hy-gain 7

by hy-gain

MODEL 3107
CITIZEN'S TWO-WAY RADIO
40 channel base station

Manufactured and Distributed by
Hy-Gain de Puerto Rico, Inc.
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CHAPTER 1 — GENERAL INFORMATION

Introduction

This service manual contains all the information needed to service and repair the Hy-Gain 7 (Model 3107) transceiver. 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.

The Hy-Gain 7 is a full 40-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. The Phase Locked Loop frequency synthesizer provides immediate operation on all channels. Use the unit with standard household power, 117 VAC.

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 completion 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 is received in full. 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 VDC - 14.5 VDC negative or positive ground, 120 VAC, 50/60Hz
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 frequency	1st IF - 10.695 MHz, 2nd IF - 455 kHz
Audio output	3 watts maximum
Current drain, receive	200 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 1.1 amp at 13.8 VDC

CHAPTER 2 — THEORY OF OPERATION

General

The theory of operation of the Hy-Gain 7 (Model 3107) 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 2-1, 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 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 in IC1 from the Channel Selector switch. 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 IC1. It is divided by 1024 within the chip in the divider circuit, producing a 10 kHz reference signal. The output of the VCO is mixed in the PLL mixer portion of IC2, with the doubled output of Q1. The mixed and converted output difference frequency (33.0 to 2.86 MHz) is then fed back to IC1, through a buffer circuit to the programmable divider and divided into a low frequency predetermined by the "N" code. The low frequency is fed to the phase detector and compared with the reference frequency.

The phase detector 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 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 17.18 to 17.62 MHz (depending on 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 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 phase detector is zero.

There is now a new DC voltage set up to tune the VCO frequency to 17.62 MHz. When this occurs the loop is considered locked. With the Channel Selector at 40, the following outputs of the PLL circuitry are produced: the 17.62 MHz VCO output is mixed with 20.48

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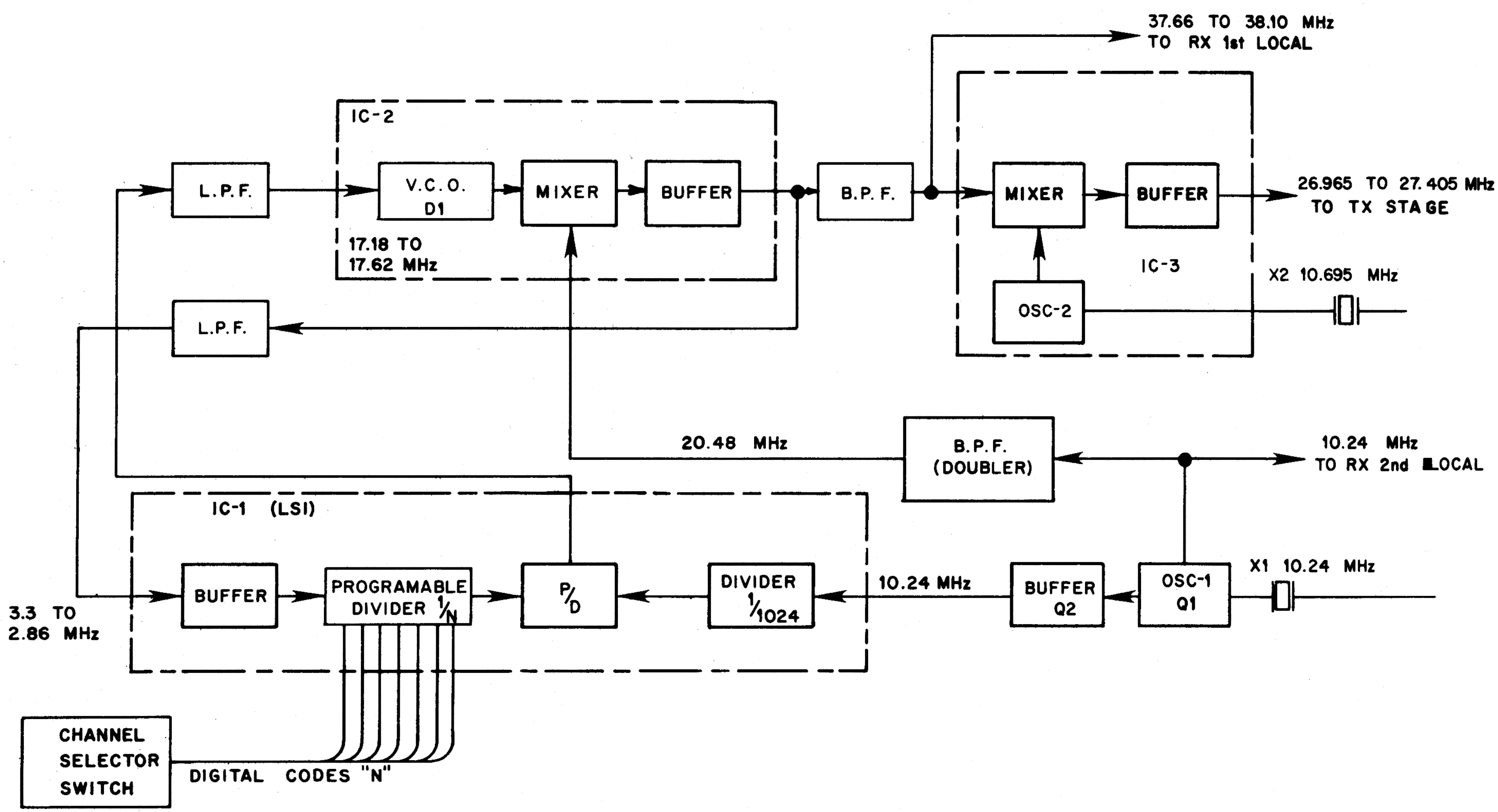

