

ENGINEERING LIBRARY
INSTRUCTION
MANUAL

Serial Number B36264

TYPE

454/R454

OSCILLOSCOPE

Tektronix, Inc.

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Abbreviations and symbols used in this manual are based on, or taken directly from, IEEE Standard 260 "Standard Symbols for Units", MIL-STD-12B and other standards of the electronics industry. Change information, if any, is located at the rear of this manual.

SEE PARTS LIST FOR SEMICONDUCTOR TYPES

SERIES M, MODEL 1, 2, 3

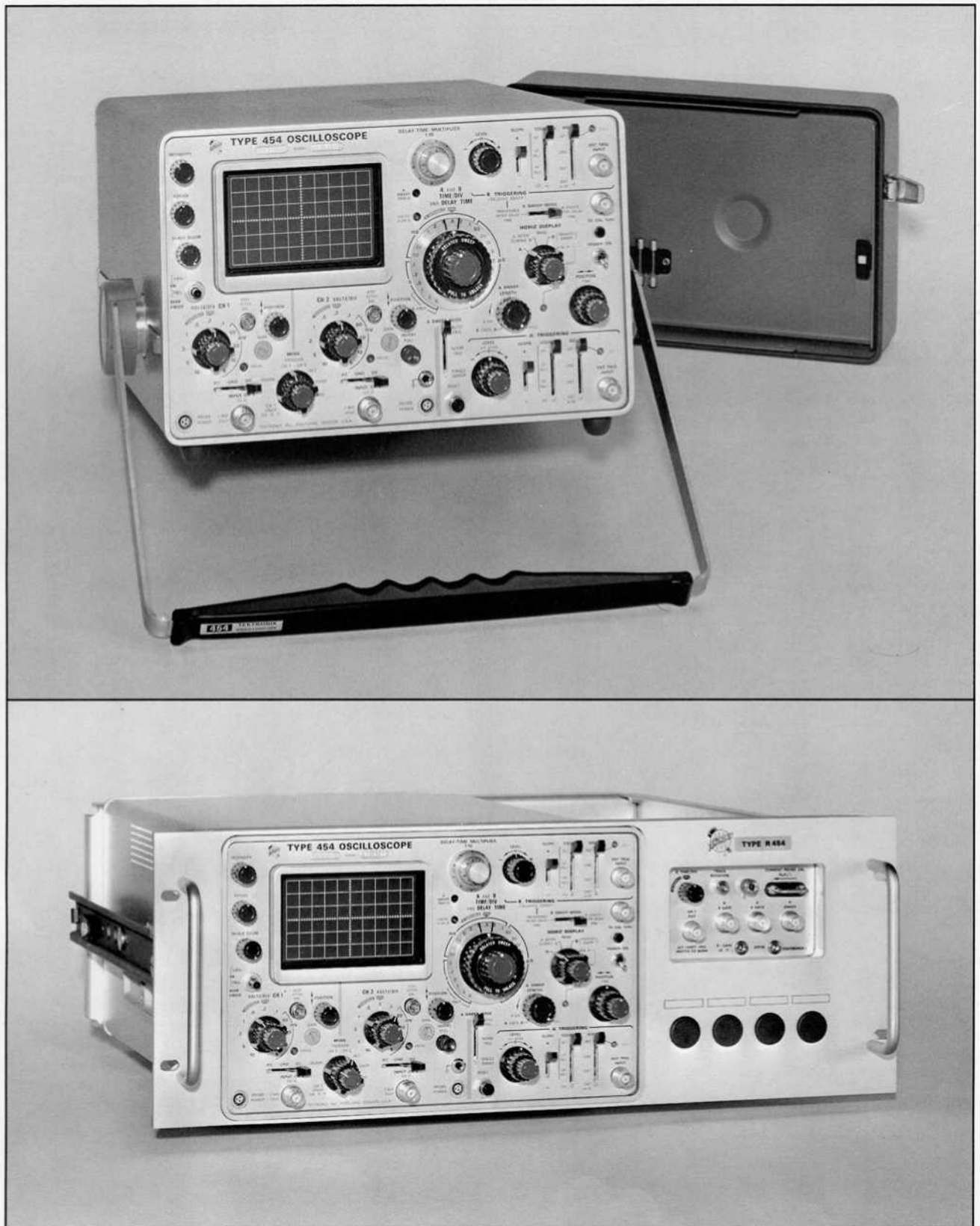


Fig. 1-1. Top; the Type 454 Oscilloscope. Bottom; the Type R454 Oscilloscope.

