TDS Ranger Survey Pro CE Version 2.1.8
RTK Base on known Control Point.
RTK Rover - Localization with Control Points.

Pre-load control Coordinates and appropriate NGS Geoid 99/96 data files into the Ranger using TDS Survey Link or, Microsoft Active Sync V3.1 © software. The horizontal datum for the coordinates can be Local Assumed, NAD83, or UTM. The vertical datum for elevations can be ellipsoidal, orthometric w/Geoid modeling, Or localization with benchmarks.

Set up the RTK Base system on control point, measure GPS Antenna HI.

Before starting the New survey – Reset the Base GPS Receiver, the unit needs to obtain a new position fix. This position can be an input as a known WGS84 latitude, longitude, and elevation or, derived from a "GET POSITION from Base Receiver".

Reset Base GPS Receiver: press ⇑ Arrow to "SETTINGS" | press ⇓ arrow for 3 Seconds | RESET Tap ⇓ arrow | Reset Receiver ? | Press ↵ <enter> – receiver displays "Done".

Connect TDS Ranger to Base RTK Receiver – Serial Port A.
Double-Tap on **Survey Pro** icon…

What do you want to Do ?

Open an Existing Job… <tap>, or

[1] Job [C] Open <tap>

Open
Type: Select Job Files (*.job) or, Coordinate Files (*.cr5)
Reston2RTK.cr5 or,
⊗Reston2RTK.job <tap>

[1] Job [A] Settings <tap>

Settings
Receiver Tab:

Brand:	**[Ashtech]**
Model:	**[Z-Surveyor/Z-Xtreme]**
GPS Mode:	**[RTK]**

[Receiver settings…] <tap>

GPS Receiver Settings
Receiver Tab

Brand: **Ashtech**
Model: **Z-Surveyor/Z-Xtreme**

Format for RTK [DBEN]

Communications:

Serial Port (Data Collector):	COM1	
Serial Port (GPS Receiver):	A	
Baud Rate	9600	
Parity	None	**[Change…]** <tap>

GPS Receiver Settings
Base Radio Tab

Radio Modem: [Pac Crest]
Serial Port

Baud Rate	9600	
Parity	None	**[Configure Serial]**
Serial	B	(External Pacific Crest PDL Base Radio – Uses Port B).

Radio Settings

Channel:	0	
Sensitivity	Low	**[Configure Modem]**

[OK] <tap>

Settings
Projection Tab

Projection Types:

Horizontal: **Localization with Control Points**

Vertical: **Localization**

Path to Data Files:
\Disk\TDS Geodata **[Browse]**

In this example, the Base might have a known Northing/Easting coordinate, and an orthometric height (3D Point) or, an unknown elevation (2D point). Your going to "localize the RTK Rover" unit by visiting 3-4 known horizontal & vertical control points the job site.

The goal of Localization with Control Points is produce ground level coordinates when the project already has coordinates, but the Geodetic orientation is not known. (i.e. Scale & Convergence angle).

Settings
Post Process

If you desire to collect data for Post Processing during the RTK Survey, i.e. ***"Concurrent RTK"***, enter an appropriate "Recording Interval". The default Recording Interval: None.

Recording Interval: 10 sec	Browse the list & select the appropriate Recording Interval; ensure the Base & Rovers sample data at the same rate.

Survey Pro Threshold Management:

[ ] Use Threshold Manager

Satellite Threshold: [5]

HDOP Threshold: [12]

Memory Threshold: [0] KB

Settings
Units Tab

Units for Distance: **Meters**
Units for Angles: **Degrees**
Display Directions as: **Azimuth**
Azimuth Type: **North Azimuth**
[OK] <tap>

Select appropriate "Units for Distance" to match stored coordinates in .cr5, or .job file. (**JOB | Settings | Units).**

Settings
Files Tab

Control File:
[ ]

[Browse]

Description File:
[Codes.txt]
[Browse]

If you have a pre-defined Data Collection Code list, or Data Dictionary, copy this file into the Ranger's \Disk\TDS Jobs directory. This file can then be associated to any project. During data collection, a pop-up menu with these description files will be made available to the user to choose from.

