hy-range IV

by hy-gain

MODEL 673B
CITIZENS TWO-WAY RADIO
base station

Manufactured and Distributed by
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VOLUME
OFF
SQUELCH
RF GAIN
MIC
FINE TUNE
OFF
ON
ANL
hy-range IV
BY hy-gain
PHONE

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CHAPTER 1 — GENERAL INFORMATION

Introduction

This service manual contains all the information needed to service and repair the Hy-Gain, Hy-Range IV (Model 673B) transceiver. It does not cover models 673 and 673A; they are covered in a separate manual. This manual 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.

The Hy-Range IV is a full 23-channel 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. Its crystal matrix frequency synthesizer provides immediate operating on all 23 channels. Its features includes a fine tune control, a switchable automatic noise limiter (ANL), an rf gain control, and an output jack for the optional telephone-style handset. Use the unit with standard household power (either 120 VAC, or 240 VAC with minor wiring).

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 Avenue
Lincoln, Nebraska 68504
attn: National Service Manager

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

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 to have him expedite the matter.

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

Units with unauthorized field modifications cannot be accepted for repair.

How to Ship Returns

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

Then 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 that we do not overlook this important 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 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 to us must be sent PREPAID. We ***do not accept*** collect shipments. After the unit has been repaired, we will send the repaired unit 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. Otherwise, these items become the property of Hy-Gain 60 days after refusal or return and will be sold for payment of charges due.

Purchase of Parts

If you need a part not stocked at your Hy-Gain Service Center, it can be purchased from the Warranty Service Department. When ordering, please supply the following information:

1. model number of the unit
2. serial number of the unit
3. description of the part
4. part number

Specifications

General

Channels .... all 23 channels in the Citizens Band (26.965 MHz - 27.255 MHz)
Antenna impedance .... 50 ohms, nominal
Dimensions (HWD) .... 4-7/16" x 12¼" x 10 ⅝"
Net weight .... 10 lbs. 0 oz.
Shipping weight .... 11 lbs. 14 oz.
Power requirement .... 120 VAC, 50/60 Hz, or 240 VAC, 50/60 Hz with modification
Compliance .... Type Accepted under FCC Rules, Part 95
Type Approved, under DOC RSS-136 (Canada)

Receiver section

Circuitry .... dual conversion superheterodyne with rf amplifier stage and 455 kHz ceramic filter
Sensitivity .... 0.7 *u*V for 10 dB (S + N)/N ratio
Intermediate frequencies .... 1st IF — 11.275 MHz
2nd IF — 455 kHz
Audio output .... 3 watts, maximum
Current drain, receive .... about 14 VA (no signal)

Transmitter section

RF power output .... 4 watts
Emission .... AM, type 8A3
Spurious response rejection .... all harmonic and spurious suppression better than FCC and DOC requirements
Modulation .... AM, 90% typical
Current drain, transmit .... less than 45 watts

CHAPTER 2 — THEORY OF OPERATION

General

The theory of operation of the Hy-Range IV is divided into four sections: the Crystal Matrix Frequency Synthesizer, the Receiver, the Transmitter, and the Power Supply. 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 attemped to explain the engineering techniques and approaches that arrived at these circuit designs.

Crystal Matrix Frequency Synthesizer

The Crystal Matrix Frequency Synthesizer is an heterodyne oscillator that generates synthesizer frequencies for use in both the transmitter and receiver sections. Its output determines the channel on which the transceiver is operating.

The output of the synthesizer is determined by the particular pair of crystals from the crystal matrix that are selected by the channel selector switch, S2. This switch is set-up so that S2b switches to the next crystal each step, while S2a switches to the next crystal every fourth step. There are twenty-four pairs possible from this. However, the twenty-fourth position of the switch, located between channels 22 and 23 is blank.

The outputs of the 23 MHz Oscillator, Q1, and of the 14 MHz Oscillator, Q3, are applied to the Synthesizer Mixer, Q2, to produce the 23 required synthesizer frequencies. Mathematically, this is expressed in the following formula:

$$f_S = f_{SO1} + f_{SO2}$$

where: f_S = synthesizer frequency, in MHz
f_{SO1} = first synthesizer oscillator frequency, in MHz
f_{SO2} = second synthesizer oscillator frequency, in MHz

example:

given that — f_{SO1} = 23.290 MHz (X1)
f_{SO2} = 14.950 MHz (X7)

$$f_S = 23.290 + 14.950$$
$$f_S = 38.240 \text{ MHz}$$

This is the channel frequency for Channel 1.

The synthesizer frequency from the Synthesizer Mixer is applied to both the Transmit Mixer and the First Receive Mixer.

Receiver

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

In the receive mode, 13.8 VDC is supplied to IC1, Q12, Q13, Q14, Q15, and to Q10 (the AVR). The AVR supplies regulated voltage to the synthesizer stages, Q1, Q2, and Q3, and to the Second Local Oscillator, Q16. A bias voltage is also applied to the base of the Transmit Switch, Q11. This bias holds the Transmit Switch open, so that the transceiver circuits remain in receive.

AM signals are received by the antenna and enter the ratio at the antenna jack. The π-filter formed by L8, L9, C33, and C1 of the rear panel acts to match the antenna impedance to the RF Amplifier, Q12. Signals in the 26.965 MHz - 27.255 MHz range are filtered out and amplified by the RF Amplifier and the tank circuit of C37/L10 that precedes it.

The output of the RF Amplifier and of the synthesizer frequency, which in this case could be called the "first local oscillator," from the Synthesizer Mixer are applied to the First Receive Mixer, Q13.

This first set of two signals is mixed in the First Receive Mixer for an output of 11.275 MHz, which is the first i-f. Mathematically, this is expressed in the following formula:

$$f_{IF1} = f_S - f_R$$

where: f_{IF1} = first i-f, (11.275 MHz)
f_R = receive frequency, in MHz
f_S = synthesizer frequency, in MHz

The first i-f passes through the i-f tuned circuit of L12 and L13. This circuit helps obtain the desired selectivity. The first i-f is then applied to the Second Receive Mixer, D11, along with the output of the Second Local Oscillator, Q16 with X12. The second local oscillator frequency is 11.730 MHz.

These two signals are mixed in the Second Receive Mixer for an output of 455 kHz, which is the second i-f. Mathematically, this is expressed in the following formula:

$$f_{IF2} = f_{LO2} - f_{IF1}$$

where: f_{IF2} = second i-f, (455 kHz)
f_{LO2} = second local oscillator frequency, in MHz
f_{IF1} = first i-f, (11.275 MHz)

or

$$f_{IF2} = 11.730 - 11.275$$
$$= .455 \text{ MHz}$$
$$= 455 \text{ kHz}$$

The second i-f is fed to the Ceramic Filter, CF. It is then amplified by Q14 and Q15. They are the Second IF, First Stage and Second Stage Amplifiers, respectively. The amplified signal is then fed to the Detector, D8. (D5 is a signal overload protector.) The Detector recovers the audio from the modulation signal to yield an af output. The output is applied to the Automatic Noise Limiter (ANL), D6, and the Squelch Switch, Q19.

The squelch functions in the following manner. In the receive mode, a bias voltage from Q10 is applied to the base of Q19, as determined by VR2. In the absence of a signal, the base of Q19 is positive biased and it turns on. This biases the squelch transistor inside IC1, which turns off the Audio Amplifier and results in squelching of the receiver.

The output of the ANL goes through the volume control, VR1, and is RC-coupled to pin 6 of the Audio Amplifier, IC1. The amplified af output from pin 10 goes through the audio transformer, T1, to be applied to the speaker jacks and the speaker.

Transmitter

The operating channel is determined by the crystal matrix frequency synthesizer. The synthesizer frequency is heterodyned with the offset oscillator frequency to yield the transmit frequency. The frequency is then amplified by a three-stage power amplifier.

In the transmit mode, the base of the Transmit Switch, Q11, is grounded via the PTT switch. Q11 is then not biased, and therefore closed. Regulated voltage from the Automatic Voltage Regulator (AVR), Q10, is then supplied through Q11 to Q4, Q5, Q6, and Q7. Although 13.8 VDC is applied to the RF Power Amplifier at all times, the amplifier is a class C amplifier; and therefore, it will conduct only when rf is applied to the bases of Q8 and Q9. Thus, under these conditions, all transceiver circuits are in transmit.

The synthesizer frequency is applied to the Transmit Mixer, Q5, along with the 11.275MHz output of the Offset Oscillator, Q4 with X11. The synthesizer frequency is determined by the channel selector switch, S2, as explained in the synthesizer section of the discussion. These two frequencies are mixed to yield the transmit frequency. Mathematically, this is expressed in the following formula:

$$f_T = f_S - f_O$$

where: f_T = transmit frequency, in MHz
f_S = synthesizer frequency, in MHz
f_O = offset oscillator frequency, in MHz

The transmit frequency from this mixer passes through the filter circuit of L4 and L5 and is then applied to the Pre-drivers, Q6 and Q7. The filter circuit removes part of the undesirable spurious signals from the transmit frequency.

The Pre-drivers of Q6 and Q7 and the Driver, Q8, form two stages of voltage amplification leading to the final stage. The filter circuit of L6 follows Q6, and L7 follows Q7. These two circuits filter out the rest of the undesirable spurious signals to be removed from the transmit frequency.

From the Driver, the signal is applied to the third stage of amplification, the RF Power Amplifier, Q9. This is a current amplifier that raises the transmit signal to an output of four watts. Its output is applied to the π-filter of L8, L9, C1 of the rear panel, and C3, and then to the antenna jack. The π-filter constitutes an antenna impedance-matching circuit.

The transmit signal is modulated in the following manner. Microphone output is applied to pin 6 of the Audio Amplifier. The resulting af is applied to the collectors of Q8 and Q9 through the secondary coil of the audio output transformer, T1.

