hy-gain VIII

by hy-gain

MODEL 3078

CITIZENS TWO-WAY RADIO

Base Station

Manufactured and Distributed by
Hy-Gain de Puerto Rico, Inc.
P.O. Box 68 State Hwy. 31, Km. 4.0
Naguabo, Puerto Rico 00718

PN 820050

EO-3078-A-001

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Table of Contents

List of Illustrations

CHAPTER 1 — GENERAL INFORMATION

Introduction

This service manual contains all the information needed to service and repair the Hy-Gain VIII transceiver (Model 3078). It includes an explanation of the theory of operation and alignment procedures. Revision, addendum, and errata sheets will be published as needed. Insert them as required in the manual.

General Description

The Hy-Gain VIII is a full 23-channel, AM/SSB transceiver designed and type accepted for Class D Citizens Radio Service, as designated by the Federal Communications Commission (FCC).

It is a completely solid-state base station, highly reliable with low power consumption. A crystal matrix frequency synthesizer provides immediate operation on all 23 channels without requiring the purchase of additional crystals. Features include a fine tune control to allow single sideband (SSB) stations to be tuned in sharply, two noise reduction circuits, a switchable automatic noise limiter (ANL) with a switchable noise blanker (NB), a digital clock, an SWR bridge, modulation metering, and AC/DC operation.

Warranty Service Department

For help with technical problems, for parts information, and information on local and factory repair facilities, contact the National Service Manager. When you write, please include all pertinent information that may be helpful in solving your problem. Address your letter to:

Hy-Gain Warranty Service Department
4900 Superior Street
Lincoln, Nebraska 68504
ATTN: National Service Manager

The Warranty Service Department can repair any unit. Before you ship a unit to us, contact the National Service Manager. Often a problem is field solvable with a little extra help. This can save lost time and shipping costs. Factory returns should be limited to the difficult problems.

How to Ship Returns

To return a unit, get a return authorization first. This is important. You will only delay the handling of your unit if you ship without it. If you must ship immediately, telephone or telex the National Service Manager for expeditious service.

When you request return authorization, you may also request notification of completion of repairs. The notification will include a copy of the bill. Paying the bill before we return your unit can save the cost of a COD fee.

For warranty repair, prepare a letter in duplicate containing the following information (for out-of-warranty repair delete items 2 and 3):

1. your name and address
2. purchaser's name and address
3. proof of purchase

4. serial number

5. a complete description of the problem

6. the return authorization

Check the unit to see that all parts and screws are in place, and attach an envelope containing a copy of the letter directly to it so that we do not overlook this information. Wrap the unit and envelope in heavy paper or put them in a plastic bag. If the original carton is not available, place the unit in a strong carton that is at least six inches larger in all three dimensions than the unit. Fill the carton equally around the unit with resilient packing material (shredded paper, excelsior, bubble pack, etc.). Seal it with gummed paper tape, tie it with a strong cord, and ship it by prepaid express, United Parcel Service, or insured parcel post to the address given previously. Mail the original of the letter in a second envelope to the same address.

It is important that the shipment be well-packed and fully insured. Damage claims must be settled between you and the carrier and this can delay repair and return of the unit.

All shipments to us must be sent PREPAID. We *do not* accept collect shipments. After the unit has been repaired, we will send it back to you COD unless you have prepaid the bill. Unclaimed or refused COD shipments will not be reshipped until payment in full is received. These items become the property of Hy-Gain 60 days after refusal or return and will be sold for payment of charges due.

Units with unauthorized field modifications cannot be accepted for repair.

Purchase of Parts

Parts can be purchased from any Hy-Gain Service Center or from the factory Warranty Service Department. When ordering, please supply the following information:

1. unit model number

2. unit serial number

3. part description

4. part number

Controls and Connections

Refer to Figures 1-1 and 1-2.

Of special interest are the following features:

Digital Clock

The clock operates as long as the unit is connected to an AC power source, regardless of whether the power switch is on or off. It will not run when the unit is connected to DC power.

SWR/CAL Switch

Set this switch on CAL in order to calibrate the SWR meter as explained in Calibrating the SWR Meter. It does not function when the calibrate control is set on RF.

Digital Clock Buttons (Rear Panel)

STOP — This stops the movement of the clock but does not turn the display off.

SLOW — This steps the movement slowly forward when resetting to the correct time.

FAST — This steps the movement forward when resetting to the correct time.

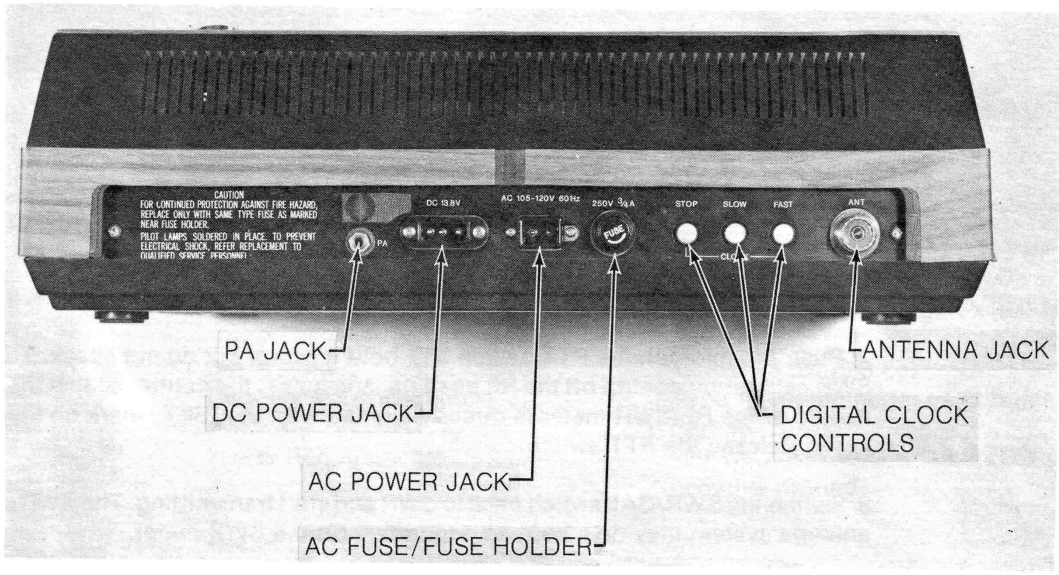


Figure 1-1

Special Features Instructions

Calibrating the Modulation Meter

1. Insure that the CB/PA switch is in the CB position, and then switch the MOD/CAL switch to CAL.

2. Adjust the modulation calibration control so the meter needle of the S/Modulation meter is directly aligned with the "SET" mark on the lower scale.

3. Switch the MOD/CAL switch back to MOD and start transmitting. The degree of modulation while speaking may now be read accurately on the modulation meter.

Calibrating the SWR Meter

1. Insure that the CB/PA switch is in the CB position, and switch the SWR/CAL switch to CAL.

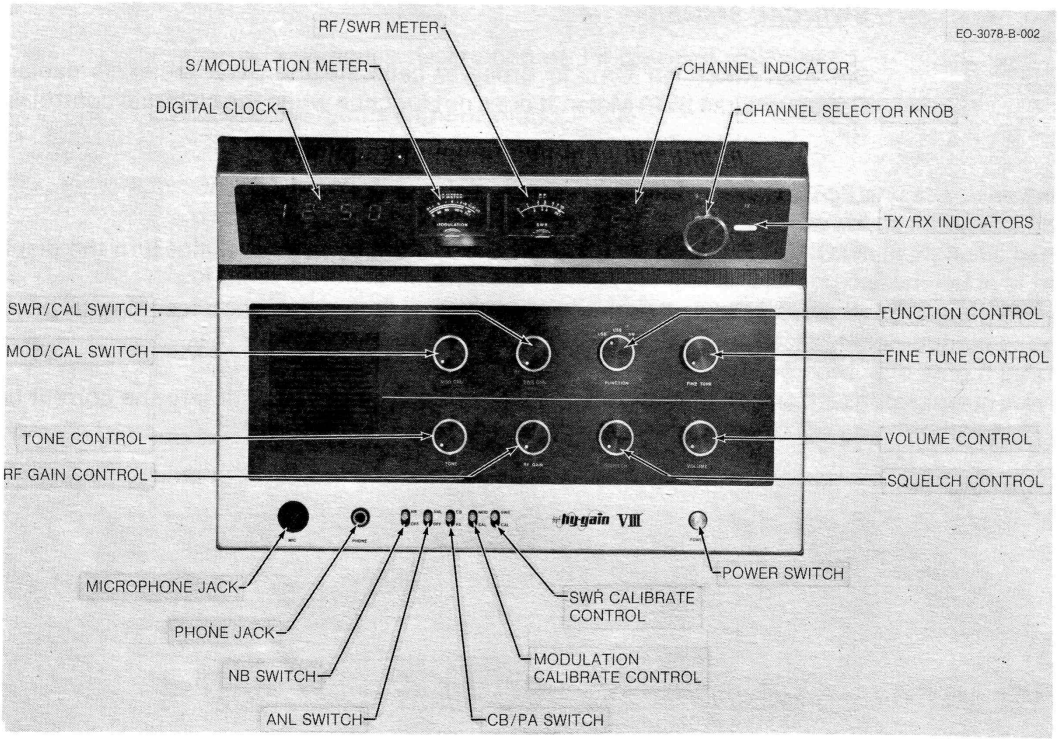


Figure 1-2

2. Push the microphone PTT switch and hold it down, but do not speak. Turn the SWR calibration control off the RF position, and adjust the control so that the meter needle of the RF/SWR meter is directly aligned with the "SET" mark on the lower scale. Release the PTT switch.

3. Switch the SWR/CAL switch back to SWR and start transmitting. The SWR of your antenna system may now be read accurately on the SWR meter.

4. After completing the SWR check, return the calibration control to the RF position to monitor your RF output power.

Resetting the Digital Clock

1. Step the clock reading to either one or two minutes ahead of the actual current time, using either the FAST or SLOW button. Then immediately hit the STOP button and hold it.

2. Hold the STOP button until actual time synchronizes with the reading on the digital clock. Release the STOP button. The digital clock will now resume normal movement and indicate the correct time.

S/Modulation Meter

In receive, the meter provides a relative indication of other stations' signal strength, as measured in "S" units (upper scale). When transmitting, the meter shows the percent of modulation of the unit's signal while speaking into the microphone (lower scale).

RF/SWR Meter

When transmitting, the meter shows the RF output power in watts (upper scale). The SWR (standing wave ratio) of the antenna system can be measured when transmitting by switching the SWR/CAL toggle switch to SWR. There are no readings in receive. (See also SWR/CAL switch.)

SWR Calibrate Control

This control is used to calibrate the SWR meter (the SWR/CAL switch must be in the CAL position). It also switches the RF/SWR meter to RF when it is in the RF position. See Calibrating the SWR Meter for complete instructions on its use.

Modulation Calibrate Control

This control is used with the MOD/CAL toggle switch to calibrate the modulation meter. See Calibrating the Modulation Meter for instructions on its use.

MOD/CAL Switch

Set this switch on CAL in order to calibrate the modulation meter as explained in Calibrating and Modulation Meter for readings when transmitting.

Specifications

General

Channels	all 23 in the citizens band (27 MHz)
Antenna impedance	50 ohms, nominal
Dimensions (HWD)	4¾" x 16" x 11" (120 mm x 400 mm x 289 mm)
Net Weight	12 lbs. 13 oz. (5.8 kg)
Compliance (transmitter)	Type Accepted under FCC Rules, Part 95
Power Requirements	120 VAC, 230 VAC or 13.8 VDC negative ground

Receiver

Sensitivity	AM: 1 microvolt for 10 dB (S+N)/N SSB: 0.25 microvolt for 10 dB (S+N)/N
Selectivity	AM: 2.4 kHz at 6 dB down, SSB: 2.4 kHz 6 dB down
Image Rejection	40 dB
Fine Tune range	± 600 Hz
Audio output	3 watts, maximum
Audio output impedance	8 to 16 ohms
Squelch range	AM & SSB: 1 microvolt
Power consumption (no signal)	less than 27 watts @ 120 VAC, less than 0.6 amps @ 13.8 VDC

Transmitter, SSB

SSB generation	balanced ring modulator with crystal lattice filter
Frequency response	400-2300 Hz (+3 dB up - 10 dB down)
RF output power	12 watts PEP max. @ 13.8 VDC
Carrier suppression	40 dB down
Harmonic suppression	50 dB down
Power consumption (no modulation)	less than 31 watts @ 120 VAC, less than 0.8 amps @ 13.8 VDC

Transmitter, AM

RF output power	4 watts max. @ 13.8 VDC
Harmonic suppression	50 dB down
Power consumption (no modulation)	less than 64 watts @ 230 VAC, less than 2.0 amps @ 13.8 VDC

CHAPTER 2 — THEORY OF OPERATION

General

The theory of operation of the Hy-Gain VIII is divided into three sections: the Crystal Matrix Frequency Synthesizer, the Receiver, and the Transmitter. The material presented here covers the functioning of the transceiver with a minimum of technical involvement. Although it is intended to be informative, we have not attempted to explain the engineering techniques and approaches that arrived at these circuit designs.

NOTE: For visual reference to the theory of operation, refer to Figures 2-1 through 2-6, the block diagrams.

Crystal Matrix Frequency Synthesizer

The crystal matrix frequency synthesizer produces and synthesizes several frequencies by making use of crystals X201 through X210 and X1. The frequencies generated in this section are as follows:

USB (TX,RX) and AM (TX) operation—
38.240 to 38.530 MHz at the L204 secondary.
LSB (TX,RX) operation —
15.690 to 15.980 MHz at the L204 secondary
AM (RX) operation —
38.2376 to 38.5276 MHz at the L17 secondary.

To generate the frequency required for each channel, several crystal elements are selected and combined by using the channel selector switch, 201a, and 201b.

In addition to crystal selection, proper transistor circuits must also be selected. This is done by turning power on or off to various circuits with the mode switch SW301a-301f and RY1.

AM Transmit and USB Transmit and Receive

Assume channel 1 is selected. The 23 MHz Oscillator, Q201, and the 14 MHz Oscillator, Q204, are oscillating at 23.330 MHz, respectively. The buffered output, the 14.910 MHz and the 23.330 MHz signals, are applied to the Main Synthesizer Mixer, Q202. The mixed output is then amplified by the Main Synthesizer Amplifier, Q203, and its output is applied to L203 and L204. The resulting frequencies are shown below.

	CH	Q201 Osc. freq.		Q204 Osc. freq.		Output
1	26.965 MHz	23.330 MHz	+	14.910 MHz	=	38.240 MHz
2	26.975	23.330	+	14.920	=	38.250
3	26.985	23.330	+	14.930	=	38.260
4	27.005	23.330	+	14.950	=	38.280
5	27.015	23.380	+	14.910	=	38.290
6	27.025	23.380	+	14.920	=	38.300
	↓	↓		↓		↓
20	27.205	↓		14.950	=	38.480
21	27.215	23.580	+	14.910	=	38.490
22	27.225	23.580	+	14.920	=	38.500
23	27.255	23.580	+	14.950	=	38.530

LSB Transmit and Receive

In the LSB mode the oscillating frequency of Q204 is 14.910 MHz and its output is applied to the base of the 7 MHz Synthesizer Mixer, Q14, through the 14 MHz Buffer, Q205, and a coupling capacitor, C165.

Receiver

AM Reception

Assuming that channel one (26.965 MHz) is being received, the signal is routed past the collector of Q32 through the antenna circuit and a pi-type filter circuit of the final stage. The signal is then applied to the RF Amplifier, Q16, through a tank circuit consisting of C95 and L18. The amplified signal output is applied to the base of the Receiver Mixer, Q17.

The synthesizer output being applied to Q17 during channel one, AM reception, is 38.2376 MHz. The resulting mixer output is 11.2726 MHz.

This is the IF frequency. The IF signal is applied to the Crystal Filter, the IF Amplifier First Stage, Q8, and the IF Amplifier Second Stage, Q10 and Q11. The amplified output is detected into an audio signal by the AM Detector, D12. The detected output is then applied to the First Preamplifier, Q12, through D14 and its associated Automatic Noise Limiting (ANL) circuitry.

The output of Q12 is further amplified by passing through the Second Preamplifier, Q28, the Audio Driver Q29, and the Audio Amplifier, Q601 and Q602, which drives the speaker. A fraction of the signal is picked up from the secondary coil of L11 to obtain the AGC signal and the controlling signal for the squelch circuit.

USB & LSB Reception

Both LSB and USB signals are applied to the RF Amplifier, Q16, and amplified. The output is applied to the base of the Receiver Mixer, Q17, as in AM reception.

Depending on the channel selected, the injection signal being applied to Q17 from the synthesizer circuit is 38.240 to 38.530 for USB and 15.690 to 15.980 for LSB. The resulting mixer output is 11.275 MHz.

The converted output is a 11.275 MHz LSB signal for both USB and LSB reception. This is the case for all 23 channels. The LSB signal passes through the Crystal Filter to the IF Amplifier First Stage, Q8, and the IF Amplifier Second Stage, Q10 and Q11. The output of Q10 and Q11 passes through L11, C59, and R52 and is applied to the base of the SSB Product Detector, Q12.

During SSB reception, the Carrier Oscillator, Q5, and the Carrier Buffer, Q6 are operating and the Local Oscillator frequency, a 11.275 MHz signal, is applied to the emitter of Q12 through the capacitor, C67. Q12 will not operate as an audio preamplifier in this case, but as a product detector. The detected audio output is then processed as in AM reception. The signal is amplified by the Second Preamplifier, Q28, the Audio Driver, Q29, and the Audio Amplifier, Q601 and Q602.

AGC & Squelch Circuits

The control voltage for these circuits is produced by rectifying a fraction of the output of the secondary coil of L11.

Noise Blanker

Impulse noise amplified by the RF Amplifier, Q16 is fed to D18 and D19 through C101. It is peak-detected and further amplified through the First and Second Noise Amplifiers, Q18 and Q19. The amplified pulse is applied to the Noise Blanker, Q20, making the transistor appear as a short-circuit to ground for L20 (or the collector of Q17) during the length of the noise pulse.

The signal generated by the Carrier Oscillator, Q5, is applied to the base of the Doubler Amplifier, Q13, through capacitor, C77. The 22.550 MHz frequency (11.275 x 2) is then applied to the base of Q14 through L12 and C84 to mix with the 14.910 MHz frequency. The resulting frequency is 7.64 MHz.

22.550 MHz - 14.910 = 7.64 MHz

The 7.64 MHz output is then applied to the gate of the 16 MHz Synthesizer Mixer, Q24, through L13 and L14. Here it is mixed with the 23.330 MHz signal being supplied to the gate through L201 and C88. The resulting output is 15.69 MHz.

23.330 MHz - 7.64 MHz = 15.69 MHz

The 15.69 MHz signal is amplified by the 16 MHz Synthesizer Amplifier, Q15. In this way, the following frequencies are obtained at the secondary coil of L17.

CH	Q201 Osc. freq.		Q13 Doubler		Q204 Osc. freq.		Output
1	(23.330 MHz)	-	(22.550 MHz	-	14.910 MHz)	=	15.690 MHz
2	(23.330 MHz)	-	(22.550 MHz	-	14.920 MHz)	=	15.700 MHz
3	(23.330 MHz)	-	(22.550 MHz	-	14.930 MHz)	=	15.710 MHz
↓	↓		↓		↓		↓
22	(23.580 MHz)	-	(22.550 MHz	-	14.920 MHz)	=	15.950 MHz
23	(23.580 MHz)	-	(22.550 MHz	-	14.950 MHz)	=	15.980 MHz

AM Receive

In this mode, the AM Receiver Frequency Shifter, Q206, operates and lowers the frequency of the 14 MHz Oscillator, Q204, by 2.4 kHz. Depending on the channel selected, Q204 will oscillate at the following frequencies.

14.910 MHz - 0.0024 MHz = 14.9076 MHz
14.920 MHz - 0.0024 MHz = 14.9176 MHz
14.930 MHz - 0.0024 MHz = 14.9276 MHz
14.950 MHz - 0.0024 MHz = 14.9476 MHz

The 14.9076 MHz output and the 23.330 MHz signals are then applied to the Synthesizer Mixer, Q202, and mixed. The frequencies obtained at the secondary coil of L204 are:

CH	Q201 Osc. freq.		Q205 Osc. freq.		Output
1	23.330 MHz	+	14.9076 MHz	=	38.2376 MHz
2	23.330 MHz	+	14.9176 MHz	=	38.2476 MHz
3	23.330 MHz	+	14.9276 MHz	=	38.2576 MHz
↓	↓		↓		↓
22	23.580 MHz	+	14.9176 MHz	=	38.4976 MHz
23	23.580 MHz	+	14.9476 MHz	=	38.5276 MHz

Transmitter

MIC Amplifier

The audio frequency signals are amplified by IC301. Q301 provides automatic gain control.

AM Transmit

Audio signals enter the mic input circuit and are applied to an integrated circuit, IC301, and amplified. Its output is then applied to Second Microphone Preamplifier, Q27. The Audio Compressor Q301, D301 and D302, which make up the AGC circuit, uses this output as a control voltage source. The audio output obtained from the emitter of Q27 is routed to the Balance Modulator, D1-D4.

USB and LSB Transmit

The amplified audio signal from the Microphone Preamplifier, IC301, is applied to the base of the Audio Driver, Q29 through C112. The output is further amplified by Q601 and Q602. The audio output is finally led to the collectors of the Driver, Q31, and the RF Power Amplifier, Q32 through D42, thus modulating the carrier frequency.

USB Transmit and LSB Transmit

The Carrier Oscillator, Q5 operates except during AM Receive. The 11.275 MHz signal is applied to the Balance Modulator, D1 through D4, to which an audio signal is also being applied. The signals are applied to the Crystal Filter through L9, the First Sideband Amplifier, Q7 and D7. Since the Crystal Filter is designed to pass only an LSB signal, the input signal is filtered and the output is an 11.275 MHz centered LSB signal.

The filtered output is amplified by the Second Sideband Amplifier, Q8. The output of Q8 is applied to the Transmit Mixer, Q1 and Q2 through L10, Q30, and L1.

NOTE: The explanation above is applicable for both USB and LSB operation. The stages following the Balance Modulator however are different in LSB and USB operation.

