

This guide provides the information required to set up and begin using your new SMART-MR15, a combined L1+L2 GNSS receiver and antenna with an integrated cellular modem with NTRIP correction support. The SMART-MR15 also provides *Bluetooth*® 2.0 wireless connectivity and Emulated Radar (ER) output.



For more detailed information about the installation and operation of your receiver, refer to the SMART-MR15 and OEMV® user manuals, which can be found on the NovAtel Web site at:

www.novatel.com/support/firmware-software-and-manuals/

SMART-MR15 BOX CONTENTS

In addition to this quick start guide, the following are provided with your SMART-MR15:

- 1 - SMART-MR15 cellular activation guide
- 1 - CD containing:
 - An installation program for the NovAtel PC Utilities
 - Product documentation
- 1 - User Manual postcard for requesting printed manuals

AVAILABLE ACCESSORIES

The following SMART-MR15 interface cables can be ordered as accessories:

- Evaluation cable (NovAtel part number 01018515) with a 23-pin connector on one end and three DB-9 connectors and exposed tinned wires for power, ER, ground, MKI, MODE, PPS and CAN, on the other. This cable is designed to allow the rapid deployment and evaluation of a SMART-MR15 on a construction or agricultural vehicle. All signals are wired out in this cable. The Evaluation cable is not intended for permanent installations.
- Streamlined cable (NovAtel part number 01018526) with two DB-9 connectors, and exposed tinned wires for power, ground and ER. This cable provides connection for power, two serial ports, and emulated radar. It has been designed for permanent installation. The cable material is capable of withstanding a wide temperature range and is not damaged by exposure to chemicals.

Four mounting kits are available for the SMART-MR15:

- Mounting Kit, Quick Release Plate (01018625)
- Mounting Kit, Quick Release Assembly (01018578)
- Mounting Kit, AG GPS 262 (01018623)
- Mounting Kit, 5/8 Inch Adapter (01018624)

In addition to the above cable and mounting accessories, the following accessories are available for the SMART-MR15:

- CDMA Antenna, 2.2 / 4 dBi, 824-896 MHz / 1850-1990 MHz, NMO [NovAtel part number 12023296] (USE with 12023301 mount only)
- CDMA Antenna Base, NMO Magnetic Mount, 30 cm cable [NovAtel part number 12023301] (USE with 12023296 CDMA Antenna. DO NOT USE with 12023303 GSM/GPRS/HSDPA Antenna)

- GSM/GPRS/HSDPA Antenna, 3 / 4 dBi, 806-960 MHz / 1710-2500 MHz, NMO [NovAtel part number 12023303]. (USE with the 12023300 GSM/GPRS/HSDPA mount only. DO NOT USE with 12023301 CDMA Base).
- GSM/GPRS/HSDPA Antenna Base, NMO Magnetic Mount, 3.65 m cable [NovAtel part number 12023300] (USE with 12023303 GSM/GPRS/HSDPA Antenna only)
- Antenna Ground Plane Kit, for use on non-metallic mounting surfaces [NovAtel part number 01018684]

ADDITIONAL EQUIPMENT REQUIRED

The following additional equipment is required for basic setup:

- A Windows®-based computer with an RS-232 DB-9 port.
- A battery connection (+9 to +36 V DC)

INSTALLING THE PC UTILITIES

Before setting up your SMART-MR15, install NovAtel's *PC Utilities* on the Windows-based computer that you will use to communicate with it. This computer must have an RS-232 DB-9 port.

1. Start up the computer.
2. Insert the accompanying CD into the CD-ROM drive of the computer.



To access and download the most current version of our OEMV PC Utilities, go to the *Support* page of the NovAtel web site at www.novatel.com.

