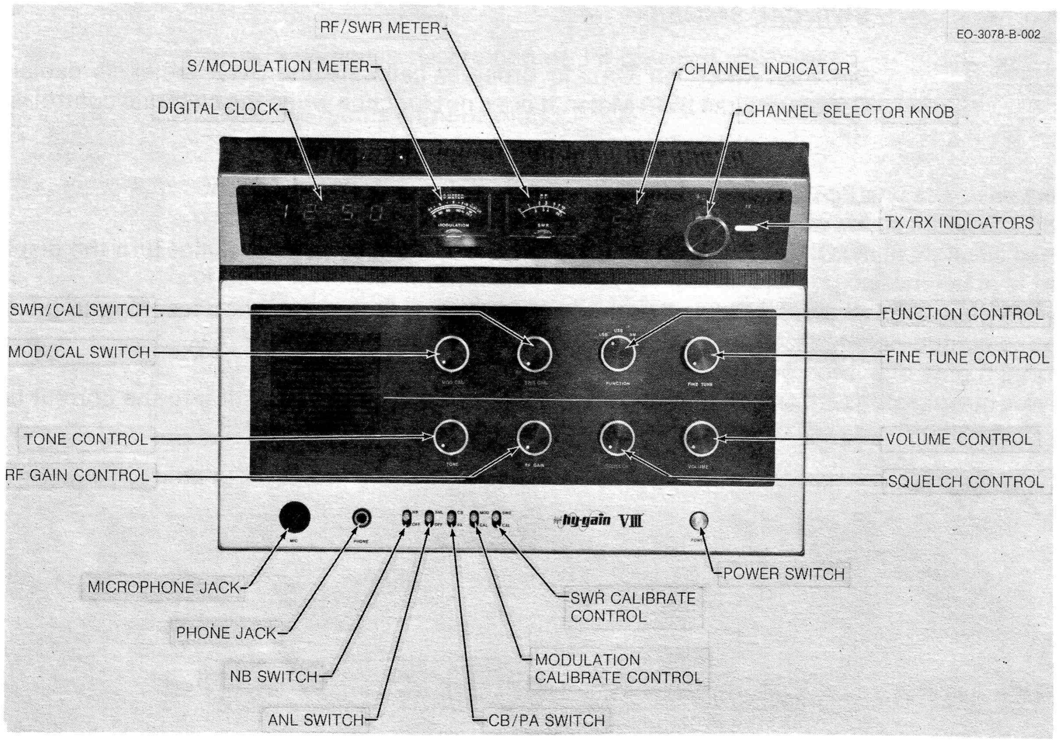


Figure 1-2

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.

$$38.240 - 11.275 = 26.965 \text{ MHz}$$

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:

$$15.690 + 11.275 = 26.965 \text{ MHz}$$

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.

