Digital Compass Module

HMR3000

*E*lectronic compass module that provides heading, pitch and roll output for navigation and guidance systems. Honeywell's solid state magnetoresistive sensors make this strapdown compass both rugged and reliable. This compass provides fast response time up to 20 Hertz and high heading accuracy of 0.5° with 0.1° resolution.
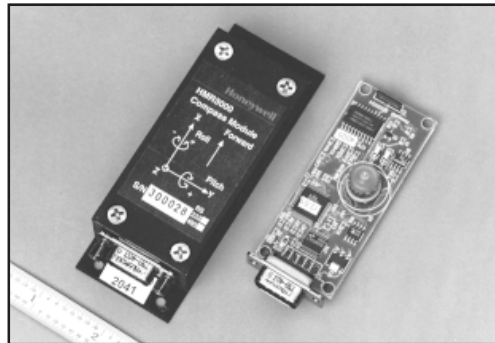
APPLICATIONS

- Oceanographic
  – Marine Compassing
  – Positioning of Buoys, Underwater Structures

- Drilling
  – Down Hole and Directional

- Attitude Reference

- Heading
  – Navigation of Unmanned Vehicles
  – Avionic Compassing

- Integration with GPS
  – Dead Reckoning

- Satellite Antenna Positioning

- Laser Range Finders
  – Surveying Applications

FEATURES AND BENEFITS

Fast Response Time	Built with solid state magnetic sensors and no moving parts improves response time, allowing faster updates compared to gimballed fluxgates.
Small Size	Available as a circuit board 1.2 x 2.95 inches, weighing less than one ounce, or in an aluminum enclosure.
Low Power	Operates with less than 35 mA, allowing for long operation with a battery.
High Accuracy	Accuracy better than 0.5° with 0.1° resolution for critical positioning applications.
Wide Tilt Range	Tilt range of ±40° for both the roll and pitch allows operation for most applications.
Hard Iron Compensation	Calibration routines to compensate for distortion due to nearby ferrous objects and stray fields, such as vehicles.
User Configurable Features	User settings of baud rate, update rate, output format, units, filter settings, deviation angles, alarms and warnings are stored internally in non-volitile memory.

INTERFACE SIGNAL DESCRIPTIONS

Communication

HMR3000 communicates with an external host via RS-232 or RS-485 electrical standard through simple ASCII character strings. ASCII characters are transmitted and received using 1 Start bit, 8 Data bits, (LSB first, MSB always 0), no parity, and 1 Stop bit. Baud rate is user configurable to 1200, 2400, 4800, 9600, 19,200 or 38,400. HMR3000 responds to all valid inputs received with correct checksum value.

Compass Output

HMR3000 can output three NMEA standard sentences, (HDG, HDT and XDR), three proprietary sentences (HPR, RCD and CCD), and an ASCII heading output for a digital display. HDG, HDT and HPR are the most commonly used sentences; the formats are given below.

$HCHDG, Heading, Deviation, Variation
        $HCHDG,85.5,0.0,E,0.0,E*77
$HCHDT, Heading, True
        $HCHDT,271.1,T*2C
$PTNTHPR, Heading, Pitch and Roll
        $PTNTHPR, Heading,Heading Status,Pitch,Pitch Status,Roll,Roll Status*hh<cr><lf>
        $PTNTHPR,85.9,N,-0.9,N,0.8,N*2C

The table shows pin assignments for the 9-pin D-shell connector. Power input can be either regulated 5V dc or unregulated 6V to 15V. Only one of the two power pins (9 or 8) should be connected in a given installation.

Name	In/Out	Pin	Description	Typ	Min (1)	Max (1)	Units
TxD / B	Out	2	RS-232 transmit out / RS-485	—	-18	18	V dc
RxD / A	In	3	RS-232 receive in / RS-485	—	-18	18	V dc
GND	In	5	Power and signal common	—			
6-15V	In	9	Unregulated power input	6 – 15	0	30	V dc
5V	In	8	Regulated power input	5 ± 5%	0	7.5	V dc
Oper / Calib (2)	In	1	Operate / Calibrate (3) input (open = Operate)	0 – 5	-20	20	V dc
Run / Stop (2)	In	6	Run / Stop (3) input (open = Run)	0 – 5	-20	20	V dc
Ready / Sleep (2)	In	4	Ready / Sleep (3) input (open = Ready)	0 – 5	-20	20	V dc
Cont / Reset (2)	In	7	Continue / Reset (3) input (open = Continue)	0 – 5	-20	14	V dc

