

**Hemisphere**  
GPS



# Crescent R100 Series Receiver

## User Guide

Part No. 875-0173-000 Rev. D1

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference that may cause undesired operation.

### **Copyright Notice**

Hemisphere GPS Precision GPS Applications

Copyright © Hemisphere GPS (2007). All rights reserved.

No part of this manual may be reproduced, transmitted, transcribed, stored in a retrieval system or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior written permission of Hemisphere GPS.

### **Trademarks**

Hemisphere GPS and the Hemisphere GPS logo, Satloc and the Satloc logo, Mapstar, Air Star, Outback Guidance and eDrive are trademarks of Hemisphere GPS. Other trademarks are the properties of their respective owners.

### **Notice to Customers**

Contact your local dealer for technical assistance. To find the authorized dealer near you, call or write us at:

#### **Hemisphere GPS**

4110 9 Street S.E.  
Calgary, AB, Canada  
T2G 3C4

Telephone number: (403) 259-3311  
Fax number: (403) 259-8866  
E-mail address: [sales@hemispheregps.com](mailto:sales@hemispheregps.com)



# Warranty Notice

## **Covered Products**

This warranty covers all products manufactured by Hemisphere GPS (the "Products").

## **Hemisphere GPS Limited Warranty**

Hemisphere GPS hereby warrants solely to the end purchaser of the Products, subject to the exclusions and procedures set forth herein below, that the Products sold to such end purchaser shall be free, under normal use and maintenance, from defects in material and workmanship for a period of 12 months from delivery to such end purchaser. Repairs and replacement components are warranted, subject to the exclusions and procedures set forth below, to be free, under normal use and maintenance, from defects in material and workmanship for 90 days from performance or delivery, or for the balance of the original warranty period, whichever is greater.

## **Purchaser's Exclusive Remedy**

The end purchaser's exclusive remedy under this warranty shall be limited to the repair or replacement, at the option of Hemisphere GPS, of any defective Products or components thereof. The end user shall notify Hemisphere GPS or a Hemisphere GPS approved service center immediately of any claimed defect. Repairs shall be made through a Hemisphere GPS approved service center only.

## **Exclusions**

Hemisphere GPS does not warrant damage occurring in transit or due to misuse, abuse, improper installation, neglect, lightning (or other electrical discharge) or fresh/salt water immersion of Products. Repair, modification or service of Hemisphere GPS products by any party other than a Hemisphere GPS approved service center shall render this warranty null and void. Hemisphere GPS does not warrant claims asserted after the end of the warranty period. Hemisphere GPS does not warrant or guarantee the precision or accuracy of positions obtained when using Products. Products are not intended for primary navigation or for use in safety of life applications. The potential accuracy of Products as stated in Hemisphere GPS literature and/or Product specifications serves to provide only an estimate of achievable accuracy based on:

- Specifications provided by the US Department of Defense for GPS Positioning,
- DGPS service provider performance specifications.

Hemisphere GPS reserves the right to modify Products without any obligation to notify, supply or install any improvements or alterations to existing Products.

**No Other Warranties**

THE FOREGOING WARRANTY IS EXCLUSIVE OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, IMPLIED OR ARISING BY STATUTE, COURSE OF DEALING OR TRADE USAGE, IN CONNECTION WITH THE DESIGN, SALE, INSTALLATION, SERVICE OR USE OF ANY PRODUCTS OR ANY COMPONENTS THEREOF, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

**Limitation of Liability**

THE EXTENT OF HEMISPHERE GPS' LIABILITY FOR DAMAGES OF ANY NATURE TO THE END PURCHASER OR ANY OTHER PERSON OR ENTITY WHETHER IN CONTRACT OR TORT AND WHETHER TO PERSONS OR PROPERTY SHALL IN NO CASE EXCEED, IN THE AGGREGATE, THE COST OF CORRECTING THE DEFECT IN THE PRODUCT OR, AT HEMISPHERE GPS' OPTION, THE COST OF REPLACING THE DEFECTIVE ITEM. IN NO EVENT WILL HEMISPHERE GPS BE LIABLE FOR ANY LOSS OF PRODUCTION, LOSS OF PROFITS, LOSS OF USE OR FOR ANY SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES, EVEN IF HEMISPHERE GPS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. WITHOUT LIMITING THE FOREGOING, HEMISPHERE GPS SHALL NOT BE LIABLE FOR ANY DAMAGES OF ANY KIND RESULTING FROM INSTALLATION, USE, QUALITY, PERFORMANCE OR ACCURACY OF ANY PRODUCTS.

**Governing Legislation**

To the greatest extent possible, this warranty shall be governed by the laws of the State of Arizona. In the event that any provision hereof is held to be invalid by a court of competent jurisdiction, such provision shall be severed from this warranty and the remaining provisions shall remain in full force and effect.

