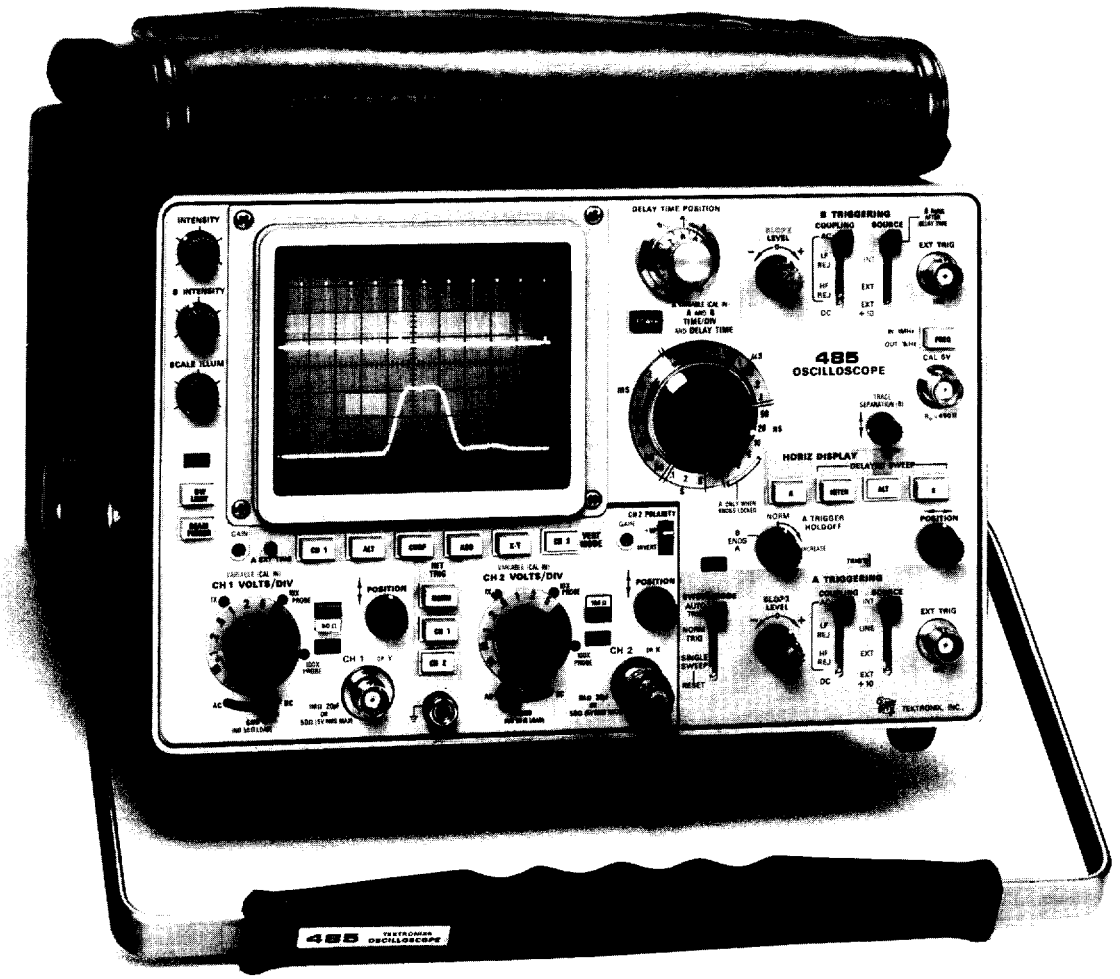


485

350 MHz at 5 mV/div

1 ns/div Sweep Rate

2.0 div/ns Writing Speed

1 MΩ & 50 Ω Input Impedances

Input Protection 50 Ω Internal

Automatic Deflection Factor Readout

Pushbutton Ext Trigger View

Battery Operation (Optional)

Weighs ≈9.5 kg (21 lb)

TYPICAL APPLICATIONS

* **Digital Circuitry Design**
* **Computer Memory Design (Disk or Tape Drive)**
* **Laser Pulse Work**
* **High Voltage Research Lab**

At just 21 pounds, the 1 ns/div, dual-trace, 350 MHz 485 oscilloscope is highly compatible with today's increasing technology. Fast 2.0 div/ns writing speed makes it especially attractive for use in field research environments.

