

ELECTRONIC THEODOLITES

Electronic theodolites use the principle of electronics to read, record and display horizontal and vertical angles. Generally, light-emitting diodes (LEOs) or liquid crystal diodes (LCDs) are used for display. The data obtained can be stored directly in an electronic data recorder for later retrieval, and computing by a microprocessor either in the field or in the office.

Sometimes the theodolite is equipped with an EDM when it becomes a total station instrument or an electronic tachometer, the instrument can then be used for measuring and displaying horizontal and vertical angles, horizontal distance, and elevation difference. With the help of in built computer slope distances can be reduced and horizontal distances can be corrected for curvature and refraction.

Coordinates for the occupied station can be obtained when coordinates of other points are known.

MIEASURING ANGLES WITH DIRECTION THEODOLITES

The direction theodolite reads "directions" or positions on its horizontal circle. It does not provide for a lower motion as is contained in a repeating instrument. For measuring the horizontal angle ABC, setup the instrument at B with the horizontal clamp loose, make a rough pointing towards A, tighten clamp and make the perfect pointing with the horizontal tangent screw. The circular optical micrometer enables directions to be read to the nearest second or less. Let the reading be $21^{\circ}15'27''$ as shown in Fig(1). Next loosen the horizontal clamp and observe the same procedure to point towards C. The reading, say, is $42^{\circ}27'41''$. The included angle is then $42^{\circ}27'41'' - 21^{\circ}15'27''$ or $21^{\circ}12'14''$.

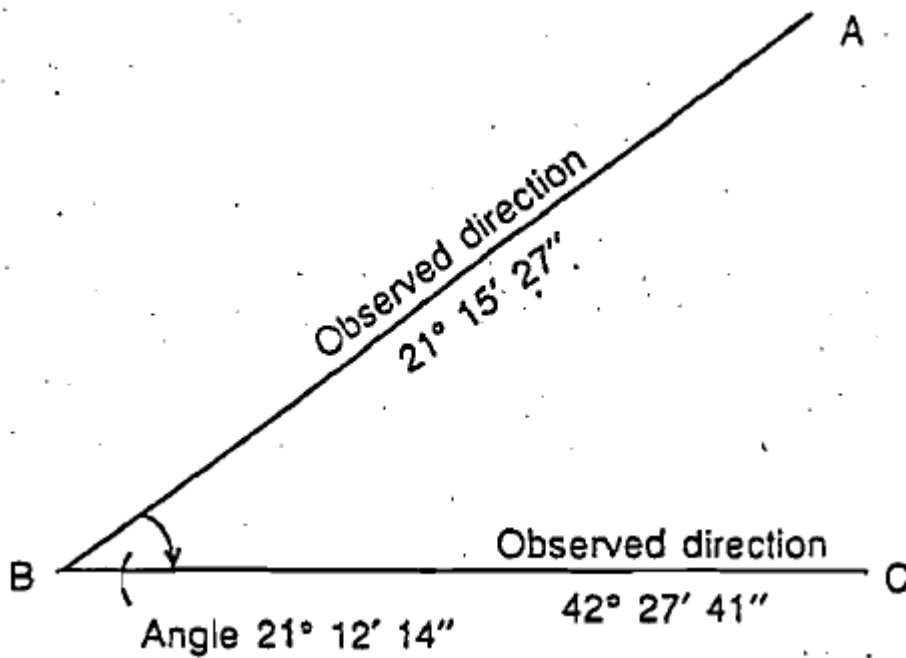


Fig. (1) Measuring single angle with direction theodolite.

Figure(2) shows how a number of angles can be more accurately measured with a direction theodolite. Set up the instrument at A and point at B, the left most station of the set. Initializing on B permits directions to be read in a clockwise sequence. Then as in single angle measurement observations should be taken on

B, C, D and E. This is the first step. Next, loosen the horizontal clamp, rotate allidade through 180° and reverse the telescope and point again to E. The reading will differ by approximate 180° from the first reading. Sights are then taken to D, C. and B in the counter-clockwise direction. This completes the 1st position or set of angles. The mean of the two second values is suffixed to the direct reading of degree and minute to give the mean value. In this way sighting errors and instrumental

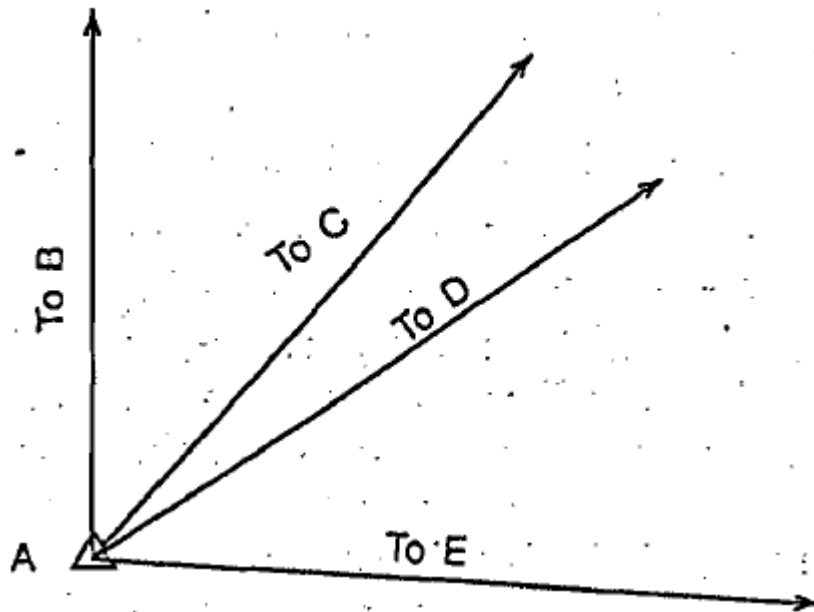


Fig. (2) Accurate measurements of angles by direction theodolite.

Errors are eliminated but not random errors. From the directions the included angles can be obtained as before. A second set of readings can then be taken and a third set and so on. The initial reading for the second set will depend on the number of sets to be observed. The second set will start from the original reading plus $180/n$ where n is the number of sets. If there are two sets, added value will be 90° if three, it will be 60° . The final angles are then the means obtained from all the sets.