Figure 2-1. Block Diagram of PLL Circuitry, Model 3107

MHz doubled output from the 10.24 MHz Doubler 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.

Receiver

The 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 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 L14 and T7. It is then applied to the Second Receiver Mixer and produces and output of 455 kHz, which is the second IF.

The second IF passes through the Ceramic Filter, CF1, and is amplified by Q11 and Q12. The amplified signal is then fed to the Detector, D9. 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 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 biases the squelch circuit inside IC4, which turns off the audio portion and squelches the receiver. When the signal is received, the AGC voltage developed by D9 biases Q13 off. This biases the squelch circuit inside IC4 in such a way 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 RC coupled to the Audio Amplifier, IC4. The audio signal then passes through the audio transformer, T11, to be applied to the speaker jacks and the speaker.

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 (AVR), Q6, is then supplied through Q7 to IC3. The operation of IC3 turns on the DC Switch, Q22, and allows Q3, Q4 and Q5 to operate.

The operating channel is determined by the PLL frequency synthesizer. 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 Pre-driver, Q3. The filter circuit partially removes spurious signals from the transmit frequency.

From the Driver 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 is applied to the collectors of Q4 and Q5 through the audio output transformer, T11. Control voltages for the transmit audio (ALC), Q15 and Q14, come from the detector diode, D11 and D12. The transmit audio ALC boosts, or lowers, the amplifier gain in response to line voltage fluctuations. This ensures 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.

Power Supply

The power supply circuit employs a Darlington-connected pair of transistors as the pass element. The bridge rectifier of D1 through 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.

Table A

Channel Frequency and "N" Code Chart

Channel No.	Channel Freq. (MHz)	"N" Digital Codes	VCO Freq. (MHz)	Channel SW. Output							RX 1st Local Freq. (MHz)
				A	B	C	D	A'	B'	C'	
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	37.80
13	27.115	315	17.33	1	1	0	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	17.83	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	27.185	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
39	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

CHAPTER 3 — ALIGNMENT

General

These procedures must be followed to align the Hy-Gain 7 (Model 3107) 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: 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 3107 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
RF wattmeter and 50 ohm, 5W dummy load
Standard RF signal generator, 27 MHz CB band
Speaker dummy resistor, 8 ohm, 5W
VOM 20 kohm/V

All test equipment should be properly calibrated.

NOTE: Test voltage is 13.8 VDC unless otherwise specified.

Setting the Power Supply Output Voltage

NOTE: Refer to Figure 3-4 for the components to be adjusted for the power supply alignment.