The 485 features a wide bandwidth at its full 5 mV/div vertical sensitivity (350 MHz at 50 Ω and 250 MHz at 1 MΩ). Selectable input impedance provides the capability to measure low and high impedance points with the same scope and without active probes.

Internal detection circuitry protects the 50 Ω input by automatically disconnecting when the signal exceeds approximately 50 V RMS.

You no longer have to mentally compensate for attenuating probes. Automatic vertical scale-factor readout is provided by three light-emitting diodes located around the edge of each input attenuator knob. A quick glance tells the correct on-screen V/div when the recommended 10X or 100X probes are used.

You always know exactly where you are in a pulse train when making a delayed sweep measurement. An alternate sweep mode allows the delayed sweep to appear alternately with the intensified main sweep. In this mode, you can view the intensified zone and the delayed display simultaneously.

The external trigger signal can be easily viewed on the 485. A front-panel pushbutton automatically routes the external signal used to trigger time base A to the vertical deflection amplifier. This feature can also be used to quickly make time comparisons between the signal of interest and the external trigger signal.

On the 485, focus is always correct for single-shot photography. An autofocus circuit eliminates the need to readjust the focus each time the intensity is changed.

When commercial power is not available, use the 1105 Battery Power Supply. It weighs only 19.5 pounds, and lets you take the high-performance 485 virtually anywhere.

Often chosen as a general-purpose scope for computer and electronic servicing environments because of its fast writing speed and wide bandwidth, the 485 can also be found in specialized and unusual applications. For example, to maintain a ground-based laser/radar acquisition system, the 485's alternate sweep switching capability can be very useful.

CHARACTERISTICS

VERTICAL SYSTEM (2 IDENTICAL CHANNELS)

Bandwidth*1 and Risetime*2

	−15°C to +35°C	+35°C to +55°C
50 Ω	Dc to 350 MHz, 1 ns	Dc to 300 MHz, 1.2 ns
1 MΩ	Dc to 250 MHz, 1.41 ns	Dc to 200 MHz, 1.8 ns

*1 *Measured at −3 dB. Bandwidth may be limited to ≈20 MHz by bandwidth limit switch.*

*2 *At all deflection factors from 50 Ω terminated source.*

Lower −3 dB Point, Ac Coupling — 1X Probe: 1 kHz or less for 50 Ω, and 10 Hz or less for 1 MΩ. 10X Probe: 100 Hz or less for 50 Ω, and 1 Hz or less for 1 MΩ.

Deflection Factor — Calibrated: 5 mV/div to 5 V/div (1-2-5 sequence). Accuracy: +2%. Uncalibrated: Continuously variable between steps and to at least 12.5 V/div. Gain can be recalibrated at the front panel.

Display Modes — CH 1, CH 2 (normal and inverted), Alternate, Chopped (≈1 MHz rate), X-Y (CH 1-Y and CH 2-X), Add (CH 1 ± CH 2).

Common-Mode Rejection Ratio — At least 20 dB at 50 MHz for common-mode signals of 6 div or less.

Automatic Scale Factor — Probe tip deflection factors for 1X, 10X, and 100X coded probes are automatically indicated by three readout lights at the edge of the knob skirts. All lights are off when the channel is not selected for display or when the trace identification control on the probe is depressed.

Selectable Input Impedance — 50 Ω and 1 MΩ impedances are available at a single BNC connector by pushbutton selection. 50 Ω ±0.5%; VSWR 1.15:1 or less from 20 mV/div to 5 V/div, 1.25:1 or less at 5 mV/div and 10 mV/div to 350 MHz.

Input R and C — 1 MΩ ±1% paralleled by ≈20 pF.

50 Ω Protection — Internal detection circuitry provides protection by automatically disconnecting excessive signals of up to 50 V. The "disconnected" condition is indicated, and has manual reset.

Maximum Input Voltage

50 Ω	Protection disconnect occurs for voltages that exceed approximately: 5 V RMS continuous 0.1 W-second for instantaneous voltages of 5 V to 50 V	
1 MΩ	Dc coupled	250 V (dc + peak ac), 500 V p-p to 1 kHz
	Ac coupled	500 V (dc + peak ac) 500 V p-p to 1 kHz

Selectable Input Coupling — Ac; dc; GND (provides zero reference, precharges coupling capacitor, disconnects 50 Ω load in 50 Ω mode).

