



## XL Series OCS GPS Receiver: HE200GPS183

### 1. INTRODUCTION

The HE200GPS183 GPS Receiver (GPS183) is an OCS accessory that provides a variety of GPS data to the control system with a high degree of accuracy. GPS stands for "Global Positioning System" – which consists of a set of earth-orbiting satellites and ground stations. GPS allows a portable receiver to calculate with a high degree of accuracy its current position, time, velocity, etc.

The GPS183 uses NMEA0183 protocol – which is a standard established by the National Marine Educators Association. The GPS183 utilizes RS-232 for data communications, and is powered by 5Vdc. Most OCS models (XLx, NX, LX, QX) provide an appropriate 5V output on their serial ports.



Figure 1 – HE200GPS183 (GPS183) GPS Receiver

### 2. SPECIFICATIONS

Table 1 – GPS183 Specifications			
Size	61mm diameter, 19.5mm height		
Weight	3.9oz (110.6g)		
Construction	Polycarbonate thermoplastic		
IP Rating	IP67 level (immersion in 1m of water for 30 minutes)		
Operating Temp.	-30 to +80C		
Storage Temp.	-40 to +90C		
Cable	6 conductor, 28AWG, 5m in length (Supply Voltage pins are 26AWG)		
Input Voltage	4.0-5.5Vdc		
Power Requirements	60mA@5.0Vdc		
GPS Receiver	WAAS enabled; 12 parallel channels continuously tracks and uses up to 12 satellites		
Acquisition Times <sup>*1</sup>	Reacquisition – less than 2 sec.	Warm – 15 sec (all data known)	Cold – 45 sec (initial position, time and almanac known)
	AutoLocate – 5 mins (almanac known)	SkySearch – 5 mins (no data known)	
Update Rate	1 record per second		
Accuracy	Position <15m, 95% typical		Velocity 0.1knot RMS steady state
Pulse Output	1Hz, with 20mS pulse width, accurate to +/-1microsecond at rising edge of pulse.		

<sup>\*1</sup> The HE200GPS183 needs time to acquire the satellite signal when power is applied. With a clear view of the sky first time acquisition of signal may take as long as two minutes, and re-acquisition fifteen seconds. Low quality reception may increase acquisition time.

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### 3. INSTALLATION PROCEDURE

#### 3.1. Mechanical Installation

1. Physically mount the GPS183 in a location where it is mechanically stable, and will have clear access to GPS satellites.
2. The central threaded recess of the GPS183 accepts a metric M3 threaded bolt. The recess is approximately 4mm deep (4.32 +/-0.08mm). Use caution when tightening the mounting bolt. Tightening the mounting bolt can cause the mount to pull tight directly against the metal insert, not against the plastic housing, which would tend to pull the insert out of the plastic.
3. Figures 2 & 3 show the GPS183 dimensions and case details.

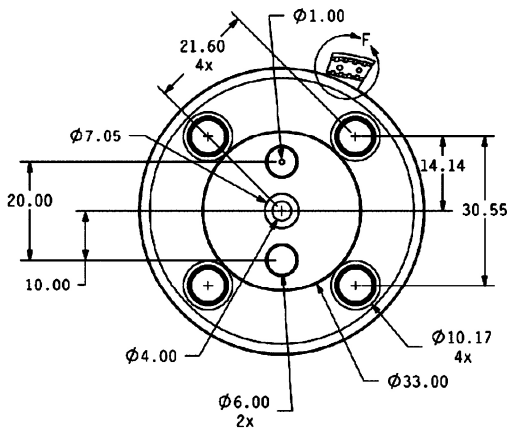


Figure 2 - GPS183 Bottom Case Dimensions, Under Mold

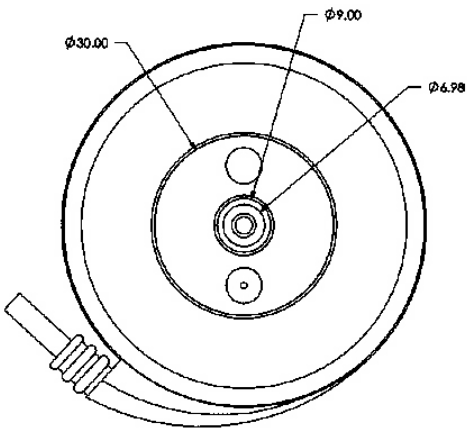


Figure 3- GPS183 Bottom Case, Outside of Casing

3.2. Electrical Installation

1. Route the GPS183 electrical cable from its mounting location to the OCS. The voltage and signals of the GPS183 are of a low voltage nature, and should be routed appropriately. Typically that means as far away as possible from higher voltage wiring, crossing at a right angle when necessary.
2. Using the appropriate wiring diagram from Table 2 below, connect the GPS183 cable to the OCS serial port. You should cut the GPS183 cable to length, eliminating excess wiring. You will discard the small white factory test connector.
3. Included with the GPS183 package is a 4-pin screw terminal connector set. This is particularly useful to interface the GPS183 wiring to an RJ-45 pigtail. If interfacing the GPS183 to a D-sub connector (for CN1 on the QX or LX) or a screw terminal connector (for CN1 on the NX) this connector set will not likely be needed.

