



PLUTO TRIGGER USER MANUAL

VERSION 1.0



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1. INFO

1.1. DISCLAIMER

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1.2. WARRANTY

Baicheng Innovations (BCI) warrants this hardware product against defects in materials and workmanship for a period of ONE (1) YEAR from the date of original retail purchase. If a defect exists, at its option BCI will exchange the product with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product. A replacement product/part assumes the remaining warranty of the original product or 60 days from the date of replacement, whichever provides longer coverage for you. When a product or part is exchanged, any replacement item becomes your property and the replaced item becomes BCI's property. To obtain product support for the Pluto Trigger, visit our website

www.bci-innovations.com.

1.3. FCC/CE COMPLIANCE

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

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

1.4. SAFETY

In order to prevent damage to the Pluto Trigger and/or a personal injury, please read and observe the following important security precautions.

1. Do not disassemble the unit

This unit is a complex electronic device and contains no user-serviceable parts, except for user-replaceable batteries. An unauthorized disassembly or modification may void service warranty on the unit.

2. Keep the unit dry

Avoid exposing the unit to the excess water or rain. Always keep weather protection seals in place where possible. Exposing unit's internal circuitry to water may result in fire and/or electric shock.

3. Do not operate in the event of malfunction

In case of a smoke or an unusual smell coming from the unit, please immediately turn the unit off, remove batteries (batteries may be hot, take care to avoid burns) and unplug an optional AC adapter if connected. Discontinue further use and forward the unit to an authorized service center. Continued use of a malfunctioning unit may result in an injury.

4. Do not expose to fire or high temperatures

When subject to high temperatures such as fire or a closed compartment exposed to the sun, the unit may be damaged. Particularly, do not leave the unit in a closed vehicle under the sun.

5. Avoid extreme temperature changes

Electronic devices may be damaged by sudden and extreme changes in environment temperature. Just like your digital camera, the Pluto Trigger should not be used immediately after bringing it from sub-freezing temperatures into a warm environment. Please allow for at least 2 hours of slow warm-up in a closed bag before using the Pluto Trigger again after bringing it in from the cold.

6. Keep out of reach of children

This unit contains small parts that may be choked on. If a child swallows or chokes on any part of the unit, consult a physician immediately.

7. Use only BCI approved accessories

Using accessories not approved by BCI may void your Pluto Trigger warranty, may cause malfunction and/or fire and/or electric shock, and may result in an injury.

2. INTRODUCTION

2.1. OVERVIEW

Thank you for purchasing Pluto Trigger, the most advanced camera trigger solution. To get started with your Pluto Trigger unit, please read the "Introduction" and "Quick Start Guide" sections. In order to get the most of your Pluto trigger, it is recommended to read the sections of different Modes as well.

The Pluto Trigger is an advanced, microprocessor controlled portable unit, capable of automatically calculating various exposure sequences, and providing super-fast trigger for high-speed event. The unit is powered from rechargeable Li-ion battery, is equipped with light/sound/PIR sensors, a infrared emitter for triggering cameras without cable, a bottom 1/4-20 inch screw for mounting on tripod, and comes with a flannel drawstring bag for carrying it in the field.

The Pluto Trigger Apps for iOS and Android are easy to use and powerful. Besides the sensors embedded in Pluto Trigger, some advanced sensors on your phone are used to trigger your camera in Phone Sensor Modes. The handy tools like ND Filter Calculator will bring your photography skills to the next level. More features will be added in the future updates.

2.2. BOX CONTENTS



- | | |
|------------------------|--------------------------|
| 1. Pluto Trigger | 6. USB charging cable |
| 2. Pluto Laser | 7. Shutter release cable |
| 3. Pluto Dongle | 8. Flash PC sync cable |
| 4. Quick guide leaflet | 9. Hot shoe adapter |
| 5. USB battery charger | 10. Drawstring handbag |

2.3. FEATURES

1. Bluetooth 4.0 Low Energy

2. Shutter Release Button

3. Infrared Remote

4. Intervalometer Modes

Shutter Release, Time-lapse, HDR, Star trail

5. Pluto Sensor Modes

Laser, Sound, Light, Lightning, PIR, Aux, Timer, Fusion

6. Phone Sensor Modes

Sound, Vibration, Distance, Voice Command, Motion, Face

7. Tools

Sun Calculator, ND Filter Calculator, DOF Calculator, Starscape Calculator, Shutter Delay Measurement

8. In-app Firmware Upgrade

2.4. SPECIFICATIONS

Size: 60*40*20mm

Bluetooth Range: 10-30 meters

Battery life: 1-2 days

2.5. PLUTO TRIGGER HARDWARE



1. Aux sensor port
2. USB charging connector
3. Camera/Flash port



1. Program status led
2. Microphone
3. Battery charging led
4. Shutter-release/Bluetooth button



1. Laser/Light sensor
2. PIR sensor
3. Infrared Emitter



1. Power switch

2.5.1. SHUTTER RELEASE BUTTON

The shutter release button let you trigger your camera manually.

