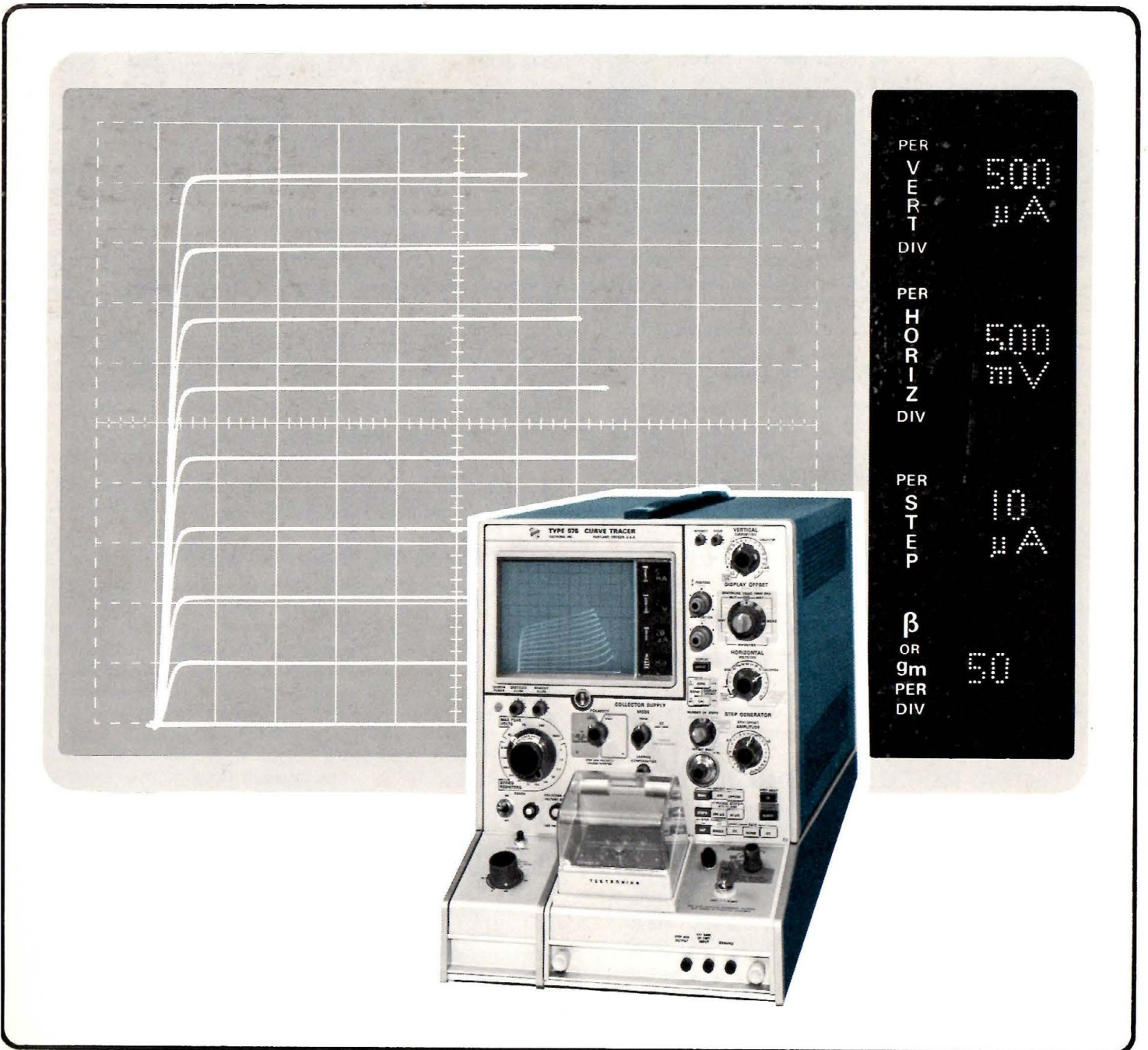




**TEKTRONIX®**

# Semiconductor Curve Tracers



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# Curve Tracer Reference

Curve tracers are capable of displaying one or more characteristic curves of two- and three-terminal devices and ICs. Each curve is developed by driving one terminal with a constant voltage or current and then sweeping the other with a half sinewave of voltage. If more than one curve is to be drawn, the driving source is stepped through several values and the sweep repeated, once for each step. The horizontal deflection is then a plot of either the driving voltage or the sweep voltage across the device under test, while the vertical deflection is a plot of the current drawn from the sweep source.

The reasons for measuring the characteristics of semiconductor devices are varied. Typical measurements are for the purpose of producing better components, sorting components, predicting performance in a circuit, or simply checking to see if the device meets specs. The characteristics of semiconductor devices that are of practical importance to their use in an electrical circuit can usually be measured with a curve tracer. Many of these measurements also provide analytical information for improving component design or maintaining production quality and specifications.

| PRODUCT | PAGE | MEASUREMENT CAPABILITIES  | PRICE                        |
|---------|------|---|------------------------------|
| 576     | 3    | Displays characteristics of diodes, FETs, SCRs, power transistors, transistors, tunnel diodes, zeners and integrated circuits (with an IC adapter).<br>Optional CRT readout of scale factors, $\beta/\text{div}$ , $g_m/\text{div}$ . | <b>\$2300</b><br><b>2800</b> |
| 172     | 10   | A programmable test fixture for the 576. Programs up to eleven measurements for faster measurements with few errors in applications such as incoming inspection.  | <b>1400</b>                  |
| 176     | 12   | A pulsed high-current fixture for the 576 which extends collector current range to 200 amps peak and base current range to 20 amps peak.  | <b>1600</b>                  |
| 575     | 3    | Displays characteristics of diodes, transistors, tunnel diodes and zeners. Optional collector supply range to 1500 V.   | <b>1500</b>                  |
| 5CT1N   | 14   | A plug-in curve tracer for the TEKTRONIX 5100-Series Oscilloscopes for displaying characteristics of transistors, FETs and diodes.  | <b>350</b>                   |
| 7CT1N   | 14   | A plug-in curve tracer for the TEKTRONIX 7000-Series Oscilloscopes for displaying characteristics of transistors, FETs and diodes.  | <b>400</b>                   |
| CT71    | 16   | A low-cost semiconductor tester which displays characteristic curves of transistors, FETs and diodes.   | <b>795</b>                   |

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- **DISPLAY DYNAMIC CHARACTERISTIC CURVES**
- **DIRECT COMPARISON OF TRANSISTOR CHARACTERISTICS**
- **MAKE DIODE MEASUREMENTS**

The Type 575 Transistor-Curve Tracer displays the dynamic characteristic curves of both NPN and PNP transistors. Several different transistor characteristic curves may be displayed, including the collector family in the common-base and common-emitter configuration. In addition to the transistor curves, the Type 575 is used to display dynamic characteristics of a wide range of semiconductor devices.

A special model (Type 575 MOD 122C), although similar to the Type 575, provides much higher voltages for diode breakdown test and collector supply. Horizontal deflection factor selections are extended to 200 V/div to accommodate the higher voltages.

### COLLECTOR SWEEP GENERATOR

The Collector Sweep Generator provides the sweep voltages that drive the collector of the transistor under test. These voltages sweep between zero and a peak value selected with a front-panel control. The peak voltage is either positive or negative depending on the setting of the polarity switch to allow the collector voltages to sweep between zero and positive peak values or zero and negative peak values. The repetition rate of the sweep is 2 times the line frequency; thus the collector voltage sweeps between zero and the peak value at least once for each step applied to the transistor base or emitter.

The peak sweep voltage is continuously adjustable from zero to 20 V with 10-A capability or from zero to 200 V with 1-A current capability. (Additional 0 to 400-V with 0.5-A current capability is provided on Type 575 MOD 122C.)

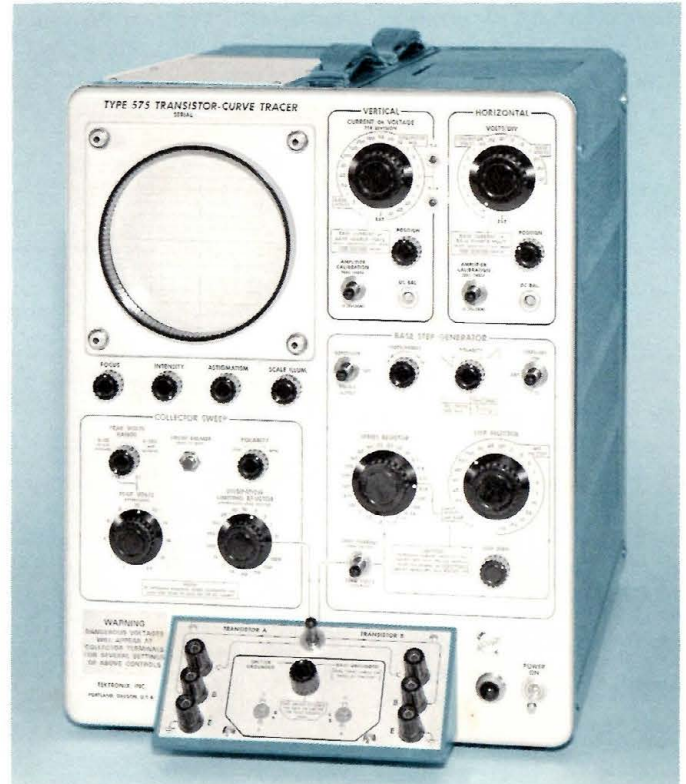
The collector current limiting resistance is selected from 16 values ranging from 1 ohm to 100 kilohms  $\pm 5\%$ .

