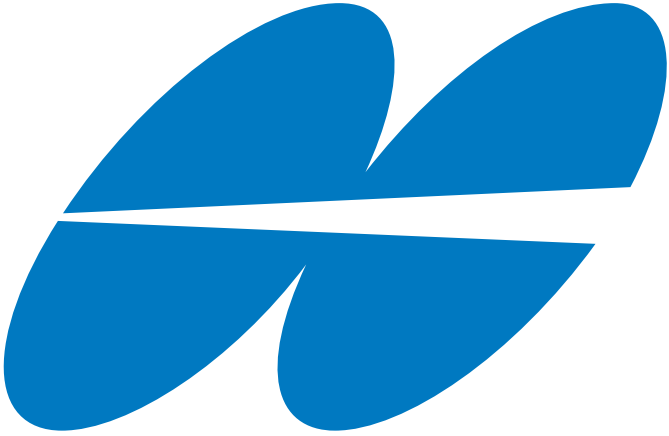


TOPCON

RTP-300™

REAL-TIME PROFILER

Powered by SSI

Installation and Quick Setup Guide

TOPCON
POSITIONING SYSTEMS

RTP-300
Installation and
Quick Setup Guide

Part Number 7010-0995
Rev A

Terms and Conditions

Thank you for buying this Topcon product. This manual has been prepared to assist you with the care and operation of the product and its use is subject to these Terms and Conditions and those more fully set forth in the Operator's/User's Manual.

Usage and Safety

This product is designed for use by professionals. Always use safety precautions when operating this or any Topcon product.

Copyrights

Trademarks

MC-R3, RTP-300, PG-A1, Topcon, and Topcon Positioning Systems are trademarks or registered trademarks of TPS.

Other product and company names mentioned herein may be trademarks of their respective owners.

Disclaimer of Warranty

EXCEPT FOR SUCH WARRANTIES AND LICENSES PROVIDED WITH THE PRODUCT, THIS MANUAL AND THE PRODUCT ARE PROVIDED "AS-IS". TOPCON AND ITS DISTRIBUTORS SHALL NOT BE LIABLE FOR TECHNICAL OR EDITORIAL ERRORS OR OMISSIONS CONTAINED HEREIN; NOR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE FURNISHING, PERFORMANCE OR USE OF THIS MATERIAL OR THE PRODUCT.

Please see the Operator's/User's Manual for detailed information on warranties and the license agreement which may apply to the Product.

License Agreement

Use of any computer programs or software supplied by Topcon or downloaded from the Topcon website in connection with the Product implies acceptance of the Terms and Conditions here and in the Operator's/User's Manual.

Please see the Operator's/User's Manual for detailed information on warranties and the license agreement which may apply to the Product.

Table of Contents

Notes:

Introduction

This manual describes the installation and setup of the RTP-300 (Real Time Profiler) high speed profiling system with GPS. The RTP-300 system collects surface profile data safely at highway speeds (up to 60 mph), or as low as 5 mph. Designed for installation onto customer owned vehicles, the system consists of collection components (lasers and accelerometers), a distance measurement system, a proprietary data collection computer, Topcon GPS antenna, Topcon receiver and controller for GPS positioning. An in-cab touchscreen computer provides on-screen viewing of data collection and immediate test results. The system allows for easy transfer of electronic format data for downloading in the field or viewing on desktop computer.

System Components

- RTP-300™ Assembly and Hitch Mounting Bracket
- Topcon PG-A1 GPS Antenna and Mounting Pole
- MC-R3 Controller/Receiver
- Pelican™ Case with Panasonic® Toughbook™ Computer
- Wheel Encoder and Bracket
- RTP-300 Software

Figure 1-1. RTP-300 System

Recommended Accessories

Topcon recommends purchasing the following items (not Topcon supplied) when using the RTP-300 system for safety and ease of use, contact your local Topcon dealer for details.

Table 1-1.

Description	Image
12V socket power outlet adapter with two (2) or more sockets Installation of cables within the cab of the vehicle requires at least two available 12V cigarette lighter sockets to power the Toughbook computer and the MC-R3.	
Rear license plate magnet mounts When installed, the RTP-300 unit covers the rear license plate of most vehicles. In order to comply with states' laws, the license plate must be visible at all times. Topcon recommends using magnet mounts, or a similar user supplied method, to relocate the license plate to a visible location when using the RTP-300 system.	

Table 1-1.

Description	Image
Roof mounted hazard light	

Installation

Required Tools

(1) 9/16 wrench

(2) 15/16 wrenches or (1) 15/16 wrench and a large crescent wrench

Components

The following section describes the installation of the RTP-300 system components.

Wheel Encoder and Bracket

1. Using the supplied wheel encoder bracket as a template, drill two holes on the top of the rear left tire's fender (Figure 2-2).

Figure 2-1. Wheel Encoder Bracket Location on Left Rear Fender

2. Install the wheel encoder bracket onto the vehicle using the two (2) bolts as shown in Figure 2-2. Secure the bracket from the inside of the fender using the two (2) nuts and washers.

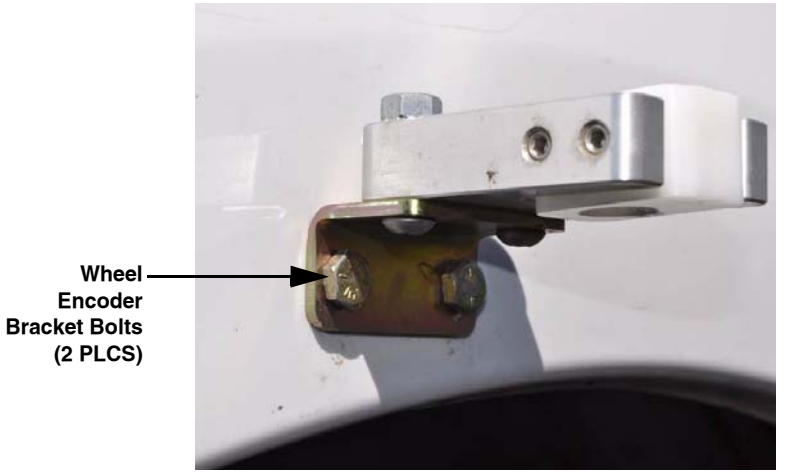


Figure 2-2. Wheel Encoder Pole Holder Installed

3. To install the three (3) lug nut mounts onto the rear, left wheel of the vehicle (Figure 2-3), pull back on the lug nut mount's hex head and slide the flared end over the vehicle's lug nuts, spacing the mounts so that they line up with the slots in the wheel encoder (Figure 2-4 and Figure 2-5). This spacing is vehicle dependant.

Figure 2-3. Lug Nut Mounts and Vehicle Lug Nuts - Before

Figure 2-4. Lug Nut Mount Spacing

Figure 2-5. Wheel Encoder Slots

4. Slide the wheel encoder pole into hole in the bracket.

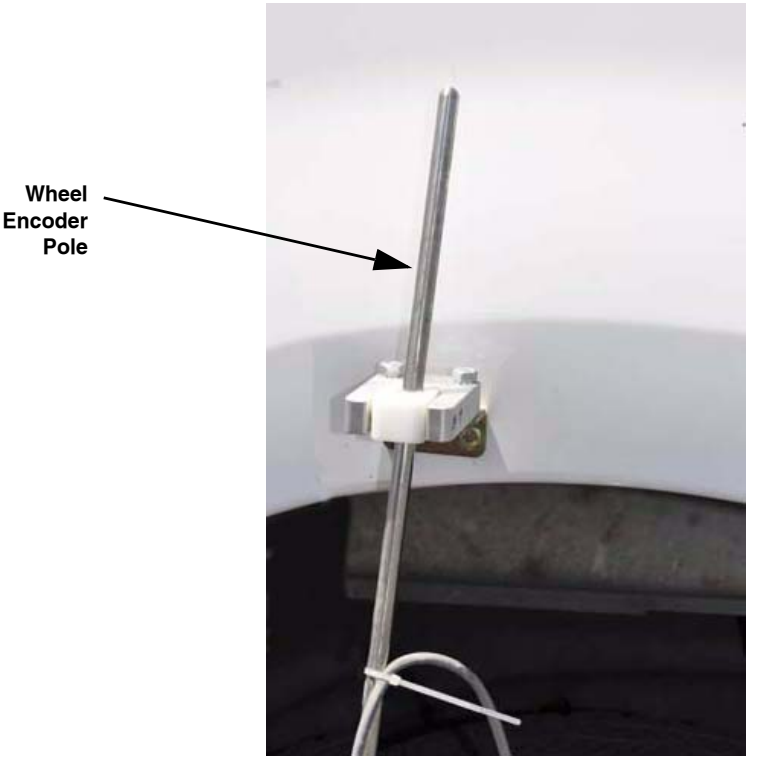


Figure 2-6. Wheel Encoder Pole in Pole Holder

5. Install the wheel encoder onto the lug nut mounts using the three (3) bolts and washers provided in the kit.

Figure 2-7. Wheel Encoder Bolts

6. Check the tire pressure on all tires on the system vehicle, paying particular attention to the tire associated with the distance measurement system. The tires should be inflated to tire manufacturer's recommended pounds per square inch (PSI) settings.

