HG4930 INERTIAL MEASUREMENT UNIT (IMU)

Performance and Installation Manual
Standard, S-Class, and SDLC Models

Honeywell

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HONEYWELL INDUSTRIAL INERTIAL MEASUREMENT UNITS

Honeywell produces no license required (NLR) Inertial Measurement Units (IMU) for industrial applications including agricultural vehicles, robotics, survey, mapping, and stabilized systems. These IMUs are designed for industrial application and can be used on air, land, and sea.

CONTACT US

For more information, email imu.sales@honeywell.com or contact us on our website aerospace.honeywell.com/HG4930

Honeywell began producing gyros in the 1940's for the Honeywell C-1 autopilot and specifically began producing MEMS gyros and accelerometers in the early 2000's. Honeywell's IMUs utilize proprietary Honeywell technology and leverage existing production and engineering infrastructure. Honeywell has deep and long lasting relations with many commercial customers and is carrying that philosophy and product pedigree into our NLR IMU line. Honeywell's forward looking product strategies will ensure that our NLR IMU's will fit your current and future needs.

The HG4930 IMU is a device which measures angular rates and linear accelerations in a body mounted strapdown configuration. It will provide compensated incremental angle and velocity data for navigation as wellas angular rates and linear accelerations for control. The data is reported through a digital serial interface bus. The unit contains MEMS gyroscopes and accelerometers as well as the electronics and software necessary to deliver precision control and navigation information. The input axes form a right handed frame aligned with the IMU mounting frame.

USING HONEYWELL MESSAGES

CONTROLLING (MESSAGES 0X01 & 0XAC)

General "rule of thumb" is that sensor control bandwidth should be 5 times the structure being controlled. The HG4930 S-Class provides a 400 Hz bandwidth (-3 db) control message allowing the control of an 80 Hz device. The HG4930 Standard and SDLC models have identical sensors to the S-Class version but are more filtered and suitable for controlling lower frequency platforms (like a car) – filter the 1800 Hz data to the desired bandwidth.

NAVIGATION (MESSAGES 0X02)

The navigation format provides data relative to the prior frame and is often referred to as Delta Velocity / Theta or Incremental Velocity / Angles. Sensor data is sampled at 1800 Hz and then summed / processed to provide 100 Hz data valid at the System Time of Validity (TOV) 100 Hz rising edge. The data is directly integrable in that the data is not "per second" but rather per the navigation frame (100 Hz, 200 Hz or 300 Hz). The Delta Velocity and Delta Theta data coning and sculling corrections which include a rotation correction" which consists of one half of the sampled delta-angle vector cross the sampled delta-velocity vector:

$$\Delta\Theta\text{Asynchronous} = \Delta\Theta\ \text{SAMPLE}$$

$$\Delta\text{VAsynchronous} = \Delta\text{VSAMPLE} - 0.5 * [\ \Delta\Theta\text{SAMPLE X } \Delta\text{VSAMPLE}]$$

As a result of the subtraction, proper integration of local-vertical navigation components will require update of the body-to-local-vertical attitude reference, transformation of the body-axis delta-velocity components to the local-vertical frame followed by update of the local-vertical attitude components.

HGUIDE HG4930 MODEL GUIDE

Part Number	Model	Features
HG4930CS36 HG4930BS36 HG4930AS36	S-Class	Wide Bandwidth Control Data (400 Hz) with very high data rates (3600 Hz @ 4 MBIT) in a convenient RS422 Asynchronous Format
HG4930CA51 HG4930BA51 HG4930AA51	Standard	Precision Honeywell 100 Hz navigation ready data in a convenient RS422 asynchronous format. Control Data (200 Hz BW) at a high data rate (600 Hz @ 1 MBit) with a convenient RS422 asynchronous format.
HG4930CB50	SDLC	Identical to the Standard Model except with a high Reliability RS422 synchronous interface that requires a clock input. Recommended primarily for legacy customers already using this bit oriented hardware protocol.

HGUIDE HG4930 PERFORMANCE

ACCELEROMETER PERFORMANCE

The HG4930 is designed to achieve full performance by 5 seconds.
Operating range is -20 g's to + 20 g's.

ACCELEROMETER TYPICAL PERFORMANCE OVER FULL TEMPERATURE RANGE						
Distributor Ordering Part Number	Performance Class	Bias Repeatability (mg 1σ)	Bias In-run Stability (mg 1σ)	VRW (m/s/√hr)	Scale Factor Repeatability (ppm 1σ)	Scale Factor Linearity (ppm 1σ)
HG4930CS36 HG4930CA51 HG4930CB50	"C"	1.7	0.025	0.03	600	100
HG4930BS36 HG4930BA51	"B"	2	0.05	0.04	800	150
HG4930AS36 HG4930AA51	"A"	3	0.075	0.06	1000	200

ANGULAR RATE PERFORMANCE

The HG4930 is designed to achieve full performance by 5 seconds.
Operating range is -400°/sec to +400°/sec.

GYRO TYPICAL PERFORMANCE OVER FULL TEMPERATURE RANGE								
Distributor Ordering Part Number	Performance Class	Bias Repeatability (°/hr 1σ)	Bias In-run Stability[1] (°/hr 1σ)	ARW (°/√hr)	Scale Factor Repeatability (ppm 1σ)	Scale Factor Linearity (ppm 1σ)	Bias G-Sensitivity (°/hr/g 1σ)	Scale Factor G-Sensitivity (ppm/g 1σ)
HG4930CS36 HG4930CA51 HG4930CB50	"C"	7	0.25	0.04	600	100	0.5	X Axis <25 Y/Z Axes <5
HG4930BS36 HG4930BA51	"B"	10	0.35	0.05	800	200	1	
HG4930AS36 HG4930CB50	"A"	20	0.45	0.06	1000	250	2	

1. Gyro bias stability is >0.5 °/hour when measured over a constant operating period of one month.

NOISE CHARACTERISTICS

HG4930 IMU TYPICAL NOISE CHARACTERISTICS					
Distributor Ordering Part Number	Model	Control Data (1σ)		Incremental Data (1σ)	
		Gyro (milli-rad/s)	Accel (mg)	Gyro micro-radian	Accel (m/s)
HG4930CS36 HG4930BS36 HG4930AS36	S-Class	< 2	< 7	3	NA
HG4930CA51 HG4930BA51 HG4930AA51 HG4930CB50	Standard and SDLC	< 0.65	< 3	< 2	0.0003

