Installation Manual
6/26/2025

Quarterhill

iTHEIA™ Portable Installation

DWG No.: **3902-00213-00101**



Rev #: C

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TABLE OF CONTENTS

TABLE OF CONTENTS **1**
1 ABOUT THIS MANUAL **3**
1.1 Quarterhill **3**
1.2 Purpose **3**
1.3 Related Documents **3**
1.4 Points of Contact **3**
1.5 Document Overview **3**
1.5.1 Document Conventions 3
1.5.2 Acronyms 4
2 HARDWARE AND SYSTEM OVERVIEW **5**
2.1 Component List **5**
3 TOOLS AND EQUIPMENT **6**
4 INITIAL ASSEMBLY **7**
4.1 Camera Installation **7**
4.1.1 Camera Mounting to Bracket on Telescoping Pole 7
4.1.2 Camera Body Installation 8
4.1.3 Camera Dome Installation 9
4.1.4 Protective Film Removal 10
4.2 Electronics Mounting Bracket Installation **10**
4.3 Charging the Battery **11**
4.3.1 Charging the Battery 12
4.4 Switching the Battery Mode **13**
5 SITE SELECTION AND INSTALLATION **15**
5.1 Site Selection **15**
5.2 Desired Camera View **16**
6 ON-SITE INSTALLATION **18**
6.1 Securing Pole to a Permanent Structure **18**
6.2 Installation of Electronics **18**
6.3 Extending the Telescoping Pole **19**
6.4 Locking the System to the Permanent Structure **20**
6.5 Connect the Camera to the Electronics **20**
6.6 Powering up the iTHEIA Electronics **21**
6.7 Connecting a Laptop to Access the iTHEIA User Interface **22**
6.8 Adjusting Camera Orientation **23**
6.9 Securing the System **24**
7 MAINTENANCE **25**
7.1 Cleaning the Camera Dome **25**
7.2 Visual Checks **25**
7.3 Software Updates **25**
8 TROUBLESHOOTING **26**
8.1 iTHEIA™ Application Issues **26**

8.2 Quarterhill Support.....26

1 ABOUT THIS MANUAL

1.1 QUARTERHILL

Quarterhill Inc., a leading provider of tolling and enforcement solutions in the Intelligent Transportation System (ITS) industry, has vested the operational responsibilities of its safety and enforcement division to its subsidiary, International Road Dynamics Inc. (IRD). Quarterhill's safety and enforcement division is legally operated by IRD. This legal designation ensures that the safety and enforcement division's activities are executed in accordance with prescribed legal and regulatory frameworks within Quarterhill's organizational structure. For the purpose of this manual, "Quarterhill" refers to both entities.

1.2 PURPOSE

The iTHEIA™ Artificial Intelligence (AI) Traffic Data System uses video and machine learning to collect data for vehicle traffic counting and classification. This system utilizes high performance AI hardware to perform the vehicle counting and classification at the roadside.

The portable version of the iTHEIA™ system is intended for short-term deployments, providing simple and quick set-up as well as the ability to acquire data at multiple site locations. This manual contains instructions on the assembly, installation and maintenance of the Portable iTHEIA™ system, as well as troubleshooting advice and hardware specifications.

1.3 RELATED DOCUMENTS

Technical Data Sheet – Portable Installation	*3902-00213-00103*
Operator's Manual	*3902-00213-00108*

The most up-to-date documents are available at the following links:

https://pages.quarterhill.com/itheia-portable

1.4 POINTS OF CONTACT

Please contact Quarterhill for any support or assistance needed.

Customer Service Hotline: (306) 653-6626
Toll Free: 1(877) 444-4473
or
Email: support@quarterhill.com

1.5 DOCUMENT OVERVIEW

Specific conventions and abbreviations are used throughout this document. Terms and general definitions are provided for quick reference.

1.5.1 Document Conventions

Indicates a potentially concerning situation that, if not avoided, may result in minor to moderate loss of data or software functionality.

Indicates *Important* information about equipment or procedures that can impact future decisions and/or actions.



Indicates a *best practice* procedure.

1.5.2 Acronyms

Quarterhill List of Abbreviations

Abbrev.	Refers To
AC	Alternating Current
DC	Direct Current
UI	User Interface

2 HARDWARE AND SYSTEM OVERVIEW

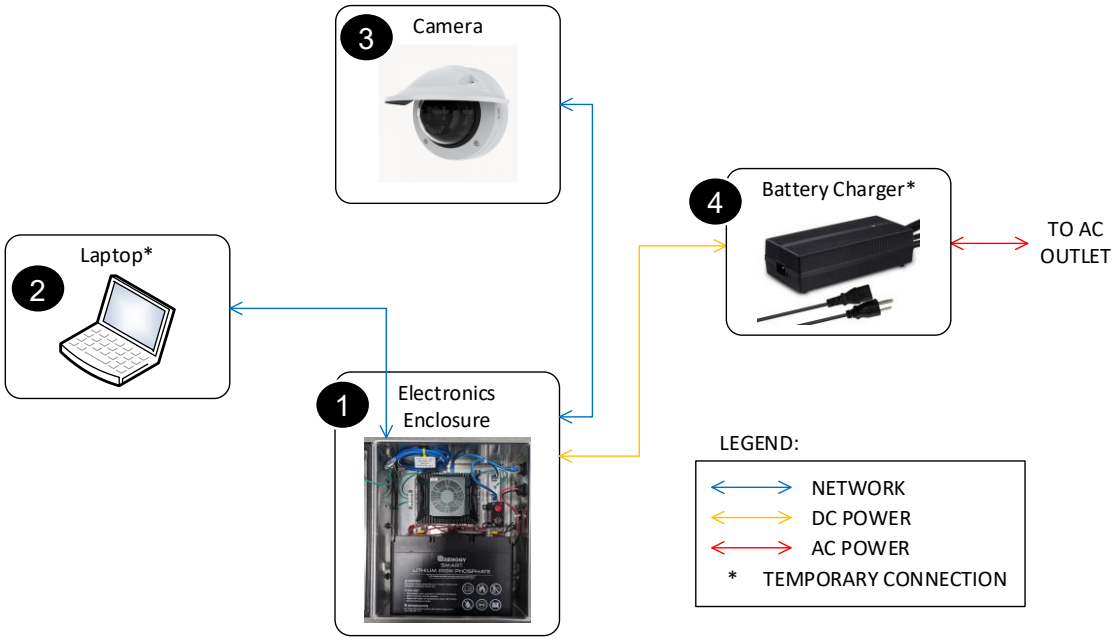


Figure 2-1 iTHEIA Portable System Components

The iTHEIA Portable system consists of four (4) main components:

❶ Electronics Enclosure

❷ Laptop: *Temporary connection when configuring or retrieving data*

❸ Camera

❹ Battery Charger: *Temporary connection for charging*

2.1 COMPONENT LIST

QUARTERHILL PART NUMBER	DESCRIPTION
1002-00233-001	iTHEIA Portable Electronics Enclosure
2000-00908-001	iTHEIA Battery Charger Assembly
2000-00909-001	iTHEIA Camera Assembly with 25ft Cable
2000-00912-001	iTHEIA Telescoping Pole Assembly
3105-00126-001	iTHEIA Cable Lock

3 TOOLS AND EQUIPMENT

This section provides a list of tools and equipment that are required prior to installation of the iTHEIA Portable System, as well as optional tools that are recommended.

Required:

- Traffic Safety Devices and Personal Protective Equipment appropriate for jurisdiction and site conditions
- Mounting straps such as gear clamps, banding, or ratchet straps that are large enough for the pole circumference (Quantity: 3+)
- Laptop to access the iTHEIA User Interface and configure the system
- Phillips® crosshead PH1 and PH2 screwdrivers
- Flathead screwdrivers
- Keys for enclosure and lock (included)
- Cleaning cloth
- Plastic lens cleaner

Optional:

- Cordless drill/driver with a 5/16 nut driver for gear clamps
- Torx® TR20 screwdriver or bit (included with camera)
- Torx® TR25 screwdriver or bit (included with camera)
- Activation Switch (comes with battery to place into storage mode or activate)
- Ethernet Network cable to allow configuration further from electronics enclosure
- Ethernet female to female connector to allow attachment of extension cable above
- Ethernet cable tester (recommended)

4 INITIAL ASSEMBLY

4.1 CAMERA INSTALLATION

4.1.1 Camera Mounting to Bracket on Telescoping Pole

Complete the following steps to mount the camera to the telescoping pole bracket:

1. Loosen the four T20 screws on the front of the camera to remove the camera dome.

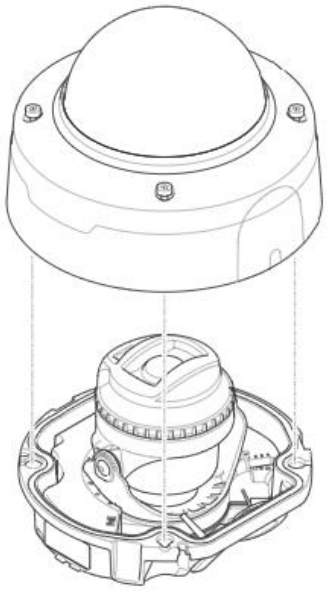


Figure 4-1 Camera Dome Removal

2. Use a flathead screwdriver to release the two side latches holding the camera to the backplate.

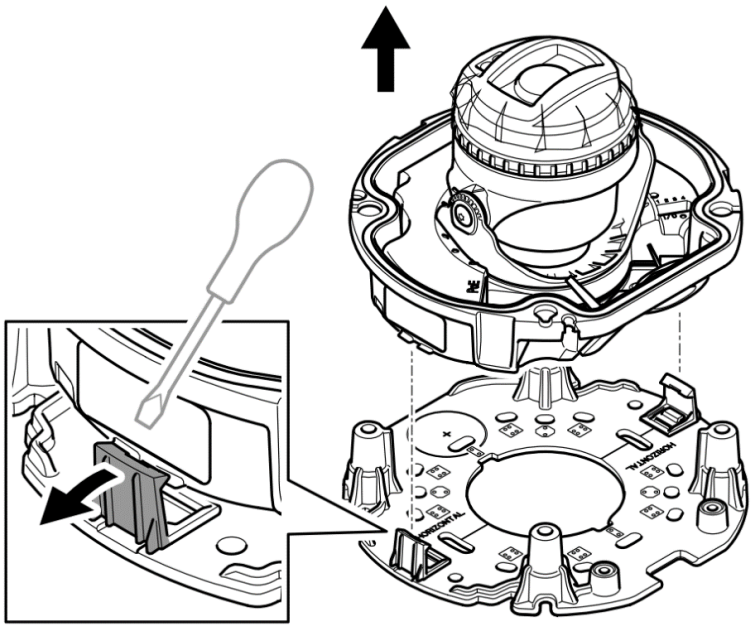


Figure 4-2 Camera Dome Removal

3. Use the T20 M4x10mm screws and washers included with the telescoping pole to secure the camera backplate to the pole mounted bracket.

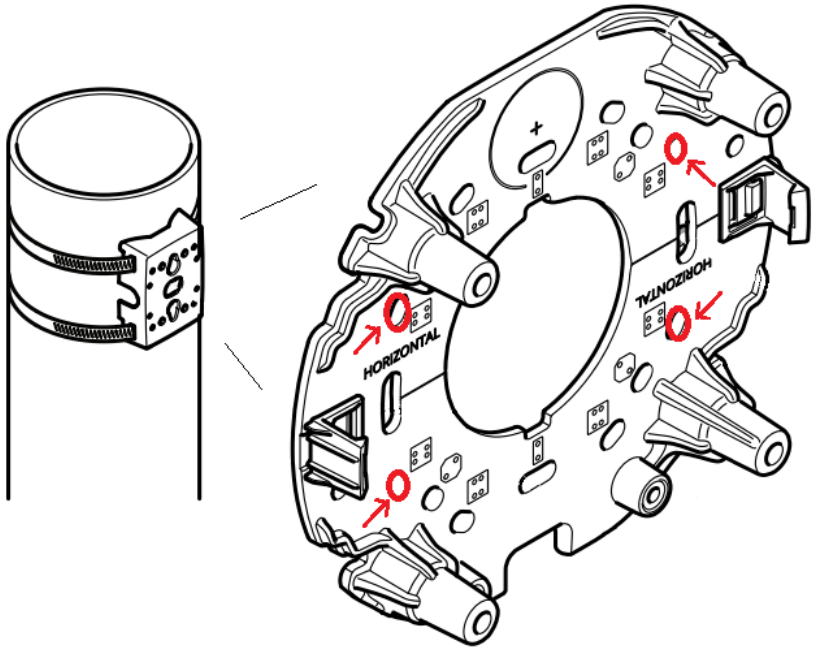


Figure 4-3 Camera Backplate Installation

4.1.2 Camera Body Installation

To install the camera body:

1. Attach the camera to the backplate using the two side clips.
2. Ensure both clips engage with the camera body.

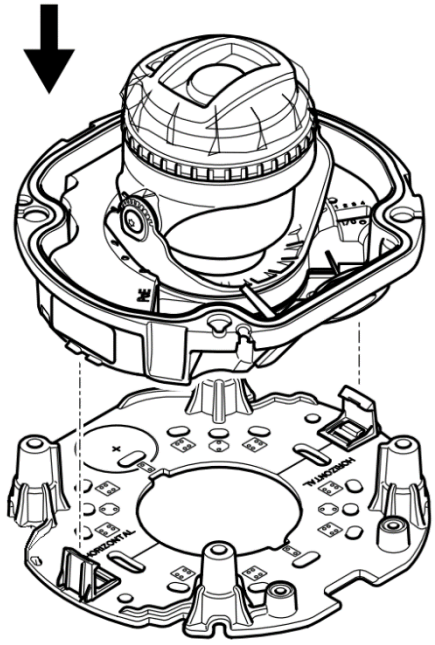


Figure 4-4 Camera to Back Panel Attachment

Camera lens is pre-assembled with a lens angle of 20-30 degrees, which will work for most installations. Illustrations above may not show this angle. • SEE SECTION 6.8 for instructions on adjusting angle, if required. •

4.1.3 Camera Dome Installation

To install the camera dome and sunshield:

1. Reinstall the protective dome and sunshield to the camera using the four T20 screws included with it.

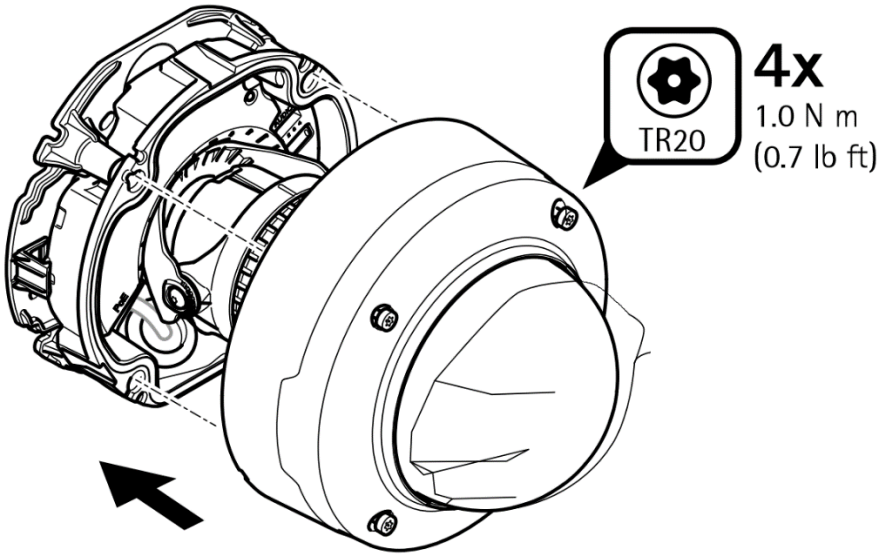


Figure 4-5 Camera Dome Installation

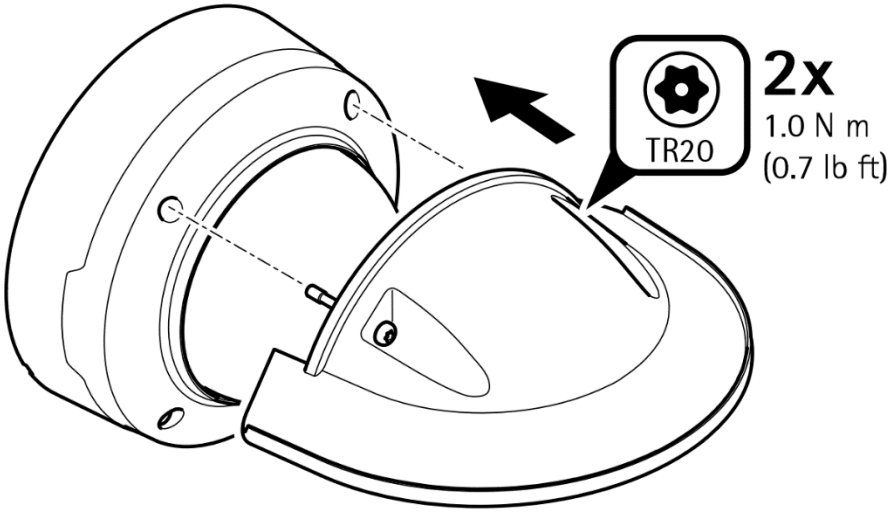


Figure 4-6 Sun Shield Installation

4.1.4 Protective Film Removal

1. Before first use, remove the protective film from the camera dome to ensure optimum image quality. Camera installation is now complete.

