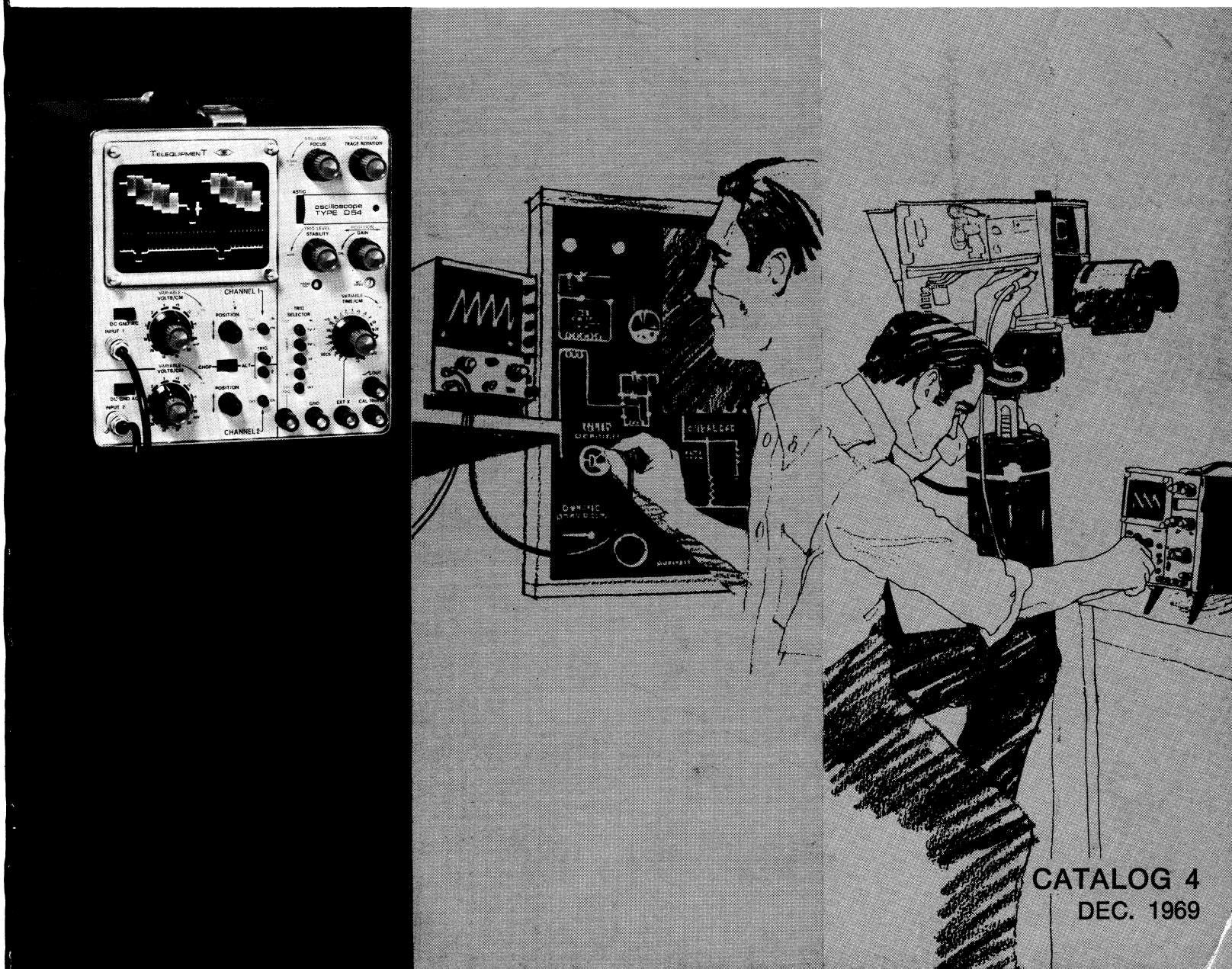
TELEQUIPMENT®

oscilloscopes



CATALOG 4
DEC. 1969

General and Ordering Information

Telequipment products are manufactured in England. They are sold and serviced throughout the world by a network of distributors and commercial representatives, who normally maintain an inventory of Telequipment instruments, accessories and parts.

ORDERING

Orders should be placed with the Telequipment distributor/representative in your country—see listing on the inside rear cover. In countries where there is no Telequipment representative, please address your enquiries and orders to—

TEKTRONIX LIMITED
P.O. Box 48
St. Peter Port
Guernsey, Channel Islands (U.K.)

SERVICE

If you require replacement parts, a warranty question resolved, or other help, please contact the distributor/representative from whom you ordered your instrument.

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 distributor.

Telequipment Ltd. is a member of the Tektronix group of companies.

Information in this catalog supersedes all previously published material. Specifications subject to change.

Brief Description of Non Plug-In Oscilloscopes

SINGLE-BEAM OSCILLOSCOPES

TYPE	Vertical Amplifier				Time Base		Horizontal Amplifier	CRT	Power Requirements	Page
	Bandwidth	Min Defl Factor	Attenuation	RC	Range	Trigger				
MINOR	DC-30 kHz	100 mV/div	Continuously variable gain control	1 MΩ 30 pF	3 position 100 ms-100 μs/div plus variable	Automatic	3 Hz-50 kHz	5 cm x 5 cm 600 V	Connected for 200/250 V 50 Hz, can be factory wired for options	5
S51B	DC-3 MHz	100 mV/cm	9 calibrated V/cm positions, freq comp attenuator, accuracy ±5%	1 MΩ 47 pF	1 μs/cm to 100 ms/cm in 6 calibrated steps, accuracy ±5%, variable between steps	INT, EXT, TV ± Auto or Trig Level	DC-500 kHz, 100 mV/cm, 1 MΩ, 100 pF	8 cm x 10 cm 3 kV P31	Connected for 240 V, can be wired for operation at following voltages 90 120 220 100 130 225 105 200 230 110 210 240 115 215 50-400 Hz 58 VA	6
S51E Educational version						INT ± Auto or Trig Level				6
	Equal X and Y Amplifiers									
S52 Equal XY	DC-3 MHz DC-1 MHz	100 mV/cm 10 mV/cm	9 calibrated V/cm positions, freq comp attenuator, accuracy ±5%	1 MΩ 44 pF	1 μs/cm to 0.5 s/cm in 18 calibrated steps, accuracy ±5%, variable between steps	INT, EXT, TV, HF ± Auto or Trig Level	10 Hz to 400 kHz	10 cm x 10 cm 2.4 kV P31	Connected for 250 V, can be switched for operation at 100 to 125 V in 5-V steps or 200 to 250 V in 10-V steps, 50-400 Hz, 90 VA	7
S54A*	DC-10 MHz	10 mV/cm	9 calibrated V/cm positions, freq comp attenuator, accuracy ±5%, var atten	1 MΩ 47 pF	0.2 μs/cm to 2 s/cm in 22 calibrated steps, accuracy ±5%, variable between steps	INT, EXT, HF, TV ± Auto or Trig Level	DC-1 MHz 0.6-3 V/cm, 1 MΩ, 30 pF, 400 V max	6 cm x 10 cm 4 kV P31 Edge Lit Graticule	Connected for 250 V, can be switched for operation at 100 to 125 V in 5-V steps or 200-250-V in 10-V steps, 48-440 Hz, 24† VA	8 & 9
D54 Dual Trace				1 MΩ 40 pF						12 & 13
S54U AC, DC Battery Powered				1 MΩ 47 pF					Will operate on 190 to 260 VAC or 95 to 130 VAC, 48 to 440 Hz, 34 VA; an external DC source of 11.5 to 30 V, 18 W; or internal rechargeable batteries.	8 & 9

DOUBLE-BEAM OSCILLOSCOPES

TYPE	Vertical Amplifiers				Time Base		Horizontal Amplifier	CRT	Power Requirements	Page
	Bandwidth	Min Defl Factor	Attenuation	RC	Range	Trigger				
D51	DC-6 MHz DC-2 MHz DC-3 MHz	100 mV/cm 10 mV/cm 100 mV/cm	9 calibrated V/cm positions, freq comp attenuator, accuracy ±5%	1 MΩ 47 pF	1 μs/cm to 100 ms/cm in 6 calibrated steps, accuracy ±5%, variable between steps	INT Y_1, INT Y_2, EXT, TV ± Auto or Trig Level	DC-500 kHz 100 mV/cm 1 MΩ, 100 pF	6 x 10 cm 3.5 kV P31 Double Beam[1]	Connected for 240 V, can be wired for operation at 90 to 130 V or 200 to 240 V in 5-V steps, 50-400 Hz, 70 VA	10
D52	DC-6 MHz DC-1 MHz	100 mV/cm 10 mV/cm	9 calibrated V/cm positions, freq comp attenuator, accuracy ±5%	1 MΩ 44 pF	1 μs/cm to 0.5 s/cm in 18 calibrated steps, accuracy ±5%, variable between steps	INT Y_1, INT Y_2, EXT, TV, HF ± Auto or Trig Level	10 Hz-400 kHz	6 x 10 cm 3.6 kV P31 Double Beam[1]	Same as S52	11

[1]Single gun with beam splitter to provide two electron beams that pass through a common set of horizontal plates and separate vertical deflection plates.

*Rackmount version also available. †32 VA for D54.

TELEQUIPMENT

Brief Description of Plug-In Oscilloscopes

SINGLE-BEAM MAIN FRAME
(Additional Characteristics on page 14)

TYPE	CRT	POWER REQUIREMENTS
S43	5 x 10 cm 3.5 kV P31[1] Edge-lit Illum Grat	Connected for 240 V, can be switched for operation at following voltages: 90 115 210 230 100 120 215 240 105 130 220 110 200 225 50-400 Hz 100 VA

TIME BASES FOR TYPE S43

TYPE	RANGE	TRIGGER	HORIZ AMP
TS41	1 μs/cm—0.5 s/cm in 18 calibrated steps, accuracy ±5%	INT, EXT, TV, HF ± Auto or Trig Level	10 Hz-350 kHz 250 mV/cm-2.5 V/cm 170 kΩ 30 pF
TS42	0.5 μs/cm—5 s/cm in 22 calibrated steps, accuracy ±5%, variable between steps	INT, EXT, TV, HF ± Auto or Trig Level, Single Shot with lockout	DC-500 kHz 100 mV/cm-1 V/cm 1 MΩ 30 pF

DOUBLE-BEAM MAIN FRAMES
(Additional Characteristics on pages 15 & 16)

TYPE	CRT	POWER REQUIREMENTS
D43 D43R 7-in Rack-mount 19-in wide	6 x 8 cm 3.5 kV P31[2] Edge-lit Illum Grat	Connected for 240 V, can be switched for operation at following voltages: 90 115 210 230 100 120 215 240 105 130 220 110 220 225 50-400 Hz 132 VA

TIME BASES FOR TYPE D43 and D43R

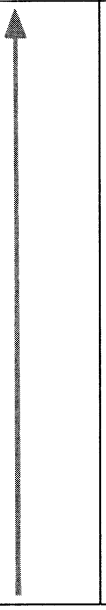
TYPE	RANGE	TRIGGER	HORIZ AMP
TD41	Same as TS41	Same as TS41 except Int Y_1 and Y_2	Same as TS41
TD42	Same as TS42	Same as TS42 except Int Y_1 and Y_2	Same as TS42

TYPE	CRT	POWER REQUIREMENTS
D53A with Type TD51 Time Base	8 x 10 8.5 kV P31[3] Edge-lit Illum Grat	Connected for 250 V, can be switched for operation at 100 to 125 V in 5-V steps, or 200 to 250 V in 10-V steps. 50-400 Hz 200 VA

RANGE	TRIGGER	HORIZ AMP
0.5 μs/cm—5 s/cm in 22 calibrated steps, accuracy ±5%, Sweep delay ranges: 250 μs-5 ms and 2.5 ms-50 ms	Int Y_1, Int Y_2, Ext, TV, HF, Line ± Auto or Trig level, Single shot	DC-1 MHz 500 mV/cm-5 V/cm 1 MΩ 30 pF

