GH2183 GPS/Gyro Compass
User Manual

also covers models
G2183 GPS and H2183 Gyro Compass

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1. Introduction

This document provides a detailed description of the communications protocol for the following Airmar products:

- GH2183 GPS/Gyro Compass module
- G2183 GPS module
- H2183 Gyro Compass module

The G2183 and GH2183 both contain a Global Positioning System receiver with WAAS (Wide Area Augmentation System) capability.

The H2183 and GH2183 both contain a 3-axis magnetoinductive electronic compass. A 3-axis accelerometer provides pitch and roll information, which is used by the compass to provide a Z-field correction. A 2-axis rate gyro further corrects the pitch and roll readings for vessel accelerations in 3 dimensions.

These products have two separate communication interfaces: one compliant with the NMEA 2000®[1] protocol, and the other with the NMEA 0183 protocol. Both interfaces are able to operate simultaneously and independently from one another.

For further information about the NMEA 2000® protocol, refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices, version 1.200.* For further information about the NMEA 0183 protocol, refer to the document, *NMEA 0183 Standard for Interfacing Marine Electronic Devices, v3.01*. Both of these documents are available from the National Marine Electronics Association (www.nmea.org).

2. NMEA 2000® Interface

Each of these products has a single NMEA 2000®-compliant network interface, and is expected to be certified as a Class 1 Level B device. Each model transmits and receives standard and proprietary NMEA 2000® Parameter Groups via this interface. Transmitted PGNs (Parameter Group Numbers) are described in section 2.4. Received PGNs are described in section 2.5.

[1] NMEA 2000® is a Registered Trademark of the National Marine Electronics Association, Inc.

2.1. Terminology

The following terms related to the NMEA 2000® protocol appear on the detailed PGN pages to follow.

PGN: Parameter Group Number. NMEA 2000® messages are organized into logical collections of data called Parameter Groups. The NMEA assigns each Parameter Group a unique Parameter Group Number, or PGN.

Single Frame: Yes = the Parameter Group has been designed to fit within the 8 bytes of a single CAN frame. No = the Parameter Group is larger than 8 bytes, so must be transmitted in multiple CAN frames using either NMEA 2000® Fast Packets, or (TBD) ISO 11783 multi-packets, using the Data Transfer Transport Protocol (PGNs 60160 and 60416).

Priority: NMEA 2000® parameter groups are each assigned a priority value between 0 and 7, which is used to arbitrate between two devices attempting to transmit simultaneously. 0 is the highest priority, and 7 is the lowest. The Priority field at the top of each of the detailed specification pages shows three values separated by slashes (e.g. 6/Y/Y). The first value is the default priority, between 0 and 7, of the parameter group as defined in the NMEA 2000® Standard. The second value is "Y" if the priority for this parameter group may be changed using the Command Group Function PGN 126208, or "N" if the priority may not be changed. The third value is "Y" if the priority is saved in nonvolatile EEPROM memory within the device and maintained upon cycling power, or "N" if the priority reverts to the default value upon cycling power.

Update Rate: Some NMEA 2000® parameter groups are transmitted periodically. The Update Rate field at the top of each of the detailed specification pages shows three values separated by slashes (e.g. 100 ms/Y/Y). The first value is the default update rate for the parameter group, as defined in the NMEA 2000® Standard. If the default behavior for the parameter group is not to transmit periodically, then this first value will be 0 (zero). The second value is "Y" if the update rate for this parameter group may be changed using the Transmission Interval field in the Request Group Function PGN 126208, or "N" if the update rate may not be changed. The third value is "Y" if the update rate is saved in nonvolatile EEPROM memory within the device and maintained upon cycling power, or "N" if the update rate reverts to the default value upon cycling power.

Destination: Global or Address. A Global Destination means that the parameter group was designed to be broadcast for use by all receiving devices on the bus. If Destination = Address, this means the parameter group was designed to be transmitted only to a specific device on the bus. In this case, the address of the destination device must be provided within the PGN.

Query Support: If the parameter group supports queries, then the device will transmit the parameter group if requested by another device on the bus. The request must be made using either the ISO Request PGN 59904, or the Complex Request Group PGN 126208.

Access Level: The GH2183/G2183/H2183 contains a security mechanism whereby certain PGNs require an access sequence to be performed in order to enable the functionality in the PGN. If the indicated Access Level is 0, then the PGN is fully functional without requiring an access sequence to be performed. If the indicated Access Level is nonzero, then it is necessary to perform an access sequence using the proprietary transmitted PGN 65287, Access Level, before the functionality of the PGN will be enabled.

Request Parameter: A "Yes" value specifies that the given field may be used by the Request Group Function PGN 126208 as a qualifier to request specific data according to the contents of the field.

DD: Data Dictionary. The Data Dictionary number defines the contents of the parameter group field. The designators in this column are described in detail in the NMEA 2000® Standard, Appendix B.2.

DF: Data Format. The Data Format number defines the format of the data in the parameter group field. The designators in this column are described in detail in the NMEA 2000® Standard, Appendix B.3.

Type: The Type designators are described in detail in the NMEA 2000® Standard, Appendix B.4.

Resolution: The resolution indicates the smallest increment of the value in the given field, in the units specified by the data format.

Value: This indicates the range of allowable values the field may contain.

2.2. Sequence ID (SID)

Some transmitted Parameter Groups contain a SID (Sequence Identification Number) field. This field contains an 8-bit upward counting number that is used to tie related information together between different Parameter Groups. The SID provides a method to indicate that the data in a given set of Parameter Groups are synchronized to the same sample interval.

In the GH2183/G2183, the following PGNs will contain identical SID values, indicating that the data from each of these PGNs was taken at the same time, even though the PGNs may be transmitted at different times:

126992 System Time
129026 COG and SOG, Rapid Update
129029 GNSS Position Data
129539 GNSS DOPs
129540 GNSS Satellites in View

2.3. Precedence of Data

In a given installation, certain data items received by the model H2183 might be available from more than one source. In this circumstance, the following precedence rules apply for the H2183 only.

Magnetic Variation:

NMEA 2000® PGN 127258 supersedes NMEA 0183 $--VTG, which supersedes $--RMC.

2.4. Transmitted NMEA 2000® PGNs

The NMEA 2000® PGNs transmitted by all models are summarized in Table 1. Each of the transmitted PGNs in Table 1 is described in detail on the subsequent pages.

Table 1: NMEA 2000® Transmitted PGNs

PGN	Description	GH2183	G2183	H2183
59392	ISO Acknowledgement	✓	✓	✓
60928	ISO Address Claim	✓	✓	✓
65285	Proprietary: Boot State Acknowledgment	✓	✓	✓
65287	Proprietary: Access Level	✓	✓	✓
65410	Proprietary: Internal Device Temperature and Supply Voltage	✓	✓	✓
126208	Acknowledge Group Function	✓	✓	✓
126464	PGN List – Transmit and Received PGNs Group Function	✓	✓	✓
126720	Proprietary: -32: Attitude Offsets -33: Calibrate Compass -35: Simulate Mode -46: NMEA 2000® Options -47: Received PGN Source -48: Altitude Settings -49: Set WAAS Satellite -50: Enable GPS Type 0 Messages	 ✓ ✓ ✓ ✓ ✓ ✓ ✓	 ✓ ✓ ✓ ✓ ✓	 ✓ ✓ ✓ ✓
126992	System Time	✓	✓	
126996	Product Information	✓	✓	✓
126998	Configuration Information	✓	✓	✓
127250	Vessel Heading	✓		✓
127251	Rate of Turn	✓		✓
127257	Attitude	✓		✓
127258	Magnetic Variation	✓	✓	
129025	Position, Rapid Update	✓	✓	
129026	COG & SOG, Rapid Update	✓	✓	
129029	GNSS Position Data	✓	✓	
129033	Time & Date	✓	✓	
129044	Datum	✓	✓	
129538	GNSS Control Status	✓	✓	
129539	GNSS DOPs	✓	✓	
129540	GNSS Sats in View	✓	✓	
130944	Proprietary: POST	✓	✓	✓

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **059392** (0x0E800)

ISO Acknowledgment

Single Frame: Yes	**Priority:** 6/N/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 59392 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

This PGN is transmitted as a handshake mechanism in response to an ISO Request PGN 59904.

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **060928** (0x0EE00)

ISO Address Claim

Single Frame: Yes	**Priority:** 6/N/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 60928 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

PGN 60928 is a network management message used to claim a network address, reply to devices requesting the claimed address, and to respond to requests for device information (NAME). The 64 bits comprised by the ten fields in this parameter group constitute the ISO 11783-5 NAME entity.

The contents of fields 3, 4, and 8 are stored in EEPROM memory and may be changed using PGN 126208, Command Group Function.

PGN **065285** (0x0FF05)

Proprietary: Boot State Acknowledgment

Single Frame: Yes	**Priority:** 7/N/N	**Update Rate:** 0/N/N	**Destination:** Global	**Query Support:** No	**Access Level:** 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	No	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	No	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Boot State	No	N/A	DF52	3 bits	1	000 = in Startup Monitor 001 = running Bootloader 010 = running Application 011 to 110 = reserved 111 = Data Not Available	
5	Reserved bits	No	DD001	DF52	45 bits	1	0x1FFFFFFFFFFF	All bits set to logic "1"

Notes

PGN 65285 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

The Boot State Acknowledgment proprietary PGN is transmitted in response to the received proprietary PGN 65286, Global Boot State Request. This PGN is transmitted from any of the following contexts: Startup Monitor, CAN Bootloader, or Application.

PGN **065287** (0x0FF07)

Proprietary: Access Level

Single Frame: Yes	**Priority:** 7/Y/N	**Update Rate:** 0/N/N	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Format Code	Yes	DD005	DF53	uint8	1 bit	1	1 = Format Code 1
5	Access Level	No	N/A	DF52	3 bits	1	0x0 = locked 0x1 = unlocked, level 1 0x2 = unlocked, level 2 0x3 to 0x7 = reserved	When this PGN is transmitted, this field indicates the current Access Level of the device. This field may be changed using the Command Group Function PGN 126208 (see text below).
6	Reserved bits	No	DD001	DF52	5 bits	1	0x1F	All bits set to logic "1"
7	Access Seed/Key	No	N/A	DF55	uint32	1 bit	0 to 4,294,967,292	When this PGN is transmitted, this field contains a Seed that may be used in a subsequent Unlock operation. This field is also used to provide a Key to the device when performing an Unlock operation, using the Command Group Function PGN 126208 (see text below).

Notes

PGN 65287 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

The Access Level proprietary PGN is a security mechanism that provides the GH2183/G2183/H2183 with a method to limit access to certain functions to devices that understand the proper unlock sequence. Certain operations will not be possible unless the Access Level is first increased to the required value. A nonzero Access Level remains in effect until the unit powers down, or 15 minutes has elapsed, whichever comes first, after which the Access Level returns to zero. The Access Level is not stored in EEPROM.

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1 and 3 must both be fully specified in the request in order for this PGN to be transmitted.

Note that the value in field 4 (Format Code) may correspond to a specific set of algorithms for calculating the key from a given seed.

If field 4 is specified in a Request Group PGN 126208, but does not agree with the format code known by the device, then the request will be NAK'ed. If field 4 is *not* specified in a request, then the PGN will be transmitted with the format code known to the device.

This PGN does not respond to ISO Requests (PGN 59904).

When this PGN is transmitted, field 5 contains the current Access Level of the unit, and field 7 contains a randomly-generated Seed that may be used in a subsequent Unlock operation.

To change the Access Level, use the Command Group Function PGN 126208, specifying the individual fields in PGN 65287 as follows:

To change the Access Level to 0 (i.e. to lock the device after having been previously unlocked):

Use the Command Group Function PGN 126208, specifying the individual fields in PGN 65287 as follows. (Note that it is not required to specify field 7.)

PGN 65287	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	1
5	0

The unit will respond with the Acknowledge Group Function PGN 126208, indicating success or failure according to the error codes provided in the parameter fields.

To change the Access Level to 1:

Use the Command Group Function PGN 126208, specifying the individual fields in PGN 65287 as follows.
Field 7 serves as a simple password to allow setting the Access Level to 1. For this Access Level, it is not necessary to obtain a Seed or calculate a Key.

PGN 65287	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	1
5	1
7	0x12345678

The unit will respond with the Acknowledge Group Function PGN 126208, indicating success or failure according to the error codes provided in the parameter fields.

To change the Access Level to 2 or higher:

1. Use the Request Group Function PGN 126208, specifying PGN 65287, to obtain a Seed.

2. The unit will respond with PGN 65287, with the current Access Level in field 5, and with a random Seed in field 7.

3. Using the Seed provided in step 2, calculate a Key according to the algorithm corresponding to the desired Access Level.

4. Use the Command Group Function PGN 126208, specifying the individual fields in PGN 65287 as follows:

PGN 65287	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	1
5	The desired Access Level
7	The calculated Key

5. The device will respond with the Acknowledge Group Function PGN 126208, indicating success or failure according to the error codes provided in the parameter fields.

After executing the above sequence to change the Access Level, you may optionally request this PGN using the Request Group Function PGN 126208 to confirm that the Access Level was in fact changed.

Note that increasing the Access Level does not in and of itself allow global access to the secure functions of the device. The Access Level is changed only for subsequent commands and requests originating from the device with the source address originally used to specify the Access Level.

PGN 065410 (0xFF82) Proprietary: Device Temp. and Supply Voltage

Single Frame: Yes	Priority: 7/Y/Y	Update Rate: 0/Y/Y	Destination: Global	Query Support: Yes	Access Level: 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	SID (Sequence ID)	No	DD056	DF53	uint8	1 bit	0 to 252	Unit-less number. Refer to section 2.2. for an explanation of this field.
5	Internal Device Temperature	No	DD043	DF39	uint16	0.01 deg K	0 to 655.32 deg K	Measured temperature of the device's internal circuit board.
6	Supply Voltage	No	DD136	DF42	int16	0.01 V	+/-327.64 V	Supply voltage, as measured by the device
7	Reserved bits	No	DD001	DF52	8 bits	1	0xFF	All bits set to logic "1"

Notes

PGN 65410 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1 and 3 must both be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **126208** (0x1ED00)

Acknowledge Group Function

Single Frame: No	**Priority:** 6/N/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 126208 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

The Acknowledgment Reply is transmitted in response to a PGN 126208 Request or Command Group Function message. In response to the Request message, the Acknowledge is only transmitted for a request that cannot be complied with.

See also related PGNs:

- the received Request Group Function PGN 126208
- the received Command Group Function PGN 126208

PGN **126464** (0x1EE00)

PGN List - Transmit/Received PGNs Group

Single Frame: No	**Priority:** 6/Y/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 126464 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

This message provides a list of the transmitted or received PGNs that are supported by the device. It is transmitted only upon request. If it is requested using the ISO Request PGN 59904, or with the Request Group Function PGN 126208 without specifying the Group Function Code in field 1, then this PGN will be transmitted twice, once each for the transmitted and received lists.

