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CONTROLS, CONNECTORS, AND INDICATORS

The following descriptions are intended to familiarize the operator with the location, operation, and function of the instrument's controls, connectors, and indicators.

DISPLAY, POWER, AND PROBE ADJUST

Refer to Figure 2-3 for location of items 1 through 8.

- 1 **Internal Graticule**—Eliminates parallax viewing error between the trace and graticule lines. Rise-time amplitude and measurement points are indicated at the left edge of the graticule.
- 2 **POWER Switch**—Turns instrument power on and off. Press in for ON; press again for OFF.
- 3 **Power Indicator**—An LED that illuminates when the instrument is operating.
- 4 **FOCUS Control**—Adjusts for optimum display definition.
- 5 **PROBE ADJUST Connector**—Provides an approximately 0.5 V, negative-going, square-wave voltage (at approximately 1 kHz) that permits an operator to compensate voltage probes and to check operation of the oscilloscope vertical system. It is not intended for verifying the accuracy of the vertical gain or time-base circuitry.
- 6 **BEAM FIND Switch**—When held in, compresses the display to within the graticule area and provides a visible viewing intensity to aid in locating off-screen displays.
- 7 **TRACE ROTATION Control**—Screwdriver adjustment used to align the crt trace with the horizontal graticule lines.
- 8 **A and B INTENSITY Controls**—Determines the brightness of the A and B Sweep traces.

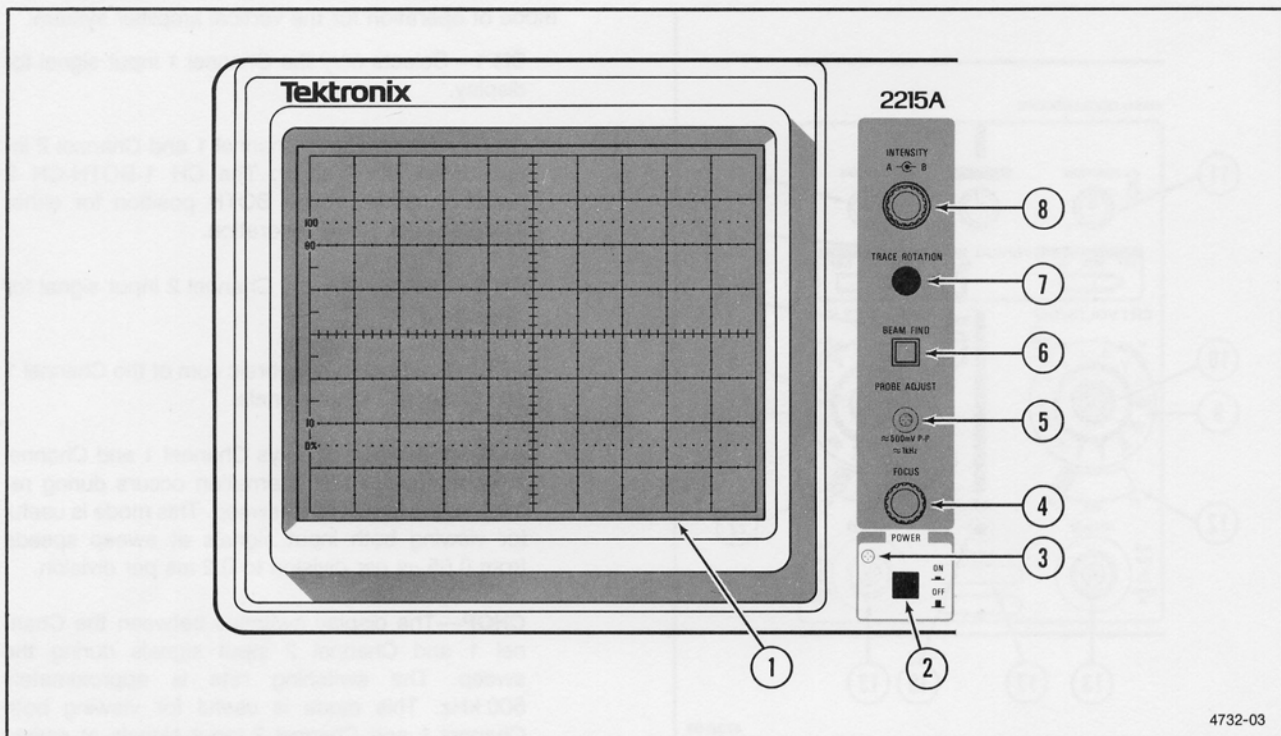


Figure 2-3. Power and display controls and indicators and PROBE ADJUST output.

