

Ashtech Z-Xtreme RTK / TDS Ranger - Survey Pro CE Version 3.2.1 - Sales Support Document

RTK Demo - TDS Mapping Plane with known WGS84/NAD83 – State Plane Coordinates & Geoid Model

Pre-load all the project's NAD83 control point's coordinates, create and transfer the necessary Geoid model over to the Ranger.

Setup RTK Base Station on known WGS84 / NAD83 Control Point
Measure the HI of the RTK Base Station.

On the TDS Ranger, start the TDS Survey Pro CE software by double-tapping on the Survey Pro icon, or from the **Start | Programs | Survey Pro** menu...

The TDS Survey Pro CE logo / splash screen will be displayed...

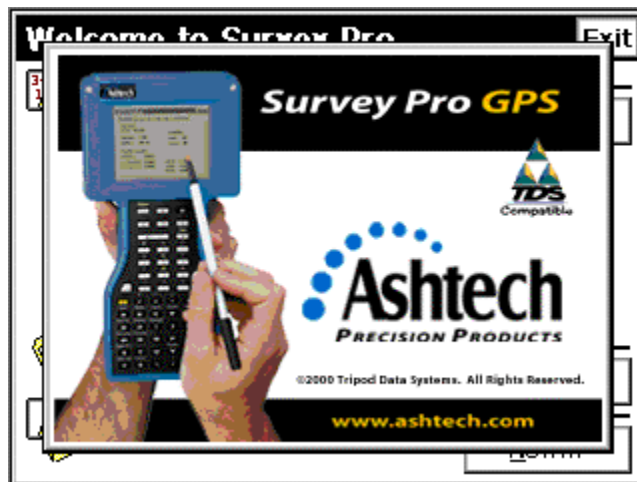


Figure 1

After a few seconds, the Logo / Splash screen will close automatically.

To manually close the Logo / Splash screen, simply tap anywhere on the screen.

The next screen...

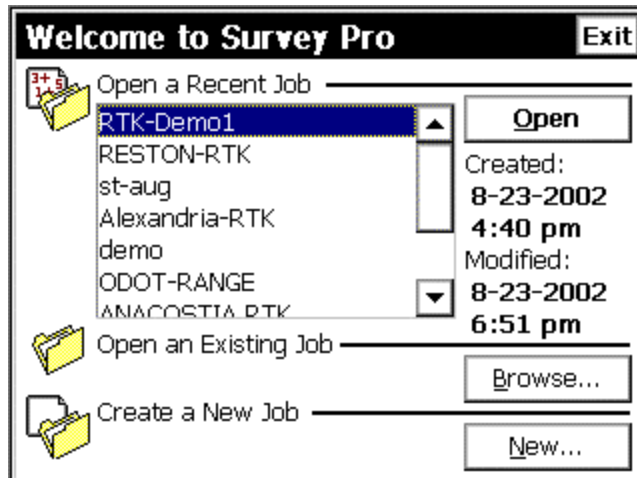


Figure 2

The Welcome to Survey Pro dialog menu...

Select the “**Create a New Job**” menu, tap the New... button,

The next screen...

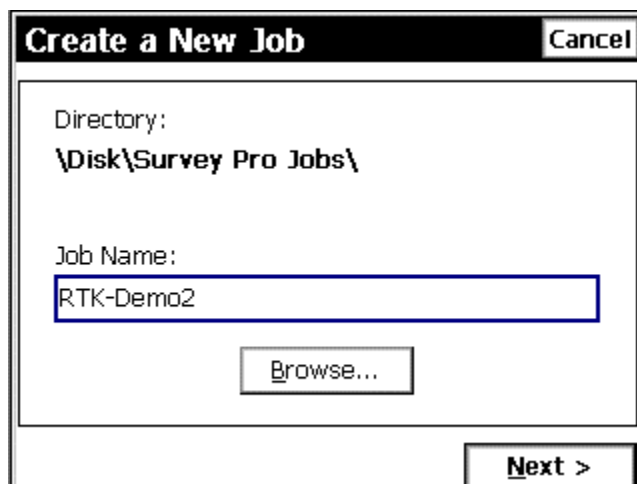
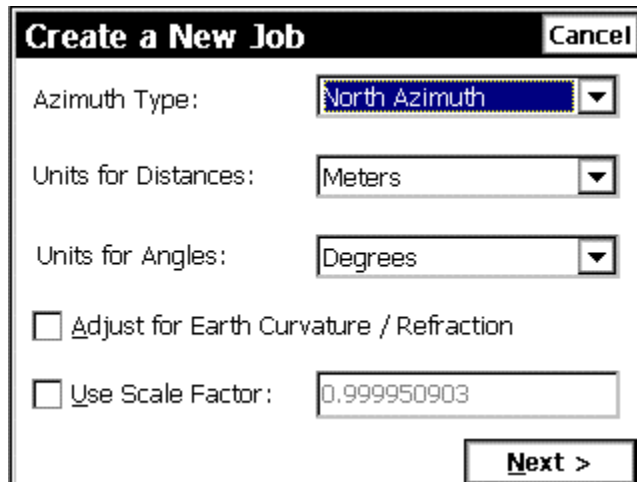


Figure 3

Input a name for the New Job: **RTK-Demo2**

Next, Tap the **Next >** button...

The next screen...



Create a New Job Cancel

Azimuth Type: North Azimuth

Units for Distances: Meters

Units for Angles: Degrees

☐ Adjust for Earth Curvature / Refraction

☒ Use Scale Factor: 0.999950903

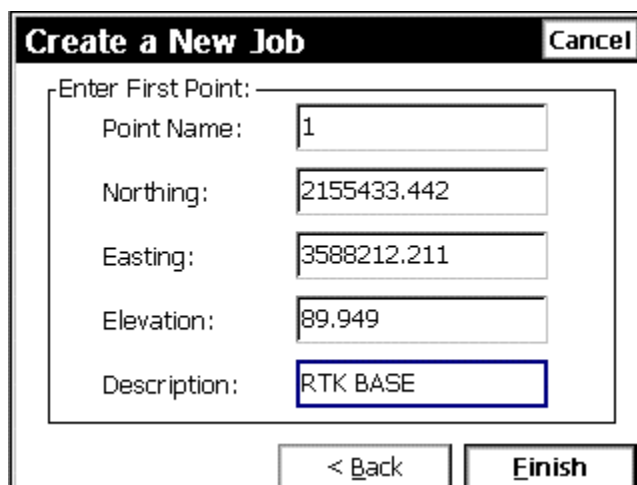
Next >

Figure 4

Select the Options as shown above

Next, tap the **Next >** button...

The next screen...



Create a New Job Cancel

Enter First Point:

Point Name: 1

Northing: 2155433.442

Easting: 3588212.211

Elevation: 89.949

Description: RTK BASE

< Back Finish

Figure 5

Enter the RTK Base points known NAD83 State Plane Coordinates,
Next , Tap the **Finish** button...

To add additional points select, [2] Job – [B] Edit Points menu then select **I**nsert...

The next screen...

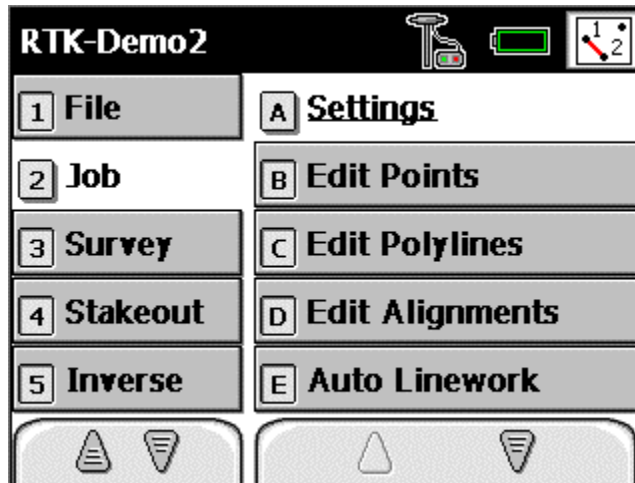


Figure 6

From the Survey Pro CE main menu,
Tap on [2] Job – [A] Settings menu...

The next screen...

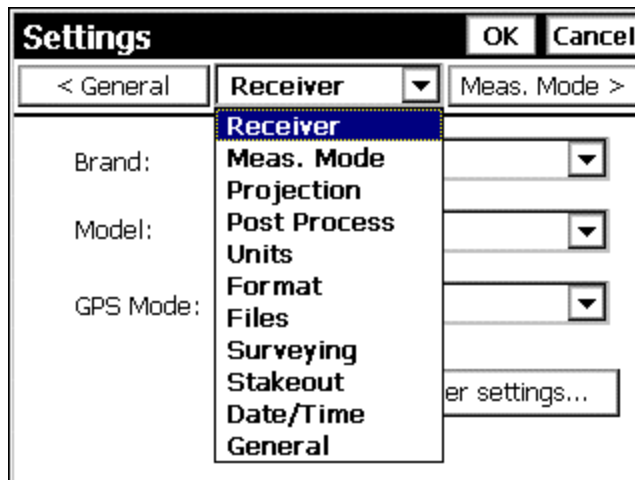


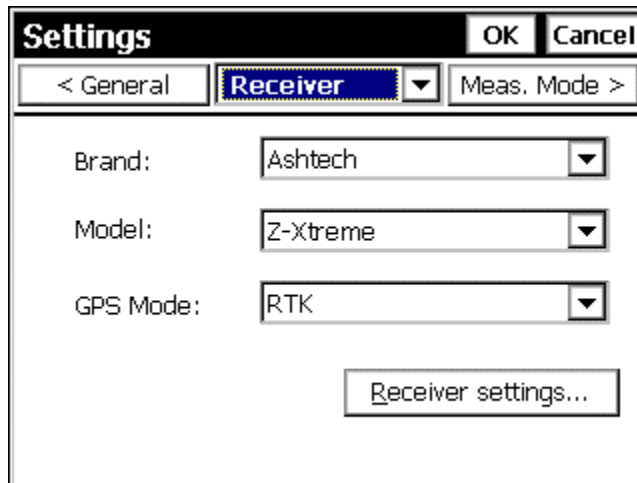
Figure 7

In the **Settings** menu, Tap on the center Pull-Down menu...
This is the Primary Settings Pull-Down menu for the Survey Pro CE software.

The basic flow-chart of the Settings menu, work your way down through the menu,
Top to bottom...

Tap on the Down-Arrow, select **Receiver...**

The next screen...



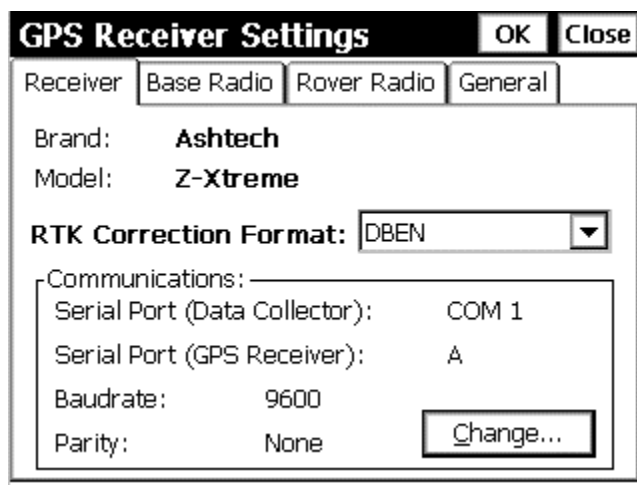
The screenshot shows a 'Settings' dialog box with a title bar containing 'Settings', 'OK', and 'Cancel'. Below the title bar is a navigation bar with three tabs: '< General', 'Receiver' (which is highlighted in blue), and 'Meas. Mode >'. The main area of the dialog contains three dropdown menus: 'Brand:' with 'Ashtech' selected, 'Model:' with 'Z-Xtreme' selected, and 'GPS Mode:' with 'RTK' selected. At the bottom right of the main area is a button labeled 'Receiver settings...'.

Figure 8

Select the Options as shown above:

Next, Tap on the **Receiver settings...** button,

The next screen...



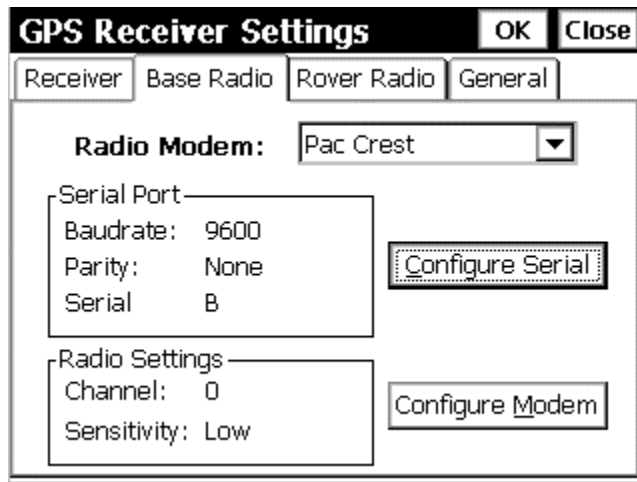
The screenshot shows a 'GPS Receiver Settings' dialog box with a title bar containing 'GPS Receiver Settings', 'OK', and 'Close'. Below the title bar is a navigation bar with four tabs: 'Receiver' (highlighted), 'Base Radio', 'Rover Radio', and 'General'. The main area contains the following settings: 'Brand:' set to 'Ashtech', 'Model:' set to 'Z-Xtreme', and 'RTK Correction Format:' set to 'DBEN' (via a dropdown menu). A section titled 'Communications:' is enclosed in a box and contains: 'Serial Port (Data Collector):' set to 'COM 1', 'Serial Port (GPS Receiver):' set to 'A', 'Baudrate:' set to '9600', and 'Parity:' set to 'None'. A 'Change...' button is located at the bottom right of the 'Communications' box.