BANDWIDTH AND DATA RATES – CONTROL MESSAGES ONLY

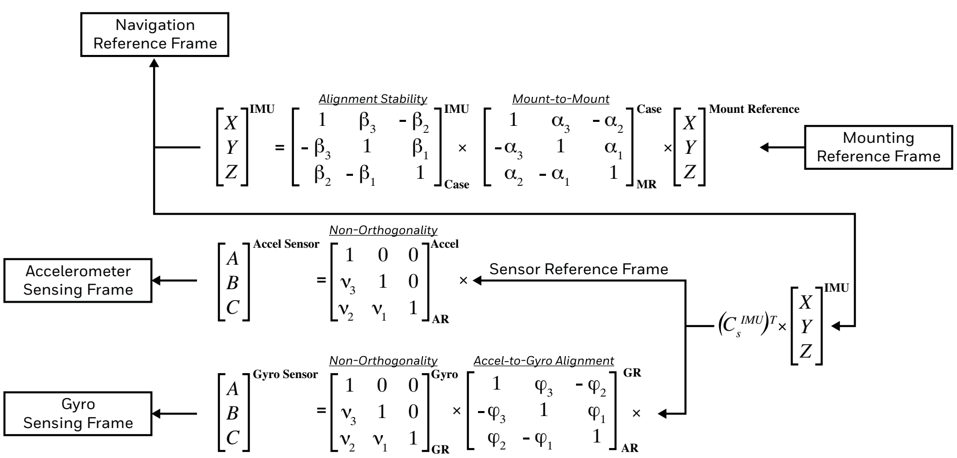
HG4930 IMU TYPICAL BANDWIDTH AND DATA RATE CHARACTERISTICS						
Distributor Ordering Part Number	Model	Control Data Only BW -90°/-3 dB (Hz)		Data Rates		Baud Rate
		Gyro	Accel	Control	Incremental	
HG4930CS36 HG4930BS36 HG4930AS36	S-Class	175/460	125/225	3600 Hz	NA	4 MBit
HG4930CA51 HG4930BA51 HG4930AA51 HG4930CB50	Standard and SDLC	70/180	70/180	600 Hz	100 Hz	1 MBit

IMU ALIGNMENT AND ORTHOGONALITY

The mathematical IMU alignment consists of the over temperature Mount-to-Mount, Alignment Stability, Accelerometer to-Gyro Alignment, and Non-Orthogonality error components, as shown in the table and figure below.

Parameter	Error Requirement	Units
Mount to Mount with Pins	3500	μrad max
Alignment Stability	750 (< 375 Typical)	μrad 1σ
Accelerometer Non-orthogonality	750 (< 375 Typical)	μrad 1σ
Accelerometer to Gyro Alignment	750 (< 375 Typical)	μrad 1σ
Gyro Non-Orthogonality	750 (< 375 Typical)	μrad 1σ

IMU FRAME MODEL



AR Accel/Sensor Reference Frame (Orthogonal)

GR Gyro Reference Frame (Orthogonal)

C_s^{IMU} Gyro Reference Frame (Orthogonal)

HGUIDE DATA READER INTEGRATION

The Honeywell HGUIDE DATA READER is a web deployed software integration tool. The software tool also provides real time and "Off Device" integration support.

TO DOWNLOAD HGUIDE DATA READER EMAIL:

hguide.support@honeywell.com

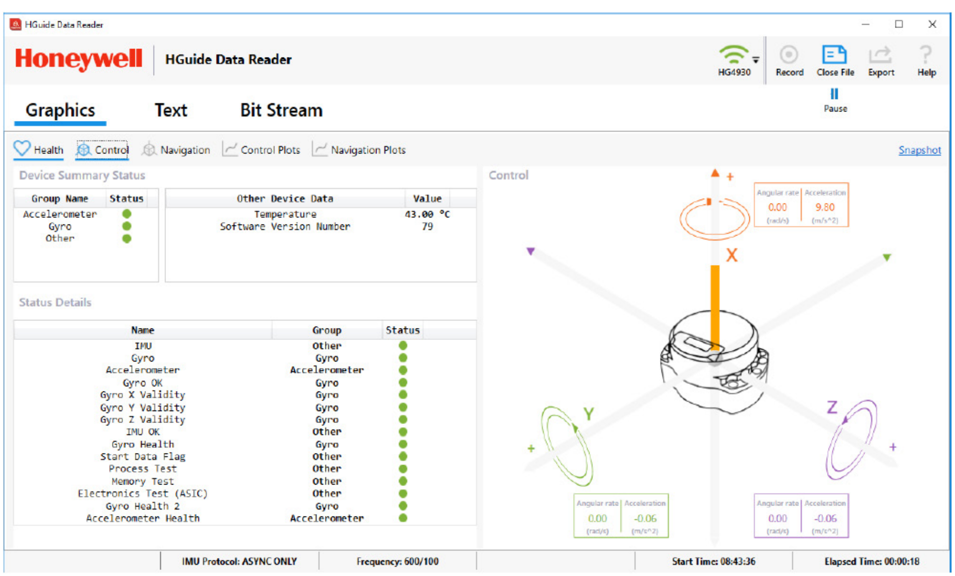
The software integration tool will display and record data, generates supporting message documentation, and includes an example Windows executable which will parse and log data. The program will also export data to CSV format for easy plotting.

The Honeywell HGuide Data reader provides a software development kit (SDK) including C/C++ source code, header files, DLL, and essential functions. See HGDR "Bit Stream" window to produce the Windows SDK. Linux and Unix support also available.

An evaluation kit is also available for separate purchase. Connect the evaluation board to the IMU being careful to align the pins to the connector.

If using the Honeywell Data reader, be sure to press the "scan/hunt" button on the introductory screen. The program will automatically do an initial search but will time out if device not connected.

HG4930 Adapter Board
Honeywell Part No. 68010308-001
HG4930 Evaluation Kit w/cable
Honeywell Part No. 68009732-003
Adapter Mounting Board to n500
Use two 2-56 x 3/16" SHCS
Grainger Part No. 1GU11 Driver size is 5/64"
HG4930 Mounting
Use two 8-32 x 1" SHCS
Grainger Part No. 6XA79 Driver size is 9/64"
i300 Adapter Board
There is an i300 adapter board described in the i300 IMU manual which can provide power regulation (~+6 VDC to +36 VDC) to an HG4930. At the time of this document, it will not provide a USB interface if powered by the USB connector.



