HUNTRON INSTRUMENTS, INC.
TRACKER 1000 SERIES
INSTRUCTION MANUAL

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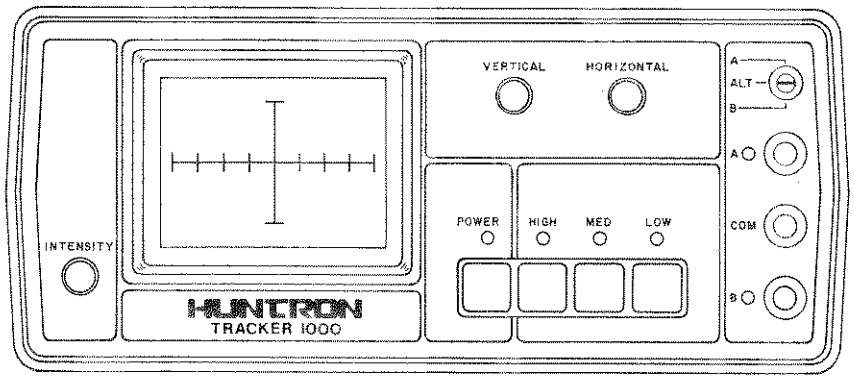
SECTION 1
INTRODUCTION AND SPECIFICATIONS



Huntron Tracker 1000 Series

1-1. INTRODUCTION

The Tracker 1000 Series is a useful and efficient troubleshooting tool enhanced by the following features:

- ★ 80 Hz test frequency.
- ★ Three impedance ranges (low, medium, high).
- ★ LED indicators for all functions.
- ★ Dual channel capability for easy comparison.
- ★ Large CRT display with easy to operate controls.

1-2. SPECIFICATIONS

The specifications for the Tracker 1000 Series are listed in Table 1-1.

Table 1-1. Tracker 1000 Series Specifications

ELECTRICAL

Unless otherwise specified, all measurements are within ± 5%

Impedance Ranges

Terminal Characteristics:

Range	Open Circuit Voltage (V_p)	Max Short Circuit Current (mA_{rms})
HIGH	60	0.6
MED	20	0.6
LOW	10	135

Test Signal

Waveform ..... sine wave
Frequency 80Hz

Channels

Number 2
Alternation Rate 0.8Hz
Overload Protection ..... 1/4A type AGC internal fuse (operator replaceable)

Display

Type ..... Monochrome CRT
Size ..... 2.8" (7cm) diagonal
Acceleration Potential ..... 1320VDC ± 20VDC (regulated)

POWER REQUIREMENTS

AC Line Voltage ..... 115VAC or 230VAC (selectable via internal switch)
Frequency 47-63Hz
Power ..... 15 Watts max
Line Fuse ..... 1/4A type AGC (internal —operator replaceable)

GENERAL

Size ..... 9"W x 4"H x 11"L (23cmW x 10cmH x 28cmL)
Weight ..... 5 lbs.
Shock and Vibration ..... will withstand shock and vibration encountered in commercial shipping and handling.

ENVIRONMENTAL

Operating Temperature ..... 0 to 50° C
Storage Temperature ..... −50 to +60° C
Relative Humidity ..... 0 to 70% R.H.

SECTION 2
OPERATING INSTRUCTIONS

2-1. INTRODUCTION

This section describes the basic operation of your 1000 (for the rest of the manual, The Tracker 1000 Series will be referred to simply as a "1000"). It is suggested that you take time to read this section carefully so that you can take full advantage of all of the troubleshooting capabilities of the 1000.

2-2. UNPACKING YOUR INSTRUMENT

Your instrument was shipped with two Huntron Microprobes (one red and one black), a common test lead (black), an accessory cable (for use with the Huntron Switchers HSR210 and HSR410), a power cord, and this manual. Check the shipment carefully and contact the place of purchase if anything is missing or damaged in shipment. If reshipment is necessary, please use the original shipping carton and packing foam. If these are not available, be sure that adequate protection is provided to prevent damage during shipment.

2-3. GENERAL OPERATION

Components are tested by the 1000 using a two terminal system where two test leads are placed on the leads of the component under test. The 1000 tests componenets in-circuit, even when there are several components in parallel.

Devices that are normally tested by the 1000 include the following: semiconductor diodes, bipolar and field effect transistors; bipolar and MOS integrated circuits (both analog and digital); resistors, capacitors, and inductors.

The 1000 is only intended for use in boards and systems with all voltage sources in a power-off condition. A 0.25 ampere signal fuse (F1) is connected in series with the channel A and B test terminals. Accidental contact of the test leads to active voltage sources (e.g. line voltage, powered-up boards or systems, charged high voltage capacitors, etc.), may cause this fuse to open, making replacement necessary. When the signal fuse blows, open circuit signatures will be displayed even with the test leads shorted together.

CAUTION: THE DEVICE TO BE TESTED MUST HAVE ALL POWER TURNED OFF AND HAVE ALL HIGH VOLTAGE CAPACITORS DISCHARGED BEFORE CONNECTING THE 1000 TO THE DEVICE.

The line fuse (F2) should only open when there is an internal failure inside the instrument. Therefore the problem should always be located and corrected before replacing F2.

2-4. FUSE REPLACEMENT

To replace either fuse, disconnect the 1000 from the power line. Remove the four case screws located on the underside of the case and lift off the top case half. The signal fuse (F1) is located in back of the front panel on the main printed circuit board assembly (refer to Figure 6-1). The line fuse (F2) is located at the back of the main printed circuit board assembly next to the power transformer (refer to Figure 6-1). Replace F1 or F2 with a 0.25A, 250V, type AGC fuse.

2-5. PHYSICAL FEATURES

Before you begin to use your 1000, please take a few minutes to familiarize yourself with the instrument. All of the externally accessible features are discussed in sections 2-6, 2-7, and 2-8.

2-6. FRONT PANEL

The front panel of the 1000 is designed to make function selection easy. Interlocking pushbutton switches are used for range selection. A toggle switch is provided for channel selection and integral LED indicators show which functions are active. Refer to Figure 2-1 and Table 2-1 for a detailed description of each item on the front panel.

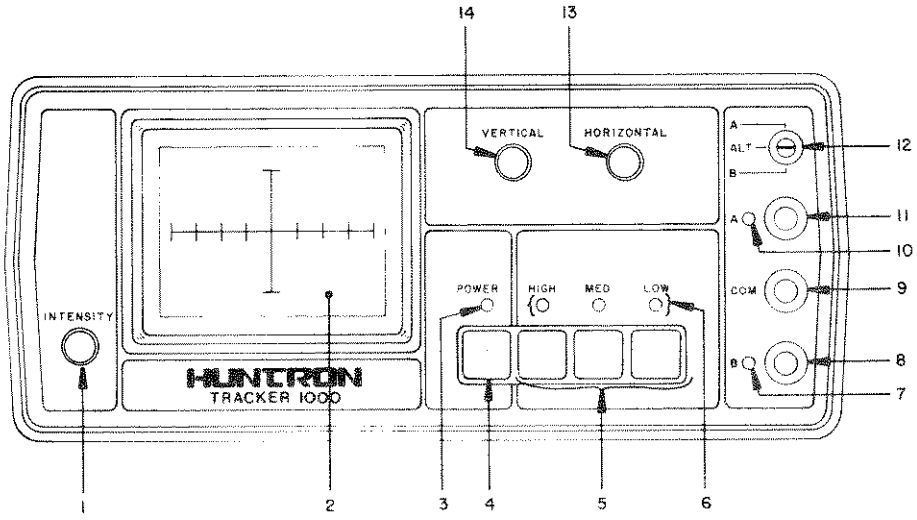


Figure 2-1. Front Panel

Table 2-1. Front Panel Controls & Connectors

ITEM NO.	NAME	FUNCTION
1	INTENSITY Control	Controls the intensity of the CRT Display.
2	CRT Display	Displays the component signatures produced by the 1000.
3	Power Indicator	LED that indicates power-on
4	Power On/Off Switch	Push-On, Push-Off.
5	Range Selectors	Push buttons that select one of three impedance ranges: low, medium high

Table 2-1. Front Panel Controls & Connectors (cont.)

ITEM NO.	NAME	FUNCTION
6	Range Indicators	LEDs that indicate which range is in use.
7	Channel B	LED that indicates channel B is in Indicator use.
8	Channel B Test Terminal	Fused test lead connector that is active when channel B is selected. All test lead connectors accept standard banana plugs.
9	COM Test Terminal	Test lead connector that is instrument common and the common reference point for both channel A and channel B.
10	Channel A Indicator	LED that indicates channel A is in use.
11	Channel A Test Terminal	Fused test lead connector that is active when channel A is selected.
12	Channel A or B or ALT Switch	Toggle switch that can be used to select either channel A or channel B or cause the 1000 to alternate between channel A and channel B at a fixed rate.
13	HORIZONTAL Control	Controls the horizontal position of the CRT display.
14	VERTICAL Control	Controls the vertical position of the CRT display.

