

Importing Total Station Data

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About this tutorial

In this tutorial, you will import total station traverse data into a project that already contains GNSS and level data. Then you will delete an incorrect station setup, change an incorrectly specified prism type for some observations, disable outlying observations, and adjust the traverse.

Note: If you need additional help at any time you are using the software, press **F1** to display the online help.

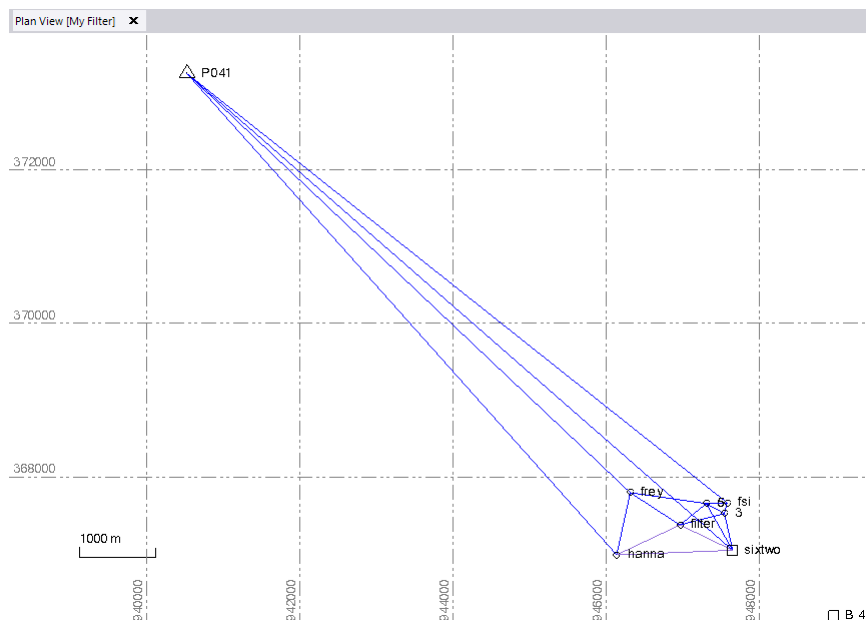
Step 1. Open the project

For this tutorial, you will use the project file *Importing Total Station Data.vce*. GNSS and digital level data has already been imported into the project, and GNSS baselines have been processed.

Note: The downloaded *ImportingTotalStationData* folder contains this PDF file, a *Data* folder, and the *Importing Total Station Data.vce* project file. You will import data from the *Data* folder later in this tutorial.

1. In SO, select **File > Open**.
2. In the **Open File** dialog, browse to `..\ImportingTotalStationData\Importing Total Station Data.vce` and click **Open**.

The project opens in the **Survey Office** window.



The project file is read-only. You can perform the tutorial steps without saving the project file. However, if you are interrupted while performing the tutorial, you can save it with a new name by selecting **File > Save Project As**. Then, you can re-open the project to continue the tutorial at a later time.

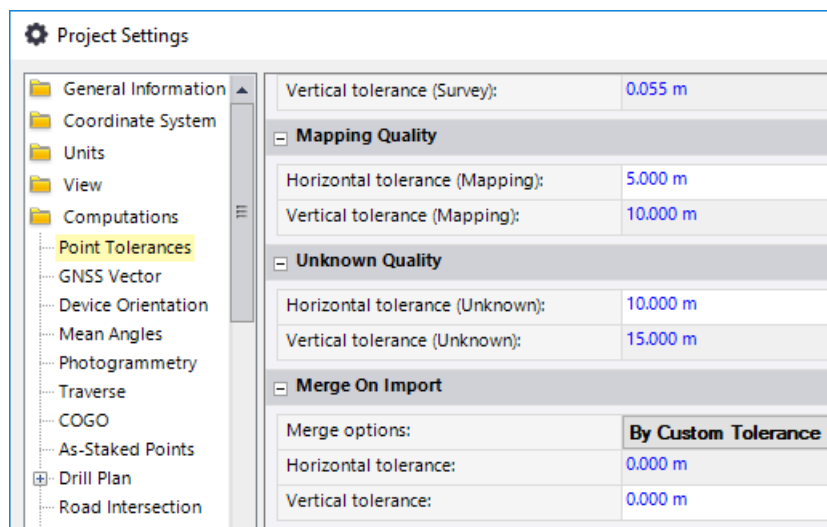
You are now ready to import total station data into your project.

