



**How To**  
**Offshore networks**  
Version 4.0.2



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## 1. Introduction

This document describes how offshore networks with USBL (Ultra Short Base Line), SBL (Short Base Line) or LBL (Long Base Line) acoustic ranges can be adjusted.

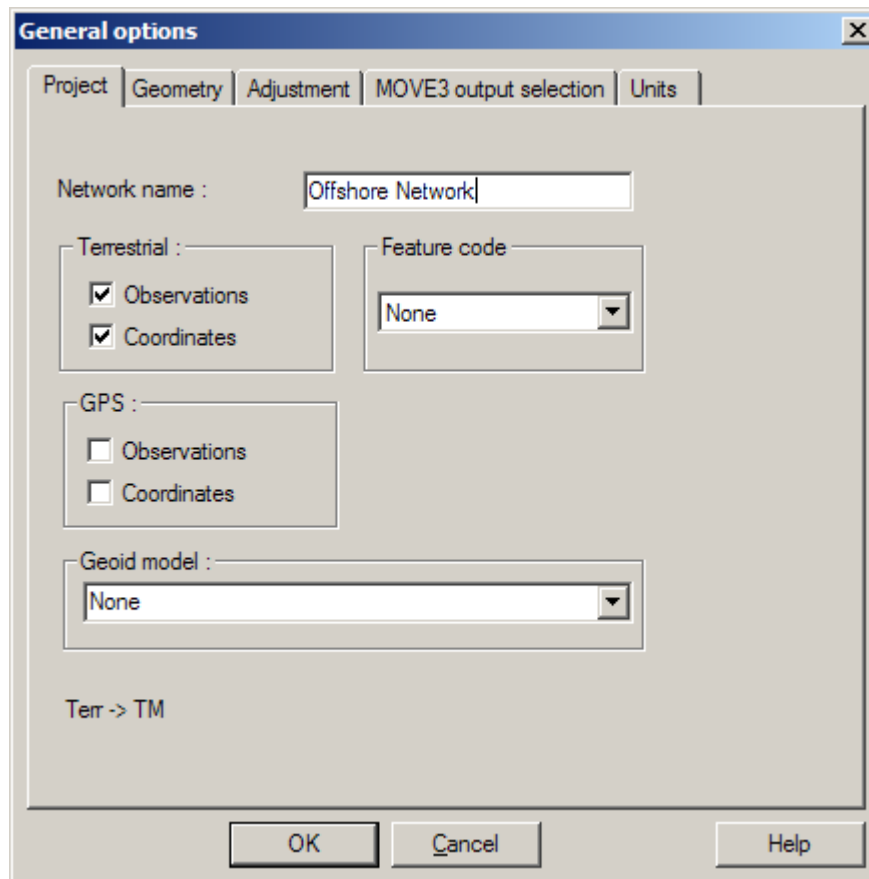
**Please note that this is a sample. The actual settings may differ depending on your local requirements.**

## 2. New MOVE3 Project

Create a new MOVE3 project by specifying the project name. A template project (option file) can be selected to use previously defined project settings.

### 3. Options

Starting a new project without using a template will set all options to the MOVE3 defaults. In this case you must set at least some of the options to meet the adjustment requirements. Set the *Project* options to terrestrial only.



The screenshot shows the 'General options' dialog box with the 'Project' tab selected. The 'Network name' field contains 'Offshore Network'. Under 'Terrestrial', both 'Observations' and 'Coordinates' are checked. Under 'GPS', both 'Observations' and 'Coordinates' are unchecked. The 'Feature code' dropdown is set to 'None'. The 'Geoid model' dropdown is also set to 'None'. At the bottom, there is a text label 'Terr -> TM' and three buttons: 'OK', 'Cancel', and 'Help'.

Project tab sheet.

In the *Geometry* tab the Dimension must be set to 3D. In most cases these offshore networks will use UTM (or TM) projection. Use a proper setting for the Central Meridian and Ellipsoid.

