



# FuelMaster FMU Installation Guide

FMU 25xx, 35xx, & 45xx

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12/16/2022

Document Version: 1.01

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

Syntech Systems, Inc.  
 100 Four Points Way  
 Tallahassee, Florida 32305

Phone: (850) 878-2558  
 FAX: (850) 877-9327  
 Support: (800) 888-9136 Ext. 2

FuelMaster FMU Installation Guide

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## Document Version History

Version	Date	Description
1.0	5/17/2022	Initial release.
1.01	12/16/2022	Added the following: <ul style="list-style-type: none"> <li>• <a href="#">Safety Precautions</a></li> <li>• <a href="#">Safety Guidelines</a></li> <li>• <a href="#">Protecting Against Electrostatic Discharge</a></li> <li>• <a href="#">Protecting Against Radio Interference</a></li> <li>• <a href="#">Wireless Network Security</a></li> <li>• <a href="#">Hold Harmless Agreement</a></li> <li>• <a href="#">Certifications and Approvals</a></li> <li>• <a href="#">Boundaries of Flammable Liquid Hazardous Location</a></li> <li>• <a href="#">FMU Electrical Safety Spacing</a></li> <li>• <a href="#">FMU ID Plates</a></li> <li>• <a href="#">FMU Door Key Reference</a></li> <li>• <a href="#">Warnings, Cautions, and Notes</a></li> <li>• <a href="#">Basic FuelMaster Warranty</a></li> <li>• <a href="#">Initialization Requirement</a></li> <li>• <a href="#">FuelMaster Equipment Specifications</a></li> <li>• <a href="#">Safety Related Inspections &amp; Preventive Maintenance</a></li> <li>• <a href="#">Cleaning Instructions</a></li> <li>• <a href="#">Fuse Reference</a></li> <li>• <a href="#">Battery Reference</a></li> <li>• <a href="#">Switch Ratings</a></li> </ul>

		<ul style="list-style-type: none"> <li>• <a href="#">Terminal Ratings (for External Component Connections)</a></li> <li>• <a href="#">Parts Substitution and Modification</a></li> <li>• <a href="#">Commercially Available Products</a></li> <li>• <a href="#">Support</a></li> <li>• <a href="#">Improvements</a></li> </ul> <p>Added various Acceptance Test Procedures to end of document</p> <p>Updated <a href="#">Initialization Requirement</a> section</p>
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## WARNINGS, CAUTIONS, and NOTES

This manual emphasizes special operations with Warnings, Cautions, or Notes preceding the applicable procedure:

***WARNING*** indicates a safety precaution that, if not followed, could result in personal injury

***CAUTION*** indicates a safety precaution that, if not followed, could result in damage to equipment

***NOTE*** indicates a procedure requiring special emphasis for the proper installation and operation of FuelMaster equipment

Warnings and Cautions in this manual are provided in both English and French to meet the needs of our French speaking customers in Canada.

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## Introduction

This manual provides installation instructions for the Syntech Systems, Inc., FuelMaster Fuel Management Unit (FMU) for fixed fueling sites (Legacy FMPlus software) and Facilities (FMLive application). These instructions have been prepared for use by technicians who are qualified to complete electrical work in hazardous locations.

This one installation manual addresses the FMU-25xx, FMU-35xx, and FMU-4xxx series/models. Notations identify the differences between these applications where applicable.

FuelMaster consists of equipment that controls access to, accounts for, and compiles reports for transactions from dispensing equipment. FuelMaster restricts unauthorized user access while maintaining complete accountability of each transaction as it occurs. The FuelMaster equipment is assembled to fulfill specific site or facility requirements and must be installed accordingly.

The FuelMaster equipment may be adapted to control dispensing equipment for any metered product (not just fuel). Optional equipment is available to utilize the same system and system access devices to activate electronic gate openers, door openers, and automated car washes.

FMU Initialization and configuration is required to make the system functional and may be performed in conjunction with the FMU hardware installation or performed later. See [Initialization Requirement](#) for more information.

It is highly recommended the installer spend some time with the customer training them about hardware setup and configuration, as well as organizing and building the database. This will permit the customer time to develop necessary fuel management skills, understand the encoding process, and test the hardware after installation.

## Safety Precautions

In addition to the safety precautions contained within this installation manual, the FuelMaster installer must be familiar with the guidelines contained within all other safety codes and standards applicable to the installation and operation of electrical equipment, particularly within hazardous locations. All FuelMaster and non-FuelMaster equipment supplied by Syntech Systems, Inc., complies with all applicable federal, state, and local safety codes and standards.

## References

The following references, as a minimum, and as they apply to the installation, must be familiar to the technician performing a FuelMaster installation.

- **NFPA Handbook 30 - Flammable and Combustible Liquids Code** provides requirements for the safe storage and handling of flammable and combustible liquids.
- **NFPA Handbook 30A - Code for Motor Fuel Dispensing Facilities and Repair Garages** provides safeguards for dispensing liquid and gaseous motor fuels into the fuel tanks of automotive vehicles and marine craft.
- **NFPA Handbook 70 - National Electrical Code (NEC)** contains guidelines for the installation and operation of electrical equipment.
- **NFPA Handbook 407 - Standard for Aircraft Fuel Servicing** provides minimum fire safety requirements for procedures, equipment, and installations during ground fuel servicing of aircraft using liquid petroleum fuels. Knowledge of this reference is necessary when performing an installation in support of aircraft fuel servicing.
- **NIST Handbook 44 - Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices** provides technical requirements for the purpose of eliminating weights and measures and weighing and measuring devices that give false readings, that are of such construction that they are faulty, or that facilitate the perpetration of fraud. Knowledge of this reference is necessary when performing an installation in support of retail fuel sales.

## Safety Guidelines

Use the following guidelines to help protect your FMU from potential damage and ensure your own personal safety.

**WARNING** Do not operate your FMU with any cover removed or door open.

**AVERTISSEMENT** N'actionnez pas votre FMU quand aucune couverture est déplacée ou aucune porte est ouverte.

**CAUTION** Do not open your FMU's doors during wet weather.

**ATTENTION** N'ouvrez pas les portes de Votre FMU par le temps de pluie.

As you use your FMU, observe the following safety guidelines:

- To avoid damaging your FMU, ensure the AC power available at your location is 110 volts, 50, or 60 hertz (Hz).
- To prevent electrical shock, connect the FMU into properly grounded sources.
- To avoid possible damage to the FMU and or other interfacing equipment, wait 5 seconds after turning off all interfacing equipment before disconnecting any interconnecting cables.
- To protect your FMU from sudden, transient electrical increases, your FMU is equipped with Surge Protection. All equipment interfacing your FMU needs to use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).
- Be sure nothing rests on your FMU's cables and that the cables are not located where they can be stepped on or tripped over.
- Do not spill food or liquids on your FMU or interfacing equipment.
- Do not push any objects into the openings of your FMU. Doing so can cause fire or electrical shock by shorting-out internal components.
- Keep your FMU away from radiators and heat sources.

**WARNING** Do not attempt to service the FMU yourself, except as explained in this manual. Always follow installation and service instructions closely.

**AVERTISSEMENT** N'essayez pas d'entretenir le FMU vous-même, excepté comme expliqué en ce manuel. Suivez toujours les instructions d'installation et de maintenance précisément.

## Protecting Against Electrostatic Discharge

Static electricity can harm delicate components inside your FuelMaster FMU. To prevent static damage, discharge static electricity from your body before you touch any of your FuelMaster FMU's electronic components. You can do so by touching an unpainted metal surface on the FuelMaster FMU chassis. As you continue to work inside your FuelMaster FMU, periodically touch an unpainted metal surface to remove any static charge your body may have accumulated. Use of a wrist-grounding strap is highly recommended.

You can also take the following steps to prevent damage from electrostatic discharge (ESD):

- Keep a static-sensitive component in its antistatic packing material until you are ready to install the component in your FuelMaster FMU. Just before unwrapping the antistatic packaging, discharge electricity from your body.
- Transport sensitive components in antistatic containers or packaging.

- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

## Protecting Against Radio Interference

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning off and on the equipment, the user is encouraged to try to correct the interference by one or more of the following measures:

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

## Wireless Network Security

The means exists for wireless network communications between your Central Controller (Legacy FMPlus) or FM*Live* and FMU. Easy connectivity is also available to those you may not wish to share your information with. The information gathered and stored by FuelMaster need not be secure, but your Central Controller and FMU may be connected to a network containing private information you want to be secure.

Syntech cannot emphasize enough the potential ramifications of breached network security. Without proper wireless network security, outside users can access your network to attain information such as social security numbers, credit card numbers, bank account numbers, and countless other very valuable and private information sources stored on your network. In planning your wireless network, ensure you purchase the right equipment and plan for a secure network that won't allow outsiders access to your information.

A [Hold Harmless Agreement](#) is attached to this manual and requested to be signed by the using customer. This agreement references the potential hazards associated with wireless network security and serves to remove liability from the seller (Syntech Systems, Inc., and its distributors) when wireless networking equipment is installed for communications to the FMU.

## Certifications and Approvals

FuelMaster FMUs have been tested and safety certified by the ETL SEMKO division of Intertek to ANSI/UL Specification 1238 for connection to UL-certified dispensers in NEC Class 1, Division 2, Group D locations. Equipment versions certified by ETL are identified by the ETL logo imprinted on the ID plate riveted to the FMU pedestal.

## Boundaries of Hazardous Locations for Flammable Liquids

Figure 1 illustrates the boundaries of a hazardous location which dispenses flammable liquids such as gasoline and E85. Propane (liquefied petroleum gas) has the same basic boundaries.

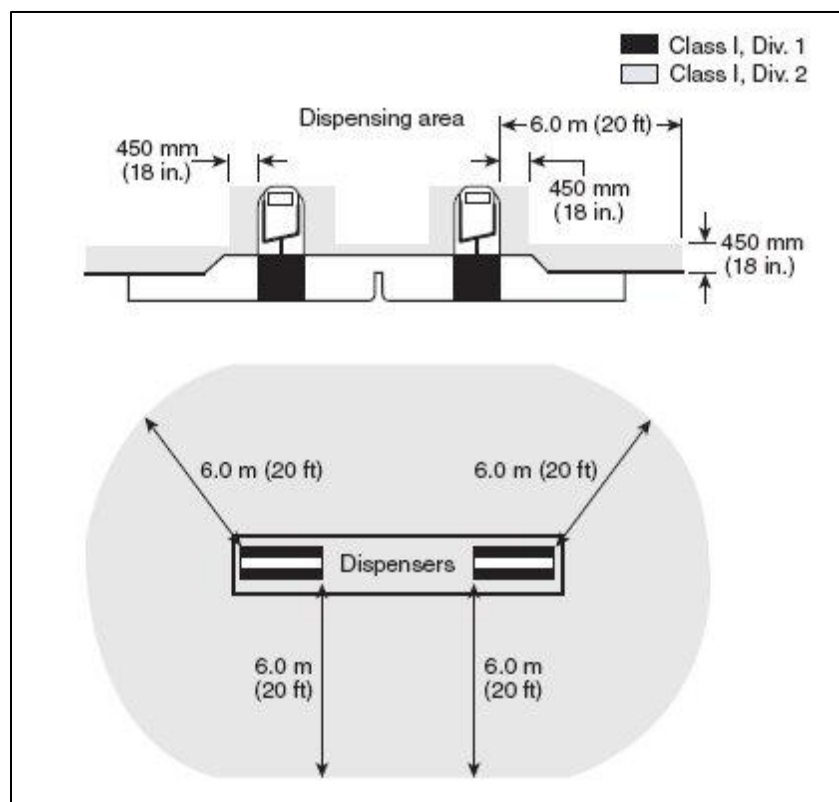


Figure 1 Boundaries of a Flammable Liquid Hazardous Location

The boundary area around a compressed natural gas (CNG) dispenser is different. It extends 5 feet from and above the dispenser. Any electrical device installed within these boundaries must be intrinsically safe or must be enclosed within an explosion-proof enclosure. Intrinsically safe devices are generally limited to very low voltage and low current devices, such as that portion of a pulser before the barrier. Examples of explosion-proof enclosures are rigid metal conduit, and junction boxes and conduit fittings approved for use in hazardous locations. If the electrical device is not

intrinsically safe or is not explosion-proof, then it must be installed outside the hazardous area.

## Electrical Safety Spacing

Figure 2 illustrates an FMU and the distance from its mounting surface to where electrical components are installed. All internal electrical components are 28 inches above the mounting surface. This places all electrical components in the FMU a full 10 inches outside the hazardous location. This 10-inch separation provides additional spacing for the installation of outlet boxes or other devices which are not explosion-proof and cannot be installed in hazardous locations.

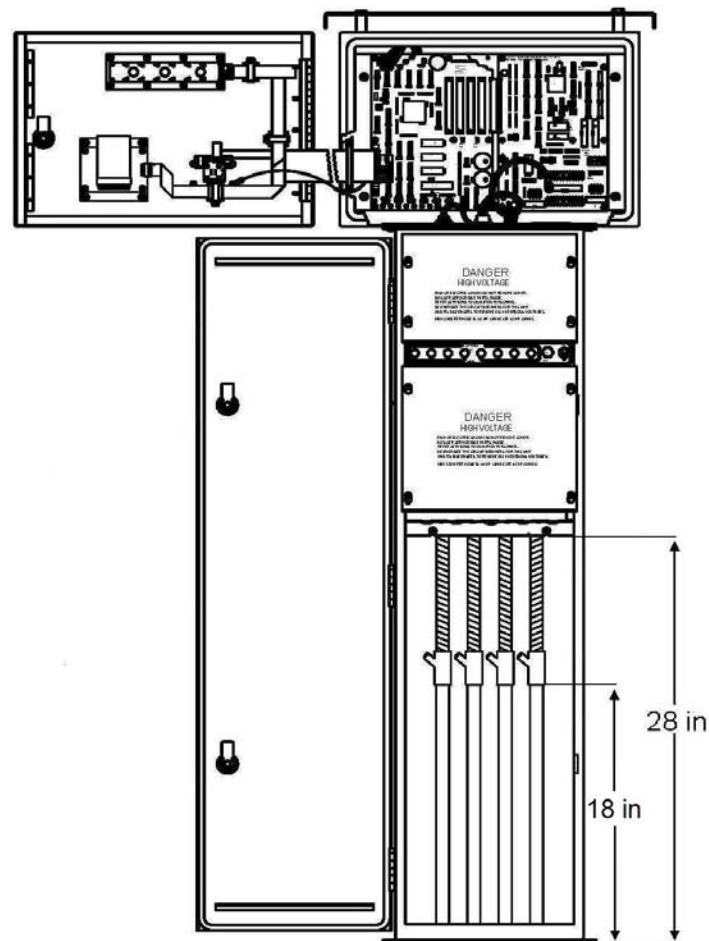


Figure 2 FMU Electrical Safety Spacing

FuelMaster has been certified for use in electrical installations in Canada and Europe as well as the United States. FMUs certified for use in Canada and Europe may be identified through the ID plate riveted to the FMU pedestal. See Figure 3 for examples of FMU ID plates for U.S., Canadian, and European certification.

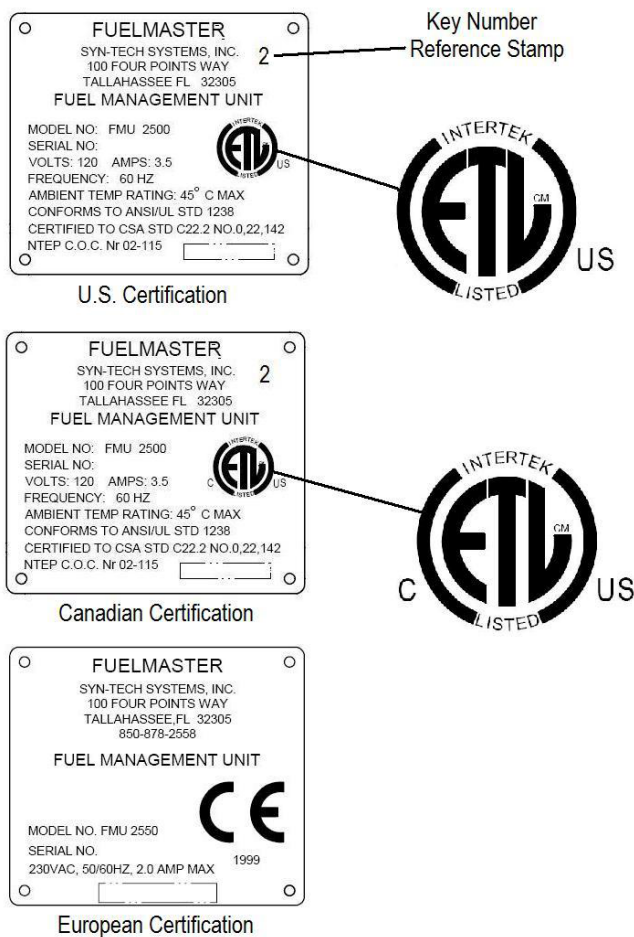


Figure 3 FMU ID Plates

## ID Plates

An ID plate (see Figure 3) is affixed to the side of the FMU pedestal closest to the pedestal door locks. The ID plate contains the serial number of the unit as well as certification information and a code to cross reference the key number used in the door locks (see Table 1). If a pedestal is replaced due to an upgrade or damage, the new pedestal will not have an ID plate installed. Remove the ID plate from the older unit, and install it on the newer unit using pop-rivets. Pop-rivets 1/8-inch-wide x 1/4 inch long should be used to secure the ID plates to the pedestal.

The FMU is shipped in two pieces, in two separate shipping containers. The upper cabinet has a bar code label inside the cabinet on the side wall closest to the door hinges. The bar code label has the FMU serial number printed to match the serial number on the pedestal ID plate. The shipping containers are also marked with the FMU serial number.

## FMU Door Key Reference

Key Number	ID Plate Code
300	0
325	1
350	2
275	3
400	4
425	5
450	6
475	7
500	8
523	9
333	10

## Basic FuelMaster FMU Warranty

The basic warranty for each FuelMaster FMU provides coverage for parts and customer support for a period of one year from date of initialization or fifteen months from date of shipment, whichever occurs first. Each Prokee is warranted against defects in material and workmanship for a period of five years. A toll-free number for technical assistance is also included. This line affords the customer access to product support personnel who will answer questions regarding operation of FuelMaster hardware or software and provide diagnostic capabilities when necessary.

Under terms of this agreement, upon calling Syntech's Customer Support Center, technicians may diagnose problems with the assistance of the customer to determine warrantable conditions and possible problem solutions. Syntech will replace all defective parts and aid the customer in installation of replacement parts to allow the unit to be repaired as expeditiously as possible.

**NOTE**

This warranty does not cover site visits by technicians for repair; however, the FuelMaster was designed in a modular manner to provide easy and rapid exchange of parts, even by non-technical personnel.

Damage resulting from acts of God, user abuse, accidents, faulty installation, or operation is not covered under this warranty. This warranty specifically excludes any indirect, special, or consequential damages to include, but not limited to, loss of product, profit, or litigation fees. Additionally, associated equipment including printers, personal computers, and other items not manufactured by Syntech Systems, Inc. are warranted only to the extent covered by the original manufacturer. Additionally, this warranty is limited to approved locations (generally the continental United States) and is not transferable except by written permission of Syntech Systems, Inc.

## Initialization Requirement

All FuelMaster Fuel Management Systems must be initialized to validate the warranty of the equipment. Initialization includes the startup, inspection, and tests performed to certify the installation. Initialization can be completed only by a Syntech FuelMaster technician, or a technician who has completed the Syntech FuelMaster Installation School. Final certification must be accomplished jointly by the Customer and Syntech factory-trained personnel.

**NOTE**

The prompt for the activation code may not appear if a credit card is inserted. If a newly installed FMU is being setup, insert a Prokee or smartcard to bring up the prompt for the activation code. An activation code must be entered to begin normal FMU operation.

When a Prokee or smartcard is inserted after initial power-up, FMUs will prompt the initializing technician to call 1-800-888-9136, ext. 2, for an activation code. This number connects to Syntech's Customer Satisfaction Center. The caller will receive a link to a form that must be completed to initiate this process. The caller will be asked pertinent questions about the site (Legacy FMPlus) or Facility (FMLive) and FMU. CSC will attempt to validate the caller installing the Unit(s) is ASR certified. If any caller does not possess this level of certification, they will be forwarded to Syntech's Training department. Once CSC has all the necessary details, including the FMU serial number, CSC will generate and provide the caller with an activation code.

**NOTE**

It is very important the FMU is assembled with the correct upper cabinet which matches the pedestal with the serialized ID plate. If not, the activation code will not activate the FMU.

## FuelMaster Equipment Specifications

<b>Rated Supply Voltage Limits</b>	120VAC +/- 10%
<b>Rated Supply Frequency</b>	50/60 Hz
<b>Rated Supply Current</b>	3.75 Amps (Max Operating)
<b>Heaters (2 per FMU)</b>	2.50 Amps (Total)
<b>Receipt Printer (Optional)</b>	1.00 Amps
<b>Other electronics</b>	0.250 Amps
<b>Operating Altitude, Max</b>	2000 meters
<b>Max Operating Relative Humidity</b>	100%
<b>Installation Category (surge arrestor)</b>	III
<b>Installation Category (after surge arrestor)</b>	II
<b>Pollution Degree</b>	2
<b>Electronics Operating Temperature Range</b>	Turn on at 37° F, turn off at 158° F
<b>Heater Operational Range</b>	Turn on at any temp below 66° F

Turn off when temp is above 73° F
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## Safety Related Inspections & Preventive Maintenance

FMUs require no preventive maintenance to retain its user safety features. Whenever an FMU is updated or repaired, a safety inspection should be performed including wiring integrity (power and grounds), board retention, and safety covers.

## Cleaning Instructions

The FuelMaster chassis, keypad, & LCD glass should be washed with a mild detergent diluted with water. A soft sponge or cloth is recommended. Rinse and dry with a soft dry cloth. The FuelMaster FMU works well and presents no safety problems when dirty. Frequency of cleaning is left to the user's discretion.

The FMU Prokee and card receptacles will require cleaning (follow the manufacturer's instructions) when Prokees, smartcards, or credit cards are not being read correctly. Some products used by Syntech in these applications are:

- Prokee: RadioShack 64-4345 Precision Electronics Cleaner
- Smartcard: KIC Products K2-HSCB50 Smartcard cleaner
- Mag-stripe card: KIC Products KW3-H19B40

## Fuse Reference

Every fuse application in the FMU has a fuse description silk-screened next to the fuse holder. All fuses are rated for 250 VAC. Listed below are the fuses used in an FMU:

<b>Fuses (Rated for 250VAC)</b>					
<b>FMU Location</b>	<b>Syntech Systems Fuse</b>			<b>Commercial Equivalent</b>	
	<b>Description</b>	<b>Quantity</b>	<b>Part #</b>	<b>Manufacturer</b>	<b>Part #</b>
Surge Panel, AC	4 amp fast-blo, 3AG	2	265394	Littelfuse	0312004
Surge Panel, Phone	3/4 amp, slo-blo, 5x20mm	2	263374	Littelfuse	0216.5
Modem, FMU-2500	¼ amp fast-blo, 5x20mm	2	213780	Littelfuse	0216.25
Modem, FMU-2000	¼ amp fast-blo, 2AG	2	206806	Radio Shack	270-1046
Power Management Board	½ amp fast-blo, 2AG	1	222534	Littelfuse	0225.500
Pedestal I/O Board	¼ amp slo-blo, 2AG	1	206672	Littelfuse	0229.250
Power Fuse	4-amp slo-blo, 3AB	1	198609	Littelfuse	0325004

## Battery Reference

To avoid losing information stored in memory, batteries are installed on several key components within the FMU. For example, there are batteries on the mainboard, credit card reader board, and data logger board.

### Precautions

- FMU mainboard batteries should be replaced with FMU power on. It is highly recommended all transactions be downloaded and a copy of the FMU configuration be made before removing the battery.
- The credit card reader board must be removed from its slot on the FMU mainboard, so the battery can be accessed. Customers should settle transactions and process batches prior to changing the battery on the board.

## Switch Ratings

The main power toggle switch and manual/automatic pump toggle switches are general purpose switches, rated for 15A @ 125VAC, 10A @ 250VAC, and 3/4 hp @ 125VAC - 250VAC.

The optional FMU Quick Stop switch is a heavy duty, oil, and watertight switch, rated for 1.0A/300VAC CSA, 0.5A/220VDC, and 1.0A/24VDC.

## Terminal Ratings (For External Component Connections)

**CAUTION** The following terminal ratings are as suggested by the component manufacturer as the maximum continuous voltage and current the component is designed to accept. These ratings do not necessarily correspond to the voltages normally applied to the component when integrated into FuelMaster as part of a complete system.

**CAUTION** Les cotes de terminaux suivants sont comme suggéré par le fabricant de composants comme la tension maximale et le courant le composant est conçu pour accepter. Ces notes ne correspondent pas nécessairement aux tensions normalement appliqué à l'élément lorsqu'ils sont intégrés dans Fuelmaster dans le cadre d'un système complet.

<b>COMPONENT</b>	<b>SWITCH</b>	<b>VOLTAGE</b>
<b>P_ Pulser Connections P1, P3, P5, P7</b>	(J4-J7 on PEDESTAL I/O BOARD)	12VDC
<b>LN_ Incoming Voltage LN1- LN8</b>	(TB1, TB2 on PEDESTAL I/O BOARD) TB = Terminal Block	300V, 25A
<b>PHS_ Pump Handle Sensing</b>	(TB3 on PEDESTAL I/O BOARD)	300V, 25A
<b>ON-SITE PRINTER</b>	(J2 on PEDESTAL I/O BOARD)	300V, 10A
<b>TANK MONITOR UNIT</b>	(JP13 on I/O SILVER BOARD)	300V, 10A
<b>INDOOR RECEIPT PRINTER</b>	(JP11 on I/O SILVER BOARD)	300V, 10A
<b>PHONE</b>	(931C0110)	125VAC, 500mA

## Parts Substitution and Modification

Modification of the equipment provided, substitution of any material requirements, or any deviation from these installation instructions must comply with all applicable safety codes and standards.

## Commercially Available Products

This FuelMaster Installation Manual refers to commercially available equipment and materials that are required to complete an installation. Trade names and part numbers are also referenced to cite products that have been tested and are known to be serviceable with FuelMaster equipment. These references should not be construed as restrictions only to those referenced products. There may be other products which have not yet been tested but may be equally suitable.

Syntech Systems inventories commercially available products necessary to complete a FuelMaster installation. When these products are purchased from Syntech Systems, the manufacturer's warranty is honored and administered by Syntech Systems.

## Support

Syntech Systems strives to provide the best customer and distributor support possible. Free on-site distributor and customer training is provided quarterly (or more often as needed) at the FuelMaster factory in Tallahassee, Florida. Training at the distributor's location is available where it may be more cost effective to send trainer(s) from Syntech rather than send several technicians to Tallahassee for factory training.

Webinars are available through the internet for training sessions between a Syntech trainer in Florida, and customer representative(s) anywhere there is internet access. See the FuelMaster website at <http://www.myfuelmaster.com/> for assistance scheduling training.

Syntech offers a well-staffed Customer Satisfaction Center (CSC) to take questions and calls from customers. In addition, a Distributor Support Center (DSC) provides answers from experienced field technicians for distributors needing installation, startup, training, or troubleshooting assistance.

Questions for the CSC should be called in to 800-888-9136, ext. 1500, or e-mailed to [support@myfuelmaster.com](mailto:support@myfuelmaster.com).

Syntech maintains an e-mail database of all FuelMaster distributors. Whenever a new publication or other pertinent information is published, it is forwarded to all distributors on the mailing list. If your e-mail address changes, or other e-mail addresses are added, forward the new address to: [distributor\\_replies@myfuelmaster.com](mailto:distributor_replies@myfuelmaster.com).

## Improvements

Recommendations for improvement or corrections to this manual may be reported to Syntech's Customer Satisfaction Center (CSC) at [support@myfuelmaster.com](mailto:support@myfuelmaster.com).

## Unpack and Inspect the Contents

**NOTE** Vibration and rough handling could cause installed parts to work loose during shipment. Do not dispose of packing materials until all components listed on the packing list are accounted for.

1. The FMU is disassembled before shipment and packed in two boxes. The FMU pedestal is packed in a 54" x 18" x 12-1/2" box, and the upper cabinet and accessory materials (i.e., software, encoder, manuals, Prokees, Smartcards, etc.) are packed in a 26" x 19" x 18" box. The components are packed in plastic bags and placed in the shipping box where packing foam is injected to protect the components in shipment. Unpack the boxes and inspect the contents against the packing list. The FMU and accessory material packing list is affixed to the FMU pedestal box.
2. Check for any missing equipment or signs of damage from shipment.
3. Verify the components shown on the packing list match the customer's requirements. If anything is not correct, it should be noted and corrected before the installation proceeds.
4. Note the serial number of the components, which make up each FMU. The serial number is written on the outside of the shipping containers. (e.g., "3469"; there will be only one pedestal box, and one upper cabinet box with matching serial numbers.) In addition, the FMU serial number may be found on the ID plate

riveted to the side of the FMU pedestal and on a bar code label adhered to the inside of the upper cabinet.

**IMPORTANT** The upper cabinet must be matched to the pedestal to successfully apply an FMU activation code after the installation is completed and power is applied.

**NOTE** Contact Syntech Systems' Customer Satisfaction Center as soon as possible if any damage is noted or anything is missing.

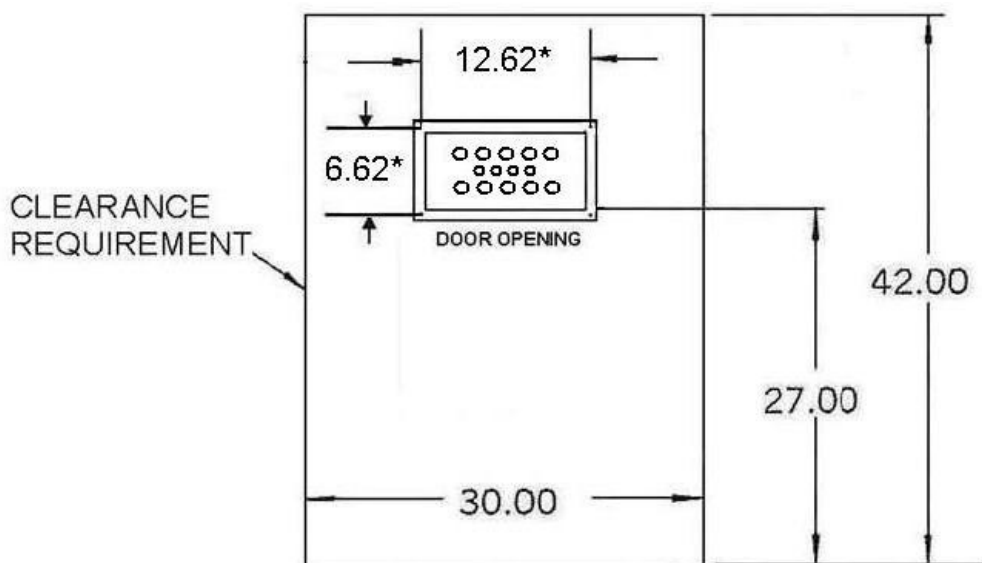
## Install the FMU

### Procedure 1: Mount the FMU Pedestal

**IMPORTANT** When selecting a mounting location, leave adequate clearance for parts replacement. The upper cabinet and pedestal doors must open fully, and any screws which enter from outside the FMU must remain accessible.

Figure 4 illustrates the FMU footprint. The FMU must be mounted on a rigid surface.

**NOTE** Asphalt is not a satisfactory mounting surface.



**PEDESTAL DIMENSIONS:**  
 INTERNAL 5.50D X 11.00W  
 EXTERNAL 6.00D X 12.00W  
**FLANGE DIMENSIONS:** 7.75D X 13.62W  
**\*SCREW ANCHOR SPACING:** 6.62D X 12.62W

Figure 4 FMU Footprint (in inches)

If desired for a particular application (e.g., a kiosk) the FMU upper cabinet may be rotated 180 degrees to permit the pedestal door to open to the inside of the kiosk

while the upper cabinet door faces outside. When using this mount method, leave sufficient workspace between the back of the pedestal and the kiosk wall to permit removal of the screws that retain the relay assemblies and Pedestal I/O Board.