On Type 575 MOD 122C, a third position has been added to the POLARITY switch, providing + and - (AC) 0 to 1500 V.

### BASE OR EMITTER STEP GENERATOR

The Step Generator develops current or voltage steps to drive the base or emitter (whichever is ungrounded) of the transistor under test. These steps are used to generate either repetitive or single-family (as selected) characteristic curves for display. The steps are adjustable in number from 4 to 12 and move in a positive or negative direction depending on the polarity switch setting. Step repetition rate is selectable as either 120 steps/s or 240 steps/s (values equal to 2X or 4X the line frequency). A control is available to set the starting point of a series of steps to zero.

Each step has a rise that is selected as either a value of current or a value of voltage. The value of each step rise in current ranges from 0.001 mA/step to 200 mA/step and is selected from 17 values (1-2-5 sequence) accurate within 3%. The value of each step rise in voltage is from 0.01 V/step to 0.2 V/step (2.4-A current capability) and is selected from 5 values (1-2-5 sequence) accurate within 3%. Also a switch is provided for grounding the transistor input to give a zero drive-voltage reference check, and opening the transistor input to give a zero drive-current reference check.



The driving resistance of the step generator, when developing voltage steps, is selected from 24 values that range from 1 ohm to 22 kilohms  $\pm 10\%$ . Any other value can be added externally.

### VERTICAL-DEFLECTION SYSTEM

Signals used for vertical deflection are selected from various points in the transistor test circuit. Each point has several selectable deflection factors available.

#### CALIBRATED DEFLECTION FACTOR

**Transistor Collector Current**—10  $\mu\text{A}/\text{div}$  to 1 A/div in 16 steps, 1-2-5 sequence. Push buttons are provided for multiplying each step by 2 or 0.1 thus extending the deflection factor from 1  $\mu\text{A}/\text{div}$  to 2 A/div. Each step is accurate within 3%.

**Transistor Base or Emitter Current**—1  $\mu\text{A}/\text{div}$  to 200 mA/div in 17 steps (1-2-5 sequence) accurate within 3%.

**Transistor Base or Emitter Voltage**—10 mV/div to 0.5 V/div in 6 steps (1-2-5 sequence) accurate within 3%.

**Base or Emitter Source Voltage**—10 mV/div to 0.2 V/div in 5 steps (1-2-5 sequence) accurate within 3%.

### HORIZONTAL-DEFLECTION SYSTEM

Signals used for horizontal deflection are selected from various points in the transistor test circuit. Each point has several selectable deflection factors available.

#### CALIBRATED DEFLECTION FACTOR

**Transistor Collector Voltage**—0.01 V/div to 20 V/div in 11 steps, 1-2-5 sequence. (10 mV/div to 200 V/div on Type 575 MOD 122C). Each step is accurate within 3%.

**Transistor Base or Emitter Current**—0.001 mA/div to 200 mA/div in 17 steps (1-2-5 sequence) accurate within 3%.



**Semiconductor Curve Tracer**

**Transistor Base or Emitter Voltage**—0.01 V/div to 0.5 V/div in 6 steps (1-2-5 sequence) accurate within 3%.

**Base or Emitter Source Voltage**—0.01 V/div to 0.2 V/div in 5 steps (1-2-5 sequence) accurate within 3%.

**CRT**

**TEKTRONIX CRT**

4-kV accelerating voltage, P31 phosphor normally supplied; P1, P2, P7, or P11 are optional without extra charge. Consult your Field Engineer, Representative, or Distributor for application information and availability.

**GRATICULE**

External, 3<sup>1</sup>/<sub>8</sub> inch x 3<sup>1</sup>/<sub>8</sub> inch viewing area, 10 divisions each axis with each division measuring <sup>5</sup>/<sub>16</sub> inch.

**OTHER CHARACTERISTICS**

**TRANSISTOR TEST PANEL**—The transistor test panel has provisions for two transistors at the same time. Two sockets accept low-power transistors with short leads and three binding posts alongside the sockets accept other transistors and semiconductors. One switch will change the sockets from the common-emitter to the common-base test circuit configuration. A second switch allows two transistors inserted into the test circuit to be rapidly compared by switching the test conditions from one to the other.

**POWER REQUIREMENT**

Wired for 105 to 125 VAC (117 V nominal); may be ordered with transformer taps connected for nominal values of 107, 127, 214, 234, or 254 V; 50 to 60 Hz. 410 watts maximum.

**TYPE 575 AND TYPE 575 MOD 122C DIMENSIONS AND WEIGHTS**

|                          |                                   |           |
|--------------------------|-----------------------------------|-----------|
| Height                   | 16 <sup>3</sup> / <sub>8</sub> in | 41.6 cm   |
| Width                    | 13 in                             | 33 cm     |
| Depth                    | 23 <sup>5</sup> / <sub>8</sub> in | 60 cm     |
| Net weight               | 66 <sup>1</sup> / <sub>4</sub> lb | 30.1 kg   |
| Domestic shipping weight | ≈ 84 lb                           | ≈ 38.2 kg |
| Export-packed weight     | ≈ 102 lb                          | ≈ 46.4 kg |

**TYPE 575 AND TYPE 575 MOD 122C INCLUDED STANDARD ACCESSORIES**

Two transistor adapters, long lead (013-0069-00); two transistor adapters, TO-3 (013-0070-01); two 2N1381 transistors (151-0039-00); 3-conductor power cord (161-0010-03); smoke-gray light filter (378-0567-00); instruction manual (070-0255-01); measurement concepts booklet "Semiconductor Device Measurements" (062-1009-00).

**Order TYPE 575 TRANSISTOR CURVE TRACER . . . . \$1500**

**INCREASED COLLECTOR VOLTAGE**

Type 575 MOD 122C, although similar to the Type 575, provides much higher diode breakdown test voltage (variable from zero to 1.5 kV, maximum short circuit current of 1 mA); also provides much higher collector supply (up to 400 V at 0.5 A).

**Order TYPE 575 MOD 122C TRANSISTOR CURVE TRACER . . . . \$1800**

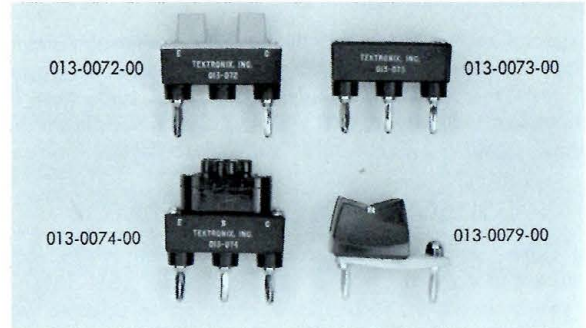
**OPTIONAL ACCESSORIES**

Optional accessories increase measurement capability and provide added convenience.

**RACKMOUNT ADAPTER**

Cradle mount to adapt the Type 575 Transistor-Curve Tracer for rackmounting. Consists of a cradle to support instrument in any standard 19-inch relay rack and mask to fit around regular instrument panel. Blue vinyl finish. Rack height requirements 17<sup>1</sup>/<sub>2</sub> inch. Order 040-0281-00 . . . \$34.50

**TYPE 575 OPTIONAL TEST FIXTURES**



**DIODE TEST FIXTURE**

Holds axial-lead diodes. Order 013-0072-00 . . . . . \$6.60

**ADAPTER BOX**

Allows mounting of additional semiconductor sockets. Order 013-0073-00 . . . . . \$4.40

**POWER TRANSISTOR SOCKET**

For power transistors with hook leads. Order 013-0074-00 . . . . . \$9.50

**DIODE TEST ADAPTER**

Production test fixture for rapid handling. Order 013-0079-00 . . . . . \$29.00

**CAMERA**

The standard C-12 camera satisfies most trace-recording requirements. For applications that might require a different viewing system, lens, or back, refer to camera descriptions or consult your Field Engineer, Representative, or Distributor.

Standard C-12: f/1.9—1:0.85 lens, beam-splitting mirror for straight-on viewing, and use of optional projected graticule; Polaroid Land\* Pack-Film Back, order C-12 . . . . . \$590

Projected graticule eliminates parallax in displays where external graticules are used, such as the 575, order 016-0204-00 (115 V) or 016-0234-00 (230 V) . . . . . \$175

Mounting Adapter for C-12, order 016-0226-01 . . . . \$16.00

**SCOPE-MOBILE® CART**

Model 202-1: storage drawer, 9-position tilt-lock oscilloscope tray, order Type 202-1 . . . . . \$165

U.S. Sales Prices FOB Beaverton, Oregon

\*Registered Trademark Polaroid Corporation



- BIG 6 1/2-INCH CRT
- AUTO SCALE-FACTOR READOUT INCLUDING  $\beta/\text{div}$  or  $g_m/\text{div}$
- THREE COLLECTOR SUPPLY MODES
- AUTO POSITIONING AND POLARITY TRACKING
- PULSED BASE OPERATION
- CALIBRATED DISPLAY OFFSET WITH MAGNIFIER
- KELVIN SENSING ADAPTERS FOR HIGH CURRENT TESTS
- PROTECTIVE FEATURES FOR OPERATOR AND DEVICE
- OPTIONAL ACCESSORIES
  - PROGRAMMABLE TEST FIXTURE
  - HIGH-CURRENT FIXTURE
  - INTEGRATED CIRCUITS ADAPTER



The Type 576 brings meaningful performance to semiconductor testing and establishes a new standard in human engineering features. The measurement requirements for diodes, transistors, and FETs (in all their different forms) established the functions of the Type 576; innovative circuits and component engineering make those measurements easy, accurate, safe and more understandable.

