

The Total Station



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Features

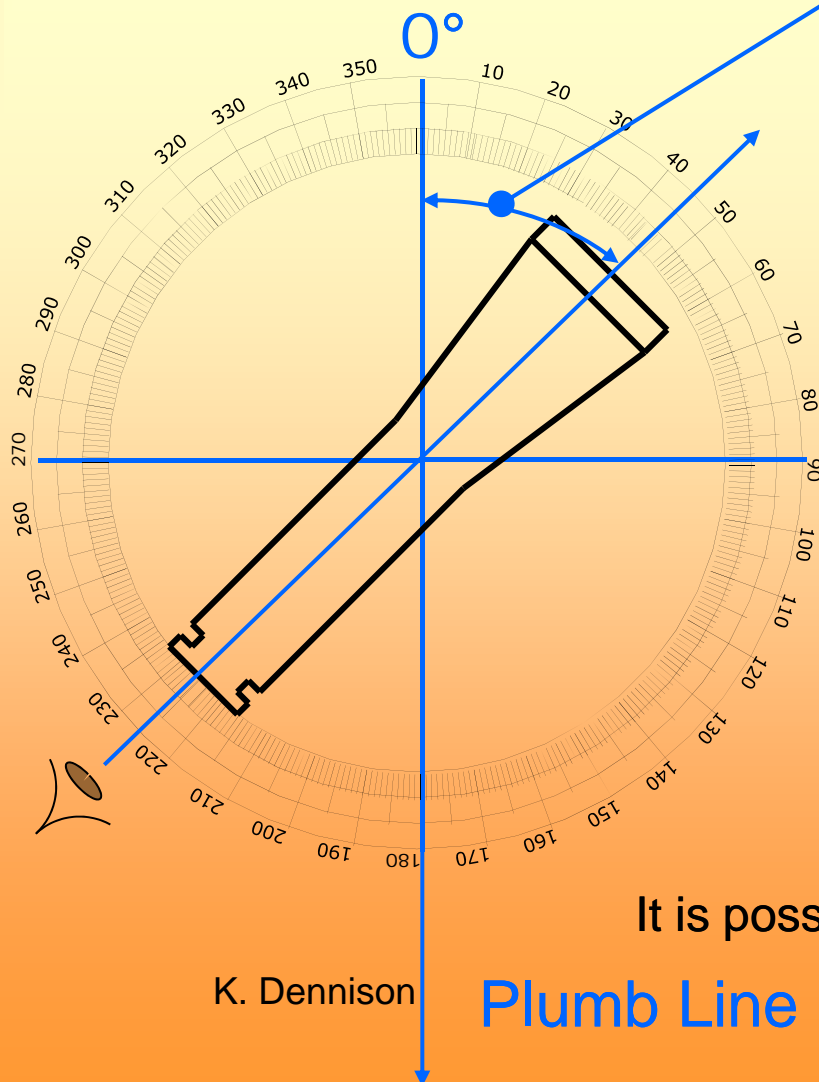
The Total Station measures: -

1. Vertical angles
2. Horizontal angles
3. Slope distances

Inbuilt software stores the data and computes relevant information for setting out and surveying



Angles in the Vertical Plane

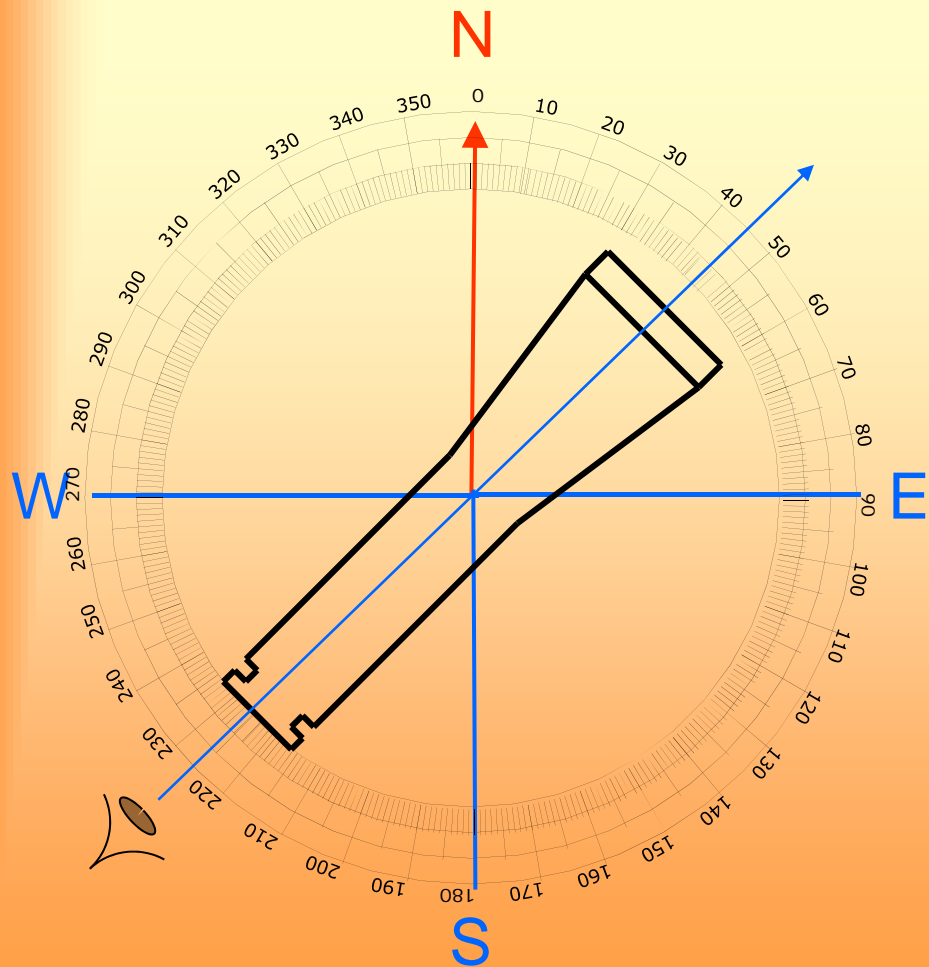


Vertical angles are referenced to the plumb line and therefore are absolute values. Therefore 90 ° and 270 ° are horizontal

Angles are usually measured in degrees, minutes, and seconds, therefore $12^{\circ} 31' 44'' = 44/3600 12+(31/60)+()$ °

It is possible to set angular units to decimal degrees.