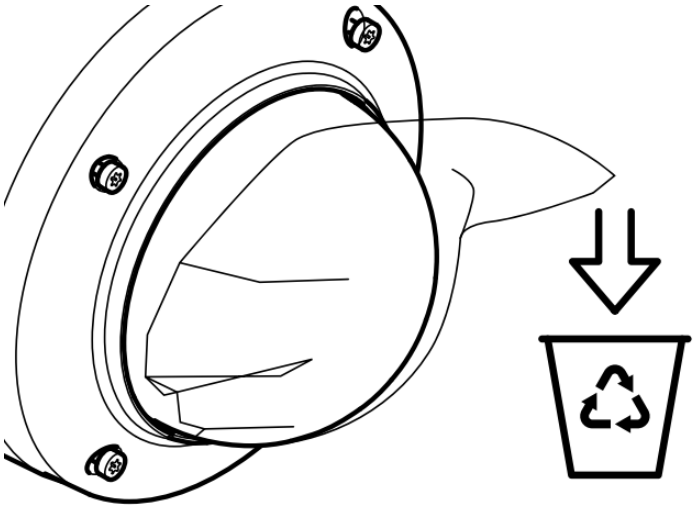


Figure 4-7 Protective Film Removal

4.2 ELECTRONICS MOUNTING BRACKET INSTALLATION

The iTHEIA Telescoping Pole Assembly comes pre-installed with brackets for securing to a permanent pole (or other structure) and for mounting the iTHEIA Portable System Electronics. For shipping purposes, these brackets have been rotated. Prior to installation, the orientation of the mounting bracket must be changed to allow for proper use.

To change mounting bracket position:

1. Unscrew and remove the screw indicated in Figure 4-8 using a large Phillips screwdriver.
2. Loosen the screw indicated in Figure 4-8.

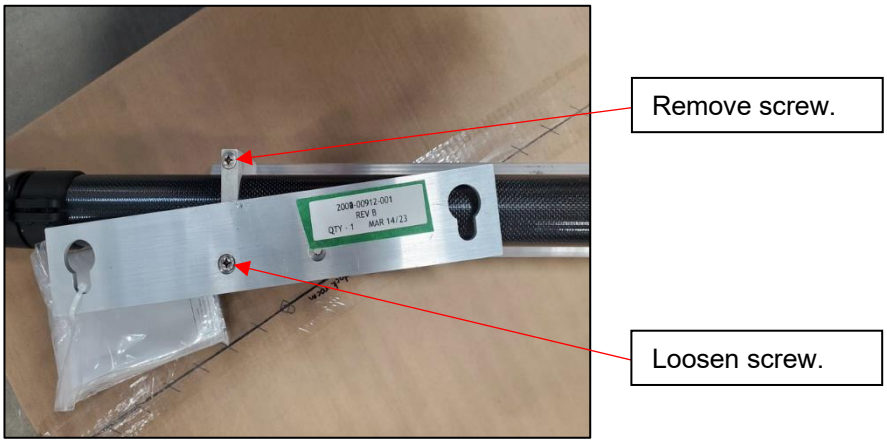


Figure 4-8 iTHEIA Pole as Shipped

3. Rotate the bracket by 90˚, as shown in Figure 4-9.

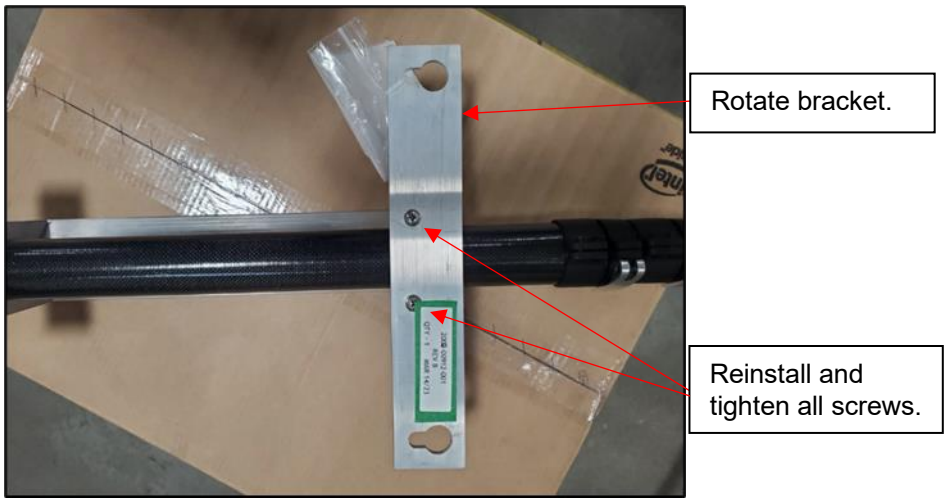


Figure 4-9 Configuring Pole

4. Re-install the removed screw.
5. Tighten all screws.

The mounting bracket and pole will now be ready for installation.

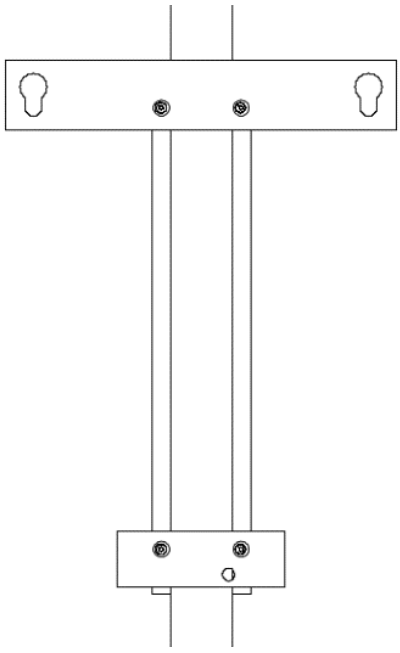


Figure 4-10 Electronics Mounting Bracket Front View

4.3 CHARGING THE BATTERY

The iTHEIA battery leaves the factory in shelf mode. Please activate the battery prior to first use by charging it or using the Activation Switch. It is safe for the battery to remain in active mode during transportation between sites and for short term storage. • SEE SECTION 4.4. •

4.3.1 Charging the Battery

To charge the battery, connect the iTHEIA Battery Charger Assembly to the iTHEIA Portable System Electronics.

To charge the battery, follow the steps below:

1. Remove the protective cap from the iTHEIA charge port as shown in Figure 4-11.
2. Connect one end of the battery charger to the iTHEIA charge port and the other end to an AC (Alternating Current) power outlet.

