TOPCON

GR-3

Operator's Manual

Satel UHF Radio Addendum

TOPCON
POSITIONING SYSTEMS

GR-3 Operator's Manual

Satel UHF Radio Addendum

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Rev. A

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GR-3 Satel UHF Radio Configuration

The GR-3 receiver is a multi-frequency, GPS+ receiver built to be the most advanced and compact receiver for the surveying market. The following is an addendum to the GR-3 Operator's Manual on configuring the Satel UHF Radio Modem for the base and rover operation in UHF mode as well as configuration of the GSM radio modem.

Getting Started

Modem-TPS is Topcon's radio modem configuration utility for modems embedded in Topcon receivers. Modem-TPS (version 2.4 or newer) provides the following functions:

- Connecting a computer to an integrated radio modem via serial port or Bluetooth wireless adaptor.
- Displaying information about a radio modem installed in the receiver.
- Programming radio modem's settings.

Topcon's configuration and surveying software, PC-CDU, TopSURV, or Pocket-3D, can also configure Topcon receivers. Refer to the corresponding manuals for more details.

If the receiver is in GSM mode and you open the Modem-TPS program, then the modem automatically switches to UHF mode. To return to GSM mode, use a Topcon configuration utility like TopSURV.

Configuring the Base and Rover Modem

To comply with RF exposure requirements, maintain at least 25cm between the user and the radio modem.

The Satel UHF radio modem provides TX/RX UHF communications between a base station and a rover. To configure a Satel UHF radio modem, have the following ready:

- Computer running Windows® 98 or newer
- Modem-TPS ver. 2.4p0 or newer installed on the computer
- PC-CDU 2.1.28.05 or newer
- A serial cable or Bluetooth wireless technology capabilities
- Valid SIM card installed (if GSM mode is supposed to be used)

Your GR-3 receiver with Satel UHF radio modem may be configured as a base or rover device, depending on your application. In the base mode, the radio modem operates as a transmitter (TX Master), providing differential corrections to a number of rovers. The TX Master can operate in normal mode when the operating frequency is set during configuration or in Free Channel Scan (FCS) mode when operating frequency is assigned automatically by some criterion from a number of authorized frequencies.

In rover mode, the radio modem works as a receiver (RX Slave) of data, and its configuration should fully correspond to the base settings. For more details, refer to the *GR-3 Operator's Manual* using the PC-CDU utility for the receiver's configuration.

Perform the following to configure a Satel UHF radio modem:

1. Connect the computer and receiver using a RS-232 cable or Bluetooth wireless adaptor. Turn on the receiver.
2. Open Modem-TPS.
   The *Connection* window appears.

3. Select the COM port to which the receiver is connected and do one of the following:
   - If you are opening Modem-TPS for the first time, then click **Cancel**. Continue to step 4 to configure Modem-TPS.
   - If you have already set your modem options, then click **Connect** and skip to step 8.

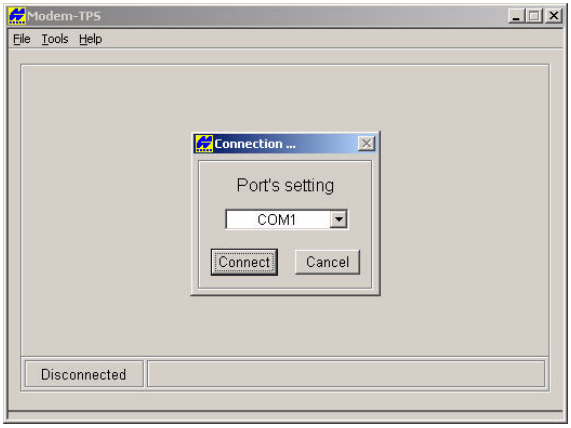

Figure 1-1. Connect to Modem-TPS

4. On the *Modem-TPS* page, click **Tools ▸ Options.** The **Options** window appears.

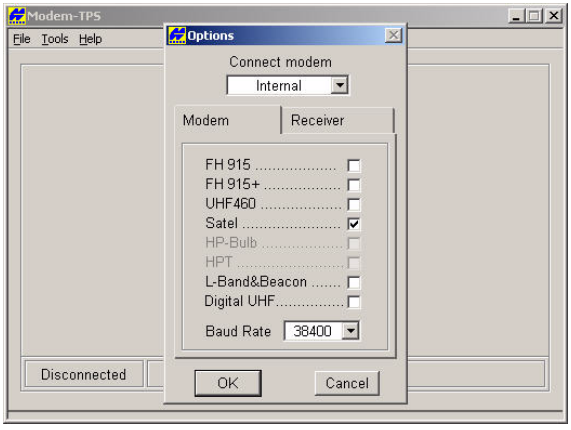

Figure 1-2. Modem-TPS Options for Modem

5. Make sure the **Satel** check box is selected and the appropriate value is set for the **Baud Rate**.
6. Click the **Receiver** tab, and set the **Connect modem** drop-down menu to **Internal**.