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

Transmitter Alignment Procedure

Equipment Set-up

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

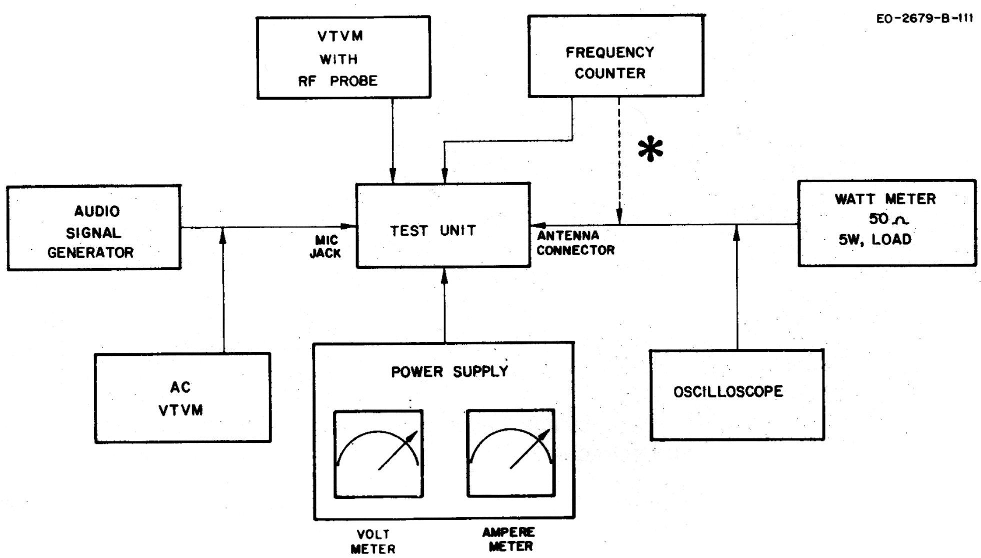

Figure 3-1. Equipment Set-up, Transmitter Alignment.

***NOTE:** See Figure 3-2 for connection of the frequency counter and the dummy load.

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.

1. Emitter of Q2, reference input, check to read 10.24 MHz accurate to four significant digits.
2. 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 the channel 1 position.
2. Connect the VOM (DC 12V range) between ground and TP8.
3. Adjust L1 core to obtain a reading of 3.6V ± 0.1V.
4. Place the Channel Selector in the channel 40 position. The reading should be within 2V ± .5V.

RF Driver Stage Alignment

1. Place the Channel Selector in the channel 19 position.
2. Connect the oscilloscope to the base of Q13 and ground.
3. Adjust T1, L2, T2, L5 and T3 in that order for maximum amplitude on the oscilloscope.
4. Reduce the power supply voltage from 13.8 to 7.0V and connect the oscilloscope between the base of Q4 and ground.
5. Adjust T3 and T4 for maximum amplitude on the scope display.

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 below.

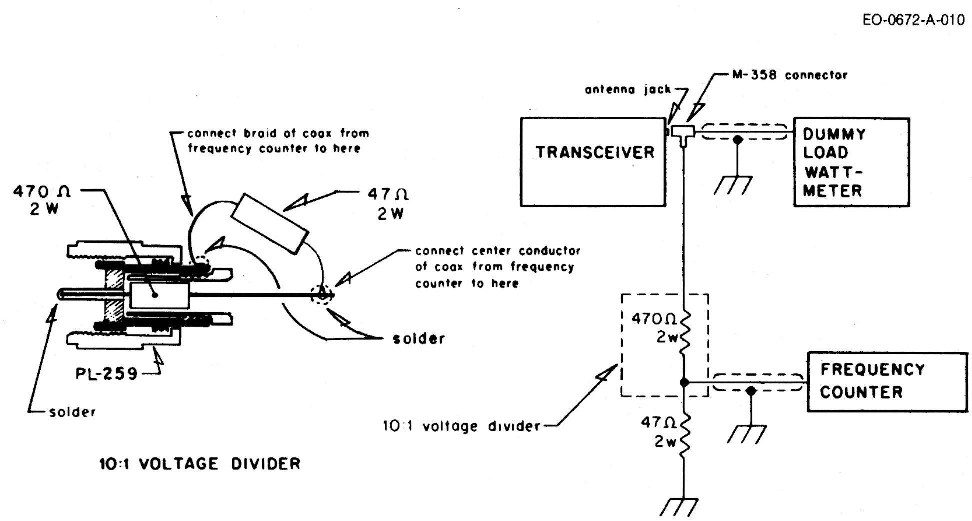

Figure 3-2. Connection of Frequency Counter and Dummy Load

3. Key the transmitter with the microphone PTT button.
4. Check the frequency of each channel with the following chart. Frequencies should be within ± 800Hz at 25° centigrade (room temperature).