PLUG-IN VERTICAL AMPLIFIERS

One Plug-In Vertical Amplifier used in Single-Beam Main Frame

Type A General Purpose	Type B Differential	Type C-2 High Gain	Type G Differential	Type J High Gain Wide Band
				

Two Plug-In Vertical Amplifiers used in Double-Beam Main Frames

Type A General Purpose	Type B Differential	Type C-2 High Gain	Type G Differential	Type J High Gain Wide Band
DC to 15 MHz to 100 mV/cm, DC to 800 kHz to 10 mV/cm, 9 calibrated V/cm positions, frequency compensated attenuator, accuracy ±5%, 1 MΩ, 40 pF See Page 17	DC to 75 kHz to 1 mV/cm, CMRR (1-50 mV/cm) 10,000:1 to 1 kHz to 1,000:1 at 75 kHz, (100 mV/cm-5 V/cm) 1000:1 to 1 kHz to 100:1 at 10 kHz, 12 calibrated V/cm positions, frequency compensated attenuator, accuracy ±5%, 1 MΩ, 40 pF See Page 17	DC to 15 MHz to 100 mV/cm, DC to 800 kHz to 10 mV/cm, 3 Hz to 100 kHz to 100 μV/cm, approx 30 μV max hum and noise. 9 calibrated V/cm positions, frequency compensated attenuator, accuracy ± 5%, 1 MΩ, 40 pF See Page 17	DC to 10 MHz to 20 mV/cm, DC to 500 kHz to 2 mV/cm. CMRR—1000:1 at 1 MHz to 50:1 at 10 MHz. 9 calibrated V/cm positions, frequency compensated attenuator, accuracy ±5%, 1 MΩ, 40 pF See Page 18	DC to 25 MHz to 100 mV/cm, DC to 5 MHz to 10 mV/cm, 3 Hz to 100 kHz to 100 μV/cm, 9 calibrated V/cm positions, frequency compensated attenuator, accuracy ±5%, 1 MΩ, 20 pF, 60 pF See Page 18

Type D53A accepts all Plug-In units listed above plus:

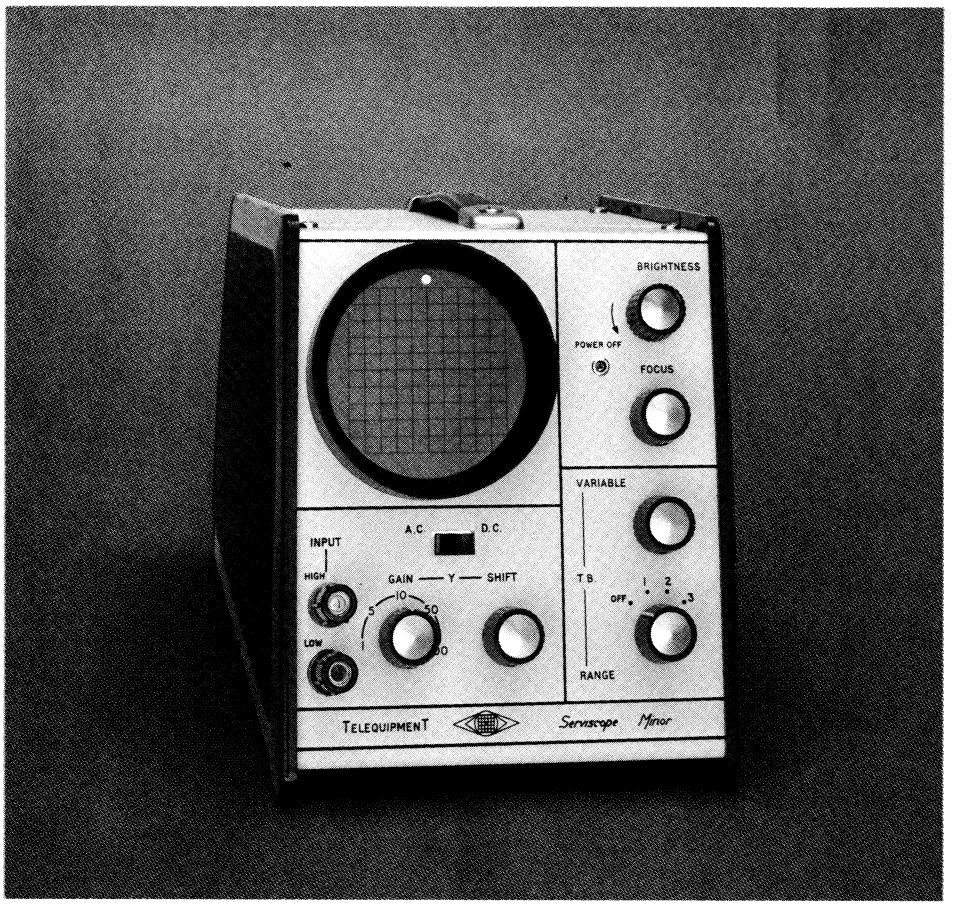
		See Page 16		Similar to J unit except it has 0.2 μs signal delay included in plug-in unit; DC to 10 MHz, 10 mV/cm. See Page 18

NOTES

[1]Single Beam

[2]Dual Gun with common horizontal deflection plates and separate vertical deflection plates

[3]Single Gun with Beam Splitter to provide 2 electron beams, common horizontal separate vertical plates



MINOR

DC-30 kHz Bandwidth

Low Cost

Extremely Light Weight

5 x 5 cm Viewing Area

Very Small Size

Operational Simplicity

General Description and Characteristics

Vertical Amplifier

Bandwidth—DC to 30 kHz (approx 3-dB down) with DC coupling. 2 Hz to 30 kHz with AC coupling.

Deflection factor—100 mV/div, continuously variable gain control. Range 100 mV/div to 50 V/div.

Input RC—1 megohm paralleled by approx 30 pF. Input terminals are fully insulated from case and ground.

Maximum Deflection—10 div, (5 cm).

External Horizontal Input

Deflection factor—Approximately 1.1 V/div.

Bandwidth—3 Hz-50 kHz (approx 3-dB down).

Input RC—1 megohm paralleled by approx 100 pF.

Time Base

Sweep Rates—Preset, approximately 100 μs/div, 1 ms/div and 10 ms/div. Uncalibrated, continuously variable between steps to approx 100 ms/div.

Trigger Circuit

Automatic—Sweep free runs below 10 Hz but triggers on any signal up to approx 30 kHz.

Cathode-Ray Tube

2 ¾-inch CRT operating at 600-V accelerating potential.

Viewing area—5 cm vertical by 5 cm horizontal, divided into 0.5-cm divisions (10 x 10 divisions). P31 phosphor only supplied. No optional phosphors available. A detachable green filter improves contrast under high ambient light conditions.

Power Requirements

Wired for 200-250 V operation. 50-100 Hz frequency range, 25 VA. Can be made available to meet other line voltage requirements. Please quote exact voltages required when ordering.

Convection Cooling

Included Standard Accessories

Instruction manual (070-0725-00)

Plastic Shatterproof Case

Dimensions and Weights

Height	6 in	15.2 cm
Width	5 ¾ in	14.6 cm
Depth	9 in	22.8 cm
Net weight	5 lb	2.3 kg
Shipping weight	≈7 lb	3.2 kg

TELEQUIPMENT

S51B

DC-3 MHz Bandwidth

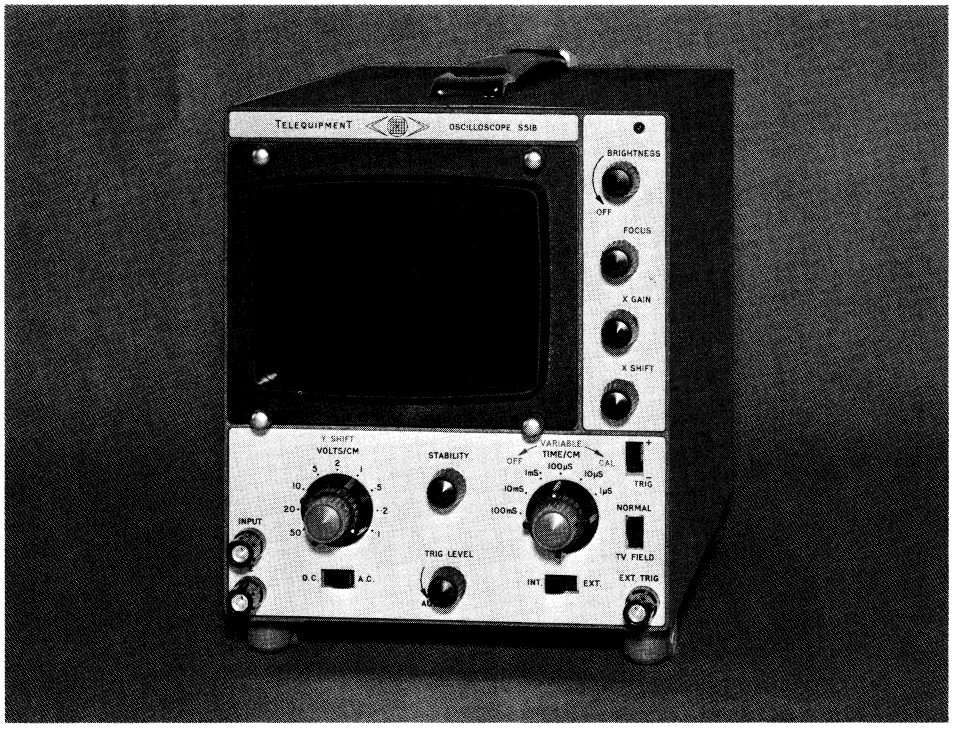
Versatile Triggering Including TV Field

8 cm x 10 cm Viewing Area

Flat-Face CRT

Small Size & Light Weight

DC Coupled Horizontal Amplifier



General Description and Characteristics

Vertical Amplifier

Bandwidth—DC to 3 MHz (approx 3-dB down) with DC coupling, 2 Hz to 3 MHz with AC coupling.
Deflection Factor—100 mV/cm to 50 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 5%.
Overshoot—Less than 2%.
Input RC—1 megohm paralleled by approx 47 pF.
Maximum Deflection—8 cm.

Horizontal Amplifier

Deflection Factor—Uncalibrated, continuously variable, approx 100 mV/cm at mid-position, range approx 2:1.
Bandwidth—DC to 500 kHz (approx 3-dB down).
Input RC—1 megohm paralleled by approx 100 pF.
Horizontal Positioning—Positions any portion of expanded trace on screen.

Time Base

Sweep Rates—1 μs/cm to 100 ms/cm in 6 calibrated steps (1-10 sequence). Uncalibrated, continuously variable between steps and to approx 1 s/cm.
Horizontal Expansion — Approx X2, continuously variable.
Time Measurement Accuracy—Within ±5% over center 8 cm (±10% over first and last 2 cm in 1 μs/cm range).
DC Coupled Unblanking.

Triggering

Automatic—Sweep free runs at a slow speed but triggers on any signal up to approx 1 MHz.
Trigger level selection—Triggering occurs at any level on the input waveform.
TV Field—Triggering occurs from the field pulses of a composite television signal.
Slope—Plus or minus.
Source—Internal or external.
Sensitivity—5 mm of signal internally, 3 V peak to peak externally.
External Trigger Input Impedance—1 megohm paralleled by approx 30 pF.

Cathode-Ray Tube

5-inch flat-faced CRT operating at 3-kV accelerating potential. Viewing area 8 cm vertical by 10 cm horizontal. P31 phosphor normally supplied, P7 optional. A detachable green filter improves contrast under high ambient light conditions.

Rear Connectors

Sweep Output—Approx 20 V peak to peak at a DC level of approx 30 V.
Horizontal Amplifier Input.
Z-axis Modulation to Cathode of CRT (0.01 μF and 1 megohm).

