9 ways of more accurate setting out with a total station

Notebook:	Hitechniques Knowledge Base		
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9 ways of more accurate setting out with a total station

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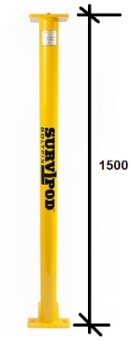
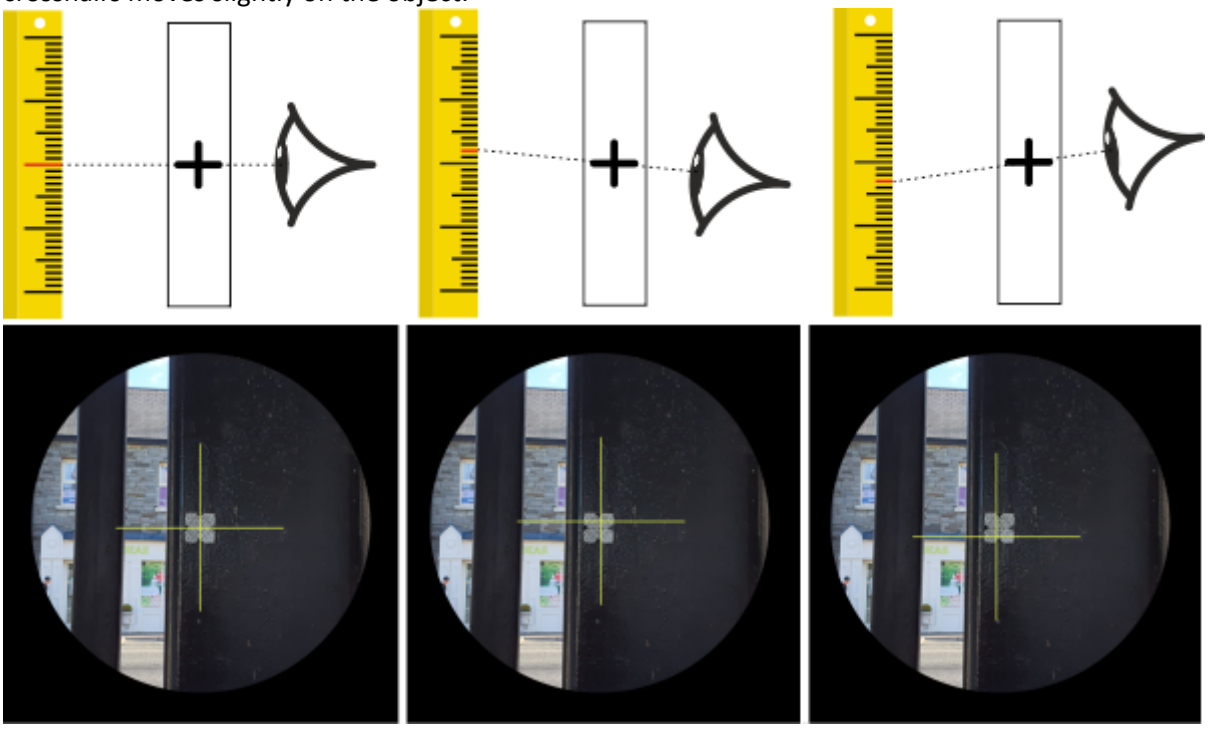
1. Stabilise the tripod
    1. Keep the tripod as low as convenient for viewing through the telescope, to inhibit wind movement and vibration of nearby machines
    2. Fix the tripod star to the ground to prevent movement, or
    3. Use a monopod