NOTICE

Lower tire pressure may be used to further reduce the PSI impact of the RTP-300 system vehicle on the pavement surface.

MC-R3 Controller

Choose a convenient location for the MC-R3 Controller on the vehicle. Suggested locations are within the cab of the vehicle or in the vehicle's bed.

Figure 2-8. MC-R3 Location and Orientation

GPS Antenna and Mounting Pole

1. Using the bolts provided, install the mounting plate onto the vehicle (i.e. the rear, left, top corner of the vehicle's bed).
2. Install the antenna mounting pole onto the threaded insert.
3. Install the GPS antenna onto the top of the pole.

The antenna can be mounted anywhere on the vehicle, as long as the offset values are entered correctly in the RTP-300 software.

RTP-300 Assembly

1. Insert the RTP-300 assembly's hitch mount into the vehicle's hitch (Figure 2-9).

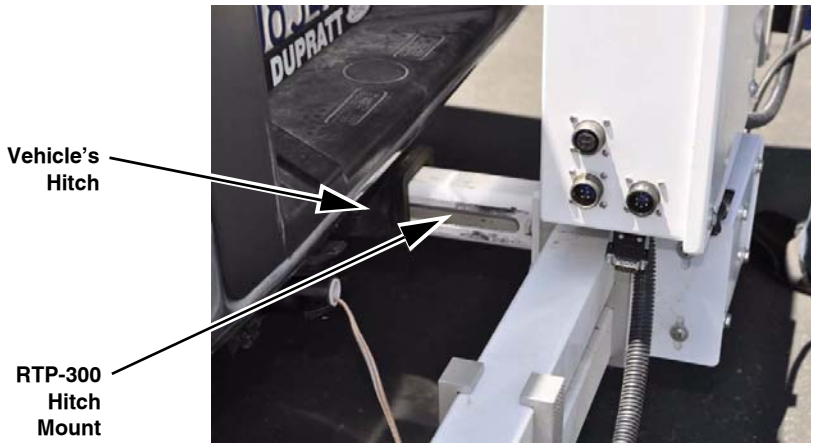


Figure 2-9. Install RTP-300 Assembly

2. Insert the hitch pin into the right side of the hitch (Figure 2-10).

Figure 2-10. Install Hitch Pin

3. Install the hitch pin clip (Figure 2-11).

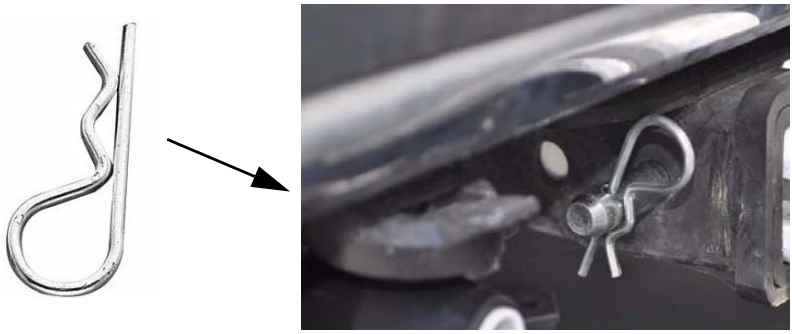


Figure 2-11. Hitch Pin Clip Installed

4. Align the right side hitch mount bracket so that the shorter edge rests above the lip of the hitch (Figure 2-12), and insert the hitch mount bracket bolt.

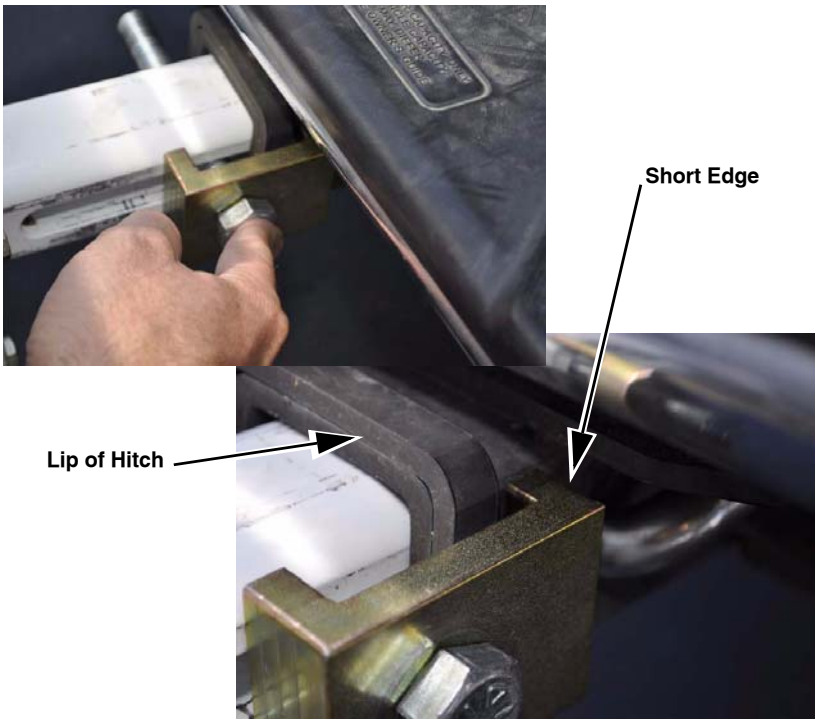


Figure 2-12. Hitch Mount Bracket Bolt

5. While holding the bracket and bolt in place, slide the left side bracket over the bolt (Figure 2-13).

Figure 2-13. Hitch Mount Bracket Alignment

6. Making sure the brackets lie flush with the hitch and the RTP-300 hitch mount, install the nut and washer onto the bracket bolt (Figure 2-14), and tighten with a wrench and socket.

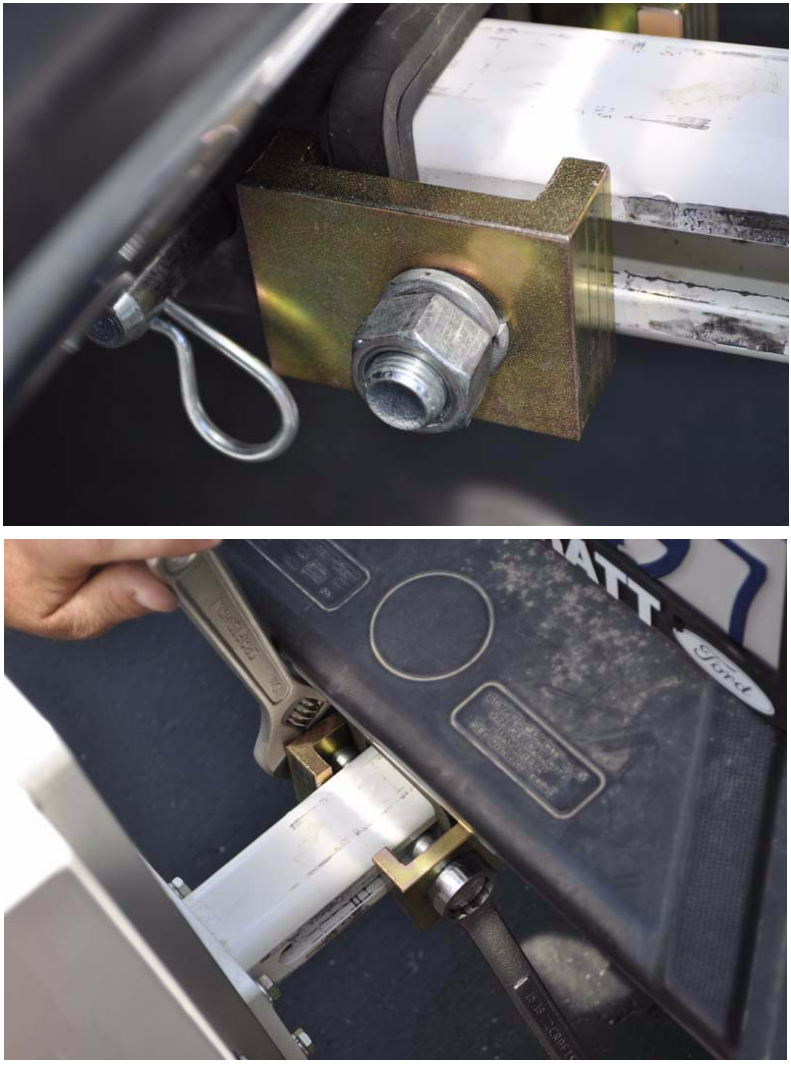


Figure 2-14. Install Hitch Mount Bracket Nut and Washer

Pelican Case with Panasonic Toughbook Computer

Place the Pelican case containing the Panasonic Toughbook computer in the cab of the vehicle within view of the operator when the vehicle is in motion (Figure 2-15).

