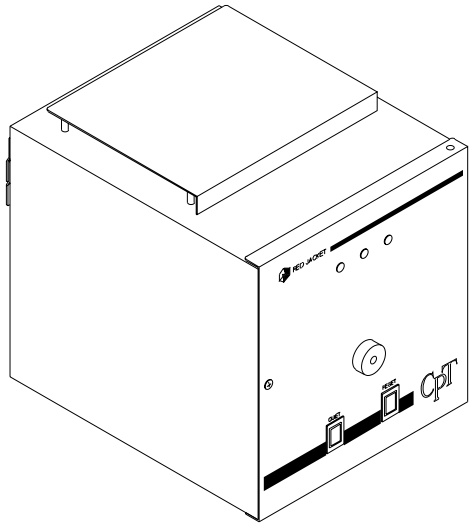
CPT Controller

Installation and Operation



Marley Pump Company

Is ISO 9001 Certified

CPT Controller Manual: Installation and Operation
RE260-240 ◆ Rev. I ◆ June 99

Certifications and Listings
The Marley Pump Company is ISO 9001 certified.

The CPT Controller has been approved by Underwriters Laboratories to carry the UL Listing Mark.

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A United Dominion Company

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About This Manual

This preface explains how the manual is organized and describes what symbols or typographical conventions are used. It also defines special terms. This manual is for use in U.S. locations only; metric conversions are not included.

Organization

The CPT Controller Manual is organized into five chapters.

Chapter 1: "Introduction" gives a brief description of each of the major features of the product.

Chapter 2: "Red Jacket CPT Controller" describes the basic components.

Chapter 3: "Installation" gives step-by-step instructions for installing and wiring the controller.

Chapter 4: "Startup, Calibration, and Operation" describes the features used in day-to-day operations.

Chapter 5: "Service and Repair" describes the warnings and faults, and gives troubleshooting tips.

The CPT Controller Manual also contains a table of figures; a list of abbreviations; appendixes containing wiring diagrams; and an index.

Terminology

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning use of the product.

DANGER!!	Indicates the presence of a hazard that will cause severe personal injury, death, or substantial property damage if ignored.
WARNING!	Indicates the presence of a hazard that can cause severe personal injury, death, or substantial property damage if ignored.
Caution	Indicates the presence of a hazard that will or can cause minor personal injury or property damage if ignored.
Notice	Indicates special instructions on installation, operation, or meintenance that are important but not related to personal injury hazards.

Abbreviations and Symbols

	chassis ground
⏚	earth ground
–	negative or ground terminal
W	ohm, resistance
µF	microfarad (10^{-6} farad)
+ or +5V	positive terminal
∿	sine wave
AC	alternating current
A	ampere
AVO	apparatus to verify operation
CPT	Constant Pressure Turbine
DC	direct current
DMM	Digital Multimeter
EPA	U.S. Environmental Protection Agency
FLA	full-load amps
FTA	field-test apparatus
ft-lb	foot-pound
FXT	a Red Jacket line-leak detection system
GND	ground
gph; gpm	gallons per hour; gallons per minute
hp	horsepower
Hz	hertz
I.S.	Intrinsic Safety
ISO	International Standards Organization
LED	light-emitting diode
LLD	line-leak detector
MOV	metal-oxide varistor, surge protection
msec	millisecond
N-m	Newton-meter
NEC	National Electrical Code
NFPA	National Fire Protection Association
psi	pounds per square inch
PVC	polyvinyl chloride
RJ	Red Jacket
THHN	a UL designation for oil-, gasoline-, and water-resistant wiring
UL	Underwriters Laboratories Inc.
V	volt
VAC	Voltage—alternating current
VDC	voltage—direct current

Chapter 1: Introduction

Overview

- Constant Pressure Output
- Line-Leak Detection
- Hourly Leak Detection
- Monthly and Annual Monitoring
- Stand-alone Pump Operation
- Tandem Pump Operation

Features of the Red Jacket CPT Controller

This section describes the major features of the Red Jacket CPT Controller. The CPT Controller has been approved by Underwriters Laboratories to carry the UL Listing Mark. It is manufactured in a facility that is ISO 9001 certified.

Flash Memory and Downloading Capability	The CPT Controller has “flash memory,” which allows updating the software remotely by modem or PC. It does not require removing an EPROM chip at the site to change future upgrades of software.
Alarms and Warnings	The CPT Controller has green, yellow and red LEDs to indicate operating state and warnings as well as an audible piezoelectric alarm.
Surge Suppression	MOV surge protection is on both the input and output of the controller.
Power Conservation	The CPT minimizes power usage during no-flow or low-flow conditions at the pump.
Brownout Protection	The CPT Controller has enough reserve power to maintain performance for 40 milliseconds (msec). Most brownouts have gaps in power of about 10 msec in duration.

Constant Pressure Output

The Red Jacket CPT (Constant Pressure Turbine) uses Controlled Pressure Technology. This technology measures the pressure downline from the pump with a pressure transducer. The controller reads the pressure and then adjusts the fundamental frequency and power applied to the motor to maintain a constant flow.

Line-Leak Detection

The Red Jacket CPT system can provide compliance with EPA requirements for hourly leak detection, monthly monitoring of leaks of 0.2 gph or greater, and annual monitoring for leaks of 0.1 gph or greater.

Hourly Leak Detection: This feature provides positive shutdown when a 3-gph or greater leak is detected. The 3-gph leak detection feature replaces the mechanical line-leak detector that was previously installed on the pump.

Monthly and Annual Monitoring: By activating the monthly and annual monitoring capabilities of the CPT, total compliance for lines is possible without the installation of extra hardware on the piping system.

Line Leak Functionality Testing: The manual line testing of the leak detecting system, which is required by EPA, for hourly monitors can be done by using snap taps installed on the line-test port of the packer-manifold. The snap tap fittings used with an FXT tester can check the functions of the leak-detecting system within a few minutes. The FXT tester offers a very quick and clean functional test of the hourly monitoring feature, in addition to running diagnostics, without spilling product.

Stand-alone Pump Operation

The CPT Controller's microprocessors are preprogrammed from the factory for stand-alone operation. Instructions in Chapter 3 explain how to set the DIP switches for stand-alone and tandem operation, and instructions in Chapter 4 explain how to set the pump pressure to achieve the maximum flow rate of 10 gpm per nozzle.

Tandem Pump Operation

When two CPT pumps are required to maintain proper flow, these units can be programmed to operate in tandem. The installer can designate one controller as the master unit and the other as the auxiliary unit. The master controller monitors line pressure to maintain proper flow.

When the master controller receives the dispense-enable signal, the primary pump starts. The controller varies the speed of the pump depending on the pressure in the line. When the pri-

mary pump can no longer maintain proper pressure, the secondary pump turns on to supplement the pressure and maintain proper flow.

For each dispensing cycle, the master controller determines which CPT will be the primary pump. This feature allows the pumps to alternate and helps prevent the problem of having one tank run dry. It also assures that one pump does not wear excessively. The master controller performs line-leak detection, if required.

Chapter 2: Red Jacket CPT Controller

Overview

- **CPT Controller Specifications**
- **Basic Components of a CPT Controller System**
- **CPT Controller Front Panel**
- **Inverter Board**
- **Capacitor Board**
- **Processor Board**
- **Pressure Transducer and Intrinsic Safety Barrier Kit**
- **Tech Pod (Optional)**

CPT Controller Specifications

Size:	9- × 9- × 12-in. wall space, plus a recommended 4 inches on the bottom side for ventilation and installation clearance.
Ambient Temperature:	25°C. (77°F.)
Input Ratings:	200–250 VAC; 22.5 FLA, 1-phase, or 17.5 FLA, 3-phase; 50 or 60 Hz.
Output Ratings:	230 VAC, 12 FLA, 3-phase; Base, 75 Hz; Range, 30–100 Hz.
Circuit Breaker	30A single phase 25A 3-phase Refer to any local, State, and NEC codes for specific requirements in your location.
Line Leak Relay Rating:	120 VAC, 4 A

Basic Components of a CPT Controller

CPT Controller Front Panel

The CPT Controller front panel has three light-emitting diodes (LEDs) on the front – green, yellow, and red. (See the section called "LED Functions" in Chapter 5 for more details.) A piezo, or audible alarm, is mounted in the center of the panel. This panel also includes a push button to silence the alarm and a reset button.

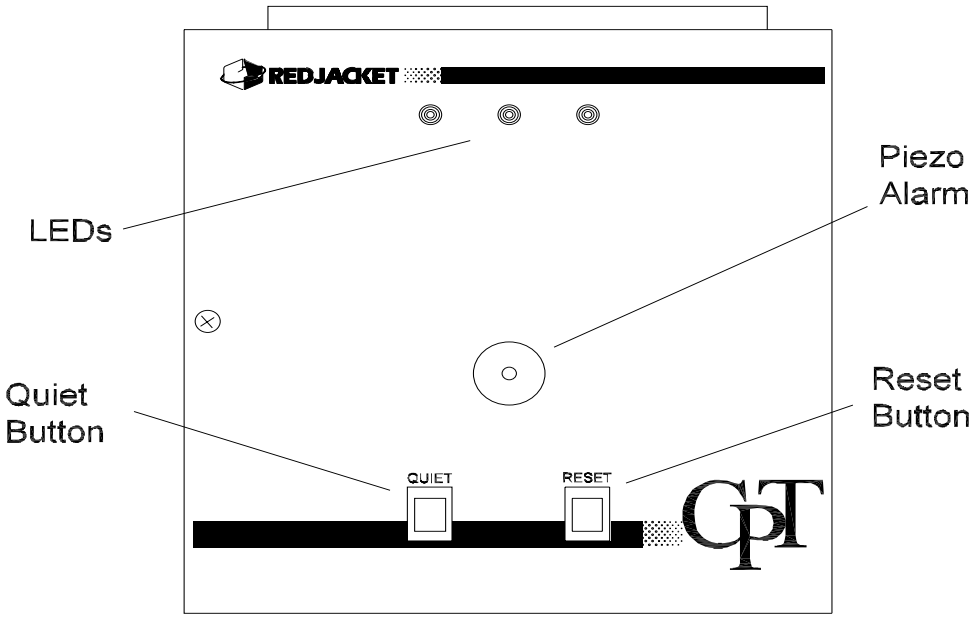

Figure 2.1 Front Panel of CPT Controller

The CPT Controller has a normally open, dry contact rated at 120 VAC and 4 amps. This dry contact activates only for line-leak hard faults; it may also be used as an auxiliary warning device. (See the "Troubleshooting" section for a description of faults.)

The CPT Controller is a metal enclosure that contains three circuit boards. All three boards are on a rack that can slide out for easy access.

Inverter Board

The Inverter board contains power semiconductors, which take the DC voltage from the Capacitor board and change it to pulse width-modulated, three-phase, electrical power for the unit motor pump(UMP). It also varies the frequency to control the speed of the motor.

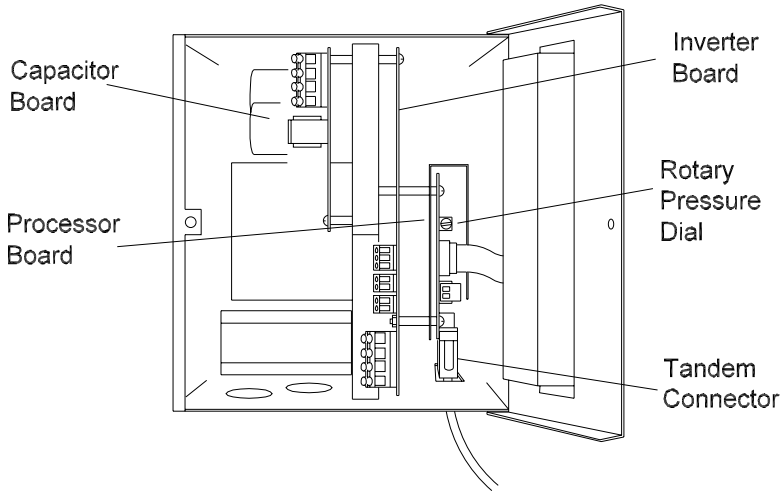

Figure 2.2 Interior of CPT Controller

The Capacitor Charge light on the Inverter board of the CPT Controller indicates when the Capacitor board is energized.

