



# System2<sup>®</sup>

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**Automated Fueling System**  
*Installation Manual*

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# 1.0 Before You Begin

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## **WARNING!**

This manual contains several important warnings. You must heed these warnings to ensure the safe and effective operation. Failure to comply with these warnings may create hazardous conditions and/or damage the system.

### 1.1 INSTALLATION CODES

Installation must be in accordance with the National Electrical Code (NFPA No.70), the Automotive and Marine Service Station Code (NFPA No. 30A) and the Compressed Natural Gas Code (NFPA No. 52). Installers are responsible for following any applicable local codes.

*See the Hazardous Area definitions on the following page. Installation to listed pumps or dispensers is subject to approval by the authority having jurisdiction.*

## **WARNING!**

ONLY the Model DIV.2 FIT can be installed within a hazardous area!

### 1.2 UNPACKING THE SYSTEM

Be sure to check the packaging carefully for any damage that might have occurred during shipping. The cabinet and most components for each **SYSTEM2** unit are packed in one box. Power supplies, pedestals, and printers are packed separately.

#### **Data Sheet**

The Data Sheet lists details about your particular system, and is packed with this manual. *Store this sheet in a secure location* - you may need it when calling for service or information.

### 1.3 EXTERNAL DEVICE CONNECTION

Terminals, modems and accessory journal printers must be UL and CSA listed, and have an EIA-standard RS-232C or RS-422 interface.

*Do NOT mount the Fuel Site Controller or any peripheral equipment within or above the hazardous area (see Illustration).*

Petro-Net uses RS-485 communication, requiring twisted pair wire for proper operation. Twisted pair wire is available from **Petro Vend** (p/n 12-1029). Twisted pair can also be made by twisting together TFFN, THHN or THWN wire, and then pulling it through a conduit. Twisted pair should have about ten twists per foot (the standard for RS-485 communications).

FITs must be properly grounded in order for the noise suppression circuitry to function properly. *Do NOT rely on the conduit to provide a ground!* The FIT(s) and PCT should all be grounded to a common point.

### **PETRO-NET LENGTH**

The **MAXIMUM TOTAL** length of Petro-Net at each site is 5,000 feet. This is **NOT** per device. This is **TOTAL** of all FITs, PCTs and other devices.

**EXAMPLE:** A site contains two FITs, a remote PCT and a junction box. Each FIT is 1,000 feet from the junction box. The remote PCT is 100 feet from the junction box. The **TOTAL** length of Petro-Net in this example is 2,100 feet.

## **1.4 DRILLING HOLES IN CABINETS**

**DO NOT** drill holes into the FIT or PCT cabinet! Besides violating the integrity of the cabinet and voiding the system warranty, drilling holes can leave metallic dust that can interfere with system circuitry.

Threaded holes are provided for mounting, and knockouts are available to connect the conduit.

## **1.5 HAZARDOUS AREA DEFINITION**

See Figures 1 and 2 on the following page. A fuel dispenser is a *hazardous area* as defined in the National Electrical Code.

Do *not* mount the Fuel Island Terminal (FIT, except Model DIV.2), the Fuel Site Controller (FSC) or the indoor Pump Control Terminal (PCT) within a hazardous area.

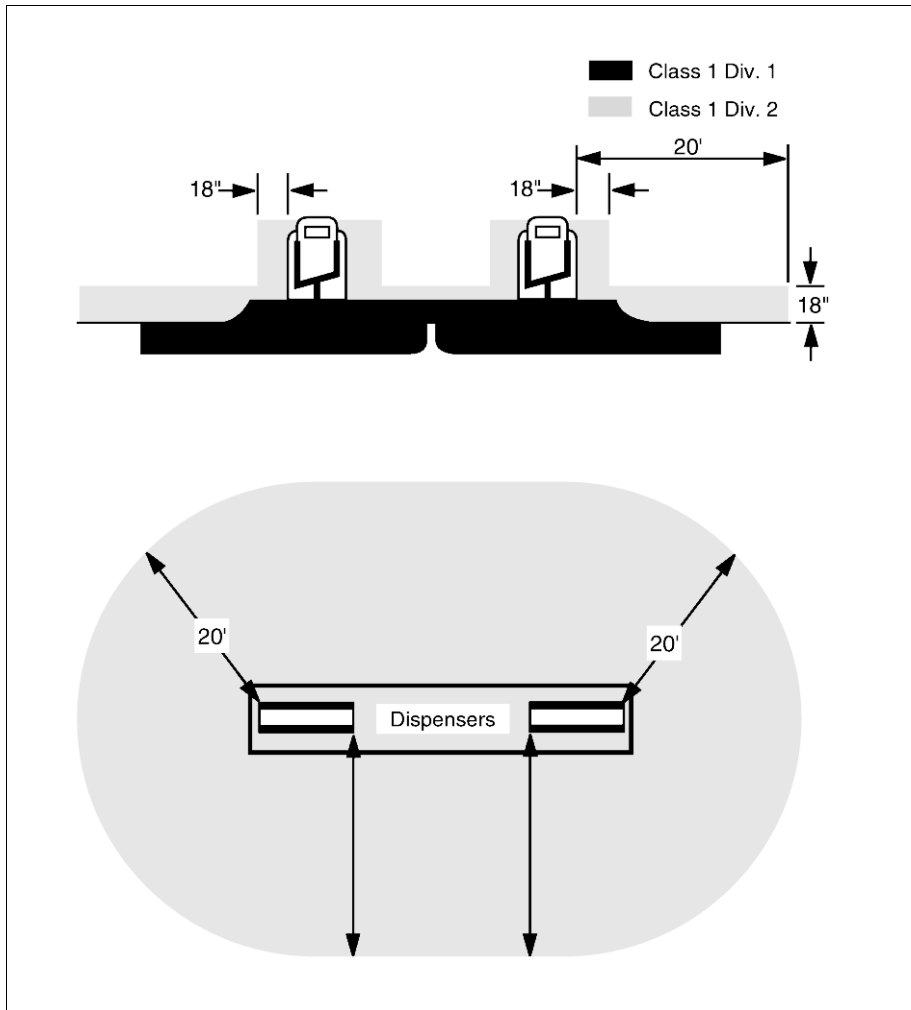


Figure 1 - Hazardous Area Definition for Gasoline/Diesel Dispensers

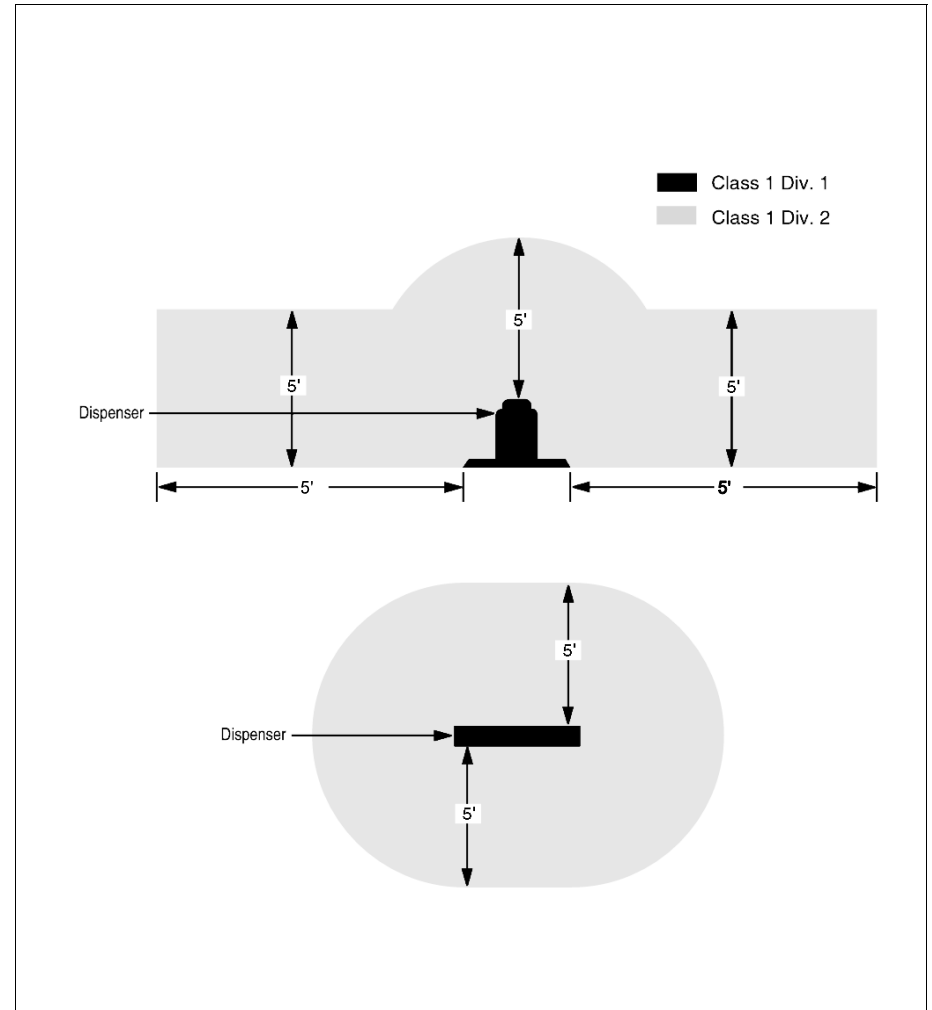


Figure 2 - Hazardous Area Definition for CNG Dispensers

Notes:



# 2.0 System Overview

## 2.1 COMPONENTS

### 2.1.1 Fuel Island Terminal (FIT)

Up to four FITs can be installed at convenient outdoor locations. Each FIT has a programmable display to greet and guide a customer through the fueling process, a keypad for customer data entry, and card or key readers to restrict access. The FIT specifications are given in the table below.

FUEL ISLAND TERMINAL	
Readers <i>(see NOTE opposite)</i> <i>(Each FIT can have one or two readers)</i>	Magnetic Stripe Card Motorized Magnetic Stripe Card Optical Card ChipKey
Display <i>(One per FIT)</i> Standard Optional	2 lines x 16 characters 1 line x 40 characters Graphics (320 x 200 pixels)
Cabinet Dimensions	15" H x 18" W x 11" D (38cm H x 46cm W x 28cm D)
Pedestal Dimensions <i>(see NOTE opposite)</i>	48" H x 14" W x 8" D (122cm H x 36cm W x 20cm D)
Power Requirements Standard Optional	120 VAC, 50/60 Hz; 200 watts max. 240 VAC, 50/60 Hz; 200 watts max.
Operating Temperature Range <i>(with optional heater)</i> <i>(heater required for receipt printer and/or graphics display)</i>	-409 F to 1229 F (-409C to 509 C)

### NOTE

The DIV.2 FIT is NOT available with a motorized magcard reader, receipt printer or pedestal-mounted pump control.

### 2.1.2 Pump Control Terminal (PCT)

Up to four PCTs can be installed per system. There are two types of PCT installation

PCT board in the FIT cabinet, with pump control relays mounted in the FIT pedestal

PCT board and pump control relays in separate, indoor cabinet.

Both types of PCT installation provide easy access to the pump relays, while also reducing electrical noise.

All types of pulsers - active, passive, electronic and mechanical - are supported. Pulsar activation can be by current flow or handle activation.

*Pump Control Board specifications are on the next page.*

PUMP CONTROL BOARD	
Pump Control	3/4 HP, 120/240 VAC
Pulser Compatibility	Contact / 12 VDC Electronic
Pulser Power Supply	12 VDC; 40 milliamps max/pulser
Pulser Rate	1:1 to 1000:1 ( <i>in one pulse increments</i> )
Pulser Type	Single or dual channel
Pulser Speed Mechanical Setting Electronic Setting	6,000 pulses per minute 100,000 pulses per minute
Pulser Duty Cycle	50%
Cabinet Dimensions of Indoor PCT	25" H x 16" W x 5" D (64 cm H x 41 cm W x 13 cm D)
Power Requirements of Indoor PCT Standard Optional	120 VAC, 50/60 Hz; 100 watts max 240 VAC, 50/60 Hz; 100 watts max
Operating Temperature Range Indoor PCT	32°F to 122°F (0°C to 50°C)

### 2.1.3 Fuel Site Controller (FSC)

The FSC *must* be installed indoors.

FITs and PCTs connect to the Petro-Net junction box. The FSC is connected to the Petro-Net junction box with Petro-Net cable, part number 20-1443. Petro-Net uses the RS-485 communications protocol. Petro-Net requires twisted pair, 18 AWG (or greater), oil and gas resistant wiring (TFFN, THHN, or THWN). The Petro-Net wiring must be installed in *rigid steel conduit* to provide weatherproofing and to minimize electrical interference.

