OPERATING INSTRUCTIONS

PREPARATION FOR USE

SAFETY

Refer to the "Operators Safety Summary" at the front of this manual for power source, grounding, and other safety considerations pertaining to the use of the 2235. Before connecting the instrument to a power source, carefully read the following information about line voltage, power cord, and fuse.

LINE VOLTAGE

This instrument is capable of continuous operation with input voltages that range from 90 V to 250 V nominal at frequencies from 48 Hz to 440 Hz.

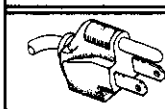
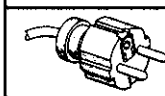
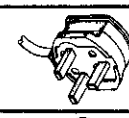
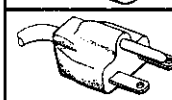
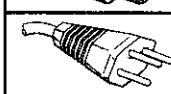
POWER CORD

A detachable three-wire power cord with a three-contact plug is provided with each instrument to permit connection to both the power source and protective ground. The protective-ground contact in the plug connects (through the protective-ground conductor) to the accessible metal parts of the instrument. For electrical-shock protection, insert this plug only into a power-source outlet that has a properly grounded protective-ground contact.

Instruments are shipped with the required power cord as ordered by the customer. Available power-cord information is presented in Figure 2-1, and part numbers are listed on the "Accessories" page at the back of this manual. Contact your Tektronix representative or local Tektronix Field Office for additional power-cord information.

LINE FUSE

The instrument fuse holder is located on the rear panel (see Figure 2-2) and contains the line fuse. The following procedure can be used to verify that the proper fuse is installed or to install a replacement fuse.

Plug Configuration	Usage	Line Voltage	Reference Standards	Option Number
	North American 120V/ 15A	120V	ANSI C73.11 NEMA 5-15-P IEC 83	Standard
	Universal Euro 240V/ 10-16A	240V	CEE (7),II,IV,VII IEC 83	A1
	UK 240V/ 13A	240V	BS 1363 IEC 83	A2
	Australian 240V/ 10A	240V	AS C112	A3
	North American 240V/ 15A	240V	ANSI C73.20 NEMA 6-15-P IEC 83	A4
	Switzerland 220V/ 6A	220V	SEV	A5

Abbreviations:
ANSI — American National Standards Institute
AS — Standards Association of Australia
BS — British Standards Institution
CEE — International Commission on Rules for the Approval of Electrical Equipment
IEC — International Electrotechnical Commission
NEMA — National Electrical Manufacturer's Association
SEV — Schweizevischer Elektrotechischer Verein

2931-21

Figure 2-1. Voltage, power cord, and fuse data.

1. Unplug the power cord from the power-input source (if applicable).

2. Press in and slightly rotate the fuse-holder cap counterclockwise to release it.

3. Pull the cap (with the attached fuse inside) out of the fuse holder.

4. Verify proper fuse value (see Figure 2-1).

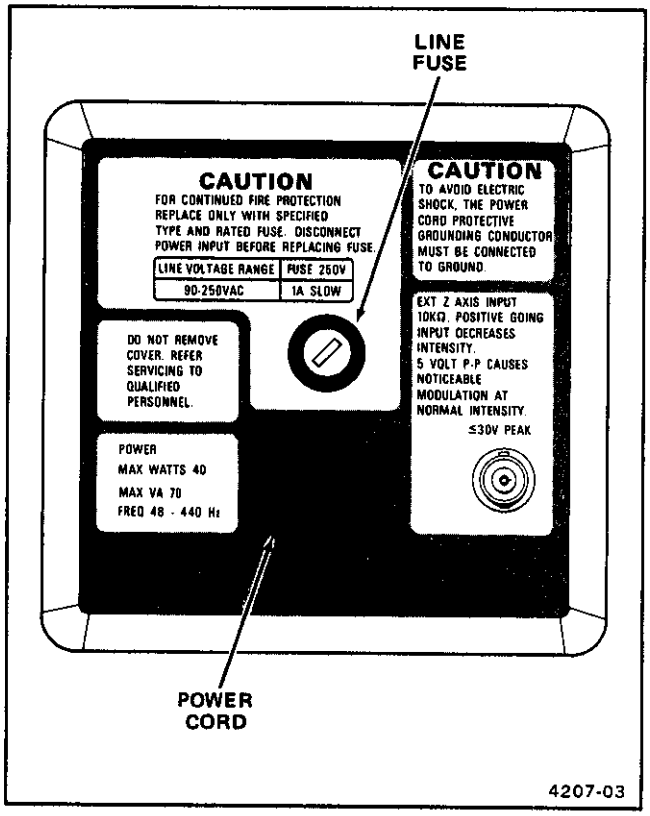


Figure 2-2. Fuse holder and power cord connector.

5. Reinstall the fuse (or replacement fuse) and the fuseholder cap.

INSTRUMENT COOLING

Always maintain adequate instrument cooling. The ventilation holes on both side of the equipment cabinet and on the rear panel must remain free of obstructions.

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.

