MODEL 2706
CITIZENS TWO-WAY RADIO
mobile

Manufactured and Distributed by
Hy-Gain de Puerto Rico, Inc.
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PN 820286

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CHAPTER 1 — GENERAL INFORMATION

Introduction

This service manual contains all the information needed to service and repair the Hy-Gain 2706. It includes an explanation of the theory of operation and alignment procedures. Revision, addendum and errata sheets will be published as needed. Insert them as required in the manual.

General Description

The Hy-Gain 2706 is a full 40 channel transceiver. It is transmitter type accepted and receiver certified for Class D Citizens Radio Service, as designated by the Federal Communications Commission (FCC).

The 2706 is a compact mobile unit, completely solid-state and highly reliable with low power consumption. The PLL (Phase Locked Loop) frequency synthesizer provides immediate operation on all 40 channels. Features include an Automatic Noise Limiter (ANL), an RF Gain control, and Public Address (PA) capabilities. The 2706 has an additional built-in receiver dedicated to a prespecified monitor channel, such as channel 9, to allow separate continuous monitoring. When the unit is set at the Monitor position, it will allow not only a selected channel to be received and transmitted on, but also allows a received monitor signal to over-ride the selected channel signal. It also has a Monitor Channel position, which provides two-way communications on the prespecified channel.

In addition, a Noise Blanker circuit, output jacks for an optional telephone style handset and an external speaker are included. Use the unit with 12 VDC (nominal), either negative or positive ground.

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 the problem. Address the 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 the unit contact the National Service Manager. Often a problem is field solvable with a little extra help. This can save 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. Handling of the unit may be delayed if shipped without it. If the unit must be shipped immediately, telephone or telex the National Service Manager for expeditious service.

When you request authorization, notification of repairs may also be requested. The notification will include a copy of the bill. Paying the bill before the return of the 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. complete description of the problem
6. the return authorization

Check the unit to see that all parts and screws are in place and attach an envelope containing a copy of the letter directly to it so 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 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 important that the shipment be well packed and fully insured. Damage claims can delay repair and return of the unit. All claims must be settled between you and the carrier.

All shipments must be sent PREPAID. We *do not* accept collect shipments. After the unit has been repaired we will send it back COD unless the bill has been prepaid. 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 40 channels in the citizens band (26.965 - 27.405 MHz)
Antenna impedance	50 ohms nominal
Power requirements	11.5 to 14.5 VDC negative or positive ground
Compliance	type accepted under the FCC rules and regulations, Part 95. Receiver certified under Part 15, FCC rules

CB Receiver Section

Circuitry	dual conversion superheterodyne with RF amplifier stage and 455 kHz ceramic filter
Sensitivity	0.7 uV for 10 dB S/N ratio
Intermediate frequency	1st IF - 10.695 MHz 2nd IF - 455 kHz
Audio output	3 watts
Current drain, receive	200 mA (no signal)

Monitor Receiver Section

Circuitry	dual conversion superheterodyne with RF amplifier stage and 455 kHz ceramic filter
Sensitivity	1 uV for 10 dB S/N ratio
Intermediate frequency	1st IF - 10.695 MHz 2nd IF - 455 kHz

Transmitter Section

RF power output	4 watts
Emission	6A3
Spurious response rejection	all harmonic and spurious suppression better than FCC requirements
Modulation	AM 90% typical
Current drain, transmit	less than 1.1 amp at 13.8 VDC

CHAPTER 2 — THEORY OF OPERATION

General

The theory of operation of the Hy-Gain 2706 transceiver is divided into three sections: the Phase Locked Loop frequency synthesizer, the Receiver, and the Transmitter. 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

Refer to the PLL Circuit block diagram, figure 2-1, for visual reference to the 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 two crystal oscillators to perform its frequency generating function.

The 10.24 MHz Oscillator, Q1, provides a reference for the PLL and an injection frequency for the Second Receiver Mixer, Q10.

The PLL circuit generates the operating frequencies needed for the transceiver in accordance with the code fed to the Programmable Divider, a portion of IC1, from the Channel Selector switch, SW-1a. Table A shows the following for each channel: the channel number, channel frequency, "N" digital code, VCO frequency, channel switch output, and the Receiver first local oscillator frequency.

For example, assume that channel 1 has been selected. The channel frequency is 26.965 MHz, the VCO frequency is 17.18 MHz, and the "N" code is 330. The Channel Selector switch programs the programmable divider for a division ratio of 330. The 10.24 MHz reference frequency is fed to the PLL IC, IC1. It is divided internally be 1024, producing a 10 kHz reference signal. The output of the VCO, D1, is mixed in the PLL Mixer portion of IC2 with the doubled output of the Reference Oscillator, Q1. The mixed and converted output difference frequency, 3.30 MHz, is then fed back to the PLL IC, IC1, through a buffer circuit in the VCO/Mixer IC, IC2, and a low pass filter circuit. In the PLL IC, IC1, the output difference frequency goes through a buffer circuit to the programmable divider, and is divided into a low frequency by the predetermined "N" code. The low frequency is fed to the phase detector and compared with the reference frequency.

The phase detector, which is internally located in the PLL IC, IC1, generates a DC output voltage corresponding to the phase difference between the two signals applied. The DC output is then applied to the VCO circuit, IC2, through a low pass filter. The VCO frequency will change so that the VCO frequency coincides with the reference frequency. The Phase Locked Loop circuitry will lock when the frequencies coincide with each other. When this happens, the VCO circuit provides stable frequencies over the band of 17.62 MHz (depending upon the "N" code or channel selected).

Assume that the channel is changed to channel 40. The Channel Selector switch now provides a code that will produce a division ratio of 286. At this instant the VCO frequency is at 17.18 MHz, which is mixed with the doubled output of the 10.24 MHz Reference Oscillator, Q1. Again the PLL Mixer produces an output of 3.30 MHz. The 3.30 MHz signal is divided by 286 to produce a frequency of 11.54 kHz. The 11.54 kHz output, along with the 10 kHz obtained from the Reference Oscillator, Q1, is fed to the phase detector. The comparison 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 this occurs the loop is considered locked and the VCO frequency is 17.62 MHz. With the Channel Selector at 40, the following outputs of the PLL circuitry are produced: the 17.62 MHz VCO output is mixed with the 20.48 MHz doubled output from the Reference Oscillator output to produce 38.10 MHz, which is fed to the First Receiver Mixer, Q9; and in the transmit mode, the 38.10 MHz is mixed with the 10.695 MHz output of the second oscillator portion of IC3 to produce a transmit frequency of 27.405 MHz.