Do not place the computer in a location that blocks the operator's view.

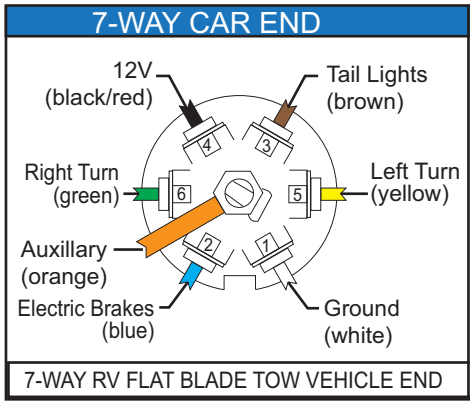
Figure 2-15. Panasonic Toughbook Computer in the Cab

Cables

The following section describes the cable connections and routings for the RTP-300 system.

1. Using the car end of a 7 Way Auto, Light Truck, RV Trailer plug with standard wiring, wire the hitch power outlet by attaching the ground wire to the frame of the truck, and connecting the 12V wire fused with a 25 amp inline fuse. A picture of the receptacle is shown in Figure 2-16 along with an image of the wiring schematic.

7 Way Auto, Light Truck, RV Trailer Wiring Diagram
(Round 2" Diameter Connector Allows Center Pin for Auxiliary Power)



1. White...Ground
2. Blue...Electric Brakes
3. Brown...Tail/Clearance Lights
4. Black...12 Volt Battery Charge
5. Yellow...Stop/Left Turn
6. Green...Stop/Right Turn
7. Orange...Auxillary

Figure 2-16. Hitch Power Outlet Wiring Diagram

2. Connect the RTP-300 power cable to the hitch's power outlet (Figure 2-17).

Figure 2-17. RTP-300 Power Cable to Hitch

3. Connect the RTP-300 power cable to the top, left connector on the RTP-300 assembly (Figure 2-18).

Figure 2-18. Connect RTP-300 Power Cable to RTP-300 Assembly

4. Connect the four socket wheel encoder assembly connector to the lower, left connector on the RTP-300 assembly (Figure 2-19).

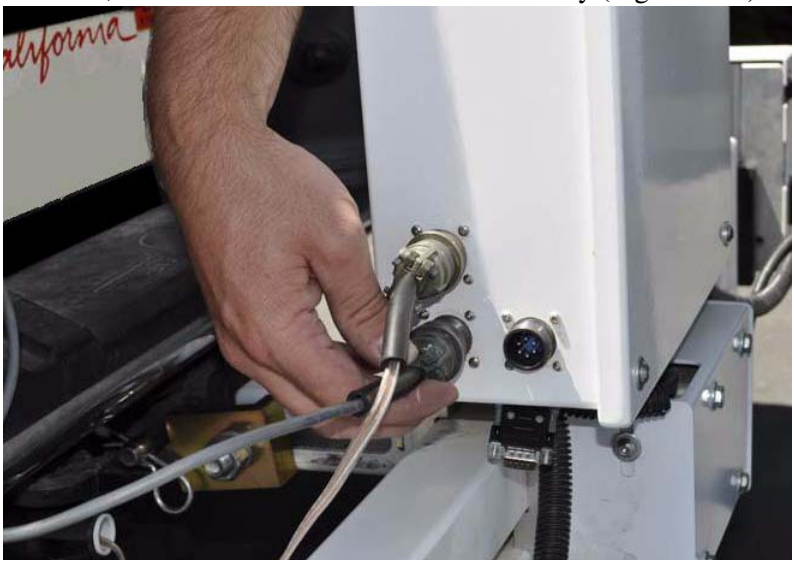


Figure 2-19. Wheel Encoder Cable to RTP-300 Assembly

5. Connect the six socket RTP-300 communication connector to the lower, right connector on the RTP-300 assembly (Figure 2-20), and then route the cable to the inside of the vehicle's cab (i.e. through the rear window).

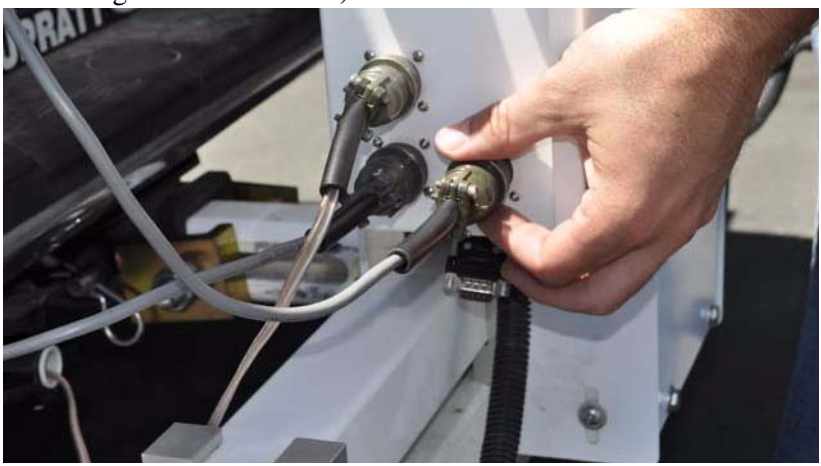


Figure 2-20. Communication Cable to RTP-300 Assembly

6. Connect the MC-R3 Deutsch connector to Connector A on the MC-R3 controller (Figure 2-21).

Figure 2-21. Deutsch Connector to MC-R3 Controller

7. Connect the MC-R3 main antenna connector on the Deutsch connector to the RTP-300 assembly (Figure 2-22).

Figure 2-22. MC-R3 Main Antenna Serial Cable to RTP-300 Assembly

8. Route the MC-R3 power cable on the Deutsch connector to the vehicle's cigarette lighter receptacle (Figure 2-23).

Figure 2-23. MC-R3 Power Cable to Cigarette Lighter Receptacle

9. Connect the GPS antenna cable to the Main GPS Antenna connector on the MC-R3 controller (Figure 2-24).

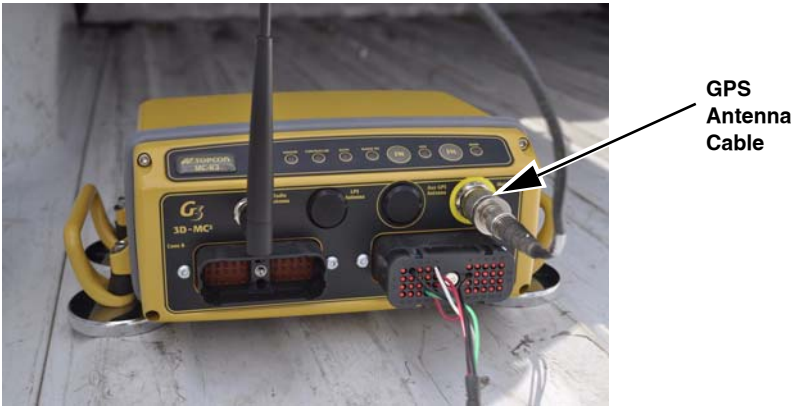


Figure 2-24. GPS Antenna Cable to MC-R3 Controller

10. Connect the GPS antenna cable to the GPS antenna (Figure 2-25).

Figure 2-25. GPS Antenna Cable to GPS Antenna

11. Connect the Toughbook computer power cable to the left connector on the Pelican case (Figure 2-26).

Figure 2-26. Toughbook Computer Power Cable to Pelican Case

12. Connect the Toughbook computer power cable to the cigarette lighter socket or a multi-socket adapter (Figure 2-27).

NOTICE

Installation of cables within the cab of the vehicle requires at least two available 12V cigarette lighter sockets to power the Toughbook computer and the MC-R3.

