

INSTALLATION INSTRUCTIONS FOR THE TRANSPORTATION ATTITUDE REFERENCE SYSTEM TARS-B SERIES

3011-2912-001
Issue A

1.0 GENERAL INFORMATION

Honeywell's Transportation Attitude Reference System (TARS) Ruggedized Inertial Measurement Unit (IMU) is designed to provide motion sensing with six degrees of freedom by reporting angular rate, acceleration, and attitude data through a CAN J1939 interface. It is ruggedized to withstand harsh environments and demanding applications.

2.0 CALIBRATION

TARS-IMU devices are calibrated on an aerospace-grade rate table providing consistency between units and minimizing the customer's need to calibrate the IMU.

3.0 INSTALLATION

Mount the sensor using the three mounting holes and three M8 bolts. The mounting tabs accommodate various bolt head styles, such as hex, socket head cap, and hex flange bolt head. Torque to 20 Nm \pm 2 Nm.

Mating connector is AMPSEAL 16™ Series, 776487-1 for 18-16 AWG conductors or 776524-1 for 20-18 AWG conductors.

4.0 SPECIFICATIONS

See Tables 1 through 6 and Figures 1 through 4.

TABLE 1. SENSOR SPECIFICATIONS

Characteristic	Parameter
Gyroscope 3 axis performance	
Range	\pm 500 deg/s
Resolution	7.81 mdps
In-run bias stability	3.8 deg/hr
Noise density	14 mdps/ $\sqrt{\text{Hz}}$
Offset (0°C to 50°C)	\pm 0.5 deg/s
Offset (-40°C to 85°C)	\pm 1.1 deg/s
Accelerometer 3 axis performance	
Range	\pm 58.84 m/s ²
Resolution	0.01 m/s ²
In-run bias stability	30 μ g
Noise density	92 μ g/ $\sqrt{\text{Hz}}$
Offset (0°C to 50°C)	\pm 0.04 m/s ²
Offset (-40°C to 85°C)	\pm 0.06 m/s ²
Inclination (pitch and roll)	
Range (roll/pitch)	\pm 180/ \pm 90 deg
Resolution	0.01 deg
Static error (0°C to 50°C)	\pm 0.3 deg
Static error (-40°C to 85°C)	\pm 0.5 deg
Translational acceleration error	\pm 0.3 deg
Centripetal acceleration error	\pm 0.3 deg

TABLE 2. ELECTRICAL SPECIFICATIONS

Characteristic	Min.	Typ.	Max.	Unit
Supply voltage	9	12/24	36	V
Supply current	–	–	100	mA
Reverse voltage	–	–	-36	V
Overvoltage	–	–	36	V
Start-up time	500	–	2000	ms
Short circuit protection	ISO 16750-2: 2012 – CAN output shorted to supply voltage or ground without damage			
Open circuit protection	ISO 16750-2: 2012 – Single-line and multiple-line interruption			
Power interruption	ISO 11783-5: 2009 – 10 ms interruption, 100 ms apart; no resets or loss of data in volatile memory			
Reset response	ISO 16750-2: 2012 – Automatic recovery after voltage dropout			
Power line test pulse 1	ISO 7637-2: 2004 AMD1: 2008 / 12 V and 24 V system			
Power line test pulse 2a	ISO 7637-2: 2004 AMD1: 2008 / 12 V and 24 V system			
Power line test pulse 2b	ISO 7637-2: 2004 AMD1: 2008 / 12 V and 24 V system			
Power line test pulses 3a and 3b	ISO 7637-2: 2004 AMD1: 2008 / 12 V and 24 V system			
Load dump	ISO 16750-2: 2012 / 12 V and 24 V system			

CAN output characteristics per SAE J1939

Characteristic	Min.	Typ.	Max.	Unit
Baud rate	125	250 ¹	500	kbps
Broadcast rate	–	–	200 ²	Hz

¹ Factory default setting is 250 kbps.

² Factory default setting is 100 Hz.