The most noticeable new feature is AUTO SCALE-FACTOR READOUT. Placed adjacent to the CRT (where you normally

focus your attention) are digital indicators of vertical and horizontal deflection factors, step amplitude, and Beta/div or  $g_m/\text{div}$ . Readout offers convenience for test setup and labeled waveform photography. It also offers freedom from the simple but bothersome arithmetic required to compute Beta/div or  $g_m/\text{div}$  or to correct for magnifiers or multipliers. The other features, such as multifunction switching, calibrated display offset, and many more, are equally important to semiconductor testing applications. The following page describes these features around waveform photographs of measurement situations.

### CHARACTERISTIC SUMMARY

#### CRT & READOUT

**CRT**—6 1/2-inch rectangular; 10 cm x 10 cm calibrated area, 4 kV, P31 phosphor.

**Readout**—Digital indicators of VERT CURRENT/div, HORIZ VOLTS/div, CURRENT or VOLTS per STEP, and BETA/div or  $g_m/\text{div}$ .

#### COLLECTOR SUPPLY

**Voltage Range**—0 V to 1500 V, continuously variable.

**Polarity**—Positive, negative, or AC.

**Peak Current**—0.1 A to 10 A; doubled in pulse mode.

**Power Limit Setting**—0.1 W (or less) to 220 W in 6 steps.

#### STEP GENERATOR

**Current Steps**—5 nA/step (0.1X MULT) to 200 mA/step; 2 A max.

**Voltage Steps**—5 mV/step (0.1X MULT) to 2 V/step; 40 V max including offset.

**Calibrated Step/Offset**—0 to X10 the step amplitude setting, AID or OPPOSE.

**Number of Steps**—0 to 10, digitally selectable.

**Pulsed Steps**—Approx 300  $\mu\text{s}$  or 80  $\mu\text{s}$  pulse width.

#### VERTICAL AND HORIZONTAL AMPLIFIERS

**Vert Collector Current**—0.1  $\mu\text{A}/\text{div}$  (X10 MAG) to 2 A/div.

**Vert Emitter Current**—1 nA/div to 2 mA/div.

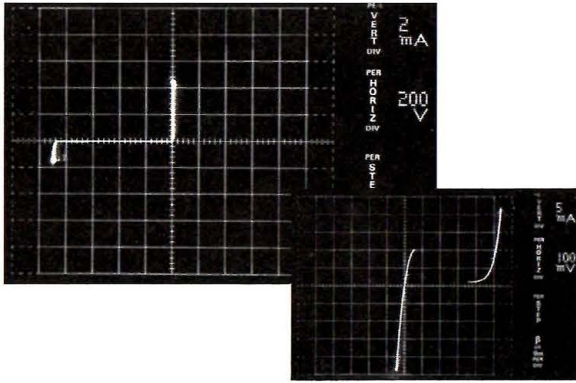
**Horiz Collector Volts**—5 mV (X10 MAG) to 200 V/div.

**Horiz Base Volts**—5 mV/div (X10 MAG) to 2 V/div.

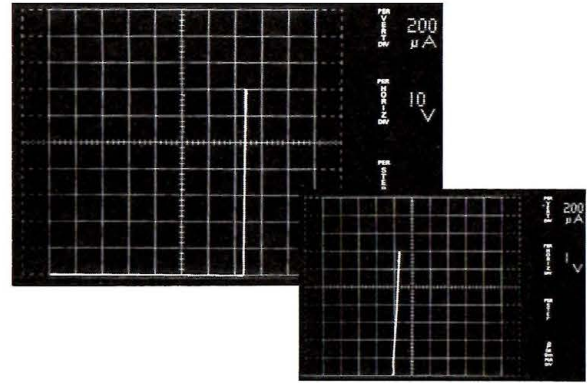
**Display Offset and Magnifier**—X10 MAG with calibrated positioning increases resolution and accuracy.



DIODES

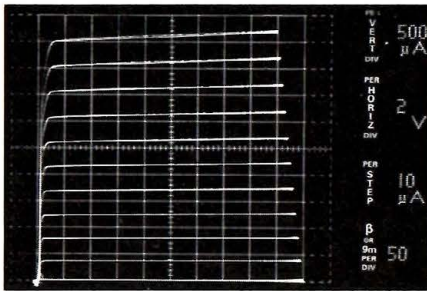


This test shows reverse breakdown and forward current characteristics simultaneously. The AC mode (+ and - collector sweep) was selected, which automatically positioned the trace to center-screen. The power limit (0.1 W) was selected with the direct-reading switch. The operator was protected from shock by the protective box, which disconnects voltage to the device when the cover is raised. The inserted waveform shows the forward and reverse characteristics of a tunnel diode. Identical functions were used except at different settings.

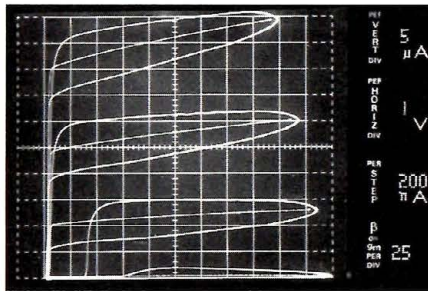


This display of a zener diode test demonstrates the use of the CALIBRATED DISPLAY OFFSET and MAGNIFIER to increase resolution. The main waveform shows the zener region to be somewhere above 73 V. With the DISPLAY OFFSET and MAG, the trace was centered, positioned horizontally exactly 7.5 divisions, and magnified 10 times (see insert). The center graticule line is now a known 75 V with the horizontal scale at 1 V/div. The zener voltage at 1 mA can now be measured at 74.2 V, accurate within 2%.

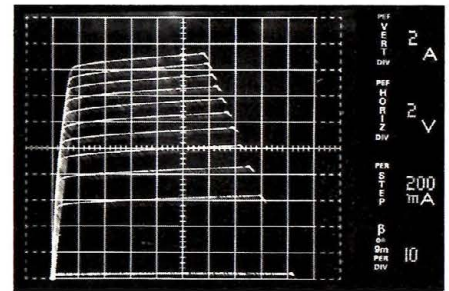
TRANSISTORS



This is an NPN transistor family of curves. When the positive collector supply polarity was selected, the step generator polarity automatically became positive and the trace start was positioned to the proper point. The display shows a full 10-step family but the number of steps could have been digitally selected between 1 and 10. The parameter readout effectively labels the waveform, giving vertical collector current/div, horizontal collector volts/div, current amplitude per step, and computes Beta/div.

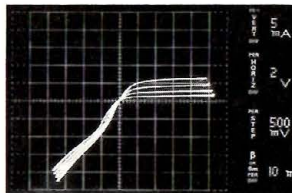
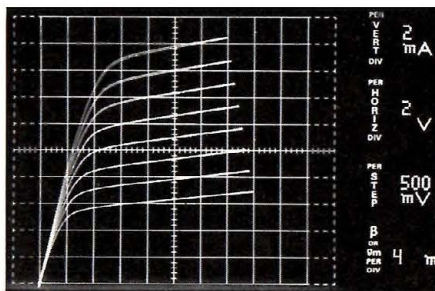


This waveform is a double exposure showing the increased readability for low-current devices obtained by using the DC collector supply mode. The wide "loops" are the result of the collector-to-base capacitance being swept at 120 Hz in the NORM collector supply mode. The center-line (in the middle of each loop) is the display obtained in the DC mode by manually turning the variable voltage control. The DC mode is functional since measurements can be made to 100 nA/div for collector currents, or 1 nA/div in the leakage mode.

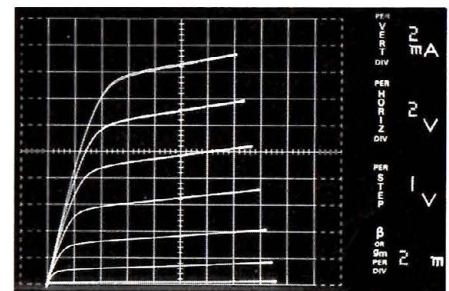


This display is a power transistor test at 17-A collector current with 2 A into the base; Beta/div is shown as 10. Power devices can be checked at 10-A continuous or 20-A peak pulse mode current. Max base is 2 A. The 80-μs pulsed base mode is used for duty-cycle limiting (300 μs also available) and single family operation offers further control. Collector-emitter voltage can be measured more accurately with the TO-3 and TO-66 adapters which employ KELVIN contacts to cancel the effects of contact resistance.

FETs



The Type 576 is particularly well suited for FET measurements. Here a FET is operating in the enhancement mode (positive drain sweep and voltage steps) with the maximum power and gate current selected and limited for device protection. For operation in the depletion mode, the step generator polarity can be inverted (INVERT switch). The insert shows a FET with AC (positive and negative) drain sweep for inspection of the resistive region characteristics.



This drain family shows FET characteristics in both enhancement and depletion modes, accomplished with the CALIBRATED DC STEP OFFSET. The voltage/step is selectable, the number of steps is digitally selectable between 1 and 10, and the first step can be started from any DC plateau between 0 and X10 the amplitude setting, aiding or opposing the step polarity. In this case an opposing DC voltage was selected allowing the positive steps to start below the zero bias point.