Note that proprietary PGNs are excluded from these lists.

(continued on next page)

The list of Transmitted PGNs, broken down by model, is as follows:

PGN	Description	GH2183	G2183	H2183
59392	ISO Acknowledgment	✓	✓	✓
60928	ISO Address Claim	✓	✓	✓
126208	Acknowledge Group Function	✓	✓	✓
126464	PGN List – Transmit and Received PGNs Group Function	✓	✓	✓
126992	System Time	✓	✓	
126996	Product Information	✓	✓	✓
126998	Configuration Information	✓	✓	✓
127250	Vessel Heading	✓		✓
127251	Rate of Turn	✓		✓
127257	Attitude	✓		✓
127258	Magnetic Variation	✓	✓	
129025	Position, Rapid Update	✓	✓	
129026	COG & SOG, Rapid Update	✓	✓	
129029	GNSS Position Data	✓	✓	
129033	Time & Date	✓	✓	
129044	Datum	✓	✓	
129538	GNSS Control Status	✓	✓	
129539	GNSS DOPs	✓	✓	
129540	GNSS Sats in View	✓	✓	

(continued on next page)

The list of Received PGNs, broken down by model, is as follows.

PGN	Description	GH2183	G2183	H2183
59904	ISO Request	✓	✓	✓
60928	ISO Address Claim	✓	✓	✓
126208	Request Group Function	✓	✓	✓
126208	Command Group Function	✓	✓	✓
127258	Magnetic Variation			✓

PGN **126720** (0x1EF00)

Addressable Multi-Frame Proprietary

Single Frame: No **Priority:** 7/Y/N **Update Rate:** 0/N/N **Destination:** Address **Query Support:** Yes **Access Level:** See PID variants

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	0 to 252	Identifier specifying how to interpret the remaining fields in this parameter group.
5+	(PID-dependent)	No	DD000	DF00	undef.	undefined	undefined	The use of the remaining bytes and the number of CAN frames required varies according to the PID (field 4).

Notes

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

The use of this PGN with the following Proprietary ID's (field 4) is described on the subsequent pages:

32: Attitude Offsets
33: Compass Calibration
35: Simulate Mode
46: NMEA 2000® Options
47: Received PGN Source
48: Altitude Settings
49: Set WAAS Satellite
50: Enable GPS Type 0 Messages

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **126720-32** (0x1EF00)

Proprietary: Attitude Offsets

Single Frame: No	**Priority:** 7/Y/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	32 (decimal)	32 = Attitude Offsets
5	Azimuth offset	No	N/A	DF04	int16	0.0001 rad	-π to +π rad Default value = 0 rad.	Negative values indicate the forward mark on the sensor housing is oriented toward the starboard side of the vessel; positive values toward the port side. Value stored in EEPROM.
6	Pitch offset	No	N/A	DF04	int16	0.0001 rad	-π/4 to +π/4 rad Default value = 0 rad.	Positive values indicate the sensor is tilted forward toward the bow; negative values indicate the sensor is tilted aftward. Value stored in EEPROM.
7	Roll offset	No	N/A	DF04	int16	0.0001 rad	-π/4 to +π/4 rad Default value = 0 rad.	Positive values indicate the sensor is tilted toward the port side; negative values toard the starboard side. Value stored in EEPROM.

Notes

PGN 126720-32 supported in:	GH2183	✓
	G2183	No
	H2183	✓

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

This PGN performs the same function in the GH2183/H2183 as the NMEA 0183 proprietary command, $PAMTC,ATTOFF. Note that in the NMEA 0183 command, the arguments are in degrees, while in the NMEA 2000® PGN, the arguments are in radians. The values are stored in the EEPROM in radians.

This PGN is used to program the device with the attitude offset angles when the sensor is not oriented parallel to the centerline, and perpendicular to the deck of the vessel. The programmed values are stored in nonvolatile EEPROM memory within the device, and so remain programmed even after cycling power.

The azimuth offset angle is used by the GH2183/H2183 to adjust the vessel's heading measured by the internal compass.

The azimuth offset angle, along with the pitch and roll offset angles, are also used to adjust the reported pitch and roll values in the transmitted PGN 127257, and in the transmitted NMEA 0183 $WIXDR sentence. A properly set azimuth offset angle will allow the unit to accurately report pitch and roll of the vessel, even though the orientation mark on the sensor housing may not be facing precisely toward the bow.

The recommended procedure to set these offsets is as follows:

1. If the unit is mounted on a vessel, this procedure should be performed with calm water and no wind, and with the vessel at rest.

2. First, zero out all offsets by using the Command Group Function PGN 126208, specifying the individual fields in PGN 126720-32 as follows.

PGN 126720	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	32 (decimal)
5	0
6	0
7	0

3. Determine the desired azimuth offset angle, and program this into the sensor using the Command Group Function PGN 126208, specifying the individual fields in PGN 126720-32 as follows. The pitch and roll offset fields should be omitted for this step (or set to zeroes).

PGN 126720	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	32 (decimal)
5	Azimuth offset angle of sensor, relative to bow

4. Allow the vessel to stabilize to its "level" state, and then read the values of pitch and roll that are reported by PGN 127257. If the vessel is rocking back and forth, then take a number of readings and calculate an average for both pitch and roll.

5. Program the negated versions of these measured pitch and roll values back into the unit as offsets using the Command Group Function PGN 126208, specifying the individual fields in PGN 126720-32 as follows. Note that field 5, azimuth offset angle, is not programmed during this step.

PGN 126720	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	32 (decimal)
6	Pitch offset angle
7	Roll offset angle

6. At this point the transmitted PGN 127257 should be producing values that are centered around 0.0 degrees for both pitch and roll.

PGN 126720-33 (0x1EF00)

Proprietary: Calibrate Compass

Single Frame: No	**Priority:** 7/Y/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level: 0/**1

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	33 (decimal)	33 = Calibrate Compass
5	Calibrate Function	Yes	DD005	DF53	uint8	1 bit	0 = X = Normal, cancel calibration mode 1 = GO, enter calibration mode 2 = RESET All User Calibration Values to Defaults 3 = Verify 4 = Reset Compass Cal Values to defaults 5. Reset Damping Values to defaults	See Notes
6	Calibration Status	No	DD005	DF53	uint8	1 bit	0 = QUERIED 1 = PASSED 2 = FAILED, Timeout 3 = FAILED, Tilt Error 4 = FAILED, Other Error 5 = IN-PROGRESS	See Notes
7	Verify Score	No	N/A	DF53	uint8	1 bit	Score	TBD
8	X-axis Gain Value	No	N/A	DF58	int16	.01	Multiplier	Default 100, range 50 to 500
9	Y-axis Gain Value	No	N/A	DF58	int16	.01	Multiplier	Default 100, range 50 to 500
10	Z-axis Gain Value	No	N/A	DF58	int16	.01	Multiplier	Default 100, range 50 to 500

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
11	X-axis Linear Offset	No	N/A	DF58	int16	.01	Teslas	Default 0, range -32000 to +32000
12	Y-axis Linear Offset	No	N/A	DF58	int16	.01	Teslas	Default 0, range -32000 to +32000
13	Z-axis Linear Offset	No	N/A	DF58	int16	.01	Teslas	Default 0, range -32000 to +32000
14	X-axis Angular Offset (Unused)	No	N/A	DF58	int16	.1	Degrees	Default 0, range 0 to 3600
15	Pitch and Roll Damping	No	N/A	DF58	int16	.05	Seconds	Default 30, range 0 to200
16	Compass/RateGyro Damping	No	N/A	DF58	int16	.05	Seconds	Default -30, range -2400 to 2400, negative numbers indicate that the rate gyro is to be used in compass computations.

Notes

This PGN can be used to manually initiate a user calibration sequence for the internal compass sensor. There is an alternative to issuing this PGN to start user compass calibration, called AutoCal. AutoCal is intended for users who do not have access to a user interface which allows them to manually start user compass calibration.

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

Queries work with access level 0, all other functions require at least access level 1.

Calibration needs to be done in calm seas, away from other boats or ferrous objects (structures or aids to navigation). Trying to turn a 2-3 minute circle in strong currents or congested areas will be difficult, if not hazardous.
The user calibration sequence for the GH2183 or H2183 is as follows:

1. The compass sensor is installed on the vessel. The unit under test is powered up.
2. Manual Start: The access level is set to 1.
   AutoCal Start: Access level not required.
3. Manual Start: PGN 126208 Command Group Function message is sent Fields 1, 3, 4 and 5 must each be fully specified, field 5 is set to 1 (GO) to initiate user calibration mode.
   AutoCal Start: Within 2 minutes of applying power to the compass sensor being calibrated, the vessel must start a slow (2-4 knots) circular turn. If it completes a full circle within 2-3 minutes, AutoCal will enter the user compass calibration procedure (See steps 4-7).
4. During the user calibration process, the vessel is rotated slowly (driven at 2-4 knots, completing a circle within 2-3 minutes), while the sensor collects data. Once the compass sensor has determined that enough data has been collected, it calculates the coefficients, and sets the status to 1 for PASS or 2 - 4 for FAIL.
5. During the user calibration process, PGN 126208 can be used to request PGN 126720-33 to obtain status at any time. While calibration is running, the status will be 5 for INPROGRESS. Once it has completed, the status will be 1 for Passed or 2-4 for Failed.
6. If PASS was transmitted, then the offsets that are now in use and saved in EEPROM are the newly calculated ones.

7. Note: During user compass calibration, heading is not valid and will be output as DataNotAvailable. After calibration is complete, heading will again be valid, and if calibration was successful it will continue to be valid, but if calibration failed, heading will alternate between valid for 10 seconds and not valid for 10 seconds.

To exit user calibration mode before it passes or fails, PGN 126208 Command Group Function message is sent. Fields 1, 3, 4 and 5 must each be fully specified, field 5 is set to 0 (X, Normal, Cancel).

To reset user calibration coefficients and damping control, PGN 126208 Command Group Function message is sent Fields 1, 3, 4 and 5 must each be fully specified, field 5 is set to 2 (Reset All).

To reset just user calibration coefficients, PGN 126208 Command Group Function message is sent Fields 1, 3, 4 and 5 must each be fully specified, field 5 is set to 4 (Reset Calibration).

To reset just user damping control, PGN 126208 Command Group Function message is sent Fields 1, 3, 4 and 5 must each be fully specified, field 5 is set to 5 (Reset Damping).

To request status or current user calibration coefficients, PGN 126208 Request Group Function message is sent Fields 1, 3, and 4 must each be fully specified. PGN 126720-33, will be transmitted with status set to 0 for QUERIED, 1 for PASSED, 2-4 for FAILED, or 5 for IN-PROGRESS.

Fields 8-16 can be used to set User Calibration Coefficients. PGN 126208 Command Group Function message is sent Fields 1, 3, 4 and the field or fields to be set must each be fully specified. Currently only Linear Offsets and Damping values are supported.

Failure modes: 2 = FAILED: 5 minute timeout occurred before successful completion or more than 30 seconds was taken to turn thru 45 degrees, 3 = FAILED: Tilt Error, or 4 = FAILED: Other Error, such as, reversing the direction of the turn for more than 45 degrees.

The user compass calibration procedure can be aborted by purposely causing one of the above errors. For example, stopping the turn will cause an error within 30 seconds, or reversing the direction of the turn will cause an error even faster.

User compass calibration procedure does not affect Pitch and Roll Damping or Compass/RateGyro Damping, but this PGN can be used to change the damping control values.

PGN **126720-35** (0x1EF00)

Proprietary: Simulate Mode

Single Frame: No	**Priority:** 7/Y/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 1

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	35 (decimal)	35 = Simulate Mode
5	Simulate Mode	No	DD003	DF52	2 bits	1	MSB/LSB: 00 = Simulate Mode Off 01 = Simulate Mode On 10 = Reserved 11 = No action/Data Not Available	This field defines whether the unit is in Simulate Mode. This field may be changed with the Command Group Function PGN 126208. It is *not* saved in EEPROM. The default value on power up is 00 (Simulate Mode Off).
6	Reserved bits	No	DD001	DF52	22 bits	1	0x3FFFFF	All bits set to logic "1"

Notes

PGN 126720-32 supported in:	GH2183	✓
	G2183	✓
	H2183	No

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

Although this is a fast-packet message, the version with this PID fits into a single CAN frame.

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To change the state of the Simulate Mode option (field 5), use the Command Group Function PGN 126208, specifying the individual fields in PGN 126720-35 as follows.

PGN 126720	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	35 (decimal)
5	One of the following: MSB/LSB: 00 = Turn Simulate Mode Off 01 = Turn Simulate Mode On

This PGN performs the same function as the received proprietary NMEA 0183 command $PAMTC,SIM.

PGN 126720-46 (0x1EF00)

Proprietary: NMEA 2000® Options

Single Frame: No	**Priority:** 7/Y/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	46 (decimal)	46 = NMEA 2000® Options
5	Transmission Interval Supersedes Measurement Interval	No	DD003	DF52	2 bits	1	MSB/LSB: 00 = Feature Disabled 01 = Feature Enabled 10 = Reserved 11 = No action/Data Not Available	See the text below for a description of this feature. This field may be changed with the Command Group Function PGN 126208. It is saved in EEPROM. The default value is 00 (Feature Disabled).
6	Reserved bits	No	DD001	DF52	22 bits	1	0x3FFFFF	All bits set to logic "1"

Notes

PGN 126720-46 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

The data provided by the GH2183/G2183/H2183 are sampled, or measured, at different rates, depending on the nature of the data being measured. For example, the GPS receiver in the GH2183 provides new position fix data once per second, while the compass heading sensor provides new data ten times per second. The rate at which a given source of data is measured is unrelated to the rate at which its corresponding PGN is transmitted. It is possible, using the Request Group Function PGN 126208, to specify a PGN transmission interval that is faster than the corresponding measurement interval for data within the PGN.

Field 5 of this PGN allows the user to specify the behavior of the unit when PGNs are requested to be transmitted faster than the measurement intervals for data within the PGNs. If the feature is disabled (the default case), then the measurement interval supersedes the requested transmission interval. If the feature is enabled, then the requested transmission interval supersedes the measurement interval.

Some examples are shown below:

Measurement Interval	Transmission Interval	Field 5	Actual Rate of Transmission	Comment
500 mS	100 mS	00 = disabled	500 mS	In the default case, the device will not transmit data any faster than it is sampled, or measured, even if requested to do so.
500 ms	100 mS	01 = enabled	100 mS	If the feature is enabled, then PGNs will be transmitted at the rate specified by the transmission interval, regardless of the measurement interval. If the transmisison interval is shorter than the measurement interval, then data will be repeated on successive PGNs until it is measured again.
500 mS	1000 mS	00 = disabled	1000 mS	If the transmission interval is greater than the measurement interval, then it will supersede regardless of the setting in field 5.
500 mS	1000 mS	01 = enabled	1000 mS	If the transmission interval is greater than the measurement interval, then it will supersede regardless of the setting in field 5.