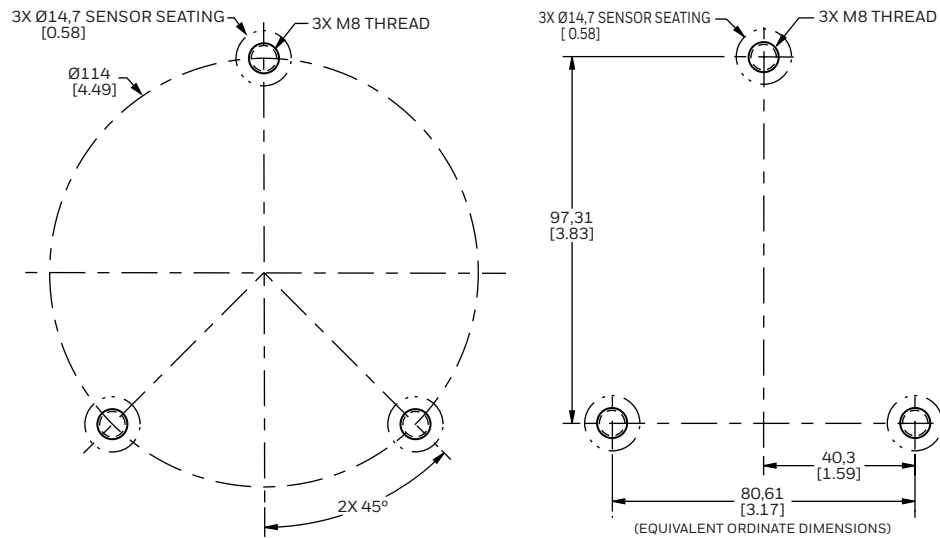
TABLE 3. ENVIRONMENTAL SPECIFICATIONS¹

Characteristic	Parameter
Operating temperature	-40°C to 85°C [40°F to 185°F]
Storage temperature ²	-40°C to 105°C [40°F to 221°F]
Housing	PBT thermoplastic
Random vibration	9 hours per axis at 16.91 Grms per MIL-STD-202, Method 214, Test Condition I, Letter E, 50 Hz to 2000 Hz
Mechanical shock	50 g 11 ms half-sine, 3 each direction, 18 total, pulse per MIL-STD-202, Method 213
Chemical compatibility	diesel fuel, hydraulic oil, ethylene glycol, motor oil, brake fluid, urea nitrogen, liquid lime, NPK fertilizer, ammonium hydroxide, alkaline degreaser, transmission oil, power steering fluid, and axle oil
Moisture resistance	per MIL-STD-202, Method 106 (10 cycles, 24 hours/cycle)
Thermal shock	250 cycles, -40°C to 85°C, 73 min dwell
Salt spray	5 % salt solution, 96 hours
Ingress protection	IP67, IP69K (DIN40050-1993) with mating connector installed
RoHS	compliant
REACH	compliant
UV rating	housing material meets outdoor suitability requirements per UL746C F1 rating

¹ For environmental conditions not covered by product specification, consult with Honeywell Engineering.

² In installed condition; otherwise, maximum storage temperature is 85°C [185°F].

FIGURE 3. MOUNTING HOLES DIMENSIONS (FOR REFERENCE ONLY: mm [in])



OPTIONAL PROTECTIVE SHIELD

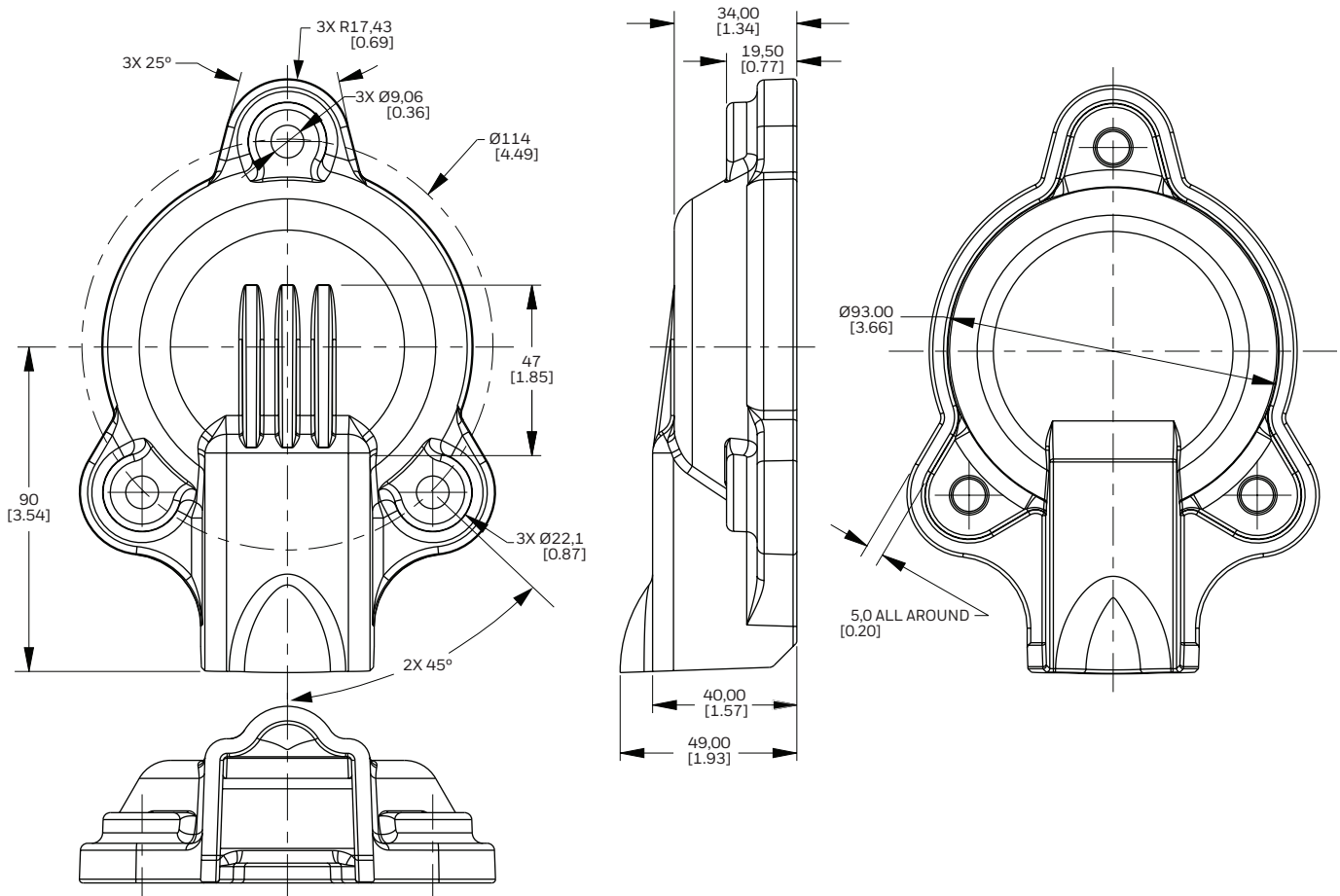
NOTICE

If the the sensor is to be used in direct gravel bombardment, or in any other environment where physical strikes are likely, install a protective shield from Honeywell (see Figure 4 and Table 6) or equivalent over the sensor.

