

CoreDEF Series Submersible DEF Pump

Installation, Service, & Parts Lists



Notice

Veeder-Root makes no warranty of any kind with regard to this publication, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Veeder-Root shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this publication.

Veeder-Root reserves the right to change system options or features, or the information contained in this publication.

This publication contains proprietary information which is protected by copyright. All rights reserved. No part of this publication may be photocopied, reproduced, or translated to another language without the prior written consent of Veeder-Root.

Contact Red Jacket Technical Support for additional troubleshooting information at 800-323-1799.

DAMAGE GOODS/LOST EQUIPMENT

Thoroughly examine all components and units as soon as they are received. If any cartons are damaged or missing, write a complete and detailed description of the damage or shortage on the face of the freight bill. The carrier's agent must verify the inspection and sign the description. Refuse only the damaged product, not the entire shipment.

VR must be notified of any damages and/or shortages within 30 days of receipt of the shipment, as stated in our Terms and Conditions.

VEEDER-ROOT'S PREFERRED CARRIER

1. Fax Bill of Lading to V/R Customer Service at 800-234-5350.
2. Call V/R Customer Service at 800-873-3313 with the specific part numbers and quantities that were received damaged or lost.
3. VR will file the claim with the carrier and replace the damaged/missing product at no charge to the customer. Customer Service will work with production facility to have the replacement product shipped as soon as possible.

CUSTOMER'S PREFERRED CARRIER

1. Customer files claim with carrier.
2. Customer may submit a replacement purchase order. Customer Service will work with production facility to have the replacement product shipped as soon as possible.
3. If "lost" equipment is delivered at a later date and is not needed, VR will allow a Return to Stock without a restocking fee.
4. VR will NOT be responsible for any compensation when a customer chooses their own carrier.

RETURN SHIPPING

For the parts return procedure, please follow the instructions in the "General Returned Goods Policy" pages of the "Policies and Literature" section of the Veeder-Root North American Red Jacket Mechanical Products Price Book. Veeder-Root will not accept any return product without a Return Goods Authorization (RGA) number clearly printed on the outside of the package.

RESPONSIBILITIES OF THE INSTALLER AND STATION OWNER

This installation, operation and service instruction manual shall be left with the owner of the service station at which this equipment is installed. Retain these instructions for future use and provide them to persons servicing or removing this equipment.

Introduction

Overview	1
Notes To Contractor/Installer	2
Recommended Bulk Head And Manway Cover Openings.....	2
Safety Precautions	3
Warnings and Instructions	4
Preliminary Precautions.....	4
Requirements For Use	4
Installation Environment	5
Cleanliness Of Surfaces In Contact With DEF	5
Safety Instructions	5
Pump Dimensions	6
Kits And Accessories	10
Temperature Data	13
Operating Data	13

Installation

Submersible DEF Pump Assembly	14
Manway Fittings And Connections	14
Installing the Pump	14
Typical Fixed Pressure Relief Installation.....	17
Adjustable Pressure Relief Option.....	19
Electrical Connections	20
Simplified Wiring Diagrams	21
Wiring Diagrams	21
Single Tank Installations.....	21
Manifolded Tank Installations	21
Operational Precautions	34
Initial Start Up of Pump	34
Maintenance	34

Troubleshooting	35
------------------------------	-----------

General Repair	36
-----------------------------	-----------

Parts Lists

Submersible Pump And Accessories	38
Capacitor Kits	38
Control Boxes	39

Figures

Figure 1.	Typical Submersible DEF Pump System Components	1
Figure 2.	Example Opening Locations in Manway Cover for DEF System	2
Figure 3.	Submersible DEF Pump Dimensions/Tank Installation W/Fixed Bypass Pressure Relief Assembly	6
Figure 4.	Submersible DEF Pump Dimensions/Tank Installation W/Adjustable Bypass Pressure Relief Assembly	7
Figure 5.	Fixed Length Submersible DEF Pump Dimensions/Tank Installation W/Fixed Bypass Pressure Relief Assembly	8
Figure 6.	Fixed Length Submersible DEF Pump Dimensions/Tank Installation W/Adjustable Bypass Pressure Relief Assembly	9
Figure 7.	Apply Loctite 8009 to Threads and Tapered Fingers of Clinch Nut	14

Figure 8.	Measuring Tank	15
Figure 9.	Attaching UMP to 1-1/4" Nipple	15
Figure 10.	Loosening Locking Nut	16
Figure 11.	Adjusting Pump Length	16
Figure 12.	Tie Strap UMP Cable to Column Piping (Shown W/Fixed Pressure Relief Assembly)	17
Figure 13.	Fixed Pressure Relief Installation Example	18
Figure 14.	Adjustable Pressure Relief Installation Example	19
Figure 15.	Setting Optional Adjustable Relief Valve Pressure	20
Figure 16.	Single Phase Wiring Diagram	21
Figure 17.	Three Phase Wiring Diagram	21
Figure 18.	Suggested 208/230 V Wiring Diagram without Optional Control Box	22
Figure 19.	240 Vac Remote Control Box with 120 Vac Coil and Capacitor (Models 880-045-5 or 410861-001)	22
Figure 20.	240 Vac Remote Control Box with 240 Vac Coil and Capacitor (Models 410860-001 or 410860-003)	23
Figure 21.	230 Vac Remote Control Box with 110Vac Coil - Model 880-041-5	23
Figure 22.	240 Vac Remote Control Box with 240 Vac Coil - Model 880-042-5	24
Figure 23.	Three Phase Remote Control Box (Starter)	25
Figure 24.	Isotrol to Remote Control Box with 120 Vac Coil and Capacitor (Models 880-045-5 or 410861-001)	26
Figure 25.	Isotrol to Remote Control Box with 240 Vac Coil and Capacitor (Models 410860-001 or 410860-003)	27
Figure 26.	Isotrol to 400 Vac Remote Control Box (Starter) with 240 Vac Coil and Three Heaters (Model 410648-002 Starter and 3x 410649-003 Heaters)	28
Figure 27.	Isotrol to 240 Vac Remote Control Box (Starter) with 120 Vac Coil and Three Heaters (Model 410648-001 Starter and 3x 410649-010 Heaters)	29
Figure 28.	Isotrol with Relay to Manifolded 240 Vac Remote Control Boxes with 120 Vac Coil and Capacitor (Models 880-045-5 or 410861-001)	30
Figure 29.	Isotrol with Relay to Manifolded 240 Vac Remote Control Boxes with 240 Vac Coil and Capacitor (Models 410860-001 or 410860-003)	31
Figure 30.	Isotrol with Relay to Manifolded 400 Vac Remote Control Boxes (Starters) with 240 Vac Coil and Three Heaters (Model 410648-002 Starter and 3x 410649-003 Heaters)	32
Figure 31.	Isotrol with Relay to Manifolded 208/240 Vac Remote Control Boxes (Starters) with 120 Vac Coil and Three Heaters (Model 410648-001 Starter and 3x 410649-010 Heaters)	33
Figure 32.	UMP Cable Holding Bracket Retaining Screws	36
Figure 33.	Capacitor Kits	38
Figure 32.	Control Box W/Capacitor	39
Figure 33.	880-041-5/880-042-5 Control Box	40

Tables

Table 1.	Electrical Service Information	13
Table 2.	Submersible DEF Pump System Troubleshooting	35
Table 3.	Pressure Expectations By Pressure Relief Type	35
Table 4.	Recommended Torque Settings	37
Table 5.	Replacement Parts	38
Table 6.	Capacitor Kits*	38
Table 7.	Control Box W/Capacitor (120V Coil)	39
Table 8.	Control Box W/Capacitor (240V Coil)	40
Table 9.	880-041-5 / 880-042-5 Control Box	40

Introduction

Overview

The CoreDEF Series Submersible DEF Pump, herein referred to as Submersible DEF pump, is only intended to be used to pump Diesel Exhaust Fluid (DEF) from underground storage tanks (UST) or above ground totes in retail, commercial, and industrial applications. The submersible DEF pump installs into a threaded opening in the bulk head with a minimum diameter of 8" (203mm) for clearance. The adjustable or fixed length column pipe is available in a variety of lengths to accommodate various tank diameters and designs.

The submersible DEF pump system is equipped with variable or fixed length column pipe, check valve, pressure relief kits, optional pressure gauge and various UMP configurations. **Operation in flammable fluids is not allowed.** The submersible DEF pump should only be used as described in this manual and is designed for DEF consisting of 32.5% urea and 67.5% de-ionized water.

The submersible DEF pump offers the following features:

- **Liquid Quality Compliance** - the pump and supplied components satisfy the ISO 22241 standard for DEF quality.
- **Continuous Run Capability** - the pressure relief valve will allow the pump to run continuously regardless of dispensing from the fueling nozzle. Fluid is recirculated back to the tank through the pressure relief valve.
- **Start/Stop Capabilities** - the pump and motor are capable of up to 30 motor/pump start and stops per hour regardless of pump flow rates.

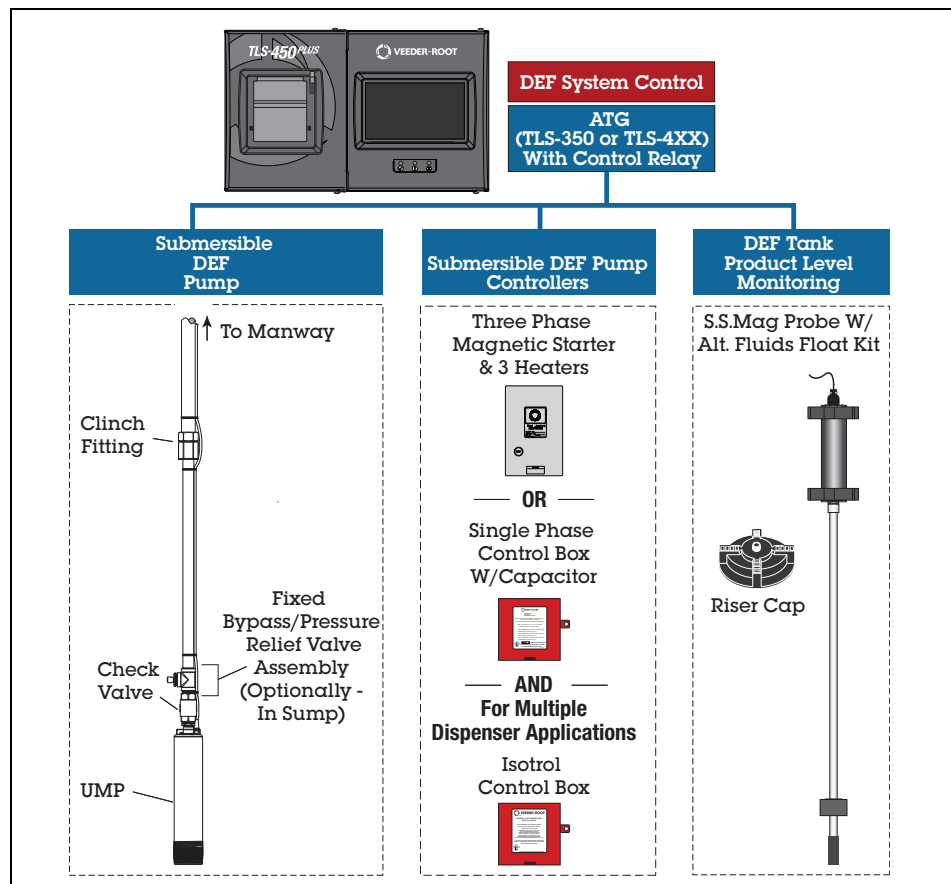


Figure 1. Typical Submersible DEF Pump System Components

Notes To Contractor/Installer

Some considerations may be needed prior to specifying the Red Jacket Submersible DEF pump and its accessories/options. The system may be purchased with either an in-tank, fixed pressure relief or the adjustable pressure relief which is installed in the sump.

The installation of the adjustable pressure relief requires plumbing to return the excess product to the tank. The system will also work with DEF recirculation systems which require a separate return port. Please ensure there are proper openings to route the product back into the tank and provision for other options such as vents, thermal relief (adjustable pressure relief system only), remote fill, probes and the electrical cord grip.

NOTICE The cord grip shall not be installed in the same opening as a product flow.

RECOMMENDED BULK HEAD AND MANWAY COVER OPENINGS

Installer to determine system needs and configuration prior to specification of manway lid and bulkhead (see Figure 2). Typical size requirements for DEF system openings are listed below:

- Strain relief for wiring - 1/2" NPT
- Probe - 4" NPT
- Submersible DEF pump - 2" full coupling
- DEF recirculation - 2" full coupling
- Remote fill - 2" NPT
- Adjustable pressure relief - 1" NPT
- Vent - 2" NPT

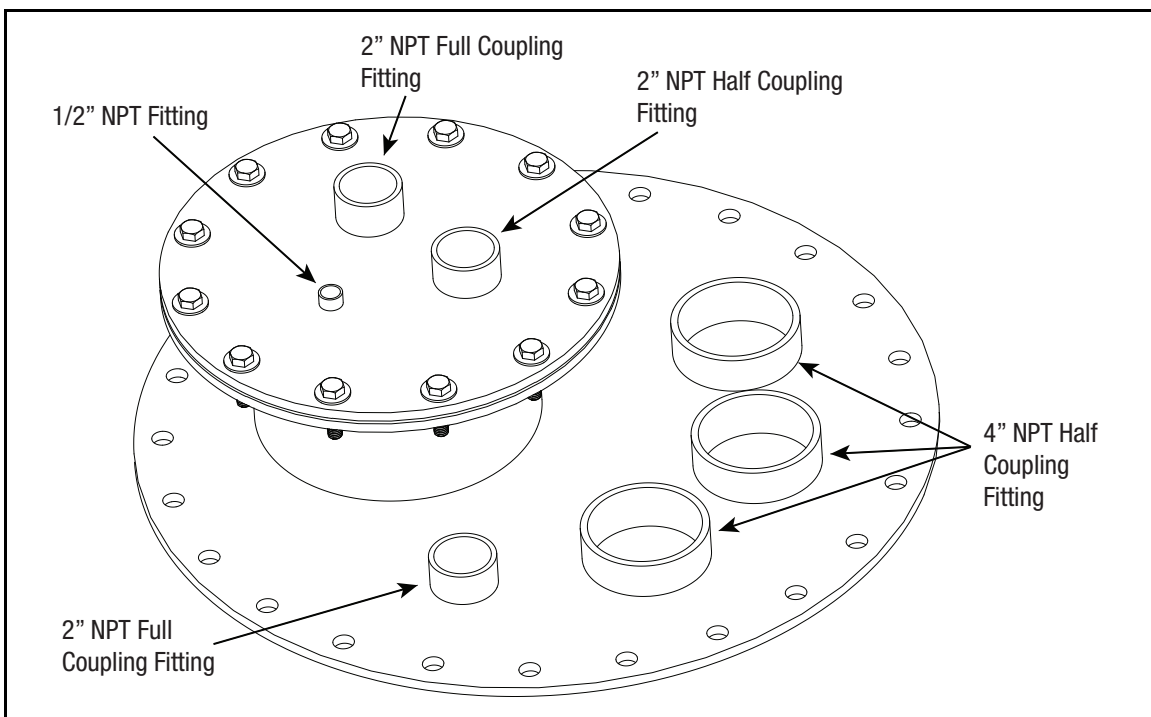











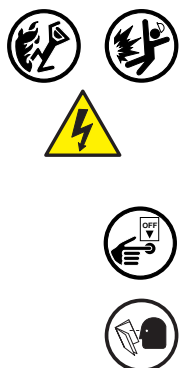
Figure 2. Example Opening Locations in Manway Cover for DEF System

Safety Precautions

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 <p>EXPLOSIVE Fuels and their vapors are extremely explosive if ignited.</p>	 <p>FLAMMABLE Fuels and their vapors are extremely flammable.</p>
 <p>ELECTRICITY High voltage exists in, and is supplied to, the device. A potential shock hazard exists.</p>	 <p>TURN POWER OFF Live power to a device creates a potential shock hazard. Turn Off power to the device and associated accessories when servicing the unit.</p>
 <p>WARNING Indicates a hazardous situation which, if not avoided, could result in death or serious injury.</p>	 <p>READ ALL RELATED MANUALS Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.</p>
 <p>WEAR EYE PROTECTION Wear eye protection when working with pressurized systems or epoxy sealant to avoid possible eye injury.</p>	 <p>WEAR GLOVES Wear gloves to protect hands from irritation or injury.</p>
 <p>CLEAN WORK AREA Remove spilled liquid and dispose of it in an environmentally sound manner.</p>	

⚠ WARNING



The Red Jacket Submersible DEF Pump and wiring shall not be installed within a hazardous environment as defined by NFPA 70 (NEC).

FAILURE TO COMPLY WITH THE FOLLOWING WARNINGS AND SAFETY PRECAUTIONS COULD CAUSE DAMAGE TO PROPERTY, ENVIRONMENT, RESULTING IN SERIOUS INJURY OR DEATH.