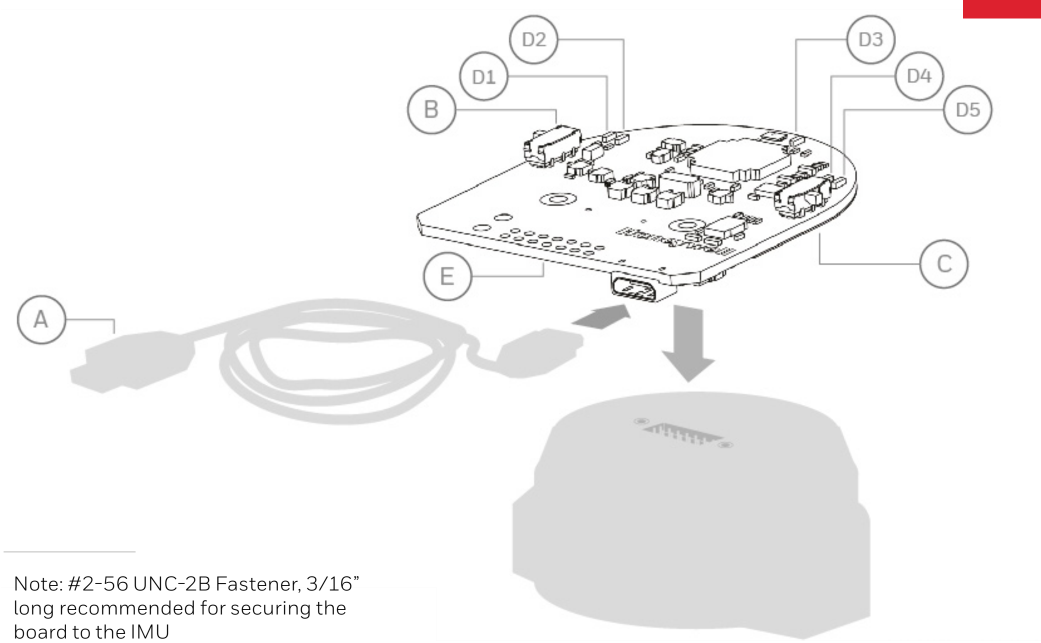
HG4930 EVALUATION KIT QUICK START GUIDE

HG4930 EVAL KIT BOARD

The HG4930 Evaluation Kit Printed Board Assembly uses a dual high-speed USB to UAR to UART Integrated Circuit that allows for the HG4930 to connect via USB to other devices for data collection.

STANDARD AND S-CLASS MODELS ONLY:

For SDLC, Contact hguide.support@honeywell.com



Note: #2-56 UNC-2B Fastener, 3/16" long recommended for securing the board to the IMU

Ⓐ USB 3.0 connector cable

Ⓑ Switch one > Power On/Off

Ⓒ Switch two > Device reset

Put in forward position prior to connecting *(towards the curved end of the board).* Toggle to reset If needed.

Ⓓ LED Indicators

- D1 **Green** steady. Indicates +5V USB power is present
- D2 **Green** steady. Indicates that the IMU is receiving input power when Switch one is forward.
- D3 **Orange** steady. Data is being transmitted from the IMU to the USB
- D4 **Inactive**. LED used during factory software loading
- D5 **Red** steady. IMU is in reset *(Device has Power, but is not transmiting)*

Ⓔ Platted through-Holes

Plated through-holes allow for standard 24 gauge wire or a standard 100mil pitch test header.
The test point numbering corresponds to the connector pin number on the HG4930

Net Name	Test point	Silk Screen	IMU Connector
Ground	TP1	GND	P1.1
Input power	TP2	PWR	P1.2
No connect ~ *Inactive*	TP3	TMI	P1.3
No connect ~ *Inactive*	TP4	TXTD	P1.4
No connect ~ *Inactive*	TP5	RXTD	P1.5
Reset	TP6	RST	P1.6
Switch two control	TP7	MS	P1.7
No connect ~ *Inactive*	TP8	DIO	P1.8
IMU data transmit high	TP9	TXH	P1.9
IMU data transmit low	TP10	TXL	P1.10
GTX	TP11	GTX	P1.11
GRX	TP12	GRX	P1.12
SDLC Clock Input High	TP13	RXH	P1.13
SDLC Clock Input Low	TP14	RXL	P1.14

ENVIRONMENTAL RELIABILITY

The HG4930 is an extremely rugged device and the customer is advised to contact Honeywell if specific advice is needed on shock and vibration environments.

ENVIRONMENT	OPERATING	NON-OPERATING	UNITS
Temperature	-54 to +85 -40 to +71 (Full Performance)	-54 to +95	°C
Temperature Shock	±3 Operating ±0.8 Full Performance	±15	°C/minute
Random Vibration	0.003 g2/Hz, 10Hz to 2KHz, 6.4 g's RMS	0.072 g2/Hz, 10Hz to 2KHz, 12 g's RMS	NA
Shock	10 g, 3ms half-sine pulse	50 g, 3ms half-sine pulse	NA
Static Acceleration	The HG4930 is designed to withstand > 50 g's of static acceleration in all directions.		
Altitude	0 to 30,000, Mean Sea Level	NA	Meters
Magnetic Field	±10	NA	Gauss

The Mean Time Between Failure (MTBF) calculations incorporate Honeywell proprietary methodologies that tailor industry standards.

TRACTORS, GROUND BASED TRANSPORT	25°C	102,000 Hours MTBF
DRONES	71°C	59,000 Hours MTBF

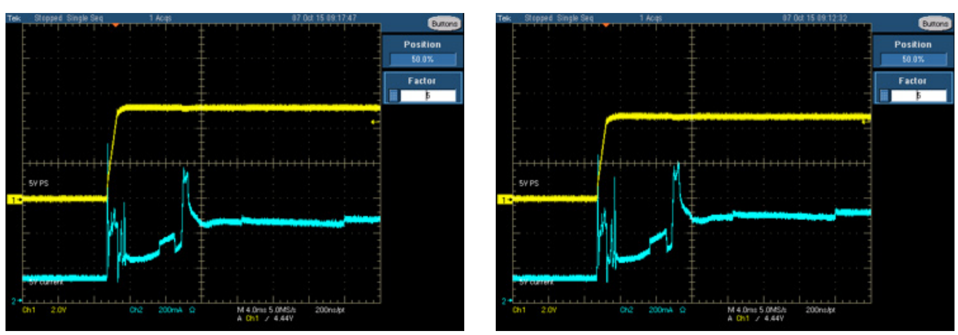
ELECTRICAL INTERFACE

HG4930 14 PIN CONNECTOR J1			
PIN	Signal Name	Input/Output & Signal Type	Signal Function
1	Ground	Ground	Ground
2	Power	Input +5 VDC +/- 5%	Power
3		No Connect	
4		No Connect	
5		No Connect	
6	RESET	Input - +3.5 to 5 VDC CMOS Compatible	Device reset input discrete. Active High Device will remain in reset while at logic 1.
7		No Connect	
8		No Connect	
9	COM3_TX_HIGH	Output RS-422	Asynchronous and SDLC Data
10	COM3_TX_LOW		
11	COM2 / System TOV Mark_HIGH	Output RS-42	System TOV Mark
12	COM2 / System TOV Mark_LOW		
13	COM3_RX_Clock_HIGH	Input R422 Shift Clock 500 Khz to 1 Mbit	SDLC Only
14	COM3_RX_Clock_LOW		

INPUT POWER				
Voltage (VDC)	Tolerance	Max Ripple (MV P-P)	Max In Rush Current (MA)	Typical Current (MA)
+5	±5%	50	800	400

The HG4930 +5 VDC input is un-regulated. Any reverse voltage or voltage over 5.25 VDC will damage the unit and void the warranty. It is recommended that the customer provide suitable protection at all times.