Power Requirements

Wired for 115 V or 240-V operation. For best performance, transformer taps should be soldered to the voltage terminals most nearly corresponding to line voltage. Voltage terminals are 90, 100, 105, 110, 115, 120, 130, 200, 210, 215, 220, 225, 230, 240 V. 50 to 400 Hz line frequency range, 58 VA.

Convection Cooling

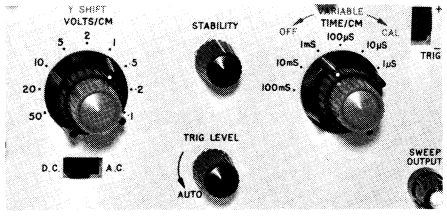
Dimensions and Weights

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
Shipping weight	22 lb	10.0 kg

S51E

DC-3 MHz Bandwidth

Simplified Triggering



The S51E is a simplified educational version of the S51B, in which the NORMAL/TV Field switch and the INT/EXT switch are deleted, providing just an internal trigger source. A front-panel SWEEP OUTPUT terminal replaces the EXT TRIG terminal on the S51B. Other characteristics are identical in both oscilloscopes.

Included Standard Accessories

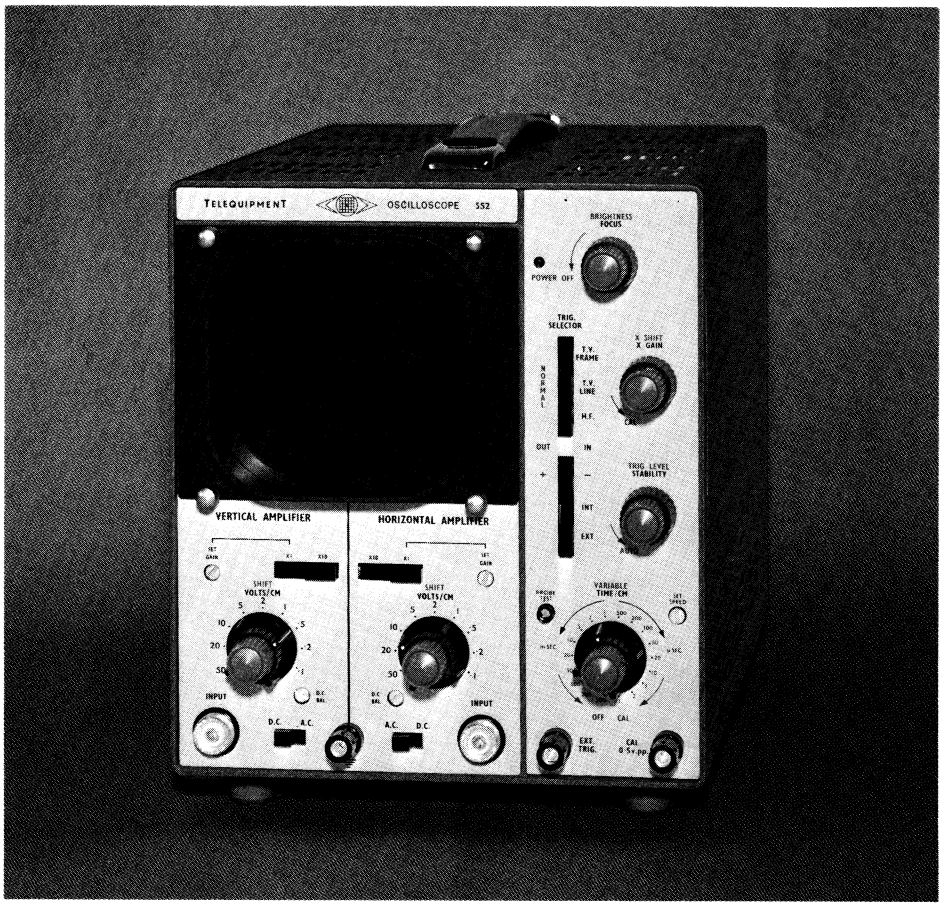
Instruction manual (070-0792-00); test leads (012-0129-00).

Optional Accessories

10X Passive Probe, UHF, order 010-0234-00

Coaxial Adapter, order 103-0085-00

Viewing Hood, order 016-0251-00



TELEQUIPMENT

S52

Matched X and Y Amplifiers

DC-3 MHz Bandwidth

Versatile Triggering Including TV Line and Frame

10 cm x 10 cm Viewing Area

Flat-Face CRT

5% Timing Accuracy

General Description and Characteristics

Vertical and Horizontal Amplifiers

Bandwidth—DC to 3 MHz (approx 3-dB down) in 100 mV/cm to 50 V/cm range (X1). DC to 1 MHz (approx 3-dB down) in 10 mV/cm to 5 V/cm range (X10). Input can be AC or DC coupled.

Deflection Factor—100 mV/cm to 50 V/cm or 10 mV/cm to 5 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 5%. Front-panel control selects (X1 or X10) appropriate range.

Overshoot—Less than 2%.

Phase Difference in X-Y Mode—$\leq 1°$ at 2 MHz for 100 mV/cm to 50 V/cm (X1), $\leq 1°$ at 10 kHz for 10 mV/cm to 5 V/cm (X10).

Input RC—1 megohm paralleled by approx 44 pF.

Maximum Deflection—10 cm.

Time Base

Sweep Rates—1 μs/cm to 500 ms/cm in 18 calibrated steps (1-2-5 sequence), accurate within 5%. Uncalibrated, continuously variable between steps.

Horizontal Expansion — Approx X10, continuously variable. Trace expands symmetrically from center of screen. Any portion of expanded trace positionable on screen.

Sweep Amplifier Bandwidth—10 Hz to 400 kHz (approx 3-dB down).

Triggering

Automatic—Sweep free runs at a low speed in the absence of a signal but triggers on any signal up to approx 1 MHz.

Trigger Level Selection—Triggering occurs at any level on the input waveform.

High Frequency Sync—1 MHz to 10 MHz synchronization.

TV frame or line.

Slope—Plus or minus.

Sources—Internal or external.

Cathode-Ray Tube

5-inch flat-faced CRT operating at 2.4-kV accelerating potential. Viewing area 10 cm vertical by 10 cm horizontal. P31 phosphor normally supplied, P7 optional. A detachable green filter improves contrast under high ambient light conditions.

Voltage Calibrator

Line frequency square wave, 0.5 V ± 2% peak to peak.

Rear Connectors

Sweep output, Z-axis modulation to CRT, horizontal amplifier input.

Power Requirements

For best performance, rear-panel quick-change connections to the transformer taps should be set to the voltage settings most nearly corresponding to the actual line voltage. Voltage settings are 100, 105, 110, 115, 120, 125, 200, 210, 220, 230, 240, 250 V. 50 to 400 Hz line frequency, 90 VA.

Convection Cooling

Dimensions and Weights

Height	9¼ in	23.4 cm
Width	8½ in	20.6 cm
Depth	15 in	38.1 cm
Net weight	24 lb	10.9 kg
Shipping weight	31 lb	14.1 kg

Included Standard Accessories

Instruction manual (070-0793-00); two UHF adapters (103-0091-00); two UHF coax connectors (131-0647-00).

Optional Probe

10X Passive Probe, UHF, order 010-0234-00

Viewing Hood, order 016-0251-00

TELEQUIPMENT

S54A/S54U

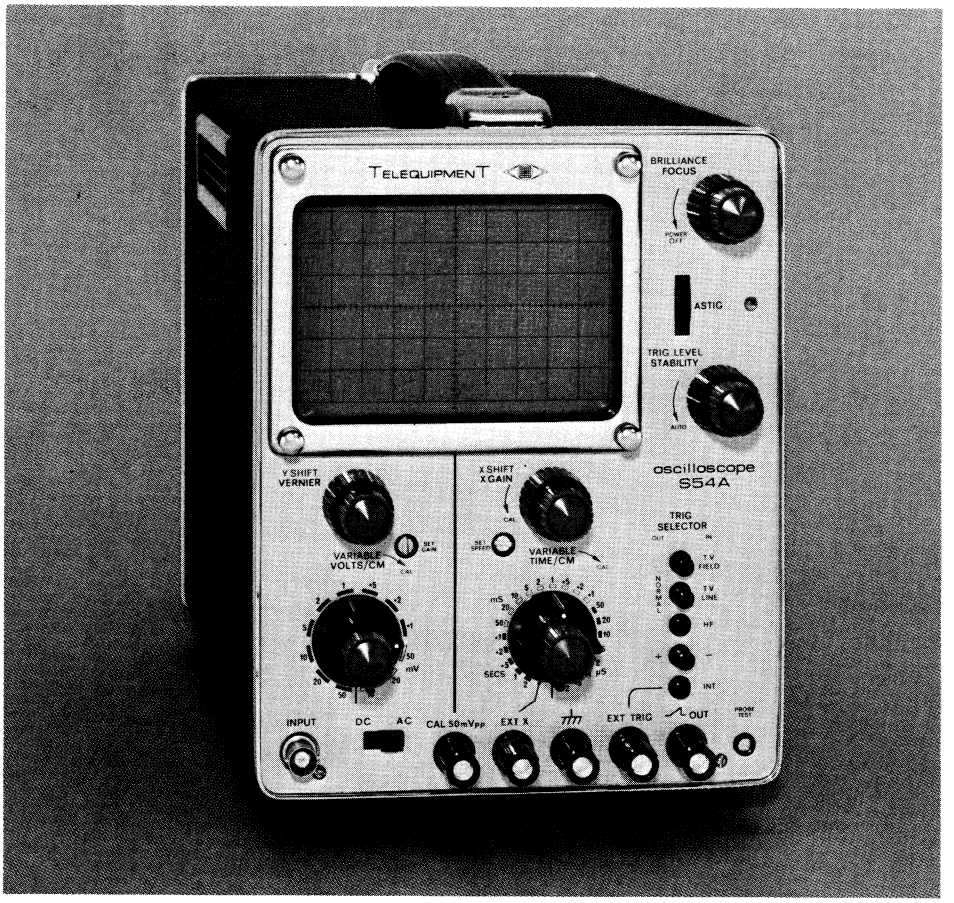
All Solid-State Design

FET Input

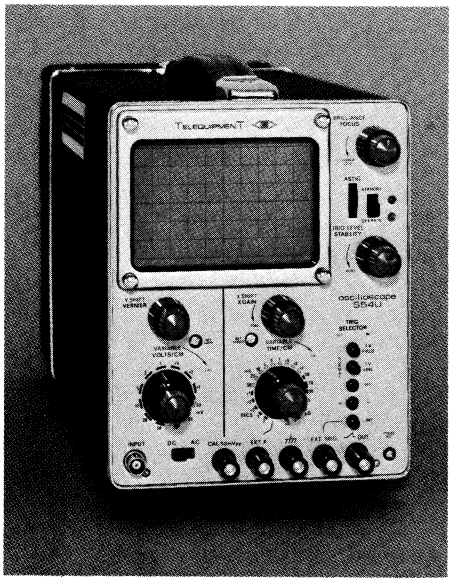
DC-to-10 MHz Bandwidth at 10 mV/cm

Triggered Sweep

Flat-Face Rectangular CRT with 6 x 10-cm Illuminated Graticule



TYPE S54A AC POWERED

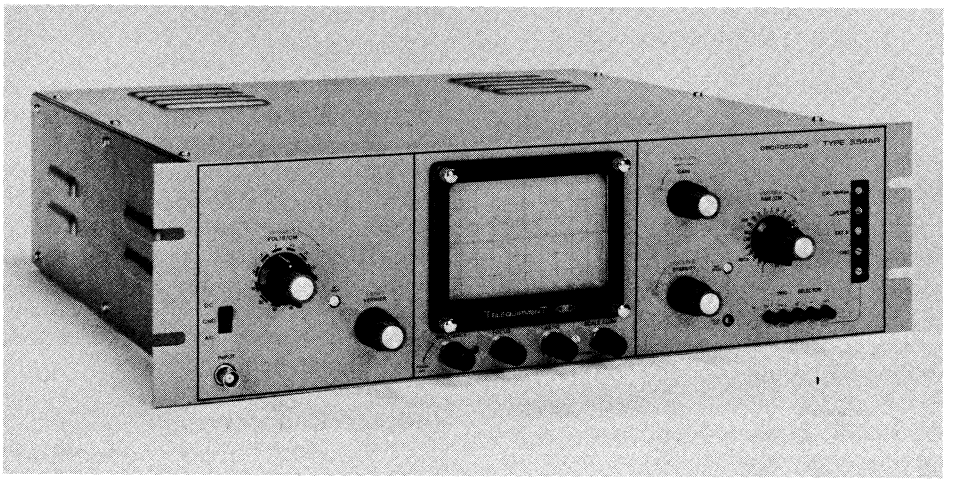


TYPE S54U
AC, DC, BATTERY POWERED

The S54 Series represents a new standard of performance for low-priced oscilloscopes. Features which serve to make the oscilloscopes a true measurement device, such as wide bandwidth, calibrated vertical and horizontal step attenuators and triggered sweep operation, are incorporated through solid-state circuitry. Other features, such as variable controls, probe calibration outputs, illuminated graticule and TV field or line triggering, make the instrument easier to use and more versatile.

