Site Preparation & Installation Guide

QT Petroleum on Demand (QTpod)

Model - M4000

Automated Fueling Terminal

Version 1.4a

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GENERAL INFORMATION

Mailing and Shipping Address:

QT Petroleum on Demand, LLC.
4909 Nautilus Ct. N., Suite 100
Boulder, CO 80301

Office Phone Number: (303) 444-3590
Fax Number: (303) 444-8736
Email: techsupport@qtpod.com

Office Hours: 7:30 AM to 5:30 PM (Mountain) MON - FRI

To assist you better and to make the customer service call as efficient and effective as possible, please have the following information ready:

Troubleshooting Background:

Try to provide a detailed description of the problem(s). Including:

1) Can the problem or issue be repeated?

2) When did the problem or issue occur (and for how long)?

3) Has any related equipment been re-configured or changed recently (especially since the initial installation of QTpod hardware)?

4) What was the recent weather activity in the area (possibility of power spikes, brownouts or related weather phenomena affecting your equipment)?

Expertise Available on Site:

If necessary, have a computer or maintenance support person available.

1) Sufficient time to follow our support staff from problem to resolution
(make appointments if necessary).

2) Depending on your warranty/service contract selections, the individual responsible for dealing with problems or issues related to QTpod software or hardware.

REPLACEMENT PARTS POLICY

If the problems or issues you are experiencing with your QTpod M4000 Automated Fuel Terminal require a permanent replacement of parts, the guidelines are as follows:

1) QTpod and the customer have discussed the issues and have mutually decided that a replacement module (or board) is required to keep the fuel terminal functioning while the original troubled module is returned, tested and then either repaired or scrapped at the QTpod facility.

2) The replacement modules will be shipped to your location as permanent replacements. These replacement modules are subject to having an invoice for the cost of the module shipped with them, and if the original is not returned within one week, you will be charged for the cost of the replacement module.

3) After the original module is fixed, QTpod will return it to our remanufactured parts pool.

RECOMMENDED PROCEDURES

Routinely review your transactions online to ensure that everything is operating normally and no suspect entries (several $0.00 sales?) are visible.

Never leave your terminal shut off (esp. line power on the terminal block, located in the pedestal of the fuel terminal) if, for any reason not related to repair or maintenance, it will not be used. Leaving the terminal power off will shut off the heaters and in inclement weather the terminal will not ward off condensation and / or possible corrosion.

Consider your QTpod Automated Fuel Terminal to be like a personal computer; do not open the head or pedestal doors in inclement weather. Any parts replacement or maintenance outside the normal scope of operation (if needed) should be performed by qualified field technicians or under direct supervision by QTpod Service Technicians (this includes telephone technical support). If you are unsure about any operation of the terminal, call a QTpod Service Technician.

Part 1 – Site Preparation

Introduction

This Site Preparation guidance has been written to assist you in understanding how the M4000 automated fueling terminal functions and what site infrastructure is required for startup. Please take the necessary time to review this booklet. Many of the suggestions and recommendations contained in these pages are sincerely presented to help you avoid costly missteps.

To assure you have a smooth start up, there are specific requirements that must be met and recommendations, which, while not mandatory, will enhance overall operation. During startup, if requirements have not been met, the startup technician may require the owner/ operator to sign a warranty exemption.

Please note that these checklist items are not totally inflexible. There can be some variance but you must check with a QT Petroleum on Demand Technician before making any deviations from these recommendations. Two of the most frequent questions center on the pulser and two-stage valves. These are mandatory requirements since they directly affect the accuracy and precision of each fuel transaction. In credit card transactions, all pre- approved sales are "pre- set". Accurate pre-set sales are not possible without a two-stage valve.

In addition, a pulser (an electric counting device that indicates how much fuel is flowing) with incorrect or insufficient resolution will result in inaccurate readings to your customers and to you, resulting in possible loss of revenue. It may also place you in jeopardy of failing local, state, and federal weights & measures inspections.

Bottom line: We want your M4000 Fuel Terminal to function 100% as advertised and the extra effort spent during the site Preparation Phase will go a long way to ensure a smooth and trouble free operating history.

Recommended Tools and Supplies:
The M4000 cabinet is manufactured from stainless steel, and therefore requires drill bits capable of making the conduit holes in that type of metal. Reference: https://www.grainger.com/content/supplylink-greenfield-metalworking-drill-bit

M4000 Components

Figure 1 - M4000 Consists of the Terminal Head & Pedestal

The M4000 Automated Fuel Terminal consists of a terminal head that is attached to a pedestal. Most site preparation work centers around the running of conduit protected conductors into the mounting pad for connection within the pedestal.

The pedestal and head are shipped in separate 45" x 15" x 25" containers weighing 54 and 58 pounds.

The pedestal is designed with a single door and a shelf that is over 18" from the bottom (Figure 9). The shelf is to be drilled for conduit holes so that rigid, explosion-proof conduit can be stubbed up to the shelf. Once wires in the conduit are pulled and rung out, they can be terminated to the circuitry inside the pedestal. For Direct Pump interfacing that would-be the DPI Relay Module, which itself is mounted onto the Direct Pump Interface (DPI) board. For Serial Protocol Dispensers, it would be 3rd party interface hardware. The optional high visibility Multi-Line Display interface installs inside the pedestal and connects to the DPI board via a ribbon cable.

System Requirements

The QT Petroleum on Demand M4000 Automated Fuel Terminal has been designed to directly control multiple mechanical and/or electrical dispensers. A maximum total of 32 dispensers can be controlled with up to eight of those being direct mechanical. The standard system comes equipped to handle a single dispenser or fueling point by default. Optional expansion DPI Relay-Module Boards provide support for additional dispensers for fueling points. The M4000 requires power in the range of 110 – 240 VAC, 50/60 Hz and is referred to as "Line Voltage" in the remainder of the documentation.

Note: The QT Petroleum on Demand M4000 may require a 3rd party serial interface for some electronic dispensers, such as the Wayne Select or Gilbarco Legacy models. Call QT Petroleum on Demand for guidance if you have an electronic dispenser.

The following list of items are required equipment to successfully interface a mechanical dispenser with the M4000 fuel terminal:

1. A fuel flow pulser must be fitted to each dispenser. The M4000 can be configured to work with a variety of pulser types and resolutions, including pulses derived from the penny wheel. When using the penny wheel, the pulser should provide one pulse per penny of fuel dispensed. The pulser may be either solid state or dry contact but it must switch a 12 Volt DC load at a frequency of up to 200 pulses/second. The Western Electronics and OPW model 500 and Veeder-Root solid state pulsers have been used with good success (Figures 2 & 3). The M4000 provides an isolated 12 VDC supply for each dispenser to power solid state pulsers.

Figure 2 - The OPW "Pipe Bomb" Pulser

Figure 3 - The Veeder Root 12v "Tuna Can" Pulser

2. A dry contact switch which closes when the mechanical register has been reset to zero AND opens when the pump handle is returned to the "OFF" position (Figure 4).

3. An electrically operated main flow valve that will allow full fuel flow when provided with a Line Voltage source.

4. An electrically operated slow flow valve which, when energized at Line Voltage, will restrict fuel flow to about 1-3 gallons per minute.

5. If an electric reset motor is used, it should also operate at Line Voltage (a separate signal is provided by the terminal to power each reset motor).

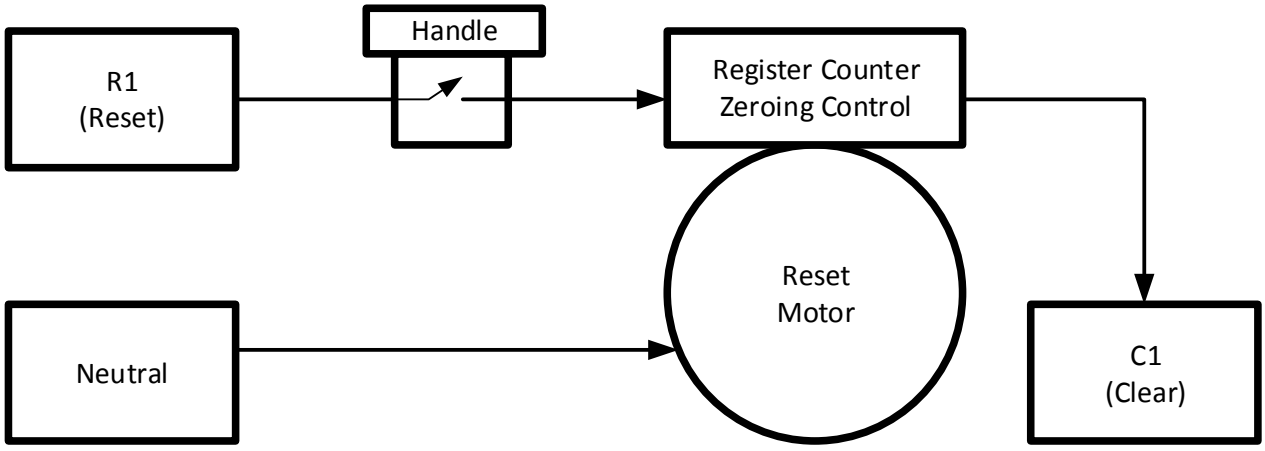

Figure 4: Reset Motor Circuit

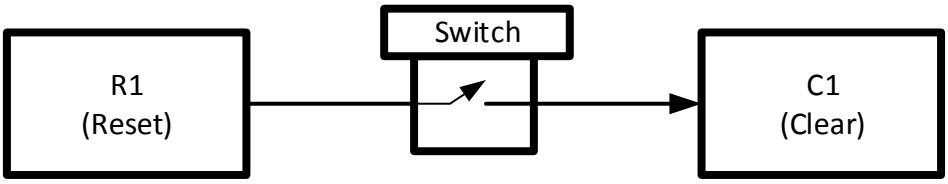

Figure 5: Mimic Switch Circuit

Two examples (Figures 4 & 5) of dry contact switch schematics. The reset motor circuit is typical for gas station style dispensers. The Mimic Switch Circuit is the minimum necessary for the M4000 direct dispenser interface.

6. The DPI board is not designed to directly drive pump motors. We require the use of high current relays (sometimes referred to as contactors) on the pump control output circuits (P1/P2, etc.) to keep the terminal electronics isolated from high current drawn by fuel pump motors. See Figures 7 & 8 for examples of relay placement. QTpod recommends using solid-state relays (SSRs) as they do not generate electrical arcing noise. They are required if the relays are located within the pedestal, where the electrical noise can adversely affect the digital electronics (Contact QTpod support for SSR recommendations).

7. A CAT5 or CAT6 Ethernet cabling is needed if a direct internet connection is used for card authorization & settlement as well as communication with the QTpod Cloud application. Cellular or Wi-Fi can be used depending on distance and site coverage.

8. The terminal and dispenser components are powered by Line Voltage line power. It is highly recommended that a large (10 AWG) ground wire is used in this conduit for lightening dissipation purposes.

9. Referring to the provided wiring guide & and schematic ensure that all high voltage circuits are delivered through the appropriate underground conduit to the terminal location. Typically, 1/2" and a 3/4" rigid conduit is run from each dispenser directly to the pedestal. In addition, a 3/4" rigid conduit is typically run from the pedestal to the nearest electrical distribution box.

10. Be sure each high voltage line is labeled correctly with both the signal name and dispenser number. Do not mix high voltage and low voltage wires within the conduits (unless low voltage wire is shielded) as mixing may cause unreliable system operation. Minor variations may exist such as the location of the main pump motors. Contact QTpod for assistance if you are unsure about your application.

Space & Functional Considerations

The M4000 ships in two large (45” x 15” x 25”) cardboard containers that weigh 54 and 58 pounds. The Terminal is not weather-proof until it is fully assembled, so the boxes and their contents should be protected from the environment until ready to install.

When selecting a location for your M4000 Automated Fuel Terminal, carefully study the dimensions of the pedestal (Figure 9) and terminal head and remember that adequate space must be maintained in front of the unit for installation and maintenance. This means that an area of several feet in radius in front of the pedestal and terminal head should be maintained.

It is also the responsibility of the person or persons doing the electrical site prep work (usually a licensed and bonded electrician) to comply with National Electrical Code (NEC). It is not QTpod's responsibility to enforce adherence to NEC but experience has shown that sometimes people design their fuel dispensing layout prior to carefully studying Article 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages of the NFPA. Minimum distances between the pedestal and dispensing equipment must be maintained and rigid conduit employing seal-offs must be installed (However, please wait until after startup to pour the seal-offs, if possible). Failure to research and comply with these codes can result in costly reengineering along with delays. If you or your site prep team have any questions, consult the appropriate authorities. In some cases, your local fire marshal may add further requirements to what you find published in the NEC or NFPA.

Figure 6 is from the NFPA 30A, (2015 National Fire Protection Association), and is presented here for INFORMATIONAL PURPOSES ONLY. Local, state, and federal requirements at your site can vary and the appropriate authorities should be consulted.