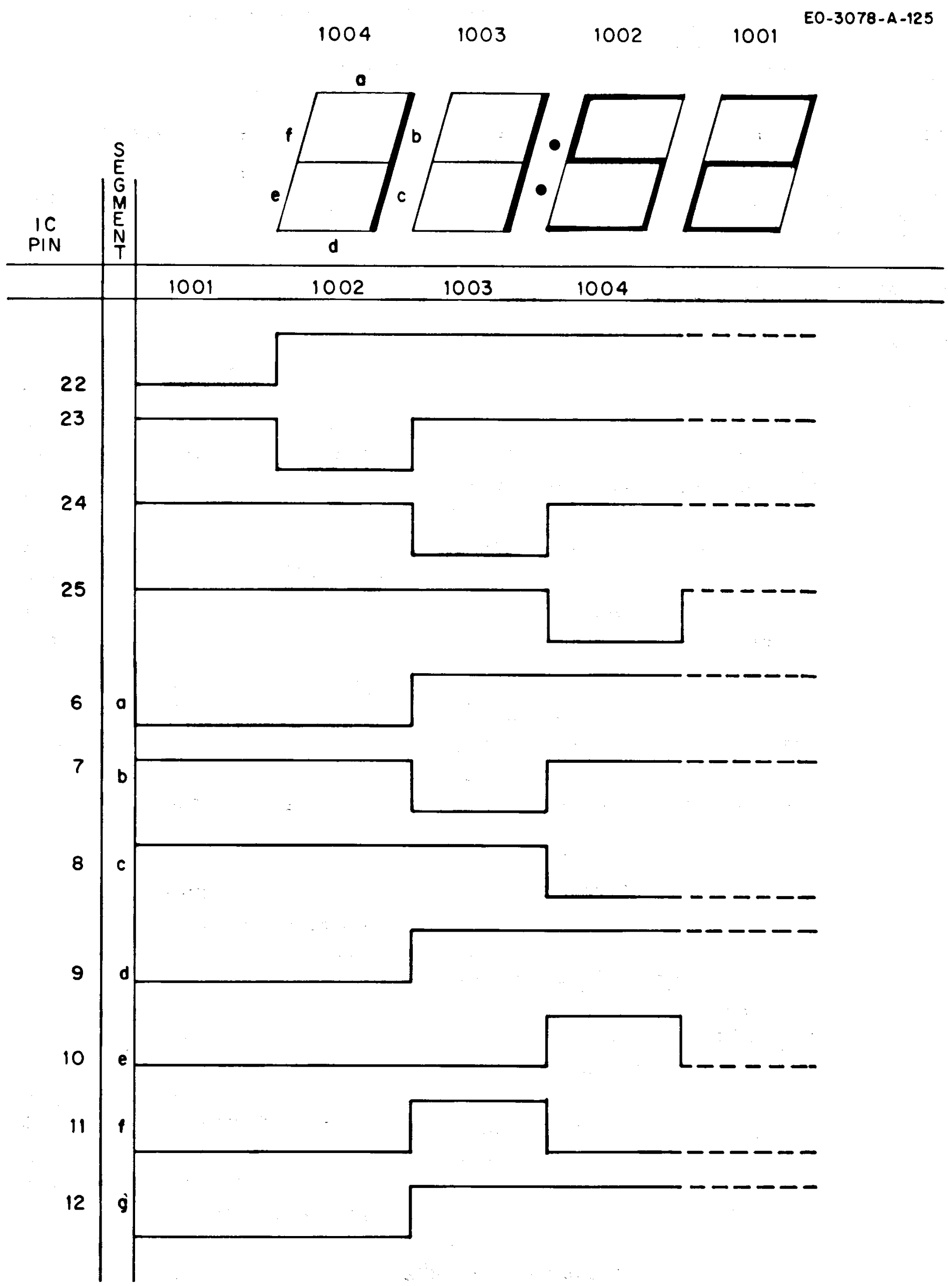


Figure 2-1

EO-3078-A-126

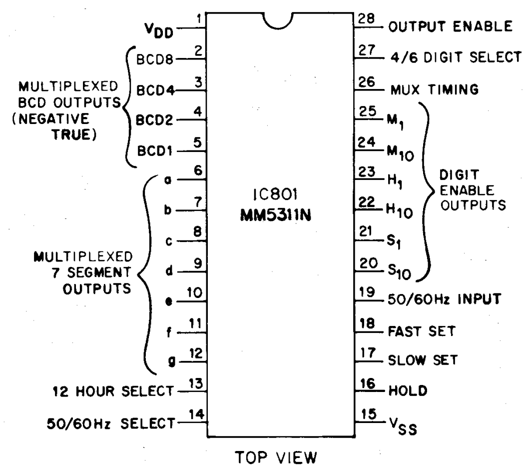


Figure 2-2

Clock Chip Diagram

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.

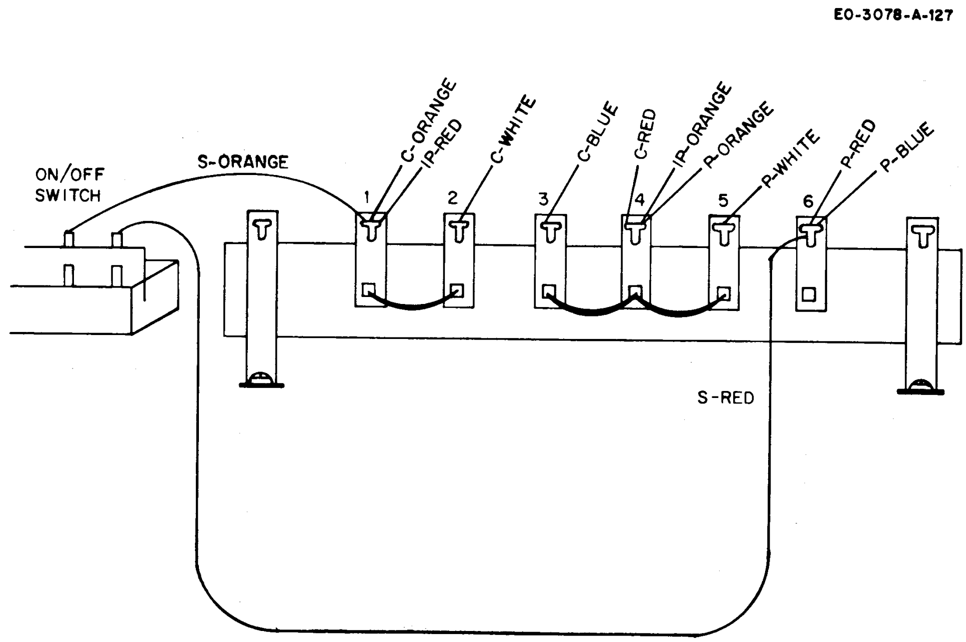
Wiring Model 3078 for 240 VAC

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.



