

SABRE *II* COGNISYS



Owner's Manual

Revision 1.0



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1. Safety Instructions


WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Follow all CAUTION notices to reduce the risk of personal injury, prevent damage to the Sabre equipment, accessories, and devices (computers, cameras, flashes, etc). Failure to follow all CAUTION notices may void your warranty. CAUTION may also indicate a potentially hazardous situation which, if not avoided, may result in personal injury.

The safety alert symbol  precedes a general CAUTION or WARNING statement.

The electrical hazard symbol  precedes an electric shock hazard CAUTION or WARNING statement.


 **CAUTION:** Only use approved power sources for Sabre equipment. Use of other power adapters or batteries may damage the sensor and/or attached equipment.

 **CAUTION:** Misuse of Sabre equipment could potentially damage your equipment. Cognisys, Inc. will not be held liable for damage to your equipment. If you have questions about safety please contact us!

CLASS 1 LASER PRODUCT

CLASSIFIED EN/IEC 60825-1 2007

Complies with US FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

 **CAUTION:** No user should modify Sabre or operate it without its housing or optics. The operation of Sabre without a housing and optics or modification of the housing or optics that exposes the laser source may result in direct exposure to laser radiation and the risk of permanent eye damage. Removal or modification of the diffuser in front of the laser optic may result in the risk of permanent eye damage.

2. Getting Started

The latest version of this manual is available on our website at:

<https://www.cognisys-inc.com/downloads/sabre2/Sabre2Manual.pdf>

The graphics/menus included in this manual may not be identical to the software that you are running. Improvements and adjustments to the software may happen prior to an updated version of the manual.

Not big on reading manuals? (What? No thumbs-up? We worked hard on this you know!) We have a few real world setups in the “0 - 7. Examples” section. There is also the “Quick Start” in “2.5 - Quick Start Guide”. You can always come back to the technical details if you get stuck. You really should finish reading this section though – it goes through battery replacement and the basic care of your Sabre.

2.1 What is Sabre?

Sabre is a dual-purposed sensor for capturing a variety of wildlife. It uses the latest technology to support excellent still and videos.

Let's go over the features:

- Dual sensor technology including laser ranging (LIDAR) and passive infrared (PIR)
- Months of battery life depending on configuration
- Visible laser for aligning the LIDAR
- Weatherproof housing
- Wifi connectivity to your computer, tablet, or phone to adjust settings
- Wireless connectivity to other Scout products
 - Compatible with the Scout Camera Box and apps
 - Compatible with Scout LED's and flashes
- Customizable camera control (number of pictures, time windows, etc)
- Full featured power management options
- Complex multiple triggering options
 - Internal PIR wakes LIDAR for pin-point accuracy
 - External wakeup by any Scout sensor
 - Half-press pre-wake to reduce camera shutter lag
- Can limit the number of shots to reduce nuisance triggers (curious squirrels)
- ¼-20 tripod mounts
- Power: Internal swappable Li-Ion battery and external power
- > 200 days of battery life (use-case dependent)
- Wide operating temperature range: -40C – 60C (-40F – 140F) battery limited

2.2 What is Included

The Sabre includes:

- Sabre Sensor
- Li-Ion battery
- ¼-20 tripod mount
- Free PC/Mac application for setup
- Camera/charging harness (optional)
- iOS/Android app (optional)

If you purchased Sabre as a kit it may include additional accessories.

2.3 How It Works

There are several different infrared technologies out there to detect objects. We'll go through a quick discussion of their pros and cons.

Passive Infrared Detector (PIR/PID):

PIR sensors look for a change in temperature from the field of view they're currently looking at. The temperature change could be warmer or colder, causing the sensor to trigger.

Pros: Relatively inexpensive, efficient power usage

Cons: False triggers, slow response time, temperature based, poor performance through glass, no absolute distance (just that some temperature changed in its field of view), sensitive to sudden temperature changes (direct sunlight, followed by clouds).

Infrared Triangulation:

Infrared Triangulation uses a high-powered infrared LED transmitter (flashlight) and a sensitive infrared receiver (think of it as its eyeball). The transmitter sends out a pulse of infrared energy and then the receiver measures the angle of the reflected light. With a little trigonometry you can determine the distance an object is away from the sensor.

Pros: Absolute distance can be measured, fairly fast, not temperature sensitive

Cons: Maximum range and returned distance can be affected by sunlight, range is limited using IR LED's, the transmitter "fan-out" makes it difficult to detect small objects at a distance.

Laser Time of Flight (LIDAR):

This is the technology that Sabre incorporates (in addition to PIR). A high-powered (but eye-safe!) infrared laser is turned on and off rapidly (500 billionths of a second in Sabre's case). Sabre then measures the *time* it takes for that laser beam to get to the target and be reflected back to its detector. If you're a techno-geek, we can tell your ears have just perked up a bit. For the rest of you – this is really cool! The speed of light is *fast* -- 300 million meters per second, or 186,000 miles per second. The nice thing is that in our application, the speed of light is constant. So *if* you can measure how long it takes to get from the Sabre and back to it, you'll know the distance (since distance is: speed × time). The tricky bit is trying to measure something that fast – but we have that covered! To maintain the accuracy, several measurements are used for every "sample" that is used to determine the distance. Typical measurement accuracy is ±2.5cm/1in up to 12 meters/39 ft (5% worst-case). Also, because a laser is used instead of an infrared LED, the beam width/fan-out is quite small. The beam-width is the distance you are at multiplied by 0.035. So at one meter the beam width would be 0.035 meters, or 3.5 cm. That's pretty small!

Pros: Accurate, long range, sunlight tolerant, temperature independent, fast response time

Cons: Expensive (sorry about that!) and power hungry.

Now that we've gone through the different technologies let's talk about what makes Sabre special. It incorporates both passive infrared and LIDAR together. As a user you can select which technology to use or a combination of both!

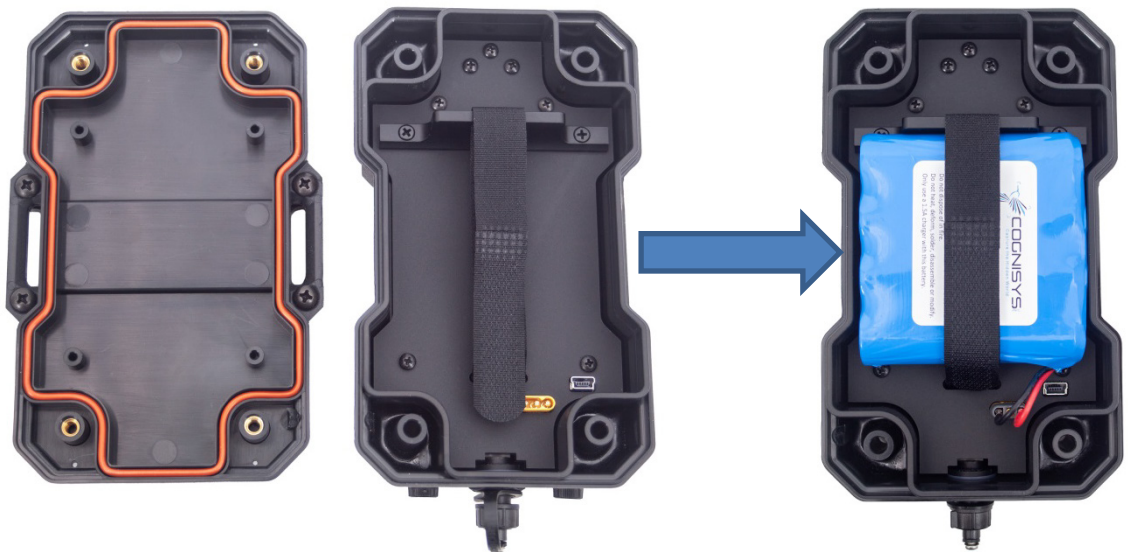
Are you doing bird photography? High speed LIDAR is for you. Camera trapping? Low speed LIDAR would be perfect. Better yet is the combination of the two sensors. Use ultra low-power PIR to have a wide look for your subject and then have it turn on LIDAR for pin-point detection (and avoid false triggers from the PIR).

Is it difficult to set Sabre up with all these options? Absolutely not. By default Sabre has "auto" modes for both LIDAR and PIR to automatically configure the sensors if it detects other Scout camera trapping equipment. The "Auto" settings are discussed in sections "4.2.2.1 - Power Mode" and "4.2.3.1 - Mode". If you don't like the default settings you can easily change them to customize your needs.

2.4 Battery Installation

Battery installation is a simple process and because Sabre has excellent battery life – you won't have to do it often!

Sabre requires our 14.8V high capacity Li-Ion battery. For details about maximizing battery life see section "7 - Maximum Battery Life".



1. Be sure Sabre is clean prior to replacing the battery otherwise dirt may compromise the weatherproof seal.
2. Remove the four screws from the front corners of Sabre using a Philips screwdriver.
3. Remove Sabre's back cover.
4. Loosen and open up the hook-and-loop strap.
5. Align the battery as shown above and plug it into the yellow connector. Note: The orientation of the battery is important as the back cover may not seal if not installed correctly. Also make sure the wires will not interfere with the back cover seal.
6. Align and push back cover onto Sabre.
7. Install screws being careful not to cross-thread them.

Sabre can charge its own battery using internal charging circuitry with the Sabre 5-pin harness. You can also power Sabre with external power using this same cable.






You do not need to remove the internal battery when using external power but you should remove the battery if the sensor will not be used for an extended period.

Note: Do not store Li-Ion battery packs in a fully discharged state. This could damage it.

2.5 Quick Start Guide

Want to be up and running in two minutes or less? Sabre II is configured to work right out of the box with the Scout Camera Traps – no settings changes needed. If you are unsure about a particular setting stay with the defaults. Here's the quick-start guide in case you misplaced it:

Quick Start

-  Press to turn on Sabre. Press and hold to turn off.
-  Press to turn Wifi on or off.
-  Cycles through the modes. See the back for using Auto / Manual mode.
-  Changes to manual mode and uses the current distance to the subject as your trigger distance.
-  Press to turn alignment laser on or off.



"Auto Mode" will auto-range the distance that it "sees". When a subject crosses 75% or closer to Sabre it will trigger your camera. Point and go!

"Manual Mode" requires that you set the maximum distance you would like to detect. Simply point Sabre at an object and press the "Set" button. Anything that distance or closer will trigger your camera.

There are many other settings and modes you can use. Be sure to check out the owner's manual for more details. As always, please let us know if you have any questions. We're glad to help!

support@cognisys-inc.com
www.cognisys-inc.com

Phone: 231-943-2425

2.6 Cleaning and Care

We want your Sabre to last – so here are some brief steps to keep it happy!

2.6.1 Cleaning

For cleaning we recommend a slightly dampened (not wet) micro-fiber cloth. Do not spray water directly into the inside of the equipment. Any liquid that goes into the sensor may cause an electrical failure of the device. Do not use a flammable liquid/solvents or cleaning agents on the sensor – just a micro-fiber cloth (dampened if needed).

2.6.2 Care and storage

Sabre is designed to handle normal wear and tear but there are some things to avoid:

- For best performance keep the IR window in front of the LIDAR sensor clean.
- Do not get the unit wet internally.
- If not using the external connector be sure to attach the protective connector cover or water may leak into the sensor causing damage.
- Do not drop the unit.
- Protect the unit's IR/clear windows and membrane when packing up your gear. If a tripod fights the windows or membrane on the sensor – the sensor will lose.
- Do not allow dirt to get into the weatherproof seal. This could cause seal failure and damage to Sabre.

Failure to properly care for Sabre could result in a leak that may damage it. The product warranty does not cover water damage resulting from user error.

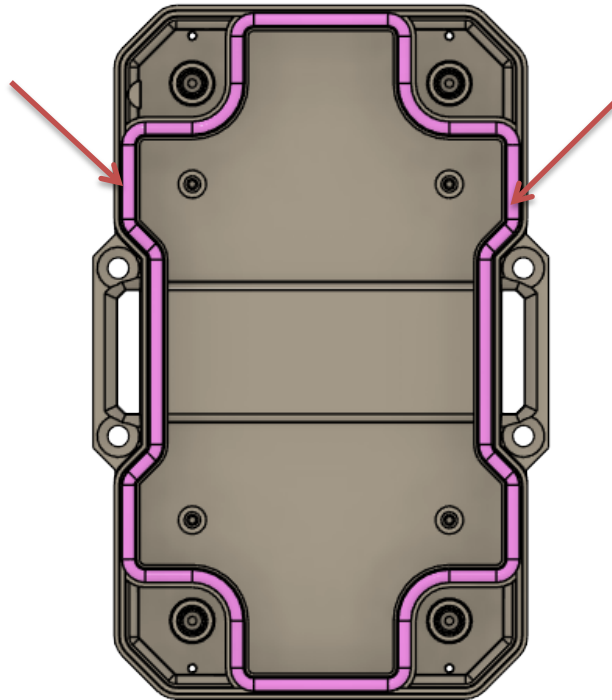
2.6.3 Maintaining Weatherproof Design

Sabre is designed to meet the most challenging environmental conditions. It does, however, require some care to maintain its weatherproof sealing.