**CHARACTERISTICS**  
**COLLECTOR SUPPLY**

**Modes**—NORM: positive or negative full wave rectified AC (line frequency); DC: positive or negative DC; LEAKAGE: emitter current rather than collector current measurements with an increase in the basic vertical deflection factor to 1 nA/div.

**Voltages**—Peak open circuit voltages within +35% and -5% of indicated range.

| RANGE                       | 15 V  | 75 V | 350 V | 1500 V |
|-----------------------------|-------|------|-------|--------|
| MAX CONTINUOUS PEAK CURRENT | 10 A  | 2 A  | 0.5 A | 0.1 A  |
| PEAK PULSE MODE CURRENT     | ≥20 A | ≥4 A | ≥1 A  | ≥0.2 A |

Series resistance is from 0.3 Ω to 6.5 MΩ in 12 steps, all within 5% or 0.1 Ω. Peak power limit setting: 0.1 W, 0.5 W, 2.2 W, 10 W, 50 W, 220 W.

**Safety Interlock**—A protective cover over Test Terminals must be closed to apply collector voltage in 75 V, 350 V, and 1500 V ranges.

**STEP GENERATOR**

**Current Mode**—Step/offset amplitude range is 5 nA/step (with 0.1X MULT) to 200 mA/step, 1-2-5 sequence. Max current (steps and aiding offset) is X20 AMPLITUDE setting, except X10 (2 A) at 200 mA/step and X15 (1.5 A) at 100 mA/step. Max voltage (steps and aiding offset) is at least 10 V. Max opposing offset current is X10 AMPLITUDE switch setting or 10 mA, whichever is less. Max opposing voltage is limited at 1 V to 3 V.

**Voltage Mode**—Step/offset amplitude range is 5 mV/step (with 0.1X MULT) to 2 V/step, 1-2-5 sequence. Max voltage (steps and aiding offset) is X20 AMPLITUDE switch setting, 40 V max. Max current (steps and aiding offset) is at least 2 A at 10 V, derating linearly to 10 mA at 40 V. Short circuit current limiting is 20 mA, 100 mA, 500 mA +100%, -0%; 2 A +50%, -0%. Max opposing offset voltage; X10 AMPLITUDE switch setting. Max opposing current; limited at 5 mA to 20 mA.

**Accuracy**—Incremental; within 5% between steps, within 10% with 0.1X MULT. Absolute; within 2% of total output including offset, or 1% of AMPLITUDE setting, whichever is greater. Offset multiplier; 0 to X10 the AMPLITUDE setting, continuously variable. Polarity AID(s) or OPPOSE(s) the step polarity.

**Step Rates**—0.5X, 1X (NORM), and 2X the collector supply rate. The collector supply rate is twice line frequency.

**Pulsed Steps**—Approx 80 μs or 300 μs width, at NORM or 0.5X rates.

**Step/Offset Polarity**—The STEP GEN polarity is the same as the COLLECTOR SUPPLY polarity, and positive in the AC position. Step polarity may be inverted by actuating the INVERT push button.

**Step Family**—REPETITIVE or SINGLE FAMILY (manually actuated).

**Number of Steps**—Digitally selectable between 1 and 10.

**VERTICAL AND HORIZONTAL AMPLIFIERS**

**Display Accuracies**—As a percentage of the highest on-screen value.

| NORM and DC MODES  | NORMAL                  | OFFSET and MAGNIFIED with CENTERLINE VALUE from: |           |           |
|--|-------------------------|--|-----------|-----------|
|  |                         | 100-40 div                                       | 35-15 div | 10-0 div  |
| Vert Collector Current                                     | 3%                      | 2%   | 3%        | 4%        |
| Horiz Collector Volts                                      | 3%                      | 2%   | 3%        | 4%        |
| Horiz Base Volts   | 3%                      | 2%   | 3%        | 4%        |
| <b>LEAKAGE MODE</b>  |                         |  |           |           |
| Vert Emitter Current/div:                                  |                         |  |           |           |
| 10 nA-2 mA/div   | 3% ± 1 nA               |  |           |           |
| 1 nA-200 μA/div (magnified)                                |                         | 2% ± 1 nA  | 3% ± 1 nA | 4% ± 1 nA |
| 5, 2, 1 nA/div   | 5% ± 1 nA               |  |           |           |
| Horiz Collector or Base Volts with Emitter Current/div of: |                         |  |           |           |
| ≥ 1 μA   | 3%                      | 2%   | 3%        | 4%        |
| 100, 10, or 1 nA   | 3% plus 25 mV/vert div  | NOT APPLICABLE                                   |           |           |
| 200, 20 or 2 nA  | 3% plus 50 mV/vert div  |  |           |           |
| 500, 50 or 5 nA  | 3% plus 125 mV/vert div |  |           |           |
| <b>VERT STEP GEN POSITION</b>                              | 4%                      | 3%   | 4%        | 5%        |
| <b>HORIZ STEP GEN POSITION</b>                             | 4%                      | 3%   | 4%        | 5%        |

**Vertical Deflection Factor**—Collector current is 1 μA/div to 2 A/div, 20 steps in 1-2-5 sequence (0.1 μA/div with X10 magnification). Emitter current is 1 nA/div to 2 mA/div, 20 steps in 1-2-5 sequence. Step generator is 1 step/div.

**Horizontal Deflection Factor**—Collector volts; 50 mV/div to 200 V/div, 12 steps in 1-2-5 sequence (5 mV/div with X10 magnification). Base volts; 50 mV/div to 2 V/div, 6 steps in 1-2-5 sequence (5 mV/div with X10 magnification). Step generator; 1 step/div.

**Displayed Noise**—1% or less or:

| RANGE                | 15 V | 75 V | 350 V | 1500 V |
|----------------------|------|------|-------|--------|
| VERTICAL—COLLECTOR   | 1 μA | 1 μA | 2 μA  | 5 μA   |
| VERTICAL—EMITTER     | 1 nA | 1 nA | 2 nA  | 5 nA   |
| HORIZONTAL—BASE      | 5 mV | 5 mV | 5 mV  | 5 mV   |
| HORIZONTAL—COLLECTOR | 5 mV | 5 mV | 20 mV | 200 mV |

**Calibrator (CAL)**—DC voltage (accurate within 1.5%) provided to check and adjust vertical and horizontal gain.

**Position Controls**—Fixed 5-div increments within 0.1 div. Continuous fine control over 5 div or less.

**Display Offset**—Provides 21 calibrated positioning increments, vertically or horizontally, of 0.5 div or 5 div with the X10 MAGNIFIER.



Semiconductor Curve Tracer

CRT AND READOUT

**CRT**—6 1/2-inch rectangular with parallax-free, illuminated graticule in centimeters. The calibrated area is 10 cm vertical by 10 cm horizontal (12 cm usable horizontal). P31 phosphor normally supplied; P2 and P7 are optional without extra charge. Consult your Field Engineer, Representative, or Distributor for application information and availability.

**Readout**—The readouts, adjacent to the CRT, are digital indicators of the following display parameters: PER VERT DIV from 1 nA/div to 2 A/div; PER HORIZ DIV from 5 mV/div to 200 V/div; PER STEP from 5 nA/step to 2 A/step, 5 mV/step to 2 V/step;  $\beta$  (BETA) or  $g_m$  PER DIV from 1  $\mu$  to 500 k calculated from CURRENT/DIV, X10 MAG, STEP AMPLITUDE, and 0.1X MULT.

OTHER CHARACTERISTICS

**Standard Test Fixture**—A plug-in fixture with two sets of 5-pin test terminals, the EMITTER GROUND-ED or BASE GROUND-ED switch, LEFT-OFF-RIGHT switch, STEP GEN OUTPUT EXT BASE or EMITTER input, and the OPERATOR PROTECTION BOX. The test terminals accept either the 6-pin universal adapters, 3-pin adapters, or the high-power transistor adapters with KELVIN contacts.

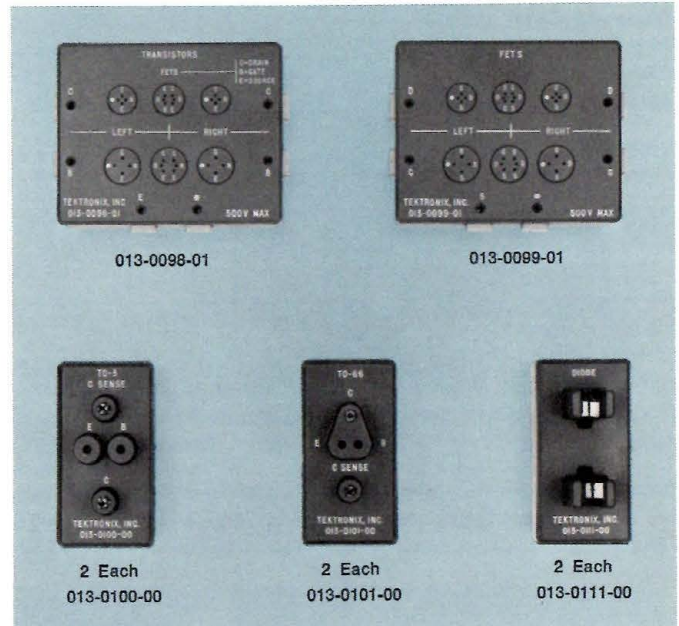
**Power Requirements**—Power Source; operates only with an unbalanced-to-ground power source. For safe operation, the power line neutral (white or "identified" conductor) must be connected to the instrument neutral (unfused), and the power plug safety ground (green conductor) must return to ground through a different path than the power line neutral. Voltage Ranges; the quick-change line-voltage range selector accommodates 90 VAC to 136 VAC or 180 VAC to 272 VAC (six positions), at 48 Hz to 66 Hz line frequency. Max power consumption is 305 W, standby power is  $\approx$ 60 W.