Step 2. Select project settings

For this tutorial, you will import a data file containing traverse data collected with a total station. The traverse was adjusted in the field software prior to import. Because of the accuracy of the equipment used to collect data for this survey, you will increase the default tolerance specified for mean angles in your project before you import the data. You will also specify zero-tolerance for imported duplicate points so that you will be prompted to select which duplicate points to merge on import.

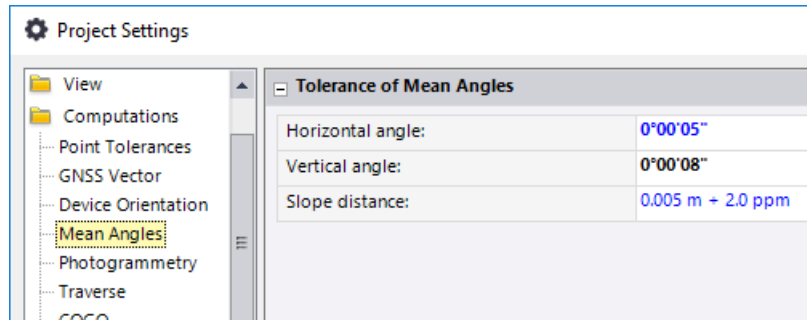
1. In the **Quick Access Toolbar** (located at the top of the **Survey Office** window), select **Project Settings** to display the **Project Settings** dialog.
2. To specify zero tolerance for imported duplicate points, do the following:
 - a. In the **Project Settings** dialog, select **Computations > Point Tolerances** in the navigation pane.
 - b. In the **Merge On Import** section, select *By Custom Tolerance* in the **Merge options** drop-down list.

You will leave the default custom tolerance values of *0.00 m*. This will cause the **Merge Points** dialog to display when you import the total station data, allowing you to select whether or not to merge each duplicate point. If you had not changed this setting for this data set, the default values used would cause the duplicate points to be merged automatically on import, without displaying the **Merge Points** dialog.



3. To increase the default tolerance specified for mean angles, do the following:

- a. In the **Project Settings** dialog, select **Computations > Mean Angles** in the navigation pane.
- b. In the **Tolerance of Mean Angles** section, enter:
 - $0^{\circ}00'05''$ in the **Horizontal angle** field
 - $0^{\circ}00'08''$ in the **Vertical angle** field




4. Click **OK**.

You are now ready to import the total station data.

Step 3. Import the total station data

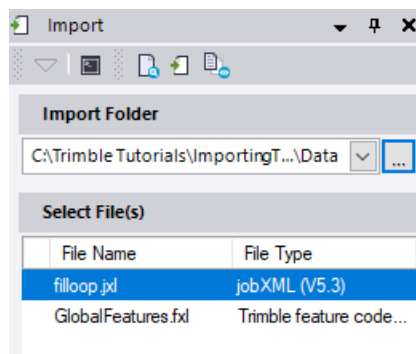
1. Select **Home > Data Exchange > Import**.

The **Import** pane displays in the right side of the **Survey Office** window.

2. In the **Import** pane, click the **Browse** button .
3. In the **Browse for Folder** dialog, browse to `..\ImportingTotalStationData\Data` and click **OK**.

The *Data* folder contains the JXL data file that you will import into the project.

The content of the *Data* folder displays in the **Select File(s)** list in the **Import** pane.



4. In the **Select File(s)** list, select *filloop.jxl* and click the **Import** button.

Since the software detects a difference between the coordinate system specified in the project and the coordinate system specified in the imported file, the **Project Coordinate System** message dialog displays.

