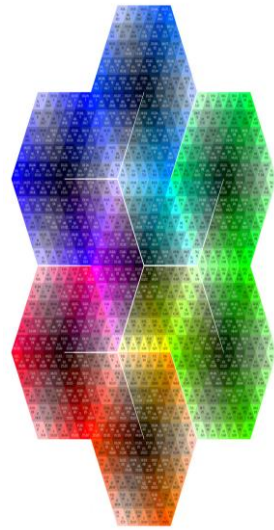




Benha University



Shoubra Faculty  
of Engineering



# Surveying Engineering

## Lecture 10: Total Station

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## Total Station

The most powerful surveying instrument: The Total station system consists of an EDM embedded with an electronic theodolite under the control of a built-in microprocessor.

### Total Station Components:

The total station consists of many components, each has its own function and role. Some of them function in the observation of surveying measurements, while the other function in data computations and storing.

**Digital Theodolite:** For measuring horizontal and vertical angles.

**EDM:** For measuring slope distances from instrument to the reflector.

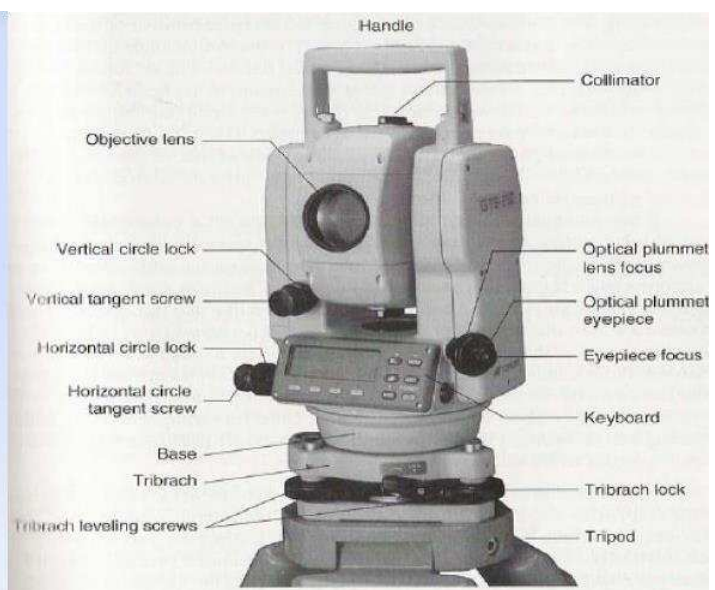
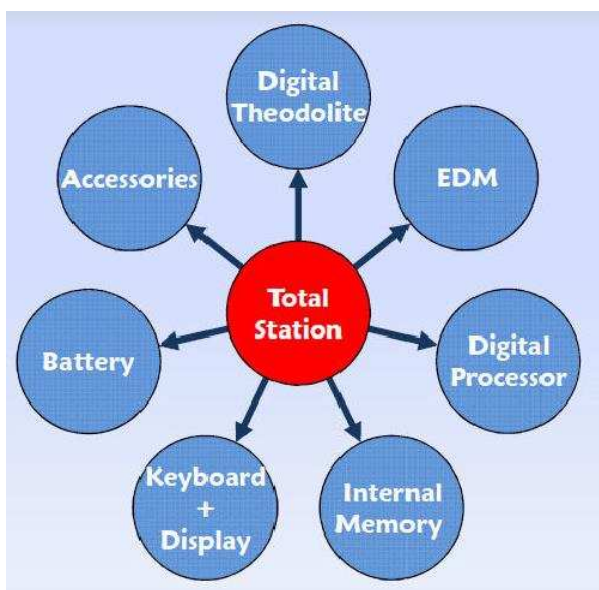
**Digital Processor:** For data computations, such as coordinates determination.

