



577/177

TYPICAL APPLICATIONS

- Incoming Inspection
- Semiconductor R&D

FEATURES

- Test Two-Terminal and Three-Terminal Discrete Semiconductors
- Storage Capability (Model D1)
- Power Capability Up to 100 Watts

The 577/177 is a low-cost, general purpose, non-programmable Curve Tracer System designed for testing semiconductor devices at power levels up to 100 Watts. Maximum continuous current is 10 amps (20 amps in pulsed mode). The 577 can be ordered with either a split-screen, bistable-storage CRT (577/D1), or with a conventional non-storage CRT (577/D2).

The 577's storage CRT may be used to overlay the characteristic curves of one device on top of the stored characteristics of another. Dot displays (generated during high-current pulsed testing or during very low-current testing under dc conditions) can be transformed into complete characteristic curves by simply moving them across the CRT while in the storage mode. A good example of a dot display occurs in op-amp testing because the open-loop, 3-dB bandwidth of many op amps is so low that the curves must be plotted slowly. Linear ICs such as op amps may be tested with the 577 by using the 178 Linear-IC Test Fixture.

CHARACTERISTICS

All characteristics are for the 577 Curve-Tracer Mainframe operating with a 177 Standard Test Fixture.

COLLECTOR SUPPLY

Modes/Polarity—Norm: AC (at line frequency); positive or negative full-wave rectified ac. DC: Positive or negative dc.

Voltage*1

Range (V)	6.5	25	100	400	1600
Max Continuous Peak Current (A)	10	2.5	0.6	0.15	0.04
Peak Pulse Current (A)	20	5	1.25	0.30	0.08

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

Series Resistance—From 0.12 Ω to 8 M Ω in 14 steps, all within 15%, $\pm 0.1 \Omega$. Peak Power Limit Setting: 100, 30, 9, 2.3, 0.6, and 0.15 W.

Safety Interlock—Protects operator from dangerous voltages.

STEP GENERATOR

Current Mode—Step/Offset Amplitude Range: 5 nA/step (with X0.1 Mult) to 200 mA/step, 1-2-5 sequence. Maximum Current (Steps and Aiding Offset): X20 amplitude setting, except X10 (2A) at 200 mA/step and X15 (1.5 A) at 100 mA/step. Maximum Voltage (Steps and Aiding Offset): At least 7 V. Maximum Opposing Offset Current: X10 amplitude setting or 10 mA, whichever is less. Maximum opposing voltage is limited at 1 to 5 V.

Voltage Mode—Step/Offset Amplitude Range: 5 mV/step (with X0.1 Mult) to 2 V/step, 1-2-5 sequence. Maximum Voltage (Steps and Aiding Offset): 20 times amplitude-switch setting. Maximum Current: At least 100 mA at 0 V. Short-Circuit Current Limiting: Not more than 200 mA. Maximum Opposing Offset Voltage: X10 amplitude-switch setting. Maximum Opposing Current: Limited between 10 and 20 mA (derating to 0 mA at 20 V).

Accuracy—Incremental: Within 2% between steps. Absolute: Within 3% of total output or amplitude setting, whichever is greater. Within 4% with X.01 mult. Offset Multiplier: Continuously variable from 0 to X10 the amplitude setting, either aiding or opposing the step polarity.

Step Rates—Selectable at X1, X2, or X4 line frequency.

Pulsed Steps— $\approx 300 \mu\text{s}$ width.

Step/Offset Polarity—Same as Collector-Supply polarity and positive in the ac position. Polarity can be independently inverted with Step/Offset Polarity control or from the test fixture.

Step Family—Repetitive or single family.

Number of Steps—Selectable from 1 to 10 full-amplitude steps. Selectable up to ≈ 95 steps when using Step X0.1 multiplier.

DEFLECTION CONTROLS

Display Accuracies*1

Display Mode	Normal	
	(unmagnified)	Magnified
Vertical Collector Current	3% ± 1 nA	4% ± 1 nA
Horizontal Collector Volts	3%	4%
Horizontal Base Volts	3%	4%
Step-Generator Mode		
Horizontal Mode	4%	5%

*1 As a percentage of highest on-screen value.

Vertical-Deflection Factor—Collector Current: 2 nA to 2 A/div, 28 steps in 1-2-5 sequence (0.2 nA to 0.2 A/div with X10 magnification).