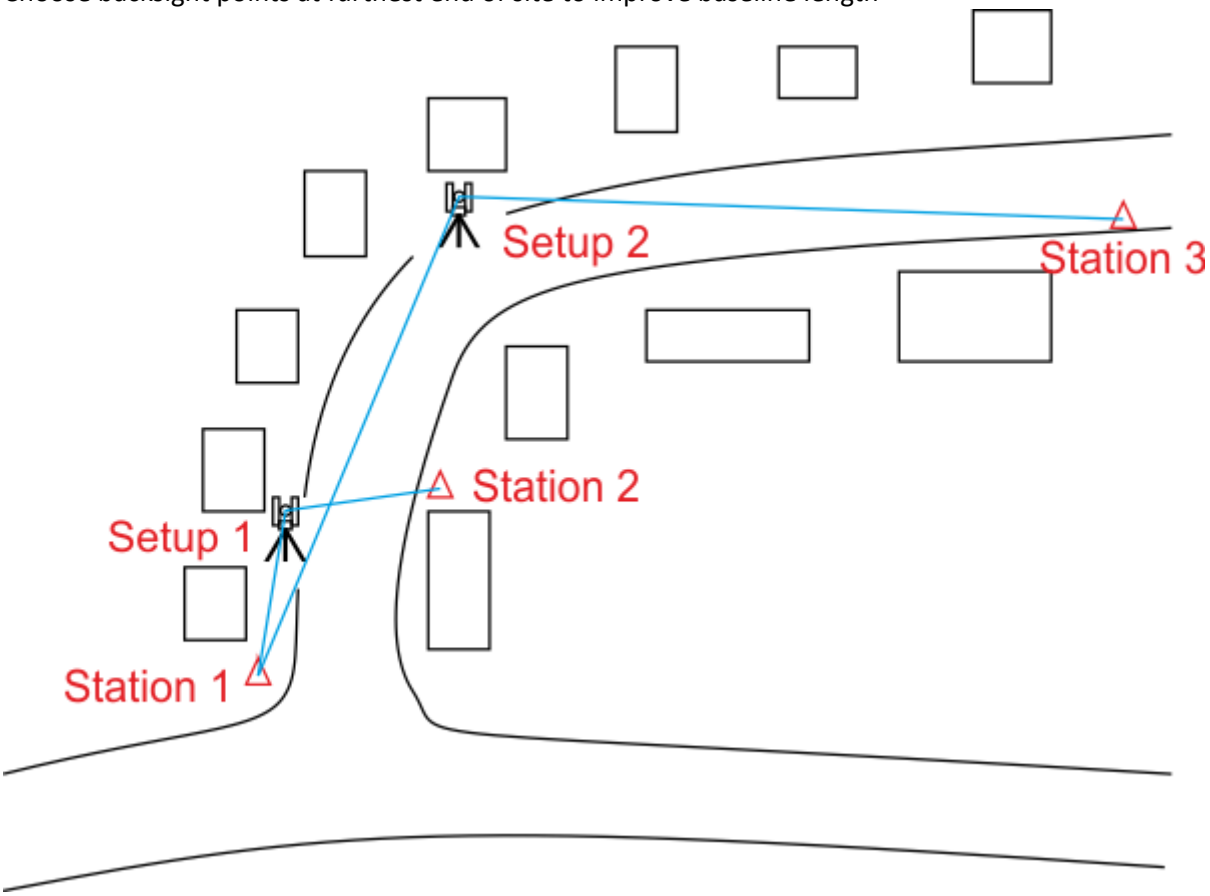


2. Eliminate parallax error.
    1. Parallax error occurs when the eyepiece crosshairs are not focused on the retina of your eye.
    2. You can see a parallax error if, when looking at the object through the telescope you move your head slightly, the crosshairs moves slightly on the object.



    3. You can fix a parallax error by adjusting the crosshair focus so that the crosshairs appear clear and black against the object and there is not movement of the crosshairs when you move your head.

