Stream
User Documentation

Legal Notices

Release Notice

This is the March 2023 version of the Stream User Manual. It applies to Stream. © FARO Technologies Inc. March 2023. All rights reserved.

No part of this publication may be reproduced, or transmitted in any form or by any means without written permission of FARO Technologies, Inc.

FARO TECHNOLOGIES, INC. MAKES NO WARRANTY, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, REGARDING FARO STREAM FARO STREAM AND ANY MATERIALS, AND MAKES SUCH MATERIALS AVAILABLE SOLELY ON AN "AS-IS" BASIS.

IN NO EVENT SHALL FARO TECHNOLOGIES INC. BE LIABLE TO ANYONE FOR SPECIAL, COLLATERAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING OUT OF THE PURCHASE OR USE OF FARO STREAM OR THEIR MATERIALS. THE SOLE AND EXCLUSIVE LIABILITY TO FARO TECHNOLOGIES, INC., REGARDLESS OF THE FORM OF ACTION, SHALL NOT EXCEED THE PURCHASE PRICE OF THE MATERIALS DESCRIBED HEREIN.

THE INFORMATION CONTAINED IN THIS MANUAL IS SUBJECT TO CHANGE WITHOUT NOTICE AND DOES NOT REPRESENT A COMMITMENT ON THE PART OF FARO TECHNOLOGIES INC. ACCEPTANCE OF THIS DOCUMENT BY THE CUSTOMER CONSTITUTES ACKNOWLEDGMENT THAT IF ANY INCONSISTENCY EXISTS BETWEEN THE ENGLISH AND NON-ENGLISH VERSIONS, THE ENGLISH VERSION TAKES PRECEDENCE.

Copyright Notice

© Copyright 2022-2023 FARO Technologies Inc. .

This product includes third-party and open source resources. For license and copyright information pertaining to the use of these resources, refer to the following document in the FARO Knowledge Base: https://knowledge.faro.com/Essentials/General/3rd-Party_Open_Source_License_Information_for_FARO_Products

Table of Contents

About this Documentation

This documentation explains how to use the Stream app. Stream is an app for your Apple or Android phone or tablet that enables you to control a FARO Focus laser scanner, get a real-time view of scan progress as it happens, add text and picture annotations to the scan, pre-register scans, and upload the project to the cloud.

NOTE: The graphics in this document may look different in your version the Stream app depending on your device and operating system.

These instructions explain how to use Stream. It does not explain how to use the FARO Focus laser scanner. Refer to the FARO Focus User Manual to learn how to use the scanner before you work with Stream.

This documentation assumes that you are an experienced user of the FARO Focus Scanner and know how to safely scan and how to connect the scanner to a WiFi network.

Requirements

To use FARO Stream you need the following devices and software:

- A recent, high-end Android (Android 12 and higher) or iPhone (iOS 15.7 and higher) with a minimum of 64 GB of storage capacity. 256 GB are recommended for larger scan projects.

- A FARO Focus Premium or Focus Core[1] laser scanner

- The FARO Stream app

Recommended

- A FARO Sphere account (Free entry-level or better)

- High-speed WiFi access

NOTE: Before starting a scan project, ensure that your smart device and scanner batteries are fully charged. For larger projects, we recommend that you use an off-the-shelf power bank to charge your smart device, in case its battery drains faster than the scanner's battery.

[1]Requires a separate FARO Sphere license to enable your Focus Core scanner.

Download the App

You need the app to use the Stream workflow. Use the instructions below to install the app.

1. On your phone, open Google Play or the Apple App Store.

2. Download and install the FARO Stream app, provided by FARO Technologies Inc.

Always check to ensure that you have the most recent version of the app, and the scanner firmware that the app requires. You can find this information on the app's page in Google Play or the Apple App Store.

Sign up for a FARO Sphere account

Although you can use Stream without a FARO Sphere account, Sphere allows you to modify and share your project in the cloud.

To sign up in the app:

1. Ensure that your phone is connected to the Internet.

2. Start the Stream app.

3. Tap ⊘ at the top of the app.

4. Tap **LOGIN**; the FARO Sphere Login page opens.

5. Tap **Sign Up**.

6. Tap on the terms of service and the privacy policy. If the terms are acceptable to you, tap to indicate your agreement.

7. Enter your email address and a password.

8. Tap **SIGN UP**.

To sign up in a browser:

Scan the QR code below or enter www.farosphere.com in a browser and follow the instructions.

Stream Workflow

The Stream app is flexible and allows many different workflows, but they are all variations of these two:

Offline workflow (described below): Capture data and operate your Focus laser scanner with the Stream app without connection to the Internet and FARO's Sphere cloud solution. This workflow may be good to use when you are first getting to know the app.

Online workflow: Capture data and operate your Focus laser scanner and the Stream app with a connection to the Internet and FARO's Sphere cloud solution.

1. Position the tripod and scanner for the first scan.

2. *Connect to the Scanner* on page 8.

3. *Create Project* on page 11.

   - *Select Profile* on page 21
   - (optional) Choose project image.
   - (optional) Set initial scan number.
   - (optional) Enter a description for the project.

4. (optional) Modify the existing scan profiles for your situation.

5. (optional) *Add Clusters* on page 18 and select the appropriate cluster for your scan.

6. Tap ▶ to begin scanning.

7. During or after scanning you can *Add or Change an Annotation* on page 16.

8. Move the scanner to a new location.

9. Tap ▶ to begin the next scan. Repeat as necessary to get complete coverage of the scan area.

Stream Icons

	Scanner connection status (blue = scanner connected to app, gray= no scanner connected to app)		Scan View for point-cloud data of scan
	Sphere connection status (blue= app connected, gray= app not connected)		Scan List with list of scans from current project
	Options		Clusters
	Battery state of the connected scanner		Begin on-site compensation
	Devices, List of known scanners		Refresh
	Project, List of projects		Cloud Upload and processing
	Tap to start scanning		Delete
	Scan Profiles, Scan Settings		Upload to Sphere
	Align registration		Flash profile
	Scan marker: active scan / last scan registered		Scan marker: inactive / currently streaming
	Flash scan marker: active scan / last scan taken		Scan marker unlocked
	Display locked / move		Cancel selection

 Hide / view scan

 View top (active)

 View front (active)

 View side (active)

Connect to the Scanner

> **NOTE:** To connect to the Focus Core scanner you must have an active FAROSphere license to enable your Focus Core for Stream app. Refer to *Devices* on page 24 for more information.