**Ambient Temperature**—Performance characteristics are valid over an ambient temperature range of +10°C to +40°C.

Dimensions and Weights

|                          |                  |                   |
|--------------------------|------------------|-------------------|
| Height                   | 15 in            | 38 cm             |
| Width                    | 11 1/2 in        | 29 cm             |
| Depth                    | 23 in            | 59 cm             |
| Net Weight               | 70 1/2 lb        | 32 kg             |
| Domestic shipping weight | $\approx$ 107 lb | $\approx$ 48.5 kg |
| Export-packed weight     | $\approx$ 127 lb | $\approx$ 57.5 kg |

INCLUDED STANDARD ACCESSORIES



TEST ADAPTERS

Not shown: measurement concepts booklet "Semiconductor Device Measurements" (062-1009-00); instruction manual.

Order TYPE 576 CURVE TRACER ..... \$2800

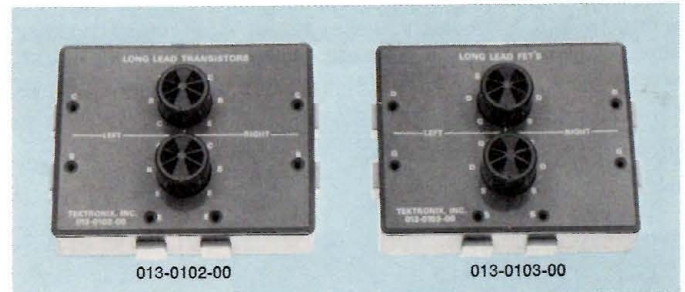
INSTRUMENT OPTION

The Type 576 MOD 301W deletes the parameter readout module, but maintains provision for insertion of the module (020-0031-00) at any time.

Order TYPE 576 MOD 301W CURVE TRACER ..... \$2300  
 Order Auto Scale-Factor Readout Module (020-0031-00) ..... \$525

OPTIONAL ACCESSORIES

LONG-LEAD ADAPTERS

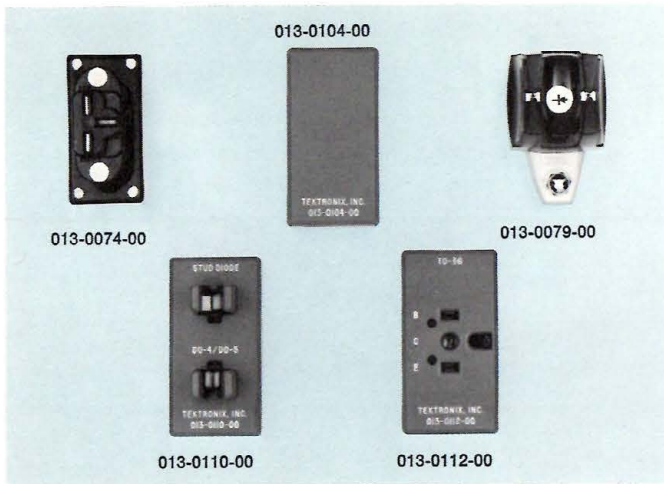


Designed to accept untrimmed bipolar or single FET's or transistors.

Long-lead transistor adapter, order 013-0102-00 ..... \$28  
 Long-lead FET adapter, order 013-0103-00 ..... \$28



**OTHER ADAPTERS**



**Adapter Box**

Blank, for mounting special semiconductor sockets.  
 Order 013-0104-00 ..... \$8

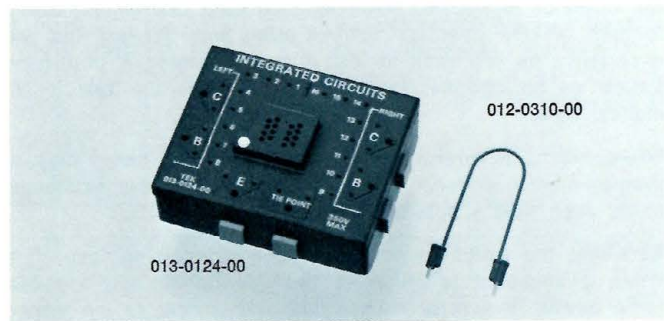
**Power Transistor Adapters**

For power transistors with hook leads.  
 Order 013-0074-00 ..... \$9.50  
 For TO-36 transistors. Adapter has Kelvin sensing terminals.  
 Order 013-0112-00 (standard with 176) ..... \$13

**Diode Adapters**

Magnetic holder for axial lead diodes, providing quick insertion and removal for production applications.  
 Order 013-0079-00 ..... \$29  
 For stud type (DO-4) and DO-5) diodes. Adapter has Kelvin sensing terminals.  
 Order 013-0110-00 (standard with 176) ..... \$10

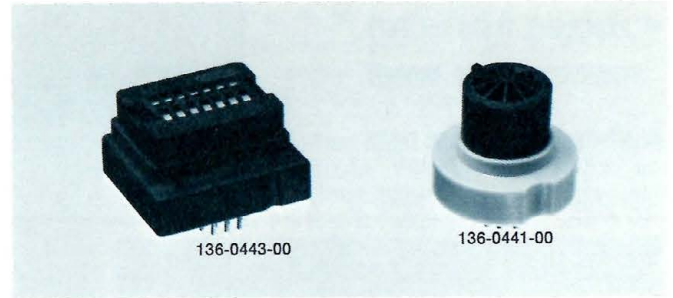
**Integrated Circuits Adapter**



The integrated circuits adapter allows many integrated circuit measurements to be made using the Type 576 Curve Tracer. The appropriate Barnes Corporation socket is plugged into the integrated circuits adapter. The pins are then connected to the collector, base, or emitter terminals by means of the patch cords. A tie point is also provided so that an external power supply or signal source may conveniently be patched to the IC pins. The pin numbers on the adapter correspond to the IC pin numbers with any of the four Barnes Corporation sockets available from Tektronix, Inc. Barnes Corporation, Landsdowne, Pa. has several other sockets available which may be purchased directly from them. All of the ones with yellow bases (and some that are not yellow) are compatible with the adapter pin numbering system.

Integrated Circuits Adapter, with 8 four-inch patch cords (012-0310-00). Order 013-0124-01 ..... \$50

**Barnes Corporation Sockets**



- Socket for 8-lead TO package (not shown).  
 Order 136-0444-00 ..... \$9
- Socket for 10-lead TO package.  
 Order 136-0441-00 ..... \$10
- Socket for 14-lead dual-in-line package.  
 Order 136-0443-00 ..... \$7
- Socket for 16-lead dual-in-line package (not shown).  
 Order 136-0442-00 ..... \$7



**CAMERA**

The C-70 camera is a general-purpose trace-recording camera designed for use with the Type 576 Curve Tracer. It features an f/1.9, 1:0.575 lens, trace-brightness photometer, range-finder focusing, accurate exposure control, electric shutter, and choice of Polaroid<sup>1</sup> Land or Graflok<sup>2</sup> Film Back.

- Order C-70-P CAMERA, Pack-Film Back ..... \$850
- Order C-70-R CAMERA, Roll-Film Back ..... \$885
- Order C-70-G CAMERA, 4 x 5 Graflok Back ..... \$815

Adapter-frame/corrector lens, part no. 016-0264-01, permits use of the C-12 or C-27 Cameras with the Type 576.

Adapter frame/corrector lens, part no. 016-0271-00, permits use of the C-50 Camera with the Type 576.

**SCOPE-MOBILE<sup>®</sup> CART**

- Model 202-1 with storage drawer ..... \$165

<sup>1</sup>Registered Trademark Polaroid Corporation

<sup>2</sup>Registered Trademark Graflex, Inc.

U.S. Sales Prices FOB Beaverton, Oregon

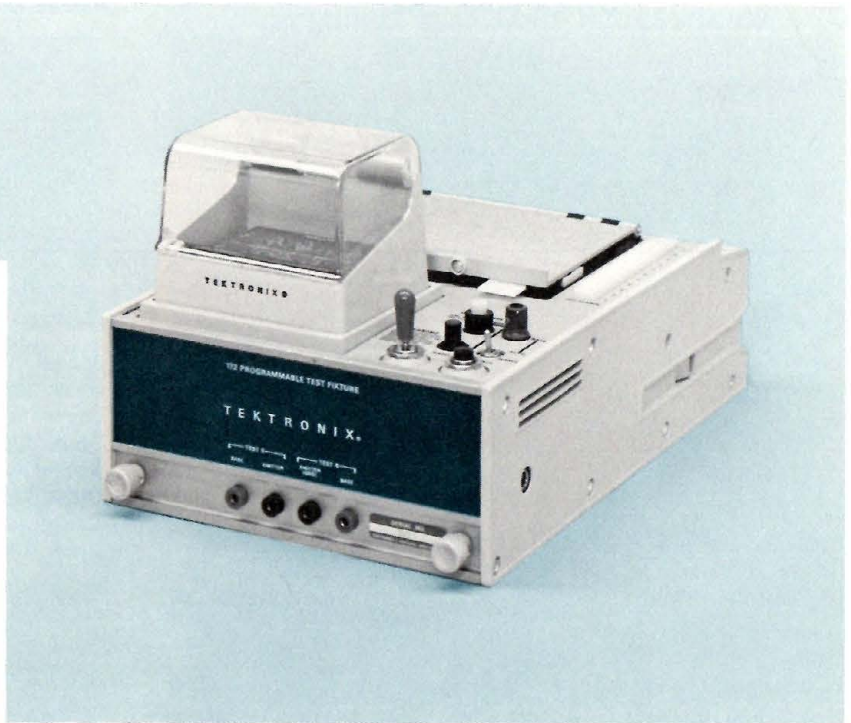


## Programmable Test Fixture

- PROGRAMS TESTS ON FETs, TRANSISTORS AND DIODES
- UP TO 11 PROGRAM TESTS



576 with 172 inserted



The 172 Programmable Test Fixture, when used with the TEKTRONIX 576 Curve Tracer, permits the operator to program up to eleven sequential tests on FETs, transistors and diodes. This fixture saves measurement time in applications where a series of tests are to be made on a number of devices. To make the same tests without this fixture requires setting the 576 controls for a particular test and inserting the devices one at a time. After the first test is completed, the 576 controls are set for the next test and the devices are inserted, again one at a time. This process is repeated for each test. The programmable fixture performs as many as eleven different tests on each device while the device remains in the test socket.