1. All installation work must comply with the latest issue of the National Electrical Code (NFPA 70), PEI/RP1100 Recommended Practices For The Storage And Dispensing Of Diesel Exhaust Fluid (DEF), and any European, national, state, and local code requirements that apply.
2. Turn off, tag, and lockout power to the submersible DEF pump before connecting or servicing it.
3. Do not step on DEF plumbing when entering or leaving the sump.
4. Before installing pipe threads apply an adequate amount of fresh DEF compatible, UL listed non-setting thread sealant.
5. Not reading and following all warnings and instructions in this manual can cause damage to property, environment, resulting in serious injury or death.

Warnings and Instructions

⚠ WARNING

This section introduces the hazards and safety precautions associated with installing, inspecting, maintaining or servicing this product. Before performing any task on this product, read this safety information and the applicable sections in this manual, where additional hazards and safety precautions for your task will be found. Fire, explosion, electrical shock or pressure release could occur and cause damage to property, environment, resulting in serious injury or death, if these safe service procedures are not followed.

PRELIMINARY PRECAUTIONS

⚠ WARNING

You are working in a potentially dangerous environment of flammable fuels, vapors, and high voltage or pressures. Only trained or authorized individuals knowledgeable in the related procedures should install, inspect, maintain or service this equipment.



Read The Manual

Read, understand and follow this manual and any other labels or related materials supplied with this equipment. If you do not understand a procedure, call 1-800-323-1799 to locate a qualified technician. It is imperative to your safety and the safety of others to understand the procedures before beginning work. **Make sure your employees and any service contractors read and follow the instructions.**

Follow The Regulations

Applicable information is available in PEI/RP1100 Recommended Practices For The Storage And Dispensing Of Diesel Exhaust Fluid (DEF)¹, NFPA 70; National Electrical Code (NEC), Occupational Safety and Hazard Association (OSHA) regulations and federal, state, and local codes. All these regulations must be followed. Failure to install, inspect, maintain or service this equipment in accordance with these codes, regulations and standards may lead to legal citations with penalties or affect the safe use and operation of the equipment.

ISO Standard For DEF

The production, handling and transportation of Diesel Exhaust Fluid (DEF) are governed by the ISO 22241 standard. Guidelines require manufacturers to follow clear procedures for the manufacture and distribution of DEF, ensuring that the product meets the requirements of vehicle manufacturers. The ISO standards are available from the ISO website².

REQUIREMENTS FOR USE

NOTICE

Contractors MUST supply additional pressure relief in the DEF system downstream of the check valve to assure the system does not exceed the recommended 50 psi during thermal expansion!

When using Loctite 567 thread sealant, apply Loctite primer 7090 to the pipe threads, then apply Loctite 567 to all contractor assembled joints for additional residual torque.

- Application of the submersible DEF pump must be consistent with NFPA Code 70/NEC, OSHA regulations, and federal, state and local fire codes, and other applicable local regulations.
- The selection of any Veeder-Root product must be based upon physical specifications and limitations and the product's compatibility with the materials to be handled. Veeder-Root makes no warranty of fitness for a particular purpose.
- All Veeder-Root products should be used in accordance with applicable federal, state and local laws, ordinances and regulations.

1. <http://pei.org/PublicationsResources/RecommendedPracticesExams/RP1100/tabid/849/Default.aspx>

2. http://www.iso.org/iso/search.htm?qt=22241&sort=rel&type=simple&published=on&active_tab=standards

INSTALLATION ENVIRONMENT

⚠ WARNING The submersible DEF pump is only intended to be used to pump DEF fluid.

CLEANLINESS OF SURFACES IN CONTACT WITH DEF

All surfaces in direct contact with DEF shall be free of foreign matter (fuel, oil, grease, detergent, dust and any other substance).

To avoid any contamination of DEF with trace elements, particles and foreign matter, surfaces of equipment not exclusively used with DEF shall be cleaned with distilled or de-ionized water and DEF in the last cleaning step immediately before the use with the DEF to be handled with the equipment.

The use of tap water should especially be avoided due to the high concentrations of alkali and alkali earth metal ions therein. However, if distilled water or de-ionized water is not readily available, the material may be cleaned with tap water, provided the last rinse is done using DEF.

SAFETY INSTRUCTIONS

- The maximum operating pressure and the operating temperature must be observed.
- High operating pressure may result in the containers, fittings, pipelines or the hoses bursting or becoming loose. Make sure that excessive pressure does not result when filling a container.



- **Remove spilled liquid from the floor and dispose of it in an environmentally sound manner.**

- Only start three-phase motors with an upstream motor-protection switch.
- Comply with technical requirements of local power supply companies.
- Only use the pump for its intended use.
- Always operate the pump in a vertical position.



- Follow internal instructions.



- **Wear protective clothing (face and breathing protection, protective gloves, etc.).**

Pump Dimensions

Figure 3 shows reference dimensions/components of a typical variable length submersible DEF pump as installed with a fixed pressure relief. Figure 4 shows reference dimensions/components of a typical variable length submersible DEF pump as installed with adjustable pressure relief.

Figure 5 shows reference dimensions/components of a typical fixed length submersible DEF pump with a fixed pressure relief. Figure 6 shows reference dimensions/components of a typical fixed length submersible DEF pump with adjustable pressure relief.

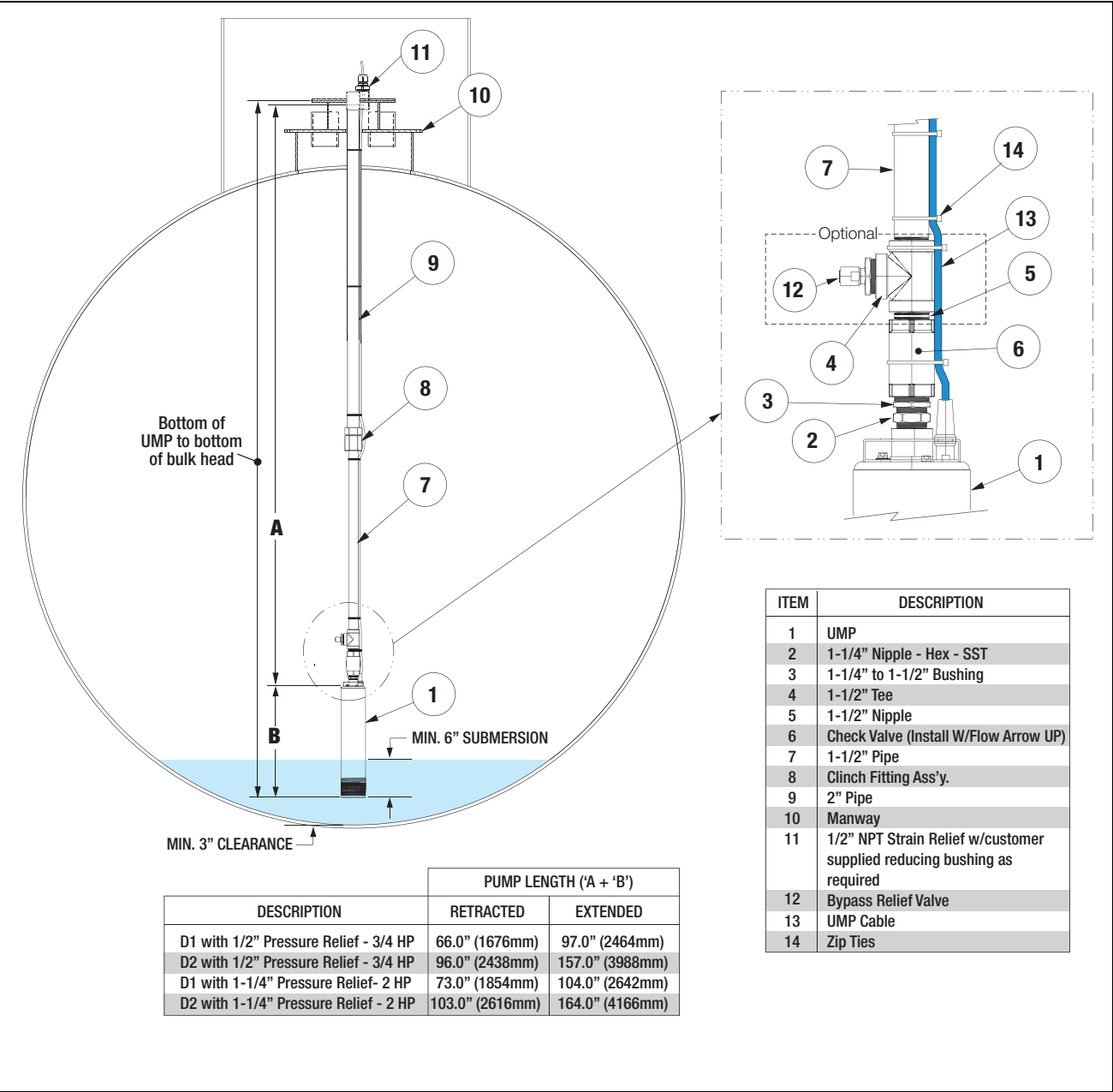


Figure 3. Submersible DEF Pump Dimensions/Tank Installation W/Fixed Bypass Pressure Relief Assembly

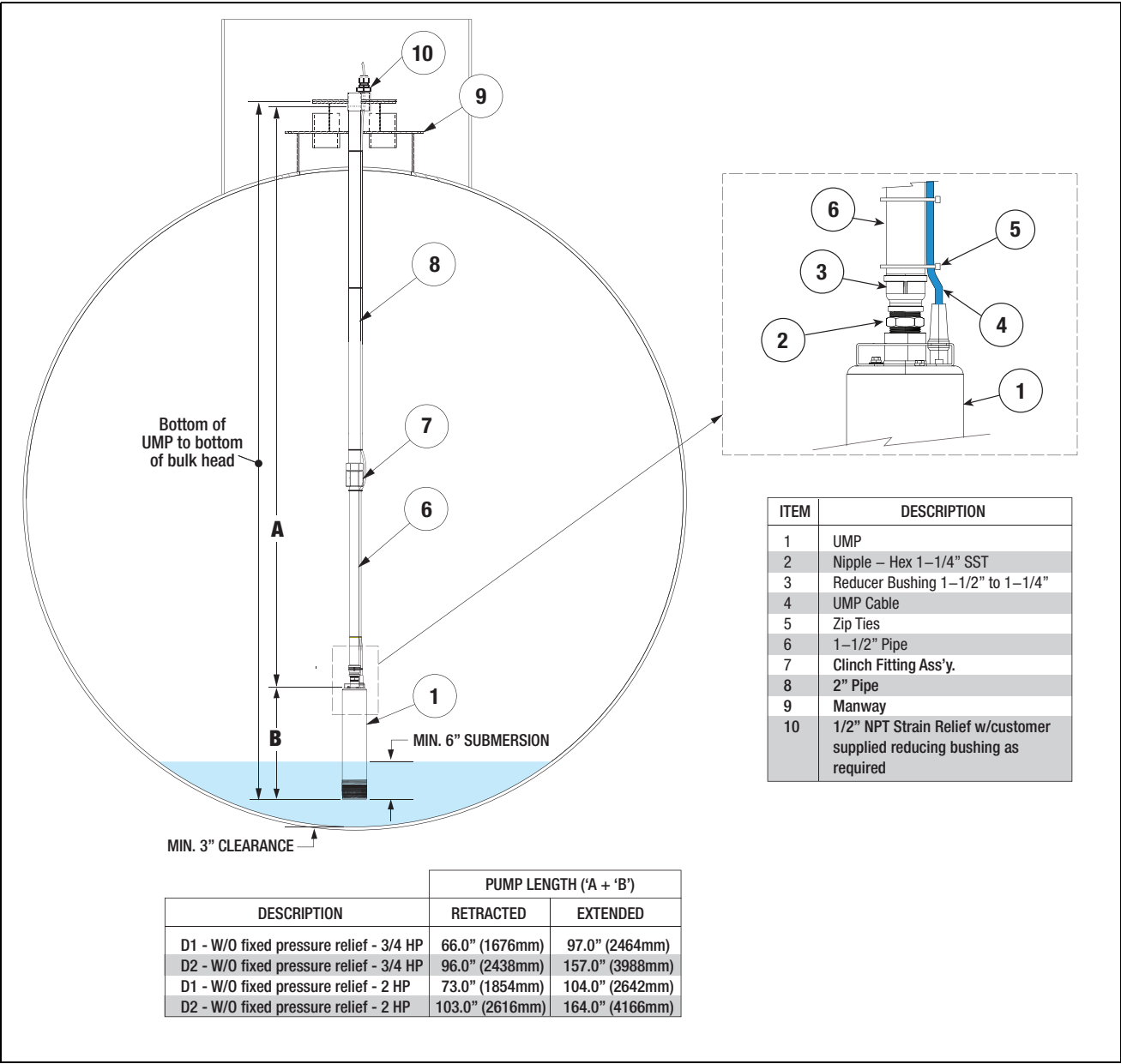


Figure 4. Submersible DEF Pump Dimensions/Tank Installation W/Adjustable Bypass Pressure Relief Assembly

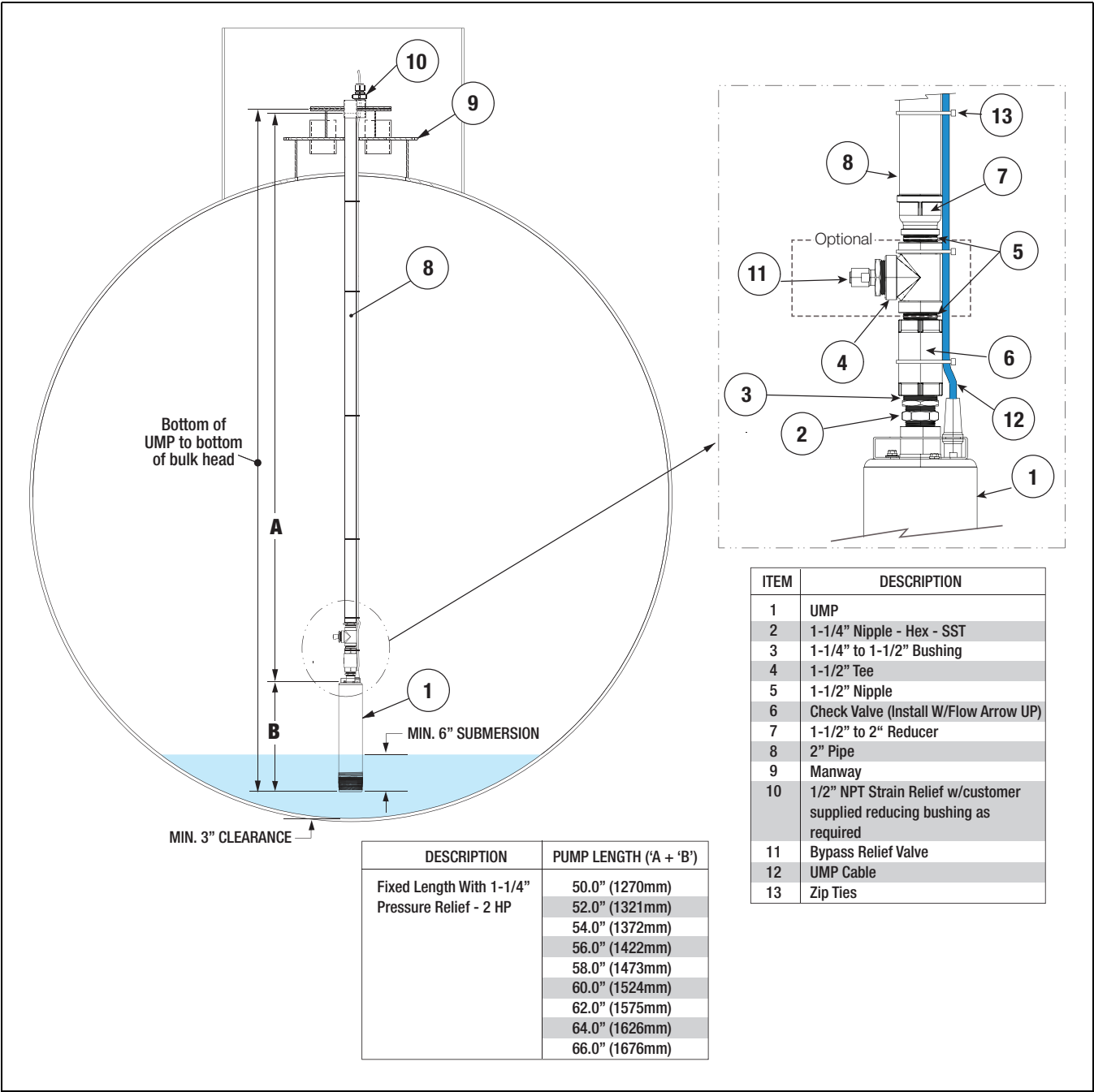


Figure 5. Fixed Length Submersible DEF Pump Dimensions/Tank Installation W/Fixed Bypass Pressure Relief Assembly