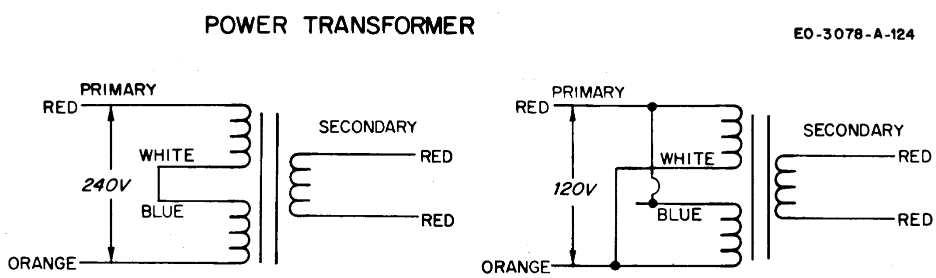
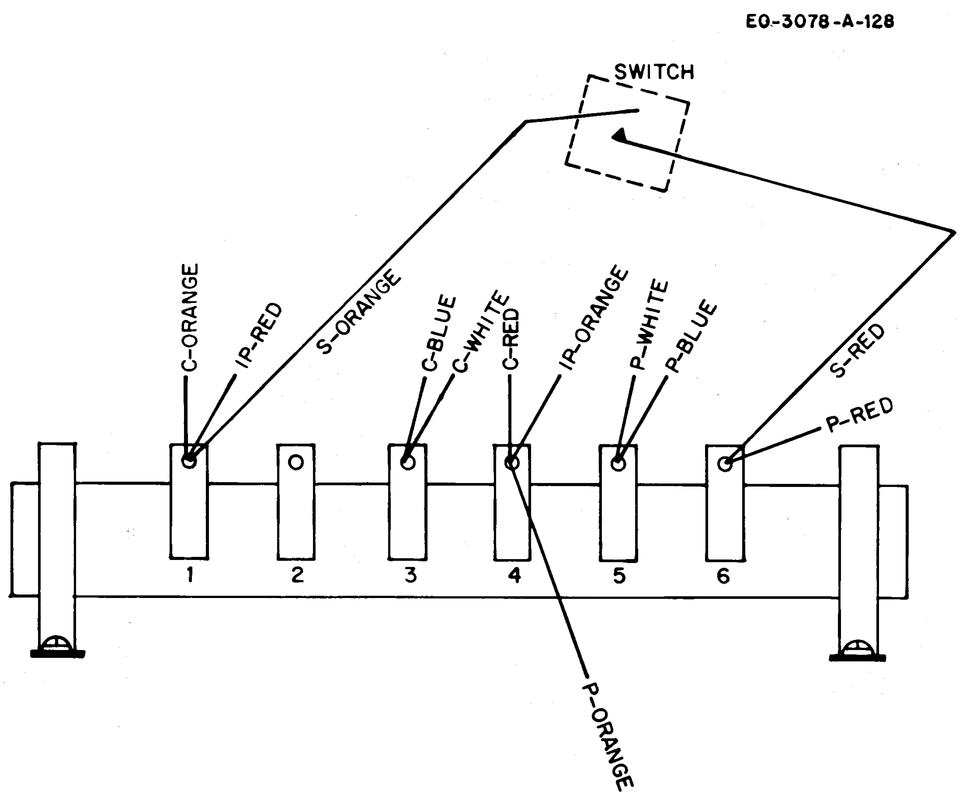


Figure 3-1

Before Wiring for 240VAC



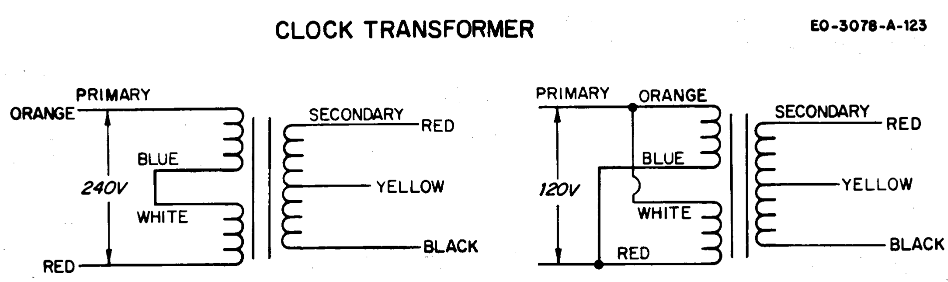


Figure 3-2

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.

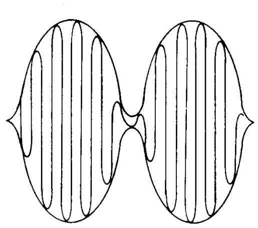


Figure A

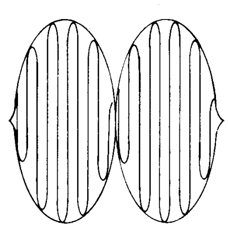


Figure B

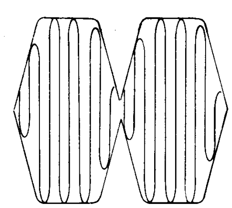


Figure C

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 40dB 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.