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.

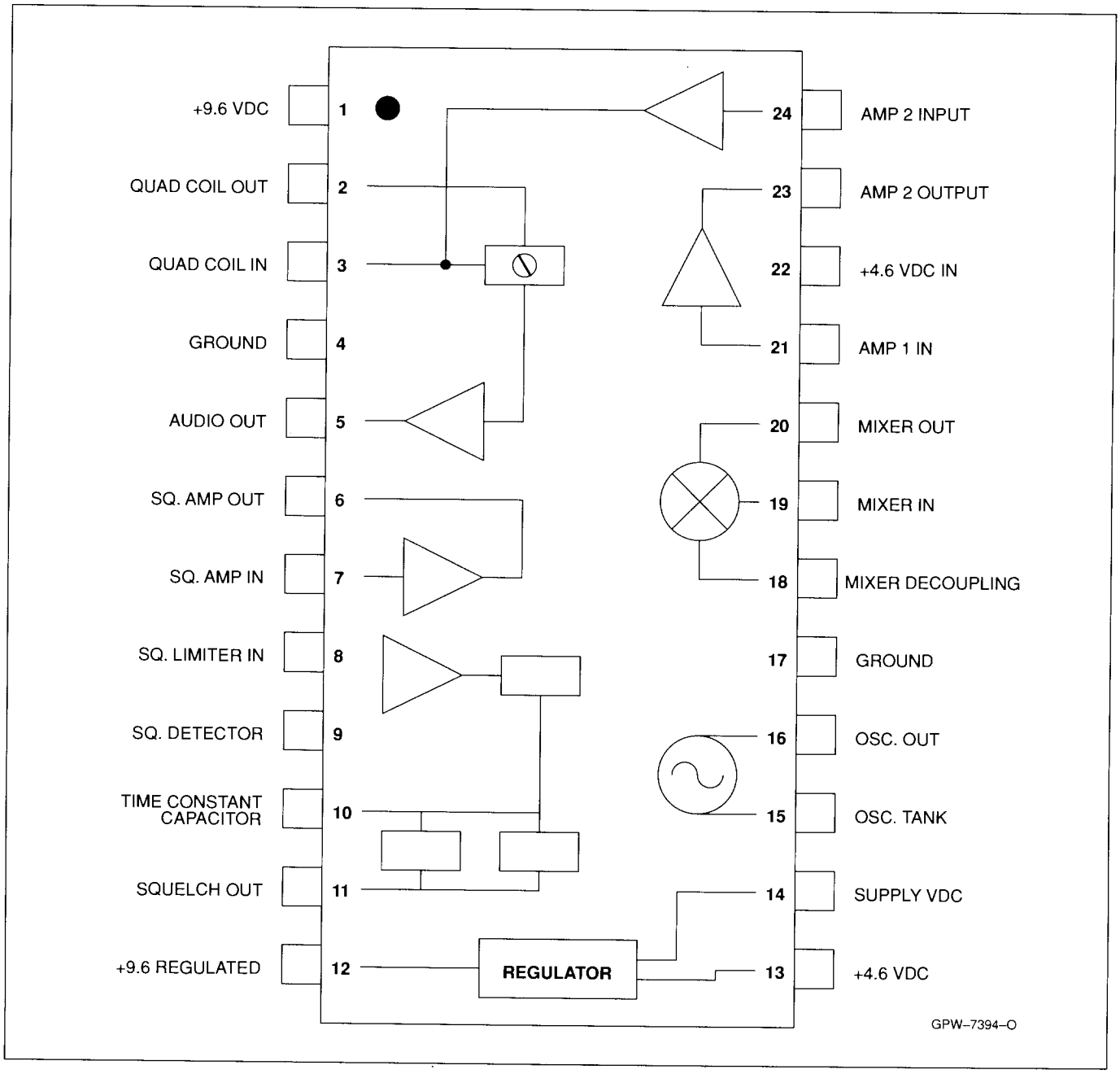


Figure 1. Receiver IC Block Diagram

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.

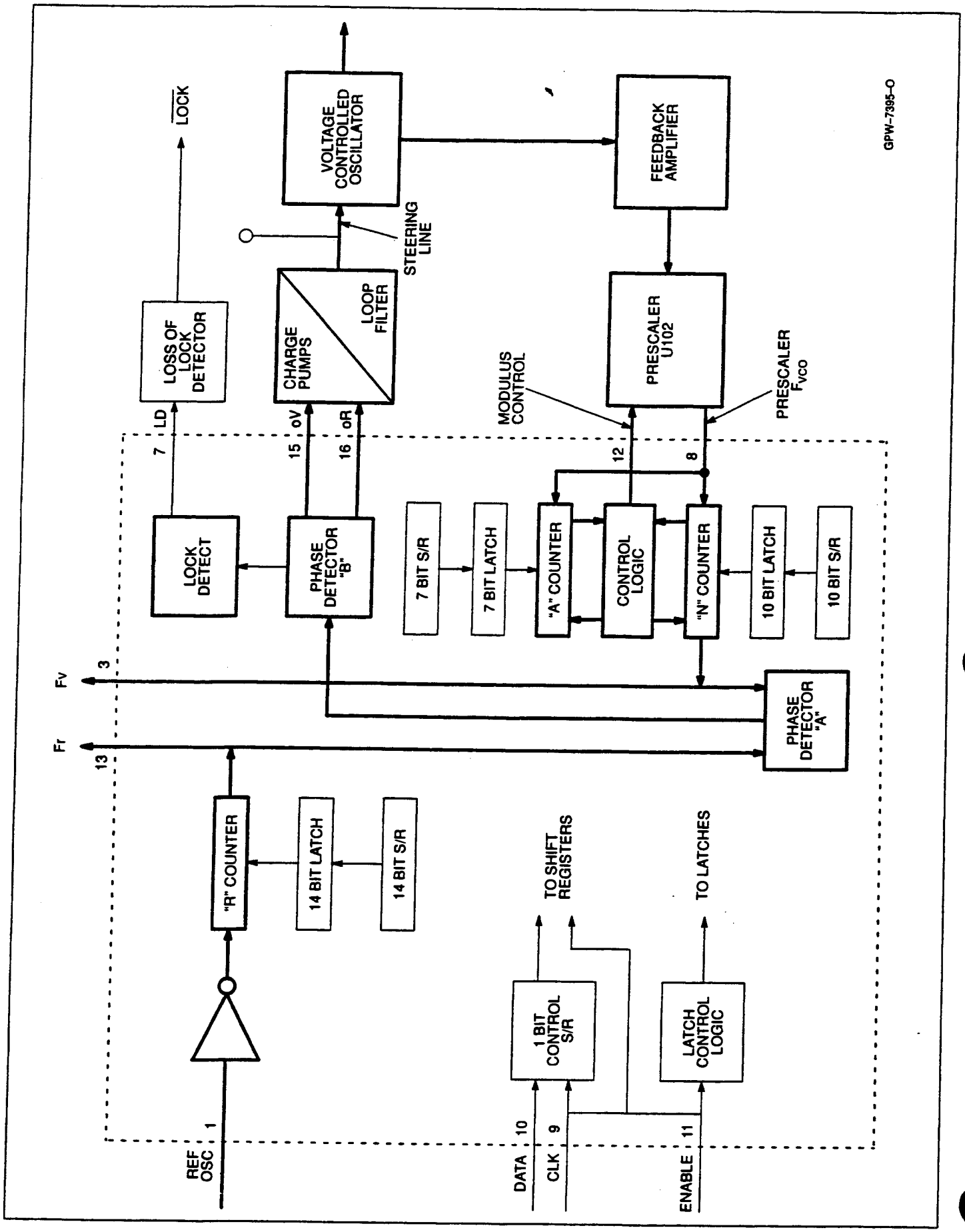


Figure 2. Synthesizer Section Block Diagram

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.

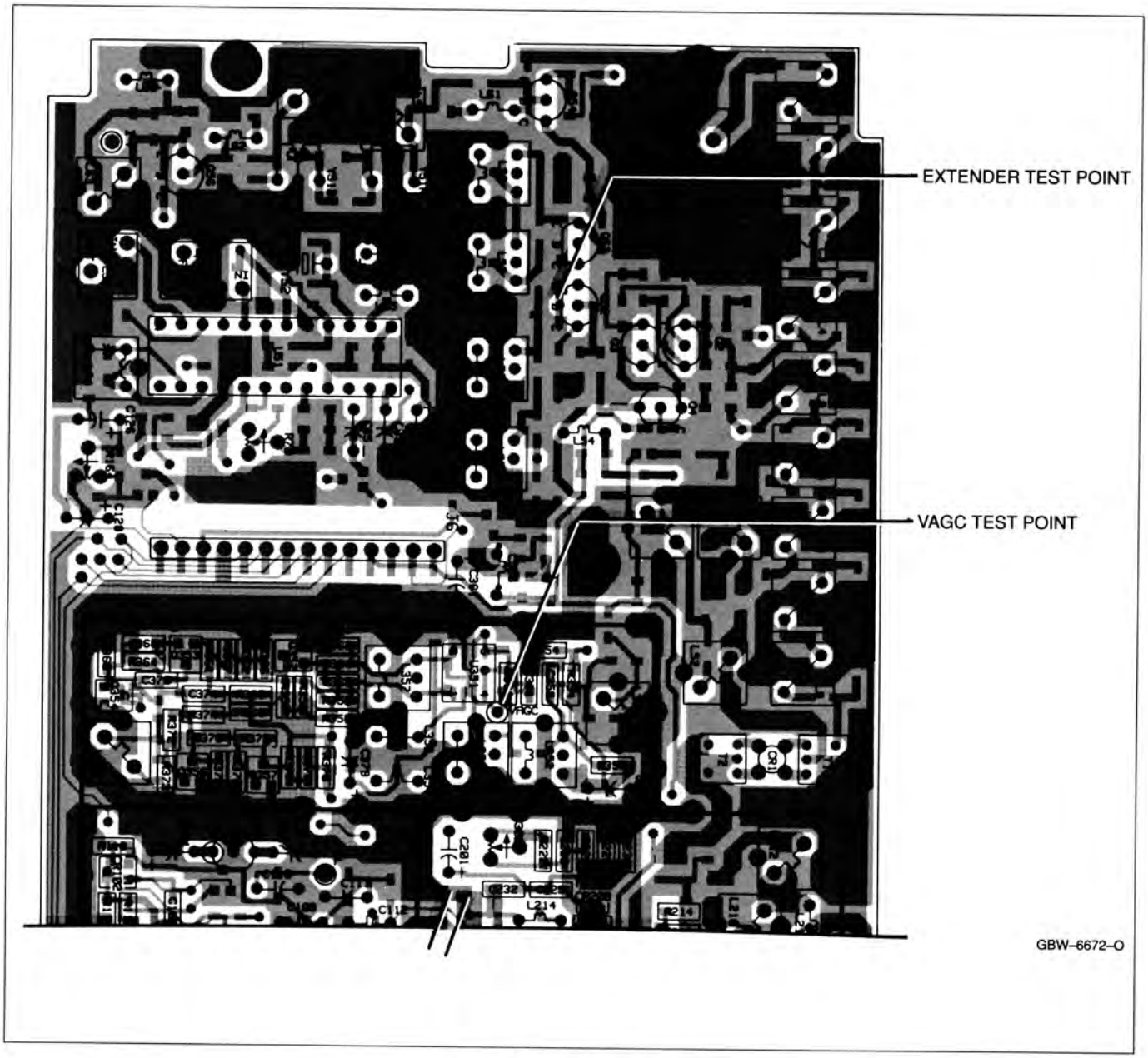
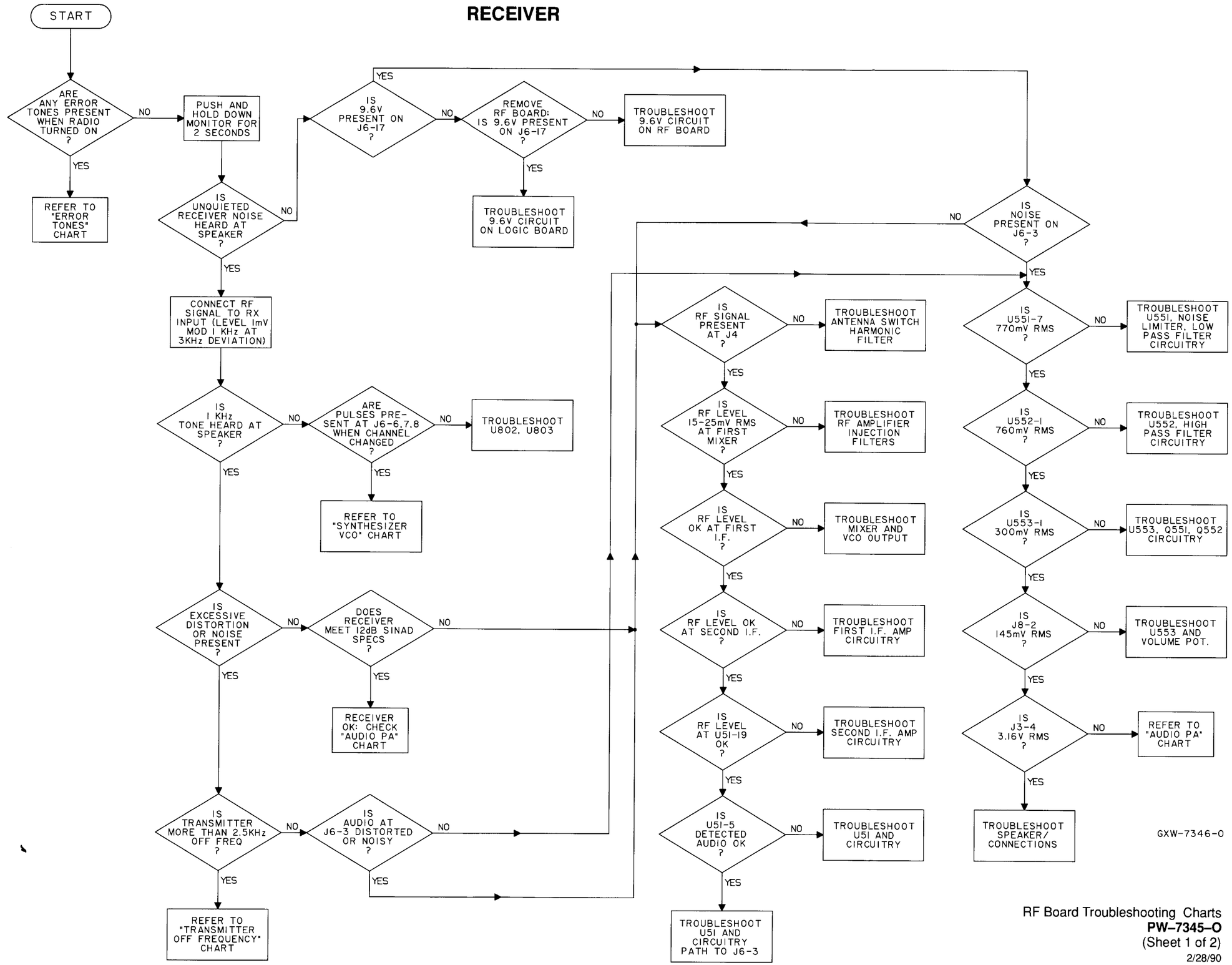


