

iGUIDE[®] IMS-5 Camera System

System and Software Documentation



iGUIDE® IMS-5 Camera System: System and Software Documentation

Table of contents

Regulatory Information	3
Camera System Overview	4
Camera System Components	5
Camera Handling	6
Tripod Setup	6
Connecting to Camera	8
Collecting Data With Survey	9
Create a Project and Floor	10
Turn Laser ON	10
Shooting Panoramas	11
Getting Best Results From Auto Settings	12
Important Shooting Notes	12
Taking Still Pictures	14
Additional Shooting Tips	14
Summary of Survey Controls and Indicators	14
Summary of Manage Tab	16
Automatic Mapping Mode (Advanced)	18
Automatic Mapping Tips	19
Outdoor and Common Area Scans	20
Processing Data With Stitch	22
About iGUIDE Images	22
Stitch Workflow	23
User Interface	23
Project Tree View	23
Adding User Panoramas	25
Toolbar Buttons	25
Data Quality	30
Maintenance	34
Fisheye Lens Cleaning	34
Laser Scanner Optical Window Cleaning	34

Compass Calibration	34
USB Flash Drive	35
Factory Reset	35
Firmware Update	35
Troubleshooting	35
Wi-Fi connectivity	35
Survey browser compatibility	36
Removing reflections in mirrors	36
Ball head drift	36
Miscellaneous Survey issues	36
Wrong camera rotation direction	36
Battery Charging	37
Specifications	38
Canon EOS Rebel T100 Menu Settings	39

Regulatory Information

This product has been tested and was found to comply with the following standards:

- FCC PART 15, SUBPART B, Class B - Unintentional Radiators.
- Industry Canada ICES-003, Issue 6, Class B - Information Technology Equipment.
- CISPR 11:2009 + A1:2010 / EN 55011:2009 +A1:2010, Class B - Industrial, Scientific and Medical Equipment.
- EN 61326-1:2013 – Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements, Part 1: General Requirements.

This product includes a laser scanner which is a Class 1 laser product and complies with IEC 60825-1 2007-03 Ed. 2.0 and 21 CFR Subchapter J Parts 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The product modifications not expressly approved by Planitar could void the user's authority to operate the equipment under FCC rules.

This product includes a Wi-Fi USB adapter that has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without RF restriction.

This product is Class B, Group 1 ISM equipment according to CISPR 11. Group 1 ISM product: A product in which there is intentionally generated and/or used conductively coupled radio-frequency energy which is necessary for the internal functioning of the equipment itself. Class B products are suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

Contact Planitar at www.planitar.com or Planitar authorized distributor for product disposal information and product take-back program.



Camera System Overview

The iGUIDE Camera System is a unique camera system that measures a space while simultaneously photographing it.

Figure 1 shows the main components of the camera system. The camera system uses a **laser scanner** for gathering laser measurement data and a **DSLR camera** with a **fisheye lens** for shooting ultra wide-angle HDR images that are later stitched into 360-degree panoramas. The scanner's laser is infra-red and is invisible. Each DSLR camera and lens assembly is factory calibrated to allow accurate rectification of fisheye images and their alignment and stitching into cubic panorama tiles. It is important to handle the camera with care to keep the alignment of the optical assembly intact. The camera is not user serviceable and must not be disassembled or the warranty will be void. The camera has a built-in Wi-Fi access point and you can connect to it from any Wi-Fi enabled device. It is controlled by the Survey web app that runs in a web browser. Phones and tablets with a 5-7 inch screen are most convenient for use with the camera.

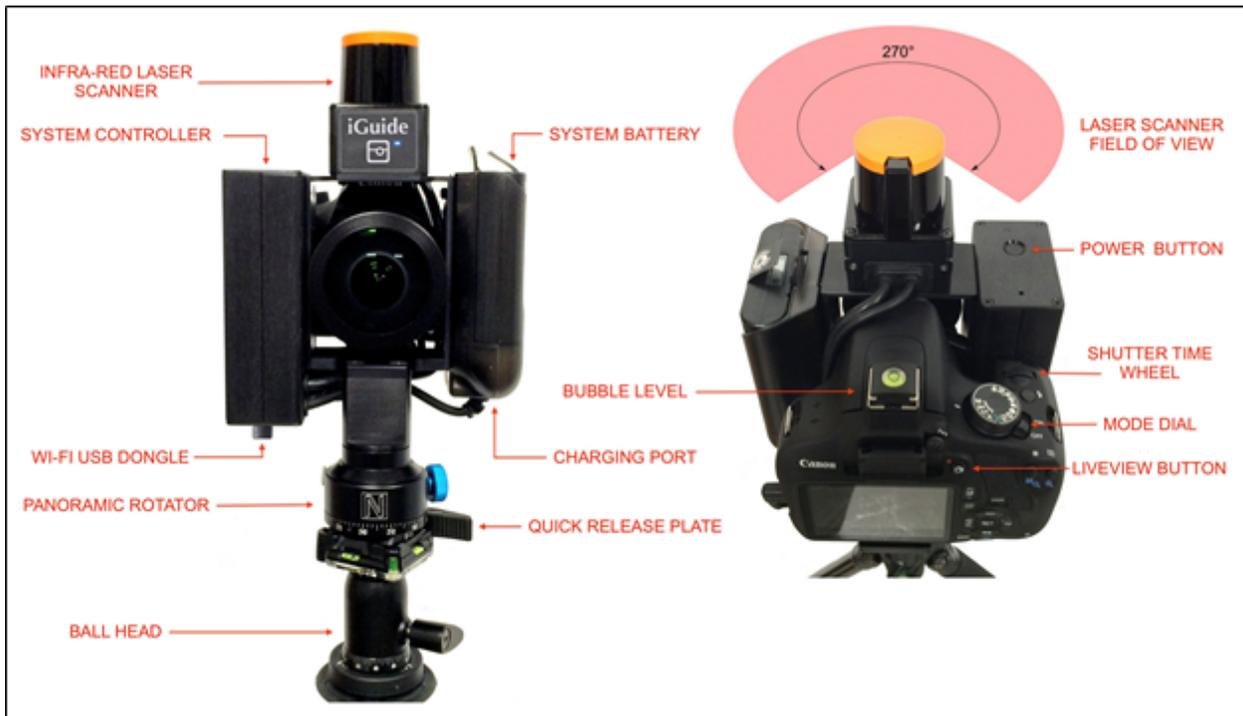


Figure 1. Camera components.

Camera System Components

The **system controller** is the black box on the side of the camera system. On top you will find the power button used to turn the system on.

The **system battery** is located on the side of the camera directly opposite the system controller. It doesn't need to be removed to be charged and has a charge level indicator on top of the battery itself.

The **USB flash drive** where all the data is stored is also plugged into the system controller. It is located under the DSLR body.

The **panoramic rotator** is located at the bottom of the camera system and must be connected to a tripod or quick release plate prior to shooting.

The **bubble level** can be seen on top of the DSLR body and is used to level the camera.

Camera Handling

The camera should be handled by the panoramic rotator and can be additionally supported by a grip onto the system controller. For lens cleaning, the camera can be placed on a table with the fisheye lens facing up and the DSLR camera LCD screen facing down, see Figure 2.

The system battery and the DSLR camera battery must be charged before the first use. It is convenient to charge the system battery while the camera is placed in the carrying case. The system battery charging port is located at the bottom of the battery holder. Consult the Troubleshooting section of this manual for the procedure for charging a completely discharged battery.



Figure 2. Camera handling.

Tripod Setup

A tripod is not included with the camera and must be supplied by the user. A tripod with a ball head is recommended to allow for easy leveling of the camera. It is also recommended to use a ball head with a quick release (QR) plate for easy installation of the camera on the tripod. The camera weight is 2.4 kg (5.2 lb). The center of gravity of the camera is offset from the panoramic rotator axis, so it is recommended to use a ball head and a tripod with a load capacity of at least 5 kg (11 lb).

The tripod height should be adjusted so that the fisheye lens is about 120cm (4 ft) above the floor to allow visually capturing the surfaces of kitchen counters and islands. Raising the camera too high will cause capturing too much of a ceiling.

It is recommended to extend the tripod column at least 10cm (4") to provide enough space for a convenient hand grip, see Figure 3. Raising the column higher will result in too much sway of the camera under its weight when the camera is rotated and will negatively affect quality of panorama alignment and stitching.

A **foam cushion disk** is provided with the camera and can be installed on the tripod column beneath the ball head and above the hand for a more comfortable grip.



Figure 3. Tripod handling.

Connecting to Camera

The camera is powered on and off by the power button located the top of the system controller. The camera boots in less than 10 seconds, so there is no Sleep mode.

After the power LED turns green, navigate to your phone or tablet Wi-Fi settings and connect to the Access Point named **planitar-xxxxxx**, where **xxxxxx** is a unique code for each camera. The default Wi-Fi password is **p1234567**.