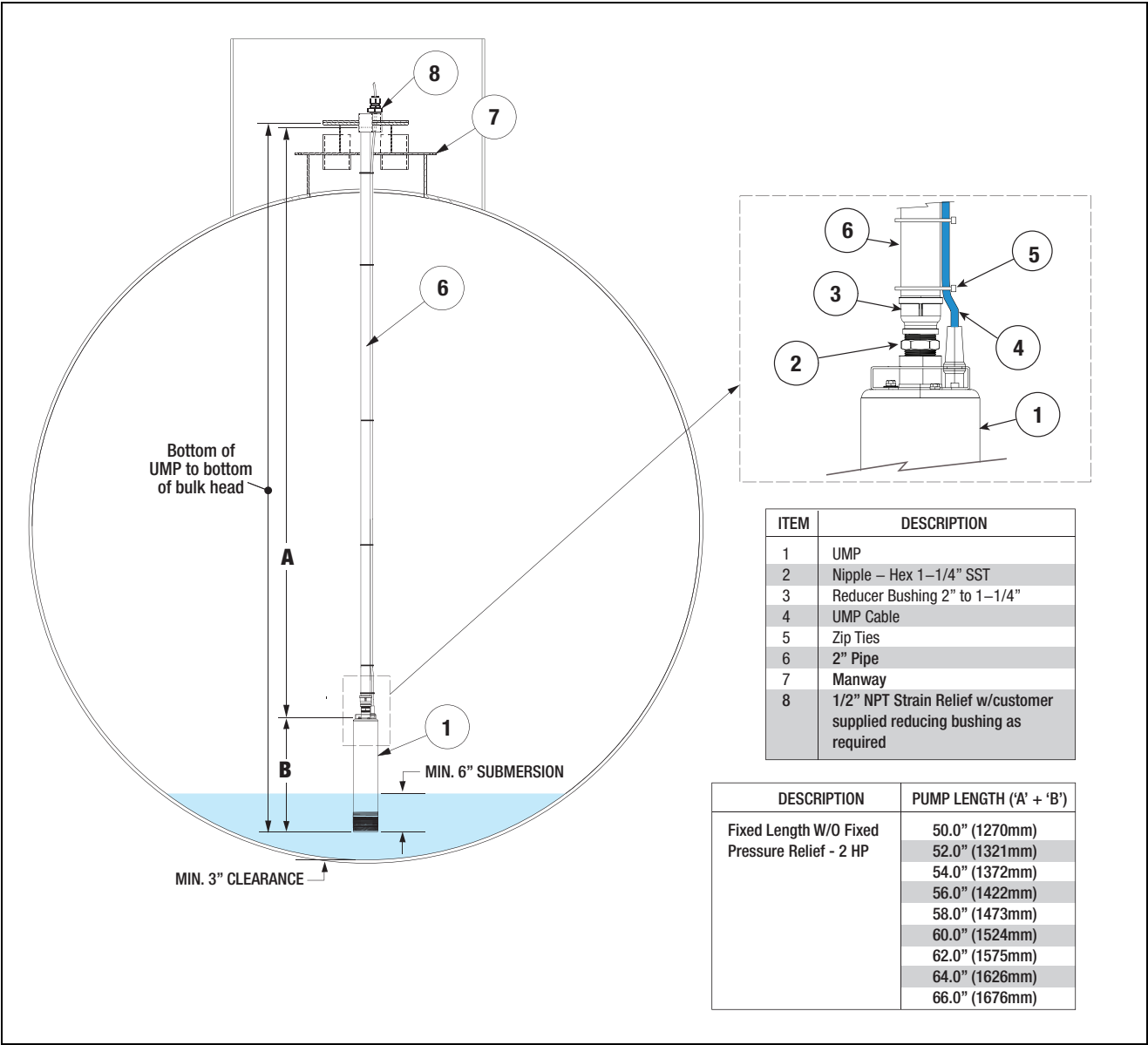


Figure 6. Fixed Length Submersible DEF Pump Dimensions/Tank Installation W/Adjustable Bypass Pressure Relief Assembly

Kits And Accessories

The submersible pump system is designed to operate as a complete solution for UST applications. The tote applications will require custom fabrication and installation of the piping systems by the contractor. The contractors should be aware of material compatibility and use only fittings, sealants and plumbing compatible with DEF per ISO 22241.

1. Select UMP (HP and voltage requirements).

Part Number	Model Number	HP	Volts	Hz	Phase	Length ('B' Figure 3)	Weight
410852-001	DP75U1	3/4	230	60	1	16.81" (427mm)	22 lbs. (10kg)
410852-002	DP75U3	3/4	230	50	1	16.81" (427mm)	22 lbs. (10kg)
410852-003	DP200U1	2	230	60	1	23.94" (608mm)	34.2 lbs. (15.5kg)
410852-004	DP200U17	2	400	50	3	23.94" (608mm)	34.2 lbs. (15.5kg)
410852-005	DP200U4	2	230	60	3	23.94" (608mm)	34.2 lbs. (15.5kg)

2. Select Piping Kit.

NOTICE

If piping version with No Pressure Relief is chosen, the customer must select the Adjustable Pressure Relief kit (see Item 5 below).

NOTICE

All fixed length piping assemblies listed are only available with the 2 HP, 60 Hz, Single Phase UMP model.

Part Number	Description
410869-001	D1 with 1/2" Pressure Relief - 3/4 HP
410869-002	D2 with 1/2" Pressure Relief - 3/4 HP
410869-003	D1 with 1-1/4" Pressure Relief - 2 HP
410869-004	D2 with 1-1/4" Pressure Relief - 2 HP
410869-005	D1 with no Pressure Relief - 3/4 or 2 HP
410869-006	D2 with no Pressure Relief - 3/4 or 2 HP
410869-007	50" Fixed Length with no Pressure Relief – 2 HP
410869-008	52" Fixed Length with no Pressure Relief – 2 HP
410869-009	54" Fixed Length with no Pressure Relief – 2 HP
410869-010	56" Fixed Length with no Pressure Relief – 2 HP
410869-011	58" Fixed Length with no Pressure Relief – 2 HP
410869-012	60" Fixed Length with no Pressure Relief – 2 HP
410869-013	62" Fixed Length with no Pressure Relief – 2 HP
410869-014	64" Fixed Length with no Pressure Relief – 2 HP
410869-015	66" Fixed Length with no Pressure Relief – 2 HP
410869-016	50" Fixed Length with 1-1/4" Pressure Relief – 2 HP

Part Number	Description
410869-017	52" Fixed Length with 1-1/4" Pressure Relief – 2 HP
410869-018	54" Fixed Length with 1-1/4" Pressure Relief – 2 HP
410869-019	56" Fixed Length with 1-1/4" Pressure Relief – 2 HP
410869-020	58" Fixed Length with 1-1/4" Pressure Relief – 2 HP
410869-021	60" Fixed Length with 1-1/4" Pressure Relief – 2 HP
410869-022	62" Fixed Length with 1-1/4" Pressure Relief – 2 HP
410869-023	64" Fixed Length with 1-1/4" Pressure Relief – 2 HP
410869-024	66" Fixed Length with 1-1/4" Pressure Relief – 2 HP

3. For multiple dispenser applications select the Isotrol box:

- Isolates the handle signals between each dispenser
- Isolates and protects individual dispensers from wiring shorts or phasing issues
- Isolates and protects technicians from dangerous feedback during service
- Accepts up to eight individual dispenser signals

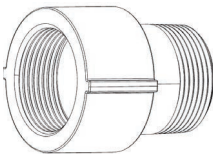
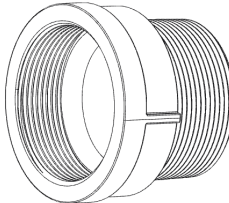
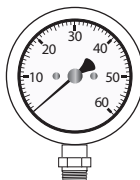
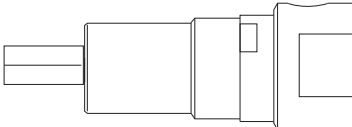
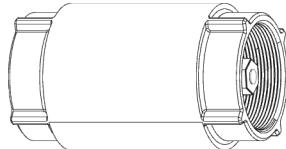
Isotrol Box	Hook Voltage	P/N
W/O Relay For Standalone	120V hook	880-049-1
	240V hook	880-050-1
W/Relay For Manifolded	120V hook	880-047-1
	240V hook	880-048-1

4. Select the Control Box for each pump.

	Dispenser Hook Voltage	UMP (Capacitor or Heater)			
		DP75U1, DP75U3-3 (17.5 μ F)	DP200U1 (40 μ F)	DP200U17 (CR123C526A)	DP200U4 (CR123C867A)
Single Phase Control Box With Capacitor	120V hook	880-045-5	410861-001	-----	-----
	240V hook	410860-003	410860-001	-----	-----
Three Phase Starter With (3) Heaters	120V hook	-----	-----	-----	410648-001 (3) 410649-010
	240V hook	-----	-----	410648-002 (3) 410649-003	410648-002 (3) 410649-010
Single Phase Control Box and Capacitor Kit	120V hook	880-041-5 & 410164-001	880-041-5 & 410164-003	-----	-----
	240V hook	880-042-5 & 410164-001	880-042-5 & 410164-003	-----	-----

NOTICE Existing applications may not require an Isotrol or a Control Box. In these applications capacitors can be purchased as listed in Table 6 on page 38.

5. Select optional accessories.

Item	Part Number	Description
NPT to BSP Adapters - SST (Stated adjustment range of column piping in Figure 3 is affected by use of adapters)	410878-001	Male 1-1/4" NPT to Female 1-1/4" BSP 
	410879-001	Female 2" NPT to Male 2" BSP 
Pressure Gauge	410880-001	1/4" NPT fitting- SST 316 components 
Adjustable Pressure Relief Kit	410881-001	Adjustable Pressure Relief Valve w/1" NPT inlet/outlet 
Check Valve*	410875-001	

* NOTE: Check valve recommended with use of Adjustable Pressure Relief valve which is not designed to hold system pressure.

Temperature Data

Operating Temperature (Fluid)	+12°F to +104°F (-11°C to +40°C)*
-------------------------------	-----------------------------------

NOTICE *DEF will degrade with prolonged storage above 77°F (25°C). Refer to the DEF manufacturer's guidelines for proper storage.

Operating Data

Table 1. Electrical Service Information

Model	HP	KW	Voltage (+6% /-10%)	Hz	PH	Max. Current (A)	Locked Rotor Amps	Capacitor (μF)	UMP Resistance (Including Cable) (Ω)			Min. Transformer Rating (KVA)
									Black- Grey	Black- Brown	Grey- Brown	
DP75U1	3/4	0.56	230	60	1	4.5	13	17.5; 440V	5.9-7.3	13.2- 16.2	18.9- 23.2	1.8
DP75U3	3/4	0.56	230	50	1	4.6	10	17.5; 440V	8.3- 10.2	17.5- 21.5	25.7- 31.5	1.8
DP200U1	2	1.5	230	60	1	10	35	40.0; 440V	2.1-2.7	4.3- 5.3	6.2-7.7	3.6
DP200U17	2	1.5	400	50	3	4.9	21	–	8.7- 10.7	8.7- 10.7	8.7- 10.7	3.6
DP200U4	2	1.5	230	60	3	9.2	40	–	2.4-3.0	2.4- 3.0	2.4- 3.0	3.6

Installation

Submersible DEF Pump Assembly

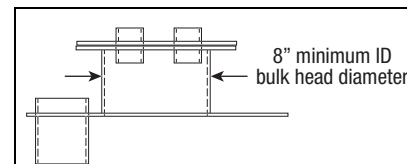
NOTICE If no column pipe assembly or fixed pressure relief valve was purchased it is **mandatory** the contractor follow the ISO 22241 guidelines. Pressure relief **must** be used with all systems to limit discharge pressure to 50 psi (344.7 kPa). Any fixed length plumbing needs to allow for proper clearance to bottom of tank per Figure 3. Ensure all sealants are DEF compatible and use only stainless steel plumbing and hardware to avoid any product contamination. It is required that if a fixed pressure relief system is not selected, the optional adjustable pressure relief must be installed in the manway.

⚠WARNING Plastic pipe is not recommended for support of pumps in any applications.

Manway Fittings And Connections

Take caution of fitting and plumbing routing, size and materials to assure adequate performance and material compatibility per ISO 22241.

NOTICE Minimum riser flange diameter recommended for installation of all assemblies is 8" (203mm). Assemblies may fit into a 6" (152mm) riser flange if no fixed pressure relief is used. The 2HP or 3/4HP UMP will not fit through a 4" (102mm) riser.



Installing the Pump

1. Before installing pipe threads apply an adequate amount of fresh, UL classified for DEF, non-setting thread sealant. Loctite 567 sealant is recommended with Loctite 7090 primer for all field serviceable pipe threads. Loctite 8009 is to be used as the DEF compatible antiseize on the clinch nut threads (see Figure 7).

NOTICE Clinch nut does not apply to fixed length pumps.

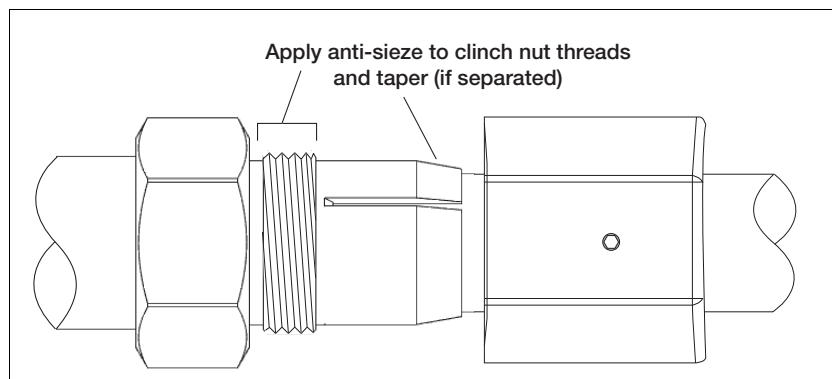


Figure 7. Apply Loctite 8009 to Threads and Tapered Fingers of Clinch Nut

2. Measure the distance from the bottom of the tank to the top of the manway as shown in Figure 8.

NOTICE For fixed length pumps, skip to Step 3.

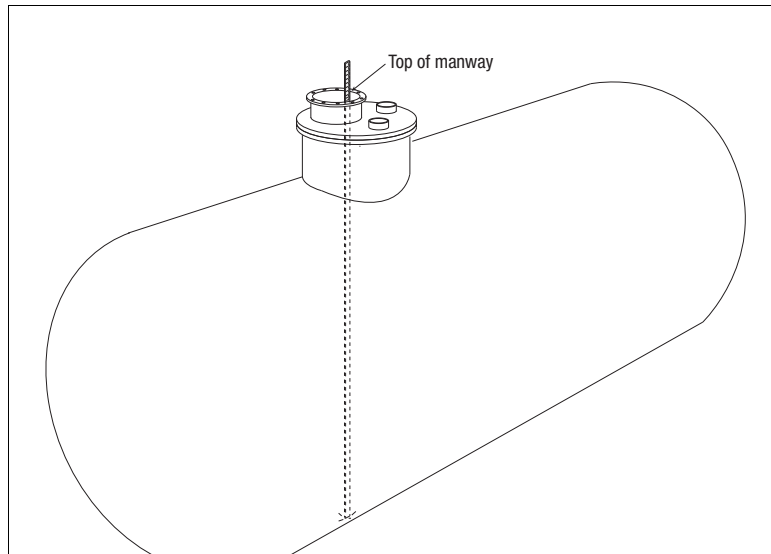


Figure 8. Measuring Tank

3. Apply Loctite 7090 primer and coat Loctite 567 sealant on threads of 1-1/4" SST hex nipple and hand screw UMP onto column pipe assembly. Place a pipe wrench over the rectangular cable holding bracket at the top of the UMP and a wrench on the hex faces of the nipple, tighten to 125 ft-lbs (170 N•m).

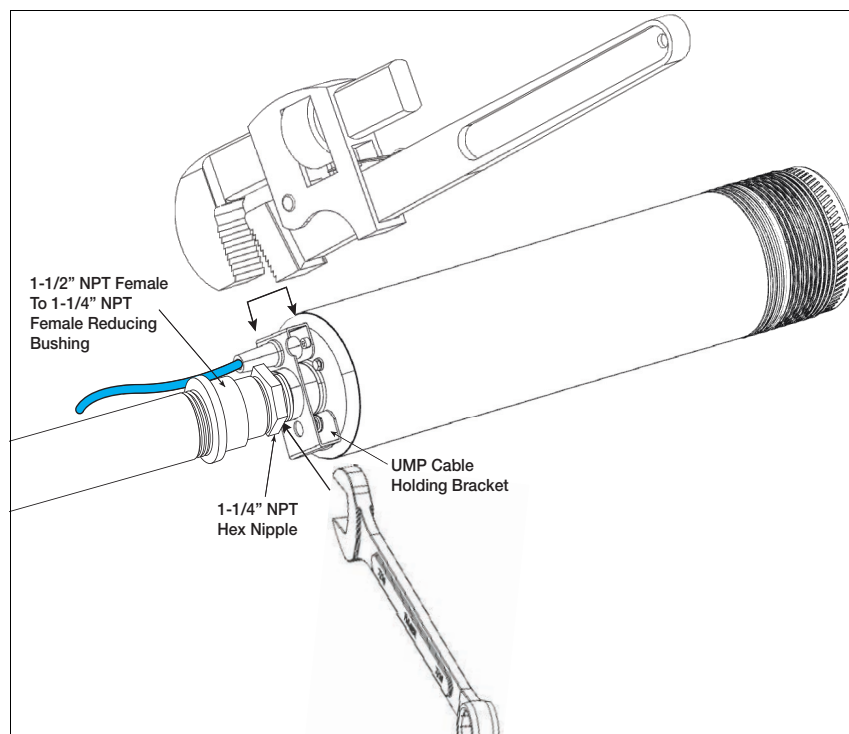


Figure 9. Attaching UMP to 1-1/4" Nipple

4. Apply Loctite 7090 primer and attach 2" NPT column pipe with Loctite 567 sealant to an ISO 22241 compliant manway cover and torque to 150 ft-lbs (203 N•m).
5. Loosen the clinch assembly on the column pipe by unscrewing the three set screws in the side of locking nut, then backing off the locking nut (see Figure 10).