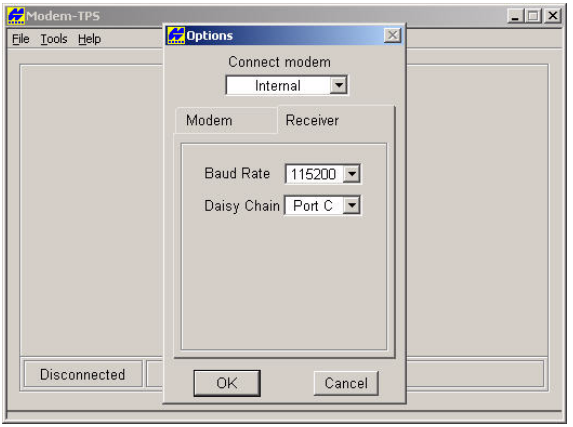

Figure 1-3. Modem-TPS Options for Receiver

7. Set the **Baud Rate** and **Daisy Chain** values if necessary, and then click **OK**. Remember that Port D is always reserved for Bluetooth wireless operation in all GR-3 receivers.
8. Click **File ▸ Connect** to connect to the modem.
   The *Satel Radio Modem* window appears.

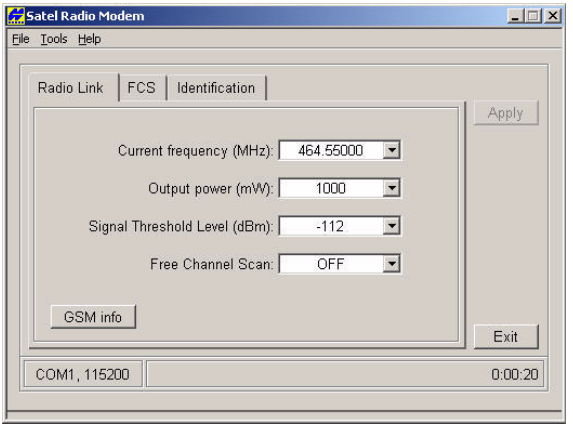

Figure 1-4. Radio Link Parameters Setup

9. To check the modem firmware version, serial or part numbers, or the model type, click the **Identification** tab.
10. On the **Radio Link** tab, set the following parameters, and click **Apply**.
    - *Current frequency* – Operating frequency in transmit/receive mode.
    - *Output power* – Carrier power for base. Selectable from (10mW...1W) range. Follow the recommendations in Table 2-2 on page 2-4 to match your requirements.
    - *Signal Threshold Level* – Strength of signal detected at assumed distance. The less the working distance, the less the absolute value of this parameter. Follow the recommendations in Table 2-2 on page 2-4 to meet your requirements.
    - *Free Channel Scan* – Mode of scanning the allowed frequency channels to establish the most effective link. If you set the FCS to On (otherwise the mode is normal), then you can adjust this mode on the FCS & Channel Map tab.

The FCS mode implements an adaptive algorithm of channel selection, depending on the receiver's sensitivity.

11. Also on the **Radio Link** tab, you can click **GSM info** to view the mobile connection parameters. For more information, see "GSM Modem Information" on page 1-6.
12. On the **FCS & Channel Map** tab, set the following parameters, and click **Apply**.
    - *Type of Modem* – Configure the modem as RX Slave (Rover) or TX Master (Base), depending on the application (not available if FCS is off).
    - *Free Scan net ID* – Identifies the base station.
    - *Frequency List* – Number of frequencies (channels) available for scanning. The check mark indicates the frequency currently in use. It is recommended not to exceed six frequency channels.