POWER, DISPLAY, 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 power is available to the instrument and the POWER switch is set to ON (button in).

(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 the check operation of the oscilloscope vertical system. It is not intended to verify 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.

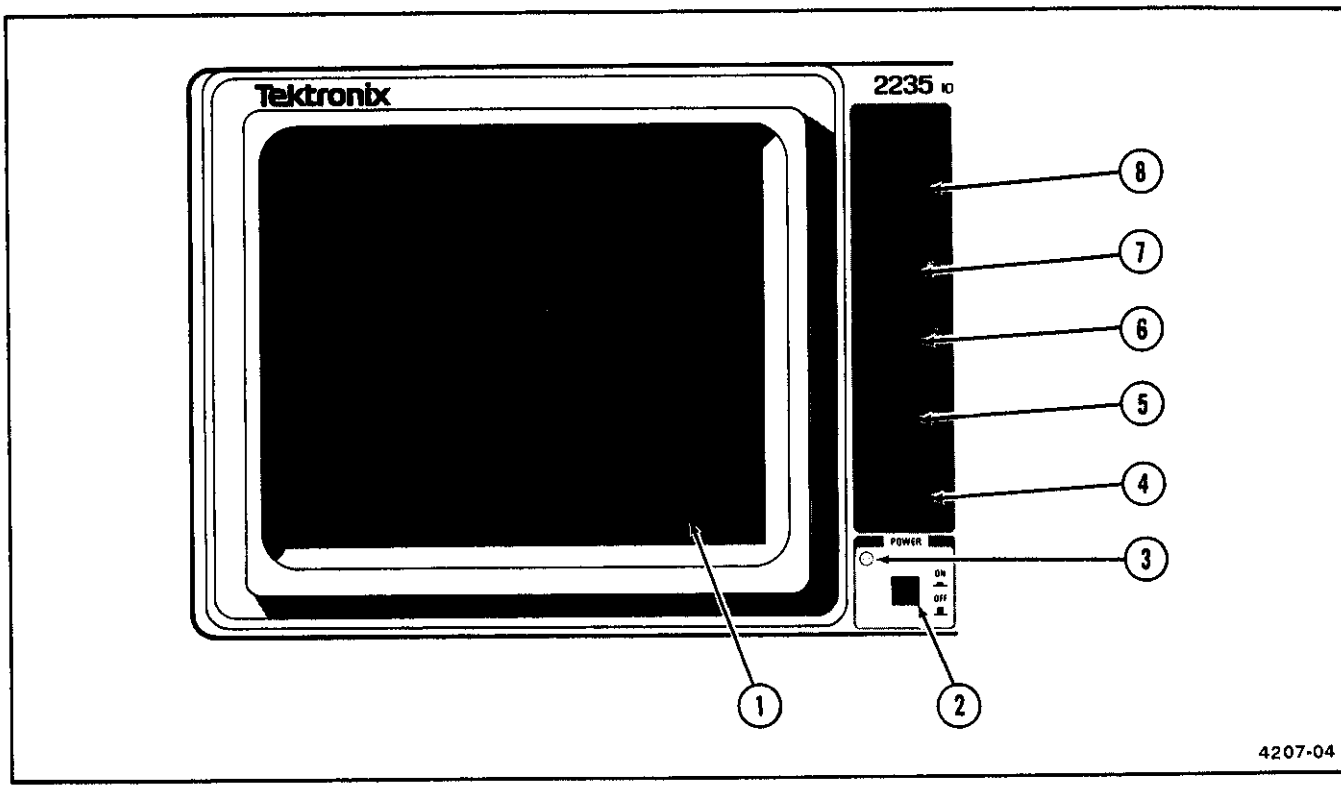


Figure 2-3. Power, display, and probe adjust controls, connector, and indicator.

(8) A and B INTENSITY Controls—Determine the brightness of the A and the B Sweep traces.

VERTICAL

Refer to Figure 2-4 for location of items 9 through 18.

(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.

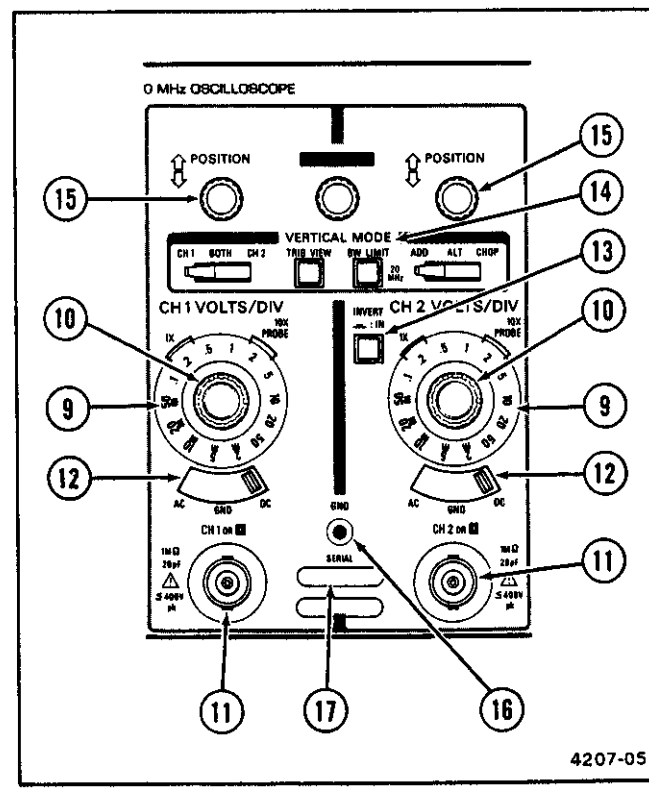


Figure 2-4. Vertical controls and connectors.