2-7. BACK PANEL

Secondary controls and connectors are on the back panel. Refer to Figure 2-2 and Table 2-2 for a detailed description of each item on the back panel.

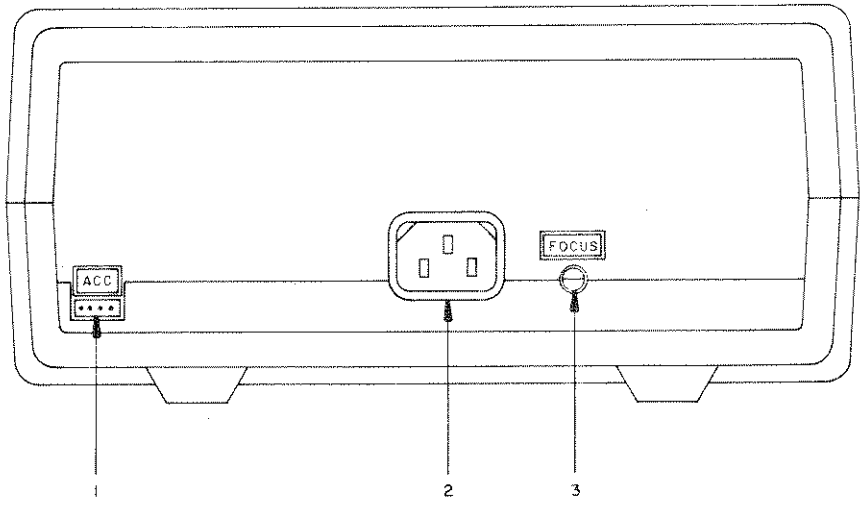


Figure 2-2. Back Panel

Table 2-2. Back Panel Controls & Connectors

ITEM NO.	NAME	FUNCTION
1	Acessory Output Connector	Connector which provides power to the Huntron Switchers, Models HSR210 and HSR410.
2	Power Cord Connector	IEC standard connector that mates with any CEE-22 power cord.
3	FOCUS Control	Controls the focus of the CRT display.

2-8. CRT DISPLAY

The CRT displays the signatures of the components being tested. The display has a graticule consisting of a horizontal axis which represents voltage, and a vertical axis which represents current. See figure 2-3.

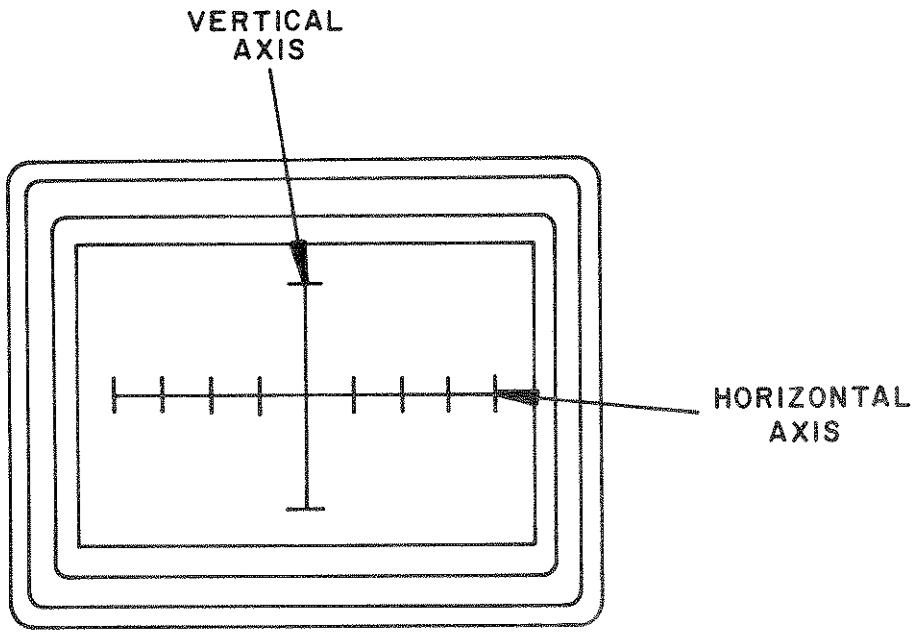


Figure 2-3. CRT Display

The horizontal axis is divided into eight divisions, which allow the operator to estimate the voltage at which changes in the signature occur. This is mainly useful in determining semiconductor junction voltages under either forward or reverse bias. Table 2-3 lists the approximate horizontal sensitivities for each range.

Table 2-3. Horizontal Sensitivities

RANGE	VOLTS/DIV
High	~15
Medium	~5
Low	~2.5

2-9. OPERATION

The following sections explain how to use the front and back panel features. Use sections 2-6 and 2-7 for the description and location of each control. Signatures of components will be covered in Sections 7 through 16.

2-10. INITIAL SETUP

Push in the power on/off switch. The 1000 should come on with the power LED illuminated.

Focusing of the 1000 display is important in analyzing the signatures displayed on the CRT. This is done by turning the intensity control to a comfortable level and adjusting the focus control (back panel) for the narrowest possible trace. Aligning the trace is important in determining the voltges at which changes in the signature occur. With a short circuit on channel A, adjust the horizontal control until the vertical trace is even with the vertical axis. Open channel A, and adjust the vertical control until the horizontal trace is even with the horizontal axis.

Once set, these adjustments should not have to be readjusted during normal operation. The power is turned off by pushing the power switch in, and when power is turned on again the same intensity setting will be present.

2-11. RANGE SELECTION

The 1000 is designed with three impedance ranges (low, medium, and high). These ranges are selected by pressing the appropriate button on the front panel. It is best to start with the medium range. If the signature on the CRT display is close to an open (horizontal trace), go to the next higher range for a more descriptive signature. If the signature is close to a short (vertical trace), go to the next lower range.

2-12. CHANNEL SELECTION

There are two channels on the 1000 (channel A and channel B) which are selected by moving the toggle switch to the desired position. When using a single channel, the red probe should be plugged into the corresponding channel test terminal and the black probe should be plugged into the common test terminal. When testing, the red proble should be connected to the positive terminal of a device (i.e. anode, +V, etc.), and the black probe should be connected to the negative terminal of a device (i.e. cathode, ground, etc.). Following this procedure should assure that the signature appears in the correct position on the CRT display.

The Alternate mode of the 1000 is provided to automatically switch back and forth between channel A and channel B. This allows easy comparison between two devices or the same points on two circuit boards. The Alternate mode is selectd by moving the toggle switch to the ALT position. One of the most useful features of the 1000 is using the Alternate mode to compare a known good device with the same type of device that is of unknown quality. Figure 2-4 shows how the instrument is connected to a known good board and a board under test. This mode uses the supplied common test lead to connect two equivalent points on the boards to the common test terminal.

SECTION 3
THEORY OF OPERATION

3-1. INTRODUCTION

This section describes how the 1000 works. An overview of the operation is provided first, followed by descriptions of the major sections of the circuit and their function. Detailed schematics of the 1000 appear in Section 6.

3-2. FUNCTIONAL DESCRIPTION

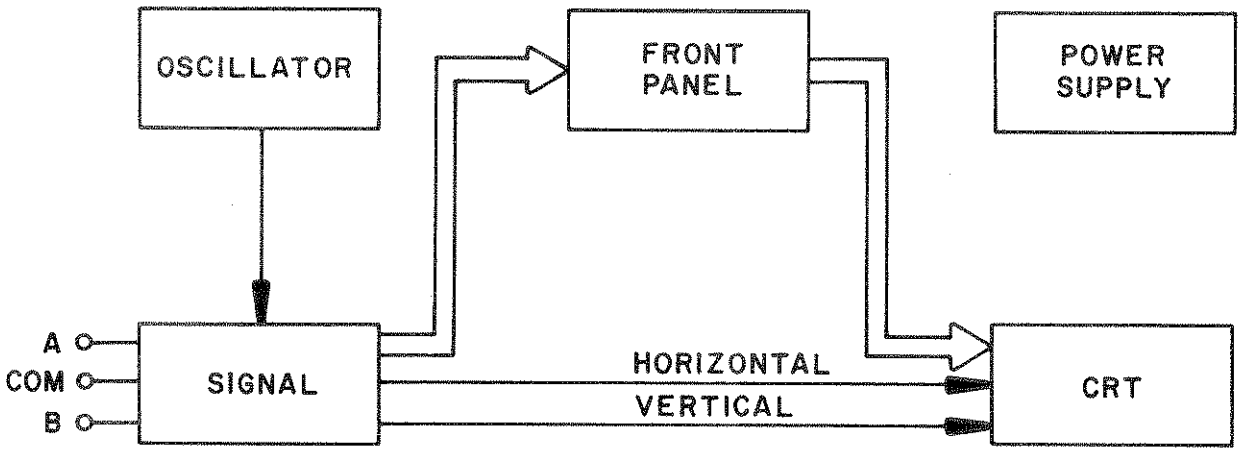


Figure 3-1. 1000 Block Diagram

The major circuits of the 1000 are arranged in a block diagram in Figure 3-l. The oscillator provides the test signal used by the signal section. In the signal section, the test terminals are driven by the test signal while signal conditioners monitor the terminals and produce the horizontal and vertical signals used to produce a component signature on the CRT display. The power supply produces voltages for the CRT acceleration, deflection, and filament as well as the low voltage general purpose supply used by all the other sections of the circuit. These circuits will be described in more detail in the following paragraphs.