Modulation Sensitivity Adjustment

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 p.c. 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%.

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

Receiver Alignment Procedure

Equipment Set-up

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

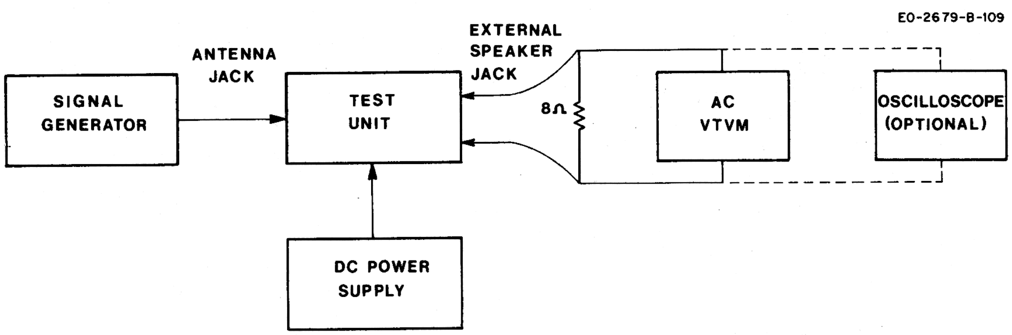

Figure 3-3. Equipment Set-up, Receiver Alignment

RF Meter Calibration

Adjust RV4 so that the meter pointer indicates the same wattage as the reading obtained on the wattmeter.

Receiver Alignment

Place the ANL switch in the "ON" position.

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

1. Set the signal generator to 27.185, 1 kHz, 30% modulation and set the transceiver to channel 19.

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 the transmitter tuning coils, 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 squelch control fully clockwise.
3. Adjust RV1 so that the squelch just breaks with the 100 uV signal input.

