

TECHNIQUE FOR SETTING OUT A DIRECTION

It can be seen that both the basic techniques of position fixing require the turning-off of a given angle. To do this efficiently the following approach is recommended:

In Figure (6), consider turning off the angle β equal to $20^{\circ} 36' 20''$ using a Watts No. 1 ($20''$) theodolite (Figure 7(a)).

(1) With theodolite set at B, backsight to A and read the horizontal circle – say, $02^{\circ} 55' 20''$.

(2) As the angle β is clockwise of BA the required reading on the theodolite will be equal to

$(02^{\circ} 55' 20'' + 20^{\circ} 36' 20'')$, i.e. $23^{\circ} 31' 40''$.

(3) As the minimum main scale division is equal to $20''$ anything less than this will appear on the micrometer (Figure 10.7(a)). Thus, set the micrometer to read $11' 40''$, now release the upper plate clamp and rotate the theodolite until it reads approximately $23^{\circ} 20'$ on the main scale; using the upper plate slow-motion screw, set the main scale to exactly $23^{\circ} 20'$. This process will not alter the micrometer scale and so the total reading is $23^{\circ} 31' 40''$, and the instrument has been swung through the angle $\beta = 20^{\circ} 36' 20''$.

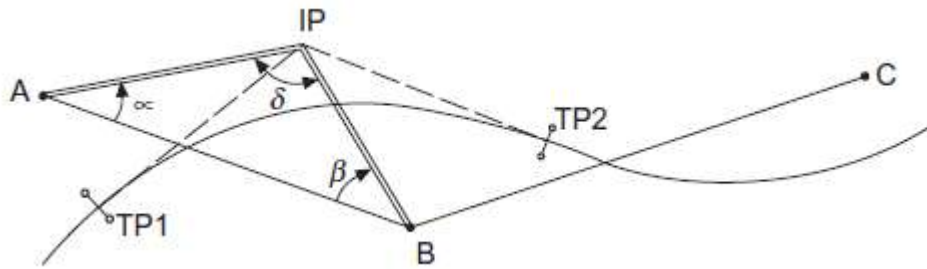


Fig (6)

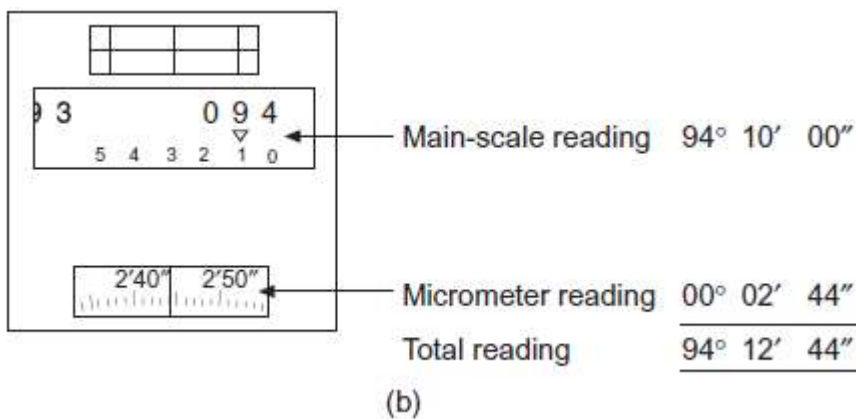
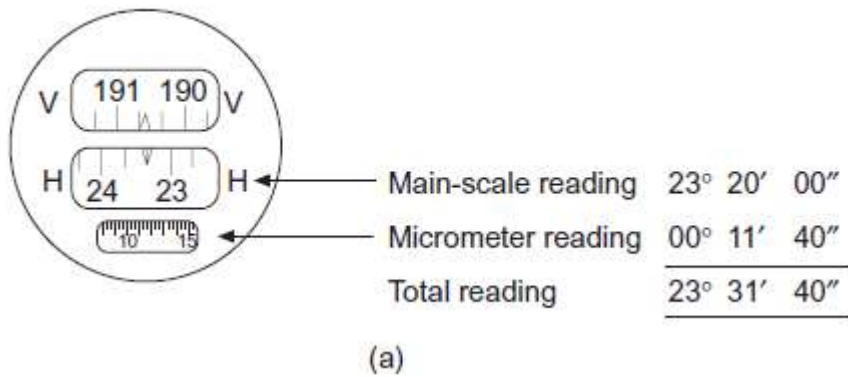


Fig. 7 (a) Watts No. – 20" theodolite, (b) T2 – 1" theodolite

If the Wild T.2 (Figure 7(b)) had been used, an examination of the main scale shows its minimum division is equal to 10'. Thus, to set the reading to $23^{\circ}31'40''$ one would set only $01'40''$ on the micrometer first before rotating the instrument to read $23^{\circ}30'$ on the main scale.

Therefore, when setting out directions with any make of theodolite, the observer should examine the reading system to find out its minimum main scale value, anything less than which is put on the micrometer first.

Basically the micrometer works as shown in Figure 8, and, if applied to the Watts theodolite, is explained as follows:

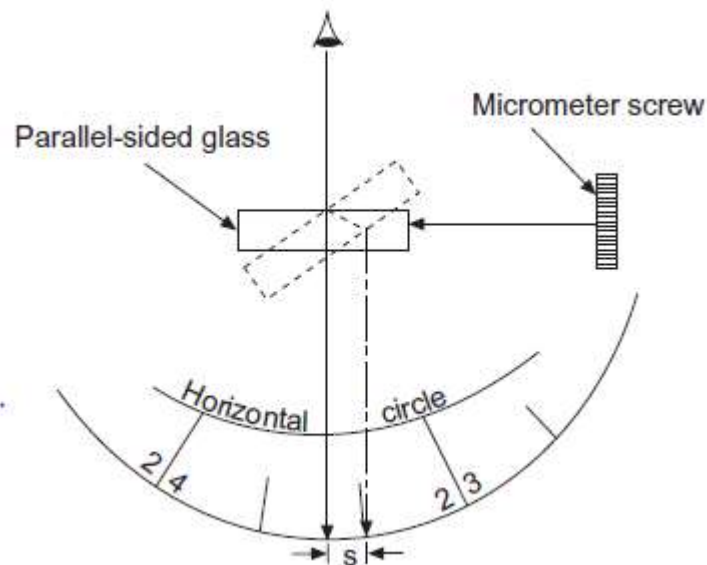
Assuming the observer's line of sight passes at 90° through the parallel plate glass, the reading is $23^{\circ}20'+ S$. The parallel plate is rotated using the micrometer screw until an exact reading ($23^{\circ}20'$) is obtained on the main scale, as a result of the line of sight being refracted towards the normal and emerging on a parallel path. The distance S , through which the viewer's image was displaced, is recorded on the micrometer scale ($11'40''$) and is a function of the rotation of the plate. Thus it can

be seen that rotating the micrometer screw in no way affects the pointing of the theodolite, but back-sets the reading so that rotation of the theodolite is through the total angle of $20^{\circ} 36'20''$.

As practically all setting-out work involves the use of the theodolite and/or level, the user should be fully conversant with the various error sources and their effects, as well as the methods of adjustment.

The use of coordinates is now universally applied to the setting out of pipelines, motorways, general roadworks, power stations, offshore piling and jetty works, housing and high-rise buildings,

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Fig(8)

etc. Thus it can be seen that although the project may vary enormously from site to site the actual setting out is completed using the basic measurements of angle and distance.

There are many advantages to the use of coordinates, the main one being that the engineer can set out any part of the works as an individual item, rather than wait for the overall establishment of a setting-out grid.