Control voltages for the Transmit Audio ALC, Q17, and the Range Boost, Q18, are obtained from detector diode D10. 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 rolls off af peaks so that a higher average af level is supplied to the Audio Amplifier. This achieves the high average modulation desired at the output of Q9 without an attendant overmodulation of the peaks.

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.

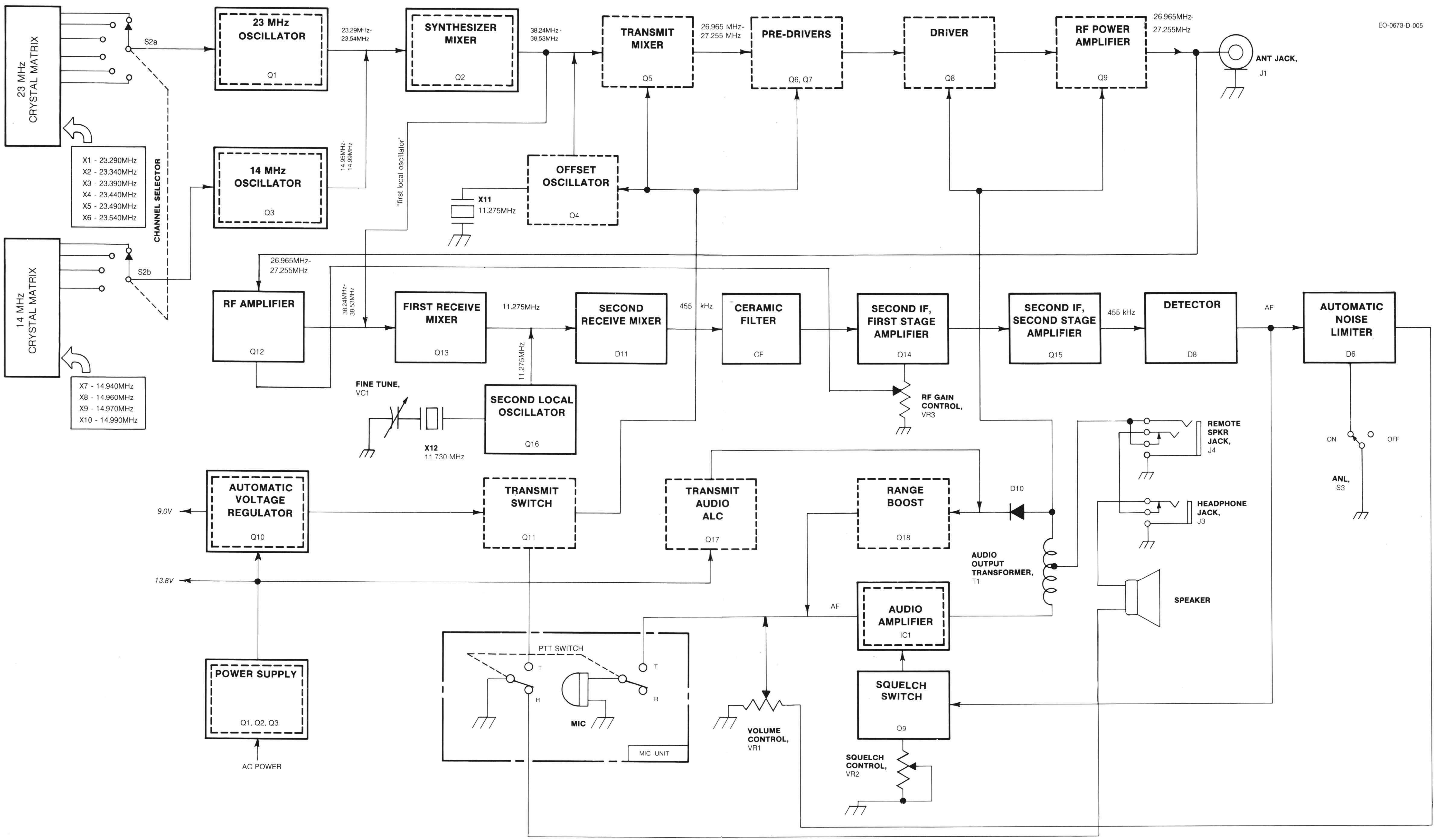

Figure 2-1. Block Diagram

CHAPTER 3 — ALIGNMENT

General

The following procedures must be followed in order to properly align the Hy-Range IV 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 two main sections: Receiver Alignment, and Transmitter Alignment. Beginning each procedure is a list of equipment needed for that procedure. See *Tools and Equipment* below for a complete list of recommended equipment.

The test procedures assume that voltages are present at all points of the unit. If not, troubleshoot it before continuing.

Notes on Methods

The ferrite cores in the tuning coils are rather easily chipped or broken. Therefore, always use care when inserting an alignment tool in the tuning coil; insert it straight into the core.

If the unit being aligned has been converted for 240 VAC service, set your power supply for 240 VAC rather than the 120 VAC setting indicated at the beginning of each procedure.

It is a good practice to check, and re-adjust if necessary, the transceiver's internal power supply before beginning any of the rest of the procedures. This is outlined in "Setting the Power Supply Output Voltage" below.

WARNING

Circuits and components that carry high voltage with potentials sufficient to kill are exposed when the covers of this unit are removed. Use extreme care to avoid coming in contact with them when performing the following procedures.

Tools and Equipment

The following tools and equipment (or their equivalents or better) are recommended for use in aligning the Hy-Range IV (all instruments must be correctly calibrated):

GC 8728-A — alignment tool
GC 9304 — alignment tool
GC 9440 — alignment tool
Heathkit IP-5220 power supply
Simpson 260 VOM
Heathkit IM-28 VTVM with PK-3 RF probe
Heathkit IB-1101 frequency counter
Tektronix 465 oscilloscope
Waters 334-A dummy load wattmeter
Zodiac U-2 signal generator

To Rewire the Power Transformer for 240 VAC

The power transformer has dual primary windings to allow it to be converted for 240 VAC use. To make the change, the primary windings must be wired in series instead of parallel. The steps below are illustrated in Figure 3-1.

1. Turn the transceiver off and unplug the power cord. Remove the bottom cover.
2. Either remove and replace the power cord (per the "A" steps below), or remove and replace the power plug (per the "B" step below). It is preferable to replace the entire power cord.

   A-1. Unsolder the two leads of the power cord from the terminal strip. Remove the strain bushing from the power cord and pull the old cord out of the chassis.

   A-2. Feed an appropriate 240 VAC power cord through the rear panel and connect the two leads to the terminal strip. Do not resolder it yet. Install a new strain bushing on the power cord where it goes through the rear panel.

   or B. Cut the plug off the power cord and install an appropriate 240 VAC plug in its place.

3. Unsolder the blue wire from the rear terminal of the fuse holder and disconnect it. Leave the red wire soldered there.
4. Unsolder the white wire (of the orange and white pair of wires from the power transformer) from the terminal strip and disconnect it. Leave the other wires and the capacitor/resistor module lead soldered there.
5. Twist the ends of the blue and white wires together and solder them. Wrap the connection with electrician's tape.
6. Solder the connections at the terminals of the terminal strip (two wires at the first terminal and two wires plus the capacitor/resistor module lead at the other terminal). If step B was followed, be sure the solder connections of the terminal strip are good.
7. Replace the bottom cover.

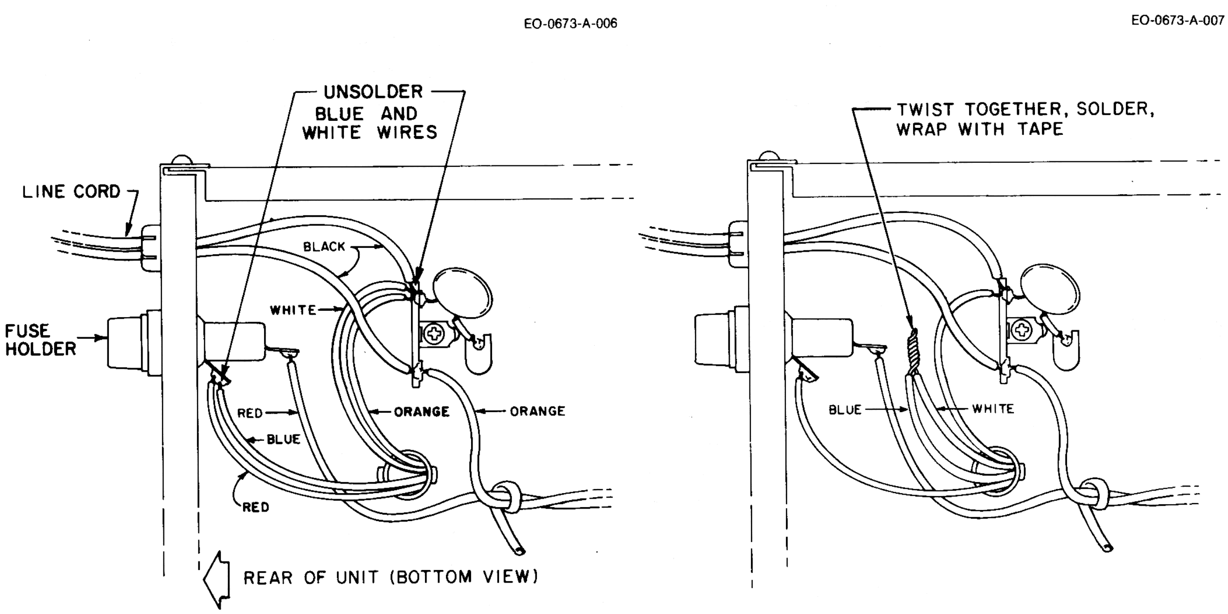

Figure 3-1. Rewiring Power Transformer for 240 VAC

Setting the Power Supply Output Voltage

test equipment needed:
Heathkit IP-5220 power supply
Simpson 260 VOM

1. Turn the transceiver off.
2. Adjust the output of the outside power supply for 120 VAC. Then plug the transceiver power cord into the power supply.
3. Turn the transceiver on.
4. Touch the probes of the VOM to pins 3 and G of the internal power supply board. Adjust RV1 of the board for a reading of 13.8 VDC. See below.
5. Turn the transceiver off and disconnect the test equipment.

