READY RoHS 2002/95/EC

Digital Compass, Roll, Pitch and GNSS Receiver based upon MEMS Technologies

Features

- **1° heading accuracy @ 0.1° resolution - 360°**
- **0.5° repeatability**
- **±60° Tilt Range (Roll and Pitch)**
- **Compensation for Hard Iron Distortions, Ferrous Objects, Stray Fields**
- **7.5Hz response time**
- **20 Channel SiRF StarIII GPS/Galileo receiver**
- **-20° to 70°C Operating Temperature Range**
- **Wide voltage input range (6-36 VDC unregulated supply)**
- **Compact Size (37mm x 52mm x 21mm)**
- **AluTECH ® red anodized aluminum casing**
- **Fix mounting, light weight and good pricing**

General Description

FIKO's **WAY HORIZON 60** is an integrated GPS/Galileo receiver with Compass solution including Roll and Pitch for Attitude and Heading Reference used in geo-referencing, agriculture, navigation, and guidance systems. FIKO uses magnetoresistive sensors from Honeywell, giving the reliability and accuracy required. Compass, Roll and Pitch sensors are based upon sophisticated MEMS technologies that together with single-chip GNSS receiver made it possibilities to develop such small, compact, and low-cost solid state designs. The WAY HORIZON 60 solutions are easily integrated into systems using a UART interface for both BINARY and ASCII formats.

The WAY HORIZON 60 is a 20-channels all-in-view GNSS receiver and has three-axis, tilt compensated compass that uses a two-axis accelerometer for enhanced performance up to a ±60° tilt range.

WAY HORIZON 60 is designed for FIKO's Patent Pending aluTECH casing made in red anodised aluminium extrusion that also comes with fastening bracket for secure fix installations.

WAY HORIZON 60 PCB design with GNSS antenna connection. Data communication are made via RS-232 RxD and TxD. Supply power are connected via the same 9-pin D-SUB data connector.

For Ordering Information see last page

Document:
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Information herein is subject to change without prior notice.

FIKO - WAY HORIZON 60

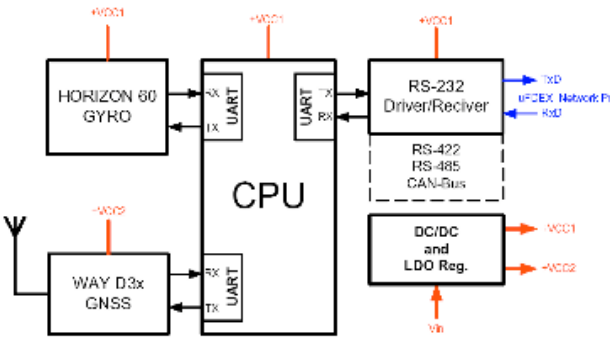
HORIZON 60 APPLICATIONS

manufactured in EUROPE and USA

APPLICATIONS

- Digital Measuring and Compassing
- Field Engineering
- Geo-referencing
- Agricultural management
- Vehicle, Marine and Experimental Aircraft Navigation
- Attitude Reference
- Satellite Antenna Positioning
- Dead tracking
- Platform and goods leveling
- GPS/Galileo Integration

HORIZON 60 Block Diagram



For pricing, delivery, ordering, and dealer list please contact FIKO at +66 53 852-954/5 or visit FIKO's website at www.gnss-tech.com

Revisions:

VERSIONS:	DATE:	APPROVED BY:	DESCRIPTION:
1.0r0.1	1st FEB 2006	Mr. Surachai Woratumgovit – Design Engineer Mr. Prettipong Neevattiyakul – Design Engineer Mr. Apisak W. – Project Manager Mr. Attila Sandor Fiko – Chief Software Architect	First release in new format.
1.0r0.2	24th MAY 2006	Mr. Attila Sandor Fiko – Chief Software Architect	Added data and information