The FMU pedestal will not always be mounted directly over conduit. Figure 5 illustrates some alternate mounting methods.

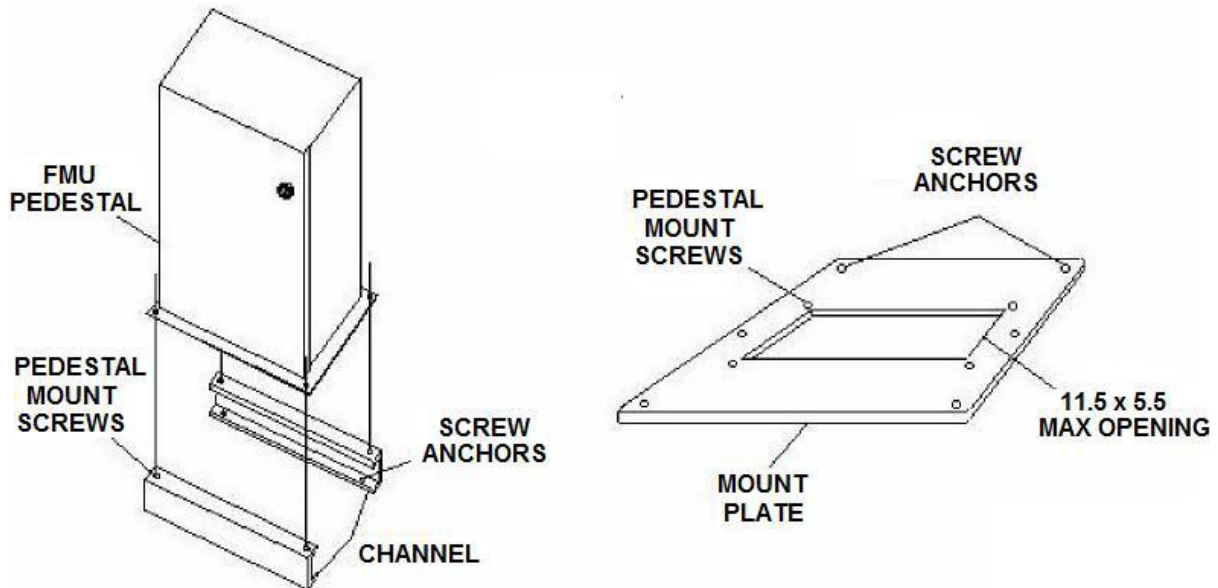


Figure 5 Alternate Mounting Methods

Installations have been performed where conduit entered the pedestal through holes punched/drilled through the pedestal. Such holes must be sealed watertight. In some instances, other automated systems have been removed and their pedestal has been retained for use as a junction box. Aluminum C-channel has been used to elevate FMUs for entry of surface mount conduit under the pedestal. For this application we have used 6061 T6 aluminum channel 3-inch-high x 1.75-inch-wide x .260 thickness x 14-inch-long. Adapter plates have been developed to cover holes in the fuel island which are larger than the opening in the FMU pedestal. When developed from sheet aluminum, such adapter plates should utilize  $\frac{1}{4}$  inch or larger sheet stock. The following procedures cover mounting the pedestal over conduit entering the pedestal base, but may be altered to allow for other mounting methods.

**NOTE** Always check National Electric Codes (NEC) and local codes for proper installation methods for a fuel island.

1. Verify that all required conduit are in place (except surface mount conduit that may be installed after FMU mounting).
2. Position the pedestal for mounting on the service island:
  - a. Unlock and open the pedestal door.
  - b. Position the pedestal over the conduit.

- c. If applicable, align the pedestal so the conduit are centered within the pedestal, and check that the pedestal door will close without conduit interference.

**CAUTION** If the pedestal is mounted on an uneven surface and the screw anchors are tightened, the welds at the base of the pedestal may be cracked. Washers, as spacers, can be installed on the screw anchors under the corners of the pedestal to account for minor irregularities in the concrete surface of the service island, or to level the pedestal.

**ATTENTION** Si le piédestal est monté sur une surface raboteuse et les ancrs de vis sont serrées, les soudures à la base du piédestal peuvent être rompues. Des écrous, comme mettredistance, peuvent être installées sur les ancrages de vis sous les coins du piédestal pour compenser des irrégularités mineures dans la surface de montage concrète, ou pour niveler le piédestal.

- d. Check that pedestal mounts are flush to the service island and level.
- e. Ensure all conduit seal-off plugs are accessible. They must be accessible after pedestal mounting, or they must be sealed before mounting the pedestal.
- f. Ensure the conduit are not too long to be routed through the conduit openings in the bottom of the FMU pedestal electrical access (liquid-tight flex conduit may be used between seal-offs and electrical access if minimum height of conduit is in accordance with NEC).

**CAUTION** If drilling screw anchor holes through the mount holes in the base of the FMU, protect the corners of the pedestal closest to the mount holes from the drill chuck. The drill chuck can remove paint and metal from the aluminum pedestal corners if allowed to contact the pedestal.

**ATTENTION** En forant des forures de vis par les trous de montage dans la base du FMU, protégez les coins du piédestal les plus proches des trous de montage du mandrin du foret. Le mandrin du foret peut enlever la peinture et le métal des coins de piédestal d'aluminium si touche le piédestal.

**NOTE** Screw anchors installed on both front (door-side) corners of the pedestal must be seated deep enough to permit door opening after installation.

- 3. Drill screw anchor holes for all four corners of the pedestal; seat the screw anchors.

**NOTE** Screw anchor nuts may be left loose in step 4 to assist with the installation of conduit or liquid-tight flex up to the FMU pedestal electrical access panel. If additional conduit or liquid-tight flex are not being installed, the screw anchor nuts should be tightened when initially installed.

- 4. Mount the pedestal on the screw anchors, and install the screw anchor nuts and washers. If additional conduit or liquid-tight flex are to be installed, loosely attach the four screw anchor nuts and washers. Use additional washers for leveling, as required.

## Procedure 2: Finish Conduit Connections at the FMU Pedestal

If the conduit entering the FMU are installed in accordance with the NEC, there is no code requirement to enclose the exposed wires. There is, however, a DoD requirement to install liquid-tight non-metallic flex conduit over all exposed wires between the rigid metal conduit and FMU pedestal electrical enclosure. If the installation is performed at a DoD site, liquid-tight must be installed to cover/protect all exposed wires exiting the rigid conduit. Syntech installers install liquid-tight over exposed wires at all installations regardless of if DoD or civilian.

1. Unlock and open the FMU pedestal door.
2. Remove both electrical access cover panels from the pedestal.
3. As required, install any surface mount conduit that may be needed. If holes are cut or punched in the pedestal to introduce conduit, ensure the entry point is sealed watertight.
4. Pop out the plastic conduit plugs, as required, in the bottom of the pedestal electrical access to permit entry of the needed conduit.
5. As required/desired, use any approved method (rigid conduit, liquid-tight flex, etc.) to route all conduit in the pedestal to the conduit openings in the bottom of the electrical access, and secure with locknuts or liquid-tight couplings.
6. If not previously accomplished, tighten the screw anchor nuts.

### Wire/Cable Connections at the Dispensers

**NOTE** The use of explosion-proof conduit and fittings may not be necessary if not working with flammable fuels dispensers, or outside a hazardous location.

1. Enclose all wire/cable connections terminating at the dispenser in explosion-proof junction boxes.
2. Route wires/cables (routed to the FMU from the dispenser) through explosion-proof and sealed conduit and terminate in the FMU pedestal electrical access enclosure.
3. If the necessary conduits, seals, and junction boxes are not in place to accommodate the wires/cables and their connections, add during the installation.
4. Add fittings, as necessary, to enclose the wires/cables and their connections in explosion-proof components and to seal the ends of conduit that surface at the dispenser.

**NOTE** Do **not** seal conduit seal-offs until all wires/cables have been pulled, and all wire connections are complete.

### Procedure 3: Wire/Cable Connections at the FMU

**NOTE** Do **not** make any connections at this time. All wires/cables except for the network cable and fiber optic are terminated on the Surge Protection Panel, the Pedestal I/O Board, or the I/O Silver Board in the FMU pedestal. Network and fiber optic cables are terminated at the network connection inside the FMU upper

cabinet. Allow for sufficient length to make these connections when pulling wires/cables.

Make the following wire/cable connections at the FMU:

**NOTE** Many wire/cable connections are made to Phoenix-style pluggable printed circuit board connectors where terminals are closed by turning a screw. Continuity will not exist if insulation is not stripped from the wires before insertion into the terminal.

**Network Cable Termination in the FMU**

FMU Mainboard STS Part ID	FMU Mainboard MFR Part ID	Mainboard contains built-in NIC*	Mainboard supports add-on NIC 941B0327A
941B0322-20	941B0322-20	✓	✓
941B0322A	941B0322-10	✓	✓
941B0222M	941B0222-70		✓

FMU Mainboard 941B0322A and 941B0322-20

- Both mainboard versions contain a built-in network port/connection. The network cable going to the FMU can be terminated directly to this connection.
- Both mainboards will also accommodate an add-on Network Interface Card (NIC) part ID 941B0327A (941B0327-20). See product bulletin, PB-114 Installation of the Network Interface Card.

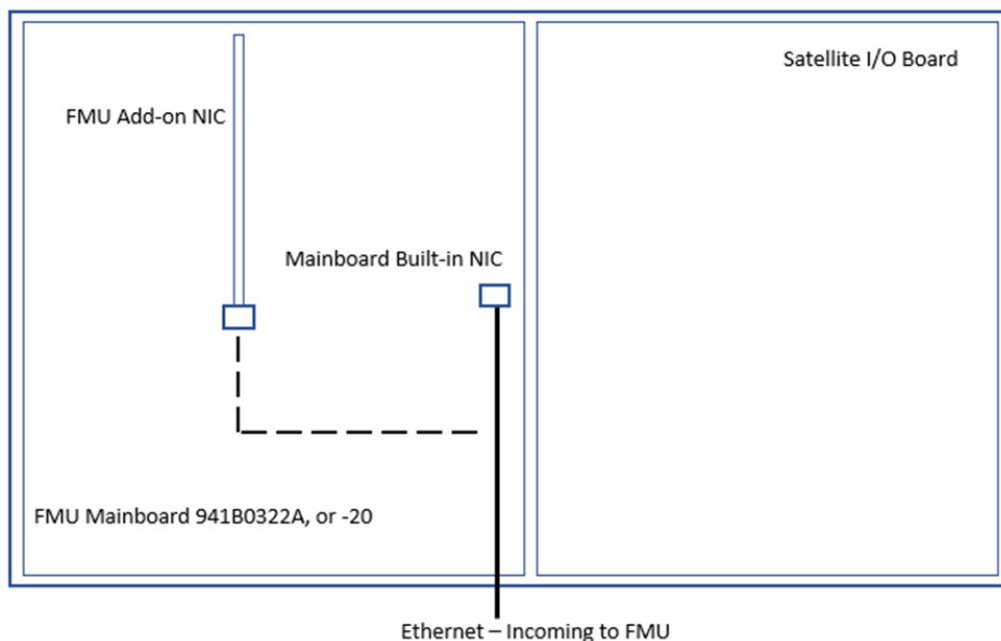


Figure 6 FMU Upper Cabinet with Incoming Ethernet

**IMPORTANT** FMU firmware versions dictate whether you can use the built-in network connection, or if you must use the add-on NIC. To use the built-in network connection, the FMU must have firmware version 3.86d or 4.03 or higher.

<b>Master-Satellite Onboard LAN Handling (*Commercial Legacy FW Only)</b>				
	<b>*Legacy FW &lt;= 4.02</b>		<b>*Legacy FW 3.86d or &gt;= 4.03</b>	
	<b>941B0222</b>	<b>941B0322</b>	<b>941B0222</b>	<b>941B0322</b>
<b>NIC Installed Check</b>	✓	✓	✓	✓
<b>Sat Pin 8 Jumper Check</b>			✓	✓
<b>CPLD V20+ Check</b>			✓	✓
<b>Onboard LAN Check</b>				✓
<b>Sat Pin 1 Jumper Check</b>	✓	✓		

### Fiber Termination in the FMU

Fiber will be terminated in the FMU using a 'Fiber to Ethernet Converter' (p/n 262236) which takes the incoming fiber cable/connection and converts it to a wired Ethernet connection/cable that can then be plugged into the built-in mainboard connection or the add-on NIC connection.

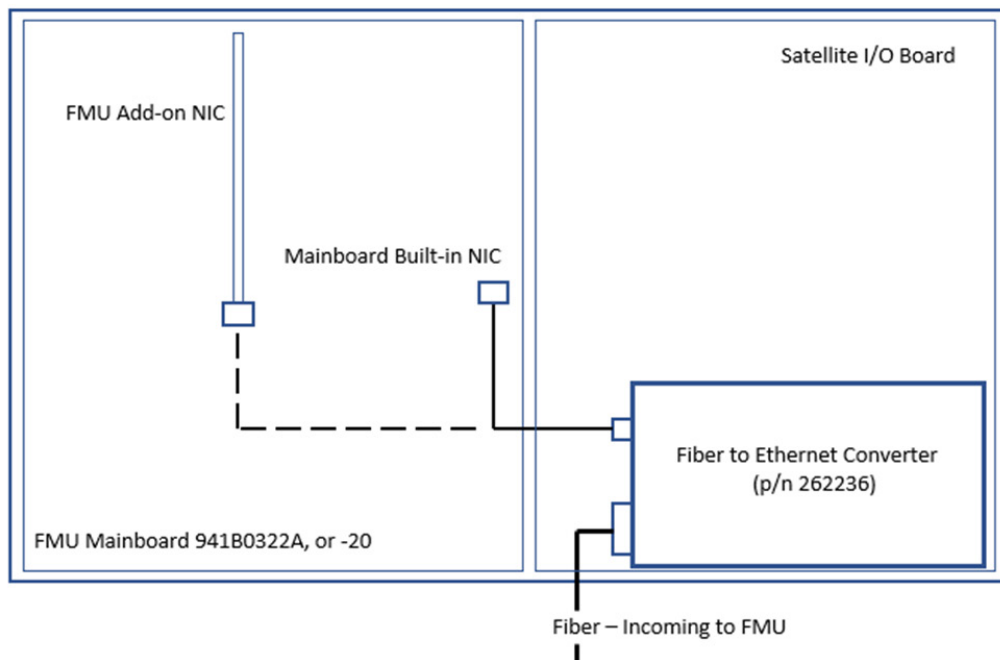


Figure 7 FMU Upper Cabinet with Incoming Fiber

## Wireless Termination in the FMU

The FMU supports wireless and cellular devices for communication with the FMU.

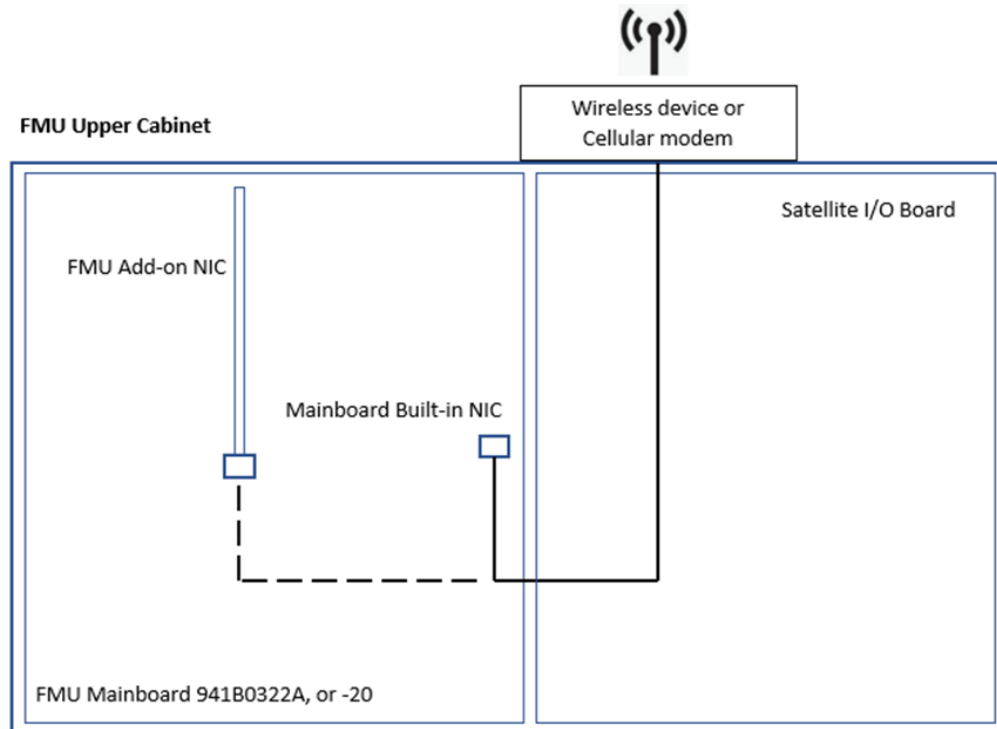


Figure 8 FMU Upper Cabinet with Wireless

### Tested Devices

- Wireless devices tested with FuelMaster include products manufactured by LigoWave and Ubiquiti, Inc. Refer to the following product bulletins: PB-130, PB-212, PB-213, and PB-228.
- Cell modem devices tested with FuelMaster include Cal Amp LandCell 882 and Sierra Wireless RV50. Refer to the following product bulletins: PB-170 and PB-256.

**NOTE** If not installed already, these devices might require an AC outlet to be installed in the FMU Upper cabinet.

For cell modem usage, Legacy systems require the following:

- FMPlus software version 5.1.x.x series: 5.1.3.44 or higher with compatible FMU firmware
- FMPlus software version 5.2.x.x series: 5.2.0.34 or higher with compatible FMU firmware

## Connect A/C Power

The three 12 AWG THHN conductors (increase to 10 AWG if length exceeds 400 feet) should be derived from a separate 15-amp circuit breaker.

**IMPORTANT** Identify where main power is being derived as minimum power requirements may not be always met if derived from another source such as a dispenser.

If an uninterruptible power supply (UPS) is installed, install UPS inline between circuit breaker and FMU.

## FMU Surge Protector Panel

**CAUTION** Although the output side of the surge protection (located within the FMU Surge Protector Panel) is a good source of protected power for many devices, it is protected by a 4-amp fast-blo fuse. The FMU uses 2.4 amps when both heaters are powered. If the device receiving the power is drawing more than 1.6 amps, it will blow the fuses. See PB-231 Field Installation of FMU Power Conditioner for more information.

**ATTENTION** Bien que la sortie de la protection surtension FMU est une bonne source d'énergie protégé pour de nombreux appareils, il est protégé par un fusible 4 ampères rapide blo. L'FMU utilise 2,4 ampères lorsque les deux appareils de chauffage sont alimentés. Si le dispositif de réception est la puissance en tirant plus de 1,6 ampères, ce sera une charge supérieure peut être pris en charge par le fusible de 4 ampères.

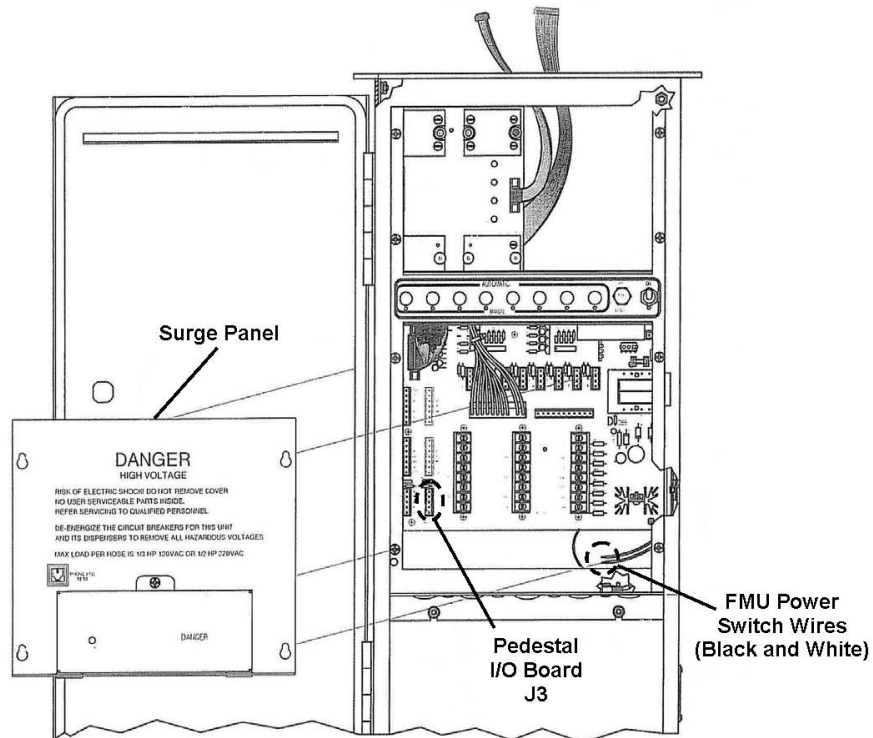


Figure 9 AC Power and Phone Connections

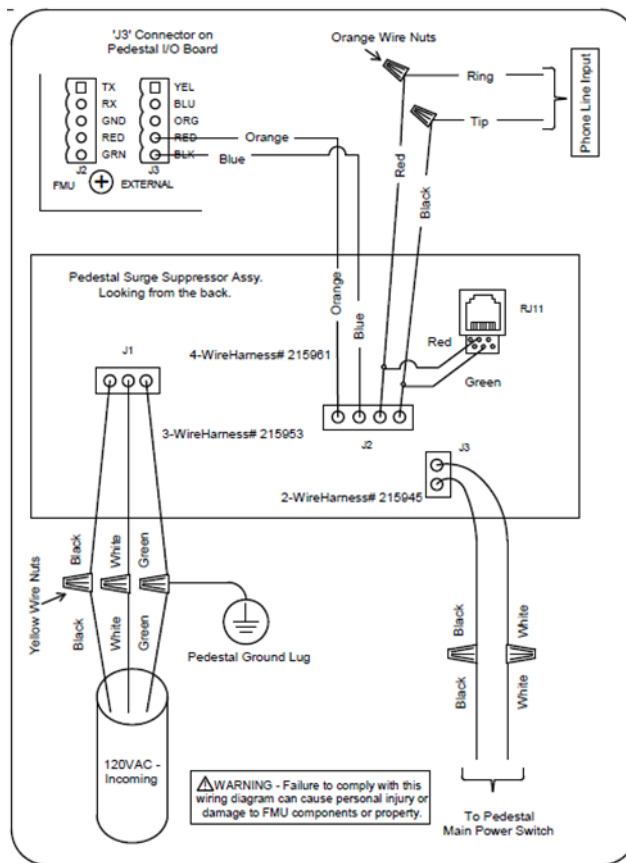


Figure 10 Surge Protector Assembly Wiring Diagram

1. Connect the AC hot (black) and neutral (white) wires from the conduit to the corresponding black and white wires of the Surge Panel 3-wire harness.
2. Connect the ground (green) wire from the conduit and the green wire of the Surge Panel 3-wire harness to the ground lug in the bottom right of the FMU pedestal electrical access.
3. Connect the black and white wires of the Surge Panel 2-wire harness to the corresponding black and white wires from the FMU power switch.

### Connect the Telephone/Two-Way Ringdown Device

The Telephone/Two-Way Ringdown device consists of two conductors and a shielded, communications cable. Manufacturer of Two-Way Ringdown Device claims range of 2.6 miles with 24 AWG twisted pair. Wireless communications are possible with phone line extenders and cell modems.

1. (FMPlus) Connect the two incoming leads of the phone/communications cable to the red and black wires of the 4-wire harness for the Surge Protection panel (see Figure 10).
2. Connect the orange and blue wires of the 4-wire harness for the Surge Protection panel to pins 4 and 5 of the 5-pin plug in location J3 EXTERNAL of the Pedestal I/O Board.

## Connect the Network Cable

The Network cable is Cat 5e/6 CMX; use shielded cable if other low voltage conductors are routed through the same conduit. Maximum recommended length is 250 feet (76.2 meters). If the distance exceeds 330 feet (100 meters), it is recommended fiber optic cable be used. Fiber optic cable may be pulled to the FMU and converted to Ethernet cable with a transceiver. It is recommended spare fiber optic strands be pulled should the originals become damaged. See Figure 11.

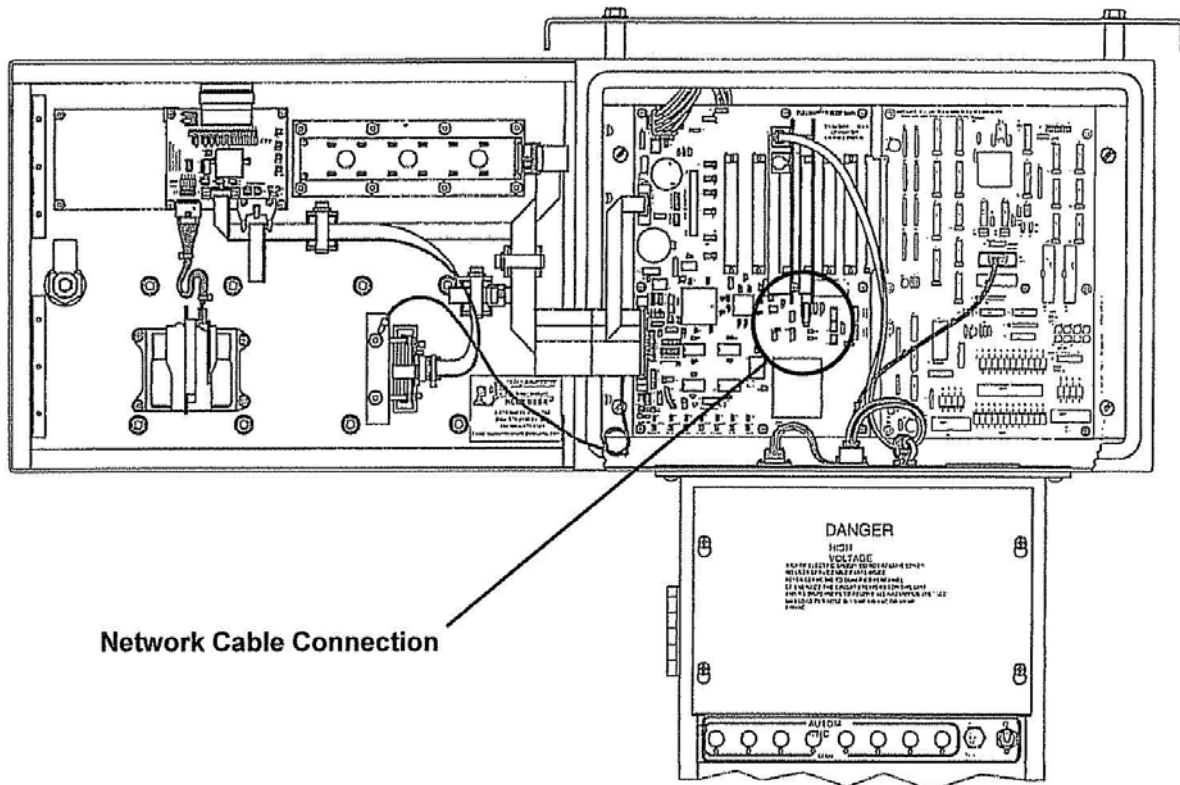


Figure 11 Network Cable Connection

1. Run either Cat 5e/6 or fiber optic cable to the FMU.
2. Terminate only Cat 5e/6 in the FMU Network Interface Card (NIC).
3. When fiber optic cable is used to carry network signals to the FMU, use a fiber optic converter to step fiber optic down to cable. Product Bulletin 178 describes the installation of one common fiber optic converter. Unlike other wires and cables that connect to the Pedestal I/O Board, the Cat 5e/6 cable must be routed to the NIC plugged into the mainboard with an RJ45 connector.

## Connect the Quick Stop Button as FMU Stop Switch

The Quick Stop Button has two terminals to receive wire connections. Power is shut off by pressing the red mushroom-shaped button. Power is restored by turning the button clockwise a partial turn until it pops out to the reset position. Check local requirements for an Emergency Stop Switch. Most regulations require an Emergency Stop Switch to be remotely located at least 20 feet from the fuel island.

1. Connect the black wire from the FMU power switch to one contact of the Quick Stop Button.
2. Connect the black wire of the Surge Panel 2-wire harness to the other contact of the Quick Stop Button. It may be necessary to splice some additional 12 AWG THHN stranded wire to this wire to make it reach the Quick Stop Button.

## Connect the Quick Stop Button as Auxiliary Emergency Stop Switch.

The Quick Stop Button has two terminals to receive wire connections. Power is shut off by pressing the red mushroom-shaped button. Power is restored by turning the button clockwise a partial turn until it pops out to the reset position. Check local requirements for an Emergency Stop Switch. Most regulations require an Emergency Stop Switch to be remotely located at least 20 feet from the fuel island.

**CAUTION** If wired as a service island emergency stop switch for all service island equipment, the Quick Stop Button must be used only to control a contact starter controlling power to the service island. Under no circumstances will power wires for other service island equipment be brought into the FMU for control by the Quick Stop Button.

To comply with the requirements for a service island emergency stop switch, all power to the service island must be removed when the emergency stop switch is activated. This must also include the 110 VAC carried to the Quick Stop Button.

**ATTENTION** Si le bouton d'arrêt rapide (Quick Stop Button) est câblé comme commutateur d'arrêt d'urgence d'îlot de service pour tout l'équipement d'îlot de service, le bouton d'arrêt rapide doit être utilisée seulement pour contrôler un interrupteur de secours contrôlant le courant pour l'îlot de service. Dans aucunes circonstances doit-on introduir des câbles pour des autres îlots de service dans le FMU pour être contrôlé par le bouton d'arrêt rapide.

Pour être conformément aux conditions pour un commutateur d'arrêt d'urgence d'îlots de service, tout courant à l'îlot de service doit être coupé quand le commutateur d'arrêt d'urgence est actionné. Ceci doit également inclure les 110 V de courant alternatif fournis au bouton d'arrêt rapide.

1. Ensure power is removed from the emergency stop switch contact starter and all service island equipment.
2. Route two 12 AWG THHN wires through approved conduit from the emergency stop switch contact starter to the FMU: one for incoming power to the contact starter and another for switched power from the Quick Stop Button back to the contact starter.

3. Connect one 12 AWG wire to one contact of the Quick Stop Button.
4. Connect the other 12 AWG wire to the other contact of the Quick Stop Button.
5. Restore power to the contact starter and all service island equipment.

**Connect the On-Site/Transaction Printer to Master FMU(s).**

**Wire/Cable Recommendations:** Three conductor; 22 AWG CMX shielded RS-232 communications cable.

Maximum length with RS-232 is 300 feet. Distance may be extended to 4,000 feet by using two twisted pair 22 AWG CMX RS-422 communications cable and short haul modems as illustrated in Product Bulletin 126. Wireless communications are possible through an RS-232 radio modem as illustrated in Product Bulletin 133.

