

**Built on Tradition**



**Highland Tank®**

# FuelShield

**HT-6123**

## User Manual

### Installation & Start-up Guide

**Carefully read and follow the instructions in this manual.**

Fuel Management System



MADE IN  
  
U. S. A.

## **IMPORTANT**

### **Warning and Disclaimer**

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**IMPORTANT:** Installation of this system shall be completed by a qualified electrician or technician. Location of FuelShield relative to the tank is at installer's discretion. Always follow local codes for installing electronics around hazardous materials and storage tanks. Always inspect parts for damage when receiving shipment. Do not sign for the shipment if any damage is visible to the packaging or components. Please reject shipment or record damages and file a claim with the carrier. Highland Tank is not liable for damage that occurred during or after shipment to the site. Any damaged parts will need to be replaced to ensure proper system function. Please call Highland Tank for replacement parts at 814-893-5701.



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## Introduction

The FuelShield is an easy to use monitoring and dispensing system for all types of fuel. The FuelShield uses the High-LINK® web-based software application. The application is accessible via any smartphone, tablet, or computer with a web browser. The software application stores and logs all level readings so that the system users can monitor tank levels, reconcile inventory, monitor for water, cross check fuel vendor bills, prevent theft and suspicious activity, configure emails or SMS alerts, and more.

Software training and support is included and will be scheduled with the High-LINK® account administrator via a webinar conference or in person.

All data is synced with the cloud at 5-minute intervals. The system works using either Wi-Fi or cellular data. Cellular data is included with the annual software and communication package.

Upon completion of installation, please contact your local Highland Tank representative or call 814-893-5701. Please locate the serial number for the FuelShield. The serial number can be found on the ID label inside the back panel. See below. The serial number is required to reference accurate High-LINK® system information.

Fuel Shield Panel	
Model:	_____
WO #	_____
Serial #	_____
Date :	_____
Team Viewer:	_____
Company:	_____
Location:	_____
Loc. I.D:	_____
Hardware I.D:	_____
IMEI #	_____
Sim Card #	_____
LOWE ENGINEERING	
1510 Stoytown Rd	Friedens, Pa 15543

FuelShield ID Label

## Included Components

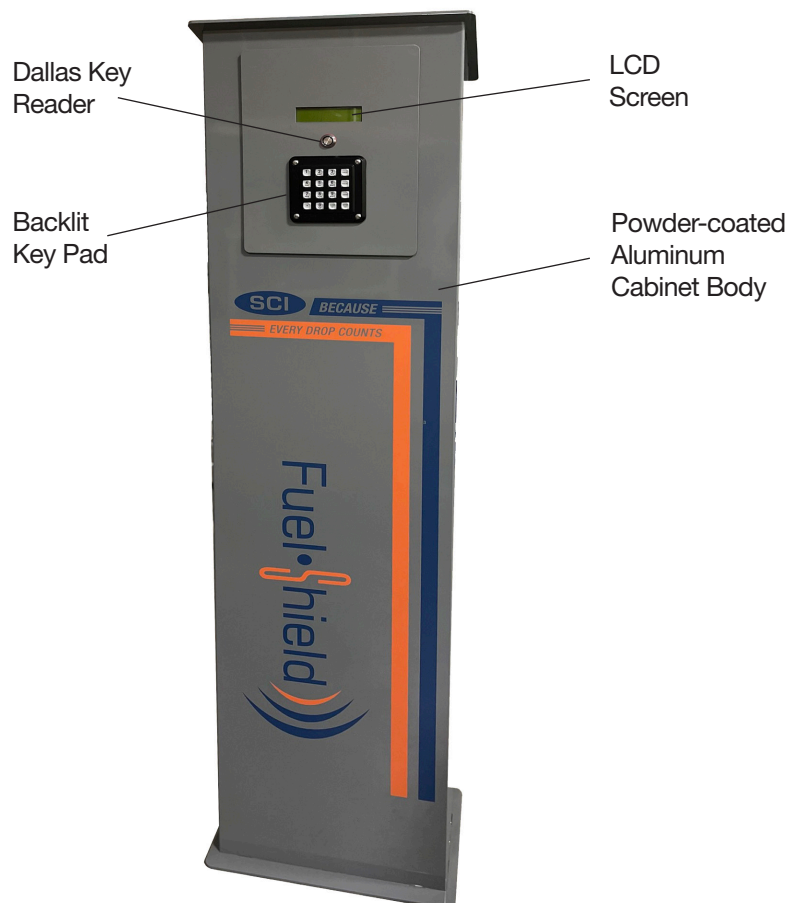
### High-LINK® FuelShield

#### Standard Features:

- Locking back panel for upper cabinet access
- Bolted-on lower access panel for access to mounting and conduit holes
- (9) pre-cut 1-7/8" diameter holes for use with maximum 1" conduit
- (4) 9/16" diameter mounting holes
- Powder-coated aluminum cabinet body
- Weatherproof enclosure
- Dallas key reader
- Backlit keypad
- Bypass switch for specified number of hoses
- LAN internet connection ready

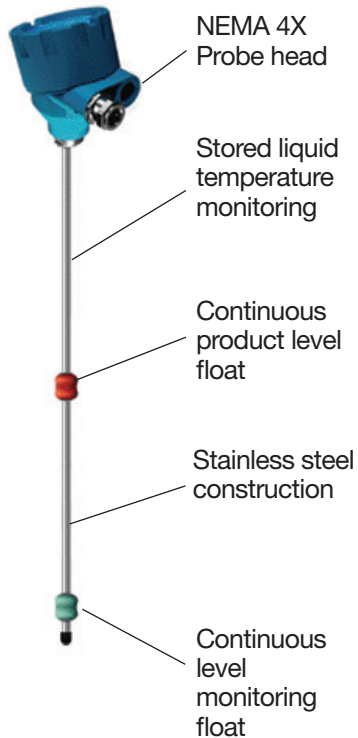
#### Optional Features:

- Wi-Fi connectivity (requires Wi-Fi bridge)
- Cellular modem
- Barcode scanner
- Magnetic card reader
- HID key fob integration
- RFID vehicle authorization system



## Included Components continued

### Magnetostrictive Probe



## High-LINK® FuelShield Plus

### Standard features

- Integral probe communication device
- High-LINK® Magnetostrictive Probe Features
  - 3/4" compression bushing for on-site probe height adjustment (see probe installation instructions).
  - Two floats for measuring product level and water level.
  - Internal thermocouple
  - 6-1/2 feet of 4-wire shielded weatherproof cable.
  - 3/4" x 2" reducer bushing to install probe into a 2" tank opening

### Optional Accessories

- Inline pulser
- Wifi-bridge
- Barcode scanner package
  - Scanner
  - Enclosure
  - Pedestal
- RFID authorization system package
  - RFID antenna
  - RFID vehicle tags
  - RFID nozzle reader
  - RFID board (preinstalled in FuelShield)
- Magnetic cards
- Dallas keys

## In-Line Pulsers



Gasoline  
Applications



Diesel  
Applications

## Site & Installer Requirements

- 1) Provide a suitable mounting location for the FuelShield
  - a) Surface should be a level concrete slab suitable to support the FuelShield.
  - b) Using the provided drawings, mount the base plate of the FuelShield to the mounting surface using screws or bolts, nuts and washers depending on FuelShield mounting location as determined by installer.
- 2) 120V AC, 1-PH, 5A minimum power
  - a) Minimum 14 AWG wire
- 3) Dedicated circuit for FuelShield power
- 4) Installation materials such as pipe thread sealant, pipe wrenches, conduit, junction boxes (if needed), conduit sealant and seal-off fittings, wire nuts or terminal blocks, drills, electrical screw drivers, miscellaneous tools as needed (supplied by others).
- 5) If using cellular communication option:
  - a) Cellular signal of at least 2 bars or ability to stream music or videos on a smart phone
- 6) If using Wi-Fi communication option:
  - a) Suitable mounting location for Wi-Fi bridge (see installation instructions).
  - b) Full strength Wi-Fi signal at FuelShield location
- 7) If using magnetostrictive probe:
  - a) 2" or greater tank top fitting, closest to the center of the tank as possible
  - b) 16AWG 4-wire shielded cable if probe wire extension is needed.



## FuelShield

### General Information

FuelShield uses mini contactors for control.

- All internal wiring to operate contactors is complete the from factory.
- Contactors are pre-wired in factory with a designated terminal on the contactor for primary control.

**See Appendix B - Sheet 3.**

- Consult with factory for questions concerning contactor's electrical ratings.
- Standard authority signal for fleet dispensers is 120V AC.
  - The installer may jump from the 120 V AC circuit (FuelShield main power) to the contactor for the appropriate hose control to supply the 120V AC signal.
  - Alternatively, a separate 120V AC source may be used for the authority signal.
  - This authority signal routes to the dispenser authority signal input. Please refer to the dispenser wiring instructions for direction.

The FuelShield requires a pulse output from the dispensing meter for each hose of the fueling system.

- Pulse input terminal blocks are located and labeled inside the FuelShield.

**See Appendix B - Sheet 3.**

- Wire used must be shielded, 2 conductor cable from the dispenser pulse output to the FuelShield pulse input for that hose.

The FuelShield enclosure can handle up to 6 hoses and pumps. The layout shown is for 2 hose control. For a 6-pump setup, the enclosure will contain 6 contactors and 6 pairs of pulse terminals (Terminal Block A).



## FuelShield Installation

### Mechanical Installation Requirements

- 1) Choose a location to install the FuelShield
- 2) Remove back panel of FuelShield using the keys provided to access conduit punch-outs (see image for reference)
- 3) Remove lower bolt-on panel to access base plate and conduit entry holes
- 4) Using the provided drawings, mount the base plate of the FuelShield to the mounting surface using 4 bolts, fastening them through the holes in the base plate

**See Appendix B - Sheet 2, Detail A.**

### Electrical Installation Requirements

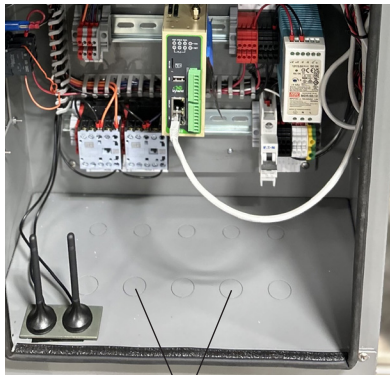
Always follow local electrical codes when installing electronics

#### General Wiring Information

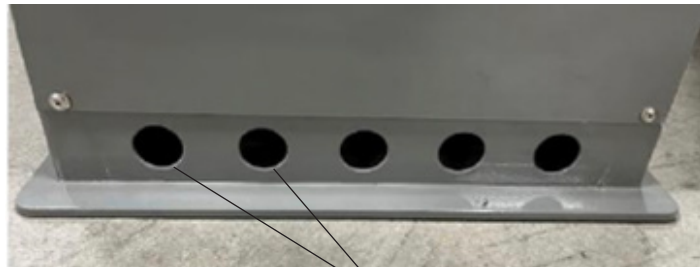
- 1) Install required conduit through as many of the holes in the base as needed
  - a) Do not put low voltage and high voltage wiring in the same conduit

**IMPORTANT:** Do not drill any holes into the FuelShield as this voids the warranty. Use only the provided conduit entry holes and punch-outs into the upper electronics cabinet.

