

SECTION C-3: FLORIDA NIKON DTM-302 SERIES TOTAL STATION WITH TRIMBLE® TSC2 DATA COLLECTOR

The use of the Trimble® 5600 total station and the Trimble® TSC2 data collector can greatly improve the efficiency of collecting and processing survey data. Survey data can be electronically recorded and stored for downloading to a computer for processing. The survey data must be collected in a manner that will be compatible with the software used for processing the data.

The following set of procedures describes how to survey with the Nikon DTM 302 total station and the Trimble® TSC2 data collector. The following document only explains features that a NRCS field office will typically use when surveying. In order to become familiar with the total station, read the *Nikon DTM 302 Series Total Station Instruction Manual* located in the appendix. This procedure will detail the user on how to setup the Trimble® TSC2 data collector, Nikon DTM 302 series total station, and conduct a field survey. See Figures 1 and 2 for illustrations of the Nikon Total Station and the Trimble® Data Collector.

Figure 1: Nikon DTM-302 Total Station



Figure 2: Trimble TSC2 Data Collector



A. INITIAL SETUP OF SURVEY STYLE IN TSC2 DATA COLLECTOR FOR THE NIKON DTM-302 SERIES SURVEY EQUIPMENT

NOTE: Once survey style is established it *will not* need to be reestablished unless the Trimble® TSC2 data collector memory is erased or the user

is supplied with a new Trimble® TSC2 data collector. The survey style may be setup in the office.

1. Turn on TSC2 data collector by pushing the green button on the lower left hand corner of the keypad.
2. From Windows Mobile Desktop main menu, select the “**Survey Controller**” icon. See Figure 3.

Figure 3: “Survey Controller” icon.



Survey Controller

3. From the six icons, select “**Configuration**” > “**Survey styles**”
4. *NikonDTM* is a pre-defined survey style for the Nikon DTM-302 Series. Select “**Esc**” and proceed to Section B if the survey style is already in the drop down menu. If this survey style is not in the dropdown list, follow Steps 5-13.
5. On the bottom of the screen there will be three small buttons, select “**New**”.
6. Name the new survey style (e.g. **NikonDTM**).
7. Select “**Conventional**” from the dropdown menu for the style type.
8. Select “**Accept**” > “**Instrument**”.
9. Fill out the resulting screen with the following parameters:
 - a. Manufacturer: “**Nikon**”
 - b. Baud rate: “**4800**” or “**9600**” depending on the total station settings.
 - c. Parity: “**None**”
 - d. HA VA status rate: “**2s**”
 - e. Measurement mode: “**Fine**”
 - f. Measure dist on face 2: **box checked**
 - g. Set backsight: “**Azimuth**”
 - h. Edit instrument precisions: “**Yes**”

- i. Select $1^{1/2}$ icon
- j. **For page 2** – Enter using Data collector keyboard.
- k. Horizontal angle: **5**
- l. Vertical angle: **5**
- m. EDM*: **0.05 sft**
- n. EDM (ppm)**: **30**
- o. Centering error: **0.02**
- p. Offset and Stakeout directions: **“Automatic”**
- q. Select **“Enter”** > **“Accept”**

*EDM= Electronic Distance Measurement

**ppm = Parts Per Million

10. Select **“Topo point”**.
11. Fill out the resulting screen with the following parameters:
 - a. Measure display: **HA VA SD**
 - b. Auto point step size: **1**
 - c. View before storage: check the box
 - d. Select **“Accept”**.
12. Select **“Store”** on the bottom of the screen.
13. The survey style is now established. (Select **“Esc”** > **“Exit”** to return to the main menu.)

B. INITIAL TSC2 DATA COLLECTOR JOB SETUP (May be performed in the office)

1. Turn on the TSC2 data collector
2. Select the **“Survey Controller”** icon from the main menu.
3. Open **“Files”** > **“New Job”**.
4. Fill out the resulting screen with the following parameters:
 - a. Give name: Enter the name of job (name or date)
 - b. Select **“Coord. Sys.”** > **“Scale Factor Only”** > **“Next”**.