The power supply for the transducer is located on the Inverter board and is fuse-protected. Using fuses prevents permanent damage to the CPT if miswiring of the high voltage to the low-voltage transducer wires occurs.

The network connector for a Prolink network is located on this board.

Notice	Fuses should be 0.1 Amp, 250V, fast-acting.

Capacitor Board

The incoming AC power is connected to the Capacitor board. This board contains four capacitors that store energy.

Processor Board

The Processor board contains two microprocessors. These microprocessors control the frequency of the power sent to the motor windings, process the pressure information from the transducer, and analyze it in accordance with Marley Pump Company's patented high-pressure line-leak detection software.

The Processor board has an RS-232 port, which allows communication with another CPT Controller in a tandem pumping situation.

Pressure Transducer and Intrinsic Safety Barrier Kit

The pressure transducer has a range of 0–50 psi with a 0.5-4.5VDC output. This is the same transducer that is used in other Red Jacket electronic line-leak detection systems. An Intrinsic Safety Barrier Kit must be installed at the appropriate place (see installation instructions in Chapter 3).

Tech Pod (Optional)

The Tech Pod is a service interface tool used for setting programming parameters in the CPT Controller and for monitoring its performance. (See the "Tech Pod User's Guide" for operation information.)

Chapter 3: Installation

Overview

- **Installation DOs and DON'Ts**
- **Installation Safety Notices**
- **Installing the Controller**
  - Setting the DIP Switches for Stand-alone or Tandem Operation
  - Routing and Connecting the Input Power
  - Routing and Connecting the Dispenser Input
  - Routing and Connecting the Output Power
  - Wiring the Contractor's Box
  - Field-Wiring the CPT Pump with Quick-Set Feature
- **Installing the Intrinsic Safety Barrier and Pressure Transducer**
  - Wiring a Transducer for a Stand-alone CPT Pump in Single Conduit
  - Wiring a Transducer for Tandem CPT Pumps in Single Conduit
- **Insulating the Wiring Connections**
  - Sealing Wire Connections in Insulating Resin
  - Sealing Wire Connections in Optional Connector Board and Housing
- **Programming for Stand-alone or Tandem Operation**

Installation DOs and DON'Ts

WARNING!	Failure to follow these guidelines could result in severe personal injury, death, or substantial property damage.

DON'Ts

The following list represents the DON'Ts for installing the CPT Controller unit. Please read through this list before beginning the installation.

DON'T short circuit the power supply. Carefully check all stranded wires at the connectors for stray strands which are shorting across terminals.

DON'T handle the CPU or other circuit boards of the CPT Controller without proper grounding straps.

DON'T mount the CPT Controller in a hazardous area.

DON'T mount the CPT Controller in a volatile, combustible, or explosive environment.

DON'T allow unauthorized field service personnel to work on the CPT. Unauthorized work adversely affects the intrinsic safety of the system and voids product warranty.

DON'T run any other lines or power devices through the CPT Controller.

DON'T run any wiring in the conduit from the CPT Controller to the pump EXCEPT the pump power cable and the transducer cable.

DON'T run the CPT Controller input or output wires through conduit, troughs or raceways containing any other wires. Failure to respect this notice could result in interference with other communication signals

DON'T drill any holes in the CPT Controller enclosure.

DON'T cross-wire the pressure transducer.

DON'T use PVC conduit for pump power wiring.

DOs

The following list represents the **DOs** for installing the CPT Controller unit. Please read through this list before beginning the installation.

DO plan all conduit and contractor's box installations before mounting the CPT Controller. Maintain as much physical separation as possible between controller and other devices. This also includes conduits.

DO run wiring from CPT Controller to pump wiring in dedicated, isolated conduit.

DO install the system to meet the requirements of the National Electrical Code; federal, state, and local codes; and any applicable safety regulations.

DO disconnect all power before making final connections.

DO maintain intrinsic safety. Observe installation instructions for installing the intrinsic safety barrier.

DO observe proper conduit access into the CPT Controller.

DO mount the CPT Controller in a dry, climate-controlled environment.

DO install the earth ground wire.

DO hardwire the CPT Controller to a dedicated isolated power source.

DO install a station ground rod (if one is not present), and connect the CPT Controller's earth ground.

Installation Safety Notices

ATTENTION INSTALLER: Read this important safety information before beginning work.

DANGER!!	**This product operates in the highly combustible environment of a gasoline storage tank. To protect yourself and others from serious injury, death, or substantial property damage, carefully read and follow the warnings and instructions in this manual.**

WARNING!	**Failure to follow all instructions in proper order can cause personal injury or death. Read all instructions before beginning installation. All installation work must comply the latest issue of the National Electrical Code (NFPA 70), the Automotive and Marine Service Code (NFPA 30A), and local code requirements that apply.**

WARNING!	**Only trained and qualified personnel may install, program, and troubleshoot Red Jacket equipment. Hazards can cause severe personal injury, death, or substantial property damage if ignored.**

WARNING!	**Always tag and lock out breakers on all circuits connected to the CPT before beginning installation or service procedures. If the electrical circuit breakers are accidentally turned on while the CPT is being serviced or installed, there is a potential for lethal electrical shock. Also, a spark could ignite any hydrocarbon vapors present, which could result in an explosion or fire.**

Notice	The CPT Controller can be used only with constant pressure turbine (CPT) pumps.

Notice	Specifications and installation instructions may change if the manufacturer recommends changes.

Installing the CPT Controller

Before beginning the installation procedures, carefully read and understand all instructions.

WARNING!	Voltage stored in the capacitor bank of the CPT Controller presents a risk of POTENTIALLY LETHAL ELECTRICAL SHOCK EVEN AFTER THE POWER IS DISCONNECTED. After disconnecting the power, wait about 2–5 minutes, and until the red Capacitor Charge light on the Inverter board goes out, before servicing or removing the controller.

WARNING!	Rubber plugs for the bottom of the contractor's box are not supplied. Install the vapor seal-offs required by NEC. Use only gasoline- and oil-resistant materials between the CPT Controller and the contractor's box. Failure to comply with applicable codes and NEC requirements could result in an unsafe installation.

Notice	Before installing the CPT Controller, carefully plan all conduit runs and wire connections. The shielded transducer cable can be run in the same conduit as the pump wires.

Before installation, select an area that is easily accessible and allows the door of the controller to open freely. The CPT Controller requires a 9-in. X 9-in. space on the wall and is 12 inches deep.

Leave approximately 4 inches below the controller for ventilation and conduit installation clearance.

Notice	Do not run the CPT controller input or output wires through conduit, troughs or raceways containing any other wires. Failure to respect this notice could result in interference with other communication signals. If communication problems persist, it may be necessary to change communication wires on the other equipment to shielded cable.

Step 1: Mount the interlocking rail (bracket) to a stable vertical structure such as a wall stud, post, or metal frame.

Step 2: Hang the controller on the interlocking rail (mounting bracket) as shown in figure 3.1.

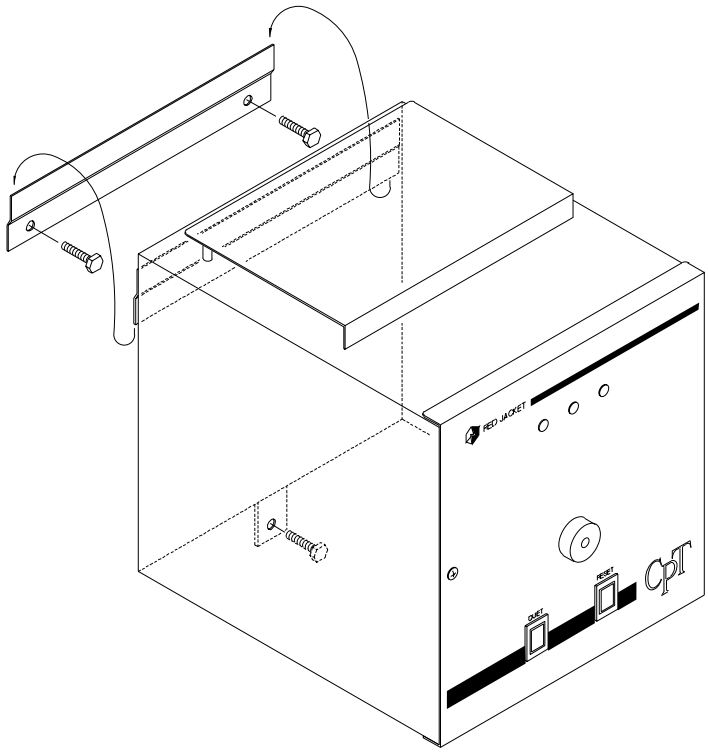

Figure 3.1 Mounting the CPT Controller to the Wall

Step 3: Anchor the bottom of the controller to the wall with the mounting tab using an appropriate fastener.

Step 4: Open the door of the controller and remove the following:

- packing material
- shipping retaining screws (top and bottom)
- cotter pin.

Step 5: Connect the approved electrical conduit (or conduits) to the bottom of the controller chassis.

Notice	Run the AC input power lines and dispenser input lines through the left front most conduit knockout ONLY. Route the AC input power lines and the dispenser input lines through the clip mounted on the top inside of the CPT enclosure. Run the Motor control lines and transducer lines through the right rear most conduit knockout ONLY. Refer to Appendix B: Figures B-1 and B-2.

Setting the DIP Switches for Stand-alone or Tandem Operation

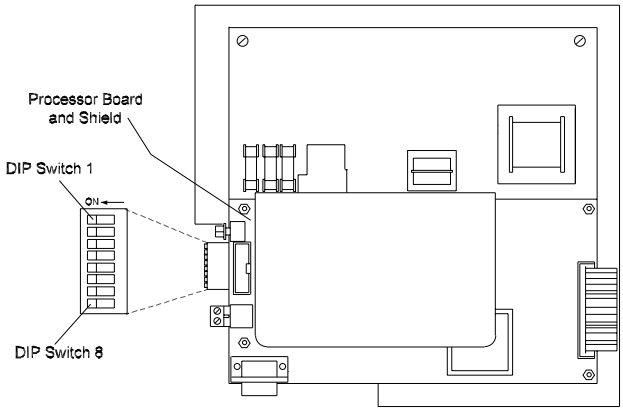

Figure 3.2 DIP Switches

Set the DIP switches for the required mode of operation (stand-alone or tandem) according to the chart below.

Stand-alone	
DIP Switch	**Pole Position**
1	Closed
2	Open
*3	Open
4	Closed
*5	Open
6	Open
7	Open
8	†Closed/Open

Tandem Pole Positions		
DIP Switch	**Master**	**Auxiliary**
1	Closed	Closed
2	Open	Open
*3	Open	Open
4	Closed	Closed
*5	Open	Open
6	Closed	Open
7	Closed	Closed
8	†Closed/Open	Open

† This DIP switch is Closed to enable leak detection and Open to disable leak detection. In tandem applications, ONLY the master CPT Controller DIP switch is set to Closed.

*DIP switches 3 and 5 are undefined and not applicable to operation. The default factory setting is Open. DIP switch 1 is on the bottom of the package.

For an explanation of each DIP switch pole position, see “DIP Switch Settings” in chapter 5.

Notice	If Line Leak Detection is not purchased, DIP switch 8 must be set to the OPEN position.

For tandem operation, only one pump can be the master and only one pump can be the auxiliary. If both controllers are programmed as the master, the dispense enable signal will turn on both pumps.

For tandem operation, the pressure transducer wires and the dispense enable wires must be connected on the master controller. On the auxiliary controller, these terminals are not used.

Routing and Connecting the Input Power

The CPT Controller can operate with 200-250 VAC single-phase or three phase power.

Caution	Do not use single or three-phase power greater than 250 VAC.

IF the incoming power is:	THEN:
three-phase	four 12 gauge wires are required—one ground and three power wires.
single-phase	three 10 gauge wires are required—one ground and two power wires.