The Stream app needs a network connection to the scanner. Decide what network you want to use. You have three options:

- Connect both the phone and the scanner to **an existing WiFi network.**
  If a WiFi network is available and has the range that you need to complete your scan project, this is the best solution.

- **Set up the scanner as an access point** and connect your phone to the scanner.
  With this option you have no Internet connection, so it is not possible to immediately upload your scans to the cloud. Also take care that if the connection to the scanner becomes weak, your phone may automatically switch to another network.

> **NOTE:**
> Select the WLAN channel that you want to use. Channels 1-13 broadcast at 2.4 GHz, channels 36 and higher broadcast at 5 GHz. The 2.4 GHz channels are slower, but have more range. The 5 GHz channels are faster and are often less crowded, but have less range.
>
> The WLAN channel you select should be a channel that is not used by any other WLAN router nearby or that is least used by other WiFi networks. By using the least busy channel, your WiFi range and transfer rates should improve.
>
> (TIP: There are phone and PC apps that can help you determine which channels are the busiest. These apps can analyze the other WiFi channels and the signal strength (measured in dBm). This helps you determine if there are channels with strong or weak signals and if the channel you've chosen is set to a busy or even unused channel. This can help you decide which channel should be used.)

- **Set up your phone as an access point** and connect the scanner to the phone.
  If you choose this option you will be connected to the Internet. Note that if you upload to the cloud, this can quickly use all the data in your data plan, or incur high costs if you have a metered data plan.

To connect the app to your scanner:

1. Switch on the phone and the scanner.

2. Connect the phone and scanner to the same WiFi network using one of the options listed above. Scanner network settings are found under **Manage** > **General Settings** > **WLAN**.

3. Start the Stream app.

4. If the network is configured to allow network discovery, an entry for the scanner will appear in the Stream app in a few minutes.

5. Tap on the devices icon to select it.

NOTE: The user interface on the scanner is limited when the scanner is connected to the Stream app.

Connect to FARO Sphere

You need a FARO Sphere account to make the best use of Stream. If you don't have an account, *Sign up for a FARO Sphere account* on page 4

To log in to Sphere:

1. Tap ☰.

2. Tap ⌀ **Account**.

3. Tap **Login**.

4. Enter your email address and password.

   NOTE: If your organization has configured single sign-on for Sphere, you will be directed to your company's authentication after entering your email address.

   ---

5. Tap **Login**.

6. Select a specific workspace for your project upload. Keep in mind that depending on the Sphere settings of your account or your company's account, other users may have access rights and view this data immediately after upload.

Create Project

A *project* is the top-level container for all the scans and related information about the site you are scanning. FARO Stream automatically creates an initial first project with a name consisting of the current timestamp (YYYY-MM-DD_hh-mm). This is the currently active project.

To create a project:

1. Swipe the navigator bar up.

2. Tap 🗗

3. Tap ⊕

4. Adjust the settings as required for your project.

    - Project Name
    - Scan Profile
    - Picture
    - Location
    - File Base Name
    - Initial Scan No.
    - Description

5. Use ← to return.

This project is now the active project. All consecutive scans will be stored in this project until the project changes.

NOTE: You can enable the option *Use automatically generated file base name* or manually define a file base name to handle the naming convention for your consecutive scans. However, it's important to note that all scan names must be unique across all your projects on the SSD or SD card. If you want to reuse a certain scan name, you'll need to delete any existing projects with similar names from your SSD or SD card, after securely storing the project. Note that deleted projects cannot be recovered. This naming convention also applies to clusters.

Scan with Stream

Make sure that your scanner is mounted securely on the tripod and positioned where you want it for your scan.

To start scanning:

1. Optional: Tap ✛ on the Focus screen to level the scanner.

2. Tap ▶. The scanner begins to scan.

Tap ⏸ to pause scanning, or ⏺ to stop.

During scanning with Stream a reduced data set is streamed live from the scanner to the app. This makes it possible to see the point cloud data live and in real time. The scanner will thin out the point-cloud so that a constant point density independent of point distance is achieved. The full scan data is stored on the scanner during scanning.

If a scan stream is interrupted (e.g., by losing the WiFi connection between Stream and the scanner), it is possible to stream the data at a later point. Just make sure you do not start a new scan before re-initiating the stream. Open the Scan List and tap 👁 for the scan that was interrupted. This will start the streaming of the interrupted scan.

Registration

About Registration

Scan points captured with the Focus Premium scanner and the Stream app are recorded and saved in a coordinate system that is relative to the scanner. The point of origin for this scan coordinate system is the position where the laser meets the mirror. The coordinates of this point are x = 0, y = 0, z = 0. If you have two or more scans taken at different locations in a room, each scan will have a separate scan coordinate system with its own point of origin. But in reality, the origins of these scan coordinate systems are at different positions in the room, so it is necessary to determine the spatial relationship between them. Determining this relationship is called *registration*, and the conversion of the individual scan coordinate system into one coordinate system for the entire scan project is called *transformation*.

The relationship between scans is determined by finding objects were captured by two scans. Stream uses points in these objects to determine how to change the scan coordinates so that the objects overlap correctly. For successful registration, you must have a good overlap between the scans. In some cases (such as between rooms) it's necessary to have very close scans (i.e., directly on both sides of a door between the two rooms).

In general, it is necessary to perform a scan registration to get a spatial relationship between the scans. This initial scan placement thereby facilitates scan registration.

When scanning, it is useful to group individual scans into clusters. A cluster can be thought of as a folder for scans that belong together, such as scans that were taken on the same floor of a building or in the same room. Use clusters to group scans by individual rooms, floors, buildings, or other grouped areas. Doing so will facilitate successful fine registrations at a later stage.

NOTE: Automatic and manual registration in Stream is a Top-View based registration and is considered to be a *pre-registration*. We strongly recommended that you perform a fine registration in SCENE as a final processing step.

Automatic Registration

If your scans have overlapping areas, Stream will automatically register the scans. Stream uses an automatic Top-View based registration. This automatic registration is performed automatically after each scan is completed. The Top-View algorithm uses a top-view 2D-Projection of the point-cloud and afterward a 2D fitting. This means it creates something like a floor plan to register the scans.

The scans are rotated locally so that their inclinometer axis points upwards (this makes it possible to register scans that are not leveled, e.g., are upside down). It's important that the scans are leveled, e.g., with the help of the inclinometer. If there is no inclinometer data, it's assumed that the scans are leveled.

The compass is used to determine the rotation around the z-axis faster and more reliably (no compass means it takes longer and the chances of success are lower). However, the compass also causes problems if its readings are wrong due to influence from ferromagnetic objects or electromagnetic fields.