After successful connection, open a web browser and type URL **http://192.168.5.1** in the address field. The browser will load the Survey web app that controls the camera. In the Survey app, navigate to the Manage tab and change the default Wi-Fi password. It is also recommended to save the Survey web app URL as a bookmark to your home screen for easy launching of Survey in full screen mode.

You can access the camera's USB Flash drive over Wi-Fi from your Mac or PC desktop computer once you connect to the camera from the desktop computer over Wi-Fi. Open Windows Explorer or Mac Finder and browse the network for a computer named **planitar-ims**. If a login dialog is presented, use login name **guest** with a blank password.

To conserve battery, the laser scanner will power off if there is no communication between Survey and the camera for more than 2 minutes. Additionally, the camera system will power off automatically if no user interaction occurs with the Survey app for 20 minutes. This default Power Off timeout can be changed or completely disabled through the Manage tab in the Survey app.

To shoot panoramas you will also have to turn the DSLR power switch to the ON position.

IMPORTANT

- Do not leave a discharged system battery in the camera for long periods of time, e.g. for more than a week with one bar of charge on the battery's LCD display. Completely charged battery can remain in the camera for up to two years.
- Do not support the camera by holding onto the system battery.
- Do not unplug Wi-Fi USB dongle while the system is powered up.
- Do not unplug USB Flash drive until it is first Safely Removed in the Survey app or the system is powered off.
- If using another USB Flash drive, ensure it is slim enough and can be inserted completely into the USB connector. It is recommended to use USB3 drives for faster image writing speed.
- The system must be powered off when charging the system battery.
- The mode dial on the DSLR camera must always be set to the M position.
- Do not change DSLR camera menu settings from the values configured by Planitar.

Collecting Data With Survey

The Survey user interface is shown in Figure 4. **There are five tabs: Survey, Pano, Floor, Project, and Manage.** Each tab represents a separate screen and functions that can be returned to at any time. Most of the time is spent working in the Survey tab than any other.

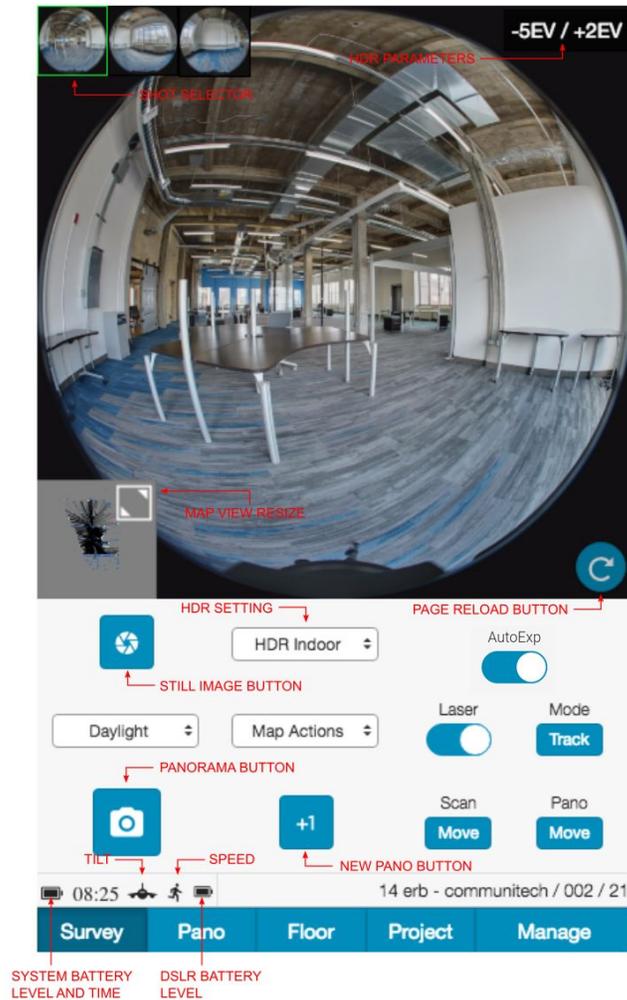


Figure 4. Survey tab.

Data collection for Planitar iGUIDEs involves using the camera to scan a property and capture fisheye images in every room to create panoramas. The integrated laser scanner collects measurement data for every room which forms a map of the space during the shooting of panoramas. The camera is rotated manually on the panoramic rotator into 3 angular positions spaced 120 degrees apart to make a 3-shot pano. The camera can be controlled from any phone or

tablet over Wi-Fi through the Survey web application running in a web browser. Collected data and images are saved to a USB Flash drive attached to the camera.

After house data has been collected, it needs to be transferred from the camera to a desktop computer either on the USB Flash drive or over Wi-Fi. The data is then loaded into Stitch application running on a desktop computer where panoramas are aligned and stitched automatically. The Stitch application allows manual adjustments to panorama alignment and color, as well as fine-tuning of room positions and floor layout before the iGUIDE data is exported and is ready for upload to the online iGUIDE Portal. Planitar processes the uploaded data to create floor plans from measured data and assemble panoramas and floor plans into a complete iGUIDE.

Create a Project and Floor

To begin shooting a property you will have to name it and select a floor to start on. Each floor is captured separately and floor creation will occur for every space in a home that requires its own floor plan. Follow the steps below to begin:

1. Switch to the Project tab.
2. Type a project name for the new house.
3. Enter exterior wall thickness (may not be needed for apartments).
4. Press the Create button.
5. Switch to the Floor tab.
6. Enter a floor name or select a predefined name from the drop-down list.
7. Select grade not set to select a grade level.
8. Enter exterior wall thickness for the floor (if required).
9. Press the Create button.

Exterior wall thickness should be measured with a tape measure at the main entrance or should be estimated. For floors with no main entrance the wall thickness will have to be measured at a window. Entering exterior wall thickness for each floor individually is optional and if not provided, the wall thickness entered for the project will be used. Sufficient accuracy for exterior wall thickness measurement or estimation is about 1cm or 0.5 inch. The value of the exterior wall thickness will be used to compute and report the Exterior Floor Area in the iGUIDE Report and on PDF floor plans delivered with the iGUIDE.

Grade level will affect total area calculations. By default above grade will be included in the total exterior area calculations and below grade will be excluded from it. Check requirements in your area for what is considered above or below grade.

Turn Laser ON

If not using the advanced AutoMap mode (described later), ensure the button labeled Mode reads Track. The laser scanner has to be turned on by tapping the button labeled Laser. This must be done prior to capturing any images if measurement data is required. If the laser scanner is not turned on there will be a warning message asking you to do so or proceed with no measurements.

Shooting Panoramas

You will need to shoot a panorama for every space in the home. This includes spaces that would typically not be photographed like storage spaces, walk in closets, large pantries, utility rooms, hallways, and landings. If any space is left uncaptured the drafting team will not be able to draw floor plans. Details such as doors, windows, fixtures, and appliances need to be visible in the panoramas so that the drafting team can see and include them on the floor plan. Some small spaces, such as closets and pantries can be drafted using surrounding walls, so you do not need to go in.

To shoot a panorama follow the steps below:

1. Turn the DSLR camera On and ensure Canon mode dial is in M position.
2. Place the camera in a suitable location for a panorama.
3. Press the "+1" button to create a new panorama.
4. Check that the rotator is firmly clicked into position.
5. Level the camera using the hot-shoe bubble level and the ball head. Precise leveling is not required as Stitch will auto-level panoramas during post-processing.
6. Turn On the LiveView mode on the DSLR camera if not using Auto Exposure.
7. Adjust white balance in Survey by choosing a preset from the drop-down list (e.g. Daylight, Tungsten, Fluorescent, Auto). Use Auto if you prefer to let the camera decide - Stitch will later correct any jumps in white balance between the three fisheye images of the same pano.
8. Adjust exposure (shutter time) using the control wheel on the DSLR camera while watching the DSLR camera LCD screen. You can refer to the on screen histogram to avoid over-exposure. Or you can turn on Auto Exposure if you prefer to let the camera optimize the exposure.
9. Tap the Panorama button to shoot. Unless HDR mode is turned Off, three exposure bracketed images will be taken and fused into an HDR image right away. Several HDR bracket presets are available and custom EV bracket values can be configured in the Manage tab. If Auto Exposure is used, it will take couple seconds to optimize the exposure, but this is done only for the first position.
10. HDR processing is performed in background and you can take new shots without waiting for it to finish. When ready, processed shots will be displayed if the active pano remains the same. While the camera is busy, green LED will blink and power off button will be ignored.
11. Rotate the camera clockwise to the second and third positions and take a shot at each position.
12. Examine the data by maximizing the map view. Tap the Move button under the heading Pano, move and rotate laser scan (room outline) on screen, to align with earlier scans, then tap the Save button to freeze it in place. Moving is done by dragging one finger on screen and rotating is done by dragging two fingers.
13. Repeat the above steps for other panoramas on the floor.

