

## DL-V3™

### QUICK START GUIDE

This guide provides the basic information you need to set up and begin using your new DL-V3. For more detailed information on the installation and operation of your receiver, please refer to the *DL-V3 User Manual* on our website at <http://www.novatel.com/Downloads/docupdates.html>. To order a printed copy of the manuals, free of charge, follow the instructions given on the enclosed *User Manuals* postcard.



There are L-band and/or GLONASS-capable models available.

The DL-V3 provides additional USB and Ethernet ports and *Bluetooth*® functionality. The USB drivers, along with installation instructions, are available in the USB Drivers directory of the CD provided. An installation program for NovAtel's *PC Utilities*, including the **CDU** (Control and Display Unit) user interface, and the OEMV Software Development Kit are also on the CD.

There are LEDs on the front of the DL-V3 that show status information on power, receiver status, COMs (COM1, COM2 and AUX), COM3 (*Bluetooth* or Ethernet), satellite tracking, flash card memory, positioning mode, and occupation time. See the *DL-V3 LEDs* section of this guide.

### BOX CONTENTS

In addition to this *Quick Start Guide*, the following is provided with your DL-V3:

- 1 power adapter cable
- 2 DB-9 serial cables (1 straight through, 1 null-modem)
- 1 I/O cable
- 1 CD with contents as described above
- OEMV Quick Reference Guide
- User Manuals postcard to request printed manuals
- 1 64 MB Compact Flash (CF) card to use for data storage on the DL-V3, see also the *Creating a Log Group Using DL Explorer* section of this guide

### ADDITIONAL EQUIPMENT REQUIRED

The additional equipment listed below is required for a typical setup:

- A Windows-based PC/laptop with an RS-232 DB-9 or USB port
- One of the following:
  - A standard 12 VDC power adapter outlet, or
  - A 9-28 VDC power supply and a power cable with a 4-pin LEMO plug (LEMO part number FGG.0B.304.CLAD52Z) at the receiver end<sup>1</sup>
- A quality GNSS antenna, such as NovAtel's ANT-532-C for airborne/high speed applications, the GPS-702L for L-band corrections use, or the GPS-702GG for GLONASS applications.
- An antenna cable with a TNC male connector at the receiver end, such as NovAtel's C016 model

### SETTING UP YOUR DL-V3

Complete the steps below to connect and power your DL-V3.

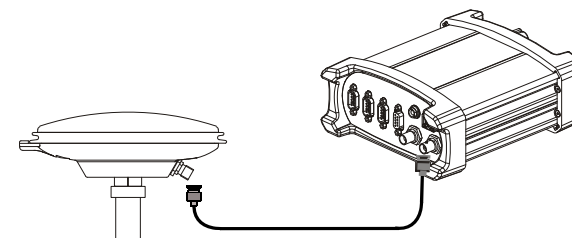
1. Mount a GNSS antenna on a secure, stable structure with an unobstructed view of the sky from horizon to horizon.
2. Ensure a CF card is in the slot behind the door on the front face of the DL-V3. Open, or secure, the door by turning the latch.

- 
- ✉ Once the CF card is installed, ensure that it is properly formatted by issuing the DISK FORMAT command or by selecting *Tools | DL Explorer | CF Card Status* in **CDU**. See also the **CDU** sections of this guide.

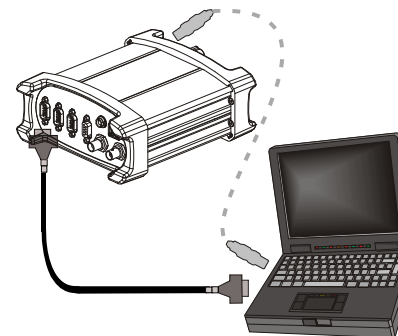


3. Using a coaxial cable, connect the antenna to the **SAT ANT** port, which is found on the back face of the DL-V3.

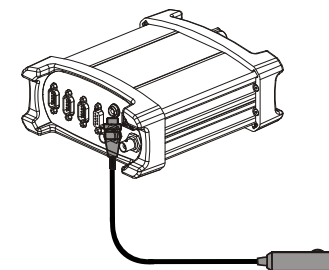
- 
1. If an alternative power source is preferred, the automobile power adapter can be cut off from the power cable. The exposed wires (red and orange for positive, brown and black for negative) can then be tied to a supply capable of at least 5 W.





