hy-gain® IV
by hy-gain

# MODEL 3084
# 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**

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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 IV transceiver (Model 3084). It includes an explanation of the theory of operation and alignment procedures. Revisions, addendums, and errata sheets will be published as needed. Insert them as required in the manual.

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

It is a compact base unit, completely solid-state, and highly reliable with low power consumption. Its Phase Locked Loop Frequency Synthesizer provides immediate operation on all 23 channels. A switchable automatic noise limiter reduces undesirable noises. Output jacks for an optional telephone-style handset and an external speaker are also included. The unit is used with 12 VDC (nominal), either negative or positive ground, or 120 VAC 50/60 Hz.

**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 shipping your unit contact the National Service Manager. Often a problem is field solvable with just a little extra help. This can save you lost time and shipping costs. Limit factory returns to the difficult problems.

**How to Ship Returns**

To return a unit, get a return authorization. This is important. You delay handling of the 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 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 your letter directly to it so this information is not overlooked. Wrap the unit and the envelope in heavy paper or put it in a plastic bag. If the original carton is not available, place the unit in a strong carton 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 the box 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 that same address.

It is very 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 to you.

All shipments 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

**Specifications**

*General*

| | |
|---|---|
| Channels | all 23 channels in the Citizens Band (26.965 - 27.255 MHz) |
| Antenna Impedance | 50 ohms, nominal |
| Power Requirements | 11.5 VDC - 14.5 VDC or 120 VDC 50/60 Hz |
| Compliance | type accepted under FCC Rules, Part 95 |

*Receiver Section*

| | |
|---|---|
| Circuitry | dual conversion superheterodyne with rf amplifier stage and 455 kHz ceramic filter |
| Sensitivity | 0.7 uV for 10 dB (S+N)/N ratio |
| Intermediate Frequencies | 1st IF - 10.695 MHz<br>2nd IF - 455 kHz |
| Audio Output | 3 watts, maximum |
| Current drain, receive | about 300 mA (no signal) |

*Transmitter Section*

| | |
|---|---|
| RF Power Output | 4 watts |
| Emission | AM, type 6A3 |
| Spurious Response Rejection | all harmonic and spurious suppression better than FCC requirements |
| Modulation | AM, 90% typical |
| Current Drain, Transmit | less than 1.2 amp @ 13.8 VDC |

# CHAPTER 2—THEORY OF OPERATION

**General**

The theory of operation of the Hy-Gain IV Transceiver is divided into four sections: The Phase Locked Loop Frequency Synthesizer, the Transmitter, the Receiver, and the Power Supply. This material covers the functioning of the transceiver with a minimum of technical involvement. We have not attempted to explain the engineering techniques and approaches that arrived at these circuit designs.

Refer to the block diagram, Figure 2-2, for visual reference to the theory of operation.

**Phase Locked Loop Frequency Synthesizer**

The Phase Locked Loop (PLL) frequency synthesizer generates frequencies for use in both the transmitter and receiver sections. Its output determines the channel on which the transceiver is operating. The PLL circuitry incorporates three crystal oscillators to perform its frequency generating function.

The 11.8066 MHz Oscillator, Q105, has its output tripled and serves as a prescaler for the output of the Voltage Controlled Oscillator (VCO), Q101. The Offset Oscillator, Q109, operates at a frequency of 10.695 MHz, which mixes with the VCO output to provide the transmit frequency. The 10.24 MHz Oscillator, Q117, provides a reference for the PLL and an injection frequency for the Second Receive Mixer.

The PLL circuit generates the operating frequencies needed for the transceiver in accordance with the code fed to the programmable divider, IC101, from the channel selector switch. Table A shows the following for each channel: the channel frequency, VCO frequency, Binary code and the division ratio of the programmable divider.

For example, assume that channel 1 has been selected. The channel frequency is 26.965 MHz, the VCO frequency is 37.660 MHz, and the Binary code ("N" code) is 224. The channel selector switch programs the Programmable Divider for a division ratio of 224. The 10.24 MHz reference frequency is fed to the integrated Circuit PLL Chip, IC101. It is divided by 1024 within the chip, producing a 10 kHz reference signal. The output of the VCO is mixed in the PLL Mixer, Q102, with the tripled output of Q105, producing a 2.24 MHz signal. This signal is fed to the Programmable Divider, which divides it by 224 to produce 10 kHz.

The two 10 kHz signals are phase compared in the phase detector within IC101 producing a DC voltage. This DC voltage controls the varactor diode, D102, and holds the VCO frequency at 37.660 MHz.

Assume that the channel is changed to channel 23. The channel selector switch now provides a code that will produce a division ratio of 253. At this instant the VCO frequency is at 37.660 MHz, which is mixed with the tripled output of Q105. Again, the PLL Mixer, Q102, produces an output of 2.24 MHz. The 2.24 MHz signal is divided by 253 to produce a frequency of 8.73 kHz.

The 8.73 kHz output, along with the 10 kHz obtained from the reference oscillator, is fed to the phase detector. The comparision of the two frequencies in the phase detector produces an error output which is a combined AC-DC voltage. The low pass filter removes the AC component and allows only the DC voltage to be fed to the VCO. The VCO frequency changes until the output of the programmable divider is again 10 kHz. When the two frequencies are matched at 10 kHz, the error voltage output of the phase detector is zero.