14. Before leaving a floor, enable the Coverage view (its slider is found in the upper left corner of the screen when the map is maximized) to display floor coverage by panoramas and see if any rooms were missed.
15. After you finish gathering data for a floor, go to the Floor tab, create a new floor and repeat shooting steps for each level of the home. You can always return to an existing floor to add more panoramas.

Getting Best Results From Auto Settings

It is recommended to use use Auto white balance and Auto Exposure. Together they produce best results most of the time, except difficult situations where manual intervention may be required.

When using Auto Exposure, point the camera toward the largest brightest area in the room for the first position.

Examine the resulting image once it has loaded and adjust HDR brackets if needed and re-shoot.

If Auto white balance and exposure did not produce desired results, you can always adjust exposure and white balance manually and re-shoot.

Examine the image for any reflections of you in the mirrors or other people in the picture and reshoot if needed.

If you need to re-shoot, move the green square shot selector in the top left of the screen to correct shot position by tapping on it. Also examine the resulting laser data for any signs that the tripod or rotator was misaligned or bumped. More details on misaligned data can be found in the Data Quality section.

Important Shooting Notes

All floors must be measured and shown in panoramas in their entirety for the drafting team to be able to draft them. **Partially mapped or photographed floors will not be drafted.** Refer to iGUIDE Drafting Standard found on the [iGUIDE Portal](#) Support section for more information.

Some panoramas will need to be shot for drafting reference only. They can be selectively disabled in the iGUIDE later if desired. It is possible to shoot only one fisheye image resulting in a partial panorama if it is only needed for reference. In this case you can ignore the warning about incomplete panorama when creating a new panorama after that. Partial panoramas will not be viewable in iGUIDE. Most common usage for partial panoramas is for measuring depth of closets where back wall is not measurable otherwise. Remember that every room should have at least one full panorama, so that the drafting team can properly place doors, windows, and other objects.

You can skip surveying complete floors, such as basements if you do not intend to be showing them in the iGUIDE. Reported Total Interior and Exterior Floor areas for the house will be affected, however.

If the Laser is On, each panorama scan will be saved separately from the AutoMap (if using the advanced AutoMap mode explained later) and panorama laser scan data will be shown in blue color. It is possible to move and rotate panorama scans independently from each other and from the AutoMap.

Exposure, white balance (when not using Auto), as well as camera leveling, and tripod position must be kept the same for all three shot positions, otherwise panorama stitching will be negatively affected.

When shooting with HDR, you may see over-exposed areas turn grey in the resulting HDR image. This typically occurs on floors and ceilings between the camera and a bright window. Reduce the exposure for the main image and re-shoot. You can use histogram on the DSLR camera LCD screen as an aid – try to avoid having too many peaks at the right edge of the histogram. Using Auto Exposure helps to avoid such image artifacts in most cases.

When shooting panoramas outside, it is the camera may not be able to measure. You will need to manually position and rotate panorama locations using the Move Pano mode.

After all three shots for a panorama are completed, the camera checks measured compass angles for proper spacing and may warn you if this check fails. It may happen due to close proximity to massive steel objects, such as steel door frames. If that happens very frequently, you may want to re-calibrate the compass. If the angle checks fail in every panorama of the project, the compass orientation on the iGUIDE will need to be set manually through the iGUIDE Portal.

You can choose an existing panorama through the Pano tab to make it active. The active panorama can be moved on the map, its data can be overwritten, and its images can be viewed.

Custom HDR exposure bracketing values can be set the Manage tab. The typical Indoor HDR preset has the underexposed image at -5EV to capture scenes behind windows and the overexposed image at +2EV to capture dark corners. If you find that the main image exposure needs to be set significantly shorter to avoid grey areas in the HDR image, you can increase the longer exposure setting (+EV), e.g. go from +2EV to +3EV. If you find that windows are too washed out, you can decrease the shortest exposure (-EV) setting, e.g. go from -5EV to -7EV.

The "+1" button will create numbered panorama folders on USB disk. Use the Pano tab if you need to name panoramas with descriptive names for easier identification during your post-processing.

You can type a custom name or choose a pre-defined name. When using pre-defined names repeatedly, they will get an auto incrementing numbering, e.g. Bedroom 1, Bedroom 2, etc.

There is no Delete Pano action, you can simply overwrite the data to re-use the panorama location.

Taking Still Pictures

If you want to take a still picture for the iGUIDE image gallery, reposition the camera and tap the Still Image button to take one fisheye image instead of a panorama. You do not need to use the "+1" button for still images, the camera will create and name image folder automatically. A still image can be captured from the single fisheye image later in Stitch.

Additional Shooting Tips

Default ISO setting is 200. You can change it as needed on the DSLR camera itself and Survey will not override it. It is not recommended to set ISO higher than 400 or to set it to Auto.

Turn on all the lights, especially pot lights and local lights.

If a room has large windows, set white balance to the Daylight setting. If pre-dominant lighting comes from incandescent light bulbs or warm yellowish fluorescent lighting, use the Tungsten setting. For cold white fluorescent lights use the Fluorescent setting. Finer control of white balance is available in Stitch application. It is recommended to use Auto white balance.

You can disable HDR to speed up shooting when capturing evenly illuminated areas such as basements or when shooting reference panoramas.

For panoramas, the optimal position of the camera in a room depends on the room size. For smaller bedrooms the optimal position is about 1m (3ft) away from the door towards the center of the room.

Objects in panoramas appear very small at distances over 5m (15ft), so in larger rooms it is recommended to shoot additional panoramas.

For still pictures, it is best to put the camera all the way into a corner or in the door opening.

Still pictures extracted from fisheye images have limited resolution of about 2 megapixels. Use a second camera with a wide-angle lens if you require high-resolution images for print.

You can turn the Laser off to conserve the system battery when shooting common areas in an apartment building that will not require a floor plan or when shooting panoramas outside.

Summary of Survey Controls and Indicators

System battery indicator shows the system battery charge level and remaining time. The DSLR camera battery indicator shows the remaining charge level in three discrete steps, approximately corresponding to 80%, 50% and 30%.

The text in the bottom right corner shows the house, floor, and panorama names.



Laser scanner switch. Turn laser scanner on or off.



Auto exposure switch. Turn auto exposure on or off.



Laser scanner mode selector. Tap to switch between AutoMap and Track modes.



Move scan. Move current laser scan (camera position) on the map.



Move pano. Move currently selected panorama on the map.



Map Actions selector. Available actions: Undo AutoMap, Re-center Map, Grow Canvas, Erase AutoMap, Merge Scan. Some actions may be hidden depending on context.



Shoot panorama. Shutter button for shooting panoramas. Shot position will advance automatically on each shutter release. The button is red when DSLR camera is powered off.



Shoot Still image. Shutter button for shooting a still image for gallery. The button is red when DSLR camera is powered off.



White balance/Color temperature selector. Exposes settings from Canon DSLR.

HDR Custom **HDR mode selector.** Turn HDR off, select between several HDR bracket presets (Indoor, Outdoor, Beach) or use Custom HDR bracket configurable through the Manage tab. Currently used HDR bracket -/+EV values are shown in the upper right corner of the screen.

+1 **New panorama location.** Creates a new folder on USB disk in the current floor folder to store panorama images. Folders will have incremental numbering. For custom folder naming use the Pano tab.

🔄 **Page reload.** Force reloading of Survey app in browser.

Coverage **Coverage switch.** When turned on, coverage of the floor by panoramas will be displayed where every panorama will be shown shaded. Use it to check if you missed any rooms. Normally the Coverage option should be turned off, as it slows down screen updates.

Summary of Manage Tab

The screenshot displays the 'Manage' tab interface, which is divided into three main sections. The left section contains a 'Mute beep on user actions' checkbox and 'HDR Custom bracket values' set to -7EV and +7EV. Below these are buttons for 'Safely Remove USB Drive', 'Power Off', 'Calibrate Compass', 'Calibration How-to Video', 'Workflow Checklist', and 'Format USB Drive'. The middle section includes 'HDR Midlevel' (130), 'AutoExp Target' (30), 'Access Point Name' (planitar-4e2bb9), 'WiFi Password' (masked), and 'WiFi Channel' (6). The right section features a 'Power Off Timeout' of 40 minutes, buttons for 'Save Settings', 'Reset to Factory Settings', 'Update System File', 'Update Firmware', and 'Save System Log', along with system information: 'Firmware Version: 1.3.22' and 'Serial Number: MS160502K001'. A bottom navigation bar shows 'Survey', 'Pano', 'Floor', 'Project', and 'Manage' tabs.

Figure 5. Manage tab.

