HUNTRON INSTRUMENTS, INC.
TRACKER 1000 SERIES
INSTRUCTION MANUAL

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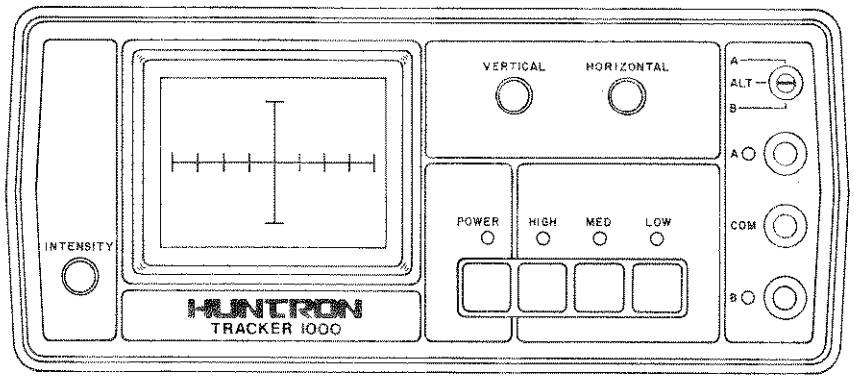
SECTION 1
INTRODUCTION AND SPECIFICATIONS



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.

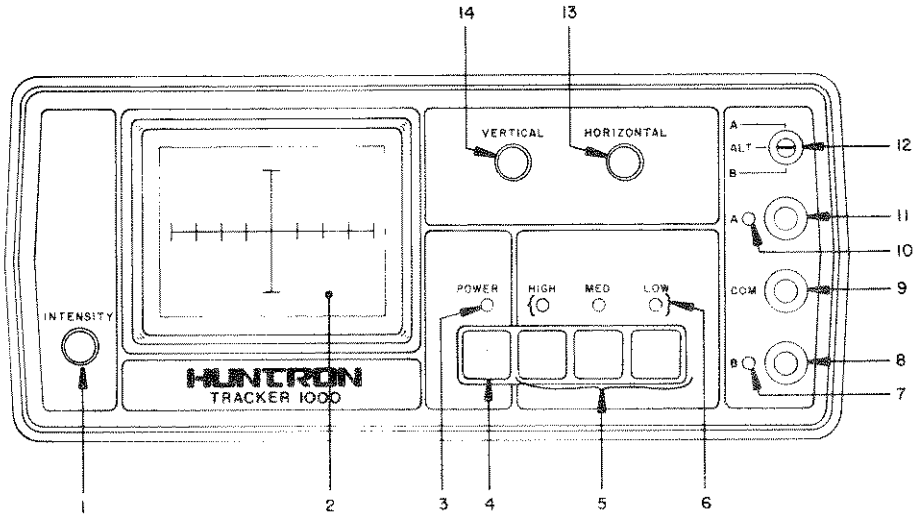


Figure 2-1. Front Panel

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.

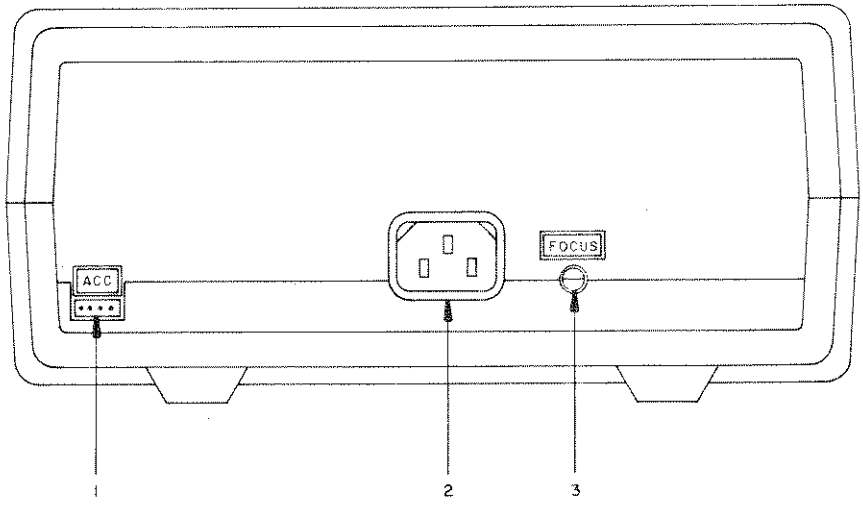


Figure 2-2. Back Panel

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.