Delay Line — Permits viewing leading edge of displayed waveform.

Probe Power — Connectors provide correct voltages for two optional P6201, P6202A or P6230 active probes.

HORIZONTAL SYSTEM

Time Base A and B — Calibrated Sweep Range: 1 ns/div to 0.5 s/div (1-2-5 sequence).

Variable Time Control — Time Base A provides continuously variable uncalibrated sweep rates between steps and to at least 1.25 s/div.

Time Base A and B Accuracy*1

Sweep Rate	+15°C to +35°C	−15°C to +55°C
1 ns/div to 20 ns/div	±3%	±5%
50 ns/div to 0.1 s/div	±2%	±4%
0.2 s/div and 0.5 s/div	±3%	±5%

*1 *Center 8 division.*

Horizontal Display Modes — A, Intensified, Alternate, and B (delayed sweep). A only is displayed for A sweep rates of 1, 2, and 5 ns/div. B ends A for increased intensity in the delayed mode.

Alternate Display Modes — Allows the B delayed sweep to appear alternately with the intensified A sweep. Trace separation control positions B (delayed sweep ≈4 div from the A sweep).

CALIBRATED SWEEP DELAY

Delay Time Range — 0 to 10X delay time/div setting of 10 ns/div to 0.5 s/div.

Differential Delay Time Measurement Accuracy

Delay Time Setting	+15°C to +35°C
10 ns/div and 20 ns/div	±(1% of measurement +0.2% of full scale)*1
50 ns/div to 1 ms/div	±(0.5% of measurement +0.1% of full scale)*1
2 ms/div to 0.5 s/div	±(1% of measurement +0.1% of full scale)*1

*1 *Full scale is 10 times the delay time/div setting.*

Jitter — 1 part or less in 20,000 of 10X the time/div setting.

TRIGGERING A and B

A Trigger Modes — Normal (sweep runs when triggered). Automatic (sweep free-runs in the absence of a triggering signal and for signals below 20 Hz). Single sweep (sweep runs one time on the first triggering event after the reset selector is pressed). Lights Indicate when sweep is triggered and when single sweep is ready.

A Trigger Holdoff — Adjustable control permits a stable presentation of repetitive complex waveforms. The control covers at least the time of one full sweep for faster than 0.2 s/div.

B Trigger Modes — B runs after delay time (starts automatically at the end of the delay time) and B triggerable after delay time (runs when triggered). The B (delayed) sweep runs once, in each of these modes, following the A sweep delay time.

Time Base A and B Trigger Sensitivity and Coupling

Coupling	To 50 MHz	To 350 MHz
Dc Internal	0.3 div deflection	1.5 div deflection
Dc External	20 mV	100 mV
Ac	Signals below 16 Hz are attenuated	
Ac LF Reject	Signals below 16 kHz are attenuated	
Ac HF Reject	Signals below 16 Hz and above 50 kHz are attenuated	

Jitter — 0.1 ns or less at 350 MHz at 1 ns/div.

A Trigger View — A spring-loaded pushbutton overrides other vertical controls and displays the external signal used for A sweep triggering. This provides quick verification of the external signal and time comparison between a vertical signal and the external trigger signal. The deflection factor is ≈50 mV/div (0.5 V/div with external ÷ 10 source).

Level and Slope — Internal, permits selection of triggering at any point on the positive or negative slope of the displayed waveform. External, level is adjustable through at least ±0.5 V for either polarity; ±5 V for external ÷ 10.

A Sources — Internal, line, external, external ÷ 10.

B Sources — B runs after delay time, internal, external, external ÷ 10.

External Inputs — R and C ≈1 MΩ paralleled by ≈20 pF. Maximum Input Voltage: 500 V (dc + peak ac), 500 V p-p to 1 kHz.

X-Y OPERATION

Full Sensitivity X-Y (CH 1 Vertical, CH 2 Horizontal) — 5 mV/div to 5 V/div, accurate ±2%. Y-axis bandwidth identical to CH 1. X-axis bandwidth is dc to at least 4 MHz (−3 dB). Phase difference between amplifiers is 3° or less to 4 MHz.