S-Meter Adjustment

1. Set the signal generator to provide a 30 uV signal output.
2. Adjust RV3 so that the S-Meter indicates "9"

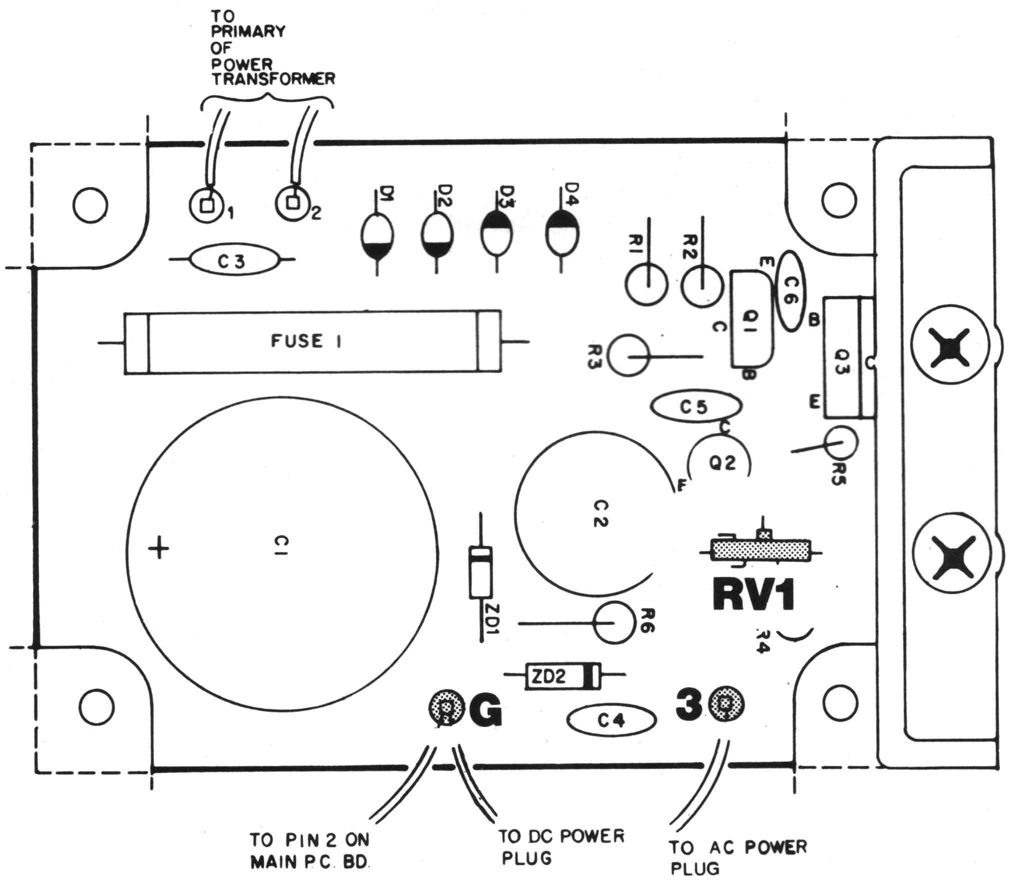

Figure 3-4. Components Adjusted for Power Supply Alignment

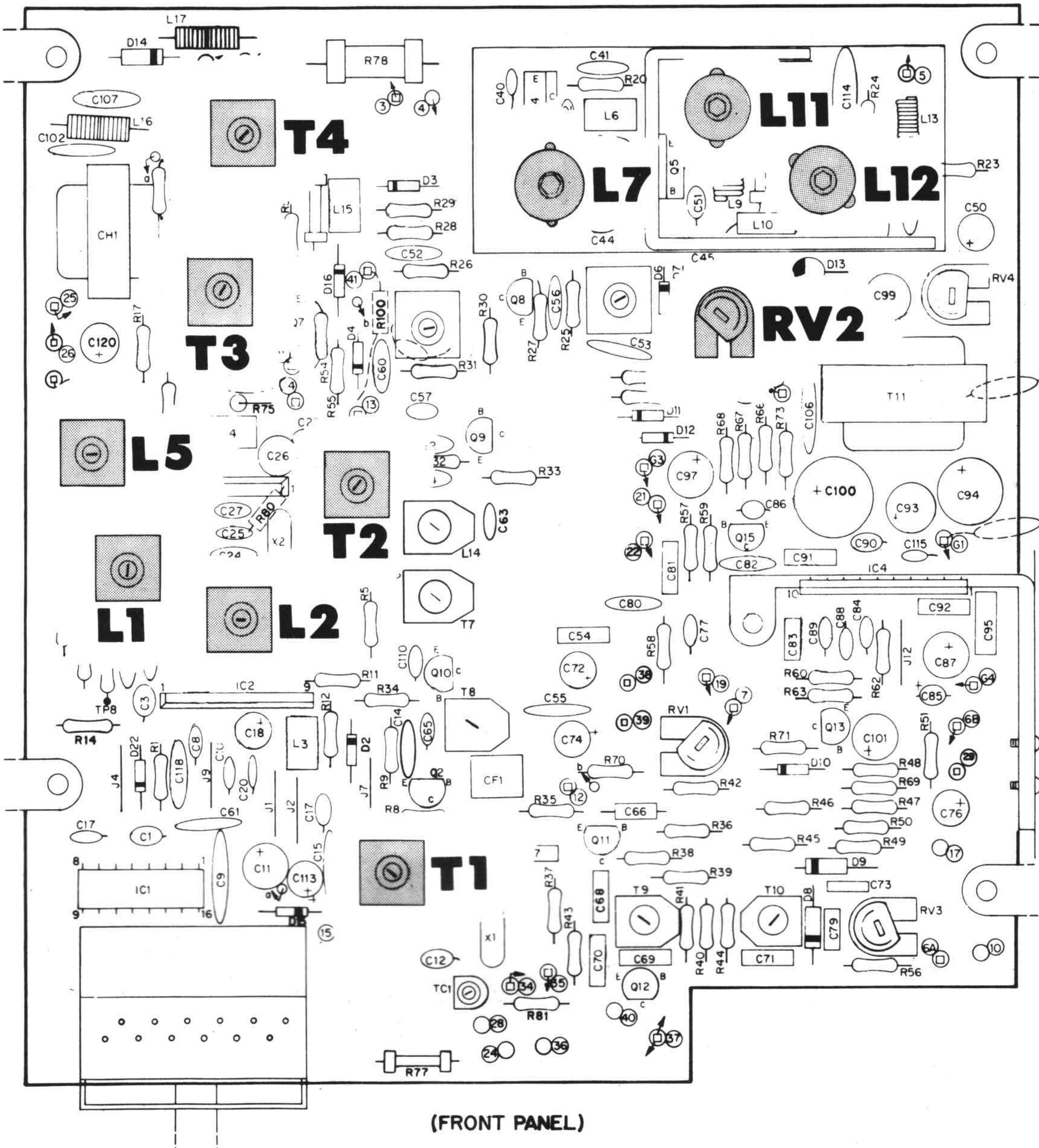

Figure 3-5. Components Adjusted for Transmitter Alignment

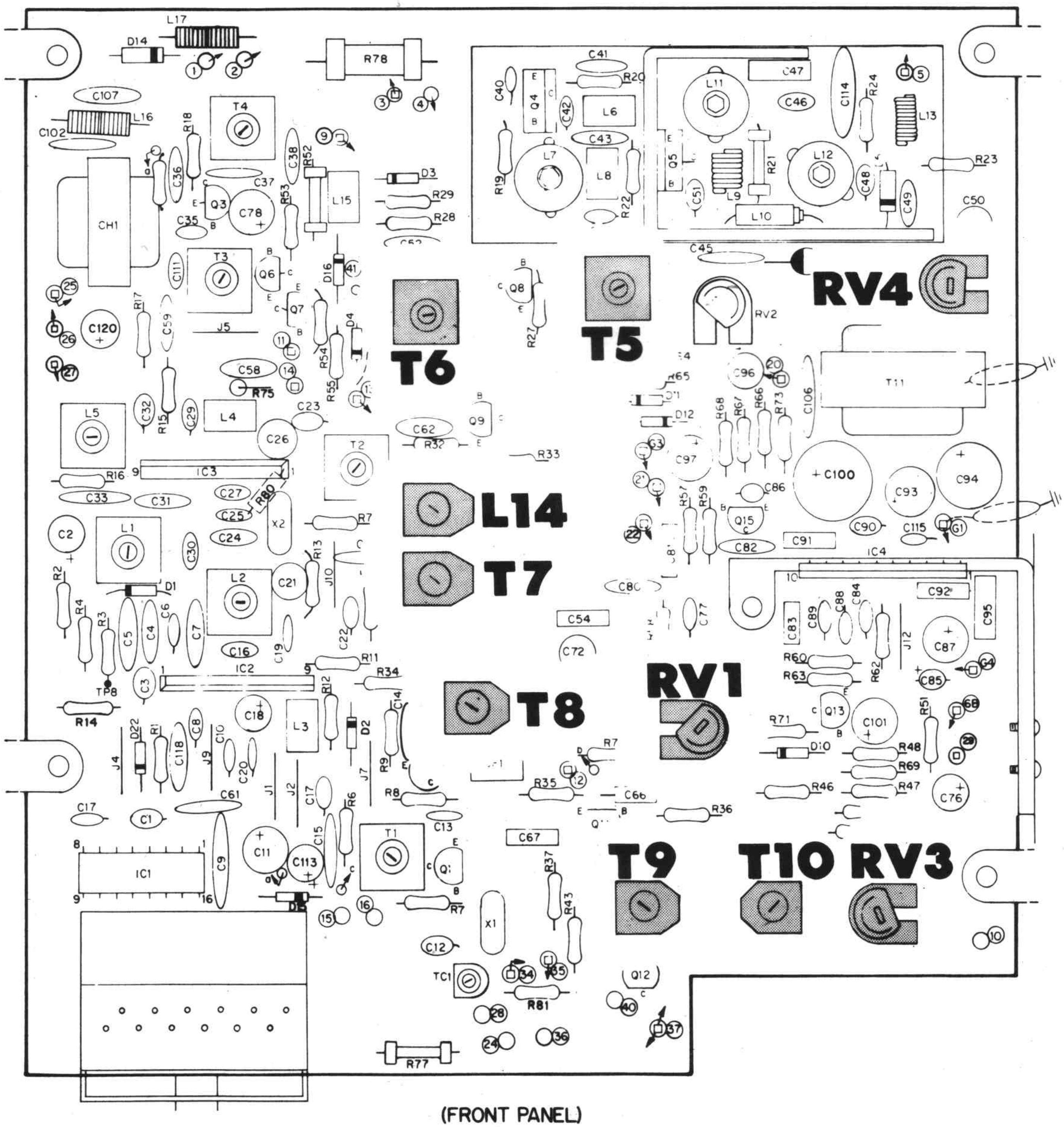

Figure 3-6. Components Adjusted for Receiver Alignment

CHAPTER 4 — CHARTS AND DRAWINGS

VOLTAGE MEASUREMENT CHARTS

Reference Designator	Mode	E	B	C
Q1	RX	2.67V	3.42V	5.55V
	TX	2.76V	3.42V	5.55V
Q2	RX	3.51V	5.55V	2.75V
	TX	3.51V	5.55V	2.75V
Q3	RX	.75V	1.42V	13.73V
	TX	.75V	1.42V	13.73V
Q4	RX	0V	0V	13.70V
	TX	0V	0V	11.5V