FUEL SITE CONTROLLER	
Cabinet Dimensions	2" H x 10" W x 11" D (5cm H x 25cm W x 28cm D)
Power Requirements Standard Optional	120 VAC, 50/60 Hz; 50 watts max. 240 VAC, 50/60 Hz; 50 watts max.
Operating Temperature Range <i>(indoors only)</i>	32°F to 122°F (0°C to 50°C)
Operating Temperature Range for Peripheral Devices <i>(indoors only)</i>	40°F to 85°F (4°C to 29°C)
Serial Communication Ports	Petro-Net ( <i>RS-485</i> ) Printer ( <i>proprietary</i> ) Terminal ( <i>RS-232</i> ) Modem ( <i>RS-232</i> ) 3 Auxiliary Ports ( <i>RS-232</i> )
Maximum Petro-Net Extension	5000' (1524 m)

With optional Universal Pump Control ("UPC") software, the FSC can authorize fueling transactions via a pump control console (such as used in a self service station).

*Pumps controlled by a UPC/console do not require a PCT.*

2.2 SITE OVERVIEW

Figures 3, 4, and 5 illustrate typical sites for the three types of pump control that can be installed for **SYSTEM2**: PCT in FIT, Indoor PCT, and an FSC/UPC software and pump control console (no PCT). If power is run with pulser wires, THE PULSER WIRES MUST BE SHIELDED. If non-shielded pulser wire is used, it must be run in its own metallic conduit.

2.2.1 PCTs in FIT

Figure 3 shows a site where the PCT board, and associated pump relays, are housed in the FIT enclosure and pedestal. The FIT can be no further than 5,000 feet from the Fuel Site Controller. *The FIT and FSC should be powered from the same circuit breaker.*

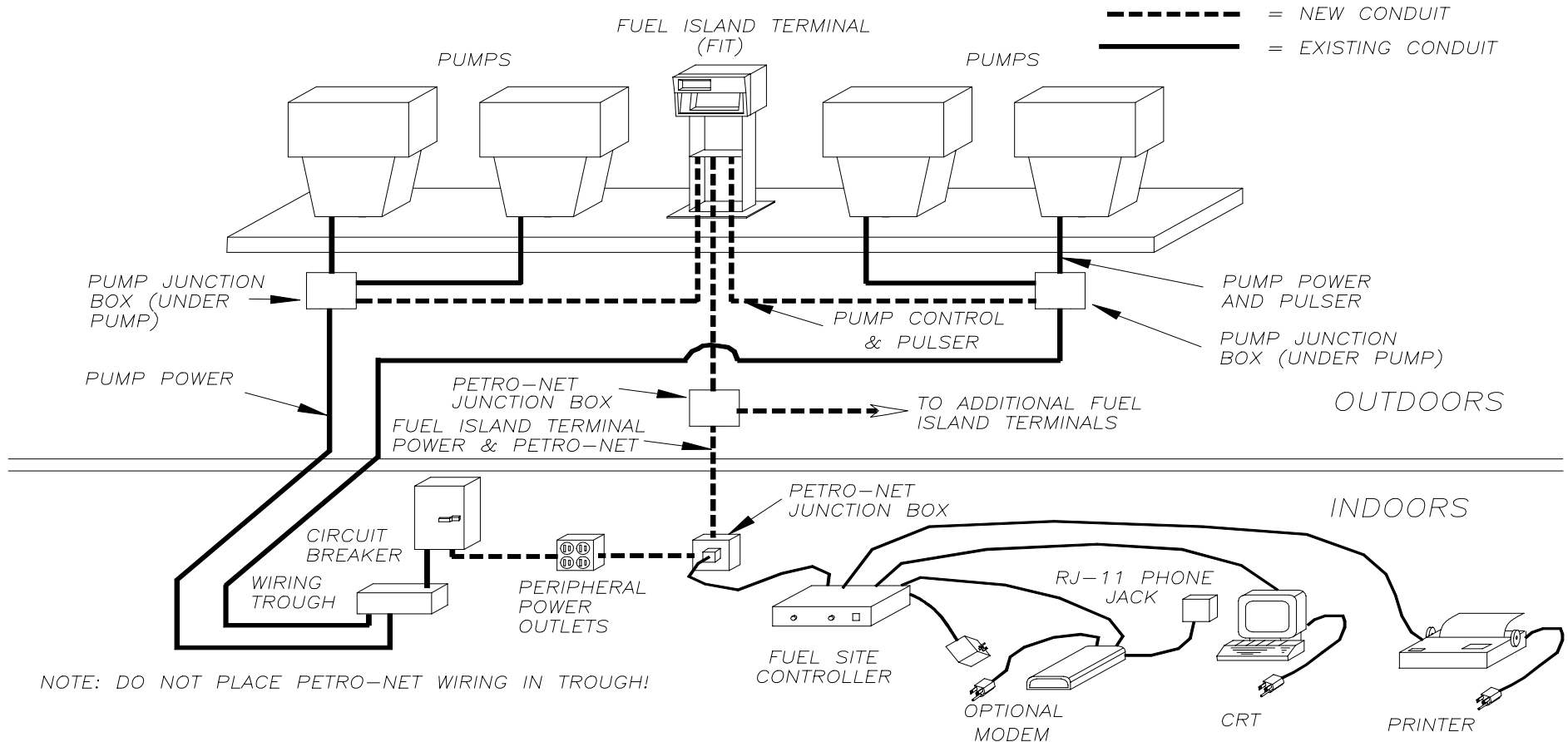


Figure 3 - TYPICAL INSTALLATION WITH PCT IN FIT

2.2.2 Indoor PCT (REQUIRED for DIV.2 FITs)

Figure 4 shows an installation with PCTs and their associated pump relays in a separate, indoor cabinet. Note that if power is run with pulser wires, **THE PULSER WIRES MUST BE SHIELDED**. If non-shielded pulser wire is used, it must be run in its own metallic conduit.

The Petro-Net wiring **CANNOT** be in the same wiring trough as the power supply wiring. As with the site where the PCT and FIT are in a common enclosure, the FIT and the FSC should be powered from the same circuit breaker.

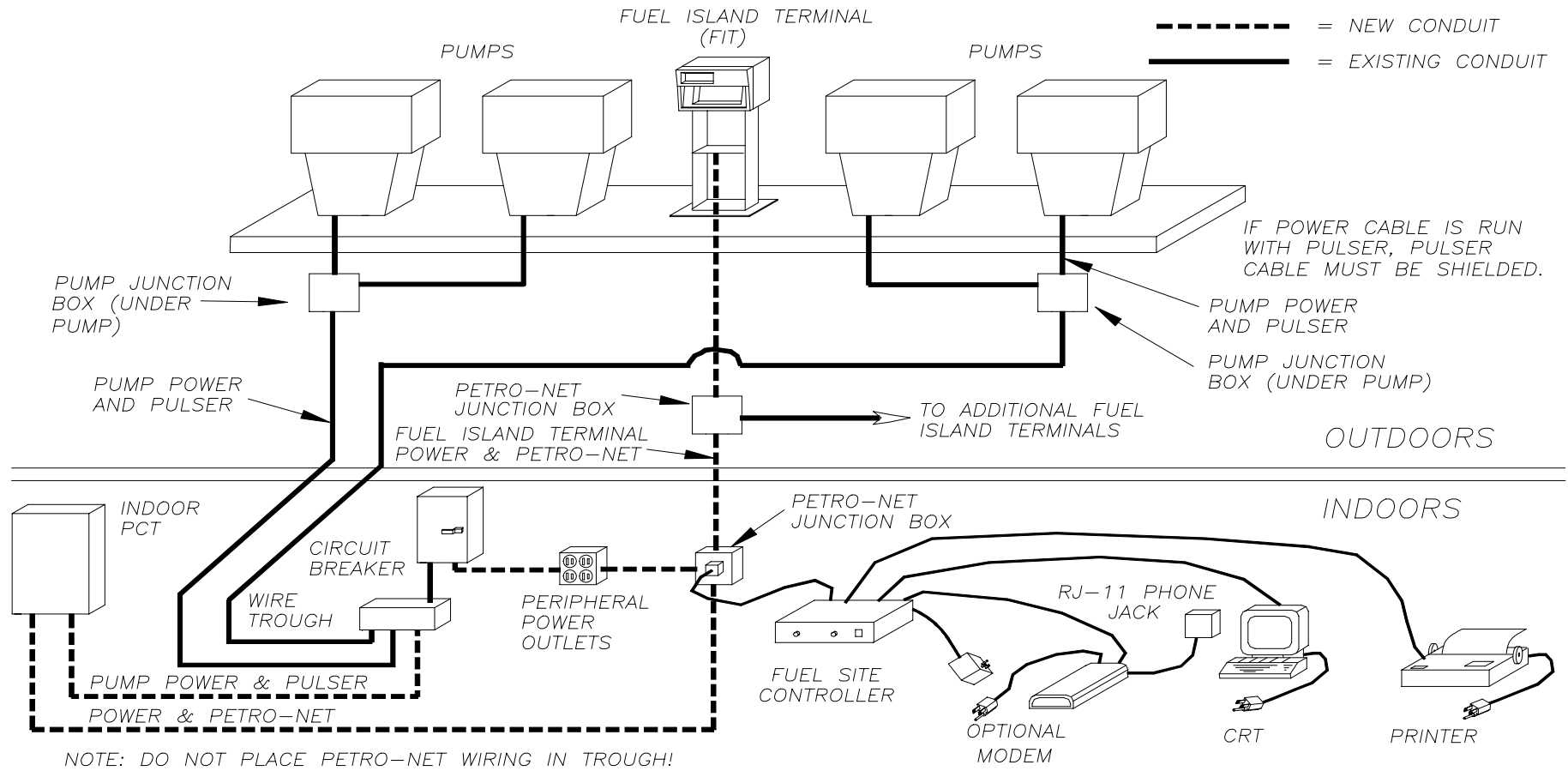


Figure 4 - TYPICAL INSTALLATION WITH INDOOR PCT

2.2.3 FSC Using Optional Universal Pump Control Software

Figure 5 shows an installation with a pump console driven by Petro Vend UPC pump control software. With this software, the FSC can authorize fueling transactions via a pump control console (such as used in a self service station).

*Pumps controlled by the FSC/UPC and a console do not require a PCT.*

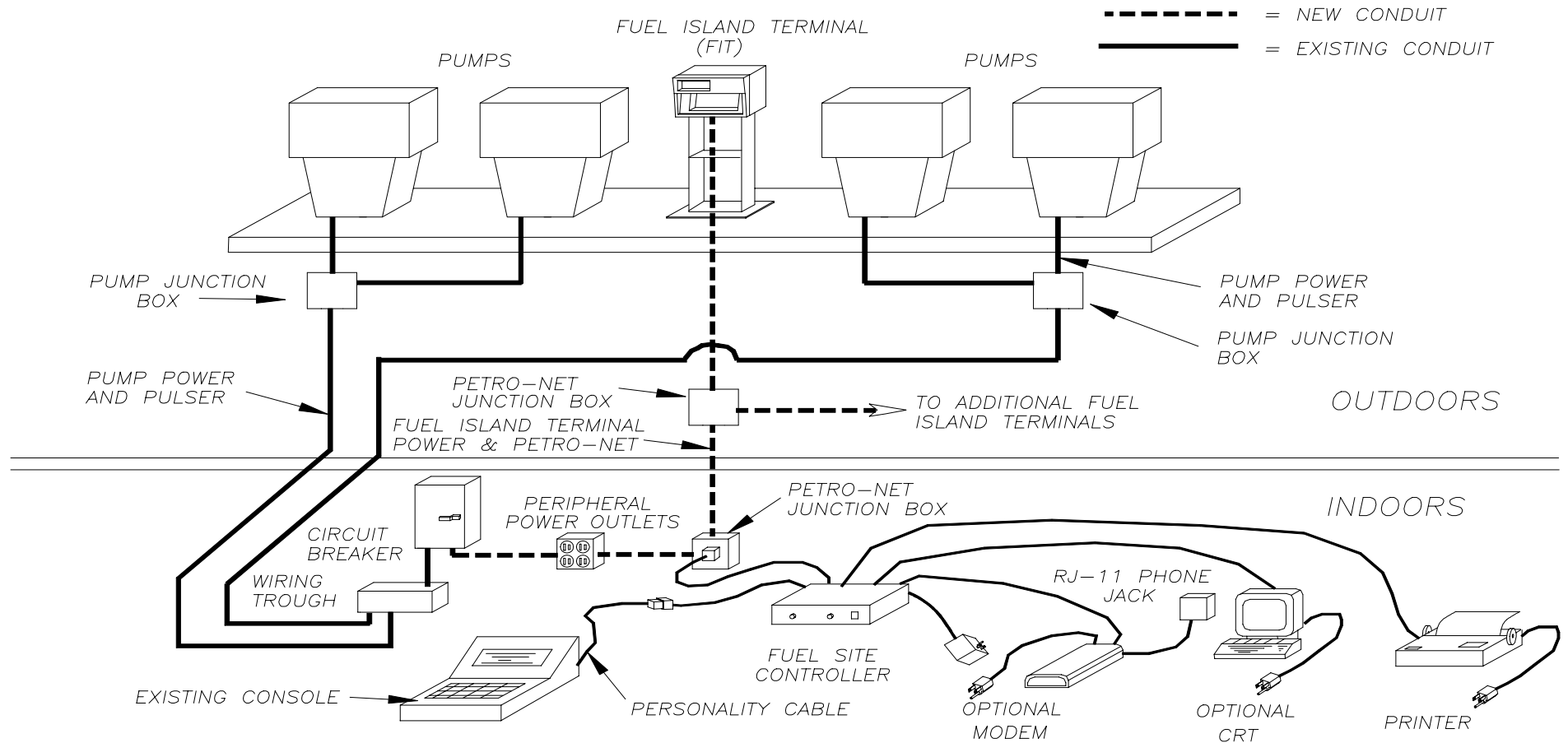


Figure 5 - TYPICAL INSTALLATION WITH PUMP CONTROL CONSOLE

Notes:

# 3.0 Installation Procedure

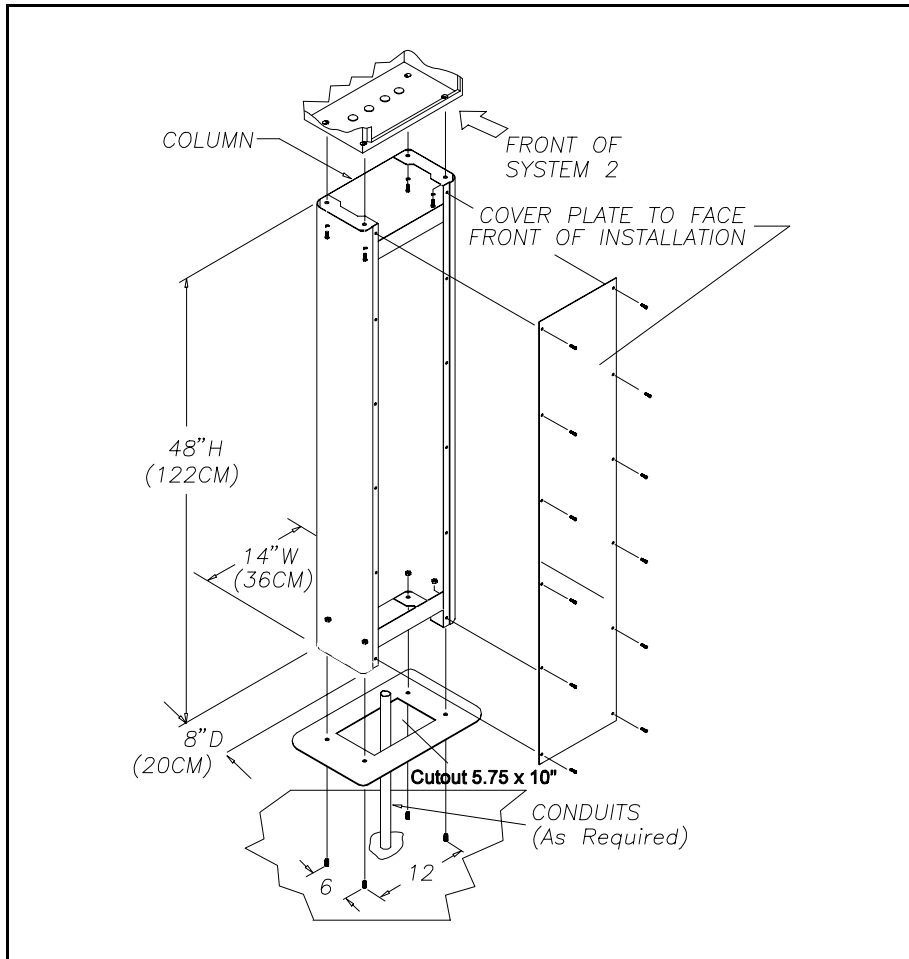


Figure 6 - FIT PEDESTAL INSTALLATION

## 3.1 FIT INSTALLATION

Up to four FITs can be connected to one Fuel Site Controller (FSC).

A typical pedestal is shown in Figure 6. There are two types of FIT pedestal. One type has mounts for internal pump relay boards, and is meant for outdoor PCTs. The other type does *not* have mounts, and is used when the relay boards are installed in an indoor PCT cabinet.

Select a location at or near a fuel island for each FIT. Shield the FIT cabinet from direct sunlight, particularly in warmer climates.

To meet requirements, *standard* (non-DIV.2) FITs must be installed:

- Min. 18" (46 cm) from the nearest *conventional* pump/dispenser.
- Min. 24" (61 cm) from the nearest *overhead* pump/ dispenser.

*DIV.2 FITs CAN be installed within the Division 2 area.*

Anchor each FIT pedestal to the concrete with 3/8" (1 cm) bolts (*not* provided). Be sure the *front* of the pedestal (the side with the relay board access cover) faces toward the user.

Mount each FIT cabinet, display side forward, onto its pedestal with the hardware provided. If the relay boards are being installed indoors, install the cover plate onto the front of the pedestal. If relay boards are going into the pedestal, continue with Section 3.1.1.

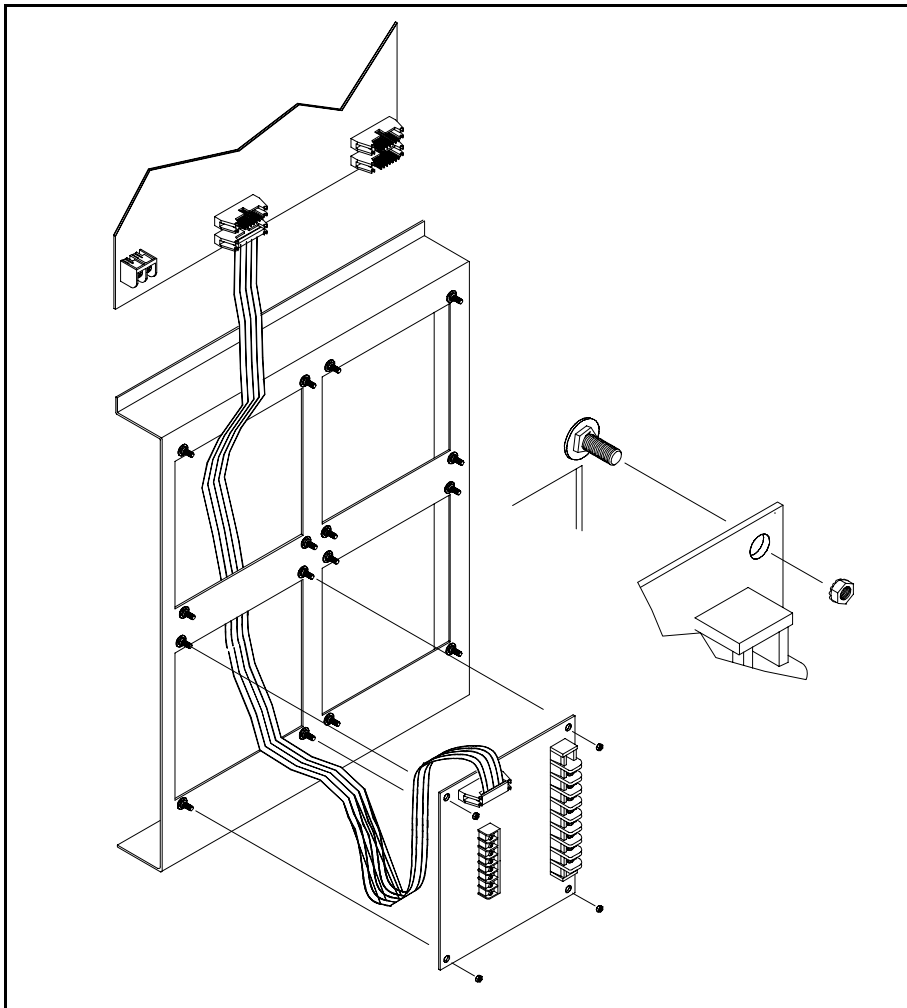


Figure 7 - RELAY BOARD INSTALLATION

### 3.1.1 Installing Relay Boards in the FIT Pedestal (NOT Available with DIV.2 FITs)

This section is for *outdoor* PCT installations only. Systems with DIV.2 FITs must have *indoor* PCTs.

**IMPORTANT**

Install the bottom relay boards *first* for proper ribbon cable placement.

Pump relay boards, with 14-wire ribbon cables, are packaged separately from the pedestals. After mounting the FIT to its pedestal, install the pump relay board(s) into the pedestal as follows:

1. Starting with the bottom boards, place the boards on the mounting studs and secure with the four nuts provided (see Figure 7).
2. Install standard knockout bushings in the FIT cabinet(s) to protect the ribbon cables. Attach one end of the ribbon cables to the J1 connector on the relay board.
3. USE TABLE, attach the other end of the ribbon cable to the appropriate J1 to J4 connectors on the PCT board.

RELAY BOARD CABLE CONNECTIONS		
Pumps	Mounting Position in Pedestal	PCT Board Connector
1 & 2	Bottom Left	J1
3 & 4	Top Left	J2
5 & 6	Bottom Right	J3
7 & 8	Top Right	J4



### 3.1.2 Receipt Printer Installation (*NOT available with DIV.2 FITs*)

See Figure 8 on the following page. The optional receipt printer is attached inside the FIT cabinet with two quick release hinges. To install the printer, do the following:

1. Remove the half of the hinges that are not attached to the printer chassis by squeezing the hinge clips.
2. Place the top hinge on the two studs in the FIT enclosure and secure with the two supplied #8-32 keps nuts. Tighten the nuts to 4 - 18 inch-pounds.
3. Place the bottom hinge on the studs in the enclosure, and attach it with the two remaining keps nuts. **DO NOT** completely tighten these nuts.
4. With the paper roll at the bottom, squeeze the bottom hinge clips on the printer, and place it on the bottom hinges. Swing the printer upward, squeeze the top hinge clips together, and push the printer onto the top hinges in the FIT.
5. Tighten the two bottom keps nuts to 4 - 18 inch-pounds. Test the hinge alignment by removing the assembly: press the hinge clips together, remove the printer, then put it back onto the hinges to see if everything slides easily.

6. Attach the 10-pin ribbon cables between the J2 connector on the PV267 printer board and the J8 connector on the PV269 FIT board.
7. The receipt guides and cutter retainer mount to the door pocket. Remove and discard the blank adaptor plate from the pocket. Mount the guides to the new slotted adaptor plate as shown.