It is also used as a switch to turn on/off the Bluetooth module. To do this, just press the button and hold for **5 seconds** and the Status Led will show notification.

Three short blinks means Bluetooth is turned ON, while **one long blink** means Bluetooth is turned OFF.

Turn off Bluetooth makes the battery life of Pluto Trigger much longer. It is useful when you are taking long time-lapse sequence or using Pluto Trigger only as a RF 2.4G receiver. You configure the settings and then turn off Bluetooth. Pluto trigger runs at about half power consumption. When you need to change settings, turn Bluetooth back on.

2.5.2. LED

The Status Led can be set to four modes as follows:

1	Off	All led notifications are turned off
2	Program Start/End	Blink led when Program starts or stops running
3	Camera Trigger	Blink when Pluto trigger your camera
4	Periodic Notification	Blink every 5 seconds, indicating Pluto is power on

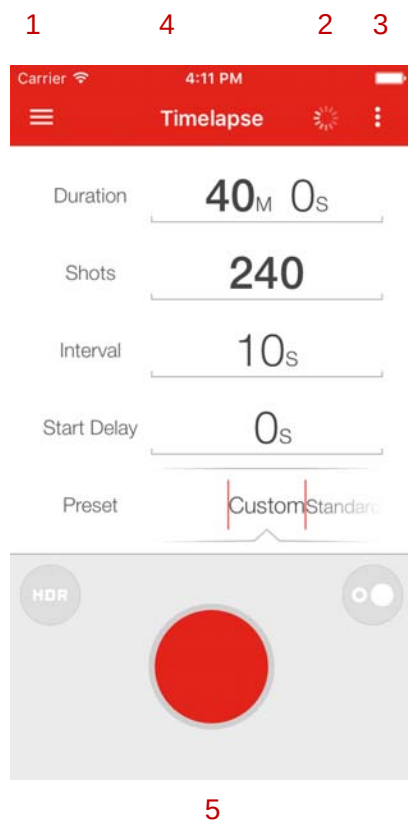
Note: Display mode with high number also covers all led notifications with lower number. For example, if display mode is set to *4-Periodic Notification*, Pluto will show all led notifications, which include *2-Program Start/End*, *3-Camera Trigger* and *4-Periodic Notification*.

Three short blinks always means Start; one long blink always means Stop.

The color of the Status Led shows the battery level of Pluto Trigger.

Green	100%
Yellow	75%
White	50%
Red	20%

2.6. SMARTPHONE APP



1. Menu
2. Device (Scan/Battery)
3. Settings
4. Parameters
5. Start/Stop

3. QUICK START GUIDE

3.1. PLUTO SETUP

Use the following workflow to get started:

1. Connect the 2.5mm headphone stereo plug to the Pluto Trigger camera port located next to its USB port. Connect the camera plug to the camera shutter release port. You may want to consult your camera user manual on where the shutter release port is located.
2. Turn Pluto Trigger on by sliding the power switch to the right. The Status Led should blink for three times, indicating system starts.
3. Make sure Bluetooth on Pluto Trigger is turn on. Bluetooth is on by default. But if it was turned off accidentally, you can toggle the Bluetooth state by pressing and hold the shutter release button on Pluto Trigger for 5 seconds. When Status Led emits three short blinks, Bluetooth is turned on. while one long blink means Bluetooth is turned off.

3.2. CAMERA SETUP

Your camera may also require a minor set up process prior to using the Pluto Trigger. We recommend the following camera settings to get the most out of your Pluto Trigger:

1. Turn your camera on.
2. Set your camera to Manual Exposure mode unless recommended otherwise.
3. Set your camera to Manual Focus mode unless recommended otherwise.
4. Set your camera to Single drive mode. Operating your camera in Continuous drive mode with Pluto Trigger may lead to unexpected results, such as extra pictures being taken. Alternatively, you can use Quiet or Silent drive mode, if available on your camera. With Quiet or Silent drive mode the frame rate may be slower, but shutter will generally sound more quiet and soft, which may be preferable in certain situations.

Should you have any problems when using Pluto Trigger with your camera, resetting your camera to the default settings may help. Please consult your camera user manual for details on how to reset camera settings.