4. Connect the **COM1**, or **USB**, port on the receiver to a DB-9, or USB, serial port respectively on the PC/laptop. If you are using a USB connection, first install the USB drivers available on the CD provided.<sup>2</sup>



5. Line up the red mark on the power cable connector with the red mark on the receiver's **INPUT 9-28 V** connector and insert the power cable.



- 
2. Before using *Bluetooth* or Ethernet, use a serial COM or USB connection to communicate with the receiver. This will give you the ability to configure the PC/laptop and DL-V3 before Ethernet or *Bluetooth* use. Refer to the *DL-V3 User Manual* on our website at: <http://www.novatel.com/support/docupdates.htm>

6. Plug in the adapter and/or connect, turn on the power supply and press the  button on the front face of the DL-V3. The power LED  on the front of the receiver glows green when the DL-V3 is turned on and properly powered.

### INSTALLING THE PC UTILITIES

Once the DL-V3 is connected to the PC/laptop, antenna, and power supply, install NovAtel's *PC Utilities*.

1. Start up the PC/laptop.
2. Insert the accompanying CD in the CD-ROM drive of the computer.
3. Select *Install the OEMV GPS PC Utilities* from the window that is automatically displayed. If the window does not automatically open when the CD is inserted, select *Run* from the *Start* menu and select the *Browse* button to locate *Setup.exe* on the CD drive.
4. Install the *PC Utilities* by advancing through the steps provided in the *NovAtel PC Utilities* setup program.

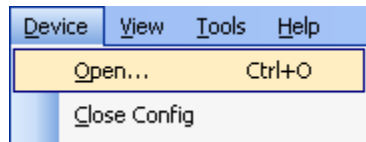


### ESTABLISHING RECEIVER COMMUNICATION

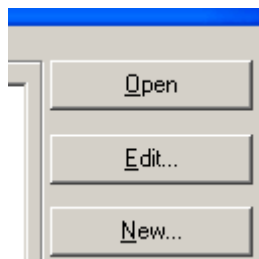
To open a serial port to communicate with the receiver, complete the following:




1. Launch **CDU** from the *Start* menu folder specified during the installation process. The default location is *Start | Programs | NovAtel OEMV | NovAtel CDU*.

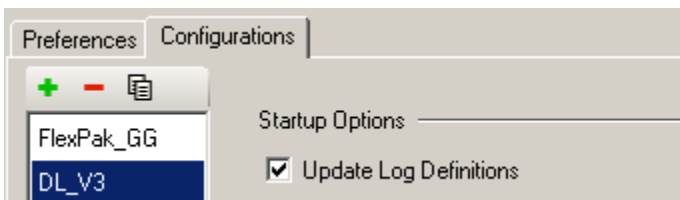
2. Select *Open....* from the *Device* menu.



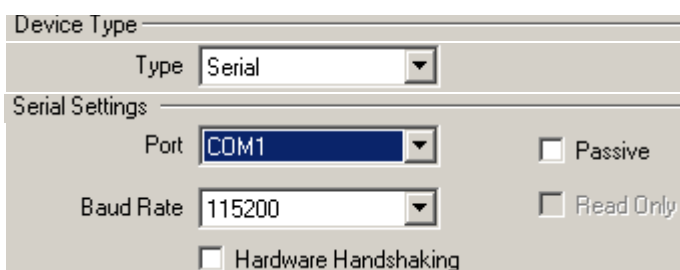
3. Select the *New...* button in the *Open* dialog box. The *Options / Configuration* dialog opens.



4. Use the  button at the top of the configurations selection box to add a new configuration. To delete a configuration, select it from the list and click on the  button. To duplicate an existing configuration, click on the  button. You can select any name in the list and edit it to change it.



5. Select *Serial* from the *Type* list and select the PC/laptop port, that the DL-V3 is connected to, from the *Port* list.



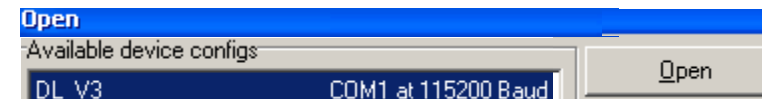
6. Select *115200* from the *Baud Rate* list.