3-3. OSCILLATOR

The oscillator is located on the main PCB. This circuit produces a constant amplitude, low distortion sine wave test signal. The frequency of the test signal is factory adjusted to 80 Hz.

3-4. SIGNAL SECTION

The signal section is located on the main PCB. In the signal section, the test signal from the oscillator is applied across two terminals of a device being tested via the front panel test terminals. The test signal causes current to flow through the device and a voltage drop across its terminals. The current flow causes a vertical deflection of the signature on the CRT display while the voltage across the device causes a horizontal deflection of the signature on the CRT display. The combined effect produces the current-voltage signature of the device on the CRT display.

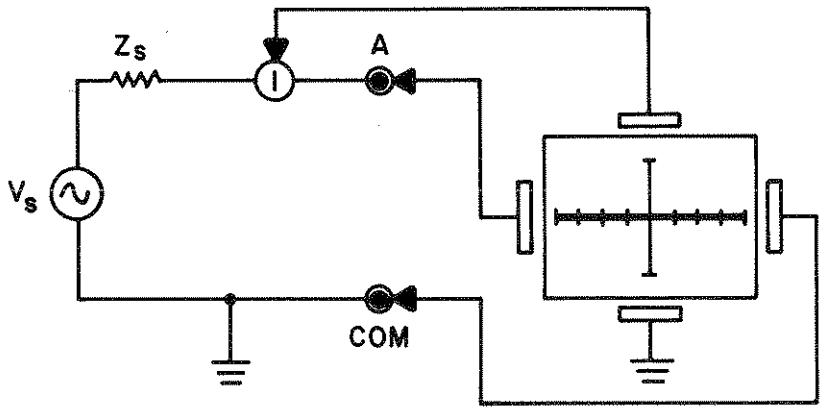


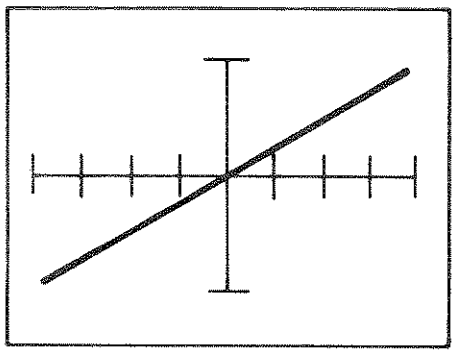
Figure 3-2. Signal Section Equivalent Circuit

Electronically, the test signal appears at the front panel test terminals as though it is being originated by a voltage source (V_s) with a series output impedance (Z_s). An equivalent circuit of the signal section is shown in Figure 3-2. The figure also shows how the terminal voltage affects the horizontal deflection plates of the CRT, and how the current through the terminals affects the vertical deflection plates through current sensing point I. The open circuit voltage and output impedance for each range is shown in Table 3-1.

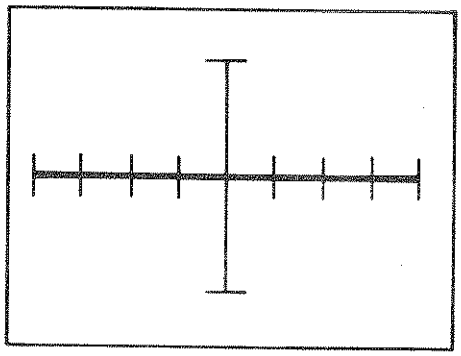
Table 3-1. Terminal Characteristics

Range	V_s (V_p)	Z_s (ohms)
High	60	83K
Medium	20	27K
Low	10	55

An open circuit has zero current flowing through the terminals and has maximum voltage across the terminals. In the LOW range, an open circuit is represented by a diagonal signature from the upper right to the lower left of the CRT (see Figure 3-3a). In the HIGH and MEDIUM ranges this is represented by a horizontal trace from the left to the right of the CRT graticule (see Figure 3-4b). When the terminals are shorted, the maximum current flows through the terminals and the voltage at the terminals is zero. This is indicated by a vertical trace from the top to the bottom of the CRT graticule in all ranges (see Figure 3-3c). Signatures of components will be covered in the second half of this manual (sections 7 through 16).



Low Range Open Circuit
Figure 3-3a.



Medium and High Open Circuit
Figure 3-3b.

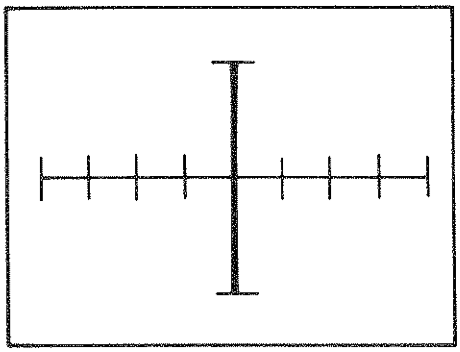


Figure 3-3c. All ranges Short Circuit

3-5. CRT DISPLAY

The CRT deflection drivers boost the low level outputs from the signal section to the higher voltage levels needed by the deflection plates in the CRT. The HORIZONTAL and VERTICAL controls on the front panel adjust the position of the trace on the CRT display.

Three other CRT controls are used to adjust the brightness and clarity of the trace: INTENSITY, FOCUS, and ASTIGMATISM. The front panel intensity control is the primary means of adjusting the visual characteristics of the trace. The focus control is located on the back panel and is operator adjustable. The astigmatism trim pot (R73), is located inside the 1000 on the main printed circuit board (see figure 6-1), and is factory adjusted to the correct setting.

3-6. POWER SUPPLY

This is an AC line operated power supply that is turned on by pushing in the POWER switch (push-off). The POWER LED will come on indicating that power is on before the CRT warms up.

The low voltage power supply provides outputs of ±12VDC (nominal) and ±5VDC (regulated) for the oscillator and signal section.

The other outputs of the power supply are related to the CRT display. The filament voltage is $6.3V_{rms}$. There is a +180VDC output which is primarily used by the deflection driver circuits. Finally, there is a regulated −1320VDC output for the CRT acceleration voltage.

SECTION 4
MAINTENANCE

WARNING: THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY.

4-1. INTRODUCTION

This section contains information regarding the maintenance of your instrument. It includes information about service, performance tests, internal adjustments, and troubleshooting. The combined performance tests are recommended as an acceptance test when the instrument is first received, and can be used later as a preventive maintenance tool.

4-2. SERVICE INFORMATION

The conditions of the 1000 warranty are given at the front of this manual. Malfunctions that occur within the limits of the warranty will be corrected at no cost to the purchaser exclusive of one-way shipping costs to Huntron Instruments, Inc. Huntron service is also available for calibration and/or repair of instruments that are beyond the warranty period. In either case, please describe clearly the problems encountered with the instrument.

For in-warranty or out of warranty factory service in the United States, call (toll-free) 800-426-9265 and receive an RMA number and shipping instructions prior to shipment. This number must be clearly displayed on the exterior of the shipping carton. Only parcels displaying an RMA number will be accepted. In Alaska or Washington, call 206-743-3171.

4-3. PERFORMANCE TESTS

The following procedures allow you to compare the performance of your instrument with the specifications listed in Section 1. They are recommended for incoming inspection, periodic adjustments, and to verify specifications. If the instrument fails any test, internal adjustment and/or repair is needed. You do not have to disassemble the instrument to perform the tests.

SIGNAL SECTION:

1. Select channel A on the front panel. Adjust the CRT controls (Intensity and Focus), for a sharp trace on the CRT display.

2. Measure the sine wave voltage between the channel A and common test terminals using an oscilloscope or a digital multimeter. Verify the presence of the following voltages on the test terminals in each range. For this test, make sure that the input impedance of your scope or DMM is at least 10 Megohm.

Range	V_p	V_{rms}
High	60	42.43
Medium	20	14.14
Low	10	7.07

3. Measure the short circuit current in each range. Connect your DMM to the channel A and common test terminals and set to AC mA. Verify the following maximum current readings:

Range	mA_{rms}
High	0.6
Medium	0.6
Low	135

4. Use a scope or frequency counter to measure the test signal frequency. The test signal frequency should be 80Hz regardless of the frequency of the power line being used.

4-4. INTERNAL ADJUSTMENTS

If your 1000 has been repaired or if it has failed any of the performance tests, it is necessary to perform these internal adjustments. To gain access to the internal adjustments, first turn the instrument over and remove the four screws holding the case together, then lift off the case top.