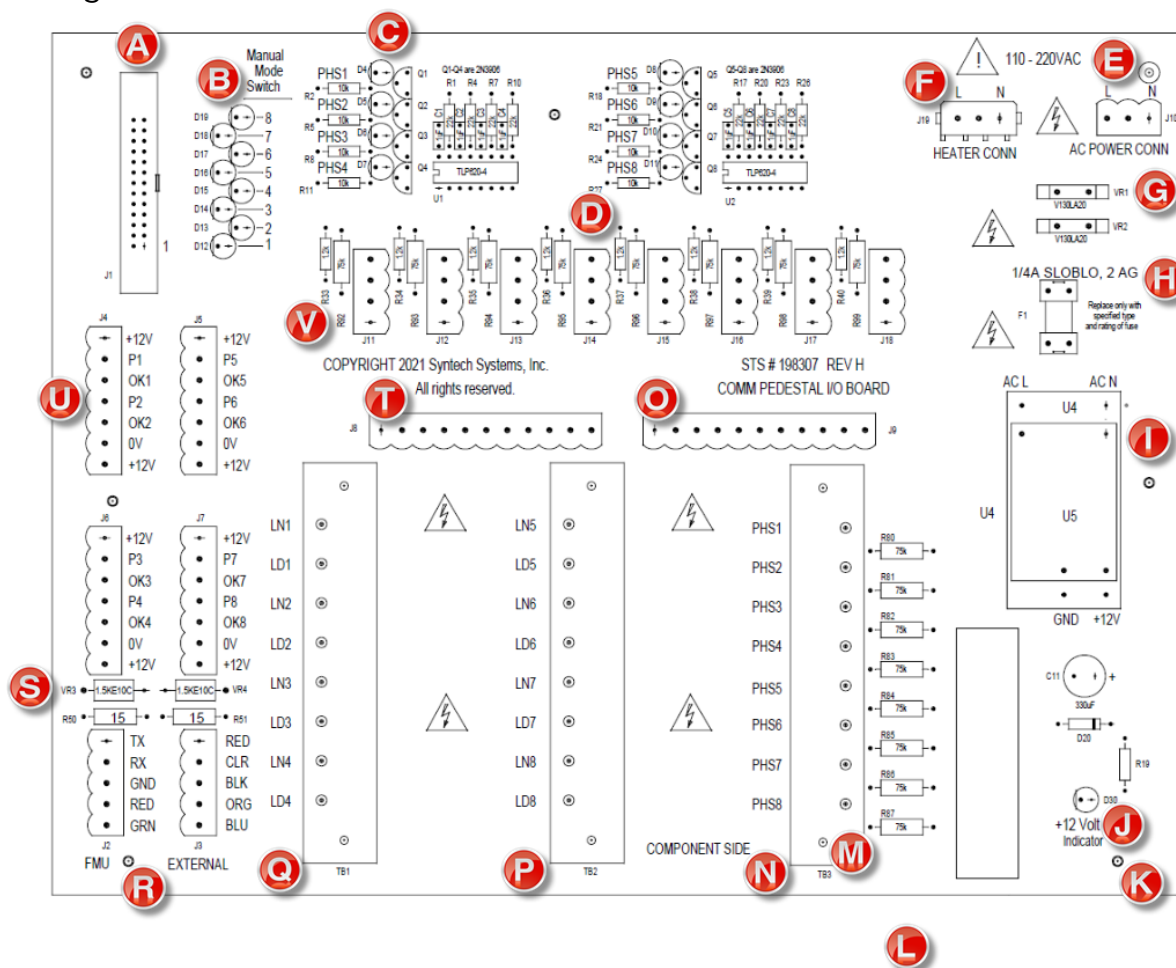


Figure 12 displays Pedestal I/O Board connections. Transaction printers are connected via a serial connection with an RS-232 cable. The Transaction printer is only connected to a Master FMU (Legacy FMPlus only) and prints transaction data and messages as they occur. If the on-site FMU configuration includes FMU Satellites (Legacy FMPlus only), all Satellite transactions and messaging is routed to the Master and printed on the Transaction Printer.

**Transaction printer parameters (Legacy only):** Transaction printers must have a serial connection capable of being set to 4800 baud, 8 data bits, no parity, and 1 stop bit. Serial connections are sometimes optional when purchasing printers. Ensure the printer being purchased has a serial connection.

If the transaction printer is purchased from Syntech Systems, Inc, it is preconfigured to the correct communications parameters, and a surge protector and interfacing cable are provided. The surge protector (part number 201421) and interfacing cable (part number 201669) may be purchased separately by addressing the applicable part number.

Transaction printer connections are made to J3 EXTERNAL on the Pedestal I/O Board. See below for the relationships between the connection points. If a connection is being made directly to the printer, use the connection points listed under “Printer DB25 Pin”. If a connection is being made to the optional 201669 printer cable, use the connections shown under “201669 Cable Color.”

#### Transaction Printer Cable Connection Points

<b>J3 External PIN</b>	<b>Printer DB25 PIN</b>	<b>201669 Cable Color</b>
Yellow (TX)	3	Red
Blue (RX)	2	Black
Orange (GND)	7	Clear

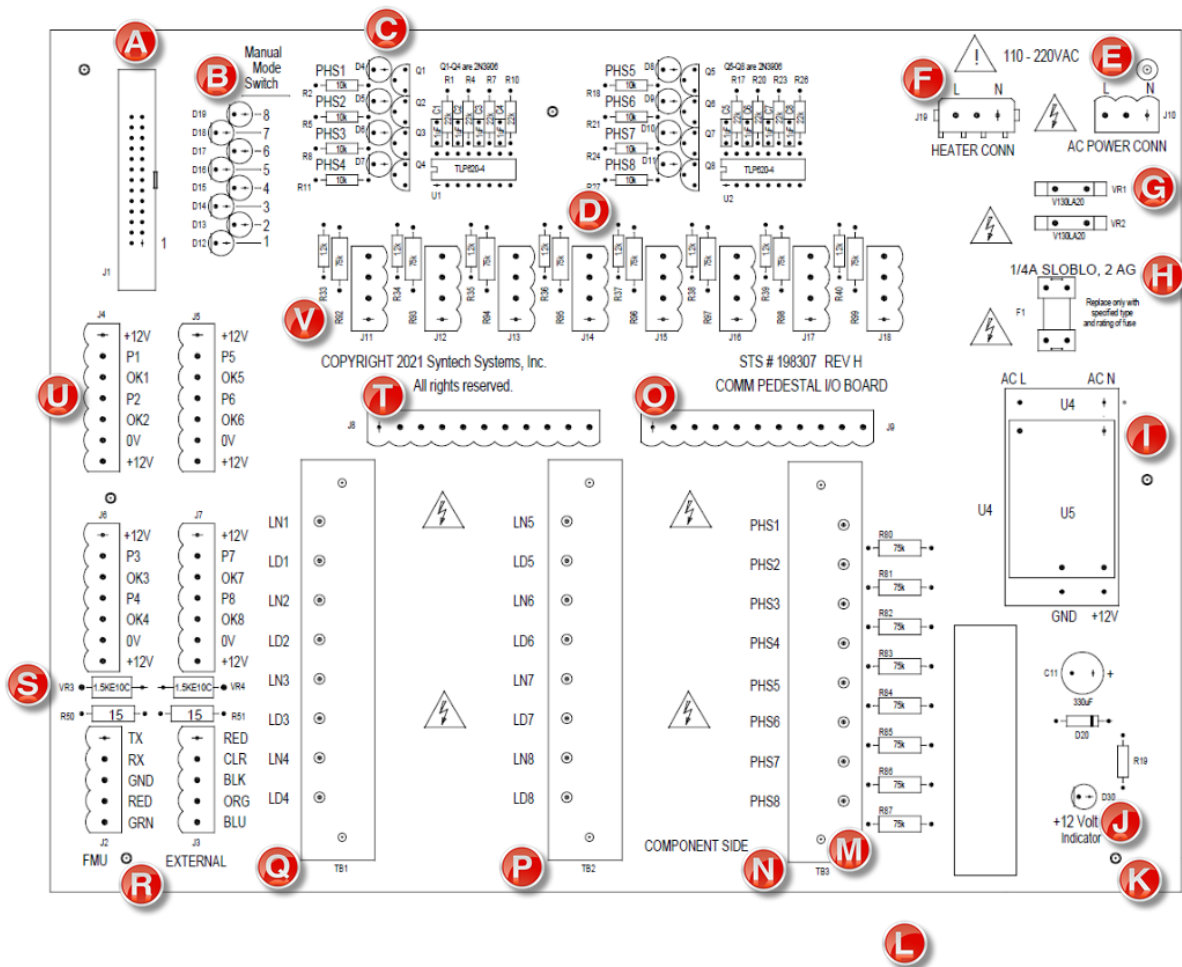


Figure 12 Pedestal I/O Board

Index	Description	Index	Description
A	Satellite I/O Control Board Ribbon Cable Connector J1	L	Ground Screw Connection (Not pictured here; back of Assembly)
B	Manual Mode Switch (Lights 1 - 8) (8 places)	M	Approximate Standoff Locations for I/O Silver Board (6 standoffs staggered over Q, P, and N )
C	Pump Handle Detect Lights PSH1 - PSH8 (8 places)	N	Terminal Strip TB3 PSH1 - PSH8
D	Pump Handle Detect Resistors R92 - R99 (8 places)	O	Relay to Harness Connector
E	Switched AC Power Input J10	P	Terminal Strip TB2 LN/LD5-LN/LD8
F	Heater Pad Connector J19	Q	Terminal Strip TB1 LN/LD1-LN/LD4
G	Varistors VR1 & VR2	R	Phone/Printer Input J3 External
H	AC Power Fuse	S	Printer Cable Varistors VR3 & VR4
I	12VDC Recom AC/DC Converter	T	Relay 1 Harness Connector
J	12VDC Red Indicator Light	U	Pulsar Connectors J4-J7 (4 place)
K	Attach Screw Holes (7 places)	V	Automatic Manual Mode Switch Connectors J11-J18 (8 places)

## Dispenser Hose Control (Mechanical Dispenser Installation)

The wire used for dispenser hose control is a 14 AWG THHN wire. See

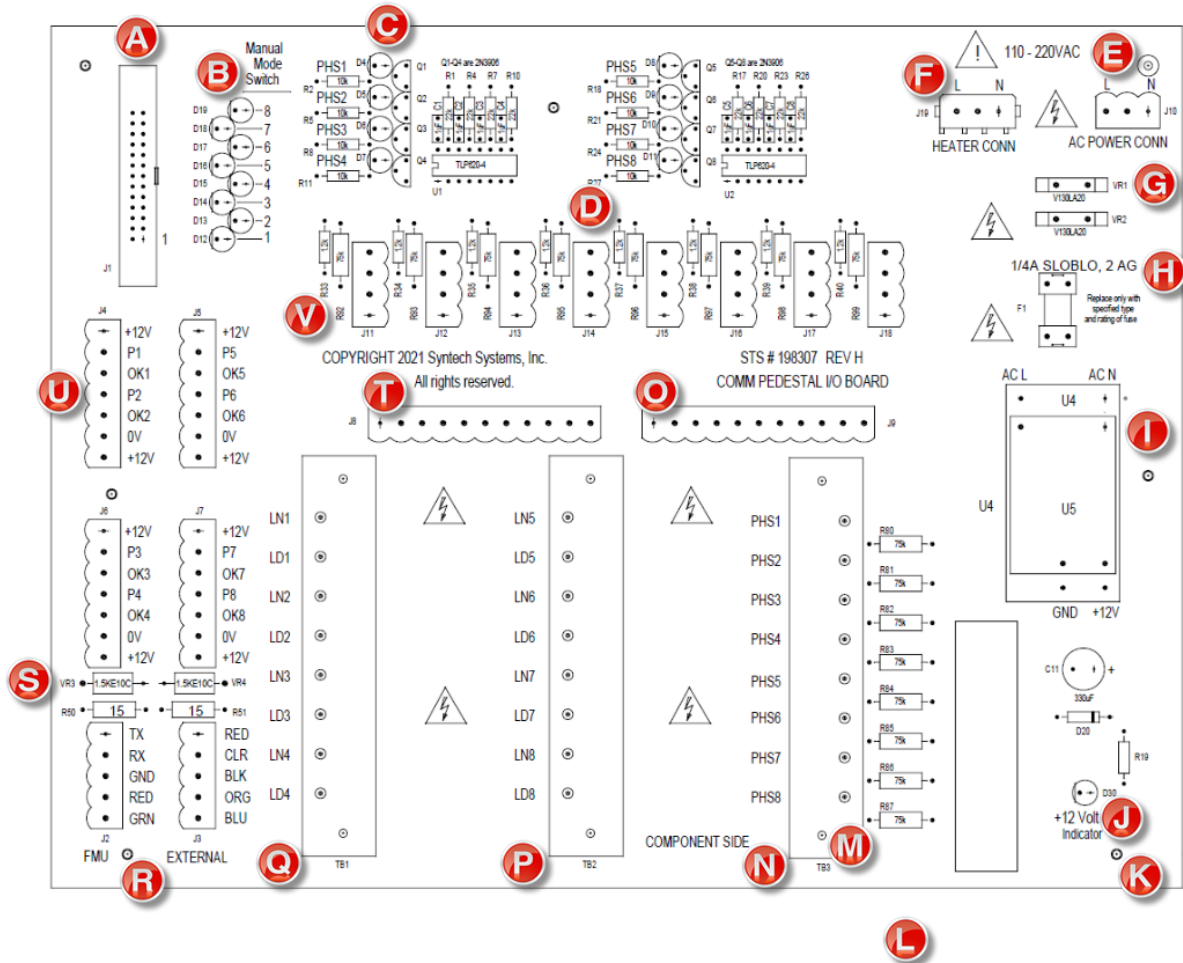


Figure 12 for connection points on the Pedestal I/O Board). These procedures only cover dispenser control. Additional connections from the FMU to the dispenser will be required for pulser connections.

**CAUTION** FMUs with 50 amp Solid State Relay Assemblies (SSRA) are designed to control dispensers with pump motors at or below 3/4 horsepower, 110 VAC, or 1 horsepower, 220 VAC. FMUs with Dual Control Relay Assemblies cannot handle loads in excess of 2 amps. Loads in excess of 2 amps require mechanical relays or contact starters.

However, FMUs with Dual Control Relay Assemblies cannot handle loads in excess of 2 amps. Loads in excess of 2 amps require mechanical relays or contact starters.

**ATTENTION** FMU avec 50 ampères Solid State Relay assemblées (APSR) sont conçus pour le contrôle des distributeurs avec les moteurs de pompe égal ou inférieur à 3 / 4 chevaux, 110 VAC ou 1 cheval- vapeur, 220 VAC. FMU avec deux ensembles de commande de relais ne peut pas manipuler des charges

de plus de 2 ampères. Des charges de plus d'un ampli 2 exigent relais mécaniques ou les démarreurs de contact.

In addition to this guide, control options for dispenser control are described in the following Product Bulletins:

- PB-122 for the Gasboy 9800
- PB-141 for the Bennett 3K
- PB-142 for the Wayne Select,
- PB-152 for the Liquid Controls LCR and LCR II
- PB-159 for the Veeder-Root EMR3.

The FMU does not provide power for activating dispensing equipment. It should be treated as a switching device with the Pedestal I/O Board LN and LD positions acting as the switch contacts: LN being incoming power, and LD being outgoing authorization power. Reference

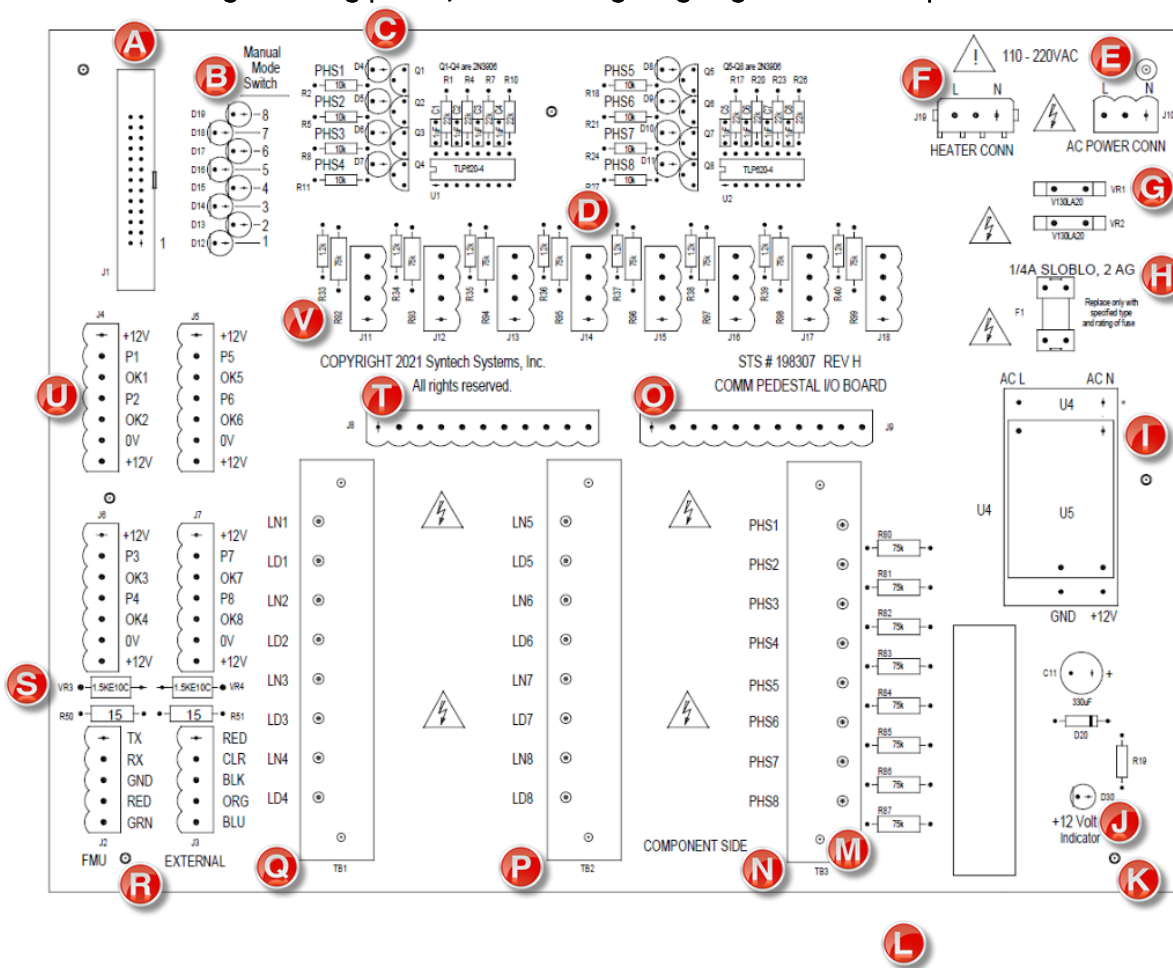


Figure 12, Terminal Blocks Q and P. Look for a circuit in the dispensing equipment that may be interrupted by the addition of a switch (i.e., the FMU) to prevent the flow of fuel. Also, there must be a means to control each individual product hose. A dual hose

dispenser must have separate solenoid valves for each hose or a separate pump motor input for each hose. In some cases, it may be necessary to add solenoid valves.

Compare the dispensing equipment to the manufacturer's wiring diagram. Where a dispenser wiring diagram may reference power coming from multiple circuit breakers, the installer may have sourced all the power requirements from a single circuit breaker. Associated actions must be identified to ensure separate control of each product hose is attained while keeping constant power on circuits which require it.

Procedures and diagrams follow for various methods of dispenser control. The diagrams contain broken lines to signify field wiring which must be added to gain control of the applicable dispenser circuit. Dispenser covers and junction boxes and the FMU pedestal door and electrical access panels must be opened to wire all control options. If installed, I/O Silver Boards must be removed to gain access to terminal strips TB1, TB2, and TB3 on the Pedestal I/O Board.

<b>NOTE</b>	Whenever pump handle detection is wired into the PHS positions of the Pedestal I/O Board, one leg of the resistor must be cut to transfer pump handle detection from LN to PHS. Cut position R92 for hose 1, R93 for hose 2, etc.
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Select the control method best suited for the application:

- [Controlling Reset](#)
- [Controlling Motors](#)
- [Controlling Solenoid Valves](#)
- [Using Dual Control Relay Assembly \(DCRA\) to Control Two Devices](#)
- [Two Stage Valve Control](#)
- [Controlling DC Devices \(Hose Reels in Lube Bays/Bulk Oil Dispensers\)](#)
- [Controlling Carwashes, Gate Openers](#)

### ***Controlling Reset***

This control method interrupts power from the circuit breaker to each dispenser reset mechanism. Figure 13 illustrates controlling reset in a dispenser using two circuit breakers, one per hose. Some arrangements may only be using one breaker. The power from one breaker may be brought into LN1, then jumped to LN2. Note that no power will be present if a solenoid valve sticks open or a reset mechanism or contact starter fails.

Some distributors/customers prefer to control reset power by running power from the breaker to the FMU, then running authorization power from the FMU to the dispenser. This prevents someone from breaking into the dispenser and bypassing the FMU with a simple jumper wire.

The diagram also illustrates wiring Pump Handle Sensing (PHS) into the FMU. Pump Handle Sensing (a.k.a. detection) is only possible through an END ONLY pump handle configuration, and only with Legacy FMPlus FMUs. If Pump Handle Sensing is not

needed or possible, omit those wires connected to the PHS positions on TB3. Control will still be attained, but Pump Handle Sensing will not be present.

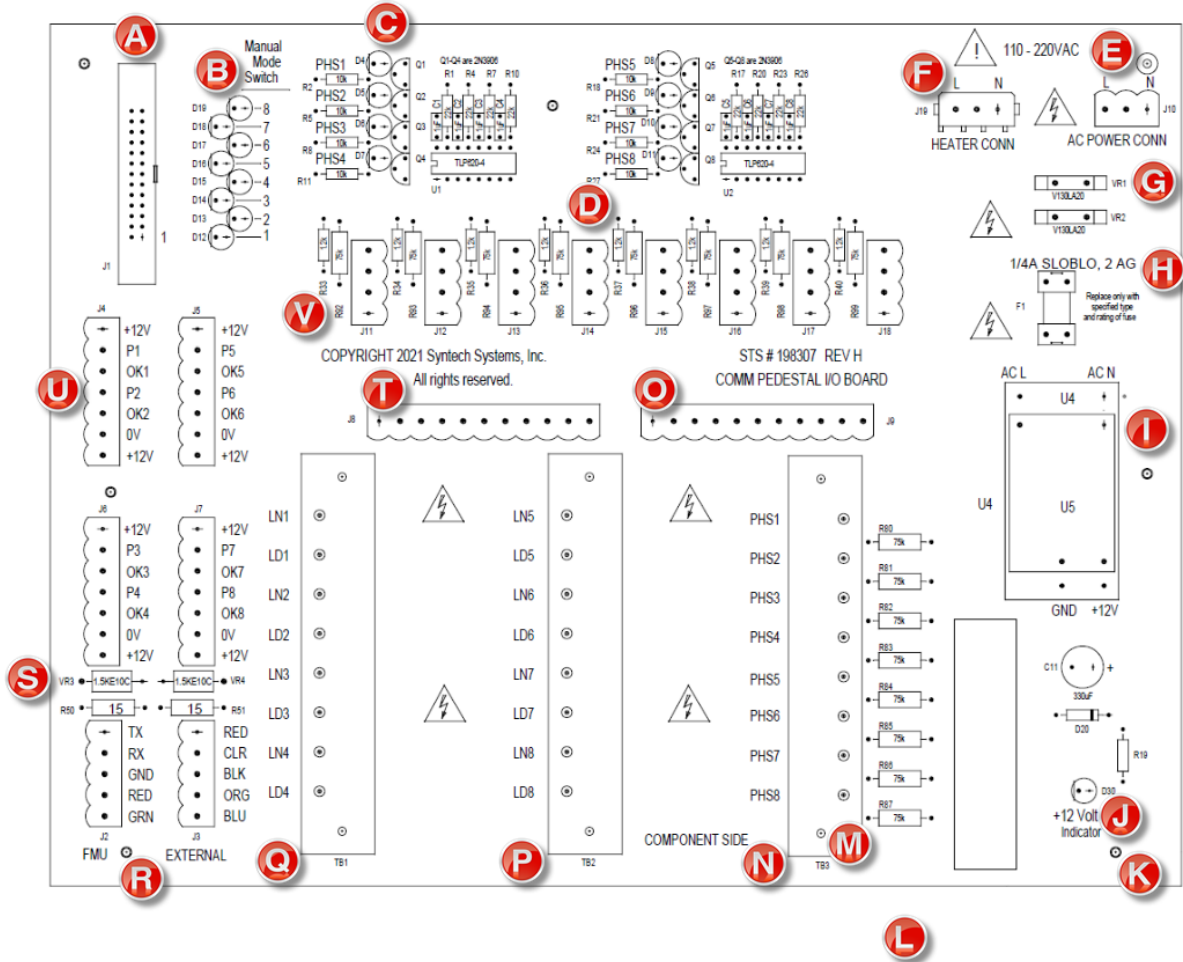
**WARNING** Each dispensing device must be provided with a means to remove all external voltage sources during periods of maintenance and service of the dispensing equipment (Ref: NFPA 70 (2008 edition), para 514.13). When two or more dispensers utilize the same STP (submersible turbine pump) control relay/contact starter, power supplied by one dispenser to activate a control relay must be isolated to prevent feedback to another dispenser. Failure to do so may result in electrical shock while performing dispenser maintenance.

**AVERTISSEMENT** Chaque dispositif de distribution doit être muni d'un moyen de supprimer toutes les sources de tension externe pendant les périodes de maintenance et de service de l'équipement de distribution. Ref: NFPA 70 (édition 2008), par 514,13. Lorsque deux ou plusieurs distributeurs utilisent la même STP (pompe à turbine submersible) relais de commande / contact démarreur, puissance fournie par un distributeur pour activer un relais de contrôle doivent être isolés pour empêcher l'alimentation de retour à un autre distributeur. Ne pas le faire peut entraîner un choc électrique pendant que la maintenance du distributeur de la scène.

**NOTE** When controlling reset in a dual hose, single product application, inputs to the STP control relay/contact starter must be isolated to prevent feedback to an unauthorized hose. If the inputs are not isolated, feedback may activate the unauthorized solenoid valve and permit fueling through an unauthorized hose.

1. Remove power at the circuit breaker.
2. Find the incoming power to the dispenser reset mechanism for hose 1. It is most likely a wire routed directly from the circuit breaker panel.
3. Run a wire from the power source to LN1. This wire does not need to be routed from the dispenser to the FMU. It may be routed directly to the FMU from the power source without passing through the dispenser. If a dual hose dispenser is being wired, and there is only one power source, run a jumper wire from LN1 to LN2.
4. If Pump Handle Sensing (PHS) will be wired, run two wires per hose from the FMU to the dispenser. If PHS will not be wired, run one wire per hose from the FMU to the dispenser.
5. Connect one end of one wire to LD1 at the FMU and the other end to hose 1 *reset feed* in the dispenser.

- (Using pump handle detection) Connect one end of the second wire to PHS1 at the EMU and the other end to hose 1 *root complete* in the dispenser



- Figure 12 (D). Clip one leg of the resistor at R92, so power cannot travel through the resistor. This action transfers pump handle detection from LN1 to PHS1. If only one leg of the resistor is clipped, the resistor may be soldered back in place, if needed.
- Repeat steps 1 through 6, as required, for all additional hoses. When performing step 6, clip one leg of the next resistor (R93 for hose 2, R94 for hose 3, etc.) for the next hose.

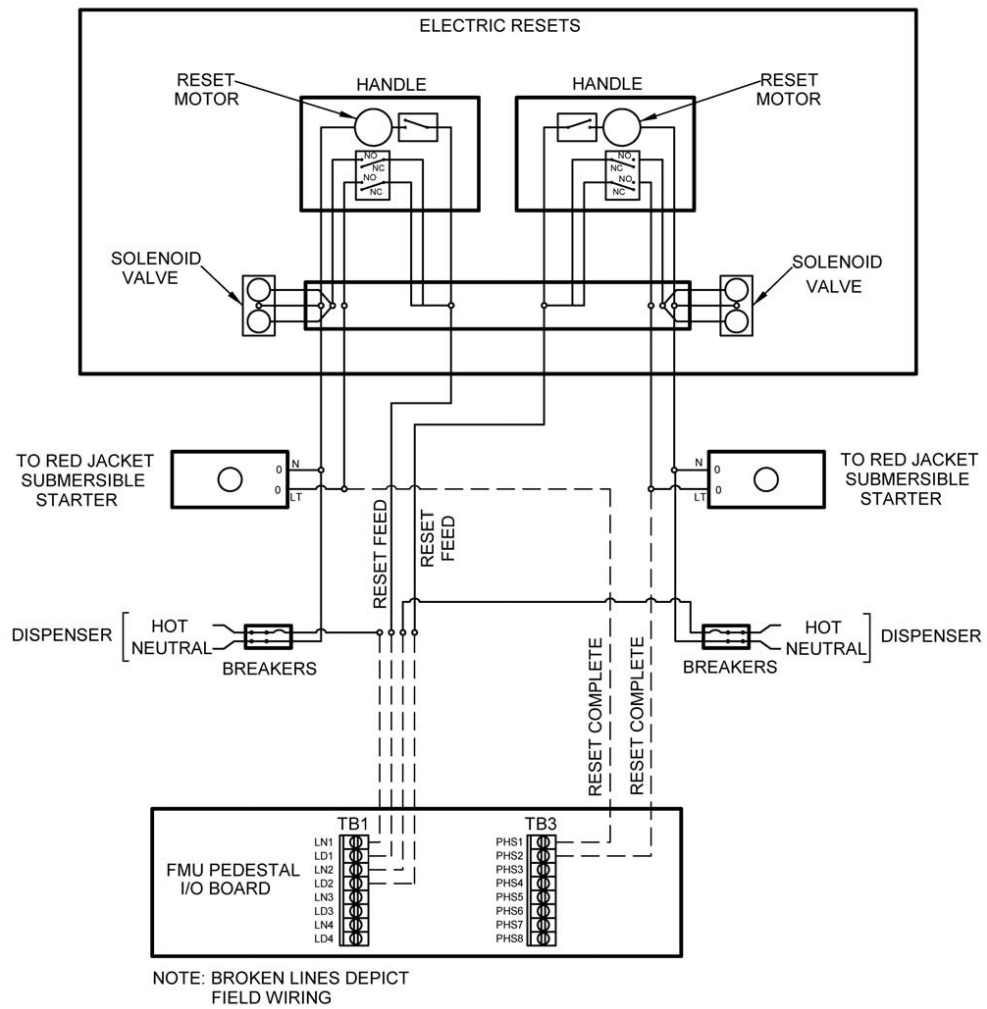


Figure 13 Wiring Diagram - Controlling Reset

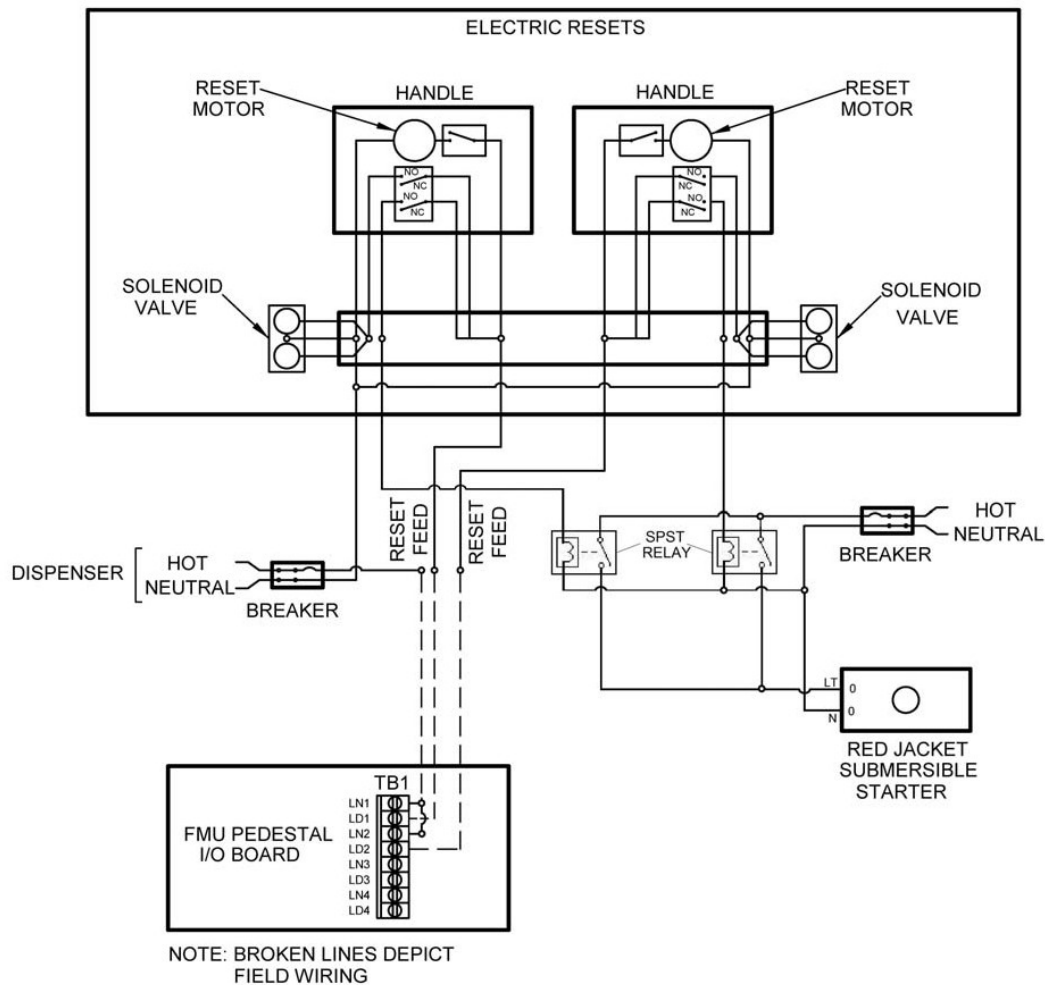


Figure 14 Controlling Reset in Dual Hose Single Product Dispenser without Backfeed (One Solution)

### Controlling Motors

See Figure 15. When controlling a Legacy FMPlus FMU or DoD FMU and pump handle detection is needed, the control method most likely used will be controlling motors or solenoid valves. If solenoid valves are not present, motors must be controlled. There must be one motor feed per hose. Motor control interrupts power from the dispenser reset mechanism to a suction pump motor or contact starter for a submersible pump motor. Siphoning from above ground tanks is possible if solenoid valves or anti-siphon valves are not present. Pump handle detection is possible from all variations of FMUs. Motors may be suction pump or submersible. Suction pump motors will most likely be wired directly to the dispenser reset mechanism. Submersible motors will most likely be controlled by a contact starter being powered through the dispenser reset mechanism. The contact starter will be remotely located away from the dispenser.

