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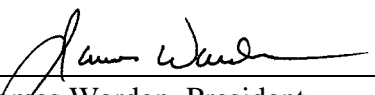
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Tri Nuclear
SUBMERSIBLE PUMPS
(Models PP-40SC, PP-100SC, PP-260SC, PP-600SC & PP-1000SC)

Troubleshooting Guide

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If you have any questions concerning changes in this document, please call the main Tri Nuclear office at 518-399-1389 or e-mail at info@trinuclear.com

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1.0 INTRODUCTION

This procedure covers the design, operation and troubleshooting of the Tri Nuclear submersible pumps operating in the Underwater Filter/Vacuum units, model UFV-100, UFV-260, UF-600 & UF-1000 as well as the Underwater Demineralizers UD-30A, UD-36A & UD-48A. After reviewing and following the troubleshooting steps in this procedure, if problems still persist, please contact Tri Nuclear Corp at 518-399-1389, Fax 518-399-9586 or e-mail: info@trinuclear.com.

2.0 SYSTEM DESIGN

All Tri Nuclear Underwater filter/vacuum and demineralizer systems operate under negative pressure. This design feature eliminates the need for special bolted pressure closures on the filter and pump housings requiring tooling for operation. Each filter and pump housing seals with a simple flat cover plate held in place by negative pressure during operation.

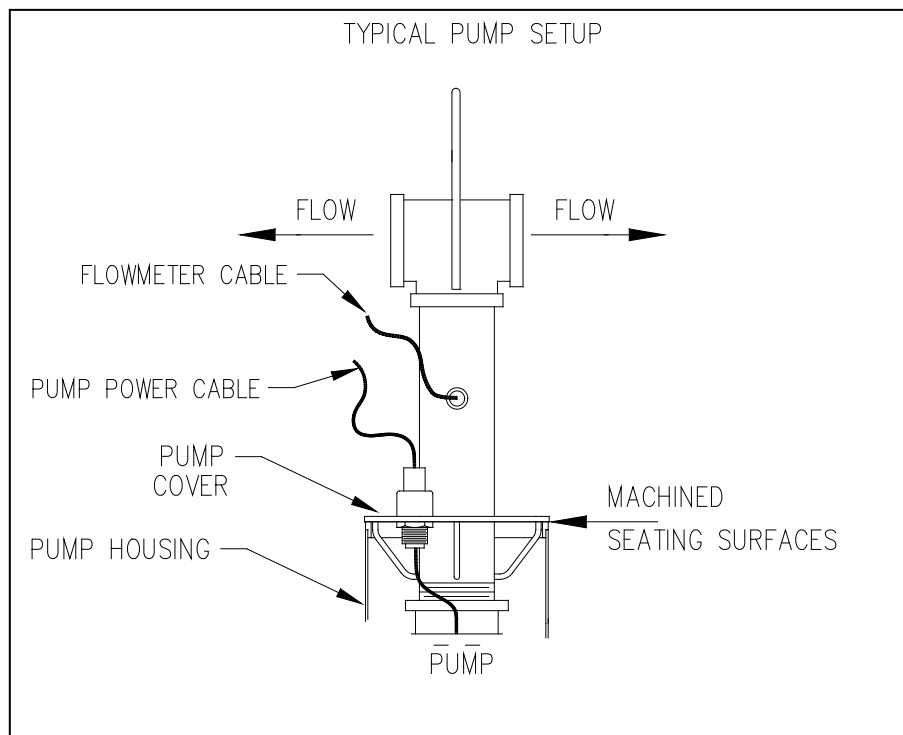


Figure 2.1

One of the many benefits of this design is that it requires no special tooling to install or remove a pump underwater. With the pump installed correctly in the pump tube, the weight of the pump keeps it in place during normal operation.

3.0 PUMP/MOTOR DESIGN

Tri Nuclear uses Grundfos stainless steel pumps and motors in our standard UFV/UF & UD equipment.

3.1 PP-40SC (for use with the UD-30A Underwater demineralizer system)

The PP-40SC is a five stage, 1-1/2HP 460V/3Ph/60Hz (dual rated for 380V/3Ph/50Hz) pump motor assembly that comes assembled and ready for operation. Nominal rated flow through the PP-40SC pump is 40GPM.

