3 Node System Training

WILLIAMSRDM INC.

Overview

▶ What is the START Sensor Network 3 Node system

▶ Kit Contents

▶ How to deploy the sensor nodes

▶ Covert Power

▶ How to use the camera trigger Module

▶ How to use the Remote IR Flash

What is the START 3 node system

- Intrusion detection system consisting of three sensor nodes capable of long-range trail camera triggering as well as an IR Flash to improve camera images at night.
- Provides two main capabilities
  - Long Range Camera Trigger Capabilities
    - Uses a radio frequency tripwire between sensor nodes to detect objects
    - Triggers a trail camera to take a picture using a simple trigger attachment
    - Triggers a camera over 800ft away instead of the PIR motion sensor range of 30-40ft
  - Enhanced IR Illumination
    - 30W IR Illuminator extendeds the night-time capabilities of trail cameras

3 Node System – Contents (8202-1 Kit)

- **8170-1 Sensor Nodes (QTY 3)**
  - Sensor Nodes Automatically set up a wireless mesh network
  - System detects and reports movement between nodes using a Radio Frequency (RF) tripwire system
  - Triggers a camera to take a picture when motion is detected
- **8160-1 Solar Rocks (QTY 4)**
  - Solar panels disguised as rocks to power equipment.
- **8175-1 Remote Camera Trigger (QTY 1)**
  - 8175-1 is for Spartan Ghost and GoLive Cameras
  - Remote Camera Trigger is a simple camera attachment that allows a camera to be triggered from much further away using START Sensor Nodes
- **8158-1 Remote Infrared (IR) Flash (QTY 1)**
  - Detects the IR flash from the camera and then uses a powerful IR floodlight to better illuminate the cameras field of view

Sensor Node Kit

- ► 8170-1 Sensor node
  - ► Internal Battery
    - ► About 2 Wks on Battery Only
    - ► Supports Recharging By Covert Solar Devices
- ► Antenna Cable
- ► Rodent Braiding
- ► Antenna

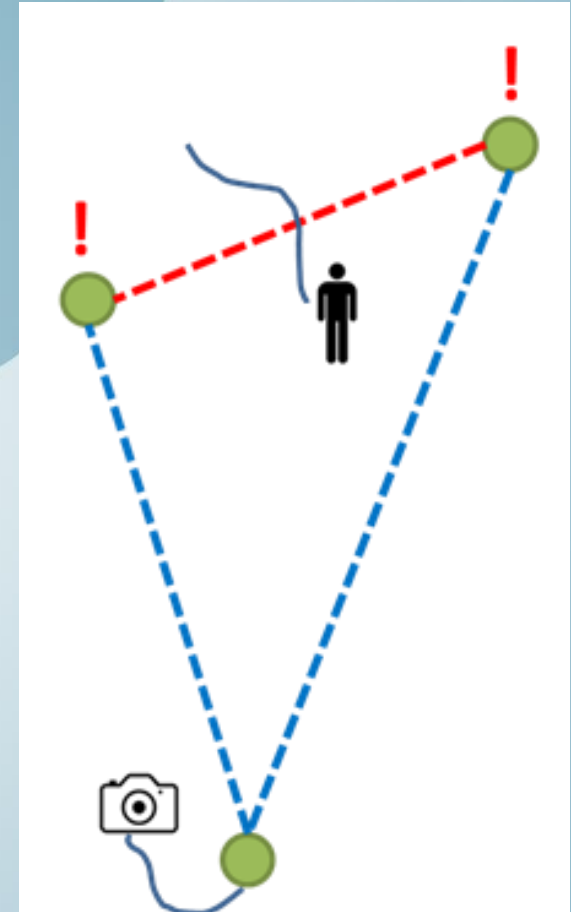Sensor Node

Antenna Cable

Rodent Resistant Braiding

Antenna

Sensor Node

- Power Button
  - Press to Power ON
  - Press and Hold for 3 Sec to power off
  - Press for Status Indication
  - Quick Press to Check if Powered Off
- Status Indicator
  - Indicates Battery
  - Indicates Connection to Other Sensor Nodes
- Accessory Connector
  - Connects to a Covert Solar Panel
  - Connects to an Eyepatch Camera Trigger Module
- Antenna Connector
  - Provides Communication and Sensing

Antenna Connector

LED Status Indicator

Power Button

Accessory Connector

Radio Frequency (RF) Tripwire

- Nodes Form A Wireless Mesh Network for data communication
  - Auto Configuring and Self Healing
- Radio Links used as RF Tripwires for Intrusion Detection
  - People, Vehicles
- RF Tripwire Links Automatically Adapt to environmental Conditions
  - Wind, Rain, Snow
  - Vehicles Parked in the system
- All Sensor Nodes Owned By a Customer Will Work Together
  - Unique ID code for each customer
  - Any group of nodes from a single customer will work together
 - Mix and Match Parts from Different Kits to make larger systems

RF Tripwire Details

- The radio signals between the antennas performs the detection
  - The sensor node monitors for signals fluctuations
- Detection region is not a pencil thin straight line but an area between the sensor node antennas.
- Detection Range 25ft – >200ft max
  - Closer Together Provides Better Sensitivity
  - Communication range for triggering the camera is >800ft Line of Sight