Prior to opening the equipment rinse it under gently running water if it is dirty.

It's very important to keep the housing's silicone seal clean. A single hair or grain of sand could potentially cause the housing to leak and damage the equipment. To clean the seal remove the back cover from the housing, and rinse the back cover in fresh water and shake dry (drying with a cloth may cause lint to compromise the seal). Allow the seal to dry prior to reassembly.

Below is an image indicating the seal location. It is recessed in a groove in the back cover of the equipment.



2.7 Sabre Connections

There is a single 5-pin connection for Sabre.



The three ends of the cable are as follows:

1. 3.5mm camera shutter cable.
2. RCA connector for dual-sensor and external flash (optional use)
3. 2.1mm power for charging and operating the device.

3. Basic Use

In this section we'll go into the basics of using Sabre without any computer or phone app. If you find your eyes glossing over with all the technical discussion you can always skip to the "0 - 7. Examples" section to start using your Sabre.

3.1 Buttons

There are five buttons on Sabre:



This is the power button. Press this button to turn on Sabre. To turn off Sabre simply press and hold this button for approximately two seconds. Pressing this button will also turn on the Scout Camera Box Wifi (if available).

Note: You can also give the power button a quick press to temporarily stop the "Half Press Always On" feature discussed in section "4.2.1.9 - HP Always On".

The power button can also be used to load the factory defaults. See section "4.2.13 - Load Defaults" for details.



The Wifi button will turn on/off Wifi. Wifi will automatically turn off after about 5 minutes to conserve power. Press it again to turn it back on. The blue indicator LED will be lit when Wi-Fi is on.



Pressing this button will cause Sabre to measure the current distance to what it "sees". Anything that crosses that distance or closer will activate the camera. This will also change the LIDAR mode from auto-ranging to manual.



The Mode button will toggle between "Auto" and "Manual" modes. "Auto" means that Sabre will auto-range the distance and automatically adapt to it. By default anything from 85% or closer to the sensor will trigger the camera. "Manual" mode uses a specific distance that is set using the "Set" button or via the app.



This will turn on or off the visible red laser alignment. The laser will automatically turn off after two minutes to conserve power.

3.2 LED Indicators

There are six LED indicators on Sabre.



The power LED indicates if Sabre is currently turned on (brilliant!). It also indicates if the battery is charging.

Solid on: Sabre is running from the battery or the battery is fully charged.

Ramping up/down: The battery is currently charging.

Flashing on/off: There is a battery fault. There is a problem with the battery or the current temperature is outside of safe charging parameters.



Indicates if Wifi is currently enabled.

● Auto

● Manual

These two LED's show what current mode the LIDAR is using.



This LED is located at the bottom integrated with the Sabre logo.

This is a multi-function LED. It will blink red every time the camera's shutter is activated.

If the "Shot Limit" feature is enabled and the shot limit is reached it will quickly flash red. See section "4.2.7 - Shot Limit Settings" for details.

The LED will flash green briefly if using the PIR wake-up feature discussed in section "4.2.3.1.2 - Wake."

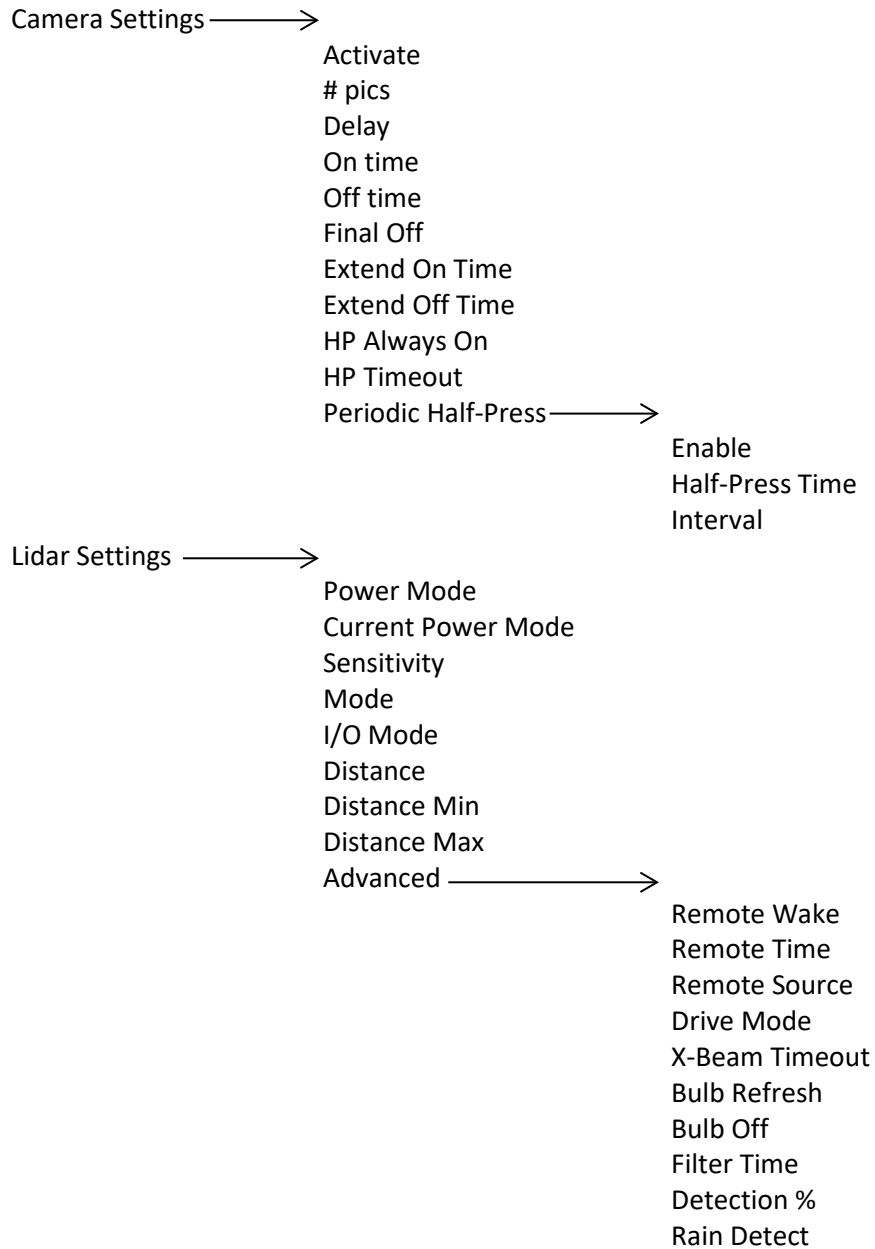
Note: If Sabre detects Scout camera trapping equipment it will automatically dim and extinguish all of the LEDs after one minute to conserve power. Tap the power button to turn them back on.

4. App Settings

Sabre has several adjustable settings for advanced users. Don't let all these options overwhelm you though! There is always the "Examples" section to walk you through a few real world scenarios.

4.1 Settings Navigational Map

Below is the navigation map for all the settings. The links are "clickable" to get you to the specific details about the setting.



- PIR Settings →
 - Mode
 - Sensitivity
 - Wake Time
- Wireless Settings →
 - ID
 - Channel
 - Wakeup Speed
- Wifi Settings →
 - Channel
 - Security
 - Password
 - Timeout
- Time Settings →
 - Enabled
 - On Time/ Off Time
- Shot Limit Settings →
 - Limit Enabled
 - Shot Limit
 - Limit Window
 - Limit Timeout
- Power Settings →
 - LED Brightness
 - Shutdown Voltage
 - LED On Trigger
 - LED Debug
- Show Stats
- Measure
- Software Version
- Battery %
- Load Defaults

4.2 Settings Description

4.2.1 Camera Settings

Sabre gives you plenty of flexibility for controlling your camera. You can choose how many pictures you want, how long the half-press is held (focus or wakeup), how long the shutter button is pressed, and even the time between each shutter button press.

4.2.1.1 *Activate*

This will trigger your camera using the settings below.

4.2.1.2 *# pics*

This is the number of times you would like to take a picture when Sabre detects something. This assumes your camera isn't in burst mode, of course! We'll also refer to it as "shutter activation".

4.2.1.3 *Delay*

This is the first step after Sabre detects something. During the delay time the camera's half-press is held down. Some cameras are quite slow to wake up before they'll respond to a shutter activation. You can use this "delay" time to make sure your camera is ready to go! Also since the half-press is held down you could potentially use this to try and get a focus lock on a subject if your lens is set to auto-focus. If "delay" is set to zero then both the full press and half press will be activated immediately.

4.2.1.4 *On time*

Once the "delay" time expires (or completely skipped if it is set to zero), the camera's full-press (shutter activation) will be held down for this time.

If your "delay" time is set to zero you will want this "on time" to be at least long enough to wake your camera out of sleep mode.

If your camera is set to burst mode, this is how long the burst mode will be active (minus the wake-up and lag time of the camera of course).

4.2.1.5 *Off time*

The "off time" is how long the shutter button is released. If your "# pics" is greater than one, this will be the duration between pictures.

Once this time expires, Sabre will start looking for another subject.

4.2.1.6 *Final Off*

Final off determines if the off time will happen after the last shutter activation. Here are two use-cases.

- 1) The “# pics” is set to one. If “final off” is set to on, then you can use the “off time” to set how long Sabre will ignore any additional subjects walking through the beam.
- 2) The “# pics” is set to two. The first shutter activation could start a video recording. You would then set “off time” (the time between shutter activations) to how long you want to record the video (let’s say 30 seconds). Then the second shutter activation would happen (because “# pics” is set to two). But for this application, you do NOT want the final off time, because it would mean you’d be waiting another 30 seconds before the Receiver would detect anything.
- 3) Use the final off time to give your camera time to finalize writing of the video or image burst before Sabre II will send the next activation. This also prevents camera from getting out of sync with video record/stop signals.

4.2.1.7 Extend On Time

For some applications (especially video) you may want to extend the duration of the shutter activation if beam activity continues. If “Extend On Time” is enabled and the shutter outputs is currently active, each time the beam is broken again the “On Time” will be extended by its programmed value. See the example below:

The “On Time” (See section “4.2.1.4 - On time”) is set to 10 seconds to record a deer as it is passing through the beam. As it would turn out, several deer are going through the beam path and ideally you would want the video recording to continue. As soon as the first deer crosses the beam, Sabre will activate video recording and keep the shutter press held down for the 10 seconds. As long as additional deer cross the beam within that 10 seconds, the shutter time will reset to 10 additional seconds each time a new deer crosses the beam.

4.2.1.8 Extend Off Time

Identical to “Extend On Time” except that the off time will be extended. If using this feature be sure to enable “Final Off” otherwise there may not be an “Off Time” to extend if the “# pics” is set to 1.

4.2.1.9 HP Always On

This will keep the half-press held down on the camera. Why would you want to do this? It can significantly reduce the camera’s shutter lag when shooting something that is moving quickly. Keep in mind that using this feature will quickly discharge your camera’s battery. This is definitely not an option for camera trapping! This is often useful for birds in flight if your camera has a long shutter lag.

4.2.1.10 HP Timeout

One of the problems with keeping the half press down on the camera will prevent you from reviewing images on the camera. You have two options – Unplug the shutter cable from the camera (not great) or simply tap the power button on Sabre. “HP Timeout” is how long the half-press will be released before automatically getting set again. This only applies if “HP Always On” is enabled.

4.2.1.11 *Periodic Half-Press*

Sabre has the capability to periodically give your camera a half-press. Why in the world would you want to do this given that it will decrease the battery life of the camera?

Some cameras (Canon) will exit live-view video recording if allowed to sit idle (in sleep mode) for about 30 minutes. The next time you wake them up – you’ll find the camera requires a physical button press to get it back into video mode. Less than ideal when your camera is sitting in a water-tight box for months at a time.

