by attenuating any stray unwanted signals.

Q206 in the transmit VCO and Q203 in the receive VCO are the FET oscillators.

Transistors Q207, Q208 in the transmit VCO and Q204, Q205 in the receive VCO are the buffer amplifiers. A sample of the VCO frequency is fed back to the synthesizer circuit from the base of Q208 (transmit) and Q205 (receive). This sample is necessary for the synthesizer to "know" if the VCO is at the required frequency. The output of Q208 goes to the PA deck to be amplified. The output of Q205 makes up the local oscillator and is fed to the first mixer CR1.

The UHF VCO has an added circuit where the VCO frequency can be shifted by changing the voltage at J6–12. At the lower range, transistor Q209 is turned on and switches 9.6 volts to pin diodes CR201 and CR208. This causes C226 (transmit) and C203 (receive) to be added to the VCO and shifts the frequency of the VCO.

In the 800 MHz radio, there is only one VCO and it is contained in module U201. The transmit frequency range is 806–825 MHz while the receive frequency range is 851–870 MHz. The receive local oscillator signal is extracted from Q202. The transmitter signal is also extracted from Q202 with an additional buffer Q203. During the receive mode, the VCO signal from transistor Q203 is attenuated by turning off Q204. An attenuated VCO output is still available at J5 during the receive mode and the receive injection frequency can be measured. In the 800 MHz talk around radio, there is a similar pin diode shift circuitry like that used in the UHF radios to shift the VCO frequency to the 851–870 MHz range.

2. Troubleshooting Guide

2.1 RECEIVER SECTION

The theory of operation and schematics along with the troubleshooting chart "RECEIVER" will aid the servicer in isolating to the faulty component.

The use of proper test equipment such as the R2021D or R2001D with TEK–10 probe will also help in making accurate comparison measurements.

Refer to the proper schematic for each band for the voltages and waveforms. Observe the notes for information on how to set up for the measurements. When using the TEK–10 probe, be sure of a good RF ground before assuming the reading is correct.

Although many of the components are located on the solder side, the schematics can be used to isolate before having to pull the board from the chassis.

2.2 SYNTHESIZER SECTION

The synthesizer uses a phase locked loop design. Before troubleshooting this section the servicer may wish to review the theory of operation before continuing.

The synthesizer can be checked for an "out–of–lock" condition by looking at the lock detect line at J6–5. When in lock, the voltage will be 0V DC and when out of lock, the line will typically be 3V DC .

Be sure the DC voltages to the synthesizer are correct before proceeding. Troubleshoot the voltage regulators if wrong voltage levels are recorded.

Next, check Fr which is pin 13 of the synthesizer. Depending on the model of radio, a frequency of either 12.5 kHz, 6.25 kHz, or 5 kHz will be seen. This proves that the reference oscillator's output and the programming of the synthesizer are good.

If Fr is bad, check to see that the reference oscillator's output is on frequency and at the proper level. If the reference oscillator is off frequency, use the Radio Service software to try and warp the oscillator frequency on. Do not attempt to warp L151 on the RF board. This coil is factory adjusted and should not be field adjusted.

If the frequency will not warp on, check to make sure the DC voltages around the reference oscillator are correct. Board replacement will have to be done if the fault does not clear after programming.

The use of an open loop test will help to isolate between the synthesizer and VCO. By using a variable DC supply and breaking the steering line voltage away from the VCO, you can insert a DC voltage and observe the VCO's output. If the VCO tracks with the external DC voltage, the problem is in the synthesizer and prior to the steering line.

Tracing the signal through the feedback amplifier, it is important to pay close attention to the signal levels. Refer to the schematics for proper signal level for each band.

At the prescaler, the frequency can be calculated by dividing Fvco by 128 for 800 and UHF. Dividing by 64 is for the VHF model. Check the Modulus Control line on pin 6 of the prescaler. There should be a pulse train at the loop rate (12.5, 6.25, 5 kHz). If this is not present, then either the prescaler is loading down the signal or the synthesizer is bad.

Finally, check Fv. This should be a pulse train at the reference rate. It should be in lock with Fr. If there is no pulse train but you have a good signal from the prescaler, then the synthesizers internal dividers are bad.

If Fv is okay then check the outputs to the Charge Pumps. The ground pulse will be at the reference rate. When Fv leads Fr, the pulse from pin 15 will have an increased pulse width. If Fr leads Fv, then the pulse out pin 16 will have an increased pulse width.

If the DC power supply is still connected on the steering line, disconnect it. Reattach the steering line circuitry and attach a DC DVM to the steering line test point. While monitoring the DVM, momentarily touch the base of Q103. The steering line voltage should drop to almost 0V DC . Next, ground the base of Q102. The DVM should increase to almost +9.6V DC . If either of these checks do not work, troubleshoot that particular side of the pumps.

Finally, if everything in the Phase Locked Loop appears to be normal, except for lock detect J6–5, check out the Lock Detect circuit. Synthesizer pin 7 should be very narrow ground pulses when in lock and the pulse width will be random when out of lock.

3. 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.

3.1 TEST EQUIPMENT

R2001D Motorola Communication System Analyzer or Equivalent.

3.2 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 R2001D with AM limit (RF Section) set to Minimum.

(4) Locate the VAGC Test Point (see Figure 3) 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 3) 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 RF board.

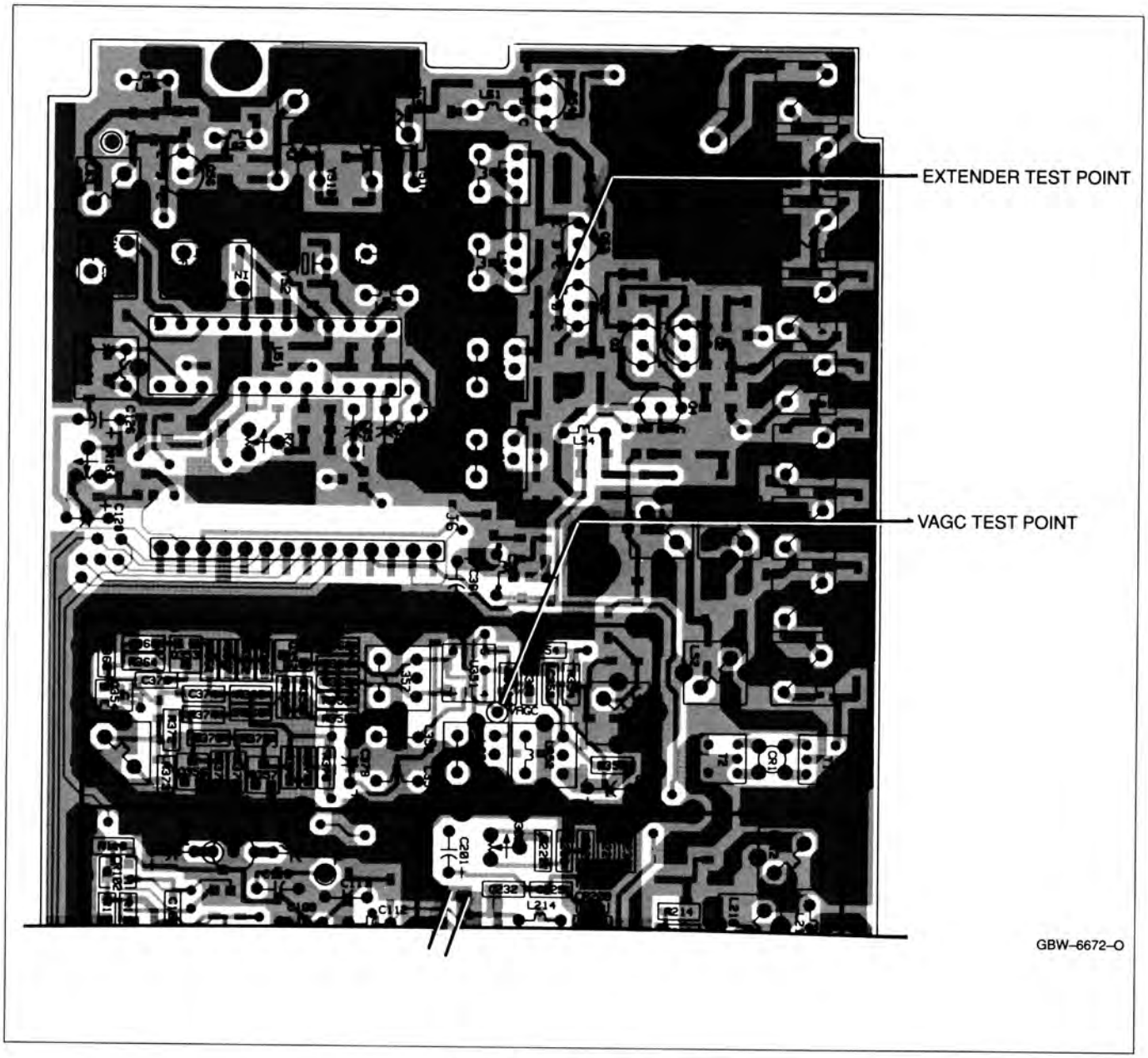
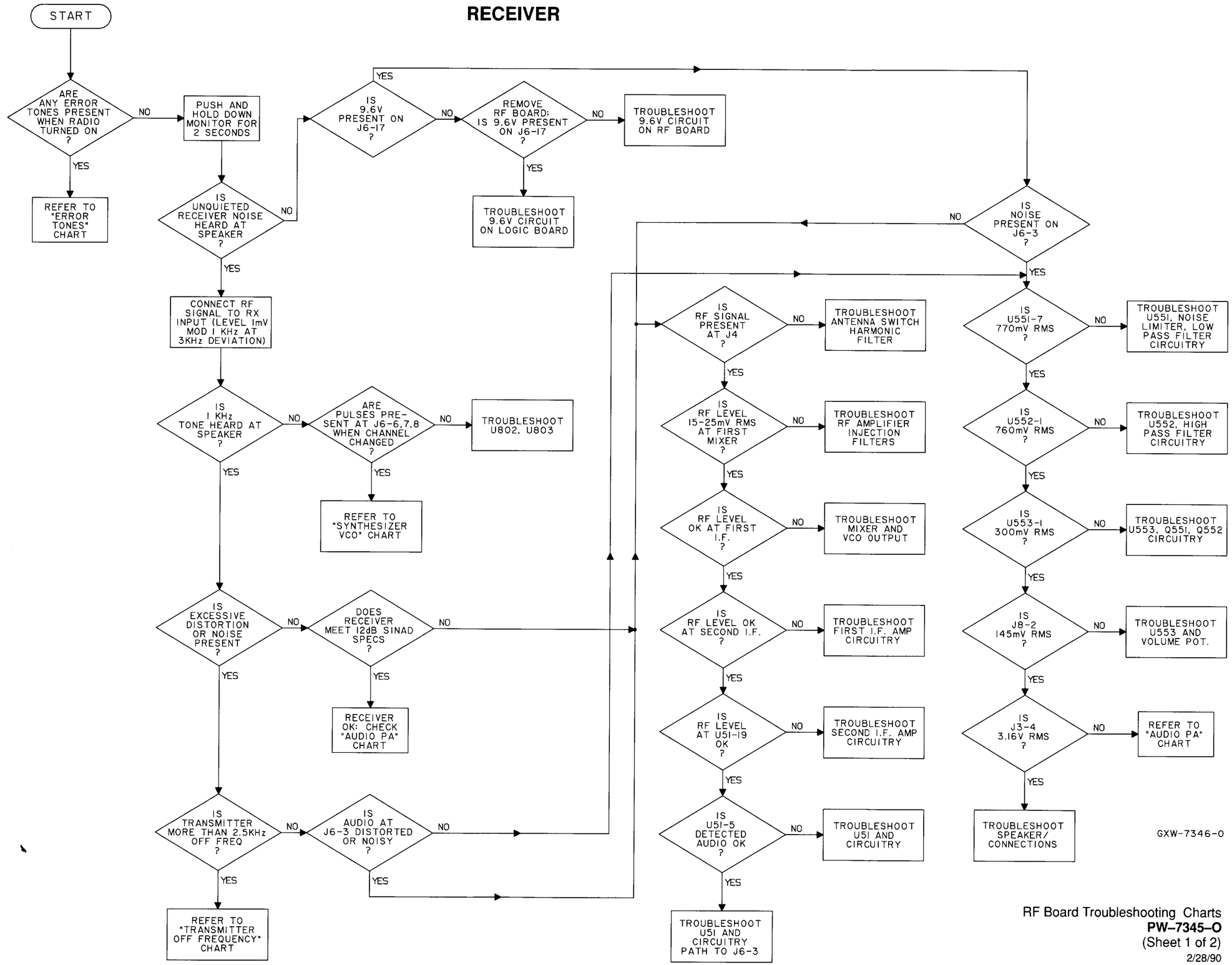


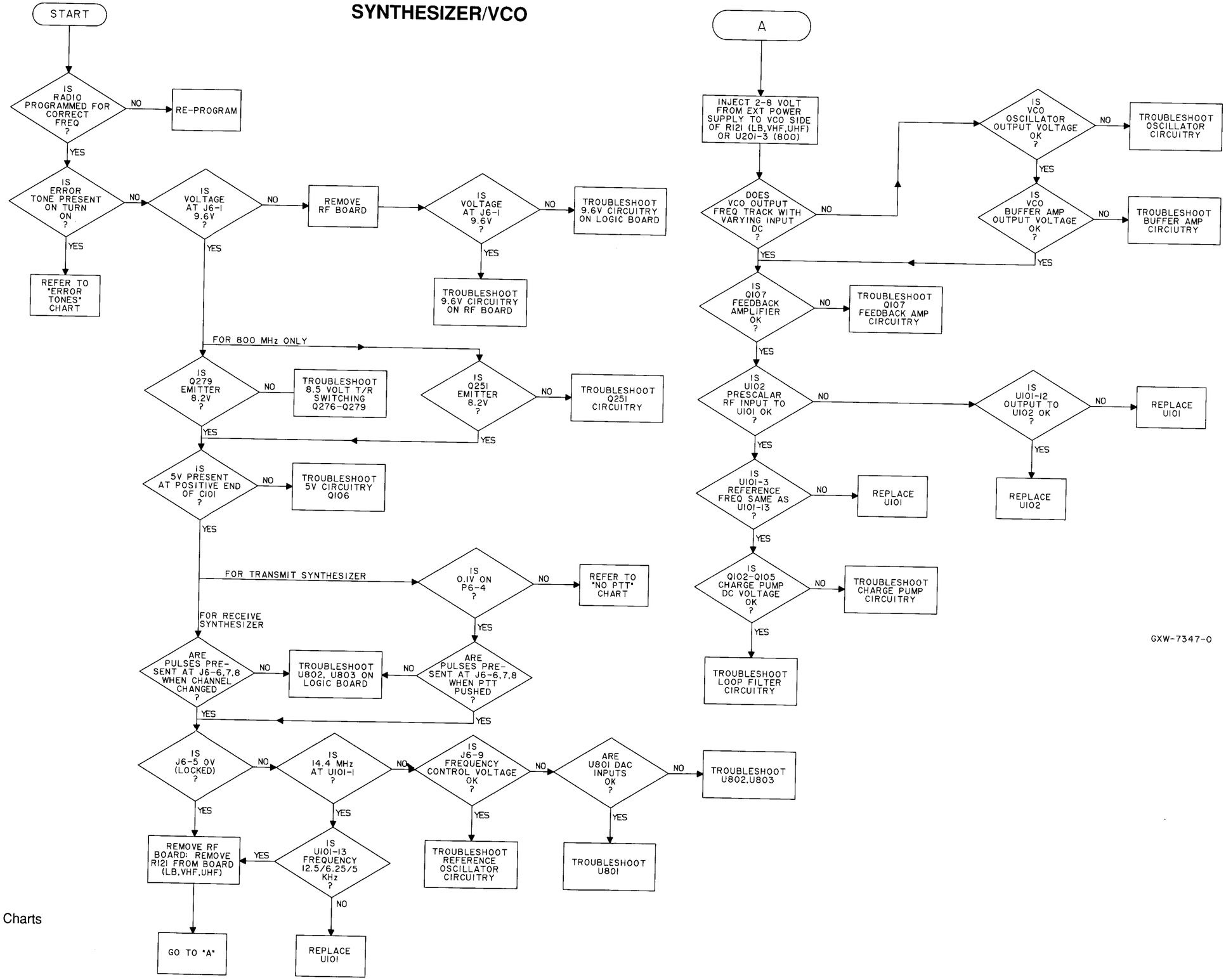
Figure 3. Extender Test Points

RECEIVER



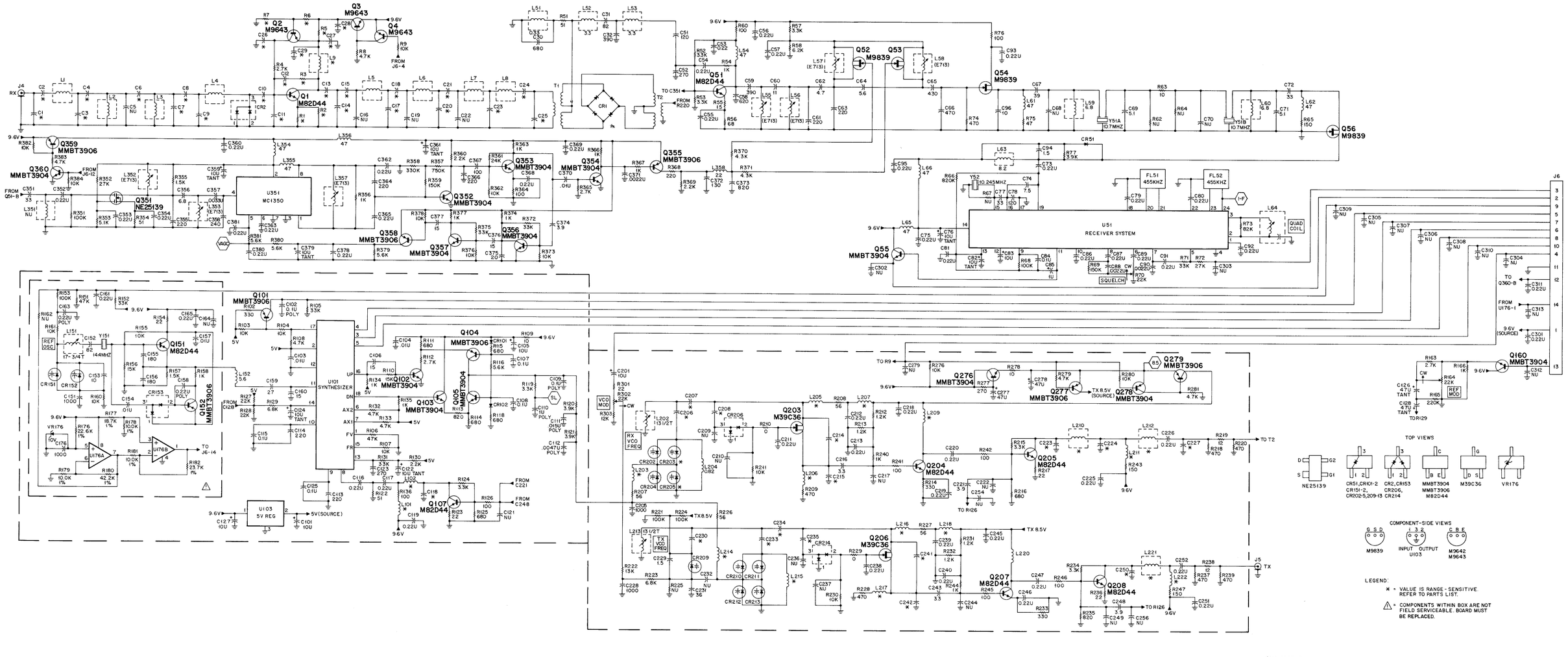
RF Board Troubleshooting Charts
PW-7345-O
(Sheet 1 of 2)
2/28/90

SYNTHESIZER/VCO



GXW-7347-O

RF Board Troubleshooting Charts
PW-7345-O
(Sheet 2 of 2)
2/28/90



GW-6347-O

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	21–13740B58	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%
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

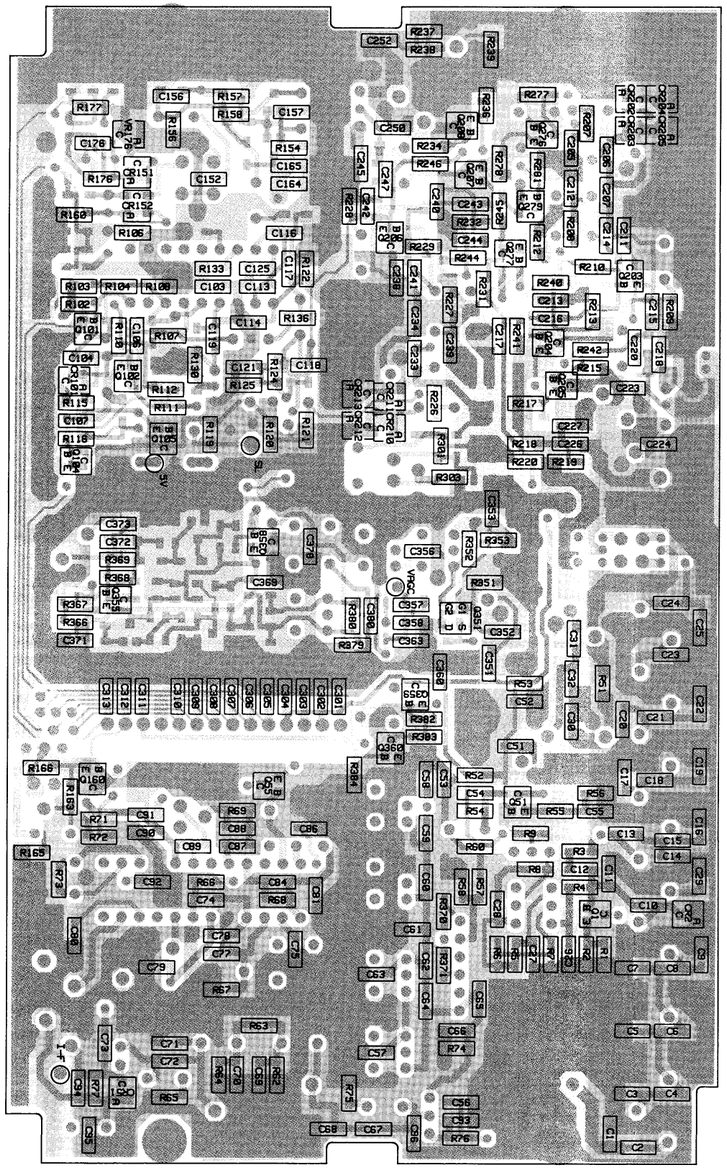
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

Schematic, Circuit Board Diagrams, and Parts Lists for HLB4099A and HLB4101A Low Band RF Boards

PW–6346–C

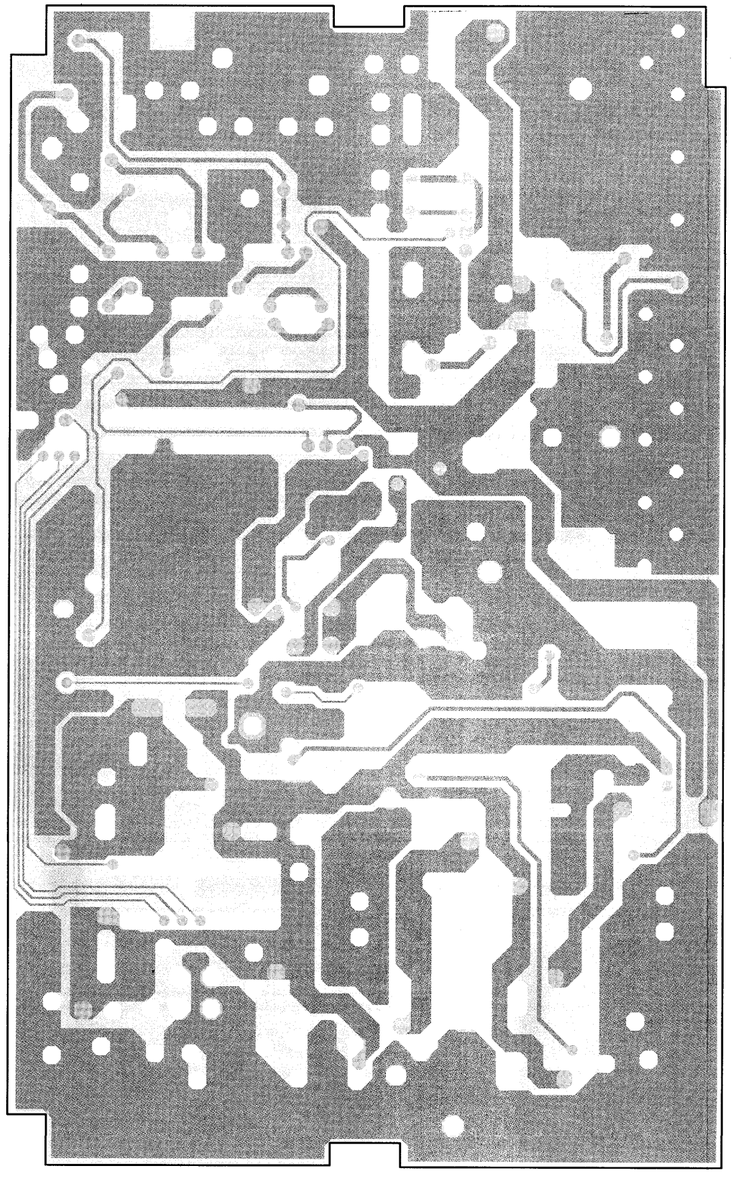
(Sheet 3 of 4)

3/31/90



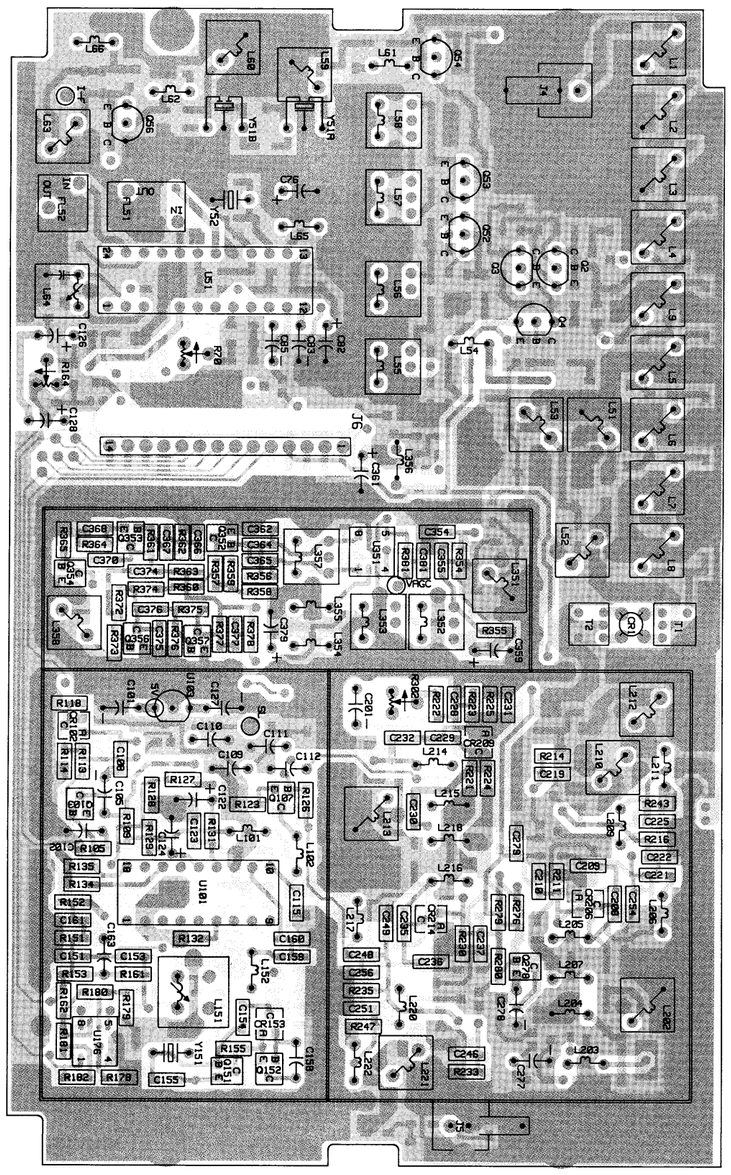
SOLDER SIDE — GBW–6349–O
COMPONENT SIDE — GBW–6350–O
OVERLAY — GBW–6351–O

SOLDER SIDE VIEW



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

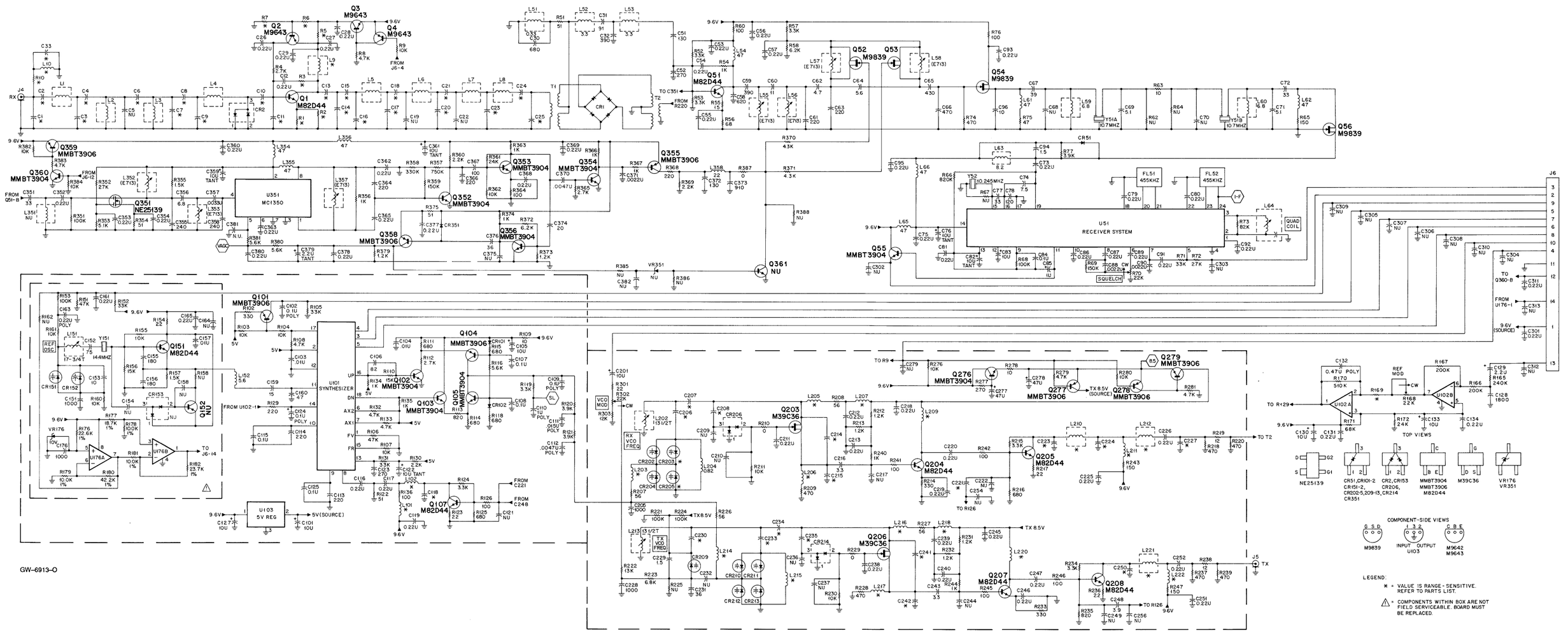
INNER LAYERS



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 — 25.50 each
Y52	48–80908W01	10.245 MHz — 14.03 each
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)
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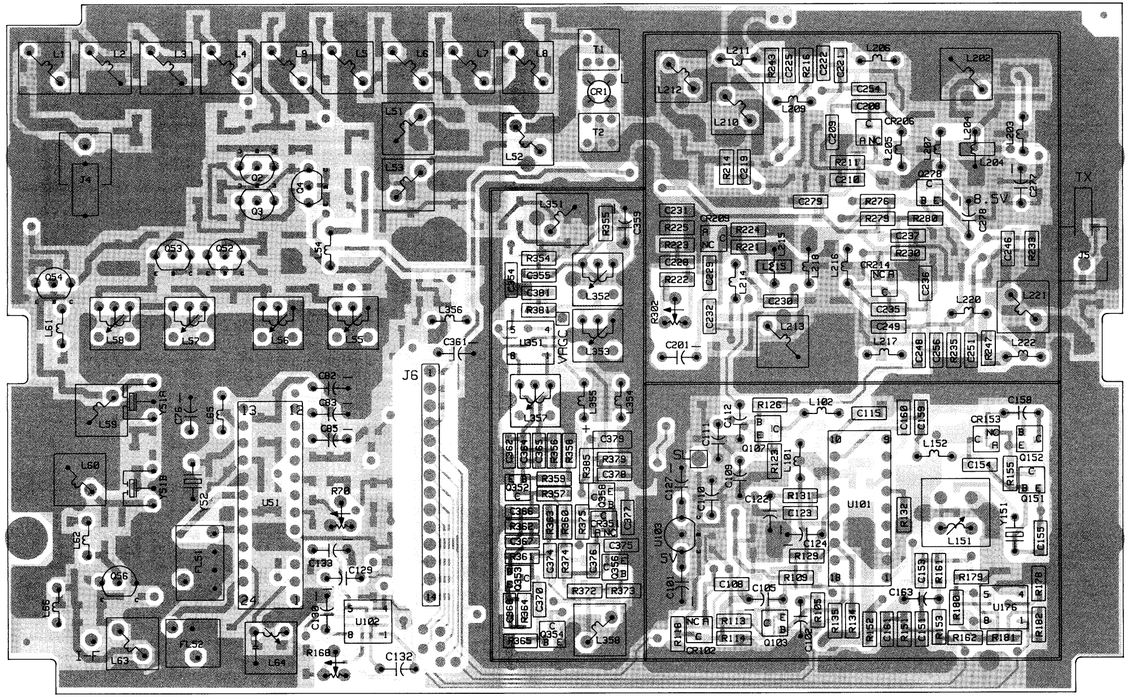
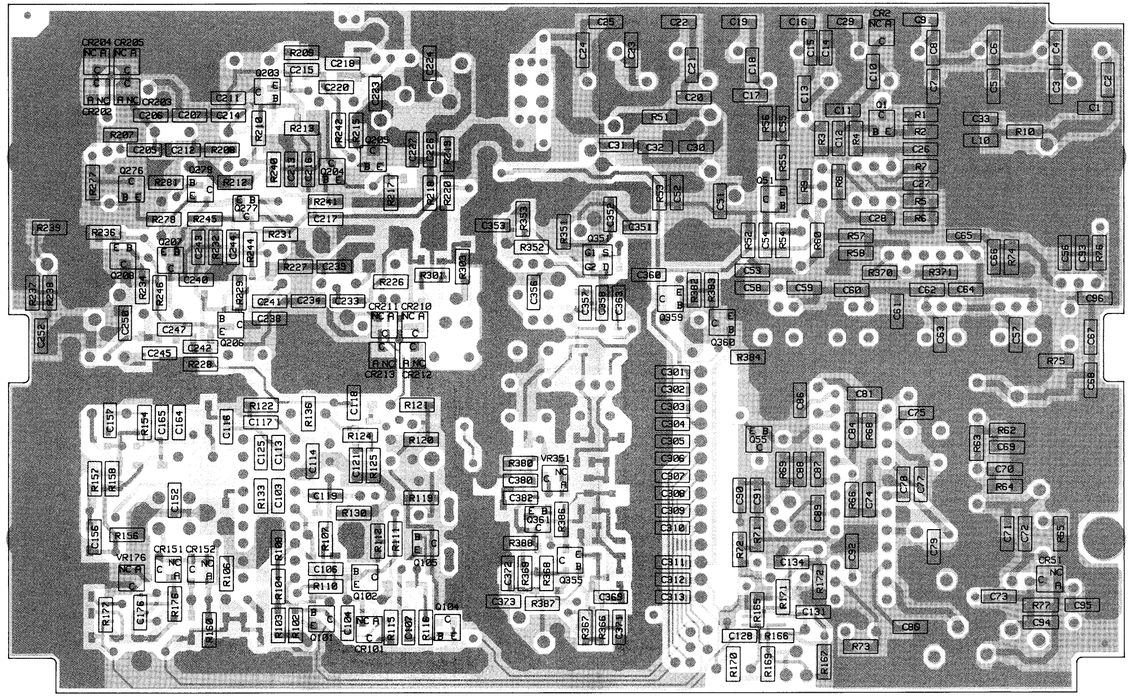


COMPONENT SIDE

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



SOLDER SIDE

COMPONENT SIDE
SOLDER SIDE
OVERLAY — GW–6915–O
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)
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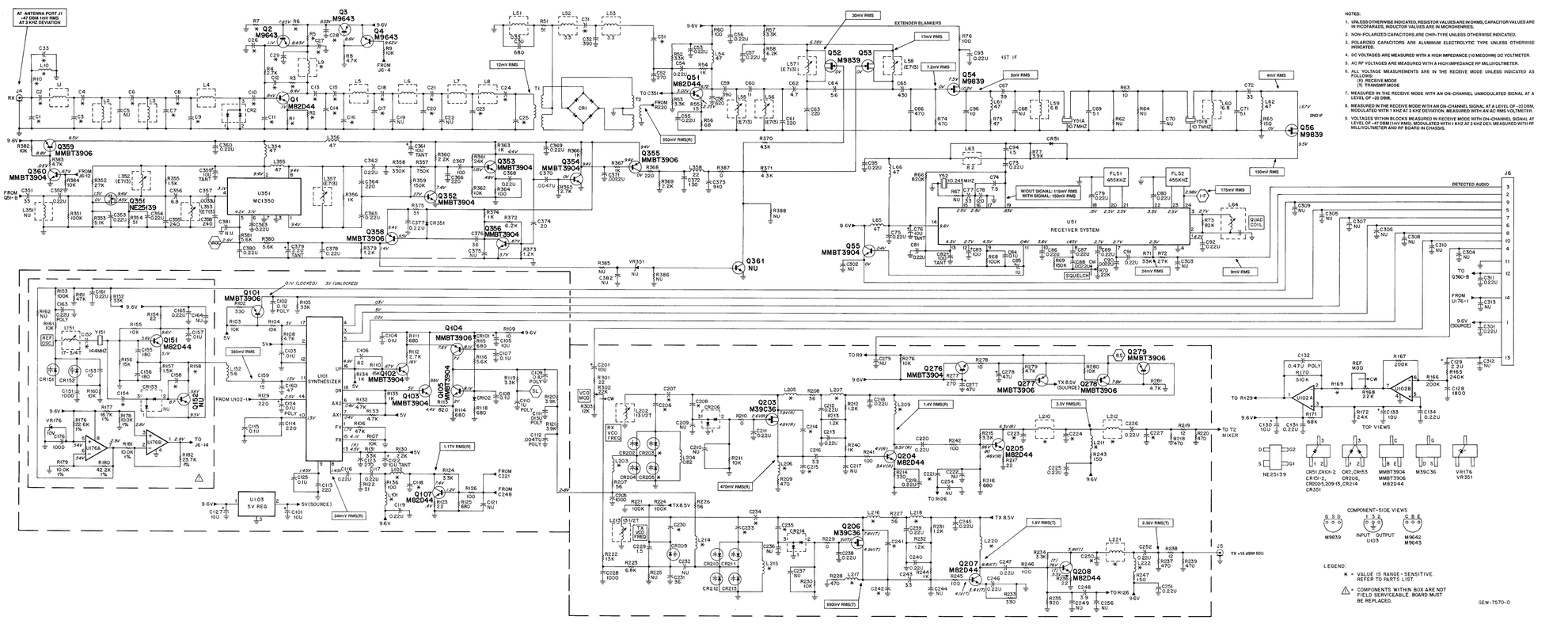
Low Band RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	0.8	0.1	8.4	—	—	—
Q2	7.8	8.4	1.1	—	—	—
Q3	8.8	9.6	9.5	—	—	—
Q4	9.6	9.6	8.8	—	—	—
Q51	3.0	2.3	6.7	—	—	—
Q52	—	—	—	0	6.3	6.3
Q53	—	—	—	0	6.3	6.3
Q54	—	—	—	0	1.1	7.5
Q55	.04	0	9.6	—	—	—
Q56	—	—	—	0	1.7	9.5
Q101	5.0	5.0	0.1	—	—	—
Q102	0.7	0	0.1	—	—	—
Q103	5.0	4.4	9.6	—	—	—
Q104	8.1	2–8v	2–8v	—	—	—
Q105	8.1	2.0	2–8v	—	—	—
Q107	1.2	0.4	7.4	—	—	—
Q151	5.6	5.1v	9.6	—	—	—
Q152	8.7v	9.5	5.8	—	—	—
Q160	4.3	3.6	9.6	—	—	—
Q203	—	—	—	2.6(R)	4.8(R)	7.9(R)
Q204	4.0(R)	3.4(R)	8.5(R)	—	—	—
Q205	.86(R)	.46(R)	6.3(R)	—	—	—
Q206	—	—	—	3.0(T)	4.9(T)	7.8(T)
Q207	4.1(T)	3.4(T)	8.4(T)	—	—	—
Q208	.76(T)	.53(T)	5.8(T)	—	—	—
Q276	9.6	8.5	9.6	—	—	—
Q277	9.5	8.5	9.5	—	—	—
Q278	9.6	8.5	7.8	—	—	—
Q279	7.8	8.5	8.5	—	—	—
Q352	.27	0	7.4	—	—	--
Q353	1.2	.48	4.4	—	—	—
Q354	0	0	9.4	—	—	—
Q355	9.4	9.4	0	—	—	—
Q356	.67	0	3.7	—	—	—
Q357	.67	0	3.7	—	—	—
Q358	9.5	9.4	1.4	—	—	—
Q359	8.8	9.6	9.5	—	—	—
Q360	.67	0	.05	—	—	—