**Obtaining Warranty Service**

In order to obtain warranty service, the end purchaser must bring the Product to a Hemisphere GPS approved service center along with the end purchaser's proof of purchase. For any questions regarding warranty service or to obtain information regarding the location of any of Hemisphere GPS' approved service centers, contact Hemisphere GPS at the following address:

**Hemisphere GPS**

7560 East Redfield Road, Suite B  
Scottsdale, Arizona 85260  
Phone 480.348.9919 Fax 480.348.6370  
techsupport@hemispheregps.com  
<http://www.hemispheregps.com>

---

## Table of Contents

---

<b>I: Overview</b> .....	<b>1</b>
<b>Introduction</b> .....	<b>2</b>
<b>2: Installation</b> .....	<b>3</b>
<b>Introduction</b> .....	<b>4</b>
<b>Mounting the Receiver</b> .....	<b>5</b>
Crescent R100 Placement	5
<b>Mounting the Antenna</b> .....	<b>7</b>
Magnetic Mount	7
Surface Mount	8
Pole Mount	9
<b>Cable interface</b> .....	<b>10</b>
Connecting Cables	10
<b>Connecting the Crescent R100 to external devices</b> ....	<b>11</b>
Factory parameters	12
Serial Ports	16
Custom configuring the Crescent R100	16
Environmental considerations	16



Table of Contents

<b>3: Operation</b> .....	<b>17</b>
<b>Introduction</b> .....	<b>18</b>
<b>Power-up</b> .....	<b>19</b>
<b>LEDs</b> .....	<b>21</b>
<b>Main Menu</b> .....	<b>22</b>
Main Menu	22
Differential Menu	27
<b>4: RTK/L-Dif</b> .....	<b>31</b>
<b>Installation</b> .....	<b>32</b>
Introduction	32
Base Station	33
Rover Radio Installation	34
<b>Using Crescent R100 as a Base Station or Rover</b> .....	<b>35</b>
Connecting the Crescent R100 to a PC	36
Connecting Crescent R100 to a Base Station or Rover Via Cable	37
Connecting Crescent R100 Via a Wireless Connection	37
<b>Operation</b> .....	<b>39</b>
<b>Appendix A: Troubleshooting</b> .....	<b>41</b>
<b>Troubleshooting</b> .....	<b>42</b>



**Appendix B: Specifications . . . . . 45**  
    **Crescent R100 Specifications . . . . . 46**

**Appendix C: Accessories . . . . . 49**  
    **Crescent R100 Accessories . . . . . 50**



Table of Contents





# **1: Overview**

Introduction

## Introduction

Congratulations on buying Hemisphere GPS' new Crescent R100®. The Crescent R100 is a GPS receiver that tracks GPS and SBAS. There are several varieties of the Crescent R100 that also track differential radio beacon signals and/or L-Band (OmniSTAR VBS®). See Table 1-1 for a list of all of the available combinations. All of the Crescent R100 Series receivers utilize Hemisphere GPS' exclusive COAST™ technology during differential outages. The Crescent R100 is also capable of using Hemisphere GPS' e-Dif® technology.



---

**Note:** Any reference to the Crescent R100 refers to the following receivers: R100, R101, R110, R120, R121 or R130. Any reference to Beacon only applies to the R110 or R130. Any reference to OmniSTAR VBS only applies to the R120, R121 and R130.

---

**Table 1-1: Crescent R100 Series versions**

<b>Name</b>	<b>Beacon</b>	<b>L-Band (OmniSTAR VBS)</b>
Crescent R100	No	No
Crescent R110	Yes	No
Crescent R120	No	Yes
Crescent R130	Yes	Yes
Crescent R101	No	No
Crescent R121	No	Yes





## **2: Installation**

Mounting the Receiver

Mounting the Antenna

Cable Interface

Connecting Crescent R100 to External Devices

## 2: Installation

### **Introduction**

The Crescent R100 can be easily setup for operating. This chapter provides information on the following topics:

- Mounting the receiver
- Mounting the antenna
- Cable interface
- Connecting the cable to other devices



## Mounting the Receiver

### Crescent R100 Placement



There are several options for mounting the Crescent R100. First of all, it is not necessary to mount the unit at all. Several thumbscrews, nuts and brackets are provided to mount the Crescent R100. When choosing a mounting location, please ensure the menu screen, LEDs and buttons are visible and accessible. Please also ensure access to the back panel is available for switching out cables and accessing the power button. There is an option within the menu system to switch the direction of the display. If it is easier to mount the unit upside down, it can be mounted this way and still operate the display easily.



---

**Note:** When mounting the Crescent R100, mount the unit inside and away from the elements and in a location that minimizes vibration, shock, extreme temperatures and moisture.

---



## 2: Installation

### **To install the brackets for mounting:**

1. Slide the nuts through the openings along the sides of the receiver.
2. Place the bracket alongside the receiver and insert the thumbscrews so they screw into the nuts.
3. Screw down the brackets.