Sony cameras will also go into a “deep sleep” after 24 hours and take significantly longer to wake up.

Periodic half-press can work around this problem by every so often giving the camera a good *poke* to make sure it doesn’t do something as silly as leaving video mode!

4.2.1.11.1 *Enable*

Selecting this will enable or disable the Periodic Half-Press feature.

4.2.1.11.2 *Half-Press Time*

This is how long the half-press will be held down on the camera at the specified interval. Most cameras will wake up with a 0.5 second interval (the default).

4.2.1.11.3 *Interval*

The “Interval” is how often the camera will receive the half-press signal. You can specify minutes or hours.

4.2.2 **Lidar Settings**

The following settings are specific to the integrated LIDAR sensor.

4.2.2.1 *Power Mode*

There are three power modes available for the LIDAR. The performance and power consumption will vary depending on what mode is selected.

Auto: Let Sabre decide which mode is best for you. If Scout equipment is present the LIDAR will operate at a lower speed (sample every 100ms or 10 times a second). If no Scout equipment is found it will operate at 10ms (100 samples a second). The assumption here is that if you are using camera trapping equipment you likely don’t need high speed performance – just pin point accuracy.

High: Sample every 10ms (100 samples per second). This is ideal for bird or other fast moving subjects. High power will decrease the battery rapidly though and under most cases shouldn’t be used for camera trapping. See section “10 - Specifications” for battery life using the different modes.

Low: Sample every 100ms (10 samples per second). This is ideal for camera trapping where extended battery life is essential.

4.2.2.2 *Current Power Mode*

This is an indicator for the current power mode. When “Power Mode” is set to “Auto” this will show what Sabre decided is the best power mode for your setup.

4.2.2.3 *Sensitivity*

Normally you would want Sabre to respond as fast as possible when it detects a subject in its beam path. There are times, however, that you may want to decrease the sensitivity in order to ignore potential “false triggers”. False triggers are in quotes because in environments where there are several large insects (bees, moths, butterflies) it is possible for Sabre to detect them – which may not necessarily be what you want! For this setting: 1 = NOT very sensitive -- big slow moving subjects are required to trigger. 10 = very sensitive. Under the covers this determines how many samples the subject needs to be present before activating the camera. **Note to Sabre V1 users:** Sensitivity of 10 is now the maximum sensitivity.

4.2.2.4 *Mode*

4.2.2.4.1 *Auto Range*

In “Auto Range” mode, Sabre will automatically adjust its maximum detection range depending on what it is pointed at. When it detects an object that is closer than the “Detection %” (see section “4.2.2.17 - Detection %”), the shutter outputs will activate to fire your camera. Simply point Sabre toward where you expect your subject to be. Setup couldn’t be easier! Keep in mind that if you move the sensor, it may trigger your camera as it will detect something within the “Detection %”. Don’t worry, though – it will quickly adjust to the new environment (the time that it averages this range is adjustable too – See section “4.2.2.16 - Filter Time”).

4.2.2.4.2 *Manual*

“Manual” mode requires you to set the maximum distance that a subject will be detected. This can be done directly on the sensor using the “Set” button, or in the app (press “Measure” next to “Distance” or enter a number). If using the “Set” button on Sabre, just point it at a tree or the ground and press the “Set” button. If using the app, you can use this same process or stand in front of the sensor. Any subject at that measured distance or closer will cause the sensor to trigger your camera.

Unlike the “Auto Range” mode where it backs off the maximum range by a percent, “Manual” mode will use the actual distance measured. This is worth noting because if you do use something down-range like a tree to set your distance, you’ll want to move the sensor back a ways after setting the maximum detection distance. This

will give you some safety room so measurement error (even as slight as it is) won't cause false triggers.

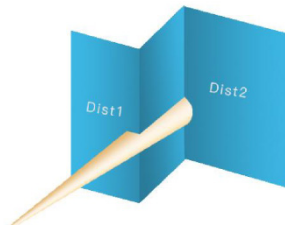
Note: All distances are in meters.

4.2.2.4.3 Window

"Window" mode is similar to "Manual" mode, except the distance is a window in space. Think of it as a virtual distance floating in space that the subject will be detected. This helps reduce out of focus shots and nuisance triggers. When in this mode, you need to press the "measure" button next to the "Distance Min" to lock in the minimum distance, and likewise for the "Distance Max" setting. Don't confuse the two though – otherwise you won't get any triggers! The minimum distance is the closest to the sensor, while the maximum is furthest away.

In "Window" mode, two measurements are used to qualify that the subject is indeed within the desired window. **This will double the response time of the sensor.** We do not recommend using "Window" for high speed subjects.

An additional problem with "Window" is how Lidar actually works. If the laser beam is half-on and half off the subject the returning measurement will be an average between those two distances. This has the potential to cause triggering outside of your programmed window. See the illustration below:



4.2.2.5 I/O Mode

4.2.2.5.1 Normal

The shutter control operates like a normal sensor. When Sabre detects something it will activate the shutter.

4.2.2.5.2 X-Beam A and B

"X-Beam A and B" means that the two sensors will be used. They can criss-cross in space to create an extremely small detection area. It requires that both sensors detect an object (using whatever settings you have programmed in them) before it will fire the camera. They don't even have to be crossed – you could have an advanced triggering requirement. An example would be setting one sensor low to the ground and another higher. This dual sensor setup could be used to only trigger when animals of a specific height cross the path. Their feet break the lower beam,

while their head breaks the upper beam. Smaller animals would be below the top beam, while birds would only cross the top beam.

This mode requires two Sabre sensors. Using an optional RCA cable attach the two sensors together using the RCA connector on the 5-pin Sabre harness. On the primary sensor (We'll call it "A"), change the "I/O Mode" to "X-Beam A and B". On the secondary sensor ("B"), make sure the sensor has its "I/O Mode" set to "Normal". Your camera would then be plugged into the primary sensor ("A").

4.2.2.5.3 X-Beam A or B

When using an optional RCA cable to connect two Sabres, if either Sabre detects a subject the one that is configured for "X-Beam A or B" mode will activate its camera output. The secondary sabre should be set to "Normal". The camera would be connected to the primary "X-Beam A or B" Sabre.

4.2.2.5.4 Bulb (Bat Mode)

In "Bulb" mode, the half-press and full-press outputs will stay active until a subject is detected. Once detected, RCA output is used to fire external flash(es). Immediately after the flash is fired to expose the image, Sabre closes the camera shutter and refreshes the frame. This mode is useful for triggering in the dark or when using our high speed shutter. See the settings "4.2.2.14 - Bulb Refresh" and "4.2.2.15 - Bulb Off" below.

The advantage of this mode is the image is exposed completely by the flashes. A xenon flash is several orders of magnitude faster than a camera's shutter speed and essentially eliminates any possibility of motion blur.

You can also use our Scout Flashes in "Bat Mode" (see section "4.2.2.12.5 - Bats"). This will allow you to wirelessly fire our flashes for a hassle and cable free setup!

4.2.2.6 Distance

When using "Manual" mode you can either press the "Set" button on Sabre to set your triggering distance or you can set it here. You can enter the distance using the keypad or you can simply press "Measure" next to it. As mentioned previously in the manual you should move the sensor (or target) back because measurement error could cause unwanted triggering.

4.2.2.7 *Distance Min*

This configuration is available when the Lidar mode is set to “Window”. “Distance Min” is the minimum distance from the sensor that will be detected. See section “4.2.2.4.3 - Window” for details on window mode.

4.2.2.8 *Distance Max*

This is the maximum distance from sensor that will be detected.

4.2.2.9 *Remote Wake*

“Remote Wake” is a unique feature for power users. Even though Sabre has an integrated PIR sensor it may not be wide enough to detect the subject you are after. Enabling this feature allows other Scout sensors to turn on Sabre’s Lidar. This can significantly improve battery life by positioning the wake-up sensors appropriately.

Note: Remote Wake will not hold down the attached camera’s half press in this situation. If using a Scout Camera Box you can take advantage of minimizing the camera’s shutter lag. See section “7.6.2 - Low Shutter Lag with external PIR” for more details.

4.2.2.10 *Remote Time*

If “Remote Wake” is enabled this is how long Sabre will keep its Lidar powered. If it does not detect anything within this time it will power down and go back to sleep.

Note: If a remote sensor detects something again this “Remote Time” will be reloaded and keep Sabre awake. An example: The remote wake is set for 30 seconds and a Scout Receiver detects something. Sabre immediately wakes up and turns on its Lidar. 15 seconds pass. The Receiver detects something again. Sabre will stay awake 30 seconds from that second signal from the Receiver (not just the 15 seconds remaining).

4.2.2.11 *Remote Source*

If “Remote Wake” is enabled this will determine what sensors are allowed to wake up Sabre. There can be complex configurations of sensors and ID’s for complete flexibility. You could even have one Sabre wake another.

4.2.2.12 *Drive Mode*

This sets the behavior of the shutter output when an object is detected.

4.2.2.12.1 *Single*

When a subject is detected, the shutter output will immediately activate and use the timing parameters for on/off/number of pictures. The subject will have to no longer be detected before the shutter outputs will activate again. This mode is

useful for only getting one picture, even if the subject lingers in the path of the sensor. This is the default mode.

4.2.2.12.2 Continuous

As long as an object remains in the sensors path, the shutter outputs will stay active. This allows you to take multiple pictures when a subject is detected – as long as your camera is in continuous mode as well. As soon as the subject is no longer detected, the shutter outputs will follow their settings. This means that if the shutter full press “on time” is set to 0.5 seconds, the shutter will close 0.5 seconds after the subject moves past the sensor.

Keep in mind that if you your "Mode" is set to "Auto-Range", if a subject stays in front of the sensor long enough it will eventually no longer trigger the sensor (auto-ranged out).

4.2.2.12.3 Hybrid

Hybrid mode is a combination of continuous and single mode. In this mode, Sabre will continue to follow the shutter settings until the subject leaves the beam path. If your shutter settings are set to only take one photo then only one photo will be taken. If, however, they are set to take 100 photos, Sabre will start taking the photos and stop when either 100 are done OR the subject leaves the beam. This is a great way to control how often photos are taken yet still limit the maximum number.

4.2.2.12.4 Enter/Exit

In this mode Sabre will activate the shutter output when a subject enters the beam and then when it leaves. If the subject moves very quickly through the beam path you will still get two activations of the shutter outputs.

4.2.2.12.5 Bats

This optimizes Sabre for photographing bats at night. It automatically switches the "IO Mode" to Bulb mode and will also try to wirelessly activate Scout flashes. The Scout flashes can be in any power mode since Sabre will keep them awake for the fastest possible response time.

4.2.2.13 X-Beam Timeout

This option is currently not used.

4.2.2.14 Bulb Refresh

When the "I/O Mode" is set to Bulb, the camera output will stay active for this duration. Once a subject is detected the camera's shutter will be closed immediately. If a subject is not detected within this time the camera's shutter will close for the duration of "Bulb Off". "Bulb Refresh" should be set to something smaller than when hot pixels or noise start to appear in your frame.

4.2.2.15 Bulb Off

When the "I/O Mode" is set to "Bulb", and either a subject is detected or the "Bulb Refresh" time expires, this is how long that the camera will NOT be active. This allows your camera time to save the frame. 500 ms (0.5 seconds) is acceptable for most cameras.

4.2.2.16 Filter Time

"Filter Time" only applies to "Auto Range" mode. This is how long Sabre averages the furthest distance it detects. A larger value will help reject noisy measurements (like leaves moving in the distance). A smaller value will "lock on" to the distance faster. This does NOT affect how fast the sensor responds. The sensor will still respond as fast as the sample rate (High Power = 10ms, Low Power = 100ms). It will only use "Filter Time" for determining the maximum down-range (not detecting anything) distance.

It is generally a good idea to not have variable-distance backgrounds for automatic mode. Because the laser beam is so small, it can easily pass between leaves as they move in the wind, potentially causing false triggers. If shooting in an environment like this you may want to consider using "Manual" mode (see section "4.2.2.4.2 - Manual" for details).

4.2.2.17 Detection %

"Detection %" only applies to "Auto Range" mode. This detection percent sets how close the subject must be to the sensor to trigger the camera. Example: If the background is roughly 4 meters away, and the "Detection %" is set to 75%, anything that crosses the beam 3 meters or closer will trigger the camera ($4 * 0.75 = 3$).

Be careful when setting this close to 100%. Small movements of the background (or error in the measurement) could cause false triggers.