CRT AND DISPLAY FEATURES

CRT — 8 x 10 division display (0.8 cm/div). Horizontal and vertical centerlines further marked in 0.2 division increments. Accelerating potential is 21 kV. GH (P31) Phosphor standard, BE (P11) optional.

Photographic Writing Speed — At least 1 div/ns with standard GH (P31) Phosphor and at least 2 div/ns with optional BE (P11) Phosphor using the Tektronix C-31B Camera and 3000 speed Type 107 film.

Autofocus — Automatically maintains beam focus for all intensity settings.

Graticule — Internal, nonparallax; variable edge lighting; markings for measurement of risetime.

Beam Finder — Compresses trace to within graticule area for ease in determining the location of an off-screen signal.

Z-Axis Input — Risetime ≈15 ns. Input R ≈500 Ω. +0.2 V (dc to 20 MHz) decreases intensity. +2 V (dc to 2 MHz) blanks maximum intensity trace.

OTHER CHARACTERISTICS

Two-Frequency, Fast-Rise Calibrator — Output resistance is 450 Ω with a risetime (positive slope) into 50 Ω of 1 ns or less. 1 kHz, duty cycle 49.8% to 50.2%, Amplitude is 5 V ±0.5% into 1 MΩ and 0.5 V ±1% into 50 Ω (±0.5%). Optional BNC accessory current loop provides 50 mA ±1%. Selectable repetition rates are 1 kHz and 1 MHz ±0.25%. Specifications apply over +15°C to +35°C range.

A Sweep Output — Open Circuit: ≈10 V positive-going sawtooth; into 50 Ω, ≈0.5 V.

A and B Gate Outputs — Open Circuit: ≈4 V positive-going rectangular pulse; into 50 Ω ≈0.5 V.

POWER REQUIREMENTS

Line Voltage Range — 90 V ac to 136 V ac and 180 V ac to 272 V ac. Recessed slide switch selects nominal operating line range.

Line Frequency — 48 Hz to 440 Hz.

Maximum Power Consumption — 60 W at 115 V line.

ENVIRONMENTAL

Ambient Temperature — Operating: −15°C to +55°C. Nonoperating: −35°C to +75°C. Filtered forced air ventilation is provided.

Altitude — Operating: To 4600 m (15,000 ft); maximum allowable ambient temperature decreased by 1°C/1000 ft from 5000 ft to 15,000 ft. Nonoperating: To 15 000 m (50,000 ft).

Vibration — Operating: 15 minutes along each of the 3 axes. 0.06 cm (0.025 in) p-p displacement (4 g's at 55 Hz) 10 Hz to 55 Hz to 10 Hz in 1 minute cycles.

Humidity — Operating and Nonoperating: 5 cycles (120 hrs) to 95% relative humidity referenced to MIL-E-16400F (par 4.5.9 through 4.5.9.5.1, Class 4).

Shock — Operating and Nonoperating: 30 g's, ½ sine, 11 ms duration, 2 shocks per axis in each direction for a total of 12 shocks.

PHYSICAL CHARACTERISTICS

	Cabinet		Rackmount	
Dimensions	**mm**	**in**	**mm**	**in**
Width	305	12.0	483	19.0
Height	168	6.6	177	7.0
Depth			457	18.0
(handle extended)	523	20.6		
(handle not extended	470	18.5		
Weights ≈	**kg**	**lb**	**kg**	**lb**
Net (with accessories)	10.9	24.0		
Net (without accessories)	9.5	21.0	11.9	26.2
Shipping	15.0	33.0	24.5	54.0

ORDERING INFORMATION

(PROBES NOT INCLUDED)

485 Oscilloscope **$9,100**

Includes: 18 inch 50 Ω BNC cable (012-0076-00); two BNC jack posts (012-0092-00); clear filter (386-0118-00); accessory pouch (016-0535-00 or 016-0537-00); four 3 amp fuses (159-0015-00); two 50 Ω terminators (011-0049-01); service manual (070-1193-00); operator manual (070-1194-00).

R485 Rackmount Oscilloscope **$9,420**

Includes: Same as 485 plus mounting hardware and slide out assemblies.

OPTIONS

Option 04 — EMC Modification. **+$220**

Option 78 — BE (P11) Phosphor. **+$200**

INTERNATIONAL POWER PLUG OPTIONS

Option A1 — Universal Euro 220 V/16 A, 50 Hz.