Scan Placement

The first scan of your scan project is automatically placed in the center of the Stream Data View (the default view in the main window). By default, all subsequent scans are placed at the origin of the previous scan, but move to the correct position after scanning, if automatic registration is successful. The last three recorded scans are used for registration.

Cross-hairs scan placement

You can also set a cross-hairs marker ⊕ at a specific position in the Data View as the origin of the next scan. Tap for about one second at the position on the Data View where you intend to scan, and a blue cross-hair symbol will be displayed. The three scans that are the closest distance to the cross-hairs are used for registration. This method lets you bridge the distance between scans that have little or no overlap. Make sure the previous unregistered scan is unlocked. Also use this feature if you need to start to scan in a cross-like order (e.g., you have scanned ten scans in linear pattern, and want to go back scan number 5 and continue scanning in a different direction.).

Make a long tap at any other position to reposition the marker. The position of the cross-hairs can be changed until you start the next scan. Tapping the cross-hairs marker again will remove the marker.

Registration Settings

In the app settings there are two slide bars, one for *Manual Registration Distance Limit* and one for *Manual Registration Angle Limit*.

Manual Registration Distance Limit: limits the distance that a registration (when triggered via the radial menu) is allowed to move the scan.

Manual Registration Angle Limit: limits the angle that a registration (when triggered via the radial menu) is allowed to rotate the scan.

Registrations that would result in a bigger movement or bigger angle as defined in the settings above are reported as failed and are not applied as a result.

In Stream, a reduced data set (the 'streamed' data during scanning) is used for top-view registration. This is the reason that top-view registration in Stream and SCENE may behave slightly differently because of the different data sets (reduced set in Stream and full set in SCENE).

Manual Registration

It is possible to perform a manual registration to place the scans at the correct relative positions manually, if automatic registration fails.

1. Tap the scan icon for the scan you want to register: ⚙ A radial menu will pop up with 4 additional buttons.

2. Tap 🔒 to unlock a scan—the points of the scan will turn orange. Unlocked scans are always orange and locked scan are black/grey. Unlocking a scan makes it possible to move or rotate the scan. Make sure the Pan/Zoom button is deactivated 🔲 . If the Pan/Zoom button is activated 🔲 the Data View will be zoomed or changed (translation/rotation) with usual gestures.

3. Use finger gestures to position the scan.

4. Check the front and side views 🔲🔲 to verify that the scan is positioned correctly. You may need to repeat the placement in different views to find the finally best and correct position in 3D. However, most important is the correct placement in Top-View 🔲.

5. Tap ⊕ (make sure you don't slide the view and move the scan again).

6. Click 🔵 to try the automatic registration again with the scan in the new position. A successful registration will automatically lock the scan.

   An info message is shown (for a few seconds) at the bottom of Data View and will notify you about a successful or a failed registration.

7. If Top-View registration is unsuccessful, manually place the scan as accurately as possible. You can perform a cloud-to-cloud registration after importing the project into SCENE, which will ensure the scan is placed in the best mathematically calculated position during fine registration.

NOTE: If you don't want to try automatic registration at the new position you can press 🔓 to lock the scan. The lock feature will "lock" the translation of the scan and "freeze" the position.

Radial Menu

The radial menu appears when you tap the scan marker's position in the scan view. It displays icons that allow you to perform different tasks. The icons may be different depending on the situation. Here are some of the icons you may encounter:

     Automatic registration.

     See, *Add or Change an Annotation* below.

     Lock or unlock the scan's position in relation to other scans in the project. Subsequent unlocking of multiple scans will add them to the group of unlocked scans.

     When scans are unlocked, tap the plus or minus icons to add or remove the scan from the selected scans.

     Toggle the visibility of the point-cloud data for this particular scan. You can change the visibility of hidden scans later in the Scan List.

Add or Change an Annotation

An annotation is text or graphics or both, that you add to a scan to provide additional information. You might want to include a photograph of a floor plan, the expiration date on a fire extinguisher, or text describing something about the area being scanned that cannot be captured by the scanner.

1. Tap in the radial menu.

2. In the **Annotation** field, give the annotation a name.

3. In the **Description**, add whatever text is you need for the annotation.

4. Add an existing picture from your phone, or make a new picture.

5. Tap the check mark to save the annotation or X to cancel.

You can add multiple annotations to a scan by repeating the above mentioned procedure.

Edit an Existing Annotation

To edit an existing annotation or add annotations after scanning:

1. Navigate to the scan list.

2. Tap the specific scan. This will open a list with existing annotations.

3. Tap the annotation to edit. You can tap to create a new annotation.

Modify Project Properties

A *project* is the top-level container for all the scans and related information about the site you are scanning.

To see all projects:

Swipe the navigator bar up and tap . A list with all known projects on the connected scanner and the Stream app will open.

- Tap the center area with the project name to open the individual project settings.

- Tap the project picture to select a project.

- Swiping to the left or clicking ••• will show commands for Sphere Upload and delete feature.

Remember that changing or deleting a project in the app will also change or delete the project on the connected scanner.