SPECIFICATIONS

Characteristics	Conditions	Min	Typ	Max	Units
Heading					
Accuracy	Level 0° to ±30° ±30° to ±60°		**1.0** **3.0** **4.0**		**Deg RMS**
Resolution			**0.1**		**deg**
Hysteresis			**0.2**	0.4	**deg**
Repeatability			**0.2**	0.4	**deg**
Roll and Pitch					
Range	Roll and Pitch Range		**± 60**		**deg**
Accuracy	0° to ± 30° ± 30° to ± 60°		**0.4** **1.0**	0.5 1.2	**deg**
Null Accuracy*	Level -20° to +70°C Thermal Hysterisis -40° to +85°C Thermal Hysterisis		**0.4** **1.0** **5.0**		**deg**
Resolution			**0.1**		**deg**
Hysteresis			**0.2**		**deg**
Repeatability			**0.2**		**deg**
Magnetic Field					
Range	Maximum Magnetic Flux Density		**± 2**		**Gauss**
Resolution	For 360°		**0.1**		**Milli-gauss**
Electricals					
Input Voltage	Unregulated Regulated	8	**12** **5**	36	**VDC** **VDC**
Current	Active Mode	110	**116**	120	**mA**
Digital Interface					
UART	1 Start, 8 Data, 1 Stop, 0 Parity		**38,400**		**BPS**
Update	Continuous/Strobed/Averaged	7	**8**	8	**Hz**
Connector	9-pin D-sub				

- **Null zeroing prior to use of the WAY HORIZON 60 and upon exposure to temperature excursions beyond the Operating Temperature limits is required to achieve highest performance.**

Characteristics	Conditions	Min	Typ	Max	Units
Physical					
Dimensions	Circuit Board Assembly AluTECH top case		**35x46x10** **37x52x21**		**mm** **mm**
Weight	HORIZON 60 incl. AluTECH housing and fastening bracket.		**75**		**Grams**
Environment					
Temperature	Operating Storage	-20 -55	**-** **-**	+70 +125	**°C** **°C**

9-PIN D-SUB CONNECTOR CONFIGURATION

Pin Number	Pin Name	Description:
1	NC	-
2	RxD	UART Receive Data
3	TxD	UART Transmit Data
4	GND	Power and Signal Ground
5	GND	Power and Signal Ground
6	NC	-
7	NC	-
8	+5VDC*	Regulated Power Input
9	+V*	Unregulated Power Input (+8 to +36 VDC)

***Note: Use either pin 8 (+5VDC) or pin 9 (+V) to power the circuit board. Power from USB cable available.**

INTERNAL WAY D3x GNSS MODULE DATA

GENERAL

Type:	Description:
Chipset	SiRF Star III
Frequency	L1, 1575.42 MHz
C/A code	1.023 MHz chip rate
Channels	20 channel All-In-View tracking
Sensitivity	-159 dBm

Accuracy

Position	10 meters, 2D RMS 2-5 meters, 2D RMS, EGNOS/WAAS enabled
Velocity	0.1 meter per second
Time	1us synchronized to GNSS time

Datum

Default	WGS-84

Average Acquisition Time

Re-acquisition	0.1 seconds
Hot start	1 second
Warm start	38 seconds
Cold start	42 seconds

Dynamic Conditions

Altitude	Maximum 18,000 meters or 60,000 feet
Velocity	Maximum 515 meters per second or 1000 knots
Acceleration	Less than 4g
Jerk	20 meters per second

CIRCUIT DESCRIPTION

The WAY HORIZON 60 Digital Compass Solutions with GNSS receiver module circuit boards include all the basic sensors and electronics to provide a digital indication of heading and GPS/Galileo navigational data. The HORIZON 60 uses three magnetic sensors plus includes an accelerometer to provide tilt (Roll and Pitch) sensing relative to the aluTECH casing horizontal (flat) position.

To archive the right data from the MEMS gyrocompass, the unit needs to mount in a way that the 9-pin D-SUB connector is pointing forwards when facing the moving direction. WAY HORIZON 60 might need to be re-calibrated before use and in such case, the object where the WAY HORIZON 60 is mounted needs to be leveled in both Roll and Pitch for correct readout. If your readout then shows non-leveled readouts, you will need to send a re-Zero command to the UART by sending **$H60O<CR><LF>** for Roll Axis re-Zero and **$H60P<CR><LF>** for Pitch Axis Re-Zero – see further down in this datasheet for more info.

The WAY HORIZON 60 circuit uses Honeywell HMC1021 and HMC1022 single and two-axis magnetic sensors providing X, Y, and Z axis magnetic sensing of the earth's field. These sensors are supplied power by a constant current source to maintain best accuracy over temperature.
The sensor output voltages and constant current sensor supply voltage are provided to multiplexed Analog to Digital Converter (ADC) integrated circuit. The WAY HORIZON 60 uses three integrated microcontrollers circuits that handles all data communication and functions such as the calibration routine via UART as well as periodically queries the multiplexed ADC and performs the offset corrections and computes the heading. For religability and best performance, an onboard EEPROM integrated circuit is employed to retain necessary data variables.