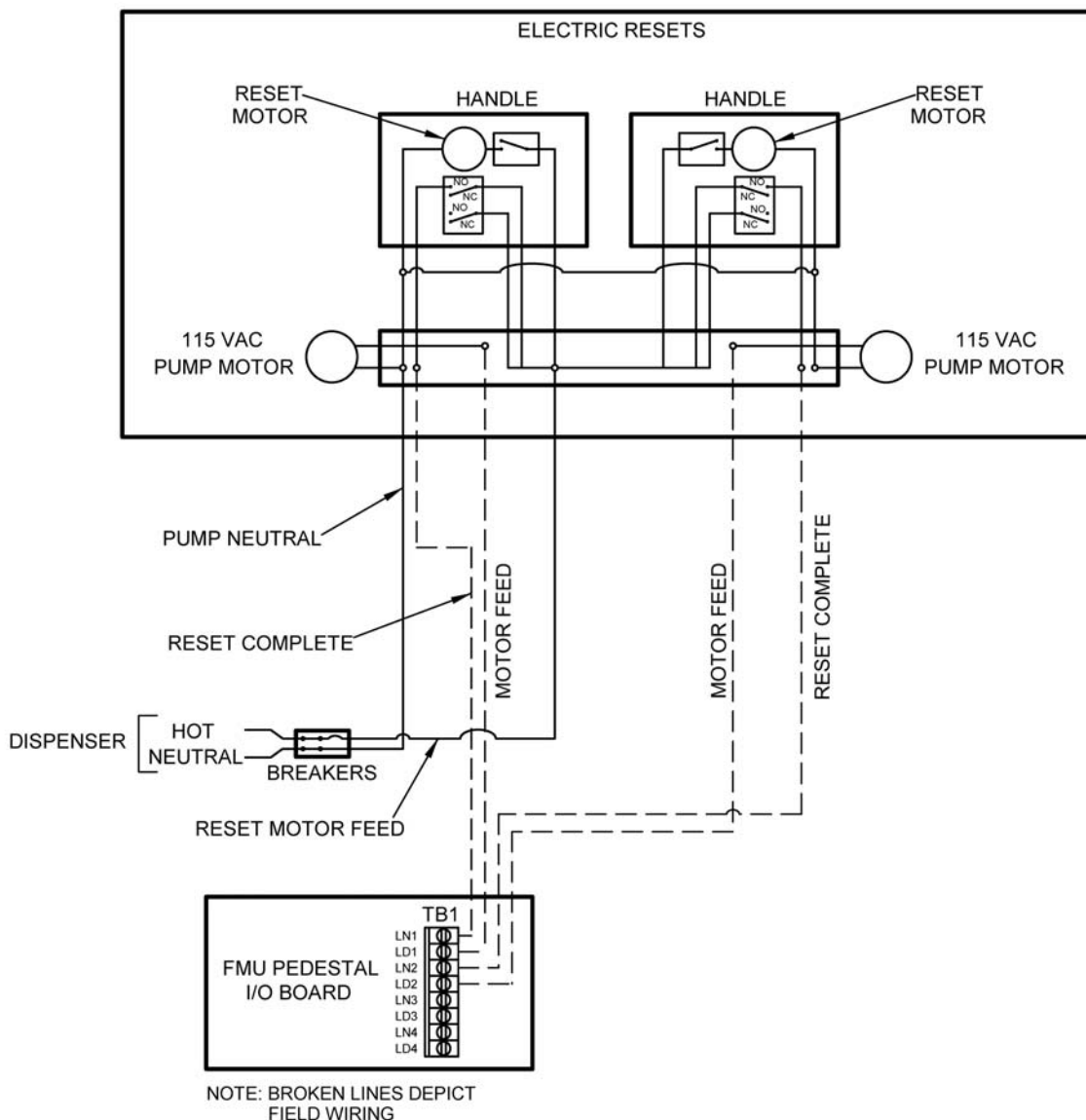


Figure 15 Wiring Diagram - Controlling Motors

If the dispenser is being fed from the top of an above ground tank, there must be an anti-siphon valve on the tank or inline between the dispenser and tank. Without an anti-siphon valve, the siphon effect created when a previous transaction is performed will permit fuel to siphon through the dispenser and pump motor to the dispenser nozzle after the pump motor is turned off. Product may then be obtained without authorization.

If the motor is powered by 220 VAC, the second motor feed may be from another power source. This may be evident by power being present on *reset complete* when the pump handle is turned off. When the pump handle is turned off, power from the second power source will backfeed through the motor coil windings to *reset complete*. To determine if this is occurring, disconnect, and check the second motor

feed line. A 110 VAC pump motor will have the second motor feed line connected to neutral. A 220 VAC pump motor will have the second motor feed line connected to 110 VAC.

Perform the following to control motors:

1. Inside the dispenser junction box, locate the wire feeding the pump motor for hose 1. It is most likely a red or orange wire from the dispenser reset mechanism wire-nutted to one of the motor leads (or contact starter). There should be power present when the dispenser pump handle is turned on, and power should be removed when the pump handle is turned off. If the motor is powered by 220 VAC, the second motor feed will be from another power source, and power may be present on the *reset complete* line when the pump handle is turned off.

**WARNING** To avoid electrical shock, remove dispenser and motor power at the circuit breaker panel. If the motor is powered by 220 VAC, there may be a second motor power wire from a second circuit breaker. Use a multimeter to verify power is removed from all motor power wires before proceeding.

**AVERTISSEMENT** Pour éviter tout choc électrique, enlever le distributeur et la puissance du moteur au panneau de disjoncteurs. Si le moteur est alimenté par 220 VAC il peut y avoir un fil second moteur électrique à partir d'un deuxième disjoncteur. Utiliser un multimètre pour vérifier l'alimentation est coupée de tous les fils d'alimentation du moteur avant de procéder.

2. Remove dispenser and motor power.
3. Run two wires from the FMU to the dispenser junction box.
4. In the FMU, connect one wire to LN1, and the second to LD1.
5. In the dispenser, disconnect the pump motor feed wire found in step 1.
6. Connect the wire running from LN1 to the red or orange *reset complete* wire.
7. Connect the wire running from LD1 to the *motor feed* wire. This is usually a black wire.
8. Repeat steps 1 through 7, as required, for all additional hoses.

### **Controlling Solenoid Valves**

See Figure 16. When controlling a Legacy FMPlus FMU or DoD FMU, and pump handle detection is needed, the control method most likely used will be controlling motors or controlling solenoid valves. When solenoid valves are present, they should be controlled. There must be one solenoid valve per hose. Solenoid control interrupts power from the dispenser reset mechanism to a solenoid valve. This control method has a drawback. It will permit dispenser reset and pump motor activation without authorization. If a user does not turn off the pump handle when the transaction is complete, the reset and pump motor will continue to run. This can result in a pump motor overheating. Pump handle detection is possible from all variations of FMUs.

Solenoid valves may be single or two-stage. A two-stage valve is illustrated in Figure 16. Single stage valves will have two wire leads which are not polarity sensitive, usually

both black. Power is wired to one lead, and neutral to the other. Two-stage valves have three leads: a neutral and separate inputs for the fast and slow side of the valve. Presets for retail transactions will make use of two-stage valves to ensure credit card payments by retail customers don't exceed the requested amount. When the two-stages do not need to be separately controlled, they may be tied together as shown in Figure 16.

Hose reels in a garage may use this control method. The major difference will be the power source. Hose reels are not typically tied to a power source, so one must be added. The power source will be dependent upon the requirements of the solenoid valve used to control the hose reel. A power supply may be installed in the FMU pedestal to provide power to the solenoid valve.

Perform the following to control solenoid valves:

1. Inside the dispenser junction box, locate the *reset complete* wire feeding the solenoid valve for hose 1. It is most likely an orange wire from the dispenser reset mechanism wire-nutted to an AC input to the solenoid valve. There should be power present when the dispenser pump handle is turned on, and power should be removed when the pump handle is turned off.
2. Remove dispenser power at the circuit breaker panel.
3. Run two wires from the FMU to the dispenser junction box.
4. In the FMU, connect one wire to LN1 and the second to LD1.
5. In the dispenser, disconnect the *reset complete* wire found in step 1 from the solenoid valve.
6. Connect the wire running from LN1 to the orange *reset complete* wire.
7. Connect the wire running from LD1 to the *valve hot* wire.
8. Repeat steps 1 through 7, as required, for all additional hoses.

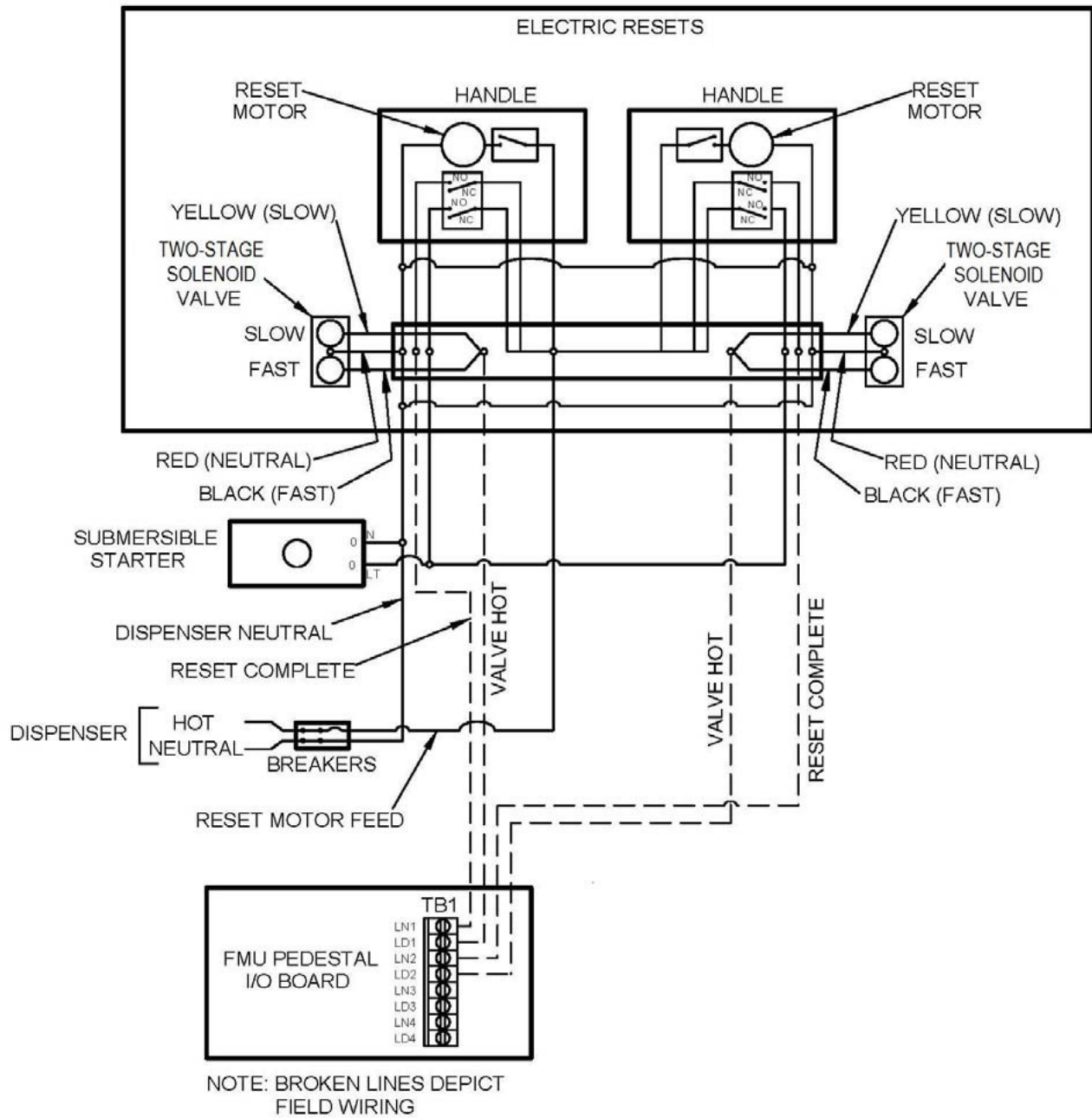


Figure 16 Wiring Diagram - Controlling Solenoid Valves

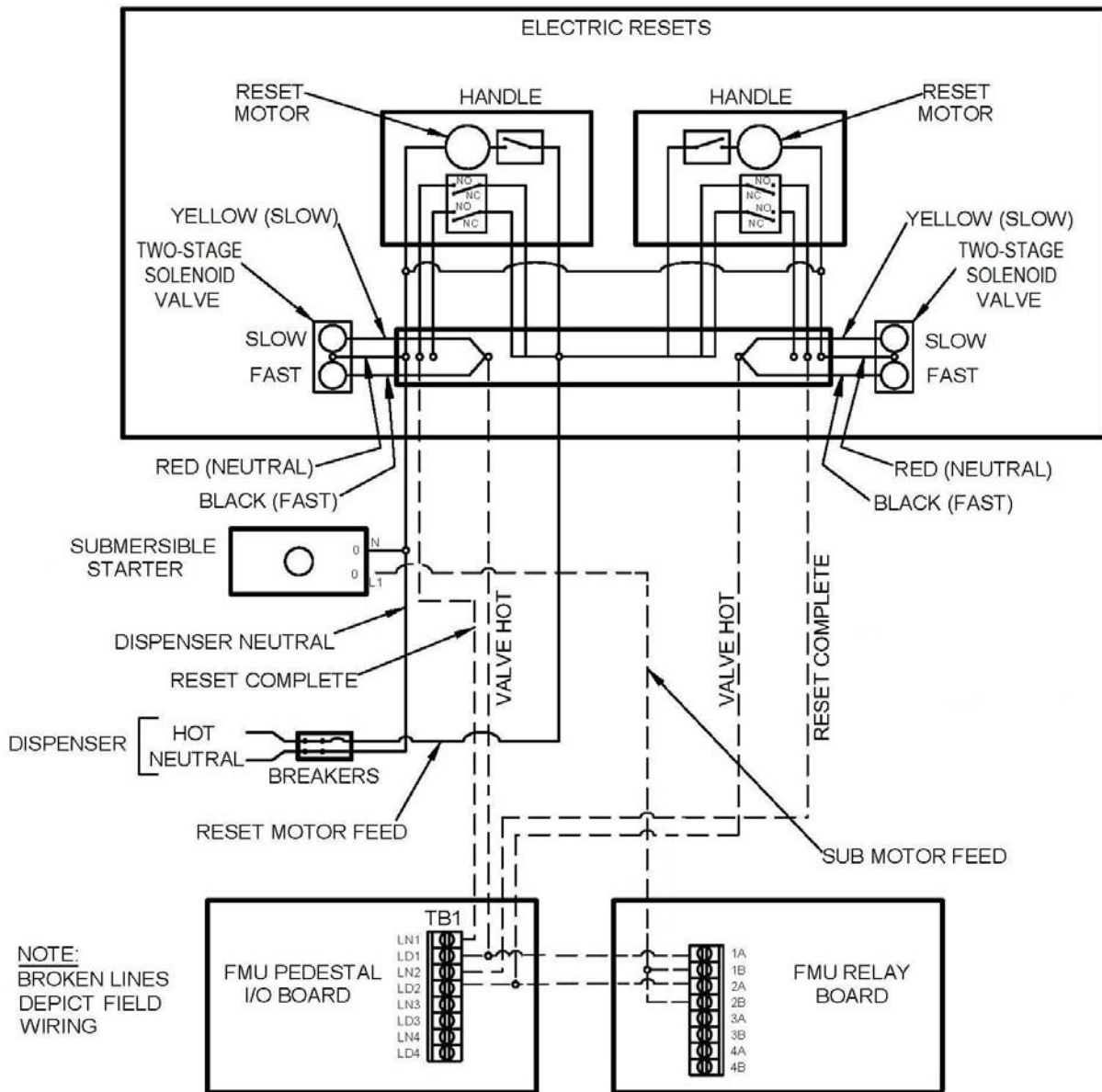


Figure 17 Wiring Diagram - Using Dual Control Relay Assembly (DCRA) to Control Two Devices

*Using Dual Control Relay Assembly (DCRA) to Control Two Devices*

**Normal Wiring Application**

The DCRA provides an additional set of relays to control two devices with each hose selection / position. This control method interrupts power from the dispenser reset mechanism to both solenoid valves and pump motors and allows dispenser reset without authorization; however, it prevents pump motor activation until authorized. Pump handle detection is possible from all variations of FMUs.

Figure 17 illustrates control of a dual hose, single product dispenser having two solenoid valves and one *submersible starter*. If the dispenser had two *submersible starters*, there would be individual wires from the *DCRA* to each starter. A wire would be run from 1B to hose 1 *submersible starter* and another wire from 2B to hose 2 *submersible starter*.

This application may also be used to control a dual hose dispenser with two suction pump motors (no internal solenoid valves) and a solenoid controlled anti-siphon valve which must be activated when either motor is turned on. In Figure 17, this would be illustrated by substituting suction pump motors where the solenoid valves are and a solenoid controlled anti-siphon valve where the *submersible starter* is shown.

Perform the following to control two devices using *DCRA*:

1. Inside the dispenser junction box, locate the *reset complete* wire feeding the solenoid valve for hose 1 and the *submersible starter*. The wire to the solenoid valve is most likely an orange wire. The wire to the starter is most likely a red wire. These wires will be wire-nutted to an AC input to the solenoid valve and starter, respectively. There should be power present on both wires when the dispenser pump handle is turned on, and power should be removed when the pump handle is turned off.
2. Remove dispenser power at the circuit breaker panel.
3. Run three wires from the FMU to the dispenser junction box.
4. In the FMU, connect one wire to LN1, the second to LD1, and the third to 1B on the terminal strip on the *DCRA*.
5. Run a jumper wire from LD1 to 1A on the terminal strip on the *DCRA*.
6. In the dispenser, disconnect the *reset complete* wire found in Step 1 from the solenoid valve and starter.
7. Connect the wire running from LN1 to the orange *reset complete* wire.
8. Connect the wire running from LD1 to the *valve hot* wire.
9. Connect the wire running from 1B to the L1 contact of the *submersible starter*.
10. Repeat steps 1 through 9, as required, for all additional hoses. For the wiring diagram shown in Figure 17, with one starter, run a jumper wire from 1B to 2B. This will provide for an output to the starter when an input is received on 2A.

### Alternative Wiring Application

DoD FMUs do not provide for control of dispenser reset while also providing pump handle detection. If it is desired to use a DoD FMU to control solenoid valves and pump motors and maintain pump handle detection, it may be accomplished using a *DCRA*.

## Unapproved Wiring Method

The following paragraph presents an unapproved wiring method with an invalid scenario. If 50-amp solid state relay assemblies (SSRA) were used to control the two solenoid valves and one *submersible starter* (or a single anti-siphon valve), LD1 and LD2 would be tied together either with a jumper or at the *submersible starter*. This wouldn't work as an authorization signal as it would activate both solenoid valves when only one was authorized.

### *Two-Stage Valve Control*

See Figure 18. Two-stage valve control is a control method for separately controlling the fast and slow stages of a two-stage valve. Two-stage valve control is used 1) to ensure preset quantities or costs are not exceeded and 2) to reduce shutdown pressure at the end of the transaction in systems with high flow rates.

Control is accomplished by turning on both the fast and slow valves at the same time, then turning off the fast valve and ending the transaction with the slow valve. This significantly reduces the flow rate and allows for the transaction to end without overrunning the preset amount and without a high-pressure shock to the mechanical pumping components.

Two relay assemblies are used to accomplish two-stage valve control. This limits the maximum number of hoses being controlled to four. The relay assemblies may be 50-amp solid state or dual control, and they may be mixed (one 50-amp solid state and one dual control relay assembly). Unless otherwise requested, all FMUs built for small airport or marina applications have two dual control relay assemblies installed.

For FMPlus units, an option in the firmware must be turned on to enable two-stage valve control. The point at which the fast valve turns off before the slow valve is called the setpoint. The setpoint may be set to any value between 0.1 and 10.0 units (dollars or gallons).

For retail operations, preset quantities or costs may only be set with credit card transactions. The transaction is started with both the fast and slow valves turned on. When the setpoint is reached, the fast valve shuts off and the transaction is finished on the slow valve.

For fleet operations, with Prokees and smartcards, the transaction is also started with both the fast and slow valves turned on, but the transaction ends with the transaction limit encoded into the Prokee or smartcard. When the setpoint is reached, the fast valve shuts off and the transaction is finished on the slow valve. Two-stage valve control method does not prevent dispenser reset and pump motor activation before authorization. Pump handle detection is possible from all FMU models.

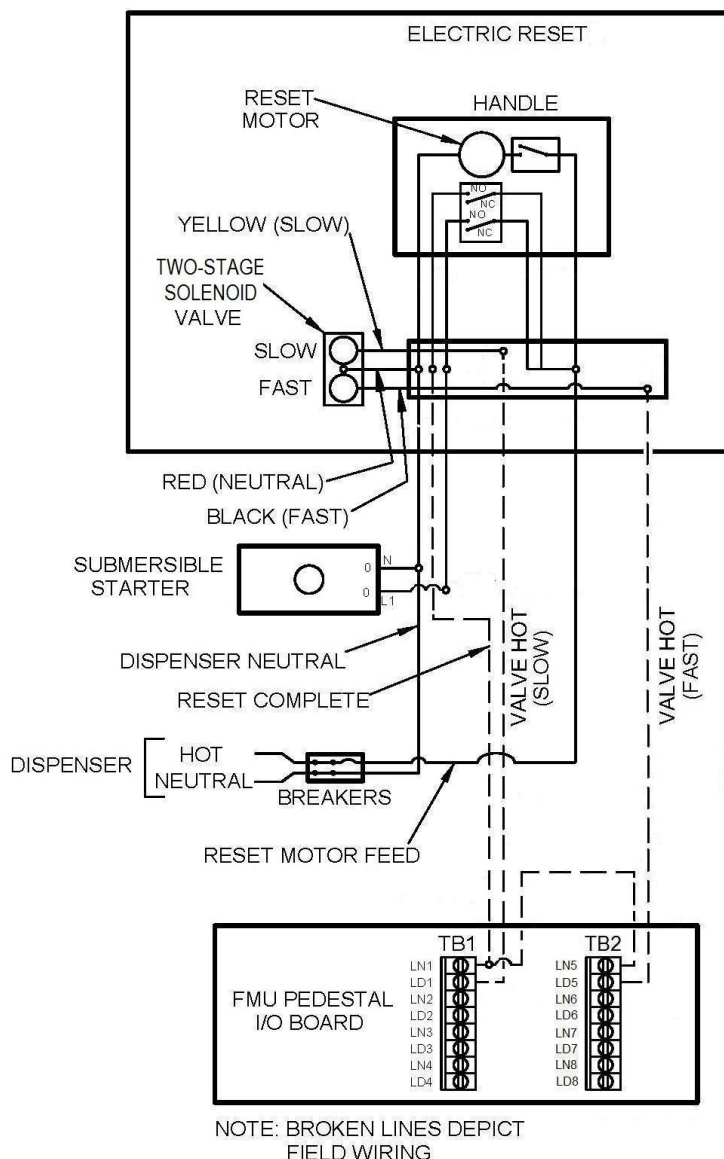


Figure 18 Wiring Diagram - Two-Stage Valve Control

Perform the following for two stage valve control:

1. Verify two relay assemblies are installed in the FMU and corresponding auto/manual switches are installed for all hoses to be controlled on both relay assemblies.

**WARNING** Failure to remove dispenser power at the circuit breaker panel may result in electrical shock.

**AVERTISSEMENT** Omettre d'enlever un distributeur de courant au panneau de disjoncteurs peut entraîner un choc électrique.

2. Remove dispenser power at the circuit breaker panel.

**NOTE** Some dispensers use one output from the dispenser reset mechanism to power both valve stages. Others will have two outputs, one for each stage of the valve. Dispensers with separate outputs to each valve stage may be influenced by CPU programming. If possible, use the output to the slow stage. The slow stage remains active from start to finish in each transaction. The FMU will use its programming to shut off the fast stage.

3. Locate the two valve inputs and identify them as slow or fast. A two-stage valve has two electrical inputs, one for the slow side of the valve (usually a yellow wire) and one for the fast side of the valve (usually a black wire), plus a neutral (usually a red wire).
4. Run three wires from the FMU to the dispenser junction box: one for a dispenser reset complete input, one for *valve hot - slow*, and one for *valve hot - fast*.
5. In the FMU, connect one wire to LN1, one wire to LD1, and one wire to LD5.
6. Connect a jumper wire from LN1 to LN5.
7. In the dispenser, disconnect the inputs to the fast and slow side of the two-stage valve.
8. Connect the wire running from LN1 to dispenser *reset complete*.
9. Connect the wire running from LD1 to the *valve hot - slow* wire.
10. Connect the wire running from LD5 to the *valve hot - fast* wire.
11. Repeat steps 2 through 10 for all additional hoses.
12. (FMPlus Only) Using a terminal emulation program (e.g., PuTTY or Procomm) installed on your PC or laptop, connect with the FMU.

**NOTE** If you do not have these tools, Syntech's CSC may be able to assist.

- a. Enable the *Two Relays per Pump* option using the **59** command.
- b. Set the setpoint for each hose using the **57** command.
- c. (Optional) Enable *Display Pump Pricing* using the **59** command. This displays price per gallon for each configured hose when the **A** key on the keypad is pressed.
- d. (Optional) Enable *Print Dollar for Prokee Receipts* using the **5B** command. This displays hose position, product, sale amount (in dollars), and quantity of last fuel transaction on the FMU display.
- e. (Optional) Set duration of display for Print Dollar for Prokee using the **7D** command. Default is 3 minutes.

### ***Controlling DC Devices (Hose Reels in Lube Bays/Bulk Oil Dispensers)***

Some minor modifications are necessary when controlling DC devices such as solenoid valves for hose reels in lube bays or bulk oil dispensers.

**NOTE** Whenever a part is field-modified, mark/label it to inform others of the modification so a replacement part may be modified in the same manner. Make Syntech aware of the modification when ordering a replacement part.

Control is similar to the method described in Controlling Valves. Power to the solenoid valves is switched. These applications often do not contain their own power source; therefore, a power supply must be added to power the solenoid valve. Pulsers or flowmeters must be added to receive quantity outputs from the device.

If the added power supply is DC voltage, use a Dual Control Relay Assembly (DCRA). DCRA, which can switch high or low and AC or DC voltages.

**CAUTION** Use caution in selecting the application. DCRA cannot work with loads in excess of 2 amps.

If a Solid-State Relay Assembly (SSRA) is used, you must replace the AC solid state relays (SSRs) with DC solid state relays. In addition, the polarity of the DC solid state relay switch contacts varies from that of the AC solid state relays. LN inputs and LD outputs are reversed to LD inputs and LN outputs on hose positions A, D, E, and H. See the table below:

**Table Error! No text of specified style in document.-1 Pedestal I/O Board Inputs/Outputs for AC and DC Solid State Relays (SSRs)**

<b>Hose Position</b>	<b>AC SSR</b>	<b>DC SSR</b>	<b>Hose Position</b>	<b>AC SSR</b>	<b>DC SSR</b>
A In	LN	LD	E In	LN	LD
A Out	LD	LN	E Out	LD	LN
B In	LN	LN	F In	LN	LN
B Out	LD	LD	F Out	LD	LD
C In	LN	LN	G In	LN	LN
C Out	LD	LD	G Out	LD	LD
D In	LN	LD	H In	LN	LD
D Out	LD	LN	H Out	LD	LN

In all cases of DC control, AC pump handle detection must be disabled and it may be disabled for individual hose positions. This is done by cutting one leg of the 75K ohm resistors at applicable positions R92-R99 and R80-R87 on the Pedestal I/O Board.

**NOTE** Cutting just one leg of the 75K ohm resistors at positions R92-R99 and positions R80-R87 retains the resistor for reconnection should it become necessary. Only cut the resistors in the positions being used for DC control (e.g., if DC control is being used only in hose position A, cut the resistors at R92 and R80).

When the AC pump handle detect resistors are cut, the PHS positions on terminal TB3 may be used to land DC common (ground). A single DC common input may be attached to one of the altered PHS positions, and jumpers may be added to connect DC common to other altered PHS positions.

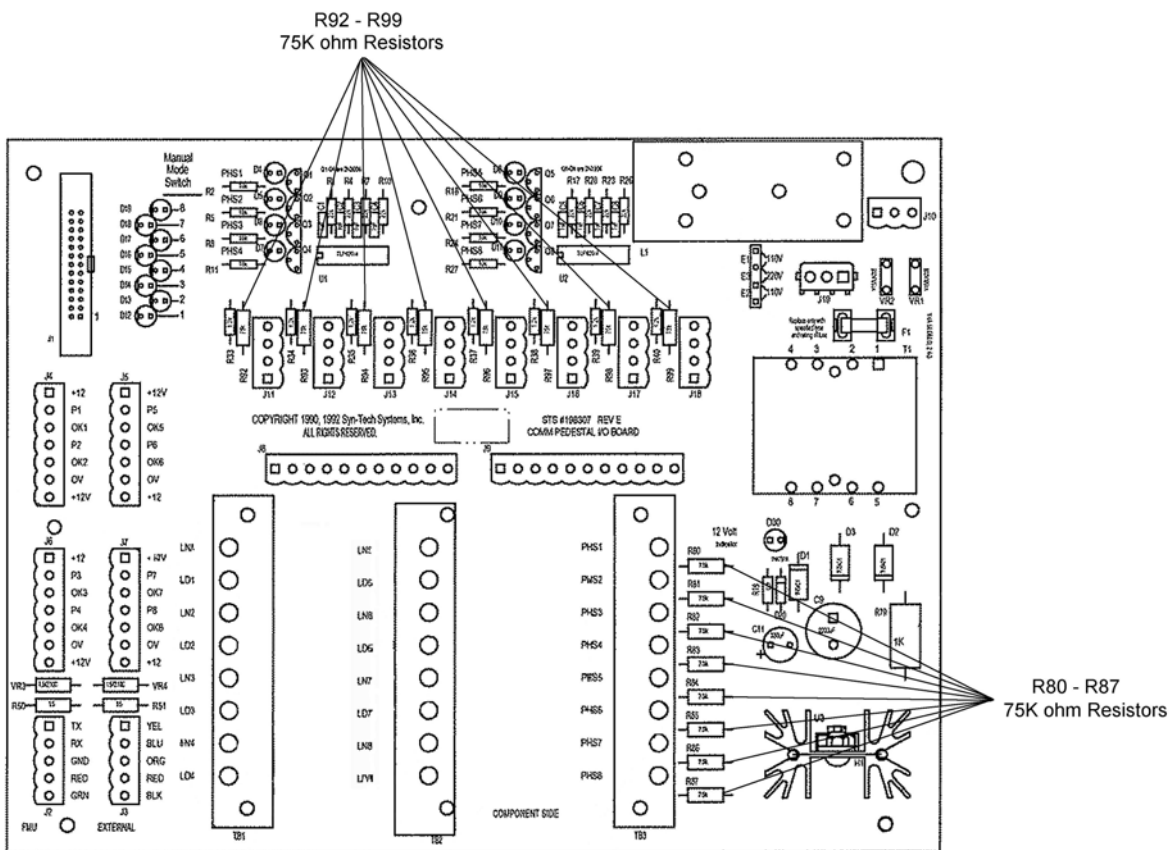


Figure 19 Location of 75K ohm Pump Handle Detect Resistors

### Controlling Car Washes and Gate Openers (Overview)

Under normal operating conditions, if an FMU provides an authorization signal, it expects to receive pulses indicating activity. When no pulses are detected, the FMU will shut down a hose position using the 'Zero Quantity Shutdown Limit' feature, a safety feature built into the FMU to prevent continual authorization when no pulses are received.