The Type S54A and S54AR operate from the AC line, the Type S54U operates from internal batteries, an external DC source, or from the AC line.

A dual-trace version of the Type S54A is also available, see the Type D54 on page 12.



The Type S54AR is a rackmount version of the Type S54A. It is electrically identical to the bench model, but mechanically designed to require only 5¼ inches of rack height in a standard 19-inch rack.

VERTICAL AMPLIFIER

Bandwidth and Risetime

DC to 10 MHz (approx 3-dB down), 35-ns risetime.
Input can be AC or DC coupled. ≈2-Hz low frequency 3-dB point when AC coupled.

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.

Maximum Deflection

6 cm up to 5 MHz, decreasing to 3 cm at 10 MHz.

Input RC

1 megohm paralleled by approx 47 pF.

Maximum Input Voltage

400 V DC plus peak AC.

TIME BASE

Sweep Rates

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 approx 5 s/cm.

Horizontal Expansion

Uncalibrated to approx X5, increasing max sweep to ≈ 40 ns/cm.

Horizontal Amplifier

DC to 1 MHz (approx 3-dB down) 0.6 V/cm-to-3 V/cm deflection factor. Input impedance 1 megohm paralleled by approx 30 pF. 400 V DC + peak AC.

TRIGGERING

Automatic

Triggers over a frequency range of approx 50 Hz to 1 MHz.

Trigger Level Selection

Triggering occurs at any level on the input waveform over a frequency range of approx 10 Hz to 4 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.

Slope

Plus or minus.

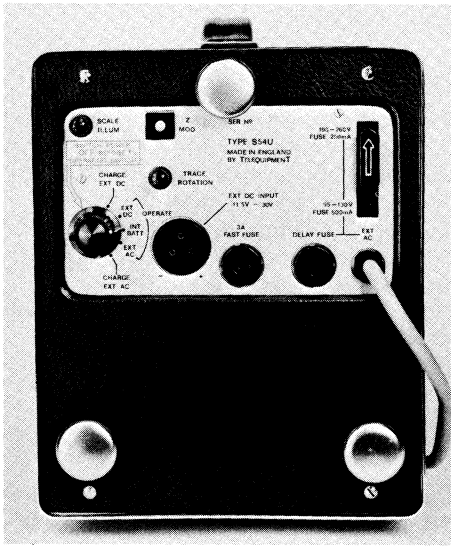
Requirements

Internal, 2-mm deflection to 1 MHz, increasing to 1-cm at 4 MHz. External, 1.5 V peak to peak up to 15 V peak to peak. Input impedance 100 kΩ paralleled by approx 10 pF.

POWER OPTIONS

Type S54A and S54AR

100 to 125 VAC in 5-V steps or 200 to 250 VAC in 10-V steps, 48 to 440 Hz, approx 24 VA. Rear-panel quick-change transformer tap connections should be set to most nearly correspond with the actual line voltage.



Type S54U

Internal NiCd batteries provide 3 hours operation (30 hours operation in standby mode). Batteries can be recharged in 14 hours from an external DC or AC source.

An external DC source of 11.5 to 30 V can be used. Power consumption is 2.5 to 3.75 W for standby, 18 W maximum for operation or maximum recharge.

An external AC source of 95 to 130 VAC or 190 to 260 VAC, 48 to 440 Hz can be used. Power consumption is 7 to 12 VA for standby, 34 VA maximum for operation or maximum recharge.

OTHER CHARACTERISTICS

Cathode-Ray Tube

5-inch flat-faced rectangular CRT operating at 4-kV accelerating potential. Viewing area 6 cm vertical by 10 cm horizontal. P31 phosphor normally supplied, P7 and P11 optional. Z-axis modulation to grid of CRT requires approx 20 V. Variable-intensity illuminated graticule (when operated from AC line).

Voltage Calibrator

Line-frequency squarewave, 50 mV P-P accurate within 2%.

Front Panel Outputs

Sawtooth Out—1-35 V DC coupled, 30-kΩ minimum load.

Probe test—approx 0.5 V.

Convection Cooling

Dimensions and Weights

S54A	Height	9¼ in	23.5 cm
	Width	6¾ in	17.2 cm
	Depth	16½ in	41.9 cm
	Net weight	17 lb	8.0 kg
S54AR	Height	5¼ in	13.3 cm
	Width	19 in	48.3 cm
	Depth	17½ in	44.5 cm
	Net weight	22 lb	10.0 kg
S54U	Height	9¼ in	23.5 cm
	Width	6¾ in	17.2 cm
	Depth	18 in	45.7 cm
	Net weight	25 lb	11.3 kg

Included Accessories for S54A

Instruction manual (070-0962-00); coax BNC connector (131-0649-00).

Included Accessories for S54U

Instruction manual (070-0951-00); coax BNC connector (131-0649-00); DC input plug (134-0113-00).

Included Accessories for S54AR

Instruction manual (070-0962-00); two coax BNC connectors (131-0649-00).

Optional BNC Probe

10X Passive Probe BNC, order 010-0233-00

TELEQUIPMENT

D51

Dual Beam

DC-6 MHz Bandwidth (Ch 1)

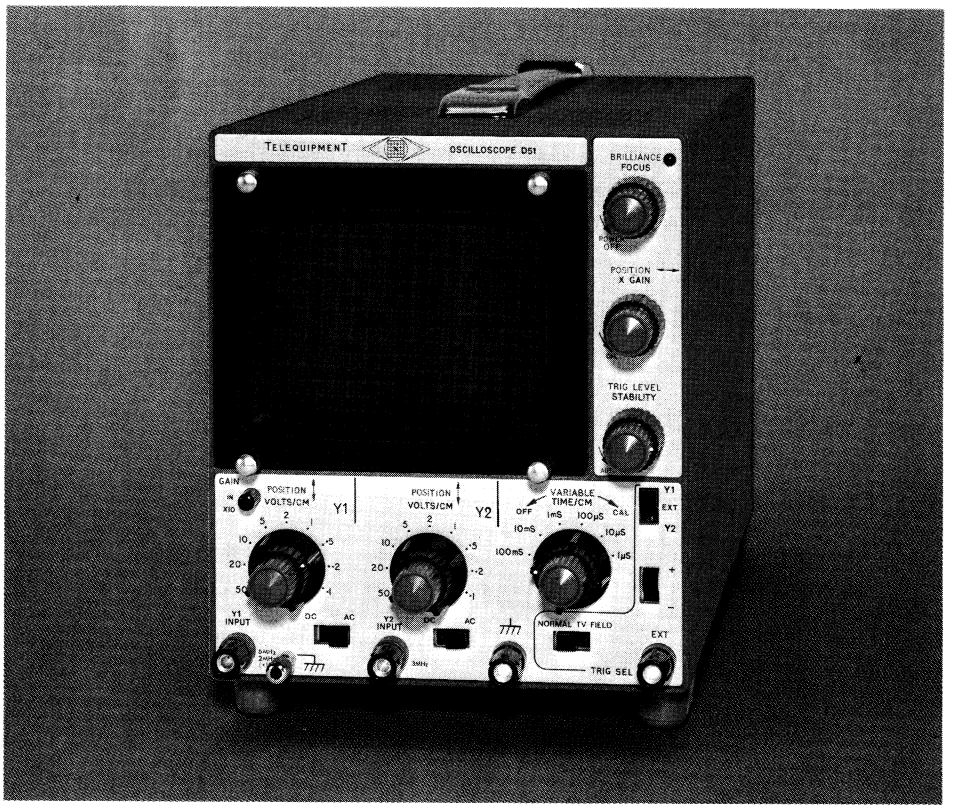
DC-3 MHz Bandwidth (Ch 2)

Versatile Triggering Including TV Field

6 x 10 cm Viewing Area

Flat-Face CRT

DC Coupled Horizontal Amplifier



General Description and Characteristics

Channel 1 Vertical Amplifier

Bandwidth—DC to 6 MHz (approx 3-dB down) with DC coupling, 2 Hz to 6 MHz with AC coupling.
Deflection Factor—100 mV/cm to 50 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 5%. Front-panel control selects X10 gain for deflection factors from 10 mV/cm to 5 V/cm at DC-to-2 MHz bandwidth (approx 3-dB down).
Input RC—1 megohm paralleled by approx 47 pF.
Maximum Input Voltage—400 V (DC + peak AC).
Maximum Deflection—6 cm for each trace.

Channel 2 Vertical Amplifier

Bandwidth—DC to 3 MHz (approx 3-dB down) with DC coupling, 2 Hz to 3 MHz with AC coupling.
Deflection Factor—100 mV/cm to 50 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 5%.
Input RC—1 megohm paralleled by approx 47 pF.
Maximum Input Voltage—400 V (DC + peak AC).
Maximum Deflection—6 cm for each trace.

Horizontal Amplifier

Bandwidth—DC to 500 kHz (approx 3-dB down).
Deflection Factor—approx 100 mV/cm.
Input RC—1 megohm paralleled by approx 100 pF.

Time Base

Sweep Rates—1 μs/cm to 100 ms/cm in 6 calibrated steps (1-10 sequence). Uncalibrated, continuously variable between steps and to approx 1 s/cm.
Horizontal Expansion — Approx X2, continuously variable, extends fastest sweep to 0.75 μs/cm.
Time Measurement Accuracy—Within ±5% over center 8 cm.

Triggering

Automatic—Repetitive signals up to 1 MHz.
Trigger Level Selection—Triggering occurs at any level on the input waveform.
TV Field.
Slope—Plus or minus.
Sources—Internal from either amplifier, or external.

Cathode-Ray Tube

5-inch flat-faced CRT operating at 3.5 kV accelerating potential, single gun with beam splitter forms 2 electron beams, common horizontal deflection plates. Viewing area 6 cm vertical by 10 cm horizontal. P31 phosphor normally supplied, P7 optional. Detachable filters improve contrast under high ambient light conditions.

Rear Connectors

Sweep Output—Z-axis modulation to CRT, horizontal amplifier input, ground.

Power Requirements

For best performance, connections to the transformer taps should correspond as closely as possible to the actual line voltage. Voltage terminals are 90, 95, 100, 105, 110, 115, 120, 125, 130, 200, 205, 210, 215, 220, 225, 230, 235, 240 V. 50 to 400-Hz line frequency range, 70 VA.