SECTION 1

TYPE 454/R454 SPECIFICATION

Introduction

The Tektronix Type 454 Oscilloscope is a wide bandwidth, portable oscilloscope designed to operate in a wide range of environmental conditions. The light weight and compact design of the Type 454 allow it to be easily transported, while providing the performance necessary for accurate high-frequency measurements. The dual-channel, DC-to-150 megahertz vertical system provides calibrated deflection factors from 5 millivolts to 10 volts/division (bandwidth is reduced at the two lowest deflection factors). Channels 1 and 2 can be cascaded using an external cable to provide a one millivolt minimum deflection factor. A bandwidth limit switch allows low-frequency, low-level signals to be viewed with reduced interference from signals above about six megahertz.

The trigger circuits provide stable triggering over the full range of vertical bandwidth. Separate trigger controls are provided to select the desired triggering for the A and B sweeps. One of three sweep modes can be selected for A sweep; automatic triggering, normal triggering or single sweep. The horizontal deflection system provides calibrated sweep rates from five seconds to 0.05 microsecond/division. A $\times 10$ magnifier allows each sweep rate to be increased 10 times to provide a maximum sweep rate of five nanoseconds/division in the .05 μ s position. The delayed sweep feature

allows the B sweep to be delayed a selected amount from the start of A sweep to provide accurate relative-time measurements. Calibrated X-Y measurements can be made with Channel 2 providing the vertical deflection and Channel 1 providing the horizontal deflection (TRIGGER switch set to CH 1 ONLY, HORIZ DISPLAY switch set to X-Y). The regulated DC power supplies assure that instrument performance is not affected by variations in line voltage and frequency. Total power consumption of the instrument is about 125 watts.