Add Clusters

A *cluster* is an organizational unit that lets you group scans together—much like data files in a folder. If you put related scans that have good overlapping areas into a cluster, it improves the accuracy of registration. You can create and access clusters via the navigator bar:
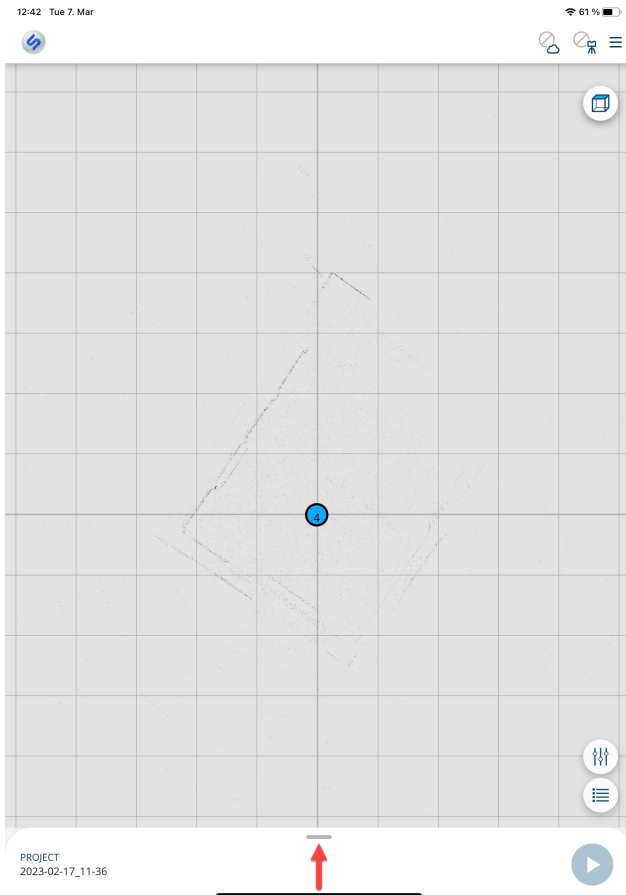
Swipe for navigator bar
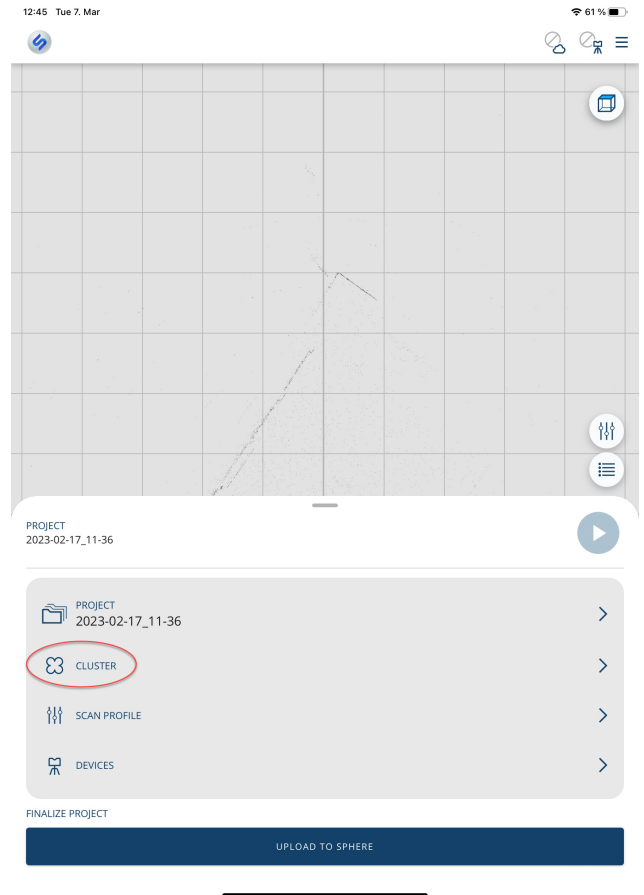
Tap for Clusters

The Projects/Clusters page displays the structure of your scan projects. A scan project usually consists of a main project that has several sub-projects called clusters. For example, if you are scanning a multi-level building as a project, each floor of this building might represent one cluster, and each of these floors or clusters can have further clusters, for rooms.

The structure of a scan project is similar to this:

- Office building

- Floor 1

- Room 1

- Room 2

- Room 3

- Floor 2

- Room 1

- Room 2

Before starting a scan project, you can manually enter this structure here.

Once the project structure has been created, assign the single scans to the corresponding clusters. To do this, select a scan project and cluster before starting a scan. This project should correspond to the current scanner position. For example, if you take scans in the office building on Floor 2, in Room 2, select *room 2* from the cluster list, then start taking the scans in that room. The next scans are then assigned to the selected project or sub-project *room 2* until you select another cluster. This information is attached to each scan. It helps SCENE or Sphere automatically assign scans to scan clusters, thus automating the scan registration. For more information on scan registration and assigning scans to scan clusters, see the SCENE user manual.

Workflow to Switch Between Clusters

1. Make scans in the first cluster until your last scan for that cluster is completed.

2. Switch to the next cluster and perform the next scan in this cluster. You will only see this new scan in ScanView.

3. After this scan is completed, activate the parent cluster (or select no cluster by deselecting the current cluster) and perform a manual registration. You may need to position this last scan manually if the appropriate position and orientation are not close enough to the previous scan to successfully complete the automatic registration.

4. After successful registration, activate again the new cluster and continue with scanning. The following scans will now register to this scan and are assigned to the new cluster.

5. Repeat as necessary for each new cluster.

To add a clusters to a project with existing scans:

1. Swipe the navigation bar up and select ⌘.

2. Tap ⊕

3. Enter a name for the cluster.

4. Tap ✓ to create the cluster or ✕ to cancel.

To move a scan from one cluster to another, tap the scan in the Scan List and swipe to the left. Select the cluster icon and then select the specific new cluster.

NOTE: The Data View will only show scans that are in the currently selected cluster hierarchy and the linked child clusters. Scans in other parallel clusters are not shown.

We recommend that you create a top cluster ("Office building" in the example above) if you need to display all clusters. Activate this top cluster to show all clusters and related scans.

For larger projects, we recommended that you display only individual clusters to improve the graphical performance of your phone or tablet. Showing a large number of scans may decrease the visualization speed on your device and cause lag in the scan view.

Select Profile

A *profile* is a named collection of scan settings that enable you to quickly change a group of settings without having to manually change each one.

To select a profile:

1. Tap 🎚️ .

2. Under Scan Profile, tap to select a scan profile. If the scanning parameters differ from the selected profile, *altered* is appended to its name.

> **NOTE:** Selecting a predefined scan profile overwrites all current scanning parameters with the settings of the selected scan profile. You can clone the predefined profiles and change the settings and save this new profile for later use. This provides the convenience to use customized scan settings in profiles for your preferred scan settings and tasks.

Profile Details

To activate a specific profile, tap on the black circle ⬤ within the profile icon. The selected profile will be indicated by a cyan check mark ✔️ inside the icon. Check to ensure that the new profile is activated.

Accelerated: best for indoor environments with average room size. This profile has a point spacing of about 12 mm for objects that are 10 m from the scanner.

Standard: best for indoor environments with larger rooms, and for outdoor environments with close objects. This profile has a point spacing of about 8 mm for objects that are 10 m from the scanner.

Extended: best for indoor environments with large rooms/areas and outdoor environments with wider area/objects. This profile has a point spacing of about 6 mm for objects that are 10 m from the scanner.

Object HD: best for indoor environments with huge areas and outdoor environments with larger area/objects or when high details and color are required. This profile has a point spacing of about 3 mm for objects that are 10 m from the scanner.

FARO Flash: Only available with a Focus Premium scanner. *For more information, see "FARO Flash" on page 22.*

NOTE: The time it takes to complete a scan increases as the point spacing decreases. In most cases and project environments, it is advisable to perform additional scans at different positions with faster scanning (larger point spacing) to increase speed and reduce shading caused by objects. This also increases the overlap of scans for better registration results.