## Mounting the Antenna

Placement of the antenna is crucial to the system's operation. The GPS engine inside the Crescent R100 computes a position based upon measurements from each satellite to the phase center of the antenna. Mount the antenna at the location where the reference position should be. When choosing a location to mount the antenna, make certain that there is a clear view of the sky available. This will ensure that GPS satellites are not masked by obstructions, potentially reducing system performance.

### To mount the antenna:

1. Mount the antenna on, or as close to, the center of the point of measurement.
2. Position the antenna as high as possible.

The Antenna can be mounted in several ways:

- Magnetic mount
- Surface mount
- Pole mount

### Magnetic Mount

The magnetic mount can be screwed into the bottom of the antenna and mounts to metal surfaces. A metal disc and foam adhesive are included with each magnetic mount. Use the foam adhesive to bond the metal disc to the desired mounting location if there are no metal surfaces. To use the metal disc and foam adhesive:

1. Clean and dry the mounting surface on the vehicle.
2. Remove the backing from one side of the foam adhesive and press the metal plate onto the mounting surface on the vehicle.
3. Remove the backing from the other side of the foam adhesive



## 2: Installation

4. Press the metal plate onto the mounting surface on the vehicle.
5. Apply firm pressure to ensure good adhesion.
6. Place the antenna on top of the metal disc.

### Surface Mount

As an alternative to the magnetic mount, the antenna is easily attached to the surface with four machine screws (no. 8-32). To surface mount the antenna:

1. Photocopy the bottom of the antenna and use it as a template to plan the mounting hole locations.



---

#### Warning!

Make sure the photocopy is scaled one to one with the mounting holes on the bottom of the antenna.

---

2. Mark the mounting hole centers, as necessary, on the mounting surface.
3. Place the antenna over the marks to ensure that the planned hole centers agree with the true hole centers, then adjust.
4. Use a center punch on the hole centers in order to guide the drill bit.
5. Drill the mounting holes with a 3/16-inch bit appropriate for the surface.
6. Place the antenna over the mounting holes and insert the mounting screws through the bottom of the mounting surface and into the antenna.



---

#### Warning!

When installing the antenna, hand tighten only. Damage resulting from overtightening the antenna is not covered by warranty.

---



**Pole Mount**

The center thread of the antenna is 5/8 inches for compatibility with a survey pole (not included).



## 2: Installation

### Cable Interface

The power cable must reach an appropriate power source. The data cable may connect to a data storage device, computer or other device that accepts GPS data.

When choosing a route for all of the Crescent R100 cables:

- Avoid running cables in areas of excessive heat
- Keep cables away from corrosive chemicals
- Do not run the extension cable through door or window jams
- Keep the cables away from rotating machinery
- Do not bend excessively or crimp the cables
- Avoid placing tension on the cables
- Remove unwanted slack from the extension cable at the receiver end
- Secure along the cable route using plastic wraps



---

#### **Warning!**

Improperly installed cables near machinery can be dangerous.

---

### Connecting Cables

When connecting the various cables from the R100 to different devices:

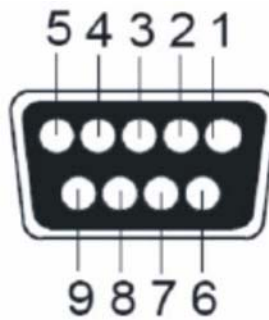
1. Connect the power cable to the appropriate power source.
2. Connect the antenna cable from the Crescent R100 to the antenna.
3. Connect the R100 data port(s) to any device as needed.



## Connecting the Crescent R100 to External Devices

The Crescent R100 has two serial ports. The Crescent R100, R110, R120 and R130 also share Port B with a USB connection. If a valid USB connection is made, messages can be logged to both the serial port B and the USB port. Commands can be sent to the serial port if there is no USB connection or via USB if connected. The USB port is designed to be connected to a host device such as a PC. The PC should recognize the R100 as a serial device. A new COM will appear as a valid connection on the PC. Set the communication software to use this new port to access the Crescent R100.

The serial ports of the Crescent R100 operate at the RS-232C interface level to communicate with external data loggers, navigation systems and other devices. The two serial ports are accessible via the back panel. On the R100, R110, R120 and R130, the serial ports are accessible via two DB9 female connectors. On the R101 and R121, the serial ports are accessible via the power/data connector. Either serial port can also be used for firmware updates. Figure 2-1 displays the numbering for the DB9 connector (female). The associated numbering for the plug connector (male) is a mirror reflection of the scheme shown in Figure 2-1.

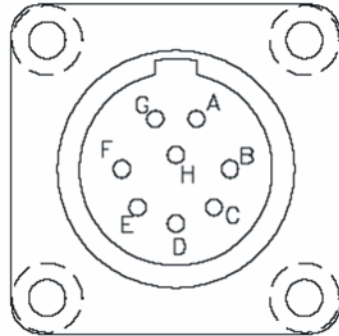


**Figure 2-1. DB9 socket numbering**



## 2: Installation

Figure 2-2 on page 12, provides the numbering for the power/data connector. The associated numbering for the plug connector is a mirror reflection of the scheme shown in Figure 2-2 on page 12.