Figure 2-27. Toughbook Computer Power Cable to Cigarette Lighter

13. Connect the RTP-300 assembly communication cable to the right connector on the Pelican case (Figure 2-28).

Figure 2-28. RTP-300 Communication Cable to Pelican Case

14. Power on the vehicle and the Toughbook computer. Double-click on the RTP-300 software icon on the computer's desktop to start the program (Figure 2-29).

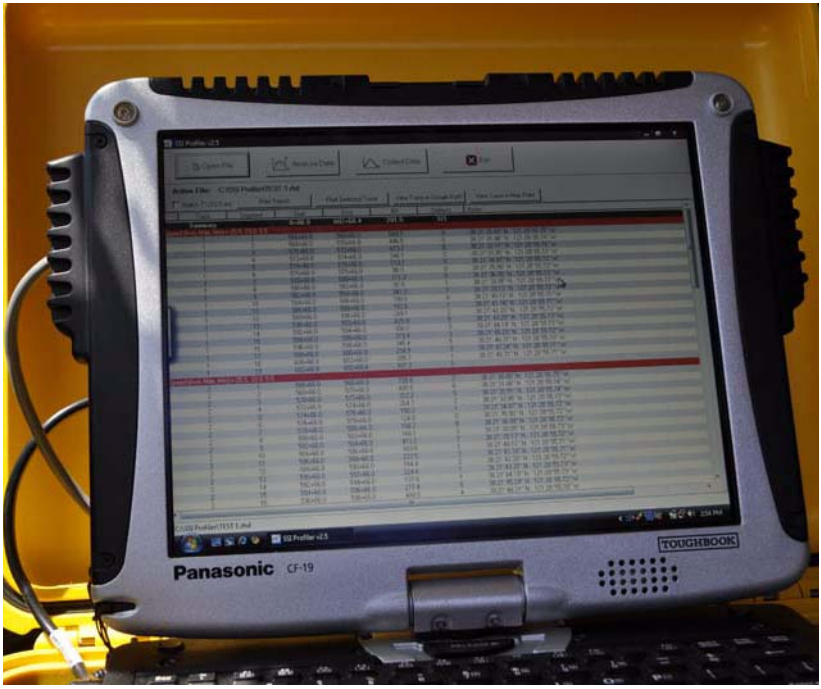


Figure 2-29. Power On the System

Software Setup

The following sections describe how to setup a base station with PC-CDU, configure a radio modem using Modem TPS, how to setup the MC-R3 for RTP communication, and how to export and work with data using, RTP-300 software, PC-CU and SiteMaster.

Base Station Setup in PC-CDU

1. Connect the receiver (MC-R3 Controller) to a PC computer running PC-CDU software, through a serial cable.
2. Power on the receiver and start PC-CDU.
3. Set the ***Port*** to **COM1** (default) and the ***Baud rate*** to **115200** (default), and click **Connect**.

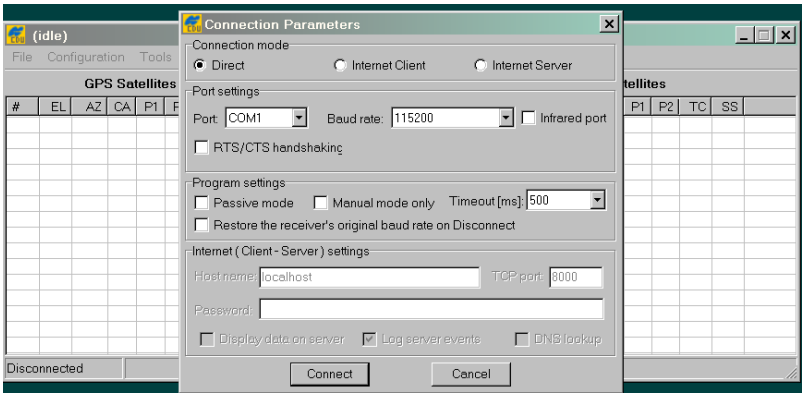


Figure 3-1. Set Port and Baud Rate

4. Select the ***Configuration*** tab.

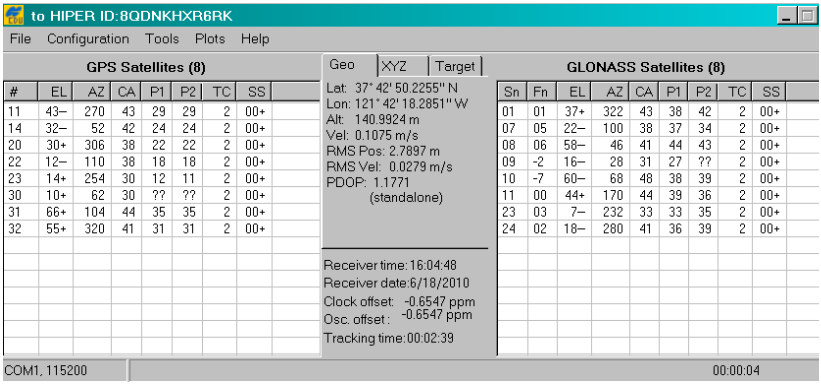


Figure 3-2. Configuration Tab

5. Select the ***Base*** tab.

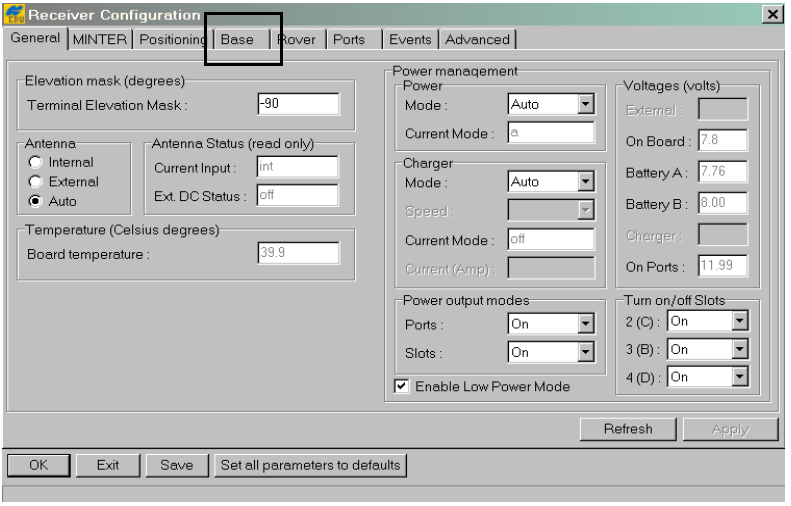


Figure 3-3. Base Tab

6. If the base position is not known, click **Get from receiver** to set the Lat., Lon. and Ht. position of the base. If the base position is known, enter the known Lat., Lon. and Ht.