Detection Area

RF Tripwire Details Continued

- Antenna Height Can Change Operation of the System
  - Antenna usually placed so that it is about mid body in height
  - Higher antenna height can be used to avoid smaller animals
  - Even higher antenna height can be used to detect vehicles and mostly avoid people.
- Sensor nodes are more sensitive the closer to the sensor node the object is
- When an intrusion is detected all cameras in the system are triggered
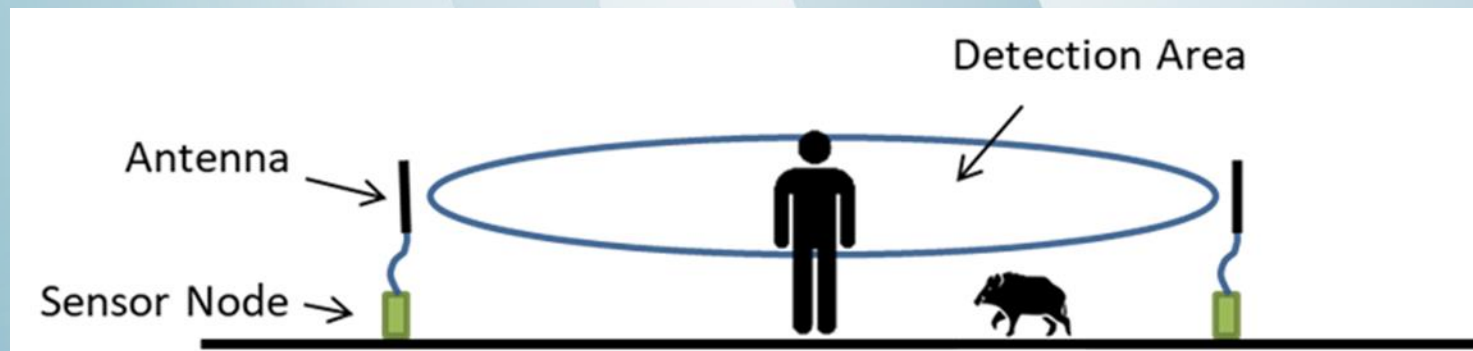
Long Range Camera Triggering

▶ Camera Can Be Located >800ft away line of light

   ▶ Because of Camera Trigger Module the Camera can be located much farther away or even in a tree

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Setup Example - Trail

- Trail Monitoring
  - Place Sensor Nodes on Either Side of a trail
  - Place Camera Far Away to Avoid Detection
- When Person or vehicle walks through the trail the camera will take a picture.
- Closely Spaces sensor nodes are more sensitive
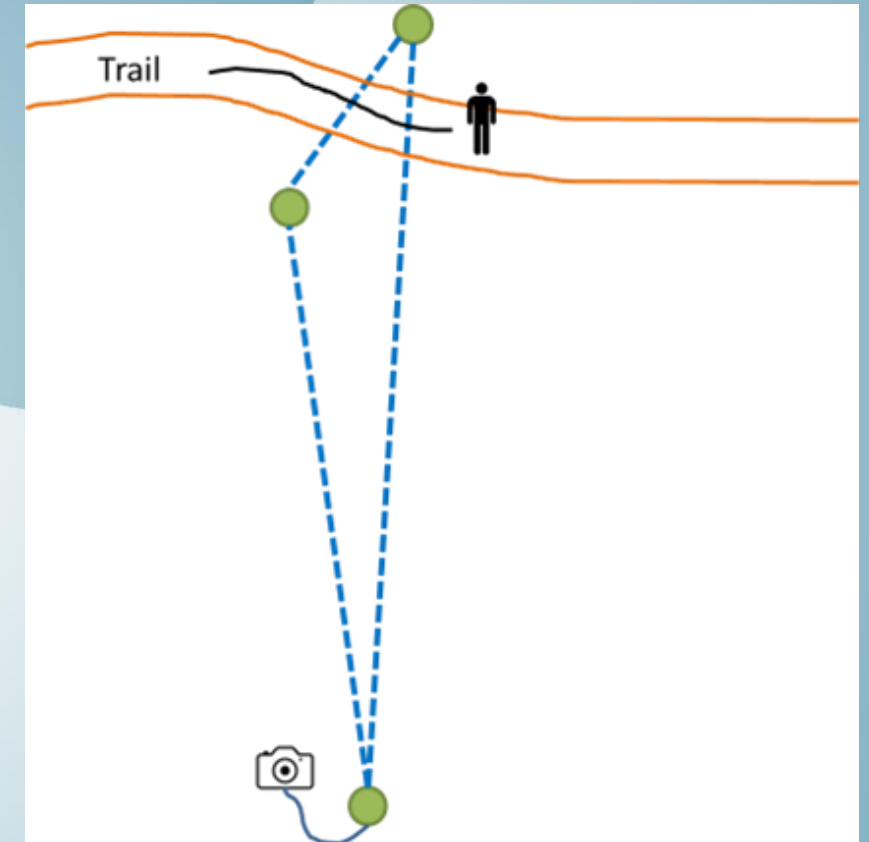
Setup Example - Multiple Path

- Multiple Paths Monitoring
  - Sensors are configured in a rough line configuration
  - Spread out the sensor nodes but keep one close to each path for best sensitivity.
- When a person walks through the tripwires the camera will take a picture.
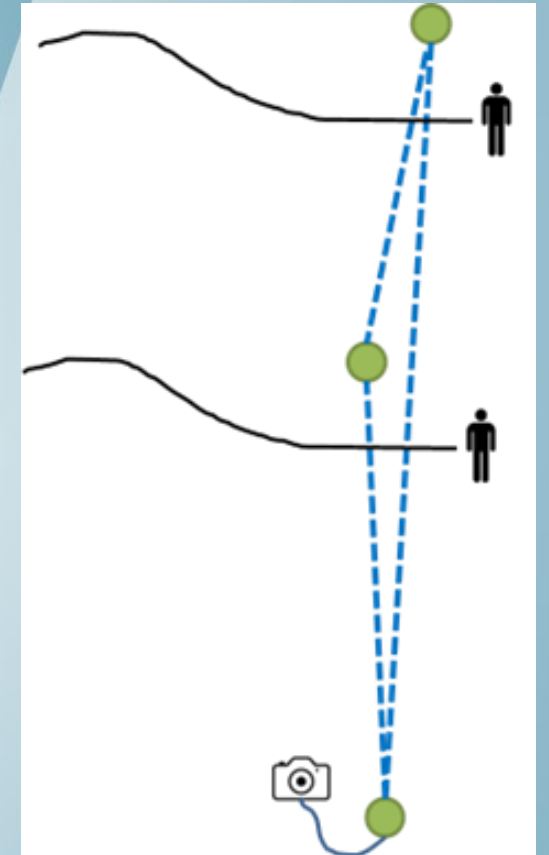
Setup Example – Area Monitoring

