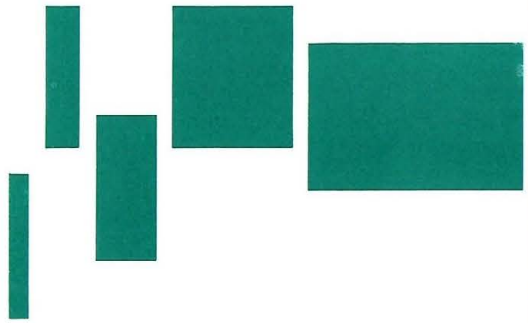


HIGH-SPEED OSCILLOSCOPES

TYPE 507 . . . . . L-2

TYPE 517A L-6

TYPE 519 . . . . . L-10

TYPE 507 SURGE-TESTING OSCILLOSCOPE

MAIN FEATURES

Deflection Factor—Approximately 50 v/cm to 500 v/cm

Calibrated Vertical Positioning

24-kv Accelerating Potential

Risetime—Approximately 10 nsec

Sweep Range—20 nsec/cm to 50 μsec/cm

6-cm by 10-cm Deflection

Concerning Ground Voltage Transients—Due to the physical configurations and electrical parameters of the apparatus used in surge testing, large voltage transients are often induced into the grounding system. Since the oscilloscope signal-cable shield must be connected to some point in this ground system for potential and current measurements, the ground-voltage transients will be impressed upon the oscilloscope chassis.

Two undesirable consequences may arise from the ground transients: First, the oscilloscope power-transformer insulation may be overstressed, causing breakdown. Second, a current flow will be set up through the chassis capacity to earth, power source, and any ground conductor that is connected to the instrument. Such circulating currents in the oscilloscope chassis may disturb the proper operation of the instrument. Ordinarily the sweep and crt-unblanking circuits will be most noticeably affected. Other circuits can be disturbed also.

Especial attention has been given to the layout and grounding of the circuitry in the Type 507 to ensure minimum sensitivity to extraneous disturbances. The excellent performance in a variety of surge testing laboratories indicates that a high degree of success has been reached in the Type 507 toward accommodating ground disturbances.

As in all practical instruments, however, there must be a limit to the ground voltages which the Type 507 can withstand. Our tests indicate a limit of 2000 crest volts to ground for transformer breakdown.

Once the ground-voltage limit is approached in a particular surge-testing apparatus the engineer will wish to employ means exterior to the Type 507 to reduce the impressed voltages. Several well known techniques are in use for isolating the oscilloscope from circulating ground currents. These range from motor generator sets for power line isolation to multiple shielded enclosures large enough to surround the oscilloscope, operator, and 60-cps power generator.

Tektronix fully realizes that instrument performance can be accurately evaluated only under the conditions of actual use. As a specialized instrument the Type 507 represents an important investment. We suggest that the prospective buyer contact his Tektronix Field Engineer or Engineering Representative and arrange for a demonstration. His address is listed in this catalog.

GENERAL DESCRIPTION

The Tektronix Type 507 is a specialized oscilloscope, designed primarily for high-voltage surge testing as applied to power transformers, high-voltage insulators, lightning arresters, and their associated design and acceptance tests. Both Indicator Unit and Power Supply are mounted on a Type 500A Scope-Mobile for convenience and mobility.

VERTICAL-DEFLECTION SYSTEM

Risetime—A passive damping network inserted in the deflection leads to the crt is adjusted for optimum transient response (without overshoot or ringing) of 10 nsec.

Deflection Factor—The Tektronix Type T507P11 crt deflection factor is approximately 50 v/cm.

Step Attenuator—The input signal is connected to a series voltage-divider chain of ten equal resistors (normally 7.2 ohms each) mounted on a tap switch. The ratio of signal applied to the deflection plates can be selected by the tap switch from 10% to 100% in 10% steps. The 72-ohm input impedance presented by the divider chain properly terminates Amphenol Type 21-125 coaxial cable. Step attenuator impedances designed to properly terminate other cable impedances as low as 50 ohms can be provided on request. Contact your Tektronix Field Engineer or Representative for information.

The vertical-input system will withstand crest voltages of 3 kv of the standard 1.5 x 40 μsec surge-testing waveform. Voltage-breakdown and heat-dissipation limitations must be considered before impressing signals greater than 3 kv and/or longer than 40 μsec.

Vertical Input —A standard UHF signal-input connector is located on the rear of the instrument.

Connectors—Standard UHF connectors for Signal In, Signal Out To Delay Line, Signal In From Delay Line, Trip Pulse Out, and External Trigger In are located at the rear of the instrument. 6.3 v ac at 1 amp is available through a front-panel pin jack.

Signal Delay—Two standard UHF connectors are provided on the rear of the Type 507 for insertion of an external length of delay cable into the vertical-input signal circuit. Choice of the appropriate length and type of cable is at the discretion of the user. No delay cable is furnished with the Type 507.

Polarity Switch—A three-position switch reverses the deflection-plate polarity. The center position is used to apply markers for photographing time references.

Positioning Switch—The Type 507 has a seven-step vertical-position switch with 50 v steps of −150 v, −100 v, −50 v, 0, +50 v, +100 v, and +150 v. A two-position switch selects either 50 v steps or continuously variable adjustment.

External Voltmeter Connectors—Terminals are provided for a high-impedance (5000 Ω/volt) dc voltmeter, permitting vertical calibration when using the variable positioning.

HORIZONTAL DEFLECTION SYSTEM

Calibrated Linear Sweep Rates—The sweep waveform is generated by a boot-strap circuit and an inverter stage for balanced deflection. Eleven fixed, calibrated sweep rates. . . 20, 50, 100, 200, 500, nanoseconds/cm, 1, 2, 5, 70, 20, and 50 μsec/cm are available.

Trigger Selection—A five-position front-panel switch selects a trigger, external or internal of either positive or negative polarity. The marker position is used when time markers are desired.