3. Select *Install the OEMV 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 GPS PC Utilities* setup program.

SETTING UP YOUR SMART-MR15

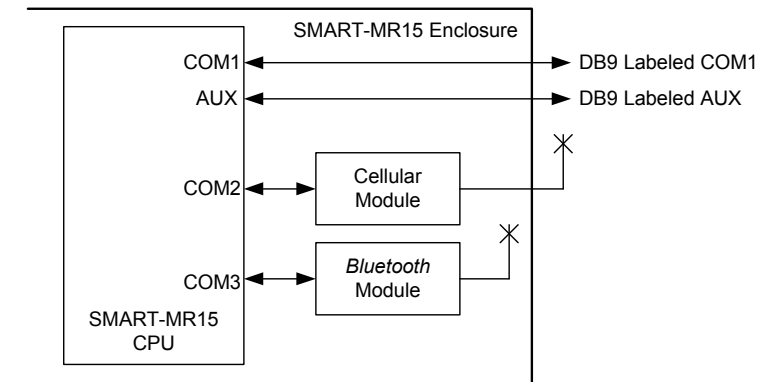


Figure 1: SMART-MR15 System Diagram

The SMART-MR15 system architecture is shown in *Figure 1*. For the basic setup, you need a Windows-based computer with an RS-232 DB-9 port and NovAtel PC Utilities installed on it, and a battery connection (+9 to +36 V DC). Complete the following steps to connect and power your receiver.

1. Mount the SMART-MR15 on a secure, stable structure with an unobstructed view of the sky. Mount the cellular antenna at least 30 cm from the SMART-MR15.
2. Connect the interface cable to the SMART-MR15.

3. Connect the SMART-MR15 to a DB-9 serial port on the computer.

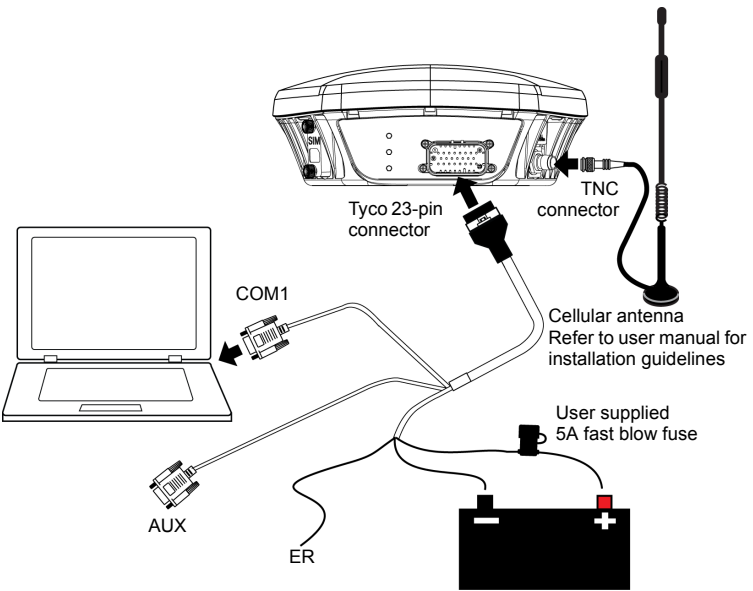


Figure 2: SMART-MR15 Cabling

4. Provide power to the SMART-MR15, as follows:
 Connect the red wire of the cable (PWR+, connector pin 1) to the positive side of a 12 or 24 V vehicular power circuit (or equivalent) that is protected by a 5 A fuse. NovAtel recommends an automotive blade-type fuse, rated for 5 A and with an operating voltage of more than 36 V (recommended fuse part numbers are in the SMART-MR10/15 User Manual).
 Connect the black wire of the cable (PWR-, connector pin 9) to the negative side of the power circuit.
 If a NovAtel-supplied SMART-MR15 cable is not used, a minimum wire size of 0.5 mm/ 20 AWG is required.

5. Connect the cellular antenna to the SMART-MR15.

6. Obtain a valid data SIM and insert into the unit (GSM/GPRS/HSDPA model only) or activate the product with Verizon (CDMA model only). Refer to the cellular activation guide for details.

