ProMark3 with PDL radios

Pacific Crest offers ***The Guide to Wireless GPS Data Links***. That little book can help people who use a radio data link work more productively. Please download it from their web page at

http://www.paccrst.com/

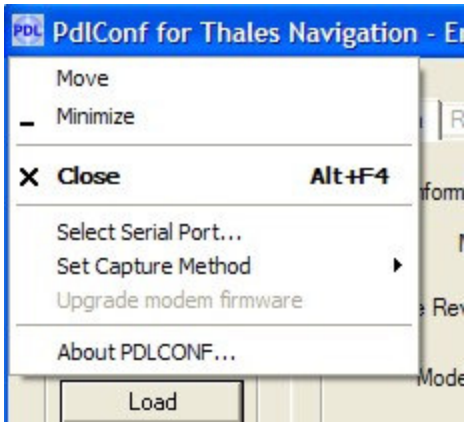
Using the PDL radios with the ProMark3 receivers includes using the PDLCONF software to examine or modify the configuration of the radios for field work. The PDLCONF software can be downloaded from the Pacific Crest web page.

This document will include screen shots illustrating the use of PDLCONF to configure PDL radios. This is not a replacement for the instructions available using the Help button in the PDLCONF software or the ProMark3 and FAST Survey manuals.

Connecting the PDL to PDLCONF

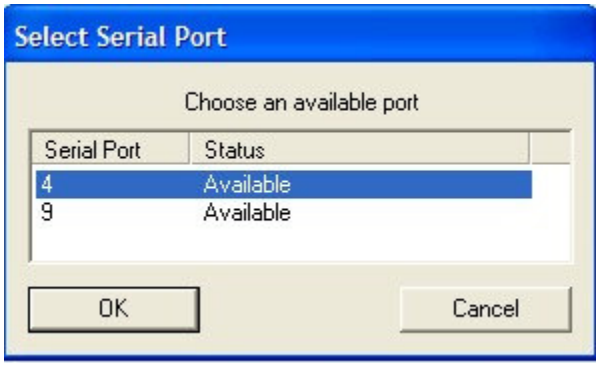
Some instructions are the same for both the base and rover radios.

Click on the small square button with PDL in it at the top left corner of the PDLCONF window to bring up a software configuration window.

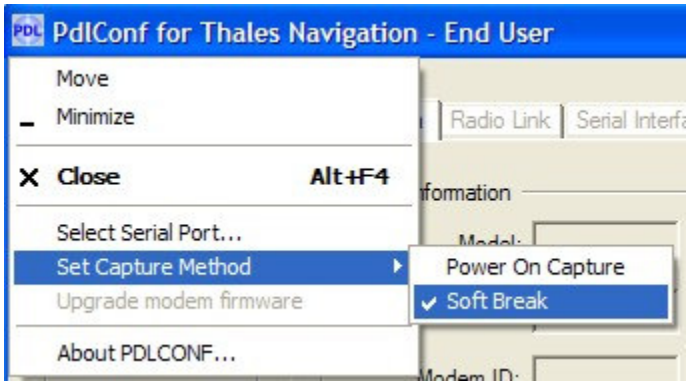


Select a Serial Port that is appropriate for your computer.

The right choice for my computer is serial port 4.



Click on OK after selecting the port.



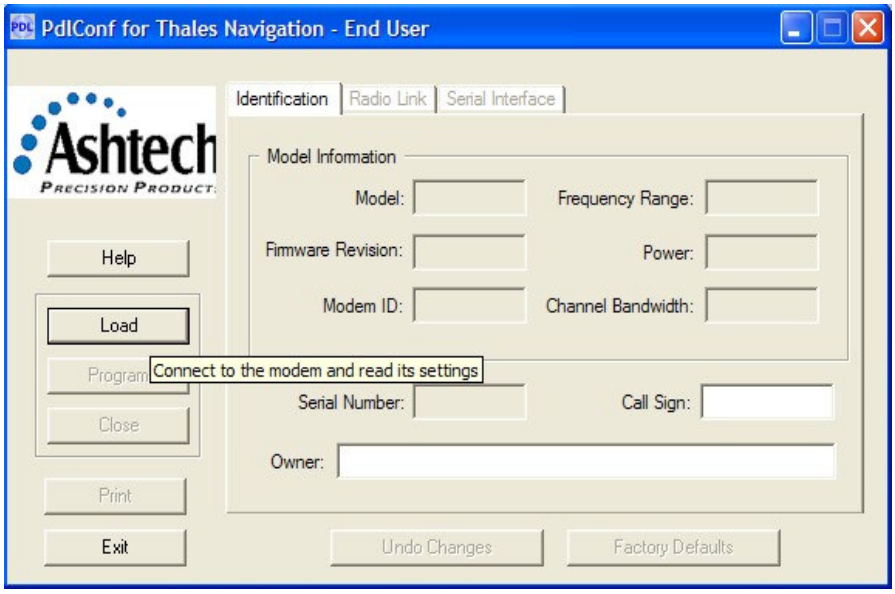
Set the Capture Method to Soft Break.

Using PDLCONF with the PDL Base

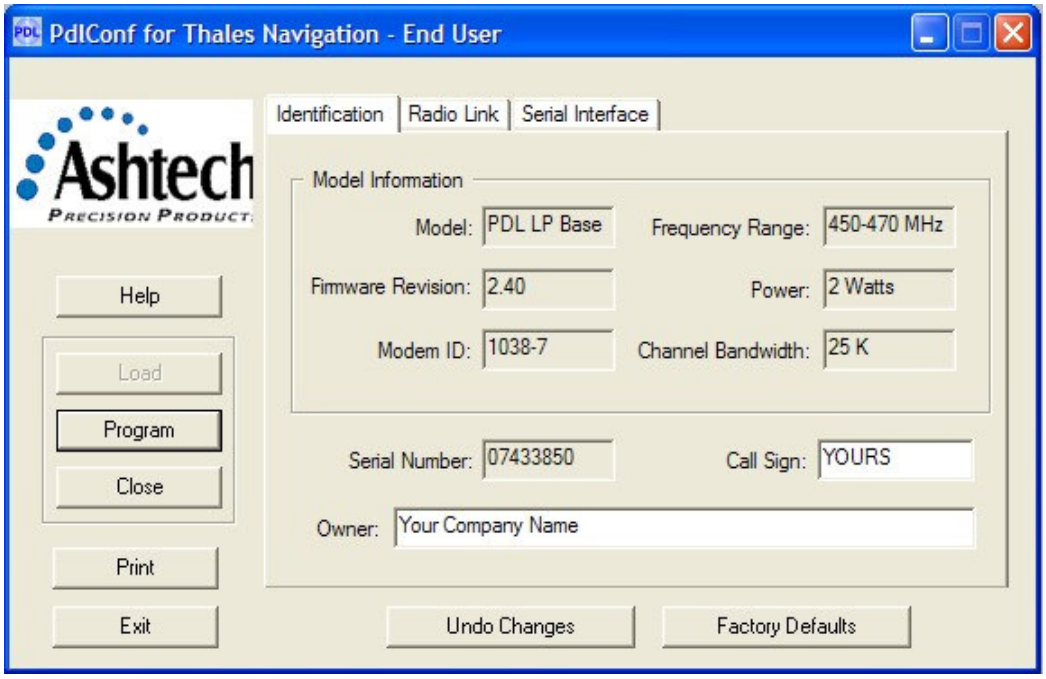
Is the PDL Base ready?