Schematic, Circuit Board Diagrams, and
Parts Lists for HLB4100A/4099B/4101B
Low Band RF Board
PW–7569–O
(Sheet 1 of 4)
3/31/90

parts list

HLB4099B Low Band RF Board 29.7–36.0 MHz (Range 1) MXW–7571–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C0001	21–13740B55	180 pF, ±5%, 50V
C0002	21–11032B15	.22 uF, +80 –20, 50V
C0003	21–13740B66	510 pF, ±5%, 50V
C0004	21–13740B57	220 pF, ±5%, 50V
C0006	21–13740B38	36 pF, ±5%, 50V
C0007	21–13740B19	5.6 pF, ±.25 pF, 50V
C0008	21–13740B55	180 pF, ±5%, 50V
C0009	21–13740B68	620 pF, ±5%, 50V
C0010	21–11032B15	.22 uF, +80 –20, 50V
C0011	21–13740B55	180 pF, ±5%, 50V
C0012,0013	21–11032B15	.22 uF, +80 –20, 50V
C0015	21–13740B46	75 pF, ±5%, 50V
C0017	21–13740B66	510 pF, ±5%, 50V
C0018	21–13740B61	330 pF, ±5%, 50V
C0020	21–13740B71	820 pF, ±5%, 50V
C0021	21–13740B60	300 pF, ±5%, 50V
C0023	21–13740B69	680 pF, ±5%, 50V
C0024	21–13740B73	1000 pF, ±5%, 50V
C0025	21–13740B61	330 pF, ±5%, 50V
C0026–0029	21–11032B15	.22 uF, +80 –20, 50V
C0030	21–13740B69	680 pF, ±5%, 50V
C0031	21–13740B48	91 pF, ±5%, 50V
C0032	21–13740B63	390 pF, ±5%, 50V
C0051	21–13740B52	130 pF, ±5%, 50V
C0052	21–13740B59	270 pF, ±5%, 50V
C0053–0057	21–11032B15	.22 uF, +80 –20, 50V
C0058	21–13740B68	620 pF, ±5%, 50V
C0059	21–13740B63	390 pF, ±5%, 50V
C0060	21–13740B26	11 pF, ±5%, 50V
C0061	21–13740B57	220 pF, ±5%, 50V
C0062	21–13740B17	4.7 pF, ±.25 pF, 50V
C0063	21–13740B57	220 pF, ±5%, 50V
C0064	21–13740B19	5.6 pF, ±.25 pF, 50V
C0065	21–13740B64	430 pF, ±5%, 50V
C0066	21–13740B65	470 pF, ±5%, 50V
C0067	21–13740B39	39 pF, ±5%, 50V
C0069	21–13740B18	5.1 pF, ±.25 pF, 50V
C0071	21–13740B18	5.1 pF, ±.25 pF, 50V
C0072	21–13740B37	33 pF, +5%, 50V
C0073	21–11032B15	.22 uF, +80 –20, 50V
C0074	21–13740B22	7.5 pF, +.25 pF, 50V
C0075	21–11032B15	.22 uF, +80 –20, 50V
C0076	23–11013D13	10 uF, ±10%, 20V
C0077	21–13740B37	33 pF, ±5%, 50V
C0078	21–13740B51	120 pF, ±5%, 50V
C0079–0081	21–11032B15	.22 uF, +80 –20, 50V
C0082	23–11013D13	10 uF, ±10%, 20V
C0083	23–11048B13	10 uF, ±20%, 16V
C0084	21–11032B13	.10 uF, +80 –20, 50V
C0085	23–11048B05	1 uF, ±20%, 50V
C0086,0087	21–11032B15	.22 uF, +80 –20, 50V
C0088	21–13741B29	.0022 uF, ±5%, 50V
C0089	21–11032B15	.22 uF, +80 –20, 50V
C0090	21–13741B29	.0022 uF, ±5%, 50V
C0091–0093	21–11032B15	.22 uF, +80 –20, 50V
C0094	21–13740B05	1.5 pF, ±.25 pF, 50V
C0095	21–11032B15	.22 uF, +80 –20, 50V
C0096	21–13740B25	10 pF, ±5%, 50V
C0102	08–11051A13	.1 uF, ±5%, 63V
C0103,0104	21–13741B45	.01 uF, ±5%, 50V
C0106	21–13740B47	82 pF, +5%, 50V
C0107,0108	21–11032B13	.10 uF, +80 –20, 50V
C0109	08–11051A13	.1 uF, ±5%, 63V
C0101	23–11048B13	10 uF, ±20%, 16V
C0105	23–11048B13	10 uF, ±20%, 16V
C0110	08–11051A19	1.0 uF, ±5%, 63V
C0111	08–11051A08	.015 uF, ±5%, 63V
C0112	08–11051A05	.0047 uF, ±5%, 63V
C0113,0114	21–13740B57	220 pF, ±5%, 50V
C0115	21–11032B13	.10 uF, +80 –20, 50V
C0116,0117	21–11032B15	.22 uF, +80 –20, 50V
C0118	21–13740B33	22 pF, ±5%, 50V
C0119	21–11032B15	.22 uF, +80 –20, 50V
C0122	23–11013D13	10 uF, ±10%, 20V
C0123	21–13740B59	270 pF, ±5%, 50V
C0124	08–11051A13	.1, ±5%, 63V
C0125	21–11032B13	.10 uF, +80 –20, 50V
C0127	23–11048B13	10 uF, ±20%, 16V
C0128	21–13740B78	180 uF, ±5%, 50V
C0129	23–11048B06	2.2 uF, ±20%, 50V
C0130	23–11048B13	10 uF, ±20%, 16V
C0131	21–11032B15	.22 uF, +80 –20, 50V
C0132	08–11051A17	.47 uF, ±5%, 63V
C0133	23–11048B13	10 uF, ±20%, 16V
C0134	21–11032B15	.22 uF, +80 –20, 50V
C0151	21–13740B73	1000 pF, ±5%, 50V
C0152	21–13740B46	75 pF, ±5%, 50V
C0153	21–13740B25	10 pF, ±5%, 50V
C0155,0156	21–13740B55	180 pF, ±5%, 50V
C0157	21–13741B45	.01 uF, ±5%, 50V
C0159	21–13740B29	15 pF, ±5%, 50V
C0160	21–13740B41	47 pF, ±5%, 50V
C0161	21–11032B15	.22 uF, +80 –20, 50V
C0163	08–11051A15	.22 uF, ±5%, 63V
C0165	21–11032B15	.22, +80 –20, 50V
C0176	21–13740B73	1000 pF, ±5%, 50V
C0201	23–11048B13	10 uF, ±20%, 16V
C0205	21–13740B73	1000 pF, ±5%, 50V
C0206,0207	21–13740B45	68 pF, ±5%, 50V

MXW–7571–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C0208	21–13740B17	4.7 pF, ±.25 pF, 50V
C0211–0213	21–11032B15	.22 uF, +80 –20, 50V
C0214,0215	21–13740B43	56 pF, ±5%, 50V
C0216	21–13740B13	3.3 pF, ±.25 pF, 50V
C0218–0220	21–11032B15	.22 uF, +80 –20, 50V
C0221	21–13740B15	3.9 pF, ±.25 pF, 50V
C0223	21–13740B25	10 pF, ±5%, 50V
C0224	21–13740B41	47 pF, ±5%, 50V
C0225,0226	21–11032B15	.22 uF, +80 –20, 50V
C0227	21–13740B41	47 pF, ±5%, 50V
C0228	21–13740B73	1000 pF, ±5%, 50V
C0229	21–13740B05	1.5 pF, ±.25 pF, 50V
C0230	21–13740B19	5.6 pF, +.25 pF, 50V
C0231	21–13740B38	36 pF, ±5%, 50V
C0233	21–13740B63	390 pF, ±5%, 50V
C0234	21–13740B49	100 pF, ±5%, 50V
C0235	21–13740B17	4.7 pF, ±.25 pF, 50V
C0238–0240	21–11032B15	.22 uF, +80 –20, 50V
C0241,0242	21–13740B47	82 pF, ±5%, 50V
C0243	21–13740B13	3.3 pF, ±.25 pF, 50V
C0245–0247	21–11032B15	.22 uF, +80 –20, 50V
C0248	21–13740B15	3.9 pF, ±.25 pF, 50V
C0250	21–13740B29	15 pF, ±5%, 50V
C0251,0252	21–11032B15	.22 uF, +80 –20, 50V
C0277,0278	23–11048B19	47 uF, ±20%, 16V
C0301	21–11032B15	.22 uF, +80 –20, 50V
C0311	21–11032B15	.22 uF, +80 –20, 50V
C0351	21–13740B37	33 pF, ±5%, 50V
C0352–0354	21–11032B15	.22 uF, +80 –20, 50V
C0355	21–13740B58	240 pF, ±5%, 50V
C0356	21–13740B21	6.8 pF, ±.25 pF, 50V
C0357	21–13741B33	.0033 uF, ±5%, 50V
C0358	21–13740B58	240 pF, ±5%, 50V
C0359	23–11013D13	10 uF, ±10%, 20V
C0360	21–11032B15	.22 uF, +80 –20, 50V
C0361	23–11013D13	10 uF, ±10%, 20V
C0362,0363	21–11032B15	.22 uF, +80 –20, 50V
C0364	21–13740B57	220 pF, ±5%, 50V
C0365	21–11032B15	.22 uF, +80 –20, 50V
C0366	21–13740B57	220 pF, ±5%, 50V
C0367	21–13740B49	100 pF, ±5%, 50V
C0368,0369	21–11032B15	.22 uF, +80 –20, 50V
C0370	21–13741B37	.0047 uF, ±5%, 50V
C0371	21–13741B29	.0022 uF, ±5%, 50V
C0372	21–13740B52	130 pF, ±5%, 50V
C0373	21–13740B72	910 pF, ±5%, 50V
C0374	21–13740B32	20 pF, ±5%, 50V
C0376	21–13740B38	36 pF, ±5%, 50V
C0378	21–11032B15	.22 uF, +80 –20, 50V
C0379	23–11049A09	2.2 uF, ±10%, 20V
C0380	21–13740B73	.01 uF, ±5%, 50V
diode		
CR001	48–80236E16	quad SCHOTTKY
CR002	48–80154K03	quad SCHOTTKY
CR051	48–05129M76	silicon SOT
CR101,0102	48–05129M76	silicon SOT
CR151,152	48–80006E10	silicon varactor SOT
CR202	48–80991T01	varactor
CR204	48–80991T01	varactor
CR206	48–80154K03	dual SCHOTTKY
CR209	48–80006E10	silicon varactor SOT
CR210–213	48–80991T01	varactor
CR214	48–80154K03	dual SCHOTTKY
CR351	48–80939T01	SCHOTTKY
filter		
FL051	91–80097D05	6–element, 455 kHz
FL052	91–80098D05	3–element, 455 kHz
connector, receptacle		
J0004,0005	09–80135M01	2–pin, coax
J0006	09–80130M03	14–pin, socket
coil		
L0001–0008	24–80148M21	147 uH, 9.5 turns
L0009	24–80063M04	.18 uH
L0051	24–80063M07	.33 uH
L0052,0053	24–80063M19	3.3 uH
L0054	24–80063M31	47 uH
L0055–0058	24–80164M01	.7 uH, 1:6 turns
L0059,0060	24–80063M23	6.8 uH
L0061,0062	24–80063M31	47 uH
L0063	24–80063M24	8.2 uH
L0064	25–80000E01	transformer, 455 KHz
L0065,0066	24–80063M31	47 uH
L0101	24–80063M24	8.2 uH
L0102	24–80063M11	.68 uH
L0151	24–80299D01	17.75 turns
L0152	24–80063M22	5.6 uH
L0202	24–80931W26	44 uH, 13.5 turns
L0203	24–80063M23	6.8 uH
L0204	24–80063M12	.82 uH
L0205–0207	24–80063M23	6.8 uH
L0209	24–80063M23	6.8 uH
L0210	24–80063M13	1.0 uH
L0211	24–80063M23	6.8 uH
L0212	24–80063M07	.33 uH
L0213	24–80931W26	44 uH, 13.5 turns
L0214	24–80063M24	8.2 uH
L0215	24–80063M12	.82 uH
L0216–0220	24–80063M24	8.2 uH

MXW–7571–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L0221	24–80063M11	.68 uH
L0222	24–80063M24	8.2 uH
L0352,0353	24–80164M01	1:6 turns
L0354–0356	24–80063M31	47 uH
L0357	24–80164M01	.7 uH, 1:6 turns
L0358	24–80063M27	22 uH
transistor		
Q0001	48–80182D44	NPN
Q0002–0004	48–11043C06	PNP
Q0051	48–80182D44	NPN
Q0052–0054	48–11043C12	n–Channel
Q0055	48–80214G02	NPN
Q0056	48–11043C12	n–Channel
Q0101	48–05128M16	PNP
Q0102,0103	48–80214G02	NPN
Q0104	48–05128M16	PNP
Q0105	48–80214G02	NPN
Q0107	48–80182D44	NPN
Q0151	48–80182D44	NPN
Q0203	48–80141L06	n–channel MOS FET
Q0204–0205	48–80182D44	NPN
Q0206	48–80141L06	N–channel MOS FET
Q0207,0208	48–80182D44	NPN
Q0276	48–80214G02	NPN
Q0277–0279	48–05128M16	PNP
Q0351	48–80930W01	dual gate FET
Q0352–0354	48–80214G02	NPN
Q0355	48–05128M16	PNP
Q0356	48–80214G02	NPN
Q0358,0359	48–05128M16	PNP
Q0360	48–80214G02	NPN
resistor, fixed ohm, ±5%, 1/8 watt (unless otherwise stated)		
R0002	06–11077A30	15
R0003	06–11077A68	560
R0004	06–11077A84	2.7k
R0005	06–11077A56	180
R0006	06–11077A98	10k
R0007	06–11077A94	6.8k
R0008	06–11077A90	4.7k
R0009	06–11077A98	10k
R0051	06–11077A43	51
R0052,0053	06–11077A86	3.3k
R0054	06–11077A74	1k
R0055	06–11077A30	15
R0056	06–11077A46	68
R0057	06–11077A86	3.3k
R0058	06–11077A93	6.2k
R0060	06–11077A50	100
R0063	06–11077A26	10
R0065	06–11077A54	150
R0066	06–11077B45	820k
R0068	06–11077B23	100k
R0069	06–11077B27	150k
R0070	18–05500L08	22k, ±20%, 100V
R0071	06–11077B11	33k
R0072	06–11077B09	27k
R0073	06–11077B21	82k
R0074	06–11077A66	470
R0075	06–11077A42	47
R0076	06–11077A50	100
R0077	06–11077A88	3.9k
R0102	06–11077A62	330
R0103,0104	06–11077A98	10k
R0105	06–11077B11	33k
R0106	06–11077B15	47k
R0107	06–11077A98	10k
R0108	06–11077A90	4.7k
R0109	06–11077A26	10
R0110	06–11077B03	15k
R0111	06–11077A70	680
R0112	06–11077A84	2.7k
R0113	06–11077A72	820
R0114,0115	06–11077A70	680
R0116	06–11077A92	5.6k
R0118	06–11077A70	680
R0119	06–11077A86	3.3k
R0120,0121	06–11077A88	3.9k
R0122	06–11077A43	51
R0123	06–11077A34	22
R0124	06–11077A86	3.3k
R0125	06–11077A70	680
R0126	06–11077A50	100
R0129	06–11077A58	220
R0130	06–11077A82	2.2k
R0131	06–11077B11	33k
R0132,0133	06–11077A90	4.7k
R0134,0135	06–11077A74	1k
R0136	06–11077A50	100
R0151	06–11077B15	47k
R0152	06–11077B11	33k
R0153	06–11077B23	100k
R0154	06–11077A34	22
R0155	06–11077A98	10k
R0156	06–11077B03	15k
R0157	06–11077A78	1.5k
R0160	06–11077A98	10k
R0161	06–11077A98	10k
R0165	06–11077B32	240k
R0166,0167	06–11077B30	200k

MXW–7571–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R0168	18–05500L08	22k, ±20%, 100V
R0169	06–11077B15	47k
R0170	06–11077B40	510k
R0171	06–11077B19	68k
R0172	06–11077B08	24k
R0176	06–11077G26	22.6k, ±1%
R0177	06–11077G18	18.7k, ±1%
R0178,0179	06–11077F91	10k, ±1%
R0180	06–11077G52	42.2k, ±1%
R0181	06–11077F91	10k, ±1%
R0182	06–11077G28	23.7k, ±1%
R0202	06–11077A50	100
R0207,0208	06–11077A44	56
R0209	06–11077A66	470
R0210	06–11077A01	0
R0211	06–11077A98	10k
R0212,0213	06–11077A76	1.2k
R0214	06–11077A62	330
R0215	06–11077A86	3.3k
R0216	06–11077A70	680
R0217	06–11077A34	22
R0218	06–11077A66	470
R0219	06–11077A28	12
R0220	06–11077A66	470
R0221	06–11077B23	100k
R0222	06–11077B02	13k
R0223	06–11077A94	6.8k
R0224	06–11077B23	100k
R0226,0227	06–11077A44	56
R0228	06–11077A66	470
R0229	06–11077A01	0
R0230	06–11077A98	10k
R0231–0232	06–11077A76	1.2k
R0233	06–11077A62	330
R0234	06–11077A86	3.3k
R0235	06–11077A72	820
R0236	06–11077A34	22
R0237	06–11077A61	300
R0238	06–11077A32	18
R0239	06–11077A61	300
R0240	06–11077A74	1k
R0241	06–11077A50	100
R0243	06–11077A54	150
R0244	06–11077A74	1k
R0245–0246	06–11077A50	100
R0247	06–11077A54	150
R0276	06–11077A98	10k
R0277	06–11077A60	270
R0278	06–11077A26	10
R0279	06–11077A90	4.7k
R0280	06–11077A98	10k
R0281	06–11077A90	4.7k
R0301	06–11077A34	22
R0302	18–05500L08	22k, ±20%, 100V
R0303	06–11077B01	12k
R0351	06–11077B23	100k
R0352	06–11077B09	27k
R0353	06–11077A91	5.1k
R0354	06–11077A43	51
R0355	06–11077A78	1.5k
R0356	06–11077A74	1k
R0357	06–11077B44	750k
R0358	06–11077B35	330k
R0359	06–11077B27	150k
R0360	06–11077A82	2.2k
R0361	06–11077B08	24k
R0362	06–11077A98	10k
R0363	06–11077A74	1k
R0364	06–11077A50	100
R0365	06–11077A84	2.7k
R0366–0367	06–11077A74	1k
R0368	06–11077A58	220
R0369	06–11077A82	2.2k
R0370,0371	06–11077A89	4.3k
R0372	06–11077A93	6.2k
R0373	06–11077A76	1.2k
R0374	06–11077A74	1k
R0375	06–11077A43	51
R0379	06–11077A76	1.2k
R0380,0381	06–11077A92	5.6k
R0382	06–11077A98	10k
R0383	06–11077A90	4.7k
R0384	06–11077A98	10k
R0387	06–11077A01	0
transformer		
T0001,0002	25–80163M02	500 MHz
integrated circuit		
U0051	51–05479G05	linear
U0101	51–80931V01	custom direct divider syn
U0102	51–80056M04	dual op amp
U0103	51–84621K27	voltage regulator
U0176	51–80932W01	dual op amp
U0351	51–80929W01	bipolar
varactor		
VR176	48–80140L15	zener diode 10V

MXW–7571–O (5)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
crystal		
Y0051	91–80172D01	filter
Y0052	48–80908W01	10.245 MHz
Y0151	48–80174D05	14.4 MHz
non–referenced items		
	26–80097M01	shield, coil can
	26–80098M01	shield, coil can (10 used)
	26–80228L01	shield, coax connector (2 used)
	26–80916V01	shield, RF Low Band
	75–05295B02	pad, crystal base (4 used)
	84–80959X01	circuit board

3/31/90

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

parts list

HLB4101B Low Band RF Board 42.0–50.0 MHz (Range 3) MXW–7572–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C0001	21–13740B48	91 pF, ±5%, 50V
C0002	21–13740B65	470 pF, ±5%, 50V
C0003	21–13740B59	270 pF, ±5%, 50V
C0004	21–13740B49	100 pF, ±5%, 50V
C0006	21–13740B29	15 pF, ±5%, 50V
C0008	21–13740B48	91 pF, ±5%, 50V
C0009	21–13740B64	430 pF, ±5%, 50V
C0010	21–13740B57	220 pF, ±5%,
C0011	21–13740B55	180 pF, ±5%, 50V
C0012	21–13741B49	.01 uF, ±5%, 50V
C0013	21–13740B51	120 pF, ±5%, 50V
C0014	21–13740B62	360 pF, ±5%, 50V
C0015	21–13740B51	120 pF, ±5%, 50V
C0017	21–13740B67	560 pF, ±5%, 50V
C0018	21–13740B52	130 pF, ±5%, 50V
C0020	21–13740B67	560 pF, ±5%, 50V
C0021	21–13740B52	130 pF, ±5%, 50V
C0023	21–13740B64	430 pF, ±5%, 50V
C0024	21–13740B58	240 pF, ±5%, 50V
C0025	21–13740B56	200 pF, ±5%, 50V
C0026–0029	21–13741B49	.015 uF, ±5%, 50V
C0030	21–13740B69	680 pF, ±5%, 50V
C0031	21–13740B47	82 pF, ±5%, 50V
C0032	21–13740B63	390 pF, ±5%, 50V
C0051	21–13740B51	120 pF, ±5%, 50V
C0052	21–13740B59	270 pF, ±5%, 50V
C0053–0057	21–11032B15	.22 uF, +80 –20, 50V
C0058	21–13740B68	620 pF, ±5%, 50V
C0059	21–13740B63	390 pF, ±5%, 50V
C0060	21–13740B26	11 pF, ±5%, 50V
C0061	21–13740B57	220 pF, ±5%, 50V
C0062	21–13740B17	4.7 pF, ±.25 pF, 50V
C0063	21–13740B57	220 pF, ±5%, 50V
C0064	21–13740B19	5.6 pF, ±.25 pF, 50V
C0065	21–13740B64	430 pF, ±5%, 50V
C0066	21–13740B65	470 pF, ±5%, 50V
C0067	21–13740B39	39 pF, ±5%, 50V
C0069	21–13740B18	5.1 pF, ±.25 pF, 50V
C0071	21–13740B18	5.1 pF, ±.25 pF, 50V
C0072	21–13740B37	33 pF, +5%, 50V
C0073	21–11032B15	.22 uF, +80 –20, 50V

MXW–7572–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C0074	21–13740B22	7.5 pF, +.25 pF, 50V
C0075	21–11032B15	.22 uF, +80 –20, 50V
C0076	23–13749C39	10 uF, ±10%, 20V
C0077	21–13740B37	33 pF, ±5%, 50V
C0078	21–13740B51	120 pF, ±5%, 50V
C0079–0081	21–11032B15	.22 uF, +80 –20, 50V
C0082	23–13749C39	10 uF, ±10%, 20V
C0083	23–11048B13	10 uF, ±20%, 16V
C0084	21–11032B13	.10 uF, +80 –20, 50V
C0085	23–11048B05	1 uF, ±20%, 50V
C0086,0087	21–11032B15	.22 uF, +80 –20, 50V
C0088	21–13741B29	.0022 uF, ±5%, 50V
C0089	21–11032B15	.22 uF, +80 –20, 50V
C0090	21–13741B29	.0022 uF, ±5%, 50V
C0091–0093	21–11032B15	.22 uF, +80 –20, 50V
C0094	21–13740B05	1.5 pF, ±.25 pF, 50V
C0095	21–11032B15	.22 uF, +80 –20, 50V
C0096	21–13740B25	10 pF, ±5%, 50V
C0101	23–11048B13	10 uF, ±20%, 16V
C0102	08–11051A13	.1 uF, ±5%, 63V
C0103,0104	21–13741B45	.01 uF, ±5%, 50V
C0105	23–11048B13	10 uF, ±20%, 16V
C0106	21–13740B47	82 pF, +5%, 50V
C0107,0108	21–11032B13	.10 uF, +80 –20, 50V
C0109	08–11051A13	.1 uF, ±5%, 63V
C0110	08–11051A19	1.0 uF, ±5%, 63V
C0111	08–11051A08	.015 uF, ±5%, 63V
C0112	08–11051A05	.0047 uF, ±5%, 63V
C0113,0114	21–13740B57	220 pF, ±5%, 50V
C0115	21–11032B13	.10 uF, +80 –20, 50V
C0116,0117	21–11032B15	.22 uF, +80 –20, 50V
C0118	21–13740B27	12 pF, ±5%, 50V
C0119	21–11032B15	.22 uF, +80 –20, 50V
C0122	23–13749c39	10 uF, ±10%, 20V
C0123	21–13740B59	270 pF, ±5%, 50V
C0124	08–11051A13	.1, ±5%, 63V
C0125	21–11032B13	.10 uF, +80 –20, 50V
C0127	23–11048B13	10 uF, ±20%, 16V
C0128	21–13740B78	180 uF, ±5%, 50V
C0129	23–11048B06	2.2 uF, ±20%, 50V
C0130	23–11048B13	10 uF, ±20%, 16V
C0131	21–11032B15	.22 uF, +80 –20, 50V
C0132	08–11051A17	.47 uF, ±5%, 63V
C0133	23–11048B13	10 uF, ±20%, 16V
C0134	21–11032B15	.22 uF, +80 –20, 50V
C0151	21–13740B73	1000 pF, ±5%, 50V
C0152	21–13740B46	75 pF, ±5%, 50V
C0153	21–13740B25	10 pF, ±5%, 50V
C0154	21–13741B45	.01 uF, ±5%, 50V
C0155,0156	21–13740B55	180 pF, ±5%, 50V
C0157	21–13741B45	.01 uF, ±5%, 50V
C0158	08–11051A15	.22 uF, ±5%, 63V
C0159	21–13740B29	15 pF, ±5%, 50V
C0160	21–13740B41	47 pF, ±5%, 50V
C0161	21–11032B15	.22 uF, +80 –20, 50V
C0163	08–11051A15	.22 uF, ±5%, 63V
C0165	21–11032B15	.22, +80 –20, 50V
C0176	21–13740B73	1000 pF, ±5%, 50V
C0201	23–11048B13	10 uF, ±20%, 16V
C0205	21–13740B73	1000 pF, ±5%, 50V
C0206	21–13740B37	33 pF, ±5%, 50V
C0207	21–13740B27	12 pF, ±5%, 50V
C0208	21–13740B17	4.7 pF, ±.25 pF, 50V
C0211–0213	21–11032B15	.22 uF, +80 –20, 50V
C0214,0215	21–13740B27	12 pF, ±5%, 50V
C0216	21–13740B13	3.3 pF, ±.25 pF, 50V
C0218–0220	21–11032B15	.22 uF, +80 –20, 50V
C0221	21–13740B15	3.9 pF, ±.25 pF, 50V
C0223	21–13740B21	6.8 pF, ±25 pF, 50V
C0224	21–13740B39	39 pF, ±5%, 50V
C0225,0226	21–11032B15	.22 uF, +80 –20, 50V
C0227	21–13740B37	33 pF, ±5%, 50V
C0228	21–13740B73	1000 pF, ±5%, 50V
C0229	21–13740B05	1.5 pF, ±.25 pF, 50V
C0230	21–13740B15	3.9 pF, +.25 pF, 50V
C0231	21–13740B38	36 pF, ±5%, 50V
C0233	21–13740B62	360 pF, ±5%, 50V
C0234	21–13740B38	36 pF, ±5%, 50V
C0235	21–13740B17	4.7 pF, ±.25 pF, 50V
C0238–0240	21–11032B15	.22 uF, +80 –20, 50V
C0241,0242	21–13740B31	18 pF, ±5%, 50V
C0243	21–13740B13	3.3 pF, ±.25 pF, 50V
C0245–0247	21–11032B15	.22 uF, +80 –20, 50V
C0248	21–13740B15	3.9 pF, ±.25 pF, 50V
C0250	21–13740B29	15 pF, ±5%, 50V
C0251,0252	21–11032B15	.22 uF, +80 –20, 50V
C0277,0278	23–11048B19	47 uF, ±20%, 16V
C0301	21–11032B15	.22 uF, +80 –20, 50V
C0311	21–11032B15	.22 uF, +80 –20, 50V
C0351	21–13740B37	33 pF, ±5%, 50V
C0352–0354	21–11032B15	.22 uF, +80 –20, 50V
C0355	21–13740B58	240 pF, ±5%, 50V
C0356	21–13740B21	6.8 pF, ±.25 pF, 50V
C0357	21–13741B33	.0033 uF, ±5%, 50V
C0358	21–13740B58	240 pF, ±5%, 50V
C0360	21–11032B15	.22 uF, +80 –20, 50V
C0361	23–13749C39	10 uF, ±10%, 20V
C0362,0363	21–11032B15	.22 uF, +80 –20, 50V
C0364	21–13740B57	220 pF, ±5%, 50V
C0365	21–11032B15	.22 uF, +80 –20, 50V

MXW–7572–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C0366	21–13740B57	220 pF, ±5%, 50V
C0367	21–13740B49	100 pF, ±5%, 50V
C0368,0369	21–11032B15	.22 uF, +80 –20, 50V
C0370	21–13741B37	.0047 uF, ±5%, 50V
C0371	21–13741B29	.0022 uF, ±5%, 50V
C0372	21–13740B52	130 pF, ±5%, 50V
C0373	21–13740B72	910 pF, ±5%, 50V
C0374	21–13740B32	20 pF, ±5%, 50V
C0376	21–13740B38	36 pF, ±5%, 50V
C0378	21–11032B15	.22 uF, +80 –20, 50V
C0379	23–11049A09	2.2 uF, ±10%, 20V
C0380	21–13740B73	.01 uF, ±5%, 50V
diode		
CR001	48–80236E16	quad SCHOTTKY
CR002	48–80154K03	quad SCHOTTKY
CR051	48–05129M76	silicon SOT
CR101,0102	48–05129M76	silicon SOT
CR151,152	48–80006E10	silicon varactor SOT
CR202–205	48–80006E10	varactor
CR206	48–80154K03	dual SCHOTTKY
CR209–213	48–80006E10	varactor
CR214	48–80154K03	dual SCHOTTKY
CR351	48–80939T01	SCHOTTKY
filter		
FL051	91–80097D05	6–element, 455 kHz
FL052	91–80098D05	3–element, 455 kHz
connector, receptacle		
J0004,0005	09–80135M01	2–pin, coax
J0006	09–80130M03	14–pin, socket
coil		
L0001–0009	24–80148M21	147 uH, 9.5 turns
L0051	24–80063M07	.33 uH
L0052,0053	24–80063M19	3.3 uH
L0054	24–80063M31	47 uH
L0055–0058	24–80164M01	.7 uH, 1:6 turns
L0059,0060	24–80063M23	6.8 uH
L0061,0062	24–80063M31	47 uH
L0063	24–80063M24	8.2 uH
L0064	25–80000E01	transformer, 455 KHz
L0065,0066	24–80063M31	47 uH
L0101	24–80063M23	6.8 uH
L0102	24–80063M09	.47 uH
L0151	24–80299D01	17.75 turns
L0152	24–80063M22	5.6 uH
L0202	24–80931W26	44 uH, 13.5 turns
L0203	24–80063M22	5.6 uH
L0204	24–80063M12	.82 uH
L0205–0207	24–80063M22	5.6 uH
L0209	24–80063M22	5.6 uH
L0210	24–80063M11	.68 uH
L0211	24–80063M22	5.6 uH
L0212	24–80063M06	.27 uH
L0213	24–80931W26	44 uH, 13.5 turns
L0214	24–80063M23	6.8 uH
L0215	24–80063M12	.82 uH
L0216–0220	24–80063M23	6.8 uH
L0221	24–80063M09	.27 uH
L0222	24–80063M23	6.8 uH
L0352,0353	24–80164M01	1:6 turns
L0354–0356	24–80063M31	47 uH
L0357	24–80164M01	.7 uH, 1:6 turns
L0358	24–80063M27	22 uH
transistor		
Q0001	48–80182D44	NPN
Q0002–0004	48–11043C06	PNP
Q0051	48–80182D44	NPN
Q0052–0054	48–11043C12	n–Channel
Q0055	48–80214G02	NPN
Q0056	48–11043C12	n–Channel
Q0101	48–05128M16	PNP
Q0102,0103	48–80214G02	NPN
Q0104	48–05128M16	PNP
Q0105	48–80214G02	NPN
Q0107	48–80182D44	NPN
Q0151	48–80182D44	NPN
Q0152	48–05128M16	PNP
Q0203	48–80141L06	n–channel MOS FET
Q0204–0205	48–80182D44	NPN
Q0206	48–80141L06	N–channel MOS FET
Q0207,0208	48–80182D44	NPN
Q0276	48–80214G02	NPN
Q0277–0279	48–05128M16	PNP
Q0351	48–80930W01	dual gate FET
Q0352–0354	48–80214G02	NPN
Q0355	48–05128M16	PNP
Q0356	48–80214G02	NPN
Q0358,0359	48–05128M16	PNP
Q0360	48–80214G02	NPN
resistor, fixed ohm, ±5%, 1/8 watt (unless otherwise stated)		
R0001	06–11077A26	10
R0002	06–11077A33	20
R0003	06–11077A66	470
R0004	06–11077A84	2.7k
R0005	06–11077A46	68
R0006	06–11077A86	3.3k
R0007	06–11077B03	15k
R0008	06–11077A90	4.7k
R0009	06–11077A98	10k

MXW–7572–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R0051	06–11077A43	51
R0052,0053	06–11077A86	3.3k
R0054	06–11077A74	1k
R0055	06–11077A30	15
R0056	06–11077A46	68
R0057	06–11077A86	3.3k
R0058	06–11077A93	6.2k
R0060	06–11077A50	100
R0063	06–11077A26	10
R0065	06–11077A54	150
R0066	06–11077B45	820k
R0068	06–11077B23	100k
R0069	06–11077B27	150k
R0070	18–05500L08	22k, ±20%, 100V
R0071	06–11077B11	33k
R0072	06–11077B09	27k
R0073	06–11077B21	82k
R0074	06–11077A66	470
R0075	06–11077A42	47
R0076	06–11077A50	100
R0077	06–11077A88	3.9k
R0102	06–11077A62	330
R0103,0104	06–11077A98	10k
R0105	06–11077B11	33k
R0106	06–11077B15	47k
R0107	06–11077A98	10k
R0108	06–11077A90	4.7k
R0109	06–11077A26	10
R0110	06–11077B03	15k
R0111	06–11077A70	680
R0112	06–11077A84	2.7k
R0113	06–11077A72	820
R0114,0115	06–11077A70	680
R0116	06–11077A92	5.6k
R0118	06–11077A70	680
R0119	06–11077A86	3.3k
R0120,0121	06–11077A88	3.9k
R0122	06–11077A43	51
R0123	06–11077A34	22
R0124	06–11077A86	3.3k
R0125	06–11077A70	680
R0126	06–11077A50	100
R0129	06–11077A58	220
R0130	06–11077A82	2.2k
R0131	06–11077B11	33k
R0132,0133	06–11077A90	4.7k
R0134,0135	06–11077A74	1k
R0136	06–11077A50	100
R0151	06–11077B15	47k
R0152	06–11077B11	33k
R0153	06–11077B23	100k
R0154	06–11077A34	22
R0155	06–11077A98	10k
R0156	06–11077B03	15k
R0157	06–11077A78	1.5k
R0158	06–11077A74	1k
R0160	06–11077A98	10k
R0161	06–11077A98	10k
R0165	06–11077B32	240k
R0166,0167	06–11077B30	200k
R0168	18–05500L08	22k, ±20%, 100V
R0169	06–11077B15	47k
R0170	06–11077B40	510k
R0171	06–11077B19	68k
R0172	06–11077B08	24k
R0176	06–11077G26	22.6k, ±1%
R0177	06–11077G18	18.7k, ±1%
R0178,0179	06–11077F91	10k, ±1%
R0180	06–11077G52	42.2k, ±1%
R0181	06–11077F91	10k, ±1%
R0182	06–11077G28	23.7k, ±1%
R0207,0208	06–11077A44	56
R0209	06–11077A66	470
R0210	06–11077A01	0
R0211	06–11077A98	10k
R0212,0213	06–11077A76	1.2k
R0214	06–11077A62	330
R0215	06–11077A86	3.3k
R0216	06–11077A70	680
R0217	06–11077A34	22
R0218	06–11077A66	470
R0219	06–11077A28	12
R0220	06–11077A66	470
R0221	06–11077B23	100k
R0222	06–11077B02	13k
R0223	06–11077A94	6.8k
R0224	06–11077B23	100k
R0226,0227	06–11077A44	56
R0228	06–11077A66	470
R0229	06–11077A01	0
R0230	06–11077A98	10k
R0231–0232	06–11077A76	1.2k
R0233	06–11077A62	330
R0234	06–11077A86	3.3k
R0235	06–11077A72	820
R0236	06–11077A34	22
R0237	06–11077A66	470
R0238	06–11077A28	12
R0239	06–11077A66	470
R0240	06–11077A74	1k

MXW–7572–O (5)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R0241,0242	06–11077A50	100
R0243	06–11077A54	150
R0244	06–11077A74	1k
R0245–0246	06–11077A50	100
R0247	06–11077A54	150
R0276	06–11077A98	10k
R0277	06–11077A60	270
R0278	06–11077A26	10
R0279	06–11077A90	4.7k
R0280	06–11077A98	10k
R0281	06–11077A90	4.7k
R0301	06–11077A34	22
R0302	18–05500L08	22k, ±20%, 100V
R0303	06–11077B01	12k
R0351	06–11077B23	100k
R0352	06–11077B09	27k
R0353	06–11077A91	5.1k
R0354	06–11077A43	51
R0355	06–11077A78	1.5k
R0356	06–11077A74	1k
R0357	06–11077B44	750k
R0358	06–11077B35	330k
R0359	06–11077B27	150k
R0360	06–11077A82	2.2k
R0361	06–11077B08	24k
R0362	06–11077A98	10k
R0363	06–11077A74	1k
R0364	06–11077A50	100
R0365	06–11077A84	2.7k
R0366–0367	06–11077A74	1k
R0368	06–11077A58	220
R0369	06–11077A82	2.2k
R0370,0371	06–11077A89	4.3k
R0372	06–11077A93	6.2k
R0373	06–11077A76	1.2k
R0374	06–11077A74	1k
R0375	06–11077A43	51
R0379	06–11077A76	1.2k
R0380,0381	06–11077A92	5.6k
R0382	06–11077A98	10k
R0383	06–11077A90	4.7k
R0384	06–11077A98	10k
R0387	06–11077A01	0
transformer		
T0001,0002	25–80163M02	500 MHz
integrated circuit		
U0051	51–05479G05	linear
U0101	51–80931V01	custom direct divider syn
U0102	51–80056M04	dual op amp
U0103	51–84621K27	voltage regulator
U0176	51–80932W01	dual op amp
U0351	51–80929W01	bipolar
varactor		
VR176	48–80140L15	zener diode 10V
crystal		
Y0051	91–80172D01	filter
Y0052	48–80908W01	10.245 MHz
Y0151	48–80174D05	14.4 MHz
non–referenced items		
	26–80097M01	shield, coil can
	26–80098M01	shield, coil can (10 used)
	26–80228L01	shield, coax connector (2 used)
	26–80916V01	shield, RF Low Band
	75–05295B02	pad, crystal base (4 used)
	84–80959X01	circuit board