[2] Survey - [B] Base Setup <Tap>

Base Point: **Base is not set:**

Base
Base Latitude: 00° 00' 00.00000"
Base Longitude: 000° 00' 00.00000"
Base Height: 000.000

[Setup…] <Tap>

+ Base Point: [ ] ∇ <Tap> on down arrow, select from the following:

"Choose from List…" or **"Choose from map…".**

In this example, select: **"Choose from list…"**

Select Point

Browse the Point List, select point # 105 – MAX1 for the RTK Base station.
<Tap> on **OK.**

Last Antenna for this receiver:
Antenna: Geodetic IV –GP: (P/N 701975-01)
Measured To: Bottom of Mount

Measured: 6.755 [Setup HR] **<tap>**

Base Receiver Antenna

Antenna Type: [Geodetic IV –GP: (P/N 701975-01] ***(Browse list available)***

Measure To: [Bottom of Mount] ***(Other Choice = Slant Measure Mark)***

Measured: [6.56]

Offset: [0.059]

Set < tap >

Enter the HI of the RTK Base stations GPS Antenna & select the appropriate Ashtech GPS Antenna by it's description / Ashtech Part Number.

<Tap> "**Next"**

Base Setup

Latitude:	0.0000	N positive
Longitude:	0.0000	E positive
Ellipsoid Ht	0.0	feet

[GET Position From RX.] [GPS Status]

Average position [60] epochs before GET

Enter "60" epochs in the average position dialog box – ***then Perform "GET"…***

After the Base RTK Receiver averages this Position for 60 Seconds, the Ranger Display's the following Autonomous Position for Point # 1:

Latitude:	38.565985970	N Positive
Longitude:	-077.214312276	E positive
Ellipsoid Ht:	404.2345	feet

[SET] <tap>

After tapping SET – the Ranger will display the message:

! **SurveyPro**
You have set the Base at a new autonomous position. You will need to re-occupy the horizontal and vertical control points.

<tap> **[OK]**

Current GPS Base Station

Base Point: 1

Base	**Base station location:**
Base:	**38◦ 56’ 59.85970” N**
Base Longitude:	**77◦ 21 43.12276” W**
Base Height:	**404.2345 feet**

<tap> **Close**

The RTK Base Station is now Set-up…

Ensure the Pacific Crest PDL Base Radio is turned on, the “TX” light should be blinking every other second, indicating the radio is broadcasting data.

Disconnect the TDS Ranger from the Base RTK receiver and connect it to the RTK Rover receiver.

Reset Rover GPS Receiver: press ⇑ Arrow to “SETTINGS” | press ⇓ arrow for 3 Seconds | RESET - Tap ⇓ arrow | Reset Receiver ? | press ⇑ & ⇓ arrow together – receiver displays “Done”.

[2] Survey [C] Rover Setup <Tap>

Rover Setup Settings Tab <tap>…

Settings
Receiver

Brand: **Ashtech**
Model: **Z-Xtreme / Z-Surveyor**
GPS Mode: **RTK**

[**Receiver settings...]** <tap>…

GPS Receiver Settings
Receiver

Brand: *Ashtech*
Model: **Z-Xtreme / Z-Surveyor**

GPS Receiver Settings

Brand: **Ashtech**
Model: **Z-Surveyor / Z-Xtreme**

Format for RTK: [DBEN]

Communications:

Serial Port (Data Collector):		COM1
Serial Port (GPS Receiver):		A
Baud Rate	9600	
Parity	None	**[Change…]** <tap>

GPS Receiver Settings
Rover Radio Tab…

Ensure RTK Rover Radio settings are properly set:

Radio Modem: [Pac Crest]
Serial Port

Baud Rate	9600	
Parity	None	**[Configure Serial]**
Serial	D	(internal Pacific Crest RXO Base Radio – Use Port D).

<Tap> **OK**
<Tap> **OK (Again…)**

Notes: If the Z-Surveyor/Z-Xtreme is configured with an Internal radio, select **Serial Port D** in the **Rover Radio** tab. If the RTK Rover uses an external radio, select Serial Port B.

Ensure the proper Rover Radio Channel is being used, it must match the Radio channel selected on the Base radio.

Returns you to the **Rover Setup Dialog.**

Rover Status: **Rover is not Set**

Rover Setup

Rover Status: **Rover is not set**

Base set at: 1
Lat: **38 °56' 59.85970" N** Height:
Long: **77 ° 21' 43.12276: W** **404.235 feet**

Select **[Get from Base]** **[Set Rover]**

Last Antenna for this receiver:
Antenna: Geodetic IV –GP: (P/N 701975-01)
Measured To: Bottom of Mount

Measured: 6.755 **[Setup HR] <tap>**

Rover Receiver Antenna

Antenna Type: [Geodetic IV –GP: (P/N 701975-01] ***(Browse list available)***

Measure To: [Bottom of Mount] ***(Other Choice = Slant Measure Mark)***

Measured: [6.755]

Offset: [0.059]

Set < tap >

Returns you to the **Rover Setup Dialog…**

< tap > [Set Rover]

If the RTK Rover's Internal Radio is receiving data from the Base RTK system, the green "RX" receive LED on the Front Panel of the Z-Xtreme / Z-Surveyor should be blinking every other second – indicating it's receiving RTK data from the RTK Base. The Ranger should be displaying the Base Station's Latitude, Longitude, Height.