- In the **Project Coordinate System** message dialog, click the **Details** button.

The *Coordinate System Comparison Report* displays in a browser window where project values and imported values are shown side-by-side. Differences are highlighted. For this tutorial, you will use the project values.

Coordinate System Comparison

Parameters	Database	Imported
		C:\Trimble Tutorials\ImportingTotalStationData\Data\filloop.jxl
Projection:	Lambert Conformal Conic Two Parallel	Lambert Conformal Conic Two Parallel
Origin latitude:	N39°20'00.00000"	N39°20'00.00000"
Origin longitude:	W105°30'00.00000"	W105°30'00.00000"
False northing:	304800.610 m	304800.610 m
False easting:	914401.829 m	914401.829 m
Scale factor:	?	?
Parallel 1:	N40°47'00.00000"	N40°47'00.00000"
Parallel 2:	N39°43'00.00000"	N39°43'00.00000"
Shift grid name:	None	None
Azimuth:		
System:	North	North
Coordinate direction:	North-East	North-East
Datum Transformation (To WGS84):		
Method:	Molodensky	None
Translation X:	0.000 m	?
Translation Y:	0.000 m	?
Translation Z:	0.000 m	?

- Close the report and select the **Keep the existing project definition** option in the **Project Coordinate System** message dialog. Then click **OK**.

The **Merge Points** dialog displays showing the imported point IDs that are duplicates of point IDs already existing in the project. For this import, you will merge each of the duplicate points.

- In the **Merge Points** dialog, check each of the **Merge** check boxes and click **Import**.

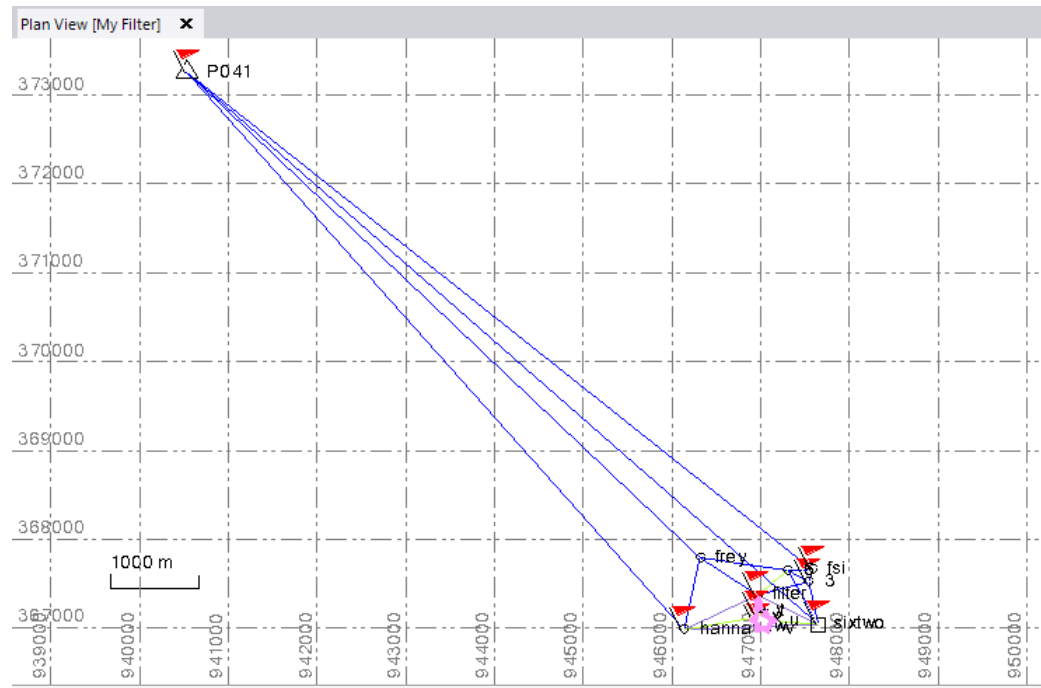
Merge Points from filloop.jxl Using By Custom Tolerance: 0.000 m, 0.000 m

<input checked="" type="checkbox"/>	Merge	Point Pair	H. Distance	V. Distance	Existing Feature
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5	0.024 m	0.029 m	SCP
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	filter	0.027 m	0.004 m	scp
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	hanna	0.065 m	0.014 m	SCP
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	sixtwo	0.042 m	0.031 m	SCP

Because the duplicate points will be merged during import, the traverse adjustment performed in the field will be removed.

