hy-gain 10

by hy-gain

MODEL 2710
CITIZENS TWO-WAY RADIO
40 channel mobile

Manufactured and Distributed by
Hy-Gain de Puerto Rico, Inc.
P.O. Box 68 State Hwy 31, KM. 4.0
Naguabo, Puerto Rico 00718

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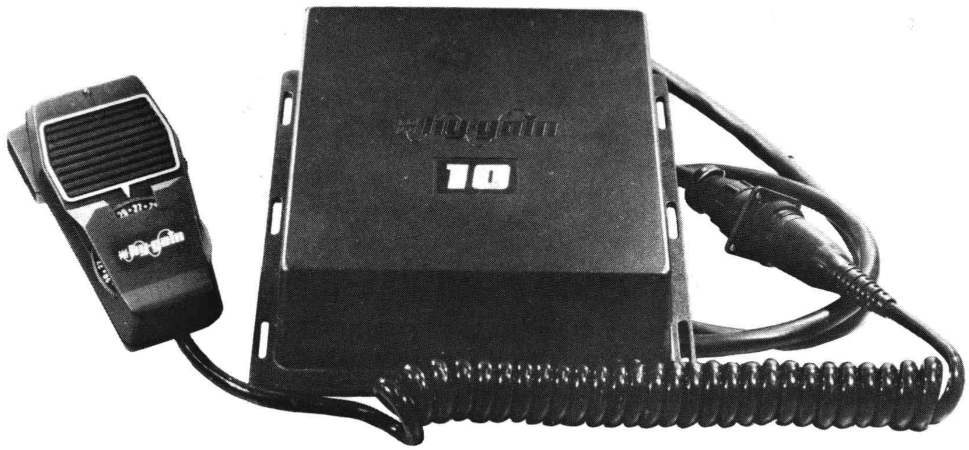

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CHAPTER 1-GENERAL INFORMATION

Introduction

This service manual contains all the information needed to service and repair the Hy-Gain 10 transceiver (Model 2710). 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 unit is a full 40-channel transceiver designed, receiver certified, and type accepted for Class D Citizens Radio Service, as designated by the Federal Communications Commission (FCC).

It is a compact mobile unit which operates by remote control. All the operator controls are built into one unit, the microphone, allowing the transceiver to be mounted out of sight in the vehicle.

The transceiver is completely solid-state and highly reliable with low power consumption. Its PLL (Phase Locked Loop) synthesizer provides immediate operation on all 40 channels. A built-in automatic noise limiter (ANL) is included to help reduce atmospheric noise. 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 your problem. Address your letter to:

Hy-Gain Warranty Service Department
4900 Superior Street
Lincoln, Nebraska 68504
ATTN: National Service Manager

The Warranty Service Department can repair any unit. Before shipping 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 difficult problems.

How to Ship Returns

To return a unit, get a return authorization first. This is important. The handling of the unit will only be delayed if shipped without it. If you must ship immediately, telephone or telex the National Service Manager for expeditious service.

When you request return authorization, notification of completion of repairs may also be requested. The notification will include a copy of the bill. Paying the bill before the unit is returned can save the cost of a COD fee.

For warranty repair, prepare a letter in duplicate containing the following information (for out-of-warranty repair delete items 2 and 3):

1. your name and address
2. purchaser's name and address
3. proof of purchase
4. serial number
5. a complete description of the problem
6. the return authorization

Check the unit to see that all parts and screws are in place and attach an envelope containing a copy of 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 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 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 MHz-27.405 MHz)
Antenna Impedance	50 ohms, nominal
Power Requirements..............	11.5 VDC - 14.5 VDC, negative or positive ground
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 to 10 dB (S+N)/N ratio
Intermediate Frequencies	1st IF - 10.695 MHz 2nd IF - 455 kHz
Audio Output	3 watts, maximum
Current Drain, Receive............	about 500 mA, standby (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	about 1.3A @ 13.8 VDC unmodulated

CHAPTER 2—THEORY OF OPERATION

General

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

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

Phase Locked Loop Frequency Synthesizer

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

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

The PLL circuit generates the operating frequencies needed for the transceiver in accordance with the binary code fed to the programmable divider, in IC101, from the channel selector switch.

Table A shows the following for each channel: the channel frequency, VCO frequency, binary code and the division ratio of the programmable divider.

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

The two 10 kHz signals are phase compared in the phase detector within IC102 producing a DC voltage. This DC voltage controls the varactor diode, D102, and holds the VCO frequency at 37.660 MHz.