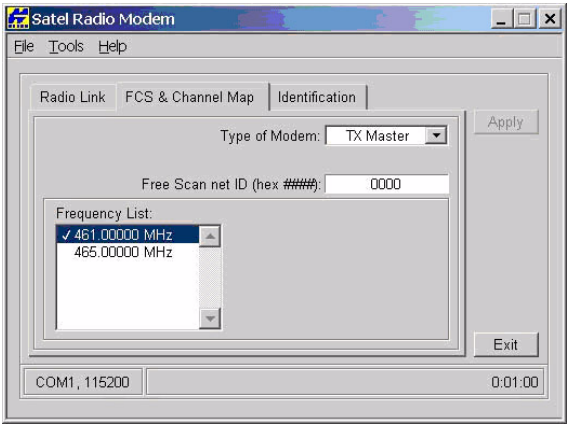

Figure 1-5. FCS Mode Configuration

13. When you finish configuring the modem, click **File ▸ Disconnect**, and then **File ▸ Exit** to close Modem-TPS.

GSM Modem Information

The Satel UHF radio modem is equipped with a Motorola G24 GSM module that provides either TX/RX communication between the base and rover or communication with the GPS network using a TCP/IP connection.

To view mobile connection parameters:

1. Click **File ▸ Connect** to open the *Satel Radio Modem* window.
2. On the **Radio Link** tab, click **GSM info**. (See Figure 1-6 on page 1-7.)

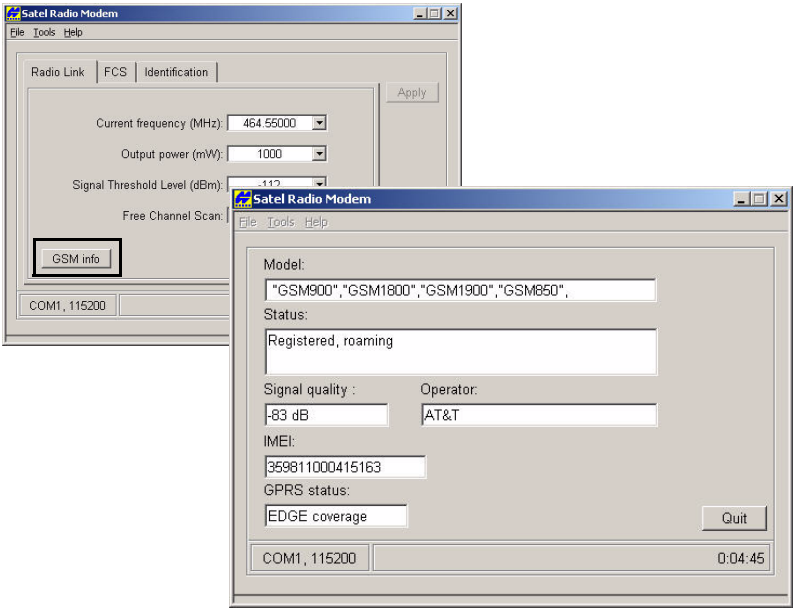

Figure 1-6. GSM Modem Available Parameters

Table 1-1.

Parameter	Description
Model	GSM bands covered by the modem
Status	Current status of the GSM connection
Signal quality	Signal strength value: the less the absolute value of signal quality, the stronger the signal
Operator	Mobile service you currently use
IMEI	International Mobile Equipment Identity: 15-digit number unique for each GSM modem.
GPRS Status	Current status of GPRS service.

Sometimes when the communication signal is weak, the GSM modem fails to establish a reliable connection and the GSM parameters window looks like the one in Figure 1-7 on page 1-8.

In this case, try to find a location with more favorable conditions for signal reception.

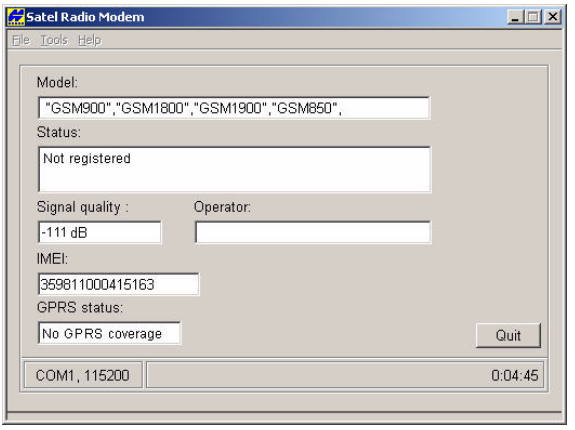

Figure 1-7. GSM Modem Parameters When Connection Fails

3. Click **Quit** to return to the **Radio Link** tab.

   If you use a SIM card that is PIN protected, then Modem-TPS will prompt you to enter the PIN.