Pin	Color	Signal Name	Direction
1	Yellow	1Hz Measurement Pulse	Out
2	Red	Supply Voltage In (5V)	In
3	Black	Signal Common (0V)	-
4	White	Transmit Data (TXD)	Out
5	Black	Supply Voltage Common (0V)	-
6	Green	Receive Data (RXD)	In

Table 2- GPS183 pin out and color code

Pin	Color	GPS183 Signal Name	XLe MJ2 RJ45	NX CN1 10-pos terminal	LX CN1 25-pin Dsub	QX CN1 25-pin Dsub	QX MJ2 RJ45
2	Red	Supply Voltage In (5V)	5*	9	9	9	3 or 4
3	Black	Signal Common (0V)	6	6**	7	7	5
4	White	Transmit Data Out (TXD)	7	7	3	3	7
5	Black	Supply Voltage Common (0V)	6*	6**	10	10	6
6	Green	Receive Data In (RXD)	8	5	2	2	8

Table 3 - GPS183 connection to OCS serial ports.

\*Early revisions of XLe (before HE-XE10x-CB) require an external 5V, 60mA Power Supply to power the GPS183.  
\*\*Both black wires must be connected to NX CN1 Common, pin 6.

4. Cscape Configuration

1. The GPS183 must be connected to an OCS model that supports downloadable serial protocols. Cscape 8.10B or later is also recommended.
2. Start Cscape, and load the application to be configured with the GPS183. From the Program Menu, select "Protocol Config" – a dialog box appears. On the appropriate port, select "GPS Protocol". While the GPS183 can be used on the primary port of the OCS, it is recommended that it be applied on one of the secondary ports (MJ2 or CN1). This leaves the primary port available for local or remote programming.

3. On the Protocol Config dialog box, press the "Network" button to see the default communications parameters, which can not be modified. The only configurable parameter is an optional Status Register. If assigned, the Status Register provides valuable feedback on the current success/failure of communications between the OCS and the GPS183. For details on the contents of the Status Register during operation, see section XX below.
4. Since the GPS183 is a point-to-point RS-232 device, there is no configuration required under the "Devices" button.
5. On the Protocol Config dialog box, press the "Scan List" button. An empty scan list is initially shown. Press the "Add" button, and the Data Mapping dialog box appears.
6. On the Data Mapping dialog box, under Target Device, fill in "main" for the Device Register and "25" for the Length.
7. On the Data Mapping dialog box, under Local Device (OCS), fill in the starting register (%R0001 is shown in the example below). This will allocate 25 consecutive registers to the data provided by the GPS183. For instance, if %R1 is configured, %R1-25 will contain the GPS data in the OCS. If %AI200 is selected, %AI200-%AI224 will contain the GPS data in the OCS.
8. On the Data Mapping dialog box, under Update Type, the default of "Polled Read" should be selected.
9. All GPS183 parameters are now set. Press the OK button on the Data Mapping dialog box, Scan List dialog box, and Protocol Config dialog box to apply the parameters.
10. After downloading the application to the OCS, and placing it in Run mode, the GPS183 should be ready for operation.

## 5. GPS Data & Communications Status

Table 4 shows the run time data that is provided from the GPS183 to the OCS if communications are occurring properly. Table 5 shows the meaning of the codes reported to the Status Register. During acquisition of signal run time data will be zeros.

