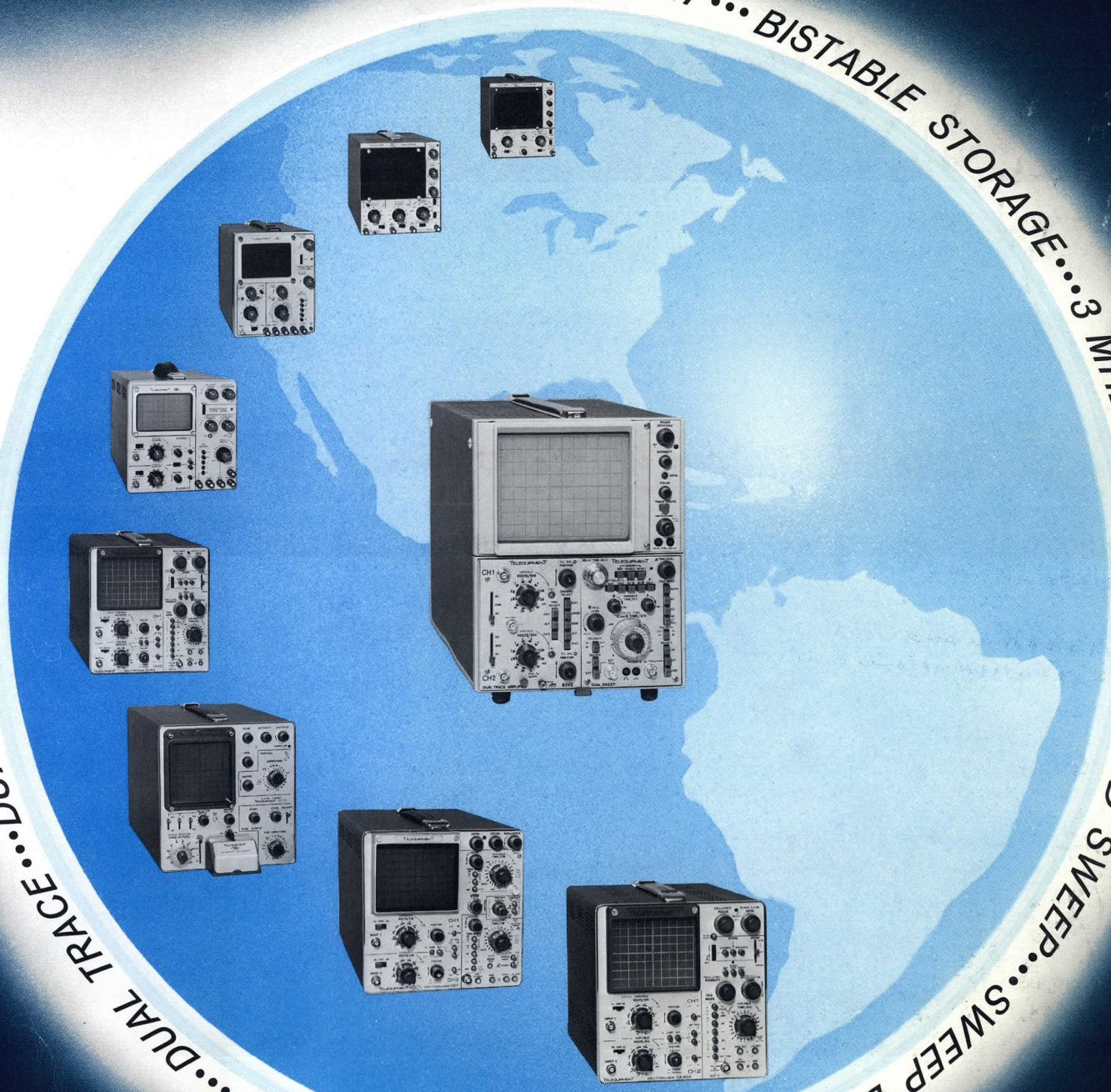
TELEQUIPMENT

PRODUCTS

FROM TEKTRONIX

WORLDWIDE PRODUCT SUPPORT ••• BISTABLE STORAGE ••• 3 MHz TO 50 MHz ••• MIXED SWEEP ••• SWEEP DELAY ••• TRIGGERED SWEEPS ••• X-Y ••• DUAL TRACE ••• DUAL BEAM ••• CURVE TRACING ••• MORE



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SELECTING YOUR OSCILLOSCOPE

There are many different types of oscilloscopes available today. Depending on performance and characteristics, they vary in price from less than $100 to several thousands of dollars. The following discussion is intended to clarify the significance of many of the characteristics requiring appraisal before you make a selection.

RISETIME AND HIGH FREQUENCY RESPONSE

The first qualification generally sought in an oscilloscope is adequate risetime or adequate high-frequency response. The two are closely related mathematically when fast step-signals produce little or no overshoot or ringing. The product of risetime and frequency response (bandwidth) produces a factor whose value lies between 0.33 and 0.35 when transient response is optimum. For example, the product of 35 ns risetime (35×10^{-9} second) and 10 MHz (10×10^{6} Hz) equals 0.35.

Ideally, scopes should have a vertical system capable of rising in about one-fifth the time that the fastest step-signal applied rises. In such a case, the risetime of the signal (as indicated on the scope) will only be in error by about 2 percent, assuming sweep timing and linearity are perfect. Vertical deflection systems which have a risetime no better than *equal* to the fastest rising signal applied are often considered adequate—a conclusion which may or may not be true depending upon the accuracy desired. Such reasoning is based upon the fact that the indicated risetime will be in error by a predictable amount when transient response is optimum. Under such conditions, signal risetime can be calculated to a close approximation by the formula $T_s = \sqrt{T_i^2 - T_a^2}$ where T_s = signal risetime, T_i = indicated risetime and T_a = vertical system (usually amplifier) risetime. The accuracy of such calculations falls off sharply for signals which rise faster than the scope amplifier. Bandwidth for TELEQUIPMENT Oscilloscopes ranges from 3-MHz to 50-MHz. Corresponding risetimes range from 120 ns to 7 ns.

WHY BUY TELEQUIPMENT?

When price is of prime importance, TELEQUIPMENT warrants serious consideration. TELEQUIPMENT oscilloscopes combine low price ($245 to $1495) with a number of features not usually found in other oscilloscopes in this price range. Features such as calibrated sweep rate and vertical step attenuators, variable controls, triggered sweep, probe calibration outputs, illuminated graticule and TV field or line triggering, make the instruments easier to use and versatile.

Not to be forgotten is the quality of after-sales service. TELEQUIPMENT products are marketed in the United States by 57 Tektronix, Inc. field offices and throughout the world by a network of Tektronix subsidiaries, distributors and representatives. Technical assistance and parts support is always nearby.

Warranty, sales and service are the same as for other TEKTRONIX products.

Telequipment is a division of Tektronix U.K. Ltd., a wholly-owned subsidiary of Tektronix, Inc.

DEFLECTION FACTOR (SENSITIVITY)

Sensitivity, like bandwidth and risetime, is one of the prime factors determining the suitability of a scope for a particular application. When the utmost in sensitivity is required, some bandwidth must be sacrificed because of the greater background noise associated with wideband, high-gain amplifiers. If amplification is sufficiently great, background noise may be evident in a display. When it is, the amount of noise should be specified so that a signal-to-noise ratio may be predicted. Oscilloscope deflection factors should be stated in terms of peak-to-peak voltage rather than RMS voltage since only sine-wave amplitudes can be read directly from a scope calibrated in RMS volts. When noise figures are stated in terms of RMS voltage, the figure should be multiplied by 5 or 6 to determine the approximate amount of peak-to-peak deflection that the noise will produce on the screen.

When an accuracy specification is stated for deflection factor, it encompasses all tolerances involved and the linearity of the entire vertical deflection system, including the CRT. If the accuracy is stated as within 3%, this means the maximum error in the voltage determination will be $\pm$ 3% (excluding operator error).

Deflection factors on TELEQUIPMENT instruments vary according to user needs. The D83 ranges from 5 mV/div to 20 V/div. 60 Series and 54 Series instruments range from 10 mV/cm to 50 V/cm. A X10 gain feature on the D66 and DM64 expands the deflection factors from 1 mV/cm to 5 V/cm. The 51 Series instruments range from 100 mV/cm to 50 V/cm. If you need to view smaller signals, consider the D83 with optional V3 differential plug-in amplifier. Its deflection factors extend from 50 μV/div to 10 V/div.

SWITCHED INPUTS AND DUAL-BEAM SCOPES

A very useful type of dual-input amplifier is one which can pass either of two input signals, one at a time, to permit viewing either signal without disturbing connections. Rapid electronic switching of the inputs, permits simultaneous viewing of two signals. Since the two signals trace out separate displays, scopes with built-in electronic switches are commonly called dual-trace scopes. They should not be confused with dual-beam scopes. Dual-trace scopes offer some advantages over dual-beam scopes and vice versa. Two simultaneous, non-recurrent signals of short duration may be displayed on a dual-beam scope, but cannot be displayed on a dual-trace scope. Also, some dual-beam scopes can display non-recurrent signals on different time-bases. The principal advantages of dual-trace scopes are lower cost and intrinsically better comparison capabilities.

Electronic switches should be capable of switching in two ways: rapidly during sweeps or synchronously during sweep retrace intervals. The first way is usually called "chopped", the second way "alternate". The alternate mode is used more frequently and is preferred for displays employing faster sweeps. The chopped mode usually is reserved for comparing low-frequency recurrent signals or long-duration, non-recurrent signals.

When displaying two very bright traces using the chopped mode, the display may show the chopping waveform transients as faint lines connecting the two traces. Some scopes blank (turn off) the CRT beam during these transition intervals to prevent them from appearing in the display.