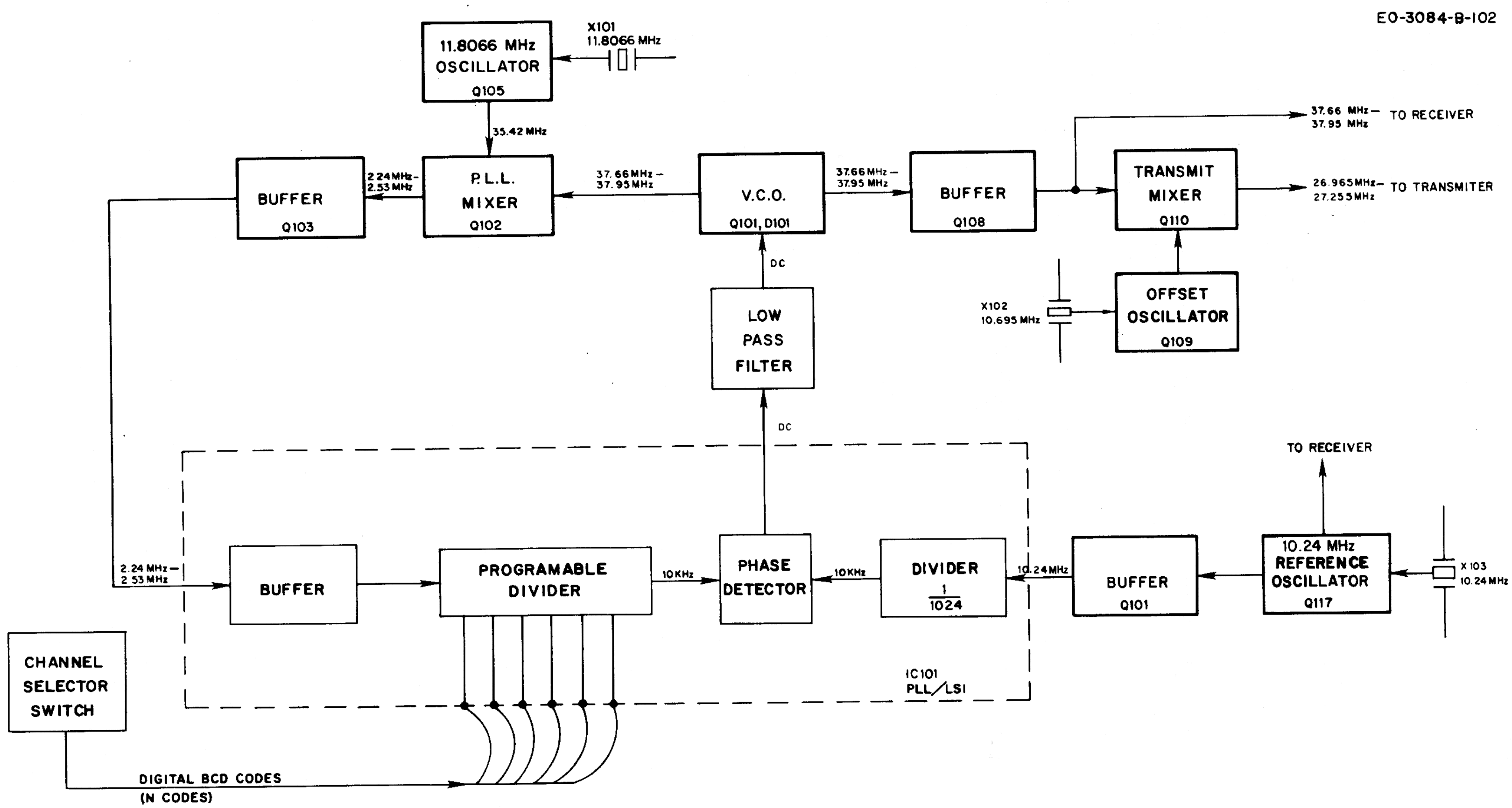



**Figure 2-1 Block Diagram of PLL Circuitry, Model 3084**

There is now a new DC voltage set up to tune the VCO frequency to 37.950 MHz. When this occurs the loop is considered locked. With the channel selector at 23, the following outputs of the PLL circuitry are produced: the 37.950 MHz VCO output is fed to the First Receiver Mixer, and in the transmit mode, is mixed with the 10.695 MHz output of Q109 to produce a transmit frequency of 27.255 MHz.

**Transmitter**

The operating channel is determined by the PLL frequency synthesizer. The buffered VCO frequency is mixed in Q110 with the 10.695 MHz Offset Oscillator, Q109, output to yield the transmit frequency. The transmit frequency from Q110 passes through the filter circuit of L103, L104, and T102 and is applied to the Pre-driver, Q111. The filter circuit partially removes spurious signals from the transmit frequency.

The Pre-driver, Q111, and the Driver, Q112, form two stages of amplification leading to the final stage. The filter circuit of T103 follows Q111, and L106 follows Q112. These two circuits filter out the remaining spurious signals from the transmit frequency.

From the Driver the signal is applied to the final stage, the RF Power Amplifier, Q113. This is a power amplifier that raises the transmit signal to an output of four watts. Its output is applied to a filter, consisting of L109, C152, L110 and C1, and then to the antenna jack.

The transmit signal is modulated in the following manner: microphone output is applied to the Audio Amplifier, IC102. The output is applied to the collectors of Q112 and Q113 through the audio output transformer, T110. Control voltages for the transmit audio (ALC), Q112, and the Range Boost, Q121, come from detector diode D111. The transmit audio ALC boosts, or lowers, the amplifier gain in response to line voltage fluctuations. This insures full modulation of the carrier despite any changes in line voltage. The Range Boost reduces AF peaks so that a higher average AF level is supplied to the Audio Amplifier. This gives the desired high average modulation without overmodulation peaks.

**Receiver**

The receiver is a dual-conversion superheterodyne, receiving AM signals for 26.965 MHz to 27.255 MHz. The operating channel is determined by the PLL frequency synthesizer, which provides the local oscillator frequency to the First Mixer. A variable squelch circuit is included to quiet the receiver between transmissions.

In the receive mode, 13.8 VDC is supplied to IC102, Q114, Q115, Q118, Q119 and to Q106 (the AVR). The AVR supplies regulated voltage to the synthesizer stages and to the reference Oscillator, Q117. A bias voltage is also applied to the base of the Transmit Switch keeping it open, so that the transceiver circuits remain in receive.

Radio signals are received by the antenna and enter the radio at the antenna jack. The filter formed by L109, L110, C152, and C1 matches the antenna impedance to the RF Amplifier. Signals in the 26.965 MHz—27.255 MHz range are filtered out and amplified by the RF Amplifier, Q114, and its tuned circuit C154/T105. D107 is a signal overload protector.

The output of the RF Amplifier and the buffered VCO signal (which in this case could be called the "first local oscillator frequency") are applied to the First Receiver Mixer and produce an output of 10.695 MHz which is the first IF.

The first IF passes through tuned circuits L112 and T106. It is then applied to the Second Receive Mixer, Q116, along with 10.240 MHz from the Reference Oscillator, Q117. The two signals are mixed in the Second Receive Mixer and produce an output of 455 kHz, which is the second IF.

The second IF passes through the Ceramic Filter, CF101, and is amplified by Q118 and Q119. The amplified signal is then fed to the Detector, D110. The Detector establishes an automatic gain control (AGC) voltage and recovers the audio from the modulated signal. The AGC voltage maintains the output volume of the receiver constant under variations in input signal strength and also controls the Squelch Switch, Q120.

The squelch functions in the following manner: in the receive mode, a bias voltage from Q106 is applied to the base of Q120, as determined by RV101. In the absence of a signal, the base of Q120 is positively biased and is on. This biases the squelch transistor inside IC102, which turns off the Audio Amplifier and squelches the receiver. When a signal is received, the AGC voltage developed by D110 biases Q120 off. This biases the squelch transistor inside IC102 such that the audio amplifier is turned on and the signal is heard.

The recovered audio from the Detector passes through a series Automatic Noise Limiter (ANL), D108. The output of the ANL goes through the volume control, VR1, and is RC coupled to the Audio Amplifier, IC102. The amplified af output from IC102 passes through the audio transformer, T110, and is applied to the speaker jacks and the speaker.