CB Receiver

The CB receiver is a dual-conversion superheterodyne, receiving AM signals from 26.965 MHz to 27.405 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 IC4, Q8, Q9, Q11, Q12 and Q6, the AVR. The AVR supplies regulated voltage to the synthesizer stages and to the Reference Oscillator, Q1. A bias voltage is also applied to the base of the Transmit switch, Q7, 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 L11, L12, L13, C46, and C47 matches the antenna impedance to the RF Amplifier, Q8, and its tuned circuit, C51 and T5. D7 and D6 are a signal overload protective circuit.

The output of the RF Amplifier, Q8, and the buffered mixer in IC2, are applied to the First Receiver Mixer, Q9, and produce an output of 10.695 MHz, which is the IF. The first IF passes through tuned circuits, L14 and T7. It is then applied to the Second Receiver Mixer, Q10, which has a second input of 10.24 MHz from the Reference Oscillator, Q1. The output of Q10 is 455 kHz, which is the second IF.

The second IF passes through the Ceramic Filter, CF1, and is amplified by the First and Second IF Amplifiers, Q11 and Q12. The amplified signal is then fed to the Detector, D9. The Detector, D9, establishes an automatic gain control, AGC, voltage and recovers the audio from the modulated signal. The AGC voltage keeps the output volume of the receiver at a constant level under variations in input signal and also controls the Squelch Switch, Q13.

The squelch functions in the following manner: in the receive mode, a bias voltage from Q6 is applied to the base of Q13, as determined by VR2. In the absence of a signal the base of Q13 is positively biased and is on. This control signal is applied to the Squelch Logic Control, IC401, the Squelch Gate, Q408, and biases the squelch circuit inside the Audio Amplifier, IC4, which turns off the audio portion and quiets the receiver. When a signal is received, the voltage developed by D9 biases Q13 off. The control signal is processed by IC401 and Q408 again and biases the squelch circuit inside IC4 so that the audio portion is turned on and the signal is heard. The recovered audio from the Detector, D9, passes through a series Automatic Noise Limiter (ANL), D10. The output of the ANL goes through the Volume Control, VR1, and is coupled to the Audio Amplifier, IC4, through the Audio Logic Control, IC402. The amplified AF ouput from IC4 passes through the Audio Transformer, T11, to be applied to the speaker jacks and the speaker.

Monitor Receiver

The Monitor Receiver is the same system as the CB Receiver with a prespecified receiving channel and associated control logic circuits. When the Mode Selector is placed in the MONITOR position 13.8 VDC is applied to the Monitor Receiver.

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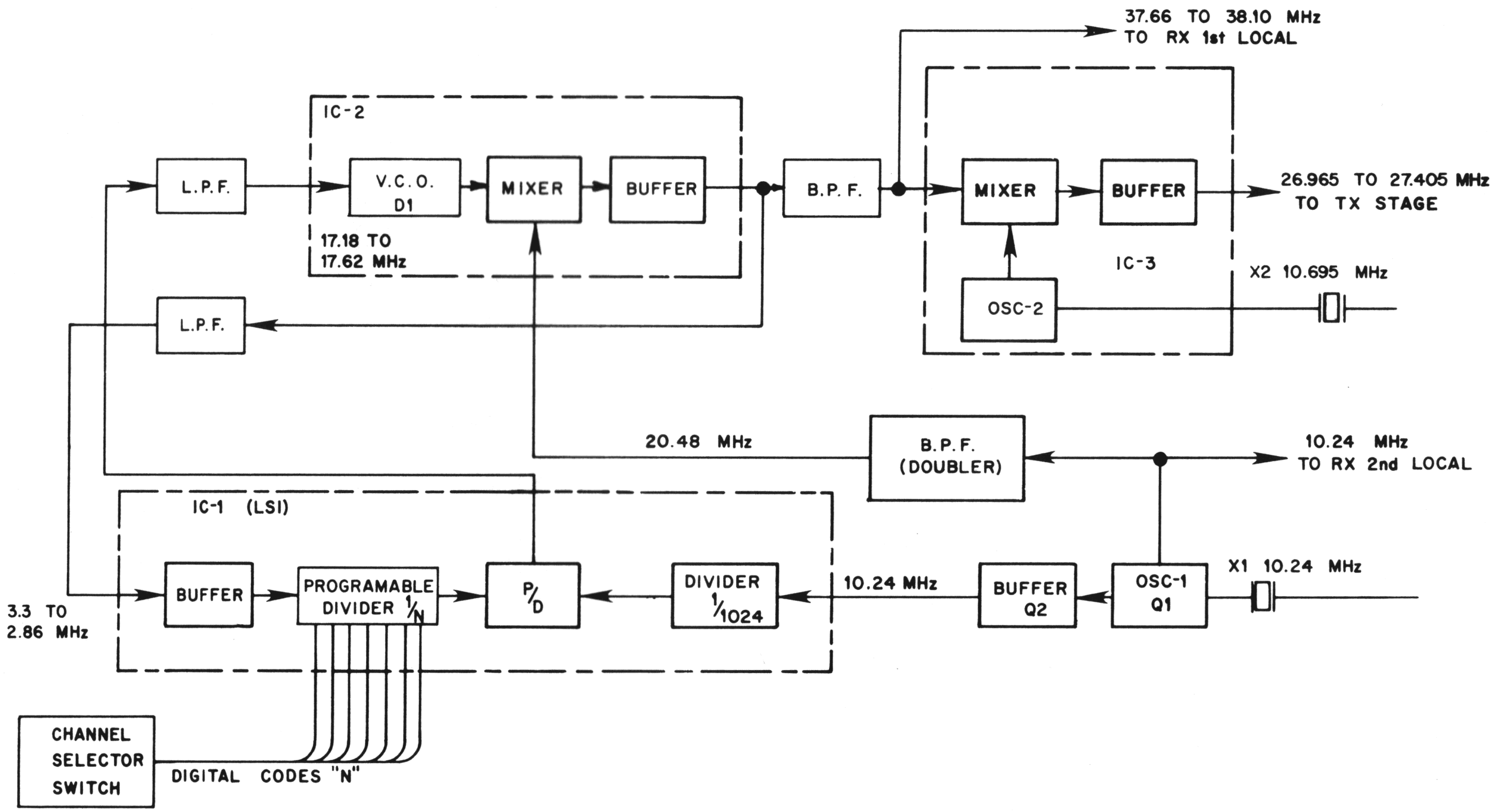