### IMPORTANT



Punch-outs  
for wiring



Pre-drilled conduit entry holes

- 2) See Appendix B, page 30 for wiring diagram.

#### Wiring Main Power

- 1) Bring 120V AC power to FuelShield using minimum #14 AWG cable with ground.
  - a) Bring hot wire to 5A breaker (J-1).
  - b) Connect ground wire to ground terminal block (D).
  - c) Connect neutral wire to spare neutral terminal blocks (C-4, C-5, or C-6).
- 2) Use supplied hole plugs to plug any remaining conduit holes.

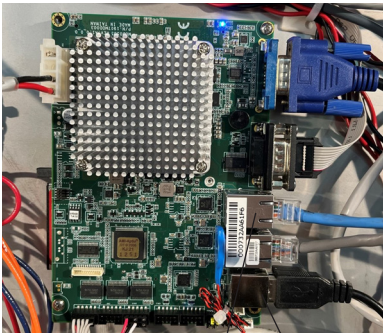
## Wiring Pulser to Fuelshield



## Wiring Pulser to Fuelshield

- 1) The FuelShield operates using a pulse signal from the meter pulse output or an external pulse source.
  - a) If a pulser is not present, please contact Highland Tank.
- 2) Please follow provided instructions from the pulser prior to wiring to the FuelShield.
- 3) Each hose must have a separate pulser.
- 4) Pulse Input Specifications
  - a) MAX 1000 pulses/gal
  - b) Common Pulse Ratios:
    - 10:1
    - 100:1
    - 500:1
    - 1000:1
  - a) 12V MAX
- 5) Please coordinate pulse ratio with Highland Tank to ensure proper programming of the system.
- 6) Wired as shown on **Appendix B - Sheet 8** "Diesel/Gasoline Pulser Wiring Information".
  - a) A-1 and A-2 for Pulser 1
  - b) Continue this wiring pattern for up to 6 pulsers (A-3 to A-12)

## Wiring Network Cable



RJ45 Port for network cable  
USB Ports

- 1) The FuelShield requires an internet connection to communicate with the High-LINK® web servers in the cloud.
- 2) The standard FuelShield is equipped with an RJ45 port for network communications located on the system CPU.  
**See Appendix B - Sheet 6, Network Cable Installation**
- 3) Connect to local network via a CAT-5e cable for internet access.
- 4) Please consult with Highland Tank® for information about FuelShield communications with the cloud for local security purposes.
- 5) It is recommended that the network cable be in a separate conduit to avoid interference.

## Optional Accessories Installation

### WiFi Option

*THE WI-FI ANTENNA IS AN OPTION SYSTEM FEATURE. IF IT IS NOT SUPPLIED WITH YOUR ORDER, SKIP THIS STEP.*



Nanostation front panel



Ubiquiti Nanostation M2 POE

#### Ubiquiti Nanostation

- 1) The Nanostation M2 is a Wi-Fi antenna. It connects the FuelShield to the local Wi-Fi network for internet communications.
  - a) It is important to make sure that the Wi-Fi signal shall not be interrupted during use. If interruption is possible, it is recommended to move the Nanostation to a different location or utilize an outdoor Wi-Fi extender to ensure a strong connection.
- 2) It is suggested that the Nanostation M2 is attached to a 1" diameter pipe or similar structure with provided zip ties. Installer shall determine the location of the pipe. Alternate mounting methods may be utilized as the installer sees fit. Please follow the instructions provided from the device manufacturer.
- 3) A POE adaptor is located inside the FuelShield.  
**See Appendix B - Sheet 2.**
- 4) An outdoor rated, double shielded CAT-5e cable is provided with the FuelShield. It is recommended to use this grade of cable, as it does not require conduit. If a different cable is preferred, it is up to the installer to determine if conduit is necessary.  
**See Appendix B - Sheet 5 for wiring diagram.**

## RFID Authorization System Option

*THE RFID AUTHORIZATION SYSTEM IS AN OPTIONAL SYSTEM FEATURE. IF IT IS NOT SUPPLIED WITH YOUR ORDER, PLEASE SKIP THIS SECTION.*

### WAF Antenna Installation

- 1) Mount the WAF antenna to selected site.
  - 2) The cable entry fitting diameter is 3/8". Inside the WAF antenna are LED lights and a COM port.
  - 3) Connect the WAF antenna to the VSU board inside the FuelShield via CAT-5e cable, which is provided. The CAT-5e cable will need to be run through conduit back to the FuelShield from the WAF antenna.
  - 4) Plug one end of the CAT-5e cable into the COM port inside the WAF antenna. Connect the other end of the CAT-5e cable to the FuelShield by inserting the cable into the RIGHT HAND CAT-5e port on the VSU board.
    - a) If applicable, connect local network cable or Wi-Fi cable through punch outs in bottom of FuelShield into the CAT-5e ports on the CPU board.
- See Appendix B - Sheet 6 for wiring information.**

WAF Antenna Enclosure



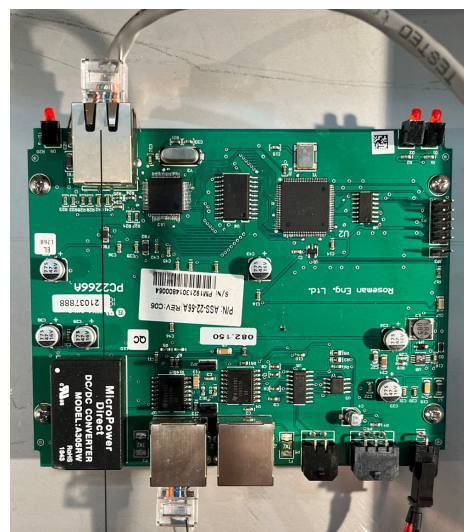
CAT5e  
Cable

Ground  
Wire

Terminal  
Block

- 5) The WAF includes a (green) ground wire that should be connected to the upper left terminal port on the green terminal block just below the RJ45 connection port. The ground wire can be run in the same conduit as the CAT-5e cable.
- 6) The WAF antenna communicates with the RFID nozzle reader via the VSU board. See "RFID Sensor Installation" for more information.

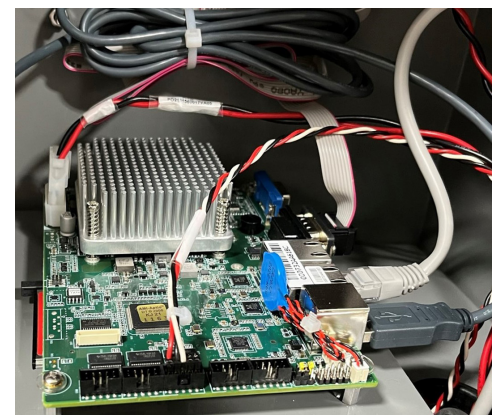
VSU Board



Connection  
to CPU

CAT5e cable to  
WAF Antenna

CPU Board





## RFID Vehicle Tag Installation

RFID Tab



RFID Mounting Ring



RFID Tank Tag Location

- 1) The RFID ring resides around the opening to the fuel tank of the vehicle in use. The RFID ring has two distinct parts: the ring and the tag (tail of the ring). The tag mounts around the fuel tank inlet.
  - a) Dry-fit the RFID ring by placing it around the fuel inlet, centering the opening in the ring.
  - b) Mark the locations of the mounting tabs of the RFID ring.
  - c) Ensure the RFID tag (tail of the ring) will be in a secure location that is not susceptible to damage from daily use.
  - d) Thoroughly clean and remove dirt, oils and debris from the mounting area around the fuel inlet. Mounting area must be clean, dry and oil free for epoxy to adhere properly.
  - e) Knead the epoxy for a full minute to ensure proper mixing. When applying to the RFID mounting ring, the epoxy must be pressed firmly onto the mounting surface and smoothed out.
  - f) Adhere the tag to the desired location on the tank using the same method. Ensure that the tag is covered with epoxy for additional protection
  - g) Ensure the ring has made full contact with the surface it is to be mounted to.
  - i) Allow epoxy to dry for a minimum of 6-12 hours to ensure proper adhesion. Epoxy will be fully cured after 7 days.

**See Appendix B - Sheet 7 for mounting locations.**

- 2) The RFID nozzle reader shall be installed on the nozzle as pictured in **Appendix B - Sheet 7**. The reader communicates the tag number to the system for vehicle identification.
  - a) A red light should illuminate on the top of the reader when it is moved. The reader utilizes motion to wake the reader when in use. When stationary, the reader will sleep to conserve battery life.
  - b) Install the reader by sliding the nozzle spout through the hole until it reaches the base of the spout and secure using the provided hose clamp.

**See Appendix B - Sheet 7 RFID Nozzle Reader Attachment Information.**



RFID Nozzle Reader



RFID Nozzle Reader  
Side View

## Barcode Scanner Installation

### Barcode Scanner



### Mechanical Installation of the Barcode Scanner

*THE BARCODE SCANNER IS AN OPTIONAL SYSTEM FEATURE.  
IF IT IS NOT SUPPLIED WITH YOUR ORDER, SKIP THIS STEP.*

- 1) The barcode scanner is an authentication method for the FuelShield. This device is most common for vehicle ID, but may be used to scan driver ID, project number, or other information required for fueling the vehicle. This device is used in conjunction with the FuelShield to authorize a transaction to fuel an approved vehicle. Therefore, it must be in a suitable location for ease of use during the fueling process.

- 1) If the barcode scanner is ordered with a prefabricated pedestal from Highland Tank:
  - a) Mount the pedestal to a concrete pad or suitable sturdy base. Location must be in a suitable location for ease of use during the fueling process.
  - b) Once the pedestal is secured, mount the provided scanner enclosure to the pedestal.
  - c) The barcode scanner cradle will be mounted to the back pan from the factory. It will temporarily be removed in a later step to complete installation of the communication cable.
  - d) Complete the barcode scanner installation as described below.
- 2) If an alternate mounting method is used:
  - a) The barcode scanner and cradle must be in a suitable location for ease of use during the fueling process.
  - b) It is highly recommended to mount the scanner inside a suitable enclosure to prevent damage to the device. An enclosure is typically provided by Highland Tank.
  - c) Mount the cradle in a suitable location for ease of use during the fueling process. The cradle will be removed temporarily in a later step to complete installation of the communication cable.