Assume that the channel is changed to channel 40. The channel select logic board now provides a code that will produce a division ratio of 268. At this instant the VCO frequency is at 37.660 MHz, which is mixed with the tripled output of Q105. Again, the PLL Mixer, Q102, produces an output of 2.24 MHz. The 2.24 MHz signal is divided by 268 to produce a frequency of 8.358 kHz.

The 8.358 kHz output, along with the 10 kHz obtained from the reference oscillator, 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 the two frequencies are matched at 10 kHz, the error voltage output of the phase detector is zero.

There is now a new DC voltage set up to tune the VCO frequency to 38.100 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 38.100 MHz VCO output is fed to the First Receiver Mixer and, in the transmit mode, is mixed with the 10.695 MHz output of Q109 to produce a transmit frequency of 27.405 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 IC102, Q114, Q115, Q118, Q119, and to Q106 (the AVR). The AVR supplies regulated voltage to the synthesizer stages and to the Reference Oscillator, Q117. A bias voltage is also applied to the base of the Transmit Switch, Q107. This bias holds the Transmit Switch open so that the transceiver circuits remain in receive.

Radio signals are received by the antenna and enter the radio at the antenna jack. The filter formed by L109, L110, C153 and C1 matches the antenna impedance to the RF Amplifier. Signals in the 26.695 MHz to 27.555 MHz range are filtered out and amplified by the RF Amplifier, Q114, and its tuned circuit, C154/T104 and T105. D107 is a signal overload protector.

The output of the RF Amplifier and buffered VCO signal (which in this case could be called the "first local oscillator frequency") are applied to the First Receiver Mixer, Q115. These two signals are mixed in the First Receiver Mixer and produce an output of 10.695 MHz, which is the first IF.

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

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

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

The recovered audio from the Detector passes through a series Automatic Noise Limiter (ANL), D108, to the Electronic Attenuator, U304. The Electronic Attenuator functions as a volume control. Its output is amplified by IC102 and is fed through transformer T110 to the external speaker jack and the microphone 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, Q107, is grounded. This establishes forward bias which causes Q107 to conduct. Regulated voltage from the Automatic Voltage Regulator (AVR), Q106, is then supplied through Q107 to Q109 and Q110.

