TOPCON

GR-3

Operator's Manual

Digital UHF Radio Addendum

TOPCON
POSITIONING SYSTEMS

GR-3 Operator's Manual

Digital UHF Radio Addendum

Part Number 7010-0802
Rev. A

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Table of Contents

Notes:

GR-3 Digital 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 configuration of the Digital UHF radio modem for the Base and Rover in PDL and Simplex mode and configuration of a GSM radio modem.

Configuring the Radio Modem

Modem-TPS is Topcon's radio modem configuration utility for modems embedded in Topcon receivers.Modem-TPS (version 2.2 or newer) provides the following functions:

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

Topcon's configuration and surveying software, TopSURV or Pocket-3D, also have the ability to configure Topcon receivers. Refer to the TopSURV or Pocket-3D manuals for details.

Configuring a Base/Rover Digital UHF Radio Modem in PDL Mode

NOTICE

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

For the GR-3 Digital UHF, the integrated radio modem provides TX/RX UHF communications between a Base Station and a Rover. To configure the UHF radio modem, have the following ready:

- PC running Windows 98 or newer
- Modem-TPS 2.2p0 or newer
- A Serial cable or Bluetooth connectivity with PC

1. Connect the computer and receiver using an RS-232 cable or Bluetooth wireless technology. Turn on the receiver.
2. Open Modem-TPS and select the COM Port the receiver is connected to (Figure 1-1). Click **Connect.**

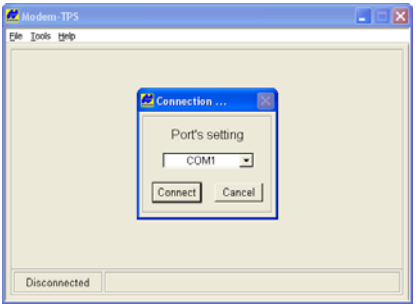

Figure 1-1. Connect to Modem-TPS

3. On the *Radio Link* tab, set the following parameters (Table 1-1 on page 1-3) for the Base and Rover's radio modem in PDL protocol and click **Apply** (Figure 1-2 on page 1-4).

Table 1-1. Receiver Parameters for the Radio Link Tab in Protocol Mode

Parameter	Base Receiver	Rover Receiver
Protocol	Select PDL w/EOT. This is the default setting for the GR-3 Digital UHF.	
Modulation	Select GMSK; recommended for most applications.	
Mode	Select Transmitter	Select Receiver
Channel	Select the current Transmit/Receive frequency channel in MHz. Assign a channel on which to transmit/receive data. • Use the same channel for both the transmitter and the receiver.	
Forward Error Correction (FEC)	Enable to maximize data communication. The rover radio modem has the capability to check and correct transmission errors (if any) in an incoming data stream. See Notice on page 1-4 for more information on FEC.	
Scrambling	Enable to provide more robust data communication over high interference areas.	
Output power	Select the transmission power for the radio modem (from 10 mW to 1W).	n/a
Link rate	Select 9600 as the link rate, which is the default link rate for GMSK (recommended for most applications). The link rate is the rate at which data is transmitted over the RF Link. For maximum efficiency, the data packet size transferred to the radio modem in a given time should be equal to or less than the link rate. Use Table 1-3 on page 1-8 to determine the link rate.	

NOTICE

FEC reduces data throughput by adding redundant check bits to the data stream. If using FEC with a differential messages format that produce a great deal of data, select a link rate of 19200 and a modulation type of 4-level FSK to ensure reliable radio communication between receivers.