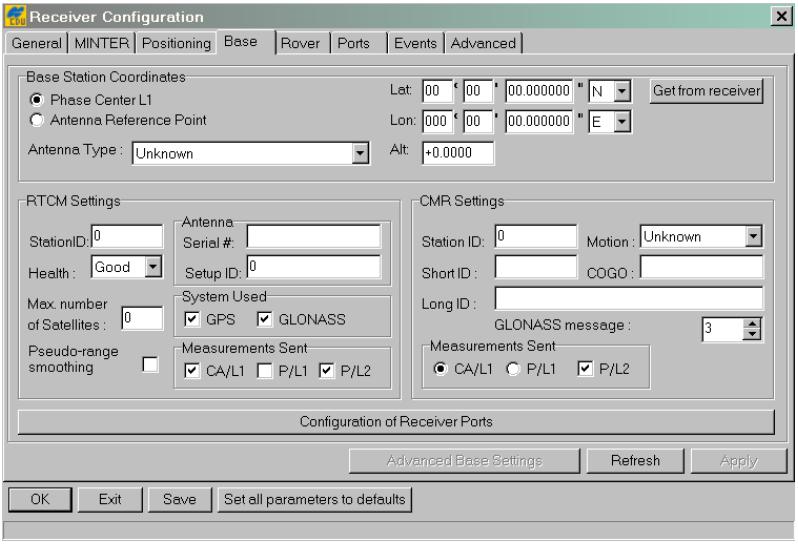


Figure 3-4. Set Base Position

7. Select the ***Ports*** tab.

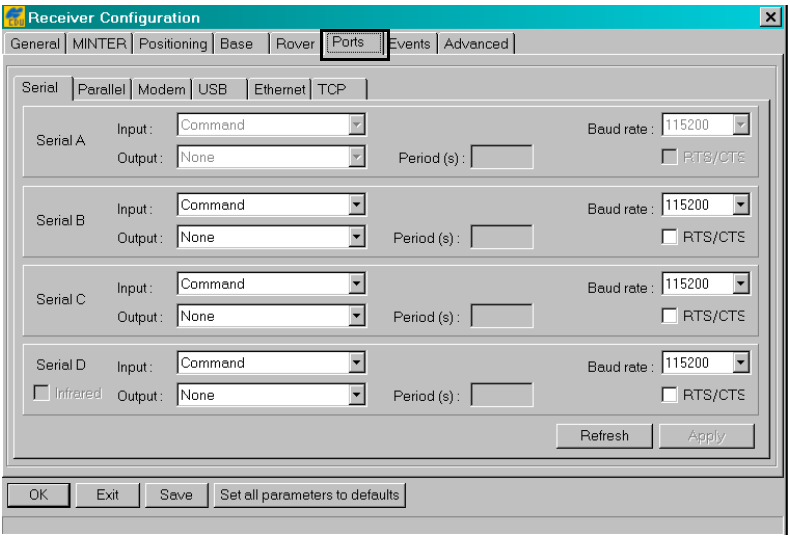


Figure 3-5. Ports Tab

8. Set the ***Serial C output*** port to the desired correction format (format must match rover). Set the baud rate to **38400** (baud rate must match rover), and check the RTS/CTS box (must match rover). Click **Apply**.

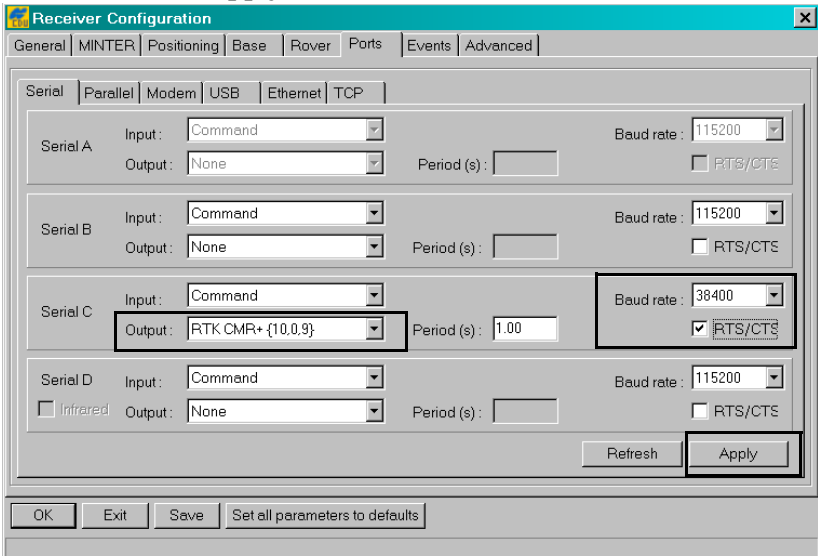


Figure 3-6. Set Output and Baud Rate

9. Click **OK**.

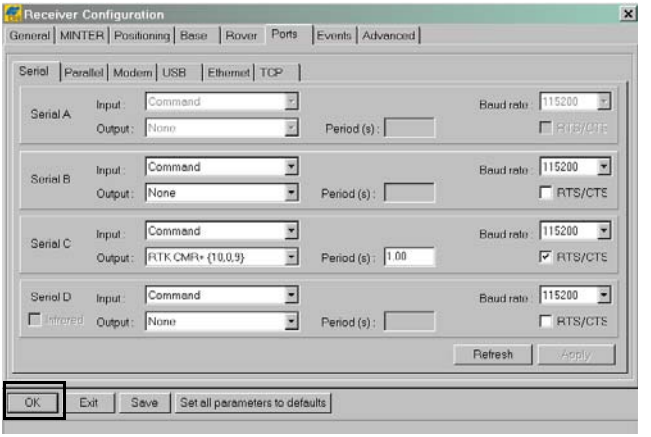


Figure 3-7. Click OK

10. Confirm the receiver is set up as a base. Select **File** --> **Disconnect**.

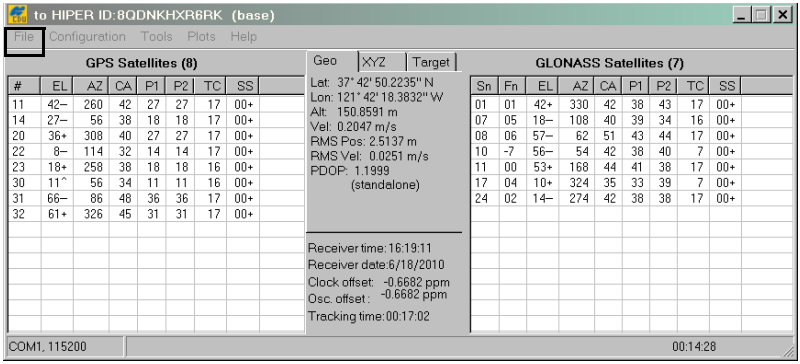


Figure 3-8. Confirm Setup

Radio Modem Setup in Modem TPS

1. Start Modem TPS, and click **Cancel** on the ***Port's settings*** box to set the correct radio modem connection parameters.

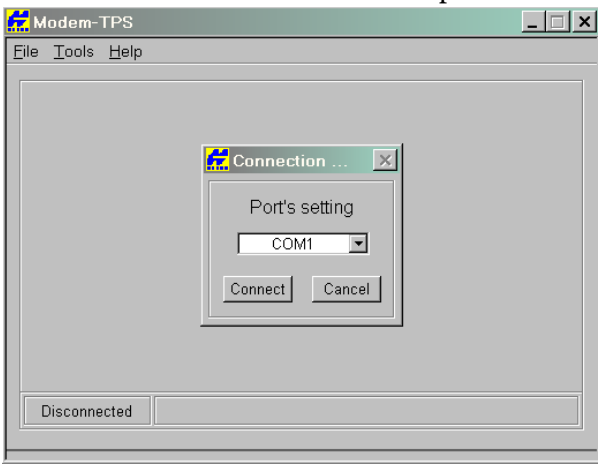


Figure 3-9. Cancel to Set Radio Connection Parameters.

2. Click **Tools** --> **Options** to display the ***Options*** screen, and click the ***Modem*** tab.

3. Set ***Connect modem*** to **Internal**, check all of radio type boxes to set all radio types to On, and set the modem ***Baud rate*** to **38400**.

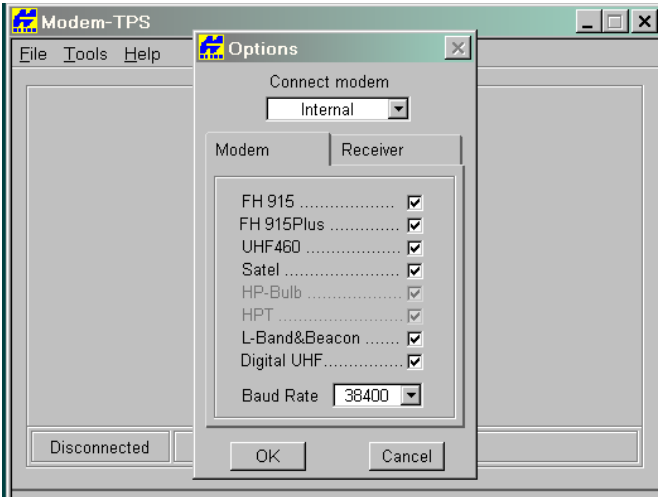


Figure 3-10. Modem Tab - Set Radio Types and Baud Rate

4. Click the ***Receiver*** tab.
5. Set the receiver ***Baud rate*** to **115200**. Set the ***Daisy Chain*** port to **Port C**. Click **OK**.

NOTICE

When connecting to an MC-R3 radio the D***aisy Chain*** port needs to be set to **Port B**.

