

# $\mu$ POINT<sup>®</sup> Gyro-Stabilized Compass Module HMR3601

The HMR3601  $\mu$ POINT<sup>®</sup> compass module is a 3-axis digital compass solution with a unique gyro stabilization to reduce effects of magnetic disturbances. Three magneto-resistive sensors, three MEMs accelerometers and a MEMS yaw rate gyro are combined to provide compass heading as well as pitch and roll angles.

The HMR3601 has provisions for hard and soft-iron correction algorithms to handle magnetic distortion effects. A World Magnetic Model feature is provided to automatically add declination angle corrections for reference to true north (geographic north). The yaw rate sensor provides temporary heading backup when the magnetic sensors are disturbed by the local presence of distorted magnetic fields.



Honeywell continues to maintain product excellence and performance by introducing innovative solid-state magnetic sensor solutions.

## FEATURES

## BENEFITS

- |   |   |
|---|---|
| ▶ Precision compass accuracy                      | ▶ 0.5° typical heading accuracy, 0.15° resolution. See specification table for details.                   |
| ▶ Tilt-compensated                                | ▶ ± 80° pitch and roll range, < 0.5° tilt accuracy. See specification table for details.                  |
| ▶ Update rate to 25Hz                             | ▶ Fast updates for smooth displays and control applications.  |
| ▶ Compact Solution in a 1" x 1.04" x 0.54" module | ▶ Small size and low weight for miniaturized applications.  |
| ▶ Hard and soft-iron compensation routines        | ▶ User driven calibration to null stray fields. A single routine for both hard and soft iron corrections. |
| ▶ World Magnetic Model (WMM)                      | ▶ Choice of True north or Magnetic north references. WMM is field reprogrammable for periodic updates.    |
| ▶ Magnetic anomaly detection                      | ▶ User-adjustable magnetic threshold alarm for field vector magnitude.                                    |
| ▶ Serial data interface                           | ▶ Asynchronous RS-232 interface, 4800 to 38400 bps.   |
| ▶ Data Protocol                                   | ▶ NMEA0183 HDG and HDT sentences, plus binary bi-directional packet data.                                 |
| ▶ Rugged construction                             | ▶ Designed for high mechanical shock tolerance.   |

# HMR3601

## OPERATING CONDITIONS

Parameter	Description	Min	Typ	Max	Units
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### Electrical

V SUPPLY	Input Voltage	3.75	5.0	5.5	Volts DC
Power Consumption	V SUPPLY at 5.0V <sup>(1)</sup>		300		mW

### Environment

Temperature	Operating Storage (OEM only)	-40	-	+85	°C
		-40	-	+85	°C

### Digital Interface

UART	RS-232 bi-directional binary packet data protocol.	4800	9600	38,400	Baud
Update Rate	Continuous Heading Updates	0.05		25	Hz

1 For reference only.

## SPECIFICATIONS <sup>(1)</sup>

Characteristics	Conditions	Min	Typ	Max	Units
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### Heading

Accuracy	(Clean Magnetic Environment) Level	-	0.5° <sup>(2)</sup>	2°	(1- $\sigma$ )
Resolution			0.15		deg $\sigma$
Repeatability	3 sweeps, 0° to 360°, level		0.2		deg $\sigma$

### Pitch and Roll

Roll Range	Default orientation, rotation about X-axis		$\pm 180^\circ$		deg
Pitch Range	Default orientation, rotation about Y-axis		$\pm 80^\circ$		deg
Accuracy	Roll $\pm 30^\circ$ , Pitch $\pm 30^\circ$		0.5	1°	deg $\sigma$
Resolution			0.2		deg
Roll Repeatability	Roll $\pm 80^\circ$		0.2		deg $\sigma$
Pitch Repeatability	Pitch $\pm 80^\circ$		0.2		deg $\sigma$

### Magnetic Field

Flux Density Range		-0.9		0.9	gauss
Resolution			0.15		milli-gauss
Dip Angle	Earth's Vertical Field Component	-80°		+80°	deg
Hysteresis			0.1		%FS

1 Values based on qualification data. Not screened at production unless stated otherwise

2 100% tested at room temperature, 5.0 $\pm$ 0.2V.

