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

RTK Demo – TDS Localization Method

The RTK Base will occupy an unknown control point, with assumed coordinates of N-5000m, E-5000m and Elevation-500m. Perform a **TDS GET** to obtain the autonomous WGS84 Latitude, Longitude and Ellipsoid Height for the RTK Base station. Perform Single-Point Localization at the RTK Base Station. The resulting Scale Factor will equal 1.00000000 and the Rotation Angle will equal 0° 00' 00".

You can demonstrate the capability of the RTK system from this single local control point. You will be able RTK survey at relatively close distances to the RTK Base station. The further the distance from the RTK Base station, (Single Point Localization) the greater the distortions.

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…

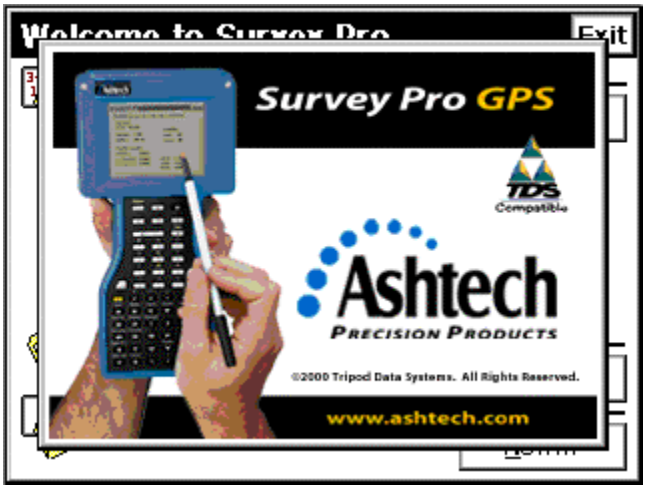


Figure 1

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…

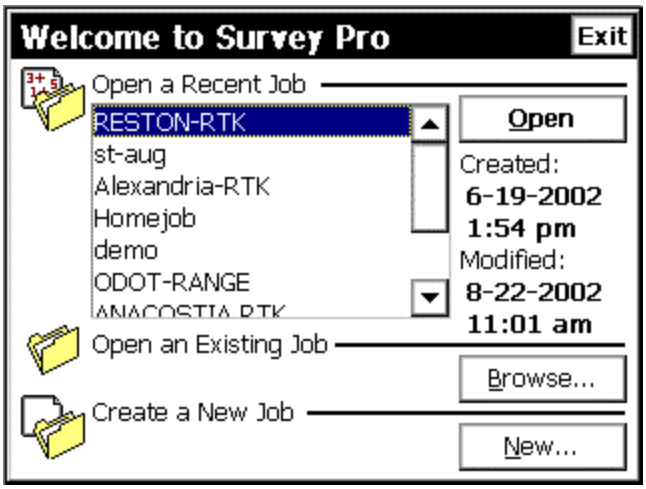


Figure 2

The Welcome to Survey Pro dialog menu…

Select the **"Create a New Job"** menu… Tap the **New…** button.

The next screen…

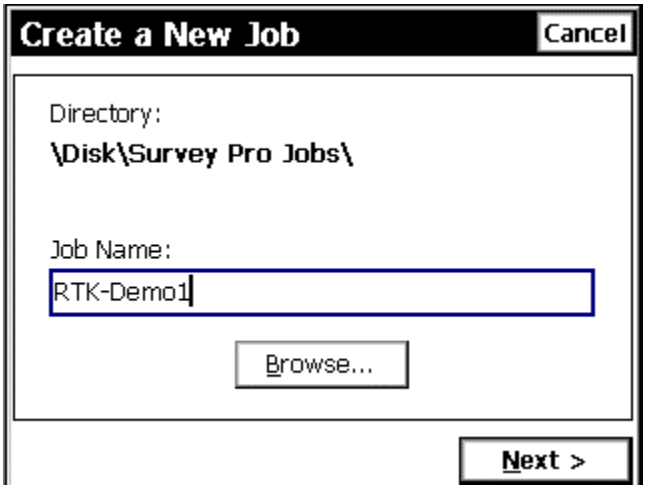


Figure 3

Input a name for the New Job: **RTK-Demo1**

Next, Tap the **Next >** button…

The next screen…

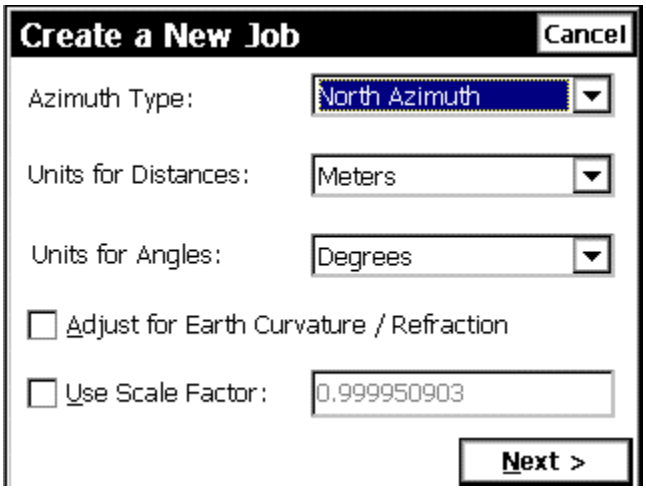


Figure 4

Select the Options as shown above:

Next, Tap the **Next** button…

The next screen…

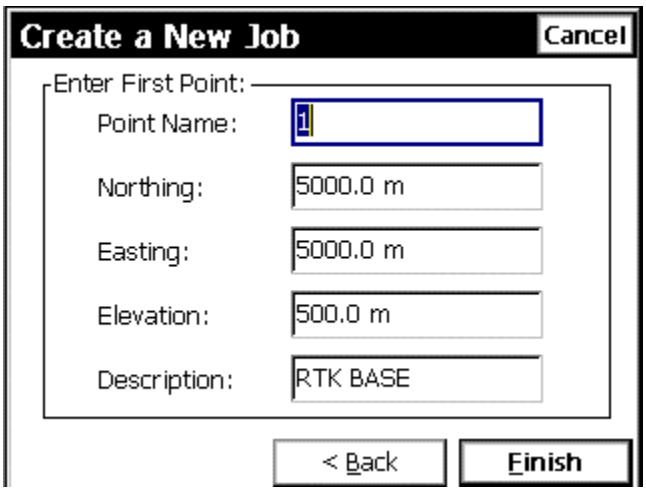


Figure 5

Enter the Coordinates as shown above:

Next, Tap the **Finish** button…

The next screen…

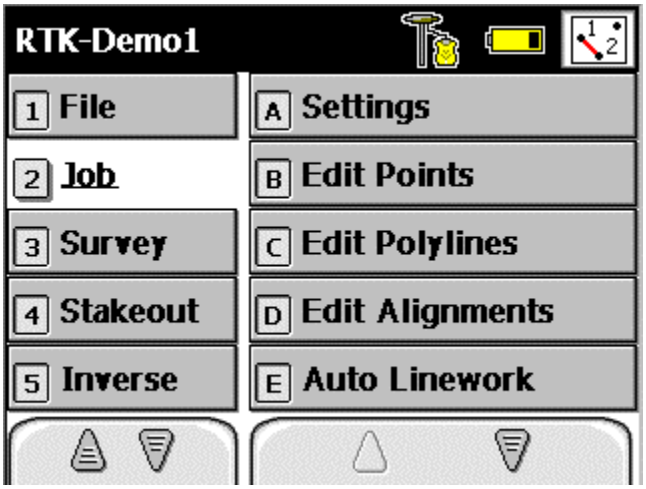


Figure 6

From the Survey Pro CE main menu, Tap on **[2] JOB - [A] Settings** menu…

The next screen…

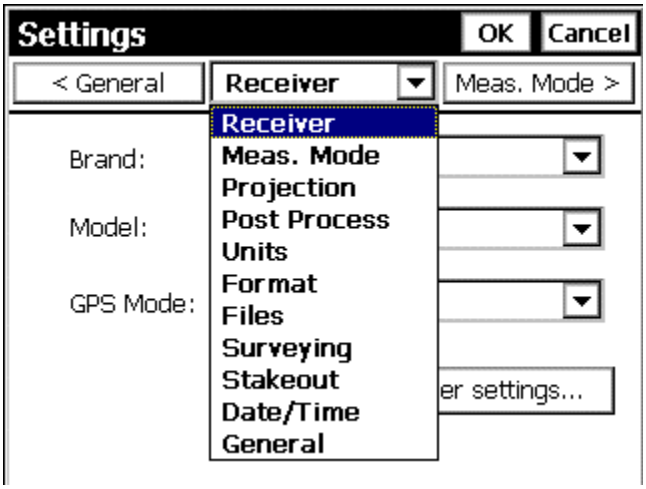


Figure 7

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, is to work your way down through menu, Top to Bottom.

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

The next screen…

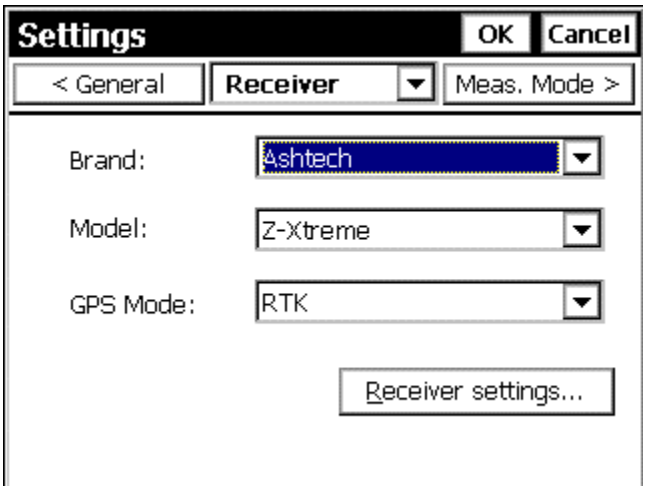


Figure 8

Select the Options as shown above:

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

The next screen…

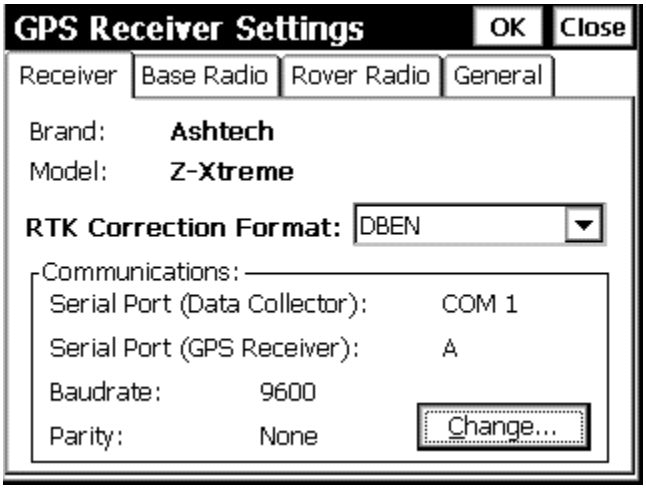


Figure 9

Select the Options as shown above:

Next, Tap on the Base Radio Tab…

The next screen…

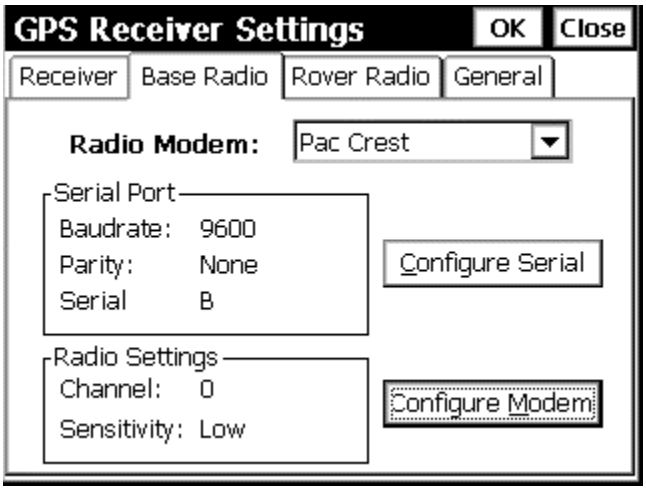


Figure 10

Select the Options as shown above:

Next, Tap on the General Tab…

The next screen…

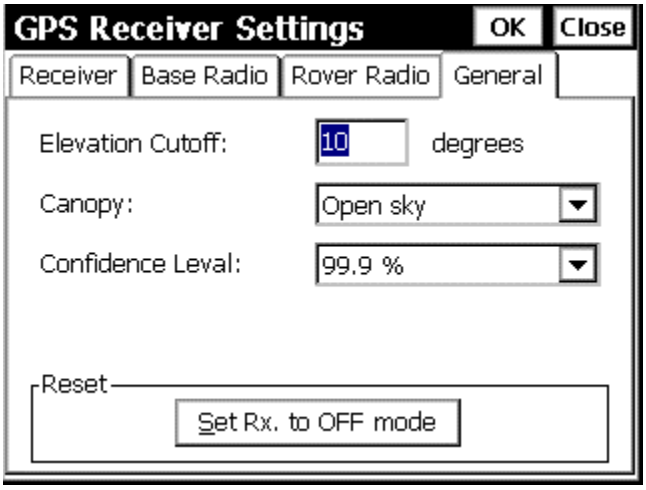


Figure 11

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…

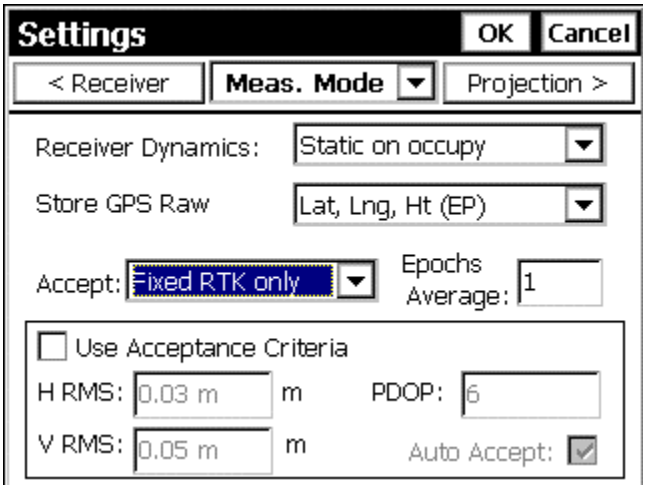


Figure 12

Select the Options as shown above:

Next, Tap on the Center Pull-Down Menu – Select **Projection…**

The next screen…

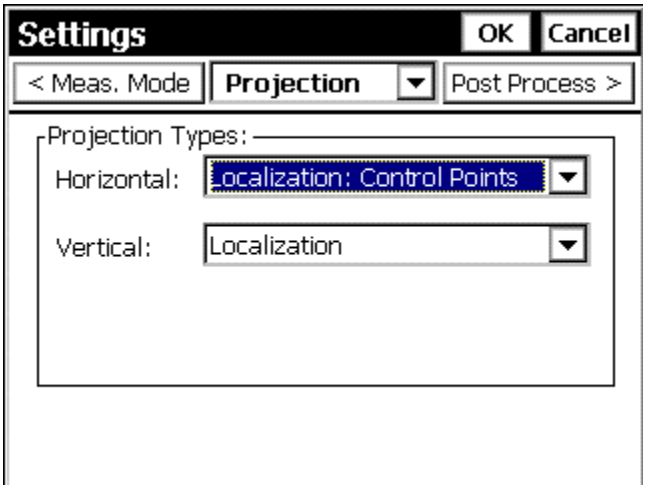


Figure 13

Select the Options as shown above:

After you have selected the desired **Projection Modes** for the Demo, Tap **OK…**
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

The next screen…

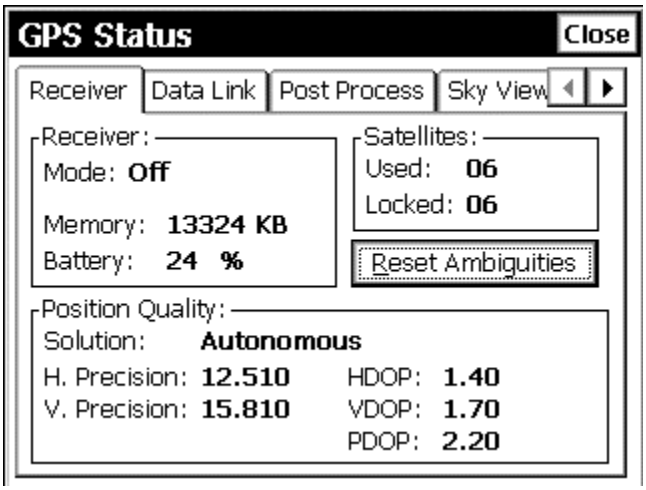


Figure 14

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…

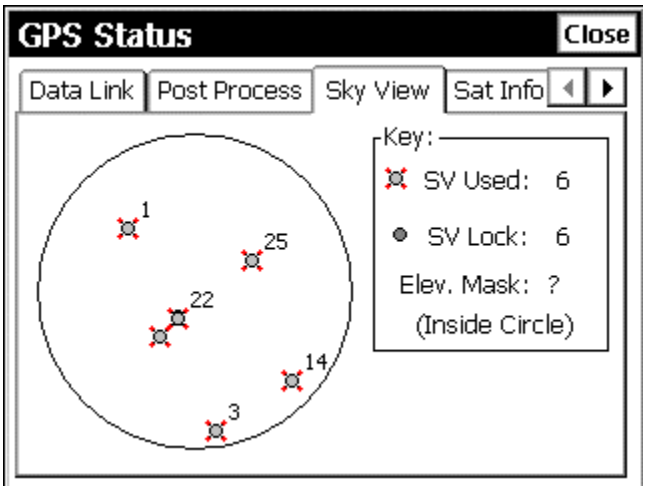


Figure 15

Next Tap on the **Close** button..