The assembly includes the pump cover, discharge piping, the flow sensor tap, top lifting bale and a 3/4" sample port. The pump mounted in the pump tube draws water through the demineralizer and discharges filtered water back to the pool. The pump 2" discharge piping has a flow sensor tap for mounting the flow sensor. A top 2" tee is mounted to the discharge pipe for horizontally directing filtered water back to the pool.

The pump has one 1" hole drilled through an internal check valve to allow for pump drainage when lifting and removing the pump from the pool.

3.2 PP-100SC (for use with the UFV-100 system & UD-36A Underwater demineralizer system)

The PP-100SC is a three stage, 2HP 460V/3Ph/60Hz (dual rated for 380V/3Ph/50Hz) pump and motor comes assembled and ready for operation. Nominal rated flow through the PP-100SC pump is 75-100GPM.

The assembly includes the pump cover, discharge piping, the flow sensor tap, top lifting bail and a capped 1/2" sample port. The pump mounted in the pump tube draws water through the UFV-100 or UD-36A demineralizer and discharges filtered water back to the pool. The pump 2" discharge piping has a flow sensor tap for mounting the flow sensor.

When used with the UD-36A Demineralizer:

A top 2" tee is mounted to the discharge pipe with two 2" male camlock hose connectors installed. During normal operations one connector is capped and the other is attached to a PH-2x25 hose for horizontally directing filtered water away from the suction of the UD-36A and back to the cavity pool.

The pump has one 1" hole drilled through an internal check valve to allow for pump drainage when lifting and removing the pump from the pool.

3.3 PP-260SC (for use with the UFV-260 system and UD-48A Underwater demineralizer system)

The PP-260SC is a single stage, 5HP 460V/3Ph/60Hz (dual rated for 380V/3Ph/50Hz) pump motor assembly that comes assembled and ready for operation. Nominal rated flow through the PP-260SC pump is 260GPM.

The assembly includes the pump cover, discharge piping, the flow sensor tap, and top lifting bale. The pump mounted in the pump tube draws water through the UFV-260 or UD-48A demineralizer and discharges filtered water back to the pool. The pump 3" discharge piping has a flow sensor tap for mounting the flow sensor. A top 3" tee is mounted to the discharge pipe for horizontally directing filtered water back to the pool.

The pump has one 1" hole drilled through an internal check valve to allow for pump drainage when lifting and removing the pump from the pool.

3.4 PP-600SC (for use with the UF-600 & UFV-600 systems)

The PP-600SC is a single stage, 15HP 460V/3Ph/60Hz (dual rated for 380V/3Ph/50Hz) pump motor assembly that comes assembled and ready for operation. Nominal rated flow through the PP-600SC pump is 600GPM.

The assembly includes the pump cover, discharge piping, the flow sensor tap, and top lifting bale. The pump 4" discharge piping has a flow sensor tap for mounting the flow sensor and two 3" horizontal branch connections with stainless steel male camlock couplers.

The pump has one 1" hole drilled through its internal check valve to allow for pump drainage when lifting and removing the pump from the pool.

3.5 PP-1000SC (for use with the UF-1000 system)

The PP-1000SC is a single stage, 20HP 460V/3Ph/60Hz (dual rated for 380V/3Ph/50Hz) pump motor assembly that comes assembled and ready for operation. Nominal rated flow through the PP-1000SC pump is 1000GPM.

The assembly includes the pump cover, discharge piping, the flow sensor tap, and top lifting bale. The pump 5" discharge piping has a flow sensor tap for mounting the flow sensor and two 4" horizontal branch connections with stainless steel male camlock couplers.

The pump has one 1" hole drilled through its internal check valve to allow for pump drainage when lifting and removing the pump from the pool.

4.0 PUMP ELECTRICAL CONNECTION & POWER CABLE

4.1 SEA CON ELECTRICAL DISCONNECT

There is a stainless steel electrical disconnect mounted on the pump cover for the 100 ft PSC-100 and PSC-100P power cable. This allows for the removal of the power cable for ease of handling and equipment storage. The electrical disconnect on the pump cover is a “Sea Con” type connector.

