SECTION 1
SPECIFICATION

Change information, if any, affecting this section will be found at the rear of the manual.

The Type 576 Curve Tracer is a dynamic semiconductor tester which allows display and measurement of characteristic curves of a variety of two and three terminal devices including bipolar transistors, field effect transistors, MOSFETs, silicon controlled rectifiers and unijunction transistors. A variety of possible measurements is available using either grounded emitter or grounded base configurations. The instrument has available either an AC or a DC collector supply voltage ranging from 0 to ±1500 volts. The step generator produces either current or voltage steps, which may be applied to either the base terminal or the emitter terminal of the device under test. Step generator outputs range from 5 nA to 2 A in the current mode, and from 5 mV to 40 V in the voltage mode. The steps may also be produced as short duration pulses. Calibrated step offset allows offsetting the step generator output either positive or negative. The vertical display amplifier measures either collector current or leakage current with a maximum deflection factor of 1 nA/division when making a leakage measurement. The horizontal display amplifier allows measurement of both collector and base voltage.

The following electrical and environmental characteristics are valid for instruments operated at an ambient temperature of from +10°C to +40°C after an initial warmup period of 5 minutes, when previously calibrated at a temperature of +25°C ±5°C. Section 5, Performance Check and Calibration Procedure, gives a procedure for checking and adjusting the Type 576 with respect to the following specification.

The Type 576 MOD 301W is a standard Type 576 without the Readout Assembly. All the information contained in this manual pertaining to the Readout Assembly and its operation should be disregarded when used in conjunction with a modified instrument.

TABLE 1-1
ELECTRICAL CHARACTERISTICS

Collector Supply

Characteristic	Performance
Sweep Modes	Normal mode: AC (at line frequency); positive-or negative-going full wave rectified AC. DC mode: positive or negative DC.
DC Mode Ripple	No-load: 2% or less of voltage, or 0.1% or less of full range voltage.
Voltages Accuracy	Peak open circuit voltages on all ranges within +35% and −5%.
Ranges	15 V 75 V 350 V 1500 V
Maximum Peak Current (Normal Mode)[1]	10 A 2 A 0.5 A 0.1 A
Peak Current (Step Generator in Pulsed Steps Mode)	At least 20 A At least 4 A At least 1 A At least 0.2 A
Minimum Series Resistance	0.3 Ω 6.5 Ω 140 Ω 3 kΩ
Maximum Series Resistance	65 kΩ 1.4 MΩ 6.5 MΩ 6.5 MΩ
Series Resistance Available	0.3 Ω, 1.4 Ω, 6.5 Ω, 30 Ω, 140 Ω, 650 Ω, 3 kΩ, 14 kΩ, 65 kΩ, 300 kΩ, 1.4 MΩ and 6.5 MΩ, all within 5% or 0.1 Ω.
Peak Power Watts Settings	0.1 W, 0.5 W, 2.2 W, 10 W, 50 W and 220 W. Derived from nominal peak open circuit collector voltages and nominal series resistance values at nominal line voltage.
Safety Interlock	When MAX PEAK VOLTS switch is set to either 75, 350 or 1500, a protective box must be in place over test terminals and its lid closed be-

[1]Collector Supply Maximum Continuous Peak Current Operating Time vs Duty Cycle and Ambient Temperature. With the PEAK POWER WATTS at 50 only, the following limitations apply: Maximum continuous operating time at rated current (100% duty cycle) into a short circuit is 20 minutes at 25°C ambient, or 10 minutes at 40°C ambient. Alternatively dury cycle may be limited to 50% at 25°C ambient or 25% at 40°C ambient. (A normal family of curves for a transistor will produce a duty cycle effect to 50% or less even if operated continuously.) Over dissipation of the collector supply will temporarily shut it off and turn on the yellow COLLECTOR SUPPLY VOLTAGE DISABLED light. No damage will result.