Horizontal-Deflection Factor—Collector Volts: 50 mV to 200 V/div, 12 steps in 1-2-5 sequence (5 mV to 20 V/div with X10 magnification). Base Volts: -50 mV to 2 V/div, 6 steps in 1-2-5 sequence (5 mV to 0.2 V/div with X10 magnification). Step Generator: 1 step/div (0.1 step/div with X10 magnification).

Automatic Scale-Factor Readout—Change in deflection factor is indicated by lights behind the knob skirt when using X10 Mag.

Automatic Positioning—Trace (or spot) is automatically positioned when Collector-Supply polarity is changed when using the 177.

Display Invert—Single control inverts display and repositions trace.

Display Filter—Selectable low-pass filter reduces vertical noise for easier high-sensitivity measurements.

CRT

CRT—Rectangular 165 mm (6.5 in.) with an 8 \times 10 div (1.27 cm/div) parallax-free internal graticule. Two display modules are available for the 577. The D1 display unit has a split-screen storage CRT with phosphor similar to GJ (P1). The D2 display unit has a nonstorage CRT with GH (P31) phosphor standard. Accelerating potential is 3.5 kV.

Beam Finder—Compresses off-screen trace to within graticule area.

POWER REQUIREMENTS

Line-Voltage Ranges ($\pm 10\%$)—100, 110, 120 or 200, 220, 240 V ac.

Line Frequency—50 to 60 Hz.

Power—155 W max at 110 V ac, 60 Hz.

PHYSICAL CHARACTERISTICS

Dimensions	577		177	
	mm	in.	mm	in.
Width	224	8.8	201	7.9
Height	503	19.8	102	4.0
Depth	584	23.0	152	6.0
Weights \approx	kg	lb	kg	lb
Net	18.1	40.0	1.1	2.5
Shipping	22.7	50.0	2.7	6.0

When the 577 and 177 are ordered together, their combined shipping weight is ≈ 24 kg or ≈ 53 lb (domestic).

178 Linear-IC Test Fixture

- Tests Single, Dual, or Quad: Operational Amplifiers, Comparators, Differential Amplifiers, Regulators, and More

Since linear ICs are typically tested under very low-current conditions, the 577/178 Curve-Tracer System is ideally suited to the task. The 178 Linear-IC Test Fixture provides the necessary and accurate low-current-measurement capability. Test cards set up the measurement function, and the 577's storage CRT allows the operator to transform the dot display (usually seen under low-current, dc conditions) into a complete characteristic curve by slowly sweeping the dot across the CRT while in the Storage Mode.

A 577/178 Curve Tracer System is composed of a 577 mainframe, 178 Linear-IC Test Fixture, appropriate test cards (choose from three op-amp cards and two regulator cards), and the proper socket adapter that interfaces the system to the device-under-test.

OP-AMP CARDS

The Standard Op-Amp Card is designed to test devices that require single or dual power supplies, have two (differential) high-impedance inputs, and a single output. Common measurements include: offset voltage, positive and negative input current, CMRR, gain, positive and negative PSRR, positive- and negative-supply current, and collector-supply current. The Multiple-Op-Amp Card allows the operator to test up to four devices in a single package by simply operating a four-position switch. The Hardwire Card is designed for applications where there is an advantage in preparing individual cards for specific devices so that they may be quickly switched to accommodate a change in the type of device-under-test.

Socket Adapters for Op-Amp Cards

The device-under-test socket on the Standard and Multiple Op-Amp Cards accepts several types of socket adapters using the Amphenol-Barnes Adapter System. This system accepts most of the standard package configurations (TO5, DIP, flat pack, etc). Sockets for these cards are shown on next page.

REGULATOR CARDS

There are two types of Regulator Cards, positive and negative. These cards are used primarily in measuring parameters of three-terminal voltage regulators. Parameters measured include: output voltage, load regulation, line regulation, and ripple regulation, and quiescent and common-terminal current.

Socket Adapters for Regulator Cards

Socket adapters for three-terminal regulators are the same as the Kelvin Sensing Adapters used on the standard curve tracer. See next page.

CHARACTERISTICS

VERTICAL AMPLIFIER

Display Accuracies/Deflection Factor

Vertical*1	Normal	Magnified
Input Voltage or Δ Input Voltage	10 μ V to 50 mV/div	1 μ V to 5 mV/div
Accuracy*2	3%	4%
Input Current	50 pA to 0.2 mA/div	5 pA to 20 μ A/div
Accuracy*2	3% \pm 50 pA	4% \pm 50 pA
Power-Supply Current	0.1 μ A to 50 mA/div	10 nA to 5 mA/div
Accuracy*2	3% \pm 0.1 μ A	4% \pm 0.1 μ A
Collector-Supply Current	1 nA to 50 mA/div	0.1 nA to 5 mA/div
Accuracy*2	3% \pm 1 nA	4% \pm 1 nA

*1 1-2-5 sequence.