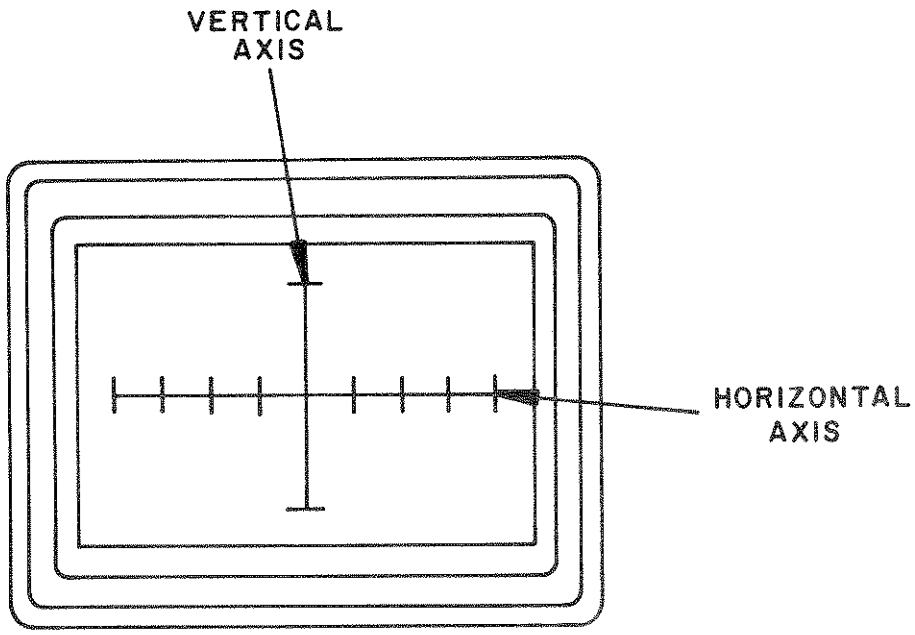


Figure 2-3. CRT Display

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

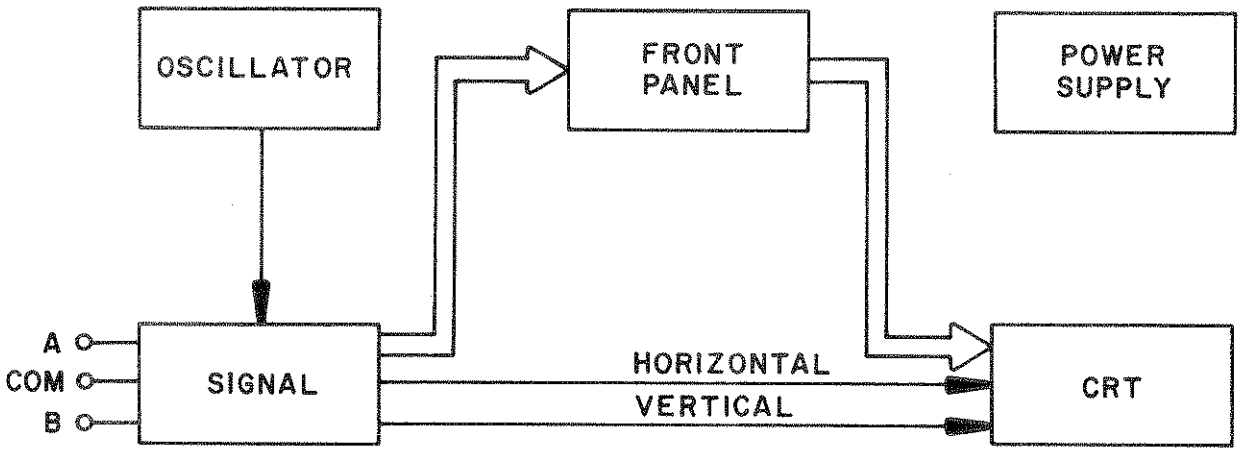


Figure 3-1. 1000 Block Diagram

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.

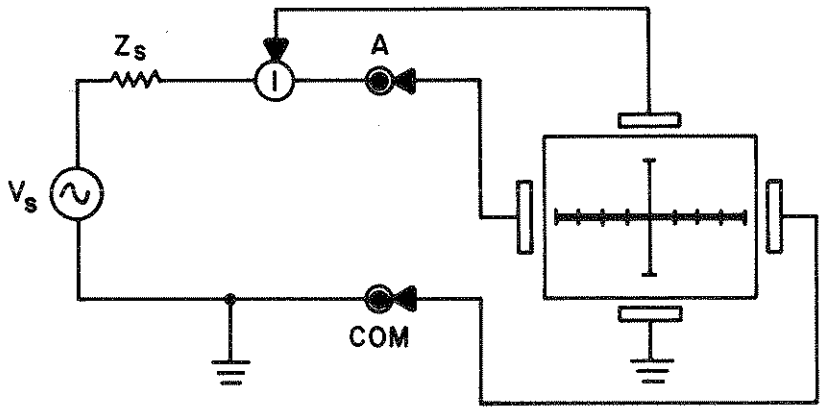


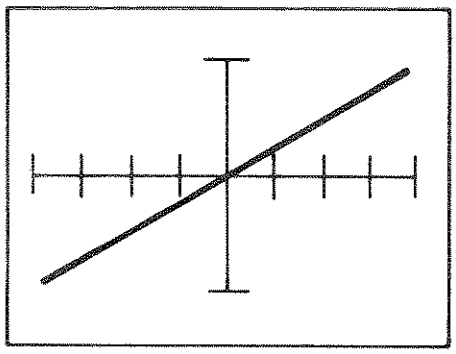
Figure 3-2. Signal Section Equivalent Circuit

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.

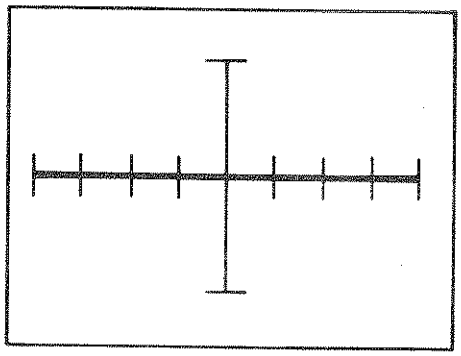
Table 3-1. Terminal Characteristics

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.

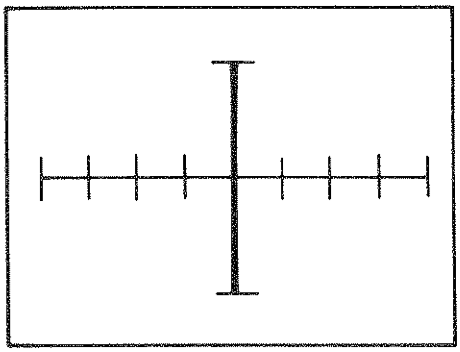


Figure 3-3c. All ranges Short Circuit

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.