TABLE 6. ORDER GUIDE

Catalog Listing	Description
TARS-SHIELD	Zinc, die-cast protective shield for use with the TARS-B Series.

FIGURE 4. TARS SHIELD DIMENSIONS (FOR REFERENCE ONLY: mm [in])



5.0 CAN MESSAGES AND COMMUNICATION

TARS-IMU utilizes CAN J1939 protocol and message format to report data. Please refer to the J1939 standard for information regarding communications and system implementation.

CAN J1939 DEVICE IDENTIFICATION

The ID is a 4-byte value that identifies the message being transmitted. The J1939 Protocol Data Unit (PDU) 29-Bit Identifier (CAN Extended Format) definition does not include the following three CAN Data Frame Bits: Start of Frame (SOF), Substitute Remote Request (SRR), and Identifier Extension Bit (IDE), as these bits are controlled entirely by ISO 11898-1. The J1939 PDU is comprised of a 29-bit identifier (see Table 7): Priority (P), Data Page (DP and EDP), PDU Format (PF), PDU Specific (PS), and Source Address (SA). Additionally, the PDU may also include a 0-8-byte data field that changes in length and definition based upon the message.

TABLE 7. 29-BIT IDENTIFIER (J1939 FRAME FORMAT)

Field	P (Priority)			E D P	D P	PF (PDU Format)								PS (PDU Specific)								SA (Source Address)							
# Bits	3			1	1	8								8								8							
Bit ID Position	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

5.1 TARS-IMU BROADCAST MESSAGES

The TARS-IMU transmits broadcast data as configured by the broadcast rate. The broadcast rate may be set independently for each message, up to a maximum rate of 200 Hz.

5.1.1 PGN 61481 (0XF029) PITCH AND ROLL BROADCAST DATA

The example below is a message for 0 deg on both pitch and roll in the Z-down format with priority 3, fully functional and compensated MEMS with 2.5 ms latency from address 0xE2.

TABLE 8. PGN 61481 PDU

Frame Format	29-Bit ID						Data (8 Bytes)								
Field	P	EDP	DP	PF	PS	SA	Pitch Angle ¹			Roll Angle ¹			Status ²	Latency	
# Bits	3	1	1	8	8	8	8	8	8	8	8	8	8	8	8
CAN Message	0x0C			0xF0	0x29	0xE2	0x00	0x00	0x7D	0x00	0x00	0x7D	0x00	0x05	
							BL	BM	BH	BL	BM	BH			

¹Angle (deg) = (B_H * 2¹⁶ + B_M * 2⁸ + B_L - 8,192,000) / 2¹⁵

²The status byte is comprised of fusion algorithm compensation status and MEMS status.

TABLE 9. PGN 61481 STATUS

Type	COMP Pitch		MEMS Pitch		COMP Roll		MEMS Roll	
# Bits	2		2		2		2	
Bit ID Position	7	6	5	4	3	2	1	0
CAN Message	00b		00b		00b		00b	

All status definitions are defined as:

00b: Fully functional

01b: Degraded

10b: Error

11b: Not available

5.1.2 PGN 61482 (0xF02A) ANGULAR RATE BROADCAST DATA

The example below is a message for 0 deg/s on pitch rate, roll rate, and yaw rate in Z-down format with priority 3, fully functional MEMS with 2.5 ms latency from address 0xE2.

TABLE 10. PGN 61482 PDU

Frame Format	29-BIT ID						DATA (8 BYTES)							
Field	P	EDP	DP	PF	PS	SA	Pitch Rate ¹		Roll Rate ¹		Yaw Rate ¹		Status ²	Latency
# Bits	3	1	1	8	8	8	8	8	8	8	8	8	8	8
CAN Message	0x0C		0xF0	0x2A	0xE2	0x00	0x7D	0x00	0x7D	0x00	0x7D	0x00	0x05	
							BL	BH	BL	BH	BL	BH		

¹Angular Rate (deg/s) = (B_H * 2⁸ + B_L - 32,000) / 2⁷

²The status byte is comprised of MEMS status for each data message.

TABLE 11. PGN 61482 STATUS

Type	Pitch		Roll		Yaw		Unused	
# Bits	2		2		2		2	
Bit ID Position	7	6	5	4	3	2	1	0
CAN Message	00b		00b		00b		00b	

All status definitions are defined as:

- 00b:** Fully functional
- 01b:** Degraded
- 10b:** Error
- 11b:** Not available

5.1.3 PGN 61485 (0xF02D) ACCELERATION BROADCAST DATA

The example below is a message for 0 m/s² on lateral and longitudinal acceleration, and +1 g (9.81 m/s²) on vertical acceleration in Z-up format with priority 3, fully functional MEMS from address 0xE2.

TABLE 12. PGN 61485 PDU

Frame Format	29-Bit ID						Data (8 Bytes)							
Field	P	EDP	DP	PF	PS	SA	Lateral ¹		Longitudinal ¹		Vertical ¹		Status ²	Unused
# Bits	3	1	1	8	8	8	8	8	8	8	8	8	8	8
CAN Message	0x08		0xF0	0x2D	0xE2	0x00	0x7D	0x00	0x7D	0xD5	0x80	0x00	0x00	
							BL	BH	BL	BH	BL	BH		

¹Acceleration (m/s²) = (B_H * 2⁸ + B_L - 32,000) / 100

²The status byte is comprised of MEMS status for each data message.