4.2.2.18 Rain Detect

This is an experimental feature and is disabled by default. Nobody likes false triggers. Unfortunately Lidar can be susceptible to very large water drops during heavy downpours. This is almost exclusively a problem when running the Lidar in high power mode. Leave this feature disabled unless you are experiencing false triggers during rain. Please contact [us](#) with specific issues and we'd be happy to walk you through these (extra) advanced settings.

4.2.3 PIR Settings

The following settings are specific to the integrated PIR sensor.

4.2.3.1 Mode

There are five operating modes available for the integrated PIR sensor.

4.2.3.1.1 Auto

Let Sabre decide which mode is best for you. If other Scout equipment is present the PIR will be used to "Wake" Sabre and start using its LIDAR sensor. It will also wake up the camera box as soon as the PIR detects something.

If no Scout gear is detected the PIR will not be used. Only LIDAR will trigger the camera.

4.2.3.1.2 Wake

Wake is used to turn on the LIDAR sensor. This helps conserve power. The green LED on Sabre will flash briefly to indicate the PIR detected something and that the LIDAR is enabled.

This mode functions as if a Scout camera box is present even if not detected. Sabre will send a wireless "Wake" signal to the camera box. Inside the camera box app you can even have the half-press held down on the camera at this point. See the Scout Camera Box owner's manual or app for more details. The setting is under Power Settings->Internal Camera->Pre-wake Time. Select Sabre as the source.

Regardless if a camera box is detected Sabre will hold the half-press down on the camera (connected directly to it) to improve shutter lag with the anticipation a subject is about to cross the LIDAR beam.

4.2.3.1.3 PIR Only

Only use the PIR as a sensor. LIDAR is powered down and will not be enabled. This gives the absolute best battery performance. The downside is that PIR has a much wider field of view and is slower to respond than LIDAR.

4.2.3.1.4 Off

The PIR is disabled. Only LIDAR will be used to trigger the camera. The LIDAR will remain completely powered. This will affect battery performance. See section "10 - Specifications" for details on battery life.

4.2.3.1.5 Half-Press

LIDAR will remain powered all the time. When the PIR detects something it will press the half-press on the attached camera. This will help reduce the camera's shutter lag with the anticipation that something is going to cross the LIDAR's beam shortly. The green LED on Sabre will flash briefly. No pre-wake signal is transmitted to the Scout camera box.

4.2.3.2 Sensitivity

By default the sensitivity is set to the maximum value of 10 (1 = minimum, 10 = maximum). The higher the sensitivity the smaller and faster a subject can move through the path of the PIR and be detected. Why not always run at maximum sensitivity?

Here's an example:

You're trying to photograph a coyote walking down a trail. Unfortunately there is also a lot of bird traffic. As the birds fly through the sensor path it is causing false triggers. You can decrease the sensitivity to reduce or eliminate smaller changes in heat (birds) while still capturing the coyote.

Decreasing the sensitivity does two things – a larger source of heat is required AND it will have to be moving slower.

Normally with PIR sensors you need to avoid having the sensor looking south because warm leaves on trees can cause false triggers. By adjusting the sensitivity you can reduce or eliminate these false triggers.

4.2.3.3 Wake Time

This setting only applies if the PIR is used for waking up the LIDAR or pressing the camera's half-press.

If the PIR is used for waking the LIDAR this is how long the LIDAR sensor will remain powered.

If "HP Only" is the selected PIR mode the "Wake Time" is how long the half-press on the attached camera will be held.

How long the LIDAR or half-press will be held down will be reloaded to "Wake Time" every time the PIR detects something.

4.2.4 Wireless Settings

Wireless is used by Sabre to communicate with other Scout equipment. It uses a 2.4 GHz proprietary RF protocol. These settings are only useful when using Sabre with other Scout equipment.

4.2.4.1 ID

If using Sabre with the Scout Camera Box you can use multiple Sabres to activate different outputs on the camera box (“ID 1” activates the camera, “ID 2” activates “Aux 1”). This allows extreme flexibility for complicated setups. This will also be which Sabre shows up in the Scout Camera box app (“Sabre 1”, “Sabre 2”, etc.).

4.2.4.2 Channel

This determines what frequency Sabre’s wireless operates on. All Scout equipment for a given setup must be on the same channel to operate properly.

If using more than one Scout setup in the same area (within 60 meters / 200 feet) you should assign each setup its own unique channel. If two setups are within a very close proximity you should have the channel spacing at least two numbers apart.

The default “channel” is 15.

4.2.4.3 Wakeup Speed

When a subject is detected, Sabre will send a wakeup signal to the other Scout equipment (Camera Box, Flashes, LEDs) to get them ready to take a photo.

The “Wakeup Speed” setting determines the speed of wireless wakeup. “Normal” works for most applications but if you need a faster response time you can change this setting to “Fast”.

Note: All Sabre/Scout equipment for a given setup **must** have its wakeup speed set to the same value. Equipment may not wake properly if not set to the same “Wakeup Speed” setting.

Battery consumption will increase on all devices when wake-up speed is set to “Fast”.

4.2.5 Wifi Settings

Wifi can be turned off and on using the Wifi button in the upper-right corner of Sabre. The blue LED above the Wifi indicator will light when it is on. Wifi will automatically turn off after a period of inactivity (no computer/phone/tablet app communication) in order to conserve battery power.

There are only four settings, which are described below.

4.2.5.1 Channel

There are 12 supported Wifi channels. This setting is included for people in heavily congested Wifi areas where interference with neighbor's routers may be a problem. Typically you will not need to adjust this setting. The hardware is optimized for channel 1 which is the default.

4.2.5.2 Security

Much like your home router Sabre has different security modes to encrypt data sent back and forth as well as prevent "undesirables" from accessing your Sabre. Your Sabre ships with security disabled. You must "save settings" and then power-cycle your Sabre for these new settings to take effect.

4.2.5.2.1 Open

No security measures are in place. This is easiest for you to connect up to Sabre – but also for your neighbors (including squirrels with phones). Any communication is unencrypted. Of course, the "open" security is also extremely effective against intruders if Wifi is turned off. Since the Wifi will turn off automatically after a period of time the chances of a security breach is minimal.

4.2.5.2.2 WPA

This encrypts all transmissions to and from Sabre using Wifi Protected Access. This will prevent anyone from connecting to Sabre unless they know the security password. You will need to make a note of the password or change it to something you will remember. If you ever forget the key, you can load the factory defaults by having Sabre turned off, press and hold the power button until the red power LED goes out, and then release the power button. The security will revert back to "Open". You will lose **all** settings doing this.

4.2.5.3 Password

This is your Wifi password. This is *only* used if the Wifi security is set to "WPA". The key must be at least eight characters/numbers and up to 64. If you change the key, you must "save settings" and then power-cycle Sabre for the new key to take effect.

4.2.5.4 Timeout

At power-on Sabre will leave Wifi turned on for this time (in minutes). Additionally if communicating to Sabre with an app this is how long after the app is closed (or stops communicating) before Wifi will automatically turn off.

4.2.6 Time Settings

Sabre can limit when it will activate the camera based on the time of day. If you are only interested in night photographs or you want to decrease “interest” in your equipment from two-leggeds during the day you can use the “time settings” to create a “window” of time.

How does Sabre know the current time? It gets set to its internal real-time clock when an app connects to it.

Two windows are supported. This lets you set up more complex scenarios for triggering (two hours in the morning, two hours in the evening).

4.2.6.1 Enabled

This determines if the “Time Window” is enabled. Each time window is completely independent of each other and can overlap if needed.

4.2.6.2 On Time/ Off Time

The “On Time” sets when the window begins. The “Off Time” is when the window stops.

Here are a couple of examples:

On Time: 6:00AM
Off Time: 8:00AM

In this case Sabre will only activate the camera for a two hour period in the morning.

The next example is a little different:

On Time: 6:00PM
Off Time: 8:00AM

Since the on time is after the off time (because it is set to PM) Sabre will activate the camera for 14 hours – starting at 6:00PM at night and ending at 8:00AM the following day. So please be sure to pay attention to the AM/PM – it could easily get you into trouble!

4.2.7 Shot Limit Settings

Sometimes you can get yourself into a bad environment where things are moving around too fast and critters (the ones you don’t care about) are causing false triggers. Wasted frames and overheating flashes – not good! There is a way to tell Sabre to stop triggering the camera if it sees too many subjects. Three settings come into play to adjust this.

4.2.7.1 Limit Enabled

This will determine if the shot limit feature is enabled. It is disabled by default.

4.2.7.2 Shot Limit

This sets the maximum number of pictures that can be taken within the time set in “Window”. If more than “Shot Limit” number of pictures is reached Sabre will no longer activate the camera. To reset the shot limit manually (instead of waiting for it to time-out) you can press “Outputs Off” in the app, or quickly press the power button on the sensor.

4.2.7.3 Limit Window

This sets the time “window” for the “shot limit”. If you get “shot limit” number of detections within “limit window” amount of time, Sabre will ignore any more detections for a period of time. If you get a few pictures but it doesn’t reach the “Shot Limit” within this amount of time, the number of pictures taken will be reset. See below.

4.2.7.4 Limit Timeout

This is how long Sabre will ignore anything crossing in front of a sensor. You won’t have any camera activations for this duration. That’s a lot of words! Let’s put some numbers to these settings and then walk through a scenario. We’ll use the defaults in this case:

“Shot Limit” is set to 10, “Limit Window” is at 20, and “Limit Timeout” is at 300. Your setup is working great – you’re getting some great shots. You leave the setup to go into town for an hour. Unfortunately a biblical swarm of cicadas appears (the horror!). Your Sabre being very effective at detecting things starts rapidly triggering. With the settings above, you’ll definitely see 10 cicadas within the 20 seconds – it’s a swarm after all! Once the sensor “sees” those 10 within the 20 seconds, Sabre will ignore any more for 300 seconds (5 minutes). Let’s say you get back from town, shoo away the swarm (the cicada story falls apart here), but now you want to start looking for critters again. Simply press the power button to reset the shot limiter and it is back to normal. You could have also waited for the 300 seconds to elapse.

4.2.8 Power Settings

These are the power settings that aren’t specific to any other systems in Sabre.

4.2.8.1 LED Brightness

This allows the adjustment of the LED brightness on Sabre for night-time photography. You can adjust it down to zero. No LED’s will be lit in this case (it also decreases the chances of someone permanently borrowing your Sabre when deployed in the field). If you touch any button on Sabre, the LED’s will resume full brightness and then return back to zero after 30 seconds.

Keep in mind that if using with the Scout Camera Box that Sabre will automatically turn off the LEDs after two minutes.

4.2.8.2 Shutdown Voltage / Under-voltage Lockout

If this is set to a non-zero value, Sabre will turn off if the external DC voltage drops below this value (regardless of its internal battery voltage). This is intended for external DC power applications only. This can be useful to prevent over-discharge of lead acid batteries. External Li-Ion batteries typically have their own shut-off voltage so you shouldn't need to use this setting for that. Keep in mind that if you incorrectly set this value, it can cause Sabre to immediately turn off. To recover from this, you will need to restore factory defaults (See section "4.2.13 - Load Defaults" for details). This will cause you to lose all of your settings.

4.2.8.3 LED On Trigger

The red LED will light up when the camera is activated. This light will be visible regardless of the "LED Brightness". Additionally, the green PIR "Wakeup" flashing LED is tied to this setting.

If using Sabre for camera trapping you may want to disable this feature so that the LED's do not light when something is detected.

4.2.8.4 LED Debug

This is used for development and field testing purposes. The LEDs give additional debugging information. It defaults to being disabled and should not be turned on unless requested.

4.2.9 Show Stats

This shows statistics of how Sabre is being used. None of this data is passed on to us unless you send it!

Num Shots: Number of shots ever taken.

Num Shots(o): Number of shots since this boot.

Temp Min: Minimum operating temperature.

Temp Max: Maximum operating temperature.

Vin Max: Maximum external voltage.

PIR Wakeup: Number of PIR wakeups ever.

PIR Wakeup(o): Number of PIR wakeups since boot.

PIR Pics: Number of PIR-only pictures ever taken.

PIR Pics(o): Number of PIR-only picture since boot.

4.2.10 Measure

This will bring up a window showing the current distance measurement. "Detected!" will be returned when the current triggering criteria are met.=.

4.2.11 Software Version

This reports the current firmware version installed on Sabre. If you see a “DEV” following the version it is a pre-release test build of the software.

4.2.12 Battery %

This section contains three power metrics.

Battery %: Estimated remaining battery percent.