This PDL base radio, with antenna mounted and battery connected, is ready for the connection to the PDLCONF software through a USB to Serial adapter cable.

Click on the Load button to begin the connection to the base radio.



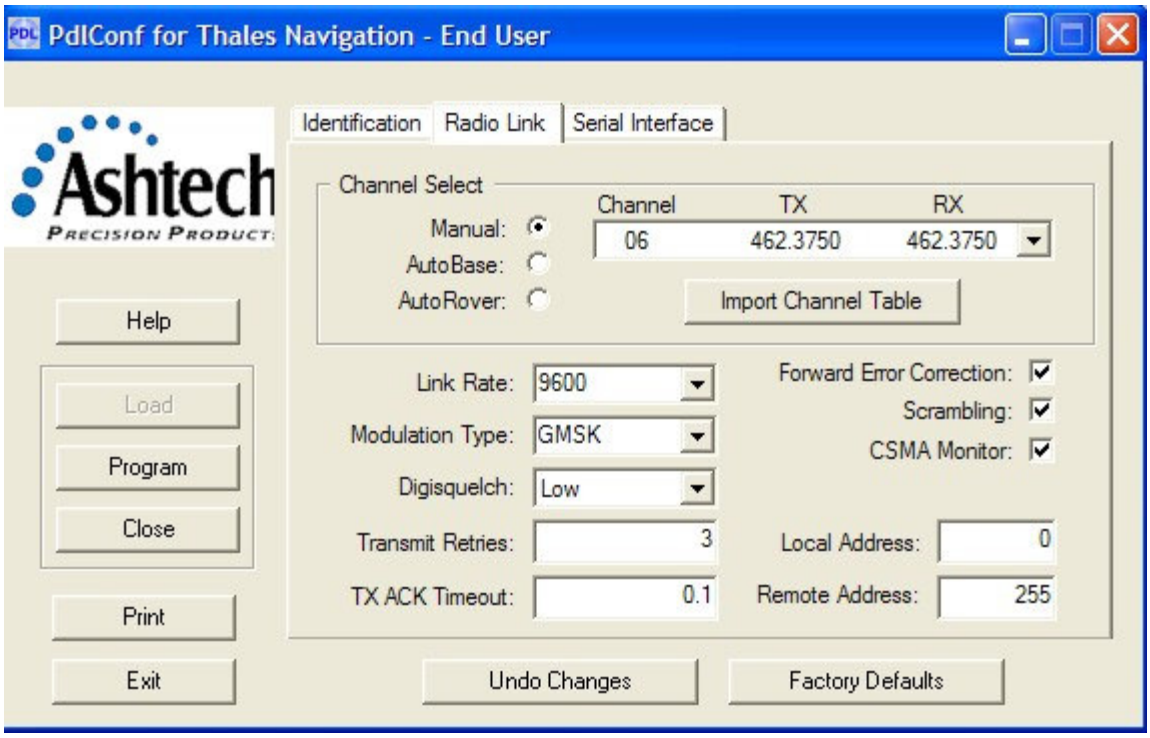
PDLCONF will read information from the radio and display it on the three tabs shown on this window.



If you want help obtaining a call sign from the government there are companies who can help get this done. Atlas License Company is one such company.

http://www.alcds.com/

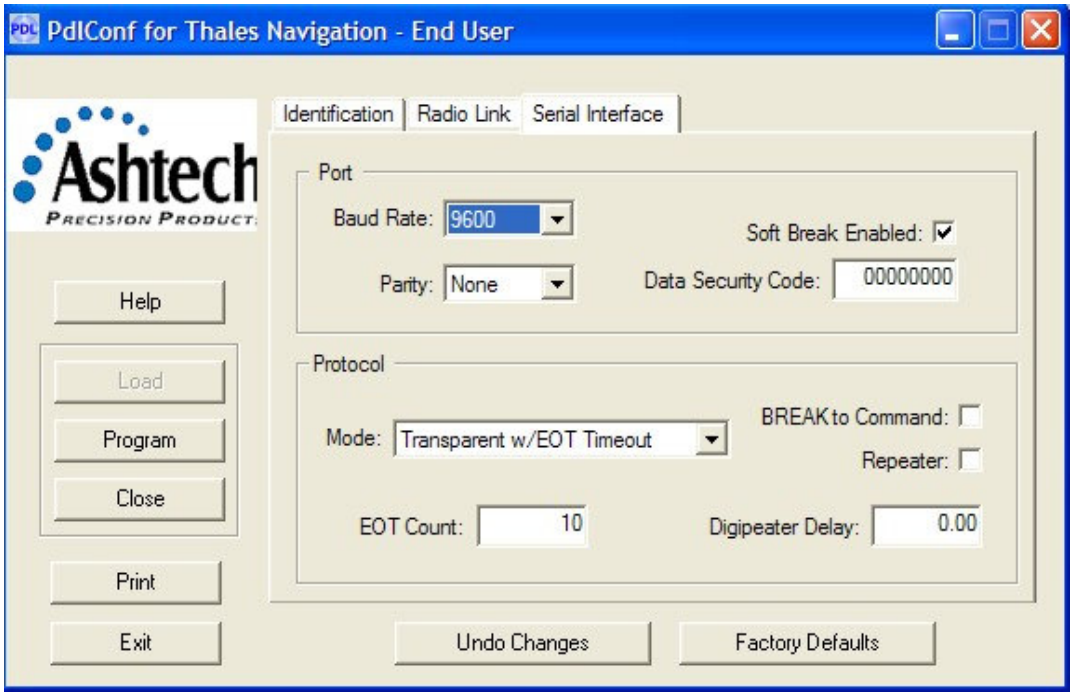
Complete the Identification tab with the call sign from the license and the name of the license holder.