Note: Points that are adjusted by a traverse adjustment are in a "fixed" state. They are not re-computed by a change to the coordinates of the starting or ending points unless you perform a least-squares network adjustment (select **Survey > Network > Adjust Network**). Although, in this case, the traverse adjustment was removed when the duplicate points were merged, you can re-adjust the traverse after the import is complete.

After import, numerous error flags display in the **Plan View**. You can view the messages associated with each of these error flags in the **Flags Pane**.



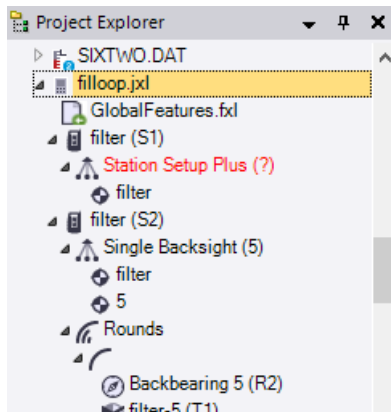
8. In the **SO** ribbon, select **Home > View > Flags Pane**.
9. Most of the error flags are due to exceeded tolerances. You will deal with these later in the tutorial. However, there is one error that you will correct now: *Station Setup Plus (?) - Setup failed to compute.*

Flagged Objects	Message
hanna	This point is out of tolerance. H = 0.121 m exceeds the computational settings for
hanna	This point is out of tolerance. H = 0.027 m exceeds the computational settings for
P041	This point is out of tolerance. H = 0.031 m exceeds the computational settings for
sixtwo	This point is out of tolerance. H = 0.028 m exceeds the computational settings for
sixtwo	This point is out of tolerance. H = 0.041 m exceeds the computational settings for
Station Setup Plus (?)	Setup failed to compute. Some backsight observations are missing or disabled.
w	This point is out of tolerance. H = 0.038 m exceeds the computational settings for
w-x-y (M12)	MTA V residual = 0°00'11" exceeds Vertical Tolerance of mean angles.

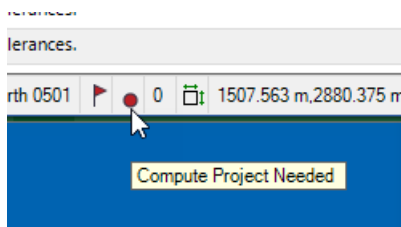
The error message indicates that the station setup is incomplete. (Note that no backsight point IDs are included in parenthesis following *Station Setup Plus*.) For this survey, the surveyors in the field mistakenly started by using *Station Setup Plus* for the setup type, which is represented by *filter (S1)*. Instead, they should have started with a *Single Backsight and Rounds* setup type, which is represented by *filter (S2)*. To resolve this issue, you will delete the first setup.

10. Select **Home > Data > Project Explorer**.
11. In the **Project Explorer**, expand the **Imported Files** node, right-click the *filloop.jxl* node, and select **Expand**.