NOTICE For fixed length pumps, skip to Step 8.

NOTICE A slight twisting of the UMP will loosen the seals and facilitate adjusting it to the correct length. Do not rotate piping beyond 1/4 turn.

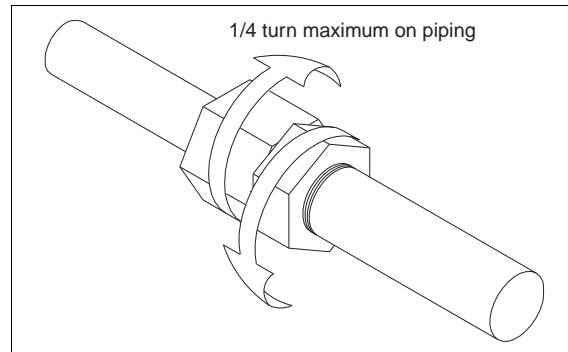


Figure 10. Loosening Locking Nut

6. Referencing Figure 11, pull the UMP end until the distance between the bottom of the bulk head and the bottom of the UMP is 3 inches (76 mm) shorter than the distance measured in Step 2.

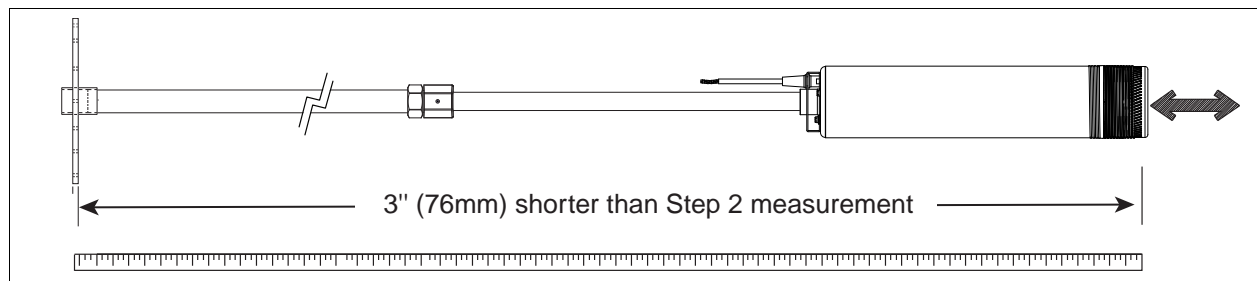


Figure 11. Adjusting Pump Length

NOTICE Take care not to damage the pigtail.

7. Tighten the column pipe locking nut and torque to 150 ft-lbs (203 N•m) minimum, then torque each set screw in the locking nut to 10 ft-lbs. (14 N•m).

NOTICE Set screw torque is critical to proper function.

8. Feed UMP cable through strain relief (supplied) and tighten cord grip to 3 ft-lbs (4 N•m) after removing excess slack in the tank. Thread sealant is not required between cord grip and bushings. Threads are 1/2" NPT.
9. Secure the UMP cable to the column pipe with tie straps. Locate the tie straps approximately as shown in Figure 12. Ensure the UMP cable is not in front of (blocking) the pressure relief nozzle (if applicable).

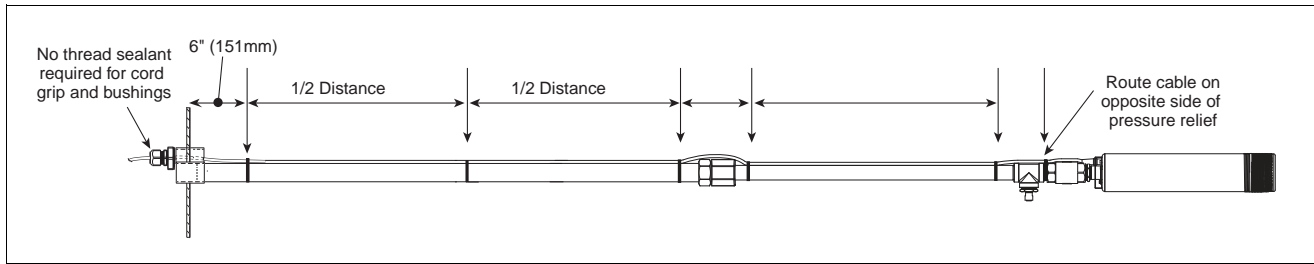


Figure 12. Tie Strap UMP Cable to Column Piping (Shown W/Fixed Pressure Relief Assembly)

10. Gently lower the assembly using manway cover.

NOTICE Do NOT use the UMP cable as a lowering or restraining device as damage can occur.

TYPICAL FIXED PRESSURE RELIEF INSTALLATION

See example installation in Figure 13.

NOTICE No additional thermal relief is needed when using fixed pressure relief when located downstream of check valve.

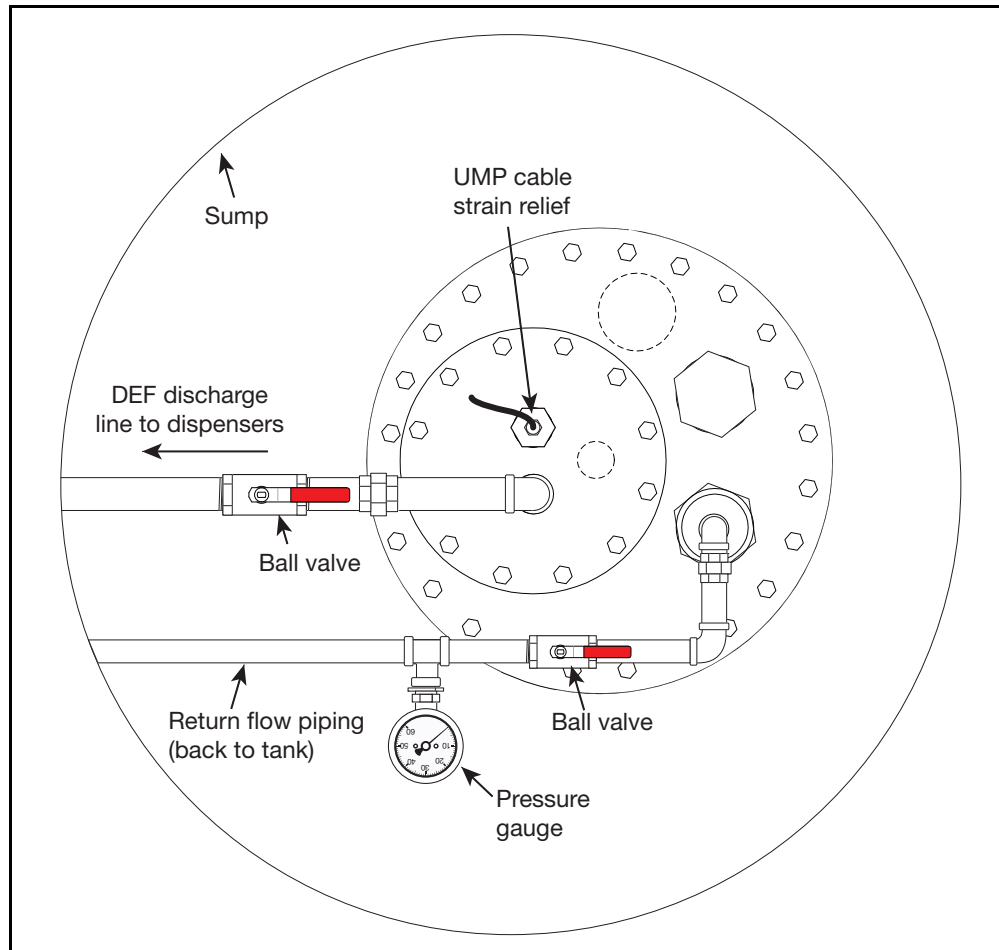


Figure 13. Fixed Pressure Relief Installation Example

NOTICE Ball valve (not supplied) should be installed to contain DEF in lines to dispenser for servicing.

NOTICE If DEF recirculation option is selected, return flow, pressure gauge and ball valve are required.

1. Install optional pressure gage if desired.

NOTICE Carefully apply sealant to port to avoid contamination of gauge.

ADJUSTABLE PRESSURE RELIEF OPTION

If the fixed pressure relief kits are not ordered it is mandatory to install the adjustable pressure relief valve in the sump. This valve is a 1" NPT fitting and will need to follow the same guidelines for material compatibility and sealant. During installation, the technician will need to plumb this valve's bypass back into the UST. A check valve is recommended downstream of the optional adjustable pressure relief valve to maintain line pressure to dispensers. See example installation in Figure 14.

NOTICE To allow for thermal expansion, ensure line pressure relief is supplied/installed downstream of the check valve.

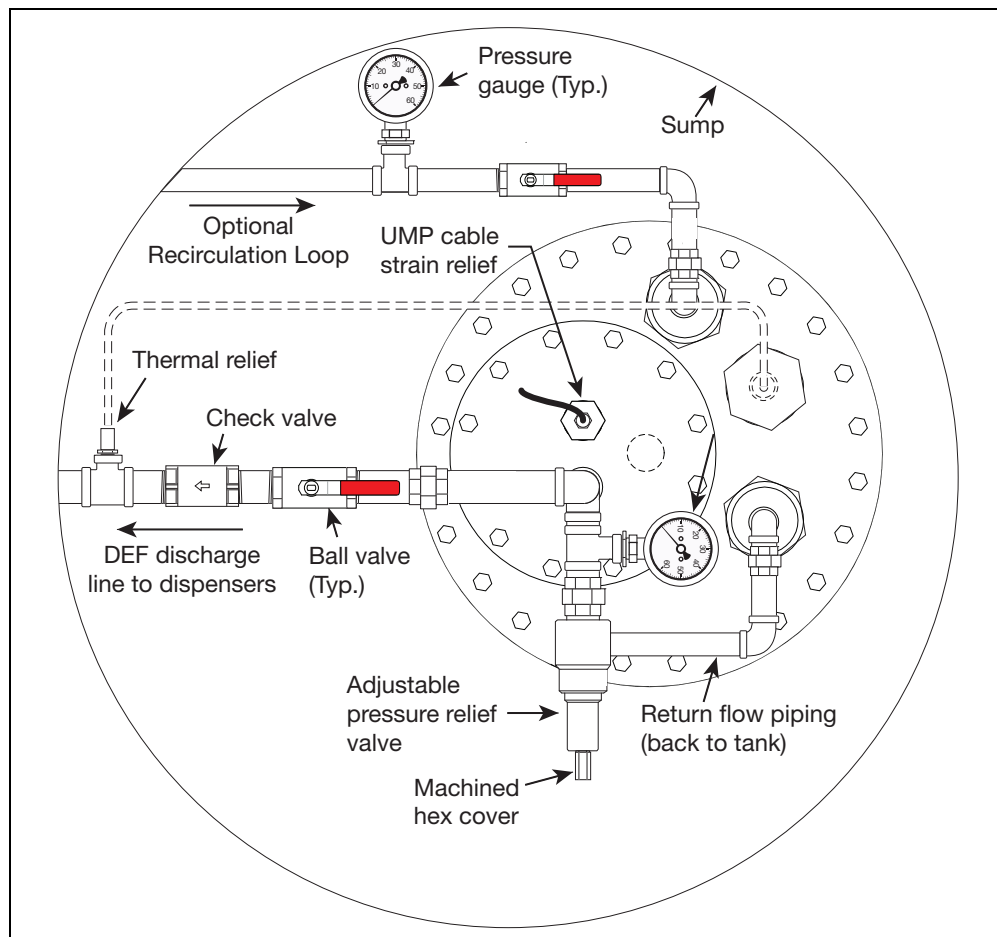


Figure 14. Adjustable Pressure Relief Installation Example

NOTICE When routing the return to the tank it may be required to extend the return line near the bottom of the tank to avoid any potential disruptions to the probe's accuracy.

NOTICE Return flow from adjustable relief valve should be separate from the recirculation loop, if present.

The adjustable pressure relief valve can be used in conjunction with the optional pressure gauge to set to system pressure.

1. Install optional pressure gauge if desired.

NOTICE Carefully apply sealant to the port to avoid contamination of the gauge.

2. Remove the machined 1-1/8" hex cover from the end of the Adjustable Pressure Relief valve.
3. Adjust the set screw with the 1/4" hex key per Figure 15.

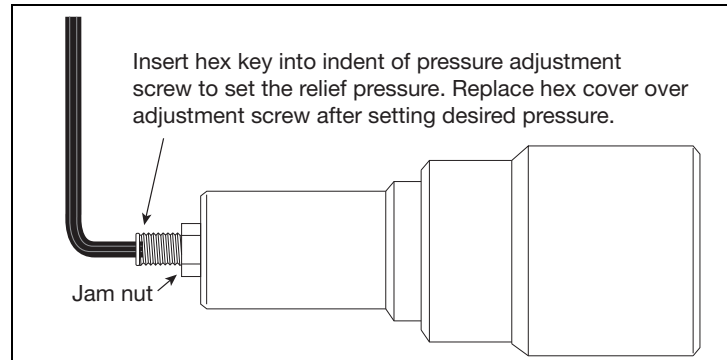


Figure 15. Setting Optional Adjustable Relief Valve Pressure

4. Turning screw clockwise increases pressure up to 50 psi (345 kPa) (maximum).
5. Determine desired flow through nozzles.
6. Adjust set screw to set flow through nozzles.
7. Lock down hex jam nut.
8. Replace hex cover and torque to 30 ft-lbs. (41 N•m).

NOTICE Do not modify valve to allow for higher pressure! Failure to install the fixed pressure relief valve or the adjustable pressure relief valve can lead to system overpressure and could possibly damage the dispenser and DEF system.

Electrical Connections

⚠ WARNING The DEF pump is NOT designed for use in flammable liquids, or to be installed in locations classified as hazardous per NFPA 70 (NEC)!

⚠ WARNING   Disconnect, lock out, and tag power at the panel before servicing the pump.

In DEF fueling sites that are being upgraded to include a Control Box with capacitor, it is imperative to verify the wiring connections between the pump and the Control Box. Energizing a pump with incorrect connections can cause the thermal overload in the pump to trip open, resulting in a very lengthy wait for the thermal protector to reset.

Resistance tests are always made with the power off and the wires disconnected from the Control Box.

Set up the electrical meter to the ohms (Ω) function. Measure the resistance between each pair of wires that run out to the pump. Consider the three readings as "low", "medium" and "high". Ignore actual color of wires.

1. Locate the two wires that give the highest ohmmeter reading. Mark the remaining wire "BLACK".
2. Mark the wire "GREY" that in combination with the "BLACK" wire (as determined in Step 1.) gives the lowest reading.
3. Mark the remaining wire "BROWN".
4. Connect the "GREY" wire to the "M1" terminal of the Control Box.
5. Connect the "BLACK" wire to the "M2" terminal of the Control Box.

6. Connect the "BROWN" wire to the "M3" terminal of the Control Box.

SIMPLIFIED WIRING DIAGRAMS

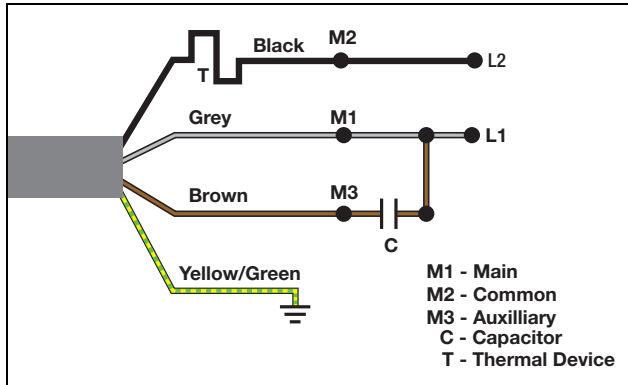


Figure 16. Single Phase Wiring Diagram

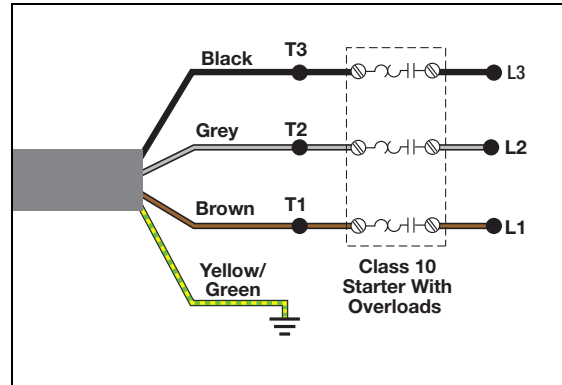


Figure 17. Three Phase Wiring Diagram

Wiring Diagrams

SINGLE TANK INSTALLATIONS

Figure 18 through Figure 27 contain example wiring diagrams for various single tank/submersible DEF pump installations.