3.3. APP USAGE

To get started, take "Time-lapse" mode as an example. Go through the following steps:

1. Turn on Bluetooth on your phone
2. Start Pluto Trigger App for iOS or Android.
3. Connect with Pluto Trigger. On first app launch, the Device button is a spinner that means no Pluto is connected. Now make sure Pluto Trigger is turned on; click the Device button. A Device Scan screen slides in, and the app is scanning for Pluto Trigger in your environment. All Pluto Triggers with Bluetooth turned on will show up in seconds; click the icon of the found device and app will connect to it. The default **Pin code** is "**000000**". Now navigate back to the Time-lapse screen. A battery icon replaces the spinner, which means a Pluto Trigger is connected; the battery icon shows the battery remained in your Pluto Trigger. If the app has connected to your Pluto Trigger before, skip this step since it will automatically make the connection on app launch.
4. Change time-lapse settings, as you need.
5. Finally, make sure your camera is properly connected to Pluto Trigger and set up as described in the **PLUTO SETUP** and **CAMERA SETUP** chapters. With your camera in Manual exposure and Manual focus, press the red "Start" button to start program. Pluto Trigger displays the current image sequence step and the time remaining. As each image sequence finishes, Pluto Trigger emits an optional Status Led notification and returns to the mode settings screen.
6. If you want to cancel an exposure sequence before it completes, press the red "Start" button again. Pluto Trigger App will return to the mode settings screen.
7. When finished using the Pluto Trigger, slide power switch to the left to turn the unit off. Pluto Trigger memorizes your current settings as it powers off and restores them the next time it powers back on.

Your Pluto Trigger offers a multitude of camera trigger modes that will help in your daily photography needs; you can easily navigate through available modes using the top left Menu. Refer to following sections to learn more about each mode.

4. INTERVALOMETER MODES

4.1. SHUTTER RELEASE MODE

Use this mode when you only need to take a single picture manually. Depending on the mode settings, the Pluto Trigger either simply instructs the camera to release the shutter with the current in-camera settings, or attempts to time an arbitrary exposure by using camera's Bulb mode.

You can choose one of the following release modes to take a picture:

1. **Single**: press to take a single picture
2. **Focus**: press to focus, release to take a picture
3. **Hold**: press to open shutter, release to end exposure
4. **Lock**: press to open shutter, press again to end exposure
5. **Bulb**: set exposure time, press to take a picture
6. **Burst**: set interval, press to start a exposure sequence
7. **Timed**: set countdown and start, take a picture when countdown finishes

For "Hold", "Lock" and "Bulb" release modes, set your camera to **BULB** mode. For others, you may use any exposure mode on the camera, including fully automatic exposure modes. Please note that Manual focus mode should still be used.

Usage

1. Make sure your camera is connected and set up.
2. Make sure Pluto Trigger is connected.
3. Select "Shutter Release" from app's menu.
4. Select a release mode; set the time if needed.
5. Press red "Start" button to take a picture.

NOTE 1: If you would like to pre-focus before exposure, switch your camera to Auto focusing; and select appropriate focus time in app's "Settings" menu, depending on the lightning condition and your camera model.

NOTE 2: Depending on your camera model and chosen mode, select appropriate shutter pulse length in app's "Settings" menu. For example, you may need to choose longer pulse length when Live View is turned on.

4.2. TIME-LAPSE MODE

Use "Time-Lapse" mode to take a number of pictures separated by a preset time interval with an optional start delay before starting the sequence. The resulting pictures can be used to create a fast motion video.

The basic Time-Lapse mode will use your camera exposure settings. Your camera should be set to Manual mode. Besides the basic Time-Lapse, another two advanced Time-Lapse are available: HDR Time-Lapse and Bulb Ramping Time-Lapse. If HDR or Bulb Ramping is enabled for your time-lapse sequence, set your camera to Bulb mode for Pluto Trigger to time an arbitrary exposure.

Usage

1. Connect Pluto Trigger to your camera with camera release cable.
2. Turn on Pluto Trigger and make sure Bluetooth is turned on.
3. Turn on your camera. If HDR or Bulb Ramping is enabled, put your camera in Bulb exposure mode. Otherwise, set your camera to any exposure mode other than Bulb mode.
4. If your memory card allows, set your camera to RAW image format. This will make post-processing much easier. If you change image quality setting, re-check that your camera can still fit the planned number of images.
5. Start Pluto Trigger app on your phone; connect to Pluto Trigger with Bluetooth; navigate to Time-lapse mode.
6. Use "Duration" setting to specify how long the time-lapse will take. This setting uses HH:MM:SS format. The maximum duration is 99:59:59.

