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Multimeter Selection Guide

	Bench Type			Hand-Held Type	
Model	B4100	B940	B845	6500	6800
No counts	200,000	4,000	20,000	50,000	80,000
No Digits	5 1/2	3 3/4	4 1/2	4 4/5	4 7/8
Dual Display					*
Analog Bar graph	*	*		*	*
Trend plot display	*				
Back light	*	*		*	*
DCV accuracy	±0.05%	±0.3%	±0.05%	±0.03%	±0.05%
True RMS	*	*		*	
AC +DC Meas.				*	*
DB				*	*
Capacitance		*		*	*
Frequency	*	*		*	*
Pulse width					*
Duty Cycle				*	*
Temperature		*			*
Continuity buzzer	*	*	*	*	*
Diode Test	*	*	*	*	*
Pulse Generator					*
±Peak Hold					*
Compare (go/no-go)	*				*
Min/Max/Avg	*	*		*	*
Relative mode	*	*		*	*
Memory Sto/RCL	*				
GPIO interface	Optional				
RS232 Interface	*	*		*	*
Comments	Selectable count Resolution	Delay hold			Auto hold
Approvals	CE	CAT II 600V CE		CAT III 1000V CE	CAT II 1000V CE CAT III 600V CE

Function Generator Selection Guide

Model	B8011	B8400	B8110	B821
Freq. Range	0.02Hz-2MHz	0.004Hz-4MHz	0.01Hz-10MHz	0.2Hz-20MHz
Counter	Yes			Yes
Sine	Yes	Yes	Yes	Yes
Square	Yes	Yes	Yes	Yes
Triangle/Ramp	Yes	Yes	Yes	Yes
Pulse	Yes			
Burst			Yes	
Gate/Trigger		Yes	Yes	
Lin Sweep	Yes	Yes	Yes	Yes
Log Sweep		Yes	Yes	
TTL Out	Yes	Yes	Yes	Yes
Ext. VCF Input	Yes	Yes	Yes	
Sweep Start/Stop		Yes	Yes	
Sweep Out		Yes	Yes	

Power Supply Selection Guide

	Triple Output			Double Output		
Model	3033B	3040T	3030T	3030D	3032B	3015B
Volts	0 to ±30V (2), 5V Fixed	0 to ±36V (2), 3.3/5.0V Fixed	0 to ±30V (2), 5V Fixed	0 to ±30V (2)	0 to ±30V (2)	0 to ±30V (2)
Amps	0 to 1.5A, 5A Fixed	0 to 2.5A, 0 to 5.0A Fixed	0 to 3.0A, 0 to 3.0A Fixed	0 to 3.0A	0 to 3.0A	0 to 1.5A
Display	2 LED	2 LED	2 LCD	2 LCD	2 LED	2 LED
Series/Parallel	Series	Both	Both	Both	N/A	N/A
AC Input Volts	120V / 220V	120V / 220V	120V / 220V	120V / 220V	120V / 220V	120V / 220V
Power Consumption	192VA	455VA	310VA	305VA	300VA	150VA
Size H x W x D (in)	6 x 9 x 13	6 x 9 x 13	8 x 11 x 13	8 x 11 x 13	6 x 9 x 13	6 x 9 x 13
Weight (lbs)	20	17	23	22	20	17

	Single Output							Programmable
Model	3005B	3003B	3006B	1805	3030	310	303	P6000
Volts	0 to ±30V	0 to ±30V	0 to ±60V	0 to ±18V	0 to ±30V	0 to ±30V	0 to ±30V	0 to ±36V
Amps	0 to 5.0A	0 to 3.0A	0 to 1.5A	0 to 5.0A	0 to 3.0A	0 to 10A	0 to 3.0A	0 to 3.0A
Display	2 LED	2 LED	2 LED	2 LED	1 LCD	Analog	Analog	1 LCD
AC Input Volts	120V / 220V	120V / 220V	120V / 220V	120V / 220V	120V	120V / 220V	120V / 220V	110V / 220V
Power Consumption	133VA	190VA	190VA	170VA	160VA	520VA	190VA	200VA
Size H x W x D (in)	6 x 5 x 13	6 x 5 x 13	6 x 5 x 13	6 x 5 x 13	8 x 5 x 11	5 x 6 x 13	5 x 6 x 13	4 x 8 x 10
Weight (lbs)	15	15	15	15	11	26	14	13

20MHz Dual Trace Oscilloscope with Alt-Mag

- 20MHz Bandwidth
- Alt-Mag sweep for simultaneous display of main and X10 magnified trace
- Alternate trigger for a stable display of unrelated signals
- X10 Horizontal Magnification
- P-P auto trigger
- High brightness CRT with internal graticule
- Z-axis modulation
- Light weight with low power consumption



SPECIFICATIONS

Vertical Amplifier (CH 1 and CH 2)

Sensitivity: 5mV/Div to 5V/Div in 10 steps (1-2-5 seq)

Accuracy: $\pm 3\%$

Bandwidth (-3dB): DC: 0Hz to 20MHz, AC: 10Hz to 20MHz

Rise Time: $< 17.5\text{ns}$

Input Impedance: Res: $1\text{M}\Omega \pm 5\%$, Cap: $25\text{pF} \pm 5\text{pF}$

Input Coupling: AC, DC, GND

Invert Channel: CH2

Display Modes: CH1, CH2, ALT, Chop, ADD, X-Y

Maximum Input Voltage: 400V (DC or AC p-p)

Horizontal Sweep

Sweep Times: 200ns/Div to 0.5s/Div in 20 steps (1-2-5 seq);

(X10 Mag: 20ns/Div to 50ms/Div)

Mag: X10

Accuracy: $\pm 3\%$ (8% X10 Mag)

Sweep Modes: TV, Normal, Auto and p-p Auto

Triggering

Source: CH 1, CH 2, ALT, Line and EXT

Slope: Positive or Negative adjustable levels

Coupling: AC

Sensitivity:

Int: DC to 10MHz (1 Div), DC to 20MHz (1.5 Div)

Ext: DC to 10MHz (0.3 p-p), DC to 20MHz (0.5 p-p)

TV Synch: Int (2 Div), Ext (0.5V p-p)

Auto Triggering: $> 20\text{Hz}$

External Trigger Input:

Impedance: $1\text{M}\Omega \pm 5\% + 20\text{pF}$ Capacitance

Maximum Input Voltage: 160V (DC or AC peak)

Z Axis Modulation

Sensitivity: 5V p-p

Maximum Input Voltage: 50V or AC p-p

Polarity: Intensity increases as the voltage increases

Input Resistance: $10\text{K}\Omega$

Bandwidth (-3dB): DC to 1MHz

X-Y Mode

Inputs: X-Axis (CH1), Y-Axis (CH2)

Sensitivity: Same as CH1

Accuracy: $\pm 5\%$

Frequency Response (-3dB):

DC: 0Hz to 1MHz, AC: 10Hz to 1MHz

Maximum Voltage: Same as CH1

X-Y Phase Difference: $< 3^\circ$ from DC to 50KHz

Calibrator Signal

Waveform: Square Wave

Amplitude: $0.5\text{V} \pm 3\%$ p-p

Frequency: $1\text{KHz} \pm 2\%$

CRT

Size: 8cm x 10cm (3.15" x 3.94")

Acceleration Voltage: 2KV

General Specifications

Power Requirements: AC Input Voltage: 120V or 220V

Frequency: 50/60Hz

Power Consumption: 40W

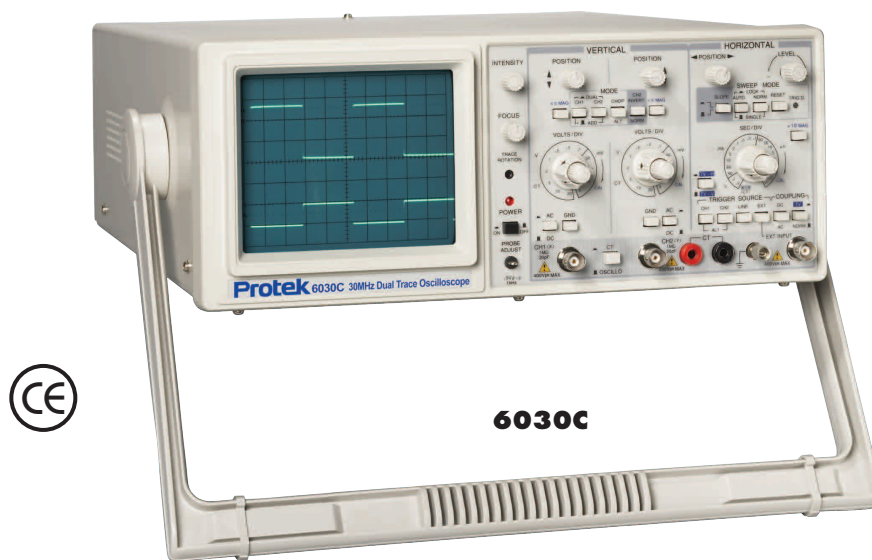
Operating Temperature: 0 to 40°C (32 to 104°F)

Size: 5.1" (H) x 12.5" (W) x 15.75" (D)

Weight: 16 lbs

Accessories: Manual, Line cord, X1/X10 Probes (2)

- 30 MHz Vertical Bandwidth (-3dB)
- LCR Component Tester
- Alternate Trigger for a stable display of unrelated signals
- X5 Mag for Vertical Input and X10 for Horizontal
- TV Synch Filter
- Trigger Signal Output
- High Brightness CRT with Internal Graticule



■ SPECIFICATIONS

Vertical Amplifier (CH 1 and CH 2)

Sensitivity: 5mV/Div to 20V/Div in 12 steps (1-2-5 seq);
1mV/Div to 4V/Div (X5 Mag)

Mag: X5

Accuracy: $\pm 3\%$ (5% in X5 Mag)

Bandwidth (-3dB): DC: 0Hz to 30MHz, AC: 10Hz to 30MHz

Rise Time: < 18ns (<70ns in X5 Mag)

Input Impedance: Res: $1M\Omega \pm 5\%$, Cap: 30pF

Input Coupling: AC, DC, GND

Invert Channel: CH2

CH1/CH2 Trigger Output: 100mV/Div into 50Ω

Display Modes: CH1, CH2, ALT, Chop, ADD, X-Y

Maximum Input Voltage: 400V (DC or AC peak)

Horizontal Sweep

Sweep Times: 100ns/Div to 0.2s/Div in 20 steps (1-2-5 seq);

10ns/Div to 20ms/Div (X10 Mag)

Mag: X10

Accuracy: $\pm 3\%$ (8% X10 Mag)

Sweep Modes: TV, Normal and Single

Triggering

Source: CH 1, CH 2, ALT, Line and EXT

Slope: Positive or Negative adjustable levels

Coupling: AC, DC, Normal/TV

Sensitivity:

Int: DC to 20MHz 1 Div, Ext: 0.3V p-p),

TV Int: 2 Div, Ext: 0.3V p-p

Trigger Lock: 50Hz to 10MHz 2 Div

External Trigger Input:

Impedance: $1M\Omega \pm 5\%$

Maximum Input Voltage: 400V (DC or AC p-p)

Z Axis Modulation

Minimum Input Level: TTL

Maximum Input Voltage: 50V or AC p-p

Polarity: Intensity increases as the voltage decreases

Input Resistance: $10K\Omega$

Bandwidth (-3dB): DC to 5MHz

X-Y Mode

Inputs: X-Axis (CH1), Y-Axis (CH2)

Sensitivity: Same as CH1

Frequency Response (-3dB):

DC: 0Hz to 1MHz, AC: 10Hz to 1MHz

Maximum Voltage: Same as CH1

X-Y Phase Difference: $< 3^\circ$

Calibrator Signal

Waveform: Square Wave

Amplitude: 0.5V $\pm 2\%$ p-p

Frequency: 1KHz $\pm 2\%$

Component Test

A 60Hz, 9V RMS signal is applied to the CH1 and CH2 input when the AC, DC, GND is in the GND position and the component test button is pushed in.

General Specifications

CRT: 8cm x 10cm (3.15" x 3.94")

Power Requirements: AC Input Voltage: 120V or 220V

Frequency: 50/60Hz

Power Consumption: 35W

Operating Temperature: 0 to 40°C (32 to 104°F)

Size: 5.1" (H) x 12.2" (W) x 16.45" (D)

Weight: 14.3 lbs

Accessories: Manual, Line cord, X1/X10 Probes (2),
Test Leads

- 20MHz [820], 40MHz [840], 60MHz [860] bandwidths
- Built in High accuracy 6000 count True RMS DMM
- 200MS/s sampling rate single channel and 100MS per channel in dual channel [840, 860], 100MS/s [820]
- 2.5GHz Equivalent sampling [840] and 5GHz Equivalent sampling [860]
- 20 automatic waveform Measurements
- Self test and Self calibration
- Help menu
- Models 840 and 860 include FFT
- 125KB record length for each channel
- 10 waveforms and setups may be stored and recalled
- USB interface and optional flash memory port [840, 860]
- High Resolution 320x 240 pixel Monochrome LCD
- Edge/Pulse width, TV/Pattern and Delay trigger modes

**820, 840, 860****SPECIFICATIONS****Vertical**

No inputs: 2
 Analog bandwidth: [820] 20MHz, [840] 40MHz, [860] 60MHz
 Rise Time: [820] <17.5ns, [840] <8.75ns, [860] <5.83ns
 Sensitivity: 5mV to 100V/div (in a 1,2,5 sequence)
 Resolution: 8 bit
 Offset: ± 5 div from the center
 Vertical Accuracy: $\pm 3\%$
 Input Impedance: $1M\Omega \pm 1\%$ and $20pF \pm 1.3pF$
 Max input V: 300V DC or AC peak
 Probe Attenuation: x1 and x10

Horizontal:

Sweep rates: [820] 50ns/Div to 50s/Div, [840] 10ns/Div to 50s/Div, [860] 5ns/Div to 50s/Div
 Time base Accuracy: $\pm 0.01\%$

Acquisition system:

Acquisition Modes: Sample, Peak detect, Envelope, Average
 Sampling: Real Time and Equivalent [840, 860]
 Sample Rates: [820] 100MS/s, [840, 860] 200MS/s single channel and 100MS/s per channel Dual channel
 Equivalent Sampling: [840] 2.5GS/s, [860] 5GS/s
 Sample Rate Accuracy: 100ppm
 Record Length: 125KB/Channel
 Waveform Interpolation: Dot, Linear, Sine, and Pulse
 Peak Detect: 10ns minimum
 Averages: 2 to 256

Trigger

Sensitivity: 0.5 Div (DC to 5MHz)
 Trigger Types: Edge, Pulse width, Video
 Coupling: AC, DC HF-Reject, LF-Reject, Noise Reject

Modes: Normal, Single, Roll, Auto

Trigger Level Range: ± 20 Div from the center of the screen

Trigger Level accuracy: ± 0.4 Div

Trigger sources: CHA and CHB

Video Trigger

Video Trigger sensitivity: 0.7 Div

Video Type: NTSC, PAL, Secam

Measurements:

Types: P-P, Max, Amplitude, Top, Base, Pos/Neg over shoot, Pre-shoot, RMS, Mean, One cycle mean, Freq., Period, \pm Width, \pm Duty cycle, Rise/Fall time, Delay and Phase shift

Math Operations:

CHA+CHB, CHA-CHB, CHB-CHA, FFT [840, 860]

Cursors: ΔV , ΔT

FFT: [840, 860]

Weighting:

Rectangular, Hamming, Hanning and Blackman-Harris

Amplitude display: 1, 2, 5, 10dB/Div

Maximum Frequency: 1.25GHz

Memory: 10 waveforms and settings saved and recalled

DMM**DC Volts:**

Range: 600mV to 1000V

Accuracy: $\pm(0.3\% + 10d)$

Best Resolution: 100 μ V

Impedance: $10M\Omega$

Overload protection: 1000VDC or AC peak

AC Volts:

Range: 6V to 600V

Accuracy: $\pm(0.75\% + 10d)$ 50Hz to 1KHz;

$\pm(2.0\% + 10d)$ 1KHz to 30KHz

Best Resolution: 1mV

Impedance: $10M\Omega$

Overload protection: 1000VDC or AC peak

Resistance

Range: 600 Ω to 60M Ω

Accuracy: $\pm(0.5\% + 10d)$

Best Resolution: 100m Ω

Overload Protection: 250V DC or AC peak

Capacitance

Range: 60nF to 300 μ F; Accuracy: $\pm(2.0\% + 10d)$

Other measurements

Diode test accuracy: $\pm 2\%$

Continuity: Buzzer will sound < 60 Ω

dBm with reference impedances of

2, 4, 8, 16, 50, 75, 93, 110, 125, 135, 150, 300, 600, 900, 1K or 1.2K Ω

High current: to 600A with external current Clamp

Temperature (with Probe): to 600°C (1112°F)

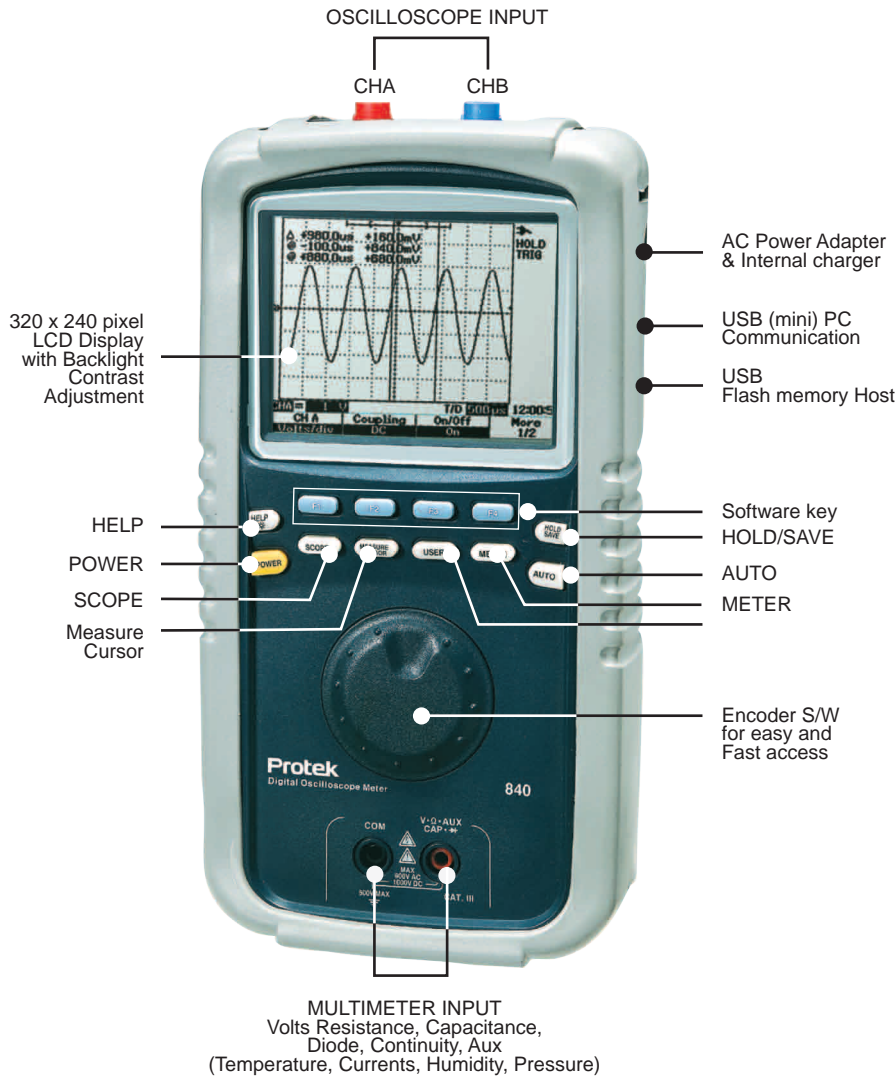
General Specifications

Size: 8.3" (H) x 4.2" (W) x 2.2" (D); Weight: 2.6 lbs

Power: 9VDC @ 1A AC/DC adapter, 7.2V NiMH rechargeable battery pack

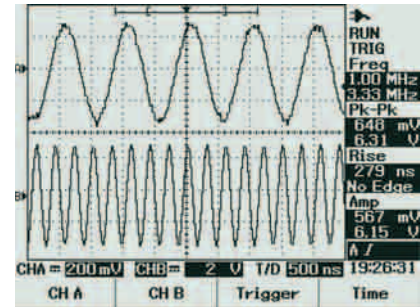
Standard accessories: AC/DC adapter, User's manual, Scope probe (2), Holster, Test Leads, USB cable and software

Optional accessories: Battery pack, Temperature adapter, Clamp-on current probe, Carrying Bag and USB flash memory



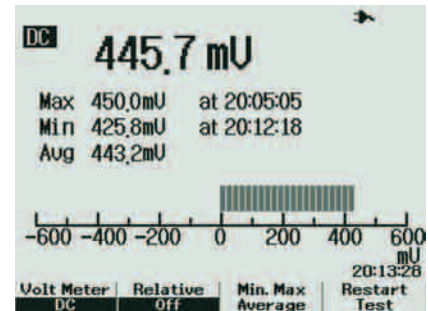
Main Display waveforms and indicators

Oscilloscope



CH1 and CH2 waveforms, along with the Dual channel Math waveform, trigger levels, horizontal positions, offsets, V/div and Time/division settings are displayed.