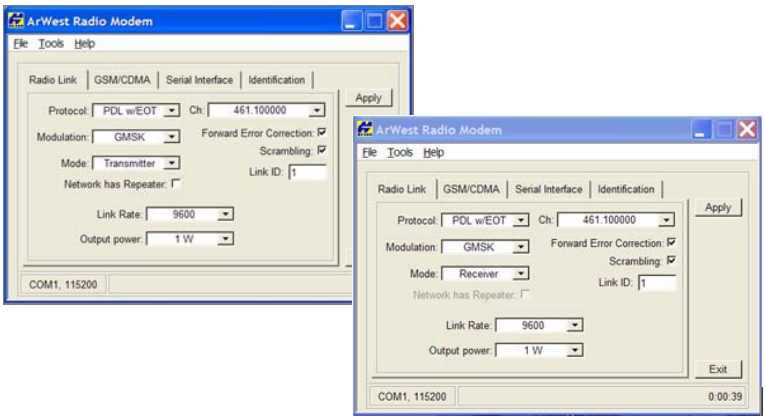

Figure 1-2. Apply Radio Link and Baud Rate Parameters

4. On the *Serial Interface* tab, select the following baud rate parameters and click **Apply** (Figure 1-3 on page 1-5).
   - *Baud Rate* – select a baud rate for the modem's serial port. The same rate must be used for the receiver and the modem.
   - *RTS/CTS* – controls the flow of data between the receiver and modem. "On" enables handshaking/hardware flow control.

NOTICE

If the serial baud rate exceeds the link rate, enable hardware handshaking to prevent the radio link from overflowing, resulting in data loss.

5. When finished, click **File ▸ Disconnect**.
6. Click **File ▸ Exit** to close Modem-TPS.

7. Launch PC-CDU and set up the receiver to run as an RTK Base Station.

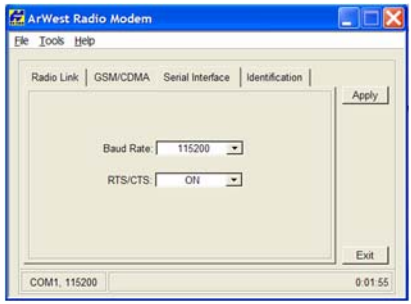

Figure 1-3. PDL/Simplex Serial Interface Tab

Configuring a Base/Rover Digital UHF Radio Modem in Simplex Mode

NOTICE

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

For the GR-3 Digital UHF, the integrated radio modem provides TX/RX UHF communications between a Base Station and a Rover. To configure the UHF radio modem, have the following ready:

- PC running Windows 98 or newer
- Modem-TPS 2.2p0 or newer
- A Serial cable or Bluetooth connectivity with PC

1. Connect the computer and receiver using an RS-232 cable or Bluetooth wireless technology. Turn on the receiver.
2. Open Modem-TPS and select the COM Port the receiver is connected to (Figure 1-4 on page 1-6). Click **Connect.**

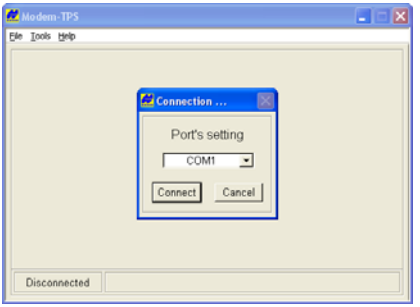

Figure 1-4. Connect to Modem-TPS

3. On the *Radio Link tab*, set the following parameters (Table 1-2) for the base station's and rover's radio modem in **Simplex Mode** (Figure 1-5 on page 1-7).

Table 1-2. Receiver Parameters for the Radio Link Tab in Simplex Mode

Parameter	Base Receiver	Rover Receiver
Protocol	Select Simplex. This is the default setting for the GR-3 Digital UHF.	
Modulation	Select DBPSK. Recommended for most applications.	
Mode	Select Transmitter	Select Receiver
Channel	Select the current Transmit/Receive frequency channel in MHz. Assign a channel on which to transmit/receive data. Each channel uses a unique communication frequency, allowing up to five simultaneously transmitting radio modems, without interference, at the jobsite. • Use the same channel for both receiver and transmitter in the same network. • Assign different channels to other networks.	
Forward Error Correction (FEC)	Enable to maximize data communication. The rover radio modem has the capability to check and correct transmission errors (if any) in an incoming data stream. See Notice below table for more information on FEC.	