7. Specify how many "Shots", or images should be taken in total. Make sure your memory card can fit that many images.
8. Use "Interval" setting to specify how often a picture should be taken.
IMPORTANT: your camera may not be able to take images as fast as the interval setting may suggest. The maximum frame rate is determined by the image type/size selected in the camera, memory card speed, presence of shutter cable and other factors. If your camera cannot keep up with the Time-Lapse interval you set, some images may be skipped.
9. Use "Start delay" setting if you wish to delay the beginning of the Time-Lapse image sequence. This setting uses HH:MM:SS format.
10. If you would like to enable HDR or Bulb Ramping, refer the following section for instruction. Otherwise skip this step.
11. Press red "Start" button to start Time-Lapse program. If you specified a start delay above, a countdown will begin, otherwise Pluto Trigger will take the first image and continue with the sequence as programmed.
12. When the Time-Lapse program finished, it will return to the settings screen. While Time-Lapse is running, at any moment you can press the red button to stop the sequence.

Note 1: When the Time-Lapse program has been started, Pluto Trigger can work alone without your phone; all timing and calculations are done on the Pluto Trigger unit. You can disconnect the Bluetooth connection, hide app in background or even close the Pluto Trigger app. Have fun with your phone when taking long and tedious Time-Lapse sequences.

NOTE 2: Turning all of your DSLR settings like exposure, white balance, and focus to manual will eliminate most flicker. However, you may still get a case of "aperture flicker". Aperture flicker is caused by a DSLR's inability to open and close the aperture blades of a lens the exact same amount every time. To avoid that, try lens twist:

1. While holding down the depth of field preview button (DOF Preview) press the lens release button. The aperture blades will be closed down to your selected aperture.

2. Now while holding down both buttons twist the lens as if you were removing it. The twist should be a very small turn. You should now see a “00” where your aperture information used to be.
3. Take a few pictures to make sure you do not get an error. Re-attach the lens and try again if you get an error.

NOTE 3: If your camera is set at an angle, and your lens is prone to unexpected zoom/focus changes due to gravity, you may want to use scotch tape to fix the zoom/focus rings. On ultrasonic lenses focus setting will not move, but zoom setting may change.

4.2.1. POWER MANAGEMENT

Your camera battery may not be able to withstand a long term Time-Lapse without being powered by an AC adapter. However, you can minimize camera power draw by enabling automatic meter-off timeout in your camera settings. The camera will then go to sleep between Time-Lapse shots. When needed, Pluto Trigger will wake it up and continue its work. With a properly chosen camera meter time-out, you may be able to run hundreds of frames through your camera before its battery is depleted.

You can turn off Bluetooth module of Pluto Trigger after a long Time-Lapse sequence has been started. Just press and hold the shutter release button on Pluto Trigger for 5 seconds. The downside is that you will not be able to check the progress of the Time-Lapse sequence.

If you plan on running Time-Lapse sequences for more than a day, you may want to power your Pluto Trigger from the USB charger. Unlike camera, your Pluto Trigger cannot afford to sleep between Time-Lapse sequences, and thus requires a source of external power for long Time-Lapse sessions.

4.2.2. BULB RAMPING TIME-LAPSE

The Bulb Ramping mode is intended for Time-Lapse users who would like to take Time-Lapse videos in changing light conditions, such as a sunset or a sunrise, which is also known as Holy-Grail in Time-Lapse. It works by gradually changing camera Bulb exposure, achieving a nearly flicker-free exposure transition from

bright to dark, or dark to bright. This section assumes familiarity with basic Time-Lapse concepts.

A bulb ramping sequence consists of taking a set of pictures with constant exposure, then changing exposure in very small increments or decrements for a certain period of time, and then taking another set of pictures with constant exposure.

Usage

Bulb Ramping Time-Lapse may greatly benefit from some preparation work. Before you taking the Time-Lapse, you'd better get exposure metering of a scene at a time of day when you bulb ramping is planned to be finished. For example, if you plan to shoot a sunset Time-Lapse, get an exposure of the same scene the night before. Set your camera ISO setting to a fixed value, remember the final exposure time, aperture and ISO values used.

Use the following workflow to prepare for bulb ramping time-lapse:

1. Navigate to the "Solar Calculator" screen from app's Menu. Remember the official sunset time (for sunset session) or civil sunrise time (for sunrise session).
2. Set up a basic Time-Lapse sequence as described above; make sure the duration will cover the whole sunset/sunrise period. Use interval of 10 seconds for general bulb ramping. Higher interval values will result in faster time-lapse videos. Lower interval values will result in slower time-lapse videos. Note that too short of an interval may limit your exposure range.
3. Make sure your camera ISO is not set to "Auto". Doing so may interfere with bulb ramping.
4. Disable Mirror Lock-Up mode on your camera. Pluto Trigger cannot ensure correct exposure timing in Bulb Ramping mode with Mirror Lock-Up enabled.
5. Disable automatic focusing on your camera, choose a fixed aperture and set ISO to the same fixed value you used when measuring your end exposure as described above. If you did not pre-meter your end exposure, use any ISO setting such as 200. Do NOT use automatic ISO feature, if available in your camera.