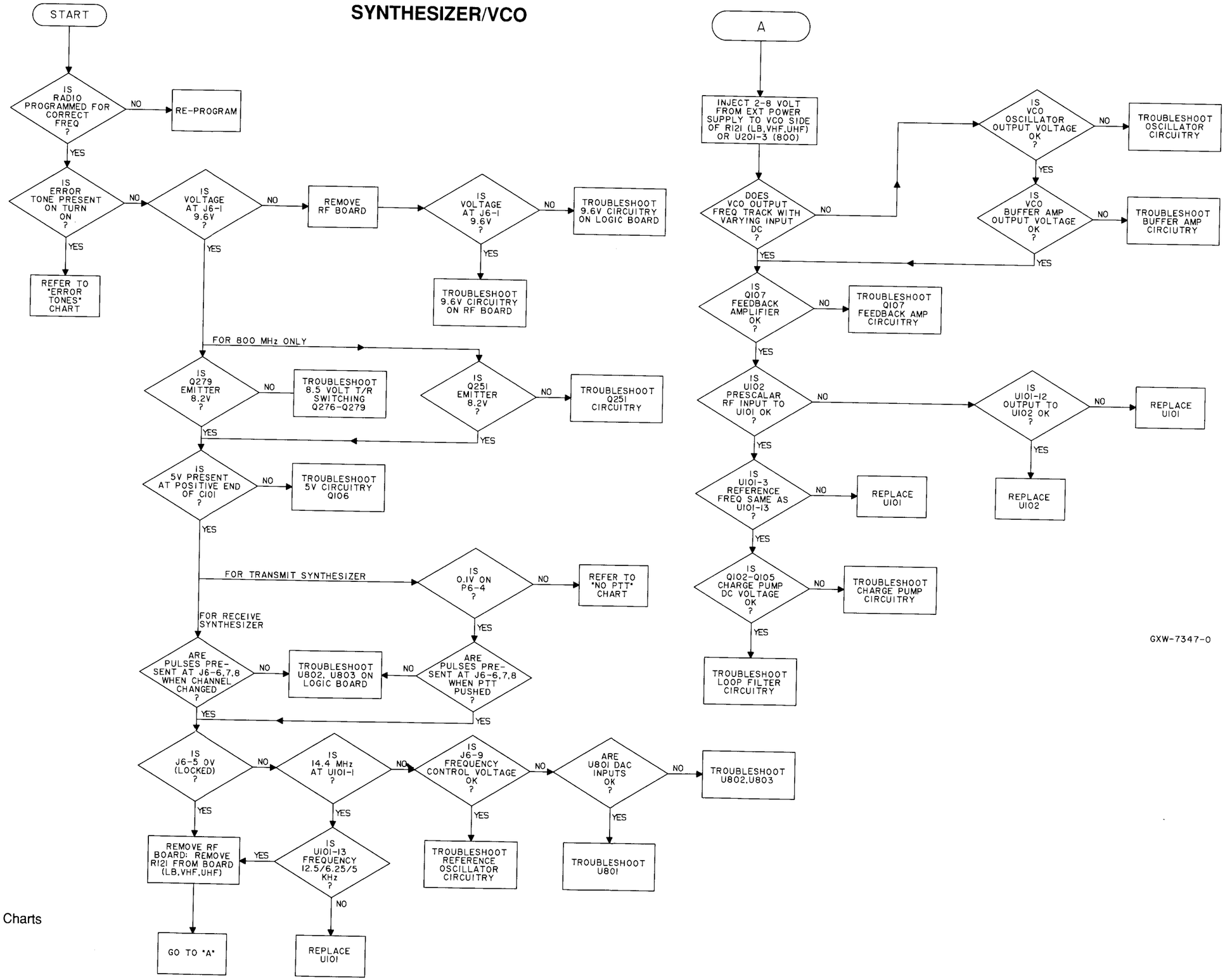
Figure 3. Extender Test Points

RECEIVER



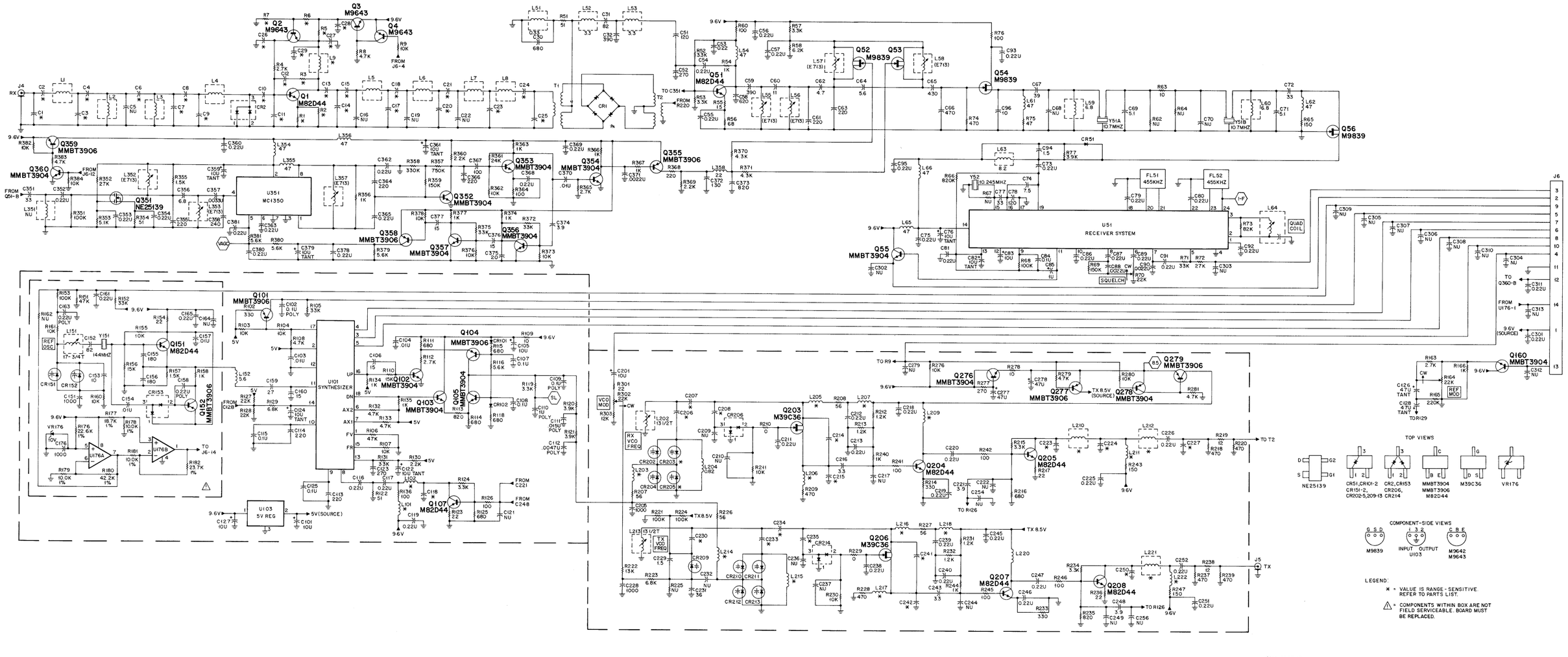
RF Board Troubleshooting Charts
PW-7345-O
(Sheet 1 of 2)
2/28/90

SYNTHESIZER/VCO



GXW-7347-O

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



GW-6347-O

LEGEND:

* = VALUE IS RANGE-SENSITIVE. REFER TO PARTS LIST.

△ = COMPONENTS WITHIN BOX ARE NOT FIELD SERVICEABLE. BOARD MUST BE REPLACED.

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

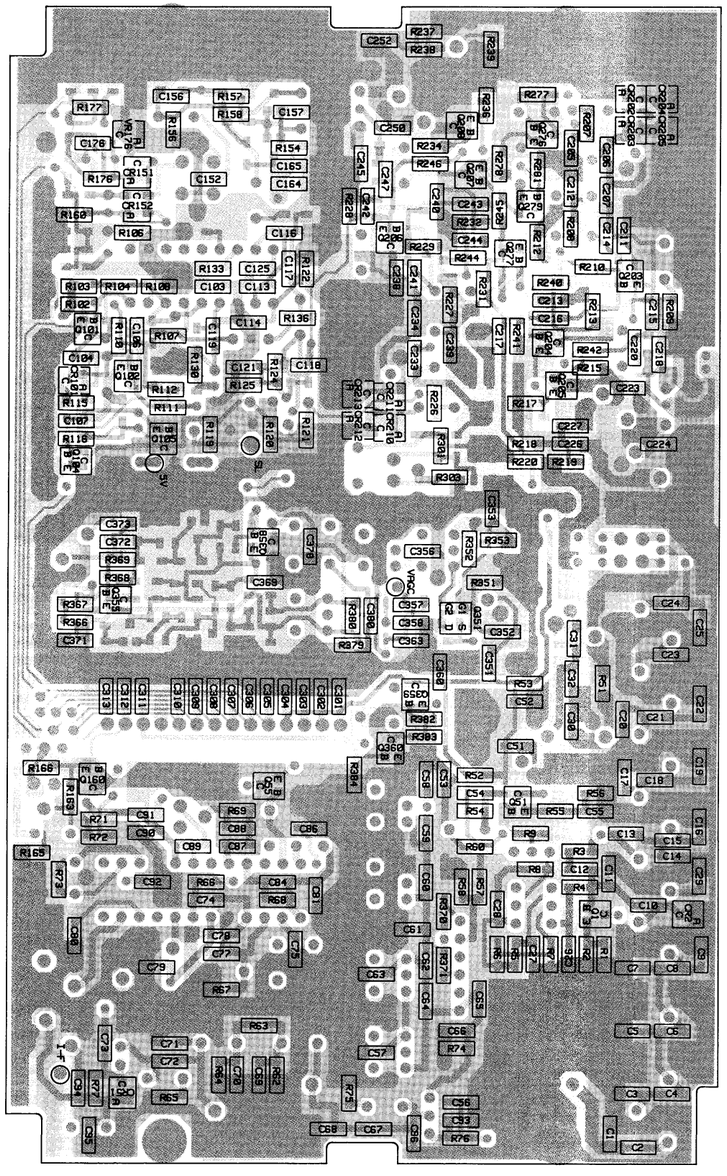
note: For best performance, order diodes, transistors, and integrated circuit devices by Motorola part number.

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

PW–6346–C

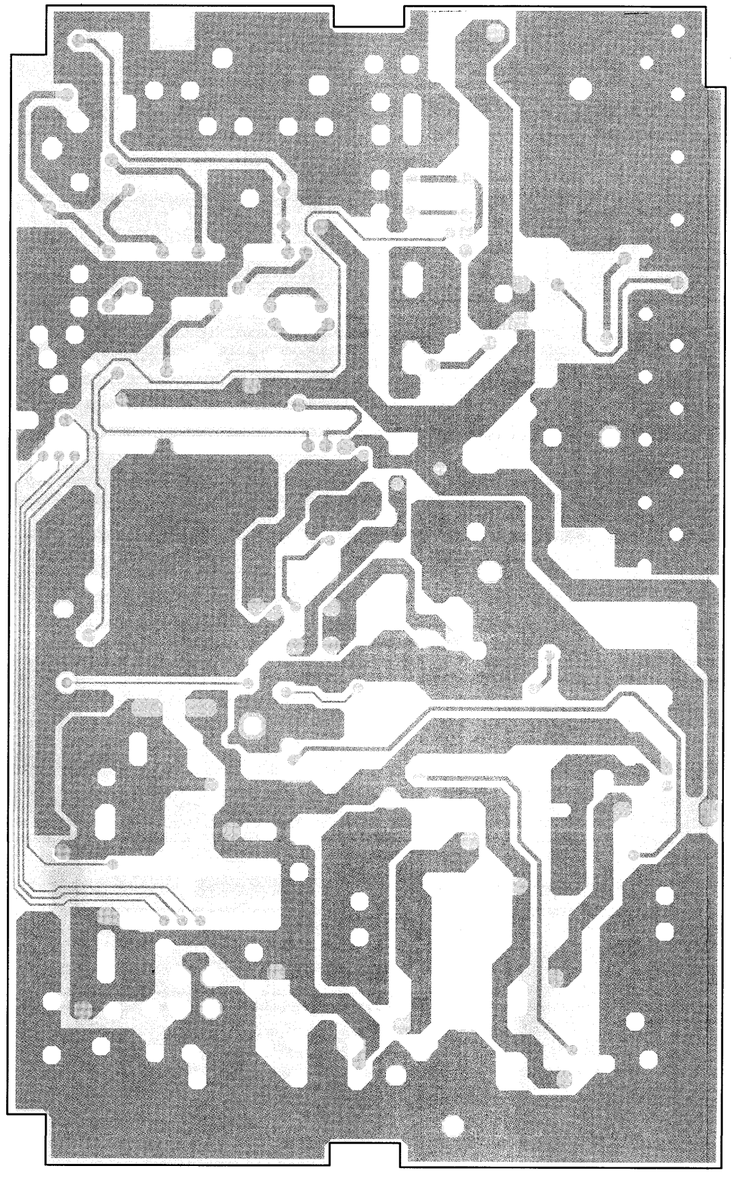
(Sheet 3 of 4)