**Figure 2-2. Power/data connector numbering for R1x1 series**



---

**Note:** For successful communication, the baud rate of the Crescent R100 serial ports must be set to match that of the devices to which they are connected. Table 2-1 on page 13 through Table 2-3 on page 14 provides the pin configuration for the serial ports.

---



### Factory Parameters

Table 2-1 on page 13 through Table 2-6 on page 16 identify the pin-outs and Crescent R100 configuration.

**Table 2-1: Port A pin-out, DB9 connector pin number description for Crescent R100, R110, R120 and R130**

Pin	Function
1	Not connected
2	Transmit data Port A
3	Receive data Port A
4	Not connected
5	Signal ground
6	Not connected
7	Not connected
8	Not connected
9	5V output, 350 mA MAX

**Table 2-2: Port B pin-out, DB9 connector pin number description for the R100, R110, R120 and R130**

Pin	Function
1	Not connected
2	Transmit data Port B
3	Receive data Port B
4	Not connected
5	Signal ground
6	Event marker



## 2: Installation

**Table 2-2: Port B pin-out, DB9 connector pin number description for the R100, R110, R120 and R130**

Pin	Function
7	Not connected
8	Not connected
9	1 PPS

**Table 2-3: Power/data connector pin-out, pin number description for R101 and R121**

Pin	Description
A	Power
B	1 PPS
C	Port A Tx
D	Port A Rx
E	Port B Tx
F	Port B Rx
G	Manual mark
H	Ground



**Table 2-4: DGPS options**

<b>DGPS option</b>
SBAS (WAAS, EGNOS, MSAS, etc)
e-Dif
Beacon (only on R110 and R130)
External RTCM
L-Band (only on R120, R121 and R130)
L-Dif

**Table 2-5: Serial port settings**

<b>Serial port</b>	<b>Baud rate</b>	<b>Data bits</b>	<b>Parity</b>	<b>Stop bit</b>	<b>Interface level</b>
Serial Port A and B	4800 9600 19200 38400 57600	8	None	1	R2-232C



## 2: Installation

**Table 2-6: GPS message output options**

<b>GPS Message</b>	<b>Update rate</b>	<b>Max DGPS age</b>	<b>Elevation mask</b>
Hemisphere GPS Binary	From 1 Hz to 20 Hz	259,200 seconds	5°
NMEA 0183 GGA	From 1 Hz to 20 Hz	259,200 seconds	5°
NMEA 0183 GLL	From 1 Hz to 20 Hz	259,200 seconds	5°
NMEA 0183 GSA	1 Hz	259,200 seconds	5°
NMEA 0183 GST	1 Hz	259,200 seconds	5°
NMEA 0183 GSV	1 Hz	259,200 seconds	5°
NMEA 0183 RMC	1 Hz	259,200 seconds	5°
NMEA 0183 RRE	1 Hz	259,200 seconds	5°
NMEA 0183 VTG	From 1 Hz to 20 Hz	259,200 seconds	5°
NMEA 0183 ZDA	1 Hz	259,200 seconds	5°

### **Serial and USB Ports**

The Crescent R100 features two serial ports. Some models also support USB. The ports handle communication to and from the Crescent R100. The ports may be configured for a mixture of NMEA 0183, binary data and RTCM SC-104 data.



### Custom Configuring the Crescent R100

All aspects of the Crescent R100 may be configured through the serial port with the use of Hemisphere GPS commands. Many aspects of the Crescent R100 receiver can be configured. Please refer to Hemisphere GPS' GPS Technical Reference for all the details.

### Environmental Considerations

The Crescent R100 is designed to be placed indoors. It is, however, splash proof in case of accidental exposure. The antenna is designed to be used outdoors. See Table B-4 in the Appendix for the environmental specifications.



---

**Note:** The changes made to the Crescent R100 via the serial port will not be saved to the memory for subsequent power-up unless a save command is issued (\$JSAVE). If changes are made via the menu system, they will automatically be saved.

---



---

**Note:** Contact a local Hemisphere GPS dealer for more information regarding the use of Hemisphere GPS commands and customized configuration.

---



## 2: Installation





## **3: Operation**

Power-up

LEDs

Menus

### 3: Operation

#### **Introduction**

The Crescent R100 was created for easy operation. This chapter provides information on the following topics:

- How to power-up the Crescent R100
- The LEDs
- The Crescent R100's Main Menu and Differential Menu



## Power-up

### To power-up the Crescent R100:

1. Connect the ends of the Crescent R100 power cable to a clean power source providing between 8 and 36 VDC.
2. Turn on the system by pressing the on/off switch on the back panel. The Crescent R100 accepts an input voltage between 8 and 36 VDC via the power cable. The supplied power should be continuous and clean for best performance. Table B-1 in the Appendix provides the power specifications of the Crescent R100.