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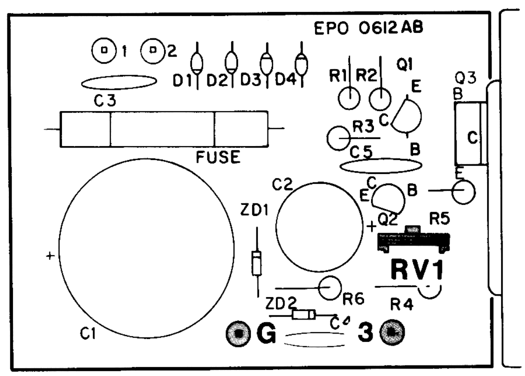


Figure 3-2. Power Supply Adjustment

Receiver Alignment Procedures

Refer to Figure 3-3 for the location of receiver alignment procedure adjustment components.

Sensitivity Adjustment

test equipment needed:
Heathkit IP-5220 power supply
Zodiac U-2 signal generator

1. Turn the transceiver off.
2. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it. Unplug the microphone from the transceiver.
3. Set the signal generator frequency for 27.115 MHz with 1 kHz, 30% modulation and the attenuator set at minimum. Then connect the generator to the transceiver antenna jack.
4. Turn the transceiver on. Set the channel selector on channel 13 (27.115 MHz).
5. Raise the signal generator attenuator output to at least 10 *u*V (or as much as 100 *u*V, if needed).

6. Adjust coils L10, L11, L12, L13, L14, L15, and L16 for maximum reading on the transceiver meter.

CAUTION

Reduce the output level of the signal generator as the receiver cans are peaked, if you begin adjustment with more than 10 uV input, to prevent readings from exceeding full scale.

7. Repeat step 6 until no further improvement is obtained.

8. Turn the transceiver off, and disconnect the test equipment.

Tight Squelch Adjustment

test equipment needed:
Heathkit IP-5220 power supply
Zodiac U-2 signal generator

1. Turn the transceiver off.

2. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it. Unplug the microphone from the transceiver.

3. Set the signal generator frequency for 27.115 MHz with 1 kHz, 30% modulation and the attenuator set at minimum. Then connect the generator to the antenna jack.

4. Turn the transceiver on. Set the channel selector on channel 13 (27.115 MHz). Set the squelch control on tight (fully clockwise).

5. Raise the signal generator attenuator output to 100 *u*V.

6. Adjust RV1 so that tight squelch just breaks with the 100 *u*V input.

7. Turn the transceiver off and disconnect the test equipment.

S Meter Adjustment

test equipment needed:
Heathkit IP-5220 power supply
Zodiac U-2 signal generator

1. Turn the receiver off.

2. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it. Unplug the microphone from the transceiver.

3. Set the signal generator frequency for 27.115 MHz with 1 kHz, 30% modulation and the attenuator set at minimum. Then connect the generator to the antenna jack.

4. Turn the transceiver on. Set the channel selector on channel 13 (27.115 MHz).

5. Raise the signal generator attenuator output to 100 *u*V.

6. Adjust RV3 for a meter reading of 9 on the upper scale.

7. Turn the transceiver off and disconnect the test equipment. This completes the receiver alignment.

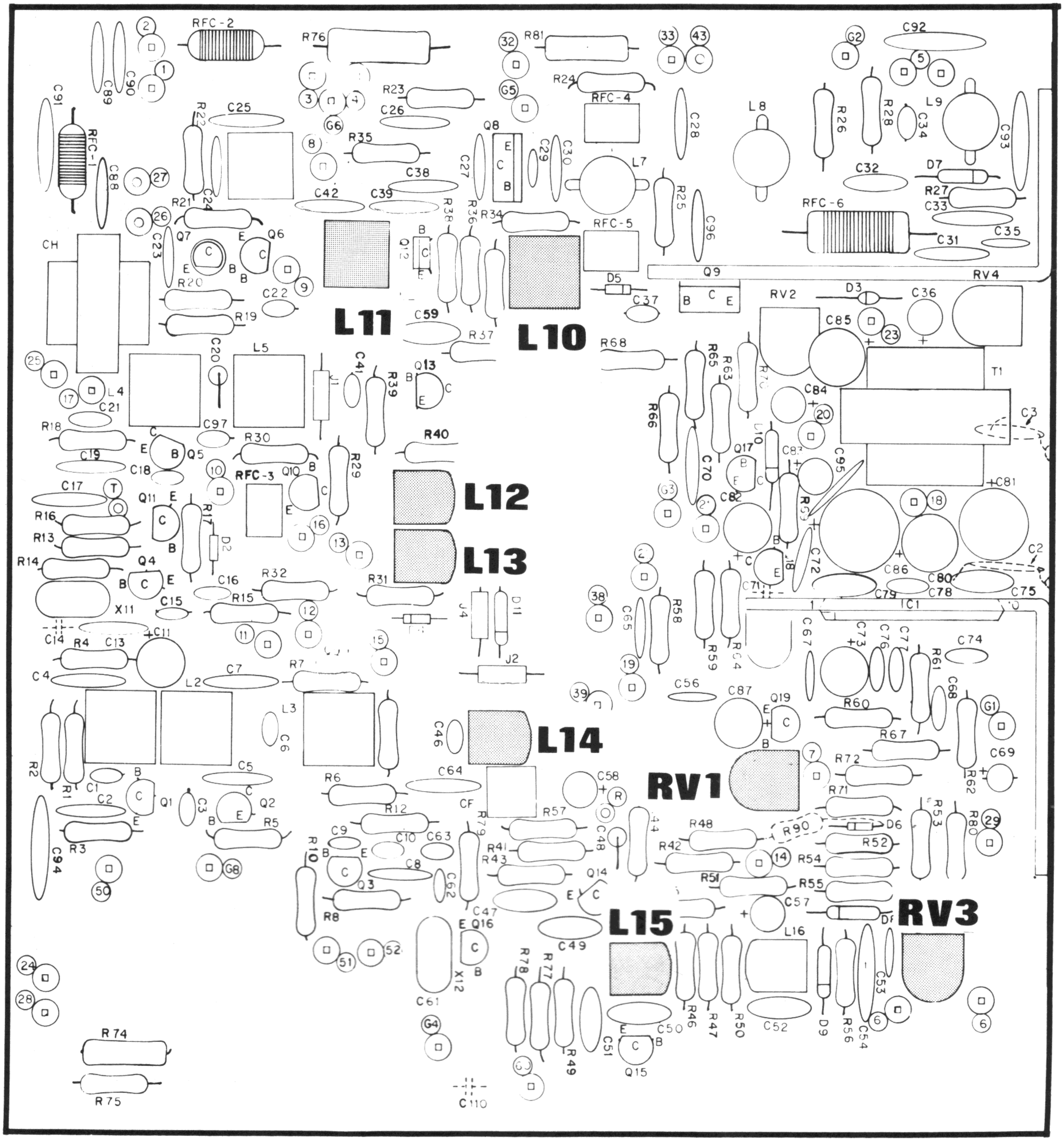
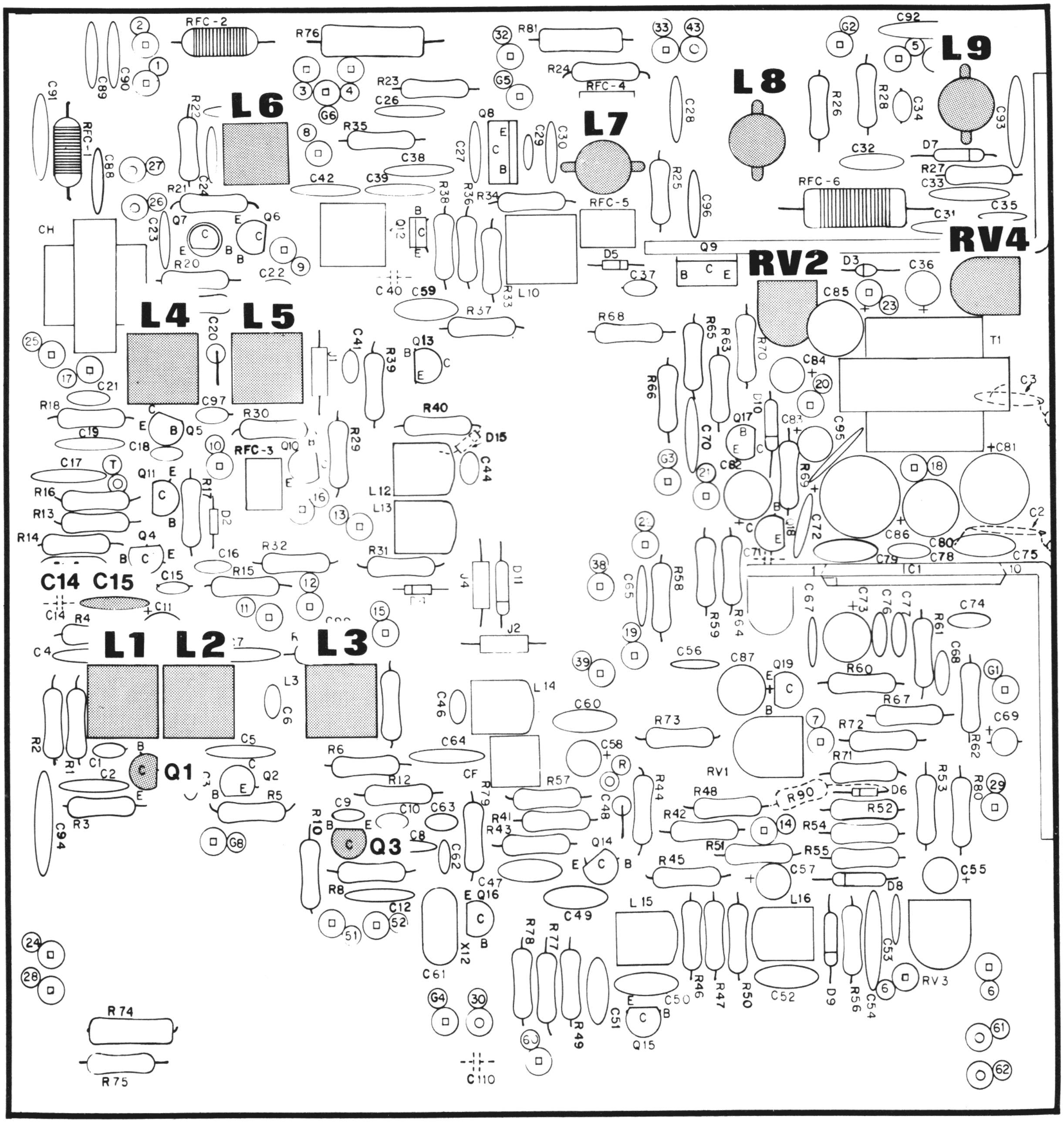