Meter

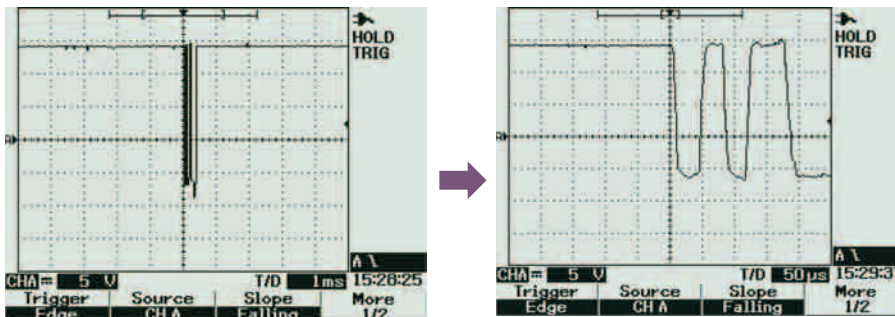


Analog Bargraph, MIN, MAX, AVG VOLT, DC, etc.

FEATURES

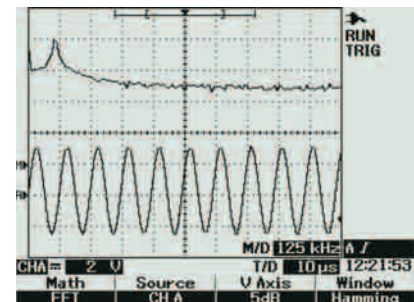
Record Length

A long record length and high-speed sampling rates allows the user to capture and view a more detailed "picture" of a complex Waveform and its components. Up to 125kB samples of waveform information may be captured and accurately displayed on the LCD screen as shown in the illustration below.



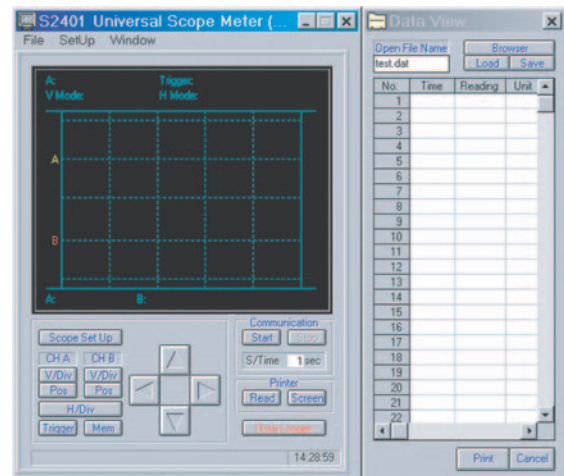
Math

Dual channel Math functions are available for adding and subtracting waveforms applied to the CHA and CHB inputs. The FFT allows you to view a waveform spectrum using a Rectangular, Hamming, Hanning or Black Man-Harris window.



**S2401**

- Dual Channel
- 50MS/s sampling rate
- 500mV/Div Vertical sensitivity
- Auto ranging Vertical and Horizontal scales
- Built-in auto/manual ranging, True RMS, 4000 count DMM
- DC to 1MHz bandwidths
- Hand held and battery operated
- Designed to UL3111, CSA C22.2 No 1010 standards
- RS-232 Port and supplied software
- User-friendly front panel



SPECIFICATIONS

Vertical (Oscilloscope)

Bandwidth: 1MHz
 Resolution: 8 bits
 Number of Channels: 2
 Coupling: AC and DC
 Input Impedance: 1M Ω
 Accuracy: $\pm 3\%$
 Max. Input Volts: 600V DC or AC RMS
 Vertical Sensitivity: 500mV/Div to 500V/Div in a 1-2-5 sequences

Horizontal (Oscilloscope)

Sample Rate:
 50MS/s single channel
 25MS/s dual channel
 Record Length:
 512 bytes single shot and Glitch capture
 256 bytes all other modes
 Samples/Div: 25 samples
 Update Rate: Real time
 Modes: Single shot, roll mode, normal
 Accuracy: $\pm 0.01\%$
 Sweep Rate: 1 μ s/Div to 5s/Div in a 1-2-5 sequences
 Memory: 16 waveforms and setups may be saved in memory

Triggering (Oscilloscope)

Trigger source: CH A, CH B, External
 Coupling: AC, DC
 Trigger sensitivity: 2/20 Division
 Trigger Modes: Auto and Normal
 Slope: Positive and Negative

DC Volts

(Digital Multimeter)
 Ranges: 5V, 50V, 500V, 1000V
 Best Resolution: 1mV
 Accuracy: $\pm (0.3\% + 3d)$
 Input Impedance: 1M Ω

AC Volts

Ranges: 3V, 30V, 300V, 750V
 Best Resolution: 1mV
 Accuracy:
 $\pm (0.75\% + 5d)$ 40Hz to 450Hz
 $\pm (2\% + 5d)$ 450Hz to 5KHz
 $\pm (2.5\% + 5d)$ 5KHz to 20KHz
 Input Impedance: 1M Ω
 Max. Input Volts: 600V DC or AC RMS

Ohms

Ranges: 5K Ω , 50K Ω , 500K Ω , 5M Ω
 Best Resolution: 1 Ω
 Accuracy: $\pm (0.5\% + 5d)$
 Overload Voltage: 600V DC or AC peak

Continuity

Test Voltage: 1.7V
 Threshold: 100 digits
 Overload Voltage: 600V DC or AC peak

Frequency

Ranges: 100Hz, 1KHz, 10KHz, 100KHz, 1MHz, 10MHz
 Best Resolution: 0.01Hz
 Accuracy: $\pm (0.05\% + 5d)$
 Overload Voltage: 600V DC or AC peak

RPM

Range: 240 to 60,000 RPM
 Resolution: 1 RPM
 Accuracy: $\pm (0.05\% + 5d)$

Pulse Width

Range: 2 μ s to 500ms (pulse width > 2 μ s)

Duty Cycle

Range: 25% to 75%

LCD Display

Size: 2.5" x 2.5"

General Specifications

Power:

4.8V NiMH battery pack
 120V to 9V @ 1A DC adapter

Battery Life:

4 hours without backlight
 3 hours with backlight on

Display: 132 x 128 Pixel super twist LCD

Size: 7.5" (H) x 3.5" (W) 1.57" (D)

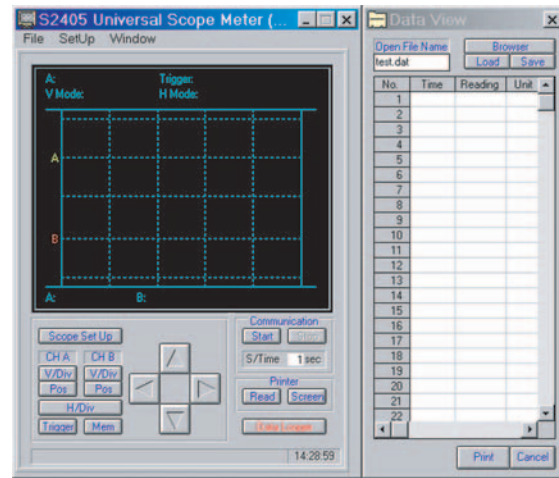
Weight: 1.5 lbs

Standard Accessories: Manual, Carrying case, Test leads,
 Holster, RS-232 cable, Software, AC/DC charger



S2405

- Dual Channel
- 50MS/s sampling rate
- 50mV/Div Vertical sensitivity
- Auto ranging Vertical and Horizontal scales
- Built-in auto/manual ranging, True RMS, 4000 count DMM
- DC to 5MHz bandwidths
- Hand held and battery operated
- Designed to UL3111, CSA C22.2 No 1010 standards
- RS-232 Port and supplied software
- User-friendly front panel



■ SPECIFICATIONS

Vertical (Oscilloscope)

Bandwidth: 5MHz
 Resolution: 8 bits
 Number of Channels: 2
 Coupling: AC and DC
 Input Impedance: 1M Ω
 Accuracy: $\pm 3\%$
 Max. Input Volts: 600V DC or AC RMS
 Vertical Sensitivity: 50mV/Div to 500V/Div in a 1-2-5 sequences

Horizontal (Oscilloscope)

Sample Rate:
 50MS/s single channel
 25MS/s dual channel
 Record Length:
 512 bytes single shot and Glitch capture
 256 bytes all other modes
 Samples/Div: 25 samples
 Update Rate: Real time
 Modes: Single shot, roll mode, normal
 Accuracy: $\pm 0.01\%$
 Sweep Rate: 1 μ s/Div to 5s/Div in a 1-2-5 sequences
 Memory: 16 waveforms and setups may be saved in memory

Triggering (Oscilloscope)

Trigger source: CH A, CH B, External
 Coupling: AC, DC
 Trigger sensitivity: 2/20 Division
 Trigger Modes: Auto and Normal
 Slope: Positive and Negative

DC Volts

(Digital Multimeter)
 Ranges: 5V, 50V, 500V, 1000V
 Best Resolution: 1mV
 Accuracy: $\pm (0.3\% + 3d)$
 Input Impedance: 1M Ω

AC Volts

Ranges: 3V, 30V, 300V, 750V
 Best Resolution: 1mV
 Accuracy:
 $\pm (0.75\% + 5d)$ 40Hz to 450Hz
 $\pm (2\% + 5d)$ 450Hz to 5KHz
 $\pm (2.5\% + 5d)$ 5KHz to 20KHz
 Input Impedance: 1M Ω
 Max. Input Volts: 600V DC or AC RMS

Ohms

Ranges: 5K Ω , 50K Ω , 500K Ω , 5M Ω
 Best Resolution: 1 Ω
 Accuracy: $\pm (0.5\% + 5d)$
 Overload Voltage: 600V DC or AC peak

Continuity

Test Voltage: 1.7V
 Threshold: 100 digits
 Overload Voltage: 600V DC or AC peak

Frequency

Ranges: 100Hz, 1KHz, 10KHz, 100KHz, 1MHz, 10MHz
 Best Resolution: 0.01Hz
 Accuracy: $\pm (0.05\% + 5d)$
 Overload Voltage: 600V DC or AC peak

RPM

Range: 240 to 60,000 RPM
 Resolution: 1 RPM
 Accuracy: $\pm (0.05\% + 5d)$

Pulse Width

Range: 2 μ s to 500ms (pulse width > 2 μ s)

Duty Cycle

Range: 25% to 75%

LCD Display

Size: 2.5" x 2.5"

General Specifications

Power:
 4.8V NiMH battery pack
 120V to 9V @ 1A DC adapter
 Battery Life:
 4 hours without backlight
 3 hours with backlight on
 Display: 132 x 128 Pixel super twist LCD
 Size: 7.5" (H) x 3.5" (W) 1.57" (D)
 Weight: 1.5 lbs
 Standard Accessories: Manual, Carrying case, Test leads, Holster, RS-232 cable, Software, AC/DC charger

Power Supplies with Analog Displays

- Continuously variable Voltage and Current output
- Short circuit and overload protected
- Separate meters for monitoring voltage and current
- Excellent regulation and ripple specs
- Constant Voltage and Constant current indicators
- Ideal for the service bench
- Cost effective

**303****310**

SPECIFICATIONS ■

[303]

Output Voltage Range: 0 to $\pm 30V$

Output Current Ranges: Range 1: 0 to 3A;

Range 2: 0 to 600mA

Load Regulation: Constant Voltage: 0.01% + 3mV

Constant Current: 0.2% + 3mA

Line Regulation: Constant Voltage: 0.01% + 3mV

Constant Current: 0.2% + 3mA

Ripple: Constant Voltage: 2mV RMS

Constant Current: 2mA RMS

Readout: Analog for both voltage and current

Meter Accuracy: $\pm 5\%$ of full scale for both voltage and current

General Specifications

AC Input Volts: 120/220V selectable

Power Consumption: 190VA

Operating Temperature: 0 to 40°C (32 to 104°F)

Size: 5.0" (H) x 6.3" (W) x 13.0" (D)

Weight: 14 lbs

Supplied Accessories: Manual, Line cord, Test leads

[310]

Output Voltage Range: 0 to $\pm 30V$

Output Current Ranges: Range 1: 0 to 10A;

Range 2: 0 to 2A

Load Regulation: Constant Voltage: 0.04% + 2mV

Constant Current: 0.4% + 2mA

Line Regulation: Constant Voltage: 0.05% + 3mV

Constant Current: 0.4% + 5mA

Ripple: Constant Voltage: 1mV RMS

Constant Current: 1mA RMS

Readout: Analog for both voltage and current

Meter Accuracy: $\pm 5\%$ of full scale for both voltage and current

General Specifications

AC Input Volts: 120/220V selectable

Power Consumption: 520VA

Operating Temperature: 0 to 40°C (32 to 104°F)

Size: 5.0" (H) x 6.3" (W) x 13.0" (D)

Weight: 26 lbs

Supplied Accessories: Manual, Line cord, Test leads

1805 Single Output Power Supply

- 0 to ± 18 Volts with 0 to ± 5 Amps load current
- Excellent Load, Line and Ripple specs
- Fully Isolated outputs terminals
- 3 digit Led displays for both current and Voltage
- Small case size
- Front panel Indicators for constant current and constant voltage operation
- Short circuit and Reverse Voltage protected



1805

3003B Single Output Power Supply

- 0 to ± 30 V with 0 to ± 3 Amps Load current
- Constant Voltage and Constant current operation
- Units can be connected together in series for Higher output voltage
- Course and Fine controls for accurate Voltage settings
- Low noise and Linear supply for powering sensitive circuits
- Front panel push button switch disconnects power supply from Load



3003B

■ SPECIFICATIONS

[1805]

Output Volts: 0 to ± 18 V DC

Output Amps: 0 to ± 5 A

Constant Voltage Mode:

Load Regulation: 0.05% + 5.6mV

Line Regulation: 0.05% + 5.6mV

Ripple and Noise: 0.5mV RMS

Constant Current Mode:

Load Regulation: 0.05% + 20mA

Line Regulation: 0.05% + 8mA

Ripple and Noise: 5mA RMS

Digital Display:

Type: 3 digit red LED

Resolution: Volts: 100mV; Amps: 10mA

Accuracy: Volts: $\pm(0.2\% + 2d)$; Current: $\pm(1\% + 3d)$

General Specifications

AC Input Voltage: 120/220V selectable

Power Consumption: 170VA

Operating Temperature: 0 to 32°C (32 to 90°F)

Size: 6.3" (H) x 5.0" (W) x 13.0" (D)

Weight : 15 lbs

Supplied Accessories: Manual, Line cord, Test leads

[3003B]

Output Volts:

0 to ± 30 V DC

Output Amps:

0 to ± 3 Amps

Constant Voltage Mode:

Load and Line Regulation: 0.02% + 2mV

Ripple and Noise: 1mV RMS

Constant Current Mode:

Load Regulation: 0.05% + 5mA

Line Regulation: 0.05% + 0.25mA

Ripple and Noise: 2mA RMS

Digital Display Resolution:

Volts: 100mV; Amps: 10mA

Accuracy: $\pm(0.5\% + 3d)$

General Specifications

AC Input Voltage: 120/220V selectable

Power Consumption: 190VA

Operating Temperature: 0 to 32°C (32 to 90°F)

Size: 6.3" (H) x 5.0" (W) x 13.0" (D)

Weight : 15 lbs

Supplied Accessories: Manual, Line cord, Test leads

3005B Single Output Power Supply

- 0 to ± 30 V with 0 to ± 5 Amps Load current
- Internal fan for cooler operation
- Excellent Line, Load and Ripple specifications
- Small case size
- Designed with energy saving circuitry
- Fully isolated output terminals for series operation
- Short circuit and Reverse Voltage protected

**3005B****3006B Single Output Power Supply**

- 0 to ± 60 V with 0 to ± 1.5 Amps Load current
- Excellent Line, Load and Ripple specifications
- Short Circuit and Reverse Voltage protected
- Constant Voltage and Constant Current operation
- 3 digit Led displays for both current and Voltage
- Front panel Indicators for Constant Voltage and constant current operation

**3006B****SPECIFICATIONS****[3005B]****Output Volts:**0 to ± 30 V DC**Output Amps:**0 to ± 5 Amps**Constant Voltage Mode:**Load and Line Regulation: $0.02\% + 2\text{mV}$

Ripple and Noise: 1mV RMS

Constant Current Mode:Load Regulation: $0.05\% + 5\text{mA}$ Line Regulation: $0.05\% + 0.25\text{mA}$

Ripple and Noise: 2mA RMS

Digital Display:

Resolution: Volts: 100mV; Amps: 10mA

Accuracy: $\pm(0.5\% + 3\text{d})$ **General Specifications****AC Input Voltage:** 120/220V selectable**Power Consumption:** 133VA**Operating Temperature:** 0 to 32°C (32 to 90°F)**Size:** 6.3" (H) x 5.0" (W) x 13.0" (D)**Weight :** 15 lbs**Supplied Accessories:** Manual, Line cord, Test leads**[3006B]****Output Volts:**0 to ± 60 V DC**Output Amps:**0 to ± 1.5 A**Constant Voltage Mode:**Load and Line Regulation: $0.02\% + 2\text{mV}$

Ripple and Noise: 1mV RMS

Constant Current Mode:Load Regulation: $0.05\% + 5\text{mA}$ Line Regulation: $0.05\% + 0.25\text{mA}$

Ripple and Noise: 2mA RMS

Digital Display:

Resolution: Volts: 100mV; Amps: 10mA

Accuracy: $\pm(0.5\% + 3\text{d})$ **General Specifications****AC Input Voltage:** 120/220V selectable**Power Consumption:** 190VA**Operating Temperature:** 0 to 32°C (32 to 90°F)**Size:** 6.3" (H) x 5.0" (W) x 13.0" (D)**Weight :** 15 lbs**Supplied Accessories:** Manual, Line cord, Test leads

3015B Dual Output Power Supply

- 0 to $\pm 30V$ with $\pm 1.5A$ load current
- Energy saver design allows cooler operation
- Excellent Load, line and Ripples specs
- Front panel indicators for Constant Current and Constant Voltage operation
- Each output has two 3 digit LED displays for monitoring Voltage and current



3015B

3032B Dual Output Power Supply

- 0 to $\pm 30V$ with $\pm 3.0A$ load current
- Low noise Linear supply for powering sensitive circuits
- Fully isolated outputs for connecting outputs in series
- Excellent Load, line and Ripple specs
- Energy Saver design for cooler operation



3032B

■ SPECIFICATIONS

[3015B]

Outputs 1 and 2

Volts: 0 to $\pm 30V$ DC

Amps: 0 to $\pm 1.5A$

Constant Voltage Mode:

Load Regulation: $0.02\% + 2mV$

Line Regulation: $0.02\% + 2mV$

Ripple and Noise: $1mV$ RMS

Constant Current Mode:

Load Regulation: $0.05\% + 5mA$

Line Regulation: $0.05\% + 0.25mA$

Ripple and Noise: $2mA$ RMS

Digital Display:

Resolution: Volts: $100mV$; Current: $10mA$

Accuracy: $\pm(0.5\% + 3d)$

General Specifications

AC Input Voltage: $120/220V$

Power Consumption: $150VA$, $50/60Hz$

Operating Temperature: 0 to $35^{\circ}C$ (32 to $95^{\circ}F$)

Size: $6.3"$ (H) \times $9.2"$ (W) \times $12.8"$ (D)

Weight: 16.5 lbs

Supplied Accessories: Manual, Line cord, Test Leads (2 sets)

[3032B]

Outputs 1 and 2

Volts: 0 to $\pm 30V$ DC

Amps: 0 to $\pm 3A$

Constant Voltage Mode:

Load Regulation: $0.02\% + 2mV$

Line Regulation: $0.02\% + 2mV$

Ripple and Noise: $1mV$ RMS

Constant Current Mode:

Load Regulation: $0.05\% + 5mA$

Line Regulation: $0.05\% + 0.25mA$

Ripple and Noise: $2mA$ RMS

Digital Display:

Resolution: Volts: $100mV$; Current: $10mA$

Accuracy: $\pm(0.5\% + 3d)$

General Specifications

AC Input Voltage: $120/220V$

Power Consumption: $300VA$, $50/60Hz$

Operating Temperature: 0 to $35^{\circ}C$ (32 to $95^{\circ}F$)

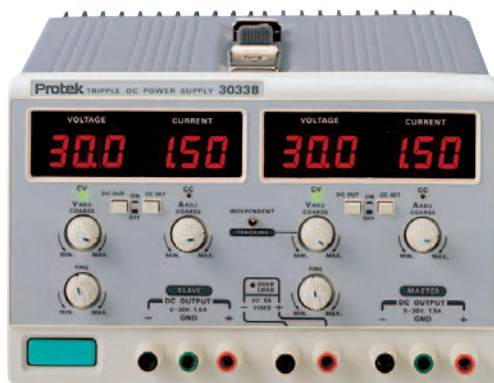
Size: $6.3"$ (H) \times $9.2"$ (W) \times $12.8"$ (D)

Weight: 20 lbs

Supplied Accessories: Manual, Line cord, Test Leads (2 sets)

3033B Triple Output Power Supply with Digital Displays

- Dual 0 to $\pm 30V$ with 0 to ± 1.5 Amps Load current outputs and a fixed 5Volt at 5 Amp output
- Both Variable outputs have a Voltage and Current display
- Series output tracking
- Small case size
- Excellent Line, Load and Ripple specifications

**3033B****3040T Triple Output Power Supply with Series/Parallel Tracking**

- Outputs may be independent or connected in Series or Parallel and are selectable from the front panel
- Fixed supply may be switched between 3.3V and 5.0V
- Series or Parallel Master/Slave tracking modes
- Energy saving design

**3040T****SPECIFICATIONS****[3033B]**

Outputs 1 and 2

Volts: 0 to $\pm 30V$ DCAmps: 0 to $\pm 1.5A$ **Constant Voltage Mode:**Load and Load Regulation: $0.02\% + 2mV$

Ripple and Noise: 1mV RMS

Constant Current Mode:Load Regulation: $0.05\% + 5mA$ Line Regulation: $0.05\% + 0.25mA$

Ripple and Noise: 2mA RMS

Digital Display (Outputs 1 & 2)

Resolution: Volts: 100mV; Current: 10mA

Accuracy: $\pm(0.5\% + 3d)$ Tracking Error: $\pm(0.5\% + 10mV)$ **Output 3**Volts Max: $5V \pm 0.25\%$ Amps Max: $5A \pm 2.5\%$ Load Regulation: $0.2\% + 2mV$ Line Regulation: $0.2\% + 2mV$ **General Specifications**

AC input Voltage: 120/220V, 50/60Hz

Power Consumption: 192VA

Operating Temperature: 0 to $35^{\circ}C$ (32 to $95^{\circ}F$)Size: 6.3" (H) \times 9.0" (W) \times 13.0" (D)

Weight: 20 lbs

Supplied Accessories: Manual, Line cord, Test Leads (3 sets)

[3040T]

Outputs 1 and 2

Volts: 0 to $\pm 36V$ DC

Amps: 0 to 2.5A

Constant Voltage Mode:Line and Load Regulation: $0.02\% + 2mV$

Ripple and noise: 0.2mV RMS, 4mV P-P

Constant Current Mode:Load Regulation: $0.05\% + 5mA$ Line Regulation: $0.05\% + 0.25mA$

Ripple and Noise: 2mA RMS, 10mA P-P

Digital Display (Outputs 1 and 2)

Resolution: Volts: 100mV; Current: 10mA

Accuracy: $\pm(0.5\% + 1d)$ **Output 3**Volts Max: 3.3V / 5V $\pm 2.5\%$ (selectable)Current Max: $5A \pm 2.5\%$ Load and Line Regulation: $0.1\% + 5mV$

Ripple: 2mV RMS

General Specifications

AC input Voltage: 120/220V, 50/60Hz

Power Consumption: 455VA

Operating Temperature: 0 to $35^{\circ}C$ (32 to $95^{\circ}F$)Size: 6.3" (H) \times 9.0" (W) \times 13.0" (D)

Weight: 16.5 lbs

Supplied Accessories: Manual, Line cord, Test Leads (3 sets)

- Large LCD display with back light for displaying Voltage and Current settings
- Outputs may be connected in series or parallel (3030D and 3030T)
- Constant voltage and current selection switch
- Incremental switch for setting Max. current value
- Excellent line and load regulation characteristics
- Fully isolated outputs for series or parallel operation
- Automatic cooling fan operation
- 10-turn voltage control for precise voltage settings
- Extended (Barrier strip) output connection



3030



3030D



3030T

■ SPECIFICATIONS

[3030 Single Output]

Output Volts: 0 to ± 30 V DC
 Output Amps: 0 to ± 3 A
Constant Voltage Mode:
 Load Regulation: 0.2% + 3mV
 Line Regulation: 0.2% + 3mV
 Ripple and Noise: 0.5mV RMS
Constant Current Mode:
 Load Regulation: 0.3% + 3mA
 Line Regulation: 0.3% + 3mA
 Ripple and Noise: 3mA RMS
Digital Display:
 Type: 3 digit LCD
 Resolution Volts: 100mV
 Resolution Amps: 10mA
 Accuracy Volts: $\pm(0.2\% + 2d)$
 Accuracy Amps: $\pm(1\% + 3d)$

General Specifications

AC Input Voltage: 120V only
 Power Consumption: 160VA
 Operating Temperature: 0 to 32°C (32 to 90°F)
 Size: 7.5" (H) x 5.1" (W) x 11.0" (D)
 Weight: 11 lbs
 Supplied Accessories: Manual, Line cord, Test leads

[3030D Dual Output]

Outputs 1 and 2
 Volts: 0 to ± 30 V DC
 Amps: 0 to ± 3 A
Constant Voltage Mode:
 Load Regulation: 0.02% + 3mV
 Line Regulation: 0.02% + 3mV
 Ripple and Noise: 0.5mV RMS
Constant Current Mode:
 Load Regulation: 0.3% + 3mA
 Line Regulation: 0.3% + 3mA
 Ripple and Noise: 3mA RMS
Digital Display :
 Type: 3 digit LCD
 Resolution Volts: 100mV
 Resolution Amps: 10mA
 Accuracy Volts: $\pm(0.2\% + 2d)$
 Accuracy Amps: $\pm(1\% + 3d)$

General Specifications

AC Input Volts: 120/220V
 Power Consumption: 305VA, 50/60Hz
 Operating Temperature: 0 to 35°C (32 to 95°F)
 Size: 7.5" (H) x 10.6" (W) x 13.0" (D)
 Weight: 22 lbs
 Supplied Accessories: Manual, Line cord,
 Test Leads (2 sets)

[3030T Triple Output]

Outputs 1 and 2
 Volts: 0 to ± 30 V DC
 Amps: 0 to 3A
Constant Voltage Mode:
 Line and Load Regulation: 0.02% + 3mV
 Ripple and noise: 0.5mV RMS
Constant Current Mode:
 Load and Load Regulation: 0.3% + 3mA
 Ripple and Noise: 3mA RMS
Digital Display :
 Type: 3 digit LCD
 Resolution Volts: 100mV
 Resolution Amps: 10mA
 Accuracy Volts: $\pm(0.2\% + 2d)$
 Accuracy Amps: $\pm(1\% + 3d)$

Output 3

Volts Max: 5V
 Current Max: 3A
 Load and Line Regulation: 0.02% + 3mV
 Ripple and Noise: 0.5mV RMS

General Specifications

AC input Voltage: 120/220V
 Power Consumption: 310VA, 50/60Hz
 Operating Temperature: 0 to 35°C (32 to 95°F)
 Size: 7.5" (H) x 10.6" (W) x 13.0" (D)
 Weight: 23.1 lbs
 Supplied Accessories: Manual, Line cord, Test Leads

- All values may be entered from keyboard or rotary dial
- RS-232/485 interface with cable, adapter and software CD
- Volts, amps and power are displayed on a backlit LCD display
- 10 settings may be stored in memory
- Light weight and energy efficient
- Over voltage and current protection
- Outstanding in Production Test Applications

**P6000**

SPECIFICATIONS

Output Voltage

Range: 0 to $\pm 36V$

Voltage Resolution:

1mV: 0 to 3.999V

10mV: 4 to 36V

Output Amps

Range: 0 to $\pm 3A$

Amps Resolution: 1mA

Constant Voltage Mode

Load Regulation: $\pm 0.02\% + 10mV$

Line Regulation: 0 to 3.999V: $\pm 0.01\% + 3mV$

4 to 36V: $\pm 0.02\% + 10mV$

Ripple: $\leq 1mV$ RMS

Constant Current Mode

Load Regulation: $\pm 0.02\% + 10mV$

Line Regulation: $\pm 0.02\% + 10mV$

Ripple and noise: $\leq 4mV$ Rms

Program Accuracy (25 °C)

Voltage: 0.1% + 20mV

Current: 0.1% + 20mA

Read Back Accuracy (25 °C)

Voltage: 0 to 19.999V: 0.2% + 20mV

20 to 36V: 0.2% + 100mV

Current: 0.2% + 20mA

Program Resolution

Voltage: 0 to 3.999V: 1mV; 4 to 36V: 10mV

Current: 1mA

Read back Resolution

Voltage: 0 to 19.999V: 10mV; 20 to 36V: 100mV

Current: 1mA

Interface

RS-232 adapter and cables

Software

Power MS Power Management software

ActiveX and DLL Support tools for VC++/VB /Delphi /LabView
(upon request)

Memory

10 Locations EEPROM for saving power settings

Protection

Over voltage, over current and power

General Specifications

AC Input Volts: 110/220V, 50/60Hz

Power Consumption: 200VA

Operating Temp: 0 to 50°C (32 to 120°F) at relative humidity of 0 to 80%

Size: 3.5" (H) x 8.3" (W) x 9.8" (D)

Weight: 13.2 lbs

Supplied Accessories: Manual, Line cord, Handels, RS-232 adapter and cables

Optional Accessories: USB adapter and cables

Power Configure ...

Please Input Config Params

ID: Power Name:

Power Address: Current Up(A):

Power Up: Voltage Configure(V):

ID	PowerName	PowerAdd	CurUp	VolCfg	PowerUp
1	Power #1	0	3	36	108
2	Power #2	1	1.5	65	97.5
3	Power #3	2	6	18	108
4	Power #4	3	5	36	180

Buttons: Add, Delete, Modify, Save, Query, Show, Print, OK, Close

Params Setting ...

COM | Address | Other

COM:

Baud:

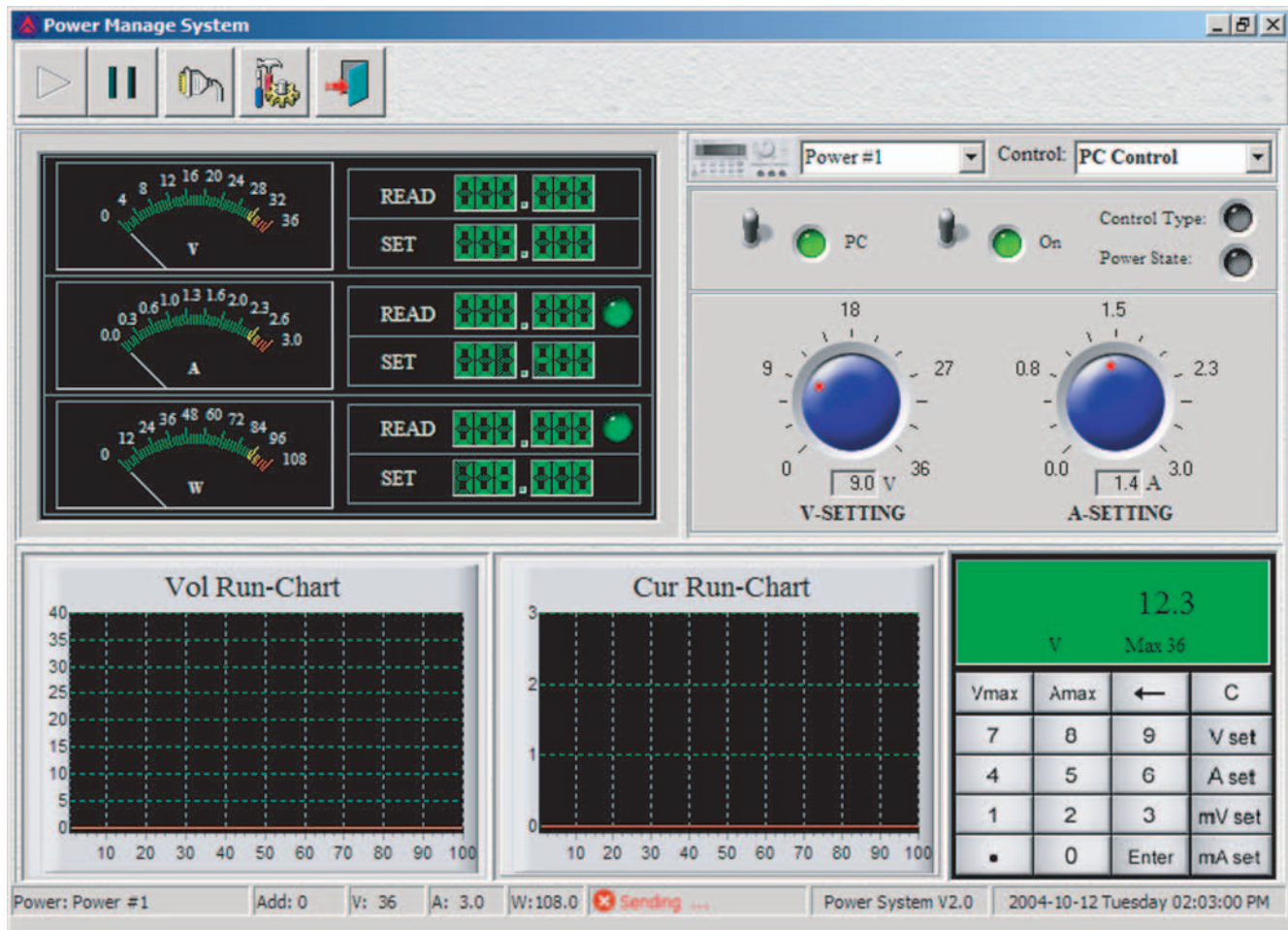
Default Power:

Buttons: OK, Close

Configuration screen: Program up to 16 model P6000 Power Supplies from this screen.

Communication Setting: Used to configure communication related settings.

■ Software



Main screen: Displays feedback from the hardware and allows the user to control various parameters directly from the computer software.

- 300W Maximum Power
- Operates in Constant current, Constant resistance or Constant power modes
- 1mA current setting resolution
- Voltage, Current and Power are displayed on the back lit display
- Back light LCD
- Values may be enter from key board or rotary dial
- RS232 interface and control software
- Small size and light weight

**L300**

SPECIFICATIONS ■

Inputs:

1

Input Volts:

0 to 360V

Input Current:

0 to 30A

Input Power:

0 to 300W

Operating Modes:

Constant current, Constant Resistance or Constant power

Voltage Resolutions:

0.000V to 3.999V $\pm(0.2\% + 3mV)$

4.00V to 35.999V $\pm(0.2\% + 30mV)$

36.0V to 360.0V $\pm(0.2\% + 30mV)$

Current Resolutions:

0.000A to 2.999A $\pm(0.2\% + 3mA)$

3.00A to 35.999 A $\pm(0.2\% + 3mA)$

Current Setting Resolution:

1mA (0 to 2.999A), 10mA (3.00A to 30A)

Power Setting Resolution:

0.1W (0 to 300W)

Resistance Setting Resolution:

0.01 Ω (0 to 99.99 Ω), 0.1 Ω (100 to 500 Ω)

Minimum Resistance:

< 0.08 Ω

Ripple:

< 10mV P-P

Protection:

Over Voltage, Over Current, Over power, Over Heating and Reverse polarity

Power:

120/220V, 50/60Hz

Communication:

RS232 or RS485

Memory:

10 setups may be stored and recalled

Software:

Monitor software CD. ActiveX modules for VC++, Visual basic, Delphi and LabView upon request.

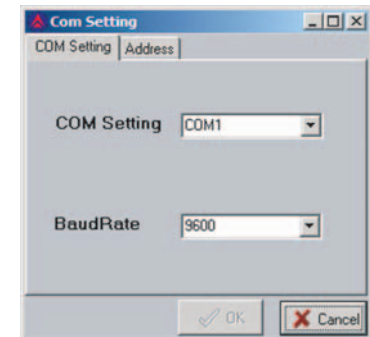
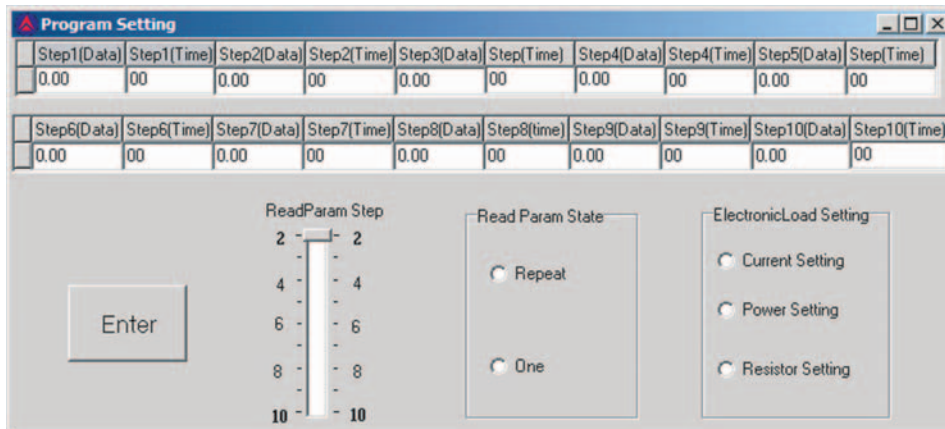
General Specifications

Size: 3.5" (H) x 8.3" (W) x 9.8" (D)

Weight: 11 lbs

Supplied Accessories: Manual, Line cord, Handles, RS-232 adapter and Cables

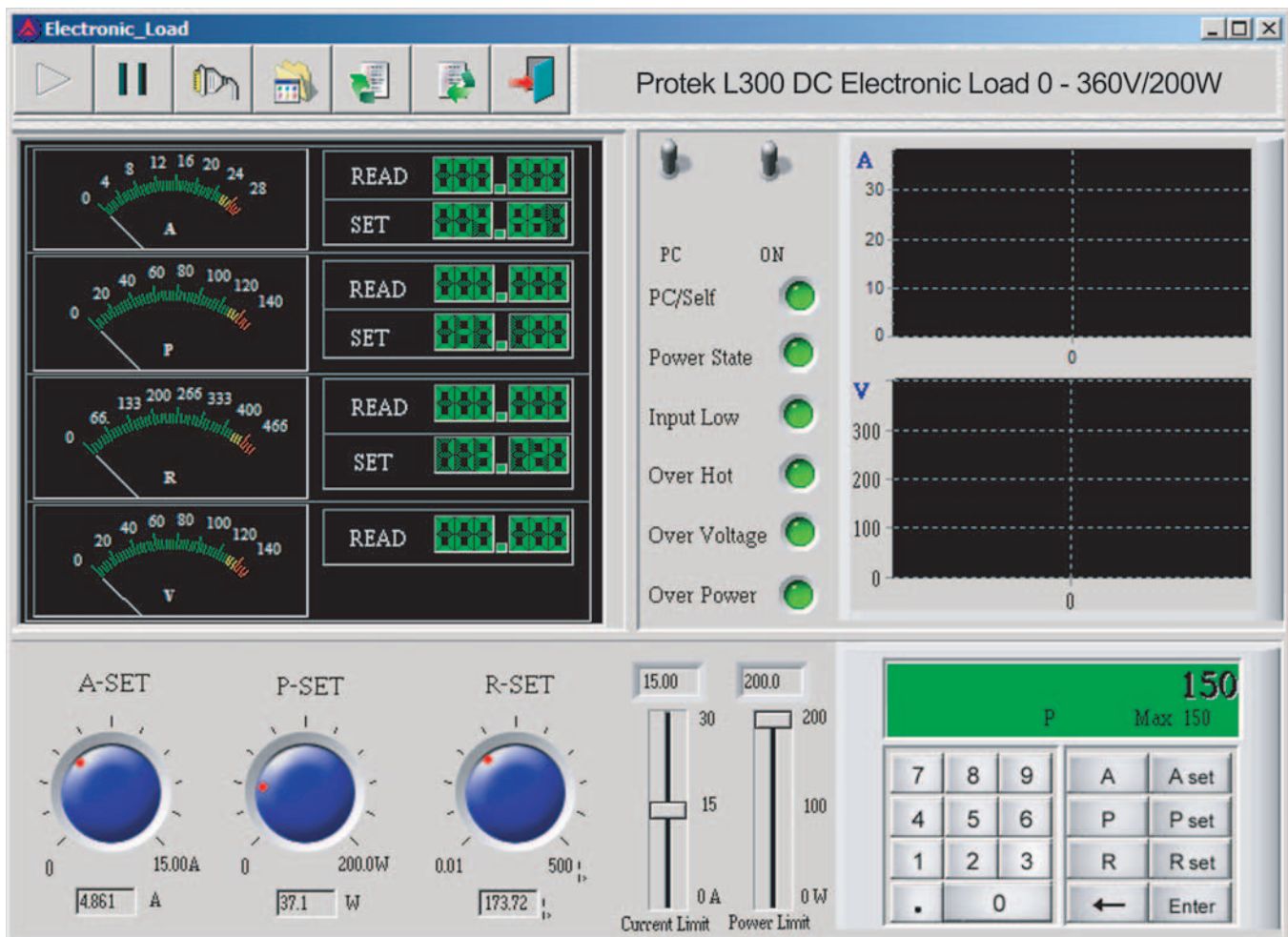
Optional Accessories: USB adapter and Cable



Configuration screen: Allows the user to set various parameters for the program.

