

# PREPARATION FOR USE

## FIRST-TIME START UP

### 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 82 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.


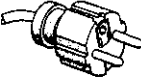




### LINE FUSE

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.

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)
5. Reinstall the fuse (or replacement fuse) and the fuse-holder cap.

### INSTRUMENT COOLING

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

Plug Configuration	Usage	Line Voltage	Reference Standards	Option Number
	North American 120V/ 15A	120V	ANSI C73.11 NEMA 6-15-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 — Schweizerischer Elektrotechnischer Verein

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

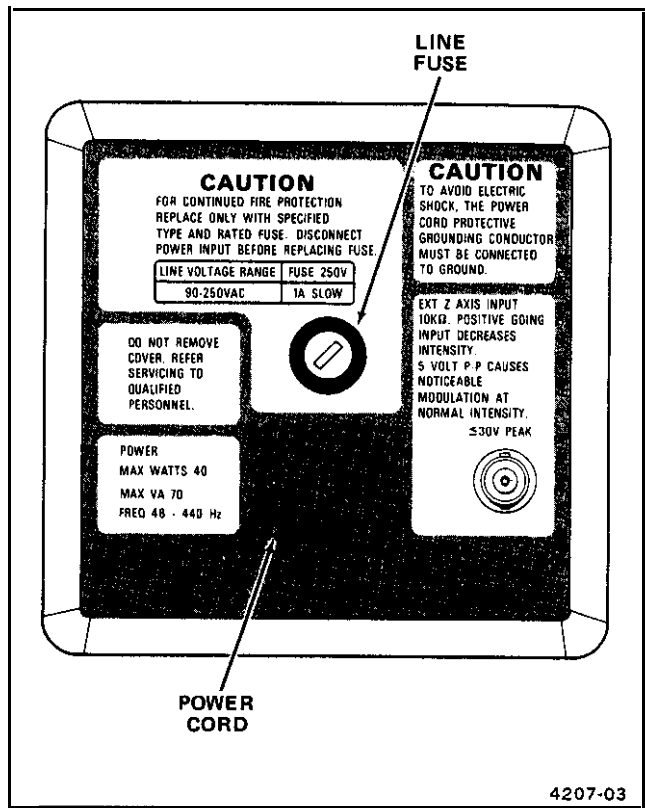


Figure 2-2. Fuse holder and power cord connector.

# 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 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-Determine the brightness of the A and the B Sweep traces.