Angles in the Horizontal Plane



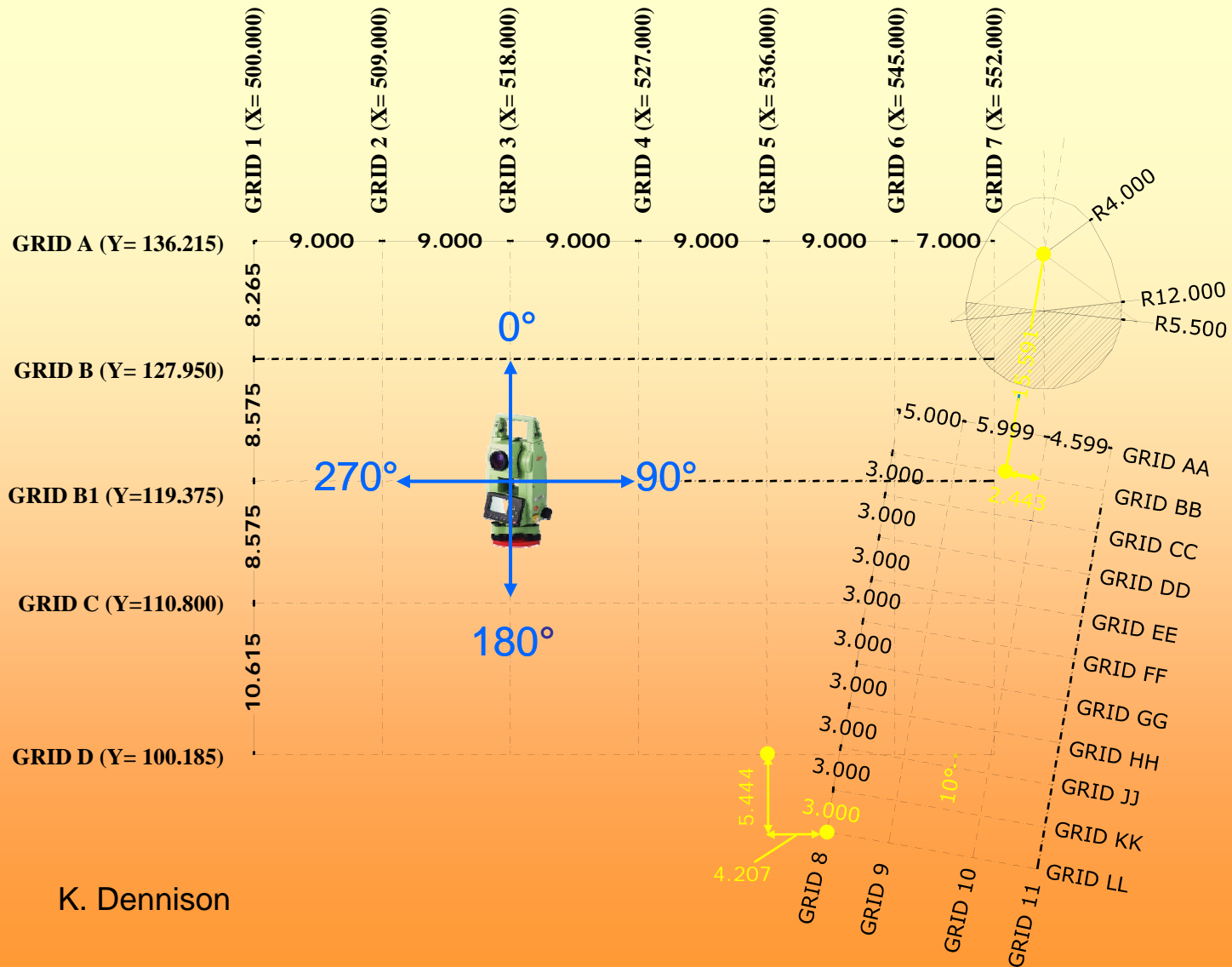
Horizontal angles are relative values.

Consequently zero is normally aligned with the site grid, commonly called “North”

In this case horizontal angles equate to directions or bearings.

Site Grids

Grid North = zero degrees

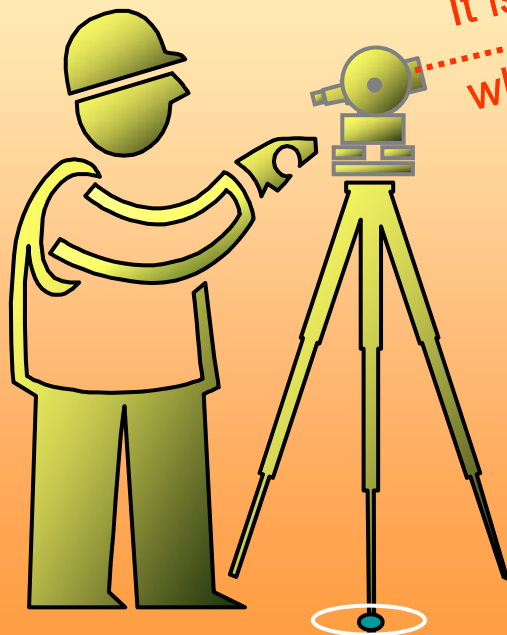


Slope Distances

Infra red fine mode measures to a prism, +/- 2mm. Range up to 1800m.

Distance units are in metres or feet

It is not possible to measure in millimetres.



*It is possible to have a visible laser beam
which can be useful indoors*

IR mode has high accuracy, long range, and measures to a specific point.