- Area Monitoring
    - Set up sensor nodes to surround the area.
    - Try to set up the nodes so that they are in the camera field of view.
- When a person enters or exits the area the camera will take a picture.
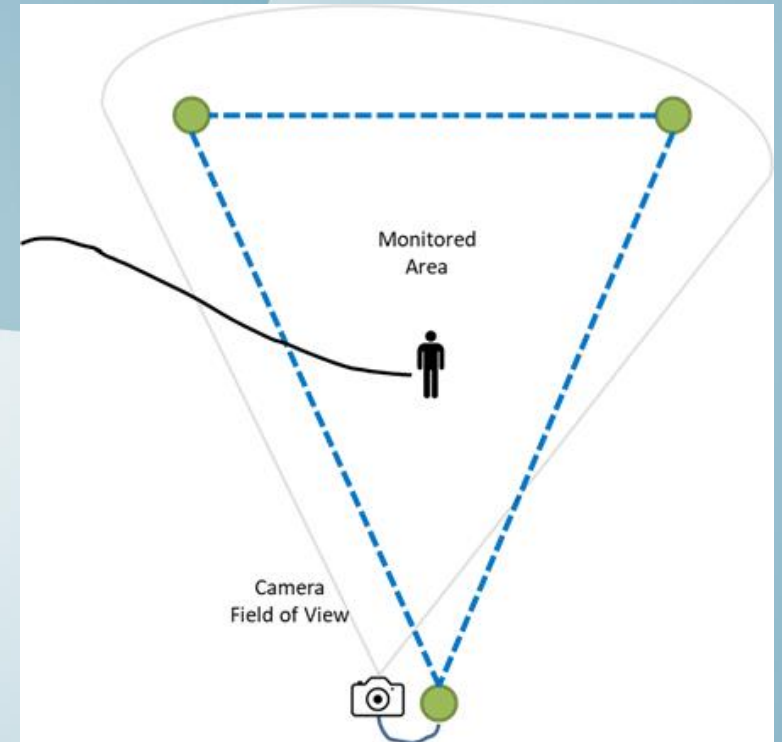
RF Tripwire Notes

- The System will adapt to weather conditions
  - When wind or rain abruptly start you may get detections until the system adapts.
  - When the system reduces sensitivity, it may be harder to detect single individuals whereas groups of people and vehicles will still be detected.
- Try to keep the path between sensor nodes clear
  - Wind and moving brush can cause issues main in open areas
- When Setting up a system it may take several minutes for the system to adapt and become sensitive to the environment
  - Recommend setting up the system then turning on the sensor nodes
- Nearby three node system will trigger each other to take pictures.
  - This can be helpful as you can build larger systems from multiple 3 node systems
  - Can be an issue if you do not want this behavior
- It can take 45 seconds between pictures for the camera to upload them. Our system has a 5 second timeout.
  - If a trigger happens outside the camera field of view and the object passes through the system another picture may night be taken for 45s.

RF Tripwire Walk Test

- The sensor nodes can be used to perform a tripwire walk test
  - Ensures that each sensor node is within tripwire range of at least one other node
- Set up a sensor node and turn it on
- Get a second sensor node and press and release the power button
  - The Status LED indicates weather this node is in range of another node to perform a tripwire.
    - Green Indicates a tripwire is available
    - Red Indicates that no other sensor nodes are within range
      - The tripwire range is much shorter than the communication range for trigger a camera. A red indicator says there is no tripwire, but it may still be able to trigger the camera.
    - Blue Indicates that the system is not ready it needs a GPS lock
- Once the location of the second sensor node is determined by a green indicator at the desired location mount the second sensor node.

Sensor Node Status Indicator

- ▶ Press and release the power button to check the status
- ▶ When First Powered On
  - ▶ Status LED Indicates Battery Health for 3s
    - ▶ Green - Battery OK
    - ▶ Red - Battery < 25%
- ▶ When Running
  - ▶ Status LED Indicates Battery Health for 0.5s (Same as Above)
  - ▶ Status LED Indicates RF Tripwire Status for 5s
    - ▶ Green - Tripwire OK at least one node in tripwire range
    - ▶ Red - Tripwire Not Available No Sensor Nodes withing range
    - ▶ Blue – No GPS Lock (Wait for GPS Lock to Proceed)
      - ▶ May take several minutes for a Lock if the system has been moved to a new location
- ▶ Blinking Red LED indicates battery exhausted the unit will resume operation automatically when charged.