VERTICAL

Refer to Figure 2-4 for location of items 9 through 17.

- 9 CH 1 VOLTS/DIV and CH 2 VOLTS/DIV Switches**—Used to select the vertical deflection factor in a 1-2-5 sequence. To obtain a calibrated deflection factor, the VOLTS/DIV variable control must be in the calibrated (CAL) detent (fully clockwise).

1X—Indicates the deflection factor selected when using either a 1X probe or a coaxial cable.

10X PROBE—Indicates the deflection factor selected when using a 10X probe.

- 10 VOLTS/DIV Variable Controls**—When rotated counterclockwise out of their calibrated detent positions, these controls provide continuously variable, uncalibrated deflection factors between the calibrated settings of the VOLTS/DIV switches.

- 11 POSITION Controls**—Used to vertically position the display on the crt. When the SEC/DIV switch is set to X-Y, the Channel 2 POSITION control moves the display vertically (Y-axis), and the Horizontal POSITION control moves the display horizontally (X-axis).

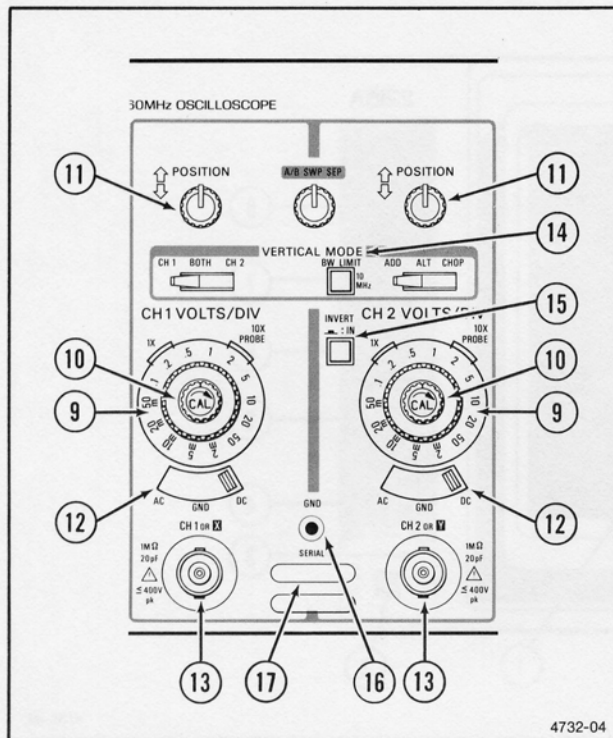


Figure 2-4. Vertical controls and connectors.

- 12 Input Coupling (AC-GND-DC) Switches**—Three-position switches that select the method of coupling the input signals to the instrument deflection system.

AC—Input signal is capacitively coupled to the vertical amplifier. The dc component of the input signal is blocked. Low-frequency limit (–3 dB point) is approximately 10 Hz.

GND—The input of the vertical amplifier is grounded to provide a zero (ground) reference-voltage display (does not ground the input signal). This switch position allows precharging the input coupling capacitor.

DC—All frequency components of the input signal are coupled to the vertical deflection systems.

- 13 CH 1 OR X and CH 2 OR Y Input Connectors**—Provide for application of external signals to the vertical deflection system or for an X-Y display. In the X-Y mode (SEC/DIV switch set to X-Y), the signal connected to the CH 1 OR X input connector provides horizontal deflection (X-axis) and the signal connected to the CH 2 OR Y input connector provides vertical deflection (Y-axis).

- 14 VERTICAL MODE Switches**—Two three-position switches and one button switch are used to select the mode of operation for the vertical amplifier system.

CH 1—Selects only the Channel 1 input signal for display.

BOTH—Selects both Channel 1 and Channel 2 input signals for display. The CH 1-BOTH-CH 2 switch must be in the BOTH position for either ADD, ALT, or CHOP operation.

CH 2—Selects only the Channel 2 input signal for display.

ADD—Displays the algebraic sum of the Channel 1 and Channel 2 input signals.

ALT—Alternately displays Channel 1 and Channel 2 input signals. The alternation occurs during retrace at the end of each sweep. This mode is useful for viewing both input signals at sweep speeds from 0.05 μ s per division to 0.2 ms per division.

CHOP—The display switches between the Channel 1 and Channel 2 input signals during the sweep. The switching rate is approximately 500 kHz. This mode is useful for viewing both Channel 1 and Channel 2 input signals at sweep speeds from 0.5 ms per division to 0.5 μ s per division.