(11) CH 1 OR X and CH 2 OR Y Connectors—Provide for application of external signals to the inputs of the vertical deflection system or for an X-Y display. In the X-Y mode, the signal connected to the CH 1 OR X connector provides horizontal deflection, and the signal connected to the CH 2 OR Y connector provides vertical deflection.

(12) Input Coupling (AC-GND-DC) Switches—Used to select the method of coupling input signals to the vertical 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 system.

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

(14) VERTICAL MODE Switches—Two three-position switches and two push-button switches 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 BOTH position must be selected 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 Alteration occurs during retrace at the end of each sweep. This mode is useful for viewing both input signals at sweep speeds from 0.05 μs 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 s per division.

TRIG VIEW—Press in and hold this push button to display a sample of the signal present in the A Trigger amplifier (for all A SOURCE switch settings). All other signal displays are removed while the TRIG VIEW Push button is held in.

BW LIMIT—When pressed in, this push-button switch limits the bandwidth of the vertical amplifier and the A Trigger system to approximately 20 MHz. Push button must be pressed a second time to release it and regain full 100 MHz bandwidth operation. Provides a method for reducing interference from high-frequency signals when viewing low-frequency signals.

(15) 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).

(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 any option number that is installed in the instrument.

HORIZONTAL

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

(18) A and B SEC/DIV Switches—Used to select the sweep speeds for the A and B Sweep Generator 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 PULL) 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.

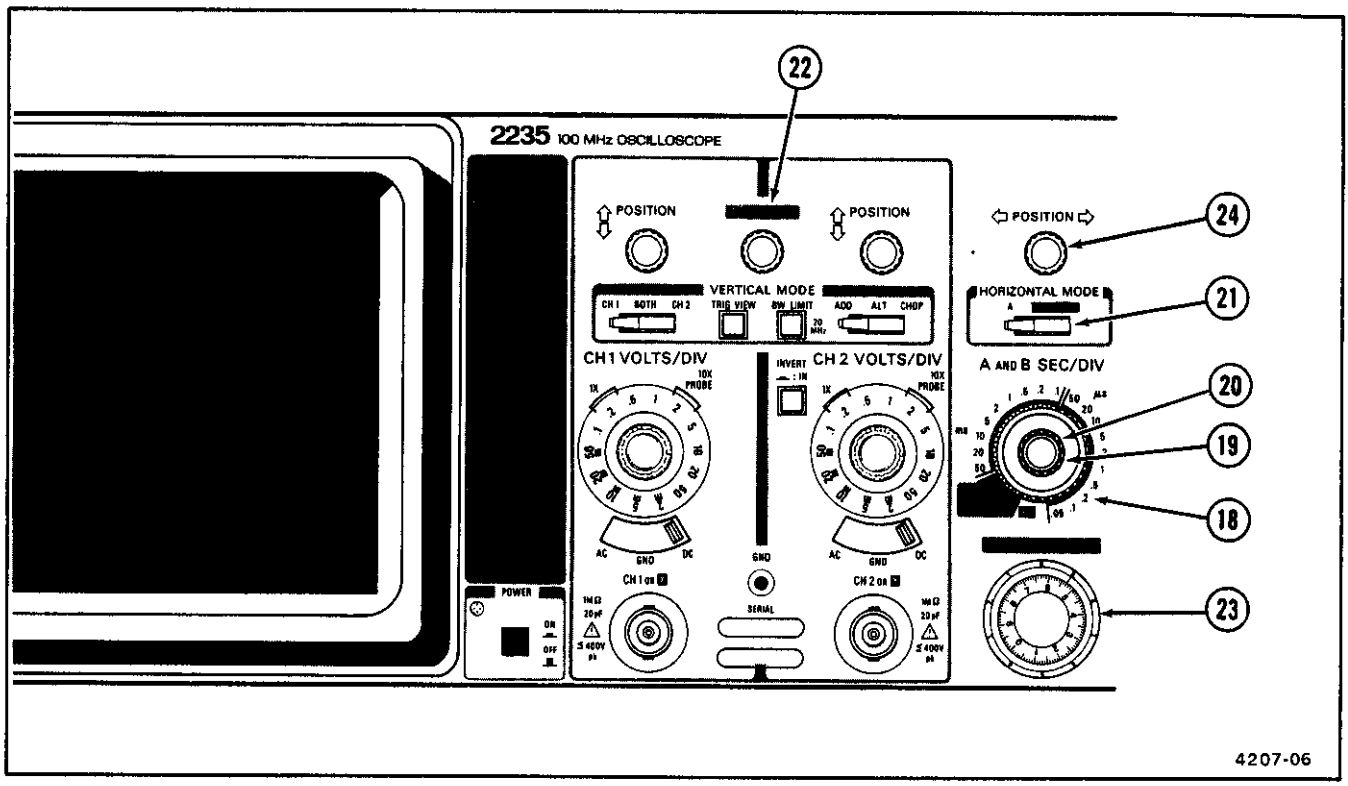


Figure 2-5. Horizontal controls.