SMART-MR15 LEDS

LEDs on the front of the SMART-MR15 provide basic receiver status information. The operation of the LEDs on the SMART-MR15 is summarized in the following table:

Table 1: SMART-MR15 LED Behavior

Red	Yellow	Green	Condition
Off	Off	Off	Power is not available (Red indicator may also not be lit if a boot failure has occurred).
Flashing ^a	Any	Off	A SIM card error is present or the SIM may not be installed. Applies only to GSM/GPRS/HSDPA version of SMART-MR15.
On	Off	Off	Power available, but no satellites are being tracked. No cellular network connection.
On	Flashing	Off	Tracking at least one satellite, but not a valid position. No cellular network connection.
On	On	Off	Position valid in basic autonomous mode. No cellular network connection.
On	On	Flashing	Connected to cellular network, but not receiving RTK corrections over NTRIP.
On	Flashing	Flashing	Tracking at least one satellite, but not a valid position. Connected to cellular network, but not receiving RTK corrections over NTRIP.
On	On	On	The following conditions are true: <ul style="list-style-type: none"> • A valid position is available. • The NTRIP client is in a STREAMING state. • An RTK solution is available over NTRIP.

a. Flashing means that the LED is turning on and off at a 1 Hz rate - 0.5 seconds on and 0.5 seconds off.

SMART-MR15 CABLES

Cable connectors are illustrated in Figure 3. One DB-9 connector can be used to connect to a computer serial (RS-232) communication port. The others can be connected to a modem or radio transmitter to receive differential corrections (refer to your user-supplied modem or radio transmitter information for its connectors). In addition, there are a number of bare wires where the outer insulation is cut away at the ends to expose tinned wires. Refer to the SMART-MR10/15 User Manual for cable pinouts. Cables are RoHS compliant.

The SMART-MR15 cable provides a means of receiving power from a battery. The bare power wires (red for positive and black for negative) are connected to a battery capable of supplying at least 5 W. A 5 A fuse must be installed between the positive terminal of the battery (or power distribution point) and the positive supply lead of the cable to protect the wiring from short circuit damage.

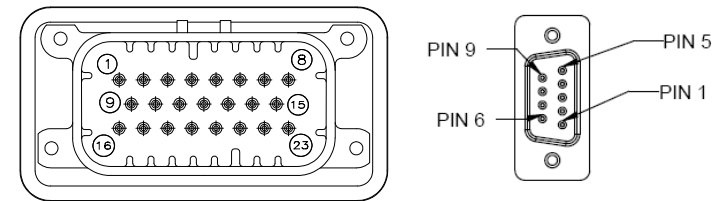


Figure 3: 23-pin and DB-9 Connectors

Table 2: SMART-MR15 Evaluation Cable

TYCO 23-pin	COM1	COM2	AUX	TINNED LEAD	SIGNAL NAME
1				PWR+ (red)	PWR+
2				PWR- (black)	PWR-
3				CAN- (green)	CAN-
4				CAN+ (yellow)	CAN+
5		2			AUXTX
6		3			AUXRX
7	2				TXD1
8			2		RTS1
9				SIGGND2 (white/black)	SIGGND2
10	RESERVED				
11	RESERVED				
12	RESERVED				
13	RESERVED				
14	CHASSIS GROUND ^a				
15	5	5	5	SIGGND1 (white/ black)	SIGGND1
16				MKI (white)	MKI
17				PPS (orange)	PPS
18				ER (blue)	ER
19				MODE (violet)	MODE
20	RESERVED				
21	RESERVED				
22			3		CTS1
23	3				RXD1

a. Pin 14 of the TYCO 23-pin connector is connected to cable shields.

Table 3: SMART-MR15 Streamlined Cable

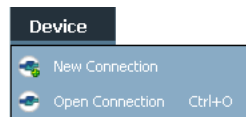
TYCO 23-pin	COM1	COM2	TINNED LEAD	SIGNAL NAME
1			PWR+ (red)	PWR+
2			PWR- (black)	PWR-
3			RESERVED	
4			RESERVED	
5		2		AUXTX
6		3		AUXRX
7	2			TXD1
8			RESERVED	
9			SIGGND2 (white/black)	SIGGND2
10			RESERVED	
11			RESERVED	
12			RESERVED	
13			RESERVED	
14			CHASSIS GROUND ^a	
15	5	5	SIGGND1 (white/black)	SIGGND1
16			RESERVED	
17			RESERVED	
18			ER (blue)	ER
19			RESERVED	
20			RESERVED	
21			RESERVED	
22			RESERVED	
23	3			RXD1

a. Pin 14 of the TYCO 23-pin connector is connected to cable shields.