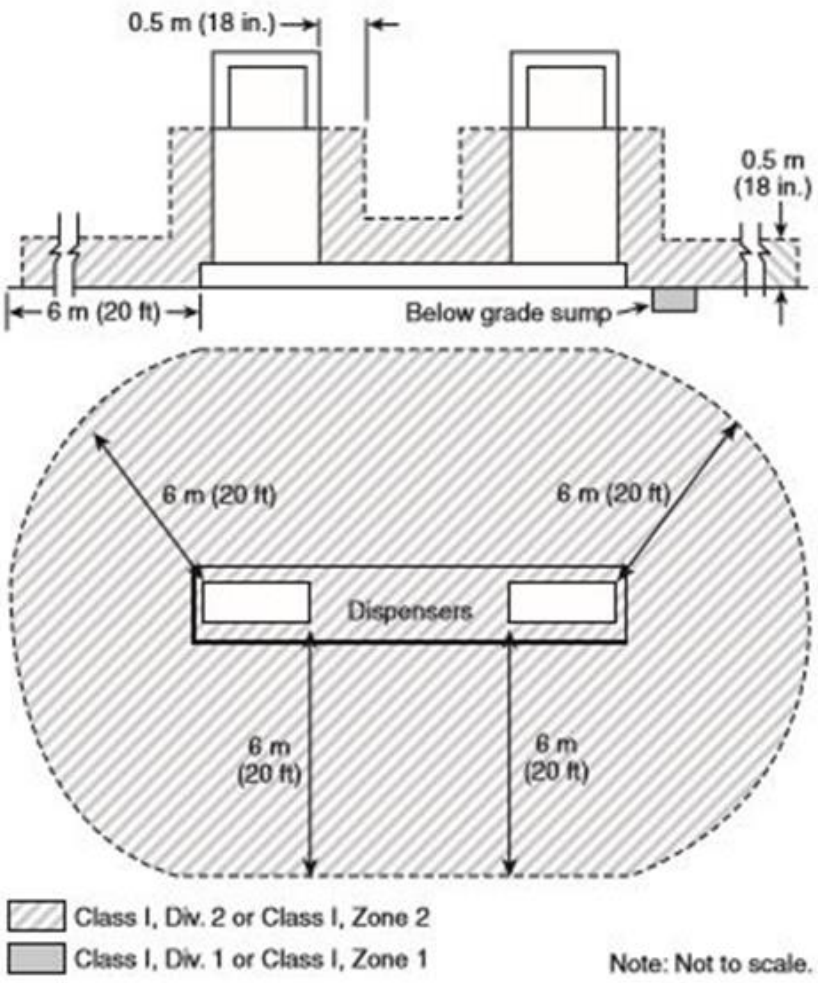

FIGURE 8.3.2(a) Classified Areas Adjacent to Dispensers.

Figure 6 - NFPA 30A Diagram reprint - For Informational Purposes Only

Wiring Requirements - Option A

The Field Wiring diagrams on this page and the next describes general requirements for conduits and wires. The actual number of wires ultimately depend on individual components, their location, power ratings, etc. In general, these are what is required;

1. Pulser signal wires (Low voltage conduit from fuel dispenser to pedestal as shown in the drawing below as **Conduit A**). Each pulser circuit has two inputs plus an isolated ground and 12VDC. Refer to Section 3 for pulser wiring requirements.
2. Dispenser component signal wires (High voltage conduit from fuel dispenser to pedestal (**Conduit B**)
3. One Cat 5 or 6 Ethernet cable (if applicable) to pedestal. (**Conduit C**)
4. A source of local power (High voltage conduit from circuit breaker to pedestal. (**Conduit D**)
5. Pump control wiring (High voltage conduit from pedestal to pump control relay. (**Conduit E**)
6. Any other required conduit, typically for a tank mounted pump motor(s), hose reels, outdoor lighting, etc. (**Conduit F**).

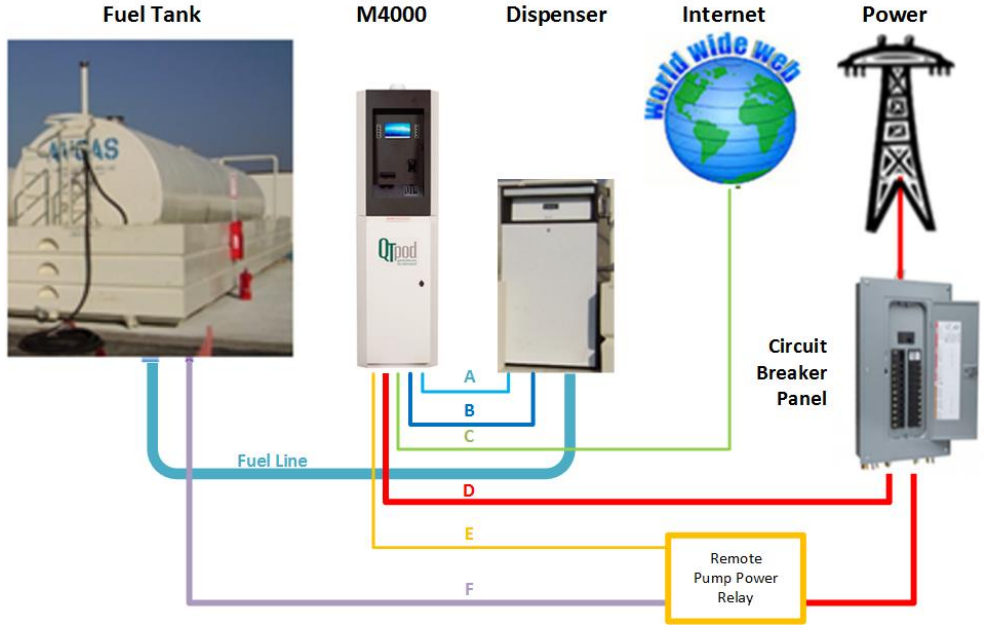

Figure 7 - Dispenser Field Wiring Diagram - Option A

Rigid Conduit	Size	Description of wires inside conduit
A	1/2"	Low voltage for pulser wires
B	3/4"	High voltage for dispenser signal wire (reset, clear, slow & fast valves)
C	1/2"	Low voltage for Ethernet Cable (if needed)
D	3/4"	High voltage for terminal and dispenser power
E	1/2"	High voltage pump control wiring
F	1/2"	Other required conduit

NOTE: This diagram is for a single dispenser setup. For more than one dispenser, add additional B & C conduits for each additional dispenser and add another pump relay control wire in conduit E.

NOTE: The low voltage conductors may be placed in the high voltage conduit if they are in shielded cable. This would eliminate the requirement for a separate conduit just for low voltage wires

IMPORTANT NOTES: Use stranded wire only. Each pump motor must be actuated through 30 amp relays. This applies to 120V and 240V motors.
If you deviate from these requirements, please call QTpod at (303) 444-3590.

Wiring Requirements - Option B

An area of variation from site to site is the pump actuation circuitry. In general, it is necessary to wire the pump motor(s) through a relay so that the current draw required by the pump motor(s) does not pass through the DPI board (see Figure 8). The relay(s) can be located anywhere that is convenient (Electrical Service Panel or pedestal, for example) and the pump actuation wires can be routed directly to the pump or share conduit with the rest of the high voltage wires.

Typically, your conduit and wiring layout will look like either "Option A" or "Option B" depicted in (Figures 7 & 8). Use them as a starting point to map out your actual wiring requirements. Keep in mind, these are recommendations only. You are responsible for Electrical Code compliance. It is strongly recommended you consult and/or contract with a qualified electrician as you proceed with this work.

Note: When setting up electric hose reels, consider routing the hose reel circuit through the NC side of the pump relay so that while the pump is running, the hose reel is "dead" and thus presents no safety hazard.

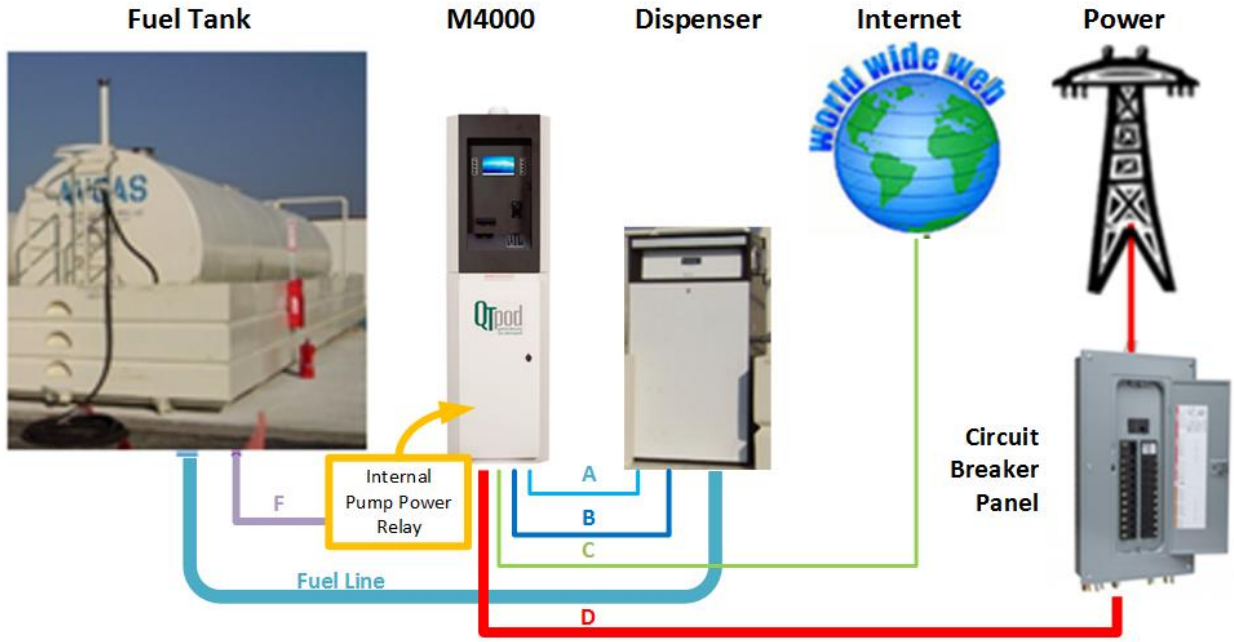

Figure 8 - Dispenser Field Wiring - Option B

Rigid Conduit	Size	Description of wires inside conduit
A	1/2"	Low voltage for pulser wires
B	3/4"	High voltage for dispenser signal wire (reset, clear, slow & fast valves)
C	1/2"	Low voltage for Ethernet Cable (if needed)
D	3/4"	Multiple High voltage for pump motor, terminal and dispenser power
E	1/2"	High voltage pump control wiring

NOTE: This diagram is for a single dispenser setup. For more than one dispenser, add additional B & C conduits for each additional dispenser.

NOTE: The low voltage conductors may be placed in the high voltage conduit if they are in shielded cable. This would eliminate the requirement for a separate conduit just for low voltage wires

IMPORTANT NOTES: Use stranded wire only. Each pump motor must be actuated through 30 amp relays. This applies to 120V and 240V motors.
If you deviate from these requirements, please call QTpod at (303) 444-3590.

Special Wiring Recommendations for DPI

The Reset (R) and Clear (C) signals (see Figures 4 & 5) can sometimes be exposed to electrical noise caused by high voltage arcing across switch contacts. Because of this potential problem, it is advised to allow an extra length of 4” to both the Reset and Clear wires. This will allow the installation of optional ferrite filters to prevent this noise from affecting the DPI logic. In extreme cases of arcing and/or inductive kick-back noise, the addition of snubber circuits has proven effective. The snubber part installs with the black lead to the Reset (pin 2) or Clear (pin 6) and the white lead attaches to either pin 7 or 8 (both are Neutral) on the Relay Modules terminal strip.

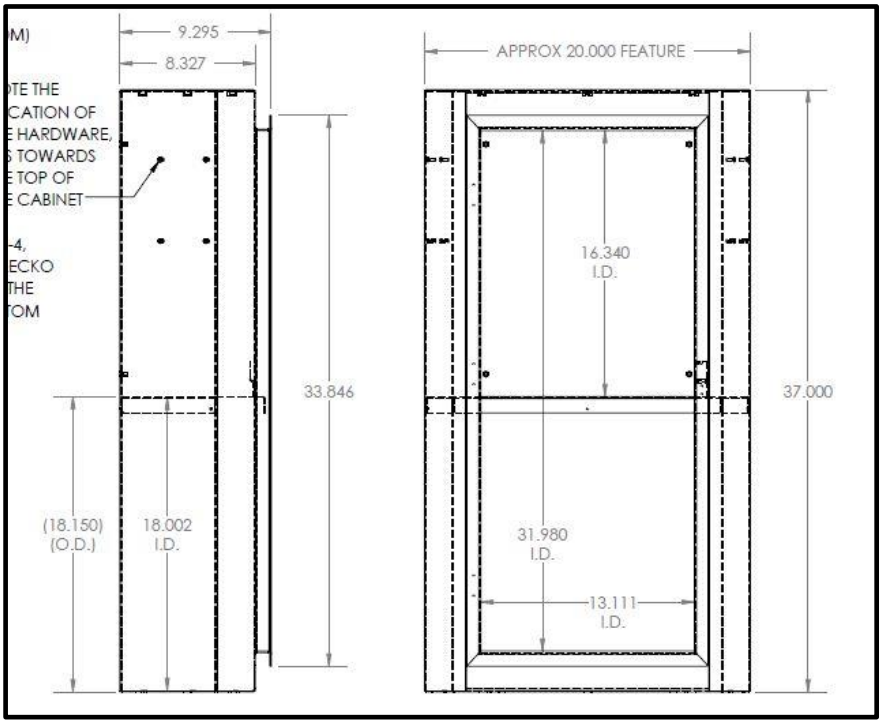

Figure 9 - Pedestal Dimensions

Preparing Terminal Wiring

1. Using the terminal pedestal as a guide, mark the location of the pedestal mounting holes.

2. Install conduit "B" as required for each dispenser. Allow room for at least 6 conductors FROM each dispenser for control signals PLUS any conductors needed for accessories such as lighting or hose reel motors.