The Radio Link settings determine how the base and rover radios will work together. This is not the only possible way to configure the base radio. This illustrates how the radios were configured for testing the system.

The PDL base radio is designed to stop transmitting whenever it receives a radio signal. With the Digisquelch set to Low it will require a strong signal to make it stop transmitting. Setting the base to work on a frequency that is used by other radio transmitters in the area will reduce reliability and range.

A portable scanner can help determine whether a clear channel can be selected for the field work. Find a scanner that will work in the same radio range as your PDL radios and carry it with you in the field. The scanner serves two useful purposes. It will help you determine whether you can select a channel from your list that has very little competition. It will help you know whether the base radio is actually transmitting the RTK corrections.



The serial interface relates to communication between the ProMark3 and the PDL. The settings illustrated were used during testing.

Once everything is configured properly a click on the Program button will save the settings to the base radio.

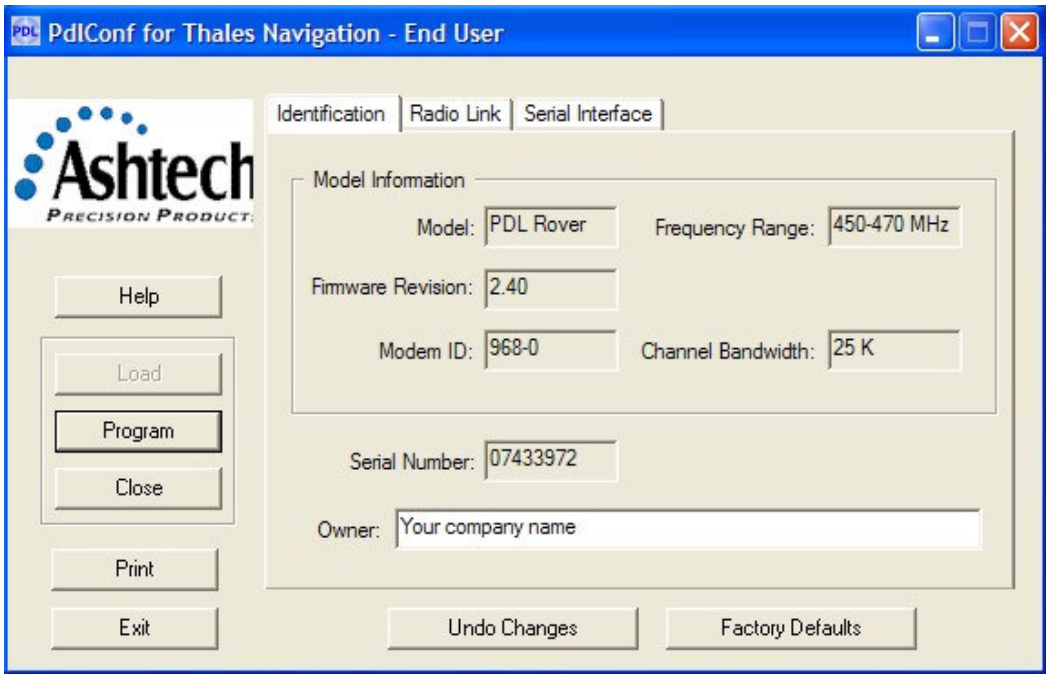
Click on the Print button to create a report about the PDL radio settings. The report provides useful information that should be part of your records.

Click on the Close button to disconnect from the base radio and prepare for the connection to the rover radio.

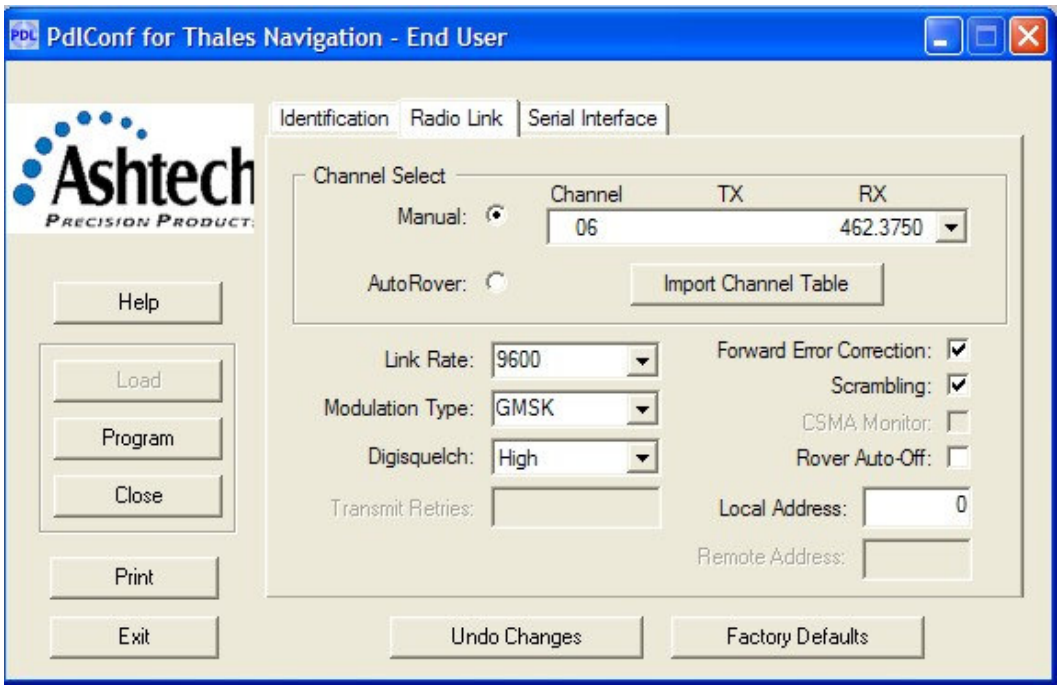
Using PDLCONF with the PDL Rover

Setting up PDLCONF to communicate with the rover radio is identical to setting it up for the base. Is the rover radio ready?

The rover PDL uses its own internal battery that is charged only while the rover radio is turned on and connected to the charger. While it is charging the LED display has a rotating line going around it. When the internal battery is fully charged **F** will appear on the LED display. This PDL rover radio is ready for a click on the Load button.