### Electrical Installation of the Barcode Scanner

- 1) The barcode scanner communicates directly with the FuelShield's CPU via USB. The barcode scanner has a 120V AC power supply. The power cable has an inline transformer to supply power to the scanner cradle. There is a pre-made cable arrangement that has power and communications in one cable. One end of the cable uses an RJ45 style connector. This end stays inside the enclosure. Ensure adequate cable length remains to connect this end into the back of the cradle during the final installation.

## Electrical Installation of the Barcode Scanner continued



Barcode Scanner Cable

- 2) A 7' USB cable is provided with the scanner. If the installation requires an extension, use a quality USB-A to USB-A extension cable suitable for the application.
- 3) A 7' 1.2mm power cable is supplied with the scanner. If the installation requires an extension, use a quality 1.2mm DC power extension cable suitable for the application.
- 4) Connect the barcode scanner power supply to a 120V AC source. This may be completed inside the FuelShield using the existing power supply, or via a separate power outlet.
- 5) Connect the USB portion of the cable to the USB port on the CPU, located inside the FuelShield.  
**See Appendix B - Sheet 6 "CPU Board" Section.**
- 6) Connect the RJ45 connector to the back of the cradle, ensuring it is tightly inserted. Replace the cradle to the original mounting position.

## Completing the Barcode Scanner Installation

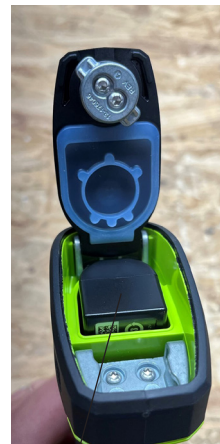
- 1) Install the battery in the handset.
  - a) Turn the handset upside down. There will be a bright green toggle switch. The switch should be in the "locked" position (as shown with a closed lock icon). Turn the toggle switch counterclockwise to unlock the base of the scanner and open the battery compartment.
  - b) Put the battery inside the compartment, close the base, and return the toggle switch to the locked position.
  - c) The handset will beep, and the light will illuminate.
- 2) The setup and configuration of the Barcode Scanner will be completed during the startup procedure by a qualified technician.



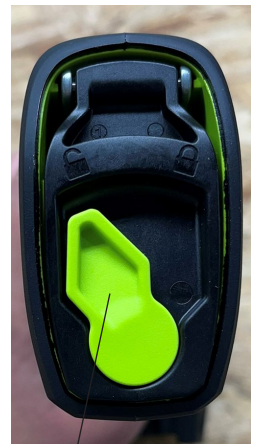
Locked  
Position



Batttrery  
Compartment



Batttrery



Unlocked  
Position



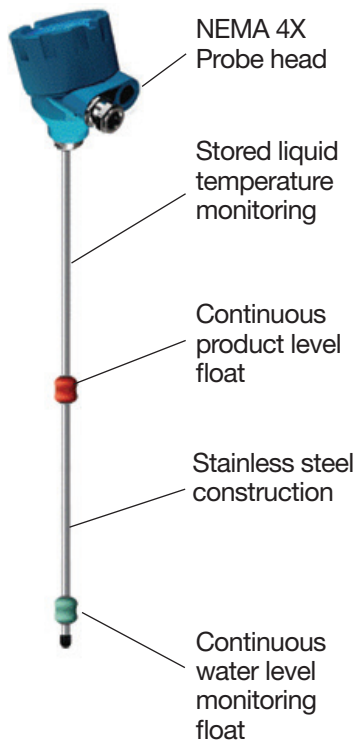
## Magnetostrictive Probe Installation

*THE MAGNETOSTRICTIVE PROBE IS AN OPTIONAL SYSTEM FEATURE THAT IS INCLUDED WITH THE FUELSHIELD PLUS SYSTEM. IF IT IS NOT SUPPLIED WITH YOUR ORDER, SKIP THIS STEP. IF THE PROBE IS NOT PRESENT BUT WAS ORDERED, PLEASE CONTACT HIGHLAND TANK.*

### NOTE

**NOTE:** Please refer to the tank drawing (if this is being installed on a new tank) to find the recommended placement of the probe on the tank. If this is a retrofit or the tank drawing is not available, please locate the probe in a 2" or larger fitting nearest to the center of the tank. If one is not available, contact Highland Tank for assistance. An installation video is available at [www.highlandtank.com](http://www.highlandtank.com). Actual probe may vary but installation does not.

### Magnetostrictive Probe



- 1) Before installing the probe, be sure to inspect the floats for chipping, cracking, or visible damage. Please make sure that the floats freely move along the probe shaft. The float marked H2O should be at the bottom with the arrow pointing up. If the floats are not in this order, please remove the bottom ring and switch the positions. If floats or other parts are damaged in shipment, please contact Highland Tank for replacements.
- 2) Inspect the shaft of the probe. It should not be bent or misshapen in any way. If the shaft is bent, the probe will not function properly. If there is anything wrong with the shaft, please contact Highland Tank.
- 3) Check the ring at the bottom of the probe shaft to ensure it is tight. This ring prevents the floats from falling off the probe shaft inside the tank, so it is particularly important that this is on tight. Do not over-tighten the ring, which will cause it to break.
- 4) Verify the serial number of the probe (printed on the cap of the probe) matches the serial number recorded on the Highland Tank work order. If it does not, please record the serial number from the probe head and have it ready during startup procedures.
- 5) Measure the length of the probe shaft that will stick up above the top of the tank.

### NOTE

**NOTE:** If the probe head is more than 8" above the tank, a riser pipe to protect the exposed probe stem is required. Couplers and nipples to be added as needed, keeping the compression bushing as close to the probe head as possible.

- 6) Lightly loosen the compression fitting at the top of the probe shaft so that the probe height can be adjusted before installation.

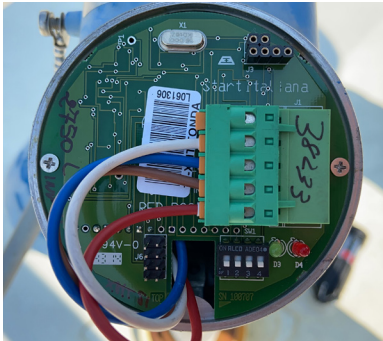
## Magnetostrictive Probe Installation continued

- 7) Carefully insert the probe into the tank fitting, sliding the probe all the way down into the tank until it touches the bottom. Ensure the probe shaft does not bend.
- 8) Tighten the reducer bushing into the tank fitting using thread sealant.
- 9) Slide the probe up through the loosened compression fitting at least 10mm (~3/8") so that the probe is not touching the bottom of the tank.
- 10) Tighten the top of the compression fitting to hold the probe at the appropriate height off the bottom of the tank.  
The probe SHOULD NOT move up and down.

### IMPORTANT

**IMPORTANT:** It is crucial to lift the probe up off the tank bottom at least 10 mm (~3/8") to allow for the tank to flex without applying pressure to the probe. Applying pressure to the probe shaft will cause the shaft to bend slightly, causing irreversible damage to the internal electronics. Tighten the top of the compression fitting so the probe will not slide back down. Do not overtighten.

## Probe Wiring



Probe head wiring. Note color and locations

- 1) The tank probes are supplied with 6' of additional cable. Any cable extension must be made with 4-conductor shielded cable, min 16AWG.
- 2) Carefully note wire colors referenced in this manual. The probe will not operate if it is wired incorrectly. See Appendix B - Sheet 4.
  - a) The wire colors listed on the drawing correspond to the factory wiring on the probe. If the wire extensions are different than factory colors, please record which extension wire colors correspond to the factory wire colors.
- 3) The probes communicate to the FuelShield in one of two ways, depending on the FuelShield model. See wiring instructions immediately below depending on the provided option.
  - a) If CELLULAR: Probes are wired into the InHand cellular modem device as shown on Appendix B, - Sheet 4.
  - b) If WI-FI or LAN: Probes are wired into the ADAM signal converter device a shown on Appendix B - Sheet 4.

### NOTE

**NOTE:** Probe wiring may vary depending on which model is being installed: Start-Italiana or Alisonic. When wiring the Alisonic probe, the RED and WHITE wire connections must be reversed.

## Wiring the Probe to the In-hand Cellular Modem

- a) If CELLULAR: Probes are wired into the InHand cellular modem device as shown on **Appendix B, - Sheet 4**.
- b) If WI-FI or LAN: Probes are wired into the ADAM signal converter device as shown on **Appendix B - Sheet 4**.

If the FuelShield is using a cellular connection for communications, there will be an In-Hand cellular modem inside the FuelShield.

Locate the cellular modem inside the FuelShield

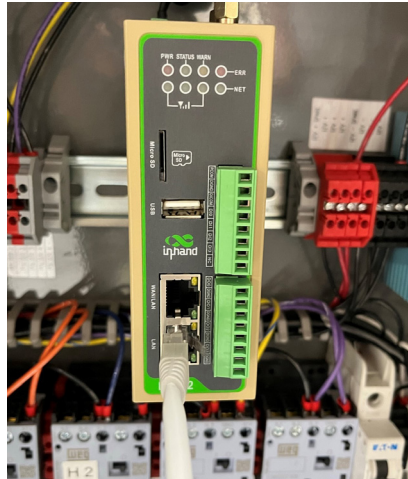
- 1) Locate **Appendix B - Sheet 4, Figure A**. This shows the wiring details for the cellular modem and probe.
  - a) Connect red probe wire to B-1 on the B terminal blocks.
  - b) Connect black probe wire to B-5 on the B terminal blocks.
  - c) Connect brown probe wire to Terminal A on the modem device

**See Appendix B - Sheet 4.**

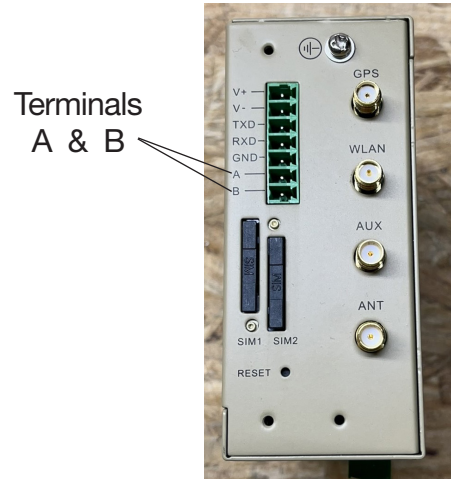
- d) Connect blue probe wire to Terminal B on the modem device

**See Appendix B - Sheet 4.**

- 2) A qualified technician will verify the connections during the startup procedure.