3/31/90



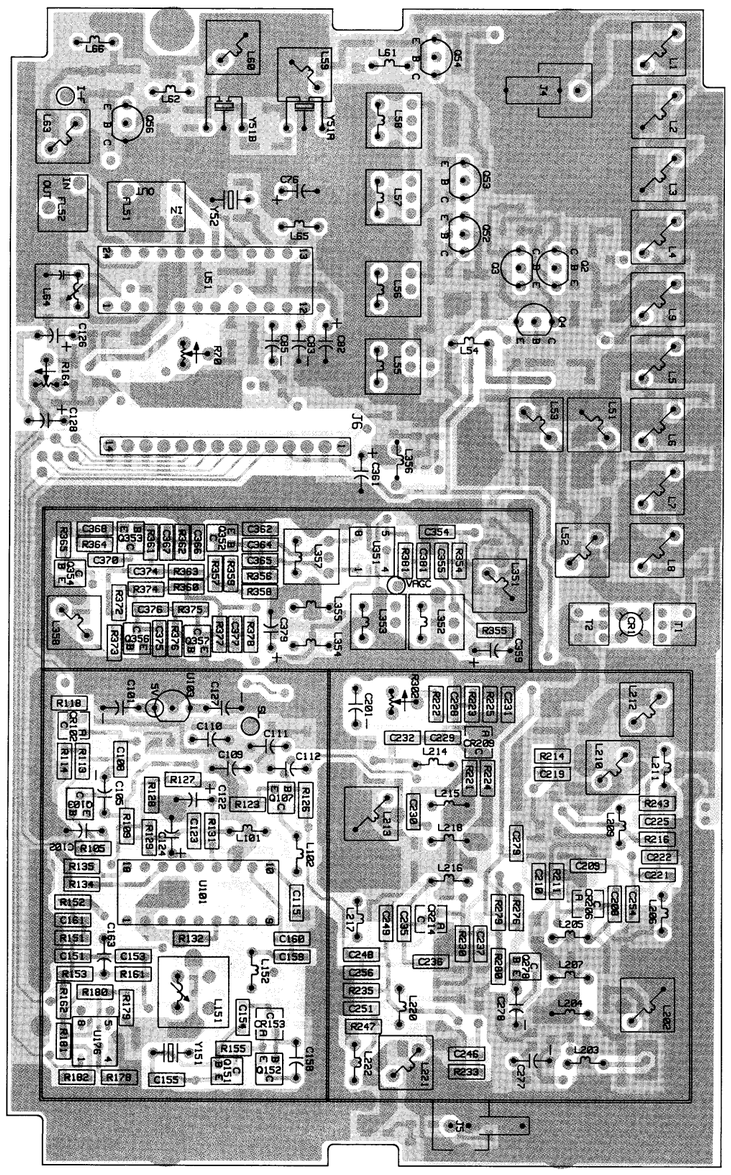
SOLDER SIDE — GBW–6349–O
COMPONENT SIDE — GBW–6350–O
OVERLAY — GBW–6351–O

SOLDER SIDE VIEW



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

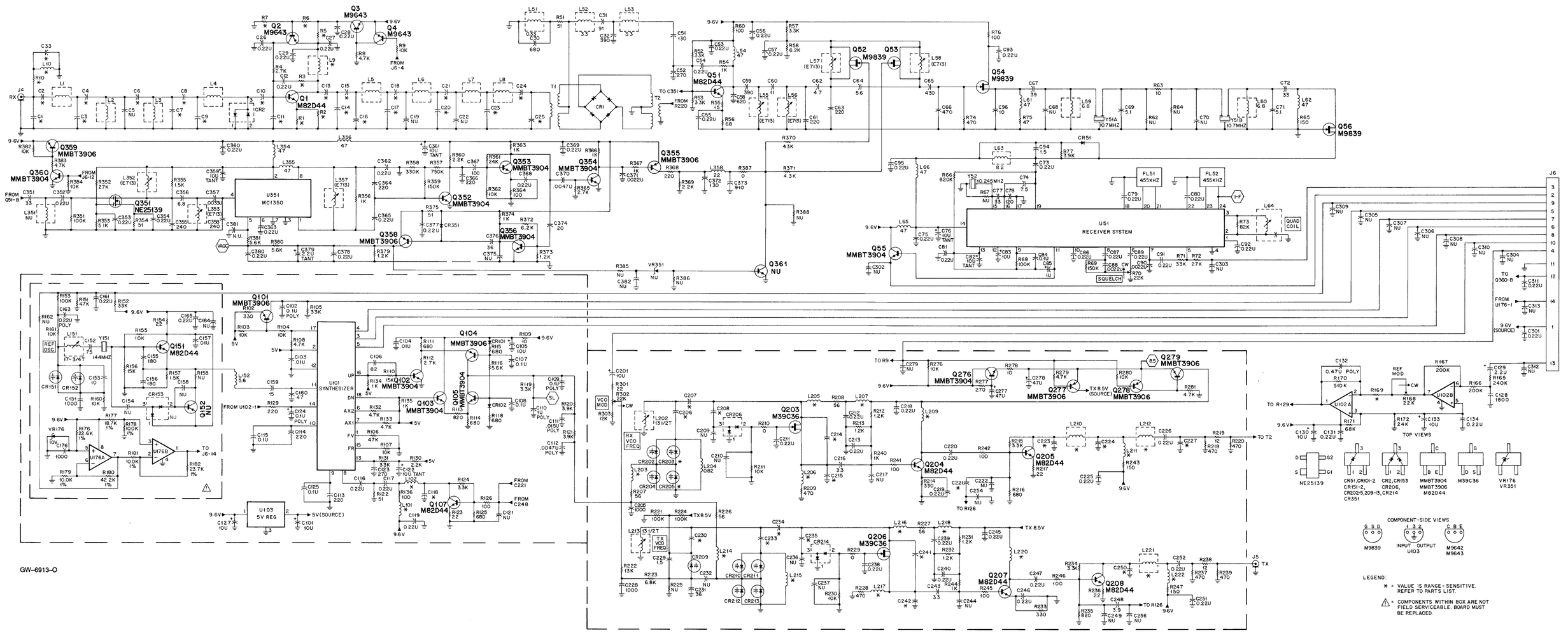
INNER LAYERS



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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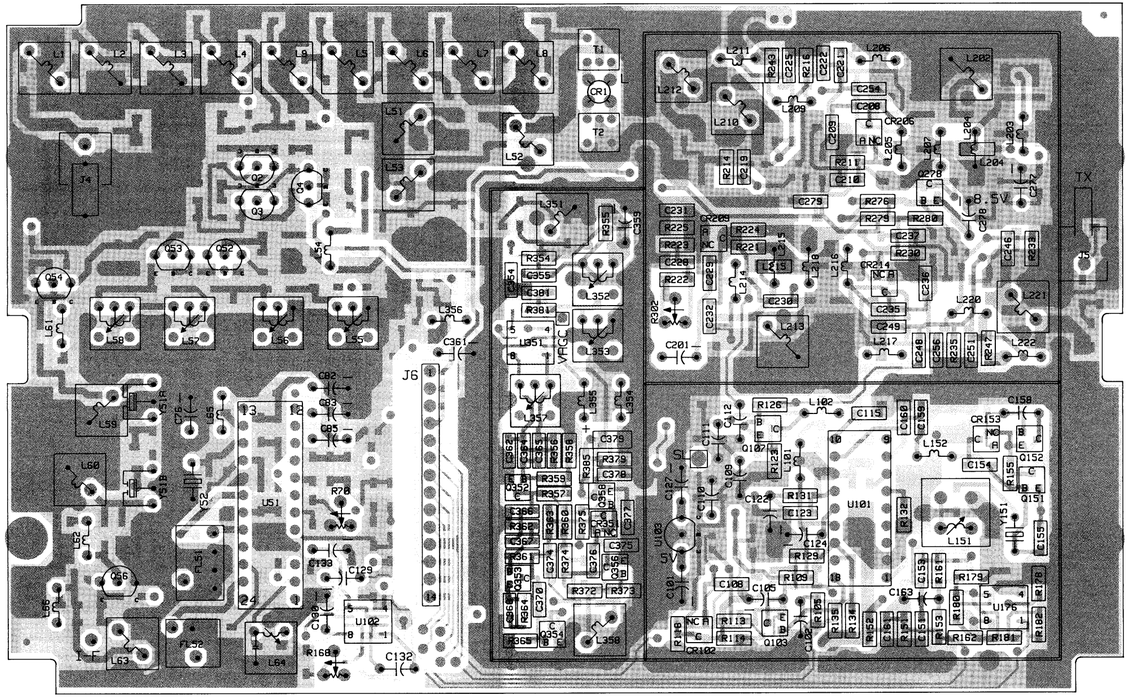
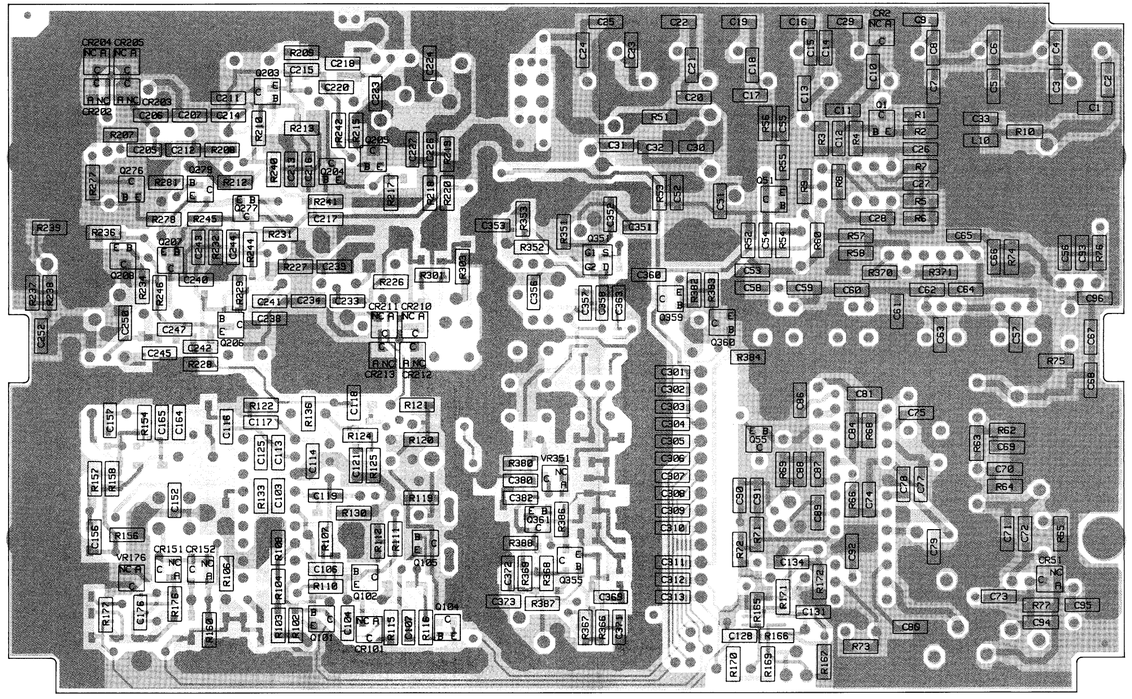


COMPONENT SIDE

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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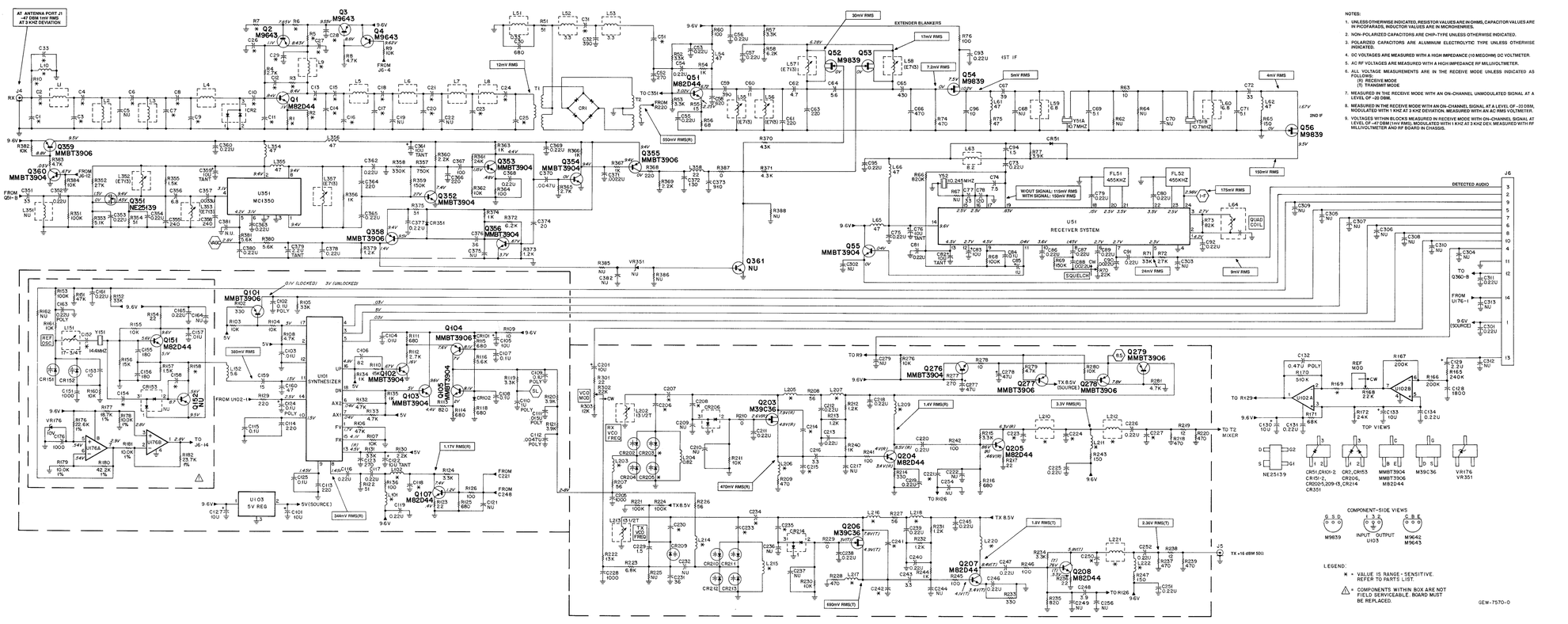
Low Band RF Board Transistor D.C. Voltage Table