Figure 2-1. Block Diagram of PLL Circuitry

N CODE — FREQUENCY CORRELATION CHART

TABLE A

Channel Number	Channel Frequency (MHz)	"N" Code	VCO Frequency (MHz)	A	B	C	D	A'	B'	C'	Receiver 1st Local Frequency (MHz)
1	26.965	330	17.18	0	1	0	1	0	0	1	37.66
2	26.975	329	17.19	1	0	0	1	0	0	1	37.67
3	26.985	328	17.20	0	0	0	1	0	0	1	37.68
4	27.005	326	17.22	0	1	1	0	0	0	1	37.70
5	27.015	325	17.23	1	0	1	0	0	0	1	37.71
6	27.025	324	17.24	0	0	1	0	0	0	1	37.72
7	27.035	323	17.25	1	1	0	0	0	0	1	37.73
8	27.055	321	17.27	1	0	0	0	0	0	1	37.75
9	27.065	320	17.28	0	0	0	0	0	0	1	37.76
10	27.075	319	17.29	1	1	1	1	1	1	0	37.77
11	27.085	318	17.30	0	1	1	1	1	1	0	37.78
12	27.105	316	17.32	0	0	1	1	1	1	0	37.81
14	27.125	314	17.34	0	1	0	1	1	1	0	37.82
15	27.135	313	17.35	1	0	0	1	1	1	0	37.83
16	27.155	311	17.37	1	1	1	0	1	1	0	37.85
17	27.165	310	17.38	0	1	1	0	1	1	0	37.86
18	27.175	309	17.39	1	0	1	0	1	1	0	37.87
19	28.185	308	17.40	0	0	1	0	1	1	0	37.88
20	27.205	306	17.42	0	1	0	0	1	1	0	37.90
21	27.215	305	17.43	1	0	0	0	1	1	0	37.91
22	27.225	304	17.44	0	0	0	0	1	1	0	37.92
23	27.255	301	17.47	1	0	1	1	0	1	0	37.95
24	27.235	303	17.45	1	1	1	1	0	1	0	37.93
25	27.245	302	17.46	0	1	1	1	0	1	0	37.94
26	27.265	300	17.48	0	0	1	1	0	1	0	37.96
27	27.275	299	17.49	1	1	0	1	0	1	0	37.97
28	27.285	298	17.50	0	1	0	1	0	1	0	37.98
29	27.295	297	17.51	1	0	0	1	0	1	0	37.99
30	27.305	296	17.52	0	0	0	1	0	1	0	38.00
31	27.315	295	17.53	1	1	1	0	0	1	0	38.01
32	27.325	294	17.54	0	1	1	0	0	1	0	38.02
33	27.335	293	17.55	1	0	1	0	0	1	0	38.03
34	27.345	292	17.56	0	0	1	0	0	1	0	38.04
35	27.355	291	17.57	1	1	0	0	0	1	0	38.05
36	27.365	290	17.58	0	1	0	0	0	1	0	38.06
37	27.375	289	17.59	1	0	0	0	0	1	0	38.07
38	27.385	288	17.60	0	0	0	0	0	1	0	38.08
30	27.395	287	17.61	1	1	1	1	1	0	0	38.09
40	27.405	286	17.62	0	1	1	1	1	0	0	38.10

When this occurs, both the CB Receiver and the Monitor Receiver are on. The CB Receiver will receive signals on any selected channel, and the Monitor Receiver will receive signals on the monitor channel. In addition, the signals received by the Monitor Receiver will over-ride the signals received by the CB Receiver when in the monitor position.

The entire Monitor Receiver functions exactly the same as the CB Receiver up to and including the ANL, D404. For example, a signal is received on channel 1 and another signal is received on the monitor channel at the same time. The CB signal is mixed, converted, amplified and detected in the usual manner and is applied to the Audio Logic Control, IC402a. At the same time, the monitor channel signal is received, mixed, converted, amplified and detected by the Monitor Receiver and is applied to the Audio Logic Control, IC402b. Squelch level on the monitor receiver is detected by Squelch Switch, Q407. When this occurs, an over-ride signal is sent to the Audio Logic Control, IC402a, blocking the audio signal from the CB Receiver. The monitor signal is passed by the Audio Logic Control, IC402b, and is applied to the Audio Amplifier, IC4, and then to the speaker.

Whenever a signal is received on the monitor channel, there is a control signal applied to the Display Gate, Q409. The output of the Display Gate is applied to the Display Drivers, Q410 and Q411. The output of the Display Drivers will turn off the LED display. In addition, the output of the Display Gate, Q409, goes to the Light Driver, Q1, on the light control board, which turns on the Monitor Indicator Light. A transmit-receive bias from Q7 is applied to IC401, the Display Logic Control, which turns on the LED display and turns off the monitor indicator when the PTT switch is closed.

Monitor Channel

When the Mode switch is turned to the Monitor Channel position, 13.8 VDC is applied to the Display Control Diode, D406, turning on the Monitor Channel Indicator. 5 VDC is applied to the monitor diode matrix which drives the PLL circuitry on the main p.c. board, and the entire transceiver is programmed for two-way communications over the monitor channel.

Transmitter

Switching to the transmit mode is accomplished in the following manner: when the PTT switch is closed, the base of the DC Switch, Q7, is grounded. This establishes forward bias which causes Q7 to conduct. Regulated voltage from the Automatic Voltage Regulator, Q6, is then supplied through Q7 to the Transmit Oscillator Mixer, IC3. When the PLL IC, IC1, is locked, and IC3 operates in the transmit mode, a control voltage actuates the DC Switch, Q22, and allows RF drive to the RF Pre-Driver, Q3, the RF Driver, Q4, and the RF Power Amplifier, Q5.

The operating channel is determined by the PLL frequency synthesizer, IC1. The VCO frequency is mixed in IC2 with the 20.48 MHz signal to yield a 37.66 to 38.10 MHz signal which is applied to IC3.

In IC3 the signal is mixed with a 10.695 MHz signal from the crystal, X2, and an internal oscillator to provide the 26.965 to 27.405 MHz transmit frequency. The transmit frequency from IC3 passes through the filter circuit of L5 and T3 and is applied to the RF Pre-Driver, Q3. The filter circuit partially removes spurious signals from the transmit frequency.

The Pre-Driver, Q3, and the RF Driver, Q4, form two stages of amplification leading to the final stage. The filter circuit of T4 follows Q3, and L7 follows Q4. These two circuits filter out the remaining spurious signals from the transmit frequency.

From the RF Driver, Q4, the signal is applied to the final stage, the RF Power Amplifier, Q5. This is a current amplifier that raises the transmit signal to an output of four watts. Its output is applied to a filter, consisting of L11, C46, C47, L12, C14 and L13, and then to the antenna jack.