USB Transmit

A 38.240 MHz signal is applied to the Transmit Mixer, Q1 and Q2, through L204. Since the tuning frequency of the output tank circuit is 27 MHz, the difference between 38.240 MHz and 11.275 MHz will be obtained as an output signal.

38.240 - 11.275 = 26.965 MHz

The USB signal will be amplified through several stages of RF amplifiers, the Predriver, Q3 and Q4, the Driver, Q31, and the RF Power Amplifier, Q32. The output of Q32 is then applied to the antenna circuit for radiation.

LSB Transmit

Assuming channel 1 is selected, a 15.690 MHz, signal is applied to the Transmit Mixer, Q1 and Q2 through L17 and C3. The mixer output is the sum frequency given below:

15.690 + 11.275 = 26.965 MHz

The LSB signal is amplified by Q3 and Q4, Q31, and Q32, then radiated through the antenna.

AM Transmit

The 11.275 MHz signal generated by the Offset Oscillator, Q5, is applied to the base of the Offset Amplifier, Q9, through the emitter of the Offset Buffer, Q6, C37, C38, and C51. The base bias circuit of Q9 is closed with SW301f in AM operation.

The 11.275 MHz signal applied to the base of Q9 is then applied to the Transmit Mixer, Q1 and Q2, through the collector of Q9 and C53, Q30 and L1. At the same time, a 38 MHz signal is being applied to the Transmit Mixer through L204. The following signals will be obtained.

CH 1 38.240 - 11.275 = 26.965 MHz
CH 2 38.250 - 11.275 = 26.975 MHz

CH 22 38.500 - 11.275 = 27.225 MHz
CH 23 38.530 - 11.275 = 27.255 MHz

The 27 MHz band signals are applied to the Predriver, Q3 and Q4, the Driver Q31 and the RF power Amplifier, Q32, to be amplified. The collectors of Q31 and Q32, receive the modulation signal at the same time, producing AM collector modulation. The output of the amplifier stages is applied to the antenna circuit and radiated.

AVR Power Supply

The voltage regulator circuit consists of transistors Q501, Q603, and Q502.

The rectified voltage from the diodes D501 through D504 is filtered by C501. Zener diode, ZD501, provides a reference voltage that partially determines the base current of Q501. Q502 is a feed back transistor that also controls the base current of Q501.

Channel Display

The selected channel is displayed by LED 1101 and LED 1102. The position of the channel Selector Switch, S201, is decoded by the Diode Matrix P.C. Board. The diode matrix determines the proper currents to apply to the LED displays.

Digital Clock

The digital clock consists of the IC, IC801, display drivers Q801 through Q814, and the light emitting diode display LED 1001 through LED 1004. The clock IC, IC801, produces all the voltages necessary to control the driver transistors, Q801 through Q814.

The display is multiplexed. Q810 through Q814 determine which display will be operational while Q801 through Q809 determine the segments to be displayed.

The timing diagram, Figure 2-1, illustrates the multiplexing scheme for a display of 11:52 during one strobe cycle. These voltages will be repeated until the time changes. The repetition rate is so fast that the clock gives the appearance of all digits being ON simultaneously.

The display is a common anode display. When pins 22 through 25 go high, transistors Q110 through Q814 conduct. This puts a ground on the anode and allows the transistors Q801 through Q807 to determine which segments are displayed. The timing diagram does not indicate the operation of the second pulsing LED's, LED 1005 and LED 1004. Their operation is similar with Q810 allowing operation of both LEDs and Q808 and Q809 determining which individual LED is operational.

The 60 Hz signal from the power transformer is coupled through R825 to pin 19 of IC801. This clock signal input is used by the clock chip to provide the proper timing and voltages used by the 3078 clock.

The time setting function is accomplished by switches SW903, SW902, and SW901 when the negative supply voltage is applied through these switches to pins 17, 18, and 19. It is necessary to reset the clock time when power is first applied to the 3078. The clock will not cycle properly unless this is done.

The clock can be set for a 24 hour mode by isolating pin 13 of IC801.