6. Set your camera to Manual exposure mode, take a few test pictures and pick a shutter speed that yields an acceptable picture.
7. Click the Bulb Ramping button on the upper-right of the red "Start" button. The Bulb Ramping screen slides in.
8. Turn on Bulb Ramping and the parameters will show up.
9. Use the next setting to set a delay to end the exposure ramping period. Most sunsets/sunrises take about 30 minutes, so this delay should be "Begin Ramp" delay + 30 minutes.
10. Specify the current shutter speed as "Start exposure".
11. Enter the "End" exposure using "End" setting. If you pre-metered the end exposure as described above, enter that exposure time here. Make sure the end exposure is shorter than the Time-Lapse Interval.
12. Specify a delay to start the exposure ramping using "Begin Ramp in" setting. If you work on a sunset, this delay would be the time from now to when the sunset starts, plus 5 minutes to allow yourself to complete this setup. You can obtain sunset start times using various tables and/or weather reports.
13. Press "Start" on Pluto Trigger. Depending on your settings, one or more prompts may be shown, clarifying the next step. Otherwise, the image sequence will begin immediately.

NOTE: In many circumstances your start exposure will be shorter than what Pluto Trigger allows you to choose. For example, you set your aperture to F/8 with ISO 100, and your camera says you need to use exposure of 1/100 second. However, Pluto Trigger will only allow going as short as 1/20 second (this may vary depending on camera model). This case would require installing and keeping ND filters in front of your camera lens to make exposures longer than 1/20 second.

4.2.3. HDR TIME-LAPSE

HDR time-lapse mode can be optionally used to create High Dynamic Range Time-Lapse sequences. This mode will take several images instead of only one at each time-lapse interval.

Usage

1. Set up a basic Time-Lapse sequence as described above;
2. Click the HDR button on the upper-left of the red “Start” button. The time-lapse HDR screen slides in.
3. Turn on HDR and the parameters will show up. Refer to “HDR Mode” section below for how to set HDR parameter.
4. Make sure the time-lapse interval is long enough to take a set of HDR images.
5. Press red “Start” button to take a HDR time-lapse sequence.

4.3. HDR MODE

High dynamic range imaging (HDR) is a process in which a greater dynamic range of light is captured throughout the lightest and darkest areas of an image. HDR Photographs are generally created by shooting multiple photographs using exposure bracketing. After that, they are merged back together into a single HDR image.

With Pluto Trigger, you can shoot up to 19 photos in a HDR sequence. And the exposure step can be set a value from 1/3 to 3 stops.

Due to using Bulb mode, the shortest exposure that can be used in HDR is limited depending on your camera model. In addition to that, exposure close to the shortest limit may be slightly less accurate and may vary in brightness.

Usage

1. Connect Pluto Trigger to your camera with camera release cable.
2. Turn on Pluto Trigger and make sure Bluetooth is turned on.
3. Turn on your camera. Set your camera to Bulb exposure mode.
4. If your memory card allows, set your camera to RAW image format. This will make post-processing much easier. If you change image quality setting, re-check that your camera can still fit the planned number of images.

5. Disable Mirror Lock-Up mode on your camera. Pluto Trigger cannot ensure correct exposure timing in Bulb HDR mode with Mirror Lock-Up enabled.
6. Disable automatic focusing on your camera. You may also need to set it to Single drive mode. Quiet or Silent mode is also acceptable, if available on your camera.
7. Start Pluto Trigger app on your phone; connect to Pluto Trigger with Bluetooth; switch to HDR mode.
8. Choose the Mid Exposure and other sequence parameters. However, in HDR mode extra care needs to be taken. As you make changes to the settings, the exposure from the HDR sequence may fall out of possible range. Due to using Bulb mode, any exposure faster than 1/20 second will be inaccurate and Pluto Trigger will use 1/20 second instead. When shooting daylight photography and other bright scenery, ND filters may be used on your camera to darken the scene and make the resulting exposures longer.
9. Press red "Start" and a series of images will be taken.

You can use image-processing software to combine these pictures and create an HDR image.

4.4. STAR TRAIL MODE

Star Trail Mode can be used to take long-exposure image sequences of the night sky. These long-exposure images can later be combined using image processing software to create a night sky picture with beautiful star trails.

Usage

1. Connect Pluto Trigger and set up your camera as described in "HDR" mode section.
2. Start Pluto Trigger app on your phone; connect to Pluto Trigger with Bluetooth; switch to "Star Trail" mode.
3. Choose number of shots, exposure time, gap time and start delay.
4. Press red "Start" and a series of images will be taken.