MANIFOLDED TANK INSTALLATIONS

When greater flow rates are needed, two pumps may be installed in the same piping system by means of a manifold. Tandem systems offer backup support so operations can continue if one pump stops working.

Figure 28 through Figure 31 contain example wiring diagrams for various manifolded tanks/submersible DEF pump installations featuring Isotrol Control Boxes.

ISOTROL CONTROL BOX WIRING PRECAUTIONS (Apply to Figure 24 through Figure 31):

⚠ WARNING



The Isotrol Control Box is intended to provide electrical isolation between the dispenser pump enable (Hook) signal and the submersible turbine pump (STP) control relay. Other energized sources of power can still exist within the dispenser even with this device. The neutral connection to the N terminal of TB1 and N terminal of TB2 must be from the service panel and be a permanently connected, unswitched connection.

- The N connection on TB1 and the eight N connections on TB2 may be spliced to a common neutral wire from the service panel described above.
- Make only one 'wire' connection on each N terminal on TB2.

NOTICE

The phase of L1 (TB1) must match the phase of the power supplying the ATG device to prevent cross phasing which may damage the input on some ATG equipment.

GENERAL WIRING PRECAUTIONS

- Wiring must be rated 90°C minimum.
- Make ground connection in accordance with local codes.

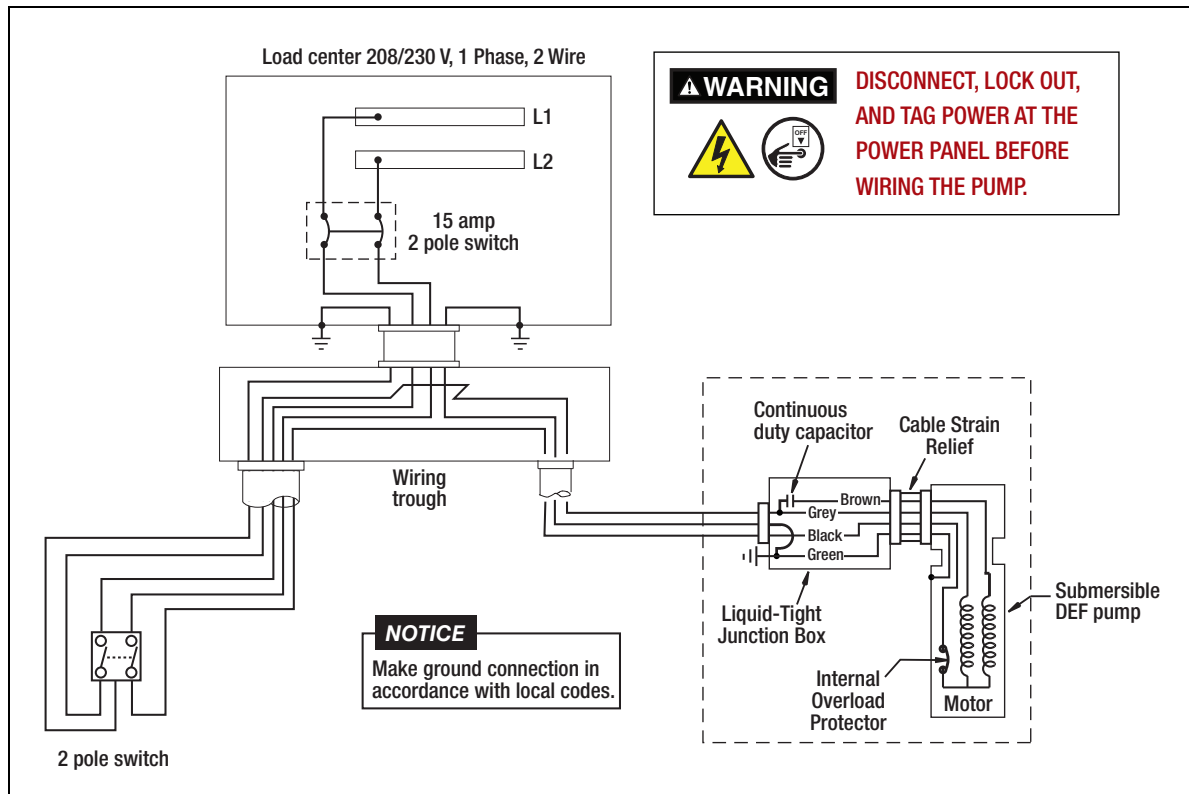


Figure 18. Suggested 208/230 V Wiring Diagram without Optional Control Box

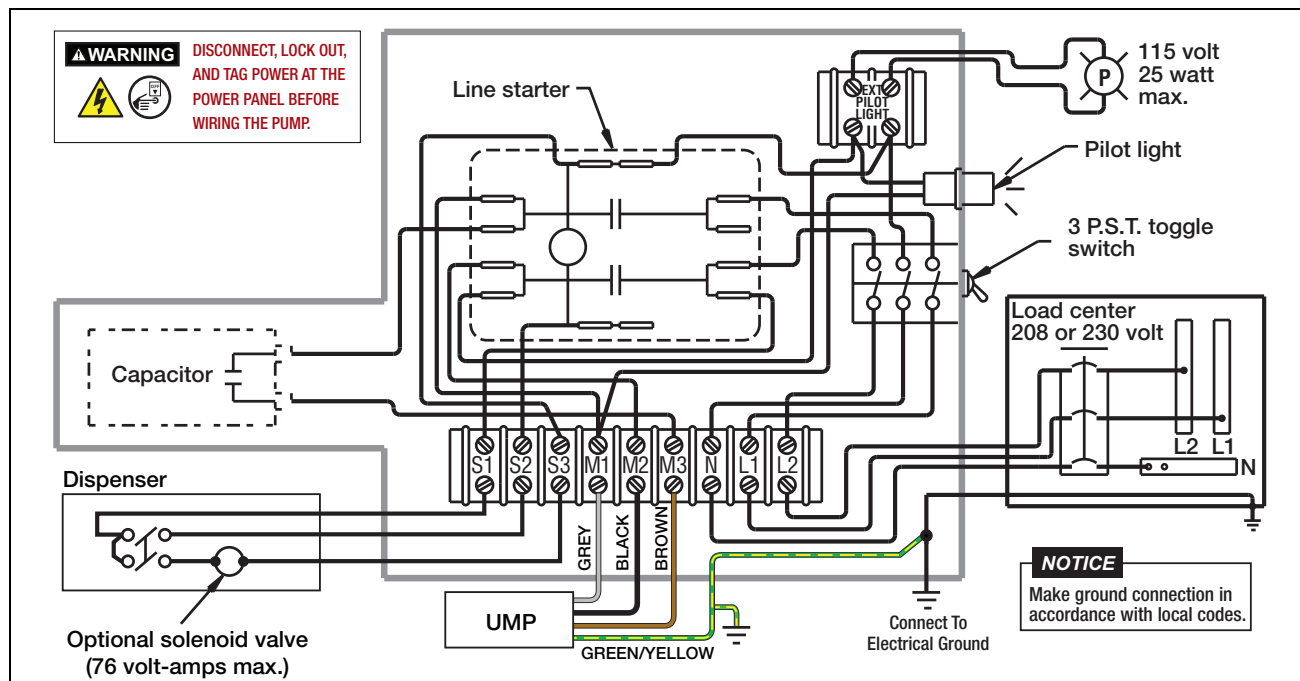


Figure 19. 240 Vac Remote Control Box with 120 Vac Coil and Capacitor (Models 880-045-5 or 410861-001)

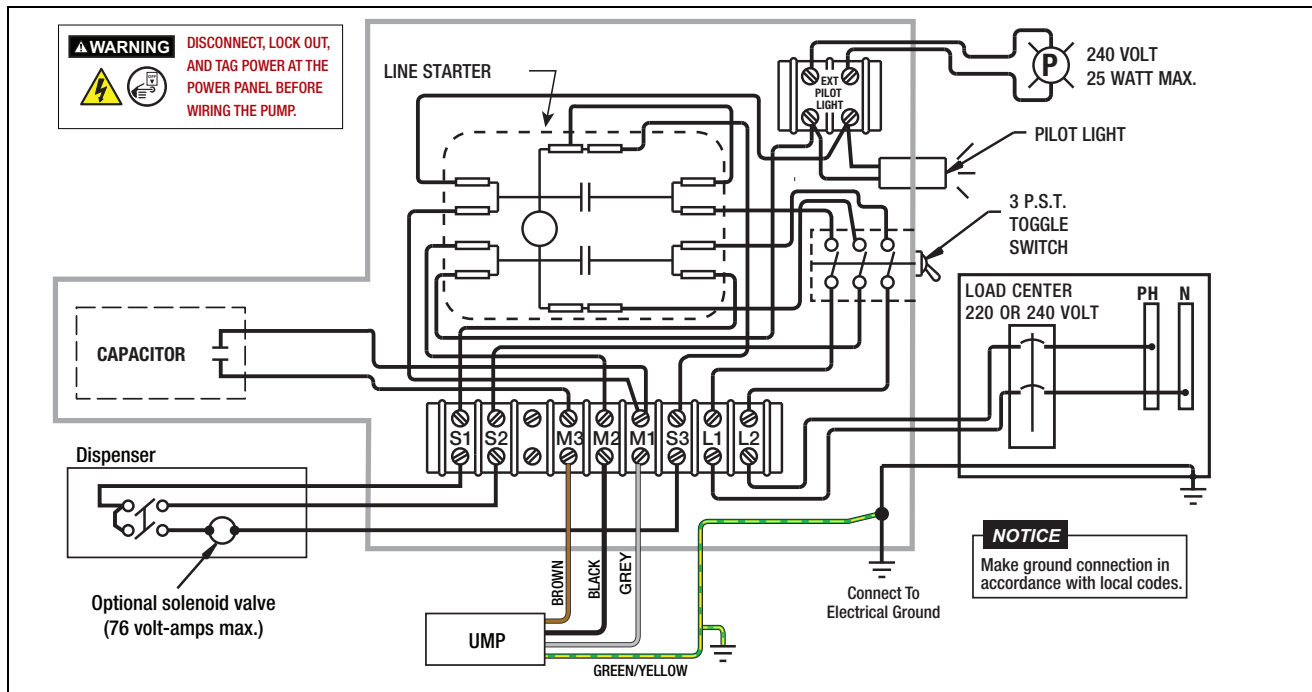


Figure 20. 240 Vac Remote Control Box with 240 Vac Coil and Capacitor (Models 410860-001 or 410860-003)