	fore voltage can be applied. Amber light on indicates interlock is open; Red light on indicates voltage is being applied to test terminals.
Looping Compensation	Cancels stray capacitance between collector test terminal and ground in Standard Test Fixture and all Standard Test Fixture Accessories.
Step Generator	
Accuracy (Current or Voltage Steps, Including Offset)	
Incremental Accuracy	Within 5% between any two steps, without .1X STEP MULT button pressed; within 10% with .1X STEP MULT button pressed.
Absolute Accuracy	Within 2% of total output, including any amount of offset, or 1% of AMPLITUDE switch setting, whichever is greater.
Step (Current or Voltage) Amplitudes	One times or 0.1 times (with .1X STEP MULT button pressed) the AMPLITUDE switch setting.
OFFSET MULT Control Range	Continuously variable from 0 to 10 times AMPLITUDE switch setting, either aiding or opposing the step generator polarity.
Current Mode	
AMPLITUDE Switch Range	200 mA to 50 nA, in 1-2-5 sequence.
Maximum Current (Steps and Aiding Offset)[2]	20 times AMPLITUDE switch setting, except 10 times switch setting when switch is set to 200 mA, and 15 times switch setting when the switch is set to 100 mA.
Maximum Voltage (Steps and Aiding Offset)	At least 10 V.
Maximum Opposing Offset Current	Whichever is less: 10 times AMPLITUDE switch setting, or between 10 mA and 20 mA.
Maximum Opposing Voltage	Between 1 V and 3 V.
Ripple Plus Noise	0.5% or less of AMPLITUDE switch setting or 4 nA, peak to peak.
Voltage Mode	
AMPLITUDE Switch Range	50 mV to 2 V, in 1-2-5 sequence.
Maximum Voltage (Steps and Aiding Offset)	20 times AMPLITUDE switch setting.
Maximum Current (Steps and Aiding Offset)	At least 2 A at 10 V or less, derating linearly to 10 mA at 40 V.
Short Circuit Current Limiting (Steps and Aiding Offset)	20 mA, 100 mA, 500 mA, +100%-0%; 2 A +50%-0%; as selected by CURRENT LIMIT switch.
Maximum Opposing Offset Voltage	10 times AMPLITUDE switch setting.
Maximum Opposing Current	Limited between 10 mA and 20 mA
Ripple Plus Noise	0.5% or less of AMPLITUDE switch setting, or 2 mV, peak to peak.
Step Rates	(Front panel RATE button labels in parentheses.) 1 times (.5X), 2 times (NORM) and 4 times (2X) line frequency. Steps occur at zero collector voltage when .5X or NORM RATE buttons are pressed, and also at peak voltage when 2X RATE button is pressed. Steps occur at collector voltage peak and at normal rate when .5X and 2X RATE buttons are pressed together.
Pulsed Steps	Pulsed steps 80 µs or 300 µs wide within +20%, –5% produced whenever one of the PULSED STEPS buttons is pressed. Pulsed steps can be produced only at normal and .5 times normal rates. Collector Supply mode automatically becomes DC when either the 300 µs or 80 µs PULSED STEPS button is pressed unless POLARITY switch is set to AC. If the 300 µs and 80 µs PULSED STEPS buttons are pressed together, 300 µs pulsed steps are produced, but collector supply mode does not change.

[2]Continuous DC Output vs Time, Temperature and Duty Cycle. 2A continuous DC output can be achieved for an unlimited period up to 30°C ambient. Between 30°C and 40°C ambient, 2A continuous DC operation should be limited to 15 minutes or limited to a 50% duty cycle or less. A family of steps (such as 10 steps at 200 mA per step) will automatically reduce the duty cycle to 50% even if generated continuously. Exceeding the rating will temporarily shut off power to the entire instrument but no damage will result.

Steps and Offset Polarity	Corresponds with collector supply polarity (positive going when POLARITY switch is set to AC) when the POLARITY INVERT button is released. Is opposite collector supply polarity (negative-going in AC) when either the POLARITY INVERT button is pressed or the Lead Selector switch is set to BASE GROUNDED. If Lead Selector switch is set to BASE GROUNDED, POLARITY INVERT button has no effect on steps and offset polarity.
Step Families	Repetitive families of characteristic curves generated with REP STEP FAMILY button pressed. Single family of characteristic curves generated each time SINGLE STEP FAMILY button is pressed.
Number of Steps	Ranges from 1 to 10 as selected by the NUMBER OF STEPS switch. For zero steps, press SINGLE STEP FAMILY button.

Display Amplifiers

Display Accuracies (%of Highest On-Screen Value)	Display magnified (DISPLAY OFFSET Selector switch set to either VERT X10 or HORIZ X10) and offset between			Display Unmagnified
	100 and 40 divisions	35 and 15 divisions	10 and 0 divisions	
Normal and DC Collector Supply Modes				
Vertical Collector Current	2%	3%	4%	3%
External Vertical (Through Interface)	2%	3%	4%	3%
Horizontal Collector Volts	2%	3%	4%	3%
Horizontal Base Volts	2%	3%	4%	3%
External Horizontal (Through Interface)	2%	3%	4%	3%
Leakage Collector Supply Mode				
Vertical Emitter Current (VERTICAL Switch set between 10 nA and 2 mA)	2% ±1 nA	3% ±1 nA	4% ±1 nA	3% ±1 nA
Vertical Emitter Current (VERTICAL Switch set to 5 nA, 2 nA or 1 nA)	Not Applicable			5% ±1nA
Horizontal Collector or Base Volts VERTICAL switch set to:				
1 μA or more	2%	3%	4%	3%
100 nA, 10 nA or 1 nA	Not Applicable			3% plus 0.025 V for each vertical division of deflection on the CRT
500 nA, 50 nA or 5 nA	Not Applicable			3% plus 0.125 V for each vertical division of deflection on the CRT
200 nA, 20 nA or 2 nA	Not Applicable			3% plus 0.050 V for each vertical division of deflection of the CRT
Step Generator Display				