(1) Absolute maximum ratings.
(2) Sink current requirement; 200 (Typ) 400 (Max) μA.
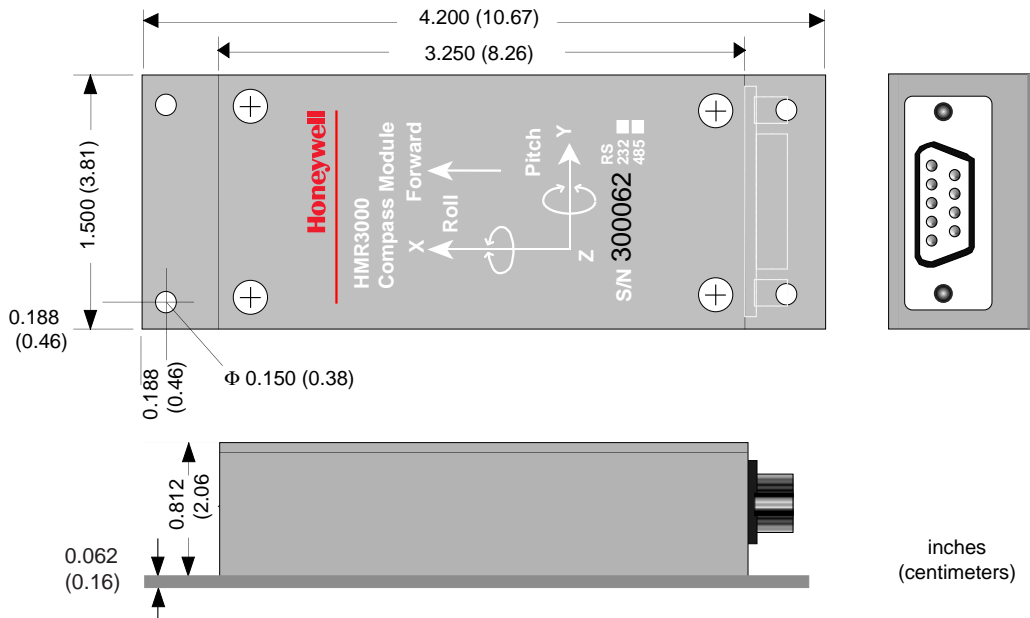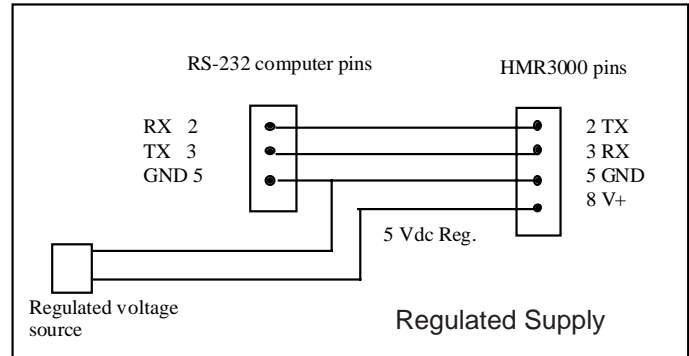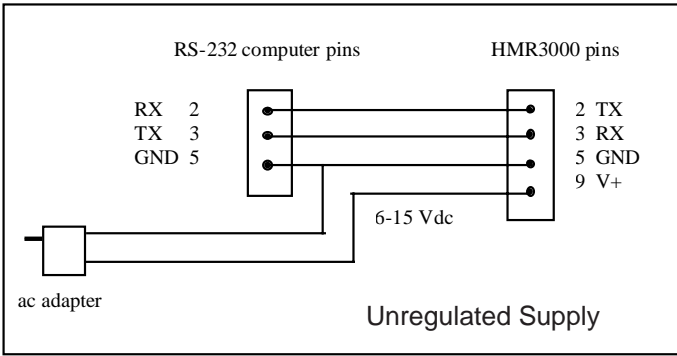(3) Open input = high logic state.

