Working with the Nikon Total Station

Operating the Total Station in the Field

About the Instrument

The Nikon Total Station measures horizontal and vertical angles using electronic distance measurement (EDM), allowing for submeter accuracy points. Featuring a dual faced screen, you can easily make edits from any position.

Equipment Components

- Nikon Total Station
- Tripod Stand
- Prism/Back Site
- Rod (two parts) to hold back site on
- Measuring tape
- Notebook + pen (recommended)

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Before Going into the Field

1. Charge backup battery the day before you plan to use the Total Station
    a. Remember to return backup battery into case
2. Charge main battery overnight before using Total Station
3. Gather equipment so that it is easily accessible
4. Write down known points

Initial Set Up

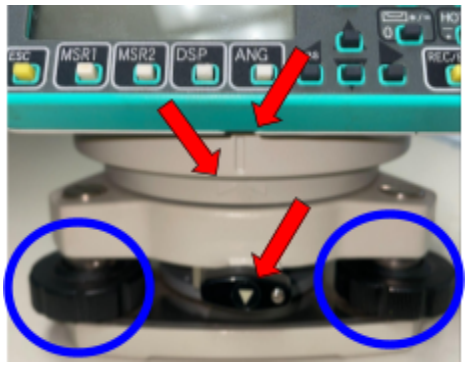
1. Start by setting up the tripod over your known point
2. Place the Total Station onto the Tripod
    a. Secure it using the screw beneath the center of the tripod
3. Check to make sure the Total Station is directly above the targeted point/stake
    a. Use the eyehole on the side of the Total Station (see right) to center the Total Station over your point
    b. You can also hang a string with a weight onto the hook and use that as a means for placement
4. Secure the legs of the tripod into the ground
    a. Make sure the height of the Total Station is level with your eyesight.
    b. Make the tripod stand as level as possible and lock into place

Leveling the Total Station

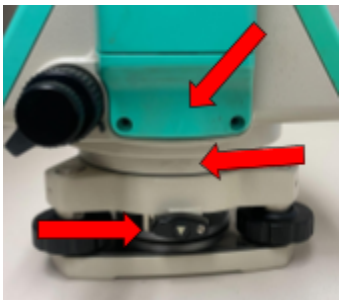
Macro-Leveling

1. Look at the bubble level on the side of the Total Station and maneuver the legs until the bubble is as close to the center as possible
    a. The legs have a height adjustment feature: unlock the lever holding them in place and move them as you see fit.
2. Once the legs are in the place you want them, lock them using the levers on their sides

Micro-Leveling



1. Start by aligning the line beneath the Nikon screen with the downturned arrow knob and the two arrows (notated with red arrows)
    a. Lock the Total Station into place
    b. Using the two horizontal knobs on the bottom of the Total Station (circled in blue), move these either towards each other or away from each other to begin micro-leveling the Total Station.
    c. This rotates one plane of the Total Station
    d. Watch the bubble above the Nikon screen to see when it is close to the center.



2. Rotate the Total Station 90 degrees so that the arrow under the battery pack is in line with the aforementioned arrows on the base of the Total Station.
    a. Lock the Total Station in place.
    b. Now you want to use the knob closest to the bubble on the side of the Total Station to adjust on the different rotational axis. Watch the level above the Nikon screen to get it aligned evenly, and the bubble level should be centered in the circle as well.
3. Once everything is level, you are ready to begin using the Total Station.

Establishing the Total Station's Location & Back-Site

1. Turn the Total Station ON and remove the camera lens
2. Spin the camera to calibrate
3. Select or create a new project:
    a. Menu → Job → ENT
    b. To start a new project, hit MSR1 (Create)
        i. Give the project a name using the alphabet keys (Mode)
        ii. Click OK (ANG button)
    c. To continue on a preexisting project, scroll using the arrow key until you find your project, then click ENT
4. Input a Datum
    a. DAT → ENT → ENT

   b. Input Coordinates for datum (N = Northing, E = Easting, Z = height)
5. Set up the Total Station
   a. Click on STN and choose one of the options for the STN setup
      i. If it's a known point, choose Known
      ii. If it's a base XYZ, scroll to #6 and Enter on Base XYZ
   b. Usually, we start with a known point, so we will discuss that process
   c. STN → Known → ENT
      i. ST = Station | HI = Height | CD = Code
   d. For each job, you can create known station points as you go. Each point will have a unique number for the station code. For the first point, use something like 01 or 001.
      i. You can include numbers and letters in these station points
   e. Type in your unique station number for the point you are over.
      i. A new screen should appear with options for the northing, easting, and height
      ii. Type in all variables and hit enter.
      iii. If you want to give it a label like "Datum 1," add this in the CODE section.
   f. Once you have chosen your station, you will then record the height of the total station from the point to the cross on the side of the Total Station machine. (~2.5 m)
6. Establish a Backsite
   a. Next, you need to establish a backsite on the Total Station using the prism and poles. Have your partner stand at the backsite location holding the pole up and ensuring that it is level.
   b. Point the total station towards the backsite, first unlocking and using the macro-adjustment knob, then locking it into place and using the smaller, micro-adjustment knob for a more accurate vertical and horizontal alignment.
   c. Once the backsite is perfectly aligned with the crossed section on the camera lens, do the following:
      i. Hit MSR1
      ii. Input a STN code that has not been used (typically BS1)
      iii. Hit ENT

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Downloading and Processing the Data

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Equipment Needed for Processing

- Nikon Total Station
- Connex software
- Serial port to USB dongle
- Total station port to serial port dongle

Post-Processing

1. Plug your Total Station into your desktop.
2. Go to Device Manager on your computer, then look to see what COM port the Total Station is plugged into.
3. Open Connex software
4. Select Transfer Settings (Transfer → Transfer Settings)
    a. The Total Station should be DTM-500/501/502 Series
    b. Choose your COM port
    c. The Baud rate is 9600
    d. The Parity is “None”
    e. Select “OK”
5. Turn on the Total Station
    a. Go to Menu → Job → Select Job
    b. Go to Menu → Comm. (Communication) → Download
6. In the Connex Software, go to Transfer → Get Job From Total Station
    a. Select “Download Raw” first (downloads all of the meta data that the instrument tags into the file itself; the Coordinates is just the X, Y, Z)
7. In the Total Station, make sure the Job Name is as desired, the Format is Nikon, and the Data is Raw (use right arrow to change to Coordinates if needed)
    a. Hit Enter → Go
8. Save the file
9. In Connex, go to File → Export → ASCII
    a. Select all points
    b. Hit “Export” and save to desired location
10. Note, if the Total Station files aren’t appearing when imported into QGIS, try using the Pseudo-Mercatorial or Project based projection.