Communication Setting: Used to configure communication related settings.

■ Software



Main screen: Displays feedback from the hardware and allows the user to control various parameters directly from the computer software.

- 24 volt internal loop supply
- Auto Step and Auto ramp modes; no need for external mA meter
- Simultaneous mA and % read out for quick, easy interpretation of reading
- 1 μ A resolution for mA source, simulate and measure
- 25% step button for quick linearity tests
- Large 4 1/2 digit 20,000 count LCD display
- Encoder dial for easy one handed operation



30C



mA Source Display



Loop Power Display



Voltage Source Display



Voltage Measure Display



Simulator Display

SPECIFICATIONS ■

Measurements:

Voltage:

Ranges: 2, 20, 50Volts

Best Resolution: 100 μ VAccuracy: $\pm(0.05\% + 5d)$

Overload Protection: 100VDC or AC peak

Current:

Ranges: 2mA and 20mA

Accuracy: $\pm(0.05\% + 5d)$ Best Resolution: 0.1 μ A**Sourcing****Current:**

Range: 4 to 20mA (Values from 0 to 24mA maybe obtained through overlapping)

Accuracy: $\pm(0.025\% + 5d)$

Loop power: 24V

Voltage

Range: 2V and 20V

Accuracy: $\pm(0.05\% + 5d)$ **TX simulator**

Type: 2-wire transmitter simulation

External Excitation Voltage: 3V min to 50V max

Simulation current: 4 to 20mA (Values from 0 to 24mA maybe obtained through overlapping)

Output current Ramp:

Range: 4mA to 20mA

Ramp Times: 5s, 20s, 50s

General Specifications:

Operating Temperature: -10 to 55°C (14 to 131°F)

Power: (1) 9V ANSI/NEDA 1604 battery

Size: 7.0" (H) x 3.5" (W) x 1.5" (D)

Weight: 10.5 oz

Accessories: Test Leads, Instruction manual, carrying case and 9 Volt battery

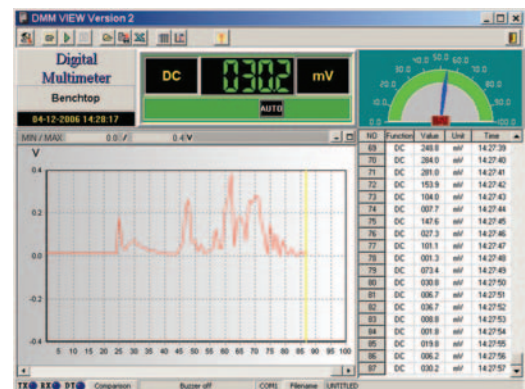
Bench Top Digital Multimeter 3-3/4 Digit DMM with RS-232

B940

- True RMS AC volts and amps measurements
- Capacitance and Frequency measurements
- Back-lit display and Auto/Manual ranging
- MIN/MAX and Relative mode
- Delay hold mode
- AC Line or Battery Operated
- RS-232 Interface with software
- Portable or Bench with Pop-up Stand
- Storage Compartment



B940



Software Display

■ SPECIFICATIONS

DC Voltage

Range: 400mV, 4V, 40V, 400V and 1000V

Best Resolution: 0.1mV

Accuracy: $\pm(0.3\% + 2d)$

AC Voltage

Range: 4V, 40V, 400V and 750V

Best Resolution: 1.0mV

Accuracy: $\pm(0.8\% + 5d)$

DC Current

Range: 4mA, 40mA, 400mA and 10A

Best Resolution: 1 μ A

Accuracy: $\pm(0.8\% + 5d)$

AC Current

Range: 4mA, 40mA, 400mA and 10A

Best Resolution: 1 μ A

Accuracy: $\pm(1.5\% + 5d)$

Resistance

Range: 400 Ω , 4K Ω , 40K Ω , 400K Ω , 4M Ω , 40M Ω

Best Resolution: 0.1 Ω

Accuracy: $\pm(0.5\% + 5d)$

Frequency

Range: 100Hz, 1KHz, 10KHz and 600KHz

Best Resolution: 0.01Hz

Accuracy: $\pm(0.1\% + 2d)$

Capacitance

Range: 4nF, 40nF, 400nF, 4 μ F, 40 μ F

Best Resolution: 0.1pF

Accuracy: $\pm(2\% + 4d)$

Diode test

Test Volt: 3V

Test Current: 0.6mA

Continuity

Buzzer: will sound at $< 40\Omega$ Resistance

General Specifications

Size: 3.3" (H) x 9.0" (W) x 9.4" (D)

Weight: 3.3 lbs

Power: 9V NEDA battery (not supplied) or 90 to

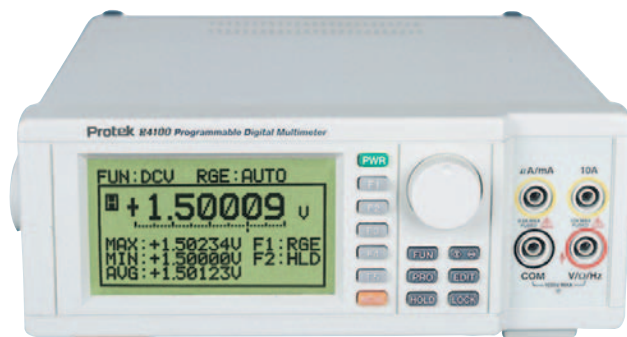
132VAC / 198 to 264VAC @ 50/60Hz (Adapter Supplied)

Accessories: Manual, Test leads, Carrying strap,

Line cord, RS-232 cable, Software CD

Bench Top Digital Multimeter 5-1/2 Digit Programmable

- 5-1/2 Digit multimeter with selectable count resolutions up to 200,000
- True RMS and measures frequency
- Selectable Count Resolutions: 2K, 20K, 200K
- Auto-ranging
- Trend plot display
- RS-232 interface standard and optional GPIB interface
- Min/Max/Avg, Relative error and comparison functions
- May be used on line voltages from 85V to 250V without any internal changes
- Software included
- Seven setups may be stored and recalled in memory



B4100

SPECIFICATIONS ■

[B4100]

Display

Slow: Counts: 200,000; Digits: 5 ½
Medium: Counts: 20,000; Digits: 4 ½
Fast: Counts: 2,000; Digits: 3 ½

Specifications (at 25°C ±5°C, 77°F ±9°F)

DC Voltage

Ranges: 2V, 20V, 200V, 1000V

Best Resolutions:

10µV (Slow), 100µV (Med), 1mV (Fast)

Accuracy: ±(0.05% + 3d)

Input Impedance: 10MΩ

Overload Protection: 1000V

AC Volts

Ranges: 2V, 20V, 200V, 1000V

Best Resolutions: 100µV (Slow and Med), 1mV (Fast)

Accuracy: ±(0.5% + 5d) 45Hz to 450Hz

Overload Protection: 1000V

Crest Factor: 3:1

DC Current

Ranges: 200µA, 200mA, 10A

Best Resolutions:

200µA: 1nA (Slow), 10nA (Med), 100nA (Fast)

200mA: 1µA (Slow), 10µ (Med), 100µA (Fast)

10A: 100µA (Slow), 1mA (Med), 10mA (Fast)

Accuracy: ±(0.1% + 5d), Max burden: 200mV

Overload Protection: 0.5A/250V and 10/250V fuse

AC Current

Best Resolutions:

200µA: 10nA (Slow and Med), 100nA (Fast)

200mA: 1µA (Slow), 10µA (Med), 100µA (Fast)

10A: 100µA (Slow), 1mA (Med), 10mA (Fast)

Accuracy: ±(0.5% + 5d), Max burden: 200mV

Overload Protection: 0.5A/250V and 10A/250V fuse

Resistance

Ranges: 200Ω, 2KΩ, 200KΩ, 2MΩ, 10MΩ

Best Resolutions:

1mΩ (Slow), 10mΩ (Med), 100mΩ (Fast)

Accuracy: ±(0.05% + 5d)

Overload Protection: 250V or AC RMS

Frequency

Ranges: 200Hz, 2KHz, 20KHz, 200KHz

Best Resolutions:

1mHz (Slow), 10mHz (Med), 100mHz (Fast)

Accuracy: ±(0.05% + 2d)

Overload Protection: 250V DC or AC RMS

Diode

Range: 2V

Test Current: Approximately 1.0mA

Test Volts: Approximately 3V

Continuity: Buzzer will sound at 100Ω or less

Interface

Type: RS-232

Connector: 9 Pin din

Baud Rate: 1200, 2400, 4800 or 9600 bps

GPIB: optional

General Specifications

Display: 128 x 64 pixel super twist LCD

Size: 3.3" (H) x 9.5" (W) x 10.5" (D)

Weight: 3.2 lbs

Operating Temperature: 0 to 50°C (32 to 120°F)

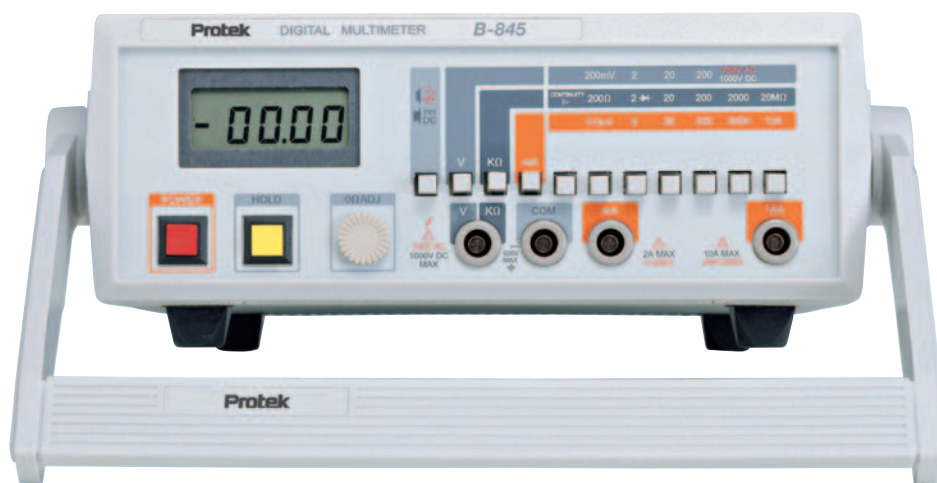
Power: 85V to 275V ±10%

Supplied Accessories: Manual, Line cord, Software disk,

RS-232 cable, Test Leads

Optional Accessories: GPIB interface

- 4-1/2 digit LCD display with polarity indicator
- 0.05% DC voltage accuracy
- 10 μ V AC & DC voltage resolution
- 10nA current resolution
- 10m Ω Resistance resolution
- Data hold switch
- Measures current to 10 Amps
- 200 μ A AC/DC Current Range



B845

■ SPECIFICATIONS

DC Voltage

Range: 200mV, 2V, 20V, 200V, 1000V

Best Resolution: 10 μ V

Accuracy: $\pm(0.05\% \text{ Rdg} + 2d)$

AC Voltage

Range: 200mV, 2V, 20V, 200V, 1000V

Best Resolution: 10 μ V

Accuracy: $\pm(0.5\% \text{ Rdg} + 10d)$

DC Current

Range: 200 μ A, 2mA, 20mA, 200mA, 10A

Best Resolution: 10nA

Accuracy: $\pm(0.3\% \text{ Rdg} + 3d)$

AC Current

Range: 200 μ A, 2mA, 20mA, 200mA, 10A

Best Resolution: 10nA

Accuracy: $\pm(0.75\% \text{ Rdg} + 10d)$

Resistance

Range: 200 Ω , 2K Ω , 20K Ω , 200K Ω , 2M Ω , 20M Ω

Best Resolution: 10m Ω

Accuracy: $\pm(0.2\% \text{ Rdg} + 5d)$

Continuity

Buzzer: Will sound at $< 200\Omega$ Resistance

Diode test

Test Volt: 2.8V

Test Current: 3mA

General Specifications

Operating Temperature: 0 to 40°C (32 to 104°F) at a relative humidity of 0 to 80%

Power: 115/230V, 50/60Hz

Size: 3.0" (H) \times 8.0" (W) \times 10.5" (D)

Weight : 5 lbs

Supplied Accessories: Manual, Line cord, Test leads

- 80,000 count Dual Display
- Basic DC accuracy is 0.05%
- Pulse output with frequency selection from 0.5Hz to 5KHz with duty cycles from 1% to 99%
- Measures frequency, ms Pulse width and duty cycle
- AC and AC+DC TRUE RMS measurements.
- Hi and Lo limit testing
- dBm measurement using 20 reference Impedances
- Min/Max/AVG
- Peak hold and Relative mode
- RS232 port
- CE and Category II 1000V and Cat III 600V safety standards
- Built in 10 hour timer



6800

SPECIFICATIONS ■

mV DC

Ranges: 80 mV, 800 mV; Best Resolution: 1 μ V
Accuracy: $\pm 0.05\% + 10d$; Input Impedance: 1G Ω

DC Volts

Ranges: 8V, 80 V, 800V, 1000V; Best Resolution: 100 μ V
Accuracy: $\pm (0.05\% + 10d)$; Max. Input Voltage: 1000V DC
Input Impedance: 10M Ω

AC mV/Volts TRUE RMS

Ranges: 80mV, 800mV, 8V, 80V, 750V
Best Resolution: 1 μ V

AC Volts Accuracy (80mV, 800mV, 8V ranges):

50/60Hz: $\pm (0.5\% + 10d)$

50Hz ~ 1KHz: $\pm (1.0\% + 10d)$

1KHz ~ 10KHz: $\pm (3.0\% + 10d)$

10KHz ~ 20KHz: $\pm (5.0\% + 10d)$

AC Volts Accuracy (80V and 750V Range):

1% from 50Hz to 400Hz

AC + DC V Accuracy: $\pm (1.0\% + 10d)$ 50Hz to 200Hz

Max. Input Voltage: 1000 V DC or AC peak

Input Impedance: 10M Ω (1G Ω 80mV and 800mV)

DC Current

Ranges: 80mA, 800mA, 8A, 10A; Best Resolution: 1.0 μ A
Accuracy: $\pm (0.5\% + 10d)$

Overload Protection: 0.8A/250V fuse and 10A/250V fuse

AC True RMS Current

Ranges: 80mA, 400mA, 8A, 10A; Best Resolution: 1.0 μ A
Accuracy: $\pm (0.5\% + 10d)$ 50Hz to 1KHz

Accuracy AC+DC Amps: $\pm (1.0\% + 10d)$ 50Hz to 200Hz

Overload Protection: 800mA/250 fuse and 10A/250V fuse

DBM

Range: -80dBm to +80dBm; Best Resolution: -0.01dBm
Accuracy: $\pm (1.0\%$ or reading)

Default Ref impedance is 600 Ω , Ref. Impedances from 4 Ω to 1200 Ω maybe selected

Resistance

Ranges: 800 Ω , 8K Ω , 80K Ω , 800K Ω , 8M Ω , 80M Ω

Best Resolution: 10.0m Ω ; Accuracy: $\pm (0.3\% + 10d)$

Max. Input Voltage: 250V

Diode and Continuity Test

Range: 8.00V; Accuracy: $\pm (3\% + 10d)$

The Buzzer sounds when the measured resistance is <50 Ω

Frequency

Ranges: 1KHz, 10KHz, 100KHz, 1000KHz, 8MHz

Best Resolution: 0.01Hz; Input sensitivity: 0.7V AC rms

Accuracy: $\pm (0.05\% + 5d)$; Max. Input Voltage: 250V

Frequencies to 1Ghz can be read with optional adapter

Secondary display reads: Duty cycle and mS pulse width

RPM

Range: 0 to 99,999; Resolution: 1RPM

Accuracy: $\pm (0.1\% + 5d)$

Note: The RPM function is the secondary display of the frequency measurement and requires the RPM adapter

Capacitance

Ranges: 1nF, 10nF, 100nF, 1 μ F, 10 μ F, 100 μ F.

Best Resolution: 1pF

Accuracy: $\pm (2.5\% + 10d)$, ($\pm 5\% + 10d$), 1nF range

Maximum Input Volts: 250V

Temperature

Ranges: -50 to 1372°C (-58 to 2502°F)

Thermocouple: K type

Display: °C primary display °F secondary display

Resolution: 0.1°

Accuracy: $\pm (2.5\% + 8d)$

Square wave Generator

Amplitude: Approx 3V

Frequencies from 0.500Hz to 5.000KHz may be selected in 15 Steps

Duty Cycle: Variable from 1% to 99%

General Specifications

Operating Temperature: 0 to 50°C (32 to 122°F)

Power: 9Volt battery @ 36 Hours of operation

Size: 7.5" (H) x 3.54" (W) x 1.45" (D)

Weight: 1.43 lbs

Auto Power-Off: 30 minutes or the timer value.

