Quick Carrier Phase Data Collection: for use when you need the highest accuracy with a carrier-capable receiver

This document outlines some techniques to increase the efficiency of carrier phase data collection, the most accurate kind, with a GPS.

In summary, the key lessons are:
1) Get carrier lock at a warmup point. You'll not use the data from this point, but the post-processing software uses it to computer better position solutions for your features
2) Monitor carrier status using the Status-Receiver screen. Once you have carrier lock, collect for a minute or two on your "warmup point," then close the point. DO NOT CLOSE THE ROVER FILE
3) Open a new point for your first feature, and collect for a minute or so with carrier lock. Monitor your expected accuracy in the Data screen.
4) Close the point, but make sure to keep the Rover file open the whole time you are collecting; if you close the rover file you lose carrier lock
5) Move from point to point, using a route that is safe, and minimizes passing under obstructions, so as to maintain carrier lock.
6) After you last feature is collected, collect an additional "cool down" point, again to improve the accuracy of your collections.

Main Instructions
Pair a Juno (SB or 3) to GPS Receiver; Pro XT, ProXH or Pro6H (see previous instructions and videos).

Stand near your first target feature, start Terrasync, and make sure the GPS Receiver is connected to your handheld device and you are able to obtain a position (Status→Skyplot, or satellite count at the top of the Data screen).

Create a new rover file, setting the correct antenna height. On the range pole, each alternating colored section is 1 foot long; with a tripod you will need to measure the height with a tape. Begin collecting a "warmup" point, labeled as such. You won't use these data directly, but it helps the post-processing software improve the accuracy of subsequent features. This doesn't have to be over your first feature, but should be at least near it. It is most important that it be in the open, with a clear view of most of the sky, and that you can get carrier lock.

While the warmup point is collecting new position fixes, open the Status tab in Terrasync on the handheld, and select Receiver in the tab below, to display a screen similar to the right.

Notice the field **Carrier time**.   When carrier time starts going up, you have carrier lock.   This time period will keep increasing as long as you have carrier lock while collecting data.

Our goal is to get carrier lock, let it settle for a minute or so to get a good carrier solution, and then maintain carrier lock while we collect features. It often takes 5 to 15 minutes to get carrier lock

the first time you are out for the day, but luckily, if you lose carrier lock momentarily, you can usually re-acquire it in a few minutes.

Once you have lock, you typically can maintain it if you hold the antenna/receiver level and above your head. If you move to another area near a tall building or under a dense canopy this will often block the antenna and you may lose carrier lock, or the satellites may move behind some obstruction causing loss of lock. However, in our experience you often regain lock again in a few minutes when this happens. You can switch back and forth between the Data and Status/Receiver screens to check carrier status without interrupting carrier lock or any data collection you have ongoing.

Once you have carrier lock at your warmup point, and have collected a minute or so with carrier lock, close the point, and move to (or stay on) your first feature. You don't really trust the warmup point because much of the file was collected without carrier lock, and will have higher positional errors. REMEMBER, DO NOT CLOSE THE ROVER FILE BETWEEN POINTS.

Move to your 1st feature, carefully level the range pole, and open a new feature point. Collect data at with carrier lock for about a minute, using the Status-Receiver screen at the start and end of your point to ensure you collected with lock. Close the point (but not the file). Move to your next feature, and repeat, until done.   Check the Status→ Receiver to verify you are keeping carrier lock for each point.

Collect a "cool down" point, after your last feature point, but before you close your Rover files. This aids the post-processing software in calculating an accurate position for your last few feature points. Collect for 1 to 2 minutes.

Close the Rover file, transfer the data and differentially correct, remembering it takes an hour for the base station files to show up on the MNDOT servers.

After exporting to a GIS format, note that the warmup and cooldown points are not of interest. You may use ArcGIS to delete them.