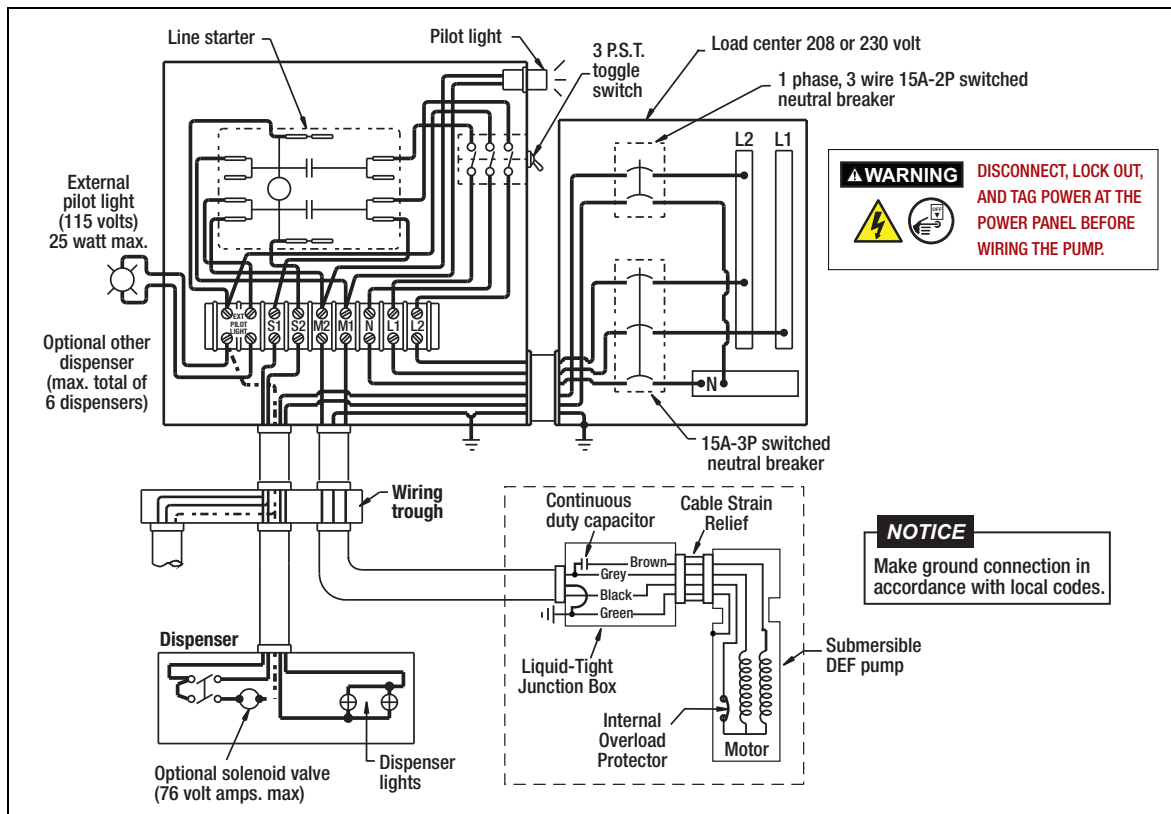


Figure 21. 230 Vac Remote Control Box with 110Vac Coil - Model 880-041-5

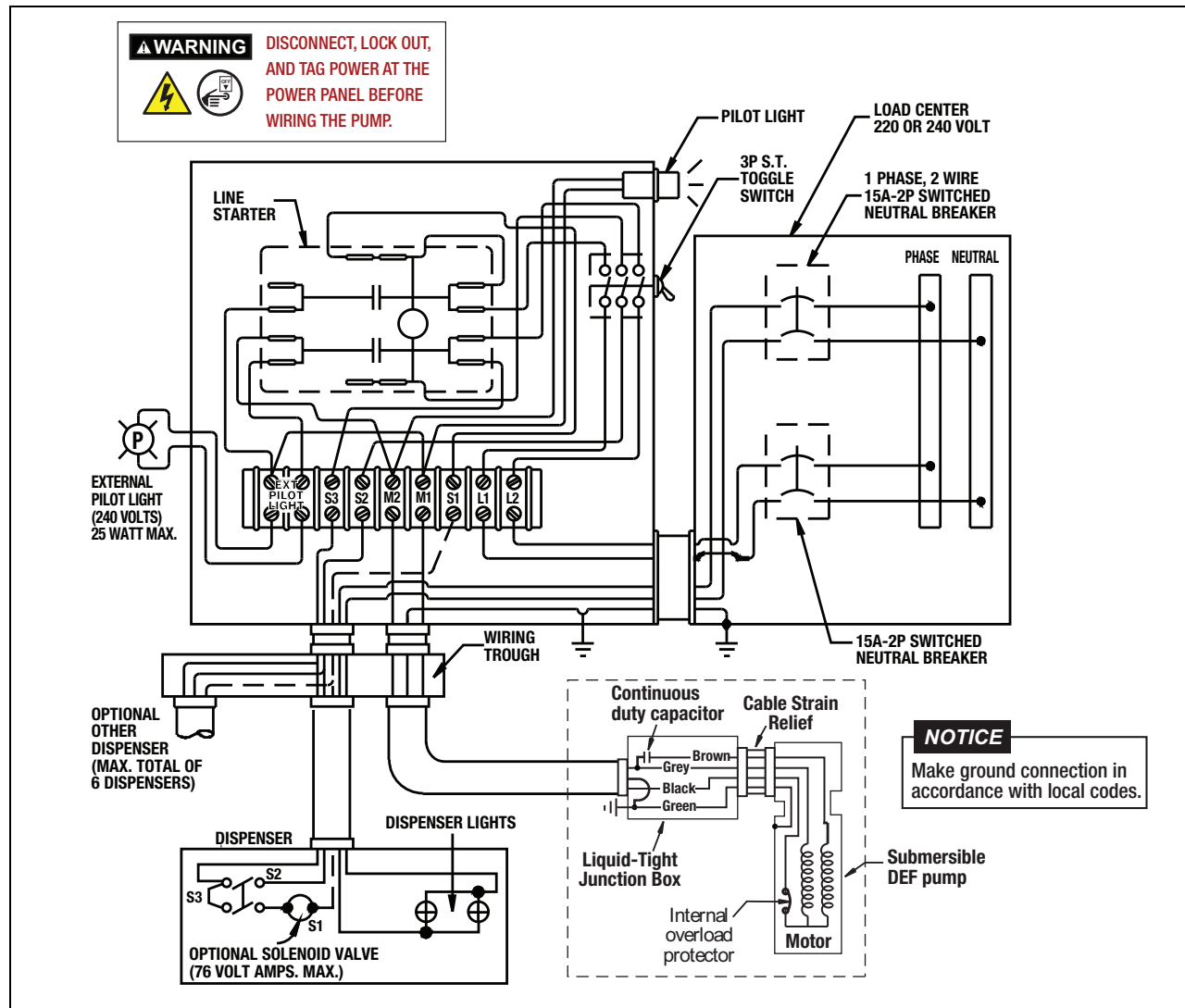


Figure 22. 240 Vac Remote Control Box with 240 Vac Coil - Model 880-042-5

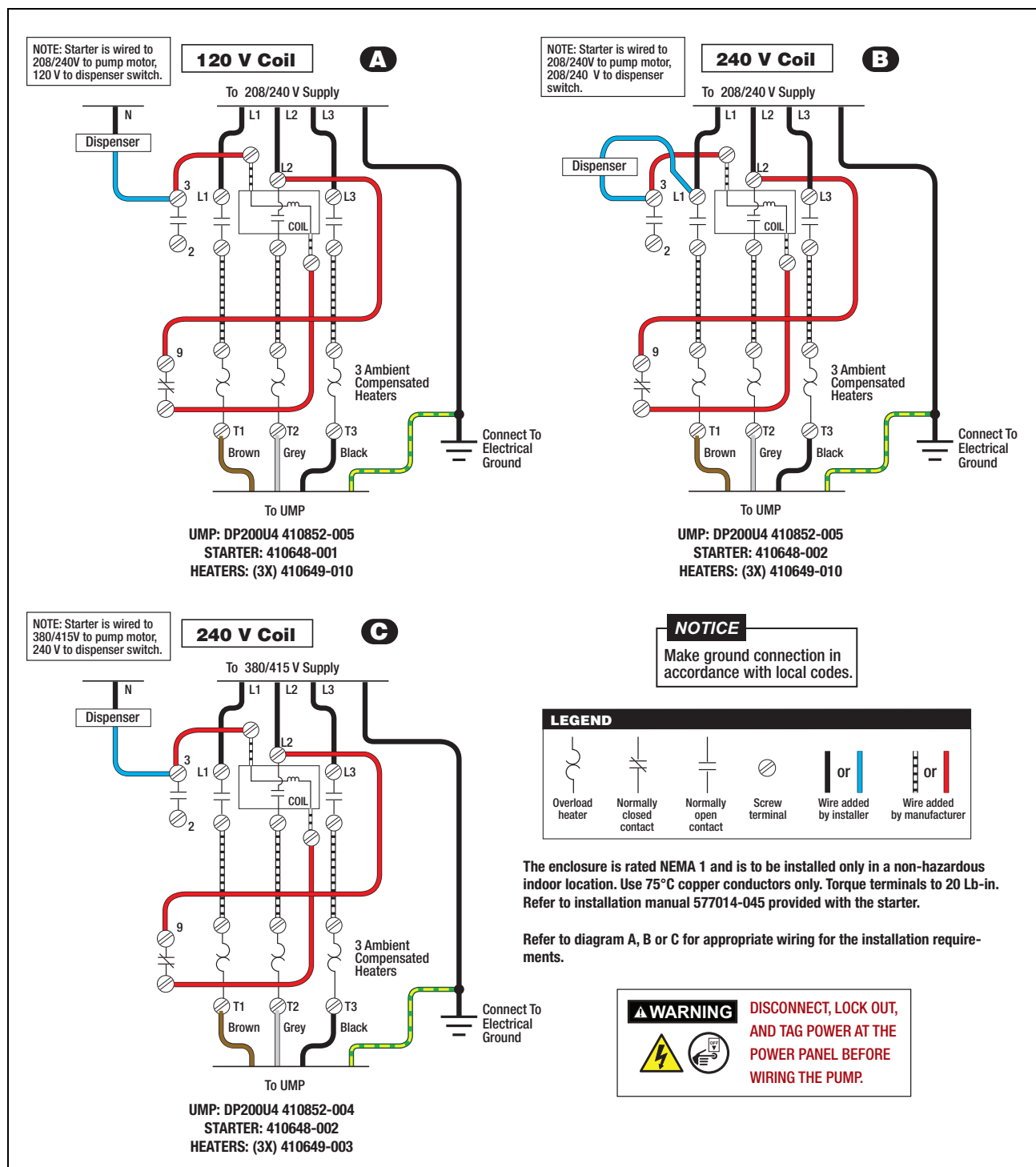


Figure 23. Three Phase Remote Control Box (Starter)

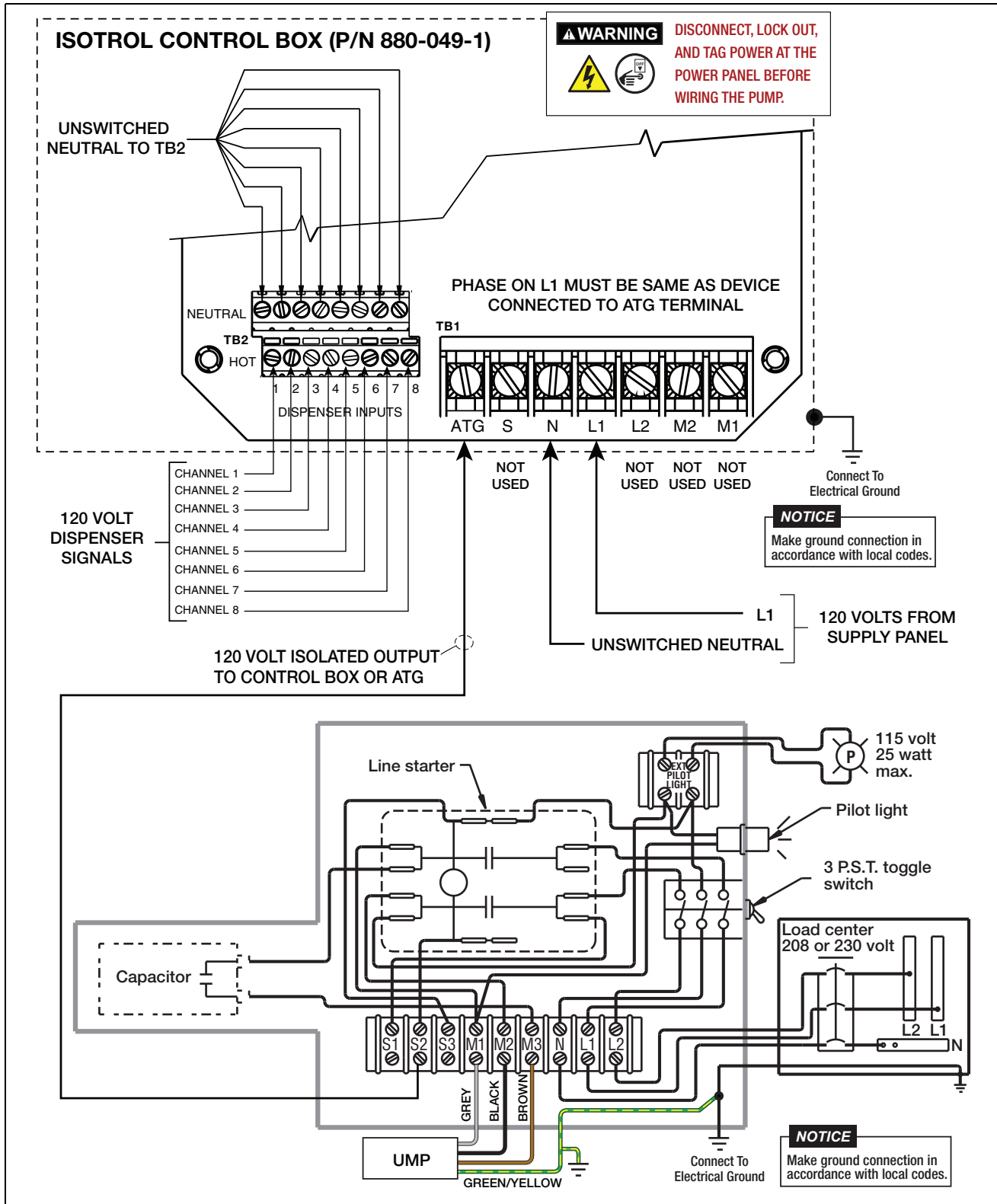


Figure 24. Isotrol to Remote Control Box with 120 Vac Coil and Capacitor (Models 880-045-5 or 410861-001)

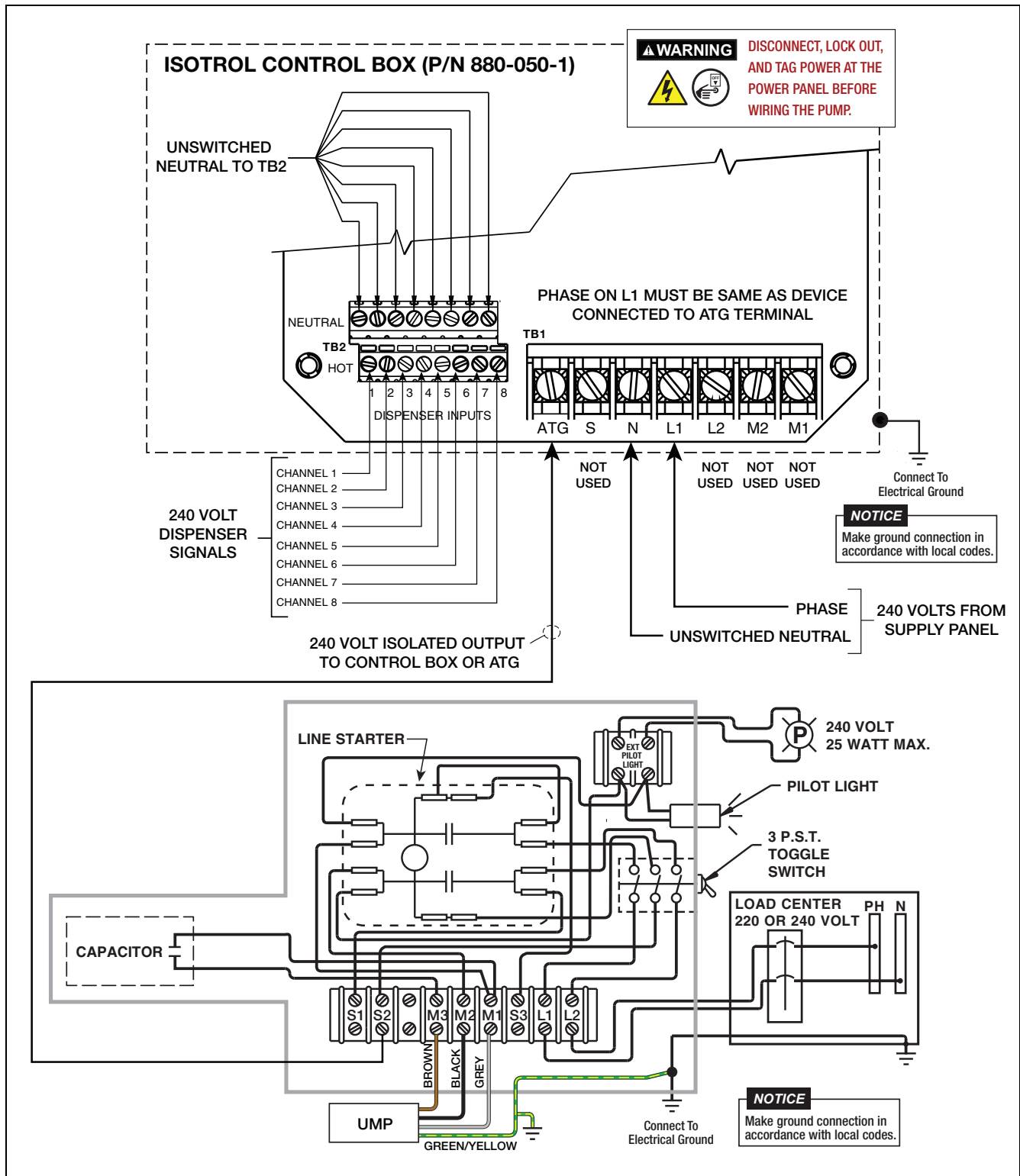


Figure 25. Isotrol to Remote Control Box with 240 Vac Coil and Capacitor (Models 410860-001 or 410860-003)

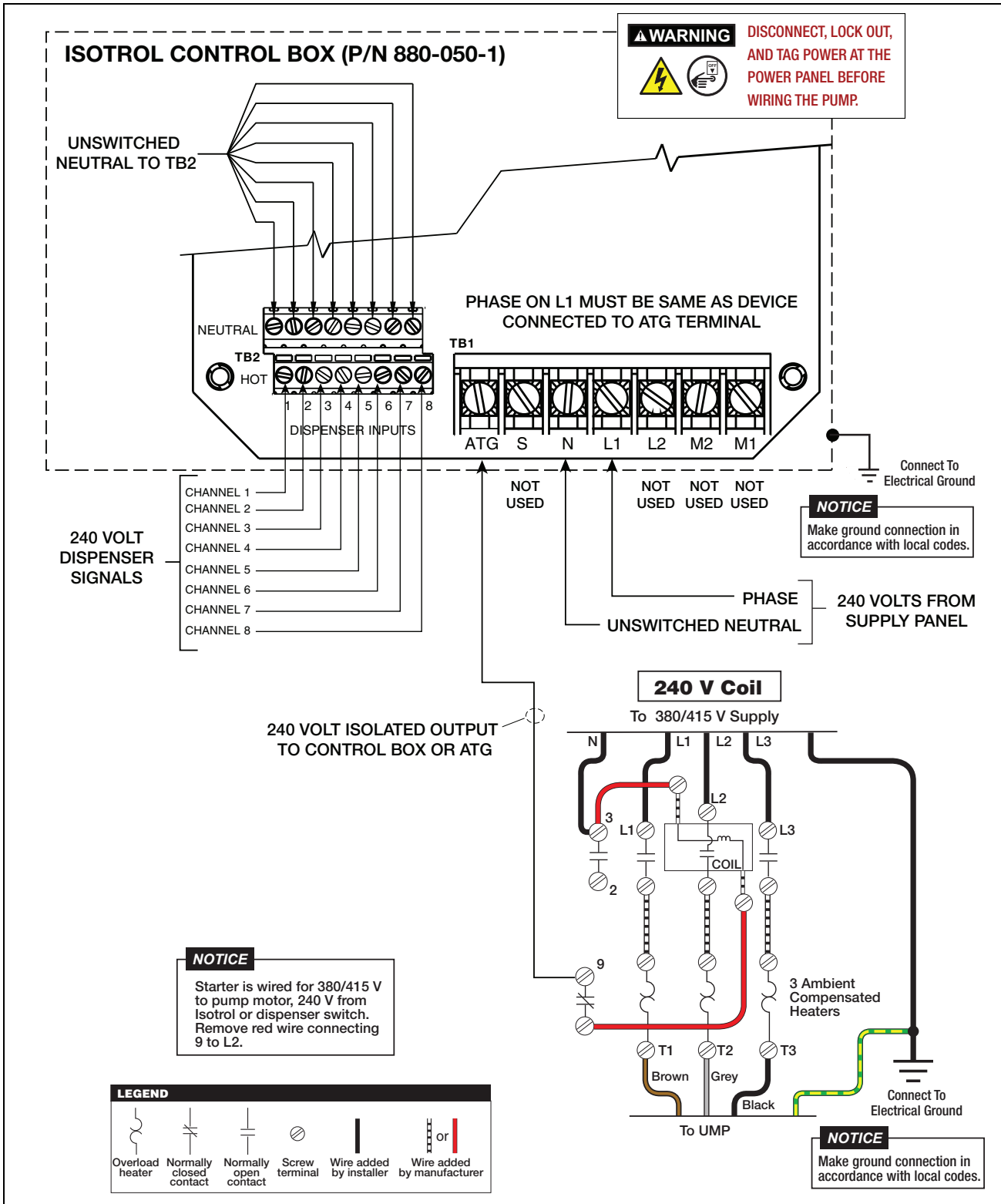


Figure 26. Isotrol to 400 Vac Remote Control Box (Starter) with 240 Vac Coil and Three Heaters (Model 410648-002 Starter and 3x 410649-003 Heaters)