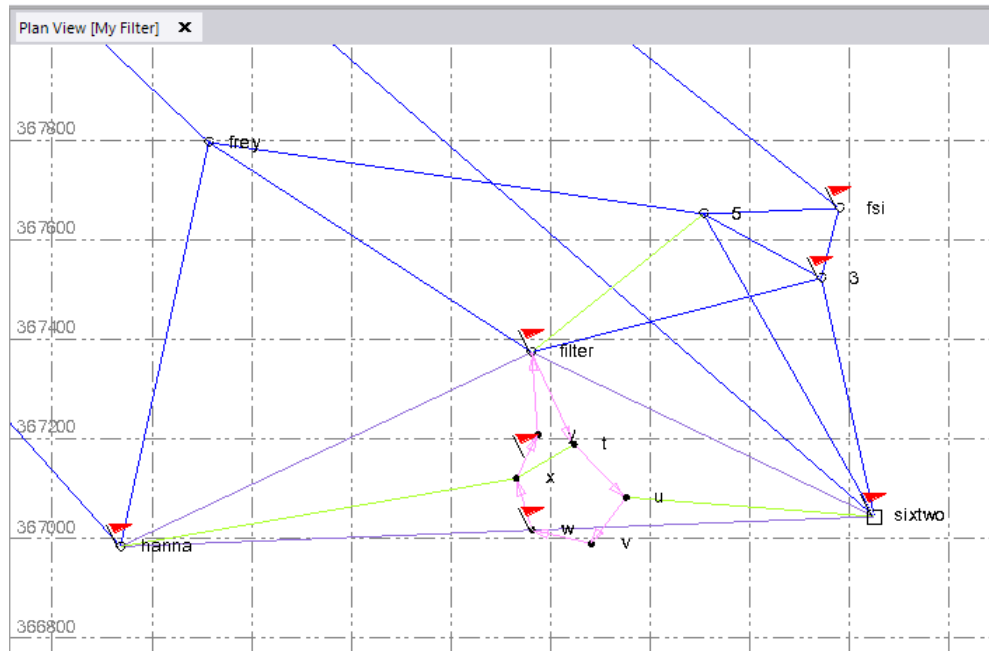
You can now quickly scan all of the *filloop.jxl* child nodes to identify the incorrect setup, which is displayed in red text.



12. To delete the setup, right-click the **Station Setup Plus (?)** node and select **Delete**.
13. Press **F4**, or click the red **Compute Project Needed** icon located in the **Status Bar**, to re-compute the project.

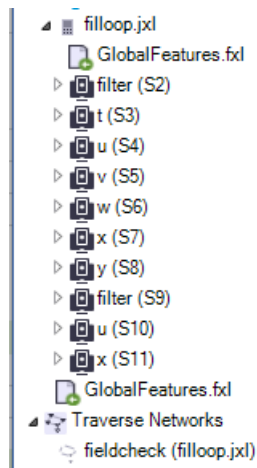


14. Click on the **Plan View** and use your mouse wheel to zoom in. Press the mouse wheel and move the mouse to center the points.



With the view enlarged, you can more easily see the newly imported data.

The **Traverse Networks** node in the **Project Explorer** indicates a traverse adjustment was performed in the field software, even though the adjustment was removed during import.



Step 4. Correct a prism type error made in the field

Because the surveyors in the field entered the incorrect prism type for observations within the mean angle $w-x-w$ ($M11$), you must correct the error before proceeding. You will start by taking a look at the *Point Derivation Report* for point w .

1. To view the *Point Derivation Report*, do the following:

- Select **Home > View > Zoom In** or use your mouse wheel to zoom in on point *w* in the **Plan View**.
- Click point *w* and select *Point: w [Points]* in the list.
- Right-click in the **Plan View** and select **Point Derivation Report** in the list.

The report displays in a browser window. The mean angle *w-x-w (M11)* is displayed with red values indicating the point exceeds tolerances you specified for mean angles earlier in the tutorial. This is the mean angle for which the prism type was incorrectly entered in the field.