Figure 3-3. Components to be Adjusted for Complete Receiver Alignment



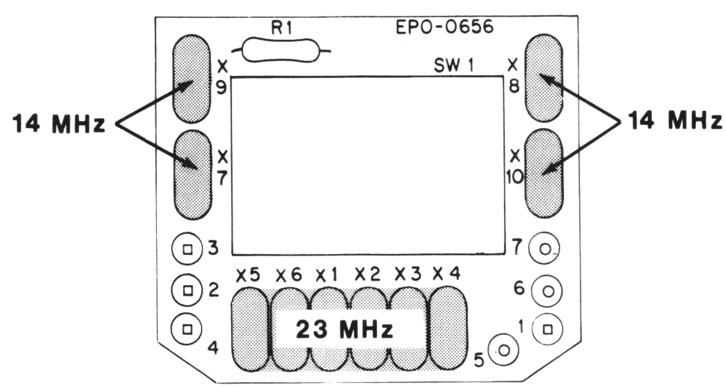


Figure 3-4. Components to be Adjusted for Complete Transmitter Alignment

Transmitter Alignment Procedure

Refer to Figure 3-4 for the location of transmitter procedures alignment components.

NOTE: Be sure to perform any indicated prerequisite procedures first, before continuing with the desired procedure.

Adjusting the Drive Level of the 23 MHz Oscillator and Checking the 14 MHz Oscillator

test equipment needed:
- Heathkit IP-5220 power supply
- Waters 334-A dummy load wattmeter
- Simpson 260 VOM
- Heathkit IB-1101 frequency counter

1. Turn the transceiver off.

2. Connect the dummy load to the antenna jack.

3. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it.

4. Turn the transceiver on. Set the channel selector on channel 13.

5. Key the transmitter with the microphone PTT button.

6. Adjust L1 so that its core is flush with the top of the can.

7. Touch the VOM probe to the emitter of Q1. Turn the core of L1 clockwise until a jump in emitter voltage is observed. This is the oscillation starting point. Turn the core of L1 one-half turn further clockwise beyond that point.

NOTE: To insure accurate readings, be sure to connect the VOM ground lead to a p.c. board ground, not the chassis frame; because the unit has a floating ground.

8. If desired, the frequency may be checked to touching the frequency counter probe to the emitterof Q1. There should be a reading of 23.440 MHz ±300 Hz.

9. The 14 MHz Oscillator may also be checked at this time, if desired. Touch the frequency counter probe to the collector of Q3. There should be a reading of 14.950 MHz ±300 Hz.

NOTE: Use a low capacity probe when measuring these frequencies. A high capacity probe can cause the oscillators to go off-frequency.

10. Unkey the transmitter, turn the transceiver off, and disconnect the test equipment.

Output Frequency Check and Adjustments

test equipment needed:
- Heathkit IP-5220 power supply
- Waters 334-A dummy load wattmeter
- Heathkit IB-1101 frequency counter

All transmit channel frequencies should be ±800 Hz at the antenna jack per FCC requirements. There are two ways to correct deviations in excess of this. If all the frequencies are off in the same direction — all high or low — they can be corrected by adjustments made to the Offset Oscillator. If a multiple of four channels or of six channels is off, the Crystal Matrix has one or more crystals that must be replaced.

A. Frequency Check

1. Turn the transceiver off.

2. Connect the dummy load and frequency counter to the antenna jack as shown below:

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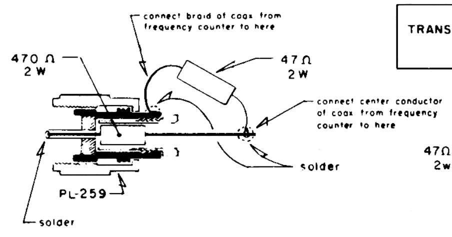
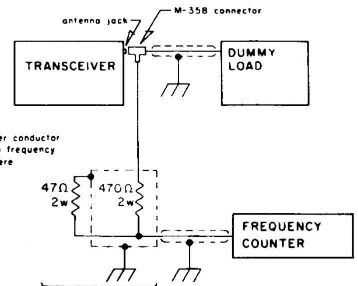


10:1 VOLTAGE DIVIDER



10:1 voltage divider

3. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it.

4. Turn the transceiver on.

5. Key the transmitter with the microphone PTT button.

6. Check the frequency of each channel per the chart below:

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		

7. If all the frequencies tend to be off in the same direction, follow B below. If a multiple of four or six channels are off, follow C below.

B. Adjusting the Offset Oscillator

1. To *raise* all the channel frequencies — first check for a jumper installed at C13 or C14, either above or below the p.c. board. If present, remove it, install a 270 pF capacitor at C13, and recheck all channel frequencies. If they still need to go higher, replace C13 with a lower value capacitor and then check all frequencies again.

2. To *lower* all the channel frequencies — first check for a jumper installed at C14, either above or below the p.c. board. If present, the frequency cannot be lowered because it

is already as low as it can go. In this case, replace X11 and then go back to Part A, Step 6. If there is no jumper, replace C13 with a higher value capacitor and recheck all channel frequencies. If the frequencies are not low enough, install a additional capacitor at C14 and recheck all frequencies. If the frequencies are still not low enough, replace C13 and C14 with a jumper and recheck frequencies again.

3. Unkey the transmitter, turn the transceiver off, and disconnect all test equipment.

C. Correcting Crystal Matrix Frequencies

1. Determine which channels are off frequency and replace the appropriate crystal with a good crystal as indicated in the chart below:

Off-frequency or Defective	**Replace Crystal**
CH 1 - 4	X1 — 23.290 MHz
CH 5 - 8	X2 — 23.340 MHz
CH 9 - 12	X3 — 23.390 MHz
CH 13 - 16	X4 — 23.440 MHz
CH 17 - 20	X5 — 23.490 MHz
CH 21 - 23	X6 — 23.540 MHz
CH 1, 5, 9, 13, 17, 21	X7 — 14.950 MHz
CH 2, 6, 10, 14, 18, 22	X8 — 14.960 MHz
CH 3, 7, 11, 15, 19	X9 — 14.970 MHz
CH 4, 8, 12, 16, 20	X10 — 14.990 MHz

2. Recheck all channel frequencies.

3. Unkey the transmitter, turn the transceiver off, and disconnect all test equipment.

RF Output Adjustment

test equipment needed:
- Heathkit IP-5220 power supply
- Waters 334-A dummy load wattmeter
- Simpson 260 VOM

1. Turn the transceiver off. Connect the dummy load wattmeter to the antenna jack.

2. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it.

3. Turn the transceiver on. Set the channel selector on channel 13.

4. Key the transmitter with the PTT button.

5. Reduce the power supply voltage for a wattmeter reading of exactly 0.5 watt. This unsaturates the cans to get the sharp peaks needed to adjust them.

6. Adjust L2, L3, L4, L5, L6, and L7 for maximum readings on the wattmeter.

7. Repeat step 6 until no further improvement is observed.

8. Change the channel selector to channel 23 and raise the power supply voltage to 120 VAC.

9. Adjust L8 and L9 for maximum readings on the wattmeter.

10. Repeat step 9 until no further improvement is observed.

11. Cut open the jumper loop (left, rear of the main p.c. board) as shown below. Set the VOM for the 10A scale. Connect the meter positive lead to the pin 1 side of the severed jumper loop; connect the negative lead to the other side of the loop.

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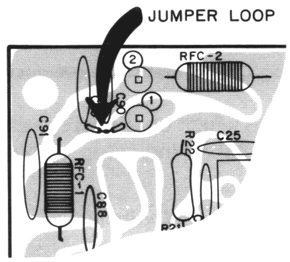


12. Back off L9 (counterclockwise) for a reading of 4.0 watts. Maximum total current at this setting must not exceed 950 mA. Readjust L8 also if necessary to meet this specification.

13. Unkey the transmitter, turn the transceiver off, and disconnect the test equipment.

14. Resolder the jumper loop back together.

Modulation Adjustment

test equipment needed:
Heathkit IP-5220 power supply
Waters 334-A dummy load wattmeter
Tektronix 465 oscilloscope

prerequisite procedure:
RF Output Adjustment

1. Turn the transceiver off.

2. Connect the dummy load to the antenna jack.

3. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it.