The chopping rate (frequency) should be high as possible so long as the resulting traces are not broadened significantly by distortion of the chopping signal. When the chopped mode is used with relatively fast non-recurrent sweeps, the traces are not continuous but are made up of separate segments, the number of segments depending on the chopping rate and the sweep duration. For instance, if the chopping rate is 100,000 Hz and the sweep duration is 1 millisecond, there will be 100 segments in each trace. How well these separate segments depict all the detail in the two waveforms establishes the limits of usefulness of the chopped mode compared to an alternately switched display or a dual-beam scope.

The D51 is a dual-beam oscilloscope. The 60 Series and the D54 are oscilloscopes with the dual-trace and multi-function display modes. The D83 is unique in that with the selection of plug-ins it can become a differential measuring device or a dual-trace, multi-function oscilloscope. Signal delay is a part of the TELEQUIPMENT instruments having 25 MHz or greater bandwidth. Chop rates range from 80 kHz on the D67, D66 to 350 kHz on the D83.

DIFFERENTIAL, BALANCED or PUSH-PULL INPUTS

Amplifiers with these inputs have the ability to cancel or reject, to a high degree, any signal components equal in amplitude and phase that appear at both inputs. This ability explains the term "differential amplifier" since essentially only the difference between two signals is amplified. Such amplifiers provide a simple and accurate means of measuring the difference between two signals. They also provide a means of rejecting most of any unwanted signal components common to both inputs, such as power line hum. Differential amplifiers are also used to display low-level signals, which would otherwise be too small for meaningful viewing.

The D83 Oscilloscope has the capability for differential measurements, using the V3 Plug-in Amplifier. In addition to this special measurement capability, the D83 is available with the V4 Dual-Trace Plug-In Amplifier

VERTICAL SIGNAL DELAY

Whenever sweeps are triggered by the displayed signals and the entire leading edge of the signals is to appear, the arrival of the signals at the vertical deflection plates must be delayed with respect to the time each sweep is started. To provide such delay a delay-cable or delay-line is used somewhere in the signal path between the deflection plates and the point in the system where a sample of the vertical signal is taken to start the triggering process. The need for signal delay is greatest in the "faster" scopes where the time required for sweeps to start (and the beam to be turned on) is equal to a significant portion of the fastest sweep.

SWEEP TRIGGERING AND SYNCHRONIZING

The sweep generator in early oscilloscopes free ran continuously at a frequency just below that of the input signal frequency (or one of its submultiples). The input signal was applied to the sweep generator and acted to speed up the free-running generator. This, then synchronized the sweep generator with the input signal to give a stable display. This simple generator suffices for many routine non-complex measurements. Careful adjustment of the sweep controls, however, is needed to "lock in" the display, and drift can cause a loss of sync. It should be borne in mind that synchronizing is very difficult or impossible if the synchronizing signal varies in amplitude or frequency.

Triggered sweep oscilloscopes overcome these problems and provide a means to conveniently display increasingly complex waveforms, without constant readjustment. The input signal (or an external input) determines the start of each sweep by triggering the sweep generator. Not only does this triggered sweep give a steady, drift-free display, but it also permits accurate control of the starting point on a given waveform—important in today's complex measurements. Moreover, triggered sweep makes possible precise signal comparisons since a common signal triggers all of the multi-trace waveforms. The sweep speed can be changed without loss of a stable display (a nuisance with sync sweep). Almost any kind of input can be used because the trigger circuit "conditions" the input. Some triggered oscilloscopes utilize the sync techniques to display their highest frequencies.

There are two basic requirements in the triggering area . . . sensitivity and frequency range. Trigger sensitivity indicates how small a signal can be displayed on the CRT and remain stable. For internal triggering, this is usually stated in divisions (or portion of a division) of CRT display. For external triggering, it is usually expressed in volts(or millivolts). Trigger bandwidth is an indication of the range of signal frequency that can be displayed in a triggered mode.

All of the TELEQUIPMENT Oscilloscopes featured in this catalog incorporate triggered sweeps.

TIME BASE

In early oscilloscopes, the sweep generator ran continuously and horizontal calibration was based on its repetition frequency. The sweeps in most modern oscilloscopes are calibrated in terms of a direct unit of time for a given distance of spot travel across the screen, hence the term 'time-base'. The higher the bandwidth of the vertical deflection system, the faster the time base required to display the signal. Conversely, a very slow time base is required to display a signal that changes very slowly with time. A versatile oscilloscope has time-base rates that vary from several seconds per division of horizontal deflection to a fraction of a microsecond per division. Time-base accuracy usually is specified in terms of the permissible full-scale sweep timing error for any calibrated sweep. That is, an accuracy of 3 percent would mean that the actual full-scale period of any sweep should not be more than 3 percent greater or less than indicated. Magnified sweeps may have poorer accuracy ratings than unmagnified sweeps, since magnification is usually achieved by reducing amplifier feedback.

SWEEP MAGNIFICATION AND SWEEP DELAY

Sometimes it is desirable to display parts of waveforms which occur considerably later than suitable sweep triggering signals occur. Such waveforms can always be displayed on sweeps which last long enough, but if the duration of the waveform is short compared to the duration of a full sweep, an accurate examination may not be possible. The need to magnify (expand) the display for the time interval during which a particular event occurs is apparent. Portions of sweeps may be magnified by increasing the gain of the horizontal amplifier (allowing either or both ends of the sweeps to go off-screen) and positioning the display so that the desired portion is on-screen. This is a simple way to meet the need. Another way is to generate suitable delayed sweep triggering signals so that fast sweeps may be triggered just prior to the moment when the signal to be examined occurs. The first method delays the *presentation* of a sweep portion; the second method delays the actual *generation* of the displayed sweep. Calibrated sweep delay can provide some advantages over ordinary sweep magnification, cost and simplicity not being among them. These advantages are:

1. Greater ratios of effective magnification
2. Elimination of "time jitter" or "time drift" of displayed waveforms
3. Greater accuracy of time-interval measurements between waveforms
4. Better long-term accuracy of the displayed time base

The TELEQUIPMENT Oscilloscopes contained in this catalog feature sweep magnification ranging from X2 in the 51 Series to X10 in the D83. Sweep delay is a specific feature of the D83 and D67.

STORAGE OSCILLOSCOPES

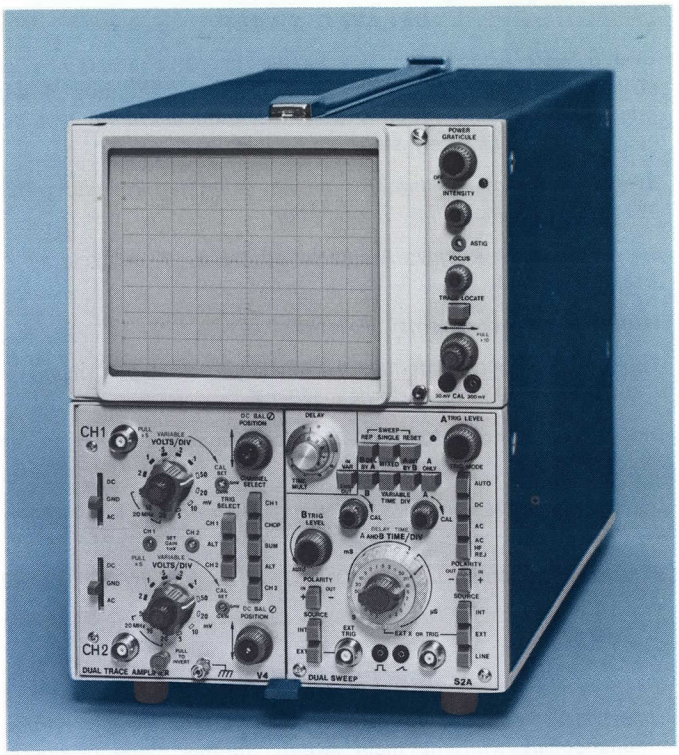
Storage CRTs have the ability to retain and display a waveform after the event which caused the waveform ceases. This image retention may be for only a few seconds or for up to an hour. The stored display may be erased to allow storage of a later waveform, or successive displays may be superimposed to indicate changes with time, such as drift. Storage tubes may also be operated as conventional (non-storage) tubes.

Storage oscilloscopes allow easy, accurate evaluation of slowly changing phenomena that would appear only as a slowly moving dot and of rapidly changing non-repetitive waveforms whose image would flash across the CRT. In many applications a storage oscilloscope eliminates the need for an oscilloscope camera.

The bistable phosphor CRT utilizes a special phosphor having two stable modes—written and unwritten. Bistable phosphor CRTs have two modes of operation—storage or conventional.

The TELEQUIPMENT DM64 offers bistable storage, with all the other advantages of a conventional dual-trace oscilloscope.

- DC-to-50 MHz BANDWIDTH at 5 mV/DIV
- DELAYED SWEEP TIME BASE
- DUAL-TRACE or DIFFERENTIAL AMPLIFIER
- BRIGHT 6½-INCH DISPLAYS



A bandwidth of 50 MHz at 5 mV/div, large bright displays, and the concept of plug-in selectability are the main features of this oscilloscope. The plug-ins include a differential amplifier, a dual-trace amplifier and a dual time base. The CRT in the D83 is from the TEKTRONIX 7403N Oscilloscope. To extend your measurement capabilities, the D83 accepts TEKTRONIX C59 or C-5 cameras. Compatibility with other TEKTRONIX accessories should be discussed with your local Tektronix Field Engineer.

