

DRM™ 4000

Dead Reckoning Module



The Dead Reckoning Module (DRM™) 4000 is a miniature, electronic device for personnel on foot that provides the user's position relative to an initialization point. Dead Reckoning (DR) data and external GPS NMEA data are blended by an internal Kalman filter. When GPS data is available the dead reckoning sensors are automatically calibrated continuously and the two data sources are blended into a composite real-time position data output. When GPS data is unavailable, dead reckoning takes over. DRM™4000 position error characteristics are independent of time, and depend primarily on distance traveled.



Patented motion classification algorithms (SmartPedometry™) analyze walking motion, and compensate when the user is running, or just "fidgeting" in place. An automatic compass orientation algorithm provides accurate azimuth information when the user is upright or prone. Commercially available gyros are included to compensate for transient magnetic disturbances and transient accelerations that may interfere with compass operation. A barometric altimeter provides vertical position accurate enough to discriminate between floors of a building (1.5 meter accuracy). High fidelity azimuth data from the magnetic compass is also available for use by the host system.

The DRM™4000 unit can be directly interfaced to many GPS receivers and man-pack computers, and includes capabilities for accurate field calibration. The DRM™4000 is a reliable GPS supplement for personnel on foot. The unit is small enough to be easily integrated into torso-mounted devices, and does not require any sensors on the legs or feet. Applications for the DRM™4000 include personnel tracking (fire, police, and security), real-time waypoint navigation, disaster relief operations, and cell phone signal strength mapping.

FEATURES & BENEFITS

- ▶ State-of-the-art dead reckoning device for personnel navigation.
- ▶ Continuous, gap-free, personnel position location, with or without GPS. Typical DR accuracy 2% distance traveled.
- ▶ Internal Kalman filter integrates dead reckoning position with external GPS, using NMEA0183 format
- ▶ Digital compass azimuth accuracy better than 1°
- ▶ Low power consumption (<0.5 watt) and small size (2 x 2 x 0.5 inches) for man-portable applications
- ▶ Built-in World Magnetic Model for accurate true direction anywhere (automatic declination)
- ▶ Motion classification and adaptive algorithms maximize accuracy under difficult conditions
- ▶ Sensors include 3 commercial grade gyros, 3 accelerometers, 3 magnetometers, and barometric altimeter
- ▶ Industrial temperature range (-40° to +85°C) for wide environment usage
- ▶ Available as a circuit card module with RS232 interface for customer integration. A demonstration kit is also available which includes an enclosure with an internal I/O adapter board with a USB interface, GPS receiver, rechargeable lithium battery, Windows™ Host software, carrying case, GPS antenna, baseball cap and 6-foot USB adapter cable. The mini-USB jack accommodates 38.4kbps data transfer as well as trickle charging the battery when required. An illuminated power on/off doubles as a momentary "event" marker button to help in data collection processing.

DRM4000

SPECIFICATIONS

Characteristics	Conditions	Min	Typical	Max	Units
-----------------	------------	-----	---------	-----	-------

Position

Horizontal Accuracy	Percent of Distance Traveled		2.0		%
Compass Azimuth Accuracy	Compass Factory Calibrated		1.0		deg
Compass Azimuth Resolution			0.1		deg
Vertical Accuracy			1.5		meters

Physical

Dimensions	PCB Assembly Only		2.0 x 2.0 x 0.5		inches
Weight	PCB Assembly Only		0.8 25		ounces grams
Mechanical Shock	PCB Assembly Only, 0.5 msec sine		>500		g's

Input Power

Voltage Range	Applied to J1, Pins 1 and 4	2.8	3.3	5.2	Volts DC
Current Range	Battery Voltage = 3.3 volts No GPS Power Supplied		TBD (Add a number)		mA

Digital Interface

Serial Data	RS-232C on J1 Pins 2 (RXD) and 3 (TXD)	9600	19200	38400	Baud
Update Rate			4		Hz
Connector	10-pin Samtech, SFSD				-
GPS RXD	NMEA0183 Data from GPS at CMOS Logic Levels, (J1, Pin 7)		9600		Baud

Environment

Temperature	Operating Storage (OEM Only)	-40 -55	- -	+85 +125	°C
-------------	---------------------------------	------------	--------	-------------	----