3. Install conduit "A" for the low voltage pulser signal wires. Allow for 4 conductors from each dispenser (two for the pulsers and two for the isolated ground and 12VDC to power the pulser).

4. For direct Ethernet connections to the Internet, Route a CAT5 or CAT6 cable through the base of the pedestal. Direct burial cable is often the best choice. It may be strapped to the outside of the conduit. The Ethernet cable terminates into a RJ45 safety grounded coupler within the Terminal head unit so allow additional six feet of wire to reach.

5. The wiring guide calls for two legs of power (3 wires) from the breaker panel out to the pedestal. One circuit powers the Terminal's 12VDC supply, the other Line Voltage circuit provides for dispenser power (power for reset motors, electrically actuated valves, pulsers, etc.). Pump motors are powered from separate circuit breakers and require their own Hot (both L1 & L2 for 220 VAC motors), as well as neutral and ground wires.

6. Optional High Visibility Displays may require conduit containing shielded four-conductor low-voltage cable (See Appendix B).

IMPORTANT NOTE: ALL WIRING MUST BE DONE IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL CODES.

The information contained in this guide is provided solely for planning purposes and so that appropriate professional personnel can gain familiarity with QTpod products. QTpod makes no guarantee or warranty that any of the recommendations or guidelines contained herein are accurate or correct regarding Fire and Electrical Codes. Compliance with local, state and federal codes are the responsibility of the owner/operator of the fuel delivery system.

Site Preparation Checklist

In Appendix E at the end of this manual is our standard Site Preparation checklist for the M4000 Self-Serve System. It is required that the customer and/or the contractor performing the installation signs off on each item as it is completed. Technical Support is always available to answer questions and clarify issues as they arise. Once the work has been completed, each item has been initialed and the completed checklist has been signed, the entire checklist should be scanned and emailed <jbroderick@qtpod.com> (or faxed: 303-444-8736) back to QTpod. This then coordinates travel to the customer's site to perform the system start-up, if such services are commissioned. QTpod does not book travel until the work has been completed and documented to avoid costly delays.

Part 2 – Installation

Section 1 – Installation Overview

SCOPE
This part of the guide covers all aspects of installing the QTpod M4000 Automated Fuel Terminal. This includes mounting the Direct Pump Interface Board (DPI) and DPI Relay Module(s), terminating Line Voltage control wires, connecting serial communication wires for specific dispensers, mounting the M4000 Terminal Head, connecting power to the pedestal, and running diagnostic operational checks. You should have on hand any supplementary manuals such as the one for Siteminder.

This part of the guide does not cover Site Preparation. Refer to Site Preparation (Part 1 of this guide) to complete all tasks and the checklist prior to beginning the installation. Use the completed checklist in the appendix at the end of this guide as a starting point for installing the M4000. Note: This step may not be necessary if upgrading from an older QTpod Self-Serve System.

TERMINAL HEAD
The M4000 terminal head should be mounted immediately after the pedestal is mounted to prevent any components from exposure to the elements. Section 2: Terminal Head describes the basic terminal head architecture and how to connect the appropriate cables for functionality. This section also covers installation of the printer and basic maintenance functions such as changing/installing printer paper.

DIRECT WIRE DISPENSERS
Depending on the complexity of the system being commissioned, different sections of this document will apply. The section on Pedestal Wiring explains how to connect dispensers which use Line Voltage control wires to interface with traditional fleet style electrical-mechanical fuel dispensers. Some of these traditional dispensers, however, have electronic pulsers and may require special electronic interface devices. Check with a QTpod Technician if you have any questions.

SERIAL DISPENSERS
Appendix A has specific information on wiring for certain electronic dispensers such as the Wayne Select series of dispensers. Section 5 Operational Check covers testing serial interface devices, the M4000 to verifying connection status, and common troubleshooting techniques. Special diagnostics that are available for serial dispensers are covered in Appendix A.

Multi-Line High Visibility Displays
Appendix B has specific information on installing interface circuit board and wiring to displays and the DPI.

SITEMINDER
Siteminder is QTpod's web-based fuel terminal control software. The functionality of the M4000 system is dependent on constant communication with QTpod's data center and the Siteminder application.

You must receive a terminal configuration download from Siteminder into your M4000 to fully test it and then place it into operation. The Siteminder section of this guide goes over the basic components of the terminal configuration and the options that must be made by the owners/operators of the fueling operation.

OPERATIONAL CHECKS
Once all equipment is setup and is fully connected, it is time to make comprehensive operational checks. Section 5 Operational Check covers comprehensive diagnostic and auto mode operational checks to ensure the system is ready for public use.

Section 2 – Component Assembly

The QTpod M4000 Terminal is thoroughly tested and inspected prior to packing and shipping. Carefully unpack the components and inspect them for any damage that may have occurred during shipping. If there has been damage, DO NOT ATTEMPT TO ASSEMBLE. Call QTpod as quickly as possible to discuss the situation and arrange for a replacement, if applicable. Once a terminal is placed into service, it will be too late to file a shipping damage claim.

NOTE: It is recommended to use the provided foam packaging to protect the finish of the terminal from chips and scratches while resting on the pavement prior to assembly.

MOUNTING THE PEDESTAL

At this point in the installation process you should be able to anchor the terminal pedestal using 3/8" anchors with either flat washers and nylon locking nuts or lock washers and standard hex nuts. It is recommended that stainless steel be used for this purpose. If you have any questions, please do not hesitate to call QTpod for assistance.

Drill holes through the 18” stainless steel barrier shelf to provide wiring pass-through. Use drill bits hardness-rated for stainless steel. Temporarily remove pre-mounted pump interface hardware as necessary to prevent damage during drilling. Clear all metal shavings, then reinstall any interface hardware removed earlier.

Wiring Notes: (for DPI systems refer to Figure 11: Sample Wiring Schematic)

a) When using the Western Electronics model 500 pulser, be sure to connect the hot side of the pulser power (BLACK WIRE) to the Clear Signal. This insures that the pulser will begin at exactly zero and not part way through the first pulse.

b) If a manual register reset mechanism is employed, a reset mimic switch must be installed for each dispenser (See Figure 5). This switch must be housed in an explosion-proof cover and simply connects the Reset (R) terminal lug with the corresponding Clear (C) terminal lug. This is required so that customers can signal the dispenser is ready to sell fuel (register has been reset to zero) and can terminate a transaction once they are done fueling, without having to wait for a timeout. In most cases, a customer depends on this switch since a typical sale involves overestimating the amount of fuel required

INSTALLING THE POWER SUPPLY

The Terminal and Pedestal digital hardware is powered by a single 12VDC power supply. The factory pre-wires the DC wiring and then after testing disconnects prior to shipping. The DC cables from the upper terminal area route through the opening to the pedestal for attachment to the DC supply's outputs on the top corner (see Figure 10). Likewise, if a DPI is present in the pedestal, its' power attaches there to the supply as well.

The Line Voltage is wired to the lower input terminals and comes from the left-most circuit breaker's top terminal and the wire distribution DIN terminal blocks. It is recommended to connect these wires prior to mounting. The supply is DIN rail mounted to the left of the DPI and circuit breakers. There is a spring-loaded clip on the bottom of the supply. Place the supply's mounting clip onto the top edge of the DIN rail then pivot down to snap in place. To release the supply, pull down the metal lever on the bottom rear to unlatch from the rail, then pivot the bottom up and lift off.

The Line Voltage line wire (Black) coming through the 10 Amp circuit-breaker. This functions as the main power switch to the M4000's electronics. Additional circuit breakers are added to control power to the dispensers and pump motors. AC Line Voltage wiring is covered in more detail in the first section on M4000 Site Preparation.

Figure 10 - Power Supply Mounted and Wired

SAMPLE WIRING SCHEMATIC FOR DPI

This diagram illustrates how the QTpod DPI Relay Module terminal strips should be connected.

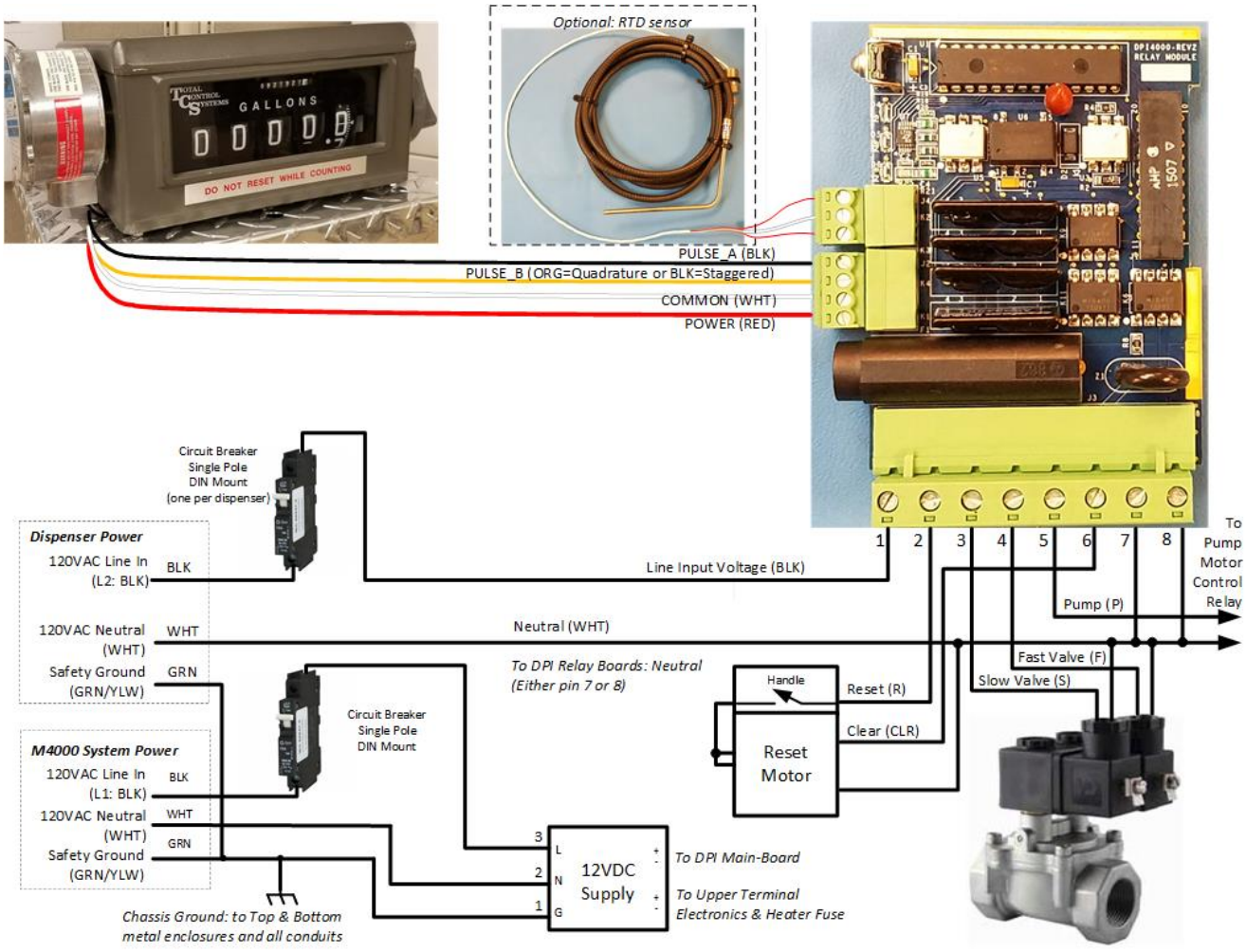

Figure 11 - Sample DPI Wiring Schematic

MOUNTING THE TERMINAL HEAD

Once the pedestal has been firmly mounted, the Terminal Head can be installed.

NOTE: It is important that all power is turned off inside the pedestal while working on assembly tasks.

Use the four large bolts and washers packaged in one of the smaller boxes to attach the Terminal head unit to the top of the Pedestal. Tighten bolts well enough to compress the gasket between the top and bottom sections to form a weather-tight seal.

Once the head is securely mounted, open the head door and expose the internal components.