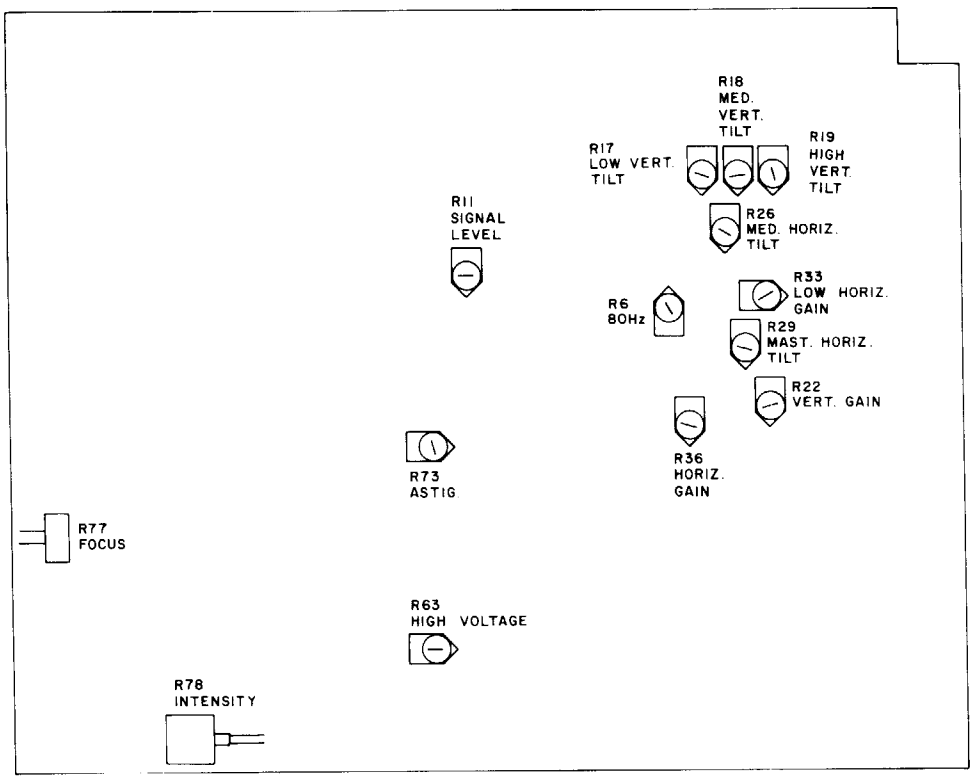


Figure 4-1. Main PCB Adjustment Locations

A. POWER SUPPLY SECTION:

The high voltage is factory adjusted to -1320VDC, and the user is advised not to readjust trimpot R63 unless it is absolutely necessary. This adjustment requires a digital multimeter (DMM) and a High Voltage probe. Refer to Figure 4-1 for adjustment location and Figure 6-2 for schematic.

WARNING: HAZARDOUS HIGH VOLTAGE.

PROCEDURE:

1. Connect the common lead of the High Voltage Probe to the common test point on the Main PCB.
2. Connect the voltage input of the High Voltage Probe to P3 pin 6 on the Main PCB.
3. Turn the power on.
4. Adjust R63 (Main PCB) until the DMM reads -1320VDC.

B. OSCILLATOR SECTION:

All adjustments in this section are located on the Main PCB Assembly. Refer to the Figure 4-1 for adjustment locations and to Figure 6-2 for the schematic.

PROCEDURE:

1. Turn power on
2. Connect frequency counter to Test Point #1 (TP1).
3. Adjust R6 (80 Hz) until frequency counter reads 80Hz.

C. SIGNAL SECTION:

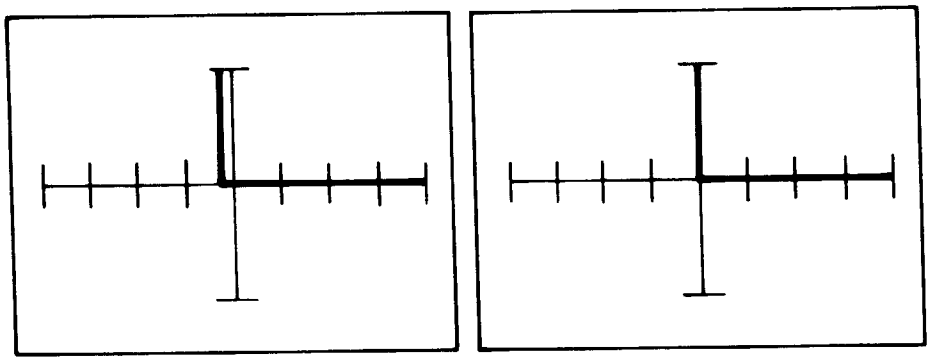
All adjustments in this section are located on the Main PCB Assembly. Refer to Figure 4-1 for adjustment locations and to Figure 6-2 for the schematic.

PROCEDURE:

1. Turn trim pots (R17,R18,R19,R22,R26,R29,R33,R36) to their fully counterclockwise position.
2. Turn Horizontal and Vertical position controls to the center of their range.
3. Turn the Intensity control fully counterclockwise.
4. Turn power on.
5. Measure the sine wave voltage between the channel A and common test terminals in low range using an oscilloscope or a digital multimeter. Adjust R11 (Signal Level) to give $10V_p$ (scope) or 7.07_{rms} (DMM).
6. Verify the presence of the following voltages on the test terminals in each range. For this test, make sure that the input impedance of your scope or DMM is at least 10 Megohm.

Range	V_p	V_{rms}
High	60	42.43
Medium	20	14.14

7. Set the Range selectors to the HIGH range position.
8. Adjust the Intensity until a spot appears on the CRT.
9. Adjust R22 (Master Vertical Gain) for vertical deflection of approximately ½ inch.
10. Adjust R77 (Focus), and R73 (Astigmatism) for the sharpest trace. Check intensity for correct brightness.
11. Adjust R29 (Master Horizontal Tilt) to the center of its range.
12. Adjust R36 (Master Horizontal Gain) until trace fills out the graticule.
13. Short between the Channel A and Common Test Terminals.
14. Adjust R22 (Master Vertical Gain) until the vertical trace is l-3/8 inch long.
15. Adjust R19 (High Vertical Tilt) until there is no vertical tilt.
16. Readjust R22 (Master Vertical Gain) if necessary.
17. Remove short from the Test Terminals.
18. Adjust R29 (Master Horizontal Tilt) until the horizontal trace has no tilt.
19. Switch to the MEDIUM range position.
20. Short between the Channel A and Common Test Terminals.
21. Adjust R18 (Medium Vertical Tilt) until the trace has no vertical tilt.
22. Remove the short from the Channel A and Common Test Terminals.
23. Adjust R26 (Medium Horizontal Tilt) until the trace has no tilt.
24. Switch back and forth between HIGH and MED range, and observe the trace. It should have no horizontal tilt on either range, and the ends of the trace should be very close to the graticule, but not out of view. Both traces should be within 5% of each other in length.
25. Short between the Channel A and Common Test Terminals, and switch back and forth between HIGH and MED ranges. Both vertical traces should be within 5% of each other in length.
26. Install a diode across the Channel A and Common Test Terminals. You should see a signature as displayed in Figure 4-2.



MED HIGH

Figure 4-2. Signatures of a diode in the MED and HIGH ranges

27. Final adjustments can be made on Horizontal and Vertical Gain, and Horizontal and Vertical Tilt for correct trace. The trace length difference should be less than 5%. The vertical and horizontal traces should have no tilt. The edge of the traces should not go off the screen.

28. Switch to the LOW range.

29. Short between the channel A and Common Test Terminals and adjust R17 (Low vertical Tilt).

30. Remove the short from the Test Terminals, and adjust R33 (Low Horizontal Gain) so that the trace looks like Figure 4-3.

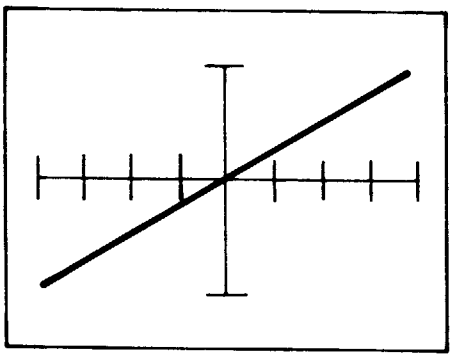


Figure 4-3. Open circuit (Low range)

31. Insert a diode between the Channel A and Common Test Terminals. The signature should look like Figure 4-4.

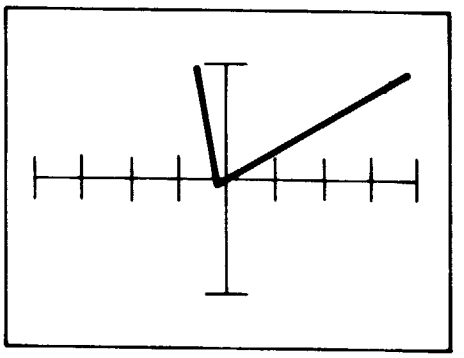


Figure 4-4. Signature of a diode in Low range

32. Final Focus and Astigmatism adjustments can be made with the diode still across the Test Terminals, and the range switch in HIGH or MEDIUM position.