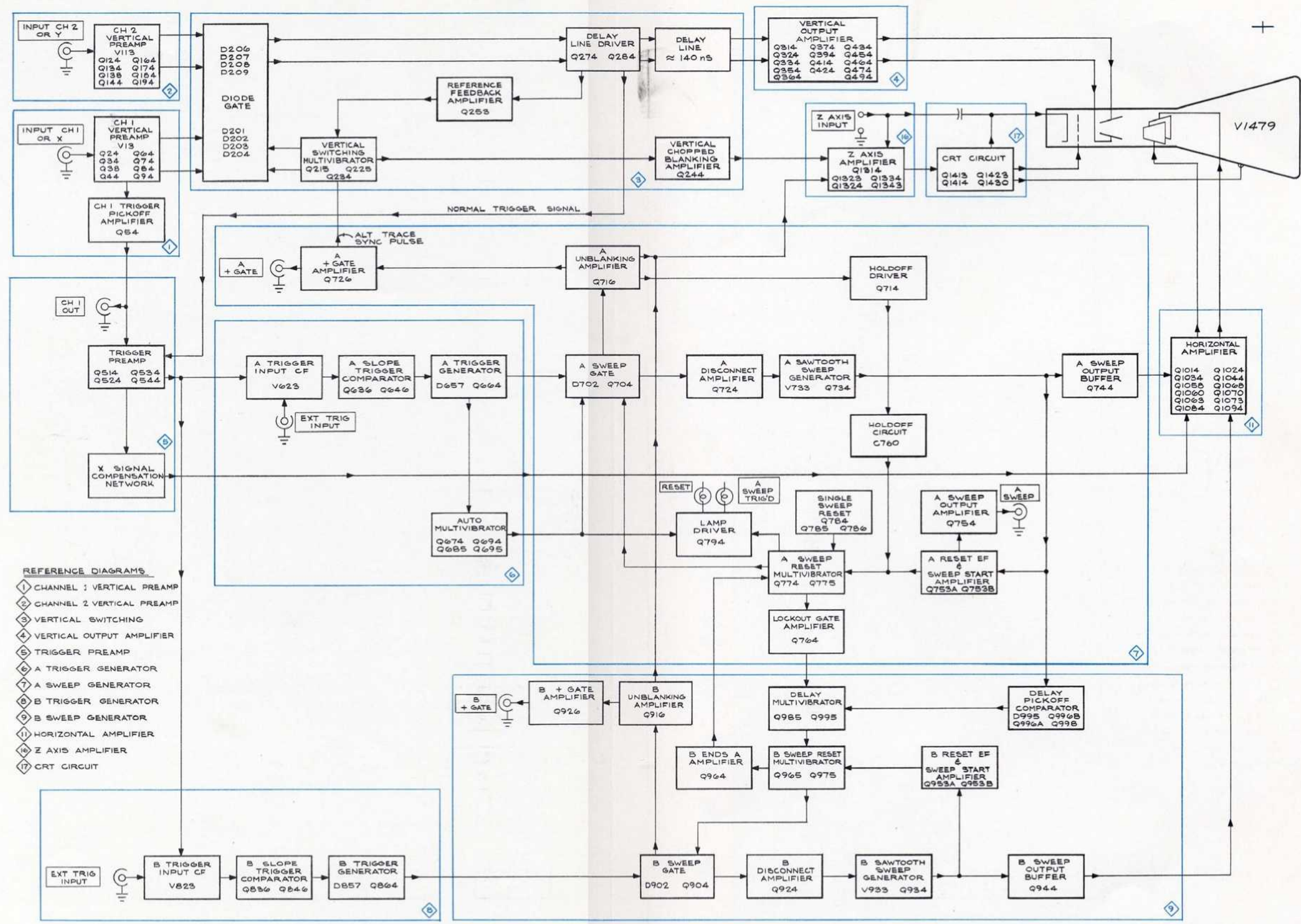
Information given in this instruction manual applies to the Type R454 also unless otherwise indicated. The Type R454 is electrically identical to the Type 454 but it is adapted for mounting in a standard 19-inch rack. Rackmounting instructions, a mechanical parts list and a dimensional drawing for the Type R454 are provided in section 10 of this manual.

This instrument will meet the electrical characteristics listed in Table 1-1 following complete calibration as given in Section 6. The performance check procedure given in Section 5 provides a convenient method to check instrument performance without making internal checks or adjustments. The following electrical characteristics apply over a calibration interval of 1000 hours and an ambient temperature range of -15°C to $+55^{\circ}\text{C}$, except as otherwise indicated. Warm-up time for given accuracy is 20 minutes.

**TABLE 1-1
ELECTRICAL**

Characteristic	Performance
VERTICAL DEFLECTION SYSTEM	
Deflection Factor	
Channel 1 or 2 calibrated range	
Without probe	Five millivolts/division to 10 volts/division in 11 steps. Steps in 1-2-5 sequence.
With P6047 Probe	50 millivolts/division to 100 volts/division in 11 steps. Steps in 1-2-5 sequence.
Channel 1 or 2 accuracy	
Without probe	Within 3% of indicated deflection with GAIN correctly adjusted at .2 V/DIV.
With P6047 Probe	Within 3% of indicated deflection with GAIN correctly adjusted at 20 mV/DIV.
Added mode accuracy	Within 3% over calibrated range.
Uncalibrated (variable) range	Continuously variable between calibrated deflection factor settings. Extends maximum uncali-