Switching to the transmit mode is accomplished in the following manner: with the PTT switch closed, the base of the DC Switch, Q107, is grounded. This establishes forward bias which causes Q107 to conduct. Regulated voltage from the Automatic Voltage Regulator (AVR), Q106, is then supplied through Q107 to Q109 and Q110. RF is now applied to Q111, Q112 and Q113.

**Power Supply**

This is a series-regulated power supply circuit employing a Darlington-connected pair of transistors as the pass element. The bridge rectifier of D1 - D4 supplies 22.1 VDC to the high gain pass element of Q1 and Q3. Zener diode ZD2 provides a voltage reference for Q2. Q2 is in turn a current regulator for the pass element. Q2's base is biased by the output of Q3. This feedback loop enables the output voltage of Q3 to be held at a constant 13.8 VDC, when RV1 is set correctly.

**RF Power and SWR Meter Circuits**

A fraction of the RF power output is applied to Diode, D501, through the inductive/capacitive coupling circuit provided on the P.C. board, PTSR002BOX. This signal is rectified into a DC voltage. The DC voltage is then applied to the meter terminals through the Meter Adjustment Trimmer, RV501, if the Meter Mode Switch, S4, is placed in the CB position. In this way the RF output will be indicated on the meter. When S3 is placed in the CAL position, the DC voltage is switched to the SWR meter calibrating circuit, consisting of R504 on PTSR002BOX and the cal. variable resistor, VR-4, on the front panel. Placing the meter pointer in the SET position on the meter scale by adjusting VR-4 is to determine the standard reference level in terms of forward traveling RF power. When S4 is placed in the SWR position, another DC voltage is produced by rectifing the antenna reflection energy applied to Diode D502. The inductive/capacitive coupling circuit is switched to the SWR indication circuit, consisting of RV502, VR-4, and the meter, thus giving the SWR of the antenna system.

# N CODE-FREQUENCY CORRELATION CHART

| Channel NO. | Channel Frequency | "N" Code | V.C.O. Frequency | Channel Switch Output (PLL Inputs) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | A | B | C | D | A |
| 1 | 26.965 MHz | 224 | 37.660 MHz | 0 | 0 | 0 | 0 | 0 |
| 2 | 26.975 MHz | 225 | 37.670 MHz | 1 | 0 | 0 | 0 | 0 |
| 3 | 26.985 MHz | 226 | 37.680 MHz | 0 | 1 | 0 | 0 | 0 |
| 4 | 27.005 MHz | 228 | 37.700 MHz | 0 | 0 | 1 | 0 | 0 |
| 5 | 27.015 MHz | 229 | 37.710 MHz | 1 | 0 | 1 | 0 | 0 |
| 6 | 27.025 MHz | 230 | 37.720 MHz | 0 | 1 | 1 | 0 | 0 |
| 7 | 27.035 MHz | 231 | 37.730 MHz | 1 | 1 | 1 | 0 | 0 |
| 8 | 27.055 MHz | 233 | 37.750 MHz | 1 | 0 | 0 | 1 | 0 |
| 9 | 27.065 MHz | 234 | 37.760 MHz | 0 | 1 | 0 | 1 | 0 |
| 10 | 27.075 MHz | 235 | 37.770 MHz | 1 | 1 | 0 | 1 | 0 |
| 11 | 27.085 MHz | 236 | 37.780 MHz | 0 | 0 | 1 | 1 | 0 |
| 12 | 27.105 MHz | 238 | 37.800 MHz | 0 | 1 | 1 | 1 | 0 |
| 13 | 27.115 MHz | 239 | 37.810 MHz | 1 | 1 | 1 | 1 | 0 |
| 14 | 27.125 MHz | 240 | 37.820 MHz | 0 | 0 | 0 | 0 | 1 |
| 15 | 27.135 MHz | 241 | 37.830 MHz | 1 | 0 | 0 | 0 | 1 |
| 16 | 27.155 MHz | 243 | 37.850 MHz | 1 | 1 | 0 | 0 | 1 |
| 17 | 27.165 MHz | 244 | 37.860 MHz | 0 | 0 | 1 | 0 | 1 |
| 18 | 27.175 MHz | 245 | 37.870 MHz | 1 | 0 | 1 | 0 | 1 |
| 19 | 27.185 MHz | 246 | 37.880 MHz | 0 | 1 | 1 | 0 | 1 |
| 20 | 27.205 MHz | 248 | 37.900 MHz | 0 | 0 | 0 | 1 | 1 |
| 21 | 27.215 MHz | 249 | 37.910 MHz | 1 | 0 | 0 | 1 | 1 |
| 22 | 27.225 MHz | 250 | 37.920 MHz | 0 | 1 | 0 | 1 | 1 |
| 23 | 27.255 MHz | 253 | 37.950 MHz | 1 | 0 | 1 | 1 | 1 |

**Table A**

# CHAPTER 3—ALIGNMENT

**General**

These procedures must be followed to align the Hy-Gain 3084 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.

These procedures are divided into two main sections: Transmitter Alignment and Receiver Alignment. See *Equipment* below for a complete list of recommended equipment.

These procedures assume that proper voltages are present at all points in the unit, if not, troubleshoot before continuing.

**NOTE:** The ferrite cores in the tuned coils are easily chipped or broken. Use care when inserting an alignment tool in the coil: insert it straight into the core.

**Recommended Equipment**

The following items of equipment are recommended for use in aligning the Hy-Gain 3084 transceiver.

1. Audio Signal Generator, 1 kHz
2. AC VTVM, 1 mV Measurable
3. DC Ampere Meter, 2A
4. Variable Regulated Power Supply, DC 8-15V, 2A or higher
5. Frequency Counter, 0 to 40 MHz, high input impedance type
6. VTVM with RF probe
7. Oscilloscope, 30 MHz, high input impedance
8. RF wattmeter and 50 ohm, 5W dummy load
9. Standard RF signal generator, 27 MHz CB band
10. Speaker dummy resistor, 8 ohm, 5W
11. VOM 20k ohm/V

All test equipment should be properly calibrated.

**NOTE:** Test voltage is DC 13.8V unless otherwise specified.

**Wiring Model 3084 for 240 VAC**

**WARNING:** This unit contains voltages sufficient to kill. Ensure that power has been disconnected before attempting this procedure.

**NOTE:** See Figures 3-1 and 3-2 for wiring changes.

1. Remove the top and bottom covers by removing the fastening screws.
2. Desolder the blue lead from the fuse holder and the white lead from the terminal board.
3. Solder the white and blue leads together.
4. Insulate the solder connection.
5. Replace the plug on the AC power cord with a plug rated for 240 VAC.
6. Reassemble the unit.