*2 Percentage of highest on-screen values.

POWER SUPPLIES

Voltage—Positive and negative supplies are adjustable from 0 to 30 V. Voltage of both supplies can be adjusted from a single calibrated control. Accuracy is within 2% \pm 100 mV. Negative supply can be independently adjusted by an uncalibrated control.

Current—At least 150 mA with adjustable current limiting.

SWEEP GENERATOR

Frequency Range—Adjustable from 0.01 Hz to 1 kHz. Sinusoidal signal controls output, common-mode input, or power-supply voltages of device-under-test.

Amplitude—Adjustable from 0 to 30 V peak.

SOURCE RESISTANCE

Resistor Values—Two each, 50 Ω , 10 k Ω , 20 k Ω , 50 k Ω , or external resistors. When vertical deflection factor is in 1 through 50 mV/div positions, add 550 Ω to all values.

LOAD RESISTANCE

Resistor Values—One each, 100 Ω , 1 k Ω , 2 k Ω , 5 k Ω , 10 k Ω , 20 k Ω , 50 k Ω , or external resistors.

COLLECTOR SUPPLY

The 25- and 100-V ranges of the collector supply (located on 577 mainframe) are available to the 178 Test Fixture. Supply output is located on the 178 front-end panel and on the device card. Automatic positioning with supply polarity is inoperative when using the 178 Test Fixture. (See 577/177 characteristics for collector-supply performance.)

THREE-TERMINAL-REGULATOR TEST-CARD CHARACTERISTICS

DUT Input Supply—Input Voltage (Two Ranges): 0 to 30 V is within 2% \pm 200 mV of dial setting. 0 to 60 V is within 2.5% \pm 300 mV of dial setting. Regulation: Within 200 mV.

Input Sweep Frequency: DC to 1 kHz. 300- μ s Pulsed Current: 5 mA to 2 A.

Short Duration DC Current**

Supply Voltage (V)	Current (mA)
0 to 10	700
10 to 20	350
20 to 40	350
40 to 60	120

**1 One minute duration.

DUT Current Load—5 mA to 2 A within \pm 3%, \pm 1.25 mA.

DUT Comparison Output DC Voltage Accuracy—0 to 10 V Range: Within 1% \pm 20 mV. 0 to 100 V Range: Within 1% \pm 150 mV.

ORDERING INFORMATION

577/D1 Storage Curve-Tracer Mainframe (Without Test Fixture). \$7,500

577/D2 Nonstorage Curve-Tracer Mainframe (Without Test Fixture). \$6,500

OPTION

Option 10—10x10-cm gratulace. + \$98

TEST FIXTURES

177 Standard \$1,540

Includes: Transistor adapter for most bipolar transistors and some MOS FETs A1007; axial lead diode adapter with Kelvin sensing terminals A1005; safety shield for test connection area (337-1194-02); instruction manual (070-1436-00).

178 Linear-IC Test Fixture. \$3,900

Includes: 16 DIP IC sockets (136-0442-00); standard Op Amp Card with cover and ten patch cords (013-0149-02); interchangeable nomenclature panel for function switch (333-1770-00); instruction manual (070-1977-00).

577 OPTIONAL ACCESSORIES

Test Set-Up Chart—Package of 250. Order 070-1639-00. \$7.50

Device Adapter Sockets—See socket adapters in this section.

CRT Implosion Shield—Clear. For 577D1. Order 337-1440-00. \$3.75

Camera—C-5C. \$495

See Instrumentation Documentation Devices section, page 501.

Cart—K213. \$625

See Cart section.

178 OPTIONAL ACCESSORIES

2 Inch Patch Cord—Package of 10. Order 012-0200-00. \$5.75

Cards—(Standard Op Amp) One included with 178. Order 013-0149-02. \$260

(Hardwire) Order 013-0150-02. \$130

(Multiple Op Amp) Order 013-0155-01. \$750

(Positive Regulator) Order 013-0147-00. \$1,735

(Negative Regulator) Order 013-0148-00. \$1,545