- c. Scale factor box leave: **“0.9996000000”**
- d. Select: **“Store”**.
- e. Units: **“US. Survey Feet”**
- f. Linked files: **“None”**
- g. Active map: **“None”**
- h. Feature library: Select the local office field library

NOTE: The feature table can be loaded onto the data collector in the office. Statewide feature table can be obtained from the Area Engineer or from the SO Engineering Section.

- i. Cogo setting:
 - Distances: **“Ground”**
 - Leave remainder default settings, Tap **“Accept”**.
- j. Leave the default settings for page 2.
- k. Select **“Accept”**.

C. INITIAL SURVEY EQUIPMENT SETUP

1. Place the total station directly over control point (#1) using the optical plummet.
 - a. (Rodman may) Place the backsight on benchmark at this time as well.
 - b. Measure the rod height (back sight height) and record in the field book
2. Level the Nikon total station.

Figure 2: Nikon DTM-302 Series – Face 1 and Face 2



- a. Loosen upper plate clamp.
 - This allows the instrument to move freely.
 - b. Level the plate level.
 - c. Use two of the three leveling screws to level the instrument referencing the bubble level.
 - d. Rotate the total station 90° .
 - e. Level the instrument using the circular (bubble) level and the third screw.
 - f. Rotate the instrument 180° and make any necessary adjustments.
3. Once Instrument is level - Measure the instrument height and record in the field book.
 - a. Instrument height is measured from the control point to the horizontal axis indication mark on side of the instrument. See Figure 2.
- D. SETTING UP FOR COLLECTING FIELD SURVEY DATA**
1. Turn the total station's power on using the red button located at the top right of the instrument key pad.
 2. Tilt the optical lens until the display appears on the keyboard.
 3. Set the instrument to true north using a compass or as close as possible. Survey may be rotated back in the office.

Note: To move the optical lens vertically, unlock the vertical clamp. Find the target, Lock the vertical clamp. Then use the vertical tangent screw to fine tune the vertical movement. To rotate the instrument, unlock the upper plate clamp. Turn the instrument to find the target. Lock the upper plate clamp. Then use the upper plate tangent screw to fine tune the rotation.
 4. Press the [ANG] button.
 5. Press [1] to zero the horizontal azimuth.
 6. Turn the instrument to face the back sight.
 7. Position the optical lens on the backsight prism. The horizontal azimuth (angle) will display on instrument keyboard.
 8. Record the horizontal azimuth in your field book.
 9. Connect the TSC2 to the Nikon total station using proper cable.
 10. Turn on the TSC2 data collector and select "**Survey Controller**" from the main menu.
 11. Open the job file you wish to use.

If you created the desired job file using the previous section it should already be selected.
 12. From the Survey Controller main menu, select the "**Survey**" icon.
 13. Select the survey style created for use with the Nikon total station.
 14. Select "**Station Setup**", the TSC2 will connect to the total station.
 15. Enter local corrections and tap "**Accept**".
 16. Enter instrument point information:
 - a. Instrument point name (e.g. 1)
 - b. Code (e.g. CP)
 - c. Instrument height (in sft)
 - d. Northing: **5000.000** (assumed)
 - e. Easting: **5000.000**
 - f. Elevation: **100.000**
 - *Following coordinates are assumed- may enter coordinates from a known point here.*
 - g. Control point: **box checked**
 - h. Select "**Accept**".
 17. Enter back sight information:
 - a. Back sight point name (e.g. 10)
 - b. Code (e.g. BM)

- c. Backsight height (rod height)
 - d. Azimuth (Keyed in) from: Use the small black arrow to the right of the field to select **“Units”** for degrees, minutes, and seconds.
 - e. Method: **“Angles and distance”**
 - f. Select **“Enter”**.
18. Tap **“Measure”** > **“Store”**.
 19. TSC2 will announce “Station set-up completed”.
 20. Select **“Survey”** > **“Measure topo”**.
 21. Continue surveying until a Turn is necessary.
 - a. Adjust rod height if visibility between the total station and the prism becomes obstructed.
 - b. Make corrections in the TSC2 data collector if Rod height changes.