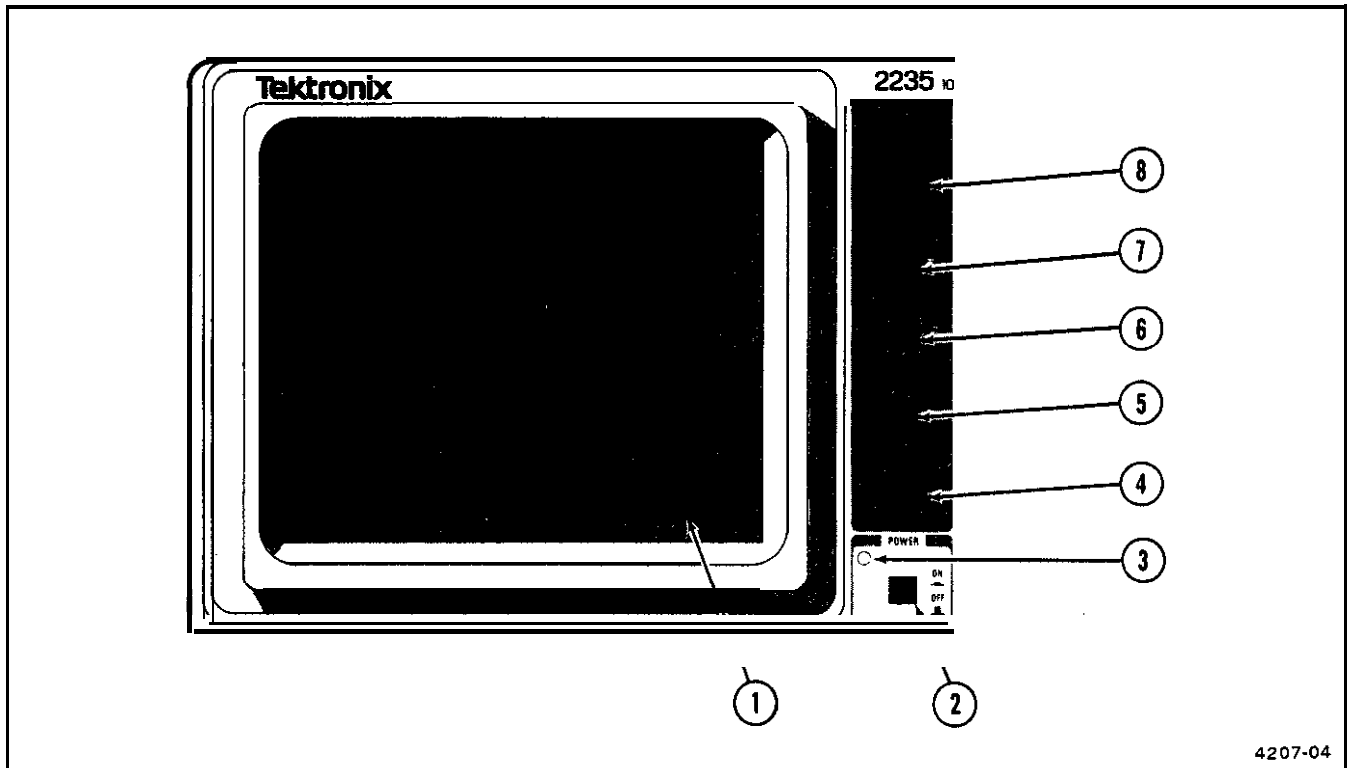


Figure 2-3. Power, display, and probe adjust controls, connector, and indicator.

## 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 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 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  $\mu$ 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

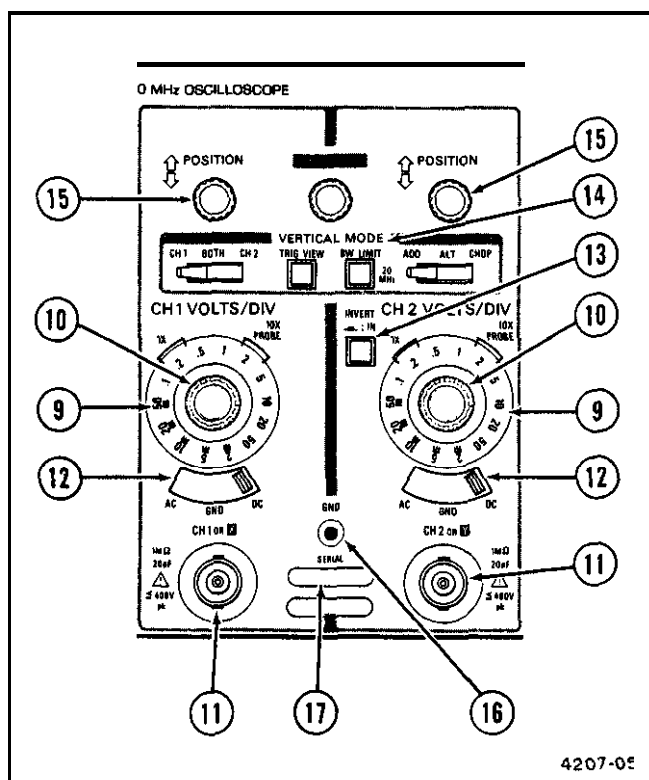


Figure 2.4. Vertical controls and connectors.

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 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 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 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.