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	—	—	—



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. 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 −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 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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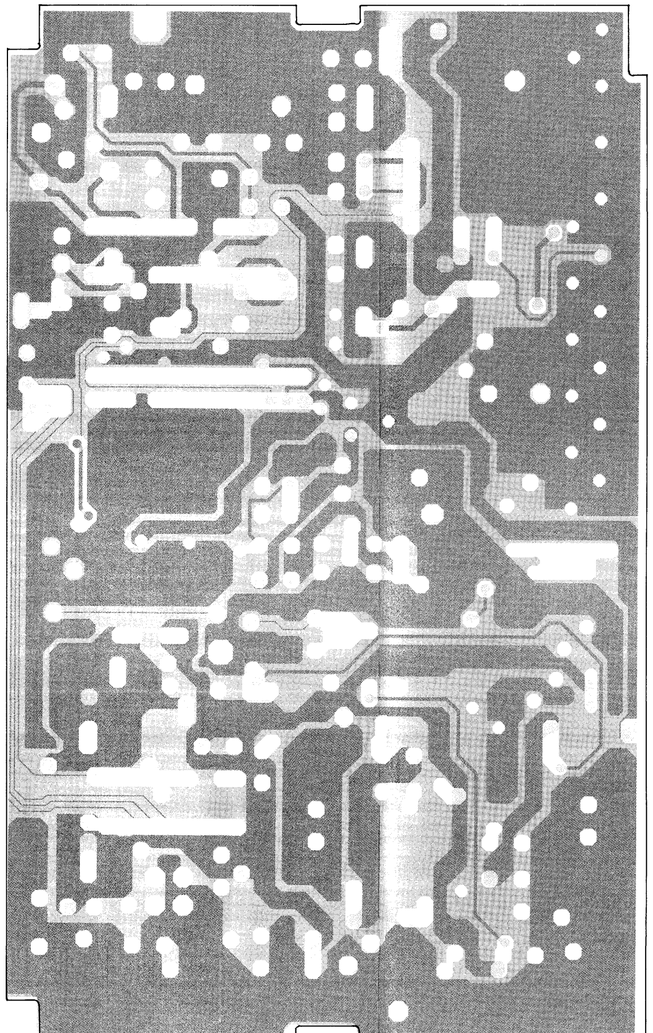
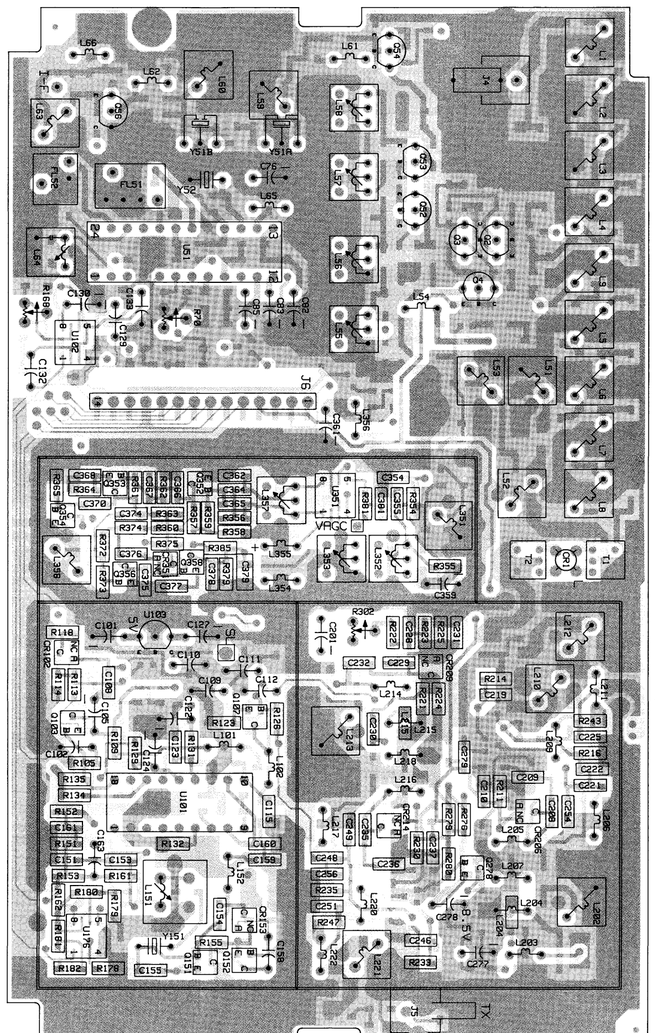


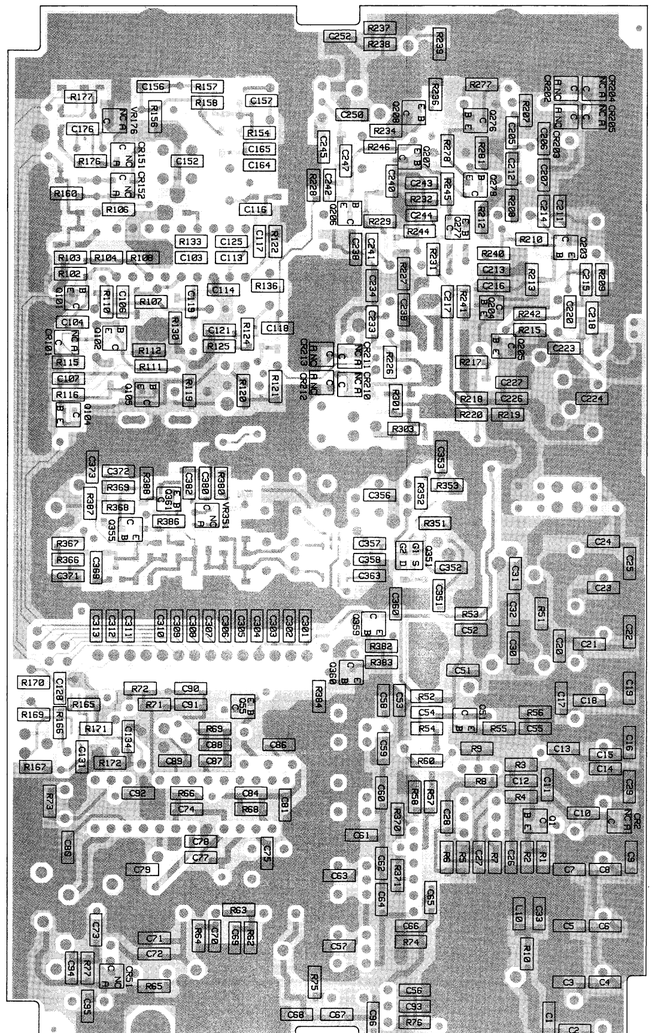
INNER LAYER 1	RED	GAW–7688–O
INNER LAYER 2	GREY	GAW–7689–O
OVERLAY	BLACK	GDW–7690–O

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
(Sheet 4 of 4)
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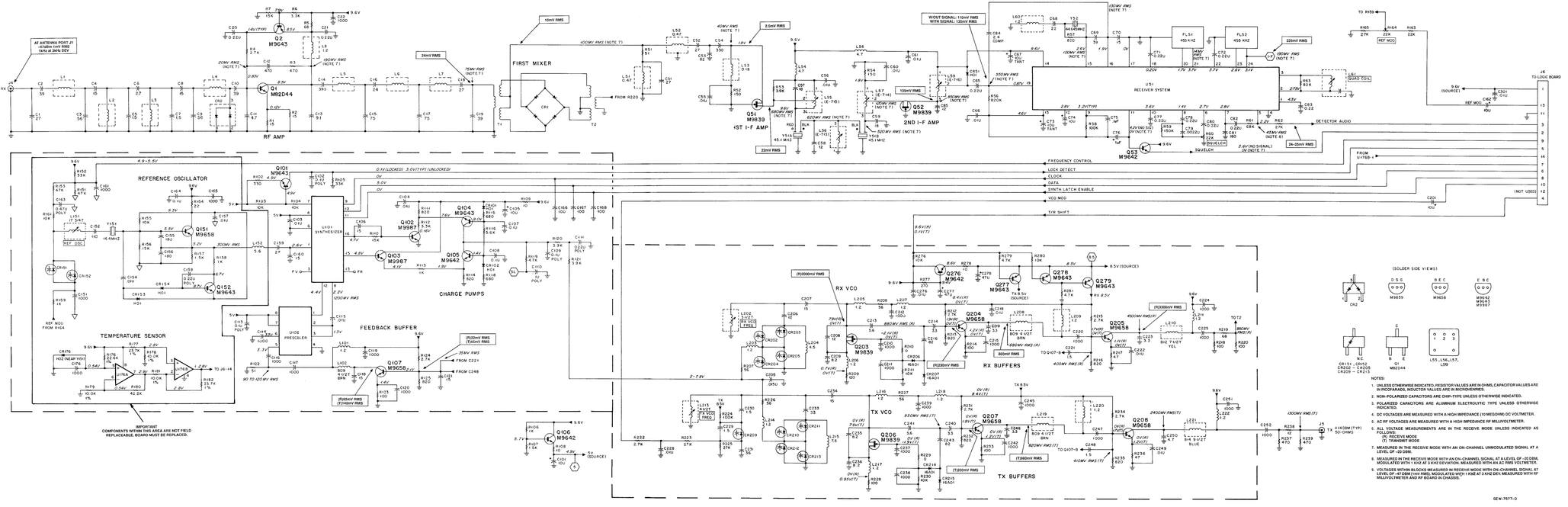
VHF RF Board Transistor D.C. Voltage Table

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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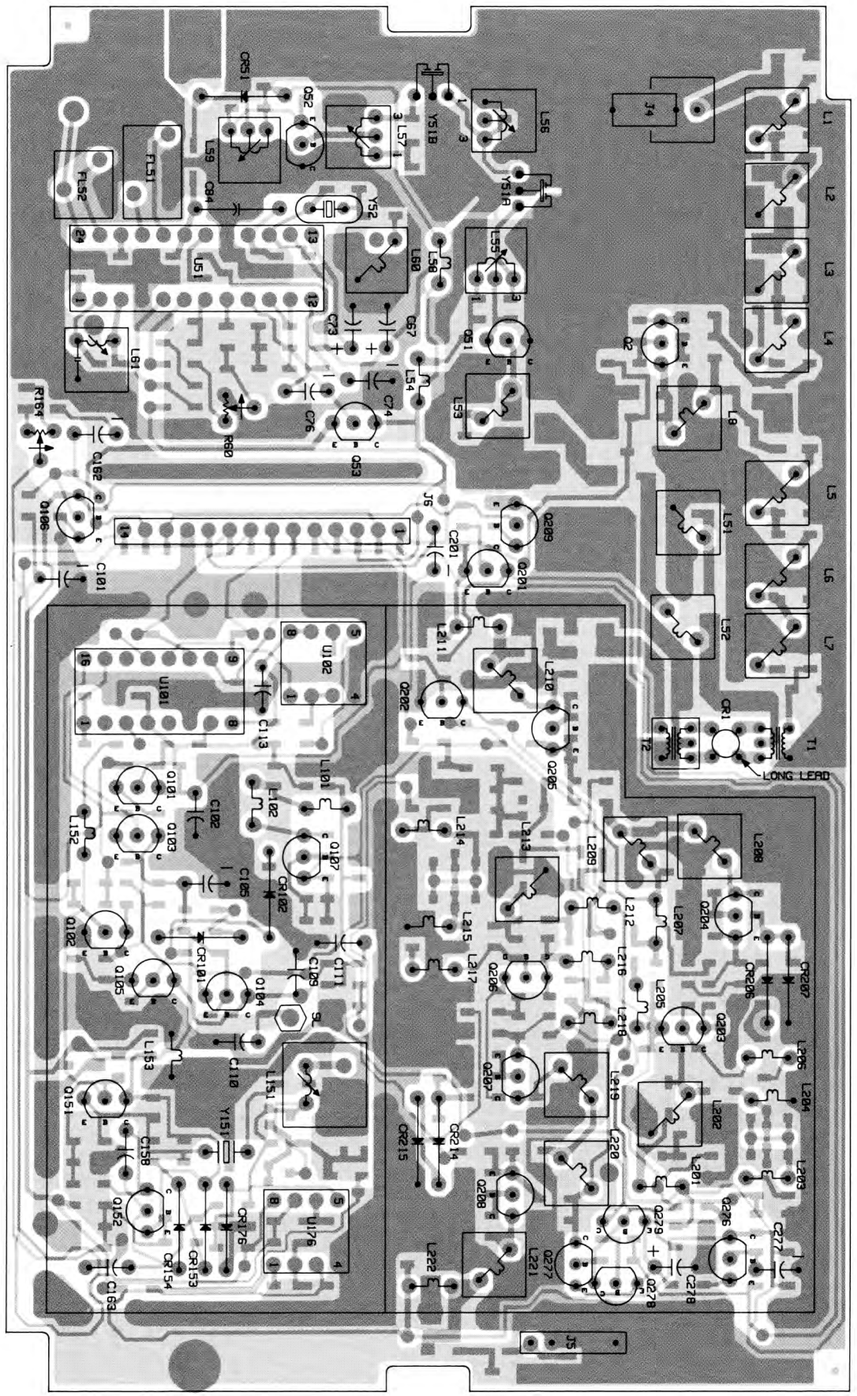
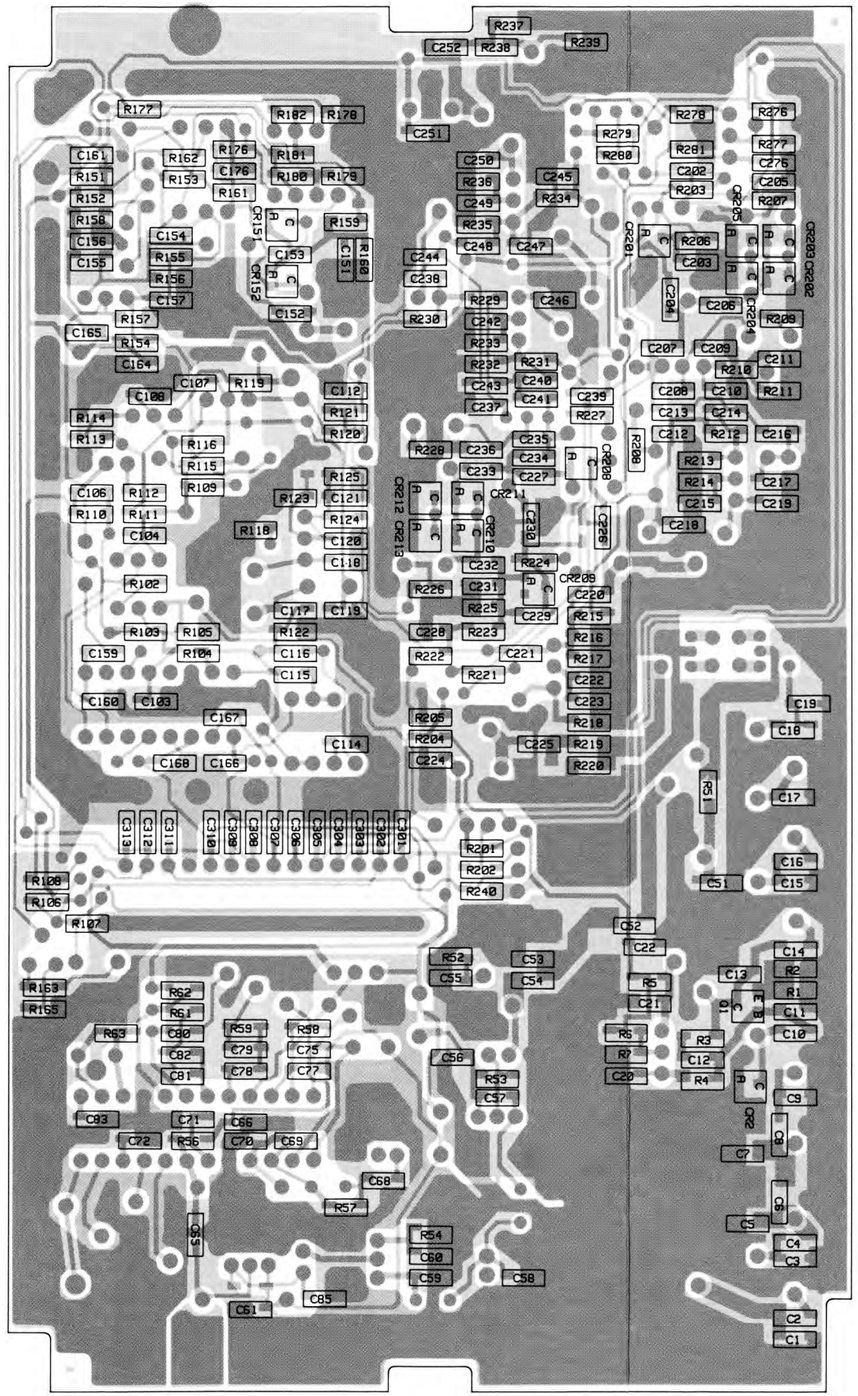