WARNING

Never attempt to commission the QTpod M4000 in inclement weather without some sort of utility shelter that completely protects all electronic components from moisture contamination. The Limited Warranty does not cover damages suffered because of improper startup procedures.

Refer to accompanying diagrams while performing the following tasks. In most cases, the cables for each peripheral device are already connected at the factory. The following set of tasks need to be accomplished prior to performing the Operational Check.

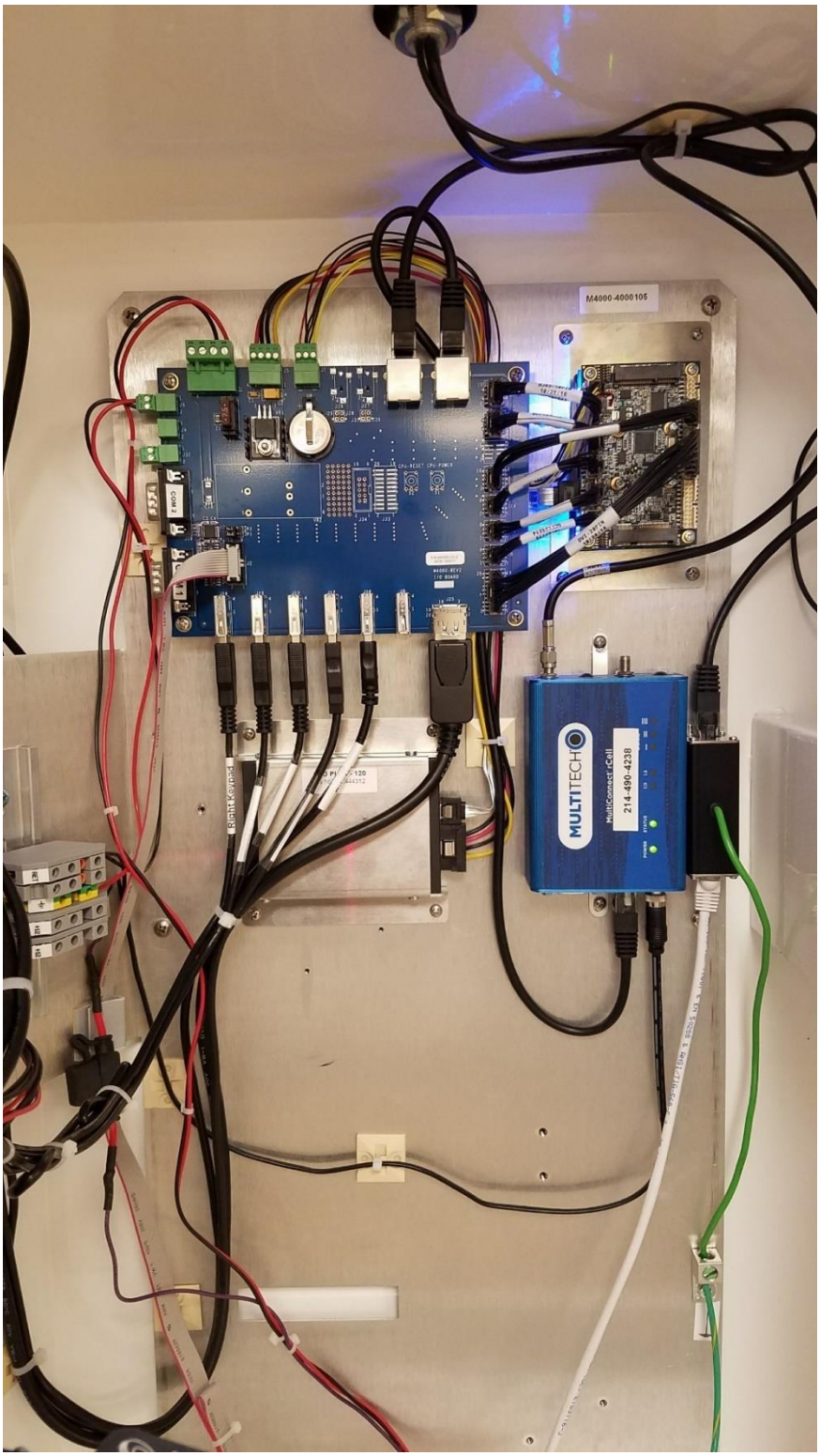

Figure 12 - Upper M4000 Component Wiring

CONNECT THE DPI RIBBON CABLE TO THE IO BOARD

Carefully identify and install the ribbon cable that connects the Terminal IO-Board J2 to the DPI J10 header. The connector headers and plugs are keyed so they can only be plugged-in correctly.

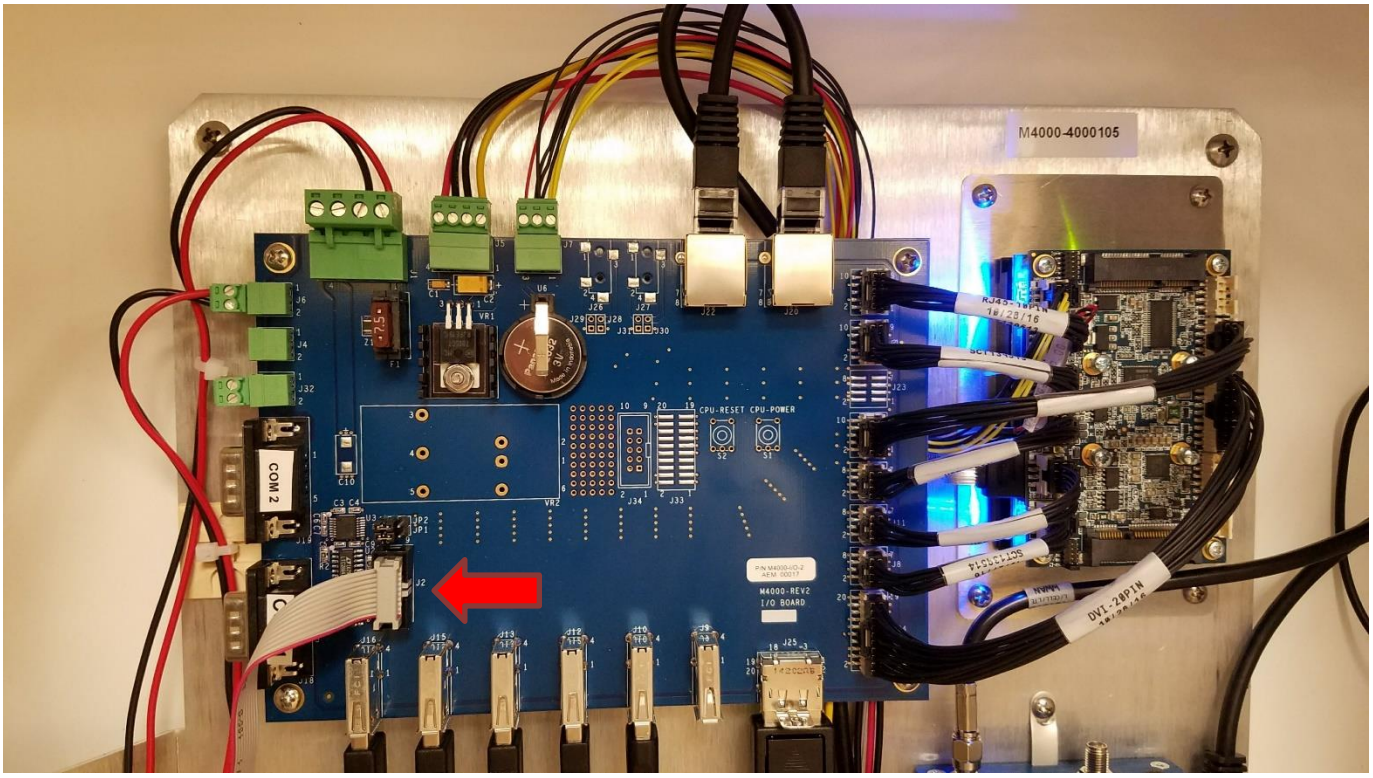

Figure 13 - Terminal IO Board and DPI

MOUNT THE PRINTER & INSTALLING PAPER

The printer is supplied in a separate box for safe transport. There are two blue retainers you pull out, to allow the printer to slide down into the mount. Pressing the retainers back locks the printer securely to the Terminal's front door. Power (Blue arrow) and USB connection (Red arrow) can then be made (see Figure 14).

Printer paper feeds from a spool that is placed in the holder just below the thermal printer. To install the paper: with power applied to the printer (should be a red LED glowing on its internal board), insert the paper into the slot marked on the back of the printer. The paper should automatically be fed and a test printout generated.

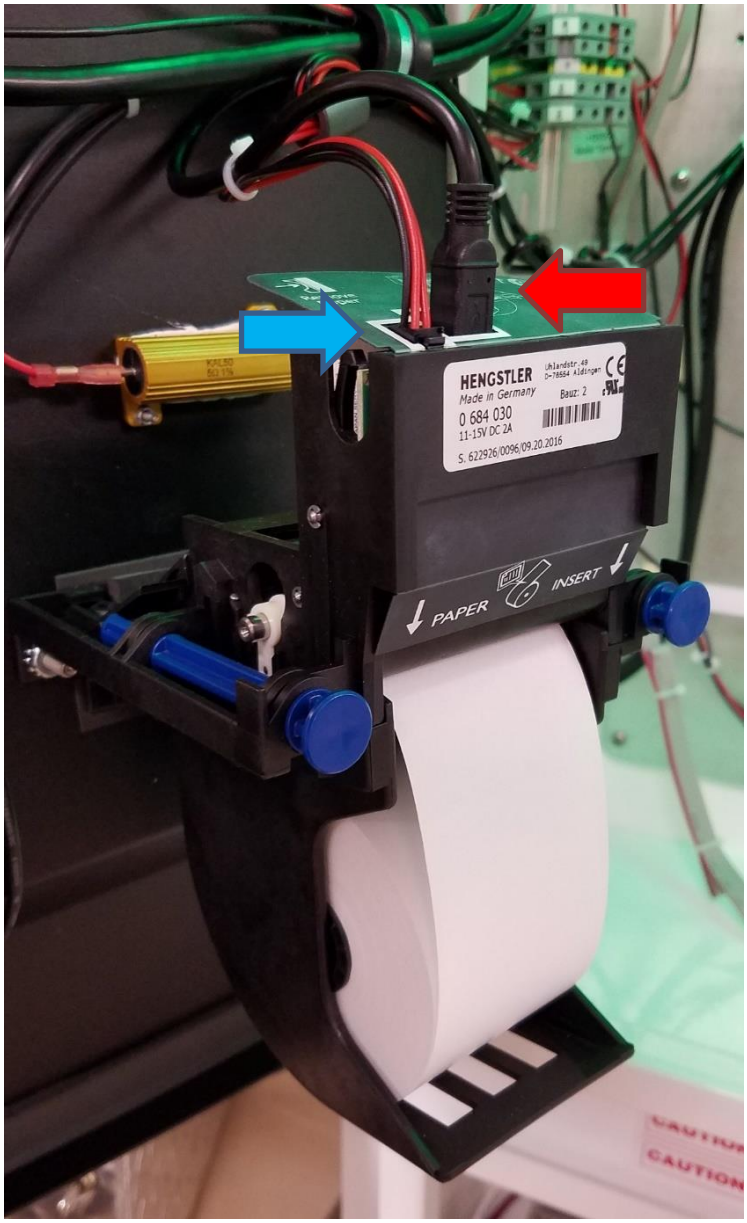

Figure 14 - Printer Mounting & Connections

Section 3 - Direct Pump Interface

The Direct Pump Interface (DPI) serves as the interface between high voltage signals routed to and from mechanical fuel dispensers and the digital control environment of the Terminal CPU and its associated peripheral devices. The DPI can be configured for the direct control of up to eight dispensers. The bottom-half has slots for the installation of Relay Modules.

The DPI Main-Board (Figure 15) has four status LEDs in the upper left corner (Refer to Section 5 for LED status definitions). In the middle is a CPU ribbon cable socket for connection to the terminal head electronics. The upper right corner is where 12VDC power is applied, and there is a 2 Amp fuse just to the lower right of the connector.