FARO Flash

If you are using a Focus Premium scanner an additional profile, FARO Flash will be available on the profile tab in the section Other Profiles.

FARO Flash: This is the quickest scanning method and can save you a significant amount of time during your scanning project. It's best for indoor environments with usual room sizes or outdoor environments with close objects. It is recommended for creating of floor plans or to map general objects.

This profile is shown in section Other Profiles until the feature is licensed for use in FARO Sphere. Contact your FARO sales representative to purchase a license.

To Activate Your FARO Flash License

After purchasing a license, log into your FARO Sphere account in the Stream app to retrieve the Flash scan profile license information for your scanner.

After the license information is available to the app, it will validate the Focus Premium scanner when it is discovered, and will then be listed under Available Profiles.

If no valid license is detected, the profile will continue to be listed under Other Profiles and additional information about your license status will be displayed in the profile information text. You cannot activate and use the Flash profile with your Focus Premium scanner if the license is expired or invalid.

After activating the license initially you can use the Focus Premium and the Flash profile without a connection to Sphere via a temporary offline license which will expire 30 days after your last login to Sphere. Stream will show the offline license expiration in the profile list. The offline license is renewed each time you log into Sphere.

FARO Flash profiles cannot be cloned and used as a template for new scan profiles.

Hybrid Reality Capture powered by Flash technology

Hybrid Reality Capture powered by Flash technology provides fast color scanning (with the panorama camera, additional accessory) while saving a lot of on-site time. No more compromise between color scanning at good resolution and on-site time.

With the Stream app and a Focus Premium, you can make scans significantly faster compared to traditional stationary scans.

This method requires a license for the FARO Flash profile, see Profiles.

Hybrid Reality Capture/ Flash requires Firmware 7.2 or later, Stream 2.0 and SCENE 2023 (or higher), a Ricoh Theta Z1 panorama camera, and the FARO PanoCam mounting bracket.

Sync Project to Sphere

Sphere is FARO's cloud solution. By syncing your project to Sphere, you put your project in the cloud, where you can process, evaluate and share it.

Before the upload to Sphere cloud can start, the full-resolution scans must be transferred from the Focus scanner to Stream.

1. Swipe the navigator bar to the top of the screen.

2. Under **Finalize Project**, tap **UPLOAD TO** SPHERE.

3. In next screen disable the two options **Uploading project** and **Processing project**.

4. Tap **START** and the download of all full scans from the scanner will be initiated. This will be indicated with the first progress bar.

5. Press **abort** to cancel the current process.

After the full scan download from the scanner to Stream is completed, you can disable the connection to the scanner.

To sync the active project to Sphere:

1. Ensure that you have an Internet connection and are logged into your FARO Sphere account.

2. Swipe the navigator bar to the top of the screen.

3. Under Finalize Project, tap UPLOAD TO Sphere.

4. A dialog will open with settings and progress bars for the upload.

To select a project to upload to Sphere:

1. Ensure that you have an Internet connection and are logged into your FARO Sphere account.

2. Navigate to the project list.

3. Slide the project you want to upload to the left. Tap ⬆ initiate the upload.

4. A dialog will open with settings and progress bars for the upload.

After "upload" is completed, the app can be closed because processing will occur in the cloud, completely independent from the app.

Upload options

Uploading project. Disable this option if you just want to transfer the full-resolution scan from the scanner to your phone or tablet, but not to Sphere.

Processing project. Disable this option if you want to upload scans in multiple actions (i.e., for jobs done over multiple days and you want to upload the data from a day each evening). Enable this option if your scanning job is finished and all scans are captured.

Remember that larger projects can take up significant memory on your phone or tablet. Be sure to delete completed projects from the Stream app to free up space on your device.

NOTE:

> If your project contains scans with pictures made with a panorama camera, you must perform a Panorama Camera Calibration scan for this project before you start the upload to Sphere.
>
> If the project contains panorama camera scans it is not possible to upload without the Panorama Camera Calibration scan. Perform this scan in an area with a ceiling and well-distributed features to achieve a suitable camera calibration.
>
> See also, *Panoramic Camera Calibration* on the next page.

Devices

To see the Devices pane, swipe the navigation bar up and tap 桼 .

Available Devices

Here you see all devices that Stream has discovered and which are currently available to connect to Stream. You can connect to a specific scanner by tapping it. Note that only one device can be connected at a time. Multiple connections are not supported. Focus Premium scanners are licensed by default.

Other Devices

Here you see all devices that Stream has previously discovered, but which are not currently available to connect to Stream. When the device becomes available, it will move to the list above.

Using Focus Core

Focus Core scanners are shown in Other Devices until they are licensed for use with Sphere. Contact your FARO sales representative to purchase a license.

After purchasing a license, open Sphere and log into your FARO Sphere account to retrieve the Focus Core license information. After the license information is available to the app, it will validate Focus Core scanner when it is discovered, and will then be listed under Available Devices.

If no valid license is detected, the scanner will continue to be listed under Other Devices and additional information about your license status will be displayed in the device information text. You cannot activate and use a Focus Core scanner with Sphere if the license is expired or invalid.

After activating the license you can use the Focus Core without a connection to Sphere via a temporary offline license which will expir 30 days after your last login to Sphere. Sphere will show the offline license expiration date in the device list. The offline license is renewed each time you log into Sphere

Panoramic Camera Calibration

SCENE uses calibration scans to align the colors of the Ricoh Theta Z1 images with points in the Focus scans.

SCENE uses calculated parameters from the system calibration (the initial full system calibration, and subsequent calibration updates) to color scans.

Calibration scan images are saved to an fls folder on the scanner's SSD or SD card, and you can use them in SCENE, just like other scans. To colorize a Panoramic Camera scan, you must capture at least one initial Panoramic Camera full system calibration scan with the same Ricoh Theta Z1 camera that is used for the scan project. The calibration data is shared across all projects for one user.

For best results:

- Power on the Focus scanner and Ricoh Theta Z1 camera approximately 15 minutes before the full system calibration scan so they can reach operating temperature.

- Ensure that the Ricoh Theta Z1 and the Panoramic Camera mount are assembled by hand-tightening the screws using the hex key provided with the mount. This helps to reduce any mechanical movement between the two devices and can minimize the need for additional Panoramic Camera calibrations.

- Perform the calibration scan in an indoor environment, such as an office, or a room.

- Walls should be a minimum of ca. 6 feet (2 meters) and a maximum of ca. 16 feet (5 meters) from the scanner.