COMPONENT SIDE VIEW



SOLDER SIDE VIEW

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

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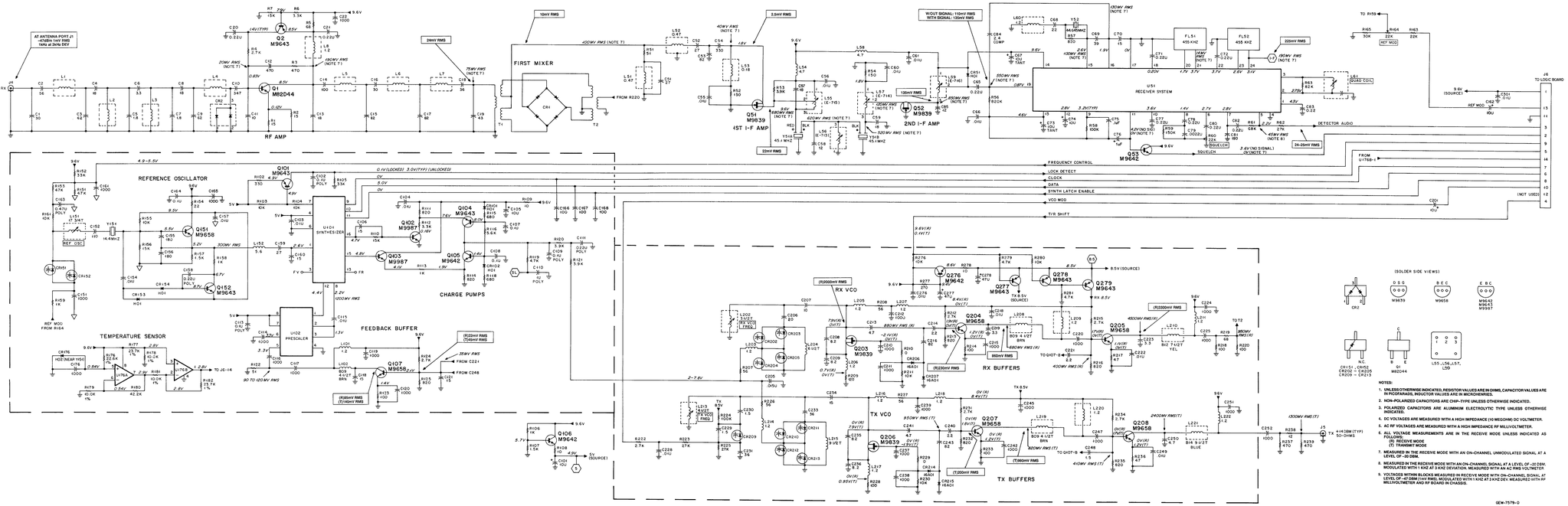
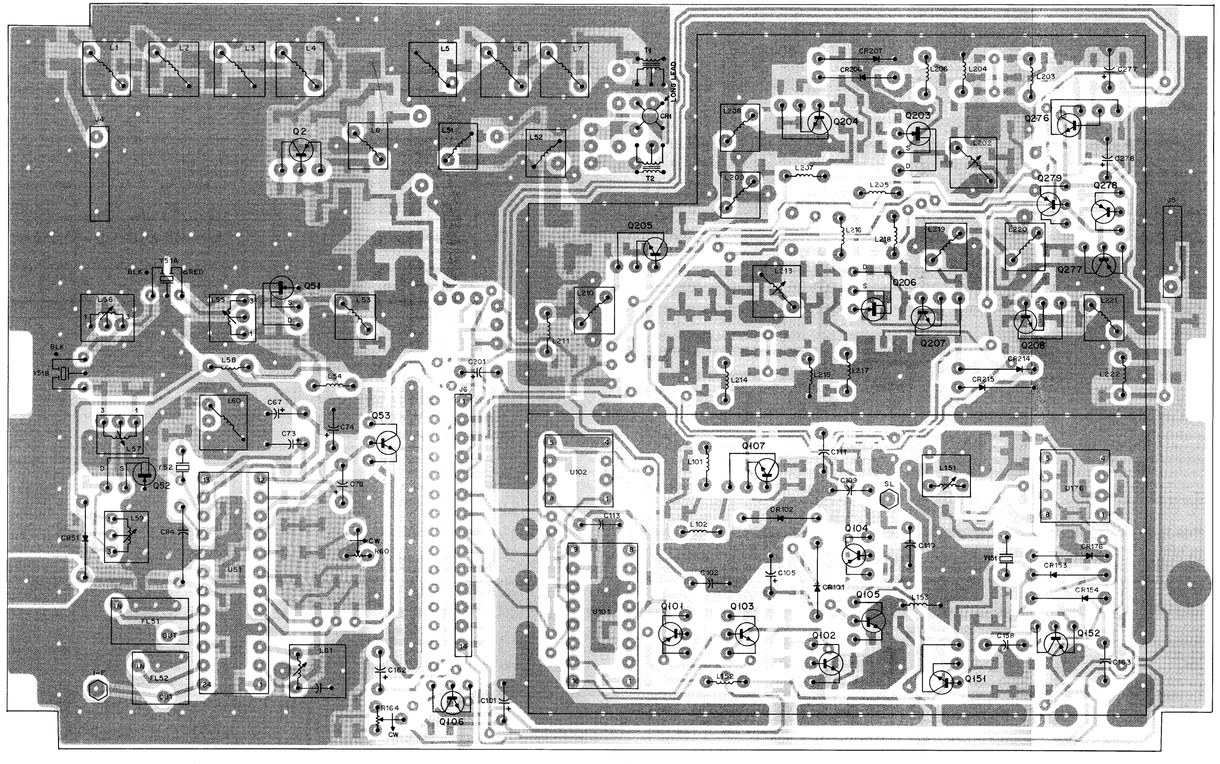
3/31/90



VHF RF Board Transistor D.C. Voltage Table

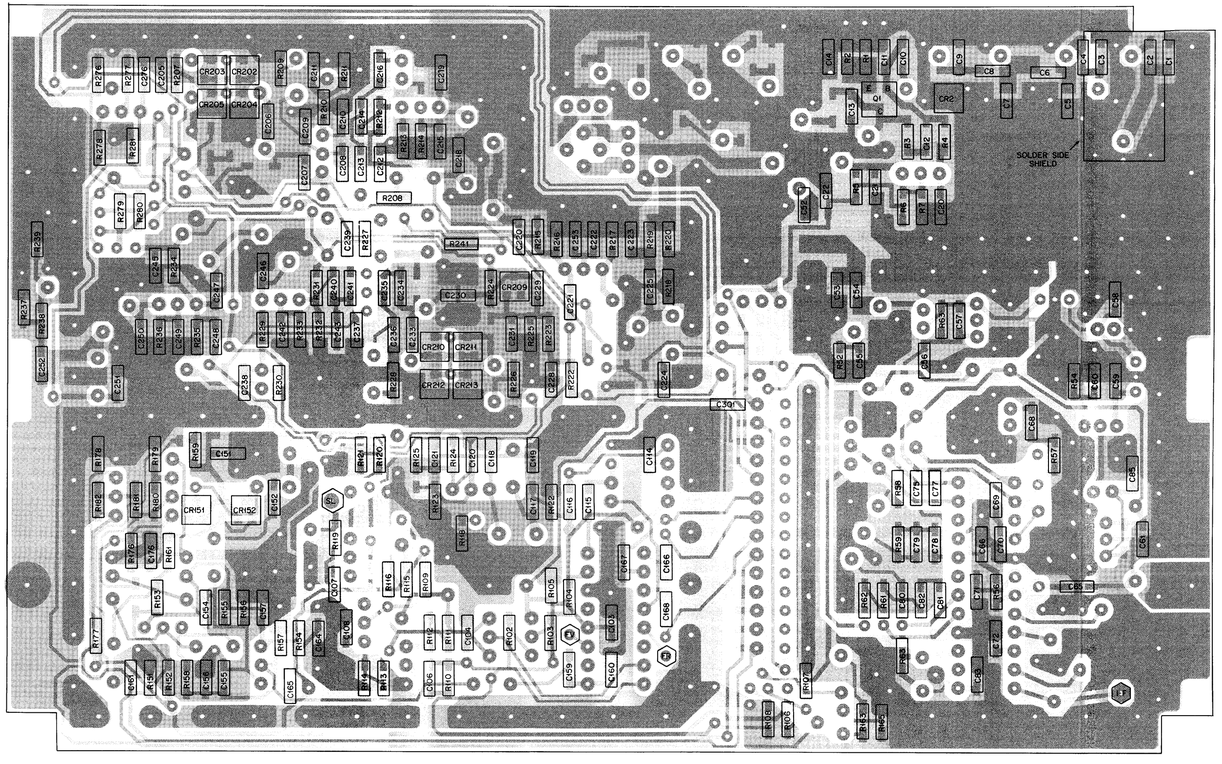
Transistor Ref. No.	VOLTAGE			VOLTAGE		
	BASE	EMITTER	COLLECTOR	GATE	SOURCE	DRAIN
Q1	.83	.12	8.5	—	—	—
Q2	7.9	8.5	1.1	—	—	—
Q51	—	—	—	0	1.8	9.6
Q52	—	—	—	0	1.8	9.6
Q53	4.2	3.6	9.6	—	—	—
Q101	5.0	5.0	.1 (LOCKED)	—	—	—
Q102	0.7	0	0	—	—	—
Q103	4.8	4.1	9.6	—	—	—
Q104	8.1	7.6	2-8V	—	—	—
Q105	1.4	1.9	2-8V	—	—	—
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
(Sheet 1 of 3)
3/31/90



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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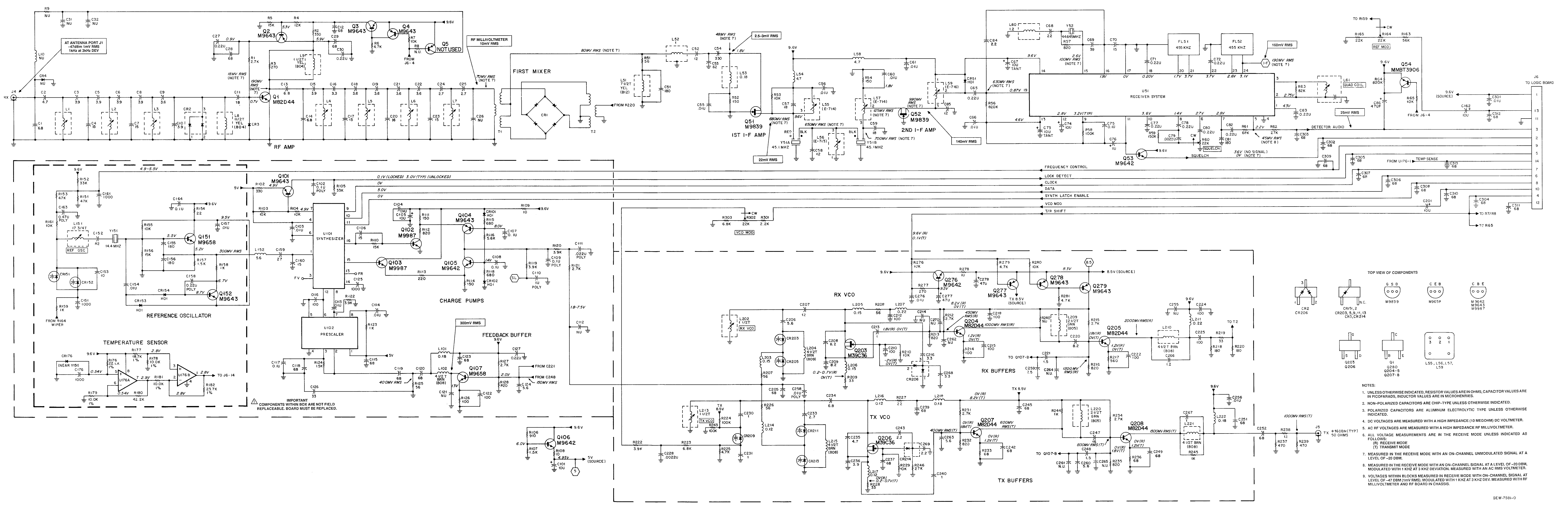
MaxTrac UHF RF Board Transistor D.C. Voltage Table