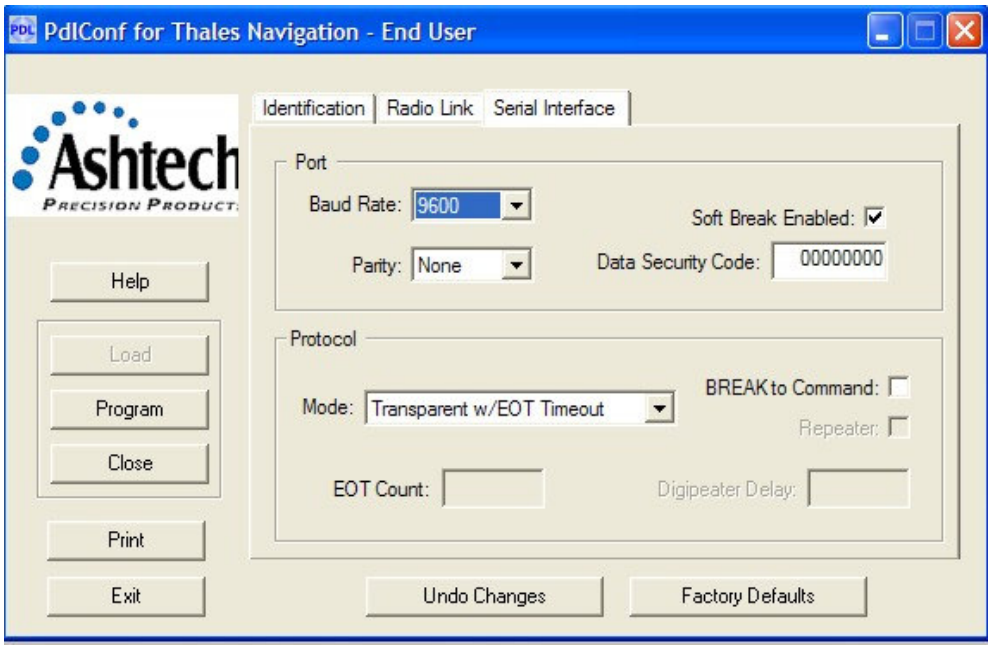
Edit the owner information to help identify this radio as yours.



The Radio Link settings are about communication between the radios.

Be certain that the rover radio Channel Table matches the base and your radio license. Contact your Pacific Crest dealer for assistance with the Channel Table. In the field all you can choose is the channel number. This is your only opportunity to know that the frequencies match.

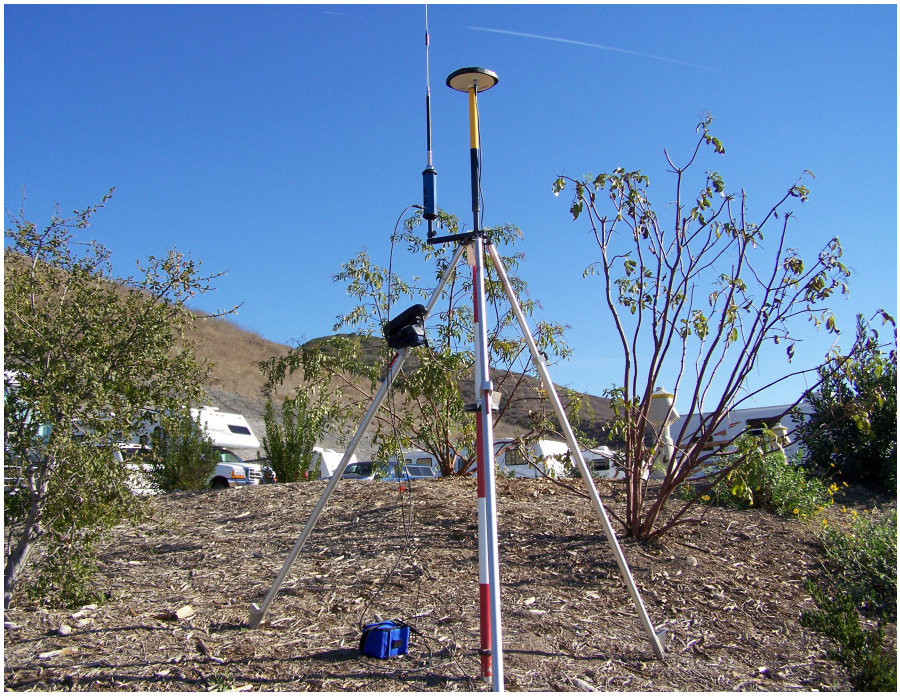
The PDL radios were tested using Digisquelch set to High in a rural environment where there was very little interference. In an urban environment with lots of competition for the radio frequencies the tests worked better with the rover Digisquelch set to Moderate. The High setting provides for maximum range in places where there is little interference with the selected radio frequency. The Moderate setting reduced the maximum range in the rural environment but made the data link work more reliably in a place where lots of radio interference caused reliability problems.



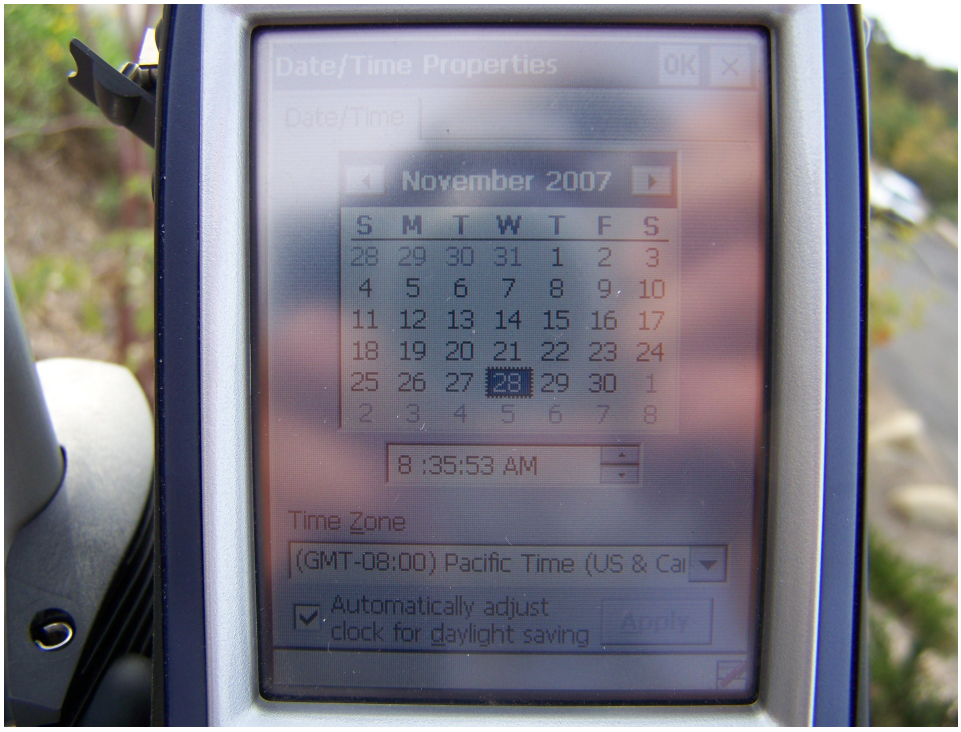
Click the Program button to send your changes to the PDL radio then click the Close and Exit buttons to disconnect from the radio and exit from PDLCONF.