- Objects or patterns should be distributed around the floor, walls and ceiling.

- Avoid calibrating in rooms with plain white walls, dark environments, or movement such as opening doors, people moving around, ceiling fans, etc.

- Make sure that there are no reflective surfaces such as mirrors, or glass walls in the scanner's field of view.

- The scanner/tripod assembly must be set up on an even, solid floor.

If the calibration scan does not have proper color overlay, repeat the system calibration and processing in SCENE.

Repeat the calibration procedure in the following circumstances:

- If you are using a different camera or scanner other that the pair which were fully calibrated, previously

- Prior to scanning projects that will contain many scans.

- When scan colors lack quality.

- When scanning in environments with extensive temperature variations, or low/high temperatures.

- If the mounting bracket is moved or bumped.

- If color overlay results show errors

The calibration process creates a 1/5 / 2x quality scan that includes two Panoramic Camera pictures, and an internal camera color capture with even weighted metering. The full system calibration process takes about 3.5 minutes.

SCENE stores system calibration and scan calibration data in a folder on your system drive:

```
Users\...\AppData\Local\FARO\SCENE\Store
```

NOTICE: Do not delete or edit the data in that folder. If the data is deleted or altered, a new calibration is required. Incorrect data can cause errors or unexpected results in SCENE.

On-Site Compensation

On-site compensation (OSC) is a process that tests and improves the angular accuracy of the scanner by measuring and correcting small inconsistencies in how the scanner measures the environment. These inconsistencies are compensated during regular scanning. The Stream app starts this process and reports the results.

Connect your Laser Scanner to your smart device through Wireless LAN and ensure you are able to remotely access and control the scanner using the Stream app.

Where to set up the scanner for OSC

OSC detects natural features such as door frames, pictures or other objects from the laser intensity data (color information is not used) captured during the scan. These natural features must be well-distributed within the room on all sides, and must be found on walls, on the ceiling, and the floor. Consider that laser intensity data looks like the preview of a scan in the Focus GUI or a Quick View in SCENE. If these views do not show structure or stronger grayscale gradients, the OSC algorithms can't detect these features. A normal office room with objects such as furniture, tables, IT equipment or other objects and pictures on the walls—and as few windows as possible—should be sufficient.

Before you begin the OSC process, ensure that the scan site has the following characteristics:

- Choose an indoor room where nothing is moving (no people, ceiling fans, etc.) and natural objects well distributed within the room. Outdoor environments don't work well because there is often substantial movement caused by wind, vehicles, or animals, or because of an insufficient number of natural features in the sky.

- The room should have as few windows or other reflective planes as possible. This may cause incorrect measurements.

- The walls, floor and ceiling should not be smooth but instead should have some sort of structure, such as textured wallpaper, carpet, acoustical tiles, and so on. Avoid areas with large, flat smooth walls.

NOTE: Lighting conditions are less important because on-site compensation is done with the laser, not with camera images.

On-Site Compensation Best Practices

- Place the scanner in the center of the room and extend only the first sections (with biggest diameter) on all 3 legs of the tripod.

- Make sure the tripod is placed on a stable, flat surface. The tripod must not move during scanning.

- Make sure the tripod is fully opened and stable and the center column is not extended.

- For best performance of the Focus scanner, perform multiple OSC in different temperature conditions of the scanner. This can be achieved to run multiple OSC starting with a cold scanner (a newly started scanner) and repeat multiple OSC for about 30 minutes.

- Leave the room before starting OCS with the Stream app. If you can't leave the room, be very still during OSC.

Perform an On-Site Compensation

Perform the steps below in the Stream app:

1. Connect the scanner in Stream app, tap ⚙ and swipe the device list entry to the left. Select ⛶ (the OSC icon).

2. Start the OSC process by clicking the start button in the OSC view.

3. During the scan and compensation process, the status of progress is displayed. You can cancel the process, if necessary.

4. A final computation step is performed and a spinning wheel indicator is displayed – this step takes about one minute.

When the compensation is finished, the compensation summary is displayed with the results of the compensation.

Understanding the Results

The summary page provides information about Passed or Failed checks and results.

- Details about the connected Focus Premium (name/serial number and IP address), Focus firmware version and last successfully finished OSC.

- Tap on the export icon to export, document, and share the PDF OSC report using your phone's sharing features.

- Shows whether the angular accuracy check has passed the acceptance criteria.

- Shows information about the quality of detected features and potential movements during the OSC scan. After the scan, the data is analyzed to detect natural features. The success of the process depends on all quality characteristics passing. If the quality check fails, you may need to enhance the setup or relocate to a more appropriate environment. Refer to Best Practices, above.

- The duration and date/time of this OSC.
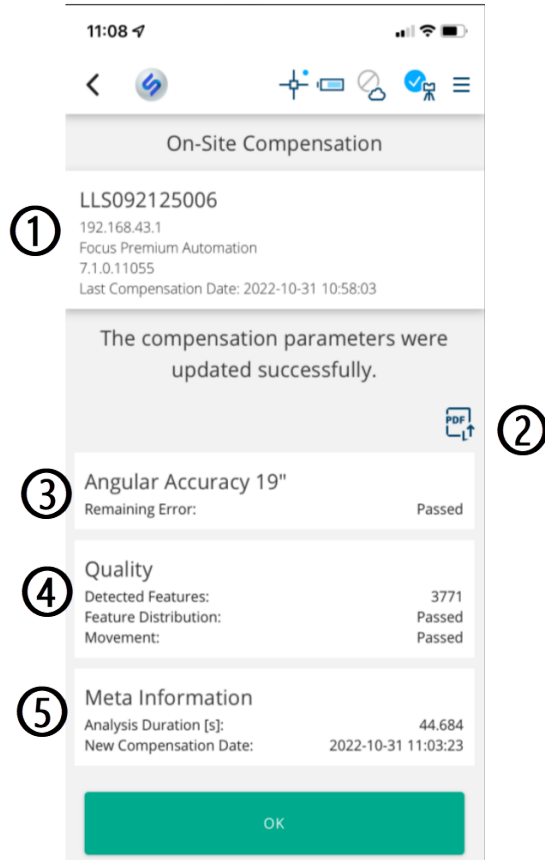
A successful compensation with its compensation data is always and directly stored on the Focus Premium and guarantees best performance of the scanner. Failed OSC will not influence the performance of the device.

Angular Accuracy

Remaining Error - Passed

OSC performs a scan with double coverage of the environment. To pass, the consistency of the scan data of the first coverage and the second coverage must reach a level that ensures overall angular accuracy of 19" (one sigma).