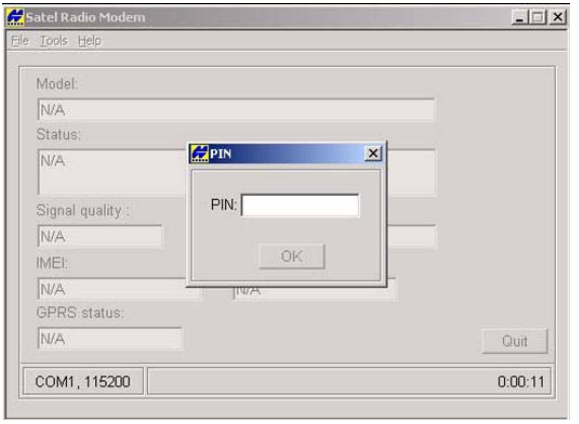

Figure 1-8. GSM Modem PIN Prompt

4. Enter the PIN, and click **OK**.

As long as the SIM card is registered, it will work, although it may be roaming.

Satel UHF Radio Modem Indication

To make sure the Satel UHF radio modem has been configured properly, refer to Table 1-2, Table 1-3, Table 1-4, Table 1-5 for indicator descriptions.

Table 1-2. Satel RX/TX Indicator in UHF Normal Mode (Non-FCS)

LED Status	Description
No Light	Modem is turned off
Green Flashes	Modem is in receiver mode
Solid Green (non-blinking)	Radio link is established. The modem has received data within the last five seconds.
Solid Green + Red Blinks	Modem is receiving data
Solid Red	Modem is in transmitter mode

Table 1-3. Satel RX/TX LED Indicator in UHF FCS Mode

LED Status	Description
No Light	Modem is turned off
Green Flashes	Modem is in receiver mode
Solid Green (non-blinking)	Radio link is established. The modem is ready to receive data. The FCS Slave modem has found the transmitter. The FCS Master is always in transmitter mode.
Solid Green + Red Blinks	Modem is receiving data
Solid Red	Modem is in transmitter mode

Table 1-4. Satel RX/TX LED Indicator in GSM Mode

LED Status	Description
No Light	Modem is turned off
Solid Orange (Red + Green)	GSM has been initialized
Green Blinking	GSM is on, registered on network, and waiting for incoming/outgoing calls.
Solid Red	GSM/GPRS connection has been established
Orange Blinking	Error has occurred

Table 1-5. Satel BT LED Indicator

LED Status	Description
No Light	Bluetooth is turned off
Blue Flashes	Bluetooth is on, but no connection is established
Solid Blue	Bluetooth is on and a connection is established

Troubleshooting

This chapter will help you diagnose and solve some common problems you may encounter with your GR-3 Satel UHF receiver.

Do not attempt to repair equipment yourself. Doing so will void your warranty and may damage the hardware.

Check This First!

Before contacting Topcon support, check the following:

- Check all external receiver connections carefully to ensure correct and secure connections. Double check for worn or damaged cables and antenna.
- Check all power sources for drained batteries or incorrectly connected batteries/cables.
- Check that the most current software is installed on your computer and that the most current firmware is loaded into the receiver. Check the TPS website for the latest updates.
- If connecting via serial cable or Bluetooth, check that the connection port is in Command mode. Refer to the *GR-3 Operator's Manual* for more information.

Then, try the following:

- Reset the receiver using PC-CDU (**Tools ▸ Reset receiver**).
- Restore the default settings using PC-CDU (**Configuration ▸ Receiver,** and then click **Set all parameters to defaults**).
- Clear the NVRAM (Refer to "Clearing the NVRAM" in the *GR-3 Operator's Manual* for more information).

- Initialize the file system (**Tools ▸ Initialize file system**). This erases all files inside the receiver.

Receiver Problems

The following are some of the most commonly encountered receiver problems:

The RX/TX LED is flashing green on my base receiver.

- The base has been set to Receiver mode, not transmit mode. Change this setting using a data collector software or Modem-TPS.
- The base has been set to GSM mode. Change this setting using a data collector software or Modem-TPS.

There is no radio link between Base and Rover and the RX/TX LED is flashing green on the rover.

- Make sure that the base receiver is powered on.
- Make sure the base and rover are set on the same channel. (In FCS mode frequency, lists on the base and rover should be the same.)
- Make sure the ID setting agrees with the ID of the base.
- Analyze the clutter (interference) environment on the site and make provisions for its mitigation.
- Make sure the rover is not set into GSM mode.

There is no radio link between Base and Rover and the Rover RX/TX LED is solid green

- The LED indicates that the rover has established a radio link with the base receiver, however it is not receiving RTK corrections.
- Make sure the base is tracking enough satellites.

Error Messages

If you encounter an error message, use Table 2-1 to learn which actions to take to correct the error.