Notice	Refer to any local, State, and NEC codes for specific requirements in your location.

Refer to figures B-1 and B-2 in Appendix B for wiring diagrams.

Step 1: Pull three or four (see chart above) THHN gasoline-, oil-, and water-resistant wires from the breaker panel to the CPT Controller through the left hand conduit knockout.

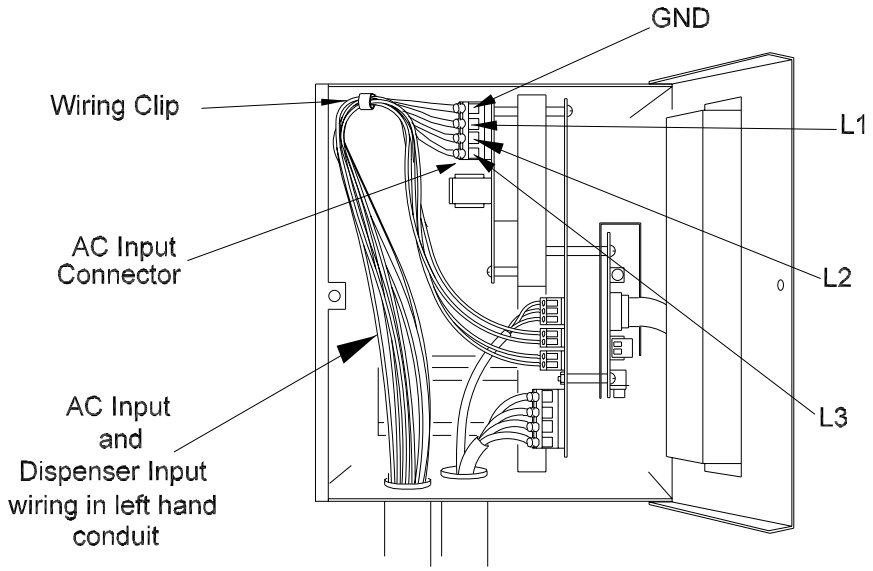

Figure 3.3 AC input wiring connections

Step 2: Route the AC input conductors through the left hand conduit and up through the clip at the top underside of the CPT Controller housing. (See figure 3.3)

DO NOT leave a service loop inside the enclosure. If a service loop is required, leave it in the wiring trough.

Keep the length of conductors in the CPT Controller housing as short as possible.

Step 3: Make the following wiring connections on the input power connector, as shown in figure 3.3:

Notice	The input power connector is the four terminal connector on the Capacitor board, which is closest to the top of the CPT Controller.

L1 to L1

L2 to L2

L3 to L3 (if three-phase power is being used for the input power)

Earth wire to the top GND terminal

For areas with 208, 220 or 230 single phase, use L1 and L2.

For three phase input use L1, L2 and L3.

For areas with 380, 400, 415 and 460 three phase, **DO NOT USE THREE PHASE POWER.** Use one phase and neutral.

WARNING!	Maximum input voltage phase to phase or phase to ground is 250 VAC.

WARNING!	The installer must connect all safety earth ground wires. Failure to connect any ground lead may result in severe personal injury, death, or substantial property damage, if ignored.

Routing and Connecting the Dispenser Input Wiring

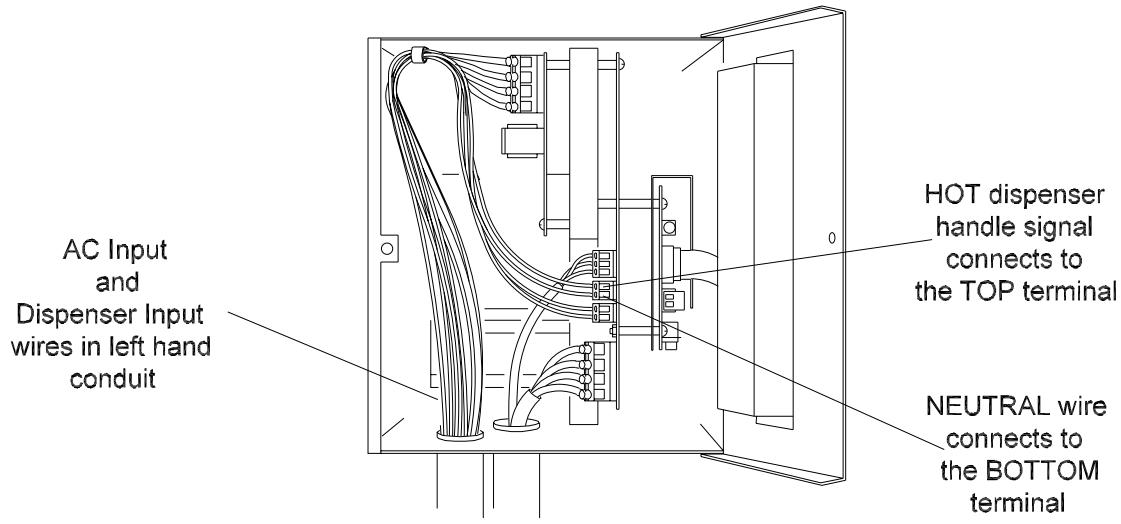

Figure 3.4 Wiring Dispenser Input Connections

Step 1: Pull the Dispenser input wires(2 conductor, hot and neutral) into the CPT Controller housing alongside the AC power input wires through the left hand conduit knockout and through the wiring clip on the top underside of the enclosure. Leave any service loop in the trough and keep wire length inside the enclosure as short as possible.

Step 2: Connect the hot dispenser handle signal (115 - 230 VAC Single Phase) to the TOP terminal of the Dispenser Input connector.

Step 3: Connect the neutral wire from the dispenser to the bottom terminal of the Dispenser Input connector. Refer to figure 3.4.

It may be necessary to run the neutral wire directly from the breaker panel. Refer to wiring diagrams B-1 and B-2.

Routing and Connecting the Output Power

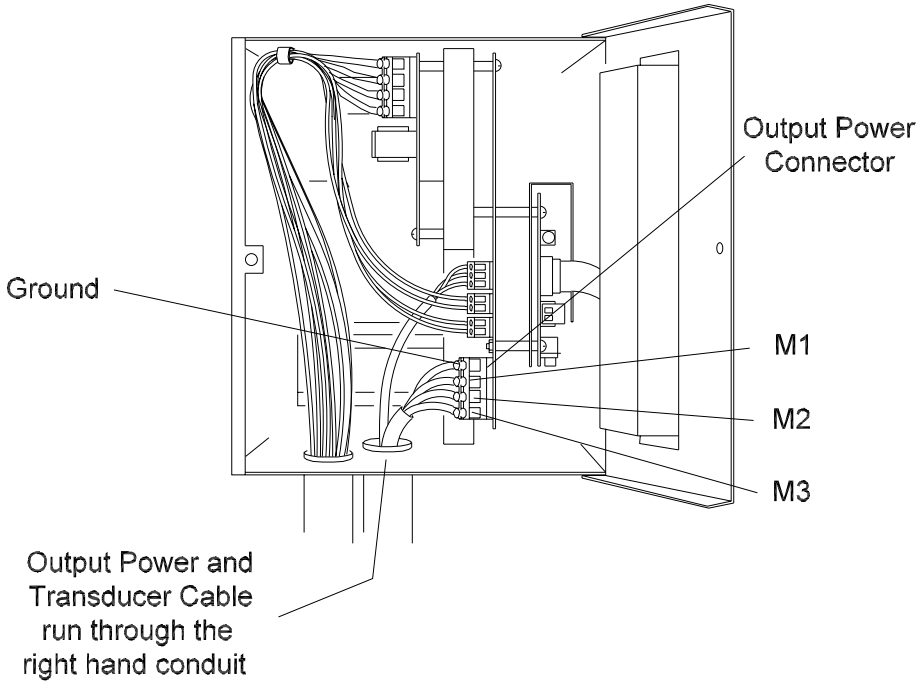

Figure 3.5 Output power connections

Step 1: Pull the Red Jacket supplied 4 conductor shielded cable from the CPT Controller through the right hand conduit knockout to the contractor's box located on the side of the CPT pump. The Red Jacket supplied cable is a UL-Classified Listed Tray Cable.

Notice	Pull the shielded transducer cable at the same time as the pump wires. Both shielded cables must be sealed in accordance with the United States National Electrical Code (NEC) Article 501-5(d) which states that the outer jacket of multi conductor cables must be removed within the seal off of the Division 1 location, (submersible sump) so that the sealing compound will surround each individual conductor. Do not break the drain wire or remove any more of the jacket than necessary.

Notice	Route the output cable through a dedicated, isolated conduit. DO NOT run this cable through the wiring trough!

Step 2: Connect the blue ground wire to the top terminal of the output power connector marked:

WARNING!	**The installer must connect this ground wire. Failure to connect any ground lead may result in severe personal injury, death, or substantial property damage, if ignored.**

Notice	The cable shield MUST remain intact as close as possible to the connector terminals. Strip the cable jacket back 1-1½" maximum. Strip the conductors ¼" maximum.

Notice	DO NOT leave a service loop in the CPT Controller enclosure.

Step 3: Make the following connections on the output power connector.

M1 to RED
M2 to ORANGE
M3 to BLACK

Notice	Tie the power cable shield to the packer ground lug in the contractor's box at one end and to the pump output power ground terminal at the other end. 

Notice	It is possible to wire the pump so that it runs in reverse, which triggers an alarm. If this alarm occurs, the red LED on the CPT Controller will flash once. To correct this problem, switch any two motor wires and check for proper rotation.

Wiring the Contractor's Box

Notice	Keep the amount of the cable shield stripped back to a minimum.

Step 1: Connect the electrical conduit with approved fittings and seal-offs to the pump contractor's box.

Step 2: Remove the cover of the pump contractor's box.

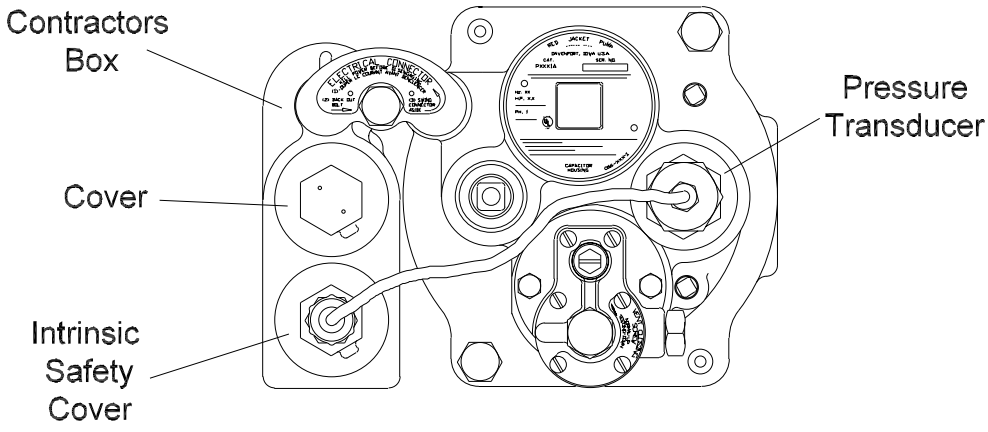

Figure 3.6 Top View of Packer

Step 3: Pull the wires from the packer out of the contractor's box.

Step 4: Cut the wires, leaving about 6 inches hanging out of the contractor's box (see figure 3.7).