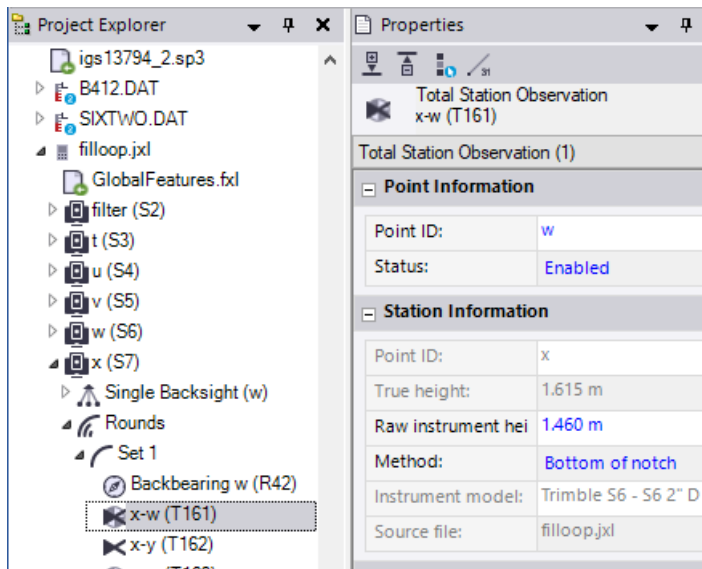
Resultant Coordinates for point: y					
Northing		Easting		Elev	
367017.172 m		946962.297 m		1667.1	
Data	Used to calc.	Status	ΔNorth (Meter)	ΔEast (Meter)	Dis
u-v-w (MS)	NEeh	Enabled	0.000 m	0.000 m	
w-x-w (M11)		Enabled	-0.037 m	0.011 m	

Survey Data used to calculate point:[y](#)

- In the **Project Explorer**, expand **Imported Files > filloop.jxl > x (S7) > Rounds > Set 1**. Then right-click *x-w (T161)* and select **Properties** in the context menu.

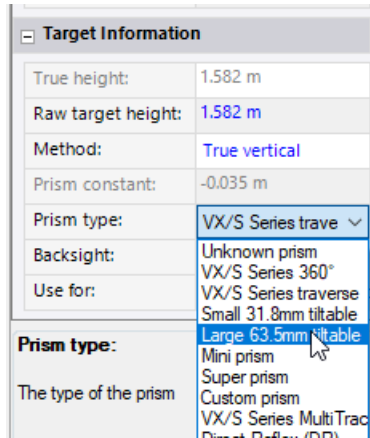
It might help if you right-click *filloop.jxl* and select **Collapse** before trying to navigate to *x-w (T161)*.

The properties for the observation are displayed in the **Properties** pane.



Note that you could have selected any of the observations within the mean angle *w-x-w (M11)* since you will be prompted to change them all.

- In the **Target Information** section of the **Properties** pane, select *Large 63.5mm tilttable* in the **Prism type** drop-down list.



- When the message displays asking if you want to extend the prism change to all other observations within this mean angle, click **Yes**.

The prism change is made to all observation within the mean angle. You must now re-compute the project.

- Press **F4** to re-compute the project.

A flag is no longer displayed for point *w* in the **Plan View**.

- Open another *Point Derivations Report* for point *w* and review the changes.

Resultant Coordinates for point: w					
Northing		Easting		Elevz	
367017.172 m		946962.297 m		1667.15	
Data	Used to calc.	Status	Δ North (Meter)	Δ East (Meter)	Dist
u-v-w (M8)	NEeh	Enabled	0.000 m	0.000 m	
w-x-w (M11)		Enabled	-0.003 m	0.001 m	

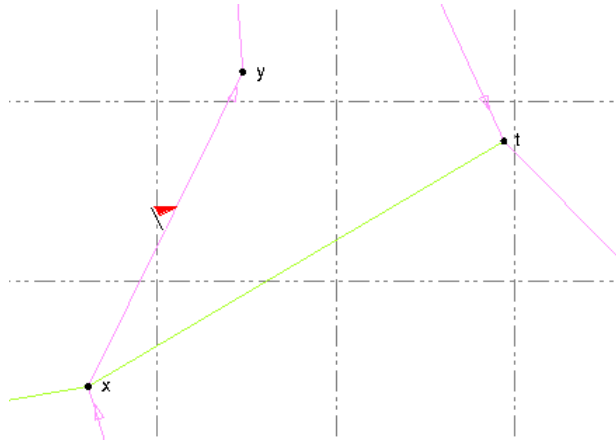
Survey Data used to calculate point:[w](#)

You are now ready to disable outlying observations in the project.