5. PLUTO SENSOR MODES

Pluto trigger is an advanced MCU controlled device, which has several sensors embedded in. These sensors are ideal for high-speed photography and trigger traps.

High-speed photography usually uses The light/laser sensor and sound sensor can respond to the light or sound change in a minimum delay (less than 1 millisecond).

The goal of the high-speed photography is capturing objects in motion. In all cases you want to be able to detect a trigger, wait for an event and take a picture. There are two methods for performing high-speed photography with the timer. The first method uses a shutter of a camera. The second method uses an electronic flash.

SHUTTER METHOD

The main advantage of the shutter method is that it can be used outdoors. The subject and the background can be fully illuminated. Since the shutter is used to freeze the motion of the subject, it offers a limited speed. Maximum speed of a shutter could range from 1/4000sec to 1/8000sec, in some cases it may not be fast enough (fast moving objects will become blurred).

Moreover, in cameras that have a focal plane shutter, a small slit moves across the photographic plane at much slower speeds (1/250), thus exposing different parts of the photographic plane at slightly different times.

Finally, there is a delay between the shutter release and the actual exposure. It could be as much 100ms or more (depending on camera). In addition there could be a small variation in timing, each time the camera takes a picture. Therefore this method should not be used when high timing accuracy is required.

FLASH METHOD

The second method of high-speed photography is the flash method. The picture is taken by opening the shutter of the camera, activating the flash and closing the shutter. The picture needs to be taken in a dark room. Because the room is dark, the long exposure time will not have any effect on the final output. The flash light duration now becomes the actual exposure time. The main advantage of the

flash method is the exposure speed and better timing consistency. Electronic flashes are capable of light strobes with durations of 1/10,000 or faster (lower the power setting of the flash, the shorter the flash duration).

The lag between the trigger and the flash strobe is insignificant. The disadvantage of this method is that the picture needs to be taken in a dark room to avoid the over exposure. Also since the flash is used to make the exposure, it may be more difficult to provide a uniform lighting or to illuminate the background.

5.1. LASER MODE

The laser mode is used is to capture picture of moving items. This can be a wild animal, a bird or a ball rolling down. In order to use this mode, you need a laser source. You will feed the laser beam to MIOPS and whenever the beam is broken MIOPS will trigger your camera or flash unit. The type of the laser source is not important. It can be a red or green laser source. The laser beam must be stabilized so it does not move away from the receiver of MIOPS. The laser sensor of Pluto Trigger is on the front side of the device.

Caution: Laser beam can be dangerous. Avoid eye contact. Use the laser source at your own risk. We strongly recommend that you use a protective goggle.

Usage

1. Connect Pluto Trigger to your camera with shutter release cable.
2. Turn on Pluto Trigger and make sure Bluetooth is turned on.
3. Turn on your camera. Set your camera to Manual exposure mode.
4. Disable automatic focusing on your camera. You may also need to set it to Single drive mode. Quiet or Silent mode is also acceptable, if available on your camera.
5. Start Pluto Trigger app on your phone; connect to Pluto Trigger with Bluetooth; switch to "Laser" mode.
6. Point you laser beam on to the laser sensor on front side of Pluto Trigger (the transparent led). Check the sensor value in the app to make sure laser is aligned.

7. Adjust the “sensitivity” setting using the slider. Make sure the sensor value is greater than the threshold (middle of the arc) when laser beam is feed to the laser sensor. And also make sure the sensor value is smaller than the threshold when you break the laser beam.
8. Use the “trigger mode” button to switch between “High trigger” and “Low trigger”. In “High trigger” mode, the trigger fires when the laser beam is feed to the sensor. Whereas in “Low trigger” mode, the trigger fires when you break the laser beam.
9. Use the “trigger speed” button to switch between “High speed” and “Power save”. In “High speed” mode, the trigger fires with the response time less than 20 microseconds. Whereas in “Power save” mode, the trigger is slowed down to a response time of 1 millisecond to save battery power. One millisecond response time is still very fast comparing with the shutter delay of your camera, which is usually tens of milliseconds. In one millisecond, Usain Bolt can only run a distance of 1cm. As a rule of thumb, use “High speed” when trigger flash, and use “Power save” when trigger camera.
10. Use the “delay” setting to delay the triggering of your camera or flash. The unit can be set to microsecond, millisecond and second.
11. Press red "Start" button to run the program.

5.2. SOUND MODE

The sound mode is used for high-speed photography where your regular DSLR camera is too slow to take pictures of popping balloons, breaking glasses, exploding items etc. The idea behind using a sound trigger is very simple. Instead of triggering your camera, you are going to trigger the flash unit. Your camera will be in bulb mode in a completely dark room. Whenever the flash is triggered, you will capture a single frame. Instead of taking many pictures with a high-speed camera, you will capture a single frame with your regular DSLR camera. In this setup, the speed of the flash unit is also very important. The faster the flash unit, the sharper will be the image.