4. Turn the transceiver on. Set the channel selector on channel 13.

5. Connect the oscilloscope probe to the center lead of the backside of the antenna jack. Connect the ground lead to the chassis wrap-around.

6. Key the transmitter with the PTT switch and whistle into the microphone. Note the oscilloscope display and adjust RV2 for 90% modulation (valleys are 90% of peaks). Unkey the transmitter.

7. Turn the transceiver off, and disconnect the test equipment.

Spurious Frequency Check

test equipment needed:
Heathkit IP-5220 power supply
Waters 334-A dummy load wattmeter
Tektronix 465 oscilloscope

prerequisite procedures:
RF Output Adjustment
Modulation Adjustment

1. Turn the transceiver off.
2. Connect the dummy load to the antenna jack.
3. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it.
4. Turn the transceiver on. Set the channel selector on channel 13. Connect the oscilloscope probe to the center lead of the backside of the antenna jack. Connect the ground lead to the chassis wrap-around.
5. Key the transmitter with the PTT switch and whistle into the microphone. Note the oscilloscope display. There should be no irregularities on any portion of the wave pattern.
6. Re-do the RF Output Adjustment procedure if any irregularities are noted. The output signal should be a clean, smooth pattern.
7. Unkey the transmitter, turn the transceiver off, and disconnect the test equipment.

Meter Adjustment, Power Scale

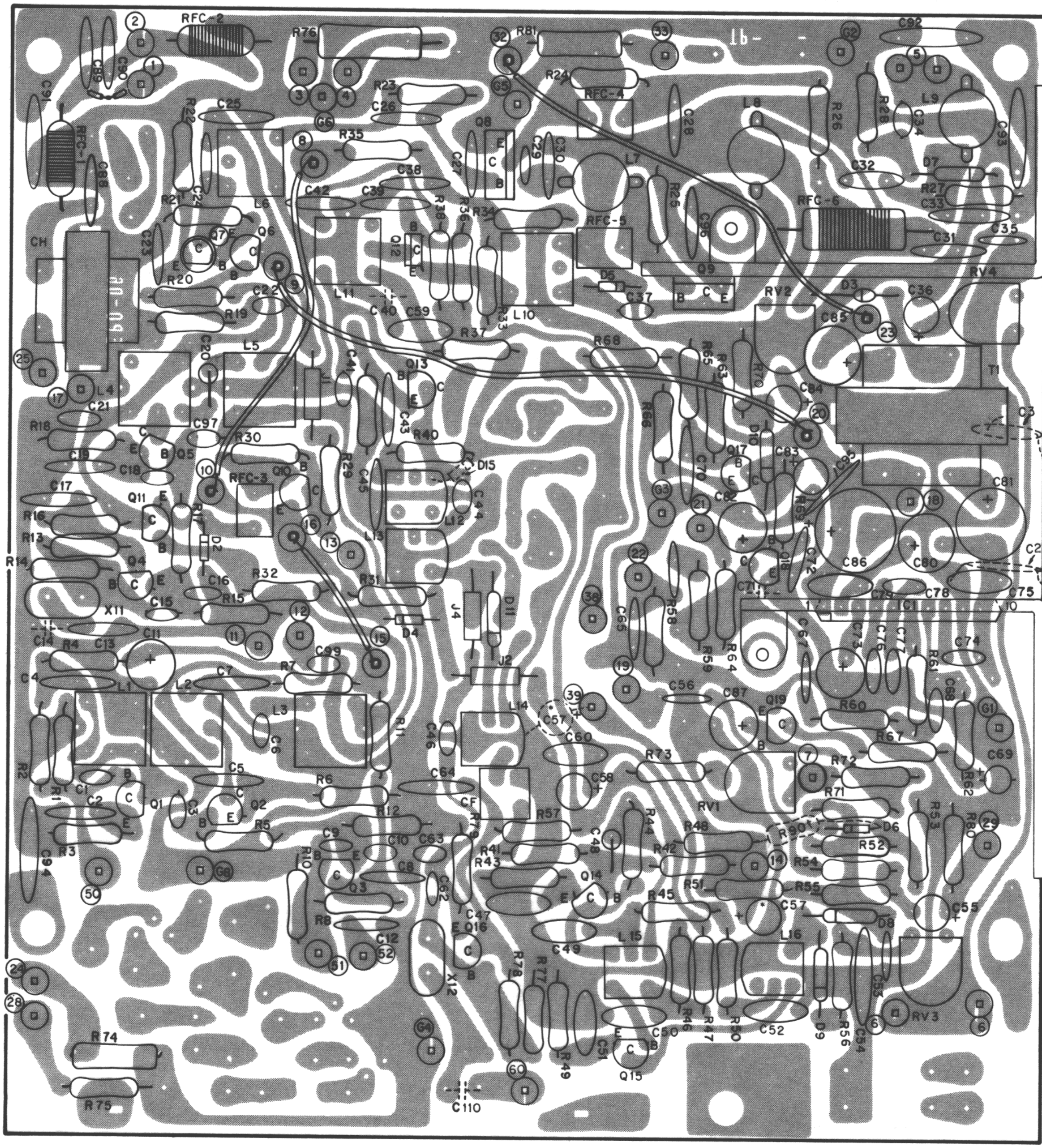
test equipment needed:
Heathkit IP-5220 power supply
Waters 334-A dummy load wattmeter

prerequisite procedure:
RF Output Adjustment

1. Turn the transceiver off.
2. Connect the dummy load to the antenna jack.
3. Adjust the power supply output for 120 VAC. Then plug the transceiver power cord into it.
4. Turn the transceiver on. Set the channel selector on channel 13.
5. Key the transmitter with the PTT switch. Adjust RV4 for the same reading on the transceiver meter power scale as is shown on the wattmeter (calibrated instrument).
6. Unkey the transmitter, turn the transceiver off, and disconnect the test equipment. This completes the transmitter alignment.

MAIN P.C. BOARD

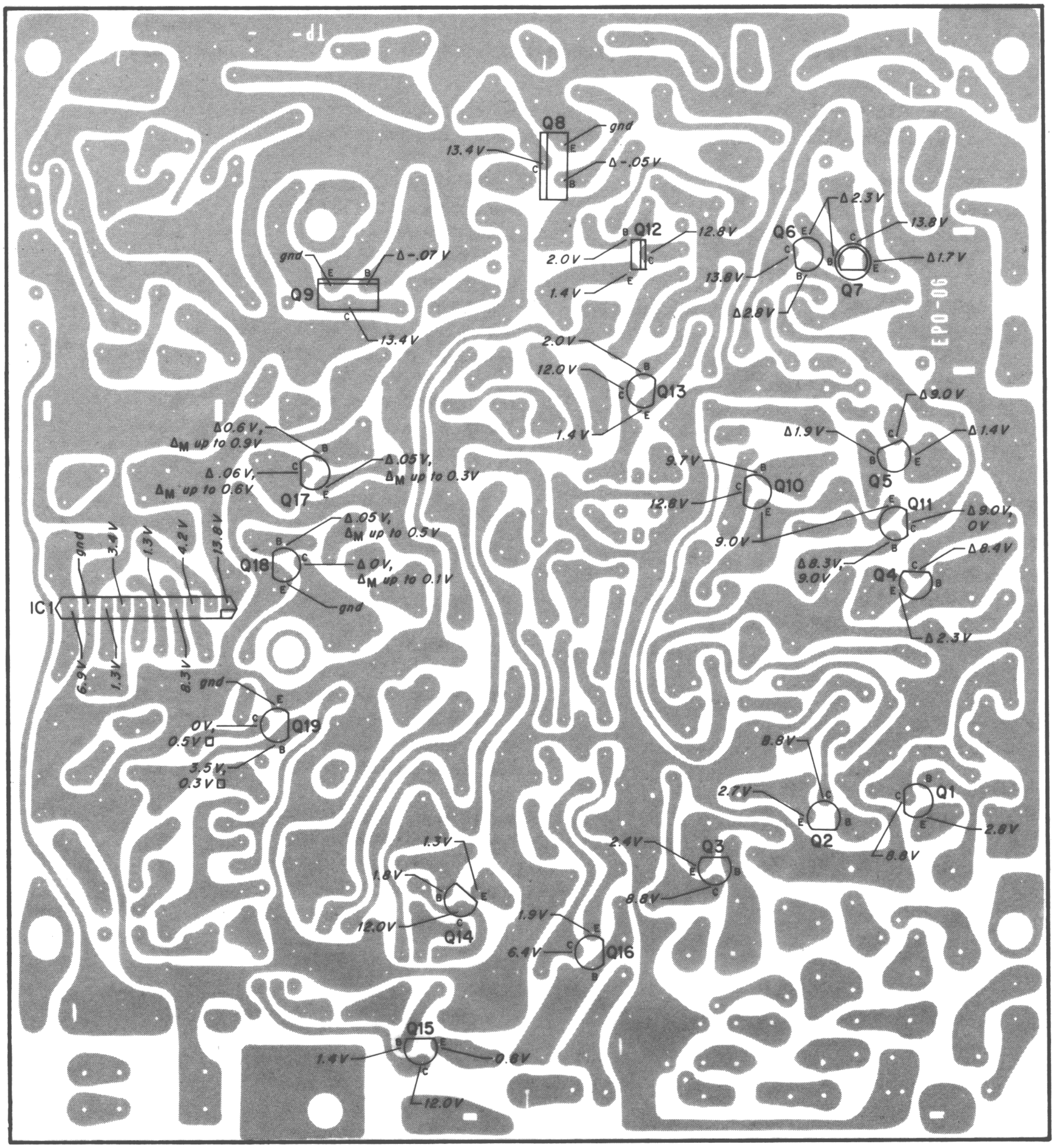
EO-0673-C-011



NOTES:

1. P.C. board shown as viewed from component side.
2. Dashed outline component - mounted on foil side.
   Dashed schematic symbol - selectable component and/or value.
3. †R90 was not used on early units.
4. *C57 may be mounted either above or below the p.c. board.