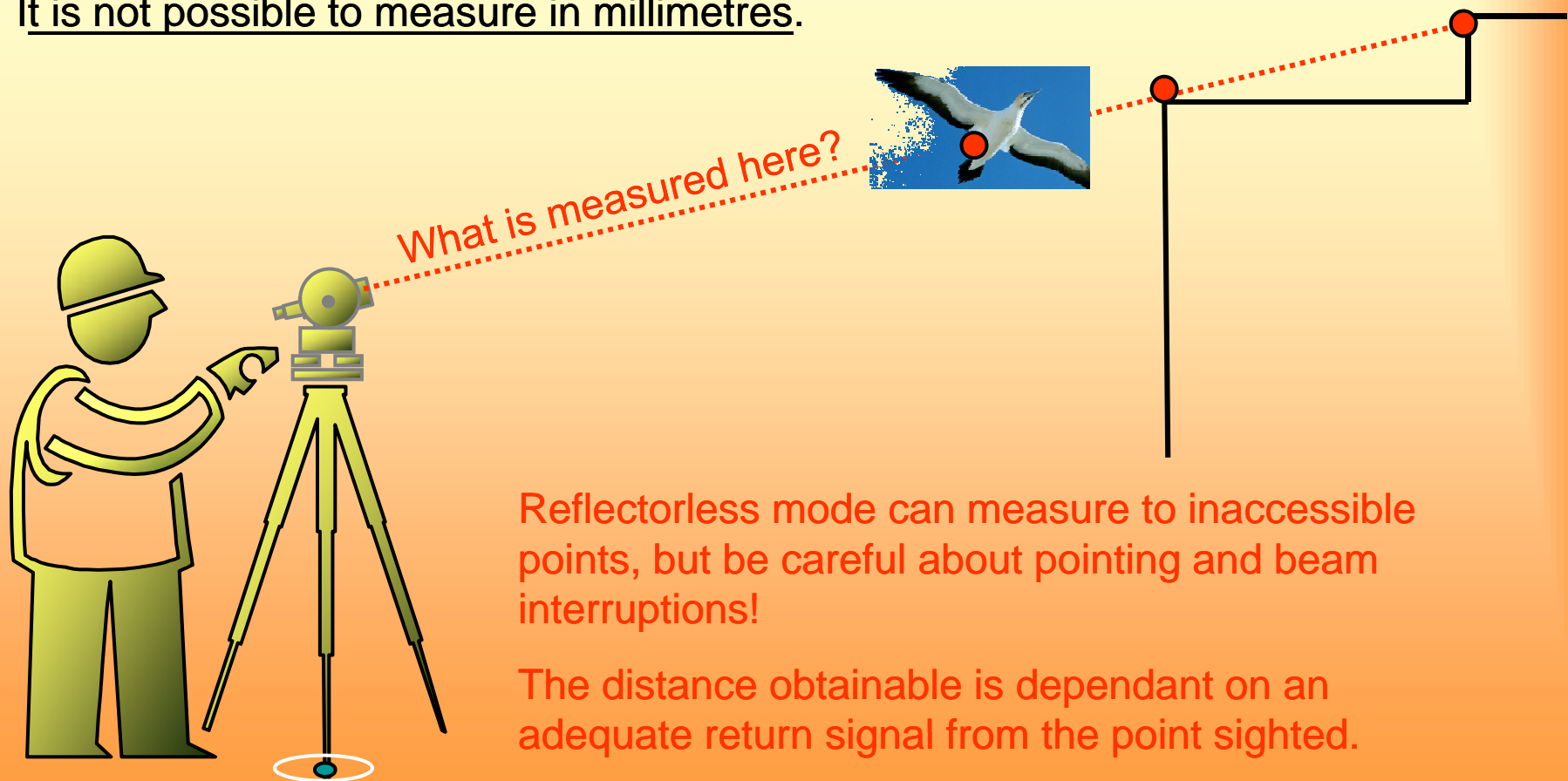
However personal access is required to the target point. This is difficult on building facades, wall corners, roof ridges, etc.

Slope Distances

Reflectorless mode requires no prism, +/- 3mm. Range up to 160m.

Distance units are in metres or feet

It is not possible to measure in millimetres.