The 5V power application to the IMU must monotonically increase from 1 to 5 volts for proper IMU start-up. The fi gure below provides representative voltage and current plots at hot and cold for a ~ 2ms start time. Worse case steady state current shown is ~500 mA (cold) and peak current shown is ~800 mA. Unit typically draws < 400 mA in normal operation.

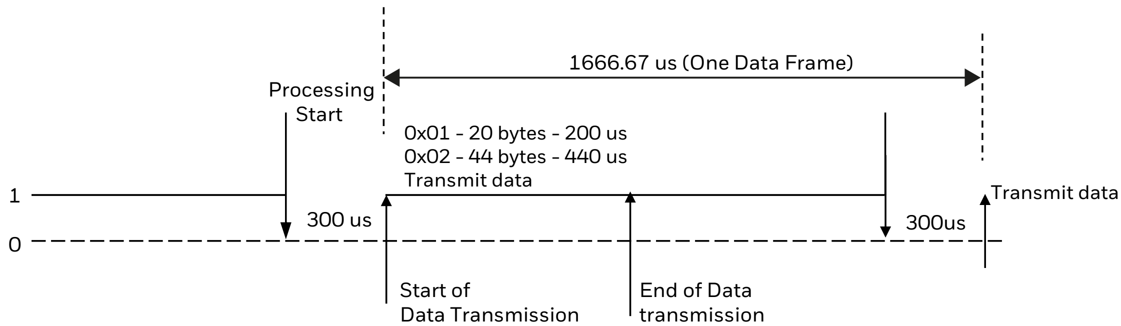


Typical Cold (Left Figure) and Hot Voltage/ In-Rush Plots

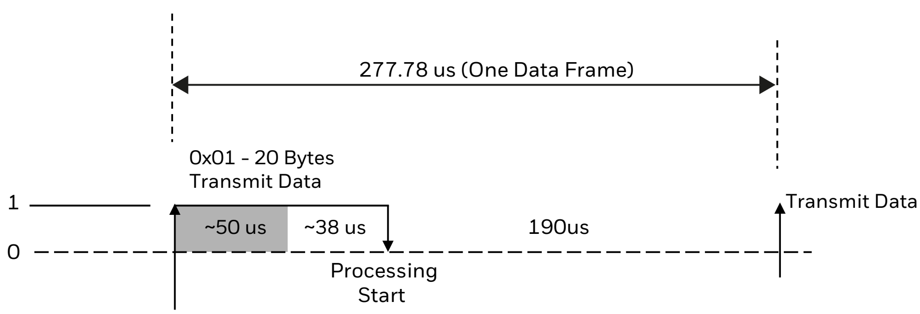
SYSTEM TIME OF VALIDITY (TOV) MARK

The TOV falling edge provides the time of validity point for the inertial delta V and delta theta information. Pulse start is within +/- 1 microsecond of the most recent data sample event. The rising edge signifies start of data transmission for asynchronous models and data availability for SDLC versions (clock input must be turned on to receive data).

STANDARD AND SDLC TIME OF VALIDITY MARK



S-CLASS TIME OF VALIDITY MARK



ASYNCHRONOUS & SLDC PROTOCOL

GENERAL DESCRIPTION

The IMU supports the asynchronous RS-422 compatible protocol.
Each Asynchronous output frame will open with an IMU address byte that can be used as a synching byte. The order of transmission is Least Significant (LS) bit first; LS byte first; LS 16 bit word first. Only gyro, accelerometer, and temperature data is signed.
The transmit baud rate will be 1Mbits/sec with 1 start bit, 8 data bits, 1 stop bit, and no parity. The SDLC protocol is described by Honeywell document DS36204-60.
Legacy users of this protocol may contact Honeywell for this document.

STANDARD AND SLDC MESSAGE CONTENTS

Message Name	ID	Rate	# Bytes	Message Contents
Control	0x01	500 Hz		Acceleration, Angular Rate, Status
Inertial	0x02	100 Hz		Linear Acceleration, Angular Rate, Delta Velocity, Delta Angle, Status
Control and Inertial	0x01 0x02	600 Hz	The 600 Hz control data output consists of the angular rates, acceleration, and IMU status words in both message ID 0x01 and 0x02.	

The start of each sequential message transmissions is on the average 1/600 seconds ±0.01% apart, with a repeating pattern of five control message transmissions followed by one inertial message transmission.

The angular and linear data is filtered and sampled at 1800 Hz. The 1800 Hz filtered angular and linear data is decimated for 600 Hz control data. Linear acceleration and angular rate data carries over the remainder from the prior frame.

The 100 Hz inertial message contains incremental or ("delta") angles and velocities in message ID 0x02. The "delta" data is unfiltered 1800 Hz sensor data which is summed to the inertial data rate (100 Hz). Accurate attitude and position calculations require that all messages be received and used.

S-CLASS MESSAGE CONTENTS

Message Name	ID	Rate	# Bytes	Message Contents
Control	0xCA	3600 Hz	20 Bytes	Acceleration, Angular Rate, Status

The start of each sequential message transmissions is on the average 1/3600 seconds ±0.06% apart. The 3600 Hz control data output consists of the angular rates, linear acceleration, and IMU status words in message ID 0xCA. The angular and linear data is filtered and sampled at 3600 Hz. Acceleration and angular rate data carries over the remainder from the prior frame.