7. Uncheck the *Use hardware handshaking* checkbox.

8. Select *OK* to save the new device settings.

9. Select the new configuration from the *Available device configs* area of the *Open* dialog.

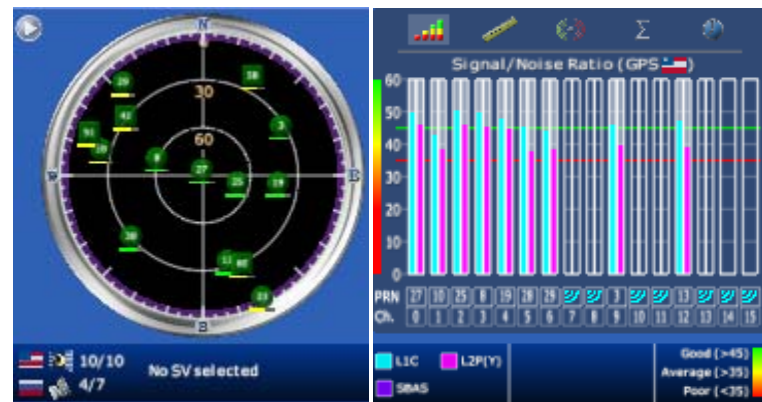
10. Select the *Open* button to open DL-V3 communications.



As **CDU** establishes the communication session with the receiver, a progress box is displayed.









### USING CDU

**CDU** provides access to key information about your receiver and its position. The information is displayed in windows accessed from the *View* menu. For example, select *Position Window* from the *View* menu to display the position solution of the receiver. To show details of the GNSS and geostationary (SBAS) satellites being tracked, select a *Tracking Status Window* (*GPS* or *GLONASS*) from the *View* menu. Select *Help* from the main menu for more details on **CDU**, its windows and features.




### DL-V3 LEDS

The LEDs on the front of the DL-V3 represent these categories:

LED Name	LED Icon	Indicators																		
Power		Orange: receiver is powered Green: receiver is turned on																		
Receiver Status		Orange flash: at start-up Off: normal operation Orange flash again: status event																		
COM1/ COM2/ AUX		Green flash (top): transmitting Amber flash (bottom): receiving																		
COM3		Blue flashing: <i>Bluetooth</i> active																		
COM3		Orange glow: Ethernet active																		
Satellite Tracking		<table border="1"> <thead> <tr> <th>LED#</th> <th># of SVs</th> <th>LED Color</th> </tr> </thead> <tbody> <tr> <td>1 (left)</td> <td>≤ 3</td> <td>Red</td> </tr> <tr> <td>2</td> <td>4 or 5</td> <td>Amber</td> </tr> <tr> <td>3</td> <td>6 or 7</td> <td>Green</td> </tr> <tr> <td>4</td> <td>8 or 9</td> <td>Green</td> </tr> <tr> <td>5 (right)</td> <td>≥ 10</td> <td>Green</td> </tr> </tbody> </table>	LED#	# of SVs	LED Color	1 (left)	≤ 3	Red	2	4 or 5	Amber	3	6 or 7	Green	4	8 or 9	Green	5 (right)	≥ 10	Green
LED#	# of SVs	LED Color																		
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Flash Card Memory		<table border="1"> <thead> <tr> <th># of LEDs</th> <th>Capacity</th> <th>LED Color</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Capacity ≤ 20%</td> <td>Red <sup>a</sup></td> </tr> <tr> <td>2</td> <td>40% ≥ Capacity &gt; 20%</td> <td>Amber</td> </tr> <tr> <td>3</td> <td>60% ≥ Capacity &gt; 40%</td> <td>Green</td> </tr> <tr> <td>4</td> <td>80% ≥ Capacity &gt; 60%</td> <td>Green</td> </tr> <tr> <td>5</td> <td>Capacity &gt; 80%</td> <td>Green</td> </tr> </tbody> </table> <p>a. This red LED can also mean that the card was not formatted, and placed in the receiver, when the receiver was powered off.</p>	# of LEDs	Capacity	LED Color	1	Capacity ≤ 20%	Red <sup>a</sup>	2	40% ≥ Capacity > 20%	Amber	3	60% ≥ Capacity > 40%	Green	4	80% ≥ Capacity > 60%	Green	5	Capacity > 80%	Green
# of LEDs	Capacity	LED Color																		
1	Capacity ≤ 20%	Red <sup>a</sup>																		
2	40% ≥ Capacity > 20%	Amber																		
3	60% ≥ Capacity > 40%	Green																		
4	80% ≥ Capacity > 60%	Green																		
5	Capacity > 80%	Green																		
Positioning Mode		See <i>Table 1</i> starting on the next panel																		