Sensor Node Installation

- We usually mount the sensor node near the ground so that a covert solar rock can be easily connected.
  - Mount with ZipTies, U-Bolts, Cable Clips, etc.
- The RF cable is then connected to the node and to an antenna and then the antenna is mounted mid body height for detection people.
  - Rodent braiding is sometimes put on the RF cable to prevent rodents from chewing it up.
- The antenna can be mounted on the trunk of the tree or branch even behind branches is typically OK.
- Orient the antenna vertically for best omnidirectional performance
- For best performance mount the antenna to a ridged object that doesn't move too much in the wind. i.e. Tree Trunk
- For best performance avoid metal objects and if the device must be attached to metal try to stick the antenna above the metal object.
  - Attaching the antenna to a metal object can block signals from behind the metal object and reduce the communication/tripwire range.
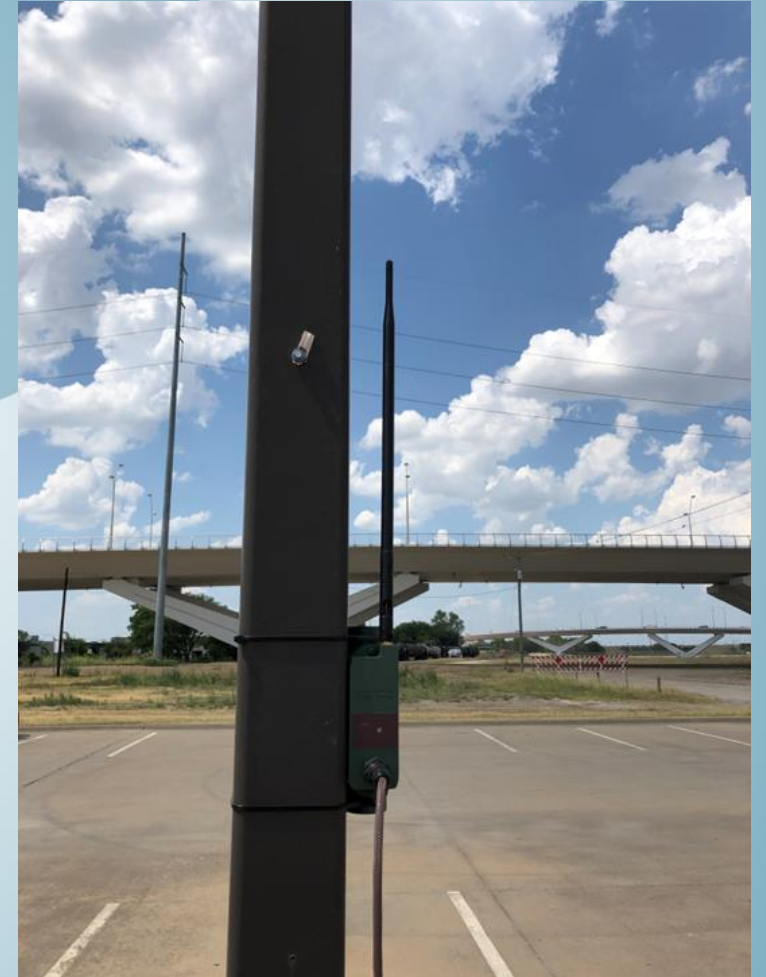
Urban Installation Example

U-Post Installation

Fence Post Installation

Light Post Installation without RF Cable

Rural Installation Example 1

Antenna

Solar Rock

Rural Installation Example 2

Antenna

Sensor
Node

Solar
Rock

Rural Installation Example 3

Sensor
Node

Additional Optional Capabilities

- 8170-2 Sensor node Has connector for external sensor interfacing
  - Qual-Tron PIR, Seismic and Magnetic Sensors
  - Scorpion Laser Tripwire System
  - PT-100 System PIR and Seismic
- Cluster Node
  - Provides a Cellular Connection for the Sensor Network for remote monitoring and configuration
  - Web based interface with alerts
  - Cameras can be configured to trigger only on when certain nodes make a detection
  - Cameras can be connected for easier viewing of images
- Accessories
  - Wall Chargers

Covert Power

Covert Power

- Covert Solar Panels Provide Power to Sensor Nodes and Cameras

- Should be placed in full sun for best performance

- Place Covert Objects where it makes sense

- 3 Node system solar rocks provide 2 – 2.5W of power

Other Covert Power Devices

Eyepatch Camera Trigger

Camera Trigger "Eyepatch"

▶ Allows the START sensor nodes to trigger a trail camera

▶ The eyepatch covers the trail camera's motion sensor and provides a trigger signal to the camera when triggered by a sensor node.

  ▶ Attaches with self adhesive magnets for easy installation and removal from the camera

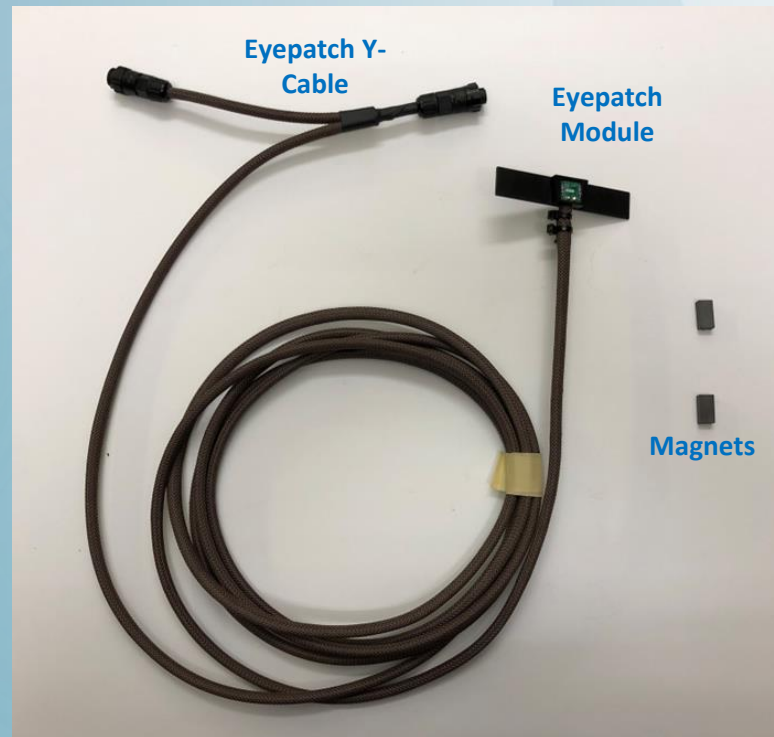▶ Y-adapter on eyepatch cable allows eyepatch and covert solar device to be connected to a sensor node
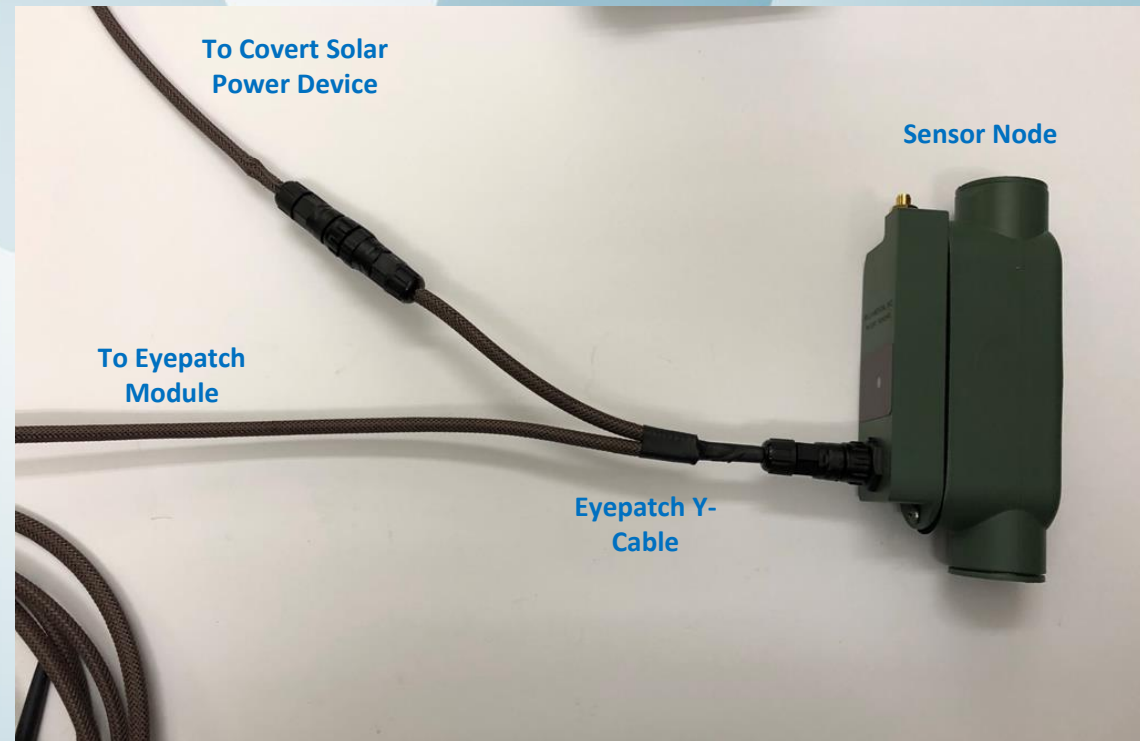