4-5. TROUBLESHOOTING

If necessary, refer to Section 2 for operating instructions or Section 3 for the theory of operation. This troubleshooting information is supported by the schematics in Section 6.

This section assumes that the user has done the performance tests in Section 4-3 and noted any discrepancies in performance. Further, it is also assumed that the user has completed or attempted to complete the internal adjustments in Section 4-4 and noted any problems found.

The troubleshooting guides that follow refer to the location of possible defective components by assembly number:

A2-Main PCB Assembly
A3-Front Control Assembly
A6-CRT Assembly
A7-CRT Harness Assembly

These are the same assembly numbers that are used in the list of replaceable parts in Section 5. The components referred to in the guides are ususally the major ones within a section of the circuit. Other miscellaneous components (eg. diodes, resistors, and capacitors) connected to the indicated parts should also be checked for possible failure. The following outline should be followed sequentially until all faults are corrected.

1. Check and verify the power supply voltages listed in Table 4-1. If any voltage is out of tolerance, use the power supply troubleshooting guide (Table 4-2).

2. Using the performance test discrepancies from Section 4-3, go through the performance test troubleshooting guide in Table 4-3.

3. If indicated in Table 4-3, the following horizontal/vertical tests should be performed:

   With an open circuit on the test terminals, check the horizontal output at U5-pin 7 with a scope. The signal at this point should be an undistorted sine wave with the same amplitude in all ranges. The amplitude should be approximately $0.6V_p$.

   Now short the test terminals. The signal at U5-7 should go to zero in all ranges.

   With the short circuit still on the test terminals, check the vertical output at U5-1 with the scope. Again, this signal should have equal amplitude regardless of the range. This amplitude should be approximately $0.25V_p$.

   Now open the test terminals. The signal at U5-1 should go to a small value less than 10mVp in amplitude (except in low range). In low range it should be approximately the same voltage with an open or a short.

   If these tests check out properly, then any problem with the display is related to the CRT circuits.

4. Using the suggestions from Table 4-3 and the preceding tests (if applicable), follow the additional troubleshooting guide (Table 4-4).

Table 4-1. Power Supply Limits

LOCATION	SUPPLY	MINIMUM	MAXIMUM
A2: U1-8	+5V	+4.5V	+5.5V
A2: U1-4	−5V	−4.5V	−5.5V
A2: Q1-E	+12V	+11V	+18V
A2: Q2-E	−12V	−11V	−18V
A2: C17+	+180V	+170V	+200V
A2: P3 pin 6	−1320V	−1310V	−1330V

Table 4-2. Power Supply Troubleshoting Guide

VOLTAGE OUT OF TOLERANCE	POSSIBLE CAUSE/SUGGESTIONS
All are zero with power on	A2: F2: (line fuse)
+5V (+12V is OK)	A2: U8
−5 (−12V is OK)	A2: U9
+12V	A2: C18, D9, D11, T2
−12V	A2: C19, D8, D10, T2
+180V	A2: C17,D4, D5, D6, D7, T2
−1320V	A2: D2, D3, Q9, R63, T2, U7

Table 4-3. Performance Test Troubleshooting Guide

TEST AND SYMPTOM	POSSIBLE CAUSE/SUGGESTIONS
SIGNAL SECTION	
2. All ranges produce zero voltage and current and the CRT display always shows open circuit signatures.	A2: F1 (Signal Fuse)
3. Proper Voltages and/or currents are not produced in all ranges.	A2: U4, Q1, Q2, S2, S3, S4, check oscillator (Table 4-4).
4. Incorrect frequencies are produced.	A2: Check oscillator (Table 4-4)
Test 2, 3, and 4 above are correct, but the CRT does not display the proper signatures.	A2: Perform the horizontal/vertical tests (step 3, section 4-5) to determine the location of the problem.

Table 4-4. Additional Troubleshooting Guide

SYMPTON	POSSIBLE CAUSE/SUGGESTIONS
OSCILLATOR	
80 Hz does not function properly	A2: U1, U2, U3
HORIZONTAL/VERTICAL	
Either output does not function properly	A2: U5, S2, S3, S4
CRT	
Display does not function properly (horizontal and vertical outputs are OK).	A2: Q3, Q4, Q5, Q6, Q7, Q8 A3: R1, R2 A6: CRT1, A7

SECTION 5
LIST OF REPLACEABLE PARTS

5-1. INTRODUCTION

This section contains the parts list for the 1000. Components are listed alphanumerically by assembly. Both electrical and mechanical components are listed by reference designation, and can be referenced to assembly drawings and schematics.

Parts lists include the following information:

1. Reference Designation
2. Description of each part
3. HUNTRON Part Number

Numbers in parenthesis following the reference designation refer to the total quantity of the part for that assembly. The part description generally includes either generic part numbers or component specifications. Unless otherwise specified, all fixed resistors are ¼ Watt, 5%, carbon film and all resistor values are in ohms.

5-2. HOW TO OBTAIN PARTS

Components may be ordered directly from a manufacturer by using the part description, or from Huntron Instruments, Inc. or its authorized distributors by using the HUNTRON PART NUMBER. In the event the part you order has been replaced by a new part, the replacement will be accompanied by an explanatory note and installation instructions if necessary.

To ensure prompt and efficient handling of your order, please include the following information:

1. Quantity
2. HUNTRON Part Number
3. Part Description
4. Reference Designation
5. Printed Circuit Board Part Number and Revision Letter
6. Instrument Model and Serial Number

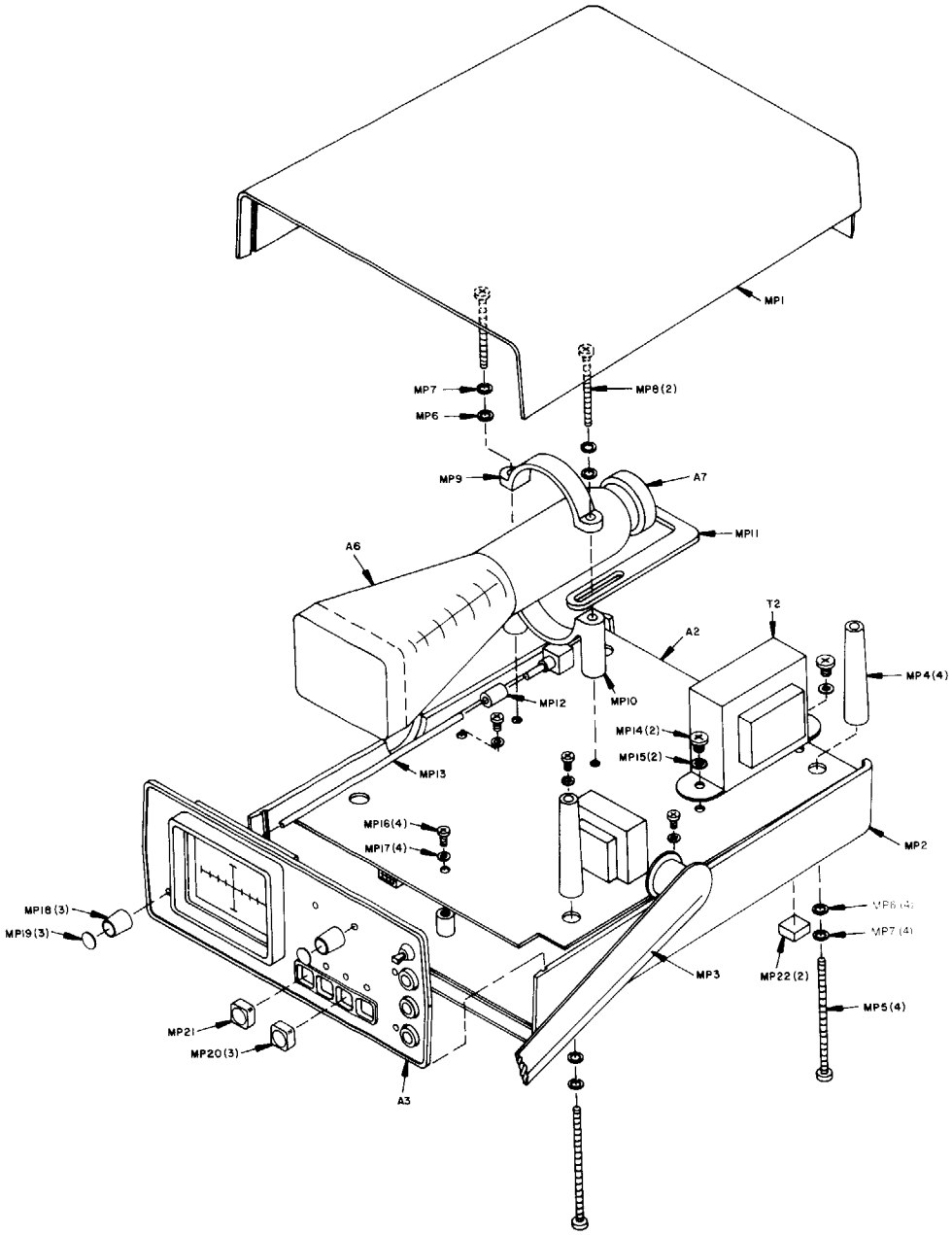


Figure 5-1. Series 1000 Final Assembly

WARNING!