Figure 3-5. Main P.C. Board, Component Outline



NOTES:

1. P.C. board shown as viewed from foil side.

2. All voltages are measured with a VTVM (11 mega-ohms/V) from a p.c. board ground and with the transceiver connected to an external power supply adjusted for 120 VAC.

All readings are measured with the transceiver in the receive mode with no signal and unsquelched (except as noted). All are in VDC.

If measurements obtained exceed ±20% of the indicated values, the cause of the difference should be corrected.

3. Symbols used:

□ - receive voltage, squelched
Δ - transmit voltage, unmodulated
Δ_M - transmit voltage, modulated (whistle)

Figure 3-6. Main P.C. Board, Voltage Callouts

Main P.C. Board

Reference Designator	Description	Part No.
	main circuit board, complete	EPA-0657A
	Main circuit board, plated and drilled	EPO-0657
C1	2 pF, 50 V, ceramic disc	DD340-65SL020C50
C2	220 pF, 50 V, ceramic disc	DD310-65SL221K50
C3	6 pF, 50 V, ceramic disc	DD340-65SL060D50
C4	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C5	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C6	1 pF, 50 V, ceramic disc	DD340-65SL010C50
C7	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C8	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C9	560 pF, 50 V, mylar	FW-561K50
C10	68 pF, 50 V, ceramic disc	DD350-65SL680K50
C11	33 uF, 16 V, electrolytic	ECE-A16V33LE
C12	220 pF, 50 V, ceramic disc	DD310-65SL221K50
C13	270 pF, 50 V, ceramic disc	DD310-65SL271K50
C14	(field selectable)	
C15	1000 pF, 50 V, mylar	FW-102K50
C16	68 pF, 50 V, ceramic disc	DD350-65SL680K50
C17	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C18	68 pF, 50 V, ceramic disc	DD350-65SL680K50
C19	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C20	1.5 pF, 50 V, ceramic disc	ECG-N51R5K
C21	.022 uF, 50 V, mylar	FW-223K50
C22	22 pF, 50 V, ceramic disc	DD340-65SL220K50
C23	.01 uF, 50V, ceramic disc	DD310-65E103P50
C24	82 pF, 50 V, ceramic disc	DD310-65PH820K50
C25	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C26	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C27	330 pF, 50 V, ceramic disc	DD310-65SL331K50
C28	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C29	120 pF, 50 V, ceramic disc	DD360-65SL121K50
C30	220 pF, 50 V, ceramic disc	DD310-65SL221K50
C31	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C32	100 pF, 500 V, mica	FM09ZC101K5
C33	270 pF, 500 V, mica	FM13ZC271K5
C34	2 pF, 50 V, ceramic disc	DD340-65SL020C50
C35	.0047 uF, 50 V, ceramic disc	DD380-65E472P50
C36	1 uF, 50 V, electrolytic	ECE-A50V1LE
C37	27 pF, 50 V, ceramic disc	DD340-65SL270K50
C38	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C39	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C40	(factory selected)	
C41	12 pF, 50 V, ceramic disc	DD340-65SL120K50
C42	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C43	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C44	2 pF, 50 V, ceramic disc	DD340-65SL020C50
C45	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C46	47 pF, 50 V, ceramic disc	DD340-65SL470K50
C47	.047 uF, 50 V, mylar	FW-473K50
C48	2.2 pF, 50 V, ceramic disc	ECG-N52R2K
C49	.047 uF, 50 V, mylar	FW-473K50
C50	.047 uF, 50 V, mylar	FW-473K50
C51	.047 uF, 50 V, mylar	FW-473K50
C52	.047 uF, 50 V, mylar	FW-473K50
C53	.015 uF, 50 V, mylar	FW-153K50
C54	.022 uF, 50 V, ceramic disc	DD314-66E223Z50
C55	I uF, 50 V, electrolytic	ECE-A50V1LE
C56	4700 pF, 50 V, mylar	FW-472K50
C57	3.3 uF, 25 V, electrolytic	ECE-A25V3R3LE
C58	10 uF, 16 V, electrolytic	ECE-A16V10LE
C59	.047 uF, 50 V, mylar	FW-473K50
C60	.047 uF, 50 V, mylar	FW-473K50
C61	(not used)	

Reference Designator	Description	Part No.
C62	560 pF, 50 V, mylar	FW-561K50
C63	68 pF, 50 V, ceramic disc	DD350-65SL680K50
C64	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C65	2200 pF, 50 V, ceramic disc	DD260-65B222K50
C66	.022 uF, 50 V, mylar	FW-223K50
C67	.01 uF, 50 V, mylar	FW-103K50
C68	2200 pF, 50 V, ceramic disc	DD350-65E222P50
C69	3.9 uF, 25 V, tantalum	ECS-Z25EF3R9Q
C70	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C71	(factory selected)	
C72	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C73	33 uF, 6.3 V, electrolytic	ECE-A6V33LE
C74	100 pF, 50 V, ceramic disc	DD360-65SL101K50
C75	.068 uF, 50 V, mylar	FW-683K50
C76	68 pF, 50 V, ceramic disc	DD350-65SL680K50
C77	68 pF, 50 V, ceramic disc	DD350-65SL680K50
C78	l00 pF, 50 V, ceramic disc	DD360-65SL101K50
C79	.068 uF, 50 V, mylar	FW-683K50
C80	47 uF, 16 V, electrolytic	ECE-A16V47LE
C81	220 uF, 20%, 10 V, electrolytic	ECE-A10Z220E
C82	330 uF, 6.3 V, electrolytic	ECE-A6V33LE
C83	10 uF, 16 V, electrolytic	ECE-A16V10LE
C84	1 uF, 50 V, electrolytic	ECE-A50V1LE
C85	47 uF, 20%, 16 V, electrolytic	ECE-A16Z47
C86	1000 uF, 16 V, electrolytic	ECE-A16V1000W
C87	33 uF, 6.3 V, electrolytic	ECE-A6V33LE
C88	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C89	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C90	.01 uF, 50 V, ceramic disc	DD310-65E103P50
C91	.047 uF, 50 V, ceramic disc	DD314-66F473Z50
C92	.047 uF, 50 V, ceramic disc	DD314-66F473Z50
C93	.047 uF, 50 V, ceramic disc	DD314-66F473Z50
C94	.047 uF, 50 V, ceramic disc	DD314-66F473Z50
C95	.047 uF, 50 V, ceramic disc	DD314F473Z50V02
C96	.01 uF, 50 V, ceramic	DD310-65E103P50
C97	22 pF, 50 V, ceramic disc	DD340-65SL220K50
C98	(not used)	
C99	47 pF, 50 V, ceramic disc	DD340-65SL470K50
C100 through C109	(not used)	
C110	82 pF, 50 V, ceramic disc	DD340-65SL820K50
CF	ceramic filter	EFC-0040
CH	0.125 uH, audio choke coil	ELA-0016
D1	(not used)	
D2	RD9.1E, silicon, zener	EDZ-0045
D3	V06C, silicon	EDS-0004
D4	1S1555, silicon	EDS-0001
D5	1S1555, silicon	EDS-0001
D6	1S1555, silicon	EDS-0001
D7	1N60, germanium	EDG-0003
D8	1N60, germanium	EDG-0003
D9	1N60, germanium	EDG-0003
D10	1N60, germanium	EDG-0003
D11	1N60, germanium	EDG-0003
D12 through D14	(not used)	
D15	1S1555, silicon	EDS-0001
IC1	(TOSHIBA) TA7205P	EICM-0060
	mylar sheet	MFO-0049