3. When free stationing
    1. Choose backsight points at furthest end of site to improve baseline length



    2. Choose backsight points that are approximately equidistant from total station. In figure above the distance from the setup 2 to the backsight station points is approximately equidistant
    3. Try to choose setup and backsight stations that will give an equilateral triangle in plan for better accuracy
    4. Closing error should be less than 2 mm.
    5. Add more points to improve free stationing accuracy
4. Always record the staked out point.
    1. Stake out report. Figure below shows the stake our report that you can have showing difference between design point and staked point

Report stakeout

Job Setting

Date 13-11-19 **Time** 12:22

Survey Point	E	N	Z	Design Point	E	N	Z	Differences E	N	Z
STN_STK	701423.991	728809.734	85.164	STN	701424.012	728809.723	85.157	0.022	-0.011	-0.007
1_STK	701422.021	728814.399	85.109	1	701422.027	728814.389	85.116	0.005	-0.010	0.007

5. Always check your backsight when finished setting out.
    1. Get a stationing report
    2. And a backsight check report, see below

STATION SETUP

Date/time:	09-05-20 14:02:47
Setup type:	Free station
Instrument Type:	GeoMax-Zoom 70/90
Instrument Height:	1.523m

Station name	E	N	Z
ST_0001	659947.573m	745275.139m	72.853m

OBSERVATIONS

Point	Code	HA	VA	SD	USE	Target H.	Target type	Const.	Ex-center T	Ex-center L	Ex-center H	ΔE	ΔN	ΔZ
1077		237°51'55"	89°41'57"	16.017m	3D	2.000m	360°	23.1 mm				-0.002m	-0.002m	-0.006m
1078		170°18'30"	91°13'52"	13.038m	3D	2.000m	360°	23.1 mm				+0.001m	-0.002m	+0.006m

Std.Dev. E:	0.0051m
Std.Dev. N:	0.0033m
Std.Dev. Z:	0.0063m
Azimuth corr.:	0°00'00"

RESULT

Station name	E	N	Z
ST_0001	659947.573m	745275.139m	72.853m

MEASUREMENTS TPS

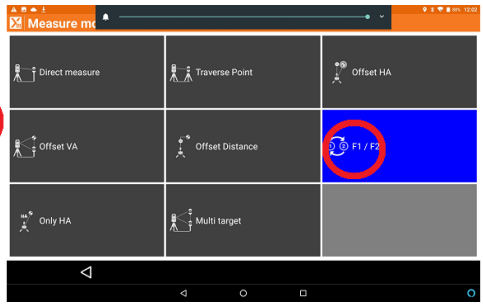
Point	Code	HA	VA	SD	E	N	Z	Target H.	Target type	Const.	Ex-center T	Ex-center L	Ex-center H
CP1	CP	251°09'21"	88°52'34"	14.700m	659933.664m	745270.392m	74.665m	0.000m	Reflectorless	34.4 mm			
CP2	CP	207°01'17"	90°49'11"	32.770m	659932.687m	745245.949m	73.908m	0.000m	Reflectorless	34.4 mm			
CP3	CP	172°00'51"	92°00'19"	14.780m	659949.625m	745260.511m	73.859m	0.000m	Reflectorless	34.4 mm			
1081	KB	124°13'53"	87°29'45"	5.591m	659952.191m	745271.996m	72.621m	2.000m	360°	23.1 mm			
1082	KB	156°57'24"	90°10'02"	8.694m	659950.976m	745267.139m	72.351m	2.000m	360°	23.1 mm			
1083	KB	176°56'57"	91°51'00"	18.035m	659948.532m	745257.138m	71.794m	2.000m	360°	23.1 mm			

6. Bring the prism down to the staked out point:
    1. Use a short pole

    2. Use reversible pole. With this pole you can fit the prism to the top or the bottom of the pole
    3. Use a mini 360° prism. Like the standard miniprism you can put this on a 50mm pin.
7. Reduce setting out threshold to 10mm. Often users, when doing the final setting out of a point, use only the sound (beeping/continuous) to position the pole, because they are looking at where the point is on the ground. If you reduce the setting out threshold the boundary at which the instrument switches from beeping to continuous you will be nearer the point.

Make it even more accurate

1. Station on a point rather than free stationing. As above the stationing least squares adjustment when free stationing will generally be about 2mm. Stationing on a point should have a stationing accuracy of <0.5mm
2. Continue to use the same station point as much as possible. Because there will not be absolute agreement between station points, using a single station point as much as possible reduces errors.
3. Use double facing when stationing



4. Double facing reduces any instrument collimation error by using the average value of the two measurements.