BW LIMIT—When pressed in, this button switch limits the bandwidth of the vertical amplifier and the A Trigger system to approximately 10 MHz. Button must be pressed a second time to release it and regain full 60 MHz bandwidth operation. Provides a method for reducing interference from high-frequency signals when viewing low-frequency signals.

15 INVERT Switch—Inverts the Channel 2 display when button is pressed in. Button must be pressed in a second time to release it and regain a noninverted display.

16 GND Connector—Provides direct connection to the instrument chassis ground.

17 SERIAL and Mod Slots—The SERIAL slot is imprinted with the instrument's serial number. The Mod slot contains the option number that is installed in the instrument.

18 A and B SEC/DIV Switches—Used to select the sweep speeds for the A and B Sweep generators in a 1-2-5 sequence. To obtain calibrated sweep speeds, the A and B SEC/DIV Variable control must be in the calibrated detent (fully clockwise).

A SEC/DIV—The calibrated sweep speed is shown between the two black lines on the clear plastic skirt. This switch also selects the delay time for delayed-sweep operation when used in conjunction with the B DELAY TIME POSITION control.

B SEC/DIV—The B Sweep speed is set by pulling out the DLY'D SWEEP knob and rotating it clockwise to a setting opposite the white line scribed on the knob. The B Sweep circuit is used only for delayed-sweep operation.

19 SEC/DIV Variable Control—Provides continuously variable, uncalibrated A Sweep speeds to at least 2.5 times slower than the calibrated setting. It extends the slowest sweep speed to at least 1.25 s per division.

20 X10 Magnifier Switch—To increase displayed sweep speed by a factor of 10, pull out the SEC/DIV Variable knob. The fastest sweep speed can be extended to 5 ns per division. Push in the SEC/DIV Variable knob to regain the X1 sweep speed.

HORIZONTAL

Refer to Figure 2-5 for location of items 18 through 24.

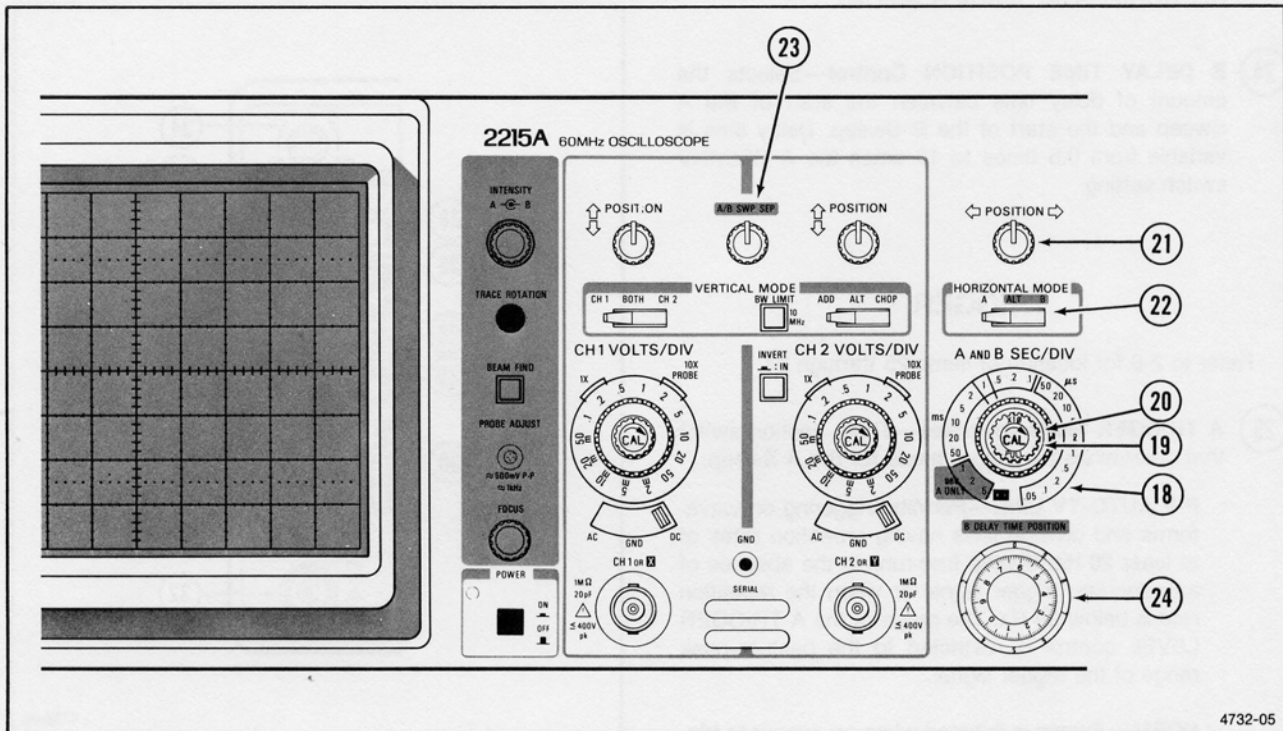


Figure 2-5. Horizontal controls.