Front



Top

## Wiring the Probe to the ADAM Signal Converter



Data + and -

If the FuelShield is using Wi-Fi or LAN connection, there will be an ADAM device within the FuelShield. Refer to the diagram on

**See Appendix B - Sheet 4** for the device location.

- 1) Locate the ADAM device within the FuelShield body.
- 2) Find the wiring details on **Appendix B - Sheet 4 Figure B**. The colors on the diagrams represent the factory wiring on the probe.
  - a) Connect red probe wire to B-1 on the B terminal blocks.
  - b) Connect black probe wire to B-5 on the B terminal blocks.
  - c) Connect blue probe wire to Data + on ADAM device

**See Appendix B - Sheet 4.**

- d) Connect brown probe wire to Data - on ADAM device

**See Appendix B - Sheet 4.**

- 3) A qualified technician will verify the connections during the startup procedure.

## Optional Loose Accessories

### Dallas Keys

- Dallas keys are an authentication device for vehicle ID and/or driver ID. One key is required per vehicle or driver.
- The Dallas keys shall be touched to the key reader, located between the LCD screen and the keypad on the FuelShield.  
**See Appendix B - Sheet 2.**
- The Dallas keys come from the factory preprogrammed and tagged for each driver or vehicle.
- Replacements or new keys can be ordered from Highland Tank.

### Magnetic Cards

- Magnetic cards are an authentication device for vehicle ID and/or driver ID. One key card is required per vehicle or driver.
- The magnetic cards shall be swiped in the magnetic card reader, located on the face of the FuelShield, if equipped.
- Replacements or new cards can be ordered from Highland Tank.

### HID Fobs

- HID fobs are an authentication device for vehicle ID and/or driver ID. One fob is required per vehicle or driver.
- The fobs shall be waved in front of the HID reader, located on the face of the FuelShield, if equipped.
- Replacements or new fobs can be ordered from Highland Tank or your local controls provider, depending on the original source.

Dallas Keys

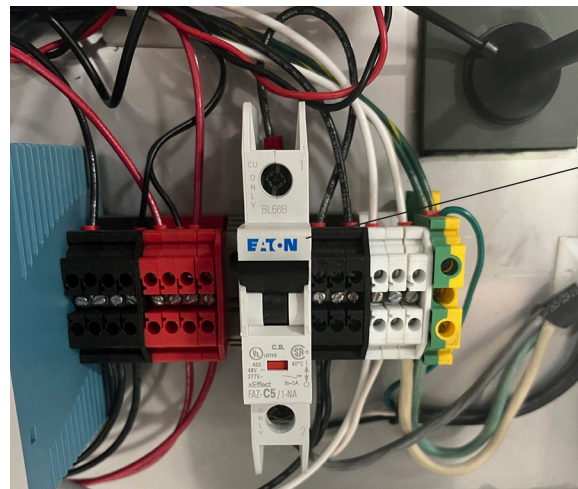


Dallas Key Reader



## Initial Power-Up

- 1) Once all steps above are completed, the system is ready to be powered up.
- 2) Turn on the local power to the system.
- 3) Switch the circuit breaker inside the CommBox to the "ON" position.



Circuit Breaker

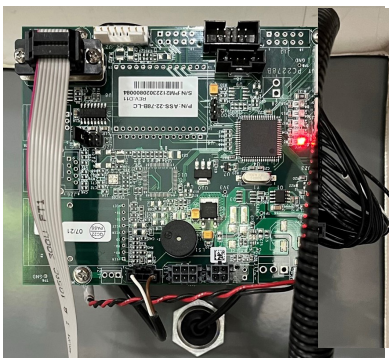
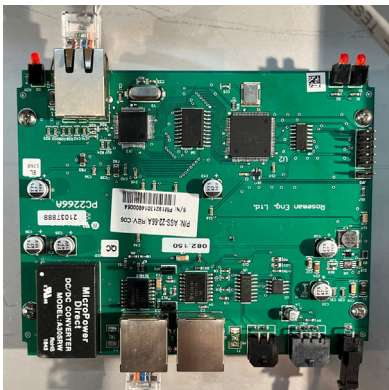
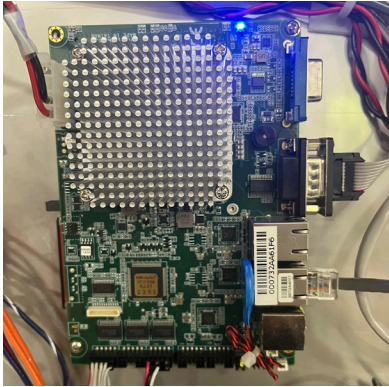
- 4) The system will sound one long beep followed by one short beep.
- 5) The LCD screen will activate and display the message
  - "SYSTEM STARTUP PLEASE WAIT". The screen may also display "SYSTEM OFFLINE" while the system boots.
  - Occasionally, this message shows for several minutes if the system is performing updates.
- 6) The keypad will illuminate.



Illuminated Keypad



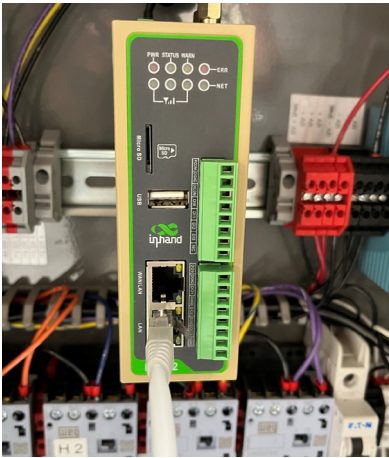
## Initial Power-Up continued



7) Observe the inside of the FuelShield to ensure the following lights come on as described:

- CPU
  - Steady blue light
  - Amber light will flash during boot-up/processing
- MPA
  - Steady red lights
  - Steady green lights
  - Communication light is blinking.
- VSU (if equipped)
  - Steady red light
- Panel Board
  - Steady red power light
  - Flashing red communication lights
- ADAM Device (if equipped)
  - Steady green light

## Initial Power-Up continued



- InHand Cellular Modem (if equipped)
  - Steady power light
  - Flashing status lights during boot-up.
  - Steady signal lights once fully booted.



- NanoStation M2 POE
  - Steady white light on POE adaptor in FuelShield.
  - Steady green power light on antenna (external).
  - Steady green LAN light on antenna (external).

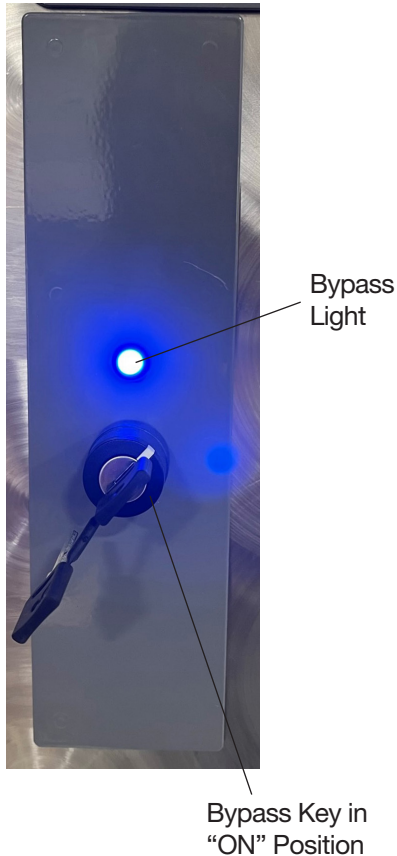
Nanostation M2 External Lights



White Lights on POE



## Initial Power-Up continued

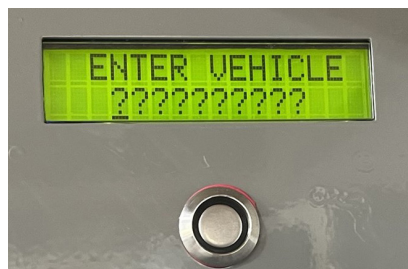


- Side of FuelShield
  - Bypass Light
    - Steady blue light when key is turned.

- If the startup sequence is done correctly, the LCD screen will display ONE OF the following once fully booted, depending on system configuration:
  - WELCOME ENTER PUMP #



- ENTER VEHICLE #

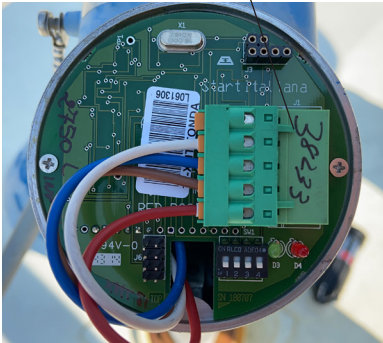


- ENTER USER #



## Initial Power-Up continued

Wiring Connector



Probe head wiring. Note color and locations

- While the cellular modem (\*\*OR WI-FI OR LAN\*\*) is booting up, unscrew the probe head and check to see that the wires are firmly in place in the green wiring connector, and that the connector is securely in place attached to the board. A green light will illuminate and remain steady. A red light will begin to flash. If these lights do not operate as described, please stop the installation and contact Highland Tank. All four dipswitches should be pre-set in the down position. If they are not, please take a photo and contact Highland Tank for further instruction.

## System Start-up and Activation

### IMPORTANT

**!!IMPORTANT!** Field service technicians are prepared to perform only the procedures as outlined below. A qualified electrician and the system installer shall be present during startup to assist with any high-voltage electrical handling, tighten pipe connections, correct accessory installations, adjust mechanical components, and more. The field service technician is available only during the previously scheduled allotted time on-site. Additional time, materials, and other related expenses are applicable if beyond the original scope of work.

- Once the above steps are complete, the system is ready for start-up. Please contact Highland Tank if the above steps could not be completed as instructed.
- To schedule start-up, call Highland Tank and be sure to have the tank work order number, purchase order number, or drawing number ready. If none of this is available, please write down the serial number of the probe and FuelShield and have them available when calling Highland Tank.

The tank work order number is typically available on the signed copy of the bill of lading that was received when the tank was delivered. It can also be found on the silver sticker on one of the tank heads.

The FuelShield serial number will be inside the door on a green label, clearly identified.

- The following must be prepared for the technician to complete all start-up procedures:
  - Fuel must be in the tank.
  - At least one test vehicle per fuel type must be available for system testing. Vehicle(s) should be as empty as possible to allow for multiple tests.
  - All accessories & options must be pre-installed as directed above.