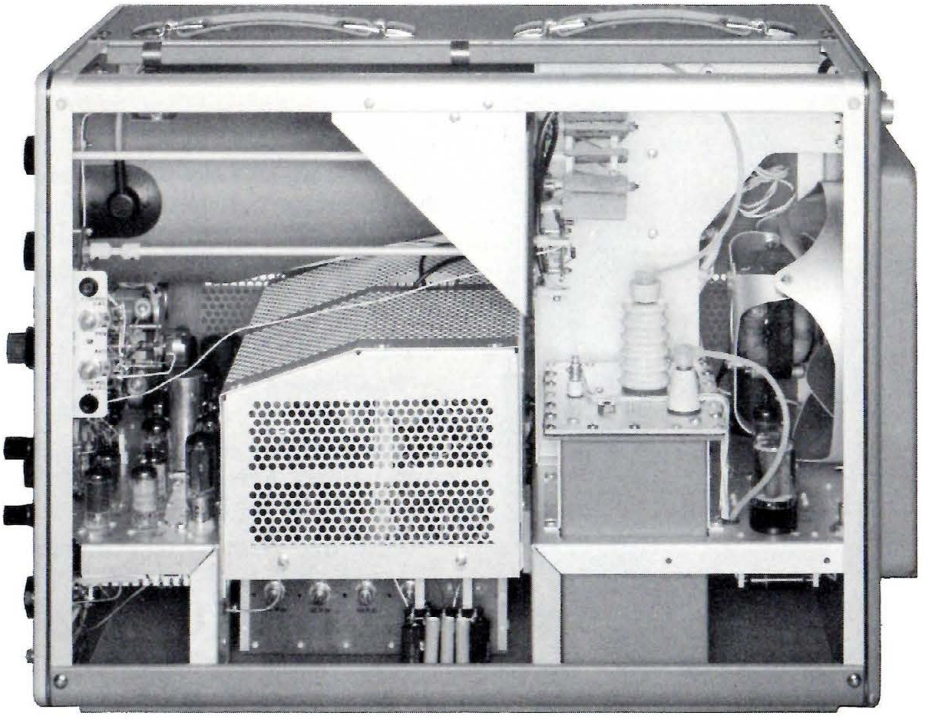
Trigger Amplitude—A signal of 100 v to 3 kv amplitude is required for both internal triggering and triggering with an external signal.

Sweep Mode—When the switch is in the single-sweep position, pressing the RESET button arms the sweep circuit. The sweep then can be triggered internally, by MANUAL TRIGGER, or by an external trigger.

POWER SUPPLY

Low Voltage—The low-voltage power supply is separate from the indicator unit, supplying power to it by an interconnecting cable. All dc supplies are electronically regulated to ensure stable operation over line-voltage and load variations between 105 and 125 v or 210 and 250 v.

High Voltage—Accelerating potentials for the crt are obtained from an oil-filled oscillator-type supply, all voltages electronically regulated to ensure stable operation for both load and line changes.



OTHER CHARACTERISTICS

Cathode-Ray Tube—The Type 507 uses the new Tektronix T507P___ crt. A P11 phosphor is normally furnished. P1, P2, and P7 are available as optional phosphors. Some other phosphors are available upon request.

Alignment of Cathode-Ray Tube—Should adjustment of the cathode-ray tube alignment become necessary, an easily accessible knob, located on the rear support bracket of the crt, provides smooth positive control of the crt alignment.

Accelerating Potential—With its 24 kv accelerating potential and high-speed sweeps, the Type 507 is well suited to single-sweep applications involving transients of very short duration.

Time Markers—Markers are available as a function of the MICROSECONDS/CM switch for convenient calibration of the sweep. The 0.05-μsec time mark is available at sweep speeds from 0.02 μsec/cm to 0.2 μsec/cm, 0.5 μsec from 0.5 μsec/cm to 2 μsec/cm, 5 μsec from 5 μsec/cm to 20 μsec/cm, and 10 μsec at 50 μsec/cm. These are useful as references when photographing pulses.

Trip Pulse For Manual Triggering—This is intended for use in triggering a trip-pulse generator. A pulse of approximately 700 v amplitude and 5 μsec width is available at the output connector. Pulse amplitude and width may be affected somewhat by the length of the cable used.

Illuminated Graticule—An edge-lighted graticule is marked in centimeter squares, 6 vertical and 10 horizontal, for convenience in making time and amplitude measurements. This graticule is removable. Illumination is controlled by a front-panel knob.

MECHANICAL SPECIFICATIONS

Ventilation—Filtered, forced-air ventilation assures safe operating temperature. A minimum of 2" of unobstructed clearance around the instrument is recommended for adequate ventilation.

Construction—Aluminum-alloy chassis and cabinets.

Finish—Photo-etched anodized panel, blue vinyl-finish cabinet.

Dimensions—Indicator unit: 16¾" high, 13" wide, 23⅝" deep. Power supply unit: 10½" high, 13" wide, 17½" deep.

Weight: Indicator, Net—53 pounds
Shipping—68 pounds appr.
Power Supply, Net—41 pounds
Shipping—51 pounds appr.
Scope-mobile, Net—35 pounds
Shipping—50 pounds appr.

Power Requirements—105-125 v or 210-250 v, 50-60 cycles, 600 watts.

TYPE 507 ..... **$3000.**

Includes: 1—Type 500A Scope-Mobile
1—Power supply unit
1—Common buss ground connector (013-011)
1—3-conductor power cord (161-010)
1—Inter-unit power cable (012-032)
1—Instruction manual

Optional Phosphors

P11 phosphor normally furnished.
P1, P2, P7 optional.....No extra charge

Rack Mount Adapter

A cradle mount to adapt the Type 507 Oscilloscope and its power supply for rack mounting is available. It consists of two cradles and two masks. The cradles, one each for the indicator and power supply units, support the instruments in any standard 19" relay rack. The two masks fit around the regular instrument panels of the two units. Rack height requirements; Indicator mask 17½", Power Supply mask 12½". Tektronix blue vinyl-finish.

ORDER PART NO. 040-183 ..... $85.00

Prices f.o.b. factory. (Please refer to **Terms and Shipment, *GENERAL INFORMATION*** page.)

TYPE 517A HIGH-SPEED OSCILLOSCOPE

MAIN FEATURES

Excellent Transient Response
7-nanosecond risetime.

Sweep Range
10 nsec/cm to 20 μsec/cm.

Single Sweep Operation
Lockout-Reset Circuitry for one shot recording

Vertical Deflection Factor
0.05 v/cm.

24-kv Accelerating Potential
Writing Rate—1100 cm/μsec.
Recorded on 35 mm TRI-X film at f1.9 with 4.2 to 1 reduction, developed 26 minutes in D-19 at 68°F.
Trace density 0.1 above film fog.

Sweep-Displacement Error
Less than 2% of 8 cm.

Signal-Displacement Error
Less than 2% of 2 cm.

Full 4-cm x 8-cm Deflection

Highly Mobile
Indicator unit and power supply mounted on Scope-Mobile.

GENERAL DESCRIPTION

The Tektronix Type 517A Cathode-Ray Oscilloscope is a wide-band high-voltage instrument for the observation and photographic recording of very-fast-rising waveforms having low duty cycle. With its risetime of 7 nanoseconds, 24-kv accelerating potential, and high-speed sweeps, the Type 517A is especially well suited to single-sweep applications involving transients of very short duration. Use of the new Tektronix metallized cathode-ray tube, T517P, increases the maximum vertical deflection to a full 4 cm and improves the linearity of the horizontal sweep. Basic vertical deflection factor of the Type 517A is 0.05 volts/cm.