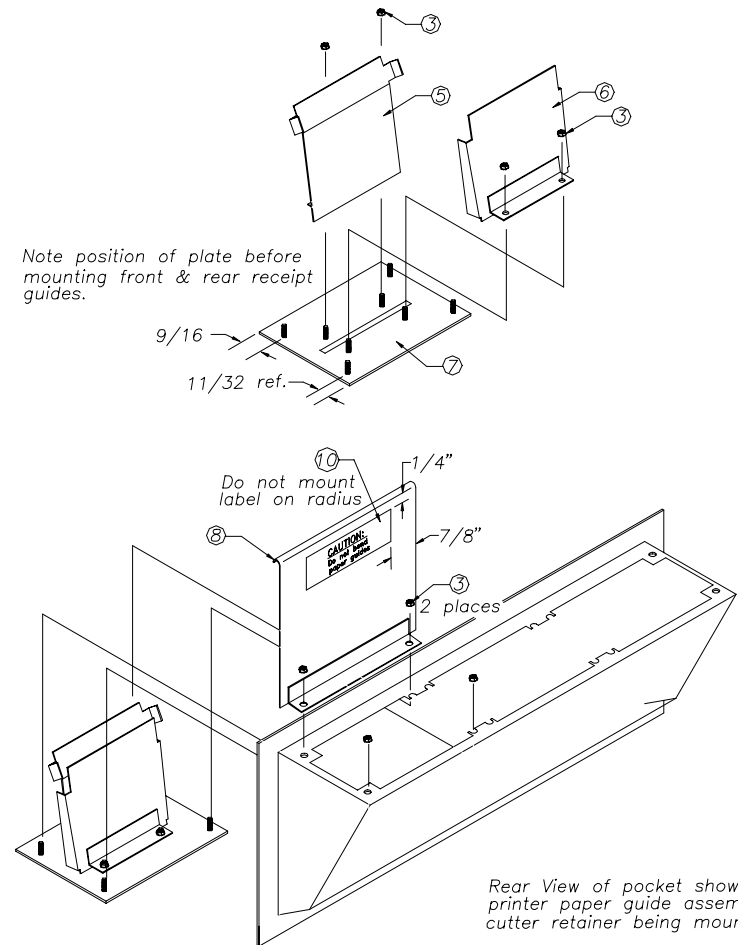
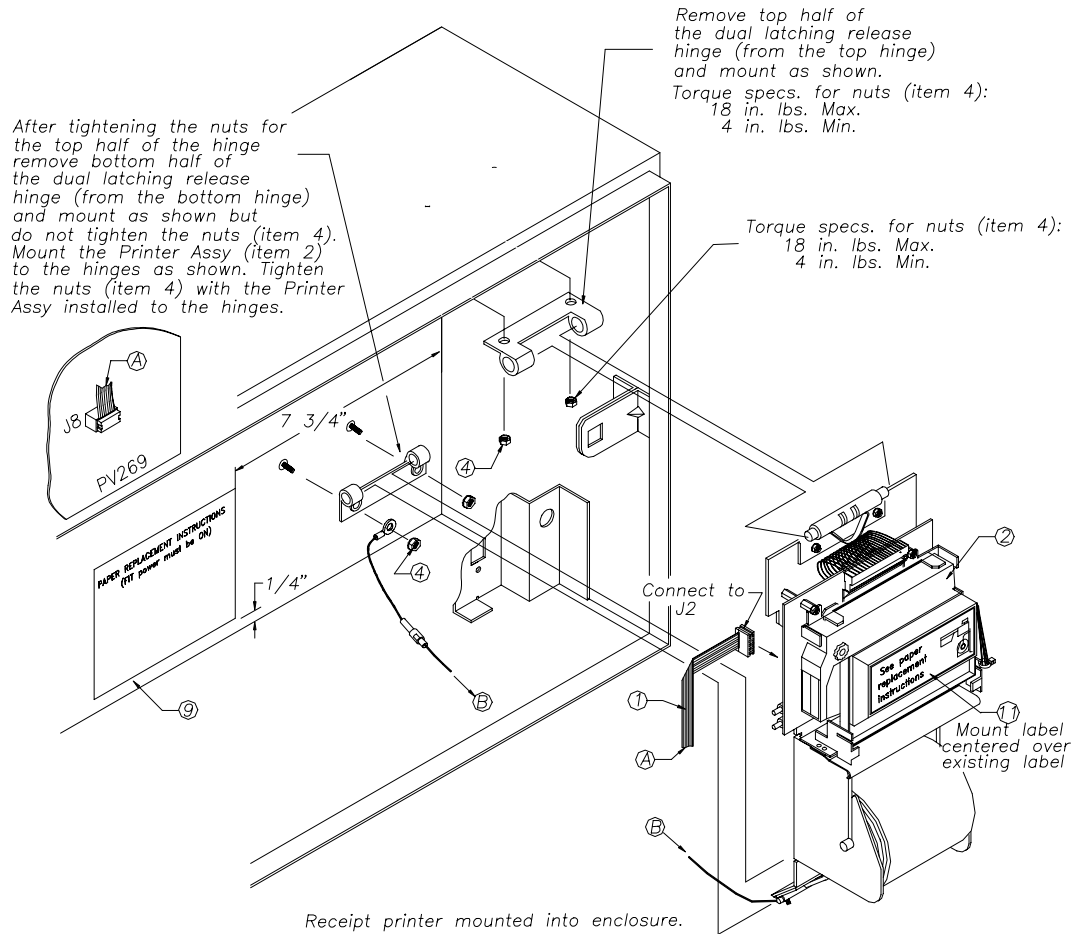
**NOTE:** *When the door is open, the receipt guides appear close together. The guides and cutter retainer are self-aligning, however, and DO NOT need adjustment.*

### 3.1.3 FIT Graphics Display Contrast

If you are having trouble reading the characters on the FIT graphics display, adjust potentiometer R5, located inside the FIT on the Display PC board. This PC board is mounted on the inside of the FIT door. The potentiometer is a small, square component in the upper-right area of the PC board.

The potentiometer is single-turn. Use a small screwdriver to either INCREASE contrast (turn clockwise) or DECREASE contrast (turn counterclockwise).

A “normal” contrast setting is obtained when R5 is centered.



ITEM	PART NUMBER	QTY	DESCRIPTION
1	20-1452	1	Receipt printer comm cable
2	20-4148	1	Receipt printer assembly
3	50-0005	8	#6-32 keps nut
4	50-0008	4	#8-32 keps nut
5	51-0163	1	Front receipt guide
6	51-0164	1	Rear receipt guide
7	52-1078-2	1	Receipt printer adapter
8	51-0168	1	Cutter Retainer
9	54-0290	1	Receipt paper replacement label
10	54-0291	1	Receipt guide warning label
11	54-0292	1	Receipt cutter label

#3953A98A

Figure 8 - Receipt Printer Installation (not available with DIV.2 FITs)

## 3.2 INDOOR PCT CABINET INSTALLATION

The indoor PCT cabinet is optional with NON-DIV.2 FIT systems. It is REQUIRED for DIV.2 systems.

The indoor cabinet is often used when all existing pump wiring is indoors. Install the PCT cabinet using the four wall-mounting tabs provided. *The PCT cabinet must be installed indoors.*

To install relay boards into a PCT cabinet, follow the instructions for board mounting and cable connections, earlier in this manual.

## 3.3 CONDUIT INSTALLATION

### 3.3.1 Pump Control Conduit

When the pump relay boards are mounted inside a FIT pedestal, install rigid steel conduit(s) from the island junction box to the FIT. If there is *no* island junction box, install individual conduit from each pump junction box.

The line voltage pump control wires and the low voltage shielded pulser wires will be pulled through these conduits.

When the relay boards are mounted in an indoor PCT cabinet, install rigid steel conduit(s) from the island junction box to the PCT. If there is *no* island junction box, install individual conduit from each pump junction box.

*With optional Universal Pump Control (UPC) software, the FSC can authorize fueling transactions via a pump control console (such as used in a self service station). Pumps controlled by the FSC/UPC and a console do not require a PCT.*

### IMPORTANT

Figures 3, 4, and 5 show the conduit runs for typical installations. For retrofit installations, new and existing conduit are distinguished.

### 3.3.2 FIT Power/Petro-Net Conduit

Install the Petro-Net junction box within three feet of the FSC. Install rigid steel conduit(s) from the FIT(s) to the Petro-Net junction box; there will be five conductors going through this conduit: three 14 AWG power wires, and two 18 AWG Petro-Net wires (as a twisted pair).

When installing more than one FIT, connect the conduit and wiring in a daisy chain fashion (from one terminal to the next) or in a "Y" fashion (where all terminals connect back to one common point).

*Only FIT power and Petro-Net wires can be in this conduit!*

### 3.3.3 Indoor PCT Power Conduit

If indoor PCTs are used, install rigid steel conduit(s) from the indoor PCT(s) to the Petro-Net junction box, located within three feet of the FSC. When installing more than one PCT, connect the conduit and wiring in a daisy chain fashion (from one terminal to the next) or in a "Y" fashion (where all terminals connect back to one common point).

*Only PCT power and Petro-Net wires can be in this conduit!*

### 3.3.4 FSC Power Conduit

Install rigid steel conduit from the Petro-Net junction box directly to the circuit breaker panel. Do *not* run this conduit through the wiring trough. An outlet box should be installed with this conduit run to power the FSC and all peripheral equipment (terminal, printer, modem, etc.) from one circuit.

# 4.0 Wiring

---

## 4.1 FIT & PCT POWER WIRING

For each FIT, pull three #14 AWG power and ground wires through conduit from the circuit breaker panel. For optional indoor PCTs, run three #14 AWG power and ground wires from the circuit breaker panel. See Figure 9.

*If pulser wiring is run in the same conduit as the pump power wiring, the pulser cable must be shielded. When planning an installation, remember that the total length of Petro-Net wiring within an installation cannot exceed 5,000 feet.*

Shielded pulser cable is available from Petro Vend: 2-conductor cable is part number **12-1025**, 4-conductor cable is part number **12-1026**.

## 4.2 PETRO-NET WIRING

Petro-Net uses RS-485 protocol, which requires twisted-pair cable to operate properly. Each twisted pair conductor must be 18 AWG or greater. *Oil/gas resistant TFFN, THHN, or THWN wire must be used.*

Twisted-pair is available from Petro-Vend: Order part number **12-1029**.

To *make* twisted pair, twist together two wires of the required gauge and type to make a pair with approximately ten twists per foot (the RS-485 standard).

Run the twisted-pair through conduit from the Petro-Net junction box to either the FIT or the indoor PCT cabinet; see figure opposite. *DO NOT run Petro-Net wiring in the same trough as pump power wiring!*

On the junction box cover, connect the twisted pair wires to pins #1 (left) and #2 (right) of the junction box cover (pins 3 and 4 remain unconnected).

Screw the cover to the junction box. Connect the other end of the twisted-pair to the Petro-Net terminals in the FIT(s) and, if applicable, the indoor PCT(s). Be sure that the left terminal of each device is *not* crossed to the right terminal of another device.

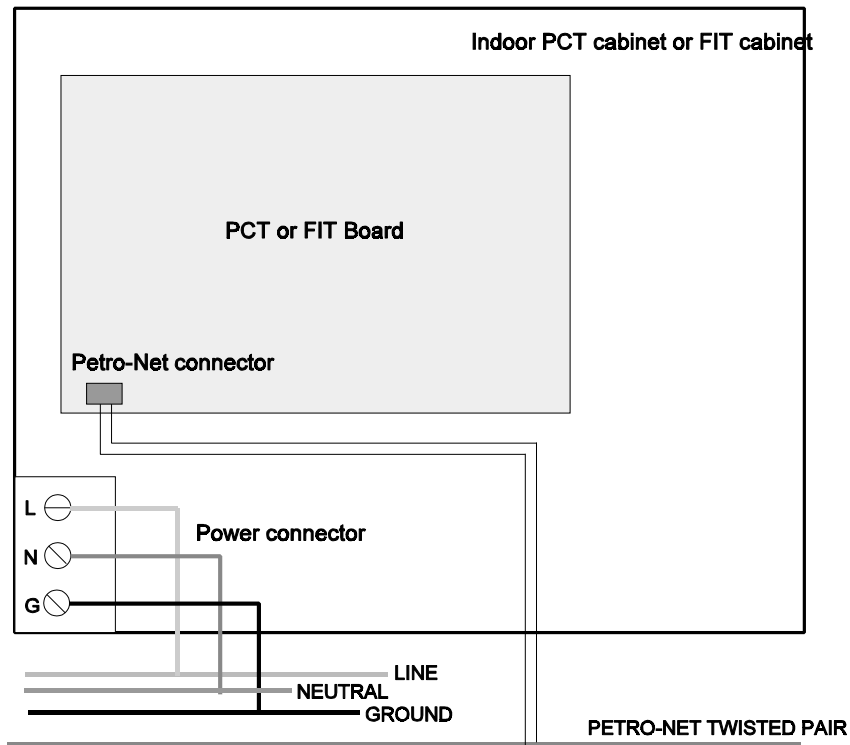


Figure 9 - FIT OR INDOOR PCT WIRING

### 4.3 SYSTEM POWER WIRES

Connect the FIT(s), FSC, and (optional) indoor PCT to the same electrical supply. Connect the line voltage supply wires and the ground wire from a dedicated circuit breaker to the power input terminal block in each FIT and, if applicable, each indoor PCT.

All ground wires must originate at the service panel.

### WARNING!

The ground wire in the FIT(s) must be properly installed for the operation of the noise suppression circuitry. Do not rely on the conduit to provide the ground.

### 4.4 PUMP CONTROL WIRING

Refer to Figures 10, 11, and 12 (on the following pages) to determine the number of line voltage control wires needed for each pump. Each relay board controls one or two pumps.

