

OPERATING INFORMATION

General

To effectively use the 485, the operation and capabilities of the instrument must be known. This section describes the operation of the controls and connections and gives first-time and general operating information.

PRELIMINARY INFORMATION

Operating Voltage

WARNING

This instrument is designed for operation from a power source with its neutral at or near earth (ground) potential with a separate safety-earth conductor. It is not intended for operation from two phases of a multi-phase system, or across the legs of a single-phase, three-wire system.

The 485 can be operated from either a 115 V or 230 V nominal line voltage source, or a 220 V external battery pack. The Line Voltage Selector switch on the rear panel converts this instrument from one operating voltage to the other.

Power Cord Conductor Identification

Conductor	Color	Alternate Color
Ungrounded (Line)	Brown	Black
Grounded (Neutral)	Blue	White
Grounding (Earthing)	Green-Yellow	Green-Yellow

CAUTION

This instrument may be damaged if operated with the Line Voltage Selector switch set to incorrect positions for the line voltage applied.

115 V
230 V

90-136 V
180-272 V

The 485 is designed to be used with a three-wire AC power system. If the three to two-wire adapter is used to connect this instrument to a two-wire AC power system, be sure to connect the ground lead of the adapter to earth (ground). Failure to complete the ground system may allow the chassis of this instrument to be elevated above ground potential and pose a shock hazard.

Operating Temperature

The 485 can be operated where the ambient air temperature is between -15°C and $+55^{\circ}\text{C}$ ($+5^{\circ}\text{F}$ and $+131^{\circ}\text{F}$). This instrument can be stored in ambient temperatures between -55°C and $+75^{\circ}\text{C}$ (-67°F and $+167^{\circ}\text{F}$). After storage at temperatures beyond the operating limits, allow the chassis temperature to come within the operating limits before power is applied.

The 485 is cooled by air entering through the air filter on the rear panel and exiting through the holes on the sides. Adequate clearance must be provided at these locations. Allow at least one inch clearance behind the air filter and at least one inch on the sides.

A thermal cutout in this instrument provides thermal protection and disconnects the power to the instrument if the internal temperature exceeds a safe operating level. Power is automatically restored when the temperature returns to a safe level. Clean the air filter periodically; a dirty filter prevents adequate air flow into the instrument.

CONTROLS AND CONNECTORS

General

The major controls and connectors for operation of the 485 are located on the front panel of the instrument. Some auxiliary functions are provided on the side, top, bottom and rear panel. To make full use of the capabilities of this instrument, the operator should be familiar with the function and use of each of these controls and connectors. A brief description of each control and connector is given here.

Front Panel

POWER Pushbutton	Turns instrument on or off.
CAL 5 V Connector	BNC connector for square-wave voltage calibrator output signal.
FREQ Pushbutton	Selects one of two frequencies (1 kHz or 1 MHz) for the fast-rise calibrator signal.
INTENSITY Control	Controls intensity of writing beam.
B INTENSITY Control	Provides additional intensity control for the B SWEEP.