The screenshot shows the 'General options' dialog box with the 'Geometry' tab selected. The settings are as follows:

Parameter	Value	Unit
Dimension	3D	
Projection	UTM North	
Longitude of origin/CM	3 00 00.00000	
Latitude of origin	0 00 00.00000	
Standard parallel 1		
Standard parallel 2		
Scalefactor	0.999600000	
False Easting	500000.0000	m
False Northing	0.0000	m
Ellipsoid	WGS 84	
Semi major axis	6378137.0000	m
Inverse flattening	298.257223563	
Transformation	None	
GPS coordinate type	XYZ	

Geometry tab sheet.

Due to the nature of the network it will probably be best to fix the Scale factor for the distances to 1.0 (or a value that compensates the already applied scale factor for projection and depth to the distances). In the *Additonal Parameters | Scale factor* tab the Scale factor can be set to fixed.

GPS transformation parameters		Other Parameters	
Scale factor		Vert refractioncoeff	Azimuth offset
0	Fixed	1.000000	
1	Free	1.000000	
2	Free	1.000000	
3	Free	1.000000	
4	Free	1.000000	
5	Free	1.000000	
6	Free	1.000000	
7	Free	1.000000	
8	Free	1.000000	
9	Free	1.000000	

Scale factor tab sheet.

Please note that this option will only be active if distance measurements have been entered.

#### 4. Default standard deviations

Before entering the measurements it is important to properly set the defaults for the standard deviations of the TPS observations distances. The standard deviations have an absolute part and a relative. The default values are added to each entered observation. Here the standard deviation of the measured acoustic distances is estimated to be 3 cm.

**Standard Deviations** [X]

Standard deviations for observations | Standard deviations for stations

	Absolute	Relative
<b>Terrestrial Observations:</b>		
Direction	0.00090 deg	0.00000 deg.km
Distance	0.0300 m	0.0 ppm
Zenith Angle	0.00090 deg	0.00000 deg.km
Azimuth	0.00090 deg	0.00000 deg.km
Height Difference	0.00 mm	1.00 mm/sqrt(km)
		0.00 mm/km
<b>GPS Observations:</b>		
GPS Baseline	0.0100 m	1.0 ppm
GPS Coordinate	0.0100 m	
<b>Geometrical Relations:</b>		
Angle	0.09000 deg	
Distance / collinearity	0.0150 m	
<b>Offsets:</b>		
Steel Tape measurement	0.0100 m	
Auxiliary point	0.0100 m	

**Update Observations**

- All
- All types with changed defaults
- All with old defaults
- None

OK Cancel Help

Standard Deviations.

## 5. Entering Points and Observations

Select the menu option View | Stations and select Edit | Insert from the menu.

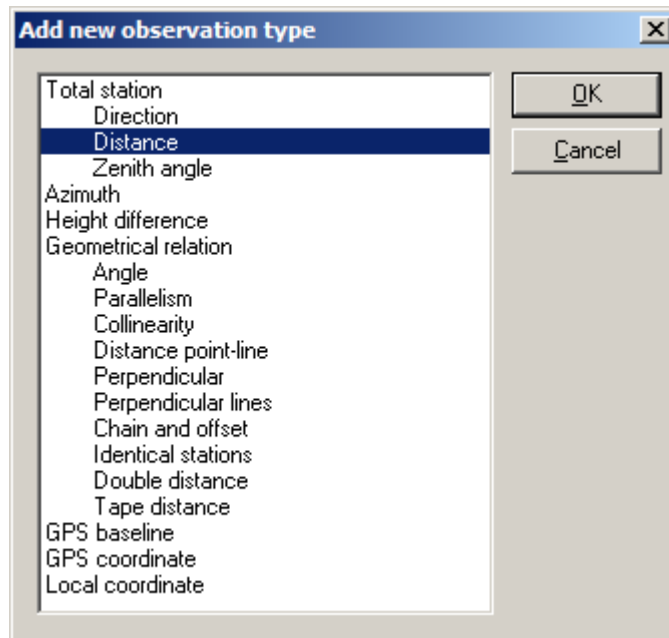
Following dialog will be shown:

Known		Standard Deviations	
X East	<input checked="" type="checkbox"/>	0.5000	m
Y North	<input checked="" type="checkbox"/>	0.5000	m
Height	<input checked="" type="checkbox"/>	0.1000	m

Edit Station dialog

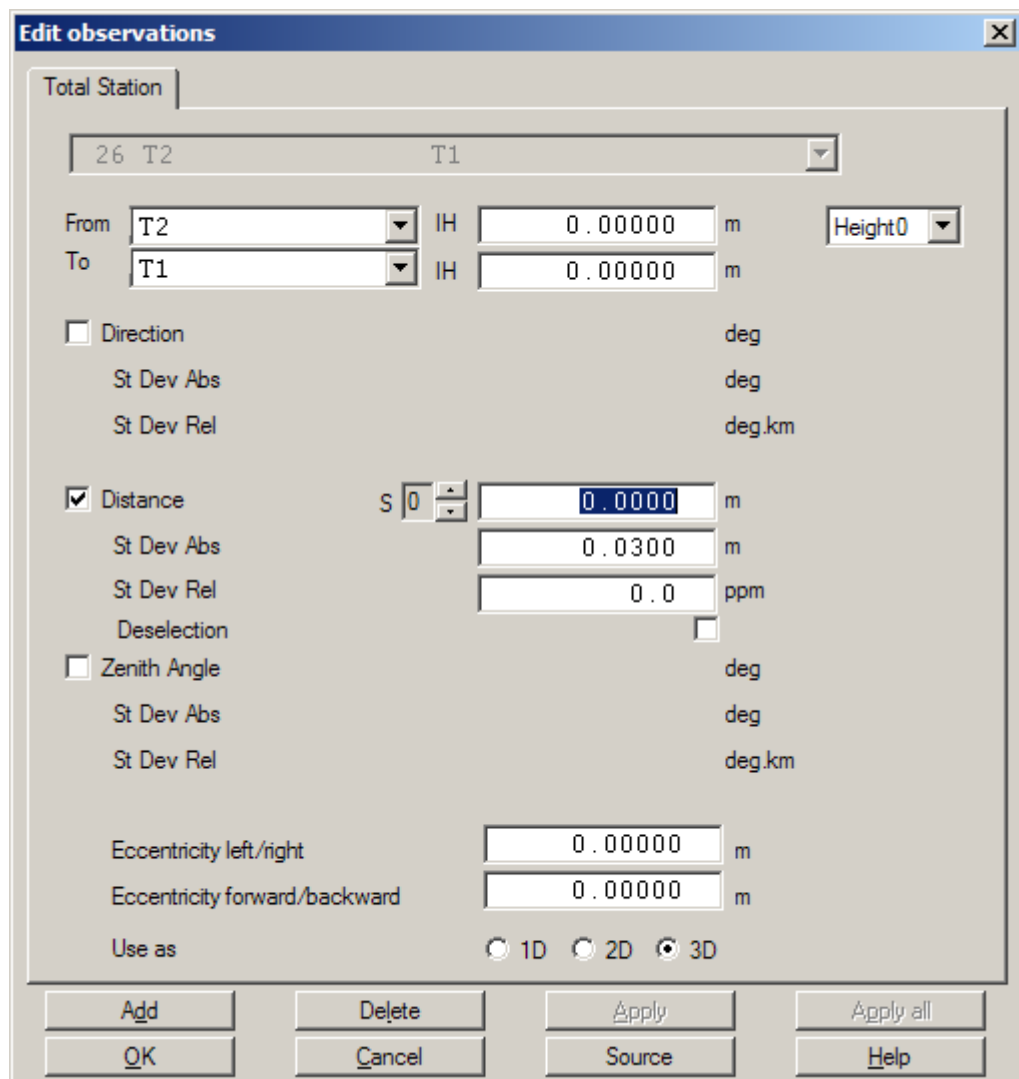
Enter the Station name, the coordinates and for known point also check the known flag and enter an appropriate standard deviation for Easting, Northing and Height. In this case the standard deviation is set to 50 cm for Easting and Northing and 10 cm for the height.