Eyepatch Module

Spartan GoLive with Eyepatch Module Attached

Eyepatch Connection to Sensor Node

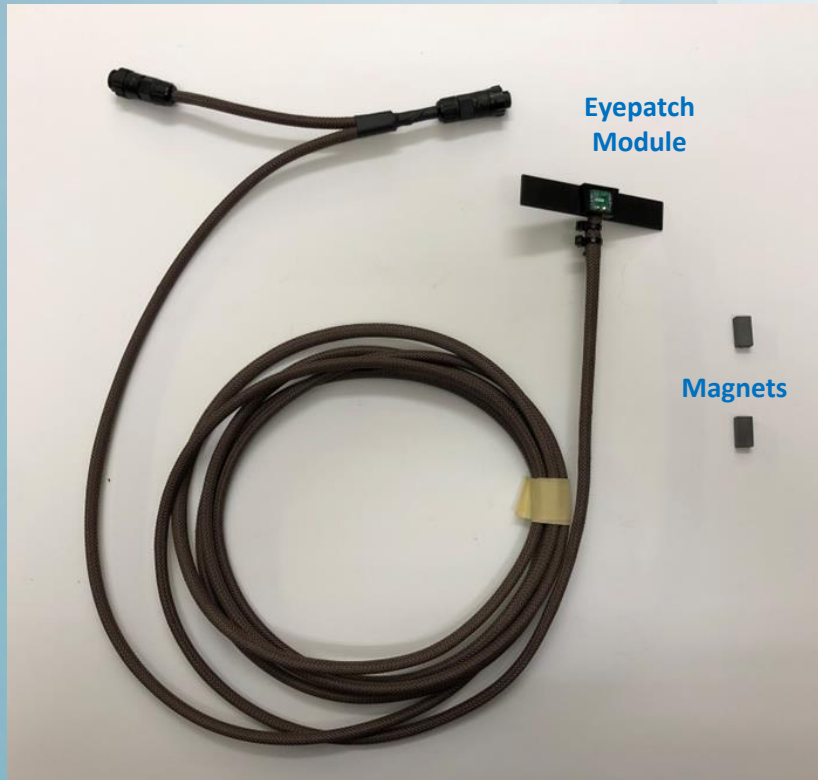▶ Eyepatch Y-Cable allow both the Eyepatch and a covert solar panel to connect to the sensor node.

Example Eyepatch Module

Eyepatch Y-Cable and Sensor Node

8175-1 Eyepatch Installation

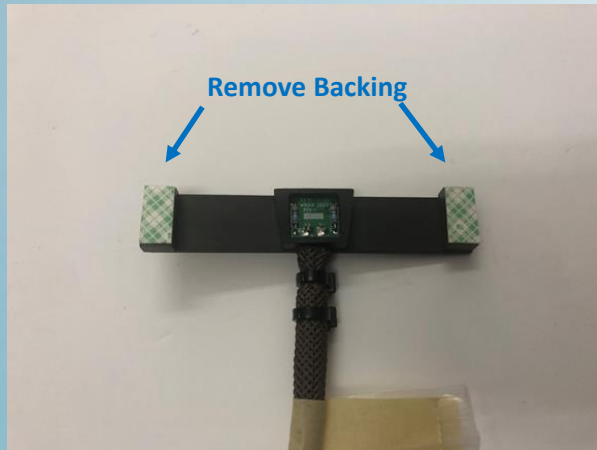▶ The 8175-1 Eyepatch is Designed to work with the Spartan Ghost and GoLive Cameras.

Eyepatch Module

Magnets

8175-1 Eyepatch Module Kit

Spartan Ghost or GoLive Camera
(Both Models Look Identical)

8175-1 Eyepatch Installation

Remove Backing

▶ **Step 1:** Place magnets at the ends of the eyepatch module bracket and remove adhesive backing

▶ **Step 2:** Align eyepatch module with the Camera's PIR Motion sensor and press down firmly to attach magnets.

▶ **Step 3:** Remove Eyepatch module magnets should stay attached to the camera housing.

Camera Settings and Testing

▶ Once the Eyepatch Is Installed, we recommend setting the camera's PIR motion sensor sensitivity to maximum for best performance.