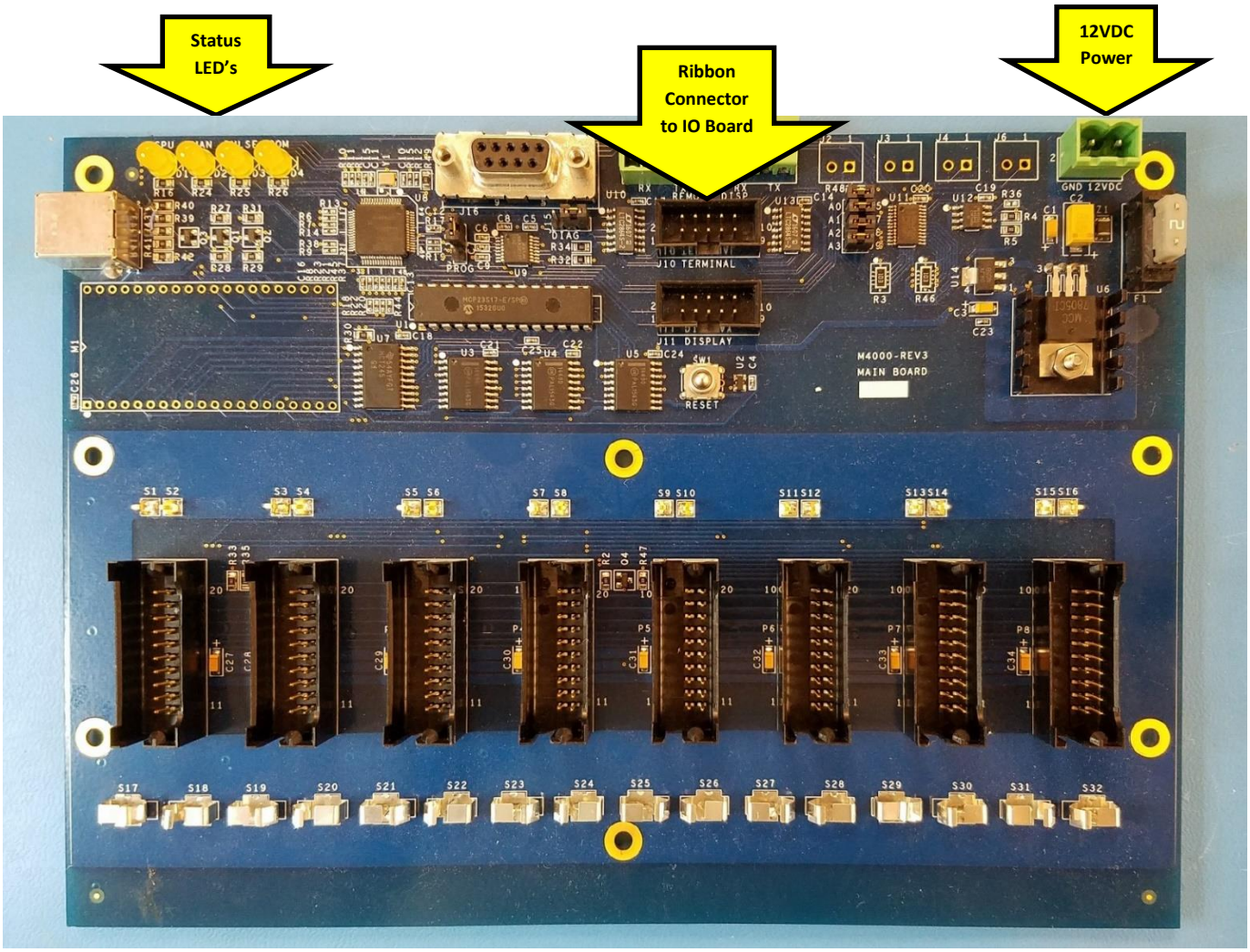

Figure 15 - Direct Pump Interface Main Board used for Mechanical Dispensers

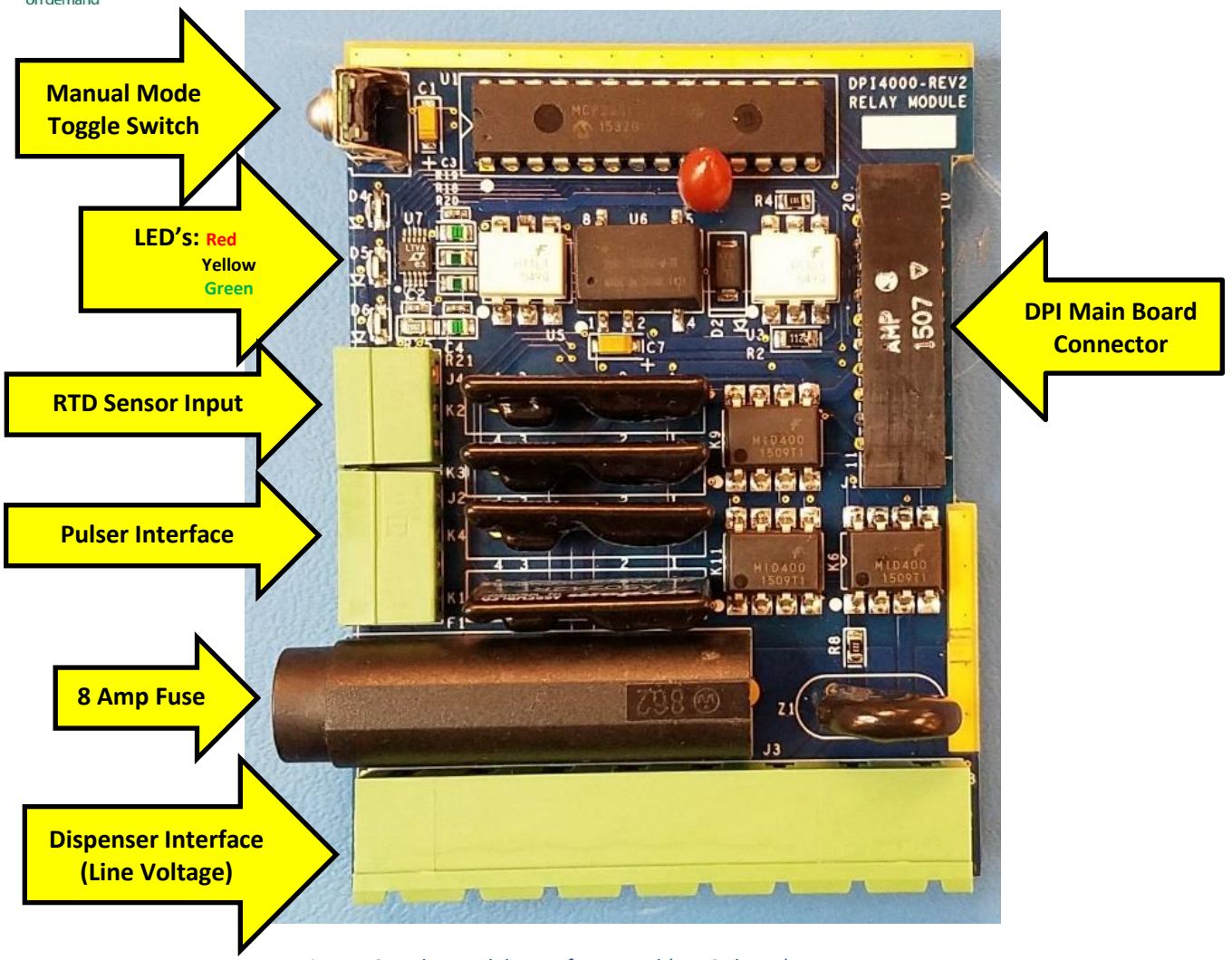

Figure 16 - Relay Module Interface Board (Rev 2 shown)

The DPI Relay Module (Figure 16) acts as an isolation device in that there is a bank of four solid-state relays for each dispenser (up to eight banks per DPI) which serve to isolate the digital portions of the DPI from the Line Voltage dispenser control signals. More protection exists in the form of 8 amp fuses located on each module. If any kind of short or voltage surge exists in any of the dispenser circuits, the fuses are designed to trip prior to further damage occurring. Take care to ring out control wires prior to applying power for the first time so you do not burn up a fuse.

The Relay Modules also contains interfaces to Pulsers and optional Resistive Temperature Detector (RTD) fuel thermal sensors. The four-pin connector below the three pin RTD connector is for attaching a pulser, a device that generates digital pulses in response to liquid flowing through the fueling system. There is an isolated 12VDC Supply and Ground per Relay Module for powering solid-state pulsers. The DPI is configurable for a variety of pulser types and resolutions on an individual dispenser basis. Two inputs are provided to support Quadrature, Staggered or Redundant versions of pulsers. Note that the Power and Ground is isolated and unique for each pulser, to prevent noise cross-coupling effects or system-wide damage if a dispenser's pulser has a problem.

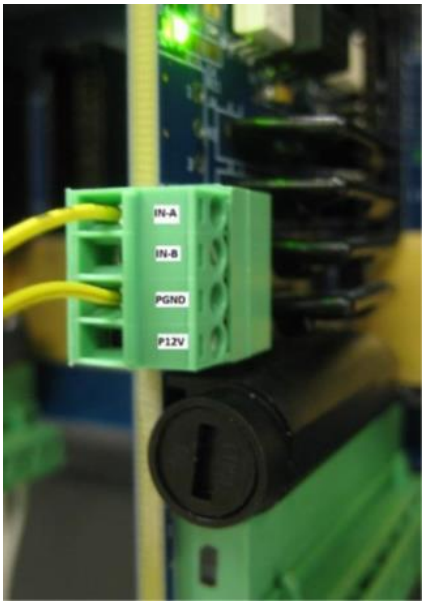

Figure 17 – Minimal Pulser Connector Wiring for a mechanical pulser

Mounting and Wiring the DPI in the Pedestal

Note: The DPI ships pre-mounted in the pedestal but may need to be temporarily removed to drill conduit access holes into the metal barrier shelf. The DPI is mounted in the pedestal on the upper most set of integral standoffs. The center three mounting points are where a custom cut and drilled metal angle stiffener is attached. It is positioned to provide a top physical reference for the insertion of one or more Relay-Module boards and provides support for the top of the plastic safety shield. Once the DPI is mounted, and the Relay Module(s) installed, the control wires may be connected. Make certain all circuits are de-energized and each wire has been rung out and marked.

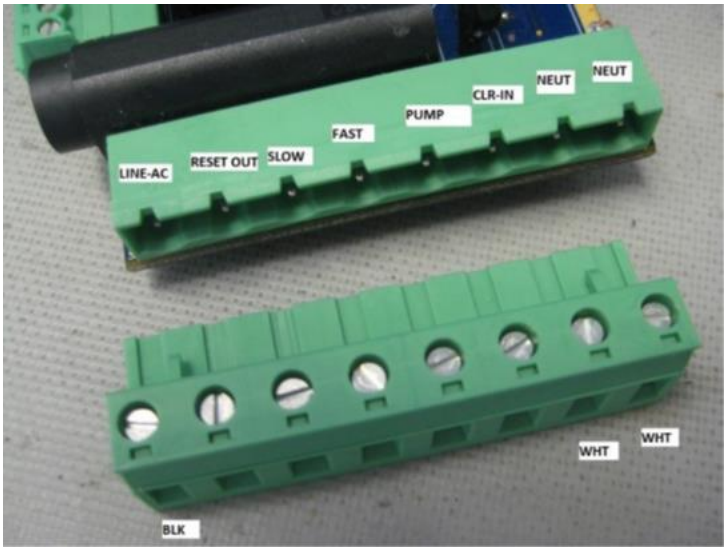

Figure 18 - Dispenser Control Wire Connections

As previously mentioned, if all work outlined in the Site Preparation Guide has been accomplished, the correct wires should be in place for termination to the DPI. Refer to Figure 11 for correct wire placement. Take a few minutes to examine such things as wire length and routing. The eight-screw terminal high voltage connector may be removed from the DPI Relay Modules if this makes wire termination easier but care should be taken not to cut wires too short. In particular, leave 4" of wire on Reset and Clear wires in case ferrite filters are deemed necessary to alleviate arc noise problems. In some cases where large current relays are present in the pedestal auxiliary 'snubber' parts are needed to be placed on the output circuit and neutral. QTpod recommends only Solid-State Relays (SSRs) to be used within the pedestal. QTpod can supply technical bulletin information for dealing with noise and high current relay issues.

Since the relay-boards power and control fuel pumping with Line Voltage signal levels, the lower section of the DPI is to be protected with a clear cover to prevent accidental contact. The top of the plastic cover is formed to rest against the board stiffener which provides mechanical support and prevents loose items (screws, washers, etc.) from accidently falling into the high voltage area. The cover has access holes for fuse, connector and switch access for each relay-board location.

Extended-length corner standoffs are used to attach the cover at the lower edge with screws. Figure 19 shows the installation of the cover over the DPI.