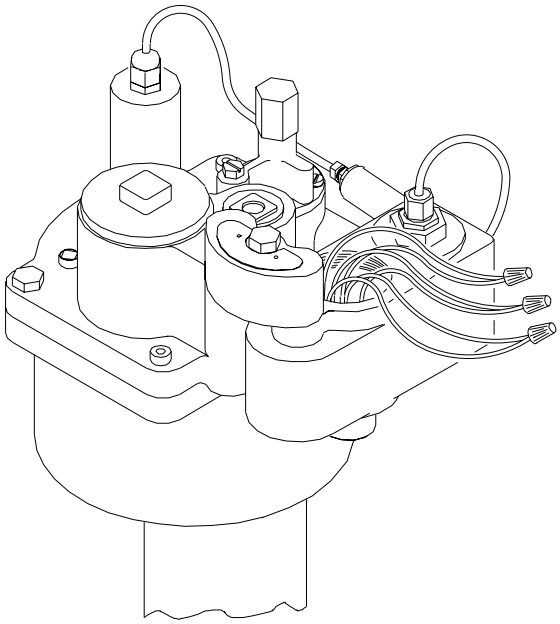

Figure 3.7 Wiring the Contractor's Box

Step 5: Connect the wires from the CPT Controller to the wires in the contractor's box. Match the color coding below:

	From CPT	In Contractor's Box
M1	RED	RED
M2	ORANGE	YELLOW
M3	BLACK	BLACK

Step 6: Connect the blue ground wire and the power cable shield to the terminal marked GND inside the contractor's box.

WARNING!	**The installer must connect this ground wire. Failure to connect any ground lead may result in severe personal injury, death, or substantial property damage, if ignored.**

Notice	Leave the 2" cover off until the Intrinsic Safety Barrier and the Pressure Transducer are wired correctly.

Notice	Resistance between submersible ground and earth ground must be less than 1 ohm (**Ω**). Use a Digital Multimeter (DMM) to test this!!

Notice	If the pressure transducer and threaded intrinsic safety barrier are used at the pump, refer to “Installing the Intrinsic Safety Barrier and Pressure Transducer,” before proceeding.

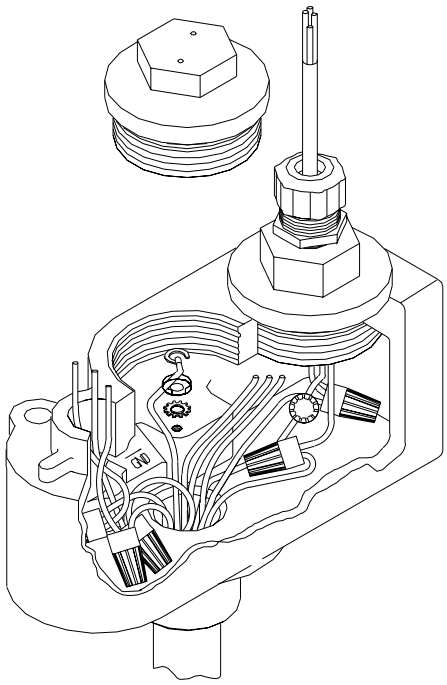

Figure 3.8 Contractor's Box, cutaway view

Notice	The CPT Controller can be used only with constant pressure turbine pumps.

Field-Wiring the CPT Pump

Step 1: Remove the cover from the old capacitor compartment.

Step 2: Pull the pigtail wires into the capacitor compartment to remove any slack in the wires.

Step 3: Cut the wires leaving about 6 inches hanging out of the capacitor compartment.

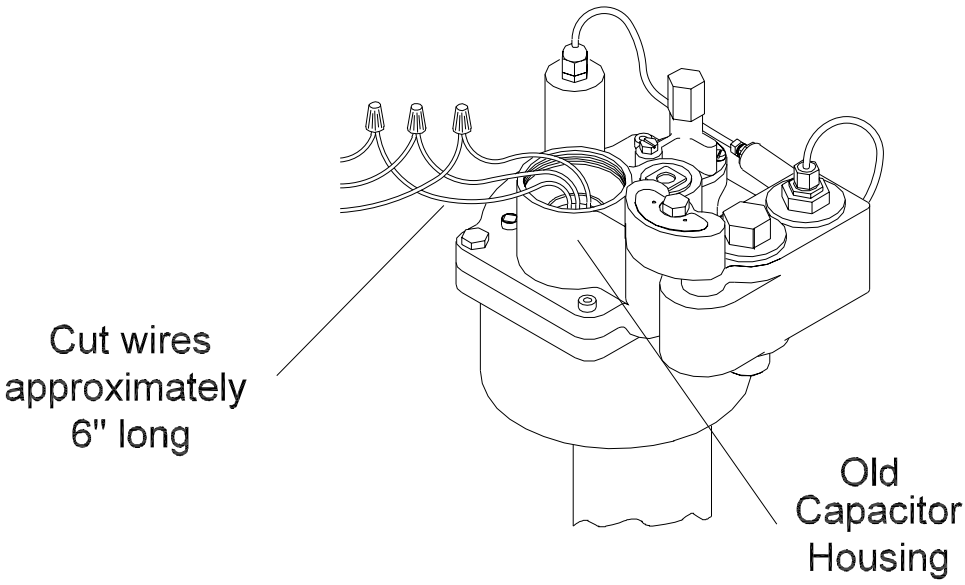

Figure 3.9 Example of correct wire length

Step 4: Using wire-nut connectors, connect the pigtail wires to the yoke wires as follows:

YELLOW to YELLOW
BLACK to BLACK
RED to RED

Step 5: Coil the excess wire into the capacitor compartment. Replace the capacitor cover using lithium grease, and torque to 35 ft-lb (50 N-m).

Step 6: Install the eyebolt plug using lithium grease, and torque to 50 ft-lb (70 N-m).

Installing the Pressure Transducer and Intrinsic Safety Barrier

Refer to the wiring diagram, figure B.1 in appendix B, for steps 1 through 6.

Notice	Using shielded wire decreases the possibility of transducer signal interference due to electronic noise emissions. It is necessary to ground the shield at both ends to get optimum noise immunity.

Step 1: Pull a Red Jacket supplied shielded cable from the contractor's box to the CPT Controller through the pump's power-line conduit and the right hand conduit knockout. Refer to figure 3.10.

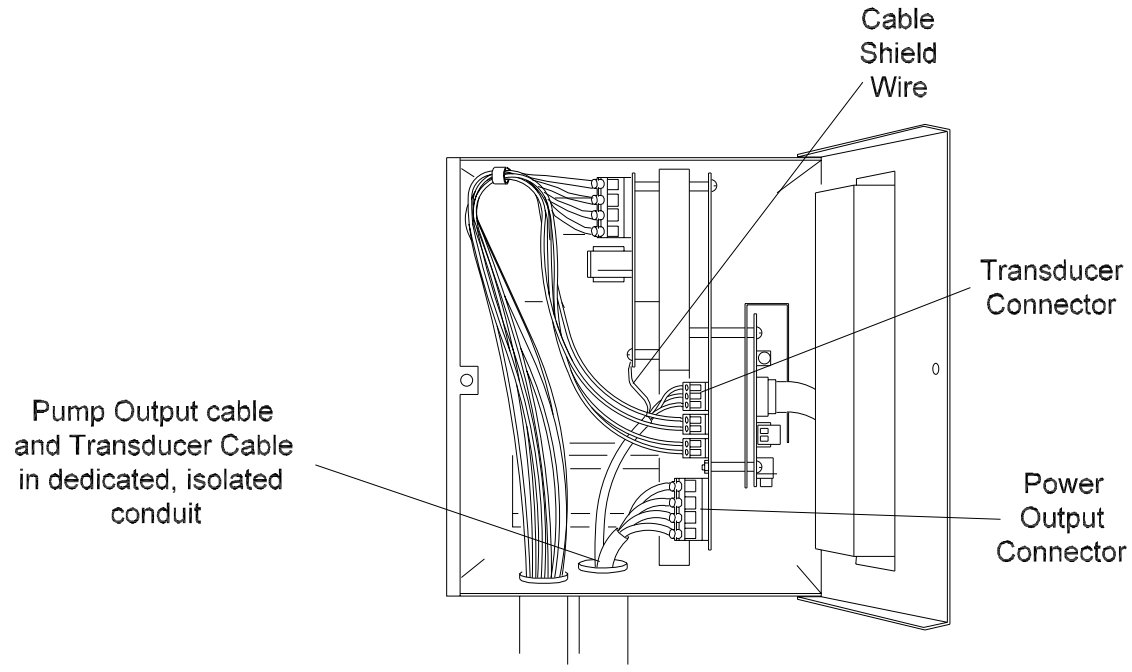

Figure 3.10 Connecting the Pressure Transducer

Step 2: Connect the wires to the transducer connector terminals on the Inverter board of the CPT Controller as follows:

+5V	RED	+
psi signal	BLUE	S
ground	BLACK	–
drain wire		Chassis

Notice	DO NOT connect the cable shield (drain wire) to the transducer minus terminal (–)!! This shield conductor MUST be connected to the chassis earth ground!

Transducer Installation

Refer to the transducer installation instructions included with the transducer.

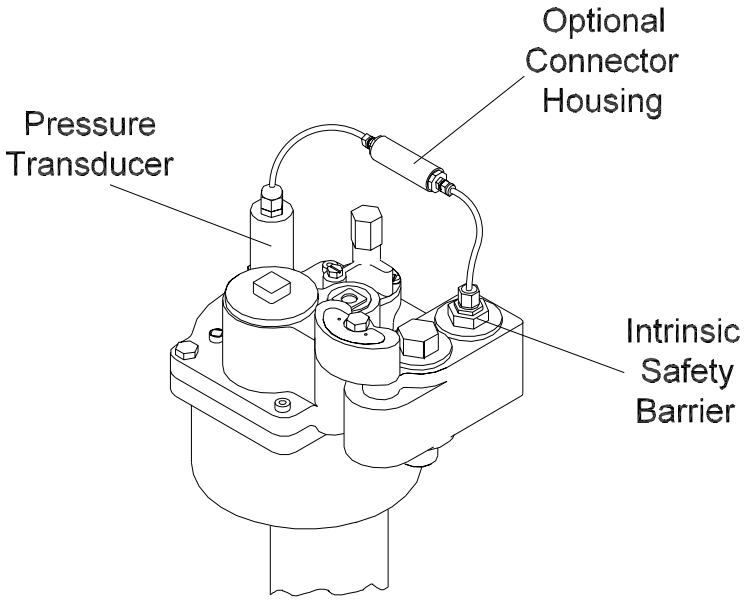

Figure 3.11 Installing the Pressure Transducer

Step 3: Install the Intrinsic Safety Barrier (2-inch plug) in the contractor's box. Refer to figures 3.11 and 3.12.

Notice	The Intrinsic Safety Barrier prevents high voltage from coming in contact with the hazardous area where the CPT pump and transducer are installed.

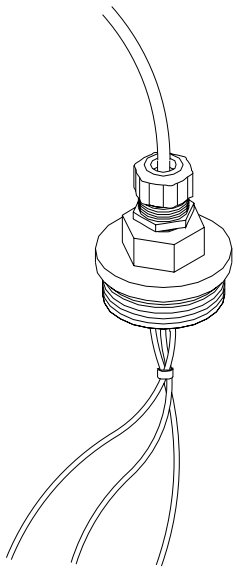

Figure 3.12 Intrinsic Safety Barrier

Step 4: In the contractor's box, wire-nut the three wires extending out of the bottom of the Intrinsic Safety Barrier Cap to the shielded-cable wires as follows:

Barrier Cap Wire		Shielded Cable Wire
RED (+5V)	to	RED
GREEN (psi signal)	to	BLUE
BLACK (ground)	to	BLACK

Step 5: Connect the shielded cable drain wire to the ground lug on the bottom of the contractor's box.

Step 6: Install the pressure transducer in the 2-in. mechanical leak detector port using UL-Classified pipe sealant on the threads.

Notice	Alternately, the pressure transducer can be installed on the product line. Refer to instructions included with the transducer.

Step 7: Using the included Scotch-Cast Connector Kit or the optional connector housing, connect the three wires from the pressure transducer to the three wires from the top of the Intrinsic Safety Barrier Cap as shown:

RED to RED
GREEN to GREEN
BLACK to BLACK

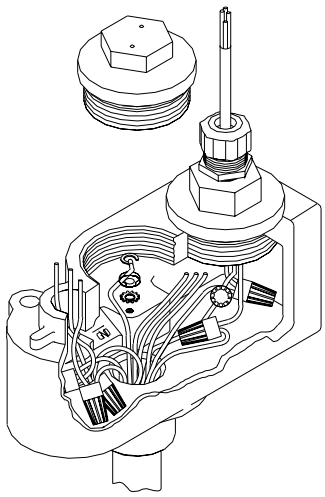

Figure 3.13 Contractor Box Wiring

For detailed instructions, see "**Sealing Wire Connections in Insulating Resin**" later in this chapter.