SPECIFICATIONS

	Parameter	Value	Comments
Heading			
	Accuracy (1)	< 0.5° RMS (2) < 1.5° RMS	Dip < 50° , Tilt <20° * Dip < 75° , Tilt <20° *
	Repeatability (3) (4)	± 0.3°	
	Resolution	0.1°	
	Units	degrees / mils	User selectable
Pitch and Roll			
	Range	± 40°	
	Accuracy	± 0.4° ± 0.6°	Tilt < 20° Tilt $\geq$ 20° *
	Repeatability (3) (4)	± 0.2°	
	Resolution	0.1°	
	Units	degree/ mils	User selectable
Magnetic Field (3)			
	Dynamic Range	± 1.0 Gauss max	± 0.5 Gauss range
	Resolution	1 mGauss	
Electrical (4)			
	Supply Voltage	5.0 Vdc regulated 6 - 15 Vdc unregulated	
	Power	35 mA @ 6 Vdc 13 mA 2.0 mA	Normal operation STOP Mode SLEEP Mode
Interface			
	Serial	RS-232 RS-485	Half Duplex
	Baud Rate	1200 to 38400 bps	
	Standard	NMEA 0183	
	Update Modes	Continuous Strobed	1/min to 20 Hz per sentence selectable averaging
Physical (4)			
	Weight	0.75 oz (22 g) 3.25 oz (92 g)	Circuit card only Housed
	Dimensions	1.2 x 2.95 x 0.760 1.5 x 4.2 x 0.88	Circuit card Housed compass
Environment (5)			
	Operating Temp	-20 to 70° C	
	Storage Temperature	-35 to 100° C	
	Shock	30 inch drop	MIL-STD-810E; TM 516.4
	Vibration	20 - 2000 Hz Random 2 hrs/axis	MIL-STD-810E; TM 514.4
Manufacturing			
	PCB	IPC 6012	
	Assembly	IPC 610	Class II or better

1. Heading accuracy assumes the Earth's magnetic field is only disturbed by hard iron fields, and has been compensated through calibration.
2. Calculated values.
3. Guaranteed by characterization or design.
4. Typical
5. Meet or exceed.
 * Device orientation not to exceed 75° during operation or storage—may cause temporary loss of accuracy.
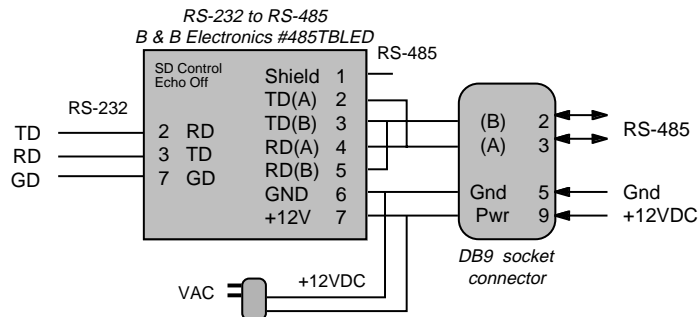
SPECIFICATIONS

HMR3000 CONNECTION DIAGRAM—COMPUTER RS232 TO HMR3000

RS-232 computer pins   HMR3000 pins

RX 2
TX 3
GND 5

2 TX
3 RX
5 GND
9 V+

6-15 Vdc

ac adapter

Unregulated Supply

RS-232 computer pins   HMR3000 pins

RX 2
TX 3
GND 5

2 TX
3 RX
5 GND
8 V+

5 Vdc Reg.

Regulated voltage source

Regulated Supply

4.200 (10.67)

3.250 (8.26)

1.500 (3.81)

0.188 (0.46)

0.188 (0.46)

Φ 0.150 (0.38)

0.812 (2.06)

0.062 (0.16)

Honeywell

HMR3000 Compass Module

Forward · Pitch · Y · Roll · X · Z

RS 232 / 485

S/N 300062

inches (centimeters)

ORDERING INFORMATION

RS-232 to RS-485
B & B Electronics #485TBLED

SD Control
Echo Off

RS-232

TD
RD
GD

2 RD
3 TD
7 GD

Shield 1
TD(A) 2
TD(B) 3
RD(A) 4
RD(B) 5
GND 6
+12V 7

RS-485

(B) 2
(A) 3

Gnd 5
Pwr 9

RS-485

Gnd
+12VDC

VAC

+12VDC

DB9 socket connector

Type	Output	Enclosure
HMR3000-Demo-232*	RS232	
HMR3000-D00-232	RS232	None
HMR3000-D21-232	RS232	Extended Base
HMR3000-D00-485	RS485	None
HMR3000-D21-485	RS485	Extended Base

*Development Kit includes one module in aluminum enclosure, cabling with power supply, demonstration software for PC running Windows™ and User's Manual.

Honeywell