Battery Voltage: The current battery voltage.

DC Voltage: The external voltage plugged into the harness. This will read zero if nothing is attached.

4.2.13 Load Defaults

Need to get back to the start? This will load the factory defaults.

Fun fact: You can load factory defaults without using the app. This applies to **all** Sabre/Scout equipment. Do the following:

1. Start with it turned off.
2. Press and **hold** the power button until the power LED goes out (about 5 seconds).
3. Release the power button.

4.3 Download the app

The PC and Mac versions of the app are free. You can download them here:

https://cognisys-inc.com/sabre-2.html#attributesupport_resources

There are also Android and iOS application available for a low price. Search the Android “Play Store” for “Sabre 2” or Apple’s “App Store” for “Sabre 2”.

Note: Make sure you get the new “Sabre 2” app. The original “Sabre” app is for the V1 hardware and is not compatible with the new V2 hardware.

4.4 Connecting to Sabre

Sabre acts as a Wifi router / access point. You do NOT need a Wifi router to use it or have internet access! It will have a name of “Sabre2” followed by a unique identifier. The unique ID for Wifi is also on the back of Sabre on the serial number.

4.4.1 PC/Mac connection

Simply connect to Sabre like you would any other Wifi connection. Find the Wifi network (as shown below) and then click on it to connect. For Mac’s the network for the first time will be under “Other Networks”.

Sabre defaults to no security but you can add security and set a password later if required. You will have to connect to Sabre each time Wifi is started unless you tell the operating system to “automatically connect”. The computer may prefer a different network (if available) for auto-connect since Sabre doesn’t have active internet.

Your computer may say this connection is insecure (which is fine for most applications) or that it does not have internet access. Make the connection anyways.

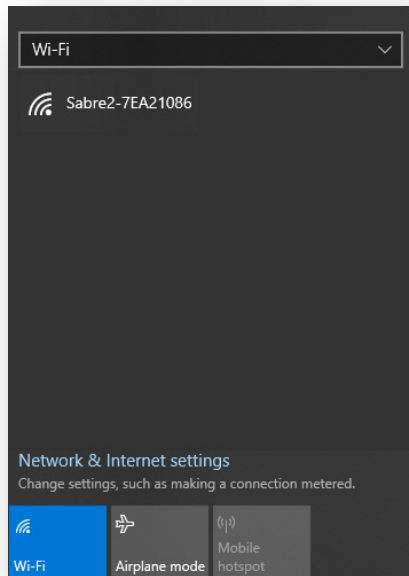


Figure 1 - Connecting Windows

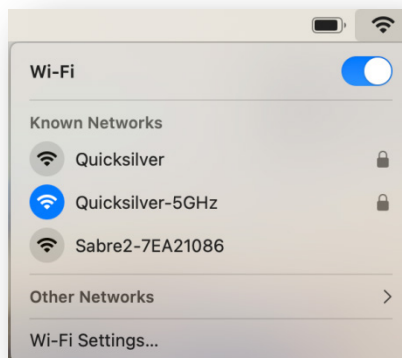
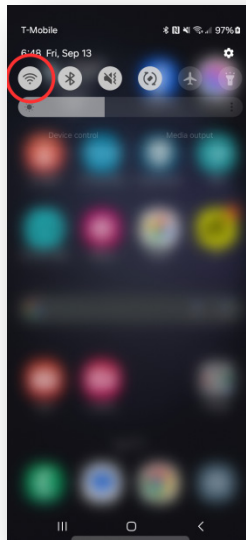


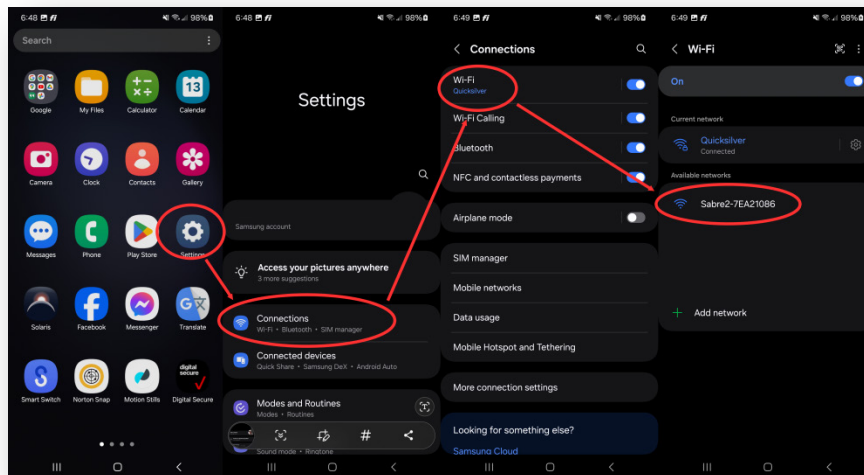
Figure 2 - Connecting OS-X

4.4.2 Android Connection

For Android the easiest way is to slowly swipe down from the top of your screen and then press and hold the Wifi indicator and then select the Sabre2 network.



The longer (and more convoluted) way is to get to your Wifi settings:



Android may mention there isn't any internet access (very true!) but connect anyways.

4.4.3 iOS connection

Connecting to your iOS device is simple. You will have to connect to Sabre each time Wifi is started unless you tell the operating system to “automatically connect”. The device may prefer a different network (if available) for auto-connect since Sabre doesn't have active internet.

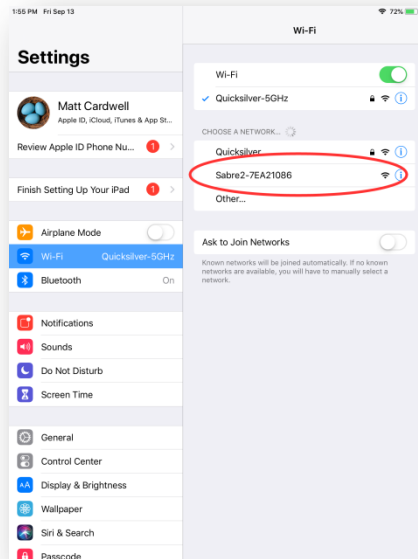


Figure 3 - Connecting iOS

iOS may mention there isn't any internet access but connect anyways.

4.4.4 Scout Camera Box App

If you already have a Scout Camera Box the app will automatically support Sabre 2. You do not need to directly connect to Sabre. Just connect to the camera box as you normally would. Please make sure your app is updated to the latest version.

The Camera Box will need firmware version 1.0.09 or later. You can get the latest firmware here:

https://cognisys-inc.com/scout-camera-trapping/scout-accessories/scout-camera-box.html#attributesupport_resources

5 Navigating the app

In this section we'll go into the basics of adjusting settings for Sabre. If you find your eyes glossing over with all the technical discussion you can always skip to the "0 - 7. Examples" section to start using your Sabre!

5.2 Connection Status

You can verify you have a connection Sabre. The indication varies depending on the operating system.

5.2.1 PC / Mac / Android connection

In the upper-right corner of the application there will be a green or a red indicator. Green indicates that the computer/device is communicating with Sabre. Red means either Wifi is not connected or there is a communication issue (firewall, networking issue, etc).



Connected



Disconnected

5.2.2 iOS connection

For iOS, the color of the Sabre icon changes to indicate the connection status. At the bottom of the screen the “Sabre” will be blue for connected and red for disconnected



Connected



Disconnected

5.3 Main buttons

There are four main buttons in the app that affect Sabre. “Read Config”, “Write Config”, “Shutter”, and “Outputs Off”. Their location varies depending on the operating system:

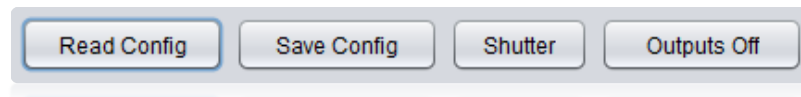


Figure 4 - Mac/PC Global Buttons (at top)



Figure 5 - Android Global buttons (under hamburger icon)



Figure 6 - iOS Global Buttons (at top)

5.3.1 Read Config

Pressing this button will read the current settings Sabre is using.

5.3.2 Write Config

This will take any app changes and permanently save them to Sabre. Any time you make a change to a setting it will be sent down to Sabre but it will not be permanently retained (after a power-cycle) unless you press the “Write Config” button.

5.3.3 Shutter

This will activate the camera (and follow the programming) for Sabre.

5.3.4 Outputs Off

“Outputs Off” will stop the camera output as well as the auxiliary output. Expect weird behavior in “Bulb” or “Bat” modes since they will re-activate the shutter shortly.

6. Sensor Placement

In this section we’ll go through some suggestions for sensor placement including things to try and things to avoid.

6.1 Sensor Height

The height of Sabre should be targeting the center body mass of the subject you are interested in. Adjusting the height also lets you “filter out” subjects that you are not interested in photographing. If the receiver is placed close to a dirt ground it is possible that in the rain dirt may splash up on the receiver blocking its ability to detect the subject. Also keep in mind that plants WILL grow and may block Sabre or cause false triggers in windy conditions.

Here is an example of a setup targeting small subjects (but it may catch some larger ones as well). Sabre is placed low on the tree:



Below is an example of targeting taller subjects. No rabbits in the photographs.



The rabbit walks under the beam and is missed (thankfully!). Setting the height of Sabre is an easy and effective way of selecting the size of the subject desired!

If at all possible place Sabre so it is not facing directly into the sun. While Sabre is very ambient light immune, facing the sun (especially when the front sensor lens gets dirty) is the worst case scenario for triggering. Think of driving down the road with a dirty windshield and the sun hits your car. What do you see? Not much!

6.2 PIR Wakeup

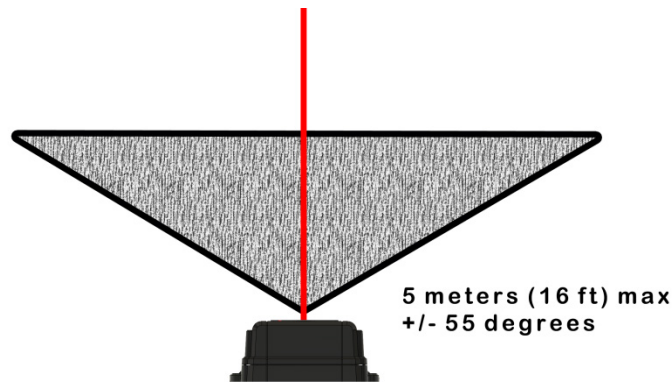
If using the internal PIR to either trigger the camera or wake up the LIDAR you may want to consider the following.

The PIR has a “cone” of area that it uses to measure the heat in the area (and looks for abrupt changes). Understanding what this “cone” looks like is the first step to a successful setup.

The “cone” has a top-to-bottom and side-to-side width of 110 degrees (+/- 55 degrees), and a side-to-side width of 20 degrees (+/- 10 degrees).

PIR’s work on detecting radiated heat. What does that mean for detecting critters? The maximum detection distance is 5 meters (16 feet). That detection range doesn’t mean you’ll pick up a mouse at 5 meters away – that’s not much heat to work with! The larger the subject is the further away the sensor can be placed.

Here is what the “cone” (sensor path) looks like from the PIR perspective:



We're going to make a few observations and recommendations:

1. The closer the sensor is to the subject the more likely you are to detect it (or the smaller it can be).
2. The further away from the sensor the subject walks through the more time you're giving LIDAR to turn on and detect the subject. That's because the cone area away from the sensor takes longer to cross than right up close (just look at the width of the cone).
3. Try and orient the sensor so it is facing North(ish). This way the PIR won't be looking at the fiery orb in the sky appearing and disappearing behind leaves. This will also help the LIDAR with ranging.
4. See section "7.1 - " for talking about background issues.

Well #1 and #2 don't seem to play well with each other! You want the sensor close to detect the subject but not too close because there won't be enough time for the LIDAR to turn on and see the subject. Let's go through some example distances for how fast a subject can be moving and still be detected by the LIDAR:

Distance from sensor	m/s	km/h	ft/sec	mph
1 m (3.3 ft)	0.714	2.57	2.34	1.6
2 m (6.6 ft)	1.428	5.14	4.68	3.2
3 m (9.8 ft)	2.14	7.72	7.03	4.8
4 m (13.1 ft)	2.86	10.28	9.37	6.39
5 m (16.4 ft)	3.57	12.85	11.71	8.0

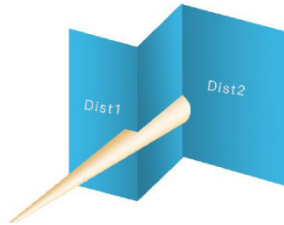
So as you can see (in your unit of choice) the further away the subject is from the sensor the faster it can be moving.