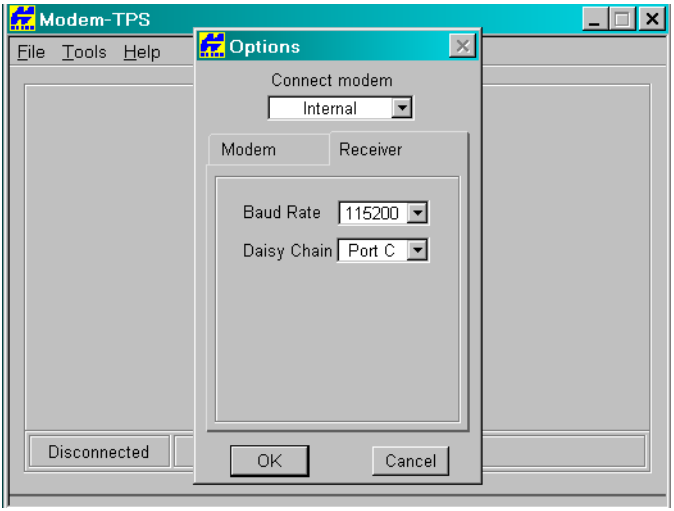
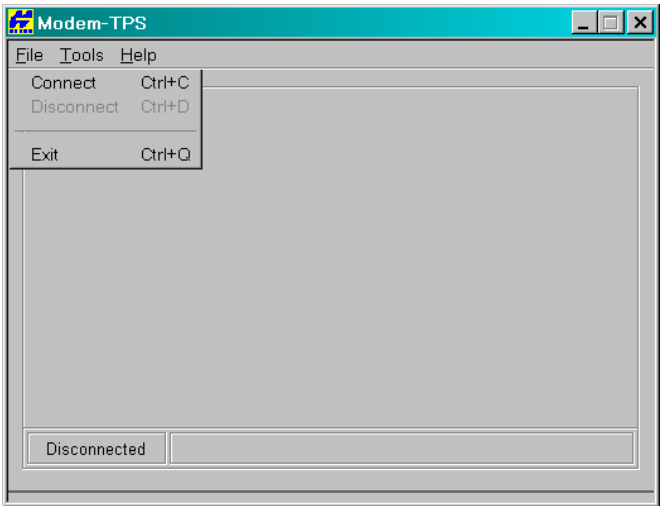


Figure 3-11. Receiver Tab - Set Baud Rate and Daisy Chain

6. Click **File** --> **Connect**.
7. Click **Connect** again on the ***Connection*** dialogue box. A progress bar appears while attempting to make connection.



8. On the ***Radio Link*** tab, select the radio channel to match the rover from the ***Ch*** (channel) drop down menu. Select the appropriate ***Mode*** (**Receiver** or **Transmitter**).
9. Click **Apply**.
10. Click **File** --> **Disconnect.**

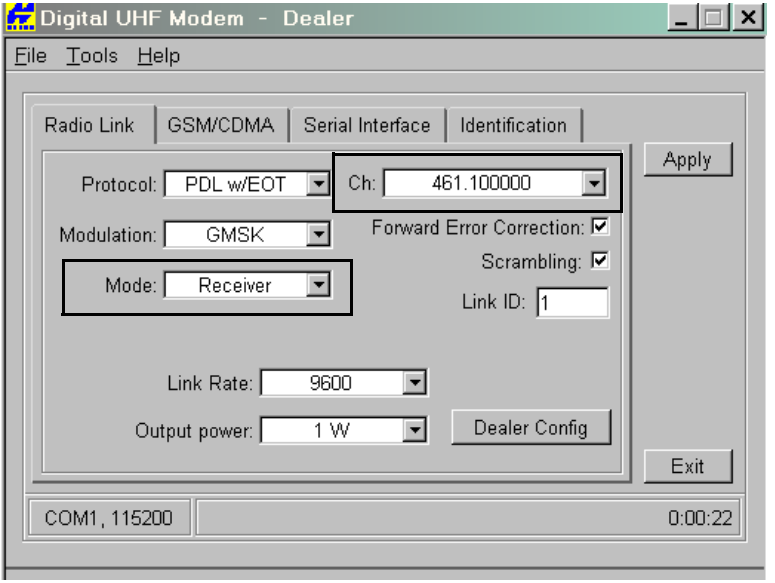


Figure 3-12. Radio Modem Settings

Setting Up the MC-R3 Controller for Profiler Communication

1. Connect to PC-CDU on COM 1 at 38400 baud rate.

NOTICE

MC-R3 baud rate must be set to 38400 for RTP communication.

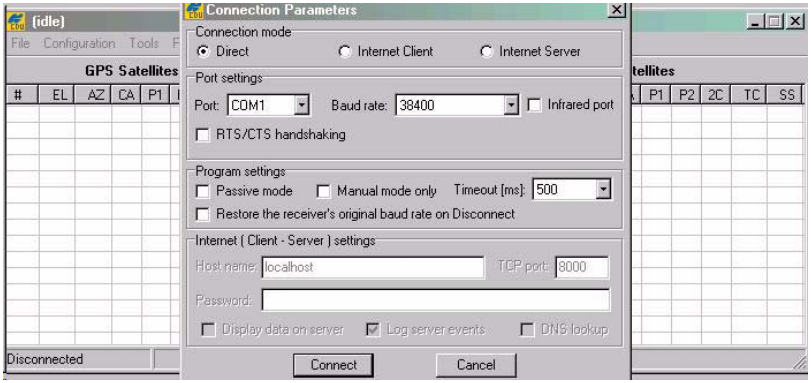


Figure 3-13. Connect - Receiver

2. Once connected at 38400 baud rate, select the ***Configuration*** tab and select **Receiver**.

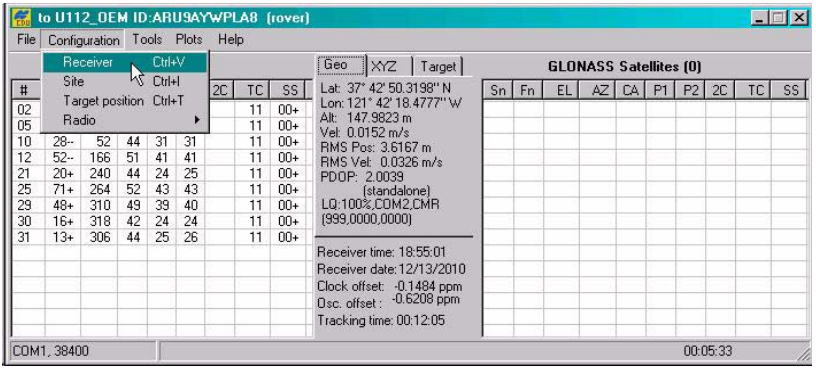


Figure 3-14. Configuration - Receiver

3. Click the ***Positioning*** tab. Under ***Positioning Mode***, select **RTK Fixed**, and click **Apply**.

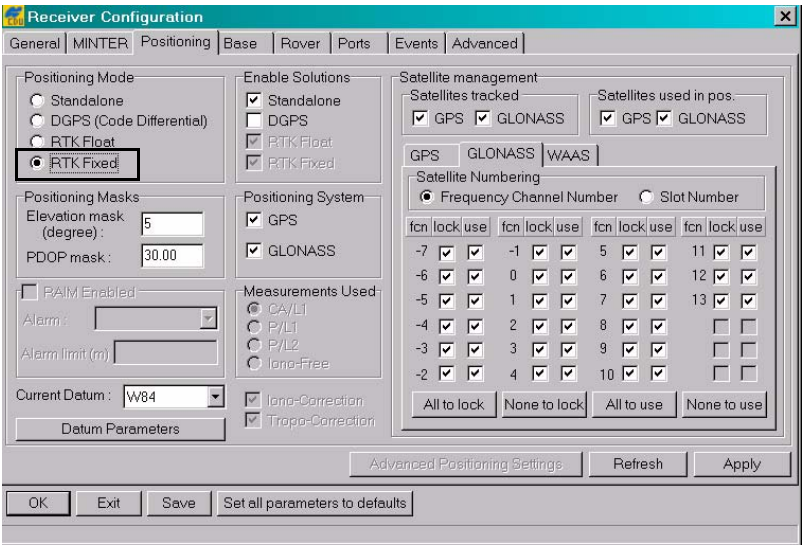


Figure 3-15. Select RTK Fixed

4. Click the ***Rover*** tab, confirm that the ***Positioning Mode*** is set to **RTK Fixed**. Under ***RTK Parameters - RTK mode***, select **Extrapolation**.