Figure 9

Select the Options as shown above:

Next, Tap on the Base Radio tab...

The next screen...



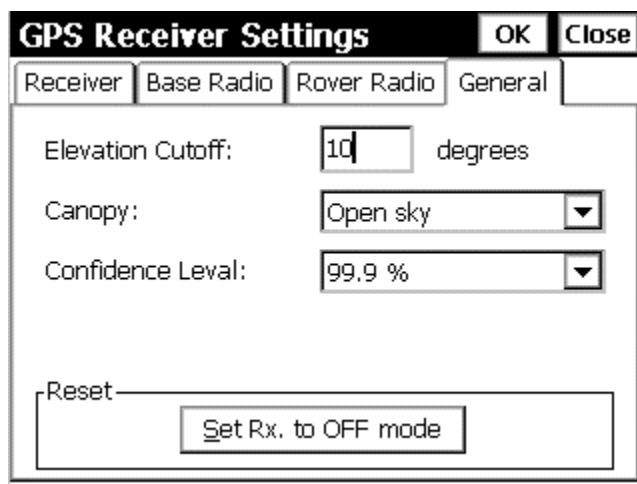
The screenshot shows the 'GPS Receiver Settings' dialog box with the 'Base Radio' tab selected. The 'Radio Modem' is set to 'Pac Crest'. Under 'Serial Port', the Baudrate is 9600, Parity is None, and Serial is B. There is a 'Configure Serial' button. Under 'Radio Settings', the Channel is 0 and Sensitivity is Low. There is a 'Configure Modem' button. The dialog has 'OK' and 'Close' buttons at the top right.

Figure 10

Select the Options as shown above:

Next, Tap on the General Tab...

The next screen...



The screenshot shows the 'GPS Receiver Settings' dialog box with the 'General' tab selected. The 'Elevation Cutoff' is set to 10 degrees. The 'Canopy' is set to 'Open sky'. The 'Confidence Level' is set to 99.9 %. There is a 'Reset' button and a 'Set Rx. to OFF mode' button. The dialog has 'OK' and 'Close' buttons at the top right.

Figure 11

Select the Options as shown above:

When finished verifying the GPS Receiver Settings – Tap **OK...**
This will return you to the **Settings** Menu...

Next, Tap on the Center Pull-Down menu, select **Measure Mode...**

The next screen...

The screenshot shows a 'Settings' dialog box with a title bar containing 'Settings', 'OK', and 'Cancel'. Below the title bar is a navigation bar with three buttons: '< Receiver', 'Meas. Mode' (which is highlighted with a dropdown arrow), and 'Projection >'. The main content area of the dialog is divided into several sections. The first section contains 'Receiver Dynamics:' with a dropdown menu set to 'Static on occupy'. Below this is 'Store GPS Raw' with a dropdown menu set to 'Lat, Lng, Ht (EP)'. The next section has 'Accept:' with a dropdown menu set to 'Fixed RTK only' and 'Epochs Average:' with a text input field containing the number '1'. Below these is a section with a checkbox labeled 'Use Acceptance Criteria' which is currently unchecked. Under this checkbox are two rows of input fields: 'H RMS:' with a text input field containing '0.03 m' and 'PDOP:' with a text input field containing '6'. The final row in this section is 'V RMS:' with a text input field containing '0.05 m' and 'Auto Accept:' with a checked checkbox.

Figure 12

Select the Options as shown above:

Next, Tap on the Center Pull-Down menu, select **Projection...**

The next screen...

The screenshot shows a 'Settings' dialog box with a title bar containing 'Settings', 'OK', and 'Cancel'. Below the title bar is a navigation bar with three buttons: '< Meas. Mode', 'Projection' (which is highlighted with a dropdown arrow), and 'Post Process >'. The main content area of the dialog is titled 'Projection Types:'. It contains two rows of input fields: 'Horizontal:' with a dropdown menu set to 'Mapping Plane' and 'Vertical:' with a dropdown menu set to 'Geoid Model'. Below these is a section titled 'Path to Data Files:' which contains a text input field with the path '\\Disk\\TDS Geodata\\' and a 'Browse' button.

Figure 13

Select the Options as shown above:

After selecting the Projection “Mapping Plane”, in the **Job | Settings** menu, for the demo, Tap **OK**, this will return you to the Survey Pro CE Main menu...

Next, Tap on the [3] **Survey - [F] Projection** menu

Select the actual parameters for the Mapping Plane...

The next screen...

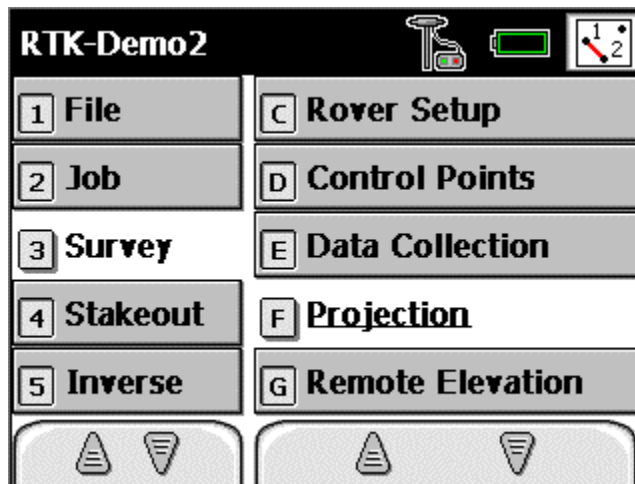


Figure 14

The next screen...

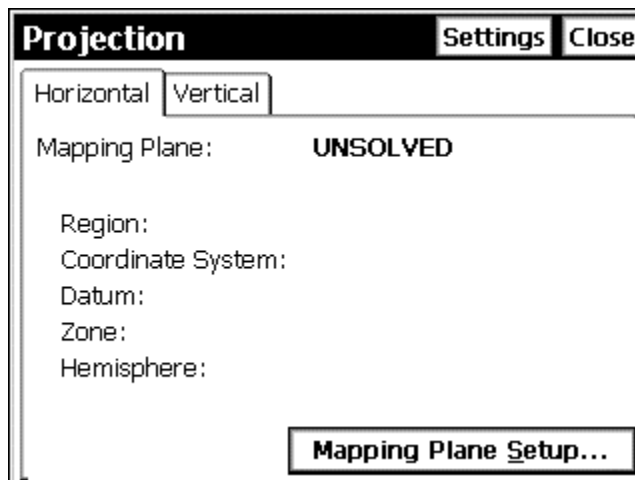
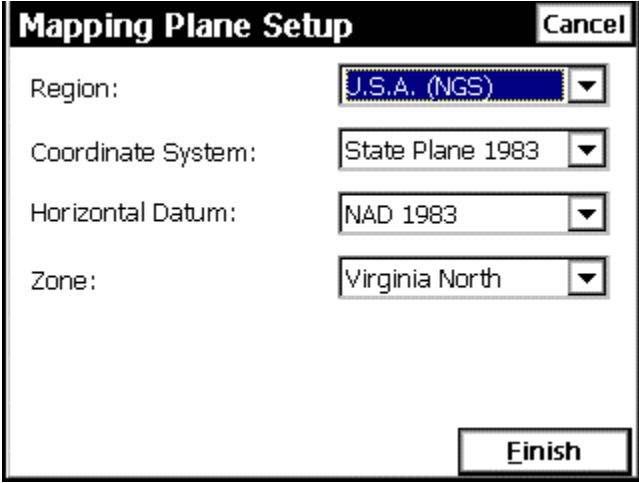


Figure 15

Initially, the Projection will report **UNSOLVED**, to establish the Mapping Plane, from the Horizontal Tab, Tap on the **Mapping Plane Setup...** button,

The next screen...



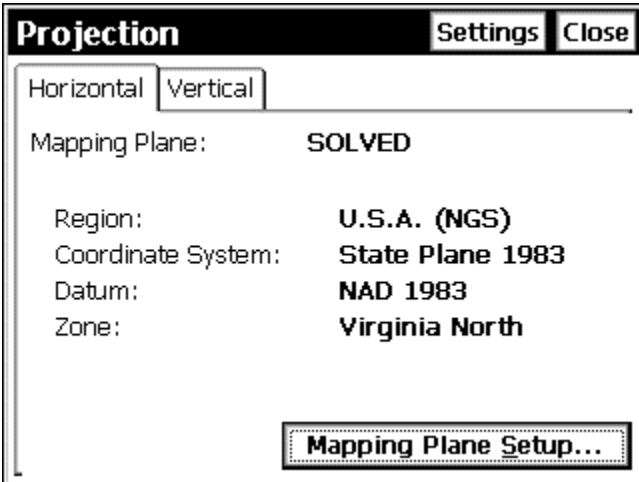
The image shows a 'Mapping Plane Setup' dialog box with a 'Cancel' button in the top right corner. It contains four dropdown menus: 'Region' set to 'U.S.A. (NGS)', 'Coordinate System' set to 'State Plane 1983', 'Horizontal Datum' set to 'NAD 1983', and 'Zone' set to 'Virginia North'. A 'Finish' button is located at the bottom right.

Figure 16

In this example, the RTK Demo will utilize NAD83 Virginia North - State Plane coordinates. Select the appropriate **ZONE** (State - Zone) for your demo.

When the Region, Coordinate System, Horizontal Datum, and Zone have been selected, Tap on the **Finish** button.

The next screen...



The image shows a 'Projection' dialog box with 'Settings' and 'Close' buttons in the top right corner. It has two tabs: 'Horizontal' (selected) and 'Vertical'. Under the 'Horizontal' tab, the 'Mapping Plane' is set to 'SOLVED'. Below this, the same settings as in Figure 16 are listed: 'Region: U.S.A. (NGS)', 'Coordinate System: State Plane 1983', 'Datum: NAD 1983', and 'Zone: Virginia North'. A 'Mapping Plane Setup...' button is at the bottom right.

Figure 17

The selected Projection – Horizontal Mapping Plane is displayed.

Next, Tap on the **Vertical** tab...

The next screen...

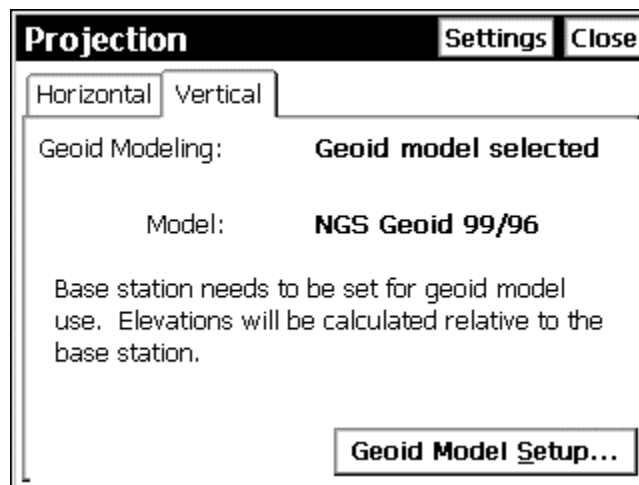


Figure 18

Tap on the **Geoid Model Setup...** button
Select the Geoid Model: NGS Geoid96/99

The next screen...

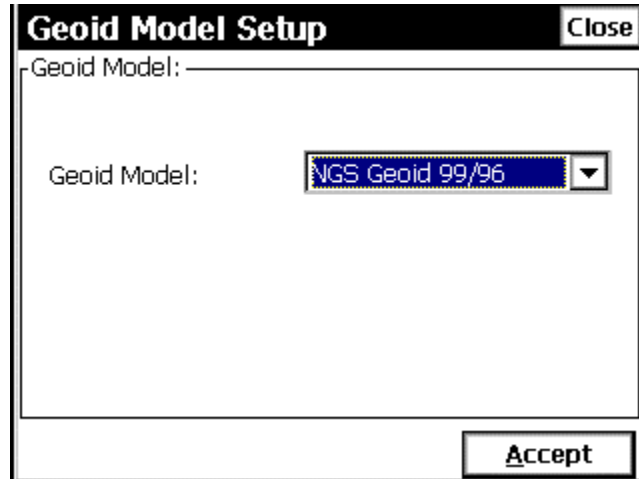


Figure 19

Next, Tap on the **Accept** button...