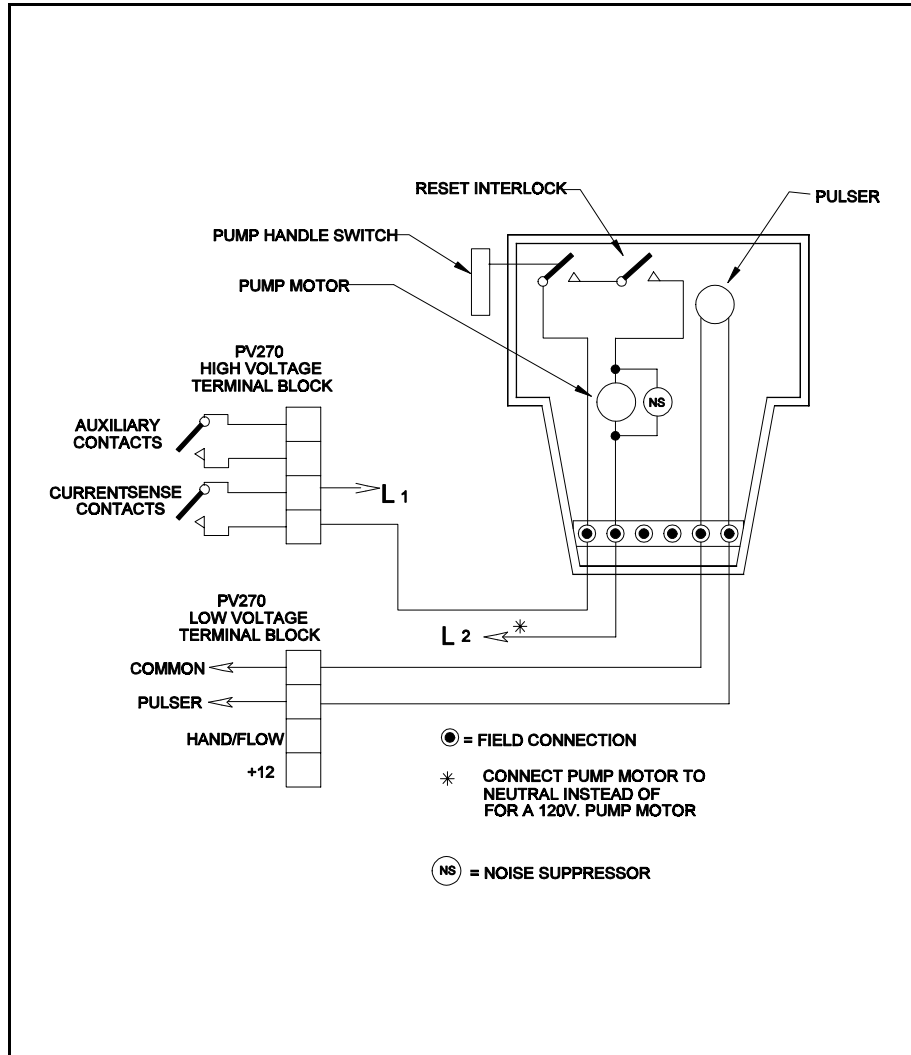


Figure 10 - TYPICAL WIRING FOR A SELF-CONTAINED PUMP (WITHOUT POWER RESET)

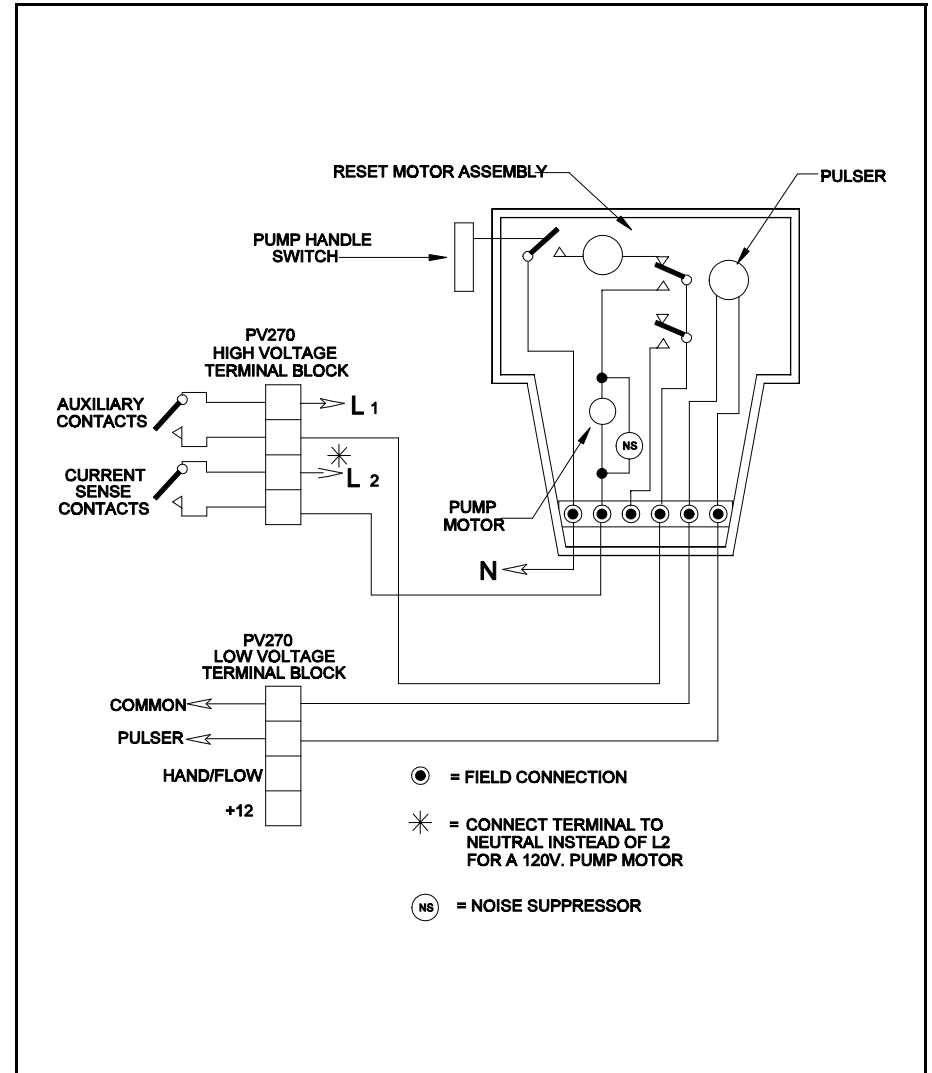


Figure 11 - TYPICAL WIRING FOR A SELF-CONTAINED PUMP (WITH POWER RESET)

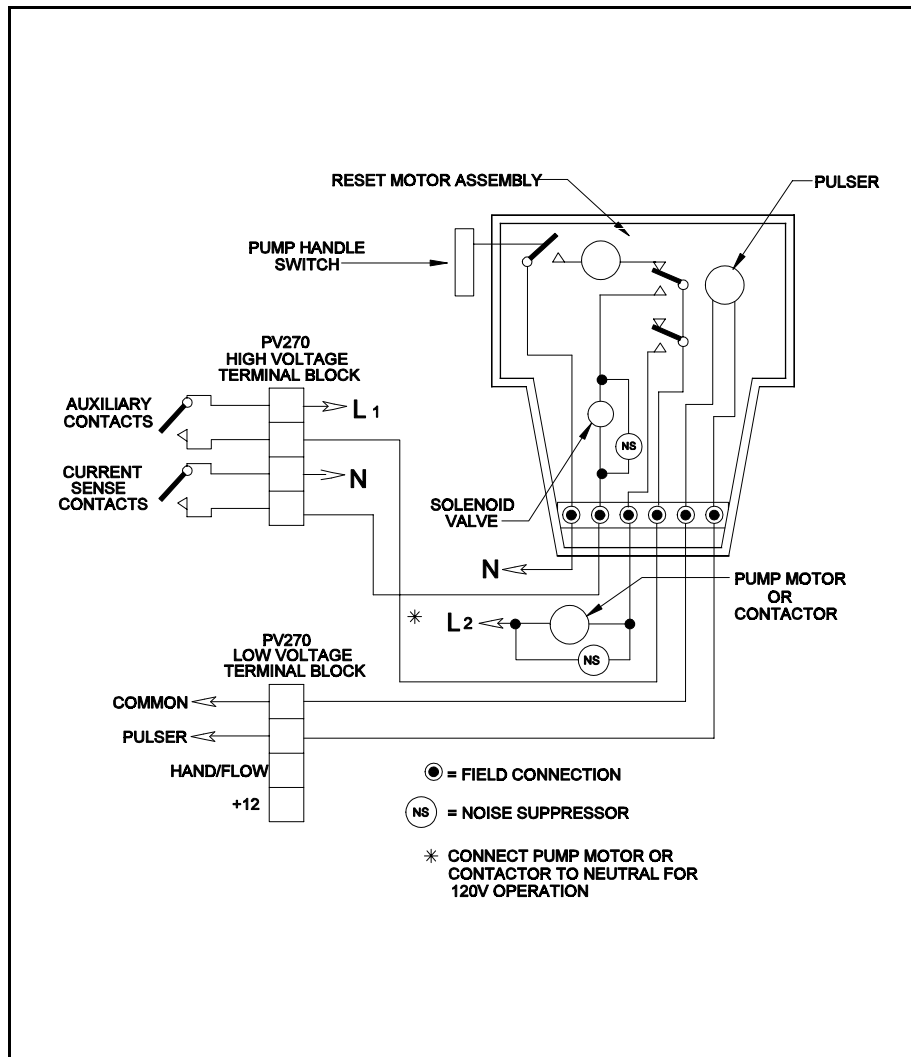


Figure 12 - TYPICAL WIRING FOR A DISPENSER (WITH POWER RESET)

### Pump Wiring Procedure

Refer to Figures 10, 11 and 12 while wiring the pumps. Connect the pump motor control wires to the *high voltage* side of the pump relay board. The current sensing contacts are used to signal to the PCT that the connected pump is running.

The current sensor activates when there is a current flow of 100 mA or more. The reset motor should *not* be wired through these contacts because pulses may be counted during the reset cycle if the pulser turns during reset.

Auxiliary contacts are used for the reset motor or to break both hot wires for a 240 volt pump motor. Both sets of contacts are rated for 3/4 HP, 120/240 VAC.

The PCT can monitor a spare set of dry contacts in the pump handle switch, instead of using the current sensor, to signal that the pump is running. This requires extra wires and is normally used only when currents are less than 100 mA.

### 115 Volt Pump Handle Interface (PV Part No. 20-4210)

This interface is used with pumps or dispensers having a 115-volt "pump-in-use" line, and no other method of sensing current, and no spare pump handle switch. This type of pump or dispenser is commonly found in self-service environments.



Each pump must have an interface module. If you are using the Pump Handle Interface, connect the wiring from the interface module to the PV-270 board Low Voltage Terminal Block for either or both pumps as follows:

Interface Module Wire	Connect to:
BLACK	<b>COMMON</b> on PV270
RED	<b>+12</b> on PV270
YELLOW	<b>HAND/FLOW</b> on PV270
WHITE	AC common
BROWN	"PUMP IN USE" from pump or dispenser

Make all connections in accordance with the NEC. Place interface modules inside cabinet.

*Noise suppressors are packaged with your system. These devices prevent electrical noise from solenoid valves and contactors from causing erratic system operation. The suppressors should be installed as close to the source of noise as possible. One suppressor is supplied for each hose position. Additional suppressors can be ordered from Petro Vend.*

The system can detect a busy pump either by sensing current flow or by pump handle activation; the method of detection is set by a DIP switch on the PCT board; see Section 5.2.1 to set this switch.

### IMPORTANT

You can *not* have both current flow and pump handle activation on the same relay board.

## 4.5 PULSER CONTROL WIRING

Refer to Figure 13 to determine the number of low voltage wires that will be needed for each pump. The type of pulser is set by a DIP switch on the PCT board (Section 5.2.1).

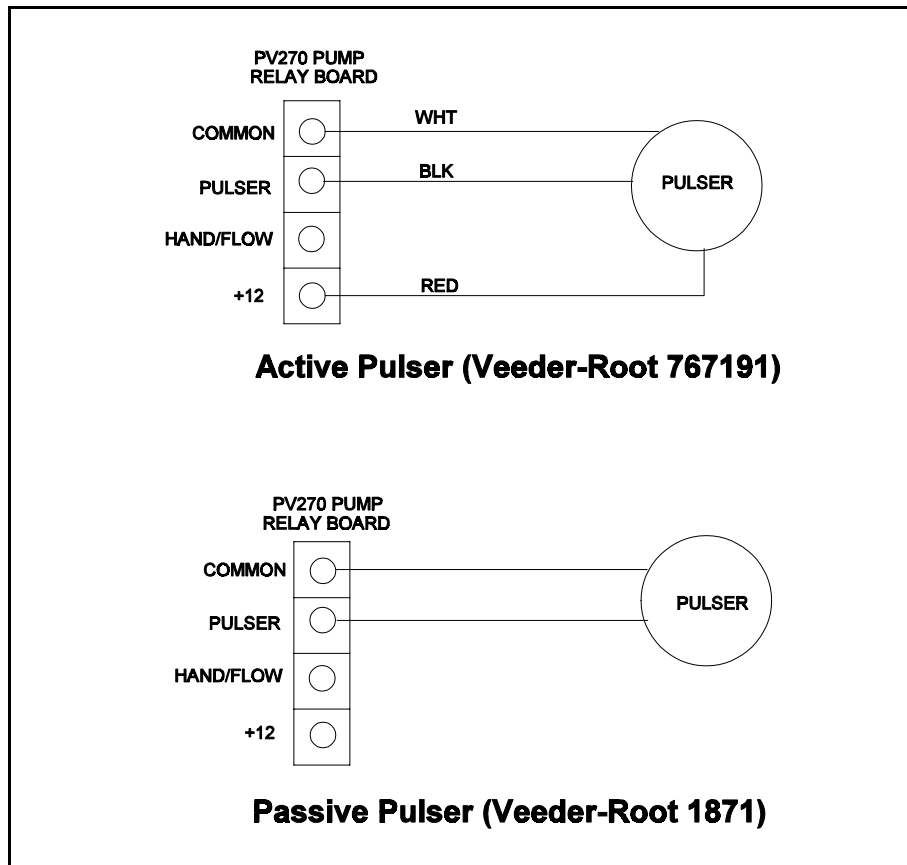


Figure 13 - PULSER WIRING

#### 4.5.1 Pulser Cable Preparation

You CANNOT connect an active and passive pulser at the same time.

