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**MICROSYSTEMS**

# Tech Spec Document

## TWG-12

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## Table of Contents

- 1.0 Company Profile & Capabilities ..... 1
- 2.0 Overview ..... 1
- 3.0 Detailed Description ..... 2
  - 3.1 Electronics ..... 2
  - 3.2 Sensors Specifications ..... 2
  - 3.3 Power ..... 3
  - 3.5 Software..... 3
  - 3.6 Mechanicals ..... 4
  - 3.7 Additional Specifications..... 4

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## 1.0 Company Profile & Capabilities

Applied Microsystems is a Canadian owned and operated corporation specializing in the manufacture of in-situ and real-time detection and measurement systems for water. The company offers an extensive line of high performance off-the-shelf instruments and has considerable experience in custom electronics design.

Located in the Ocean Technology cluster in Sidney B.C., on Canada's Pacific coast, Applied Microsystems has an impressive history of innovation. Key facts include:

- Founded in 1974 to manufacture oceanographic instruments;
- Invented the first time-of-flight direct measurement of the speed of sound in water in 1994;
- Current market leader in ocean-going sound velocity instruments; and
- Brought to market the first underwater mass spectrometer in 2001.

We are successful because we understand that our customers buy more than simple sensors; they buy the ability to reliably obtain accurate underwater data. We win business by providing unparalleled in-water measurement capabilities. We keep customers happy by supporting our technologies with knowledge, expertise and excellence in customer service.

Applied Microsystems has four specific areas of expertise. They are: 1) Sound velocity; and 2) Instrument design for harsh environments; 3) Underwater mass spectroscopy; and 4) Integration and customization.

## 2.0 Overview

The TWG-12 is a solid state Tide & Wave Gauge incorporating microprocessor based CMOS circuitry with a precision thermistor and a high resolution, high accuracy Paroscientific Digiquartz® pressure transducer for the measurement and recording of tide and wave data. The TWG-12 features an internal 2 Mbytes (expandable to 40Mb) data storage capacity, 9 alkaline D-cell batteries, programmable sample/burst rates and an Acetyl homopolymer plastic (Delrin®) housing providing the capability of in-situ deployments in excess of six months.

The TWG-12 communication protocol is standard ASCII RS-232C permitting data transfer via 3-conductor cable with the baud rate automatically determined to a maximum of 19,200 baud. The data output may be configured to display either unprocessed integers (RAW), or computed engineering values of time, temperature, tide data, wave burst data and battery status.

The TWG-12 is supplied with a comprehensive menu driven software package which provides interaction between the instrument and an IBM-PC or compatible for the purpose of instrument setup, deployment programming, data transfer, editing, graphing and printing of the logged data. Deployment programming options include; logged and/or real time data sampling, user programmable sampling rates and user programmable burst rates with variable duration.

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Several options and configurations are available to maximize the measurement capabilities of the TWG-12. In addition to conductivity, temperature and power options, is the current sensor which provides directional information for the tide and wave data.

## 3.0 Detailed Description

### 3.1 Electronics

The TWG-12 electronics is comprised of two printed circuit boards, a sensor interface and a signal processor.

The sensor interface board contains the necessary electronics required to interface the pressure transducer, temperature sensor, battery level and the PCMCIA flash memory card.

The digital board is comprised of a Hitachi 64180 microprocessor at a clock speed of 6 MHz, a 4 1/2 digit ratiometric A/D converter with a resolution of 1 in 40,000, a CMOS real time clock, 128K of battery backed RAM and 64K of EPROM. The optically isolated RS-232C communications circuitry and associated power supplies are also located on the signal processor board.