Mute beep on user actions

Check the box to mute the beep that occurs after a panorama is taken or another action is completed.

HDR Custom bracket values

The values entered here will affect the custom preset selection found on the Survey tab. Values range from -1 to -7 and +1 to +7.

Safely Remove USB Drive

Tapping this button will disconnect the usb drive from the system software. Use this button when removing the usb drive while the camera is running to prevent data loss or corruption.

Power Off

The camera can be powered off remotely by tapping this button.

Calibrate Compass

The camera has built in compass that is used for various functions. The compass may need to be calibrated if frequent warnings occur. Follow the calibration procedure

Calibration How-to Video

Watch this video to learn the compass calibration procedure. The video is stored on the camera and can be viewed at any time.

Format USB Drive

You can format the usb drive while it is inserted into the camera. This can be used as a quick way to delete all the project data from the USB drive.

IMPORTANT NOTE: This will delete all the data from the USB drive permanently. Please be sure to backup all important data before formatting.

HDR Midlevel

Changing this setting will affect the brightness of the final HDR images.

AutoExp Target

Auto exposure will adjust the shutter speed automatically based on the available light in a space. The AutoExp target is a value that will affect the shutter speed and the brightness of the final images. Decrease this value for darker images and increase for brighter images. Once this value is set it will apply to all images taken by the camera from that point onward.

Access Point Name

Change the WiFi access point name to something other than the default.

WiFi Password

Change the WiFi password used to log into the camera's WiFi hotspot.

WiFi Channel

The WiFi channel can be changed to avoid problems when interference is encountered. Acceptable values range from 1 to 11 and Auto.

Power Off Timeout

Specify the length of time the camera will wait, while inactive, before automatically powering off.

Reset to Factory Settings

Reset all settings back to their factory default values.

Update System File

Update the camera's system file when a new one is available. A new system file is provided by Planitar and is available upon request.

Update Firmware

Update the camera's firmware when a new version becomes available.

System Information

Firmware version and camera serial number are displayed.

Save System Log

A log of system activity can be saved to the USB drive.

Automatic Mapping Mode (Advanced)

Once the Laser is switched On, the camera can be in two modes – AutoMap or Track. Automatic mapping mode (AutoMap) will allow the camera to map the house as you walk around while at the same time tracking the camera's position. **This mode is optional and is for advanced users only.** You can incorporate automatic mapping mode into your workflow once you are comfortable with capturing panoramas. The map data gathered in this mode is used for room positioning and

alignment only and is not required for drafting. To use automatic mapping mode follow the steps below:

1. Switch to the Survey tab.
2. Turn the Laser on.
3. Maximize the map view (tap on the resize icon in the upper right corner of the view).
4. Tap the Mode button to set the mode to AutoMap if the camera is in Track mode.
5. Start walking slowly and steadily and observe the map as it grows. Map the whole floor.

Once you mapped the whole floor, switch the camera to Track mode and proceed to shooting panoramas. In Track mode the camera will only track its position on an existing map and should not have to use the Move Pano operation.

It is possible to both map space and shoot panoramas in AutoMap mode while moving through space without switching to Track mode. For more complicated spaces or if you find that mapping errors occur frequently, it will be best to first concentrate all attention on mapping in AutoMap mode and then switch to Track mode and do a second pass through the space concentrating on shooting panoramas.

Automatic Mapping Tips

What you see in the map view is called occupancy probability map. White pixels indicate high probability of the space being occupied - walls will be white. Black pixels indicate high probability of the space being unoccupied - space without walls or other objects will be black. Grey pixels have 50-50 chance of being occupied or free and initially all map pixels are grey. In Map mode, as you walk around and the laser scanner probes the space, and pixel probabilities are constantly updated.

The camera tries to match each new scan with the existing map. If matching succeeds, the current scan is shown in green color. The map is then updated with the current scan provided the camera moved or rotated enough since the last map update. Red scan color means it could not be matched and the map will not be updated.

Below are important things to consider and keep in mind when mapping space:

You can pan and pinch-zoom the map view.

Avoid fast or sudden rotation of the camera. That is the main cause for mapping errors.

When walking through doors, move slower to give camera time to build a more reliable map of new space beyond the doors as you are entering that space. If you walk too fast, the map may build incorrectly, "bending" to one side.

When the current scan turns red, try taking few steps back to the last location where it was green.

If stepping back does not help or if you moved the camera while the laser was off and it lost its position on the map, you can move the scan into correct position manually. Follow these steps. Tap the **Move** button under the heading **Scan**. The current scan color will turn yellow. Drag the scan on the screen into place approximately. You can rotate the scan with a pinch. Tap Save when done.

If you see that the map is being built incorrectly, you can use **Undo AutoMap** action from **Map Actions** drop-down to backtrack and undo the last few steps and map updates. A restore point is created every 3m (9 ft). The camera keeps last five restore points.

If backtracking does not help, you can erase a part of the map or the entire map. Use **Map Actions/Eraser Map** option. All pixels visible within the map window will get erased and will become grey again. If you zoom into the map, you will erase only the zoomed part of the map.

If the camera is tilted too much, the **Tilt indicator** will turn red. Level the camera. Accelerated movement or fast rotation will also trip the Tilt indicator.

If you walk too fast, the **Speed indicator** will turn red. Slow down.

If you find yourself scanning at the edge of the map and the current scan stays red, use **Map Actions/Re-center Map** option.

If the map grows too large, use **Actions/Grow Canvas** option to double the size of the map. The initial map size is 30 meters (98 feet). The maximum map size is 240 meters (786 feet).

If you find that the current scan always stays red and cannot be matched even when using the Move Scan, you can use **Map Actions/Merge Scan** option while in the Move Scan mode to force adding the current scan to the map after you move it into place. That way you can manually build the map even for the most difficult spaces.

Mirrors will create reflected laser scan points on the map, resulting in virtual space. While that can be confusing at first, it will get easier to spot such reflections with practice and they will not affect the mapping process.

The range of the laser scanner is reduced for dark walls, so you will need to come closer to them.

The laser scanner has a 270 degree field of view with the 90 degree sector behind the camera being blind. Try to stay in that sector.

When mapping long hallways, hold the camera off to your side and slightly rotated, so that the scanner can see in both forward and backward directions along the hallway.

Moving people or objects close to the camera will make it harder for the camera to match scans.

Outdoor and Common Area Scans

The camera system can be used to capture scans that will appear outside of a floor plan. This is typically done to document interesting features outside the property like the exterior appearance, landscaping, pools, patios, decks, etc, or to document common areas in a condominium or apartment building. There is no limit to the number of exterior scans and their distance from the building.

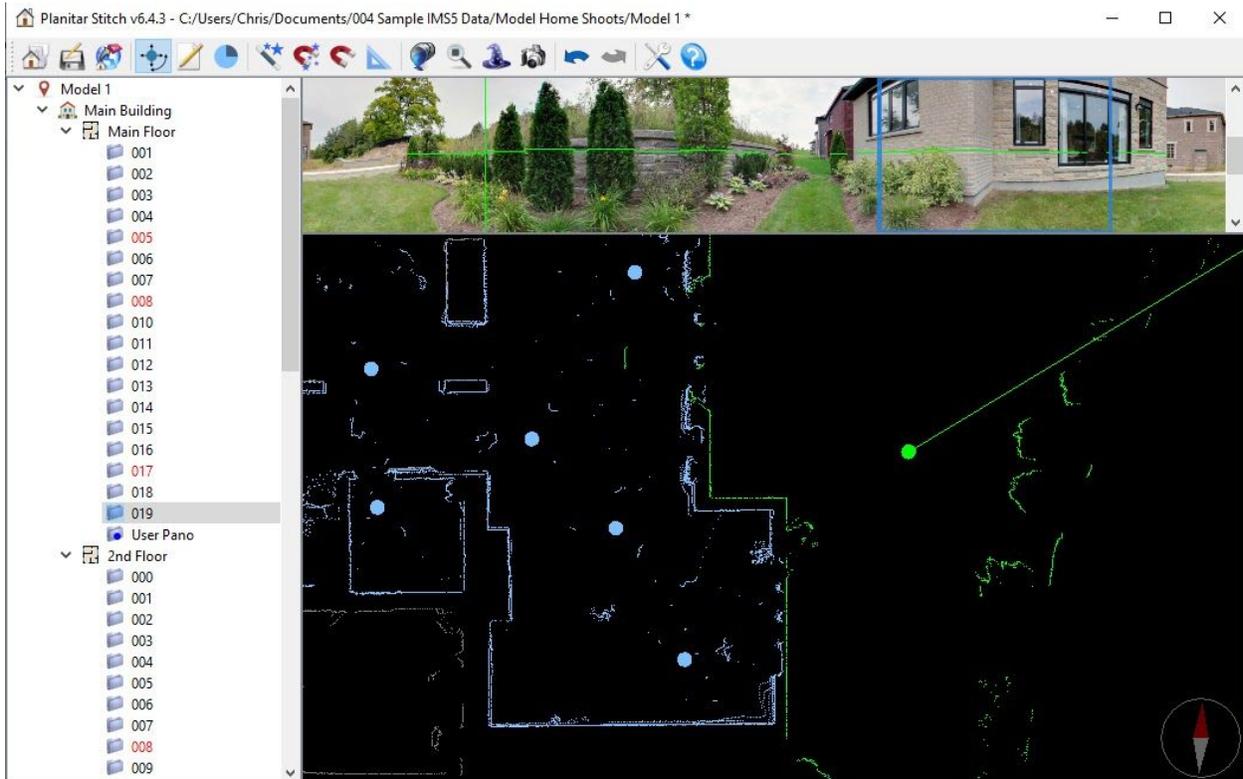


Figure 6. Exterior pano is highlighted in green.

