

Archaeology and the Total Station

The main purpose of using a total station for archaeological fieldwork is to impose a grid (X-northing, Y-easting, Z-elevation) on the site to locate every artifact and feature in 3-D space and to make topographic maps of the site. Some features that are mapped include elevation, streams, roads, excavation units, artifacts, features, the datum, site boundaries, and any other important features. Data collected by the total station can be downloaded into a computer and mapped using mapping software.

Introduction to the Total Station

A total station (a.k.a. EDM, transit, theodolite, the instrument) is the ultimate in survey instruments. A total station combines a digital theodolite and an EDM that work together with a microprocessor to rapidly and accurately perform tasks. With this combination, the total station can measure horizontal and vertical angles, slope, and horizontal and vertical distances. A total station also has a built-in calculator that performs trigonometric calculations, as well as an electronic field notebook used for storing data. The total station can interface with a computer for data transfer.

EDM (Electronic Distance Measuring Device): An EDM is a device mounted on the top of the total station that sends out a light wavelength. The EDM measures the time it takes for the light to travel from the EDM to a prism, bounce off the prism, then return to the EDM. This measurement is displayed as distance, but it is really a measurement of time. Very accurate distance measurements are taken using an EDM.

Theodolite (Transit): A theodolite measures horizontal and vertical angles. Horizontal angles are measured along a level horizontal axis. Vertical angles are measured along a level vertical axis.

Components of a Total Station

Tripod: The base that the total station instrument is mounted on.

Plumb Bob: Used to center the tripod over a point (an optical plummet on the instrument can also be used).

Total Station Instrument: The electronic unit that combines the EDM, theodolite, and field notebook.

Prism and Rod: A prism is mounted on a graduated rod. The EDM reflects light off the prism. The rod has a circle level to keep the rod plumb.

Using the Top Con Total Station

1. Set up and Balance Total Station

- a. Set up tripod and level by eye.
- b. Attach instrument. Do not tighten fully.
 - i. If this is a new setup, position tripod to establish Datum A
 - ii. If this is a returning setup to an established Datum, press the star key and choose laser and align instrument to center laser over Datum.
- c. Use balance wheels to balance the bull's-eye bubble level (bottom of instrument)
- d. Use balance wheels to balance bubble level above keypad. Rotate instrument to each wheel and adjust all the way around.

2. Set up Instrument

- a. Press distance mode button
 - i. Select page 2 (F4)
 - ii. Input OCC (occupied point) (F3), then (F1).
 - iii. Input Instrument Height (INSHT) (F2). Measure from ground to laser height
 - iv. Input Rod Height (R.HT) (F1)

3. Zero Set, Establish "North" (true or grid)

- a. Enter ANG mode
- b. Using compass, align instrument to north (or an object close to north) and have rod operator align with instrument. If open site with no objects, set north with stake and flag.
- c. When instrument is set to north and aligned on prism, tighten knob, Select OSET (zero set), and choose yes.
- d. HR should now read 0 degrees. You have now aligned the instrument to "grid north".

4. Collect Data

- a. Choose MENU, then Data collection (F1)
- b. Set File Name; choose input if creating a new file (job) or list if opening a previous file (job).
- c. Input occupied point (F1), Point#1, ID Datum A
- d. Select OCNEZ (F4), Make sure it reads PT#1, Select NEZ (F3)
 - i. Double check instrument height
 - ii. REC? Yes, if first time. No, if returning to position.
- e. In Data Collection Menu, choose FS/SS (forward shot/side shot) (F3)
 - i. First shot must enter #2 if new set up or last shot# if returning
 - ii. Enter PCODE, TO=Topo, HS=Headstone, FS=Footstone, BD=boundary
 - iii. Hit ALL for first shot, Save Shot
 - iv. Move to next shot location, Change PCODE if feature changes

5. Download Data

- a. Choose MENU, then Memory Manager (F3)
- b. Page down twice, choose Data Transfer (F1)
- c. Choose RS-232C (F2)
- d. Choose GTS Format (F1)

Go to TopLINK

- a. Select Import from Device
- b. Select Topcon Total Station, Add New Station if needed, select COM Port
- c. Double Click on New Station
- d. Select Folder to download to

Return to TopCon

- a. Select Comm Parameters (F3)
- b. Confirm Parameters are the same as TopLINK Total Station Advanced Properties
- c. Esc to Data Transfer Menu
- d. Choose Send Data (F1)
- e. Choose Meas Data (F1)
- f. Load File to transfer, Chose Enter

Return to TopLINK

- a. Choose file1.txt within Topcon Total Station
- b. Hit Start

Choose YES on Total Station

Convert to csv

Open in Excel and add headers

Save as sitename.CSV (MS-DOS)

Open in Arc GIS, Display Data