The TDS Survey Link software supports creation of a Geoid Sub-Grid suitable for use in the field with the Ranger data collector. The Geoid model data can be computed in Geoid96, EGM96 or the newest Geoid Model – Geoid 99.

See the Technical Support Notes on how to create a Geoid Sub-Grid using TDS Survey Link software.

When the Job's Horizontal and Vertical Projections selections have been made,
Tap on the **CLOSE** button, this will return you to the Survey Pro CE main menu,

At this stage of the demo, the TDS Ranger needs to be connected to the Base RTK receiver. Both of the GPS receivers should be powered ON and tracking satellites. The PDL Base Radio should also be powered ON.

Measure the GPS Antenna Heights for the RTK Base GPS Antenna and the RTK Rover GPS antenna.

Next, Tap on the [3] Survey – [A] GPS Status Menu

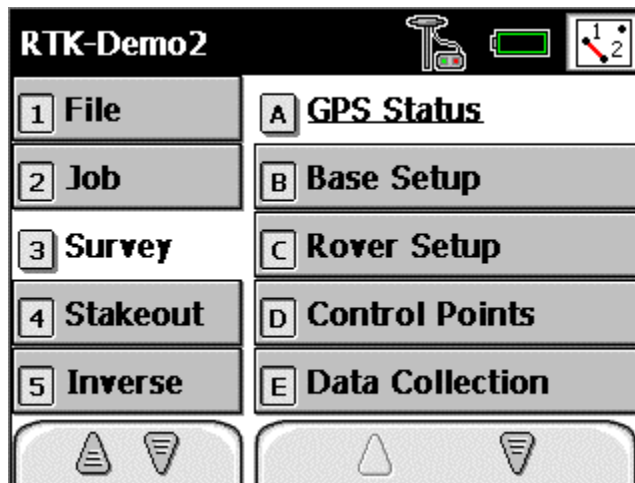


Figure 20

The next screen...

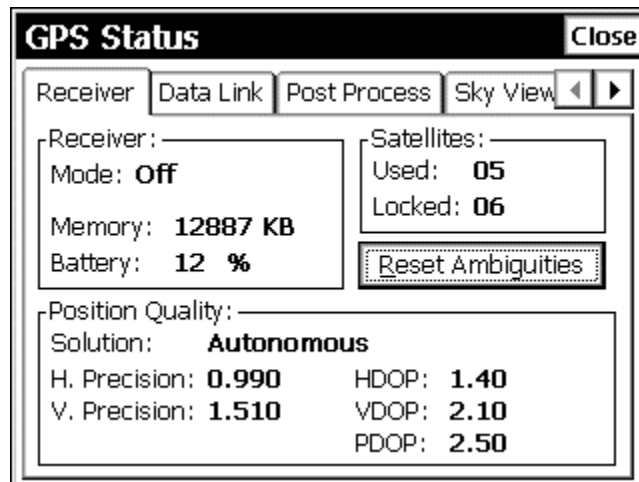


Figure 21

The GPS Status screen confirms you have established communications between the TDS Ranger and the RTK base Receiver.

Notice the Receiver Mode: **Off**, this indicates the GPS receiver is still in STATIC mode, configure the GPS Receiver for RTK Base mode.

Note the Receiver is already tracking and using 6 Satellites.

Next, Tap on the Sky View tab...

The next screen...

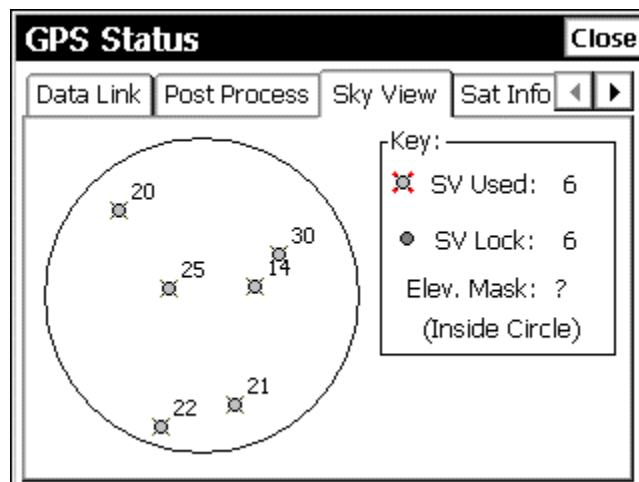


Figure 22

Next, Tap on the **CLOSE** button,

This will return you to the Survey Pro CE main menu...

Next, Select tap on the [3] Survey – [B] Base Setup menu...

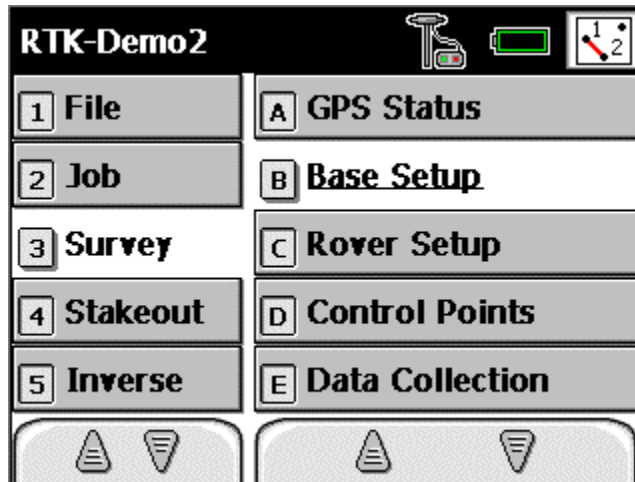


Figure 23

The next screen...

The image shows a settings screen titled "Current GPS Base Station". At the top right, there are "Settings" and "Close" buttons. The screen contains several input fields: "Base Point:" followed by a large text area; "Base" followed by "Base is not set:"; "Base Longitude:"; "Base Height:"; and "Antenna:" followed by a large text area. At the bottom, there are two buttons: "Setup ..." and "Close".

Figure 24

Tap on the Setup ... button,

The next screen...

The 'Base Setup' screen has a title bar with 'Settings' and 'Cancel' buttons. The main area contains a '+ Base Point:' label, a point selection icon, a text box with '1', and a dropdown arrow. A context menu is open from the dropdown arrow, showing options: 'Choose from list...', 'Choose from map...', 'Show point details...', and 'Zoom to point...'. Below the point selection, there is a label 'Last antenna for this receiver' followed by 'Antenna: Geodetic IV -GP:(P'. Below that is 'Measured To: Slant measure'. A 'Measured:' label is followed by a text box containing '1.486 m'. To the right is a 'Setup HR' button. At the bottom, it says 'Radius: 0.100 / Offset: 0.016'. A 'Next >' button is at the bottom right.

Figure 25

Tap on the Down-Arrow and select – **Choose from list...**

The next screen...

The 'Select Point' screen has a title bar with 'OK' and 'Close' buttons. It features a table with four columns: 'Point', 'Description', 'Northing (m)', and 'Ea'. The first row is highlighted in blue and contains the following data:

Point	Description	Northing (m)	Ea
+ 1	RTK BASE	2,155,433.442	3,

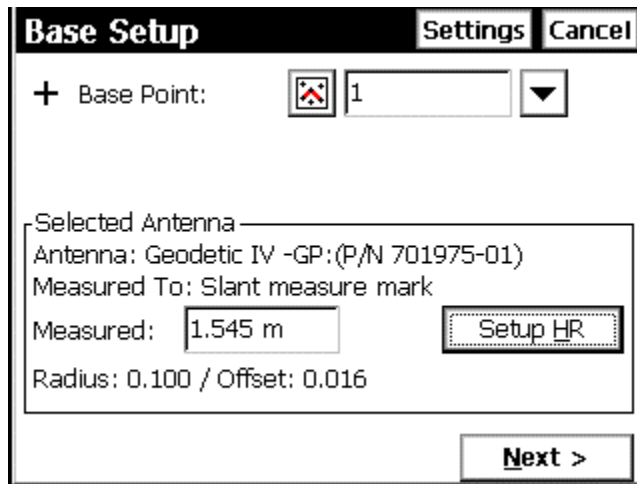
Below the table is a large empty rectangular area. At the bottom left is a left-pointing arrow and a text box. At the bottom right is a right-pointing arrow.

Figure 26

Tap/Select Point 1, RTK Base with the known SPC83 Northing, Easting and Elevation.

Next, Tap the **OK** button...

The next screen...

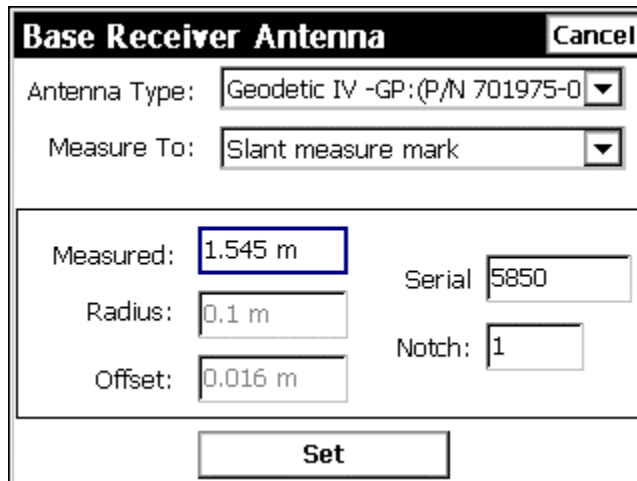


The 'Base Setup' dialog box has a title bar with 'Settings' and 'Cancel' buttons. It contains a 'Base Point' section with a crosshair icon, a text box containing '1', and a dropdown arrow. Below this is a 'Selected Antenna' section with a text box containing 'Antenna: Geodetic IV -GP:(P/N 701975-01)', a label 'Measured To: Slant measure mark', a text box for 'Measured:' containing '1.545 m', a 'Setup HR' button, and a label 'Radius: 0.100 / Offset: 0.016'. At the bottom right is a 'Next >' button.

Figure 27

Tap on the **Setup HR** button...

The next screen...



The 'Base Receiver Antenna' dialog box has a title bar with a 'Cancel' button. It contains two dropdown menus: 'Antenna Type:' set to 'Geodetic IV -GP:(P/N 701975-0)' and 'Measure To:' set to 'Slant measure mark'. Below these is a section with four text boxes: 'Measured:' (1.545 m), 'Radius:' (0.1 m), 'Offset:' (0.016 m), and 'Serial' (5850). There is also a 'Notch:' text box with the value '1'. At the bottom center is a 'Set' button.

Figure 28

Select the Options as shown above:

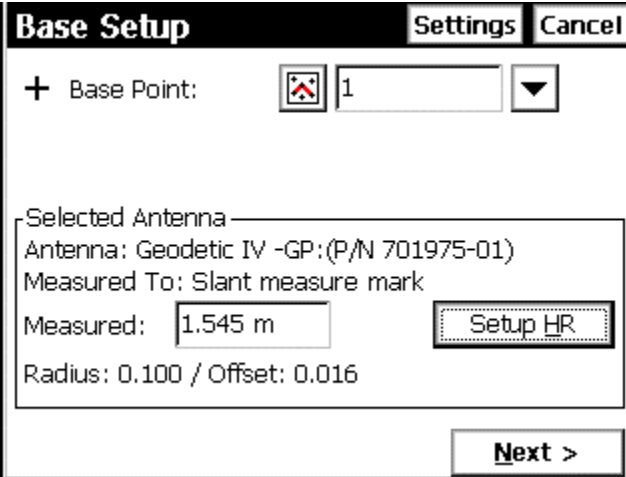
The Antenna Type: **Geodetic IV -GP: (P/N 701975-01)**. The -GP = No Ground plane. In this example, The RTK Base GPS Antenna is mounted to a wooden tripod/Tribrach. The HI Flag = **Slant measure mark**. Enter the Slant HI, measured to TGP (Top of Ground Plane), Units = Meters.

Measured HI = 1.545 m

Serial Number for the GPS Antenna = 5851

When finished with the data entry, Tap **Set...**

The next screen...

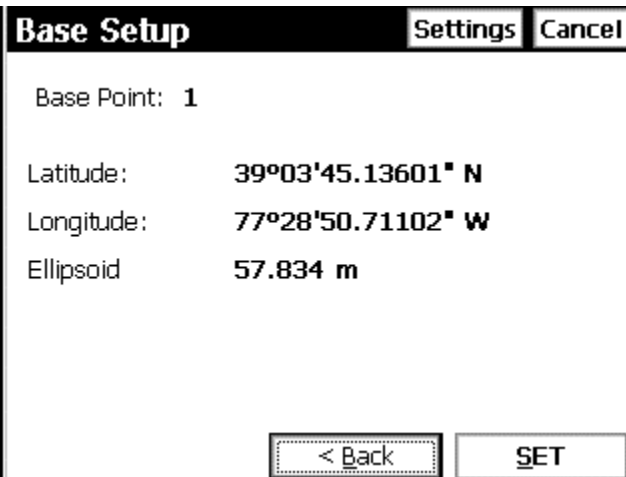


The screenshot shows the 'Base Setup' dialog box. At the top are 'Settings' and 'Cancel' buttons. Below is a 'Base Point:' label with a red cross icon, a text field containing '1', and a dropdown arrow. A section titled 'Selected Antenna' contains the following text: 'Antenna: Geodetic IV -GP:(P/N 701975-01)', 'Measured To: Slant measure mark', 'Measured: 1.545 m' (with a text field), and 'Radius: 0.100 / Offset: 0.016'. There is a 'Setup HR' button next to the 'Measured' value. At the bottom right is a 'Next >' button.