Accessories: Instruction manual, Test leads, Holster,

Temperature probe, 9V battery, RS-232 software and cable



6500

- 50,000 count and 50 segment bar graph backlit display
- Basic DC accuracy is $\pm 0.03\%$
- RS232 interface with software and cable
- dBm measurement with 4Ω to 1200Ω reference resistances
- AC and (AC+DC) TRUE RMS measurement
- Measures frequency, Duty cycle and Capacitance
- Cat III 1000V
- Max/Min and Relative measurements
- Auto power off and backlit display

SPECIFICATIONS

DC mV

Ranges: 50mV, 500mV; Best Resolution: $1\mu\text{V}$
Accuracy: $\pm(0.03\% + 6\text{d})$; Input Impedance: $1\text{G}\Omega$

DC Volts

Ranges: 5V, 50V, 500V, 1000V; Best Resolution: $100\mu\text{V}$
Accuracy: $\pm(0.03\% + 6\text{d})$; Max. Input Voltage: 1000V DC
Input Impedance: $10\text{M}\Omega$

AC mV

Ranges: 50mV, 500mV; Best Resolution: $1\mu\text{V}$
AC mV Accuracy:
40Hz to 1KHz: $\pm(0.5\% + 40\text{d})$, 1KHz to 10KHz: $\pm(1.0\% + 40\text{d})$,
10KHz to 20KHz: $\pm(2.5\% + 40\text{d})$
Input Impedance: $1\text{G}\Omega$

AC Volts

Ranges: 5V, 50V, 500V, 1000V; Best Resolution: $100\mu\text{V}$
AC Volts Accuracy (5V to 500V ranges):
40Hz to 1KHz: $\pm(0.5\% + 40\text{d})$, 1KHz to 10KHz: $\pm(1.0\% + 40\text{d})$,
10KHz to 20KHz: $\pm(2.5\% + 40\text{d})$
Max. Input Voltage: 1000V DC or AC peak
Input Impedance: $10\text{M}\Omega$

DC μA :

Ranges: 500 μA , 5000 μA ; Best Resolution: 10.0nA
Accuracy: $\pm(0.15\% + 1\text{d})$
Overload Protection: 0.5A/250V fuse

DC mA

Ranges: 50mA, 500mA; Best Resolution: $1.0\mu\text{A}$
Accuracy: $\pm(0.15\% + 10\text{d})$
Overload Protection: 0.5A/250V fuse

DC A

Ranges: 5A, 10A; Best Resolution: $100\mu\text{A}$
Accuracy: $\pm(0.5\% + 10\text{d})$
Overload Protection: 10A/250V fuse

AC μA

Ranges: 500 μA , 5000 μA ; Best Resolution: 10.0nA
Accuracy: $\pm(0.75\% + 10\text{d})$ 40Hz to 1KHz
Overload Protection: 0.5A/250V fuse

AC mA

Ranges: 50mA, 500mA; Best Resolution: $1.0\mu\text{A}$
Accuracy: $\pm(0.75\% + 20\text{d})$ 40Hz to 1KHz
Overload Protection: 0.5A/250V fuse

AC A

Ranges: 5A, 10A; Best Resolution: $100\mu\text{A}$
Accuracy:
40Hz to 1KHz 5A: $\pm(0.75\% + 20\text{d})$
40Hz to 1KHz 10A: $\pm(0.75\% + 20\text{d})$
Overload Protection: 10A/250V fuse

Resistance

Ranges: 500Ω , $5\text{K}\Omega$, $50\text{K}\Omega$, $500\text{K}\Omega$, $5\text{M}\Omega$, $50\text{M}\Omega$
Best Resolution: $10.0\text{m}\Omega$; Accuracy: $\pm(0.1\% + 5\text{d})$
Max. Input Voltage: 250V

Continuity Buzzer

Buzzer Will Sound: $< 60\Omega$ resistance

Capacitance

Ranges: 50nF, 500nF, $5\mu\text{F}$, $50\mu\text{F}$, $500\mu\text{F}$, $5000\mu\text{F}$
Best Resolution: 10pF ; Accuracy: $\pm(1.0\% + 5\text{d})$
Maximum Input Volts: 250V

Diode Test

Range: 2.5V; Resolution: 0.1mV
Accuracy: $\pm(1.0\% + 5\text{d})$; Test Current: Approx. 0.7mA

Logic Frequency

Sensitivity: +2V to +5V Square wave
Accuracy: $\pm(0.006\% + 4\text{d})$
Frequency Range: 5Hz to 2MHz

Frequency

Ranges: 5Hz to 200KHz; Best Resolution: 0.001Hz
Accuracy: $\pm(0.006\% + 4\text{d})$
Input Sensitivities (Range/Sensitivity):
(500mV / 0.1V), (5V / 0.5V), (50V / 4V), (500V / 40V),
(1000V / 400V), (5000 μA / 1000 μA), (500mA / 100mA)

Duty Cycle

Range: 0 to 90%; Resolution: 0.01%
Accuracy: $\pm 10\%$

General Specifications

Operating Temperature:
0 to 30°C (32 to 86°F) @ 80% Relative Humidity
31 to 51°C (87 to 124°F) @ 50% Relative Humidity
Power: (6) AAA Batteries
Size: 7.9" (H) x 3.94" (W) x 1.57" (D)
Weight: 1.23 lbs
Accessories: Manual, test leads, RS232 cable and software CD

**304 3-1/2 Digit
AC/DC Mini Clamp-On Meter**

- Measures AC/DC current to 1000A
- Manual ranging
- Measures Volts, Amps and Ohms
- 1.37" Jaw opening for cramped wiring locations
- Overload protection with indicator
- Data hold, Fused input
- Meets IEC-1010 Category III 600V safety standards



CE
304

SPECIFICATIONS**[304]****Volts DC**

Ranges: 200V
Best Resolution: 0.1V
Accuracy: $\pm(0.8\% + 1d)$
Maximum Input: 500V DC or AC RMS

Volts AC

Ranges: 500V
Best Resolution: 0.1V
Accuracy: $\pm(1.0\% + 3d)$, 40Hz to 400Hz
Maximum Input: 500V DC or AC RMS

Resistance

Ranges: 200 Ω
Best Resolution: 0.1 Ω
Accuracy: $\pm(1.2\% + 5d)$
Maximum Input: 400V or AC RMS

DC/AC Current

Ranges: 200 and 1000A
Best Resolution: 0.1A
Accuracy: $\pm(1.2\% + 5d)$
Maximum Input: 1200A DC or AC RMS

General Specifications

Power: 9V battery
Size: 7.1" (H) \times 1.9" (W) \times 1.4" (D)
Weight: 20 oz
Accessories: Manual, Test leads, Carrying case

**305 3-3/4 Digit True RMS
AC/DC Clamp-On Meter**

- Measures AC/DC current to 1000A
- True RMS AC Measurements
- Auto/Manual ranging
- Frequency counter
- 40 segment analog bar graph
- 2-1/4" Jaw opening
- Meets IEC-1010 Category III 600V Safety Standards



CE
305

[305]**Volts DC**

Ranges: 400mV, 4V, 40V, 400V, 600V
Best Resolution: 100 μ V; Accuracy: $\pm(0.5\% \text{ Rgd} + 3d)$
Maximum Input: 1000V DC or 750V RMS
Input Impedance: 10M Ω

Volts AC

Ranges: 4V, 40V, 400V, 600V; Accuracy: $\pm(0.5\% \text{ Rgd} + 5d)$
Maximum Input: 750V RMS; Input Impedance: 10M Ω

Resistance

Ranges: 400 Ω , 4K Ω , 40K Ω , 400K Ω , 4M Ω , 40M Ω
Best Resolution: 0.1 Ω ; Accuracy: $\pm(1.5\% + 5d)$
Maximum Input: 250V DC or AC RMS

DC/AC Current

Ranges: 400 and 1000A; Best Resolution: 0.1A
Accuracy: $\pm(2.0\% \text{ Rgd} + 5d)$
Maximum Input: 1000A DC or AC RMS

Continuity Buzzer

Buzzer will sound < 40 Ω resistance

Frequency

Ranges: 100Hz, 1KHz, 10KHz, 100KHz, 1MHz
Best Resolution: 0.01Hz; Accuracy: $\pm(0.2\% \text{ Rgd} + 2d)$
Maximum Input: 250V DC or AC RMS

General Specifications

Operating Temperature: 0 to 40°C (32 to 104°F), relative humidity 0 to 80% Rgd
Size: 9.6" (H) \times 3.4" (W) \times 1.7" (D); Jaw Size: 2.25"
Weight: 15 oz; Power: (2) 1.5V AAA batteries
Accessories: Manual, Test leads, Carrying case

**A480B 300 Amp
Analog Clamp-On Meter**

- Temperature measurement
- Meter Lock Switch freezes measured reading for closer examination at safe location
- For use in plant maintenance, HVAC, electrical installation, motor repair and similar applications



CE
A480B

[A480B]**Volts DC**

Range: 60V
Sensitivity: 8K Ω /V
Accuracy: $\pm 3\%$ FS

Volts AC

Ranges: 150V, 300V and 750V
Sensitivity: 2K Ω /V
Accuracy: $\pm 3\%$ FS

AC Current

Ranges: 6A, 60A, 300A
Accuracy: $\pm 5\%$ FS

Temperature

Ranges: -20 to 150°C
Accuracy: $\pm 5\%$ FS

Resistance

Ranges: X1 Ω and X10 Ω
Mid Scale: 30 Ω and 300 Ω
Accuracy: $\pm 4\%$ of FS

General Specifications

Size: 9.0" (H) \times 3.0" (W) \times 1.5" (D)
Jaw Size: 2.5"
Weight: 1 lb
Power: (1) 1.5 V AA battery
Accessories: Manual, Test leads, Carrying case

- Sine, Square, Ramp and Pulse wave forms
- Built-in 2MHz frequency counter
- 7 frequency ranges with 100:1 frequency control
- Less than 0.5% sine wave distortion
- Variable symmetry
- Sweep time from 20ms to 2 seconds
- TTL sync output



CE
B8011

■ SPECIFICATIONS

Output Characteristics

Frequency Range: 0.02Hz to 2MHz

Ranges: 7

Output level:

High: 10Volts into 50Ω

Low: 1V P-P into 50Ω

Waveforms: Sine, Square, Ramp, Pulse

Impedance: 50Ω

DC offset: 5.0V in to 50Ω

Sine Wave

Distortion: <0.5% from 5Hz to 20KHz

Triangle

Linearity: >99% to 100KHz

Square wave

Rise/Fall Time: <100ns (into 50)

Pulse

Duty Cycles: 20:80 to 80:20 may be obtained

Sweep

Types: Linear

Sweep time: 2ms to 20s

Sweep width: variable to 100:1

Frequency Counter

Modes: Internal and external

Measuring Range: 0.005KHz to 2000KHz

No. of digits: 4

Accuracy: 0.01% + 1count

Sensitivity: 100mV rms

Input Impedance: 1MΩ + 25pF

Max input V: 150V DC and AC rms

General Specifications

Line Voltage: 120/220V, 50/60Hz

Dimensions: 3.1" (H) x 9.0" (W) x 10.4" (D)

Weight: 4.4 lbs

Operating Temperature: 0 to 45°C (32 to 113°F)

Accessories: Manual, Line cord, BNC cable

- Wide 0.004Hz to 4MHz Frequency range
- CW/Triggered and Gated modes
- Sweep output and VCG input
- 1000:1 linear sweep and 10,000:1 frequency log sweep widths
- Settable Sweep Start and Stop Frequencies
- Low Distortion sinewave

**B8400**

SPECIFICATIONS

Frequency Characteristics

Frequency Range: 0.004Hz to 4MHz in 7 ranges

Ranges: x1, x10x, x100, x1K, x10k, x100k, x1M

Dial Accuracy: 5% of full scale

Output Characteristics

Waveforms: Sine, Square, Triangle, TTL Pulse

High output:

Amplitude: 15mV to 10V (into 50Ω)

DC Offset: 0 to ±5 into 50Ω

Impedance: 50Ω

Attenuator: 30dB variable

Low Output:

Amplitude: 0 to 1V (into 50Ω)

DC Offset: 0 to ±0.5 (into 50Ω)

Impedance: 50Ω

Attenuator: 30dB variable

Sine Wave

Frequency Range: 0.004Hz to 4MHz

Flatness:

±2.0 % (0.004Hz to 400KHz)

±10% (400KHz to 4MHz)

Harmonic Distortion:

< 0.5 % on the 1K and 10K range

1% on the x1, x10, x 100 and x100K ranges

25dBc on the x1M range

Square Wave

Frequency Range: 0.004Hz to 4MHz

Rise/Fall Time: < 50ns into 50Ω (High output terminals)

Symmetry: ±1% to 100KHz, ±5% to 4MHz

Triangle

Linearity: > 99% to 200KHz

Operating modes

CW, Triggered, Gated, Sweep, Manually Triggered

Trigger/Gate input level: TTL

Trigger/Gate Frequency Range: to 4MHz Max.

Trigger/gate minimum pulse width: < 50ns

Sweep

Type: Linear and Log

Sweep Time: 30ms to 60 seconds continuously variable

Sweep width: 1:1,000 linear; 1:10,000 log continuously variable. Sweep start and stop frequencies may be set with the Freq dial and the Freq. Stop control.

Outputs

Sync: TTL level

GCV: output proportional to the selected frequency, 0 to -5V

Sweep: 4V P-P; **Impedance:** 600Ω

VCG Input

Input Voltage: 0 to ±4V P-P will cause a 1:1,000 frequency change (linear) and 1:10,000 (Log)

Input Impedance: 2KΩ

General Specifications

Operating Temperature: 0 to 50°C (32 to 120°F)

Dimensions: 3.5" (H) x 11.4" (W) x 10.6" (D)

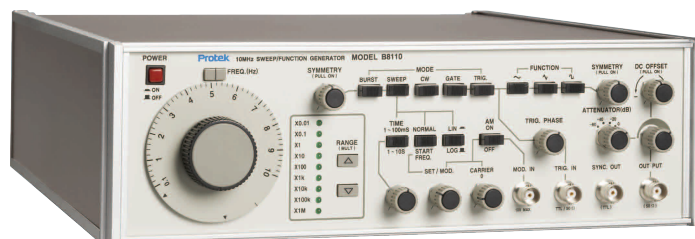
Weight: 5 lbs

AC line Voltage: 120/220V, 50/60Hz

Accessories: Manual, Line cord, BNC cable

B8110 10MHz Sweep Function Generator

- Wide 0.01Hz to 10MHz frequency range
- Log/Lin sweep
- Burst /gate and triggered modes
- Output may be FM modulated using the VCG input.
- Low distortion Sine wave
- Sweep start and Stop capability

**B8110****B1990**

■ SPECIFICATIONS

[B8110]**Frequency Characteristics**

Frequency Range: 0.01Hz to 10MHz

Output Characteristics

Waveforms: Sine, Square Pulse, Triangle and ramp

Impedance: 50Ω

Attenuator: 20dB, 40 dB, 60dB and 20 dB variable

Amplitude: 0 to ±10 Volts in to an open circuit

DC Offset: 0 to ±10 V in to an open circuit (0 to ±5 into 50Ω)

Sine Wave

Frequency Range: 0.01Hz to 10MHz

Flatness: ±3.5% from 0.01Hz to 100KHz

±10% 100KHz to 10MHz

Harmonic Distortion: < 0.5 % from 10 Hz to 40KHz

Symmetry: 20:80 to 80:20

Square Wave

Frequency Range: 0.01Hz to 10MHz

Rise/Fall Time: < 25ns into 50Ω

Pulse

Frequency Range: 0.01Hz to 10MHz; **Rise Time:** < 10ns

Duty Cycle: adjustable symmetry control from 20:80 to 80:20

Ramp and Triangle

Linearity: > 99%

Operating Modes

CW, Triggered, Gated, Burst Sweep

Trigger/Gate input level: TTL

Trigger/Gate Frequency Range: DC to 100KHz

Burst time: 1ms to 10s

Sweep

Type: Linear and Log

Sweep Time: 1ms to 2s in 2 ranges, continuously variable

Sweep width: 1:100 continuously variable. Sweep start frequency may be set with the SET/MOD control.

Modulation

Type: AM

Input: External Through the MOD input connector

Frequency: DC to 1MHz

Modulation Range: 0 to 100%

Modulation Voltage: 0 to 5V P-P

Type: FM

Input: External through the VCG input

Tuning Range: 1000:1 with an input of 0 to -5V

Outputs

Sync: TTL level

GCV: output proportional to the selected frequency, 0 to -5V

Sweep: 0 to -5V; **Sweep/Burst Gate:** TTL level

General Specifications

Operating Temperature: 0 to 50°C (32 to 120°F)

Dimensions: 4.3" (H) x 12.5" (W) x 14" (D)

Weight: 15 lbs

AC line Voltage: 120/220V, 50/60Hz

Accessories: Manual, line cord, BNC cable

[B1990]**Frequency Characteristics****Frequency Range:**

Internal: 1Hz to 10MHz (100ns to 1s) in 7 ranges

Xtal: 10Hz to 10MHz

Output Characteristics

Amplitude: 0.5 to 5V p-p (into 50Ω)

Impedance: 50Ω

Input Impedance: 2KΩ

Rise Time: 10ns (into 50Ω)

Output Polarity: Positive or Negative

Pulse Width Range: 50ns to 5ms in 5 ranges

Pulse Delay Range: 0 to 2μs in

Trigger**Trigger modes:**

Internal, Ext (+ or - edge triggered), Xtal and Manual

Trigger out:

Width: 20ns; Amplitude: 5V; Impedance: 50Ω

External Trigger in:

Input V range: +1.0V to -1.0V P-P (sine or square wave)

Repetition Rates: 10Hz to 10MHz; Impedance: 2KΩ

General Specifications

Operating Temperature: 0 to 40°C (32 to 104°F)

at less than 85% humidity

Stability: 0.1% per hour after warm up

Dimensions: 4.3" (H) x 11.4" (W) x 10.2" (D)

Weight: 6.4 lbs

AC line Voltage: 120/220V, 50/60Hz

Accessories: Manual, line cord, BNC cable

- Sweep Function Generator and Frequency Counter
- Sine, Square, Triangle, Ramp, Pulse, Skewed Sine and TTL Square Waveforms
- 0.2Hz to 20MHz Frequency Output (Sine wave)
- Built-in 8 digit 3.0GHz Frequency Counter
- Internal and External linear Sweep control
- Variable Symmetry for generating Sawtooth (Ramp), Skewed Sine and Pulse Waveforms
- Variable DC Offset control
- Variable Output level control and 20 dB attenuator

**B821**

SPECIFICATIONS ■

[B821]

Output Characteristics

Frequency Range:

Sine wave: 0.2Hz to 20MHz

Square & Triangle wave: 0.2Hz to 10MHz

Range selection in 8 ranges (1,10,100,1K,10K,100K,1M,10M)

Output Level:

20 \pm 1 Vp-p in open circuit

10 \pm 0.5 Vp-p into 50 Ω Load

Waveforms:

Sine, Square, Triangle, Ramp, Pulse, Sawtooth, TTL Leveled Square

Attenuator: 20dB fixed and continuously variable (20dB)

Impedance: 50 Ω \pm 0.5%

Frequency Accuracy: \pm 5% of full scale

Waveform Characteristics

Sine Wave:

Flatness: \pm 3dB to 20MHz

Distortion: Less than 1.5 % at 0.2Hz to 100KHz

Duty error: Less than 10% in 50:50

Square Wave:

Rise and Fall Time: < 25ns at 10MHz

Triangle Wave: Linearity: More than 99% at 0.2Hz to 100KHz

TTL Output:

Rise and Fall Time: < 25ns at 10MHz

TTL Level: H \geq 2.4V, L \leq 0.4V

Symmetry Variation:

Sine & Square: 80:20 to 20:80 at 0.2Hz to 2MHz

Triangle: 80:20 to 20:80 at 0.2Hz to 1MHz

Sweep Function Characteristics

Mode: Linear

Width: Variable from 1:1 to 10:1

Rate: 0.5Hz to 50Hz (20ms to 2s)

External VCF Input:

Input Voltage: 0 to 10V

Input Impedance: Approx. 10K Ω

Frequency Counter Characteristics

Display: 8 digits Green LED, Overflow, Gate time, MHz, KHz, Hz

Frequency Range:

Input A: 0.1Hz to 100MHz

Input C: 80MHz to 3.0GHz

Accuracy: \pm Timebase Error \pm 1 count

Low pass Filter: -3 dB, 100KHz

Timebase: 10MHz TCO, 1 ppm

Input Sensitivity:

Input A (30mVrms): 0.1Hz to 80MHz

Input A (70mVrms): 80MHz to 100MHz

Input C (20mVrms): 80MHz to 2.0GHz

Input C (70mVrms): 2.0GHz to 3.0GHz with RG58 cable

Input C (40mVrms): 2.0GHz to 3.0GHz with RG400 cable

Max. Input Voltage:

Input A: 35Vp-p

Input C: 3Vrms

General Specifications

Power Requirements: 115/230VAC \pm 10%, 48 to 66Hz

Operating Temperature:

0 to 40°C (Accuracy specified at 23°C \pm 5°C),

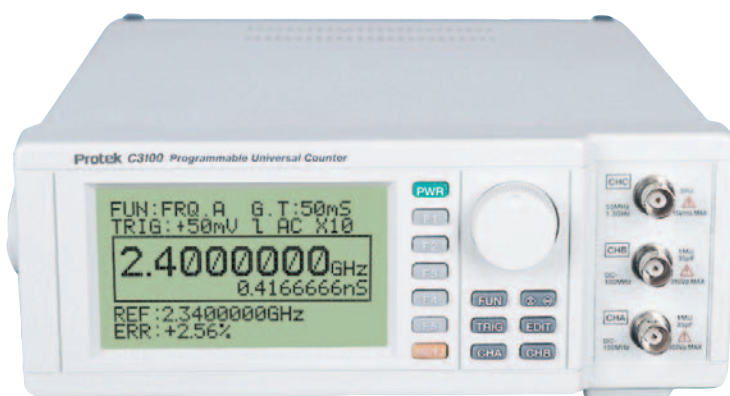
32 to 104°F (Accuracy specified at 73°F \pm 9°F)

Size: 3.5" (H) x 9.5" (W) x 11.0" (D)

Weight: 6.6 lbs

Supplied Accessories: Manual, Line cord, BNC cable

- Accurate frequency measurements to 2.4GHz
- Measures Frequency, Period, Duty Cycle, RPM, Frequency ratio, Difference frequency, Time interval and Totalize
- Nine measurement functions
- Plots trend graph on LCD display
- Compare, Relative Error and Min/Max functions
- Standard RS-232 with optional GPIB interface
- Eight setup screens may be saved and retrieved from memory
- Software for controlling, displaying data and data logging
- Operates on all line voltages from 85V to 270V without any changes



C3100

■ SPECIFICATIONS

Frequency Measurement

Freq A

Ranges: DC coupled: 0 to 120MHz
AC coupled: 10Hz to 120MHz
Resolution: 0.00001Hz @ 200Hz
Gate Times: 50ms to 10s (20 settings)
Accuracy: ± 2 PPM; Coupling: AC or DC
Trigger Level: ± 1.8 V in a scale from -99 to +99

Freq B

Ranges: DC coupled: 0 to 120MHz
AC coupled: 10Hz to 120MHz
Resolution: 0.00001Hz @ 200Hz
Gate Times: 50ms to 10s (20 settings)
Accuracy: ± 2 PPM; Coupling: AC or DC
Trigger Level: ± 1.8 V in a scale from -99 to +99

Freq C

Ranges: 100MHz to 2.4GHz
Resolution: 100Hz @ 500MHz
Gate Times: 50ms to 10s (20 settings)
Accuracy: ± 2 PPM + 1 count
Coupling: AC only
Trigger Level: Auto

Totalize

Input: CH A
Frequency Range: DC to 10MHz
Count Capacity: 0 to 99,999,999 counts
Resolution: 1 count
Accuracy: ± 1 count

Time Interval (A \rightarrow B)

Input: CH A and CH B
Range: 0.5 μ s to 200,000 μ s
Minimum Pulse Width: 250ns
Resolution: 1 μ s
Accuracy: ± 1 count + timebase accuracy

Ratio (A/B)

Inputs: CH A and CH B
Range: CH A: 10MHz to 150MHz
CH B: 0.1MHz to 10MHz
Resolution (0.000001)

Duty Cycle

Input: CH A
Measurement Range: 0.01% to 99.99%
Frequency Range: 0 to 100KHz

RPM

Input: CH A
Measurement Range: 0 to 600,000 RPM
Minimum Pulse Width: 250ns
Resolution: 0.1 RPM

Input Characteristics

Channel A & B
Frequency Range: 0 to 120MHz
Sensitivity: 25mV
Input Impedance: 1M Ω + 35 μ F capacitance
Attenuator: X1, X10
Maximum Input Volts: 250V DC or AC peak

Channel C

Frequency Range: 100MHz to 2.4GHz (usable to 2.7GHz)
Sensitivity: 25mV RMS (100MHz to 2.4GHz)
Maximum Input voltage: 5V DC or AC peak
Attenuator: None
Input Impedance: 50 Ω

Reference Timebase Oscillator

Standard Frequency: 10MHz, 4.194304MHz
Frequency Stability: ± 5.0 PPM Max
Aging Rate: ± 1.0 PPM Max/Yr
Temperature: -30 to +60°C (-22 to +140°F)
Storage Temperature Range: -40 to +85°C (-40 to +185°F)

Software

The supplied software is a Windows®-based program, which runs under Windows 95/98/ME/XP/2000. It allows the user to set the Instrument Parameters from the PC via the RS-232 interface and provides time stamped data logging for all functions.

General Specifications

Display: 128 \times 64 pixel super twist LCD
Line Voltage: AC Input Volts: 85 to 270V AC $\pm 10\%$
Line Frequency: 48Hz to 66Hz
Power Consumption: 15W
Operating Temperature: 0 to 40°C (32 to 104°F)
Size: 3.3" (H) \times 11.6" (W) \times 11.0" (D); Weight: 4.4 lbs
Supplied Accessories: Manual, Line cord, BNC cable, Software, RS-232 cable
Optional Accessories: GPIB (installed)

- High accuracy frequency measurements to 3.0GHz
- Measures Frequency, Period, Time Interval, Ratio and Totalize
- High Stability TXCO
- Variable Trigger level on Inputs A and B
- Large Bright 8 digit LED display With gate time and function indicators
- Low Pass filter and X10 attenuator



B3110

SPECIFICATIONS ■

Frequency Measurement

Input A

Ranges

Low Range:

DC coupled: 0.1Hz to 10MHz

AC coupled: 10Hz to 100MHz

High Range: 10MHz to 100MHz

Best Resolution:

Low Range: 0.1Hz

High Range: 1Hz

Gate Times: 0.01s to 10s in 4 decades

Accuracy: \pm (Time base error + 1 count)

Input B: (Used only for Ratio A/B and Time interval)

Range:

DC coupled: 0.1 to 10MHz

AC coupled: 10Hz to 100MHz

Freq C

Range: 100MHz to 3.0GHz

Best Resolution: 10Hz

Gate Times: 0.0128s, 0.128s, 1.28s and 12.8s

Accuracy: \pm (Time base error + 1 count)

Totalize

Input: A

Frequency range: DC to 10MHz

Count Capacity: 0 to 99,999,999 counts

Resolution: 1 count

Minimum Pulse width: 250ns

Accuracy: \pm 1 count

Time Interval: (A \rightarrow B)

Inputs: A and B

Range: 0.5 μ s to 200ms (5Hz to 2MHz)

Minimum Pulse Width: 250ns

Best Resolution: 100ns

Multipliers: x1, x10, 100, 1000

Accuracy: \pm (Time base error + 1 count) \pm Input A

Trigger error \pm Multiplier

Ratio: (A/B)

Inputs: A and B

Range:

CHA: 10MHz to 100MHz

CHB: 0.1Hz to 10MHz

Resolution: Input B/(Input A x multiplier)

Accuracy: \pm Input B trigger error/Input B x Gate time)

\pm 1 count

Period: Input A

Range: 0.5 μ s to 200ms (5Hz to 2MHz)

Minimum pulse width: 250ns

Best Resolution: 100ps

Accuracy: \pm (Time base error + 1 count) \pm Input A Trigger

error

Input Characteristics:

Inputs A & B

Sensitivity: \leq 25mV

Input Impedance: 1M Ω + 40pF capacitance

Attenuator: x1, x10

Coupling: AC and DC

Low pass filter: To approx. 100KHz

Slope: Plus or Minus

Trigger level: \pm 350mV variable and 0V fixed

Maximum input volts: 250V DC or AC peak

Input C

Frequency Range: 100MHz to 3.0GHz

Sensitivity:

\leq 15mV (100MHz to 800MHz)

\leq 60mV (800MHz to 3.0 GHz)

Maximum input voltage: 3V rms

Attenuator: None

Input Impedance: 50 Ω

Coupling: AC

Time Base

Type: TXCO

Frequency: 10.00000MHz

Stability: \pm 3.0 PPM per week

Time base output: 500mV p-p into 50 Ω

General Specifications

AC input Volts: 100V/120V/220V/240V

Line Frequency: 50/60Hz

Power consumption: 20VA

Operating temperature: 0 to 40°C (32 to 104°F)

Size: 4.0" (H) x 10.0" (W) x 11.0" (D)

Weight: 5.25 lbs

Accessories: Manual, Line cord, BNC cable

- High accuracy frequency measurements to 1.3 GHz
- Frequency Resolution to 0.1Hz
- High input sensitivity
- Large Bright 8 digit LED display With gate time and function indicators
- X10 attenuator
- Measures Frequency, Period and Totalise



B8118

■ SPECIFICATIONS

Frequency Measurement

Input A

Range: 10 Hz to 100MHz
Resolutions: 0.1Hz,
Gate Times: 0.01s to 10s in 4 decades
Accuracy: \pm (Time base error + 1 count)

Input B

Range: 100MHz to 1.3GHz
Best Resolution: 10Hz
Gate Times: 0.01s to 10s in 4 decades
Accuracy: \pm (Time base error + 1 count)

Totalize: Input A

Frequency range: DC to 10MHz
Count Capacity: 0 to 99,999,999 counts
Resolution: 1 count
Minimum Pulse width: 250ns
Accuracy: \pm 1 count

Period: Input A

Range: 1.0 μ s to 100ms (10Hz to 1MHz)
Minimum pulse width: 250ns
Resolutions: 100ps, 1ns, 10ns, 100ns
Accuracy: \pm (Time base error + 1 count) + Trigger error

Input Characteristics

Input A

Sensitivity: 50 mV (10Hz to 100Hz)
20mV (100Hz to 100MHz)
Input Impedance: 1M Ω + 30pF capacitance
Attenuator: x1, x10
Coupling: AC
Maximum input volts: 30V rms

Input B

Sensitivity: 15mV (100MHz to 1000MHz)
40mV (1000MHz to 1300MHz)
Input Impedance: 50 Ω
Coupling: AC
Max input Volts: 7V

Time Base

Frequency: 10.00000MHz
Stability: \pm 3 PPM per week

General Specifications

AC input Volts: 120V or 220V
Line Frequency: 50/60Hz
Operating temperature: 0 to 40°C (32 to 104°F)
Size: 4.0" (H) x 10.0" (W) x 11.0" (D)
Weight: 3.75 lbs
Accessories: Line cord, Manual, BNC cable

High Accuracy, Wide Range LCR Meter with LCD Readout

- 0.02% Basic accuracy
- Wide measurement Ranges for Capacitors, Resistors and Inductors
- Menus and parameters are displayed on an easy to read 320x 240 Graphics LCD with backlight
- Measurement Rates to 12 times per second
- 500 Test Frequencies from 12Hz to 100KHz
- Open and short-circuit compensation for accurate zeroing
- Binning and Pass/Fail operation
- Measurement averaging from 1 to 255
- Optional GPIB and handler interface
- LCD displays measured values, Q/D, Absolute Δ and $\% \Delta$



SPECIFICATIONS

Measured Components

L(Inductance), C(Capacitance), R(Resistance)

Measurement Circuit configurations:

Series and Parallel

Measurements

Resistance:

Measured Parameter: R+Q

Measurement Ranges:

R: 10 $\mu\Omega$ to 100M Ω

Q: 0.0001 to 9,999

Inductance:

Measured Parameter: L+Q

Measurement Range:

L: 0.01 μ H to 99,999 H

Q: 0.0001 to 9,999

Capacitance:

Measured Parameters: C+D and C+R

Measurement Range:

C: 0.00001pF to 99,999 μ F

D: 0.0001 to 9,999

R: 0.0001 Ω to 9,999K Ω

Display

Display Type: 320x 240 Graphics LCD W/Backlight

Display value: 5 digit LCR and a 4 digit Q/D measurement

Parameters Displayed: Measured values, absolute Δ and $\% \Delta$

Test Environment

Test Frequencies: 500 test frequencies from 12Hz to 100KHz

Test Voltage: 5mV to 1.275V in 5mV increments

Test Voltage Accuracy: $\pm(5\% + 5mV)$ (1 + 001 x F2)

Measurement rates:

Slow 1 Meas/sec

Medium: 5 Meas/sec

Fast: 12 Meas/sec

Measurement Delay: from 1ms to 99,999ms

Ranging: Auto or Manual.

DC Bias: Internal: 2V, External: 0 to 60V

Triggering: Continuous or Triggered

Zeroing correction: Open and short circuit

Averaging: 1 to 255 Avgs

Measurement Accuracy

Basic accuracy: $\pm >0.02\%$ at 23°C $\pm 5^\circ\text{C}$ (73°F $\pm 9^\circ\text{F}$), (See user manual for all accuracy conditions)

Remote Operation: GPIB and Handler (Optional)

General Specifications

AC Voltage input: 120 or 220 Volts

Frequency: 50/60 Hz

Power Consumption: 20Watts (Max)

Operating Temperature:

0 to 50°C (32 to 122°F) at $\leq 85\%$ Relative Humidity

Size: 5.5" (H) x 15" (W) x 18" (D)

Weight: 17.6 lbs

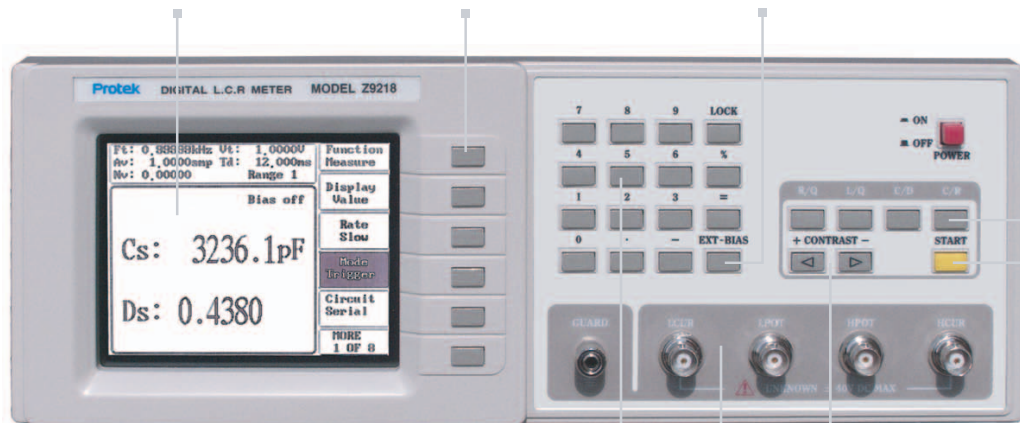
Accessories: Manual, Line Cord, Kelvin leads with bag, GPIB Handler (Optional)

320 x 240 pixel LCD for displaying the component value along with its Q or D value in a absolute, Δ or $\% \Delta$ display. Test Frequency, Test voltage, Circuit mode, Number of averages, Binning and the Soft Keys for selecting these parameters are also displayed.

The function Keys select the operating parameters displayed on the LCD. Trigger mode, Measurement rate, Component value in absolute, Δ or $\% \Delta$ are some of the functions that may be selected.

EXT Bias key when in the C+D or C+R mode allows an external bias voltage up to 60V to be applied to the capacitor under test. This is normally used to stabilize a High value Electrolytic for an accurate reading.

Selects the type of component and parameter to be measured. R&Q, L&Q, C&D, C&R or Auto may be selected.



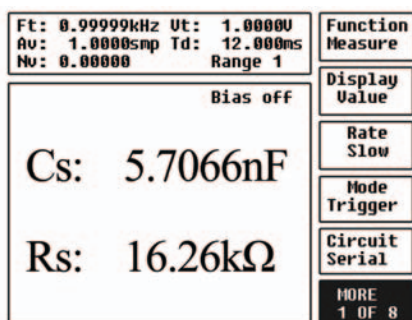
Numeric keyboard for entering Test Frequency, Voltage values, Number of averages, Cal Data Measurement delay and Nominal values.

Four wire input: 2 inputs supply the drive signal and 2 inputs are for input sensing, thereby removing errors caused by lead length.

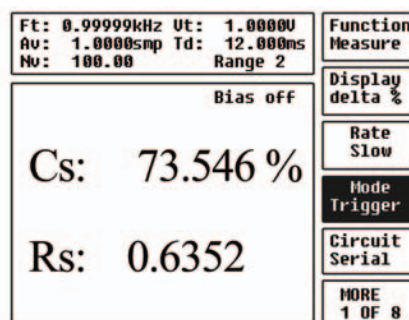
These two keys are used to adjust the contrast of the LCD display.

The start key initiates a measurement in the triggered mode.

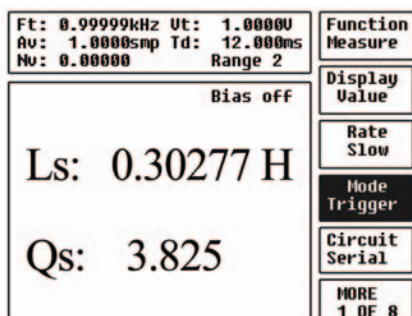
SCREENS



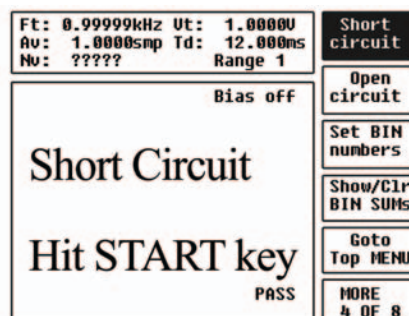
C/R MEASUREMENT SCREEN



C/R $\Delta\%$ MEASUREMENT SCREEN



L/Q MEASUREMENT SCREEN



SHORT CIRCUIT CALIBRATION SCREEN

- Measures L, C, R, $|Z|$, Q and D
- Displays component value, Q or D, Delta, or Delta%
- 5 digit display for component value and Q/D
- Auto ranging or Range hold
- Built-in comparator with 4 bin-sorting function
- Open and short circuit calibration for accurate zeroing
- Series and parallel equivalent circuit modes
- Three test frequencies
- Warning alarm for pass or fail binning
- Easy to use



SPECIFICATIONS

Measurements

Components:

L (Inductance)
C (Capacitance)
R (Resistance)
Z (Impedance)

Circuit Configuration: Series and Parallel

Parameters Displayed: Measured values, absolute Delta and Delta %

Resistance/Impedance

Measured Parameter: R + Q and $|Z|$

Measurement Range:

R: 1m Ω to 999.99M Ω

Q: 0.0001 to 99999

Inductance

Measured Parameter: L + Q

Measurement Range:

L: 1 μ H to 999.99H (100Hz & 120Hz)

L: 0.1 μ H to 999.99 (1KHz)

Q: 0.0001 to 99999

Capacitance

Measured Parameter: C + D

Measurement Range:

C: 1pF to 999.99 μ F

D: 0.0001 to 99999

Test Environment

Test Frequency: 100Hz, 120Hz, 1KHz

Test Voltage: 0.3V RMS

Drive Voltage Accuracy: $\pm 10\%$

Measurement Rate: 2 Measurements/Sec

Ranging: Auto or Hold

Measurement Accuracy

Basic Accuracy: $\pm 0.3\%$ @ 23°C $\pm 5^\circ\text{C}$ (73°F $\pm 9^\circ\text{F}$)

(See user manual for detailed accuracy conditions)

Zero Input Correction: Open and short circuit

General Specifications

Power Requirement: AC Voltage Input: 120/220V

Frequency: 50/60Hz

Power Consumption: 10W (Max)

Operating Temperature:

0 to 40°C (32 to 104°F) at $\leq 85\%$ Relative Humidity

Size: 4.3" (H) x 10.6" (W) x 10.2" (D)