TABLE 13. PGN 61485 STATUS

Type	Lateral		Longitudinal		Vertical		Unused	
# Bits	2		2		2		2	
Bit ID Position	7	6	5	4	3	2	1	0
CAN Message	00b		00b		00b		00b	

All status definitions are defined as:

- 00b:** Fully functional
- 01b:** Degraded
- 10b:** Error
- 11b:** Not available

5.2 TARS-IMU COMMAND MESSAGES

5.2.1 ZEROING FUNCTION

The zeroing function allows users to remove mounting orientation variations. Users may use fixed values, known values, or automated zeroing commands. Zeroing may be done repeatedly, if necessary. The results are stored in non-volatile memory. For more details on the use of the Zeroing function, refer to Honeywell document 3011-2915-001.

5.2.1.1 61184 (0XEF00) ZEROING FUNCTION

The example below is a message to automatically set the roll and pitch to 0 deg.

TABLE 14. ZEROING PGN 61184

Frame Format	29-Bit ID						Data (8 Bytes)						
Field	P	EDP	DP	PF	PS	SA	ID	Cmd ²	Roll ¹	Pitch ¹	Yaw ¹		
# Bits	3	1	1	8	8	8	8	8	8	8	8		
CAN Message	0x19		0xEF	0xE2	0xF6	0x02	0x68	0x00	0x00	0x00	0x00	0x64	0x80
								BL	BH	BL	BH	BL	BH

¹Angle (deg) = (BH* 2⁸ + BL – 2¹⁵) / 100

PS: Destination Address

Roll/Pitch/Yaw: RPY value (0,0,0)

²Zeroing command.

SA: Requester Address

TABLE 15. ZEROING COMMAND

Type	All	Roll	Pitch	Yaw
# Bits	2	2	2	2
Bit ID Position	7	6	5	4
CAN Message	01b	10b	10b	00b

All status definitions are defined as:

- 00b:** No action
- 01b:** Set
- 10b:** Add
- 11b:** Reserved

Set All: Resets the zeroing roll/pitch/yaw to RPY (0,0,0).

Set Roll/Pitch/Yaw: Replaces the zeroing roll/pitch/yaw with the PGN RPY value.

Add Roll/Pitch: Updates the existing zeroing roll/pitch with the difference between the supplied PGN and the TARS device measured value.

5.2.2 CORRECTED ACCELERATION FUNCTION

The corrected acceleration function allows utilization of acceleration data from the machine ECU to help improve the quality of the calculated pitch and roll angles. For more details on the use of the Corrected Acceleration function, refer to Honeywell document 3011-2916-001.

5.2.2.1 PGN 61184 (0XEF00) CORRECTED ACCELERATION COMMAND

TABLE 16. CORRECTED ACCELERATION PGN 61184

Frame Format	29-Bit ID						Data (8 Bytes)						
Field	P	EDP	DP	PF	PS	SA	ID	Lateral ¹	Longitudinal ¹	Vertical ¹	Status ²		
# Bits	3	1	1	8	8	8	8	8	8	8	8		
CAN Message	0x19		0xEF	0xE2	0xF6	0xA1	0x00	0x7D	0x00	0x7D	0x00	0x7D	0x01
								BL	BH	BL	BH	BL	BH

¹Acceleration (m/s²) = (B_H * 2⁸ + B_L – 32,000) / 100

PS: Destination Address

²Machine status: Only two bits are used to describe the machine motion.

SA: Requester Address

- 0x00 00B Moving
- 0x01 01B Stationary
- 0x02 10B Unused
- 0x03 11B Invalid

6.0 TARS FIRMWARE

6.1 DESCRIPTION

The TARS-IMU contains two different user-updatable firmware files: application firmware and a configuration file. Both files must be loaded on the TARS-IMU for correct operation. The general sales listings are supplied from the Honeywell factory preloaded with application firmware and a configuration file.

Follow the instructions given below to download the latest application firmware from the web:

1. Go to <https://sps.honeywell.com/us/en/products/advanced-sensing-technologies/aero-and-transportation-sensing/aero-and-transportation-sensors/motion-and-position-sensors/inertial-measurement-units>
2. Select the "TARS-B Series" tile.
3. Select the "Resources" tab.
4. Scroll down to the "Software" section for available downloads.

Software tools for installing these files onto the TARS-IMU are also available at this location.

NOTICE **FIRMWARE REVISION**

When evaluating TARS-IMU for new applications, it is highly recommended that the latest application firmware be used to realize the latest advancements in performance.

6.2 APPLICATION FIRMWARE

The application firmware contains the TARS-IMU sensor fusion algorithm. As advancements and improvements are realized, application firmware updates are made available for download at the Honeywell website referenced in Section 6.1. Customers may update the application firmware if a new feature is desired or to access the latest performance improvements.

6.3 CONFIGURATION FILE

The configuration file defines settings for all variables in the application firmware. The configuration file facilitates simplified customization of the TARS-IMU. Parameters, such as mounting orientation at which pitch and roll output zero degrees, preferred CAN bus address, broadcast rate, filter settings, etc., may be set in the configuration file. Once settings are determined for an application, they may be saved using a unique name for the configuration file. This enables the same hardware, e.g., TARS-BAASS, to be customized for one application using configuration file A, and quickly customized for another application using configuration file B, etc. The TARS-IMU may be customized at the point of installation by loading the appropriate configuration file.

6.4 FIRMWARE DEPLOYMENT

As described in Section 6.3, the configuration file may be used to allow the same TARS-IMU hardware to be configured for many different applications. Similarly, the application firmware may be deployed at the point of installation. Applying the application firmware and the configuration file at the point of installation allows for deployment of firmware with minimal part numbers established for purchase. If preferred, the TARS-IMU may be preloaded with specific application firmware and configuration file and identified by a unique catalog listing, TARS-BAASS-NNN, where NNN designates a unique 3-digit number.