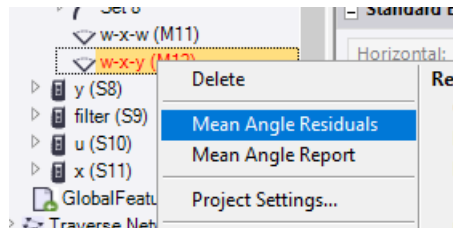
Step 5. Disable outlying observations

A mean angle represents the combining and averaging of redundant observations to the same point. You can view residuals for any mean angle and, if you want, disable any outlying observations.

For this tutorial, you will view residuals for the mean angle *w-x-y (M12)*. This mean angle is flagged in the **Plan View** because there are observations within it that exceed tolerances you set for mean angles earlier in this tutorial.



1. In the **Project Explorer**, expand *filloop.jxl* > *x (S7)* > *Rounds*. Then, right-click *w-x-y (M12)* and select **Mean Angle** in the context menu.



The **Mean Angle Residuals** dialog displays.

Enabled	Observation	H. Angle Residual	V. Angle Residual	Slope Residual
<input checked="" type="checkbox"/>	x-y (T162)	-0°00'01"	-0°00'02"	-0.001 m
<input checked="" type="checkbox"/>	x-y (T164)	0°00'00"	-0°00'01"	0.000 m
<input checked="" type="checkbox"/>	x-y (T166)	0°00'01"	-0°00'04"	0.000 m
<input checked="" type="checkbox"/>	x-y (T168)	0°00'01"	-0°00'09"	-0.001 m
<input checked="" type="checkbox"/>	x-y (T170)	0°00'01"	-0°00'05"	0.000 m
<input checked="" type="checkbox"/>	x-y (T172)	0°00'01"	-0°00'11"	0.000 m
<input checked="" type="checkbox"/>	x-y (T174)	0°00'02"	-0°00'00"	0.000 m
<input checked="" type="checkbox"/>	x-y (T176)	-0°00'00"	-0°00'01"	0.000 m

Flags are displayed for two observations within the mean angle. You will disable the observation with the largest residual first to see if this corrects the other flagged observation.

2. Uncheck the checkbox for observation *x-y (T172)*.
3. In the **Change Observation Status** dialog, click **Yes** to apply the same change to *x-y (T170)*.

As you enable or disable observations, the means and residuals are re-calculated so you can immediately see the effects of the change. However, these changes are temporary and do not apply to the project until you click **OK**.

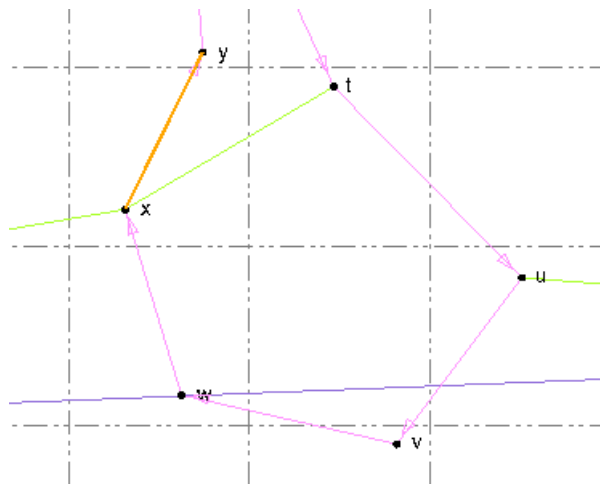
You can click the **Report** button to view the *Mean Angle Report*, which provides additional information about each observation.

Note that a flag still displays for *x-y (T168)*, so you will need to disable that observation as well.

4. Uncheck the checkbox for observation *x-y (T168)*.
5. In the **Change Observation Status** dialog, click **Yes** to apply the same change to *x-y (T166)*.