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	—	—	—



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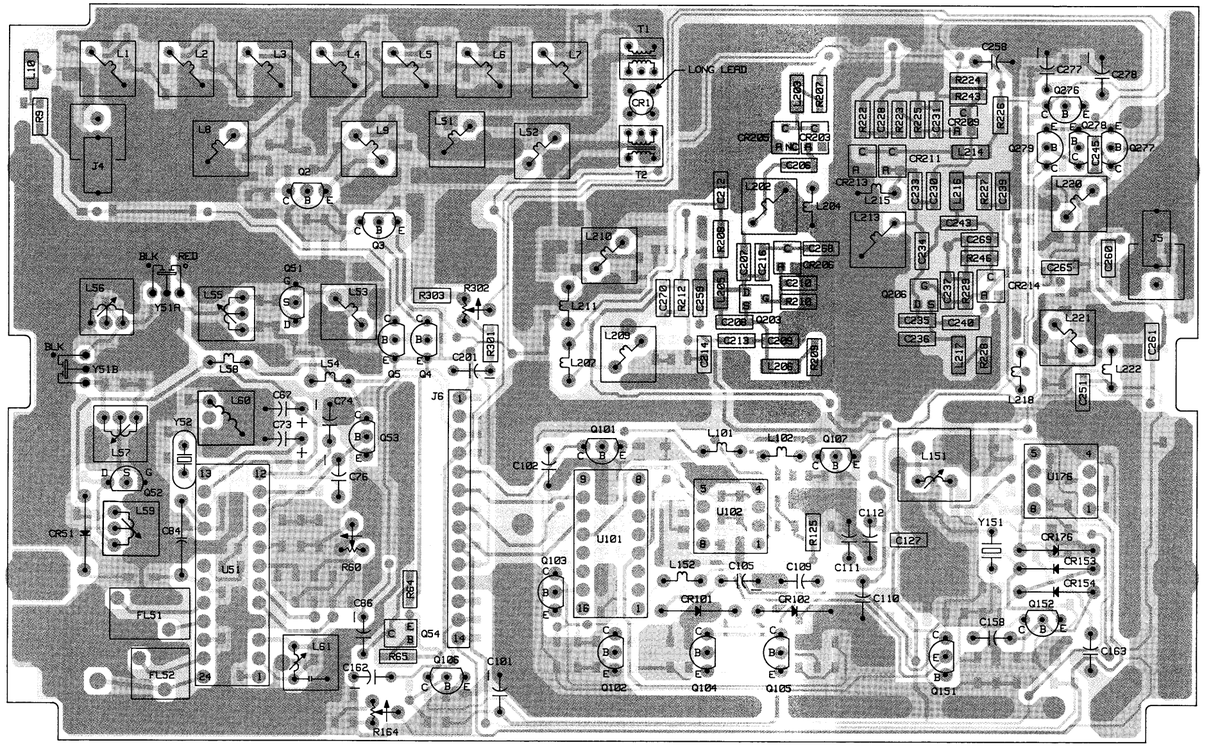
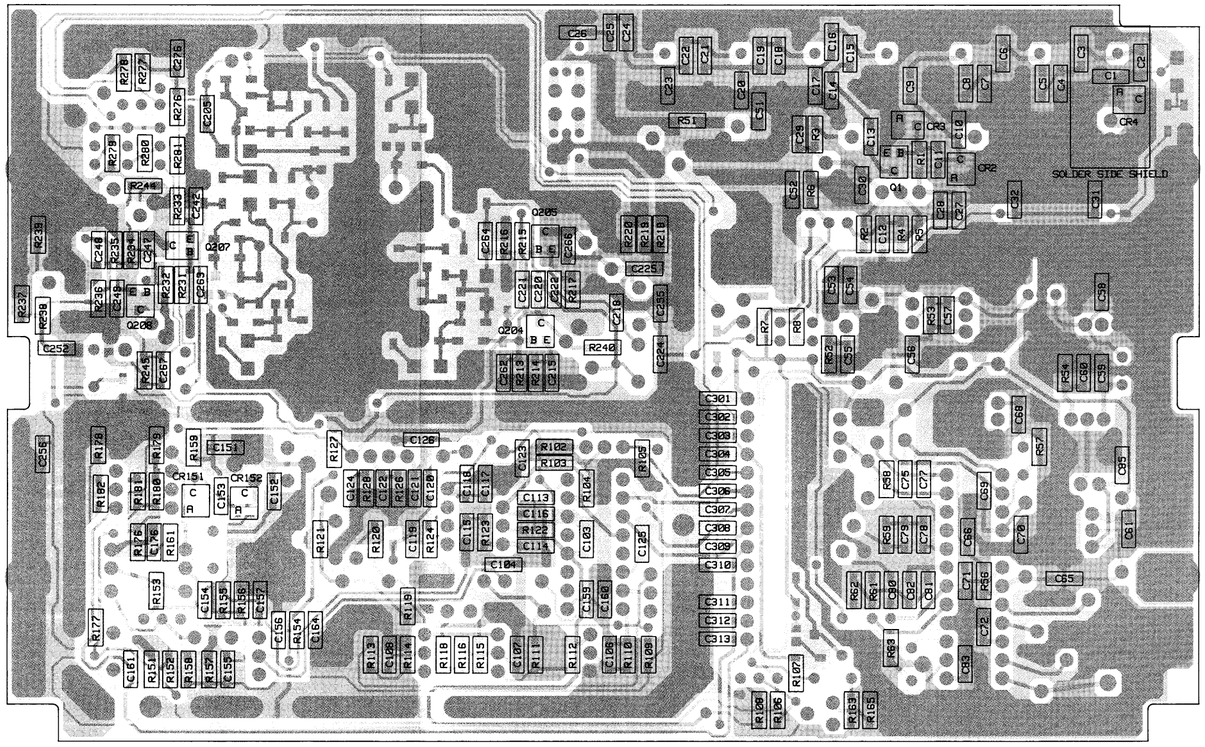


SOLDER SIDE GCW–7617–O
COMPONENT SIDE GCW–7616–O
OVERLAY GCW–7618–O

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
PW–7580–O
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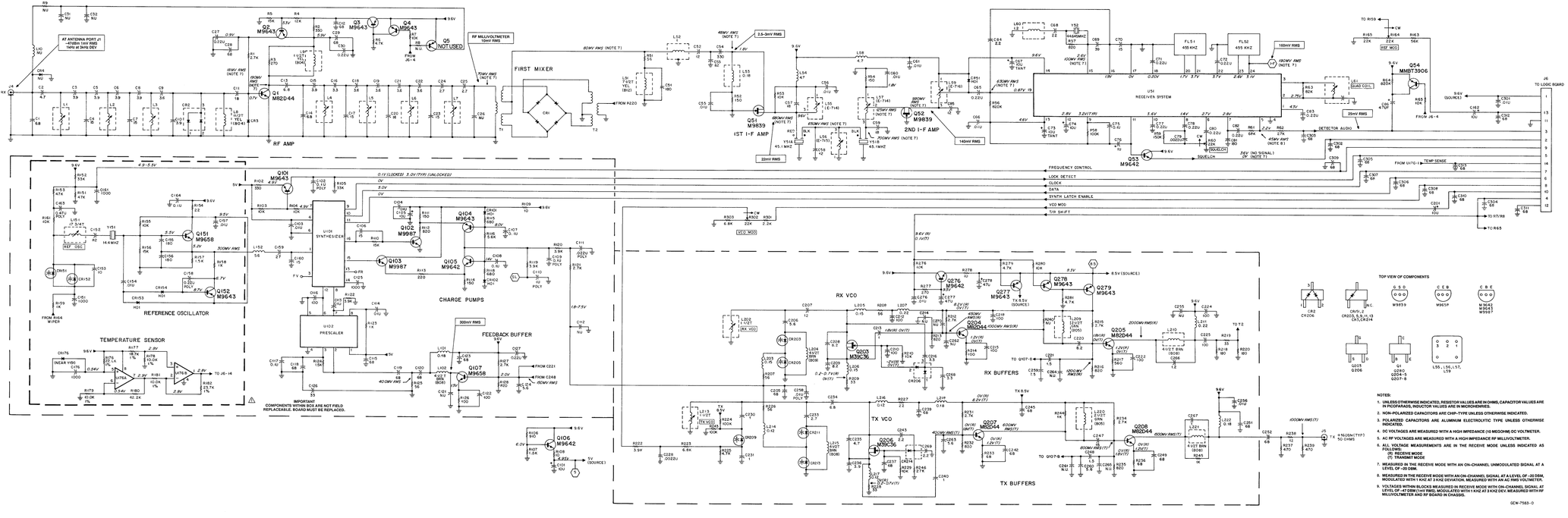

UHF RF Board Transistor D.C. Voltage Table

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 HLE9310B UHF RF Board
PW–7582–O
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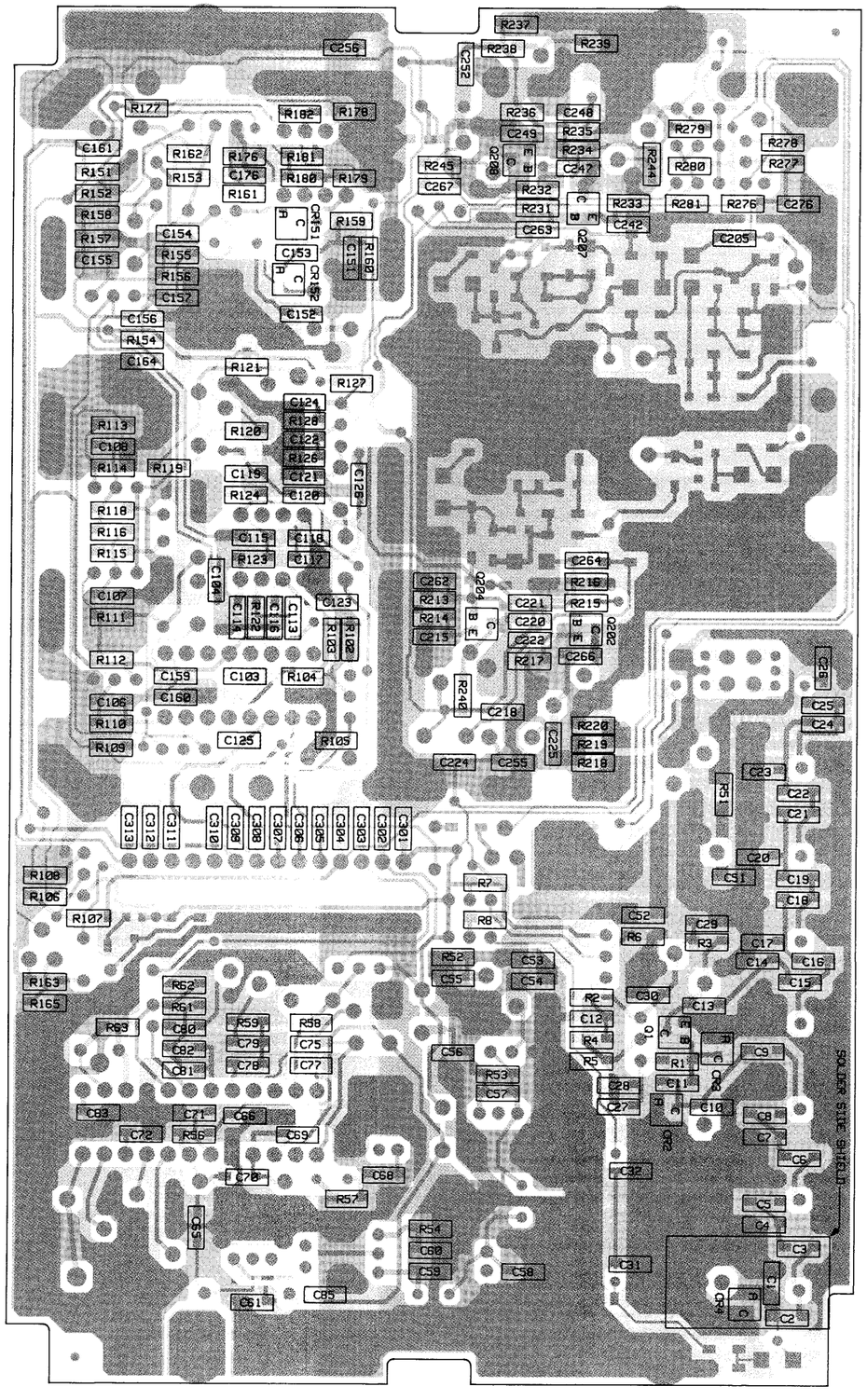
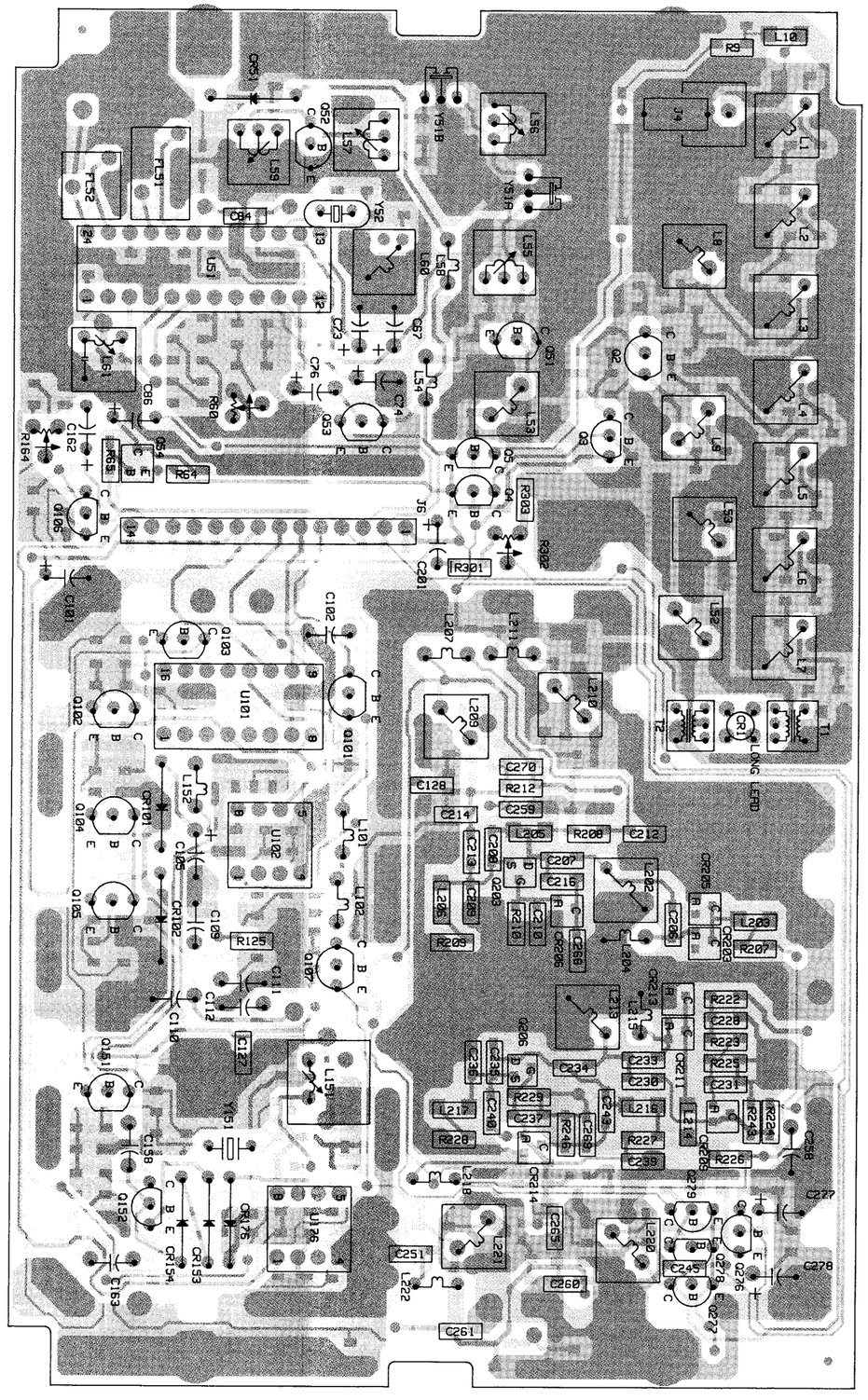


SOLDER SIDE VIEW



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
(Sheet 2 of 3)
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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