Wiring a Transducer for Tandem CPT Pumps

When wiring the transducer for a tandem setup, only one transducer is required. The wiring is the same as for a stand-alone CPT described above. See wiring diagram (figure B.2) in appendix B for details.

Insulating the Wiring Connections

Wiring connections between the transducer and the I.S. barrier may be made using one of the following methods:

- either the included insulating resin pouch
- or the optional cable connector board and housing.
- The connector board provides a stable, low-impedance connection while the housing protects the wires from corrosion and provides a watertight seal. Each method is described below.

Sealing Wire Connections in Insulating Resin

The following steps describe how to seal the wire connections in insulating resin using the Scotch-Cast Connector Kit provided.

Step 1: Connect wires as described above.

Step 2: Remove the resin pouch from its package. Grip both edges of the resin pouch, wrinkling and flexing it across the divider until the divider ruptures.

Step 3: Squeeze the clear side of the resin pouch, forcing the resin through the ruptured divider.

Step 4: Mix thoroughly to a uniform color by squeezing the contents back and forth 25 to 30 times.

Step 5: Squeeze the resin to one end of the pouch and cut off the other end.

Step 6: Slowly insert the wire-nut connections into the resin pouch, moving them around to ensure complete immersion in the resin.

Step 7: Fit the connections snugly against the opposite end of the pouch so that the cable jacket coming from the transducer is also submerged in resin.

Caution	Failure to fit the connections correctly may cause moisture to wick up the cable and destroy the transducer.

Step 8: Wrap the open end of the resin pouch with electrical tape or wire tie (not included), and leave the pouch in a wire-up position until the resin gels.

Caution	*DO NOT* turn the resin pouch upside down until it has hardened.

Sealing Wire Connections in the Optional Connector Board and Housing

The following steps describe the task of sealing wire connections in the optional connector board and housing.

Notice	DO NOT use this connector housing when the transducer cable is run in dedicated, isolated conduit or direct bury applications. It is necessary to use the Scotch-Cast Connector Kit in this situation. In these applications, it is ABSOLUTELY ESSENTIAL to connect the transducer cable shield to the WHITE wire from the transducer.

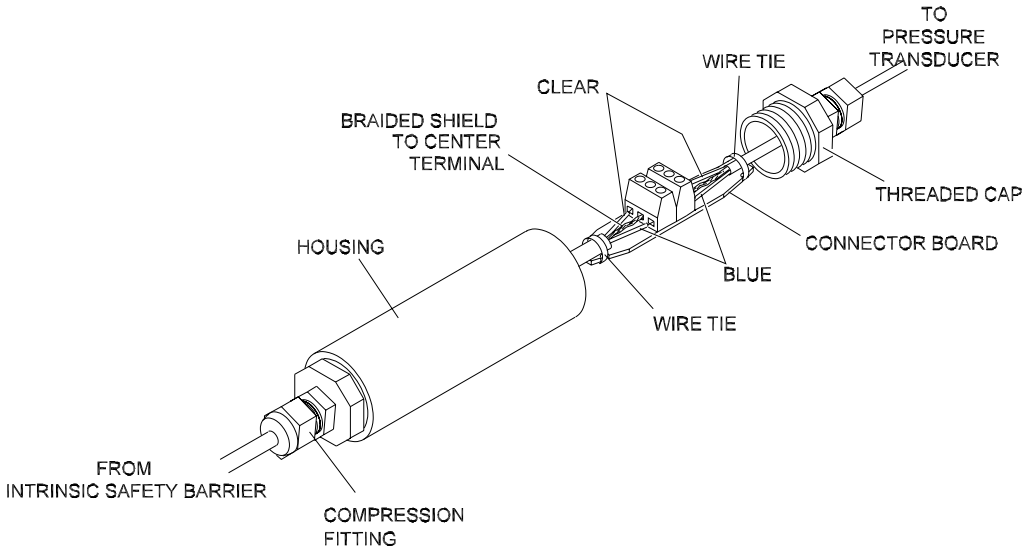

Figure 3.14 Optional Connector Board and Housing

Caution	Make sure that the power is turned off until the connector board and housing are installed.

Step 1: Remove the threaded end caps (not the compression fitting) from the housing.

Step 2: Feed the cables through the compression fittings in each threaded cap, pulling enough cable through one threaded cap to accommodate sliding the housing over it.

Step 3: Strip the insulation on the conductors back about 1/8 inch.

Step 4: Connect the conductors as follows:

Transducer Cable		IS Barrier Cable
RED	to	RED
GREEN	to	GREEN
BLACK	to	BLACK

Step 5: With the wire ties provided, strap each cable securely to the connector board. This relieves strain on the connections.

Step 6: Apply UL-Classified pipe sealant to the threads of one of the threaded end caps and screw it into the housing.

Step 7: Pull the connector board into the housing and place the desiccant packets along with it.

Step 8: Apply UL-Classified pipe sealant to the threads of the remaining threaded end cap and screw it into the housing.

Step 9: Tighten the compression fittings around the cables to make sure that moisture does not enter the connector housing.

Programming for Stand-alone or Tandem Operation

Stand-alone

The CPT is pre-programmed at the factory for stand-alone operation. For **dip** switch identification and settings, refer to **Chapter 5**.

Tandem.

When two CPT pumps are installed to operate in tandem, you must program their controllers for tandem operation. One CPT Controller is designated as the master and the other controller as the auxiliary. The master controller has the dispense-enable wiring running to it and has primary control over the sequence in which the pumps respond to a dispense-enable signal. The auxiliary controller is activated by the master controller.

If leak detection is enabled, only the master CPT Controller's DIP switches are set to enable leak detection.

To install and connect two CPT Controllers in tandem operation, follow the procedure below.

Step 1: Connect and secure the Red Jacket supplied Tandem interface cable between the RS-232 DB9 connectors on both CPT Processor boards.

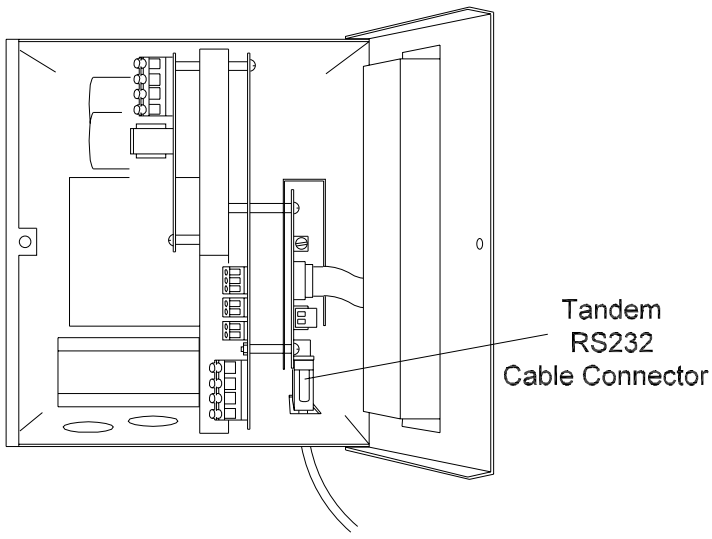

Figure 3.15 Connecting the RS-232 Tandem Cable

Step 2: On both controllers, connect the Input wires as described in the section called "Routing and Connecting the Input Power."

Step 3: Connect the dispense-enable signal wires to the terminals on the master controller's Inverter board as described in "Routing and Connecting the Dispenser Input."

Notice	For tandem operation, the dispense-enable wires must be connected to the master controller.

Step 4: On both controllers, connect the Output wires as described in the section called "Routing and Connecting the Output Power."

Step 5: Install the transducer and I.S. barrier by following the instructions in the appropriate section listed in the "Installing the Intrinsic Safety Barrier and Pressure Transducer.

Notice	For tandem operation, the transducer wires must be connected to the master controller ONLY.

Chapter 4: Startup, Calibration, and Operation

Overview

- **Verifying Wiring Connections**
- **Setting the Pump Control Pressure**
- **Purging Air from the Line**
- **Adjusting the Functional Element**
- **Calibrating the Flow Rate**
- **Verifying Line-Leak Detection**
- **Testing the Installation**
- **Verifying Wiring Connections**

Notice	It is extremely important to recheck and verify ALL wiring connections IMMEDIATELY BEFORE applying power to the CPT Controller(s) and CPT pump(s).

The resistance and continuity checks outlined below will prevent problems during operation due to improper installation.

Checking Motor Field Wiring

The resistance measured between the terminals below should be between 2–3 Ohms.

Terminals			Resistance
M1	to	M2	2–3 Ω
M1	to	M3	2–3 Ω
M2	to	M3	2–3 Ω

Notice	Resistance measured between three legs must be within ± 5% to ensure proper phase balance.

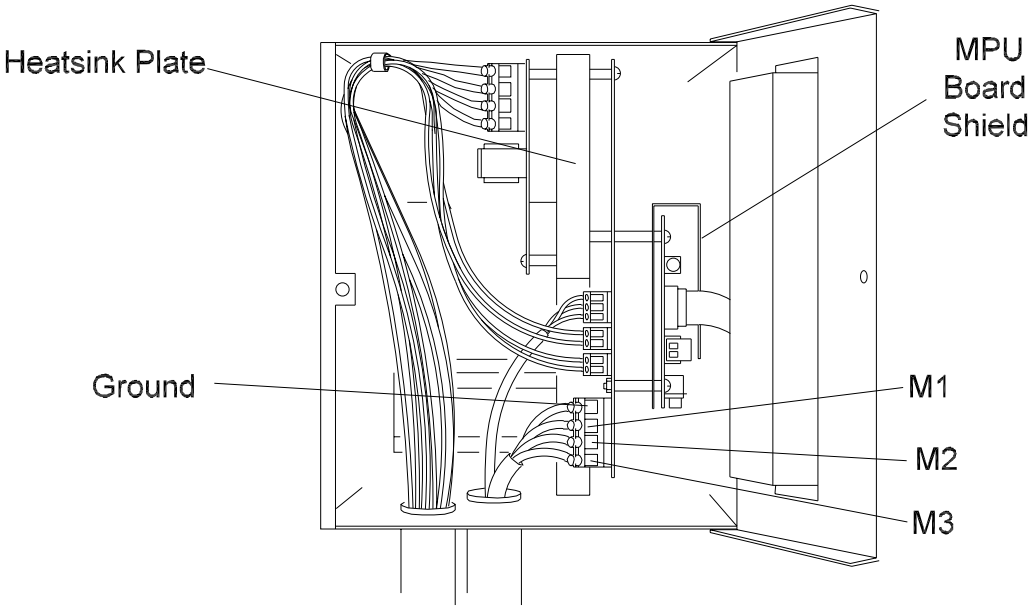

Figure 4.1 Resistance and Continuity Checking

Checking Motor Wiring to Ground

The resistance between the terminals below should be infinite.

Terminals			Resistance
M1	to	Ground	Infinite
M2	to	Ground	Infinite
M3	to	Ground	Infinite

Notice	The resistance between the heatsink plate and the MPU board shield should be infinite.

