SMART-MR10

QUICK START GUIDE

This guide provides the information you need to set up and begin using your new SMART-MR10, a combined L1+L2 GNSS receiver and antenna, with L-band support and Emulated Radar (ER) output.

For more detailed information on the installation and operation of your receiver, refer to the SMART-MR10 and OEMV® user manuals, which can be found on the NovAtel Web site at:

http://www.novatel.com/support/docupdates.htm

To order a printed copy of the manuals, free of charge, follow the instructions on the enclosed *User Manuals* postcard.

The SMART-MR10 supports Emulated Radar (ER) and *Bluetooth®* functionality. Drivers and installation instructions, where required, are available in the associated drivers directory of the CD provided with the SMART-MR10. 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 included on the CD.

SMART-MR10 CONTENTS

In addition to this quick start guide, the following are provided with your SMART-MR10:

- 1 - CD containing:
  - An installation program for NovAtel's Control and Display Unit (**CDU**) graphical user interface software
  - Product documentation
- 1 - User Manual postcard for requesting printed manuals

The following SMART-MR10 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-MR10 on a construction or agricultural vehicle. All signals are wired out in this cable. The evaluation cable is not intended for permanent installation.

- 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 will not be damaged by exposure to chemicals.

Four mounting plates are available for the SMART-MR10:

- Universal mounting plate (70023085)
- AG GPS 262 layout mounting plate (70023086)
- Pole-mount (70023087)
- Quick-release kit (01018578)

INSTALLING THE PC UTILITIES

Before setting up your SMART-MR10, install NovAtel's *PC Utilities* on the Windows-based PC that you will use to communicate with it. This PC must have an RS-232 DB-9 port.

1. Start up the PC.
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-MR10

For the basic setup, you will require a Windows-based PC with an RS-232 DB-9 port and NovAtel utilities installed on it, and a battery connection (+8 to +36 V DC). Complete the following steps to connect and power your receiver.

1. Mount the SMART-MR10 on a secure, stable structure with an unobstructed view of the sky.
2. Connect the SMART-MR10 to a DB-9 serial port on the PC.
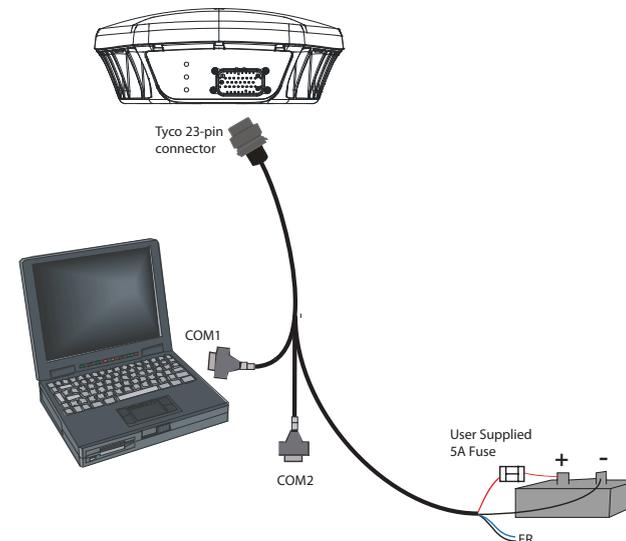
3. Provide power to the SMART-MR10, as follows. Connect the cable's red wire (PWR+, connector pin 1) to the positive side of a 12 or 24V vehicular power circuit (or equivalent) that is protected by a 5A fuse. NovAtel recommends an automotive blade-type fuse, rated for 5A and with an operating voltage of more than 36V (recommended fuse part numbers can be found in the SMART-MR10 user manual). Connect the cable's black wire (PWR-, connector pin 9) to the negative side of the power circuit. If a NovAtel-supplied SMART-MR10 cable is not used, a minimum wire size of 0.5 mm/ 20AWG is required.