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

Schematic, Circuit Board Diagrams, and Parts Lists for HLB4100A/4099B/4101B Low Band RF Board

PW–7569–O

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parts list

HLB4100A Low Band RF Board 36.0–41.999 MHz (Range 2) MXW–6910–A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C0001	21–13740B53	150 pF, ±5%, 50V
C0002	21–13740B74	1200 pF, ±5%, 50V
C0003	21–13740B63	390 pF, ±5%, 50V
C0004	21–13740B53	150 pF, ±5%, 50V
C0006	21–13740B36	30 pF, ±5%, 50V
C0008	21–13740B52	130 pF, ±5%, 50V
C0009	21–13740B65	470 pF, ±5%, 50V
C0010	21–13740B73	1000 pF, ±5%,
C0011	21–13740B54	160 pF, ±5%, 50V
C0012,0013	21–11032B15	.22 uF, +80 –20, 50V
C0015	21–11032B15	.22 uF, +80 –20, 50V
C0016	21–13740B51	120 pF, ±5%, 50V
C0017	21–13740B66	510 pF, ±5%, 50V
C0018	21–13740B55	180 pF, ±5%, 50V
C0020	21–13740B66	510 pF, ±5%, 50V
C0021	21–13740B56	200 pF, ±5%, 50V
C0023	21–13740B65	470 pF, ±5%, 50V
C0024	21–13740B61	330 pF, ±5%, 50V
C0025	21–13740B60	300 pF, ±5%, 50V
C0026–0029	21–11032B15	.022 uF, +80 –20, 50V
C0030	21–13740B69	680 pF, ±5%, 50V
C0031	21–13740B48	91 pF, ±5%, 50V
C0032	21–13740B63	390 pF, ±5%, 50V
C0051	21–13740B52	130 pF, ±5%, 50V
C0052	21–13740B59	270 pF, ±5%, 50V
C0053–0057	21–11032B15	.22 uF, +80 –20, 50V
C0058	21–13740B68	620 pF, ±5%, 50V
C0059	21–13740B63	390 pF, ±5%, 50V
C0060	21–13740B26	11 pF, ±5%, 50V
C0061	21–13740B57	220 pF, ±5%, 50V
C0062	21–13740B17	4.7 pF, ±.25 pF, 50V
C0063	21–13740B57	220 pF, ±5%, 50V
C0064	21–13740B19	5.6 pF, ±.25 pF, 50V
C0065	21–13740B64	430 pF, ±5%, 50V
C0066	21–13740B65	470 pF, ±5%, 50V
C0067	21–13740B39	39 pF, ±5%, 50V
C0069	21–13740B18	5.1 pF, ±.25 pF, 50V
C0071	21–13740B18	5.1 pF, ±.25 pF, 50V
C0072	21–13740B37	33 pF, +5%, 50V
C0073	21–11032B15	.22 uF, +80 –20, 50V
C0074	21–13740B22	7.5 pF, +.25 pF, 50V
C0075	21–11032B15	.22 uF, +80 –20, 50V
C0076	23–13749C39	10 uF, +10%, 20V
C0077	21–13740B37	33 pF, +5%, 50V
C0078	21–13740B51	120 pF, ±5%, 50V
C0079–0081	21–11032B15	.22 uF, +80 –20, 50V
C0082	23–13749C39	10 uF, +10%, 20V
C0083	23–11048B13	10 uF, ±20%, 16V
C0084	21–13741B69	.01 uF, ±5%, 50V
C0085	23–11048B05	1 uF, ±20%, 50V
C0086,0087	21–11032B15	.22 uF, +80 –20, 50V
C0088	21–13741B29	.0022 uF, ±5%, 50V
C0089	21–11032B15	.22 uF, +80 –20, 50V
C0090	21–13741B29	.0022 uF, ±5%, 50V
C0091–0093	21–11032B15	.22 uF, +80 –20, 50V
C0094	21–13740B05	1.5 pF, ±.25 pF, 50V
C0095	21–11032B15	.22 uF, +80 –20, 50V
C0096	21–13740B25	10 pF, ±5%, 50V
C0101	23–11048B13	10 uF, ±20%, 16V
C0102	08–11051A13	.1 uF, ±5%, 63V
C0103,0104	21–13741B45	.01 uF, ±5%, 50V
C0105	23–11048B13	10 uF, ±20%, 16V
C0106	21–13740B47	82 pF, ±5%, 50V
C0107,0108	21–13741B69	.01 uF, ±5%, 50V
C0109	08–11051A13	.1 uF, ±5%, 63V
C0110	08–11051A19	1.0 uF, ±5%, 63V
C0111	08–11051A08	.015 uF, ±5%, 63V
C0112	08–11051A05	.0047 uF, ±5%, 63V
C0113,0114	21–13740B57	220 pF, ±5%, 50V
C0115	21–13741B69	.01 uF, ±5%, 50V
C0116,0117	21–11032B15	.22 uF, +80 –20, 50V
C0118	21–13740B29	15 pF, ±5%, 50V
C0119	21–11032B15	.22 uF, +80 –20, 50V
C0122	23–13749C39	10 uF, ±10%, 20V
C0123	21–13740B59	270 pF, ±5%, 50V
C0124	08–11051A13	.1, ±5%, 63V
C0125	21–13741B69	.01 uF, ±5%, 50V
C0127	23–11048B13	10 uF, ±20%, 16V
C0128	21–13740B78	180 uF, ±5%, 50V
C0129	23–11048B06	2.2 uF, ±20%, 50V
C0130	23–11048B13	10 uF, ±20%, 16V
C0131	21–11032B15	.22 uF, +80 –20, 50V
C0132	08–11051A17	.47 uF, ±5%, 63V
C0133	23–11048B13	10 uF, ±20%, 16V
C0134	21–11032B15	.22 uF, +80 –20, 50V
C0151	21–13740B73	1000 pF, ±5%, 50V
C0152	21–13740B45	68 pF, ±5%, 50V
C0153	21–13740B25	10 pF, ±5%, 50V
C0155,0156	21–13740B55	180 pF, ±5%, 50V
C0157	21–13741B45	.01 uF, ±5%, 50V
C0159	21–13740B29	15 pF, ±5%, 50V
C0160	21–13740B41	47 pF, ±5%, 50V
C0161	21–11032B15	.22 uF, +80 –20, 50V
C0163	08–11051A15	.22 uF, ±5%, 63V
C0165	21–11032B15	.22, +80 –20, 50V
C0176	21–13740B73	1000 pF, ±5%, 50V
C0201	23–11048B13	10 uF, ±20%, 16V
C0205	21–13740B73	1000 pF, ±5%, 50V
C0206	21–13740B38	36 pF, ±5%, 50V

MXW–6910–A (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C0207	21–13740B27	12 pF, ±5%, 50V
C0208	21–13740B35	27 pF, ±.25 pF, 50V
C0211–0213	21–11032B15	.22 uF, +80 –20, 50V
C0214,0215	21–13740B35	27 pF, ±5%, 50V
C0216	21–13740B13	3.3 pF, ±.25 pF, 50V
C0218–0220	21–11032B15	.22 uF, +80 –20, 50V
C0221	21–13740B09	2.2 pF, ±.25 pF, 50V
C0223	21–13740B23	8.2 pF, ±25 pF, 50V
C0224	21–13740B39	39 pF, ±5%, 50V
C0225,0226	21–11032B15	.22 uF, +80 –20, 50V
C0227	21–13740B37	33 pF, ±5%, 50V
C0228	21–13740B73	1000 pF, ±5%, 50V
C0229	21–13740B05	1.5 pF, ±.25 pF, 50V
C0230	21–13740B17	4.7 pF, ±.25 pF, 50V
C0231	21–13740B38	36 pF, ±5%, 50V
C0233	21–13740B49	100 pF, ±5%, 50V
C0234	21–13740B38	36 pF, ±5%, 50V
C0235	21–13740B17	4.7 pF, ±.25 pF, 50V
C0238–0240	21–11032B15	.22 uF, +80 –20, 50V
C0241,0242	21–13740B31	18 pF, ±5%, 50V
C0243	21–13740B13	3.3 pF, ±.25 pF, 50V
C0245–0247	21–11032B15	.22 uF, +80 –20, 50V
C0248	21–13740B15	3.9 pF, ±.25 pF, 50V
C0250	21–13740B31	18 pF, ±5%, 50V
C0251,0252	21–11032B15	.22 uF, +80 –20, 50V
C0277,0278	23–11048B19	47 uF, ±20%, 16V
C0301	21–11032B15	.22 uF, +80 –20, 50V
C0311	21–11032B15	.22 uF, +80 –20, 50V
C0351	21–13740B37	33 pF, ±5%, 50V
C0352–0354	21–11032B15	.22 uF, +80 –20, 50V
C0355	21–13740B58	240 pF, ±5%, 50V
C0356	21–13740B21	6.8 pF, ±.25 pF, 50V
C0357	21–13741B33	.0033 uF, ±5%, 50V
C0358	21–13740B58	240 pF, ±5%, 50V
C0359	21–13749C39	10 uF, ±10%, 20V
C0360	21–11032B15	.22 uF, +80 –20, 50V
C0361	23–13749C39	10 uF, ±10%, 20V
C0362,0363	21–11032B15	.22 uF, +80 –20, 50V
C0364	21–13740B57	220 pF, ±5%, 50V
C0365	21–11032B15	.22 uF, +80 –20, 50V
C0366	21–13740B57	220 pF, ±5%, 50V
C0367	21–13740B49	100 pF, ±5%, 50V
C0368,0369	21–11032B15	.22 uF, +80 –20, 50V
C0370	21–13741B37	.0047 uF, ±5%, 50V
C0371	21–13741B29	.0022 uF, ±5%, 50V
C0372	21–13740B52	130 pF, ±5%, 50V
C0373	21–13740B72	910 pF, ±5%, 50V
C0374	21–13740B32	20 pF, ±5%, 50V
C0376	21–13740B38	36 pF, ±5%, 50V
C0377,0378	21–11032B15	.22 uF, +80 –20, 50V
C0379	23–11049A09	2.2 uF, ±10%, 20V
C0380	21–11032B15	.22 uF, +80 –20, 50V
diode		
CR001	48–80236E16	quad SCHOTTKY
CR002	48–80154K03	quad SCHOTTKY
CR051	48–05129M76	silicon SOT
CR101,0102	48–05129M76	silicon SOT
CR151,152	48–80006E10	silicon varactor SOT
CR202–205	48–80006E10	varactor
CR206	48–80154K03	dual SCHOTTKY
CR209	48–80006E10	varactor
CR210–213	48–80991T01	varactor
CR214	48–80154K03	dual SCHOTTKY
CR351	48–80939T01	SCHOTTKY
filter		
FL051	91–80097D05	6–element, 455 kHz
FL052	91–80098D05	3–element, 455 kHz
connector, receptacle		
J0004,0005	09–80135M01	2–pin, coax
J0006	09–80130M03	14–pin, socket
coil		
L0001–0008	24–80148M21	147 uH, 9.5 turns
L0009	24–80063M31	47 uH
L0051	24–80063M07	.33 uH
L0052,0053	24–80063M19	3.3 uH
L0054	24–80063M31	47 uH
L0055–0058	24–80164M01	.7 uH, 1:6 turns
L0059,0060	24–80063M23	6.8 uH
L0061,0062	24–80063M31	47 uH
L0063	24–80063M24	8.2 uH
L0064	25–80000E01	transformer, 455 KHz
L0065,0066	24–80063M31	47 uH
L0101	24–80063M24	8.2 uH
L0102	24–80063M10	.56 uH
L0151	24–80299D01	17.75 turns
L0152	24–80063M22	5.6 uH
L0202	24–80931W26	44 uH, 13.5 turns
L0203	24–80063M23	6.8 uH
L0204	24–80063M12	.82 uH
L0205–0207	24–80063M23	6.8 uH
L0209	24–80063M23	6.8 uH
L0210	24–80063M10	.82 uH
L0211	24–80063M23	6.8 uH
L0212	24–80063M06	.27 uH
L0213	24–80931W26	44 uH, 13.5 turns
L0214	24–80063M24	8.2 uH
L0215	24–80063M12	.82 uH
L0216–0218	24–80063M24	8.2 uH

MXW–6910–A (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L0220	24–80063M24	8.2 uH
L0221	24–80063M10	5.6 uH
L0222	24–80063M24	8.2 uH
L0352,0353	24–80164M01	1:6 turns
L0354–0356	24–80063M31	47 uH
L0357	24–80164M01	.7 uH, 1:6 turns
L0358	24–80063M27	22 uH
transistor		
Q0001	48–80182D44	NPN
Q0002–0004	48–11043C06	PNP
Q0051	48–80182D44	NPN
Q0052–0054	48–11043C12	n–Channel
Q0055	48–80214G02	NPN
Q0056	48–11043C12	n–Channel
Q0101	48–05128M16	PNP
Q0102,0103	48–80214G02	NPN
Q0104	48–05128M16	PNP
Q0105	48–80214G02	NPN
Q0107	48–80182D44	NPN
Q0151	48–80182D44	NPN
Q0152	48–05128M16	PNP
Q0203	48–80141L06	n–channel MOS FET
Q0204–0205	48–80182D44	NPN
Q0206	48–80141L06	N–channel MOS FET
Q0207,0208	48–80182D44	NPN
Q0276	48–80214G02	NPN
Q0277–0279	48–05128M16	PNP
Q0351	48–80930W01	dual gate FET
Q0352–0354	48–80214G02	NPN
Q0355	48–05128M16	PNP
Q0356	48–80214G02	NPN
Q0358,0359	48–05128M16	PNP
Q0360	48–80214G02	NPN
resistor, fixed ohm, ±5%, 1/8 watt (unless otherwise stated)		
R0002	06–11077A29	13
R0003	06–11077A68	560
R0004	06–11077A84	2.7k
R0005	06–11077A56	180
R0006	06–11077A98	10k
R0007	06–11077A94	6.8k
R0008	06–11077A90	4.7k
R0009	06–11077A98	10k
R0051	06–11077A43	51
R0052,0053	06–11077A86	3.3k
R0054	06–11077A74	1k
R0055	06–11077A30	15
R0056	06–11077A46	68
R0057	06–11077A86	3.3k
R0058	06–11077A93	6.2k
R0060	06–11077A50	100
R0063	06–11077A26	10
R0065	06–11077A54	150
R0066	06–11077B45	820k
R0068	06–11077B23	100k
R0069	06–11077B27	150k
R0070	18–05500L08	22k, ±20%, 100V
R0071	06–11077B11	33k
R0072	06–11077B09	27k
R0073	06–11077B21	82k
R0074	06–11077A66	470
R0075	06–11077A42	47
R0076	06–11077A50	100
R0077	06–11077A88	3.9k
R0102	06–11077A62	330
R0103,0104	06–11077A98	10k
R0105	06–11077B11	33k
R0106	06–11077B15	47k
R0107	06–11077A98	10k
R0108	06–11077A90	4.7k
R0109	06–11077A26	10
R0110	06–11077B03	15k
R0111	06–11077A70	680
R0112	06–11077A84	2.7k
R0113	06–11077A72	820
R0114,0115	06–11077A70	680
R0116	06–11077A92	5.6k
R0118	06–11077A70	680
R0119	06–11077A86	3.3k
R0120,0121	06–11077A88	3.9k
R0122	06–11077A43	51
R0123	06–11077A34	22
R0124	06–11077A86	3.3k
R0125	06–11077A70	680
R0126	06–11077A50	100
R0129	06–11077A58	220
R0130	06–11077A82	2.2k
R0131	06–11077B11	33k
R0132,0133	06–11077A90	4.7k
R0134,0135	06–11077A74	1k
R0136	06–11077A50	100
R0151	06–11077B15	47k
R0152	06–11077B11	33k
R0153	06–11077B23	100k
R0154	06–11077A34	22
R0155	06–11077A98	10k
R0156	06–11077B03	15k
R0157	06–11077A78	1.5k
R0160,161	06–11077A98	10k
R0165	06–11077B32	240k
R0166,0167	06–11077B30	200k

MXW–6910–A (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R0168	18–05500L08	22k, ±20%, 100V
R0169	06–11077B17	56k
R0170	06–11077B40	510k
R0171	06–11077B19	68k
R0172	06–11077B08	24k
R0176	06–11077G26	22.6k, ±1%
R0177	06–11077G18	18.7k, ±1%
R0178,0179	06–11077F91	10k, ±1%
R0180	06–11077G52	42.2k, ±1%
R0181	06–11077F91	10k, ±1%
R0182	06–11077G28	23.7k, ±1%
R0207,0208	06–11077A44	56
R0209	06–11077A66	470
R0210	06–11077A01	0
R0211	06–11077A98	10k
R0212,0213	06–11077A76	1.2k
R0214	06–11077A62	330
R0215	06–11077A86	3.3k
R0216	06–11077A70	680
R0217	06–11077A34	22
R0218	06–11077A66	470
R0219	06–11077A28	12
R0220	06–11077A66	470
R0221	06–11077B23	100k
R0222	06–11077B02	13k
R0223	06–11077A94	6.8k
R0224	06–11077B23	100k
R0226,0227	06–11077A44	56
R0228	06–11077A66	470
R0229	06–11077A01	0
R0230	06–11077A98	10k
R0231–0232	06–11077A76	1.2k
R0233	06–11077A62	330
R0234	06–11077A86	3.3k
R0235	06–11077A72	820
R0236	06–11077A34	22
R0237	06–11077A66	470
R0238	06–11077A28	12
R0239	06–11077A66	470
R0240	06–11077A74	1k
R0241,0242	06–11077A50	100
R0243	06–11077A54	150
R0244	06–11077A74	1k
R0245–0246	06–11077A50	100
R0247	06–11077A54	150
R0276	06–11077A98	10k
R0277	06–11077A60	270
R0278	06–11077A26	10
R0279	06–11077A90	4.7k
R0280	06–11077A98	10k
R0281	06–11077A90	4.7k
R0301	06–11077A34	22
R0302	18–05500L08	22k, ±20%, 100V
R0303	06–11077B01	12k
R0351	06–11077B23	100k
R0352	06–11077B09	27k
R0353	06–11077A91	5.1k
R0354	06–11077A43	51
R0355	06–11077A78	1.5k
R0356	06–11077A74	1k
R0357	06–11077B44	750k
R0358	06–11077B35	330k
R0359	06–11077B27	150k
R0360	06–11077A82	2.2k
R0361	06–11077B08	24k
R0362	06–11077A98	10k
R0363	06–11077A74	1k
R0364	06–11077A50	100
R0365	06–11077A84	2.7k
R0366–0367	06–11077A74	1k
R0368	06–11077A58	220
R0369	06–11077A82	2.2k
R0370,0371	06–11077A89	4.3k
R0372	06–11077A93	6.2k
R0373	06–11077A76	1.2k
R0374	06–11077A74	1k
R0375	06–11077A43	51
R0379	06–11077A76	1.2k
R0380,0381	06–11077A92	5.6k
R0382	06–11077A98	10k
R0383	06–11077A90	4.7k
R0384	06–11077A98	10k
R0387	06–11077A01	0
transformer		
T0001,0002	25–80163M02	500 MHz
integrated circuit		
U0051	51–05479G05	linear
U0101	51–80931V01	custom direct divider syn
U0102	51–02198J22	dual op amp
U0103	51–84621K27	voltage regulator
U0176	51–80932W01	dual op amp
U0351	51–80929W01	bipolar
varactor		
VR176	48–80140L15	zener diode 10V

MXW–6910–A (5)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
crystal		
Y0051	91–80172D01	filter
Y0052	48–80908W01	10.245 MHz
Y0151	48–80174D05	14.4 MHz
non–referenced items		
	26–80098M01	shield, coil can (11 used)
	26–80228L01	shield, coax connector (2 used)
	26–80916V01	shield, RF Low Band
	75–05295B02	pad, crystal base (4 used)
	84–80959X01	circuit board

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

Schematic, Circuit Board Diagrams, and Parts Lists for HLB4100A/4099B/4101B Low Band RF Board
PW–7569–O
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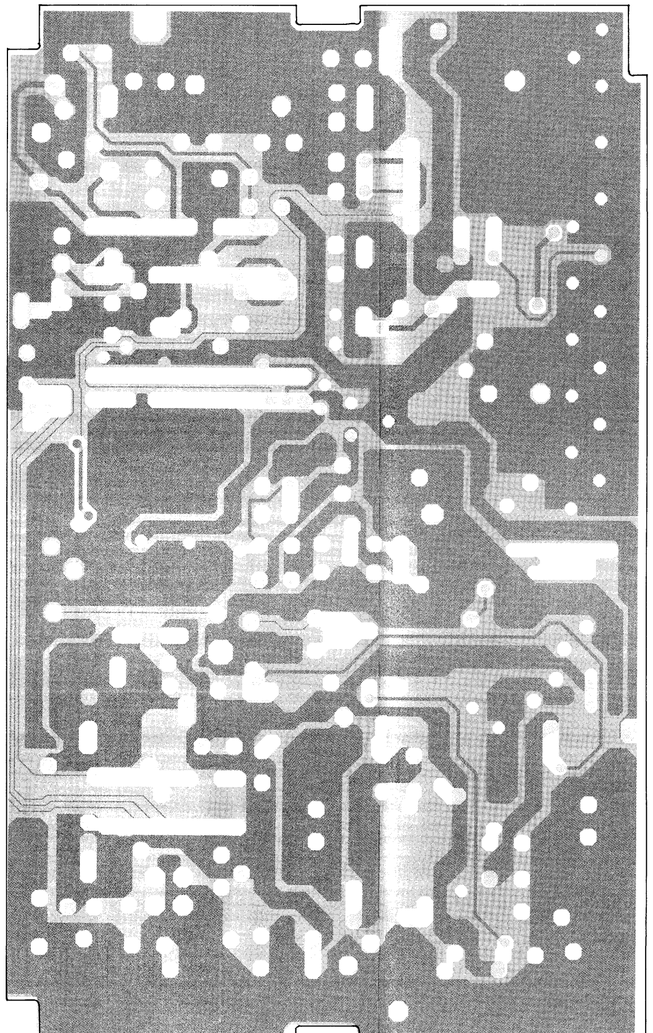
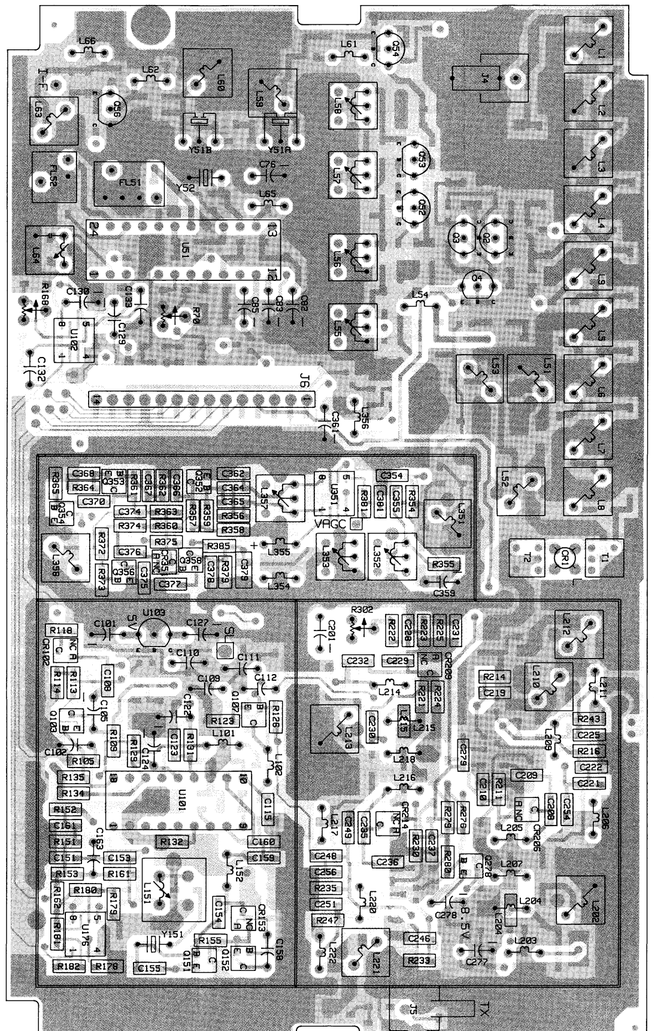


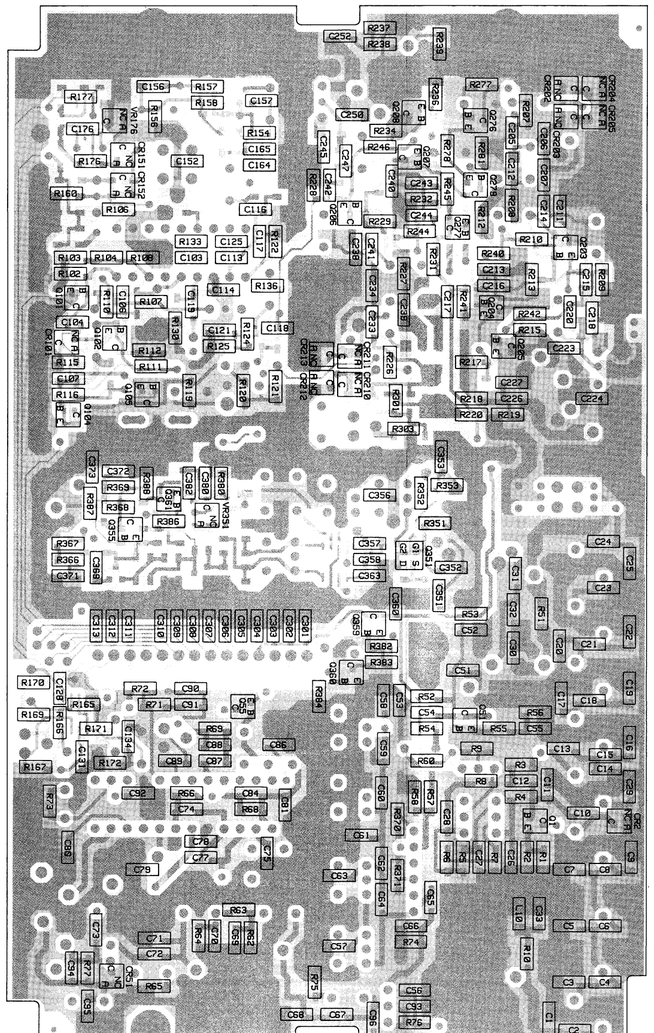
INNER LAYER 1 RED GAW–7688–O
INNER LAYER 2 GREY GAW–7689–O
OVERLAY BLACK GDW–7690–O

INNER LAYERS



COMPONENT SIDE VIEW

SOLDER SIDE RED GAW–7685–O
COMPONENT SIDE GREY GAW–7686–O
OVERLAYS BLACK GDW–7687–O



SOLDER SIDE VIEW

Schematic, Circuit Board Diagrams, and
Parts Lists for HLB4100A/4099B/4101B
Low Band RF Board
PW–7569–O
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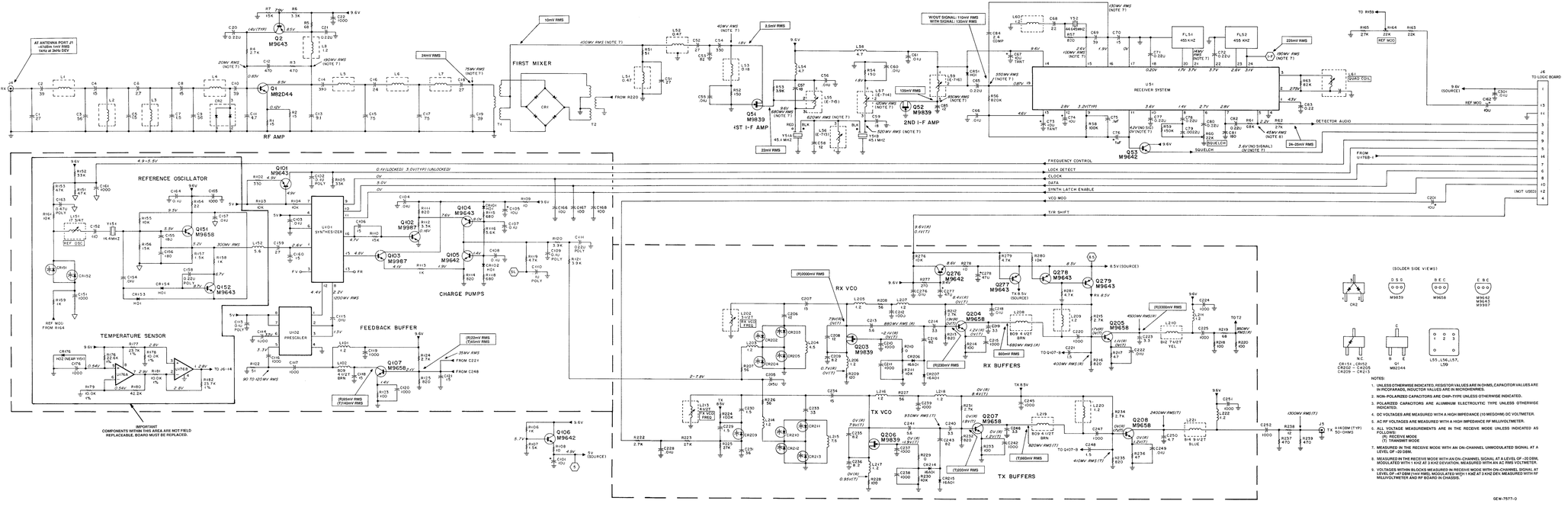
VHF RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	.83	.12	8.5	—	—	—
Q2	7.9	8.5	1.1	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	4.2	3.6	9.6	—	—	—
Q101	5.0	5.0	.1 (LOCKED)	—	—	—
Q102	0.7	0	0	—	—	—
Q103	4.8	4.1	9.6	—	—	—
Q104	8.1	7.6	2–8v	—	—	—
Q105	1.4	1.9	2–8v	—	—	—
Q106	5.7	4.9	9.6	—	—	—
Q107	2.1	1.4	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6.7	—	—	—
Q203	—	—	—	-2.1(R)	.7(R)	7.9
Q204	1.9(R)	1.2(R)	8.5	—	—	—
Q205	1.7(R)	1.1(R)	9.6	—	—	—
Q206	—	—	—	-1.9(T)	.95(T)	7.9
Q207	1.8(T)	1.2(T)	8.5	—	—	—
Q208	1.7(T)	1.2(T)	9.6	—	—	—
Q276	9.5	8.6	9.6	—	—	—
Q277	9.6	8.5(T)	8.5	—	—	—
Q278	9.6(R)	8.5	8.5	—	—	—
Q279	7.6(R)	8.5	8.5	—	—	—



Schematic, Circuit Board Diagrams, and Parts List for HLD4322B VHF RF Board
PW–7576–O
(Sheet 1 of 3)
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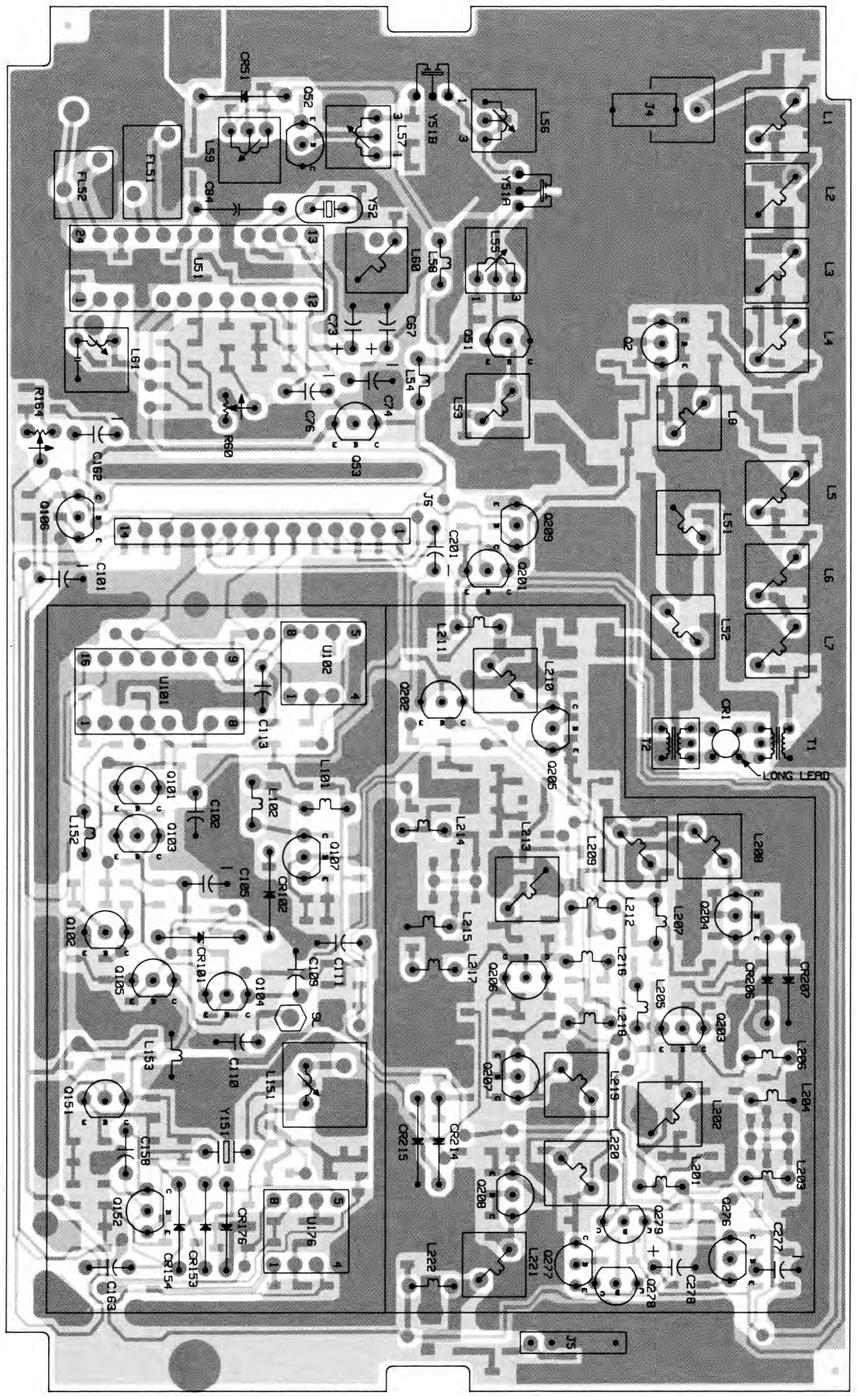
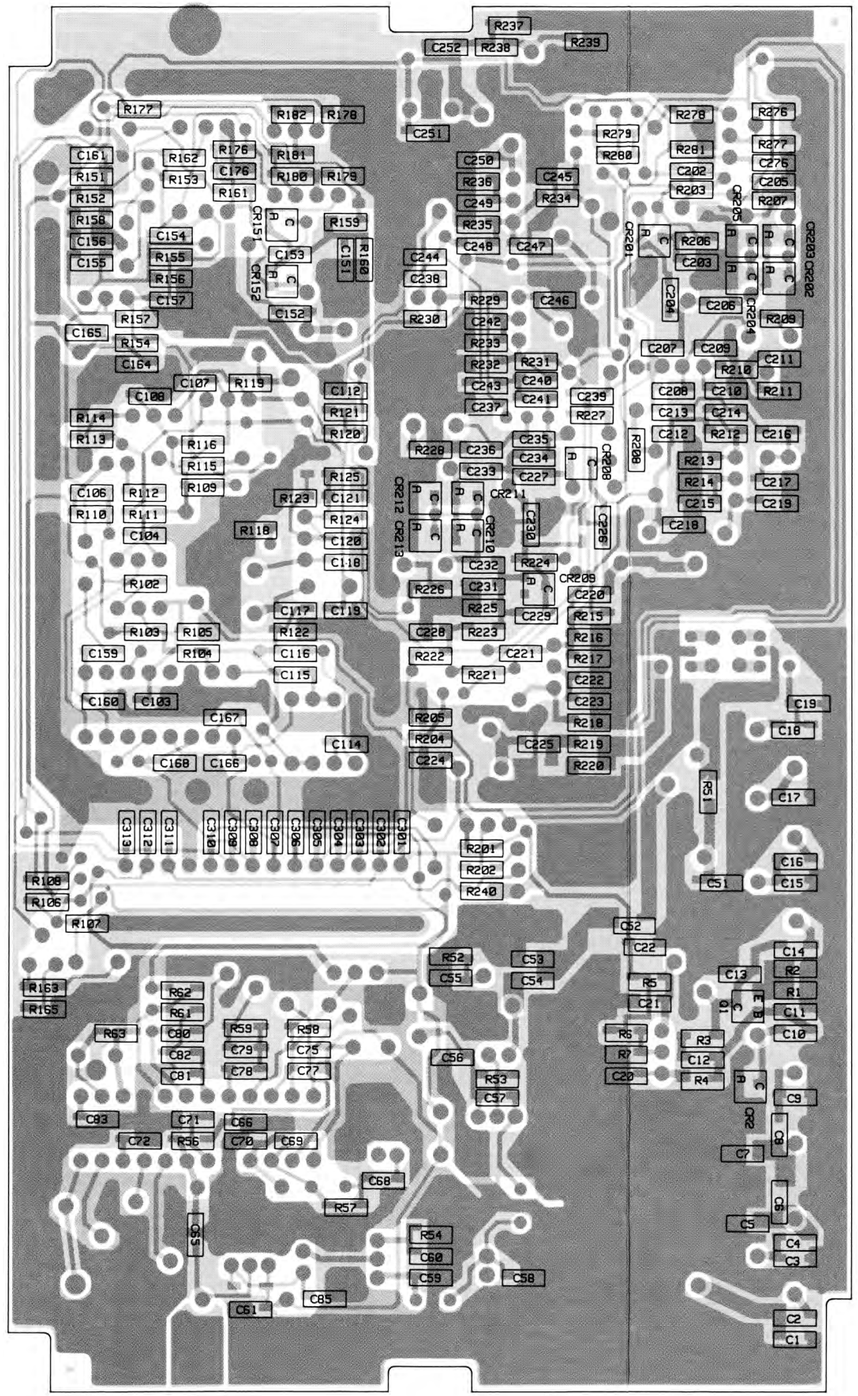


COMPONENT SIDE VIEW

SOLDER SIDE	RED	GAW–7702–O
COMPONENT SIDE	GREY	GAW–7701–O
OVERLAYS	BLACK	GDW–7703–O



SOLDER SIDE VIEW

Schematic, Circuit Board Diagrams, and
Parts List for HLD4322B VHF RF Board
PW–7576–O
(Sheet 2 of 3)
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parts list