**IF PULSER WIRING IS RUN IN THE SAME CONDUIT AS THE PUMP POWER WIRING, THE PULSER CABLE *MUST BE***

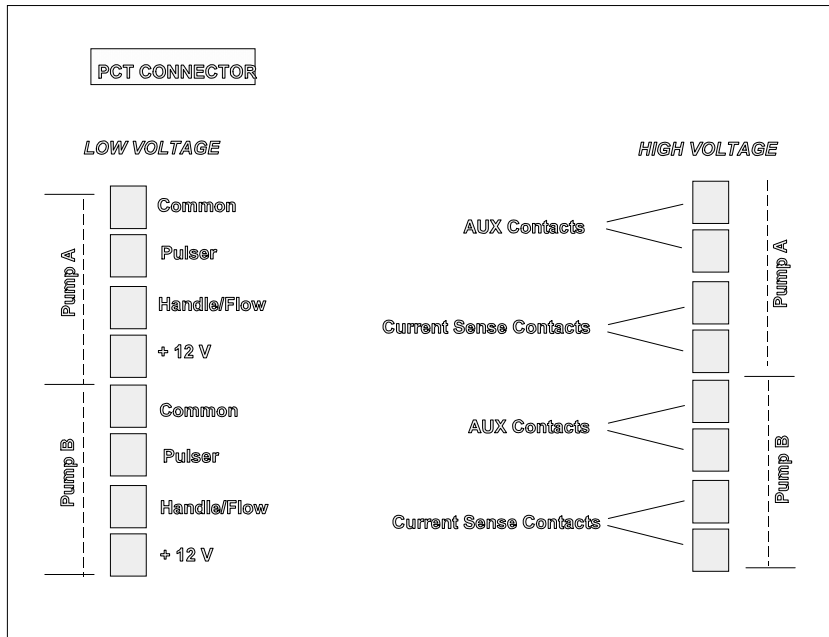
### ***SHIELDED!***

### **WARNING!**

Low-voltage pulser wires must be UL style #2567 shielded cable, which is gas and oil resistant. This cable is also 100% shielded for noise immunity. It is available from Petro Vend with either two conductors (part# 12-1025) or four conductors (part# 12-1026). *Use of another cable will void your warranty and may cause erratic readings.*

Since shielded cable is *not* vapor-tight, the cable jacket must be stripped back. Strip the jacket to allow approximately three inches of non-jacketed cable to extend past each sealoff. Take care *not* to damage the shield wire!

The stripped cable section must be within the sealoff area.



### 4.5.2 Pulsar Relay Board

Refer to Figure 14 to connect pump control and pulser wires for a SINGLE-channel pulser.

The pulser shield wire should be cut off and insulated in the pump junction box.

**WARNING!**

Connecting line voltage to low voltage terminals will cause permanent damage to the unit!

Figure 14 - PULSER RELAY BOARD

**WARNING!**

Connecting line voltage to low voltage terminals will cause permanent damage to the unit!

**4.6 FLOW SWITCHES (OPTIONAL)**

When pump activation is monitored by *current*, a flow switch can be connected. The flow switch connects between the "common" terminal and the "hndl/flow" terminal (Figure 16).

The flow switch is installed in the line to the pump nozzle. When the pump is dispensing fuel, the switch closes and tells the PCT that the pulses should be received. If pulses stop, and do not resume within a certain amount of time, the transaction is terminated.

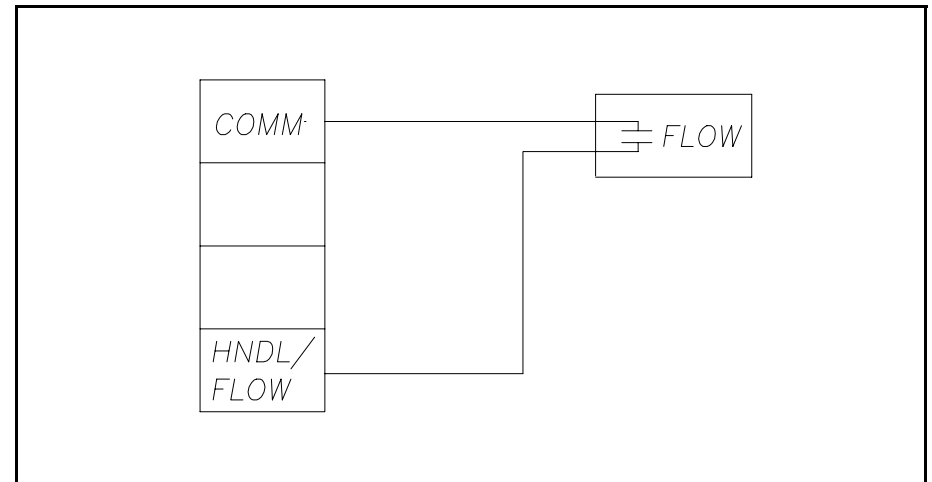


Figure 16 - FLOW SWITCH WIRING

## 4.7 INTER-COMPONENT WIRING

### 4.7.1 FSC-to-FIT (or Indoor PCT)

To connect the FSC to the FIT(s) or indoor PCT(s), plug the Petro-Net DIN connector into the PETRO NET socket on the FSC (see Figure 17). The other end of the cable goes to the Petro-Net junction box.

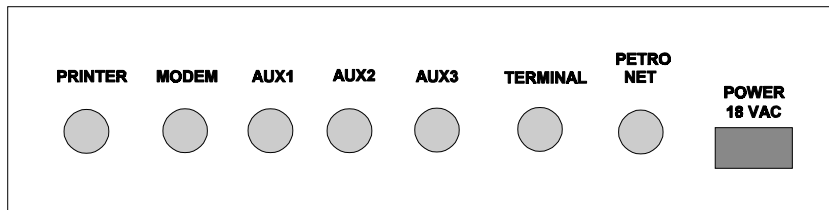


Figure 17 - FSC Rear Panel

### 4.7.2 Connecting Peripheral Devices to the FSC

#### Terminals/PCs

A local ASCII terminal (or PC) connects to the TERMINAL socket on the FSC. To communicate with **SYSTEM2** using a PC, the PC must run terminal emulation software (see your *System2 Operator's Guide*).

#### Journal Printer

Attach your journal printer to the PRINTER socket on a standard (non-network) FSC; for a networked FSC (with network software), connect the printer to AUX1. Only a **Petro Vend** printer can be used with

## SYSTEM2.

### Modems

To communicate with the FSC remotely via standard telephone lines, you will need a pair of modems. To connect the local modem to the FSC, plug one end of the modem cable into the FSC MODEM socket; connect the other end of the cable to the modem. Be sure to configure the modem for the same baud rate as used by **SYSTEM2**.

### Bank Card Retrofits

Optional hardware and software is available to let **SYSTEM2** accept bank cards such as VISA and MasterCard. To communicate with the bank computer (for transaction approval, data downloads, etc.), the FSC connects to a network interface device (a type of modem), which is connected to a telephone line. For these types of installations, connect the interface device to the AUX3 socket on the FSC.

## 4.8 TRANSFORMER VOLTAGES

If needed, use a voltmeter across the following points of your system FIT and PCT to check voltages. The System2 plug-in power supply for the FSC should produce 18VAC.

FIT/PCT		
Test across wire colors:	Circuit	Proper Voltage
BROWN-BROWN	Petro-Net	8.0 VAC
ORANGE-ORANGE	Receipt printer	18.2 VAC
RED-RED	System logic	18.2 VAC
YELLOW-YELLOW	PCT/Pulser	18.3 VAC

Notes:

# 5.0 System Setup

## 5.1 FIT CONFIGURATION

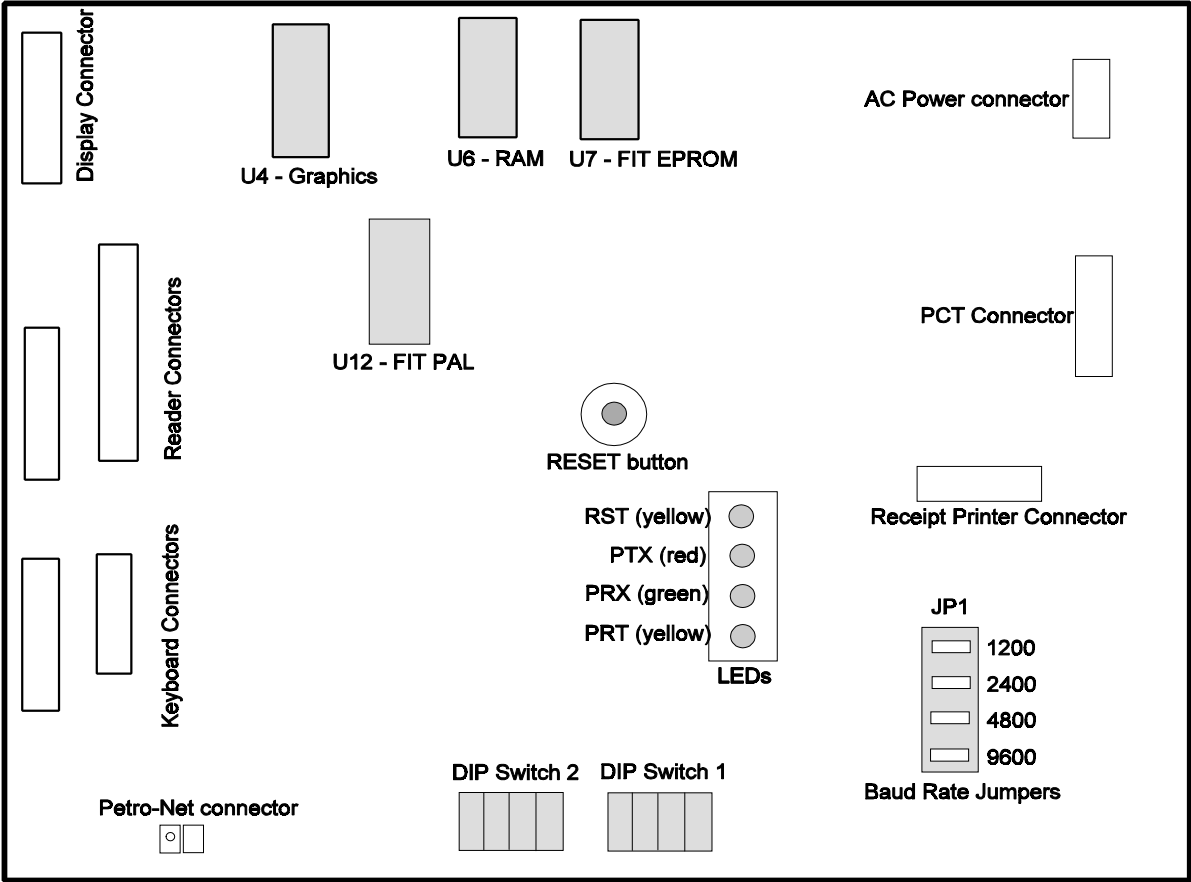


Figure 18 - FIT PC BOARD OVERVIEW (PV269)

**5.1.1 FIT DIP Switches**

Refer to Figure 18 on the previous page for switch location.

Switch #1 is a 4-position DIP switch. The first position of this switch is OPEN for normal operation, or CLOSED to enable test mode (contact Petro Vend for instructions on using this mode).