Select the menu option View | Observations and select Edit | Insert from the menu. Select the observation type Distance.



Add new observation dialog

This will show the Edit observation dialog:

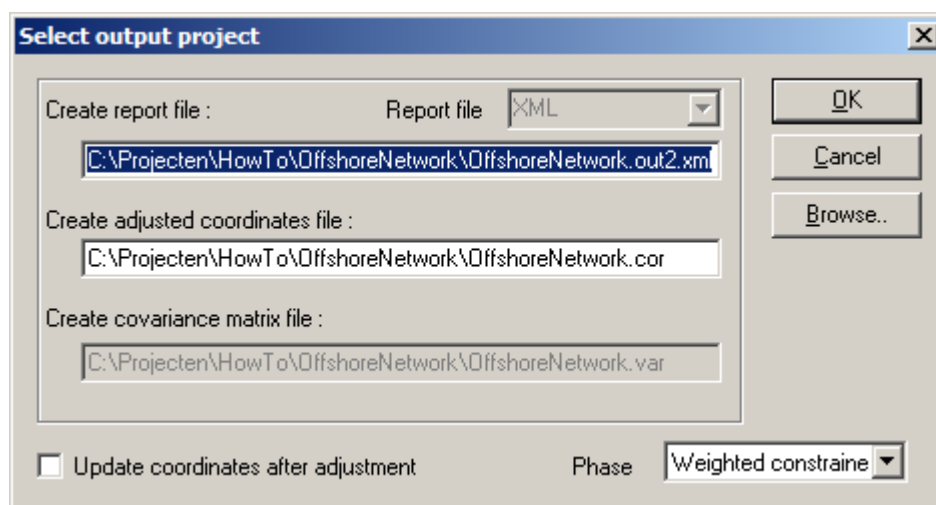


Edit Observation dialog

Select the From and the To station and enter the measured distance. The standard deviation defaults to 3 cm. Since the measured distance is a slope distance the Use as selection should be set to 3D. Please note that since the MOVE3 model is a 3D ellipsoidal model the entered distances should NOT be corrected for projection scale factor and depth.

## 6. Adjustment

Since the network only consists of measured distances in most cases an approximate coordinate computation with COGO3 will not be possible. Therefore it is required to enter the approximate coordinates manually or via an import. Likewise a Free network adjustment is usually not possible. You're now ready to adjust the network. Go to Compute| MOVE3 and set the phase to Weighted Constrained.



Compute Weighted Constrained network

The MOVE3 report will give the testing results of the adjustment, allowing to identify errors when sufficient redundancy is available.

In case one does not meet the predefined quality of the observations the global F-test will be rejected. This may be caused by either a too optimistic set of standard deviations of the observations or by errors in observations or known points. Usually a rejection is caused by errors in the observations or known points. To identify the errors one can use the W-test. The observation or known point with the largest W-test is the most suspect. One should try to solve the cause of the error, maybe an input error has been made when entering the observations or known points coordinates. The estimated error can be used for this purpose because it gives an estimate of the size of the error. If the error cannot be repaired, the observation can be deselected (not used in the adjustment) or the known point can be removed as a control point. This will however affect the reliability of the network. In some cases rejected observations may have to be re-measured to maintain proper reliability.

The final results are stored in the MOVE3 report file, but they are also written to the MOVE3 COR file. The adjusted coordinates can also be exported using the Import/export menu option Adjusted Coordinates. Specify the format and the fields you want to export and write the data to an ASCII file.

	Begin	Length	Field
Stations name	0	0	1
X East	0	0	2
Y North	0	0	3
Height	0	0	4
St dev X East	0	0	5
St dev Y North	0	0	6
St dev Height	0	0	7
Feature code	0	0	8
Ext Rel X East	0	0	9
Ext Rel Y North	0	0	10
Ext Rel Height	0	0	11
St Ellipse A	0	0	12
St Ellipse B	0	0	13
St Ellipse Phi	0	0	14

Export Adjusted Coordinates tab sheet