HLD4322B *MaxTrac* VHF RF Board — MXW–7404–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C0001	21–13740B35	27 pF, ±5%, 50V
C0002	21–13740B39	39 pF, ±5%, 50V
C0003	21–13740B43	56 pF, ±5%, 50V
C0004	21–13740B29	15 pF, ±5%, 50V
C0005	21–13740B05	1.5 pF, ±5%, 50V
C0006	21–13740B11	2.7 pF, ±5%, 50V
C0007	21–13740B05	1.5 pF, ±5%, 50V
C0008	21–13740B29	15 pF, ±5%, 50V
C0009	21–13740B43	56 pF, ±5%, 50V
C0010	21–13740B39	39 pF, ±5%, 50V
C0011	21–13740B17	4.7 pF, ±5%, 50V
C0012	21–13740B65	470 pF, ±5%, 50V
C0013	21–13740B24	9.1 pF, ±5%, 50V
C0014	21–13740B63	390 pF, ±5%, 50V
C0015	21–13740B46	75 pF, ±5%, 50V
C0016	21–13740B34	24 pF, ±5%, 50V
C0017	21–13740B46	75 pF, ±5%, 50V
C0018	21–13740B35	27 pF, ±5%, 50V
C0019	21–13740B39	39 pF, ±5%, 50V
C0020,0021	21–11032B15	.22 uF, +80, –20%, 50V
C0022	21–13740B73	.001 uF, ±5%, 50V
C0051,0052	21–13740B35	27 pF, ±5%, 50V
C0053	21–13740B47	82 pF, ±5%, 50V
C0054	21–13740B61	330 pF, ±5%, 50V
C0055,0056	21–13741B45	.01 uF, ±5%, 50V
C0057	21–13740B31	18 pF, ±5%, 50V
C0058	21–13740B27	12 pF, ±5%, 50V
C0059	21–13740B31	18 pF, ±5%, 50V
C0060,0061	21–13741B45	.01 uF, ±5%, 50V
C0065	21–11032B15	.22 uF, +80, –20%, 50V
C0066	21–13741B45	.01 uF, ±5%, 50V
C0067	23–13749C39	10 uF, ±10%, 50V, tantalum
C0068	21–13740B33	22 pF, ±5%, 50V
C0069	21–13740B39	39 pF, ±5%, 50V
C0070	21–13740B29	15 pF, ±5%, 50V
C0071,0072	21–11032B15	.22 uF, +80, –20%, 50V
C0073	23–13749C39	10 uF, ±10%, 50V, tantalum
C0074	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0075	21–13741B69	.1 uF, ±5%, 50V
C0076	23–11048B05	1 uF, ±20%, 50V, electrolytic
C0077,0078	21–11032B15	.22 uF, +80, –20%, 50V
C0079	21–13741B29	.0022 uF, ±5%, 50V
C0080	21–11032B15	.22 uF, +80, –20%, 50V
C0081	21–13740B55	180 pF, ±5%, 50V
C0082,0083	21–11032B15	.22 uF, +80, –20%, 50V
C0084	21–82450B14	2.4 pF, ±5%, 500V
C0085	21–13740B27	12 pF, ±5%, 50V
C0101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0102	08–11051A13	.1 uF, ±5%, 63V
C0103,0104	21–13741B45	.01 uF, ±5%, 50V
C0105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0106	21–13740B29	15 pF, ±5%, 50V
C0107,0108	21–13741B69	.1 uF, ±5%, 50V
C0109	08–11051A13	.1 uF, ±5%, 63V
C0110	08–11051A19	1 uF, ±5%, 63V
C0111	08–11051A09	.022 uF, ±5%, 63V
C0113	08–11051A13	.1 uF, ±5%, 63V
C0114	21–13740B73	.001 uF, ±5%, 50V
C0115	21–13741B45	.01 uF, ±5%, 50V
C0116,0117	21–13740B73	.001 uF, ±5%, 50V
C0118	21–13740B29	15 pF, ±5%, 50V
C0119,0120	21–13740B73	.001 uF, ±5%, 50V
C0121	21–13740B29	15 pF, ±5%, 50V
C0151	21–13740B73	.001 uF, ±5%, 50V
C0152	21–13740B50	110 pF, ±5%, 50V
C0154	21–13741B45	.01 uF, ±5%, 50V
C0155,0156	21–13740B55	180 pF, ±5%, 50V
C0157	21–13741B45	.01 uF, ±5%, 50V
C0158	08–11051A15	.22 uF, ±5%, 63V
C0159	21–13740B35	27 pF, ±5%, 50V
C0160	21–13740B29	15 pF, ±5%, 50V
C0161	21–13740B73	.001 uF, ±5%, 50V
C0162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0163	08–11051A17	.47 uF, ±5%, 63V
C0164	21–13741B69	.1 uF, ±5%, 50V
C0165	21–13740B73	.001 uF, ±5%, 50V
C0166–0168	21–13740B49	100 pF, ±5%, 50V
C0176	21–13740B73	.001 uF, ±5%, 50V
C0201	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0205	21–13741B49	.015 uF, ±5%, 50V
C0206	21–13740B27	12 pF, ±5%, 50V
C0207	21–13740B29	15 pF, ±5%, 50V
C0208	21–13740B27	12 pF, ±5%, 50V
C0209	21–13740B23	8.2 pF, ±5%, 50V
C0210–212	21–13740B73	.001 uF, ±5%, 50V
C0213	21–13740B19	5.6 pF, ±5%, 50V
C0214	21–13740B13	3.3 pF, ±5%, 50V
C0215	21–13740B73	.001 uF, ±5%, 50V
C0216	21–13740B47	82 pF, ±5%, 50V

MXW–7404–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C0218	21–13741B45	.01 uF, ±5%, 50V
C0219	21–13740B13	3.3 pF, ±5%, 50V
C0220	21–13740B73	.001 uF, ±5%, 50V
C0221	21–13740B05	1.5 pF, ±5%, 50V
C0222	21–13741B45	.01 uF, ±5%, 50V
C0223	21–13740B13	3.3 pF, ±5%, 50V
C0224,0225	21–13740B73	.001 uF, ±5%, 50V
C0228	21–13741B45	.01 uF, ±5%, 50V
C0229,0230	21–13740B05	1.5 pF, ±5%, 50V
C0231	21–13740B38	36 pF, ±5%, 50V
C0233	21–13740B37	33 pF, ±5%, 50V
C0234	21–13740B29	15 pF, ±5%, 50V
C0235,0236	21–13740B23	8.2 pF, ±5%, 50V
C0237–0239	21–13740B73	.001 uF, ±5%, 50V
C0240	21–13740B13	3.3 pF, ±5%, 50V
C0241	21–13740B19	5.6 pF, ±5%, 50V
C0242	21–13740B73	.001 uF, ±5%, 50V
C0243	21–13740B47	82 pF, ±5%, 50V
C0245	21–13740B73	.001 uF, ±5%, 50V
C0246	21–13740B13	3.3 pF, ±5%, 50V
C0247	21–13740B73	.001 uF, ±5%, 50V
C0248	21–13740B05	1.5 pF, ±5%, 50V
C0249	21–13741B45	.01 uF, ±5%, 50V
C0250	21–13740B17	4.7 pF, ±5%, 50V
C0251,0252	21–13740B73	.001 uF, ±5%, 50V
C0253	21–13740B29	15 pF, ±5%, 50V
C0276	21–13741B45	.01 uF, ±5%, 50V
C0277,0278	23–11048B19	47 uF, +20%, 16V, electrolytic
C0301	21–13741B45	.01 uF, ±5%, 50V
diode (see note)		
CR0001	48–80236E16	Schottky
CR002	48–80154K03	Schottky
CR0051	48–83654H01	silicon
CR0101,0102	48–83654H01	silicon
CR0151,0152	48–80006E10	silicon
CR0153,0154	48–83654H01	silicon
CR0176	48–83654H02	silicon
CR0202–0205	48–80006E10	silicon
CR0206,0207	48–84616A01	hot carrier
CR0209–0213	48–80006E10	silicon
CR0214,0215	48–84616A01	hot carrier
filter		
FL0051	91–80097D06	6 element, ceramic
FL0052	91–80098D06	3 wire, ceramic
connector receptacle		
J0004,0005	09–80135M01	2 pin coax
J0006	09–80130M03	14 position socket
RF coil		
L0001–0007	24–80148M06	82 nH, 4.5 turns
L0008	24–80063M14	1.2 uH
L0051,0052	24–80063M09	.47 uH
L0053	24–80063M04	.18 uH
L0054	24–80063M21	4.7 uH
L0055	24–80164M02	1.8 turns, variable
L0056	24–80164M01	1:6 ratio, variable
L0057	24–80164M04	5.2 turns, variable
L0058	24–80063M21	4.7 uH
L0059	24–80164M03	4.3 turns, variable
L0060	24–80063M14	1.2 uH
L0061	25–80000E01	transmformer
L0101	24–80063M14	1.2 uH
L0102	24–11030B09	4.5 turns, brown
L0151	24–80299D01	17.75 turns, orange
L0152	24–80063M22	5.6 uH
L0202	24–80148M05	62 nH, 3.5 turns
L0203	24–80063M14	1.2 uH
L0204	24–11030B08	4.5 turns, brown
L0205–0207	24–80063M14	1.2 uH
L0208	24–11030B09	4.5 turns, brown
L0209	24–80063M14	1.2 uH
L0210	24–11030B12	7.5 turns, yellow
L0211	24–80063M14	1.2 uH
L0213	24–80148M08	82 nH, 4.5 turns
L0214	24–80063M14	1.2 uH
L0215	24–11030B12	7.5 turns, yellow
L0216–0218	24–80063M14	1.2 uH
L0219	24–11030B09	4.5 turns, brown
L0220	24–80063M14	1.2 uH
L0221	24–11030B14	9.5 turns, blue
L0222	24–80063M14	1.2 uH
transistor (see note)		
Q0001	48–80182D44	NPN
Q0002	48–00869643	N–channel
Q0051,0052	48–00869839	NPN
Q0053	48–00869642	NPN
Q0101	48–00869643	PNP
Q0102,0103	48–80182D20	NPN

MXW–7404–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R0053	06–11077A88	3.9k
Q0104	48–00869643	PNP
Q0105,0106	48–00869642	NPN
Q0107	48–00869658	NPN
Q0151	48–00869658	NPN
Q0152	48–00869643	PNP
Q0203	48–00869839	N–channel
Q0204,0205	48–00869658	NPN
Q0206	48–00869839	NPN
Q0207,0208	48–00869658	NPN
Q0276	48–00869642	NPN
Q0277–0279	48–00869643	PNP
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R0001,0002	06–11077A30	15
R0003	06–11077A66	470
R0004	06–11077A84	2.7k
R0005	06–11077A46	68
R0006	06–11077A86	3.3k
R0007	06–11077B03	15k
R0051	06–11077A43	51
R0052	06–11077A54	150
R0054	06–11077A54	150
R0056	06–11077B45	820k
R0057	06–11077A72	820
R0058	06–11077B31	220k
R0059	06–11077B27	150k
R0060	18–05500L08	22k, +20%, potentiometer
R0061	06–11077B19	68k
R0062	06–11077B09	27k
R0063	06–11077B21	82k
R0102	06–11077A62	330
R0103,0104	06–11077A98	10k
R0105	06–11077B11	33k
R0106	06–11077A74	1k
R0107	06–11077A78	1.5k
R0108,0109	06–11077A26	10
R0110	06–11077B03	15k
R0111	06–11077A72	820
R0112	06–11077A86	3.3k
R0113	06–11077A74	1k
R0114	06–11077A72	820
R0115	06–11077A70	680
R0116	06–11077A92	5.6k
R0118	06–11077A70	680
R0119	06–11077A90	4.7k
R0120,0121	06–11077A88	3.9k
R0122	06–11077A43	51
R0123	06–11077A50	100
R0124	06–11077A84	2.7k
R0125	06–11077A72	820
R0151	06–11077B15	47k
R0152	06–11077B11	33k
R0153	06–11077B15	47k
R0154	06–11077A34	22
R0155	06–11077A98	10k
R0156	06–11077B03	15k
R0157	06–11077A78	1.5k
R0158,0159	06–11077A74	1k
R0161	06–11077A98	10k
R0163	06–11077B07	22k
R0164	18–05500L08	22k, ±20%, potentiometer
R0165	06–11077B09	27k
R0176	06–11077G26	22.6k, ±1%
R0177	06–11077G28	23.7k, ±1%
R0178,0179	06–11077F91	10k, ±1%
R0180	06–11077G52	42.2k, ±1%
R0181	06–11077F91	10k, ±1%
R0182	06–11077G28	23.7k, ±1%
R0207,0208	06–11077A44	56
R0209	06–11077A52	120
R0210	06–11077A01	0 ohm
R0211	06–11077A98	10k
R0212	06–11077A84	2.7k
R0213	06–11077A72	820
R0214	06–11077A50	100
R0215	06–11077A84	2.7k
R0216	06–11077A72	820
R0217	06–11077A42	47
R0218	06–11077A50	100
R0219	06–11077A46	68
R0220	06–11077A50	100
R0222	06–11077A84	2.7k
R0223	06–11077B09	27k
R0224	06–11077B23	100k
R0225	06–11077B09	27k
R0226,0227	06–11077A44	56
R0228	06–11077A50	100
R0229	06–11077A01	0 ohm
R0230	06–11077A98	10k

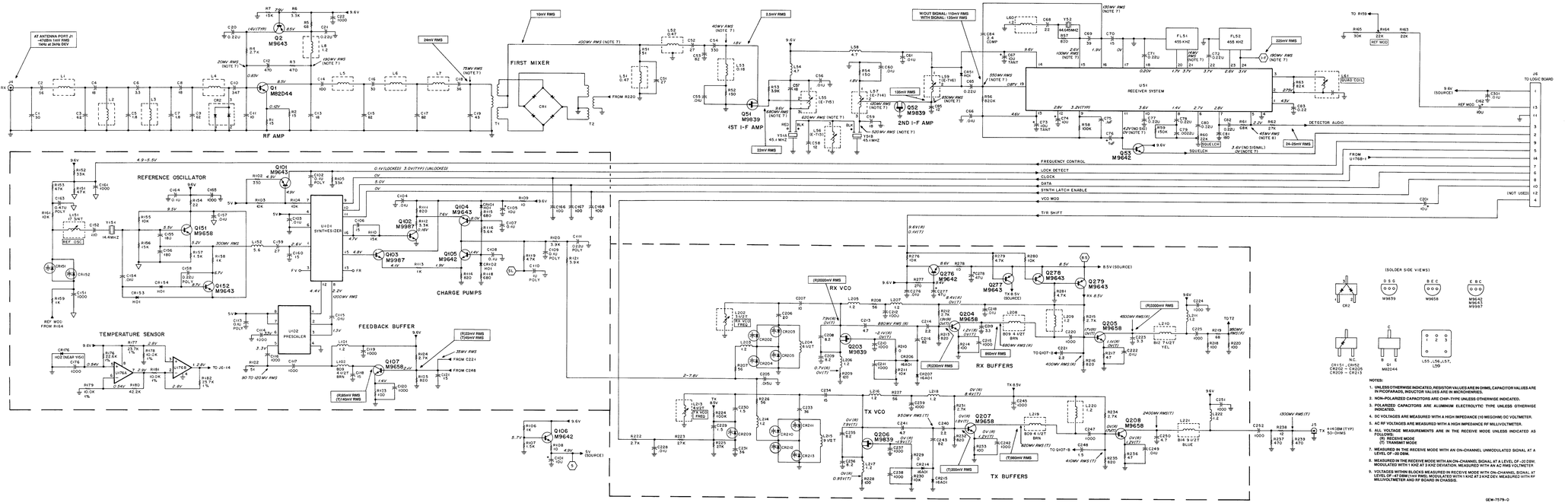
MXW–7404–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R0231	06–11077A84	2.7k
R0232	06–11077A72	820
R0233	06–11077A50	100
R0234	06–11077A84	2.7k
R0235	06–11077A72	820
R0236	06–11077A42	47
R0237	06–11077A66	470
R0238	06–11077A28	12
R0239	06–11077A66	470
R0241	06–11077B23	100k
R0276	06–11077A98	10k
R0277	06–11077A60	270
R0278	06–11077A26	10
R0279	06–11077A90	4.7k
R0280	06–11077A98	10k
R0281	06–11077A90	4.7k
transformer		
T0001,0002	25–80163M02	500 MHz balance transformer
integrated circuits (see note)		
U0051	51–05479G05	linear
U0101	51–84704M75	synthesizer
U0102	51–84810F66	dual divider
U0176	51–84621K89	dual opamp
crystal (see note)		
Y0051	91–80022M02	45.1 MHz
Y0052	48–80008K02	44.645 MHz
Y0151	48–80174D05	14.4 MHz
non–referenced parts		
	14–05160A01	insulator
M0201–0211	26–80098M01	coil can shield
	26–80097M01	coil can shield
M0004	26–80228L01	coax connector shield
M0005	26–80228L01	coax connector shield
M0002	26–80229L03	VCO shield
M4016	26–80256L02	coax connector bottom shield
	30–10286A72	24 strand wire, white
	54–80111F01	PROM label
	75–05295B07	crystal base pad, 2 used
	84–80927T01	circuit board

2/28/90

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

Schematic, Circuit Board Diagrams, and Parts List for HLD4322B VHF RF Board
PW–7576–O
(Sheet 3 of 3)
3/31/90



VHF RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	.83	.12	8.5	—	—	—
Q2	7.9	8.5	1.1	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	4.2	3.6	9.6	—	—	—
Q101	5.0	5.0	.1 (LOCKED)	—	—	—
Q102	0.7	0	0	—	—	—
Q103	4.8	4.1	9.6	—	—	—
Q104	8.1	7.6	2-8V	—	—	—
Q105	1.4	1.9	2-8V	—	—	—
Q106	5.7	4.9	9.6	—	—	—
Q107	2.1	1.4	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6.7	—	—	—
Q203	—	—	—	-2.1(R)	.7(R)	7.9
Q204	1.9(R)	1.2(R)	8.5	—	—	—
Q205	1.7(R)	1.1(R)	9.6	—	—	—
Q206	—	—	—	-1.9(T)	.95(T)	7.9
Q207	1.8(T)	1.2(T)	8.5	—	—	—
Q208	1.7(T)	1.2(T)	9.6	—	—	—
Q276	9.5	8.6	9.6	—	—	—
Q277	9.6	8.5(T)	8.5	—	—	—
Q278	9.6(R)	8.5	8.5	—	—	—
Q279	7.6(R)	8.5	8.5	—	—	—

Schematic, Circuit Board Diagrams, and Parts List for HLD4321B VHF RF Board

PW–7579–O

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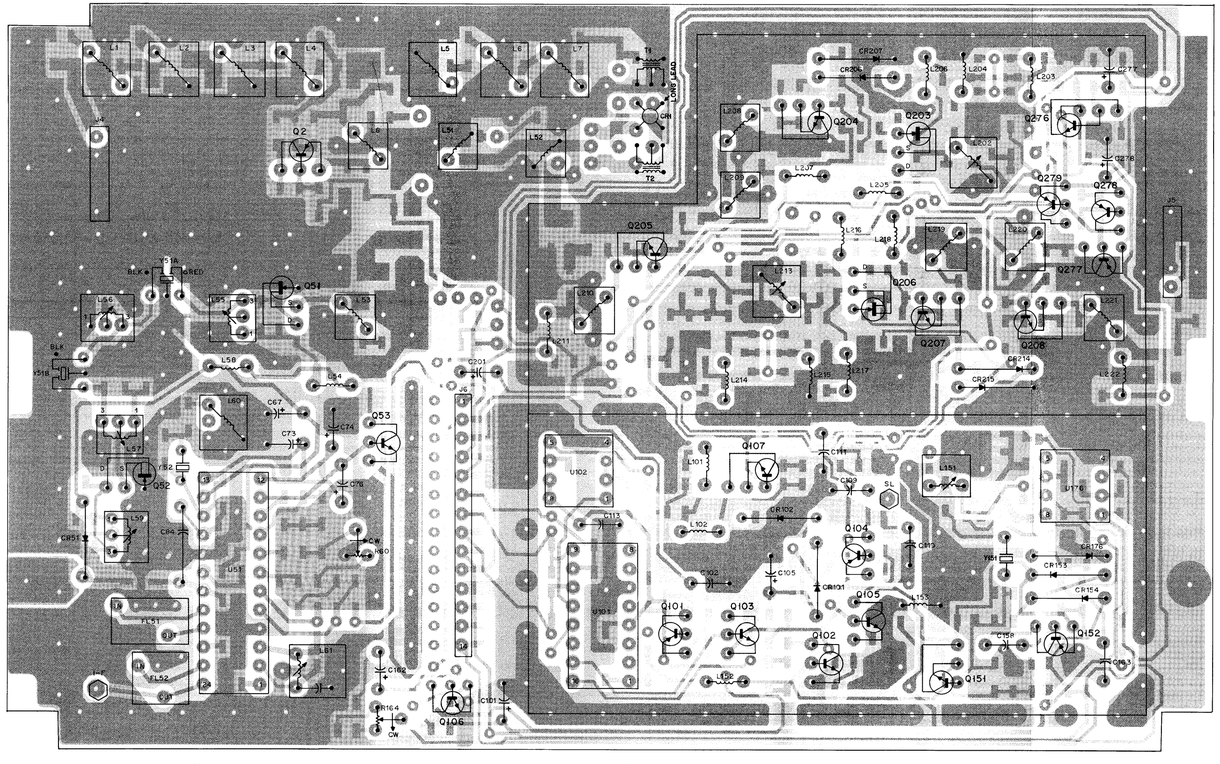
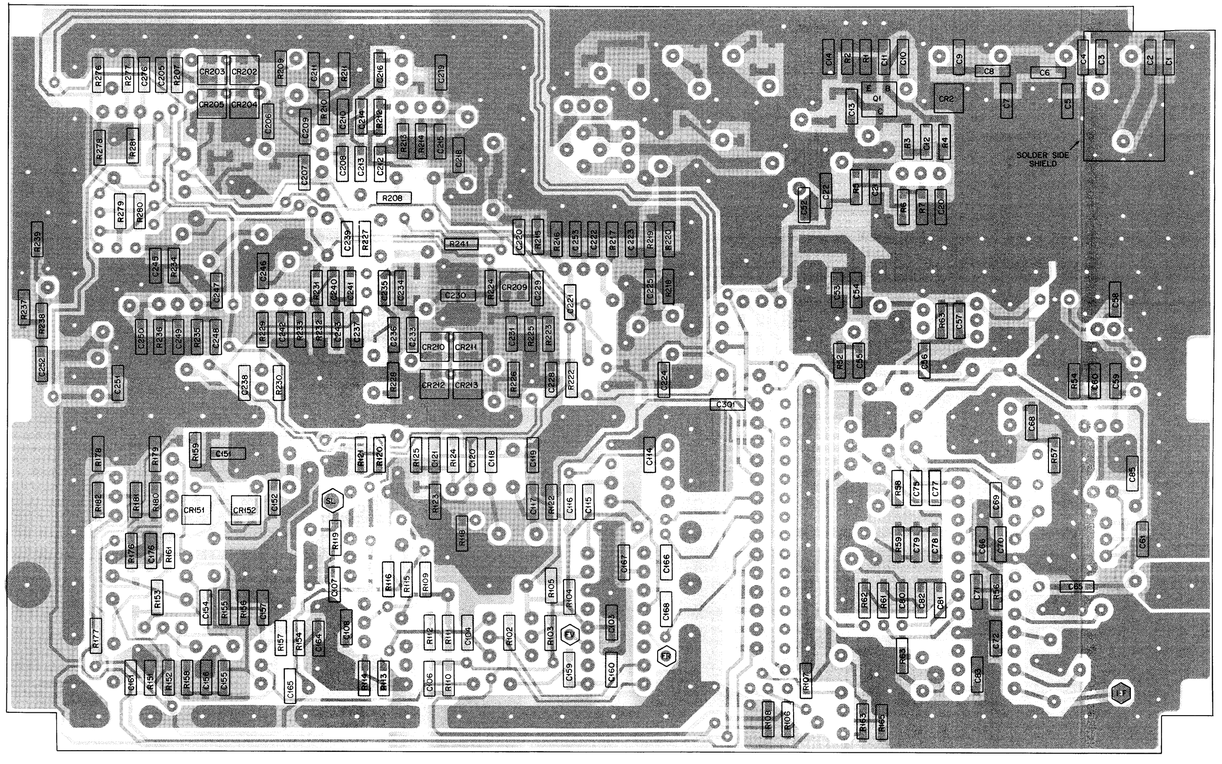


SOLDER SIDE RED GAW-7714-O
COMPONENT SIDE GRAY GAW-7715-O
OVERLAY BLACK GDW-7716-O

COMPONENT SIDE VIEW



SOLDER SIDE RED GAW-7714-O
COMPONENT SIDE GRAY GAW-7715-O
OVERLAY BLACK GDW-7889-O

SOLDER SIDE VIEW

Schematic, Circuit Board Diagrams, and
Parts List for HLD4321B VHF RF Board
PW–7578–O
(Sheet 2 of 3)
3/31/90

parts list

HLD4321B *MaxTrac* VHF 30 kHz RF Board — MXW–7405–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C0001	21–13740B36	30 pF, ±5%, 50V
C0002	21–13740B43	56 pF, ±5%, 50V
C0003	21–13740B44	62 pF, ±5%, 50V
C0004	21–13740B31	18 pF, ±5%, 50V
C0005	21–13740B07	1.8 pF, ±5%, 50V
C0006	21–13740B13	3.3 pF, ±5%, 50V
C0007	21–13740B07	1.8 pF, ±5%, 50V
C0008	21–13740B31	18 pF, ±5%, 50V
C0009	21–13740B44	62 pF, ±5%, 50V
C0010	21–13740B41	347pF, ±5%, 50V
C0011	21–13740B25	10 pF, ±5%, 50V
C0012	21–13740B65	470 pF, ±5%, 50V
C0013	21–13740B31	18 pF, ±5%, 50V
C0014	21–13740B49	100 pF, ±5%, 50V
C0015	21–13740B47	82 pF, ±5%, 50V
C0016	21–13740B36	30 pF, ±5%, 50V
C0017	21–13740B47	82 pF, ±5%, 50V
C0018	21–13740B38	36 pF, ±5%, 50V
C0019	21–13740B40	43 pF, ±5%, 50V
C0020,0021	21–11032B15	.22 uF, +80, –20%, 50V
C0022	21–13740B73	.001 uF, ±5%, 50V
C0051,0052	21–13740B35	27 pF, ±5%, 50V
C0053	21–13740B47	82 pF, ±5%, 50V
C0054	21–13740B61	330 pF, ±5%, 50V
C0055,0056	21–13741B45	.01 uF, ±5%, 50V
C0057	21–13740B31	18 pF, ±5%, 50V
C0058	21–13740B27	12 pF, ±5%, 50V
C0059	21–13740B31	18 pF, ±5%, 50V
C0060,0061	21–13741B45	.01 uF, ±5%, 50V
C0065	21–11032B15	.22 uF, +80, –20%, 50V
C0066	21–13741B45	.01 uF, ±5%, 50V
C0067	23–13749C39	10 uF, ±10%, 50V, tantalum
C0068	21–13740B33	22 pF, ±5%, 50V
C0069	21–13740B39	39 pF, ±5%, 50V
C0070	21–13740B29	15 pF, ±5%, 50V
C0071,0072	21–11032B15	.22 uF, +80, –20%, 50V
C0073	23–13749C39	10 uF, ±10%, 50V, tantalum
C0074	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0075	21–13741B69	.1 uF, ±5%, 50V
C0076	23–11048B05	1 uF, ±20%, 50V, electrolytic
C0077,0078	21–11032B15	.22 uF, +80, –20%, 50V
C0079	21–13741B29	.0022 uF, ±5%, 50V
C0080	21–11032B15	.22 uF, +80, –20%, 50V
C0081	21–13740B55	180 pF, ±5%, 50V
C0082,0083	21–11032B15	.22 uF, +80, –20%, 50V
C0084	21–82450B14	2.4 pF, ±5%, 500V
C0085	21–13740B27	12 pF, ±5%, 50V
C0101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0102	08–11051A13	.1 uF, ±5%, 63V
C0103,0104	21–13741B45	.01 uF, ±5%, 50V
C0105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0106	21–13740B29	15 pF, ±5%, 50V
C0107,0108	21–13741B69	.1 uF, ±5%, 50V
C0109	08–11051A13	.1 uF, ±5%, 63V
C0110	08–11051A19	1 uF, ±5%, 63V
C0111	08–11051A09	.022 uF, ±5%, 63V
C0113	08–11051A13	.1 uF, ±5%, 63V
C0114	21–13740B73	.001 uF, ±5%, 50V
C0115	21–13741B45	.01 uF, ±5%, 50V
C0116,0117	21–13740B73	.001 uF, ±5%, 50V
C0118	21–13740B29	15 pF, ±5%, 50V
C0119,0120	21–13740B73	.001 uF, ±5%, 50V
C0121	21–13740B29	15 pF, ±5%, 50V
C0151	21–13740B73	.001 uF, ±5%, 50V
C0152	21–13740B50	110 pF, ±5%, 50V
C0154	21–13741B45	.01 uF, ±5%, 50V
C0155	21–13740B55	180 pF, ±5%, 50V
C0156,0157	21–13740B55	180 pF, ±5%, 50V
C0158	08–11051A15	.22 uF, ±5%, 63V
C0159	21–13740B35	27 pF, ±5%, 50V
C0160	21–13740B29	15 pF, ±5%, 50V
C0161	21–13740B73	.001 uF, ±5%, 50V
C0162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0163	08–11051A17	.47 uF, ±5%, 63V
C0164	21–13741B69	.1 uF, ±5%, 50V
C0165	21–13740B73	.001 uF, ±5%, 50V
C0166–0168	21–13740B49	100 pF, ±5%, 50V
C0176	21–13740B73	.001 uF, ±5%, 50V
C0201	23–11048B13	10 uF, ±20%, 16V, electrolytic
C0205	21–13741B49	.015 uF, ±5%, 50V
C0206	21–13740B32	20 pF, ±5%, 50V
C0207	21–13740B25	10 pF, ±5%, 50V
C0208,0209	21–13740B23	8.2 pF, ±5%, 50V
C0210–0212	21–13740B73	.001 uF, ±5%, 50V
C0213	21–13740B17	4.7 pF, ±5%, 50V
C0214	21–13740B09	2.2 pF, ±5%, 50V
C0215	21–13740B73	.001 uF, ±5%, 50V
C0216	21–13740B47	82 pF, ±5%, 50V
C0218	21–13741B45	.01 uF, ±5%, 50V
C0219	21–13740B13	3.3 pF, ±5%, 50V
C0220	21–13740B73	.001 uF, ±5%, 50V
C0221	21–13740B09	2.2 pF, ±5%, 50V
C0222	21–13741B45	.01 uF, ±5%, 50V
C0223	21–13740B13	3.3 pF, ±5%, 50V
C0224,0225	21–13740B73	.001 uF, ±5%, 50V
C0228	21–13741B45	.01 uF, ±5%, 50V
C0229,0230	21–13740B05	1.5 pF, ±5%, 50V
C0231	21–13740B38	36 pF, ±5%, 50V
C0233	21–13740B38	36 pF, ±5%, 50V

MXW–7405–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C0234	21–13740B29	15 pF, ±5%, 50V
C0235,0236	21–13740B23	8.2 pF, ±5%, 50V
C0237–0239	21–13740B73	.001 uF, ±5%, 50V
C0240	21–13740B09	2.2 pF, ±5%, 50V
C0241	21–13740B17	4.7 pF, ±5%, 50V
C0242	21–13740B73	.001 uF, ±5%, 50V
C0243	21–13740B47	82 pF, ±5%, 50V
C0245	21–13740B73	.001 uF, ±5%, 50V
C0247	21–13740B73	.001 uF, ±5%, 50V
C0248	21–13740B05	1.5 pF, ±5%, 50V
C0249	21–13741B45	.01 uF, ±5%, 50V
C0250	21–13740B17	4.7 pF, ±5%, 50V
C0251,0252	21–13740B73	.001 uF, ±5%, 50V
C0276	21–13741B45	.01 uF, ±5%, 50V
C0277,0278	23–11048B19	47 uF, ±20%, 16V, electrolytic
C0301	21–13741B45	.01 uF, ±5%, 50V
diode (see note)		
CR0001	48–80236E16	Schottky
CR002	48–80154K03	Schottky
CR0051	48–83654H01	silicon
CR0101,0102	48–83654H01	silicon
CR0151,0152	48–80006E10	silicon
CR0153,0154	48–83654H01	silicon
CR0176	48–83654H02	silicon
CR0202–0205	48–05129M21	silicon
CR0206,0207	48–84616A01	hot carrier
CR0209–0213	48–05129M21	silicon
CR0214,0215	48–84616A01	hot carrier
filter		
FL0051	91–80097D06	6 element, ceramic
FL0052	91–80098D06	3 wire, ceramic
connector receptacle		
J0004,0005	09–80135M01	2 pin coax
J0006	09–80130M03	14 position socket
RF coil		
L0001–0007	24–80148M06	82 nH, 4.5 turns
L0008	24–80063M14	1.2 uH
L0051,0052	24–80063M09	.47 uH
L0053	24–80063M04	.18 uH
L0054	24–80063M21	4.7 uH
L0055	24–80164M02	1.8 turns, variable
L0056	24–80164M01	1:6 ratio, variable
L0057	24–80164M04	5.2 turns, variable
L0058	24–80063M21	4.7 uH
L0059	24–80164M03	4.3 turns, variable
L0060	24–80063M14	1.2 uH
L0061	25–80000E01	transmformer
L0101	24–80063M14	1.2 uH
L0102	24–11030B09	4.5 turns, brown
L0151	24–80299D01	17.75 turns, orange
L0152	24–80063M22	5.6 uH
L0202	24–80148M05	62 nH, 3.5 turns
L0203	24–80063M14	1.2 uH
L0204	24–11030B11	6.5 turns, orange
L0205	24–80063M14	1.2 uH
L0206,0207	24–80063M14	1.2 uH
L0208	24–11030B09	4.5 turns, brown
L0209	24–80063M14	1.2 uH
L0210	24–11030B12	7.5 turns, yellow
L0211	24–80063M14	1.2 uH
L0213	24–80148M08	82 nH, 4.5 turns
L0214	24–80063M14	1.2 uH
L0215	24–11030B14	9.5 turns, blue
L0216–0218	24–80063M14	1.2 uH
L0219	24–11030B09	4.5 turns, brown
L0220	24–80063M14	1.2 uH
L0221	24–11030B14	9.5 turns, blue
L0222	24–80063M14	1.2 uH
transistor (see note)		
Q0001	48–80182D44	NPN
Q0002	48–00869643	N–channel
Q0051,0052	48–00869839	NPN
Q0053	48–00869642	NPN
Q0101	48–00869643	PNP
Q0102,0103	48–80182D20	NPN
Q0104	48–00869643	PNP
Q0105,0106	48–00869642	NPN
Q0107	48–00869658	NPN
Q0151	48–00869658	NPN
Q0152	48–00869643	PNP
Q0203	48–00869839	N–channel
Q0204,0204	48–00869658	NPN
Q0206	48–00869839	N–channel
Q0207,0208	48–00869658	NPN
Q0276	48–00869642	NPN
Q0277–0279	48–00869643	PNP
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R0001,0002	06–11077A30	15
R0003	06–11077A66	470
R0004	06–11077A84	2.7k
R0005	06–11077A46	68
R0006	06–11077A86	3.3k
R0007	06–11077B03	15k
R0051	06–11077A43	51
R0052	06–11077A54	150
R0053	06–11077A88	3.9k
R0054	06–11077A54	150

MXW–7405–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R0056	06–11077B45	820k
R0057	06–11077A72	820
R0058	06–11077B23	100k
R0059	06–11077B27	150k
R0060	18–05500L08	22k, ±20%, potentiometer
R0061	06–11077B19	68k
R0062	06–11077B09	27k
R0063	06–11077B21	82k
R0102	06–11077A62	330
R0103,0104	06–11077A98	10k
R0105	06–11077B11	33k
R0106	06–11077A74	1k
R0107	06–11077A78	1.5k
R0108,0109	06–11077A26	10
R0110	06–11077B03	15k
R0111	06–11077A72	820
R0112	06–11077A86	3.3k
R0113	06–11077A74	1k
R0114	06–11077A72	820
R0115	06–11077A70	680
R0116	06–11077A92	5.6k
R0118	06–11077A70	680
R0119	06–11077A90	4.7k
R0120,0121	06–11077A88	3.9k
R0122	06–11077A43	51
R0123	06–11077A50	100
R0124	06–11077A84	2.7k
R0125	06–11077A72	820
R0151	06–11077B15	47k
R0152	06–11077B11	33k
R0153	06–11077B15	47k
R0154	06–11077A34	22
R0155	06–11077A98	10k
R0156	06–11077B03	15k
R0157	06–11077A78	1.5k
R0158,0159	06–11077A74	1k
R0161	06–11077A98	10k
R0163	06–11077B07	22k
R0164	18–05500L08	22k, ±20%, potentiometer
R0165	06–11077B10	30k
R0176	06–11077G26	22.6k, ±1%
R0177	06–11077G28	23.7k, ±1%
R0178,0179	06–11077F91	10k, ±1%
R0180	06–11077G52	42.2k, ±1%
R0181	06–11077F91	10k, ±1%
R0182	06–11077G28	23.7k, ±1%
R0207,0208	06–11077A44	56
R0209	06–11077A52	120
R0210	06–11077A01	0 ohm
R0211	06–11077A98	10k
R0212	06–11077A84	2.7k
R0213	06–11077A72	820
R0214	06–11077A50	100
R0215	06–11077A84	2.7k
R0216	06–11077A72	820
R0217	06–11077A42	47
R0218	06–11077A50	100
R0219	06–11077A46	68
R0220	06–11077A50	100
R0222	06–11077A84	2.7k
R0223	06–11077B09	27k
R0224	06–11077B23	100k
R0225	06–11077B09	27k
R0226,0227	06–11077A44	56
R0228	06–11077A50	100
R0229	06–11077A01	0 ohm
R0230	06–11077A98	10k
R0231	06–11077A84	2.7k
R0232	06–11077A72	820
R0233	06–11077A50	100
R0234	06–11077A84	2.7k
R0235	06–11077A72	820
R0236	06–11077A42	47
R0237	06–11077A66	470
R0238	06–11077A28	12
R0239	06–11077A66	470
R0241	06–11077B23	100k
R0276	06–11077A98	10k
R0277	06–11077A60	270
R0278	06–11077A26	10
R0279	06–11077A90	4.7k
R0280	06–11077A98	10k
R0281	06–11077A90	4.7k
transformer		
T0001,0002	25–80163M02	500 MHz balance transformer
integrated circuits (see note)		
U0051	51–05479G05	linear
U0101	51–84704M75	synthesizer
U0102	51–84810F66	dual divider
U0176	51–84621K89	dual opamp
crystal (see note)		
Y0051	91–80022M02	45.1 MHz
Y0052	48–80008K02	44.645 MHz
Y0151	48–80174D05	14.4 MHz
non–referenced parts		
	26–80228L01	coax connector shield
	26–80228L01	coax connector shield
	26–80229L03	VCO shield

MXW–7405–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	14–05160A01	insulator
	26–80098M01	coil can shield (10 used)
	26–80097M01	coil can shield
	26–80256L02	coax connector bottom shield
	30–10286A72	24 strand wire, white
	54–80111F01	PROM label
	75–05295B07	crystal base pad, 2 used
	84–80232L01	circuit board

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

Schematic, Circuit Board Diagrams, and Parts List for HLD4321B VHF RF Board
PW–7578–O
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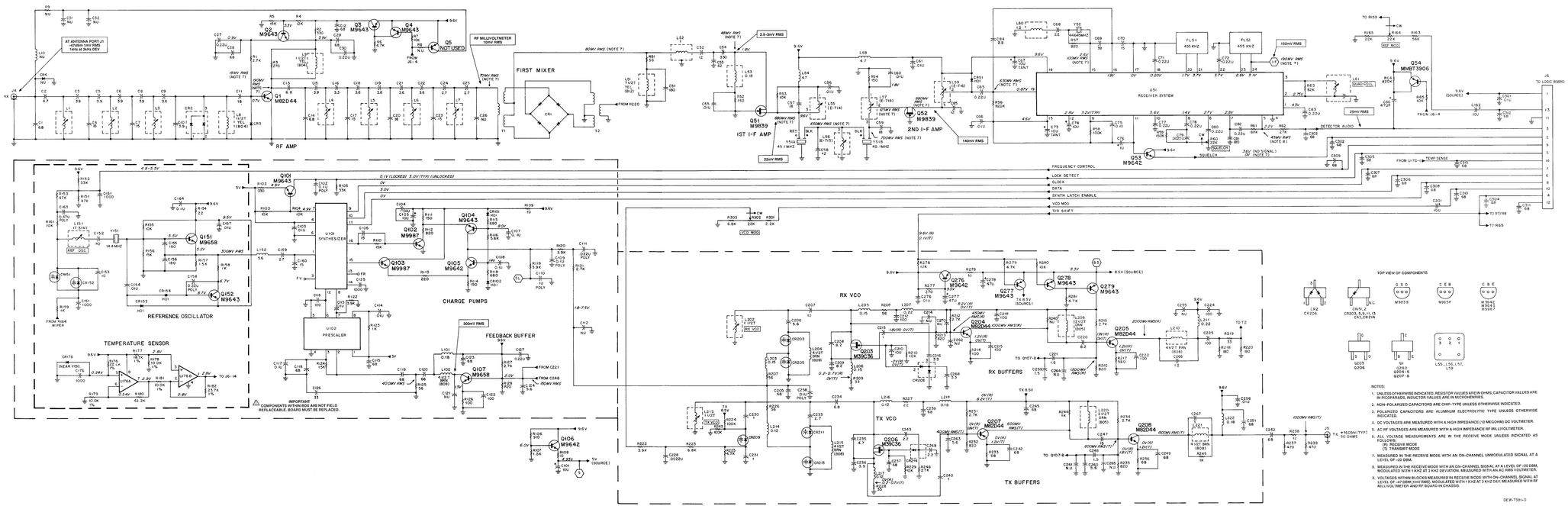
MaxTrac UHF RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	.7	0	5.9	—	—	—
Q2	5.3	5.9	.9	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	0	0 (W/ SIG)	9.6	—	—	—
Q101	5.0	4.9	.1 (LOCKED)	—	—	—
Q102	.7	0	0.1	—	—	—
Q103	5.0	4.4	9.6	—	—	—
Q104	8.1	2.8v	2-8v	—	—	—
Q105	1.4	VAR.	2-8v	—	—	—
Q106	6.0	5.0	9.6	—	—	—
Q107	2.0	1.3	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6.7	—	—	—
Q201	—	9.6	0(U) 9.3(L)	U=UPPER L=LOWER RANGE		
Q202	0(U).7(L)	0	6.7(U)0(L)	—	—	—
Q203	—	—	—	2.6(R)	4.8(R)	7.9(R)
Q204	1.8(R)	1.2(R)	8.2(R)	—	—	—
Q205	1.8(R)	1.2(R)	9.6	—	—	—
Q206	—	—	—	~.5(T)	1.1(T)	7.8(T)
Q207	1.8(T)	1.2(T)	8.5(T)	—	—	—
Q208	1.8(T)	1.2(T)	9.6	—	—	—
Q276	9.5	8.6	9.6	—	—	—
Q277	9.6	8.5(T)	8.5	—	—	—
Q278	9.6	8.3	7.6(R)	—	—	—
Q279	7.6(R)	8.5	8.5	—	—	—



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN PICOFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
5. AC RF VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE RF MILLIVOLTMETER.
6. ALL VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL UNMODULATED SIGNAL AT A LEVEL OF +20 DBM.
8. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF –47 DBM (1kHz RMS), MODULATED WITH 1 kHZ AT 3 kHZ DEV. MEASURED WITH RF MILLIVOLTMETER AND RF BOARD IN CHASSIS.
9. VOLTAGES WITHIN BLOCKS MEASURED IN RECEIVE MODE WITH ON-CHANNEL SIGNAL AT LEVEL OF –47 DBM (1kHz RMS), MODULATED WITH 1 kHZ AT 3 kHZ DEV. MEASURED WITH RF MILLIVOLTMETER AND RF BOARD IN CHASSIS.