Characteristic	Performance
	brated deflection factor to at least 25 volts/division.
Channels 1 and 2 cascaded (uncalibrated)	One millivolt/division minimum with signal connected to INPUT CH 1, CH 1 OUT connected to INPUT CH 2 through a 50-ohm 18-inch RG-58A/U BNC cable, CH 1 and 2 VOLTS/DIV switches set to 5 mV, MODE switch set to CH 2 and TRIGGER switch set to NORM.
Low-Frequency Linearity	0.1 division or less compression or expansion of a center-screen two-division signal when positioned to the top and bottom of the graticule area.
Bandwidth at -3 dB Points with Four-division Reference (CH 1 and CH 2 VARIABLE controls set to CAL)	
BW-BEAM FINDER switch set to FULL (all vertical modes)	
DC input coupling	DC to upper limit defined in Table 1-1A.



- REFERENCE DIAGRAMS
- ① CHANNEL 1 VERTICAL PREAMP
 - ② CHANNEL 2 VERTICAL PREAMP
 - ③ VERTICAL SWITCHING
 - ④ VERTICAL OUTPUT AMPLIFIER
 - ⑤ TRIGGER PREAMP
 - ⑥ A TRIGGER GENERATOR
 - ⑦ A SWEEP GENERATOR
 - ⑧ B TRIGGER GENERATOR
 - ⑨ B SWEEP GENERATOR
 - ⑩ HORIZONTAL AMPLIFIER
 - ⑪ Z AXIS AMPLIFIER
 - ⑫ CRT CIRCUIT

TYPE 454 OSCILLOSCOPE

BLOCK DIAGRAM

VOLTAGE AND WAVEFORM TEST CONDITIONS

Typical voltage measurements and waveform photographs were obtained under the following conditions unless noted otherwise on the individual diagrams:

Test Oscilloscope (with 10X Probe)

Frequency response	DC to 50 MHz
Deflection factor (with probe)	50 millivolts to 10 volts/division
Input impedance	10 Megohms, 7.5 picofarads
Probe ground	Type 454 chassis ground
Trigger Source	External from A + GATE connector to indicate true time relationship between signals
Recommended type (as used for waveforms on diagrams)	Tektronix Type 545B with Type 1A1 plug-in unit

Voltmeter

Type	Non-loading AC (RMS)-DC VTVM
Sensitivity	20,000 ohms/volt
Range	0 to 300 volts
Reference voltage	Type 454 chassis ground
Recommended type (as used for voltages on diagrams)	General Radio Type 1806-A Electronic Voltmeter

Type 454 Conditions

Line voltage	115 volts
Signal applied	Calibrator output signal connected to INPUT CH 1 and INPUT CH 2 connectors for waveforms only
Connectors	No connections
Trace position	Centered
Control settings	As follows except as noted, otherwise on individual diagrams:

CRT Controls

INTENSITY	Midrange
FOCUS	Adjust for focused display
SCALE ILLUM	As desired
BW-BEAM FINDER	FULL

Vertical Controls (both channels if applicable)

VOLTS/DIV	.2
VARIABLE	CAL
POSITION	Midrange
Input Coupling	DC
MODE	CH 1
TRIGGER	NORM
INVERT	Pushed in

Triggering Controls (both A and B if applicable)