The indicator and power-supply units are mounted on a Type 500 Scope-Mobile, making the Type 517A a convenient, mobile unit. If desired, the indicator and power-supply units can be easily removed from the Scope-Mobile for bench use.

VERTICAL DEFLECTION SYSTEM

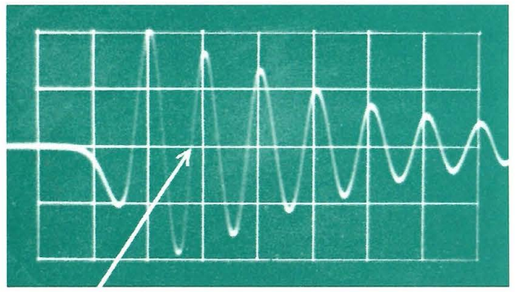
Distributed Amplifier—A 5-stage distributed amplifier is used to derive a transient-response risetime of 7 nanoseconds.

Sensitivity—Basic deflection factor is 0.05 v/cm with 24-kv accelerating potential. A front-panel variable-attenuator control is provided to adjust the sensitivity.

Input—The input of the vertical amplifier is connected through a coaxial connector directly to the 170-ohm first-stage grid line.

Cathode-Follower Probe—To provide higher input impedances, a cathode-follower probe and three capacitive attenuator heads are supplied with the Type 517A. The input impedance of the probe alone consists of 12 megohms paralleled by approximately 5 pf. Each attenuator head will present a different input capacitance, decreasing with higher attenuation ratios. Each attenuator head is adjustable over a ten-to-one range by means of a screwdriver adjustment in the nose of the head, making the following deflection factors and attenuator ranges available:

	Deflection Factor of Type 517A at 24-KV Accelerating Potential	Total Attenuation at CRT
Scope Input	0.05 to 0.1 v/cm	1:1 to 2:1
Probe Body Alone	0.1 to 0.2 v/cm	2:1 to 4:1
Probe with Attenuator I	0.2 to 4 v/cm	4:1 to 80:1
Probe with Attenuator II	2 to 40 v/cm	40:1 to 800:1
Probe with Attenuator III	20 to 400 v/cm	400:1 to 8000:1



Arrow indicates 1100 cm/μsec writing-rate point on 100-mc damped oscillation, displayed on single 10 nsec/cm sweep of Type 517A Oscilloscope with T517P11 crt. Recorded on 35-mm TRI-X film at f1.9 with 4.2 to 1 reduction, developed 26 minutes in D-19 at 68°F.

Step Attenuator—A separate 170-ohm step attenuator is furnished with the Type 517A. The attenuator uses 2% precision resistors, and covers the range of 1 to 64 db in 1-db steps. It is rated at 0.25 w. Also furnished is a 170-ohm coaxial cable, 42" long.

Auxiliary Power—A front-panel socket is provided to supply power for a cathode-follower probe or an auxiliary amplifier stage connected close to the circuit under observation. 6.3 v dc at 1 amp and 120 v regulated dc at 10 ma are available.

Signal Delay—Approximately 65 nsec of delay cable is incorporated in the vertical amplifier. This delay, along with an inherent 55 nsec delay in the amplifier, permits the sweep to start before the signal reaches the vertical deflection plates.

Direct Input CRT—An aperture in the side of the cabinet permits direct connection to the crt deflection plates for observation of extremely-fast transients.

HORIZONTAL DEFLECTION SYSTEM

Calibrated Sweep Rates—The basic sweep waveform is generated by a boot-strap circuit with an inverter stage for balanced deflection. Eleven fixed, calibrated sweep rates accurate within 2% . . . 10, 20, 50, 100, 200, 500 nsec/cm, 1, 2, 5, 10, 20 μsec/cm are available at 24 kv accelerating potential; and 5, 10, 25, 50, 100, 250 nsec/cm, 0.5, 1, 2.5, 5, 10 μsec per cm at 12 kv.

Single-Sweep Operation—Lockout-reset circuitry provides for one shot recording. After a single sweep is triggered, the sweep circuit is automatically locked out until manually reset. When reset, the sweep will fire on the next trigger received, then automatically lock out until the operator presses the reset button.

Trigger Selection—A front-panel switch selects a trigger from an observed signal of either polarity, an external trigger source of either polarity, or the internal trigger generator.

Trigger Requirements—The Type 517A uses a distributed amplifier in the trigger circuitry to handle fast-rise trigger signals. An internal trigger giving a 2-mm deflection will trigger the Type 517A. External trigger requirements are 0.3 to 15 v.

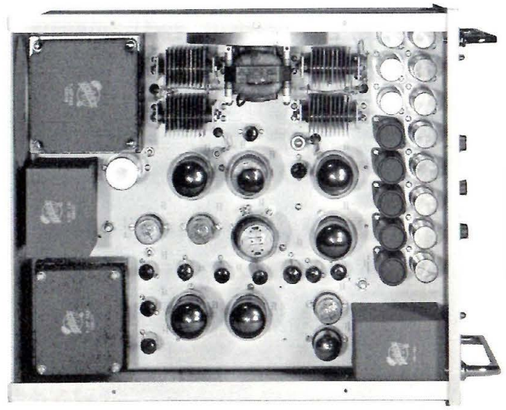
Trigger-Rate Generator — Internal trigger-rate generator is continuously variable from 15 to 15,000 cycles in three ranges with accuracy within 5% of full scale. Two cathode-follower outputs are available. . . 20 v at 50 ohms internal impedance and 60 v at 200 ohms internal impedance. Risetime is approximately 0.15 μsec.

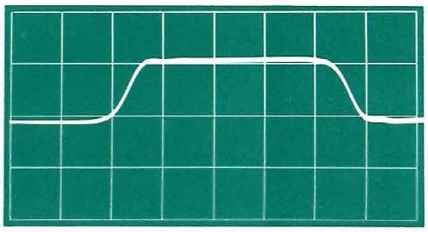
Automatic Duty-Cycle Limiter—The maximum duty cycle of the sweep system is automatically limited to about 30% to avoid exceeding the dissipation limits of some of the sweep circuit components.

POWER SUPPLY

Low Voltage—The low-voltage power supply is separate from the indicator unit, supplying power to it by an inter-connecting cable. All dc supplies are electronically regulated and heaters in the indicator unit are regulated by a saturable-reactor method to insure stable operation over line-voltage and load variations between 105 and 125 v or 210 and 215 v.