If the internal PIR doesn't give you the flexibility you need you can always use a secondary sensor to wake up the LIDAR if needed. See section "7.6.2 - Low Shutter Lag with external PIR" which talks about remote wakeup.

The other variable with the PIR is sensitivity (see section “4.2.3.2 - Sensitivity” for more details). The higher the sensitivity the more likely you’ll detect the subject early – but that could cause false wake-ups. Be sure to read section “7.1 - ”.

6.3 Background problems

As discussed elsewhere in the owner’s manual, if the LIDAR beam overlaps two objects the range becomes an average of the two distances:



This means if the first distance is swaying in the wind that the actual measured distance could be bouncing around with the wind. Ideally you would have a background that either is solid or nothing there at all. That being said it is sometimes unavoidable. If that is the case be sure to use a manual distance instead of the auto-ranging. You can change this by going to Lidar Settings->Mode and changing it to “Manual”. The next step is to enter the distance. The easiest way of doing this is to simply stand in front of the troublesome background and press the “Measure” button next to “Distance”. This will measure you and make sure that only that distance or closer will fire the camera.

Another background problem involves using the internal PIR to wake the LIDAR. Background temperature changes (like leaves blowing in the wind on a sunny day) can cause a false trigger on the PIR. The LIDAR will turn on, won’t see anything, and thankfully won’t fire the camera. Unfortunately frequent PIR false triggers will decrease the battery life significantly. Try and position the sensor to avoid situations like this or angle the sensor down instead of pointing across or up. Chances are the leaves and branches that could cause false triggers are further away than the subject is that you’re trying to photograph. You can turn down the PIR sensitivity enough so that it will ignore the further away potentially false triggers while still working fine for waking up the LIDAR. Go to PIR Settings->Sensitivity and adjust as necessary.

6.4 LIDAR in direct sunlight

LIDAR is relatively immune to the effects of sunlight. The Sun's temperature doesn't affect it (unlike PIR sensors). One use case where LIDAR can struggle is with sunlight shining straight into the LIDAR opening. This can cause it to not see a subject or potentially cause false triggers. If at all possible align Sabre so it is not exposed to direct sunlight. This can be achieved three different ways. Place the sensor so it is facing north or south. Angled sunshine like this won't affect the LIDAR. Another option is to have the sensor angled slightly down. If these aren't possible with your setup then a snoot may be required to protect the LIDAR from direct sunshine.

7. Examples

In the following sections we will walk you through some real-world setups/examples using your Sabre. Be sure to check out our website and follow us on YouTube (<http://www.youtube.com/user/CognisysInc/>) for video examples. Sometimes watching a video makes the whole process much easier to understand!

The most important task in setting up a successful sensor is to test-test-test your setup once you *think* it is working. We're not talking just framing and lighting but waiting for the camera to enter sleep mode, make sure it wakes up and goes back to sleep.

7.1 Proper power settings

Sabre has a lot of knobs to turn for maximizing the battery life. The day-use photographer or videographer probably doesn't really care. "Hey, if it lasts a day then I'm good!" For camera trapping, however, battery life is critical! We've broken down the two vastly different use cases below.

7.1.1 Day use

Doing bird photography? Not worried about multi-day (or month) battery life? No worries! If there isn't a Scout Camera Box around then you don't have to do anything. Out of the box Sabre will default to automatically adjusting the power modes. Since no camera box is found it will run the LIDAR in high power mode (the fastest sample rate). The LED's will always stay on so you can keep an eye on things.

The LIDAR high power mode will be plenty fast to capture virtually anything – from birds in flight to flying squirrels.

7.1.2 Camera trapping

Since the default settings for Sabre are "Auto" it will go out and look for a Scout Camera Box periodically. If it finds one it will then adjust the LIDAR power to a low power mode. It will also use the integrated PIR to turn on the LIDAR. This means that the LIDAR will in most cases be turned off giving you months of battery life.

This does make a few assumptions. Whatever you're photographing or shooting video with is going to be moving slow enough for the PIR to detect it and give the LIDAR enough time to power up (about a half a second). This is fine for most mammals on trails but isn't suitable for quickly moving subjects and definitely not flying birds. So we'll go into a few potential power options for specific situations.

If a camera box is detected Sabre will turn off its LED's after two minutes to conserve battery power. Additionally, the LIDAR will be powered while using the app so that

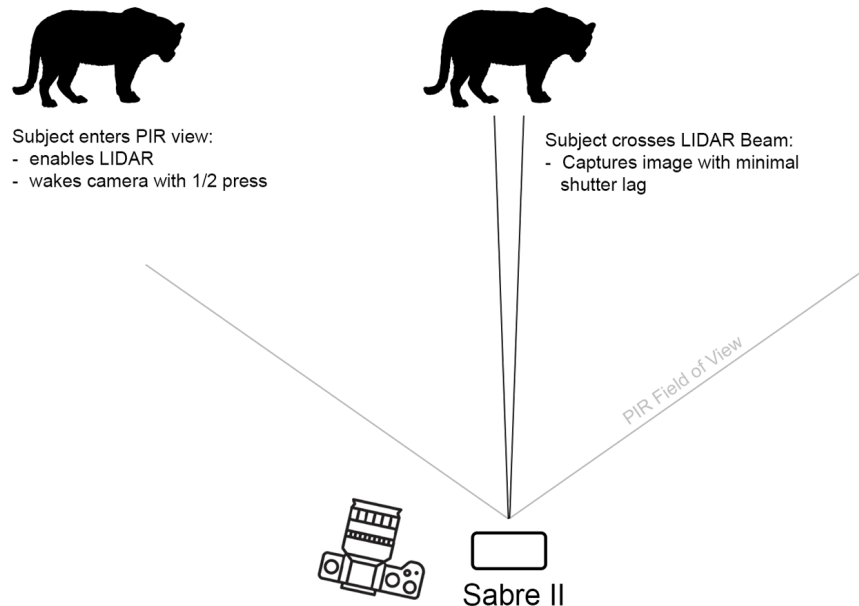
measurements can be made (if needed). After no longer communicating with the app it will enter low power mode about two minutes later (using the internal PIR to wake the LIDAR if so configured).

You will likely want to turn off the “LED On Trigger” option under “Power Settings”. Otherwise the PIR wakeup and shutter LED’s will be visible.

7.1.2.1 *Slow moving mammals*

As mentioned above – you’re all set if a camera box is detected. The “LIDAR – Auto” and “PIR – Auto” boil down to the LIDAR normally being turned off, the PIR waking it, and then the LIDAR running in a low power mode for the duration of the “PIR Wake Time” (see section “4.2.3.3 - Wake Time”). You’re looking at over 200 days of battery life! You can optionally run the LIDAR in “High Power” mode by going to Lidar Settings->Power Mode and change it to high. This will give you a fast response time (once the LIDAR is powered).

Camera Trapping Setup Diagram



If the integrated PIR isn't quite fast enough to wake up the LIDAR or you can't quite position Sabre's PIR to accommodate your physical landscape then you can optionally use another sensor (Scout PIR, RX, or another Sabre) to “remote wake” the LIDAR. See section “7.6.2 - Low Shutter Lag with external PIR” for more details. You could set

this “Wake” sensor further up or down the trail to guarantee the LIDAR will be running in time to detect your subject. This still gives great battery life (200+ days) but still lets you have the pin-point accuracy of LIDAR.

If you don't want to add another sensor for the “Remote Wake” feature you can always leave the LIDAR running in a low power mode. To do this simply turn off the “PIR Wake” feature by going to PIR Settings->Mode and change it to “Off”. You'll get over 16 days of battery life.

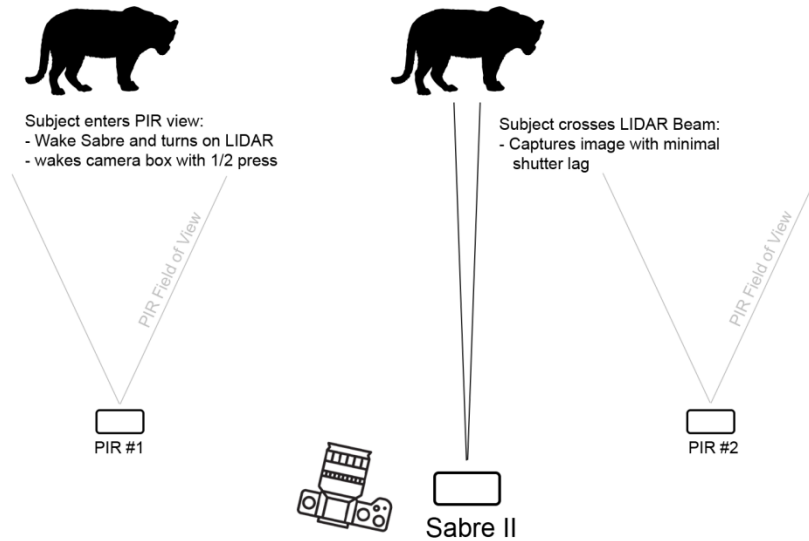
7.1.2.2 Fast moving mammals

In this situation you have to take into consideration battery life. The integrated PIR sensor probably won't be fast enough to get the LIDAR running in time before the subject passes through. Here are the best options in order of battery life.

If possible as mentioned above use an external Scout PIR or RX sensor to “Pre-Wake” Sabre's LIDAR. To turn this on go to Lidar Settings->Advanced->Remote Wake, enable it, and then choose how long you want to have the LIDAR remain powered looking for a subject and which sensor is supposed to wake the LIDAR. Since the LIDAR power mode is still set to “Auto”, it will use the low power mode and sample 10 times a second. That speed should be fine for fairly fast animals but you *may* need to change the LIDAR power mode to “High”. This really won't affect the overall battery life drastically since the LIDAR is still only turned on for how long the “Remote Time” is set for.

The example below shows two Scout PIR sensors being used to remotely wake Sabre and turn on its LIDAR. This way if the subject is approaching Sabre from either direction it will be ready to fire the camera.

Camera Trapping Remote Wake Diagram



Another possible configuration is just leaving LIDAR always on in a low power mode. To do this you just have to disable the “PIR Wake” feature. To do this go to PIR Settings->Mode and change it to “Off”. The LIDAR will operate in a low power mode and sample 10 times a second. This will result in about 16 days of battery life.

The least favorable option is to operate the LIDAR in high power mode (Lidar Settings->Power Mode->High). Only use this for very fast moving animals (like birds or bats in flight). You’ll have to turn off the “PIR Wake” feature so that the LIDAR never powers down. Do this by going to PIR Settings->Mode and change it to “Off”. Unfortunately running the LIDAR in high power mode this way results in just less than three days of battery life.

7.2 Camera Settings for camera traps

Here are some suggested camera settings.

Drive Mode: Single or Continuous. If set for “Single”, then you can have Sabre control how many shots are taken and how much time there should be between the shots (“Off time”). If set to “Continuous”, then the “# pics” should be set to “1”, and the “On time” on Sabre should be set to how long you want to run the camera in “Continuous” mode. You’ll want to make sure your flashes can keep up at the camera’s frame rate with whatever power setting they’re set at. Make sure that mirror lock-up is turned off!

Camera Mode: For camera trapping you only really have two options. Aperture Priority (Av) or Manual (M) mode. If set to Aperture Priority then you’ll have a nice background during the day, but as night comes the camera’s shutter speed is going to become very long. In complete darkness, this means it could increase to in excess of 10 seconds – meaning you’ll probably only get one shot of the subject moving through. As the sun sets, however, you could be running a one second shutter but the flashes will still fire. This will cause ghosting in the final image. Some camera models have a shutter speed limit so be sure to check your owner’s manual.

In Manual (M) mode, you’ll have to have the f-stop high enough to not become over-exposed during the day, but also allow enough light from the flashes to expose the subject. This may mean a compromise of the background being fully illuminated at night.

Either of these modes have compromises for day/night operation. Just remember that Sabre has two separate “Time Settings” that can let you exclude trouble periods for ambient light.

f-stop: Since you don’t know where in the beam-path the subject will be (front to back) – set your f-stop as large as you can possibly stomach. f/8 is a good starting point. The larger the f-stop though, the brighter the flashes will have to be. Brighter flashes = shorter battery life.