# HMR3601

## PIN CONFIGURATION

Pin Number	Pin Name	Description
1	GND	Power Supply Return and Ground Reference
2	V SUPPLY	DC Power
3	TX OUT	RS-232 Transmit Data
4	RX IN	RS-232 Receive Data

## BASIC DEVICE OPERATION

The HMR3601  $\mu$ Point<sup>®</sup> Compass Module includes 3-axis Anisotropic Magneto-Resistive (AMR) sensors, 3-axis MEMS accelerometers, 3-axis rate gyro, a temperature sensor, analog to digital converter, and 16-bit microprocessor. The HMR3601 is available as an encapsulated module. A demonstration kit of the HMR3601 is available with the brass base plate, cable assembly, a CD of the MicroPointHost windows utility software for the user's personal computer.

As a factory default, the RS-232 interface is set at 9600 baud with one start bit, 8 data bits, one stop bit, and no parity bits. The HMR3601 does not require any hardware or software handshaking or related features. The baud rate can be changed by command after initial communication at the current baud rate.

The MicroPointHost utility software is a 32-bit Windows<sup>®</sup> application program that is provided with the HMR3601 demonstration kit, and can be used to evaluate the HMR3601's performance and demonstrate the compass features. With exception of the baud rate change command, the MicroPointHost is capable of sending and receiving all of the commands of the compass/computer interface. Host computers should be capable of running Windows 9x, ME, NT, 2000, XP and follow-on operating systems. An install program loads the executable file MicroPointHost.exe and ActiveX components. A readme.txt file is also included to describe the installation process.

## PHYSICAL CHARACTERISTICS

The HMR3601 is encapsulated in low outgassing epoxy with an overall dimension of 1.00 x 1.04 x 0.54 inches. The weight is approximately 0.6oz.



Figure 1: HMR3601 Top View

## MOUNTING CONSIDERATIONS

The following is the recommend printed circuit board footprint for the HMR3601. The forward direction is indicated by the "x" arrow in Figure 1. The pin functions are indicated on the label.

Brass machine screws with #2-56 UNC thread are recommended for mounting compass. Make sure that penetration into the brass inserts of the  $\mu$ POINT<sup>®</sup> is between 0.050" and 0.150." Excess length of the mounting screws may damage the unit.

# HMR3601

## CASE DIMENSIONS (in inches)

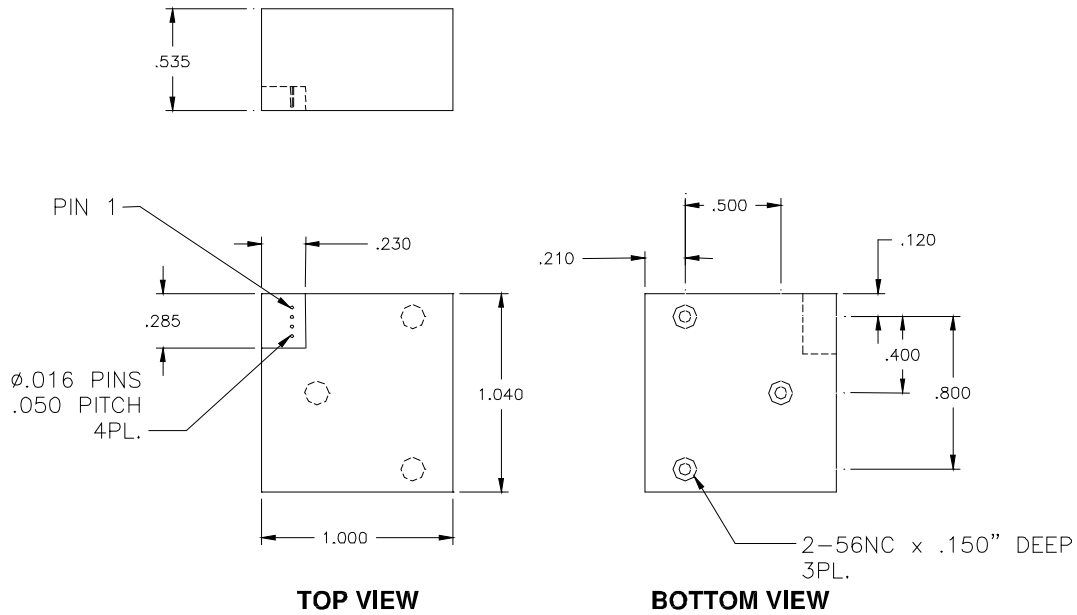


Figure 2 : HMR3601 Mounting Holes Locations

## UART COMMUNICATION INTERFACE

The 4-pin power supply and UART interface connector on the HMR3601, mates with MilMax 851-43-004-10-001000 per the pin configuration table earlier in this document. The interface hardware protocol is RS-232 without any further handshaking or hardware control lines.