The preferred way to align these scans is to position their data in the appropriate position relative to the rest of the data captured from the interior of the structure (see figure 6). When drafted, the scans will be placed in their approximate positions.

The scans can also be captured on a separate floor named "Common Areas" or "Exteriors." This will result in the scans being displayed in the iGUIDE on a separate floor, accessible from the floor selector, that has thumbnails instead of a floor plan for navigation.

Processing Data With Stitch

The Stitch application is used to pre-process the data collected with the Survey app and prepare it for upload to the iGUIDE Portal. The Stitch application can load and process multiple houses in parallel and can run unattended during that time. Below is a typical Stitch workflow.

About iGUIDE Images

The iGUIDE camera collects 3 fisheye images for each 360-degree panorama. The Stitch application can output 360-degree panoramas in two formats – six cubic tiles (always used) and photo spheres (optional).

The iGUIDE viewer uses cubic panoramas composed of six square images as the six sides of a cube (cubic tiles) with the view point being at the center of the cube. The cubic panoramas are the most compatible way to display 360-degree images on a wide range of computing devices including mobile phones. Another way to store 360-degree images is a photo sphere, where the complete 360-degree image is stored in one file in the equirectangular format with 2:1 aspect ratio for 360 by 180 degree coverage. Photo spheres are named s.pic. These files are created in each panorama folder when the Export operation is performed.

Many 360-degree image viewers accept photo spheres, notable examples are Facebook and Google Street View. The iGUIDE VR option also requires photo spheres.

Stitch allows editing panorama colors and alignment. Other image editing, such as editing out photographer reflections in mirrors is best done using the original fisheye images before they are imported into Stitch. Stitch outputs images in an encoded format for portal upload, so it is not possible to edit Stitch output directly. Once the images are uploaded to the portal, they can be downloaded for additional editing and re-uploaded again, one panorama at a time. There is a limited time window when the cubic tiles can be modified on the portal after the iGUIDE has been completed.

Stitch Workflow

1. Transfer house data from the camera's USB Flash drive to desktop computer. You can transfer data from camera either over network or directly on the USB drive. Do not process data directly off USB drive, as that may result in data corruption.
2. Press Load Project button and select a project folder. You can select multiple projects with a single click of the mouse on each folder. Fisheye images are automatically aligned for panoramas during house loading.
3. Check that the panoramas are correctly arranged by floor and drag them between floors if needed.
4. Check positioning of outside panoramas.
5. Check that panoramas are positioned and rotated to form a correct floor layout on each floor. It is important to have good panorama alignment for drafting team to be able to draft the project.
6. Leave any notes for the drafting team either on a floor using the Notes tool or at the project level by selecting the top level project in the tree view.
7. Rotate each floor to have walls parallel to the sides of the screen. All floors must have the same orientation.
8. Check that panoramas are properly aligned and the verticals are vertical.
9. Adjust panorama colors if desired.
10. Hide panoramas that you do not wish to be shown in the iGUIDE.
11. Review assignment of floors to buildings and wall thickness.
12. Select initial panorama and viewing angle.
13. Export the house data.
14. Upload the project file and gallery images to the iGUIDE Portal.

User Interface

The Stitch application main window is shown in Figure 5. Buttons on the toolbar represents available commands. When you hover the mouse cursor over a button, a tooltip with the button description and keyboard shortcut will appear if available.

Project Tree View

Once you load a project into Stitch, the left pane will show scans organized by floors and buildings. By default, there is only Main Building, but you can define additional buildings, such as a standalone garage or guest house.

You can drag scans between floors or reorder scans within a floor. You can also drag floors between buildings and reorder floors within a building. Panoramas without measurements, such as common areas in an apartment building, should be placed on a separate floor.

The order of floors in the house tree view will determine the order of floors shown in the iGUIDE. The order of scans within each floor determines the order in which scans are visited in iGUIDE Autoplay mode. By default, the scans are sorted by creation date. Floor right-click menu allows re-sorting scans by name or date.

The displayed floor names in Stitch are used to label floors in the iGUIDE. The displayed scan names are used in the iGUIDE only for floors that have no floor plan, such a common areas for an apartment building, where panoramas are displayed as a bullet list with labels. The ordering of panoramas in the list is the same as in the project tree.

When you right-click on the house, on a floor, or on a scan in the project tree, a context sensitive menu will pop up. On Macs with one button mouse you can use Ctrl-click to bring up the context sensitive menu.

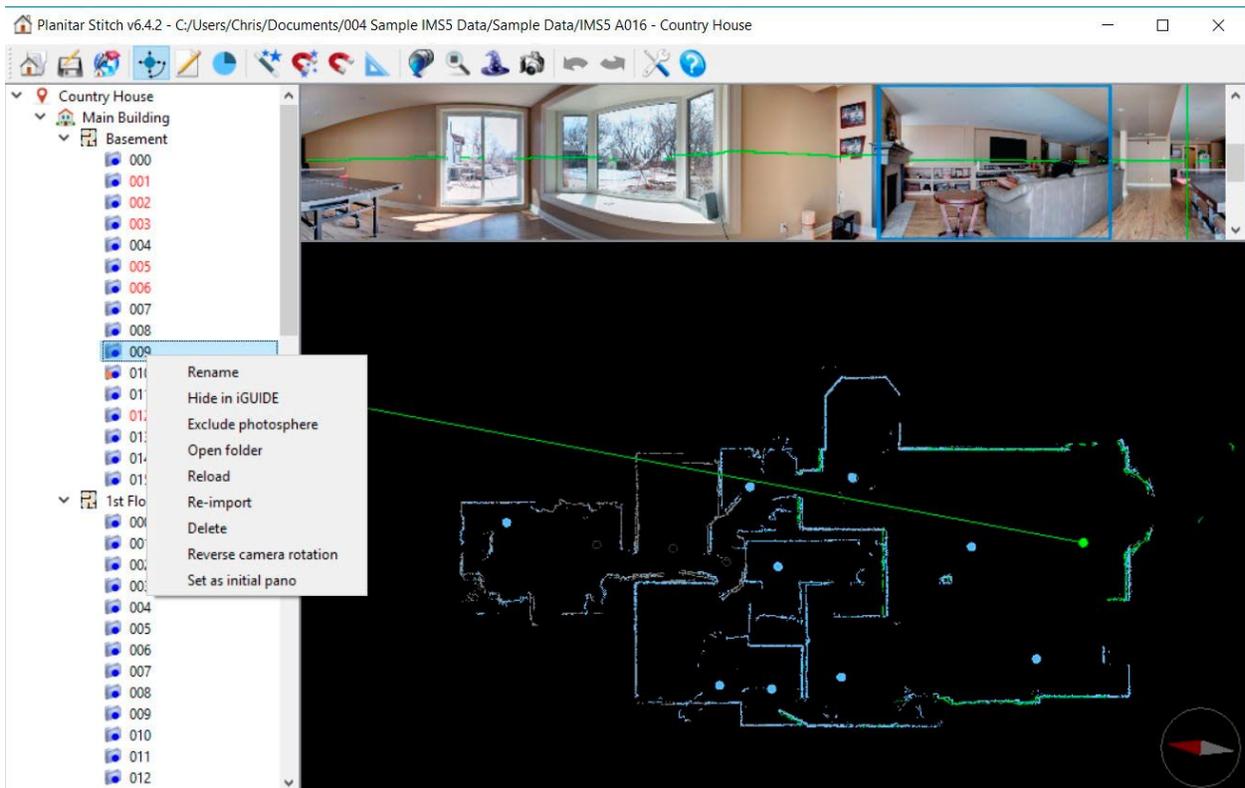


Figure 7. Stitch application.

You can hide a panorama in the iGUIDE using the context menu. Another way to hide/show a panorama is to click on it with the mouse wheel or middle mouse button.

The initial pano that will appear on iGUIDE load can be set here. An orange dot will appear on the panorama folder indicating that the initial panorama has been set..