Table 1-2. Receiver Parameters for the Radio Link Tab in Simplex Mode (Continued)

Parameter	Base Receiver	Rover Receiver
Scrambling	Enable to provide more robust data communication over high interference areas. Note: For Simplex protocol, the scrambling should be toggled off.	
Output power	Select the transmission power for the radio modem (from 10 mW to 1 W).	n/a
Link rate	Select 9600 as the link rate, which is the default link rate for DBPSK. Recommended for most applications. The link rate is the rate at which data is transmitted over the RF Link. See Table 1-3 on page 1-8 to determine the link rate.	

FEC reduces data throughput by adding redundant check bits to the data stream. If using FEC with a differential messages format that produce a great deal of data, select a link rate of 19200 and a modulation type of 4-level FSK to ensure reliable radio communication between receivers.

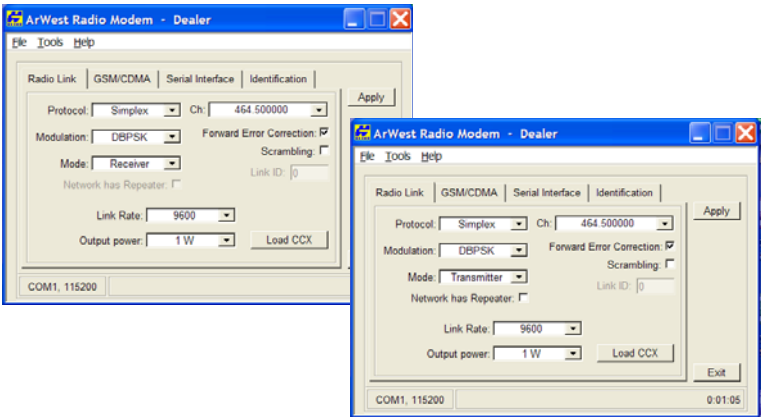

Figure 1-5. Apply Radio Link and Baud Rate Parameters

Table 1-3. Link Rate vs. Modulation Type

For this Link Rate	Use this Modulation Type
4800 baud	DBPSK
9600 baud (default; recommended)	DBPSK (default; recommended) or DQPSK
19200 baud	DQPSK

4. On the *Serial Interface* tab, select the following baud rate parameters and click **Apply** (Figure 1-6).
   - *Baud Rate* – select a baud rate for the modem's serial port. The same rate must be used for the receiver and the modem. Recommended baud rate is 115200.
   - *RTS/CTS* – controls the flow of data between the receiver and modem. "On" enables handshaking/hardware flow control.

If the serial baud rate exceeds the link rate, enable hardware handshaking to prevent the radio link from overflowing, resulting in data loss.

5. When finished, click **File ▸ Disconnect**.
6. Click **File ▸ Exit** to close Modem-TPS.

7. Launch PC-CDU and set up the receiver to run as an RTK Base station.

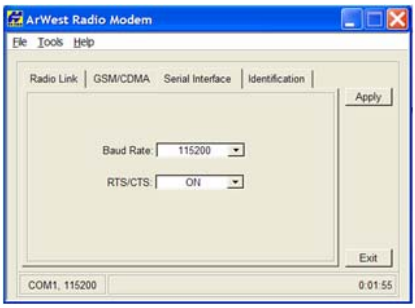

Figure 1-6. Apply Baud Rate Parameters

Configuring a GSM Radio Modem

NOTICE

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

For the GR-3 Digital UHF, the integrated radio modem configured with a Wavecom GSM Module provides TX/RX GSM communications between a Base and Rover, or communications with a GPS network using IP based connections. To configure a GSM modem, have the following ready:

- PC running Windows 98 or newer
- Modem-TPS 2.2p0 or newer
- A Serial cable or Bluetooth connectivity with PC