This will return you to Survey Pro CE Main menu…

Next, Tap on the **[3] Survey - [B] Base Setup** menu

The next screen…

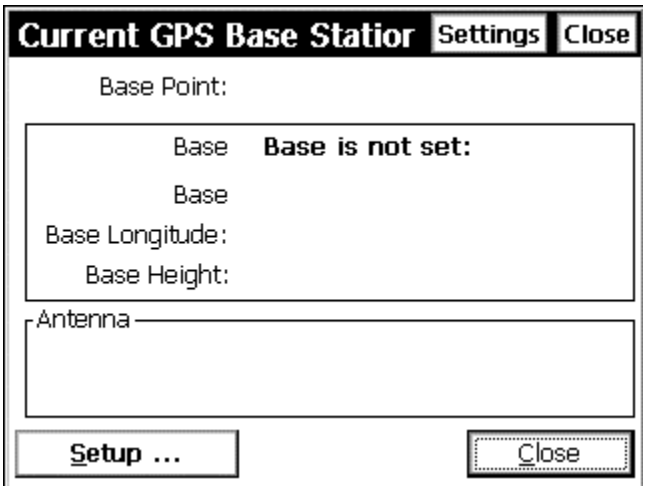


Figure 16

Tap on the **Setup…** button,

The next screen…

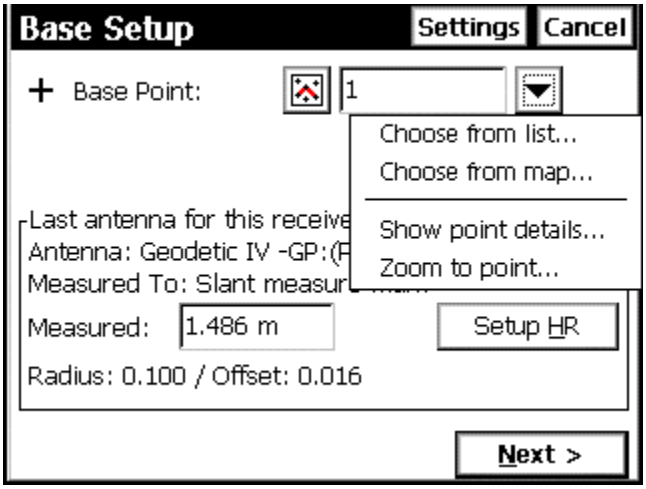


Figure 17

Tap on the Down Arrow and Select – **Choose from list…**

The next screen…

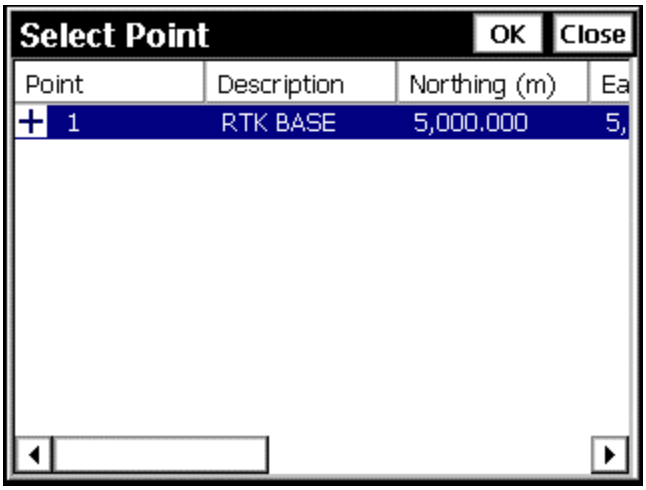


Figure 18

Tap / Select Point 1, RTK Base, N-5000, E-5000, Elev. 500

Next, Tap the **OK** button…

The next screen…

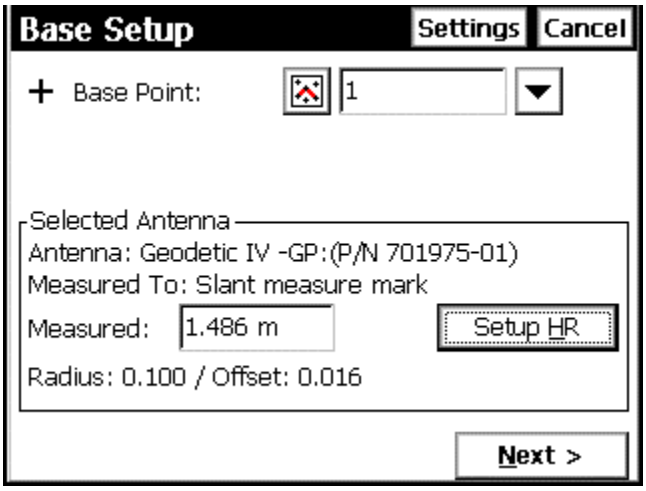


Figure 19

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

The next screen…

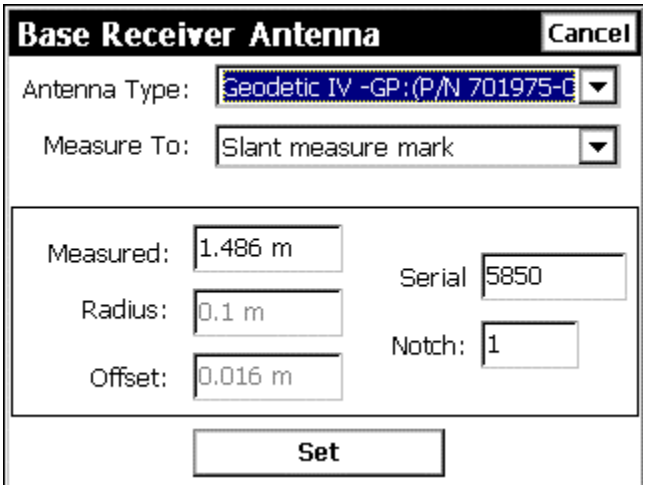


Figure 20

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 , the Measured HI = 1.486m, the Serial Number for the GPS Antenna = 5851

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

The next screen…

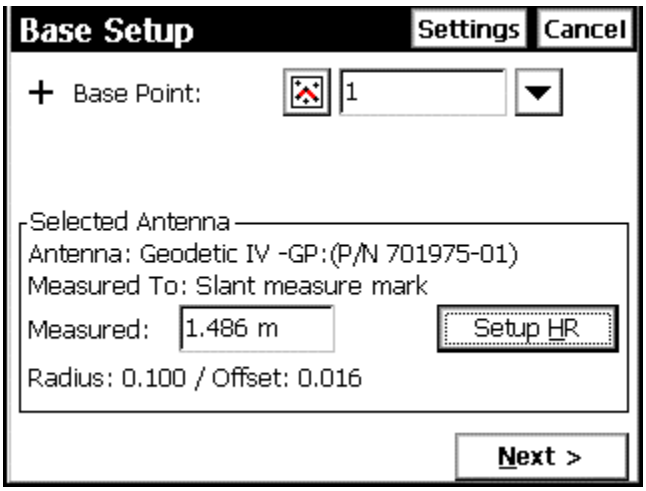


Figure 21

This returns to the **Base Setup** menu…

Tap on the **Next >** button…

The next screen…

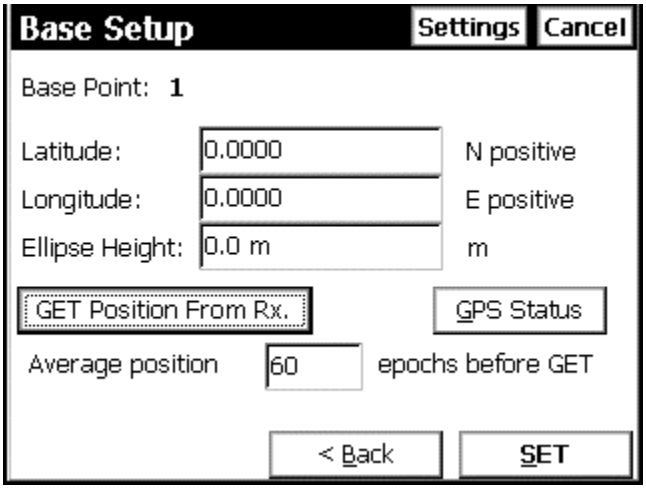


Figure 22

In this menu, perform the **TDS GET (GET Position From Rx.)**
But, first input Average Position **60** Epochs before GET, then Tap
"GET Position From Rx."

When using the TDS Localization, the recommended field procedure is to read / average the WGS84 position from the RTK Base receiver for 60 seconds. This provides a better base reference position. A one-second Get with bad PDOP spike and weak Satellite Geometry may result in a suspicious RTK Base reference point.

The next screen…

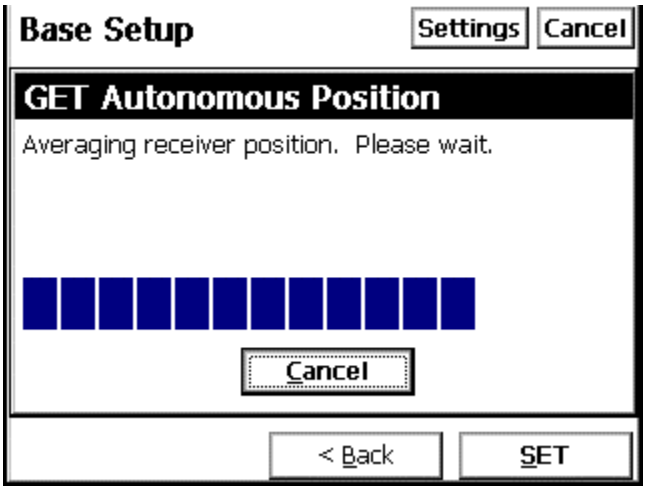


Figure 23

Status Screen during 60-second from **GET Autonomous Position…**
When the 60-seconds is completed, the window automatically closes.

The next screen…

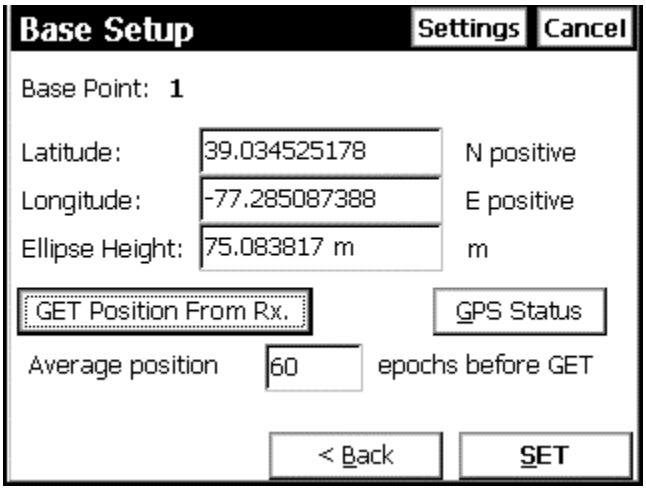


Figure 24

Resulting WGS84 Position for the RTK Base.

Tap on the **Set** button…

The next screen…

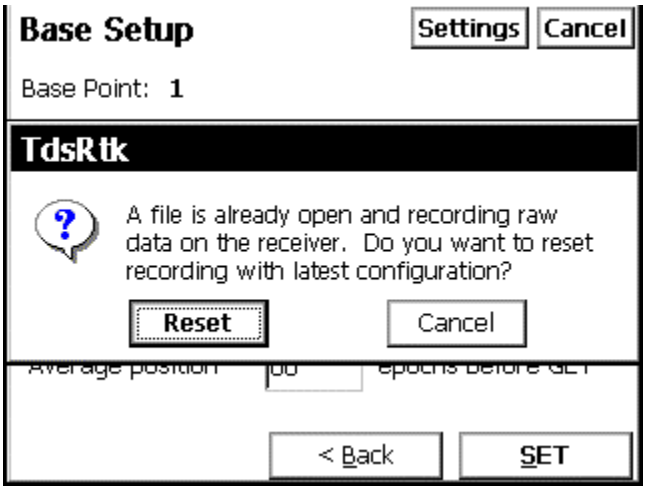


Figure 25

Tap on the **Reset** button…

This will start a new a data file in the GPS receiver's internal PC Card memory, for Post-Processing applications, (Code & Carrier Data).

The next screen…

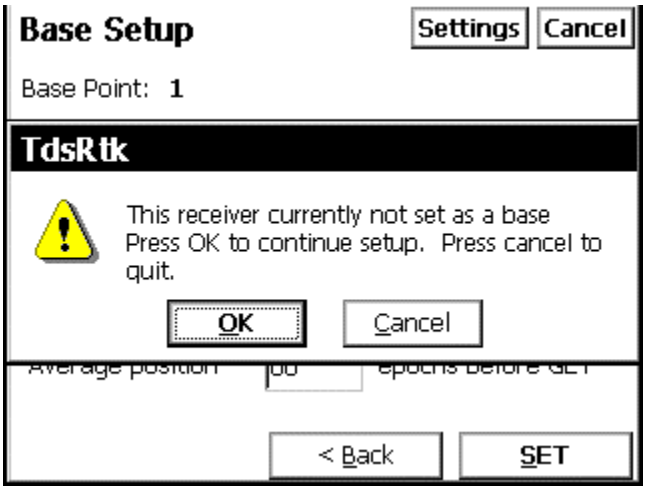


Figure 26

Tap the **OK** button

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…

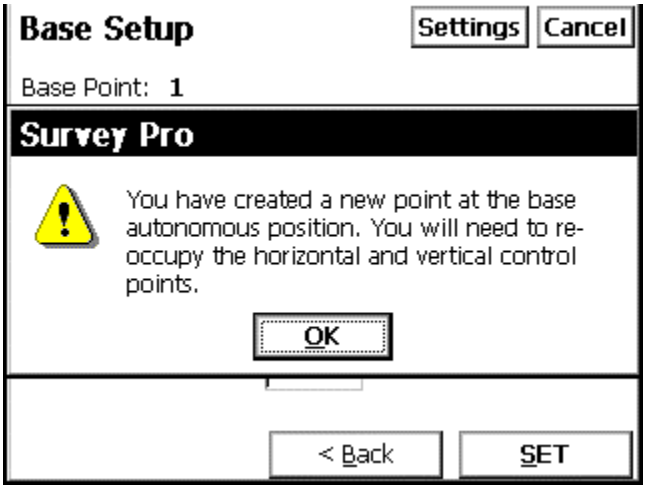


Figure 27

Tap on the **OK** button…

This screen informs the User, the current Localization will be discarded, (if the User Taps OK), the RTK Rover must then re-occupy the Horizontal and Vertical control points, then SOLVE & ACCEPT for the new Localization.