Floor properties and settings can be accessed by left clicking on a floor name in the project tree as shown in Figure 8. You will be able to select above grade or below grade and enter a wall thickness for each floor individually.



Figure 8. Floor Properties and Settings.

Adding User Panoramas

The option to add user panoramas taken with another device, is available from the context menu by right clicking on any floor in the house tree view and selecting the Add User Pano option. User panoramas must be .jpg or .png images in equirectangular format. The panorama location can be moved and rotated, but the image cannot be edited on the adjustments window. When placing and rotating the panorama be sure to position it as closely as possible to its actual location relative to the rest of the data so that when viewed in the tour it appears to be a view of the property from that position.

Toolbar Buttons

Some buttons have keyboard shortcut commands and they are shown in the help screen.



Load Property(s). You can select multiple houses and they will be processed in parallel. The last selected house will get loaded and displayed at the end of processing.



Save. House data is saved automatically when the Load Project or Export buttons are pressed. You can use the Save button at any time.



Export. For each panorama a photo sphere s.pic will be created. A folder named "_Export" will be created inside the house folder. It will contain a .tar file with the data to be uploaded to the iGUIDE Portal for drafting the iGUIDE.



Move or Rotate Scans. Use this function to drag the active scan to fine-tune its position. A scan can be made active either by selecting it in the project tree view or by holding the Shift key down and clicking on scan points in the main window. Right-click and drag will rotate the active scan. On Macs with single button mouse use Ctrl-click to rotate. You can pan the floor with all panoramas with mouse and zoom in and out with mouse wheel. Select multiple scans to rotate them all at once.



Notes. Double-click on a floor to create and place a text label. Clicking on an existing label will select it, so that it can be moved or deleted with the Delete key. Use notes for passing comments to the drafting team about particular property features. Label all closed spaces that cannot be seen in panoramas because of a closed door and when it is not clear what the function of that space is, so that the drafting team knows how to label it properly. Pantries and closets are most frequent examples. Closets in bedrooms are easier to guess, so there is no need to label them generally. Label spaces as Excluded if you wish them to be excluded from Total Floor Area reporting.



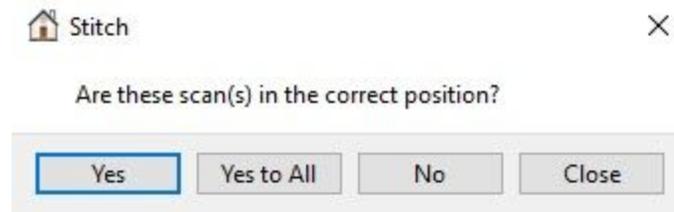
Set Initial pano direction. The panorama will show the selected initial direction when loaded. The blue box on the preview image represents what has been selected. This can be configured for every panorama



Figure 9. Initial panorama direction.



Arrange all panos. All panoramas will be aligned automatically. User input is required to confirm the positions of the data during this process if there are multiple locations where the data might belong. Click Yes to All to skip user input.



Arrange selected panos. Any panorama selected will be aligned to the rest of the data. If the button is clicked a second time the data will move to another likely position.



Fine tune selected panos. Any panorama selected will be aligned to rest of the data. The amount of movement and rotation subtle and is meant for more precise alignment when the data is already very close to being aligned.



Square up floor. Rotate all data to align with vertical and horizontal axis.



Panorama Coverage. Show panorama coverage of the floor to ensure drafting team will have enough data.



Zoom to Fit. Scale view to fit all measured points in the main window.



Adjust panoramas for alignment and color. The panoramas can be aligned manually using sliders or automatically with the Auto Align button. See Figure 9. There are two automatic alignment methods available, Align Using Features and Align Using Color. The first method uses alignment by key features (such as corners) and is the default method that is used during house loading, so images are already pre-aligned. It is fast and gives good results most of the time. Empty spaces without furniture may be harder to align using this method. The second method uses

alignment by color matching. It is slower and does not work in some situations, but can provide more accurate alignment. It works faster if the images are first pre-aligned using features. After the images are aligned, use the Verticals sliders to ensure walls are vertical. Or use the Auto button. All sliders can be controlled using arrow keys in addition to mouse control. You can adjust color for each panorama individually. For white balance, you can either use a color-picker tool on the images or use the Temperature slider. Try avoiding extreme slider positions as this may lead to color-banding. If any alignment or color adjustments are made, you will need to re-Export the house. If you find that you increase Exposure for most images, you can increase the HDR Midlevel setting on the camera found in Survey app on Manage tab.



Take Snapshots. You can use this tool to snap still pictures for the iGUIDE image gallery from fisheye images. See Figure 10. These pictures will have limited resolution, however. Compose a shot by panning with a mouse. The panorama can be rotated with the mouse wheel or right-click and drag for finer rotation control. On Macs with single button mouse use Ctrl-click. The field of view slider will allow you to create an image with a wider perspective.



Undo. When clicked this button will undo the last action taken. This button can be used more than once to undo multiple actions.



Redo. When clicked this button will redo the last action taken. This button can be used more than once to redo multiple actions.



Settings. In Settings you can choose processing options for when importing or exporting a house. Auto color adjustments can be enabled on import and following that a preset can be applied.



Help. A dialog with tips on the workflow and most common operations.

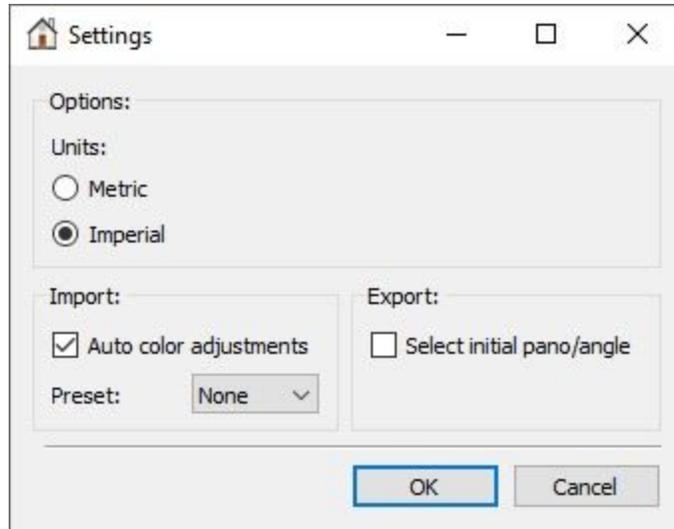


Figure 10. Stitch Settings.

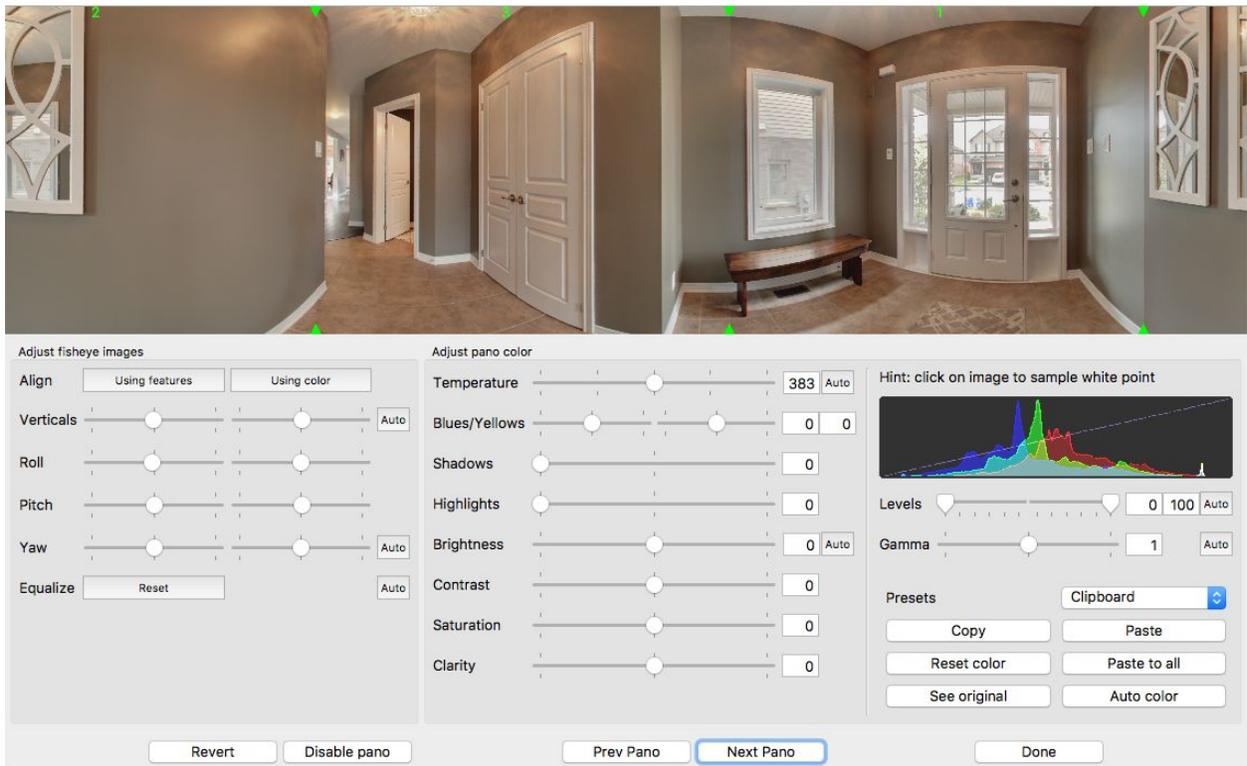


Figure 11. Align Panoramas and Adjust Color.