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

Although this is a fast-packet message, the version with this PID fits into a single CAN frame.

To change the state of field 5, use the Command Group Function PGN 126208, specifying the individual fields in PGN 126720-46 as follows.

PGN 126720	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	46 (decimal)
5	One of the following: MSB/LSB: 00 = Disable Feature 01 = Enable Feature

PGN 126720-47 (0x1EF00) Proprietary: Received PGN Source

Single Frame: No	**Priority:** 7/Y/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	47 (decimal)	47 = Received PGN Source
5	Received PGN number	Yes	DD009	DF52	24 bits	1	127258 only (for H2183)	24-bit Parameter Group Number (PGN) expressed in binary, LSB is transmitted first.
6	Rule	No	DD003	DF52	3 bits	1	0 = Reserved 1 = Highest priority Airmar device 2 = Highest priority device, any mfr. 3 = Specific device 4 = Specific device, or highest priority 5-6 = Reserved 7 = No action/Data Not Available	The default value for this field is 1. This field is saved in EEPROM. See the text below for an explanation of this field.
7	Reserved bits	No	DD001	DF52	5 bits	1	0x1F	All bits set to logic "1"
8	CAN name	No	N/A	DF52	64 bits	1	Variable	CAN name for the specific transmitting device intended to provide the PGN specified in field 5. The CAN name is supplied by the address claim PGN 60928 of the transmitting device. This field is saved in EEPROM.

Notes

PGN 126720-47 supported in:	GH2183	No
	G2183	No
	H2183	✓

This PGN is used to specify the rules by which the H2183 decides which device on the NMEA 2000® bus is used to provide a given PGN received by the H2183.

For the H2183, this PGN is used only in relation to received PGN 127258 (magnetic variation).

The Rule field, field 6, is interpreted as follows:

Rule value 1: for the received PGN specified in field 5, use the device on the bus transmitting the given PGN, and having the highest priority CAN name (lowest value) with a manufacturer code of 135, corresponding to AIRMAR Technology Corporation. If there are no Airmar devices on the bus transmitting the given PGN, then use the device having the highest priority CAN name, regardless of its manufacturer code. This is the default behavior for all of the listed PGNs.

Rule value 2: for the received PGN specified in field 5, use the device on the bus transmitting the given PGN, and having the highest priority CAN name (lowest value) irrespective of manufacturer code.

Rule value 3: for the received PGN specified in field 5, use the device on the bus corresponding to the CAN name specified in field 8.

Rule value 4: for the received PGN specified in field 5, use the device on the bus corresponding to the CAN name specified in field 8. If that device is not present on the bus, or is not transmitting the given PGN, then use the device having the highest priority CAN name, regardless of its manufacturer code.

Fields 6 and 8 are stored in nonvolatile EEPROM within the H2183.

To change the Rule (field 6) to a value of 1 or 2 for PGN 127258, use the Command Group Function PGN 126208, specifying the individual fields in PGN 126720-47 as follows.

PGN 126720	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	47 (decimal)
5	127258
6	1 or 2, as desired

Note that when changing the Rule (field 6) to 1 or 2, it is not necessary to specify field 8.

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To specify a certain transmitting device to be used to supply PGN 127258, set the Rule field (field 6) to a value of 3 or 4, and specify the CAN name of the transmitting device using the Command Group Function PGN 126208, specifying the individual fields in PGN 126720-47 as follows.

PGN 126720	
Field	**Value**
1	135 (decimal)
3	4 (decimal)
4	47 (decimal)
5	127258
6	3 or 4, as desired
8	The CAN name of the device transmitting the PGN of interest.

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

PGN **126720-48** (0x1EF00)

Proprietary: Altitude Settings

Single Frame: No	**Priority:** 7/Y/N	**Update Rate:** 0/N/N	**Destination:** Address	**Query Support:** Yes	**Access Level:** 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	48 (decimal)	48 = Altitude Settings
5	Altitude	No	DD024	DF15	int32	0.01 m	Legal range of values is -999.99 to +40,000 meters	Altitude of sensor. The contents of this field are mirrored in field 9 of transmitted PGN 129538. Default value = 0 meters. This value is stored in EEPROM memory in the GH2183/G2183/H2183, and is changeable with the Command Group Function PGN 126208.
6	Use Antenna Altitude for GPS 2D Mode	No	DD002	DF52	2 bits	1	MSb/LSb: 00 = [No, Off, Disabled, Reset, "0"] 01 = [Yes, On, Enabled, Set, "1"] 10 = Error 11 = [Unavailable, Unknown]	The contents of this field are mirrored in field 10 of transmitted PGN 129538. Default value = 00 (disabled). This value is stored in EEPROM memory in the GH2183/G2183/H2183, and is changeable with the Command Group Function PGN 126208.

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
7	Altitude Option for Barometric Pressure	No	N/A	DF52	3 bits	1	0 = Do not use altitude for barometric pressure altimeter setting 1 = Barometric pressure altimeter setting uses fixed altitude (field 5) 2 = Barometric pressure altimeter setting uses GPS altitude when GPS has a 3D fix, or fixed altitude (field 5) when GPS does not have a 3D fix 3-6 = reserved 7 = Data not available./Do not change	Default value = 2. This field has no effect. It is defined here for compatibility with WeatherStation Instruments.
8	Reserved bits	No	DD001	DF52	3 bits	1	0x7	All bits set to logic "1"

Notes

Notes

PGN 126720-48 supported in:	GH2183	✓
	G2183	✓
	H2183	No

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

This PGN performs the same function as the received NMEA 0183 sentence $PAMTC,ALT.

PGN 126720-49 (0x1EF00) Proprietary: Set WAAS Satellite

Single Frame: No	Priority: 7/Y/N	Update Rate: 0/N/N	Destination: Address	Query Support: Yes	Access Level: 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	49 (decimal)	49 = Set WAAS Satellite
5	WAAS Satellite Number	No	DD074	DF53	uint8	1 bit	0=Auto Mode (default) 120-138=WAAS satellite ID 255=Data Not Available / Do Not Change	This command can be used to direct the GPS to use a specific WAAS satellite. This value is NOT stored in Eeprom, but is changeable with the Command Group Function PGN 126208.

Notes

PGN 126720-49 supported in:	GH2183	✓
	G2183	✓
	H2183	No

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

This PGN performs the same function as the received NMEA 0183 sentence $PAMTC,OPTION,4,XXX.

PGN 126720-50 (0x1EF00) Proprietary: Enable GPS Type 0 Messages

Single Frame: No	Priority: 7/Y/N	Update Rate: 0/N/N	Destination: Address	Query Support: Yes	Access Level: 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	Yes	DD005	DF53	uint8	1 bit	50 (decimal)	50 = Enable GPS Type 0 Messages
5	Enable GPS Type 0 Messages Parameter	No	N/A	N/A	uint16	1 bit	0=Ignore type 0 message for 60 seconds 1-39=Enable type 0 messages as data 255=Ignore type 0 messages (default) 65535=Data Not Available / Do Not Change	This command can be used to direct the GPS how to handle type 0 messages. This value is NOT stored in Eeprom, but is changeable with the Command Group Function PGN 126208.

Notes

PGN 126720-50 supported in:	GH2183	✓
	G2183	✓
	H2183	No

This PGN is transmitted in response to a PGN 126208 Request Group Function message. Fields 1, 3, and 4 must each be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

This PGN performs the same function as the received NMEA 0183 sentence $PAMTC,OPTION,5,XXX.

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **126992** (0x1F010)

System Time

Single Frame: Yes	**Priority:** 3/Y/Y	**Update Rate:** 1000 ms/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 126992 supported in:	GH2183	✓
	G2183	✓
	H2183	No

The Date and Time fields will only contain valid data once the GPS receiver within the unit has achieved a position fix.

The latency of this parameter group will be governed by overall bus traffic.

The following transmitted PGNs are linked by their SID fields: 126992, 129026, 129029, 129539, and 129540.

PGN **126996** (0x1F014)

Product Information

Single Frame: No	**Priority:** 6/Y/N	**Update Rate:** 0/N/N	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 126996 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN 126998 (0x1F016) Configuration Information

Single Frame: No	Priority: 6/Y/N	Update Rate: 0/N/N	Destination: Global	Query Support: Yes	Access Level: 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 126998 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

The contents of fields 1 and 2 are stored in nonvolatile memory, and may be programmed using the NMEA Command Group Function, PGN 126208.

To change the state of the Installation Description (fields 1 and 2), use the Command Group Function PGN 126208, specifying the individual fields in PGN 126998 as follows.

PGN 126998	
Field	**Value**
1	Desired variable length ASCII string, up to 70 characters
2	Desired variable length ASCII string, up to 70 characters

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN 127250 (0x1F112)

Vessel Heading

Single Frame: Yes	**Priority:** 2/Y/Y	**Update Rate:** 100 mS/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 127250 supported in:	GH2183	✓
	G2183	No
	H2183	✓

The value in field 2 provides ship heading relative to magnetic north. This value includes corrections for deviation and attitude offsets. Use PGN 126720-33 to calibrate the compass (produce a deviation table). Use PGN 126720-32 to establish sensor attitude offsets.

To obtain ship heading relative to true north, add the variation value in field 4 to the heading sensor reading in field 2.

The magnetic variation (field 4) may be provided from one of the following sources:

- In the GH2183, magnetic variation is calculated using the present position and today's date provided by the GPS once it has achieved a fix. If a GPS fix has been previously attained, then the variation value will have been stored in EEPROM and will be used until the GPS achieves a new fix. (See the transmitted Magnetic Variation PGN 127258).
- In the H2183, magnetic variation is provided from one of the following received messages, in decreasing order of precedence:
  - NMEA 2000® PGN 127258
  - NMEA 0183 VTG sentence
  - NMEA 0183 RMC sentence

  In the H2183, magnetic variation is not saved in EEPROM memory.

PGN **127251** (0x1F113)

Rate of Turn

Single Frame: Yes	**Priority:** 2/Y/Y	**Update Rate:** 100 mS/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 127251 supported in:	GH2183	✓
	G2183	No
	H2183	✓

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **127257** (0x1F119)

Attitude

Single Frame: Yes	**Priority:** 3/Y/Y	**Update Rate:** 1000 mS/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 127257 supported in:	GH2183	✓
	G2183	No
	H2183	✓

Use PGN 126720-32 to establish sensor attitude offsets.

PGN **127258** (0x1F11A)

Magnetic Variation

Single Frame: Yes	**Priority:** 7/Y/Y	**Update Rate:** 1000 mS/Y/Y	**Destination:** Global	**Query Support:** No	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 127258 supported in:	GH2183	✓
	G2183	✓
	H2183	No

The magnetic variation provided in field 5 is calculated based on the current date and position provided by the GPS, using the World Magnetic Model for 2005. Prior to the GPS achieving a position fix, the last known Variation and Age of Service (fields 5 and 4, respectively) are retrieved from EEPROM memory and supplied in these fields.

See also field 4 of PGN 127250.

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **129025** (0x1F801)

Position, Rapid Update

Single Frame: Yes	**Priority:** 2/Y/Y	**Update Rate:** 100 mS/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 129025 supported in:	GH2183	✓
	G2183	✓
	H2183	No

If the GPS has not achieved a fix, then both fields will contain the value +2,147,483,647, indicating Data Not Available.

The latitude and longitude values are referenced to the WGS-84 datum.

See also PGN 129029.

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **129026** (0x1F802)

COG & SOG, Rapid Update

Single Frame: Yes	**Priority:** 2/Y/Y	**Update Rate:** 250 mS/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 129026 supported in:	GH2183	✓
	G2183	✓
	H2183	No

The following transmitted PGNs are linked by their SID fields: 126992, 129026, 129029, 129539, and 129540.

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN 129029 (0x1F805) GNSS Position Data

Single Frame: No	**Priority:** 3/Y/Y	**Update Rate:** 1000 mS/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 129029 supported in:	GH2183	✓
	G2183	✓
	H2183	No

Some of the data in this parameter group will only be available once the GPS has achieved a position fix. Other data will be available once satellites are being tracked.

Fields 16, 17, 18 are repeated for each station indicated by field 15, and therefore are not present when field 15 is 0, which is the case for the GH2183/G2183.

The following transmitted PGNs are linked by their SID fields: 126992, 129026, 129029, 129539, and 129540.

PGN **129033** (0x1F809)

Time & Date

Single Frame: Yes	**Priority:** 3/Y/Y	**Update Rate:** 1000 ms/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 129033 supported in:	GH2183	✓
	G2183	✓
	H2183	No

Fields 1 and 2 will only contain valid data once the GH2183/G2183 has achieved a position fix.

To change the Local Offset value (field 3), use the Command Group Function PGN 126208, specifying the individual fields in PGN 129033 as follows.

PGN 129033	
Field	**Value**
3	Desired local offset, minutes

PGN **129044** (0x1F814)

Datum

Single Frame: No	**Priority:** 6/Y/Y	**Update Rate:** 10,000 ms/Y/Y	**Destination:** Global	**Query Support:** No	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 129044 supported in:	GH2183	✓
	G2183	✓
	H2183	No

To change to a different Local Datum (field 1), use the Command Group Function PGN 126208, specifying the individual fields in PGN 129044 as follows.

PGN 129044	
Field	**Value**
1	4-character Local Datum code

KGS, OHI-A, OHI-B, OHI-C, OHI-D, OHI-M, SIR, P90, and S85 are not currently supported by the GPS Engine used in the GH2183/G2183, and therefore are not available for use as Local Datum (field 1).

See also the NMEA 0183 transmitted sentence $GPDTM, and the received NMEA 0183 proprietary command $PAMTC,DATUM.

PGN 129538 (0x1FA02) GNSS Control Status

Single Frame: No	Priority: 6/Y/Y	Update Rate: 0/N/N	Destination: Global	Query Support: Yes	Access Level: 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 129538 supported in:	GH2183	✓
	G2183	✓
	H2183	No

Each field in this PGN contains a setting stored in nonvolatile EEPROM within the GH2183/G2183. The default values are shown in the Remarks column. The value in each field may be changed using PGN 126208, Command Group Function.

See also the NMEA 0183 received proprietary sentences $PAMTC,OPTION and $PAMTC,ALT regarding the calculation of 2D position fixes.

NMEA 2000® TRANSMITTED PARAMETER GROUP

PGN **129539** (0x1FA03)

GNSS DOPs

Single Frame: Yes	**Priority:** 6/Y/Y	**Update Rate:** 1000 mS/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 129539 supported in:	GH2183	✓
	G2183	✓
	H2183	No

The following transmitted PGNs are linked by their SID fields: 126992, 129026, 129029, 129539, and 129540.

PGN **129540** (0x1FA04)

GNSS Sats in View

Single Frame: No	**Priority:** 6/Y/Y	**Update Rate:** 1000 mS/Y/Y	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 129540 supported in:	GH2183	✓
	G2183	✓
	H2183	No

This parameter group contains a variable number of fields, depending on the number of Satellites in View (field 4). Fields 5 through 11 are repeated for each satellite in view.