SEW-7581-O

Schematic, Circuit Board Diagrams, and Parts List for HLE9310A UHF RF Board
PW–7580–O
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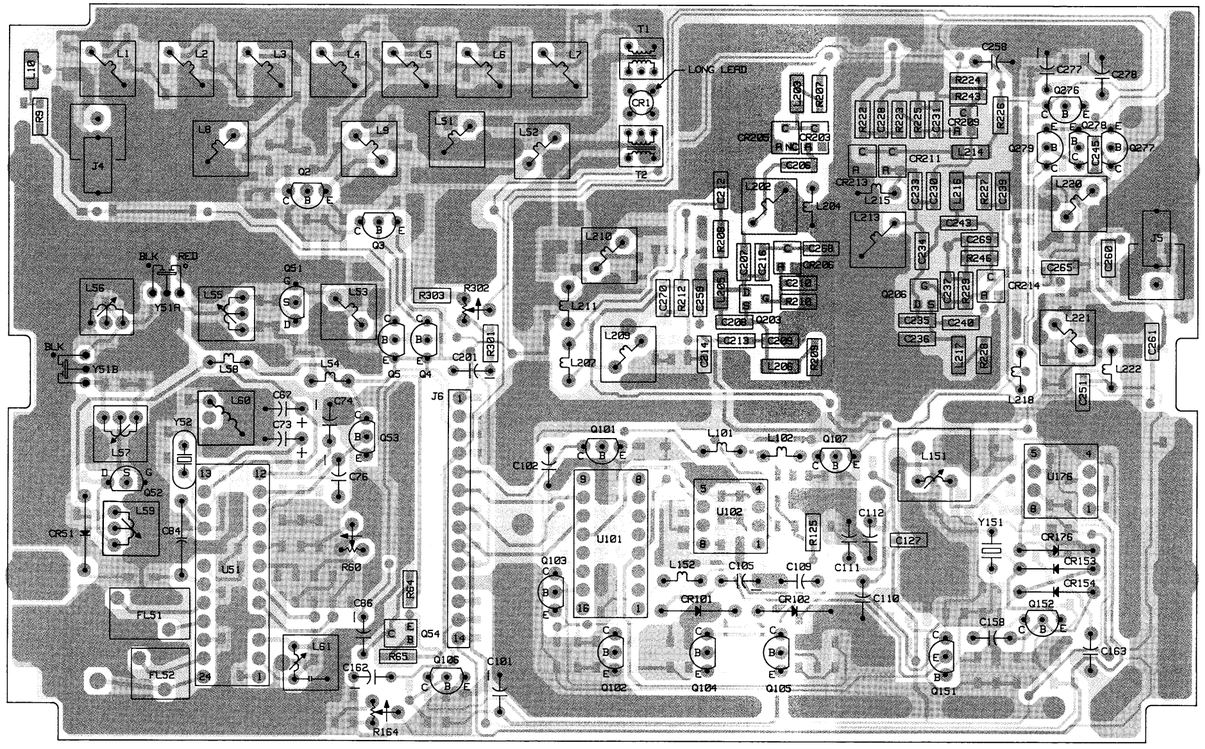
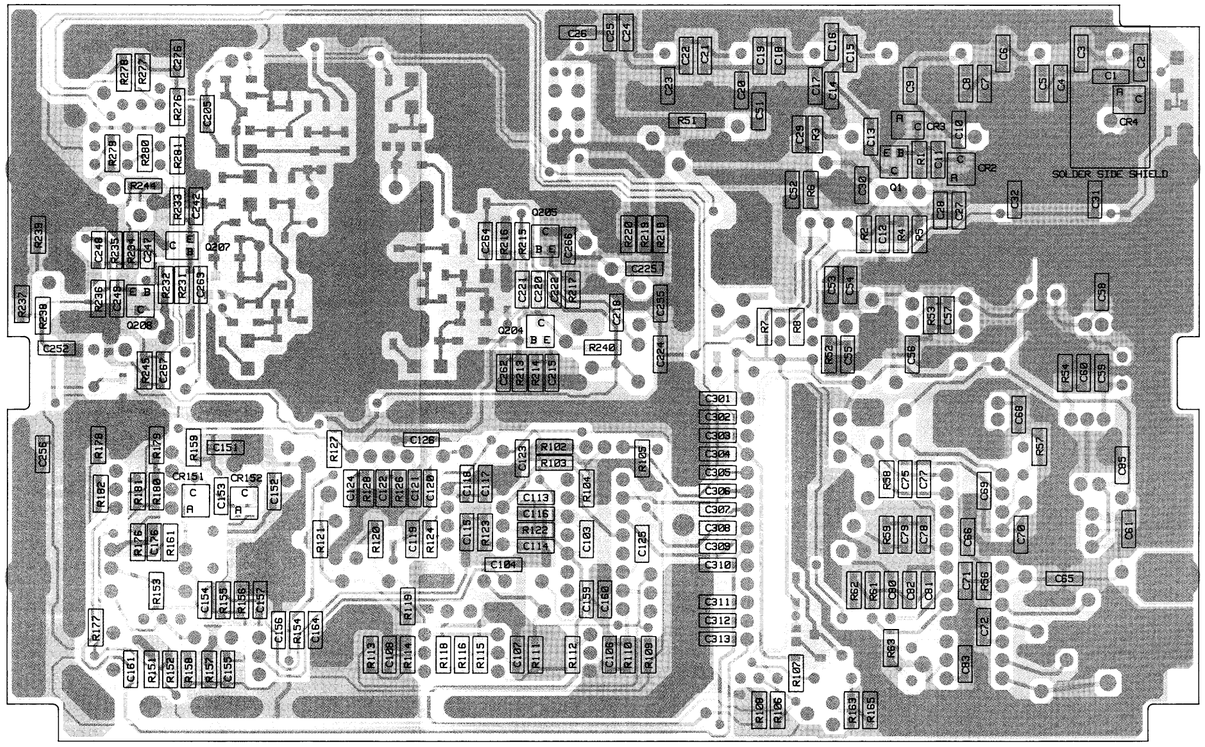


SOLDER SIDE GCW–7617–O
COMPONENT SIDE GCW–7616–O
OVERLAY GCW–7618–O

COMPONENT SIDE VIEW



SOLDER SIDE GCW–7617–O
COMPONENT SIDE GCW–7616–O
OVERLAY GCW–7619–O

SOLDER SIDE VIEW

Schematic, Circuit Board Diagrams, and
Parts List for HLE9310A UHF RF Board
PW–7580–O
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parts list

HLE9310A UHF RF Board — MXW–7406–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C1	21–13740B21	6.8 pF, ±5%, 50V
C2	21–13740B17	4.7 pF, ±5%, 50V
C3	21–13740B15	3.9 pF, ±5%, 50V
C4	21–13740B29	15 pF, ±5%, 50V
C5,6	21–13740B15	3.9 pF, ±5%, 50V
C7	21–13740B29	15 pF, ±5%, 50V
C8	21–13740B15	3.9 pF, ±5%, 50V
C9	21–13740B14	3.6 pF, ±5%, 50V
C10	21–13740B15	3.9 pF, ±5%, 50V
C11	21–13740B31	18 pF, ±5%, 50V
C12	21–13740B45	68 pF, ±5%, 50V
C13,14	21–13740B21	6.8 pF, ±5%, 50V
C15	21–13740B15	3.9 pF, ±5%, 50V
C16	21–13740B13	3.3 pF, ±5%, 50V
C17	21–13740B29	15 pF, ±5%, 50V
C18,19	21–13740B14	3.6 pF, ±5%, 50V
C20	21–13740B30	16 pF, ±5%, 50V
C21,22	21–13740B14	3.6 pF, ±5%, 50V
C23	21–13740B29	15 pF, ±5%, 50V
C24,25	21–13740B11	2.7 pF, ±5%, 50V
C27	21–11032B15	.22 uF, +80, –20%, 50V
C28,29	21–13740B45	68 pF, ±5%, 50V
C30	21–11032B15	.22 uF, +80, –20%, 50V
C51	21–13740B55	180 pF, ±5%, 50V
C52	21–13740B27	12 pF, ±5%, 50V
C53	21–13740B47	82 pF, ±5%, 50V
C54	21–13740B61	330 pF, ±5%, 50V
C55,56	21–13741B45	.01 uF, ±5%, 50V
C57	21–13740B31	18 pF, ±5%, 50V
C58	21–13740B27	12 pF, ±5%, 50V
C59	21–13740B31	18 pF, ±5%, 50V
C60,61	21–13741B45	.01 uF, ±5%, 50V
C65	21–11032B15	.22 uF, +80, –20%, 50V
C66	21–13741B45	.01 uF, ±5%, 50V
C67	23–13749C39	10 uF, ±10%, 50V, tantalum
C68	21–13740B33	22 pF, ±5%, 50V
C69	21–13740B39	39 pF, ±5%, 50V
C70	21–13740B29	15 pF, ±5%, 50V
C71	21–11032B15	.22 uF, +80, –20%, 50V
C72	21–11032B15	.22 uF, +80, –20%, 50V
C73	23–13749C39	10 uF, ±10%, 50V, tantalum
C74	23–11048B13	10 uF, ±20%, 16V, electrolytic
C75	21–13741B69	.1 uF, ±5%, 50V
C76	23–11048B05	1 uF, ±20%, 50V, electrolytic
C77,78	21–11032B15	.22 uF, +80, –20%, 50V
C79	21–13741B29	.0022 uF, ±5%, 50V
C80	21–11032B15	.22 uF, +80, –20%, 50V
C81	21–13740B55	180 pF, ±5%, 50V
C82,83	21–11032B15	.22 uF, +80, –20%, 50V
C84	21–13740B09	2.2 pF, ±5%, 50V
C85	21–13740B27	12 pF, ±5%, 50V
C86	23–11048B49	47 uF, ±20%, 16V, electrolytic
C101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C102	08–11051A13	.1 uF, ±5%, 63V
C103,104	21–13741B45	.01 uF, ±5%, 50V
C105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C106	21–13740B29	15 pF, ±5%, 50V
C107,108	21–13741B69	.1 uF, ±5%, 50V
C109	08–11051A13	.1 uF, ±5%, 63V
C110	08–11051A19	1 uF, ±5%, 63V
C111	08–11051A09	.022 uF, ±5%, 63V
C113–114	21–13741B45	.01 uF, ±5%, 50V
C115	21–13740B45	68 pF,±5%, 50V
C116	21–13740B49	100 pF, ±5%, 50V
C117	21–13741B69	.1 uF, ±5%, 50V
C118–120	21–13740B45	68 pF, ±5%, 50V
C121		not used
C122	21–13740B49	100 pF, ±5%, 50V
C123	21–13740B45	68 pF, ±5%, 50V
C124	21–13740B19	5.6 pF, ±5%, 50V
C125	21–13740B73	.001 uF, ±5%, 50V
C126	21–13740B37	33 pF, ±5%, 50V
C127	21–11032B15	.22 uF, +80, –20%, 50V
C151	21–13740B73	.001 uF, ±5%, 50V
C152	21–13740B47	82 pF, ±5%, 50V
C153	21–13740B25	10 pF, ±5%, 50V
C154	21–13741B45	.01 uF, ±5%, 50V
C155,156	21–13740B55	180 pF, ±5%, 50V
C157	21–13741B45	.01 uF, ±5%, 50V
C158	08–11051A15	.22 uF, ±5%, 63V
C159	21–13740B35	27 pF, ±5%, 50V
C160	21–13740B29	15 pF, ±5%, 50V
C161	21–13740B73	.001 uF, ±5%, 50V
C162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C163	08–11051A17	.47 uF, ±5%, 63V
C164	21–13741B69	.1 uF, ±5%, 50V
C165		not used
C166		not used
C167		not used
C168		not used
C176	21–13740B73	.001 uF, ±5%, 50V
C201	23–11048B13	10 uF, ±20%, 16V, electrolytic
C205	21–13740B45	68 pF, ±5%, 50V
C206	21–13740B19	5.6 pF, ±5%, 50V
C207	21–13740B27	12 pF, ±5%, 50V
C208,209	21–13740B23	8.2 pF, ±5%, 50V
C210	21–13740B49	100 pF, ±5%, 50V
C211		not used
C212	21–13740B49	100 pF, ±5%, 50V

MXW–7406–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C213	21–13740B01	1 pF, ±5%, 50V
C121		not used
C215	21–13740B49	100 pF, ±5%, 50V
C216	21–13740B13	3.3 pF, ±5%, 50V
C218	21–13741B49	100 pF, ±5%, 50V
C219		not used
C220	21–13740B23	8.2 pF, ±5%, 50V
C221	21–13740B05	1.5 pF, ±5%, 50V
C222	21–13740B49	100 pF, ±5%, 50V
C223		not used
C224,225	21–13740B49	100 pF, ±5%, 50V
C228	21–13741B29	.0022 uF, ±5%, 50V
C229		not used
C230,231	21–13740B01	1 pF, ±5%, 50V
C233	21–13740B11	2.7 pF, ±5%, 50V
C234	21–13740B21	6.8 pF, ±5%, 50V
C235	21–13740B17	4.7 pF, ±5%, 50V
C236	21–13740B15	3.9 pF, ±5%, 50V
C237	21–13740B45	68 pF, ±5%, 50V
C238		not used
C239	21–13740B45	68 pF, ±5%, 50V
C240	21–13740B01	1 pF, ±5%, 50V
C241		not used
C242	21–13740B45	68 pF, ±5%, 50V
C243	21–13740B09	2.2 pF, ±5%, 50V
C245	21–13740B45	68 pF, ±5%, 50V
C246		not used
C247	21–13740B29	15 pF, ±5%, 50V
C248	21–13740B05	1.5 pF, ±5%, 50V
C249	21–13740B45	68 pF, ±5%, 50V
C250		not used
C251,252	21–13740B45	68 pF, ±5%, 50V
C253		not used
C256	21–13741B45	.01 uF, ±5%, 50V
C258	08–11051A07	.01 uF, ±5%, 63V
C259	21–13740B22	7.5 pF, ±5%, 50V
C260	21–13740B19	5.6 pF, ±5%, 50V
C263	21–13740B19	5.6 pF, ±5%, 50V
C266	21–13740B03	1.2 pF, ±5%, 50V
C267	21–13740B01	1 pF, ±5%, 50V
C268	21–13740B13	3.3 pF, ±5%, 50V
C269	21–13740B09	2.2 pF, ±5%, 50V
C276	21–13741B45	.01 uF, ±5%, 50V
C277,278	23–11048B19	47 uF, ±20%, 16V, electrolytic
C301	21–13741B45	.01 uF, ±5%, 50V
C302–313	21–13740B45	68 pF, ±5%, 50V
diode (see note)		
CR1	48–80236E16	Schottky
CR2	48–80154K02	Schottky
CR3	48–80939T01	Schottky
CR51	48–83654H01	silicon
CR101,102	48–83654H01	silicon
CR151,152	48–05129M21	varactor
CR153,154	48–83654H01	silicon
CR176	48–83654H02	silicon
CR203	48–84534N02	varactor
CR205	48–84534N02	varactor
CR206	48–80154K02	Schottky
CR209	48–84534N02	varactor
CR211	48–84534N02	varactor
CR213	48–84534N02	varactor
CR214	48–80939T01	Schottky
filter		
FL51	91–80097D06	6 element, ceramic
FL52	91–80098D06	3 element, ceramic
connector receptacle		
J4,5	09–80135M01	2 pin coax
J6	09–80130M03	14 position socket
RF coil		
L1–7	24–80148M01	27 nH, 1.5 turns
L8,9	24–11030B04	1.5 turns, yellow
L51	24–11030B12	7.5 turns, yellow
L52	24–80063M13	1 uH
L53	24–80063M04	.18 uH
L54	24–80063M21	4.7 uH
L55	24–80164M04	5.2 turns, variable
L56	24–80164M01	1:6 ratio, variable
L57	24–80164M04	5.2 turns, variable
L58	24–80063M21	4.7 uH
L59	24–80164M03	4.3 turns, variable
L60	24–80063M14	1.2 uH
L61	25–80000E01	transmformer
L101	24–80063M04	.18 uH
L102	24–11030B08	4.5 turns, brown
L151	24–80299D01	17.75 turns, orange
L152	24–80063M22	5.6 uH
L202	24–80148M01	27 nH, 1.5 turns
L203	24–80989T02	150 nH, ±20%
L204	24–11030B09	4.5 turns, brown
L205,206	24–80989T02	150 nH, ±20%
L207	24–80063M05	.22 uH
L209	24–11030B05	2.5 turns, green
L210	24–11030B08	4.5 turns, brown
L211	24–80063M05	.22 uH
L213	24–80148M01	27 nH, 1.5 turns
L214	24–80989T01	120 nH, ±20%
L215	24–11030B08	4.5 turns, brown
L216,217	24–80989T01	120 nH, ±20%

MXW–7406–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L218	24–80063M04	.18 uH
L220	24–11030B05	2.5 turns, green
L221	24–11030B08	4.5 turns, brown
L222	24–80063M04	.18 uH
transistor (see note)		
Q1	48–80182D44	NPN
Q2–4	48–00869643	PNP
Q51,52	48–00869839	N–channel
Q53	48–00869642	NPN
Q54	48–05128M16	PNP
Q101	48–00869643	PNP
Q102,103	48–80182D20	NPN
Q104	48–00869643	PNP
Q105,106	48–00869642	NPN
Q107	48–00869658	NPN
Q151	48–00869658	NPN
Q152	48–00869643	PNP
Q203	48–05128M66	N–channel
Q204,205	48–80950X01	NPN
Q206	48–05128M66	N–channel
Q207,208	48–80950X01	NPN
Q276	48–00869642	NPN
Q277–279	48–00869643	PNP
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R1	06–11077A84	2.7k
R2	06–11077A62	330
R3	06–11077A60	270
R4	06–11077B01	12k
R5	06–11077B03	15k
R6	06–11077A90	4.7k
R7	06–11077A98	10k
R51	06–11077A44	56
R52	06–11077A54	150
R53	06–11077A98	10k
R54	06–11077A54	150
R56	06–11077B45	820k
R57	06–11077A72	820
R58	06–11077B23	100k
R59	06–11077B27	150k
R60	18–05500L08	22k, ±20%, potentiometer
R61	06–11077B19	68k
R62	06–11077B09	27k
R63	06–11077B21	82k
R64	06–11077B45	820k
R65	06–11077A98	10k
R102	06–11077A62	330
R103,104	06–11077A98	10k
R105	06–11077B11	33k
R106	06–11077A43	910
R107	06–11077A78	1.5k
R108,109	06–11077A26	10
R110	06–11077B03	15k
R111	06–11077A54	150
R112	06–11077A72	820
R113	06–11077A58	220
R114	06–11077A50	150
R115	06–11077A70	680
R116	06–11077A92	5.6k
R118	06–11077A70	680
R119,120	06–11077A88	3.9k
R121	06–11077A84	2.7k
R122	06–11077A88	3.9K
R123	06–11077A74	1k
R124	06–11077A78	1.5k
R125	06–11077A44	56
R126	06–11077A50	100
R127	06–11077A84	2.7k
R128	06–11077A72	820
R151	06–11077B15	47k
R152	06–11077B11	33k
R153	06–11077B15	47k
R154	06–11077A34	22
R155	06–11077A98	10k
R156	06–11077B03	15k
R157	06–11077A78	1.5k
R158,159	06–11077A74	1k
R161	06–11077A98	10k
R163	06–11077B17	56k
R164	18–05500L08	22k, ±20%, potentiometer
R165	06–11077B07	22k
R176	06–11077G26	22.6k, ±1%
R177	06–11077G18	18.7k, ±1%
R178	06–11077F91	10k, ±1%
R179	06–11077F91	10k, ±1%
R180	06–11077G52	42.2k, ±1%
R181	06–11077F91	10k, ±1%
R182	06–11077G28	23.7k, ±1%
R207,208	06–11077A44	56
R209	06–11077A38	33
R210	06–11077A98	10k
R211		not used
R212	06–11077A84	2.7k
R213	06–11077A72	820
R214	06–11077A50	100
R215	06–11077A84	2.7k
R216	06–11077A72	820
R217	06–11077A68	560
R218	06–11077A56	180
R219	06–11077A38	33
R220	06–11077A56	180

MXW–7406–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R222	06–11077A88	3.9k
R223	06–11077A94	6.8k
R224	06–11077B23	100k
R225	06–11077A90	4.7k
R226	06–11077A44	56
R227	06–11077A34	22
R228	06–11077A38	33
R229	06–11077A98	10k
R231	06–11077A84	2.7k
R232	06–11077A72	820
R233	06–11077A46	68
R234	06–11077A84	2.7k
R235	06–11077A72	820
R236	06–11077A46	68
R237	06–11077A66	470
R238	06–11077A28	12
R239	06–11077A66	470
R241		not used
R243	06–11077B23	100k
R244,245	06–11077A74	1k
R246	06–11077B09	27k
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	06–11077A82	2.2k
R302	18–05500L08	22k, ±20%, 100V, potentiometer
R303	06–11077A94	6.8k
transformer		
T1,2	25–80163M02	500 MHz balance transformer
integrated circuits (see note)		
U51	51–05479G05	linear
U101	51–84704M75	synthesizer
U102	51–83977M45	prescaler
U176	51–84621K89	dual opamp
crystal (see note)		
Y51	91–80022M02	45.1 MHz
Y52	48–80008K02	44.645 MHz
Y151	48–80174D05	14.4 MHz
mechanical parts		
	14–05160A01	insulator
	26–80098M01	coil can shield, 10 used
	26–80097M01	coil can shield
	26–80228L01	coax connector shield
	26–80228L01	coax connector shield
	26–80229L03	VCO shield
	26–80256L02	coax connector bottom shield
	30–10286A72	24 strand wire, white
	42–80957X01	grounding clip
	54–80111F01	PROM label
	75–05295B02	crystal base pad, 2 used
	75–05295B07	crystal base pad, 2 used
	84–80233L01	circuit board

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

Schematic, Circuit Board Diagrams, and Parts List for HLE9310A UHF RF Board
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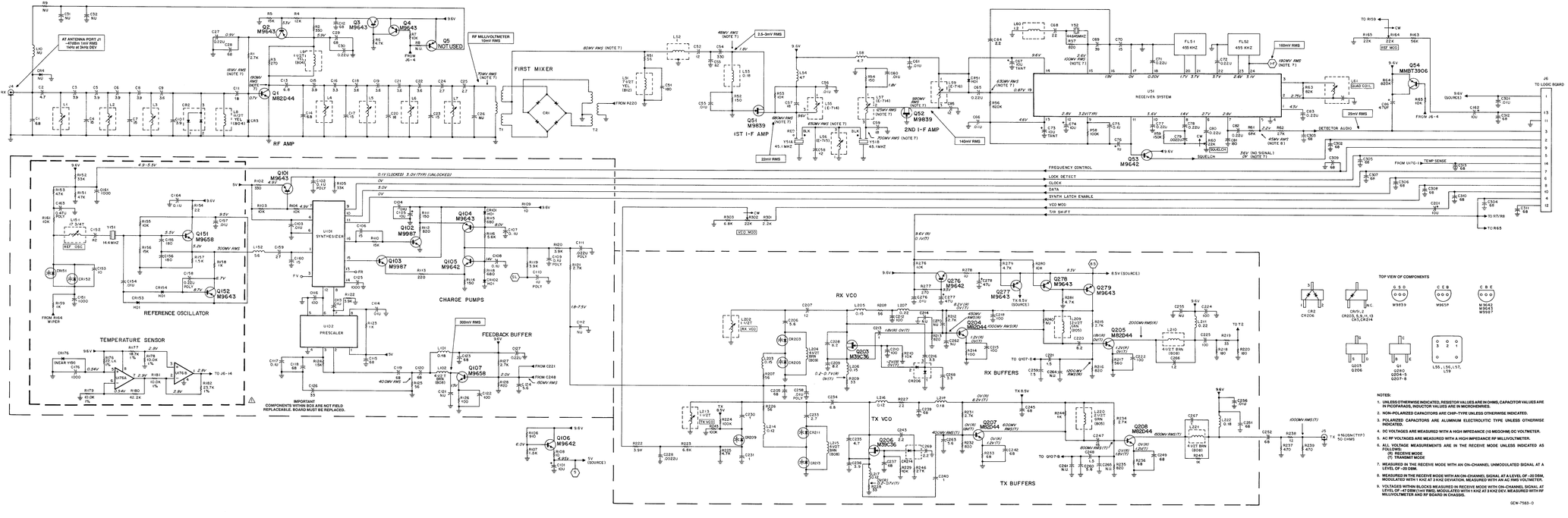
3/31/90



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN PICOFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
5. AC RF VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE RF MILLIVOLTMETER.
6. ALL VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL UNMODULATED SIGNAL AT A LEVEL OF -30 DBM.
8. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
9. VOLTAGES WITHIN BLOCKS MEASURED IN RECEIVE MODE WITH ON-CHANNEL SIGNAL AT LEVEL OF -47 DBM (1 UV RMS), MODULATED WITH 1 KHZ AT 3 KHZ DEV. MEASURED WITH RF MILLIVOLTMETER AND RF BOARD IN CHASSIS.

UHF RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	.7	0	5.9	—	—	—
Q2	5.3	5.9	9	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	0	0 (W/ SIG)	9.6	—	—	—
Q101	5.0	4.9	.1 (LOCKED)	—	—	—
Q102	.7	0	0.1	—	—	—
Q103	5.0	4.4	9.6	—	—	—
Q104	8.1	2.8v	2–8v	—	—	—
Q105	1.4	VAR.	2–8v	—	—	—
Q106	6.0	5.0	9.6	—	—	—
Q107	2.0	1.3	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6,7	—	—	—
Q201	—	9.6	0(U) 9.3(L)	U=UPPER L=LOWER RANGE		
Q202	0(U) 7(L)	0	6.7(U)0(L)	—	—	—
Q203	—	—	—	2.6(R)	4.8(R)	7.9(R)
Q204	1.8(R)	1.2(R)	8.2(R)	—	—	—
Q205	1.8(R)	1.2(R)	9.6	—	—	—
Q206	—	—	—	–.5(T)	1.1(T)	7.8(T)
Q207	1.8(T)	1.2(T)	8.5(T)	—	—	—
Q208	1.8(T)	1.2(T)	9.6	—	—	—
Q276	9.5	8.6	9.6	—	—	—
Q277	9.6	8.5(T)	8.5	—	—	—
Q278	9.6	8.3	7.6(R)	—	—	—
Q279	7.6(R)	8.5	8.5	—	—	—

Schematic, Circuit Board Diagrams, and Parts List for HLE9310B UHF RF Board
PW–7582–O
(Sheet 1 of 3)
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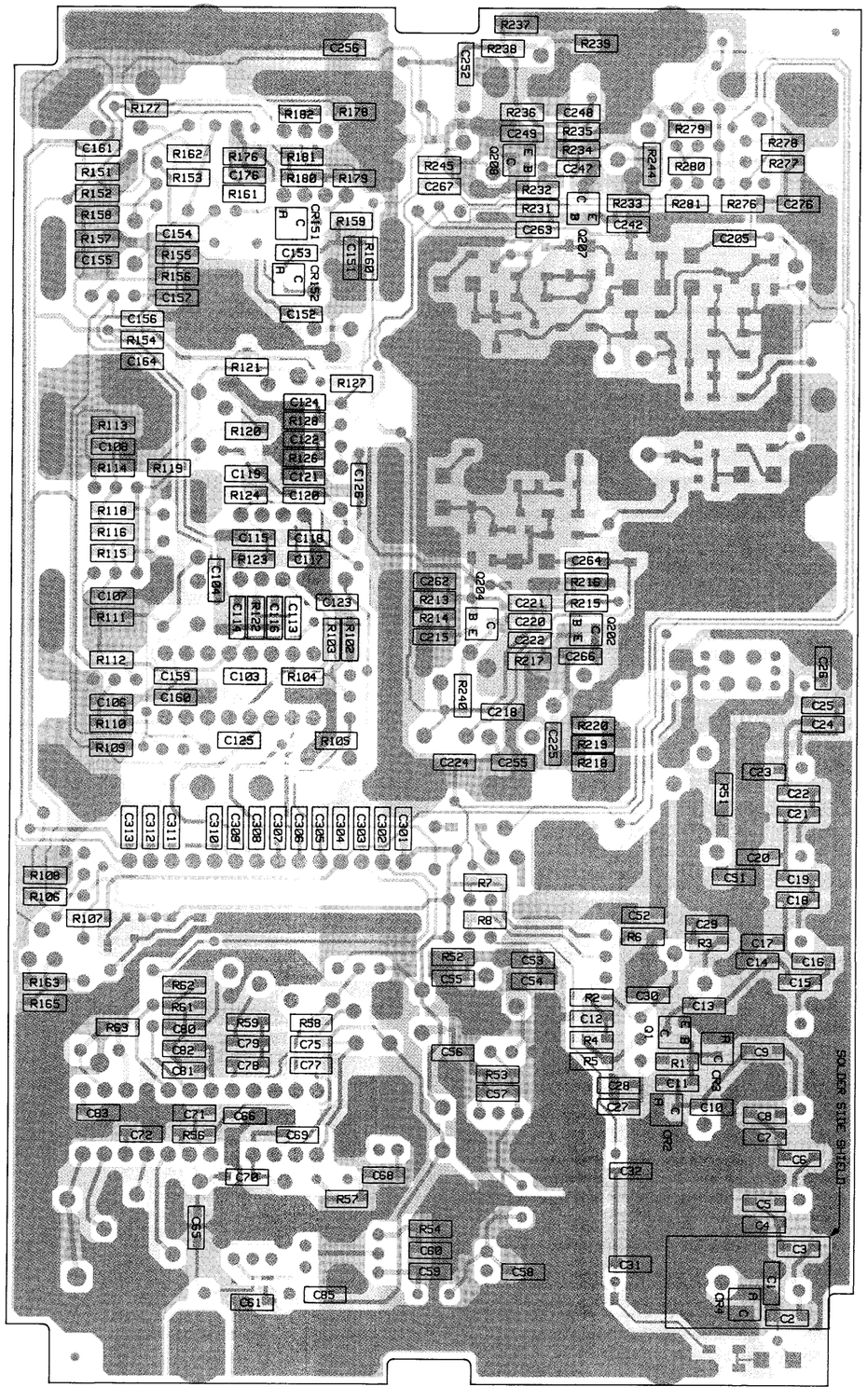
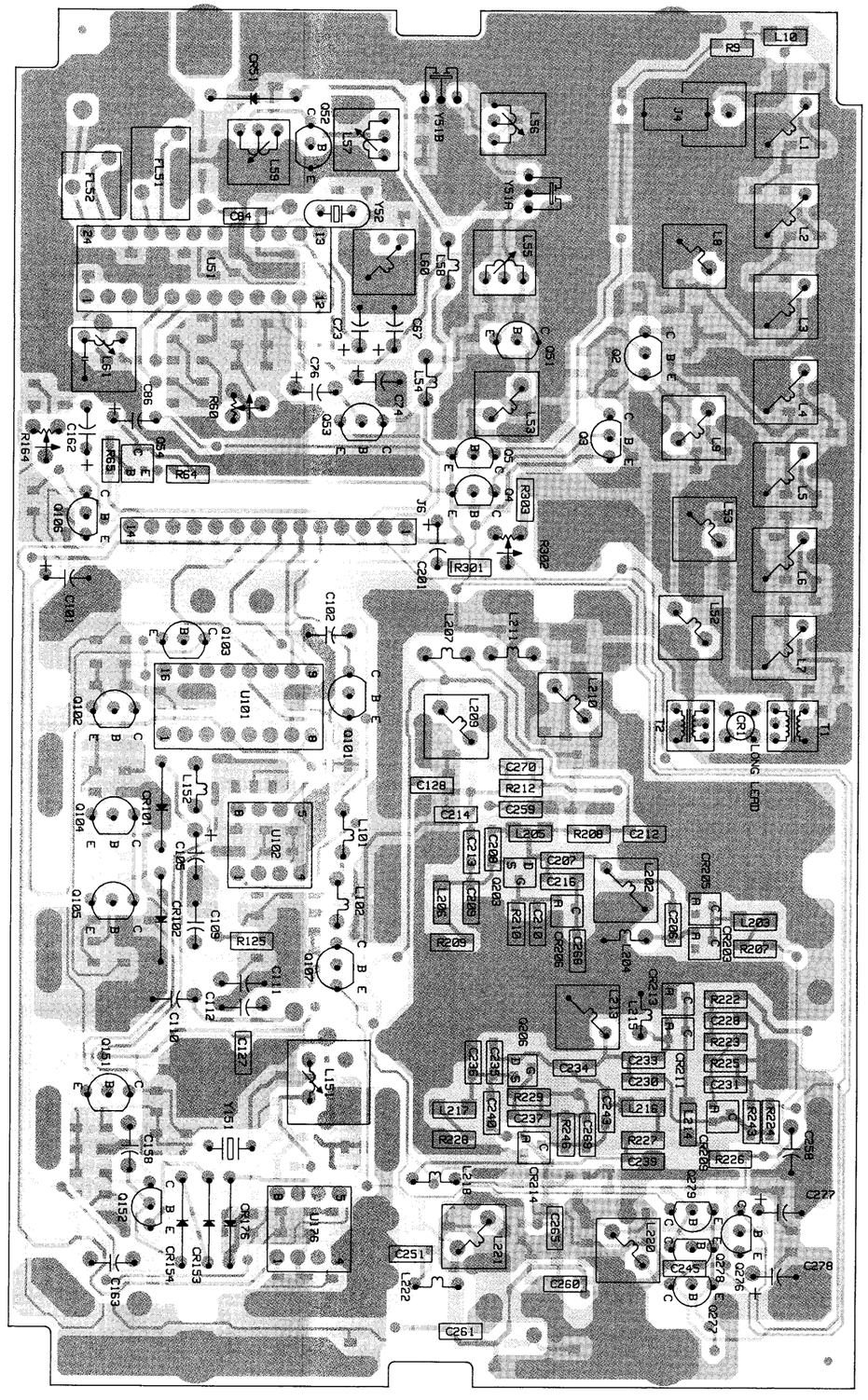


SOLDER SIDE VIEW



COMPONENT SIDE VIEW

SOLDER SIDE	RED	GAW–7704–O
COMPONENT SIDE	GREY	GAW–7705–O
OVERLAYS	BLACK	GDW–7706–O

Schematic, Circuit Board Diagrams, and Parts List for HLE9310B UHF RF Board
PW–7582–O
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parts list

HLE9310B UHF RF Board — MXW–7584–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C1	21–13740B21	6.8 pF, ±5%, 50V
C2	21–13740B17	4.7 pF, ±5%, 50V
C3	21–13740B15	3.9 pF, ±5%, 50V
C4	21–13740B29	15 pF, ±5%, 50V
C5,6	21–13740B15	3.9 pF, ±5%, 50V
C7	21–13740B29	15 pF, ±5%, 50V
C8	21–13740B15	3.9 pF, ±5%, 50V
C9	21–13740B14	3.6 pF, ±5%, 50V
C10	21–13740B15	3.9 pF, ±5%, 50V
C11	21–13740B31	18 pF, ±5%, 50V
C12	21–13740B45	68 pF, ±5%, 50V
C13,14	21–13740B21	6.8 pF, ±5%, 50V
C15	21–13740B15	3.9 pF, ±5%, 50V
C16	21–13740B13	3.3 pF, ±5%, 50V
C17	21–13740B29	15 pF, ±5%, 50V
C18,19	21–13740B14	3.6 pF, ±5%, 50V
C20	21–13740B30	16 pF, ±5%, 50V
C21,22	21–13740B14	3.6 pF, ±5%, 50V
C23	21–13740B29	15 pF, ±5%, 50V
C24,25	21–13740B11	2.7 pF, ±5%, 50V
C27	21–11032B15	.22 uF, +80, –20%, 50V
C28,29	21–13740B45	68 pF, ±5%, 50V
C30	21–11032B15	.22 uF, +80, –20%, 50V
C51	21–13740B55	180 pF, ±5%, 50V
C52	21–13740B27	12 pF, ±5%, 50V
C53	21–13740B47	82 pF, ±5%, 50V
C54	21–13740B61	330 pF, ±5%, 50V
C55,56	21–13741B45	.01 uF, ±5%, 50V
C57	21–13740B31	18 pF, ±5%, 50V
C58	21–13740B27	12 pF, ±5%, 50V
C59	21–13740B31	18 pF, ±5%, 50V
C60,61	21–13741B45	.01 uF, ±5%, 50V
C65	21–11032B15	.22 uF, +80, –20%, 50V
C66	21–13741B45	.01 uF, ±5%, 50V
C67	23–13749C39	10 uF, ±10%, 50V, tantalum
C68	21–13740B33	22 pF, ±5%, 50V
C69	21–13740B39	39 pF, ±5%, 50V
C70	21–13740B29	15 pF, ±5%, 50V
C71	21–11032B15	.22 uF, +80, –20%, 50V
C72	21–11032B15	.22 uF, +80, –20%, 50V
C73	23–13749C39	10 uF, ±10%, 50V, tantalum
C74	23–11048B13	10 uF, ±20%, 16V, electrolytic
C75	21–13741B69	.1 uF, ±5%, 50V
C76	23–11048B05	1 uF, ±20%, 50V, electrolytic
C77,78	21–11032B15	.22 uF, +80, –20%, 50V
C79	21–13741B29	.0022 uF, ±5%, 50V
C80	21–11032B15	.22 uF, +80, –20%, 50V
C81	21–13740B55	180 pF, ±5%, 50V
C82,83	21–11032B15	.22 uF, +80, –20%, 50V
C84	21–13740B09	2.2 pF, ±5%, 50V
C85	21–13740B27	12 pF, ±5%, 50V
C86	23–11048B49	47 uF, ±20%, 16V, electrolytic
C101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C102	08–11051A13	.1 uF, ±5%, 63V
C103,104	21–13741B45	.01 uF, ±5%, 50V
C105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C106	21–13740B29	15 pF, ±5%, 50V
C107,108	21–13741B69	.1 uF, ±5%, 50V
C109	08–11051A13	.1 uF, ±5%, 63V
C110	08–11051A19	1 uF, ±5%, 63V
C111	08–11051A09	.022 uF, ±5%, 63V
C113–114	21–13741B45	.01 uF, ±5%, 50V
C115	21–13740B45	68 pF,±5%, 50V
C116	21–13740B49	100 pF, ±5%, 50V
C117	21–13741B69	.1 uF, ±5%, 50V
C118–120	21–13740B45	68 pF, ±5%, 50V
C121		not used
C122	21–13740B49	100 pF, ±5%, 50V
C123	21–13740B45	68 pF, ±5%, 50V
C124	21–13740B19	5.6 pF, ±5%, 50V
C125	21–13740B73	.001 uF, ±5%, 50V
C126	21–13740B37	33 pF, ±5%, 50V
C127	21–11032B15	.22 uF, +80, –20%, 50V
C151	21–13740B73	.001 uF, ±5%, 50V
C152	21–13740B47	82 pF, ±5%, 50V
C153	21–13740B25	10 pF, ±5%, 50V
C154	21–13741B45	.01 uF, ±5%, 50V
C155,156	21–13740B55	180 pF, ±5%, 50V
C157	21–13741B45	.01 uF, ±5%, 50V
C158	08–11051A15	.22 uF, ±5%, 63V
C159	21–13740B35	27 pF, ±5%, 50V
C160	21–13740B29	15 pF, ±5%, 50V
C161	21–13740B73	.001 uF, ±5%, 50V
C162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C163	08–11051A17	.47 uF, ±5%, 63V
C164	21–13741B69	.1 uF, ±5%, 50V
C165		not used
C166		not used
C167		not used
C168		not used
C176	21–13740B73	.001 uF, ±5%, 50V
C201	23–11048B13	10 uF, ±20%, 16V, electrolytic
C205	21–13740B45	68 pF, ±5%, 50V
C206	21–13740B19	5.6 pF, ±5%, 50V
C207	21–13740B27	12 pF, ±5%, 50V
C208,209	21–13740B23	8.2 pF, ±5%, 50V
C210	21–13740B49	100 pF, ±5%, 50V
C211		not used
C212	21–13740B49	100 pF, ±5%, 50V