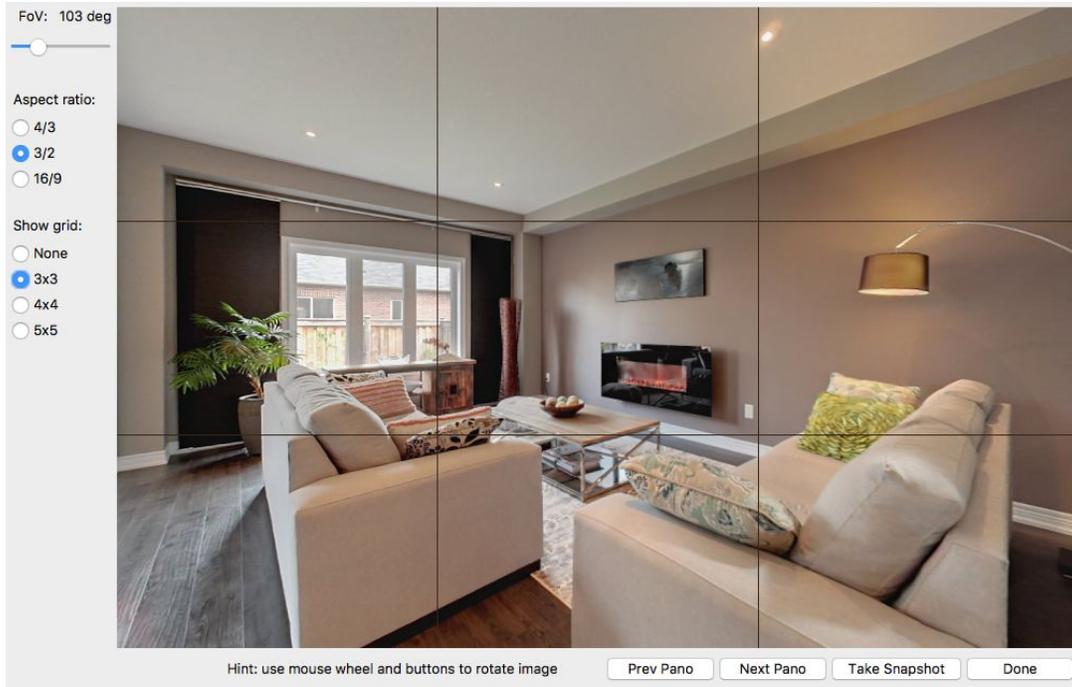


Figure 12. Take Snapshots.

Data Quality

This section will illustrate what is considered good and bad data. Bad data includes insufficient data or data not properly pre-processed for drafting. Planitar drafting team will not be able to draft a property until sufficient data is received and that data is acceptably aligned into correct floor layout. Below are examples with explanations.

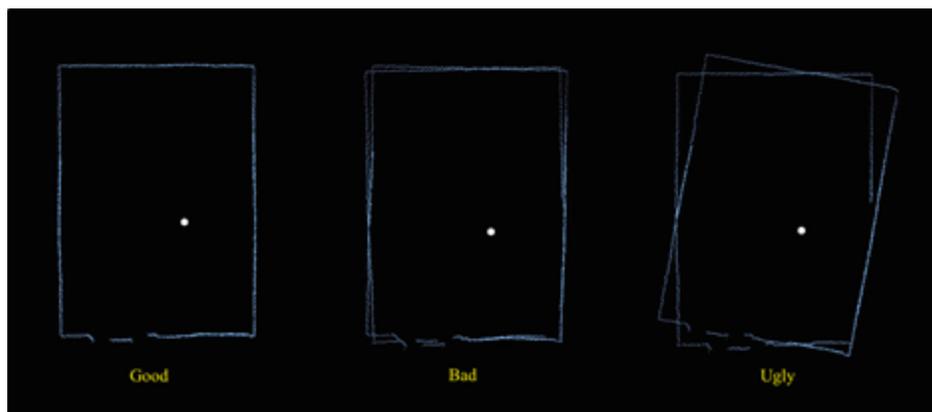


Figure 13. In Bad and Ugly cases, the camera was not placed in the rotator divot or the tripod shifted when rotating the camera. While Bad data can be used in drafting and Stitch can correct it,

alignment between images and floor plan in the iGUIDE may be off. The Ugly data can sometimes be used in drafting, but will have stitching issues in panorama with visible artifacts.



Figure 14. Very good and properly aligned data. Planitar drafting team will love you.



Figure 15. Not very well aligned data. Planitar drafting team may be able to correct room alignment, but will have to spend extra time doing that. Red-circled data resulted from improperly rotated camera. Reported dimensions for that room may be off.



Figure 16. Badly positioned and aligned data. Planitar drafting team will not accept this data for drafting until all rooms are positioned on the floor in the correct relationship and are sufficiently aligned.



Figure 17. Completely unaligned data. Planitar drafting team will not accept this data for drafting until all panoramas are properly positioned and aligned.



Figure 18. Wrong panorama rotation direction. It must be corrected in Stitch by using the Reverse Camera Rotation option.



Figure 19. Missing room data - not all rooms on the floor have image data, so windows and other features cannot be shown properly on the floor plan. Planitar drafting team will not accept this data for drafting.

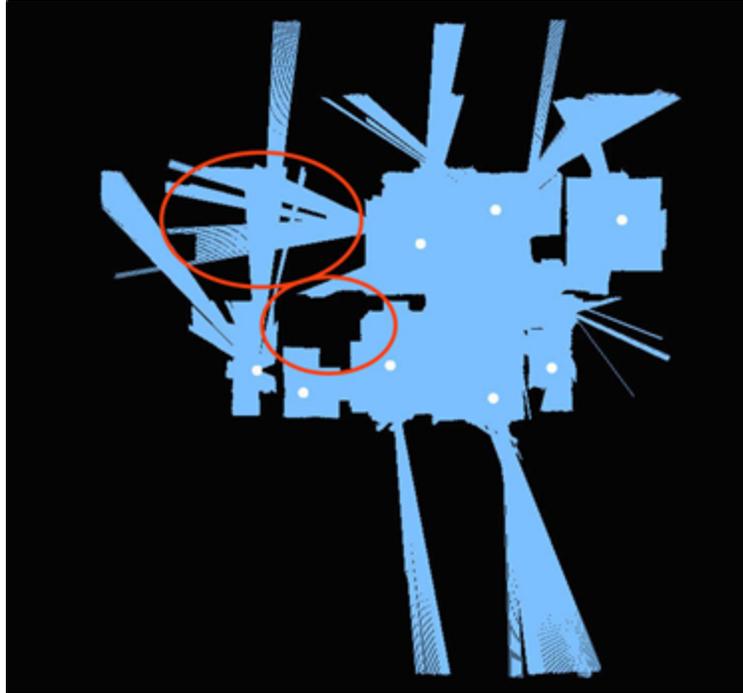


Figure 20. Missing data may be easier to see with the coverage mode enabled. Coverage can be visualized in both Survey onsite and in Stitch at home.

Maintenance

Fisheye Lens Cleaning

The fisheye lens should be kept dust-free as dust will appear in images as diffuse circles when shooting against bright objects. It is important to ensure there are no hard particles either on the surface of the lens or on the cleaning cloth that can scratch the lens' anti-reflection coating, so it is recommended to dust off the lens and the cloth with a bulb-style air blower before cleaning. The cleaning cloth must be lint free. You can breath on the lens to create a thin layer of condensation and then wipe it off with the cleaning cloth held stretched between two hands such that no direct finger pressure is applied to the lens. If you have spots on the lens that will not come off, you will need to use a lens cleaning solution or pre-moistened lens cleaning tissues and gently rub the spot with folded cloth and avoiding direct finger pressure.

Laser Scanner Optical Window Cleaning

The laser scanner conical optical window (top half of the scanner) needs to be kept free of dust. Wipe it with a micro-fiber or other soft cloth and avoid scratching the plastic surface. Do not use any solvents!