---

**Note:** We suggest that a weather-tight connection and connector be used if the connection will be located outside.

---



#### **Warning!**

Be careful not to provide a voltage higher than the input range (36 VDC). This will damage the receiver and will void the warranty.

---



#### **Warning!**

Do not attempt to operate the Crescent R100 with the fuse bypassed. Such a modification will void the product warranty.

---

The Crescent R100 features reverse polarity protection to prevent damage if the power leads are accidentally reversed. With the application of power, the Crescent R100 will proceed through an internal start-up sequence, however, it will be ready to communicate immediately.

---



**Note:** The first start-up can take from 5 to 15 minutes depending on the location. Subsequent start-ups will output a valid position within 1 to 5 minutes depending on the location and time since the last start-up.

---



### 3: Operation



---

**Note:** The Crescent R100 can take up to five minutes for a full ionospheric map to be received from SBAS. Optimum accuracy will be obtained once the Crescent R100 is processing corrected positions using complete ionospheric information.

---



## LEDs

The Crescent R100 uses three LEDs. The LED functions are defined as:

- Power Indicator LED: red. This LED will illuminate when the Crescent R100 is powered.



- GPS Lock Indicator LED: yellow. This LED will remain illuminated once the Crescent R100 achieves a solid GPS lock.



- DGPS Position Indicator LED: green. This LED will illuminate solid green when the receiver has achieved a differential position and a pseudo range residual of better than 10.0 meters (32.8 feet). If the residual value is worse than the current threshold, the green LED will blink indicating that differential mode has been attained, but that the residual has not met the threshold.



## Main Menu

The menu system on the R100 is designed for easy setup and configuration of the unit in or out of the field. Most configurations can be done entirely through the menu system without having to connect to a computer or PDA. The menu software supports many different languages so that the configuration of the receiver can easily be understood.

### To return the menu system to the factory default configuration:

1. Hold down the ENTER key on power-on until the splash screen disappears.

## Main Menu

The main sections of the Main Menu are listed below:

### GPS

- POSITION STATUS
- SATELLITES
- CONFIGURE

### CONFIG WIZARD

- PROCEED WIZARD
- DELETED SAVED
- USE PREVIOUS
- CANCEL

### SYSTEM SETUP

- DISPLAY APPS
- DISPLAY FORMAT
- BAUD RATES
- DISPLAY LOGS
- SOFTWARE DISPLAY



The Crescent R100's main menu is fully expanded on pages 25 to 28.

## GPS

### POSITION STATUS

- Lt
- Ln
- Hgt
- Hdg
- Vel
- Age
- Sv count
- Hdop
- Precision
  - Res Rms
  - Sigma-a
  - Sigma-b
  - Azimuth
  - Sigma-Lat
  - Sigma-Lon
  - Sigma-Alt
- Navcnd
  - Sar Smooth
  - Eph Exists
  - Eph Healthy
  - NotUsed Prev
  - Above Ele
  - Diff corr
  - No Diff Corr
- Dsp-arm
  - DSP:CarLock
  - DSP:BER
  - DSP:DSPLock
  - DSP:FrmSync
  - DSP:TrkMode
  - ARM:GPSLock
  - ARM:DiffData
  - ARM:ARMLock



### 3: Operation

ARM:DGPS  
ARM:Solutn

#### GPS (continued)

##### SATELLITES

Chxx svxx elxxx

Azxxx snr xx

##### CONFIGURE

Elev Mask

MaskDGPSAge

Data PORT A

Data PORT B

UTC Offset

#### CONFIG WIZARD

##### PROCEED WIZARD

Create new

Enter Name XXX

Diff

Data PORT A

Data PORT B

Elev Mask

MaxDGPSAge

PORT A

PORT B

Save to Location

Not used1

Not used2

Not used3

Not used4

Not used5

##### SAVE CURRENT

Enter Name

Save to Location

Not used1

Not used2

Not used3



Not used4  
Not used5

CONFIG WIZARD (continued)

DELETED SAVED

Not Used 1  
Not Used 2  
Not Used 3  
Not Used 4  
Not Used 5

USE PREVIOUS

Not Used 1  
Not Used 2  
Not Used 3  
Not Used 4  
Not Used 5

CANCEL

SYSTEM SETUP

DISPLAY APPS

In-Use  
Other  
SwapApplications

DISPLAY FORMAT

Display update  
LL Unit  
Hgt Unit  
Vel Unit

BAUD RATES

Port A  
Port B



3: Operation

SYSTEM SETUP (continued)

DISPLAY LOGS

Gga

Gll

Gsa

Gst

Gsv

Rmc

Rre

Vtg

Zda

Bin1

Bin2

Bin80

Bin93

Bin94

Bin95

Bin96

Bin97

Bin98

Bin99

RTCM

RD1

SOFTWARE DISPLAY

Menu System

CrescentApp

S/n

CONTRAST

ANIMATION

SUBSCRIPTION

FLIP DISPLAY

LANGUAGE



## **Differential Menu**

The Differential Main Menu is listed below:

### **L-DIF**

- RTCM PORT
- RTCM BAUD
- RADIO

### **BASE STATION**

- REFERENCE
- RADIO

### **EXTERNAL RTCM**

- RTCM PORT
- RTCM BAUD
- DIFF

### **SBAS**

- SIGNAL STATUS
- SATELLITES
- DIFF

### **BEACON**

- SIGNAL STATUS
- CONFIGURE
- DIFF

### **AUTONOMOUS**

- NO DIFF SOURCE
- DIFF



### 3: Operation

#### E-DIF

MODE

STATUS (shown as "e-Dif")

RECALIBRATE (disappears and "REFERNECE" appears if in base station mode)

AGE OF DIFF (disappears and "REFEENCE" appears if in base station mode)

DIFF

The Crescent R100's differential hierarchy is expanded on pages 30 to 32.

#### L-DIF

RTCM PORT

RTCM BAUD

RADIO

#### BASE STATION

REFERENCE

Lt

Ln

Hgt

Set Reference

Use Current Pos

RADIO

#### EXTERNAL RTCM

RTCM PORT

RTCM BAUD

DIFF



SBAS

SIGNAL STATUS

BER

BER

LN

LN

Elev

Elev

Az

Az

SATELLITES

Mode

PRN

PRN

DIFF

BEACON

SIGNAL STATUS

F

SS SRN

MTP % Q

Unselectee Bx

ID H

CONFIGURE

Tune

Auto Tune

TuneBeaconName

Africa

Asia

Australia

Central America

Europe

North America

South America

DIFF



### 3: Operation

AUTONOMOUS  
NO DIFF SOURCE  
DIFF

E-DIF  
MODE  
STATUS (E-DIF)  
RECALIBRATE  
AGE OF DIFF  
DIFF





## **4: RTK/L-Dif**

Installation

Using Crescent R100 as a Base Station or Rover Receiver

Operation

## **Installation**

### **Introduction**

RTK and Local Differential (L-Dif) are two differential options for the Crescent R100 that provide the most precise accuracy (See Appendix B for details). A local base station is required for both differential options. Most commonly, the base station is comprised of a GPS receiver, GPS antenna, radio transmitter and power source (such as available in the Crescent MasterLink). The base station is typically set up near the working area, tracks GPS signals and broadcasts differential corrections to a radio and rover GPS receiver. The rover GPS system processes the corrections and outputs very accurate position information.



## Base Station

### To set up the base station:

1. Place the base station at a location with no obstructions between the rover radio and base station. (See to Figure 4-1 and 4-2 on pages 35 and 36.)



**Figure 4-1. Base station on tripod**



---

**Note:** Do not place the base station near metal objects.

---



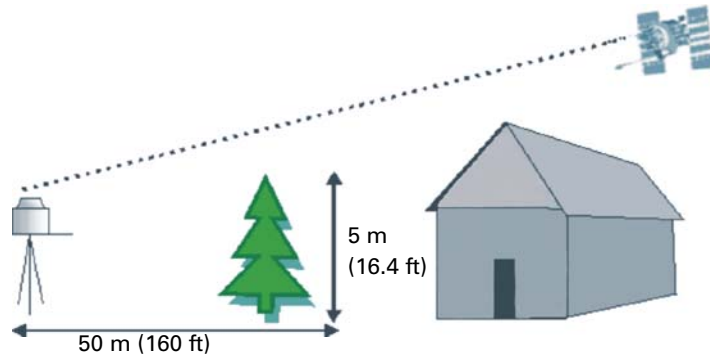
---

**Note:** Make sure the base station is at least 50 meters (160 feet) from obstructions. (See Figure 4-2 on page 36.)

---



#### 4: RTK/L-Dif



**Figure 4-2. Location of base station**



---

**Note:** Make sure the base station and rover radio have a clear line of sight up to 5 kilometers (3 miles) or less depending on the radio type when operating the L-Dif/RTK.

---

#### Rover Radio Installation



---

**Note:** Make sure the rover radio and the GPS antenna are at least 1 meter (3 feet) from each other.

---



---

**Note:** The GPS antenna must not be blocked by the rover radio.

---



---

**Note:** The rover radio must receive regular corrections from the base station, every one to two seconds (differential age), for up to 15 minutes to achieve RTK lock (maximum accuracy). Typically, a lock is achieved in under five minutes.

---



## Using Crescent R100 as a Base Station or Rover

The Crescent R100 can be used as a base station or rover receiver, but requires a link between the base and rover for transfer of differential corrections. The link can be wired or wireless (i.e. radio modem). The corrections must be transferred to the rover receiver through the desired link.

### To set up the proper application:


1. Make sure the current Crescent R100 application is set to RTKBAS for a base station, or RTK for a rover, by using the interface on the front panel.