The next screen…

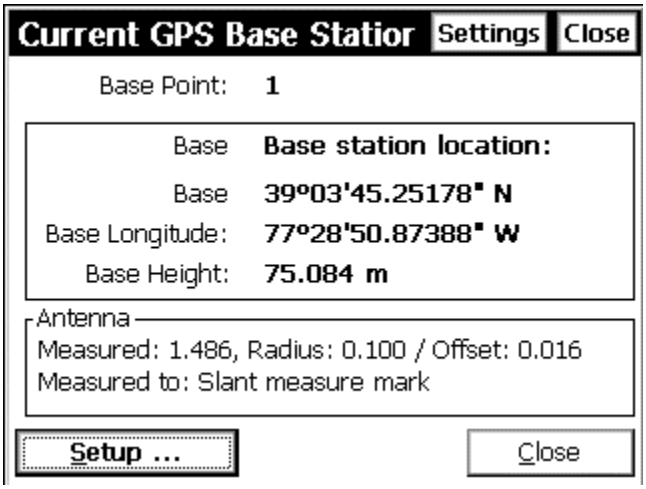


Figure 28

This is Current GPS Base Station Position

Tap on the **Close** button…
This will return you to the Survey Pro CE Main menu…

The next screen…

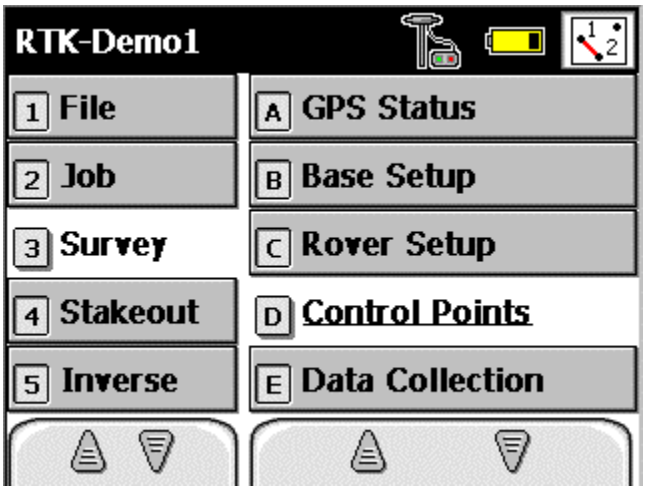


Figure 29

Next, Tap on **[3] Survey - [D] Control Points**

The next screen…

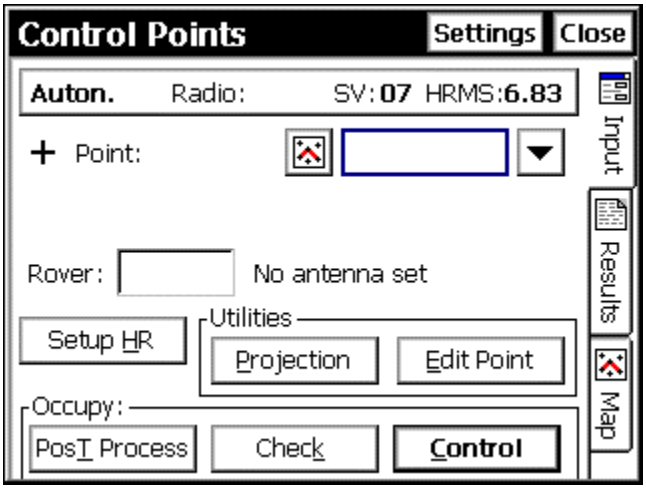


Figure 30

In this menu, select the point number for the RTK Base Point, Calculate a Single Point Localization…

Control Points menu

+ **Point:** Tap on the Down Arrow for the Pull-Down menu… Select "**Choose from List"** option, select Point 1, the RTK Base point,

Next, Tap on the **Utilities | Projection** menu button,

The next screens…

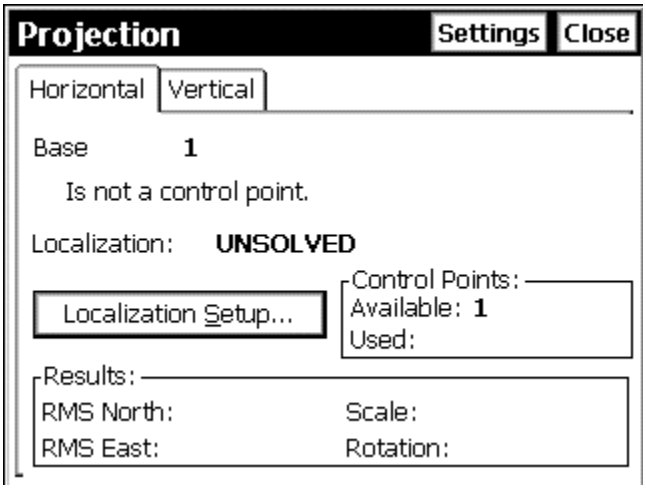


Figure 31

Next, Tap on the **Localization Setup…** menu button…

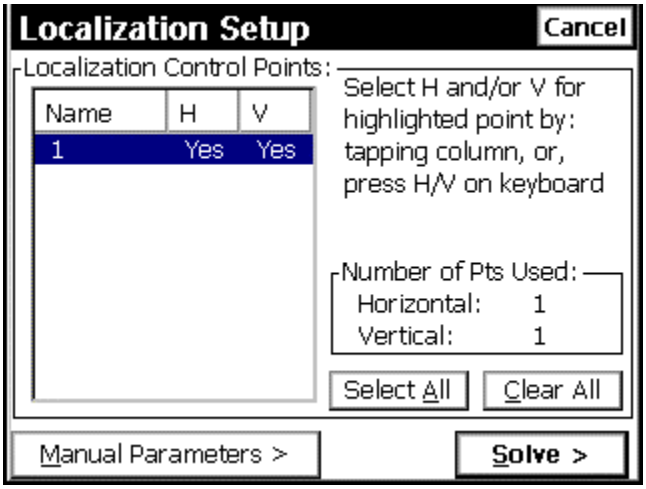


Figure 32

Press the "**H"** key on the Keyboard, then press the **"V"** key on the Keyboard, or tap with the stylus under H and V adjacent to Point 1, this selects the Point(s) for the Localization. After selecting Point 1, Tap the **Solve** button.

The next screen…

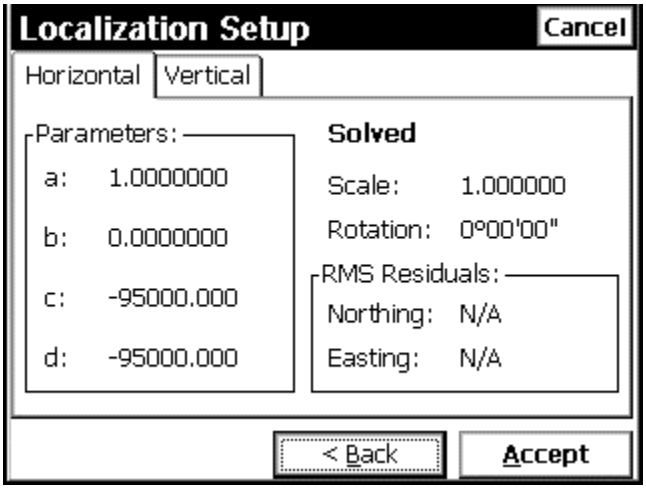


Figure 33

You have just performed a single Point Localization, holding the N-5000, E-5000, 500 Elevation coordinates, with the autonomous WGS84 position from the TDS GET:

Latitude 39° 03' 45.25178" N

Longitude 77° 28' 50.87388" W

Base Height 75.084m

Next, to accept the Localization, Tap on the **Accept** button…

The next screen…

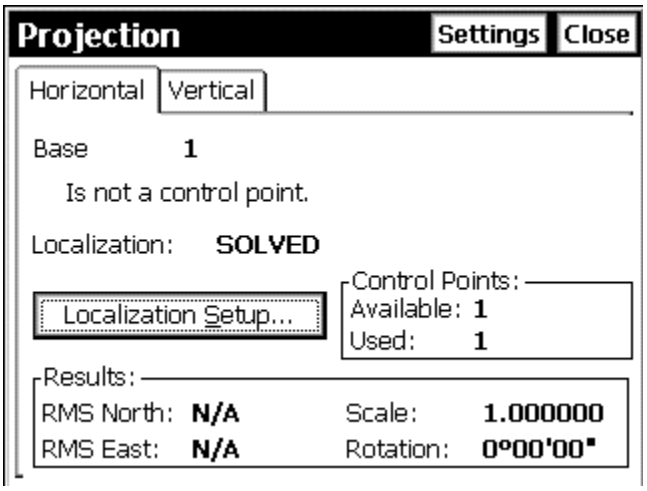


Figure 34

Note the results of the Single Point Localization, the Scale Factor = 1.000000
The Rotation Angle = 0° 00’ 00”. The data collector cannot compute the RMS residuals on the control points, there’s not enough control points to compute these residuals.

Tap on the **Close** button…

This will return you to Survey Pro CE Main menu…

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

Next, select **[3] Survey - [C] Rover Setup…**

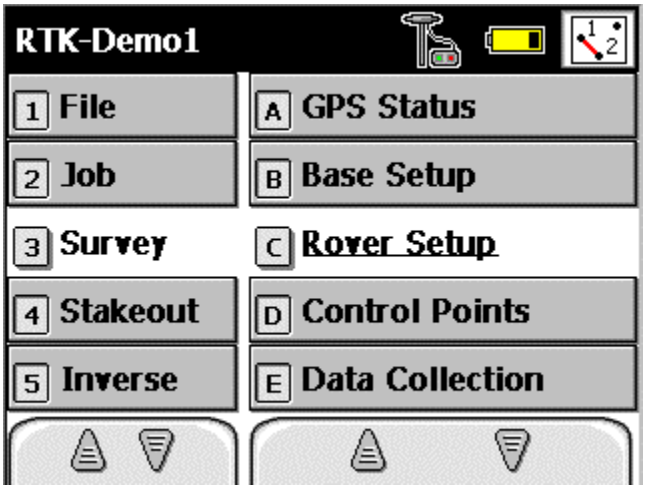


Figure 35

The next screen…

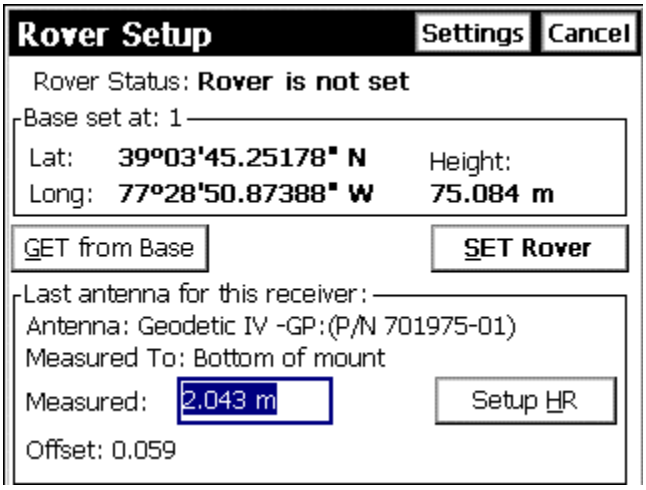


Figure 36

Note the Position of the RTK Base, this is the resulting WGS84 position from the TDS GET function. This is the position SET into the RTK Base receiver, this is position the PDL base radio is transmitting.