MXW–7584–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C213	21–13740B01	1 pF, ±5%, 50V
C121		not used
C215	21–13740B49	100 pF, ±5%, 50V
C216	21–13740B13	3.3 pF, ±5%, 50V
C218	21–13741B49	100 pF, ±5%, 50V
C219		not used
C220	21–13740B23	8.2 pF, ±5%, 50V
C221	21–13740B05	1.5 pF, ±5%, 50V
C222	21–13740B49	100 pF, ±5%, 50V
C223		not used
C224,225	21–13740B49	100 pF, ±5%, 50V
C228	21–13741B29	.0022 uF, ±5%, 50V
C229		not used
C230,231	21–13740B01	1 pF, ±5%, 50V
C233	21–13740B11	2.7 pF, ±5%, 50V
C234	21–13740B21	6.8 pF, ±5%, 50V
C235	21–13740B17	4.7 pF, ±5%, 50V
C236	21–13740B15	3.9 pF, ±5%, 50V
C237	21–13740B45	68 pF, ±5%, 50V
C238		not used
C239	21–13740B45	68 pF, ±5%, 50V
C240	21–13740B01	1 pF, ±5%, 50V
C241		not used
C242	21–13740B45	68 pF, ±5%, 50V
C243	21–13740B09	2.2 pF, ±5%, 50V
C245	21–13740B45	68 pF, ±5%, 50V
C246		not used
C247	21–13740B29	15 pF, ±5%, 50V
C248	21–13740B05	1.5 pF, ±5%, 50V
C249	21–13740B45	68 pF, ±5%, 50V
C250		not used
C251,252	21–13740B45	68 pF, ±5%, 50V
C253		not used
C256	21–13741B45	.01 uF, ±5%, 50V
C258	08–11051A07	.01 uF, ±5%, 63V
C259	21–13740B22	7.5 pF, ±5%, 50V
C260	21–13740B19	5.6 pF, ±5%, 50V
C263	21–13740B19	5.6 pF, ±5%, 50V
C266	21–13740B03	1.2 pF, ±5%, 50V
C267	21–13740B01	1 pF, ±5%, 50V
C268	21–13740B13	3.3 pF, ±5%, 50V
C269	21–13740B09	2.2 pF, ±5%, 50V
C276	21–13741B45	.01 uF, ±5%, 50V
C277,278	23–11048B19	47 uF, ±20%, 16V, electrolytic
C301	21–13741B45	.01 uF, ±5%, 50V
C302–313	21–13740B45	68 pF, ±5%, 50V
diode (see note)		
CR1	48–80236E16	Schottky
CR2	48–80154K02	Schottky
CR3	48–80939T01	Schottky
CR51	48–83654H01	silicon
CR101,102	48–83654H01	silicon
CR151,152	48–05129M21	varactor
CR153,154	48–83654H01	silicon
CR176	48–82256C11	zener
CR203	48–84534N02	varactor
CR205	48–84534N02	varactor
CR206	48–80154K02	Schottky
CR209	48–84534N02	varactor
CR211	48–84534N02	varactor
CR213	48–84534N02	varactor
CR214	48–80939T01	Schottky
filter		
FL51	91–80097D06	6 element, ceramic
FL52	91–80098D06	3 element, ceramic
connector receptacle		
J4,5	09–80135M01	2 pin coax
J6	09–80130M03	14 position socket
RF coil		
L1–7	24–80148M01	27 nH, 1.5 turns
L8,9	24–11030B04	1.5 turns, yellow
L51	24–11030B12	7.5 turns, yellow
L52	24–80063M13	1 uH
L53	24–80063M04	.18 uH
L54	24–80063M21	4.7 uH
L55	24–80164M04	5.2 turns, variable
L56	24–80164M01	1:6 ratio, variable
L57	24–80164M04	5.2 turns, variable
L58	24–80063M21	4.7 uH
L59	24–80164M03	4.3 turns, variable
L60	24–80063M14	1.2 uH
L61	25–80000E01	transmformer
L101	24–80063M04	.18 uH
L102	24–11030B08	4.5 turns, brown
L151	24–80299D01	17.75 turns, orange
L152	24–80063M22	5.6 uH
L202	24–80148M01	27 nH, 1.5 turns
L203	24–60578C15	150 nH, ±20%
L204	24–11030B09	4.5 turns, brown
L205,206	24–60578C15	150 nH, ±20%
L207	24–80063M05	.22 uH
L209	24–11030B05	2.5 turns, green
L210	24–11030B08	4.5 turns, brown
L211	24–80063M05	.22 uH
L213	24–80148M01	27 nH, 1.5 turns
L214	24–60578C14	120 nH, ±20%
L215	24–11030B08	4.5 turns, brown
L216,217	24–60578C14	120 nH, ±20%

MXW–7584–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L218	24–80063M04	.18 uH
L220	24–11030B05	2.5 turns, green
L221	24–11030B08	4.5 turns, brown
L222	24–80063M04	.18 uH
transistor (see note)		
Q1	48–80182D44	NPN
Q2–4	48–00869643	PNP
Q51,52	48–00869839	N–channel
Q53	48–00869642	NPN
Q54	48–05128M16	PNP
Q101	48–00869643	PNP
Q102,103	48–80182D20	NPN
Q104	48–00869643	PNP
Q105,106	48–00869642	NPN
Q107	48–00869658	NPN
Q151	48–00869658	NPN
Q152	48–00869643	PNP
Q203	48–05128M66	N–channel
Q204,205	48–80950X01	NPN
Q206	48–05128M66	N–channel
Q207,208	48–80950X01	NPN
Q276	48–00869642	NPN
Q277–279	48–00869643	PNP
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R1	06–11077A84	2.7k
R2	06–11077A62	330
R3	06–11077A60	270
R4	06–11077B01	12k
R5	06–11077B03	15k
R6	06–11077A90	4.7k
R7	06–11077A98	10k
R51	06–11077A44	56
R52	06–11077A54	150
R53	06–11077A98	10k
R54	06–11077A54	150
R56	06–11077B45	820k
R57	06–11077A72	820
R58	06–11077B23	100k
R59	06–11077B27	150k
R60	18–05500L08	22k, ±20%, potentiometer
R61	06–11077B19	68k
R62	06–11077B09	27k
R63	06–11077B21	82k
R64	06–11077B45	820k
R65	06–11077A98	10k
R102	06–11077A62	330
R103,104	06–11077A98	10k
R105	06–11077B11	33k
R106	06–11077A43	910
R107	06–11077A78	1.5k
R108,109	06–11077A26	10
R110	06–11077B03	15k
R111	06–11077A54	150
R112	06–11077A72	820
R113	06–11077A58	220
R114	06–11077A50	150
R115	06–11077A70	680
R116	06–11077A92	5.6k
R118	06–11077A70	680
R119,120	06–11077A88	3.9k
R121	06–11077A84	2.7k
R122	06–11077A88	3.9K
R123	06–11077A74	1k
R124	06–11077A78	1.5k
R125	06–11077A44	56
R126	06–11077A50	100
R127	06–11077A84	2.7k
R128	06–11077A72	820
R151	06–11077B15	47k
R152	06–11077B11	33k
R153	06–11077B15	47k
R154	06–11077A34	22
R155	06–11077A98	10k
R156	06–11077B03	15k
R157	06–11077A78	1.5k
R158,159	06–11077A74	1k
R161	06–11077A98	10k
R163	06–11077B17	56k
R164	18–05500L08	22k, ±20%, potentiometer
R165	06–11077B07	22k
R176	06–11077G26	22.6k, ±1%
R177	06–11077G18	18.7k, ±1%
R178	06–11077F91	10k, ±1%
R179	06–11077F91	10k, ±1%
R180	06–11077G52	42.2k, ±1%
R181	06–11077F91	10k, ±1%
R182	06–11077G28	23.7k, ±1%
R207,208	06–11077A44	56
R209	06–11077A38	33
R210	06–11077A98	10k
R211		not used
R212	06–11077A84	2.7k
R213	06–11077A72	820
R214	06–11077A50	100
R215	06–11077A84	2.7k
R216	06–11077A72	820
R217	06–11077A68	560
R218	06–11077A56	180
R219	06–11077A38	33
R220	06–11077A56	180

MXW–7584–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R222	06–11077A88	3.9k
R223	06–11077A94	6.8k
R224	06–11077B23	100k
R225	06–11077A90	4.7k
R226	06–11077A44	56
R227	06–11077A34	22
R228	06–11077A38	33
R229	06–11077A98	10k
R231	06–11077A84	2.7k
R232	06–11077A72	820
R233	06–11077A46	68
R234	06–11077A84	2.7k
R235	06–11077A72	820
R236	06–11077A46	68
R237	06–11077A66	470
R238	06–11077A28	12
R239	06–11077A66	470
R241		not used
R243	06–11077B23	100k
R244,245	06–11077A74	1k
R246	06–11077B09	27k
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	06–11077A82	2.2k
R302	18–05500L08	22k, ±20%, 100V, potentiometer
R303	06–11077A94	6.8k
transformer		
T1,2	25–80163M02	500 MHz balance transformer
integrated circuits (see note)		
U51	51–05479G05	linear
U101	51–84704M75	synthesizer
U102	51–83977M45	prescaler
U176	51–84621K89	dual opamp
crystal (see note)		
Y51	91–80022M02	45.1 MHz
Y52	48–80008K02	44.645 MHz
Y151	48–80174D05	14.4 MHz
mechanical parts		
	14–05160A01	insulator
	26–80098M01	coil can shield, 10 used
	26–80097M01	coil can shield
	26–80228L01	coax connector shield
	26–80228L01	coax connector shield
	26–80229L03	VCO shield
	26–80256L02	coax connector bottom shield
	30–10286A72	24 strand wire, white
	42–80957X01	grounding clip
	54–80111F01	PROM label
	75–05295B02	crystal base pad, 2 used
	75–05295B07	crystal base pad, 2 used
	84–80233L02	circuit board

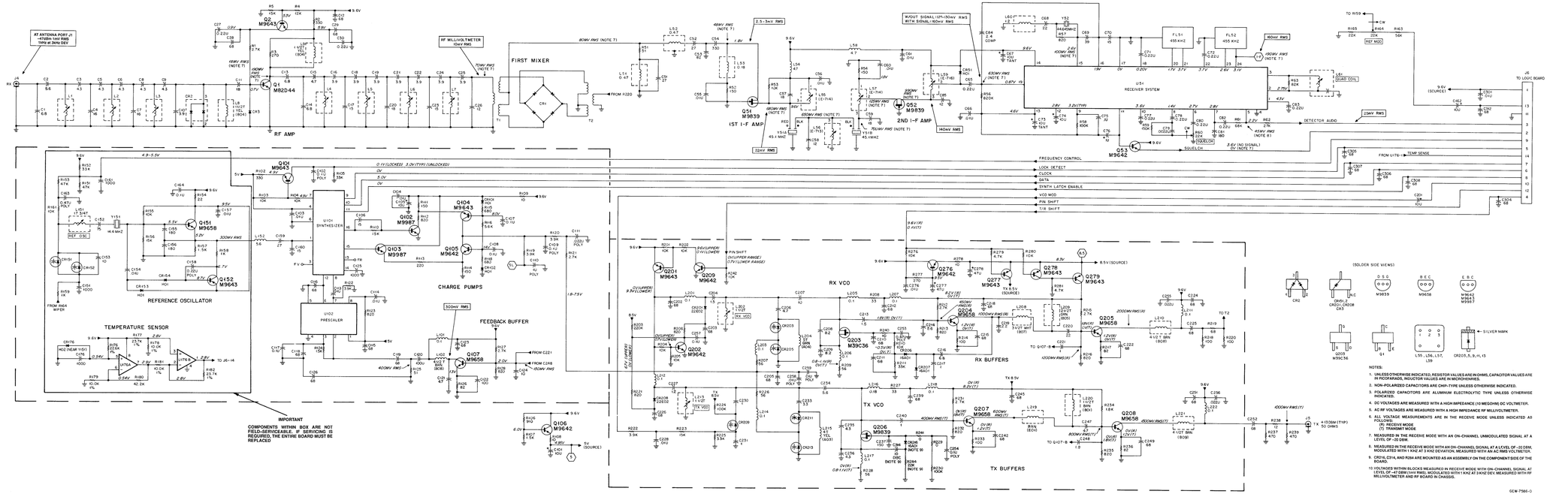
2/28/90

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

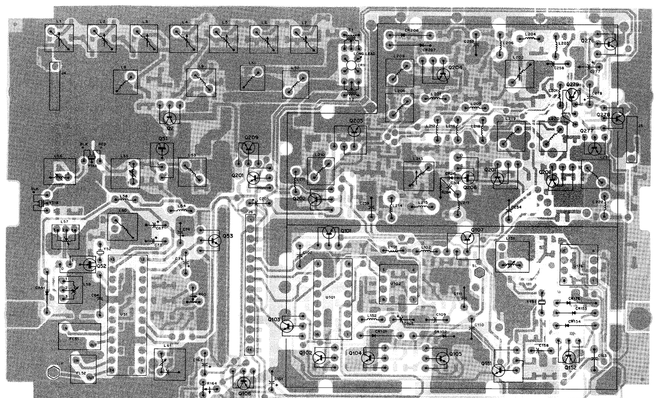
Schematic, Circuit Board Diagrams, and Parts List for HLE9310B UHF RF Board
PW–7582–O
(Sheet 3 of 3)
3/31/90

UHF RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	.7	0	5.9	—	—	—
Q2	5.3	5.9	.9	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	0	0 (W/ SIG)	9.6	—	—	—
Q101	5.0	4.9	.1 (LOCKED)	—	—	—
Q102	.7	0	0.1	—	—	—
Q103	5.0	4.4	9.6	—	—	—
Q104	8.1	2.8v	2–8v	—	—	—
Q105	1.4	VAR.	2–8v	—	—	—
Q106	6.0	5.0	9.6	—	—	—
Q107	2.0	1.3	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6.7	—	—	—
Q201	—	9.6	0(U) 9.3(L)	U=UPPER L=LOWER RANGE		
Q202	0(U).7(L)	0	6.7(U)0(L)	—	—	—
Q203	—	—	—	2.6(R)	4.8(R)	7.9(R)
Q204	1.8(R)	1.2(R)	8.2(R)	—	—	—
Q205	1.8(R)	1.2(R)	9.6	—	—	—
Q206	—	—	—	~.5(T)	1.1(T)	7.8(T)
Q207	1.8(T)	1.2(T)	8.5(T)	—	—	—
Q208	1.8(T)	1.2(T)	9.6	—	—	—
Q276	9.5	8.6	9.6	—	—	—
Q277	9.6	8.5(T)	8.5	—	—	—
Q278	9.6	8.3	7.6(R)	—	—	—
Q279	7.6(R)	8.5	8.5	—	—	—

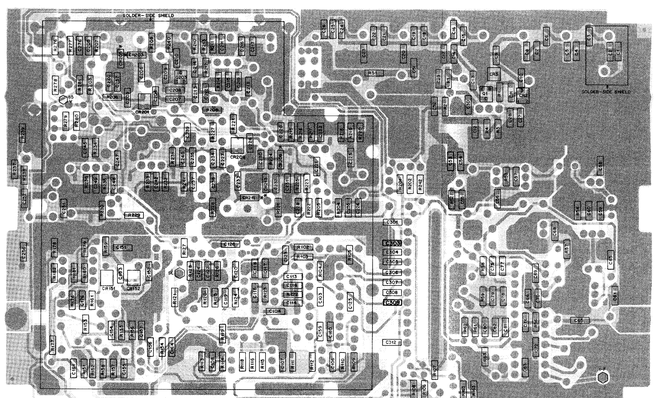


Schematic, Circuit Board Diagrams, and Parts List for HLE4425B UHF RF Board
PW–5283–C
(Sheet 1 of 2)
4/28/90



SOLDER SIDE	RED	GBW–7890–O
COMPONENT SIDE	GRAY	GBW–7891–O
OVERLAY	BLACK	GBW–5294–O

COMPONENT SIDE VIEW



SOLDER SIDE	RED	GBW–7890–O
COMPONENT SIDE	GRAY	GBW–7891–O
OVERLAY	BLACK	GBW–5297–A

SOLDER SIDE VIEW

parts list

HLE4425B *MaxTrac* UHF 25 kHz Range 2 RF Board — MXW–7407–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C1	21–13740B21	6.8 pF, ±5%, 50V
C2	21–13740B19	5.6 pF, ±5%, 50V
C3	21–13740B16	4.3 pF, ±5%, 50V
C4	21–13740B00	16 pF, ±5%, 50V
C5,6	21–13740B16	4.3 pF, ±5%, 50V
C7	21–13740B00	16 pF, ±5%, 50V
C8,9	21–13740B16	4.3 pF, ±5%, 50V
C10	21–13740B19	3.9 pF, ±5%, 50V
C11	21–13740B31	18 pF, ±5%, 50V
C12	21–13740B45	68 pF, ±5%, 50V
C13,14	21–13740B21	6.8 pF, ±5%, 50V
C15	21–13740B17	4.7 pF, ±5%, 50V
C16	21–13740B15	3.9 pF, ±5%, 50V
C17	21–13740B29	15 pF, ±5%, 50V
C18,19	21–13740B15	3.9 pF, ±5%, 50V
C20	21–13740B31	18 pF, ±5%, 50V
C21,22	21–13740B15	3.9 pF, ±5%, 50V
C23	21–13740B29	15 pF, ±5%, 50V
C24,25	21–13740B15	3.9 pF, ±5%, 50V
C26	21–13740B27	12 pF, ±5%, 50V
C27	21–11032B15	.22 uF, +80, –20%, 50V
C28,29	21–13740B45	68 pF, ±5%, 50V
C30	21–11032B15	.22 uF, +80, –20%, 50V
C51,52	21–13740B35	27 pF, ±5%, 50V
C53	21–13740B47	82 pF, ±5%, 50V
C54	21–13740B61	330 pF, ±5%, 50V
C55,56	21–13741B45	.01 uF, ±5%, 50V
C57	21–13741B31	18 pF, ±5%, 50V
C58	21–13740B27	12 pF, ±5%, 50V
C59	21–13740B31	18 pF, ±5%, 50V
C60,61	21–13741B45	.01 uF, ±5%, 50V
C65	21–11032B15	.22 uF, +80, –20%, 50V
C66	21–13741B45	.01 uF, ±5%, 50V
C67	23–13749C39	10 uF, +10%, 50V, tantalum
C68	21–13740B33	22 pF, ±5%, 50V
C69	21–13740B39	39 pF, ±5%, 50V
C70	21–13740B29	15 pF, ±5%, 50V
C71,72	21–11032B15	.22 uF, +80, –20%, 50V
C73	23–13749C39	10 uF, +10%, 50V, tantalum
C74	23–11048B13	10 uF, ±20%, 16V, electrolytic
C75	21–13741B69	1 uF, ±5%, 50V
C76	23–11048B05	1 uF, ±20%, 50V, electrolytic
C77,78	21–11032B15	.22 uF, +80, –20%, 50V
C79	21–13741B29	.0022 uF, ±5%, 50V
C80	21–11032B15	.22 uF, +80, –20%, 50V
C81	21–13740B65	180 pF, ±5%, 50V
C82,83	21–11032B15	.22 uF, +80, –20%, 50V
C84	21–8243S01	2.4 pF, ±5%, 50V
C85	21–13745B27	12 pF, ±5%, 50V
C101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C102	08–11051A13	1 uF, ±5%, 63V
C103,104	21–13741B41	.01 uF, ±5%, 50V
C105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C106	21–13740B29	15 pF, ±5%, 50V
C107,108	21–13741B69	1 uF, ±5%, 50V
C109	08–11051A13	1 uF, ±5%, 63V
C110	08–11051A19	1 uF, ±5%, 63V
C111	08–11051A09	.022 uF, ±5%, 63V
C113,114	21–13741B45	.01 uF, ±5%, 50V
C115,116	21–13740B45	68 pF, ±5%, 50V
C117	21–13741B69	1 uF, ±5%, 50V
C118,119	21–13740B45	68 pF, ±5%, 50V
C120	21–13740B73	.001 uF, ±5%, 50V
C121	21–13740B17	4.7 pF, ±5%, 50V
C122	21–13740B49	100 pF, ±5%, 50V
C123	21–13740B45	68 pF, ±5%, 50V
C124	21–13740B25	10 pF, ±5%, 50V
C125	21–13740B73	.001 uF, ±5%, 50V
C126	21–13740B45	68 pF, ±5%, 50V
C151	21–13740B73	.001 uF, ±5%, 50V
C152	21–13740B46	75 pF, ±5%, 50V
C153	21–13740B25	10 pF, ±5%, 50V
C154	21–13741B45	.01 uF, ±5%, 50V
C155,156	21–13740B55	180 pF, ±5%, 50V
C157	21–13741B45	.01 uF, ±5%, 50V
C158	08–11051A15	.22 uF, ±5%, 63V
C159	21–13740B35	27 pF, ±5%, 50V
C160	21–13740B29	15 pF, ±5%, 50V
C161	21–13740B73	.001 uF, ±5%, 50V
C162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C163	08–11051A17	.47 uF, ±5%, 63V
C164	21–13741B69	1 uF, ±5%, 50V
C176	21–13740B73	.001 uF, ±5%, 50V
C201	23–11048B13	10 uF, ±20%, 16V, electrolytic
C202,203	21–13740B45	68 pF, ±5%, 50V
C204	21–13740B05	1.5 pF, ±5%, 50V
C205	21–13740B45	68 pF, ±5%, 50V
C206	21–13740B17	4.7 pF, ±5%, 50V
C207	21–13740B25	10 pF, ±5%, 50V
C208,209	21–13740B23	8.2 pF, ±5%, 50V
C210–212	21–13740B45	68 pF, ±5%, 50V
C213	21–13740B05	1.5 pF, ±5%, 50V
C214	21–13740B19	5.6 pF, ±5%, 50V
C215	21–13740B45	68 pF, ±5%, 50V
C216	21–13740B21	6.8 pF, ±5%, 50V
C217	21–13740B01	1 pF, ±5%, 50V
C218	21–13741B45	68 pF, ±5%, 50V
C219	21–13740B09	2.2 pF, ±5%, 50V
C220	21–13740B33	2.2 pF, ±5%, 50V

MXW–7407–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C221	21–13740B01	1 pF, ±5%, 50V
C222	21–13740B45	68 pF, ±5%, 50V
C223		not used
C224–226	21–13740B45	68 pF, ±5%, 50V
C227	21–13740B01	1 pF, ±5%, 50V
C228	21–13741B45	.01 uF, ±5%, 50V
C230,231	21–13741B69	1 pF, ±5%, 50V
C233	21–13740B13	3.3 pF, ±5%, 50V
C234	21–13740B19	5.6 pF, ±5%, 50V
C235,236	21–13740B16	4.3 pF, ±5%, 50V
C237	21–13740B53	150 pF, ±5%, 50V
C238		not used
C239	21–13740B45	68 pF, ±5%, 50V
C240	21–13740B01	1 pF, ±5%, 50V
C242	21–13740B45	68 pF, ±5%, 50V
C245	21–13740B45	68 pF, ±5%, 50V
C247	21–13741B17	4.7 pF, ±5%, 50V
C248	21–13740B07	1.8 pF, ±5%, 50V
C249	21–13740B45	68 pF, ±5%, 50V
C251,252	21–13740B45	68 pF, ±5%, 50V
C253	08–11051A17	.47 uF, ±5%, 63V
C254	08–11051A13	.1 uF, ±5%, 63V
C255,256	21–13741B53	.022 uF, ±5%, 50V
C257	21–13741B69	.1 uF, ±5%, 50V
C258,259	08–11041A07	.01 uF, ±5%, 63V
C276	21–13741B45	.01 uF, ±5%, 50V
C277,278	23–11048B19	47 uF, ±20%, 16V, electrolytic
C301	21–13741B45	.01 uF, ±5%, 50V
C302		not used
C303		not used
C304–308	21–13740B45	68 pF, ±5%, 50V
C309		not used
C312	21–13740B45	68 pF, ±5%, 50V
C314	21–11022H27	10 pF, ±.5 pF, 50V
diode (see note)		
CR1	48–80236E16	Schottky
CR2	48–80154K02	Schottky
CR3	48–80397T01	Schottky
CR51	48–83654H01	silicon
CR101,102	48–83654H01	silicon
CR151,152	48–05129M21	varactor
CR153,154	48–83654H01	silicon
CR176	48–83654H02	silicon
CR201	48–80142L01	pin
CR203	48–05649Q01	varactor
CR205	48–05649Q02	varactor
CR206,207	48–84616A01	hot carrier
CR208	48–80142L01	pin
CR209	48–05649Q02	varactor
CR211	48–05649Q02	varactor
CR213	48–05649Q01	varactor
CR216	48–84616A01	hot carrier
filter		
FL51	91–80097D06	6 element, ceramic
FL52	91–80098D06	3 element, ceramic
connector receptacle		
J4,5	09–80135M01	2 pin coax
J6	09–80130M03	14 position socket
RF coil		
L1–7	24–80148M01	27 nH, 1.5 turns
L8,9	24–11033B04	1.5 turns, yellow
L51,52	24–80063M09	.47 uH
L53	24–80063M04	.18 uH
L54	24–80063M21	4.7 uH
L55	24–80164M04	5.2 turns, variable
L56	24–80164M01	1.6 ratio, variable
L57	24–80164M04	5.2 turns, variable
L58	24–80063M21	4.7 uH
L59	24–80164M03	4.3 turns, variable
L60	24–80063M14	1.2 uH
L61	25–80020E01	transformer
L101	24–80063M01	.1 uH
L102	24–11033B08	4.5 turns, brown
L151	24–80299D01	7.75 turns, orange
L152	24–80063M22	5.6 uH
L201	24–80063M01	.1 uH
L202	24–80148M01	27 nH, 1.5 turns
L203	24–80063M01	.1 uH
L204	24–11030A04	5 turns, green
L205–207	24–80063M01	.1 uH
L209	24–11030B07	3.5 turns, white
L210	24–11033B05	2.5 turns, green
L211	24–11030B08	4.5 turns, brown
L212	24–80063M01	.1 uH
L213	24–80148M01	27 nH, 1.5 turns
L214	24–80063M01	.1 uH
L215	24–11030A03	4 turns, yellow
L216	24–80063M04	.18 uH
L217,218	24–80063M01	.1 uH
L219	24–11030E01	brown
L220	24–11030B01	1.5 turns, brown
L221	24–11033B09	4.5 turns, brown
L222	24–80063M01	.1 uH
transformer		
T1,2	25–80163M02	500 MHz balance transformer
transistor (see note)		
Q1	48–80950X01	NPN

MXW–7407–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q2	48–03869643	PNP
Q51,52	48–80869839	n–Channel
Q53	48–80869642	NPN
Q101	48–03869643	PNP
Q102,103	48–80182D20	NPN
Q104	48–03869643	PNP
Q105,106	48–03869642	NPN
Q107	48–03869658	NPN
Q151	48–03869658	NPN
Q152	48–03869643	PNP
Q201	48–03869643	PNP
Q202	48–03869642	NPN
Q203	48–84039C36	N–channel
Q204,205	48–03869658	NPN
Q206	48–80861B39	N–channel
Q207,208	48–80181D39	NPN
Q209	48–80861B42	NPN
Q276	48–03861642	NPN
Q277–279	48–03869643	PNP
R277	06–11077A60	270
R278	06–11077A26	10
R279	06–11077A90	4.7k
R280	06–11077A98	10k
R281	06–11077A90	4.7k
R284	19–05500L08	22k, ±20%, 100V, potentiometer
integrated circuits (see note)		
U51	51–05479G05	linear
U101	51–84704M75	synthesizer
U102	51–83977M45	prescaler
U176	51–84621K89	dual opamp
crystal (see note)		
Y51	91–80022M02	45.1 MHz
Y52	48–80008K02	44.645 MHz
Y151	48–80174D05	14.4 MHz

non–referenced parts

	05–00003152	eyelet
	14–05160A01	insulator
	26–80098M01	coil can shield, 10 used
	26–80097M01	coil can shield
	26–80228L01	IF bottom shield
	26–80256L02	coax connector bottom shield
	26–80229L03	coax shield
	30–10284A73	24 strand wire, white
	42–80957X01	grounding clip
	54–80111F01	PROM label
	75–05295B02	crystal base pad, 2 used
	75–05293B07	crystal base pad, 2 used
	84–80233L01	circuit board

MXW–7407–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R225	06–11077A86	3.3k
R226	06–11077A44	56
R227	06–11077A36	33
R228	06–11077A44	56
R229	06–11077A01	0 ohm
R230	06–11077B23	100k
R231	06–11077A84	2.7k
R232	06–11077A72	820
R233	06–11077A50	100
R234	06–11077A80	1.8k
R235	06–11077A72	820
R236	06–11077A48	82
R237	06–11077A66	470
R238	06–11077A28	12
R239	06–11077A66	470
R240	06–11077A26	10
R241	06–4086 3642	0 ohm
R242	06–11077A98	10k
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
R284	19–05500L08	22k, ±20%, 100V, potentiometer
integrated circuits (see note)		
U51	51–05479G05	linear
U101	51–84704M75	synthesizer
U102	51–83977M45	prescaler
U176	51–84621K89	dual opamp
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R1	06–11077A84	2.7k
R2	06–11077A52	330
R3	06–11077A60	270
R4	06–11077B01	12k
R5	06–11077B03	15k
R51	06–11077A43	51
R52	06–11077A54	150
R53	06–11077A96	10k
R54	06–11077A54	150
R56	06–11077B45	820k
R57	06–11077A72	820
R58	06–11077B23	100k
R59	06–11077B27	150k
R60	18–05500L08	22k, ±20%, potentiometer
R61	06–11077B19	68k
R62	06–11077B09	27k
R63	06–11077B21	82k
R102	06–11077A52	330
R103,104	06–11077A98	10k
R105	06–11077B11	33k
R106	06–11077A73	910
R107	06–11077A78	1.5k
R108,109	06–11077A26	10
R110	06–11077B03	15k
R111	06–11077A54	150
R112	06–11077A72	820
R113	06–11077A58	220
R114	06–11077A54	150
R115	06–11077A70	680
R116	06–11077A82	3.9k
R118	06–11077A70	680
R119,120	06–11077A98	10k
R121	06–11077A84	2.7k
R122	06–11077A88	3.9K
R123	06–11077A72	820
R124	06–11077A78	1.5k
R125	06–11077A51	110
R126	06–11077A46	82
R127	06–11077A84	2.7k
R128	06–11077A72	820
R151	06–11077B15	47k
R152	06–11077B31	33k
R153	06–11077B15	47k
R154	06–11077A34	22
R155	06–11077A98	10k
R156	06–11077B03	15k
R157	06–11077A78	1.5k
R158,159	06–11077A74	1k
R161	06–11077A98	10k
R163	06–11077B17	56k
R164	18–05500L08	22k, ±20%, potentiometer
R165	06–11077B07	22k
R176	06–11077G26	22.6k, ±1%
R177	06–11077G28	23.7k, ±1%
R178,179	06–11077F91	10k, ±1%
R180	06–11077G53	42.2k
R181	06–11077F91	10k, ±1%
R182	06–11077G28	23.7k, ±1%
R201,202	06–11077A68	10k
R203	06–11077B31	220K
R204,205	06–11077A98	10k
R206	06–11077A72	820
R207	06–11077A44	56
R208	06–11077A38	33
R209	06–11077A44	56
R210	06–11077A98	10k
R211	06–11077B11	33k
R212	06–11077A84	2.7k
R213	06–11077A72	820
R214	06–11077A50	100
R215	06–11077A84	2.7k
R216	06–11077A72	820
R217	06–11077A48	82
R218	06–11077A50	100
R219	06–11077A46	68
R220	06–11077A50	100
R221	06–11077A72	820
R222	06–11077A88	3.9k
R223	06–11077B03	15k
R224	06–11077B23	100k

2/28/90

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

Schematic, Circuit Board Diagrams, and Parts List for HLE4425B UHF RF Board

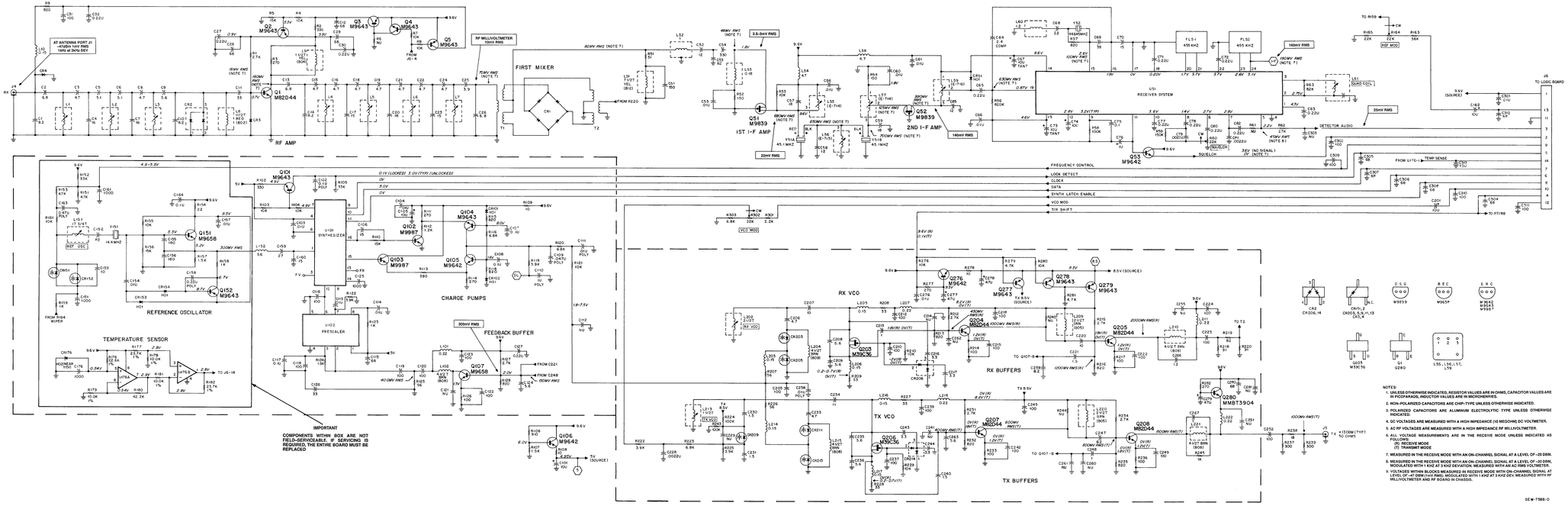
PW–5289–C

(Sheet 2 of 2)

4/28/90

UHF RF Board Transistor D.C. Voltage Table

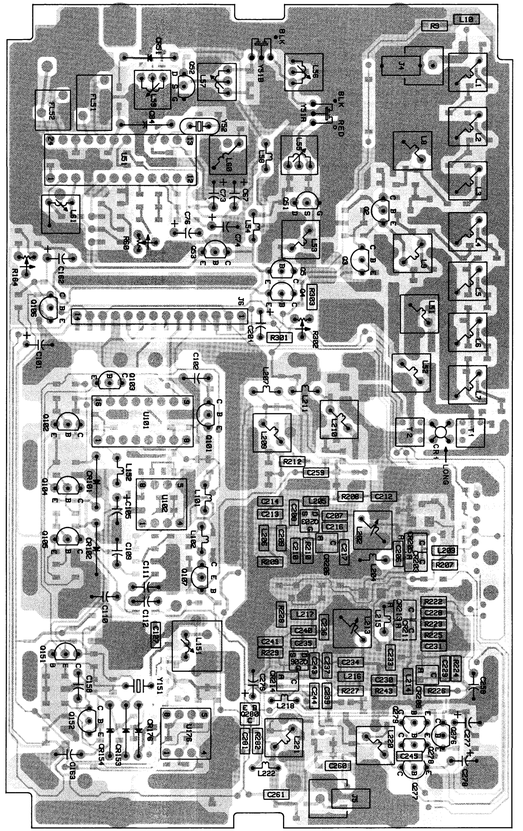
Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	.7	0	5.9	—	—	—
Q2	5.3	5.9	.9	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	0	0 (W/ SIG)	9.6	—	—	—
Q101	5.0	4.9	.1 (LOCKED)	—	—	—
Q102	.7	0	0.1	—	—	—
Q103	5.0	4.4	9.6	—	—	—
Q104	8.1	2.8v	2–8v	—	—	—
Q105	1.4	VAR.	2–8v	—	—	—
Q106	6.0	5.0	9.6	—	—	—
Q107	2.0	1.3	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6.7	—	—	—
Q201	—	9.6	0(U) 9.3(L)	U=UPPER L=LOWER RANGE		
Q202	0(U).7(L)	0	6.7(U)0(L)	—	—	—
Q203	—	—	—	2.6(R)	4.8(R)	7.9(R)
Q204	1.8(R)	1.2(R)	8.2(R)	—	—	—
Q205	1.8(R)	1.2(R)	9.6	—	—	—
Q206	—	—	—	–5(T)	1.1(T)	7.8(I_T)
Q207	1.8(T)	1.2(T)	8.5(T)	—	—	—
Q208	1.8(T)	1.2(T)	9.6	—	—	—
Q276	9.5	8.6	9.6	—	—	—
Q277	9.6	8.5(T)	8.5	—	—	—
Q278	9.6	8.3	7.6(R)	—	—	—
Q279	7.6(R)	8.5	8.5	—	—	—



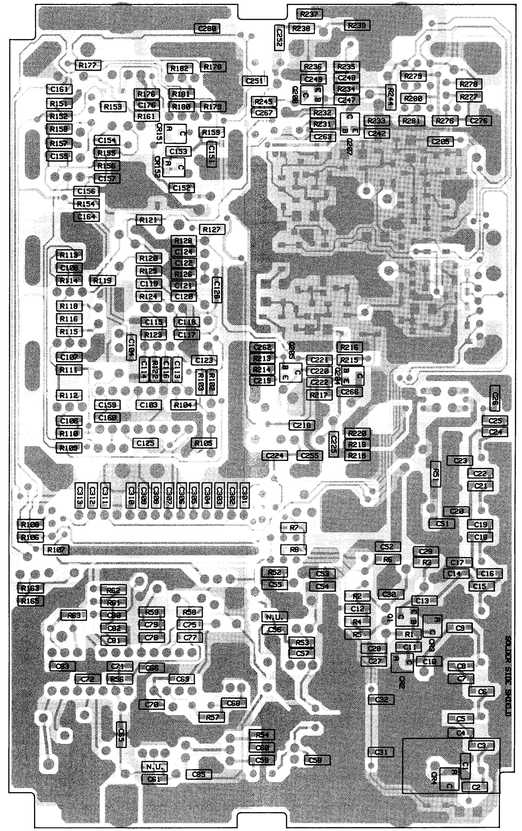
Schematic, Circuit Board Diagrams, and Parts List for HLE4424A UHF RF Board
PW–7587–O
(Sheet 1 of 2)
3/31/90

NOTES:
1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN PICOFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
5. AC RF VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE RF MILLIVOLTMETER.
6. ALL VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF –20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION, MEASURED WITH AN AC RMS VOLTMETER.
8. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF –20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION, MEASURED WITH AN AC RMS VOLTMETER.
9. VOLTAGES WITHIN BLOCKS MEASURED IN RECEIVE MODE WITH ON-CHANNEL SIGNAL AT A LEVEL OF –20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEV, MEASURED WITH RF MILLIVOLTMETER AND RF BOARD IN CHASSIS.