7.0 TARS CONFIGURATOR TOOL (TCT) SOFTWARE

7.1 DESCRIPTION

The TARS-IMU may be customized to best meet application needs by using the TCT software to change selected parameters, such as broadcast rate, orientation, filter settings, etc. This tool creates a unique configuration file which is then uploaded to the TARS-IMU for implementation.

**⚠ WARNING
PERSONAL INJURY, EQUIPMENT DAMAGE**

Ensure TCT software users understand how:

- The TARS-IMU output is used in the end application.
- The TARS-IMU output impacts the function and safety of the products in which it will be used.
- Potentially hazardous operating conditions may result from the activity or non-activity of a control system responding to the output of a TARS-IMU that has been customized by a configuration file created with the TCT software.
- Implementing a configuration file in a TARS-IMU that is unsuitable for an application may result in damage to equipment, the surrounding environment, and/or injuries to personnel. Risks exist so long as the unique configuration file is loaded on the TARS-IMU.

Failure to comply with these instructions could result in death or serious injury.

7.2 IMPORTANT USER INFORMATION

**NOTICE
USER HELP**

The information in this section (7.0) provides an overview of the TCT software and is not intended to provide a complete review of its functionality. For user help:

- Refer to the "TARS Configurator User Manual" available under the TCT software "Help" menu item.
- To view additional information about customizable parameters, hover over these items in the TCT software and a grey box will appear containing the information.

7.3 TCT SOFTWARE DOWNLOAD

To access the TCT software, see Section 6.1 for instructions on how to find the available TARS-IMU software. Download the file "TARS Configurator Tool" to a location of your choice on your computer. Activate by double-clicking on the .exe file.

7.4 CONFIGURATION FILE MANAGEMENT

Configuration files are saved using the following standard memory storage formats:

- Motorola S record (.srec)
- Intel Hex format (.hex)

Configuration files may be created and downloaded to the TARS- IMU. The configuration file currently loaded on a TARS-IMU may be read and saved.

7.5 ORIENTATION AXIS AND COORDINATE SYSTEM

The TARS-IMU is oriented using the North/East/Down convention (see Figure 5):

- X axis facing forward
- Y axis facing right
- Z axis facing down

The extrinsic axis frame of reference for the TARS-IMU is as follows:

- X axis = positive at front side
- Y axis = positive at right side
- Z axis = positive at bottom side

FIGURE 5. TARS-IMU AXES

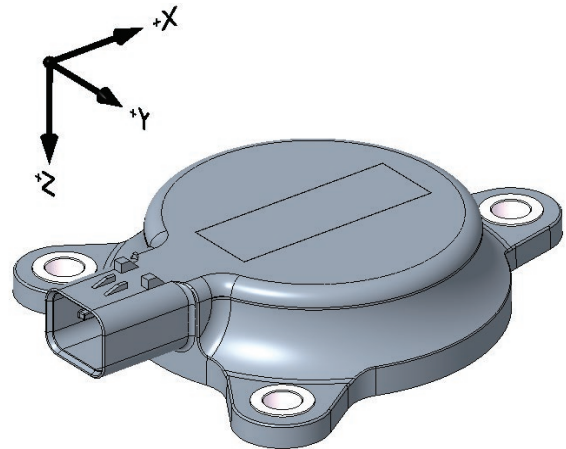


TABLE 17. TARS-IMU ORIENTATION

Configuration ¹	Positive Rotation ²	Description
Yaw	clockwise	rotation about the Z axis
Pitch	clockwise	rotation about the Y axis
Roll	clockwise	rotation about the X axis

¹Orientation is configured in the order of yaw, pitch, roll.

²Positive rotation is established using the right-hand rule.

7.6 CUSTOMIZABLE PARAMETERS

The TCT software facilitates adjustment of the following parameters within range limits.

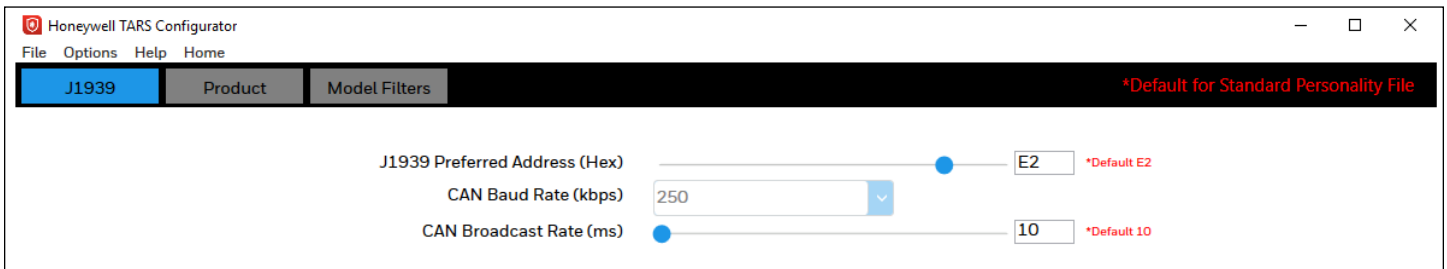
7.6.1 J1939 TAB (SEE FIGURE 6)

7.6.1.1 J1939 Preferred Address. Assigns a unique CAN bus address.

7.6.1.2 CAN Baud Rate. Sets the rate at which data is transferred.

7.6.1.3 CAN Broadcast Rate. Sets a controlled update rate for the broadcast of PGNs.

FIGURE 6. J1939 TAB



7.6.2 INDEPENDENT BROADCAST RATES

The CAN broadcast rates for the broadcast messages described in Section 5.1 are set from the product of the CAN Broadcast Rate and a multiplier. In the example below, the CAN Broadcast Rate used is 10 ms. This allows for a broadcast of messages at independent rates that may be selected from a wide range, including off (multiplier of 0).

