



Fundamentals of Water Velocity Measurement

Directional Wave and Tide Measurements using the MAVS-3WTG and MWAVES Software

Introduction

Directing marine operations in harbors and coastal waters requires real-time knowledge of the directional wave spectrum and other statistical characteristics of the wave and current velocity field. Real-time and historical wave and tide statistics are also important for coastal engineering projects and for the investigation of coastal processes such as the erosion and deposition of sediments. Williams (NOBSKA) and Terray (WHOI) have shown that these properties can be calculated from integrated MAVS time-series measurements of velocity and pressure. However, the calculation is non-trivial, both numerically and for practical reasons, and



MAVS-3WTG Directional Wave and Tide Gauge

care is required in the design of the algorithms. Realistically, that kernel of processing routines also requires a simple operator interface and the presentation of results must be both quantitative and easily interpreted. Marine operations personnel, in particular, must be able to make their decisions in real-time. Nobska has developed MWAVES directional wave spectra software to address these needs.

Specifications:

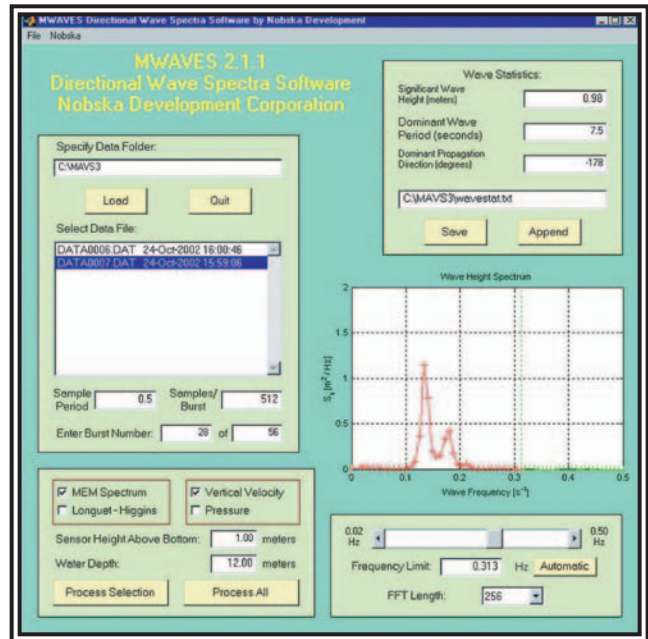
Parameter	Accuracy	Resolution	Range
Speed	0.3cm/sec	0.03 cm/sec	200
Direction	+/- 2 deg	0.1 deg	360
Temperature	0.1 deg	0.03 deg	-5 to 45
Pressure	0.1% FS 0.04% FS	0.024% FS 0.024% FS	User-defined User-defined
Tilt	2 deg	0.1 deg	20

Optional Logging Memory: 512 Mbyte maximum

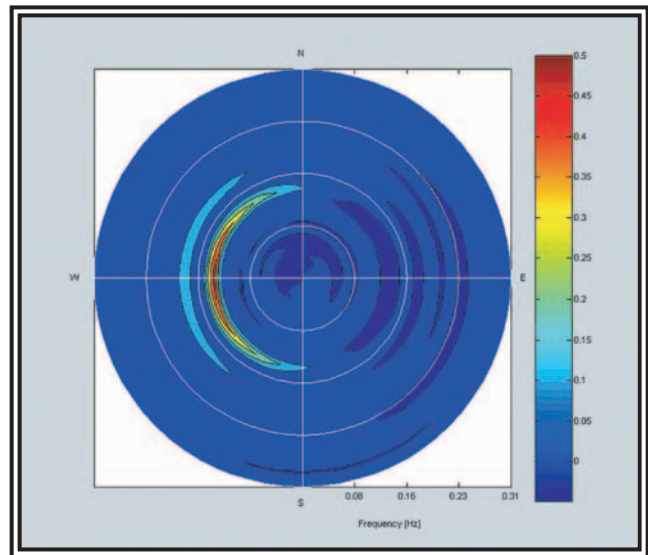
Direct Reading: RS-232 or RS-485

Power: 10-15 Volts DC

Optional sensors available upon request



MWAVES Control Panel and Wave Height Spectrum



Polar Presentation of Directional Wave Spectrum

Data for plots courtesy of NWRI/CCIW Canada in Lake Ontario, 2002

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SPECIFICATIONS:

<u>Parameter</u>	<u>Accuracy</u>	<u>Resolution</u>	<u>Range</u>
Speed	0.3 cm/sec	0.03 cm/sec	200 cm/sec (optional ranges available)
Direction	+/- 2 deg	1 deg	360 deg
Temperature	0.1 deg C	0.03 deg C	-5 to 45 deg C
Conductivity	0.2 mS/cm	0.02 mS/cm	0 to 75 mS/cm
Pressure	0.5% F.S. 0.04% optional 0.08% optional	0.024% F.S.	15, 30, 60, 450, 3,000, 7,500 & 10,000 PSI
Tilt	2 deg	0.1 deg	20 deg, 45 degree optional

Drift: 0.15 cm/sec per month

Measurement Technique: Differential travel time, 3 axis

Acoustic Paths: 4 measured, 4 used

Power:

Internal Recording: 13.5 VDC, 18 AA Alkaline batteries, @ 4.8 Ah, optional lithium thionyl chloride 14.4 VDC @ 8.8 Ah

Direct Reading: External 12-15 VDC

Current Drain: 23 ma. Measuring
0.6 ma. Sleep Mode

Internal Recording Memory: 16, 32, 48, 64, 96, 128, 160, 192, 256, 300, 512 Mbyte compact flash card

Memory Usage: Dependent on sampling method and size of memory installed

Communications: TTL, RS-232 or RS-485 @ 38,400 baud maximum 115.2 K baud

Depth: 2,000 m. or 6,000 m.

Dimensions:

Cylinder Diameter: 3.25 in.

Overall Length: 25 in.

Weight:

Water: 2.6 lbs.

Air: 5 lbs.

Mooring Frame: 2000 lbs. Optional 10,000 lbs. available

Sampling Rates: 10 Hz in Earth Coordinates (resolved to V_e , V_n , V_{up}) or
15 Hz in instrument coordinates
25 Hz Raw Data, No Compass, No Options

Sea Cable: RS-485 or RS-232 4 wire (inquire for other communication protocols)

Data Record Size: Standard Instrument: 32 bytes per record for Day, Hour, Min, Sec, T, Tilt, V_e , V_n , V_u
Recorded as Binary and transmitted as ASCII Comma separated variables with CR LF

Operating Modes: Vector Averaging
Burst Mode (programmed for timed sampling)
Externally Triggered Sample
Continuous Sampling

Software: MAVSOFT Windows95, Windows98, Windows XP/NT user interface
Terminal Emulator: Hyperterminal, Crosscut or Tattleterm
Optional Graphical Software available upon request