Register Offset	Data Name	Size (words)	Data Type	Range	Eng. Units
0	Latitude Degree	1	UINT	0 - 360	degrees
1	Latitude Minute	1	UINT	0 - 60	minutes
2	Latitude Seconds	1	UINT	0 - 60	seconds
3	Latitude Hemisphere	1	ASCII	"N", "E", "W", "S"	-
4	Longitude Degree	1	UINT	0 - 360	degrees
5	Longitude Minute	1	UINT	0 - 60	minutes
6	Longitude Seconds	1	UINT	0 - 60	Seconds
7	Longitude Hemisphere	1	ASCII	"N", "E", "W", "S"	-
8	Current Day	1	UINT	1- 31	-
9	Current Month	1	UINT	1- 12	-
10	Current Year	1	UINT	2000 - 2099	-
11	Current Second	1	UINT	00 - 59	-
12	Current Minute	1	UINT	00 - 59	-
13	Current Hour	1	UINT	00 - 23	-
14	GPS Quality	1	UINT	0 = fix not available 1 = non-differential GPS fix available 6 = estimated	-
15	Number of Satellites in View	1	UINT	0 - 12	-
16	Horizontal Dilution of Precision	2	DINT	Represented Data: 5 - 999 Actual Data: 0.5 – 99.9	-
18	Antenna Height above/below sea level	2	DINT	Represented Data: -99999 to 99999 Actual Data: -9999.9 to 9999.9	meters
20	Geoidal Height	2	DINT	Represented Data: -9999 to 99999 Actual Data: -999.9 to 9999.9	meters
22	Speed over Ground	2	DINT	Represented Data: 0 to 9999 Actual Data 000.0 to 999.9	knots
24	Course over Ground	2	DINT	Represented Data: 0 to 3599 Actual Data 000.0 to 359.9	degrees
26	Latitude Seconds (Non Truncated)	1	UINT	Represented as : 0 to 59999 Actual Data : 00.0 to 59.999 seconds	seconds
27	Longitude Seconds (Non Truncated)	1	UINT	Represented as : 0 to 59999 Actual Data : 00.0 to 59.999 seconds	seconds

**Table 4 - GPS183 Runtime Data**

Error Code Description	INT Value	Hex Value
Normal Operations	0	0000H
Invalid Function	-201	FF37H
No Response	-204	FF34H
Invalid Response	-205	FF33H
Invalid Initialization	-207	FF31H

Table 5 - GPS183 Communications Status

### 5.1. 1Hz Measurement Pulse

One of the signals provided by the GPS183 is a 1Hz measurement pulse. The pulse has a magnitude of 5vdc, as measured between the Yellow wire (Pin 1) and the Black wire (signal common, Pin 3). The pulse occurs every 1 Hz, with a pulse width of 20mS. The leading edge of the signal indicates precisely the start of every second, +/-1 microsecond. The OCS does not utilize this signal by default, but it can be optionally connected to an OCS input terminal of appropriate input threshold and speed. It can be used in combination with ladder logic for some application purpose (periodic synchronizing of clocks on multiple controllers, etc)

## 6. SAFETY

When found on the product, the following symbols specify:



**Warning:** Consult user documentation.



**Warning:** Electrical Shock Hazard.

**WARNING:** To avoid the risk of electric shock or burns, always connect the safety (or earth) ground before making any other connections.

**WARNING:** To reduce the risk of fire, electrical shock, or physical injury it is strongly recommended to fuse the voltage measurement inputs. Be sure to locate fuses as close to the source as possible.

**WARNING:** Replace fuse with the same type and rating to provide protection against risk of fire and shock hazards.

**WARNING:** In the event of repeated failure, do not replace the fuse again as a repeated failure indicates a defective condition that will not clear by replacing the fuse.

**WARNING:** Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Read and understand this manual and other applicable manuals in their entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

- ☐ All applicable codes and standards need to be followed in the installation of this product.
- ☐ Adhere to the following safety precautions whenever any type of connection is made to the module:
  - Connect the safety (earth) ground on the power connector first before making any other connections.
  - When connecting to electric circuits or pulse-initiating equipment, open their related breakers.
  - Do not make connections to live power lines.
  - Make connections to the module first; then connect to the circuit to be monitored.
  - Route power wires in a safe manner in accordance with good practice and local codes.
  - Wear proper personal protective equipment including safety glasses and insulated gloves when making connections to power circuits.
  - Ensure hands, shoes, and floor are dry before making any connection to a power line.
  - Make sure the unit is turned OFF before making connection to terminals.
  - Make sure all circuits are de-energized before making connections.
  - Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.

## 7. TECHNICAL SUPPORT

For assistance, contact Technical Support at the following locations:

### North America:

Tel: 317 916-4274

Fax: 317 639-4279

Web: <http://www.heapg.com>

Email: [techspt@heapg.com](mailto:techspt@heapg.com)

### Europe:

Tel: +353-21-4321266

Fax: +353-21-4321826

Web: <http://www.horner-apg.com>

Email: [tech.support@horner-apg.com](mailto:tech.support@horner-apg.com)

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