▶ To test a connected eyepatch module, press and release the sensor node's power button.

   ▶ If the eyepatch is attached to a camera the camera will trigger.

   ▶ If using a camera in walk test mode, the camera's test LED will illuminate verifying the trigger.

Power Button

Camera and Eyepatch Deployment

- The camera is typically mounted using a strap or other standard method

- Strain relief should be added to the eyepatch cable to ensure the eyepatch does not come detached from the magnets
  - We've used Zip Ties or Hammered Staples

- Since the cameras PIR motion sensor is covered only the camera lens and IR flash need to be exposed to take pictures.

- Press the power button on the connected sensor node to trigger the camera and test its filed of view.

Cable Strain Relief

Camera and Eyepatch Deployment with Strain Relief

Eyepatch Kit Options

- 8175-1 Spartan Ghost and GoLive Camera
- 8179-1 Spartan GoLive2 Camera
- 8182-1 Spartan GoCam Camera
- 8159-1 Buckeye Camera

Covert IR Flash

Covert IR Flash

▶ Extends the IR Flash Range of most trail cameras
- ▶ 30W IR Floodlight
- ▶ Uses 940nm low glow IR Light

▶ Required no modification to the camera

▶ Improves long range nighttime capabilities of trail cameras

▶ Adjustable flash duration up to 60s supports GoLive and video capture capabilities.
- ▶ Included IR Emitter Limited to 5-9s duration

▶ Supports 300 flashes per battery charge

▶ 100ft+ trigger range

▶ Recharges via Covert Solar Panels.

IR Flash Control Box

IR Emitter

IR Sensor

IR Flash Visibility Improvement
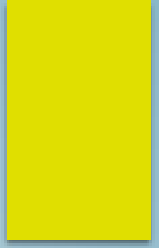
IR Flash Kit Components

- IR Flash Control Box
- IR Emitter
- IR Sensor
- Mounting Screws

IR Flash Control Box

- Simple On/Off power button
- Status Indicator
  - 5 Blinks Full Charge
  - 1 Blink Low Battery
  - Rapidly Blinking Needs Recharging
  - Support a Field Alignment Test
- OUT Connector
  - IR Emitter
- SENSOR Connector
  - IR Sensor
- CHRG Connector
  - Covert Solar Panel

Battery Status and Alignment Test Indicator

Power Button

OUT   SENSOR

STATUS

CHRG
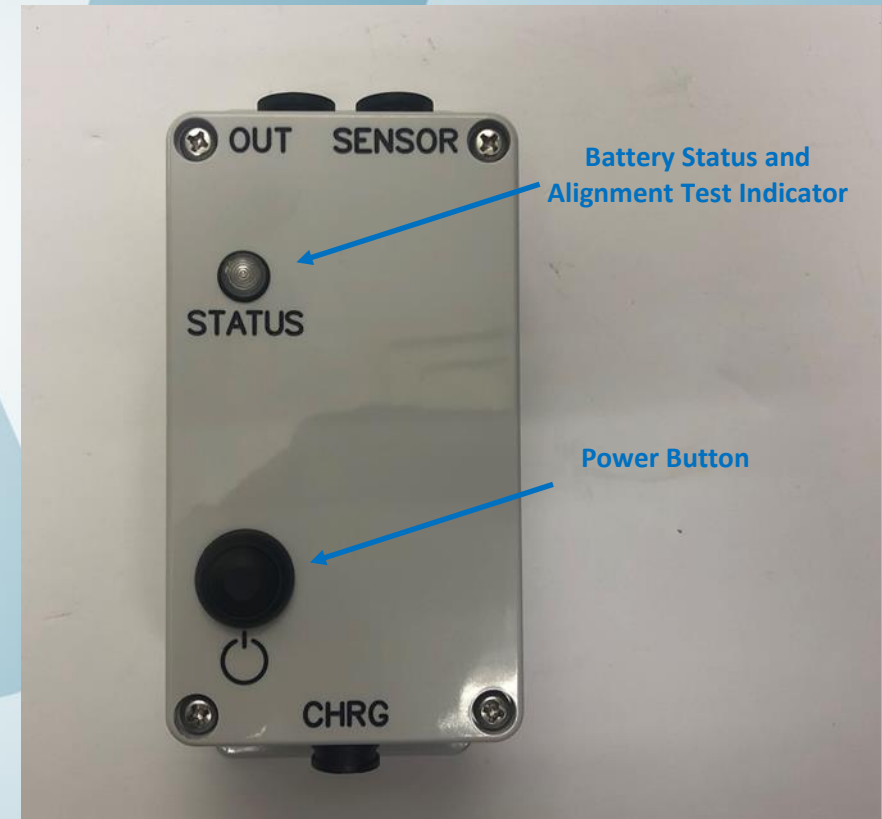
IR Sensor and Emitter

- IR Emitter
  - Has a lens to focus the IR light
  - Black Tipped Connector
- IR Sensor
  - has a bark textured surface
  - White Tipped Connector
- Connect IR Emitter and Sensor to the Control Box with Power Off
- Pay Attention to the Control Box labels.
  - IR Emitter and Sensor Will only fit one way.