ASYNCHRONOUS MESSAGE CONTENT

STANDARD AND SDLC CONTROL MESSAGE (0X01)				
Position	Parameter	Length (Bytes)	LSB Weight	Units or Contents
1	IMU Address	1	N/A	Constant 0x0E
2	Message ID	1	N/A	Constant 0x01
3	Angular Rate X	2	2^{-20} * 600	rad/sec/LSB
4	Angular Rate Y	2	2^{-20} * 600	rad/sec/LSB
5	Angular Rate Z	2	2^{-20} * 600	rad/sec/LSB
6	Linear Acceleration X	2	2^{-14} * 600*.3048	meters/sec^2/LSB
7	Linear Acceleration Y	2	2^{-14} * 600*.3048	meters/sec^2/LSB
8	Linear Acceleration Z	2	2^{-14} * 600*.3048	meters/sec^2/LSB
9	Status 1	2	N/A	See Status Word 1 Table
10	Status 2A or 2B	2	N/A	See Status Word 2A/2B Tables

11	Checksum
	
	Sum of all message data (positions 1...10 of this table), taken as 16 bit words, and summed without regard for rollover.
		2	N/A	// this pseudo code illustrates the checksum algorithm
				
				u16sum = 0; for (i=0; i<9; i++) // (20-2)/2=9 { u16sum += u16_msg_array[i]; } Checksum = u16_msg_array[9]; if (Checksum != u16sum) {checksum error}

	Total Length	20		

S-CLASS CONTROL MESSAGE (0XCA)				
Position	Parameter	Length (Bytes)	LSB Weight	Units or Contents
1	IMU Address	1	N/A	Constant 0x0E
2	Message ID	1	N/A	Constant 0xCA
3	Angular Rate X	2	2^{-15}* 499* π/180	rad/sec/LSB
4	Angular Rate Y	2	2^{-15}* 499* π/180	rad/sec/LSB
5	Angular Rate Z	2	2^{-15}* 499* π/180	rad/sec/LSB
6	Linear Acceleration X	2	2^{-15} * 21* 9.805989024	meters/sec^2/LSB
7	Linear Acceleration Y	2	2^{-15} * 21* 9.805989024	meters/sec^2/LSB
8	Linear Acceleration Z	2	2^{-15} * 21* 9.805989024	meters/sec^2/LSB
9	Status 1	2	N/A	See Status Word 1 Table
10	Status 2A or 2B	2	N/A	See Status Word 2A/2B Tables

11	Checksum
	
	Sum of all message data (positions 1...10 of this table), taken as 16 bit words, and summed without regard for rollover.
		2	N/A	// this pseudo code illustrates the checksum algorithm
				
				u16sum = 0; for (i=0; i<9; i++) // (20-2)/2=9 { u16sum += u16_msg_array[i]; } Checksum = u16_msg_array[9]; if (Checksum != u16sum) {checksum error}

	Total Length	20		

STANDARD AND SDLC INERTIAL MESSAGE (0X02)				
Position	**Parameter**	**Length (Bytes)**	**LSB Weight**	**Units or Contents**
1	IMU Address	1	N/A	Constant 0x0E
2	Message ID	1	N/A	Constant 0x02
3-10	Control Data	16	N/A	Contents same as Message 0x01. Positions 3-10.
11	Delta Angle X	4	2^{-33}	Radians/LSB or equivalently, radians/second/Hz/LSB
12	Delta Angle Y	4	2^{-33}	
13	Delta Angle Z	4	2^{-33}	
14	Delta Velocity X	4	2^{-27}	0.3048 meters/sec/LSB or equivalently, 0.3048 meters/sec2/Hz/LSB meters/sec2/LSB
15	Delta Velocity Y	4	2^{-27}	
16	Delta Velocity Z	4	2^{-27}	

17	Checksum
	
	Sum of all message data (positions 1-16 of this table), taken as 16 bit words, and summed without regard for rollover.
		2	N/A	// this pseudo code illustrates the checksum algorithm
				
				u16sum = 0; for (i=0; i<21; i++) // (44-2)/2=21 { u16sum += u16_msg_array[i]; } Checksum = u16_msg_array[21]; if (Checksum != u16sum) {checksum error}

	Total Length	44		

STATUS WORD 1 TABLE		
Bit	**Definition**	**Notes**
Bit 0-1	2 Bit Counter	00 01 10 11
Bit 2-3	2 bit BIT-mode indicator	0=Power-up BIT 1=Continuous BIT 2-3 = Reserved
Bit 4	IMU	0=OK, 1=Failed These fault monitors are aggregate and latched (continue after the failure has stopped) but will only latch after a lower level test has failed. The latching logic may require multiple consecutive failures before setting. These latched failures are cleared after power up or reset.
Bit 5	Gyro	
Bit 6	Accelerometer	
Bits 7-10	Gyro Sensor	0=OK, 1=Failed Bit 7 checks sensor voltage levels. Bits 8-10 check that Gyros X, Y, and Z are individually functioning.
Bit 11-14	Reserved	N/A
Bit 15	IMU OK	0=OK, 1=Failed

STATUS WORD 2A TABLE		
Bit	Definition	Notes
Bit 0-7	Software Version Number	00 01 10 11
Bit 8	Gyro Health 1	0=OK, 1=Failed
Bit 9	Start data flag	0=sensor data, 1=0x5555 data transmitted for synchronization
Bit 10	Process Test	0=OK, 1=Failed
Bit 11	Memory Test	0=OK, 1=Failed
Bit 12	Electronics Test (ASIC)	0=OK, 1=Failed
Bit 13	Gyro Health 2	0=OK, 1=Failed
Bit 14	Accelerometer Health	0=OK, 1=Failed
Bit 15	Status Word 2X flag	0=2A

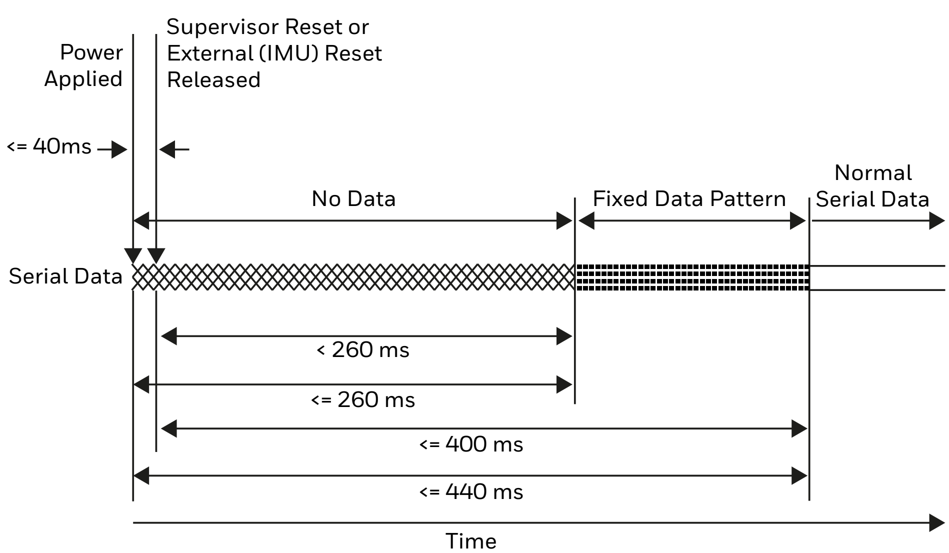
STATUS WORD 2B TABLE		
Bit	Definition	Notes
Bit 0-7	Accelerometer X Temperature	LSB=1°C, Not Calibrated
Bits 8-14	Identical to Field Status Word 2A	
Bit 15	Status Word 2X flag	1=2B

POWER UP DESCRIPTION

The serial data interface is operational within 300 milliseconds after the last applied power form is within the specified tolerances and the reset line is inactive.