For the WAY HORIZON 60, an additional pair of data inputs from the ±2g accelerometer is received by one of the microcontroller. These tilt inputs (Roll and Pitch) are added to sensor data inputs to form a complete data set for a three dimensional computation of heading.

The power supply for the WAY HORIZON 60 circuit is regulated DC-DC switching design allowing the user to directly provide a regulated supply voltage of +5V DC (from i.e. USB port) or a +8 to +36 volt unregulated supply voltage. The power supply is a dual ground (analog and digital) system to control internal noise and maximize measurment accuracy.

PHYSICAL CHARACTERISTICS

The circuit board for the WAY HORIZON 60 Digital Compassing Solutions is approximately 35x46x10 mm or 1.37x1.81x0.39 inches while the ready mounted aluTECH case is approximately 55x38x25 mm or 2.16x1.5x0.98 inches. The WAY HORIZON 60 contains two set of PCB's (Printed Circuit Boards) mounted on top of each other where the bottom PCB is the main power supply and microcontroller board while the top is the gyro board with the bottom-side mounted magnetic sensor integrated circuits Honeywell HMC1021 and HMC1022. Figure 1 shows the bottom PCB with dimensions.

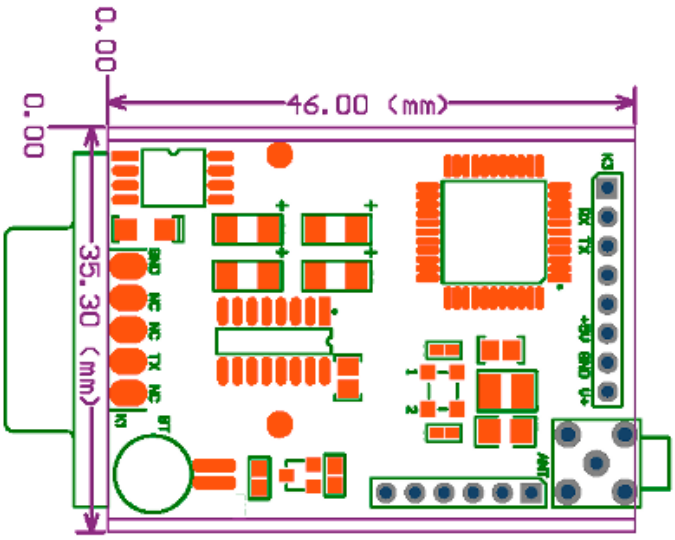


Figure 1*. Bottom PCB with power supply and microcontroller*

Figure 2 and 3 on the next page shows the dimensions of FIKO's aluTECH top case and the fastening bracket with screw-hole positioning. The width of the top case is the same as for the fastening bracket 53-mm or 2.08 inches. Fastening screws for the WAY HORIZON 60 are provided.

Fix installation of WAY HORIZON 60 requires that the aluminum back plate must first be removed so the fastening bracket can be removed by sliding it off the top case. Information about installation is found in the following pages of this datasheet.

The most important aspects of using WAY HORIZON 60 is to make sure that the unit is mounted is such way that the 9-pin D-SUB connector is facing parallel with the forward direction from of movements.

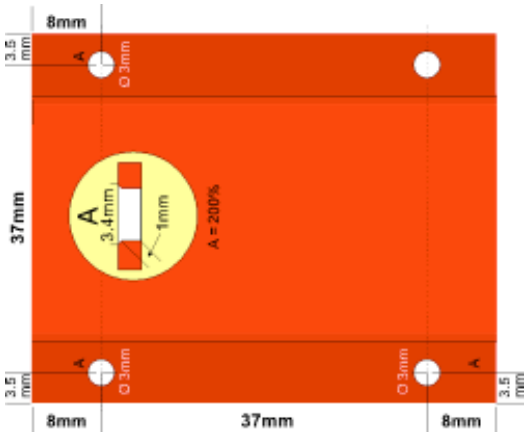


***Figure 2**. – Fastening bracket for the aluTECH case*

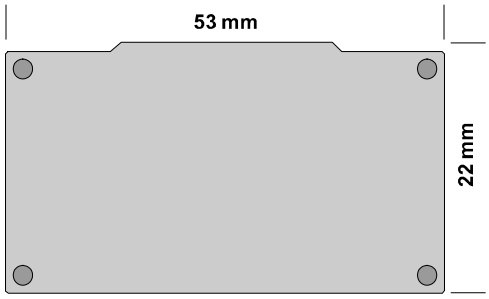


***Figure 3**. Back plate side of the aluTECH case*

INSTALLATION

The fix installation of WAY HORIZON 60 requires that one of the end plates be removed to allow release of the fastening bracket. Once released, it can be fixed to suitable surface and fastened with the provided screws. If fastened to plastic, glass fiber, or metal sheet you will need to drill the four holes with a suitable drill. Once fastened, you will need to re-insert the end plate for securely fastening of the unit. See next section for further installation details.