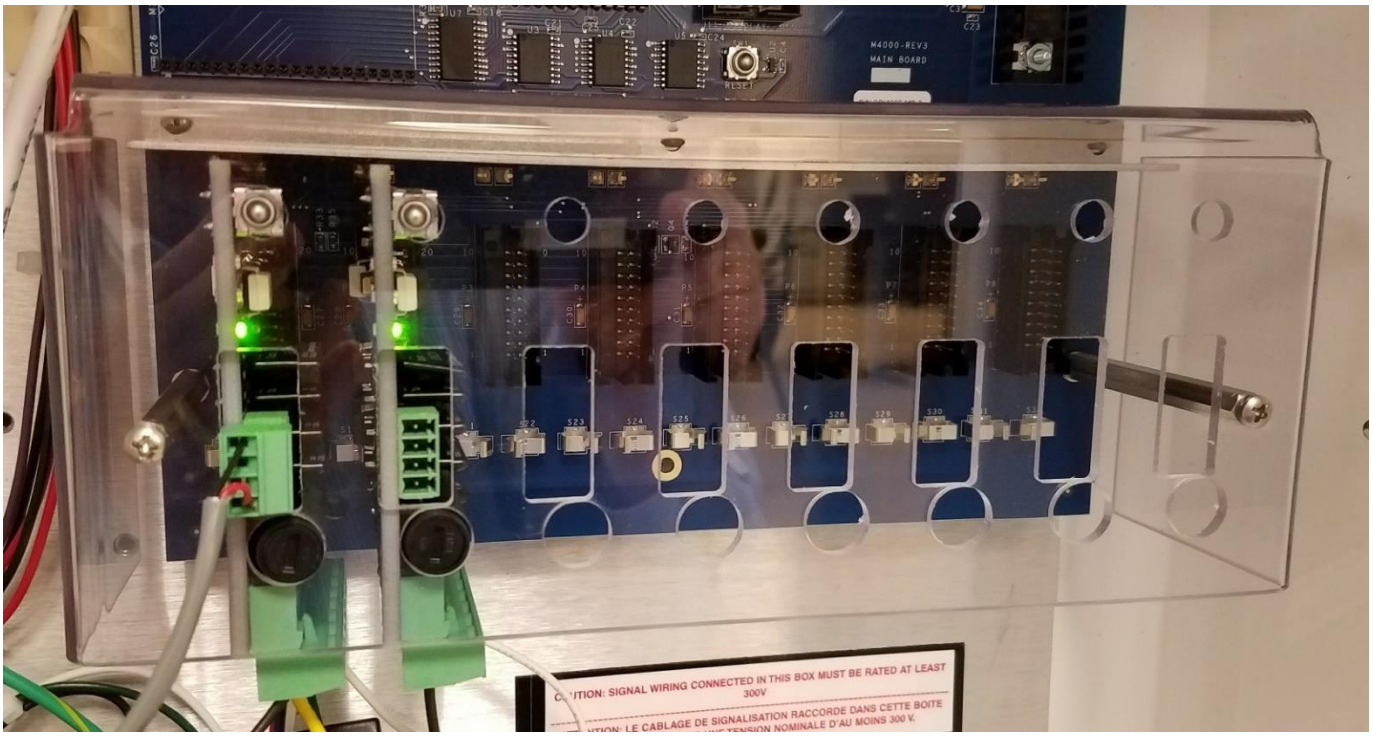

Figure 19 - Protective Cover Installation

CONNECTING INCOMING LINE VOLTAGE
In ideal circumstances, the line voltage (110 – 240 VAC) that powers the terminal 12VDC power supply is on a different circuit breaker than the line voltage provided to the DPI Relay Modules for activating dispenser components. It is highly recommended a separate circuit be utilized, one for the M4000 electronic components and a separate circuit for each dispenser. In ALL cases, these should be separated by high current relays (preferably Solid-State) from the voltage used to power motors.

Both green and green with yellow stripe are safety chassis grounds.

INITIAL SYSTEMS CHECK
The M4000 works with any combination of direct-wire and serial dispensers. In general, each type of dispenser operates the same during a customer transaction but the process of performing diagnostics varies from DPI (Direct Wire), and Serial Wire Dispenser Control Systems.

INITIAL POWER UP
Check to make sure all wires and connectors are in place and you are ready to apply power to the unit.

CONNECTING TO THE INTERNET
Utilizing the communication option selected during purchase (Ethernet, WiFi, or Cellular), connect to the Internet.

Connecting via WiFi will require additional steps done at the terminal to connect to a customer supplied wireless router. The external router will need to be pre-installed, connected to the Internet, and be located within connection range of the terminal. Refer to Appendix C for detailed instructions.

DOWNLOAD TERMINAL CONFIGURATION
Once finished booting, you can perform some rudimentary checks but before doing any actual dispenser tests, you'll have to download the terminal configuration from Siteminder.

If you are ready to receive your terminal configuration contact QTpod at (303) 444-3590 Option 3- 7:30 AM to 5:30 PM (Mountain) Monday through Friday. Be prepared with the following items (in most cases, QT will pre-configure the device's parameter's in Siteminder prior to shipment):

1) Number of and type of Dispensers

2) Price per gallon/liter and fuel types

3) Pulser resolution (number of pulses per gallon/liter/unit)

4) Receipt information (Business name and address)

The technician taking the info will guide you through the process and then attempt to send the terminal configuration over the internet you set up. Refer to Section 4 - Siteminder.

Once the Terminal Configuration has been successfully saved and sent to the Terminal, various tests need to be run to assure the M4000 is performing properly.

Section 4 - Siteminder

TERMINAL CONFIGURATION

In most cases, QTpod will set-up your configuration prior to delivery of the hardware.

In general, the terminal configuration provides the terminal with basic information about the number and types of dispensers controlled by the terminal, fuel prices, receipt messages, credit card account data, and other important information. Prior to commissioning your system, oil company account representatives and/or QTpod personnel may assist you in obtaining account data which allows your system to process credit cards. If you chose to set up your fuel terminal prior to obtaining credit card account information, your terminal can still operate in self-service operation but will be restricted only to private cards you issue to your customers.

Section 5 - Operational Check

The operational check phase is critical since this is the final check prior to placing the system into operation for public use. As you go through and test the system, think of it in terms of discrete sub-systems.

1) All aspects of the user interface need to be configured for ease of use.

2) All aspects of the dispenser control interface need to be wired and configured correctly.

3) All aspects of the credit card network and communications interface need to be configured correctly.

TERMINAL OPERATING MODES
While the Site Preparation Guide does a good job of describing mechanical dispenser operation, it is worth a quick review here. A fuel transaction, whether in auto or manual mode, always begins with the Reset Signal (R1, R2, etc.).

MANUAL MODE
In manual mode, Reset (R1 in our example) is always energized so that if a customer turns the handle/switch on the dispenser, a contact is closed, a Clear (C1) is detected back at the DPI, and all other pump signals are energized (S1, F1, and P1). The customer is now free to pump fuel in manual mode with no automated services operating. Manual mode is a great mode to use while testing the dispenser wiring into the DPI. Even if the technician has no way to actually dispense fuel, they can verify that all applicable circuits are energizing their appropriate dispenser components at the right time.

DIAGNOSTIC MODE
Using the Diagnostic Utility, you can monitor all the DPI's functions while performing a Manual-Mode operation. There are neon colored icons on the screen corresponding to Reset, Slow, Fast, Pump, and Clear.

TESTING DIRECT WIRE SYSTEMS

Direct Wire Systems are those systems that employ the DPI for dispenser control via Line Voltage wires. A total of eight (8) direct wire dispensers can be installed into a DPI within each M4000 pedestal.

MAIN-BOARD's FOUR (4) YELLOW LEDs

LED is short for Light Emitting Diode and are key to ensuring your equipment is operating correctly.

Figure 20 - Main Board LEDs

On Power-up or Reset:

The DPI does a self-test and configuration operation on every reset. The four LEDs will count up in a binary pattern as an indicator of progress. On any step that an error occurs on, the system will stop and the LEDs will be left indicating which step failed. (ON = 1)

Pattern Represents

0000: No LEDs, check power supply, fuse, DC polarity
0001: DPI application started
0010: I2C is connecting to Interface and non-volatile memory ICs
0011: SPI interfaces configured, scanning for installed Relay Modules
0100: Relay Module LED test, all three colored LEDs on (for 1 sec delay)
0101: NVMEM contents being verified
0110: NVMEM working contents loading back into system memory
0111: Serial Command Interface enabled

While Operational:

The four LEDs are labeled left-to-right as CPU, MAN, PULSE and COM.

- **CPU** will flash ON/OFF every second as an indication that the CPU is running the DPI application properly.
- **MAN** will light anytime one or more Relay-Boards are enabled for **Manual-Mode*** Pump operation.
- **PULSE** will flash on the detection of a valid pulse event on any of the Relay-Modules.
- **COM** will flash to indicate serial communication with the terminal. The flash will be longer on reception of a valid command addressed to this DPI.

RELAY MODULE LEDS

The modules are addressed by the DPI from left-to-right as slots 1 through 8. There are three colored LEDs along the top outer edge of each relay module board (Figure 21).

Figure 21 - Relay Module LEDs

Red LED: (*Located directly below the pushbutton switch*)

- Flashes briefly on any valid command received for that Relay Module
- Stays constantly on when in **Manual Mode***

Yellow LED:

Flashes as an indicator of Pulser activity detection over a recent time interval

- Once = Pulse input A edge detected
- Twice = Pulse input B edge detected
- Thrice = activity on both A&B (Quadrature, Staggered, Redundant modes)

Green LED:

Indicates status of AC powered Pump

- Solid green when standing-by and ready
- 1 sec flashing when AC power not detected (check fuse, breaker or wiring)
- Solid green with brief off pulsing while waiting for Clear (nozzle handle removal)
- Medium speed flashing on/off when pumping with slow valve open
- Fast flashing speed on/off when pumping with fast valve open
- Solid green with brief off pulsing when waiting for nozzle handle's return

**__Manual-Mode__ is available only when AC power is connected and the relay module is not already active with a pumping transaction. Pressing the button will light the red LED and immediately enable pump power, awaiting the Clear handle operation. Pressing the button again prior to the Clear Handle will abort the manual mode, turning off pump power and the red LED.*

Once the Clear-Handle event occurs and after pumping operation completed, the Manual Mode is terminated by returning of the Handle.

NOTE: Pumping activity under Manual-Mode is logged into non-volatile memory for eventual retrieval by the Terminal controller.

THE DIAGNOSTIC UTILITY

Starting from the Terminal's splash screen:

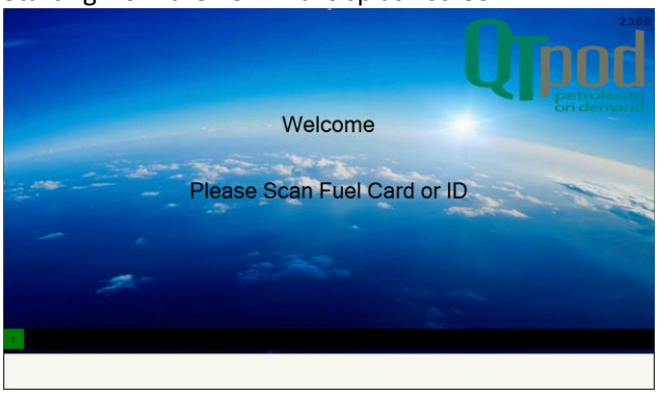

Figure 22 - Splash Screen

Swipe the Diagnostic card containing the manager's code or enter the site manager's code using the numeric keypad:

To enter the code by keypad, press the CLR key, enter the site manager's code, then press the CLR key.

If remotely connected, or using a PC keyboard:
substitute Backspace for the CLR keystrokes above.

NOTE: Each Terminal could have a unique code assigned via Siteminder. The "ManagerCode" key value can be found as the pvt card code.

Figure 23 - M4000 Keypad

The Diagnostic Display Screen

The screen should briefly revert to the windows desktop as it loads the Utility. The screen should eventually be similar to that shown below:

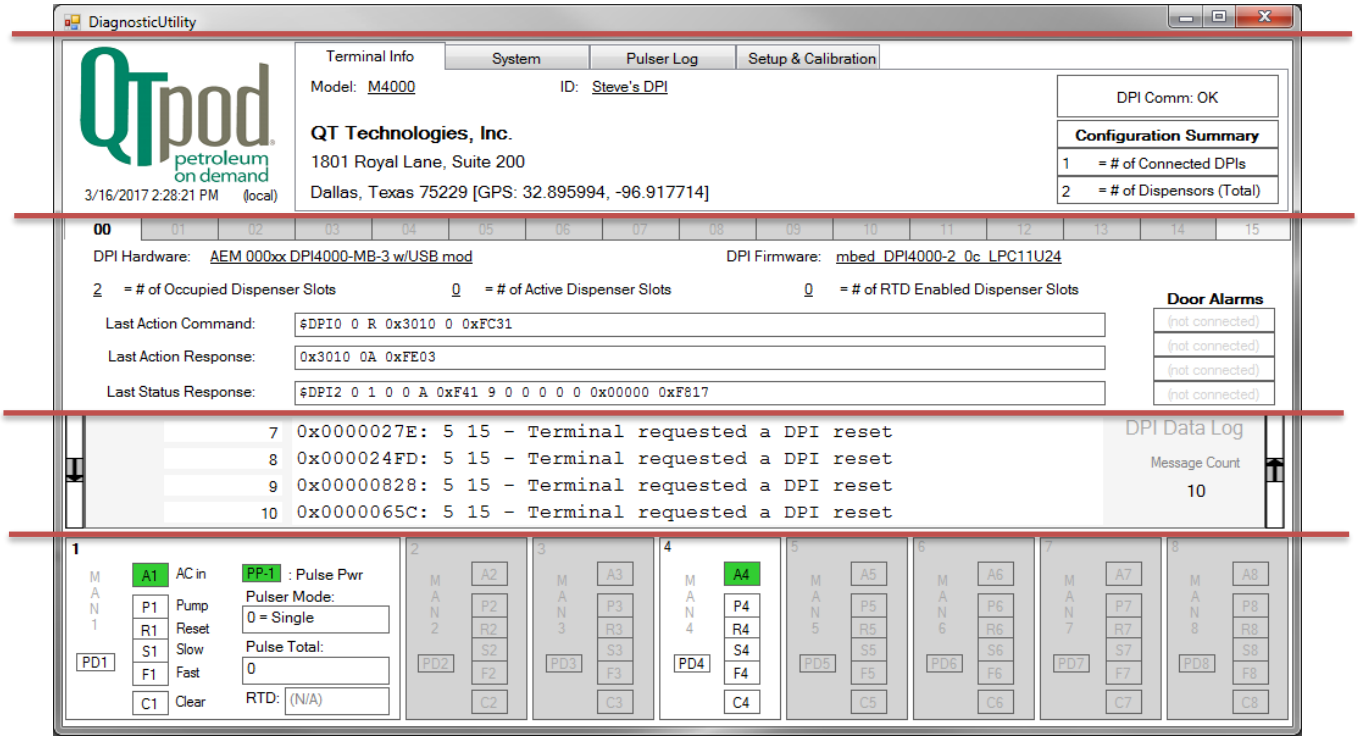

Figure 24 - Diagnostic Screen

The screen is divided vertically into four sections (red lines added) that correspond to the location of the Terminal display's side switches. The following instructions detail the information contained within the four sections.

