

Carlson Scan 3D (iOS based)

Target setup and measurement

- Set AprilTags
- Minimum 3 AprilTags. Recommended 5 or more, place 2-3 AprilTags in the area that will be the start of the scan as these are used to close the scan loop. Place the others sparsely through the area to be scanned. Ideally place that AprilTags at corners (plane intersections).
- Start SurvPC project and configure the projection and geoid correction for the job.
- Setup the total station (CRx) or GNSS receiver (BRx7/RTK5).
- Measure the coordinates at the red center of the AprilTags with total station or GNSS.
- The point number used must match the AprilTag number. Please note that the AprilTag can be set on the ground or on a wall. Also, when tape measured distances are valid to use for the AprilTags, for example, if working on a building interior.

Export coordinates

When working on an iPhone or iPad, there are several ways to import the coordinate file into the device:

Option 1- email

- In SurvPC, export the AprilTags coordinates in PENZ comma delimited format.
- Sent the .txt or .scp file to an email account that you have access on your mobile device.
- Open the email on the mobile device and tap the Share icon.
- Tap *Save to Files*.
- Choose or create a new folder for the job.
- Tap *Save* to copy the file to your device.

Option 2- Linked cloud services

If you are using linked cloud services such as Dropbox, OneDrive, etc. you can export the coordinate file from the controller to the shared/linked folder in the controller for automated transfer to your mobile device. Using Dropbox as an example:

- In SurvPC, export the AprilTags coordinates in **PENZ comma delimited** format and save to the Dropbox linked folder in the data collector.

Option 3- Upload to cloud sharing service

If you use a file sharing service but it isn't linked to the data collector. Using Apple iCloud as an example:

- In SurvPC, export the AprilTags coordinates in **PENZ comma delimited** format to the job folder.
- Close SurvPC.
- Open the web browser on the tablet and login to iCloud.
- Browse to the File page.
- Select or create new folder for the job.
- Click upload and select the coordinate file to exported from SurvPC.

Option 4- USB drive compatible with iPhone or iPad

If you don't use any file sharing system, don't have email configured on the data collector or don't have access to the Internet at the job site, you can use a USB drive compatible with iPhone or iPad such as the Sandisk iXpand Flash Drive. This type of USB drives have both USB 3.0 and Apple Lightning connections. Using the iXpand flash drive as an example.

- Connect the iXpand flash drive to your mobile device. The first time you do, you will be prompted to download the iXpand app from Apple Store. Once the app has been installed on your mobile device you are ready to use the flash drive.
- Connect the iXpand flash drive to the USB port on the tablet.
- In SurvPC, export the AprilTags coordinates in **PENZ comma delimited** format to the USB drive. You may want to create a new *Folder* on the USB drive to keep your files sorted.
- Connect the flash drive to the mobile device, this will open the iXpand app.
- Tap **View Files**, make sure **IXPAND** is selected. Open the folder where you saved the coordinate file.
- Select the coordinate file and tap the *Share* icon.
- Tap **Save to Files**.
- Select or create new folder for the job and click **Save**.

Scan

- Open **Scan3D** app on the device.
- Tap the **New Scan** icon.
- Move close to the corner where you placed the AprilTags, note that the button on the right has a green circle that will fill in as the program detects the corner. Try to fill the green circle as much as possible.
- Push the button to start scanning.
- Move laterally to capture the geometry. The program will track geometry automatically.
- Move back/forth, up/down to increase density. This also helps if you get a message that it lost geometry as you can back track to a last position. Note that you can tap on "select relocation position" and it will present pictures of an identifiable location from which you can restart.
- Loop back to the AprilTags at the beginning of the area. On the loop back, the AprilTags may be slightly offset, this is normal.
- Click the circle button on the right to finish the scan. Same button to start the scan.
- The un-optimized scan is displayed.

Optimize the scan

- Tap the **Targets** icon.
- Tap **Load Control File**.
- Set the units to match the SurvPC job, for example, **US Survey Feet**.
- Tap **Open Control File**.
- This will open *Files*. Browse and select the coordinate file from the folder you copied the file into earlier or select the cloud file sharing directory if using that method.
- The selected file name will be displayed and the number of *Control Targets* will be highlighted in blue. The number should match the number of AprilTags laid out.
- Tap **Import**.
- Make sure **Right-Handed** is **on**. This option matches the PENZ comma delimited files. If you were working with coordinates in PNEZ format, use *Left-Handed*.
- Note that you can double-tap on any of the targets to display their coordinate information and apply changes if necessary.
- Tap **Fit Control Targets**.
- Tap **Optimize**. *Use constraints from Targeting* and *Apply Color Leveling* will be defaulted on. Other settings will also be set, for example, *Use AprilTags for Loop Closure*.
- Tap **Optimize Scene**. The process will start and the results will be displayed momentarily.

Display, Measure and Edit in Scan3D

Once the optimization is complete, you can export the resulting point cloud data back to your desktop/laptop for CAD work in Point Cloud Advanced for feature extraction. This said, in Scan3D you can also take a moment to review the job.

- Display
 - Tap **View Options**.
 - Notice you can select from *Top-Down View*, *Front View*, *Side View*, and *Ortho View*. Tap **Ortho View** and then select a preset view for simple navigation.
 - You can pinch zoom and pan using two fingers. Or rotate the view with a one finger.
- Measure
 - Tap **Measure**.
 - Tap **Add new annotation**.
 - Tap **Distance**.
 - Long-tap (and keep pressed to move) on a first point to set the beginning end.
 - Long-tap (and keep pressed to move) on a second point to set the end point.
 - The measurement will be annotated.
 - Use the *slider-up* to expand the annotations list. You can edit/delete the annotations.
 - Tap the **up-arrow** to return to the menu.

- Annotate
 - Tap **Annotate**
 - Tap **Add new annotation**.
 - Long-tap to select the label point.
 - Type the label.
 - Use the *slider-up* to expand the annotations list. You can edit/delete the annotations.
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- Edit
 - Tap **Edit**
 - Tap **Cropping** if you would like to crop the scene to the intended work area.
 - Use the **up-arrow** to return to the menu.

Save

- Save the scene by tapping on **File** then **Save**. Note that *Control Targets* should be defaulted on. The scene will be save in a compressed/optimized .dp format.

Export Point Cloud in LAS Format

- Tap the **Share** icon.
- Tap **Share**.
- Tap **As Other File**.
- Select **LAS 1.2 (*.las)** from the list. Note that other common formats including .laz and .e57 are also available.
- Tap on the file name field and adjust the name if you like. Tap **Next**.
- Make sure the *Units* match your job. For example, **US survey feet**.
- Tap **Export Scene**.
- You will be prompted for the new file location. Earlier, different file share options were discussed, use the appropriate method for your situation:
 - Tap **Save to Files** and save to the *Files* directory you are using for example in iCloud or Dropbox.
 - Connect the USB Flash drive and tap on **iXpand Drive** if you are saving directly to USB flash drive. Tap **Save Here**. Tap **OK** at the successful save message.
- Close **Scan3D**.

Depending on the location where the point cloud was saved, on your desktop open a browser or connect the USB drive to copy the .las file to the local drive for work with Carlson Point Cloud Advanced and Survey/Civil to complete the map or design.