High Voltage—Accelerating potentials for the crt are obtained from an oil-filled oscillator-type supply, all voltages electronically regulated to insure stable operation for both load and line changes. A front-panel





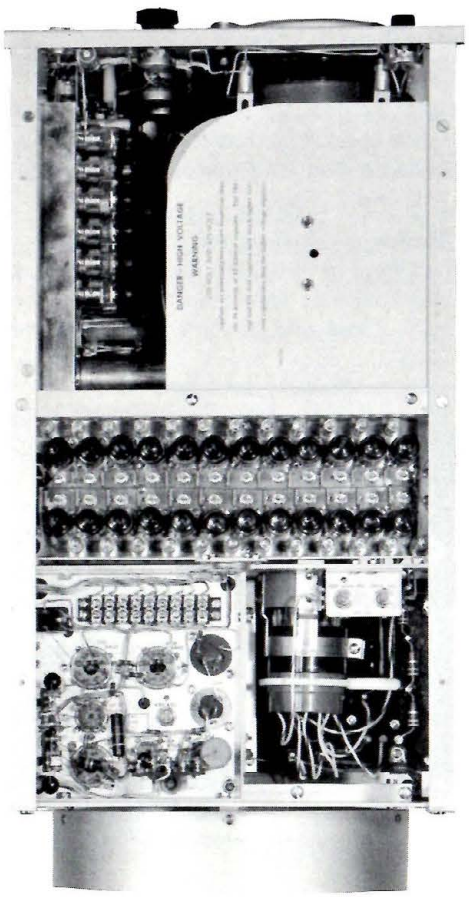
A 45 nsec pulse, initial risetime one nsec, displayed with a sweep time of 10 nsec per centimeter. Note amplifier risetime and freedom from ringing and overshoot.

switch on the indicator unit changes the accelerating voltage from 24 kv to 12 kv by changing the sampling voltage in the regulator circuit.

OTHER CHARACTERISTICS

Amplitude Calibrator—A pulse-type calibrator is used in the Type 517A and is available at the front-panel through a coaxial connector. The output voltage is continuously variable from 0.15 v to 50 v peak full scale in 6 ranges with accuracy within 4% of full scale. Frequency is approximately 25 kc.

Horizontal-Position Vernier—In addition to the normal horizontal-position control, a vernier control calibrated in millimeters provides accurate measurements over a range of 1 cm (24-kv accelerating potential) for use in measuring risetimes, etc.



Metallized Cathode-Ray Tube—The Type 517A uses a new Tektronix crt, T517P___. The T517P___ is a 5" flat-faced metallized precision tube with helical post-accelerating anode. It provides a full 4-cm x 8-cm viewing area when operated at 24-kv accelerating potential. Position of the high-voltage connector permits bringing the tube face flush with the panel. A P11 phosphor is normally furnished. P1, P2, or P7 can be furnished instead if desired. Some other phosphors are available on special order.

Output Waveforms—In addition to the two trigger-rate generator outputs and calibrator output, a +GATE waveform of approximately 30 volts amplitude is available. Its duration is approximately equal to the sweep being generated. Risetime is 30 nsec, from a cathode-follower source impedance of 200 ohms.

Illuminated Graticule—An edge-lighted graticule is marked in centimeter squares, 4 vertical and 8 horizontal, for convenience in making time and amplitude measurements. Illumination is controlled by a front-panel knob.

Cathode-Ray Tube Alignment—A molded nylon handle on the crt socket facilitates realignment of the cathode-ray tube.

ELECTRON-TUBE COMPLEMENT

First distributed amplifier	6	6AK5
Second distributed amplifier	6	6AK5
Third distributed amplifier	7	6CB6
Phase inverter stage	3	6CB6
Driver amplifier	12	6CB6
Output amplifier	24	6CB6
Internal trigger coupling		6CB6
Trigger phase-splitter		6J6
Trigger amplifier	6	6AK5
Trigger limiter		6AG7
Trigger switch		6AG7
Coupling diode		6X4
Lockout CF and Indicator amplifier		12BH7
Sweep Lockout		2D21
Multivibrator	2	6AG7
Duty-cycle limiter		6AN8
Sweep clamp	2	6AG7
Bootstrap cathode followers	2	12BH7
Decoupling diode		6X4
Positive sweep out CF		12BH7
Sweep inverter		6AG7
Voltage regulator CF		12AU7
Negative sweep clamp		6AL5
Sweep out dc restorer		6AL5
Unblanking amplifiers	2	6AG7
Voltage regulator CF		6AS5

Unblanking cathode follower		6J6
+Gate out cathode follower		6J6
Cal multivibrator		12AU7
Clipper		6J6
Cal voltage adjust CF		6J6
Cal out CF		6J6
Trigger rate phantastron generator		6BH6
Trigger coupling and recharging CF		12AU7
Plate catcher		12AU7
Blocking oscillator		12AU7
Output cathode followers	2	12AU7
Astigmatism and probe voltage CF		12AU7
Low-voltage rectifiers	4	6X4
Rectifier		5R4GY
Voltage reference		5651
Comparator		12AX7
Regulator amplifiers	5	6AU6
Series regulators	2	6AU5
Series regulators	6	6AS7
Heater voltage control diode		2AS-15
Heater-regulator amplifier		6AU5
High-voltage rectifiers	5	1X2
High-voltage oscillator		6AU5
Regulator amplifier		12AU7
Series regulator	2	6AU5
High-voltage time delay		6C4
High-voltage rectifier filament oscillator		6AQ5
Astigmatism and probe power CF		12AU7
Cathode-ray tube		T517P11

MECHANICAL SPECIFICATIONS

Ventilation—Filtered, forced-air ventilation assures safe operating temperature. A minimum of 2" of unobstructed clearance around the instruments is recommended for adequate ventilation.

Construction—Aluminum-alloy chassis and cabinets.

Finish—Photo-etched anodized panel, blue vinyl-finish cabinet.

Dimensions—Indicator unit: 18 3/8" high, 13" wide, 27" deep. Power supply unit: 9 5/8" high, 13" wide, 19 3/4" deep.

Weight: Indicator, Net—76 pounds
Shipping—94 pounds appr.
Power Supply, Net—69 pounds
Shipping—81 pounds approx.
Scope-mobile, Net—35 pounds
Shipping—50 pounds approx.

Power Requirements—105-125 v or 210-250 v, 50-60 cycles, 1250 watts.

Type 517A **$3500**

Includes: 1—Type 500A Scope-Mobile
1—Power supply unit
1—P170CF cathode-follower probe (010-101)
1—B170A step attenuator (011-017)
1—P170 coaxial cable (012-006)
1—H510 viewing hood (016-001)
1—B510 bezel (014-001)
1—3-conductor power cord (161-010)
1—Inter-unit power cable (012-032)
1—Instruction manual

Optional Phosphors

P11 phosphor normally furnished.
P1, P2, P7 optional.....No extra charge

Prices f.o.b. factory. (Please refer to **Terms and Shipment, GENERAL INFORMATION** page.)