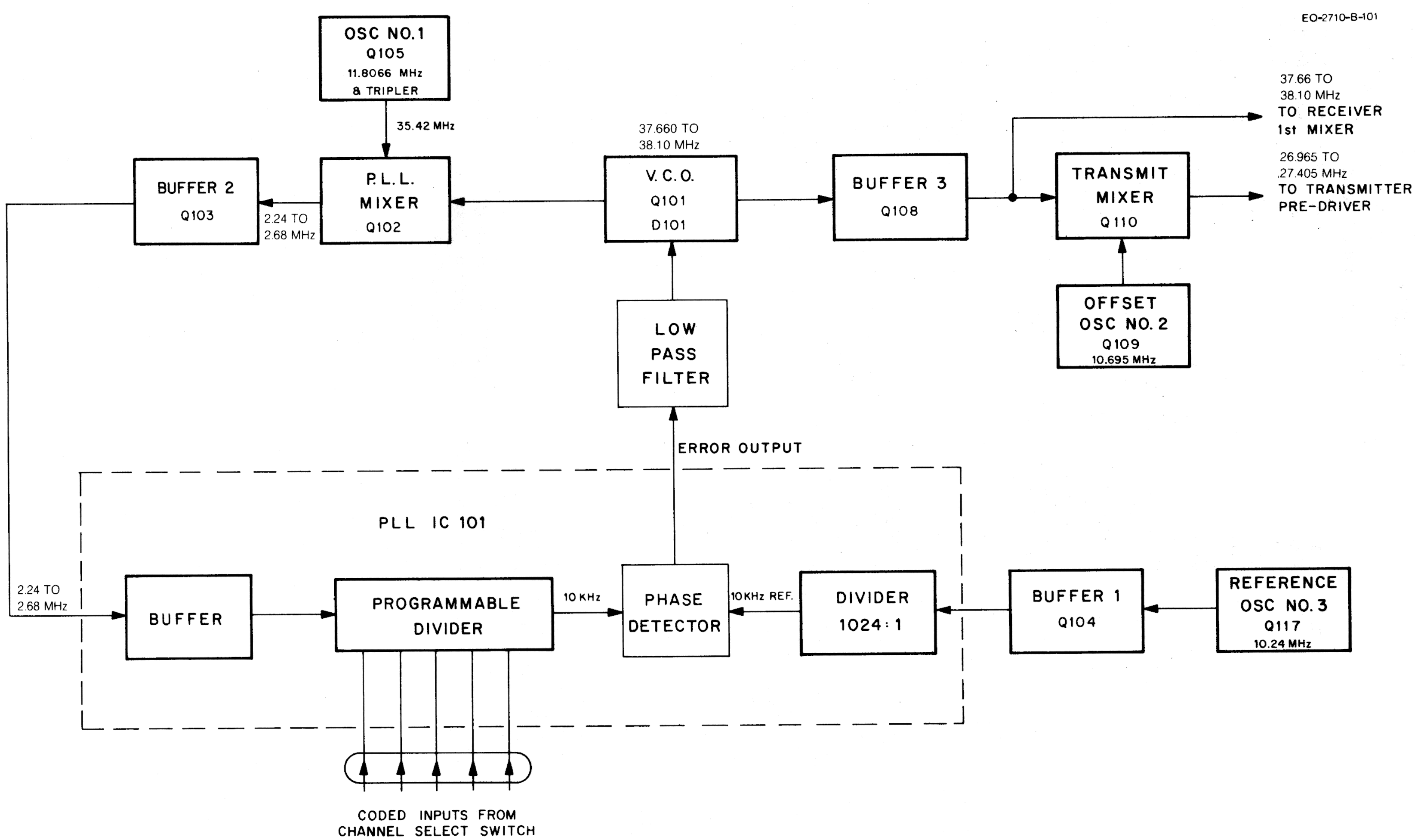


Figure 2-1. PLL Circuitry, Model 2710

"N" Code-Frequency Correlation Chart

Channel No.	Channel Frequency	"N" Code	V.C.O. Frequency	PLL INPUT CODE (256) B8	(128) B7	(64) B6	(32) B5	(16) B4	(8) B3	(4) B2	(2) B1	(1) B0
1	26.965 MHz	224	37.660 MHz	0	1	1	1	0	0	0	0	0
2	26.975 MHz	225	37.670 MHz	0	1	1	1	0	0	0	0	1
3	26.985 MHz	226	37.680 MHz	0	1	1	1	0	0	0	1	0
4	27.005 MHz	228	37.700 MHz	0	1	1	1	0	0	1	0	0
5	27.015 MHz	229	37.710 MHz	0	1	1	1	0	0	1	0	1
6	27.025 MHz	230	37.720 MHz	0	1	1	1	0	0	1	1	0
7	27.035 MHz	231	37.730 MHz	0	1	1	1	0	0	1	1	1
8	27.055 MHz	233	37.750 MHz	0	1	1	1	0	1	0	0	1
9	27.065 MHz	234	37.760 MHz	0	1	1	1	0	1	0	1	0
10	27.075 MHz	235	37.770 MHz	0	1	1	1	0	1	0	1	1
11	27.085 MHz	236	37.780 MHz	0	1	1	1	0	1	1	0	0
12	27.105 MHz	238	37.800 MHz	0	1	1	1	0	1	1	1	0
13	27.115 MHz	239	37.810 MHz	0	1	1	1	0	1	1	1	1
14	27.125 MHz	240	37.820 MHz	0	1	1	1	1	0	0	0	0
15	27.135 MHz	241	37.830 MHz	0	1	1	1	1	0	0	0	1
16	27.155 MHz	243	37.850 MHz	0	1	1	1	1	0	0	1	1
17	27.165 MHz	244	37.860 MHz	0	1	1	1	1	0	1	0	0
18	27.175 MHz	245	37.870 MHz	0	1	1	1	1	0	1	0	1
19	27.185 MHz	246	37.880 MHz	0	1	1	1	1	0	1	1	0
20	27.205 MHz	248	37.900 MHz	0	1	1	1	1	1	0	0	0
21	27.215 MHz	249	37.910 MHz	0	1	1	1	1	1	0	0	1
22	27.225 MHz	250	37.920 MHz	0	1	1	1	1	1	0	1	0
23	27.255 MHz	253	37.950 MHz	0	1	1	1	1	1	1	0	1
24	27.235 MHz	251	37.930 MHz	0	1	1	1	1	1	0	1	1
25	27.245 MHz	252	37.940 MHz	0	1	1	1	1	1	1	0	0
26	27.265 MHz	254	37.960 MHz	0	1	1	1	1	1	1	1	0
27	27.275 MHz	255	37.970 MHz	0	1	1	1	1	1	1	1	1
28	27.285 MHz	256	37.980 MHz	1	0	0	0	0	0	0	0	0
29	27.295 MHz	257	37.990 MHz	1	0	0	0	0	0	0	0	1
30	27.305 MHz	258	38.000 MHz	1	0	0	0	0	0	0	1	0
31	27.315 MHz	259	38.010 MHz	1	0	0	0	0	0	0	1	1
32	27.325 MHz	260	38.020 MHz	1	0	0	0	0	0	1	0	0
33	27.335 MHz	261	38.030 MHz	1	0	0	0	0	0	1	0	1
34	27.345 MHz	262	38.040 MHz	1	0	0	0	0	0	1	1	0
35	27.355 MHz	263	38.050 MHz	1	0	0	0	0	0	1	1	1
36	27.365 MHz	264	38.060 MHz	1	0	0	0	0	1	0	0	0
37	27.375 MHz	265	38.070 MHz	1	0	0	0	0	1	0	0	1
38	27.385 MHz	266	38.080 MHz	1	0	0	0	0	1	0	1	0
39	27.395 MHz	267	38.090 MHz	1	0	0	0	0	1	0	1	1
40	27.405 MHz	268	38.100 MHz	1	0	0	0	0	1	1	0	0