DUAL-TRACE AMPLIFIER (V4)

Bandwidth—*DC to at least 50 MHz at 3-dB down. DC to at least 15 MHz using X5 gain. Low frequency 3 dB-down point with AC coupling is 2 Hz or less. Bandwidth is 20 MHz at 5, 10, or 20 V; 12 MHz using X5 gain at 1, 2 or 4 V.*

Risetime— *7 ns or less; 23 ns using X5 gain.*

Deflection Factor— *5 mV/div to 20 V/div in 12 calibrated steps (1-2-5 sequence), 1 mV/div to 4 V/div using X5 gain, all steps accurate within 3%. Uncalibrated continuously variable between steps and to at least 50 V/div.*

Display Modes—*Channel 1 only; Channel 2 (normal and invert); Alternate; Chopped (approx 350 kHz rate); Added.*

Input R and C— *1 MΩ, approx 29 pF.*

Maximum Input Voltage— *400 V DC + peak AC.*

Internal Trigger Source—*Channel 1 only; Channel 2 only; Alternate (from displayed signal).*

DIFFERENTIAL AMPLIFIER (V3)

Bandwidth— *150 kHz at 50 μV/div rising to 2 MHz at 2 mV/div through 10 V/div. Bandwidth limited to approx 2.5 kHz on all deflection factor ranges by operation of a pull switch associated with the variable control.*

Deflection Factor— *50 μV/div to 10 V/div in 17 calibrated steps (1-2-5 sequence); accurate within 3%. Uncalibrated, continuously variable between steps and to at least 25 V/div.*

Input R and C— *1 MΩ, approx 40 pF.*

Differential Input—*CMRR of 100,000:1 at 50 μV/div to 500 μV/div, DC to 1 kHz. CMRR derating at higher deflection factors and bandwidth.*

Signal Output—*DC to 150 kHz, providing load does not exceed 100 pF, approx 250 mV/div.*

DUAL TIME BASE (S2A)

MAIN (DELAYING) SWEEP

Sweep Rate— *100 ns/div to 2 s/div in 23 calibrated steps (1-2-5 sequence). 10 ns/div is the fastest calibrated sweep rate, obtained with the X10 magnifier. Uncalibrated, continuously variable between steps and to at least 5 s/div.*

Sweep Accuracy—*Within 3% on all calibrated ranges; within 6% with X10 magnifier in operation.*

Trigger Coupling—*DC, AC, AC-LF Reject*

Trigger Sources—*Internal, External and Line.*

Trigger Sensitivity—*Internal, 0.2 divisions to 10 MHz rising to 1 division at 50 MHz; External, 500 mV.*

Single Sweep—*A single-shot facility with lockout is provided. A panel light indicates when time base is armed.*

DELAYED SWEEP

Sweep Rate— *100 ns/div to 1 s/div in 22 calibrated steps (1-2-5 sequence). 10 ns/div is the fastest calibrated sweep rate, obtained with the X10 magnifier. Uncalibrated, continuously variable between steps and to at least 2 s/div.*

Sweep Accuracy—*Within 3% on all calibrated ranges; within 6% with X10 magnifier in operation.*

Sweep Modes—*A only; A intensified by B; B delayed by A; A and B mixed.*

Trigger Sources—*Internal, External*

Trigger Sensitivity—*Internal, 0.2 divisions at 50 kHz rising to 1 division at 50 MHz; External, 500 mV.*

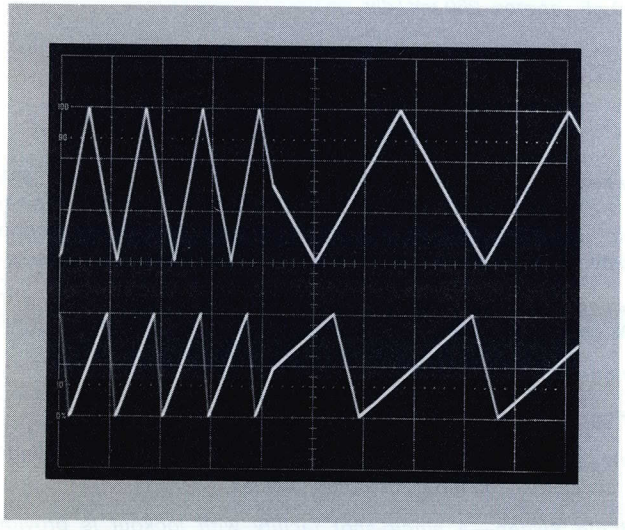
Delay Time Range—*10 μs to 20 s continuously variable by ten turn multiplier.*

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

External Horizontal Input—*DC to 1 MHz; 400 mV/div or 40 mV/div.*

MIXED SWEEP

This allows the user to observe the delayed sweep portion simultaneously with the main sweep. In this mode of operation, the sweep first runs at the main sweep rate and then, after the selected delay interval, runs at the delayed sweep rate. The point at which magnification occurs is adjustable across the entire display. This feature has previously been available only in more expensive and complex oscilloscopes.



MAINFRAME

TEKTRONIX CRT— *6½-inch rectangular tube; 8 x 10-div display area, each div is 1.22 cm. Horizontal and vertical centerlines further marked in 0.2-div increments. P31 phosphor normally supplied. 15-kV accelerating potential.*

Z-Axis Modulation—*Bandwidth DC to approx 5 MHz; +20 V for full blanking at maximum intensity.*

Graticule—*Internal, no parallax; variable edge lighting.*

Trace Locate—*Pressing a front-panel control positions the CRT beam on screen, regardless of vertical and horizontal position control settings.*

Calibrator— *300 mV and 30 mV P-P squarewaves at 1 kHz; shorting the two outputs together supplies a 3-mA P-P current. Voltage and current accurate within 1%.*

Signal Delay—*Permits viewing leading edge of displayed waveforms.*

Power Requirements— *100-125 in 5-V steps or 200-250 in 10-V steps; 48-400 Hz. 85 VA power consumption.*

Temperature Limits, Ambient— *−5° C to +40° C operating; −25° C to +70° C non-operating.*

Included Accessories—*Four coax BNC connectors.*

OSCILLOSCOPE DIMENSIONS and WEIGHTS		
Height	11.3 in	28.6 cm
Width	8.5 in	21.6 cm
Depth	19.0 in	48.3 cm
Net Weight	24.8 lb	11.3 kg

PLUG-IN DIMENSIONS and WEIGHTS		
Height	5.0 in	12.5 cm
Width	4.0 in	10.1 cm
Length	12.3 in	31.2 cm
Net Weight	3.3 lb	1.5 kg

ORDERING INFORMATION

D83 Oscilloscope, Order D83
V3 Differential Amplifier, Order V3
V4 Dual-Trace Amplifier, Order V4
S2A Dual-Time Base, Order S2A

ACCESSORIES

TEKTRONIX C-5 Camera—*This low-cost camera is designed to complement the D83. Its light weight, fixed-focus (f/16), fixed-aperture design simplifies waveform photography. The C-5 Camera fits directly onto the instrument and needs no additional adapter. The Polaroid* Pack-film back is permanently attached to the camera.*

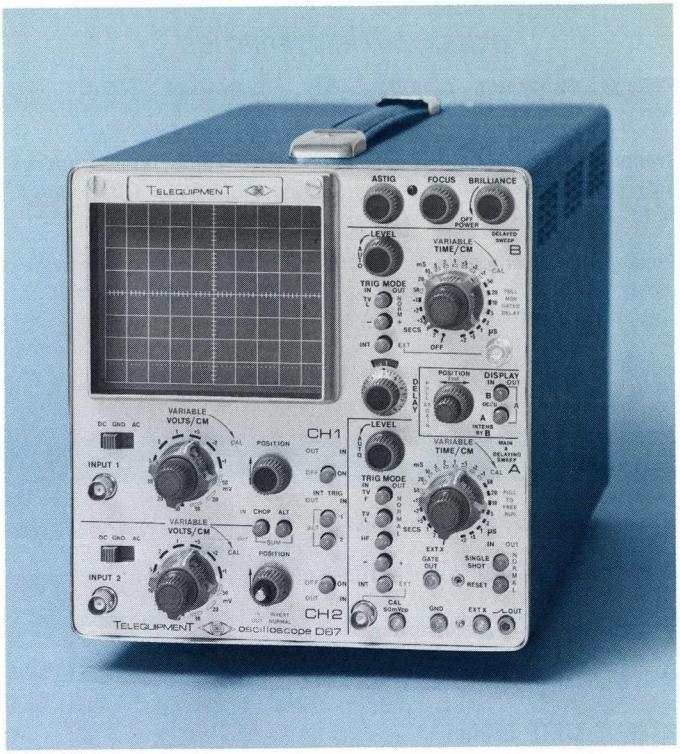
Order C-5 Camera

TEKTRONIX C-59 Camera—*This camera is recommended for the D83. Its features include • accurate exposure control • trace-brightness photometer • range-finder focusing. The shutter is mechanically actuated with speeds from 1 to 1/50 second. A magnification of 0.67 and aperture settings from f/2.8 to f/16 optimizes this camera for general-purpose trace recording. Polaroid* Pack-film back may be removed and replaced with optional roll-film and Graflok† backs.*

C-59-G (Graflok back)
C-59-P (Pack-film back)
C-59-R (Roll-film back)

**Registered Trademark Polaroid Corporation*
†Registered Trademark Graflex, Inc.

- 25-MHz BANDWIDTH at 10 mV/CM
- 3% MEASURING ACCURACY
- SIGNAL and SWEEP DELAY
- ALL SOLID-STATE DESIGN
- LARGE, BRIGHT 8 x 10-CM DISPLAY
- SMALL SIZE — LIGHT WEIGHT
- REGULATED POWER SUPPLIES
- TRIGGERED SWEEP



The D67 is a 25-MHz, all solid-state dual-trace portable oscilloscope. An 8 x 10-cm mesh CRT provides a bright, clear display. The dual-trace vertical system displays either channel separately, adds channels algebraically, alternates between channels or chops between channels. The delayed sweep feature permits close examination of any part of a complex waveform and also allows for accurate measurements of the time jitter in the input waveform. Solid-state design, using FET input circuitry, provides minimum drift, fast stabilization time and extra reliability ensuring long periods of operation without attention. Transistors are in sockets for easy servicing.