The following transmitted PGNs are linked by their SID fields: 126992, 129026, 129029, 129539, and 129540.

PGN **130944** (0x1FF80)

Proprietary: POST

Single Frame: No	**Priority:** 7/Y/N	**Update Rate:** 0/Y/N	**Destination:** Global	**Query Support:** Yes	**Access Level:** 0

Field #	Name	Request Param.	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	Yes	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	No	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	Yes	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Control	Yes	N/A	DF52	1 bit	1	0 = report previous values 1 = generate new values	Default value = 0 This field only applies when this PGN is transmitted in response to a query. Periodic transmissions of this PGN will always generate new values.
5	Reserved bits	No	DD001	DF52	7 bits	1	0x7F	All bits set to logic "1"
6	Number of ID/test result pairs to follow	No	DD006	DF53	uint8	1 bit	0 to 252 This field contains 4 for this product.	
7	Test ID #1	No	DD005	DF53	uint8	1 bit	0 to 252	Refer to the Table of IDs and Failure Codes.
8	Test result #1	No	N/A	DF53	uint8	1 bit	0x00 = Pass 0x01-0xEF = Fail 0xF0-0xFE = reserved 0xFF = Data Not Available	Refer to the Table of IDs and Failure Codes.
9	Variable number of fields, field 7 repeated	No	DD005	DF53	uint8	1 bit	0 to 252	Refer to the Table of IDs and Failure Codes.
10	Variable number of fields, field 8 repeated	No	N/A	DF53	uint8	1 bit	0x00 = Pass 0x01-0xEF = Fail 0xF0-0xFE = reserved 0xFF = Data Not Available	Refer to the Table of IDs and Failure Codes.

Notes

PGN 130944 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

This PGN is transmitted once automatically upon power up of the GH2183/G2183/H2183. Thereafter, it may be transmitted in response to a PGN 126208 Request Group Function message. Fields 1 and 3 must both be fully specified in the request in order for this PGN to be transmitted.

This PGN does not respond to ISO Requests (PGN 59904).

This PGN provides a method of reporting the results of the Power On Self Test performed by the GH2183/G2183/H2183. The various tests performed by the POST are simple tests to determine if the hardware is minimally responding to software stimuli. The POST function should not be regarded as a comprehensive indicator that a given unit is healthy. In other words, it is possible that a defective unit might still pass the POST operation. However, the POST can be useful to identify certain types of problems with the unit.

Field 4, Control, specifies whether this PGN will report the results of the last test, or whether the device will conduct a new self test prior to reporting the results. This field should be specified when requesting a single transmission of this PGN.

This PGN may be configured to transmit periodically by specifying an Update Rate using the Request Group Function PGN 126208. By default, this PGN is not transmitted periodically.

If Field 4, Control, is not specified, then Field 4 will be regarded as 0 (report previous values) for single requests, and 1 (generate new values) for periodic transmissions.

The Power-On Self Test is performed automatically a few seconds after applying power to the unit.

See also the proprietary NMEA 0183 command $PAMTC,POST.

Table of IDs and Failure Codes:

ID	Description	Failure Codes	GH2183	G2183	H2183
1	Format Code	0x01 = Format Code mismatch 0x02-0xEF = reserved	✓	✓	✓
2	Factory EEPROM	0x01-0xEE = count of checksum errors 0xEF = one or more illegal values detected	✓	✓	✓
3	User EEPROM	0x01-0xEE = count of checksum errors 0xEF = one or more illegal values detected	✓	✓	✓
7	Internal temperature sensor	0x01 = Thermistor shorted 0x02 = Thermistor open 0x03-0xEF = reserved	✓	✓	✓
8	Battery voltage sensor	0x01 = Sensor not functional 0x02-0xEF = reserved	✓	✓	✓

ID	Description	Failure Codes	GH2183	G2183	H2183
14	Compass sensor	0x01 = Sensor fault 0x02-0xEF = reserved	✓		✓
15	GPS receiver	0x01 = Fault 0x02-0xEE = reserved 0xEF = Test results not yet available	✓	✓	
16	Attitude sensor	0x01 = Sensor fault 0x02-0xEF = reserved	✓		✓
17	Rate gyro	0x01 = Sensor fault 0x02-0xEF = reserved	✓		✓

2.5. Received NMEA 2000® PGNs

The NMEA 2000® PGNs recognized by the GH2183/G2183/H2183 are summarized in Table 2. Each of the PGNs in Table 2 is described in detail on the subsequent pages.

Table 2: NMEA 2000® Received PGNs

PGN	Description	GH2183	G2183	H2183
59904	ISO Request	✓	✓	✓
60928	ISO Address Claim	✓	✓	✓
65286	Proprietary: Boot State Request	✓	✓	✓
126208	Request Group Function	✓	✓	✓
126208	Command Group Function	✓	✓	✓
126720	Proprietary -1: Master Reset -130: Restore EEPROM -132: Reset GPS	 ✓ ✓ ✓	 ✓ ✓ ✓	 ✓ ✓
127258	Magnetic Variation			✓

NMEA 2000® RECEIVED PARAMETER GROUP

PGN **059904** (0x0EA00)

ISO Request

Single Frame: Yes **Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 59904 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

When this PGN is received, the unit will respond by transmitting either the PGN being requested, or the ISO Acknowledge PGN 59392.

See also the received Request Group Function PGN 126208.

NMEA 2000® RECEIVED PARAMETER GROUP

PGN **060928** (0x0EE00)

ISO Address Claim

Single Frame: Yes	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 60928 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

PGN 60928 is a network management message used to claim a network address, reply to devices requesting the claimed address, and to respond to requests for device information (NAME). The 64 bits comprised by the ten fields in this parameter group constitute the ISO 11783-5 NAME entity.

NMEA 2000® RECEIVED PARAMETER GROUP

PGN 065286 (0x0FF06)

Proprietary: Boot State Request

Single Frame: Yes **Access Level:** 0

Field #	Name	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Reserved bits	DD001	DF52	48 bits	1	0xFFFFFFFFFFFF	All bits set to logic "1"

Notes

PGN 65286 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

When this destination global PGN is received, the unit will respond by transmitting PGN 65285 (see). It is intended that all Airmar devices connected to the NMEA 2000® bus will likewise also reply accordingly when receiving this PGN.

PGN **126208** (0x1ED00)

Request Group Function

Single Frame: No	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 126208 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

When this PGN is received, the unit will compare the specified Request Parameters in fields 6, 7 (and any following fields) against the contents of the actual fields in the requested PGN. The only fields that may be used as Request Parameters are those which indicate a "Yes" in the "Request Param." column in the detailed description for the specific transmitted PGN. If all specified parameters match the values in the corresponding fields, then the requested PGN will be transmitted. If any of the parameters do not match, then the unit will respond by transmitting the Acknowledge Group Function PGN 126208 with the appropriate error code(s) provided.

This PGN may also be used to specify the Transmission Interval (Update Rate) between successive transmissions of a periodically transmitted PGN. (Note: certain PGNs do not permit changing the transmission interval.) For all single-frame PGNs that permit changing the transmission interval, the allowable range of interval values is 50 ms to 60 seconds. For all fast packet PGNs that permit changing the transmission interval, the allowable range of interval values is 100 ms to 60 seconds. Note that it may be possible to specify an update rate that is faster than the unit's ability to generate new data. In this case, the PGN will be transmitted only as new data becomes available.

Use the proprietary received PGN 126720-130 to reset all Transmission Intervals for all PGNs to their factory defaults.

Refer to the detailed descriptions of the specific transmitted PGNs in this document for any exceptions or special cases with regard to using the Request Group Function PGN 126208 with each PGN.

All parameter value fields must be padded (with 1's) if necessary to ensure byte boundaries are adhered to.

When the Requested PGN field 2 (of PGN 126208) refers to a proprietary PGN, fields 1 and 3 (manufacturer code and industry group) of the proprietary PGN must be specified *first* in the list of field number and parameter value pairs in PGN 126208. All other field number and parameter value pairs may appear in any order in this message.

For proprietary PGNs described in this document, fields 1, 2, and 3 (manufacturer code, reserved bits, and industry group) of the proprietary PGN may optionally be combined into a single 16-bit field when specifying fields in PGN 126208. For Airmar proprietary PGNs, the 16-bit field is constructed as follows:

- bits 15-13 = binary 100 = decimal 4 (industry group for "Marine Industry")
- bits 12-11 = binary 11 = reserved bits
- bits 10-0 = binary 000 1000 0111 = decimal 135 (manufacturer code for Airmar Technology)

The concatenation of these 16 bits produces the binary value 1001 1000 1000 0111 = hexadecimal 0x9887. Therefore, instead of specifying the two fields, 11-bit field 1 and 3-bit field 3 for a proprietary PGN, it is permissible to specify a single 16 bit field 1, containing the value 0x9887, for the proprietary PGNs described in this document. When doing so, field 3 may *not* also be specified, or the PGN will not be accepted. The 16-bit field 1 must be specified first in the list of field number and parameter value pairs in PGN 126208.

See also related PGNs:

- the received ISO Request PGN 59904
- the received Command Group Function PGN 126208
- the transmitted Acknowledge Group Function PGN 126208

NMEA 2000® RECEIVED PARAMETER GROUP

PGN **126208** (0x1ED00)

Command Group Function

Single Frame: No	**Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 126208 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

This received PGN is used by the device to set the value of one or more parameters in a Parameter Group. The individual parameters of the Commanded PGN are specified in the Field Number/Value pairs (fields 6 and 7 of this PGN). Refer to the detailed description for each transmitted PGN for specific instructions regarding which fields to specify when using the Command Group Function PGN 126208. (Note that some required fields are not changeable, but are used as qualifiers when changing other fields.)

This PGN may also be used to specify the Priority field of a given transmitted PGN. (Note: certain PGNs do not permit changing the Priority field.)

Upon receiving this PGN, the device will respond by transmitting the Acknowledge Group Function PGN 126208.

Use the proprietary received PGN 126720-130 to reset all Priority fields for all PGNs to their factory defaults.

All parameter value fields must be padded (with 1's) if necessary to ensure byte boundaries are adhered to.

When the Commanded PGN field 2 (of PGN 126208) refers to a proprietary PGN, fields 1 and 3 (manufacturer code and industry group) of the proprietary PGN must be specified *first* in the list of field number and parameter value pairs in PGN 126208. All other field number and parameter value pairs may appear in any order in this message.

For proprietary PGNs described in this document, fields 1, 2, and 3 (manufacturer code, reserved bits, and industry group) of the proprietary PGN may optionally be combined into a single 16-bit field when specifying fields in PGN 126208. For Airmar proprietary PGNs, the 16-bit field is constructed as follows:

- bits 15-13 = binary 100 = decimal 4 (industry group for "Marine Industry")
- bits 12-11 = binary 11 = reserved bits
- bits 10-0 = binary 000 1000 0111 = decimal 135 (manufacturer code for Airmar Technology)

The concatenation of these 16 bits produces the binary value 1001 1000 1000 0111 = hexadecimal 0x9887. Therefore, instead of specifying the two fields, 11-bit field 1 and 3-bit field 3 for a proprietary PGN, it is permissible to specify a single 16 bit field 1, containing the value 0x9887, for the proprietary PGNs described in this document. When doing so, field 3 may *not* also be specified, or the PGN will not be accepted. The 16-bit field 1 must be specified first in the list of field number and parameter value pairs in PGN 126208.

See also related PGNs:

- the received Request Group Function PGN 126208
- the transmitted Acknowledge Group Function PGN 126208

NMEA 2000® RECEIVED PARAMETER GROUP

PGN **126720** (0x1EF00) Addressable Multi-Frame Proprietary

Single Frame: No **Access Level:** See PID variants

Field #	Name	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	DD005	DF53	uint8	1 bit	0 to 252	Identifier specifying how to interpret the remaining fields in this parameter group.
5+	(PID-dependent)	DD000	DF00	undef.	undefined	undefined	The use of the remaining bytes and the number of CAN frames required varies according to the PID (field 4).

Notes

In order for this received PGN to be recognized by the device, the Manufacturer Code and Industry Group (fields 1 and 3) must match the values shown.

The use of this PGN with the following Proprietary ID's (field 4) is described on the subsequent pages:

1: Master Reset
130: Restore user EEPROM memory to factory defaults
132: Reset GPS

NMEA 2000® RECEIVED PARAMETER GROUP

PGN 126720-1 (0x1EF00)

Proprietary: Master Reset

Single Frame: No **Access Level:** 1

Field #	Name	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	DD005	DF53	uint8	1 bit	1 = Master Reset	Identifier specifying how to interpret this PGN.
5	Reserved bits	DD001	DF52	24 bits	1	0xFFFFFF	All bits set to logic "1"

Notes

PGN 126720-1 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Upon receiving this PGN, the device will perform a master CPU reset, as though the power had been turned off and back on again. This PGN performs the same function as the NMEA 0183 proprietary command, $PAMTC,RESET.

In order for this received PGN to be recognized by the device, the Manufacturer Code, Industry Group, and Proprietary ID (fields 1, 3, and 4) must match the values shown.

Although this is a fast-packet message, the version with this PID fits into a single CAN frame.

NMEA 2000® RECEIVED PARAMETER GROUP

PGN 126720-130 (0x1EF00)

Proprietary: Reset EEPROM

Single Frame: No **Access Level:** 1

Field #	Name	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	DD005	DF53	uint8	1 bit	130 (decimal) = Reset EEPROM	Identifier specifying how to interpret this PGN.
5	Options	N/A	DF52	4 bits	1	0x0 = Restore entire user EEPROM except Unique Number 0x1 = Restore all message Priorities 0x2 = Restore all message Update Rates 0x3 = Restore all message Priorities *and* Update Rates 0x4 = Restore user Unique Number 0x4 to 0xE = reserved 0xF = reserved	
6	Reserved bits	DD001	DF52	20 bits	1	0xFFFFF	All bits set to logic "1"

Notes

PGN 126720-130 supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Upon receiving this PGN, the device will restore part of user EEPROM memory to its factory default state.

The Options field (field 5) specifies whether all of user EEPROM memory (except the user Unique Number) is to be restored (value 0x0), or only a subset of EEPROM memory is to be restored.

Note that this PGN requires Access Level 1, even when resetting the Unique Number to its factory default value (option 0x4). The proprietary PGN to change the Unique Number to a value other than the factory default value, which is described in another document, requires Access Level 2.

In order for this received PGN to be recognized by the device, the Manufacturer Code, Industry Group, and Proprietary ID (fields 1, 3, and 4) must match the values shown.

Although this is a fast-packet message, the version with this PID fits into a single CAN frame.

See also the proprietary received NMEA 0183 command $PAMTC,ERST.