The transmit signal is modulated in the following manner: the microphone output is applied to the Audio Amplifier, IC4. The output of IC4 is applied to the collectors of the RF Driver, Q4, and the RF Power Amplifier, Q5, through the Audio Output Transformer, T11. Control voltages for the Automatic Level Compensation circuit (ALC), composed of Q15 and Q14, come from the Detector Diodes, D11 and D12. 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. Q14 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 of peaks.

Noise Blanking Circuit

This circuit silences undesirable impulse noises by disabling the receiver circuit for the short time the impulse is applied to the antenna circuit.

When the ANL-NB switch, S2, is in the NB position, noise impulses will be picked up through capacitor C134 and applied to the base of the Noise Amplifier, Q18. Q18 will amplify the impulse which is then applied to Voltage Detectors, D18 and D19. D18 and D19 rectify the amplified impulses, and the resultant DC voltage is applied to the Noise Blanker Switch, Q19. Q19 then turns on the Noise Blanker, Q20. When Q20 operates, it causes T8 to short circuit to ground, thereby inactivating the receiver circuit for a short time. The noise impulse duration determines the cut-off time the receiver will be silenced during reception of noise impulses. Similar noise blanking function is performed by Q404 on the Monitor Receiver.

Transmitter Lamp Circuit

When the Switching Transistor, Q7, supplies DC voltage to the transmit circuit, the voltage is also applied to terminal 3 on EPO-0649. This makes Q2 (on EPO-0649) activate. The Transmitter Lamp, PL2 will be lit indicating a transmit condition.

PA Amplifier and Switch

When the PA mode is selected by placing S3 in the PA position, the PA Gate Switch, Q4, is grounded. With Q4 grounded all other functions of the unit except the PA are inoperative.

The PA Audio Gate, Q3, functions as an amplifier for the microphone when it is not clamped to AC ground by Q4. The audio signal from the microphone is amplified by Q3 and is then applied to the Audio Amplifier, IC4. The audio signal is amplified by IC4 and is then applied to the PA jack, J4.

CHAPTER 3 — ALIGNMENT

General

These procedures must be followed to align the 2706 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 these transceivers "shall be made by or under the immediate supervision and responsibility of a person holding a first or second class commercial radio operator's license", as stipulated in Part 95.97 (b) of the FCC Rules and Regulations.

The 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. Always use care when inserting an alignment tool in the coil: insert it straight into the core.

Recommended Tools and Equipment

The following equipment is recommended for use in aligning the Hy-Gain 2706 transceiver:

Audio Signal Generator, 1 kHz

AC VTVM, 1 mV measurable

DC Ampere Meter, 2A

Variable Regulated Power Supply, DC 8-15V, 2A

Frequency Counter, 0 to 40 MHz, high input impedance type

VTVM with RF probe

Oscilloscope, 30 MHz, high input impedance

Low capacitance RF probe, capacitance not to exceed 13 pF

RF Wattmeter and 50 ohm, 5 watt dummy load

Standard RF Signal Generator, 27 MHz CB band

Speaker dummy resistor, 8 ohm, 5 watt

VOM, 20 kohm/V

All test equipment should be properly calibrated.

NOTE: Test voltage is 13.8 VDC unless otherwise specified.

Transmitter Alignment Procedure

Equipment Set-up

Refer to figure 3-1 for the test equipment set-up.

Refer to figure 3-5 for location of components to be adjusted for transmitter alignment.

Connect test equipment as shown below.

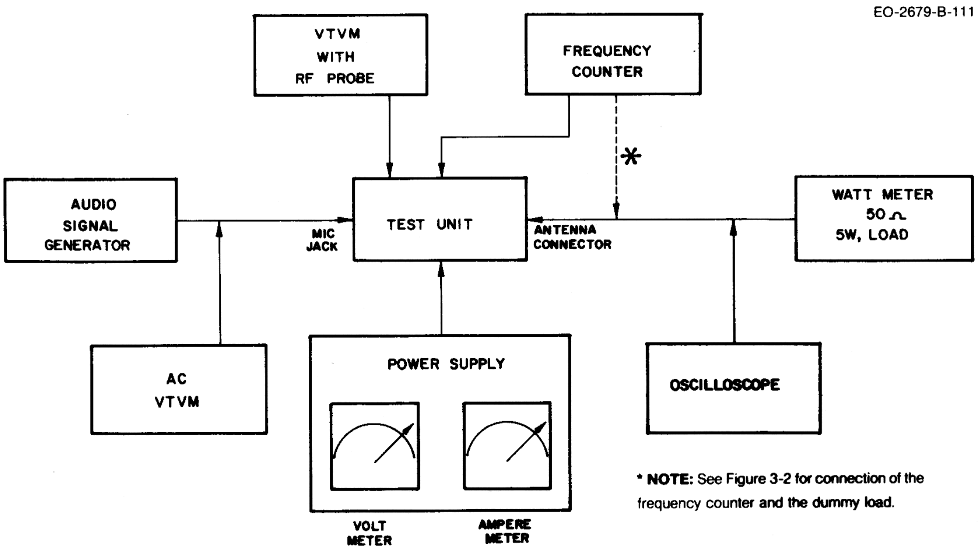

Figure 3-1. Equipment Set-up, Transmitter Alignment

Pre-Alignment Frequency Check

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

Emitter of Q2, reference input, check to read 10.24 MHz accurate to four significant digits.

Pin 6 of IC2, transceiver on channel 1, check to read 37.66 MHz accurate to four significant digits.

VCO Circuit Alignment

1. Place the Channel Selector in channel 1 position.
2. Connect the VOM (DC 12V range) between ground and TP8.
3. Adjust L1 core to obtain a reading no lower than 3.6V ± .1V.
4. Place the Channel Selector in channel 40 position. The reading should be within 1.5V ± .1V.

RF Driver Stage Alignment

NOTE: An RF VTVM is the preferred test equipment for this alignment. In part 3, T1 *must* be adjusted with an RF VTVM to prevent detuning of the circuit. If an oscilloscope is used for the rest of the alignment procedures, use a low capacity (less than 1 uF) high impedance probe.