TYPE 519

DC to 1 GIGACYCLE OSCILLOSCOPE

MAIN FEATURES

Single-unit including delay line
DC-coupled—less than 3 db down at 1 gigacycle*
Less than 0.35-nsec risetime
125 Ω ± 2% basic input impedance
Vertical sensitivity better than 10 v/cm
VSWR 1.25, or less, to 1 gigacycle
Sensitive wideband trigger system
Synchronization to over 1 gigacycle
Distributed-deflection crt
24-kv accelerating potential
2 x 6 centimeters viewing area
P11 photographic phosphor
9 accurately calibrated sweeps
Sweep range from 2 nsec to 1 μsec/cm
Single-shot photographs at 2 nsec/cm
Single sweep spot size of 0.004 inches
Calibration-step generator
Avalanche transistor rate generator

GENERAL DESCRIPTION

The Tektronix Type 519 Oscilloscope is a calibrated, high-speed, laboratory instrument designed for observation, measurement, and photographic recording of fractional nanosecond risetimes. A 2 x 6 cm viewing area, coupled with 24-kv accelerating potential, affords bright displays with excellent definition. Performance features include: passband from dc to beyond 1 gigacycle, risetime less than 0.35 nsec, sensitivity less than 10 v/cm, linear sweeps to 2 nsec/cm, sweep delay through 35 nsec, and a sensitive wideband trigger system. All features are fully compatible with the signal bandwidth capabilities of the instrument. The single unit houses a fixed signal delay line, a convenient sweep-delay control, a pulse-rate generator, a standard amplitude and waveshape generator, and regulated power supplies and high-voltage supply. Only one connection is necessary for normal operation—signal input.

Combining simple operation with laboratory precision and reliability, the Type 519 ideally suits single-shot or random nuclear events. In addition, the extreme passband of the Type 519 permits applications to general measurements where oscilloscope risetime must be much faster than signal risetime.

VERTICAL DEFLECTION SYSTEM

Distributed Deflection System—The signal passes through a trigger-energy take-off, then through a 45 nsec delay cable to the distributed vertical deflection plates of the crt. Passband is dc to 1 gigacycle and risetime is less than 0.35 nsec.

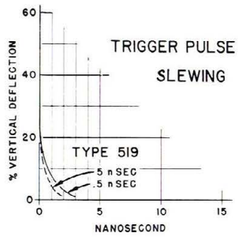
Sensitivity—Vertical deflection factor is less than 10 v/cm. Sensitivity is quickly and accurately checked by means of the CALIBRATION-STEP GENERATOR.

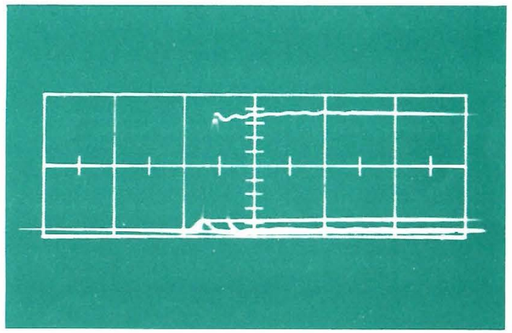
Signal Delay—An internal delay line provides a fixed delay of 45 nsec.

Input—The dc-coupled signal input has an impedance of 125 Ω ±2%. Maximum signal input is ± 15 volts dc or rms, or ±100 volts pulse. Maximum power input is 1.8 watts.

* 1 gigacycle = 1000 megacycles

High-frequency synchronization permits locking to sine waves or constant-repetition-rates to over 1 gigacycle. Triggering circuits count down from triggers faster than 400 kc.





Negligible Trigger-Pulse Slewing for Sweep Speed of 2 nsec/cm

TRIGGERING FACILITIES

Trigger Selection—A front-panel switch permits selection of trigger from the following sources: (1) displayed waveform, (2) externally derived waveform, (3) CALIBRATION-STEP GENERATOR waveform, (4) RATE GENERATOR waveform.

Trigger Function—Three modes of operation are provided: (1) PULSE—Permits choice of a free-running sweep or a stable sweep which can be triggered on random or uniform repetition rates up to approximately 50 mc, (2) SYNC—Permits stable displays of waveforms occurring at a constant repetition rate up to approximately 150 mc, (3) HF SYNC—Permits the sweep to be synchronized with signals from approximately 100 mc to over 1 gigacycle.

Trigger Requirements—Internally, a vertical signal deflection of two trace-widths or more, and 1 nsec duration. Externally, a waveform 20 mv in amplitude and duration of 1 nsec or more. Sweep triggers on either the rising or falling portion of the triggering waveform.

Trigger Gain—Four gain settings of X0.2, NORMAL, X5, and X20 provide for attenuation or amplification of trigger signals.

HORIZONTAL DEFLECTION SYSTEM

Calibrated Sweep—Nine calibrated rates: 2, 5, 10, 20, 50, 100, 200, 500, and 1000 nsec/cm are provided by a linear, push-pull, time-base generator. Calibrated sweeps are typically within 3% for the 2 nsec/cm position and within 2% for slower rates. For the fastest time-base range, only 2.5 μsec elapses between sweeps.

Sweep Delay—Provides sweep start delay through 35 nsec, permitting access to transients before and after the main event.

Single Sweep—Permits single-sweep presentation to be obtained. After a single sweep is triggered, the sweep circuit is locked out until the RESET button is pressed; sweep will then fire on the next trigger received.

Synchroscope Operation—The output signal from either the +TRIGGER 50 Ω, the DELAYED +GATE, or the +RATE 50 Ω connector can be used to initiate the input waveform.

Rate Generator—Supplies an output pulse of approximately +15 volts, with risetime of less than 0.8 nsec and duration of 10 nsec. Repetition rate is variable between 3 cps and 30 kc. The output impedance is 50 Ω.

Calibration-Step Generator—A step-waveform of approximately 750 cps, continuously variable and calibrated from 0 to 10 volts into 125 ohms, or 0 to 1 volt into 50 ohms through a T50/T125 adapter, is available at a front-panel 125 ohm connector. Risetime is approximately 0.1 nsec and either positive or negative polarity can be selected. Continuously variable uncalibrated amplitudes of 0 to 50 volts into 125 ohms are also available. The step-waveform can be used to drive a device under test or check the sensitivity and transient response of the oscilloscope itself.