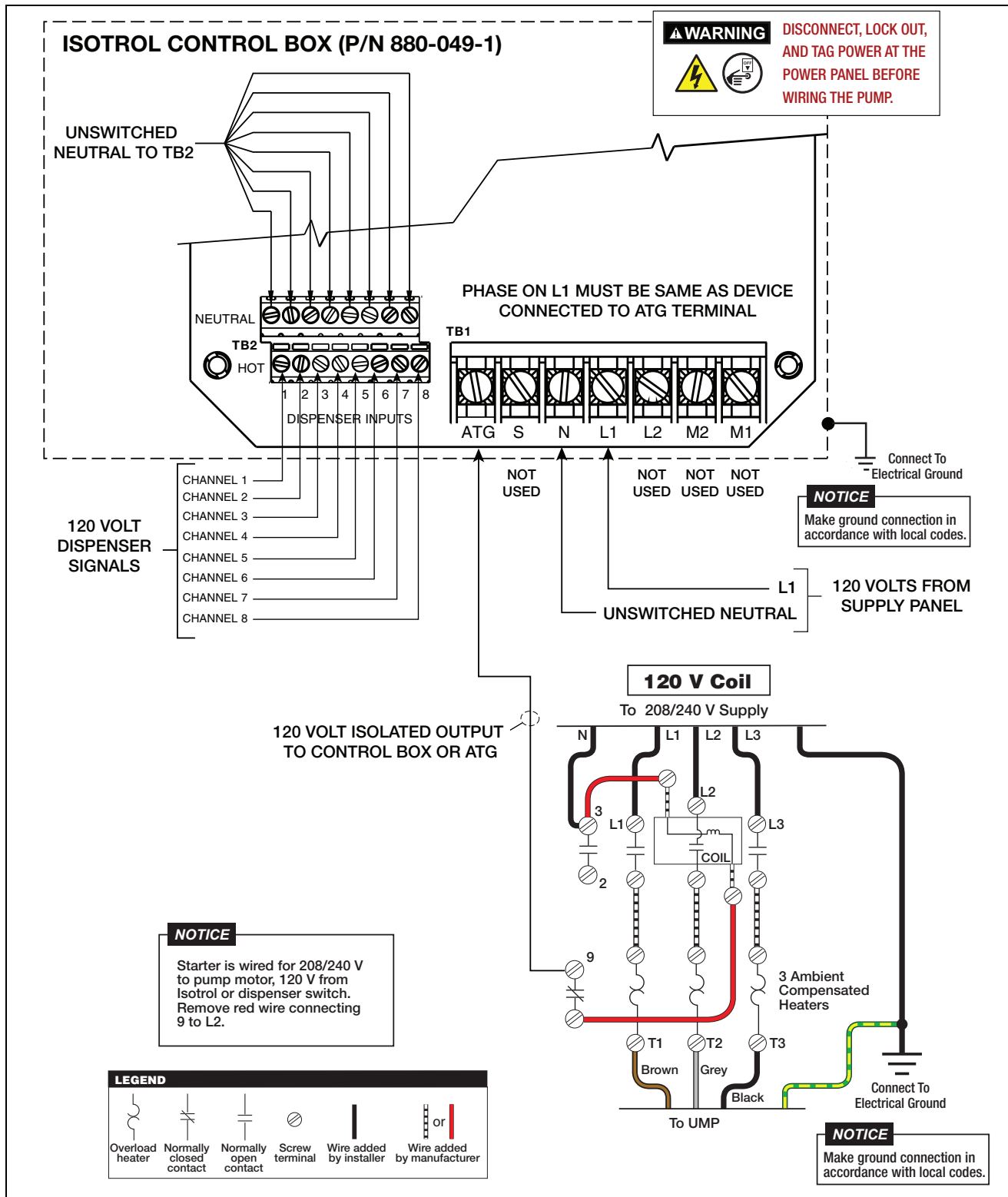


Figure 27. Isotrol to 240 Vac Remote Control Box (Starter) with 120 Vac Coil and Three Heaters (Model 410648-001 Starter and 3x 410649-010 Heaters)

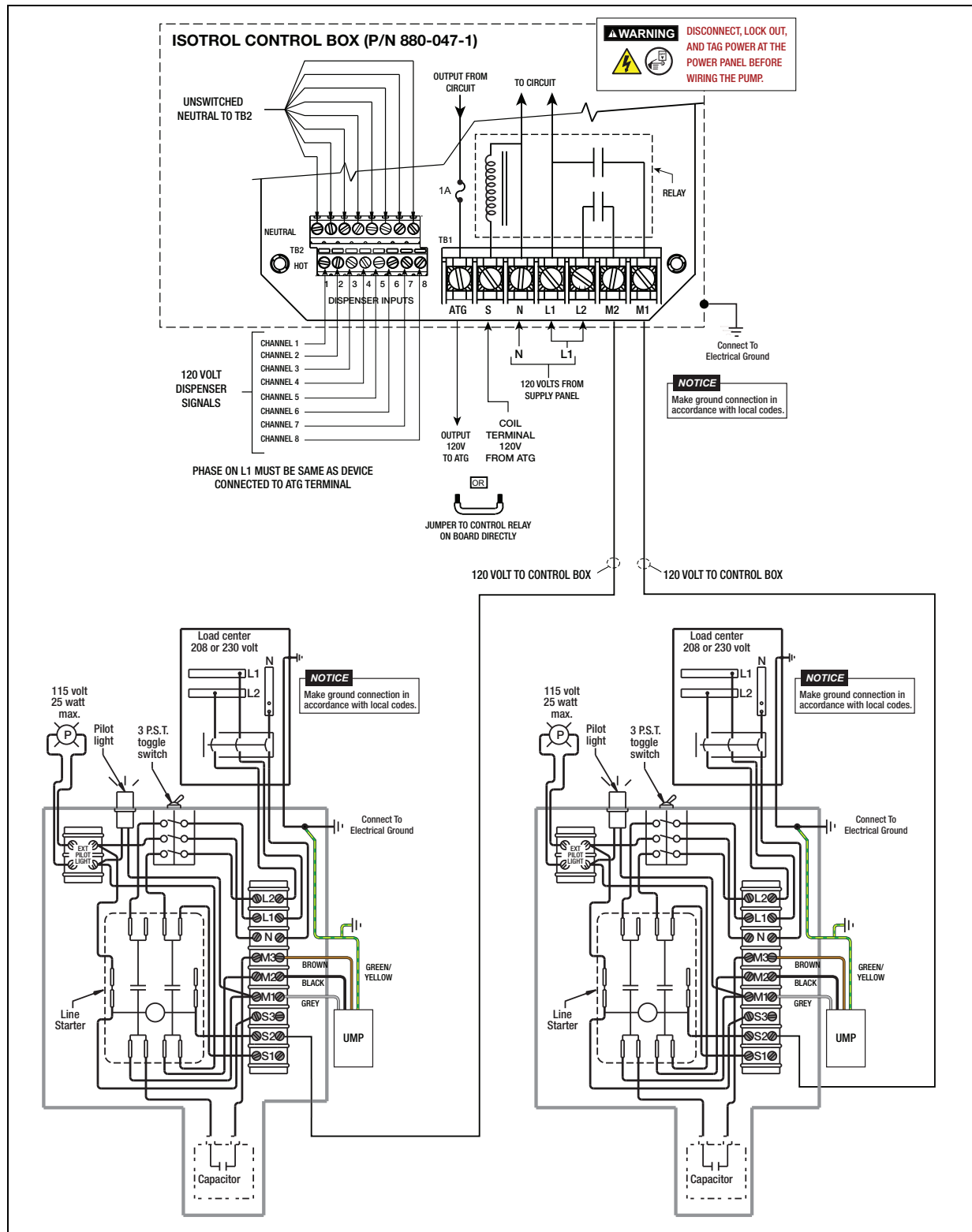


Figure 28. Isotrol with Relay to Manifolded 240 Vac Remote Control Boxes with 120 Vac Coil and Capacitor (Models 880-045-5 or 410861-001)

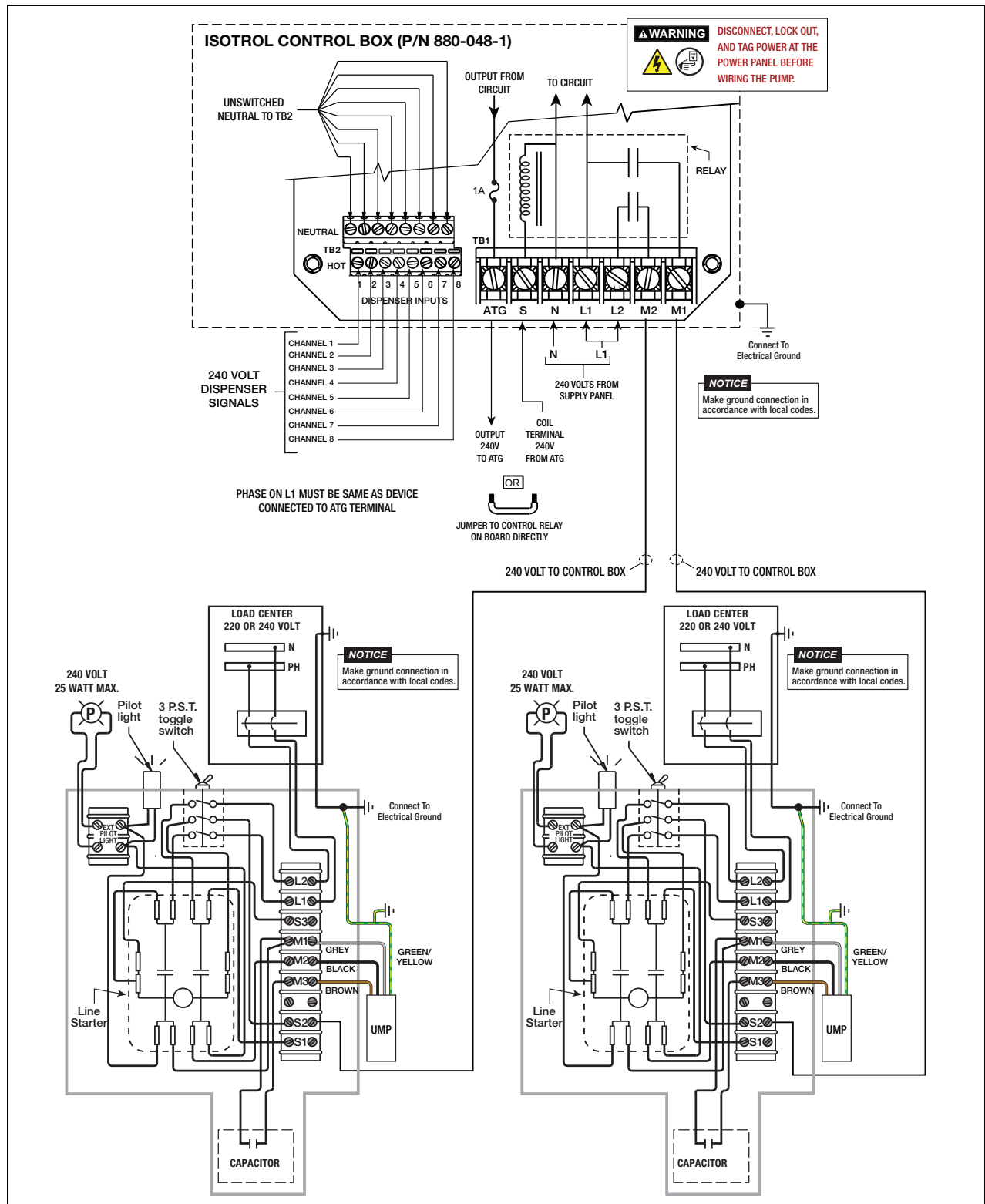


Figure 29. Isotrol with Relay to Manifolded 240 Vac Remote Control Boxes with 240 Vac Coil and Capacitor (Models 410860-001 or 410860-003)

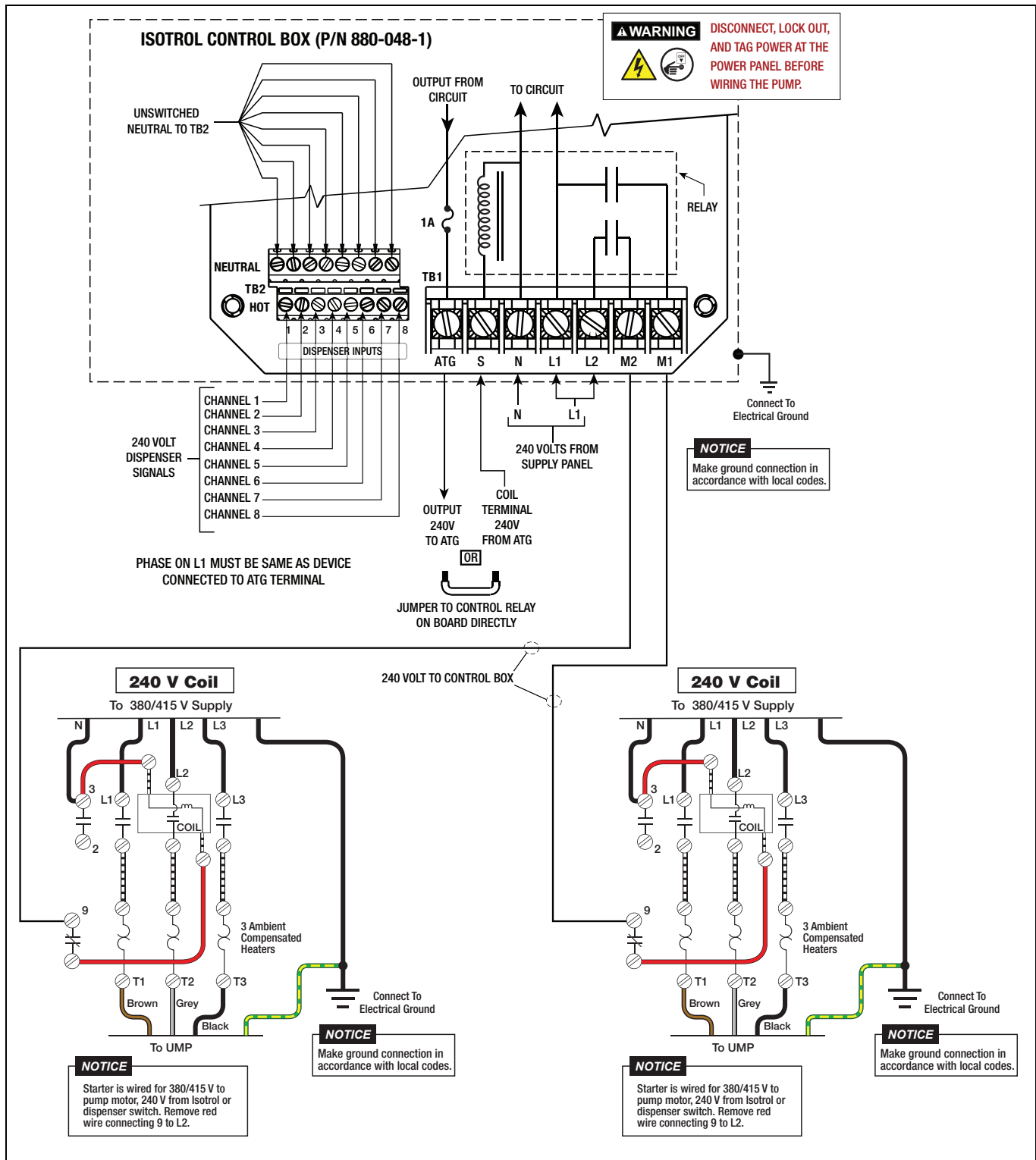


Figure 30. Isotrol with Relay to Manifolded 400 Vac Remote Control Boxes (Starters) with 240 Vac Coil and Three Heaters (Model 410648-002 Starter and 3x 410649-003 Heaters)

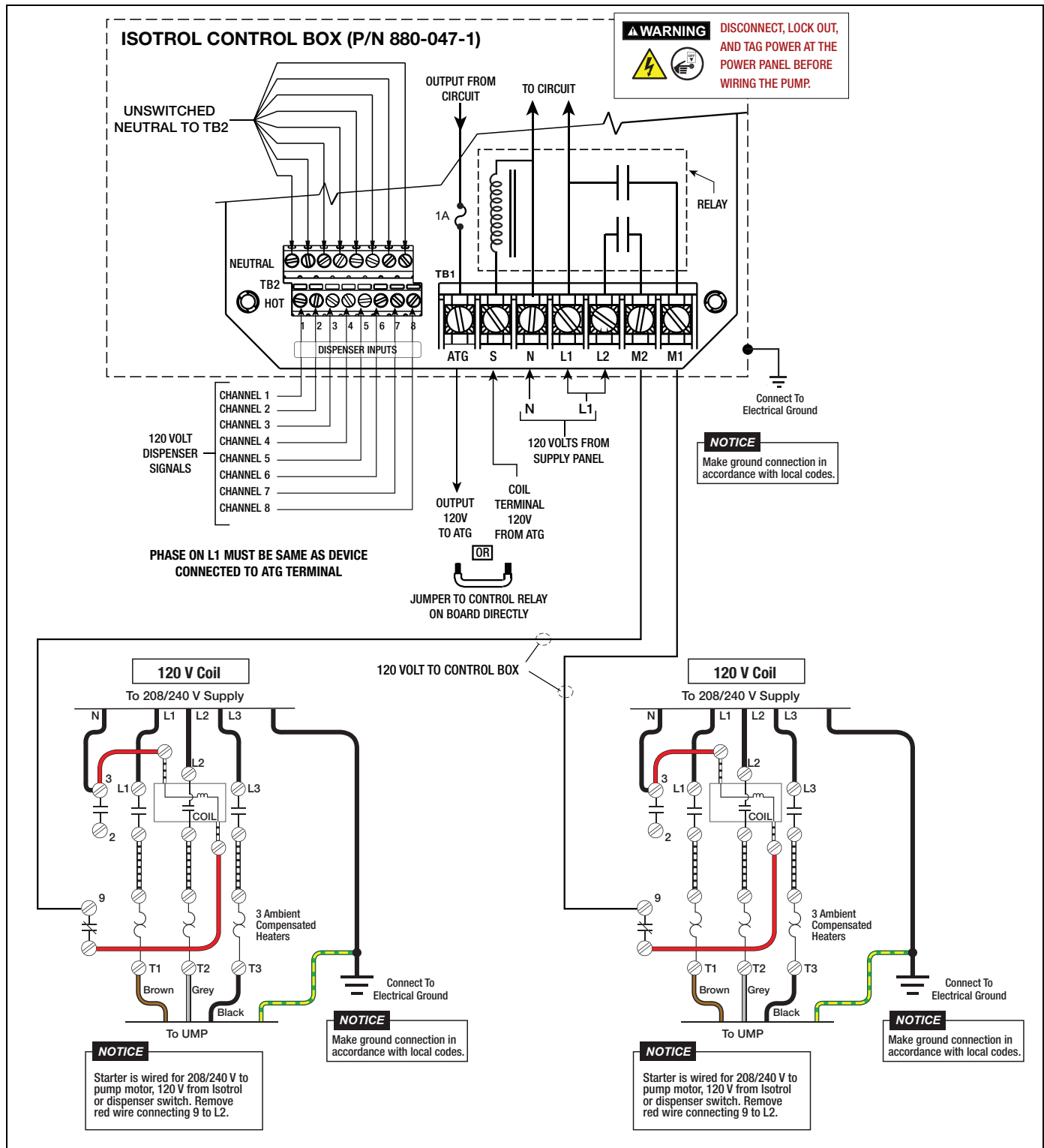


Figure 31. Isotrol with Relay to Manifolded 208/240 Vac Remote Control Boxes (Starters) with 120 Vac Coil and Three Heaters (Model 410648-001 Starter and 3x 410649-010 Heaters)

Operational Precautions

- Pump must be completely submerged in DEF (primed) prior for initial install to avoid a dry start condition.
- Do not allow pump to run dry or damage will occur.
- DEF freezes at approximately 12°F (-11°C).
- Bypass/relief valves (capable of minimum 5 gpm [19 lpm]) are needed for proper pump cooling when no product is flowing through dispensers. These valves are provided by Veeder-Root as part of the plumbing system.
- Do not allow DEF to freeze in plumbing, pump or in any fittings or damage may occur.
- Only skilled contractors may install the submersible DEF pump, accessories and controls.