## **System Start-up and Activation continued**

- A qualified technician will perform the following during start-up procedures:
  - Power system on.
  - Ensure proper boot sequence.
  - Check programming and make adjustments as necessary.
  - Check probe wiring.
  - Check accessory communication & wiring.
  - Confirm network communication via intended method.
  - Confirm back-end support sees system on-line and can remotely connect
  - Confirm probe levels are reporting and accurate based on local mechanical gauge readout.
  - Set up RFID system, if applicable.
  - Set up Barcode Scanner, if applicable.
  - Perform test transactions, verifying gallons read by FuelShield system matches gallons displayed on fuel system meter, adjusting calibration on the FuelShield system as necessary.
  - Perform end-user FuelShield operation training.
  - Perform end-user High-LINK<sup>®</sup> software training.
- Ongoing software support is included with use of the High-LINK<sup>®</sup> software application. Please contact Highland Tank or SCI support for help. The on-site technician will provide contact information at the time of startup.

## APPENDIX A

### FuelShield Field Wiring Table

Category	Callout	Description
<b>Pulse Inputs*</b>	A-1	Hose 1 Pulse Input (+)
	A-2	Hose 1 Pulse Input (-)
	A-3	Hose 2 Pulse Input (+)
	A-4	Hose 2 Pulse Input (-)
<b>B Terminal Blocks</b>	B-1	12V (+) – Probe Wire
	B-2	Spare 12V (+)
	B-3	Spare 12V (+)
	B-4	Spare 12V (+)
	B-5	12V (-) – Probe Wire
	B-6	Spare 12V (-)
	B-7	Spare 12V (-)
	B-8	Spare 12V (-)
<b>C Terminal Blocks</b>	C-1	120V AC Hot
	C-2	120V AC Hot
	C-3	120V AC Hot
	C-4	120V AC Neutral
	C-5	120V AC Neutral
	C-6	120V AC Neutral
<b>Ground</b>	D	120V AC Ground
<b>Hose 1 Contactor</b>	E-1	Hose 1 Contactor Spare
	E-2	Hose 1 Contactor Spare
	E-3	Hose 1 Power or Auth. Signal In
	E-4	Hose 1 Power or Auth. Signal In
<b>Hose 2 Contactor*</b>	F-1	Hose 2 Contactor Spare
	F-2	Hose 2 Contactor Spare
	F-3	Hose 2 Power or Auth. Signal In
	F-4	Hose 2 Power or Auth. Signal In
<b>Power In</b>	J-1	120V AC Power In
<b>Hose 1 Terminal Block</b>	K	Hose 1 Power or Auth. Signal Out
<b>Hose 2 Terminal Block*</b>	L	Hose 2 Power or Auth. Signal Out
<b>12V Power Supply</b>	G	12V Power Supply Unit
<b>Main Circuit Breaker</b>	J	Main 120V Circuit Breaker
<b>Cellular Modem</b>	H	InHand Device (Cellular Modem)

\*Repeat for hoses 3-6, if applicable

# HIGH-LINK FUELSHIELD FIELD INSTALLATION PACKAGE

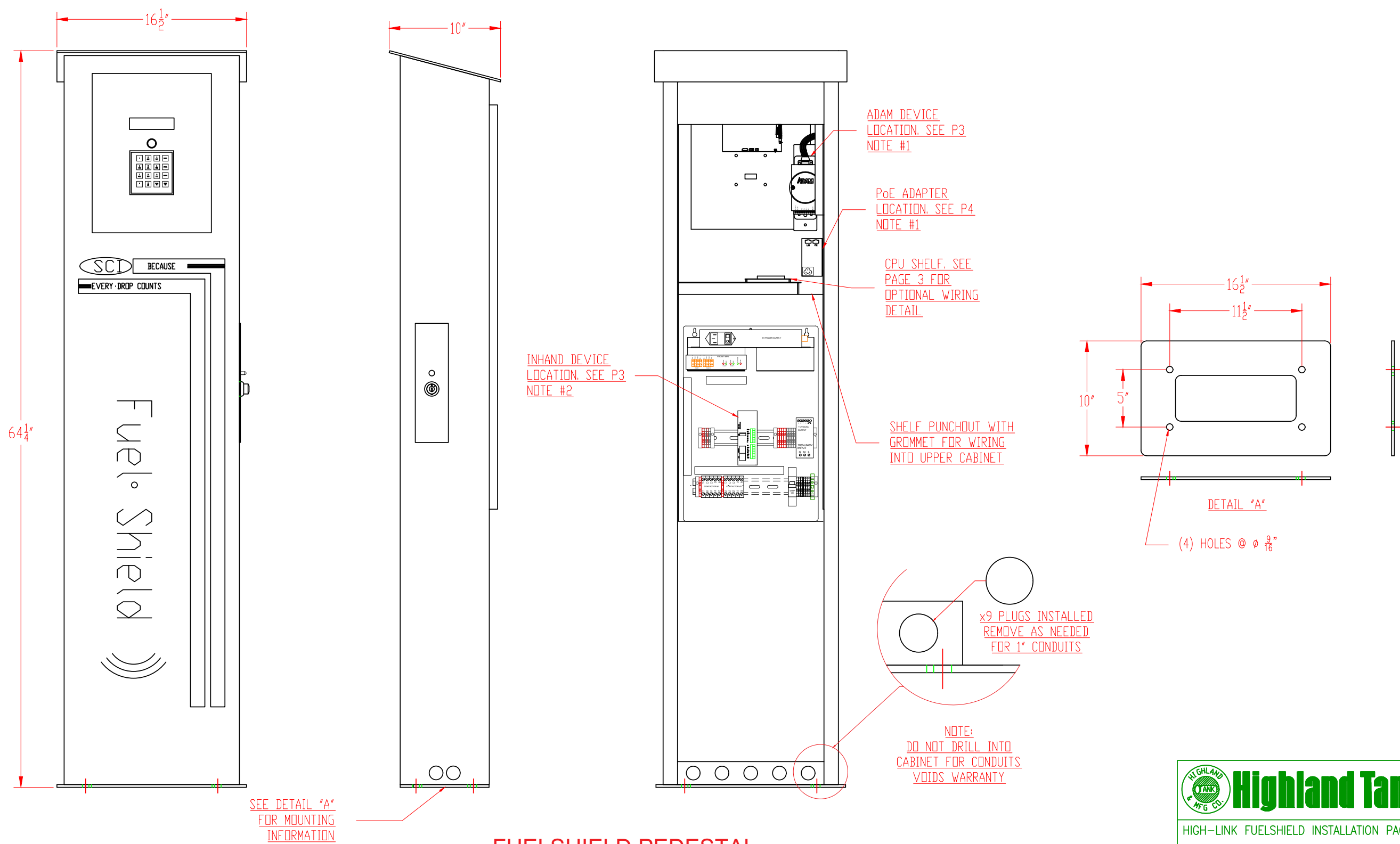
SHEET 1.....	FUELSHIELD PEDESTAL
SHEET 2.....	MIDDLE CABINET INSTALLATION GUIDE
SHEET 3.....	INHAND MODEM DEVICE/ADAM DEVICE PROBE WIRING INFORMATION
SHEET 4.....	NanoStation M2 ATTACHMENT/PROBE WIRING INFORMATION
SHEET 5.....	WAF ANTENNA WIRING INFORMATION
SHEET 6.....	RFID NOZZLE READER ATTACHMENT INFORMATION
SHEET 7.....	DIESEL/GASOLINE PULSER WIRING INFORMATION

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HIGH-LINK FUELSHIELD INSTALLATION PACKAGE

VERSION — 001

SCALE:	DATE:	DWG. BY:	DWG. NO.:
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FUELSHIELD PEDESTAL

**Highland Tank®**

HIGH-LINK FUELSHIELD INSTALLATION PACKAGE

FUELSHIELD PEDESTAL

SCALE:	DATE:	DWG. BY:	DWG. NO.:
NTS	6/29/2023	CMW	PAGE 1 OF 7

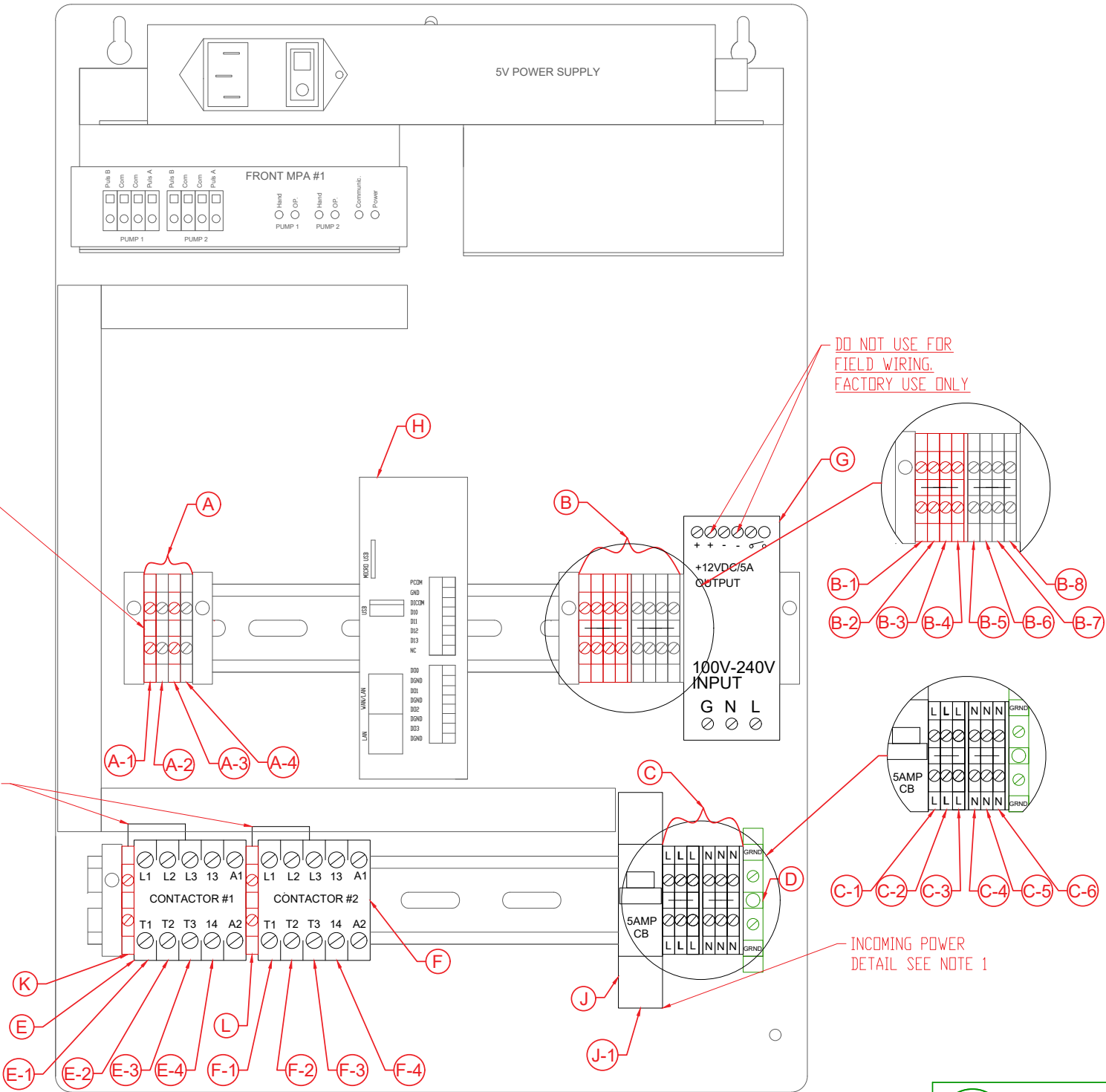


NOTE:

- (1) 120VAC POWER TO LAND ON 5A CIRCUIT BREAKER, J. NEUTRAL TO LAND ON TERMINAL C-5. GND TO LAND ON TERMINAL D.
- (2) RECOMMENDED POWER CABLE TO BE MINIMUM #14-2C W/GND, 15A FEED.
- (3) MOST DISPENSERS REQUIRE 120VAC AUTH. SIGNAL FROM FUEL SHIELD, MAY TAKE 120VAC FROM FUEL SHIELD 120VAC POWER. IF POWERING PUMPS DIRECTLY, BRING ONLY ONE HOT WIRE THROUGH CONTACTOR.
- (4) THE FUEL SHIELD ENCLOSURE CAN HANDLE UP TO (6) FUEL LINES AND PUMPS. THE LAYOUT SHOWN IS FOR 2 FUEL LINE CONTROL. FOR A 6 PUMP SETUP, THE ENCLOSURE WILL CONTAIN 6 CONTACTORS AND 6 PAIRS OF PULSE TERMINALS (TERMINAL BLOCK A)

FIELD WIRING	
A-1	HOSE 1 PULSE INPUT + (RED)
A-2	HOSE 1 PULSE INPUT - (GRAY)
A-3	HOSE 2 PULSE INPUT + (RED)
A-4	HOSE 2 PULSE INPUT - (GRAY)
B-1	12V+ (PROBE WIRE)
B-2	SPARE 12V+
B-3	SPARE 12V+
B-4	SPARE 12V+
B-5	12V- (PROBE WIRE)
B-6	SPARE 12V-
B-7	SPARE 12V-
B-8	SPARE 12V-
C-1	120 VAC HOT
C-2	120 VAC HOT
C-3	120 VAC HOT
C-4	120 VAC NEUTRAL IN
C-5	120 VAC NEUTRAL
C-6	120 VAC NEUTRAL
D	120 VAC GROUND
E-1	HOSE 1 CONTACTOR SPARE
E-2	HOSE 1 CONTACTOR SPARE
E-3	H1 POWER OR AUTH. SIGNAL IN
E-4	H1 POWER OR AUTH. SIGNAL IN
F-1	HOSE 2 CONTACTOR SPARE
F-2	HOSE 2 CONTACTOR SPARE
F-3	H2 POWER OR AUTH. SIGNAL IN
F-4	H2 POWER OR AUTH. SIGNAL IN
J-1	120 VAC IN
K	H1 POWER OR AUTH. SIGNAL OUT
L	H2 POWER OR AUTH. SIGNAL OUT

	QTY	DESCRIPTION
A	4	PULSE INPUT TERMINALS
B	7	12V +/- POWER SUPPLY TERMINALS
C	6	110V POWER TERMINALS
D	1	GROUND TERMINAL
E	1	HOSE 1 CONTACTOR
F	1	HOSE 2 CONTACTOR
G	1	12V POWER SUPPLY
H	1	INHAND DEVICE (CELLULAR MODEM)
J	1	MAIN 120 V CIRCUIT BREAKER



PEDESTAL BACK PAN  
COMPONENT LAYOUT

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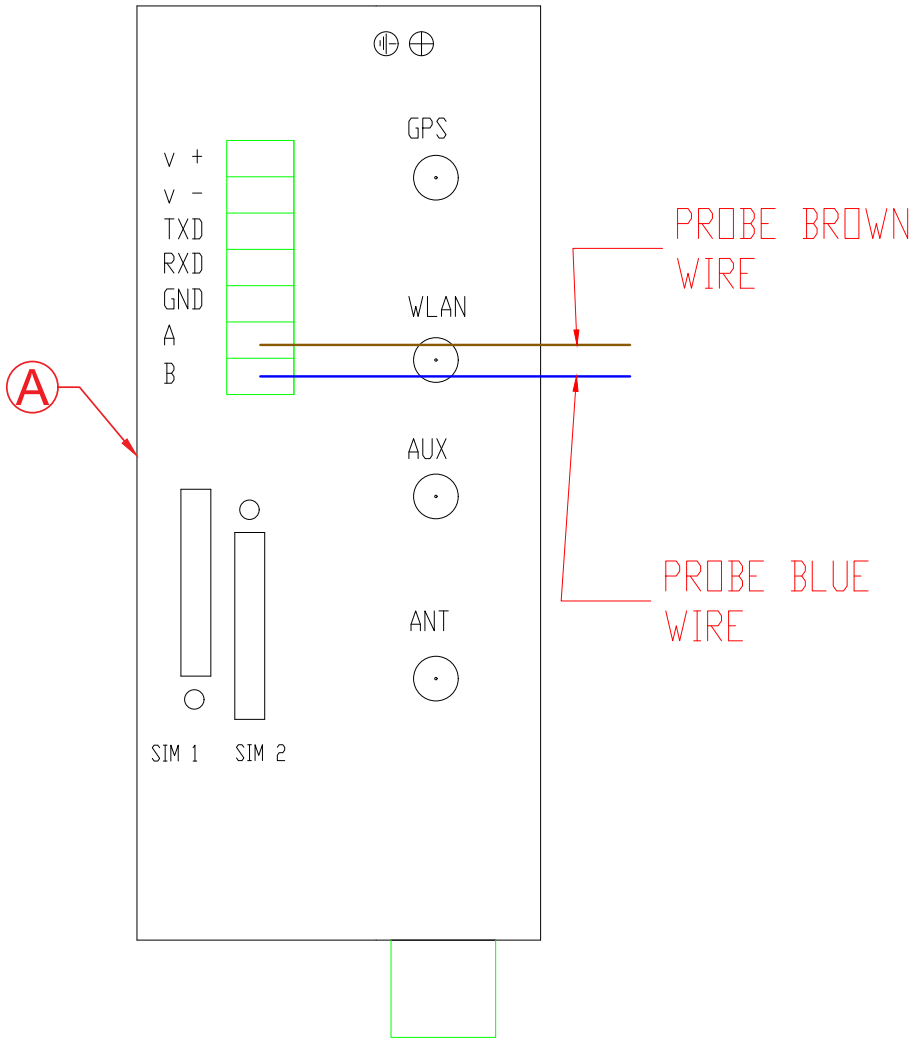
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HIGH-LINK FUELSHIELD INSTALLATION PACKAGE  
MIDDLE CABINET INSTALLATION GUIDE

SCALE: NTS DATE: 6/29/2023 DWG. BY: CMW DWG. NO: PAGE 2 OF 7

NOTE FOR PROBE WIRING

- SEE P.1 FOR LOCATION OF PROBE WIRING DEVICES
- 1. INHAND CELLULAR MODEM WIRING. SEE FIGURE (A) FOR DETAIL
- RED PROBE WIRE TO B1 (12V+)
- BLACK PROBE WIRE TO B5 (12V-)
- BROWN WIRE TO INHAND MODEM TERMINAL "A"
- BLUE WIRE TO INHAND MODEM TERMINAL "B"

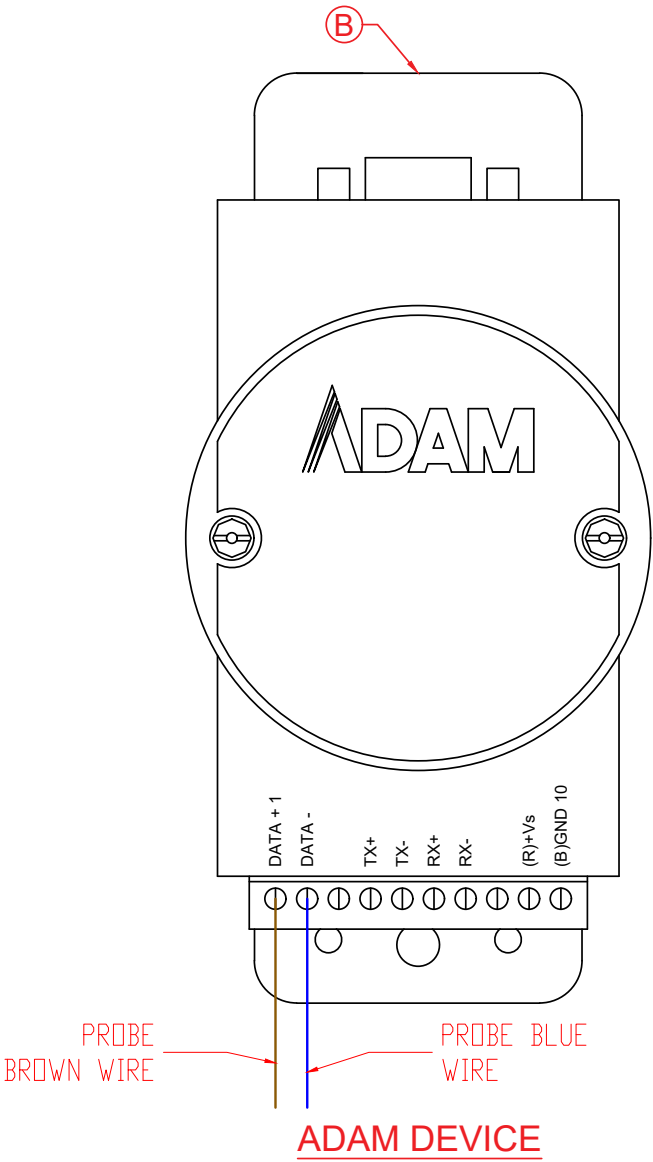


INHAND MODEM DEVICE

- INSTALLER TO OBSERVE THE INSIDE OF THE FUELSHIELD TO DETERMINE IF THE INHAND CELLULAR MODEM OR THE ADAM DEVICE IS USED

NOTE FOR PROBE WIRING

- SEE P.1 FOR LOCATION OF PROBE WIRING DEVICES
- 1. ADAM DEVICE WIRING. SEE FIGURE (C) FOR DETAIL
- RED PROBE WIRE TO B1 (12V+)
- BLACK PROBE WIRE TO B5 (12V-)
- BROWN WIRE TO DATA+
- BLUE WIRE TO DATA-