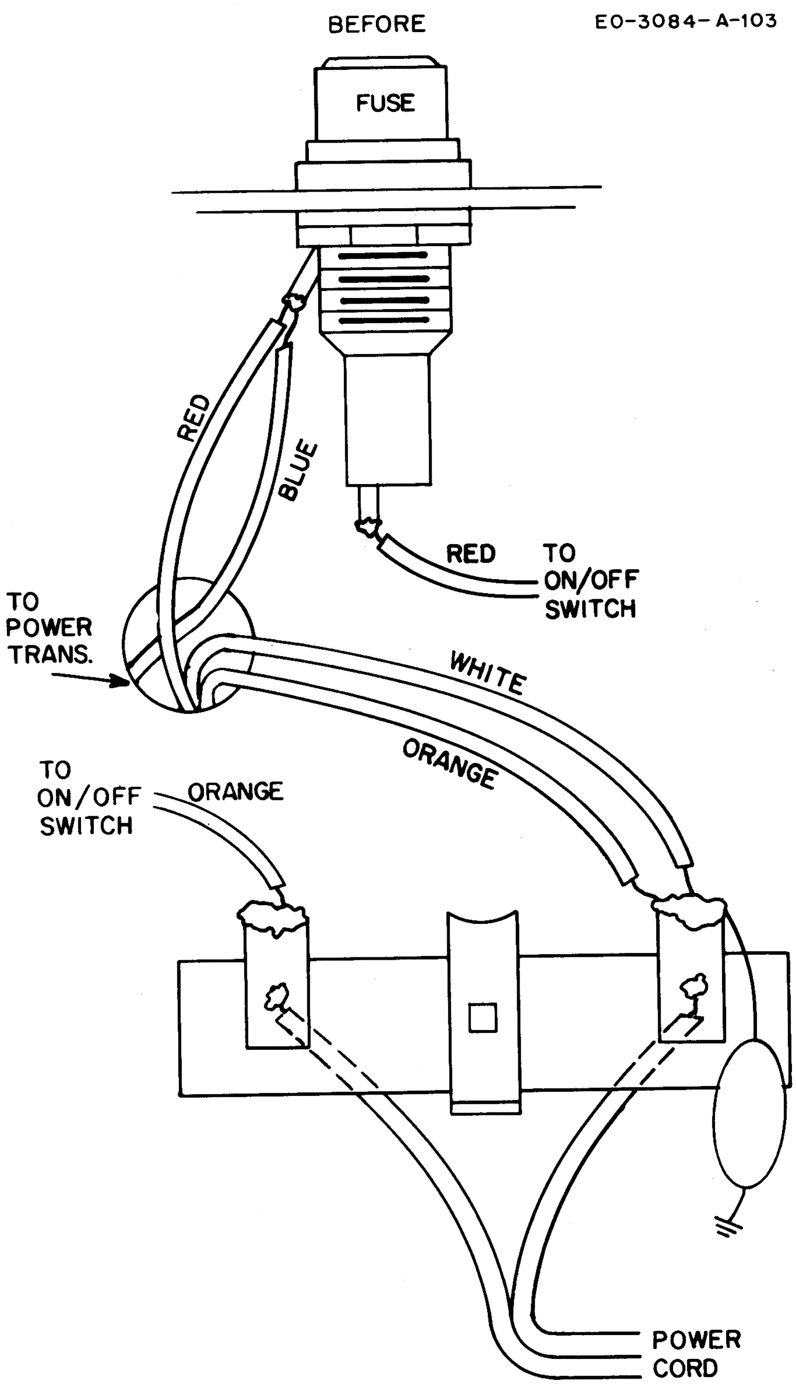



**Figure 3-1. Before Wiring Model 3084 for 240 VAC**

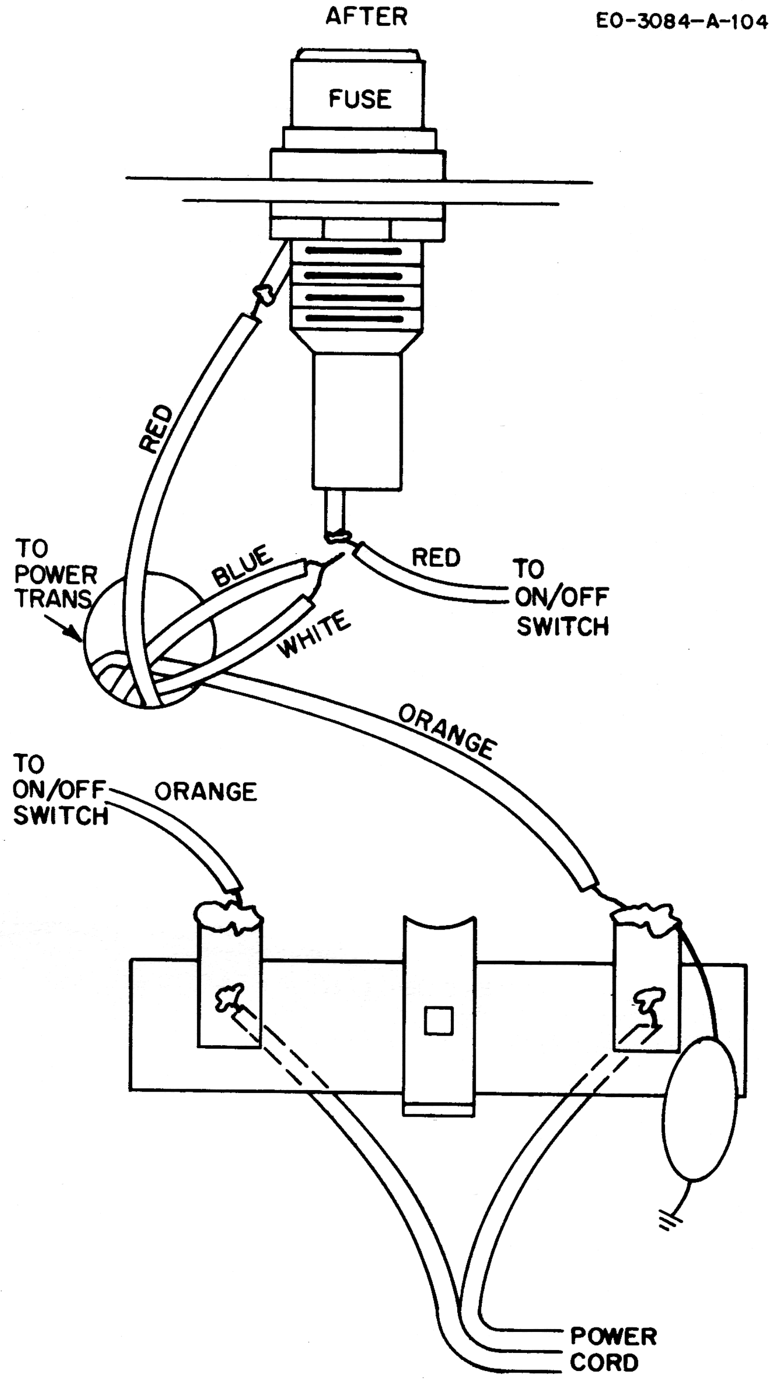



**Figure 3-2. After Wiring Model 3084 for 240 VAC**

## Transmitter Alignment Procedure

### *Equipment Set-up*

Refer to Figure 3-6 for the location of components to be adjusted for transmitter alignment.