Please check your firmware and app versions to verify the reference of this document.

The sound mode has three different parameters. These are Sensitivity, Delay and Lock. The sensitivity can be set to a value between 1 and 99 using the dial. Setting the sensitivity to a high value will let you to capture more sound events. If you want to capture only high level sound events, you need to set the sensitivity to a lower value. You can try and see which sensitivity level fits your needs. The second parameter is delay. This parameter is very useful for high speed photography. Let's assume you want to take the picture of a bullet flying through an apple. When the shotgun is fired, it will make a big noise.

The sound event will be captured but it is too early to trigger the flash unit. The bullet has not reached the apple yet. So, you need to add some delay. The flash unit will be triggered after the delay you specified and this will allow you to capture the picture at the exact moment. You can set the delay anywhere between 0 ms and 999 ms.

The third parameter is lock. This parameter is used if you want to trigger the flash unit for a single time only. In a dark room setup, there will be usually repeating sound events, which will cause the flash unit to be fired more than once. As your camera will be in bulb mode, this will cause blur in the image. In order to avoid this you can use the lock parameter. If you set the lock parameter to on, the device will be triggered once only.

5.3. LIGHT MODE

Light mode is similar to sound mode, but use ambient light as the signal to trigger the camera.

5.4. LIGHTNING MODE

mode is one of the six basic modes of MIOPS. In this mode, MIOPS will trigger your camera or flash unit, if it detects any sudden light event like lightning, fireworks, sparks, flash lights etc. Lightning mode has a single parameter to be adjusted and it is the sensitivity. You can set the sensitivity anywhere between 1 percent to 99 percent. If you want to capture light events which are not very powerful, you need to set the sensitivity to a high value. This will help you to capture more events. If you want to capture the most distinctive events only, you need to set the sensitivity to a lower value. In this case, MIOPS will not trigger your camera for a lightning which strikes very far away with little light emission.

The optical sensor of MIOPS is also sensitive against IR (Infrared) light. As human eye cannot see IR, you may wonder why MIOPS is triggering your camera even if there is no lightning. The reason is most probably that there is an IR light event in the environment.

The artificial light sources may cause false triggering. So, make sure that you are away from artificial light source. Light bulbs are the most common form of artificial light. When you are using MIOPS in lightning mode, make sure that you are away from light bulbs.

Please check your firmware and app versions to verify the reference of this document.

The sensitivity of the lightning mode can be adjusted, using the touch dial on the screen. Turning the dial clockwise will increase the sensitivity and vice versa. The faster you turn the dial, the faster will change the sensitivity. The current level can be read in the middle of the dial. If you want to fine tune the sensitivity level, you need to turn dial really slow. You can change the level by +/- 1 percent if you do so.

You can change the sensitivity anytime, by using the buttons on MIOPS as well. But the settings on the smartphone app will override the settings on MIOPS, whenever data is sent from the app to MIOPS

As it is the case in all modes, do not forget to touch the “start” button. Verify that data has been successfully sent to MIOPS to ensure a proper operation.

5.10. DIY MODE

DIY mode enables you to use external sensors for creative photography. You can hookup external sensor for pressure, temperature, humidity etc. The output voltage of the sensor must be between 0 and 3 Volts and the sensor must be connected to MIOPS using the DIY port. The DIY port is 3.5 mm jack. This mode has three different parameters. These are Threshold, Delay and Mode. You need to set a threshold value between 1 and 99 percent. The second parameter is delay. You can set a delay value

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between 1 msec and 999 msec. Finally, you can also define the signal change mode. This determines what kind of signal change from the output of the sensor would be treated as a valid triggering event. There are three different options: Raise, Fall and Change. If you set it to Raise, MIOPS will detect only raising signals. If you set it to Fall, MIOPS will detect falling signals. If you want both types of signals to be detected, then you need to set the parameter to Change.

6. PHONE SENSOR MODES

Phone sensor modes use various sensors on your smart phone to trigger your camera.

7. TOOLS

7.1. SUN CALCULATOR

Sun Calculator calculates the time of official sunrise/sunset and civil sunrise/sunset based on your location and local time. The period between civil sunrise and official sunrise, together with the period between official sunset and civil sunset, are called civil twilight. The sun is below the horizon, but its light is visible because it illuminates the upper layers of the atmosphere. Due to diffused light and different shades of color in the sky, civil twilight is ideal for portrait and landscape photography.