NMEA 2000® RECEIVED PARAMETER GROUP

PGN 126720-132 (0x1EF00)

Proprietary: Reset GPS

Single Frame: No **Access Level:** 0

Field #	Name	DD	DF	Type	Resolution	Value	Remark
1	Manufacturer Code	DD172	DF52	11 bits	1	135 (decimal)	Manufacturer Code for Airmar Technology.
2	Reserved bits	DD001	DF52	2 bits	1	0x3	All bits set to logic "1"
3	Industry Group	DD168	DF52	3 bits	1	4 (decimal)	Industry Group for "Marine Industry".
4	Proprietary ID (PID)	DD005	DF53	uint8	1 bit	132 (decimal) = Reset GPS	Identifier specifying how to interpret this PGN.
5	(Remaining fields TBD)						

Notes

PGN 126720-132 supported in:	GH2183	✓
	G2183	✓
	H2183	No

Upon receiving this PGN, the GH2183/G2183 will reset its internal GPS module.

In order for this received PGN to be recognized by the GH2183/G2183, the Manufacturer Code, Industry Group, and Proprietary ID (fields 1, 3, and 4) must match the values shown.

Although this is a fast-packet message, the version with this PID fits into a single CAN frame.

NMEA 2000® RECEIVED PARAMETER GROUP

PGN 127258 (0x1F11A)

Magnetic Variation

Single Frame: Yes **Access Level:** 0

For further information about the NMEA 2000® protocol, including field descriptions refer to the document, *NMEA 2000® Standard for Serial-Data Networking of Marine Electronic Devices* available from NMEA.

Notes

PGN 127258 supported in:	GH2183	No
	G2183	No
	H2183	✓

Note that this received PGN is only recognized by the H2183. In that model it is used to provide the magnetic variation reported in field 4 of the transmitted PGN 127250.

See section 2.3. for precedence rules regarding data received in this PGN.

3. NMEA 0183 Interfaces

The Airmar GH2183/G2183/H2183 has a single standard NMEA 0183-compliant output channel, and a single standard NMEA 0183-compliant input channel. The unit transmits standard NMEA 0183 sentences on its output channel. It also recognizes standard and proprietary NMEA 0183 sentences received on its input channel. The standard baud rate for both input and output channels is 4800 baud, though if desired this may be increased to 38400 baud via a proprietary command.[1]

The transmitted NMEA 0183 sentences are described in section 3.1. Received NMEA 0183 sentences and proprietary commands are described in section 3.2.

3.1. Transmitted NMEA 0183 Sentences

By default, only certain NMEA sentences are enabled for transmission. Other sentences may be enabled individually for transmission via commands sent to the input channel.[2]

The standard transmission interval for most of the transmitted sentences is once per second. However, in models that include an integrated GPS, if every sentence were enabled for transmission, there would not be enough bandwidth in the output channel at 4800 baud to output all sentences within a one second timeframe. Therefore, one or more of the following remedies should be employed:

- To conserve bandwidth, only enable for transmission those sentences required for the given application, and disable all others.
- Reduce the frequency of transmission for less critical sentences.
- Increase the overall bandwidth eightfold by increasing the baud rate from the standard 4800 baud to 38400 baud (though keep in mind that most NMEA 0183 instruments are not capable of operating at 38400 baud)

All NMEA sentences transmitted by the device include a checksum at the end of the sentence, consisting of an asterisk (*) followed by two ASCII hexadecimal characters. In the detailed specifications to follow, these hexadecimal characters are designated by "`hh`".

The standard NMEA 0183 sentences provided by the GH2183/G2183/H2183 are summarized in Table 3. Each of the transmitted sentences in Table 3 is described in detail on the subsequent pages.

[1] See the `$PAMTC,BAUD` command.
[2] See the `$PAMTC,EN` command.

The Maximum Length (chars) column in the table indicates an expected worst-case scenario that can be used for bandwidth budgeting. The total time in seconds required to transmit all enabled sentences in a single interval is

$$Total\_transmission\_time = \frac{Total\_number\_of\_characters \times 10}{baud\_rate}$$

Table 3: NMEA 0183 Transmitted Sentences

Sentence	Description	GH2183	G2183	H2183	Maximum Length (chars)
$GP**DTM**	Datum Reference	☐	☑	×	47
$GP**GGA**	GPS Fix Data	☐	☑	×	82
$GP**GLL**	Geographic Position – Latitude/Longitude	☐	☑	×	48
$GP**GSA**	GNSS DOP and Active Satellites	☐	☐	×	66
$GP**GSV**	GNSS Satellites in View	☐	☐	×	70
$HC**HDG**	Heading, Deviation, and Variation	☑	×	☑	33
$HC**HDT**	Heading relative to True North	☐	×	☐	19
$GP**RMC**	Recommended Minimum Specific GNSS Data	☑	☑	×	74
$TI**ROT**	Rate of Turn	☑	×	☑	22
$GP**VTG**	Course Over Ground and Ground Speed	☐	☑	×	42
$YX**XDR**	Transducer Measurements: vessel attitude	☑	×	☑	43
$GP**ZDA**	Time & Date	☐	☑	×	38

☑ = supported and enabled by default
☐ = supported but not enabled by default
× = not supported

$GPDTM

Summary

NMEA 0183 standard Datum Reference.

$GPDTM supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

`$GPDTM,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>*hh<CR><LF>`

Fields

`<1>` Three character alphabetical code for local datum:
W84 (WGS84)
W72 (WGS72)
S85 (SGS85)
P90 (PE90)
or IHO datum code from the International Hydrographic Organization Publication S-60 Appendices B and C.

`<2>` One character subdivision datum code when available, as defined in IHO Publication S-60 Appendices B and C.

`<3>` Latitude offset, to the nearest .0001 minute

`<4>` N if field <3> is North Latitude
S if field <3> is South Latitude

`<5>` Longitude offset, to the nearest .0001 minute

`<6>` E if field <5> is East Longitude
W if field <5> is West Longitude

`<7>` Signed altitude offset, to the nearest meter

`<8>` 3-character reference datum code:
W84 = WGS-84

Default State

Disabled. Once per second when enabled.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,DTM command.

Latitude and longitude offsets are positive numbers; the altitude offset may be negative. Offsets change with position; position in the local datum is offset from the position in the reference datum in the directions indicated:

$$P_{local\ datum} = P_{ref\ datum} + offset$$

KGS, OHI-A, OHI-B, OHI-C, OHI-D, OHI-M, SIR, P90, and S85 are not currently supported by the GPS Engine used in the GH2183/G2183, and therefore are not available for use as Local Datum.

See also the proprietary NMEA 0183 command $PAMTC,DATUM, and the transmitted NMEA 2000® Datum PGN 129044.

$GPGGA

Summary

NMEA 0183 standard GPS Fix Data.

$GPGGA supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

```
$GPGGA,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,
<9>,<10>,<11>,<12>,<13>,<14>*hh<CR><LF>
```

Fields

<1> UTC of position, in the form hhmmss

<2> Latitude, to the nearest .0001 minute

<3> N if field <2> is North Latitude
S if field <2> is South Latitude

<4> Longitude, to the nearest .0001 minute

<5> E if field <4> is East Longitude
W if field <4> is West Longitude

<6> GPS quality indicator:

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
4 = Real Time Kinematic (RTK)
5 = Float RTK
6 = Estimated (dead reckoning) Mode
7 = Manual Input Mode
8 = Simulator Mode

The only values transmitted by the GH2183/G2183 for the quality indicator are 0,1, and 8.

<7> Number of satellites in use, 0-12

<8> Horizontal dilution of precision (HDOP)

<9> Altitude relative to mean-sea-level (geoid), meters (to the nearest whole meter)

<10> M

<11> Geoidal separation, meters (to the nearest whole meter). This field is not provided by the GH2183/G2183, and appears as a null field.

<12> M. This field is not provided by the GH2183/G2183, and appears as a null field.

<13> Age of Differential GPS data, seconds. This field is not provided by the GH2183/G2183, and appears as a null field.

<14> Differential reference station ID, 0000-1023. This field is not provided by the GH2183/G2183, and appears as a null field.

Default State

Disabled. Once per second when enabled.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,GGA command.

$GPGLL

Summary

NMEA 0183 standard Geographic Position – Latitude/Longitude.

$GPGLL supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

`$GPGLL,<1>,<2>,<3>,<4>,<5>,<6>,<7>*hh<CR><LF>`

Fields

`<1>` Latitude, to the nearest .0001 minute

`<2>` N if field <1> is North Latitude
S if field <1> is South Latitude

`<3>` Longitude, to the nearest .0001 minute

`<4>` E if field <3> is East Longitude
W if field <3> is West Longitude

`<5>` UTC of position, in the form hhmmss

`<6>` Status:
A = data valid; V = data invalid

`<7>` Mode indicator:

A = Autonomous mode
D = Differential mode
E = Estimated (dead reckoning) mode
M = Manual input mode
S = Simulator mode
N = Data not valid

The only values transmitted by the GH2183/G2183 for the Mode indicator are A, S, and N.

Default State

Disabled. Once per second when enabled.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,GLL command.

$GPGSA

Summary

NMEA 0183 standard GNSS DOP and Active Satellites.

$GPGSA supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

```
$GPGSA,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,
<12>,<13>,<14>,<15>,<16>,<17>*hh<CR><LF>
```

Fields

<1>	M = Manual, forced to operate in 2D or 3D mode A = Automatic, allowed to automatically switch 2D/3D In the GH2183/G2183, field <1> always contains the value of "A" (automatic).
<2>	1 = Fix not available 2 = 2D fix 3 = 3D fix
<3>-<14>	ID numbers of satellites used in solution
<15>	Positional Dilution of Precision (PDOP). This field is null unless the GPS has a 3D fix.
<16>	Horizontal Dilution of Precision (HDOP). This field is null unless the GPS has either a 2D fix or a 3D fix.
<17>	Vertical Dilution of Precision (VDOP). This field is null unless the GPS has a 3D fix.

Default State

Disabled. Once per second when enabled.

Notes

This sentence may be enabled via the $PAMTC,EN,GSA command.

$GPGSV

Summary

NMEA 0183 standard GNSS Satellites in View.

$GPGSV supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

```
$GPGSV,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,
<12>,<13>,<14>,<15>,<16>,<17>,<18>,<19>*hh<CR><LF>
```

Fields

<1>	Total number of GSV sentences (1 to 3)
<2>	Sentence number (1, 2, or 3)
<3>	Total number of satellites in view
<4>	Satellite ID number, 1st SV
<5>	Elevation degrees, 0 to 90, to the nearest degree, 1st SV
<6>	Azimuth, degrees True, to the nearest degree, 1st SV
<7>	SNR (C/No) 00-99 dB-Hz, 1st SV (null field if satellite not tracked)
<8>	Satellite ID number, 2nd SV
<9>	Elevation degrees, 0 to 90, to the nearest degree, 2nd SV
<10>	Azimuth, degrees True, to the nearest degree, 2nd SV
<11>	SNR (C/No) 00-99 dB-Hz, 2nd SV (null field if satellite not tracked)
<12>	Satellite ID number, 3rd SV
<13>	Elevation degrees, 0 to 90, to the nearest degree, 3rd SV
<14>	Azimuth, degrees True, to the nearest degree, 3rd SV
<15>	SNR (C/No) 00-99 dB-Hz, 3rd SV (null field if satellite not tracked)
<16>	Satellite ID number, 4th SV
<17>	Elevation degrees, 0 to 90, to the nearest degree, 4th SV
<18>	Azimuth, degrees True, to the nearest degree, 4th SV
<19>	SNR (C/No) 00-99 dB-Hz, 4th SV (null field if satellite not tracked)

Default State

Disabled. Once per second when enabled. This sentence is transmitted in groups of up to three instances, containing data for up to 4 satellites with each instance, for a total of up to 12 satellites. Fields <1> and <3> only contain data in the first instance; they are null fields in the second and third instances.

Notes

This sentence may be enabled via the $PAMTC,EN,GSV command.

$HCHDG

Summary

NMEA 0183 standard Heading, Deviation and Variation.

$HCHDG supported in:	GH2183	✓
	G2183	No
	H2183	✓

Syntax

`$HCHDG,<1>,<2>,<3>,<4>,<5>*hh<CR><LF>`

Fields

<1>	Magnetic sensor heading, degrees, to the nearest 0.1 degree.
<2>	Magnetic deviation, degrees east or west, to the nearest 0.1 degree.
<3>	E if field <2> is degrees East W if field <2> is degrees West
<4>	Magnetic variation, degrees east or west, to the nearest 0.1 degree.
<5>	E if field <4> is degrees East W if field <4> is degrees West

Default State

Enabled. In the GH2183, the default transmission rate is 10 times per second. In the H2183, the default transmission rate is 10 times per second.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,HDG command.

$HCHDT

Summary

NMEA 0183 standard Heading relative to True North

$HCHDT supported in:	GH2183	✓
	G2183	No
	H2183	✓

Syntax

`$HCHDT,<1>,<2>*hh<CR><LF>`

Fields

<1> Heading relative to True North

<2> T = True

Default State

Disabled. Twice per second when enabled.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,HDT command.

The data in field <1> is only provided if both magnetic compass heading and magnetic variation values are available.

$GPRMC

Summary

NMEA 0183 standard Recommended Minimum Specific GNSS Data.

$GPRMC supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

```
$GPRMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,
<9>,<10>,<11>,<12>*hh<CR><LF>
```

Fields

<1>	UTC of position, in the form hhmmss
<2>	Status: A = Data Valid; V = Navigation Receiver Warning
<3>	Latitude, to the nearest .0001 minute
<4>	N if field <2> is North Latitude S if field <2> is South Latitude
<5>	Longitude, to the nearest .0001 minute
<6>	E if field <4> is East Longitude W if field <4> is West Longitude
<7>	Speed Over Ground, knots, to the nearest 0.1 knot
<8>	Course Over Ground, degrees True, to the nearest 0.1 degree
<9>	Date: ddmmyy
<10>	Magnetic Variation, degrees E/W, to the nearest 0.1 degree
<11>	E if field <10> is degrees East W if field <10> is degrees West
<12>	Mode indicator: A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode M = Manual input mode S = Simulator mode N = Data not valid The only values transmitted by the GH2183/G2183 for the Mode indicator are A, S, and N.

Default State

Enabled. Transmitted once per second.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,RMC command.

$TIROT

Summary

NMEA 0183 standard Rate of Turn.

$TIROT supported in:	GH2183	✓
	G2183	No
	H2183	✓

Syntax

`$TIROT,<1>,<2>*hh<CR><LF>`

Fields

<1>	Signed rate of turn, degrees per minute, to the nearest 0.1 degree. Negative values indicate the bow is turning to port.
<2>	Status: A = Data Valid; V = Data Invalid.

Default State

Enabled. In the GH2183, the default transmission rate is once per second. In the H2183, the default transmission rate is 5 times per 3 seconds.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,ROT command.

$GPVTG

Summary

NMEA 0183 standard Course Over Ground and Ground Speed.