Connect test equipment as shown below.

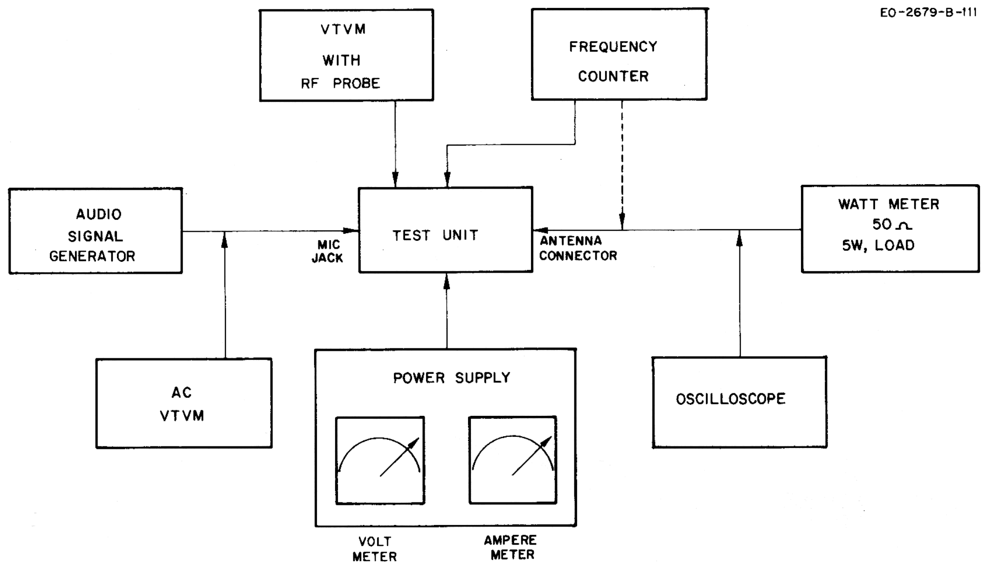



**Figure 3-3. Equipment Set-Up for Transmitter Alignment**

**NOTE:** See Figure 3-4 for connection of the frequency counter and the dummy load.

### *Pre-Alignment Frequency Check*

Before alignment, check the operating frequencies at the following points using the frequency counter through a 1000 pF coupling capacitor connected in series with the counter input probe.

Pin 3 of IC101, reference input, check to read 10.24 MHz in accuracy.

Q108 base, transceiver on Ch 1, check to read 37.66 MHz in accuracy.

### *VCO Alignment*

1. Connect VOM (DC 10V ranged) across C135 and check to read 5.0 - 5.5VDC.
2. Place the channel selector in the channel 1 position.
3. Connect the VOM between ground and R114 (TP-8 side).
4. Adjust T101 to obtain 1.5V ± .1V.
5. Place the channel selector in the open channel position. A voltage reading of 5.1 to 5.4V is obtained.
6. Place the channel selector in the channel 23 position and read the value on the meter. It should be 2.7 ± 0.6V.

### *RF Output Adjustment*

1. Adjust the power supply voltage to 8.0 volts.
2. Connect the VTVM RF probe between the base of Q111 and ground.
3. Set the transceiver channel selector to channel 13. Perform the following procedure on channel 13.

4. Key the transmitter.
5. Adjust the slugs of L103, L104 and T102 for a maximum reading on the VTVM.
6. Connect the VTVM RF probe between the base of Q112 and ground.
7. Adjust the slug of T103 for a maximum reading on the VTVM.
8. Adjust L109, L110 for maximum RF power output as indicated on the wattmeter.
9. Raise the power supply voltage to 13.8V.
10. Repeat steps 2 thru 8.
11. Repeat step 8 until no further improvement is noted.
12. Back off L110 (counterclockwise) for a reading of 4.0 watts RF power output.
13. Readjust L109 for maximum power out.
14. Repeat steps 12 and 13 until the maximum power output is 4.0 watts with L109 peaked for maximum output.

Total transceiver current at this setting should not exceed 1.35A.

### *Transmitter Frequency Check*

1. Turn the transceiver off.
2. Connect the dummy load and frequency counter of the antenna jack as shown below:

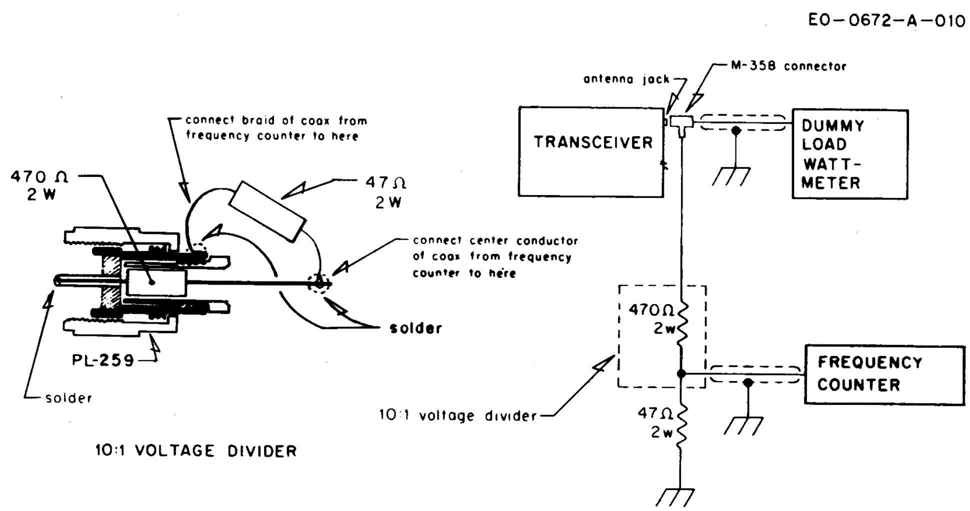



**Figure 3-4. Connection of Frequency Counter and Dummy Load**

3. Key the transmitter with the microphone PTT button.
4. Check the frequency of each channel with the chart below, frequencies should be within 800 Hz at 25°C. (Room Temperature).