The IMU transmits a fixed pattern 0x5555 (Hex) in place of Control sensor data and 0x55555555 (Hex) in place of Inertial sensor data until the completion of Power Up BIT.

The IMU completes Power Up BIT and report the results within 400 milliseconds after power is within specified tolerances and IMU Reset is inactive.



MECHANICAL DRAWING AND INSTALLATION

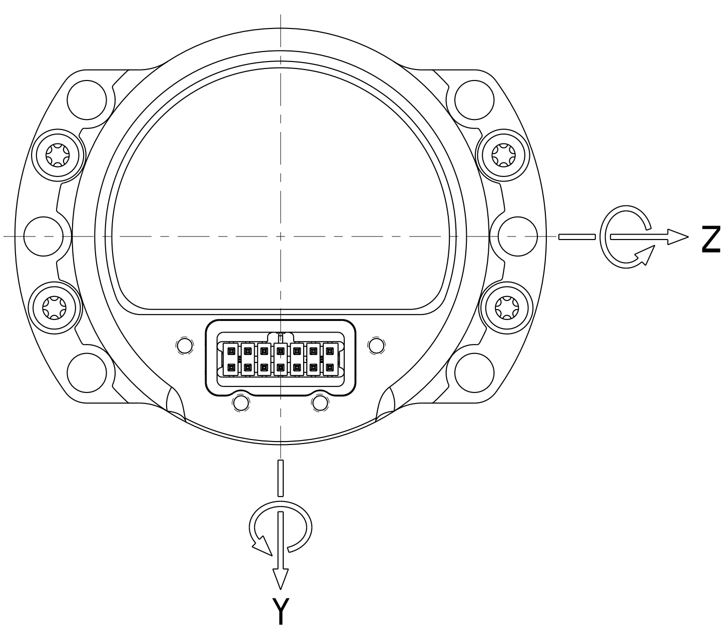
A CAD compatible STP file is available from Honeywell upon request. The typical IMU weight is 140 grams (0.3 lbs).

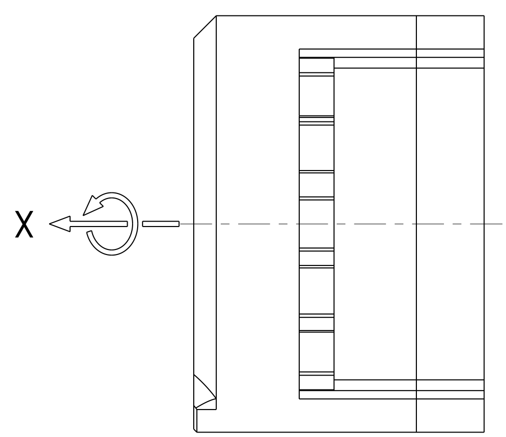
Honeywell recommends a #2-56 UNC 2B screw (2ea) torqued to 4.25 in-lbs for the I/O connector. Length is determined by evaluating the thickness of the mating connector assembly.

IMUs are precision instruments which measure angular rate and linear acceleration across a broad temperature range. Because of their precision, users can interpret real motion (both angular and linear) as sensor noise. This noise can often be coupled mechanically through the mounting plate. Installation on a thin structure is generally not desirable. Placement at anti-nodes will minimize angular rotation and maximize linear displacement. Placement at nodes will maximize angular rotation and minimize linear displacement.

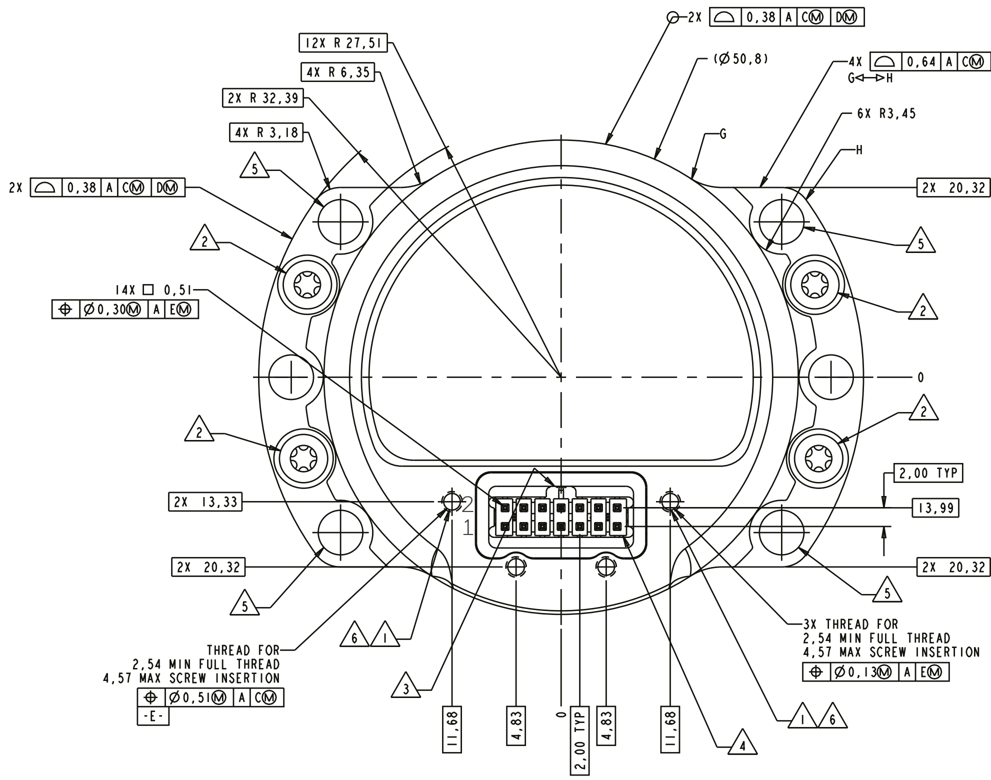
This device has been designed to meet stringent EMI and EMC requirements, and as such, the user should shield the I/O cabling and provide chassis ground connection to the IMU housing.

The IMU should not be subjected to contact with any fuels, lubricants, solvents, or their vapors. The IMU shall operate in a 10% helium environment.