   Once connected, the charger may take approximately 5 hours to fully charge the iTHEIA battery. The light on the charger will turn green once charging is complete.

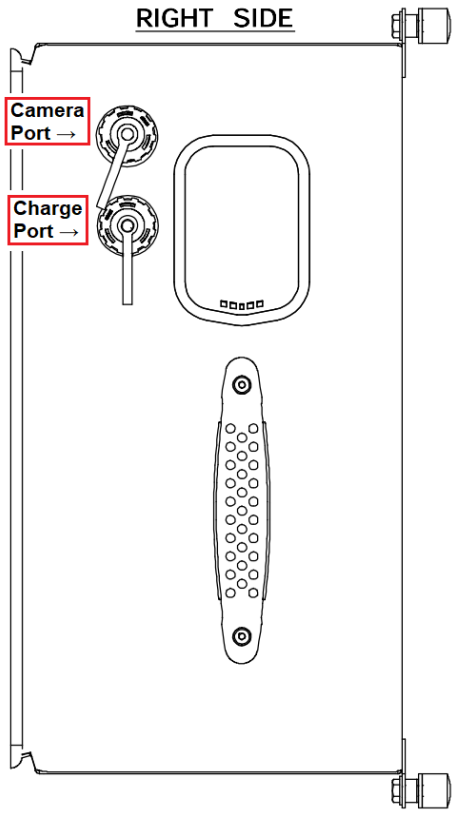


Figure 4-11 iTHEIA Connection Ports

When charging the battery, the mode will automatically switch to active mode.

The iTHEIA battery is expected to provide at least 48 hours of operation. It is recommended to fully recharge the battery after each deployment.

The iTHEIA battery may not charge when its internal temperature is below 50°F (10°C). The battery should be moved indoors, and the smart charger will charge it when the battery temperature is warm enough. In this case, warming and charging may take up to 10 hours.

4.4 SWITCHING THE BATTERY MODE

Some battery models may come with an activation switch. Use the included Activation Switch to switch the battery between active mode and shelf mode.

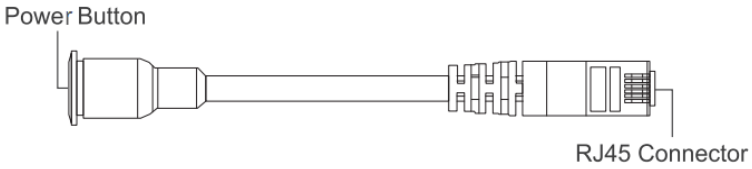


Figure 4-12 Activation Switch

To switch to active mode using the Activation Switch, follow the steps below:

1. Plug the RJ45 Connector of the Activation Switch into the leftmost connection (labelled “Up”) on the top of the battery.

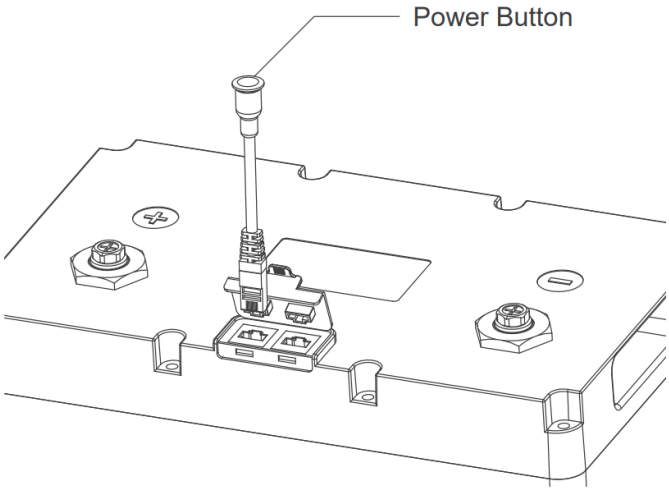


Figure 4-13 Battery Power Cable Connection

2. Press the power button on the end of the cable.

   The power button should immediately light up bright blue when the battery is in active mode.



Figure 4-14 Activation Switch – Active Mode

To place the battery back into shelf mode:

1. Repeat the steps above, but hold the power button for 3 seconds and then release. The power button light will turn off (or become dim blue when no load is connected). This mode is used when storing for longer than a month or when servicing.



It is safe for the battery to remain in active mode during transportation between sites and for short term storage.

5 SITE SELECTION AND INSTALLATION

Refer to the iTHEIA PORTABLE INSTALLATION TECHNICAL DATA SHEET 3902-00213-00103 for more site selection considerations.

5.1 SITE SELECTION

To optimize the accuracy of classification we recommend that the iTHEIA Portable system be installed a minimum of 30 ft (9 m) from the edge of the closest lane. This distance provides the best balance of field-of-view and image quality for most vehicles. A larger offset distance of 45 ft (14 m) may be required for longer vehicles such as multi-trailer trucks.

The maximum recommended operating distance of the iTHEIA Portable system is 150 ft (46 m). Beyond this distance, reduction of image quality may result in degraded classification and the shallow viewing angle will hinder lane discrimination, leaving the system more susceptible to occlusion.

The iTHEIA Portable system comes with a 20 ft (6 m) telescoping pole to reduce line-of-sight occlusion.