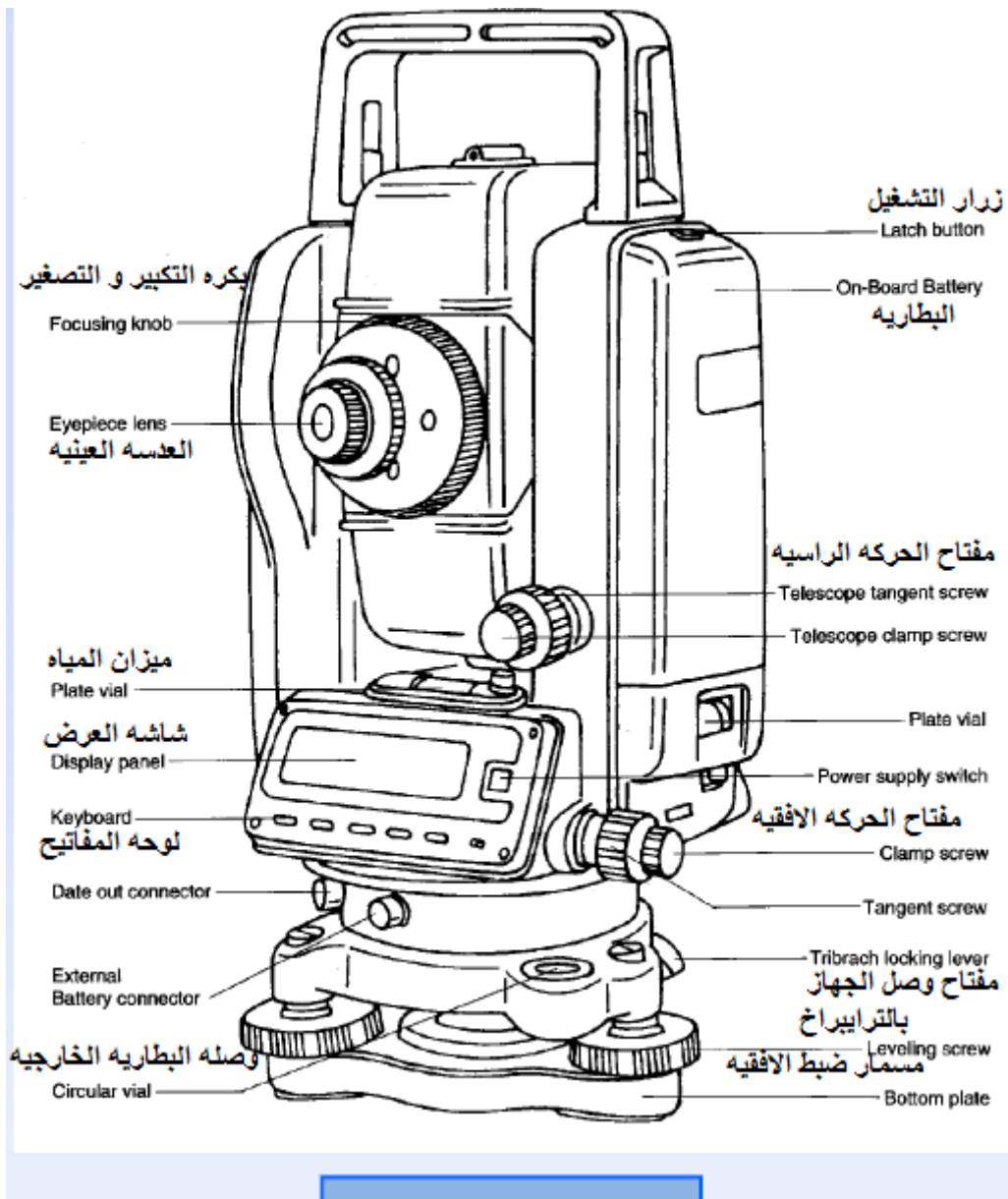
**Internal Memory:** For digital storing of data.