Acceleration broadcast rate multiplier	<input type="text" value="0"/>	Acceleration message broadcast rate (ms)	<u>Off</u>
Angular rate broadcast rate multiplier	<input type="text" value="2"/>	Angular message broadcast rate (ms)	<u>20</u>
Pitch and roll broadcast rate multiplier	<input type="text" value="225"/>	Pitch and Roll message broadcast rate (ms)	<u>2,550</u>

7.6.3 PRODUCT TAB (SEE FIGURE 7)

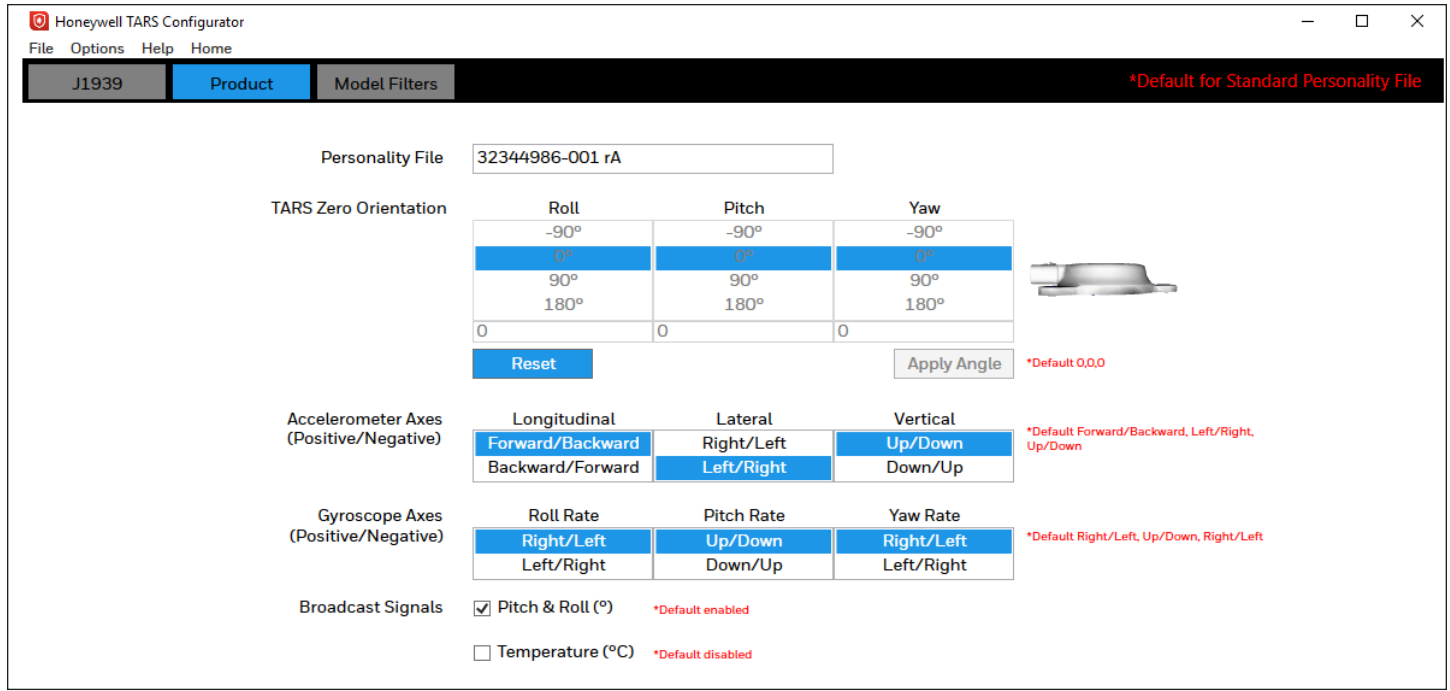
7.6.3.1 TARS Zero Orientation. Sets the orientation at which the pitch and roll outputs will read zero degrees when mounted to machinery (see also Figure 5).

7.6.3.2 Accelerometer Axes. Alters the sign convention for acceleration output.

7.6.3.3 Gyroscope Axes. Alters the sign convention for angular rate output.

7.6.3.4 Broadcast Signals. Selects to broadcast pitch and roll angles and/or an uncalibrated temperature output. Refer to Section 7.6.4 for an additional option to independently turn on/off broadcast messages, including acceleration and angular rate.

FIGURE 7. PRODUCT TAB



7.6.4 MODEL FILTERS

Figure 8 shows an overview of the data flow through the TARS-IMU and Figure 9 shows the available filters.