(19) A and B SEC/DIV Variable Control—Provides continuously variable, uncalibrated A Sweep speeds to at least 2.5 times 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 A and B SEC/DIV Variable knob. The fastest sweep speed can be extended to 5 ns per division. Push in the A and B SEC/DIV Variable knob to regain the X1 sweep speed.

(21) HORIZONTAL MODE Switch—This three-position switch determines the mode of operation for the horizontal deflection system.

A—Horizontal deflection is provided by the A Sweep generator at a sweep speed determined by the A SEC/DIV switch setting.

ALT—Alternates the horizontal displays between the A Sweep (with an intensified zone) and the B Delayed Sweep. The A Sweep speed is determined by the setting of the A SEC/DIV switch. The B Sweep speed and the length of the intensified zone on the A Sweep are both determined by the B SEC/DIV switch setting.

B—Horizontal deflection is provided by the B Sweep generator at a sweep speed determined by the B SEC/DIV switch setting. The start of the B Sweep is delayed from the start of the A Sweep by a time determined by the settings of both the A SEC/DIV switch and the B DELAY TIME POSITION control.

(22) A/B SWP SEP Control—Vertically positions the B Sweep trace with respect to the A Sweep trace when ALT HORIZONTAL MODE is selected.

(23) B DELAY TIME POSITION Control—Selects the amount of delay time between the start of the A Sweep and the start of the B Sweep. Delay time is variable from 0.5 times to 10 times the A SEC/DIV switch setting.

(24) POSITION Control—Horizontally positions both the A Sweep and the B Sweep displays and horizontally positions X-axis in the X-Y mode.

TRIGGER

Refer to Figure 2-6 for locations of items 25 through 34.

(25) TRIGGER Mode Switches—Three push-button switches that determine the trigger mode for the A Sweep.

SGL SWP RESET—Press in the spring-return push button momentarily to arm the A Sweep circuit for a single-sweep display. This mode operates the same as NORM, except only one sweep is displayed for each trigger signal. Another sweep cannot be displayed until the SGL SWP RESET Push button is momentarily pressed in again to reset the A Sweep circuit. This mode is useful for displaying and photographing either nonrepetitive signals or signals that cause unstable conventional displays (e.g., signals that vary in amplitude, shape, or time).

P-P AUTO-TV LINE—Permits triggering on waveforms having repetition rates of at least 20 Hz and television lines. Sweep free-runs in the absence of an adequate trigger signal or when the repetition rate is below 20 Hz. The range of the A TRIGGER LEVEL control is restricted to the peak-to-peak range of the trigger signal.

NORM—Sweep is initiated when an adequate trigger signal is applied. In the absence of a trigger signal, no baseline trace will be present.

TV FIELD—Press in both P-P AUTO and NORM push buttons. Permits triggering on television field signals.

(26) TRIG'D READY Indicator—The LED illuminates when either the P-P AUTO or the NORM Trigger Mode is selected to indicate that the A Sweep is triggered (TRIG'D). When the SGL SWP RESET button is momentarily pressed in, the LED illuminates to indicate that the A Trigger circuit is armed (READY) for a single-sweep display.

(27) A TRIGGER LEVEL Control—Selects the amplitude point on the trigger signal at which the sweep is triggered.

(28) SLOPE Switches—Select the slope of the signal that triggers the sweep.

OUT—When push button is released out, sweep is triggered from the positive-going slope of the trigger signal.

IN—When push button is pressed in, sweep is triggered from the negative-going slope of the trigger signal.