Table A

The operating channel is determined by the PLL frequency synthesizer. The buffered VCO frequency is mixed in Q110 with the 10.965 MHz Offset Oscillator, Q109, output to yield the transmit frequency. The transmit frequency from Q110 passes through the filter circuit of L103, L104, and T102 and is applied to the Pre-driver, Q111. The filter circuit partially removes spurious signals from the transmit frequency.

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

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

The transmit signal is modulated in the following manner: Microphone output is applied through the mic transformer, to the Audio Amplifier, IC102. The output of IC102 is applied to the collectors of Q112 and Q113 through the audio output transformer, T110. Control voltages for the transmit audio (ALC), Q122, and the Range Boost, Q121, come from detector diode D111. The transmit audio (ALC) boosts, or lowers, the amplifier gain in response to line voltage fluctuations. This ensures full modulation of the carrier despite any changes in line voltage. The Range Boost reduces AF peaks so that higher average AF level is supplied to the Audio Amplifier. This gives the desired high average modulation without overmodulation on peaks.

Control and Logic Functions

All operator controls, on/off switch, volume, push-to-talk switch, and channel selector switch, are located in the microphone unit. The microphone also includes a speaker for receiver audio (which doubles as the microphone element) and LED radiants which indicate the channel selected and whether the transceiver is transmitting.

Channel selection is accomplished with the channel selector switch located in the microphone control unit. The switch selects the proper binary code and feeds it to the programmable divider of the PLL, IC101.

Squelch Override Function

The squelch override function operates when an AM/FM stereo receiver (Hy-Gain Model 4601 or 4701) and the transceiver are operating. Set the squelch on the transceiver to eliminate background static. This allows the AM/FM stereo receiver to play. When the collector of the CB Transceiver Squelch Switch, Q120, is biased properly it enables Q12, in the Hy-Gain Model 4601 or 4701 stereo receiver, to kill the audio amplifiers IC2 and IC3 in the 4601 or IC4 and IC5 in the 4701. This allows a transceiver CB signal to be received. This function will work best when the transceiver's squelch knob is set in approximately the middle position.

CHAPTER 3—ALIGNMENT

General

These procedures must be followed to align the 2710 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 tuning coils are easily chipped or broken. Use care when inserting an alignment tool in the coil: insert it straight into the core.

Recommended Equipment

The following equipment is recommended for use in aligning the transceiver.

Audio Signal Generator, 1 kHz

AC VTVM, 1 mV measurable

DC Ampere Meter, 2A

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

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 20k ohm/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 3-4 for the location of components to be adjusted for transmitter alignment.

Connect test equipment as shown in Figure 3-1.