**Input and output Units:** Keyboard and display screen.

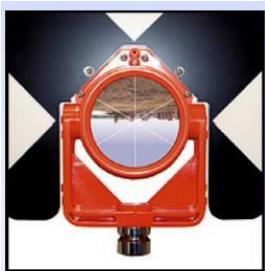
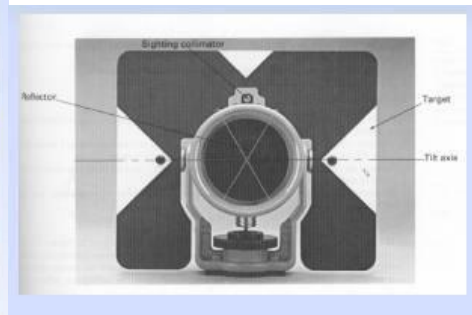
**Battery:** For power supply to generate the electromagnetic waves.

**Accessories:** External memory, Battery, Cables, Case, Cleaning tools and tripod.





## Reflector and Target:







One Reflector



Three Reflectors



Nine Reflectors



Paper Prism



360 Reflector

**Modern Total Stations:**

Topcon



Leica



Sokkia



Nikon



Water and dustproof



Smart Station



Reflectorless



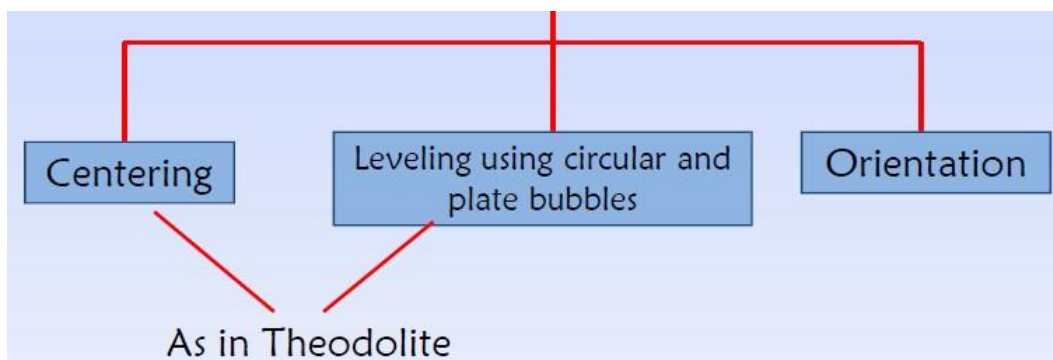
## Robotic Total Stations:

Some modern total stations are 'robotic' allowing the operator to control the instrument from a distance via remote control. This eliminates the need for an assistant staff member to hold the reflector prism over the point to be measured. The operator holds the reflector himself and controls the total station from the observed point.

