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 / 1710-1785 MHz, NMO [NovAtel part number 01233001] (USE with 12023301 mount only)
- CDMA Antenna Base, NMO Magnetic Mount, 30 cm cable [NovAtel part number 01233296] (USE with 12023301 mount only)
- GSM/GPRS/HSDDPA Antenna, 3 / 4 dBi, 806-960 MHz / 1710-2500 MHz, NMO [NovAtel part number 12023303] (USE with the 12023300 GSM/GPRS/HSDDPA mount only; DO NOT USE with 12023301 CDMA Base)
- GSM/GPRS/HSDDPA Antenna Base, NMO Magnetic Mount, 3.65 m cable [NovAtel part number 12023300] (USE with 12023300 GSM/GPRS/HSDDPA 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 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.
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

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. 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.
4. 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.
5. Install the PC Utilities by advancing through the steps provided in the NovAtel GPS PC Utilities setup program.
3. Connect the SMART-MR15 to a DB-9 serial port on the computer.

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 cellular service.

SMART-MR15 CABLES

d. Power cables can be used to connect to a computer serial (RS-232) communication port. The cables 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-MR15/15 User Manual for cable pinouts. Cables are RoHS compliant.

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

<table>
<thead>
<tr>
<th>Red</th>
<th>Yellow</th>
<th>Green</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Power is not available (Red indicator may also not be lit if a boot failure has occurred).</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Off</td>
<td>Power available, but no satellites are being tracked. No cellular network connection.</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>On</td>
<td>Position valid in basic autonomous mode. No cellular network connection.</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>Flashing</td>
<td>Tracking at least one satellite, but not a valid position. No cellular network connection.</td>
</tr>
<tr>
<td>On</td>
<td>Flashing</td>
<td>Flashing</td>
<td>Tracking at least one satellite, but not a valid position. Connected to cellular network, but not receiving RTK corrections over NTRIP.</td>
</tr>
<tr>
<td>On</td>
<td>Flashing</td>
<td>On</td>
<td>Position valid in basic autonomous mode. Connected to cellular network, but not receiving RTK corrections over NTRIP.</td>
</tr>
</tbody>
</table>
| On  | On     | On    | The following conditions are true:
   - A valid position is available.
   - The NTRIP client is in a STREAMING state.
   - An RTK solution is available over NTRIP. |

SMART-MR15 CABLES

d. Power cables can be used to connect to a computer serial (RS-232) communication port. The cables 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-MR15/15 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.
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.

Table 3: SMART-MR15 Streamlined Cable

<table>
<thead>
<tr>
<th>TYCO 23-pin</th>
<th>COM1</th>
<th>COM2</th>
<th>TINNED LEAD</th>
<th>SIGNAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PWR+ (red)</td>
<td>PWR+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PWR- (black)</td>
<td>PWR-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>AUXTX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>AUXRX</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>TXD1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>SGNND2 (white/black)</td>
<td>SGNND2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CHASSIS GROUND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>SGNND1 (white/black)</td>
<td>SGNND1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>ER (blue)</td>
<td>ER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>RESERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>3</td>
<td>RXD1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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.
Obtain the following information from your NTRIP caster:

**CONFIGURING NTRIP**

status information, enter the NTRIP client mount point command. 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`.

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.

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 every 10 seconds, the following commands should be used: `ntripcaster www.igs-ip.net 80 ntripclient mount mountpoint user_id password rtcmv3 10`.

To view NTRIP status and configuration, enter: `log ntripstatus`. To configure the receiver output through the command line:

**NEAM 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 detect off, enter the following: `com com1 9600 n 8 1 n off on`

2. To 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`

**ENABLED SBAS POSITIONING**

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

To enable GL1DE, enter the following commands:

- `pdccfilter enable`
- `pdmode relative auto`

**ENABLED GL1DE**

To enable GL1DE, enter the following commands:

- `pdccfilter enable`
- `pdmode relative auto`

**ENABLED 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`

**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.

**CONFIGURING NTRIP**

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 (PNG): PGN 129025 GNSSPositionData, PGN 129025 GNSSPositionRapidUpdate, and PGN 129025 GNSSPositionRapidUpdate.

**EMULATED RADIUS (ER)**

The SMART-MR15 provides an emulated ground speed RADIUS pulse output. The enclosure outputs ER via the bare wire labeled ER on both the SMART-MR15 evaluation and streamed lines. Refer to Appendix B.5 RADIUSCFG of the SMART-MR15 User Manual. ER is enabled by default. To disable ER, use the **RADIUSCFG** command as follows:

```
radiuscfg disable
```

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

```
radiuscfg enable 36.11 1 1 2
```

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

```
radiuscfg enable
```

**CONFIGURING NTRIP**

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 ER high when the output is logic high. ER 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 28.11 or 28.12 Hz/km/hr using the **RADCPRG** 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

SMART-MR15-specific logs are not included in the Connect drop-down menus.