SEW-7588-O



COMPONENT SIDE VIEW



SOLDER SIDE VIEW

SOLDER SIDE	RED	GBW–7720–O
COMPONENT SIDE	GREY	GBW–7721–O
OVERLAYS	BLACK	GDW–7722–O

parts list

HLE4424A *MaxTrac* UHF 25 kHz Range 1 RF Board — MXW–7408–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C1	21–13740B23	8.2 pF, ±5%, 50V
C2	21–13740B21	6.8 pF, ±5%, 50V
C3	21–13740B17	4.7 pF, ±5%, 50V
C4	21–13740B30	16 pF, ±5%, 50V
C5,6	21–13740B18	5.1 pF, ±5%, 50V
C7	21–13740B30	16 pF, ±5%, 50V
C8	21–13740B17	4.7 pF, ±5%, 50V
C9	21–13740B19	5.6 pF, ±5%, 50V
C10	21–13740B23	8.2 pF, ±5%, 50V
C11	21–13740B37	33 pF, ±5%, 50V
C12	21–13740B45	68 pF, ±5%, 50V
C13	21–13740B21	6.8 pF, ±5%, 50V
C14	21–13740B23	8.2 pF, ±5%, 50V
C15,16	21–13740B17	4.7 pF, ±5%, 50V
C17	21–13740B29	15 pF, ±5%, 50V
C18,19	21–13740B17	4.7 pF, ±5%, 50V
C20	21–13740B31	18 pF, ±5%, 50V
C21,22	21–13740B17	4.7 pF, ±5%, 50V
C23	21–13740B29	15 pF, ±5%, 50V
C24	21–13740B17	4.7 pF, ±5%, 50V
C25	21–13740B15	3.9 pF, ±5%, 50V
C26	21–13740B21	6.8 pF, ±5%, 50V
C27	21–11032B15	.22 uF, +80, –20%, 50V
C28,29	21–13740B45	68 pF, ±5%, 50V
C30	21–11032B15	.22 uF, +80, –20%, 50V
C31	21–13740B49	100 pF, ±5%, 50V
C32	21–11032B15	.22 uF, +80, –20%, 50V
C51	21–13740B55	150 pF, ±5%, 50V
C52	21–13740B27	12 pF, ±5%, 50V
C53	21–13740B47	82 pF, ±5%, 50V
C54	21–13740B61	330 pF, ±5%, 50V
C55,56	21–13741B45	.01 uF, ±5%, 50V
C57	21–13740B31	18 pF, ±5%, 50V
C58	21–13740B27	12 pF, ±5%, 50V
C59	21–13740B31	18 pF, ±5%, 50V
C60,61	21–13741B45	.01 uF, ±5%, 50V
C65	21–11032B15	.22 uF, +80, –20%, 50V
C66	21–13741B45	.01 uF, ±5%, 50V
C67	23–13749C39	10 uF, ±10%, 50V, tantalum
C68	21–13740B33	22 pF, ±5%, 50V
C69	21–13740B39	39 pF, ±5%, 50V
C70	21–13740B29	15 pF, ±5%, 50V
C71,72	21–11032B15	.22 uF, +80, –20%, 50V
C73	23–13749C39	10 uF, ±10%, 50V, tantalum
C74	23–11048B13	10 uF, ±20%, 16V, electrolytic
C75	21–13741B69	.1 uF, ±5%, 50V
C76	23–11048B05	1 uF, ±20%, 50V, electrolytic
C77,78	21–11032B15	.22 uF, +80, –20%, 50V
C79	21–13741B29	.0022 uF, ±5%, 50V
C80	21–11032B15	.22 uF, +80, –20%, 50V
C81	21–13740B55	180 pF, ±5%, 50V
C82,83	21–11032B15	.22 uF, +80, –20%, 50V
C84	21–82450B14	2.4 pF, ±5%, 500V
C85	21–13740B27	12 pF, ±5%, 50V
C101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C102	08–11051A13	.1 uF, ±5%, 63V
C103,104	21–13741B45	.01 uF, ±5%, 50V
C105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C106	21–13740B29	15 pF, ±5%, 50V
C107,108	21–13741B69	.1 uF, ±5%, 50V
C109	08–11051A11	.047 uF, ±5%, 63V
C110	08–11051A19	1 uF, ±5%, 63V
C111	08–11051A07	.01 uF, ±5%, 63V
C113,114	21–13741B45	.01 uF, ±5%, 50V
C115	21–13740B45	68 pF, ±5%, 50V
C116	21–13740B49	100 pF, ±5%, 50V
C117	21–13741B69	.1 uF, ±5%, 50V
C118–123	21–13740B49	100 pF, ±5%, 50V
C124	21–13740B19	5.6 pF, ±5%, 50V
C125	21–13740B73	.001 uF, ±5%, 50V
C126	21–13740B37	33 pF, ±5%, 50V
C127	21–11032B15	.22 uF, +80, –20%, 50V
C151	21–13740B73	.001 uF, ±5%, 50V
C152	21–13740B47	82 pF, ±5%, 50V
C153	21–13740B25	10 pF, ±5%, 50V
C154	21–13741B45	.01 uF, ±5%, 50V
C155,156	21–13740B55	180 pF, ±5%, 50V
C157	21–13741B45	.01 uF, ±5%, 50V
C158	08–11051A15	.22 uF, ±5%, 63V
C159	21–13740B35	27 pF, ±5%, 50V
C160	21–13740B29	15 pF, ±5%, 50V
C161	21–13740B73	.001 uF, ±5%, 50V
C162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C163	08–11051A17	.47 uF, ±5%, 63V
C164	21–13741B69	.1 uF, ±5%, 50V
C176	21–13740B73	.001 uF, ±5%, 50V
C201	23–11048B13	10 uF, ±20%, 16V, electrolytic
C205	21–13740B49	100 pF, ±5%, 50V
C206	21–13740B17	4.7 pF, ±5%, 50V
C207	21–13740B25	10 pF, ±5%, 50V
C208,209	21–13740B19	5.6 pF, ±5%, 50V
C210	21–13740B49	100 pF, ±5%, 50V
C212	21–13740B49	100 pF, ±5%, 50V
C213	21–13740B01	1 pF, ±5%, 50V
C215	21–13740B49	100 pF, ±5%, 50V
C216,217	21–13740B13	3.3 pF, ±5%, 50V
C218	21–13741B49	100 pF, ±5%, 50V
C220	21–13740B25	10 pF, ±5%, 50V
C221	21–13740B05	1.5 pF, ±5%, 50V

MXW–7408–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C222	21–13740B49	100 pF, ±5%, 50V
C224,225	21–13740B49	100 pF, ±5%, 50V
C228	21–13741B29	.0022 uF, ±5%, 50V
C230,231	21–13740B05	1.5 pF, ±5%, 50V
C233	21–13740B17	4.7 pF, ±5%, 50V
C234	21–13740B26	11 pF, ±5%, 50V
C235,236	21–13740B19	5.6 pF, ±5%, 50V
C237	21–13740B49	100 pF, ±5%, 50V
C239	21–13740B49	100 pF, ±5%, 50V
C240	21–13740B05	1.5 pF, ±5%, 50V
C242	21–13740B49	100 pF, ±5%, 50V
C243,244	21–13740B13	3.3 pF, ±5%, 50V
C245	21–13740B49	100 pF, ±5%, 50V
C247	21–13740B23	8.2 pF, ±5%, 50V
C248	21–13740B01	1 pF, ±5%, 50V
C249	21–13740B49	100 pF, ±5%, 50V
C252	21–13740B49	100 pF, ±5%, 50V
C258	08–11051A07	.01 uF, ±5%, 63V
C259	21–13740B23	8.2 pF, ±5%, 50V
C263	21–13740B19	5.6 pF, ±5%, 50V
C266	21–13740B03	1.2 pF, ±5%, 50V
C267	21–13740B01	1 pF, ±5%, 50V
C276	21–13741B45	.01 uF, ±5%, 50V
C277–279	23–11048B19	47 uF, +20%, 16V, electrolytic
C280	21–13740B45	68 pF, ±5%, 50V
C301	21–13741B45	.01 uF, ±5%, 50V
C302	21–13740B49	100 pF, ±5%, 50V
C304–308	21–13740B45	68 pF, ±5%, 50V
C309–311	21–13740B49	100 pF, ±5%, 50V
C312	21–13740B45	68 pF, ±5%, 50V
C313	21–13740B49	100 pF, ±5%, 50V
C314	21–11022H27	10 pF, ±.5 pF, 50V
diode (see note)		
CR1	48–80236E16	Schottky
CR2	48–80154K02	Schottky
CR3	48–80939T01	Schottky
CR4	48–80142L01	pin
CR51	48–83654H01	silicon
CR101,102	48–83654H01	silicon
CR151,152	48–05129M21	varactor
CR153,154	48–83654H01	silicon
CR176	48–83654H02	silicon
CR203	48–84534N02	varactor
CR205	48–84534N02	varactor
CR206	48–80154K02	Schottky
CR209	48–84534N02	varactor
CR211	48–84534N02	varactor
CR213	48–84534N02	varactor
CR214	48–80154K02	Schottky
filter		
FL51	91–80097D06	6 element, ceramic
FL52	91–80098D06	3 wire, ceramic
connector receptacle		
J4,5	09–80135M01	2 pin coax
J6	09–80130M03	14 position socket
RF coil		
L1–7	24–80148M01	27 nH, 1.5 turns
L8	24–11030B02	1.5 turns, red
L9	24–11030B04	1.5 turns, yellow
L10	24–80989T02	150 nH, ±20%
L51	24–11030B12	7.5 turns, yellow
L52	24–80063M13	1 uH
L53	24–80063M04	.18 uH
L54	24–80063M21	4.7 uH
L55	24–80164M04	5.2 turns, variable
L56	24–80164M01	1.6 ratio, variable
L57	24–80164M04	5.2 turns, variable
L58	24–80063M21	4.7 uH
L59	24–80164M03	4.3 turns, variable
L60	24–80063M14	1.2 uH
L61	25–80000E01	transmformer
L101	24–80063M05	.22 uH
L102	24–11030B08	4.5 turns, brown
L151	24–80299D01	17.75 turns, orange
L152	24–80063M22	5.6 uH
L202	24–80148M02	43 nH, 2.5 turns
L203	24–80989T02	150 nH, ±20%
L204	24–11030A04	5 turns, green
L205,206	24–80989T02	150 nH, ±20%
L207	24–80063M05	.22 uH
L209	24–11030B05	2.5 turns, green
L210	24–11030B08	4.5 turns, brown
L211	24–80063M05	.22 uH
L213	24–80148M01	27 nH, 1.5 turns
L214	24–80989T02	150 nH, ±20%
L215	24–11030B08	4.5 turns, brown
L216	24–80989T02	150 nH, ±20%
L217	24–80989T02	150 nH, ±20%
L218	24–80063M05	.22 uH
L220	24–11030B05	2.5 turns, green
L221	24–11030B08	4.5 turns, brown
L222	24–80063M05	.22 uH
transistor (see note)		
Q1	48–80950X01	NPN
Q2–5	48–80869643	N–channel
Q51,52	48–80869839	NPN
Q53	48–80869642	NPN

MXW–7408–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q101	48–80869643	PNP
Q102,103	48–80182D20	NPN
Q104	48–80869643	PNP
Q105,106	48–80869642	NPN
Q107	48–80869658	NPN
Q151	48–80869658	NPN
Q152	48–80869643	PNP
Q203	48–05128M66	N–channel
Q204,205	48–80950X01	NPN
Q206	48–05128M66	N–channel
Q207,208	48–80950X01	NPN
Q276	48–80869642	NPN
Q277–279	48–80869643	PNP
Q280	48–80214G02	
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R1	06–11077A84	2.7k
R2	06–11077A62	330
R3	06–11077A60	270
R4	06–11077B01	12k
R5	06–11077B03	15k
R7,8	06–11077A98	10k
R9	06–11077A72	820
R51	06–11077A43	51
R52	06–11077A54	150
R53	06–11077A98	10k
R54	06–11077A54	150
R56	06–11077B45	820k
R57	06–11077A72	820
R58	06–11077B23	100k
R59	06–11077B27	150k
R60	18–05500L08	22k, ±20%, potentiometer
R62	06–11077B09	27k
R63	06–11077B21	82k
R102	06–11077A62	330
R103,104	06–11077A98	10k
R105	06–11077B11	33k
R106	06–11077A73	910
R107	06–11077A15	1.5k
R108,109	06–11077A26	10
R110	06–11077B03	15k
R111	06–11077A60	270
R112	06–11077A76	1.2k
R113	06–11077A64	390
R114	06–11077A60	270
R115	06–11077A72	820
R116	06–11077A94	6.8k
R118	06–11077A72	820
R119	06–11077A88	3.9k
R120	06–11077A94	6.8k
R121	06–11077A98	10k
R122	06–11077A88	3.9k
R123	06–11077A74	1k
R124	06–11077A78	1.5k
R125	06–11077A44	56
R126	06–11077A50	100
R127	06–11077A84	2.7k
R128	06–11077A72	820
R151	06–11077B15	47k
R152	06–11077B11	33k
R153	06–11077B15	47k
R154	06–11077A34	22
R155	06–11077A98	10k
R156	06–11077B03	15k
R157	06–11077A78	1.5k
R158,159	06–11077A74	1k
R161	06–11077A98	10k
R163	06–11077B17	56k
R164	18–05500L08	22k, ±20%, potentiometer
R165	06–11077B07	22k
R176	06–11077G26	22.6k, ±1%
R177	06–11077G28	23.7k, ±1%
R178,179	06–11077F91	10k, ±1%
R180	06–11077G52	42.2k, ±1%
R181	06–11077F91	10k, ±1%
R182	06–11077G28	23.7k, ±1%
R207	06–11077A44	56
R208,209	06–11077A38	33
R210	06–11077A98	10k
R212	06–11077A84	2.7k
R213	06–11077A72	820
R214	06–11077A50	100
R215	06–11077A84	2.7k
R216	06–11077A72	820
R217	06–11077A50	100
R218	06–11077A49	91
R219	06–11077A48	82
R220	06–11077A49	91
R222	06–11077A88	3.9k
R223	06–11077A94	6.8k
R224	06–11077B23	100k
R225	06–11077A88	3.9k
R226	06–11077A44	56
R227	06–11077A38	33
R228	06–11077A88	3.9k
R229	06–11077A98	10k
R231	06–11077A84	2.7k
R232	06–11077A72	820
R233	06–11077A50	100
R234	06–11077A84	2.7k
R235	06–11077A72	820

MXW–7408–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R236	06–11077A50	100
R237	06–11077A61	300
R238	06–11077A32	18
R239	06–11077A61	300
R243	06–11077B23	100k
R245	06–11077A74	1k
R276	06–11077A88	10k
R277	06–11077A60	270
R278	06–11077A26	10
R279	06–11077A90	4.7k
R280	06–11077A98	10k
R281	06–11077A60	4.7k
R282	06–11077A60	270
R301	06–11077A82	2.2k
R302	18–05500L08	22k, ±20%, 100V, potentiometer
R303	06–11077A94	6.8k
transformer		
T1,2	25–80163M02	500 MHz balance transformer
integrated circuits (see note)		
U51	51–05479G05	linear
U101	51–84704M75	synthesizer
U102	51–83977M45	prescaler
U176	51–84621K89	dual opamp
crystal (see note)		
Y51	91–80022M02	45.1 MHz
Y52	48–80008K02	44.645 MHz
Y151	48–80174D02	14.4 MHz
non–referenced parts		
	05–00003152	eyelet
	14–05160A01	insulator
	26–80088M01	coil can shield, 10 used
	26–80097M01	coil can shield
	26–80228L01	PC bottom shield
	26–80256L02	coax connector bottom shield
	26–80229L03	VCO shield
	30–10286A77	24 strand wire, white
	42–80957X01	grounding clip
	54–80117F01	PROM label
	75–05295B02	crystal base pad, 2 used
	75–05295B07	crystal base pad, 2 used
	84–80929V01	circuit board

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

Schematic, Circuit Board Diagrams, and Parts List for HLE4424A UHF RF Board

PW–7587–O

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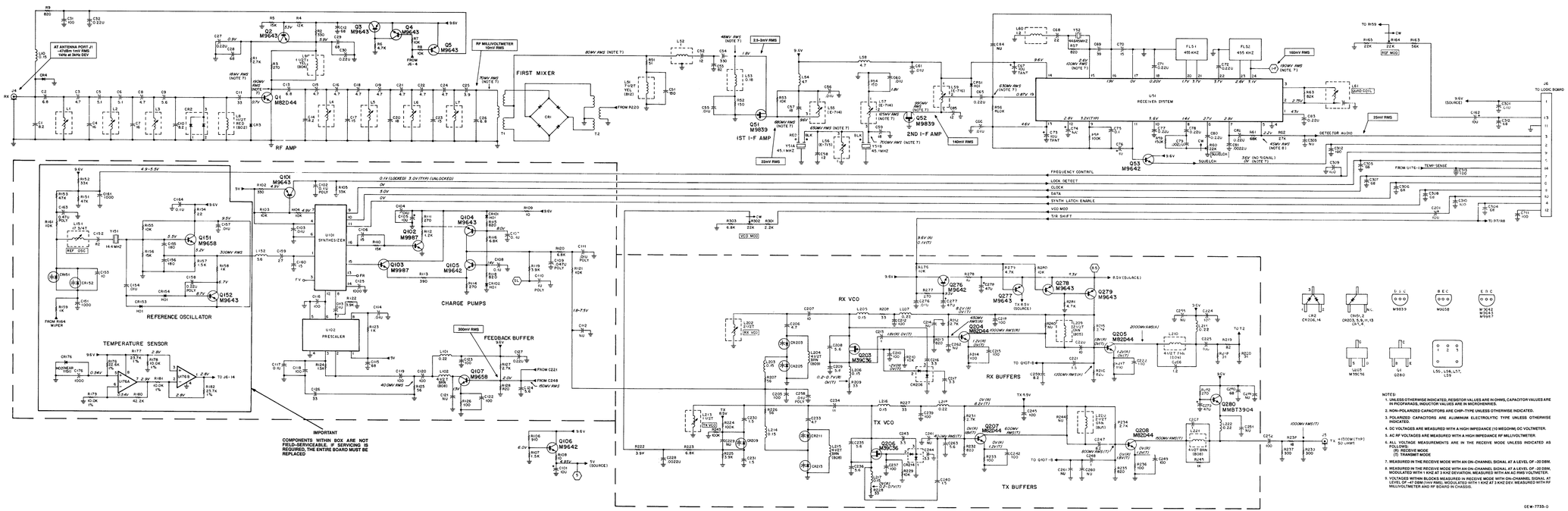
UHF RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	.7	0	5.9	—	—	—
Q2	5.3	5.9	.9	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	0	0 (W/ SIG)	9.6	—	—	—
Q101	5.0	4.9	.1 (LOCKED)	—	—	—
Q102	.7	0	0.1	—	—	—
Q103	5.0	4.4	9.6	—	—	—
Q104	8.1	2.8v	2-8v	—	—	—
Q105	1.4	VAR.	2-8v	—	—	—
Q106	6.0	5.0	9.6	—	—	—
Q107	2.0	1.3	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6.7	—	—	—
Q201	—	9.6	0(U) 9.3(L)	U=UPPER L=LOWER RANGE		
Q202	0(U) 7(L)	0	6.7(U)0(L)	—	—	—
Q203	—	—	—	2.6(R)	4.8(R)	7.9(R)
Q204	1.8(R)	1.2(R)	8.2(R)	—	—	—
Q205	1.8(R)	1.2(R)	9.6	—	—	—
Q206	—	—	—	-.5(T)	1.1(T)	7.8(T)
Q207	1.8(T)	1.2(T)	8.5(T)	—	—	—
Q208	1.8(T)	1.2(T)	9.6	—	—	—
Q276	9.5	8.6	9.6	—	—	—
Q277	9.6	8.5(T)	8.5	—	—	—
Q278	9.6	8.3	7.6(R)	—	—	—
Q279	7.6(R)	8.5	8.5	—	—	—



Schematic, Circuit Board Diagrams, and Parts List for HLE4424B UHF RF Board
PW–7723–O
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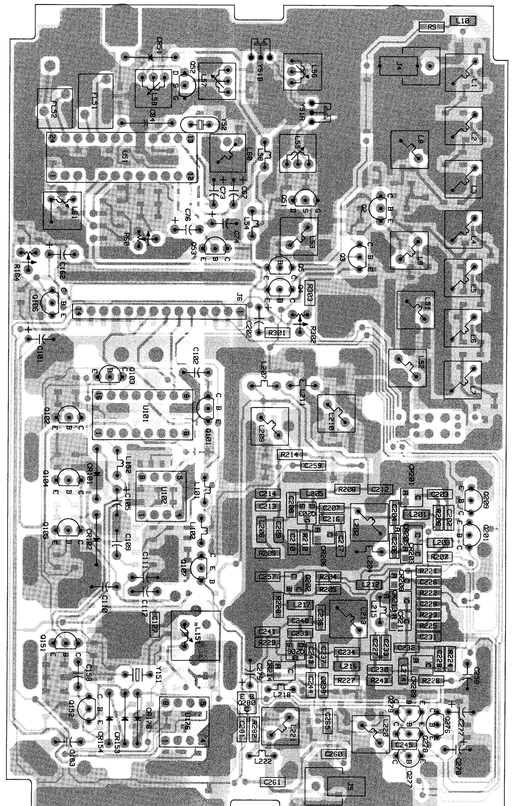
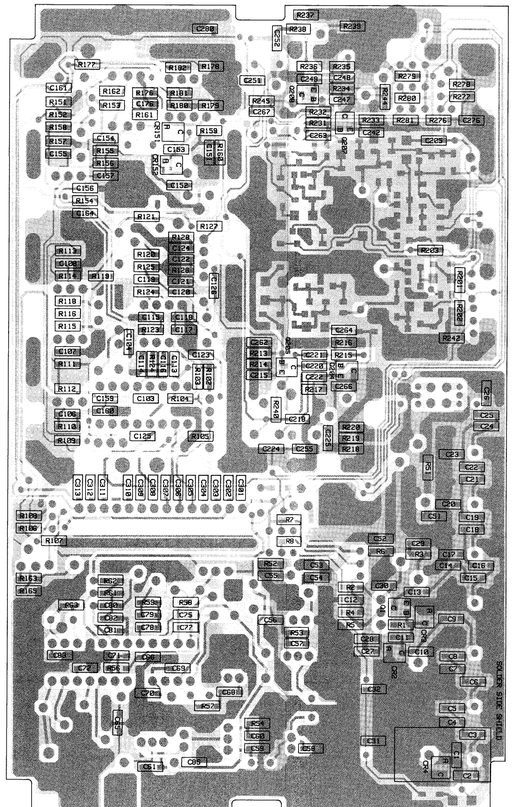


COMPONENT SIDE VIEW



SOLDER SIDE VIEW

SOLDER SIDE	RED	GAW–7724–O
COMPONENT SIDE	GREY	GAW–7725–O
OVERLAYS	BLACK	GDW–7726–O

parts list

HLE4424B *MaxTrac* UHF 25 kHz Range 1 RF Board — MXW–7758–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C1	21–13740B23	8.2 pF, ±5%, 50V
C2	21–13740B21	6.8 pF, ±5%, 50V
C3	21–13740B17	4.7 pF, ±5%, 50V
C4	21–13740B30	16 pF, ±5%, 50V
C5,6	21–13740B18	5.1 pF, ±5%, 50V
C7	21–13740B31	16 pF, ±5%, 50V
C8	21–13740B17	4.7 pF, ±5%, 50V
C9	21–13740B19	5.6 pF, ±5%, 50V
C10	21–13740B23	8.2 pF, ±5%, 50V
C11	21–13740B37	33 pF, ±5%, 50V
C12	21–13740B45	68 pF, ±5%, 50V
C13	21–13740B21	6.8 pF, ±5%, 50V
C14	21–13740B23	8.2 pF, ±5%, 50V
C15,16	21–13740B17	4.7 pF, ±5%, 50V
C17	21–13740B29	15 pF, ±5%, 50V
C18,19	21–13740B17	4.7 pF, ±5%, 50V
C20	21–13740B31	18 pF, ±5%, 50V
C21,22	21–13740B17	4.7 pF, ±5%, 50V
C23	21–13740B29	15 pF, ±5%, 50V
C24	21–13740B17	4.7 pF, ±5%, 50V
C25	21–13740B15	3.9 pF, ±5%, 50V
C26	21–13740B21	6.8 pF, ±5%, 50V
C27	21–11032B15	.22 uF, +80, -20%, 50V
C28,29	21–13740B45	68 pF, ±5%, 50V
C30	21–11032B15	.22 uF, +80, -20%, 50V
C31	21–13740B49	100 pF, ±5%, 50V
C32	21–11032B15	.22 uF, +80, -20%, 50V
C51	21–13740B55	150 pF, ±5%, 50V
C52	21–13740B27	12 pF, ±5%, 50V
C53	21–13740B47	82 pF, ±5%, 50V
C54	21–13740B61	330 pF, ±5%, 50V
C55,56	21–13741B45	.01 uF, ±5%, 50V
C57	21–13740B31	18 pF, ±5%, 50V
C58	21–13740B27	12 pF, ±5%, 50V
C59	21–13740B31	18 pF, ±5%, 50V
C60,61	21–13741B45	.01 uF, ±5%, 50V
C65	21–11032B15	.22 uF, +80, -20%, 50V
C66	21–13741B45	.01 uF, ±5%, 50V
C67	23–13749C39	10 uF, ±10%, 50V, tantalum
C68	21–13740B33	22 pF, ±5%, 50V
C69	21–13740B39	39 pF, ±5%, 50V
C70	21–13740B29	15 pF, ±5%, 50V
C71,72	21–11032B15	.22 uF, +80, -20%, 50V
C73	23–13749C39	10 uF, ±10%, 50V, tantalum
C74	23–11048B13	10 uF, ±20%, 16V, electrolytic
C75	21–13741B69	.1 uF, ±5%, 50V
C76	23–11048B05	1 uF, ±20%, 50V, electrolytic
C77,78	21–11032B15	.22 uF, +80, -20%, 50V
C79	21–13741B29	.0022 uF, ±5%, 50V
C80	21–11032B15	.22 uF, +80, -20%, 50V
C81	21–13740B55	180 pF, ±5%, 50V
C82,83	21–11032B15	.22 uF, +80, -20%, 50V
C85	21–13740B27	12 pF, ±5%, 50V
C101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C102	08–11051A13	.1 uF, ±5%, 63V
C103,104	21–13741B45	.01 uF, ±5%, 50V
C105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C106	21–13740B29	15 pF, ±5%, 50V
C107,108	21–13741B69	.1 uF, ±5%, 50V
C109	08–11051A11	.047 uF, ±5%, 63V
C110	08–11051A19	1 uF, ±5%, 63V
C111	08–11051A07	.01 uF, ±5%, 63V
C113,114	21–13741B45	.01 uF, ±5%, 50V
C115	21–13740B45	68 pF, ±5%, 50V
C116	21–13740B49	100 pF, ±5%, 50V
C117	21–13741B69	.1 uF, ±5%, 50V
C118–120	21–13740B49	100 pF, ±5%, 50V
C122,123	21–13740B49	100 pF, ±5%, 50V
C124	21–13740B19	5.6 pF, ±5%, 50V
C125	21–13740B73	.001 uF, ±5%, 50V
C126	21–13740B37	33 pF, ±5%, 50V
C127	21–11032B15	.22 uF, +80, -20%, 50V
C151	21–13740B73	.001 uF, ±5%, 50V
C152	21–13740B47	82 pF, ±5%, 50V
C153	21–13740B25	10 pF, ±5%, 50V
C154	21–13741B45	.01 uF, ±5%, 50V
C155,156	21–13740B55	180 pF, ±5%, 50V
C157	21–13741B45	.01 uF, ±5%, 50V
C158	08–11051A15	.22 uF, ±5%, 63V
C159	21–13740B35	27 pF, ±5%, 50V
C160	21–13740B29	15 pF, ±5%, 50V
C161	21–13740B73	.001 uF, ±5%, 50V
C162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C163	08–11051A17	.47 uF, ±5%, 63V
C164	21–13741B69	.1 uF, ±5%, 50V
C176	21–13740B73	.001 uF, ±5%, 50V
C201	23–11048B13	10 uF, ±20%, 16V, electrolytic
C205	21–13740B49	100 pF, ±5%, 50V
C206	21–13740B17	4.7 pF, ±5%, 50V
C207	21–13740B25	10 pF, ±5%, 50V
C208,209	21–13740B19	5.6 pF, ±5%, 50V
C210	21–13740B49	100 pF, ±5%, 50V
C212	21–13740B49	100 pF, ±5%, 50V
C213	21–13740B01	1 pF, ±5%, 50V
C215	21–13740B49	100 pF, ±5%, 50V
C216,217	21–13740B13	3.9 pF, ±5%, 50V
C218	21–13741B49	100 pF, ±5%, 50V
C220	21–13740B25	10 pF, ±5%, 50V
C221	21–13740B05	1.5 pF, ±5%, 50V

MXW–7758–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C222	21–13740B49	100 pF, ±5%, 50V
C224,225	21–13740B49	100 pF, ±5%, 50V
C228	21–13741B29	.0022 uF, ±5%, 50V
C230,231	21–13740B05	1.5 pF, ±5%, 50V
C233	21–13740B17	4.7 pF, ±5%, 50V
C234	21–13740B26	11 pF, ±5%, 50V
C235,236	21–13740B19	5.6 pF, ±5%, 50V
C237	21–13740B49	100 pF, ±5%, 50V
C239	21–13740B49	100 pF, ±5%, 50V
C240	21–13740B05	1.5 pF, ±5%, 50V
C242	21–13740B49	100 pF, ±5%, 50V
C243,244	21–13740B13	3.3 pF, ±5%, 50V
C245	21–13740B49	100 pF, ±5%, 50V
C247	21–13740B23	8.2 pF, ±5%, 50V
C248	21–13740B01	1 pF, ±5%, 50V
C249	21–13740B49	100 pF, ±5%, 50V
C252	21–13740B49	100 pF, ±5%, 50V
C258	08–11051A07	.01 uF, ±5%, 63V
C259	21–13740B23	8.2 pF, ±5%, 50V
C261	21–13740B01	1 pF, ±5%, 50V
C263	21–13740B19	5.6 pF, ±5%, 50V
C266	21–13740B03	1.2 pF, ±5%, 50V
C267	21–13740B01	1 pF, ±5%, 50V
C276	21–13741B45	.01 uF, ±5%, 50V
C277–279	23–11048B19	47 uF, ±20%, 16V, electrolytic
C280	21–13740B45	68 pF, ±5%, 50V
C301	21–13741B45	.01 uF, ±5%, 50V
C302	21–13740B49	100 pF, ±5%, 50V
C304–308	21–13740B49	68 pF, ±5%, 50V
C309–311	21–13740B49	100 pF, ±5%, 50V
C312	21–13740B45	68 pF, ±5%, 50V
C313	21–13740B49	100 pF, ±5%, 50V
C314	21–11022H27	10 pF, ±.5 pF, 50V
diode (see note)		
CR1	48–80236E16	Schottky
CR2	48–80154K02	Schottky
CR3	48–80939T01	Schottky
CR4	48–80142L01	pin
CR51	48–83654H01	silicon
CR101,102	48–83654H01	silicon
CR151,152	48–05129M21	varactor
CR153,154	48–83654H01	silicon
CR176	48–82256C11	zener
CR203	48–84534N02	varactor
CR205	48–84534N02	varactor
CR206	48–80154K02	Schottky
CR209	48–84534N02	varactor
CR211	48–84534N02	varactor
CR213	48–84534N02	varactor
CR214	48–80154K02	Schottky
filter		
FL51	91–80097D06	6 element, ceramic
FL52	91–80098D06	3 wire, ceramic
connector receptacle		
J4,5	09–80135M01	2 pin coax
J6	09–80130M03	14 position socket
RF coil		
L1–7	24–80148M01	27 nH, 1.5 turns
L8	24–11030B02	1.5 turns, red
L9	24–11030B04	1.5 turns, yellow
L10	24–60578C15	150 nH, ±20%
L51	24–11030B12	7.5 turns, yellow
L52	24–80063M13	1 uH
L53	24–80063M04	.18 uH
L54	24–80063M21	4.7 uH
L55	24–80164M04	5.2 turns, variable
L56	24–80164M01	1.6 ratio, variable
L57	24–80164M04	5.2 turns, variable
L58	24–80063M21	4.7 uH
L59	24–80164M03	4.3 turns, variable
L60	24–80063M14	1.2 uH
L61	25–80000E01	transmformer
L101	24–80063M05	.22 uH
L102	24–11030B08	4.5 turns, brown
L151	24–80299D01	17.75 turns, orange
L152	24–80063M22	5.6 uH
L202	24–80148M02	43 nH, 2.5 turns
L203	24–60578C15	150 nH, ±20%
L204	24–11030B09	4.5 turns
L205,206	24–60578C15	150 nH, ±20%
L207	24–80063M05	.22 uH
L209	24–11030B05	2.5 turns, green
L210	24–11030B08	4.5 turns, brown
L211	24–80063M05	.22 uH
L213	24–80148M01	27 nH, 1.5 turns
L214	24–60578C15	150 nH, ±20%
L215	24–11030B08	4.5 turns, brown
L216,217	24–60578C15	150 nH, ±20%
L218	24–80063M05	.22 uH
L220	24–11030B05	2.5 turns, green
L221	24–11030B08	4.5 turns, brown
L222	24–80063M05	.22 uH
transistor (see note)		
Q1	48–80950X01	NPN
Q2–5	48–80869643	N–channel
Q51,52	48–80869639	NPN
Q53	48–80869642	NPN

MXW–7758–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q101	48–80869643	PNP
Q102,103	48–80182D20	NPN
Q104	48–80869643	PNP
Q105,106	48–80869642	NPN
Q107	48–80869658	NPN
Q151	48–80869658	NPN
Q152	48–80869643	PNP
Q203	48–05128M66	N–channel
Q204,205	48–80950X01	NPN
Q206	48–05128M66	N–channel
Q207,208	48–80950X01	NPN
Q276	48–80869642	NPN
Q277–279	48–80869643	PNP
Q280	48–80214G02	
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R1	06–11077A84	2.7k
R2	06–11077A62	330
R3	06–11077A60	270
R4	06–11077B01	12k
R5	06–11077B03	15k
R6	06–11077A90	4.7k
R7,8	06–11077A98	10k
R9	06–11077A72	820
R51	06–11077A43	51
R52	06–11077A54	150
R53	06–11077A98	10k
R54	06–11077A54	150
R56	06–11077B45	820k
R57	06–11077A72	820
R58	06–11077B23	100k
R59	06–11077B27	150k
R60	18–05500L08	22k, ±20%, potentiometer
R61	06–11077B19	68k
R62	06–11077B09	27k
R63	06–11077B21	82k
R102	06–11077A62	330
R103,104	06–11077A98	10k
R105	06–11077B11	33k
R106	06–11077A70	910
R107	06–11077A78	1.5k
R108,109	06–11077A26	10
R110	06–11077B03	15k
R111	06–11077A60	270
R112	06–11077A76	1.2k
R113	06–11077A64	390
R114	06–11077A60	270
R115	06–11077A72	820
R116	06–11077A94	6.8k
R118	06–11077A72	820
R119	06–11077A88	3.9k
R120	06–11077A94	6.8k
R121	06–11077A98	10k
R122	06–11077A88	3.9k
R123	06–11077A74	1k
R124	06–11077A78	1.5k
R125	06–11077A42	56
R126	06–11077A50	100
R127	06–11077A84	2.7k
R128	06–11077A72	820
R151	06–11077B15	47k
R152	06–11077B11	33k
R153	06–11077B15	47k
R154	06–11077A34	22
R155	06–11077A98	10k
R156	06–11077B03	15k
R157	06–11077A78	1.5k
R158,159	06–11077A74	1k
R161	06–11077A98	10k
R163	06–11077B17	56k
R164	18–05500L08	22k, ±20%, potentiometer
R165	06–11077B07	22k
R176	06–11077G26	22.6k, ±1%
R177	06–11077G28	23.7k, ±1%
R178,179	06–11077F91	10k, ±1%
R180	06–11077G52	42.2k, ±1%
R181	06–11077F91	10k, ±1%
R182	06–11077G28	23.7k, ±1%
R207	06–11077A44	56
R208,209	06–11077A38	33
R210	06–11077A98	10k
R212	06–11077A84	2.7k
R213	06–11077A72	820
R214	06–11077A50	100
R215	06–11077A84	2.7k
R216	06–11077A72	820
R217	06–11077A50	100
R218	06–11077A49	91
R219	06–11077A48	82
R220	06–11077A49	91
R222	06–11077A88	3.9k
R223	06–11077A94	6.8k
R224	06–11077B23	100k
R225	06–11077A88	3.9k
R226	06–11077A44	56
R227,228	06–11077A38	33
R229	06–11077A98	10k
R231	06–11077A84	2.7k
R232	06–11077A72	820
R233	06–11077A50	100
R234	06–11077A84	2.7k

MXW–7758–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R235	06–11077A72	820
R236	06–11077A50	100
R237	06–11077A61	300
R238	06–11077A32	18
R239	06–11077A61	300
R243	06–11077B23	100k
R245	06–11077A74	1k
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
R282	06–11077A60	270
R301	06–11077A82	2.2k
R302	18–05500L08	22k, ±20%, 100V, potentiometer
R303	06–11077A94	6.8k
transformer		
T1,2	25–80163M02	500 MHz balance transformer
integrated circuits (see note)		
U51	51–05479G05	linear
U101	51–84704M75	synthesizer
U102	51–83977M45	prescaler
U176	51–84621K89	dual opamp
crystal (see note)		
Y51	91–80022M02	45.1 MHz
Y52	48–80008K02	44.645 MHz
Y151	48–80174D05	14.4 MHz

mechanical parts

	26–80098M01	coil can shield, 12 used
	26–80097M01	coil can shield
	26–80228L01	IF bottom shield, 3 used
	26–80229L02	VCO shield
	75–05295B02	crystal base pad, 2 used
	75–05295B07	crystal base pad, 2 used
	84–80929V02	circuit board

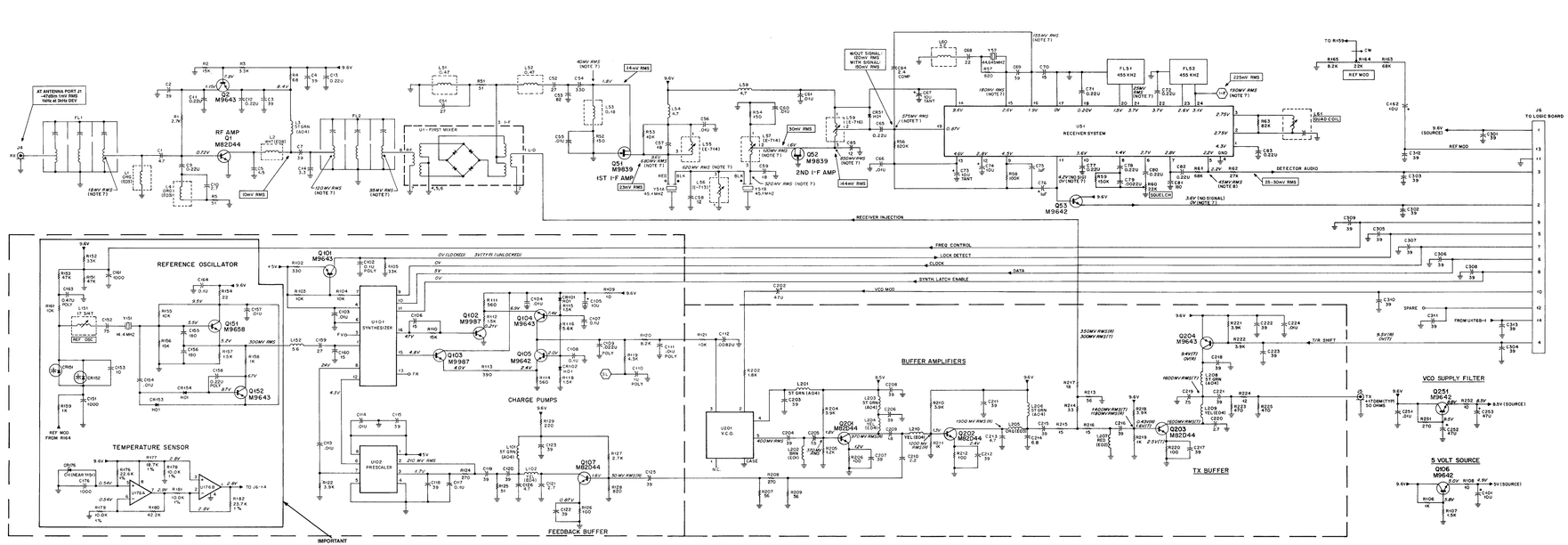
3/31/90

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

Schematic, Circuit Board Diagrams, and Parts List for HLE4424B UHF RF Board
PW–7723–O
(Sheet 2 of 2)
3/31/90

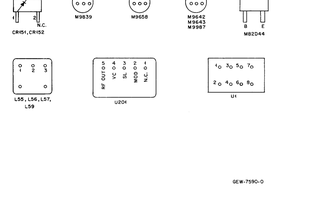
800 MHz RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	7.2	0	8.4	—	—	—
Q2	7.8	8.4	1.2	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	0(SIG)	0(SIG)	9.6	—	—	—
Q101	4.8	4.8	0 (LOCK)	—	—	—
Q102	.72(R)	0	.21	—	—	—
Q103	4.8	4.0	9.6	—	—	—
Q104	7.4	6.9	2–8v	—	—	—
Q105	2.0	2.4	2–8v	—	—	—
Q106	5.8	5.0	9.6	—	—	—
Q107	1.6	.87	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6.7	—	—	—
Q201	1.8	1.2	8.5	—	—	—
Q202	1.3	2.4	9.6	—	—	—
Q203	1.6(T)	2.5(T)	9.4(T)	—	—	—
Q204	9.5(R)	9.6	9.4(T)	—	—	—
Q251	9.5	8.8	9.6	—	—	—

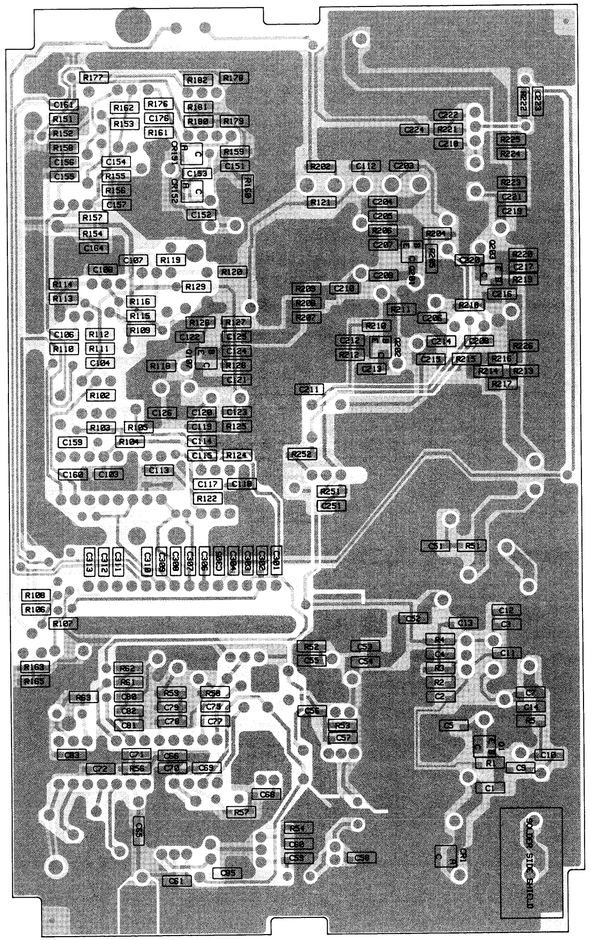


NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN PICOFARADS, INDUCTOR VALUES ARE IN MICROHENRYS.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
5. AC RF VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE RF MILLIVOLTMETER.
6. ALL VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM.
8. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
9. VOLTAGES WITHIN BLOCKS MEASURED IN RECEIVE MODE WITH ON-CHANNEL SIGNAL AT LEVEL OF -47 DBM (1mV RMS), MODULATED WITH 1 KHZ AT 3 KHZ DEV. MEASURED WITH RF MILLIVOLTMETER AND RF BOARD IN CHASSIS.