### 3.2 Sensors Specifications

#### Pressure:

Type:	Paroscientific Digiquartz® quartz crystal.
Range:	Available ranges are: 0 - 30, 45, 100, 200, 300 and 400 PSIA full scale range.
Accuracy:	0.01% Full Scale
Repeatability:	0.005% Full Scale
Hysteresis:	0.005% Full Scale
Tide Resolution:	0.000635% Full Scale at 1 minute integration 0.000317% Full Scale at 15 minute integration
Wave Resolution:	0.00127% Full Scale at 0.25 second integration 0.000317% Full Scale at 1 second integration

#### Temperature:

Type:	Pressure protected precision aged thermistor.
Range:	-2°C to 32°C.
Accuracy:	0.01°C
Resolution:	0.001°C

### 3.3 Power

The TWG-12 has a deep sleep current consumption of less than 40  $\mu$ A and a sampling current consumption of 40 mA. The unit can be operated from internal batteries or optionally configured to accept 12 VDC external power.

The standard internal battery configuration is 9 x "D" cell alkaline batteries.

Battery options include:

	<u>Capacity</u>
9 x "D" cell Alkaline (standard)	10 AHr
9 x "D" cell Rechargeable Ni-Cad	4 AHr
3 x "D" cell Lithium	14 AHr
6 x "D" cell Lithium	28 AHr

### 3.5 Software

The software package supplied with the TWG-12 takes the mystery out of programming the instrument. All software functions, from setting the sampling parameters, to retrieving the data from the TWG-12, are handled in a user-friendly, easy-to-understand menu driven fashion.

The software package can be broken down into three distinct programs. The first being the DOS interface which allows an IBM personal computer or compatible to communicate directly with the instrument and appears as another disc drive. Data files can be transferred, deleted or renamed using standard MS-DOS commands, any third party file management utilities or the TWG-SOFT system software program.

The second software package is SmartTalk, which is a comprehensive Microsoft Windows 95™ based program that allows the user to communicate to an AML instrument through the computer's serial port. The user can identify the instrumentation, select and modify the instrument's configuration file, view data from the instrument, set the logging parameters and transfer data to the computer's hard drive.

The third program, is the ISS (Integrated Systems Software) program which facilitates the viewing, editing, printing and graphing of your data. It consists of the following features:

- 1) Allows for viewing, editing, printing or graphing of the logged data.
- 2) Configuration of instrument for a cast.
- 3) Real time viewing and capturing of data.
- 4) Capturing of data can be selective or total.
- 5) File management utility for copying, deleting or renaming of files.
- 6) Viewing and altering of coefficients.
- 7) Frequency & time series analysis and statistics reporting.
- 8) Exportable ASCII files to Lotus 123 or other database software.
- 9) Completely menu driven with full mouse support.

The minimum system requirements are;

- 1) IBM 286 compatible computer
- 2) 640K of system memory
- 3) MS-DOS Version 3.3 or greater
- 4) One free serial port for communications with the instrument

### 3.6 Mechanicals

The pressure housing and end caps are made of an Acetyl homopolymer plastic commonly known as Delrin® with a maximum depth rating of 600 meters. The diameter is 100 mm (3.95") with an overall length of 610 mm (24.0"). The weight in air is 6.0 Kg (13.2 lb.) and in water is 3.9 Kg (8.6 lb.).

### 3.7 Additional Specifications

Memory:	2 Mbytes PCMCIA flash memory card expandable to 40 MB. The standard 2 MB RAM can record 150,000 data scans of the 5 data channels (time, temperature, water level, wave burst data and battery status).
Time Code:	Real time clock.
Output:	RS-232C 300 to 19200 baud, ASCII, 8 data bits, no parity, 1 stop bit. The baud rate is automatically determined and selected.
Sample frequency:	Programmable from 1 sample per minute to 1 sample every 24 hours. Each sample includes a measurement of time, temperature, tide data, wave burst data and battery voltage status.
Tide Integration:	Programmable from 1 minute to 15 minutes.
Wave Burst Duration:	Programmable from 30 seconds to 1 hour in length.
Wave integration:	Programmable from 0.25 seconds to 2 seconds.

(Example: The instrument can be programmed for a 10 minute tide measurement integration, a 2 minute wave data burst duration with a 0.5 second integration at a sample frequency of every 20 minutes.)



## DISCLAIMER

AML reserves the right to make any changes in design or specifications at any time without incurring any obligation to modify previously delivered instruments. Manuals are produced for information and reference purposes and are subject to change without notice.