1. Place the Channel Selector in channel 19 position.

2. Connect the RF VTVM to the base of Q3 and ground.

3. Adjust T1, L2, T2, L5 and T3 in that order for maximum amplitude on the RF VTVM.

4. Reduce the power supply voltage from 13.8 to 7.0V, and connect the RF VTVM between the base of Q4 and ground.

5. Adjust T3 and T4 for maximum amplitude on the RF VTVM.

RF Power Amplifier Alignment

1. Set the power supply voltage to 13.8V. Place the Channel Selector switch in the channel 19 position.

2. Connect the RF wattmeter to the Antenna Connector of the transceiver.

3. Adjust L7 for maximum reading on the RF wattmeter.

4. Adjust L11 for maximum reading on the RF wattmeter.

5. Adjust L12 for maximum reading on the RF wattmeter.

6. Readjust L11 for maximum reading.

7. Turn the core of L7 clockwise so that the RF wattmeter indicates 4.4 watts.

8. Turn the core of L12 counterclockwise until the power reading is 3.8 watts.

Transmitter Frequency Check

1. Turn the transceiver off.

2. Connect the dummy load and frequency counter to the antenna jack as shown in figure 3-3.

3. Turn the transceiver on.

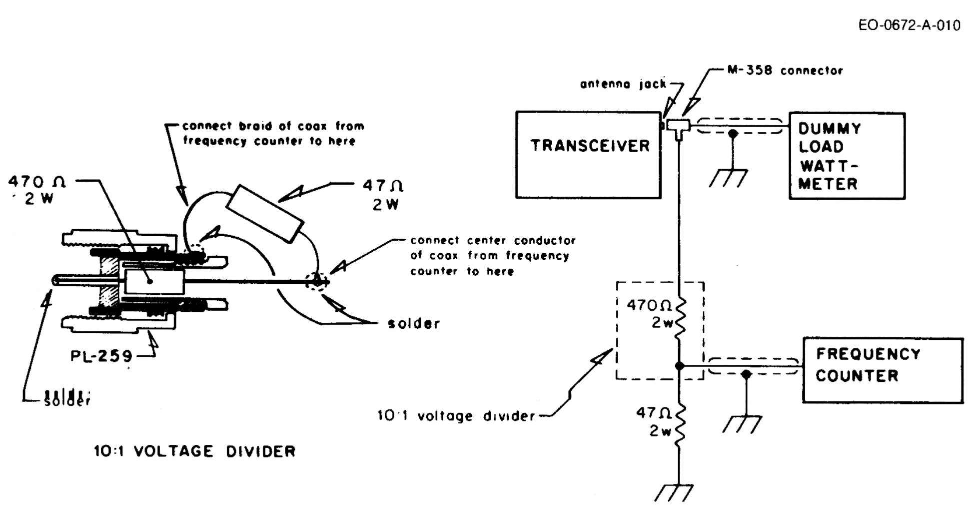

Figure 3-2. Connection of Frequency Counter and Dummy Load

4. Key the transmitter with the microphone PTT button.

5. Check the frequency of each channel with the following chart. Frequencies should be within 800Hz at 25° centigrade.

CHANNEL FREQUENCY

Channel	MHz	Channel	MHz
1	26.965	21	27.215
2	26.975	22	27.225
3	26.985	23	27.255
4	27.005	24	27.235
5	27.015	25	27.245
6	27.025	26	27.265
7	27.035	27	27.275
8	27.055	28	27.285
9	27.065	29	27.295
10	27.075	30	27.305
11	27.085	31	27.315
12	27.105	32	27.325
13	27.115	33	27.335
14	27.125	34	27.345
15	27.135	35	27.355
16	27.155	36	27.365
17	27.165	37	27.375
18	27.175	38	27.385
19	27.185	39	27.395
20	27.205	40	27.405

Modulation Sensitivity Alignment

1. Place the unit in the transmit mode and apply a 20 mV, 1 kHz signal to the junction of C80, R58 and C81 on the radio PC board.

2. Adjust RV2 to obtain 90% modulation as observed on the oscilloscope.

3. Decrease the signal input to 6 mV. Modulation should not fall below 80%.

CB Receiver Alignment Procedure

Refer to figure 3-6 for the location of components to be adjusted for receiver alignment.

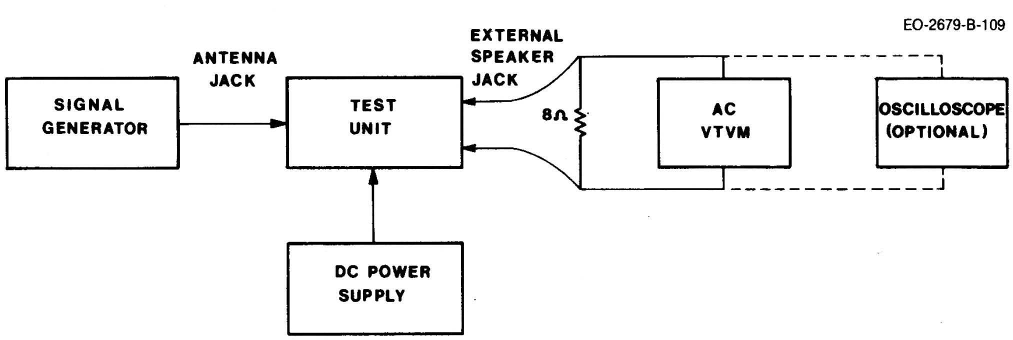

Figure 3-3. Equipment Set-up, CB Receiver Alignment

Lock Out Circuit Check

Position the Channel Selector switch in the open channel position. Check the voltage at the base of Q3. The voltage should be between 0.05 to 0.4V.

Receiver Alignment

Place the ANL switch in the "OFF" position. To put the transceiver into the receive mode, short pins 5 and 3 of the MIC jack on the front panel together.

1. Set the signal generator to 27.185, 1 kHz, 30% modulation and set the transceiver to channel 19. Set the CB squelch fully counter clockwise.

NOTE: This alignment should be performed with an extremely small signal input from the signal generator to avoid inaccurate alignment due to AGC action.

2. Adjust T5, T6, L14, T7, T8, T9 and T10 for maximum audio output as indicated on the AC VTVM (or oscilloscope if used).

3. Turn the core of T5 one turn clockwise.

Tight Squelch Adjustment

1. Set the signal generator to provide an RF input signal of 100 uV, 1 kHz, 30% modulation.

2. Rotate the CB squelch control fully clockwise.

3. Adjust RV1 so that the squelch just breaks with the 100 uV signal input.

Monitor Receiver Alignment Procedure

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

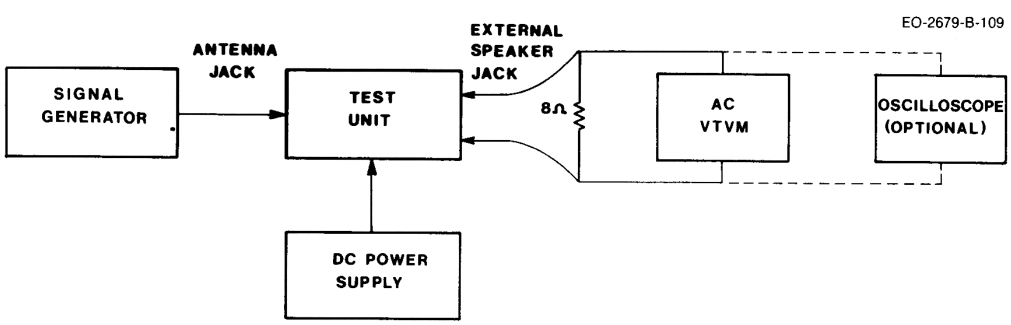

Figure 3-4. Equipment Set-up, Monitor Receiver Alignment

Receiver Alignment

Place the ANL switch in the "OFF" position.