1. Connect the computer and receiver using an RS-232 cable or Bluetooth wireless technology. Turn on the receiver.

2. Open Modem-TPS and select the COM Port the receiver is connected to (Figure 1-7). Click **Connect**.

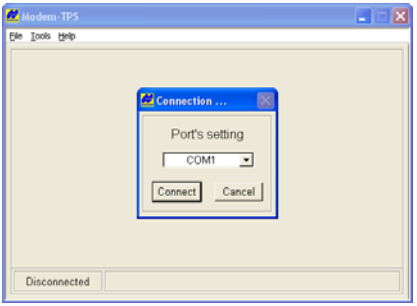

Figure 1-7. Connect to Modem-TPS

3. On the *GSM/CDMA* tab, set the following parameters (Table 1-4 on page 1-10), and click **Apply** (Figure 1-8 on page 1-11).

Table 1-4. Receiver Parameters for a GSM Radio Modem

Parameter	Base Receiver	Rover Receiver
Model	Shows the model of the Wavecom module and the GSM band that it uses.	
Status	Shows whether the SIM card inserted into the GR-3 is registered on the service provider's network. It will report one of three things: 1. Registered, home network 2. Registered, roaming 3. Not registered	
Operator	Shows the service provider on the SIM card inserted into the GR-3 Digital UHF.	
S/N GSM modem	Reports the electronic serial number of the Wavecom GSM module inside the GR-3 Digital UHF.	
Signal quality	Indicates the strength of the GSM signal. The lower the number – the closer to zero (0) – the better the signal quality. The minimum signal cutoff is -111 dB.	

NOTICE

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

4. Select **ON** in the ***Mode*** *drop-down entry box*, then click **Apply** to enable the GSM module.

   "On" enables handshaking/hardware flow control.

   The Wavecom GSM modem can either be in the US GSM band (GSM 850/1900 MHz as in Figure 1-8 on page 1-11) or the European GSM band (900/1800 MHz).

5. Click on the *GSM info* tab (Figure 1-8) to view GSM modem information, then click **Quit** to return to the previous screen.

6. On the *Serial Interface* tab (Figure 1-7 on page 1-9), select a baud rate for the modem's serial port. For the GR-3 digital UHF, the baud rate must be set to **115200**. The same rate must be used for both the receiver and the modem.

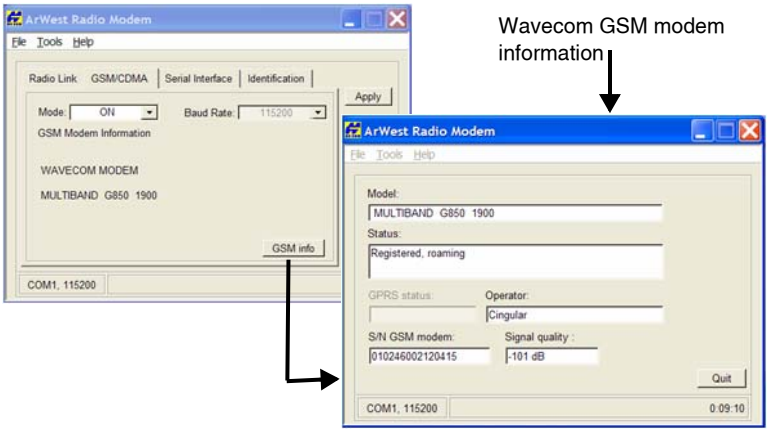

Figure 1-8. Enable the GSM Module/View GSM Parameters

7. Click **Apply** (Figure 1-8), then click **File ▸ Disconnect**.

8. If needed, launch PC-CDU and set up the receiver to run as an RTK Base station.

Notes:

Troubleshooting

This chapter will help you diagnose and solve some common problems you may encounter with your GR-3 Digital 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 defective cables.
- Check all power sources for drained batteries or incorrectly connected batteries/cables.
- Check that the most current software is downloaded onto the computer and that the most current firmware is loaded into the receiver. Check the TPS website for the latest updates.
- If connecting via Bluetooth, check that the port used for connection 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 default settings using PC-CDU (**Configuration ▸ Receiver**, then click **Set all parameters to defaults**).
- Clear the NVRAM (Refer to "Clearing the NVRAM" on page 5-13 in the *GR-3 Operator's Manual* for more information).