ProMark3 RTK and PDL Base in the field

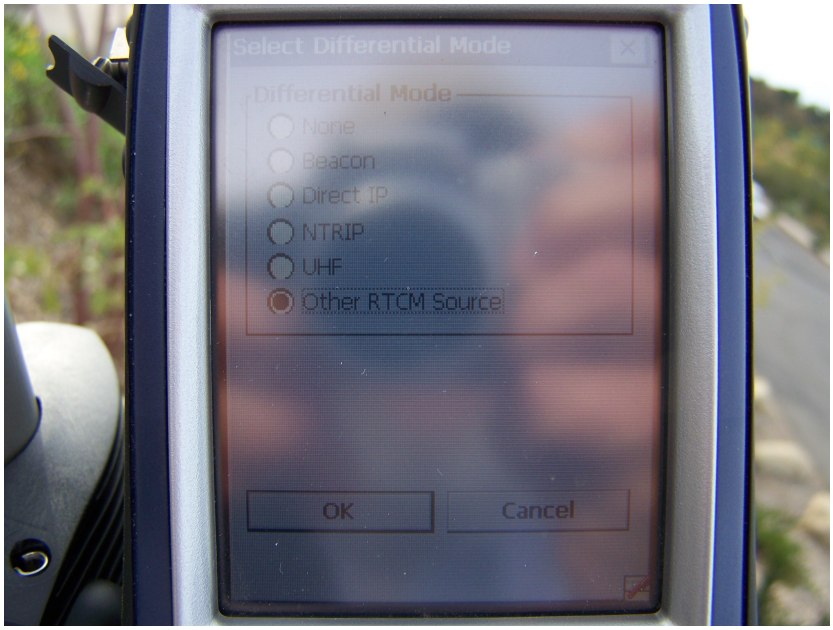
With the PDL radios configured for field work it is time to set up the ProMark3 RTK base. Find a base station location that has a clear view of the sky. Make all the cable connections before you power on the ProMark3. Make sure the radio battery will provide adequate power for the radio and the ProMark3. This may require testing with a voltmeter. Time spent on the battery charger is not a guarantee that the battery provides adequate power.



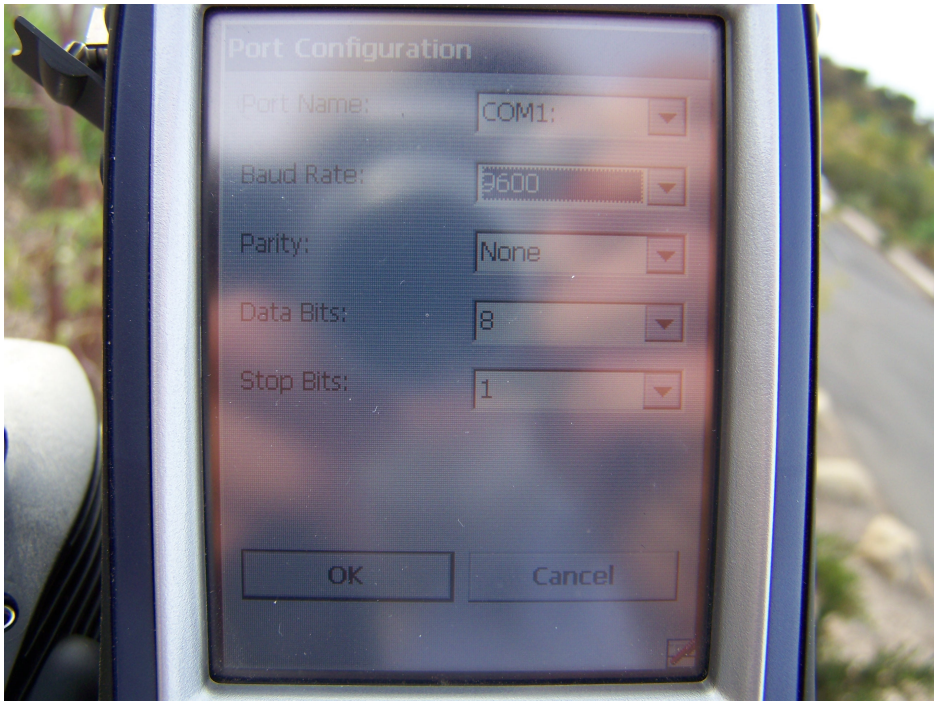
After the ProMark3 boots up check to make sure the clock sets properly. Wait for the GPS signal to set the clock.



The first indication that the radio cable is properly connected is the charge light on the ProMark3. The PDL radio battery will charge the ProMark3 battery while it is set up as a base station.



Open the DGPS Configuration menu from the ProMark3 desktop and choose Other RTCM Source. The base station will receive differential corrections from the SBAS. This configuration will set the base to send corrections using the settings appropriate for the PDL base radio as it was configured using PDLCONF.



The PDL base radio on COM1 with a Baud Rate of 9600. Parity None, Data Bits 8, and Stop Bits 1 completes the settings for the connection to the PDL base radio. Tap the OK button to apply these settings. Tap the Connect button to make the connection to the PDL

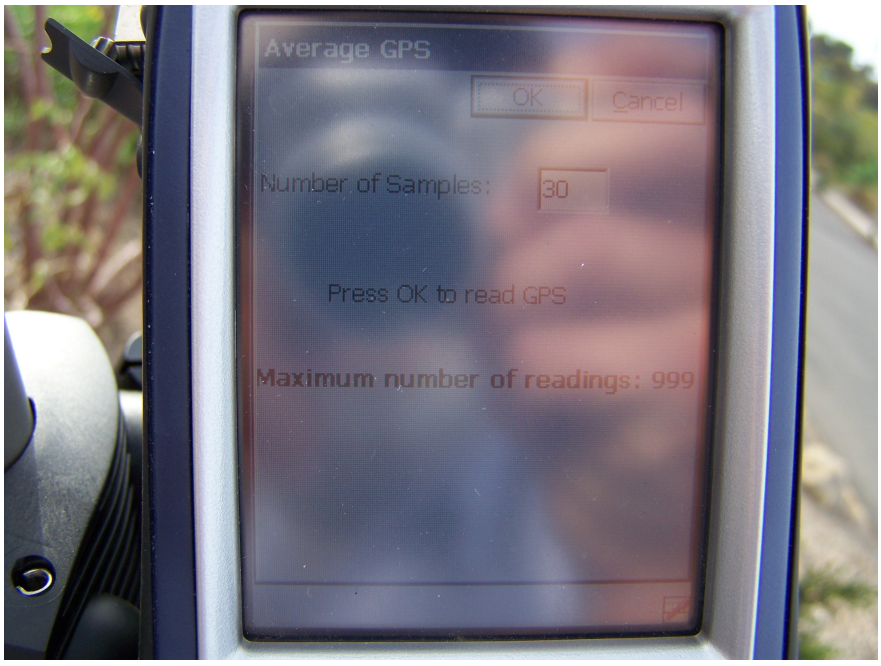
base radio. The base radio will not indicate incoming data because this connection is for the purpose of sending corrections from the ProMark3 RTK base. The DGPS Configuration for the rover will be done the same way.

Find additional information about these settings in the ProMark3 RTK Reference Manual on pages 219 - 220.

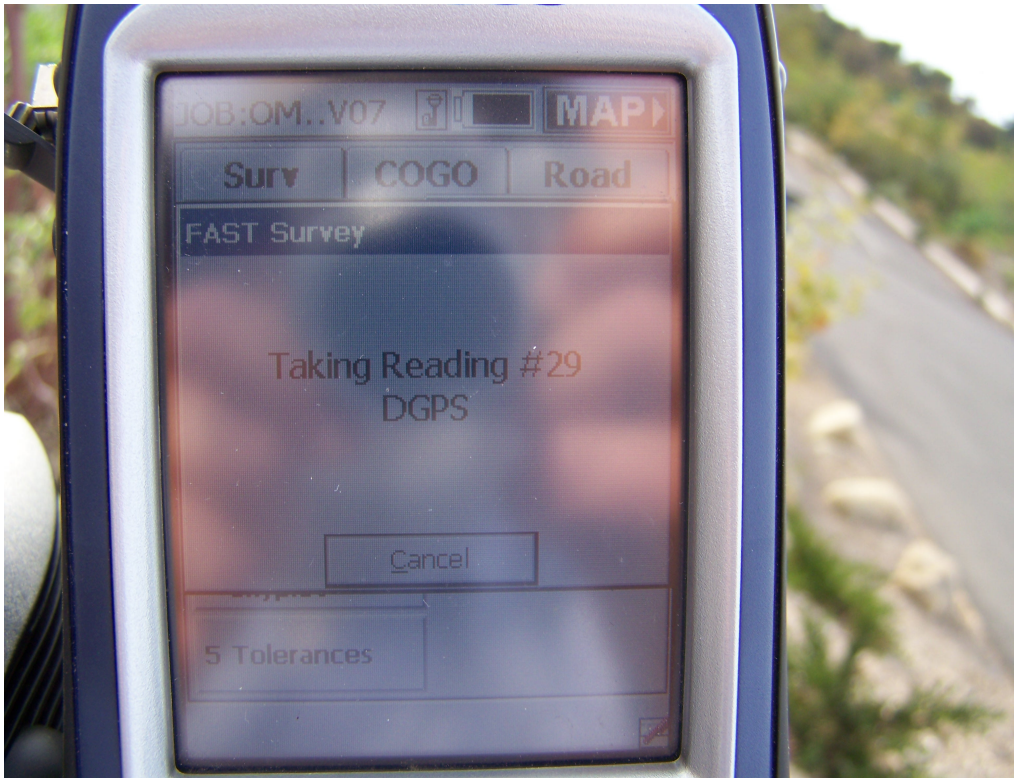
The instructions for setting up the ProMark3 as an RTK base station are in the manuals. The following photos illustrate some of the procedures used during testing.

Before setting the base check to see what kind of position is being computed. Evaluate how good the position is. The autonomous position is not bad but waiting for a DGPS solution with the SBAS will improve the accuracy of the base station coordinates.

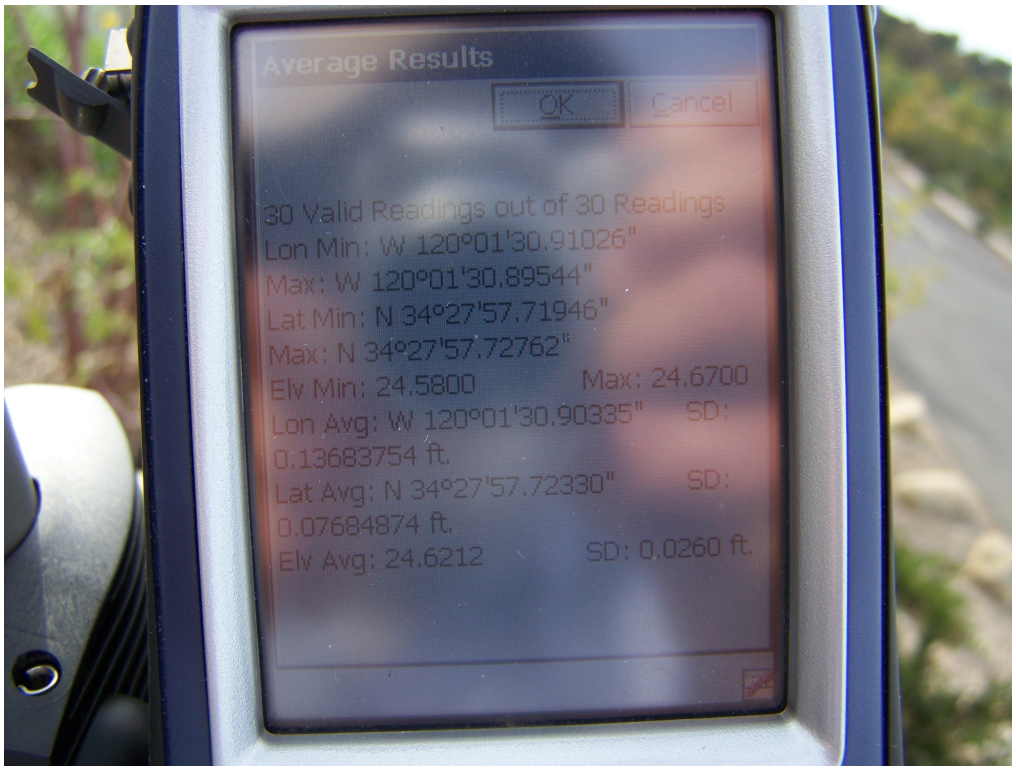
Data recording is not required for RTK work but the raw data file can be used in GNSS Solutions to compute even more accurate base station coordinates relative to the CORS or another ProMark3 set on a geodetic control point.