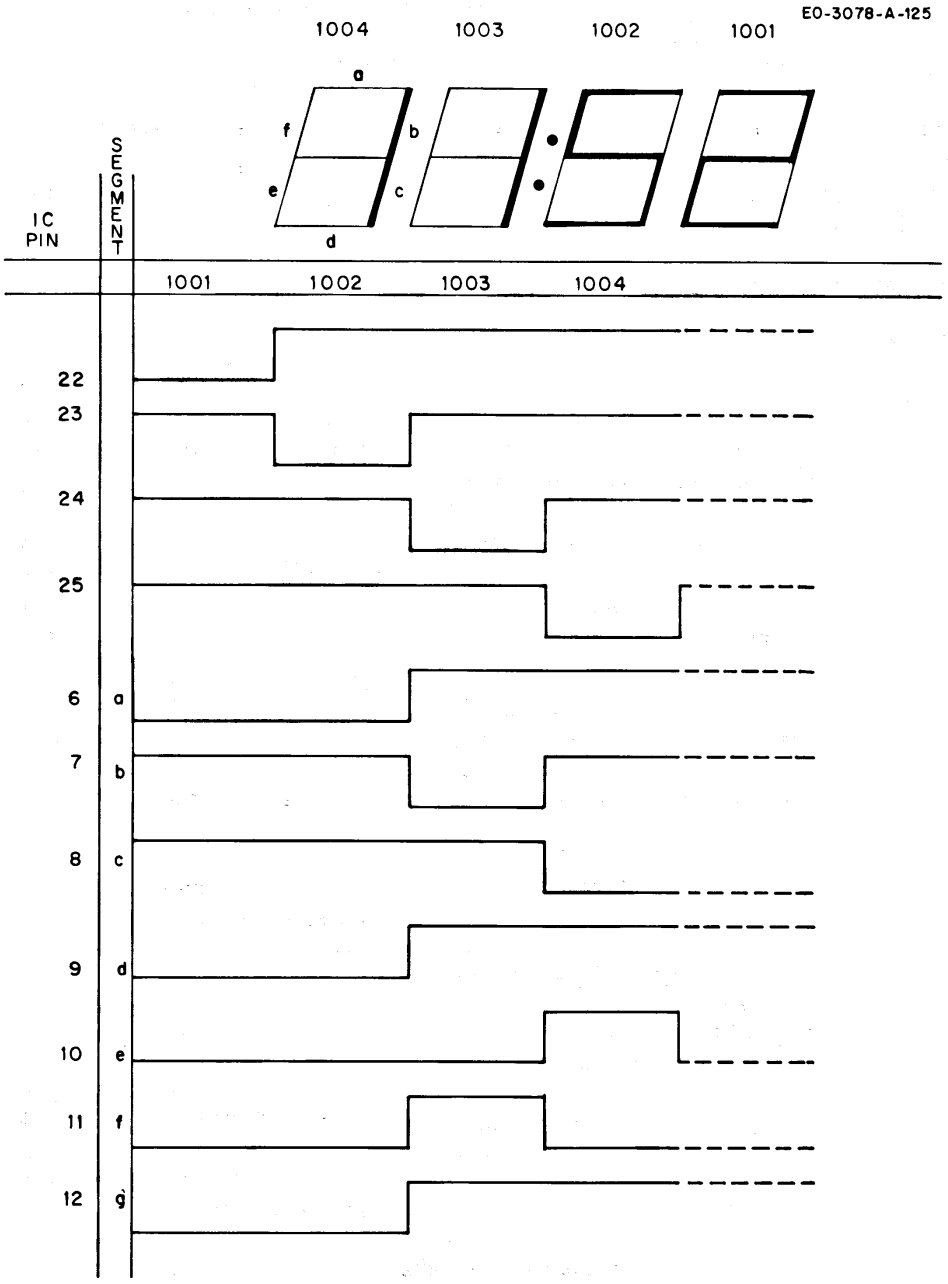


Figure 2-1

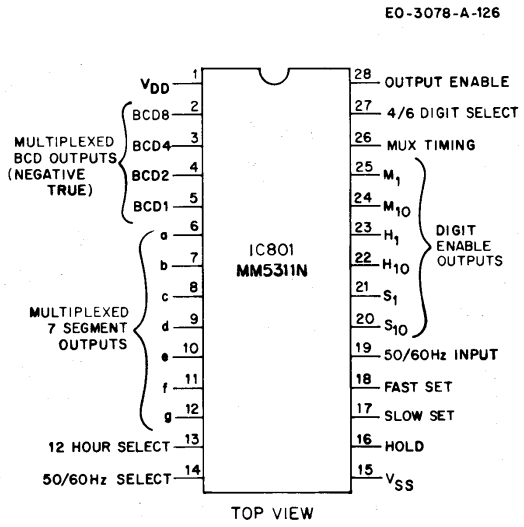


Figure 2-2

Clock Chip Diagram

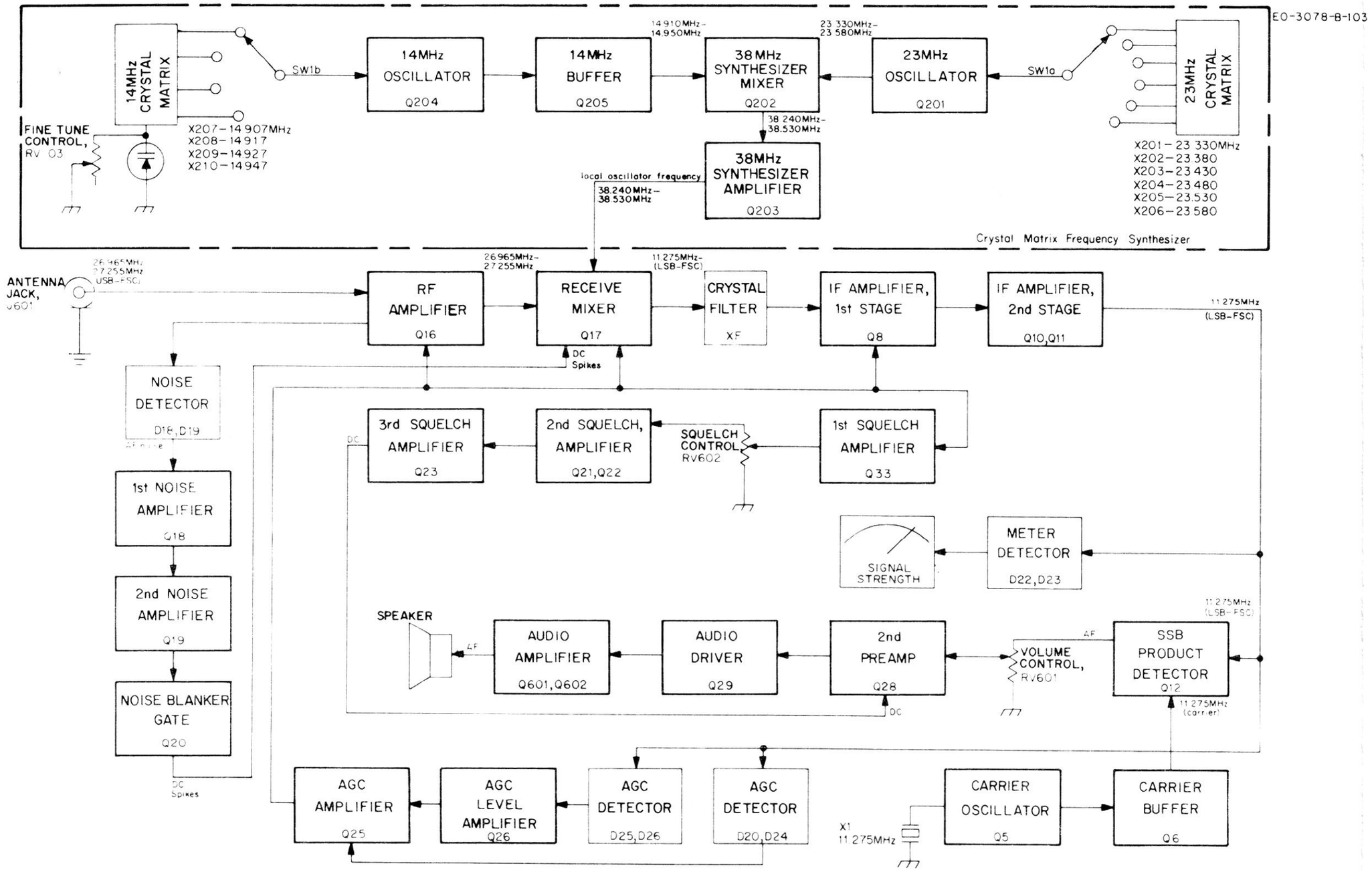


Figure 2-3. Block Diagram, USB Receive

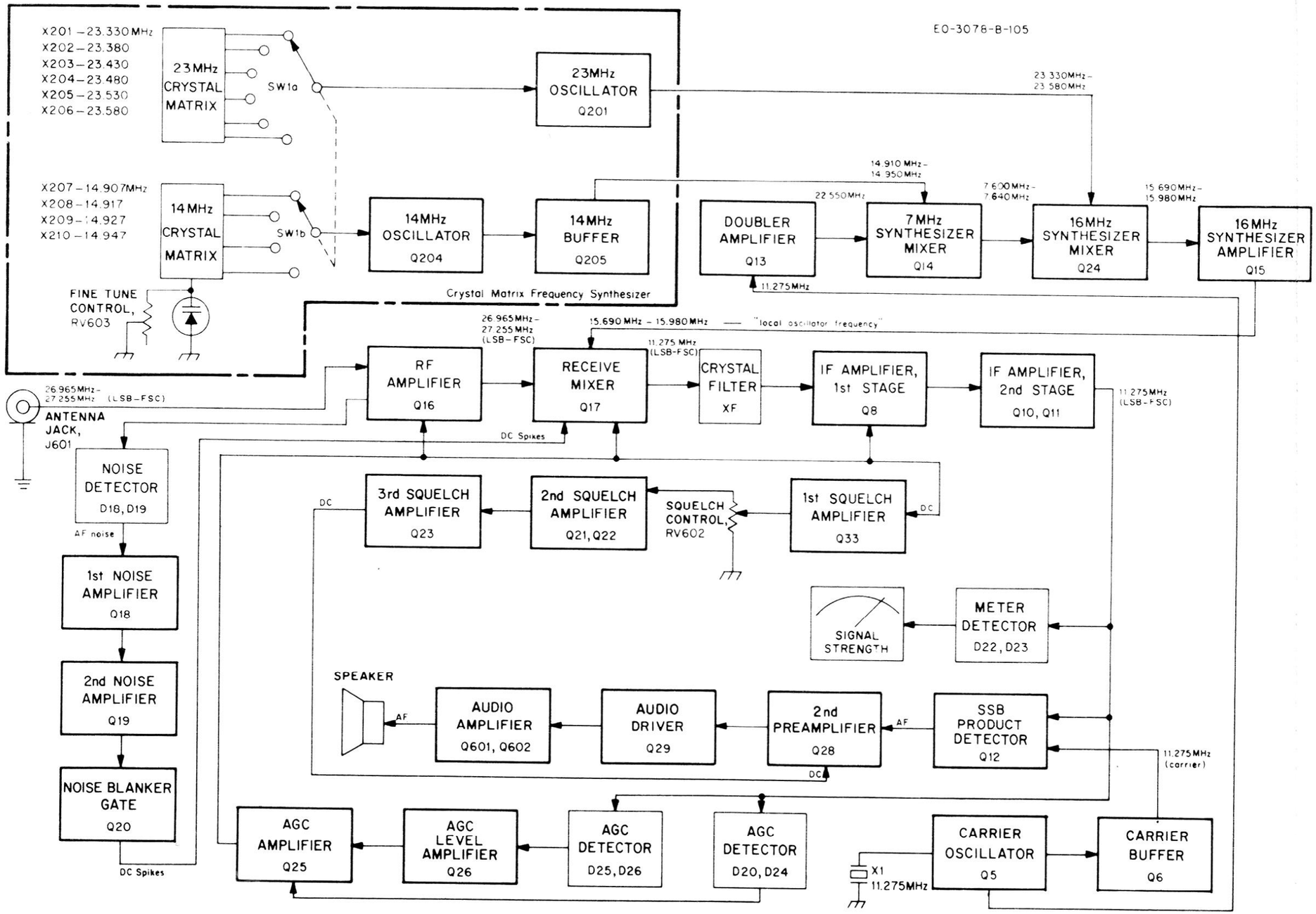


Figure 2-4. Block Diagram, LSB Receive

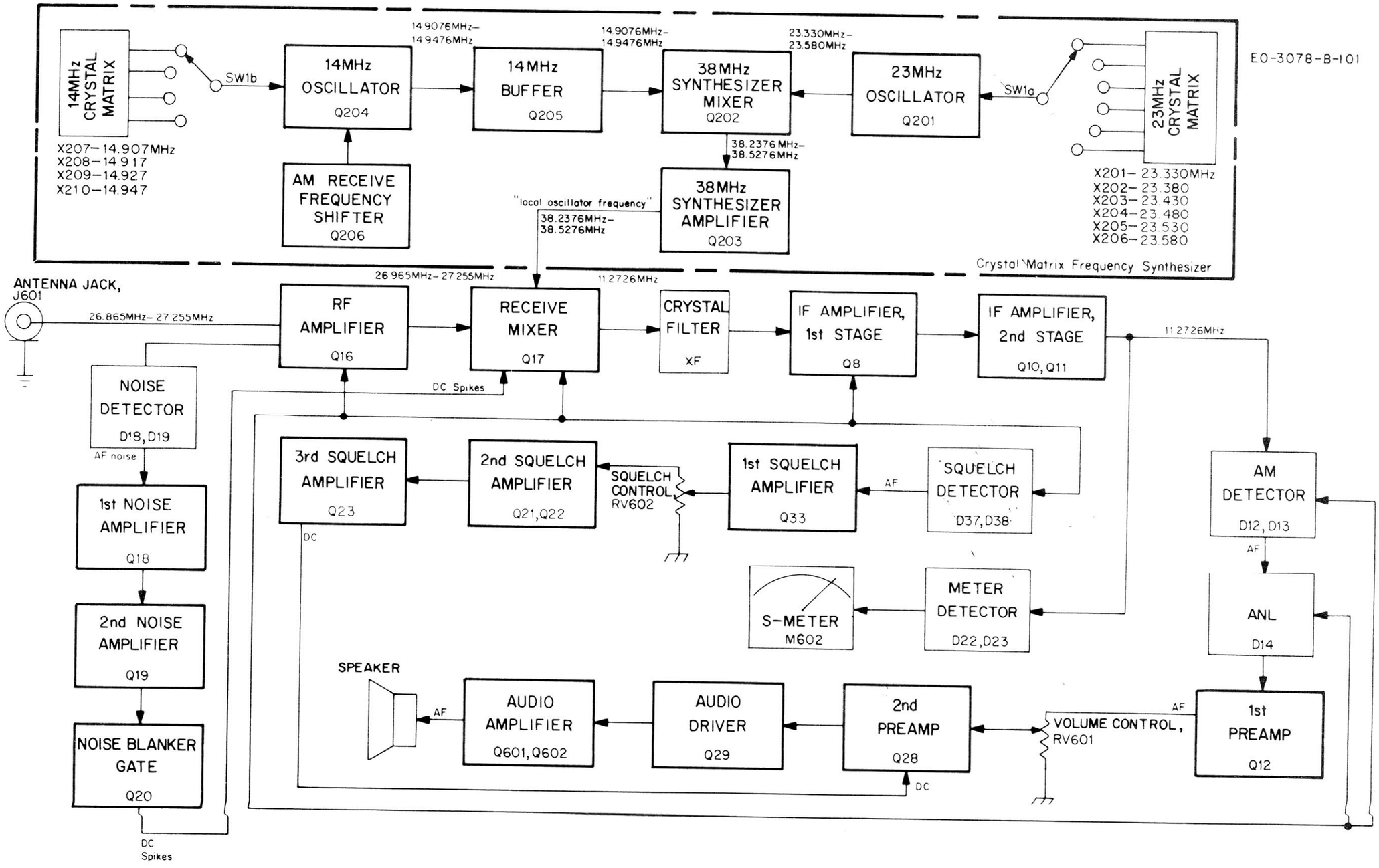


Figure 2-5. Block Diagram, AM Receive

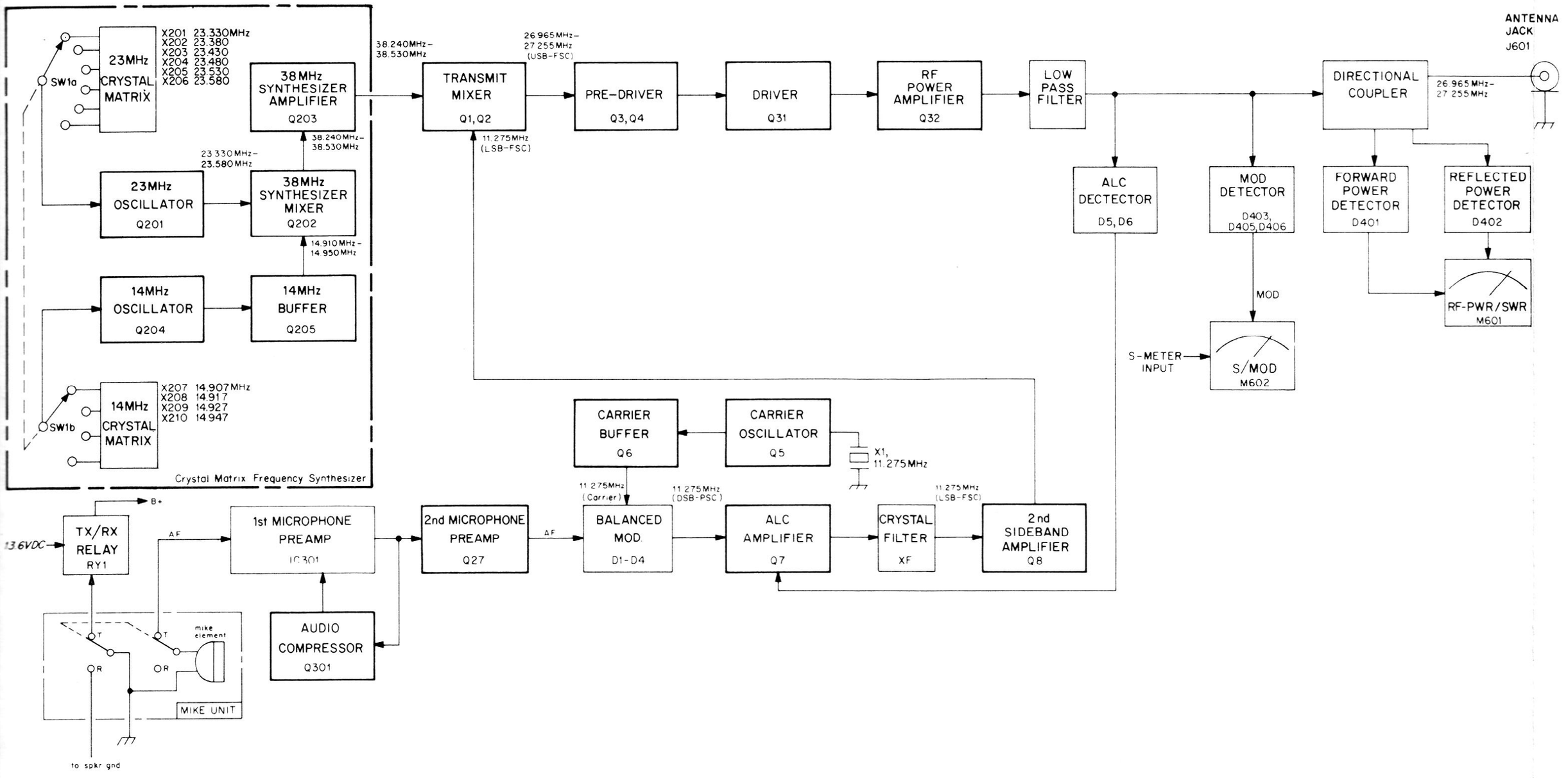


Figure 2-6. Block Diagram, USB Transmit

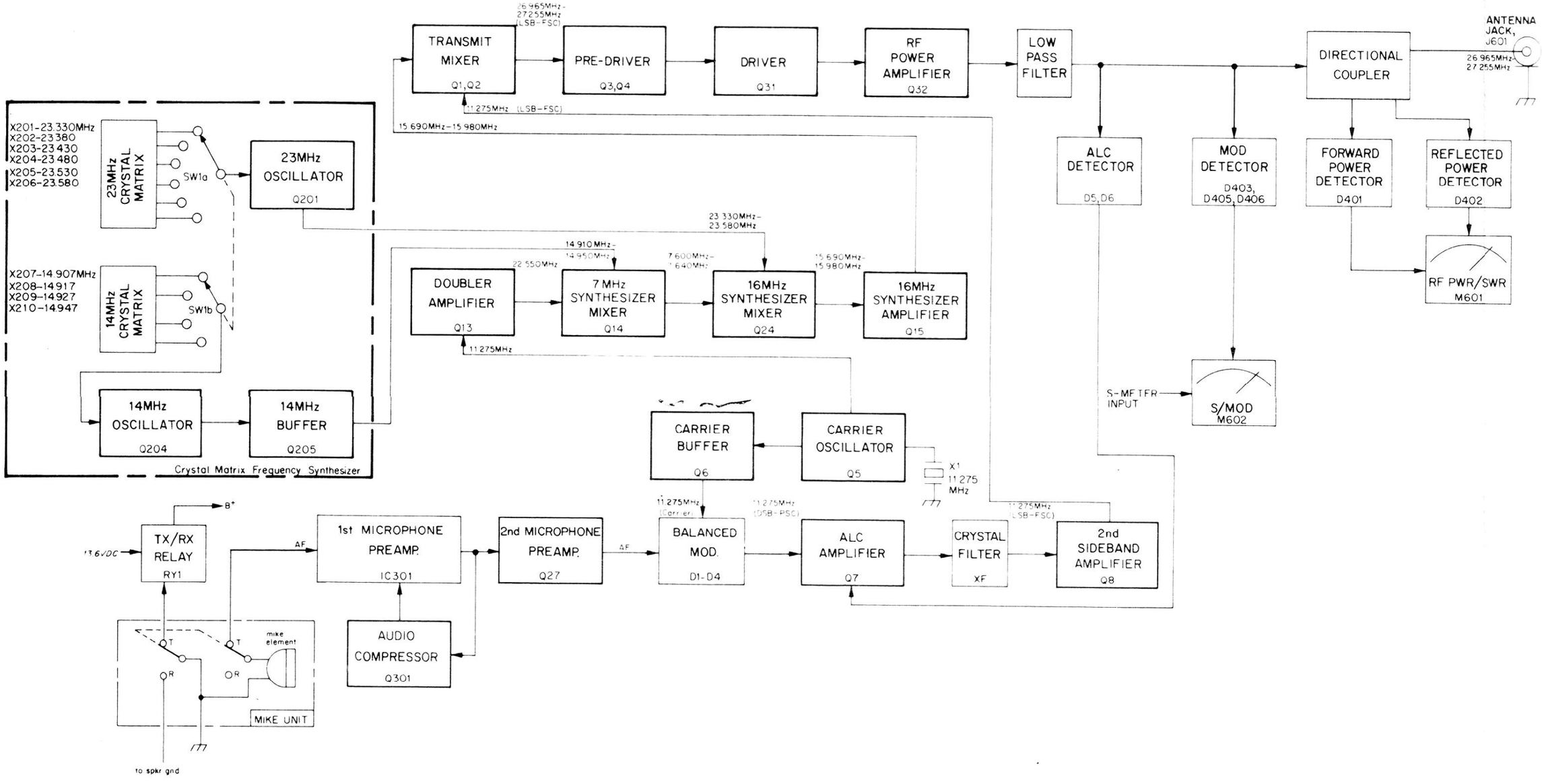


Figure 2-7. Block Diagram, LSB Transmit

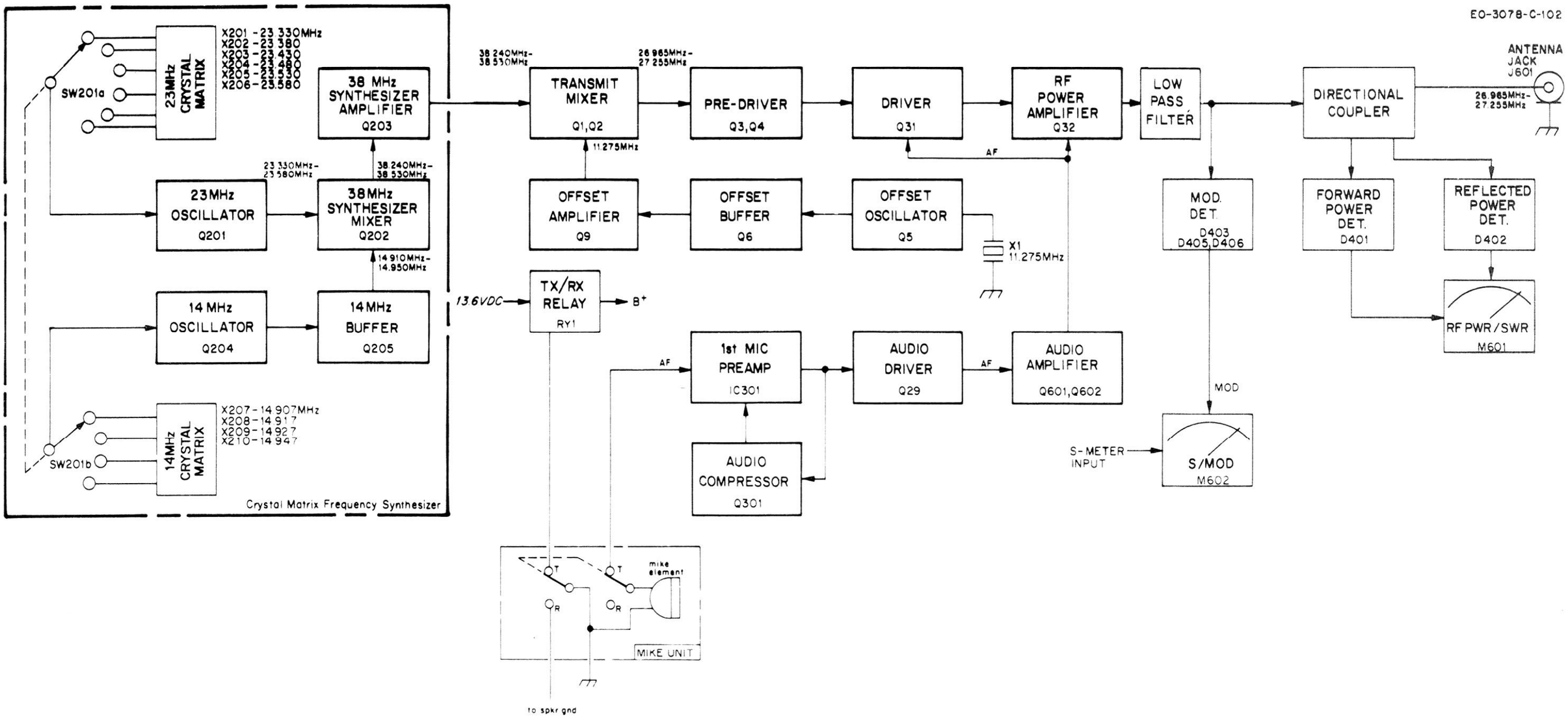


Figure 2-8. Block Diagram, AM Transmit

CHAPTER 3 — ALIGNMENT

General

The following procedures must be followed to properly align the Hy-Gain VIII transceiver. Alignment should not be undertaken unless the technician has adequate test equipment and a full understanding of the circuitry of the transceiver.

IMPORTANT: Tuning adjustment of this transceiver "shall be made by or under the immediate supervision and responsibility of a person holding a first- or second-class commercial radio operator license," as stipulated in Part 95.97 (b) of the FCC Rules and Regulations.

The procedures are divided into three main sections: Synthesizer Alignment, Transmitter Alignment, and Receiver Alignment. See *Tools and Equipment* below for a complete list of recommended equipment.

See Figures 3-4, 3-5, and 3-6 for the location of the components to be adjusted.

NOTE: The ferrite cores in the tuning coils are easily chipped or broken. Always exercise care in inserting an alignment tool into the tuning coil; insert it straight into the core.

Tools and Equipment

The following tools and equipment are recommended for use in aligning the Hy-Gain VIII. (All instruments must be correctly calibrated.)

Audio signal generator, 20 Hz - 20 kHz
VTVM, 1 mV - 10 V
DC ammeter, 0 - 3 A
DC power supply, DC 0 to 20 V, 2 A or higher
Frequency counter, 0 to 40 MHz, high input impedance type
RF VTVM
Oscilloscope, 0 to 30 MHz, high input impedance type
RF Wattmeter, 5 to 15 w, 50-ohm thermocouple type
Signal generator, 10 kHz to 50 MHz
Pulse generator, 50 to 500 Hz, 50-ohm, rise time 10 sec. or less pulse width duty 50%
Dummy load, 8 ohm, 5 w
Dummy load, 100 ohm

NOTE: a) Set the power supply voltage to 13.8 V unless otherwise specified. b) The mic must be plugged in to obtain audio from the speaker.

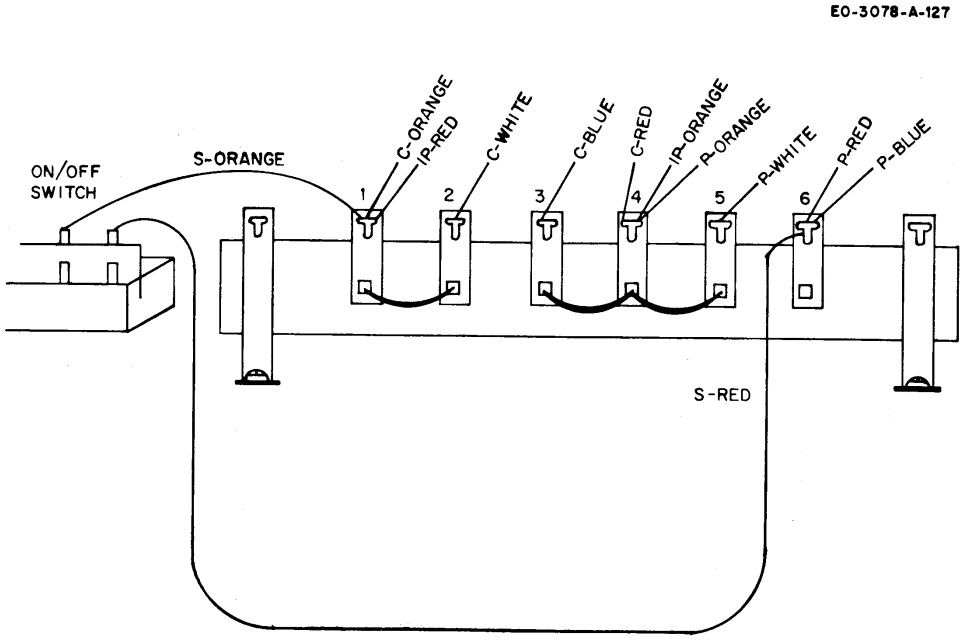
Wiring Model 3078 for 240 VAC

WARNING: Disconnect the unit from the power source before attempting any wiring changes.

Make certain that power has been disconnected, and remove the case by removing the six screws in the bottom of the unit. Remove all knobs and the top cover.

See Figures 3-1 and 3-2 for diagrams of the terminal strip.

1. Remove the short jumpers between terminals three and four and between terminals four and five.



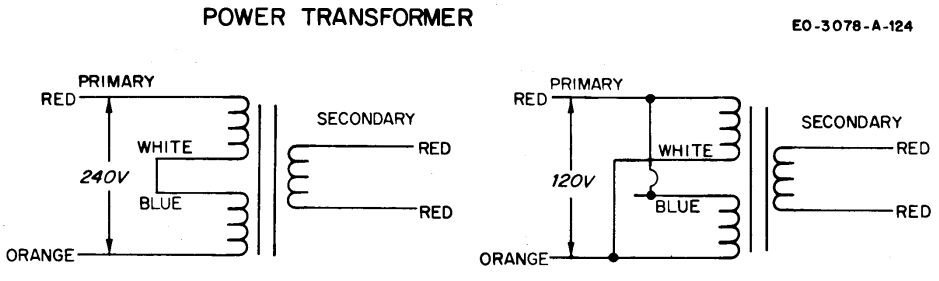
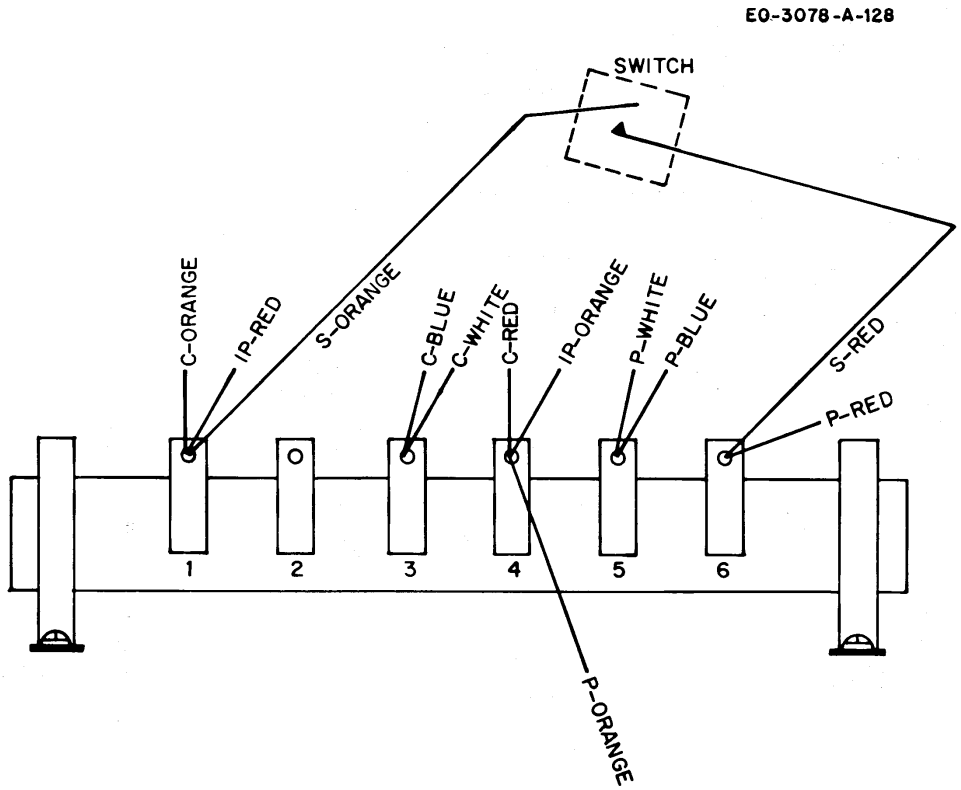


Figure 3-1

Before Wiring for 240VAC



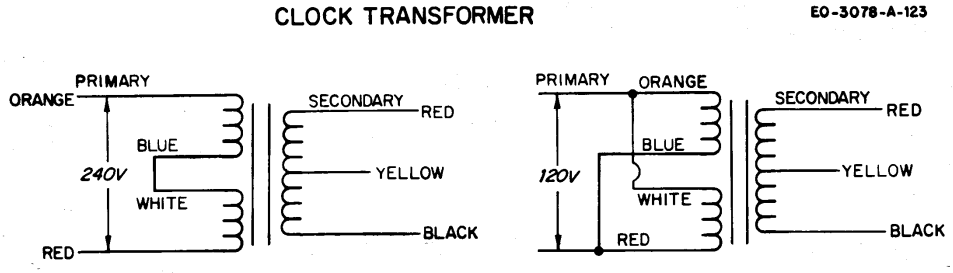


Figure 3-2

After Wiring for 240VAC

2. Desolder the white wire (clock-white) from terminal two and solder it to terminal three.

3. Desolder the blue wire (power-blue) from terminal six and solder it to terminal five.

4. Change the fuse, F601, to a ½ ampere, 250 VAC fuse.

5. Reassemble the unit.

Synthesizer Alignment Procedures

11 MHz Oscillator Circuit

1. Connect the frequency counter to the emitter of Q6 and chassis ground.

2. Set the transceiver to the USB or LSB Receive Mode.

3. Adjust trimmer capacitor, TC1 so that the frequency counter reads 11.275 MHz ± 50 Hz.

14 MHz Oscillator Circuit

1. Connect the freqency counter to the emitter of Q205 and chassis ground.

2. Connect the dummy load to the antenna connector.

3. Place the mode switch in USB or LSB position.

4. Place the channel selector in the channel 1 position.

5. Key the transmitter.

6. Adjust trimmer capacitor TC201 so that the frequency counter reads 14.910 MHz ± 50 Hz.

7. Move the channel selector to channel 2, 3, and 4 and adjust TC202, TC203, and TC204 for frequency readings of 14.920 MHz, 14.930 MHz, 14.950 MHz ± 50 Hz, respectively.

8. Set the transceiver to the receive mode.

9. Put the fine tune control in the 12 o'clock position.

10. Place the mode switch in the AM position and read the frequency counter. It should read 2 to 3 kHz lower than the value obtained in steps 6 and 7. If not, adjust TC205.

23 MHz Oscillator Circuit

1. Connect the frequency counter at the junction of L201 and R205.

2. Set the transceiver to the transmit mode.

3. Place the mode switch in the AM position.

4. Place the channel selector in the channel 23 position.

5. Rotate L201 counterclockwise until oscillation stops. Slowly rotate L201 clockwise and observe the oscillator starting point. Further rotate L201 one half turn clockwise from the oscillator starting point.

6. Change the channel selector position and confirm that the frequency reading is within the following limits:

Channel	Counter Reading
1	23.330 MHz ± 350 Hz
5	23.380 MHz ± 350 Hz
9	23.430 MHz ± 350 Hz
13	23.480 MHz ± 350 Hz
17	23.530 MHz ± 350 Hz
21	23.580 MHz ± 350 Hz

38 MHz Synthesizer Circuit

1. Place the channel selector in the channel 13 position.

2. Place the mode switch in the AM position.

3. Connect an oscilloscope or a VTVM to the secondary coil of L204.

4. Adjust the cores of L202, L203, and L204 for a maximum reading on the VTVM.

5. Rotate the channel selector through channels 1 to 23 and observe the readings on the VTVM or scope. The reading should be almost the same at each channel. If excessive difference is observed, readjust L202, L203, and L204 for maximum reading.

16 MHz Synthesizer Circuit

1. Place the channel selector in the channel 3 position.

2. Temporarily place RV11 in its center position.

3. Place the mode switch in the LSB position.

4. Connect an oscilloscope between the secondary coil of L12 and chassis ground.

5. Adjust L12 for maximum amplitude.

6. Connect the oscilloscope between the secondary coil of L14 and chassis ground. Adjust L13 and L14 for maximum amplitude.

7. Place the channel selector in the channel 13 position.

8. Connect the oscilloscope in the secondary coil of L17 and chassis ground and adjust RV11, L15, L16, and L17 for maximum amplitude without distortion.

9. Rotate the channel selector and make sure the amplitude at each channel is almost the same. If excessive difference is observed, readjust L15, L16, and L17 for maximum amplitude.

Transmitter Alignment Procedures

27 MHz SSB Transmitter Stage Adjustment

1. Connect an RF wattmeter (50 ohm) to the antenna connector with a T-connector on the wattmeter.

2. Connect the oscilloscope with a x10 probe or RF VTVM to the open leg of the T-Connector.

3. Place the channel selector in the channel 13 position.

4. Place the mode switch in the USB position.

5. Key the transmitter.

6. Apply a 2.4 kHz, 10 mV audio signal to the microphone input circuit.

7. Temporarily place RV1, RV2, and RV8 in their center positions.

8. Adjust L2, L3, L4, L5, L6, and L7 for maximum amplitude.

9. Rotate the channel selector and make sure that the amplitude at each channel is almost the same. If an excessive difference is observed, readjust L2 and L3.

10. Adjust RV5 and L6 to obtain an RF output of 11 w on the wattmeter.

11. Apply two signals, 500 Hz and 2.4 kHz, of 5 mV to the microphone input circuit and adjust RVI and RV2 so that an oscilloscope display as shown in Figure B is obtained.