IR Emitter

IR Emitter Connector

IR Sensor

IR Sensor Connector

IR Flash Operation

- The IR flash only works At night
- IR Sensor Should face the Camera to detect the Flash
- IR Emitter Should Face the area to be illuminated
- The Trigger Range is >100ft but depends on camera model
- Recommend setting the camera flash to the brightest setting if possible
- IR Flashes Can Trigger Other IR Flashes for Greater Range
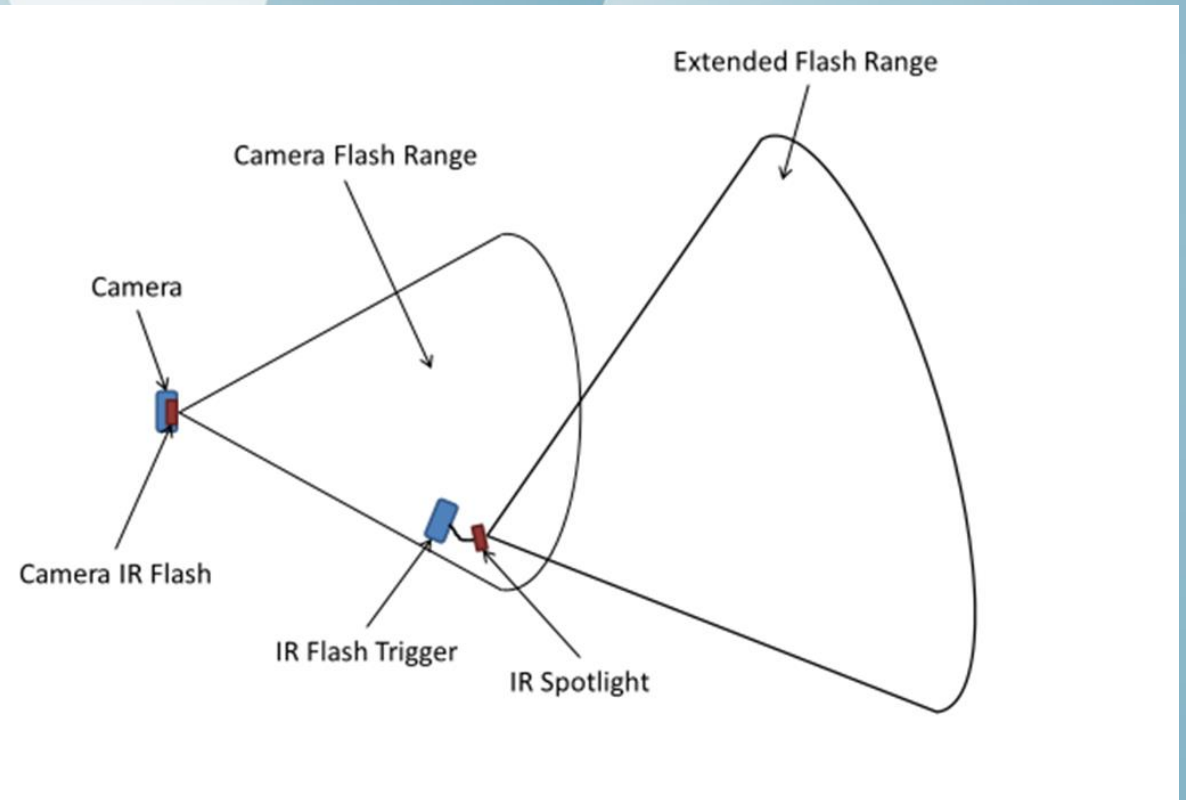
Mounting and Installation

- Mounts using included wood screws
- Typically Place the control box near the bottom of the tree
- IR Sensor is places so that it can "see" the camera flash. Vertical placement is idea.
  - 180-degree horizontal detection pattern
  - 60-degree Vertical Detection pattern
- IR Emitter is placed facing the area to be illuminated

IR Sensor

IR Emitter

IR Flash Control Box

Alignment Test

- First 10 Minutes after power on Alignment Mode is active
  - When the IR flash is triggered the status LED illuminates for the flash duration
  - Only works at night since during the day the IR Flash is in low power mode
  - After 10 Minutes the status LED no longer illuminates with a trigger
- To re-enable the alignment test, the IR flash must be power cycled.
- Alignment test mode is used to ensure the camera is able to trigger the IR flash. If the IR Flash is not triggering ensure the camera flash is set to the highest settings and if necessary, adjust the position of the IR sensor.
  - Keep in mind if the IR Sensor is mounted horizontally (On a Brach for example) the left right detection range is limited.

Glare

▶ The IR Emitter should face away from the camera to minimize glare.

▶ Haven't seen many issues with this but it is something to be aware of.


Glare from IR Eimtter

Painting

▶ Painting with spray paint is permitted as long as key areas remain clear or lightly painted.

▶ The sensor and emitter come lightly painted from WilliamsRDM

▶ Avoid the IR Emitter Lens and light sensor area

▶ Avoid the IR Sensor Location.

▶ In both cases a very light dusting may be needed to avoid a shine but keep the paint light in these areas.

IR Emitter Location (Minimize Paint)

IR Sensor Location (Minimize Paint)

IR Emitter Light Sensor (Minimize Paint)
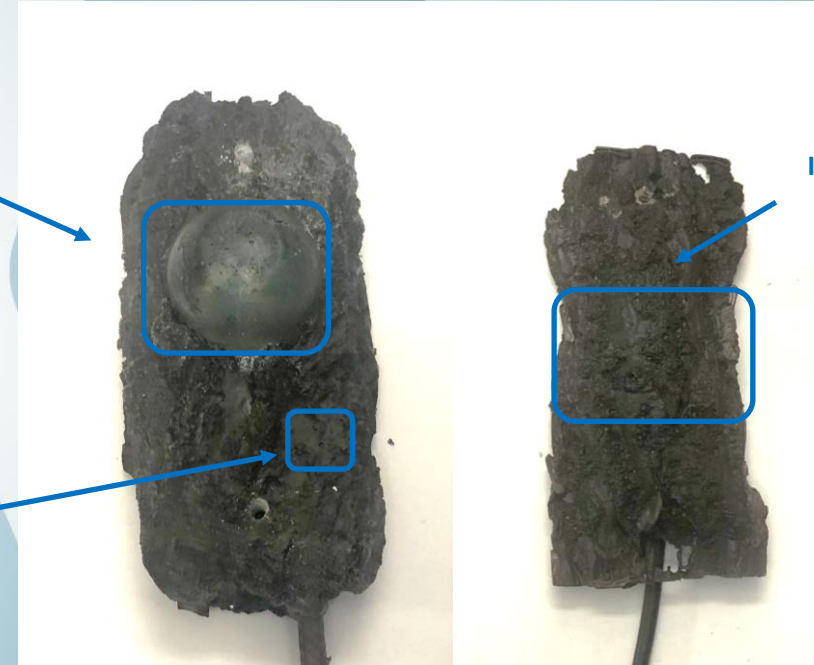
Flash Duration Adjustment

▶ The Minimum Flash Duration is 2.5 seconds which is also the default setting from WilliamsRDM.