To put the transceiver into the receive mode, short pins 5 and 3 of the MIC jack on the front panel together.

1. Set the signal generator to 27.065 MHz, 1 kHz, 30% modulation and set the Mode Select switch to "MON" position. Set the Monitor Squelch fully counter clockwise.

NOTE: This alignment should be performed with an extremely small signal input from the signal generator to avoid inaccurate alignment due to AGC action.

2. Adjust T405, T406, L414, T407, T408, T409 and T410 for maximum audio output as indicated on the AC VTVM (or oscilloscope if used).

3. Turn the core of T401 one turn counter clockwise.

Tight Squelch Adjustment

1. Set the signal generator to provide an RF input signal of 70 uV, 1 kHz, 30% modulation.

2. Rotate the monitor squelch control fully clockwise.

3. Adjust RV400 so that the squelch just breaks with the 70 uV signal input.

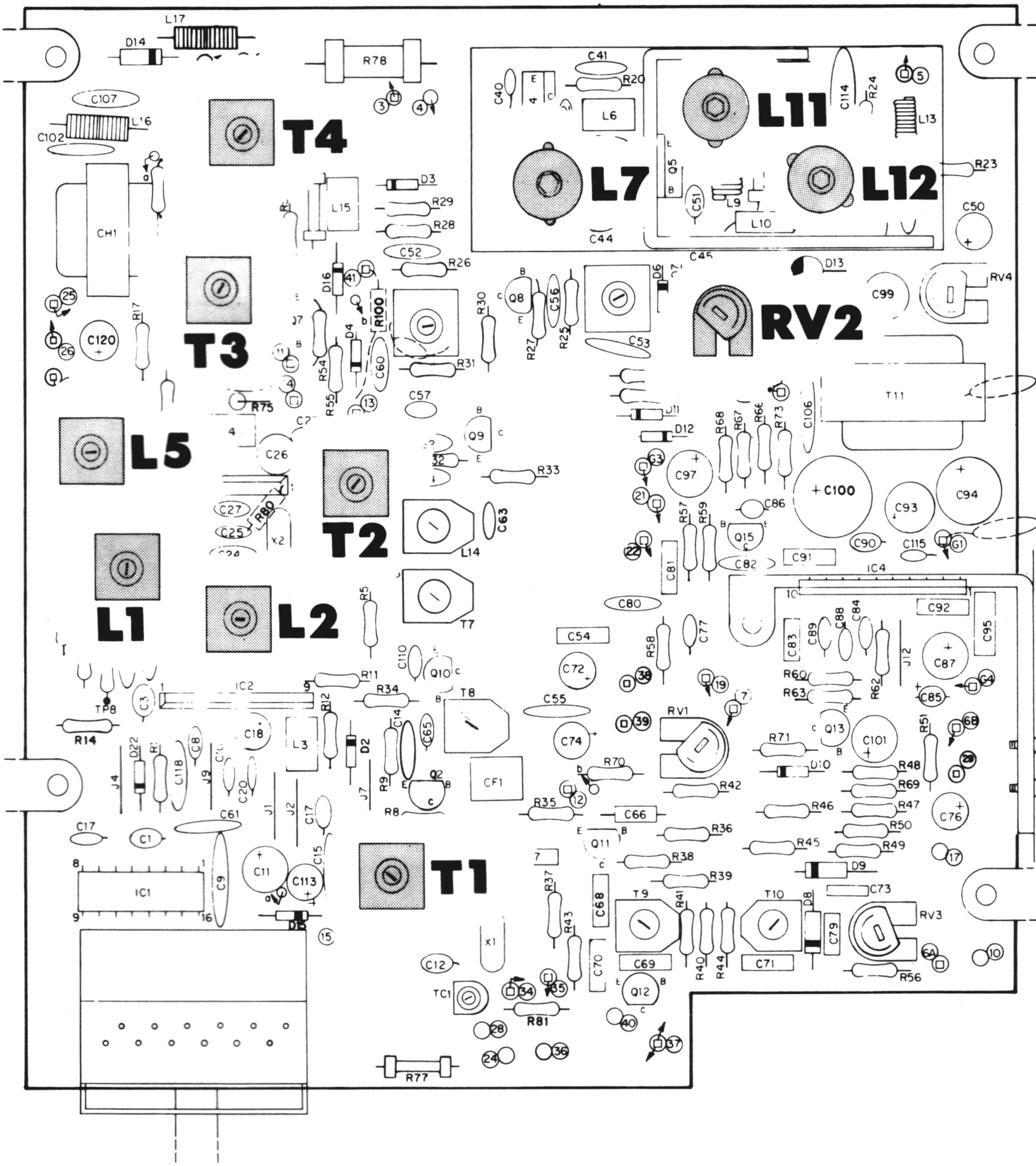

Figure 3-5. Components Adjusted for Transmitter Alignment

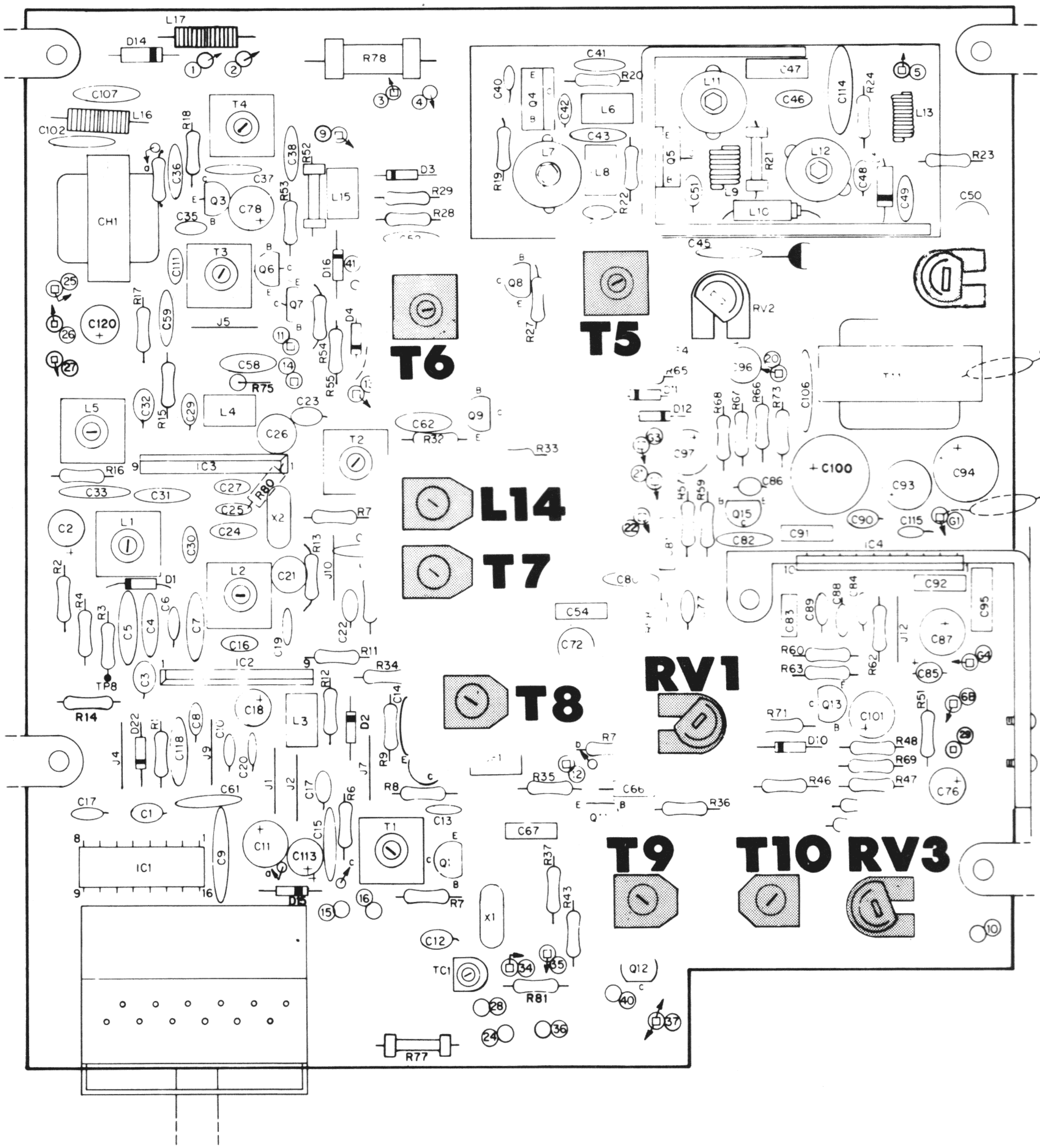

Figure 3-6. Components Adjusted for CB Receiver Alignment

EO-2706-C-103

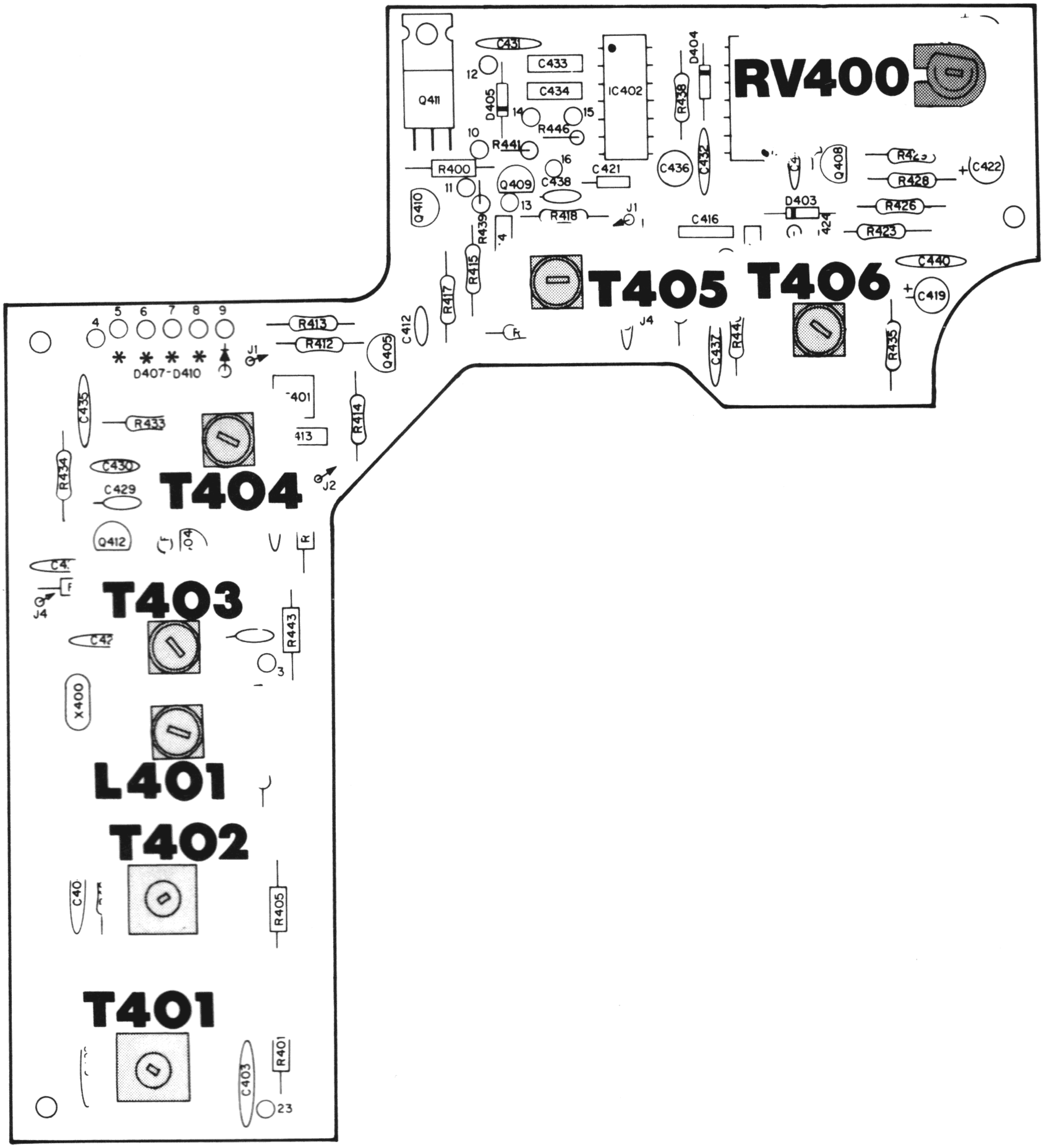

Figure 3-7. Components Adjusted for Monitor Receiver Alignment

CHAPTER 4 — CHARTS AND DRAWINGS

VOLTAGE MEASUREMENT CHART

Reference Designator	Mode	E	B	C
Q1	RX	2.8V	3.3V	5.6V
	TX	2.8V	3.3V	5.6V
Q2	RX	2.8V	2.9V	5.6V
	TX	2.8V	2.9V	5.6V
Q3	RX	1.8V	2.6V	13.8V
	TX	1V	1/7V	13.8V
Q4	RX	0	0	13.8V
	TX	0	0	10.5V
Q5	RX	0	0	13.8V
	TX	0	0	10.5V
Q6	RX	8.8V	9.4V	13.8V
	TX	8.8V	9.4V	12.5V
