

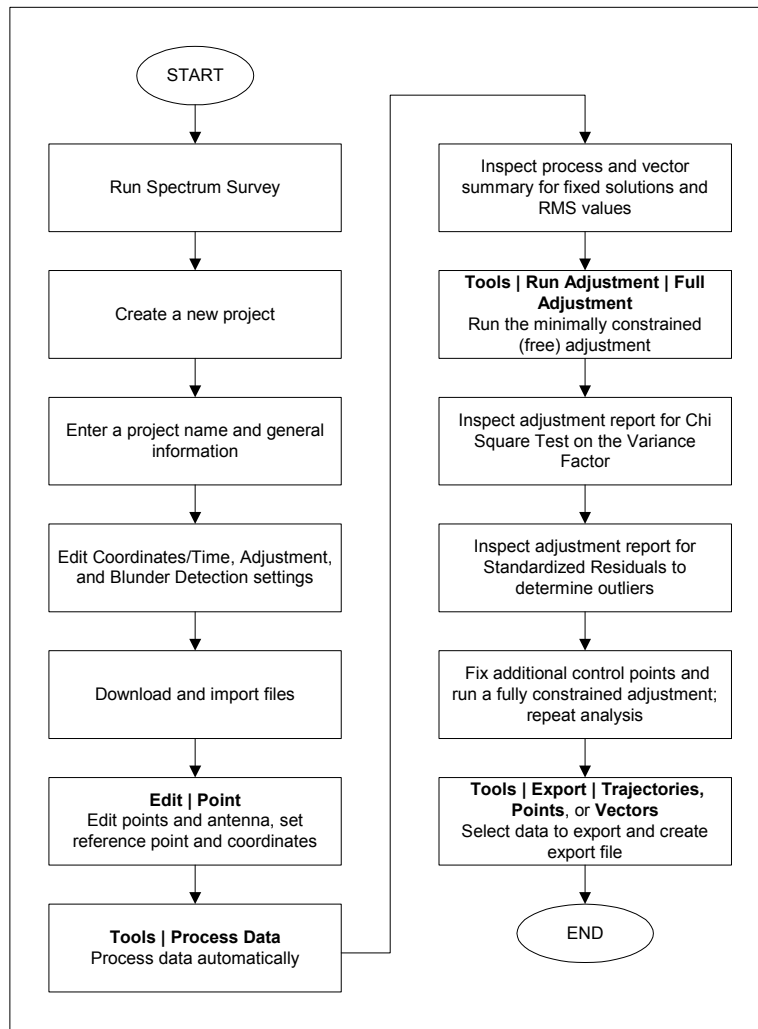
## Static Survey Workflows and Tips

This guide includes the following workflows and tips for static surveys:

- **General**—Basic operations for using Spectrum Survey from start to finish. See *Static Survey General Workflow*, below.
- **Analyzing processed data**—Basic operations for analyzing processed data. See *Static Survey Processing Analysis Workflow* on page 3.
- **Analyzing adjusted data**—Basic operations for analyzing adjusted data. See *Static Survey Adjustment Analysis Workflow* on page 4.
- **Tips for fieldwork methods**—Tips for collecting data to improve your network data. See *Tips for Static Survey Fieldwork Methods* on page 5.

Use this information to help you use Spectrum Survey Suite. For further details, refer to the *Spectrum Survey User Guide* and the *Planning User Guide*.