[2] Survey - [D] Control Points

Control Points [Settings] <tap>…

Measure Mode

Acceptance Mode: **[Fine]**
Store GPS Raw: **[lat, lng, ht]**

Epochs to Average on Accept: **1**

[ ] Use Acceptance Criteria

HRMS [0.00000] feet
VRMS [0.00000] feet PDOP: [6]

[ ] Use Criteria to Auot Accept Data Points

[OK] <tap>

This returns you to the **Control Points** Dialog…

Control Points

[Fix Radio 99% SV 10 HRMS 0.015] (RTK Rover Status Bar Display)

+ Point [100] Browse with the down arrow…

Select: "Choose from list…" Select the arbitrary Point 1.

Select: **100 Dan1 N 2143074.662 E 3598537.023 EL 122.625**

<tap> **OK**

<tap> Occupy:

[Check] **[Control] <tap>**

Occupy the Control Point and tap **[Control Point]** to begin the measurement.

When your happy with the measurement, tap **[Accept].**

Move to the next control point and repeat the process. Collect a minimum of 2 control points to solve the horizontal localization. Collect a minimum of 3 vertical control points to solve the vertical localization.

[2] Survey | [F] Projection

Projection

Horizontal tab

Base 1

Localization: **UNSOLVED**

[Localization Setup…] <tap>…

Localization Setup

Localization Control Points:

Name	H	V
105	**Yes**	**Yes**
100	**Yes**	**Yes**
102	**Yes**	**Yes**

Select H and/or V for highlighted point by: tapping column, or, press H/V on Keyboard.

Number of Pts Used:
Horizontal: **3**
Vertical: **3**

[Solve] <tap>…

Localization Setup ***POST Solve*…**

Horizontal

Parameters: **Solved**

a: 1.0000000
b: 0.0000000
c: -95.000
d: -95000.000

Scale: 0.99994236
Rotation: -01° 12’ 16”

RMS Residuals:
Northing: N/A
Easting: N/A

Check Points

After you solve your Localization, it is a good idea to check to an independent point, specifically a point that was not included in the localization.

[2] Survey | [D] Control Points

Choose a valid point and enter the point number in the **Occupy | Check...**
When you are happy with the measurement, press **Accept.** This returns you to the **Control Points** screen.

<tap> Results Tab:

Check the results of your check point. The program will display Delta N / Delta E/ Delta EL. If the differences are within expected tolerances, then you can confidently collect data, or stake-out design points. If your Delta's are larger than expected, check for problems in the Localization. You may need to add additional points to your Localization and re-solve. Be sure to isolate problems before continuing with the RTK Survey.

[2] Survey [A] GPS Status <Tap>…

The RTK Rover is now Setup on a Local Datum, The RTK Rover will display a N, E, Elev., relative to the RTK Base Station's Position. Continue with the RTK survey.

GPS Status
Receiver Tab

Receiver	Satellites:
Mode: **Rover**	Used: **8**
	Locked: **7**
Memory: **7497 Kb**	
Battery: **98 %**	[Reset Ambiguities]

Position Quality:		
Solution:	**Fixed**	
H. Precision:	**0.012 m**	HDOP: **1.20**
V. Precision	**0.014 m**	VDOP: **1.35**
		PDOP: **001**

GPS Status
Data Link Tab

Receiver Mode: **Rover**

Radio Reception:
Signal Latency: **0.038**
Reception: **100 %**

Position Quality:
Solution: **Fixed**
H. Precision: **0.012 m** HDOP: **1.20**
V. Precision **0.014 m** VDOP: **1.35**
PDOP: **001**

[2] Survey [A] GPS Status <Tap>…

GPS Status
Sky View Tab… Observe current SV Sky View…

Your now ready to perform Data Collection and/or Stakeout….

[2] Survey [E] Data Collection

-or-

[3] Stakeout [A] Stake Points

For additional information, please consult the TDS Survey CE Manuals.

Prepared by Bob LeMoine – Thales Navigation, Last Updated 6-9-01