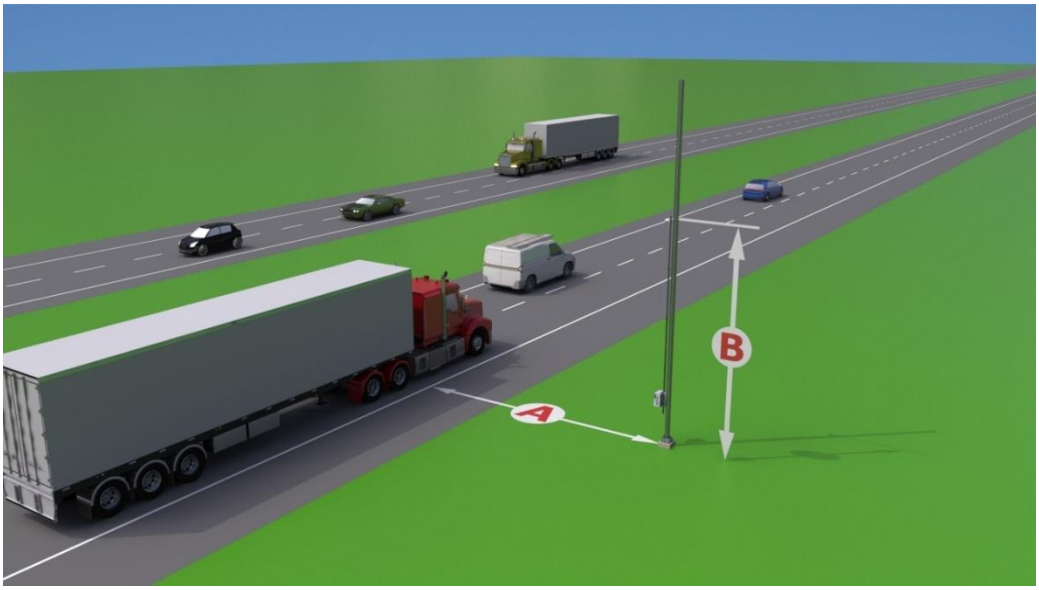


Figure 5-1 Pole Offset Distance

A) Pole Offset Distance (from the painted edge of closest lane of interest)
30 ft (9 m) to 150 ft (46 m)

The camera needs a clear view of the whole side of vehicles including long trucks travelling horizontally in the camera view, so areas with obstructions such as trees, shrubs, barriers, signs, overhead lines or poles should be avoided if possible.

Mounting to a street light pole or selecting a sturdy pole with lighting beside or behind the camera is recommended as this increases performance of the system at night by augmenting the built-in illuminator.

Caution: Ensure there are no overhead power lines when choosing a site for safety reasons. Look up when extending the camera pole to ensure there is no dangerous contact with power lines.

The following conditions should be avoided as performance may be reduced or impacted by these items:

- Camera views with bright light sources such as the sun, headlights, building lights, or parking lot lighting in the background.
- Backgrounds with reflective surfaces such as lakes, rivers, or glass/shiny buildings.
- Areas with adverse weather conditions like nearby water bodies where fog may develop or hills where it may be very windy.
- Active backgrounds with moving objects – especially vehicles or equipment.
- Dusty areas like bare dirt fields or construction sites.

5.2 DESIRED CAMERA VIEW

To optimize system performance, striving to achieve a good camera view is best practice.

Table 5.1 Achieving the Best Camera View

	**Correct View** ▪ Vehicles are perpendicular to the camera view. ▪ All lanes are visible. • Lane lines are horizontal.
	**Poor View** ▪ Vehicles are too high in the frame. • Adjust the camera angle up.

	**Poor View** ▪ Road is too sloped. ▪ Pan to the right by rotating the camera pole.
	**Poor View** ▪ Road is too sloped. ▪ Pan to the left by rotating camera pole.
	**Poor View** ▪ Too much sky is in the frame; the sun may blind the camera if facing east, west or south. ▪ Road and vehicles are too low in the frame. • Adjust camera angle down.

6 ON-SITE INSTALLATION

6.1 SECURING POLE TO A PERMANENT STRUCTURE

To secure the pole to a permanent structure, complete the following steps:

1. Before installing the iTHEIA Portable Electronics Enclosure, lean the iTHEIA telescoping pole up against another permanent pole or other rigid structure. The L-shaped bracket should cup against the permanent pole.
2. Use ratchet straps, gear clamps, or banding (not included with system) to securely tighten the aluminum angle bracket of telescoping pole assembly to the permanent pole by routing the straps between the telescoping pole and the rear L-shaped bracket and around the permanent pole. Use at least 2 straps spread vertically to provide stability to the telescoping pole.



Figure 6-1 Securing Pole to a Permanent Structure

6.2 INSTALLATION OF ELECTRONICS

Complete the following steps to install the electronics:

1. Position the two stud locations on the top back side of the enclosure to fit into the two keyhole slots of the bracket assembly of the telescoping pole.
2. Then lower the enclosure, ensuring that the enclosure studs are seated fully into the keyhole slots.

On rare occasion, the position of the studs may need to be adjusted slightly from the factory default to achieve an ideal fit.

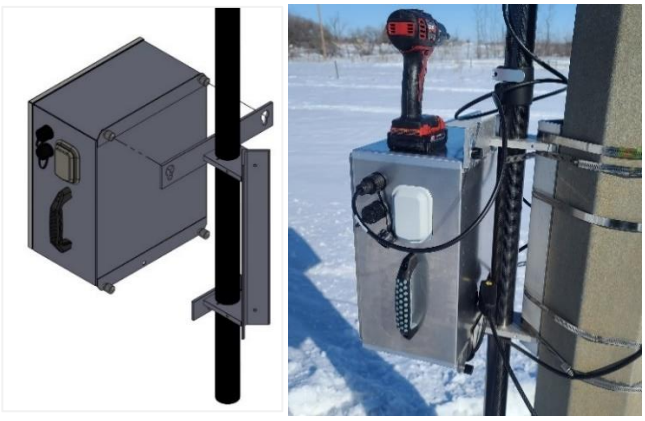


Figure 6-2 Installation of Electronics

6.3 EXTENDING THE TELESCOPING POLE

To extend the telescoping pole, follow the steps below:

1. Beginning with the top latch of the telescoping pole, open the latch with a levering action to loosen the connection between pole segments.
2. Lift the top pole segment vertically approximately 1.4 m [4.5 ft] until resistance is felt or red line is visible.
3. Close the latch to retighten the connection between pole segments.
4. Guide the camera cable to ensure it does not bind as the pole is extended and keep the camera aimed at the road by rotating the pole horizontally.
5. Working your way down, repeat this procedure for the middle and lower pole segments until the telescoping pole is extended to its full height (approximately 6 m [20ft]).