Figure 29

This returns you to the **Base Setup** menu...

Next, Tap on the **Next** > button...



The screenshot shows the 'Base Setup' dialog box after calculation. It displays the 'Base Point: 1' and the resulting WGS84 coordinates: 'Latitude: 39°03'45.13601" N', 'Longitude: 77°28'50.71102" W', and 'Ellipsoid 57.834 m'. At the bottom are '< Back' and 'SET' buttons.

Figure 30

Note the Latitude, Longitude and Ellipsoid Height position. This is the Real-World geodetic WGS84 position. The displayed Geodetic position is derived from the RTK Base point's Northing, Easting and the selected **Survey | Projection** parameters.

Compare the displayed WGS84 position with the Data Sheet, or the known WGS84 position; verify the WGS84 positions match. This is your “In-the-Field” check that the RTK Base station is properly setup. If the WGS84 Positions does not agree, verify the RTK Base Point Number, coordinates and Survey Projection settings.

If the WGS84 position agrees – Tap on the **Set** button.

The next screen...

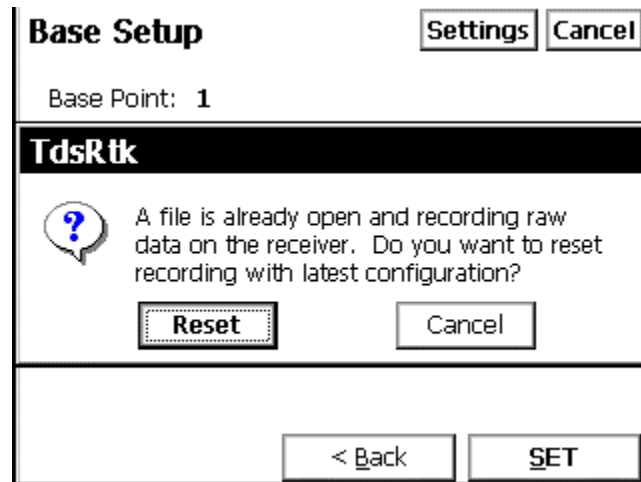


Figure 31

Tap **Reset** button, this function will re-start recording of raw data in the Receiver's PC Card memory, with the latest Post-Processing configurations.

The next screen...

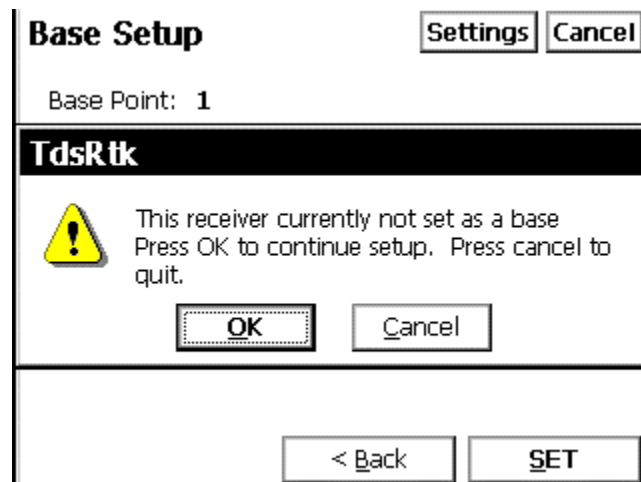


Figure 32

This is the “Trigger” that switches the receiver from STATIC MODE into RTK BASE MODE. The receiver is now configured as a RTK Base, the PDL Base Radio should now begin to Transmit RTK corrections out to the RTK Rover(s)...

The Next screen...

Current GPS Base Station Settings Close

Base Point: 1

Base station location:

Base 39°03'45.13601° N

Base Longitude: 77°28'50.71102° W

Base Height: 57.834 m

Antenna

Measured: 1.545, Radius: 0.100 / Offset: 0.016

Measured to: Slant measure mark

Setup ... Close

Figure 33

This is the known WGS84 position of the RTK Base station,
This is the position and DBEN data the PDL Base radio will broadcast to
the RTK Rover(s). Tap on the **Close** button...

This will return you to the Survey Pro CE main menu...

**Disconnect the TDS Ranger from the RTK Base Receiver,
Connect the TDS Ranger to the RTK Rover Receiver.**

Tap on the [3] Survey – [C] **Rover Setup** menu

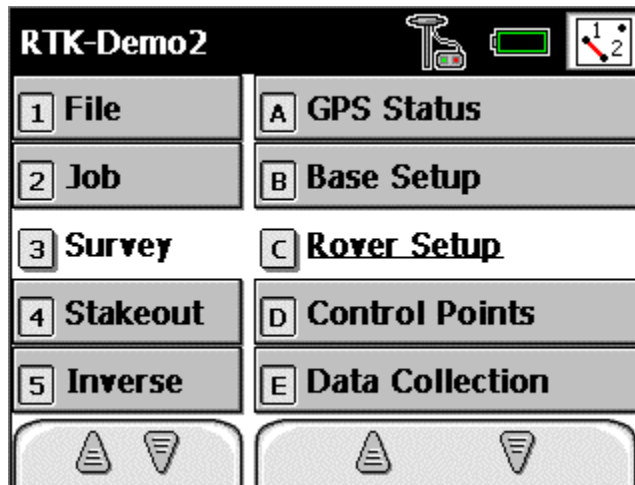


Figure 34

The next screen...

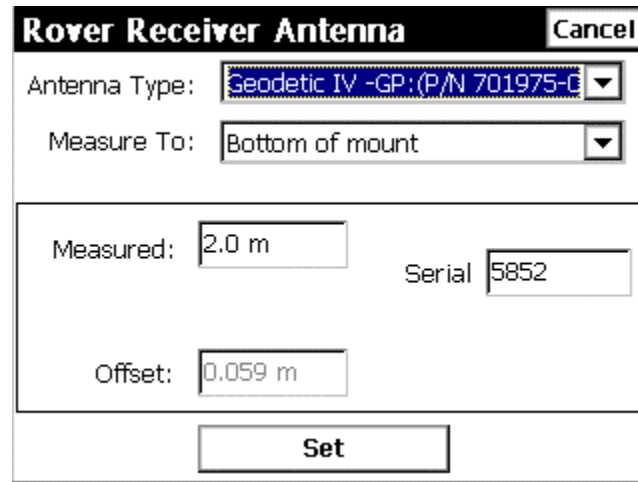
Figure 35

Note the Rover Status: **Rover is not set**, the RTK Rover equipment needs to be configured. Observe the Base point number and WGS84 position, visually confirm this is correct.

DO NOT tap Set Rover yet – Configure the RTK Rover Antenna Parameters first,

Tap Setup HR

The next screen...



Rover Receiver Antenna Cancel

Antenna Type: Geodetic IV -GP: (P/N 701975-0)

Measure To: Bottom of mount

Measured: 2.0 m Serial: 5852

Offset: 0.059 m

Set

Figure 36

Select the following parameters:

Antenna: **Geodetic IV –GP: (P/N 701975-01**

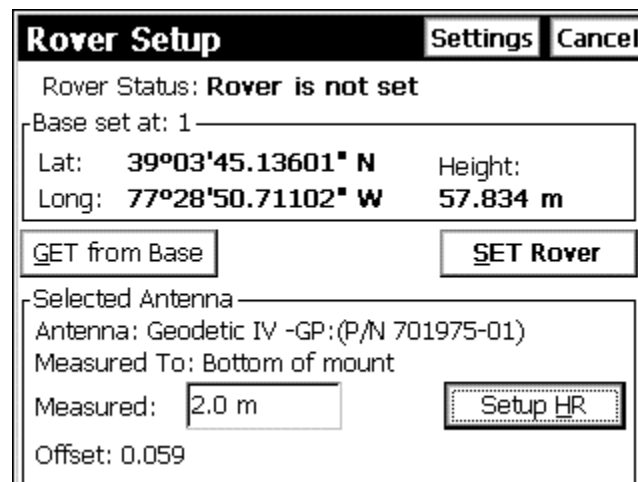
Measure To: **Bottom of Mount**

Measured: **2.000 m**

Serial **5852**

When you have enter the RTK Rover Antenna parameters,
Tap the **Set** button...

The next screen...



Rover Setup Settings Cancel

Rover Status: **Rover is not set**

Base set at: 1

Lat: 39°03'45.13601" N Height: 57.834 m

Long: 77°28'50.71102" W

GET from Base SET Rover

Selected Antenna

Antenna: Geodetic IV -GP: (P/N 701975-01)

Measured To: Bottom of mount

Measured: 2.0 m Setup HR

Offset: 0.059

Figure 37

When the antenna parameters for the RTK Rover have been determined,
Tap on the **SET Rover** button...

The next screen...

The screenshot shows the 'Rover Setup' screen. At the top, there are 'Settings' and 'Cancel' buttons. Below them, the text reads 'Rover Status: **Rover is not set**' and 'Base set at: 1'. A black bar with the text 'TdsRtk' is present. Below this bar, a speech bubble icon with a question mark is next to the text: 'A file is already open and recording raw data on the receiver. Do you want to reset recording with latest configuration?'. There are two buttons: 'Reset' and 'Cancel'. At the bottom, there are input fields for 'Measured: 2.0 m' and 'Offset: 0.059', and a 'Setup HR' button.

Figure 38

Tap Reset button, this function will open a new file. Recording raw data in the Receiver's PC Card memory, will the latest Post-Processing configurations.

The next screen...

The screenshot shows the 'Rover Setup' screen. At the top, there are 'Settings' and 'Cancel' buttons. Below them, the text reads 'Rover Status: **Rover is not set**' and 'Base set at: 1'. A black bar with the text 'TdsRtk' is present. Below this bar, a yellow warning triangle icon is next to the text: 'This receiver currently not set as a rover Press OK to continue setup. Press cancel to quit.'. There are two buttons: 'OK' and 'Cancel'. At the bottom, there are input fields for 'Measured: 2.0 m' and 'Offset: 0.059', and a 'Setup HR' button.

Figure 39

This is the “Trigger” that switches the receiver from STATIC MODE into RTK ROVER MODE. The receiver is now configured as a RTK Rover.

This will return to the Survey Pro CE main menu...

Select [3] Survey – [A] GPS Status

The next screen...

GPS Status [Close]

Receiver | Data Link | Post Process | Sky View ◀ ▶

Receiver: —
Mode: **Rover**
Memory: **14687 KB**
Battery: **N/A**

Satellites: —
Used: **05**
Locked: **08**
Reset Ambiguities

Position Quality: —
Solution: **Fixed**
H. Precision: **0.011** HDOP: **1.40**
V. Precision: **0.015** VDOP: **2.10**
PDOP: **2.50**

Figure 40

Receiver Tab – note the Receiver mode: **Rover**
Position Quality is **Fixed**, Satellites Used: 5

The next screen..

GPS Status [Close]

Receiver | Data Link | Post Process | Sky View ◀ ▶

Receiver Mode: **Rover**

Radio Reception: —
Signal Latency: **0.66 sec.**
Reception: **100 %**

Position Quality: —
Solution: **Fixed**
H. Precision: **0.010** HDOP: **1.20**
V. Precision: **0.014** VDOP: **2.00**
PDOP: **2.30**

Figure 41

Data Link Tab – this screen display's Radio Reception and Position Quality information.

The next screen...

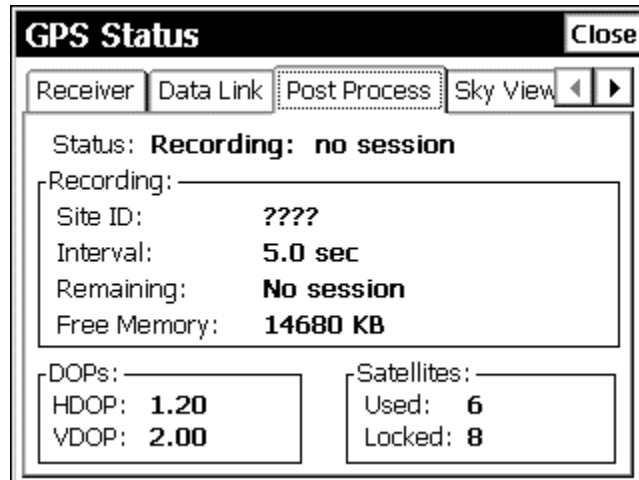


Figure 42

Post Process Tab – Indicates Status for any post-processing
Data recording: SITE ID, Interval, DOPs, Satellites

The next screen...