OPERATORS FAMILIARIZATION

GENERAL OPERATING INFORMATION

GRATICULE

The graticule is internally marked on the faceplate of the crt to enable accurate measurements without parallax error (see Figure 3-1). It is marked with eight vertical and ten horizontal major divisions. Each major division is divided into five subdivisions. The vertical deflection factors and horizontal timing are calibrated to the graticule so that accurate measurements can be made directly from the crt. Also, percentage markers for the measurement of rise and fall times are located on the left side of the graticule.

GROUNDING

The most reliable signal measurements are made when the 2215A and the unit under test are connected by a common reference (ground lead), in addition to the signal lead or probe. The probe's ground lead provides the best grounding method for signal interconnection and ensures the maximum amount of signal-lead shielding in the probe cable. A separate ground lead can also be connected from the unit under test to the oscilloscope GND connector located on the front panel.

SIGNAL CONNECTIONS

Generally, probes offer the most convenient means of connecting an input signal to the instrument. They are shielded to prevent pickup of electromagnetic interference, and the supplied 10X probe offers a high input impedance that minimizes circuit loading. This allows the circuit under test to operate with a minimum of change from its normal condition as measurements are being made.

Coaxial cables may also be used to connect signals to the input connectors, but they may have considerable effect on the accuracy of a displayed waveform. To maintain the original frequency characteristics of an applied signal, only high-quality, low-loss coaxial cables should be used. Coaxial cables should be terminated at both ends in their characteristic impedance. If this is not possible, use suitable impedance-matching devices.

INPUT COUPLING CAPACITOR PRECHARGING

When the Input Coupling switch is set to GND, the input signal is connected to ground through the input coupling capacitor in series with a 1 M Ω resistor to form a precharging network. This network allows the input coupling capacitor to charge to the average dc-voltage level of the signal applied to the probe. Thus any large voltage transients that may accidentally be generated will not be applied to the amplifier input when the Input Coupling switch is moved from GND to AC. The precharging network also provides a measure of protection to the external circuitry by reducing the current levels that can be drawn from the external circuitry during capacitor charging.

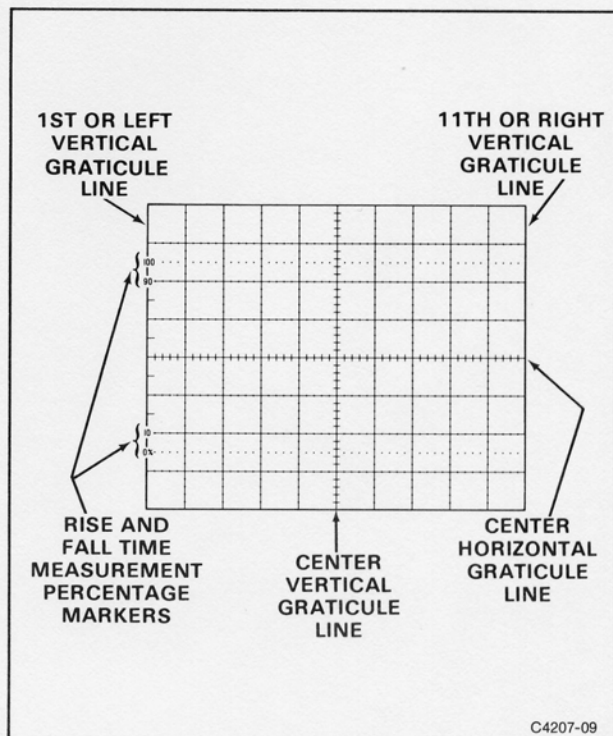


Figure 3-1. Graticule measurement markings.

11. Calculate the time difference between the Channel 1 and Channel 2 pulses as in the preceding "Time Difference On Single Waveforms" measurement procedure.

EXAMPLE: With the A SEC/DIV switch set to $50 \mu\text{s}$ per division, the dial reading for the reference pulse (Channel 1) is 2.60 and the dial reading for the comparison pulse (Channel 2) is 7.10.