2. Scroll down to **System Setup>**.

3. Click  to enter the **System Setup** screen.



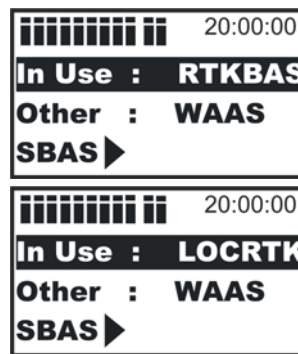
4. Select **Display Apps>** and click

-  to enter the **Display Applications** screen.



#### 4: RTK/L-Dif

Make sure that **In Use:** displays either **RTKBAS** for a RKT or L-Dif base base station or **LOCRTK** for a RTK or L-Dif rover receiver. If the **RTK** application only appears as **Other:**, scroll down and select **SWAPAPPLICATIONS**. The desired application will be shown as **In Use**.



#### Connecting the Crescent R100 to a PC

This application selection can also be done by using a terminal program, such as Hyper Terminal®, SLXMon or PocketMax™.

When using direct commands from a PC, send the command \$JAPP to view the current application. A response, like \$>JAPP,RTKBASE,WAAS,1,2 will appear. This means that the RTKBASE application is active and WAAS is the secondary application. If the application was different and WAAS was first, such as \$>JAPP,WAAS,RTKBASE,2,1, then \$JAPP,other will have to be sent, which will swap applications so that correct application is used.

1. Make sure the 9-pin cable from the IO-X,CIRC(F) 6-FT cable (part number 051-0160) is connected to the desired on the Crescent R100 receiver.
2. With RTKBASE or LOCRTK as the active application, the Crescent R100 automatically configures all messages necessary on Port B of the receiver for correct RTK operation. The baud rate of Port B will also be automatically set to 9600.



### Connecting Crescent R100 to a Base Station or Rover Via Cable

The steps in the preceding section allows the Crescent R100 receiver to be used as a base station or rover either with or without a radio connection.

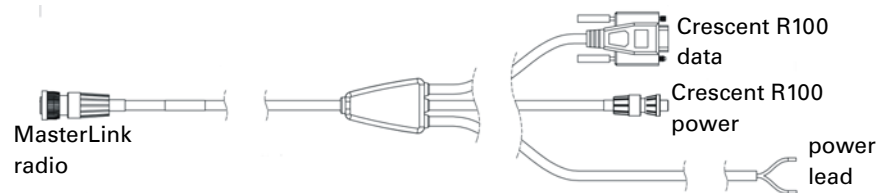
#### To use a wired connection:

1. Connect the Crescent R100 to the base station, or rover, with a 9-pin serial cable from Port B of the base station to Port B of the rover receiver using a null modem adaptor.

### Connecting Crescent R100 Via a Wireless Connection

The Crescent R100 can be connected through a wireless connection in two ways:

1. Use the MasterLink rover radio cable (part number 051-0160) to connect the MasterLink rover radio to the Crescent R100. (See figure 4-3 below.)



**Figure 4-3. MasterLink rover radio cable**



#### 4: RTK/L-Dif

2. Use a wireless connection. This wireless connection must meet these requirements:
  - Non-interference with GPS
  - Serial connection set to 9600,N,8,1
  - Enable throughput of at least 300 bytes per second



---

**Note:** We recommend testing with a wired condition prior to using a third party wireless connection.

---



---

**Note:** Make sure both the rover radio and base station are on the same channel or frequency in order for the rover radio to receive corrections from the base station.

---



## Operation

This section deals with the RTK operation after connecting to the Crescent R100.

The status LEDs indicate the following:

- Yellow: tracking GPS.
- Flashing green: differential has been attained, but the residual has not met the threshold.
- Solid green: RTK lock.

The Crescent R100 will output standard NMEA messages through Port A as desired. Set the message and port output as required by the user-supplied interface.



4: RTK/L-Dif





## **Appendix A: Troubleshooting**

## Troubleshooting

Table A-1 provides a checklist to troubleshoot common problems and their solutions for the Crescent R100.

**Table A-1: Troubleshooting**

<b>Problem</b>	<b>Possible solution</b>
Receiver fails to power	<ul style="list-style-type: none"> <li>• Verify polarity of power leads</li> <li>• Check integrity of power cable connections</li> <li>• Check power input voltage (8 - 36 VDC)</li> <li>• Check current restrictions imposed by power source (maximum is 250 mA @ 12 VDC)</li> <li>• Press the POWER button</li> </ul>
No data from Crescent R100	<ul style="list-style-type: none"> <li>• Check receiver power status (red LED)</li> <li>• Check integrity and connectivity of power and data cable connections</li> <li>• The volume of data requested to be output by the Crescent R100 could be higher than what the current baud rate supports. Try using 19,200 or higher as the baud rate for all devices.</li> </ul>
No GPS lock	<ul style="list-style-type: none"> <li>• Check integrity of cable connections</li> <li>• Verify antenna's clear view of the sky</li> </ul>