Setting the Pump Control Pressure

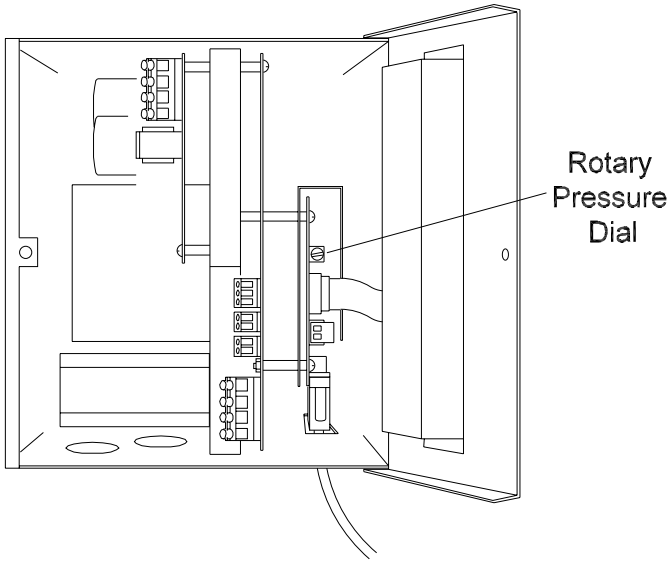

Figure 4.2 Rotary Pressure Dial

Step 1: Turn the power to the CPT Controller(s) on.

The CPT Controller(s) will now run through a self diagnostic test for reverse rotation for about one minute.

Setting the CPT Controller pressure to maintain the maximum flow rate of 10 gpm to each nozzle is accomplished by adjusting the rotary dial inside the housing of the CPT Controller (see figure 4.2).

The dial settings and their equivalent pressures are shown in the chart below.

Setting	psi	Setting	psi
0	18	5	33
1	21	6	36
2	24	7	39
3	27	8	42
*4	30	9	45

* This is the default setting.

Step 2: Set the rotary dial at the pressure necessary to maintain 10 gpm flow through one nozzle.

For details on confirming the proper flow, see “Calibrating the Flow Rate.”

Purging Air from the Line

Step 1: After confirming that all lines have been pressure tested prior to fuel being introduced, close ball valve on discharge outlet of CPT pump.

Notice	If air is trapped in the line, the ability of the pressure transducer to sense a leak may be hampered. Therefore, clearing the air from the pipeline is extremely important.

Step 2: Start the pump. Slowly open the ball valve to pressurize the lines gradually

Step 3: Open the nozzle furthest from the submersible pump, dispensing about 20–30 gallons of fuel.

Step 4: Purge ALL remaining air from the system by dispensing about 5–10 gallons from each remaining nozzle, working from the furthest dispenser toward the pump.

Step 5: Check the system for leaks.

Adjusting the Functional Element

The functional element is factory-set at 11.5 to 13 psi. If line-leak detection is enabled in the CPT Controller, you will need to increase the holding pressure for the adjustable functional element to about 2 psi below the pump's operating pressure. This is not always possible as the functional element can only be adjusted so far. A relief pressure of 25–27 psi is sufficient.

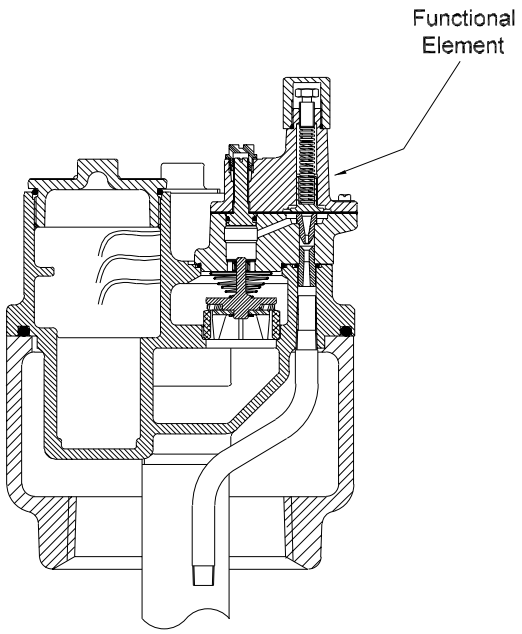

Figure 4.3 Adjustable Functional Element

WARNING!	**When the adjustable functional element is installed, the pump-motor unit must operate at approximately 2 psi greater than the relief (seating) pressure that has been set for the functional element.** **When installing a siphon system, set the functional element at 5 psi below the pump operating pressure**

Notice	Make sure that the relief pressure is always lower than the pump running pressure. Setting the relief pressure equal to or above pump desired pressure can cause failure to pressurize alarms.

WARNING!	**If the CPT is used in conjunction with other electronic leak detectors, the pressure must be set in accordance with the requirements for the specific device. Refer to the appropriate operating instructions for the correct pressure setting.**

Step 1: Remove the hex brass cap on the top of the adjustable functional element.

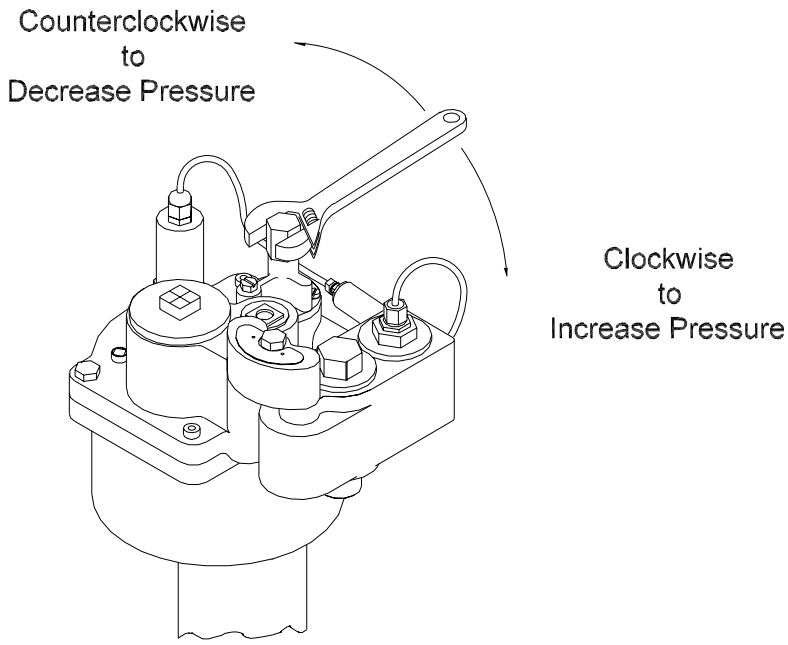

Figure 4.4 Adjusting the Functional Element

Step 2: Set the holding pressure by adjusting the pressure adjustment screw:

To increase the pressure, turn the adjustment screw clockwise.

To decrease the pressure, turn the screw counterclockwise.

If the line-leak alarm occurs, try adjusting the functional element by turning the adjustment screw all the way down and then back up two turns. This will set the functional element at about 22 psi.

When the adjusting screw is fully down, the relief pressure is about 30 psi. When the adjusting screw is fully up, the relief pressure is about 3 psi.

After adjusting the screw, turn the pump on and off; then, observe the static pressure. Three methods exist for verifying the relief pressure setting:

The pressure reading can be taken from the CPT Controller using a Tech Pod (see “Tech Pod User’s Guide”).

Relief pressure settings may be observed using existing electronic line-leak detection consoles (see appropriate operating instruction manual).

Pressure may be observed using a gauge attached at the impact valve or the line-test port at the pump (see appropriate operating instruction manual).

If the pressure is not correct, adjust the screw again, as explained in step 2.

When the pressure is correct, replace the brass cap until it touches the functional element body.

Notice	If a siphon system is used, the operating pressure of the pump must be approximately 5 psi greater than the setting for the functional element.

Calibrating the Flow Rate

To calibrate the flow rate, it is necessary to determine the volume of fuel that is pumped during a set time interval.

Tools: You will need the following:

a stop watch, and

a 5-gal (or larger) container approved for flammable liquids.

Caution	Do Not overflow the container while dispensing.

Notice	Be sure all air has been cleared from the lines.

Red Jacket suggests starting with a pressure setting of 30 psi. This will need to be adjusted to meet your site requirements.

Red Jacket recommends installing new filters before performing a flow rate test.

Step 1: With the nozzle closest to the pump fully open, and dispensing into an approved 5-gal container or the gas tank of an automobile, pump fuel for a timed interval of 15 seconds, using a stopwatch.

Follow these procedures to get an accurate flow rate test:

- **Lift the dispenser handle.**
- **Wait 15 seconds.**
- **Pump fuel for 15 seconds.**

Step 2: Record the gallons pumped during the timed interval.

To calculate the flow rate, multiply by 4 the number of gallons pumped during the 15-second interval. The result gives you the flow rate in gallons per minute (gpm).

Flow Rate = A × B

where:
A = the number of gallons pumped during the timed interval
B = the number of timed intervals in 1 minute (that is, there are four 15-second intervals)

Step 3: Adjust the pump pressure, if necessary.

IF the flow rate is:	THEN:
less than 10 gpm	increase the pressure setting.
more than 10 gpm	decrease the pressure setting.
10 gpm	do not change the pressure setting.

Step 4: Adjust the pressure setting by turning the rotary dial inside the CPT Controller enclosure (clockwise to increase the pressure; counterclockwise to decrease the pressure).

Step 5: Repeat this calibration test until the flow rate reaches but does not exceed 10 gpm, the maximum flow rate allowable by EPA regulations.

Verifying Line-Leak Detection

If you ordered the CPT with 3-gph line-leak detection from the factory, then no setup for leak detection is necessary.

Red Jacket recommends three different methods for testing line-leak detectors:

Apparatus to Verify Operation (AVO)

Field Test Apparatus (FTA)

FX Tester (FXT)

All three methods can be used to confirm proper operation of the CPT's electronic line-leak detection.

Each method is briefly described here. Although these tests were documented for the Red Jacket mechanical leak detectors, the procedures can be used for electronic line-leak detection.

Apparatus to Verify Operation (AVO) for Evaluating Basic Functions

This device evaluates only the basic functions of the line-leak detector. The AVO procedure also evaluates the pumping system as well as the line-leak detector (LLD). The AVO satisfies the minimum EPA functionality check requirements for annual inspection of leak detectors. The AVO is the most common procedure for testing for leaks (the 3-gph function of leak detection).

For complete instructions on the AVO testing method, see Red Jacket Bulletin RJ-21.

Field Test Apparatus (FTA) for Finite Testing

The FTA provides a finite approach to testing the Red Jacket line-leak detector. Finite testing allows more consistent comparisons of leak rates, which may be used as a management and maintenance tool for populations of leak detectors. The FTA can check the volume and pressure for EPA requirements.

For complete instructions on the FTA method, see Red Jacket Bulletin RJ-20.

FX Tester

The FX Tester (FXT) has been specially designed to work with the FX2 leak detector. The FXT offers quick, clean, easily performed, functional checks of leak detectors.

For complete instructions on the FXT, see Red Jacket Bulletin 051-259, Rev. B.

Testing the Installation

Test the piping and the tank to make certain the system is installed correctly.

Piping may be tested by blocking lines at each dispenser and closing the pump check valve. Use testing methods in accordance with nationally certified line-testing standards and applicable local codes.

Tanks may be tested by closing the pump check valve and applying pressure at the tank test port. Use testing methods approved by national and local standards. Final testing of tanks before startup must be done in accordance with nationally certified tank-testing methods and applicable local codes.

Chapter 5: Service and Repair

Overview

- **Technical Support**
- **Troubleshooting**
- **LED Functions**
- **Signals and Alarms**
- **Hard Faults**
- **Soft Faults**
- **DIP Switch Settings**
- **Guide to Troubleshooting**

Technical Support

For technical assistance 24 hours a day, 7 days a week, call:

1-800-777-2480

or

(913) 557-4452.

Please have your Red Jacket Technical Support ID number when calling.

Troubleshooting

This section describes the lights and signals on the controller as well as the problems or faults they indicate. It includes DIP switch settings and has a “Guide to Troubleshooting.”

LED Functions

The light-emitting diodes (LEDs) on the cover of the controller indicate the status of the system.

Green LED. The green LED indicates whether the controller is powered up (see “DIP Switch Settings”). If it appears as a solid green light, the controller is on (DIP switch 1 is Open). If the green LED is pulsing slowly, DIP switch 1 is Closed; when the motor turns on, then the green light pulses rapidly.

Yellow LED. The yellow LED on the cover indicates soft fault occurrences. If the yellow LED is off, no fault has occurred. If the yellow LED is flashing, a soft fault has occurred. (See “Soft Faults” and “Signals and Alarms” below.)