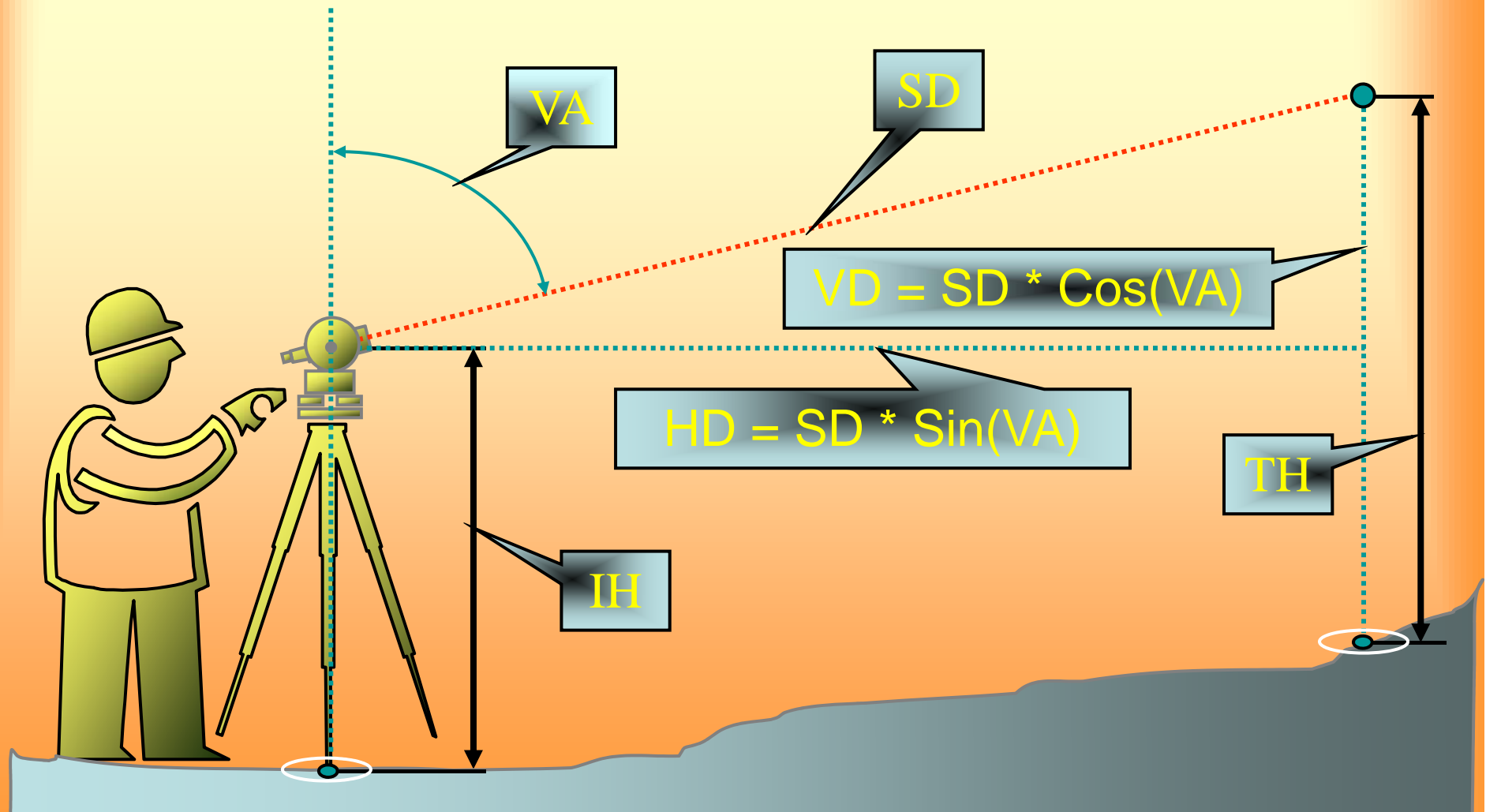


Reflectorless mode can measure to inaccessible points, but be careful about pointing and beam interruptions!

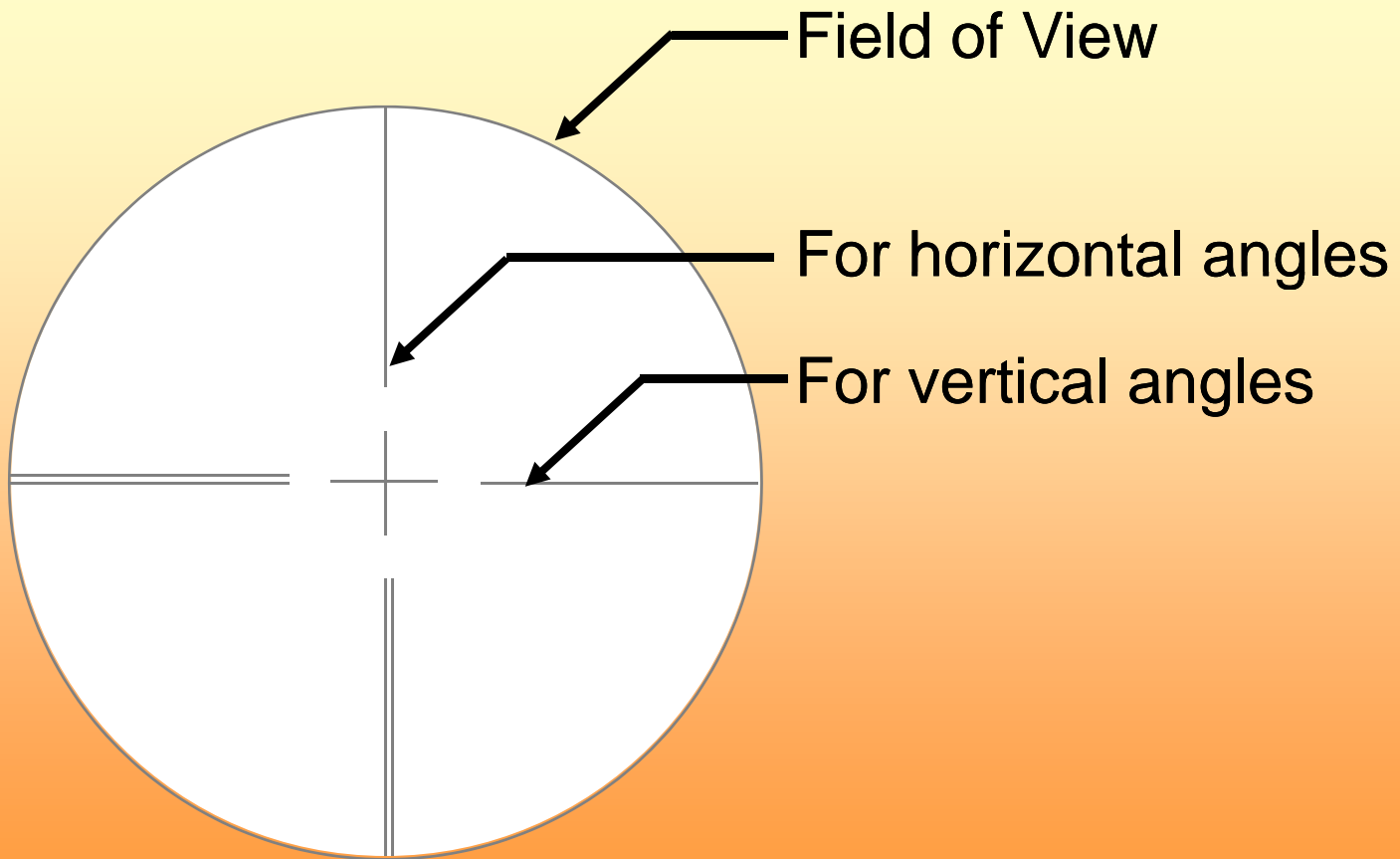
The distance obtainable is dependant on an adequate return signal from the point sighted.