SMART-MR10 LEDS

LEDs on the front of the SMART-MR10 provide basic receiver status information. The operation of the LEDs on the SMART-MR10 is summarized in the following table:

Red	Yellow	Green	Condition
Off	Off	Off	Power is not available. (Red indicator may also not be lit if a boot failure has occurred.)
On	Off	Off	Power available but no satellites are being tracked
On	Flashing	Off	Tracking at least one satellite but not a valid position
On	On	Off	Position valid in basic autonomous mode
On	On	Flashing	SBAS tracking, but not enough data for enhanced solution.
On	On	On	Position valid in an enhanced accuracy mode[a] (WAAS/EGNOS/MSAS/DGPS, OmniSTAR VBS/XP/HP, or RTK)
On	Flashing	Flashing	Fixed position with bad integrity

a. When acting as a reference receiver, all lights on solid indicates a good fixed position.

CONNECTING TO THE SMART-MR10

Cable connectors are illustrated in *Figure 1*. One DB-9 connector can be used to connect to a PC/laptop 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. See *Table 1* and *Table 2* for their pinouts. Cables are RoHS compliant.

The SMART-MR10 cable provides a means of supplying 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 AMP 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.
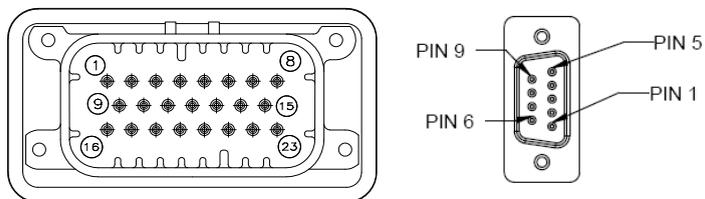
Figure 1: 23-pin and DB-9 Connectors

Table 1: SMART-MR10 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			TXD2
6		3			RXD2
7	2				TXD1
8			2		RTS1/AUXTX
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[b]
20	RESERVED				
21	RESERVED				
22			3		CTS1/AUXRX
23	3				RXD1

a. Pin 14 of the TYCO 23-pin connector is connected to cable shields.
b. If the MODE pin is not connected, pins 8 and 22 provide RS-232 access to the AUX port and COM1 has no flow control. If the MODE pin is tied LOW, pins 8 and 22 provide TXD1- and RXD1- for COM1 RS-422, and the AUX port (RXD3, TXD3) is not available. If the MODE pin is tied HIGH, pins 8 and 22 provide RTS1 and CTS1 for COM1 flow control, and the AUX port (RXD3, TXD3) is not available.

Table 2: SMART-MR10 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		TXD2
6		3		RXD2
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
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-MR10

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

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

2. Select *Open....* from the *Device* menu.
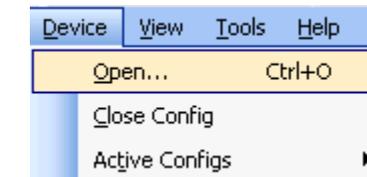
3. Select the *New...* in the *Open* dialog box. The *Options | Configuration* dialog opens.
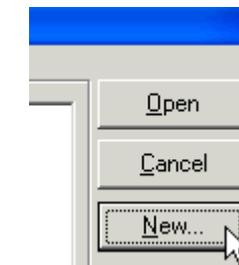
4. Click ✚ at the top of the configurations selection box to add a new configuration. To delete a configuration, select it from the list and click ➖. To duplicate an existing configuration, click 🗐 . You can select any name in the list and edit it.
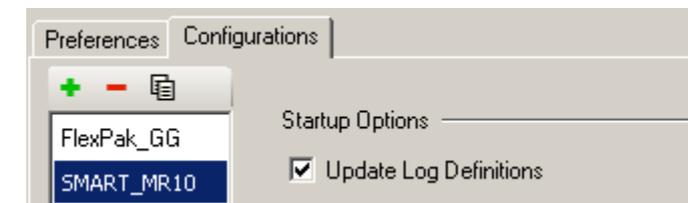
5. Select *Serial* from the *Type* list and select the PC/laptop port to which the SMART-MR10 is connected, from the *Port* list.