An average of 30 readings will help record a good base station position for the RTK work.



Thirty seconds passes quickly. The next screen shows the base station coordinates that will be used for the corrections. Localization, if desired, will be done at the rover.



With the ProMark3 RTK base station set the PDL base radio begins blinking the TX light at a uniform interval. A RX light indicates competition for the selected frequency. A different channel must be selected if the RX light is on and the TX light is not blinking.

It is time to set up the rover.

ProMark3 RTK and PDL rover in the field

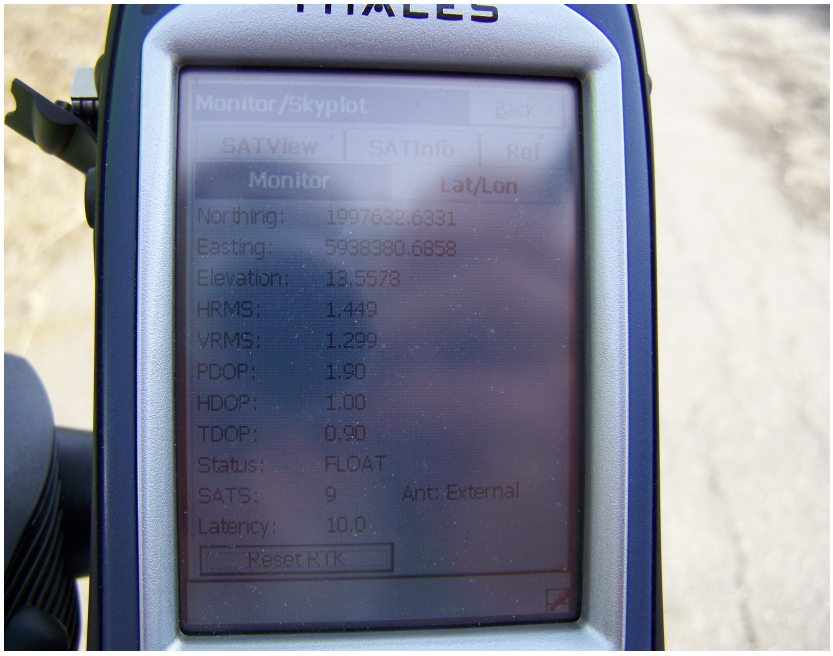
Some people have asked why the PDL rover radio was mounted on the SECO backpack that I typically use to mount the NAP100 antenna for Mobile Mapping work. The pole bracket for the rover radio was not available during testing. Contact your dealer about the pole bracket made by SECO.

http://www.surveying.com/products/details.asp?prodID=2133-03

The PDL rover radio is powered by its internal battery. The ProMark3 and the GPS antenna will draw power from the ProMark3 internal battery

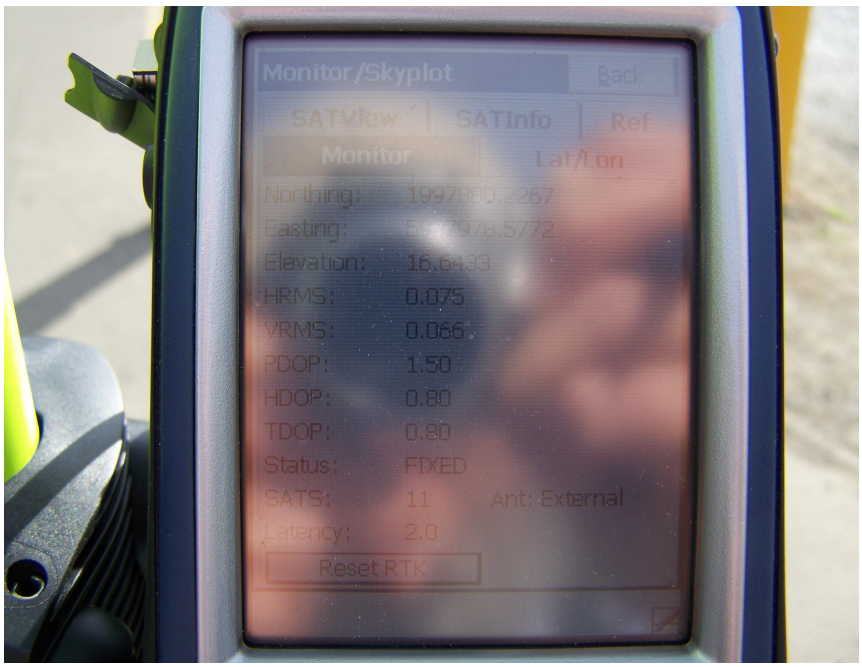
Use the DGPS Configuration menu from the ProMark3 desktop to set up the rover connection to the PDL rover radio in the same way as it was done with the PDL base. This time the DGPS Configuration menu will show data being received after the Connect button is tapped.