The sunrise/sunset time is also very useful if you are taking sunrise/sunset holy grail time-lapse. You will need to set the start time of Bulb Ramping based on sunrise/sunset time.

For convenience, two countdown clocks are provided to show the forthcoming sunrise/sunset events.

7.2. ND FILTER CALCULATOR

ND Filter Calculator is a utility that helps you determine the correct exposure time/shutter speed when using Neutral Density Filters. Set the filter you are using and the shutter speed without the filter and the calculator calculates the new shutter speed with your filter(s) fitted.

7.3. DOF CALCULATOR

Depth of Field (DOF) is the range of distance in a photo that appears to be in sharp focus. Depth of field is a creative decision and one of your most important choices when composing nature photographs.

Based on the focal length, aperture and camera type you have entered, DOF calculator calculates the hyper focal distance. This is the focus distance where everything from half the hyper focal distance to infinity is within the depth of field. This is useful when deciding where to focus such that you maximize the sharpness within your scene,

Use the actual focal length of the lens for depth of field calculations. The calculator will automatically adjust for any "crop factor" for the selected camera.

7.4. STAR SKY RULE

When taking pictures of the sky with stars at night, a long exposure time is preferred in order to get as much light as possible onto the image sensor of your camera. However, there is a limit if you are not taking star trail pictures. To get sharp dot stars, you should not cross this limit. The exposure time limit is calculated with a formula called Rule of 600.

You select camera model and actual focal length; the slowest shutter speed is calculated automatically with the crop-factor of your camera already accounted.

The stars near the equator move much faster than the stars near the poles. You can choose Rule of 500 or 400 for fast moving stars.

8. SETTINGS

8.1. TRIGGER

Change these settings to control the timing of trigger signals.

8.1.1. PRE FOCUS TIME

Default: 0 - Manual Focus

Depending on the mode of Pluto Trigger is running, you should choose different focus time.

For high-speed photography, fast response is critical. Your camera is set to manual mode. You should choose "0-Manual focus" to tell Pluto Trigger no need to focus before release shutter.

If you set your camera to Auto-focus mode and want the camera pre focus before exposure, then choose appropriate focus time depending on the lightning condition and your camera model. Please be noted in auto-focus mode camera will not take picture if it doesn't get focus. You are not guaranteed to have your camera triggered in the mode.

In time-lapse mode of timer mode, you may like to put your camera into sleep mode during the long interval to save a lot battery power. The you can set pre focus time to "0.5" - Pre Wake Up" in order to wake your camera up before taking next picture.

8.1.2. SHUTTER PULSE TIME

Default: 150ms – Camera

Shutter Pulse Time setting depends a lot on what device your want to trigger. For speed flash, a shot pulse works fine. For normal cameras, 150mm is adequate. If that is not enough to trigger you camera, choose longer time.

8.1.3. TRIGGER RESET TIME

Default: 3"

Trigger Reset Time is very important in those sensor trigger modes. It determines how often the trigger can be fired. The default value is 3", which means the trigger will not fire in the 3" period after trigger fires. Using this setting, you can purposely ignore some unwanted trigger event (like camera shutter sound), and also set the minimum trigger interval.

8.2. INFRARED

Pluto Trigger can control your camera via infrared. Many popular camera brands are supported. For some camera models, you can even start/stop video

recording using infrared signal. For cameras without shutter release port, infrared control can be a good option. And this makes Pluto Trigger support many more cameras.

8.2.1. IR REMOTE MODE

Default: Off

Use this setting to make Pluto Trigger emit different type of infrared signal. Available options are: Off, Single, 2S and Video. Certain mode may not work, depending on the setting “Camera Brand” below.

8.2.2. CAMERA BRAND

Default: Off

Change this setting to match you camera brand. Infrared remote of different brand emit different signal.

You can set this setting to “All brands”, then Pluto Trigger will emit infrared signal of all brands. Thus, you can use Pluto Trigger as an infrared remote for all supported brands.

8.4. BURST

Change this setting if you want to take multiple pictures when trigger is fired. This setting only applies in “Pluto Sensor Modes”.

8.4.1. BURST COUNT

Default: 0

Set this value to the number of pictures you want to take when Pluto Trigger is fired. This setting only applies in “Pluto Sensor Modes”.

8.4.2. BURST INTERVAL

Default: 0.5”

Change this setting to set the time interval, at which multiple pictures are taken.

8.5. LED

Default: "Periodic blink"

Change this setting to set when the Status Led show notifications.

Off	All led notifications are turned off
Program Start/End	Blink led when Program starts or stops running
Camera Trigger	Blink when Pluto trigger fires
Periodic Notification	Blink every 5 seconds, indicating Pluto is power on

8.6. RESET

Reset all the settings to default values.

Note:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.