Convection Cooling

Dimensions and Weights

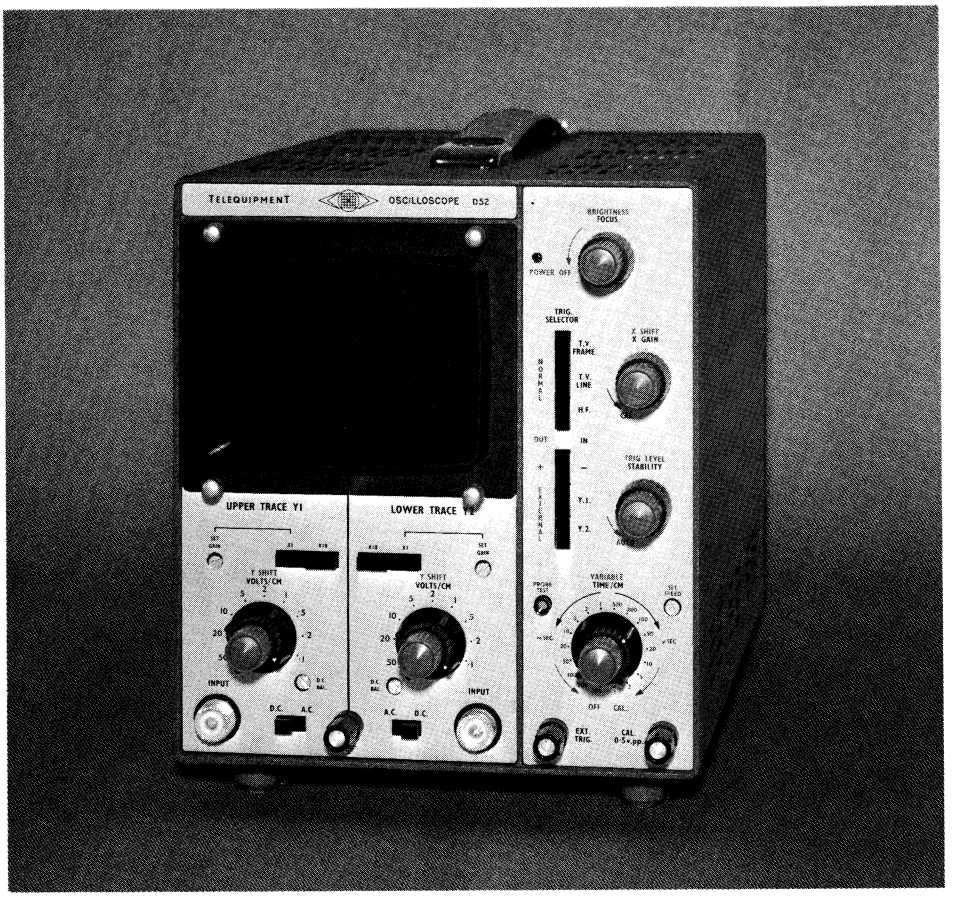
Height	9 in	23 cm
Width	7 in	18 cm
Depth	18 in	45 cm
Net Weight	20 lb	9.1 kg

Included Standard Accessories

Instruction manual (070-0993-00); test leads (012-0168-00).

Optional Accessories

10X Passive Probe, UHF, order 010-0234-00
Coaxial Adapter, order 103-0085-00
Viewing Hood, order 016-0251-00



TELEQUIPMENT

D52

Double Beams

DC-6 MHz Bandwidth

6 cm x 10 cm Viewing Area

Flat-Face CRT

Versatile Triggering Including TV Line and Frame

5% Timing Accuracy

Twin 10 mV (At 1 MHz) Vertical Amplifiers

General Description and Characteristics

Vertical Amplifiers

Bandwidth—DC to 6 MHz (approx 3-dB down) in 100 mV/cm to 50 V/cm range (X1). DC to 1 MHz (approx 3-dB down) in 10 mV/cm to 5 V/cm range (X10). Input can be AC or DC coupled.

Deflection Factor—100 mV/cm to 50 V/cm or 10 mV/cm to 5 V/cm in 9 calibrated steps (1-2-5 sequence), accurate within 5%. Front panel control selects (X1 or X10) appropriate range.

Overshoot—Less than 2%.

Input RC—1 megohm paralleled by approx 44 pF.

Maximum Deflection—6 cm for each trace.

Time Base

Sweep Rates—1 μs/cm to 500 ms/cm in 18 calibrated steps (1-2-5 sequence), accurate within 5%. Uncalibrated, continuously variable between steps.

Horizontal Expansion — Approx X10, continuously variable. Trace expands symmetrically from center of screen. Any portion of expanded trace positionable on screen.

Amplifier Bandwidth—10 Hz to 400 kHz (approx 3-dB down).

Triggering

Automatic—Sweep free runs at a low speed in the absence of a signal but triggers on any signal up to approx 1 MHz.

Trigger Level Selection—Triggering occurs at any level on the input waveform.

High Frequency Sync—1 MHz to 10 MHz synchronization.

TV frame or line.

Slope—Plus or minus.

Sources—Internal from either vertical amplifier or external.

Cathode-Ray Tube

5-inch flat-faced CRT operating at 3.6-kV accelerating potential, single gun with beam splitter plate forms 2 electron beams, common horizontal deflection plates, separate vertical deflection plates. Viewing area 6 cm vertical by 10 cm horizontal. P31 phosphor normally supplied, P7 optional. A detachable green filter improves contrast under high ambient light conditions.

Voltage Calibrator

Line frequency square wave, 0.5 V ±2%, peak to peak.

Rear Connectors

Sweep output, Z-axis modulation to CRT, horizontal amplifier input.

Power Requirements

For best performance, rear-panel quick-change connections to the transformer taps should be set to the voltage settings most nearly corresponding to the actual line voltage. Voltage settings are 100, 105, 110, 115, 120, 125, 200, 210, 220, 230, 240, 250 V. 50 to 400 Hz line frequency, 90 VA.

Convection Cooling

Dimensions and Weights

Height	9¼ in	23.4 cm
Width	8½ in	20.6 cm
Depth	15 in	38.1 cm
Net weight	24 lb	10.9 kg
Shipping weight	31 lb	14.1 kg

Included Standard Accessories

Instruction manual (070-0793-00); two UHF coax adapters (103-0091-00); two UHF coax connectors (131-0647-00).

Optional Probe

10X Passive Probe, UHF,
order 010-0234-00

Viewing Hood,
order 016-0251-00

TELEQUIPMENT

D54

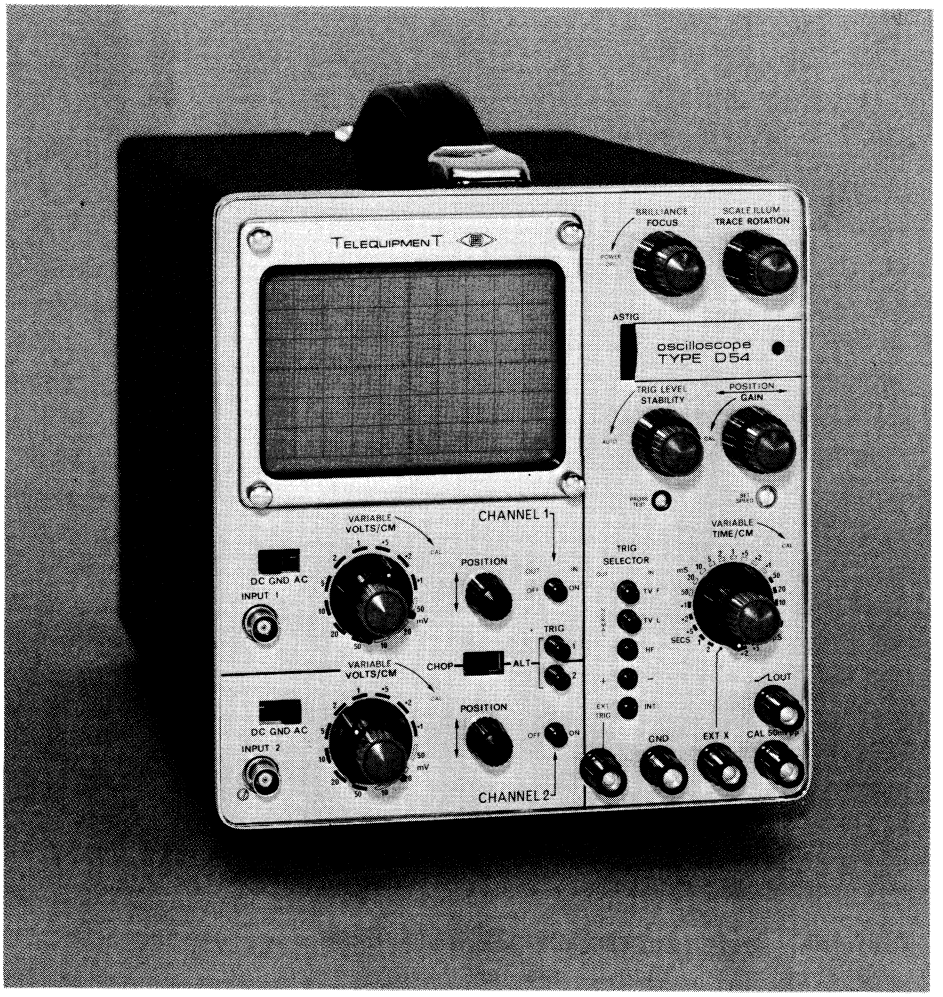
All Solid-State Design

Dual Trace, FET Inputs

DC-to-10 MHz Bandwidth at 10 mV/cm

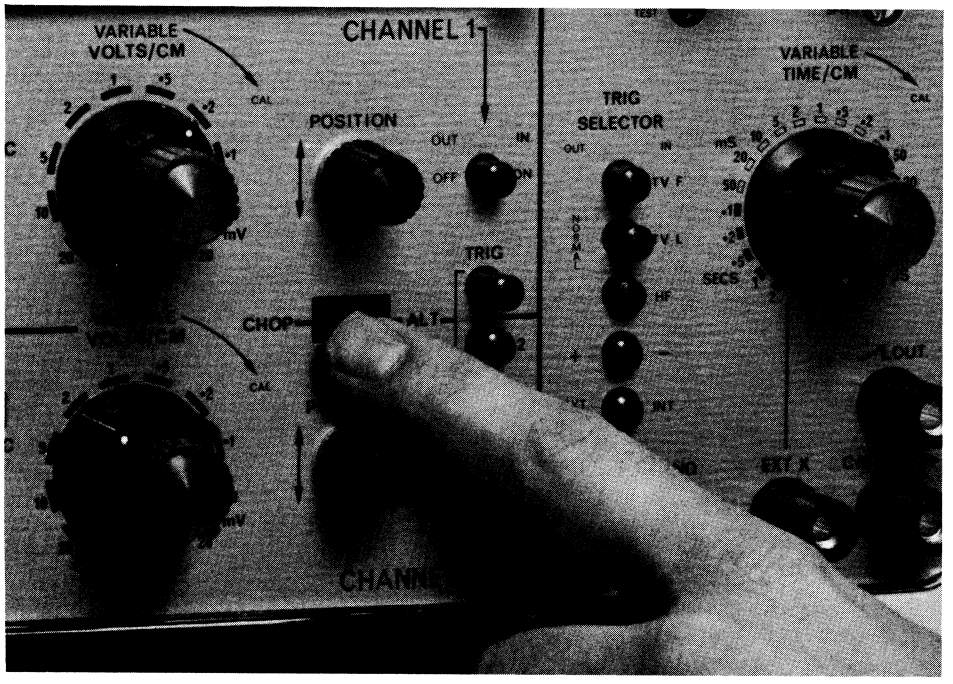
Triggered Sweep

Flat-Face Rectangular CRT with 6 x 10-cm Illuminated Graticule



FOUR DISPLAY MODES

Channel 1 only, Channel 2 only, chopped or alternate electronic switching between channels. Alternate: channels switched at the end of each trace during sweep retrace time. Chopped: successive 5-μs segments of each channel displayed at an approximate 100-kHz rate per channel. A switch permits selection of either channel 1 or channel 2 as the trigger source.



VERTICAL AMPLIFIER

Bandwidth and Risetime

DC to 10 MHz (approx 3-dB down), 35-ns risetime.

Input can be AC or DC coupled. ≈2-Hz low frequency 3-dB point when AC coupled.