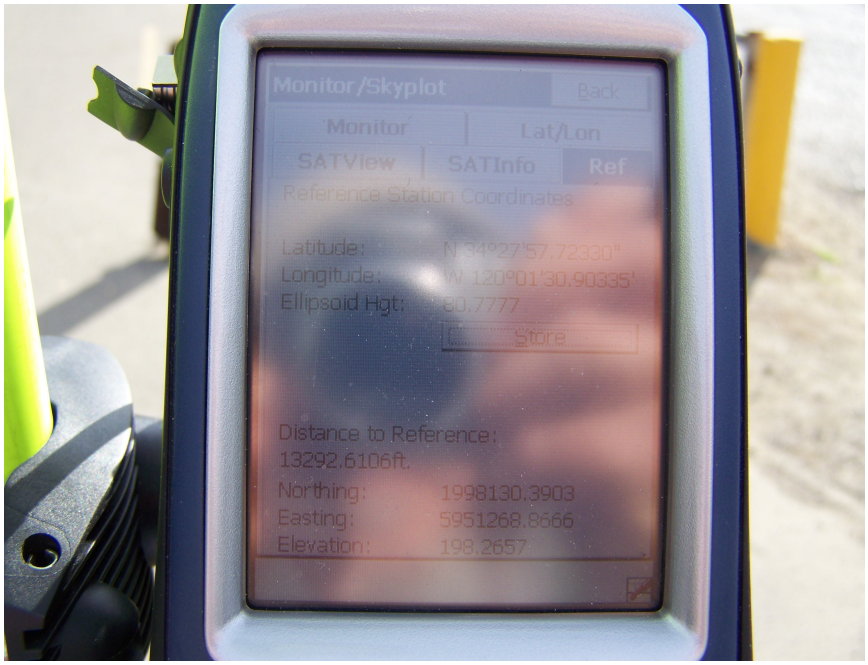
When the rover first receives corrections from the base it will show a Float solution.



A latency of 10 is rather high. When the radio link is performing well the latency will typically be near 2.0

Using a static on the fly RTK initialization together with the SBAS corrections the fixed RTK solution is not far behind the float solution.

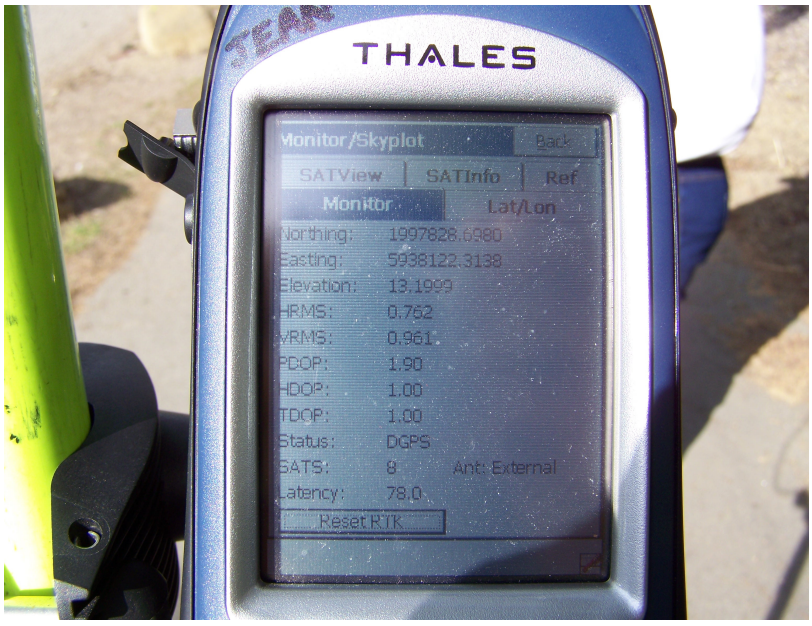




Check the Ref tab to see where the base station is located. This fixed solution 2.5 miles from the ProMark3 RTK base was good news. It was also a reasonable number. This indicates that the corrections being used are coming from the base station that was set up for this project. Tap the Store button to record the base station coordinates in the rover data file.

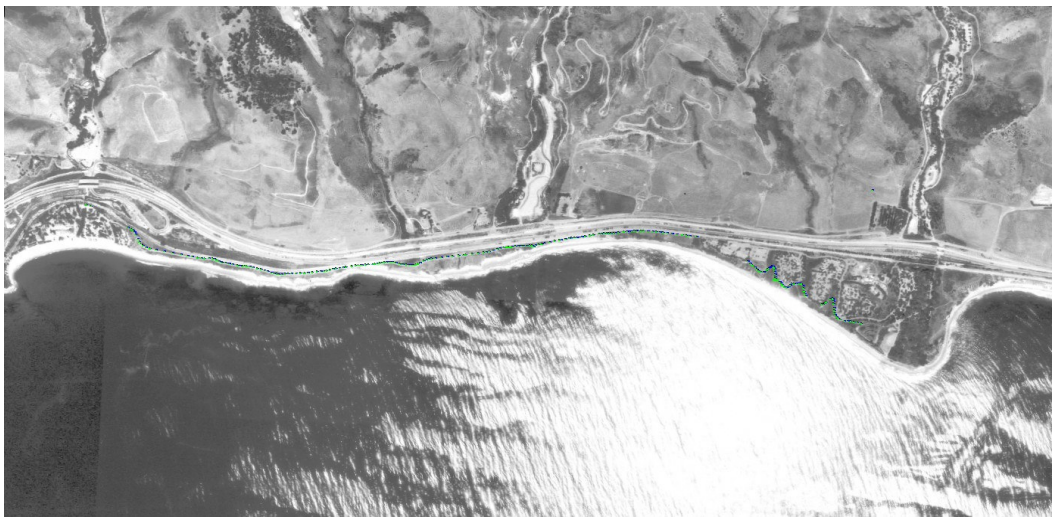
Note: The elevation of the Reference station is the elevation at the antenna rather than the point where the ProMark3 base station is set up.

This Float solution with a Latency of 58.0 indicates that the data link has been lost. The HRMS and VRMS are accuracy estimates. The estimates do not guarantee accuracy nor do they measure the potential for error.



If the data link is lost the ProMark3 rover will default to a DGPS solution using the SBAS. The latency of 78.0 indicates that the radio data link is not working. Can this be explained by ***The Guide to Wireless GPS Data Links***? Is the portable scanner picking up a signal from the base? Are the base and rover batteries providing adequate power?

One of the projects done while testing was a profile of the hiking trail that connects El Capitan State Beach with Refugio State Beach in Santa Barbara County, California.



In this overall map Refugio is on the left and El Capitan on the right. The profile shots are barely visible but the aerial photo helps to reveal the variations in terrain and environment that made this an excellent test of the potential of the ProMark3 RTK system with the PDL radios. Zooming in on the mid section shows some of the measurements.

Phil Stevenson
December 30, 2007