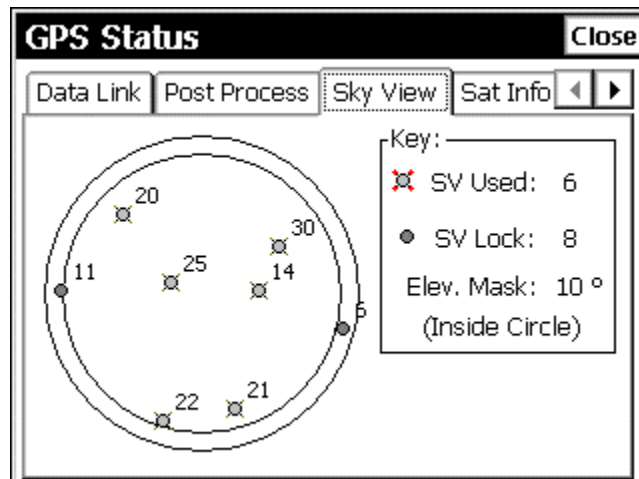


Figure 43

Sky View tab – displays location of satellites relative to Antenna.

The next screen...

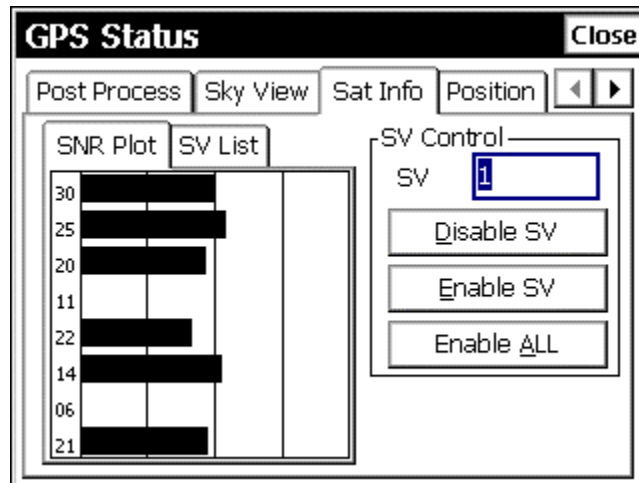


Figure 44

SNR Plot tab – displays SNR (Signal to Noise Ratio) plots.

The next screen...

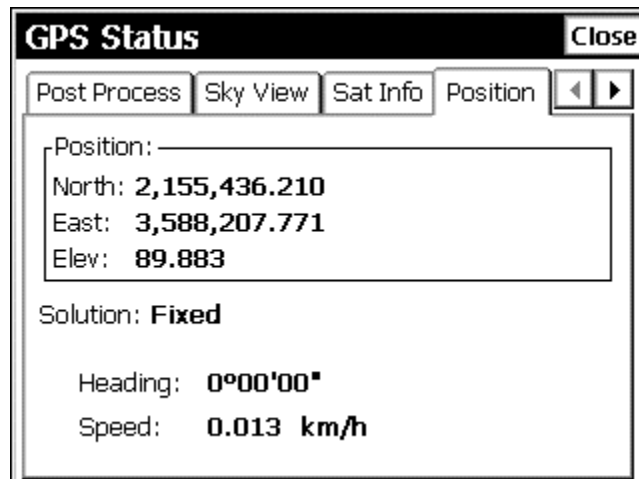


Figure 45

Position tab – displays current Real-Time coordinate and Solution quality, If the Mapping Plane has been Set, coordinates are displayed. If Geodetic Position (Latitude, Longitude, Ellipsoid Ht) are displayed, the Mapping Plane has not been set; return to the **Survey | Projection** menu and define.

The RTK Base and Rover are now configured, continue the demonstration by collecting some Data Collection, perhaps performing some Stake-out...

Select [3] Survey – [E] Data Collection

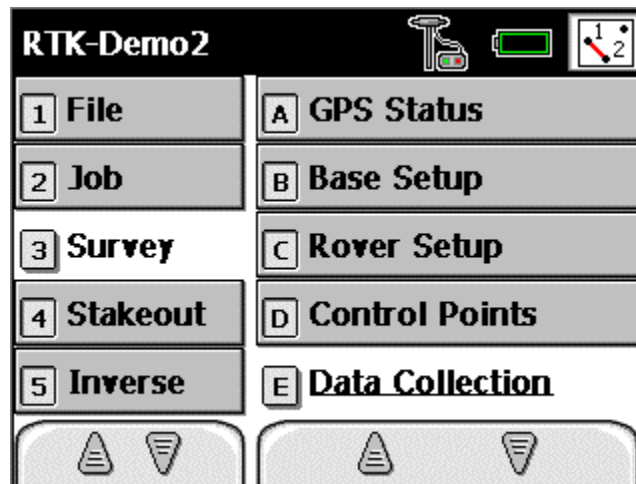


Figure 46

The next screen...

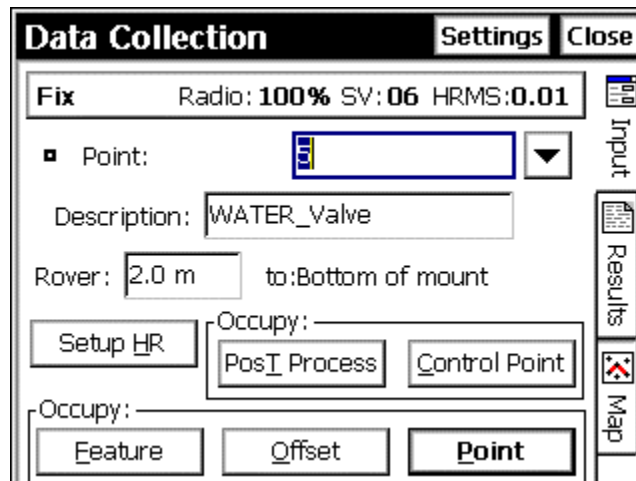


Figure 47

Physically occupy the point of interest, in this example the top surface of a Water Valve lid found in the parking lot. Select the Description for the desired feature, when the RTK Rover pole is plumb and level – Tap on the **Point** button to “Take-the-Shot”.

The next screen...

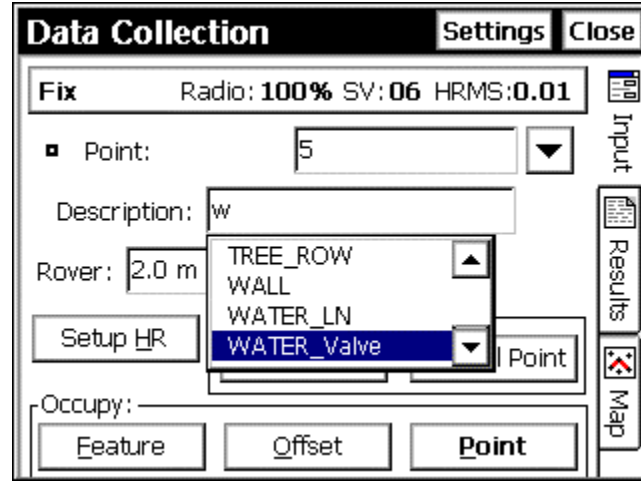


Figure 48

Enter a Description from the Pull-Down Menu, type the first letters of the description. If the user created and copied a descriptor file (Codes.txt), over to the Ranger; a Drop-down menu will automatically appear, exposing the descriptors list. Browse the list and select the topographic code.

To associate a Descriptor file to the Job: **Job | Settings | Files | Description Files:**

Note the Status-Bar in the top portion of the display, The Status-Bar will always indicate the Fix/Float indicator, Radio Reception %, Number of SV's and HRMS.

The next screen...

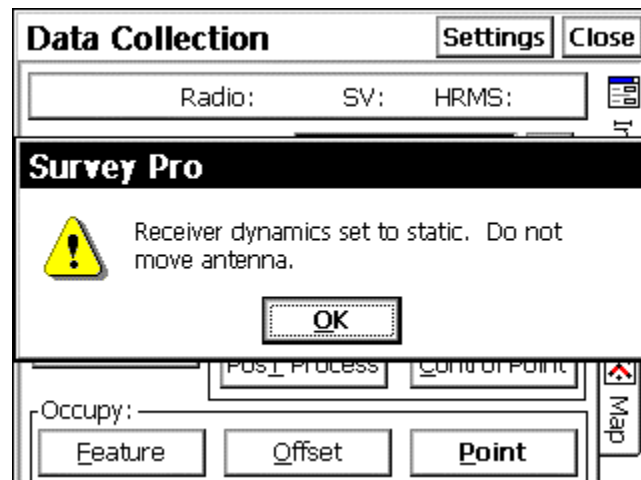


Figure 49

The program warns to user – the Receiver Dynamics are set to Static. This is a reminder: “Do not move antenna”, during the collection process.

The next screen...

The screen is titled "Occupancy Data Points" with "Settings" and "Cancel" buttons in the top right. It displays the following information:

- Local Coordinates:**
 - Northing: 2,155,430.651
 - Easting: 3,588,221.985
 - Elevation: 90.090
- Solution Quality:**
 - Solution: **Fixed**
 - Num. SV: 6
 - H. Precision: 0.004
 - V. Precision: 0.005
- Epochs:** 8
- Count Status:** Measuring

At the bottom, there are two buttons: "Accept" and "GPS Status".

Figure 50

Live screen displaying Coordinates and Solution Quality during Data collection, typically when you observe a **Fixed Solution** and have desirable Horizontal and Vertical Precisions – tap the **Accept** button.

The screen is titled "Occupancy Data Points" with "Settings" and "Cancel" buttons in the top right. It displays the following information:

- Local Coordinates:**
 - Northing: 2,155,420.151
 - Easting: 3,588,316.838
 - Elevation: 90.090
- Solution Quality:**
 - Solution: **Fixed**
 - Num. SV: 6
 - H. Precision: 0.004
 - V. Precision: 0.002
- Epochs:** 8
- Count Status:** Measuring

A dialog box titled "Store GPS Point" with an "OK" button is overlaid on the screen. It contains the following fields:

- Description:** WATER_Valve
- Feature:** <None>
- Attributes...** button

At the bottom of the main screen, there are two buttons: "Accept" and "GPS Status".

Figure 51

Survey Pro CE allows the user to append the Description if necessary. This Feature can be turned off by the user.

GPS Staking

Note: to perform any Stakeout functions, the Stake-out Point's: Point Number, Northing, Easting, Elevation and Descriptions MUST be Pre-loaded into the Ranger, before any stake out work can be started. Typically, these coordinates are pre-loaded into the Ranger back at the office.

The Customer may have calculated these coordinates with a COGO software, or the coordinates may have been generated from a design, or drawing file.

The coordinates for Control Points and the Design (Stake-Out) points MUST be on the same coordinate system. That is, the points used on the job site for the Control MUST be on the same coordinate system as the Design Points.

Select [4] Stakeout – [A] Stake Points

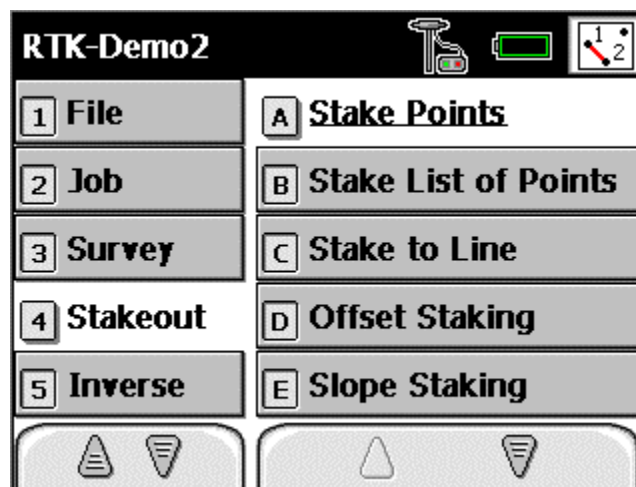


Figure 52

The next screen...

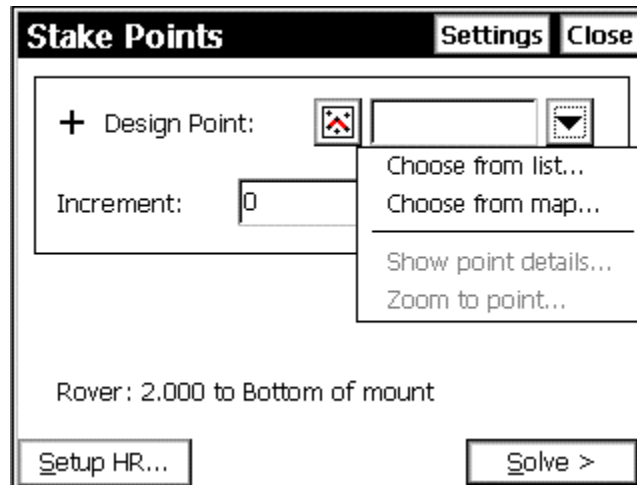


Figure 53

Tap on the Pull-down Arrow, select **Choose from list...**
Select Point Number – 3...