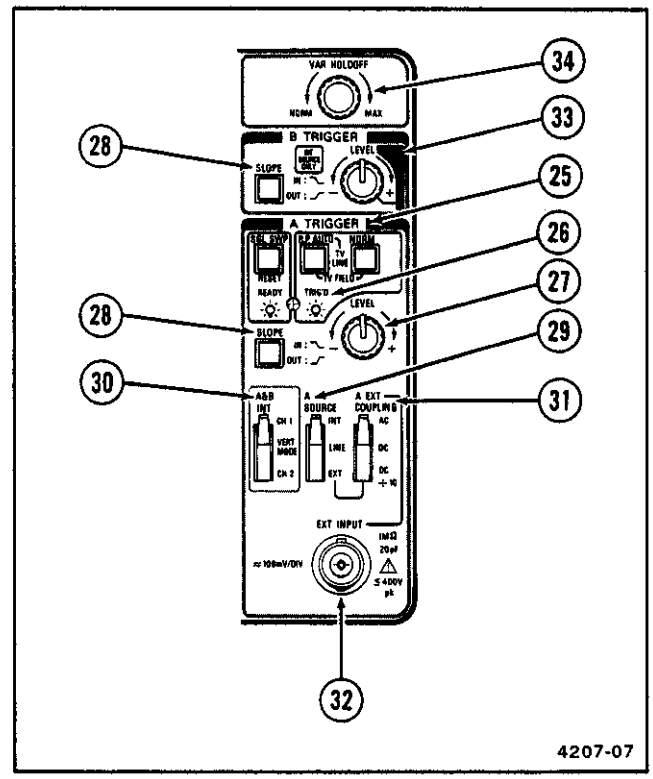


Figure 2-6. Trigger controls, connector, and indicator.

(29) A SOURCE Switch—Determines the source of the trigger signal that is coupled to the input of the A Trigger circuit.

INT—Permits triggering on signals that are applied to the CH 1 OR X and CH 2 OR Y input connectors. The source of the internal signal is selected by the A & B INT switch.

LINE—Selects the power-source waveform as the source of the trigger signal. This trigger source is useful when vertical-input signals are time related (multiple or submultiple) to the frequency of the power-source voltage.

EXT—Permits triggering on signals applied to the EXT INPUT connector.

(30) A & B INT Switch—Selects the source of the internal trigger signal when the A SOURCE switch is set to INT.

CH 1—The signal applied to the CH 1 OR X input connector is the source of the trigger signal.

VERT MODE—The internal trigger source is determined by the signals selected for display by the VERTICAL MODE switches.

CH 2—The signal applied to the CH 2 OR Y input connector is the source of the trigger signal.

(31) A EXT COUPLING Switch—Determines the method used to couple external signals to the A Trigger circuit from the EXT INPUT connector.

AC—Signals above 60 Hz are capacitively coupled to the input of the A Trigger circuit. Any dc components are blocked, and signals below 60 Hz are attenuated.

DC—All components of the signal are coupled to the input of the A Trigger circuitry. This position is useful for displaying low-frequency or low-repetition-rate signals.

DC ÷ 10—External trigger signals are attenuated by a factor of 10. All components of the signal are coupled to the input of the A Trigger circuit.

(32) EXT INPUT Connector—Provides a means of introducing external signals into the A Trigger circuit through the A EXT COUPLING switch.

(33) B TRIGGER LEVEL Control—Selects the amplitude point on the trigger signals at which the sweep is triggered. When fully clockwise; (B RUNS AFTER DLY), the B Sweep circuit runs immediately following the delay time selected by the A SEC/DIV switch and the B DELAY TIME POSITION control.

(34) VAR HOLDOFF control—Provides continuous control of holdoff time between sweeps. Increases the holdoff time by at least a factor of 10. This control improves the ability to trigger on aperiodic signals (such as complex digital waveforms).

REAR PANEL

Refer to Figure 2-7 for location of item 35.

(35) EXT Z-AXIS Connector—Provides a means of connecting external signals to the Z-axis amplifier to intensity module the crt display. Applied signals do not affect display waveshape. Signals with fast rise times and fall times provide the most abrupt intensity change, and a 5 V p-p signal will produce noticeable modulation. The Z-axis signals must be time-related to the display to obtain a stable presentation on the crt.

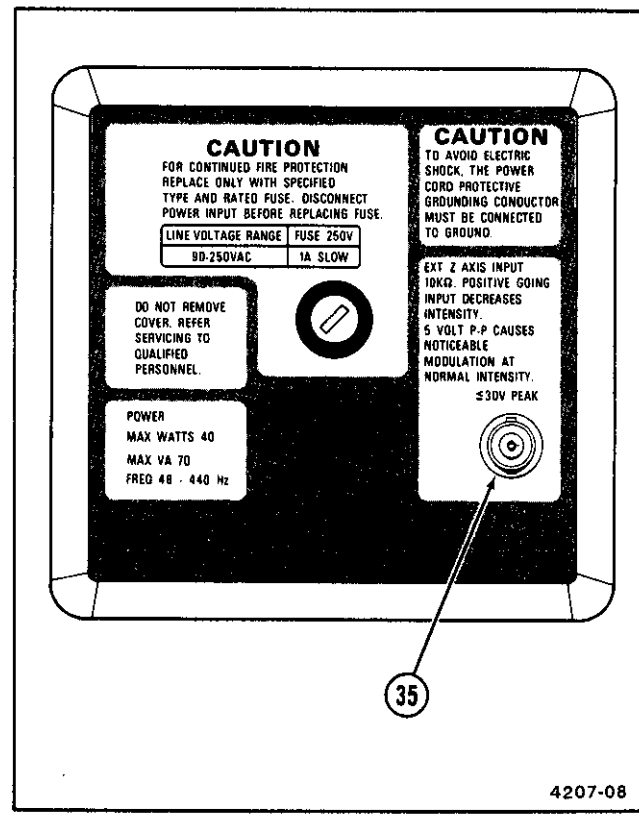


Figure 2-7. Rear-panel connector.