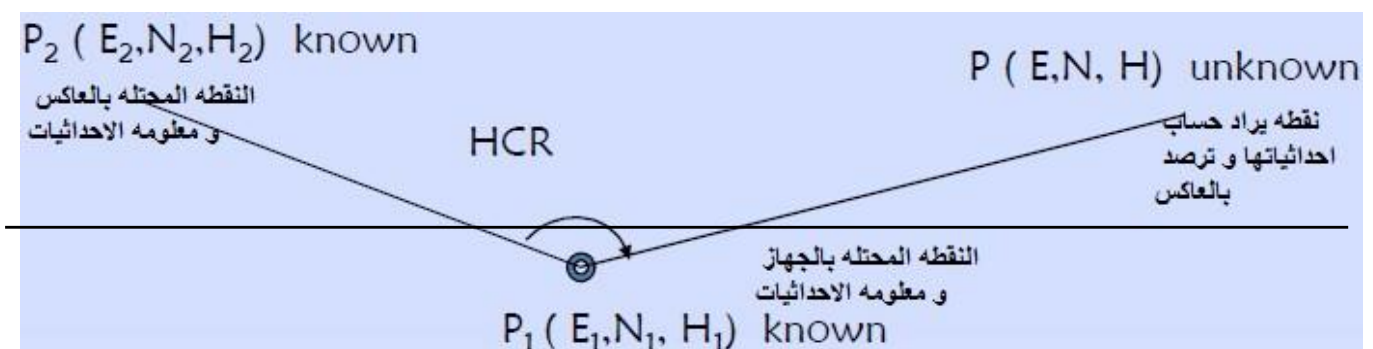


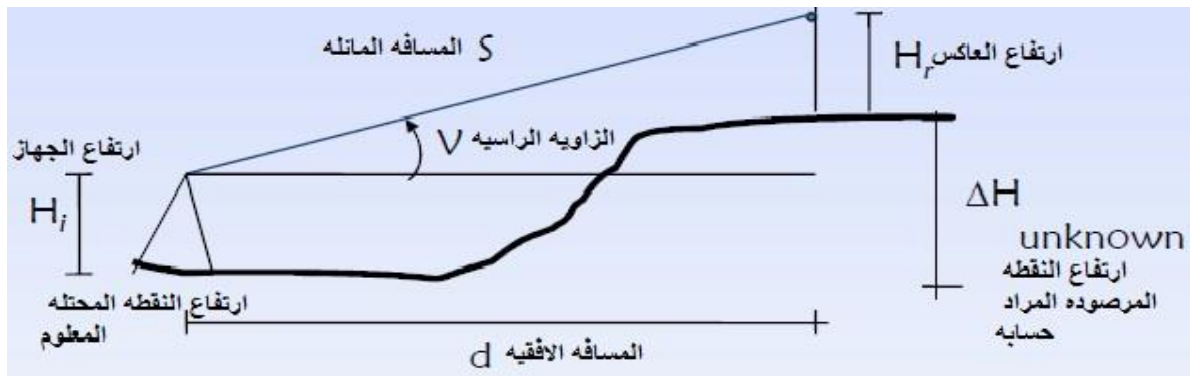
## Setting up the instrument:

The temporary adjustment of the total station is performed at each occupied station. It consists of:



## What is required?





## **Field Procedure:**

- 1- Creating new file (job) for data storing:
- 2- Input the data of the occupied station:

Station name =  
 E\_coor =  
 N\_coor =  
 H\_coor =  
 Inst. Ht =

- 3- Input the data of the target station:

Station name =  
 E\_coor =  
 N\_coor =  
 H\_coor =  
 Ref. Ht =

- 4- Set orientation by sighting the target station (backsight). This rotates the horizontal circle and makes HCR of Total station = Bearing of the Baseline.