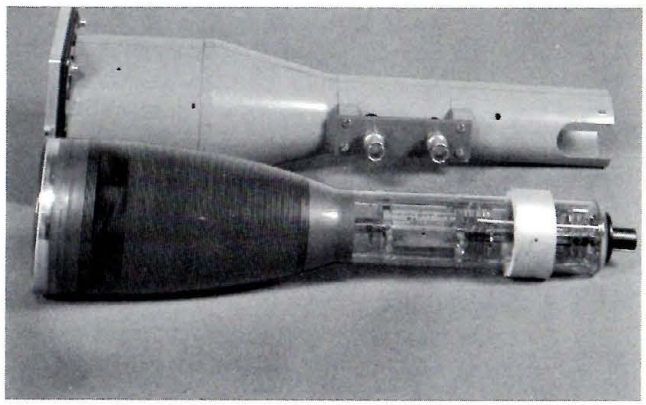
OTHER CHARACTERISTICS

Tektronix Cathode-Ray Tube—A metallized, flat-faced precision tube, with a fine-grain P11 phosphor, provides a spot diameter of 0.004 inch at normal intensity. Accelerating potential is 24 kv. Tube construction completely prevents any possible x-ray hazard. Usable viewing area is 2 x 6 cm. Rotational alignment of trace to graticule is by front-panel screwdriver adjustment.

Graticule—The graticule is accurately marked in 6 horizontal and 2 vertical 1-centimeter divisions. The horizontal centerline markings are 5 millimeters apart, vertical centerline markings are 2 mm apart. Illumination is controlled by a front-panel knob. The graticule drops out of view if desired.

Camera Mounting—Provision is made for quick, convenient mounting of a Tektronix C-12, C-13, or C-19 camera. The Type C-19 camera is recommended for single-shot photographs. Hinge fittings allow the camera to swing away from the crt screen when not in use.

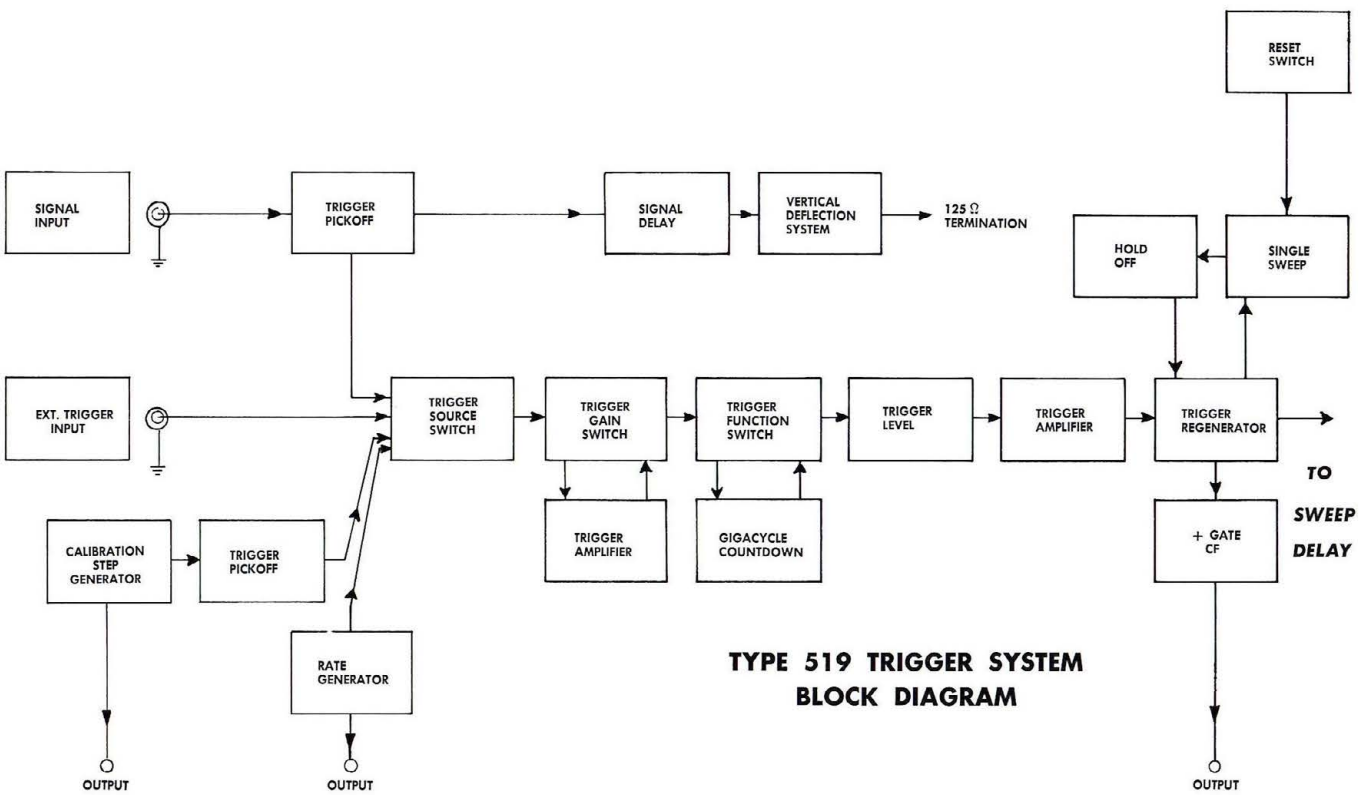
A 6.3 volt source is available at the front-panel for use with a projected-graticule accessory. When this source is used, the oscilloscope SCALE ILLUM control and graticule lights are automatically disconnected and a virtual-image graticule is projected on the face of the crt.



Distributed-Deflection CRT and Close Fitting Magnetic Shield

Regulated Power Supply—Electronically-regulated dc supplies assure stable operation over line variations between 105 and 125 volts or 210 and 250 volts, 50 to 60 cycles.

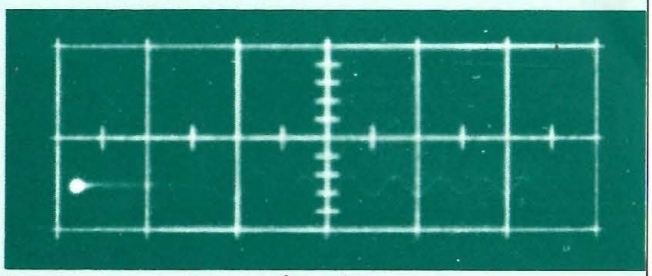
Shielded Construction—Electrostatic and electromagnetic shielding minimize disturbance of spot by power transformers and other hum sources.



TYPE 519 TRIGGER SYSTEM BLOCK DIAGRAM

SINGLE-SHOT PHOTOGRAPHY

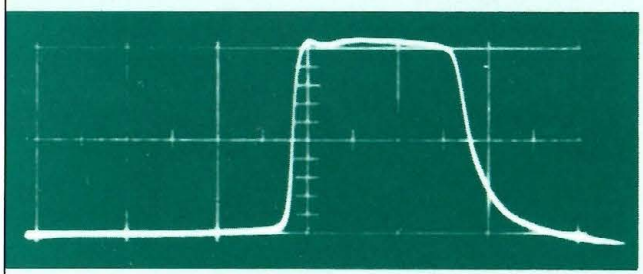
A single-shot exposure using film-prefogging technique was used to take the picture at the right. The display shows a 1 gigacycle damped wave on the fastest rate of the oscilloscope.