$GPVTG supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

`$GPVTG,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>`

Fields

<1> Course Over Ground, degrees True, to the nearest 0.1 degree

<2> T = True

<3> Course Over Ground, degrees Magnetic, to the nearest 0.1 degree

<4> M = Magnetic

<5> Speed Over Ground, knots, to the nearest 0.1 knot

<6> N = Knots

<7> Speed Over Ground, km/hr, to the nearest 0.1 km/hr

<8> K = km/hr

<9> Mode indicator:

A = Autonomous mode
D = Differential mode
E = Estimated (dead reckoning) mode
M = Manual input mode
S = Simulator mode
N = Data not valid

The only values transmitted by the GH2183/G2183 for the Mode indicator are A, S, and N.

Default State

Disabled. Once per second when enabled.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,VTG command.

$YXXDR

Summary

NMEA 0183 Transducer Measurements. Used in the GH2183/H2183 to provide vessel attitude (pitch and roll) data.

$YXXDR supported in:	GH2183	✓
	G2183	No
	H2183	✓

Syntax

```
$YXXDR,<1>, <2>, <3>, <4>,
       <5>, <6>, <7>, <8>
       *hh<CR><LF>
```

Fields

There is only one version of this sentence for the GH2183/H2183, but for compatibility with the PB200, which has an "A" and a "B" version, the GH2183/H2183 will implement it as a "B" version. The output does not change, only its identifier for enable/disable purposes is different.

<1>	A = angular displacement
<2>	Pitch: oscillation of vessel about its latitudinal axis. Bow moving up is positive. Value reported to the nearest 0.1 degree.
<3>	D = degrees
<4>	PTCH (ID indicating pitch of vessel)
<5>	A = angular displacement
<6>	Roll: oscillation of vessel about its longitudinal axis. Roll to the starboard is positive. Value reported to the nearest 0.1 degree.
<7>	D = degrees
<8>	ROLL (ID indicating roll of vessel)

Default State

$YXXDR(B): Enabled. In the GH2183, the default transmission rate is 5 times per 4 seconds. In the H2183, the default transmission rate is 5 times per 2 seconds.

Notes

The fields in an XDR sentence are grouped in sets of four. There may be up to four sets, with four fields per set, in a single transmitted XDR sentence. Each set contains, in order, the four fields <Type>, <Data>, <Units>, and <ID>. If for some reason the contents of a given set are not available, then the entire set (including commas) may be omitted. Future versions of firmware may provide multiple XDR sentences, containing different types of data in each sentence. Therefore, it is necessary when parsing any XDR sentence to examine the <ID> field in each set of four fields in order to identify the meaning of the data in that set.

The XDR(B) sentence may be enabled via the $PAMTC,EN,XDRB command.

The reported pitch and roll values are adjusted by the azimuth, pitch, and roll offsets established with the $PAMTC,ATTOFF command.

$GPZDA

Summary

NMEA 0183 standard Time and Date.

$GPZDA supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

`$GPZDA,<1>,<2>,<3>,<4>,<5>,<6>*hh<CR><LF>`

Fields

<1>	UTC time of day, in the form hhmmss
<2>	UTC day, 01 to 31
<3>	UTC month, 01 to 12
<4>	UTC year (four digits, e.g. 2006)
<5>	Local time zone hours, 00 to +/-13 hrs
<6>	Local time zone minutes, 00 to +59

Default State

Disabled. Once per second when enabled.

Notes

This sentence may be enabled or disabled via the $PAMTC,EN,ZDA command.

Local time zone is the magnitude of hours plus the magnitude of minutes added, with the sign of local zone hours, to local time to obtain UTC. Local zone is generally negative for East longitudes with local exceptions near the International Date Line.

Examples:

At Chatham Is. (New Zealand) at 1230 (noon) local time on June 10, 1995:
`$GPZDA,234500,09,06,1995,-12,45*6C<CR><LF>`

In the Cook Islands at 1500 local time on June 10, 1995:
`$GPZDA,013000,11,06,1995,10,30*4A<CR><LF>`

In the GH2183/G2183, the local time zone fields in the NMEA 0183 $GPZDA sentence may only be changed by receiving an NMEA 2000® Command Group

Function PGN 126208 to change the Local Offset field 3 of the Time and Date PGN 129033. (See page 45.) The local time zone is not changeable via the NMEA 0183 interface.

3.2. Received NMEA 0183 Sentences and Commands

The GH2183/G2183/H2183 has an NMEA 0183-compliant input channel that is capable of receiving standard NMEA sentences as well as proprietary commands for initialization, calibration, or to modify the behavior of the unit.

All received sentences and commands can include or omit the NMEA checksum. If a checksum is included, the sentence will be checked against its checksum, and the sentence will be accepted only if there is a checksum match. If the NMEA checksum is excluded, it is required that the preceding asterisk (*) also be excluded. If no checksum is provided, the device will accept the sentence without error checking. It is recommended that all sentences and commands provided to the device include a checksum to help ensure integrity of the transmitted data.

The sentences recognized by the GH2183/G2183/H2183 on the serial input channel are summarized in Table 4 on the next page.

Note that the prefix "$--" appearing in the descriptions for several of the listed sentences should be replaced by a "$" followed by the two-character talker ID of the transmitting device.

Each of the sentences in Table 4 is described in detail on the subsequent pages.

Table 4: NMEA 0183 Received Sentences and Commands

Sentence or Command	Description	GH2183	G2183	H2183
$--RMC	Standard NMEA Recommended Minimum Specific GNSS Data (for magnetic variation)	No	No	✓
$--VTG	Standard NMEA COG and SOG (for magnetic variation)	No	No	✓
$PAMTC,ALT	Program the GH2183/G2183 with an altitude to be used for calculation of 2D position fixes.	✓	✓	No
$PAMTC,ATTOFF	Program the GH2183/H2183 with angular attitude offsets: azimuth, pitch, and roll	✓	No	✓
$PAMTC,BAUD	Change the baud rate from the nominal 4800 baud to 38400 baud	✓	✓	✓
$PAMTC,DATUM	Define the local datum to which GPS position locations are referenced	✓	✓	No
$PAMTC,EN	Enable/disable transmission of specific sentences, and change their rate of transmission	✓	✓	✓
$PAMTC,ERST	Reset the user portion of nonvolatile EEPROM to factory defaults	✓	✓	✓
$PAMTC,OPTION	Enable/disable certain product features.	✓	✓	No
$PAMTC,POST	Perform the Power On Self Test function.	✓	✓	✓
$PAMTC,QPS	Query device part number and serial number	✓	✓	✓
$PAMTC,QV	Query device hardware and firmware versions	✓	✓	✓
$PAMTC,RESET	Reset the device	✓	✓	✓
$PAMTC,SIM	Enable/disable Simulate Mode	✓	✓	No
$PAMTX	Pause or resume all automatic transmission of messages	✓	✓	✓

NMEA 0183 RECEIVED SENTENCE

$--RMC

Summary

NMEA 0183 standard Recommended Minimum Specific GNSS Data.

$--RMC supported in:	GH2183	No
	G2183	No
	H2183	✓

Syntax

```
$--RMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,
<9>,<10>,<11>,<12>*hh<CR><LF>
```

Fields

<1>	UTC of position
<2>	Status: A = Data Valid; V = Navigation Receiver Warning
<3>	Latitude
<4>	N if field <2> is North Latitude S if field <2> is South Latitude
<5>	Longitude
<6>	E if field <4> is East Longitude W if field <4> is West Longitude
<7>	Speed Over Ground, knots
<8>	Course Over Ground, degrees True
<9>	Date: ddmmyy
<10>	Magnetic Variation, degrees E/W
<11>	E if field <10> is degrees East W if field <10> is degrees West
<12>	Mode indicator: A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode M = Manual input mode S = Simulator mode N = Data not valid

Notes

This received sentence may be used by the H2183 to provide magnetic variation used for calculating heading relative to true north.

Refer to the remarks for the transmitted Vessel Heading PGN 127250 for precedence rules regarding data received via this sentence.

See section 2.3. for precedence rules regarding data received via this sentence.

$--VTG

Summary

NMEA 0183 standard Course Over Ground and Ground Speed.

$--VTG supported in:	GH2183	No
	G2183	No
	H2183	✓

Syntax

`$--VTG,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>`

Fields

<1>	Course Over Ground, degrees True
<2>	T = True
<3>	Course Over Ground, degrees Magnetic
<4>	M = Magnetic
<5>	Speed Over Ground, knots
<6>	N = Knots
<7>	Speed Over Ground, km/hr
<8>	K = km/hr
<9>	Mode indicator: A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode M = Manual input mode S = Simulator mode N = Data not valid

Notes

This received sentence may be used by the H2183 to provide magnetic variation used for calculating heading relative to true north.

Refer to the remarks for the transmitted Vessel Heading PGN 127250 for precedence rules regarding data received via this sentence.

See section 2.3. for precedence rules regarding data received via this sentence.

NMEA 0183 RECEIVED SENTENCE

$PAMTC

Summary

Prefix for recognized proprietary commands.

Syntax

`$PAMTC,<1>…*hh<CR><LF>`

Fields

`<1>` Command mnemonic. This may be any of the following:

```
ALT
ATTOFF
BAUD
DATUM
EN
ERST
OPTION
POST
QPS
QV
RESET
SIM
```

The number and meaning of any subsequent fields is dependent on the command mnemonic. Each of the command mnemonics defines a separate proprietary command (or set of commands) recognized by the unit. These commands are each described in their own section on the following pages.

NMEA 0183 RECEIVED SENTENCE

$PAMTC,**ALT**

Summary

Settings related to the altitude of the GH2183/G2183.

Syntax

One of the following forms:

`$PAMTC,ALT,SET,<2>,<3>*hh<CR><LF>`

`$PAMTC,ALT,Q*hh<CR><LF>`

Fields

<2>	Fixed altitude, -999.9 meters to +40,000.0 meters, to the nearest 0.1 meter. Default value = 0 meters
<3>	0 = Do not use fixed altitude for GPS 2D mode 1 = Use fixed altitude for GPS 2D mode Default value = 0

Notes

The $PAMTC,ALT,SET,<2>,<3> command is used to program the GH2183/G2183 with a fixed altitude setting to be used in calculating a more accurate GPS position when the GPS is operating in 2D mode.

Field <3> of the $PAMTC,ALT,SET command defines how to use the altitude setting provided in field <2>.

Both of the parameters of the $PAMTC,ALT,SET command are stored in nonvolatile EEPROM memory within the GH2183/G2183, and so remain programmed even after cycling power. If either of the fields <2> or <3> are null fields, the corresponding stored value will remain unchanged.

The $PAMTC,ALT,Q command is used to query the values of the parameters currently programmed into the GH2183/G2183. The unit will reply with

$PAMTR,ALT,*a,b*

where *a* and *b* correspond to fields <2> and <3>, respectively, in the $PAMTC,ALT,SET command.

Field <2> corresponds to the NMEA 2000® transmitted PGN 129538, field 9.
Field <3> corresponds to the NMEA 2000® transmitted PGN 129538, field 10.

See also:

NMEA 0183 received proprietary sentence $PAMTC,OPTION, option 2.

NMEA 2000® transmitted GNSS Position Data PGN 129029 (field 6, altitude).

NMEA 2000® transmitted GNSS Control Status PGN 129538 (fields 5, 9 and 10).

NMEA 0183 RECEIVED SENTENCE

$PAMTC,**ATTOFF**

Summary

A set of proprietary commands to set and query the angular attitude offsets for the installed product housing.

$PAMTC,ATTOFF supported in:	GH2183	✓
	G2183	No
	H2183	✓

Syntax

One of the following forms:

`$PAMTC,ATTOFF,SET,<3>,<4>,<5>*hh<CR><LF>`

`$PAMTC,ATTOFF,Q*hh<CR><LF>`

Fields

<3>	Signed azimuth offset (yaw, or bow offset), degrees, to the nearest tenth of a degree. The value must be between -180.0 and +180.0 degrees. Negative values indicate the forward mark on the sensor housing is oriented toward the starboard side of the vessel; positive values toward the port side.
<4>	Signed pitch offset, degrees, to the nearest tenth of a degree. The value must be between -45.0 and +45.0 degrees. Positive values indicate the sensor is tilted forward toward the bow; negative values indicate the sensor is tilted aftward.
<5>	Signed roll offset, degrees, to the nearest tenth of a degree. The value must be between -45.0 and +45.0 degrees. Positive values indicate the sensor is tilted toward the port side; negative values toward the starboard side.

Notes

The $PAMTC,ATTOFF set of commands perform the same function in the GH2183/H2183 as the transmitted proprietary NMEA 2000® PGN 126720-32. Note that in the NMEA 0183 command, the arguments are in degrees, while in the NMEA 2000® PGN, the arguments are in radians. The values stored in the GH2183/H2183 are in radians. Therefore, when using the $PAMTC,ATTOFF command, there may be a slight rounding error causing the values read back from the GH2183/H2183 to be different than the commanded values by one least significant digit.

The $PAMTC,ATTOFF,SET,<3>,<4>,<5> command is used to program the GH2183/H2183 with the attitude offset angles when the sensor is not oriented parallel to the centerline, and perpendicular to the deck of the vessel. The programmed values are stored in nonvolatile EEPROM memory within the device, and so remain programmed even after cycling power. If any of the fields <3>, <4>, or <5> are null fields, the corresponding stored value will remain unchanged.

The $PAMTC,ATTOFF,Q command is used to query the values of the attitude offset angles currently programmed into the device. The unit will reply with

$PAMTR,ATTOFF,*a,b,c*

where *a* is the current signed azimuth offset value, *b* is the current signed pitch offset value, and *c* is the current signed roll offset value. All values are reported to the nearest tenth of a degree.

The factory default value for all three parameters is 0.0 degrees.

The azimuth offset angle is used to adjust the heading value provided by the compass.

The azimuth offset angle, along with the pitch and roll offset angles are also used to adjust the reported pitch and roll values in the transmitted $YXXDR sentence. A properly set azimuth offset angle will allow the unit to accurately report pitch and roll of the vessel, even though the orientation mark on the sensor housing may not be facing precisely toward the bow. The recommended procedure to set these offsets is as follows:

1. If the unit is mounted on a vessel, this procedure should be performed with calm water and no wind, and with the vessel at rest.
2. First, zero out all offsets by sending the command $PAMTC,ATTOFF,SET,0,0,0.
3. Determine the desired azimuth offset angle, and program this into the sensor using the command $PAMTC,ATTOFF,SET,*a* where *a* is the azimuth offset of the sensor relative to the bow, in degrees. The pitch and roll offset fields should be omitted for this step (or set to zeroes).
4. Allow the vessel to stabilize to its "level" state, and then read the values of pitch and roll that are reported by the XDR sentence. If the vessel is rocking back and forth, then take a number of readings and calculate an average for both pitch and roll.
5. Program the *negated* versions of these measured pitch and roll values back into the unit with the $PAMTC,ATTOFF,SET,,*b,c* sentence. For example, if the XDR sentence reports an average pitch angle of 6.2 degrees, and an average roll angle of -4.3 degrees, then you would send the sentence $PAMTC,ATTOFF,SET,,-6.2,4.3 to the unit. Note that the azimuth offset field

in this sentence is a null field, indicating we are not changing its value at this time.