E. COLLECTING FIELD SURVEY DATA

The following procedures explain the user how to use the equipment to survey.

1. Move the prism to the desired survey point location.
2. Tap **“Survey”** > **“Measure topo”**.
3. In the “Measure Topo” screen, enter the following information.
 - a. Point name: **“1000”**
 - b. Code: Use the appropriate alpha or numeric code. Tap **“Enter”**. See Appendix C-A for Florida NRCS numeric and alpha survey codes.
 - c. Method: **“Angles and distance”**
 - d. Target height: The height of the backsight should be correctly inputted every time the height of the backsight is adjusted.
4. Tap **“Measure”** > **“Store”**. The equipment will announce “observation stored”.
5. Repeat steps 3 and 4 until all the shots have been taken for the given control point. Note that the point name automatically increases in value after each shot.
6. If a Turn becomes necessary, continue to Section “G” before powering down the data collector.

F. MAKING A TURN

1. Once a turn becomes necessary set a new control point. Make sure control point has adequate vision to get the most out of the turn.
2. Setup a Prism over the new control point.
3. Take a shot. Code it (CP2) for the next control point. Record the number of the shot in field book.
4. Before performing the turn, end the survey by selecting **“Survey”** and then **“End conventional survey”**.
5. Shut down the Nikon DTM 332 total station and TSC2 data collector. Disconnect the TSC2 from the total station.
6. Move to and setup Nikon DTM 332 over control point #2.
7. Measure and record the height of instrument. Record in field book.
8. Set rod with bi-pod over the previous control point or instrument point. Measure the height of rod and record in field book.
9. Turn on instrument, tilt optical lens until display comes up on keyboard.
10. Turn and aim towards last CP or the previous instrument point.
11. Lock down vertical and horizontal clamps use tangent screws to precisely aim to Prism.

- a. (Optional) Once locked on to the prism press the [ANG] button on Nikon keyboard.
 - b. (Optional) Press [1] to zero the horizontal azimuth.
12. Reconnect the TSC2 data collector.
 13. Go to **“Survey Controller”** > **“Survey”**.
 14. Select the Survey Style for the Nikon DTM total station.
 15. Select **“Station Setup”**, the TSC2 will connect to the total station.
 16. Enter local corrections and tap **“Accept”**.
 17. Enter the instrument information by selecting the arrow next to the **“Instrument point name”** field and selecting the desired point name/code (CP#2).
 18. Northing, easting, and elevation will populate. The HA at this time should be set to Zero (0°00’00”)
 19. Enter the height of instrument (recorded in field book).
 20. Select **“Enter”** > **“Accept”**.
 21. Enter the Control Point information by selecting the arrow next to the **“Back sight point name”** field and selecting the desired point name/code (CP#1).
 22. This will automatically populate the field according to the chosen point.
 23. Select **“Enter”**.
 24. Select **“Measure”** > **“Store”**.
 25. Select the **“Survey”** icon.
 26. Select **“Measure Topo”** and change the point name to 2000 side shots.
 27. Refer to the backsight if visible.
 28. Continue with survey. See Section “E. COLLECTING SURVEY DATA” Steps 3-4
- G. TO END A SURVEY**
1. Select **“Esc”** button.
 2. Select **“Survey”** > **“End conventional survey”** > **“Exit”**.
 3. Shut down TSC2 data collector and Nikon DTM 332 total station. Disassemble each to the condition needed for transport/storage.
 4. For a procedure on how to import the TSC2 job file into Civil 3D, refer to EFH Chapter 1, Section D, sub-section B *“IMPORTING A TSC2 JOB FILE INTO AUTOCAD CIVIL 3D”*.

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