H3-IMU
High Performance
Inertial Measurement Unit

FUNCTIONAL DESCRIPTION

The H3-IMU provides serial digital outputs of triaxial acceleration, rate of turn (gyro) and magnetic field data. Custom algorithms provide high performance, temperature compensated data in real time via the RS-422 protocol at sample rates up to 800 Hz. Two performance options are available the HN for normal applications or the HP which dramatically reduces the accelerometer bias offset and noise. The H3-IMU also supports 2 spare analog inputs, 3 spare digital inputs and 2 spare digital outputs. The H3 is available in a custom package measuring 2.000 in. × 1.110 in. × 0.645 in. height. The H3-IMU is provided with a 15 pin Bi-Lobe connector. Table 4 details the pin-out of the connector configuration.

Further technical details are available in the H3 IMU User Guide. For pricing information contact Omni Instruments Ltd on +44 845 9000 601 or via email at info@omni.uk.com

APPLICATIONS

- Unmanned Aerial Vehicles
- Unmanned Underwater Vehicles
- Missile Correction
- Antenna Control/Stabilization
- Turret Control/Stabilization
- Sports Performance Analysis

Figure 1 – H3-IMU

FEATURES

- **Sample rates up to 800 Hz**
- **Wide Accelerometer and Gyro Dynamic Ranges**
- **1 Sigma accelerometer bias repeatability: 0.5 mg**
- **Gyro Bias Instability: 20 °/h**
- **Gyro Angle Random Walk: 2 °/h$^{1/2}$**
- **Miniature Size and Weight**

ORDERING INFORMATION

Table 1 – Standard Part Numbers

Part Number	Accel (g)	Rate (°/s)	Bandwidth (Hz)	Protocol
HN02-0150F050R	2	150	50	RS422
HP02-0150F050R	2	150	50	RS422
HN02-0300F050R	2	300	50	RS422
HP02-0300F050R	2	300	50	RS422
HN05-0300F050R	5	300	50	RS422
HP05-0300F050R	5	300	50	RS422
HN05-0600F050R	5	600	50	RS422
HP05-0600F050R	5	600	50	RS422
HN10-1200F050R	10	1200	50	RS422
HP10-1200F050R	10	1200	50	RS422

1.) Custom Acceleration Ranges ± 200g also available
2.) Custom Angular Rate Ranges available up to ± 5400 °/s
3.) Commercial Temperature Range add a "C" after the "R" in the Part Number
4.) Military Temperature Range of add a "M" after the "R" in the Part Number
5.) Add the option code from Table 2 after the temperature code.
6.) Custom Bandwidth can be ordered contact sales for more information.

Table 2 - Output sample rate & baud rate configurations.

Option Code	Sample Rate	Baud Rate
A	150	115200
B	200	230400
C	400	460800
D	600	921600
E	800	921600

ORIENTATION DIAGRAM

Figure 2 – H3-IMU Orientation Diagram

SPECIFICATIONS

Table 3 – Specifications

PARAMETER	SPECIFICATION					UNITS	CONDITIONS
Operational Requirements							
Supply Voltage	5.4 to 9.0					VDC	
Supply Current	210					mA	Typical
Physical Properties							
Alignment Error	±1					%	
Mass	55					grams	
Acceleration – HN Option	**HN02**		**HN05**		**HN10**		
Dynamic Range	± 2		± 5		± 10	g	
Offset	± 30		± 30		± 30	mg	
Nonlinearity	± 0.4 (± 1.0)		± 0.4 (± 1.0)		± 0.4 (± 1.0)	% of FS	
Noise	0.6 (0.8)		1.1 (1.3)		2.1 (2.8)	mg	
Digital Scale Factor	9.1553E-05		2.2888E-04		4.5776E-04	g/bit	
Bandwidth [1]	50		50		50	Hz	
Acceleration – HP Option	**HP02**	**HP05**	**HP10**	**HP30**	**HP50**		
Dynamic Range	± 2	± 5	± 10	± 30	± 50	g	
Bias (In Run)	± 0.04 (± 0.07)	± 0.10 (±2)	± 0.20 (±0.5)	± 0.6 (±1.2)	± 0.8 (±1.2)	mg	Typical (Max)
Offset	< 4.1	< 5.3	< 6.5	< 15.7	< 21.7	mg	Max
Nonlinearity	± 0.3 (± 0.8)	± 0.3 (± 0.8)	± 0.3 (± 0.8)	± 0.3 (± 0.8)	± 0.3 (± 0.8)	% of FS	Typical (Max)
Noise Density	42 (71)	99 (127)	170 (212)	665 (2,232)	772 (1,942)	µg	Typical (Max), 1 σ
Digital Scale Factor	9.1553E-05	2.2888E-04	4.5776E-04	1.3733E-03	2.2888E-03	g/bit	
Bandwidth [1]	50	50	50	50	50	Hz	-3dB point
Angular Rate	**-0150F050**	**-0300F050**	**-0600F050**	**-1200F050**			
Dynamic Range	± 150	± 300	± 600	± 1200		°/s	
Offset	+/-1.5	+/-1.5	+/-1.5	+/-1.5		°/s	0 to 70 °C Max
Cross-Axis Sensitivity	+/-1	+/-1	+/-1	+/-1		%	Maximum
Nonlinearity	0.1	0.1	0.1	0.1		% of FS	Best fit straight line
Noise	0.36 (0.95)	0.56 (0.95)	0.56 (0.95)	0.56 (0.95)		°/s	Typical (Max), 1 σ
Digital Scale Factor	6.8665E-03	1.3733E-02	2.7466E-02	5.4932E-02		°/s/bit	
Bandwidth [1]	50	50	50	50		Hz	-3dB point
Magnetic Field							
Dynamic Range	±1.9					gauss	
Offset	0.020					gauss	Max
Nonlinearity	0.5					% of FS	Best fit straight line
Noise	0.00056 (0.0015)					gauss	Typical (Max), 1 σ
Digital Scale Factor	8.6975E-05					gauss/bit	
Bandwidth[1]	50					Hz	-3dB point
Temperature							
Digital Sensitivity	1.8165E-02					°C /bit	
External Analog Inputs							
Voltage Range	0 to 5					VDC	
Input Impedance	8					MΩ	
Bandwidth	50					Hz	-3dB point
External Digital Inputs	Minimum		Maximum				
High Level Input Voltage	2.31		3.3			V	
Low Level Input Voltage	0		0.99			V	
Input Leakage Current	± 1					µA	
Absolute Max Ratings							
Acceleration Powered	2000 max					*g*	Any axis 0.5ms
Supply Voltage	-0.3 (min) +12 (max)					VDC	
Operating Temperature	0 to +70					°C	
Mil Operating Temperature	-40 to +85					°C	
Storage Temperature	-55 to +125					°C	
Typical Values at 25°C, Supply Voltage = 5.6 VDC, 0 °/s, unless otherwise noted.							

1.) Other configurations are available on a special order basis. Contact sales for more information.

FUNCTIONAL BLOCK DIAGRAM

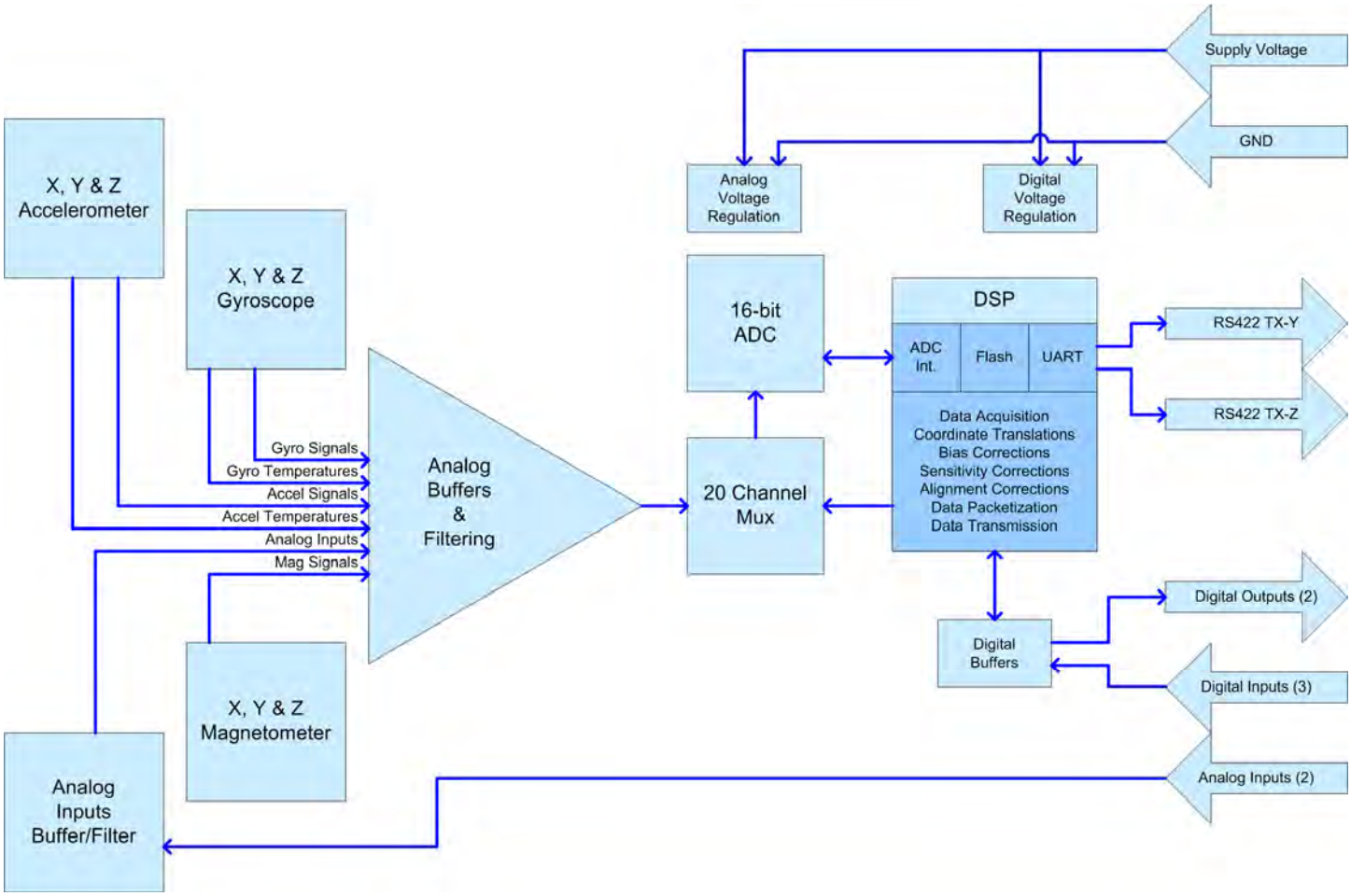

Figure 3 – H3-IMU Functional Block Diagram

PIN FUNCTION DESCRIPTIONS

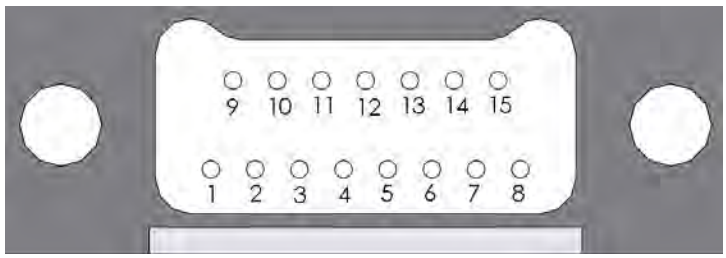

Figure 4 – Omnetics Bi-Lobe Nano interface connector A29100-015

Table 4 – H3-IMU Connector Interface Pin Functions

Pin No.	Signal Name	Description	Wire Color
1	VSUPPLY	Supply Voltage Input	Black 1
2	GND	Supply Voltage Return	Brown 1
3	ASPIN2	Analog External Input 2	Red 1
4	DSPIN2	Digital External Input 2 (Not Implemented in Revision A)	Orange 1
5	DSPOUT1	Digital Sensor Encode Pulse Output	Yellow 1
6	DSPOUT2	Pulse Output at 1 Second Intervals	Green 1
7	TX_Z	RS422 Inverting Output	Blue 1
8	TX_Y	RS422 Non-Inverting Output	Purple 1
9	GND	Supply Voltage Return	Grey 1
10	ASPIN1	Analog External Input 1	White 1
11	DSPIN1	Digital External Input 1 (Not Implemented in Revision A)	Black 2
12	DSPIN3	Digital External Input 3 (Not Implemented in Revision A)	Brown 2
13	NC	No Connect, Internal Use Only	Red 2
14	RX_B	RS422 Inverting Input (Not Implemented in Revision A)	Orange 2
15	RX_A	RS422 Non-Inverting Input (Not Implemented in Revision A)	Yellow 2

Note: Mating connector is from Omnetics part number A28000-015 (included with your order).

USB Data Acquisition (DAQ) Module Options

The USB DAQ is available to purchase with your IMU to facilitate simple data collection using a PC. The module converts the IMU RS422 output to USB signals and in the case of the USB-H-8.5UR model utilizes an internal charge pump to boost the USB 5 volt power up to 8.3 volts to power the IMU. Model number USB-H-8.5XR allows the use of an external power supply and has maximum voltage of 8.5 volts. Each USB DAQ model number in Table 5 below is compatible with the MX IMU and is available for order.

Table 5 – USB DAQ Module Options

Model Number	Description	Max Voltage	Power Source	Protocol	Availability
USB-H-8.5UR	H3-IMU USB RS422 DAQ, USB power	8.5V	USB	RS422	Standard – with all H3-IMUs ordered
USB-H-8.5XR	H3-IMU USB RS422 DAQ, Ext. power	8.5V	External Power	RS422	Option available upon request

PHYSICAL DIMENSIONS

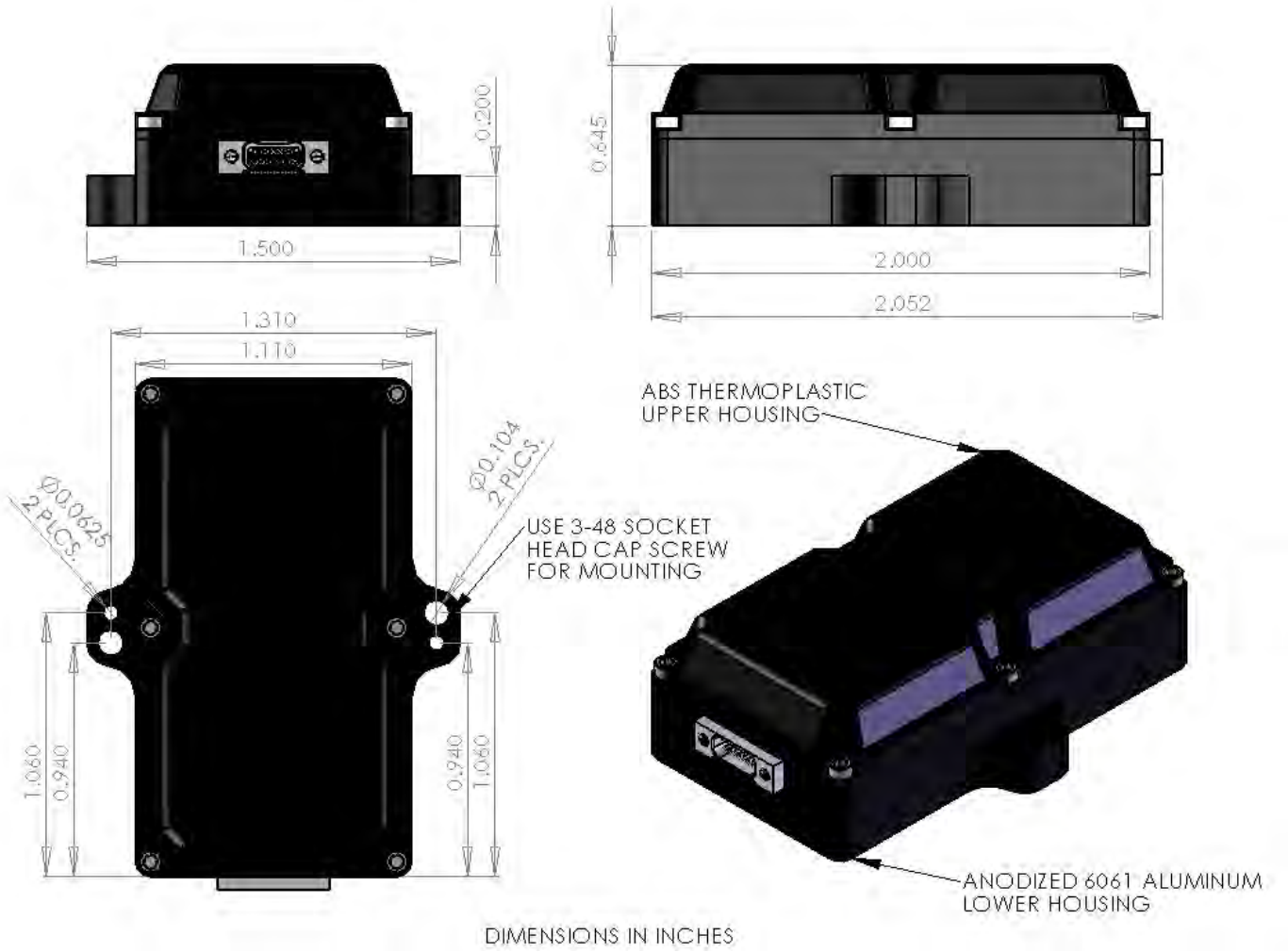

Figure 5 – Physical Dimensions

Document Change History

Rev	Status	Description	Date
A	Obsolete	New Data Sheet	5/5/2010
B	Obsolete	Updated specification table.	11/15/2010
C	Released	Updated Memsense logo. Added output configuration table. Updated accelerometer specifications.	4/11/2013