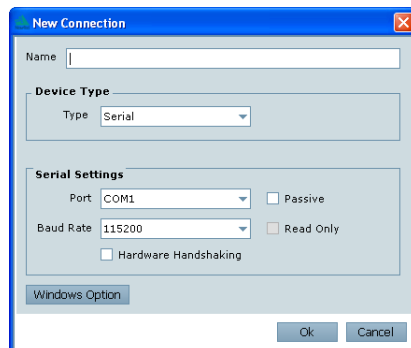
COMMUNICATING WITH THE SMART-MR15

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

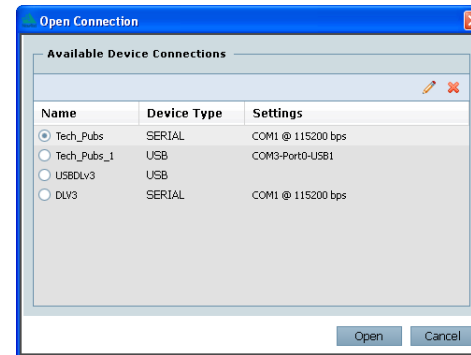
1. Launch **Connect** from the *Start* menu folder specified during the installation process. The default location is *Start | All Programs | NovAtel PC Software | NovAtel Connect*.
2. Select New from the Device Menu.



3. Enter a name for the Connection setup.



4. Select *Serial* from the *Type* list.
5. Select the computer port to which the SMART-MR15 is connected, from the *Port* list.
6. Set the COM port for the receiver to communicate through.
7. Select *115200* from the *Baud Rate* list.
8. Ensure the *Hardware Handshaking* box is not checked and press **OK**.
9. From the *Device* menu select **Open Connection**.

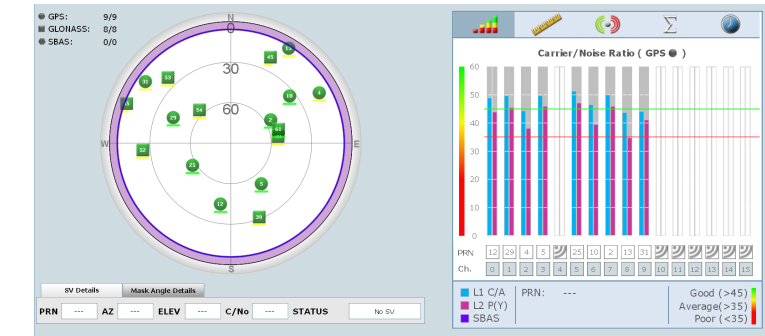


10. Select the *Open* button to open SMART-MR15 communications.

Connect establishes the communication session with the receiver and displays the progress. Once connected, the progress box disappears and several windows open, including the *Console* window. Connect is now ready for use to view status information, enter commands or log data.

USING NOVATEL CONNECT

Connect 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 the *Tracking Status Window* from the *View* menu. Select *Help* from the main menu for more details on Connect, its windows and features.



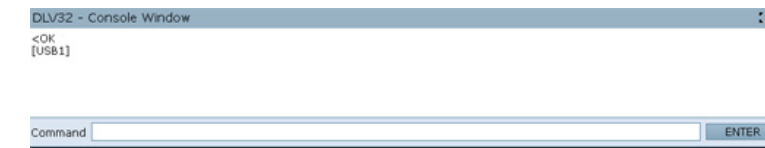
DETERMINING WHEN THE POSITION IS VALID

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



ENTERING COMMANDS

The SMART-MR15 uses a comprehensive command interface. Commands can be sent to the receiver using the *Console* window in Connect, which is opened from the *View* menu. Enter commands in the text box at the bottom of the *Console* window.