The remaining three positions do the following:

SWITCH #1 - DISPLAY TYPE			
Display	Status		
	Position #2	Position #3	Position #4
1 x 40	OPEN	OPEN	CLOSED
2 x 16	OPEN	CLOSED	CLOSED
Epson Graphics	CLOSED	CLOSED	CLOSED
Stanley Graphics	OPEN	OPEN	OPEN

Switch #2 is a 4-position DIP switch. Position 1 determines which tracks on a magnetic card are read by the FIT reader (OPEN is default setting):

- POSITION 1 OPEN:** Only Track 2 data is read.
- POSITION 1 CLOSED:** Both Tracks 1 and 2 are read.

Positions 2 and 3 in Switch #2 determine the FIT address; note that each FIT must have a unique address:

SWITCH #2/POSITIONS 2, 3 - FIT ADDRESS		
FIT	Position	
	Position #2	Position #3
1	OPEN	OPEN
2	OPEN	CLOSED
3	CLOSED	OPEN
4	CLOSED	CLOSED

The fourth position of Switch #2 either allows or prohibits a user to re-enter their card number on the keyboard after three bad card reads (CLOSED is default setting):

- POSITION 4 OPEN:** Allow user to re-enter card number on keyboard.
- POSITION 4 CLOSED:** Prohibit user from re-entering card number.

**5.1.2 FIT Board LEDs**

The table below identifies the LEDs on the FIT board:

PV269 FIT BOARDS LEDES		
Label	Color	Function
CR2	Yellow	Reset
CR3	Red	RS-485 Petro-Net Transmit
CR4	Green	RS-485 Petro-Net Receive
CR5	Yellow	RS-485 Petro-Net TX Enable



5.1.3 Receipt Printer Board Setup and Test

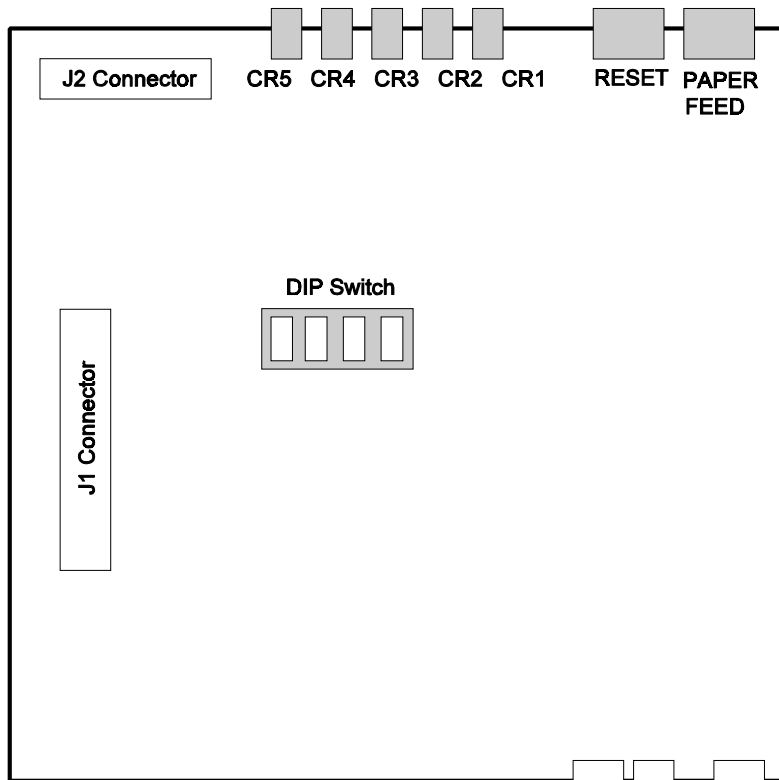


Figure 19 - RECEIPT PRINTER BOARD (PV267)

See Figure 19. Position #1 of the four-position DIP switch determines the printer format. The table opposite shows possible format settings. Positions 2, 3 and 4 are currently *not* used - leave them "OPEN".

PV267 RECEIPT PRINTER BOARD SWITCH		
Position	Status	Function
1	OPEN	USA format
	CLOSED	UK format
2	OPEN	<i>not</i> used
3	OPEN	<i>not</i> used
4	OPEN	<i>not</i> used

**NOTE:** The USA format uses the dollar sign ("\$\$") to indicate product prices and totals. The UK format uses the pound/sterling sign ("£") for these values.

**Printer Switches**

The paper FEED/CUT switch has two functions. When you press and hold the switch, paper is advanced through the printing mechanism as long as the switch is pressed. When you press and immediately release the switch, the paper cutter is activated.

The printer RESET switch resets the printer. If the printer jams (indicated by CR2 flashing), press the printer reset button after correcting the cause of the jam (clearing an obstacle from the mechanism, freeing the paper or ribbon, etc.).

**Printer Test**

To test the printer, press *both* the paper feed/cut switch and the printer reset switch *simultaneously*. Release the reset switch and hold the paper feed/cut switch until the printing begins. When the printer is properly installed and functioning, it prints a message with: (1) the current printer software version, (2) samples of the three font sizes in both red and black print, (3) the format selections for DIP switch position #1, and (4) the selected currency symbol. When the test is completed, the receipt is cut.

### 5.1.4 Receipt Printer Board LEDs

The table below describes the LEDs used on the printer board, located underneath the optional receipt printer in the FIT enclosure.

PV267 RECEIPT PRINTER BOARD LEDs		
Label	Color	Function
CR5	Green	RXD
CR4	Red	TXD
CR3	Yellow	DTR
CR2	Yellow	Error
CR1	Yellow	Reset

**RESET (CR1)** - flashes continuously if the program for the printer microcontroller is disrupted or if the microcontroller has failed.

**ERROR (CR2)** - indicates an error with a flashing sequence. The LED flashes once, twice, or three times, pauses, and then repeats the sequence. CR2 flashes once when the printer motor is jammed, twice when paper is low (or out), and three times when the printer cutter is jammed.

## 5.2 PCT CONFIGURATION

### 5.2.1 PCT DIP Switches

There are five DIP switches on the PCT board (Refer to Figure 20, and the four tables the next page). Set the switches to configure your system. Each relay board can have only one type of pulser. *Each PCT must have a unique device number so that the FSC can identify and control the unit.*

### 5.2.2 PCT Jumpers & The Position/Pump Dilemma

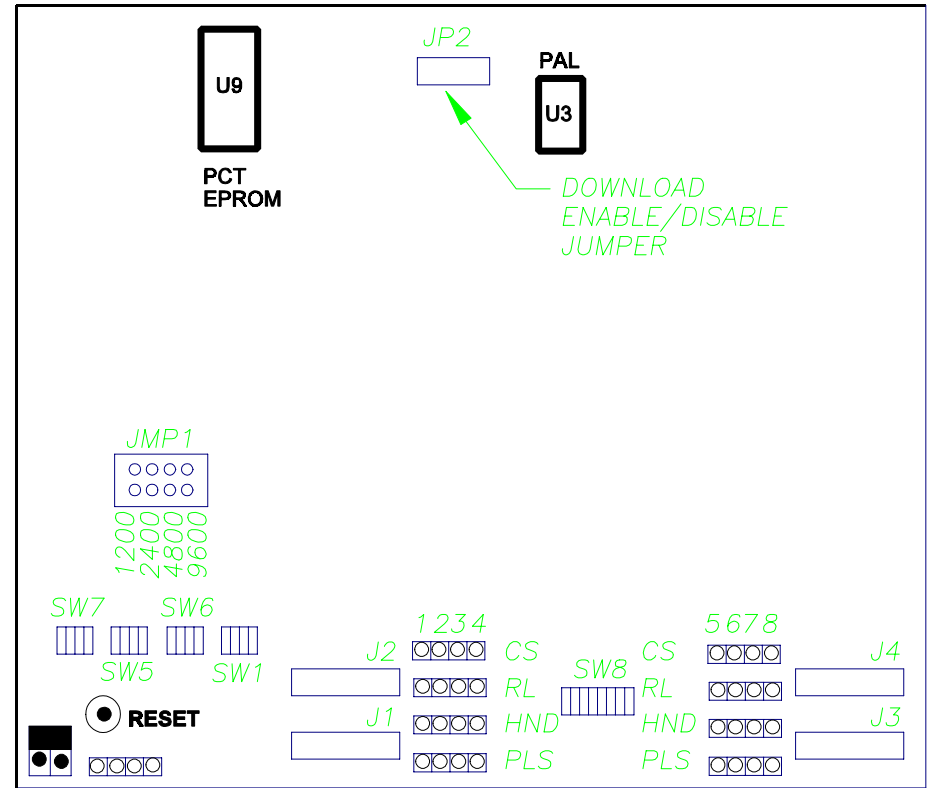
This table shows that, when programming the System2, “positions” are the same as “pumps.” Remember this as you manipulate the four jumpers on the PV269 board.

PV269 Board Jumpers: Relationship Between “Position” and “Pump”		
Jumper	Position (“POS”)	Pump
J1	1 and 2	1 and 2
J2	3 and 4	3 and 4
J3	5 and 6	5 and 6
J4	7 and 8	7 and 8

PCT DIP SWITCH #1 - PULSER TYPE (ACTIVE pulser produces voltage, PASSIVE do not)		
Position	Function	Status
1	pulsers 1 & 2 active	OPEN
	pulsers 1 & 2 passive	CLOSED
2	pulsers 3 & 4 active	OPEN
	pulsers 3 & 4 passive	CLOSED
3	pulsers 5 & 6 active	OPEN
	pulsers 5 & 6 passive	CLOSED
4	pulsers 7 & 8 active	OPEN
	pulsers 7 & 8 passive	CLOSED

**NOTE:** Position #4 on SWITCH 5 (below) MUST BE OPEN. If it is CLOSED, Petro-Net communication will fail.

PCT DIP SWITCH #5 - PCT ADDRESS			
PCT	Status		
	Position #1	Position #2	Position #3
1	OPEN	OPEN	OPEN
2	OPEN	OPEN	CLOSED
3	OPEN	CLOSED	OPEN
4	OPEN	CLOSED	CLOSED



39699813

PCT DIP SWITCH #6 - HANDLE or CURRENT/FLOW		
Position	Function	Status
1	pulsers 1 & 2 current/flow	CLOSED
	pulsers 1 & 2 handle	OPEN
2	pulsers 3 & 4 current/flow	CLOSED
	pulsers 3 & 4 handle	OPEN
3	pulsers 5 & 6 current/flow	CLOSED
	pulsers 5 & 6 handle	OPEN
4	pulsers 7 & 8 current/flow	CLOSED
	pulsers 7 & 8 handle	OPEN

PCT DIP SWITCH #7 - MECHANICAL / ELECTRONIC		
Position	Function	Status
1	pulsers 1 & 2 electronic	CLOSED
	pulsers 1 & 2 mechanical	OPEN
2	pulsers 3 & 4 electronic	CLOSED
	pulsers 3 & 4 mechanical	OPEN
3	pulsers 5 & 6 electronic	CLOSED
	pulsers 5 & 6 mechanical	OPEN
4	pulsers 7 & 8 electronic	CLOSED
	pulsers 7 & 8 mechanical	OPEN

The power relay for each pump can be activated by the system (*normal operation*) or manually overridden (*bypass system control*). See the table below for details.

DIP SWITCH #8 - NORMAL / OVERRIDE		
Position	Function	Status
1	override	CLOSED
	normal	OPEN
2	override	CLOSED
	normal	OPEN
3	override	CLOSED
	normal	OPEN
4	override	CLOSED
	normal	OPEN
5	override	CLOSED
	normal	OPEN
6	override	CLOSED
	normal	OPEN
7	override	CLOSED
	normal	OPEN
8	override	CLOSED
	normal	OPEN

### 5.2.2 PCT Board LEDs

The PCT board can control up to eight pumps. Each pump has four associated LEDs that monitor operation. The table below describes these LEDs.

PV 268 PCT BOARD LEDS									
Color	Function	Pump Number							
		1	2	3	4	5	6	7	8
Yellow	Current Sense	CR25	CR26	CR27	CR28	CR29	CR30	CR31	CR32
Red	Relay ON	CR17	CR18	CR19	CR20	CR21	CR22	CR23	CR24
Yellow	Handle	CR9	CR10	CR11	CR12	CR13	CR14	CR15	CR16
Green	Pulse	CR1	CR2	CR3	CR4	CR5	CR6	CR7	CR8

An additional group of four LEDs indicate Petro-Net operation:

PV268 PCT BOARD LEDS		
Label	Color	Function
CR60	Yellow	RS-485 Petro-Net
CR58	Red	RS-485 Petro-Net Transmit
CR59	Green	RS-485 Petro-Net Receive
CR57	Yellow	RS-485 Petro-Net TX Enable

### 5.2.3 Internal System PetroNet Baud Rate

The default baud rate is 9600; this rate usually does *not* need to be changed. The other rates are 1200, 2400, and 4800 baud. If you wish to change this rate, change the JMP1 jumpers on *all* FIT and PCT boards to the corresponding sets of terminals.