Slope Distances

The inbuilt software computes the HD and VD from the SD and the VA



Field of view



2. Operation

Calibration: – (demo & practical exercise)

1. Damage
2. Plummet
3. Bubbles
4. Vertical angles
5. Horizontal angles

Checks must be done in this order

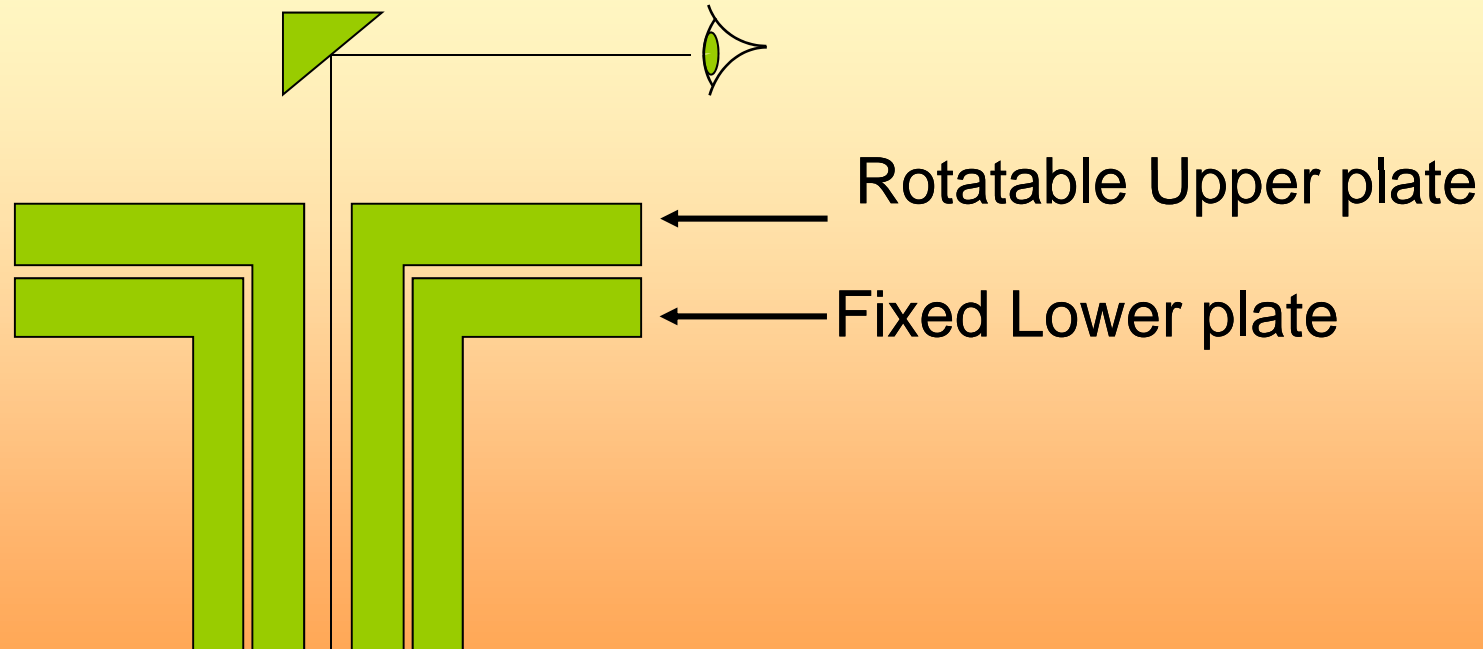
Test 1 - Damage

- a) Obvious physical damage, (instrument & accessories).
- b) Water penetration, (cloudy optics).
- c) Battery condition, (if applicable).
- d) Does everything work properly?