The *OEMV Family Quick Reference Guide*, available on the CD or on our Web site, provides comprehensive information about available commands. The *SMART-MR10/15 User Manual* provides information on a subset of these commands; in particular, the ones commonly used by the SMART-MR15.

SAVECONFIG COMMAND

If you change the configuration of a function and want to save the new settings for your next session, use the SAVECONFIG command.



When using NovAtel Connect to configure your receiver, ensure all of the graphical windows are closed before you issue the SAVECONFIG command.

CELLULAR ACTIVATION

Follow the procedure outlined in the cellular activation guide included with your SMART-MR15. To check cellular modem status information, enter `log cellstatus`.

CONFIGURING NTRIP

Obtain the following information from your NTRIP caster:

- IP address or domain name of caster (`www.igs-ip.net` in the following example)
- IP port (80 in the following example)
- Mount point (`mountpoint` in the following example)
- User ID and password (`user_id` and `password` in the following example)
- Type of corrections expected from the caster (`rtcmv3` in the following example)
- Data rate for transmitting NMEA position logs (GPGLG) to caster (10 in the following example) (optional, see below)

Connect to the caster as shown in the following example:

```
ntripcaster www.igs-ip.net 80
ntripclient mount mountpoint user_id
password rtcmv3 10
```



If connecting to an RTK caster that employs VRS technology, the data rate for transmitting NMEA positions to the caster must also be specified. For example, to transmit position messages to a network RTK caster every 10 seconds, the following commands should be used:

```
ntripcaster www.igs-ip.net 80
ntripclient mount mountpoint user_id password rtcmv3 10
```



NTRIP commands are save-configurable. After you save the settings, the SMART-MR15 automatically connects to the NTRIP caster after a power cycle. For more information about configuring NTRIP, refer to application note APN-057 found on our Web site at <http://www.novatel.com/support/knowledge-and-learning/>.

To view NTRIP status and configuration, enter:

```
log ntripstatus
```

NMEA LOGS

To configure the receiver output through the command line:

1. Configure the communication port using the COM command. For example, to set COM port 1 to 9600 bps, no parity, 8 data bits, 1 stop bit, no handshaking, echo off, and break detection on, enter the following:

```
com com1 9600 n 8 1 n off on
```

2. Select and configure the NMEA string that you want to output through COM port 1. For example, to log gpgga (position system fix data and undulation) at 2 Hz, enter the following:

```
log com1 gpgga ontime 0.5
```

ENABLING SBAS POSITIONING

This positioning mode is enabled using the SBASCONTROL command, as follows:

```
sbascontrol enable auto
```

Once enabled, the *Solution type* field shown in Connect's *Position* window changes from *Single* to *SBAS*, and you may see SBAS satellites in the *Constellation window*. SMART-MR15 will track available SBAS satellites, including WAAS, EGNOS and other SBAS systems.

Latitude	51.116695592° ±	0.82m
Longitude	-114.038813659° ±	0.69m
Hgt. (MSL)	1062.639m ±	1.95m
Solution type	SBAS	

ENABLING GL1DE®

To enable GL1DE, enter the following commands:

```
pdpfilter enable
pdpmode relative auto
```

ENABLING Bluetooth WIRELESS TECHNOLOGY

Bluetooth wireless technology is configured on the SMART-MR15 COM3 internal port and is enabled by default.

To disable Bluetooth wireless technology:

```
btcontrol disable
```

To enable Bluetooth wireless technology:

```
btcontrol enable
```

For detailed information about the configuration and enabling of Bluetooth wireless technology on the SMART-MR15, refer to *Chapter 5 Bluetooth Configuration* in the *SMART-MR10/15 User Manual*.

USING THE CAN BUS

The CAN Bus is a serial bus that provides services for processes, data and network management. CAN Bus capability is available through the SMART-MR15 evaluation cable.