### Static Survey General Workflow

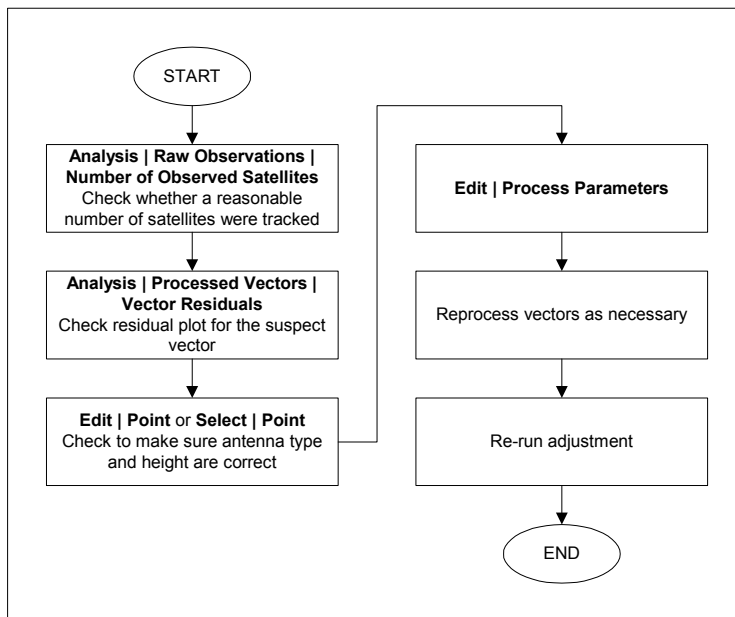


## Spectrum Survey Suite Static Survey Workflows and Tips

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1. Start Spectrum Survey.
2. In the *Welcome* dialog box, click <Create a new project>.
3. In the *Project Settings* dialog box, enter the **Project Name** and any other general information about the project. Also check and edit the **Coordinates/Time**, **Adjustment**, and/or **Blunder Detection** settings by choosing the appropriate tab. Click <OK> when you are finished.
4. In the *Project Startup* dialog box, click <Download files via Bluetooth> to download files from the receiver to your PC.
5. In the *Data File Manager*, click <Import> to import the downloaded data files into your project.
6. Select **Edit | Point** to check/rename/move points, check/edit antenna type and height, set reference point (for processing and adjustment), and edit coordinates as necessary. Or, to view/edit multiple point information, choose **Select | Point**, highlight the appropriate points, edit the necessary point information, and click <Apply>.
7. Select **Tools | Process Data** to enable the software to verify vectors and process data automatically.
8. Inspect the *Process Summary* report for fixed solutions and RMS values. For further analysis, inspect the individual vector summaries.
9. Select **Tools | Run Adjustment | Full Adjustment** to run the minimally constrained (free) adjustment.
10. Analyze the *Network Adjustment* report for Chi Square Test on the Variance Factor (standard deviation of unit weight) to make sure it falls within limits. Often, it can fall below the minimum value. This indicates that your results were better than your estimates of precision (see the **Standard Weight** section of the **General** tab by selecting **Edit | Adjustment Parameters**).
11. Analyze the report for Standardized Residuals (standard error of unit weight for each vector component) located in the Observations and Residuals section for individual vector components to determine outliers (if necessary).
12. Fix additional control and run a fully constrained adjustment when necessary. Repeat analysis.
13. Select **Tools | Export | Points** to select the points to export and the proper **Coordinate Format**. Select **Tools | Export | Vectors** or **Trajectories** to select the vectors or trajectories to export in a format suitable for your external software package (for example, \*.sdr).

## Static Survey Processing Analysis Workflow



Vectors that do not fit in the adjustment may require further analysis, reprocessing, or modification in Spectrum Survey. Try these selections to analyze and try to fix weak data sets.

1. Select **Analysis | Raw Observations | Number of Observed Satellites** to check whether a reasonable number of satellites were tracked during the point occupation. If not, check satellite availability using Planning software and conduct more fieldwork to obtain a better data set for this point, or lower the elevation mask in the processing parameters to reprocess with more satellite data.

*Note:* Lower elevation satellites (<15°) have more noise on their measurements.

2. Select **Analysis | Processed Vectors | Vector Residuals** to check the residual plot for the suspect vector. Look for the following:

- A satellite residual that is comparatively worse. If you find one, add that satellite number to the list of rejected satellites in the processing parameters. Or, increase the elevation mask in the processing parameters to try to reduce the high residuals.

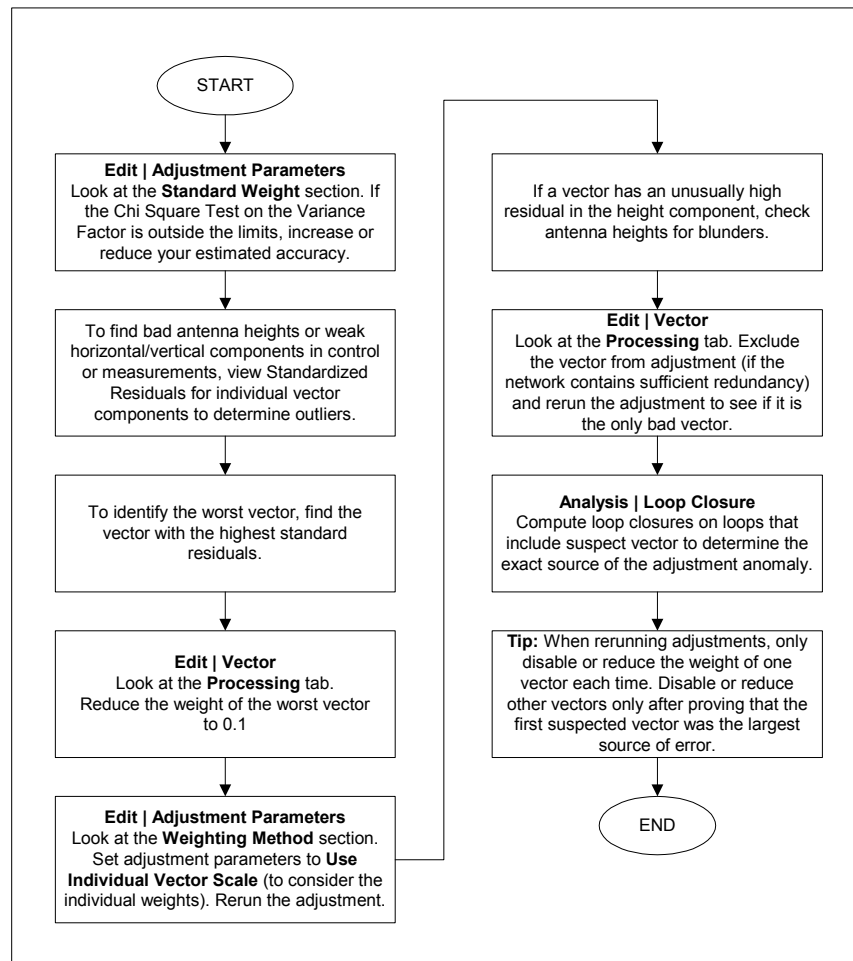
*Note:* Increasing the elevation mask will remove more data.