▶ Turing the adjustment dial clockwise increase the flash duration up to 60s.

  ▶ Longer durations are useful when capturing video clips or using the spartan camera GoLive mode

  ▶ The covert IR Emitter that comes with the IR Flash Kit is internally limited to approximately 5-9s in duration. To extend the flash time up to 60s, an off-the-shelf IR flash must be used which requires the 8158-1-31 adapter cable.

▶ Longer flash durations will impact battery life.

Duration Adjustment Dial
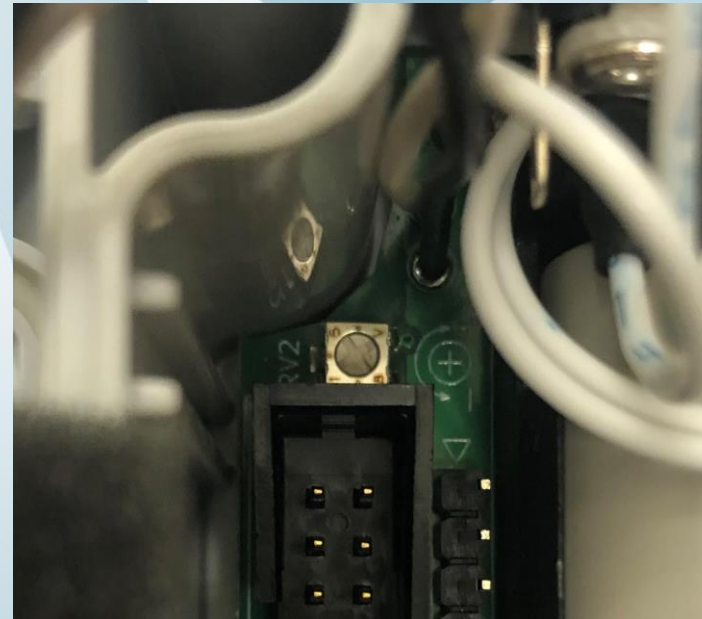
Power and Battery Replacement

- The IR Flash uses standard 18650 Li-Ion batteries
  - Support 300 flashes of 2.5s on a full battery charge
- The batteries will recharge via a covert solar panel attached to the CHRG connector for long term operation
- Batteries can be recharged in a standard Li-Ion 18650 battery charger if needed
- When replacing batteries ensure they are both new, are of the same brand, and fully charged before replacing
- When replacing batteries ensure desiccant packet in inside of the enclosure.
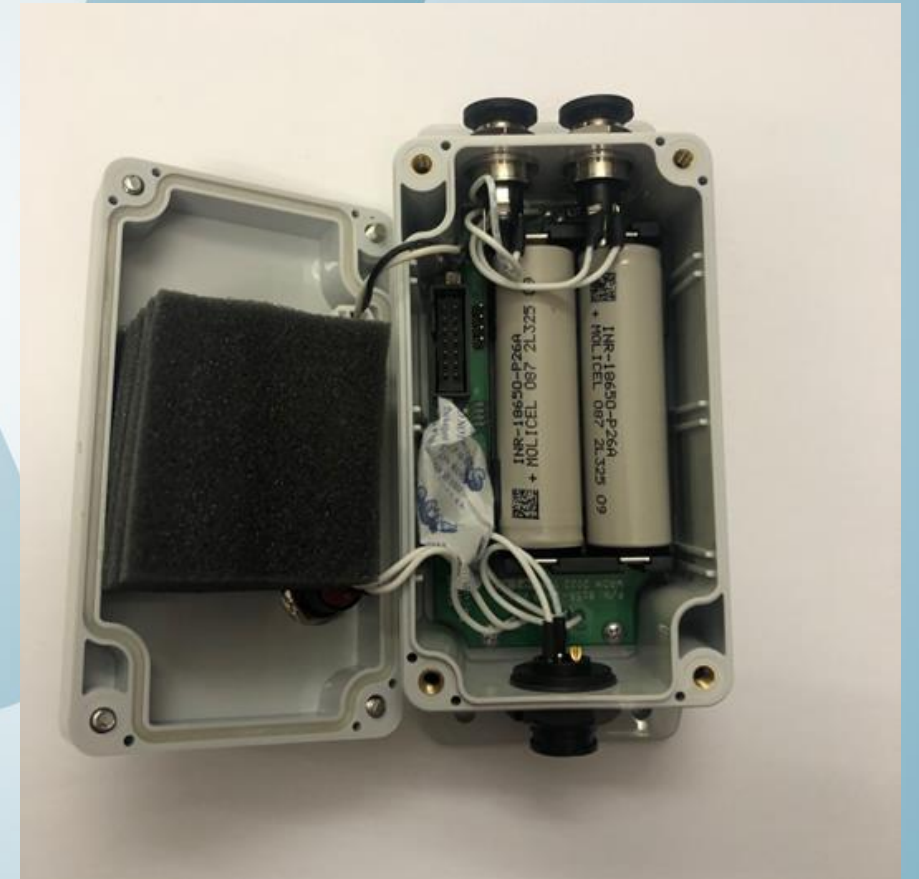
Misc IR Flash Notes

- The Unit is only waterproof when the IR Emitter and IR Sensor Cables are attached or when the Dust Caps are in place.

- COTS 12V IR Emitters can be used with an optional 8158-1-31 adapter cable.

- If using the pushbutton test mode to take a picture with a Spartan GoLive/GoLive2 camera to test the covert IR flash there is a delay between the GoLive/Golive2's flash and picture, but only while in test mode. This delay results in the camera taking a picture after the Covert IR Flash has turned off (2.5s after being triggered). In actual operational mode the cameras works correctly with the 2.5s covert IR flash on duration. If desired, the flash duration of the covert IR Flash can be increased to work with the test mode of these cameras but will slightly impact battery life.

Questions