When the FMU interfaces with a car wash or gate controller, these devices do not generate pulses; therefore, the control method must change to prevent FMU hose positions controlling the car wash or gate from shutting down. The change in method is that pulse emitters are not used, and the car wash controller and gate controller may be controlled by closing the contact on a switch or relay.

Devices or applications which do not use pulse emitters may implement control by using one of four methods:

- Option 1: Utilizing a Dual Control Relay Assembly (DCRA). No special programming is required.
- Option 2: Utilizing the Pump Relay Board Assembly / Solid State Relay Assembly (SSRA) with Solid-State (50A) relays. No special programming is required.
- Option 3: Utilizing an FMU configured as an Access Management Unit (AMU). The AMU must be configured for 'controlling', not 'monitoring.' Refer to the following product bulletins for more detail regarding AMU setup and configuration:
  - PB-225\_Installation of Controlling Access Management Unit.pdf
  - PB-182\_Access\_Management\_Unit\_Survey.pdf

**NOTE** If an FMU is configured as an AMU and AIM equipped vehicles are not being used to activate the gate or car wash, the control must be through a non-programmable wiring workaround (options 1 or 2) or a programmable Smart Relay Assembly (SRA) (option 4).

- Option 4: Utilizing a programmable Smart Relay Assembly (SRA).
  - The normal Pump Relay Board Assembly is replaced with a programmable Smart Relay Assembly (SRA). Refer to Figure 019 below.

**IMPORTANT** The Programmable Interface Controller (PIC) on the SRA must be programmed to tell the FMU how to behave when activated for car wash or gate control. Therefore, Syntech needs to know how the customer wants their SRA/PIC to function. The sales rep or distributor must gather and pass this information to Syntech prior to the shipment of the FMU/SRA.

- All FMU Auto/Manual Mode Switches are disconnected because the SRA contains its own Auto/Manual switches.
- In the configuration, *hose positions* are used to identify where the Car Wash or Gate Controller is wired / connected.
- Products identified as *Car Wash* and/or *Gate Controller* are created as part of the software and FMU configuration. These products must be encoded on the Prokee, Smartcard, or AIM, as well as be configured in the FMU.
- When a valid Prokee or SmartCard is inserted and a hose is selected, the FMU will activate the hose input to the SRA, which will then activate relay K1 (Hose 1), K2 (Hose 2), or K3 (Hose 3) for the time determined by the dip switch (1 to 16 seconds). The SRA will also generate 10 pulses for the FMU pulser input. The pulses tell the FMU there is activity on that hose position, and the FMU will not increment the 'Zero Quantity Shutdown Limit' counter.

### ***Controlling Car Washes and Gate Openers (Application and Configuration)***

If a single momentary activation signal may be used to activate a gate or a carwash, then a simple wiring solution may be used. In addition to providing a momentary power signal to activate the device, the solution must generate a pulse to record a transaction. There are two wiring schemes based on the type of relay assembly in use: 1) The DCRA can accomplish this in its standard configuration by adding only a couple pieces of wire for each device to be activated. 2) A SSRA must have a mechanical relay installed for each device being activated.

**Configuration Settings for Non-Programmable Wiring Workaround** - The duration of the momentary power signal and pulse is regulated by the *Pump Finish Timer*. If the device being controlled requires a 15 second momentary power signal, set the Pump Finish Timer to 15 seconds. Because only one pulse is being generated when one of these transactions is recorded, the divide rate must be set to 1:1. Pump handle detection should be set to *none*. Repeat these settings for each FMU hose position used.

**CAUTION** The objective of this application is to apply a momentary power signal to a gate or carwash controller. If it is necessary to use an Automatic/Manual Mode Switch to activate the gate or carwash, the Manual Mode Switch only needs to be switched to manual long enough to supply the momentary power signal and activate the gate or carwash. Moving the switch to manual and leaving it there applies a constant pulse signal to the P\_ positions and may shorten the life of FMU internal components. When the gate or carwash is activated, turn the switch back to automatic. If the gate or carwash does not respond to the momentary power signal, the problem may not be with the FMU.

**ATTENTION** Le but de cette application est d'appliquer un signal de puissance momentanée à une porte ou un contrôleur carwash. S'il est nécessaire d'utiliser un commutateur de mode automatique / manuel pour activer la porte ou carwash, le sélecteur de mode manuel ne doit être activé pour assez longtemps pour fournir le momentané et activer la porte ou lave-auto manuel. Déplacer le commutateur manuel et l'y laisser applique un signal d'impulsion constante aux positions de P\_, et peut raccourcir la durée de vie des composants internes UFA. Lorsque la porte ou lave-auto est activé, tournez le commutateur de retour en mode automatique. Si la porte ou carwash ne répond pas à la momentané, le problème ne peut pas être avec l'UFA.

**Using Dual Control Relay Assembly (DCRA) to Generate Pulses** - A DCRA may be used with either an AC or DC momentary power signal and can switch two positions with each authorization. Figure 20 illustrates how a DCRA may be wired to use an AC or DC input on LN to send a momentary on LD and how to apply a 12VDC pulse to P1. Repeat this wiring configuration for each FMU hose position used.

**CAUTION** For all relay assemblies requiring power from the FMU's 12 VDC line, care must be taken not to exceed 2 amps on any controlled devices or damage to the FMU may occur.

**Using Solid State Relay Assembly (SSRA) to Generate Pulses** - A standard SSRA can only switch AC power. As a minimum, a DC relay with AC control needs to be added to switch +12V to P1. If the gate or carwash controller requires a DC momentary power signal, a DC relay will also need to be added for authorization. If two or more mechanical relays must be installed, consider exchanging the SSRA for a DCRA. Figure 21 illustrates how an SSRA may be wired to control the device and send a pulse from +12V to P1. Repeat this wiring configuration for each FMU hose position used.

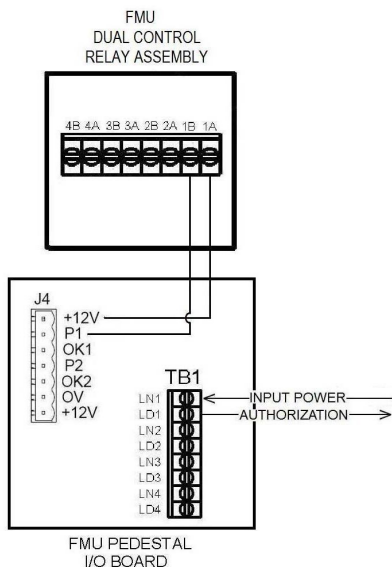


Figure 20 Generating Pulse with Dual Control Relay Assembly

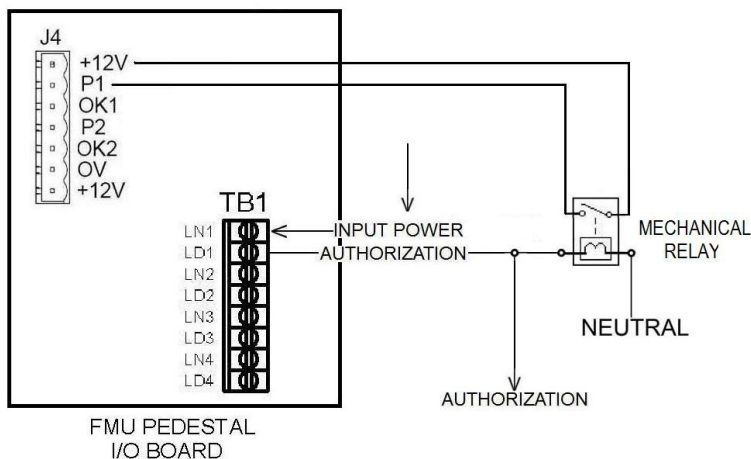


Figure 21 Generating Pulse with Solid State Relay Assembly

**Using a Smart Relay Assembly (SRA)** - The SRA (see Figure 22) is so named because of its ability to be programmed to perform multiple functions not possible with simple wiring workarounds. It has a Programmable Interface Controller (PIC) which may be programmed to perform multiple functions. A SRA may be added as a first or second

relay assembly in an FMU. Each relay activation generates 10 pulses, which is translated to one transaction.

SRA's do not utilize the Pedestal I/O Board and FMU Auto/Manual Switches when controlling devices. Control wires are wired directly into the SRA. Auto/manual switches specified for use with the SRA are installed on the board.

**NOTE**

The DCRA solution relies on the normal auto/manual switches in the FMU's pedestal, while the SRA does not use these switches, since it has its own auto/manual switches mounted on the board assembly.

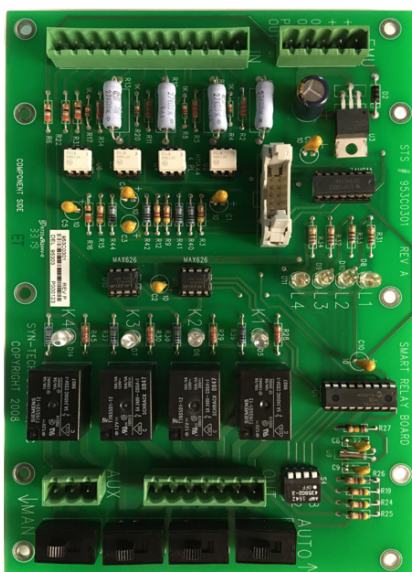
For either of these solutions, the devices they control only expect an activation voltage to be applied for a short period of time (the device runs its own controlling program when the activation signal is received).

With this being the case, the auto/manual switches may still be used to generate this activation signal manually; however, leaving the switch in manual mode will continue to supply power to the gate/car wash controller, and neither the DCRA nor SRA is designed to provide continuous power to a load and can cause these devices to fail.

SRA's produce a momentary contact closure adjustable for 1 to 16 seconds through dip switches located on the board. The dip switches are numbered 1-4 and provide the following momentary settings:

Switch	State	Duration
All Switches	Off	1 second
Switch 1	On	4 seconds
Switches 1 and 2	On	8 seconds
Switches 1, 2, and 3	On	12 seconds
All Switches	On	16 seconds

The J3 receptacle is fitted with a 7-pin terminal plug for control wiring inputs. Control wiring to J3 is matched as follows: hose 1 = pins 2 and 3, hose 2 = pins 4 and 5, and hose 3 = pins 6 and 7. Use one pin of each pair to receive input and the other to send an output. It doesn't matter which is used for the input or which is used for the output.



**Figure 22 Smart Relay Assembly (installed orientation)**

When an SRA is installed, the Divide Rate for the applicable hose position is set to 10:1, the Pump Finish Timer is to 10 seconds, and the No Pulse Timeout is set to 10 seconds.

The indicator lights L1, L2, and L3 illuminate when a signal is sent to the SRA. The light stays on until the relay turns off and the 10 second Pump Finish Timer expires. The indicator lights K1, K2, and K3 illuminate when the corresponding relay is activated and stays on for the duration set by the dip switches. The indicator light, K4, illuminates when the relay is generating pulses and flashes until enough pulses are generated to create a transaction.

Each SRA can control up to a maximum of three devices. If more than one device is being controlled, a jumper wire must be added for each additional pulser input. If two devices are installed and connected to hose positions A and B, install a jumper between pins 2 (P1) and 4 (P2) of J4. If three devices are installed and connected to hose positions A, B, and C, install a jumper between pins 2 (P1) and 4 (P2) of J4 and another jumper between pin 4 (P2) of J4 and pin 2 (P3) of J6. One pulse output from the Smart Relay Assembly is used as a pulse input for three positions on the Pedestal I/O Board.

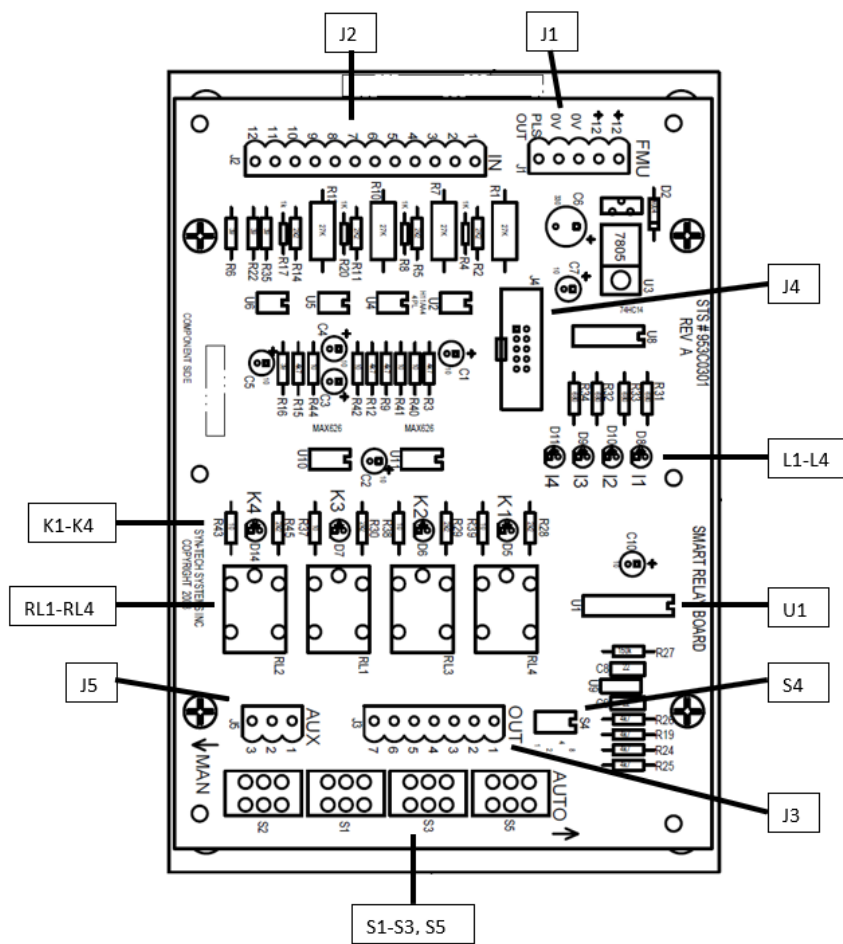


Figure 23 Smart Relay Indexed

Index	Type	Description
J1	Connector	To J4 on Pedestal I/O Board
J2	Connector	Not Used
J3	Connector	Control Wiring Inputs
J4	Connector	To Satellite I/O Control Board PRB1 or PRB2
J5	Connector	Not Used
K1-K4	LEDs	Indicator Lights K1, K2, K3, K4
U1	PIC	Programmable Interface Controller
S4	Switch bank	Dip Switches
S1-S3, S5	Switch	Auto/ Manual Switches (4)
RL1-RL4	Relay	Relays (4)
L1-L4	LEDs	Indicator Lights L1, L2, L3, L4

The J1 receptacle is fitted with a 5-pin terminal plug for pulse outputs. Positions in J1 are +12 (pins 1 and 2), 0V (pins 3 and 4), and PLS OUT (pin 5).

Connectivity is as follows:

<b>SRA J1</b>	<b>Wire Color</b>	<b>Pedestal I/O Board J4</b>
1 (+12)	White	1 (+12)
3 (0V)	Black	6 (P1)
5 (PLS OUT)	Green	2 (0V)

A cable (part number 233129) is provided with the SRA which connects J1 to the Pedestal I/O Board and any applicable pulser connector (J4, J5, J6, J7).

**NOTE** If the part number 233129 cable is not connected between J1 on the Smart Relay Assembly and a Pedestal I/O Board pulser connector (J4-J7), the Smart Relay Assembly will not function. It needs both the 12VDC and 0V from the Pedestal I/O Board for power and ground.

### ***Monitor Mode (FMPlus Only)***

There are applications which may require FuelMaster to continuously monitor the flow of fuel but not through individual transactions. Such would be the flow of fuel to a furnace or some other device, which is continually operating. Another application is monitoring the continuous flow of water and glycol into a deicing fluid blender. These scenarios may be accomplished using the Monitor Mode.

In Monitor Mode, no authorization signal is required, so nothing needs to be connected to the Pedestal I/O Board LN and LD positions. FMU firmware activates the relay for the hose put in Monitor Mode. An LED on the Relay Assembly corresponding to the activated relay will illuminate steady while in Monitor Mode.

Any of the eight hose positions available in the FMU can be configured for the Monitor Mode.

Pulses from a pulser or flowmeter are required, so connections are made to the Pedestal I/O Board pulser connectors on J4, J5, J6, and/or J7 as needed.

Monitor Mode monitors incoming pulses and records a transaction after 10,000 pulses or once per day (24-hour cycle), whichever occurs first.

Monitor Mode may be turned on with a laptop connection, Supervisor Prokee, or Smartcard. If a Supervisor Prokee or Smartcard are used to configure Monitor Mode, the only option is to enable all hoses. If performed with a laptop connection (or by the Customer Satisfaction Center), individual hoses may be configured.

#### **Option A - Configuring Monitor Mode with a laptop connection:**

1. Make a laptop connection in accordance with Product Bulletin 111.
2. Enter the **54** command to display the *Pump Mode Menu*.
3. Select the hose position (A-H) to modify by typing the hose letter and selecting **Enter**. The Pump Mode Configuration Menu will be displayed.

4. Select **5** to *Enable Monitor Mode*. The Pump Mode Menu will be displayed and show the selection of Monitor Mode.
5. Select **Esc** to exit. The prompt *Configuration has changed. Would you like to save it? (Y/N)* will appear.
6. Select **Y** to save the configuration change. The prompt will show *Saving Configuration Changes... Pump # -> Monitor Mode enabled Save Complete!*
7. Enter the **7** command to exit the laptop connection.

**Option b.** - Perform the following to configure Monitor Mode with a Supervisor Prokee or Smartcard:

1. Insert a Supervisor Prokee or Smartcard. The SUPV: menu will appear.
2. Select **B=ISSUES**. The SUPERVISOR ISSUES MENU will appear.
3. Select **B=MODE**. The MODE MENU will appear.
4. Select **B=MONITOR**. The SUPERVISOR MONITOR MODE MENU will appear.
5. Select **A=TURN ON**. The prompt ALL ACTIVE PUMPS IN SEMI MANUAL MODE -OR- MONITOR MODE! will appear.
6. Depress **D=EXIT** to exit the Supervisor menus.

#### Procedure 4: Wiring Pulse Inputs and Connections

**NOTE** AC ground cannot be substituted for 0V in pulser applications.

**Dispenser Pulse** - 22 AWG. The number of conductors will be dependent upon the requirements of the pulser used. If run with AC power or control in the conduit, it must be shielded and insulated to the maximum voltage rating.

**Standard Pulsers/Pulse Generators** - Pulse inputs are necessary to register quantity. Pulse inputs are made to receptacles J4 (hoses A and B), J6 (hoses C and D), J5 (hoses E and F), and J7 (hoses G and H) located at left center on the Pedestal I/O Board. The +12V positions are sending 12 VDC to the pulsers. This 12 VDC is constant whenever power is applied to the FMU, and the FMU power switch is on. The P\_ (P1 for hose A, P2 for hose B, etc.) positions are receiving pulses from the pulsers. The 0V positions are common or ground. The OK\_ (OK1 for hose A, OK2 for hose B, etc.) positions are for 12 VDC pump handle or switch detection.

The +12V and 0V positions are not tied to a specific P\_ position. Any +12V or 0V position may be used with any P\_ position. Since there is only one 0V position for every two P\_ positions, two conductors must be connected to each 0V position when 0V connections are required.

Typical connections to mechanical pulsers are with two or three conductors. All mechanical pulsers will require a 12 VDC input to return a 12 VDC pulse for the

FMU. Many will also require a third conductor connection to 0V ground or common.

**CAUTION** Some 'open collector' pulse generators such as the Gasboy Pump I/F Board cannot accept a direct 12 VDC input. Applying 12 VDC directly to the Pump I/F Board will damage it.

**ATTENTION** Certains générateurs d'impulsions collecteur ouvert comme la pompe, je Gasboy Conseil / F n'acceptera pas une entrée 12 VDC directe. Application 12 VDC directement à la pompe, je / F Conseil sera l'endommager.

Some pulse generators are referred to as 'open collector', meaning, they require a power input on the pulse return line before a pulse may be generated. Open collector pulsers will also require a pull-up resistor. The pull-up resistor carries a reduced voltage from the 12 VDC output to the pulse return line. The size of the pull-up resistor will vary depending on the amount of power needed to generate a pulse. Figure 4-24 is an example of a connection to an open collector pulse transmitter using a pull-up resistor. Syntech's *Dispenser Compatibility List* identifies the correct applications for pullup resistors. Connect with Syntech's CSC for the most current version.

**CAUTION** Do not connect more than 12 VDC to J4, J5, J6, or J7. Voltages greater than 12 VDC will damage the Pedestal I/O Board.

**ATTENTION** Ne connectez pas plus de 12 volts courant continu à J4, J5, J6, ou J7. Plus de 12 volts courant continu endommageront le tableau Dedans/Déhors du piédestal.

**Pulse Filtering:** DC pulser wires and AC control wires may be routed through the same conduit providing all wires are insulated for the maximum voltage routed through the conduit. When routed through the same conduit, the pulser wires should also be shielded to prevent bleed-over from AC control wires into the DC pulser wires/cable. Should bleed-over occur, the FMU has provisions for removing the bleed-over. The FMU Satellite I/O Control Board has a bank of eight PULSE FILTERING dipswitches, one for each of eight hose positions. When these dipswitches are turned on, they filter bleed-over from AC wires into DC pulser wires/cables. The maximum number of pulses the FMU can interpret when these dipswitches are turned on is 9000 per minute.

If it is necessary to turn on these dipswitches, give careful consideration to the flow rate of the pump and the divide rate of the pulser being used. A 1000:1 divide rate will only allow for a 9 gallon per minute flow rate (1000:1 divide rate x 9 gallons per minute = 9000 pulses per minute) while maintaining a maximum of 9000 pulses per minute.

It should not be necessary to turn on these dipswitches if the pulser wires are shielded and insulated for the maximum power carried through the conduit, or the

pulser wires are in a separate conduit from any AC power wires. If the dipswitches are not turned on, the FMU can interpret 120,000 or more pulses per minute. This would equate to using a 1000:1 divide rate pulse output with a hose pumping 120 gallons per minute.

1. Determine the pulser wiring requirements by comparing the selected pulser with Figures 17 - 23.
2. Pull a cable with enough conductors to make the necessary pulser connections.
3. Connect the 12 VDC pulser power feed to the +12V pin closest to the applicable P\_ (P1 for hose A, P2 for hose B, etc.) pin. If a pullup resistor is required, install the pullup resistor between +12V and P\_.
4. Connect the 12 VDC pulse return to P1 for hose A, P2 for hose B, etc.
5. Where required, connect the pulser common to 0V.

**NOTE** The maximum number of pulses that may be counted by the FMU when a PULSE FILTERING dipswitch is turned on is 9000 per minute. Determine the number of pulses by multiplying the flow rate (i.e., 10 gallons/minute) times the divide rate (i.e., 100:1). If PULSE FILTERING is not turned on, the maximum number of pulses increases to 120,000+ per minute.

6. If the pulser wires are pulled in the same conduit with AC control wires and the pulser wires are not shielded, turn on the applicable PULSE FILTERING dipswitch on the Satellite I/O Control Board to prevent AC bleedover into the pulser wires.
7. Repeat steps 1-6 for each additional pulser to be installed.

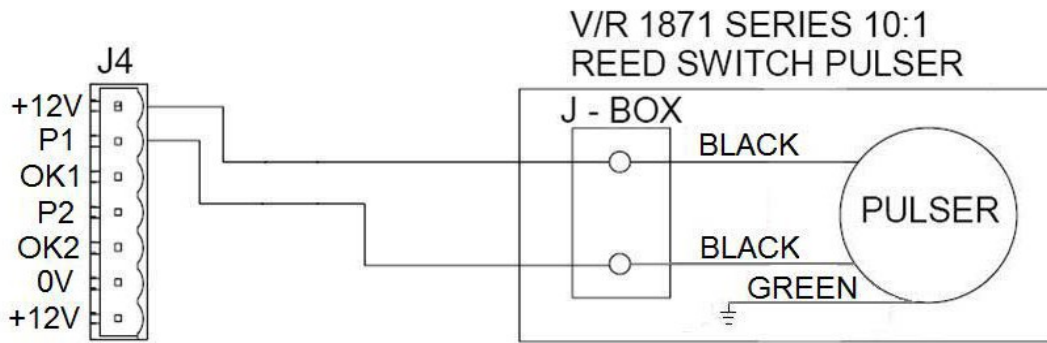


Figure 24 Connecting to Veeder Root 1871 Pulser

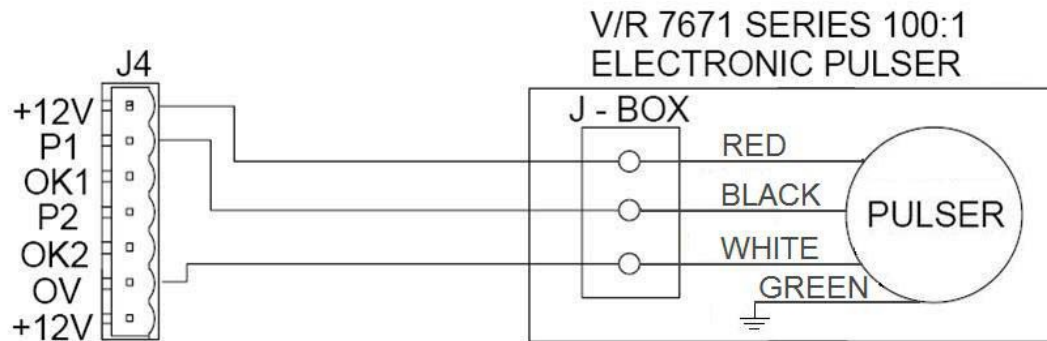


Figure 25 Connecting to Veeder Rot 7671 Pulser

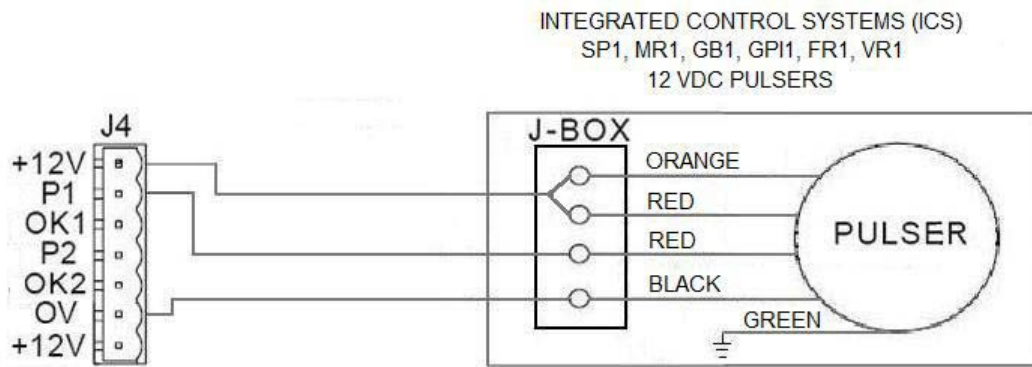


Figure 26 Connecting to ICS 12VDC Pulsers

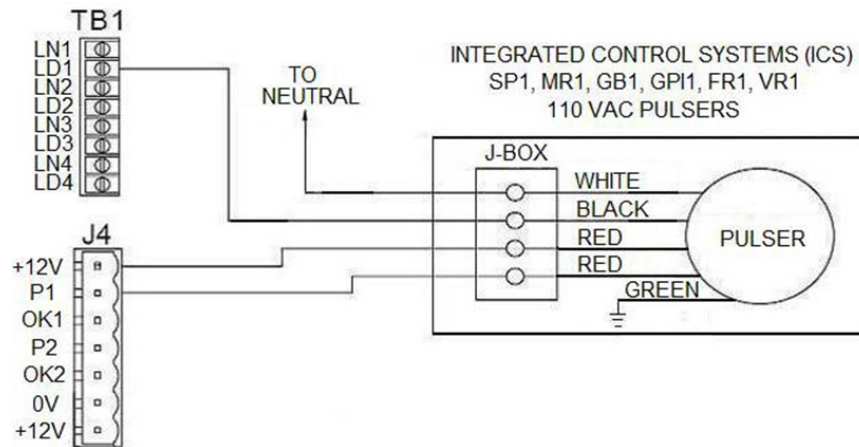


Figure 27 Connecting to ICS 110 VAC Pulsers

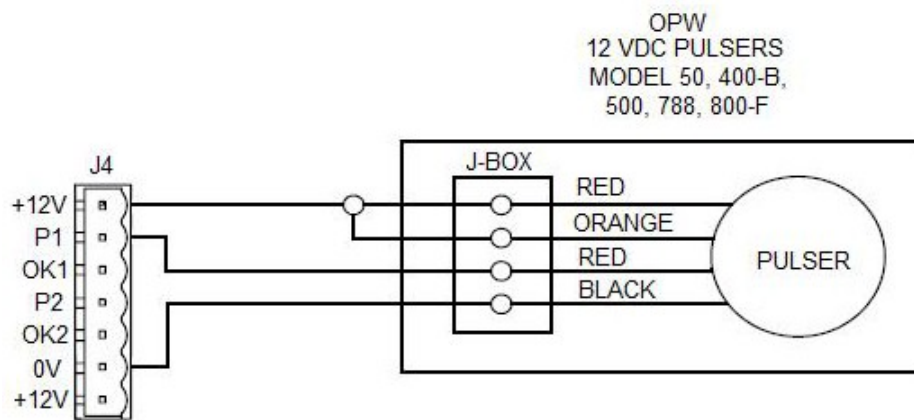


Figure 28 Connecting to OPW 12 VDC Pulsers

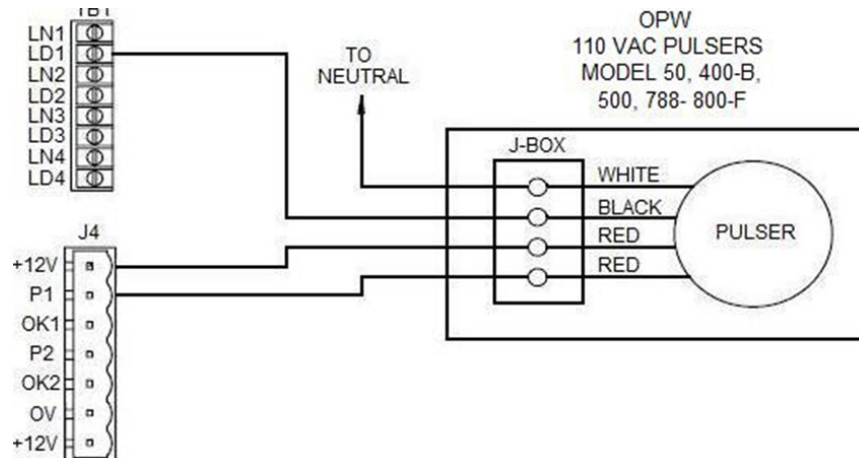


Figure 29 Connecting to OPW 110 VAC Pulsers

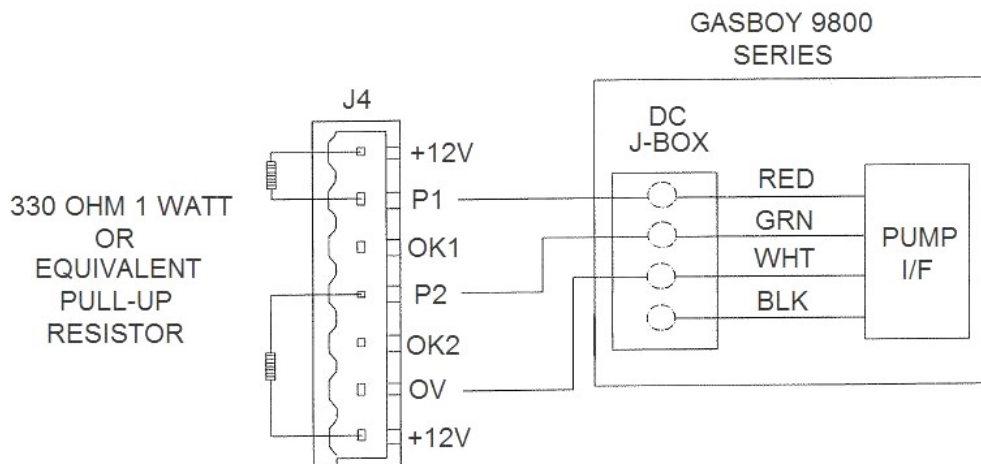


Figure 30 Connecting to Open Collector Pulsers (Gasboy 9800 I/F shown)

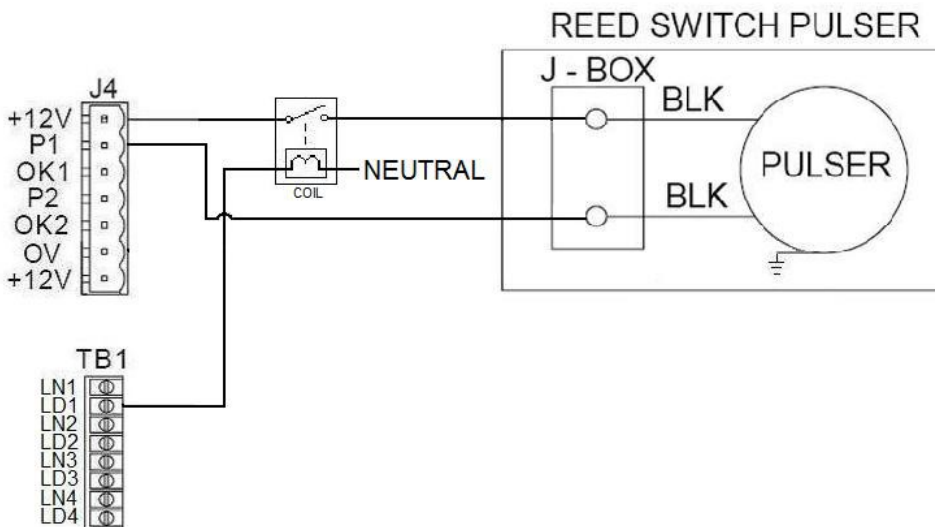


Figure 31 Removing Counts During Resets

**Dual Output Pulsers** - Pulsers are available with dual outputs; pulsers which provide outputs to two different devices such as an FMU and a tank monitor. An application which may require a dual output pulser is a system having both an FMU and a TLS-350R Veeder-Root tank monitor. Pulses from the fuel dispenser are needed by both the FMU and the TLS-350R. Single output pulsers have supported some similar applications but may not under all circumstances. If working with existing equipment with single output pulsers, test the outputs from the single output pulsers first. If the single output pulser won't support both applications, switch to a dual output pulser.