- If it appears that the residuals deviate from the 0 residual during a unique period of time, make note of the time and edit the data accordingly. Edit the data's **Start** and **End** times (**Edit | Vector**). A curved residual pattern often indicates a presence of multipath and will probably require more fieldwork.
3. Select **Edit | Point** or **Select | Point** to verify that the antenna type and antenna height are correct. If not, make the corrections in **Edit | Point** or **Select | Point**, then select the necessary vectors (**Select | Vector**) and reprocess the data.
  4. Select **Edit | Process Parameters** to set options for altering the processing parameters.

**Caution:** Changing process parameters options is recommended for advanced users only.

5. After data or options have been edited, reprocess the data as required. It is not necessary to reprocess all data; you only need to reprocess data (vectors) that have been modified.
6. Rerun the adjustment.

## Static Survey Adjustment Analysis Workflow



Vectors that do not fit in the adjustment may require further analysis, modification, and adjustments. If the Chi Square Test on the Variance Factor (standard deviation of unit weight) for the project is outside the limits, try these selections to analyze and possibly fix weak data sets.

1. If the Chi Square Test on the Variance Factor (standard deviation of unit weight) is outside the limits, you might choose to increase or reduce your estimated accuracy in the **Standard Weight** section (**Edit | Adjustment Parameters**). A value below the limit indicates that your estimated accuracy was too pessimistic, and a value above the limit indicates an accuracy that may have been too optimistic. This is a good tool for analyzing results when different levels of accuracy are required.
2. View the Standardized Residuals (standard error of unit weight for each vector component) located in the Observations and Residuals section for individual vector components to determine outliers. This can help you find bad antenna heights or weak horizontal/vertical components in control or measurements.
3. By viewing the Standardized Residuals, identify the worst vector by finding the vector with the highest standard residuals.
4. Reduce the weight of the worst vector to 0.1 (on the **Processing** tab in **Edit | Vector**). Set the adjustment parameters (**Edit | Adjustment Parameters**) by selecting the **Use individual vector scale** check box, in the **Weighting Method** section, to consider the individual weights. Rerun the adjustment—if you see an improvement in the results, it is likely that the vector is causing problems.
5. If a vector has an unusually high residual in the height component, check antenna heights for blunders.

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6. If the network contains sufficient redundancy, exclude the vector from adjustment (on the **Processing** tab in **Edit | Vector**) and run the adjustment without it to determine if it is the only bad vector.
7. Compute loop closures (**Analysis | Loop Closures**) on loops that include the suspect vector to determine the exact source of the adjustment anomaly. Reduce the weight or disable the poor-fitting vector(s).

*Note:* When rerunning the adjustment, only disable or reduce the weight of one vector each time. Disable or reduce the weight of other vectors only after proving that the first suspected vector was the largest source of error.

## Tips for Static Survey Fieldwork Methods

The following fieldwork methods can improve your network:

1. Tie control points together first and check results to determine if control is good (results check within appropriate accuracy expected).
2. Vary the length of time that observations are collected by a greater amount to make use of a more significant change in satellite geometry.
3. Use Planning software to determine the optimal time for satellite availability.
4. Establish more distance (between 200 and 800 meters) between local points, particularly if you are using them as station pairs.
5. Tie the local (nearby) points together, especially when setting station pairs on a job site.
6. A third local point (instead of just a pair) offers a good check and an alternative in case one of the other points was destroyed or could not be occupied for some other reason.
7. Additional horizontal and vertical control is usually necessary. A minimum of three horizontal and four vertical control points are recommended.
8. Take down the set-up from every occupation and reset the antenna over the point to help uncover potential blunders and prevent excessive settlement of the tripod.