Vertical Step Generator	3%	4%	5%	4%
Horizontal Step Generator	3%	4%	5%	4%

Deflection Factors	
Vertical	
Collector Current	1 μA/division to 2 A/division in 1-2-5 sequence.
Emitter Current	1 nA/division to 2 mA/division in 1-2-5 sequence.
Step Generator	1 step/division.
Horizontal	
Collector Volts	50 mV/division to 200 V/division in 1-2-5 sequence
Base Volts	50 mV/division to 2 V/division in 1 2 5 sequence.
Input Impedance	At least 100 MΩ with HORIZONTAL switch set to 50 mV, 100 mV and 200 mV BASE; 1 MΩ within 2% with switch set to .5 V, 1 V and 2 V.
Step Generator	1 step/division

Maximum Displayed Noise

	1% or less, or MAX PEAK VOLTS Switch			
	15	75	350	1500
Vertical				
COLLECTOR	1 μA	1 μA	2 μA	5 μA
EMITTER	1 nA	1 nA	2 nA	5 nA
Horizontal				
COLLECTOR	5 mV	5 mV	20 mV	200 mV
BASE	5 mV	5 mV	5 mV	5 mV

Calibration Check	With DISPLAY OFFSET Selector switch set to NORM (OFF), spot is deflected 10 divisions both vertically and horizontally within 1.5% whenever the CAL button is pressed. With DISPLAY OFFSET Selector switch set to X10 MAGNIFIER (either axis) the calibration spot is within 0.5% of zero spot (previously set to CRT graticule center) when CAL button is pressed.
Vertical and Horizontal Position Controls	Coarse positioning in 5 division increments within 0.1 division; continuous fine positioning over at least 5 divisions for each coarse position.
Display Offset	Vertical or Horizontal offset of display centerline value up to 10 divisions in 21 half division steps.
Display Positioning Accuracy Using POLARITY Switch	Spot positioning with change in POLARITY switch setting (using AC position as reference), within 0.1 division of:

	Vertically	Horizontally
AC	Centered	Centered
+(NPN)	−5 divisions	−5 divisions
−(PNP)	+5 divisions	+5 divisions

CRT and Readout

CRT	
Type	Electrostatic deflection.
Screen Size	Calibrated area of 10 divisions by 10 divisions; 12 usable divisions horizontally (1 division equals 1 cm).
Typical Accelerating Potential	4000 V
Readouts	Automatic digitally lighted display. Readout is automatically blanked if readings would be outside the available ranges or would give erroneous display.
PER VERT DIV	1 nA to 20 A calculated from VERTICAL switch setting, DISPLAY OFFSET Selector switch setting and MODE switch setting (or X10 Vertical Interface Input).
PER HORIZ DIV	5 mV to 200 V calculated from HORIZONTAL switch setting and DISPLAY OFFSET Selector switch setting
PER STEPS	5 nA to 2A and 5 mV to 20 V calculated from AMPLITUDE switch setting and .1X STEP MULT button position (or X10 Step Interface Input).

β or g_m PER DIV	1 μ to 500 k calculated from VERTICAL switch setting, DISPLAY OFFSET Selector switch setting, AMPLITUDE switch setting, .1X STEP MULT button position, X10 Vertical Interface Input and X10 Step Interface Input.

Power Requirements

Power Connection	This instrument is designed for operation from power source with its neutral at or near ground (earth) potential. It is not intended for operation from two phases of multi-phase system, or across legs of single-phase, three wire system. It is provided with a three-wire power cord with three-terminal polarized plug for connection to the power source. Third wire is directly connected to instrument frame, and is intended to ground the instrument to protect operating personnel, as recommended by national and international safety codes.	
Line Voltage Ranges	115 VAC	230 VAC
Low	90 V to 110 V	180 V to 220 V
Medium	104 V to 126 V	208 V to 252 V
High	112 V to 136 V	224 V to 272 V
Line Frequency Range	48 to 66 Hz	
Maximum Power Consumption at 115 VAC, 60 Hz	305 W, 3.2 A	

Table 1-2
ENVIRONMENTAL CHARACTERISTICS

Characteristic	Information
Temperature	
Nonoperating	−40°C to +65°C
Useful Operation	0°C to +50°C
Specified Operation	+10°C to +40°C
Altitude	
Nonoperating	To 50,000 feet
Operating	To 10,000 feet
Vibration	
Operating	15 minutes along each axis at 0.015 inch with frequency varied from 10-50-10 c/s in 1-minute cycles. Three minutes at any resonant point or at 50 c/s.
Shock	
Nonoperating	30 g's, 1/2 sine, 11 ms duration, 1 shock per axis. Total of 6 shocks
Transportation	12 inch package drop. Qualified under the National Safe Transit Committee test procedure 1A.

TABLE 1-3
MECHANICAL CHARACTERISTICS

Characteristic	Description
Dimensions	
Height	≈15 inches
Width	≈11 3/4 inches
Depth	≈23 1/4 inches
Weight	≈69 lbs.
Finish	
Front Panel (Type 576 and Standard Test Fixture)	Anodized Aluminum
Cabinet	Blue vinyl painted aluminum
Trim and Rear Panel	Satin finished chrome