FIGURE 8. DATA FLOW BLOCK DIAGRAM

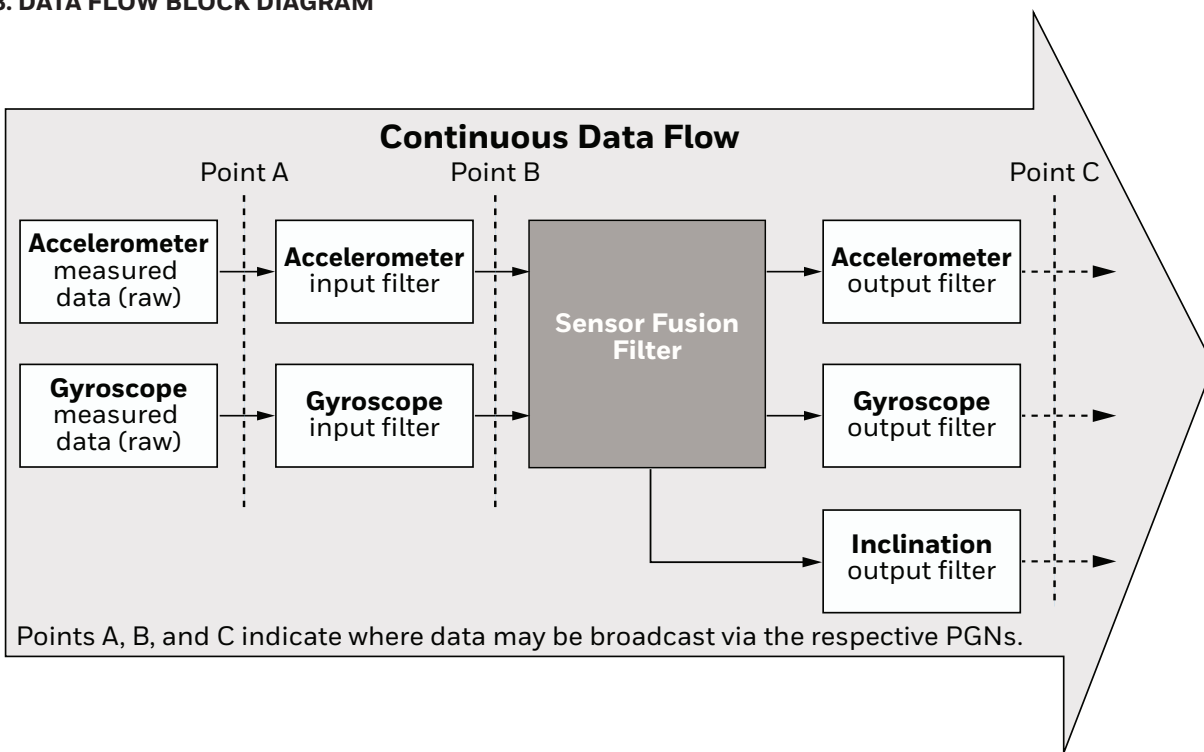
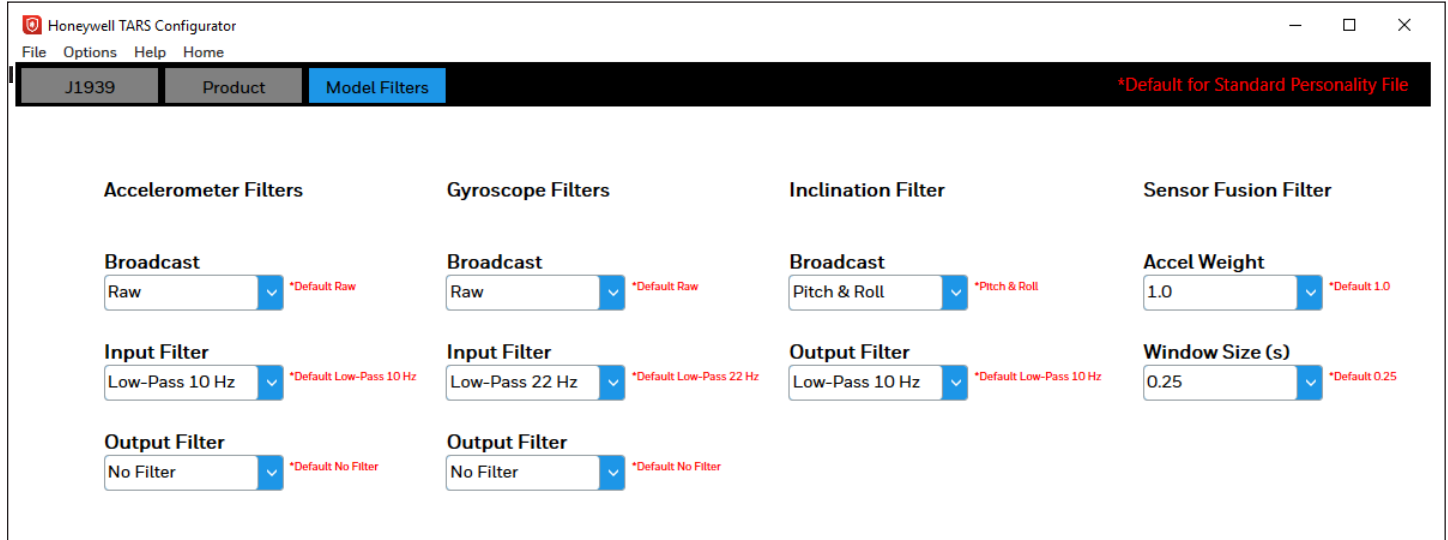


FIGURE 9. MODEL FILTERS TAB



7.6.4.1 Accelerometer Filters. The Input Filter and Output Filter fields allow for application of filters before and after the Sensor Fusion Filter. The Broadcast field selects the data to be broadcast to PGN61485. The following settings are available. (Refer to Figure 8 for location of Points A, B, and C):

- **Off:** Turns off data broadcast.
- **Raw:** Broadcasts data from Point A.
- **Input:** Broadcasts data from Point B.
- **Output:** Broadcasts data from Point C.

7.6.4.2 Gyroscope Filters. The Input Filter and Output Filter fields allow for application of filters before and after the Sensor Fusion Filter. The Broadcast field selects the data to be broadcast to PGN61482. The following settings are available. (Refer to Figure 8 for location of Points A, B, and C):

- **Off:** Turns off data broadcast.
- **Raw:** Broadcasts data from Point A.
- **Input:** Broadcasts data from Point B.
- **Output:** Broadcasts data from Point C.