There is a seal plug (P/N: SC-P) that should be installed on the pump sea con connector when ever the power cord is not installed. The seal plug provides sealing of the connector for underwater storage of the pump (without the power cable) and protects the threads of the sea con connector when the power cord is not installed.

Stainless Steel “Sea Con” electrical disconnect shown on a PP-260SC pump

Tri Nuclear has used the Stainless Steel “Sea Con” electrical disconnect since 2010

SC-P Seal Plug



Molded Stainless Steel “Sea Con” electrical disconnect shown on a PP-260SC pump

Shown with a PSC-100 power cable



4.2 PSC-100 POWER CABLE

The PSC-100 Pump Power cable is a 100' 10/4 SO cable with a Sea Con Connector x bare wire. This Pump Power cable is to supply the pump from any Tri Nuclear Control Box to the PP-xxxSC pump. .

This Pump Power cable is to supply power to the pump from any Control Box without the twistlock plug connections.

PSC-100 Pump Power Cable shown with the
“Sea Con” connector on one end

*This item is described here for legacy
purposes only.*



4.3 PSC-100P POWER CABLE

The PSC-100P Pump Power cable is a 100' 10/4 SO cable with a male Nema 4x Twist lock plug x Sea Con Connector. This Pump Power cable is to supply the pump from the Phase Reversing Control Box.

PSC-100P Pump Power Cable shown with the "Sea Con" connector on one end (to the left).

The plug to the right (with the male Twist Lock connections) is to connect to the female line out on the CB-PR-xxx-4XP control box.



4.4 PC-50 DROP CABLE

The PC-50 Control Box Drop Cable is a 50' 10/4 SO cable with a female Nema 4X twist lock plug x bare wire. This drop cable is to supply the control box from the in plant power source / motor control center / welding outlets etc.

PC-50 Pump Power Cable shown with bare wires on one end (to connect to the in plant power connection/supply (to the right)).

The plug to the left (with the female Twist Lock connections) is to connect to the male line in on the CB-PR-xxx-4XP control box.



5.0 PUMP CONTROL BOXES

Tri Nuclear has used four different control boxes for our underwater pumps over the years. They are the CB-xxx, CB-xxx-4X, the CB-PR-xxx-4X and the most recent is the CB-PR-xxx-4XP. (where xxx is the identifier for the control box – 40, 100, 260, 600 or 1000)

The CB-100, 260 & 600 control boxes (see section 5.1) are no longer produced and are referenced here for legacy purposes only.

The CB-xxx-4X (see section 5.1) and CB-PR-600-4X (see section 2.3.3) have been replaced by the upgraded CB-PR-600-4XP (see section 2.3.4).

5.1 CB-xxx USED Prior to May 2005 See Drawing MS-109

On control boxes purchased prior to May 2005, the control box for all Tri Nuclear Grundfos pumps was housed in a NEMA 1 type enclosure and was a 460V/3Ph/60Hz “Definite Purpose Starter” that protected the pump from over current. The control box has two pushbuttons, start and stop, three K-67 Furnas overload heaters and a three phase magnetic starter. NOTE: This control box is dual rated for 460V/60Hz & 380V/50hz.

This item is discontinued and his described here for legacy purposes only.

