

Model 9500 Specifications

Specifications (Total Uncertainties for 1 year, T_{cal} ± 5°C. Frequency specifications valid for 5 years)

DC Voltage

Amplitude: ±1mV to ±200V into 1MΩ
±1mV to ±5V into 50Ω
Accuracy: ±(0.025% + 25μV)
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous
Deviation: ±11.2%

Squarewave

Amplitude: 40μV to 200V pk-pk into 1MΩ
40μV to 5V pk-pk into 50Ω
Polarity: Positive, negative or
symmetrical about ground
Accuracy (10Hz to 10kHz):
 <1mV ±(1% + 10μV)
 1mV-21mV ±(0.10% + 20μV)
 21mV-556mV ±(0.10% + 1μV)
 556mV-210V ±(0.05% + 1μV)
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous
Deviation: ±11.2%
Rise/Fall Time: <100V <150ns
≥100V <200ns
Aberrations: <2% peak for first 500ns
Frequency: 10Hz to 100kHz
Accuracy: ±10ppm (±0.25ppm with
Option 100)
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous

Low-Edge Pulse

Amplitude: 5mV to 3V pk-pk into 50Ω
Range: 5mV to 3V pk-pk into 50Ω
Accuracy: ±3%
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous
Deviation: ±11.2%
Rise/Fall Time: 500ps return to ground
Mark/Space Ratio: 1:9
Aberrations: <2% peak for first 10ns
<0.25% peak 10 ns to 1μs
<0.1% peak beyond 1μs
Frequency: 10Hz to 2MHz
Range: 10Hz to 2MHz
Accuracy: ±10ppm (±0.25ppm with
Option 100)
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous

High-Edge Pulse

Amplitude: 1V to 200V pk-pk into 1MΩ
1V to 5V pk-pk into 50Ω
Range: 1V to 200V pk-pk into 1MΩ
1V to 5V pk-pk into 50Ω
Accuracy: ±3%
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous
Deviation: ±11.2%
Rise/Fall Time: <100V <150ns
≥100V <200ns
Mark/Space Ratio: 1:1
Aberrations: <2% peak for first 500ns
<0.1% peak 500ns to 100μs
<0.01% peak beyond 100μs
Frequency: 10Hz to 100kHz
Accuracy: ±10ppm (±0.25ppm with
Option 100)
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous

Fast-Edge

(only available
on Model 9520 and Model 9530 Active Heads)
Amplitude: 5mV to 3V pk-pk into 50Ω
Range: 5mV to 3V pk-pk into 50Ω
Accuracy: ±3%
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous
Deviation: ±11.2%
Rise/Fall Time: 150ps return to ground
Mark/Space Ratio: 1:9
Aberrations: <3% peak for first 1ns
<2% peak 1 ns to 10ns
<0.25% peak 10 ns to 50ns
Frequency: 10Hz to 2MHz
Range: 10Hz to 2MHz
Accuracy: ±10ppm (±0.25ppm with
Option 100)
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous

Timing Markers

Styles: Square/Sine, Pulse or
Narrow Triangle
Square/Sine: Period Square: 10ns to 50s
Period Sine: 9500/400 2.0ns to 10ns
9500/600 1.0ns to 10ns
9500/1100 0.5ns to 10ns
9500/3200 0.5ns to 10ns

Pulse:

Period: 1μs to 50s
Rise/Fall Time: <700ps
Narrow Triangle: Period: 1μs to 50s
Rise/Fall Time: 2.5% of period
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous for period of
all waveshapes
Timing Accuracy: Normal: ±10ppm
With Option 100: ±0.25ppm
Timing Jitter: ≤ 10ps pk-pk
Deviation: ±45% for period
Amplitude: 100mV to 1V pk-pk
Sub-Division: Every 10th marker can be set to
higher amplitude for periods
≥1μs for all waveshapes

Leveled Sine and Dual Sine

Frequency Range: 9500/400 0.1 Hz to 400 MHz
9500/600 0.1 Hz to 600 MHz
9500/1100 0.1 Hz to 1.1 GHz
9500/3200 0.1 Hz to 3.2 GHz
Accuracy: Normal: ±12ppm
With Option 100: ±0.25ppm max for f ≥ 12kHz
±3ppm max for f < 12kHz
Deviation: ±11.2%
Amplitude (Leveled Sine into 50Ω):
0.1Hz - 550MHz 4.44mV to 5.560V pk-pk
550MHz - 2.5GHz 4.44mV to 3.336V pk-pk
2.5GHz - 3.2GHz 4.44mV to 2.224V pk-pk
Accuracy ±1.5% at 50 kHz
Flatness (Leveled Sine relative to 50kHz):
0.1Hz - 100MHz ±1.5%
100MHz - 550MHz ±3%
550MHz - 1.1GHz ±4%
1.1GHz - 3.2GHz ±5%
Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5
or continuous
Sine Purity: 2nd Harmonic <-35dBc
3rd Harmonic <-40dBc
All Other Spurious Signals <-40dBc (typical)

Input Impedance



Resistance Measurement:

Range: 10 Ω - 150 Ω and 50k Ω - 12M Ω

Accuracy:

(Ω) 10 - 40 $\pm 0.5\%$

40 - 90 $\pm 0.1\%$

90 - 150 $\pm 0.5\%$

50k - 800k $\pm 0.5\%$

800k - 1.2M $\pm 0.1\%$

1.2M - 12M $\pm 0.5\%$

Capacitance Measurement:

Range: 1pF to 95pF

Accuracy:

1pF - 35pF 2% \pm 0.25pF

35pF - 95pF 3% \pm 0.25pF

Current



Amplitude:

DC: $\pm 100\mu\text{A}$ to $\pm 100\text{mA}$

Squarewave: 100 μA to 100mA pk-pk

Accuracy: $\pm(0.25\% + 0.5\mu\text{A})$

Frequency: 10Hz to 100kHz

Accuracy: $\pm 10\text{ppm}$ ($\pm 0.25\text{ppm}$ with Option 100)

Ranging: 1, 2, 5 or 1, 2, 2.5, 4, 5 or continuous

Composite Video Output



Amplitude: 1.0V, 0.7V, 0.3V

Pattern: White, Grey or Black

Sync Polarity: Positive or negative

Standards: 625-line 50Hz or 525-line 60Hz

LF Linear Ramp



Waveforms: 1V pk-pk symmetrical triangle

Ramp Time: 1ms to 1s

Overload Pulse



Amplitude: 5V to 20V into 50 Ω

Polarity: Positive or negative

Duration: 0.2s to 100s

Trigger: Manual

Zero Skew



Unadjusted Skew: $\pm 50\text{ps}$ channel to channel

Adjusted Skew: $\pm 5\text{ps}$ channel to channel

Frequency Range: 10Hz to 100MHz

Short/Open Output



Output Leakage:

Open Circuit: $\pm 50\text{pA}$

Short Circuit: $\pm 15\mu\text{V}$

Auxiliary Input



Signal Routing: Rear input to any Active Head

Maximum Input:

Voltage: $\pm 40\text{V}$ pk-pk

Current: $\pm 400\text{mA}$ pk-pk

Trigger

Amplitude: $\geq 1\text{V}$ pk-pk into 50 Ω

Risetime: $< 700\text{ps}$

Rate:

User Selectable: f (up to 120 MHz), f/10 or f/100

Free Run: 100Hz

Reference Frequency Input

Frequency Range: 1MHz to 20MHz in 1MHz steps

Level: 90 mV to 1V pk-pk (typical)

Lock Range: $\pm 50\text{ppm}$

Reference Frequency Output

Frequency: 1MHz or 10MHz

Level:

Into 50 Ω : 1V pk-pk (typical)

Into 1M Ω : 2V pk-pk (typical)

Environment

Temperature:

Operating: 5°C to 40°C

Storage: 0°C to 50°C

Humidity: (non-condensing)

Operating: $< 90\%$ over 5°C to 30°C

$< 75\%$ over 30°C to 40°C

Storage: $< 95\%$ over 0°C to 50°C

Power

Voltage: 95V to 132V rms
or 209V to 264V rms

Frequency: 48Hz to 63Hz

Consumption: 400 VA

Warm-up: 20 minutes

Dimensions

Model 9500 Mainframe:

H x W x D 133 x 427 x 440 mm

(5.24 x 16.8 x 17.3 inches)

Weight: 12 kg approx. (27 lbs approx.)

Module 9510, 9520 or 9530:

H x W x D 65 x 31 x 140 mm

(2.56 x 1.22 x 5.51 inches)

Weight: 0.45 kg approx. (1 lb approx.)

Safety

Designed to UL3111 and EN61010-1-1:1993/A2:1995.

CE Marked

EMC (including options)

Emissions: EN55011:1991

Immunity: EN50082-1:1992

FCC Rules part 15 sub-part J class B

Warranty

Period:

Mainframe 1-year

Active Heads 3-year Active Plus CarePlan

Ordering Information

Model 9500/400 400 MHz High-Performance Oscilloscope Calibration Workstation, complete with Windows™ Automated IEEE-488 Calibration Software, GPIB Interface and Security Key, Inventory Management Software and Scope Procedures. A Certificate of Traceable Calibration and a Trigger Lead are also included. (Note: Requires one 9510 or 9520 Output Module)

Model 9500/600 600 MHz High-Performance Oscilloscope Calibration Workstation (otherwise as above)

Model 9500/1100 1.1 GHz High-Performance Oscilloscope Calibration Workstation (otherwise as above)

Model 9500/3200 3.2 GHz High-Performance Oscilloscope Calibration Workstation (otherwise as above)

Model 9510 1.1 GHz Active Head with 500 ps pulse risetime (3-year *Active Plus CarePlan* warranty)

Model 9520 1.1 GHz Active Head with 150 ps and 500 ps pulse risetime (3-year *Active Plus CarePlan* warranty)

Model 9530 3.2 GHz Active Head with 150 ps and 500 ps pulse risetime (3-year *Active Plus CarePlan* warranty)

Option 5 5-Channel Output (allows any mix of 9510/9520/9530 Heads up to a total of five. Upper frequency limited by Model 9500 mainframe.)

Option 10 Blank 256-Kbyte FLASH PCMCIA card (for procedure mode procedures)

Option 30 Blank 256-Kbyte battery-backed SRAM PCMCIA card (for procedure mode results)

Option 40 PCMCIA Read/Write Module (for desktop or tower PC)

Option 50 Tracker Ball

Option 60 Soft Carrying Case

Option 90 Rack Mounting Kit

Option 100 High-Stability Crystal Reference

Software Option 10 Software Support Program (access to all procedures, software updates and enhancements produced by Wavetek's Software Support Group over a 12-month period.)