REMOVING THE END PLATE

After unpacking the WAY HORIZON 60 you will need to release the fastening bracket by removing the front plate as shown in Figure 4. You will need a small Philips-type + screwdriver for this job.

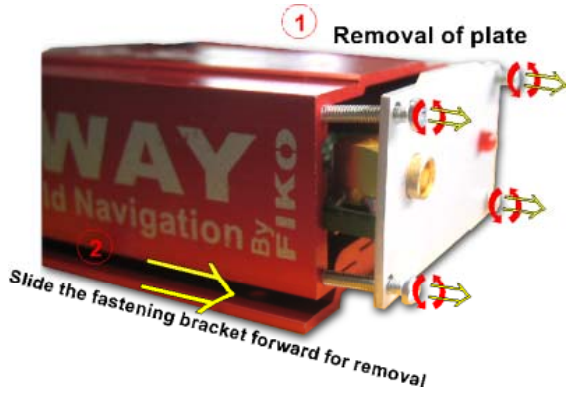


***Figure 4**. The removal of the front plate*

When the end plate is removed, the fastening bracket can be released from the top case that now needs to be fastened or mounted to its place where you like to install the WAY HORIZON 60 module. Be careful not to remove the whole electronics inside the aluTECH case and make sure that power is not connected to the unit during this operation.

Be aware to never touch the electronic parts on the PCB inside the case as this could cause electronic discharge from your body and therefore might damage the components causing the WAY HORIZON 60 to become unusable and void any guarantee. If you're not sure, ask an authorised person to conduct the installation for you. As a golden rule, touch a ground point before handling WAY HORIZON 60.

For fix mounting of WAY HORIZON 60 you will first of all need to drill the four holes for the fastening bracket. You will find the four fastening screws provided with the package. Figure 2 shows the placement where you need to drill the holes. If you don't have a measuring tool, then just place the bracket on the place where you like to have it mounted and use a pencil or a pen to mark the 4 holes.

Before making the choice for placement of your WAY HORIZON 60 module, you must ensure enough free space on both sides of the bracket to enable the top case to slide onto the bracket. As you need to use a small screwdriver to fasten the cover plate you also needs enough space for the power and data connector on the connector side.

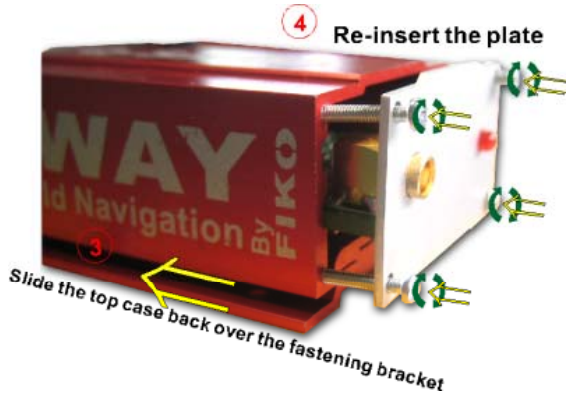


Figure 5*. After fastening the fastening bracket, re-insert top case and the front plate*

Once the bracket is fastened, you will need to slide back the top case onto the fastening bracket (as it was in the original packaging) and tighten up the four screws of the end plate as shown in figure 5. You should now be ready to connect power and data cable.

CONNECTING POWER

Extra care shall be taken when connecting power to the WAY HORIZON 60. Make sure that the power source is right for the unit and that you use the red cable with fuse holder for + (plus) and the black cable for – (ground).

Before connecting power to the WAY HORIZON 60, make sure you understand what you're doing. If you're not sure, ask an authorized person to conduct the installation for you. As a golden rule, touch a grounded point before handling the WAY HORIZON 60. Make sure that your WAY HORIZON 60 module is suited for your intended power source. If you purchased the standard version, then max voltage is 36V DC which is OK to be used on motorbikes, boats, aircraft, cars, busses and trucks as they normally uses between 9-24V.

If you're not sure about what max voltage your WAY HORIZON 60 is designed for, you can check this out by reading the label found on the top of the fastening bracket. If you need to use the WAY HORIZON 60 for 48V, you will need to use i.e. 48V to 12V (or 48V to 24V) DC-DC power adapter.