VERTICAL DEFLECTION

Bandwidth and Risetime—*DC to 25 MHz at 3-dB down. Low frequency 3-dB-down point with AC coupling is approx 2 Hz. 14-ns risetime. Bandwidth is 10 MHz at 10, 20 or 50 V.*

Deflection Factor— *10 mV/cm to 50 V/cm in 12 calibrated steps (1-2-5 sequence) accurate within 3%. Uncalibrated, continuously variable between steps and to at least 125 V/cm.*

Display Modes—*Channel 1 only; Channel 2 only (normal or inverted); Alternate; Chopped (approx 80 kHz rate); Added.*

Input R and C— *1 MΩ, approx 47 pF.*

Maximum Input Voltage— *400 V (DC + peak AC).*

Delay Line— *200-ns signal delay permits viewing leading edge of displayed waveform.*

HORIZONTAL DEFLECTION

Time Base A and B— *0.2 μs/cm to 2 s/cm in 22 calibrated steps (1-2-5 sequence) accurate within 3%. Uncalibrated, continuously variable between steps and to at least 5 s/cm.*

X5 Magnifier—*Operates over full time base range, increases fastest rate to 40 ns/cm. Magnified display accurate within 2% in addition to specified time base sweep accuracy.*

Horizontal Display Modes—*A only, A intensified during B, B delayed by A. Delay is uncalibrated.*

Time Base A Sweep Modes—*Auto trigger (sweep free runs in absence of triggering signal); Normal Trigger; Single Sweep. Light indicates when sweep is triggered.*

Time Base B Sweep Modes—*B triggerable after delay time; B starts after delay time (non-gated delay).*

Horizontal Amplifier—*DC to 1 MHz at 3-dB down; 0.6 V/cm to 3 V/cm deflection. Input impedance 1 MΩ, approx 30 pF; max input voltage 400 V (DC + peak AC).*

TRIGGER

Modes—*Automatic or Normal (Trigger Level) on Time Base A and B. Automatic and Trigger Level operation useful between 15 Hz to 5 MHz. High Frequency synchronizes the sweep over a frequency range of approx 1 MHz to >25 MHz (A sweep only).*

TV—*Triggers at TV field or line rate (A sweep); triggers at TV line rate (B sweep).*

Sensitivity—*Internal, 2-cm deflection to 5 MHz, except HF is 1-cm deflection to 25 MHz. External, 250 mV P-P up to 15 V P-P, input impedance 100 kΩ, approx 30 pF.*

CRT

CRT— *5-inch rectangular tube; 8 x 10-cm display area, each div is 1 cm. P31 phosphor normally supplied, P7 and P11 optional without extra charge. 10 kV accelerating potential. Z axis input AC coupled to CRT cathode; noticeable modulation at normal intensity with 5-V or more P-P signal.*

Graticule—*External; variable edge lighting.*

OTHER CHARACTERISTICS

Voltage Calibrator—*Line-frequency squarewave, 500 mV P-P accurate within 1%.*

Signal Outputs—*Negative gates from both time bases (approx 5 V) and a sawtooth from Time Base A (1-36 V, DC coupled, 30 kΩ, minimum load).*

Power Requirements—*Quick-change line selector provides these ranges: 100-125 VAC in 5-V steps or 200-250 VAC in 10-V steps. 48-400 Hz, 50 VA power consumption.*

Cooling—*Convection*

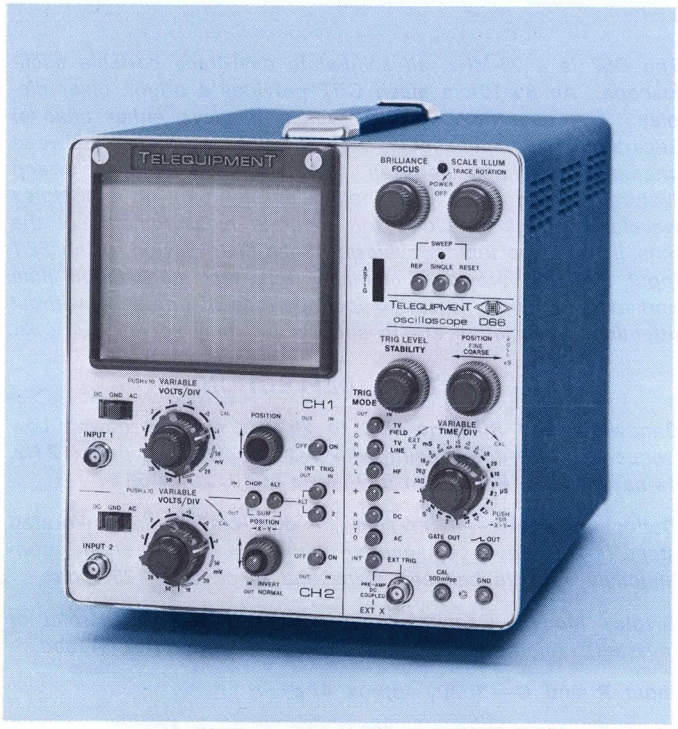
Dimensions and Weights		
Height	9.8 in	24.7 cm
Width	8.3 in	21.0 cm
Depth	17.5 in	44.5 cm
Net Weight	25.5 lb	11.5 kg

Included Accessories—*Four coax BNC connectors.*

Optional Accessories—*Additional accessories are described at the conclusion of this oscilloscope section.*

D66 25-MHz Dual-Trace Oscilloscope

- **25-MHz BANDWIDTH at 10 mV/CM**
- **MINIMUM DEFLECTION FACTOR 1 mV/CM**
- **SWITCHED X-Y OPERATION**
- **8 x 10-CM DISPLAY**
- **SOLID-STATE DESIGN**
- **SMALL SIZE — LIGHT WEIGHT**



The D66 is a portable dual-trace oscilloscope which combines small size and light weight. An 8 x 10-cm mesh CRT provides a bright and clear display. An X-Y facility utilizing two vertical channels provides 1-MHz bandwidth displays to 1 mV/cm. Solid-state design, using FET input circuitry, provides minimum drift and fast stabilization time.

VERTICAL DEFLECTION

Bandwidth—*DC to at least 25 MHz, at least 15 MHz 3-dB down using the X10 gain. Low frequency 3-dB-down point with AC coupling is 2 Hz. Bandwidth is 10 MHz at 10, 20 or 50 V.*

Risetime— *14 ns; 23 ns with X10 gain.*

Deflection Factor— *10 mV/cm to 50 V/cm in 12 calibrated steps (1-2-5 sequence), 1 mV/cm to 5 V/cm using X10 gain, all steps accurate within 5%. Uncalibrated, continuously variable between steps and to approx 125 V/cm.*

Display Modes—*Channel 1 only; Channel 2 (normal and inverted); Alternate; Chopped (approx 80 kHz rate); Added; X-Y (Channel 1-Y and Channel 2-X).*

Input R and C— *1 MΩ, approx 47 pF.*

Maximum Input Voltage— *400 V (DC + peak AC).*

Delay Line— *200-ns signal delay permits viewing leading edge of displayed waveform.*

Maximum Deflection—*Reduces to 7 cm at 25 MHz.*

HORIZONTAL DEFLECTION

Time Base A— *100 ns/cm to 2 s/cm in 23 calibrated steps (1-2-5 sequence), accurate within 5%. Uncalibrated, continuously variable between steps and to at least 5 s/cm.*

X5 Magnifier—*Operates over full time base range, increases fastest rate to 20 ns/cm. Magnified display accurate within 2% in addition to specified time base sweep accuracy.*

Time Base A Sweep Modes—*Auto Trigger (sweep free runs in absence of triggering signal); Normal Trigger (Trigger Level); Single Sweep. Light indicates when sweep is triggered.*

Horizontal Amplifier—*DC to 1 MHz at 3-dB down; approx 1 V/cm deflection factor, approx 0.2 V/cm with X5 magnifier. Input R and C, 100 kΩ, approx 30 pF. Max input voltage, 400 V (DC + peak AC).*

TRIGGER

Modes—*Automatic or Normal (Trigger Level). Automatic operation useful between 20 Hz to 5 MHz. Trigger Level selection occurs at any level on the input waveform over a frequency range of DC to approx 5 MHz. High Frequency synchronizes the sweep over a frequency range of approx 1 MHz to at least 25 MHz.*

TV—*Triggers on TV field or line.*

Sensitivity—*Internal, 0.2 cm deflection to 5 MHz, except HF is 1-cm deflection to 25 MHz. External, 250 mV P-P up to 15 V P-P, input impedance 100 kΩ, approx 30 pF.*

X-Y OPERATION

Full Sensitivity (Ch 1-Vert, Ch 2-Horiz)—*10 mV/div to 50 V/cm in 12 calibrated steps (1-2-5 sequence), 1 mV/cm to 5 V/cm using X10 gain, all steps accurate within 5%; variable on both channels. Bandwidth is DC to at least 1 MHz (—3 dB). Phase difference between amplifiers is less than 1° at 25 kHz.*