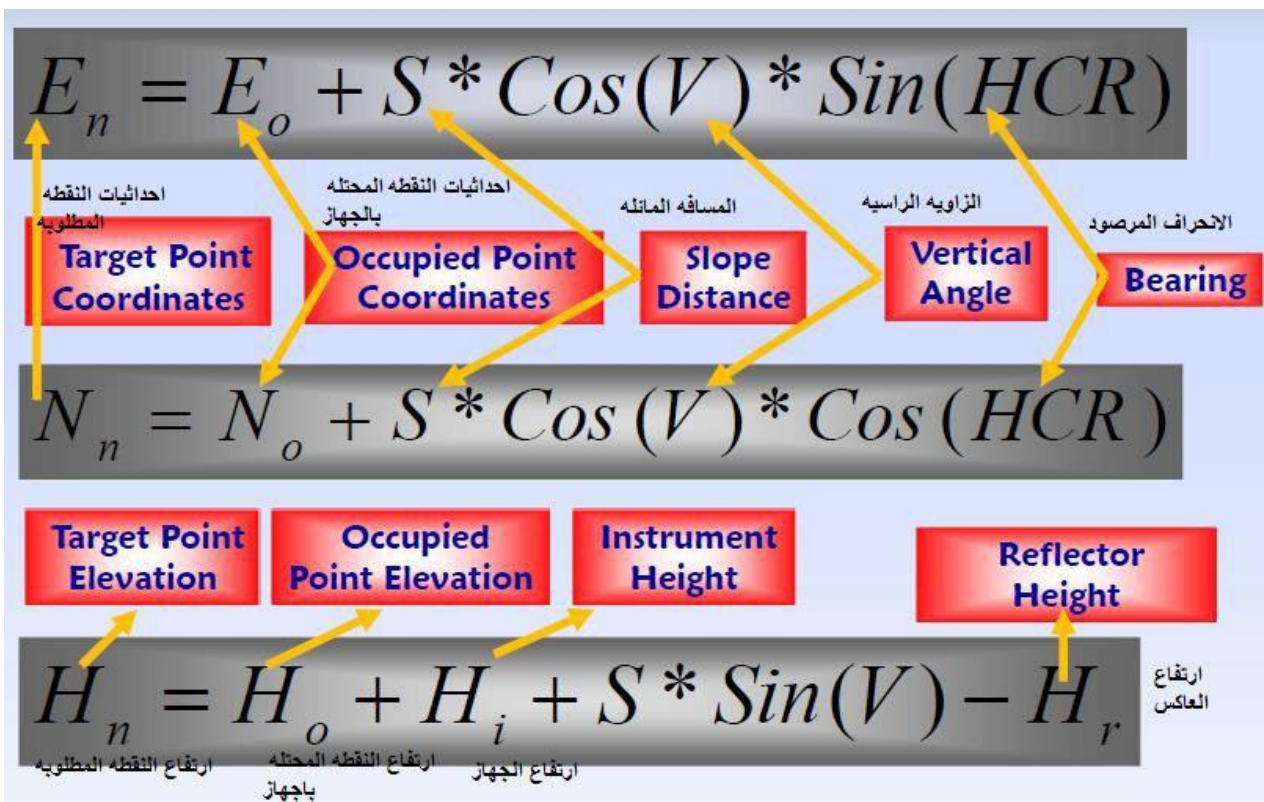
$$\alpha_{12} = \tan^{-1} \left[ \frac{E_2 - E_1}{N_2 - N_1} \right]$$

- 5- Sighting the required station and recording The HCR, VCR and slope distance.





6- The total station will compute, display and record the E, N, H coordinates.