INSTALLATION DRAWING



1 - A. MAX SCREW EXTENSION .180 FROM TOP SURFACE, .100 MIN SCREW INSERTION RECOMMENDED

B. DO NOT SOLDER INTERCONNECT, SEAL INTEGRITY CAN BE COMPROMISED

2 - DO NOT REMOVE SCREWS OR SEAL INTEGRITY WILL BE COMPROMISED)

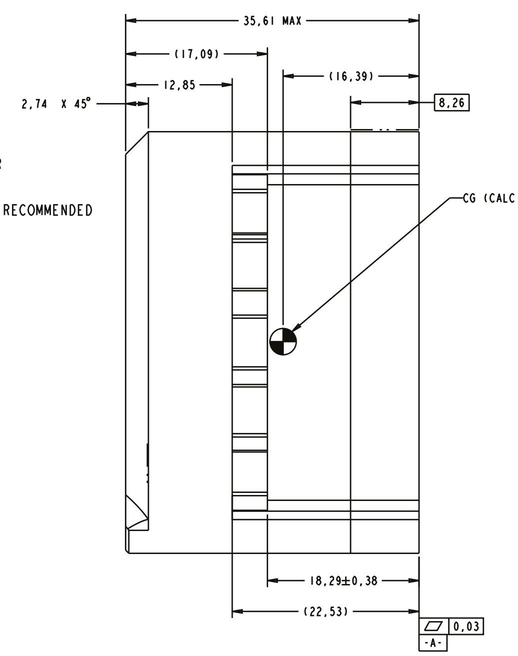
3 - A KEYING FEATURE IS PROVIDED TO ADDRESS MISORIENTATION OF CONNECTOR INTERFACE. IMPROPER ORIENTATION CAN CAUSE IMU DAMAGE

4 - DEVICE CONNECTOR SAMTEC PART NUMBER MTMM-107 SERIES. MATES WITH SAMTEC CLT SERIES CONNECTOR, KEYED CONNECTOR SAMTEC PART NUMBER ASP-115812-01

5 - MOUNT DEVICE WITH FOUR .164-32UNC SCREWS (100kpi MIN TENSILE STRENGTH) TORQUED TO 25 IN-LBS MIN, 32 IN-LBS RECOMMENDED

6 - A. SPIRALOCK THREAD FORM .086-56SL MINOR Ø .074 - .077 THREAD FORM PROPRIETARY TO SPIRALOCK CORP, MADISON HEIGHTS, MI. THREAD TOOLING, GAGING AND IGAGE CERTIFICATION AVAILABLE

B. REFERENCE ONLY : TORQUE SCREWS TO 4.25 IN-LBS MAX

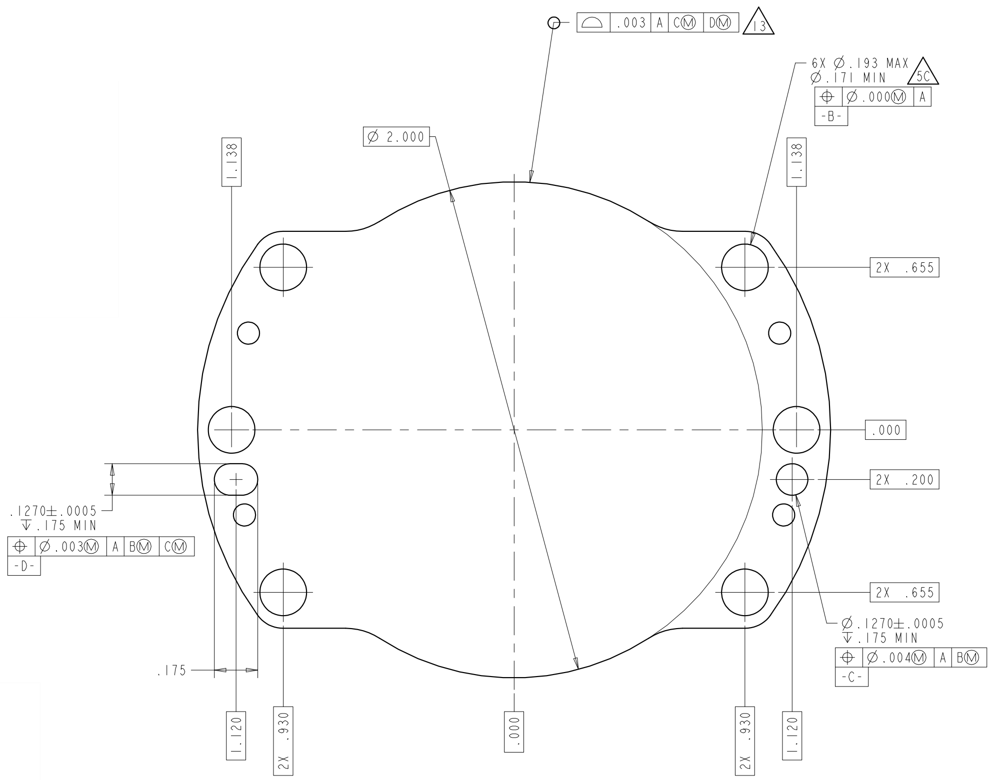


Dimensioning and tolerancing IAW ANSI Y14.5M-1982.

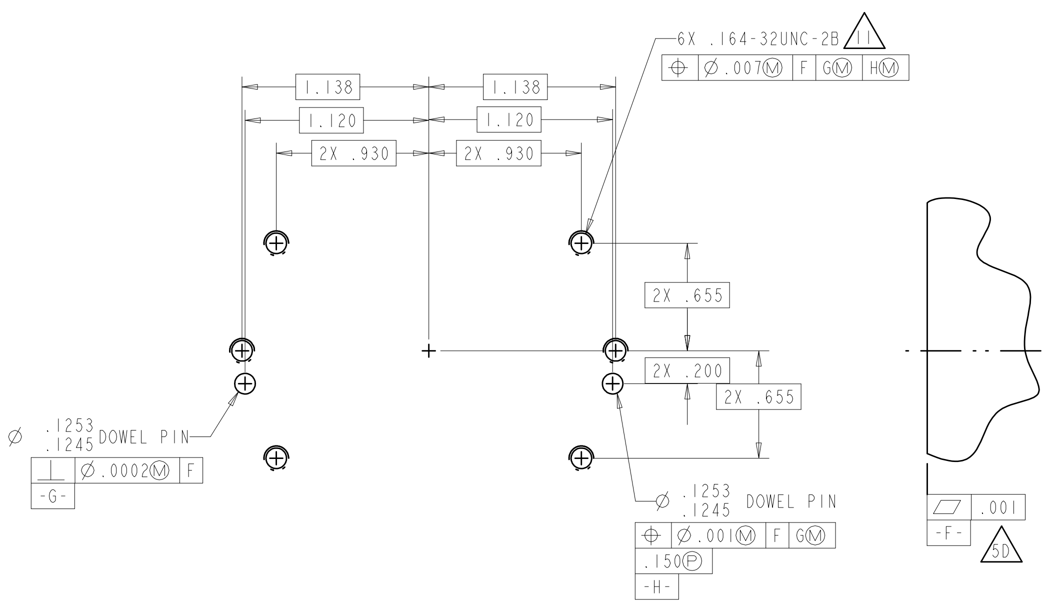
All dimensions are in millimeters.