12. If the display shown in Figure C is obtained, adjust RV8 for the display of Figure B.

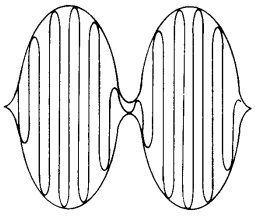


Figure A

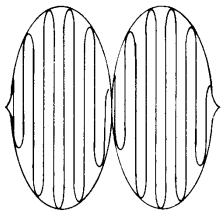


Figure B

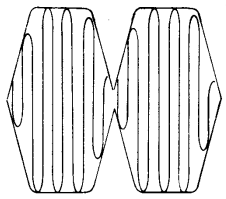


Figure C

13. Measure the RF output voltage at the antenna connector with a 2.4 kHz modulating signal of 5 mV applied to the mic input circuit. Note the value.

14. Measure the output with no modulating signal applied to the mic circuit and read the RF output voltage. The reading should be 40 dB lower than in step 13. If not, adjust RV4 and TC2.

AM Transmitter Stage Adjustment

1. Connect a wattmeter, 50 ohm, to the antenna connector on the rear panel.

2. Connect the oscilloscope across the antenna connector as noted for SSB.

3. Place the channel selector in the channel 13 position.

4. Place the mode switch in the AM position.

5. Key the transmitter.

6. Adjust RV608 so that the wattmeter indicates 3.8 w.

7. Apply a 2.5 kHz, 7 mV audio signal to the microphone input circuit and adjust RV7 to obtain 90% modulation.

Receiver Alignment Procedures

AGC Adjustment

Separate AGC adjustments must be made for AM and SSB operation.

AM

1. Place the 3078 in the AM mode.

2. Connect the DC voltmeter across the ground and the junction of RV10 and the drain of Q25.

3. Adjust RV10 for 1.4 volts.

SSB

1. Place the 3078 in either LSB or USB mode.

2. Connect the DC voltmeter across the wiper of RV6 and ground.

3. Adjust RV6 for 1.4 volts.

Sensitivity Adjustment

1. Place the channel selector in the channel 13 position.

2. Turn the RF gain control fully clockwise.

3. Place the fine tune control in the 12 o'clock position and the NB-OFF switch in the OFF position.

4. Turn the squelch control fully counterclockwise and adjust the volume as required for proper scope level.

5. Connect an oscilloscope across the 8 ohm dummy load. The S/meter can also be used for this adjustment in lieu of the external speaker and oscilloscope.

7. Place the mode switch in the USB position.

8. Connect the signal generator in the antenna connector and set it for 27.115 MHz output.

9. Switch the signal generator to the CW position and turn the fine tune until a 1000 Hz tone is heard in the speaker.

10. Adjust L18, L19, L20, L10, and L11 for maximum output.

Squelch Circuit Adjustment

1. Apply a 100 uV signal to the antenna connector and adjust RV6 so that audio output barely appears on the oscilloscope with the squelch control in the clockwise position.

Meter Calibration

RF Power Meter

Adjust RV401 until the RF/SWR meter reads the same as the wattmeter.

Modulation Meter

1. Set the MOD/CAL switch to CAL.

2. Key the transmitter.

3. Set the MOD/CAL control on the front panel to the center position.

4. Adjust RV403 until the meter needle reaches the "SET" mark on the S/MOD meter.

SWR Meter

1. Fabricate a 100 ohm dummy load using a PL259 connector and a 100 ohm 2w resistor. Attach the 100 ohm load to the antenna connector.

2. Set SWR/CAL switch to CAL.

3. Key the transmitter and adjust the SWR/CAL control on the front panel until the RF/SWR meter reaches the set mark.

4. Return the CAL/SWR switch to SWR.

5. Adjust RV402 until the meter indicates an SWR of "2".

S-Meter Adjustment

1. Apply a 10 uV signal to the antenna connector and adjust RV9 so that S-meter reads between S5 and S6.

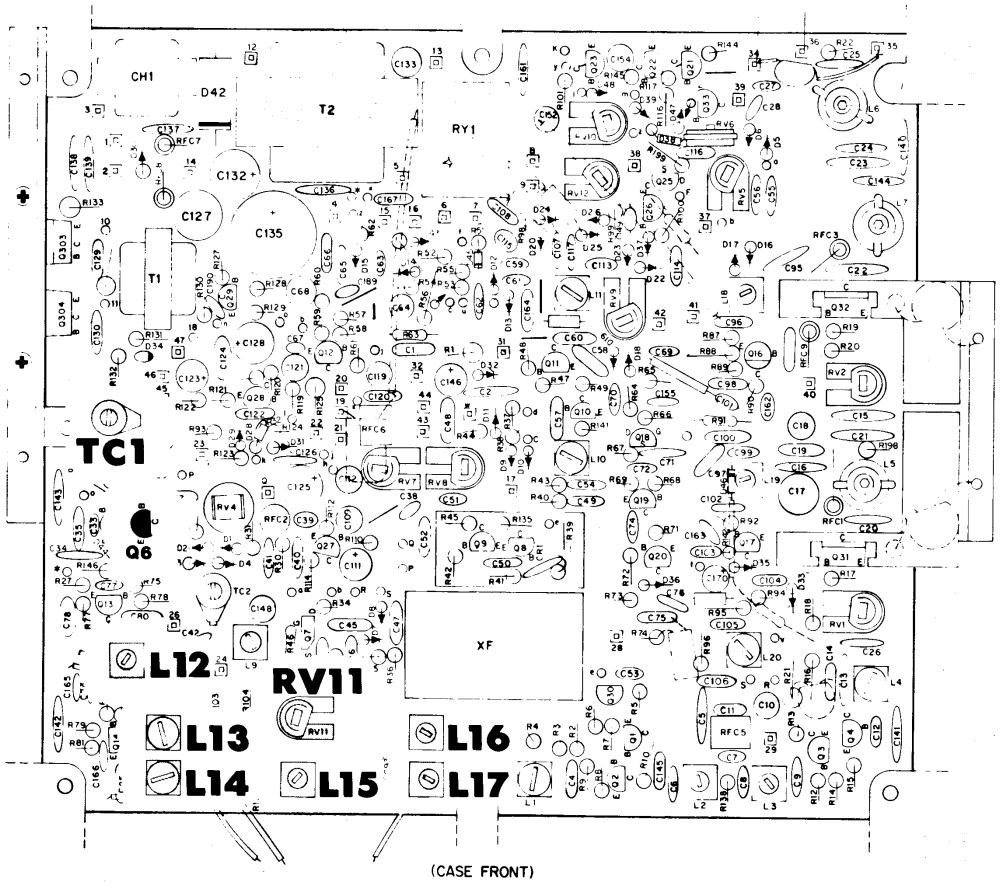


Figure 3-3

Components Adjusted for Synthesizer Alignment

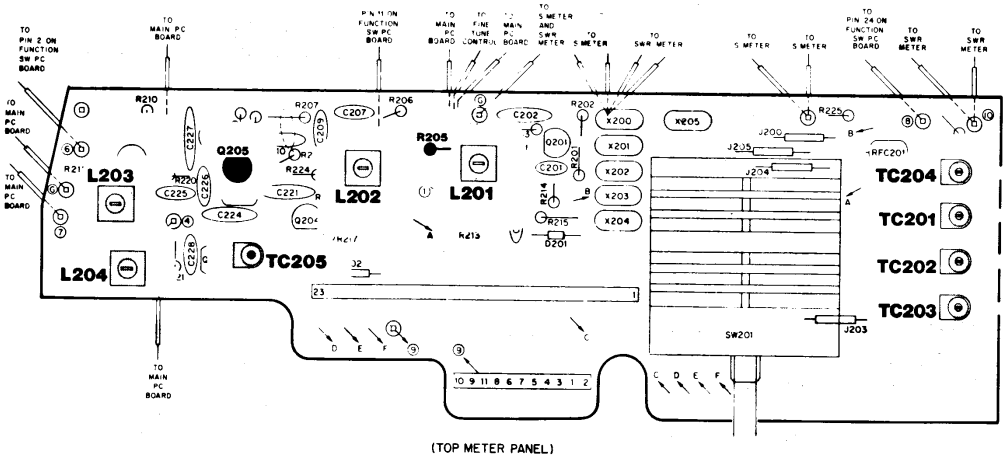


Figure 3-4

Components Adjusted for Synthesizer Alignment

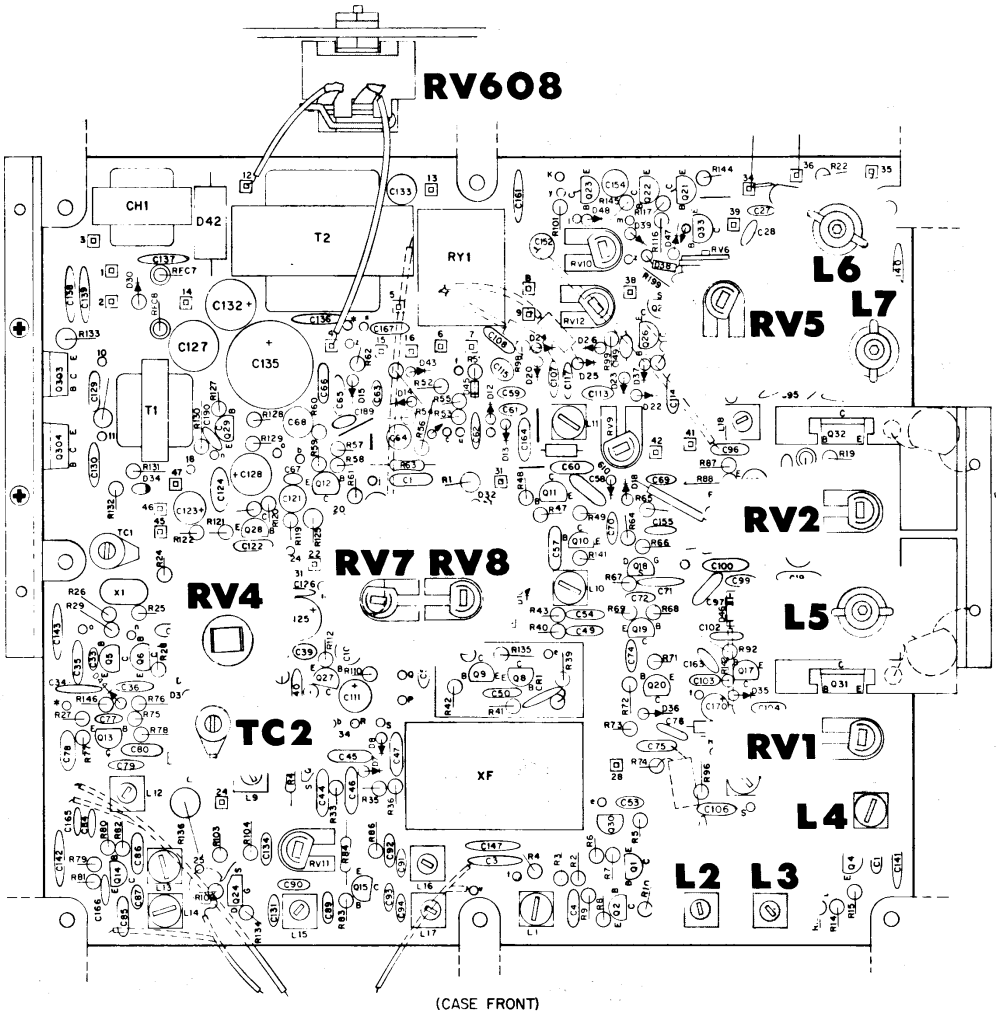


Figure 3-5

Components Adjusted for Transmitter Alignment

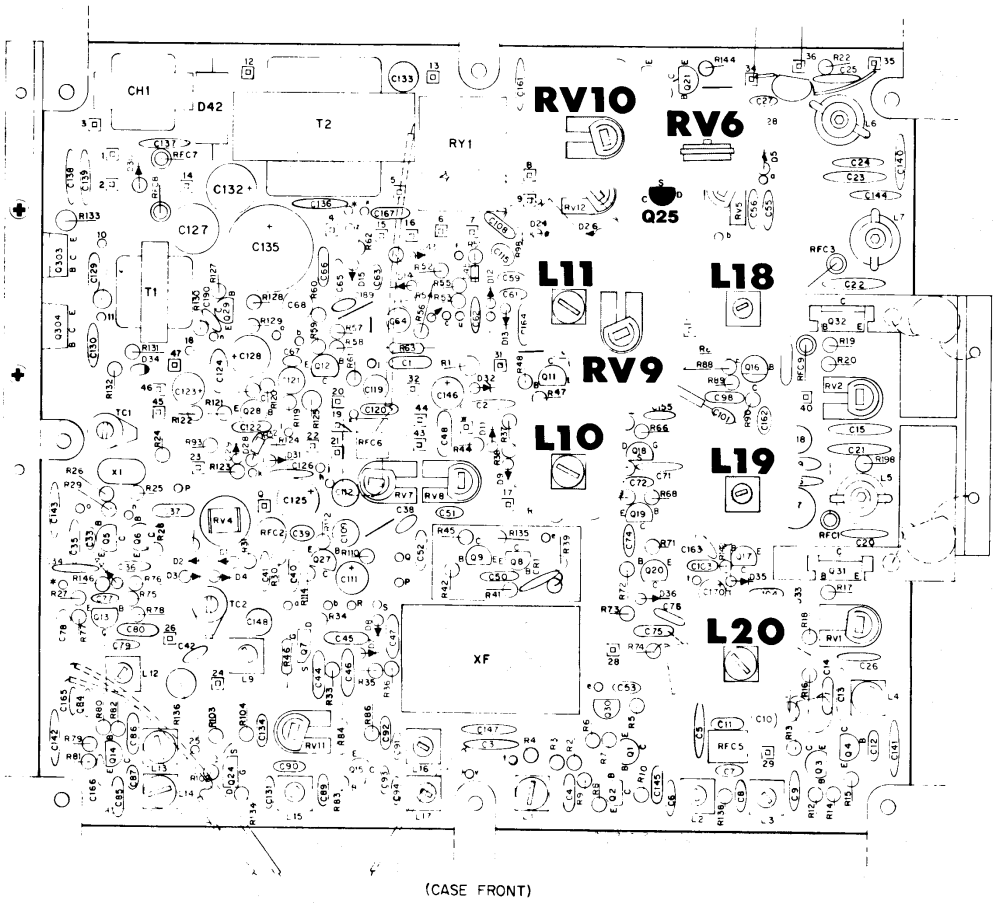


Figure 3-6

Components Adjusted for Receiver Alignment

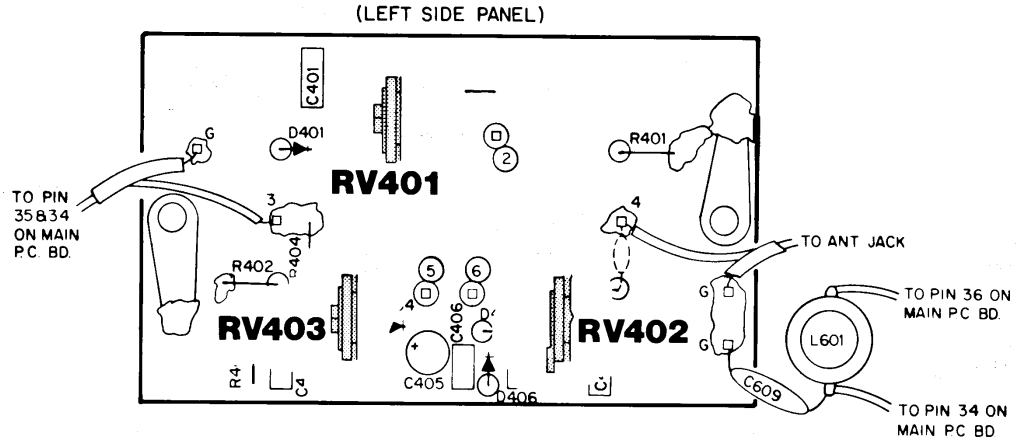


Figure 3-7

Components Adjusted for Meter Alignment

CHAPTER 4 — CHARTS AND DRAWINGS

VOLTAGE MEASUREMENT CHART

Main P.C. Board

Reference Designator	Mode	AM			USB			LSB		
		E	B	C	E	B	C	E	B	C
Q1	TX	.96	1.4	12,4	.95	1.45	12.9	1.1	1.47	12.9
	RX	0	o	o	o	o	o	o	o	o
Q2	TX	.96	1.4	12.4	.97	1.47	12.9	1.09	1.47	12.8
	RX	0	0	0	0	0	0	0	0	0
Q3	TX	2.15	2.6	12.8	2.1	2.7	13.2	2.08	2.7	13.2
	RX	0	0	0	0	0	0	0	0	0
Q4	TX	1.76	2.15	12.5	1.43	2.09	13	1.42	2.09	13
	RX	0	0	0	0	0	0	0	0	0
Q5	TX	3.2	3.8	7.8	3.2	3.8	7.8	3.2	3.8	7.8
	RX	3.85	4.2	8.55	3.25	3.8	7.8	3.2	3.8	7.8
Q6	TX	4.7	2.7	7.8	4.7	2.7	7.8	4.7	2.7	7.8
	RX	4.3	3.1	8.5	4.7	2.7	7.8	4.7	2.7	7.8
Q7	See Field Effect Transistor List									
Q8	TX	1.12	.06	8.3	1.2	1.5	8.4	1.2	1.5	8.4
	RX	.98	1.34	8.6	.8	1.13	8.7	.8	1.13	8.7
Q9	TX	1.12	1.47	8.3	1.2	0	8.4	1.2	0	8.4
	RX	0	.98	8.6	0	.8	8.7	0	.8	8.7
Q10	TX	-.65	0	-.26	0	0	0	0	0	0
	RX	.65	0	1.67	.65	0	1.67	.65	0	1.67
Q11	TX	-.26	0	-.08	0	0	0	0	0	0
	RX	1.67	.94	6.6	1.67	.94	6.6	1.67	.94	6.6
Q12	TX	0	0	-.06	0	0	0	0	0	0
	RX	.46	.9	7.0	.5	.9	6.9	.5	.9	6.9
Q13	TX	0	0	-.06	0	0	-.06	1.12	1.49	8.8
	RX	0	0	-.06	0	0	-.06	1.12	1.49	8.8
Q14	TX	0	0	-.06	0	0	-.06	1.0	1.48	8.8
	RX	0	0	-.06	0	0	-.06	1.0	1.48	8.8
Q15	TX	0	0	-.06	0	0	-.06	1.27	1.50	8.8
	RX	0	0	-.06	0	0	-.06	1.27	1.50	8.8
Q16	TX	.25	.14	1.05	.02	.24	1.38	.02	.24	1.38
	RX	.5	.88	7.5	.42	.80	7.6	.42	.80	7.6
Q17	TX	1.0	0	.9	1.3	.15	1.4	1.3	.15	7.4
	RX	.4	.75	7.6	.3	.7	7.6	.3	.7	7.6
Q18	See Field Effect Transistor List									
Q19	TX	0	0	0	0	0	0	0	0	0
(NB-ON)	RX	7.4	6.7	2.1	7.4	6.7	2.1	7.4	6.7	2.1
Q20	RX	0	0	0	0	0	0	0	0	0
(NB-ON)	RX	.27	0	0	.27	0	0	.27	0	0
Q21	unsquelch	0	0	.6	0	0	.6	0	0	.6
	squelched	0	.55	0	0	.55	0	0	.55	0
Q22	unsquelched	0	.6	0	0	.6	0	0	.6	0
	squelched	0	0	7	0	0	7	0	0	7
Q23	unsquelched	0	0	8.2	0	0	8.2	0	0	8.2
	squelched	6.9	7	8.2	6.9	7	8.2	6.9	7	8.2
Q24	See Field Effect Transistor List									
Q25	See Field Effect Transistor List									
Q26	TX	0	0	.55	0	0	.55	0	0	.55
	RX	0	0	0	0	0	.55	0	0	.55
Q27	TX	0	0	.5	7.3	4.7	10.5	7.3	4.7	10.5
	RX	0	0	0	0	0	0	0	0	0

Reference Designator	Mode	AM			USB			LSB		
		E	B	C	E	B	C	E	B	C
Q28	TX	4.7	0	0	4.9	0	0	4.9	0	0
	RX		2.5	8	3	2.5	8	3	2.5	8
Q29	TX	1.4	1.9	8.2	0	0	0	0	0	0
	RX	1.5	2.0	8.	1.5	2.0	8.6	1.5	2.0	8.6
Q31	TX	0	.1	6.5	0	.6	12	0	.6	12
	RX	0	0	12	0	0	0	0	0	0
Q32	TX	0	-0.2	6.4	0	.55	12	0	.55	12
	RX	0	0	12	0	0	0	0	0	0
Q33	TX	.25	.15	0	.45	0	0	.45	0	0
	RX	2.1	1.3	0	1.8	1.2	0	1.2	0	
Q60I	TX	0	.6	11.5	0	0	0	0	0	0
	RX	0	.6	12.2	0	.6	12.2	0	.6	12.2
Q602	TX	0	.6	11.5	0	0	0	0	0	0
	RX	0	.6	12.2	0	.6	12.2	0	.6	12.2

Synthesizer/Oscillator P.C. Board

Reference Designator	AM			USB			LSB		
	E	B	C	E	B	C	E	B	C
Q201	2.78	1.73	8.80	2.76	1.70	8.76	2.83	1.68	8.74
Q202	See Field Effect Transistor List								
Q203	1.56	2.17	8.95	1.55	2.17	8.92	0	0	0
Q204	2.40	3.02	8.85	2.38	3.05	8.84	2.37	3.04	8.82
Q205	5.25	5.53	9.29	5.20	5.51	9.26	5.19	5.50	9.24
Q206	0	.72	.01	0	.14	.44	0	.14	/45

Field Effect Transistors

Reference Designator	Mode	AM			USB			LSB		
		G	D	S	G	D	S	G	D	S
Q202	TX	0	8.77	.98	0	8.79	.98	0	0	0
	RX	0	8.82	1.01	0	8.81	.98	0	0	0
Q7	TX	-1.5	.45	0	0	10.5	.45	0	10.5	.45
	RX	0	0	0	0	0	0	0	0	0
Q18	TX	0	0	0	0	0	0	0	0	0
(UB-ON)	RX	0	5.1	2.1	0	5.1	2.1	0	5.1	2.1
Q24	TX	0	0	0	0	0	0	0	8.3	.9
	RX	0	0	0	0	0	0	0	8.3	.9
Q25	TX	.07	/2	.2	.07	.2	.2	.07	.2	.2
	RX	0	0	0	0	7.6	3	0	7.6	3