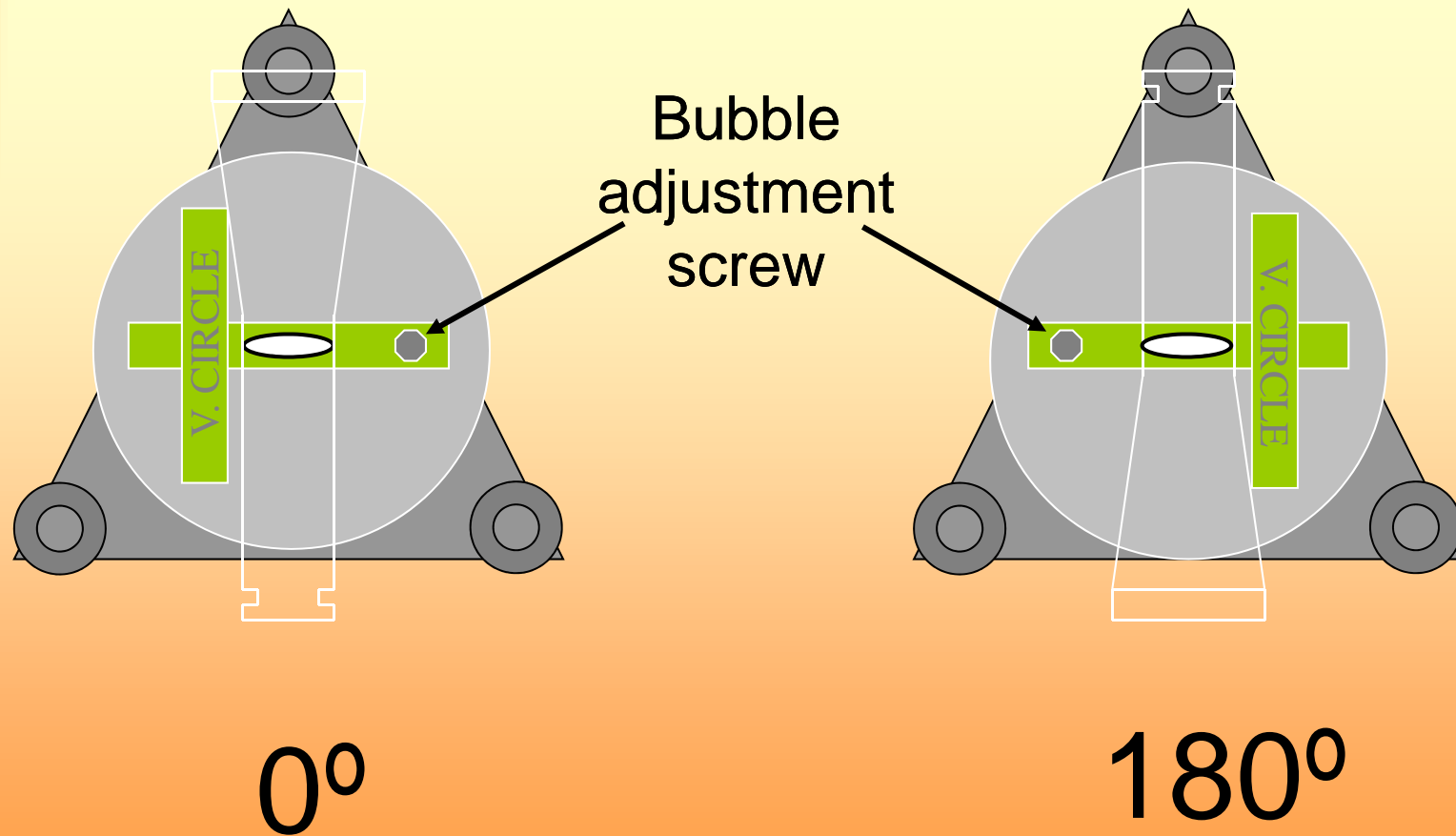
Test 2 - Plummet

Optical Plummet or Laser Plummet

+/- 1mm at 1.5 metres



Test 3 – Bubbles 0° & 180°



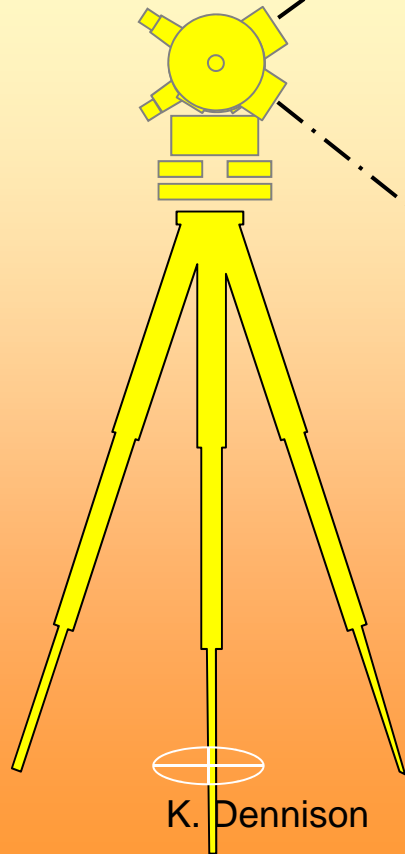
Test 4 – Vertical angles

- Bisect a clear object about 100m. distant.
- Record the vertical circle reading.
- Change face.
- Bisect the same object as before.
- Record the vertical circle reading.
- The sum of the readings should be $360^{\circ} 00' 00''$ +/- the manufacturer's tolerance.

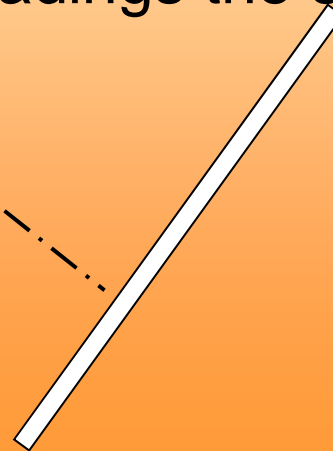
Test 5 – Horizontal angles

- Bisect a clear object about 100m. distant.
- Record the horizontal circle reading.
- Change face.
- Bisect the same object as before.
- Record the horizontal circle reading.
- The difference between the readings should be $180^{\circ} 00' 00'' \mp$ the manufacturer's tolerance.