2 nsec/cm

Photograph of a Single 1-Gigacycle Transient

AVALANCHE TRANSISTOR



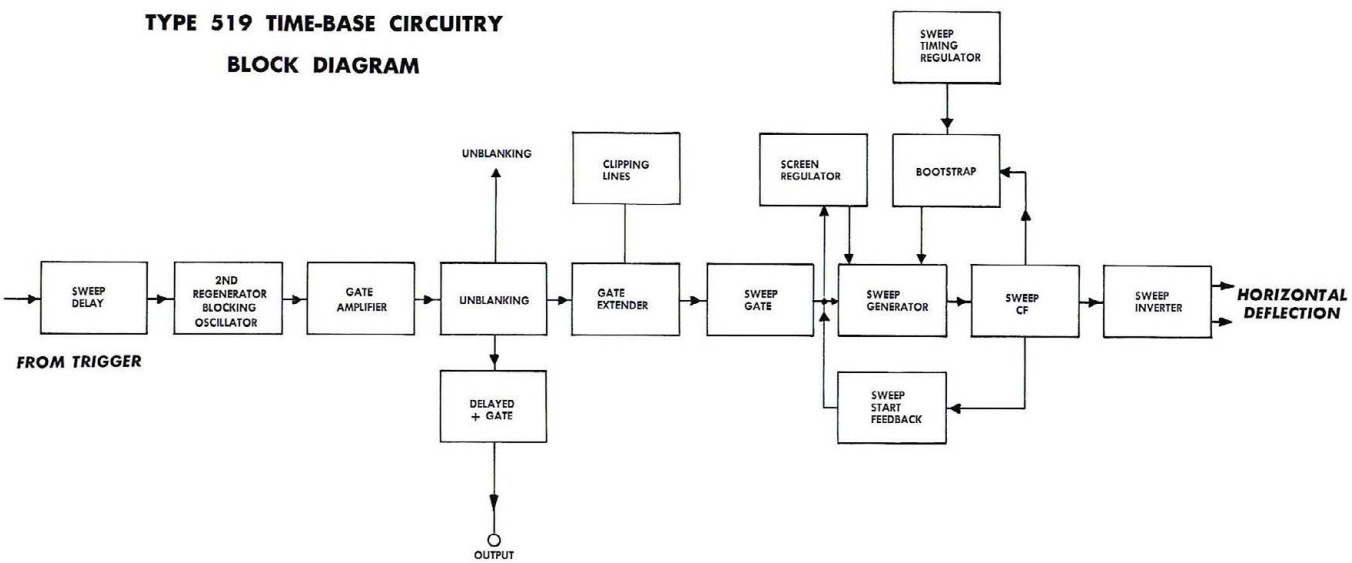
5 nsec/cm

Pulse of a Transistor in Avalanche

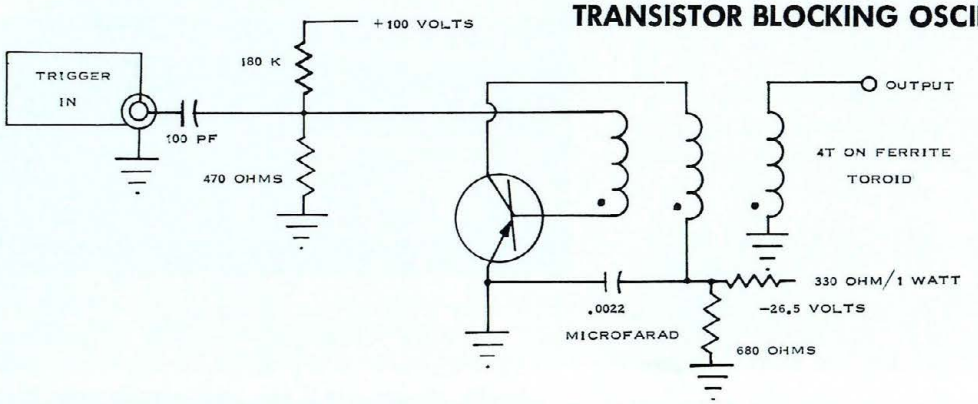
A Type 2N636 transistor in avalanche generates the pulse shown at the left. This pulse is available from the + RATE 50 Ω connector of the RATE GENERATOR on the Type 519.

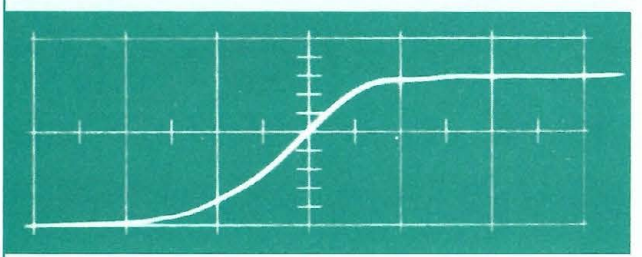
TYPE 519 TIME-BASE CIRCUITRY

BLOCK DIAGRAM



TRANSISTOR BLOCKING OSCILLATOR OUTPUT

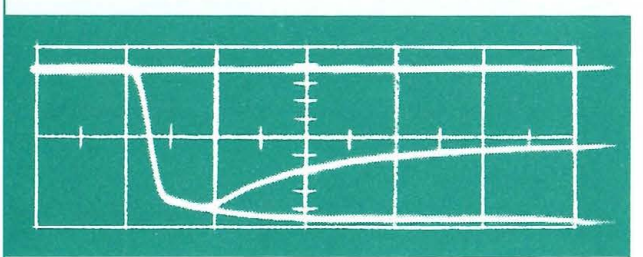




2 nsec/cm
Transistor Blocking Oscillator Output Pulse

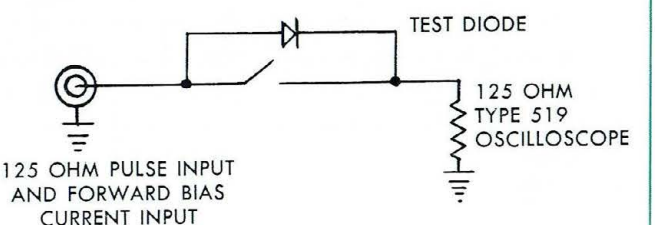
The transistor circuit illustrated rapidly switches 1 watt into 125 ohms. A ferrite-core transformer, such as the one used under "Circuit Design" on the next page, produces the coupling from collector-to-emitter with proper phase relationship. This type of circuit is employed within the Type 519 to generate power for gating signals.