7.6.4.3 Inclination Filter. The Output Filter field allows for application of a filter after the Sensor Fusion Filter. The Broadcast field selects the data to be broadcast to PGN61481. The following settings are available. (Refer to Figure 8 for location of Point C):

- **Off:** Turns off data broadcast.
- **Pitch & Roll:** Broadcasts data from Point C.

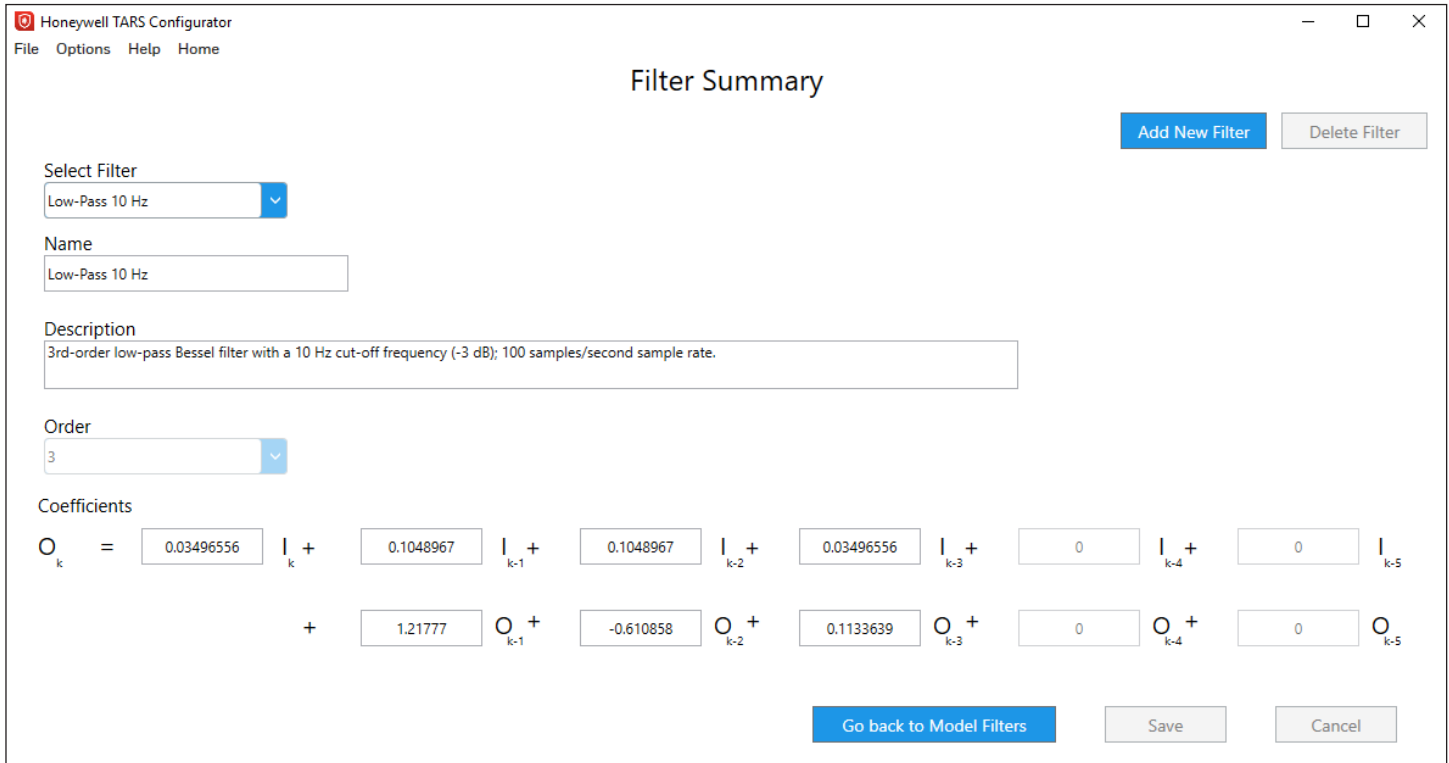
7.6.4.4 Sensor Fusion Filter. This field adjusts the weighting factor on accelerometer data (higher values apply more weight to accelerometer data and less to gyroscope data). Sets the window of time used to monitor incoming data.

7.7 MODEL FILTER MANAGEMENT (FIGURE 10)

The "Filter Summary" page facilitates the following:

- Creation of new input/output filters.
- Adjustment of Bessel filter equation coefficients.

FIGURE 10. FILTER SUMMARY PAGE



Honeywell TARS Configurator
File Options Help Home

Filter Summary

Select Filter

Name

Description

Order

Coefficients

$$\begin{aligned}
 O_k = & \text{0.03496556 } I_k + \text{0.1048967 } I_{k-1} + \text{0.1048967 } I_{k-2} + \text{0.03496556 } I_{k-3} + \text{0 } I_{k-4} + \text{0 } I_{k-5} \\
 & + \text{1.21777 } O_{k-1} - \text{0.610858 } O_{k-2} + \text{0.1133639 } O_{k-3} + \text{0 } O_{k-4} + \text{0 } O_{k-5}
 \end{aligned}$$

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell web site, it is buyer's sole responsibility to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this writing. However, Honeywell assumes no responsibility for its use.

FOR MORE INFORMATION

Honeywell Sensing and Safety Technologies services its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or the nearest Authorized Distributor, visit sps.honeywell.com/ast or call:

USA/Canada	+1 302 613 4491
Latin America	+1 305 805 8188
Europe	+44 1344 238258
Japan	+81 (0) 3-6730-7152
Singapore	+65 6355 2828
Greater China	+86 4006396841

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**⚠ WARNING
PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

**⚠ WARNING
MISUSE OF
DOCUMENTATION**

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

AMPSEAL 16™ is a trademark of Tyco Electronics Services GMBH.