MP6 and MP7 MUST BEINSTALLED.
FAILURE TO DO SO MAY RESULT IN
DAMAGE TO THE CASE.

DO NOT USE AIR TOOLS TO
TIGHTEN CASE SCREWS (MP5).

FINAL ASSEMBLY:
(Refer to Figure 5-1)

REF. DES.		DESCRIPTION	HUNTRON PART NO.
A1		Tracker, Final Assembly 1000	01-2082
A2		Main PCB Assembly	07-1038
A3		Front Control Assembly	01-2143
A6		CRT Assembly NEC	07-1072
		Toshiba	07-1073
MP1		Top, Case	01-1155
MP2		Bottom, Case	01-1156
MP3		Handle, Case	01-1157
MP4	(4)	Spacer, Case	01-1158
MP5	(4)	Screw, #6-32 2 7/8" P.H. Phil.	01-1019
MP6	(4)	Washer, #6 Flat Steel	07-7123
MP7	(4)	Washer, #6 Lock Split	07-7384
MP8	(2)	Screw, #6-32 2" P.H. Phil.	07-7383
MP9		Cap, CRT Yoke	01-1165
MP10		Base, CRT Yoke	01-1166
MP11		Stop, CRT	01-1167
MP12		Coupler, 1/8" to 1/8"	07-7147
MP13		Shaft, Intensity, 1/8"D x 7 3/4"L	07-7397
MP14	(2)	Screw, #8-32 3/8" P.H. Phil.	07-7385
MP15	(2)	Washer, #8 Lock Star	07-7176
MP16	(4)	Screw, #4-40 1/4" P.H. Phil	07-7085
MP17	(4)	Washer, #4 Lock Star	07-7089
MP18	(3)	Knob, Black	01-1081
MP19	(3)	Knob Cap, Blue	01-1106
MP20	(3)	Button, Swtich,Gray	07-7398
MP21		Button, Switch, Black	07-7233
MP22	(2)	Feet, Rubber, 1/2" sq.	01-1115
MP23		Decal, Instruction	01-1160
MP24		Decal FOCUS	01-1161
MP25		Decal, ACC (Accessory)	01-1162
T2		Transformer, Power 115VAC/230VAC	06-6028

FACE PLATE ASSEMBLY:

REF. DES.	DESCRIPTION	HUNTRON PART NO.
A5	Face Plate Assembly	01-2142
J1	Socket, 6 pin Polarized	07-7225
MP1	Face Plate	01-1153

MP2	Overlay	01-1159
MP3	Jack Banana, Red W/Hex Nut	01-1030
MP4	Jack Banana, Black W/Hex Nut	01-1031
MP5	Jack Banana, Blue W/Hex Nut	01-1082
MP6	Lens, Glass	01-1006
MP7	Graticule, Film	01-2002
MP8	Lens Gasket, Vertical	01-1107
MP9	Lens Gasket, Horizontal	01-1108
S6	Toggle Switch	07-7071

FRONT CONTROL ASSEMBLY:

REF. DES.	DESCRIPTION	HUNTRON PART NO.
A3	Front Control Assembly	01-2143
A4	Control PCB Assembly	07-1039
A5	Face Plate Assembly	01-2142
MP1 (5)	Screw, #4-40 ¼" P.H. Phil.	07-7085
MP2 (5)	Washer, #4 Lock Star	07-7089

CRT ASSEMBLY:

REF. DES.	DESCRIPTION		HUNTRON PART NO.
A6	CRT Assembly	NEC	07-1072
		Toshiba	07-1073
CRT1	Cathode Ray Tube	NEC	07-7059
		Toshiba	07-7076

MAIN PCB ASSEMBLY:
(Refer to Figures 6-1 and 6-2)

REF. DES.	DESCRIPTION		HUNTRON PART NO.
A2	Main PCB Assembly		07-1038
C1	Not Used		
C2	Cap, Tantalum	10uF, 25V	03-3011
C3	Cap, Mono. Ceramic	100pF, 50V	03-3071
C4	Cap, Mono. Ceramic	.01uF, 50V	03-3051
C5	Cap, WIMA	.luF, 50V, 5%(WIMA)	03-3063
C6	Cap, WIMA	.luF, 50V, 5%(WIMA)	03-3063

C7	Cap, WIMA	.22uF, 50V, 5%(WIMA)	03-3054
C8	Cap, Mono. Ceramic	.1uF, 50V	03-3028
C9	Cap, Mono. Cermaic	.1uF, 50V	03-3028
C10	Cap, WIMA	.22uF, 50V, 5%(WIMA)	03-3054
C11	Cap, Electrolytic	1uF, 450V	03-3040
C12	Cap, Electrolytic	1uF 450V	03-3040
C13	Cap, Electrolytic	1uF, 450V	03-3040
C14	Cap, Electrolytic	1uF, 450V	03-3040
C15	Cap, Ceramic	.01uF, 2kV	03-3042
C16	Cap, Ceramic	.1uF, 500V	03-3007
C17	Cap, Electrolytic	22uF, 250V	03-3055
C18	Cap, Electrolytic	2200uF, 250V	03-3056
C19	Cap, Electrolytic	2200uF, 25V	03-3056
C20	Cap, Tantalum	10uF, 25V	03-3011
C21	Cap, Tantalum	10uF, 25V	03-3011
C22	Cap, Mono. Ceramic	.1uF, 50V	03-3028
C23	Cap, Mono. Ceramic	.1uF, 50V	03-3028
C24	Cap, Electrolytic	1uF, 450V	03-3040
C25	Cap, Ceramic	.02uF, 1kV	03-3004
D1	Diode, Signal	1N914	04-4007
D2	Diode, 3kV	HV30	04-4016
D3	Diode, 3kV	HV30	04-4016
D4	Diode, 600V	1N4005	04-4012
D5	Diode, 600V	1N4005	04-4012
D6	Diode, 600V	1N4005	04-4012
D7	Diode, 600V	1N4005	04-4012
D8	Diode, 600V	1N4005	04-4012
D9	Diode, 600V	1N4005	04-4012
D10	Diode, 600V	1N4005	04-4012
D11	Diode, 600V	1N4005	04-4012
D12	Diode, Signal	1N914	04-4007
D13	Diode, Signal	1N914	04-4007
F1	Fuse, AGC	¼ A, 250V	02-2041
F2	Fuse, AGC	¼ A, 250V	02-2041
J2	Socket, Dual Row, 7 pin		07-7377
K1	Relay, 1 Form C 5V		07-7904
MP1	PCB, Main		07-7735
MP2 (4)	Clip, Fuse		02-2044
MP4 (5)	Screw, 4-40, ¼" P.H. Phil.		07-7085
MP5 (5)	Washer, #4 Lock Star		07-7089
MP7 (5)	Insulator, Capacitor		07-7226
P1	Header, 6 Pin, Polarized		07-7224
P3	Header, 12 Pin, Polarized		07-7158
P4	Header, 14 Pin, Polarized		07-7376
P5	Header, Power Receptacle		07-7379
P6	Header, 4 Pin Recessed, Polarized		07-7380