Quality

Detected Features– Passed
Feature Distribution – Passed

Features must be distributed over the complete vertical range, e.g., near the zenith, near the horizon, and near the nadir. In all these zones a significant amount of features must be detected, otherwise stochastic influences would be too large.

Movement – Passed

The scan data of the first coverage and the scan data of the second coverage is checked for misalignment that is caused by tilt or wobble of the complete scanner.

Troubleshooting

Issue: The process did not identify enough natural features for compensation.

Solution: Select a room with a sufficient number of natural objects on walls, ceiling and floor. In case of an insufficient number of detected natural features, the quality section of the summary will indicate. Change the room according to the suggestions in *Where to set up the scanner for OSC* on page 27.

Issue: No consistent solution could be determined.

Solution: Ensure that the tripod and visible objects did not move during the procedure. Repeat the procedure in a different environment.

Issue: Communication with the scanner failed.

Solution: Ensure that the WLAN connection to the scanner is stable. If this error appears while connecting to the scanner or applying the compensation parameters, repeat the OSC.

App Settings

Use the Setting page to change various defaults in the app.

Tap ☰ , ⚙ **Settings** and adjust the settings for your situation.

Display Settings
Switch Dark Mode on or off. Using Dark mode may prolong the life of the battery in the device where you are running the Stream app.

Language Settings
Select the language you would like the interface to display.

Registration Settings
Set the **Manual Registration Distance Limit**. This limits the amount that you can move a scan during manual registration. For large scan projects where you need to zoom out to see where a scan fits into the project, limiting the distance that you can manually move the scan may prevent you from accidentally moving the scan far from its intended position.

Set the **Manual Registration Angle Limit**. This limits the amount that you can rotate a scan during manual registration. For large scan projects where you need to zoom out to see where a scan fits into the project, limiting the distance that you can manually rotate the scan may prevent you from accidentally rotating the scan far from its intend position.

Unit Settings
Choose feet or meters as your unit of length.

Notification
Choose how you want to be notified that the scanner has finished scanning and can be moved. You can select a vibration (if your device supports vibration) or a sound notification.

Data Download Settings
Choose whether to automatically download scan data when opening existing projects. Downloading larger projects can take a significant amount of time if the project was not captured on the phone or tablet that is currently being used.

Analytics Settings
Decide whether to help FARO improve Stream by sending us anonymous usage data. We encourage you to enable this option. This will help us to improve our app features and scanner settings. No project data or scans are transferred to FARO.

Profile settings

Stream comes with four scan profiles plus an optional licensed Flash profile for very fast scanning. You can adjust the settings of these profiles to your specific situation. To adjust profile settings:

1. Swipe the navigation bar up and select ☰.

2. Tap the profile you want to edit.

Quality and Resolution

Quality refers to the accuracy with which points are measured.

Resolution sets the density of the scan points. A higher resolution captures more scan points thus creating a more detailed image.

NOTE: Because higher resolution and quality require more time, you should select the lowest values that will meet your needs for the scan.

To set quality and resolution:

1. Swipe the navigation bar up, tap ☰, and select the scan profile you want to modify.

2. Scroll down to Quality / Resolution and adjust the setting for your situation.

Color Settings

Color settings are parameters that you can change to adjust how the scanner acquires and processes color information and applies it to the points in your scan when you process it in SCENE or Sphere. Note that not all settings are available in all Scan Profiles.

To adjust color settings:

1. Swipe the navigation bar up, tap ☰, and select the scan profile you want to modify.

2. Scroll down to Color Settings.

3. You can adjust the following settings:

Color Acquisition: Switch on for color scans, off for black and white.

- **Internal Camera**: Uses the integrated camera of the Focus laser scanner. This method provides the best color capture performance but also takes the longest. See details for integrated camera settings below.

  ○ **Exposure Metering** changes how the scanner determines what exposure to use when taking pictures with the internal camera. Choose one of the following:

    - **Even Weighted Metering**: sets the exposure by using light information taken from every direction.

    - **Horizon Weighted Metering**: sets the exposure by using light information taken from the horizon. This mode is commonly used in scenarios with bright light coming directly from above (e.g., indoors with bright ceiling lighting or outdoors in bright sunlight).

    - **Zenith Weighted Metering**: sets the exposure by using light information taken from above the scanner. Use this mode when there is very bright light coming from windows, for example, and you want to achieve the most correct balance of light and exposure for objects on the ceiling of the building.

    - **HDR Mode:** Switch on for High Dynamic Range color images. This setting corresponds to the exposure levels.

      NOTE: When HDR is enabled, a larger number of captured images result in a longer capturing and processing time.

    - **High Resolution**: With high resolution enabled, the full 13 MPx resolution of Focus Premium's internal camera is used. This improves colorization quality in SCENE and Sphere. Note, though, that this increases the file size and processing times. Only activate this option if the very best quality colorization is required. If this option is turned off, the 13 MPx image is down-sampled to 8 MPx and used for colorization (identical to the Focus CoreFocus ^{S} and Focus ^{S} Plus models).

    - **Night Mode:** Select to improve the quality of color photos under relatively dark lighting conditions.

    - **Speed Mode**: Select to reduce the scan duration. This happens at the cost of color picture quality. It cannot be combined with HDR or Night Mode.

- **Panorama Camera**: Uses the accessory panorama camera which can be attached to the scanner. This method provides fastest color capture performance but has slightly reduced color quality due to possible parallax. Select the number of used panorama camera pictures. Default and recommended are 2 pictures. (Refer to the Accessories Manual for the Focus Laser Scanner for more information.)

Sensor Settings

The scanner's sensors, GPS, inclinometer, altimeter and compass can be switched on or off. In most situations, we recommend that all sensors be switched on.

To switch sensors on or off:

1. Swipe the navigation bar up, tap ☰, and select the scan profile you want to modify.

2. Scroll to Sensor Settings and switch the sensors on or off, as you situation requires.

About the Sensors

Use Inclinometer - Enable or disable the automatic use of the inclination measurement of the built-in dual-axis compensator (inclinometer) for the scan registration in SCENE or Sphere. If the inclinometer data is enabled, it is automatically used to register the scans; if it is disabled, the data is ignored.

NOTE: To get the most reliable data from the dual-axis compensator, ensure that the scanner's inclination is less than 2°. Use the inclinometer bubble on the Focus UI to level the scanner within these limits.