DO NOT tap on **Set Rover** yet…

Configure the RTK Rover GPS Antenna, Measure To and RTK Rover's HI.

Tap on **Setup HR** button…

The next screen…

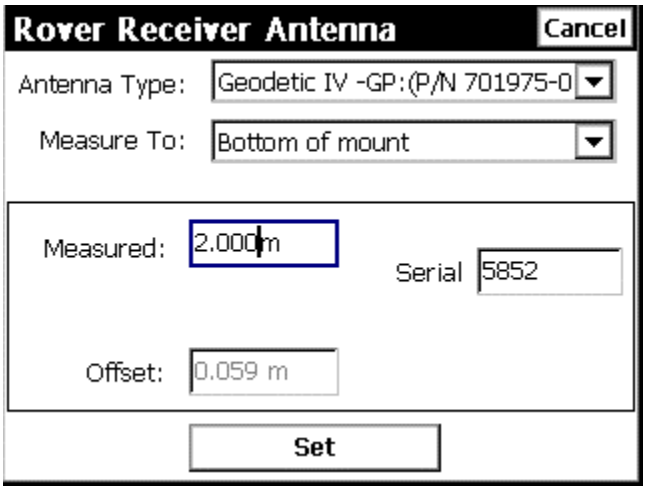


Figure 37

Antenna Type: **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 menu will close and return you to the Rover Setup menu…

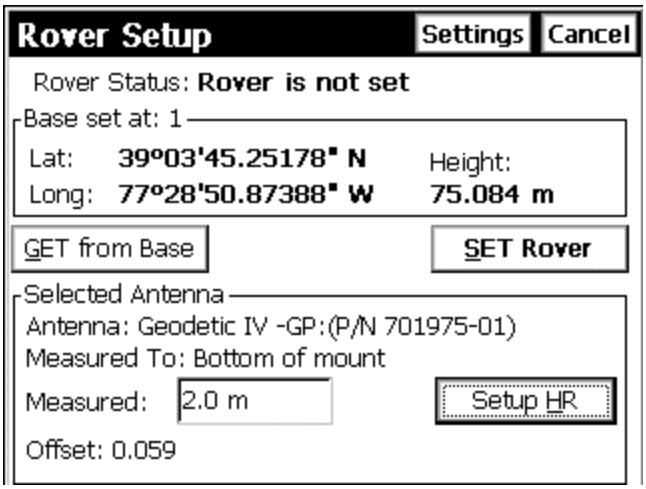


Figure 38

After the RTK Rover Antenna Parameters are determined – Tap **Set Rover…**

The next screen…

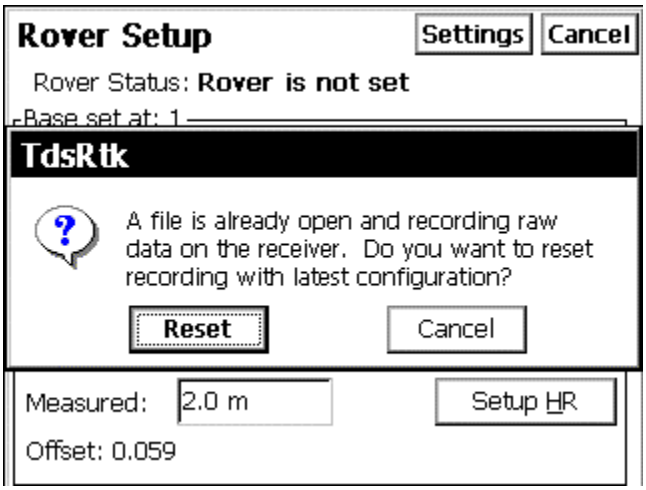


Figure 39

This will start a new a data file in the GPS receiver's internal PC Card memory, for Post-Processing applications, (Code & Carrier Data).

Tap the **Reset** button…

The next screen…

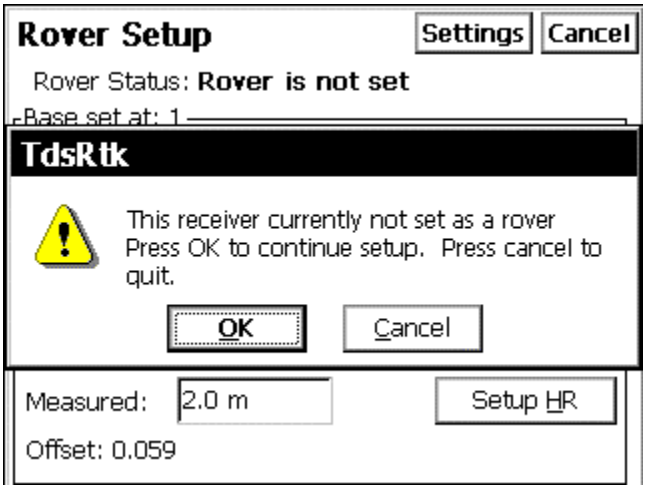


Figure 40

Tap the **OK** button…

This is the "Trigger" that switches the receiver from STATIC MODE into RTK ROVER MODE. The receiver is now configured as a RTK Rover, the internal PDL - RXO Rover Radio should now begin to Receive corrections from the RTK Base