**Channel Frequency**

| Channel | MHz | Channel | MHz |
|---|---|---|---|
| 1 | 26.965 | 13 | 27.115 |
| 2 | 26.975 | 14 | 27.125 |
| 3 | 26.985 | 15 | 27.135 |
| 4 | 27.005 | 16 | 27.155 |
| 5 | 27.015 | 17 | 27.165 |
| 6 | 27.025 | 18 | 27.175 |
| 7 | 27.035 | 19 | 27.185 |
| 8 | 27.055 | 20 | 27.205 |
| 9 | 27.065 | 21 | 27.215 |
| 10 | 27.075 | 22 | 27.225 |
| 11 | 27.085 | 23 | 27.255 |
| 12 | 27.105 | | |

***Modulation Sensitivity Alignment***

1. Place the unit in the transmit mode and apply a 20 mV, 1 kHz signal to wire wrap pin 22 on the radio PC board.
2. Adjust RV-102 to obtain 90% modulation as observed on the oscilloscope.
3. Decrease the signal input to 6 mV. Modulation should not fall below 80%.

**Receiver Alignment Procedure**

***Equipment Set-Up***

Refer to Figure 3-7 for the location of components to be adjusted for receiver alignment.

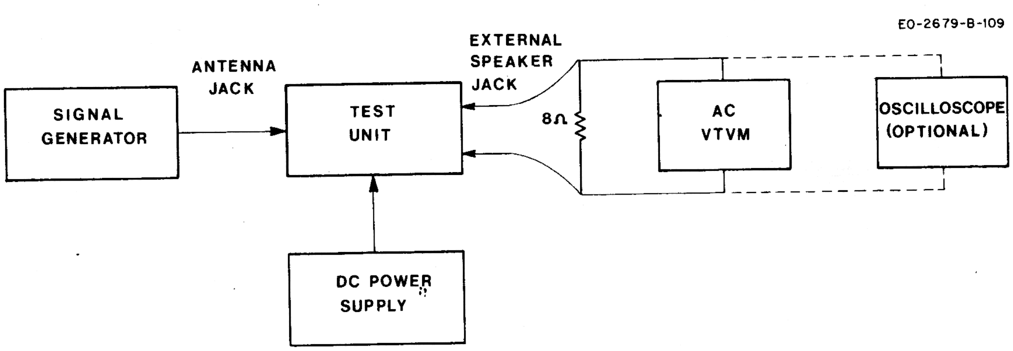



**Figure 3-5. Equipment Set-Up for Receiver Alignment**

***Receiver Alignment***

1. Set the Signal Generator to 27.115 MHz, 30% 1 kHz, modulation and set the transceiver to channel 13.

**NOTE:** This alignment should be performed with low generator output levels to avoid inaccurate alignment due to AGC action.

2. Adjust T104, T105, T112, T106, T107, T108 and T109 for maximum audio output as indicated on the AC VTVM (or oscilloscope if used).

### *Tight Squelch Adjustment*

1. Set the signal generator to provide an RF input signal of 100 uV, (1kHz, 30% mod.).
2. Rotate the squelch control fully clockwise.
3. Adjust RV-101 so that the squelch just breaks with the 100 uV signal input.

## Meter Calibration

### *RF Power Meter*

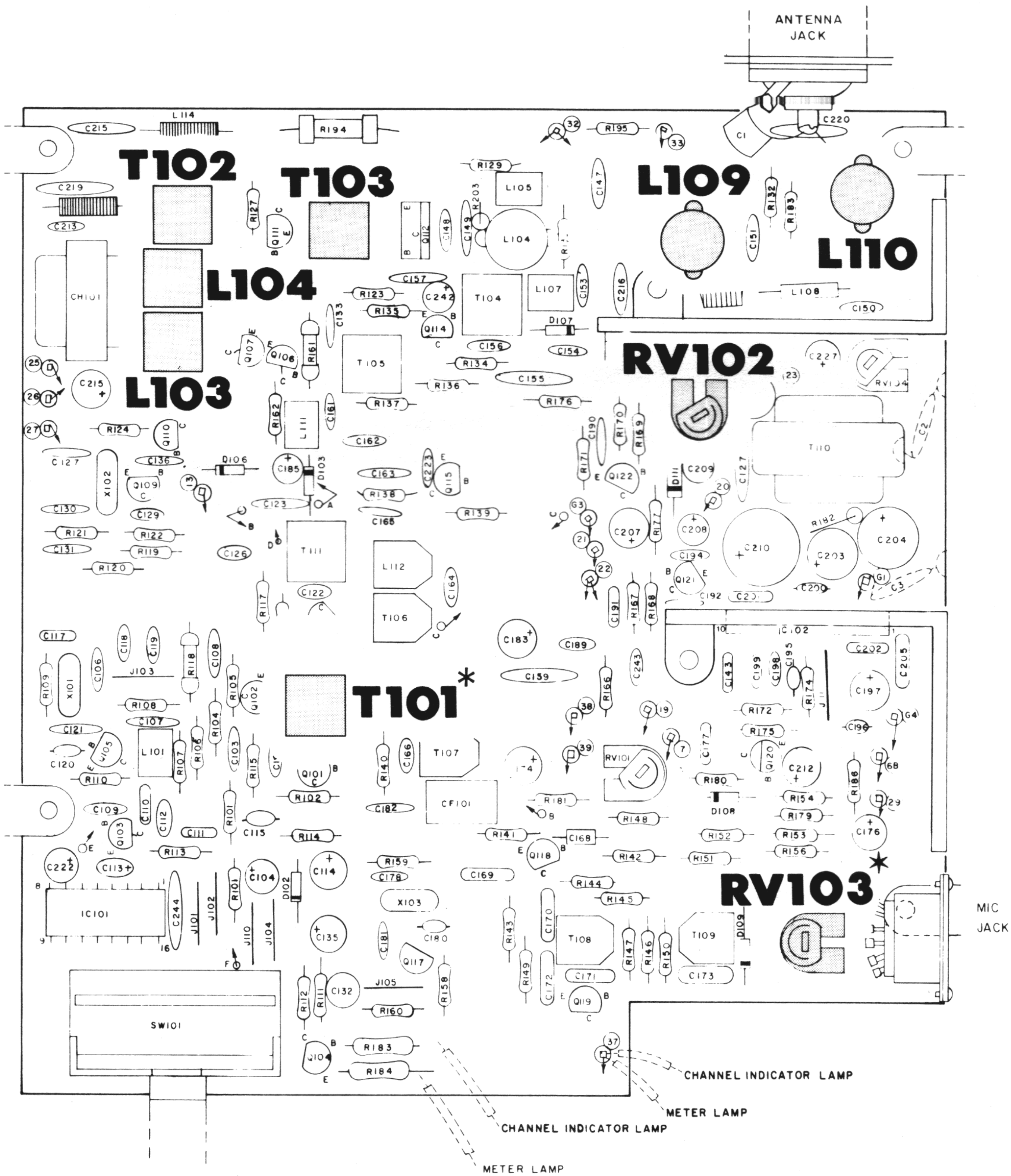
Adjust RV501 until the RF/SWR meter reads the same as the wattmeter.