DRM4000

CONFIGURATION

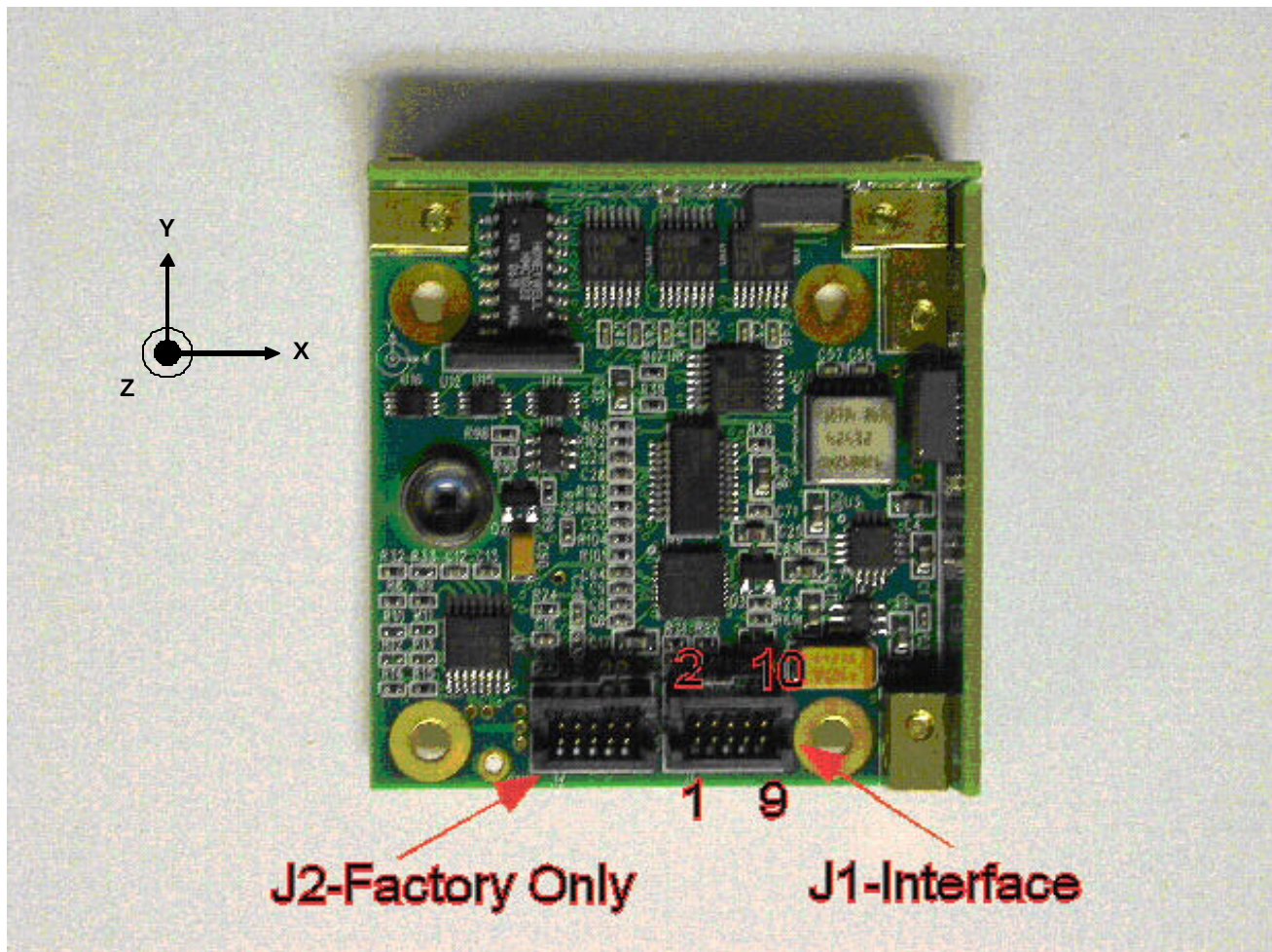
Configuration information is stored internally in the microprocessor's flash memory. There are a finite number of write cycles to the flash. The limit will not normally be reached if changes are made manually. Care should be taken if the writing is made automatically.

Default board orientation is +Y axis up and +Z axis forward. The axes are printed on the module circuit board. This orientation puts the module flat against the torso.

Default baud rate is 19200.

A factory backup configuration is stored in the module. If an error is generated in the normal configuration, the backup configuration can be read and saved.

Hardware jumpers allow for some interface flexibility. Either CMOS or RS232 logic levels are possible on the port pins; with RS-232 for the host computer interface, and CMOS logic for the GPS NMEA0183 data input interface.



DRM4000

CONNECTIONS

Use the Samtec Tiger Eye Assembly SFSD series connector to interface to the J1 connector on the module.

Interface Pin-Out Definition

J1 DRM4000	Signal Definition	Comment
1	BAT+	2.8 to 5.5 Volts
2	HOST_RXD	from Host to DRM
3	HOST_TXD	to Host
4	GND	Power and Data
5	1PULSEPERSEC	not used
6	ODOMETER	not used
7	EGPS_RXD	from GPS to DRM
8	EGPS_TXD	to GPS
9	EVENT	not used
10	+3.3V, 50mA	External GPS power/control

ORDERING INFORMATION

Ordering Number	Output	Product
DRM4000-N00-232	RS 232	Dead Reckoning Module
DRM4000-N00-USB-demo	USB	Dead Reckoning Module Development Kit *

* The Development Kit includes an enclosure with an internal I/O adapter board with a USB interface, GPS receiver, rechargeable lithium battery, Windows™ Host software, carrying case, GPS antenna, baseball cap and 6-foot USB adapter cable. The mini-USB jack accommodates 38.4kbps data transfer as well as trickle charging the battery when required. An illuminated power on/off doubles as a momentary "event" marker button to help in data collection processing.

FIND OUT MORE

For more information on Honeywell's Magnetic Sensors, Compassing, Magnetometry and Dead Reckoning visit us online at www.honeywell.com/magneticsensors or contact us at 800-323-8295 (763-954-2474 internationally).

U.S. patents 5583776, 6813582, 6842991 & other patents pending. DRM and SmartPedometry are trademarks of Honeywell. Honeywell reserves the right to make changes to any products or technology herein to improve reliability, function or design. Honeywell does not assume any liability arising out of the application or use of any product; neither does it convey any license under its patent rights nor the rights of others.