*Continued on the next panel*

Occupation Time	LED#	Baseline Length (km)	LED Color
	1 (left)	≤ 5	Green
	2	> 5 ≤ 10	Green
	3	> 10 ≤ 15	Green
	4	> 15 ≤ 20	Green
	5 (right)	≥ 20	Green

**Table 1: Positioning Mode LEDs** <sup>1</sup>

Position Mode	Position Mode Detail	1 left	2	3	4	5 right
Single Point	Autonomous (fixed height)	Amber	Off	Off	Off	Off
	Autonomous (3D)	Amber	Off	Off	Off	Off
Differential GPS	SBAS	Off	Green	Off	Off	Off
	CDGPS	Off	Off	Green	Off	Off
	DGPS	Off	Green	Green	Off	Off
RTK (see note below)	Float (RT-20 unconverged)	Amber	Off	Off	Green	Off
RTK (see note below)	Float (RT-20)	Amber	Off	Off	Green	Off
RTK	Fixed (RT-2, unconverged)	Amber	Off	Off	Off	Green
RTK	Fixed (RT-2)	Amber	Off	Off	Off	Green

*Continued on the next page*

 The LEDs show the total number of satellites used in the solution (GPS or GPS+GLONASS) without making a distinction between GPS and GLONASS. Check the Constellation window in CDU for details on the availability of GPS and GLONASS satellites.

<sup>1</sup> Table Cell Color: *Solid*: LED glowing; *Dim*: LED flashing; *White*: Off

Positioning Mode LEDs table continued from the previous page

Position Mode	Position Mode Detail	1 left	2	3	4	5 right
OmniSTAR	VBS (searching)	Amber	Green	Off	Off	Off
	VBS (pulling in)	Amber	Green	Off	Off	Off
	VBS	Amber	Green	Off	Off	Off
	XP (searching)	Amber	Off	Green	Off	Off
	XP (pulling in)	Amber	Off	Green	Off	Off
	XP	Amber	Off	Green	Off	Off
	HP (searching)	Amber	Green	Green	Off	Off
	HP (pulling in)	Amber	Green	Green	Off	Off
	HP	Amber	Green	Green	Off	Off

## DETERMINING WHEN THE POSITION IS VALID

When the receiver has a valid position, the *Solution Status* field in **CDU's** *Position* window shows *Computed*.



## ENTERING COMMANDS

The DL-V3 uses a comprehensive command interface. Commands can be sent to the receiver using the *Console* window in **CDU**, which is opened from the *View* menu. Enter commands in the text box at the bottom of the *Console* window.



The following information is important when entering commands:

- Commands can be entered in three formats:

- ASCII (log bestposa)
- Abbreviated ASCII (log bestpos)
- Binary (log bestposb).

Abbreviated ASCII is the best format to use to work with the receiver directly. For data collection, use ASCII or Binary.

- Press *Enter* to send the command string to the receiver.
- The commands are not case sensitive.

Refer also to the *DL-V3 User Manual*, available from our website at <http://www.novatel.com/Downloads/docupdates.html>, for DL-V3-specific commands and logs. The *OEMV Family Quick Reference Guide*, provided with the receiver, lists other OEMV available commands and the parameters they use for the *Abbreviated ASCII* format.

## CREATING A LOG GROUP USING DL EXPLORER

**CDU** is available to download from our website at <http://www.novatel.com/support/fswupdates.htm>. *DL Explorer* is part of **CDU**. Log groups are sets of logs used by the DL-V3. A group can be created in *DL Explorer* and then uploaded to the DL-V3.