WARNING! Please note that providing more then +5V DC to the regulated input will BURN DOWN AND DESTROY the unit within seconds. Make sure that you are providing unregulated power to pin 9 (+8-36V DC) and pin 4 or 5 (GND) of the 9-pin D-SUB connector.

If the supplied power cable is to short to reach the battery, you will need to extend the power cables and securing the connection points against short circuit. **Make sure that you use the same thickness of cables and colours (red and black) for your cable extension.**

PIN CONNECTIONS AND CABELING

The standard version of WAY HORIZON 60 comes with a female 9-pin D-SUB connector that contains both RS-232 data communication ports (RxD and TxD) and power input. Figure 6 shows the pin connections viewed from outside the aluTECH case of WAY HORIZON 60.

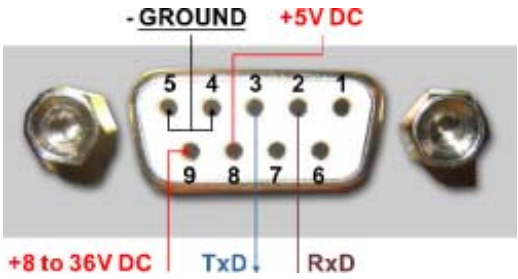


Figure 6. The pin connection for the standard version of WAY HORIZON 60 (outside view)

The 9-pin D-SUB female connector found on WAY HORIZON 60 acts as both power and data connector and there is therefore need to add a second connector where on the WAY HORIZON 60 side, the unregulated power is supplied between pin 9 (+ 8-36V DC) and pin 4 (GND). On the other end, pin 9 is left open to avoid sending the supplied power to the same pin on the computer side (RS-232). Regulated power is supplied to pin 8 (+5V DC). See Figure 7 for more details.

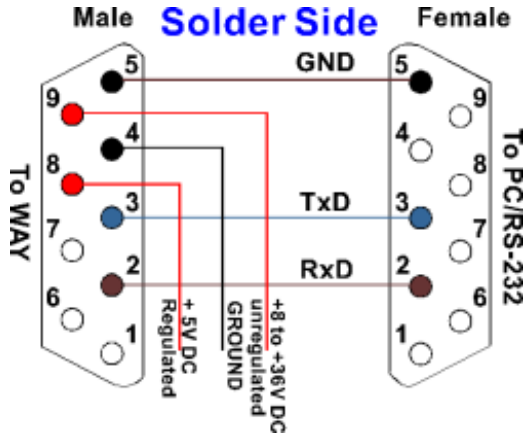


Figure 7. The pin connection for extension and power cable for WAY HORIZON 60

Max length of connector cable for RS-232 shall not be more then 9 meters and you should use two-wired shield twisted pair cable for the RxD and TxD data. Once connected to the RS-232 on your PC, you should be able to receive satellite data. If you don't have any RS-232 (COM-port) on your PC, you can also use i.e. our WAY iUSB, an RS-232 to USB converter that will create a virtual COM-port under Windows. Please not that such converters will not work under DOS unless you have a DOS driver for the device.

Application Notes

The **WAY HORIZON 60** modules communicate through ASCII code at baud rate of 38,400 bps. The data format is 1 Start, 8 Data, 1 Stop, and No parity bits. Some of the operating commands are:

UART COMMUNICATION PROTOCOL

GYRO DATA

WAY HORIZON 60 modules communicate through ASCII code at baud rate of 38,400 bps. The system has three integrated Universal Asynchronous Receiver Transmitter's ("UART") where one is soft-UART, a UART programmed via internal microcontroller software. The data bit format is 1 Start, 8 Data, 1 Stop, and No parity bits. Asynchronous communication has the complete menu of commands. The receiving data (**RxD**) towards PC or embedded computer system are indicated with i.e. **$H60G, 354.3,12.1,5.9*24** where **$H60G** is the message header indicating that the data is being received from the **HO**RIZON **60 G**YRO, **354.3** is the magnetic bearing in degrees, **12.1** is the Roll in degrees, **5.9** is the Pitch in degrees and ***24** is the check sum of the string where the string is terminated with **<CR><LF>**. The $H60G data is transmitted about 6 times following the GPS NMEA data.

GPS/GNSS DATA

The **$H60G** data is transmitted about 6 times following the GPS NMEA data **$GPGGA**, **$GPGLL**, **$GPGSA**, **$GPRMC** and **$GPVTG**.