Weight: 5.5 lbs

Accessories: Manual, Line cord, Test leads with Kelvin clips

CM109 3-1/2 Digit LCD Capacitance Meter

- Measures capacitance to 20mF
- Zero adjust
- Fused input
- Large LCD display
- Rugged case design
- Inputs for clip leads and lead insertion



CM109

CM110 3-1/2 Digit 2000 Count Capacitance Meter

- Zero adjust for compensating stray capacitance
- Large easy to read 3-1/2 digits, 2000 count LCD
- 0.5% measurement accuracy
- Fused input
- 9 measurement ranges
- Three measurement frequencies
- Includes holster



CM110

CL200 3-1/2 Digit 2000 Count L/C Meter

- Six capacitance ranges and four inductance ranges
- High accuracy measurement
- Automatic zeroing
- Low battery indicator
- Fuse protected input
- Includes holster



CL200

■ SPECIFICATIONS

[CM109]

Capacitance

Range: 200pF, 2nF, 20nF, 200nF 2μF, 20μF, 200μF, 2000μF, 20mF

Best Resolution: 0.1pF

Accuracy:

- ±(0.5% Rdg + 1d): 200pF to 200μF Ranges
- ±(1% Rdg + 1d): 2000μF Range
- ±(2% Rdg + 1d): 20mF Range

Test Frequencies:

- 200pF to 2μF Ranges: 200Hz
- 20μF Range: 80Hz
- 200μF to 20mF Ranges: 8Hz

Zero Adjustment Range: ±20pF

Overload Protection: 0.25A/250V fuse

General Specifications

Power: 9V battery

Operating Temperature: 0 to 40°C (32 to 104°F) with a relative humidity of less than 70%

Size: 5.3" (H) x 2.8" (W) x 1.3" (D)

Weight: 7.5 oz

Supplied Accessories: Manual, Test leads, Battery

[CM110]

Measurement Condition: Specifications are measured within a temperature range of 18°C to 28°C (64°F to 82°F)

Capacitance

Ranges: 200pF, 2nF, 20nF, 200nF, 2μF, 20μF, 200μF, 2000μF, 20000μF

Best Resolution: 0.1pF

Accuracy:

- ±(0.5% + 1d): 200pF to 200μ ranges
- ±(1% + 1d): 2000μ range
- ±(2% + 1d): 20mF range

Test Frequencies:

- 200pF to 2μF ranges: 800Hz
- 20μF range: 80Hz
- 200μF to 20,000μF ranges: 8Hz

Zero Adjustment Range: ±20pF

Overload Protection: 0.25A/250V fuse

General Specifications

Power: 9V Battery

Calibration Interval: 1 year

Operating Temperature: 0 to 40°C (32 to 104°F) with a relative humidity of less than 70%

Size: 7.4" (H) x 3.7" (W) x 1.3" (D)

Weight: 7.5 oz

Supplied Accessories: Manual, Test leads, Holster

[CL200]

Measurement Condition: Specifications are measured within a temperature Range of 18 to 28°C (64 to 82°F)

Capacitance

Ranges: 2nF, 20nF, 200nF, 2μF, 20μF, 200μF

Best Resolution: 1pF

Accuracy:

- ±(1% + 1d): 2nF to 200nF ranges
- ±(2% + 1d): 2μ to 200μF ranges

Test Frequencies:

- 2nF to 2μF ranges: 900Hz
- 20 μF and 200μF ranges: 80Hz

Inductance

Ranges: 2mH, 20mH, 200mH, 2H

Best Resolution: 1μH

Accuracy:

- ±(2% + 1d), 2mH to 200mH range
- ±(5% + 1d), 2H range

Test Frequency: 900Hz

General Specifications

Power: 9V NEDA Battery

Calibration Interval: 1 year

Operating Temperature: 0 to 40°C (32 to 104°F) with a relative humidity of less than 70%

Size: 7.4" (H) x 3.7" (W) x 1.3" (D)

Weight: 7.5 oz

Supplied Accessories: Manual, Test leads, Holster

Hand-Held 2GHz RF Signal Strength Analyzer

- Hand-Held and battery operated
- 100KHz to 2060MHz measurement range
- 12.5 Ch/sec scan rate
- Built-in 2GHz frequency counter
- High sensitivity (-117 dBm max)
- Detects Wide band and Narrow band FM, AM and Single Sideband Signals
- Phase lock loop for precise frequency tuning
- RS-232 interface (includes software and cable)
- Up to 160 channels may be scanned and displayed
- Audio output with built-in speaker
- Detachable antenna included
- Back-lit display
- All functions are menu selected
- Instrument setups & display data may be stored in memory
- Hard copy printer output of spectrum and bar graph displays



3201

SPECIFICATIONS ■

Frequency

Frequency Range: 100KHz to 2060MHz
Frequency Step: 5KHz to 9995KHz in multiples of 5KHz or 6.25KHz
Ref. Oscillator Accuracy: ± 3 PPM
Frequency Marker Accuracy: ± 25 PPM
Frequency Measurements: Narrow Band FM, Wide Band FM, AM and Single side band

Input

Input Impedance: 50 Ω
Maximum Input Volts: 5V RMS (+27dBm)
Measurement Units: dBmV, dB μ V, dBm
Attenuation: 0dB or -10dB internal; 0dB to 60dB with external Attenuator

Narrow Band FM

Level Measurement Range:
 -117dBm to -67dBm (1MHz to 2060MHz)
Resolution: ± 0.5 dB; **Accuracy:** ± 3 dB
Bandwidth: 12.5KHz

Wide Band FM, AM & SSB

Level Measurement Range:
 -108dBm to -58dBm (10MHz to 2060MHz)
Resolution: ± 0.5 dB; **Accuracy:** ± 3 dB
Bandwidth:
 Wide band FM: Approx. 180KHz
 AM and SSB: Approx. 2.4KHz
BFO Frequency Range: ± 1.5 KHz
Reception Sensitivity: 0 to 6dB μ V EMF with supplied antenna
Antenna Reception S/N Ratio: N-FM: 10 dB; W-FM: 12 dB

Display

Display Modes: Spectrum, Bar graph, Frequency counter
Spectrum Display: Displays 160 channels
Bar Graph Displays: Multi channel (2, 5, 10, 20, 40, 80, 160 bar graphs per display), Single Channel and 2 Channel difference
Sweep Modes: Single, Normal, Free run
Spurious Signals: (internally generated) -35dBc for W-FM -45dBc for N-FM (typical below full scale signal level)

Scan Mode

Mode: Manual, Channel (memory scan) and Search scan
Scan Rate: 12.5 Ch/sec

Memory

Data Memory: Stores 10 displays of up to 160 CH per display
Setup Memory: Stores 10 setups for each scan mode

Frequency Counter

Bandwidth: 9MHz to 2060MHz
Resolution: 1KHz
Accuracy: 50PPM ± 1 count
Input Impedance: 50 Ω
Max Input Volts: 5V RMS
Response Time: 0.512 sec
Input Sensitivity:
 9MHz to 2060MHz: 120mV
 20MHz to 1500MHz: 50mV
 2MHz to 2060MHz: 500mV
Data Memory: Stores 10 Readings

Miscellaneous

LCD: 192 x 192 Pixels, Light green
Back Light: LED. Back light will shut off 5 seconds after the last key depression
Interfaces: Std RS-232 interface with female 8 pin mini Din connector. Baud Rates of 1200, 2400, 4800 or 9600 BPS are menu selected. The software supplied is a Windows®-based program, which runs under Windows 95/98/ME/XP/2000.
Auto Power Off: 5, 10, 20 or 30 minutes after the last key depression (user selected).
Audio Output: 120mW into 8 Ω Speaker
Power Requirements: (6) AA NiCd or Alkaline Batteries, 12 volt car adapter or 11V to 16V 500 mA Max AC to DC adapter

General Specifications

Operating Temperature: 0°C to 40°C (32 to 104°F)
Relative Humidity: 35% to 85%
Storage Temperature: -10 to 50°C (14 to 122°F)
Size: 9.5" (H) x 4.0" (W) x 1.8" (D)
Weight: 1.4 lbs
Supplied Accessories: Manual, (6) 1.5V AA NiCd Batteries, Detachable 9" whip antenna, RS-232 Cable and Software, Carrying case, Earphone, Carrying strap, Vehicle power adapter, AC/DC adapter

Hand-Held 2GHz RF Signal Strength Analyzer

3201

X10 Attenuator
Extends input range

Antenna or Coax Input

Volume Control

Earphone Jack
For noisy environment operations

Input for Frequency Counter
Built-in 9MHz to 2060MHz

Belt Clip
Hands-free transport

LCD Display
Bright, easy-to-read, 192 x 192
pixels, up to 160 channels

Function Keys
Fast entry of preset or
custom values and functions

Numeric Input Keys (+ or -)
For entering
8 digit freq. values

On-Off Power
Auto-power off saves batteries

LCD Key
Varies contrast for easy viewing

Audio Speaker

Dial Knob
Fast one-hand selection of menu
items and freq. marker

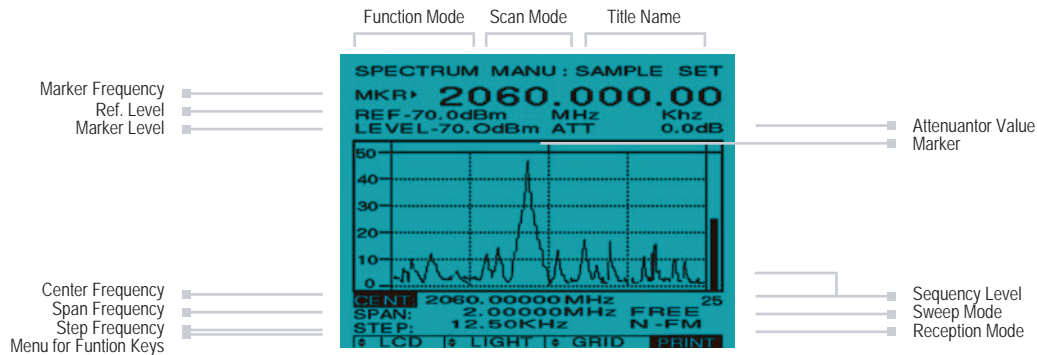
DC Input Jack
Accepts AC/DC adaptor; car
adaptors; and battery charger
(included)

Frequency keys
Marker or Menu edit

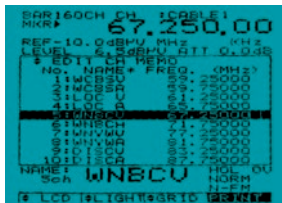
RS-232C Connector
Printer or computer connection
(software included)



DISPLAY

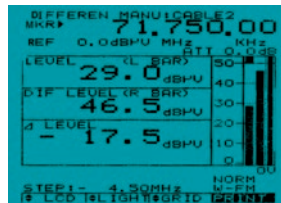


SPECTRUM ANALYZER DISPLAY



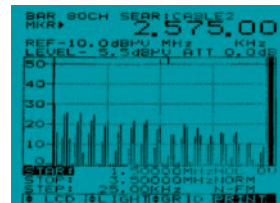
CHANNEL EDIT MODE

Up to 1600 channels may be stored in any order, then scanned and identified by 9-digit freq. and 5-letter title. Useful for Cable TV, Cellular phone, and other field applications where repetitive measurements need to be made.



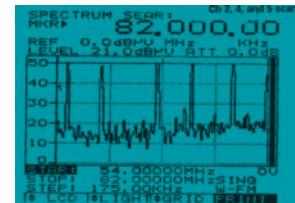
TWO CHANNEL DIFFERENCE MODE

This Mode displays 2 carrier levels and their difference. A key application verifies that a TV or Cable channel's video and audio carriers are within specifications.



BAR-GRAPH DISPLAY

This feature makes level readings easy and "cleans up" each frequency (compared to a spectrum display). Patterns may be readily seen, for example: this display of computer monitor radiation.



SPECTRUM DISPLAY

This Mode scans and displays 160 channels. Squelch level may be set above or below carrier level in order to pause scan and detect the signal. Detection modes are AM, NFM, WFM and SSB.

Hand-Held 2.9GHz RF Signal Strength Analyzer

- Hand-Held and battery operated
- 100KHz to 2900MHz measurement range
- 125 Ch/sec scan rate
- Built-in 2.9GHz frequency counter
- High sensitivity (-117 dBm max)
- Detects Wide band and Narrow band FM, AM and Single Sideband Signals
- Phase lock loop for precise frequency tuning
- RS-232 interface (includes software and cable)
- Up to 160 channels may be scanned and displayed
- Audio output with built-in speaker
- Detachable antenna included
- Back-lit display
- All functions are menu selected
- Instrument setups & display data may be stored in memory
- Hard copy printer output of spectrum and bar graph displays
- Ideal for IEEE 802.11 applications, Cellular Telephones, RF paging systems, Indoor repeaters, Surveillance applications

**3290**

SPECIFICATIONS ■

Frequency

Frequency Range: 100KHz to 2900MHz

Frequency Step: 5KHz to 9995KHz in multiples of 5KHz or 6.25KHz

Ref. Oscillator Accuracy: ± 3 PPM

Frequency Marker Accuracy: ± 25 PPM

Frequency Measurements: Narrow Band FM, Wide Band FM, AM and Single side band

Input

Input Impedance: 50 Ω

Maximum Input Volts: 5V RMS (+27dBm)

Measurement Units: dBmV, dB μ V, dBm

Attenuation: 0dB or -10dB internal; 0dB to 60dB with external Attenuator

Narrow Band FM

Level Measurement Range:

-117dBm to -67dBm (300MHz to 1800MHz)

-107dBm to -67dBm (1MHz to 300MHz and 1800MHz to 2900MHz)

Resolution: ± 0.5 dB; **Accuracy:** ± 3 dB

Bandwidth: 12.5KHz

Wide Band FM, AM & SSB

Level Measurement Range:

-107dBm to -57dBm (300MHz to 1800MHz)

-97dBm to -57dBm (10MHz to 300MHz and 1800MHz to 2900MHz)

Resolution: ± 0.5 dB; **Accuracy:** ± 3 dB

Bandwidth:

Wide band FM: Approx. 180KHz

AM and SSB: Approx. 2.4KHz

BFO Frequency Range: ± 1.5 KHz

Reception Sensitivity: 0 to 6dB μ V EMF with supplied antenna

Antenna Reception S/N Ratio: N-FM: 10 dB; W-FM: 12 dB

Display

Display Modes: Spectrum, Bar graph, Frequency counter

Spectrum Display: Displays 160 channels

Bar Graph Displays: Multi channel (2, 5, 10, 20, 40, 80, 160 bar graphs per display), Single Channel and 2 Channel difference

Sweep Modes: Single, Normal, Free run

Spurious Signals: (internally generated) -35dBc for W-FM -45dBc for N-FM (typical below full scale signal level)

Scan Mode

Mode: Manual, Channel (memory scan) and Search scan

Scan Rate: 125 Ch/sec

Memory

Data Memory: Stores 10 displays of up to 160 CH per display

Setup Memory: Stores 10 setups for each scan mode

Frequency Counter

Bandwidth: 9MHz to 2900MHz

Resolution: 1KHz

Accuracy: 50PPM ± 1 count

Input Impedance: 50 Ω

Max Input Volts: 5V RMS

Response Time: 0.512 sec

Input Sensitivity:

9MHz to 2060MHz: 120mV

20MHz to 1500MHz: 50mV

2MHz to 2800MHz: 500mV

2800MHz to 2900MHz: 750mV

Data Memory: Stores 10 Readings

Miscellaneous

LCD: 192 x 192 Pixels, Light green

Back Light: LED. Back light will shut off 5 seconds after the last key depression

Interfaces: Std RS-232 interface with female 8 pin mini Din connector. Baud Rates of 1200, 2400, 4800 or 9600 BPS are menu selected. The software supplied is a Windows®-based program, which runs under Windows 95/98/ME/XP/2000.

Auto Power Off: 5, 10, 20 or 30 minutes after the last key depression (user selected).

Audio Output: 120mW into 8 Ω Speaker

Power Requirements: (6) AA NiCd or Alkaline Batteries, 12 volt car adapter or 11V to 16V 500 mA Max AC to DC adapter

General Specifications

Operating Temperature: 0°C to 40°C (32 to 104°F)

Relative Humidity: 35% to 85%

Storage Temperature: -10 to 50°C (14 to 122°F)

Size: 9.5" (H) x 4.0" (W) x 1.8" (D)

Weight: 1.4 lbs

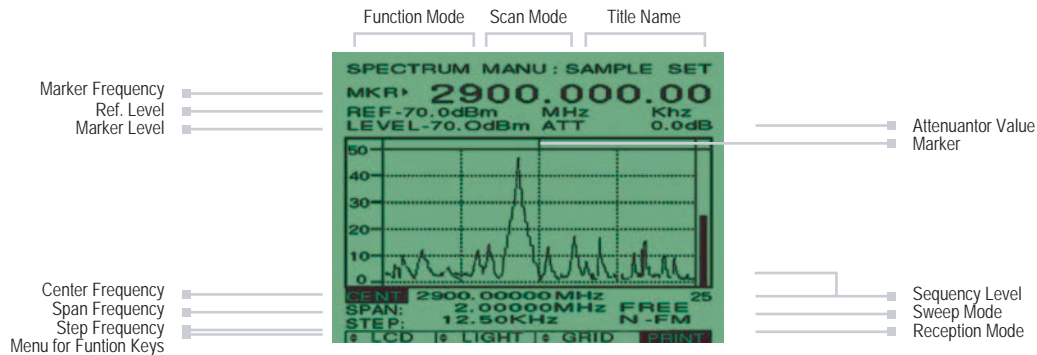
Supplied Accessories: Manual, (6) 1.5V AA NiCd Batteries, Detachable 9" whip antenna, RS-232 Cable and Software, Carrying case, Earphone, Carrying strap, Vehicle power adapter, AC/DC adapter, Holster

Hand-Held 2.9GHz RF Signal Strength Analyzer

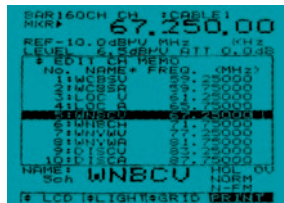
3290



DISPLAY

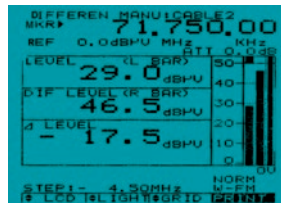


SPECTRUM ANALYZER DISPLAY



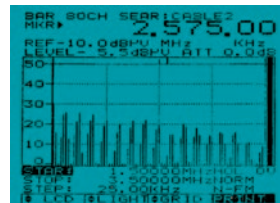
CHANNEL EDIT MODE

Up to 1600 channels may be stored in any order, then scanned and identified by 9-digit freq. and 5-letter title. Useful for Cable TV, Cellular phone, and other field applications where repetitive measurements need to be made.



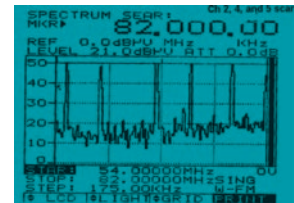
TWO CHANNEL DIFFERENCE MODE

This Mode displays 2 carrier levels and their difference. A key application verifies that a TV or Cable channel's video and audio carriers are within specifications.



BAR-GRAPH DISPLAY

This feature makes level readings easy and "cleans up" each frequency (compared to a spectrum display). Patterns may be readily seen, for example: this display of computer monitor radiation.



SPECTRUM DISPLAY

This Mode scans and displays 160 channels. Squelch level may be set above or below carrier level in order to pause scan and detect the signal. Detection modes are AM, NFM, WFM and SSB.