The CAN module is activated by entering the command `SETCANNAME 305`. If this is followed by entering the `SAVECONFIG` command, the CAN module is activated immediately on all subsequent start-ups. The module supports NMEA 2000 Parameter Group Message (PGN): PGN 129029 GNSSPositionData, PGN 129025 GNSSPositionRapidUpdate, and PGN 129026 COGandSOGRapidUpdate.

EMULATED RADAR (ER)

The SMART-MR15 provides an emulated ground speed RADAR pulse output. The enclosure outputs ER via the bare wire labeled ER on both the SMART-MR15 evaluation and streamlined cables. Refer to *Appendix B.5 RADARCFG* of the *SMART-MR10/15 User Manual*.

ER is enabled by default. To disable ER, use the RADARCFG command as follows:

```
radarcfg disable
```

The following command enables ER, sets frequency step to 36.11 Hz/kph, update rate to 1 Hz and no smoothing:

```
radarcfg enable 36.11 1 1 2
```

To enable ER, for example, enter the following command:

```
radarcfg enable
```

The ER low and high pulse levels are within 0.5V of the ground and battery, respectively. Note this is not a logic level output. The rise and fall time is less than 1 ms. The ER outputs reference battery GND when the output is logic low. It outputs logic low until the vehicle speed is greater than 1 km/hr. It provides an output frequency that represents 36.11 Hz/km/hr (default value) with an effective range from 1 km/hr to 55 km/hr, and uses 2D velocity for near-horizontal applications. The default value can be changed to 26.11 or 28.12 Hz/km/hr using the RADARCFG command.

LOGGING DATA

An extensive set of logs has been created to capture the data your SMART-MR15 receives and processes. These logs can be directed to a SMART-MR15 port (COM1 or AUX) and can be automatically generated when new or changed data becomes available, or at regular intervals. Available logs are listed in the *OEMV Family Quick Reference Guide*, found on our Web site at www.novatel.com through *Support | Firmware/Software and Manuals*.

To log data, use the LOG command. For example, to log the pseudorange position to COM 1 every 30 seconds, enter the following:

```
log com1 psrposb ontime 30
```

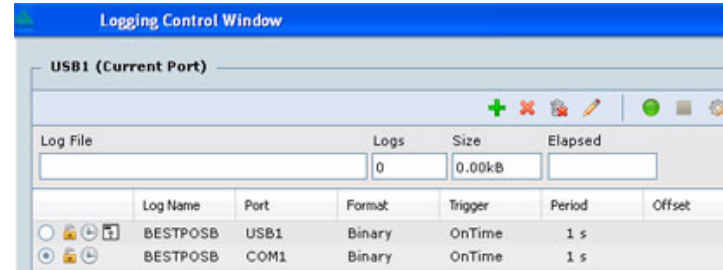
When requesting logs, you can request the output data in three formats:

- ASCII
- Abbreviated ASCII
- Binary

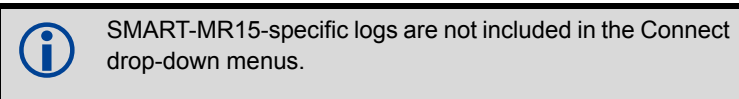
Abbreviated ASCII is the best format to use when you want to work with the receiver directly and review individual log contents visually.

Refer to the *SMART-MR10/15 User Manual (OM-20000130)* or the *OEMV Family Firmware Reference Manual (OM-20000094)* for information about the LOG command.

If you prefer, **Connect** provides a graphical interface for configuring data logging. Select *Logging Control Window* from the *Tools* menu. In the *Logging Control Window*, you can select which logs to capture and choose the ports to which you want the data sent. You can also specify a file in which to save the data.



When logging data through Connect, close all unused windows to maximize COM port throughput and receiver CPU performance.



QUESTIONS OR COMMENTS

If you have any questions or comments regarding your SMART-MR15 please contact NovAtel using one of these methods:

Email: support@novatel.com

Web: www.novatel.com

Phone: 1-800-NOVATEL (U.S. & Canada)
1-800-668-2835

1-403-295-4900 (International)

Fax: 1-403-295-4901



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