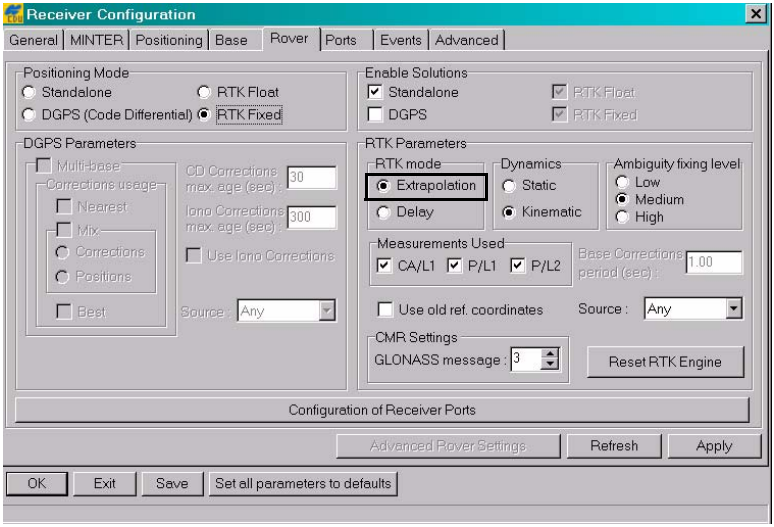


Figure 3-16. RTK Mode Set to Extrapolation

5. Click the ***Ports*** tab. Select the ***Serial B Input*** (i.e. **CMR**) that matches the base output. Select **38400** as the ***Baud rate***, and check the ***RTS/CTS*** box. Click **Save**, and then click **Exit**.

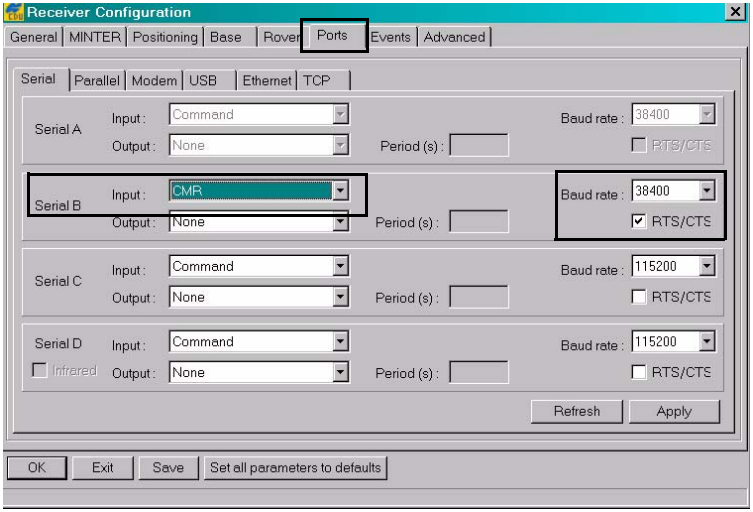


Figure 3-17. Set Serial B Input and Baud Rate

NOTICE

When outputting CMR+ corrections from the base, select **CMR** as your input on the MC-R3.

6. Click **File** --> **Manual Mode**.

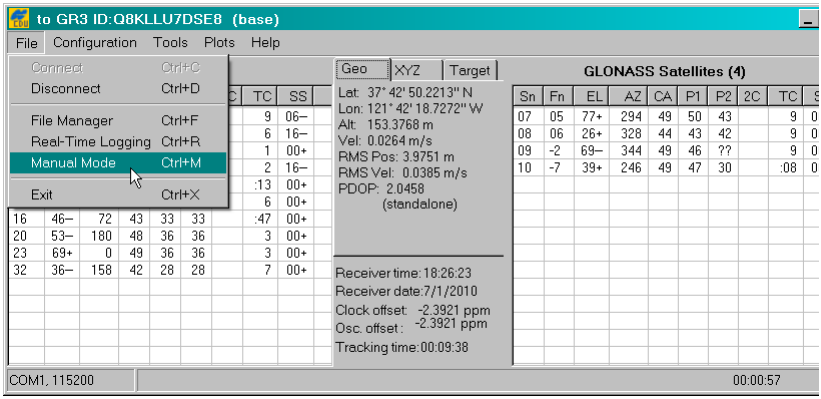


Figure 3-18. Select Manual Mode

7. Enter the command: **%%em,/dev/ser/a,nmea/GGA: .10**

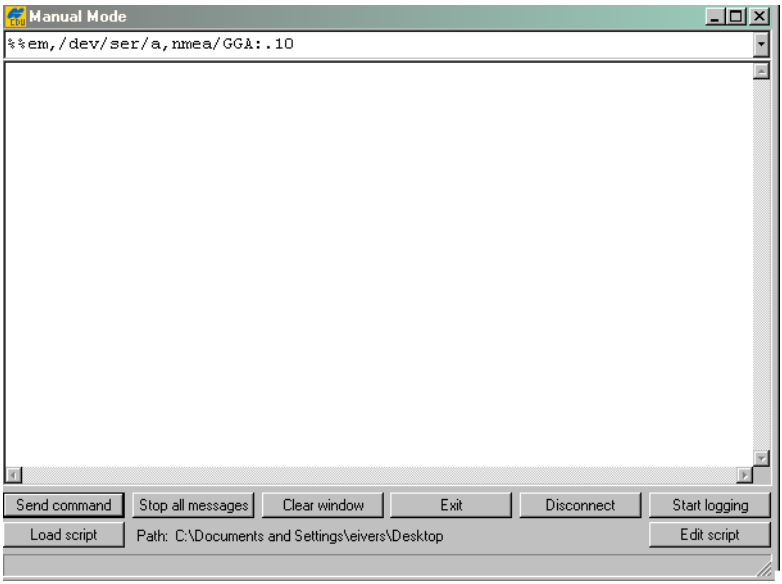


Figure 3-19. Enter Command in Manual Mode

8. Click **Send command**. The **RE002%...** message indicates that the command was accepted and the GGA message is sending.

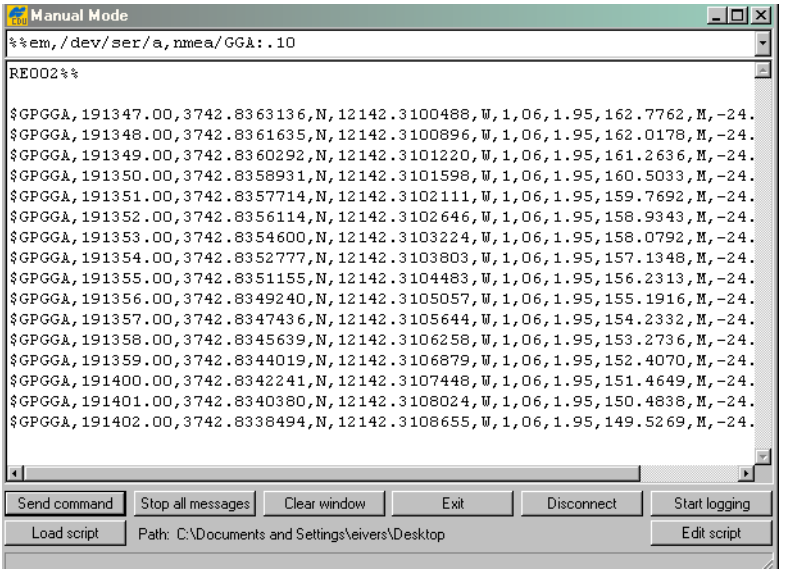


Figure 3-20. Command Sending

NOTICE

If the RE002%% message is not displayed and the GGA messages do not send, check that the command is entered properly.

9. **DO NOT** select any other options, simply disconnect the cable from the unit. The GGA message continues to send every time the unit is powered on, until a receiver reset or clear NVRAM is performed. If a reset or clear NVRAM is performed, connect to PC-CDU and re-send the command as stated above.