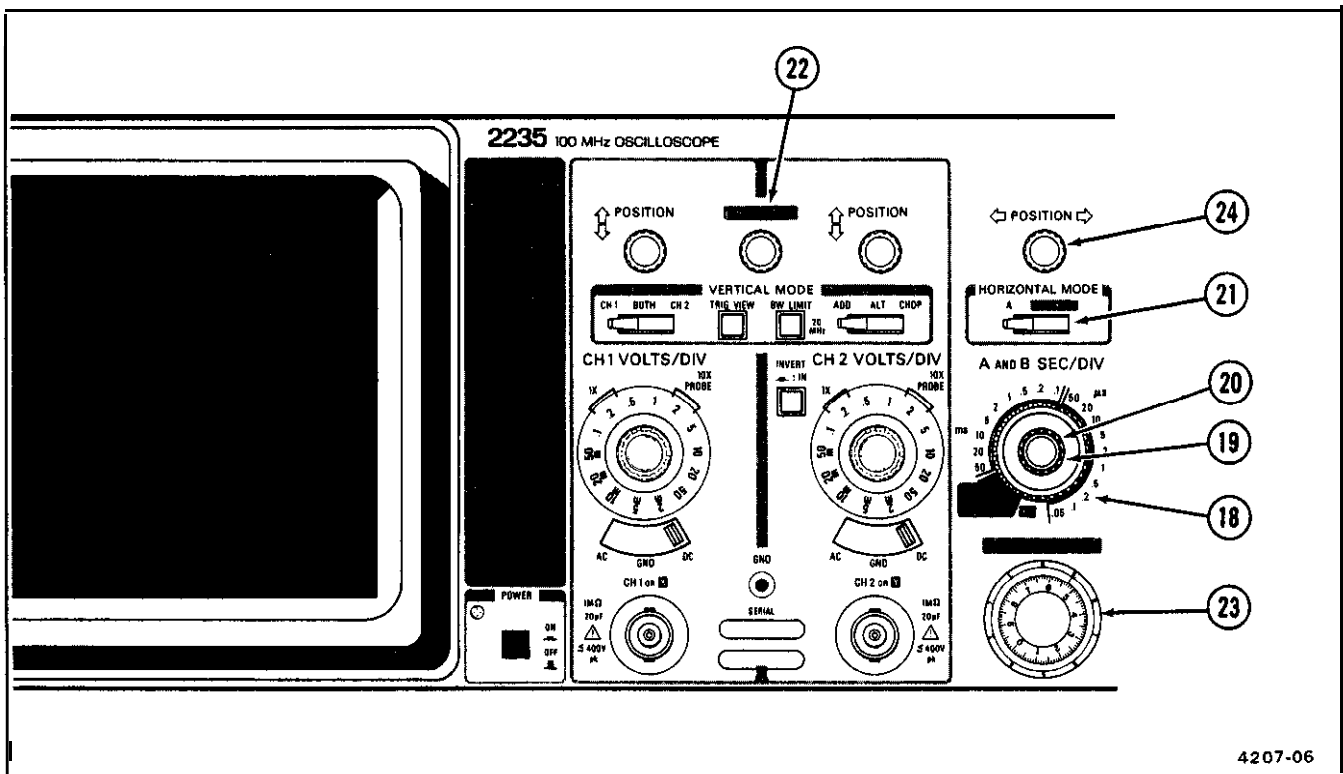


Figure 2-5. Horizontal controls.

- 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 XI 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 A TRIGGER Mode Switcher-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.

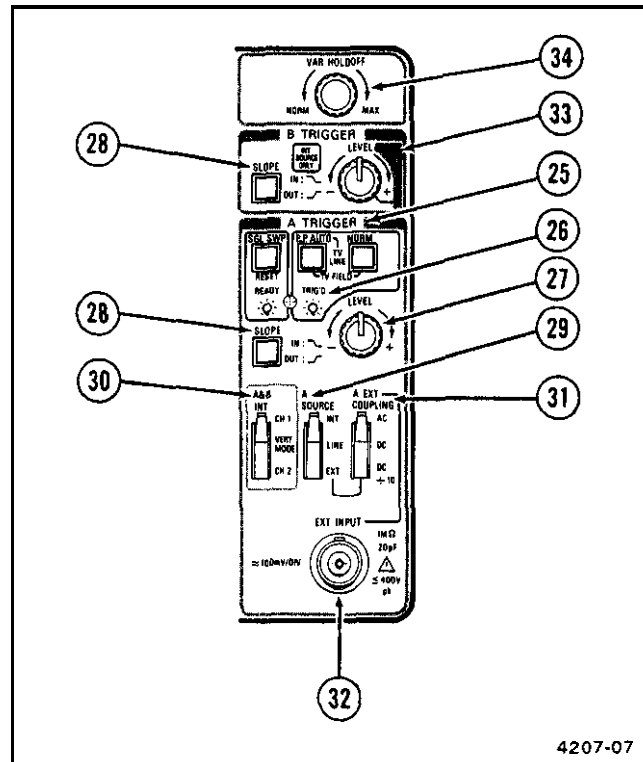


Figure 2-6. Trigger controls, connector, and indicator.


**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.

**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 triggering signal when the **A SOURCE** switch is set to **INT**.

**CH I**-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 Z**-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 HOLDDFF 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 modulate 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.

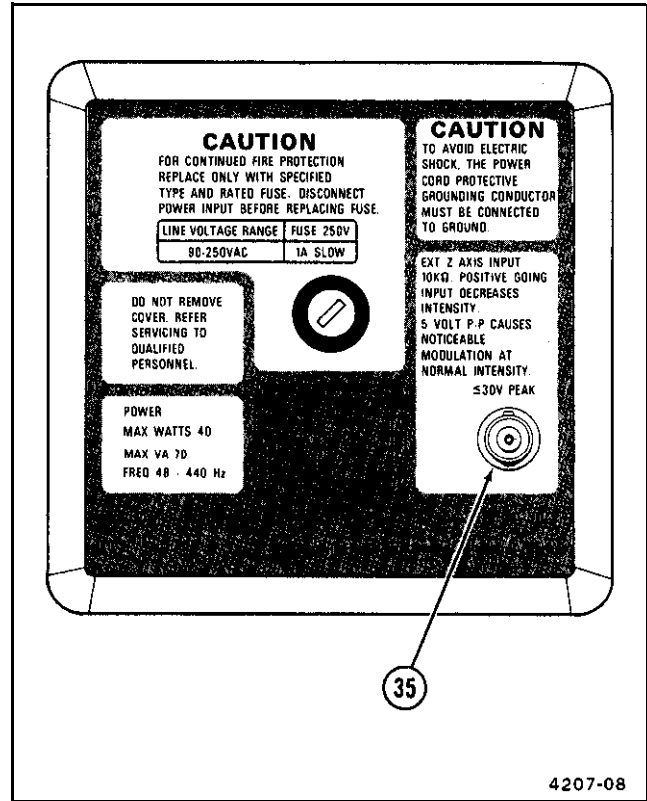


Figure 2-7. Rear-panel connector.