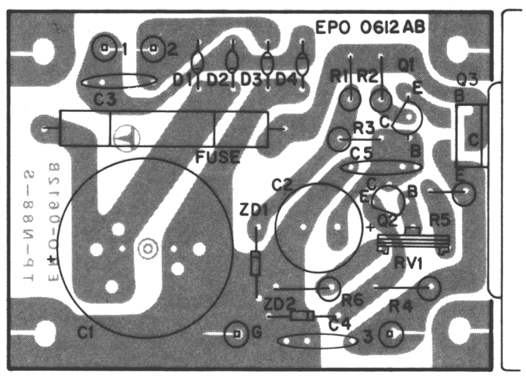
Reference Designator	Description	Part No.
L1	rf coil	ETR-0336
L2	rf coil	ETR0337
L3	rf coil	ETR-0338
L4	rf coil	ETR-0339
L5	rf coil	ETR-0340
L6	rf coil	ETR-0341
L7	rf coil	ETR-0342
L8	rf coil	ETR-0343
L9	rf coil	ETR-0344
L10	rf coil	ETR-0333
L11	rf coil	ETR-0334
L12	rf coil	ETR-0335
L13	rf coil	ETR-0335
L14	i-f coil	ETI-0122
L15	i-f coil	ETI-0123
L16	i-f coil	ETI-0129
Q1	(NEC) 2SC839(H)	EQS-0100
Q2	(MITSUBISHI) 2SC710(C)	EQS-0195
Q3	(NEC) 2SC839(H)	EQS-0100
Q4	(NEC) 2SC839(H)	EQS-0100
Q5	(MITSUBISHI) 2SC710(C)	EQS-0195
Q6	(MITSUBISHI) 2SC710(C)	EQS-0195
Q7	(TOSHIBA) 2SC735(O)	EQS-0192
Q8	(SONY) 2SC1760-3	EQS-0184
Q9	(NEC) 2SC1306	EQS-0160
Q10	(MATSUSHITA) 2SC1318(Q)	EQS-0165
Q11	(MATSUSHITA) 2SA719(Q)	EQR-0038
Q12	(HITACHI) 2SC460(A)	EQS-0018
Q13	(MITSUBISHI) 2SC710(C)	EQS-0195
Q14	(MITSUBISHI) 2SC710(C)	EQS-0195
Q15	(MITSUBISHI) 2SC710(C)	EQS-0195
Q16	(NEC) 2SC839(H)	EQS-0100
Q17	(NEC) 2SC945(R)	EQS-0061
Q18	(NEC) 2SC945(R)	EQS-0061
Q19	(NEC) 2SC945(R)	EQS-0061
R1	3.9 k, 5%, 1/4 w, carbon	FCR14-A392
R2	12 k, 5%, 1/4 w, carbon	FCR14-A123
R3	330, 5%, 1/4 w, carbon	FCR14-A331
R4	47, 5%, 1/4 w, carbon	FCR14-A470
R5	1 k, 5%, 1/4 w, carbon	FCR14-A102
R6	680, 5%, 1/4 w, carbon	FCR14-A681
R7	47, 5%, 1/4 w, carbon	FCR14-A470
R8	6.8 k, 5%, 1/4 w, carbon	FCR14-A682
R9	(not used)	
R10	3.3 k, 5%, 1/4 w, carbon	FCR14-A332
R11	47, 5%, 1/4 w, carbon	FCR14-A470
R12	470, 5%, 1/4 w, carbon	FCR14-A471
R13	6.8 k, 5%, 1/4 w, carbon	FCR14-A682
R14	3.3 k, 5%, 1/4 w, carbon	FCR14-A332
R15	470, 5%, 1/4 w, carbon	FCR14-A471
R16	100, 5%, 1/4 w, carbon	FCR14-A101
R17	3.9 k, 5%, 1/4 w, carbon	FCR14-A392
R18	270, 5%, 1/4 w, carbon	FCR14-A271
R19	2.7 k, 5%, 1/4 w, carbon	FCR14-A272
R20	5.6 k, 5%, 1/4 w, carbon	FCR14-A562
R21	220, 5%, 1/4 w, carbon	FCR14-A221
R22	68, 5%, 1/4 w, carbon	FCR14-A680
R23	100, 5%, 1/4 w, carbon	FCR14-A101
R24	220, 5%, 1/4 w, carbon	FCR14-A221
R25	47, 5%, 1/4 w, carbon	FCR14-A470
R26	10, 5%, 1/2 w, metal oxide	ERX-12ANJ100
R27	47 k, 5%, 1/4 w, carbon	FCR14-A473

Reference Designator	Description	Part No.
R28	1 k, 5%, 1/4 w, carbon	FCR14-A102
R29	22, 5%, 1/2 w, metal oxide	ERG-12ANJ220
R30	1 k, 5%, 1/4 w, carbon	FCR14-A102
R31	390, 5%, 1/4 w, carbon	FCR14-A391
R32	3.3 k, 5%, 1/4 w, carbon	FCR14-A332
R33	330, 5%, 1/4 w, carbon	FCR14-A331
R34	1 k, 5%, 1/4 w, carbon	FCR14-A102
R35	33 k, 5%, 1/4 w, carbon	FCR14-A333
R36	680, 5%, 1/4 w, carbon	FCR14-A681
R37	220, 5%, 1/4 w, carbon	FCR14-A221
R38	1.8 k, 5%, 1/4 w, carbon	FCR14-A182
R39	560, 5%, 1/4 w, carbon	FCR14-A561
R40	470, 5%, 1/4 w, carbon	FCR14-A471
R41	1 k, 5%, 1/4 w, carbon	FCR14-A102
R42	4.7 k, 5%, 1/4 w, carbon	FCR14-A472
R43	470, 5%, 1/4 w, carbon	FCR14-A471
R44	33 k, 5%, 1/4 w, carbon	FCR14-A333
R45	470, 5%, 1/4 w, carbon	FCR14-A471
R46	4.7 k, 5%, 1/4 w, carbon	FCR14-A472
R47	12 k, 5%, 1/4 w, carbon	FCR14-A123
R48	22 k, 5%, 1/4 w, carbon	FCR14-A223
R49	330, 5%, 1/4 w, carbon	FCR14-A331
R50	470, 5%, 1/4 w,carbon	FCR14-A471
R51	22 k, 5%, 1/4 w, carbon	FCR14-A223
R52	47 k, 5%, 1/4 w, carbon	FCR14-A473
R53	68 k, 5%, 1/4 w, carbon	FCR14-A683
R54	47 k, 5%, 1/4 w, carbon	FCR14-A473
R55	33 k, 5%, 1/4 w, carbon	FCR14-A333
R56	820, 5%, 1/4 w, carbon	FCR14-A821
R57	100, 5%, 1/4 w, carbon	FCR14-A101
R58	5.6 k, 5%, 1/4 w, carbon	FCR14-A562
R59	3.3 k, 5%, 1/4 w, carbon	FCR14-A332
R60	2.2 k, 5%, 1.4 w, carbon	FCR14-A222
R61	820, 5%, 1/4 w, carbon	FCR14-A821
R62	47, 5%, 1/4 w, carbon	FCR14-A470
R63	220, 5%, 1/4 w, carbon	FCR14-A224
R64	27 k, 5%, 1/4 w, carbon	FCR14-A273
R65	22 k, 5%, 1/4 w, carbon	FCR14-A223
R66	150, 5%, 1/4 w, carbon	FCR14-A151
R67	10 k, 5%, 1/4 w, carbon	FCR14-A103
R68	82, 5%, 1/4 w, carbon	FCR14-A820
R69	270, 5%, 1/4 w, carbon	FCR14-A271
R70	680, 5%, 1/4 w, carbon	FCR14-A681
R71	22 k, 5%, 1/4 w, carbon	FCR14-A223
R72	1.8 k, 5%, 1/4 w, carbon	FCR14-A182
R73	12 k, 5%, 1/4 w, carbon	FCR14-A123
R74	150, 5%, 1/2 w, metal oxide	ERG-12ANJ151
R75	270, 5%, 1/2 w, metal oxide	ERG-12ANJ271
R76	15, 5%, 2 w, metal oxide	ERX-2ANJ150
R77	3.3 k, 5%, 1/4 w, carbon	FCR14-A332
R78	5.6 k, 5%, 1/4 w, carbon	FCR14-A562
R79	560, 5%, 1/4 w, carbon	FCR14-A561
R80	10 k, 5%, 1/4 w, carbon	FCR14-A103
R81	150, 5%, 1 w, metal oxide	ERG-1ANJ151
R82 through R89	(not used)	
R90	390 k, 10%, 1/4 w, solid	ERC-12GK394
RFC1	0.75 uH, rf choke coil	ELR-0011
RFC2	0.75 uH, rf choke coil	ELR-0011
RFC3	68 uH, rf choke coil	ELR-0125
RFC4	15 uH, rf choke coil	ELR-0126
RFC5	68 uH, rf choke coil	ELR-0125
RFC6	rf choke coil	ELR-0127

Reference Designator	Description	Part No.
RV1	10 k, potentiometer	ERP-0041
RV2	2 k, potentiometer	ERP-0047
RV3	20 k, potentiometer	ERP-0022
RV4	20 k, potentiometer	ERP-0022
T1	audio transformer	ETA-0066
X1 through X10	(see crystal p.c. board)	
X11	11.275 MHz crystal	EXT-002Z011275
X12	11.730 MHz crystal	EXT-002Z011730

POWER SUPPLY P.C. BOARD

EO-0673-A-014

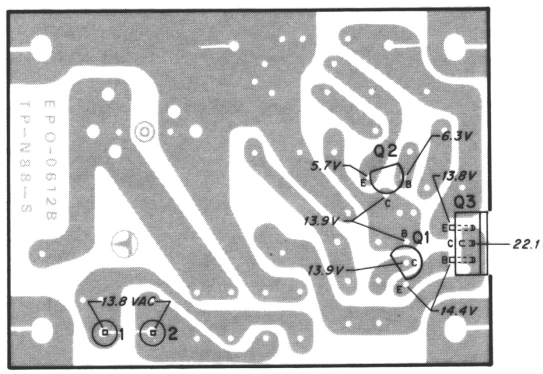


NOTE:

P.C. board shown as viewed from component side.

Figure 3-7. Power Supply P.C. Board, Component Outline

EO-0673-A-015



NOTES:

1. P.C. board shown as viewed from foil side.

2. All voltages are measured with a VTVM (11 megaohms/V) from a p.c. board ground and with the transceiver connected to an external power supply adjusted for 120 VAC.

All readings are in VDC except as noted.

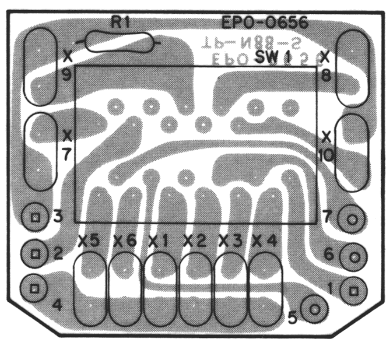
If measurements obtained exceed ±20% of the indicated values, the cause of the difference should be corrected.