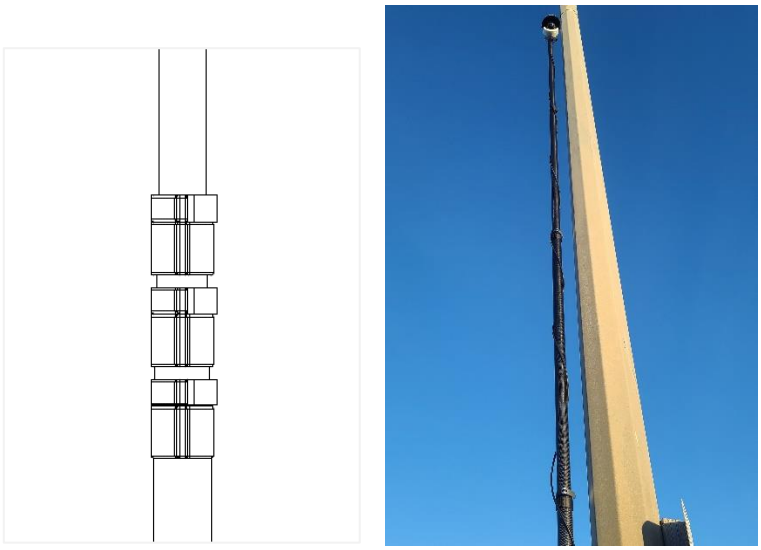


Figure 6-3 Telescoping Pole Latches (Left) and Extended Pole (Right)

6.4 LOCKING THE SYSTEM TO THE PERMANENT STRUCTURE

To lock the system to the permanent structure:

1. Use the key to unlock the cable, and then pull out the cable end.
2. Starting from the front of the unit, insert the full length of the provided iTHEIA Cable Lock through the holes in the lower back bracket of the enclosure and the lower bracket of the pole mount assembly.



Figure 6-4 Cable Lock



Figure 6-5 Bracket Lock Hole Location

3. Extend the cable around the permanent pole and back under the electronics enclosure.
4. Feed the cable end back through the lock mechanism attached to the cable. Be sure to feed the cable through the lock mechanism in the direction indicated on the lock.
5. Keep feeding the cable through the lock until all slack is removed and the cable loop is tight between the system and the permanent pole.

6.5 CONNECT THE CAMERA TO THE ELECTRONICS

To connect the camera to the electronics:

1. Remove the protective cap from the iTHEIA camera port (• SEE FIGURE 4-11 •) and connect the Ethernet cable from the camera.
2. Turn the connection a quarter turn until it clicks to lock the connector. This is necessary to ensure that the system remains watertight during operation. Excess cable may be wrapped around the pole or secured with strapping.

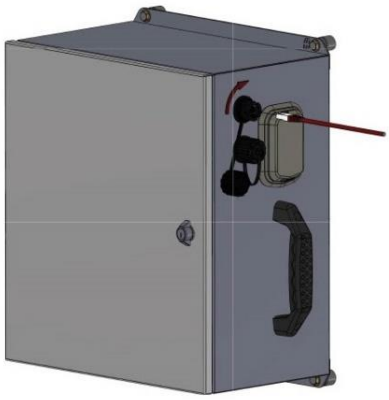


Figure 6-6 Connecting the Camera to the Electronics

6.6 POWERING UP THE iTHEIA ELECTRONICS

To power up the iTHEIA electronics:

1. Open the door to the electronics enclosure by turning the winged door lock mechanism a quarter turn. Use the included key to unlock first if necessary.
2. Press the large red power button to power up the system. The button should light up red when the system is powered.

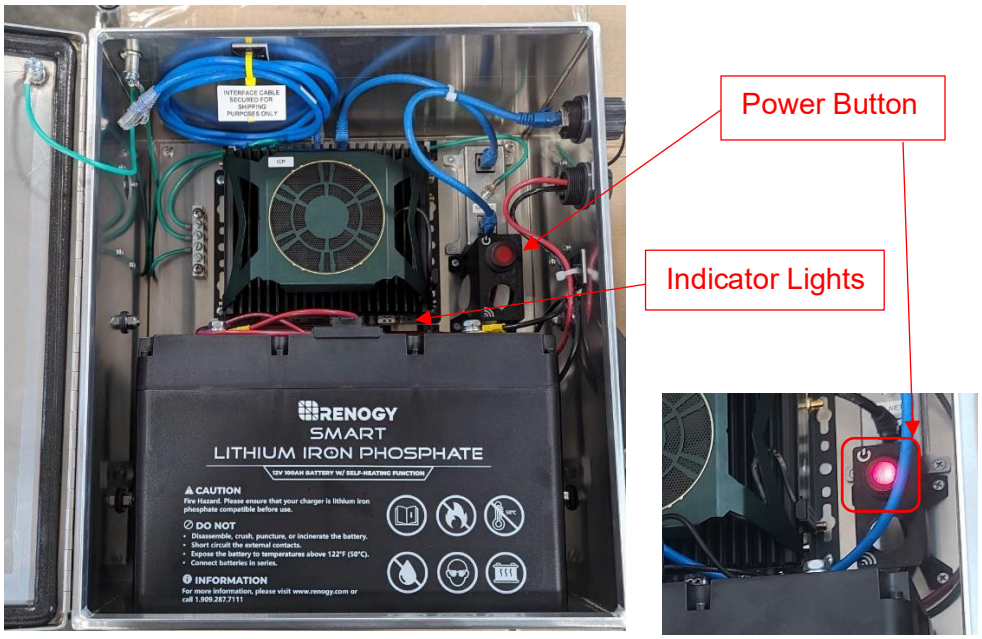


Figure 6-7 Powering Up the Electronics

3. The electronics processor has three color indicators on the bottom edge. All lights will be on when system is operational.

Table 6.1 Indicator Lights

Indicator Location	Indicator Color	Description
Top	Yellow	Lights up when the large red power button is ON.
Middle	Red	Lights up when the electronics are ready to operate. May take 10 seconds once power is on.
Bottom	Green	Lights up when the electronics are powered ON.