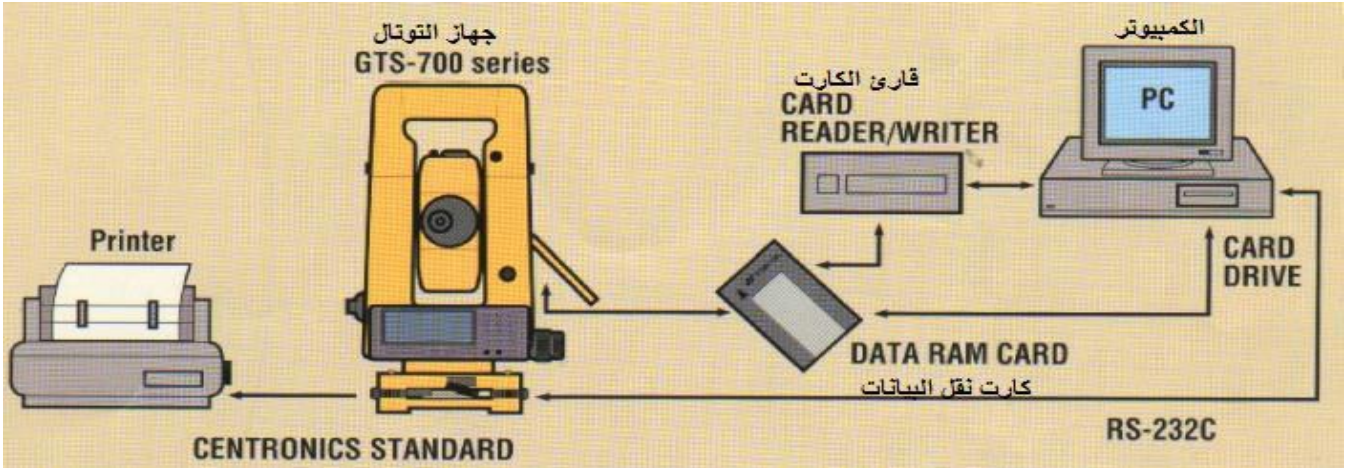




## Output Format:

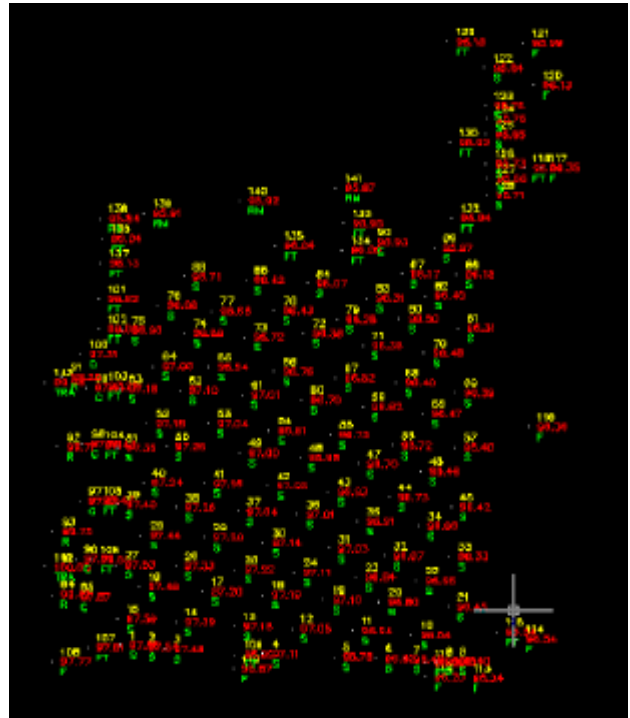
- **Raw data file (FILE.RAW):** includes raw information  
pt. No, HCR, VCR, Slope distance, Ht
- **Coordinates file (FILE.XYZ):** includes the coordinates of points  
pt. No, X, Y, Z, Description
- **DXF file (FILE.DXF):** (Drawing eXchange Format)  
Can be used to support CAD graphics
- **AutoCAD file (FILE.DWG):** AutoCAD DraWinG files  
Ready made AutoCAD drawings (only in specific models)

## Communication with Computer:



## Coordinate XYZ file:

رقم النقاط Point No.	الشرقيات Easting	الشمائيات Northing	الارتفاع Elevation	اسماء النقاط Code
400	640896.6763	813207.4323	80.5563	AS
401	640895.8187	813198.1255	80.4468	AS
402	640896.5557	813196.0025	80.8166	F
403	640893.4376	813191.5368	80.8757	L
404	640897.4736	813176.1023	81.4952	L
405	640893.7807	813164.1254	83.5167	L
406	640902.8609	813193.4194	80.5318	L
407	640899.5848	813186.4329	80.9566	L
408	640888.1240	813156.2176	81.6658	L
409	640885.2171	813151.0230	81.7215	L
410	640902.8094	813193.3859	80.4877	L
411	640883.4153	813145.7055	82.5481	L
412	640901.3829	813190.6251	78.7841	L
413	640905.4400	813181.0550	80.6097	L
414	640889.1213	813141.1963	85.0940	L
415	640893.4473	813136.9530	85.5830	L
416	640896.0911	813142.1652	84.6758	L
417	640901.1432	813138.3622	84.3246	L
418	640907.6104	813135.6985	84.9710	L
419	640914.3459	813132.7300	86.7156	L
420	640910.9138	813193.4587	80.3698	F
421	640904.5112	813174.2545	81.3507	L
422	640889.9653	813147.1994	82.2077	L



## Point Information:

