GNSS - Determine Coordinate System using Multiple Points

This guide is designed to enable the user to create a co-ordinate system on System Viva, for a site which already has a local grid system in place, having existing points with known co-ordinates able to be surveyed with the GPS sensor, typically survey control stations. It is based upon a 'One-Step' method which is suitable for sites up to 10km in length.

Enter the site control points into a job as fixpoints.
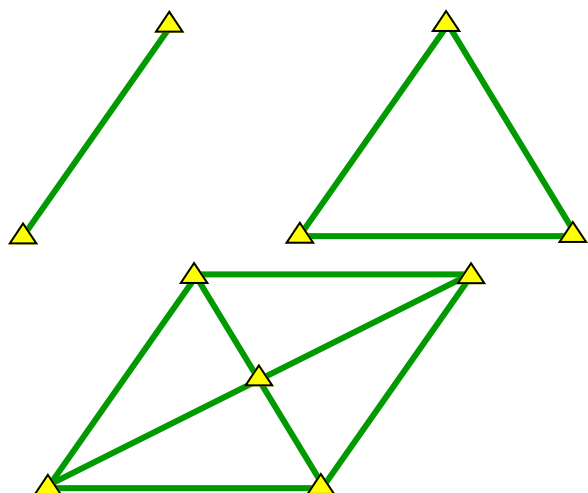
Go out and measure the stations in WGS84, **naming the stations the same as for the entered fixpoints.**

2 points allows for a local orientation

3 points create a plane surface & orientation
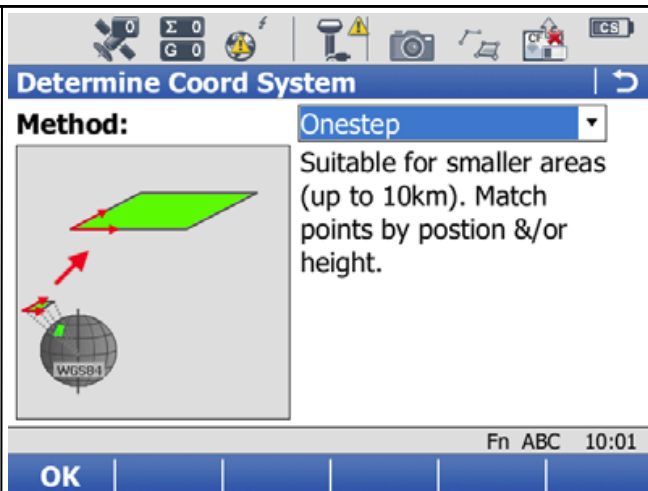
4+ points creates & checks the surface.

First, create a new working job (BATH) where the measured points will be stored. This can use either OSGB36 or WGS-84 as the coordinate system, it doesn't matter. *All points are stored as WGS-84 by default.*
go out and measure all the points, taking repeated shots to ensure a robust solution.

Second, create a new job for the local coordinates (BATH LOCAL CTRL), and enter the Eastings/Northings/Ortho-Heights for the given control stations.
Ensure point ID's are the same.
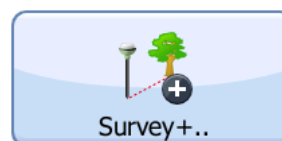
1

Determine Coord System

| Method: | Onestep ▼ |

Suitable for smaller areas (up to 10km). Match points by postion &/or height.
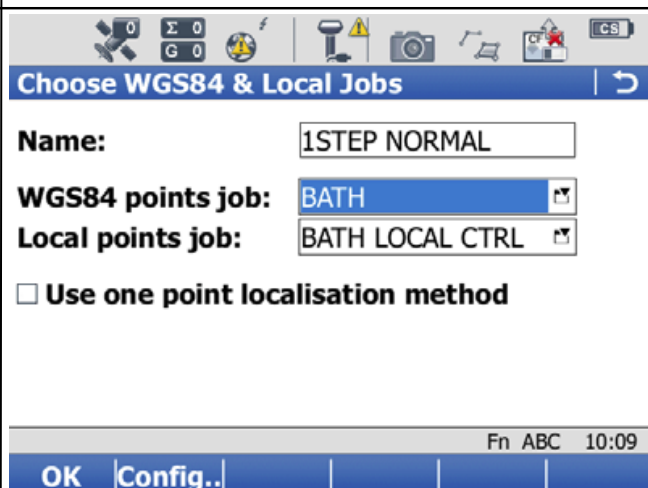
WGS84

Fn ABC 10:01

OK

Go to Work!
Survey & stake pts
Start base station

Survey+..

Determine coord sys

Select the Onestep method for sites up to 10km in length.

2

Choose WGS84 & Local Jobs

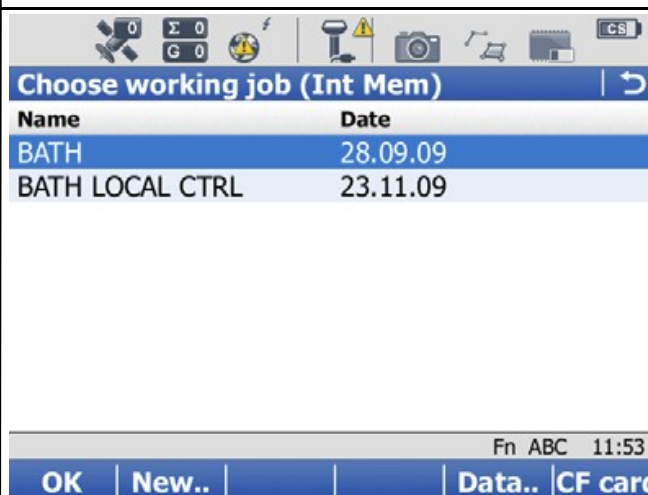| Name: | 1STEP NORMAL |
| WGS84 points job: | BATH |
| Local points job: | BATH LOCAL CTRL |

☐ Use one point localisation method

Fn ABC 10:09

OK **Config..**

Input a name for the Coordinate system to be created. Since the coordinate system will be site specific, it is recommended to incorporate the site name, eg <SITE NAME> LOCAL SYSTEM.

For matching multiple points, leave the <Use one pt localisation method> button unchecked. Select or define the job in which the GPS surveyed points are stored (WGS84 Points Job) and the job in which the local grid coordinated points are stored. If you can't find the job by scrolling through, then press Enter to change the storage device.
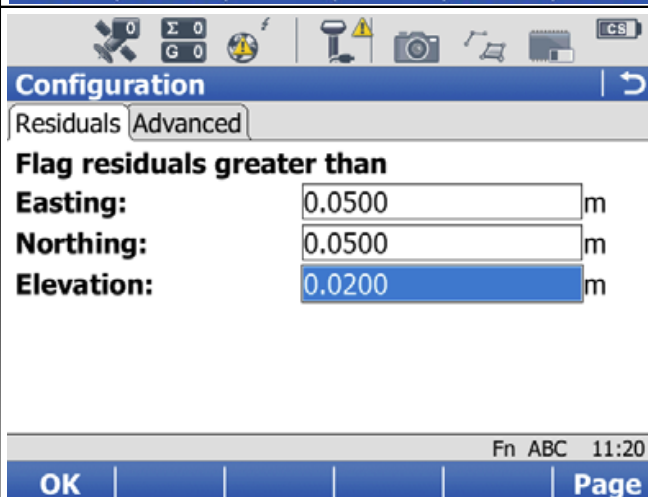

3

Choose working job (Int Mem)

Name	Date
BATH	28.09.09
BATH LOCAL CTRL	23.11.09

Fn ABC 11:53

OK **New..** **Data..** **CF card**

The job location is shown in the blue location bar, in this case Int Mem. F6 allows the user to toggle between CF card, USB stick, SD card to locate your job. Alternatively a new job can be created using F2 <New..>. Job data can be viewed using F5 <Data..>, and new points can be added here also if required.
Press <OK> to continue.

4

Configuration

Residuals | Advanced

Flag residuals greater than

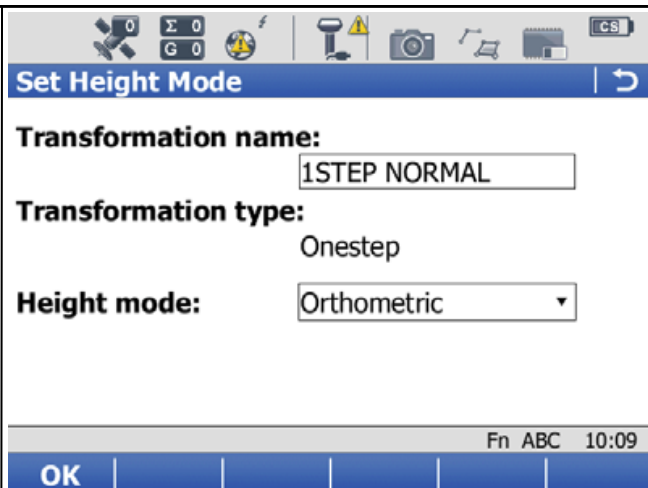| Easting: | 0.0500 | m |
| Northing: | 0.0500 | m |
| Elevation: | 0.0200 | m |

Fn ABC 11:20

OK **Page**

Pressing F2 <Config..> will let you define the size of residuals to be flagged.
Press <OK> to continue.

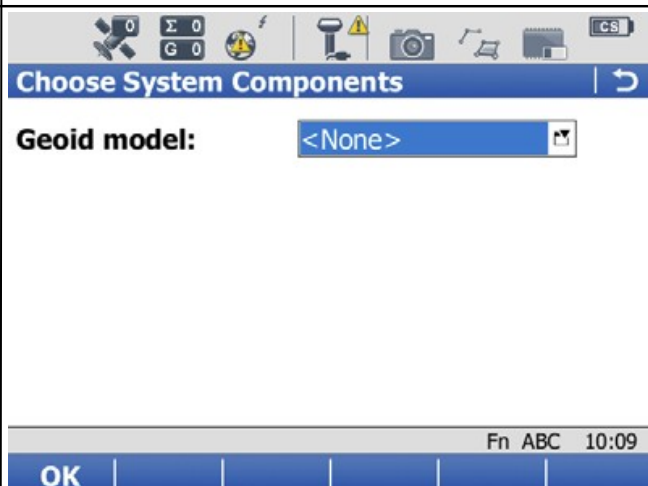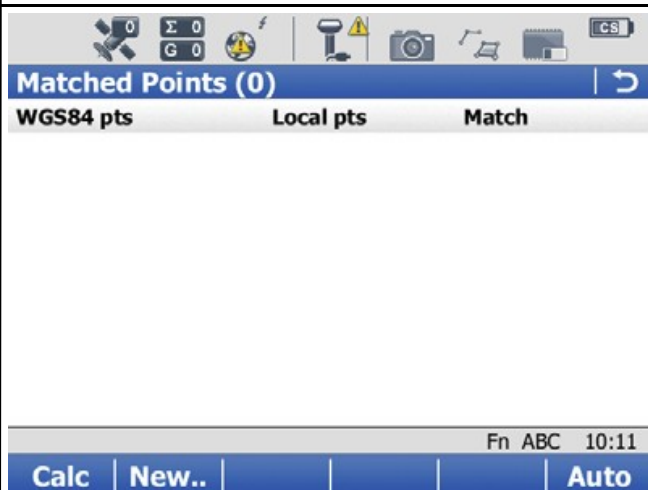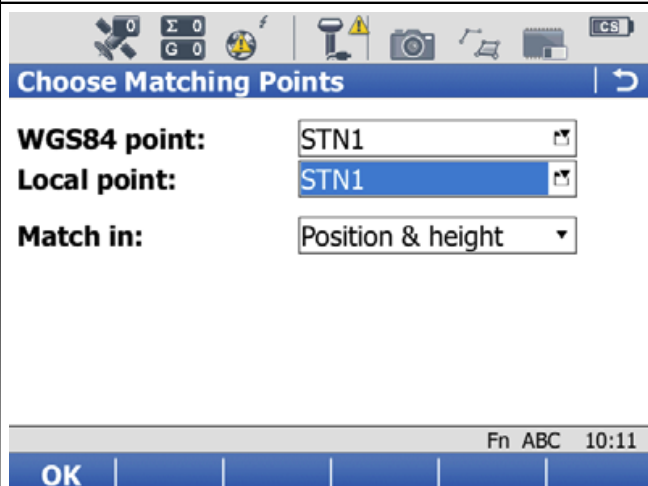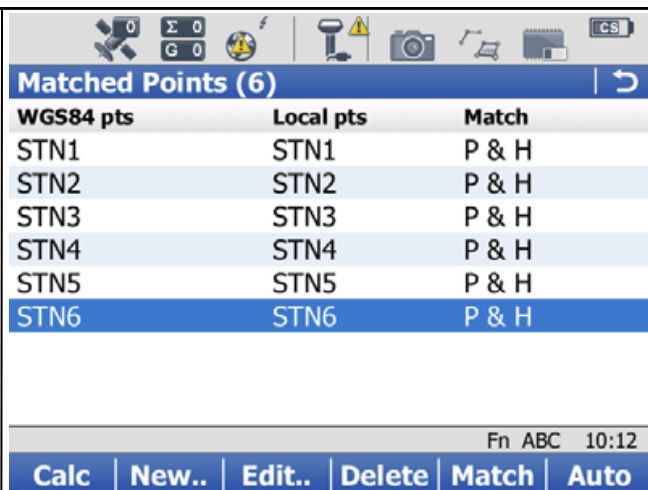|		
5	**Set Height Mode** **Transformation name:** 1STEP NORMAL **Transformation type:** Onestep **Height mode:** Orthometric Fn ABC 10:09 **OK**	Set height mode. If a local height datum is being used, set this to Orthometric. If a Geoid model is to be used, set to Ellipsoidal. Press <OK> to continue.
6	**Choose System Components** **Geoid model:** <None> Fn ABC 10:09 **OK**	If a Geoid model is to be used, select it here i.e. OSGM02 or a site specific "x.GEM" file. Press <OK> to continue.
7	**Matched Points (0)** WGS84 pts Local pts Match Fn ABC 10:11 **Calc** | **New..** | | | | **Auto**	This is where GPS surveyed points are matched to the corresponding point with known local grid coordinates. Press F2 <New..> to add points one by one. *Note: If the WGS84 job and local job have identical point ID's, then F6 <Auto> will match these automatically.
8	**Choose Matching Points** **WGS84 point:** STN1 **Local point:** STN1 **Match in:** Position & height Fn ABC 10:11 **OK**	Select the point ID's to be matched. With WGS84 Point highlighted, pressing enter will give the user the opportunity to survey a position at this time. With Local Point highlighted, pressing enter will give the user the opportunity to create/input new local coordinated points. Select the elements to be matched, e.g. height only for site datum mark. Press <OK> to continue.

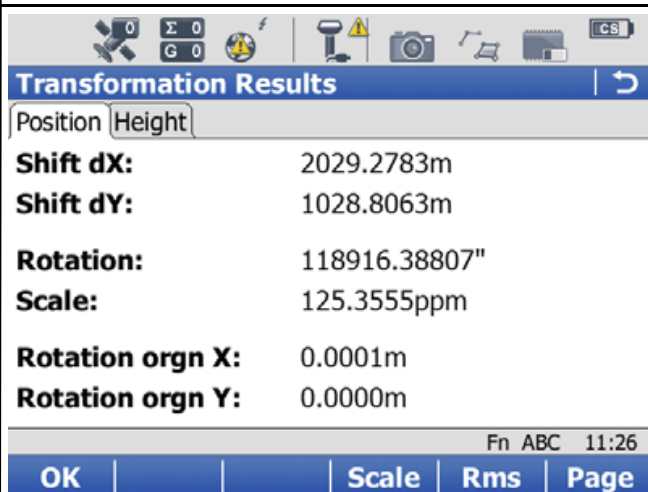| 9 | Matched Points (6) | Continue until all your points are matched. <Edit..> to make any changes to the points, <Delete> to remove the points from the solution, <Match> to toggle through the Matched elements (e.g. Pos. & Ht., Pos Only, Ht. Only). |

Matched Points (6)

WGS84 pts	Local pts	Match
STN1	STN1	P & H
STN2	STN2	P & H
STN3	STN3	P & H
STN4	STN4	P & H
STN5	STN5	P & H
STN6	STN6	P & H

Fn ABC 10:12

Calc | New.. | Edit.. | Delete | Match | Auto

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Check Residuals

WGS84 pts	East[m]	North[m]
STN1	-0.003	0.003
STN2	0.001	-0.010!
STN3	-0.005	0.002
STN4	0.008!	0.002
STN5	0.003	0.000
STN6	-0.004	0.002

Fn ABC 10:31

OK | | Result | | More |

The calculated residuals are displayed. The highest residual for each element is flagged, along with any which exceed the limits set in step 1.3. Press F4 <More> to view the height element. If any changes need to be made, then press the back button to return to the match screen. If the residuals are satisfactory, F3 <result> to view the transformation results (see x), or F1 <OK> to store the coordinate system (go to x).

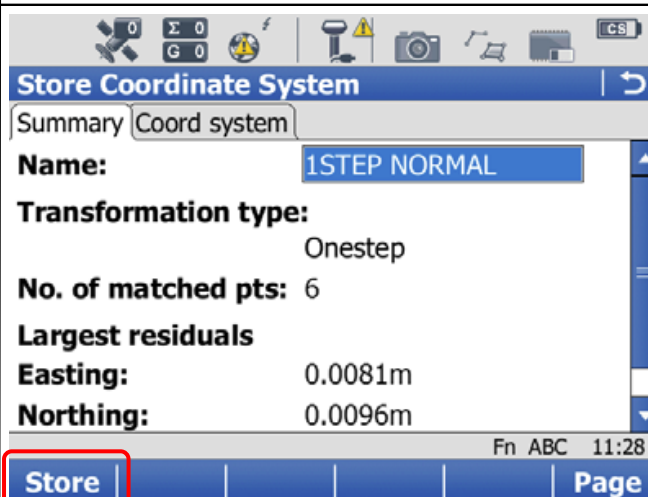
11

Transformation Results

Position | Height

Shift dX:	2029.2783m
Shift dY:	1028.8063m
Rotation:	118916.38807"
Scale:	125.3555ppm
Rotation orgn X:	0.0001m
Rotation orgn Y:	0.0000m

Fn ABC 11:26

OK | | | Scale | Rms | Page

This screen shows the transformation parameters.

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Store Coordinate System

Summary | Coord system

Name:	1STEP NORMAL
Transformation type:	Onestep
No. of matched pts:	6
Largest residuals	
Easting:	0.0081m
Northing:	0.0096m

Fn ABC 11:28

Store | | | | Page

A summary is displayed, and if the user wishes residuals to be distributed using a particular method, this can be defined in the Coord system tab. Otherwise press F1 <Store> to store the new coordinate system, attach it to the WGS84 job and return to the main menu.