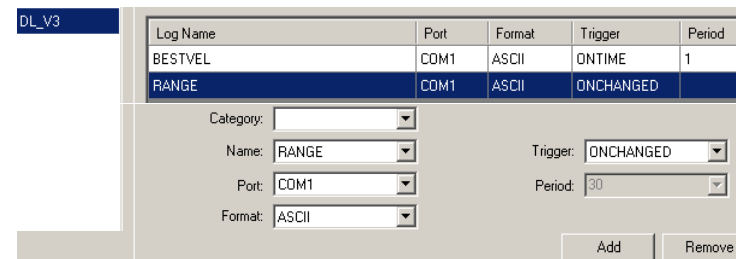
1. Launch *CDU* and open, or create, a DL-V3 configuration. See the *Establishing Receiver Communication* section on the first page of this guide.
2. Select *DL Explorer* in the *Tools* menu and then select the *Edit DL Groups...* button.

Within the *DL Groups* dialog, an empty log group is provided. You can change its name by clicking on it and editing it directly.

3. In the *Logs* tab, select the log to add from the *Name* drop-down list.
4. Select the log format using the *Format* drop-down list. You can only use ASCII or Binary format to log to file.
5. Select the trigger for the log using the *Trigger* drop-down list.

If the *On Time* trigger is selected, select the period for logging using the *Period* drop-down list or type it in.

6. Select *OK* to add the new log to the log group.



7. To log to file, select *File* from the *Port* drop-down list.
8. Repeat steps 3 through 7 to add more logs to the group.
9. Select *OK* in the *DL Groups* dialog to save the changes to the group.



## UPLOADING A LOG GROUP

Once a log group has been created, it can be uploaded to the DL-V3. The steps below provide details on uploading a group.

1. In the *DL Explorer* window, select the *Group Management* button.



2. Select the group to upload to the DL-V3 from the list of groups in the *CDU* panel of the dialog.



3. Select the *UpLoad* button to copy the group.



4. Select a group in the *DL Groups* panel and press *Start* on the dialog's right to start logging to your CF card or COM port.



1. A red cross beside a log group name indicates the group is not active in the DL-V3. A green check mark indicates the group is active in the DL-V3.
2. Up to 5 log groups can be stored in the DL-V3 at any one time.

## ENABLING SBAS

DL-V3 models are also capable of SBAS positioning. This positioning mode is enabled using the `SBASCONTROL` command. These commands are typically used to enable the WAAS (North America) and EGNOS (Europe) systems respectively:

```
SBASCONTROL ENABLE WAAS
SBASCONTROL ENABLE EGNOS
```

Once enabled, the *Position Type* field shown in **CDU's** *Position* window should change from *Single* to *WAAS* and you may see SBAS satellites in the *Constellation* window. An example is shown on the next page.



DL-V3 - Position		
Latitude	51.116687581° ±	0.95m
Longitude	-114.038801393° ±	0.64m
Height (MSL)	1063.845m ±	1.49m
Solution type	WAAS	
Tone correction	Multi-frequency	



## ENABLING L-BAND

L-band equipped receivers allow you to achieve sub-meter accuracy. To use this positioning mode, you must enable L-band tracking to the Canada-Wide Differential GPS (CDGPS) or OmniSTAR signal. A subscription to OmniSTAR is required to use the OmniSTAR VBS, XP or HP service (visit <http://www.omnistar.com> with your receiver serial number ready). The CDGPS signal is free and available without subscription over North America (visit <http://www.cdgps.com>).

The ASSIGNLBAND command allows you to set OmniSTAR or CDGPS base station communication parameters. It should include a relevant frequency and data rate. The frequency assignment can be made in Hz or KHz. For example:

```
Hz:    assignlband omnistar 1536782000 1200
KHz:   assignlband omnistar 1536782 1200
```

A value entered in Hz is rounded to the nearest 500 Hz.

To confirm you are tracking an L-band signal, log the L-band status information by entering: `log lbandstat`. For example, if you are receiving CDGPS, the fifth field after the header should be 00c2:

```
lbandstata com1 0 43.5 finesteering 1295
149951.671 00000000 976f 34461;
1547546977 46.18 4541.0 0.00 00c2 00f0 ...
```

To specify the correction source, use the PSRDIFFSOURCE command as shown in the examples below:

```
PSRDIFFSOURCE OMNISTAR    or,
PSRDIFFSOURCE CDGPS
```

otherwise it is left at the default AUTOMATIC.