CRT

CRT— *5-inch rectangular tube; 8 x 10-cm display area, each div is 1 cm. P31 phosphor normally supplied, P7 and P11 optional without extra charge. 10 kV accelerating potential, Z axis input AC coupled to CRT grid; noticeable modulation at normal intensity requires approx 15 V.*

Graticule—*External, variable edge lighting.*

OTHER CHARACTERISTICS

Voltage Calibrator—*Line-frequency squarewave, 500 mV P-P accuracy within 2%.*

Signal Outputs—*Positive gate (0.5 V) and a sawtooth (10 V, DC coupled, 47 kΩ minimum load).*

Power Requirements—*Quick-change line voltage selector provides these ranges: 100-125 VAC in 5-V steps or 200-250 VAC in 10-V steps. 48-400 Hz, 50 VA power consumption.*

Cooling—*Convection*

Dimensions and Weights		
Height	*9.5 in*	*24.0 cm*
Width	*8.3 in*	*21.0 cm*
Depth	*14.5 in*	*37.0 cm*
Net Weight	*25.5 lb*	*11.5 kg*

Included Accessories—*Three coax BNC connectors.*

Optional Accessories—*Additional accessories are described at the conclusion of this oscilloscope section.*

DM64 Dual-Trace Bistable Storage Oscilloscope

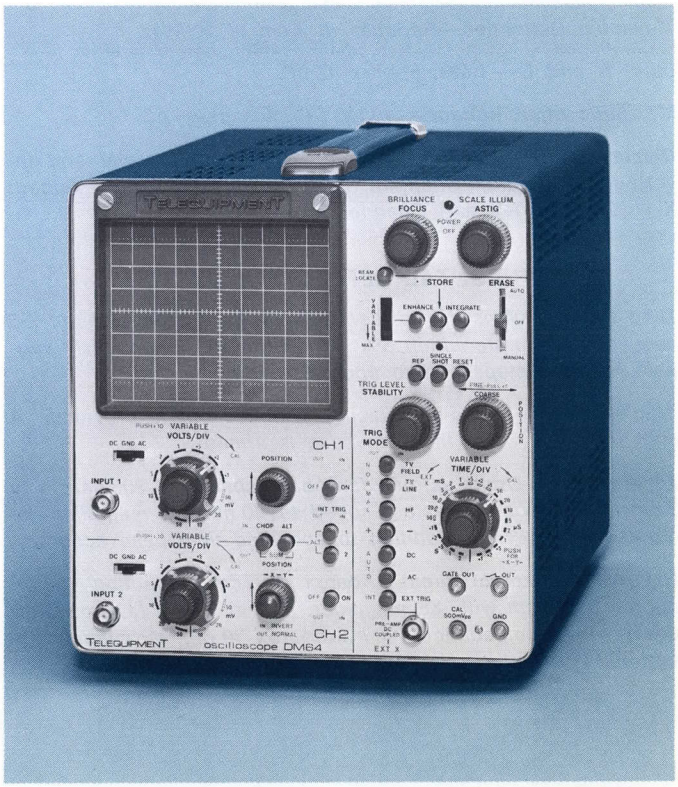
- **DC-to-10 MHz BANDWIDTH at 1 mV/CM**
- **BISTABLE STORAGE and CONVENTIONAL DISPLAYS**
- **CONVENIENT X-Y OPERATION**
- **DUAL TRACE**
- **8 x 10-cm VIEWING AREA**

The DM64 offers all the advantages of a conventional 10-MHz oscilloscope plus the added advantages of a bistable storage CRT. The storage CRT design is that used in the much-proven TEKTRONIX 564B Oscilloscope System. Through front panel controls, the storage writing speed of the DM64 can be increased from 25 cm/ms to 250 cm/ms. Solid-state design, using FET input circuitry, provides minimum drift and fast stabilization time.

A storage oscilloscope has the ability to store a CRT display in order that it may be observed for a period of time. This stored display may be instantly erased to make way for storage of a later event. By the flick of a switch, the instrument is converted to a normal display oscilloscope.

Storage oscilloscopes enable the user to make meaningful evaluations of slowly changing phenomenon that would appear not as a line, but as a slowly-moving dot on a conventional oscilloscope. Very rapidly changing "one-shot" events whose image would flash across the conventional oscilloscope screen too fast to be seen without elaborate camera equipment, are easily viewed using only the DM64.

The DM64 with the combination of conventional and bistable storage capabilities is priced low for easier affordability.



STORAGE CHARACTERISTICS

Writing Speed—*Normal writing speed is at least 25 cm/ms. Adjustment to at least 250 cm/ms in Enhanced Mode.*

Storage View Time—*Up to 1 hour.*

Erase Time—*Approx 0.25 second.*

Enhance Mode—*Controls single sweep capabilities of the storage CRT. Through adjustment of the front panel Enhance control, spot velocities of up to 250 cm/ms can be stored with minimal loss of resolution and contrast.*

Single-Shot Signals—*At slow or medium speeds, single-shot signals are easily stored for extended viewing time.*

Integrate Mode—*Increases the effective writing speed for repetitive fast signals with repetition rates that are too low for effective storage, but which may be too fast for satisfactory single-shot storage with enhancement.*

Auto Erase—*Display is automatically erased at the end of each sweep.*

VERTICAL AMPLIFIER

Bandwidth and Risetime—*DC-to-10 MHz (approx 3-dB down) at all deflection factors. Approximately 2 Hz low frequency 3-dB point when AC coupled. Risetime is 35 ns.*

Deflection Factor— *10 mV/cm to 50 V/cm in 12 calibrated steps (1-2-5 sequence), 1 mV/cm to 5 V/cm using X10 gain, all steps accurate within 5%. Uncalibrated, continuously variable between steps and to approx 125 V/cm.*

Maximum Deflection—*Reduces to 4 cm at 10 MHz.*

Input R and C— *1 MΩ, approx 47 pF.*

Maximum Input Voltage— *400 V DC plus peak AC.*

Display Modes—*Channel 1 only; Channel 2 (normal and inverted); Alternate; Chopped (approx 150-kHz rate); Added: X-Y (Channel 1-Y and Channel 2-X).*

HORIZONTAL DEFLECTION SYSTEM

Time Base— *100 ns/cm to 2 s/cm in 23 calibrated steps (1-2-5 sequence) accurate within 5%. Uncalibrated, continuously variable between steps and to approx 5 s/cm.*

Single-Sweep—*Single-shot facility with lockout is provided. A light indicates when the time base is armed.*

X5 Magnifier—*Operates over time base speeds of 200 ns/cm to 2 s/cm and extends fastest speed to 40 ns/cm; magnifier accurate within 2% in addition to specified time base accuracy.*

External Horizontal Input—*Approx 1 V/cm deflection factor, approx 0.2 V/cm with X5 magnifier. DC to 1 MHz (approx 3-dB down). Input impedance 100 kΩ, approx 30 pF. Max input voltage 400 V DC plus peak AC.*

X-Y OPERATION

Full Sensitivity X-Y— *10 mV/cm to 50 V/cm in 12 calibrated steps (1-2-5 sequence), 1 mV/cm to 5 V/cm using X10 gain; variables work on both channels, all steps accurate within 5%. Bandwidth is DC to at least 1 MHz (—3 dB). Phase difference between amplifiers is less than 1° at 10 kHz.*

TRIGGERING

Internal-External—*Triggers over a frequency range of DC to approx 1 MHz. Automatic trigger operates from 40 Hz to 1 MHz.*

Trigger Level Selection—*Occurs at any selected level on the waveform over a frequency range of DC to approx 1 MHz.*

High Frequency Sync—*Synchronizes the sweep over a frequency range of approx 1 MHz to at least 10 MHz.*

TV—*Triggers on TV field or line.*

Sensitivity—*Internal, 0.2 cm deflection to 1 MHz, except HF is 1 cm deflection to 10 MHz. External, 250 mV P-P to 15 V P-P; input impedance 100 kΩ, approx 30 pF.*

CRT

TEKTRONIX CRT—*Flat faced bistable storage tube with beam deflection blanking and an accelerating potential of 3.5 V. The viewing area is 8 x 10 cm. Phosphor similar to P1 is used. Z-axis modulation to CRT grid requires approx 20 V for perceptible modulation, AC coupling, 50 V maximum.*

Graticule—*External; variable edge lighting.*

OTHER CHARACTERISTICS

Voltage Calibrator—*Line frequency squarewave, 500 mV P-P, accurate within 2%.*

Front Panel Outputs—*Sawtooth out —10 V, DC coupled, 47 kΩ minimum load.*

Gate Out—*Positive-going rectangular pulses, 0.5 V peak, lasting for the duration of the sweep.*

Power Requirements— *100 to 125 VAC in 5-V steps or 200 to 250 VAC in 10-V steps, 48-400 Hz. The instrument specifications apply over a ±10% power line variation for the step chosen. Power consumption is approx 100 VA.*

Cooling—*Convection*

Temperature Limits, Ambient— *—5° C to +40° C operating; —25° C to +70° C non-operating.*

Dimensions and Weights		
Height	*9.5 in*	*24 cm*
Width	*8.3 in*	*21 cm*
Depth	*14.5 in*	*37 cm*
Net Weight	*27.5 lb*	*12.5 kg*

Included Accessories—*Three coax BNC connectors.*

Optional Accessories—*Additional accessories are described at the conclusion of this oscilloscope section.*

- **10-MHz BANDWIDTH at 10 mV/CM**
- **ALL SOLID-STATE DESIGN**
- **TRIGGERED SWEEP**
- **6 x 10-cm VIEWING AREA**

The 54 Series is available in two different configurations. The D54 is a dual-trace version and the S54 is the single-trace configuration.

The D54 and S54A may be ordered also in a rackmount configuration.