Q7	RX	8.8V	8.3V	0
	TX	8.8V	8V	8.7V
Q8	RX	1.5V	2.2V	13V
	TX	1.95V	.25V	13V
Q9	RX	1.6V	2.15V	11.5V
	TX	0	.25V	13V
Q10	RX	0	.6V	0
	TX	0	0	0
Q11	RX	1.5V	1.75V	12.2V
	TX	0	.25V	13V
Q12	RX	.85V	1.5V	12.8V
	TX	0	.15V	13V
Q13	RX	0	0	13V
	TX	0	.65V	0
Q14	RX	1.5V	7.1V	0
	TX	1.5V	6.8V	0
Q15	RX	0	0	0
	TX	0	0	0
Q18	RX	0	.7V	4V
	TX	0	.7V	4V
Q19	RX	0	0	0
	TX	0	0	0
Q20	RX	0	0	0
	TX	0	0	0
Q22	RX	4.5V	.9V	5.6V
	TX	4.2V	.9V	5.6V
with Noise Blanker on				
Q18	RX	0	.7V	4V
Q19	RX	8.8V	8.2V	0
Q20	RX	0	0	0

Reference Designator	Mode	E	B	C
Q401	RX	1.95V	2.42V	11.7V
	TX	3.5V	.6V	13.5V
Q402	RX	1.9V	2.4V	10.8V
	TX	.1V	.5V	13.5V
Q403	RX	0	.35V	0
	TX	0	0	0
Q404	RX	0	0	0
	TX	0	0	0
Q405	RX	1.85V	2.09V	11.2V
	TX	0	.27V	13.4V
Q406	RX	.75V	1.5V	12.9V
	TX	0	.15V	13.5V
Q407 unsquelched	RX	0	0	11.8V
	TX	0	0	12V
Q407 squelched	RX	0	.62V	0
	TX	0	.15V	12V
Q408	RX	0	0	6.5V
	TX	0	0	6.5V
Q409	RX	11.8V	12V	13.5V
display off	TX	0	0	13.5V
Q409	RX	0	0	13.5V
display on	TX	0	0	13.5V
Q410	RX	3.6V	2.2V	0
display on	TX	3.2V	1.2V	0
Q410	RX	11.2V	11V	0
display off	TX	3.2V	1.2V	0
Q411	RX	12.8V	11V	0
display off	TX	3.9V	3.2V	0
Q411	RX	4.2V	3.6V	0
display on	TX	3.9V	3.2V	0
Q412	RX	1V	1.5V	11V
	TX	0	.15V	13.5V

IC 401

Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Unsquelched	13.5V	.9V	0	0	2.4V	8.5V	0	8.5V	8.5V	0	13.5V	0	.9V	13.5V
Squelched	13.5V	.9V	0	13.5V	0	0	0	0	0	13.5V	0	13.5V	.9V	13.5V

IC 402

PIN No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Unsquelched	.07V	.07V	.07V	.05V	0	13.5V	0	13.5V	13.5V	13.5V	0	0	11V	0