Next, select **[3] Survey - [A] GPS Status…**

The next screen…

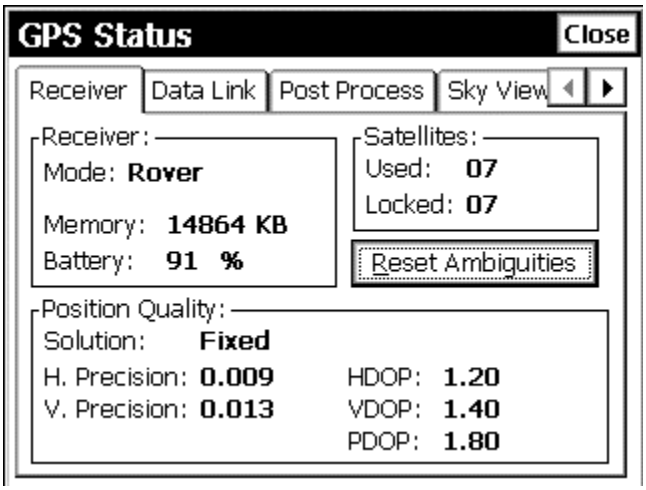


Figure 41

GPS Status – Receiver display menu…

The next screen…

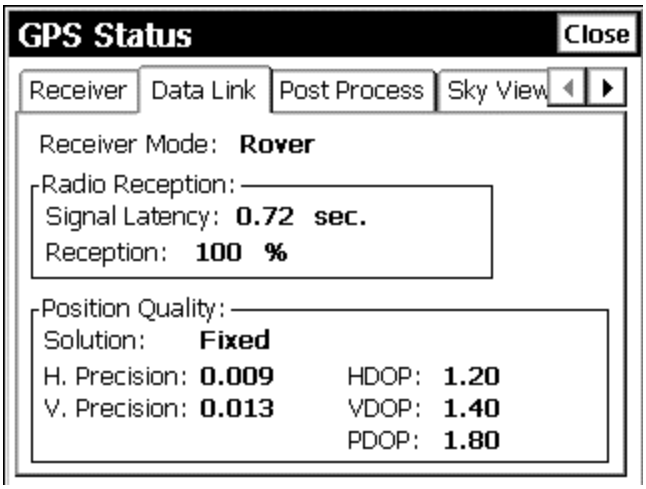


Figure 42

GPS Status – Data Link display menu…

The next screen…

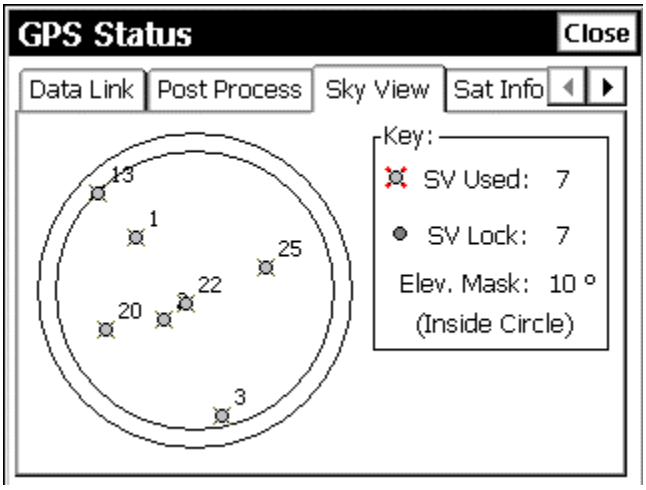


Figure 43

GPS Status – Sky View display menu…

The next screen…

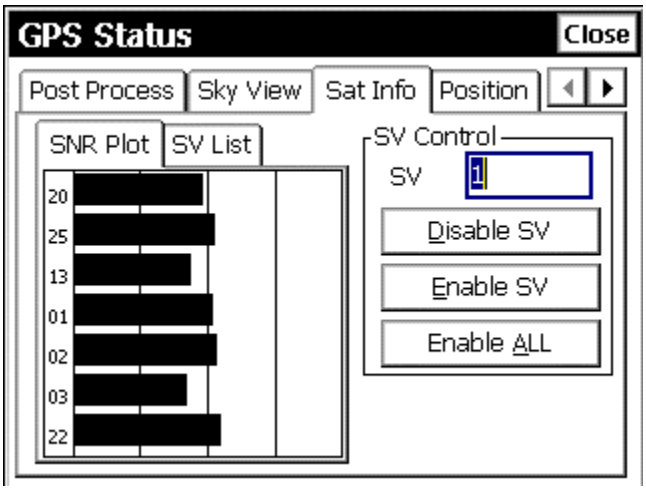


Figure 44

GPS Status – SNR Plot display menu…

The next screen…

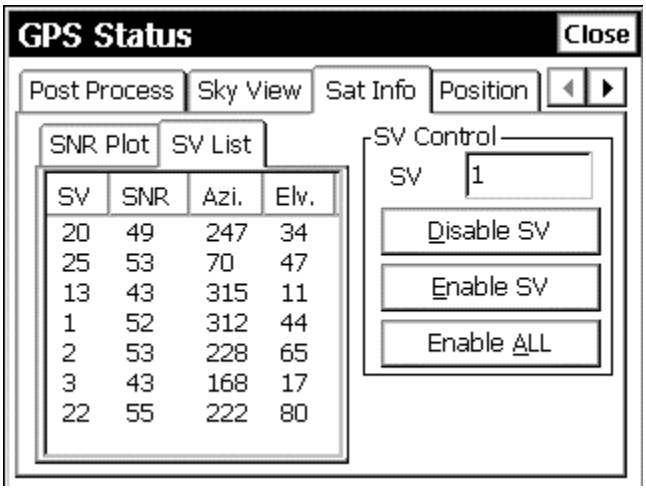


Figure 45

GPS Status – SV List display menu…

The next screen …

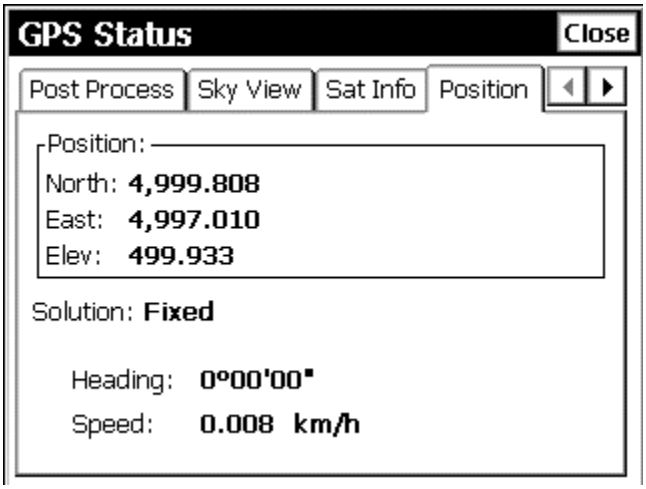


Figure 46

GPS Status – Position display menu…

Note: if the Localization HAS been Solved & Accepted, the Position display will show Northing, Easting and Elevation coordinates, relative to the RTK Base station.
If the Localization has NOT been Solved & Accepted, the Position display will show the differentially corrected Latitude, Longitude and Ellipsoid – relative to the RTK Base station.

When finished with **GPS Status,** tap **Close…**
This will return you the Survey Pro CE Main menu…

Next, select **[3] Survey - [C] Rover Setup…**

The next screen…

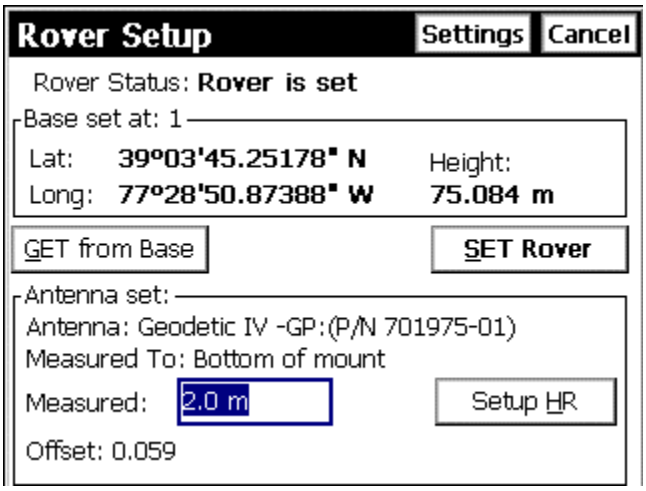


Figure 47

Note the Rover Status: **Rover is Set…**

The RTK system both Base and Rover are operational, the Localization is Solved and Accepted. You are now ready to Check a Control point, perform Data Collection, or perform Stakeout. Continue with the RTK demonstration…

To check Control Points, select **[3] Survey – [D] Control Points…**

To collect Topographic Data Points,
From the Survey Pro CE Main menu,

Select, **[3] Survey - [D] Data Collection…**

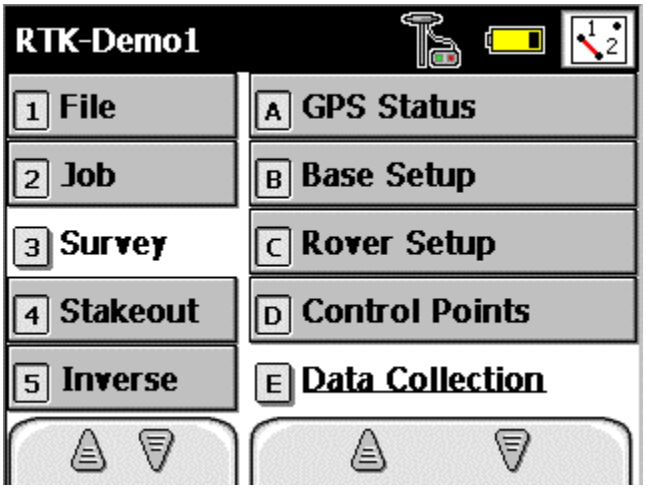


Figure 48

The next screen…

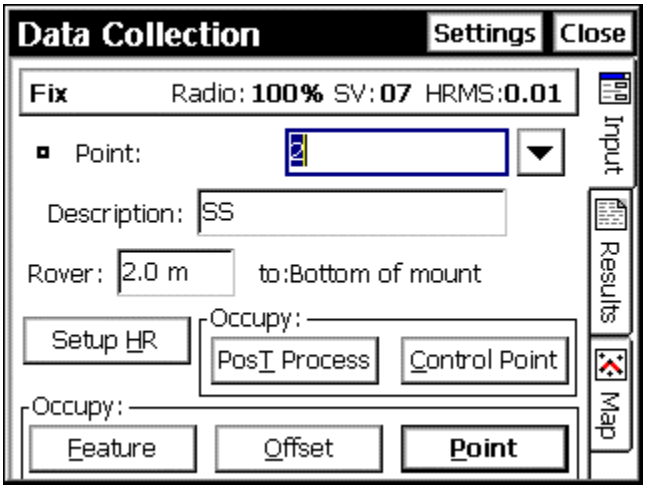


Figure 49

Note the Status Bar, in the top portion of the **Data Collection** menu, the Status Bar will constantly display Fix / Float status, Radio reception, Number of SV's and HRMS.

The Point number will sequentially increase, input a Description as needed, when your ready to "take-the-shot", tap **Point…**

The next screen…

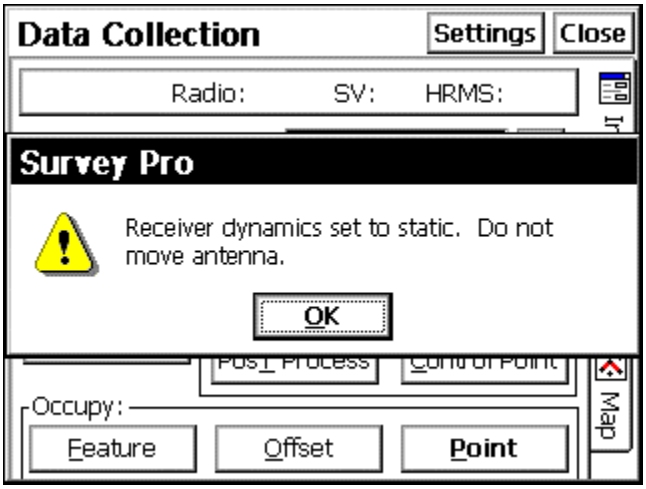


Figure 50

While "taking-the-shot", if the Receiver Dynamics are set to **Static,** you will observe the message: **"Receiver Dynamics set to static. Do not move antenna".**

Tap the **OK** button to "take-the-shot"…

Hold the RTK Rover's range pole steady, if there's a lot of motion while "taking-the-shot", the RTK Rover receiver may not allow you to store the point, until the pole motion ceases.

Alternatively, the **Data Collection – Settings** can be changed from **Static,** to **Dynamic Always.** This filter will tolerate more motion on the RTK Rover Pole.

The next screen…

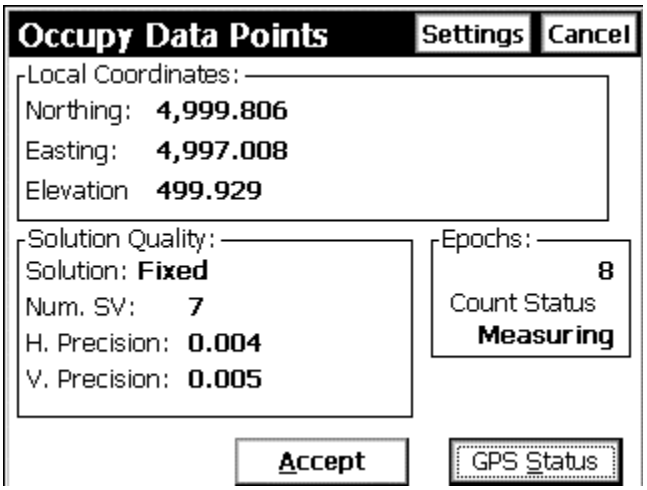


Figure 51

Tap **Accept** to record the shot…

The next screen …

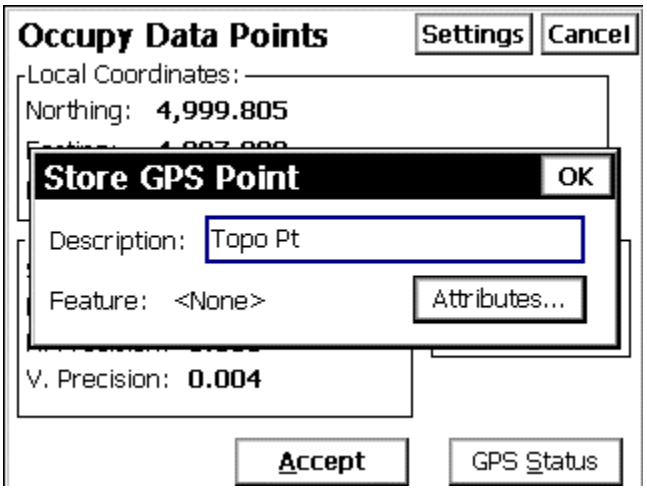


Figure 52

The Survey Pro CE software will allow the user to Append the Description after the point has been stored. This featured can be turned off if desired.