ISO: You likely don’t have a \$5,000 camera in your camera box do you? That means the high-end of your ISO is going to be pretty limited. Setting it low, however, will mean the flashes may have to work that much harder.

Auto-focus: While you CAN use auto-focus, you’re counting on the subject to not be moving terribly fast. Your camera has to wake up and achieve a focus lock (hopefully on your subject!). Definitely don’t use auto-focus if doing night-time photography. Because of those variables we’d recommend sticking with manual focus if possible. If you’re only interested in day-time photography you can always have Sabre operate just during the day. See section “4.2.6 - Time Settings” for details.

Power Management: Turn off the image review feature (or set it to a minimum duration). Also set the “auto power off” to the minimum.

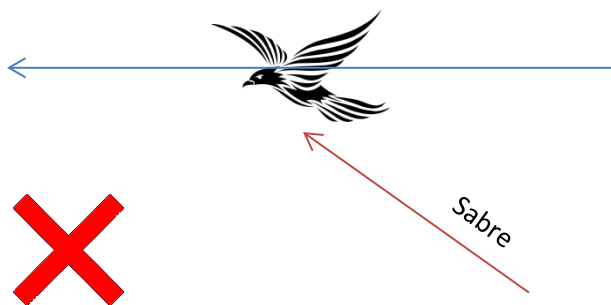
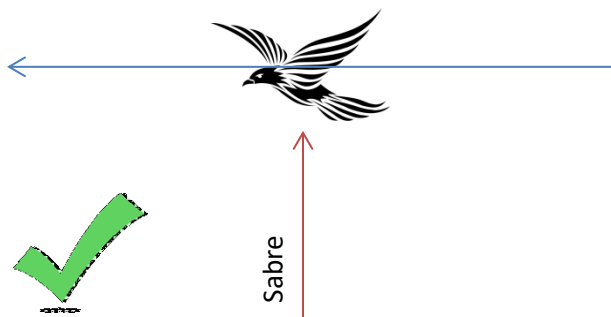
Noise Management: For all that is holy in the world be sure that your focus-lock “beep” is turned off.

Lens: Wide-angle, auto-focus turned off (probably), image-stabilization turned off.

Note: We experienced issues with the Canon EF-S 10-18mm lens. It seems to be a problem with their STM lenses (not their USM). The first shot would always be blurry even if auto-focus was turned off. If you hold the half-press down for a short duration (by setting the “Delay”) you could then get a good focus. Sacrificing time to get a lens to work? The STM series wouldn’t be on our recommended list. Sony PZ (power zoom) lenses are also not good as they lose settings when powered off.

7.3 Bird Photography

Because Sabre transmits a beam of invisible light, it is best to position the sensor so that it will receive the maximum amount of reflected light. This usually means it should be perpendicular to the subject that you're shooting. This will result in the highest returned signal strength. This isn't to say it *has* to be perpendicular, it's just the best way to have the sensor set up. Also the best way for bird photography is to have the sensor pointed straight up. This gives a larger detection area of the bird.



Avoid shooting through glass. If that is unavoidable, make sure that Sabre is pushed directly to the glass. Otherwise the distance measured can drift between the glass and what is outside the glass, causing false triggers.

Also, avoid having a pool of water down-range from Sabre (where its beam will reach the water). This can cause erroneous measurements as the beam reflects off of the water, potentially causing false triggers.

We go into additional details about the physical setup (using the previous generation of Sabre) along with some helpful hints here:

<https://cognisys-inc.com/learn-how-to/sabre-birds-in-flight>

One of the struggles doing bird or bat photography is that they're moving *fast*. Sabre's response time is pretty quick – 10 thousands of a second! The camera, however, can have a dreadfully long shutter lag. Shutter lag is the time from when Sabre tells the camera to take a picture before it actually gets around to taking it. It's not unusual for DSLR's to take over a quarter of a second to respond. Mirrorless cameras if allowed to go to sleep could be *seconds*! Sabre has a feature to reduce the shutter lag by keeping the half press held down on your camera. You'll want to enable this feature for bird photography by checking the box in Camera Settings->HP Always On (Half press always on). See section "4.2.1.9 - HP Always On" for details. The camera's battery won't last terribly long using this feature though.

Sabre defaults to holding down the full press on the camera for a half a second. For bird photography you could set your camera to single shot mode or burst mode. For longer bursts you'll want to adjust the full press time of the shutter by going to Camera Settings->On Time and adjusting as needed.

Sabre defaults to having the LIDAR use auto-ranging. This means it automatically adjusts where it will trigger the camera based off of how far away it sees. If you're shooting up into the sky this works great. If, however, you're shooting up into trees and the wind is blowing this could cause false triggers. In this situation it would be best to change the LIDAR mode to "Manual" (Lidar Settings->Mode->Manual). Then you can enter the maximum distance you want Sabre to look at (something less than the trees).

Since you're shooting in the daylight if you would like to use flashes they would be controlled directly by your camera.

7.4 Races and Runs

Whether its cars, people, horses, or rollercoasters Sabre has you covered! One of the challenges is trying to figure out how many photographs you would like to take and at what interval.

Do you want a burst of photographs? It's best to use continuous shooting on your camera and then adjust how long Sabre holds down the shutter button on the camera (Camera Settings->On Time).

If your camera doesn't support adjusting how fast it takes pictures during continuous shooting you can also have Sabre press the shutter button a fixed number of times each time the LIDAR beam is broken. You do this by adjusting the "# pics", the "On Time" (how long the shutter is pressed), and the "Off Time" (time between pictures). Just keep in mind that if you go too fast the camera may ignore the presses.

If you're shooting something with several subjects (think a marathon with people in groups) but you want to guarantee you have pictures for a duration after the person leaves the beam you could use the "Extend On" feature. What this means is that if Sabre continues to detect something it will keep extending how long the shutter is applied. This guarantees that the shutter will be held for a fixed time *after* someone passes through the beam.

The easiest mode to operate Sabre in is the "Auto" mode where it auto-ranges and looks for something to cross the beam path. While convenient this can cause problems if the area the LIDAR is looking into has traffic on the opposite side of what you're trying to photograph (people on both sides of an event). In this case it may be beneficial to use a fixed distance instead of automatically adjusting the range. To adjust this go to Lidar Settings->Mode and change it to "Manual". You can then enter the distance below in the app or have it measure by pressing the measure button.

7.5 Bat Photography

Is this a thing? Absolutely! Sabre is perfectly suited for shooting bats (this strategy works for flying squirrels or anything else that likes to play at night).

Since this photography is done at night we can take advantage of a couple things. Flashes are very VERY fast. Considerably faster than your camera's shutter speed. Also, since it is dark, we can use the camera's bulb mode which will eliminate shutter lag. That means that the picture of what you're shooting will have your subject directly where Sabre detects it. The one caveat is that since the camera's shutter is open for an extended period it means that you'll need virtually no background light as it will become overexposed.

How do you use bulb mode? First set your camera to bulb mode (either a separate shooting mode on the camera or decreasing the shutter speed until it gets to "bulb"). This means when you press the shutter button on the camera the shutter will open and when you press the shutter button again it will close.

How do you set that up in Sabre? We're first going to want to tell Sabre that the LIDAR should use bulb mode. Go to Lidar Settings->I/O mode and change it to "Bulb". By default, Sabre will open your camera's for 30 seconds. If it detects something it will use its auxiliary connector to fire your flashes and then immediately close the camera for a half second to let the camera save the picture. Both of these durations are adjustable. The shutter is held open for Lidar Settings->Bulb Refresh, and it is closed for "Bulb Off". What happens if Sabre doesn't detect

anything? That means (by default) you'll have a black frame every 30 seconds. With modern cameras and their superior noise reduction you should be able to increase the "Bulb Refresh" time. Just keep an eye out for sensor noise or hot pixels in the black images. Once Sabre detects something it will immediately close the camera's shutter. You can see how to connect your flashes using our previous generation Sabre here:

<https://cognisys-inc.com/learn-how-to/sabre-in-the-dark>

If you're using our Scout Flashes it's very simple. Simple go to Lidar Settings->Drive Mode->Bats. Done! You can still adjust the "Bulb Refresh" and "Bulb Off" times as needed.

7.6 Camera Trapping Advanced

We've gone through a few of the basics to moderate use cases for camera trapping. Let's explore some more advanced setups.

7.6.1 Low Shutter Lag with internal PIR

Typical camera trapping for stills assumes that whatever subject you're shooting will be past the sensor a ways since the camera box, flashes, and especially the (slow) camera will have to wake up before a picture is taken.

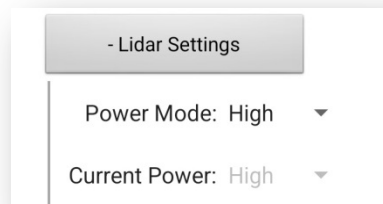
What if there was a way to significantly decrease that delay? Welcome to the "advanced class" in camera trapping!

Thanks to an update to the Scout Camera Box (software version 1.0.09 or later) you have the option to pre-wake everything prior to firing the camera. Enabling this feature is pretty easy.

Let's review Sabre's settings first.

For the LIDAR settings you can select the power settings to be either Auto, High, or Low. If a camera box is detected Sabre will go with "Low" if "Auto" is selected. In this example we want the fastest response time so we'll change that to "High".

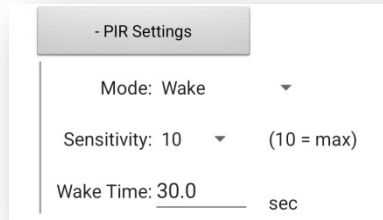
Lidar Settings->Power Mode->High



Next are the PIR settings on Sabre. We want Sabre to wake up the camera box (and flashes) as soon as the PIR detects something. By default the PIR mode is set to "Auto" which if a

camera box is detected will go with “PIR Wake”. You can explicitly change the PIR mode to “PIR Wake” to always force that condition even if a camera box isn’t detected.

PIR Settings->Mode->PIR Wake



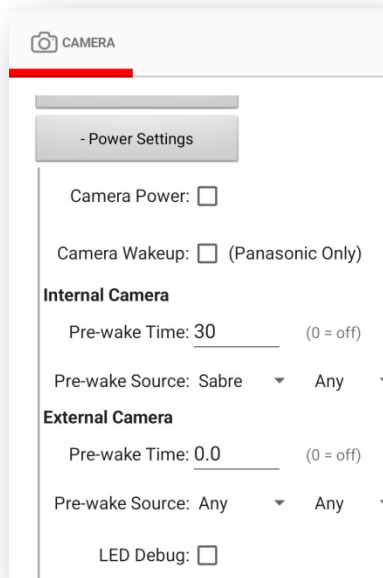
That’s it for Sabre settings! Now for the camera box.

We want to take advantage of the new “Remote Wake” feature. When Sabre’s PIR detects something we want the camera box to hold down the half-press on the camera to minimize the shutter lag. This is easily done in the Scout Camera app by going to:

Power Settings->Internal Camera->Pre-wake Time

This is how long the half press will be held down on the camera. If Sabre doesn’t detect something using its LIDAR in time to actually fire the shutter, the half press will be released.

Be sure to select Sabre as the “Pre-wake Source”.



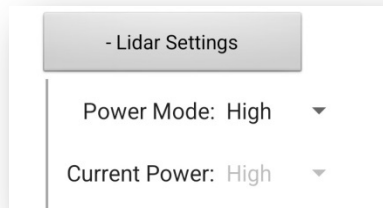
That’s it! Sabre’s internal PIR will wake the LIDAR. The internal PIR will also get the camera box to hold down the half-press on the camera. Welcome to incredibly short shutter lag!

7.6.2 Low Shutter Lag with external PIR

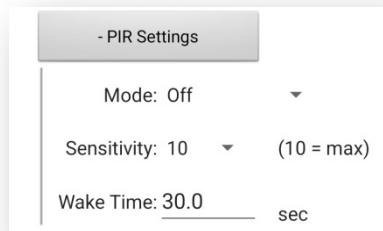
This is a twist of the above. What if your subject is moving quickly – way too fast for Sabre’s internal PIR to have enough time to get the LIDAR up and running. This is covered as well.

The physical setup is placing either a Scout PIR or Scout RX up the trail a distance from Sabre and the camera box. Let’s assume you’re going to use the Scout PIR in this case. The Scout PIR is responsible for waking the camera box, flashes, as well as Sabre. The Scout PIR will also get the half-press down on the camera. As soon as the subject crosses Sabre’s LIDAR beam the camera will take the shot. In this case we’ll keep things awake a little longer (60 seconds) in case the subject is taking a nice lazy stroll instead of running quickly.