Further HMR3601 interface commands and protocol are in the HMR3601 user's guide document.

# HMR3601

## TEST SOFTWARE DESCRIPTION

Computer test software is provided in the HMR3601 demonstration kit that will permit a thorough evaluation and demonstration of the compass capabilities. MicroPointHost is a 32-bit Windows test program. It is capable of sending and receiving all messages described in this manual except the BAUD message. It can display all messages received from the module in the main window with scrolling text. It has a small window summarizing the current status of the module and a graphic display of the current compass heading, roll, and pitch.

MicroPointHost can be run under Windows 9x, ME, NT 4.0, 2000 or their successors. One available serial port is required for communicating with the compass. Processor, memory, and disk space requirements are minimal.

The MicroPointHost software is not described in this datasheet, but given in depth description in the HMR3601 user's guide document.

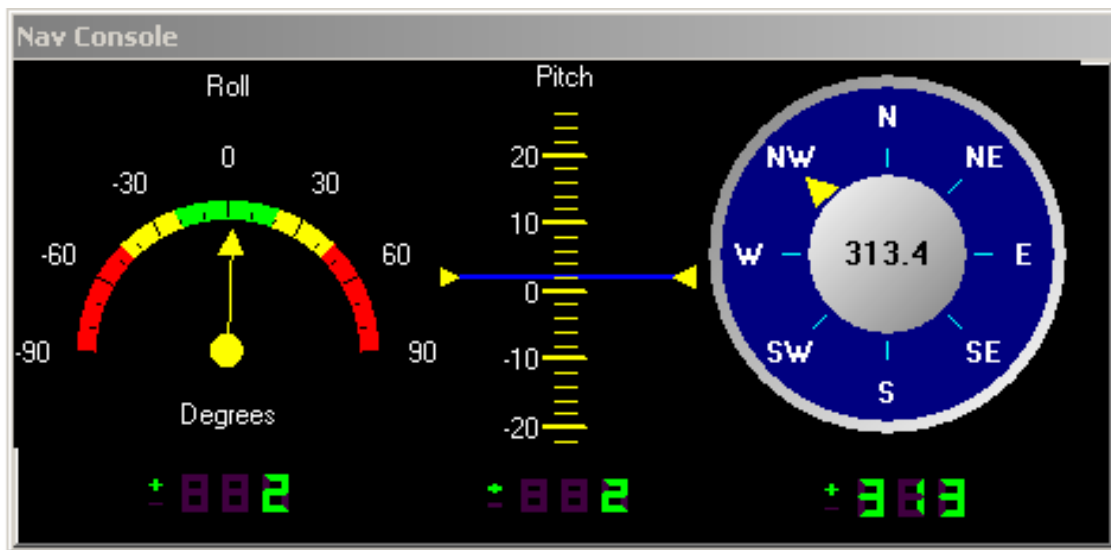


Figure 4: Compass Test Evaluation Software Display

# HMR3601

## ORDERING INFORMATION

Ordering Number	Product
HMR3601 HMR3601 Demo	$\mu$ Point Compass Module Only (RS232) $\mu$ Point Compass Demonstration Kit

## FIND OUT MORE

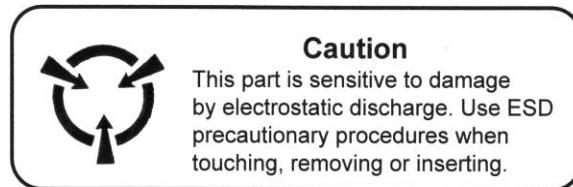
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U.S. Patents 4,441,072, 4,533,872, 4,569,742, 4,681,812, 4,847,584 and 6,529,114 apply to the technology described

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