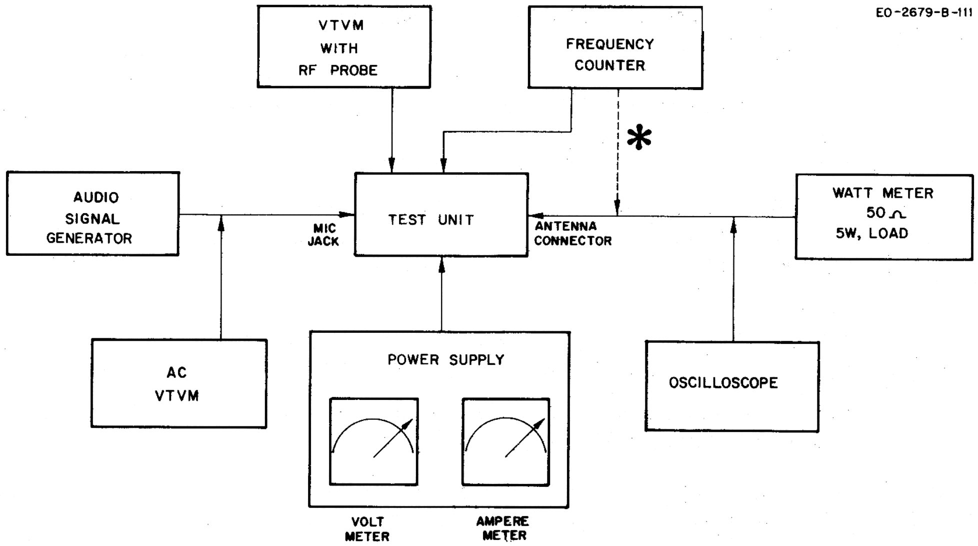


Figure 3-1. Equipment Set-up, Transmitter Alignment

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

Pre-Alignment Frequency Check

Before alignment, use a high input impedance frequency counter through a 100 pF capacitor connected in series with the counter input probe to check the operating frequencies at the following points.

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

2. Disconnect C103 from base of Q102. Check to read 11.8066 MHz at the base of Q102. If necessary, adjust C119 to obtain this frequency. Reconnect C103.

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

VCO Alignment

1. Connect VOM (DC 10V ranged) across C135 and check to read 5.0V-5.5V.

2. Place the channel selector in the channel 1 position.

3. Connect the VOM between ground and R114 (PT-8 side).

4. Adjust T101 to obtain 1.5V ± 0.1V.

RF Output Adjustment

1. Adjust the power supply voltage to 8.0 volts.

2. Connect the VTVM RF probe between the base of Q111 and ground.

3. Set the transceiver channel selector to channel 19. Perform the following procedures on channel 19.

4. Key the transmitter.

5. Adjust the slugs of L103, L104, and T102 for a maximum reading on the VTVM.

6. Connect the RF VTVM probe between the base of Q112 and ground.

7. Adjust the slug of T103 for a maximum reading on the VTVM.

8. Adjust L106 for maximum RF output as indicated on the wattmeter.

9. Adjust L109, L110 for maximum RF power output as indicated on the wattmeter.

10. Raise the power supply voltage to 13.8V.

11. Repeat steps 2 through 7 only.

12. Back off L110 (counterclockwise) for a reading of 4.0 watts RF power output.

13. Readjust L109 for maximum power out.

14. Repeat steps 12 and 13 until the maximum power output is 4.0 watts with L109 peaked for maximum output.

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

Transmitter Frequency Check

1. Turn the transceiver off.

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

3. Turn the transceiver on.

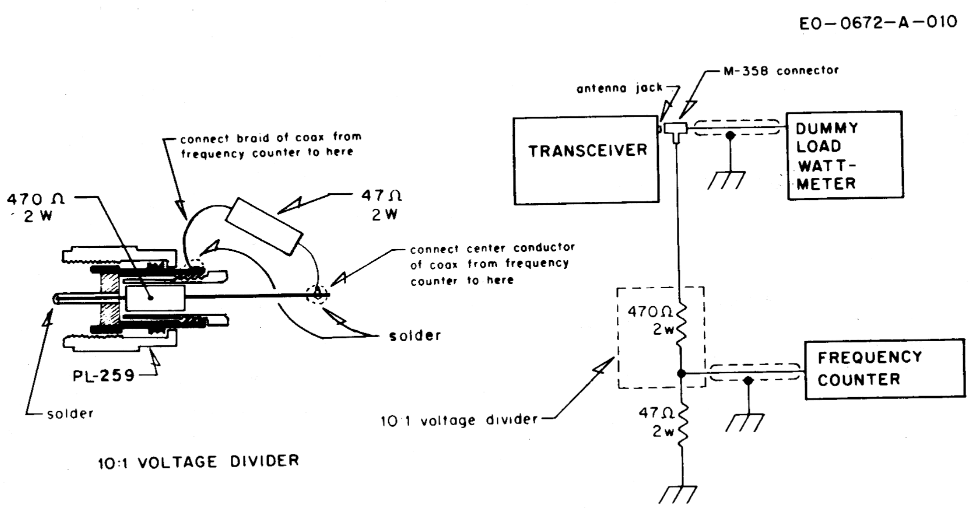


Figure 3-2. Connection of Frequency Counter and Dummy Load

4. Key the transmitter with the microphone PTT button.

5. Check the frequency of each channel with the following chart. Frequencies should be within ± 800 Hz at 25°C (room temperature).