Operating Information—485/R485 Service

SCALE ILLUM Control	Controls illumination of internal CRT graticule.		not selected for display by the VERT MODE selector, or when using probe IDENTify.
BEAM FINDER Pushbutton	Compresses trace within graticule area, regardless of position control settings or amplitude of signal applied.	VARIABLE volts/div Control, CH 1 and CH 2	Provide continuously variable deflection factors between calibrated steps. Maximum deflection factor range is extended to 12.5 V/div. Push-away control provides calibrated deflection factor in the CAL IN position.
BW LIMIT Pushbutton	Limits to approximately 20 MHz the bandwidth of the vertical amplifier system and of the INTERNAL TRIGGER signal.		
20 MHz Indicator	Lights when bandwidth of vertical amplifier is being limited.	GAIN Adjustment, CH 1 and CH 2	Screwdriver adjustment allows calibration of vertical deflection factor.
VERT MODE Pushbutton Selector		A EXT TRIG Pushbutton (momentary not on 485-1 and 485-2)	Overrides other vertical controls to display the external signal being used for A sweep triggering.
CH 1	Displays Channel 1 only.		
ALT	Dual trace display by switching between channels at the end of A sweep.	1 M Ω /50 Ω Switch, CH 1 and CH 2 (485-2 has RESET-PUSH)	Illuminated push-push selection for input impedance. Is also used to reset 50 Ω overload condition (1 M Ω /50 Ω switch must be pushed twice to return to 50 Ω input impedance). 485-2 is non-illuminated momentary switch for RESET only.
CHOP	Dual trace display by switching between channels every 0.5 μ s (1 MHz chopped display).		
ADD	Algebraically adds CH 1 and CH 2 input signals.	RESET Indicator	When maximum input power is exceeded in the 50 Ω mode causing the overload disconnect to operate, the RESET indicator is illuminated, and the 1 M Ω /50 Ω lamp is turned off.
X-Y	Permits X-Y operation. Displays CH 1 signal on the vertical (Y) axis and the CH 2 signal on the horizontal (X) axis, with a 4 MHz phase-compensated bandwidth.	Input Selector Switch, CH 1 and CH 2	
CH 2	Displays CH 2 only.	AC	Capacitively couples input signal to vertical amplifier.
INT TRIG Pushbutton Selector		GND	Grounds the amplifier input and permits precharging the AC input coupling capacitor. 50 Ω termination disconnected in the 50 Ω mode.
NORM	The signal being displayed is the internal trigger source.	DC	Signal is directly coupled to the vertical amplifier.
CH 1	Selects CH 1 as the internal trigger source.	Input CH 1 or Y Connector and CH 2 or X Connector	BNC connectors for applying external signals. Included are concentric coding rings for probes with scale factor and identify switching.
CH 2	Selects CH 2 as the internal trigger source.		
VOLTS/DIV Switch, CH 1 and CH 2	Selects 1X calibrated deflection factors from 5 mV/div to 5 V/div in ten steps (1-2-5 sequence). Attenuating probe tip deflection factors for X10 and X100 coded probes are automatically indicated by the three readout lamps at the circumference of this knob. All three lamps are off when the channel is	POSITION Controls, CH 1 and CH 2	Vertically positions the display. In X-Y mode, CH 1 controls positions in the Y (vertical) axis and the CH 2 control positions in the X (horizontal) axis.