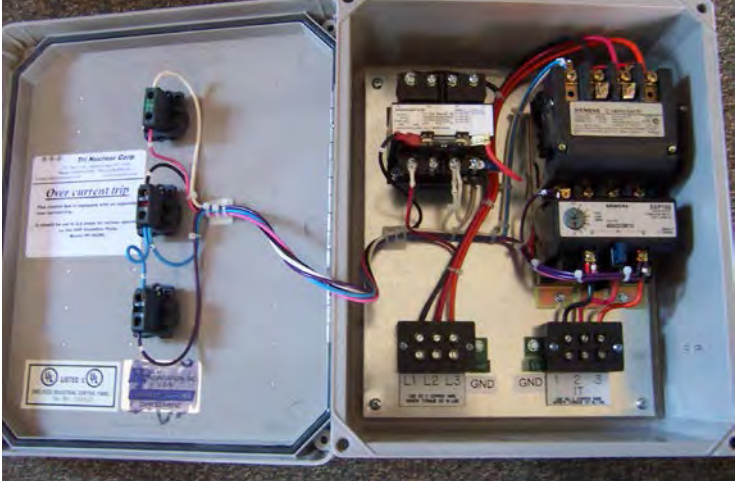

CB-600 Control Box
showing
(3) bi-metallic overload heaters



CB-100	K-33 heaters
CB-260	K-50 heaters
CB-600	K-67 heaters

5.2 CB-xxx-4X USED from May 2005 to August 2009 See Drawing TNC-018-01

The CB-600-4X control box is mounted in a NEMA 4X type enclosure and has a 460V/3Ph/60Hz solid state controller with an adjustable over current trip. The control box has start/stop pushbuttons and a green “run” indicating light on the front of the panel. *This item is discontinued and his described here for legacy purposes only.*

<p>Inside view of a typical control box showing solid state starter, transformer, and line in and load terminal blocks.</p>	
<p>CB-260-4X shown mounted on the UT-10 control panel with associated flow meter (All other similar)</p>	

5.3 CB-xxx-4X-380 USED from May 2005 to August 2009 See Drawing TNC-018-04

In July 2007, Tri Nuclear Corp introduced a NEMA 4X box for use in countries where their main power supply is 380V/50Hz.

The control box for the Underwater Filter/Vacuum equipment is in a NEMA 4X type enclosure and has a 380V/3Ph/50Hz solid state controller with an adjustable over current trip. The control box has start/stop pushbuttons and a green “run” indicating light on the front of the panel.

NOTE: This control box is ONLY rated for 380V/3Ph/50Hz

Inside view of 50hz control box showing solid state starter, transformer, 120V 10A circuit breaker, and line in and load terminal blocks.

Not ALL 380V/50Hz Control Boxes have in internal 10A circuit breaker.





5.4 CB-PR-xxx-4X Phase Reversing Control Box
 USED from August 2009 to November 2012 See Drawing TNC-018-02

In August of 2009 Tri Nuclear introduced an upgraded version of our standard control box that allows the operator to change the phase rotation of the pump WITHOUT having to open the control box and swap two of the three motor leads.

This is accomplished by a switch on the front of the control box and two motor starters inside the control box. These two motor starters are wired such that when the “Phase Rotation Switch” is in the “A” position the pump motor rotates one direction, and when the “Phase Rotation Switch” is in the “B” position the pump motor rotates in the opposite direction. If the “Phase Rotation Switch” is in the center position, neither motor starter will be energized and the pump will not start.

The CB-PR-600-4X is a NEMA 4X type enclosure (14x16) and has two 460V/3Ph/60Hz solid state controllers with an single adjustable over current trip. The control box has a “Phase Rotation Switch” with safety cover, start/stop pushbuttons and a green “run” indicating light on the front of the panel.

<p>CB-PR-260-4X shown (all others similar)</p> <p>The Phase Rotation Switch has a safety cover to prevent inadvertent actuation.</p>	
<p>Inside view of a typical CB-PR-xxx-4X control box showing the two solid state motor starters, over current trip, transformer, and line in and load terminal blocks</p>	

NOTE: This control box is ONLY rated for 460V/3Ph/60Hz.
 A 380V/50Hz control box can be supplied upon request. See Drawing TNC-018-05 for details.