6. At this point the transmitted XDR sentences should be producing values that are centered around 0.0 degrees for both pitch and roll.
7. The programmed attitude offset values may be checked at any time by sending the command $PAMTC,ATTOFF,Q to the unit; it will reply with $PAMTR,ATTOFF,*a,b,c*.

NMEA 0183 RECEIVED SENTENCE

$PAMTC,**BAUD**

Summary

Change the baud rate for both the transmitting and receiving NMEA 0183 channels.

$PAMTC,BAUD supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Syntax

One of the following forms:

`$PAMTC,BAUD,4800*hh<CR><LF>`

`$PAMTC,BAUD,38400*hh<CR><LF>`

Notes

The $PAMTC,BAUD command may be used to increase the baud rate from the standard 4800 baud to 38400 baud. This will provide an eightfold increase in the bandwidth of the NMEA 0183 interface, allowing more data to be transmitted in a given period of time.

On power up, the NMEA input and output interfaces always default to 4800 baud.

It is recommended to employ the following sequence when changing the baud rate from 4800 baud to 38400 baud. The following assumes there is a single host device communicating with the GH2183/G2183/H2183:

1. Send the $PAMTX command to the GH2183/G2183/H2183 (at 4800 baud) to temporarily disable transmission of periodic sentences.
2. Send the $PAMTC,BAUD,38400 command (at 4800 baud) to instruct the unit to change its baud rate to 38400. The unit will finish transmitting any periodic sentences in progress at 4800 baud, and will then change its interface to use 38400 baud.
3. Delay a short interval within the host to allow reception of any remaining queued sentences from the device at 4800 baud.
4. Change the baud rate on the host's serial port to 38400 baud.
5. Send the $PAMTX,1 command to the device (at 38400 baud) to resume transmission of periodic sentences.
6. All subsequent communication with the device will be at 38400 baud, until it is powered down or reset, or the $PAMTC,BAUD,4800 command is sent to the unit.

Note that a baud rate of 38400 does not comply with the NMEA 0183 standard.

NMEA 0183 RECEIVED SENTENCE

$PAMTC,COMP

Summary

User calibration commands for the internal compass sensor.

Syntax

One of the following forms:

```
$PAMTC,COMP,GO*hh<CR><LF>
$PAMTC,COMP,RESETALL*hh<CR><LF>
$PAMTC,COMP,RESETCAL*hh<CR><LF>
$PAMTC,COMP,RESETDAMP*hh<CR><LF>
$PAMTC,COMP,SET,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>
$PAMTC,COMP,Q*hh<CR><LF>
$PAMTC,COMP,X*hh<CR><LF>
$PAMTC,COMP,VERIFY*hh<CR><LF>
```

$PAMTC,COMP,GO

Summary

Manually initiate a user calibration sequence for the internal compass sensor. There is an alternative to issuing the "GO" command to start user compass calibration, called AutoCal. AutoCal is intended for users who do not have access to a user interface which allows them to manually start user compass calibration.

Syntax

`$PAMTC,COMP,GO*hh<CR><LF>`

Calibration needs to be done in calm seas, away from other boats or ferrous objects (structures or aids to navigation). Trying to turn a 2-3 minute circle in strong currents or congested areas will be difficult, if not hazardous.
The user calibration sequence for the GH2183 or H2183 is as follows:

1. The compass sensor is installed on the vessel. The unit under test is powered up.
2. Manual Start: The `$PAMTC,COMP,GO*hh<CR><LF>` command is sent to the compass sensor's NMEA 0183 input channel to initiate user calibration mode. AutoCal Start: Within 2 minutes of applying power to the compass sensor being calibrated, the vessel must start a slow circular turn. If it completes a full circle within 2-3 minutes, AutoCal will enter the user compass calibration procedure (See steps 3-5).
3. During the user calibration process, the vessel is rotated slowly (driven at 2-4 knots, completing a circle within 2-3 minutes), while the sensor collects data. Once the compass sensor has determined that enough data has been collected for the purpose of calculating the coefficients, it transmits the following sentence: `$PAMTR,COMP,XXXX,`
`<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>`. Where XXXX is "PASS" or "FAIL".
4. If PASS was transmitted, then the offsets that are now in use and saved in EEPROM are the newly calculated ones.
5. Note: During user compass calibration, heading is not valid and will be output as NULL fields. After calibration is complete, heading will again be valid, and if calibration was successful it will continue to be valid, but if calibration failed, heading will alternate between valid for 10 seconds and not valid for 10 seconds for 60 seconds.

Reply

The compass sensor will reply immediately with:
`$PAMTR,COMP,INPROCESS,`
`<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>`

Where fields <1> through <9> contain the data from the compass sensor's nonvolatile EEPROM, as defined in the "Q", Query Command.

Upon successful completion the compass sensor will reply with:

```
$PAMTR,COMP,PASS,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>
```

Or, upon failure it will reply with:

```
$PAMTR,COMP,FAILx,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>
```

Where x indicates the type of failure, 1 = Timeout, 2 = Tilt Error, or 3 = Other Error. Timeout errors: 5 minute timeout occurred before successful completion or more than 30 seconds was taken to turn thru 45 degrees. Other Errors: reversing the direction of the turn for more than 45 degrees, for example. The user compass calibration procedure can be aborted by purposely causing one of the above errors. For example, stopping the turn will cause an error within 30 seconds, or reversing the direction of the turn will cause an error even faster.

$PAMTC,COMP,RESETALL

Summary

Reset the user calibration coefficients and damping control to the default values.

Syntax

```
$PAMTC,COMP,RESETALL*hh<CR><LF>
```

Reply

The compass will reset the user calibration coefficients and damping control (fields 1-9) and reply with:

```
$PAMTR,COMP,RESETALL,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>
```

where fields <1> through <9> contain the data from the compass's nonvolatile EEPROM, as defined in the "Q", Query Command.

$PAMTC,COMP,RESETCAL

Summary

Reset the user calibration coefficients to the default values.

Syntax

```
$PAMTC,COMP,RESETCAL*hh<CR><LF>
```

Reply

The compass will reset the user calibration coefficients (fields 1 – 6) and reply with:

```
$PAMTR,COMP,RESETCAL,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>
```

where fields <1> through <9> contain the data from the compass's nonvolatile EEPROM, as defined in the "Q", Query Command.

$PAMTC,COMP,RESETDAMP

Summary

Reset the user damping control to the default values.

Syntax

```
$PAMTC,COMP,RESETDAMP*hh<CR><LF>
```

Reply

The compass will reset the user damping control (fields 7-9) and reply with:

```
$PAMTR,COMP,RESETDAMP,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>
```

where fields <1> through <9> contain the data from the compass's nonvolatile EEPROM, as defined in the "Q", Query Command.

$PAMTC,COMP,SET

Summary

Set one or more user compass calibration coefficients.

Syntax

`$PAMTC,COMP,SET,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>`

where fields <1> through <9> contain the data to be set into the compass's nonvolatile EEPROM corresponding to the fields as follows.

All fields are 16-bit signed fixed point decimal integers.

<1>	X axis Gain value, hundredths used as multiplier.
<2>	Y axis Gain value, hundredths used as multiplier.
<3>	Z axis Gain value, hundredths used as multiplier.
<4>	X axis linear offset, hundredths of micro-Teslas.
<5>	Y axis linear offset, hundredths of micro-Teslas.
<6>	Z axis linear offset, hundredths of micro-Teslas.
<7>	X axis angular offset, tenths of degrees.
<8>	Pitch and Roll Damping, twentieths of a second.
<9>	Compass/RateGyro Damping, twentieths of a second, negative numbers indicate that the rate gyro is to be used in compass computations.

Notes

Currently only Linear Offsets and Damping values are supported.
Valid ranges for data:
Gain: 50 to 500
Linear Offset: -32000 to +32000
X-Angular Offset: 0 to 3600
Pitch and Roll Damping: 0 to 200
Compass/RateGyro Damping: -2400 to 2400

$PAMTC,COMP,Q

Summary

Query the compass for the stored user compass calibration coefficients.

Syntax

`$PAMTC,COMP,Q*hh<CR><LF>`

Reply

The compass will reply with:

```
$PAMTR,COMP,Q,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>
```

where fields <1> through <9> contain the data from the compass's nonvolatile EEPROM corresponding to the fields as follows.

All fields are 16-bit signed fixed point decimal integers.

<1>	X axis Gain value, hundredths used as multiplier.
<2>	Y axis Gain value, hundredths used as multiplier.
<3>	Z axis Gain value, hundredths used as multiplier.
<4>	X axis linear offset, hundredths of micro-Teslas.
<5>	Y axis linear offset, hundredths of micro-Teslas.
<6>	Z axis linear offset, hundredths of micro-Teslas.
<7>	X axis angular offset, tenths of degrees.
<8>	Pitch and Roll Damping, twentieths of a second.
<9>	Compass/RateGyro Damping, twentieths of a second, negative numbers indicate that the rate gyro is to be used in compass computations.

Notes

Currently only Linear Offsets and Damping values are supported.
If in user calibration mode, the "Q" will be replaced by "INPROGRESS".
If a user calibration pass has been completed, the "Q" will be replaced by "PASS" or "FAIL".

$PAMTC,COMP,X

Summary

Terminate the user compass calibration mode.

Syntax

$PAMTC,COMP,X*hh<CR><LF>

Reply

$PAMTR,COMP,X,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>

Notes

Upon receiving $PAMTC,COMP,X user calibration mode will be terminated, if it had been previously entered by a $PAMTC,COMP,GO. The reply will always be issued.

If not in user calibration mode, the “X” will be replaced by “Q”.

$PAMTC,COMP,VERIFY

Summary

Verify the user compass calibration mode.

Syntax

$PAMTC,COMP,VERIFY*hh<CR><LF>

The verify user calibration sequence for the GH2183/H2183 is as follows:

1. The compass is installed on the vessel. The unit under test is powered up. User calibration has been completed successfully.
2. The $PAMTC,COMP,VERIFY*hh<CR><LF> command is sent to the compass's NMEA 0183 input channel to initiate user calibration mode.
3. During the verify user calibration process, the vessel is rotated slowly (driven in a circle) and the sensor calculates the resulting score. Once the compass has determined that enough data has been collected, it transmits the following sentence: $PAMTR,COMP,SCORE,XXX*hh<CR><LF>

Reply

The compass will reply immediately with:
$PAMTR,COMP,INPROGRESS,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>

Where fields <1> through <9> contain the data from the compass's nonvolatile EEPROM, as defined in the "Q", Query Command.

Upon successful completion the compass will reply with:
$PAMTR,COMP,SCORE,XXX*hh<CR><LF>

Where XXX is a score from 0 – 255, meaning TBD.

Or, upon failure it will reply with:

$PAMTR,COMP,FAILx,
<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>*hh<CR><LF>

Where x indicates the type of failure, 1 = Timeout, 2 = Tilt Error, or 3 = Other Error.

NMEA 0183 RECEIVED SENTENCE

$PAMTC,DATUM

Summary

Define the local datum to which GPS position locations are referenced.

$PAMTC,DATUM supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

One of the following forms:

```
$PAMTC,DATUM,SET,<3>,<4>*hh<CR><LF>
```

```
$PAMTC,DATUM,Q*hh<CR><LF>
```

Fields

<3> Three character alphabetical code for local datum:
W84 (WGS84)
W72 (WGS72)
S85 (SGS85)
P90 (PE90)
or IHO datum code from the International Hydrographic Organization Publication S-60 Appendices B and C.

<4> One character subdivision datum code when available, as defined in IHO Publication S-60 Appendices B and C.

Notes

The $PAMTC,DATUM,SET,<3>,<4> command is used to establish the local datum used by the GPS receiver for calculating position. These values are stored in EEPROM memory within the unit. The default value for field <3> is W84 (WGS84). The default value for field <4> is a null field (no subdivision datum code).

Unlike other NMEA 0183 proprietary commands, if in the command $PAMTC,DATUM,SET,<3>,<4> field <4> is a null field, the value will be actually set to null (no subdivision datum code).

The $PAMTC,DATUM,Q command may be used to determine the current datum setting within the unit. Upon receiving this command, the unit will reply with $PAMTR,DATUM,<3>,<4>, where fields <3> and <4> are as described above.

The value established by this command will be used by the transmitted $GPDTM sentence.

KGS, OHI-A, OHI-B, OHI-C, OHI-D, OHI-M, SIR, P90, and S85 are not currently supported by the GPS Engine used in the GH2183/G2183, and therefore are not available for use as Local Datum.

Important Note: Chart transformations based on IHO S60 parameters may result in significant positional errors when applied to chart data.

Also refer to the transmitted NMEA 2000® PGN 129044, Datum.

NMEA 0183 RECEIVED SENTENCE

$PAMTC,**EN**

Summary

Enable or disable the periodic transmission of individual standard NMEA 0183 sentences, and specify their rate of transmission.

$PAMTC,EN supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Syntax

One of the following forms:

`$PAMTC,EN,<2>,<3>,<4>*hh<CR><LF>`

`$PAMTC,EN,S*hh<CR><LF>`

`$PAMTC,EN,L*hh<CR><LF>`

`$PAMTC,EN,LD*hh<CR><LF>`

`$PAMTC,EN,Q*hh<CR><LF>`

Fields

`<2>` The identifier `ALL`, or one of the following sentence ID's:

Model GH2183: `DTM, GGA, GLL, GSA, GSV, HDG, HDT, RMC, ROT, VTG, XDR, ZDA`

Model G2183: `DTM, GGA, GLL, GSA, GSV, RMC, VTG, ZDA`

Model H2183: `HDG, HDT, ROT, XDR`

`<3>` If field <2> is the `ALL` identifier, then

0 = disable transmission of all sentences
1 = enable transmission of all sentences.

Otherwise,

0 = disable transmission of the specified sentence
1 = enable transmission of the specified sentence

<4> The amount of time between successive transmissions of the specified sentence, in tenths of a second. For example, if field <4> contains the value 5, this specifies an interval of 0.5 seconds between successive transmissions of the specified sentence.

If field <2> is the ALL identifier, then field <4> specifies the transmission interval for all sentences.

Notes

The factory default settings are as follows:

MODEL GH2183:

Sentence ID	Enabled by default?	Default Transmission Interval
DTM	–	10
GGA	–	10
GLL	–	10
GSA	–	10
GSV	–	10
HDG	✓	1
HDT	–	5
RMC	✓	10
ROT	✓	10
VTG	–	10
XDR	✓	8
ZDA	–	10

MODEL G2183:

Sentence ID	Enabled by default?	Default Transmission Interval
DTM	✓	10
GGA	✓	10
GLL	✓	10
GSA	–	10
GSV	–	10
RMC	✓	10
VTG	✓	10
ZDA	✓	10

MODEL H2183:

Sentence ID	Enabled by default?	Default Transmission Interval
HDG	✓	1
HDT	–	5
ROT	✓	6
XDR	✓	4

If either of fields <3> or <4> is a null field, then that field will remain unchanged from its previous value.