NOTE: If accessing the Terminal remotely (via SOTI) or using wireless keyboard mousepad, then the selection process simplifies to using mouse clicks. The following instructions are tailored for use when at the M4000 Terminal.

Figure 25 - Option Keys to the left of the Display

The upper switch pair allows selection of labeled tabs. The left-side switch increments selection to the right and the right-side switch moves back to the left.

Likewise, the remaining three switch pairs apply to the selections for DPI, Messages log, and Slot expanded view.

At any time, you can use the <CLR> keypad button to revert to the M4000 Terminal program.

NOTE: *Inactivity over 5 minutes will cause the Diagnostics Utility to quit and restart the Terminal Application.*

Top Tabs, First Section:
The keypad is used to select numbered options from the upper tabbed section:

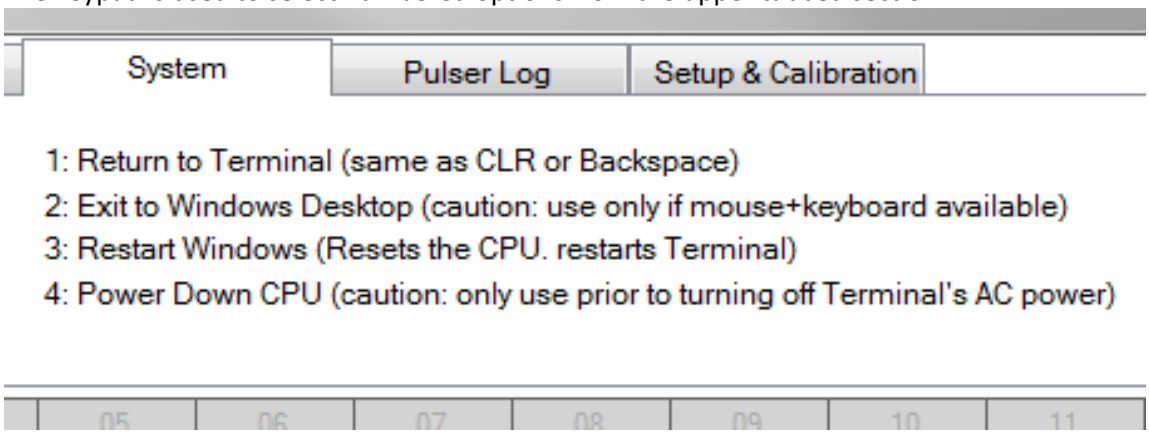

Figure 26 - System Tab in First section

For the 'System' tab, Options #2 and #4 should only be used if there is unlocked enclosure access as it could require full power cycling to return the Terminal to operation.

The 'Pulser Log' tab is there for Weights & Measures conformance and will allow the generation of either a printout or screen display of timestamped changes to the pulser resolution settings. Refer to Appendix D for more information, including a list of the letter code meanings.

The 'Setup & Calibration' tab is intended for use during factory functional testing.

Second section:
The second level of switches allows selections of one to fifteen (addresses 0 - 14) connected DPIs. The last address (15) is reserved for special initialization and calibration steps to be done at the factory. The selection of a DPI affects the information shown in the bottom three zones of the display.
The first couple lines of information presented is derived from the Siteminder-generated "Terminal.xml" data file as well as information retrieved from the DPI's non-volatile memory. The 'Last Action / Status' lines are there predominately for engineering development use. They show the communication to-and-from the DPI over the serial port.

Third section:
The currently selected DPIs data log section is generally intended for engineering development use, but the messages are also retrieved by the Terminal when online, and some are included in the Terminal's system log.

Bottom, Fourth section:

Graphical representation of the eight slots on the currently selected DPI board. Grayed slots are considered empty and the white ones are present and selectable. When selected, there is additional detail information present in the widened area.

The upper left corner is the slot number; the font is in **bold** when that slot is selected. The green blocks represent power status; the AC power into the relay module, and the 12VDC isolated supply provided for external pulser use.

The RED section indicates when a slot is being used in Manual Mode, the YELLOW block indicates when pulse activity is detected on that slot. The ORANGE blocks represent the status of the Line Voltage relays and signals connected to the bottom eight-pin connector of the relay module board.

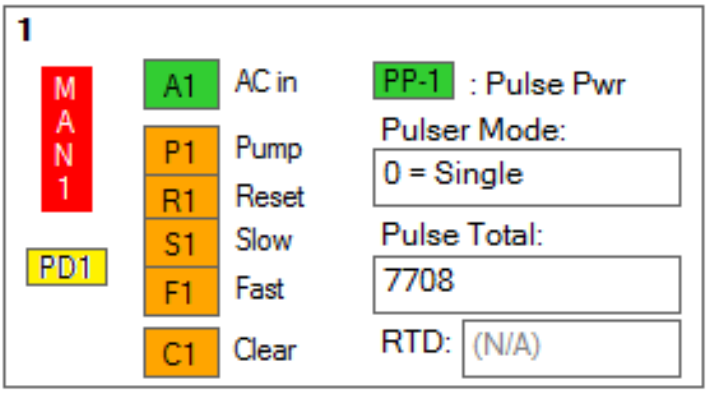

Figure 27 - DPI Board Slot Graphic

The orange indicators are a functional throw-back to the neon bulbs used on legacy products.

Pulser mode is defined in Siteminder, which generates the “Terminal.xml” file and is defined as follows:

0 = Single input
1 = Quadrature or Overlapping pulses, both inputs used
2 = Staggered or non-overlapping pulses, both inputs used
3 = Redundant, both inputs used, having same signal

Note: The DPI only deals with counting pulse edges; therefore, totalizer values, pulser resolution, temperature compensation are all handled by the Terminal program.

The DPI auto-detects when a Relay-Board has the RTD (temperature) hardware present and will update the value in that field during fueling operations.

INITIATE TEST SALE IN AUTO MODE

If the M4000 is functioning properly in Diagnostic Mode, it is time to see if all is well in Auto Mode. It is best to use a private (or proprietary) card for testing so that you are not introducing the added issue of communicating out for approvals and possibly being charged for fuel being pumped for test purposes. There will be a specific test for credit card approvals later.

Make sure you have somewhere to pump the fuel. It is ideal if you can pump back into the tank since this allows you to circulate a large amount (for greater overall accuracy) but if this is impossible, arrange for a vehicle with an approved container.
With the Unit in Auto Mode:

1) Swipe your test card and follow the prompts - make note of prompts which may need modification in the Terminal Configuration.

2) Select one gallon and press <enter>. Press <enter> again to confirm.

3) The Pump Motor should come on, and on the bottom section of the screen the prompt will read (in effect), "Turn Pump Handle on". The small numbered square green blocks on the lower section of the screen will turn yellow indicating that the dispenser is busy. If you look at the DPI at this point, you will notice that the appropriate Relay-Module's Green LED is briefly pulsing OFF to indicate it is waiting for the Clear Handle switch to be activated.

NOTE

The pump motor comes on prior to the 'pump handle' being lifted due to a feature called 'Hose Prime Duration' in which the hose is primed by running the pump motor and cycling the valves for a second (this is configurable). This is a popular and necessary feature at airports which typically have long, large diameter hoses that accumulate air between fueling events. It is also useful at any sort of retail fueling facility but can cause confusion if the sound of the motor makes customers think the handle is already lifted.

NOTE

For every discrepancy you find in the Terminal Configuration, the correct parameter must be modified in Siteminder and then pushed to the terminal. To save time, look for several discrepancies which need to be corrected before downloading and retesting.

4) Lift the pump handle and a switch closes, sending a Line Voltage signal from 'Reset' to 'Clear'. The program logic now also turns on the slow valve ('Slow') and waits for the customer to begin pumping fuel. The DPI Relay Module's Green LED should now be moderately flashing to indicate the Slow valve is activated.

5) You may now begin to pump fuel and you will notice it flows slowly since the fast valve is not yet on. As the first bit of fuel passes the meter, pulses are generated and the 'Pulses Before Fast Flow' parameter is satisfied. Once the system registers pulses, the 'Fast' circuit energizes and fuel should flow at full flow. The Green LED on the Relay-Module will flash faster to indicate this.

6) As the sale approaches the end of its preapproved amount, the 'Fast' circuit will cut off per the parameter, 'Slow Flow Engage Pulses'. This assures the flow of fuel slows for precise metering. As the fuel 'creeps' up to the targeted amount (in this case, one gallon), note whether the 'creep' is way too long or missing. If too long, decrease the number of 'Slow Flow Engage Pulses' set in the terminal's Siteminder configuration and do another test. If there seems to be no 'creep' at all, add more 'Slow Flow Engage Pulses' and do another test.

7) After the test sale terminates, compare the receipt to the actual amount dispensed and note any discrepancies. If the amount on the receipt differs from the amount displayed on the meter, you may need to contact QTpod support. There are other Siteminder parameters, Overshoot pulses and Completion delay that can help if a dispenser runs past the expected value.

NOTE, recommended additional tests: You can also repeat the above test but stop fueling prior to reaching the target. Returning the handle should immediately complete the transaction. In another test you can repeat the above but rather than returning the handle, you wait for an inactivity timeout to complete the transaction.

Glossary of Terms

*(suggested **web** resource for further information:* https://en.wikipedia.org/wiki/Main_Page*)*

BIOS: an acronym for Basic Input / Output System. The fundamental purposes of the BIOS are to initialize and test the system hardware components, and to load (**boot**) an operating system from a mass memory device.

Boot: In computing, it is the initialization of a system and the loading of an **OS** (operating system).

CPU: an acronym for Central Processing Unit. The electronic circuit within a computer system that carries out the instructions of a computer program.

DIN (rail): A DIN rail is a metal rail of a standard type widely used for mounting circuit breakers and industrial control equipment inside equipment racks. The term derives from the original specifications published by Deutsches Institut für Normung (DIN) in Germany, which have since been adopted as European (EN) and international (IEC) standards.

DisplayPort (DP++): a digital display interface used to connect a video source (computer) to a display device (computer monitor). A Dual mode version also known as DisplayPort++ (DP++) allows connections through passive adaptors to displays with **DVI** input interfaces.

DPI: an acronym used by QTpod for the Direct Pump Interface. It is the hardware circuitry mounted within the terminal's pedestal that interfaces the terminal controller with the fueling equipment's valves, pumps and measurement hardware.

DVI: an acronym for Digital Video Interface. An interface for connecting a video source, such as a computer's video display controller to a display device, like a computer monitor.

Ethernet: is a family of computer networking technologies commonly used in local area networks. The most common forms used are 10BASE-T, 100BASE-TX, and 1000BASE-T. All three utilize twisted pair cables and 8P8C (**RJ45**) modular connectors. They run at 10 Mbit/s, 100 Mbit/s, and 1 Gbit/s, respectively.

FLASH: A type of electronic memory that is solid-state and non-volatile (**NVMEM**). A computer storage medium that can be electrically erased and reprogrammed.

HVD: an acronym used by QTpod for the High Visibility Display, a metal enclosed circuit board with large 7-segment arrays of red **LED**s arranged to display numbers and limited characters that can be viewed from a distance. One or more of these can be wired to a single QTpod Terminal as the individual panels have selector switches for assigning unique addresses (1 – 15).

I2C (I^2C): pronounced I-squared-C, is a multi-master, multi-slave, packet switched, single-ended, serial computer bus. Master and Slave devices communicate over a two-wire interface.

IDE: The term Integrated Drive Electronics refers not just to the connector and interface definition, but also to the fact that the drive controller is integrated into the drive, as opposed to a separate controller. Developed by Western Digital as an interfacing method between Hard drives and computers.

IO: an acronym for Input / Output, typically referring to data ports that transfer binary (logical) signals into and out from computers and their peripherals.