VERTICAL DEFLECTION

***Bandwidth and Risetime**—DC to at least 10 MHz at 3-dB down. Low frequency 3-dB-down point with AC coupling is approx 2 Hz. 35-ns risetime.*

***Deflection Factor**— 10 mV/cm to 50 V/cm in 12 calibrated steps (1-2-5 sequence) accurate within 5%. Uncalibrated, continuously variable between steps and to approx 125 V/cm.*

***Display Modes (D54 only)**—Channel 1 only; Channel 2 only; Alternate; Chopped (approx 100 kHz rate).*

***Input R and C**— 1 MΩ, approx 40 pF (D54); 1 MΩ, approx 47 pF (S54).*

***Maximum Input Voltage**— 400 V (DC + peak AC).*

***Maximum Deflection**— 6 cm up to 5 MHz, decreasing to 3 cm at 10 MHz.*

HORIZONTAL DEFLECTION

***Time Base**— 200 ns/cm to 2 s/cm in 22 calibrated steps (1-2-5 sequence) accurate within 5%. Uncalibrated, continuously variable between steps and to at least 5 s/cm.*

***X5 Magnifier**—Operates over full time base, increases fastest sweep rate to approx 40 ns/cm, uncalibrated.*

***Horizontal Amplifier**—DC to at least 1 MHz at 3-dB down, 0.6 V/cm to 3 V/cm deflection factor. Input impedance 1 MΩ, approx 30 pF. 400 V (DC + peak AC).*

***Time Base Sweep Modes**—Auto Trigger (sweep free runs in absence of triggering signal); Normal Trigger.*

TRIGGER

***Modes**—Automatic or Normal (Trigger Level). Automatic operation useful between 50 Hz to 1 MHz. Trigger level selection occurs at any level on the input waveform over a frequency range of approx 40 Hz to 4 MHz. High Frequency synchronizes the sweep over a frequency range of approx 1 MHz to at least 10 MHz.*

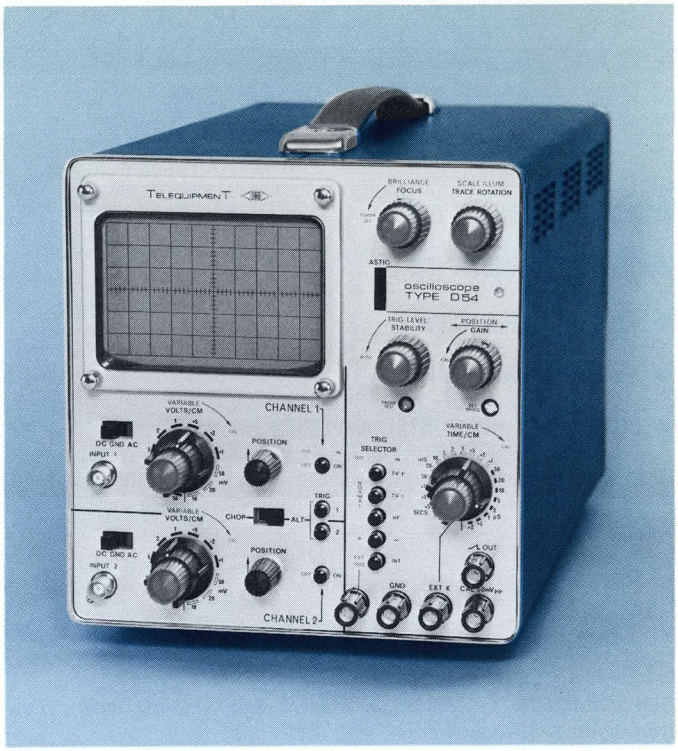
***TV**—Triggers on TV field or line.*

***Sensitivity**—Internal, 2 mm deflection to 1 MHz, increasing to 1 cm at 4 MHz. External, 1.5 V P-P up to 15 V P-P. Input impedance 100 kΩ, approx 10 pF.*

CRT

***CRT**— 5-inch rectangular tube; 6 x 10-cm display area, each div is 1 cm. P31 phosphor normally supplied, P7 and P11 optional without extra charge. 4-kV accelerating potential. Z-axis input AC coupled to CRT grid; noticeable modulation at normal intensity requires approx 20 V.*

***Graticule**—External, variable edge lighting.*



OTHER CHARACTERISTICS

***Voltage Calibrator**—Line-frequency squarewave, 50 mV P-P accurate within 2%.*

***Signal Outputs**—Positive-going sawtooth (1-35 V, DC coupled, 30-kΩ minimum load). Probe test approx 0.5 V.*

***Power Requirements (D54 and S54A(R))**—Quick-change line voltage selector provides these ranges: 100 to 125 VAC in 5-V steps or 200 to 250 VAC in 10-V steps. 48 to 440 Hz; 32 VA (D54), 24 VA (S54).*

***Cooling**—Convection*

Dimensions and Weights

Type	Height		Width		Depth		Net Weight	
	in	cm	in	cm	in	cm	lb	kg
D54	9.75	24.7	8.3	21.0	17.5	44.5	20	9.1
D54R	5.25	13.3	19.0	48.3	17.5	44.5	24	11.3
S54A	9.25	23.5	6.8	17.2	16.5	41.9	17	8.0
S54AR	5.25	13.3	19.0	48.3	17.5	44.5	22	10.0

***Included Accessories**—Two coax BNC connectors.*

***Optional Accessories**—Additional accessories are described at the conclusion of this oscilloscope section.*

ORDERING INFORMATION

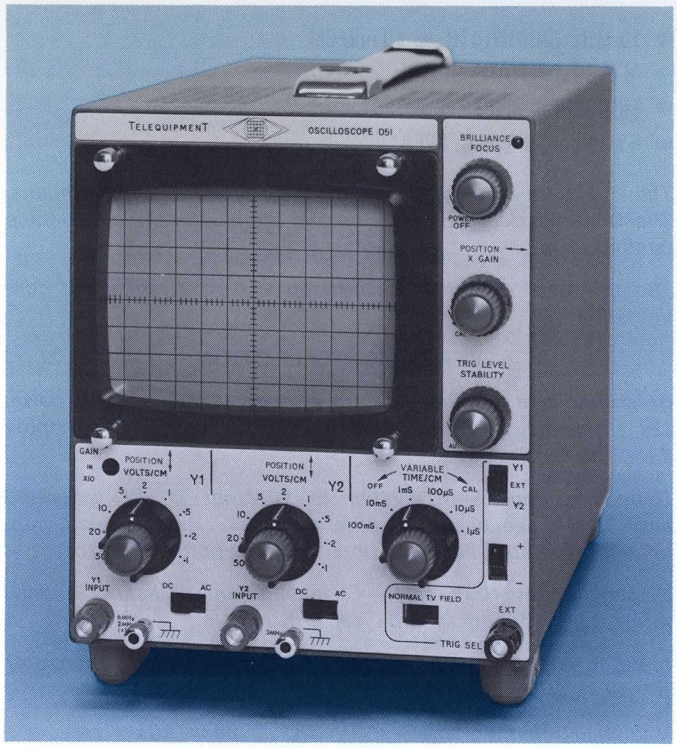
D54 OSCILLOSCOPE, Order D54

D54R OSCILLOSCOPE, Order D54R (Rack Model)

S54A OSCILLOSCOPE, Order S54A

S54AR OSCILLOSCOPE, Order S54AR (Rack Model)

- **6-MHz BANDWIDTH (CH 1)**
- **3-MHz BANDWIDTH (CH 2)**
- **VERSATILE TRIGGERING**
- **6 x 10-cm VIEWING AREA**
- **DC COUPLED HORIZONTAL AMPLIFIER**



VERTICAL DEFLECTION

Bandwidth (CH 1)—*DC to at least 6 MHz at 3-dB down. Low frequency 3-dB-down point with AC coupling is 2 Hz.*

Bandwidth (CH 2)—*DC to at least 3 MHz at 3-dB down. Low frequency 3-dB-down point with AC coupling is 2 Hz.*

Deflection Factor— *100 mV/cm to 50 V/cm in 9 calibrated steps (1-2-5 sequence) accurate within 5%. Channel 1 front-panel control selects X10 gain for deflection factors from 10 mV/cm to 5 V/cm at DC to at least 2 MHz bandwidth at 3-dB down.*

Input R and C— *1 MΩ, approx 47 pF.*

Maximum Input Voltage— *400 V (DC + peak AC).*

Maximum Deflection— *6 cm for each trace.*

HORIZONTAL DEFLECTION

Time Base— *1 µs/cm to 100 ms/cm in 6 calibrated steps (1-10 sequence). Uncalibrated, continuously variable between steps and to at least 1 s/cm. Accuracy within 5% over center 8 cm.*

X2 Magnifier (Approx)—*Operates over full time base, increases fastest sweep rate to 0.75 µs/cm.*

Time Base Sweep Modes—*Auto Trigger (sweep free runs in absence of triggering signals), Normal Trigger.*

Horizontal Amplifier—*DC to at least 500 kHz at 3-dB down, approx 100 mV/cm deflection factor. Input R and C, 1 MΩ, approx 100 pF.*

TRIGGER

Modes—*Automatic or Normal (Trigger Level). Automatic operation useful on repetitive signals up to 1 MHz. Trigger Level selection allows triggering at any level on the input waveform.*

TV—*TV field.*

Sensitivities—*Internal, Automatic operation 5 mm and for Trig Level 2 mm. External, 3 V P-P.*

CRT

CRT— *5-inch tube; 6 x 10-cm display area, each div is 1 cm. P31 phosphor normally supplied, P11 and P7 optional without extra charge. 3.5-kV accelerating potential. Single gun with beam-splitter forms 2 electron beams, common horizontal deflection plates. Z-axis input AC coupled to CRT grid; noticeable modulation at normal intensity with approx 20 V.*