**Opto-Isolators** - Before electronic dispenser interfaces were adapted to FuelMaster, several different optical isolators were developed to receive pulses

from some older electronic dispenser applications such as the Gilbarco Advantage and Legacy series, Tokheim 262, Wayne 360/370 series dispensers, and some Schlumberger models. These optical isolators were designed to support commercial fleet operations and did not attain the accuracy required by Weights and Measures for retail operations. The optical isolators also provided for reduction of pulses through “divide by” circuitry which could divide the number of pulses received by 1 (no reduction), 2, 4, or 8.

**Counts During Reset** - 12 VDC pulser power from the FMU to a pulser is constant whenever the FMU power switch is on. This can result in “counts during reset”, pulse counts generated when a mechanical dispenser resets. If this occurs, it may be eliminated by wiring pump handle detection and setting the USE PUMP HANDLE setting in the FMU to START or START AND END (FMPlus systems). If pump handle detection may not be wired or set to these configuration options, two other methods are available to eliminate counts during reset. One option is to install pulsers with 110 VAC connections. The other option is illustrated in Figure 4-25. Install mechanical relays to control the 12 VDC pulser power. Relays with 110 VAC coils and 12 VDC switching are necessary. Install the relays so the 12 VDC power to the pulser is interrupted by the relay and controlled by a 110 VAC input from FMU authorization (LD\_).

**AC Bleed-over to Pulse Inputs** - AC control wires and DC pulser cables may be pulled within the same conduit if the DC pulser cables are shielded and insulated to the maximum voltage in the conduit. The NEC allows for this and specifies the requirement for cable insulation in NFPA 70, para 522.24(A). Syntech Systems further specifies the pulser cable be shielded. Bleed-over from AC control wires to DC pulser wires should not occur when these conditions are met. If it does, ensure the PULSE FILTERING dip switches on the Satellite I/O Control Board are turned on for each applicable hose position (read the hose positions from the silkscreen on the board, not the dip switch block). When the PULSE FILTERING dip switches are turned on, the pulse count cannot exceed 9000 pulses per minute. The pulse count is determined by multiplying the flow rate (i.e., 9 gallons per minute) times the divide rate (i.e., 100 pulses per gallon). This example would be 900 pulses per minute. Separating the AC control wires and DC pulser cables in separate conduit will also eliminate any bleed-over.

### Redundancy - Two FMUs, One Dispenser/Pulser

**CAUTION** Power inputs (+12V) from two different FMUs or power sources to a single pulser can result in damage to both FMUs and the pulser. If possible, power the pulser from only one power source. DC grounds (0V) from both sources must be joined (made common) for pulses to be detected by both FMUs. Grounds must not be joined (made common) unless both power sources are 12 VDC. AC grounds are not the same as DC commons/grounds.

**ATTENTION** Des entrées d'alimentation (+12 V) de deux FMU différentes sources ou de la puissance d'un émetteur unique peut entraîner des dommages aux deux FMU et, éventuellement, le générateur d'impulsions. Si possible, le pouvoir du pulseur d'une seule source d'alimentation. motifs DC (0V) à partir de deux sources doivent être rejoint (en commun) pour les légumineuses à détecter par les deux FMU. Motifs ne doit pas être rejoint (en commun) à moins que les sources d'énergie sont de 12 VDC. AC motifs ne sont pas les mêmes que Commons CC / motifs.

Applications have been requested for redundancy where two FMUs connect to one dispenser. When doing so, caution must be used in making pulser connections. See Figure 32. Only one FMU may be used as the +12V power source to a pulser, but both must have a common 0V. Power from two different FMUs or power sources to a single pulser may result in damage to the FMUs and pulser. Power from either source will feed back to the other source and may result in damage to both FMUs and the pulser. DC commons/grounds (0V) from both sources must be joined (common) for pulses to be detected by both FMUs. The FMU AC ground cannot be used for a DC common/ground.

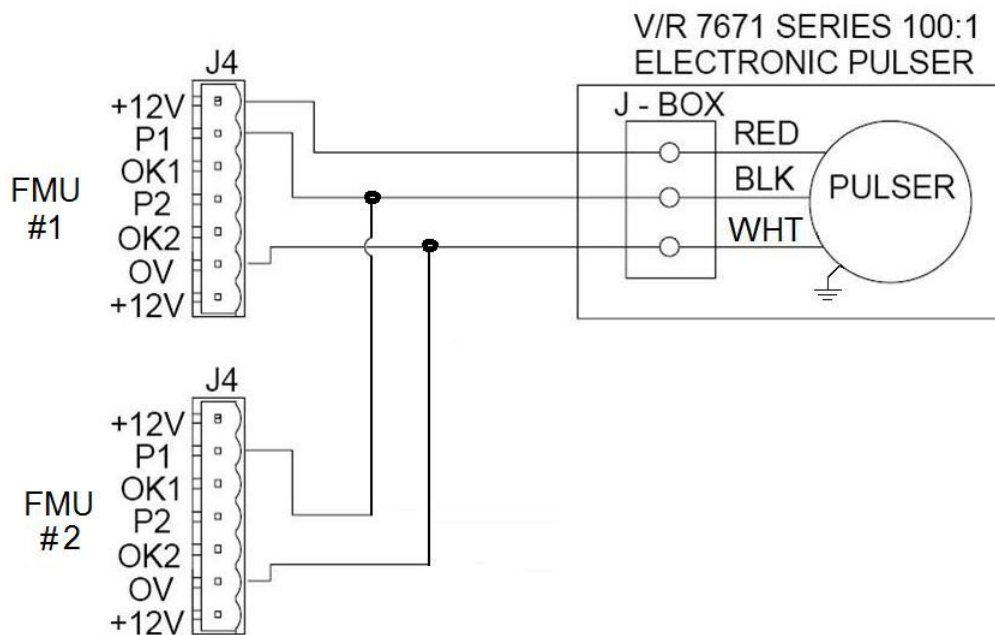


Figure 32 Redundant FMUs with one Dispenser and one Pulser

**NOTE** If two FMUs are receiving pulses from one pulser, the PULSE FILTERING dip switches must be set the same in both FMUs or quantity variations will show between the two FMUs.

See Figure 4-27, location J (DS1), for the location of the PULSE FILTERING dipswitches on the Satellite I/O Control Board. Follow the numbering silkscreened on the board (not the dipswitch panel).

### Connect Tank Monitor Interface Kit to Master FMU

The Tank Monitor connection is a communications cable that cannot be routed in the same conduit with AC power or dispenser control but can also be routed in the same conduit with other communications cables. Use a 3-conductor shielded cable if using RS-232. Use two twisted pair shielded with a drain if using RS-422. See Figures 31 - 32.

Tank monitor interfaces are only possible on a Master FMU equipped with a Tank Monitor Interface Kit, part number 202002A. Interface cable connections at the FMU will be dependent upon the use of RS-232 (3-conductor) or RS-422 (2-pair with drain) cable. In either case, connections will be made to a 5-pin connector in JP13 on the I/O Silver Board. RS-422 may be necessitated by the length of the cable run.

Many tank monitors do not recommend RS-232 cable lengths in excess of 50 feet. Where excessive distances dictate the use of RS-422, an RS-232/422 converter such as the Patton Electronics 222N (Syntech part number 219517) may be used to step down RS-422 to RS-232 with a DB25 connector for connection to the tank monitor. Patton also makes an RS-422/232 converter with DB9, RJ-11, or RJ-45 connectors for connection to the tank monitor. Syntech does not carry inventory converters without a DB25 connector. Patton advises the separation distance is extended to 4000 feet with their RS-422/232 converters.

Also available is a wireless TMU Kit (part ID 191F0223-10).

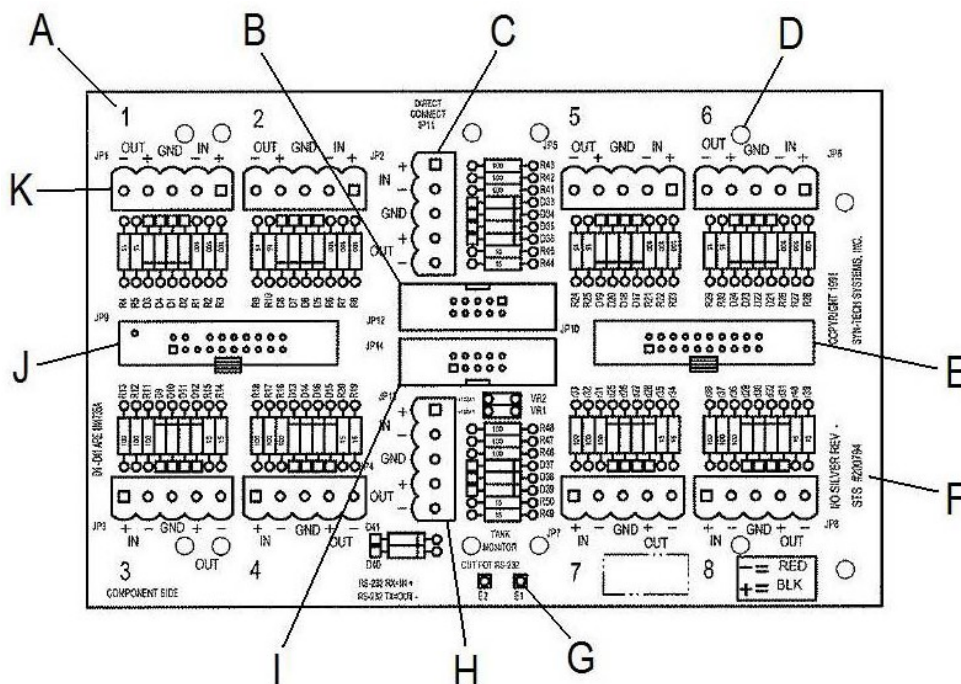


Figure 33 I/O Silver Board

<b>Index</b>	<b>Description</b>
A	Satellite Position Number
B	Electronic Dispenser Interface or Indoor Receipt Printer Ribbon Cable Connector, JP12 (see Note)
C	Electronic Dispenser Interface or Indoor Receipt Printer RS-232 Connector, JP11 (see Note)
D	Attach Screws Over Standoffs (6 places)
E	Satellite Ribbon Cable Connector for Satellites 5-8, JP1
F	Board Part Number and Revision Level Marking
G	Cut E1-E2 Trace for RS-232 (Do Not Cut for RS-422)
H	Tank Monitor RS-232/RS-422 Cable Connector, JP13
I	Tank Monitor Ribbon Cable Connector, JP14
J	Satellite Ribbon Cable Connector for Satellites 1-4, JP9
K	Satellite RS-422 Connector, JP1-JP8 (8 places)

**NOTE** The part number 221813 I/O Silver Board will work with both the Electronic Dispenser Interface and the Indoor Receipt Printer. The 203610 or 203629 I/O Silver Board will work with the Indoor Receipt Printer, but not the Electronic Dispenser Interface.

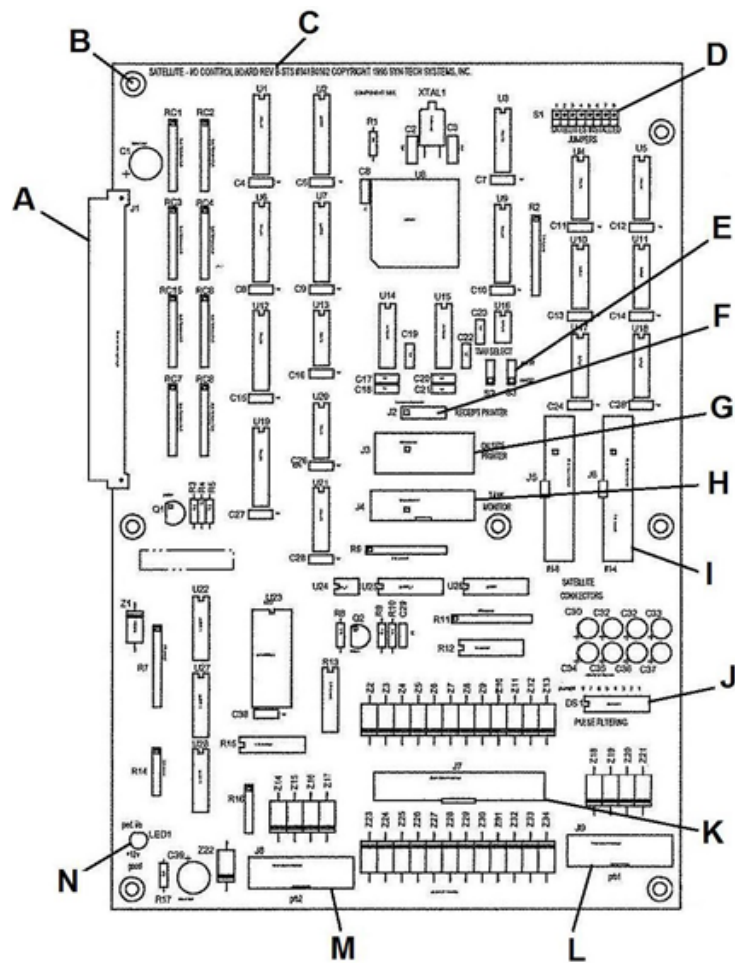
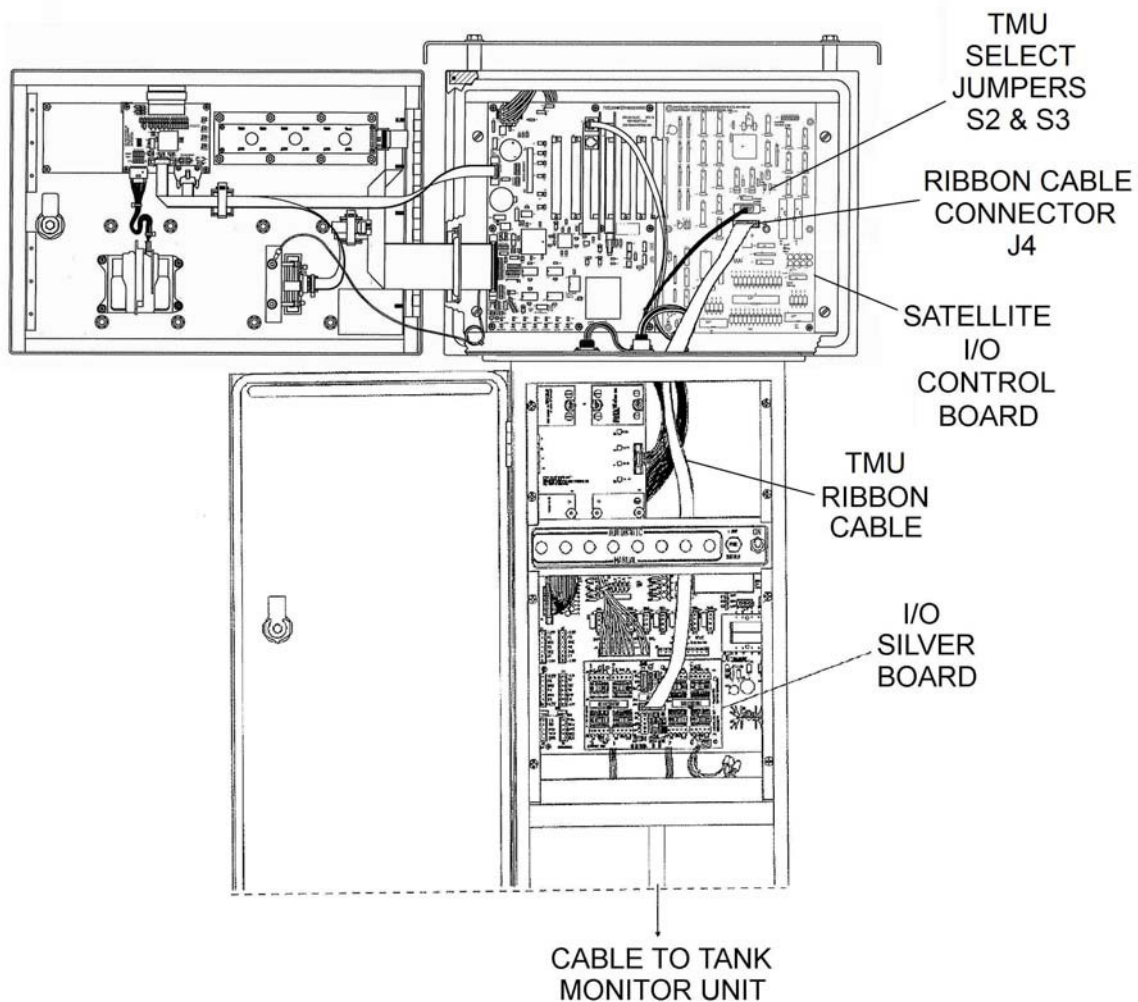


Figure 34 Satellite I/O Control Board

Index	Description	Index	Description
A	MAINBOARD CONNECTOR (J1)	H	TANK MONITOR (J4)
B	Attach Screws (7 places)	I	SATELLITE CONNECTORS (J5/J6)
C	Board Revision Level	J	PULSE FILTERING (DS1)
D	SATELLITES INSTALLED JUMPERS (S1)	K	Ribbon cable to Pedestal I/O Board (J7)
E	TMU SELECT JUMPERS (S2/S3)	L	Ribbon cable to Relay Assy 1 (PRB1)
F	RECEIPT PRINTER (J2)	M	Ribbon cable to Relay Assy 2 (PRB2)
G	ON SITE PRINTER (J3)	N	+12V GOOD (LED1)



**Figure 35 Install Tank Monitor Interface Kit**

Tank monitors use differing connectors. Some receive inputs through a DB25 connector, some receive inputs through a DB9 serial connector, and others use RJ-11 or RJ-45 connectors. Some tank monitors have a built-in RS-232 connection. Others require the purchase of an RS-232 option.

If communications are not achieved after making these connections, try reversing transmit and receive connections.

Wireless communications are possible via a wireless TMU Kit (part ID 191F0223-10).

Perform the following to make the Tank Monitor Interface:

**NOTE** If an RS-232 cable is used, the circuit board trace between E1 and E2 at the bottom of the I/O Silver Board must be cut to create an opening. If RS-422 cable is used, the circuit board trace between E2 and E1 at the bottom of the I/O Silver Board must be intact.

1. In the FMU upper cabinet, locate the Satellite I/O Control Board and install two TMU SELECT jumpers on positions S2 and S3. Positions are dependent upon

the use of RS-232 (upper two pins) or RS-422 (lower two pins) as the means of communication.

2. Connect ribbon cable (201839) between J4 on the Satellite I/O Control Board and JP14 on the I/O Silver Board noted below.

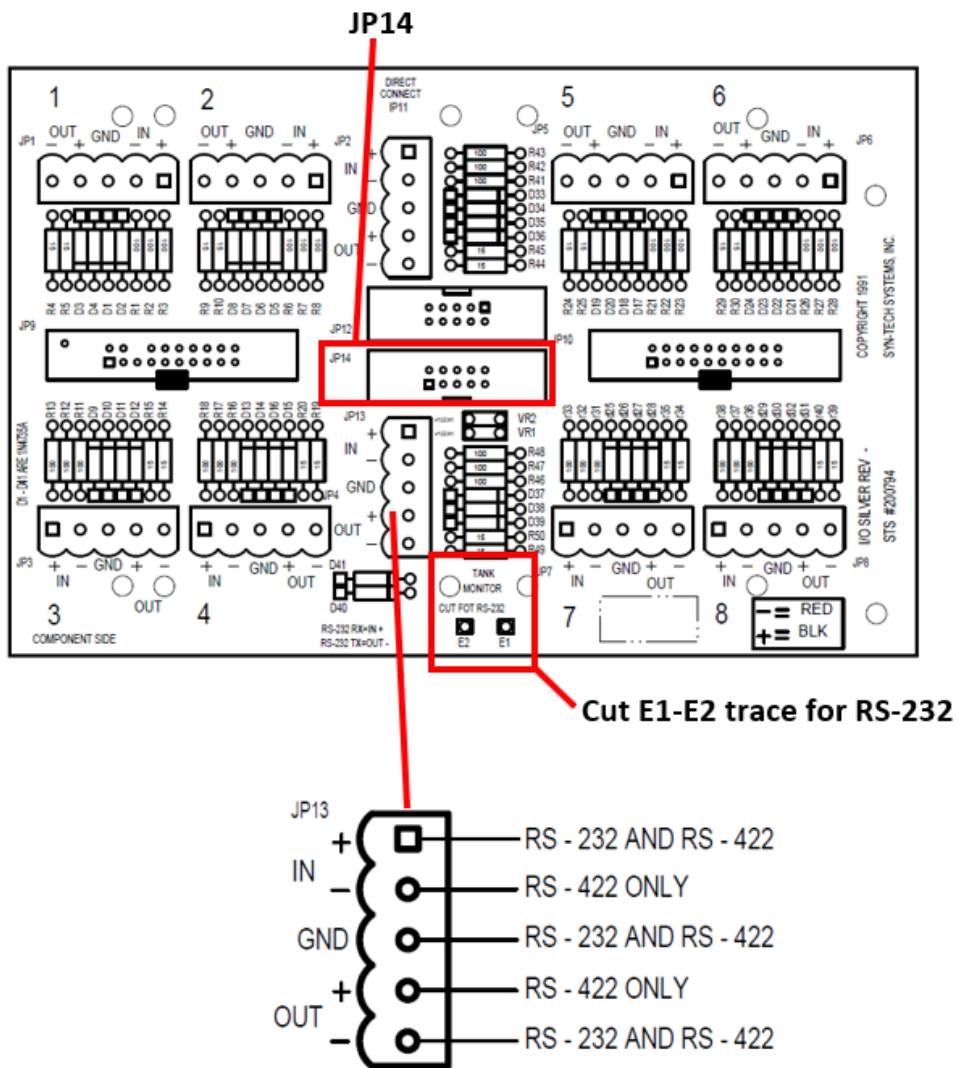


Figure 36 I/O Silver Board Connections for Tank Monitor Interface

3. Pull cable.
  - a. RS-232:
    - i. Pull an RS-232 cable from the tank monitor to the FMU. If pulled in a conduit with other low voltage cables, shield the cable.
    - ii. At the FMU, connect the cable to pins 1 (IN+), 3 (GND) and 5 (OUT-). Note the color coding to correctly match the connections to the tank monitor.

- iii. At the tank monitor the appropriate connector must be installed to make the connection. The conductor routed from pin 1 should connect to transmit (TX). The conductor from pin 3 should connect to ground (GND). The conductor from pin 5 should connect to receive (RX).

b. RS-422:

- i. Pull an RS-422 cable from the tank monitor to the FMU. If pulled in a conduit with other low voltage cables, it is recommended the cable be shielded.

**NOTE** The GND pin is for connection of a cable drain. It is connected only on one end (either end). The other end is bent back over the cable and taped (not connected).

- ii. At the FMU, connect the cable to pins 1 (IN+), 3 (GND), 4 (OUT+), and 5 (OUT-). Note the color coding to correctly match the connections to the tank monitor.
  - iii. At the tank monitor, install the appropriate connector. If the tank monitor will accept RS-422, the conductor routed from pin 1 should connect to OUT+. The conductor from pin 2 should connect to OUT-. The conductor from pin 3 should be bent back over the cable and taped. The conductor from pin 4 should connect to IN+. The conductor from pin 5 should connect to IN-. If the tank monitor will not accept RS-422, an RS422/232 converter will be needed. Follow the manufacturer's recommendations for attaching the converter. Product Bulletin 69 describes the connection of a Patton Electronics 22N.
4. Communication parameters (data bits, stop bits, parity, and baud rate) must match in both the FMU and Tank Monitor Unit (TMU) for successful communication and data transfer. Configure or verify the parameters. The parameters may be set with a laptop connection with the FMU and issuing FMU command '5A.' If you need assistance, contact Syntech Customer Satisfaction Center at 1 (800) 888-9136 x 2.

Next, unbox the upper cabinet assembly specific to the needs of the installation.:

- [FMU 25xx Plus & 35xx Plus - Unbox the New Legacy Upper Cabinet Assembly](#)
- [FMU 45xx - Unbox the FMLive Upper Cabinet Assembly](#)

## FMU 25xx Plus & 35xx Plus - Unbox the New Legacy Upper Cabinet Assembly

**NOTE** The box containing the FMU upper cabinet typically contains the manuals (in bubble-wrap below) and software CD/DVD. A protective plastic piece is placed over the contents before sealing the contents with spray foam. If several smaller items are included on an order, for example manuals, CD/DVD, an encoder, cables, etc., all these items may ship in a separate box and not with the upper cabinet.

1. Open the cabinet shipping carton.
2. Peel away the plastic to expose the components (Figure 37).



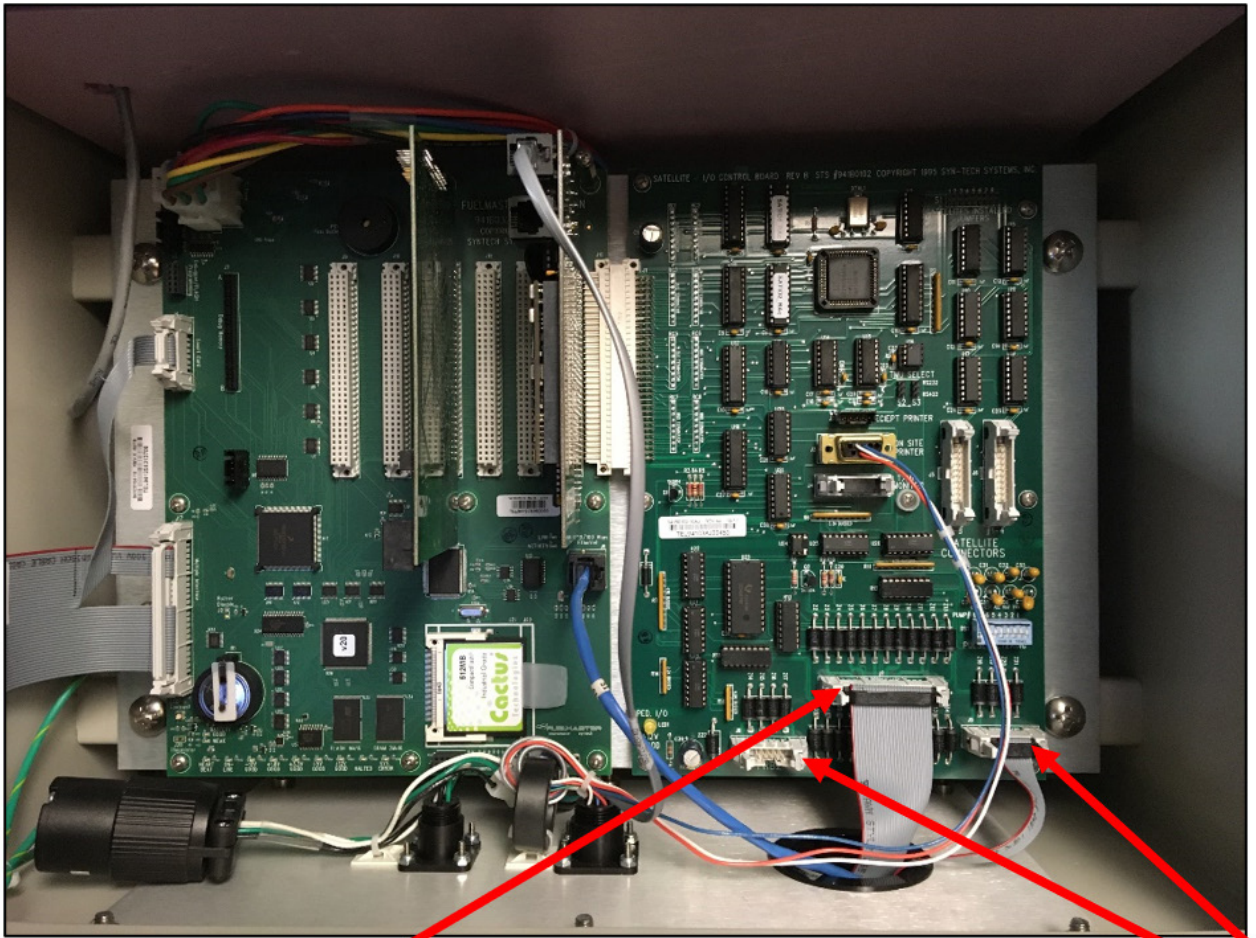
Figure 37 Assembly Protected by Plastic



Figure 38 Bubble-wrapped Manuals

### Install the Legacy Upper Cabinet Assembly

1. Lift the new Legacy Upper Cabinet Assembly onto the top of the pedestal with the door facing the front of the unit.
2. Ensure the gasket between the upper cabinet and pedestal is seated properly.
3. Carefully attach the assembly with six (6) of the bolts removed from the Legacy Upper Cabinet assembly.
4. Reconnect the cables from the Pedestal I/O Board to connector (J7).
5. Reconnect cables from the 50A Pump Relay Assembly or Dual Control Board to connectors PRB1 (J9 - Hoses 1-4) and PRB2 (J8 - Hoses 5-8) (Figure 39).