STP file available from Honeywell.

BOTTOM VIEW



RECOMMENDED MOUNTING



GYRO DEFINITIONS

GYRO BIAS IN RUN STABILITY

In-run gyro bias stability is a measure of random variation in bias as computed over a specified sample time and averaging time interval. This non-stationary (evolutionary) process is characterized by 1/f power spectral density. It is typically expressed in °/hr and measured using the Allan Variance method.

GYRO BIAS REPEATABILITY

Gyro bias repeatability is defined as the residual output bias error after calibration and internal compensation, including the effects of turn-off and turn-on, time, and temperature variations. This measure represents the statistical expected value for output bias error at any given time and thermal condition.

GYRO VIBRATION RECTIFICATION ERROR (VRE)

Gyro vibration rectification error is a measure of the apparent shift in gyro steady state bias error as a function of a change in the applied vibration level. This effect may be nonlinear with vibration level, and may also depend on the spectrum.

GYRO OUTPUT SCALE FACTOR (SF)

The ratio of a change in output to a change in the input intended to be measured. Scale factor is generally evaluated as the slope of the straight line that can be fitted by the method of least squares to input-output data.

GYRO SCALE FACTOR REPEATABILITY

Gyro SF repeatability is defined as the residual output SF error, after calibration and internal compensation, including the effects of turn-off and turn-on, time, and temperature variations. The repeatability error is expressed in ppm of the output angular rate. For low rates (< 100 °/s), gyro SF repeatability is considered inclusive of the linearity error and static g sensitivity.

GYRO SCALE FACTOR LINEARITY

Gyro SF linearity is a measure of the one sigma deviation of the output from the least squares linear fit of the input-output data expressed in ppm of the output.

GYRO ANGLE RANDOM WALK (ARW)

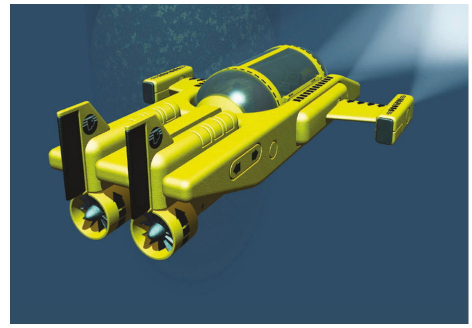
ARW is the angular error buildup with time due to white noise in angular rate expressed in °/√hr.

GYRO FREQUENCY RESPONSE

The gyro frequency response is defined as the total IMU transfer function, from linear acceleration input to digital acceleration data being made available to the customer. This includes the isolator, the actual sensor, the IMU processing delay, and any incorporated filters.

GYRO OPERATING RATE RANGE

Gyro operating rate range is the maximum angular rate input in both directions at which the IMU rate output performance parameters apply.



ACCELEROMETER DEFINITIONS

ACCELEROMETER BIAS IN RUN STABILITY

In-run accelerometer bias stability is a measure of random variation in bias as computed over a specified sample time and averaging time interval. This non-stationary (evolutionary) process is characterized by 1/f power spectral density. It is typically expressed in mg and measured using the Allan Variance method.

ACCELEROMETER BIAS REPEATABILITY

Accelerometer bias repeatability should be defined as the residual output bias error after calibration and internal compensation, including the effects of turn-off and turn-on, time, and temperature variations. This measure represents the statistical expected value for output bias error at any given time and thermal condition.

ACCELEROMETER VIBRATION RECTIFICATION ERROR (VRE)

Accelerometer vibration rectification error is a measure of the apparent shift in accelerometer bias as a function of a change in the applied vibration level. This effect may be nonlinear with vibration level, and may also depend on the spectrum.

ACCELEROMETER SCALE FACTOR (SF)

The ratio of a change in output to a change in the input intended to be measured. Scale factor is generally evaluated as the slope of the straight line that can be fitted by the method of least squares to input-output data.

ACCELEROMETER SCALE FACTOR REPEATABILITY

SF repeatability is defined as the residual output SF error after calibration and internal compensation, including the effects of turn-off and turn-on, time, and temperature variations. The repeatability error is expressed in ppm of the output acceleration. For under 1 g, accelerometer scale factor repeatability sis inclusive of the linearity error.

LINEARITY ERROR

Accelerometer SF linearity error is a measure of the one-sigma deviation of the output from the least squares linear fit of the input-output data expressed in ppm of the output. The linearity error under 1 g is typically negligible.

ACCELEROMETER VELOCITY RANDOM WALK (VRW)

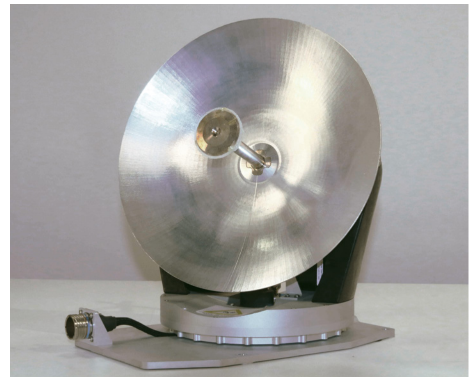
VRW is the velocity error buildup with time due to white noise in acceleration expressed in m/sec/√hr.

ACCELEROMETER FREQUENCY RESPONSE

The accelerometer frequency response is defined as the total IMU transfer function, from linear acceleration input to digital acceleration data being made available to the customer. This includes the isolator, the actual sensor, the IMU processing delay, and any incorporated filters.

ACCELEROMETER OPERATING RATE RANGE

Accelerometer operating rate range is the maximum linear acceleration input in both directions at which the IMU acceleration output performance parameters apply.



Export Guidance
All technology that leaves the United States is subject to export regulations. This manual contains technology that has an Export Commodity Classification of EAR99. This technology generally will not require a license to be exported or reexported. However, if you plan to export this item to an embargoed or sanctioned country, to a party of concern, or in support of a prohibited end-use, you may be required to obtain a license.

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