The WAY HORIZON 60 are capable of sending GPS data according to National Marine Electronics Association's NMEA-0183 interface specification defined as NMEA 0183 or just NMEA protocol where this section of this datasheet will focus on the NMEA sentences.

NMEA sentences used by the internal WAY D3x GNSS receiver are shown as below:

NMEA sentence	Descriptions
$GPGGA	Global Positioning system fixed data
$GPGLL	Geographic Position Latitude/Longitude
$GPGSA	GNSS DOP and Active Satellites
$GPGSV	GNSS Satellites in view
$GPRMC	Recommended minimum specific GNSS data
$GPVTG	Course over ground and ground speed

Table I NMEA-0183 output sentence format

Global Positioning System Fix Data (GGA)

The most common used NMEA sentence is the GGA or $GPGGA. A sample of the $GPGGA sentence for our factory location in France would be:

$GPGGA,171959.000,4729.7386,N,00654.6398,E,1,06,3.1,406.7,M,48.0,M,,0000*52

Name	Example	Units	Description
Message ID	**$GPGGA**		GGA protocol header
UTC Time	**171959.000**		hhmmss.sss
Latitude	**4729.7386**		ddmm.mmmm
N/S Indicator	**N**		N=North and S=South
Longitude	**00654.6398**		dddmm.mmmm
E/W Indicator	**E**		E=East and W=West
Position Fix Indicator	**1**		See Table 3
Satellites Used	**06**		Range 0 to 12
HDOP	**3.1**		Horizontal Dilution of Precision
MSL Altitude[1]	**406.7**	meters	
Units	**M**	meters	
Geoid Separation[1]	**48.0**	meters	
Units	**M**	meters	
AGE OF DIFF. CORR.		seconds	Null fields when DGPS is not used
Diff. Ref. Station ID	**0000**		
Checksum	***18**		
<CR><LF>			End of message termination

Table 2. NMEA GGA sentence

[1] SiRF Technology Inc. does not support geoid corrections. Values are WGS84 ellipsoid heights.

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode , fix valid
3	GPS PPS Mode, fix valid

Table 3. NMEA position Fix Indicator

Geographic Position with Latitude/Longitude (GLL)

$GPGLL,3723.2475,N,12158.3416,W,161229.487,A*2C

Name	Example	Units	Description
Message ID	**$GPGLL**		GLL protocol header
Latitude	**3723.2475**		ddmm.mmmm
N/S Indicator	**N**		N=North and S=South
Longitude	**12158.3416**		dddmm.mmmm
E/W Indicator	**W**		E=East and W=West
UTC Position	**161229.487**		hhmmss.sss
Status	**A**		A=Data Valid or V=Data NOT Valid
Checksum	***2C**		
<CR><LF>			End of message termination

Table 4. NMEA GLL sentence

GNSS DOP and Active Satellites (GSA)

$GPGSA,A,3,08,04,27,13,23,24,,,,,,4.0,3.1,2.5*3F

Name	Example	Units	Description
Message ID	**$GPGSA**		GSA protocol header
Mode1	**A**		See Table 6
Mode2	**3**		See Table 7
Satellite Used[1]	**08**		SV on Channel 1
Satellite Used[1]	**04**		SV on Channel 2
…..			
Satellite Used[1]			SV on Channel 12
PDOP	**4.0**		Position dilution of Precision
HDOP	**3.1**		Horizontal dilution of Precision
VDOP	**2.5**		Vertical dilution of Precision
Checksum	***3F**		
<CR><LF>			End of message termination

Table 5. NMEA GLL sentence

[1] Satellites used in solution.

Value	Description
M	Manual-forced to operate in 2D or 3D mode
A	2D automatic-allowed to automatically switch 2D/3D

Table 6. Mode1

Value	Description
1	Fix Not Available
2	2D
3	3D

Table 7. Mode2

GNSS Satellites in View (GSV)

$GPGSV,3,1,10,27,64,164,49,13,54,059,42,02,46,261,39,04,41,215,48*7E
$GPGSV,3,2,10,08,35,190,41,10,24,303,14,23,20,071,47,24,16,180,43*71
$GPGSV,3,3,10,16,09,032,18,06,00,331,07*7E