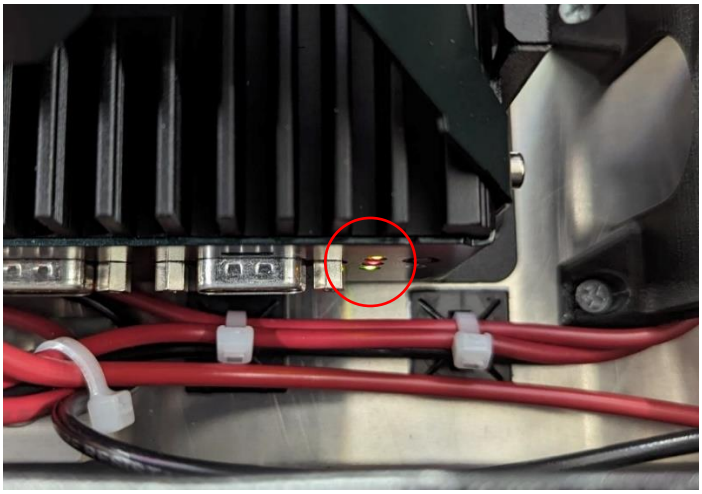


Figure 6-8 Indicator Lights

6.7 CONNECTING A LAPTOP TO ACCESS THE iTHEIA USER INTERFACE

To connect an interface device to the iTHEIA:

1. Inside the enclosure there is an Ethernet interface cable for connecting to the iTHEIA User Interface (iTHEIA Web UI). Connect the open end of the interface cable to a laptop.



Figure 6-9 iTHEIA Interface Cable

2. Open a web browser on the laptop and type https://itheia.quarterhill.local/ into the address bar to access the iTHEIA Web UI. Log in using a valid username and password (*as assigned by an administrator*).

See 3902-00213-00108 – OPERATOR'S MANUAL for more detail on connecting to and configuring the iTHEIA Web UI.

6.8 ADJUSTING CAMERA ORIENTATION

Once the camera configuration has been completed in the iTHEIA Web UI, the camera angle may need to be physically adjusted for proper lane alignment.

• SEE SECTION 5.2 for desired camera view references. •

Please observe the following rules when determining and adjusting camera alignment:

1. The lanes of interest should be centred vertically in the image frame. Make sure to leave enough room at the top of the frame to capture the full height of tall vehicles in the farthest lane of interest.

   If required, to vertically adjust the camera angle:

   - Tilt the lens to the desired angle. Each notch is approximately 15 degrees. A downward angle of 20-30 degrees from horizontal is suitable for most applications.

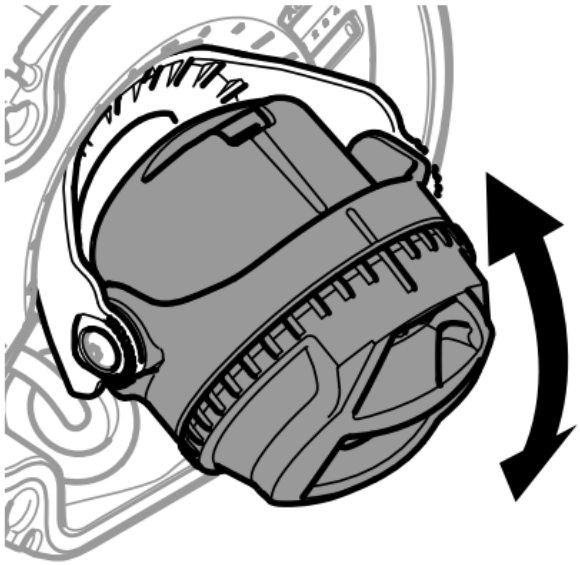


Figure 6-10 Camera Aiming Angle Adjustment



Figure 6-11 Camera Angles

2. The lanes of interest should run perpendicular to the camera view (horizontal in the image frame). If the lane alignment is off, this can affect performance of the system.
    - If horizontal alignment is required, loosen the lowest extension segment of the telescoping pole and rotate the pole slightly until the camera pans to the desired alignment.



Figure 6-12 Adjusting Camera Orientation

6.9 SECURING THE SYSTEM

Before leaving the site, complete the following steps to secure the system:

1. Ensure the enclosure door is closed tightly and that both the enclosure door and cable lock are locked using the provided keys.
2. Ensure all segments of the telescoping pole are securely latched.
3. Ensure the battery charge port cap is covering the unused port.

7 MAINTENANCE

7.1 CLEANING THE CAMERA DOME

The iTHEIA camera dome may become dirty over time. Inspect the camera dome before each deployment and, if necessary, gently clean the dome with a damp microfiber cloth.

7.2 VISUAL CHECKS

Routine visual checks should be performed to ensure that no system components have become damaged or need maintenance.

- Visual check of enclosure ports and inside of enclosure to ensure no signs of moisture ingress, corrosion, or loosening.
- Visual check of pole latches and enclosure mounting hardware for signs of loosening or other wear.
- Visual check of overall system for signs of cracks or other damage.

7.3 SOFTWARE UPDATES

iTHEIA software updates will be available when enrolled in one of the optional maintenance programs.

8 TROUBLESHOOTING

8.1 ITHEIA™ APPLICATION ISSUES

Issue	Action
Trouble Accessing the Login Page	▪ Check physical network connection between system and laptop. ▪ Ensure laptop network port is set up correctly. ▪ Check that the network port on the AI hardware that is connected to the laptop has a flashing or solid amber light. ▪ Try an alternate web browser. ▪ Try restarting the AI hardware unit. ▪ If the problem persists, please contact your administrator.
Live View not Working	▪ Disconnect and reconnect the camera. ▪ Check that the camera has power. A power light should be visible within the camera enclosure for a few moments while the camera is powering up. ▪ Check that the network port on the AI hardware that is connected to the camera has flashing or solid amber light.
Camera Video Quality Issues (Stutter, artifacts, broken images, or intermittent connection lost)	▪ If viewing remotely, the video feed will be limited by the available bandwidth of the connection. ▪ If image is blurry or dirty, clean the camera lens. ▪ Unplug and plug the camera back in. The camera may correct its focus on reboot.

8.2 QUARTERHILL SUPPORT

REQUESTING SUPPORT

Quarterhill Phone:	**1-877-444-4473** **(1-877-444-4IRD)**
E-mail:	**support@quarterhill.com**