6. Select *115200* from the *Baud Rate* list.
7. Cancel *Hardware Handshaking*.
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 SMART-MR10 communications.
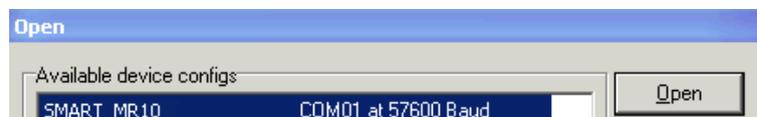
As **CDU** establishes the communication session with the receiver, it displays a progress box. Once **CDU** is connected, the progress box disappears and several windows open, including the *Console* window. **CDU** is now ready for use to view status information, enter commands, or log data.

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

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 SMART-MR10 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 (for example, `log bestposa`)
  - Abbreviated ASCII (for example, `log best-pos`)
  - Binary (for example, `log bestposb`).

  Abbreviated ASCII is the best format to use when you want to work with the receiver directly. For data collection, use ASCII or Binary.
- Click *Enter* to send the command string to the receiver.
- Commands are not case sensitive.

The *OEMV Family Quick Reference Guide,* provided on the CD, provides comprehensive information about available commands. The *SMART-MR10 User Manual* provides information on a subset of these commands; in particular, the ones commonly used on the SMART-MR10.

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. This applies to most configuration changes, *Bluetooth* and ER enable and disable, for example.

LOGGING DATA

An extensive set of logs has been created to capture the data your SMART-MR10 receives and processes. These logs can be directed to a SMART-MR10 port (COM1, COM2 or AUX) and can be automatically generated when new or changed data becomes available, or at regular intervals. The available logs are listed in the *OEMV Family Quick Reference Guide*.

To log data, use the LOG command. For example, to log the pseudorange position to COM 2 every 30 seconds, enter the following:

```
log com2 psrposb ontime 30
```

Logs can be generated in one of three formats: ASCII, Abbreviated ASCII, or Binary. Refer to the *SMART-MR10 User Manual (OM-20000130)* or the *OEMV Family Firmware Reference Manual (OM-20000094)* for information on the LOG command, specifying the output format, and the detailed contents of each log.

If you prefer, **CDU** 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 CDU, close all unused windows to maximize COM port throughput and receiver CPU performance.

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 2 to 9600 bps, no parity, 8 data bits, 1 stop bit, no handshaking, echo off, and break on, enter the following:

```
com com2 9600 n 8 1 n off on
```

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

```
log 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 **CDU**'s *Position* window changes from *Single* to *SBAS,* and you may see SBAS satellites in the *Constellation window*. SMART-MR10 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*

Bluetooth is configured on the SMART-MR10 COM3 internal port and is enabled by default.

To disable *Bluetooth*:

```
btcontrol disable
```

To enable *Bluetooth*, enter the following commands:

```
btcontrol enable
```

For detailed information about the configuration and enabling of *Bluetooth* on the SMART-MR10, refer to *Chapter 5 Bluetooth Configuration* in *SMART-MR10 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-MR10 evaluation cable, as shown in *Table 1.* CAN Bus functionality is controlled through NovAtel's optional API software available through Customer Service. The API header file (*.h) in the API folder provides documentation about the use of the CAN Bus.

The CAN module is activated when a SETCANNAME command is entered then after a SAVECONFIG, 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-MR10 outputs an emulated RADAR signal. The enclosure outputs ER via the bare wire labeled ER on the SMART-MR10 cable. See *Table 1* and *Table 2* for the pin-out details of this cable. Also see *Appendix B.5 RADARCFG* of the *SMART-MR10 User Manual.*

ER is enabled by default. Use the RADARCFG command to disable ER, then RADARCFG to enable it, as necessary.

The ER output pulse high level is equal to the vehicle's supply voltage minus 0.5V minimum and the low level is 0.5V maximum. 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.

QUESTIONS OR COMMENTS

If you have any questions or comments regarding your SMART-MR10 please contact NovAtel using one of these methods:

Email: support@novatel.com

Web: www.novatel.com

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

Fax: +1-403-295-4901