Name	Example		Description
Message ID	**$GPGSV**		GSV protocol header
Number of Messages[1]	**3**		Range 1 to 3
Message Number[1]	**1**		Range 1 to 3
Satellites in View	**10**		
Satellite ID	**27**		Channel 1 (Range 1 to 32)
Elevation	**64**	Degrees	Channel 1 (Maximum90)
Azimuth	**164**	Degrees	Channel 1 (True, Range 0 to 359)
SNR(C/No)	**49**	DBHz	Range 0 to 99, null when not tracking
…….			…….
Satellite ID	**04**		Channel 4 (Range 1 to 32)
Elevation	**41**	Degrees	Channel 4 (Maximum90)
Azimuth	**215**	Degrees	Channel 4 (True, Range 0 to 359)
SNR(C/No)	**48**	DBHz	Range 0 to 99, null when not tracking
Checksum	***7E**		
<CR><LF>			End of message termination

Table 8. NMEA GSV sentence

[1] Depending on the number of satellites tracked multiple messages of GSV data may be required.

Recommended Minimum Specific GNSS Data (RMC)

$GPRMC,171956.000,A,4729.7386,N,00654.6399,E,0.19,313.58,020406,,*0A

Name	Example	Units	Description
Message ID	**$GPRMC**		RMC protocol header
UTC Time	**171956.000**		Hhmmss.sss
Status	**A**		A=Data Valid or V=Data NOT Valid
Latitude	**4729.7386**		Ddmm.mmmm
N/S Indicator	**N**		N=North and S=South
Longitude	**00654.6399**		Dddmm.mmmm
E/W Indicator	**E**		E=East and W=West
Speed Over Ground	**0.19**	Knots	
Course Over Ground	**313.58**	Degrees	True
Date	**020406**		Ddmmyy
Magnetic Variation[1]		Degrees	E=east or W=west
Checksum	***0A**		
<CR><LF>			End of message termination

Table 9. NMEA RMC sentence

[1] SiRF does not support magnetic declination. All "course over ground" data are geodetic WGS48 directions.

Course Over Ground and Ground Speed (VTG)

$GPVTG,309.62,T,,M,0.13,N,0.2,K*6E

Name	Example	Units	Description
Message ID	**$GPVTG**		VTG protocol header
Course	**309.62**	Degrees	Measured heading
Reference	**T**		True
Course		Degrees	Measured heading
Reference	**M**		Magnetic
Speed	**0.13**	Knots	Measured horizontal speed
Units	**N**		Knots
Speed	**0.2**	Km/hr	Measured horizontal speed
Units	**K**		Kilometers per hour
Checksum	***6E**		
<CR><LF>			End of message termination

Table 10. NMEA VTG sentence

PROGRAMMING COMMANDS

GYRO COMMANDS

Syntax: $H60X<CR><LF>
Sends command for an operational mode change

$H60H<CR><LF> - Heading Output Command
Selects the Heading output mode (factory set default).
Format: Heading
Output i.e.: **183.4**

$H60M<CR><LF> - Magnetometer Output Command
Selects the magnetometer output mode.
Format: MagX, MagY, MagZ
Output i.e.: **1143, -143, 1725**

$H60S<CR><LF> - Starting and Stopping Data Output
Starting and Stopping the data output will toggle each time this command is issued (factory set default is start, first start/stop command will stop data output).

$H60Q<CR><LF> - Query
Query for an output in the currently selected mode (mag/head). Allowed only in stop data mode.

$H60O<CR><LF> - Roll Axis Re-Zero
Allows the user to zero the roll output. This command should only be issued when the roll axis is leveled (±0.3°).

$H60P<CR><LF> - Pitch Axis Re-Zero
Allows the user to zero the pitch output. This command should only be used when the roll axis is leveled (±0.3°).

$H60A<CR><LF> - Averaged Output
Same result as the Query command, except that the output data is the result of an averaging of the last 20 readings. Allowed only in stop data mode.

$H60F<CR><LF> - Split Filter Toggle
Toggles the split filter bit. The parameter setting is saved in the EEPROM immediately. Requires power cycling or a reset command to activate.

$H60R<CR><LF> - Reset
Resets compass to power-up condition.

$H60C<CR><LF> - User Calibration
Command to be issued to enter and exit the calibration mode.
Once in the calibration mode, the device will send magnetometer data appended by a “C” character to indicate the Calibration Mode operation.

Output i.e.: **135,726,1398,C**

During the calibration procedure, the compass and the platform to which the compass is attached is rotated at a reasonably steady speed through 360 degrees. This process should at least take one minute for best accuracy. For WAY HORIZON 60, the rotation should include as much pitch and roll orientations possible. At the completion of the rotations, issue another **$H60C<CR><LF>** to exit the calibration mode.