Red LED. The red LED on the cover indicates hard fault occurrences. If the red LED is off, no fault has occurred. If the red LED is on continuously or flashing, a hard fault has occurred. (See “Hard Faults” and “Signals and Alarms” below.)

Red Capacitor Charge Light. The red LED on the Inverter board indicates hazardous voltage on the capacitor bank. This LED is located on the inverter board behind the output power connector terminals. Personal injury can occur if service is performed while this LED is on.

WARNING!	Voltage stored in the capacitor bank of the CPT Controller presents a risk of potentially lethal electrical shock EVEN AFTER THE POWER IS DISCONNECTED. After disconnecting the power, wait until the red Capacitor Charge Light is out, before servicing or removing the controller.

WARNING!	Tag and Lock Out power to the CPT Controller BEFORE SERVICING! Failure to do this will create a hazard that **CAN** cause **SEVERE** personal injury, death, or substantial property damage **IF IGNORED**.

WARNING!	When working on the CPT Controller, the dispenser input signal could be live. Tag and Lock Out each dispenser input signal BEFORE SERVICING! Failure to do this will create a hazard that **CAN** cause **SEVERE** personal injury, death, or substantial property damage **IF IGNORED**.

Signals and Alarms

The Red Jacket CPT Controller system has two types of warnings — hard faults and soft faults. By reading the indicators on the controller, the owner may determine what fault has occurred and can inform the service technician before a service trip is made.

The following chart summarizes the various signals and alarms that may occur. Each of these problems is logged by the CPT Controller and may be viewed with the TechPod or Red Jacket Electronics' Pathway Plus software.

Signals and Alarms

LED (Color)	LED (No. Flashes)	Piezo Alarm (Yes, No)	Fault Type (Hard, Soft)	Problem
Red	solid	Yes	Hard	Line leak detected
Red	1	Yes	Hard	Reverse rotation
Red	2	Yes	Hard	Dry run
Red	3	Yes	Hard	Pressure transducer failure (with leak detection enabled)
Red	4	Yes	Hard	Failure to pressurize
Red	5	Yes	Hard	Locked rotor or short circuit
Red	6	Yes	Hard	Over-temperature*
Red	7	Yes	Hard	Open circuit*
Red	8	Yes	Hard	Amps calibration error
Red	9	Yes	Hard	Limit error
Red	10	Yes	Hard	Over pressure (Line pressure has exceeded 50 psi)

Signals and Alarms

LED (Color)	LED (No. Flashes)	Piezo Alarm (Yes, No)	Fault Type (Hard, Soft)	Problem
Yellow	1	No	Soft	Extended pump run
Yellow	2	No	Soft	No dispenser activity
Yellow	3	No	Soft	Mechanical pump problem
Yellow	4	No	Soft	Pressure transducer failure (without leak detection enabled)
Yellow	5	No	Soft	Neuron communication failure
Yellow	6	No	Soft	Peer communication failure
Yellow	7	No	Soft	Over-temperature*
Yellow	8	No	Soft	Over-current*
Yellow	9	No	Soft	Open circuit*

*The first four occurrences are soft faults; the fifth occurrence is a hard fault.

To clear any of these faults, use the reset button or key to reset the controller or restart the power cycle.

Each fault is defined under “Hard Faults” or “Soft Faults” on the following pages.

Hard Faults

Hard faults are problems that will shut down the system. They are indicated by a red flashing light on the controller and an audible piezo alarm. (See “Signals and Alarms” in this chapter.) Following is a list of the hard faults in alphabetical order and a description of each.

Hard Faults

Hard Fault	Description
Amps Calibration Error	If the amp-monitoring system is not calibrated, the amp monitoring system will not function correctly.
Dry Run	A submersible pump is running and no pressure has developed. Fluid is below the inlet of the pump. The “dry run” alarm may also occur as the result of an “air lock.” A pump may become air-locked when drop pipes are too close to the submersible pump in bottom-fill applications. Occasionally, the air displaced from the drop hose is expelled into the pump end, air-locking the pump.
Failure to Pressurize	The CPT Controller detects the request-to-pump signal but the pump does not generate any pressure. This detection occurs 6 seconds after the pump is turned on. The CPT Controller requires pressures >16 psi. If the CPT Controller records three consecutive occurrences of pressure <16 psi, then the Failure to Pressurize fault is indicated. This may be the result of a faulty dispenser signal, short dispenser solenoid delays, functional element seating pressure set to high, thermal overload tripping in the motor, an open circuit, or something plugging the inlet of the pump.
Limit Error	When the current limiting resistor for the capacitor board malfunctions or fails, the service circuit breaker can continually trip.
Line Leak Detected	Shuts down the submersible pump in the event of a loss of product, in accordance with EPA protocol.
Locked Rotor	Detected if, during any period of operation, the over-current fault of the power module is activated. The processor automatically retries every 5 seconds. If five consecutive occurrences of over-current are recorded, the alarm triggers and the pump shuts down.(*Note*: The first four occurrences are soft faults; the fifth is a hard fault.)

Hard Faults

Hard Fault	Description
Open Circuit	Detected if the drive is On and the output current is less than the open-circuit detection threshold. The processor retries every 5 seconds. If five consecutive occurrences of open circuit are recorded, the alarm triggers and the pump shuts down. Open circuits are wiring faults between the controller and the motor, which shut down the pump. (*Note*: The first four occurrences are soft faults; the fifth is a hard fault.)
Over-temperature	Occurs if, during any period of operation, the over-temperature fault of the power module is activated (i.e., when the temperature inside the controller gets too hot, >100°C in the power module). This may indicate fan failure. The thermal-measuring device on the power module communicates the temperature of the inverter board to the processor. If the temperature exceeds 100°C, the pump shuts down. (*Note*: The first four occurrences are soft faults; the fifth is a hard fault.)

Soft Faults

Soft faults are indicated by a yellow flashing light. (See “Signals and Alarms” in this chapter.) Following is a list of soft faults in alphabetical order and a description of each.

Soft Faults

Soft Fault	Description
Extended Pump Run	When the CPT Controller senses the pump running for more than 6 hours continuously, this fault is indicated. A continuously running pump will prevent leak detection from taking place because leak detection occurs while the pump is off. This fault may also indicate a constant signal coming from the dispense-enable switch. The pump will continue to operate if this fault occurs.
Mechanical Pump Problem	Occurs when the controller load is at maximum and the controller output frequency is less than a preset threshold. Once the controller goes into current-regulation mode, any condition that increases motor load current forces it to drive the frequency down. Once the low-threshold frequency is reached, this fault is indicated. High amps at certain frequencies may indicate pump problems, such as dragging impellers, bearings, or internal parts in the pump and motor.
Neuron Communication Failure	The CPT has two internal processors that must continually communicate. If communication fails, then leak detection cannot successfully operate.
No Dispenser Activity	Occurs if the pump does not come on (no dispense-enable signal) within 72 hours.
Open Circuit	Open circuits are wiring faults between the controller and the motor. Detected if the drive is On and the output current is less than the Open-circuit detection threshold. The processor retries every 5 seconds. If five consecutive occurrences of open circuit are recorded, the alarm triggers and the pump shuts down. (*Note*: The first four occurrences are soft faults; the fifth is a hard fault.) This fault can sometimes occur from incorrect transducer shield ground connections.
Over-current	Detected if, during any period of operation, the over-current fault of the power module is activated. The processor automatically retries every 5 seconds. If five consecutive occurrences of over-current are recorded, the alarm triggers and the pump shuts down. (*Note*: The first four occurrences are soft faults; the fifth is a hard fault.)

Soft Faults

Soft Fault	Description
Over-temperature	Occurs if, during any period of operation, the over-temperature fault of the power module is activated (i.e., when the temperature inside the controller gets too hot, >100°C in the power module). This may indicate fan failure. The thermal-measuring device on the power module communicates the inverter board's temperature to the processor; if the inverter board's temperature exceeds 100°C, the pump shuts down. (*Note*: The first four occurrences are soft faults; the fifth is a hard fault.)
Peer Communication Failure	In tandem operation, communication between the two CPT Controllers must continually occur. If communication is lost, then the tandem pump operation will not work properly.
Pressure Transducer Failure (without Leak Detection enabled)	Detects the presence of the pressure transducer by monitoring the signal. If the CPT Controller senses an abnormal voltage (less than 0.5 VDC or greater than 4.5 VDC) sustained for 15 seconds, it indicates a fault condition. If leak detection is disabled, the detection of the failed pressure transducer stops the control loop from running and will default the controller to run at a fixed frequency. To convert transducer voltage to psi, use the following formula: $\frac{VDC - 0.5}{0.08} = PSI$

DIP Switch Settings

The following chart shows the DIP switch settings for the CPT Controller.

DIP Switch Settings

Pole Position	Open/ Closed	Description
1	Open: Closed:	Green LED is on continuously Green LED flashes slowly; when the pump motor turns on, the light flashes rapidly
2	Open: Closed:	Normal Pressure Spike Line Leak Mode
3	Open: Closed:	Undefined Undefined
4	Open: Closed:	Reverse rotation test disabled Reverse rotation test enabled
5	Open: Closed:	Undefined Undefined
6	Open: Closed:	Tandem Auxiliary/Stand Alone Tandem Master
7	Open: Closed:	Stand-alone operation Tandem operation
8	Open: Closed:	Leak detection disabled Leak detection enabled *

* For this switch to function properly, leak detection must also be enabled in the software.

Guide to Troubleshooting

Symptom	Probable Cause	Suggested Action
Cooling fan does not run.	Fan is not receiving power or has an internal fault.	Check for AC power to fan.
Dry run detected.	Low product level. Malfunctioning pressure transducer. Ground fault in motor. Shorted controller Shorted wiring.	Check fuel level.
Excessive current/trip breakers.	Locked pump rotor. Motor wiring shorted to ground.	Pull pump and check for stuck parts. Measure insulation resistance of motor. Check controller and wiring for shorts to ground.
Extended pump run.	Pump has run for 6 hours.	Check dispenser input signal. Confirm dispenser activity.
Fail to pressurize alarm on ST when connected to CPT.	Improper ST software.	Call Red Jacket Tech Support for updated software.
Failure to pressurize.	Low product in tank. Short dispenser solenoid delays. Plugged pump outlet. Functional element relief pressure too high	Check fuel level. Increase delays to 4–5 seconds. Remove check valve and let fuel drain back to tank. Set relief pressure 2 psi below pump running pressure.
Line leak detected.	Leak has been detected in line. Low seating pressure Debris in functional element	Check line for leaks. Set relief pressure 2 psi below pump running pressure. Clean or replace functional element
Locked rotor or short circuit.	Ground fault in motor. Shorted controller. Shorted wiring. Locked pump rotor.	Measure insulation resistance of motor. Check controller wiring for shorts to ground. (Must have open circuit between motor windings and ground.) Pull pump and check for stuck parts.
Mechanical pump problems.	Dragging impellers, bearings, or internal parts in the pump and motor.	Refer to Mechanical Pump Course #100: Red Jacket Techs Program Call Red Jacket Technical Support.
No dispenser activity.	Lost signal from dispenser.	Check wiring. Refer to Appendix B

Open circuit, or no current.	Open wiring circuit between controller and pump.	Check wiring. Refer to Appendix B
	Incorrect transducer shielding	Check wiring. Refer to Appendix B
Over temperature.	Cooling fan failure or excessive current.	Check fan for proper operation. See excessive current solution above.
Pressure reading from transducer reads accurately when pump is not running, but is erratic when pump is running.	Noise is being induced on transducer wiring.	Check grounding; confirm that transducer cable is three conductor **WITH** shield. **BOTH** ends of shield must be connected to an earth ground.
Pressure transducer failure with leak detection enabled	Failed transducer/faulty wiring.	Fix wiring or replace transducer as needed. Make sure transducer has +5VDC. Check for shorts to ground.
Pressure transducer failure without leak detection enabled.	Failed transducer/faulty wiring.	Fix wiring or replace transducer as needed. Make sure transducer has +5VDC. Check for shorts to ground.
Pump not able to maintain set-point pressure.	Reverse pump rotation.	Turn off power to controller and switch two power leads.
Reverse rotation detected.	Reverse pump rotation.	Turn off power to controller and switch two motor power leads.
RV6 , RV8, or RV9 burnt out.	AC input wiring incorrect.	Check wiring diagram for correct connections.
	Excess voltage at input terminals.	Check input AC voltage.

