WA-1500 / WA-1000 WAVEMETER® Laser Wavelength Meters

- Accuracy of ± 0.2 ppm for WA-1500
- Accuracy of ± 1 ppm for WA-1000
- Built-in wavelength standard for continuous calibration
- Operation from 400 nm to 4 µm
- Displays wavelength, wavenumber or frequency
- Convenient, pre-aligned fiber coupling
- Free space input for IR wavelengths
- Visible tracer beam to facilitate alignment

Proven WAVEMETER® Technology

1500

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The WA-1500 WAVEMETER® Laser Wavelength Meter measures the absolute wavelength of virtually any CW laser to the highest accuracy available, ± 0.2 ppm (± 0.0002 nm at 1000 nm). When the highest accuracy is not required, the WA-1000 is available as a lower cost alternative to provide an absolute wavelength accuracy of ± 1 ppm (± 0.001 nm at 1000 nm).

Proven WAVEMETER® technology

Both the WA-1500 and WA-1000 systems employ Burleigh's proven scanning Michelson interferometer-based WAVEMETER technology to determine the absolute wavelength of a laser by comparing its interference fringe pattern with that of a built-in HeNe laser wavelength standard. Unlike other wavelength meters, all factors that can affect the accuracy of the wavelength measurement are taken into account. For example, in order to measure absolute laser wavelength to the highest accuracy of ± 0.2 ppm, the WA-1500 uses a stabilized single-frequency HeNe laser, with a wavelength known to better than 0.025 ppm, as the internal wavelength standard. In addition, both the WA-1500 and WA-1000 systems utilize internal temperature and pressure sensors to give the necessary data to correct for any dispersion between the wavelengths of the built-in HeNe laser and the laser under test.

Choice of operational wavelength ranges

Three versions of the WA-1500 and WA-1000 WAVEMETER are available for different operational wavelength ranges: visible (VIS: 400-1100 nm), near infrared (NIR: 600-1800 nm), and infrared (IR: 1.5-4 µm). Each version includes a photodetector and a beamsplitter optimized for its operational wavelength range. Conversion from one wavelength range to another is accomplished simply by replacing the photodetector and beamsplitter.

Convenient laser input for easy test set up

These WAVEMETER systems include two standard methods of laser input. A laser beam from an optical fiber enters through a standard FC/PC (FC/APC optional) connector on the front panel. Or, a free space laser beam enters through an aperture on the side of the system. A flip mirror is used to switch from one input method to the other. The fiber-optic input is used primarily for visible and near infrared wavelengths. Burleigh's BC-1 Input Beam Coupler and PC-F-1300 Fiber-Optic Patch Cord can be used if the laser beam is not already launched into a fiber. The free space aperture is necessary for infrared wavelengths when suitable optical fibers are not available.The fiber optic input is pre-aligned at Burleigh for optimum performance. For free space laser input, the internal reference HeNe laser beam is emitted from the input aperture as a weak visible tracer beam to facilitate alignment. The laser under test is simply superimposed on the tracer beam.

Because the intensity of lasers vary, the WA-1500 and WA-1000 include an attenuator to provide a total dynamic range of 100 for the optical input. The attenuation is adjusted automatically, or it can be set manually. The automatic attenuator mode is particularly useful when scanning a tunable laser over its wavelength range, since the intensity of a tunable laser is quite different at the peak and the ends of its tuning curve.

Easy to read display output

These WAVEMETER systems display either the wavelength (nm) or the wavenumber (cm^{-1}), as an air or vacuum value, or the frequency (GHz) of the laser under test. The resolution of the display depends upon the accuracy to which the wavelength is measured. The highest display resolution is achieved when the laser's bandwidth is less than 1 GHz for the WA-1500 and less than 10 GHz for the WA-1000. As the laser's bandwidth increases, the WAVEMETER automatically displays an appropriately reduced resolution. Therefore, only significant digits are displayed using this auto-resolution feature. A fixed resolution mode allows for a fixed display resolution appropriate for a specific application. However, the accuracy of the measurement is still limited by the bandwidth of the laser under test.

These WAVEMETER systems also can also display a deviation in either wavelength, wavenumber or frequency from any setpoint. Or, a running average of any 2 to 50 measurements can be calculated.

Choice of interfaces to enhance system control

An RS-232 interface is standard with these WAVEMETER systems. A GPIB/IEEE-488 interface is optional. Both interfaces are bi-directional, making it possible to read the wavelength information and control the status of the system. In addition, an analog output provides a voltage that is proportional to the deviation from a specified wavelength setpoint. This signal can be used to monitor or control a laser's wavelength relative to the setpoint.

WA-1500 / WA-1000 WAVEMETER Specifications

	WA-1500	WA-1000
Wavelength		
Range		
VIS	400 - 1100 nm	
NIR	600 - 1800 nm	
IR	1.5 - 4 µm	
Absolute Accuracy [1]	± 0.2 ppm ± 0.0002 nm @ 1000 nm ± 0.002 cm^{-1} @ 10,000 cm^{-1} ± 0.06 GHz @ 300,000 GHz	± 1.0 ppm ± 0.001 nm @ 1000 nm ±0.01 cm^{-1} @ 10,000 cm^{-1} ± 0.3 GHz @ 300,000 GHz
Display Resolution	0.0001 nm 0.001 cm^{-1} 0.01 GHz	0.001 nm 0.01 cm^{-1} 0.1 GHz
Units	nm or cm^{-1}(vacuum or air), GHz	
Optical Input Signal		
Sensitivity	20 µW (VIS, NIR) 1 mW (IR)	
Maximum Input	2 mW (VIS, NIR) 100 mW (IR)	
Measurement Update		
Rate	1 Hz	4 Hz
Inputs/Outputs		
Optical Input		
Fiber	FC/PC connector standard, FC/APC connector optional	
Free Space Beam	2 mm aperture standard	
Instrument Interface	RS-232 standard GPIB/IEEE-488 optional	
Analog Output	± 5 volts proportional to wavelength deviation	
Monitor Output	Analog signal of interference fringes and measurement timing signals	
Warm-up		
Nominal Time	7 minutes	N/A
Dimensions and Weight		
Dimensions (WxHxD)	15.3" x 8.0" x 11.5" (389 mm x 203 mm x 292 mm)	
Weight	25 lbs (11.3 kg)	
Power Requirements		
Voltage and Frequency	90 to 270 VAC, 50/60 Hz	

1. WA-1500 accuracy of ± 0.2 ppm is achieved when laser spectral bandwidth is less than 1 GHz (FWHM). WA-1000 accuracy of ± 1.0 ppm achieved when laser spectral bandwidth is less than 10 GHz (FWHM). When spectral bandwidth is greater, the wavelength measurement is displayed with the reduced accuracy listed in the following table.

Laser Bandwidth ($\Delta\nu$)	*Accuracy*	*Display Resolution*
$\Delta\nu \leq 1$ GHz	*± 0.2 ppm*	*0.0001 nm*
1 GHz < $\Delta\nu \leq 10$ GHz	*± 1 ppm*	*0.001 nm*
10 GHz < $\Delta\nu \leq 100$ GHz	*± 10 ppm*	*0.01 nm*
100 GHz < $\Delta\nu \leq 1$ THz	*± 100 ppm*	*0.1 nm*

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