AVR

Reference Designator	Mode	AM			USB			LSB		
		E	B	C	E	B	C	E	B	C
Q501	RX	.24	.62	.62	.23	.60	.60	.23	.60	.60
Q502	RX	0	0	.61	0	0	.60	0	0	.60
Q603	RX	0	.23	.61	0	.23	.60	0	.22	.60

Mode Switch

Reference Designator		AM			USB			LSB		
	Mode	E	B	C	E	B	C	E	B	C
Q301	TX	0	0	0	0	0	0	0	0	0
	RX	0	0	0	0	0	0	0	0	0

Reference Designator		Pin No						
	Mode	1	2	3	4	5	6	7
IC301	TX	1.2	0.46	0	0	.64	5.4	8.4
	RX	0	0	0	0	0	0	0

MAIN P.C. BOARD

WIRING CHART

PIN NO.	WIRING CONNECTIONS
1	red wire to AC power jack
2	black wire to DC power jack
3	red wire to power switch
4	orange wire to pin 22 on switch board
	orange wire to RV608
5	blue wire to pin 23 on main p.c. board
	orange wire to pin 6 on switch board
6	dark pink wire to pin 15 on switch board
	light pink wire to pin 22 on main p.c. board
7	green wire to fine tune switch
8	pink wire to mic jack
9	orange/white wire to fine tune switch
10	white wire to T2 on main p.c. board
11	blue wire to T2 on main p.c. board
12	pink wire to RV608
13	yellow wire to remote jack
	yellow wire to PA jack
14	white wire to pin 4 on function switch p.c. board
15	white wire to pin 4 on syn/osc p.c. board
	white wire to pin 9 on function switch p.c. board
16	green wire to pin 10 on function switch p.c. board
17	brown wire to pin 5 on function switch p.c. board
18	black wire to T2 on main p.c. board
19	gray shield to volume switch
	pink wire to volume switch
20	gray shield to pin 11 on switch p.c. board
	pink wire to pin 11 on switch p.c. board
21	blue/white wire to pin 2 on switch p.c. board
22	light pink wire to pin 6 on main p.c. board
23	blue wire to pin 5 on main p.c. board
	blue wire to pin 18 on function switch board
24	brown/white wire to phone jack
25	yellow wire to speaker
26	yellow/white wire to pin 3 on function switch p.c. board
27	no wire
28	orange/white wire to pin 1 on switch p.c. board
29	purple wire to pin 13 on function switch p.c. board
30	no wire
31	blue wire to pin 45 on main p.c. board
	gray wire to pin 11 on function switch p.c. board
32	orange wire to pin 21 on switch p.c. board
33	no pin
34	copper wire to L601
	gray shield to pin 3 on swr p.c. board
	clear wire to pin 3 on swr p.c. board
35	thick gray wire to pin G on swr p.c. board
36	copper wire to L601
37	red/white wire to pin 6 on function switch p.c. board
	green wire to hole d on main p.c. board
38	orange/white wire to squelch switch
39	red/white wire to squelch switch
40	red wire to pin 12 on function switch p.c. board
41	gray wire to RF GAIN switch
42	purple wire to MOD CAL switch
	purple wire to S-meter
43	gray shield to pin 17 on function switch p.c. board
	white wire to pin 17 on function switch p.c. board
44	gray wire with brown tip to pin G3 on function switch p.c. board
	gray wire with brown tip to no where
45	blue wire to pin 31 on main p.c. board
46	gray with brown tip to pin 8 on switch p.c. board
	gray with orange tip wire to volume switch
47	yellow wire to pin 14 on function switch p.c. board
48	no pin
49	no pin
50	no pin
51	black/white wire to pin 1 on function switch p.c. board
U	white wire to RF GAIN switch

EO-3078-C-107

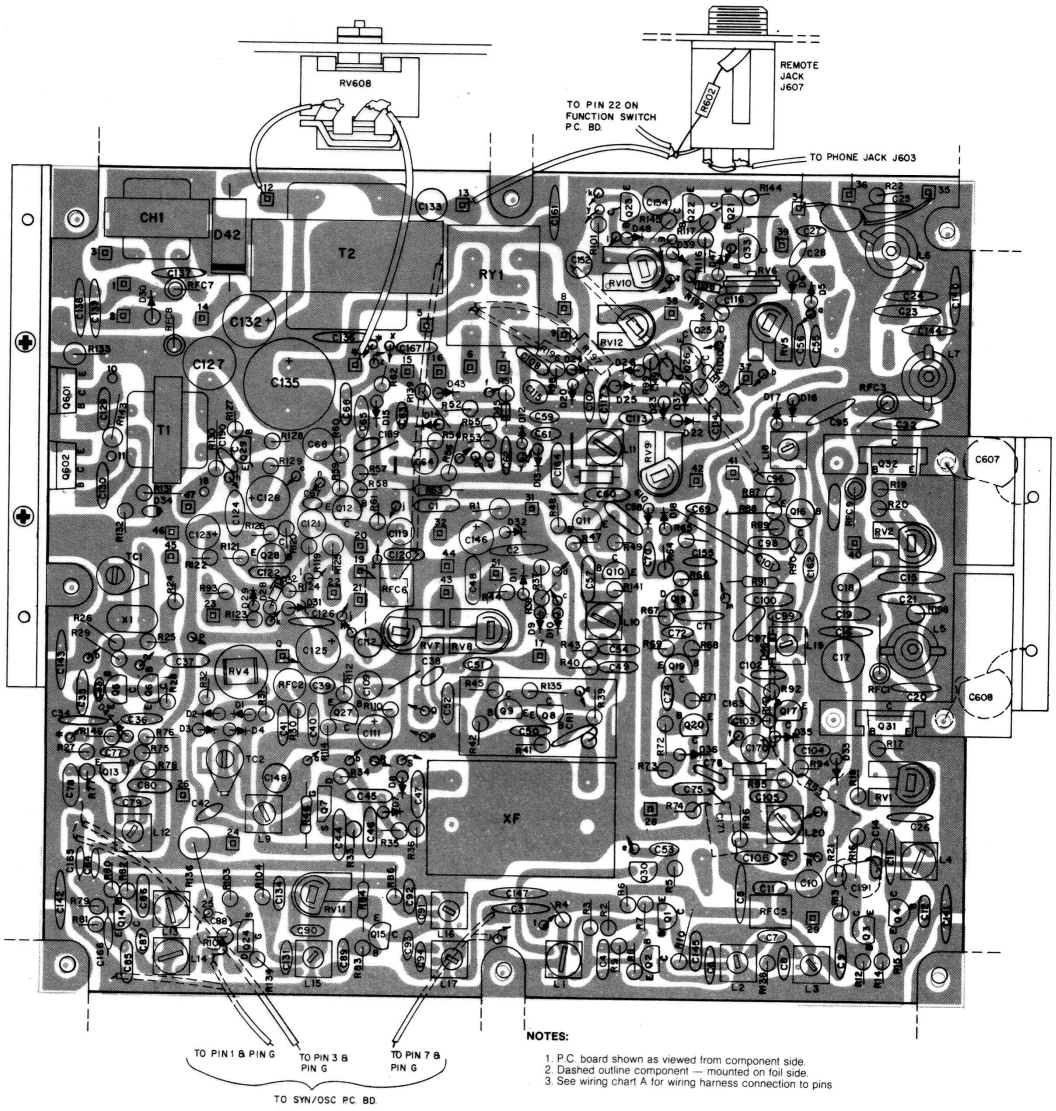


Figure 4-1

Component Outline - Main P.C. Board

Component Outline
Synthesizer/Oscillator P.C. Board

EO-3078-B-116

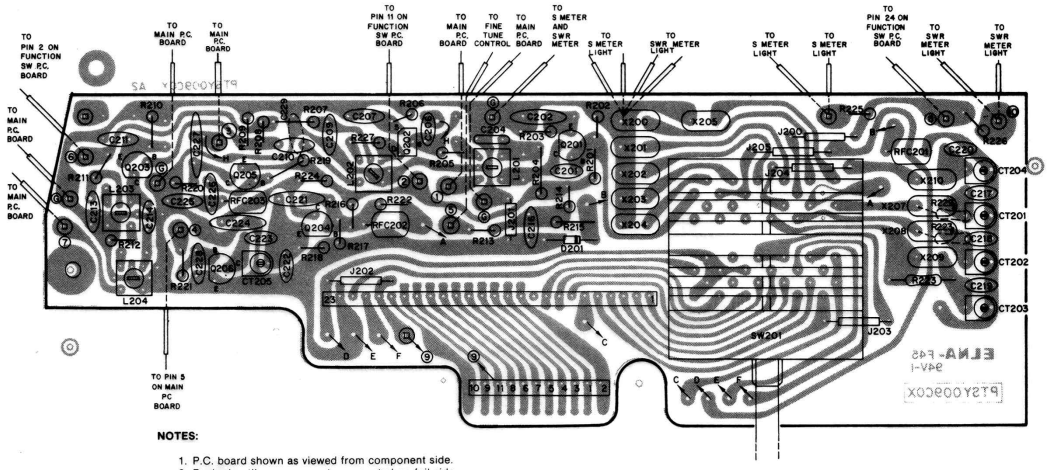
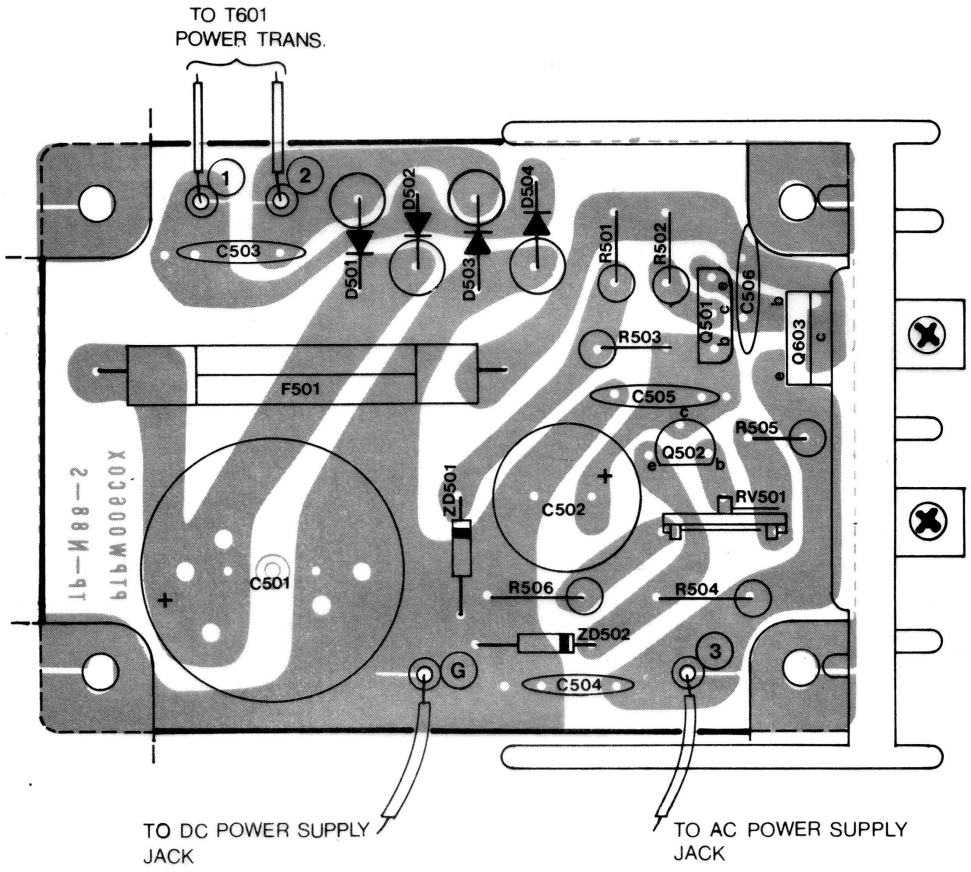


Figure 4-2

Component Outline Synthesizer/Oscillator P.C.Board

Component Outline
Power Supply P.C. Board

EO-3078-A-115



NOTES:

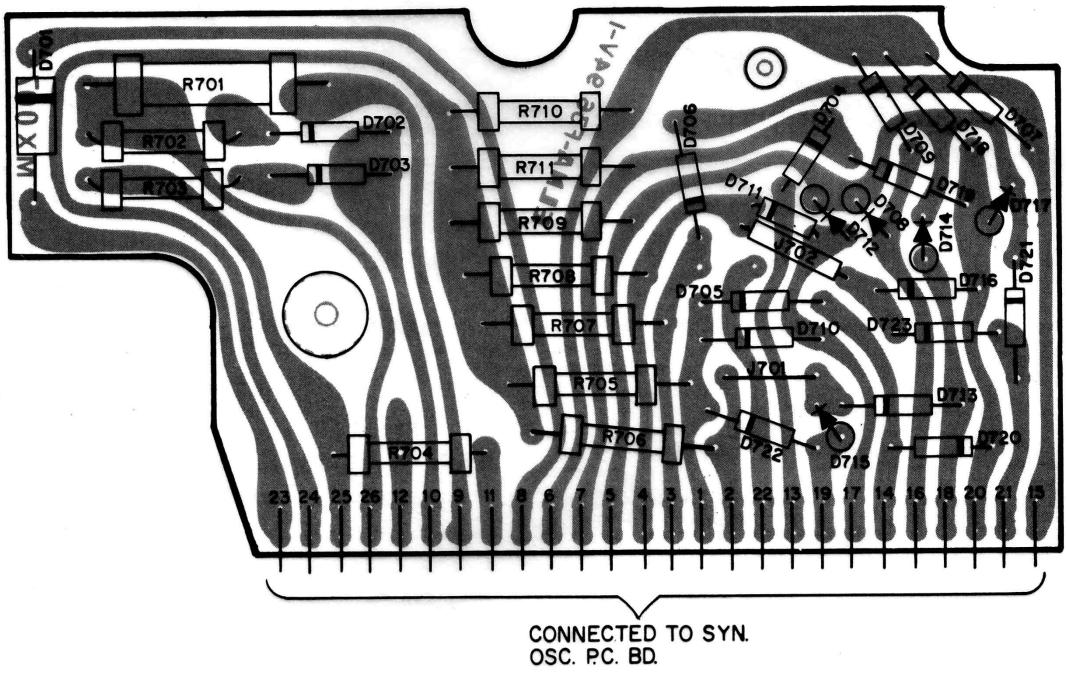
1. P.C. board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.

Figure 4-3

Component Outline Power Supply P.C. Board

Component Outline
Matrix P.C. Board

EO-3078-A-112



NOTES:

1. P.C. Board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.

Figure 4-4

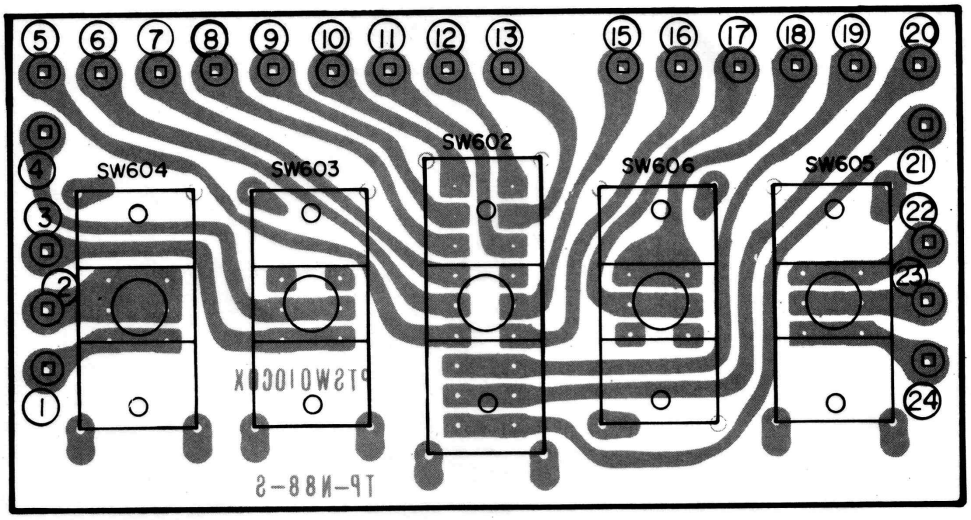
Component Outline Matrix P.C. Board

SWITCH P.C. BOARD

WIRING CHART

PIN NO.	WIRING CONNECTIONS
1	orange/white wire to pin 28 on main p.c. board
2	blue/white wire to pin 15 on mic p.c. board
3	gray wire to 'U' on main p.c. board
4	black wire to pin 8 on switch board
5	purple/white wire to pin 13 on mic p.c. board
6	orange wire to pin 5 on main p.c. board
7	purple wire to PA jack
8	black wire to pin 4 on switch board
	two portion gray wire - brown tip portion to pin 46 on main p.c. board, pink portion to RV607 tone control switch
9	gray with green tip wire to RV601 VOLUME control switch
10	gray wire with blue tip to mic jack
	gray wire with blue tip to pin G1 on Mic p.c. board
11	gray with brown tip and pink wire coming out goes to pin 20 on main p.c. board
12	gray shield to mic jack
	pink wire to mic jack
	gray shield to pin 16 on mic p.c. board
	pink wire to pin 16 on mic p.c. board
13	gray shield to RV601 VOLUME control switch
	pink wire to RV601 VOLUME control switch
15	pink wire to pin 8 on mic p.c. board
16	blue wire to pin 21 on mic p.c. board
17	purple wire to pin 5 on PTSR003DOX
	purple wire to pin 5 on swr p.c. board
18	gray wire to pin 6 on swr p.c. board
	purple/white wire to MOD CAL control switch
19	white wire to pin 14 on mic board
20	orange/white wire to pin 7 on mic p.c. board
	green/white wire to pin power switch
21	orange wire to pin 32 on main p.c. board
22	red wire to pin 2 on swr p.c. board
23	brown/white wire to swr cal control switch
24	yellow wire to pin 7 on swr p.c. board

EO-3078-A-114



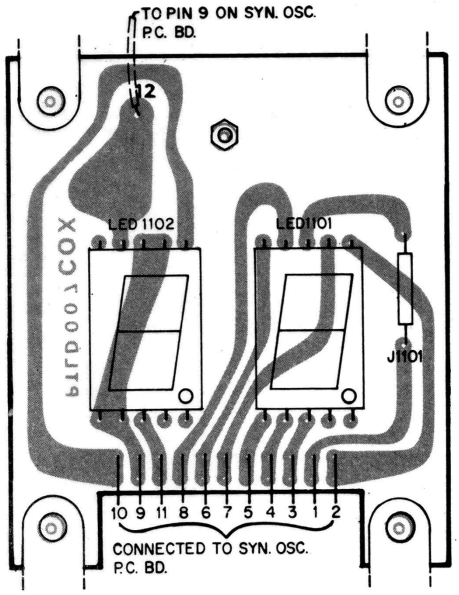
NOTES:

1. P.C. Board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.
3. See wiring Chart B for connection of wiring to pins.

Figure 4-5

Component Outline Switch P.C. Board

EO-3078-A-109



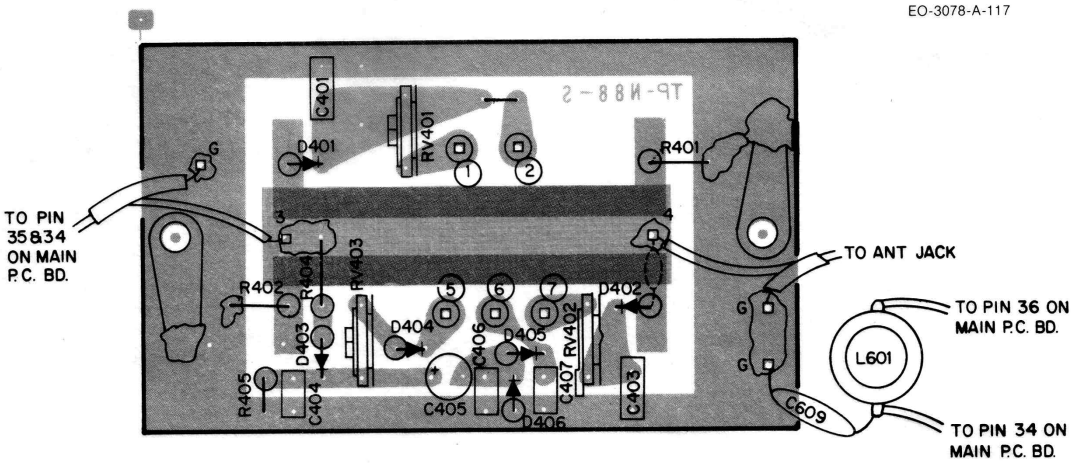
NOTES:

1. P.C. Board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.

Figure 4-6

Component Outline LED P.C. Board

Component Outline
SWR P.C. Board



NOTES:

1. P.C. Board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.
3. See wiring chart C for connection of wiring to pins.