- Initialize the file system (click **Tools ▸ Initialize file system**). This will erase 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 into Receiver mode, not transmit mode. Change this using the data collector software or Modem-TPS.
- The base is set into GSM mode. Change this using 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.

- The LED indicates that the receiver is set into Receive mode; however no radio link has been established
- Check to make sure that the base receiver is powered on
- Check to make sure that the base and rover receivers are on the same channel.
- Check to 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.
- Check to make sure that the base is tracking enough satellites.
- Check to make sure that the base is transmitting via a radio scanner or by setting up the base receiver with PC-CDU or application software.

The RX/TX LED is flashing red on my receiver

- A fault condition has been detected.
- Check the radio modem's antenna to see if it is undamaged.
- Check to see if the radio antenna is connected properly and securely.

Notes:

Specifications

This TPS product is a 72-channel GNSS receiver with an internal radio modem, a Bluetooth® wireless technology module, an optional GMS module, an optional, removable SD memory card, and a rugged magnesium housing complete with MINTER and cable connectors.

Receiver Specifications

The following sections provide specifications for the GR-3 Digital UHF Modem and its internal components.

General Details

Table A-1 lists the modem's general specifications.

Table A-1. GR-3 Digital UHF Modem General Specifications

Parameter	Specification
Operating frequency range country/region/purpose dependent	410-470 MHz
Modulation techniques	GMSK, 4-level FSK, DBPSK, DQPSK, DBPSK, and 16QAM
Channel spacing	12.5 kHz/25 kHz
Transmission rates at 25 kHz spacing	• DBPSK/GMSK – 9600 bps • DQPSK/4FSK – 19200 bps • DBPSK – 28800 bps • D16QAM – 38400 bps
Transmission rates at 12.5 kHz spacing	• DBPSK/GMSK – 4800 bps • DBPSK/4FSK – 9600 bps • DBPSK – 14400 bps • D16QAM – 19200 bps

Table A-1. GR-3 Digital UHF Modem General Specifications (Continued)

Parameter	Specification
Data speed of serial interface	Max 115200 bps
Forward Error Correction	Available
Scrambling	Available
Communication mode	Half-Duplex

Digital UHF Transmitter Specifications

Table A-2. Digital UHF Transmitter Specifications

Parameter	Selection
Output power	0.01 W (+10dBm), 0.02 W (+13 dBm), 0.05 W (+17 dBm), 0.1 W (+20 dBm), 0.25W (+24 dBm), 0.5 W (+27 dBm), 1W (+30 dBm)
Nominal output impedance	50 Ohms 2.0:1 VSWR
Output power control accuracy	+ 1dB (at normal test condition) +2.0 dB and -3.0 dB (under extreme test condition)

Digital UHF Receiver Specifications

Table A-3. Digital UHF Receiver Specifications

Parameter	Specification
Receiver sensitivity for DBPSK (@ BER $<1x10^{-4}$, over temperature -30°C to +60°C	-115 dBm for 25 kHz Channel Spacing -116 dBm for 12.5 kHz Channel Spacing
Adjacent channel selectivity	-70 dB for 25 kHz Channel Spacing -60 dB for 12.5 kHz Channel Spacing
Nominal output impedance	50 Ohms 2.0:1 VSWR
Output power control accuracy	+ 1dB (at normal test condition) +2.0 dB and -3.0 dB (under extreme test condition)

Notes:

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ISO 9001:2000
FM 68448

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