Figure 3-8. Power Supply P.C. Board, Voltage Callouts

Power Supply P.C. Board

Reference Designator	Description	Part No.
	power supply circuit board, complete	EPA-0612BA
	power supply circuit board, plated & drilled	EPO-0612B
C1	2200 uF, 25 V, electrolytic	ECE-T25R2200S
C2	100 uF, 25 V, electrolytic	ECE-A25V100L
C3	.022 uF, 50 V, ceramic disc	RD209YZ223P50
C4	.01 uF, 50 V, ceramic disc	RD208YZ103P50
C5	.047 uF, 50 V, ceramic disc	RD208YZ103P50
C6	.022 uF, 50 V, ceramic disc	RD209YM223P50
D1	F14A, silicon	EDS-0017
D2	F14A, silicon	EDS-0017
C3	F14A, silicon	EDS-0017
D4	F14A, silicon	EDS-0017
F1	2.5 amp, 250 V, 30 mm, fuse w/lead	EZF-0049
Q1	(NEC) 2SC900F	EQS-0078
Q2	(NEC) 2SC900F	EQS-0078
Q3	(SANYO) 2SD3I3	EQS-0154
R1	220, 5%, 1/2 w, solid	ERC-12GK221
R2	47, 5%, 1/2 w, solid	ERC-12GK470
R3	100, 5%, 1/2 w, solid	ERC-12GK101
R4	820, 5%, 1/2 w, solid	ERC-12GK821
R5	1.2 k, 5%, 1/2 w, solid	ERC12GK122
R6	820, 5%, 1/2 w, solid	ERC-12GK821
RV1	500 ohm, potentiometer	ERP-0019
ZD1	BZ-162, silicon, zener	EDZ-0030
ZD2	RD-6A M, silicon, zener	EDZ-0019

EO-0673-A-013



NOTE:

P.C. board shown as viewed from component side.

Figure 3-9. Crystal P.C. Board, Component Outline

Crystal P.C. Board

Reference Designator	Description	Part No.
	crystal circuit board, complete	EPA-0656A
	crystal circuit board, plated & drilled	EPO-0656
R1	5.6 k, 5%, 1/4 w, carbon	ERD-14TJ562
S2	rotary wafer switch	ESR-0171
X1	23.290 MHz crystal	EXT-002S023290
X2	23.340 MHz crystal	EXT-002S023340
X3	23.390 MHz crystal	EXT-002S023390
X4	23.440 MHz crystal	EXT-002S023440
X5	23.490 MHz crystal	EXT-002S023490
X6	23.540 MHz crystal	EXT-002S023540
X7	14.950 MHz crystal	EXT-002S014950
X8	14.960 MHz crystal	EXT-002S014960
X9	14.970 MHz crystal	EXT-002S014970
X10	14.990 MHz crystal	EXT-002S014990

CHASSIS-MOUNTED COMPONENTS, MECHANICAL PARTS, AND ACCESSORY PARTS

Chassis-Mounted Components

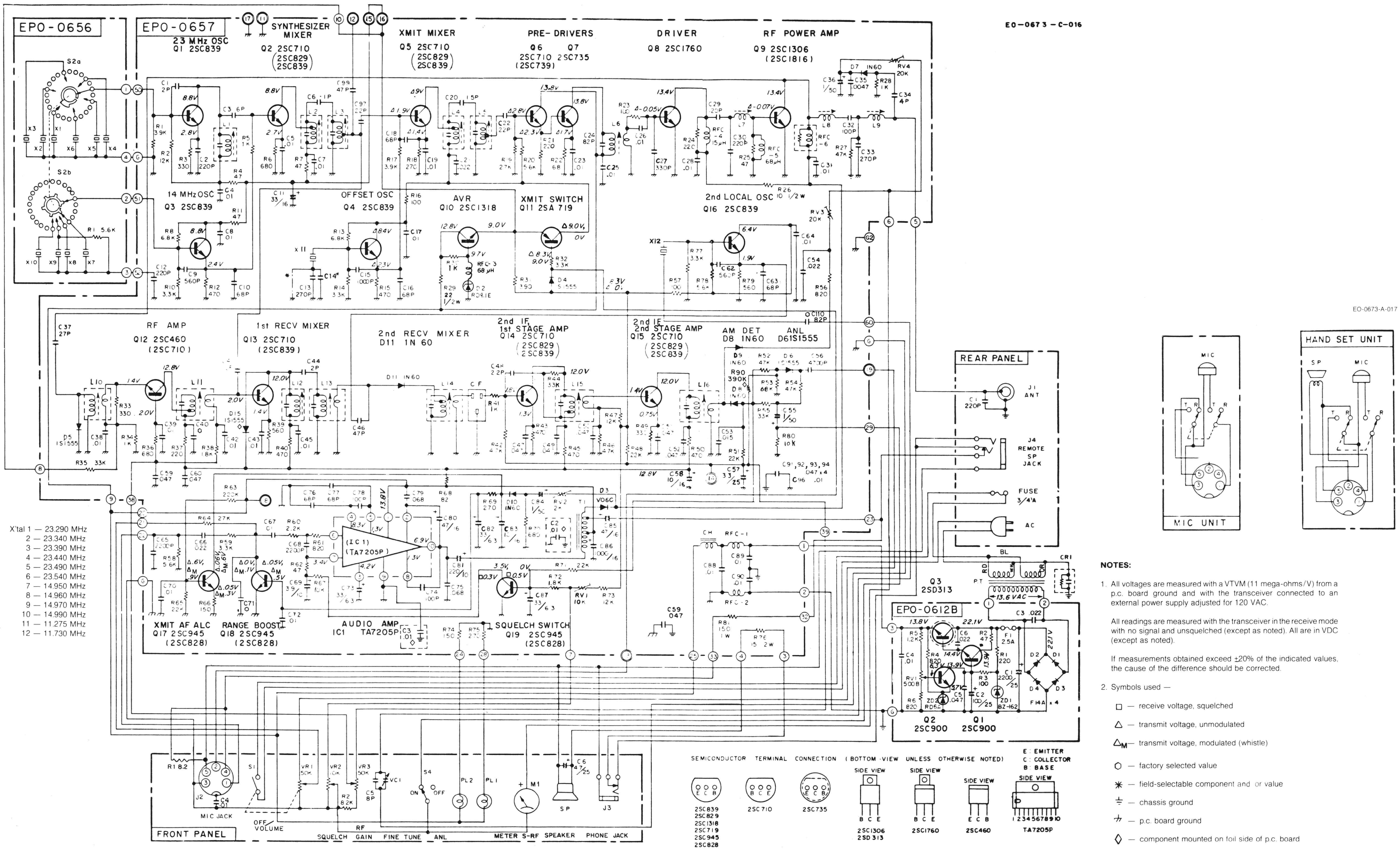
Reference Designator	Description	Part No.
C1	220 pF, 50 V, mica	FM11ZC221K5
C2	.01 uF, 50 V, ceramic disc	DD310E103P50
C3	.01 uF, 50 V, ceramic disc	DD310E103P50
C4	.01 uF, 50 V, ceramic disc	DD310E103P50
C5	8 pF, 50 V, ceramic disc	DD340-65SL080D50
C6	4.7 uF, 25 V, electrolytic	ECE-A25V4R7L
CR1	capacitor/resistor module	ECR-0013
F1	0.75 A, 30 mm, fuse	EZF-0059
J1	SO-239 UHF jack	EZS-0066
J2	5-pin, DIN microphone jack	EZS-0084
J3	1/4" dia., phone jack	EZS-0127
J4	1/4" dia., 3-conductor phone jack	EZS-0126
M	meter	EMM-0048A
PL1	pilot lamp	EZP-0024A
PL2	pilot lamp	EZP-0021
R1	8.2, 5%, 1/4 w, carbon	ERD-14TJ5R2
R2	82 k, 5%, 1/4 w, carbon	ERD-14TJ823
S1	on/off power switch (part of volume control)	ERV-0184
S2	(see crystal circuit board)	
S3	DPDT toggle switch	EST-0004
SP	8 ohm, 95 x 50 mm oval, speaker	EAS-0018
VC1	3 pF - 77 pF, variable capacitor	ECV-0030
VR1	50 k, potentiometer (volume control w/power switch)	ERV-0184
VR2	10 k, potentiometer — squelch (½ of squelch/ rf gain control)	
VR3	50 k, potentiometer — rf gain (½ of squelch/ rf gain control)	ERV-0184
	power transformer	ETP-0099
	heat sink (A) - for IC1	MC092P007
	heat sink (B) - for Q8	MC092P008
	heat sink - for Q3 of power supply	MC063P003

Mechanical Parts

Part No.	Description	Qty.
MC091A001	escutcheon assembly (front panel)	1
MC052A002	side panel assembly, wood	1
MC091P001	chassis	1
MC091P002	rear panel	1
MC052P006	bottom plate	1
MC052P007	front plate	1
MC009P012	bracket, meter	2
MNO-0117	knob, fine tune	1
MNO-0133	knob, channel selector	1
MNO-0197	knob, volume	1
MNO-0195	knob, squelch	1
MNo-0196	knob, rf gain	1
EZZ-0003	rubber foot	4
EZS-0001	fuse holder	1
EZZ-0001U	power cord	1
EZZ-0025	bushing, power cord	1

Accessory Parts

Part No.	Description	Qty.
EAM-0032	microphone	1
EZF-0059	0.75A, 30 mm, fuse	1



X'tal 1 — 23.290 MHz
2 — 23.340 MHz
3 — 23.390 MHz
4 — 23.440 MHz
5 — 23.490 MHz
6 — 23.540 MHz
7 — 14.950 MHz
8 — 14.960 MHz
9 — 14.970 MHz
10 — 14.990 MHz
11 — 11.275 MHz
12 — 11.730 MHz

NOTES:

1. All voltages are measured with a VTVM (11 mega-ohms/V) from a p.c. board ground and with the transceiver connected to an external power supply adjusted for 120 VAC.

   All readings are measured with the transceiver in the receive mode with no signal and unsquelched (except as noted). All are in VDC (except as noted).

   If measurements obtained exceed ±20% of the indicated values, the cause of the difference should be corrected.

2. Symbols used —

   □ — receive voltage, squelched

   △ — transmit voltage, unmodulated

   Δ_M — transmit voltage, modulated (whistle)

   ⬡ — factory selected value

   ✱ — field-selectable component and/or value

   ⏚ — chassis ground

   ⏚ — p.c. board ground

   ◇ — component mounted on foil side of p.c. board

Figure 3-10. Schematic Diagram

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