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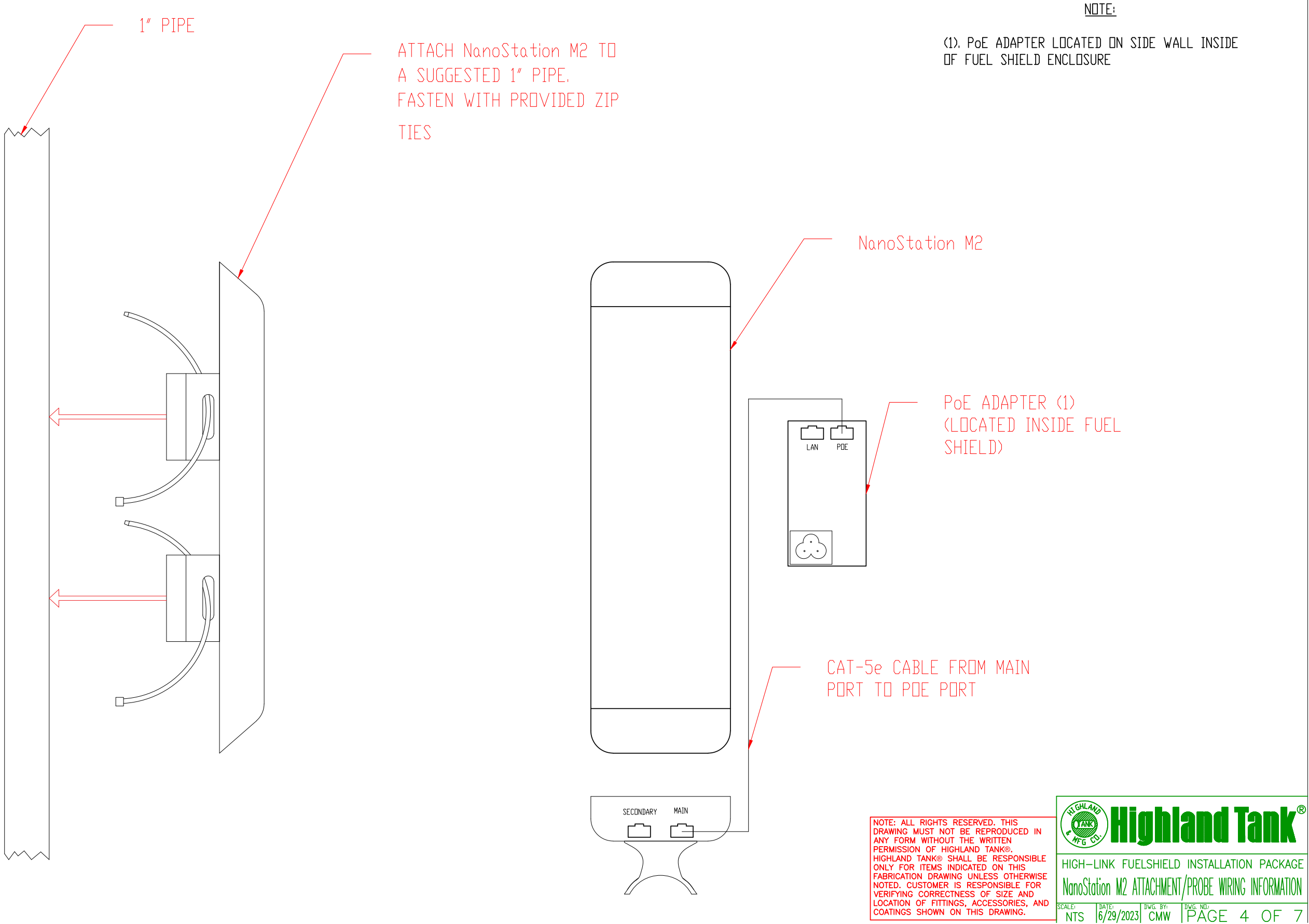
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IN-HAND MODEM DEVICE/ADAM DEVICE PROBE WIRING INFORMATION

SCALE: NTS DATE: 6/29/2023 DWG. BY: CMW DWG. NO.: PAGE 3 OF 7

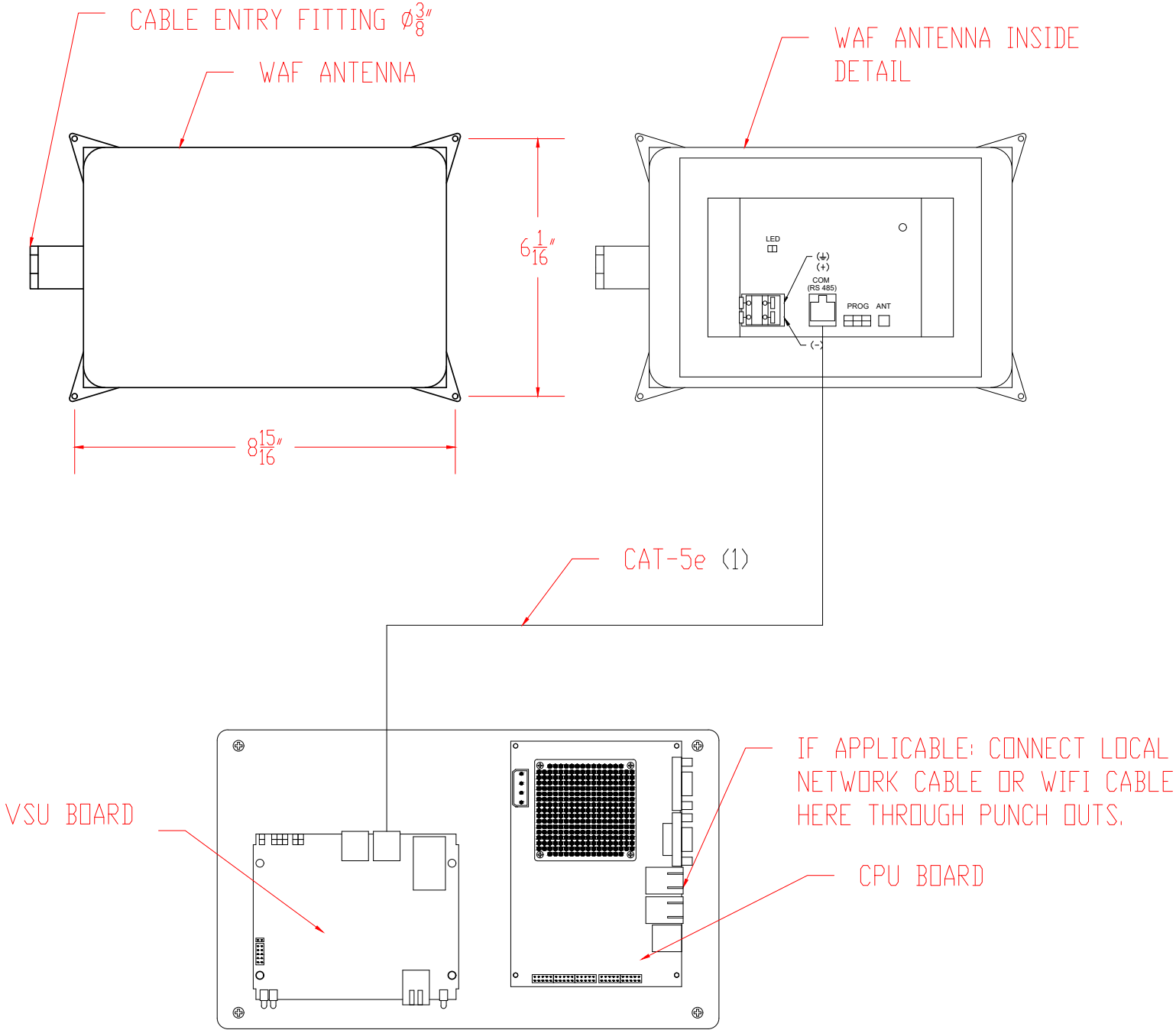
FIELD WIRING	
A	INHAND MODEM DEVICE
B	ADAM DEVICE





WAF ANTENNA

- NOTES
1. RUN CAT-5e CABLE WITH RJ45 PLUG FROM WAF ANTENNA TO VSU BOARD



CPU/VSU BOARD

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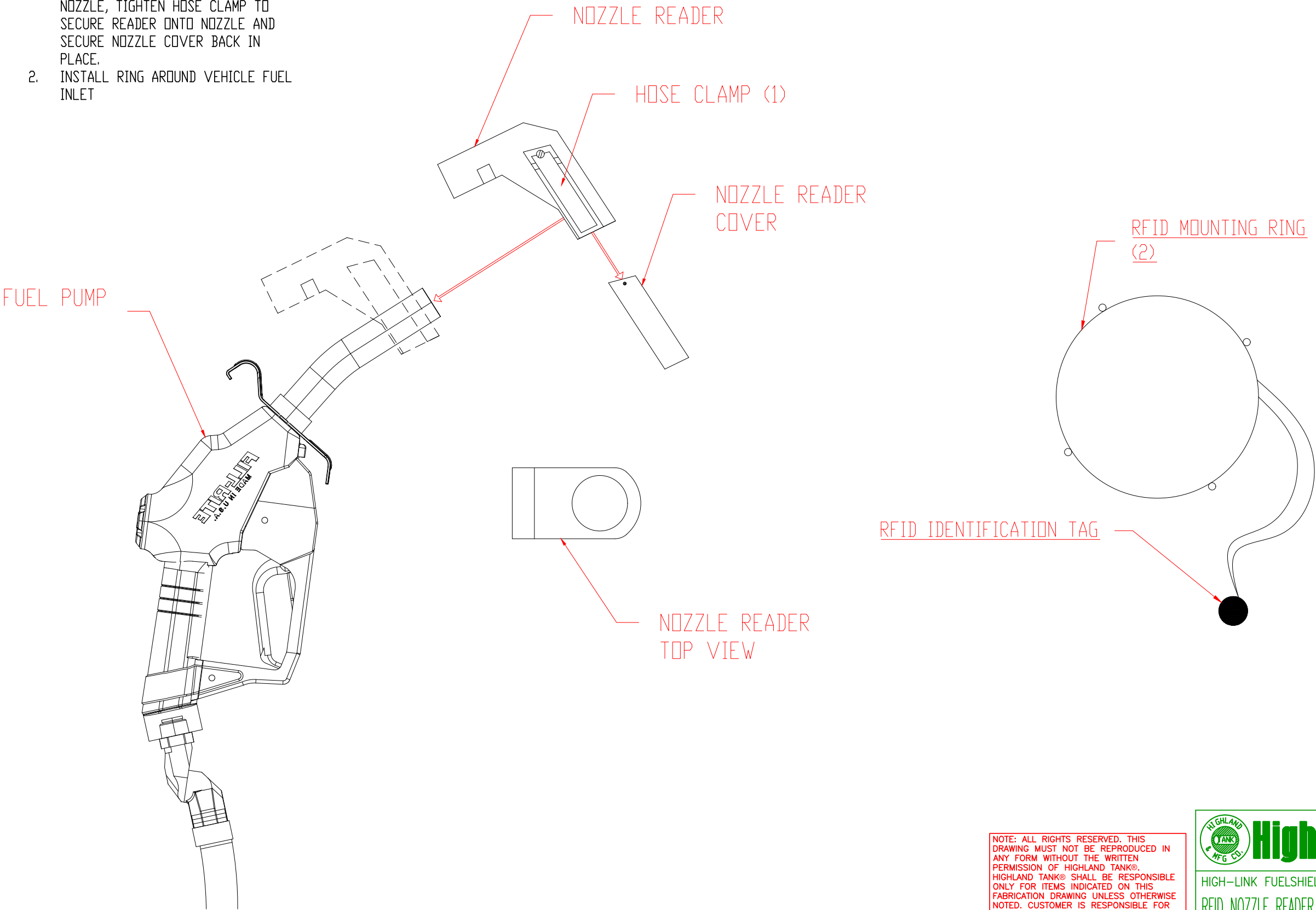
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WAF ANTENNA WIRING INFORMATION