Squelched	0	0	0	0	13.5V	13.5V	0	13.5V	13.5V	13.5V	13.5V	13.5V	0	13.5V

IC 2 VCO/MIXER

Pin No.	1	2	3	4	5	6	7	8	9
Measured in receive	2.5V	2V	1.3V	2.35V	0	8.5V	2.1V	4.4V	1.6V

IC 3 OSC 2/MIXER

Pin No.	1	2	3	4	5	6	7	8	9
Measured in transmit	3.6V	2.1V	1.4V	2.7V	0	8.6V	2.1V	7.8V	8.2V

IC 4 (BA52)

Pin No.	1	2	3	4	5	6	7	8	9	10
Squelched	12.69V	0	0	6.76V	5.8V	2.9V	.10V	13.61V	13.64V	13.71V
Unsquelched	6.82V		1.28V	6.76V	6V	6.70V	.98V	8.06V	13.39V	13.70V

IC 1 (PLL 02A)

Pin No.	Voltage	Channels Selected
1	5.6V	N/A
2	.2V	N/A
3	.8V	N/A
4	5.4V	N/A
5	2 - 3.6V	40 - 1
6	5.6V	N/A
7	5.6V	N/A
8	0	N/A
9	5.6V	1, 2, 3, 4, 5, 6, 7, 8, 9
10	5.6V	10, 11, 12, 13 14, 15, 16 17,18, 19, 20, 21, 22, 23, 24, 25 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38
11	5.6V	10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 39, 40
12	5.6V	1, 2, 3, 10, 11, 12, 13, 14, 15, 23, 24, 25, 26, 27, 28, 29, 30, 39, 40
13	5.6V	4, 5, 6, 10, 11, 12, 16, 17, 18, 19, 23, 24, 25, 26, 31, 32, 33, 34, 39, 40
14	5.6V	1, 4, 7, 10, 11, 13, 14, 16, 17, 20, 24, 25, 27, 28, 31, 32, 35, 36, 39, 40
15	5.6V	2, 5, 7, 8, 10, 13, 15, 16, 18, 21, 23, 24, 27, 29, 31, 33, 35, 37, 39
16	0	N/A

Front Panel Lamp Controller
Q1 - Q4 (2SC945)

Reference Designator	Mode	E	B	C		E	B	C
Q1	RX	0	.7V	0				
	TX	0	.7V	12.8V				
Q2	RX	0	0	12.8V				
	TX	0	.7V	0				
Q3	RX	0	0	0	PA	.1V	.6V	.1V
	TX	0	0	0				
Q4	RX	0	.6V	0	PA	0	.1V	.6V
	TX	0	.6V	0				

NOTE: All voltage measurements are taken with the external power supply set at exactly 13.8 VDC.