The selections as to which sentences are enabled for transmission, and the rate at which each sentence is transmitted, are stored in nonvolatile EEPROM memory within the unit. On power up, these settings are copied from EEPROM into a working copy in RAM memory. It is the working copy in RAM that determines the behavior of the unit, with regard to the transmission of sentences.

Any changes to these settings using the $PAMTC,EN,<2>,<3>,<4> command only affect the working copy in RAM. When power is lost, the changes to the working copy in RAM will be lost.

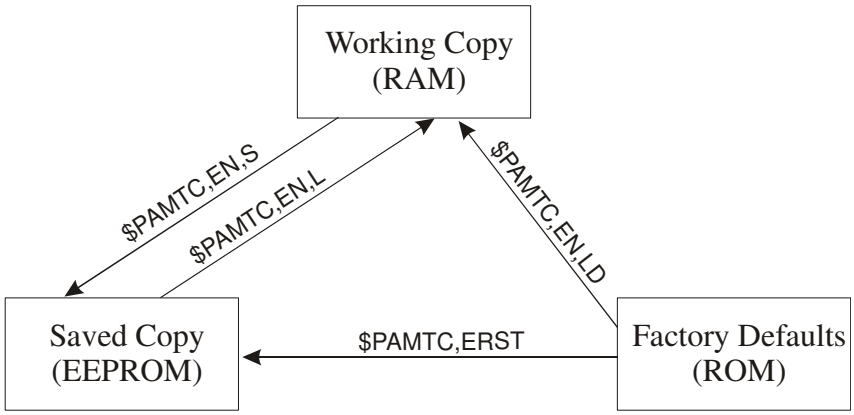
The **$PAMTC,EN,S** command causes the contents of the current working copy in RAM to be saved to EEPROM. The saved settings will then be restored to RAM each time power is applied to the unit.

The **$PAMTC,EN,L** command allows the settings to be reloaded from EEPROM to RAM without cycling power to the unit. This can be used to discard any changes made to the working copy in RAM, and restore the saved settings as though the unit had been turned off and then back on again.

The **$PAMTC,EN,LD** command loads the factory default settings from ROM memory into RAM memory.

Note that the $PAMTC,ERST command (see separate description) differs from the $PAMTC,EN,LD command in that $PAMTC,ERST will initialize *all* of user EEPROM memory to its factory default settings. This includes settings unrelated to the selection of transmitted sentences.

The above paragraphs are summarized in the below figure.



The **$PAMTC,EN,Q** command provides a query function to allow reading the current settings from the working copy in RAM. The reply to the $PAMTC,EN,Q command is a series of sentences with the following format:

```
$PAMTR,EN,<1>,<2>,<3>,<4>,<5>*hh<CR><LF>
```

where

<1> = Total number of $PAMTR,EN sentences in the reply
<2> = Sentence number
<3> = Sentence ID (DTM, GGA, GLL, GSA, GSV, HDG, RMC, ROT, VTG, XDR, or ZDA) (depending on model)
<4> = 0 or 1 (0=disabled, 1=enabled)
<5> = Transmission interval (tenths of a second)

For example, a G2183 programmed with only the factory default settings would provide the following as a reply to the $PAMTC,EN,Q command:

```
$PAMTR,EN,8,1,DTM,1,10*35
$PAMTR,EN,8,2,GGA,1,10*2A
$PAMTR,EN,8,3,GLL,1,10*2D
$PAMTR,EN,8,4,GSA,0,10*39
$PAMTR,EN,8,5,GSV,0,10*2F
$PAMTR,EN,8,6,RMC,1,10*33
$PAMTR,EN,8,7,VTG,1,10*2B
$PAMTR,EN,8,8,ZDA,1,10*3E
```

Keep in mind when enabling sentences that the overall bandwidth of the interface should not be exceeded. At 4800 baud, only 480 characters can be transmitted in a one second period of time. It is possible to use the $PAMTC,EN command to overspecify the amount of data transmitted, beyond the bandwidth capacity of the NMEA output channel. See section 3.1. for further information regarding bus bandwidth.

Examples

Example 1:

To disable all sentences for transmission, except transmit the recommended minimum GNSS sentence (RMC) 5 times per second, and save the settings in EEPROM, send the following sequence of commands to the unit:

```
$PAMTC,EN,ALL,0
$PAMTC,EN,RMC,1,2
$PAMTC,EN,S
```

Example 2:

To reload the factory defaults for the $PAMTC,EN settings into EEPROM without affecting other EEPROM settings, send the following sequence of commands to the unit:

$PAMTC,EN,LD
$PAMTC,EN,S

Example 3:

To enable transmission of the VTG sentence and set it to transmit at the slow rate of once every 10 seconds *for the current session only*, send the following command to the unit:

$PAMTC,EN,VTG,1,100

Example 4:

To disable transmission of the GSA sentence permanently:

$PAMTC,EN,GSA,0
$PAMTC,EN,S

NMEA 0183 RECEIVED SENTENCE

$PAMTC,ERST

Summary

Reset the user portion of nonvolatile EEPROM to its factory default state.

$PAMTC,ERST supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Syntax

`$PAMTC,ERST*hh<CR><LF>`

Notes

This command performs the same function as the received proprietary NMEA 2000® PGN 126720-130 (Option 0).

NMEA 0183 RECEIVED SENTENCE

$PAMTC,OPTION

Summary

Enable or disable certain features, or query their state.

$PAMTC,OPTION supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

One of the following forms:

```
$PAMTC,OPTION,SET,<3>,<4>*hh<CR><LF>
$PAMTC,OPTION,Q,<3>*hh<CR><LF>
```

Fields

Option 2:

<3> 2 = Set GPS fix mode

<4> 1 = 2D fix only
2 = 3D fix only
3 = Automatic selection of 2D or 3D mode (default)

Option 3:

<3> 3 = Set WAAS mode

<4> 0 = WAAS Disabled
1 = WAAS Enabled, but report fixes as GPS, Autonomous
2 = WAAS Enabled, report fixes as Differential

Option 4:

<3> 4 = Set WAAS Satellite

<4> 0 = Auto Mode (default)
120-138 = WAAS Satellite ID

Option 5:

<3> 5 = Enable Type 0 Messages

<4> 0 = Ignore Type 0 messages for 60 seconds
1-39 = Enable Type 0 messages as data
255 = Ignore Type 0 messages (default)

Notes

Option 2:

The GPS receiver in the GH2183/G2183 can calculate a position fix when it has achieved a lock on at least three GPS satellites. If it has achieved a lock on four or more satellites, the unit may be able to calculate a *3D position fix*, meaning it can determine latitude, longitude, and altitude. But if it has achieved a lock on only three satellites, it may only be able to calculate a *2D position fix*, meaning it can determine latitude and longitude, but not altitude.

By default, the unit will automatically calculate a 3D position fix if it is able to, but will fall back to 2D position fixing if there are not enough satellites being tracked.

It is possible to restrict the operation of the GPS to only allow 3D position fixes by sending the unit the command $PAMTC,OPTION,SET,2,2. If this is done, then the unit will not calculate a position fix until it has achieved a lock on at least four satellites.

Note that sometimes the GPS may be tracking at least four satellites, but is still unable to calculate a position fix. This is because the positions of the satellites in the sky must be satisfactory in order to achieve good geometry in the fix calculation, as determined by the HDOP, VDOP, and PDOP values.

It is also possible to restrict the operation of the GPS to only allow 2D position fixes by sending the unit the command $PAMTC,OPTION,SET,2,1.

To re-enable the automatic selection of 2D versus 3D fix calculations, send the unit the command $PAMTC,OPTION,SET,2,3.

This setting is stored in EEPROM within the unit, and retrieved on power up.

The current setting may be queried by issuing the $PAMTC,OPTION,Q,2 command. The unit will respond with the sentence $PAMTR,OPTION,Q,2,<4>, where the value of <4> is 1, 2, or 3, corresponding to 2D, 3D, or Automatic mode, respectively.

This setting is mirrored in the NMEA 2000® transmitted GNSS Control Status PGN 129538, field 5.

When calculating a 2D position fix, the latitude/longitude values may have a relatively large error if the altitude of the GPS receiver is not set appropriately. This can be corrected by programming a fixed altitude offset into the unit. See the $PAMTC,ALT command on page 93.

Note that sometimes the GPS may be tracking at least four satellites, but is still unable to calculate a position fix. This is because the positions of the satellites in the

sky must be satisfactory in order to achieve good geometry in the fix calculation, as determined by the HDOP, VDOP, and PDOP values.

See also NMEA 2000® PGN 129538.

Option 3:

The Wide Area Augmentation System (WAAS) uses a system of land based reference stations and geostationary satellites to augment the Global Positioning System (GPS) in order to provide additional accuracy, integrity, and availability. Several GPS Sentences are able to differentiate between WAAS (Differential) fixes and those fixes that do not use WAAS corrections.
The available WAAS modes are:

0 – Disable WAAS
1 – Enable WAAS, but report WAAS fixes as GPS (Autonomous, non-differential). This is provided for backward compatibility for systems that might not recognize WAAS (Differential) fixes.
2 – Enable WAAS, and report WAAS fixes as Differential.

The default mode is 2.
This setting is stored in EEPROM within the unit, and retrieved on power up.

Option 4:

This option can be used to direct the GPS to use a specific WAAS satellite. This value is NOT stored in EEPROM.

Option 5:

This option can be used to direct the GPS how to handle type 0 messages. This value is NOT stored in EEPROM.

NMEA 0183 RECEIVED SENTENCE

$PAMTC,**POST**

Summary

Perform the Power-On Self Test.

$PAMTC,POST supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Syntax

`$PAMTC,POST*hh<CR><LF>`

The device will reply with a sentence in the following form:

`$PAMTR,POST,<1>,<2>,<3>,<4>,<5>,<6>,<7>>,<8>,<9>,<10>`
`*hh<CR><LF>`

Each of the fields <1> through <9> contains an integer value that represents the status of a simple test performed on a given submodule within the unit. For each field, a value of 0 (zero) indicates the unit passed the respective test; a nonzero value indicates a possible problem was discovered with the given submodule. A null field (i.e. two adjacent commas) indicates this model does not include the specified submodule. Therefore, a properly operating GH2183 would reply with $PAMTR,POST,0,0,0,0,0,0,0,0,0,GCR200.

The fields and their corresponding submodules are listed below.

where

<1> = Format Code
<2> = Factory EEPROM
<3> = User EEPROM
<4> = Compass sensor (GH2183 and H2183 only)
<5> = GPS receiver (GH2183 and G2183 only)
<6> = Attitude sensor (GH2183 and H2183 only)
<7> = Rate gyro (GH2183 and H2183 only)
<8> = Internal temperature Sensor
<9> = Battery voltage Sensor
<10> = "GCR200" string that indicates POST results are for the class of products described in this specification.

Notes

The Power-On Self Test is performed automatically a few seconds after applying power to the unit.

A properly operating GH2183 will reply with
$PAMTR,POST,0,0,0,0,0,0,0,0,0,GCR200.

A properly operating G2183 will reply with $PAMTR,POST,0,0,0,,0,,,0,0,GCR200.

A properly operating H2183 will reply with
$PAMTR,POST,0,0,0,0,,0,0,0,0,GCR200.

See also the transmitted proprietary NMEA 2000® PGN 130944.

NMEA 0183 RECEIVED SENTENCE

$PAMTC,QPS

Summary

Query part number and serial number information.

$PAMTC,QPS supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Syntax

`$PAMTC,QPS*hh<CR><LF>`

The device will reply with a sentence in the following form:

`$PAMTR,QPS,<1>,<2>*hh<CR><LF>`

where

`<1>` = Part number string (up to 32 ASCII characters)
`<2>` = Serial number string (up to 32 ASCII characters)

Notes

The part number and serial number strings may not contain the following characters:
"$" (dollar sign)
"," (comma)
"*" (asterisk)
" " (space)

NMEA 0183 RECEIVED SENTENCE

$PAMTC,QV

Summary

Query version information.

$PAMTC,QV supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Syntax

`$PAMTC,QV*hh<CR><LF>`

The device will reply with a sentence in the following form:

`$PAMTR,QV,<1>,<2>,<3>,<4>,<5>,<6>,<7>*hh<CR><LF>`

where

- `<1>` = Null field
- `<2>` = Hardware version
- `<3>` = OEM option
- `<4>` = Null field
- `<5>` = Bootloader firmware version
- `<6>` = Application firmware version
- `<7>` = GPS module version (models GH2183 and G2183 only)

NMEA 0183 RECEIVED SENTENCE

$PAMTC,**RESET**

Summary

Reset the unit.

$PAMTC,RESET supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Syntax

`$PAMTC,RESET*hh<CR><LF>`

The device will reset as though power had been removed and reapplied. All settings will revert to their power-on defaults.

This command performs the same function as the received proprietary NMEA 2000® PGN 126720-1.

NMEA 0183 RECEIVED SENTENCE

$PAMTC,**SIM**

Summary

Turn Simulate Mode On or Off.

$PAMTC,SIM supported in:	GH2183	✓
	G2183	✓
	H2183	No

Syntax

One of the following forms:

`$PAMTC,SIM,0*hh<CR><LF>`	Turn Simulate Mode Off (default state).
`$PAMTC,SIM,1*hh<CR><LF>`	Turn Simulate Mode On.
`$PAMTC,SIM,Q*hh<CR><LF>`	Query Simulate state.

The **$PAMTC,SIM,Q** command provides a query function to allow reading the current Simulate state. The reply to the $PAMTC,SIM,Q command is one of the following:

`$PAMTR,SIM,0*hh<CR><LF>`	Simulate Mode is Off
`$PAMTR,SIM,1*hh<CR><LF>`	Simulate Mode is On

Notes

The Simulate Mode is *not* stored in EEPROM. On power up, the Simulate Mode returns to the Off state.

This command performs the same function as the transmitted proprietary NMEA 2000® PGN 126720-35.

NMEA 0183 RECEIVED SENTENCE

$PAMTX

Summary

Suspend and resume transmission of NMEA sentences.

$PAMTX supported in:	GH2183	✓
	G2183	✓
	H2183	✓

Syntax

`$PAMTX,<1>*hh<CR><LF>`

Fields

`<1>` 0 = temporarily suspend transmission of all NMEA sentences. (default)

1 = resume transmission

Notes

Upon receiving this sentence, the device will suspend transmission of all future NMEA sentences after the currently transmitting sentence has completed.

If the $PAMTX command is received with no fields present (i.e. $PAMTX*50<CR><LF> or $PAMTX<CR><LF>, the default case shall prevail, i.e. transmission of sentences will be suspended.

Transmission of NMEA sentences will resume when one of the following has occurred:

- A `$PAMTX,1` command has been received.
- The power to the unit has been cycled.
- A `$PAMTC,RESET` command has been received.

4. Revision History

Created 1.000
Date: 02/19/10
Description: Released
Changes: Removed NMEA 2000 Proprietary PGN information contained in Technical Manual