Appendix A: Bulletins

Red Jacket Bulletins:

Subject	Bulletin Number
AVO Testing Method	RJ-21
FTA Testing Method	RJ-20
FX Tester	RJ-051-259 Rev B

Appendix B: Wiring Diagrams

Overview

Wiring Diagram for Stand-alone CPT Pump, Single Conduit (Fig. B.1)

Wiring Diagram for Tandem CPT Controller Pumps, Single Conduit (Fig. B.2)

WARNING!

Use L1 and L2 for single phase

Use L1, L2, & L3 for three plhase

For areas with 380, 400, 415, &480 three phase power, DO NOT USE three phase power. Use one phase and neutral.

Maximum input voltage phase to phase and phase to ground = 250 VAC

NOTICE

AC INPUT WIRING MUST BE AS FOL-LOWS:

SINGLE PHASE: 10AWG with 30 A circuit breaker

3 PHASE: 12AWG with 25 A circuit breaker

Refer to any local, state, and NEC codes for specific requirements in your location.

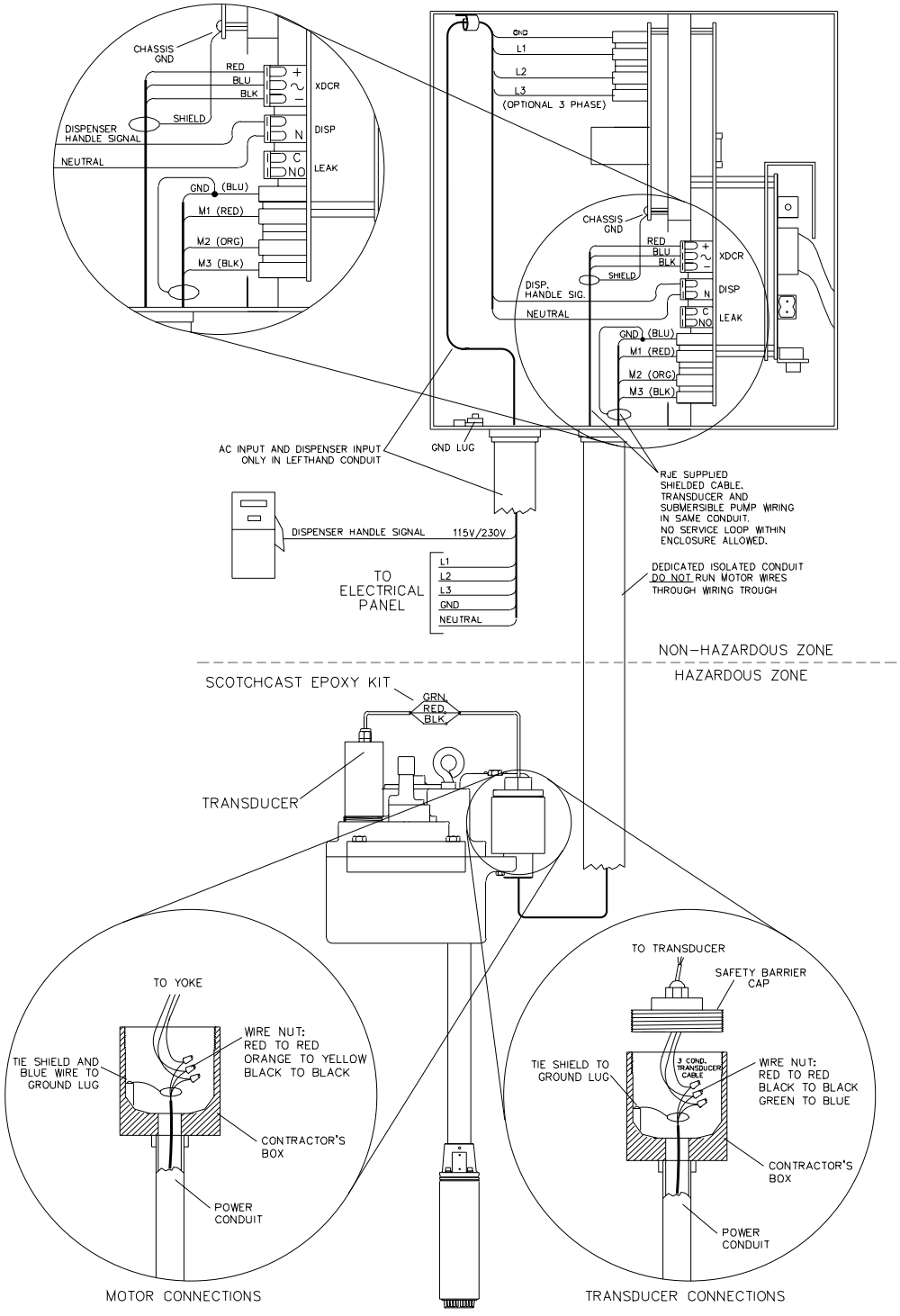

Figure B.1 Wiring Diagram for single CPT Controller

CPT Controller Wiring Connections

Have you made the following connections?

CPT Controller Connections			YES	NO
AC Input Connections				
L1	TO	L1		
L2	TO	L2		
L3 (If using 3 phase power)	TO	L3 (If using 3 phase power)		
Transducer Connections (to shielded cable)				
RED	TO	Top (+) Terminal		
BLUE	TO	Middle ( ) Terminal		
BLACK	TO	Bottom (–) Terminal		
Dispenser Input Connections				
HOT - 115/230VAC	TO	Top Terminal		
NEUTRAL	TO	Bottom Terminal		
Pump Output Connections (To Shielded Cable)				
GND		GND (Blue		
M1	TO	M1 (Red)		
M2	TO	M2 (Orange)		
M3	TO	M3 (Black)		
Contractor's Box Connections				
Shielded Power Cable				
From CPT Control-ler		In Contractor's Box		
GND (Blue	TO	GND terminal (With power cable shield)		
M1 (RED)	TO	RED		
M2 (ORANGE)	TO	YELLOW		
M3 (BLACK)	TO	BLACK		

Transducer Cable Connections		

Transducer Cable		IS Barrier Cable		
RED	TO	RED		
BLUE	TO	GREEN		
BLACK	TO	BLACK		

IS Barrier to Transducer		

IS Barrier Cable		Transducer		
RED	TO	RED		
GREEN	TO	GREEN		
BLACK	TO	BLACK		

DIP Switch Settings

DIP Switch Settings

Stand-Alone

DIP Switch	Pole Position
1	Closed
2	Open
*3	Open
4	Closed
*5	Open
6	Open
7	Open
8	†Closed/Open

Tandem

DIP Switch	Master	Auxiliary
1	Closed	Closed
2	Open	Open
*3	Open	Open
4	Closed	Closed
*5	Open	Open
6	Closed	Open
7	Closed	Closed
8	†Closed/Open	Open

† This DIP switch is Closed to enable leak detection and Open to disable leak detection. In tandem applications, ONLY the master CPT Controller DIP switch is set to Closed.

*DIP switches 3 and 5 are undefined and not applicable to operation. The default factory setting is Open. DIP switch 1 is on the bottom of the package.

For an explanation of each DIP switch pole position, see “DIP Switch Settings” in Chapter 5.

WARNING!

Use L1 and L2 for single phase

Use L1, L2, & L3 for three phase

For areas with 208, 220, and 230 single phase, use L1 & L2.

For areas with 380, 400, 415, & 480 three phase power, DO NOT USE three phase power. Use one phase and neutral.

Maximum input voltage phase to phase to ground = 250 VAC

NOTICE

AC INPUT WIRING MUST BE AS FOLLOWS:

SINGLE PHASE: 10AWG with 30 A circuit breaker

3 PHASE: 12AWG with 25 A circuit breaker

Refer to any local, state, and NEC codes for specific requirements in your location.

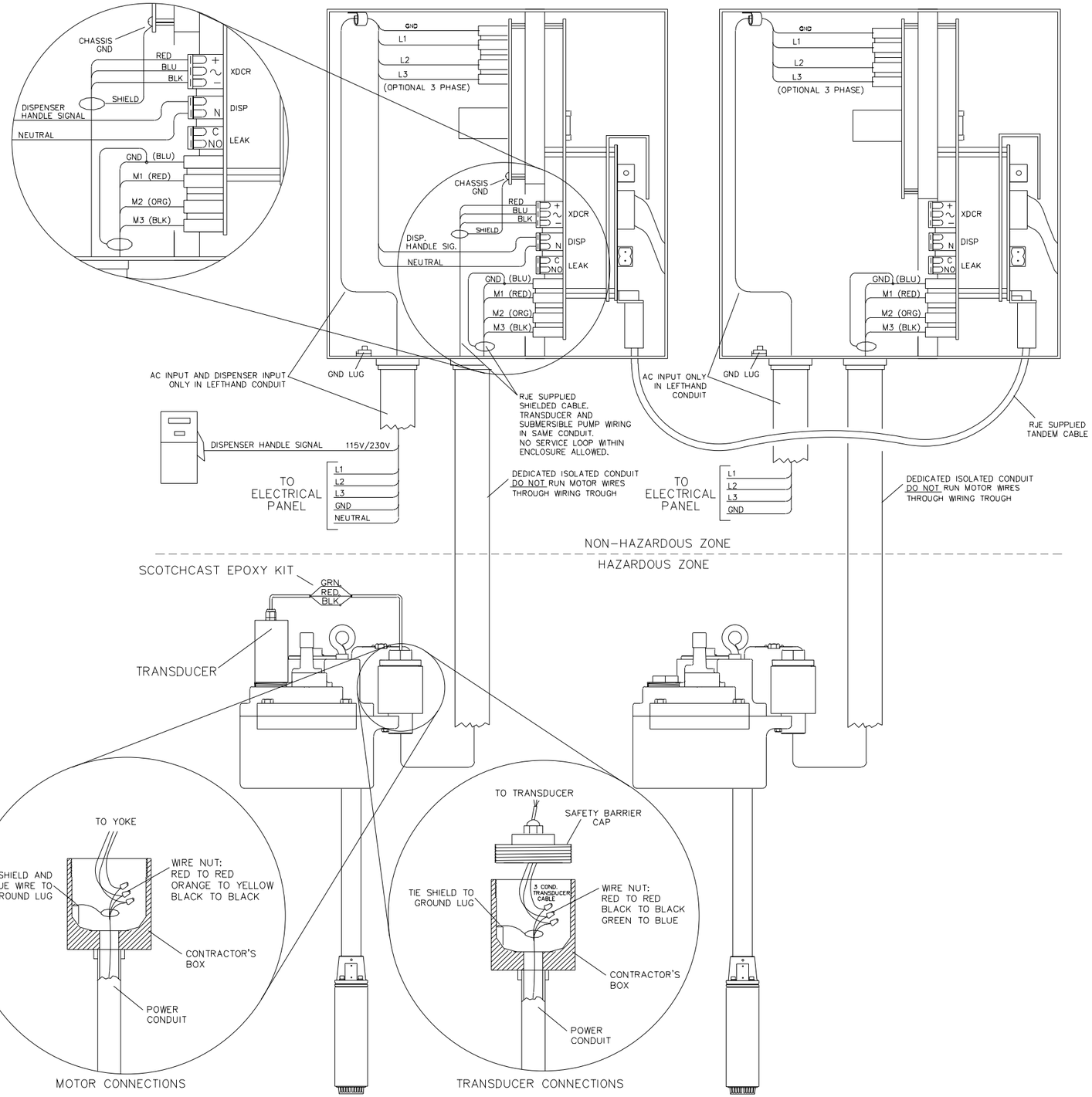

Figure B.2 Tandem CPT Wiring Diagram

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