Q1	Transistor, PNP, Power	TIP30	05-5008
Q2	Transistor, NPN, Power	TIP29	05-5007
Q3	Transistor, NPN, 300V	MPSA42	05-5003
Q4	Transistor, NPN, 300V	MPSA42	05-5003
Q5	Transistor, NPN, 300V	MPSA42	05-5003
Q6	Transistor, NPN, 300V	MPSA42	05-5003
Q7	Transistor, NPN, 300V	MPSA42	05-5003
Q8	Transistor, NPN, 300V	MPSA42	05-5003
Q9	Transistor, NPN, 500V	TIP50	05-5016
R1	Resistor	10K	02-2137
R2	Resistor	4.7K	02-2145
R3	Resistor	10K	02-2137
R4	Resistor	2K	02-2184
R5	Resistor	62K	02-2172
R6	Pot, Trimmer	1K	02-2083
R7	Resistor	1.8K	02-2128
R8	Resistor	180K	02-2124
R9	Resistor	10K	02-2137
R10	Resistor	10K	02-2137
R11	Pot Trimmer	10K	02-2084
R12	Resistor	150	02-2138
R13	Resistor	150	02-2138
R14	Resistor	47	02-2141
R15	Resistor	10	02-2097
R16	Resistor	6.8, 1W	02-2086
R17	Pot, Trimmer	5K	02-2090
R18	Pot, Trimmer	5K	02-2090
R19	Pot, Trimmer	5K	02-2090
R20	Resistor	180	02-2101
R21	Resistor, Metal Film	43.2K, 1%	02-2195
R22	Pot, Trimmer	50K	02-2085
R23	Resistor, Metal Film	681K, 1%	02-2123
R24	Resistor, Metal Film	2M, 1%	02-2161
R25	Resistor	10, 1W	02-2000
R26	Pot, Trimmer	100K	02-2091
R27	Resistor, Metal Film	86.6K, 1%	02-2136
R28	Resistor	16K	02-2134
R29	Pot Trimmer	25K	02-2155
R30	Resistor	20K NEC	02-2082
		47K Toshiba	02-2143
R31	Resistor	10K	02-2137
R32	Resistor	220, ½W	02-2003
R33	Pot Trimmer	500K	02-2058
R34	Resistor, Metal Film	196K, 1%	02-2153
R35	Resistor, Metal Film	590K, 1%	02-2154
R36	Pot, Trimmer	10K	02-2084
R37	Resistor	180K	02-2124
R38	Resistor	180K	02-2124
R39	Resistor	1K	02-2125
R40	Resistor	1K	02-2125
R41	Resistor	1.6K	02.2135
R42	Resistor	3K	02-2126

R43	Resistor	16K	02-2134
R44	Resistor	180K	02-2124
R45	Resistor	180K	02-2124
R46	Resistor	1K	02-2125
R47	Resistor	1K	02-2125
R48	Resistor	1.6K	02-2135
R49	Resistor	180	02-2101
R50	Resistor	180	02-2101
R51	Resistor	2K	02-2184
R52	Resistor	2M	02-2129
R53	Resistor	15K	02-2151
R54	Resistor	180	02-2101
R55	Resistor	1M	02-2130
R56	Resistor	10M, ½W	02-2102
R57	Resistor	10M, ½W	02-2102
R58	Resistor	10M, ½W	02-2102
R59	Resistor	10M, ½W	02-2102
R61	Resistor, High Voltage	5M, ½W	02-2088
R63	Pot Trimmer	10K	02-2084
R64	Resistor	12K	02-2238
R65	Resistor	2M	02-2129
R66	Resistor	1K	02-2125
R67	Resistor	2M	02-2129
R68	Resistor	2.2K	02-2079
R69	Resistor	180K	02-2124
R70	Resistor	1.8K	02-2128
R71	Resistor	1.8K	02-2128
R72	Resistor	4.7M	02-2127
R73	Pot, Trimmer	1M	02-2070
R75	Resistor, High Voltage	5M, ½W	02-2088
R77	Pot, Trimmer, W/Shaft	1M	02-2207
R78	Pot, Control, W/Shaft	500K	02-2095
R79	Resistor	510K NEC	02-2142
		220K Toshiba	02-2204
R80	Resistor	68K	02-2144
S1-S4	Switch Assembly		07-7067
S5	Switch, DPDT		07-7381
T1	Transformer, Signal		06-6034
U1	IC, Dual Op-Amp	LM1458N	05-5012
U2	IC, Voltage Ref, 1.2V	ICL8069	05-5014
U3	IC, Voltage Ref, 1.2V	ICL8069	05-5014
U4	IC, Op-Amp	LF 351	05-5034
U5	IC, Dual Op-Amp	LM1458	05-5012
U6	IC, Timer	NE555	05-5006
U7	IC, Op-Amp	741	05-5009
U8	IC, Regulator, +5V	7805	05-5017
U9	IC, Regulator, −5V	7905	05-5037
Z1	ZNR 130V		02-2038

CONTROL PCB ASSEMBLY

(Refer to Figures 6-3 and 6-4)

REF. DES.	DESCRIPTION		HUNTRON PART NO.
A4	Front Panel PCB Assembly		07-1039
D1	LED, (Red)	T-1 ¾	04-4013
D2	LED, (Yellow)	T-1 ¾	04-4017
D3	LED, (Red)	T-1 ¾	04-4013
D4	LED, (Green)	T-1 ¾	04-4014
D5	LED, (Green)	T-1 ¾	04-4014
D6	LED, (Green)	T-1 ¾	04-4014
MP1	PCB, Front Panel		07-7736
P2	Header, Dual Row, 7 Pin		07-7378
R1	Pot, Control W/¼" Shaft 1K		02-2186
R2	Pot, Control W/¼" Shaft 1K		02-2186

SECTION 6
SCHEMATIC DIAGRAMS

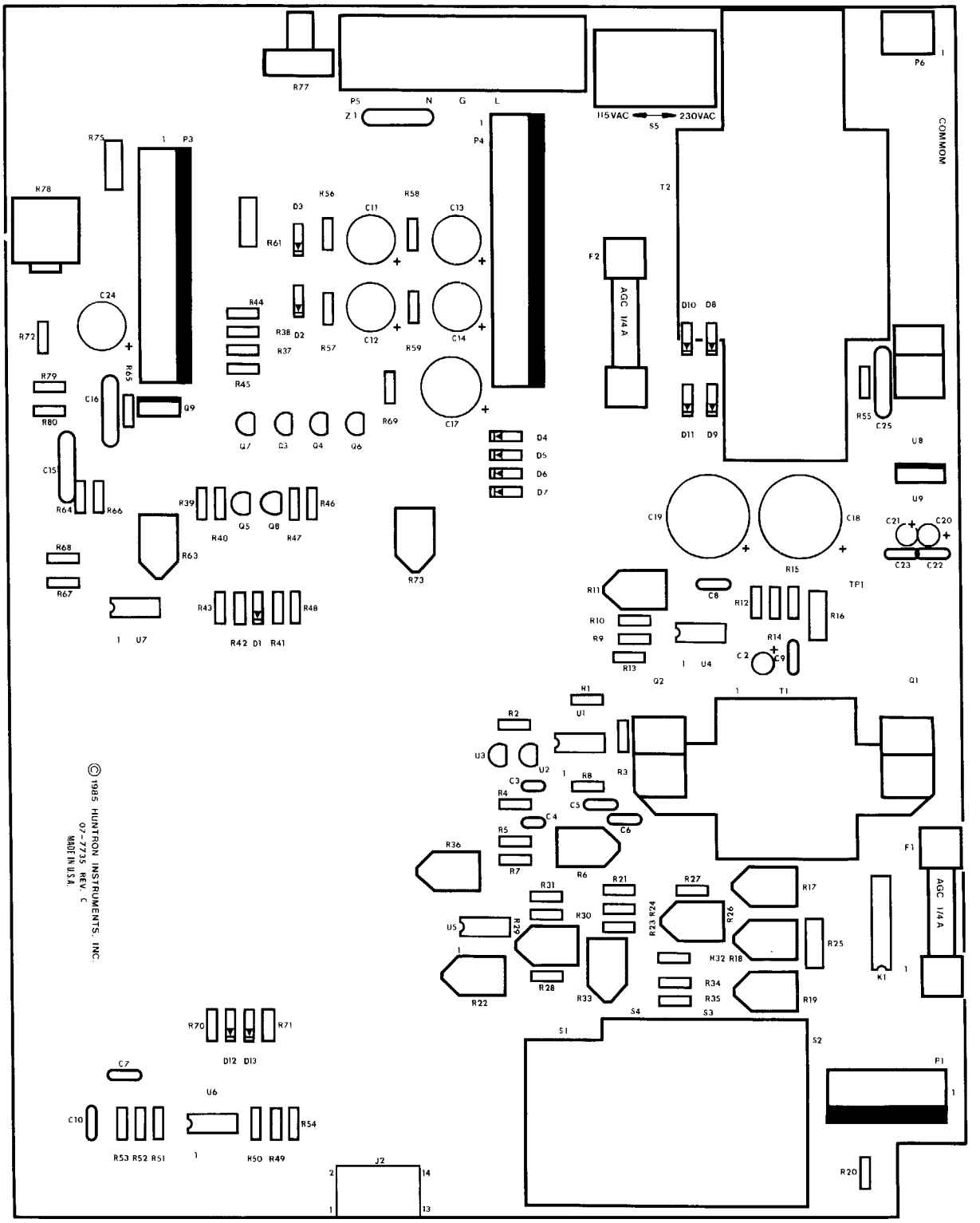


Figure 6-1. Main PCB Component Locations.