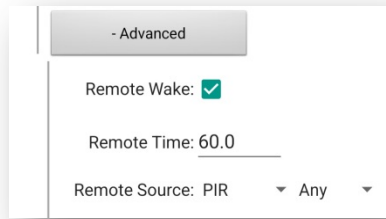
On Sabre we’ll stick with the LIDAR in high power mode since the critter *may* be moving quickly. Lidar Settings->Power Mode->High



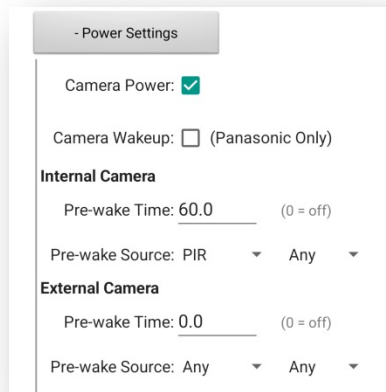
We’re not going to be using the internal PIR in this case so we’ll just set it to off. PIR Settings->Mode->Off.



What we *do* want to turn on is Sabre’s “Remote Wake” feature. This lets Sabre use the external Scout PIR to turn on its LIDAR beam. This is tucked under Lidar Settings->Advanced->Remote Wake. We’ll also explicitly say we want the Scout PIR to wake up Sabre (in case there are other sensors in use for the setup). We’ll also bump up the remote wake time to 60 seconds for the possibly slow moving critter.



Now in the camera box we'll want to select the Scout PIR (not Sabre) to pre-wake the camera. Again we will be setting the remote wake time to 60 seconds.



Perfect. Now when a critter is detected by the external Scout PIR it will fire up Sabre's LIDAR *and* have the camera box press the camera's half press. As soon as something crosses the LIDAR beam the camera will fire. If nothing passes through in 60 seconds, Sabre will go back into low power and the camera box will let go of the camera's half press (and shortly after go back to sleep). The flexibility is pretty incredible.

7.7 Video Recording

This assumes the camera supports video recording using a shutter release cable. For cameras that require a press to start / press to end please do the following:

1. Set the number of pictures to be taken to two:
Camera Settings-># pics->2
2. Set the "Delay" duration to something long enough to guarantee that the camera will be awake and respond to the shutter activation to start video recording:
Camera Settings->Delay (See "4.2.1.3 - Delay"). This time will vary depending on the camera but 0.5 seconds is a good place to start except for Sony and Panasonic cameras.
3. Set the duration of the video recording by adjusting the time between the shutter activations:
Camera Settings->Off time (See "4.2.1.5 - Off time").
4. Turn off Camera Settings->Final off (See "4.2.1.6 - Final Off").

This setup assumes it takes one shutter press to start video recording and another to stop it. It is absolutely critical that you verify the delay time (the duration the half-press is held down) is sufficient to wake the camera and have it respond to the start recording signal (the first shutter press). If it is not long enough you could run into a situation where it misses the first start recording shutter activation but catches the second one. This means the camera would be recording for the entire duration that you DON'T want it to! (All the time between detected events) You might come back to a full memory card if this happens...

The Cognisys Sony Video Switch does **not** require two shutter activations. You only need to set the "On Time" to the duration of the video you'd like to record. Most Sony cameras do require at least two seconds of delay time, with older models like the A6000 in excess of four seconds.

You can get additional details about using Sabre or Scout equipment for video (and app settings) here:

<https://cognisys-inc.com/learn-how-to/cambox-configure>

7. Maximum Battery Life

Battery life is a tricky business. There is some magic chemistry going on inside of those little things that can significantly affect the performance of your Sabre. Here are some general tips:

1. Close the app when you're done configuring Sabre. This will let it automatically turn off Wifi (if turned on) after a period of five minutes.
2. If possible use the LIDAR in "Low Power" mode. This will increase the battery life from days to a couple of weeks. For extra power savings try "PIR Wake" and see if it is fast enough for you. This will turn weeks into almost a year!
3. If possible keep Sabre out of direct sunlight. Electronics tend to draw more current when warm. The internal battery is also less efficient at elevated temperatures.
4. The Li-Ion pack will automatically turn off when the pack reaches its minimum voltage (about 12V). Do not store the Li-Ion pack in a fully discharged state as this can significantly degrade its capacity.
5. Li-Ion batteries self-discharge at a rate of about 3% per month.
6. Li-Ion batteries should only be charged at room temperature. Be sure to let the battery acclimate itself prior to charging. The power indicator will flash at you indicating that it is not charging the battery due to an out of temperature range.
7. Only charge the batteries using the recommended charger (or the internal charging).
8. Be sure to supply clean AC power to the charger and/or to the Sabre power supply. Noisy AC power may make it through the charger or power supply damaging Sabre or the internal battery.

8. Installing the Reflash software (optional)

What is “reflash”? It’s a small program that allows you to update the firmware on your Sabre. **You do not need this program to use your Sabre.** Rest assured if you just purchased your Sabre it ships with the latest software available. If, however, new firmware becomes available you may want to upgrade your sensor. Do you have to upgrade your firmware? No. Should I upgrade your firmware? Maybe. We say “maybe” because as new firmware is released we are adding and improving features. This means changes to the user interface and things might not look exactly how they did before you updated the firmware. So if you discover that a new feature is available that you absolutely have to have, then by all means go ahead and reflash your sensor. Just keep in mind that things might look and behave a little different! The other consequence to reflashing your Sabre is that you *may* lose any stored settings. Reflashing may require updating other Scout equipment in your system as well.

Sabre can only be updated over USB. The reflash process takes just a few seconds.

Reflash requires a firmware package (instructions included). You can find the package here: https://cognisys-inc.com/sabre-2.html#attributesupport_resources

8.1 Windows Installation

Windows installations should automatically detect and download the USB drivers required. Some operating system settings can prevent automatically downloading the drivers. If that is the case, use the above link in section “8 - Installing the Reflash software

Once the installation is complete you will have a “Start Menu” folder called Cognisys. Underneath that you will find the Reflash icon.



8.2 OS X Installation

Reflash requires Java 1.7 or later from Oracle. This version of Java requires that your OS X version be 10.7.3 (Lion) or above. It has not been tested with older versions of Java or earlier versions of OS X and is not supported.

Use the above link in section “8 - Installing the Reflash software”.

Once installation completes you will have a “Reflash” icon on your Launch Pad:



9 Troubleshooting

Problem	Cause	Solution
Does not turn on when power button is pressed	Battery not installed.	Insert a battery pack.
	Battery is empty.	Charge the battery.
LED's keeps turning off	Low batteries	Use fresh batteries
	Low-power mode entered	This is normal if no app is communicating with the sensor. Tap the Wifi or Power button to wake from sleep mode
Green LED is blinking	PIR Wake-up is enabled	This indicates that the PIR sensor detected something. If not using the PIR for your setup you can disable it by going to PIR Settings->Mode->PIR Off.
Camera or flash does not activate when beam is broken (or when the "activate" button is pressed).	"Camera Settings" are incorrect.	See "0 - 7. Examples" for proper settings. They could be too fast for your camera.
	Camera is off.	Turn on the camera.
	Camera has auto-focus turned on.	If the camera cannot achieve focus lock it may not take a photo. Turn off auto-focus on the lens.
	Shutter cable not fully seated.	With new products the connectors can be quite stiff. Be sure the shutter cable is fully seated into the camera.
Camera takes multiple pictures.	Camera set to burst shooting mode.	Turn your camera to "single shot" mode.
	"Camera Settings" are incorrect.	See section "4.2.1.2 - # pics" for adjusting the number of pictures.
App can't connect to Sabre	Wifi disabled on phone/tablet/computer	Turn on Wifi and make sure device isn't in airplane mode.
	Wifi turned off on Sabre	Press the Wifi button so the blue LED lights.
	Firewall is preventing it	Try temporarily disabling the firewall to see if the connection then works. If so, review your firewall settings to allow permissions for the app.
Need to restore factory settings	You just want to start over!	With Sabre powered off, press and hold the power button until the red power light goes out. Release the power button. Optionally you can load the defaults from the

		settings page. See section “4.2.13 - Load Defaults”.
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If you cannot resolve a problem with your Sabre, please contact us at support@cognisys-inc.com. We want to make sure that you are completely satisfied!

10 Specifications

Specifications are intended for reference only. The design may be modified to improve features or functionality without notice.

Specifications	MIN	NOM	MAX	UNITS
Input Voltage ¹	8	12	20	Vdc
Battery Voltage	12	14.8	16.8	Vdc
Battery Capacity (at 14.8V)		3200		mAh
Battery Current – LIDAR at high power ²		50.6		mA
Battery Current – LIDAR at low power ³		8.45		mA
Battery Current – LIDAR at high, Cambox detected ⁴		42.6		mA
Battery Current – PIR Wake ⁵		230		uA
Battery life (LIDAR at high power) ²		2.75		days
Battery life (LIDAR at low power) ³		16.5		days
Battery life (LIDAR at high power, cambox found) ⁴		3.25		days
Battery life (PIR Wake, cambox found) ⁵		300		days
Battery charge time (empty battery, internal charger)		4		hours
Battery charge current		1		A
DC current when charging battery (12V)			1.5	A
Charging efficiency at 12V		96		%
LIDAR range at high power			12	meters
LIDAR range at low power			8	meters
LIDAR beam width (multiplied by distance)		0.035		
LIDAR wavelength		850		nm
PIR viewing angle		+/- 55		degrees
Shutter/Aux Output Current Sink	-	-	1	Adc
Wireless Range ⁶			12	m
			40	feet
Operating Temperature (battery limited)	-30	25	60	C
	-22	77	140	F

- 32-bit power optimized ARM Processor
- Wifi 802.11 a/b/g/n
- Wireless connectivity: Proprietary 2.4GHz
- Real-time clock for time-windowed triggering (two windows provided)
- Powered by internal Li-Ion battery pack or external power
- Flash sync output
- All outputs are open drain (Can be used for flash, shutter, or relays)
- USB for reprogramming

¹ External DC power used for operation and charging of the internal battery.

² LIDAR set to high power, no camera box found.

³ LIDAR set to low power regardless if a Scout camera box is found.

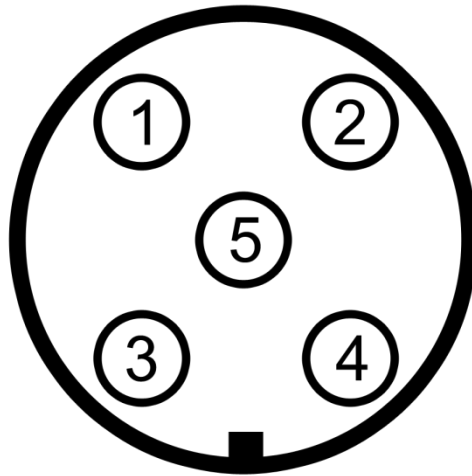
⁴ LIDAR set to High power, PIR set to off, Scout camera box found.

⁵ LIDAR set to Auto, PIR set to Auto, Scout camera box found.

⁶ Several factors can affect the wireless range. Congestion, terrain, etc...

10.1 Connector pin-out

Below are the pin-outs for the three connectors. This is provided for those who wish to do custom wiring for “special” applications.



1. Shutter Full Press
2. Ground
3. Shutter Half Press
4. DC Power In
5. Flash Out / Aux

11 Warranty

Limited Warranty

The Sabre (hereby referred to as “Sabre”), software, and related equipment is provided by Cognisys, Inc. "as is" and "with all faults." Cognisys, Inc. makes no representations or warranties of any kind concerning the safety, suitability, lack of viruses, inaccuracies, typographical errors, or other harmful components of Sabre and its related software. There are inherent dangers in the use of any product, and you are solely responsible for determining whether Sabre is compatible with your equipment and other software installed on your equipment. You are also solely responsible for the protection of your equipment and backup of your data, and Cognisys, Inc. will not be liable for any damages you may suffer in connection with using or modifying Sabre Equipment and/or its related software.

Sabre electronics are warranted to be free from defects in materials or workmanship for two (2) years from the date of purchase. The internal battery is warranted for a period of ninety (90) days. Within this period, Cognisys Inc. will, at its sole option, repair or replace any components which fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alterations or repairs. This warranty is non-transferable.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL COGNISYS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THE PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Cognisys, Inc. retains the exclusive right to repair or replace the product or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

12 Revision History

Revision	Date	Change
1.0	11/13/2024	Initial Release