Figure 4-7

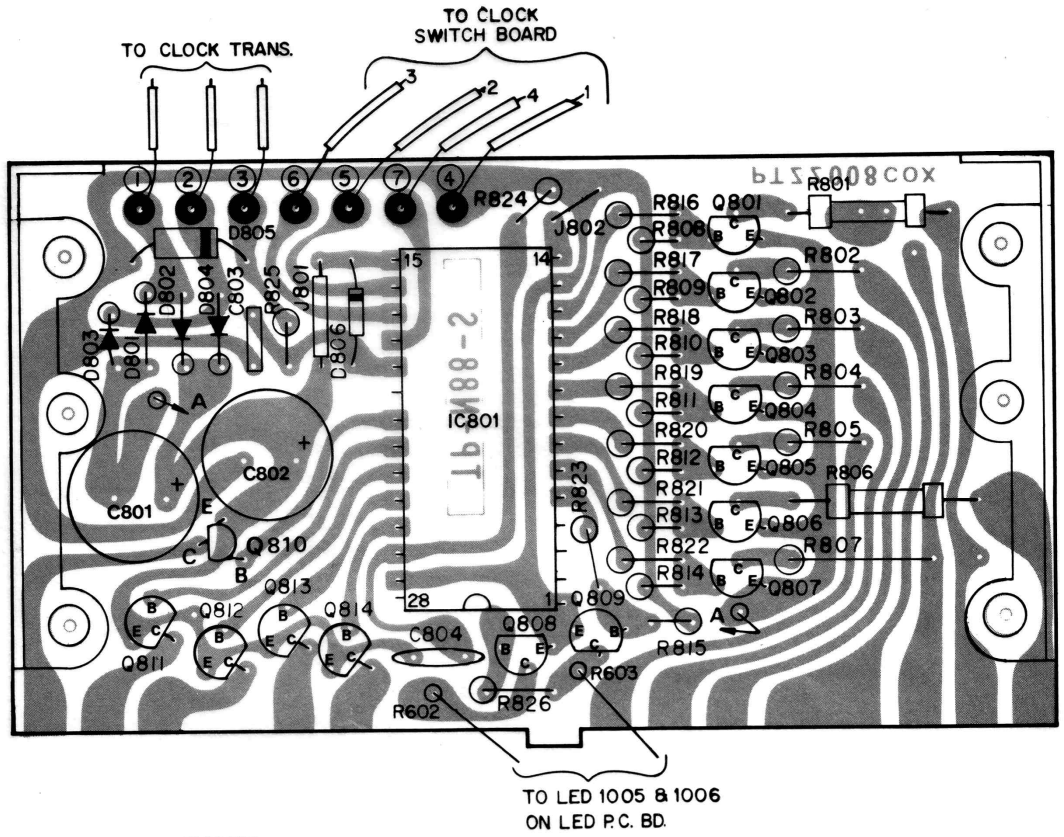
Component Outline SWR P.C. Board

WIRING CHART

PIN NO.	WIRING CONNECTIONS
1	to swr CAL control switch
2	to pin 22 on switch board
5	to pin 17 on switch board
6	to pin 18 on switch board
7	to pin 24 on switch board

Component Outline
Clock Control P.C. Board

EO-3078-A-111

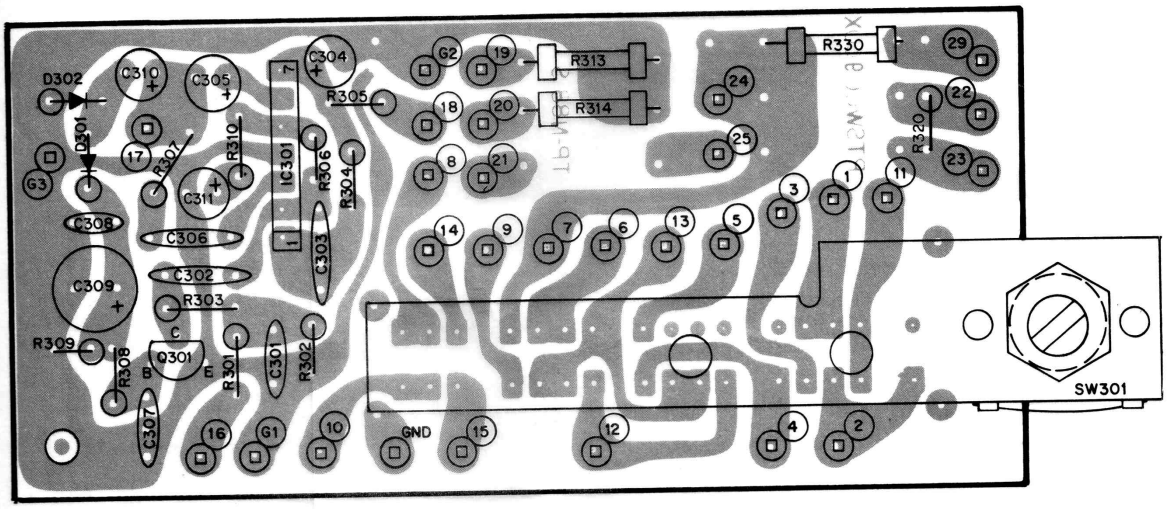


NOTES:

1. P.C. Board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.

Figure 4-8
Component Outline Clock Control P.C. Board

Component Outline
Function Switch P.C. Board



NOTES:

1. P.C. Board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.
3. See wiring chart D for connection of wiring to pins.

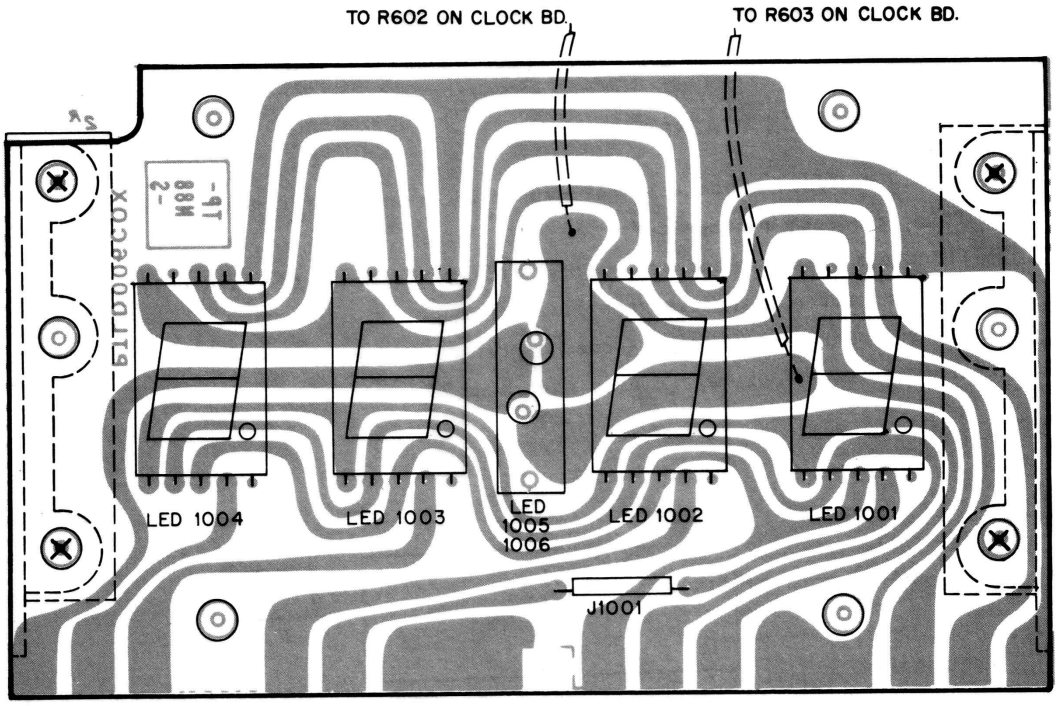
Figure 4-9

Component Outline Function Switch P.C. Board

WIRING CHART

PIN NO.	WIRING CONNECTIONS	PIN NO.	WIRING CONNECTIONS
1	black/white wire to pin 51 on main p.c. board	15	1 blue/white wire to pin 21 on main p.c. board 1 blue/white wire to pin 2 on switch p.c. board
2	orange/white wire to pin 6 on syn. osc. board	16	gray shield to pin 11 on switch p.c. board
4	white wire to pin 14 on main p.c. board		pink wire to pin 11 on switch p.c. board
5	brown wire to pin 17 on main p.c. board	17	gray shield to pin 43 on main p.c. board
6	red/white wire to pin 37 on main p.c. board		white wire to pin 43 on main p.c. board
7	orange wire to pin 4 on main p.c. board	18	blue wire to pin 23 on main p.c. board
	orange/white wire to pin 20 on switch p.c. board	19	white wire to TX indicator light
8	1 pink wire to pin 15 on switch p.c. board	20	white wire to RX indicator light
	1 pink wire to pin 6 on main p.c. board	21	red wire to RX indicator light
9	white wire to pin 15 on main p.c. board		blue wire to pin 16 on switch p.c. board
10	green wire to pin 16 on main p.c. board	22	brown/white to remote speaker jack
11	1 gray wire to pin 2 on syn. osc. board	23	blue wire to mic jack
	1 gray wire to pin 31 on main p.c. board	24	green/white wire to pin 8 on syn. osc. board
12	red wire to pin 40 on main p.c. board	25	no wire
13	purple wire to pin 29 on main p.c. board	29	red wire to ON/OFF power indicator light
	purple/white wire to pin 5 on switch p.c. board	GND	no wire
	red wire to TX indicator light	G1	gray with blue tip wire to pin 10 on switch p.c. board
14	yellow wire to pin 47 on main p.c. board	G2	white wire to ON/OFF power indcator ligh
	white wire to pin 19 on switch p.c. board	G3	gray with brown tip wire to pin 44 on main p.c. board

EQ-3078-A-113



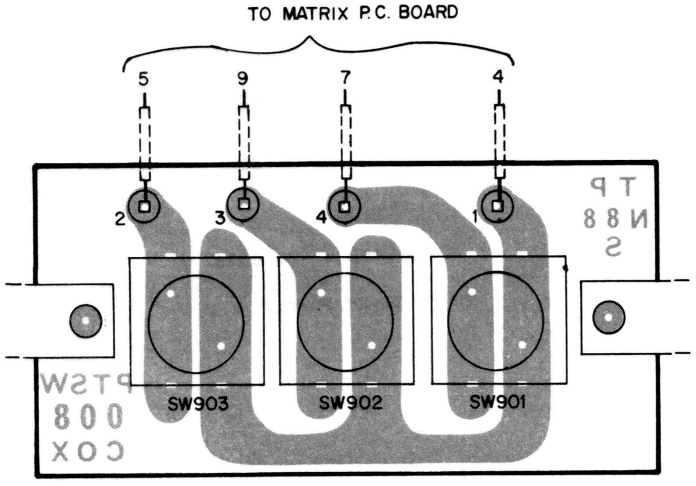
NOTES:

1. P.C. Board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.

Figure 4-10

Component Outline Clock LED P.C. Board

EO-3078-A-108



NOTES:

1. P.C. Board shown as viewed from component side.
2. Dashed outline component — mounted on foil side.

Figure 4-11

Component Outline Clock Switch P.C. Board

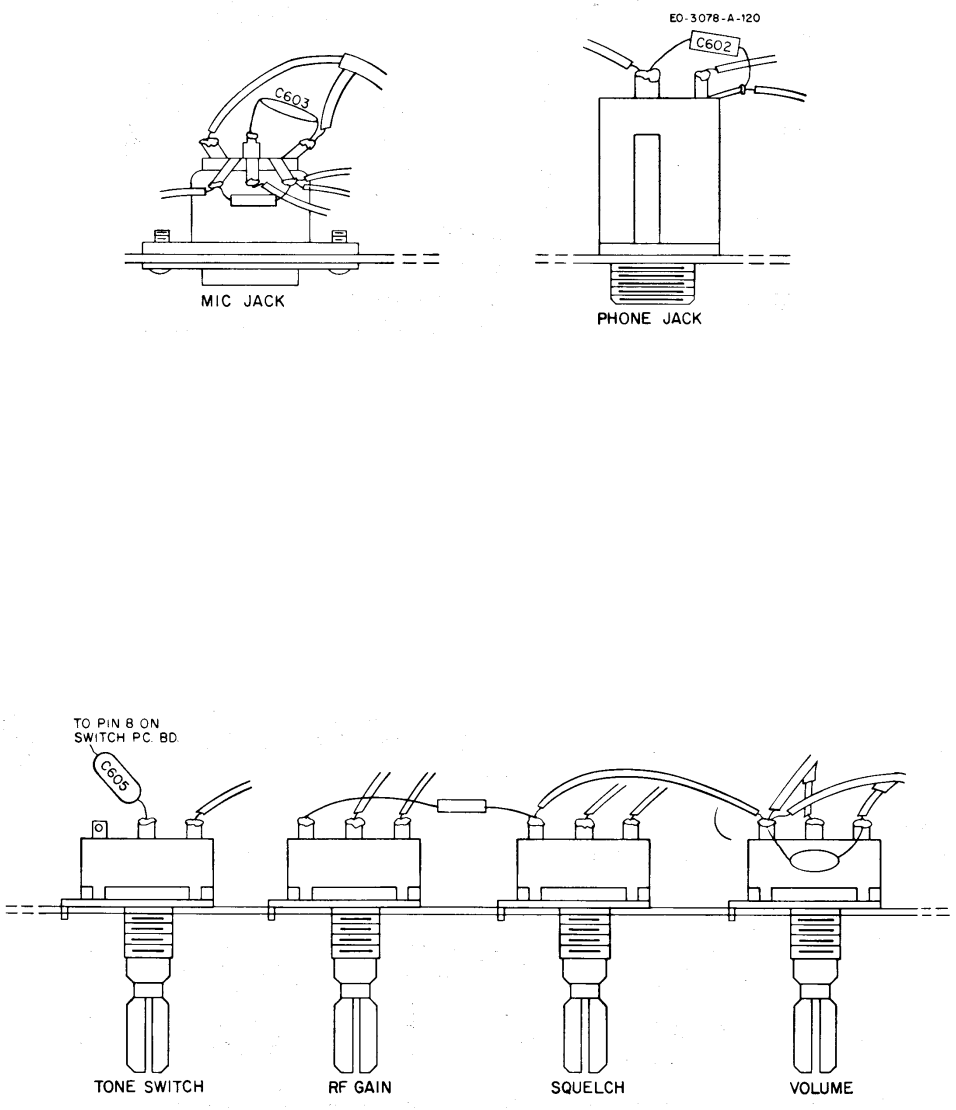


Figure 4-12

Switch and Chassis Mounted Components

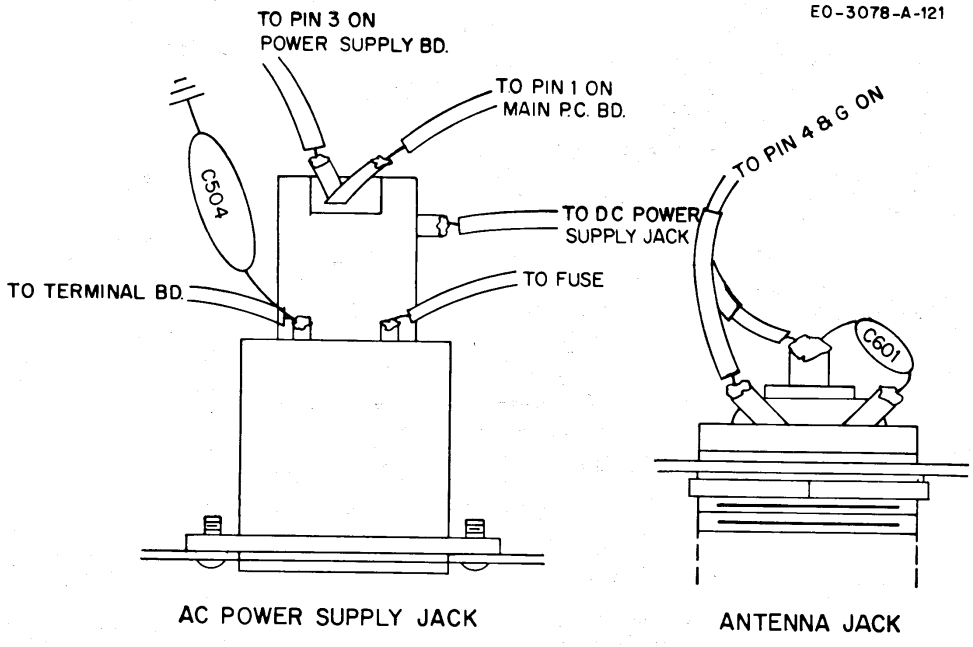


Figure 4-13

Jack Mounted Components

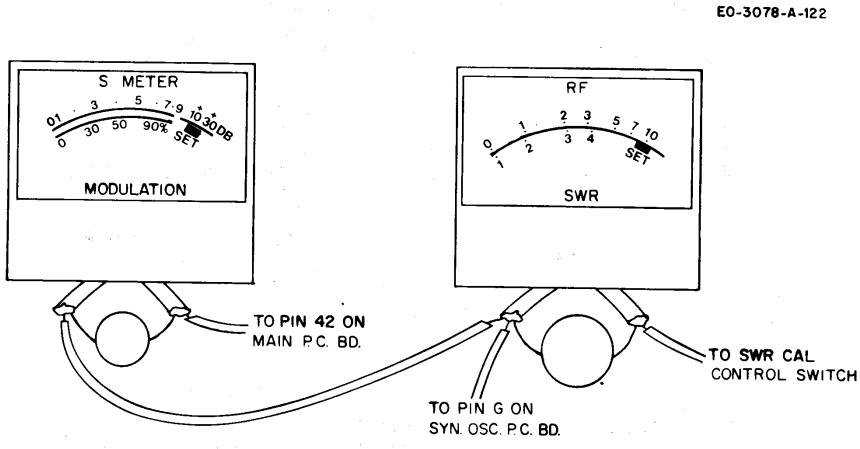


Figure 4-14

Meter Mounted Components

Main P.C. Board

Reference Designator	Description	Part No.
	main p.c. board, complete	AP-TBM035BA
	main p.c. board, plated and drilled	PT-BM035COX
C1	.01uF, 50V, mylar	CQ-MB103KEH
C2	.047uF, 50V, ceramic disc	CK-EB473ZFM
C3	68pF, 50V, ceramic disc	CC-DB680KPM
C4	.022uF, 50V, mylar	CQ-MB223KEH
C5	.047uF, 50V, ceramic disc	CK-EB473ZFM
C6	39pF, 50V, ceramic disc	CC-DB390KPM
C7	15pF, 50V, ceramic disc	CC-DB150KPM
C8	39pF, 50V, ceramic disc	CC-DB390KPM
C9	82pF, 50V, ceramic disc	CC-DB820KPM
C10	10uF, 16V, electrolytic	CE-AD100ALN
C11	.01uF, 50V, mylar	CQ-MB103KEH
C12	.01uF, 50V, mylar	CQ-MB103KEH
C13	100pF, 50V, ceramic disc	CC-DB101KPM
C14	.01uF, 50V, mylar	CQ-MB103KEH
C15	.047uF, 50V, ceramic disc	CK-EB473ZFM
C16	.047uF, 50V, ceramic disc	CK-EB473ZFM
C17	100uF, 50V, electrolytic	CE-AC101ALN
C18	3.3uF, 25V, electrolytic	CE-EE3R3ALN
C19	.01uF, 50V, mylar	CQ-MB103KEH
C20	68pF, 50V, ceramic disc	CC-DB680KPM
C21	150pF, 50V, ceramic disc	CC-DB151KPM
C22	.047uF, 50V, ceramic disc	CK-EB473ZFM
C23	220pF, 50V, ceramic disc	CC-DB221KPM
C24	100pF, 50V, ceramic disc	CC-DB101KPM
C25	330pF, 50V, ceramic disc	CC-DB331KOM
C26	330pF, 50V, ceramic disc	CC-DB331KOM
C27	2pF, 50V, ceramic disc	CC-DB020CPM
C28	2pF, 50V, ceramic disc	CC-DB20CPM
C29 through C32	(not used)	
C33	1000pF, 50V, ceramic disc	CK-RB102KWM
C34	68pF, 50V, mylar	CC-DB680KPM
C35	.022uF, 50V, mylar	CQ-MB223KEH
C36	150pF, 50V, ceramic disc	CC-DB151KOM
C37	.01uF, 50V, mylar	CQ-MB103KEH
C38	22pF, 50V, ceramic disc	CC-DB220KPM
C39	1uF, 25V, tantalum	CS-SF010MDC
C40	.022uF, 50V, mylar	CQ-MB223KEH
C41	.022uF, 50V, mylar	CQ-MB223KEH
C42	10pF, 50V, ceramic disc	CC-DB100FPM
C43	(not used)	
C44	.022uF, 50V, mylar	CQ-MB223KEH
C45	.01uF, 50V, mylar	CQ-MB103KEH
C46	.047uF, 50V, mylar	CQ-MB473KEH
C47	.01uF, 50V, mylar	CQ-MB103KEH
C48	.022uF, 50V, mylar	CQ-MB223KEH
C49	.022uF, 50V, mylar	CQ-MB223KEH
C50	.022uF, 50V, mylar	CQ-MB223KEH
C51	22pF, 50V, ceramic disc	CC-DB220KPM
C52	.022uF, 50V, mylar	CQ-MB223KEH
C53	3pF, 50V, ceramic disc	CC-DB030CPM
C54	.022uF, 50V, mylar	CQ-MB223KEH
C55	.01uF, 50V, ceramic disc	CK-EB103PEM
C56	.01uF, 50V, ceramic disc	CK-EB103PEM
C57	.01uF, 50V, mylar	CQ-MB103KEH
C58	.022uF, 50V, mylar	CQ-MB223KEH
C59	5pF, 50V, ceramic disc	CC-DB050CPM
C60	.022uF, 50V, mylar	CQ-MB223KEH
C61	22pF, 50V, ceramic disc	CC-DB220KPM
C62	1000pF, 50V, mylar	CQ-MB102KEH
C63	4700pF, 50V, mylar	CQ-MB472KEH
C64	4.7uF, 25V, electrolytic	CE-AE4R7ALN
C65	1000pF, 50V, mylar	CQ-MB102KEH
C66	.022uF, 50V, mylar	CQ-MB223KEH
C67	22pF, 50V, ceramic disc	CC-DB220KPM
C68	33uF, 10V, electrolytic	CE-AC330ALN
C69	4700pF, 50V, mylar	CQ-MB472KEH
C70	1000pF, 50V, mylar	CQ-MB102KEH