Even experienced operators are likely to make errors in applications where repeated adjustments in control settings are needed. The 172 removes this error source. Once the 172 is programmed, an operator with little or no experience makes tests quickly and accurately since the automatic programming removes human errors.

Standard accessories include a plastic card upon which the programmer graphs the test limits. This card is then placed

against the 576 display area for quick operator comparison of test results and limits. A more experienced operator may determine if the device performs to test limits directly from the CRT.

The 172 sequences through the various tests either automatically or manually. A variable RATE control is provided for the operator to set the test sequence at a rate which is best for him. A new operator requires more time per test, but with experience he will want to test at a faster rate. A front-panel switch or an optional foot switch advances the test in the manual mode.

When testing several different devices, plastic cards may be programmed in advance. Then the operator simply exchanges cards each time a different device is tested.

Retaining the programmed cards speeds incoming inspection. When a shipment is received, the operator selects the card for a device, inserts it into the 172 and completes the inspection. Programmed testing frees technically trained personnel to concentrate on more creative processes.

Programming is straightforward. Inserting plastic pins in holes in the programming card sets individual test conditions. Omit the pin from a particular test hole and the 172 skips that test. After installing the program pins in the card, the card is put into the card reader portion of the 172 and the operator starts the test sequence.



**CHARACTERISTICS**

**VERTICAL AND HORIZONTAL AMPLIFIERS**

**Display Accuracies**—As a percentage of the highest on-screen value.

| NORM DISPLAY MODES                             | NORMAL (UNMAGNIFIED)                           | OFFSET and MAGNIFIED with CENTERLINE VALUE from: |             |            |
|--|--|--|-------------|------------|
|  |  | 100 - 40 div                                     | 35 - 15 div | 10 - 0 div |
| Vert Current                                   | 3%   | 2%   | 3%          | 4%         |
| Horiz Base Volts                               | 3%   | 2%   | 3%          | 4%         |
| Horiz Volts                                    | 3%   | 2%   | 3%          | 4%         |
| LEAKAGE DISPLAY MODE                           |  |  |             |            |
| Vert Current                                   |  |  |             |            |
| 10 nA - 0.5 A/div                              | 3% ±1 nA                                       |  |             |            |
| 1 nA - 50 mA/div (magnified)                   |  | 2% ±1 nA   | 3% ±1 nA    | 4% ±1 nA   |
| 5, 2, & 1 nA/div                               | 5% ±1 nA                                       |  |             |            |
| Horiz Volts (Vert current of 1 μA/div or more) | 3%   | 2%   | 3%          | 4%         |
| Horiz Volts with Vert Current of:              |  |  |             |            |
| 100, 10 or 1 nA/div                            | 3% + 0.025 V/vert div (norm, unmagnified mode) | NOT APPLICABLE                                   |             |            |
| 200, 20 or 2 nA/div                            | 3% + 0.050 V/vert div (norm, unmagnified mode) |  |             |            |
| 500, 50, 5 nA/div                              | 3% + 0.125 V/vert div (norm, unmagnified mode) |  |             |            |

| PERFORM TESTS ON: |  |                             |          | PROGRAMMABLE CAPABILITIES   |
|-------------------|--|-----------------------------|----------|---|
| TEST              | XSTR   | FETs                        | DIODES   |   |
| 1*                | $H_{FE}$ , $V_{CE}^{(sat)†}$                                       | $V_{p†}$                    | $V_{F†}$ | PEAK VOLTS up to 350 V  |
| 2                 | $V_{BE}$   |                             |          | Horiz range is 100 mV/div to 2 V/div (Other conditions same as Test 1)  |
| 3                 | $H_{FE}$ , $V_{CE}^{(sat)}$  | $I_{DSS}$ , $R_{DS}^{(on)}$ |          | Base Drive: 100 nA to 110 mA<br>Collector Sweep: 2 V to 20 V peak<br>Vert range is 1 μA/div to 0.5 A/div<br>Horiz range is 0.1 V/div to 2 V/div |
| 4                 | Same as #3   |                             |          |   |
| 5                 | $I_{CEO}$ or $I_{CES}$ , $I_{CER}$ with external short or resistor |                             |          | Voltage Supply: 1 V to 500 VDC<br>Vert range is 1 nA/div to 0.5 A/div<br>Horiz range is 0.1 V/div to 50 V/div                                   |
| 6                 | $I_{CBO}$  | $I_{GSS}$                   |          | Same as #5  |
| 7                 | $I_{EBO}$  |                             | $I_R$    | Same as #5  |
| 8                 | $V_{(BR)CEO}$ or $V_{(BR)CER}$ with external resistor              |                             | $V_F$    | Current Supply: 100 nA to 110 mA DC<br>Vert range is 1 μA/div to 0.5 A/div<br>Horizontal range is 0.1 V/div to 50 V/div                         |
| 9                 | $V_{(BR)CES}$  |                             |          | Same as #8  |
| 10                | $V_{(BR)CBO}$  | $BV_{GSS}$                  |          | Same as #8  |
| 11                | $V_{(BR)EBO}$  |                             | $V_R$    | Same as #8  |

**Vertical Deflection Factor**—Test 1 and 2 (Collector or Emitter Current):  $I_C$ , 1 μA to 2 A/div in 20 steps. Test 3, 4, and 8, 9, 10, 11 (Collector or Breakdown Current): 1 μA to 0.5 A/div in 18 steps. Test 5, 6, 7 (Leakage Current): 1 nA to 0.5 A/div in 27 steps. All steps are in a 1, 2, 5 sequence.

**Horizontal Deflection Factor**—Test 1: 0.05 V/div to 200 V/div in 12 steps. Test 2 (Base Voltage): 100 mV/div to 2 V/div in 5 steps. Input Z for test 2, at least 100 MΩ at 100 mV/div and 200 mV/div. 1 MΩ (within 2%) at 0.5 V/div, 1 V/div, and 2 V/div. Tests 3 and 4 (Collector Voltage): 100 mV/div to 2 V/div in 5 steps. Test 5 through 11 (Breakdown or Leakage Voltage): 100 mV/div to 50 V/div in 9 steps. All steps are in a 1, 2, 5 sequence.

**Collector Sweep Voltage**—At least 2 V open circuit, or 1.5 A short circuit, at 100 mV/div and 200 mV/div. At least 5 V open circuit, or 2 A short circuit, at 500 mV/div. At least 20 V open circuit, or 150 mA short circuit, at 1 V/div and 2 V/div.

**Current Supply Accuracy**—0.1 μA to 1 μA, accurate within 3% ±30 nA with up to 500 V compliance. 1 μA to 11 mA, accurate within 2% ±30 nA with up to 500 V compliance. 10 mA to 110 mA, accurate within 2% ±30 nA with up to 50 V compliance. Increments of current are: 0.1 μA (from 0.1 μA to 11 μA), 1 μA (from 10 μA to 110 μA), 10 μA (from 100 μA to 1.1 mA), 100 μA (from 1 mA to 11 mA) and 1 mA (from 10 mA to 110 mA).

**Voltage Supply Accuracy**—1 V to 500 V, accurate within 3% ±300 mV with at least 0.5 mA compliance.

**Test Display Time Range (Automatic)**—300 ms or less to at least 2 s continuously variable. Manual operation from a front-panel switch or optional foot switch.

**OTHER CHARACTERISTICS**

**Ambient Temperature**—Performance characteristics are valid over an ambient temperature range of +10°C to +40°C.

**Dimensions and Weights**

|                 |           |         |
|-----------------|-----------|---------|
| Height w/cover  | 6 1/2 in  | 16.6 cm |
| Width           | 7 3/4 in  | 19.8 cm |
| Depth           | 12 3/8 in | 31.5 cm |
| Net weight      | 11.5 lb   | 5.3 kg  |
| Shipping weight | 16 lb     | 7.2 kg  |
| Export weight   | 23 lb     | 10.5 kg |

**Included Standard Accessories**—One instruction manual, one protective cover, five programming cards, 250 programming card pins, five limit cards (CRT overlay).