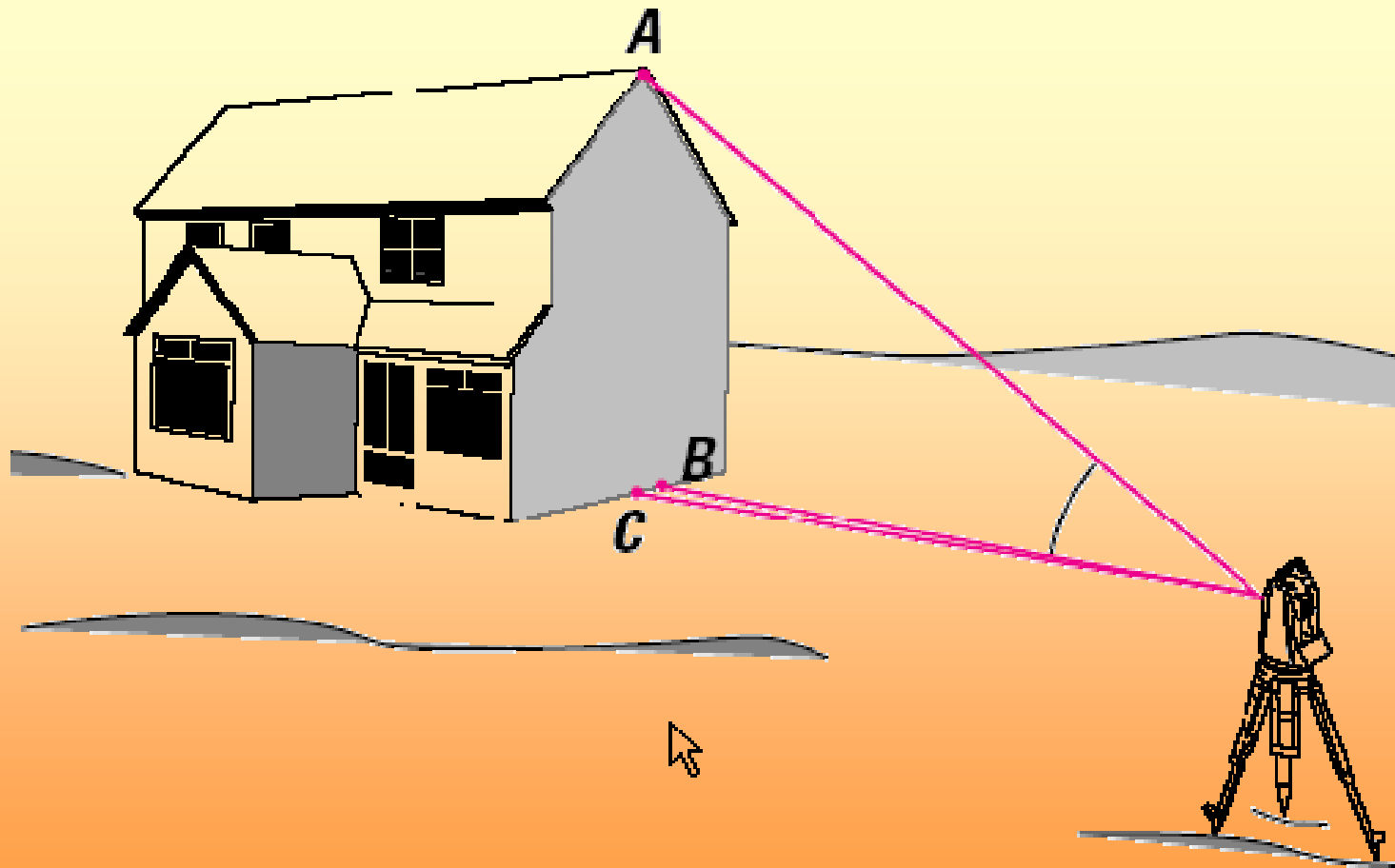
Test 6 Tilting Axis Check



1. Sight a high object
2. Read a low level staff/tape
3. Change face
4. Repeat 1, and 2
5. Are both readings the same?

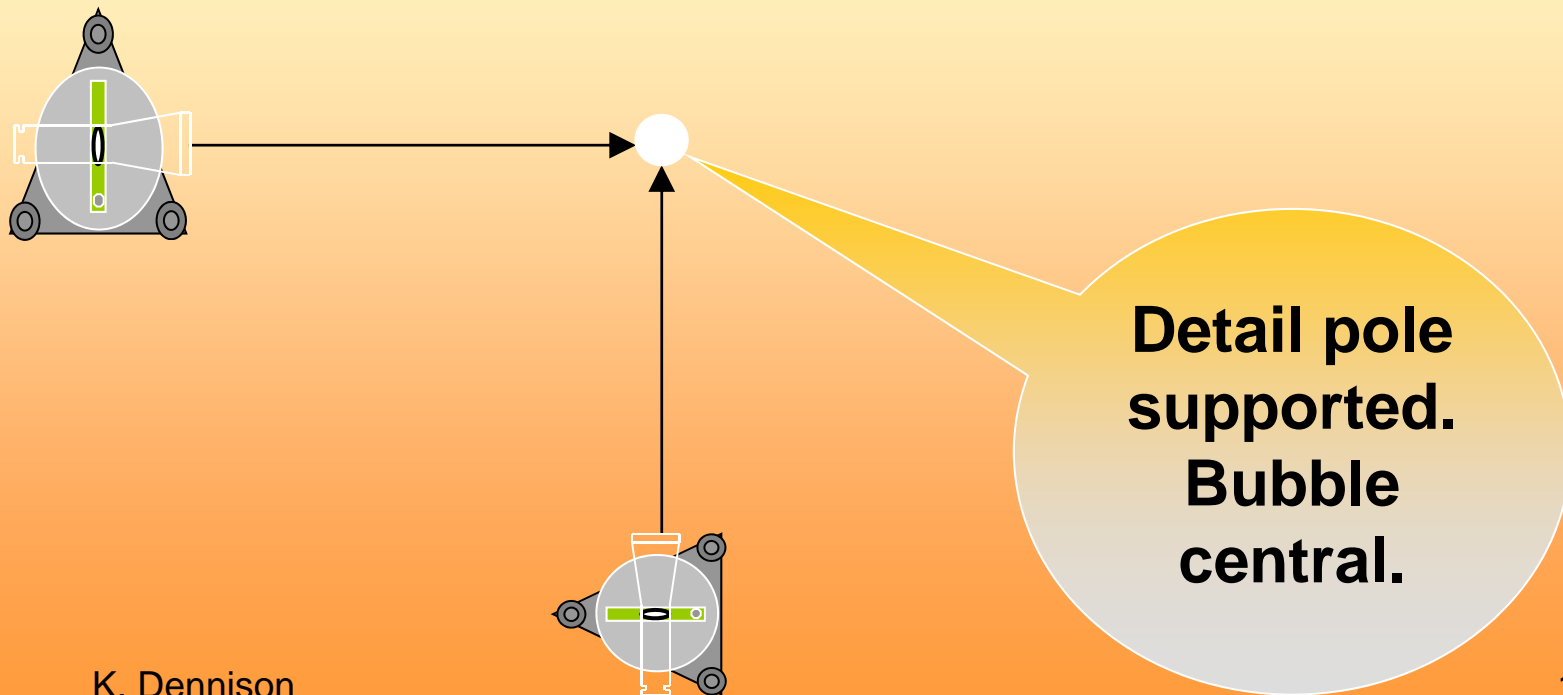


Test 6 Tilting Axis Check

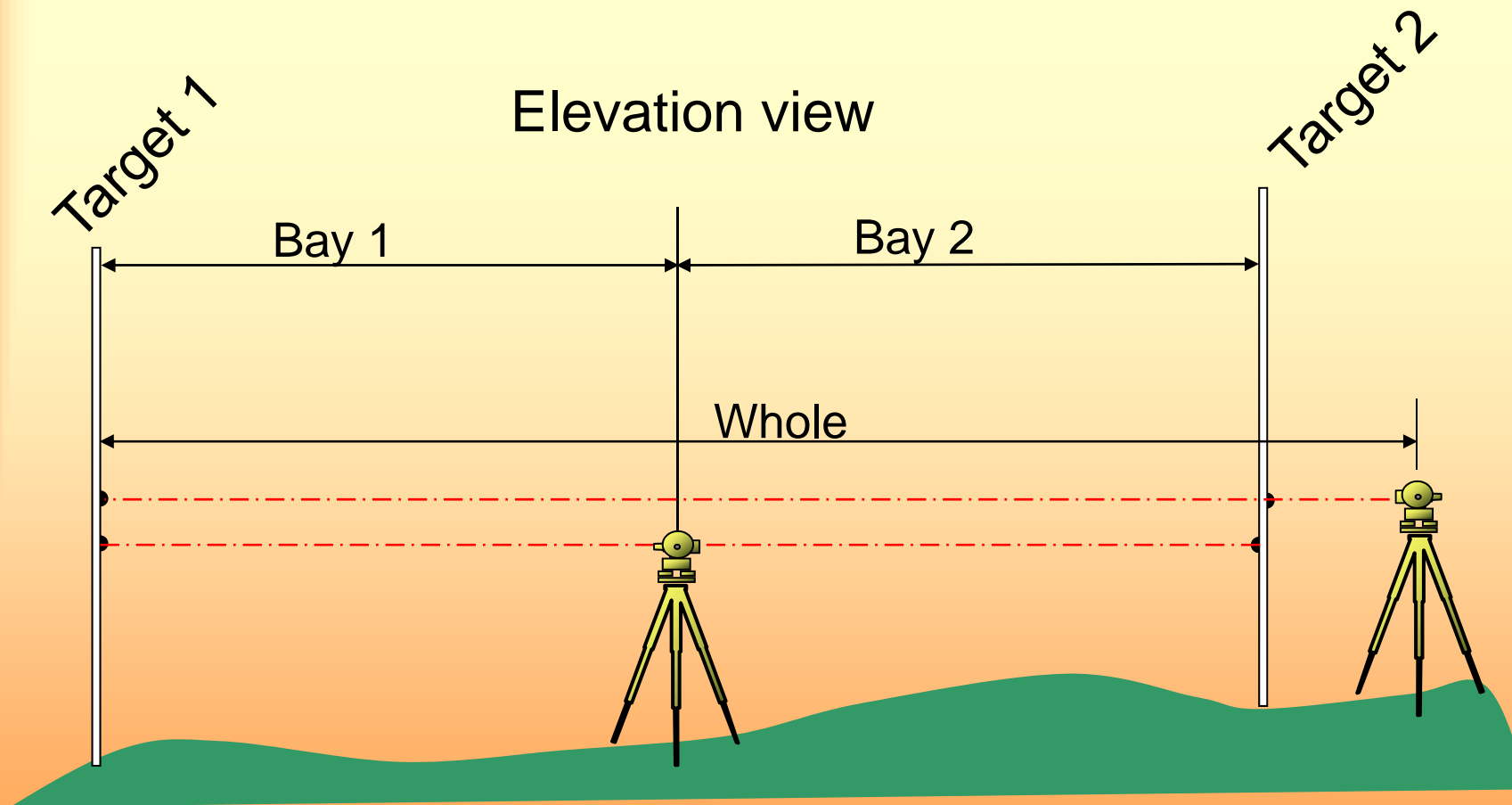


Test 7 Detail Pole Check

1. Check straightness of pole by rolling
2. Set two theodolites at 90 degrees to check plumb

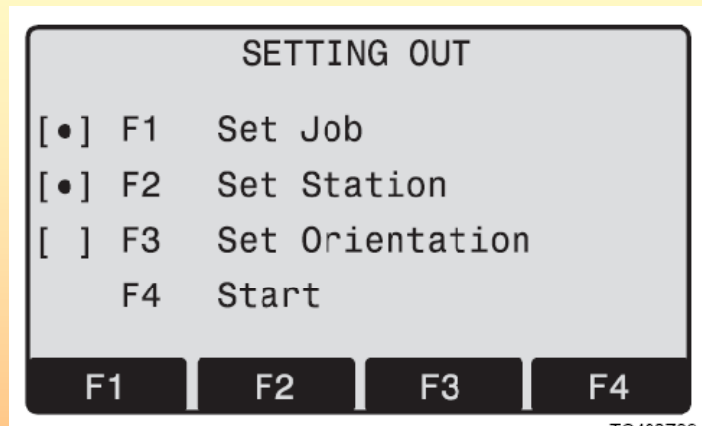


Test 8 Distance Check



$$\text{Error} = (\text{Whole} - \text{bay 1} - \text{bay 2})/2$$

Setting Out & Surveying



Application pre-settings

F1 = Name of job

F2 = Name of setup station


F3 = Orientation to grid

F4 = Begin

Free Station, (Resection).

FREE STATION RESULT	
Station :	Stp1
hi :	1.560 m
EO :	102.338 m
NO :	406.426 m
HO :	99.350 m

AddPt RESID StdDev SET

FREE STATION RESIDUALS 1/3	
PtID :	Target 1 ◀▶
▲ Hz :	0.0020 g
▲  :	0.030 m
▲ H :	0.028 m

BACK

There is anecdotal evidence that this application sometimes gives acceptable residuals and SD's, but the setup data is obviously wrong.

Avoid sighting over heavy traffic or wherever there is atmospheric disturbance

Free Station, (Resection).

When searching for a new point by a FREESTATION and surveying by installing a instrument in the point, accuracy may not be stabilized compared with the case where a instrument is installed on a known point. In the work which needs a high-precision survey, we cannot recommend you.