The next screen...

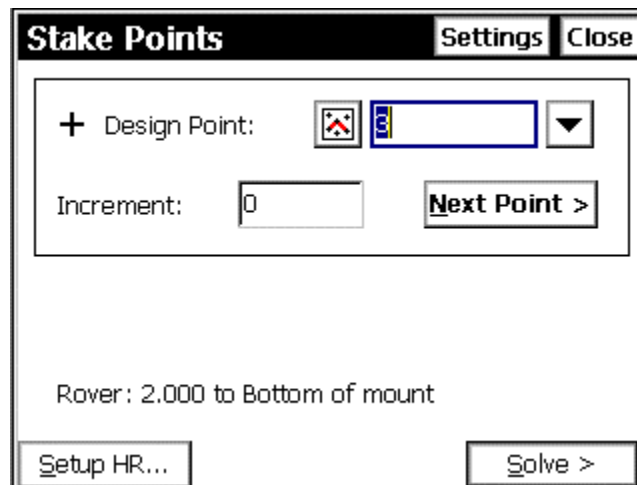
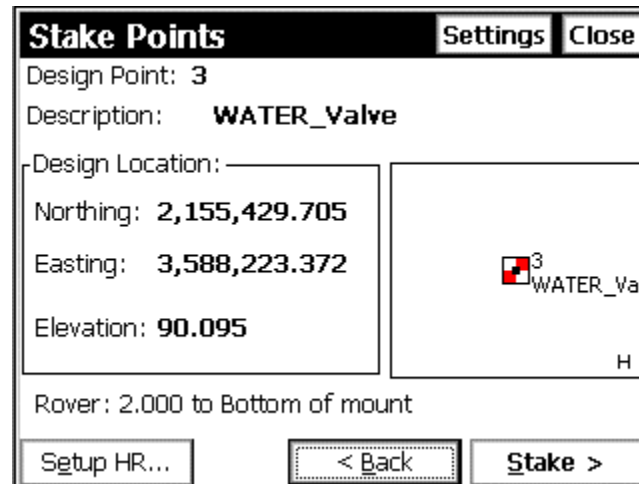


Figure 54

After the Stake Point selection, Tap on the **Solve** button...

The next screen...



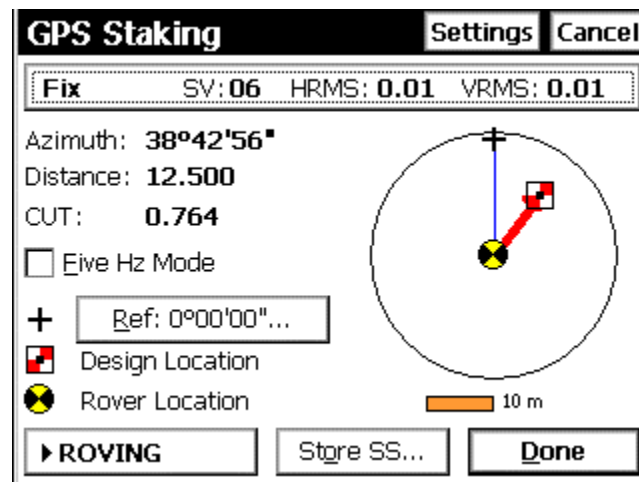
The 'Stake Points' dialog box has a title bar with 'Stake Points', 'Settings', and 'Close' buttons. It contains the following fields: 'Design Point: 3', 'Description: WATER_Valve', 'Design Location:' (with a sub-label 'H'), 'Northing: 2,155,429.705', 'Easting: 3,588,223.372', and 'Elevation: 90.095'. A 'Rover: 2.000 to Bottom of mount' label is at the bottom. At the bottom are three buttons: 'Setup HR...', '< Back', and 'Stake >'. A small map icon shows a red crosshair labeled '3 WATER_Va'.

Figure 55

The selected Points Design Coordinates are displayed,

Next, tap on the **Stake >** button...

The next screen...



The 'GPS Staking' dialog box has a title bar with 'GPS Staking', 'Settings', and 'Cancel' buttons. It displays 'Fix' status, 'SV: 06', 'HRMS: 0.01', and 'VRMS: 0.01'. Below are 'Azimuth: 38°42'56"', 'Distance: 12.500', and 'CUT: 0.764'. There is a checkbox for 'Five Hz Mode'. A legend shows a red crosshair for 'Design Location' and a yellow/black circle for 'Rover Location'. A circular diagram shows the rover's position relative to the design location. A scale bar indicates '10 m'. At the bottom are three buttons: '▶ ROVING', 'Store SS...', and 'Done'. A 'Ref: 0°00'00"...' field is also present.

Figure 56

The Azimuth and Distance to the Stake-out point are displayed.

When Staking-out with RTK, it takes a little while to get use to the flow of things... When performing Stake-out with Total stations, the Instrument person back sights a reference point, turns an Angle-Right to direct the Rodman for line, then shoots a distance to determine the distance towards the gun, or distance away from the gun to stake the point's location.

With RTK systems, there are not these types of survey crew deployments. The RTK Base station is typically un-attended, it sits there all by itself. The two-person survey crew is working with the RTK Rover system. One person to carry and operate the RTK Rover system, the second person to carry the wooden stakes, Lath or guard stakes, the sledge hammer and the project's design plans.

To orientate Stakeout directions on the job site with the RTK Rover, Survey Pro CE allows the user to select from two types of orientation on the job site:

Reference Direction: 0° 00' 00000" (Geodetic North), the surveyor can utilize a compass to determine orientation on the job site.

Reference Point: Select any physical point on the job to be used for Orientation.

The next screen...

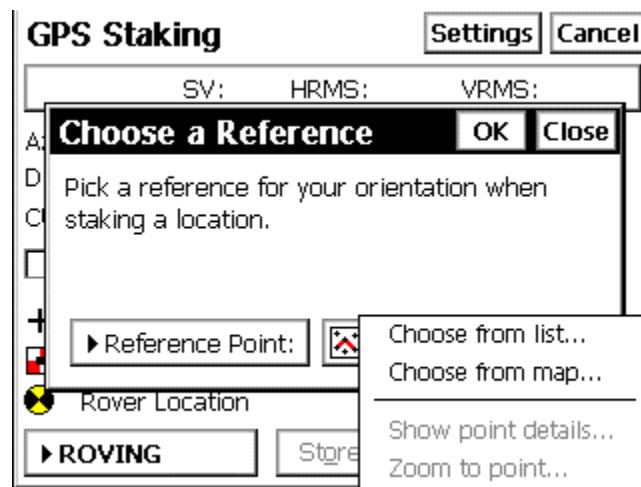


Figure 57

Tap on the **Reference: 0° 00' 0000"** button, the display will Change to **Reference Point:**

The next screen...

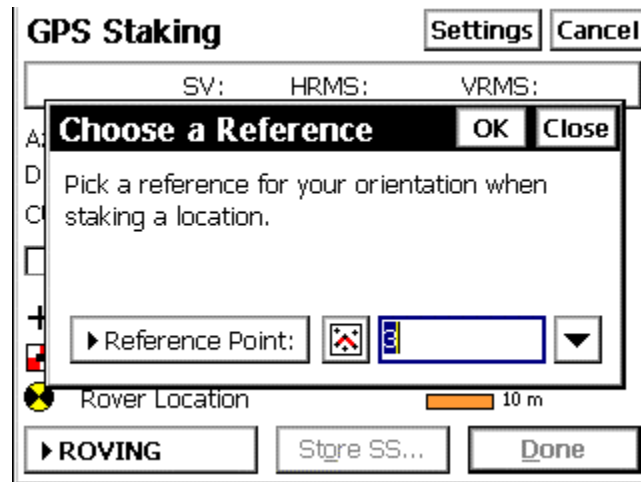


Figure 58

Then tap on the Pull-Down menu and select **Choose from list...**

The next screen...

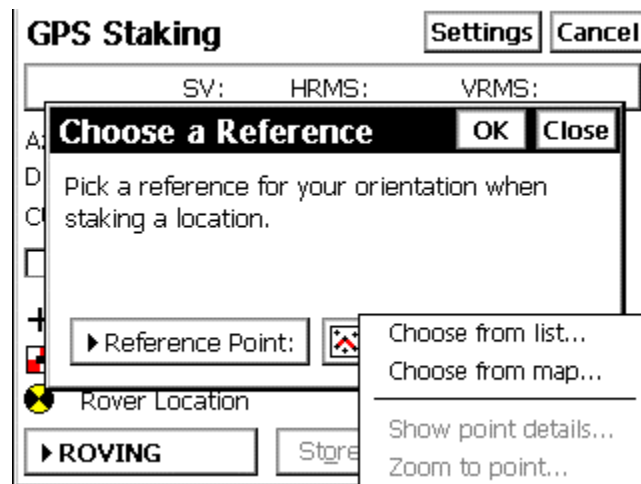
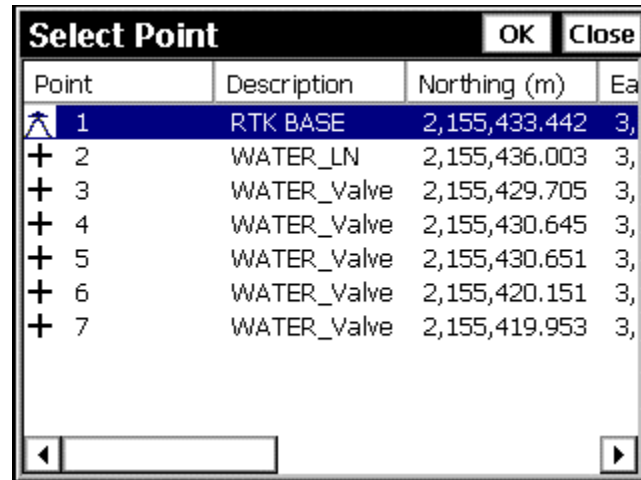


Figure 59

The next screen...



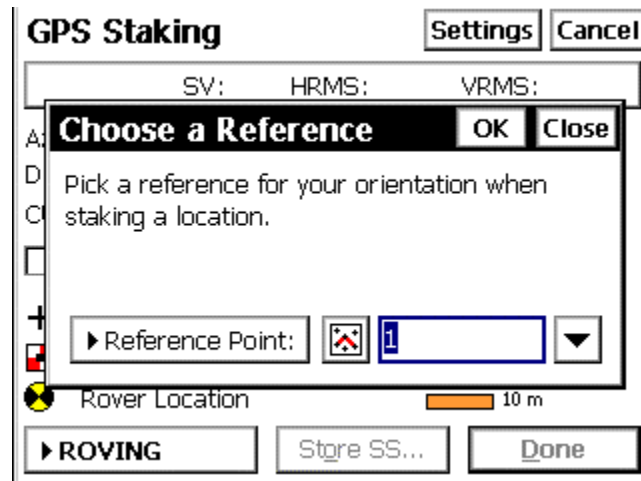
The 'Select Point' dialog box contains a table with four columns: Point, Description, Northing (m), and Easting (m). Point 1 is selected and highlighted in blue. The table lists seven points, with Point 1 being the RTK BASE and the others being water valves.

Point	Description	Northing (m)	East (m)
1	RTK BASE	2,155,433.442	3,155,433.442
2	WATER_LN	2,155,436.003	3,155,436.003
3	WATER_Valve	2,155,429.705	3,155,429.705
4	WATER_Valve	2,155,430.645	3,155,430.645
5	WATER_Valve	2,155,430.651	3,155,430.651
6	WATER_Valve	2,155,420.151	3,155,420.151
7	WATER_Valve	2,155,419.953	3,155,419.953

Figure 60

In this example, Point number 1 (the RTK Base) was selected for the Reference point.

The next screen...



The 'GPS Staking' dialog box has a 'Choose a Reference' sub-dialog box open. The sub-dialog box contains the text 'Pick a reference for your orientation when staking a location.' and a 'Reference Point' dropdown menu with '1' selected. The main dialog box has buttons for 'Settings', 'Cancel', 'ROVING', 'Store SS...', and 'Done'. It also displays 'SV:', 'HRMS:', and 'VRMS:' values, a 'Rover Location' indicator, and a 10 m scale bar.

Figure 61

After selecting the Reference Point, tap **OK**

The next screen...

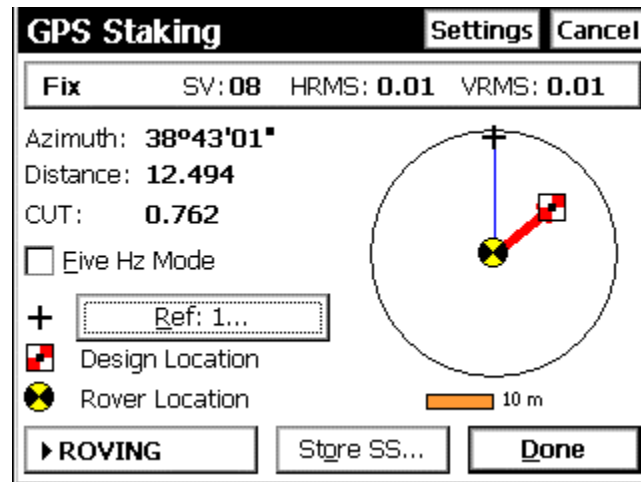


Figure 62

Direction and Distance with visual cues - to the Stakeout Point are presented, with the Reference Point 1, the RTK Base station .