Pedestal I/O Board Connection (J7)

Pump Relay or Dual Control Board Connections (J8 & J9)

Figure 39 Reconnecting Cable Connections

## New Features

Note the physical differences between the old mainboard (941B0222) and the new mainboard (941B0322) (Figure 40):

- Fewer components on the board.
- Network interface (RJ-45 for Ethernet) is built into the mainboard.



Figure 40 Mainboard 941B0322A

### Cabinets with Wired Ethernet Surge Protection Kit (144F0249)

\*Wired Ethernet models only. If using the Ethernet Surge Kit Option, connections are as follows:

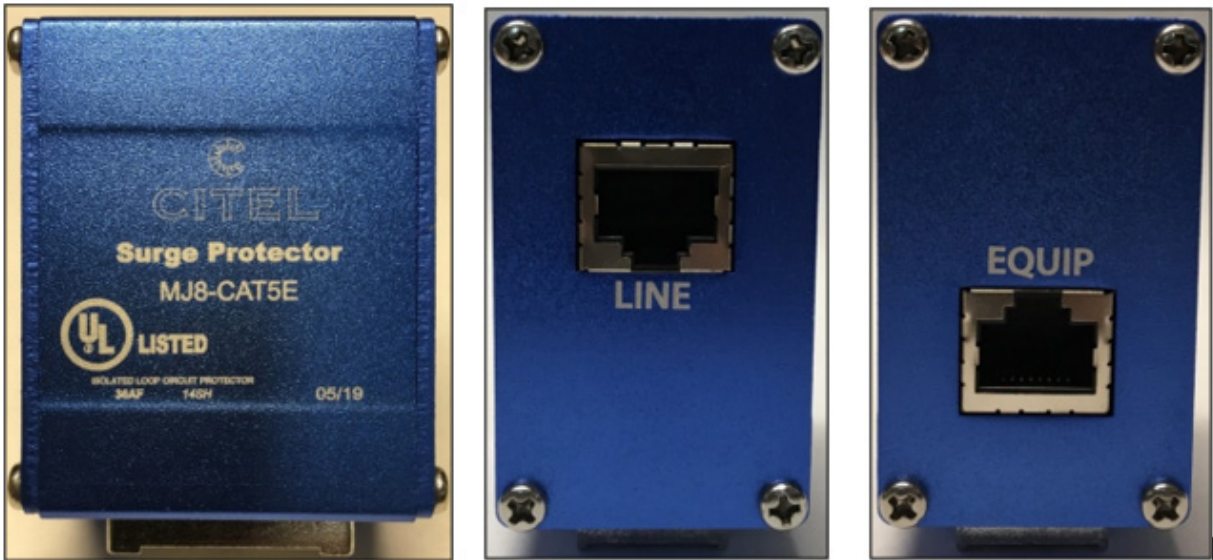
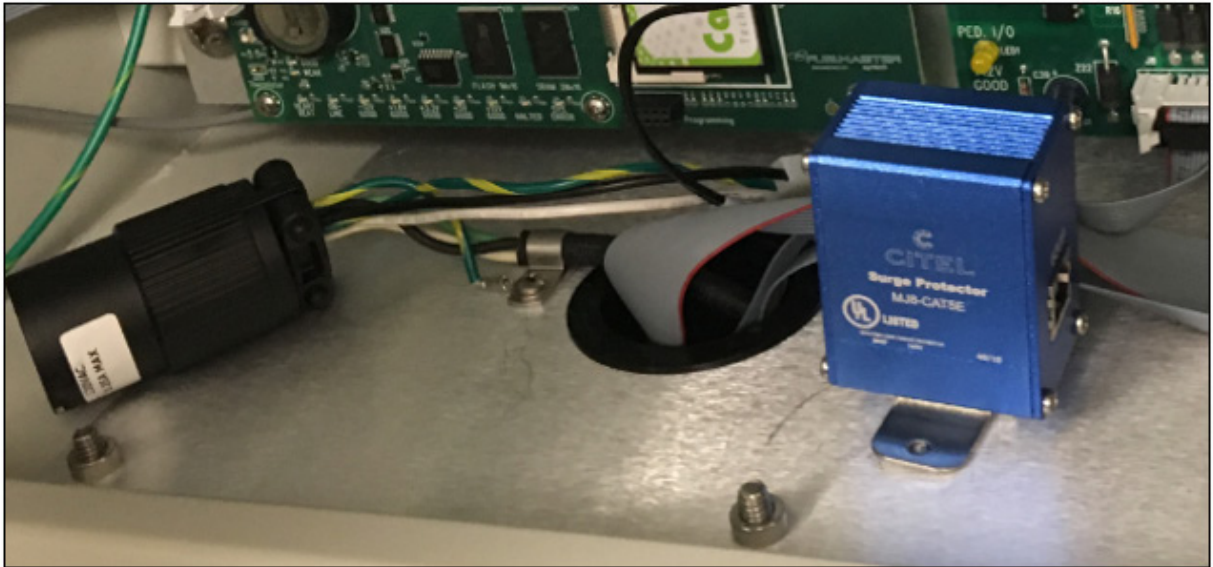


Figure 41 Ethernet Surge Protector Kit, CAT5e, 20V, UL, 497B (144F0249)

## Post Upgrade Initialization and Bootup Overview

Initially, the Boot Sequence for Legacy units with 941B0222 Mainboards is powered OFF with all required cables and harnesses connected and the Compact Flash (CF) card installed.

The CF card is the Legacy FMU's means of file storage. It acts much like a PC's hard drive. The most important contents stored on the Compact Flash (CF) card are:

- Log (audit) files
- Image files (Mainboard image, AIM firmware image, AIM encryption keys)
- AIM firmware image
- Mainboard image
- AIM encryption keys

## Installation of the Compact Flash (CF) Card

1. Verify power is OFF.
2. Carefully insert the compact flash (CF) card observing proper orientation.

**CAUTION** The CF card can only be inserted one way into the holder on the mainboard. If the CF card does not go in easily, do not force it! Verify you are inserting the CF card correctly and try again.

## Power ON / Startup

Apply Power to the FMU.

## FMU Prompts and Messaging During Boot-up

Once the Legacy FMU boot-up process begins, it runs through the FMU boot-up sequence displaying prompts and messages pertaining to configuration and installed peripherals, taking less than a second per peripheral. Below is an example of prompts and messages displayed during the Legacy FMU boot-up process and captured in FMU memory (Figure 42).

```

255 'FUELMaster FMU2500+ v4.09 (12/02/20)' 08/12 16:35
256 'NMI POWER ON RESET' 08/12 16:35
257 'COPYRIGHT 2020 SYNTECH SYSTEMS, INC.' 08/12 16:35
258 'TESTING WATCHDOG TIMER...' 08/12 16:35
259 'WATCHDOG TIMER TEST -- PASSED!' 08/12 16:35
260 'INITIALIZING UARTS...' 08/12 16:35
261 'NETWORK INTERFACE CARD DETECTED!' 08/12 16:35
262 'SECOND QUART BOARD DETECTED!' 08/12 16:35
263 'MULTI INPUT BOARD DETECTED!' 08/12 16:35
264 'COMPACT FLASH CARD DETECTED!' 08/12 16:35
265 'MAINBOARD CPLD VERSION: 2' 08/12 16:35
266 'INITIALIZING SECONDARY UARTS...' 08/12 16:35
267 'DETECTING ELECTRONIC PUMP CONTROLLER...' 08/12 16:35
268 'NO ELECTRONIC PUMP CONTROLLER DETECTED!' 08/12 16:35
269 'VEHICLE KEY SYSTEM' 08/12 16:36
270 'INITIALIZING RTIP NETWORK STACK...' 08/12 16:36
271 'DATA LOGGER BOARD DETECTED!' 08/12 16:36
272 'INITIALIZING COMPACT FLASH...' 08/12 16:36
273 'INITIALIZING VIRTUAL FILE SYSTEM...' 08/12 16:36
274 'INITIALIZING NETWORKING...' 08/12 16:36
275 'MODEM TYPE: ROCKWELL SOCKET MODEM 33600' 08/12 16:36
276 'CHECKING SYSTEM CONFIGURATION...' 08/12 16:36
277 '***** INITIALIZING AIM2 SYSTEM *****' 08/12 16:36
278 'ATTEMPTING TO RESET THE REMOTE FRB...' 08/12 16:36
279 'CHECKING FOR SATELLITES...' 08/12 16:36
280 'NO SATELLITES DETECTED!' 08/12 16:36
281 '** FuelMaster FUELS ACCOUNTING SYSTEM **' 08/12 16:36
282 '** INSERT KEY, HOLD 1 SECOND TO BEGIN **' 08/12 16:36
    
```

Figure 42 Prompts and Messages

**NOTE** Prompts and messaging may vary according to the options installed (Wired Ethernet, Cell Modem, Wi-Fi, Credit Card, etc.).

## The Main FMU Prompt

The customizable Main FMU Prompt appears (Figure 43) when the power-on/boot-up process is complete.

```

** FuelMaster FUELS ACCOUNTING SYSTEM **
PRESS ENTER For AIM USER ID THEN PRESS 1
    
```

Figure 43 Custom Main FMU Prompt

## FMU Power-on and Mainboard LED Status Check

### Mainboard

- On power-up, all LEDs flash momentarily except for the 'Halted' LED (D13).
- The 'Battery Good' LED (D4) should be lit.

- The voltage LEDs (D8 to D11) and the ‘Heartbeat’ LED (D6) all light-up solid Green.
- The ‘Heartbeat’ LED (D6) will start to flash after a few seconds.
- The FMU will go through its boot sequence and then display the main prompt.

LED	Status	Error Status
Heartbeat	Green-Blinking	Green-Blinking
Online	Green-Blinking	Green-Blinking
-12V	Green - Solid	Green - Solid
+1.8V	Green - Solid	Green - Solid
+3.3V	Green - Solid	Green - Solid
+5V	Green - Solid	Green - Solid
+12V	Green - Solid	Green - Solid
Halted	Off	Red - Solid (with Continuous Beep)
SYS.ERROR	Off	Red - Flashing (with possible FMU Reboots)

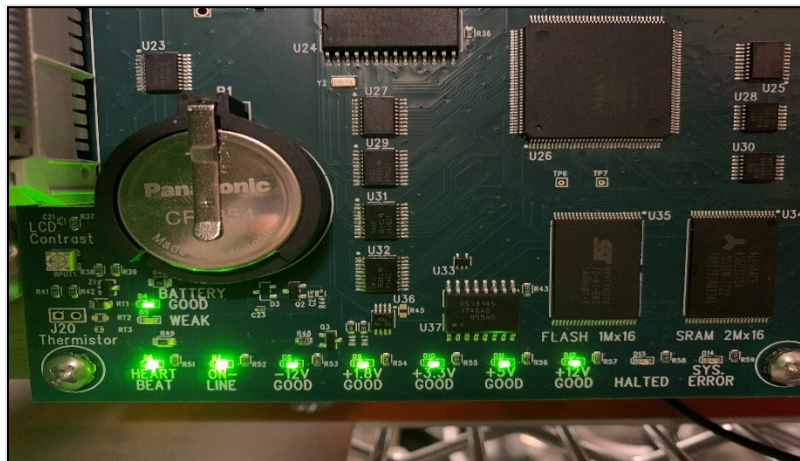


Figure 44 Mainboard LED Status

### FMU Configuration Alerts

If something goes wrong during FMU boot-up, the FMU responds with a message on the LCD display, an LED error condition on the mainboard, an audible alert signaling an error (constant beep), or any combination of these.

**IMPORTANT** If the ‘Halted’ LED is RED-SOLID, power off the FMU and contact Syntech Customer Satisfaction Center (CSC) immediately.

## Site Signature, System Type, and Test Fueling Transactions

***IMPORTANT*** The new FMU upper cabinet should have shipped with the unique Site Signature and System Type for the customer already configured. The FMU however, must be further configured (programmed) with specific site and fuel island configuration data (pumps, hoses, products, etc.) for the upgraded site before fueling transactions can be authorized and fuel dispensed.

Refer to the FMU User Manual (FM-028\_FMPlus\_User\_Manual\_v5.2.pdf) for the procedure on how to upload site configuration data to the FMU. When this step is complete, run test transactions to verify proper FMU operation.

## FMU 45xx - Unbox the FMLive Upper Cabinet Assembly

**CAUTION** The Supercap Assembly is shipped uninstalled with the cabinet and encased in bubble wrap for protection. Do **NOT** apply power to the FMU prior to installing the Supercap Assembly as it will damage the EAPro Assembly.

1. Open the cabinet shipping carton.
2. Peel away the foam to expose the Supercap components. The Supercap assembly is secured to the face of the door by the shipping foam (Figure 45).



Figure 45 Assembly Protected by Shipping Foam



Figure 46 Bubble-wrapped Supercap Assembly

3. Remove the bubble-wrapped Supercap assembly (Figure 46), and set in a safe place.

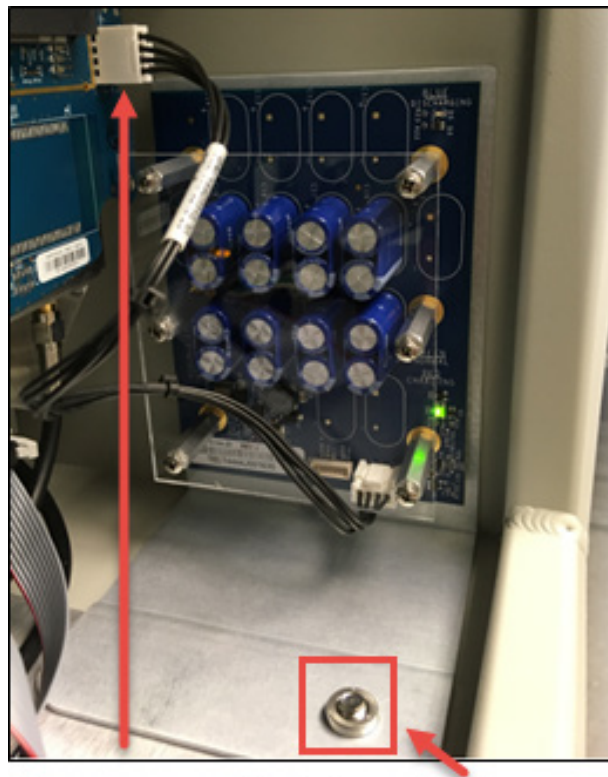
### Install the FMLive Upper Cabinet Assembly

1. Lift the FMLive Upper Cabinet Assembly onto the top of the pedestal with the door facing the front of the unit.
2. Ensure the gasket between the upper cabinet and pedestal is seated properly.
3. Carefully attach the assembly with five (5) of the bolts removed from the Legacy Upper Cabinet assembly.

**IMPORTANT** A slightly longer bolt is used for the Supercap installation in the far-right front position (circled below). This bolt will hold the Supercap assembly in place (Figure 47).

**CAUTION** Never connect the Supercap to the EAPro assembly while the FMU is powered on and power is supplied to the EAPro. This may damage the EAPro assembly, Supercap, or both. If you must disconnect the Supercap from the EAPro, disconnect the Supercap only after FMU power is OFF and the Supercap has completely discharged. This can take up to four (4) minutes.

4. Install the bolt to secure the Supercap to the cabinet.
5. Connect the Supercap cable (144F0219-20) to the EAPro assembly (connector J30) (Figure 47). The other end of the cable should already be connected to the Supercap (connector J2).

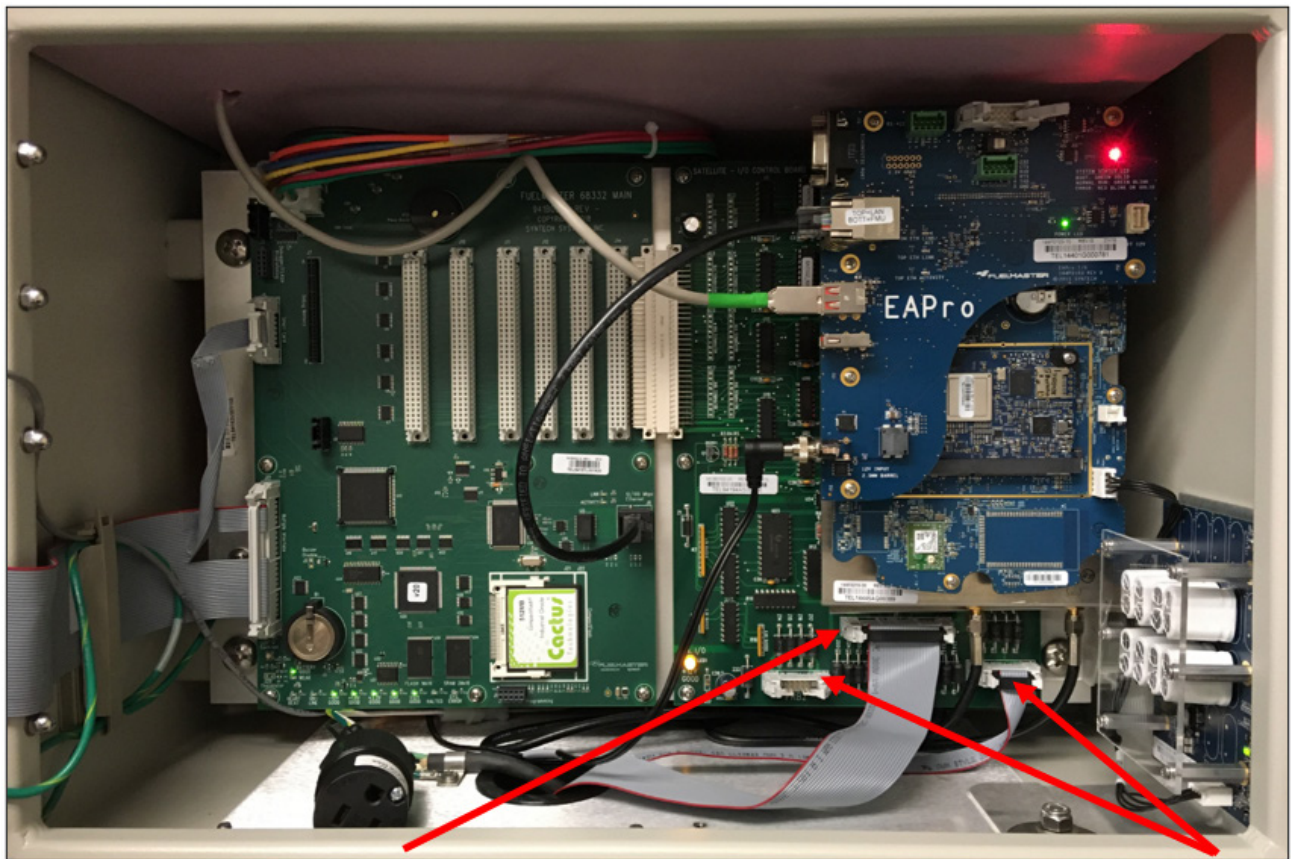


**Supercap Cable Bolt**

**Figure 47 Supercap Installation**

6. Connect the power harness barrel connector that feeds power to the upper cabinet.
7. Reconnect the cables from the Pedestal I/O Board to connector (J7) (Figure 48).
8. Reconnect cables from the 50A Pump Relay Assembly or Dual Control Board to connectors PRB1 (J9 - Hoses 1-4) and PRB2 (J8 - Hoses 5-8).

**NOTE** FMU Satellites and transaction printing are not supported by FMLive systems. Therefore, these cables will not be re-connected.



Pedestal I/O Board Connection (J7)

Pump Relay or Dual Control Board Connections (J8 & J9)

**Figure 48 Reconnecting Cable Connections**

## Cabinets with Wired Ethernet Surge Protection Kit (144F0249)

\*Wired Ethernet models only.

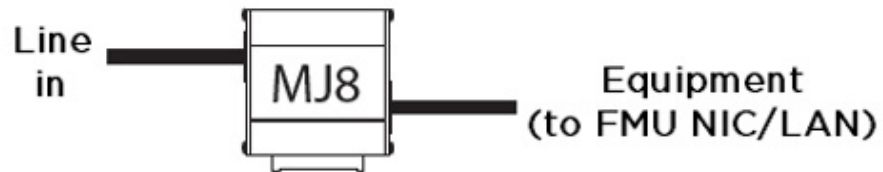
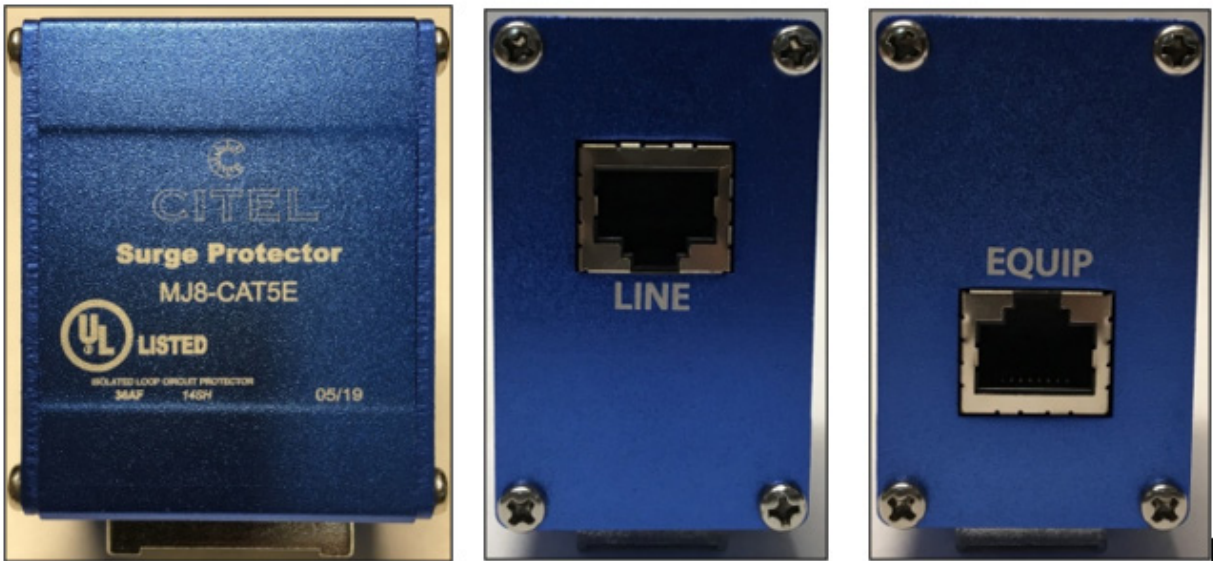
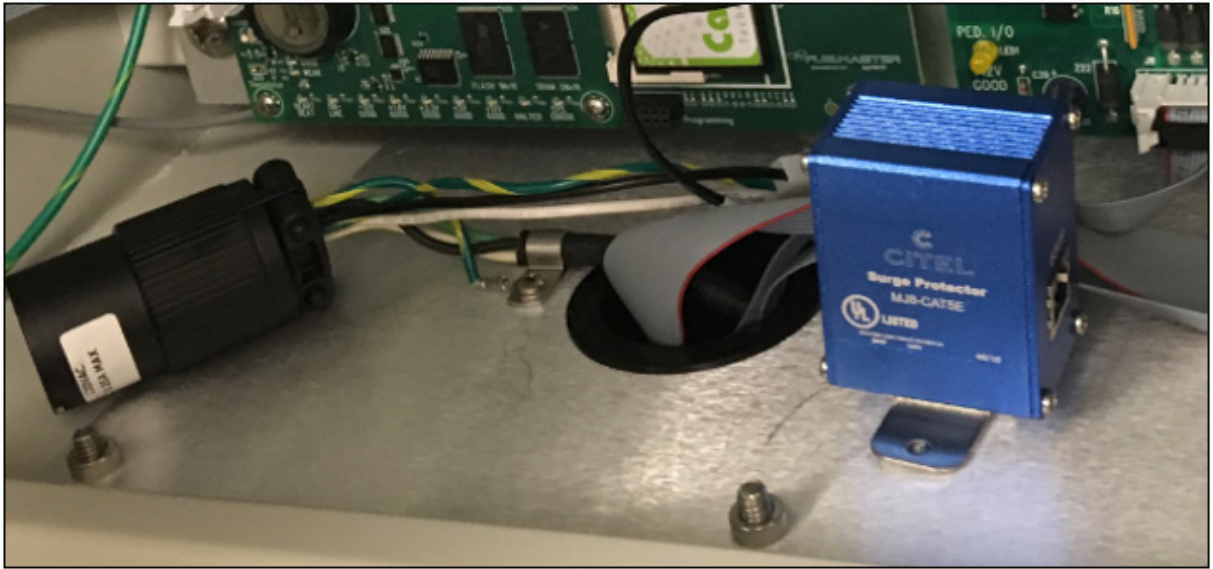


Figure 49 Ethernet Surge Protector Kit, CAT5e, 20V, UL, 497B (144F0249)

### EAPro Board Connections

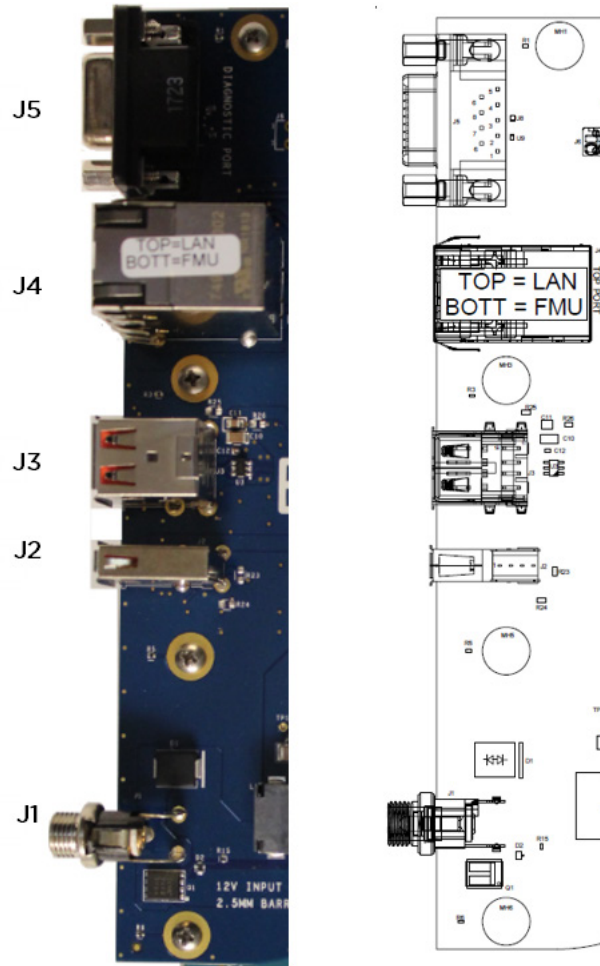


Figure 50 EAPro Left-side Top to Bottom Detail

### EAPro Board Connections

Designation	Connection	Comments
J5	Diagnostic Port	Syntech usage only
J4	Ethernet	Top = LAN; Bottom = FMU mainboard
J3	USB	
J2	USB	<i>If using AIM: AIM External Radio Module (ERM)</i>
J1	EAPro Power	12Volt 3Amp DC Supply (fed from the Power Management Board)

## Post Upgrade Initialization and Registration Overview

Initially, the Boot Sequence for FMLive units with 941B0322A Mainboards is powered OFF with all required cables and harnesses connected.

Much like a PC's hard drive, the **microSD (uSD) card** (Figure 48) is the primary boot memory and storage for the EAPro.



Figure 51 MicroSD (uSD) Card

The most important contents of the microSD card are:

- Operating System (Syntux)
- Certificates for authorization with Syntech servers
- Attributes files for networking configuration
- Transaction data
- Log (audit) files
- The FMLive unit code
- AIM firmware image
- Mainboard image
- AIM encryption keys

**IMPORTANT** Every microSD card is uniquely programmed for a specific customer/account/site/unit. You cannot swap the microSD card to another FMLive FMU without causing operational issues on that FMU.

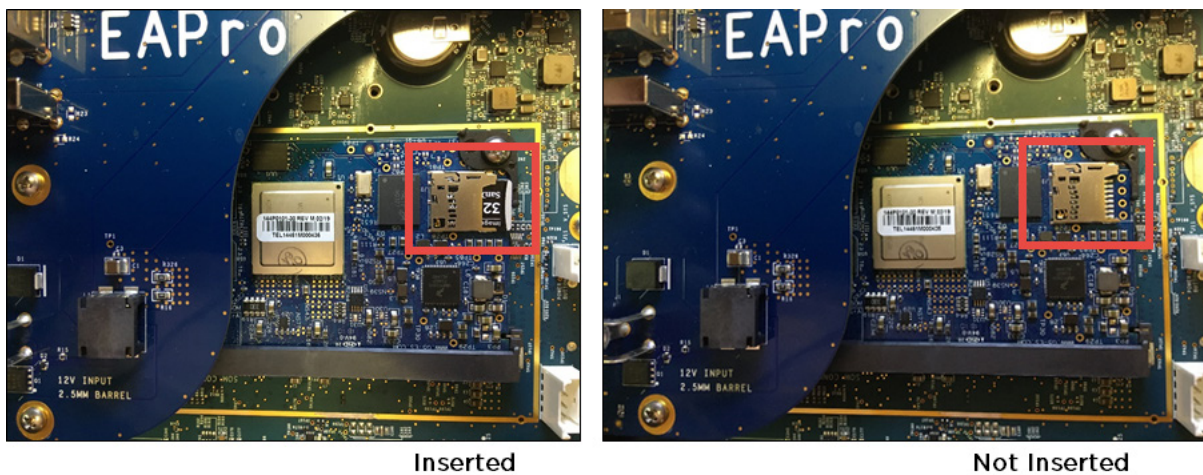


Figure 52 MicroSD Card

The microSD card comes pre-installed in the EAPro Assembly. In the case where a site has not been chosen (site: 'TBD'), Syntech will ship an FMLive FMU without a microSD card installed (typically per the installer's instructions). Once the site details have been provided, Syntech will then program and ship the microSD card separately.

The microSD card must be installed for proper FMU operation, initialization, and registration.

Care must be taken during installation as the microSD card is delicate to handle. Also, the microSD card can only be inserted one way. If the card is not going in easily, do not force it! Verify you are inserting the microSD card correctly and try again.

Figure 52 shows the microSD card inserted and not inserted on the EAPro assembly.

### Install the MicroSD Card

1. Verify the power is OFF.
2. Carefully unscrew the Phillips screw, and remove the locking lever, setting the screwdriver and screw in a safe place (Figure 53).