Graticule—*External, detachable filters improve contrast under high ambient light conditions.*

OTHER CHARACTERISTICS

Signal Outputs (Rear Panel)—*A negative-going sawtooth (14 V P-P, DC coupled, minimum load 100 kΩ).*

Power Requirements—*Quick-change line voltage selector provides these ranges: 90-130 VAC and 200-240 VAC in 5-V steps. 50 to 400 Hz, 70 VA.*

Cooling—*Convection.*

Dimensions and Weights		
Height	*8 in*	*20.3 cm*
Width	*7 in*	*18.0 cm*
Depth	*18 in*	*45.0 cm*
Net Weight	*20 lb*	*9.1 kg*

Included Accessories—*Test leads.*

Optional Accessories—*Additional accessories are described at the conclusion of this oscilloscope section.*

- **3-MHz BANDWIDTH**
- **VERSATILE TRIGGERING**
- **8 x 10-cm VIEWING AREA**
- **DC COUPLED HORIZONTAL AMPLIFIER**

VERTICAL DEFLECTION

Bandwidth—*DC to at least 3 MHz at 3-dB down. Low frequency 3-dB-down point with AC coupling is 2 Hz.*

Deflection Factor— *100 mV/cm to 50 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 5%.*

Input R and C— *1 MΩ, approx 47 pF.*

HORIZONTAL DEFLECTION

Time Base— *1 μs/cm to 100 ms/cm in 6 calibrated steps (1-10 sequence). Uncalibrated, continuously variable between steps and to at least 1 s/cm. Accuracy within 5% over center 8 cm (10% over first and last 2 cm in 1 μs/cm range).*

X2 Magnifier (Approx)—*Operates over full time base.*

Time Base Sweep Modes—*Auto Trigger (sweep free runs in absence of triggering signal). Normal Trigger.*

Horizontal Amplifier—*DC to at least 500 kHz at 3-dB down. Uncalibrated, continuously variable to approx 100 mV/cm deflection factor at mid-position, range approx 2:1. Input R and C, 1 MΩ, approx 100 pF.*

TRIGGER

Modes—*Automatic or Normal (Trigger Level). Automatic operation useful on signals from 50 Hz to 1 MHz. Trigger Level selection allows triggering at any level on the input waveform.*

TV—*TV field*

Sensitivities—*Internal, 5 mm. External, 3 V P-P.*

Ext Trig Input Impedance— *1 MΩ, approx 30 pF.*

CRT

CRT— *5-inch tube; 8 x 10-cm display area, each div is 1 cm. P31 phosphor normally supplied, P11 and P7 optional without extra charge. 3-kV accelerating potential. Z-axis input coupled to the CRT grid; noticeable modulation at normal intensity with approx 15 V.*

Graticule—*External, detachable green filter improves contrast under high ambient light conditions.*

OTHER CHARACTERISTICS

Signal Outputs (Rear Panel)—*A negative-going sawtooth (20 V P-P, DC coupled, minimum load 100 kΩ).*

Power Requirements—*Quick-change line voltage selector provides these ranges: 91-130 VAC and 200-240 VAC in 5-V steps. 50 to 400 Hz, 58 VA.*

Cooling—*Convection*

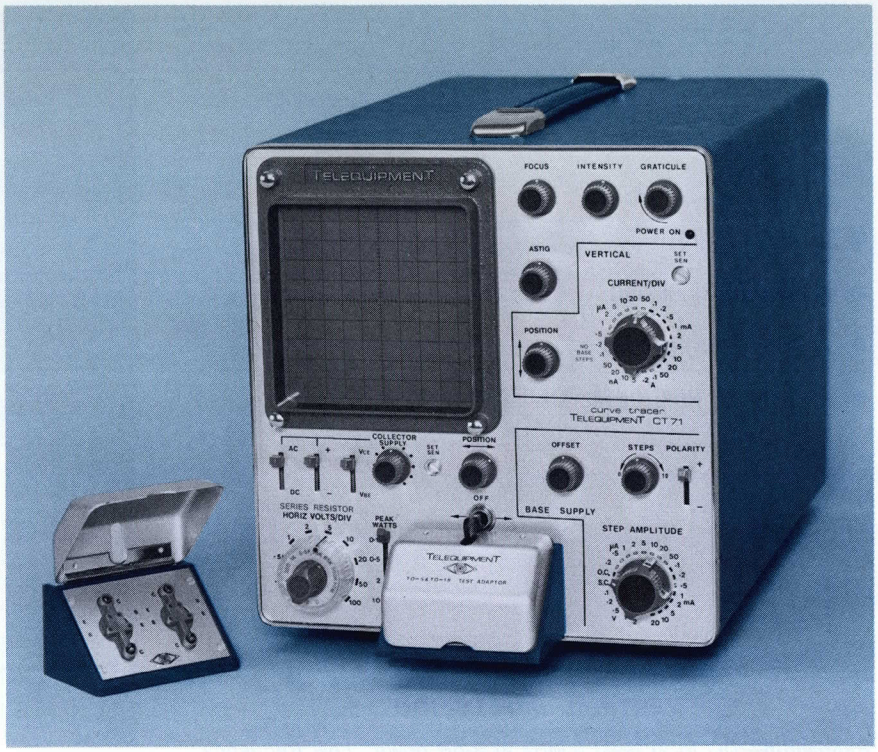
Dimensions and Weights		
Height	*8 in*	*20.3 cm*
Width	*7 in*	*17.8 cm*
Depth	*15 in*	*38.1 cm*
Net Weight	*16 lb*	*7.3 kg*

Included Accessories—*Test leads*

Optional Accessories—*Additional accessories are described at the conclusion of this oscilloscope section.*

- **DISPLAYS DYNAMIC CHARACTERISTIC CURVES of TRANSISTORS, DIODES and FETS**
- **DIRECT COMPARISON of SIMILAR DEVICES**
- **DC COLLECTOR SUPPLY to 1 kV**
- **LEAKAGE MEASUREMENTS to 5 nA**
- **STEP GENERATOR RANGE to 200 mA or 20 V**
- **10 x 10 cm VIEWING AREA**

The Telequipment CT71 Curve Tracer is a dynamic semiconductor tester which displays characteristic curves of transistors, FETs and diodes. The CT71 is easy to operate and is well suited for student lab use and industrial applications which require less versatility than is provided by higher performance curve tracers.



COLLECTOR SUPPLY

Voltage Range—*Peak voltage continuously variable from 0 to 1 kV, selected by horizontal volts/div switch. Polarity is selectable, either positive or negative. The collector voltage repetition rate is twice the line frequency or DC, selectable.*

Peak Current— *2 A; the peak power settings are 0.1, 0.5, 2 and 10 watts. Maximum power available is 15 watts.*

Collector Series Resistances—*Selectable: 0 Ω, 2.5 Ω, 10 Ω, 65 Ω, 250 Ω, 1 kΩ, 6.5 kΩ, 25 kΩ, 85 kΩ, 500 kΩ and 1.7 MΩ, all within 5%.*

BASE STEP GENERATOR

Current Range— *0.2 μA/step to 20 mA/step in 16 steps (1-2-5 sequence).*

Voltage Range— *0.1 V/step to 2 V/step in 5 steps (1-2-5 sequence). Two positions are also available on the step amplitude switch to either open circuit the base allowing it to float, or short circuit the base to the emitter.*

Steps/Offset—*The steps are adjustable from 0 to 10 steps, selectable either positive or negative depending upon polarity switch setting. A continously variable offset with a ±1 step range is provided. Steps and offset are available on collector current ranges greater than 10 μA/div.*

VERTICAL AMPLIFIER

Collector Current Range—*Provides collector current from 5 nA/div to 0.2 A/div in 24 steps (1-2-5 sequence).*

HORIZONTAL AMPLIFIER

Collector Voltage Range—*Selectable collector or base voltage from 0.1 V/div to 100 V/div in 10 steps (1-2-5 sequence).*

OTHER CHARACTERISTICS

Two test fixtures are provided, which plug into the front of the CT71, providing a means of connecting collector supply output, step generator output and display amplifiers to the device under test.

One fixture provides the following sockets: 1 pair of TO-18s in a source-drain-gate configuration, 1 pair of TO-18s in an emitter-base-collector configuration, 1 pair of TO-5s in an emitter-base-collector configuration. Two sets of 3 terminals in the emitter-base-collector configuration are also provided.

The other fixture provides two pairs of power transistor sockets (a pair of TO-66s and a pair of TO-3s) in an emitter-base-collector configuration.

Safety Interlock—*The protective cover cannot be opened until the supplies to the test fixtures are interrupted.*

Cathode-Ray Tube— *5½-inch CRT with a 10 x 10-cm viewing area. 2.5-kV accelerating potential with P31 phosphor. A front-panel control varies the graticule illumination intensity.*

Power Requirements—*Voltage settings are 100 V to 125 V in 5-V steps. 200 V to 250 V in 10-V steps. 48 Hz to 63 Hz line frequency, 37 VA.*

Dimensions and Weights		
Height	9.6 in	24.5 cm
Width	9.3 in	23.5 cm
Depth	19.0 in	48.3 cm
Net Weight	25.0 lb	11.7 kg

Included Accessories—*Two test fixtures.*

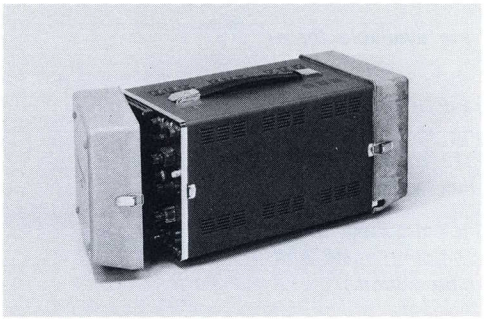
OPTIONS and OPTIONAL ACCESSORIES

OPTION 1

Factory option is available for the D67, D66, DM64 and D54 which adds hooks to the side panels to accommodate the optional protective panel cover.