Synthesized AM/FM Signal Generator

- 10 KHz to 1040KHz frequency range
- AM, PM and FM modulation
- -127dBm to +6dBm output level
- Self Test and Calibration capabilities
- 25W reverse power protection
- 100 location memory for storing Frequency, modulation and output level data
- Optional GPIB interface



B1240

SPECIFICATIONS

Frequency:

Range: 10KHz to 1040MHz

Display Resolution:

10Hz (10KHz to 520MHz), 20Hz (520MHz to 1040MHz)

Accuracy: $\pm 1.5 \times 10^{-6}$ after 20 minutes of warm up

Output Characteristics:

Output level Range: -127dBm to + 6dBm

Display Resolution: 0.1dB

Accuracy: ± 1 dB (> -10dBm), ± 2 dB (< -10dBm)

Amplitude Flatness:

< 0.5dB (10KHz to 1040KHz, -10dBm to +6dBm)

Output impedance: 50 Ω

Amplitude Units: dBm and dB μ

Output Protection: 25W of reverse power

Spectral Purity:

Spurious:

Better than -35dB at carrier frequency < 62.5MHz and 0dBm

Better than -25dB at carrier frequency > 62.5MHz and 0dBm

Residual Modulation: FM: 7Hz, AM: 0.05%

Modulation

FM:

Deviation:

0 to 100KHz (1Mz to 1040MHz)

Carrier Freq. x 10% (below 1MHz)

Resolution:

10Hz (0 to 10KHz deviation)

100Hz (10KHz to 100KHz deviation)

Accuracy: $\pm 5\%$ for 1KHz or 400Hz modulation

Frequency Response: ± 0.5 dB (50Hz to 50KHz)

Distortion: < 2% THD (1KHz Mod., Max deviation and

Carrier Freq. > 250KHz)

PM:

Range: 0 to 10 Radians

Resolution: 0.01 Radians

Frequency Response: ± 1 dB (10KHz to 10KHz)

Deviation Accuracy: $\pm 5\%$ at 1KHz Modulation

AM:

Range: 0 to 99%

Resolution: 0.5%

Accuracy: better than $\pm 4\%$ of depth setting + 1% at 1KHz

Frequency Response: $\pm 0.5\%$ (50Hz to 50KHz)

Envelope Distortion: < 3% THD (at 70% mod and 1KHz)

Modulation Oscillator: Frequency: 1KHz and 400Hz

External modulation Input:

Range: 10Hz to 50KHz

Input Level: 0.9V to 1.1V RMS (With Modulation ALC)

Input Impedance: 100K Ω (Approx.)

Memory:

Locations 0 to 19 store Frequency, Modulation and Output level

data; Locations 20 to 99 store Frequency data only;

3 independent memories for storing output level data.

Display:

Carrier Frequency: 9-digit LED

Modulation: 3-digit LED

Output Level: 4 -digit LED

Memory Location: 2-digit LED

General Specifications

Input Power: 110/220V

Frequency: 50/60

Size: 4.7" (H) x 17" (W) x 17.7" (D)

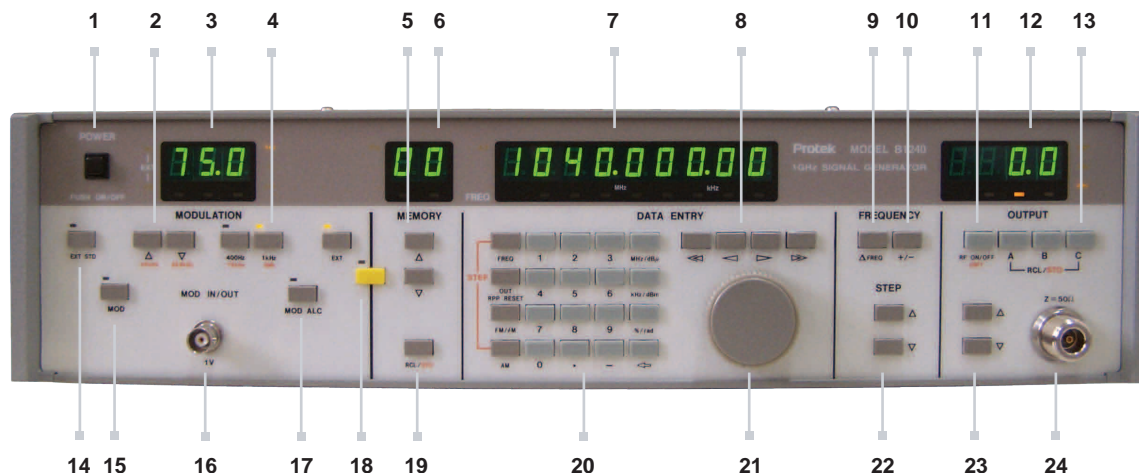
Weight: 26.5 lbs

Standard Accessories:

Operation manual, Line cord and Type N cable

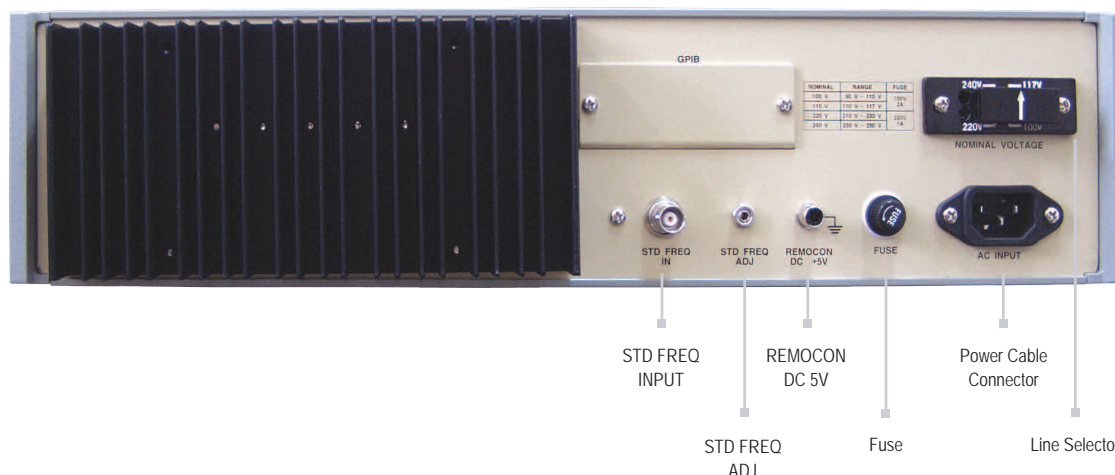
Optional Accessories:

GPIB interface



1. Power On/off.
2. Increases ▲ or decreases ▼ the % mod or Mod Frequency by a preset value. In the second function selects 3.5KHz or 22.5 KHz FM deviation.
3. Displays % Modulation in AM and Frequency Deviation in FM.
4. Selects 400Hz or 1KHz modulation frequencies. In the 2nd function selects 75KHz deviation or 30% AM modulation.
5. Increments or decrements the memory address.
6. Displays the Memory Address.
7. Displays the RF Output Frequency.
8. Function cursor keys
The outer 2 keys selected the display to be changed; the inner 2 keys select the digit in the selected display to be changed.
9. The Delta Frequency is used to generate a new output frequency by adding or subtracting the delta value to the current frequency.
10. +/- keys determine if the Delta frequency is added or subtracted to the current frequency.
11. Turns the output on or off. In the second function selects the dB units.
12. Displays the RF Output Level.
13. These keys are used to store preset RF output levels in memory and recall them when needed.
14. When pressed, an External Reference frequency will be used.
15. Modulation On or Off key.
16. The Input connector for the external modulation signal when External Modulation is selected. The Modulation output signal is present at this connector when internal modulation is selected.
17. When this key is press, the input-modulating signal is kept at a constant level. (0.9V to 1.1V)
18. 2nd Function Key, Some keys on the front are dual function, pressing this key enables the second function.
19. Selects if data is being stored in or recalled from the displayed memory.
20. Keypad
Enter values for the RF Frequency, output level, Modulation or memory values in the selected display.
21. Rotary knob
Used also for entering Frequency, output level, Modulation or memory values in the selected display.
22. Frequency step keys
Increases ▲ or decreases ▼ the frequency by a Preset value.
23. These keys increase ▲ or decrease ▼ the output level by a Preset value.
24. 'N' type RF 50Ω output connector.

■ PANELS



SL100 Sound Level Meter

- ANSI & IEC 651 Type 2 standards
- 3-1/2 digit LCD display
- A&C frequency weighting
- 0.1dB resolution
- Maximum hold function
- Internal calibration check
- Fast and slow response
- Analog output jack

**SL100****B850 Audio Generator**

- Wide 10Hz to 1MHz Frequency range
- Low distortion Sine wave and Square wave output
- Lightweight, Rugged construction
- Frequency setting via large frequency dial
- Ideal for classroom or audio bench

**B850****SPECIFICATIONS****[SL100]****Measurement Ranges****Frequency:** 31.5Hz to 8KHz**Decibel:**

A Lo: Weighting: 35 to 100dB

A Hi: Weighting: 65 to 130dB

C Lo: Weighting: 35 to 100dB

C Hi: Weighting: 65 to 130dB

Best Resolution: 0.1dB**Accuracy:** ±2dB**Dynamic Range:** 65dB**Input:** Condenser Microphone**Time Weighting:** Slow or Fast**Maximum Hold Decay:** < 1dB/3min**Analog Output:**

AC Conditioned: 0.7V RMS, corresponding to each range step

Output Impedance: 600Ω

DC Conditioned: 10mV/dB

Output Impedance: 100Ω

General Specifications**Operating Temperature:** 0 to 50°C (32 to 122°F)

at relative humidity of less than 80%

Power: 9V battery for 100 hours life with alkaline battery**Size:** 9.5" (H) × 2.7" (W) × 1.0" (D)**Weight:** 7.6 oz**Supplied Accessories:** Manual, battery, Adjustment screwdriver, Carrying case**[B850]****Output Characteristics****Frequency Range:** 10Hz to 1MHz in 5 ranges**Frequency Accuracy:**

10Hz to 1MHz: ±5%

100Hz to 100KHz: ±3%

Amplitude: > 20V P-P open circuit; > 10V P-P into 600Ω**Output Impedance:** 600Ω**Output Attenuation:** 0dB, 20dB, 40dB steps and fine adjustment attenuator control**Sine Wave Characteristics****Distortion:**

< 0.05% from 500Hz to 50KHz

< 0.5% from 50Hz to 500KHz

Square Wave Output**Frequency Range:** 10Hz to 100KHz**Output Voltage:** > 15V P-P**Rise Time:** < 500ns**External Sync Input****Input Impedance:** Approx. 10KΩ**Max. Input Voltage:** 10V RMS**General Specifications****Power Requirements:** 115/230V ±10%**Frequency:** 48Hz to 66Hz**Power Consumption:** 3VA**Size:** 6.0" (H) × 10.0" (W) × 5.0" (D)**Weight:** 5.5 lbs**Supplied Accessories:** Manual, Line cord, Test leads

DI2001 Cat. III Insulation Tester

- Measures insulation resistance to 2GΩ
- 250V, 500V and 1000V test voltages
- Meets IEC 1010-1, Category III-600V safety standards
- Data and Max hold
- 3-1/2 digit, 2000 count LCD
- Continuity buzzer



DI2001

DI4000 Insulation Tester

- Measures insulation resistance to 2GΩ
- Measures AC volts
- Data hold and backlight
- 3-1/2 digits, 3200 count LCD
- Designed to IEC-1557-2 standards
- Rugged case and lightweight
- 125V, 250V and 1000V test voltages



DI4000

■ SPECIFICATIONS

[DI2001]

DC Voltage

Range: 0 to 1000V

Resolution: 1V

Accuracy: $\pm(0.5\% \text{ Rdg} + 1\text{d})$

AC Voltage

Ranges: 0 to 750V

Resolution: 1V

Accuracy: $\pm(0.8\% \text{ Rdg} + 4\text{d})$

Mega Ohms

Ranges:

0 to 250MΩ @ 250V

0 to 250MΩ @ 500V

0 to 2000MΩ @ 1000V

Resolution:

0.1MΩ (250MΩ Range)

1.0MΩ (2000MΩ Range)

Accuracy: $\pm(3\% + 5\text{d})$

Display: 2000 Count, 3-1/2 Digit

General Specifications

Power: (8) 1.5V AA Batteries

Operating Temperature: 0 to 40°C (32 to 104°F)

at a relative humidity of < 80%

Size: 6.3" (H) x 3.8" (W) x 2.0" (D)

Weight: 17 oz

Supplied Accessories: Manual, Test probe, Leads, Batteries

[DI4000]

AC Voltage

Ranges: 0 to 600V

Resolution: 1V; Accuracy: $\pm(2.5\% \text{ Rdg})$

Input Impedance: 20MΩ

Max. Input: 600V

Insulation Measurement

Effective Measuring Resistance:

20MΩ @ 125V; 50MΩ @ 250V; 2000MΩ @ 1000V

Rated Measurement Current: Approx. 1mA +20% - 0%

Short Circuit Current: < 2mA

Minimum Measurable Resistance:

20MΩ Range: 0.125MΩ

50MΩ Range: 0.250MΩ

1000MΩ Range: 1.0 MΩ

Accuracy :

125V: 0.02Ω to 10MΩ: < $\pm 5\%$

500V: 0.1MΩ to 50MΩ: < $\pm 5\%$

1000V: 2MΩ to 1000Ω: < $\pm 5\%$

125V: 0.1MΩ to 0.03MΩ and 10MΩ to 100MΩ: < $\pm 10\%$

500V: 0.05MΩ to 0.1MΩ and 50MΩ to 100MΩ: < $\pm 10\%$

1000V: 1MΩ to 2MΩ and 1000MΩ to 2000MΩ: < $\pm 10\%$

General Specifications

Power: (6) 1.5V AA Batteries

Operating Temperature: 0 to 40°C (32 to 104°F)

at a relative humidity of < 80%

Size: 4.1" (H) x 7.0" (W) x 2.1" (D); Weight: 13 oz

Supplied Accessories: Manual, Test Probe, Lead with Case, 6 AA Batteries

Accessories

PP80

DC to 60 MHz, X1/X10 Probes
Max.Input: 600V P-P



PP150

DC to 100MHz, X10 Probes.
Input Impedance:
9M Ω resistance and 14pF Capacitance.
Max Input: 600V P-P



TP25

TP-25: Temp. probe for model A480B



TP35

'K' type temp. probe for models
TM1300K, D910F, D981, A421, 506,
608, 610, B4000



PROBES & Etc.

Test Leads: TL101 TL102 TL206 TL250 TL501

A413, A410B, A800, A801
D901, A403
305, 307
A480B, D640AB, D1200D, BT407
B845, D910F, D980, D981, B4000, B4100, S2401, S2405,
TM1300K, 304, 505, 506, A802, 608, 610
A421, A450

TL505



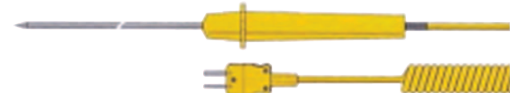
[TL102]
[TL206]

[TL250]
[TL501]
[TL505]

[TL101]

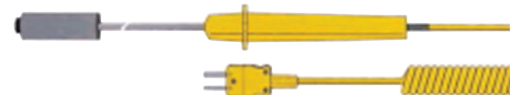
TP111 Universal K Type Immersion Probe

Temp Range: -40°F to 1562°F, -40°C to 850°C



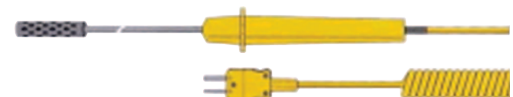
TP112 Universal K Type Surface Probe

Temp Range: -40°F to 950°F, -40°C to 510°C



TP113 Universal K Type Air Probe

Temp Range: -40°F to 500°F, -40°C to 250°C



TP115 Universal K Type General Purpose Probe

Temp Range: -40°F to 1562°F, -40°C to 850°C



CASES & HOLSTERS

Meter Carrying Cases: CB25A CB35D CB50A CB50D CB506 CB77D

DI4000, A421
D910F, D981, D980, A802, CM110, CL200, 2700
A450, A803
FC250
505, 506, 608, 610
CM109, D930A, TM1300K



SALES & CONTACT

Protek Test and Measurement

45 Smith Street, Englewood, NJ 07631

Tel: 201-818-7711 Fax: 201-760-9888

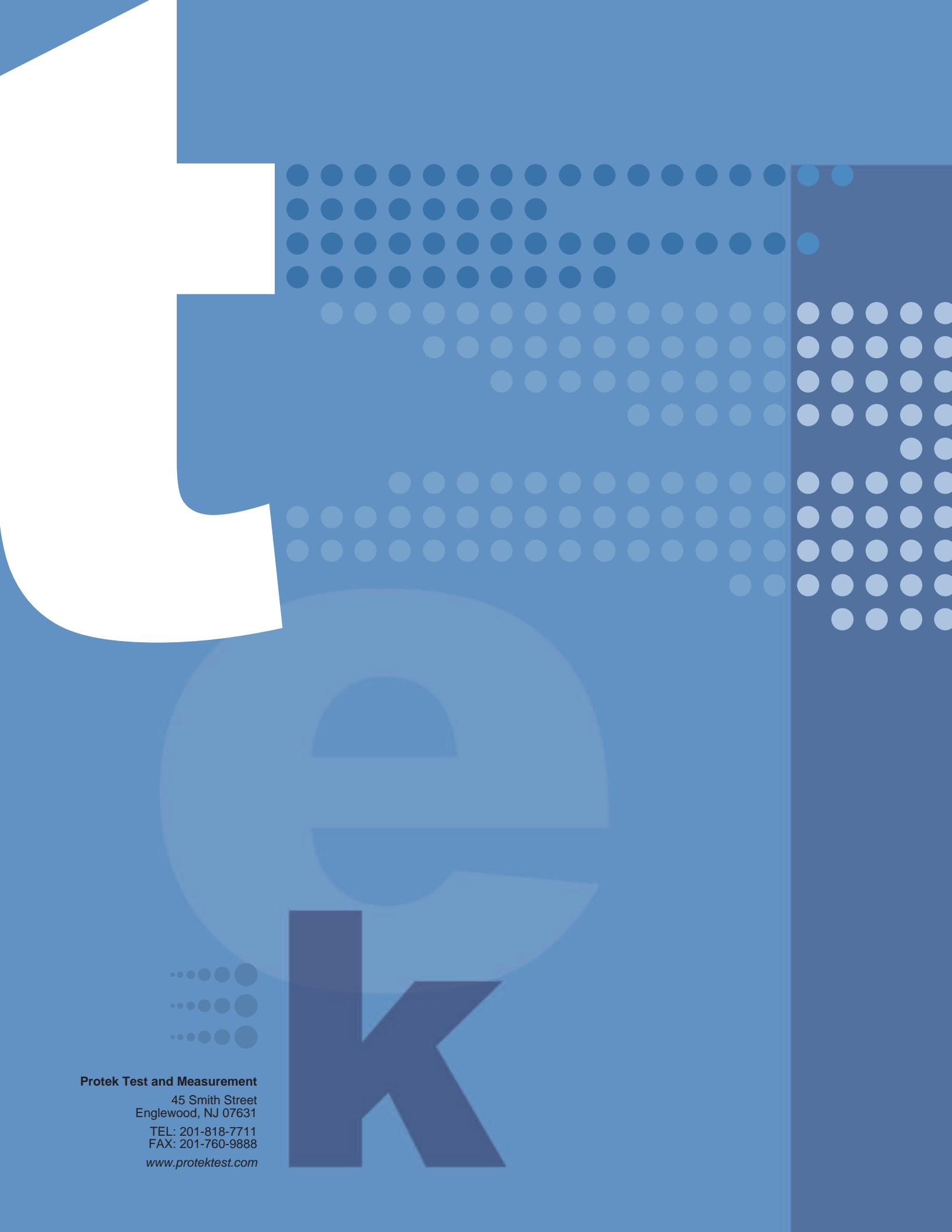
E-Mail: sales@protektest.com

www.protektest.com

WARRANTY

Protek T & M Limited Warranty

Protek T & M products are warranted against defects in workmanship and materials to the user for a period of 2 years from the date of purchase (90 days for models priced less than \$75.00). All warranty claims must be sent in to an authorized repair depot, transportation prepaid, and must be accompanied by a copy of the sales invoice, if a warranty. Protek T & M reserves the right to repair or replace all such defective products. All repaired or replaced units will be returned transportation charges prepaid. Products subjected to physical or electrical abuse, or if used in an unprescribed manner, are not covered by this warranty. This limited warranty does not apply to batteries or fuses.



Protek Test and Measurement

45 Smith Street
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FAX: 201-760-9888

www.protektest.com

Mouser Electronics

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[TP111](#) [TP115](#)