Internet: is the global system of interconnected computer networks that use the Internet protocol suite to link devices worldwide. It is a network of networks that consists of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (**WWW**), electronic mail, telephony, and peer-to-peer networks for file sharing.

Latency: The time delay between a triggering event and the start of the system reaction to the stimulus.

LED: A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode that emits light when electrical current flows through it. Often used as indicator lamps for electronic devices, replacing small incandescent bulbs, due to their lower power and longer life.

NVMEM: an acronym for Non-Volatile Memory, a type of computer storage device that can retrieve stored information even after having been power cycled (turned off and back on).

OS: An operating system (OS) is system software that manages computer hardware and software resources and provides common services for computer programs.

PCIe: Peripheral Component Interconnect Express, officially abbreviated as PCIe is a high-speed serial computer expansion bus standard, designed to replace the older bus standards. A reduced form factor variant named mini-PCIe (mPCIe) is sometimes available for adding peripheral hardware to smaller-sized systems.

PIE: Progressive International Electronics is manufacturer of electronic interfaces to a variety of fuel dispenser hardware. Website link: http://www.pie-corp.com/products.html

Quadrature: Regarding pulse counting on fueling systems, pulsers with the two signal quadrature outputs can represent both quantity and the direction of flow.

Relay: A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays (**SSR**). Relays are used where it is necessary to control a circuit by a separate low-power signal.

Relay Module: The M4000 **DPI** consists of a mainboard with eight slots for the addition of expansion modules that use **SSR**s to convert logic-level control signals to high voltage outputs to control valves and pumps used in fuel dispensers.

RJ45: The 8 position 8 contact (8P8C) connector is a modular connector commonly used to terminate twisted pair cable. These connectors are commonly used for **Ethernet** over twisted pair. Commonly referred to as an RJ45 in the context of Ethernet and category 5 & 6 (CAT5 & 6) cables.

RS232: is a standard for serial communication transmission of data. It formally defines the signals connecting between a DTE (data terminal equipment) such as a computer terminal, and a DCE (data circuit-terminating equipment or data communication equipment), such as a modem. The RS-232 standard is commonly used in computer serial ports.

RS422: is a technical standard that specifies electrical characteristics of a digital signaling circuit. Differential signaling can transmit data at high rates over very long cable runs.

RTD: Resistance temperature detectors, also called Resistance thermometers, are sensors used to measure temperature. Many RTD elements consist of a length of fine wire wrapped around a ceramic or glass core but other constructions are also used. The RTD wire is a pure material, typically platinum, nickel, or copper. The material has an accurate resistance/temperature relationship which is used to provide an indication of temperature. As RTD elements are fragile, they are often housed in protective probes.

SATA: abbreviated from Serial AT Attachment, an interface standard for the connection of storage devices such as hard disk drives to computers. The ATA interface itself evolved in several stages from Western Digital's original parallel **IDE** interface. The Serial ATA interface was introduced in 2003.

SQL: Structured Query Language is a domain-specific language used in programming and designed for managing data held in a relational database management system. It consists of a data definition language, data manipulation language, and data control language. The scope of SQL includes data insert, query, update and delete, schema creation and modification, and data access control.

SOTI: A company known for software tools for Enterprise Mobility Management (EMM). website: https://www.soti.net/products/mobicontrol/overview/

SPI: The Serial Peripheral Interface bus is a synchronous serial communication interface specification used for short distance communication, primarily in embedded systems. SPI devices communicate in full duplex mode using a master-slave architecture with a single master. The master device originates the frame for reading and writing. Multiple slave devices are supported through selection with individual slave select (SS) lines.

SSD: A solid-state drive (SSD, also known as a solid-state disk) is a solid-state storage device that uses integrated circuit assemblies as memory to store data persistently. SSD technology primarily uses electronic interfaces compatible with traditional block input/output (I/O) hard disks. SSDs have no moving mechanical components.

SSR: A solid-state relay is an electronic switching device that switches on or off when a small external voltage is applied across its control terminals. SSRs consist of a sensor which responds to an appropriate input (control signal), a solid-state electronic switching device which switches power to the load circuitry, and a coupling mechanism to enable the control signal to activate this switch without mechanical parts. The relay may be designed to switch either AC or DC to the load. It serves the same function as an electromechanical relay, but has no moving parts.

Taskbar: A taskbar is an element of a graphical user interface which has various purposes. It typically shows which programs or applications are running on the device, as well as provide links or shortcuts to other programs or places, such as a start menu, notification area, and clock.

URL: A Uniform Resource Locator, colloquially termed a **web** address, is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it.

USB: short for Universal Serial Bus, is an industry standard that defines cables, connectors and communications protocols for connection, communication, and power supply between computers and electronic devices.

WiFi: Wi-Fi or WiFi is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. Wi-Fi most commonly uses the 2.4 gigahertz and 5 gigahertz radio bands. Wi-Fi technology may be used to provide Internet access to devices that are within the range of a wireless network that is connected to the **Internet**.

WWW(Web): The World Wide Web (abbreviated WWW or the Web) is an information space where documents and other web resources are identified by Uniform Resource Locators (**URL**s), interlinked by hypertext links, and can be accessed via the **Internet**.

Write caching: A cache's sole purpose is to reduce accesses to the underlying slower storage. Fundamentally, caching realizes a performance increase for transfers of data that is being repeatedly transferred. This performance increase is due to buffering occurring within the caching system. Since buffered (cached) data is held in standard computer memory, there is a danger of data loss during power failures. With the high transfer speeds provided by **SATA** connected **SSD** devices, the risk of data loss may outweigh any advantage of write caching.

Appendix A – Serial Protocol Dispensers

NOTE: QTpod will forward the documentation provided by the 3rd party equipment that is installed for a customer site.

Appendix B – Multi-Line High Visibility Displays

Note: Reference M3000 documentation (T0139) with the only change being that the ribbon cable now plugs into J11 on the DPI board.

Appendix C – WiFi Setup Instructions

The following steps are for those customers who purchased the WiFi connection option for their M4000.

Reference: Link for setting up WiFi router that connects to Internet:
https://support.microsoft.com/en-us/help/17137/windows-setting-up-wireless-network

It is recommended that installation technicians first attempt connecting to WiFi at the terminal's location with their cell phone or other WiFi enabled equipment. This will acquaint them with the procedural steps and verify they can correctly identify the router's name and enter the correct secure password. Signal strength can also be evaluated by the device's strength meter, if provided.

Difficulty in reliably connecting during the above operation will indicate serious connectivity problems for the M4000 as well. Contact QTpod regarding other options for connecting the M4000 to the Internet.

Terminals with the WiFi option include a small keyboard-touchpad accessory that connects to the Terminal via a small USB transmitter. Install the USB interface into one of the available USB connectors along the bottom edge of the IO-Board. If no connectors are available you can temporarily unplug one of the other connectors during this setup procedure.

The terminal will always powerup and/or reset to run the QTpod terminal application. To change WiFi settings you will need to exit that default application. Methods to exit the application are: Go to the QTpod Diagnostic-Utility by swiping a special managers code card, or by entering the code via either the terminal's front keypad or using the newly connected keyboard. The code is entered by first pressing the CLR (backspace) key on the keypad first, then the code numbers followed by another CLR (backspace) keypress.

Once the Diagnostic-Utility starts you can abort to the windows desktop by either clicking the upper right red "X" or by tabbing the Diagnostic-Utility's top section to "System" and then pressing option "2".

Continue configuring WiFi connectivity once the terminal is at the Windows 10 desktop.

1. Go to "Settings > Network & Internet > Wi-Fi > Show available networks"
2. Click on the network name (SSID = service set identifier) you are to connect to
3. Check the box to always "Connect automatically"
4. Enter the network security key
5. Decline sharing of the M4000 by selecting "No", or closing the Settings screen.

Use the lower left windows icon to get to the option to "Restart Windows"
This will reboot and reload the application

Helpful links for setting WiFi connectivity on the terminal.
https://www.wikihow.com/Connect-to-WiFi-in-Windows-10
https://support.microsoft.com/en-us/help/4000432/windows-10-fix-wi-fi-problems

Appendix D – Accessing Change Log

Weights and Measures Change Log

The M4000 maintains a log file containing all changes made to parameters that could affect pricing and the measured quantity of fuel dispensed.

Log file location

On the terminal, the log file is typically named PulserResolution.txt and is stored in the c:\PCITrace folder (the file name is based on what is configured in the Nlog.config file).

Log File Display and Printing

The contents of the log file can be accessed from the terminal screen by means of the Diagnostic Utility. The terminals have a site manager's keypad access code or a Diagnostic card that will suspend the terminal program (if no transactions are in process) and start the utility.

Use the top left terminal screen button to highlight the "Pulser Log" tab. From there you can use number keys on the keypad to print or display the file's contents.

Log File Codes

Each parameter change is time and date stamped with a code and parameter. **The codes are as follows:**

PT: Pulser Type [0 = Single, 1=Quadrature, 2=Staggered, 3=Redundant]

PR: Pulser Resolution, number of pulses per gallon

PC: Price Change, the new value in dollars per gallon (*dollars.cents*)

SF: Slow Flow pulses before the FAST valve is opened

OS: Overshoot compensation, number of pulses prior to reaching end target to stop flow

HP: Hose Prime duration (seconds)

CD: Completion Delay, number of seconds before timeout if clear-handle is not returned

Refer Section 5 for additional instructions on the use of the diagnostic utility.

Appendix E – SITE PREPARATION CHECKLIST

The terms of this site installation (as agreed) are for an authorized factory technician to be on site for start-up and training. The following items must be fully completed prior to our technician booking travel to site. Additional charges may be incurred if site preparation is not completed as stated. Please initial each item, sign form, then scan and email all pages to techsupport@qtpod.com (or fax to QT Petroleum on Demand @ (303) 444-8736). An installation cannot be scheduled until this checklist is received, fully completed.

Terminal / Dispenser System Related Requirements

1. A low voltage conduit (or shielded cable in conduit B) going from each dispenser Junction Box to the terminal pedestal with at least five #16 AWG (See Figure 7 or 8 — Dispenser Field Wiring Diagram, conduit A). If LEVEL 2 grounding is desired, a conduit going from the low voltage J-Box to the ground reel with two # 16 AWG wires is needed. The wire size may have to be increased on long distances or runs.

   Completed on __/__/____ by_____

2. A high voltage conduit going from each dispenser J-Box to the terminal pedestal with at least six #14 AWG wires (See Figure 7 or 8 — Dispenser Field Wiring Diagram, conduit B). Other wires such as 220v pump, hose reels, etc., would need extra wires for their support needs. The wire size may need to be increased on long distances or runs.

   Completed on __/__/____ by_____

3. (for direct connect systems) A low voltage conduit going from the terminal pedestal to the site's Internet access point (Router or Switch). This conduit has at least one Cat5 or Cat6 Ethernet cable. (See Figure 7 or 8 — Dispenser Field Wiring Diagram, conduit C)

   Completed on __/__/____ by_____

4. All wiring to run the pump is completed (See Figure 7 or 8 — Dispenser Field Wiring Diagram, conduit E or F). One wire per pump control relay is required in conduit E if the relay(s) are located at or near the Breaker Panel.

   Completed on __/__/____ by_____

5. A high voltage conduit going from the terminal pedestal to the breaker box (See Figure 7 or 8 — Dispenser Field Wiring Diagram, conduit D). The conduit will contain a dedicated neutral & hot for the terminal computer and fuel dispensers (NOT Pump Motors). Electricians should determine the wire

size. Include a ground wire of 10 AWG. [Note: this requirement is for terminal and dispenser power ONLY, accessories such as 220V pumps, hose reels, lighting, etc. need their own circuits.]

Completed on __ /__ /____ by_____

6. The terminal pedestal has been mounted with all appropriate conduits stubbed up to the shelf. Check clearances for installation & maintenance access.

   Completed on __ /__ /____ by_____

7. Each dispenser has a 2-stage electric solenoid valve. This type of valve has a fast valve for full flow and a slow valve (2-3 GPM) for pre-set sale amounts. This item is NOT OPTIONAL. You must have this for the fuel terminal to function correctly. Call QT Petroleum on Demand if you need to order a 2-stage valve.

   Completed on __ /__ /____ by_____

8. Each dispenser has at least a 100:1 resolution pulser for gallon only meters, or a 1 pulse per penny pulser for a dollar dispenser. Pulsers with less resolution WILL NOT WORK, since they will fail weights & measures inspections.

   Completed on __ /__ /____ by_____

9. Each dispenser has an electric reset or a way to mimic the electric reset. This is done through a lever-actuated switch in an explosion proof housing (See Figure 5).

   Completed on __ /__ /____ by_____

10. Each tank has fuel in the tank for testing purposes. We will also need somewhere to pump the fuel within the reach of the hose. Usually back into the tank, a fuel truck, vehicle, boat or plane. It may require pumping 100 gallons or more for testing.

    Completed on __ /__ /____ by_____

11. The system has been pressure tested for leaks all the way to the end of the hose.

    Completed on __ /__ /____ by_____

The site preparation has been completed in compliance with the above checklist.

Signature Date

Name (Please Print)

Company Phone Number

Site Name