SiteMaster v9.1 Data Import

1. From SiteMaster's ***Main Menu***, click **File –> Import**.

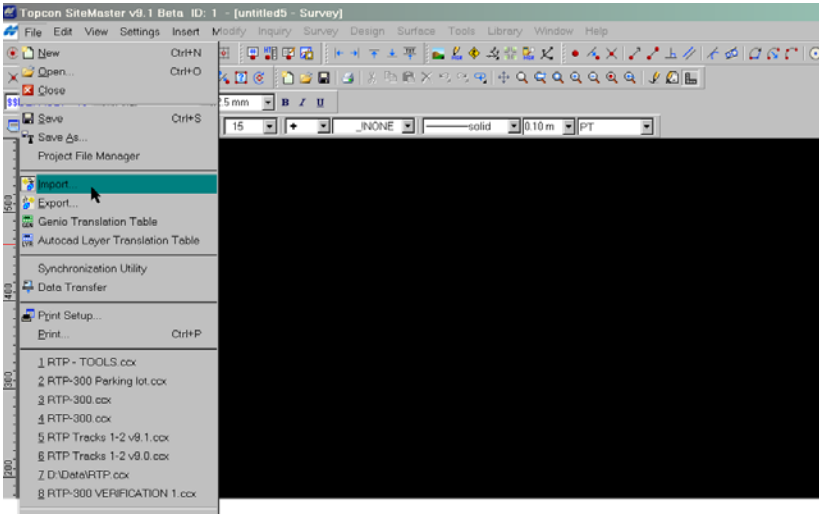


Figure 3-21. Import a File

2. Change the file type to **ASCII (*pts, *asc,* csv, *txt)**, and then navigate to the GPS corrected files from the Profiler software (see Profiler export above), and click **Open**.

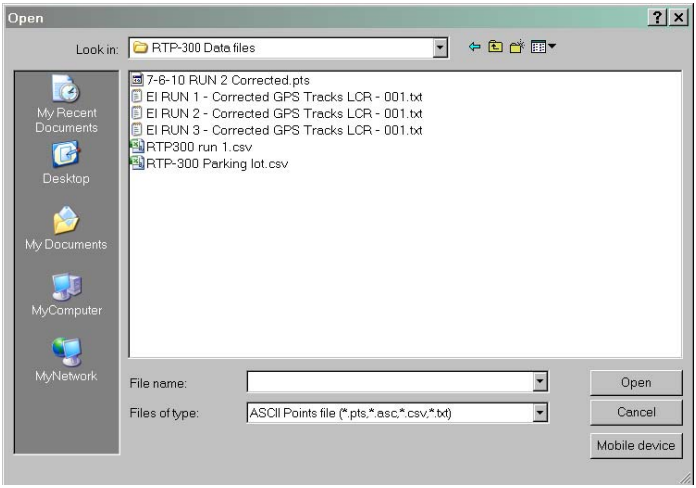


Figure 3-22. Change File Type

3. From the ***ASCII File Format*** screen (Figure 3-23), confirm that the ***Field Order*** is correct for the data in the corrected file being imported (P-Point Number, N-Northing, E-Easting, Z-Elevation, C-Code).

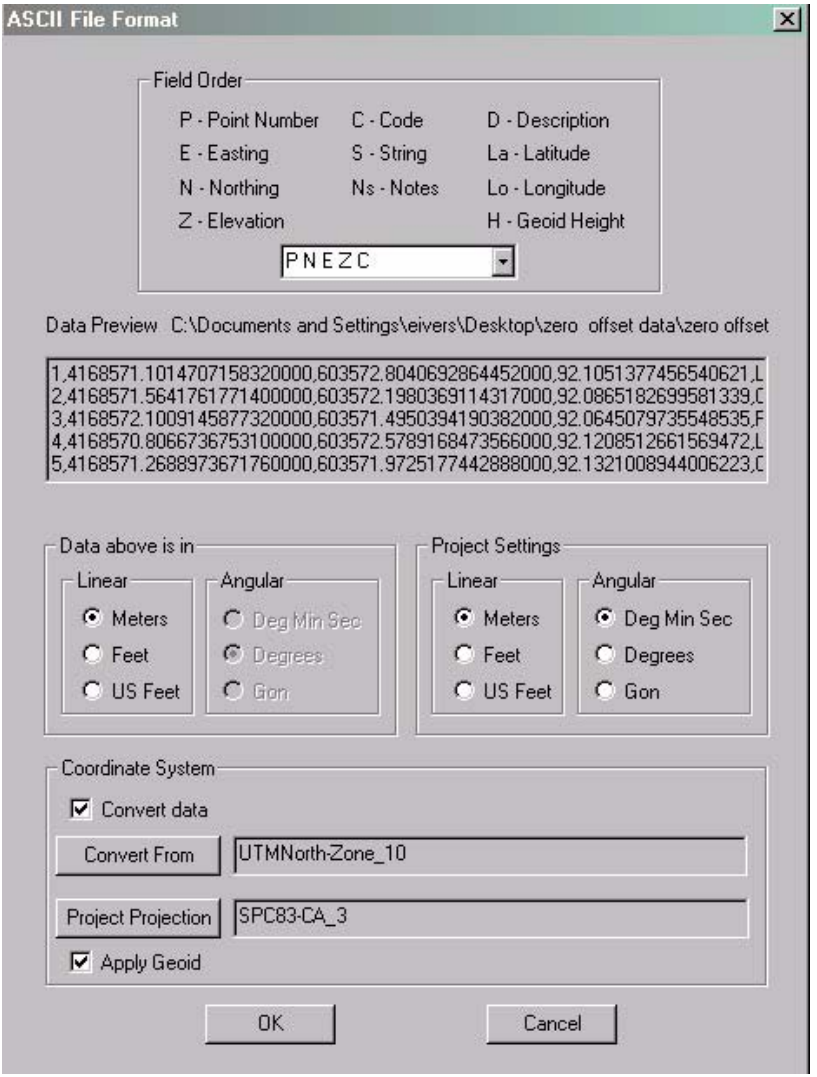


Figure 3-23. File Format Confirmation

4. Select the appropriate units in the corrected file (Figure 3-23).

SiteMaster will automatically convert the corrected file units to match the units being used in the SiteMaster project.

The project units will be generated by the units defined in the SiteMaster project.

5. Select the appropriate ***Coordinate System*** for the corrected data file being imported (Figure 3-23).
   If converting to a coordinate system other than UTM, select the **Convert data** check box, and select the appropriate coordinate system of the corrected data (UTM, north or south and the appropriate zone).

All corrected RTP data is in UTM format.

The project projection will be generated form the coordinate system defined in the SiteMaster project.

6. If a geoid is being applied to the data in the SiteMaster project, select the **Apply geoid** check box (Figure 3-23).

The elevations in the corrected RTP data files do NOT have a geoid applied.

7. Click **OK**.

8. From the ***Point Code and Attributes*** screen, set the ***Point code*** to **Field codes**, and click **OK**.

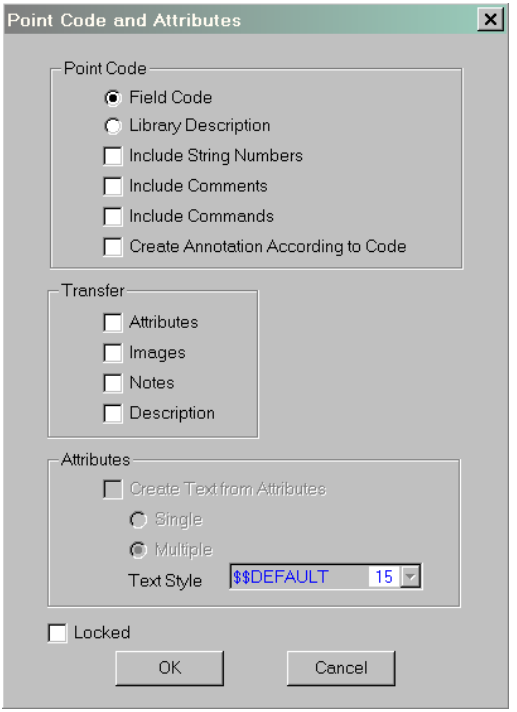


Figure 3-24. Field Code

NOTICE

Please refer to the SiteMaster Reference Manual (7010-0946) for further instructions on how to utilize SiteMaster for creating a DTM.

NOTICE

If working with State Plane Coordinates or localization on your job site, please refer to the SiteMaster manual (7010-0946) Chapter 12 Translating/Rotating data.

Topcon Positioning Systems, Inc.
7400 National Drive, Livermore, CA 94550
800·443·4567 www.topconpositioning.com

ISO 9001:2000
FM 68448

RTP-300 Installation and Quick Setup Guide
P/N: 7010-0995 Rev A 1/11