DRM™4000L
Dead Reckoning Module

Honeywell

The Dead Reckoning Module (DRM™) 4000L 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™4000L 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. 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, pitch and roll data from the magnetic compass is also available for use by the host system.

The DRM™4000L unit can be directly interfaced to many GPS receivers and man-pack computers, and includes capabilities for accurate field calibration. The DRM™4000L 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™4000L 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. DR accuracy up to 2% of 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 (approx 2 x 2 x 0.4 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, temperature, and barometric altimeter

▸ Industrial temperature range (-40° to +85°C) for wide environment usage

▸ Available as a circuit card module with RS232 interface or a demonstration kit with a USB interface.

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SPECIFICATIONS

| Characteristics	Conditions	Min	Typical	Max	Units
Position					
Horizontal Accuracy	Error as Percent of Distance Traveled in Ideal Terrain		2.0		%
Compass Azimuth Accuracy	Compass Factory Calibrated		1.0		deg
Compass Azimuth Resolution			0.1		deg
Vertical Accuracy	Pressure Altimeter		1.5		meters
Physical					
Dimensions	PCB Assembly Only		1.83 x 1.9 x 0.4		inches
Mounting Holes	Four Holes (#4 Hardware Recommended)		0.112		inches
Weight	PCB Assembly Only		0.8 25		ounces grams
Mechancial 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 Reciever Power Supplied		75		mA
Digital Interface					
Serial Data	RS-232C on J1 Pins 2 (RXD) and 3 (TXD)	9600	19200	38400	Baud
Update Rate			4		Hz
J1 Connector	Samtech TFM-105-02-S-D-LC Pinned Socket				-
GPS RXD	NMEA0183 Data from GPS (J1, Pin 7)	4800	9600	38400	Baud
Environment					
Temperature	Operating Storage (OEM Only)	-40 -55	- -	+85 +125	°C

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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 performed automatically.

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

The default RS-232 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.

The DRM4000L is stocked and ships in a standard configuration for RS-232 data inputs and outputs. The GPS NMEA0183 data input interface will be maintained from DRM input to the output plus the DRM unique commands and responses.
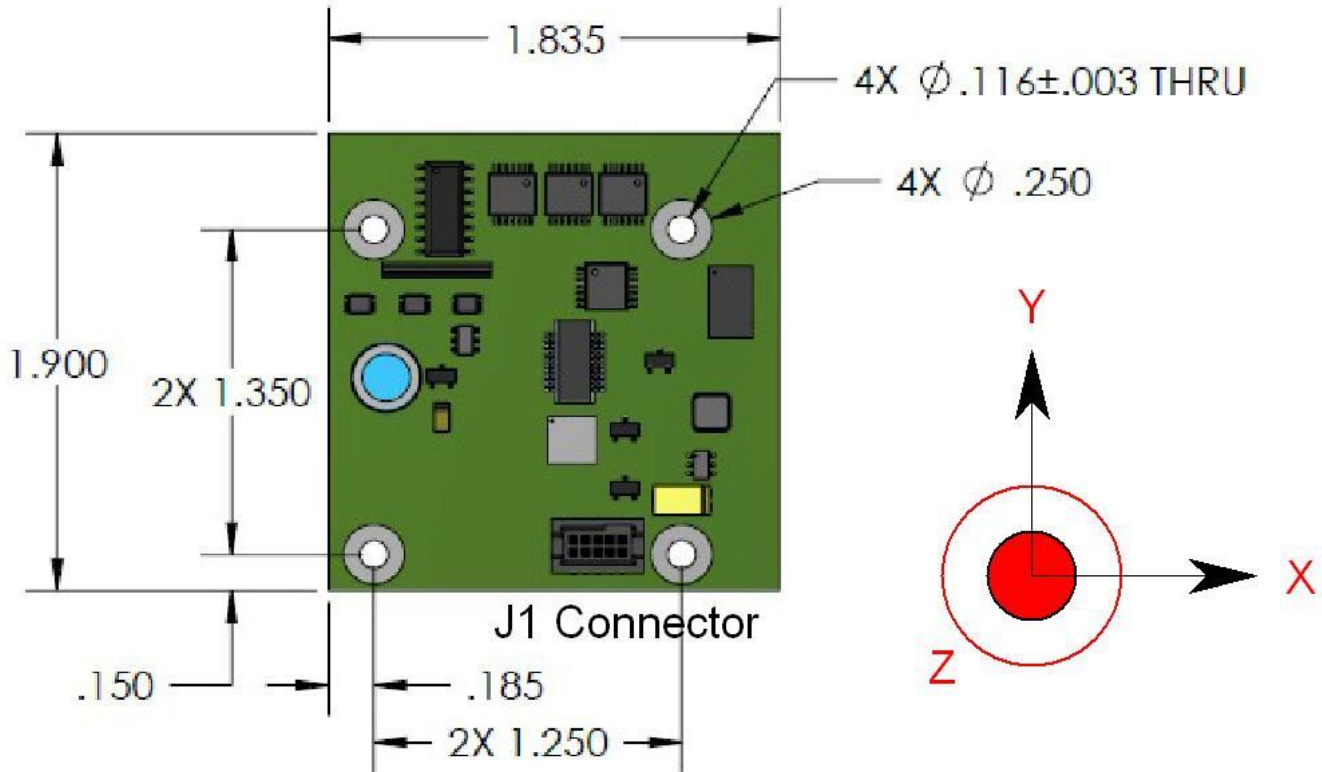
DRM4000L Basic Dimensions

DRM4000L

CONNECTIONS

The DRM4000L has a Samtec TFM-105-02-S-D-LC connector on the circuit board for the J1 electrical interface. Possible mating connectors would be the Samtec SFSD-05- for wired assemblies and the SFM-105- for mating circuit boards. The table below shows the interface pin-out definition for J1.

J1 Interface Pin-Out Definition

J1 Pin	Signal Definition	Comment
1	BAT+	+2.8 to +5.5 Volts from Battery
2	HOST_RXD	Data from Host Computer to DRM
3	HOST_TXD	Data to Host Computer from DRM
4	GND	Power and Data Return
5	1PULSEPERSEC	not used
6	ODOMETER	not used
7	EGPS RXD	Data from GPS receiver to DRM
8	EGPS TXD	Data to GPS receiver from DRM
9	EVENT	Optional Event Marker Input
10	+3.3V, 50mA max	To external GPS receiver power input

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DEVELOPMENT KIT

The DRM4000L Development Kit includes a plastic enclosure with an internal I/O adapter board with a USB interface, GPS receiver, and a rechargeable lithium battery, Also included are the Windows™ DRM4000L Host Software, DRM4000L User's Guide, carrying case, GPS antenna, baseball cap with Velcro antenna mount and a USB patch cable. It is highly recommended that first time users procure the development kit first, before ordering additional DRM4000L OEM modules.

The mini-B USB jack on the DRM4000L kit enclosure accommodates data transfer upto 38.4kbps as well as trickle charging the battery when required. The pushbutton power on/off switch doubles as a momentary "event" marker button to help in data collection processing.

ORDERING INFORMATION

Ordering Number	Data Interface	Product
DRM4000L-N00-232	RS-232	Dead Reckoning Module
DRM4000L-N00-USB-DEMO	USB	Dead Reckoning Module Development Kit

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).