OPERATING CONSIDERATIONS

The following basic operating information and techniques should be considered before attempting to make any measurements with your instrument.

GRATICULE

The graticule is internally marked on the faceplate of the crt to enable accurate measurements without parallax error (see Figure 2-8). 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 2235 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.

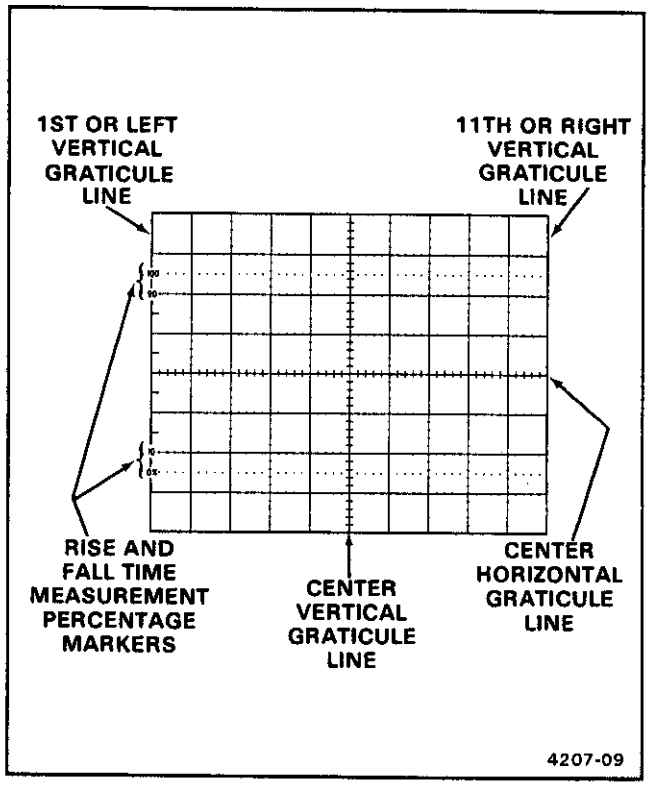


Figure 2-8. Graticule measurement markings.

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 MΩ 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.

The following procedure should be used whenever the probe tip is connected to a signal source having a different dc level than that previously applied, especially if the dc-

level difference is more than 10 times the VOLTS/DIV switch setting:

1. Set the AC-GND-DC switch to GND.

2. Insert the probe tip into the oscilloscope GND connector and wait several seconds for the input coupling capacitor to discharge.

3. Connect the probe tip to the signal source and wait several seconds for the input coupling capacitor to charge.

4. Set the AC-GND-DC switch to AC. The display will remain on the screen, and the ac component of the signal can be measured in the normal manner.

OPERATOR'S ADJUSTMENTS

INTRODUCTION

Two adjustments should be performed before making measurements with your oscilloscope: Trace Rotation and Probe Compensation. Before starting either of these adjustments, set the instrument controls and obtain a baseline trace as described under "Baseline Trace" on the next page. Allow the instrument to warm up for at least 20 minutes when specified in the procedure.

TRACE ROTATION

1. Use the Channel 1 POSITION control to move the baseline trace to the center horizontal graticule line.

NOTE

Normally, the resulting trace will be parallel to the center horizontal graticule line, and the Trace Rotation adjustment should not be required.

2. If the resulting trace is not parallel to the center horizontal graticule line, use small flat-bit screwdriver to adjust the TRACE ROTATION control and align the trace with the center horizontal graticule line.

PROBE COMPENSATION

Misadjustment of probe compensation is one of the source of measurement error. Most attenuator probes are equipped with a compensation adjustment. To ensure optimum measurement accuracy, always compensate the oscilloscope probes before making measurements. Probe compensation is accomplished as follows:

1. Connect the two 10X probes (supplied with the instrument) to the CH 1 and CH 2 input connectors.

2. Set both VOLTS/DIV switches to 0.1 (10X PROBE) and set both AC-GND-DC switches to DC.

3. Select CH 1 VERTICAL MODE and insert the tip of the Channel 1 probe into the PROBE ADJUST output jack.

4. Obtain a display of the PROBE ADJUST signal (approximately 1 kHz square-wave) by following steps 3 through 6 under "Signal Display" on the next page.

5. Check the waveform presentation for overshoot and rolloff (see Figure 2-9). If necessary, adjust the probe compensation for flat tops on the waveforms. Refer to the instructions supplied with the probe for details of compensation adjustment.

6. Disconnect the Channel 1 probe tip, select CH 2 VERTICAL MODE, and connect the Channel 2 probe tip to the PROBE ADJUST Output jack.