**Table A-1: Troubleshooting**

<b>Problem</b>	<b>Possible solution</b>
No SBAS lock	<ul style="list-style-type: none"> <li>• Check integrity of cable connections</li> <li>• Verify antenna's clear view of the sky</li> <li>• Check SBAS visibility map</li> </ul>
No beacon lock	<ul style="list-style-type: none"> <li>• Check beacon listings to ensure proximity to a beacon station</li> <li>• Ensure there are no sources of interference nearby</li> <li>• Check antenna connections</li> <li>• Verify MSK rate is set correctly</li> <li>• Verify frequency of transmitting beacon</li> <li>• Select alternate antenna position</li> </ul>
No OmniSTAR VBS lock	<ul style="list-style-type: none"> <li>• Subscription activated and not expired</li> <li>• Check antenna connections</li> <li>• Verify antenna's clear view of the sky</li> </ul>



Appendix A: Troubleshooting





## **Appendix B: Specifications**

## Crescent R100 Specifications

Table B-1 to B-5 on pages 48 to page 50, provides the power, mechanical, communication, environmental and DGPS specifications for the Crescent R100.

**Table B-1: Power specifications**

Item	Specification
Input voltage	8 - 36 VDC
Power consumption	< 3 W @ 12 VDC (typical)
Current consumption	250 mA @ 12 VDC (typical)

**Table B-2: Receiver mechanical specifications**

Item	Specification
Height	45 mm (1.77 in)
Width	114 mm (4.49 in)
Length	160 mm (6.30 in)
Weight	0.54 kg (1.19 lbs)

**Table B-3: Environmental specifications**

Item	Specification
Operating temperature	-32° C to +74° C (-25.6° F to +165.2° F)
Storage temperature	-40° C to +85° C (-40° F to +185° F)
Humidity	95%, non condensing



**Table B-4: GPS sensor specifications**

<b>Item</b>	<b>Specification</b>
Receiver type	L1, C/A code with carrier phase smoothing (Patented COAST technology during differential signal outage)
Channels	12-channel, parallel tracking or 10-channel, GPS 2-channel, SBAS
Update rate	1 - 20 Hz
Horizontal accuracy	<ul style="list-style-type: none"> <li>• &lt; 0.6 m 95% confidence (DGPS) *</li> <li>• &lt; 2.5 m 95% confidence (autonomous) **</li> <li>• 1.5 cm + 1 ppm 95% accuracy (RTK)*</li> </ul>
Differential options	SBAS, e-Dif, L-Dif, Radio Beacon, L-Band, Autonomous, External RTCM, RTK
SBAS tracking	2-channel, parallel tracking
Start up time	~60 s (no almanac and RTC)
Satellite reacquisition	< 1 s

\* Depends on multipath environment, number of satellites in view, satellite geometry, baseline length (for local services) and ionospheric activity

\*\*Depends on multipath environment, number of satellites in view, satellite geometry and ionospheric activity.



Appendix B: Specifications

**Table B-5: Communication specifications**

<b>Item</b>	<b>Description</b>
Serial ports	2 full duplex RS232, 1 USB
Pulse output	1 PPS (HCMOS, active high, rising edge sync)
Baud rates	4800 - 57600
Differential correction I/O protocol	RTCM SC-104, Hemisphere GPS proprietary
Data I/O protocol	NMEA 0183 and Hemisphere GPS binary and RTCM
Event mark output	HCMOS, active low, falling edge sync, 10 k-ohm, 10 pF load





## **Appendix C: Accessories**

## Crescent R100 Accessories

Tables C-1 and C2 provide the Crescent R100 unit numbers and the available accessories for the Crescent R100.

**Table C-1: Crescent receivers**

Part Number	Accessories
803-0047	Crescent R100
803-0048	Crescent R110
803-0049	Crescent R120
803-0050	Crescent R130
803-0043	Crescent R101
803-0044	Crescent R121

**Table C-2: Crescent R100 part accessories**

Part Number	Accessories
050-0011	Data cable (DB-9)
051-0160	L-Dif cable (radio to serial, power and external power)
052-0005	Antenna cable, 5 m (16.4 ft) (TNC-TNG)
054-0009	Power cable (unterminated), 6.7 m (21.98 ft)
054-0093	Power cable (weatherpack termination)
600-1021	Threaded adapter, 1.59 cm to 2.54 cm (5/8 in to 1 in)
602-1005	Mounting brackets



**Table C-2: Crescent R100 part accessories**

<b>Part Number</b>	<b>Accessories</b>
725-0007	Magnetic mount
804-3030	A30 antenna
804-3032	A20 antenna
875-0173-000	Crescent R100 User Guide



Appendix C: Accessories





[www.hemispheregps.com](http://www.hemispheregps.com)  
e-mail: [info@hemispheregps.com](mailto:info@hemispheregps.com)