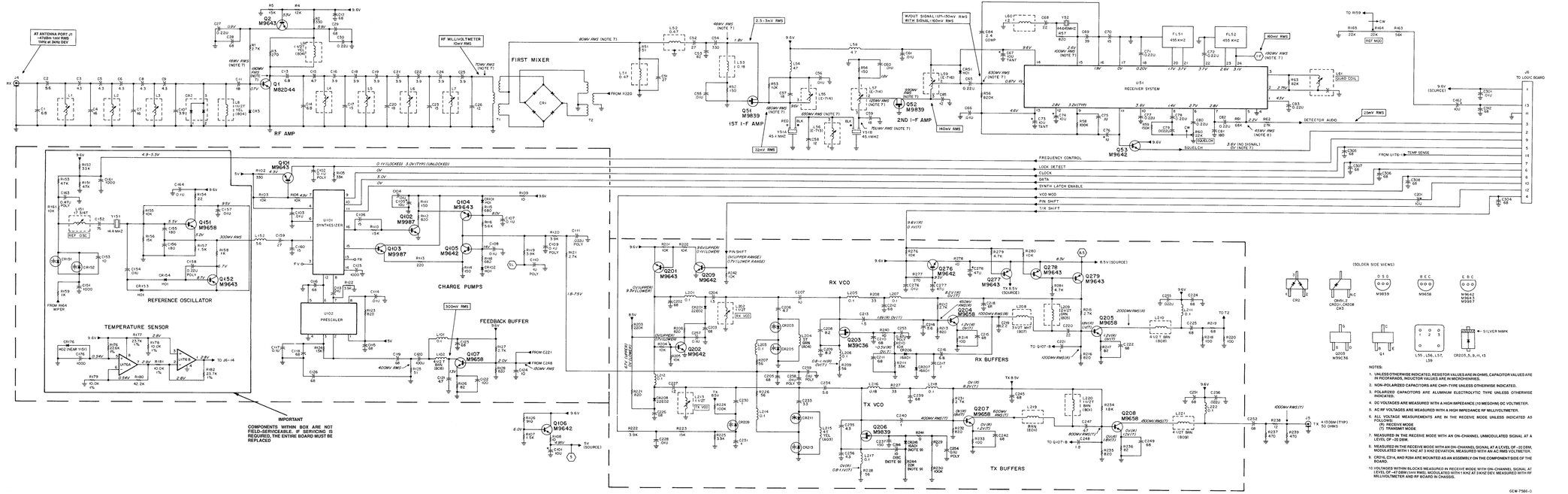
2/28/90

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

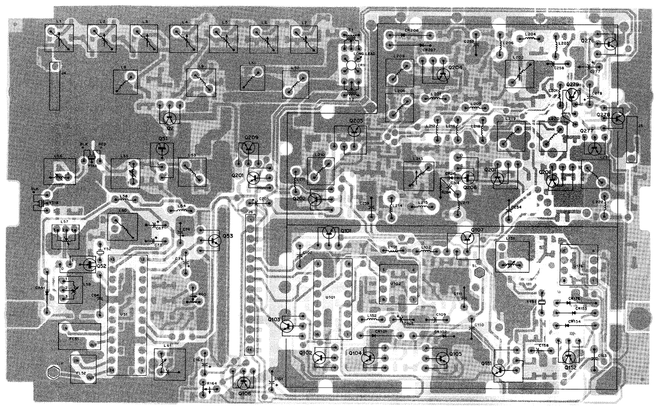
Schematic, Circuit Board Diagrams, and Parts List for HLE9310B UHF RF Board
PW–7582–O
(Sheet 3 of 3)
3/31/90

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	—	—	—

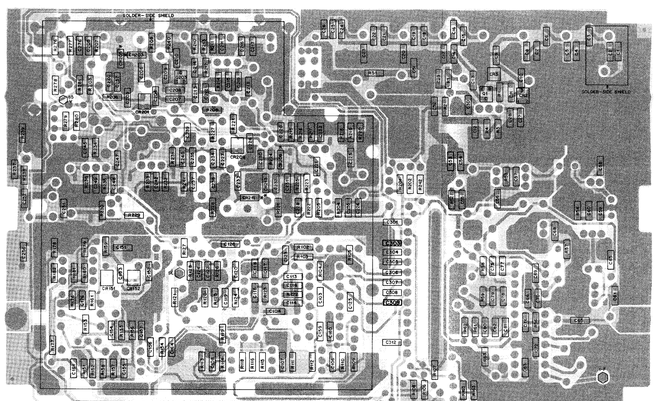


Schematic, Circuit Board Diagrams, and Parts List for HLE4425B UHF RF Board
PW–5283–C
(Sheet 1 of 2)
4/28/90



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, ±0.5%, 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	82 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	21–13741B01	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	08–08669642	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	08–11051A07	.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	5.75 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	24–11033B08	4.5 turns, brown
L211,212	24–80063M01	.1 uH
L213	24–80148M01	27 nH, 1.5 turns
L214	24–80063M04	.18 uH
L215	24–11030A03	4 turns, yellow
L216	24–80063M04	.18 uH
L217,218	24–80063M01	.1 uH
L219	24–11033E01	brown
L220	24–11033B01	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	48–8018D20D	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	48–8018I39	N–channel
Q207,208	48–8018 ID39	NPN
Q209	48–03869642	NPN
Q276	48–03869642	NPN
Q277–279	48–03869643	PNP
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	100k
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	06–11077A62	390
R118	06–11077A70	680
R119,120	06–11077A78	1.5k
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	06–11077A68	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

MXW–7407–O (4)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R225	06–11077A86	3.3k
R226	06–11077A44	56
R227	06–11077A38	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	06–0086 3642	0 ohm
R242	06–11077A98	10k
R276	06–03869643	PNP
R277	06–11077A60	270
R278	06–11077A26	10
R279	06–11077A90	4.7k
R280	06–11077A98	10k
R281	06–11077A90	4.7k
R284	18–05500L08	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	VCO 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

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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 HLE4425B UHF RF Board

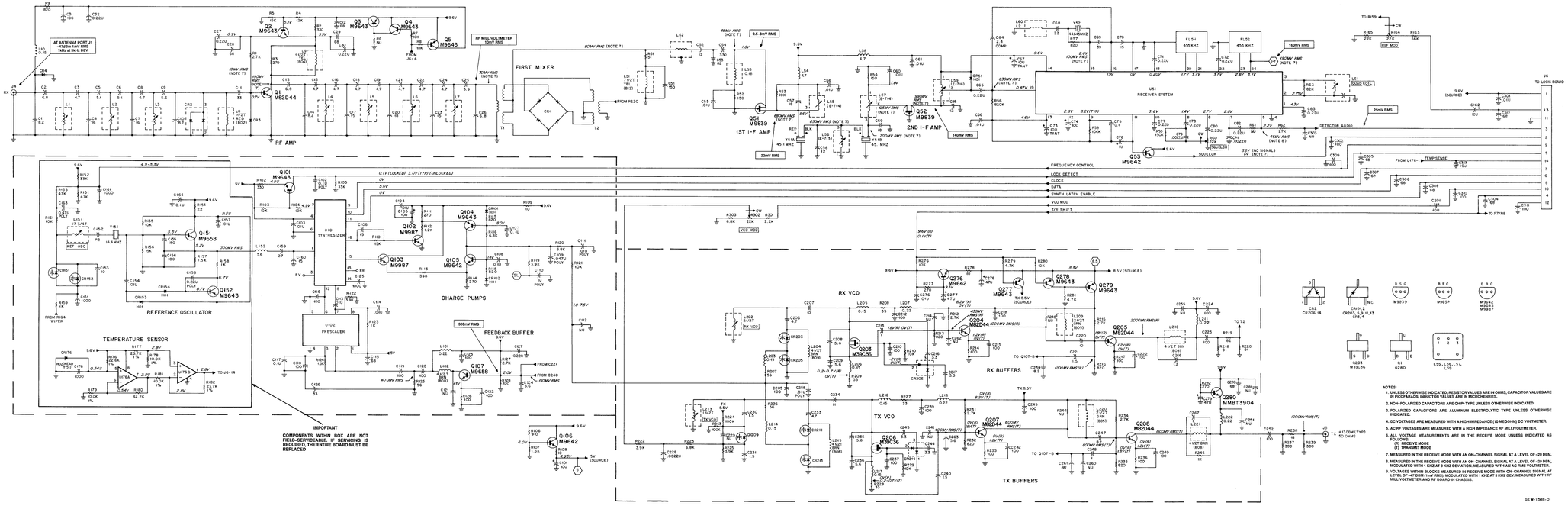
PW–5285–C

(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(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)
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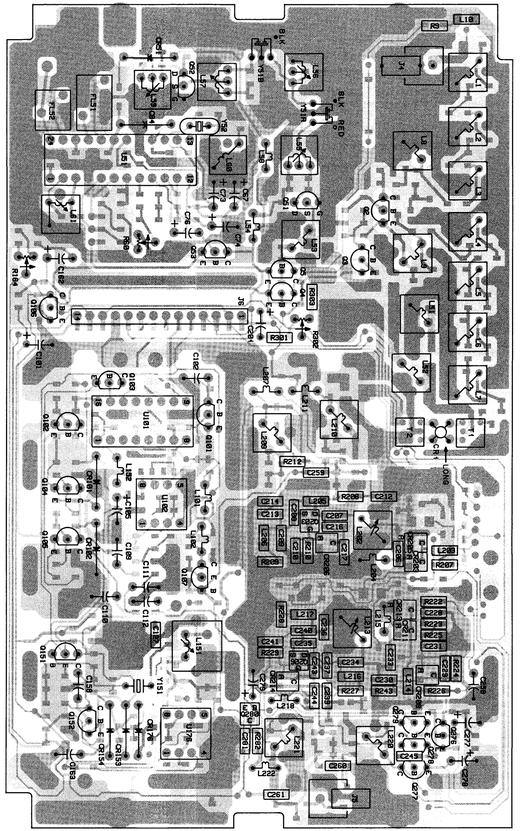
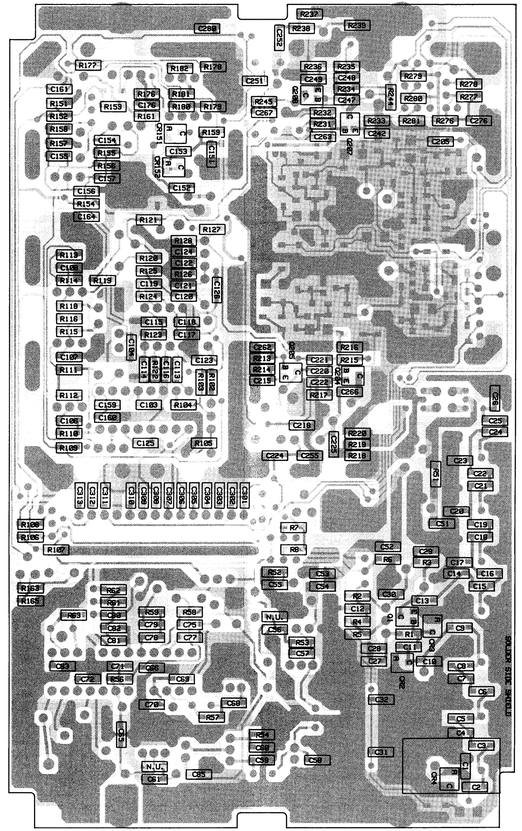


COMPONENT SIDE VIEW



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	06–11077A78	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	06–11077A44	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	06–11077A38	33
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	2.2k, ±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
	26–80098M01	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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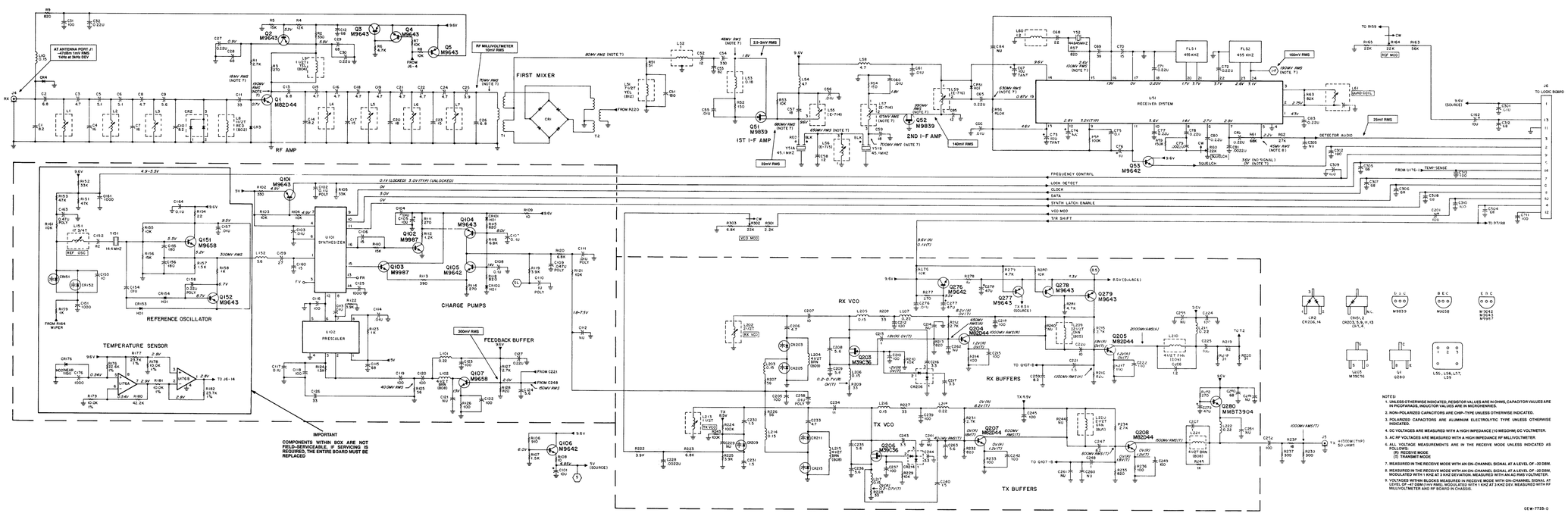
UHF RF Board Transistor D.C. Voltage Table