LEVEL	0
SLOPE	+
COUPLING	AC
SOURCE	INT

Sweep Controls

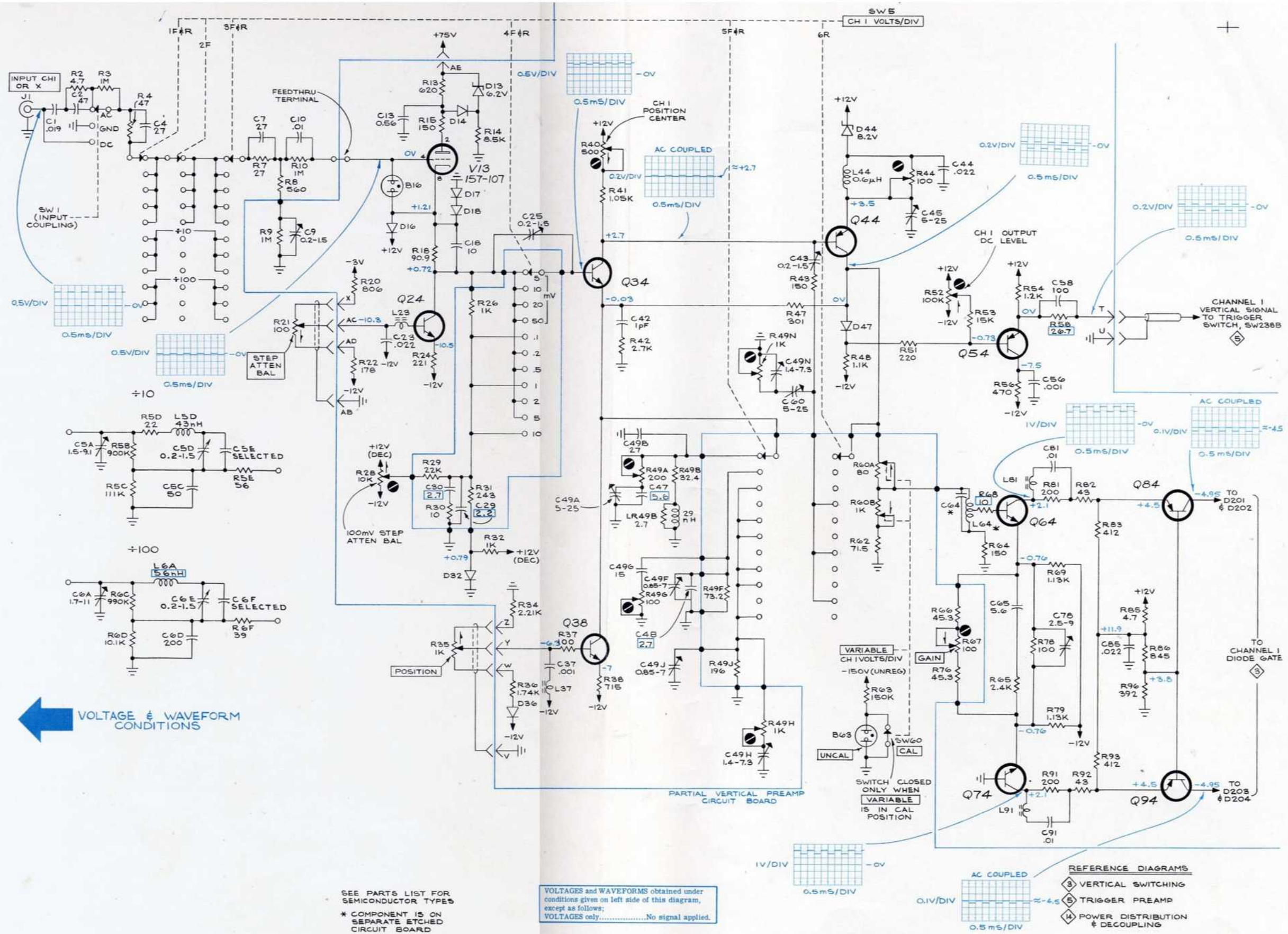
DELAY-TIME MULTIPLIER	0.10
A TIME/DIV	1 ms
B TIME/DIV	1 ms
A VARIABLE	CAL
A SWEEP MODE	AUTO TRIG
B SWEEP MODE	TRIGGERABLE AFTER DELAY TIME
HORIZ DISPLAY	A
MAG	OFF
A SWEEP LENGTH	FULL
POSITION	Midrange
FINE	Midrange
POWER	ON

Side-Panel Controls

B TIME/DIV VARIABLE	CAL
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All voltages given on the diagrams are in volts. Waveforms shown are actual waveform photographs taken with a Tektronix Oscilloscope Camera System and Projected Graticule.

Voltages and waveforms on the diagrams (shown in blue) are not absolute and may vary between instruments because of differing component tolerances, internal calibration or front-panel control settings.



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① CHANNEL 1 VERTICAL PREAMP

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