Tap **OK,** or hit **Enter** on the Ranger keyboard to accept the Descriptor. If desired, Tap on the **Attributes…** button to store additional information related to the description.

If finished collecting Topographic data, return to the Survey Pro CE Main menu…

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 Localization MUST be on the same coordinate system as the Design Points.

You cannot perform a TDS Localization based on N-5000, E-5000, Elev-500m and then Stake out points that have State Plane NAD 83 coordinates.

There is no established physical relationship between these two coordinate systems.

Select, **[4] Stakeout - [A] Stake Points…**

The next screen …

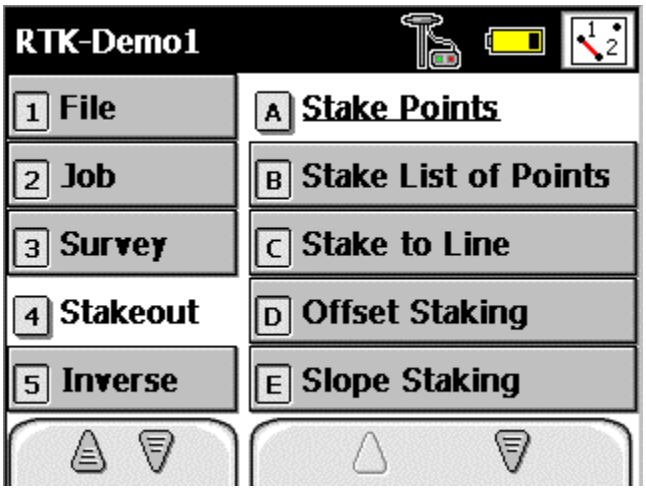


Figure 53

The next screen…

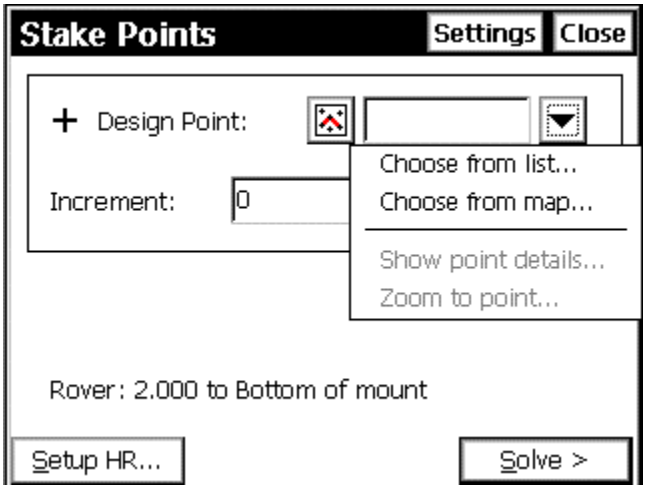


Figure 54

Tap on the **Down Arrow,** then select **Choose from List…**

Select the Design Point for Stake-Out..

The next screen …

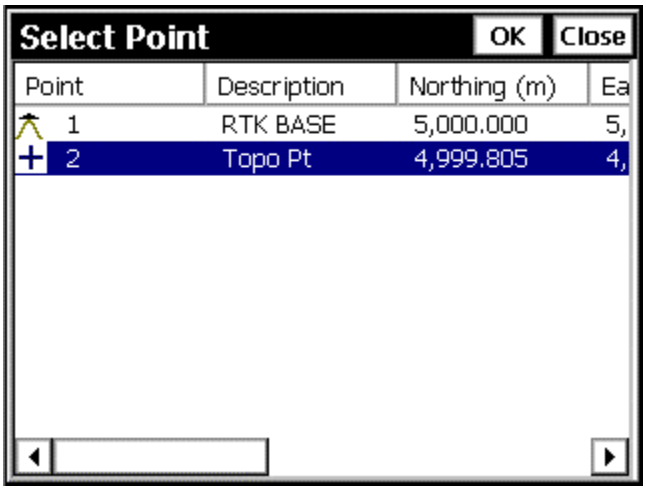


Figure 55

In this example, Point 2 was selected for Stake-Out..

After selecting Point 2, tap **OK…**

The next screen …

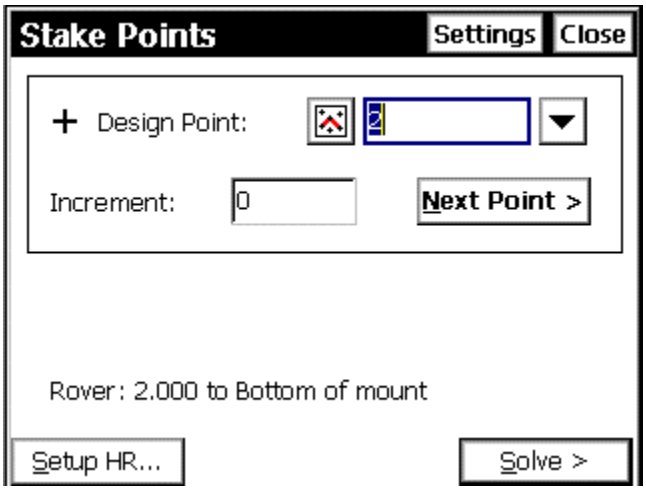


Figure 56

To begin the Stake-Out routines, Tap **Solve…**

The next screen …

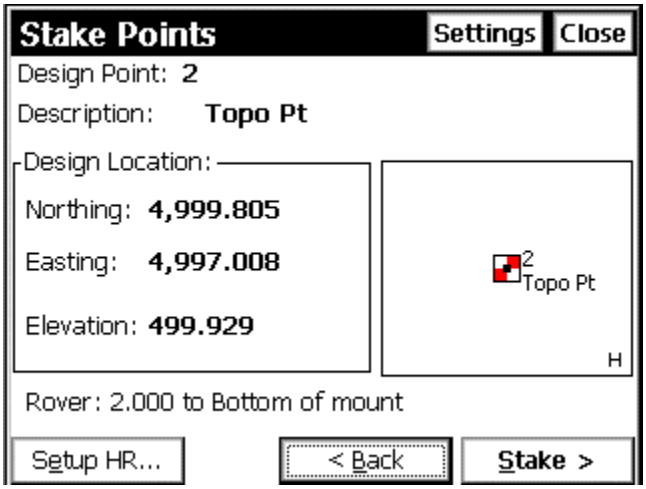


Figure 57

The selected Point 2's Design Coordinates are displayed…

Next, tap the **Stake** button…

The next screen …

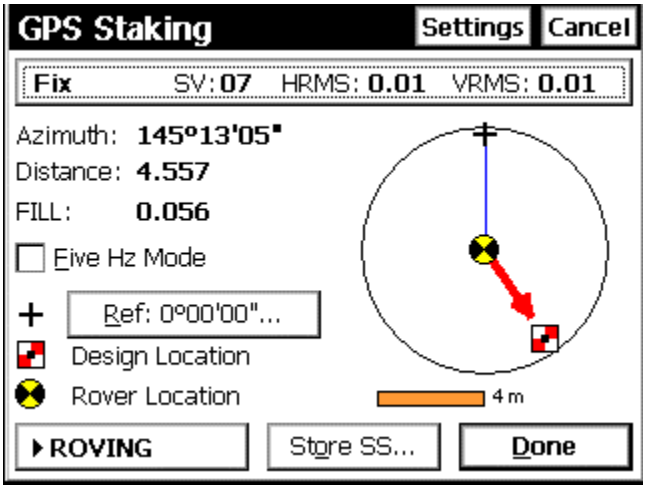


Figure 58

Live Screen displays: Azimuth, Distance, Cut –or- Fill To the Design Point.

Note, the Status Bar, in the top portion of the **GPS Staking** menu, the Status Bar will constantly display Fix / Float status, Radio reception, Number of SV's and HRMS.

In this screen capture, the **Ref: 0° 00' 00"** (Geodetic North) is being used. If the Compass vile is mounted on the RTK Rover Pole, use this to orientate direction to the Design point.

Alternatively, the user can tap on the **Ref: 0° 00' 00"** menu button, and change to the selection to **Ref Point,** then tap the Down Arrow , then choose the option: **Choose from List,** selecting the desired back-sight's point number.

To get the first few points staked, it may be easier to select the RTK Base Station point number for the back-sight. The RTK Base Station can usually be seen on the job site.

In all cases, the Back-sight Reference Direction, or Reference Point is depicted on the GPS Staking display menu at the top of the display circle, (12 O'clock), orientate yourself to this display and navigate to the point.

The next screen …

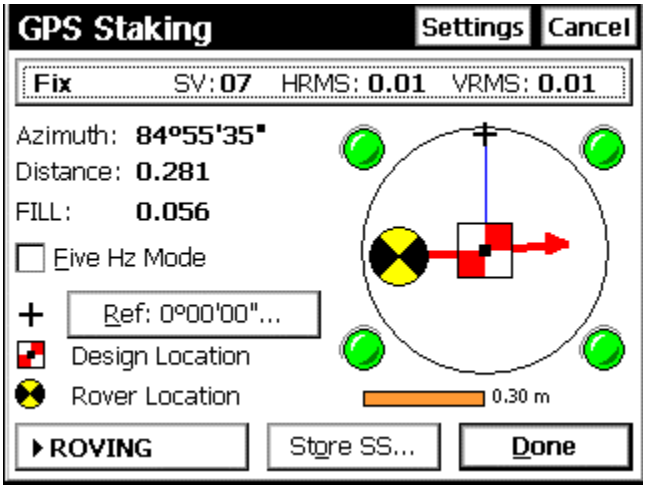


Figure 59

When you approach the Design Point, (Stake-out point), when you get within a few feet, or within a meter, the **GPS Staking** display screen graphics will enlarge…

The enlarged display will have the "Four-Rivet" style display…

We refer to this enlarged display as the "***Kill Zone"*** …

This display provides greater detail / sensitivity to stake the point.

The Design point is the Square Target / The RTK Rover Pole is the Round target.

Put the Round target in the Square…

When the point has been successfully located, Tap the **Done** button,
the "AZ-built" position can be stored.

Follow the on-screen prompts to **Store** the Point.