Option A2 — UK 240 V/13 A, 50 Hz.

Option A3 — Australian 240 V/10 A, 50 Hz.

Option A4 — North American 240 V/15 A, 60 Hz.

OPTIONAL ACCESSORIES

Passive Probes

	Scope Input	Attenuation	Loading	Bandwidth*1 with 485
P6056 6 ft	50 Ω	10X	500 Ω 1 pF	350 MHz
P6057 6 ft	50 Ω	100X	5000 Ω 1 pF	350 MHz
P6106A 2 m	1 MΩ	10X	10 MΩ 13 pF	250 MHz
P6130 1.5 m	1 MΩ	10X	10 MΩ 12.7 pF	250 MHz
P6063B 6 ft	1 MΩ	Switchable 1X	1 MΩ 12 pF	6 MHz
		10X	10 MΩ 14 pF	200 MHz

Active Probes

P6230 1.5 m	50 Ω/1 MΩ	10X	450 Ω 1.3 pF	350 MHz
P6201 2 m	50 Ω/1MΩ	1X	100 kΩ 3 pF	
		10X Head	1 MΩ 1.5 pF	330 MHz
		100X Head	1 MΩ 1.5 pF	
P6202A 2 m	50 Ω/1 MΩ	10X	10 MΩ 2 pF	285 MHz
		100X Head	10 MΩ 2 pF	

Current Probes

P6022 5 ft	1 MΩ	Switchable*2 10 mA/div 100 mA/div	0.03 Ω @ 1 MHz, 0.2 Ω @ 120 MHz	935 Hz to 120 MHz
A6302/ AM 503 2 m	50 Ω/1 MΩ	Selectable*2 1 mA/div to 5 A/div	0.1 Ω @ 5 MHz, 0.5 Ω @ 50 MHz	Dc to 50 MHz
A6303/ AM 503 2 m	50 Ω/1 MΩ	Selectable*2 10 mA/div to 5 A/div	0.02 Ω @ 1 MHz, 0.15 Ω @ 15 MHz	Dc to 15 MHz

*1 *Bandwidths measured at upper −3 dB for given cable lengths.*

*2 *Scope sensitivity set at 10 mV/div.*

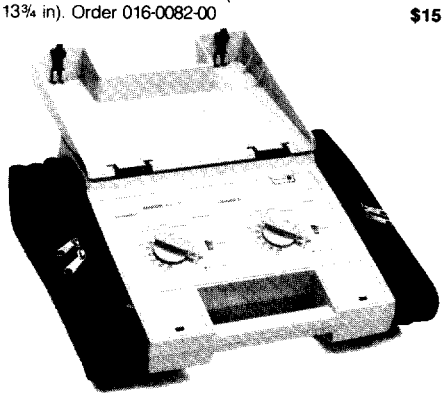
Carrying Strap — Order 346-0199-00 **$17**

Current Loop Adaptor — The adaptor provides an accurate 50 mA squarewave calibrator when connected to the 485 voltage calibrator. The risetime is ≈25 ns. Order 012-0341-00 **$60**

50 Ω 5X Pad — Provides reverse termination for the calibrator. Order 011-0060-02 **$35**

Folding Viewing Hoods — Folds to 1.2 x 11.5 x 19.1 cm (7/16 x 7 ½ x 7 ½ in). Order 016-0274-00 **$15**

Folds to 1.4 x 17.2 x 34.9 cm (9/16 x 6¾ x 13¾ in). Order 016-0082-00 **$15**



A6902B Isolator — For floating measurements see page 437 for complete description. Order A6902B **$1,995**

Battery Power Supply — Order 1105 Battery Power Supply **$1,650**

Rack Adaptor — Order 016-0558-00 **$470**

RECOMMENDED CAMERAS

For further information see camera section, page 412.

C-30BP General Purpose Camera — Includes 016-0306-01 mounting adaptor. Order C-30BP **$1,480**

C-31BP High Speed Camera — Includes 016-0306-01 mounting adaptor. Order C-31BP **$1,700**

RECOMMENDED CARTS

K212 Portable Instrument Cart — For on-site mobility. See page 423. **$330**

K117 Instrument Shuttle — For site-to-site mobility. See page 423. **$265**