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 Adjustment

1. Place the unit in the transmit mode and apply a 20 mV, 1 kHz signal to wire wrap pin 22 on the radio PC board.

2. Adjust RV-102 to obtain 90% modulation as observed on the oscilloscope.

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

Receiver Alignment Procedure

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

Equipment Set-up

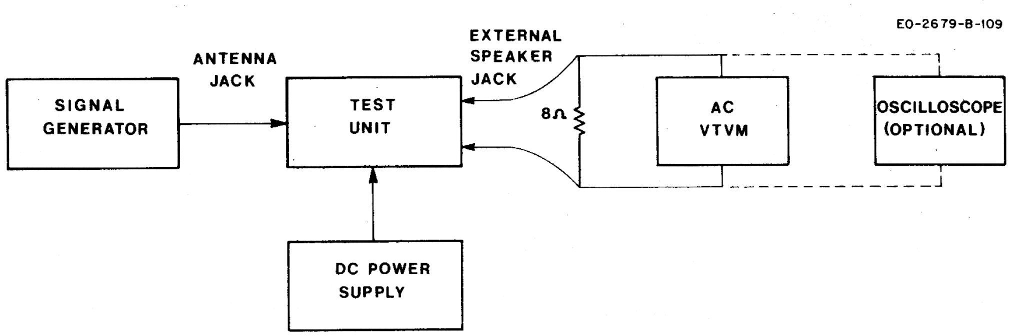


Figure 3-3. Equipment Set-up, Receiver Alignment

Receiver Alignment

1. Set the Signal Generator to 27.185 MHz, 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.

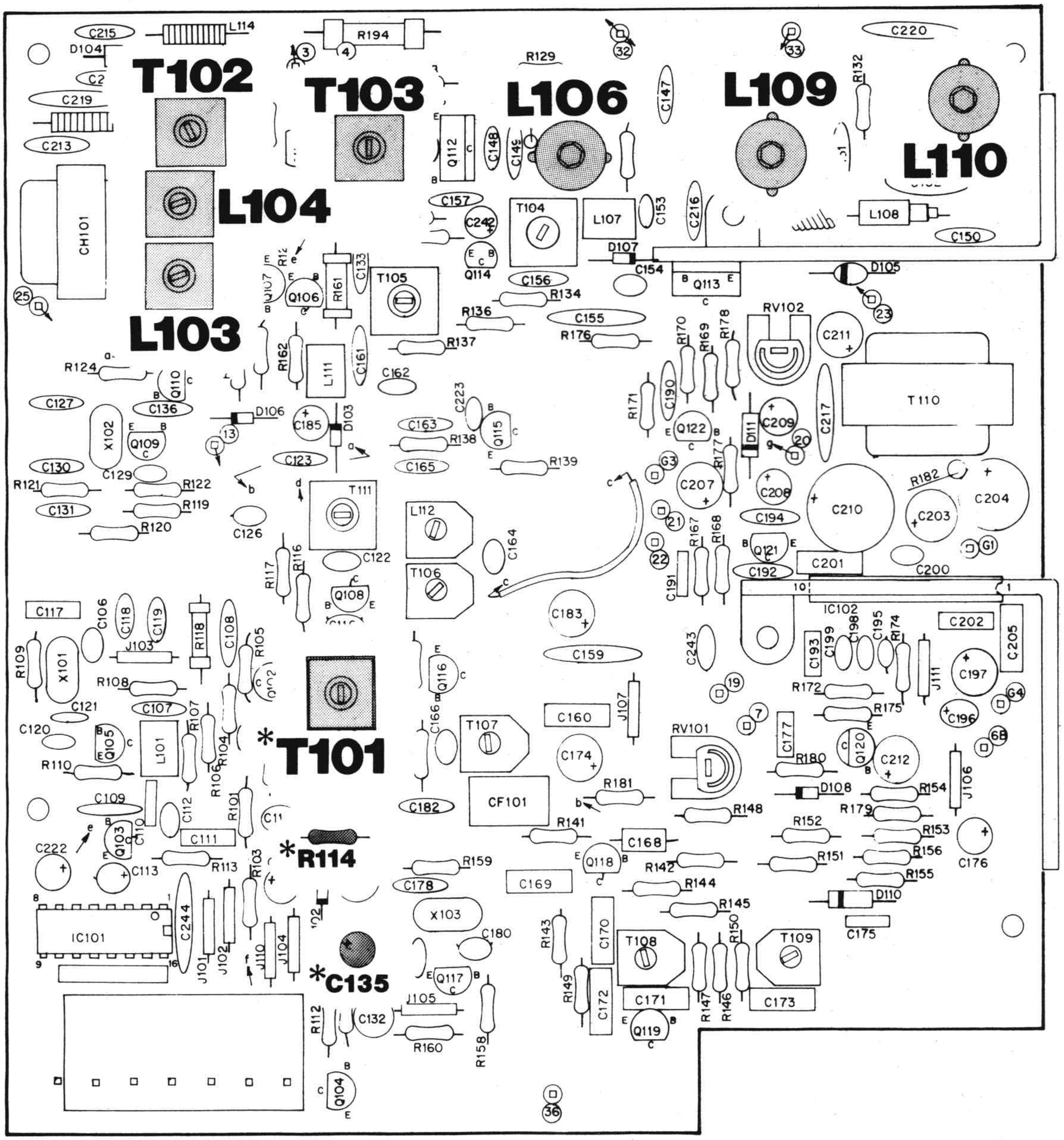
2. Adjust T104, T105, L112, T106, T107, T108 and T109 for maximum audio output as indicated on the AC VTVM (or oscilloscope if used).