Pentax recommendation.

Setting Out/As-Built/Deformation.

Where design positions are known and have to be set out or checked for position, a file of coordinates can be loaded into the Total Station.

This involves producing a text file , then converting it to a GSI file which is then downloaded into a job file in the instrument.

The setting out programme is then used in the field, and the corrections, (dE, dN, dH) are shown on the display.

The data can then be recorded and a report file produced

Setting Out/As-Built/Deformation.

A Report File Example

300/400/700/800 Series SET OUT and AS BUILT FILTER (as_built v1) K. DENNISON 15/11/07

Date: 2008/01/11 Time 14:51 Instrument #640 Job: K1 Operator: KD

Point	Design E	Design N	Design H	Obs E	Obs N	Obs H	Diff E	Diff N	Diff H
A	500.000	100.000	10.000	500.000	100.000	10.000	+0.000	+0.000	+0.000
104	500.000	104.438	11.433	500.001	104.440	11.426	+0.001	+0.002	-0.007
101	501.002	103.906	10.041	501.002	103.907	10.037	-0.000	+0.001	-0.004
102	499.002	103.904	10.038	499.003	103.890	10.040	+0.001	-0.014	+0.002
51	498.594	103.031	11.479	498.593	103.031	11.417	-0.001	+0.000	-0.062
A	500.000	100.000	10.000	500.000	100.000	10.000	+0.000	-0.000	+0.000

Note that the start point is re-observed at the end as a check.

End Of File

THE END