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.

Maximum Deflection

6 cm up to 5 MHz, decreasing to 3 cm at 10 MHz.

Input RC

1 megohm paralleled by approx 40 pF.

Maximum Input Voltage

400 V DC plus peak AC.

TELEQUIPMENT

D54

TIME BASE

Sweep Rates

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 approx 5 s/cm.

Horizontal Expansion

Uncalibrated to approx X5, increasing max sweep to ≈40 ns/cm.

Horizontal Amplifier

DC to 1 MHz (approx 3-dB down) 0.6 V/cm-to-3 V/cm deflection factor. Input impedance 1 megohm paralleled by approx 30 pF. 400 V DC + peak AC.

TRIGGERING

Automatic

Triggers over a frequency range of approx 50 Hz to 1 MHz.

Trigger Level Selection

Triggering occurs at any level on the input waveform over a frequency range of approx 10 Hz to 4 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.

Slope

Plus or minus.

Requirements

Internal, 2-mm deflection to 1 MHz, increasing to 1-cm at 4 MHz. External, 1.5 V peak to peak up to 15 V peak to peak. Input impedance 100 kΩ paralleled by approx 10 pF.

OTHER CHARACTERISTICS

Cathode-Ray Tube

5-inch flat-faced rectangular CRT operating at 4-kV accelerating potential. Viewing area 6 cm vertical by 10 cm horizontal. P31 phosphor normally supplied, P7 and P11 optional. Z-axis modulation to grid of CRT requires approx 20 V. Variable-intensity illuminated graticule.

Voltage Calibrator

Line-frequency squarewave, 50 mV P-P accurate within 2%.

Front Panel Outputs

Sawtooth Out—1-35 V DC coupled, 30-kΩ minimum load.
Probe test—approx 0.5 V.

Power Requirements

For best performance rear-panel quick-change connections to the transformer taps should be set to the voltage settings most nearly corresponding to the actual line voltage. Voltage settings are 100, 105, 110, 115, 120, 125, 200, 210, 220 230 240 250 V. 48-to-440 Hz line frequency, 32 VA.

Convection Cooling

Dimensions and Weights

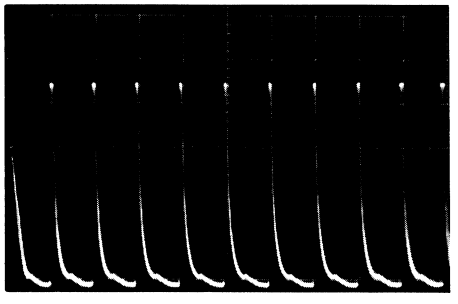
Height	9¾ in	24.7 cm
Width	8¼ in	21.0 cm
Depth	17½ in	44.5 cm
Net weight	20 lb	9.1 kg
Shipping weight	27 lb	12.2 kg

Included Standard Accessories

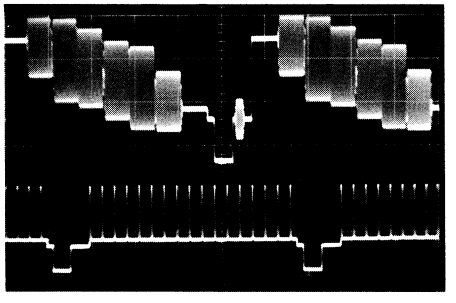
Instruction manual (070-0989-00); two coax BNC connectors (131-0649-00).

Optional BNC Probe

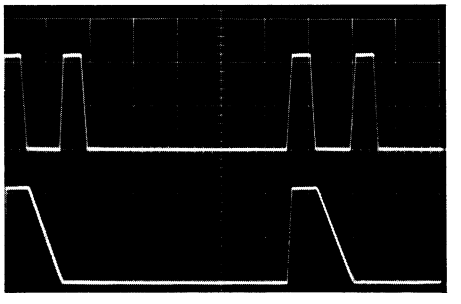
10X Passive Probe BNC, order 010-0233-00



1 μs markers from a time mark generator clearly show the sweep to be linear, even at fast TIME/CM settings.



TV field or line triggering allows viewing of complex video waveforms.



Dual-trace capability makes most measurements easier; pulse circuit analysis is but one application.

TELEQUIPMENT

S43

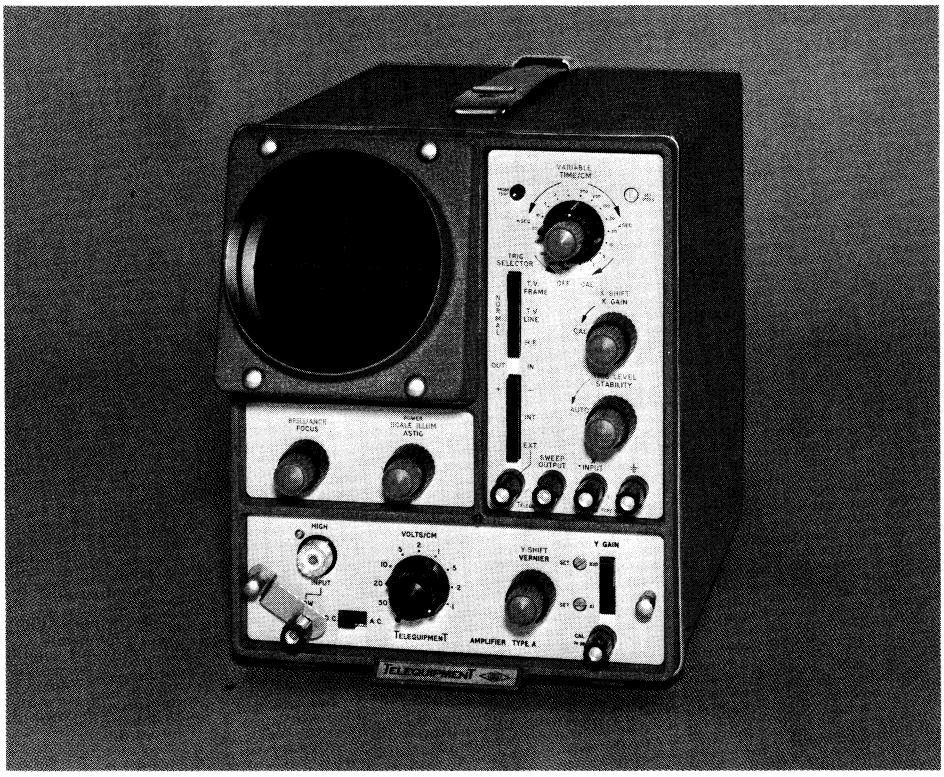
DC-25 MHz Bandwidth

Plug-In Versatility

5 cm x 8 cm Display Area

Flat-Face CRT

Versatile Triggering Including TV Line and Frame



General Description and Characteristics

Type S43 Oscilloscope with Type TS41 Time Base Unit

Vertical Amplifier

Interchangeable Plug-In Units—Five amplifier units are available for a variety of applications. See pages 17 and 18.

Horizontal Amplifier

Deflection Factor—Uncalibrated, continuously variable from 250 mV/cm to 2.5 V/cm. 1 to 25 V input voltage.

Bandwidth—10 Hz to 350 kHz (approx 3-dB down).

Input RC—170 kilohm paralleled by approx 30 pF.

Horizontal Expansion — Uncalibrated, continuously variable gain control magnifies horizontal axis up to approx 10 screen diameters, symmetrically about center of screen. Any portion of expanded trace positionable on screen.

Standard Time Base—Type TS41

Sweep Rates—1 μs/cm to 0.5 s/cm in 18 calibrated steps (1-2-5 sequence), accurate within 5%. Uncalibrated, continuously variable between steps.

Triggering

Automatic—Sweep free runs at approx 40 Hz in absence of an input signal but triggers internal on 5 mm of deflection or 0.5 V external between 50 Hz and 1 MHz.

Trigger Level Selection—Triggering occurs at any level on the waveform.

HF Sync—Synchronizes to input signals from 1 MHz to 12 MHz.

Triggers at TV frame or line rates.

Sources—Internal, external.

Slope—Plus or minus.

Cathode-Ray Tube

4-inch flat-faced CRT operating at 3.5 kV accelerating potential. Viewing area 5 cm vertical by 8 cm horizontal. P31 phosphor normally supplied. Variable illuminated graticule.

Voltage Calibrator

Line Frequency square wave, 1 V ± 2% peak to peak.

Power Requirements

For best performance, rear-panel quick-change connections to the transformer taps should be set to the voltage setting most nearly corresponding to the actual line voltage. Voltage settings are 90, 100, 105, 110, 115, 120, 130, 200, 210, 215, 220, 225, 230, 240 V. 50 to 400 Hz line frequency, 100 VA.

Convection Cooling

Dimensions and Weights

Height	10½ in	26.7 cm
Width	8¼ in	21.0 cm
Depth	19 in	48.0 cm
Net weight	28 lb	12.7 kg
Shipping weight	34 lb	15.4 kg

Included Standard Accessory

Instruction manual (070-0952-00).

Type S43 Oscilloscope with Type TS42 Time Base Unit

An optional time base for the Type S43 Oscilloscope provides wider ranges of sweep rates, improved horizontal amplifier performance, and facilities for single sweeps. All other characteristics remain as described with the standard time base.

Time Base

Sweep Rates—0.5 μs/cm to 5 s/cm in 22 calibrated steps (1-2-5 sequence), accurate within 5%. Uncalibrated, continuously variable between steps.

Horizontal Amplifier

Deflection Factor—Uncalibrated, continuously variable from 100 mV/cm to 1 V/cm.

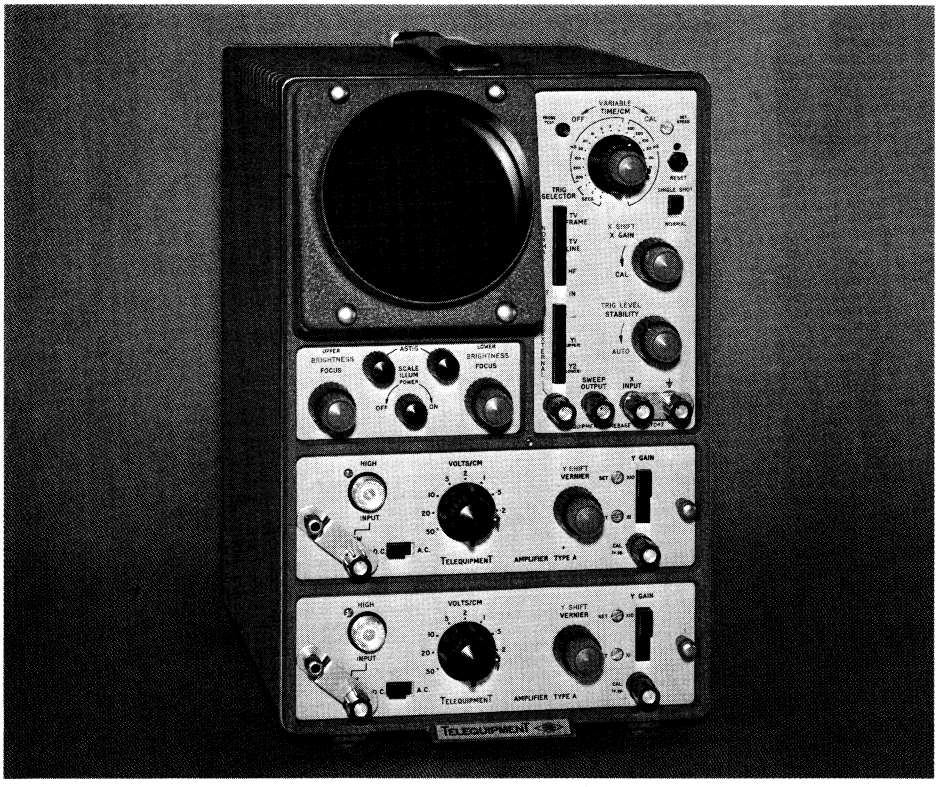
Bandwidth—DC to 500 kHz (approx 3-dB down).

Triggering

Same as TS41 with addition of single sweep with sweep lockout and front-panel indicator of armed trigger.

Optional Accessories

10X Passive Probe, UHF,
order 010-0234-00
Viewing Hood,
order 016-0250-00
Plug-In Extension Cable,
order 012-0126-00



TELEQUIPMENT

D43 and D43R

Dual Beam

DC-25 MHz Bandwidth

Plug-In Versatility

6 cm x 8 cm Display Area

Flat-Face CRT

Versatile Triggering Including TV Line and Frame

Optional Accessories

10X Passive Probe, UHF,
order 010-0234-00
Viewing Hood,
order 016-0250-00
Plug-In Extension Cable,
order 012-0126-00

Type D43 Oscilloscope with Type TD42 Time Base Unit (shown)

An optional time base, Type TD42, for the Type D43 Oscilloscope provides wider ranges of sweep rates, improved horizontal amplifier performance, and facilities for single sweeps. All other characteristics remain the same. See Type S43 description for complete characteristics.

General Description and Characteristics

Type D43 Oscilloscope with Type TD41 Time Base Unit

The Type D43 Oscilloscope is a dual-beam instrument and has characteristics similar to the Type S43 Oscilloscope. The characteristics different from the Type S43 are indicated.

Vertical Amplifiers

Interchangeable Plug-In Units—Two units are required for oscilloscope operation. See pages 17 and 18 for complete characteristics.

Triggering

Sources—Internal from either trace and external.

Cathode-Ray Tube

4-inch flat-faced CRT operating at 4 kV accelerating potential. Viewing area 6 cm vertical by 8 cm horizontal, 4-cm overlap. P31 phosphor normally supplied, P7 optional. Variable illuminated graticule.

Power Requirements

For best performance, rear-panel quick-change connections to the transformer taps should be set to the voltage setting most nearly corresponding to the actual line voltage. Voltage settings are 90, 100, 105, 110, 115, 120, 130, 200, 210, 215, 220, 225, 230, 240 V. 50 to 400 Hz line frequency, 132 VA.

Dimensions and Weights

Height	13 in	33.0 cm
Width	8¼ in	21.0 cm
Depth	19 in	48.0 cm
Net weight	36 lb	16.0 kg
Shipping weight	56 lb	25.4 kg

Included Standard Accessory

Instruction manual (070-0952-00).

Rack Mount Oscilloscope

The Type D43R Oscilloscope is a rack-mount version of the Type D43 and is available with the Type TD41 unit or the Type TD42 unit. Characteristics of the rack mount model are the same as those of the cabinet models.

Dimensions and Weights

Height	7 in	17.8 cm
Width	19 in	48.0 cm
Depth	16 in	40.6 cm
Net weight	38 lb	17.2 kg
Shipping weight	45 lb	20.4 kg

TELEQUIPMENT

D53A

DC-25 MHz Bandwidth

Double-Beam

Sweep Delay

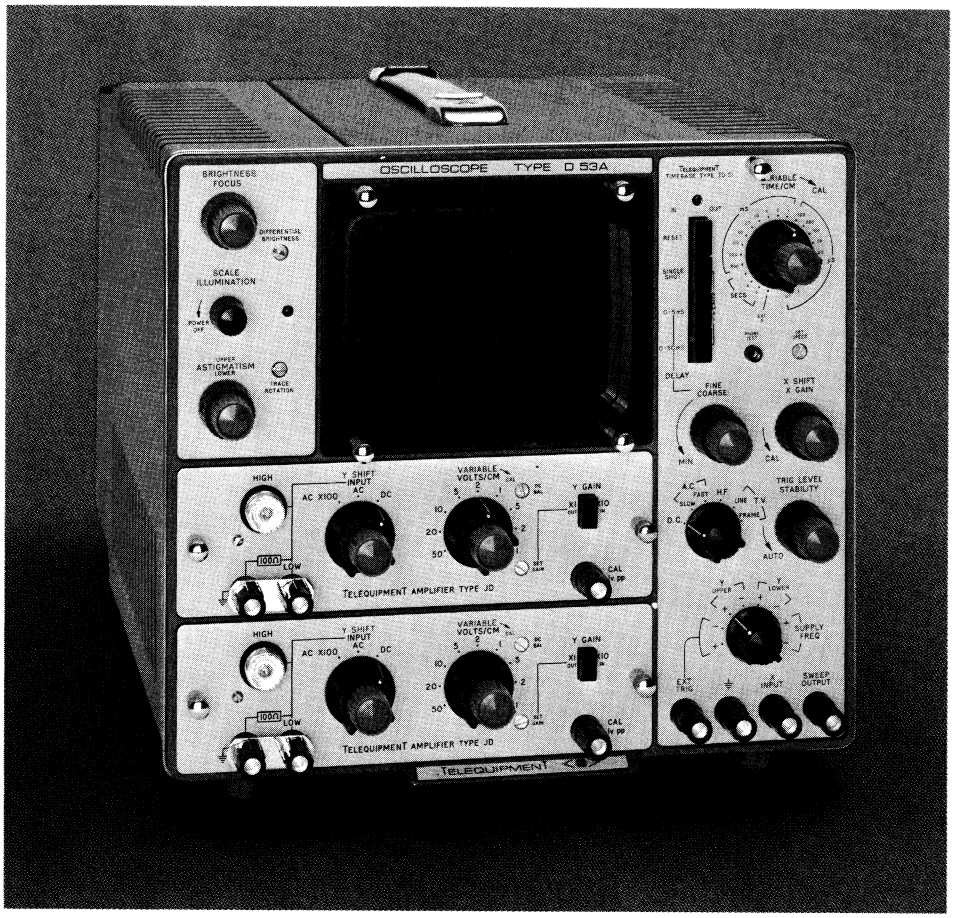
Plug-In Versatility

8 cm x 10 cm Viewing Area

Flat-Face Rectangular CRT

Versatile Triggering Including TV Line and Frame

Single Shot



Vertical Amplifiers

Interchangeable Plug-In Units — The Type D53A accepts the five amplifier units used with the S43 and D43 Oscilloscopes, and accepts one additional amplifier unit. The Type JD is similar to the Type J, except signal delay of 0.2 μs is incorporated in the amplifier and bandwidth is DC-10 MHz at 10 mV/cm. Maximum vertical deflection is 6 cm.

Horizontal Amplifier

Deflection Factor—Uncalibrated, continuously variable from 500 mV/cm to 5 V/cm.

Bandwidth—DC to 1 MHz (approx 3-dB down).

Horizontal Expansion — Uncalibrated, continuously variable gain control expands horizontal axis up to approx 10 screen diameters, symmetrically about center of screen. Horizontal positioning positions any part of trace on screen.

Time Base

Sweep Rates—0.5 μs/cm to 5 s/cm in 22 calibrated steps (1-2-5 sequence), accurate within 5%. Uncalibrated, continuously variable between steps, and to approx 12 s/cm.

Single-shot facility with sweep lock-out is provided. A light indicates when time base is armed. Delay ranges up to 5 ms or 50 ms, uncalibrated, continuously variable.

Triggering

Automatic—Sweep free runs at approx 40 Hz in absence of an input signal but triggers on 5 mm of deflection or 0.5-V external between 50 Hz and 1 MHz.

Trigger Level Selection—Triggering occurs at any level selected on the input waveform.

HF Sync—Synchronizes to input signals from approx 1 MHz to approx 25 MHz.

DC—Permits triggering from pre-selected DC level.

AC Slow—Removes DC components.

AC Fast—Removes low-frequency components.

TV—Triggers at TV frame or line rates.

Sources—Internal from either trace, external and line.

Slope—Plus or minus.

Cathode-Ray Tube

Rectangular flat-face, mesh CRT operating at 9 kV accelerating potential. Viewing area 8 cm vertical by 10 cm horizontal. P31 phosphor normally supplied, P7 optional. Variable illuminated graticule.

Rear Connectors

Z-axis Input—To CRT grids. (0.01 μf and 1 MΩ).

Power Requirements

For best performance, rear-panel quick-change connections to the transformer taps should be set to the voltage setting most nearly corresponding to the actual line voltage. Voltage settings are 100, 105, 110, 115, 120, 125, 200, 210, 220, 230, 240, 250 V. 50 to 400 Hz line frequency, 200 VA.

Convection Cooling

Voltage Calibrator

Line frequency square wave, 1 V peak to peak, accurate within 2%.

Dimensions and Weights

Height	11 in	28.0 cm
Width	11½ in	29.2 cm
Depth	20¼ in	51.5 cm
Net weight	52 lb	24 kg
Shipping weight	56 lb	26 kg

Included Standard Accessory

Instruction manual (070-0994-00).

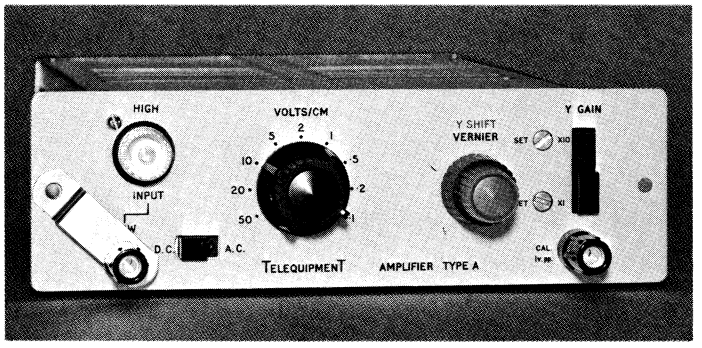
Please order Type JD Wide-Band Amplifier separately.

Optional Accessories

10X Passive Probe, UHF, order 010-0234-00

Viewing Hood, order 016-0251-00

CHARACTERISTICS OF PLUG-IN VERTICAL AMPLIFIERS
For S43, D43, D43R, and D53A MAIN FRAMES



TYPE 'A' General Purpose Amplifier

BANDWIDTH & DEFLECTION FACTOR—DC—15 MHz, 100 mV to 50 V/cm.

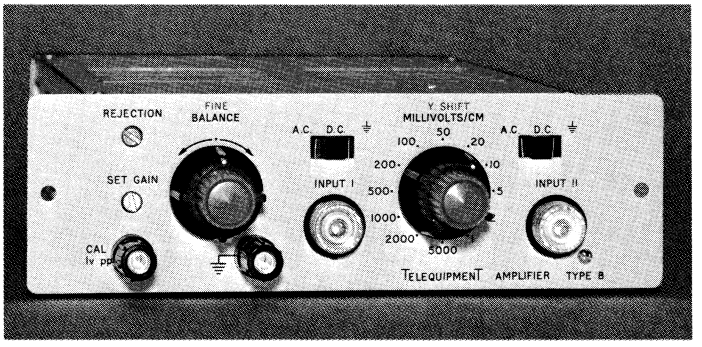
DC—0.8 MHz, 10 mV/cm to 5 V/cm.

INPUT RC—1 MΩ in parallel with approx 40 pF.

ATTENUATOR—Frequency Compensated. Calibrated volts/cm. 9 position 1, 2, 5, sequence. Accuracy ±5%.

NET WEIGHT .... 3 lb 1.3 kg SHIPPING WEIGHT .... 4 lb 1.8 kg

Includes: instruction manual (070-0953-00), UHF coax adapter (103-0091-00), UHF coax connector (131-0647-00).



TYPE 'B' Differential Amplifier

BANDWIDTH—DC—75 kHz

DEFLECTION FACTOR—1 mV/cm—5 V/cm.

COMMON MODE REJECTION RATIO—10,000:1 from DC to 1 kHz reducing to 1,000:1 at 75 kHz on 1 to 50 mV/cm ranges. On 100 mV/cm—5 V/cm ranges 1,000:1 DC to 1 kHz reducing to 100:1 at 10 kHz.

MAXIMUM IN-PHASE INPUT—5 V P to P (1—50 mV ranges.)