### *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 RV502 until the meter indicates an SWR of "2".

### *S-Meter Adjustment*

1. Apply a 10 uV signal to the antenna connector and adjust RV103 so that the S-meter reads between S5 and S6.




**NOTE:**

1. T101 is adjusted for VCO alignment only.
2. RV103 is adjusted for S-meter adjustment only.

**Figure 3-6. Components Adjusted for Transmitter Alignment**

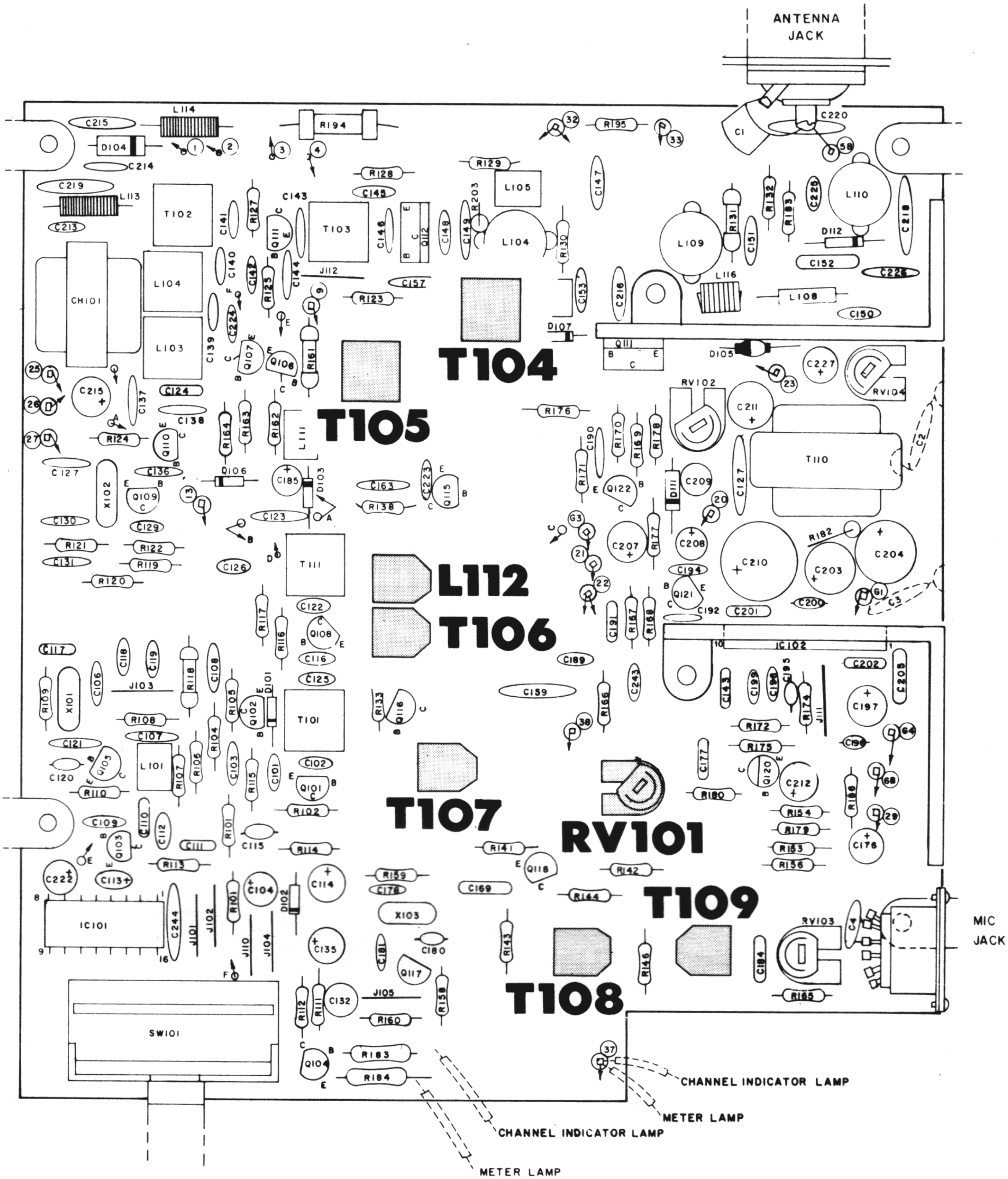



**Figure 3-7. Components Adjusted for Receiver Alignment**

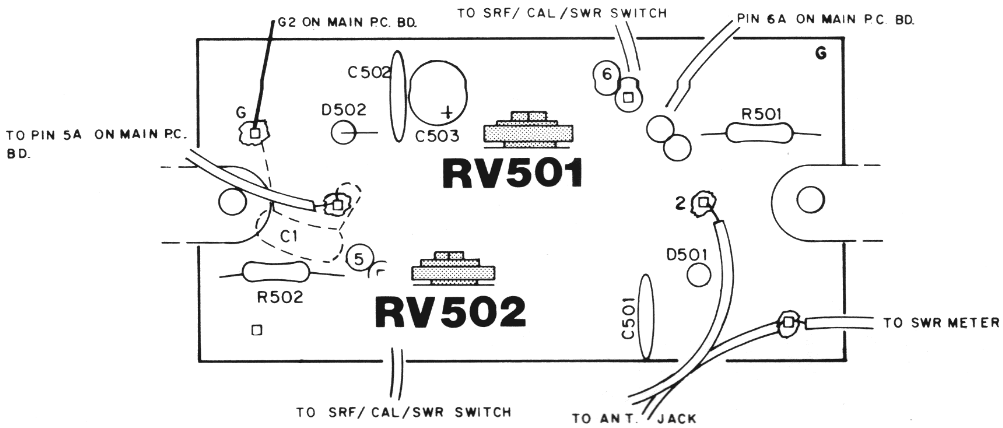



**Figure 3-8. Components Adjusted for Meter Alignment**

# CHAPTER 4—CHARTS AND DRAWINGS

# VOLTAGE MEASUREMENT CHART

## Main P.C. Board

| Reference Designator | Mode | E | B | C |
|---|---|---|---|---|
| Q101 | RX | 0V | 0V | 2.5V |
| | TX | 0V | 0V | 0V |
| Q102 | RX | 0V | .4V | 1.9V |
| | TX | 0V | 0V | 0V |
| Q103 | RX | 0V | .63V | 2.25V |
| | TX | 0V | .63V | 2.25V |
| Q104 | RX | 0V | .6V | 2.45V |
| | TX | 0V | .6V | 2.45V |
| Q105 | RX | 2.4V | 1.5V | 3.8V |
| | TX | 2.4V | 1.5V | 3.8V |
| Q106 | RX | 8.9V | 9.6V | 12.6V |
| | TX | 8.9V | 9.6V | 12.6V |
| Q107 | RX | 8.2V | 8.9V | 0V |
| | TX | 8.2V | 8.9V | 8.9V |
| Q108 | RX | 0V | .75V | 4.4V |
| | TX | 0V | .75V | 4.4V |
| Q109 | RX | 0V | 0V | 0V |
| | TX | 2.6V | 2V | 4.9V |
| Q110 | RX | 0V | 0V | 0V |
| | TX | 2V | 2.5V | 8.9V |
| Q111 | RX | 1.62V | 2.25V | 13.8V |
| | TX | 1.05V | 1.5V | 13.8V |
| Q112 | RX | 0V | 0V | 13.2V |
| | TX | 0V | 0V | 10.8V |
| Q113 | RX | 0V | 0V | 13.5V |