Refer to the *OEMV Family Firmware Reference Manual* for more on individual L-band, GLONASS or SBAS commands and logs.

## REAL-TIME KINEMATIC (RTK) POSITIONING

Corrections can be transmitted from a base station to a rover station to improve position accuracy. The base station is the GNSS receiver which is acting as the stationary reference. It has a known position and transmits correction messages to the rover station. The rover station is the GNSS receiver which does not know its exact position and can receive correction messages from a base station to calculate differential GNSS positions.

In most cases, provide a data link between the base station and rover station (two NovAtel receivers) in order to receive corrections. SBAS and L-band corrections can be accomplished with one receiver and are exceptions to the base/rover concept. Generally a link capable of data throughput at a rate of 9600 bits per second, and less than 4.0 s latency, is recommended.

Once your base and rover are set up, you can configure them for RTCA, RTCM, RTCMV3, CMR+ or CMR corrections. Below is an RTCM example (replace the latitude, longitude and height coordinates shown with those of your base):

### Base

```
interfacemode com2 none rtkm off
```

```
fix position 51.11358042 -114.04358013
1059.4105
log com2 rtkm3 ontime 10
log com2 rtkm22 ontime 10 1
log com2 rtkm1819 ontime 1
log com2 rtkm1 ontime 5
```

### Rover

```
interfacemode com2 rtkm none off
```

RT-2 (OEMV-2 and OEMV-3) and RT-20 (OEMV-1, OEMV-1G, OEMV-2 and OEMV-3), all with AdVance RTK, are real-time kinematic software products developed by NovAtel. Optimal RTK performance is achieved when both the base and rovers are NovAtel products. However, AdVance RTK will operate with equipment from other manufacturers when using RTCM messaging.

RT-2 and RT-20 are supported by GPS-only and GPS+GLONASS OEMV-based models. Also, RT-20 with GPS+GLONASS provides faster convergence.

1. Refer to the GPGST log's usage box in the *OEMV Firmware Reference Manual* for a definition of RMS and other statistics.
2. For more base/rover configurations, search the key words "rover base" on our Knowledge Database at: <http://www.novatel.com/support/knowledgedb.htm>

## EXTERNAL OSCILLATOR

For certain applications requiring greater precision than what is possible using the on-board 20 MHz, voltage-controlled, temperature-compensated crystal oscillator (VCTCXO), you may wish to connect the DL-V3 to an external, high-stability oscillator. The external oscillator can be either 5 MHz or 10 MHz.

To install, connect a cable from the external oscillator to the DL-V3 port labelled *EXT OSC*. The receiver does not have to be powered down during this procedure.

Once the external oscillator has been installed, issue the EXTERNALCLOCK command to define the clock model (for

example, cesium, rubidium or ovenized crystal). If the input clock rate is 5 MHz, you must issue the EXTERNALCLOCK command to change the 10 MHz default rate.

## POST PROCESSING

Post-mission data processing refers to when the GNSS data collected by the receiver is processed after the entire data-collection session is complete.

OEMV-based output is compatible with post-processing software from the Waypoint Products Group, NovAtel Inc. For details, visit our website at:

[http://www.novatel.com/products/waypoint\\_pps.htm](http://www.novatel.com/products/waypoint_pps.htm)

## MOUNTING BRACKET

A mounting kit is provided with the DL-V3 enclosure enabling you to mount the receiver to a surface. The mounting kit is not designed for use in high-dynamics/vibration environments. Refer also to its accompanying instruction sheet.

## QUESTIONS OR COMMENTS

If you have any questions or comments regarding your DL-V3, please contact NovAtel using one of these methods:

Email: [support@novatel.com](mailto:support@novatel.com)

Web: [www.novatel.com](http://www.novatel.com)

Phone: 1-800-NOVATEL (U.S. & Canada)  
+1-403-295-4900 (International)

Fax: +1-403-295-4901



Quick Start Guide:



DL-V3:



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