Substituting the given values into the time-difference formula:

$$\text{Time Difference} = (7.10 - 2.60) (50 \mu\text{s}/\text{div}) = 225 \mu\text{s}$$

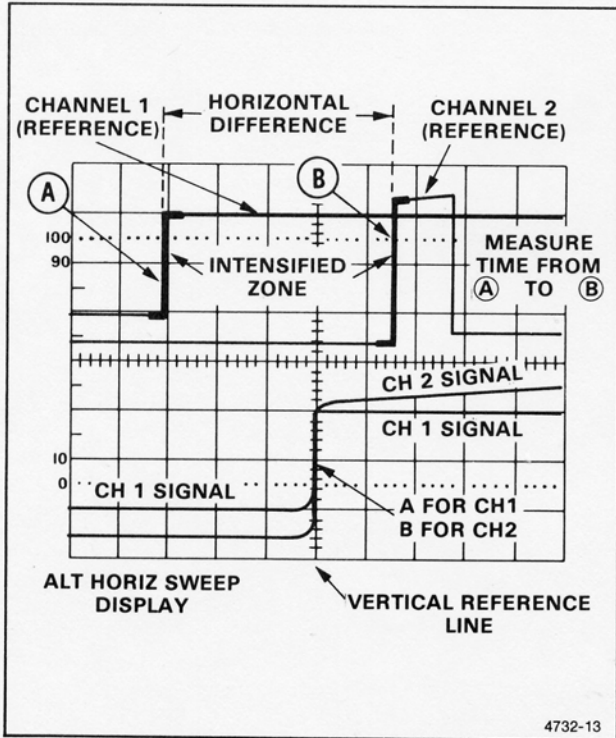


Figure 4-15. Time difference between two pulses on two time-related signals.

OPTIONS AND ACCESSORIES

INTRODUCTION

This section contains a general description of instrument options available at the time of publication of this manual. Also included is a complete list (with Tektronix part number) of standard accessories included with each instrument and a partial list of optional accessories. Additional information about instrument options, option availability, and other accessories can be obtained either by consulting the current Tektronix Product Catalog or by contacting your Tektronix Field Office or representative.

OPTIONS

There are currently no options available for the 2215A.

INTERNATIONAL POWER CORDS

Instruments are shipped with the detachable power-cord configuration ordered by the customer. Descriptive information about the international power-cords is provided in Section 2, "Preparation for Use". The following list identifies the Tektronix part numbers for the available power cords.

Description	Order
Universal Euro 10-16A, 50 Hz	020-0859-00
UK 240 V/13A, 50 Hz	020-0860-00
Australian 240 V/10A, 50 Hz	020-0861-00
North American 240 V/15A, 60 Hz	020-0862-00
Switzerland 220 V/10A, 50 Hz	020-0863-00

STANDARD ACCESSORIES

The following standard accessories are provided with each instrument.

Qty	Description	Order
2	Probes, 10X 1.5-meter length with accessories	010-6122-01
1	Power Cord	161-0104-00
1	Operators Manual	070-4732-00

OPTIONAL ACCESSORIES

The following optional accessories are recommended for use with the 2215A Oscilloscope.

Description	Order
Service Manual	070-4735-00
Protective Front Panel Cover	200-2520-00
Cord Wrap and Storage Pouch	016-0677-00
Protective Front Panel Cover, Cord Wrap, and Storage Pouch	020-0672-00
Probe Accessory, Grabber Tips	013-0191-00
Carrying Strap	346-0199-00
Carrying Case	016-0694-00
Low-Cost, General-Purpose Camera . . .	C-5C Option 04
Rackmount Adapter Kit	016-0466-00
SCOPE-MOBILE CART-Occupies less than 18 inches of aisle space, with storage area in base	Model 200C

DESCRIPTION

PG. 46

EFFECTIVE ALL SERIAL NUMBERS

TEXT CHANGES

For Page 1-2, Table 1-1

VERTICAL DEFLECTION SYSTEM

Add the following specification to the Bandwidth (−3 dB) under the 0°C to +35°C characteristic.

Bandwidth (−3 dB) 0°C to +35°C 2 mV per Division	Dc to at least 50 MHz.	Measured with a vertically centered 6-division reference signal from a 50 Ω source driving a 50 Ω coaxial cable that is terminated in 50 Ω, both at the input connector and at the probe input, with the VOLTS/DIV Variable control in the CAL detent.
5 mV per Division to 5 V per Division	Dc to at least 60 MHz.	