Tight Squelch Adjustment

1. Set the Signal Generator to provide an RF input signal of 100 uV, (1 kHz, 30% modulation).

2. Rotate the squelch control fully clockwise.

3. Adjust RV-101 so that the squelch just breaks with the 100 uV signal input.



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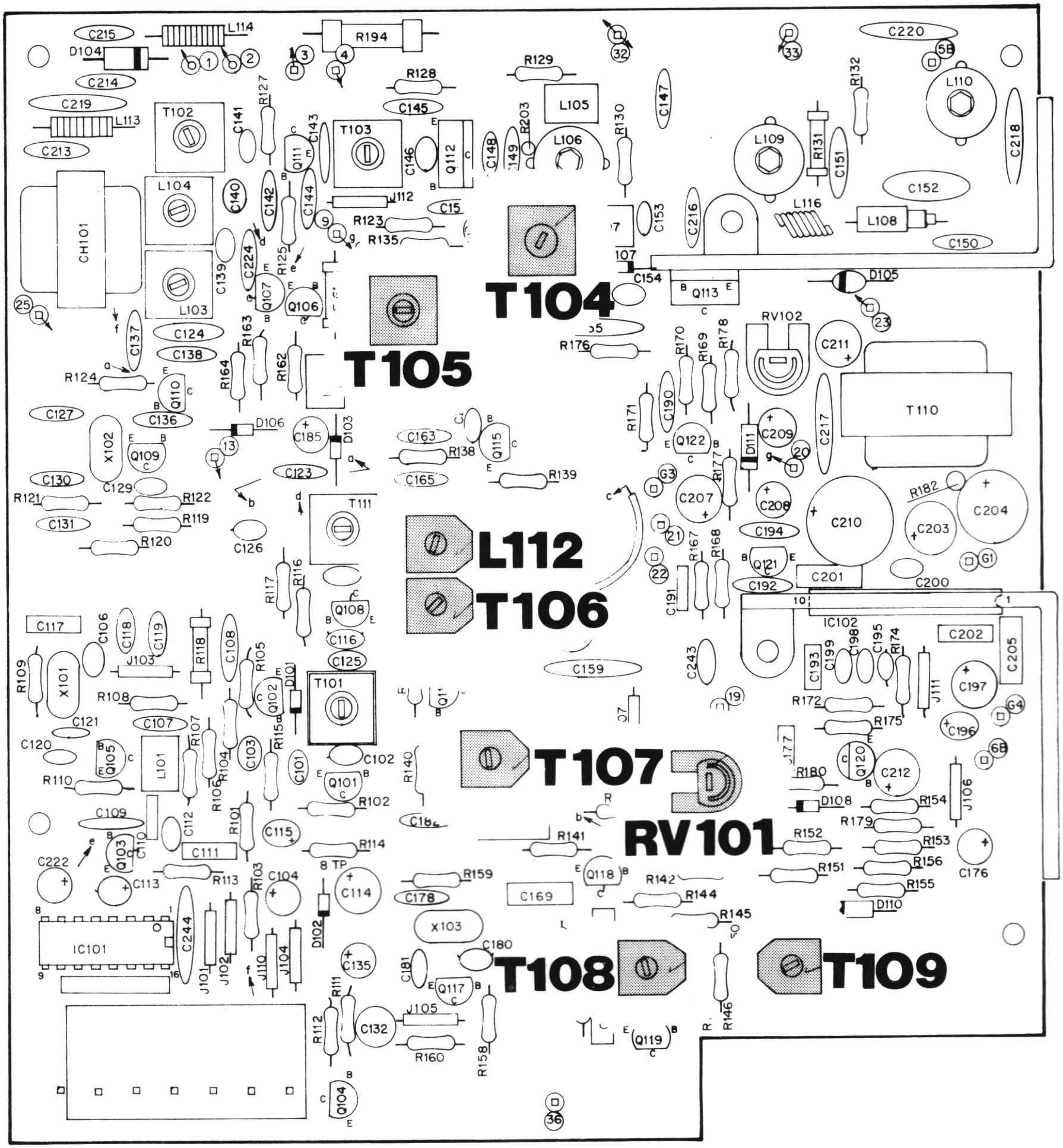
NOTE:

✱ Adjusted for VCO alignment only.