**Order 172 PROGRAMMABLE TEST FIXTURE** ..... \$1400

**Foot Switch**—for manually sequencing the programmed test.  
**Order 260-1189-01** ..... \$15

†These are the *usual* tests performed because of the higher current capability and pulse mode operation. However, other tests could be performed as well.

\*All of the test conditions for Test 1 are controlled by the Type 576 front-panel controls. Test 2 has the same conditions as for Test 1 except the horizontal amplifier is connected to the emitter-base terminals, and the horizontal deflection factor is controlled by the programming card.

For the remaining tests the only Type 576 controls that are functional are the Polarity and CRT controls such as INTENSITY, FOCUS, DISPLAY OFFSET.

U.S. Sales Prices FOB Beaverton, Oregon



- 200 AMP PEAK COLLECTOR DISPLAYS
- 20 AMP PEAK BASE SUPPLY



576 with 176 inserted



## CHARACTERISTICS

### COLLECTOR SUPPLY (PULSED)

**Width**— 300  $\mu$ s or 80  $\mu$ s determined by 576.

**Repetition Rate**—Power-line frequency.

**Polarity**— + or - determined by 576 polarity control.

**Amplitude**—Ranges are 15, 75, 350 volts nominal, controlled by MAX PEAK VOLTS switch on 576. Current (minimum available at low line into shorted load) is 15 V range, 200 A; 75 V range, 40 A; 350 V range, 8 A.

**Maximum Peak Watts**—Three illuminated push buttons select 10, 100, 1000 watts maximum peak power.

### STEP GENERATOR

**Current Ranges (X10 STEP selected)**—Step-Offset Amplitude Range is 100 mA to 2 A, 5 steps in a 1-2-5 sequence. Max Current (Steps and Aiding Offset) is X200 576 AMPLITUDE setting or 20 A, whichever is less. Max Voltage (Steps and Aiding Offset) is at least 5 V up to 10 A and 2 V up to 20 A.

**576 Offset Multiplier**—0 to X100 576 AMPLITUDE switch setting.

**Step Rate**—Power-line frequency.

**Pulsed Steps**— 300  $\mu$ s or 80  $\mu$ s wide.

**Step/Offset Polarity**—The STEP GEN polarity is the same as the COLLECTOR SUPPLY polarity. Step polarity may be inverted by actuating the INVERT push button.

**Accuracy (Current steps including offset)**—Incremental is within 5% between any two steps; within 10% with 0.1X STEP MULT. Absolute is within 3% of total output  $\pm$  1% of one step or within 3% of one step, whichever is greater.

The 176 Pulsed High-Current Fixture extends the capabilities of the 576 Curve Tracer by providing pulsed collector operation to 200 amps peak and pulsed base steps to 20 amps peak. The step offset, when selected, is also pulsed. The pulsed operating mode allows many tests previously impossible. For example, small signal transistors can be tested under pulsed collector breakdown conditions without over-dissipation. The 176 "front porch" configuration fits in place of the 576 Standard Test Fixture, and is programmed from the 576 mainframe except for controls not provided on the mainframe. The collector pulse is slaved to the 576 in regard to width and repetition rate. The pulse width is selected by depressing the 300  $\mu$ s or 80  $\mu$ s push button on the 576 mainframe (usually, 300  $\mu$ s should be selected). The rep rate is automatically set when the 176 is inserted in the mainframe. Rep rate is also dependent on power-line frequency. The five highest VERTICAL CURRENT/DIV (0.1 A/div to 2 A/div) of the 576 can be multiplied X10 by actuation of the X10 VERT push button on the 176. This feature enables viewing of up to a 200 amp peak display. The five highest STEP GENERATOR AMPLITUDE base current steps of the 576 (10 mA to 200 mA) can be multiplied X10 by actuation of the X10 STEP push button on the 176. This feature enables the pulsed base step generator on the 176 to provide up to a 20 amp base step (tenth step). Both X10 VERT and X10 STEP push buttons provide inputs to the fiberoptic readout to display actual values. **If STEP GENERATOR AMPLITUDE or VERTICAL CURRENT/DIV controls are moved out of the five highest current settings, the multiplication of the affected function automatically drops back to X1.**



Pulsed High-Current Fixture

VERTICAL AMPLIFIER

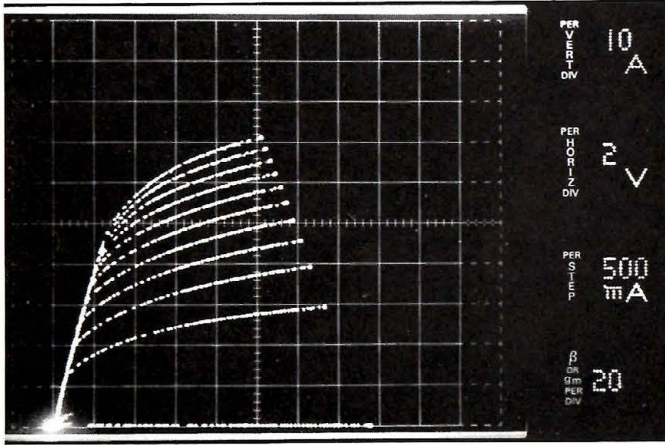
**Deflection Factor** (X10 VERT selected)—1 A/div to 20 A/div, 5 steps in a 1-2-5 sequence.

OTHER CHARACTERISTICS

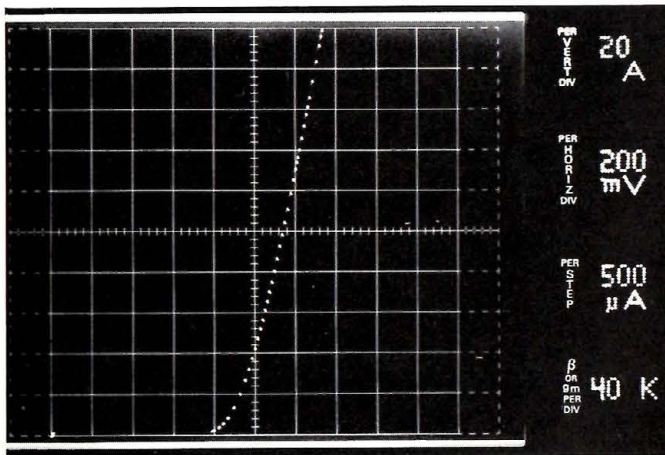
**Ambient Temperature**—Performance characteristics are valid over a temperature range of 0°C to +40°C.

**Dimensions and Weights**

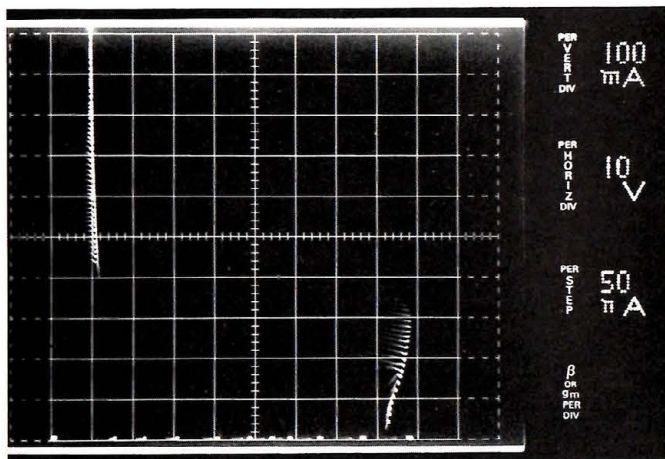
|            |           |         |
|------------|-----------|---------|
| Height     | 4 5/8 in  | 11.8 cm |
| Width      | 7 7/8 in  | 20.0 cm |
| Depth      | 11 3/8 in | 28.8 cm |
| Net weight | 12 3/4 lb | 5.8 kg  |



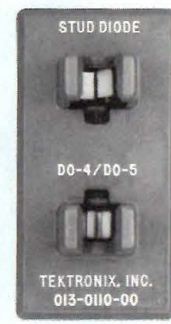
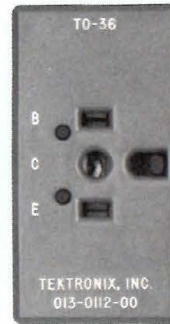
Collector voltage manually swept to obtain entire family of curves.



15 A rectifier diode driven to 200 A.



NPN (TO-3)  $V_{(BR) CES}$  pulsed into secondary breakdown.



INCLUDED STANDARD ACCESSORIES

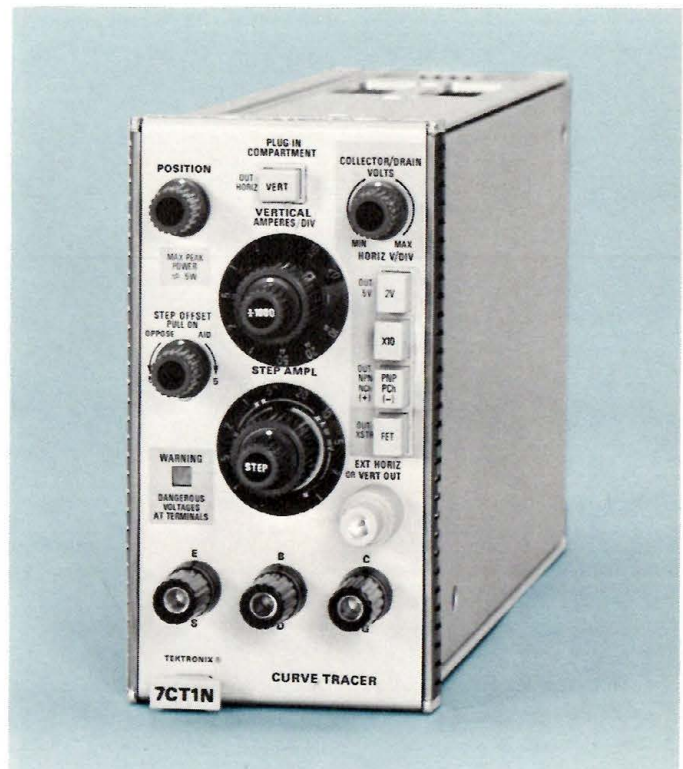
Adapter TO-36 (013-0112-00); adapter stud diode (013-0110-00); protective cover (337-1194-00); instruction manual.