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
(Sheet 1 of 2)
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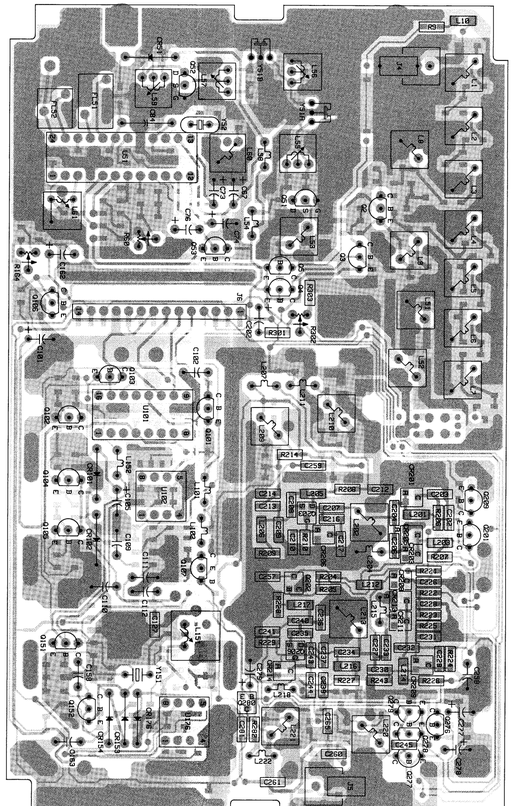
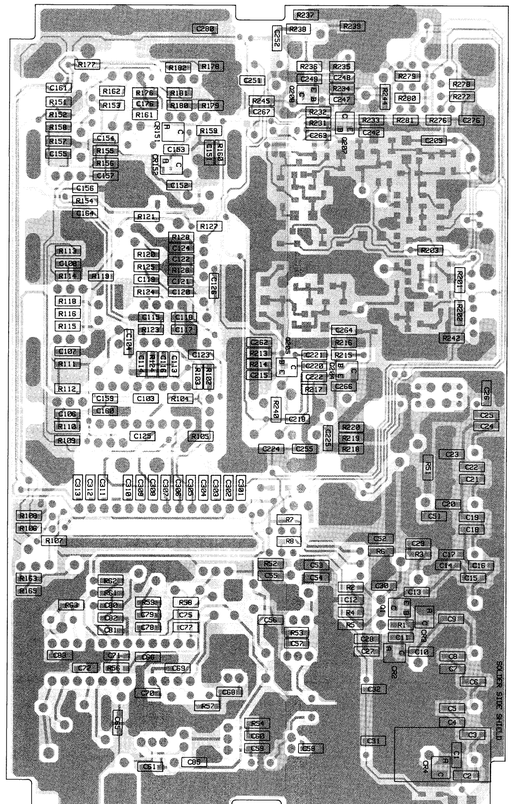


COMPONENT SIDE VIEW



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	21–13740B27	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	21–13741B45	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	transformer
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

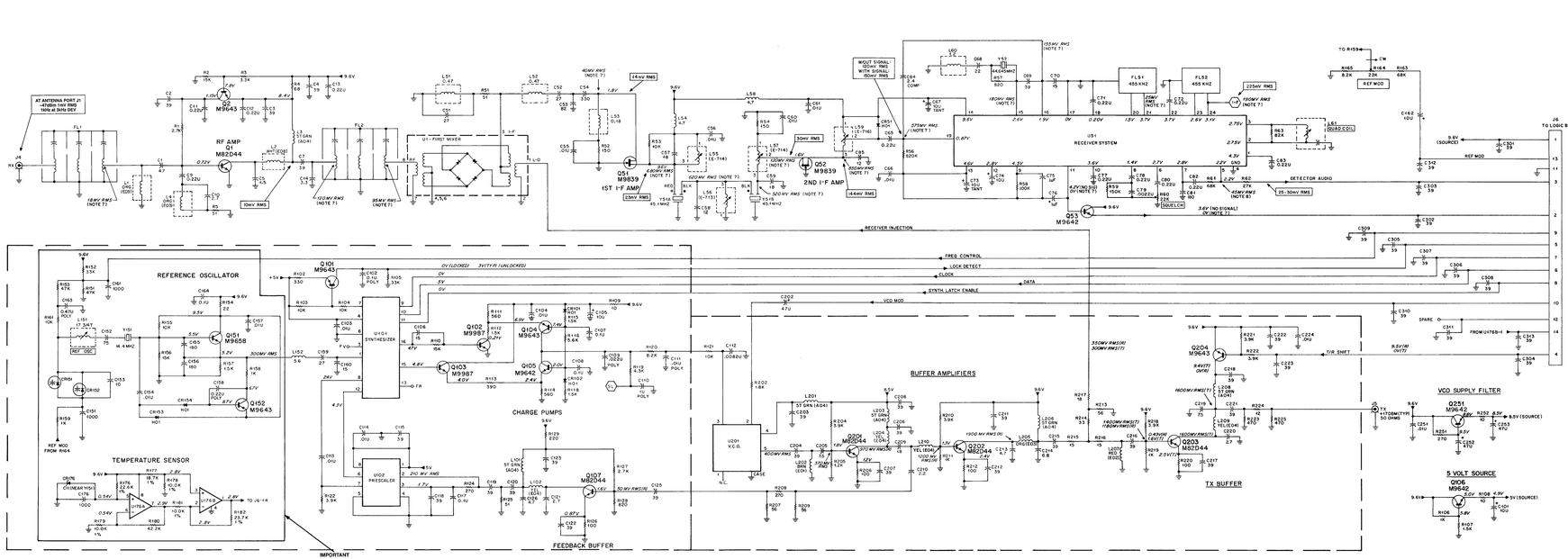
3/31/90

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

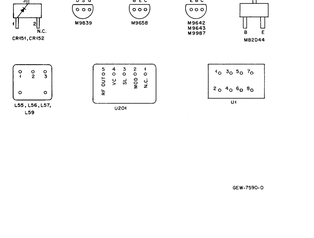
800 MHz RF Board Transistor D.C. Voltage Table

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	—	—	—



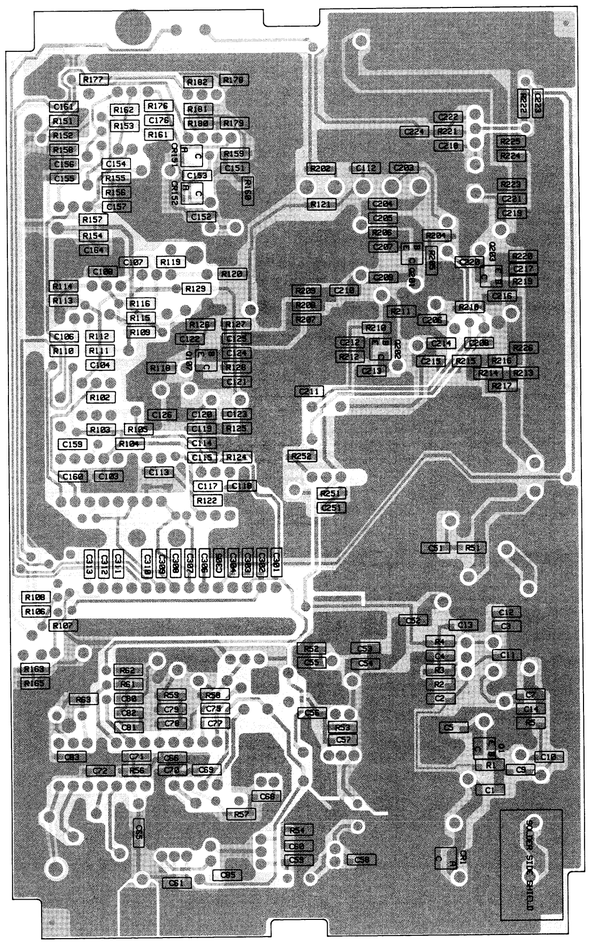
NOTES:

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.



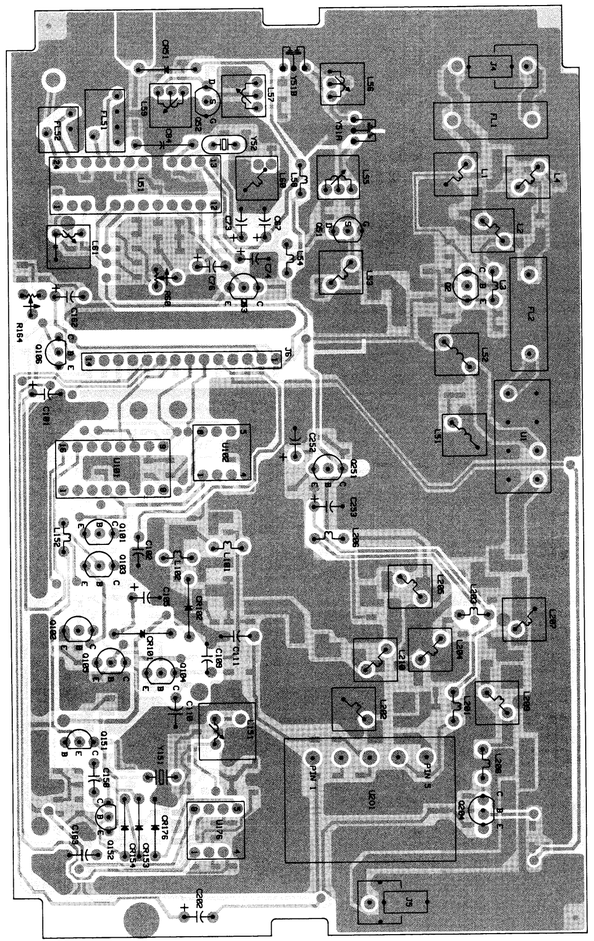
GEW-7590-O

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

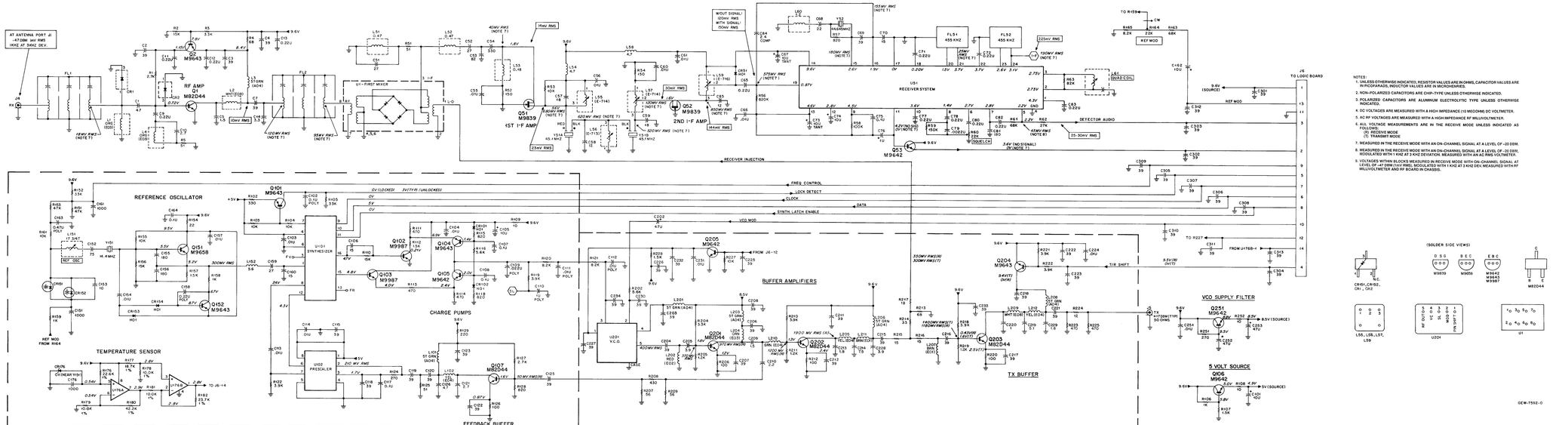
3/31/90

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

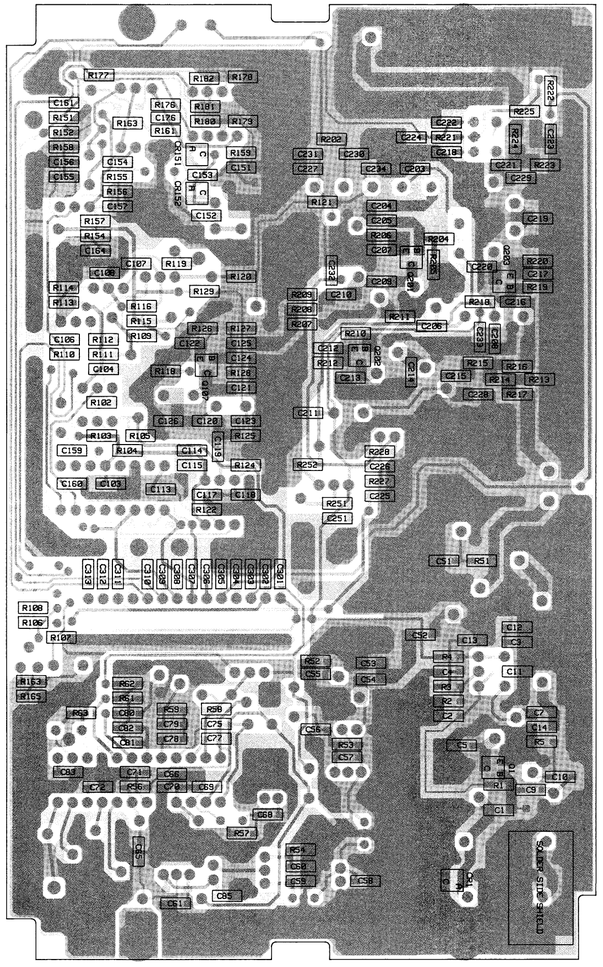
Schematic, Circuit Board Diagrams, and Parts List for HLF4095B 800 MHz RF Board
PW–7589–O
(Sheet 2 of 2)
3/31/90

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	—	—	—

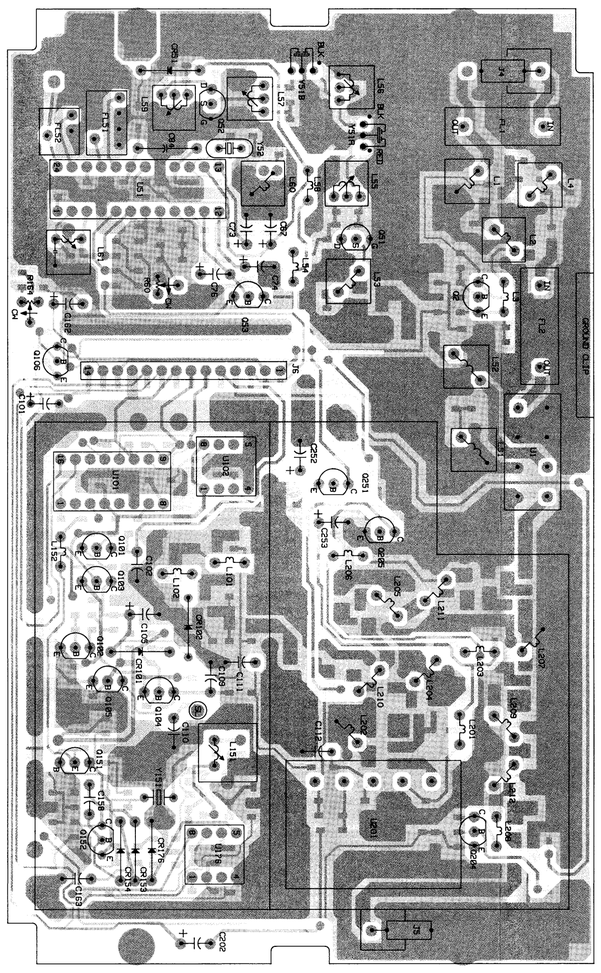


Schematic, Circuit Board Diagrams, and
Parts List for HLF9122A 800 MHz RF Board
PW–7591–O
(Sheet 1 of 2)
3/31/90



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
PW–7591–O
(Sheet 2 of 2)
3/31/90