Navigate towards the Design Point, this is live screen. If your Navigating in the right direction – the distance should decrease. If your navigating in the wrong direction, the distance will increase...

The next screen...

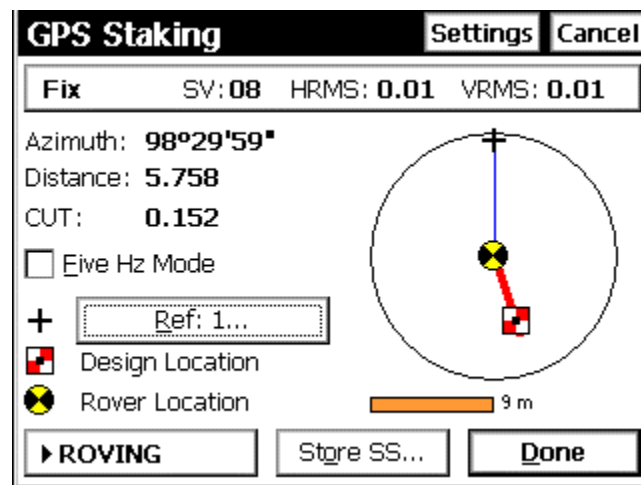


Figure 63

The Distance is decreasing – your getting closer...

The next screen...

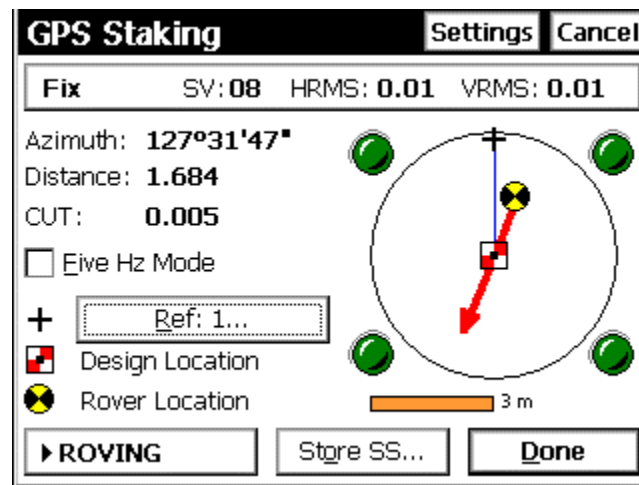


Figure 64

When you get within a meter of the Design Point,
The scales of the GPS Staking screen will enlarge,
Providing greater detail to stakeout the point...

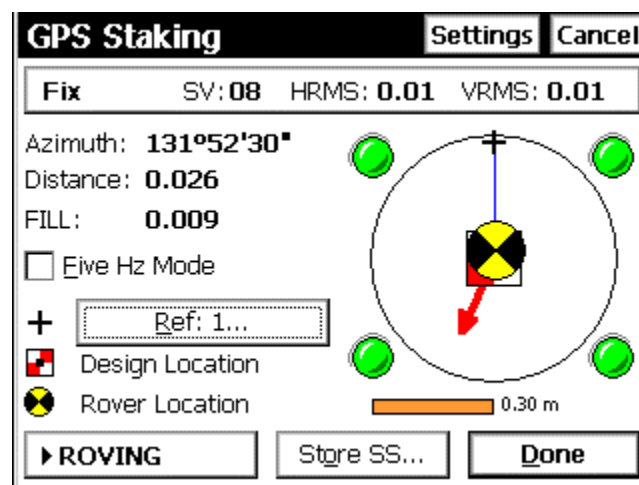


Figure 65

When you get within a few decimeters,
the scale is enlarged once again.

When you arrived at the Design Point, Tap **Done**,
The next screen...

The screenshot shows the 'Stake Points' screen with the following elements:

- Title Bar:** 'Stake Points' with 'Settings' and 'Close' buttons.
- Design Elev:** 90.095, with a 'Change...' button.
- Shot...** button.
- Results:**
 - Azimuth: 126°02'19
 - Distance: 0.024
 - FILL: 0.014
- HR:** 2.059
- Shot Data:**
 - Northing: 2,155,429.719
 - Easting: 3,588,223.352
 - Elevation: 90.082
- Store...** button.
- GPS Status...** button.
- < Back** and **Stake Next >** buttons.

Figure 66

To accept the “AZ-Built” Shot Data, Tap **Store...**

The next screen...

The screenshot shows the 'Stake Points' screen with a 'Stake Out Point' dialog box open. The dialog box contains:

- Title Bar:** 'Stake Out Point' with 'OK' and 'Cancel' buttons.
- Point:** 8 (selected from a dropdown menu).
- Description:** FLD-3 (text input field).
- Feature:** <None> (dropdown menu).
- Attributes...** button.

The background 'Stake Points' screen shows the same data as Figure 66, with the 'Store...' button visible.

Figure 67

A Description can be appended to the Stake Out Point...

The “FLD-3” Description can be used to store the AZ-Built Coordinates, where the FLD-3 = Field coordinate for design 3. This type of description can help locate the Cut/Fill data.

The next screen...

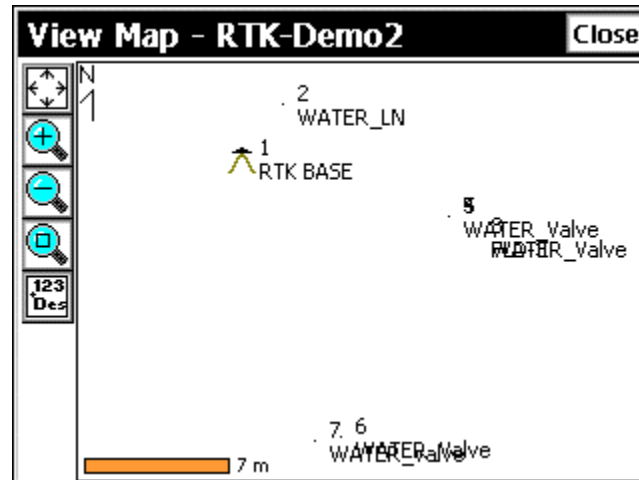


Figure 68

Points in the current job file can be viewed by tapping on the **View Map** icon...

The next screen...

Point Details			Close
Point	2		
Description	WATER_LN		
Feature	None		
Layer	Points		
N	2,155,436.003	m	
E	3,588,214.028	m	
Z	89.934	m	
Lat	39°03'45.21841" N		
Lng	77°28'50.63427" W		
Ht	57.819	m	
Type	Existing Pt.		

Figure 69

Tap on a point in the **View Map** display, the **Point Details** Will be displayed...

Tap **Close** to return to the View Map...

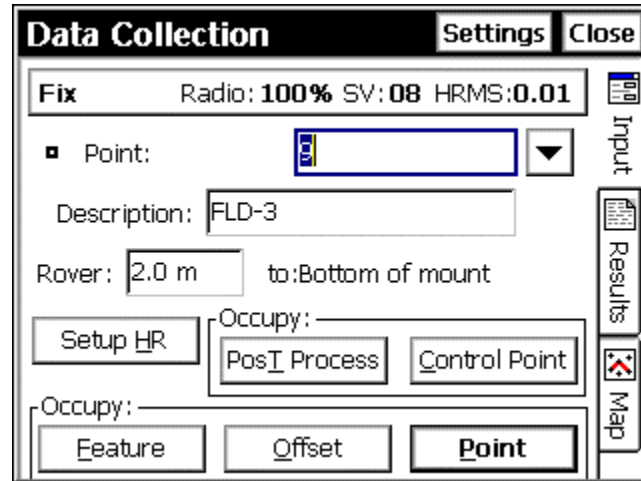
Tap **Close** to return to the Survey Pro CE main menu...

Advanced Data Collection:

Collect continuous data by Time –or- Distance filters:

Select [3] Survey – [E] Data Collection

The next screen...

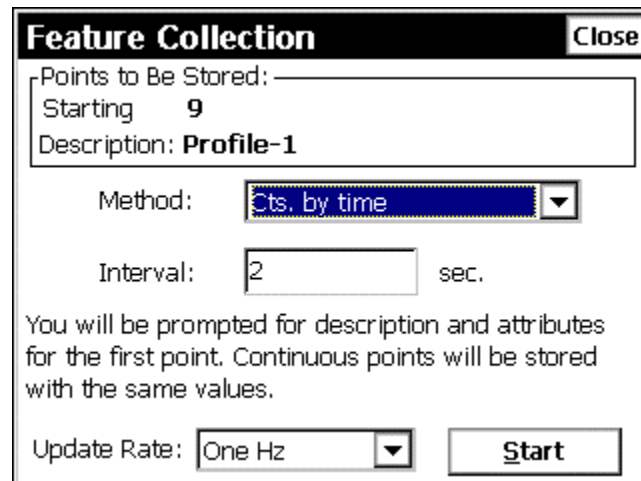


The screenshot shows the 'Data Collection' screen with a title bar containing 'Data Collection', 'Settings', and 'Close' buttons. The main area includes a 'Fix' status indicator, 'Radio: 100%', 'SV: 08', and 'HRMS: 0.01'. Below this is a 'Point:' label next to a text input field containing '01'. A 'Description:' label is followed by a text input field containing 'FLD-3'. The 'Rover:' label is next to a text input field containing '2.0 m', followed by the text 'to: Bottom of mount'. There are three buttons: 'Setup HR', 'PosI Process', and 'Control Point'. Below these is an 'Occupy:' label followed by a text input field. At the bottom are three buttons: 'Feature', 'Offset', and 'Point'. On the right side, there is a vertical toolbar with icons for 'Input', 'Results', and 'Map'.

Figure 70

Specify the Description, then Tap Feature...

The next screen...

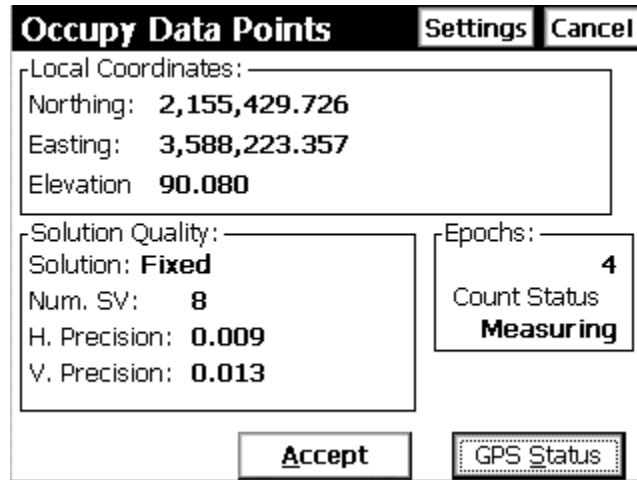


The screenshot shows the 'Feature Collection' screen with a title bar containing 'Feature Collection' and a 'Close' button. The main area includes a 'Points to Be Stored:' label followed by a text input field containing '9'. Below this is a 'Starting' label followed by a text input field containing '9'. The 'Description:' label is followed by a text input field containing 'Profile-1'. The 'Method:' label is next to a dropdown menu showing 'Cts. by time'. The 'Interval:' label is next to a text input field containing '2', followed by the text 'sec.'. Below this is a paragraph of text: 'You will be prompted for description and attributes for the first point. Continuous points will be stored with the same values.' At the bottom, there is an 'Update Rate:' label next to a dropdown menu showing 'One Hz', and a 'Start' button.

Figure 71

Select Method: Cts. by Time –or- Cts. by Distance,
In this example Cts. by Time / 2 Second Interval has been selected.
When ready to begin, Tap Start...

The next screen...



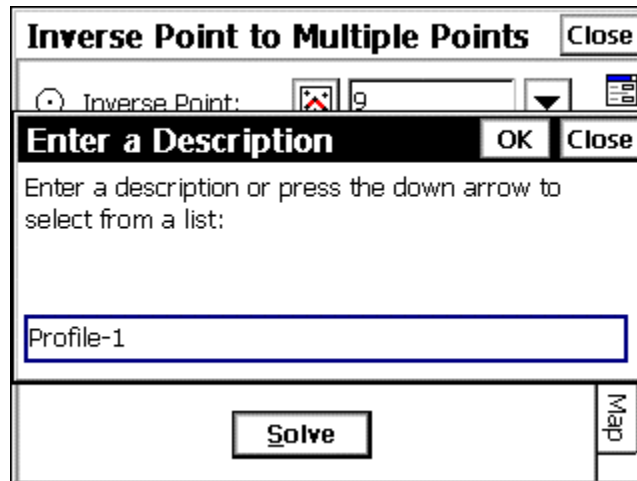
The screenshot shows a software interface titled "Occupancy Data Points" with "Settings" and "Cancel" buttons. It displays local coordinates (Northing: 2,155,429.726; Easting: 3,588,223.357; Elevation: 90.080), solution quality (Fixed), number of satellites (8), and precision values. It also shows 4 epochs and a "Measuring" count status. "Accept" and "GPS Status" buttons are at the bottom.