Reference Designator	Description	Part No.
C71	.047uF, 50V, ceramic disc	CK-EB473ZFM
C72	4700pF, 50V, mylar	CQ-MB472KEH
C73	(not used)	
C74	4700pF, 50V, mylar	CQ-MB472KEH
C75	.047uF, 50V, mylar	CQ-MB473KEH
C76	1000pF, 50V, mylar	CQ-MB102KEH
C77	2pF, 50V, ceramic disc	CC-DB020CPM
C78	.022uF, 50V, mylar	CQ-MB223KEH
C79	56pF, 50V, ceramic disc	CC-DB560KPM
C80	.022uF, 50V, mylar	CQ-MB223KEH
C81	(not used)	
C82	(not used)	
C83	(not used)	
C84	100pF, 50V, ceramic disc	CC-DB101KPM
C85	.047uF, 50V, mylar	CQ-MB473KEH
C86	.047uF, 50V, mylar	CQ-MB473KEH
C87	4pF, 50V, ceramic disc	CC-DB040DPM
C88	82pF, 50V, ceramic disc	CC-DB820KPM
C89	.0luF, 50V, mylar	CQ-MB103KEH
C90	.0luF, 50V, mylar	CQ-MBl03KEH
C91	39pF, 50V, ceramic disc	CC-DB390KPM
C92	.0luF, 50V, mylar	CQ-MB103KEH
C93	2pF, 50V, ceramic disc	CC-DB020CPM
C94	47pF, 50V, ceramic disc	CC-DB470KPM
C95	33pF, 50V, ceramic disc	CC-DB330KPM
C96	.0luF, 50V, mylar	CQ-MB103KEH
C97	.0luF, 50V, mylar	CQ-MB103KEH
C98	.0luF, 50V, mylar	CQ-MB103KEH
C99	33pF, 50V, ceramic disc	CC-DB330KPM
C100	.0luF, 50V, mylar	CQ-MB103KEH
C101	8pF, 50V, ceramic disc	CC-DB080CPM
C102	.022uF, 50V, mylar	CQ-MB223KEH
C103	.022uF, 50V, mylar	CQ-MB223KEH
C104	.022uF, 50V, mylar	CQ-MB223KEH
C105	.022uF, 50V, mylar	CQ-MB223KEH
C106	.022uF, 50V, mylar	CQ-MB223KEH
C107	5pF, 50V, ceramic disc	CC-DB050CPM
C108	.01uF, 50V, mylar	CQ-MB103KEH
C109	1uF, 50V, electrolytic	CE-AG010ALN
C110	(not used)	
C111	33uF, 16V, electrolytic	CE-AD330ALN
C112	1uF, 50V, electrolytic	CE-AG0l0ALN
C113	100pF, 50V, ceramic disc	CC-DB101KOM
C114	.022uF, 50V, mylar	CQ-MB223KEH
C115	1uF, 25V, tantalum	CS-SF010MDC
C116	.01uF, 50V, mylar	CQ-MB103KEH
C117	47pF, 50V, ceramic disc	CC-DB470KPM
C118	(not used)	
C119	.47uF, 50V, electrolytic	CE-AGR47ALN
C120	.0luF, 50V, mylar	CQ-MB103KEH
C121	.47uF, 50V, electrolytic	CE-AGR47ALN
C122	.0luF, 50V, mylar	CQ-MB103KEH
C123	47uF, 10V, electrolytic	CE-AC470ALN
C124	.1uF, 50V, mylar	CQ-MB104KEH
C125	100uF, 10V, electrolytic	CE-AC101ALN
C126	.047uF, 50V, ceramic disc	CK-EB473ZFM
C127	100uF, 16V, electrolytic	CE-AD101ALN
C128	100uF, 10V, electrolytic	CE-AC101ALN
C129	.022uF, 50V, mylar	CQ-MB223KEH
C130	.022uF, 50V, mylar	CQ-MB223KEH
C131	39pF, 50V, ceramic disc	CC-DB390KPM
C132	100uF, 16V, electrolytic	CE-AD101ALN
C133	33uF, 16V, electrolytic	CE-AD330ALN
C134	.01uF, 50V, mylar	CQ-MB103KEH
C135	2200uF, 16V, electrolytic	CE-AD222ALN
C136	.047uF, 50V, ceramic disc	CK-EB473ZFM
C137	.047uF, 50V, ceramic disc	CK-EB473ZFM
C138	.047uF, 50V, ceramic disc	CK-EB473ZFM
C139	.047uF, 50V, ceramic disc	CK-EB473ZFM
C140	.047uF, 50V, ceramic disc	CK-EB473ZFM
C141	.047uF, 50V, ceramic disc	CK-EB473ZFM
C142	.047uF, 50V, ceramic disc	CK-EB473ZFM
C143	.047uF, 50V, ceramic disc	CK-EB473ZFM

Reference Designator	Description	Part No.
C144	180pF, 50V, ceramic disc	CC-DB181KPM
C145	.01uF, 50V, mylar	CQ-MB103KEH
C146	47uF, 10V, electrolytic	CE-AC470ALN
C147	68pF, 50V, ceramic disc	CC-DB680KPM
C148	3.3uF, 25V, electrolytic	CE-AE3R3ALN
C149	.1uF, 35V, tantalum	CS-SF0R1MDC
C150	(not used)	
C151	(not used)	
C152	3.3uFm 25V, electrolytic	CE-AE3R3ALN
C153	(not used)	
C154	1uF, 50V, electrolytic	CE-AG010ALN
C155	100pF, 50V, ceramic disc	CC-DB101KOM
C156 through C160	(not used)	
C161	.0luF, 50V, ceramic disc	CK-DB103PEM
C162	5pF, 50V, ceramic disc	CC-DB050CPM
C163	47pF, 50V, ceramic disc	CC-DB470KPM
C164	.047uF, 50V, mylar	CQ-MB473KEH
C165	10pF, 50V, ceramic disc	CC-DB100FPM
C166	220pF, 50V, ceramic disc	CC-DB221KPM
C167	.047uF, 50V, mylar	CQ-MB473KEH
C168	(not used)	
C169	.01uF, 50V, mylar	CQ-MB103KEH
C170	10uF, 16V, electrolytic	CE-AD100ALN
C171 through C187	(not used)	
C188	68pF, 50V, ceramic disc	CC-DB680KPM
C189	27pF, 50V, ceramic disc	CC-DB270KPM
C190	33pF, 50V, ceramic disc	CC-DB330KPM
C191	4700pF, 50V, ceramic disc	CK-DB472KWM
CH1	choke coil	LJ-119H003W
CR1	CR module	CR-B103A01K
D1	1N60P, germanium	QD-G1N60PXT
D2	1N60P, germanium	QD-G1N60PXT
D3	1N60P, germanium	QD-G1N60PXT
D4	1N60P, germanium	QD-G1N60PXT
D5	1N60, germanium	QD-G1N60XXT
D6	1N60, germanium	QD-G1N60XXT
D7	1S953, silicon	QD-S1S953XA
D8	1S953, silicon	QD-S1S953XA;
D9	1S953, silicon	QD-S1S953XA
D10	1S953, silicon	QD-S1S953XA
D11	1S953, silicon	QD-S1S953XA
D12	1N60, germanium	QD-G1N60XXT
D13	1N60, germanium	QD-G1N60XXT
D14	1S953, silicon	QD-S1S953XA
D15	1S953, silicon	QD-S1S953XA
D16	1S953, silicon	QD-S1S953XA
D17	1S953, silicon	QD-S1S953XA
D18	1N60, germanium	QD-G1N60XXT
D19	1N60, germanium	QD-G1N60XXT
D20	1N60, germanium	QD-G1N60XXT
D21	(not used)	
D22	1N60, germanium	QD-G1N60XXT
D23	1N60, germanium	QD-G1N60XXT
D24	1S953, silicon	QD-S1S953XA
D25	1N60, germanium	QD-G1N60XXT
D26	1S953, silicon	QD-S1S953XA
D27	(not used)	
D28	1S953, silicon	QD-S1S953XA
D29	1S953, silicon	QD-S1S953XA
D30	SP1K-4, silicon	QD-SSR1KX4P
D31	MZ408-02C, zener	QD-ZMZ408CE
D32	MZ409-02B, zener	QD-ZMZ409BE
D33	MZ409-02B, zener	QD-ZMZ409BE
D34	VD-1124, varistor	QV-BD1126A
D35	1S953, silicon	QD-S1S953XA
D36	1N60, germanium	QD-G1N60XXT
D37	1S953, silicon	QD-S1S953XA

Reference Designator	Description	Part No.
D38	1N60, germanium	QD-G1N60XXT
D39	1N60, germanium	QD-G1N60XXT
D40	(not used)	
D41	(not used)	
D42	SR3AM-2	QD-SSR3AMBE
D43	1S953, silicon	QD-S1S953XA
D44	1S953, silicon	QD-S1S953XA
D45	1S953, silicon	QD-S1S953XA
D46	1S1555, silicon	QD-SS1555XT
D47	1S953, silicon	QD-S1S953XA
D48	1S953, silicon	QD-S1S953XA
L1	i-f transformer	TR-07MA004T
L2	rf transformer	TR-07CN004T
L3	rf transformer	TR-07CN005T
L4	rf transformer	TR-07CP010S
L5	rf coil	TR-A5CZ004M
L6	rf coil	TR-A5CZ004M
L7	rf coil	TR-A5CZ004M
L8	(not used)	
L9	i-f transformer	TR-07DP003T
L10	i-f transformer	TR-07MA004T
L11	i-f transformer	TR-07MA005T
L12	rf transformer	TR-07DN001T
L13	i-f transformer	TR-07DA002T
L14	i-f transformer	TR-07DA002T
L15	rf transformer	TR-07DN003T
L16	rf transformer	TR-07DN003T
L17	rf transformer	TR-07DN003T
L18	rf transformer	TR-07MP005T
L19	rf transformer	TR-07CN003T
L20	i-f transformer	TR-07MB005T
Q1	(NEC) 2SC839(H)	QT-C0839XBA
Q2	(NEC) 2SC839(H)	QT-C0839XBA
Q3	(MITSUBISHI) 2SC710(D)	QT-C0710XBE
Q4	BC546	QT-CBC546AA
Q5	(NEC) 2SC839(H)	QT-C0839XBE
Q6	(MITSUBISHI) 2SC710(D)	QT-C0710XBE
Q7	2SK23A-540	QT-K0023AAS
Q8	(NEC) 2SC710(D)	QT-C0710XBE
Q9	(NEC) 2SC710(D)	QT-C0710XBE
Q10	(NEC) 2SC710(D)	QT-C0710XBE
Q11	(NEC) 2SC710(D)	QT-C0710XBE
Q12	(NEC) 2SC945(A-P)	QT-C0945AAA
Q13	(NEC) 2SC710(C)	QT-C0710XAE
Q14	(NEC) 2SC710(C)	QT-C0710XAE
Q15	(NEC) 2SC710(C)	QT-C0710XAE
Q16	2SC784(R)	QT-C0784XBT
Q17	(NEC) 2SC710(C)	QT-C0710XAE
Q18	2SK33(E)	QT-K0033XBE
Q19	2SA733(Q)	QT-A0733XAA
Q20	2SC723	
Q21	(NEC) 2SC945(A-P)	QT-C0945AAA
Q22	(NEC) 2SC945(A-P)	QT-C0945AAA
Q23	(NEC) 2SC945(A-P)	QT-C0945AAA
Q24	2SK23A-540	QT-K0023AAS
Q25	2SK33(F)	QT-K0033XAE
Q26	(NEC) 2SC945(A-P)	QT-C0945AAA
Q27	(NEC) 2SC945(A-P)	QT-C0945AAA
Q28	(NEC) 2SC945(A-P)	QT-C0945AAA
Q29	2SC945(A-P)	QT-C0945AAA
Q30	(MITSUBISHI) 2SC710C	QT-C0710XAE
Q31	(NEC) 2SC1306	QT-C1306XZA
Q32	2SC1307	QT-C1307XZA
Q33	2SA733(Q)	QT-A0733XAA

Reference Designator	Description	Part No.
R1	68, 10%, ¼w, metal oxide	RG-1ANJ680N
R2	470, 10%, ¼w, carbon film	RD-14VJ471N
R3	470, 10%, ¼w, carbon film	RD-14VJ471N
R4	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R5	15k, 10%, ¼w, carbon film	RD-14VJ153N
R6	33k, 10%, ¼w, carbon film	RD-14VJ333N
R7	22, 10%, ¼w, carbon film	RD-14VJ220N
R8	22, 10%, ¼w, carbon film	RD-14VJ220N
R9	470, 10%, ¼w, carbon film	RD-14VJ471N
R10	220, 10%, ¼w, carbon film	RD-14VJ221N
R11	(not used)	
R12	2.7k, 10%, ¼w, carbon film	RD-14VJ272N
R13	10k, 10%, ¼w, carbon film	RD-14VJ103N
R14	220, 10%, ¼w, carbon film	RD-14VJ221N
R15	68, 10%, ¼w, carbon film	RD-14VJ680N
R16	10, 10%, ¼w, carbon film	RD-14VJ100N
R17	100, 10%, ¼w, carbon film	RD-14VJ101N
R18	560, 10%, ¼w, carbon film	RD-14VJ561N
R19	56, 10%, ¼w, carbon film	RD-14VJ560N
R20	470, 10%, ¼w, carbon film	RD-14VJ471N
R21	68, 10%, 1w, metal oxide	RG-1ANJ680N
R22	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R23	(not used)	
R24	220, 10%, ¼w, carbon film	RD-14VJ221N
R25	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R26	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R27	1k, 10%, ¼w, carbon film	RD-14VJ102N
R28	220k, 10%, ¼w, carbon film	RD-14VJ224N
R29	1.5k, 10%, ¼w, carbon film	RD-14VJ152N
R30	47k, 10%, ¼w, carbon film	RD-14VJ473N
R31	390, 10%, ¼w, carbon film	RD-14VJ391N
R32	390, 10%, ¼w, carbon film	RD-14VJ391N
R33	220, 10%, ¼w, carbon film	RD-14VJ221N
R34	680, 10%, ¼w, carbon film	RD-14VJ681N
R35	3.3k, 10%, ¼w, carbon film	RD-14VJ332N
R36	680, 10%, ¼w, carbon film	RD-14VJ681N
R27	3.3k, 10%, ¼w, carbon film	RD-14VJ332N
R38	15k, 10%, ¼w, carbon film	RD-14VJ153N
R39	330, 10%, ¼w, carbon film	RD-14VJ331N
R40	10k, 10%, ¼w, carbon film	RD-14VJ103N
R41	560, 10%, ¼w, carbon film	RD-14VJ561N
R42	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R43	220, 10%, ¼w, carbon film	RD-14VJ221N
R44	3.3k, 10%, ¼w, carbon film	RD-14VJ332N
R45	33k, 10%, ¼w, carbon film	RD-14VJ333N
R46	10k, 10%, ¼w, carbon film	RD-14VJ103N
R47	22k, 10%, ¼w, carbon film	RD-14VJ223N
R48	3.3k, 10%, ¼w, carbon film	RD-14VJ332N
R49	56, 10%, ¼w, carbon film	RD-14VJ560N
R50	(not used)	
R51	2.7k, 10%, ¼w, solid carbon	RC-14GK272N
R52	10k, 10%, ¼w, carbon film	RD-14VJ103N
R53	33k, 10%, ¼w, carbon film	RD-14VJ333N
R54	47k, 10%, ¼w, carbon film	RD-14VJ473N
R55	47k, 10%, 10%, ¼w, carbon film	RD-14VJ473N
R56	6.8k, 10%, ¼w, carbon film	RD-14VJ682N
R57	10k, 10%, ¼w, carbon film	RD-14VJ103N
R58	68k, 10%, ¼w, carbon film	RD-14VJ683N
R59	220, 10%, ¼w, carbon film	RD-14VJ221N
R60	1k, 10%, ¼w, carbon film	RD-14VJ102N
R61	3.3k, 10%, ¼w, carbon film	RD-14VJ332N
R63	100, 10%, ¼w, carbon film	RD-14VJ101N
R64	470k, 10%, ¼w, carbon film	RD-14VJ474N
R65	1.5M, 10%, ¼w, carbon film	RD-14VJ155N
R66	5.6k, 10%, ¼w, carbon film	RD-14VJ562N
R67	5.6k, 10%, ¼w, carbon film	RD-14VJ562N
R68	1M, 10%, ¼w, carbon film	RD-14VJ105N
R69	100k, 10%, ¼w, carbon film	RD-14VJ104N
R70	(not used)	
R71	10k, 10%, ¼w, carbon film	RD-14VJ103N
R72	2.7k, 10%, ¼w, carbon film	RD-14VJ272N
R73	4.7k, 10%, ¼w, carbon film	RD-14VJ472N

Reference Designator	Description	Part No.
R74	330, 10%, ¼w, carbon film	RD-14VJ331N
R75	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R76	22k, 10%, ¼w, carbon film	RD-14VJ223N
R77	1k, 10%, ¼w, carbon film	RD-14VJ102N
R78	470, 10%, ¼w, carbon film	RD-14VJ471N
R79	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R80	22k, 10%, ¼w, carbon film	RD-14VJ223N
R81	1k, 10%, ¼w, carbon film	RD-14VJ102N
R82	470, 10%, ¼w, carbon film	RD-14VJ471N
R83	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R84	22k, 10%, ¼w, carbon film	RD-14VJ223N
R85	(not used)	
R86	470, 10%, ¼w, carbon film	RD-14VJ471N
R87	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R88	33k, 10%, ¼w, carbon film	RD-14VJ333N
R89	1k, 10%, ¼w, carbon film	RD-14VJ102N
R90	330, 10%, ¼w, carbon film	RD-14VJ331N
R91	470, 10%, ¼w, carbon film	RD-14VJ471N
R92	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R93	4.7k, 10%, ¼w,carbon film	RD-14VJ472N
R94	1k, 10%, ¼w, carbon film	RD-14VJ102N
R95	470, 10%, ¼w, carbon film	RD-14VJ471N
R96	3.3k, 10%, ¼w, carbon film	RD-14VJ332N
R97	(not used)	
R98	1k, 10%, ¼w, carbon film	RD-14VJ102N
R99	10M, 10%, ½w, solid carbon	RC-12GK106N
R100	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R101	22k, 10%, ¼w, carbon film	RD-14VJ223N
R102	220, 10%, ¼w, carbon film	RD-14VJ221N
R103	1k, 10%, ¼w, carbon film	RD-14VJ102N
R104	470, 10%, ¼w, carbon film	RD-14VJ471N
R105 through R109	(not used)	
R110	220k, 10%, ¼w, carbon film	RD-14VJ224N
R111	(not used)	
R112	1.5k, 10%, ¼w, carbon film	RD-14VJ152N
R113	(not used)	
R114	330, 10%, ¼w, carbon film	RD-14VJ331N
R115	(not used)	
R116	10k, 10%, ¼w, carbon film	RD-14VJ103N
R117	22k, 10%, ¼w, carbon film	RD-14VJ223N
R118	(not used)	
R119	10k, 10%, ¼w, carbon film	RD-14VJ103N
R120	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R121	68, 10%, ¼w, carbon film	RD-14VJ480N
R122	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R123	3.3k, 10%, ¼w, carbon film	RD-14VJ332N
R124	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R125	100, 10%, 1w, metal oxide	RG-1ANJ101N
R126	1.8k, 10%, ¼w, carbon film	RD-14VJ182N
R127	22k, 10%, ¼w, carbon film	RD-14VJ223N
R128	6.8k, 10%, ¼w, carbon film	RD-14VJ682N
R129	100, 10%, ¼w, carbon film	RD-14VJ101N
R130	220, 10%, ¼w, carbon film	RD-14VJ22IN
R131	680, 10%, ¼w, carbon film	RD-14VJ221N
R132	56, 10%, ¼w, carbon film	RD-14VJ560N
R133	.82, 10%, 1w, metal oxide	RX-1ANJR82N
R134	100, 10%, ¼w, carbon film	RD-14VJ101N
R135	220, 10%, ¼w, carbon film	RD-14VJ221N
R136	15, 10%, 2w, metal oxide	RX-2ANJ150N
R137	(not used)	
R138	10k, 10%, ¼w, carbon film	RD-14VJ103N
R139	82k, 10%, ¼w, carbon film	RD-14VJ823N
R140	(not used)	
R141	470, 10%, ¼w, carbon film	RD-14VJ471N
R142	100, 10%, ¼w, carbon film	RC-14GK101N

Reference Designator	Description	Part No.
R143	390, 10%, 1w, metal oxide	RG-1ANJ391N
R144	22, 10%, ¼w, carbon film	RD-14VJ220N
R145	15k, 10%, ¼w, carbon film	RD-14VJ153N
R146	1k, 10%, ¼w, carbon film	RD-14VJ102N
R147	3.3k, 10%, ¼w, solid carbon	RC-14GK332N
R148	10k, 10%, ¼w, carbon film	RD-14TJ103N
R149 through R195	(not used)	
R196	5.6k, 10%, ¼w, solid carbon	RC-14GK562N
R197	5.6k, 10%, ¼w, carbon film	RC-14GK562N
R198	560, 10%, ¼w, carbon film	RC-12GK561N
R199	15k, 10%, ¼w, carbon film	RD-14VJ153N
RFC1	r-f choke coil	LD-ADA3038J
RFC2	r-f choke coil	LF-102KB01S
RFC3	r-f choke coil	LD-ADB4024B
RFC4	(not used)	
RFC5	rf choke coil	LF-2R2KD01N
RFC6	rf choke coil	LF-680KD01N
RFC7	rf choke coil	LD-ADB4024B
RFC8	rf choke coil	LD-ADB4024B
RFC9	rf choke coil	LD-ADB4024B
RV1	1k, potentiometer	RP-GNB10202
RV2	500, potentiometer	RP-GNB50101
RV3	(not used)	
RV4	330, potentiometer	RP-JNB33101
RV5	10k, potentiometer	RP-GNB10302
RV6	5k, potentiometer	RP-DNB50201
RV7	20k, potentiometer	RP-GNB20302
RV8	20k, potentiometer	RP-GNB20302
RV9	10k, potentiometer	RP-GNB10302
RV10	100k, potentiometer	RP-GNB10402
RV11	1k, potentiometer	RP-GNB10202
RV12	50k, potentiometer	RP-GNB50302
RY	relay	ZR-A236102Z
T1	af transformer	TA-Y19A001W
T2	af transformer	TB-G37B001Y
TC1	50pF, trim capacitor	CT-Z7500K01
TC2	20pF, trim capacitor	CT-Z7500K01
X1	11.275MHz crystal	XA-Z1A7001T
XF	crystal filter	FF-11R2502A