When finished Staking Points, return to the Survey Pro CE Main Menu…

To Export Coordinates:

Select **[1] File – [D] Export Coordinates**

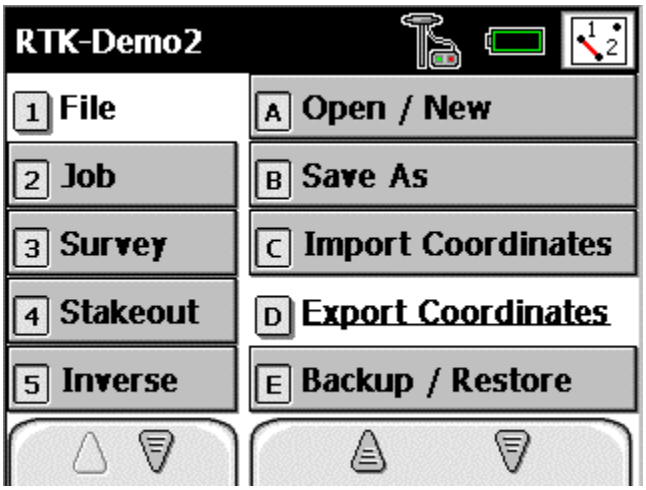
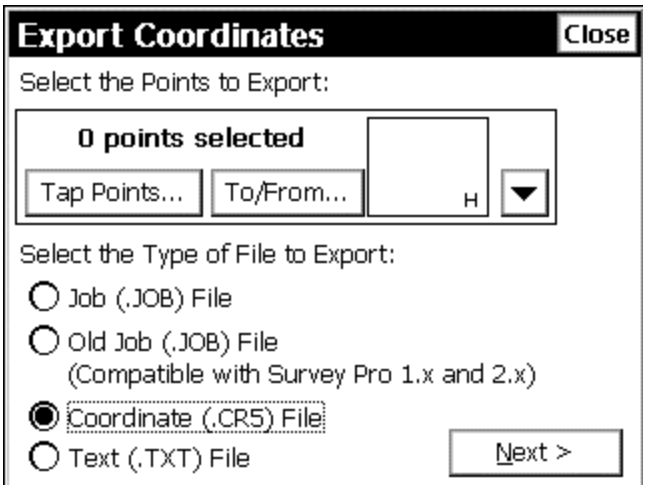


Figure 60

Select **Coordinate (.CR5) File** option…



Tap on the Drop-Down Arrow, choose **Select All Points**

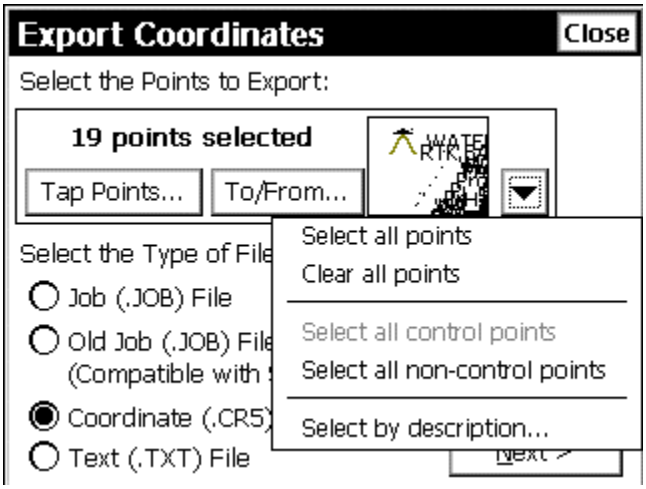


Figure 61

Select Sequential or, Non-Sequential…

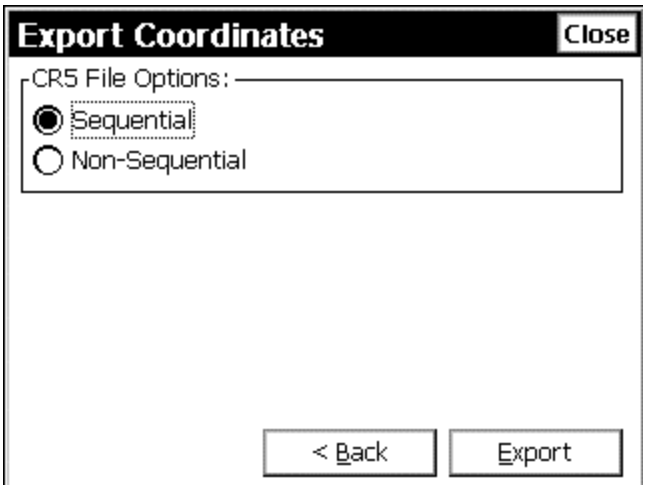


Figure 62

Tap on **Export …**

Save As menu…

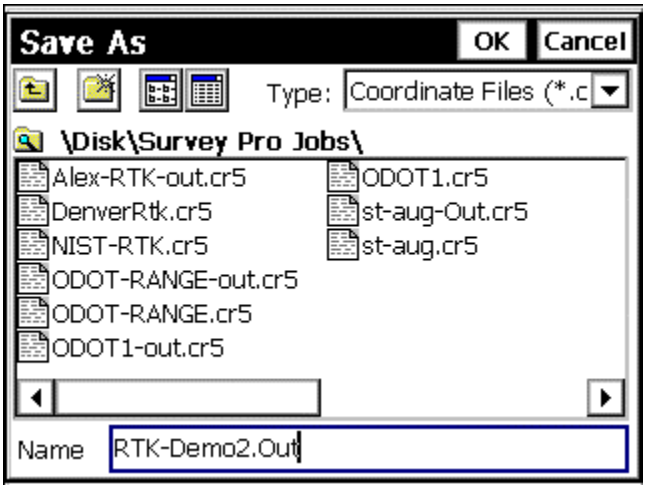


Figure 63

Input a Filename: **RTK-Demo-Out.CR5…**

To Transfer the Exported Coordinates from the TDS Ranger:

Select **[1] File – [F] Transfer…**

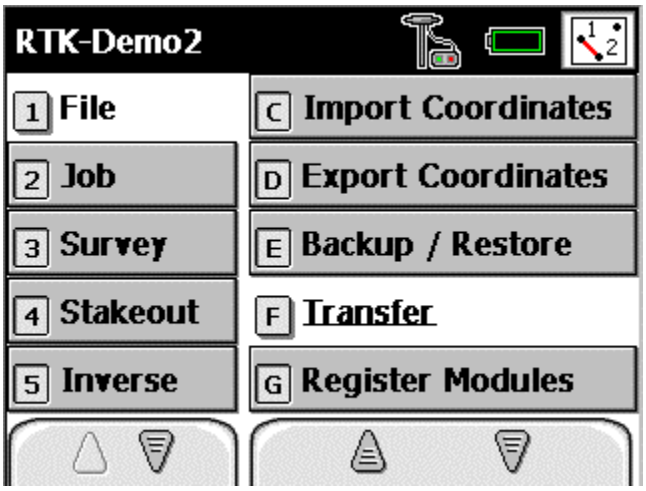


Figure 64

Transfer menu…

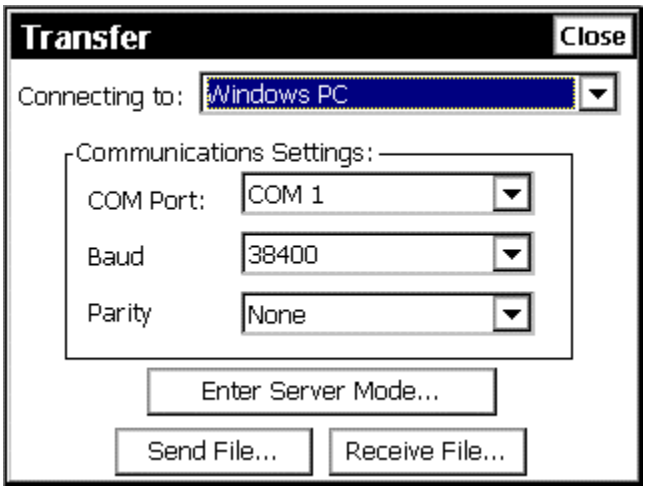


Figure 65

Specify connecting to Windows PC

Specify 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…**

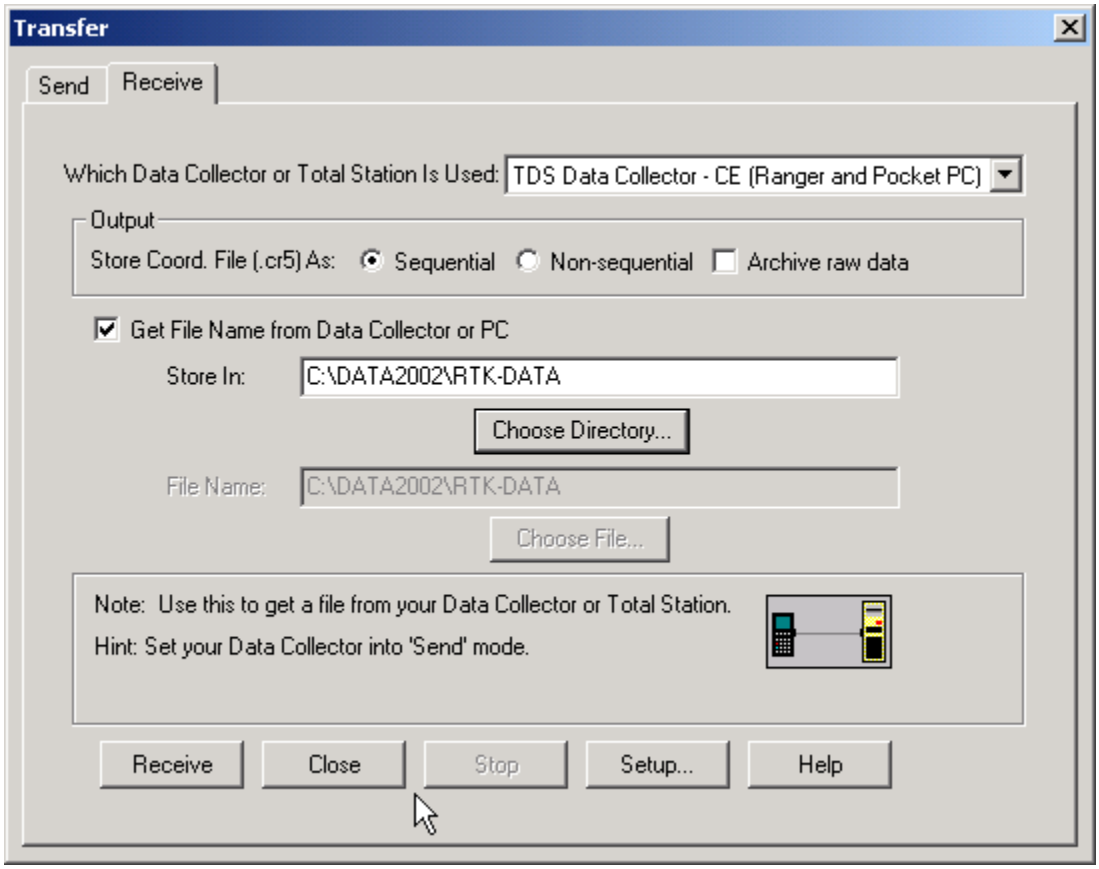


Figure 66

Last Updated by RDL: 9/10/02