CH 2 POLARITY Switch	+UP and INVERT slide selector provides for inverting CH 2 display.	DC	DC (direct) couples all trigger signals to the trigger circuitry.
HORIZ DISPLAY Pushbutton Selector (Blue Panel Background)	(Inoperative in the X-Y, VERT MODE, and when timing knobs are locked in the 1, 2, and 5 ns/div position.)	EXT TRIG Input Connector	BNC connector providing input for external trigger signals.
A	Displays A sweep.	SLOPE Switch, A TRIGGERING and B TRIGGERING	Permits triggering the sweep on the positive or negative-going portion of the trigger signal.
INTEN (A)	Displays A sweep intensified (after the delay time) for the duration of B sweep.	LEVEL Control, A TRIGGERING and B TRIGGERING	Selects amplitude point on the triggering signal where sweep-triggering occurs.
ALT	Alternately provides INTEN (A) and B (DLY'D) displays.	TRIG'D Indicator	Lights when A sweep is triggered.
B (DLY'D)	Displays B (DLY'D) sweep.	SWEEP MODE Switch, A TRIGGERING	
TRACE SEPARATION Control	Provides additional positioning to B (DLY'D) display in the ALT horizontal display mode.	AUTO TRIG	Permits normal triggering on waveforms with repetition rates of at least 20 Hz. Sweep free-runs in the absence of an adequate triggering signal.
Triggering Source Switch, A TRIGGERING and B Triggering (Green Panel Background)		NORM TRIG	Permits normal triggering. No CRT display in the absence of an adequate trigger signal.
INT	Uses the signal selected by the INT TRIG switch as the triggering signal.	SINGLE SWEEP	Displays one sweep only until reset.
LINE (A TRIGGERING only)	Uses a portion of the line-frequency voltage as a trigger signal.	RESET	A momentary-contact position of the SWEEP MODE switch that provides for re-arming the A sweep generator during the SINGLE SWEEP mode of operation.
B RUNS AFTER DELAY TIME (B TRIGGERING Only)	B runs automatically after the time selected by A TIME/DIV and the calibrated DELAY TIME POSITION control.	READY Indicator	Is illuminated when A sweep is armed in the SINGLE SWEEP mode.
EXT	Permits triggering on signals applied to the EXT TRIG INPUT connector.	A TRIGGER HOLDOFF	Adjustable control of the time between sweep steps, permits a stable presentation of repetitive complex waveforms. The control covers at least the time of one full sweep for all but the two slowest sweeps.
EXT 10	Attenuates external trigger signal by a factor of 10.	DELAY TIME POSITION	Ten-turn calibrated control delays B sweep start (or B trigger arming) from 0 to 9.9 times the Time Base A TIME/DIV setting after the start of A sweep.
Triggering COUPLING Switch, A TRIGGERING and B TRIGGERING		A and B TIME/DIV AND DELAY TIME Switch	Selects calibrated A and B sweep rates from 0.5 s/div to 1 ns/div in 27 steps (1-2-5 sequence). Delay Time operation extends from 0.5 s/div to 10 ns/div.
AC	Trigger signals are AC (capacitively) coupled to the trigger circuitry. Trigger signals below 16 Hz are attenuated.		
LF REJ (AC Coupled)	Attenuates triggering signals below 16 kHz.		
HF REJ (AC Coupled)	Triggering signals below 16 Hz and above 50 kHz are attenuated.		

Operating Information—485/R485 Service

A VARIABLE Control	Provides continuously variable A sweep rate to approximately 2.5 times the calibrated setting (uncalibrated sweep rate is extended to 1.25 s/div). Push away control provides calibrated rate in the CAL IN position.	Z AXIS INPUT Connector	BNC input connector for intensity modulation of the CRT display.
DLY'D SWEEP PULL Knob	Provides for advancing the B (DLY'D) sweep rate ahead of the A (DELAYING) sweep rate. (When A rate is 1, 2, or 5 ns/div the concentric knobs are locked together, and only the A sweep is displayed.)	PROBE POWER	Two 4-pin connectors at the rear of the instrument provide power suitable for optional active probes such as the P6201.
POSITION (horizontal) Control	Horizontally positions trace. Inoperative in X-Y mode.	LINE CORD	Power cord is a 3-wire, permanently attached cable, approximately 7.5 feet in length.
Rear Panel		LINE VOLTAGE SELECTOR	Recessed slide switch selects nominal operating line range. 115 V (90 to 136 V) or 230 V (180 to 272 V).
TRACE ROTATION Adjustment	Screwdriver adjustment to align trace with horizontal graticule lines.	OPERATING TIME	Elapsed operating time indicator. 5000 hr. scale.
FOCUS and ASTIG Adjustment	Adjustment used to obtain a well defined display. Requires infrequent readjustment.	Bottom Side	
B +GATE	BNC Connector providing a positive-going rectangular waveform coincident with B sweep.	1 MΩ BAL, CH 1 and CH 2	Adjustment provides for DC balance of 1 M Ω Buffer amplifier.
A +GATE	BNC connector providing a positive-going rectangular waveform coincident with A sweep.		
A SWEEP Connector	BNC connector provides a sample of A sawtooth generator signal.		

NOTE

Two types of crt graticules have been used in some Tektronix oscilloscopes. One graticule has 0% and 100% risetime reference points that are separated by 6 vertical graticule divisions. The other graticule has the 0% and 100% risetime reference points separated by 5 vertical divisions. In your manual, illustrations of the crt face or risetime measurement instructions may not correspond with the graticule markings on your oscilloscope.