Compass Calibration

If you frequently get Survey warnings about compass angles failing consistency check when shooting panoramas, it is recommended to re-calibrate the compass. Choose Calibrate Compass in the Manage tab in Survey. You will need to rotate the camera approximately in three orthogonal planes or around three orthogonal axes. The How-to Video in the Manage tab will provide a demonstration. Camera rotation should be performed slowly and should take about 10-20 seconds to complete. If the calibration data collection is not completed in 60 seconds, the procedure will time out and will need to be repeated.

USB Flash Drive

Do not let the drive to run low on free disk space, that will slow down writing new data. Keep at least 50% of the drive free. Do not edit houses in Stitch off the USB drive, instead copy all houses from USB drive to your computer's hard disk first. That way you will also have a backup.

Factory Reset

A reset button is located beneath the hole at the top of the system controller. It can be used to reset all user settings, including Wi-Fi password, to factory defaults. To reset, power the camera on, wait until the LED at the top of the system controller is green and use a paper clip to hold the reset button down until the LED turns orange. **Do not keep the reset button pressed after the LED turns orange!** User settings can also be reset to factory defaults from the Manage tab. After Factory Reset it is recommended to perform **Compass Calibration**.

Firmware Update

To update system firmware, download a firmware update file **fw_update.7z** from the iGUIDE Portal Support area. Then follow these steps:

- Ensure the file is named **fw_update.7z** and put it on USB Flash drive.
- Safely eject USB drive to avoid file corruption.
- Ensure the system battery has at least one bar of battery charge.
- Insert the USB Flash drive into the camera system and power it on.
- Navigate in Survey to Manage page and use the Update Firmware button.
- If Survey does not reconnect automatically, ensure you are still connected to camera over Wi-Fi.
- In case of any Survey errors, clear browser history and navigate to <http://192.168.5.1>.

Update via WiFi

Stitch will detect older versions of the firmware automatically. Updates can be done in Stitch by connecting the camera to your computer via WiFi when prompted.

Troubleshooting

Wi-Fi connectivity

- If you do not see the camera among available Wi-Fi access points and cannot connect to it, turn Wi-Fi on your smart device off and back on before you try anything else.
- If your connection to camera from Survey seems to timeout, ensure your phone or tablet is still connected to the camera. It is possible that your phone or tablet connected to another access point, such as your home Wi-Fi router, if it had it saved previously.
- If when trying to connect to camera, you get a message about incorrect password and you know the password was entered correctly, try forgetting the camera from your smart device's list of Wi-Fi access points. If you do not remember the password, you will need to do factory reset.
- If your Wi-Fi connection to the camera works, but is slow, try changing Wi-Fi channel to Auto. If you want to set WiFi channel manually, the best channels are usually 1, 6 and, 11. The optimal Wi-Fi channel depends on the Wi-Fi environment in a particular location and on how many other Wi-Fi devices are transmitting on different channels.
- If you connection worked, but then stopped, try to return to the location in the house where it worked last and connect to the camera again and change WiFi channel to Auto.
- If you still cannot connect to the camera and are on Android phone, try turning off cellular data.

Survey browser compatibility

Make sure you are using the latest version of your browser on your phone or tablet. In some cases, that may require updating your operating system.

Removing reflections in mirrors

To remove photographer or camera reflections in mirrors, you can use any image editing software to edit h*.jpg files. If you edit the h*.jpg files after the project has been loaded into Stitch you will have to re-process the images by right clicking on the corresponding panorama folder and using the context menu.

Ball head drift

The ball head must be tightened so that the camera does not tilt when rotated on the panoramic rotator. If extra force is required to achieve a good lock of the ball head, the ball may need to be degreased for a better grip. Wet a paper towel with rubbing alcohol, put it in contact with the ball in the ball head and rotate the ball around to wipe its whole surface. If that does not help, the ball head may be too small for the weight of the camera.

Miscellaneous Survey issues

If you run into any issues with Survey, first try re-loading the web app using the Page Reload button from the Survey tab. In case of continued problems, power cycle the camera. When instructed by Planitar, you can save System Log file from the Manage tab and send it to Planitar for further troubleshooting.

Wrong camera rotation direction

If the camera was not rotated in the clockwise direction then measured points and panoramas will have incorrect ordering. If discovered onsite, it is easiest to just re-shoot a panorama. To fix the ordering during post-processing, follow these steps:

1. Right click on the affected panorama folder in Stitch.
2. Select Reverse Camera Rotation.

This will correct the problem and the results will be visible in Stitch immediately when looking at the laser measurement data or the panorama preview image.

Battery Charging

If the system battery is completely discharged (no charge bars are shown on the battery's LCD display) and the battery does not charge when the charger's power supply is connected to the charger (green light on the charger is not blinking), a different charging start up procedure must be used. First, disconnect the battery from the charger by sliding out it just enough as to break the electrical contact between the battery and the charger. Second, unplug the power supply from the charger if it was plugged in and then plug the power supply into the charger again – the green light should illuminate on the charger, but it will go out in 2-3 seconds if no battery is detected. Third, while the green light is still on, slide the battery into the charger. If the green light does not start blinking indicating that the battery is charging, repeat the procedure.

Specifications

Product Name

Indoor Mapping System 5

Product Model

IMS-5

Performance

Measurement range: up to 10m (30ft)

Measurement uncertainty: +/- 10mm up to max range (typical, based on at least 60cm wide wall segment)

Laser scanner field of view: 270 degrees

Lens: 5.6mm, F/5.6, 185 degrees field of view, full circle fisheye

Shots for 360 degree panorama: 3

DSLR camera sensor: 18 megapixels

Electrical

System power: 14.4V 49Wh Li-Ion battery, user-replaceable

System battery charger: Input - 100-240VAC, 50-60Hz, 1.4A; Output - 24VDC, 2.7A

DSLR camera power: 7.4V battery, user-replaceable

System battery capacity: 8-10 hours of typical operation

Wireless

Wi-Fi 802.11 g/n 2.4GHz Access Point

Mechanical

System unit weight: 2.4 kg (5.2 lbs)

System unit dimensions: W: 15.3cm (6.0") x D: 15.7cm (6.2") x H: 24.6cm (9.7")

Tripod mounting thread: 3/8-16 (1/4-20 with included adapter)

Shipping weight (with storage case, without packaging): 5.5 kg (12 lbs)

Storage case dimensions: W: 37cm (14.6") x D: 24cm (9.4") x H: 34cm (13.4")

Environmental

Operating temperature range: 5-40 degrees C (41-104 degrees F)

Storage temperature range: 0-45 degrees C (32-113 degrees F)

Relative humidity: 0-80%

Radiation Safety

CLASS I LASER PRODUCT

Regulatory Compliance

FCC PART 15, SUBPART B, Class B

CAN ICES-3 (B)/NMB-3(B)

CISPR 11:2009 + A1:2010 / EN 55011:2009 +A1:2010

EN 61326-1:2013

IEC 60825-1 2007-03 Ed. 2.0

21 CFR Subchapter J Parts 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

Canon EOS Rebel T100 Menu Settings

These are factory settings and should not be modified, unless noted.

Camera controls

Set Mode Dial to M

Set ISO to 200. Can set to 100 for sunny locations.

Shooting 1

Quality: L 18M

Beep: Disable

Release shutter without card: Enable

Image review: Off

Peripheral illumin. correct.: Disable

Red-eye reduc.: Disable

Flash control: Firing - Disable

Shooting 2

Auto lighting optimizer: OFF

Color space: sRGB

Picture style: Faithful

Shooting 3

ISO Auto: Max 400

Shooting 4

LiveView shoot: Enable

Grid display: ON, Grid 1

Aspect ratio: 3:2

Playback 1

N/A

Playback 2

Histogram: Brightness

Setup 1

Auto power off: 30 sec

Auto rotate: Off

Setup 2

Feature guide: Disable

Setup 3

WiFi: Disabled

Custom Functions (C.Fn):

C. Fn I: Exposure <1> Exposure level increments: 1 - 1/3 stop

C. Fn I: Exposure <2> ISO expansion: 0 - Off

C. Fn I: Exposure <3> Flash sync. speed in Av mode: 0 - Auto

C. Fn II: Image <4> Long. exp noise reduction: 0 - Off

C. Fn II: Image <5> High ISO speed noise reduction: 3 - Disable

C. Fn II: Image <6> Highlight tone priority: 0 - Disable

C. Fn III: Autofocus/Drive <7> Af assist beam firing: 1 - Disable

C. Fn IV: Operation/Others <8> Shutter AE Lock button: 0 - AF/AE lock

C. Fn IV: Operation/Others <9> Assign SET button: 0 - Normal (disabled)

C. Fn IV: Operation/Others <10> Flash button: 0 - raise built-in flash

C. Fn IV: Operation/Others <11> LCD display when power ON: 1 - Previous display status