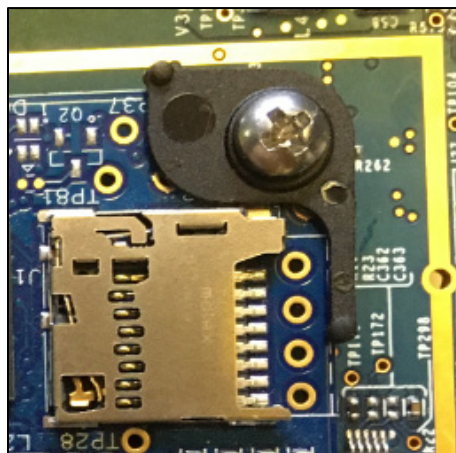


Figure 53 Screw and Locking Lever

3. Insert the microSD card observing proper orientation (Figure 54).

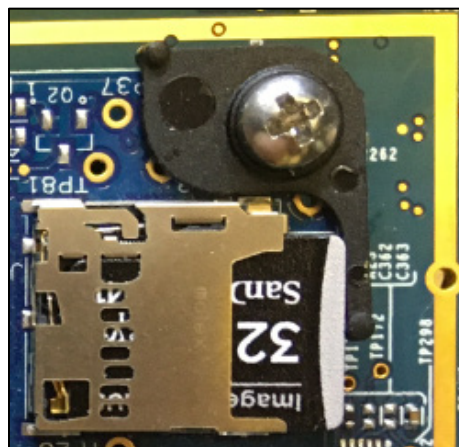


Figure 54 MicroSD Card Inserted

4. Re-install the Phillips screw and locking lever as shown. Installed properly, the lever should not allow the SD card to come out or be removed.

## Power ON / Startup Sequence

1. Apply Power. There is an approximately 3-5 second delay before power is supplied to the EAPro and the mainboard.
2. Check the Mainboard for the following:
  - All LEDs Flash except the 'Halted' LED (D13).
  - The 'Battery Good' LED (D4) should be lit.
  - The 'voltage' LEDs (D8 to D11) and the 'Heartbeat' LED (D6) all light-up solid Green.
  - The 'Heartbeat' LED (D6) will start to flash after a few seconds.
  - The FMU will go through its boot sequence and then display the main prompt unless it needs configuration information.
  - If configuration information has not been downloaded, the FMU will beep periodically and display the message, "Requesting Configuration" until it receives the information.
3. Check the Supercap for the following:
  - LED (D4) turns red (Charging) when power is applied.
  - LED (D4) will turn green (Normal) after a minute or two indicating the Supercap is charged.
4. Check the EAPro for the following:
  - LED (D17 - System Status) will be solid green during the boot process.
  - LED (D12 - Power LED) will also be green.
  - LED (D17) will start to blink when the EAPro has completed the boot cycle.
  - LED (D16 - Bottom ETH LINK / ACT) should start to blink indicating there is successful communication with the mainboard.
5. Check the Cell Modem for the following:
  - If a cell modem is installed, LED (D16) will double-blink slowly, indicating it has a cell signal/link.
  - Verizon Network:
    - Connected: Blink cycle is ON 1 second, OFF 1 second.
    - Not Connected: Blink cycle is ON 1 second, OFF 9 seconds.

## Power OFF / Shutdown Sequence

1. Power down the FMU.

2. Check the Supercap for the following:
  - LED (D5 - Discharging) will turn Blue indicating it is discharging and the EAPro will start the shut-down sequence.
  - LED (D4 - Normal / Charging) will go out completely when the EAPro is shut down and all power is expended from the Supercap.
3. Check the EAPro for the following during power-down:
  - LED (D12- Power LED) will go out shortly after power is removed.
  - LED (D16 - Bottom ETH LINK / ACT) will continue to blink until it is shut down, then it will be solid red until the Supercap side discharges completely.

**IMPORTANT** If you must disconnect the Supercap from the EAPro assembly, disconnect the Supercap only after FMU power is OFF and the Supercap has completely discharged. Otherwise, you will damage the Supercap and EAPro assembly.

## FMU Prompts and Messaging During Boot-up

Once the FMLive boot-up process begins, it runs through the FMU initialization displaying prompts and messages pertaining to installed peripherals and configuration, taking less than one second per peripheral. Below is an example of prompts and messages displayed during the FMLive boot-up process and captured in FMU memory (Figure 55).

```

1.  ` FMLive MAINBOARD      v7.94.0           ` 12/15 12:29:14
2.  ` NMI POWER ON RESET    ` 12/15 12:29:14
3.  ` BUILT ON: 2020.11.20-112524 ` 12/15 12:29:15
4.  ` COPYRIGHT 2020 SYNTECH SYSTEMS INC ` 12/15 12:29:16
5.  ` TESTING WATCHDOG TIMER. . . ` 12/15 12:29:17
6.  ` WATCHDOG TIMER TEST - PASSED! ` 12/15 12:29:19
7.  ` MODEM TYPE: NONE DETECTED! ` 12/15 12:29:20
8.  ` MAINBOARD LAN INTERFACE DETECTED! ` 12/15 12:29:21
9.  ` MULTI INPUT BOARD DETECTED! ` 12/15 12:29:22
10. ` COMPACT FLASH CARD DETECTED! ` 12/15 12:29:23
11. ` INITIALIZING RTIP NETWORK STACK. . . ` 12/15 12:29:25
12. ` INITIALIZING COMPACT FLASH . . . ` 12/15 12:29:26
13. ` INITIALIZING VIRTUAL FILE SYSTEM . . . ` 12/15 12:29:37
14. ` INITIALIZING NETWORKING . . . ` 12/15 12:29:42
15. ` CHECKING SYSTEM CONFIGURATION. . . ` 12/15 12:29:46
16. ` CHECKING SYSTEM CONFIGURATION. . . ` 12/15 12:29:53
17. ` ** <CUSTOM HOME PROMPT (LINE 1) DISPLAYED> ` 12/15 12:29:53
18. ` ** <CUSTOM HOME PROMPT (LINE 2) DISPLAYED> ` 12/15 12:29:53

```

**Figure 55 Prompts and Messages**

**NOTE** Prompts and messaging may vary according to the options installed (Wired Ethernet, Cell Modem, Wi-Fi, Credit Card, etc.).

## Custom Home Prompt

The customizable **Custom Home Prompt** appears when the process is complete and registration is successful (Figure 56).

```

** FuelMaster FUELS ACCOUNTING SYSTEM **
PRESS ENTER For AIM USER ID THEN PRESS 1
  
```

Figure 56 Custom Home Prompt

## Configuration and Registration Alerts

During boot-up, if there is a delay or error in reading the FMU configuration or if registration fails, messages like the following will be displayed (Figure 57).

```

571' ** FuelMaster FUELS ACCOUNTING SYSTEM **' 12/10 16:15:06
572' ***   WAITING FOR CONFIGURATION   ***' 12/10 16:15:06
573'   UNEXPECTED ERROR AT LINE 09279 IN   ' 12/10 16:15:06
574'           cfg.c                       ' 12/10 16:15:06
575' ** FuelMaster FUELS ACCOUNTING SYSTEM **' 12/10 16:15:20
576'           REQUESTING CONFIG...        ' 12/10 16:15:20
577' ** FuelMaster FUELS ACCOUNTING SYSTEM **' 12/10 16:15:34
578' ***   WAITING FOR CONFIGURATION   ***' 12/10 16:15:34
579'   UNEXPECTED ERROR AT LINE 09279 IN   ' 12/10 18:50:28
           cfg.c                           ' 12/10 18:50:28
  
```

Figure 57 Configuration and Registration Alerts

**NOTE** The FMU attempts to retrieve the configuration every couple of seconds, so these messages should only appear momentarily. If the FMU cannot retrieve the configuration, verify the short Ethernet cable is plugged in securely between the EAPro and the mainboard.

## New Features

### FMLive Upper Cabinet Board Assembly Identification

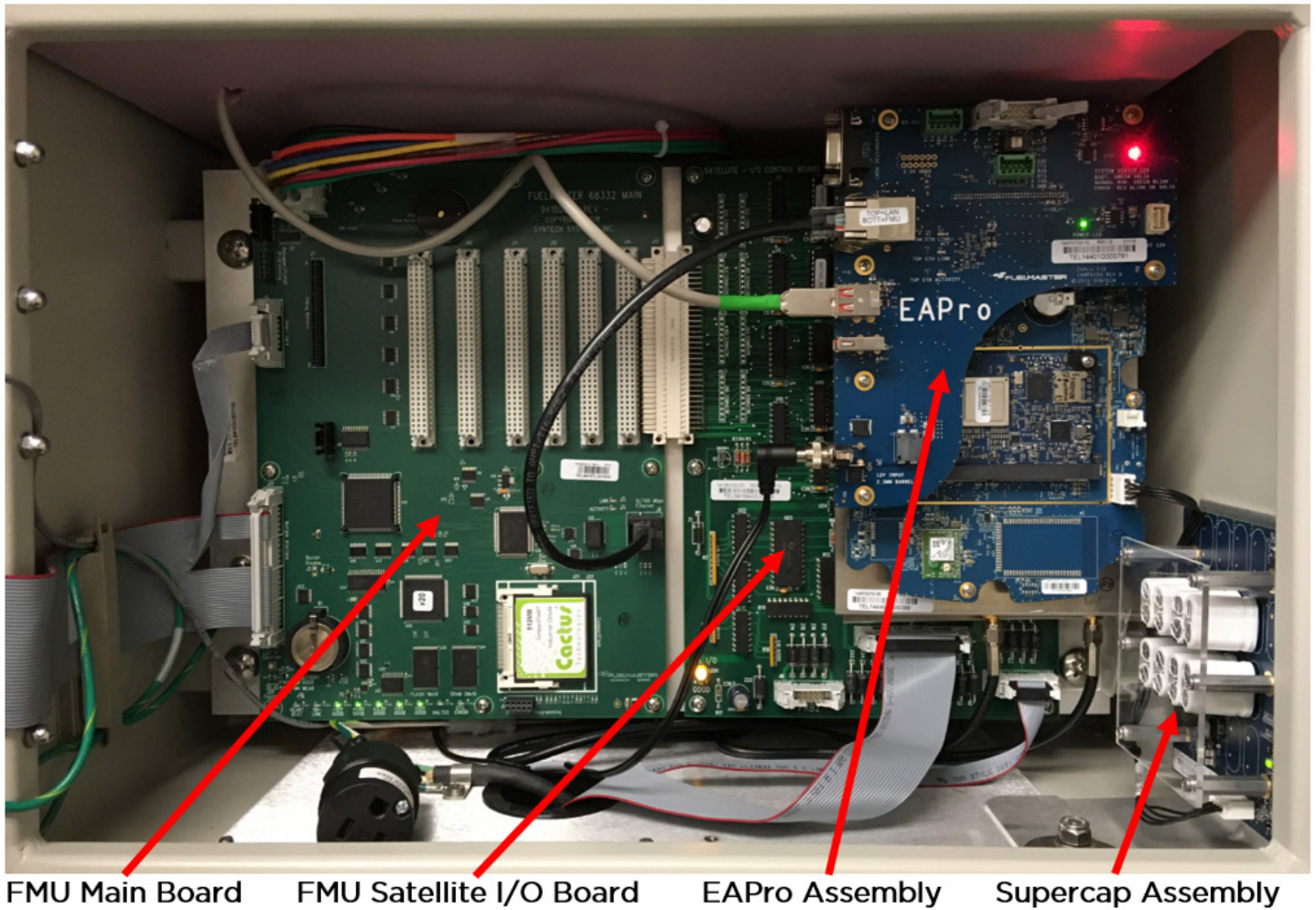


Figure 58 FMLive Upper Cabinet Board Assembly Identification

## Differences between FMU Mainboard 941B0222 and 941B0322 (new)

- Fewer components on board
- Network interface (RJ-45 for Ethernet) is built into the Mainboard

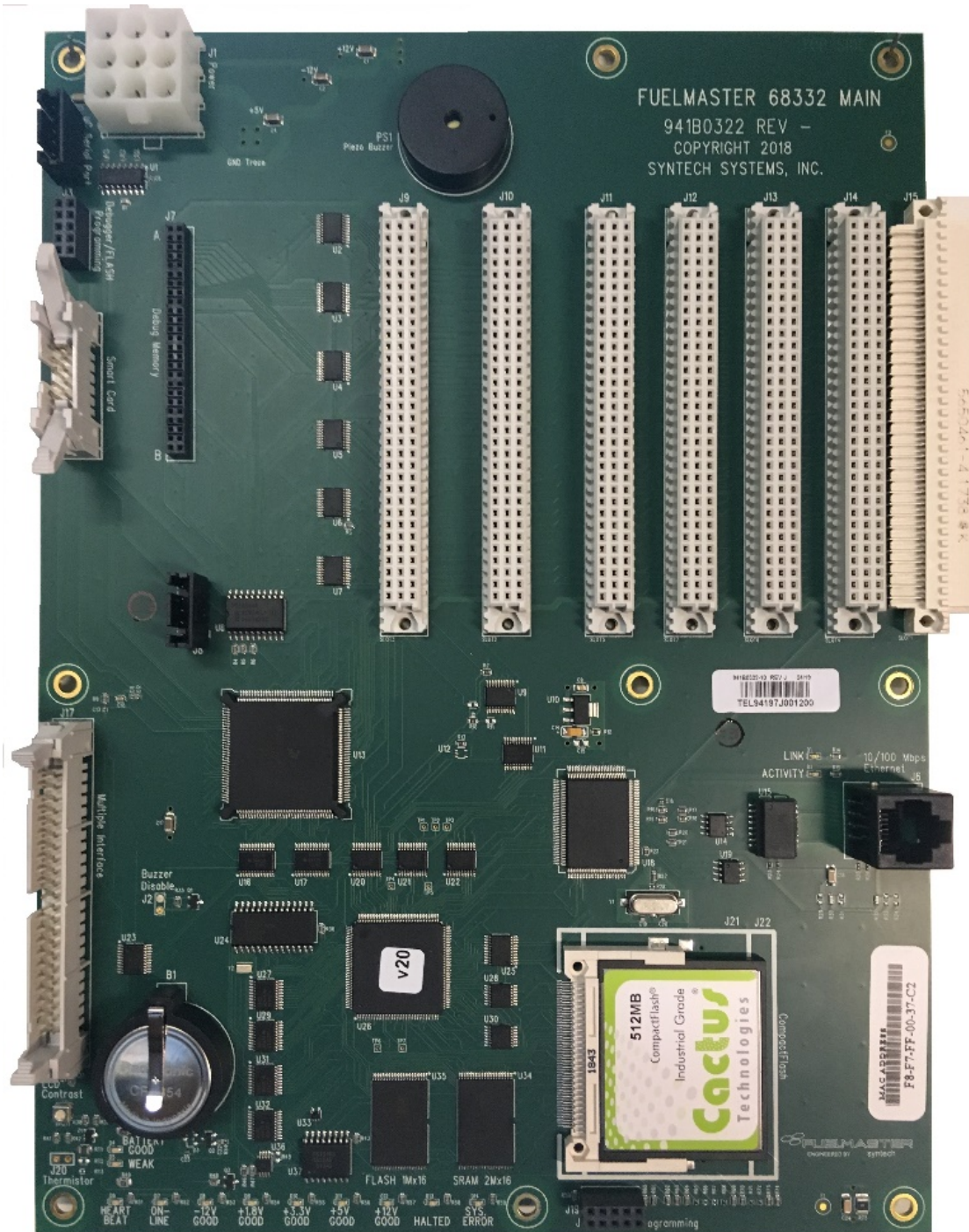


Figure 59 New Mainboard 941B0322A

## Differences between Satellite I/O Board 941B0102B, 941B0102F and 941B0102D (new)

- Fewer components on the board
- TMU connections are made directly to the EAPro assembly

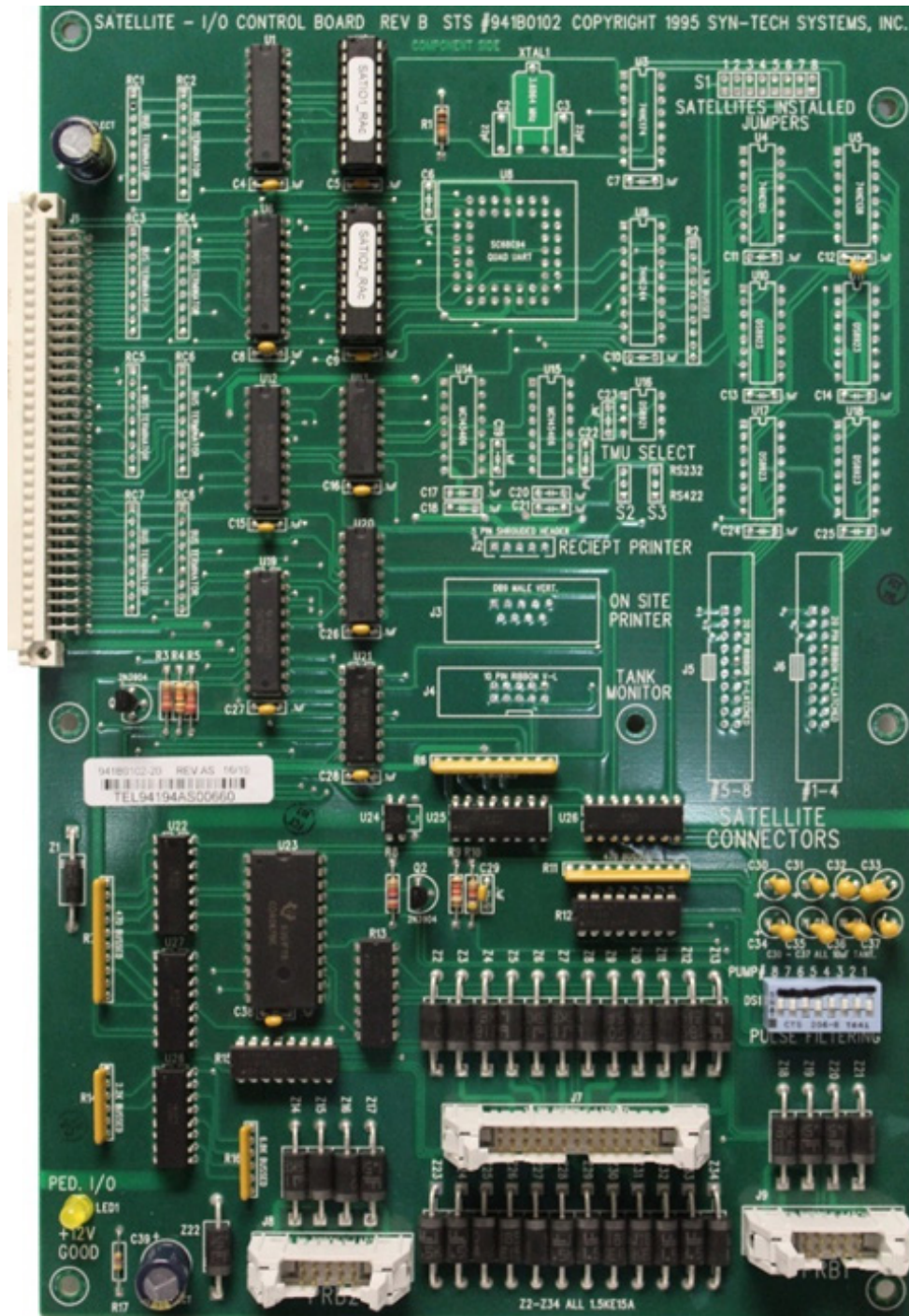


Figure 60 New Satellite I/O Board 941B0102D

## EAPro Assembly

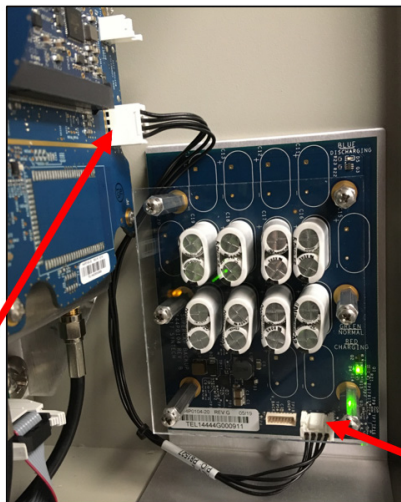
The Embedded Applications Processor (EAPro) Assembly is the heart of the FMLive system.



Figure 61 EAPro Assembly

## Supercap Assembly with Cable Connections

The Supercap's primary function is to provide backup power to the EAPro exclusively. In the event of a power-fail, the EAPro relies on the Supercap (instead of a battery back-up option) to provide orderly shutdown and to save transaction data.



EAPro connector J30

Supercap connector J2

Figure 62 Supercap Assembly with Connections

## TMU Connections to the EAPro Assembly

In the FMLive unit, the Tank Monitor Unit (TMU/ATG) connector is at the top of the EAPro board.

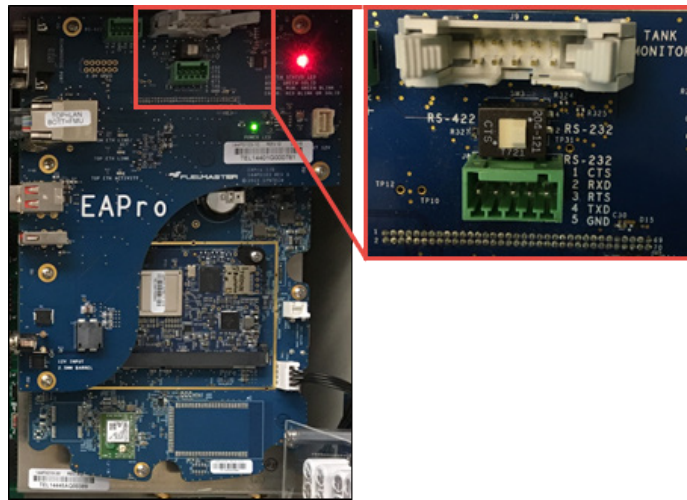


Figure 63 TMU Connector Magnified

### Connect the TMU Cable

1. Verify the switch underneath the TMU connector is slid to the right (Figure 63), selecting RS-232.
2. Connect the TMU cable (Figure 64).

**NOTE** The connector is keyed (tabbed), so it can only be installed in one direction. If there is resistance, do **NOT** force the connector. Verify the key is oriented correctly and try again.



Figure 64 TMU Cable Connected to EAPro

## Upgrade to Wired Ethernet - Part Numbers

<b>Part #</b>	<b>Description</b>
UPG4610	FMLIVE, UPGRADE, WIRED ETH, PROKEE, 2-4 HOSE
UPG4610-D5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE, DUAL CNTL, 5-8 HOSE
UPG4610-F5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE, 50A, 5-8 HOSE
UPG4615	FMLIVE, UPGRADE, WIRED ETH, PROKEE, AIM, 2-4 HOSE
UPG4615-D5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE, AIM, DUAL CNTL, 5-8 HOSE
UPG4615-F5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE, AIM, 50A, 5-8 HOSE
UPG4615-T	FMLIVE, UPGRADE, WIRED ETH, PROKEE, AIM, 2-4 HOSE, TAN
UPG4810	FMLIVE, UPGRADE, WIRED ETH, PROKEE/PROX, 2-4 HOSE
UPG4620-D5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/PROX, DUAL CNTL, 5-8 HOSE
UPG4620-F5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/PROX, 50A, 5-8 HOSE
UPG4625	FMLIVE, UPGRADE, WIRED ETH, PROKEE/PROX, AIM, 2-4 HOSE
UPG4625-D5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/PROX, AIM, DUAL CNTL, 5-8 HOSE
UPG4625-F5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/PROX, AIM, 50A, 5-8 HOSE
UPG4625-T	FMLIVE, UPGRADE, WIRED ETH, PROKEE/PROX, AIM, 2-4 HOSE, TAN
UPG4630	FMLIVE, UPGRADE, WIRED ETH, PROKEE/MAGSTRIPE, 2-4 HOSE
UPG4630-D5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/MAGSTRIPE, DUAL CNTL, 5-8 HOSE
UPG4630-F5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/MAGSTRIPE, 50A, 5-8 HOSE
UPG4635	FMLIVE, UPGRADE, WIRED ETH, PROKEE/MAGSTRIPE, AIM, 2-4 HOSE
UPG4635-D5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/MAGSTRIPE, AIM, DUAL CNTL, 5-8 HOSE
UPG4635-F5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/MAGSTRIPE, AIM, 50A, 5-8 HOSE
UPG4640	FMLIVE, UPGRADE, WIRED ETH, PROKEE/EMV, 2-4 HOSE
UPG4640-D5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/EMV, DUAL CNTL, 5-8 HOSE
UPG4640-F5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/EMV, 50A, 5-8 HOSE
UPG4645	FMLIVE, UPGRADE, WIRED ETH, PROKEE/EMV, AIM, 2-4 HOSE
UPG4645-D5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/EMV, AIM, DUAL CNTL, 5-8 HOSE
UPG4645-F5+	FMLIVE, UPGRADE, WIRED ETH, PROKEE/EMV, AIM, 50A, 5-8 HOSE

## Upgrade to Cellular - Part Numbers

<b>Part #</b>	<b>Description</b>
UPG4710	FMLIVE, UPGRADE, CELLULAR, PROKEE, 2-4 HOSE
UPG4710-D5+	FMLIVE, UPGRADE, CELLULAR, PROKEE, DUAL CNTL, 5-8 HOSE
UPG4710-F5+	FMLIVE, UPGRADE, CELLULAR, PROKEE, 50A, 5-8 HOSE
UPG4710-T	FMLIVE, UPGRADE, CELLULAR, PROKEE, TAN
UPG4715	FMLIVE, UPGRADE, CELLULAR, PROKEE, AIM, 2-4 HOSE
UPG4715-D5+	FMLIVE, UPGRADE, CELLULAR, PROKEE, AIM, DUAL CNTL, 5-8 HOSE
UPG4715-F5+	FMLIVE, UPGRADE, CELLULAR, PROKEE, AIM, 50A, 5-8 HOSE
UPG4715-T	FMLIVE, UPGRADE, CELLULAR, PROKEE, AIM, TAN
UPG4720	FMLIVE, UPGRADE, CELLULAR, PROKEE/PROX, 2-4 HOSE
UPG4720-D5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/PROX, DUAL CNTL, 5-8 HOSE
UPG4720-F5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/PROX, 50A, 5-8 HOSE
UPG4725	FMLIVE, UPGRADE, CELLULAR, PROKEE/PROX, AIM, 2-4 HOSE
UPG4725-D5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/PROX, AIM, DUAL CNTL, 5-8 HOSE
UPG4725-F5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/PROX, AIM, 50A, 5-8 HOSE
UPG4730	FMLIVE, UPGRADE, CELLULAR, PROKEE/MAGSTRIPE, 2-4 HOSE
UPG4730-D5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/MAGSTRIPE, DUAL CNTL, 5-8 HOSE
UPG4730-F5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/MAGSTRIPE, 50A, 5-8 HOSE
UPG4735	FMLIVE, UPGRADE, CELLULAR, PROKEE/MAGSTRIPE, AIM, 2-4 HOSE
UPG4735-D5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/MAGSTRIPE, AIM, DUAL CNTL, 5-8 HOSE
UPG4735-F5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/MAGSTRIPE, AIM, 50A, 5-8 HOSE
UPG4740	FMLIVE, UPGRADE, CELLULAR, PROKEE/EMV, 2-4 HOSE
UPG4740-D5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/EMV, DUAL CNTL, 5-8 HOSE
UPG4740-F5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/EMV, 50A, 5-8 HOSE
UPG4745	FMLIVE, UPGRADE, CELLULAR, PROKEE/EMV, AIM, 2-4 HOSE
UPG4745-D5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/EMV, AIM, DUAL CNTL, 5-8 HOSE
UPG4745-F5+	FMLIVE, UPGRADE, CELLULAR, PROKEE/EMV, AIM, 50A, 5-8 HOSE

## Upgrade to Wi-Fi - Part Numbers

<b>Part #</b>	<b>Description</b>
UPG4810	FMLIVE, UPGRADE, WI-FI, PROKEE, 2-4 HOSE
UPG4810-D5+	FMLIVE, UPGRADE, WI-FI, PROKEE, DUAL CNTL, 5-8 HOSE
UPG4810-F5+	FMLIVE, UPGRADE, WI-FI, PROKEE, 50A, 5-8 HOSE
UPG4815	FMLIVE, UPGRADE, WI-FI, PROKEE, AIM, 2-4 HOSE
UPG4815-D5+	FMLIVE, UPGRADE, WI-FI, PROKEE, AIM, DUAL CNTL, 5-8 HOSE
UPG4815-F5+	FMLIVE, UPGRADE, WI-FI, PROKEE, AIM, 50A, 5-8 HOSE
UPG4820	FMLIVE, UPGRADE, WI-FI, PROKEE/PROX, 2-4 HOSE
UPG4820-D5+	FMLIVE, UPGRADE, WI-FI, PROKEE/PROX, DUAL CNTL, 5-8 HOSE
UPG4820-F5+	FMLIVE, UPGRADE, WI-FI, PROKEE/PROX, 50A, 5-8 HOSE
UPG4825	FMLIVE, UPGRADE, WI-FI, PROKEE/PROX, AIM, 2-4 HOSE
UPG4825-D5+	FMLIVE, UPGRADE, WI-FI, PROKEE/PROX, AIM, DUAL CNTL, 5-8 HOSE
UPG4825-F5+	FMLIVE, UPGRADE, WI-FI, PROKEE/PROX, AIM, 50A, 5-8 HOSE
UPG4830	FMLIVE, UPGRADE, WI-FI, PROKEE/MAGSTRIPE, 2-4 HOSE
UPG4830-D5+	FMLIVE, UPGRADE, WI-FI, PROKEE/MAGSTRIPE, DUAL CNTL, 5-8 HOSE
UPG4830-F5+	FMLIVE, UPGRADE, WI-FI, PROKEE/MAGSTRIPE, 50A, 5-8 HOSE
UPG4835	FMLIVE, UPGRADE, WI-FI, PROKEE/MAGSTRIPE, AIM, 2-4 HOSE
UPG4835-D5+	FMLIVE, UPGRADE, WI-FI, PROKEE/MAGSTRIPE, AIM, DUAL CNTL, 5-8 HOSE
UPG4835-F5+	FMLIVE, UPGRADE, WI-FI, PROKEE/MAGSTRIPE, AIM, 50A, 5-8 HOSE
UPG4840	FMLIVE, UPGRADE, WI-FI, PROKEE/EMV, 2-4 HOSE
UPG4840-D5+	FMLIVE, UPGRADE, WI-FI, PROKEE/EMV, DUAL CNTL, 5-8 HOSE
UPG4840-F5+	FMLIVE, UPGRADE, WI-FI, PROKEE/EMV, 50A, 5-8 HOSE
UPG4845	FMLIVE, UPGRADE, WI-FI, PROKEE/EMV, AIM, 2-4 HOSE
UPG4845-D5+	FMLIVE, UPGRADE, WI-FI, PROKEE/EMV, AIM, DUAL CNTL, 5-8 HOSE
UPG4845-F5+	FMLIVE, UPGRADE, WI-FI, PROKEE/EMV, AIM, 50A, 5-8 HOSE

# Hold Harmless Agreement

To be completed when installing wireless networking equipment

TO: \_\_\_\_\_

SUBJECT: Potential Security Breaches Through Wireless Network Connections to FuelMaster

FuelMaster Fuel Management Units (FMUs) and software do not contain personal information subject to the Privacy Act of 1974. However, when added to a network, the FMU may provide a link to other resources which do contain personal or privileged information. Cable or fiber optic network connections are not easily accessible. Wireless networks operate on radio waves that can be intercepted by anyone with the right equipment and within range of the transmitter. Without proper wireless network security, outside users can access your network to attain such valuable information as social security numbers, credit card numbers, bank account numbers, and countless other private information sources stored on your network. If accessibility is achieved, outside users can access anything stored in your network, not just FuelMaster-related information.

Though the physical installation of the equipment may be accomplished by anybody with the knowledge and experience, the responsibility for the network, IP addresses, wireless components and devices, access points and network configuration rests entirely on the customer and, where applicable, his/her Information Technology (IT) person(s) or Network Administrator(s) for that site.

Syntech Systems, Inc., cannot emphasize enough the potential damage that may result from a breach in network security. When a wireless network connection to FuelMaster is established, Syntech Systems, Inc, cannot prevent accessibility by outside users. As such, this HOLD HARMLESS AGREEMENT is prepared to remove liability from Syntech Systems, Inc., for any breach of security resulting from the development of a wireless network connection to FuelMaster. Please acknowledge receipt and concurrence with the terms of this agreement by signing below.

**ACKNOWLEDGEMENT:**

I acknowledge receipt and concurrence with the terms of this agreement:

\_\_\_\_\_  
(Signature of Authorized Representative)