CONFIGURATION COMMANDS

Syntax: **#H60Dev? <CR><LF>** Queries for the parameter value
#H60Dev=±xxxx<CR><LF> Sets parameter value

Variation Input - Declination Angle Correction
#H60Var=±nnnn<CR><LF> where the variation is ± nnn.n degrees
Sets or returns the angle between magnetic north and geographic north.
Eg: #Var=**-205<CR><LF>** sets the declination angle to –20.5 degrees.

Deviation Input - Platform Angle Correction
#H60Dev=±nnnn<CR><LF> where the angle is ± nnn.n degrees
Sets or returns the angle between compass forward direction and that of the mounting platform.
i.e.: #Dev=**205<CR><LF>** sets the deviation angle to +20.5 degrees.

#H60X<CR><LF> - User Magnetic offset value X
Sets or returns the user offset values for each magnetic axis.
i.e.: **#H60X=+45<CR><LF>** sets the x offset value to +45.

#H60Y<CR><LF> - User Magnetic offset value Y
Sets or returns the user offset values for each magnetic axis.
i.e.: **#H60Y=+45<CR><LF>** sets the y offset value to +45.

#H60Z<CR><LF> - User Magnetic offset value Z
Sets or returns the user offset values for each magnetic axis.
i.e.: **#H60Z=+45<CR><LF>** sets the z offset value to +45.

#H60M<CR><LF> - Magnetic Filter
The MFL command sets and reads the Magnetic Filter setting. When the Split Filter bit is cleared, this parameter value will default to the value of SFL, the system filter. When the Split Filter bit is set, MFL parameter setting will control the Magnetic Filter value. The parameter input is saved in the EEPROM immediately. Requires power cycling or a Reset command (**$H60R<CR><LF>**) to become effective.

GPS/GNSS COMMANDS

$D3XB<CR><LF> - Reset internal Baud rate
Reset WAY D3x GNSS module to 19,200 bps (NB! WAY HORIZON 60 uses internal WAY D3x GNSS GPS/Galileo receiver module and it's monetary to set the internal WAY D3X GNSS to fix baud rate of 19,200 bps hence the UART connected to the WAY HORIZON 60 is fixed at 38,400 bps.)

$D3XG<CR><LF> - Set D3x to EGNOS/WAAS mode ON
This command will activate the EGNOS/WAAS mode of the WAY D3x GNSS. If you're in Europe the WAY D3x GNSS will use EGNOS (European Geostationary Navigation Overlay System) allowing position to be determined to within 2 meters or if in Central America, the module will use the US equivalent WAAS (Wide Area Augmentation System). Other part of the world has no EGNOS or WAAS coverage.

$D3XO<CR><LF> - Set D3x to EGNOS/WAAS mode OFF
This command will deactivate the EGNOS/WAAS mode function.

$D3XR<CR><LF> - Reset the D3x module
This command will reset the D3x module to warm start.

$D3XQ<CR><LF> - D3x Query
This command will send data about the WAY D3x GNSS module to the UART.

Command RESPONSES

The WAY HORIZON 60 is capable of sending response data to the UART. This version of WAY HORIZON 60 has at the time this document was written only one response.

#ERR<CR><LF>
Invalid command response. Sent in response to any command not of correct syntax or not listed in this document. Please remember that all data communication to WAY HORIZON 60 has to be 38,400 bps in 1 Start, 8 Data, 1 Stop, 0 Parity communication format.

Demo Module Kit Set

The WAY HORIZON 60 Demo Module Kit Set includes the WAY HORIZON 60 Gyro/GNSS module, USB cable for 5VDC power, USB to RS-232 converter, RS-232 cable, active GPS antenna and Windows software where all this forms a development kit for electronic compassing, gyro functions, GPS tracking. The Demo Module Kit Set includes DLL's and other development tools for rapid software developments using the WAY HORIZON 60. This kit includes the appropriate HORIZON 60 module, an RS-232 motherboard with serial port connector, serial port cable with attached AC adapter power supply, interface software, and documentation.

Product Ordering Information

Ordering Number	Product	Product Information
HOR60V36-01	HORIZON 60	Complete in aluTECH casing
HOR60V36-02	HORIZON 60 ANT	Complete in aluTECH casing w/GPS antenna
HOR60V36-03	HORIZON 60 PCB	PCB Module Only
HOR60V36-04	HORIZON 60 SW	DLL and Software for developments
HOR60V36-05	HORIZON 60 Demo	Complete HORIZON 60 Module with all cables, interfaces, antenna and Development Kit

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