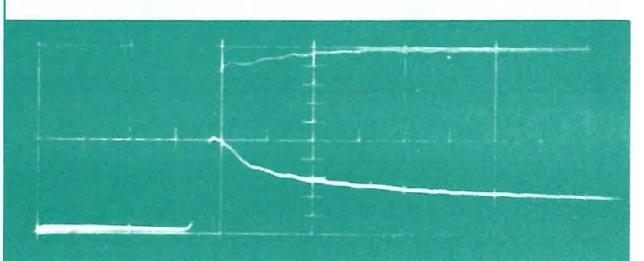
DIODE CHARACTERISTICS



2 nsec/cm
Diode Recovery-Time Characteristics

Switching and storage times in fast transistors and diodes can be measured using the outstanding characteristics of the Type 519. In the typical diode recovery-time waveform, the upper trace is a reference trace, the middle trace shows the diode turned on, and the lower trace shows the diode shorted.





2 nsec/cm
Diode Turn-On Characteristics

In the typical diode turn-on waveform, the upper trace is the input pulse alone and the lower trace shows the effect of diode turn-on.

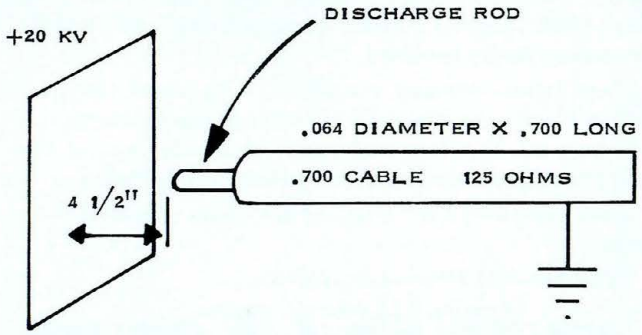
RANDOM HIGH VOLTAGE CORONA DISCHARGE

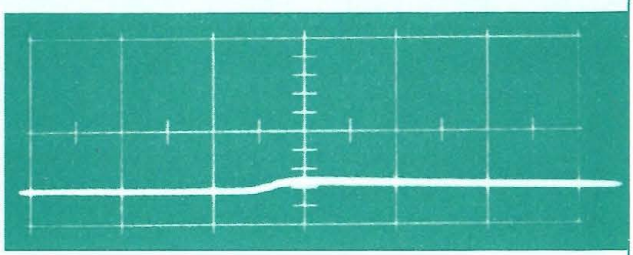
The random repetition rate was measured as 2300 pps average by the following substitution method:

(1) connect the anode of a semiconductor diode to the + GATE OUT connector and the cathode to a grounded 0.5 microfarad capacitor, then measure the dc produced with the Type 519 triggered by the corona;

(2) switch the oscilloscope triggering to the RATE GENERATOR and select the appropriate rate to produce the same dc output;

(3) read the average signal repetition rate from the CYCLES/SEC and MULTIPLIER controls on the front-panel.

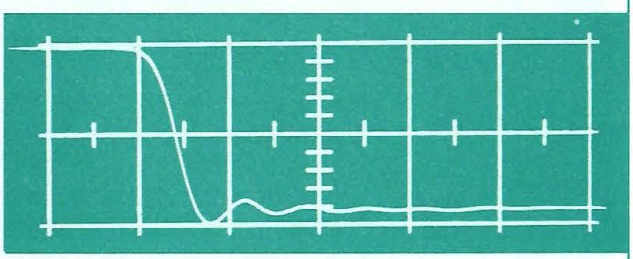




5 nsec/cm
Rapid Rise Produced in Corona Discharge

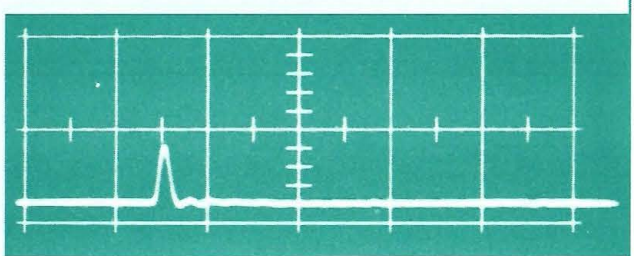
CIRCUIT DESIGN

The Type 519 is an invaluable tool for testing active or passive wideband circuits. In the wideband amplifier waveform, little or no correction is necessary for the inherent risetime of the oscilloscope.



5 nsec/cm
Wideband Amplifier Transient Response

Passive network measurements frequently demand the full risetime and bandwidth capabilities of the instrument. The wideband transformer waveform illustrates 1.8 gigacycle ringing in response to a test impulse.



5 nsec/cm
Wideband Transformer Impulse Response

TYPE 519

MECHANICAL SPECIFICATIONS

Construction—Single-unit construction with light-weight aluminum-alloy chassis and four-piece blue vinyl-finish cabinet. Side panels, top, and bottom panels are easily removed.

Ventilation—Filtered forced-air, with protective thermal cut-out, assures safe operating temperatures. A minimum of 2" of unobstructed clearance around the instrument is recommended for adequate ventilation.

Dimensions—22 ½" high, 14 ¼" wide, and 24 ¼" long.

Weight—Net 99 pounds, approx.
Shipping 125 pounds, approx.

Power Requirements—105 to 125 v or 210 to 250 v, 50 to 60 cycles, 650 watts.

Type 519 ..... **$3800.00**

Includes: 1—Viewing Hood (016-025)
1—125 Ω Termination
1—125Ω Min. loss att., T50/T125
1—125 Ω Insertion unit (017-013)
1—125 Ω Adapter, N50/N125
1—125 Ω Adapter, T50/N125
1—125 Ω Coupling capacitor (017-018)
1—125 Ω 1 Gigacycle Timing Std. (017-019)
1—Double-button contact assembly (017-032)
1—Panel adapter assembly (017-033)
1—Cable connector (017-035)
1—1-nsec cable (017-507)
1—2-nsec cable (017-508)
1—5-nsec cable (017-509)
1—10-nsec cable (017-510)
1—3-conductor power cord (161-010)
2—Reed switches (260-362)
1—Instruction Manual

OPTIONAL ACCESSORIES

DESCRIPTION	PART NO.	PRICE
125 Ω Atten. 2:1	017-004	$25.00
125 Ω Atten. 5:1	017-005	$25.00
125 Ω Atten. 10:1	017-006	$25.00
125 Ω Adapter N50/T125	017-016	$ 7.95
125 Ω 90° Elbow Assembly	017-043	$10.65
125 Ω 20 nsec cable	017-511	$23.25

C-19 Camera—please refer to Camera Section, page W-6, for complete description.

Prices f.o.b. factory. (Please refer to **Terms and Shipping, *GENERAL INFORMATION*** page).