Order 176 PULSED HIGH-CURRENT FIXTURE ..... \$1600

U.S. Sales Price FOB Beaverton, Oregon



# 5CT1N 7CT1N Plug-In Curve Tracers



- TESTS SEMICONDUCTOR DEVICES TO 0.5 W
- 10 nA/DIV TO 20 mA/DIV VERTICAL DEFLECTION FACTORS
- 0.5 V/DIV TO 20 V/DIV HORIZONTAL DEFLECTION FACTORS
- LIGHTED KNOB SKIRTS FOR SCALE FACTOR READOUT
- EASY TO OPERATE

The 7CT1N Curve Tracer is a plug-in unit for use in TEKTRONIX 7000-Series Oscilloscope Systems and the 5CT1N Curve Tracer is a plug-in unit for use in TEKTRONIX 5100-Series Oscilloscope Systems. Both are for displaying characteristic curves of small-signal semiconductor devices to power levels up to 0.5 watts. The plug-ins operate in either vertical compartment of the respective mainframes. Horizontal deflection is achieved through a front panel source which drives the external input of either a vertical or horizontal plug-in unit installed in the mainframe's horizontal compartment.

The following discussion and characteristics apply to both units.

A variable collector/drain sweep produces a maximum peak voltage of at least 250 volts; a base/gate step generator produces up to 10 calibrated current or voltage steps. Ranges of step amplitudes are 1  $\mu$ A/step to 1 mA/step for current and 1 mV/step to 1 V/step for voltage. Maximum power output is 0.5 watts. In addition, the unit has a vertical display amplifier with deflection factors ranging from 10 nA/div to 20 mA/div and a horizontal display amplifier with deflection factors ranging from 0.5 V/div to 20 V/div.

A front panel button switches the base/gate step generator output from current steps of the same polarity as the collector/drain sweep for checking transistors, to voltage steps of the opposite polarity of the collector/drain sweep for checking FETs in the depletion region. This button also internally switches the test fixture leads so that one test socket can be used to test both transistors and FETs.

The OFFSET control allows the base/gate step generator output to be offset at least 5 steps in the aiding or opposing direction for conveniently checking the enhancement region of FETs.

A  $\div 1000$  button increases the sensitivity of the vertical display amplifier to 10 nA/div allowing leakage current measurements. When the button is pressed, the collector/drain supply is changed from a sweeping output to a DC output for checking leakage currents without looping aberrations.

## CHARACTERISTICS COLLECTOR/DRAIN SUPPLY

| Horizontal Volts/Div | X1        |          | X10      |           |
|----------------------|-----------|----------|----------|-----------|
|                      | 0.5       | 2        | 0.5      | 2         |
| Voltage Range        | 0 - 7.5 V | 0 - 30 V | 0 - 75 V | 0 - 300 V |
| Maximum Current      | 240 mA    | 60 mA    | 24 mA    | 6 mA      |

**Maximum Open Circuit Voltage**—Within  $\pm 20\%$ . Maximum short circuit current, within 30%.



**Series Resistance**—Automatically selected with horizontal volts/div switches. Peak power is 0.5 W or less, depending upon control settings.

**High Voltage Warning**—When the horizontal volts/div switch is in the X10 position, a flashing warning light appears on the front panel indicating that dangerous voltages may exist at the test terminals.

## STEP GENERATOR

**Transistor Mode**—Step amplitude range is 1  $\mu$ A/step to 1 mA/step, 1-2-5 sequence. Maximum current (steps plus aiding offset) is X15 amplitude setting. Maximum voltage (steps plus aiding offset) is at least 13 V. Maximum opposing offset current is at least X5 amplitude setting.

**FET Mode**—Step amplitude range is 1 mV/step to 1 V/step, 1-2-5 sequence. Voltage amplitude (steps plus aiding offset) is X15 amplitude setting, 13 V maximum. Source impedance is 1 k $\Omega$   $\pm$  1%.

**Accuracy**—Incremental; within 3% between steps. Absolute; within  $\pm$  (3% + X0.3 amplitude setting).

**Step Polarity**—The step generator polarity is the same as the collector/drain supply in the transistor mode and opposing in the FET mode.

**Number of Steps**—Selectable in one step increments between 0 and 10.

**Offset**—Selectable from 0 to 5 steps. Polarity aid(s) or oppose(s) the step polarity.

**Vertical Deflection Factors**—10 nA/div to 20  $\mu$ A/div with the  $\div$ 1000 control activated. 10  $\mu$ A/div to 20 mA/div in the X1 mode.

**Vertical Display Accuracy**—Within 5% in the X1 mode. Within 5%  $\pm$  0.2 nA per displayed horizontal volt when in the  $\div$ 1000 mode.

**Horizontal Deflection Factors**—Selectable: 0.5 V, 2 V, 5 V, or 20 V, when driving an amplifier with a deflection factor of 50 mV/div and an input R of at least 50 k $\Omega$ .

**5CT1N Horizontal Display Accuracy**—Within 5% plus the deflection factor accuracy of the plug-in being driven. The plug-in would be a vertical or horizontal amplifier (such as the TEKTRONIX 5100-Series plug-ins) with a 50 mV/div deflection factor and would be used in the horizontal compartment of the 5100-Series Oscilloscope mainframe.

**7CT1N Horizontal Display Accuracy**—Within 5% plus the deflection factor accuracy of the plug-in being driven. The plug-in would be a vertical or horizontal amplifier (such as the TEKTRONIX 7000-Series plug-ins) with a 100 mV/div deflection factor and would be used in the horizontal compartment of the 7000-Series Oscilloscope mainframe.

## OTHER CHARACTERISTICS

**Ambient Temperature**—Performance characteristics are valid from 0°C to +50°C.

| Dimensions        | 5CT1N |      | 7CT1N |      |
|-------------------|-------|------|-------|------|
|                   | in    | cm   | in    | cm   |
| Length            | 12    | 30.5 | 14.5  | 36.9 |
| Width             | 2.6   | 6.7  | 2.8   | 7.1  |
| Height            | 5     | 12.7 | 5     | 12.7 |
| Weight            | lb    | kg   | lb    | kg   |
| Net               | 1.8   | 0.8  | 2.5   | 1.1  |
| Domestic Shipping | 4     | 1.8  | 6     | 2.7  |
| Export Packed     | 9     | 4.1  | 11    | 5    |

**Included Standard Accessories**—Test Fixture (013-0128-00) with two sets of test terminals, one with TO-5 basing and the other with TO-18 basing; instruction manual.

Order 5CT1N CURVE TRACER ..... \$350

Order 7CT1N CURVE TRACER ..... \$400

## OPTIONAL ACCESSORIES

**Adapters**—For transistors with long leads.  
Order 013-0069-00 ..... \$6.60

For transistors with TO-3 or TO-66 basing.  
Order 013-0070-01 ..... \$5.50

**Diode Test Fixture**—Holds axial-lead diodes.  
Order 013-0072-00 ..... \$6.60

**Adapter Box**—Allows mounting of additional semiconductor sockets. Order 013-0073-00 ..... \$4.40

**Power Transistor Socket**—For power transistors with hook leads. Order 013-0074-00 ..... \$9.50

**Diode Test Adapter**—Production test fixture for rapid handling.  
Order 013-0079-00 ..... \$29.00

U.S. Sales Prices FOB Beaverton, Oregon



- 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.



### CHARACTERISTICS 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  $\Omega$ , 2.5  $\Omega$ , 10  $\Omega$ , 65  $\Omega$ , 250  $\Omega$ , 1 k $\Omega$ , 6.5 k $\Omega$ , 25 k $\Omega$ , 85 k $\Omega$ , 500 k $\Omega$  and 1.7 M $\Omega$ , all within 5%.

### BASE STEP GENERATOR

**Current Range**—0.2  $\mu$ A/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 continuously variable offset with a  $\pm 1$  step range is provided. Steps and offset are available on collector current ranges greater than 10  $\mu$ A/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).

The CT71 is manufactured by Telequipment, a division of Tektronix U.K. Ltd., a wholly-owned subsidiary of Tektronix, Inc.

### 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. 220 V to 250 V in 10-V steps. 48 Hz to 63 Hz line frequency, 37 VA.

### Dimensions and Weights

|            |                    |         |
|------------|--------------------|---------|
| Height     | 9 $\frac{3}{8}$ in | 24.5 cm |
| Width      | 9 $\frac{1}{4}$ in | 23.5 cm |
| Depth      | 19 in              | 48.3 cm |
| Net Weight | 25 lb              | 11.7 kg |

**Included Standard Accessories**—Two test fixtures; instruction manual.

CT71, order TLCT71 CURVE TRACER ..... \$795

U.S. Sales Price FOB Beaverton, Oregon