For D67, D66, DM64 and D54, with Option 1

PROTECTIVE PANEL COVER



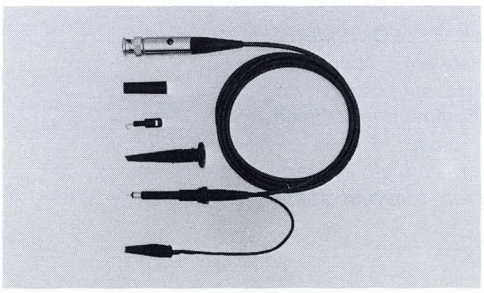
The panel cover protects the D67, D66, D54 or DM64 during transport and storage. The cover fits either the front or rear of the oscilloscope. A slot in the cover is provided for the power cord. This cover fits only instruments with Option 1 (side panels with hooks) or instruments converted with the new side panel accessory.
Order 016-0513-01

SIDE PANELS

D67, D66, D54, DM64 side panel conversion kit, to accommodate the optional protective panel cover. Conversion kit includes one side panel and hardware. For both sides order two conversion kits.
Order 390-0207-03

PROBES

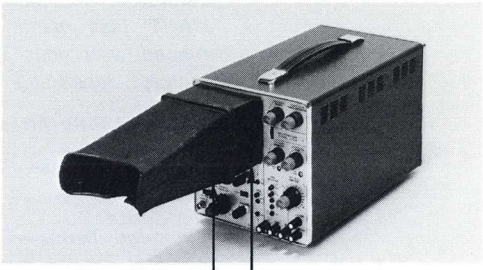
The probe's function is to provide a medium for the transfer of signal energy from a source to the input of the oscilloscope without disturbing the source and without changing the structure of the transferred energy. The attenuator probe will change the sensitivity range of the oscilloscope to which it is connected. A passive probe contains only passive elements and is an extension of the oscilloscope's passive vertical input attenuator. The HZ25 is recommended for all TELEQUIPMENT oscilloscopes.



HZ25 10X Passive Probe Package, BNC
Order 010-0263-01 4.5 ft

Order 010-0263-03 6.0 ft

VIEWING HOOD



For D54, S54A and S54U
Tubular light shield
Order 016-0293-01

Separate rubber eyepiece for above
Order 016-0292-00

COAXIAL ADAPTERS

BNC Female to Dual Banana
Order 103-0128-00

UHF Female to Dual Banana
Order 103-0129-00

BNC Female to UHF Male
Order 103-0015-00

PROTECTIVE CARRYING CASE

The protective canvas carrying case is padded and provides protection during transport or storage. The carrying case is designed to accept the D67, D66, D54 or DM64 instruments with their optional protective panel covers.
Order 016-0538-00

PROTECTIVE COVERS

The protective canvas cover is heavily padded and provides protection during transport or storage. The cover slips easily over the top of the instrument and has a slot which allows access to the instrument handle.

For S54A, S51B and S51E
Order 016-0138-00

For D51, D52, D54, DM64, D65, D66, D67 and S52
Order 016-0143-00

For D53A
Order 016-0144-00

GENERAL and ORDERING INFORMATION

Ordering

TELEQUIPMENT products are manufactured in England. They are sold and serviced in the United States by Tektronix, Inc. Tektronix, Inc. maintains a warehouse inventory of TELEQUIPMENT instruments, accessories and parts. Orders can be placed with your Tektronix Field Offices or directly with the factory, depending on terms of sale.

Terms of Sale Arranged Through Your Tektronix Field Engineer

Standard Terms—Payment due within 30 days of the shipping date.

Extended Terms—Terms of 60 to 120 days are available for a nominal service charge.

Security Agreement—An advance of at least 10% of sales price is required. Installment terms covering the balance of the contract price are available for 6, 12, 18 or 24 months. All products carry the standard Tektronix, Inc. warranty.

Terms of Sale on Direct Order Form—*Use attached order forms or your company purchase order. (Shipping costs and state and local taxes, where applicable, will be added.)*

Cash—Cash, check or money order.

Net 30 days—See order form.

Your Tektronix Field Office can arrange Convenient short-term use of TELEQUIPMENT Products

Rental Agreement—This plan makes TELEQUIPMENT products available to customers at a competitive cost and solves the critical maintenance problems frequently faced by users of rented equipment.

Lease Agreement—All new instruments are available under this program. Accessories and parts are not available unless they are associated with the products being leased. Minimum lease is $1,000.

Shipment

Prices and quotations are FOB Beaverton, Oregon. Shipment will be made via most economical method (typically TEK-AIR and UPS). If a specific carrier or mode is specified, shipment will be made at full valuation unless your order instructs differently.

Maintenance

Sections of the manual provided with each TELEQUIPMENT product describe circuit operation and adjustment. Your Tektronix Field Engineering Office will process all orders for TELEQUIPMENT parts and service. Field Engineering Offices and Service Centers are listed on the rear cover. Please include instrument type number, serial number, and all descriptive information contained in the manual when ordering spare parts.

Warranty

All TELEQUIPMENT instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be discussed with your Tektronix Field Engineer.

Factory direct shipments are warranted under the same conditions as described above. If the instrument is damaged because of the shipment, the packing material must be saved. Call the delivering carrier immediately for an inspection and notify your Tektronix Field Engineer.

FIRST CLASS
PERMIT NO. 61
BEAVERTON, OREGON

BUSINESS REPLY MAIL

No postage necessary if mailed in the United States

Postage will be paid by

TEKTRONIX, INC.
P.O. Box 500 Del. Stn. 55-755
Beaverton, Oregon 97005

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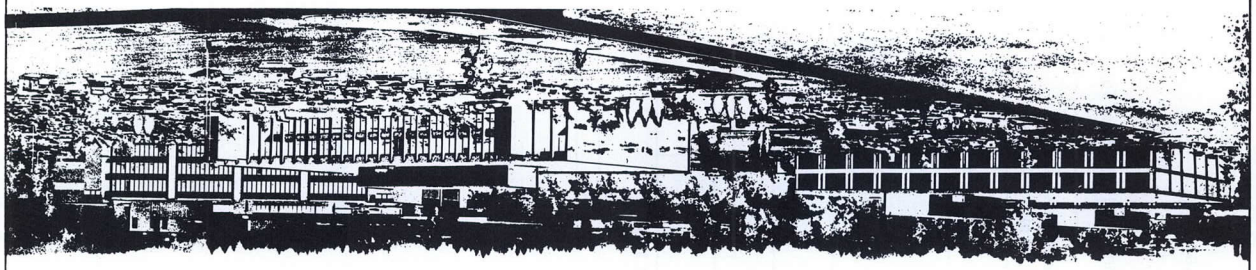

TEKTRONIX, INC. *order form*

P. O. Box 500, Beaverton, Oregon 97005 Telex: 36-0485 Phone: (503) 644-0161

Please Print Name, Address, and Phone Number

Name _____

Address _____

City _____ *State* _____

Zip Code _____ *Phone Number* _____

Ship to Another Address? Give directions here

_____

_____

_____

_____

Quantity Ordered	Stock Number	Description	Unit Price	Total

Total State and local taxes (where applicable)

Shipping charges (see facing page)

Total Amount

EASY WAYS TO BUY:

☐ *Cash—check or money order enclosed*

☐ *Company Purchase Order enclosed*

☐ *Net 30 Days—Please indicate bank information below.*

Bank name _____

Branch Location or Phone Number _____

Terms: All prices are FOB Beaverton, Oregon. Prices, Specifications and Conditions of Sale are subject to change without notice.

Signature _____ *Date* _____

PRODUCT PRICES, TRANSPORTATION & HANDLING

Type	Sales Price	Weight	11 Western States	Central & Eastern States
CT71	$ 795	35#	$ 9.00	$13.00
D83	800	42*	12.00*	15.00*
V4 Amplifier	295	4	4.00	4.00
V3 Amplifier	295	4	4.00	4.00
S2A Time Base	400	3	4.00	4.00
D67	975	34	9.00	13.00
D66	795	32	8.00	12.00
DM64	1095	34	9.00	13.00
D54	595	27	7.00	10.00
D54R	640	37	9.00	13.00
S54A	450	24	6.00	9.00
S54AR	495	34	8.00	13.00
D51	375	29	7.00	11.00
S51B	245	25	6.00	10.00

CAMERAS

C5	185	5	3.00	4.00
C59G	415	10	4.00	5.00
C59P	450	11	5.00	6.00
C59R	485	11	5.00	6.00

ACCESSORIES

010-0263-01	22.00	1	.75	.75
010-0263-03	22.00	1	.75	.75
016-0138-00	16.50	3	1.50	1.50
016-0143-00	12.50	3	1.50	1.50
016-0144-00	22.75	5	2.00	2.00
016-0292-00	10.00	1	.75	.75
016-0293-01	10.00	1	.75	.75
016-0513-01	9.50	3	1.50	1.50
016-0538-00	17.50	8	2.00	3.00
103-0015-00	2.25	1	.75	.75
103-0128-00	2.65	1	.75	.75
103-0129-00	2.25	1	.75	.75
390-0207-03	10.00	4	1.50	1.50

*Combined shipping weight and handling charges of D83, S2A and V4 or V3.

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