Initial Start Up of Pump

1. If a ball valve is installed down line from the pump, close it.
2. Turn the pump on and let it run for about 2 minutes to verify or set discharge pressure (50 psi maximum).
3. If applicable, open the ball valve down line from the pump.
4. Purge system of air by pumping at least 15 gallons (57 liters) through each dispenser. Begin with the dispenser furthest from the pump and work back toward the pump.
5. Turn off pump.
6. Pump start-up is now complete.

NOTICE For Three Phase Pumps Only!

Where it is not convenient to predetermine the power supply phase rotation, proper rotation can be determined by pump performance. Pump head pressure and capacity will be considerably less than rated when rotating backwards.

Connect the pump leads to terminal T1, T2, and T3 of the magnetic starter observing color code shown in Figure 23, Figure 26, Figure 27, Figure 30 and Figure 31. With ample product in the tank and the system purged of air, start the pump and make a pressure gauge reading of the system pressure with the ball valve closed; or, open valve and calculate pumping rate.

Next, reverse power leads at L1 and L2. Repeat either pressure or capacity tests, as described above. If results are higher than the first test, the rotation of the second test is correct. If the second test gives lower performance than the first, reconnect the power leads to L1 and L2 (as under test 1) for correct rotation.

Where the power supply has been properly marked L1, L2, and L3 in accordance with accepted phase rotation standards, it is possible to predetermine the proper rotation of these units. The pump power leads are color coded brown, grey and black, if connected through the magnetic starter to L1, L2, and L3 respectively, the UMP will rotate in the correct direction. It is recommended, however, that the performance tests always be made whether or not the power supply has been properly 'phased out'.

Maintenance

- No maintenance of system is required. Service only as needed utilizing the included troubleshooting guide.
- UMP contains no internal serviceable parts.
- Check valves and pressure relief have no internal serviceable parts.
- All replacement parts are to be serviced by a qualified contractor.

Troubleshooting

Table 2. Submersible DEF Pump System Troubleshooting

Trouble	Cause	Corrective Action
Pump stops and starts	a. Incorrect voltage or voltage drop. b. Open circuit or incorrect pump wiring. c. Motor protection trips out.	a. Check the voltage during starting. If the wiring cross-section is too small, the voltage drop may be such that the motor cannot function normally. Installation of a voltage boost transformer may be necessary. b. Measure the resistance between pump wires. Check the pump cable and all wiring to the pump and control boxes is per the manuals. c. Confirm pump has bypass flow per manual requirements. For 3-phase pumps, verify the heaters in the starter box are the correct size. For single phase pumps, check capacitor for opens or shorts.
No product flow	a. Pump is not running. b. Controller not powered. c. Restriction in piping system. d. Insufficient DEF in tank. e. Frozen DEF in piping system. f. Wrong direction of rotation (single phase).	a. See above. b. Check that the circuit breaker and lockout switch on control box are not in the Off or tripped position. c. Confirm flow direction of check valve is correct. Confirm ball valves and plumbing in sump is correct. d. Check fluid level in tank, Confirm minimum of 6 inches (150mm) above the pump strainer/inlet. e. DEF freezes at +12°F (-11°C). Installation of pipe heaters or a DEF recirculation system may be necessary. f. Interchange the two pump wires to the capacitor.
Insufficient product flow	a. Bypass valve is set below desired pressure. b. Strainer clogged. c. Wrong direction of rotation (3 Phase). d. Fixed pressure relief is stuck open. e. Partially frozen DEF in piping system.	a. Set bypass pressure per requirements stated in manual. b. Confirm pump strainer is not clogged. c. Interchange two pump wires at box. d. Confirm fixed pressure relief valve is closed and sealed before setting pressure (45 psi [310 kPa]). e. Continue to dispense DEF to thaw out piping.
Slow to discharge DEF	a. Confirm system is holding pressure.	a. Check pressure holding of system with pump off and assure check valve does not have any contamination.

Table 3. Pressure Expectations By Pressure Relief Type

UMP	Pump Off		Pump On	
	Fixed	Adjustable	Fixed	Adjustable
3/4 HP	28 psi (193.1 kPa)	0	45 psi 310.3 kPa)	As Set
2 HP				

NOTICE Pump-Off pressure expectations for adjustable pressure relief type are only 0 psi upstream of check valve. Downstream pressure is trapped by check valve.

General Repair

⚠ WARNING   **Disconnect, lock out, and tag power at the panel before servicing the pump.**

If a system has any issues found during the troubleshooting process follow the steps below:

1. Remove pressure from system. Ensure no DEF fluid is in the lines in the sump.
2. Carefully disconnect all plumbing, gauges and any pressure relief units in manway as is necessary to allow removal of the manway cover.
3. Disconnect electrical connections to UMP cable.
4. Loosen and remove manway cover fasteners from tank.
5. Carefully lift bulk head cover from tank with column pipe and UMP connected.

NOTICE **Approximate weight of the submersible DEF pump/piping assembly is 75 pounds (34 kg).**

6. Determine clean, safe workspace and carefully set down motor assembly/plumbing and manway cover.

NOTICE **All surfaces in direct contact with DEF shall be free of foreign matter (fuel, oil, grease, detergent, dust and any other substance). See “Cleanliness Of Surfaces In Contact With DEF” on page 5.**

7. Remove device that is being replaced (UMP, fixed pressure relief or check valve) from system.

NOTICE **Ensure check valve’s flow arrow is correctly oriented (towards manway cover) during its replacement.**

8. Clean all fittings and reapply thread sealant (Loctite 567 recommended).
9. Replace cord if damaged with kit 410886-001. Remove the two 5/32” hex socket head screws and the 5/16” hex bolt holding the UMP cable/bracket assembly and replace (see Figure 32). Torque to fasteners to 10 ft-lbs. (14 N•m).



Figure 32. UMP Cable Holding Bracket Retaining Screws

10. See recommended torque settings for fittings in Table 4.

Table 4. Recommended Torque Settings

Item	Torque
All 1-1/4" NPT Fittings	125 ft-lbs (170 N•m)
2" NPT Column Pipe To Manway Cover Nipple	150 ft- lbs (203 N•m)
Column Pipe Locking (Clinch) Nut	150 ft- lbs (203 N•m)
Column Pipe Locking (Clinch) Nut Set Screw	10 ft-lbs (14 N•m)
UMP to 1-1/4" Nipple	125 ft- lbs (170 N•m)
1/2" Small Fixed Pressure Relief	65 ft-lbs (88 N•m)
1-1/4" Large Fixed Pressure Relief	125 ft- lbs (170 N•m)
1" NPT Adjustable Pressure Relief Valve	100 ft- lbs (136 N•m)
Adjustable Pressure Relief Valve Hex Cover	30 ft-lbs (41 N•m)
Cable Cord Grip	3 ft- lbs (4 N•m)
UMP Cable Holding Bracket Fasteners	10 ft-lbs (14 N•m)

Parts Lists

Submersible Pump And Accessories

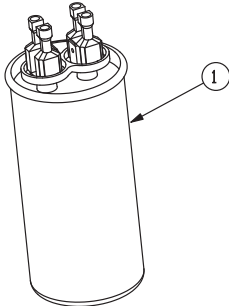
Table 5. Replacement Parts

Item	Description	P/N
UMP	DP75U1	410852-001
	DP75U3	410852-002
	DP200U1	410852-003
	DP200U17	410852-004
	DP200U4	410852-005
Pressure Relief Kit	Adjustable Pressure Relief Kit	410881-001
Replacement Cable Kit	Cable Repair Kit	410886-001
Miscellaneous Accessories	3/4 HP Relief Valve Kit, 1/2" NPT	410882-001
	2 HP Relief Valve Kit, 1-1/4" NPT	410883-001
	Check valve kit	410875-001
	1-1/4" Adapter Kit, NPT To BSP	410878-001
	2" Adapter Kit, NPT To BSP	410879-001
	Pressure Gauge Kit	410880-001

Capacitor Kits

Table 6 lists the capacitor kits parts list.

Table 6. Capacitor Kits*

Item (ref. Figure 33)	Part Number	Description	Qty.	Figure 33. Capacitor Kits
1	410164-001	17.5 μ F Capacitor	1	
1	410164-002	25 μ F Capacitor	1	
1	410164-003	40 μ F Capacitor	1	
<i>*All capacitors contain internal bleed-down resistor and are rated 440 volts.</i>				

Control Boxes

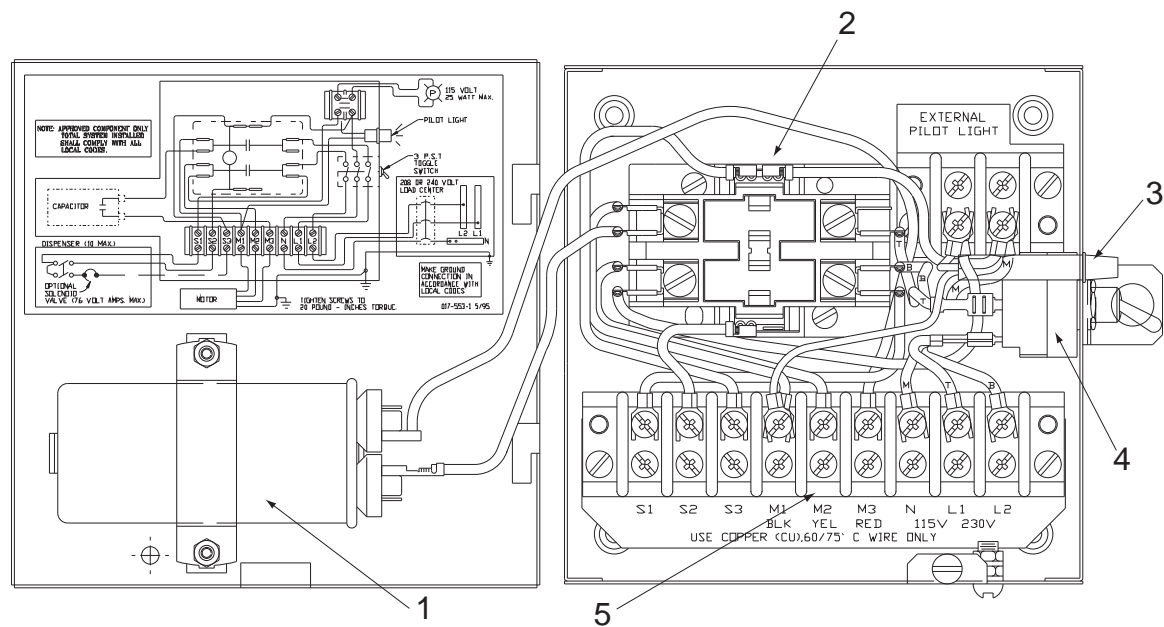


Figure 32. Control Box W/Capacitor

Table 7. Control Box W/Capacitor (120V Coil)

Item (Refer Figure 32)	Qty. / Part Number	Description	880-045-5	880-046-5	0410861-001
			CB-3/4 HP 17.5 µF 120V Coil	CB-1-1/2 HP 25 µF 120V Coil	CB-2 HP 40 µF 120V Coil
1	1	Capacitor Kit	410164-001	410164-002	410164-003
2	014-723-1	Line Contactor Relay	1	1	1
3	247-001-5	Pilot Light Assy.	1	1	1
4	080-858-1	Toggle Switch	1	1	1
5	008-202-1	Terminal Block	1	1	1

Table 8. Control Box W/Capacitor (240V Coil)

Item (Refer Figure 32)	Qty./Part Number	Description	0410860-003	0410860-002	0410860-001
			CB-3/4 HP 17.5 µF 240V Coil	CB-1-1/2 HP 25 µF 240V Coil	CB-2 HP 40 µF 240V Coil
1	1	Capacitor Kit	410164-001	410164-002	410164-003
2	014-720-1	Line Contactor Relay	1	1	1
3	247-001-5	Pilot Light Assy.	1	1	1
4	080-858-1	Toggle Switch	1	1	1
5	008-202-1	Terminal Block	1	1	1

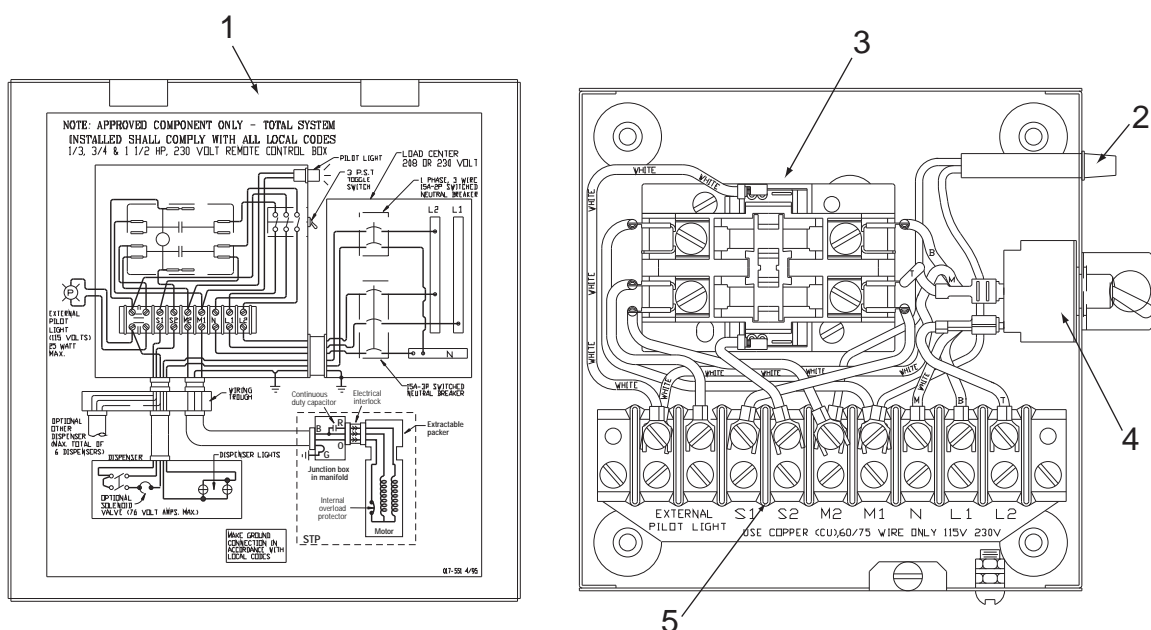


Figure 33. 880-041-5/880-042-5 Control Box

Table 9. 880-041-5 / 880-042-5 Control Box

Item (Ref. Figure 33)	Part No.	Description	880-041-5 Control Box W/115V Coil	880-042-5 Control Box W/230V Coil
1	108-572-4	Control box	1	1
2	247-001-5	Pilot Light Ass'y	1	1
3	1	Line Contactor Relay	014-723-1	014-72-1
4	080-858-1	Toggle Switch	1	1
5	008-202-1	Terminal Block	1	1



For technical support, sales or
other assistance, please visit:
veeder.com