7. Repeat steps 4 and 5 for the Channel 2 probe.

8. Disconnect the Channel 2 probe tip.

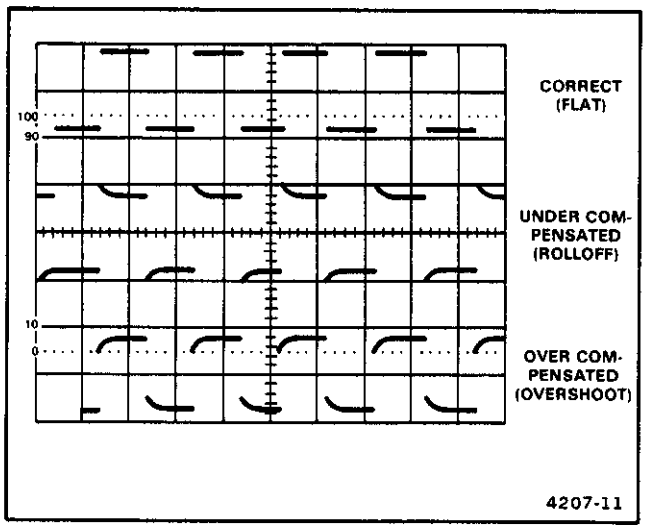


Figure 2-9. Probe compensation.

OSCILLOSCOPE DISPLAYS

INTRODUCTION

The procedure in this section will allow you to set up and operate your instrument to obtain the most commonly used oscilloscope display.

BASELINE TRACE

1. Set the instrument front-panel controls as follows:

Display

INTENSITY	As desired
FOCUS	Best focused display

Vertical (Both Channels)

POSITION	Midrange
VERTICAL MODE	CH 1
BW LIMIT	Off (button out)
VOLTS/DIV	50 m
VOLTS/DIV Variable	CAL detent
INVERT	Off (button out)
AC-GND-DC	AC

Horizontal

A/B SWP SEP	Off midrange
POSITION	Midrange
HORIZONTAL MODE	A
A and B SEC/DIV	0.5 ms
SEC/DIV Variable	CAL detent
X10 Magnifier	Off (knob in)
B DELAY TIME POSITION	Fully counterclockwise

B TRIGGER

SLOPE	OUT
LEVEL	Fully clockwise

A TRIGGER

VAR HOLDOFF	NORM
Mode	P-P AUTO
SLOPE	OUT
LEVEL	Midrange
A&B INT	VERT MODE
A SOURCE	INT
A EXT COUPLING	AC

2. Press in the POWER switch button (on) and allow the instrument to warm up or at least 20 minutes.

3. Adjust the A INTENSITY control for desired display brightness.

4. Adjust both the Vertical and Horizontal POSITION controls to center the trace on the screen.

SIGNAL DISPLAY

1. Obtain a baseline trace.

2. Apply a signal to either vertical-channel input connector and set the VERTICAL MODE switch to display the channel used. To display two time-related input signal, use both vertical-channel input connectors and select BOTH VERTICAL MODE; then select either ALT or CHOP, depending on the frequency of input signals.

3. Adjust the A INTENSITY control for desired display brightness. If the display is not visible with the INTENSITY control at midrange, press the BEAM FIND push button and hold it in while adjusting the appropriate VOLTS/DIV switch(es) to reduce the vertical display size. Center the compressed display within the graticule area using the Vertical and Horizontal POSITION control, then release the BEAM FIND push button.

4. Adjust the A TRIGGER LEVEL control, if necessary, to obtain a stable display.

5. Set the appropriate VOLTS/DIV switch(es) and readjust the Vertical and Horizontal POSITION controls to center the display within the graticule area.

6. Set the A SEC/DIV switch to display several cycles of the displayed signal. Then adjust the FOCUS control for the best-defined display.

MAGNIFIED-SWEEP DISPLAY

1. Obtain a Signal Display (see preceding instructions).

2. Adjust the Horizontal POSITION control to move the trace area that is to be magnified to the center of the crt graticule (0.5 division on each side of the center vertical graticule line). Change the A SEC/DIV switch setting as required.

3. Pull out the SEC/DIV Variable knob (X10) to obtain sweep magnification.

4. Adjust the Horizontal POSITION control for precise positioning of the magnified display.

5. To calculate the magnified sweep speed, divide the A SEC/DIV switch setting by 10.

DELAYED-SWEEP DISPLAY

1. Obtain a Signal Display.

2. Select ALT HORIZONTAL MODE. Adjust the A and B INTENSITY controls for desired display brightness.

3. Adjust the appropriate channel POSITION control and the A/B SWP SEP control to display the A trace above the B trace.

4. Adjust the A INTENSITY control as needed to make the intensified zone distinguishable from the remainder of the display. Set the B SEC/DIV switch until the intensified zone is the desired length.

5. Adjust the B DELAY TIME POSITION control to move the intensified zone to cover that portion of the A trace that is to be displayed on the B trace. The B HORIZONTAL MODE may be used to display the intensified portion of the A Sweep.