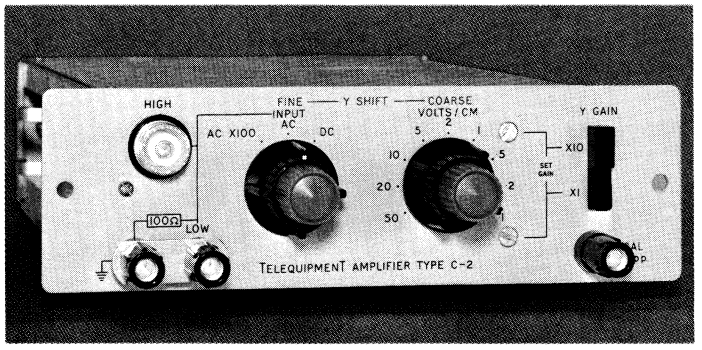
STABILITY—Normal drift approximately 5 mV/hour.

INPUT RC—1 MΩ in parallel with approx 40 pF.

ATTENUATOR—Frequency Compensated. Calibrated volts/cm. 12 position 1, 2, 5 sequence. Accuracy ±5%.

NET WEIGHT .... 5 lb 2.3 kg SHIPPING WEIGHT .... 6 lb 2.7 kg

Includes: instruction manual (070-0954-00), two UHF coax adapters (103-0091-00), two UHF coax connectors (131-0647-00).



TYPE 'C-2' High Gain Amplifier

BANDWIDTH & DEFLECTION FACTOR—DC—15 MHz, 100 mV/cm—50 V/cm.

DC—0.8 MHz, 10 mV/cm—5 V/cm.

3 Hz—100 kHz, 100 μV/cm—50 mV/cm.

INPUT RC—1 MΩ in parallel with approx 40 pF.

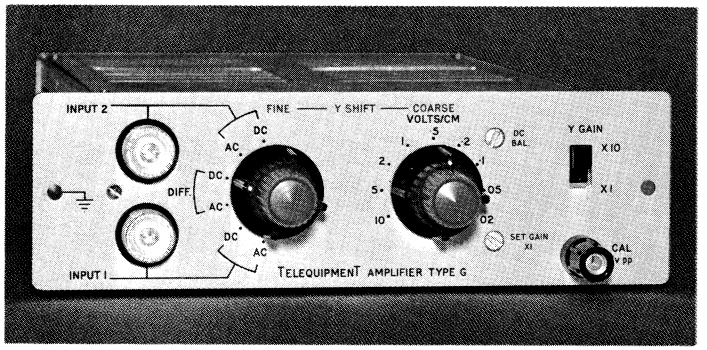
ATTENUATOR—Frequency Compensated. Calibrated volts/cm. 9 position 1, 2, 5, sequence. Accuracy ±5%.

TOTAL HUM AND NOISE—At max sensitivity, with input short circuited, approximately 30 μV.

NET WEIGHT .... 4 lb 1.8 kg SHIPPING WEIGHT .... 5 lb 2.3 kg

Includes: instruction manual (070-0941-00), UHF coax adapter (103-0091-00), UHF coax connector (131-0647-00).

CHARACTERISTICS OF PLUG-IN VERTICAL AMPLIFIERS
For S43, D43, D43R, and D53A MAIN FRAMES



TYPE 'G' General Purpose Differential

BANDWIDTH & DEFLECTION FACTOR—DC—10 MHz from 20 mV/cm to 10 V/cm and DC—500 kHz from 2 mV/cm to 1 V/cm.

COMMON MODE REJECTION RATIO—1,000:1, at 1 MHz falling to 50:1 at 10 MHz (sine wave input).

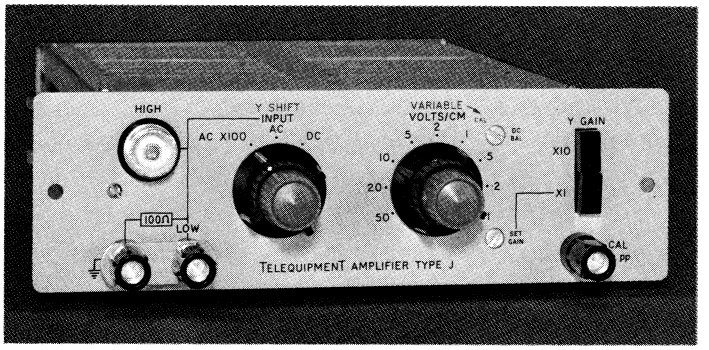
MAXIMUM INPUT—5 V P to P in 2 mV/cm and 20 mV/cm positions.

INPUT RC—1 MΩ in parallel with approx 40 pF.

ATTENUATOR—Frequency Compensated. Calibrated volts/cm. 9 position 1, 2, 5, sequence. Accuracy ±5%.

NET WEIGHT .... 3 lb 1.3 kg SHIPPING WEIGHT .... 4 lb 1.8 kg

Includes: instruction manual (070-0955-00), two UHF coax adapters (103-0091-00), two UHF coax connectors (131-0647-00).



TYPE 'J' High-Gain, Wideband Amplifier

BANDWIDTH & DEFLECTION FACTOR—DC—25 MHz from 100 mV/cm to 50 V/cm (X1), DC—5 MHz from 10 mV/cm to 5 V/cm (X10), 3 Hz—100 kHz from 1 mV/cm to 500 mV/cm (X100), 3 Hz—100 kHz from 100 μV/cm to 50 mV/cm (X1000). A control provides continuous uncalibrated variation of gain, reducing calibrated setting by a factor of 2.5:1 or greater.

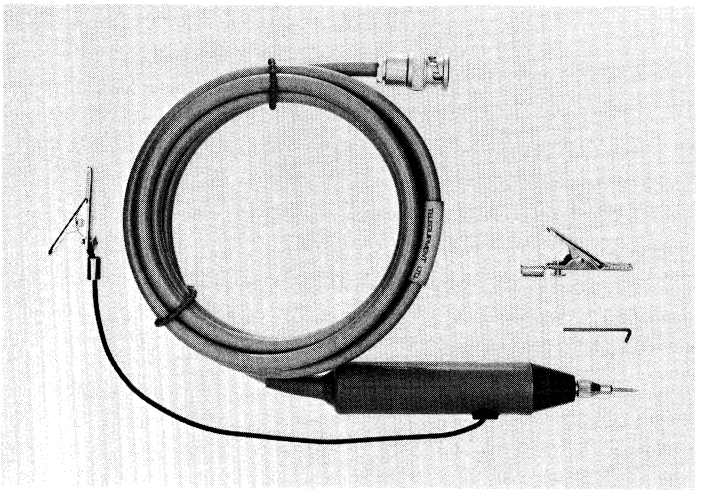
INPUT RC—1 MΩ in parallel with 60 pF in X1 and X10.
1 MΩ in parallel with 20 pF in X100.

ATTENUATOR—Frequency compensated. Calibrated volts/cm. 9 positions, 1, 2, 5 sequence. Accuracy ±5%.

HUM AND NOISE—With input short circuited, 20 μV P-P or less. With input open circuited, 100 μV P-P or less.

NET WEIGHT .... 3 lb 1.3 kg SHIPPING WEIGHT .... 4 lb 1.8 kg

Includes: instruction manual (070-0956-00), UHF coax adapter (103-0091-00), UHF coax connector (131-0647-00).



PROBES

10X Passive Probe, BNC
Order 010-0233-00

10X Passive Probe, UHF
Order 010-0234-00

TEKTRONIX INTERNATIONAL FIELD OFFICES

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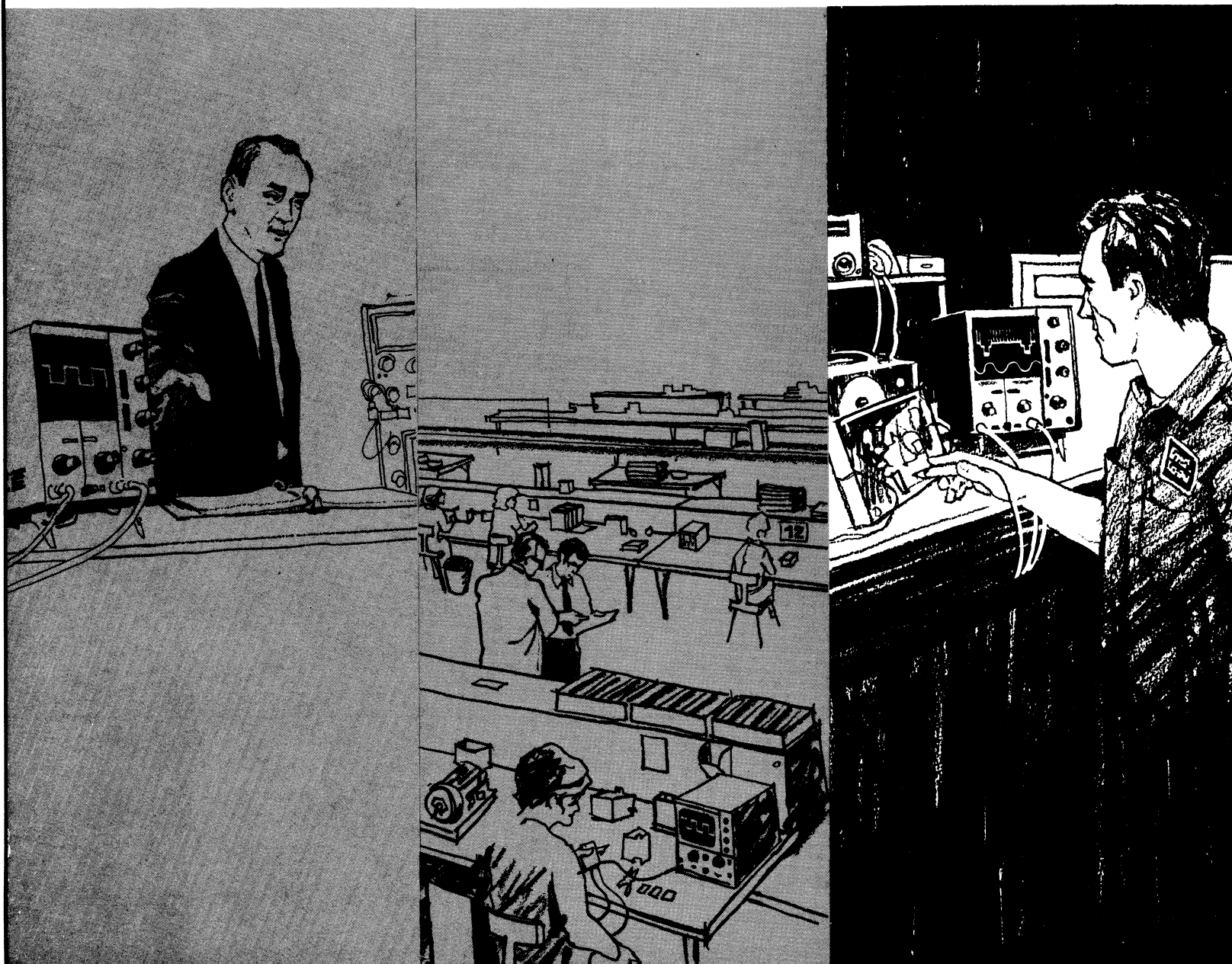

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	FST Ex.	FST Incl.
Minor	80.	90.
S51B	225.	245.
S51E	225.	245.
S52	490.	525.
S54A	435.	465.
S54AR	470.	505.
S54U	685.	735.
D51	345.	370.
D52	450.	480.
D54	550.	590.
S43/TS41	350.	375.
S43/TS42	385.	410.
D43/TD41	390.	415.
D43/TD42	425.	455.
D43R/TD41	410.	440.
D43R/TD42	445.	475.
D53A	775.	830.
A	85.	95.
B	135.	145.
C-2	125.	135.
G	125.	135.
J	135.	145.
JD	140.	150.

	Duty Free	Duty Paid	Duty + FST
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