Synthesizer/Oscillator P.C. Board

Reference Designator	Description	Part No.
	synthesizer/oscillator p.c. board, complete	AP-TSY009AA
	synthesizer/oscillator p.c. board, plated and drilled	PT-SY009COX
C201	2pF, 50V, ceramic disc	CC-DB020CPM
C202	220pF, 50V, ceramic disc	CC-DB221KPM
C203	(not used)	
C204	.047uF, 50V, mylar	CQ-MB473KEH
C205	(not used)	
C206	10pF, 50V, ceramic disc	CC-DB100DPM
C207	.01uF, 50V, ceramic disc	CK-EB103PEM
C208	(not used)	
C209	.01uF, 50V, ceramic disc	CK-EB103PEM
C210	100pF, 50V, ceramic disc	CC-DB101KPM
C211	.01uF, 50V, ceramic disc	CK-EB103PEM
C212	(not used)	
C213	.01uF, 50V, ceramic disc	CK-EB103PEM
C214	1pF, 50V, ceramic disc	CC-DB010CPM
C215	(not used)	
C216	.01uF, 50V, ceramic disc	CK-EB103PEM
C217	22pF, 50V, ceramic disc	CC-DB220KPM
C218	22pF, 50V, ceramic disc	CC-DB220KPM
C219	22pF, 50V, ceramic disc	CC-DB220KPM
C220	22pF, 50V, ceramic disc	CC-DB220KPM
C221	220pF, 50V, ceramic disc	CC-DB220KPM
C222	22pF, 50V, ceramic disc	CC-DB220KPM
C223	22pF, 50V, ceramic disc	CC-DB220KPM
C224	120pF, 50V, ceramic disc	CC-DB121KPM
C225	68pF, 50V, ceramic disc	CC-DB680KPM
C226	68pF, 50V, ceramic disc	CC-DB680KPM
C227	150pF, 50V, ceramic disc	CC-DB151KPM
C228	.01uF, 50V, ceramic disc	CK-EB103PEM
C229	.01uF, 50V, ceramic disc	CK-EB103PEM
D201	1S2688, silicon	QD-CS2688DJ
L201	rf coil	TR-07DM001S
L202	rf coil	TR-07DA001S
L203	rf coil	TR-07DA001S
L204	rf coil	TR-07DA001S
Q201	(NEC) 2SC839H	QT-C0839XDA
Q202	2SK23A-540	QT-K0023AAS
Q203	(NEC) 2SC839H	QT-C0839XDA
Q204	(NEC) 2SC839H	QT-C0839XDA
Q205	(MITSUBISHI) 2SC710C	QT-C0710XAE
Q206	(MITSUBISHI) 2SC710C	QT-C0710XAE
R201	15k, 10%, ¼w, carbon film	RD-14VJ153N
R202	3.9k, 10%, ¼w, carbon film	RD-14VJ392N
R203	330, 10%, ¼w, carbon film	RD-14VJ331N
R204	100, 10%, ¼w, carbon film	RD-14VJ101N
R205	1.5k, 10%, ¼w, carbon film	RD-14VJ152N
R206	1k, 10%, ¼w, carbon film	RD-14VJ102N
R207	470, 10%, ¼w, carbon film	RD-14VJ471N
R208	15k, 10%, ¼w, carbon film	RD-14VJ153N
R209	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R210	1k, 10%, ¼w, carbon film	RD-14VJ102N
R211	220, 10%, ¼w, carbon film	RD-14VJ221N
R212	1k, 10%, ¼w, carbon film	RD-14VJ102N
R213	470, 10%, ¼w, carbon film	RD-14VJ471N
R214	5.6k, 10%, ¼w, carbon film	RD-14VJ562N
R215	100k, 10%, ¼w, carbon film	RD-14VJ104N
R216	18k, 10%, ¼w, carbon film	RD-14VJ183N
R217	10K, 10%, ¼w, carbon film	RD-14VJ103N
R218	560, 10%, ¼w, carbon film	RD-14VJ561N
R219	100k, 10%, ¼w, carbon film	RD-14VJ104N

Reference Designator	Description	Part No.
R220	1.2k, 10%, ¼w, carbon film	RD-14VJ122N
R221	3.9k, 10%, ¼w, carbon film	RD-14VJ392N
R222	1k, 10%, ¼w, carbon film	RD-14VJ102N
R223	22k, 10%, ¼w, carbon film	RD-14VJ223N
R224	100, 10%, ¼w, carbon film	RD-14VJ101N
R225	120, 10%, 1w, metal oxide	RG-1ANJ121N
R226	120, 10%, 1w, metal oxide	RG-1ANJ121N
R227	10k, 10%, ¼w, carbon film	RD-14VJ103N
R228	10k, 10%, ¼w, carbon film	RD-14VJ103N
RFC201	rf choke coil	LF-4R3JA01S
RFC202	rf choke coil	LF-2R7JA01S
RFC203	rf choke coil	LF-020JA01S
SW201	switch, rotary	SR-0924401H
TC201	20pF, trimmer capacitor	CT-Z7200H01
TC202	20pF, trimmer capacitor	CT-Z7200H01
TC203	20pF, trimmer capacitor	CT-Z7200H01
TC204	20pF, trimmer capacitor	CT-Z7200H0l
TC205	20pF, trimmer capacitor	CT-Z7200H01
X201	23.330 MHz crystal	XA-S1A8001T
X202	23.380 MHz crystal	XA-S1A8002T
X203	23.430 MHz crystal	XA-S1A8003T
X204	23.480 MHz crystal	XA-S1A8004T
X205	23.530 MHz crystal	XA-S1A8005T
X206	23.580 MHz crystal	XA-S1A8006T
X207	14.907 MHz crystal	XA-S1A7001T
X208	14.917 MHz crystal	XA-S1A7002T
X209	14.927 MHz crystal	XA-S1A7003T
X210	14.947 MHz crystal	XA-S1A7004T

Clock Control P.C. Board

Reference Designator	Description	Part No.
	clock control p.c. board, complete	AP-TZZ008AA
	clock control p.c. board, plated and drilled	PT-ZZ008COX
C801	1000uF, 16V, electrolytic	CE-ED102ZUN
C802	470uF, 16V, electrolytic	CE-ED471ALN
C803	.022uF, 50V, mylar	CQ-MB223KCH
C804	223K, 50V, mylar	CQ-MB223KCH
D801	1S1885	QD-SS1885XT
D802	1S1885	QD-SS1885XT
D803	1S1885	QD-SS1885XT
D804	1S1885	QD-SS1885XT
D805	1S1885	QD-SS1885XT
D806	1SS53	QD-SSS53XXA
IC801	MM5311N	QQ-5311NAL
Q801	(NEC) 2SC945A(R/Q)	QT-C0945ADA
Q802	(NEC) 2SC945A(R/Q)	QT-C0945ADA
Q803	(NEC) 2SC945A(R/Q)	QT-C0945ADA
Q804	(NEC) 2SC945A(R/Q)	QT-C0945ADA
Q805	(NEC) 2SC945A(R/Q)	QT-C0945ADA
Q806	(NEC) 2SC945A(R/Q)	QT-C0945ADA
Q807	(NEC) 2SC945A(R/Q)	QT-C0945ADA
Q808	(NEC) 2SC945A(R/Q)	QT-C0945ADA

Reference Designator	Description	Part No.
Q809	(NEC) 2SC945A(R/Q)	QT-C0945ADA
Q810	(NEC) 2SA733(P)	QT-A0733XBA
Q811	(NEC) 2SA733(P)	QT-A0733XBA
Q812	(NEC) 2SA733(P)	QT-A0733XBA
Q813	(NEC) 2SA733(P)	QT-A0733XBA
Q814	(NEC) 2SA733(P)	QT-A0733XBA
R801	68, 10%, 1w, metal oxide	RG-1ANJ680N
R802	68, 10%, 1w, metal oxide	RG-1ANJ680N
R803	68, 10%, 1w, metal oxide	RG-1ANJ680N
R804	68, 10%, 1w, metal oxide	RG-1ANJ680N
R805	68, 10%,1w, metal oxide	RG-1ANJ680N
R806	68, 10%, 1w, metal oxide	RG-1ANJ680N
R807	68, 10%, 1w, metal oxide	RG-1ANJ680N
R808	10k,10%, ¼w, carbon film	RD-14VJ103N
R809	10k, 10%, ¼w, carbon film	RD-14VJ103N
R809	10k, 10%, ¼w, carbon film	RD-14VJ103N
R810	10k, 10%, ¼w, carbon film	RD-14VJ103N
R811	10k, 10%, ¼w, carbon film	RD-14VJ103N
R812	10k, 10%, ¼w, carbon film	RD-14VJ103N
R813	10k, 10%, ¼w, carbon film	RD-14VJ103N
R814	10k, 10%, ¼w, carbon film	RD-14VJ103N
R815	5.6k, 10%, ¼w, carbon film	RD-14VJ562N
R816	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R817	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R818	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R819	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R820	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R821	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R822	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R823	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R824	100k, 10%, ¼w, carbon film	RD-14VJ104N
R825	100k, 10%, ¼w, carbon film	RD-14VJ104N
R826	47k, 10%, ¼w, carbon film	RD14VJ473N

Clock LED P.C. Board

Reference Designator	Description	Part No.
	clock LED p.c. board, complete	AP-TLD006AA
	clock LED p.c. board, plated and drilled	PT-LD006COX
LED1001	SN7I3A, I.6V	QL-DSN713AA
LED1002	SN713A, 1.6V	QL-DSN713AA
LED1003	SN713A, 1.6V	QL-DSN713AA
LED1004	SN713A, 1.6V	QL-DSN713AA
LED1005	TLR102T, 1.95V	QL-ETLR102T
LED1006	TLR102T, 1.95V	QL-ETLR102T

Clock Switch P.C. Board

Reference Designator	Description	Part No.
	clock switch p.c. board, complete	AP-TSW008AA
	clock switch p.c. board, plated and drilled	PT-SW008COX
SW901	switch, push (fast)	SP-0IABX23N
SW902	switch, push (slow)	SP-0IABX23N
SW903	switch, push (stop)	SP-0IABX23N

Matrix P.C. Board

Reference Designator	Description	Part No.
	matrix p.c. board, complete	AP-TMX007AA
	matrix p.c. board, plated and drilled	PT-MX007COX
D701	1S1885, silicon	QD-SS1885XT
D702	1SS53, silicon	QD-SSS53XXA
D703	1SS53, silicon	QD-SSS53XXA
D704	1SS53, silicon	QD-SSS53XXA
D705	1SS53, silicon	QD-SSS53XXA
D706	1SSS53, silicon	QD-SSS53XXA
D707	1SS53, silicon	QD-SSS53XXA
D708	1SS53,silicon	QD-SSS53XXA
D709	1SS53, silicon	QD-SSS53XXA
D710	1SS53, silicon	QD-SSS53XXA
D711	1SS53, silicon	QD-SSS53XXA
D712	1SS53, silicon	QD-SSS53XXA
D713	1SS53, silicon	QD-SSS53XXA
D714	1SS53, silicon	QD-SSS53XXA
D715	1SS53, silicon	QD-SSS53XXA
D716	1SS53, silicon	QD-SSS53XXA
D717	1SS53, silicon	QD-SSS53XXA
D718	1SS53, silicon	QD-SSS53XXA
D7[illegible]	[illegible]S53, silicon	QD-SSS53XXA
[illegible]	[illegible]S53, silicon	QD-SSS53XXA
D721	1SS53, silicon	QD-SSS53XXA
D722	1SS53, silicon	QD-SSS53XXA
D733	1SS53, silicon	QD-SSS53XXA
R701	330, 10%, 2w, metal oxide	RG-2ANJ331N
R702	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R703	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R704	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R705	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R706	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R707	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R708	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R709	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R710	1.2k, 10%, ½w, metal oxide	RG-HANJ122N
R711	1.2k, 10%, ½w, metal oxide	RG-HANJ122N

Channel LED P.C. Board

Reference Designator	Description	Part No.
	channel LED p.c. board, complete	AP-TLD007AA
	channel LED p.c. board, plated and drilled	PT-LD007COX
LED1101	SN713A, 1.6V	QL-DSN713AA
LED1102	SN713A, 1.6V	QL-DSN713AA

Power Supply P.C. Board

Reference Designator	Description	Part No.
	power supply p.c. board, complete	AP-TPW006AA
	power supply p.c. board, plated and drilled	PT-PW006COX
C501	2200uF, 25V, electrolytic	CE-T1E22201
C502	100uF, 25V, electrolytic	CE-AE101ALN
C503	.022uF, 50V, ceramic disc	CK-RB223PZM
C504	.0luF, 50V, ceramic disc	CK-RB103PZM
C505	.047uF, 50V, ceramic disc	CK-RB473PMM
C506	.022uF, 50V, ceramic disc	CK-RB223PZM
D501	GP25G, germanium	QD-SGP25GXG
D502	GP25G, germanium	QD-SGP25GXG
D503	GP25G	QD-SGP25GXG
D504	GP25G	QD-SGP25GXG
F501	fuse, 250V, 3A	ZF-AQ30202U
Q501	2SC945	QT-C0945AAA
Q502	2SC900(F)	QT-CO900XBA
R501	220, 10%, ½w, solid carbon	RC-12GK221N
R502	47, I0%, ½w, solid carbon	RC-12GK470N
R503	100, 10%, ½w, solid carbon	RC-12GK101N
R504	820, 10%, ½w, solid carbon	RC-12GK821N
R505	1.2k, 10%, ½w, solid carbon	RC-12GK122N
R506	820,10%, ½w, solid carbon	RC-12GK821N
RV501	500, potentiometer	EVL-61AA00B52
ZD501	BZ-162, zener	QD-ZBZ162XJ
ZD502	RD5.6E(C), zener	QD-ZRD56EAA

Switch P.C. Board

Reference Designator	Description	Part No.
	switch p.c. board, complete	AP-TSW010AA
	switch p.c. board, plated and drilled	PT-SW010COX
SW601	(see chassis mounted components)	
SW602	switch, lower slide (PA/CB)	SL-600201ZA
SW603	switch, lower slide (ANL)	SL-020207ZA
SW604	switch, lower slide (NB)	SL-020207ZA
SW605	switch, lower slide (CAL/MOD)	SL-020207ZA
SW606	switch, lower slide (CAL/SWR)	SL-020207ZA

SWR P.C. Board

Reference Designator	Description	Part No.
	swr p.c. board, complete	
	swr p.c. board, plated and drilled	PT-SR003DOX
C401	.01uF, 50V, mylar	CQ-MB103KEH
C402	(not used)	
C403	.01uF, 50V, mylar	CQ-MB103KEH
C404	4700pF, 50V, mylar	CO-MB472KEH
C405	3.3uF, 25V, electrolytic	CE-AE3R3ALN
C406	4700pF, 50V, mylar	CQ-MB472KEH
C407	4700pF, 50V, mylar	CQ-MB472KEH
D401	1N60, germanium	QD-G1N60XXT
D402	1N60, germanium	QD-G1N60XXT
D403	1N60, germanium	QD-G1N60XXT
D404	1N60, germanium	QD-G1N60XXT
D405	1N60, germanium	QD-G1N60XXT
D406	1N60, germanium	QD-G1N60XXT
R401	56, 10%, ¼w, carbon film	RD-14VJ560N
R402	56, 10%, ¼w, carbon film	RD-14VJ560N
R403	(not used)	
R404	1k, 10%, ¼w, carbon film	RD-14VJ102N
R405	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
RV401	10k, potentiometer	RP-DNB10301
RV402	2k, potentiometer	RP-DNB20201
RV403	20k, potentiometer	RP-DNB20301

Chassis Mounted Components

Referenc Designator	Description	Part No.
C601	150pF, 50V, ceramic disc	CC-DB151KPM
C602	.047uF, 50V, mylar	CQ-MB473KEH
C603	4700pF, 50V, ceramic disc	CK-DB472KBM
C604	1000pF, 50V, ceramic disc	CK-DB102KBM
C605	.1uF, 50V, mylar	CQ-MB104KEH
C606	.01uF, 50V, ceramic disc	CK-EB103PEM
C607	.047uF, 50V, ceramic disc	CK-EB473ZFM
C608	.047uF, 50V, ceramic disc	CK-EB473ZFM
C609	10pF, 50V, ceramic disc	CC-DB100FPM
C610	680pF, 50V, ceramic disc	CK-DB681KBM
C611	100uF, 10V, electrolytic	CE-AC101ALN
C612	33uF, 16V, electrolytic	CE-AD330ALN
F601	fuse, 1 ampere	ZF-BQ10202U
FH601	holder, fuse	YH-F1S3001U
J601	jack, coaxial	YJ-L02S009Z
J602	jack, PA	YJ-T03S003Z
J603	jack, phone	YJ-S03S007Z
J604	jack, 5-pin, microphone	YJ-D05D002Z
J605	jack, AC	YJ-A02S001U
J606	jack, DC	YJ-B02S001U
J607	jack, remote speaker	YJ-S04S002Z
L601	rf coil	LT-DLG5004A
M601	meter, RF/SWR	ZM-J2050N03
M602	meter, S/MOD	ZM-J2050N04
PL601	lamp, pilot	ZP-A064102U
PL602	lamp, pilot	ZP-A064102U
PL603	lamp, pilot	ZP-A064102U
PL604	lamp, pilot	ZP-A064102U
PL605	lamp, pilot	ZP-A064102U
PL606	lamp, pilot	ZP-A064102U
PL607	lamp, pilot	ZP-A064102U
Q601	2SD325(E)	QT-D0325XAC
Q602	2SD325(E)	QT-D0325XAC
Q603	2SD525(Y)	QT-D0525XDT
R601	82k, 10%, ¼w, solid carbon	RC-14GK823N
R602	390, 10%, ½w, metal oxide	RG-HANJ391N
R603	390, 10%, ½w, metal oxide	RG-HANJ391N
R604	10, 10%, ½w, solid carbon	RC-12GK101N
R605	150, 10%, 1w, metal oxide	RG-1ANJ151N
RV601	10k, potentiometer (volume control)	RV-NA103A03
RV602	10k, potentiometer, (squelch control)	RV-NA103C07
RV603	10k, potentiometer (fine tune)	RV-NA103K01
RV604	50k, potentiometer (rf gain)	RV-NA503B06
RV605	5k, potentiometer (SWR with switch)	RV-NC502B04
RV606	50k, potentiometer (MOD calibrate)	RV-NA503C01
RV607	50k, potentiometer (tone control)	RV-NA503A05
RV608	10k, function switch	RW-VA100B01
SW601	switch, push	SP-01AAU04N

Reference Designator	Description	Part No.
T601	transformer, power	TP-H78U001Y
T602	transformer, power	TP-H41V001Y
CR601	CR module	CR-E471A01M
	cover, CR module	VX-521VL001

Function Switch P.C. Board

Reference Designator	Description	Part No.
	function switch p.c. board, complete	AP-RSW009AA
	function switch p.c. board, plated and drilled	PT-SW009COX
C301	2200pF, 50V, ceramic disc	CK-RB222MWM
C302	.2uF, 125V, ceramic disc	CB-DIB204MM
C303	150pF, 50V, ceramic disc	CC-DB151KOM
C304	10uF, 16V, electrolytic	CE-AD1C0ALN
C305	33uF, 10V, electrolytic	CE-AC330ALN
C306	.047uF, 50V, mylar	CQ-MB473KEH
C307	2200pF, 50V, ceramic disc	CK-RB222MWM
C308	3300pF, 50V, ceramic disc	CK-RB332MWM
C309	100uF, 6.3V, electrolytic	CE-AB101ALN
C310	10uF, 16V, electrolytic	CE-AD100ALN
C311	1uF, 50V, electrolytic	CE-AG010ALN
D301	1S1885, silicon	QD-SS1885XY
D302	1S1885, silicon	QD-SS1885XT
IC301	uPC566H	QQ-M00566AA
Q301	2SC900(F)	QT-C0900XBA
R301	1k, 10%, ¼w, carbon film	RD-14VJ102N
R302	6.8k, 10%, ¼w, carbon film	RD-14VJ682N
R303	4.7k, 10%, ¼w, carbon film	RD-14VJ472N
R303		
R304	39k, 10%, ¼w, carbon film	RD-14VJ393N
R305	2.2k, 10%, ¼w, carbon film	RD-14VJ222N
R306	150k, 10%, ¼w, carbon film	RD-14VJ154N
R307	56k, 10%, ¼w, carbon film	RD-14VJ563N
R308	560, 10%, ¼w, carbon film	RD-14VJ561N
R309	560, 10%, ¼w, carbon film	RD-14VJ103N
R310	5.6k, 10%, ¼w, carbon film	RD-14VJ562N
R311	220, 10%, ½w, metal oxide	RG-HANJ221N
R312	(not used)	
R313	220, 10%, ¼w, carbon film	RG-HANJ221N
R314	220. 10%, ¼w, carbon film	RG-HANJ221N
R315 through R329	(not used)	
R330	150, 10%, 1w, metal oxide	RG-1ANJ151N
SW301	switch, slide, rotary	SH-080302ZA

Mechanical Parts

Part No.	Description	Qty.
AM-3078##01	assembly, top cabinet	1
VB-8835B003	assembly, bottom cabinet	1
MB-885SZ001	chassis, main frame	1
MB-873SZ009	cover, top	1
MX-865SM001	panel, front	1
MS-845AX001	panel, rear	1
MU-55ISD001	bracket, clock p.c. board mounting	2
MC-722SX001	bracket, meter holding	1
ML-342SZ006	bracket, TX,RX, lamp mounting	1
MZ-322SZ002	bracket, power switch mounting	1
MZ-353SZ001	bracket, function switch mounting	1
ML-132SZ002	bracket, syn/osc p.c. board mounting	1
VS-627AS001	window, clock indicating	1
MS-317SZ006	stiffener, power transformer	2
MU-645AD001	heat sink, (power)	1
VF-131AR001	indicator, TX (red)	1
VF-131AD001	indicator, RX (orange)	1
VM-165RX001	holder, lamp (power)	5
VX-321NN001	clamp, cord	2
ZQ-A0770802	speaker	1
MZ-111SZ005	bracket, speaker holding	3
VM-174RX002	foot, rubber	4
AV-KNOB#044	knob, channel selector	1
AV-KNOB#045	knob, variable resistor	8
AV-KNOB#051	knob, power switch	1

Accessory Parts

Part No.	Description	Qty.
ZG-APZ70101	microphone	1
AC-DCO37ULA	cord, DC power with fuse	1
AC-AC008ULA	cord, AC power	1

Figure 4-15. Schematic Diagram, Model 3078