Occupancy Data Points		Settings	Cancel
Local Coordinates:			
Northing:	2,155,429.726		
Easting:	3,588,223.357		
Elevation:	90.080		
Solution Quality:		Epochs:	
Solution:	Fixed	4	
Num. SV:	8	Count Status	
H. Precision:	0.009	Measuring	
V. Precision:	0.013		
Accept		GPS Status	

Figure 72

To start the Continuous Data Collection mode, the user must manually accept the first shot, Tap **A**cept...

The next screen...



The screenshot shows a software interface titled "Inverse Point to Multiple Points" with a "Close" button. It includes an "Inverse Point" field with a dropdown menu. Below is a sub-section titled "Enter a Description" with "OK" and "Close" buttons. It prompts the user to enter a description or select from a list, with "Profile-1" entered in the text field. A "Solve" button and a "Map" button are at the bottom.

Inverse Point to Multiple Points		Close
Inverse Point:	9	
Enter a Description		OK Close
Enter a description or press the down arrow to select from a list:		
Profile-1		
Solve		Map

Figure 73

An opportunity is provided to append the Description, Tap **O**K, or press Enter on the Ranger keyboard...

Once the initial shot has been Accepted, the continuous Data Collection mode will begin, in this example **Cts. by Time / 2-Second Interval** was selected. If the conditions of the HRMS/VRMS filter are met, the Ranger will beep every 2-seconds, indicating data collection is occurring. Start walking the feature you desire to data collect / map.

The next screen...

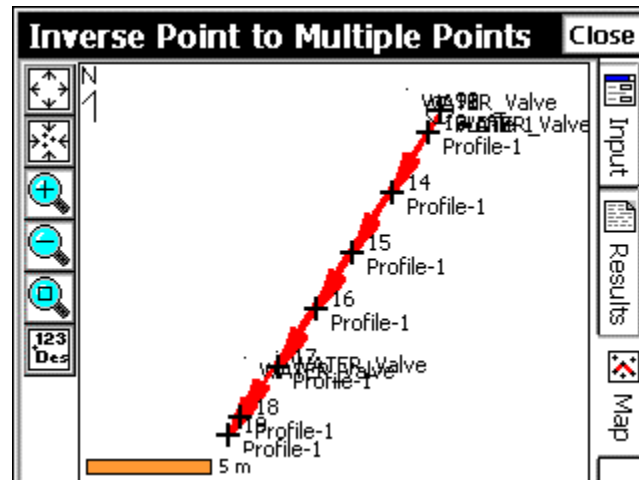


Figure 74

Example of Profile Line collected with the Continuous Data Collection Mode.

To Export coordinates:

Select [1] File – [D] Export Coordinates



Figure 75

The next screen...

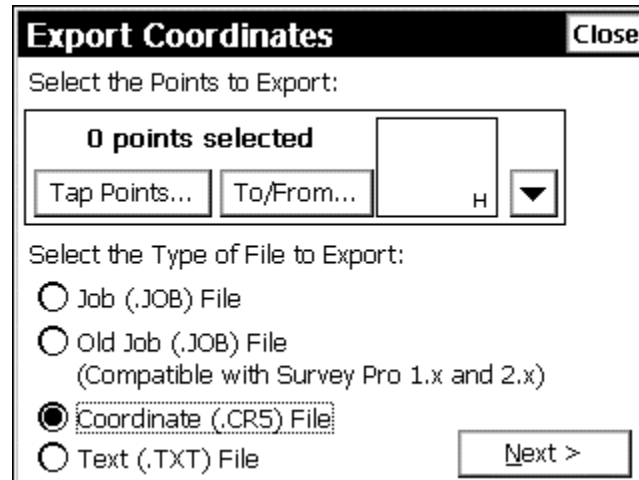


Figure 76

Tap on the Down Arrow...

The next screen...

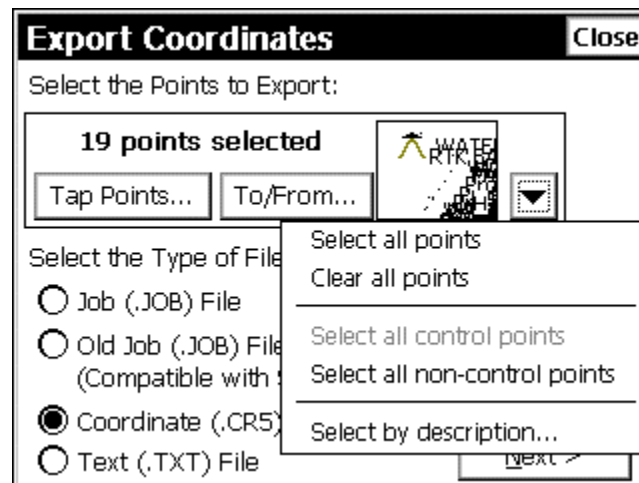


Figure 77

Tap on the **Select all Points** option...

The next screen...

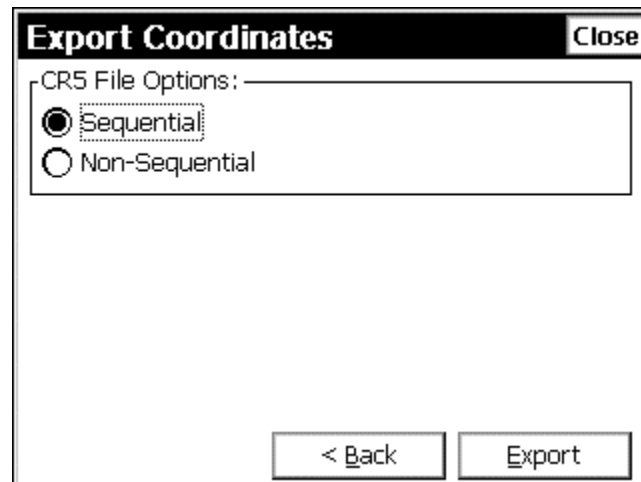


Figure 78

Choose Sequential –or- Non-sequential option...

Tap the **Export** button...

The next screen...

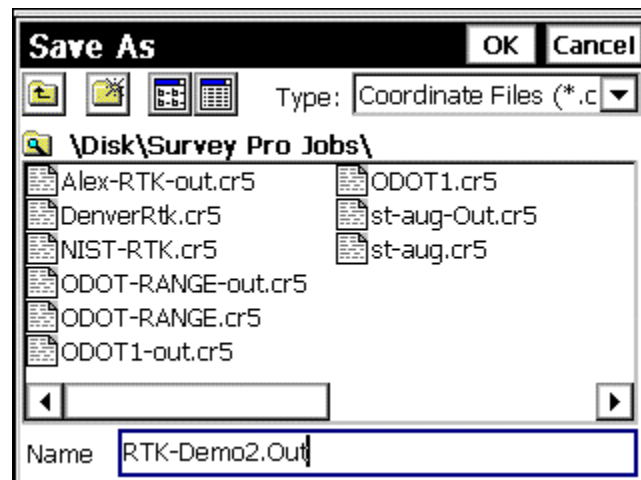


Figure 79

Specify a **Name and File -Type Extension** for the **Export Coordinates...**

Next, Transfer the Coordinates from the Ranger back over to the office Computer,

The next screen...

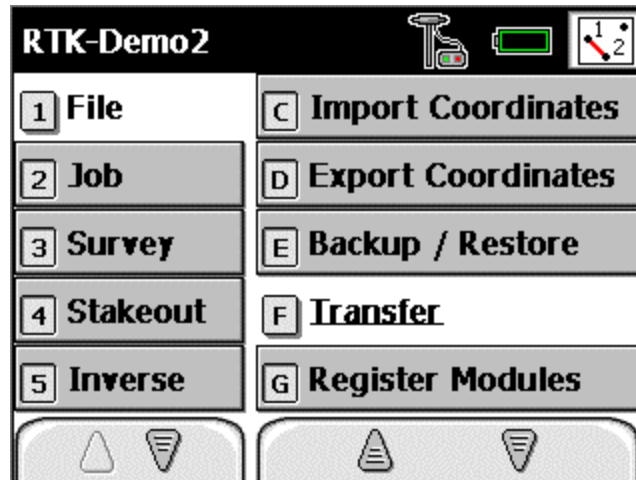


Figure 80

The next screen...

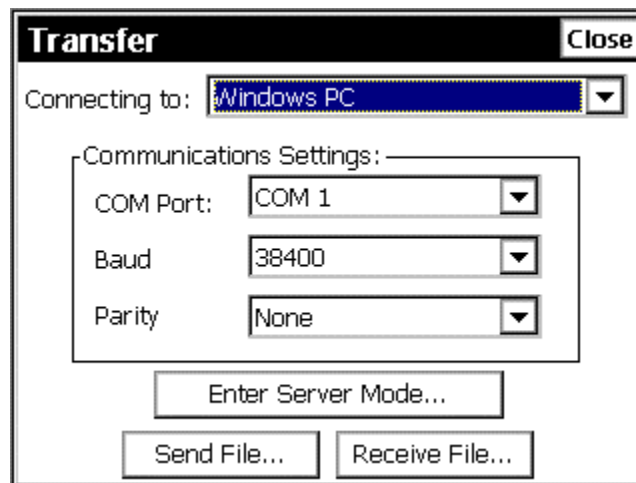


Figure 81

Select the Transfer **Communications Settings**,

Start the TDS Survey Link software on the PC,

Start | Programs | TDS Survey Works | Survey Link...

From the Pull-Down menu → Select **Transfer | Send / Receive...**

Select the **Receiver Tab...**

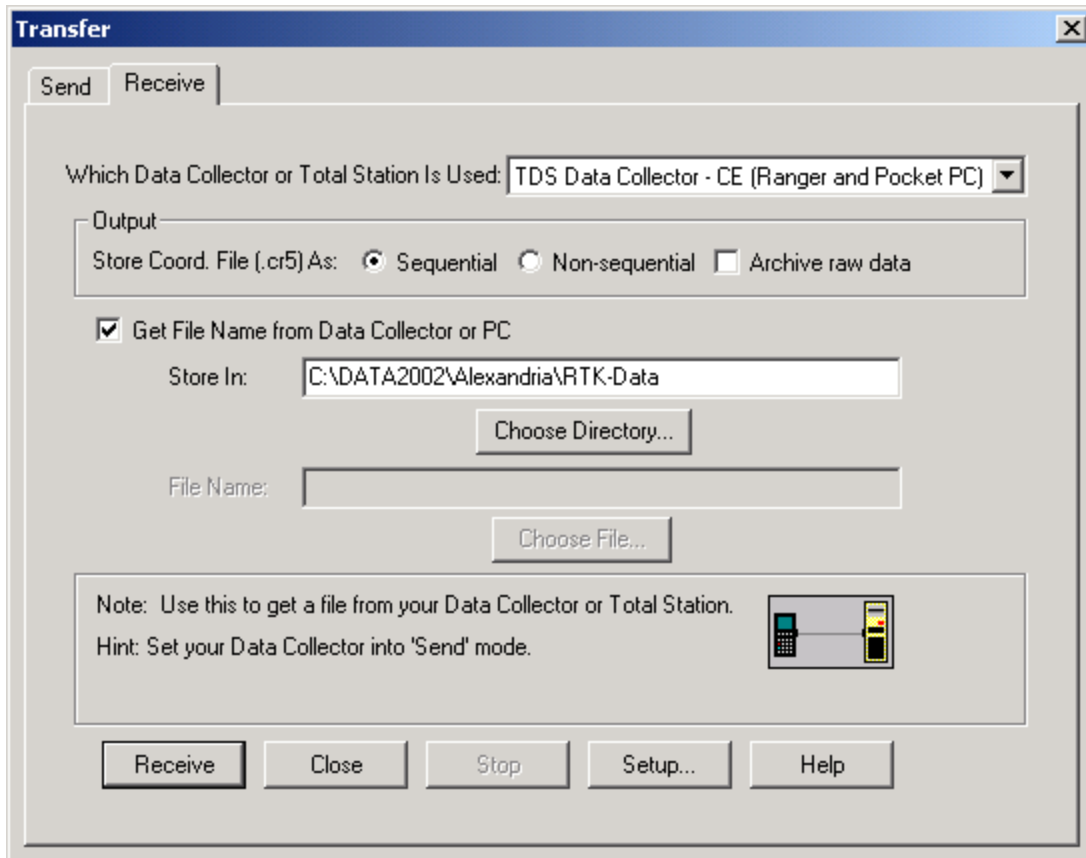


Figure 82

Last Updated by RDL: 9/10/02