Q5	RX	0V	0V	13.8V
	TX	0V	0V	12.2V
Q6	RX	8.93V	9.60V	13.16V
	TX	8.93V	9.60V	12.43V
Q7	RX	8.93V	8.92V	0V
	TX	8.93V	8.42V	8.84V
Q8	RX	1.65V	2.57V	12.43V
	TX	1.65V	2.57V	12.43V
Q9	RX	1.83V	2.53V	11.05V
	TX	0V	.42V	12.97V
Q10	RX	0V	.47V	0V
	TX	0V	47V	0V
Q11	RX	1.80V	2.42V	11.76V
	TX	0V	.42V	12.97V
Q12	RX	1.00V	1.70V	12.38V
	TX	0V	.24V	12.97V
Q13	RX	0V	0V	6.75V
	TX	0V	0V	6.75V
Q14	RX	1.47V	6.86V	0V
	TX	1.47V	6.86V	0V
Q15	RX	0V	0V	0V
	TX	0V	0V	0V
Q22	RX	4.39V	4.57V	5.55V
	TX	4.39V	4.57V	5.55V

NOTE: All measurements performed with the internal power supply set at exactly 13.8 VDC.

Power Supply Board

	E	B	C
Q1	14.29V	14.98V	22.1V
Q2	6.00V	6.62V	14.87V
Q3	13.64V	14.30V	22.2V

IC 's

PINS	1	2	3	4	5	6	7	8	9	10
IC1										
Receive	5.56V	2.18V	2.63V			5.55V				
Transmit	5.56V	2.18V	2.63V			5.55V				
IC2										
Receive	2.64V	1.99V		2.24V		8.6V	2.1V	4.42V	5.53V	
Transmit	2.64V	1.99V		2.24V		8.6V	2.1V	4.42V	5.53V	
IC3										
Receive	0	0	0	0	0	0	0	0	0	
Transmit	2.77V	2.0V	2.0V	2.74V	0	8.84V	2.16V	8.0V	8.48V	
IC4										
Receive	6.81V	0	1.22V	6.78V	6.73V	6.76V	.97V	8.0V	13.18V	13.73V
Transmit	6.81V	0	1.22V	6.78V	6.73V	6.76V	.97V	8.0V	13.18V	13.73V

PIN	1	2	3	4	5	6	7	8	9	10
IC4										
Receive										
Unsquelched	6.81	0	1.22	6.78	6.73	6.76	.97	8.0	13.18	13.73
Squelched	12.7	0	0	6.77	6.69	2.46	0	13.62	13.74	

	E	B	C
Q13			
Unsquelched	0V	0V	6.75V
Squelched	0V	.68V	0V