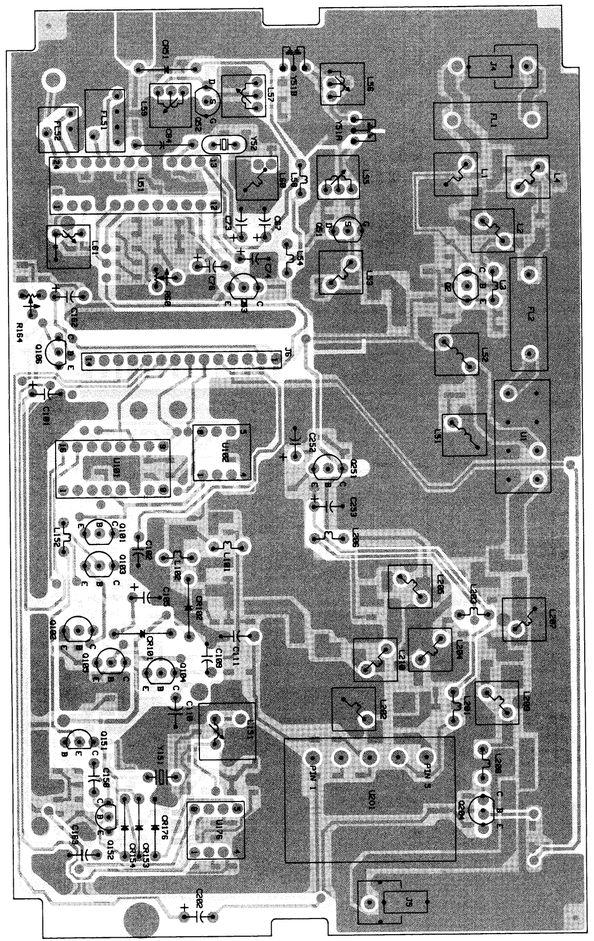


Schematic, Circuit Board Diagrams, and Parts List for HLF4095B 800 MHz RF Board
PW–7589–O
(Sheet 1 of 2)
3/31/90



SOLDER SIDE VIEW

SOLDER SIDE	RED	GAW–7727–O
COMPONENT SIDE	GREY	GAW–7728–O
OVERLAYS	BLACK	GDW–7729–O



COMPONENT SIDE VIEW

parts list

HLF4095B *MaxTrac* 800 MHz RF Board — MXW–7409–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C1	21–13740B17	4.7 pF, ±5%, 50V
C2–4	21–13740B39	39 pF, ±5%, 50V
C5	21–13740B05	1.5 pF, ±5%, 50V
C7	21–13740B39	39 pF, ±5%, 50V
C9	21–11032B15	.22 uF, +80%, –20%, 50V
C10	21–13740B11	2.7 pF, ±5%, 50V
C11–13	21–11032B15	.22 uF, +80%, –20%, 50V
C14	21–13740B13	3.3 pF, ±5%, 50V
C51	21–13740B35	27 pF, ±5%, 50V
C52	21–13740B35	27 pF, ±5%, 50V
C53	21–13740B47	82 pF, ±5%, 50V
C54	21–13740B61	330 pF, ±5%, 50V
C55,56	21–13741B45	.01 uF, ±5%, 50V
C57	21–13740B31	18 pF, ±5%, 50V
C58	21–13740B27	12 pF, ±5%, 50V
C59	21–13740B31	18 pF, ±5%, 50V
C60,61	21–13741B45	.01 uF, ±5%, 50V
C65	21–11032B15	.22 uF, +80, –20%, 50V
C66	21–13741B45	.01 uF, ±5%, 50V
C67	23–11013D13	10 uF, ±10%, 20V, tantalum
C68	21–13740B33	22 pF, ±5%, 50V
C69	21–13740B39	39 pF, ±5%, 50V
C70	21–13740B29	15 pF, ±5%, 50V
C71,72	21–11032B15	.22 uF, +80, –20%, 50V
C73	23–11013D13	10 uF, ±10%, 20V, tantalum
C74	23–11048B13	10 uF, ±20%, 16V, electrolytic
C75	21–13741B69	.1 uF, ±5%, 50V
C76	23–11048B05	1 uF, ±20%, 50V, electrolytic
C77,78	21–11032B15	.22 uF, +80, –20%, 50V
C79	21–13741B29	.0022 uF, ±5%, 50V
C80	21–11032B15	.22 uF, +80, –20%, 50V
C81	21–13740B55	180 pF, ±5%, 50V
C82,83	21–11032B15	.22 uF, +80, –20%, 50V
C84	21–82450B14	2.4 pF, ±.5%, 500V
C85	21–13740B27	12 pF, ±5%, 50V
C101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C102	08–11051A13	.1 uF, ±5%, 63V
C103,104	21–13741B45	.01 uF, ±5%, 50V
C105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C106	21–13740B29	15 pF, ±5%, 50V
C107	21–13741B69	.1 uF, ±5%, 50V
C108	21–13741B69	.1 uF, ±5%, 50V
C109	08–11051A09	.022 uF, ±5%, 63V
C110	08–11051A19	1 uF, ±5%, 63V
C111	08–11051A07	.01 uF, ±5%, 63V
C112	21–13741B43	.0082 uF, ±5%, 50V
C113,114	21–13741B45	.01 uF, ±5%, 50V
C115	21–13740B39	39 pF, ±5%, 50V
C117	21–13741B69	.1 uF, ±5%, 50V
C118–120	21–13740B39	39 pF, ±5%, 50V
C121	21–13740B11	2.7 pF, ±5%, 50V
C122,123	21–13740B39	39 pF, ±5%, 50V
C125	21–13740B39	39 pF, ±5%, 50V
C126	21–13740B17	4.7 pF, ±5%, 50V
C151	21–13740B73	.001 uF, ±5%, 50V
C152	21–13740B46	75 pF, ±5%, 50V
C153	21–13740B25	10 pF, ±5%, 50V
C154	21–13741B45	.01 uF, ±5%, 50V
C155,156	21–13740B55	180 pF, ±5%, 50V
C157	21–13741B45	.01 uF, ±5%, 50V
C158	08–11051A15	.22 uF, ±5%, 63V
C159	21–13740B35	27 pF, ±5%, 50V
C160	21–13740B29	15 pF, ±5%, 50V
C161	21–13740B73	.001 uF, ±5%, 50V
C162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C163	08–11051A17	.47 uF, ±5%, 63V
C164	21–13741B69	.1 uF, ±5%, 50V
C176	21–13740B73	.001 uF, ±5%, 50V
C202	23–11048B19	47 uF, ±20%, 16V, electrolytic
C203,204	21–13740B39	39 pF, ±5%, 50V
C205	21–13740B22	7.5 pF, ±5%, 50V
C206–208	21–13740B39	39 pF, ±5%, 50V
C209	21–13740B07	1.8 pF, ±5%, 50V
C210	21–13740B09	2.2 pF, ±5%, 50V
C211,212	21–13740B39	39 pF, ±5%, 50V
C213	21–13740B17	4.7 pF, ±5%, 50V
C214	21–13740B21	6.8 pF, ±5%, 50V
C215–217	21–13740B39	39 pF, ±5%, 50V
C218	21–13741B39	39 pF, ±5%, 50V
C219	21–13740B22	7.5 pF, ±5%, 50V
C220	21–13740B11	2.7 pF, ±5%, 50V
C221–223	21–13740B39	39 pF, ±5%, 50V
C224	21–13740B45	.01 uF, ±5%, 50V
C251	21–13740B45	68 pF, ±5%, 50V
C252,253	23–11048B19	47 uF, ±20%, 16V, electrolytic
C301–313	21–13740B39	39 pF, ±5%, 50V
diode (see note)		
CR51	48–83654H01	silicon
CR101,102	48–83654H01	silicon
CR151,152	48–05129M21	varactor
CR153,154	48–83654H01	silicon
CR176	48–82256C11	10V zener
filter		
FL1,2	91–80054M01	3 pole, ceramic
FL51	91–80097D06	6 element, ceramic
FL52	91–80098D06	3 element, ceramic
RF coil		
L1	24–11030E03	orange

MXW–7409–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L2	24–11030E08	white
L3	24–11030A04	5 turns, green
L4	24–11030E03	orange
L51,52	24–80063M09	.47 uH
L53	24–80063M04	.18 uH
L54	24–80063M21	4.7 uH
L55	24–80164M04	5.2 turns, variable
L56	24–80164M01	1.6 ratio, variable
L57	24–80164M04	5.2 turns, variable
L58	24–80063M21	4.7 uH
L59	24–80164M03	4.3 turns, variable
L60	24–80063M14	1.2 uH
L61	25–80000E01	transmformer
L101	24–11030A04	5 turns, green
L102	24–11030E04	yellow
L151	24–80299D01	17.75 turns, orange
L152	24–80063M22	5.6 uH
L201	24–11030A04	5 turns, green
L202	24–11030E01	brown
L203	24–11030A04	5 turns, green
L204	24–11030E04	yellow
L205	24–11030E03	orange
L206	24–11030A04	5 turns, green
L207	24–11030E02	red
L208	24–11030A04	5 turns, green
L209,210	24–11030E04	yellow
connector receptacle		
J4,5	09–80135M01	2 pin coax
J6	09–80130M03	14 position socket
transformer		
T1,2	25–80163M02	500 MHz balance transformer
transistor (see note)		
Q1	48–80950X01	NPN
Q2	48–00869643	PNP
Q51,52	48–00869839	N–channel
Q53	48–00869642	NPN
Q101	48–00869643	PNP
Q102,103	48–80182D20	NPN
Q104	48–00869643	PNP
Q105,106	48–00869642	NPN
Q107	48–80950X01	NPN
Q151	48–00869658	NPN
Q152	48–00869643	PNP
Q201–203	48–80950X01	NPN
Q204	48–00869643	PNP
Q251	48–00869642	NPN
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R1	06–11077A94	2.7k
R2	06–11077B03	15k
R3	06–11077A86	3.3k
R4	06–11077A46	68
R5	06–11077A43	51
R51	06–11077A43	51
R52	06–11077A54	150
R53	06–11077A98	10k
R54	06–11077A54	150
R56	06–11077B45	820k
R57	06–11077A72	820
R58	06–11077B23	100k
R59	06–11077B27	150k
R60	18–05500L08	22k, ±20%, potentiometer
R61	06–11077B19	68k
R62	06–11077B09	27k
R63	06–11077B21	82k
R102	06–11077A62	330
R103,104	06–11077A98	10k
R105	06–11077B11	33k
R106	06–11077A74	1k
R107	06–11077A78	1.5k
R108,109	06–11077A26	10
R110	06–11077B03	15k
R111	06–11077A68	560
R112	06–11077A78	1.5k
R113	06–11077A64	390
R114	06–11077A68	560
R115	06–11077A78	1.5k
R116	06–11077A92	5.6k
R118	06–11077A78	1.5k
R119	06–11077A89	4.3k
R120	06–11077A96	8.2k
R121	06–11077A98	10k
R122	06–11077A88	3.9K
R124	06–11077A60	270
R125	06–11077A43	51
R126	06–11077A50	100
R127	06–11077A84	2.7k
R128	06–11077A72	820
R129	06–11077A58	220
R151	06–11077B15	47k
R152	06–11077B11	33k
R153	06–11077B15	47k
R154	06–11077A34	22
R155	06–11077A98	10k
R156	06–11077B03	15k
R157	06–11077A78	1.5k
R158,159	06–11077A74	1k
R161	06–11077A98	10k
R163	06–11077B19	68k

MXW–7409–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R164	18–05500L08	22k, ±20%, potentiometer
R165	06–11077A96	8.2k
R176	06–11077G26	22.6k, ±1%
R177	06–11077G18	18.7k, ±1%
R178,179	06–11077F91	10k, ±1%
R180	06–11077G52	42.2K, ±1%
R181	06–11077F91	10K, ±1%
R182	06–11077G28	23.7K, ±1%
R202	06–11077A80	1.8k
R204	06–11077A88	3.9k
R205	06–11077A76	1.2k
R206	06–11077A50	100
R207	06–11077A44	56
R208	06–11077A60	270
R209	06–11077A44	56
R210	06–11077A88	3.9k
R211	06–11077A74	1k
R212	06–11077A50	100
R213	06–11077A44	56
R214	06–11077A38	33
R215,216	06–11077A30	15
R217	06–11077A32	18
R218	06–11077A88	3.9k
R219	06–11077A74	1k
R220	06–11077A50	100
R221	06–11077A88	3.9k
R222	06–11077A88	3.9k
R223	06–11077A66	470
R224	06–11077A28	12
R225	06–11077A66	470
R251	06–11077A60	270
R252	06–11077A26	10
integrated circuits (see note)		
U1	51–80058M01	mixer
U51	51–05479G05	linear
U101	51–84704M75	synthesizer
U102	51–80924V01	prescaler
U176	51–84621K89	dual opamp
U201	51–80267L01	VCO hybrid
crystal (see note)		
Y51	91–80022M02	45.1 MHz
Y52	48–80008K02	44.645 MHz
Y151	48–80174D05	14.4 MHz

non–referenced parts

	14–05160A01	insulator
	26–80098M01	coil can shield, 7 used
	26–80097N01	coil can shield
	26–80228L01	coax connector shield
	26–80228L01	coax connector shield
	26–80229L03	VCO shield
	26–80256L01	coax connector bottom shield
	30–10286A72	24 strand wire, white
	42–80047N01	grounding clip
	54–80111F01	PROM label
	75–05295B02	crystal base pad, 2 used
	75–05295B07	crystal base pad, 2 used
	84–80132L01	circuit board

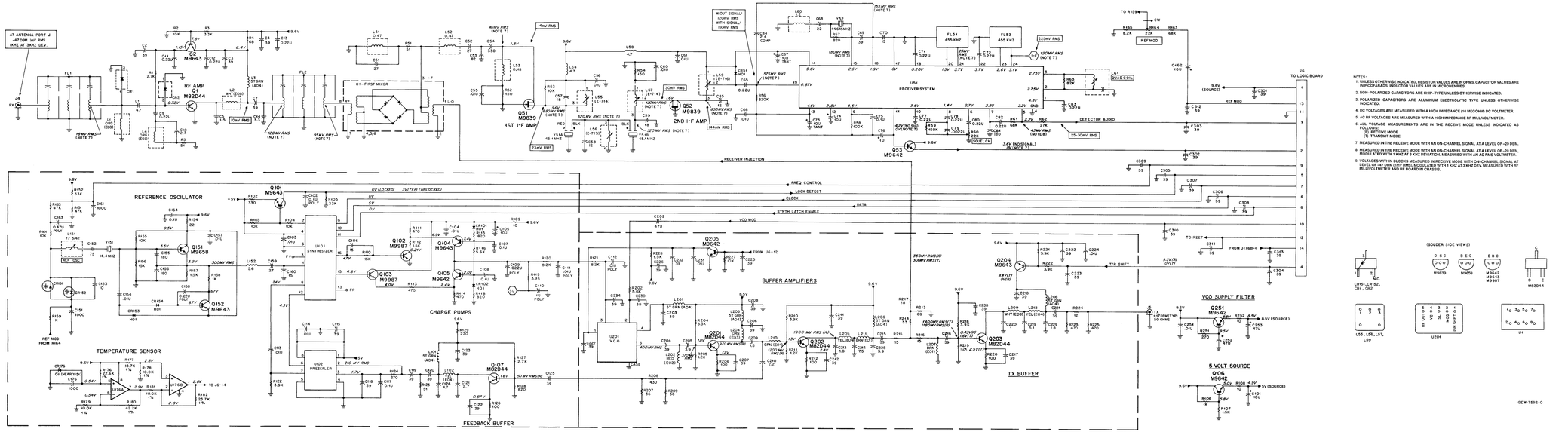
3/31/90

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

Schematic, Circuit Board Diagrams, and Parts List for HLF4095B 800 MHz RF Board
PW–7589–O
(Sheet 2 of 2)
3/31/90

800 MHz RF Board Transistor D.C. Voltage Table

Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	7.2	0	8.4	—	—	—
Q2	7.8	8.4	1.2	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	0(SIG)	0(SIG)	9.6	—	—	—
Q101	4.8	4.8	0 (LOCK)	—	—	—
Q102	.72(R)	0	.21	—	—	—
Q103	4.8	4.0	9.6	—	—	—
Q104	7.4	6.9	2–8v	—	—	—
Q105	2.0	2.4	2–8v	—	—	—
Q106	5.8	5.0	9.6	—	—	—
Q107	1.6	.87	9.6	—	—	—
Q151	5.5	5.2	9.5	—	—	—
Q152	8.7	9.5	6.7	—	—	—
Q201	1.8	1.2	8.5	—	—	—
Q202	1.3	2.4	9.6	—	—	—
Q203	1.6(T)	2.5(T)	9.4(T)	—	—	—
Q204	9.5(R)	9.6	9.4(T)	—	—	—
Q251	9.5	8.8	9.6	—	—	—



NOTES:
1. UNLESS OTHERWISE INDICATED, RESISTOR VALUES ARE IN OHMS, CAPACITOR VALUES ARE IN PICOFARADS, INDUCTOR VALUES ARE IN MICROHENRIES.
2. NON-POLARIZED CAPACITORS ARE CHIP-TYPE UNLESS OTHERWISE INDICATED.
3. POLARIZED CAPACITORS ARE ALUMINUM ELECTROLYTIC TYPE UNLESS OTHERWISE INDICATED.
4. DC VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE (10 MEGOHM) DC VOLTMETER.
5. AC RF VOLTAGES ARE MEASURED WITH A HIGH IMPEDANCE RF MILLIVOLTMETER.
6. ALL VOLTAGE MEASUREMENTS ARE IN THE RECEIVE MODE UNLESS INDICATED AS FOLLOWS:
   (R) RECEIVE MODE
   (T) TRANSMIT MODE
7. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM.
8. MEASURED IN THE RECEIVE MODE WITH AN ON-CHANNEL SIGNAL AT A LEVEL OF -20 DBM, MODULATED WITH 1 KHZ AT 3 KHZ DEVIATION. MEASURED WITH AN AC RMS VOLTMETER.
9. VOLTAGES WITHIN BLOCKS MEASURED IN RECEIVE MODE WITH ON-CHANNEL SIGNAL AT LEVEL OF -47 DBM (1MV RMS), MODULATED WITH 1 KHZ AT 3 KHZ DEV. MEASURED WITH RF MILLIVOLTMETER AND RF BOARD IN CHASSIS.

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Schematic, Circuit Board Diagrams, and
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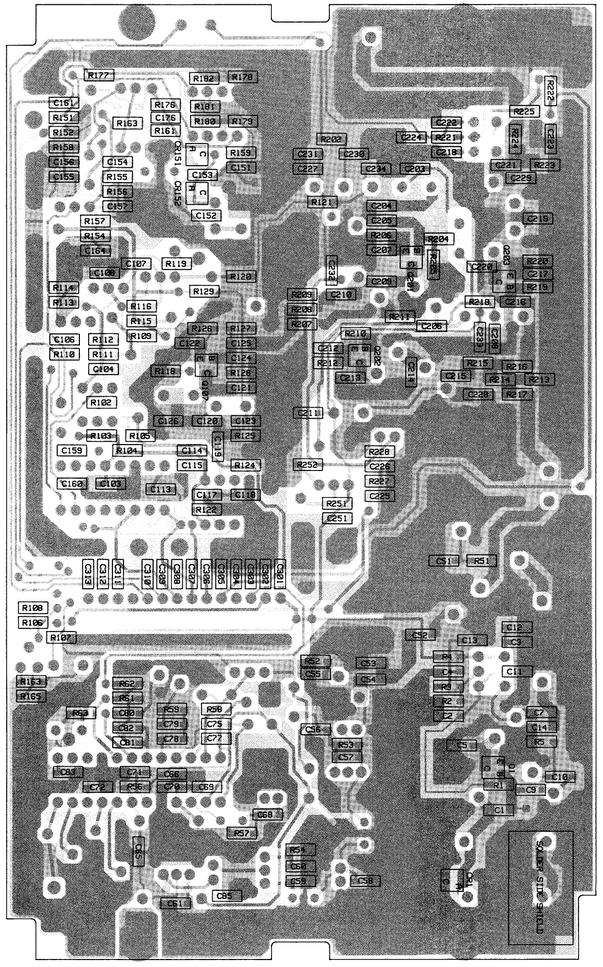
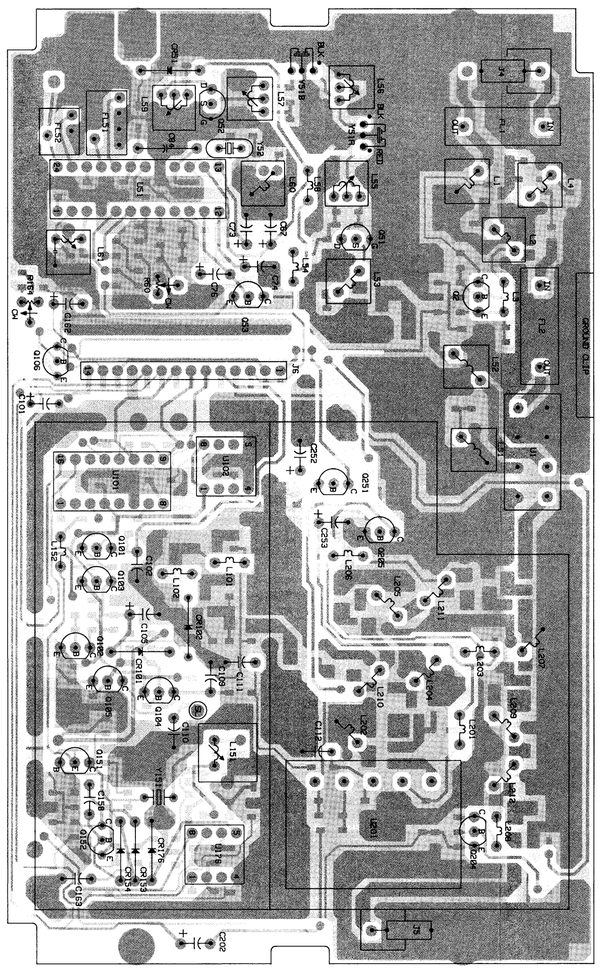


SOLDER SIDE VIEW

SOLDER SIDE	RED	GAW–7730–O
COMPONENT SIDE	GREY	GAW–7731–O
OVERLAYS	BLACK	GDW–7732–O



COMPONENT SIDE VIEW

parts list

HLF9122A *MaxTrac* 800 MHz RF Board with Talkaround — MXW–7410–O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
capacitor, fixed (unless otherwise stated)		
C1	21–13740B17	4.7 pF, ±5%, 50V
C2–4	21–13740B39	39 pF, ±5%, 50V
C5	21–13740B05	1.5 pF, ±5%, 50V
C7	21–13740B39	39 pF, ±5%, 50V
C8		not used
C9	21–60521H41	.22 uF, +80%, –20%, 50V
C10	21–13740B11	2.7 pF, ±5%, 50V
C11–13	21–60521H41	.22 uF, +80%, –20%, 50V
C14	21–13740B13	3.3 pF, ±.25pF, 50V
C51,52	21–13740B35	27 pF, ±5%, 50V
C53	21–13740B47	82 pF, ±5%, 50V
C54	21–13740B61	330 pF, ±5%, 50V
C55,56	21–13741B45	.01 uF, ±5%, 50V
C56	21–13741B45	.01 uF, ±5%, 50V
C57	21–13740B31	18 pF, ±5%, 50V
C58	21–13740B27	12 pF, ±5%, 50V
C59	21–13740B31	18 pF, ±5%, 50V
C60,61	21–13741B45	.01 uF, ±5%, 50V
C65	21–60521H41	.22 uF, +80, –20%, 50V
C66	21–13741B45	.01 uF, ±5%, 50V
C67	23–43749C39	10 uF, ±10%, 50V, tantalum
C68	21–13740B33	22 pF, ±5%, 50V
C69	21–13740B39	39 pF, ±5%, 50V
C70	21–13740B29	15 pF, ±5%, 50V
C71,72	21–60521H41	.22 uF, +80, –20%, 50V
C73	23–11013D13	10 uF, ±10%, 20V, tantalum
C74	23–11048B13	10 uF, ±20%, 16V, electrolytic
C75	21–13741B69	.1 uF, ±5%, 50V
C76	23–11048B05	1 uF, ±20%, 50V, electrolytic
C77,78	21–60521H41	.22 uF, +80, –20%, 50V
C79	21–13741B29	.0022 uF, ±5%, 50V
C80	21–60521H41	.22 uF, +80, –20%, 50V
C81	21–13740B55	180 pF, ±5%, 50V
C82,83	21–60521H41	.22 uF, +80, –20%, 50V
C84	21–82450B14	2.4 pF, ±5%, 500V
C85	21–13740B27	12 pF, ±5%, 50V
C101	23–11048B13	10 uF, ±20%, 16V, electrolytic
C102	08–11051A13	.1 uF, ±5%, 63V
C103,104	21–13741B45	.01 uF, ±5%, 50V
C105	23–11048B13	10 uF, ±20%, 16V, electrolytic
C106	21–13740B29	15 pF, ±5%, 50V
C107,108	21–13741B69	.1 uF, ±5%, 50V
C109	08–11051A09	.022 uF, ±5%, 63V
C110	08–11051A19	1 uF, ±5%, 63V
C111,112	08–11051A07	.01 uF, ±5%, 63V
C113,114	21–13741B45	.01 uF, ±5%, 50V
C115	21–13740B39	39 pF, ±5%, 50V
C116		not used
C117	21–13741B69	.1 uF, ±5%, 50V
C118–120	21–13740B39	39 pF, ±5%, 50V
C121	21–13740B11	2.7 pF, ±5%, 50V
C122,123	21–13740B39	39 pF, ±5%, 50V
C124		not used
C125	21–13740B39	39 pF, ±5%, 50V
C126	21–13740B17	4.7 pF, ±5%, 50V
C127		not used
C151	21–13740B73	.001 uF, ±5%, 50V
C152	21–13740B46	75 pF, ±5%, 50V
C153	21–13740B25	10 pF, ±5%, 50V
C154	21–13741B45	.01 uF, ±5%, 50V
C155,156	21–13740B55	180 pF, ±5%, 50V
C157	21–13741B45	.01 uF, ±5%, 50V
C158	08–11051A15	.22 uF, ±5%, 63V
C159	21–13740B35	27 pF, ±5%, 50V
C160	21–13740B29	15 pF, ±5%, 50V
C161	21–13740B73	.001 uF, ±5%, 50V
C162	23–11048B13	10 uF, ±20%, 16V, electrolytic
C163	08–11051A17	.47 uF, ±5%, 63V
C164	21–13741B69	.1 uF, ±5%, 50V
C176	21–13740B73	.001 uF, ±5%, 50V
C201		not used
C202	23–11048B19	47 uF, ±20%, 16V, electrolytic
C203,204	21–13740B39	39 pF, ±5%, 50V
C205	21–13740B15	3.9 pF, ±5%, 50V
C206–208	21–13740B39	39 pF, ±5%, 50V
C209	21–13740B05	1.5 pF, ±5%, 50V
C210	21–13740B09	2.2 pF, ±5%, 50V
C211,212	21–13740B39	39 pF, ±5%, 50V
C213	21–13740B07	1.8 pF, ±5%, 50V
C214	21–13740B22	7.5 pF, ±5%, 50V
C215–217	21–13740B39	39 pF, ±5%, 50V
C218	21–13741B39	39 pF, ±5%, 50V
C219	21–13740B18	5.1 pF, ±5%, 50V
C220	21–13740B01	1 pF, ±5%, 50V
C221–223	21–13740B39	39 pF, ±5%, 50V
C224	21–13740B45	.01 uF, ±5%, 50V
C225–227	21–13740B39	39 pF, ±5%, 50V
C228	21–13740B15	3.9 pF, ±5%, 50V
C229	21–13740B07	1.8 pF, ±5%, 50V
C230	21–13740B39	39 pF, ±5%, 50V
C231	21–13741B45	.01 uF, ±5%, 50V
C232–234	21–13740B39	39 pF, ±5%, 50V
C251	21–13741B45	.01 uF, ±5%, 50V
C252,253	23–11048B19	47 uF, ±20%, 16V, electrolytic
C301–313	21–13740B39	39 pF, ±5%, 50V
diode (see note)		
CR1	48–80939T01	Schottky
CR51	48–83654H01	silicon
CR101,102	48–83654H01	silicon

MXW–7410–O (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR151,152	48–05129M21	varactor
CR153,154	48–83654H01	silicon
CR176	48–82256C11	10V zener
filter		
FL1,2	91–80054M01	3 pole, ceramic
FL51	91–80097D06	6 element, ceramic
FL52	91–80098D06	3 element, ceramic
RF coil		
L1	24–11030E03	orange
L2	24–11030E08	white
L3	24–11030A04	5 turns, green
L4	24–11030E03	orange
L51,52	24–80063M09	.47 uH
L53	24–80063M04	.18 uH
L54	24–80063M21	4.7 uH
L55	24–80164M04	5.2 turns, variable
L56	24–80164M01	1.6 ratio, variable
L57	24–80164M04	5.2 turns, variable
L58	24–80063M21	4.7 uH
L59	24–80164M03	4.3 turns, variable
L60	24–80063M14	1.2 uH
L61	25–80000E01	transmformer
L101	24–11030A04	5 turns, green
L102	24–11030E04	yellow
L151	24–80299D01	17.75 turns, orange
L152	24–80063M22	5.6 uH
L201	24–11030A04	5 turns, green
L202	24–11030E02	red
L203	24–11030A04	5 turns, green
L204,205	24–11030E03	orange
L206	24–11030A04	5 turns, green
L207	24–11030E01	brown
L208	24–11030A04	5 turns, green
L209	24–11030E08	white
L210	24–11030E05	green
L211	24–11030E01	brown
L212	24–11030E04	yellow
connector receptacle		
J4,5	09–80135M01	2 pin coax
J6	09–80130M03	14 position socket
transformer		
T1,2	25–80163M02	500 MHz balance transformer (Part of U1)
transistor (see note)		
Q1	48–80950X01	NPN
Q2	48–80869643	PNP
Q51,52	48–80869839	N–channel
Q53	48–80869642	NPN
Q101	48–80869643	PNP
Q102,103	48–80182D20	NPN
Q104	48–80869643	PNP
Q105,106	48–80869642	NPN
Q107	48–80950X01	NPN
Q151	48–80869658	NPN
Q152	48–80869643	PNP
Q201–203	48–80950X01	NPN
Q204	48–80869643	PNP
Q205	48–80869642	NPN
Q251	48–80869642	NPN
resistor, fixed, ohm, ±5%, 1/8 watt (unless otherwise stated)		
R1	06–11077A84	2.7k
R2	06–11077B03	15k
R3	06–11077A86	3.3k
R4	06–11077A46	68
R5	06–11077A43	51
R51	06–11077A43	51
R52	06–11077A54	150
R53	06–11077A98	10k
R54	06–11077A54	150
R56	06–11077B45	820k
R57	06–11077A72	820
R58	06–11077B23	100k
R59	06–11077B27	150k
R60	18–05500L08	22k, ±20%, potentiometer
R61	06–11077B19	68k
R62	06–11077B09	27k
R63	06–11077B21	82k
R102	06–11077A62	330
R103,104	06–11077A98	10k
R105	06–11077B11	33k
R106	06–11077A74	1k
R107	06–11077A78	1.5k
R108,109	06–11077A26	10
R110	06–11077B03	15k
R111	06–11077A66	470
R112	06–11077A78	1.5k
R113,114	06–11077A66	470
R115	06–11077A72	820
R116	06–11077A92	5.6k
R118	06–11077A72	820
R119	06–11077A88	3.9k
R120,121	06–11077A96	8.2k
R122	06–11077A88	3.9K
R124	06–11077A60	270
R125	06–11077A43	51
R126	06–11077A50	100
R127	06–11077A84	2.7k
R128	06–11077A72	820

MXW–7410–O (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R129	06–11077A58	220
R151	06–11077B15	47k
R152	06–11077B11	33k
R153	06–11077B15	47k
R154	06–11077A34	22
R155	06–11077A98	10k
R156	06–11077B03	15k
R157	06–11077A78	1.5k
R158,159	06–11077A74	1k
R161	06–11077A98	10k
R163	06–11077B19	68k
R164	18–05500L08	22k, ±20%, potentiometer
R165	06–11077A96	8.2k
R176	06–11077G26	22.6k, ±1%
R177	06–11077G18	18.7k, ±1%
R178	06–11077F91	10k, ±1%
R179	06–11077F91	10k, ±1%
R180	06–11077G52	42.2k, ±1%
R181	06–11077F91	10k, ±1%
R182	06–11077G28	23.7k, ±1%
R202	06–11077A80	1.8k
R204	06–11077A86	3.3k
R205	06–11077A76	1.2k
R206	06–11077A50	100
R207	06–11077A44	56
R208	06–11077A65	430
R209	06–11077A44	56
R210	06–11077A88	3.9k
R211	06–11077A76	1.2k
R212	06–11077A50	100
R213	06–11077A46	68
R214	06–11077A38	33
R215,216	06–11077A30	15
R217	06–11077A32	18
R218	06–11077A88	3.9k
R219	06–11077A76	1.2k
R220	06–11077A50	100
R221,222	06–11077A88	3.9k
R223	06–11077A66	470
R224	06–11077A28	12
R225	06–11077A66	470
R227	06–11077A98	10k
R228	06–11077A78	1.5k
R251	06–11077A60	270
R252	06–11077A26	10
integrated circuits (see note)		
U1	51–80058M01	mixer
U51	51–05479G05	linear
U101	51–84704M75	synthesizer
U102	51–80924V01	prescaler
U176	51–84621K89	dual opamp
U201	51–80267L01	VCO hybrid
crystal (see note)		
Y51	91–80022M02	45.1 MHz
Y52	48–80008K02	44.645 MHz
Y151	48–80174D05	14.4 MHz

non–referenced parts

	14–05160A01	insulator
	26–80098M01	coil can shield, 7 used
	26–80097M01	coil can shield
	26–80228L01	coax connector shield
	26–80228L01	coax connector shield
	26–80229L03	VCO shield
	42–80047N01	grounding clip
	75–05295B02	crystal base pad, 2 used
	75–05295B07	crystal base pad, 2 used
	84–80949T01	circuit board

2/28/90

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

END OF PART 3 OF 4

Schematic, Circuit Board Diagrams, and Parts List for HLF9122A 800 MHz RF Board
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