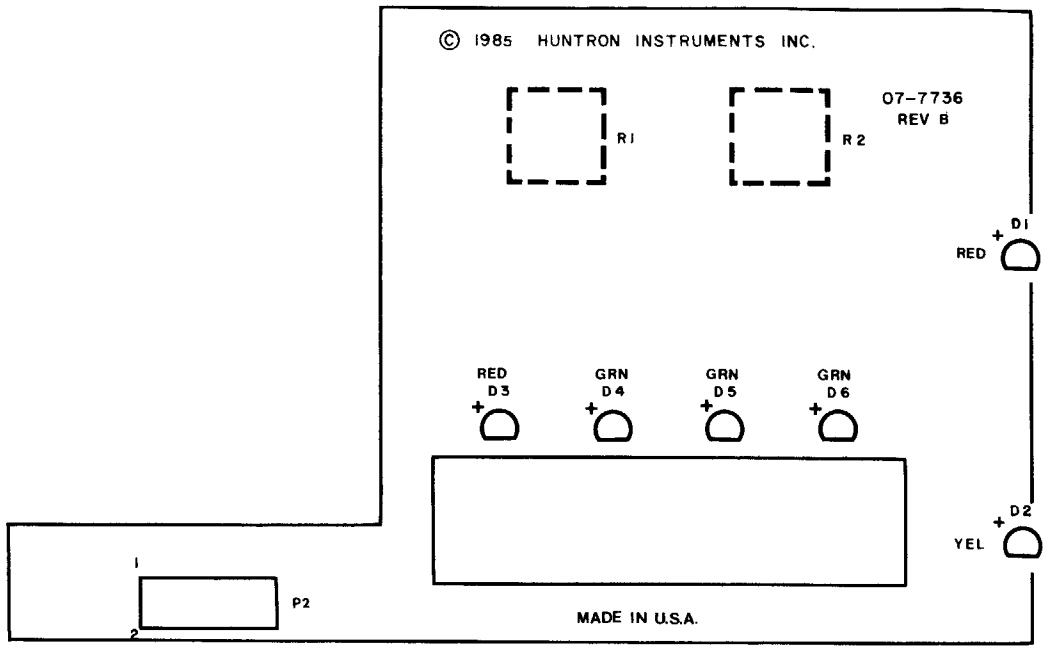


Figure 6-3. Control PCB Component Locations.

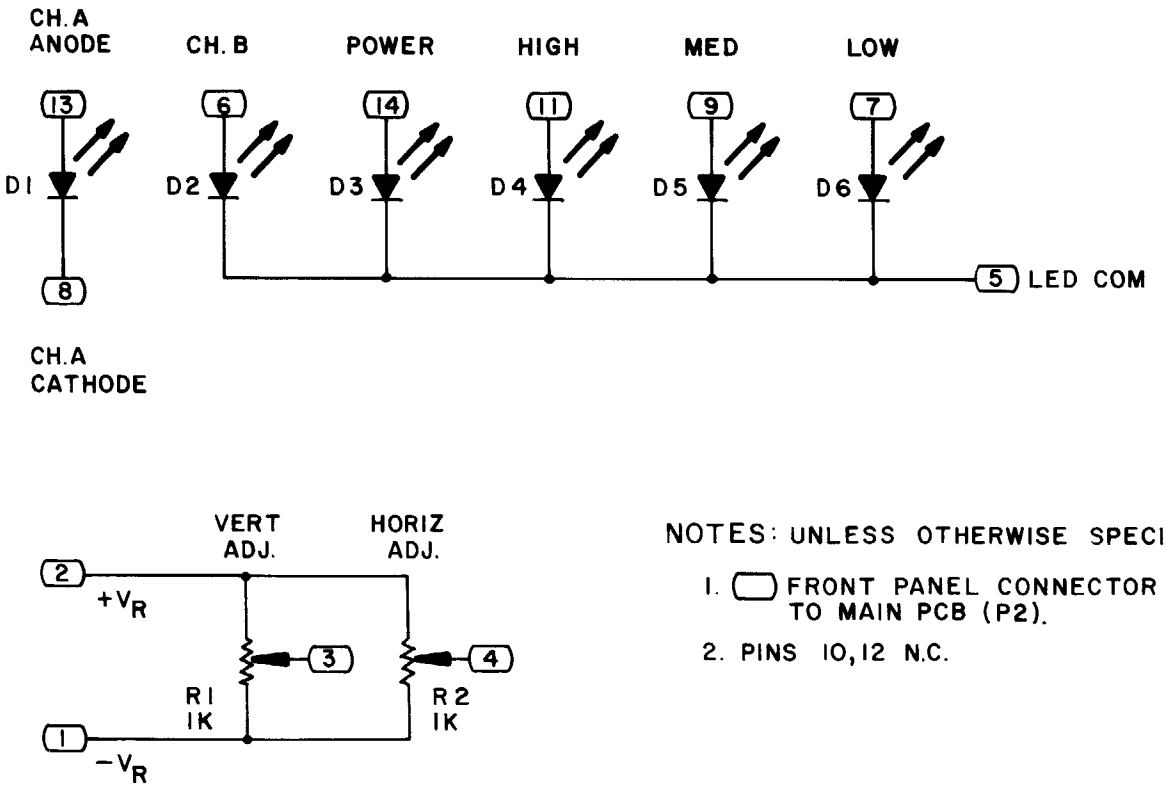


Figure 6-4. Control PCB Schematic.

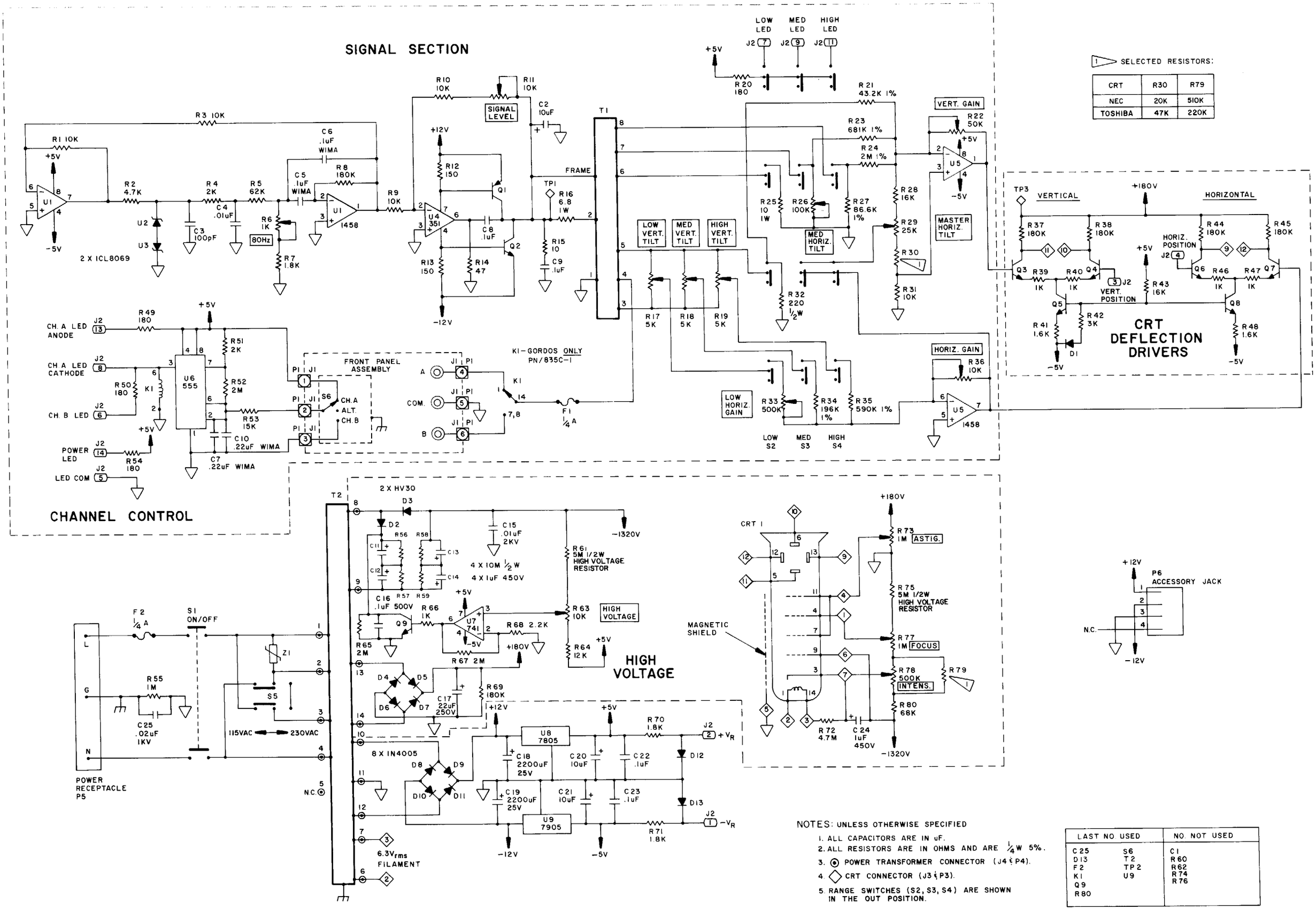


Figure 6-2. Main PCB Schematic.