The FSC, all FITs, and all PCTs must be set for the same baud rate.

## 5.3 FSC CONFIGURATION

### 5.3.1 FSC DIP Switches

Figure 21 shows FSC DIP switch location. Switch #1, positions 1 and 2, determine default display messages.

FSC SWITCH #1: FSC CONFIGURATION		
Display Type	Position 1	Position 2
2 x 16	OPEN	OPEN
1 x 40	OPEN	CLOSED
Graphics	CLOSED	OPEN

The FSC baud rate is set with Switch #1, positions 6 and 7. The terminal and modem must use the *same* baud rate. Positions 3, 4, 5, and 8 of Switch #1 are *not* currently used and should be left OPEN.

### IMPORTANT

You must do a "cold start" after changing display type.

**IMPORTANT**

You must plug in the battery *before* configuring the FSC.

Switch #1 does not affect Petro-Net or other port's baud rate.

**RESET SWITCH**

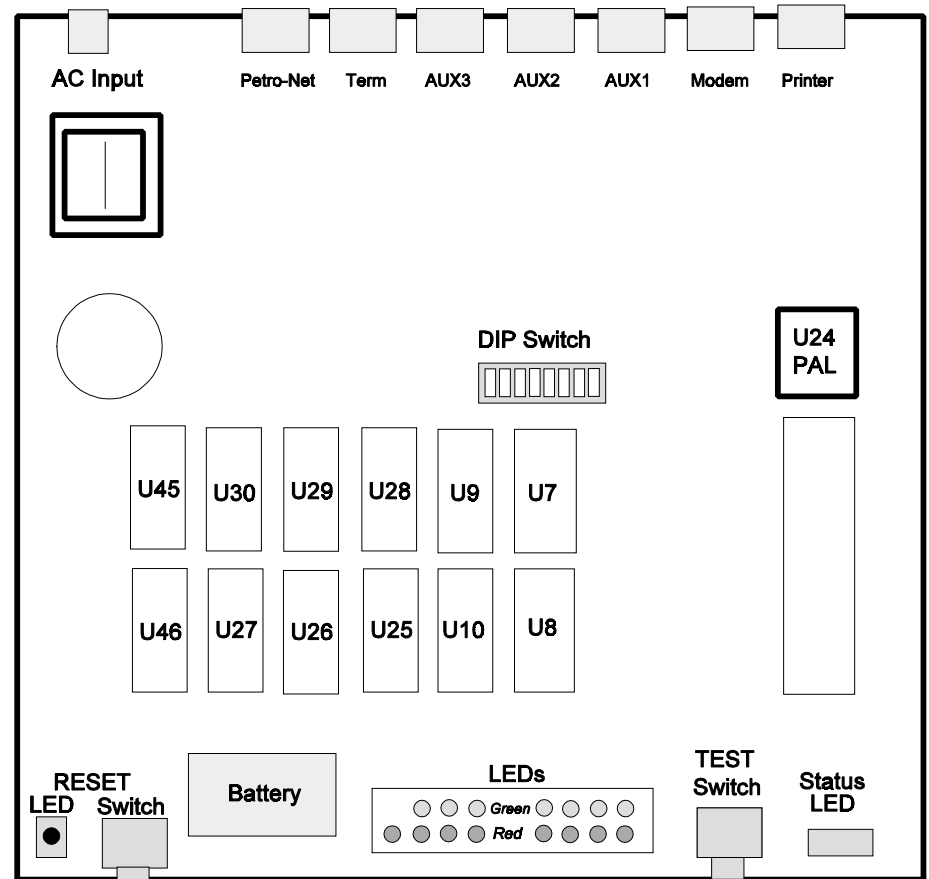
The reset switch is used to warm-start the FSC. No completed data is lost or changed by resetting the FSC.

**5.3.2 Internal System FSC Baud Rate**

The default FSC baud rate is 9600; this rate usually does *not* need to be changed. Available rates are 1200, 2400, and 4800 baud.

FSC SWITCH #1: FSC CONFIGURATION		
Peripheral Baud Rate	Position 6	Position 7
300	OPEN	OPEN
1200	OPEN	CLOSED
2400	CLOSED	OPEN
9600	CLOSED	CLOSED

The FSC, all FITs, and all PCTs must be set for the same baud rate. To change FIT and PCT baud rate, change the JMP1 jumpers on *all* FIT and PCT boards to match the FSC rate. See Page 27 for the FIT board jumper locations and Page 30 for the PCT board jumper locations.



**Figure 21 - FSC PC Board (PV271)**

If you experience communication problems with very long runs of FIT-to-FSC cable (approaching the 5,000' limit), try *decreasing* the baud rate.

### 5.3.3 FSC Board LEDs

The following table describes the FSC LEDs.

PV271 FSC BOARD LEDS		
Label	Color	Function
CR31	Yellow	Reset
CR23	Red	RS-485 Petro-Net Transmit
CR22	Green	RS-485 Petro-Net Receive
CR24	Yellow	RS-485 Petro-Net TX Enable
CR81	Red	RS-232 Terminal Transmit
CR86	Green	RS-232 Terminal Receive
CR36	Red	RS-232 AUX 3 Transmit
CR38	Green	RS-232 AUX 3 Receive
CR32	Red	RS-232 Printer Transmit
CR37	Green	RS-232 Printer Receive
CR80	Red	RS-232 Modem Transmit
CR85	Green	RS-232 Modem Receive
CR35	Red	RS-232 AUX 1 Transmit
CR40	Green	RS-232 AUX 1 Receive
CR41	Red	RS-232 AUX 2 Transmit
CR39	Green	RS-232 AUX 2 Receive





# 6.0 Start-Up

## 6.1 DISPLAY TERMINAL SETUP INSTRUCTIONS

This section explains setting up and configuring the Link terminal. You will need the following parts:

<i>Part# 20-1478</i>	System2 FSC-to-PC/CRT Cable
<i>Part# 75-0046</i>	Link Terminal

1. With the terminal and FSC power OFF, plug the DB-25 end of the 20-1478 cable into the "MAIN PORT" on the terminal.
2. Plug the DIN connector end of the cable into the FSC port marked TERMINAL.
3. Plug in the FSC power supply, and connect the cord from the power supply to the back of the FSC.
4. Set the Link terminal to the following parameters (see the Link owner's manual):

Data Bits: 7  
 Stop Bits: 1  
 Parity: Even  
 Emulation: WYSE 50  
 Baud Rate: Same as FSC Switch 1 (see Page 33).

5. Press the  key on the terminal to get the > prompt.

## 6.2 POWERING UP SYSTEM 2

### 6.2.1 Cold Start With Power OFF

To power up SYSTEM2, turn ON the power switch for each FIT and, if applicable, each remote PCT. If not already done from terminal configuration, plug the FSC power supply into a standard AC socket.

When the FIT is properly installed and functioning, its display shows the following series of messages and information:

```

TESTING RAM
VERSION ##.##
DISPLAY TYPE
RECEIPT LENGTH
TESTING READERS
READER1 TYPE
READER2 TYPE
TESTING EPROM
TESTING EPROM
DOWNLOAD ...
  
```

The last message indicates that the FIT is running

*NOTE: If the download message does not display, turn the system OFF and check the installation wiring.*

### 6.2.2 Cold Start With Power ON

To cold-start the SYSTEM2 with power ON, do the following on the FSC board:

1. With power ON, unplug the battery connector from the PC board.
2. While holding down the TEST button, hit the RESET button. A "C" appears in the FSC display.
3. Release the TEST button, and reconnect the battery. The FSC now enters the communication default mode described in the next section.

### 6.3 COMMUNICATION DEFAULTS

When the system is cold-started, it "installs" (establishes a communication link with) FIT #1 and the first 2 pump positions for PCT #1. The system also downloads "default," or preprogrammed, values for several of its features. These include the messages, fuel types, pump numbers, etc.

When the FSC is first powered up, the front-panel STATUS display sequences for about 45 seconds. During this time, the FSC counts the number of FITs and indoor PCTs that are installed and communicating with the FSC via Petro-Net. This number is then indicated on the status display as two numbers flashed in sequence.

For example, if eight OPTs and four PCTs are connected and operating correctly, the status LED displays **1**, then **2**, then a pause, and then **1** again, to signify **12**. The blinking dot on the status LED indicates that Petro-Net is active.

### 6.4 BASIC SYSTEM OPERATION

This section outlines a basic system setup you can use to test the system. The commands below are described in greater detail in your *System2 Operator's Guide*.

If you are using a PC to set up the system, the PC must run terminal emulation software. Refer to Appendix D in the *Operator's Guide* for more information about using a PC.

For remote operation, modems must be installed at the local system site and at the remote programming location. Refer to Appendix C in the *Operator's Guide* for more information about modem operation.

1. Turn ON the terminal connected to the system. Press **[ENTER]** several times to display the system prompt (`` >``).
2. When the prompt appears, enter the command ``HELLO'`. (Do *not* enter the quotation marks.) You are prompted to enter the privileged mode password. Enter the default password of ``HELLO'`.

3. The system prompt changes to the privileged prompt, `P>'.
4. Enter the command `SET TIME'. The format is `hh:mm am/pm'. For example, `12:57 PM'. If PM is *not* specified, AM is assumed.
5. Enter the command `SET DATE'. The format is `mmm dd, yyyy'. For example, `MAY 16, 1994.'
6. Enter the command `SET CARD BUFFER'. The following menu displays:

```

1 - SPECIFY CARD/ACCOUNT BUFFER SIZE
2 - DEFINE CARD/ACCOUNT RECORD
3 - CLEAR CARD RECORD TOTALS
4 - RECONCILE CARD RECORD ALLOCATION
5 - CLEAR ALL ACCOUNT RECORD TOTALS
6 - RECONCILE ACCOUNT RECORD
  ALLOCATION
7 - MONTH END TOTALS
8 - SET KEYBOARD CARD CONTROL DATA
9 - ADDITIONAL OPTIONS
X - EXIT
  ENTER CHOICE:

```

7. Enter `1' to split the buffer into two sections. The following message is displayed:

**TRANSACTION AND MESSAGE BUFFER WILL BE CLEARED (Y/N)?**

## CAUTION

This command destroys all transaction data when activated.

8. Enter `Y' to continue (or enter `N' to exit). The next prompt is:

**-- ENABLE MESSAGING (Y/N) ?**

For testing, simply enter `N'.

9. The next prompt is for transaction size code.

### ENTER TRANSACTION SIZE CODE:

For testing, simply enter `1' and then enter `Y' when the system asks to save this configuration. The menu returns to the display. (Setting the card buffer for a specific system involves a number of details that are not necessary for this test.)

Card Type	Magnetic Card#	Optical Card#
1 Single	NNNN000000000001	NNNN000001
2 Driver	NNNN000000000002	NNNN000002
3 Vehicle	NNNN000000000003	NNNN000003

`NNNN' is one of the network numbers for the system. (The network numbers are listed on the data sheet that was packed with the system; most systems have only one network number.)

10. Enter the command ``INSERT CARD'`; you are prompted to enter the card numbers and types. After entering the data for the test cards, press **[ENTER]** *without* an entry to exit the command.

## IMPORTANT!

**If you want to actually test the system by inserting a card, use Option 2, DEFINE CARD/ACCOUNT RECORD in the SET CARD menu before continuing with Step 11. System2 will not accept a card without your defining the card or account records with this command!**

11. The power to the fuel pumps can now be turned ON. Insert one of the test cards into a FIT reader and select pump #1 or #2. (Pump position #1 and #2 are automatically "installed" on power up.
12. If practical, pump fuel to generate a transaction. Note that fuel does *not* have to be pumped to register a transaction. Also note that there are time-outs for activating the pump and dispensing fuel (see the Operator's Guide for more details). If a time-out is exceeded, a zero transaction is registered by the system.

## 6.5 REPORT OVERVIEW (Not in all systems)

To check on the transactions, enter the command ``SHOW TRANS'`. To check on the pump, enter the ``SHOW PUMP 1 TOTALS'` command.

If you have a journal printer attached, enter ``SET JOURNAL PRINTER'`. The first prompt asks to select the Office Printer; enter ``Y'` for yes. You are then prompted to configure the printer; enter ``Y'` at the prompt. Enter ``N'` (for no) for each of the remaining prompts. You can then enter the command ``PRINT PUMP 1 TOTALS'` to have the data printed out.

More printer setup info, and other reports, are explained in detail in your *Operator's Guide* (if your System2 is equipped for reports).

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