SCALE: NTS	DATE: 6/29/2023	DWG. BY: CMW	DWG. NO: PAGE 5 OF 7
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- NOTES
1. AFTER READER IS SLID ONTO NOZZLE, TIGHTEN HOSE CLAMP TO SECURE READER ONTO NOZZLE AND SECURE NOZZLE COVER BACK IN PLACE.
  2. INSTALL RING AROUND VEHICLE FUEL INLET



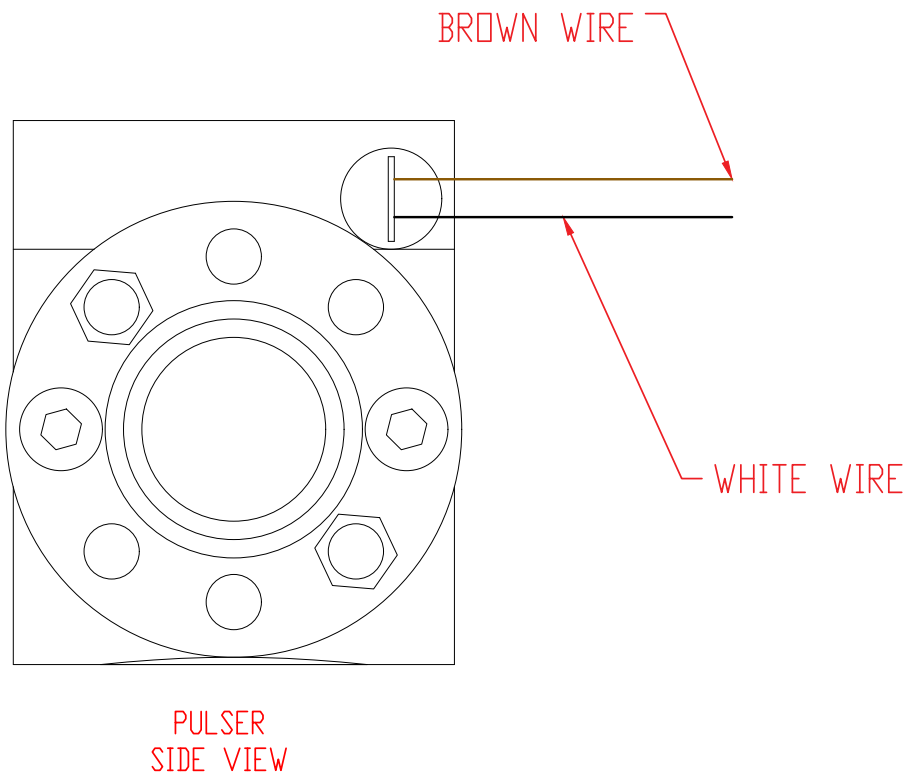
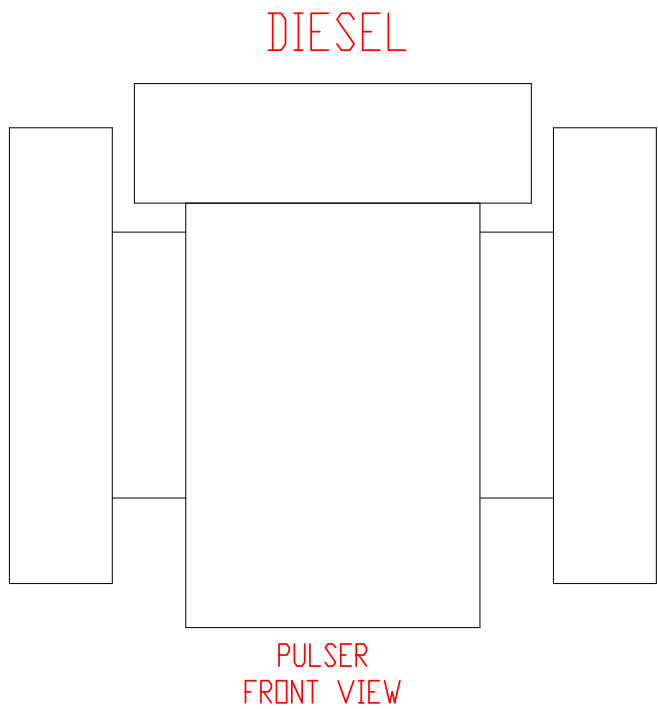
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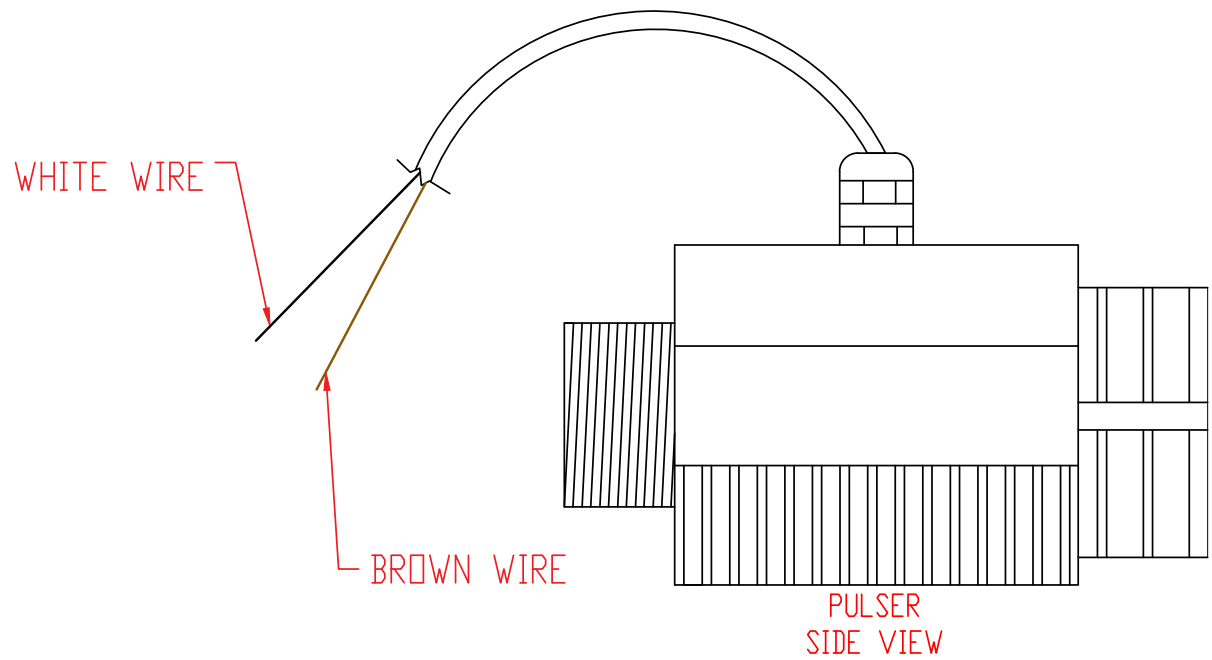
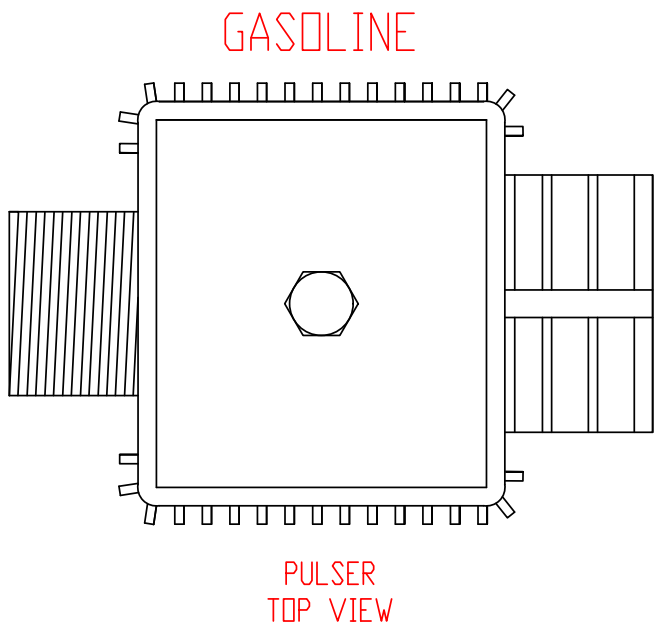
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RFID NOZZLE READER ATTACHMENT INFORMATION

SCALE:	DATE:	DWG. BY:	DWG. NO.:
NTS	6/29/2023	CMW	PAGE 6 OF 7



- NOTE FOR PROBE WIRING
- FOLLOW MANUFACTURE'S PROVIDED MANUAL FOR MECHANICAL INSTALLATION.
- WIRE TO PULSE INPUT IN FUELSHIELD. SEE PAGE 2 (REPEAT FOR EACH HOSE)
  - BROWN WIRE TO HOSE 1 PULSER INPUT + (RED) "A-1"
  - WHITE WIRE TO HOSE 1 PULSER INPUT - (GRAY) "B-2"



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HIGH-LINK FUELSHIELD INSTALLATION PACKAGE  
DIESEL/GASOLINE PULSER WIRING INFORMATION

SCALE: NTS	DATE: 6/29/2023	DWG. BY: CMW	DWG. NO.: PAGE 7 OF 7
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# FuelShield

HT-6123

## User Manual

### Installation & Start-up Guide

[www.highlandtank.com](http://www.highlandtank.com)

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# Highland Tank®



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