DELAYED-SWEEP MEASUREMENTS

1. Obtain a Signal Display.

2. Select ALT HORIZONTAL MODE. Adjust the A and B INTENSITY controls for desired display brightness.

3. Adjust the appropriate channel POSITION control and the A/B SWP SEP control to display the A trace above the B trace.

4. Adjust the A INTENSITY control as needed to make the intensified zone distinguishable from the remainder of the display. Set the B SEC/DIV switch until the intensified zone is the desired length.

5. Adjust the B DELAY TIME POSITION control to move the intensified zone to the leading edge of the first pulse of interest; then fine adjust until the rising portion is centered at any convenient vertical graticule line.

6. Record the B DELAY TIME POSITION control dial setting.

7. Adjust the B DELAY TIME POSITION control clockwise until the rising portion of the second pulse of interest is positioned to the same vertical reference line selected in step 5.

8. Record the B DELAY TIME POSITION control dial setting.

9. Use the following formula to calculate the time difference:

$$\begin{pmatrix}\text{Time Difference} \\ \text{(delayed sweep)}\end{pmatrix} = \begin{pmatrix}\text{second dial setting} - \text{first dial setting}\end{pmatrix}\begin{pmatrix}\text{A SEC/DIV switch setting} \\ \text{(delay time)}\end{pmatrix}$$

SINGLE-SWEEP DISPLAY

1. Obtain a Signal Display.

2. For random signals, set the A TRIGGER LEVEL control to trigger the sweep on a signal that is approximately the same amplitude as the random signal.

3. Momentarily press in the A TRIGGER SGL SWP RESET push button. If no trigger signal is present, the TRIG'D-READY light should illuminate to indicate that the A Sweep Generator circuit is set to initiate a sweep when a trigger signal is received. The next trigger pulse will initiate the sweep, and a single trace will be displayed.

4. When the single sweep is triggered and the sweep completed, the Sweep-Logic circuitry is then locked out. Another sweep cannot be generated until the SGL SWP RESET push button is again pressed in to set the A Sweep Generator to the READY condition.

X-Y DISPLAY

1. Obtain a baseline trace.

2. Use equal-length coaxial cables, or the two 10X probes supplied with the instrument, to apply the horizontal signal (X-axis) to the CH 1 OR X input connector and to apply the vertical signal (Y-axis) to the CH 2 OR Y input connector.

3. Select X-Y mode by rotating the A SEC/DIV switch to its fully counterclockwise position.

4. Rotate the A INTENSITY control clockwise until two dots are displayed. The display can be positioned horizontally with the Horizontal POSITION control and vertically with the Channel 2 POSITION control.

NOTE

The display obtained when sinusoidal signals are applied to the X- and Y-axis is called a Lissajous figure. This display is commonly used to compare the frequency and phase relationships of two input signals. The frequency relationship of the two input signals determines the pattern seen. The pattern will be stable only if a common divisor exists between the two frequencies.

TV SIGNAL DISPLAYS

Displaying a TV Line-rate Signal

1. Display of the desired TV signal (see "Signal Display" procedure).

2. Set the A SEC/DIV control to 10 μs, and the A & B INT switch either to CH 1 or to CH 2, as appropriate for the applied signal.

3. Set the A TRIGGER SLOPE switch either for a positive-going signal (lever up, if the applied TV signal sync pulses are positive-going) or for a negative-going signal (lever down, if the TV sync pulses are negative-going).

4. Adjust the A TRIGGER LEVEL control for a stable display, and the A INTENSITY control for desired display brightness. If necessary, adjust the VERTICAL VOLTS/DIV control to obtain a trace having 5 divisions or greater amplitude with a stable display.

NOTE

To examine a TV Line-rate signal in more detail, either the X10 Magnifier or HORIZONTAL MODE functions may be employed as previously described in this manual.

Displaying a TV Field-rate Signal

1. Obtain a Signal Display of the desired TV signal (see "Signal Display" procedure).

2. Set the following controls:

A SEC/DIV	2 ms
A TRIGGER Mode	TV FIELD
A & B INT	Either CH 1 or CH 2, appropriate

3. Perform Steps 3 and 4 under the preceding "Displaying a TV Line-rate Signal" procedure.

4. To display either Field 1 or Field 2 individually at faster sweep rates (displays or less than one full field), set VERTICAL MODE to BOTH and ALT simultaneously. This synchronizes the Channel 1 display to one field and the Channel 2 display to the other field.

To change the field that is displayed, interrupt the triggering either by repeatedly setting the AC-GND-DC switch to GND or by disconnecting and reconnecting the signal from the input connector until the other field is displayed. To display both fields simultaneously, apply the input signal to both the CH 1 and CH 2 inputs, using either two probes, two cables, or a dual-input coupler.

NOTE

To examine a TV Field-rate signal in more detail, either the X10 Magnifier or HORIZONTAL MODE functions may be employed as previously described in the subsection of the manual.

5. To display a selected horizontal line, first trigger the sweep on a vertical (field rate) sync pulse, then use the delayed sweep to delay out to that line for close examination. This procedure is useful for examining VITS signals.