Table 2-1. Error Message Solutions

Error Message	Action to Take
Modem is not configured: Channel map is missing. Please contact your dealer.	It means there is no valid frequency list uploaded in your modem, and you need your dealer to add the licensed frequencies into the channel map for the modem to work properly.
Internal modem is not accessible. Make sure that receiver options are valid. Check if Daisy Chain port is correctly set.	It may happen that your receiver's options are expired or somehow damaged, so you won't be able to work with the modem. Contact your dealer to restore the receiver's options.

Recommendations for Modem Configuration Parameters

Table 2-2 provides recommendations for setting parameters during the configuration process.

The output levels less than 0.1W can hardly be useful in the field; these levels are appropriate for laboratory measurements only.

The following considerations may also be useful for practical usage:

- At transmit power 0.1W, the battery life will be 1-2 hours longer (depending on the corrections output period; the more frequent outputs, the less the battery life increase) compared to higher power settings.
- Recommended distances in Table 2-2 suppose no interference in the radio link.

- The most suitable values of output power and sensitivity can be chosen on site during field experiments.

Table 2-2. Satel UHF Modem Recommended Configuration Parameters

Distance, KM	Environment	Output Power, W	Receive Threshold, DBM
5	Field	1	-114
2.6	Field	0.1	-114
2.6	Field	1	-104
2	Suburb	1	-114
1.2	Suburb	0.1	-114
1.2	Suburb	1	-104
1	Downtown	1	-114
0.6	Downtown	0.1	-114
0.6	Downtown	1	-104

Specifications

This chapter provides specifications for the GR-3 Satel UHF Radio Modem and its internal components.

UHF Radio Transceiver Specifications

Table A-1. UHF Radio Transceiver Specifications

Parameters	Specification
Frequency Range	400 to 470 MHz
Channel Spacing	12.5 kHz / 25 kHz
Number of Channels	160 / 80 or (2 x160 / 2 x 80)
Frequency Stability	< ± 1.5 kHz
Type of Emission	F1D
Communication Mode	Half-Duplex

UHF Radio Transmitter Specifications

Table A-2. UHF Radio Transmitter Specifications

Parameter	Specification
Carrier Power	10 mW to 1 W / 50 Ω
Carrier Power Stability	+2 dB / -3 dB
Adjacent Channel Power	according to EN 300 113
Spurious Radiation's	according to EN 300 113

UHF Radio Receiver Specifications

Table A-3. UHF Radio Receiver Specifications

Parameter	Specification
Sensitivity	-116 to -110 dBm (BER < 10 E-3) depending on the receiver's settings
Common Channel Rejection	> -12 dB
Adjacent Channel Selectivity	> 60 dB @ 12.5 kHz > 70 dB @ 25 kHz
Inter-modulation Attenuation	> 65 dB
Spurious Radiation's	> 2 nW

Modem Specifications

Table A-4. Modem Specifications

Parameter	Specification
Interface	LVTTL
Interface Connector	32-pin Eurocard connector type B
Data Speed of Serial Interface	1200 - 38400 bps
Data Speed of Radio Interface	19200 bps (25 kHz channel) / 9600 bps (12.5 kHz channel)
Data Format	Asynchronous LVTTL

Table A-4. Modem Specifications

Parameter	Specification
GSM Module	Motorola G24
Bluetooth Module	TAIYO YUDEN EYSF2CAUX

General Specifications

Table A-5. GR-3 Digital UHF Modem General Specifications

Parameter	Specification
Operating Voltage	+6.0 to +14.0 VDC
Power Consumption (average)	• UHF mode - receive: 1.9 VA (320mA@6VDC) • UHF mode - transmit: <5.0 VA (670mA@6VDC/output power 0.5W) (820mA@6VDC/output power 1W) • GSM mode: 1.2 VA (200mA@6VDC (see G24 manual) • Standby mode: 0.05 VA
Startup Time	200 ms (typical)
Operating Temperature Range	-25°C...+55°C
Vibration	Not specified
Antenna Connector	MMCX, 50 W, female
Antenna Connector (GSM module)	MMCX, 50 W, female
Antenna Connector (Bluetooth)	RADIALL R107 003 010
Housing	SATELLINE-3AS-OEM11 is delivered without the housing - the metal shields cover the component blocks on the PCB
Size H x W x L	15.5 x 97 x 113 mm
Weight	150g (without GSM module)

Notes:

Topcon Positioning Systems, Inc.
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800·443·4567 www.topconpositioning.com

ISO 9001:2000
FM 68448

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