Use Compass - Enable or disable the automatic use of the built-in compass' data for the scan registration in SCENE or Sphere. The compass' data is always measured and attached to each scan during scanning and is automatically used for the scan registration, if is enabled. If it is disabled, the data is ignored.

NOTICE: Ferromagnetic objects and electromagnetic fields can disturb the earth magnetic field. This, as well as local variations in earth magnetic field (magnetic declination/variation) can lead to inaccurate compass measurements. In this case it's recommended to switch off the use of the compass data.

Use Altimeter - Enable or disable the automatic use of the altimeter data for the scan registration. Refer to the Focus laser scanner documentation for more information.

Use GPS - Turns the GPS sensor ON or OFF. Refer to the Focus laser scanner documentation for more information.

Filter Settings

Clear Contour Filter - Enables the dynamic contour filter. This hardware filter removes scan points that resulted from the laser spot hitting two objects. This usually happens at the edges of objects.

Clear Sky Filter - Enables the dynamic sky filter. During scanning, this hardware filter removes scan points resulting from scanning empty spaces in the sky.

To switch filters on or off:

1. Swipe the navigation bar up, tap ☰, and select the scan profile you want to modify.

2. Scroll down to Filter Settings and adjust the settings for your situation.

Distance Range Settings

To improve the quality of the scans, you can use the *distance settings* to indicate how far from the scanner the important scanned objects will be.

To optimize scanning for a specific distance range:

1. Swipe the navigation bar up, tap ☰, and select the scan profile you want to modify.

2. Scroll to **Distance Range Settings**.

3. Select one of the distance ranges:

   Normal: Select this to scan most objects.

   Near Distances[1]: Select this to scan objects that are near the scanner or if there are many reflective many objects in area you are scanning.

   Far Distances: Select this when scanning surfaces that are located at distances of greater than 20 m (65 ft) from the scanner. This setting is not recommended for indoor scanning.

NOTE: The distance range settings influence the emitted laser power during scanning, with the lowest laser power used for near distances and the highest laser power used for far distances. Using higher laser power can yield better scan results for dark or low-reflective and faraway objects, while lower laser power is more suitable for reflective or shiny objects that are closer.

---

[1]Not available with Focus Core.

Glossary

C

cloud-to-cloud registration
A registration method that serves as refinement of already roughly positioned scans (by sensors, manually or other algorithms). Different initial positions may lead to different results.

cluster
A collection of scans which belong together, for example, scans that were recorded on the same floor of a building, or scans which were taken in the same room. Scan groups, created by the FARO Focus scanner, are also automatically put into clusters when they are imported into SCENE.

collection
A list of projects that belong together and which is used for the joint assignment of project permissions

F

FARO Focus Core
FARO's entry-level professional scanner. It provides most of the features of the FARO Focus premium with a scanning range of 70-meters.

FARO Focus Premium
FARO's most advanced laser scanner, providing exceptional capturing efficiency, data quality and accuracy for professional applications.

FARO Sphere
A cloud-based information platform provided by FARO that provides a centralized, collaborative experience across the company's reality capture applications and customer support tools through a secure, single point sign-on process.

FARO Stream
A FARO phone app from which you can control your FARO Focus Premium laser scanner, pre-register captured scans, collect complementary data, and upload captures directly into FARO Sphere.

folder
An object type which stores any objects other than scans. It is similar to the Windows file system folder. The complement to this is the Scan Folder, in which scans are contained.

G

group
A list of users that share the same project roles.

I

inclinometer
An instrument, similar to a level, used to measure angles of slope.

M

model
A node in the structure view that contains CAD objects.

O

on-site compensation
The process of checking the accuracy of the device and making software adjustments to compensate for any errors.

P

processing
A series of software manipulations to the scan data in a project that improve the quality of the scan.

project role
A list of permissions for a particular project or collection of projects. It can be assigned to either a user or a group of users.

R

radial menu
A menu consisting of icons arranged in a circle that is displayed when you click an object.

registration
The process of aligning multiple scans in a parent coordinate system using reference positions common between scans. References are common points between scans that are used to create a "best-fit" alignment.

S

scan
A file or collection of files recorded by scanner, containing millions of data points that include position, reflectance, and color for single scan points. A scan consists of scan points that were recorded from a single scanner location. Its points are organized in a row column order.

scan project
A collection of related scans and additional data needed to represent a scanned object or site, such as a building or a crime scene.

single sign-on
Authentication method that allows users to log in with one user name and password to their operating systems as well as any related platforms and systems. This authentication method must be configured by an administrator.

sphere
A sphere-shaped target used for target-based registration of scan projects.

structure view
Tree-structure on the left side of the screen in SCENE. It shows the project structure, including subfolders and objects.

T

target-based registration
A registration methods that uses targets (e.g., spheres, checkerboards, markers) to determine the alignment of the scans. This registration method does not use scan positions.

top-view registration
A registration method for indoor or rough outdoor placement of scans. It is independent of the initial scan position if inclinometer data is available. It may need refinement with cloud-to-cloud.

W

workspace
A collection of projects and applications that can be assigned to users and groups. Different users and groups can have different permissions in the workspace.

FARO Technologies, Inc.
250 Technology Park
Lake Mary, FL 32746
800-736-2771 U.S. / +1 407-333-3182 Worldwide
Email: support@faro.com

FARO Brazil
Rua San José, 360
Cotia, SP 06715-862
Phone: 0800-047-4271 / +55 11 3500-4600
Email: suporte@faro.com

FARO Europe GmbH
Lingwiesenstrasse 11/2 D-70825
Korntal-Münchingen, Germany
FREECALL +800 3276 73 78 / +49 7150/9797-400
FREEFAX +800 3276 1737 / +49 7150/9797-9400
Email: support.emea@faro.com

FARO Singapore Pte. Ltd.
No. 03 Changi South Street 2
#01-01 Xilin Districentre Building B
SINGAPORE 486548
TEL: +65 6511.1350
Email: supportap@faro.com

FARO Japan,c.
716 Kumada, Nagakute-City,
Aichi, 480-1144, Japan
Tel: 0120-922-927, 0561-63-1411
FAX:0561-63-1412
Email: supportjapan@faro.com

FARO (Shanghai) Co., Ltd.
1/F, Building No. 2,
Juxin Information Technology Park
188 Pingfu Road, Xuhui District
Shanghai 200231, China
Tel.: 400.677.6826
Email: supportchina@faro.com

FARO Business Technologies India Pvt. Ltd.
E-12, B-1 Extension,
Mohan Cooperative Industria Estate,
New Delhi-110044, India
Tel.: 1800.1028456
Email: supportindia@faro.com