Figure 3-4. Components Adjusted for Transmitter Alignment



(FRONT PANEL)

Figure 3-5. Components Adjusted for Receiver Alignment

CHAPTER 4 — CHARTS & DRAWINGS

VOLTAGE MEASUREMENT CHART

Reference Designator	Mode	E	B	C
Q101	RX	0	.08	1.60
Q102	RX	0	.03	1.71
Q103	RX	0	.08	1.32
Q104	RX	0	0	1.61
Q105	RX	1.12	.06	1.89
Q106	RX	8.64	6.71	12.54
Q107	RX	8.64	7.86	0.0
Q108	RX	0	.18	.41
Q109	RX	0	0	0
	TX	1.20	.09	1.73
Q110	TX	0	0	0
	TX	2.02	.84	8.49
Q111	RX	1.56	.46	13.70
	TX	1.00	.45	13.20
Q112	RX	0	0	12.93
	TX	0	-.13	9.75
Q113	RX	0	0	13.06
	TX	.01	-.05	10.75
Q114	Rx	1.47	.24	10.97
	TX	.50	.08	10.88
Q115	Rx	1.58	.23	7.93
	TX	7.76	.36	8.37
Q116	RX	0	.02	0
	TX	0	.01	0
Q117	Rx	.99	.06	1.85
	Tx	.99	.06	1.85
Q118	RX	1.53	.19	9.45
	TX	.01	.04	9.93
Q119	RX	.59	1.00	11.41
	TX	.01	.18	11.40
Q120	squelched	0	0.0	.02
	unsquelched	0	.23	.25
Q121	RX	0	.01	0
Q122	RX	.01	.07	.02

IC 102 (TA 7205P)

Pin No.	1	2	3	4	5	6	7	8	9	10
RX Voltage	6.79	.01	.12	.63	.18	.31	.68	5.19	11.85	12.88
TX Voltage	6.38	.01	.11	.59	.17	.29	.68	5.19	11.85	12.88

IC 101 (PLL 02A)

Pin No.	Voltage	Channels Selected
1	5.26	N/A
2	1.32	N/A
3	1.60	N/A
4	(not used)	
5	1.32-1.58	All channels
6	2.35	All channels
7	Low	Ch. 1-27
	High	Ch. 28-40
8		
9	Low	Ch. 28-40
10	High	Ch. 1-27
11	Low	Ch. 1-23, 28-40
	High	Ch. 14-27
12	Low	Ch. 1-7, 14-19, 28-35
	High	Ch. 8-13, 20-27, 36-40
13	Low	Ch. 1-3, 8-10, 14-16, 20-22, 24, 28-31, 36-39
	High	Ch. 4-7, 11-13, 17-19, 23, 25-27, 32-35, 40
14	Low	Ch. 1, 2, 4, 5, 8, 11, 14, 15, 17, 18, 20, 21, 23, 25, 28, 29, 32, 33, 36, 37, 40
	High	Ch. 3, 6, 7, 9, 10, 12, 13, 16, 19, 22, 24, 26, 27, 30, 31, 34, 35, 38, 39
15	Low	Ch. 1, 3, 4, 6, 9, 11, 12, 14, 17, 19, 20, 22, 25, 26, 28, 30, 32, 34, 36, 38, 40
	High	Ch. 2, 5, 7, 8, 10, 13, 15, 16, 18, 21, 23, 24, 27, 29, 31, 33, 35, 37, 39
16	Ground	

NOTE:

High = 2.30 volts to 2.80 volts
Low = 0 volts

CHANNEL SELECTOR P.C. BOARD

Q301	**E**	GND	All ch.
	B	Low	Ch. 28-40
		High	Ch. 1-27
	C	Low	Ch. 1-27
		High	Ch. 28-40

NOTES:

1. Base Low = 0 volts
   High = 0.75 volts

2. Collector Low = 0.06 volts
   High = 2.98 volts

U 304 (MC 3340P)

Pin No.	Voltage	Channel Selected
1	0.08	All channels
2	0.81	All channels
3	GND	
4	(not used)	
5	(not used)	
6	3.51	All channels
7	5.26	All channels
8	11.65	All channels