| | TX | 0V | 0V | 1.18V |
| Q114 | RX | 1.65V | 2.00V | 12.7V |
| | TX | .25V | .31V | 12.7V |
| Q115 | RX | 1.65V | 2.00V | 12.0V |
| | TX | .05V | .3V | 12.0V |
| Q116 | RX | 0V | .45V | 0V |
| | TX | 0V | .45V | 0V |
| Q117 | RX | 1.95V | 1.40V | 3.6V |
| | TX | 1.95V | 1.40V | 3.6V |
| Q118 | RX | 1 | 1.85V | 12V |
| | TX | .05V | .3V | 12V |
| Q119 | RX | .6V | 1.3V | 12.8V |
| | TX | .05V | .2V | 12.8V |
| Q120 | unsquelched | 0V | 0V | 6.4V |
| | squelched | 0V | .65V | 0V |
| Q121 | unsquelched | 0V | 0V | 0V |
| | squelched | 0V | 0V | 0V |
| Q122 | unsquelched | 0V | .58V | 0V |
| | squelched | 0V | .58V | 0V |

**IC102**

| Pin No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Voltage | 7V | 0V | 1.05V | 6.5V | 5.6V | 6.8V | .97V | 8.3V | 13.2V | 13.5V |

**Power Supply P.C. Board**

| Reference Designator | E | B | C |
|---|---|---|---|
| Q1 | 14.2V | 14.9V | 22.3V |
| Q2 | 5.9V | 6.6V | 14.9V |
| Q3 | 13.5V | 14.2V | 23.5V |

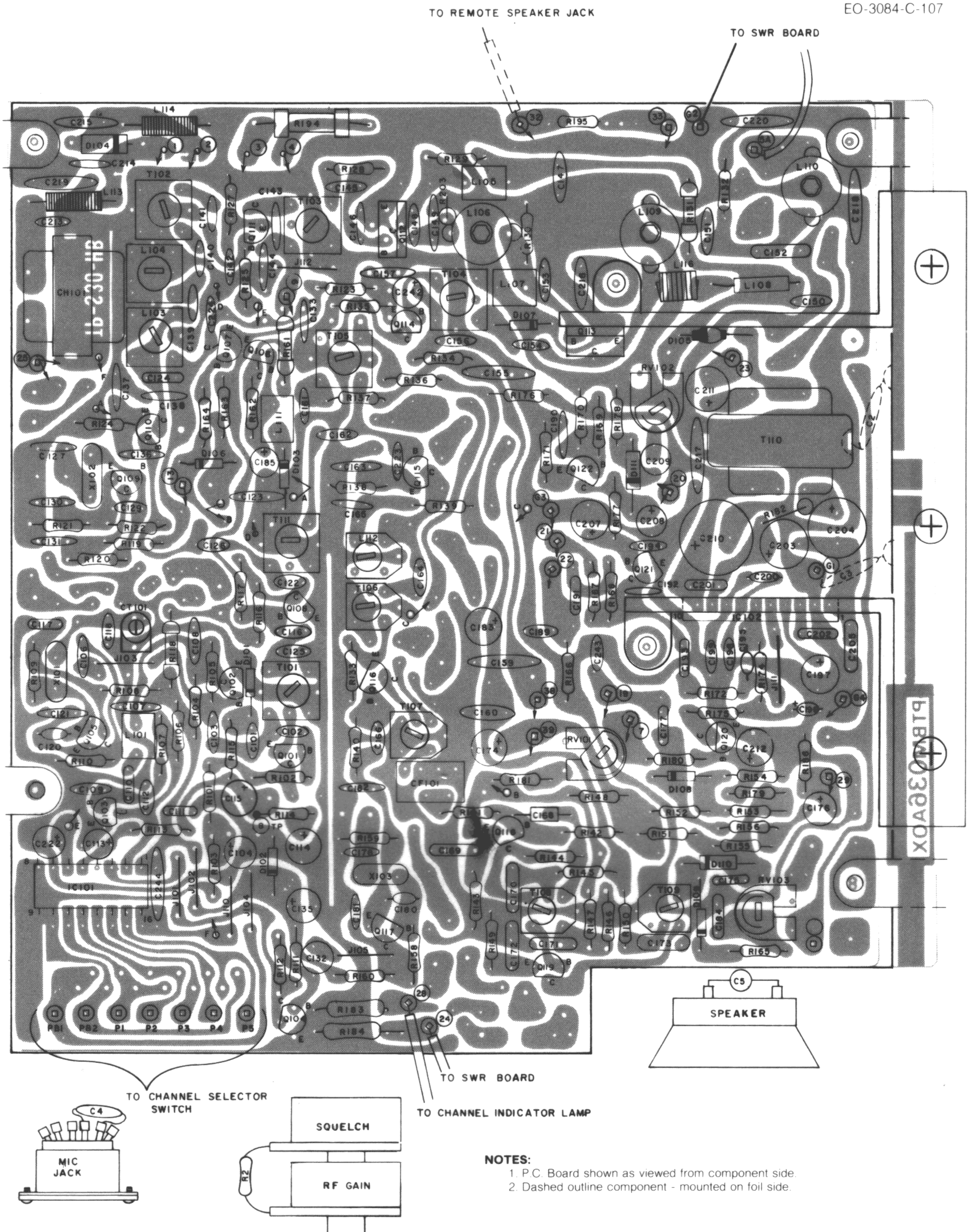
**SWR P.C. Board**

| Pin No. | 5 | 6 | 7 |
|---|---|---|---|
| Voltage | .10V | .98V | 2.8V |

**NOTES:**

1. All voltage measurements are taken with the internal power supply set at exactly 13.8VDC.
2. All SWR P.C. Board measurements are taken in the transmit mode with a 50 ohm dummy load.

## Component Outline, Main P.C. Board, Model 3084




**NOTES:**
1. P.C. Board shown as viewed from component side.
2. Dashed outline component - mounted on foil side.

**Figure 4-1. Component Outline Main P.C. Board**