Enabled	Observation	H. Angle Residual	V. Angle Residual	Slope Residual
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> x-y (T162)	-0°00'01"	-0°00'04"	-0°00'00"
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> x-y (T164)	0°00'00"	-0°00'03"	-0°00'00"
<input type="checkbox"/>	<input checked="" type="checkbox"/> x-y (T166)	?	?	?
<input type="checkbox"/>	<input checked="" type="checkbox"/> x-y (T168)	?	?	?
<input type="checkbox"/>	<input checked="" type="checkbox"/> x-y (T170)	?	?	?
<input type="checkbox"/>	<input checked="" type="checkbox"/> x-y (T172)	?	?	?
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> x-y (T174)	0°00'02"	-0°00'03"	-0°00'00"
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> x-y (T176)	-0°00'00"	-0°00'04"	-0°00'00"

6. In the **Mean Angle Residuals** dialog, click **OK**.
 7. Press **F4** to re-compute the project.
- Mean angle *w-x-y (M12)* is no longer flagged in the **Plan View**.



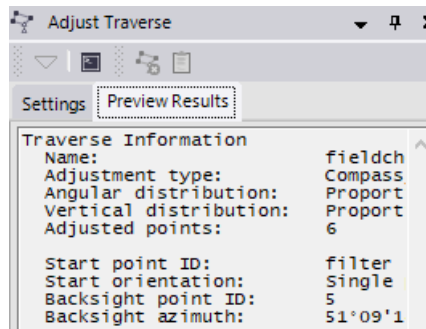
Next, you will adjust the imported traverse.

Step 6. Adjust the traverse

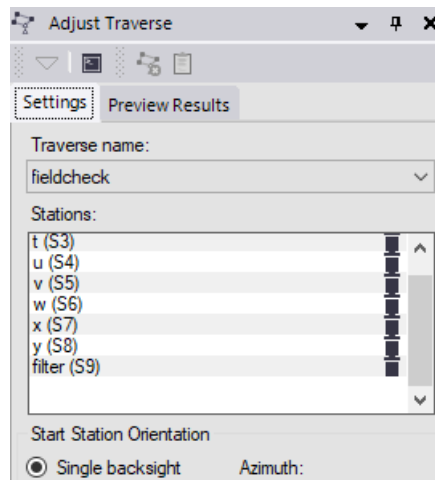
You can now adjust the imported traverse.

1. In the **Project Explorer** pane, click to expand the **Traverse Networks** node, right-click *fieldcheck (filloop.jxl)*, and select **Adjust Traverse**.

The **Adjust Traverse** pane displays showing a preview of the results of the adjustment on the **Preview Results** tab, including before and after misclosure values.



To view adjustment setting, select the **Settings** tab. There is no need to make any changes for this tutorial.



Note: For additional instructions on working with traverses, see the *Creating and Adjusting Traverses* tutorial.

2. Select the **Preview Results** tab.



3. Click the **Apply** button.
4. To see additional information about the traverse adjustment, click the **Traverse Adjustment Report** button located in the **Traverse Adjustment** pane toolbar.
The report displays on a new tab in Survey Office.

Traverse Adjustment Report			
Summary			
Traverse name:	fieldcheck	Adjustment method:	Compass/Bowditch
Adjustment mode:	Adjust manually	Angular adjustment:	Proportional to distance
Adjustment date:	11/8/2018 2:59:21 PM	Vertical adjustment:	Proportional to distance
Adjusted points:	6		
End-Point Orientations			
Start point:	filter	End point:	filter
Orientation method:	Single Point	Orientation method:	Single Point
Orientation point:	5	Orientation point:	5
Point azimuth:	51°09'14"	Point azimuth:	51°09'14"
Before Adjustment			
Angular misclosure:	1.445 sec (32.000 sec)	Traverse length:	963.071 m
Meaning misclosure:	0.001 m	Meaning misclosure:	0.001 m

This completes the tutorial.