5.5 CB-PR-xxx-4Xp PHASE REVERSING CONTROL BOX WITH TWIST LOCK PLUGS

See Drawing TNC-018-07

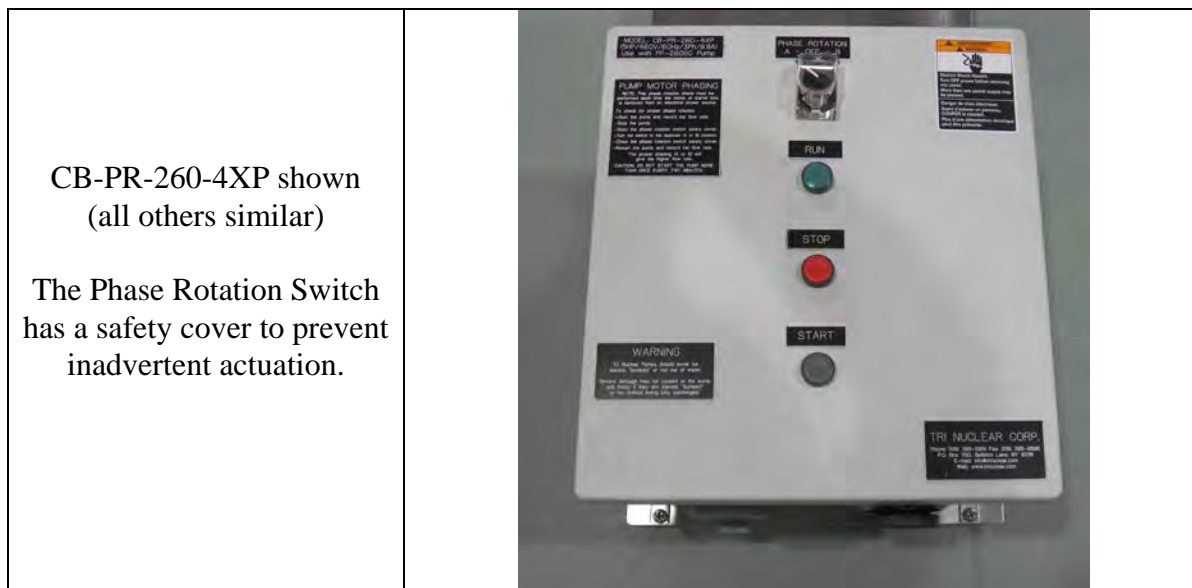
In 2012 Tri Nuclear upgraded the standard phase reversing control box by adding twist lock plugs for the line in / out.

The CB-PR-xxx-4XP is a NEMA 4X type enclosure (14x16) and has two 460V/3Ph/60Hz solid state controllers with an single adjustable over current trip. The control box has a “Phase Rotation Switch” with safety cover, start/stop pushbuttons and a green “run” indicating light on the front of the panel.

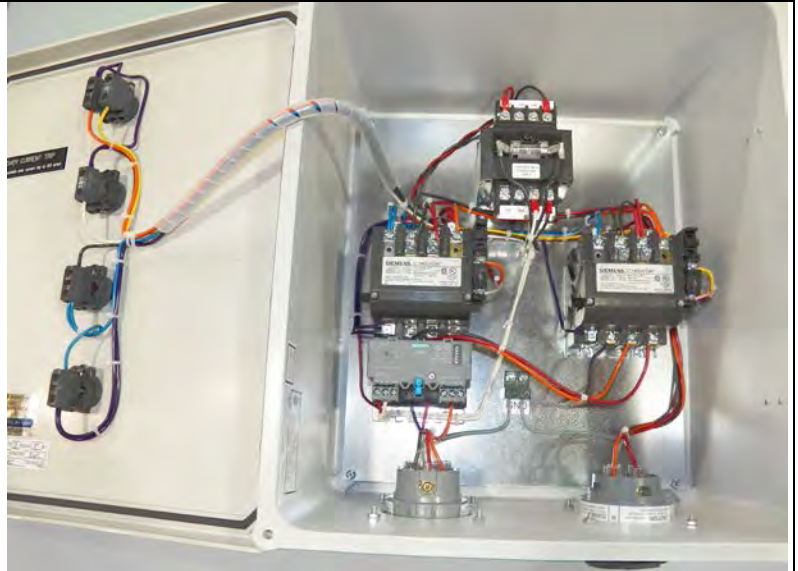
The Phase Reversing feature in this control box allows the operator to change the phase rotation of the pump WITHOUT having to open the control box and swap two of the three motor leads.

This is accomplished by a switch on the front of the control box and two motor starters inside the control box. These two motor starters are wired such that when the “Phase Rotation Switch” is in the “A” position the pump motor rotates one direction and when the “Phase Rotation Switch” is in the “B” position the pump motor rotates in the opposite direction. If the “Phase Rotation Switch” is in the center position, the neither motor starter will be energized and the pump will not start.

The 460V / 3ph / AC 30amp Nema 4X Twist Lock plugs allow the operator to quickly and easily install the new PC-50 drop cable and PSC-100P pump power cable to the control box without drilling and connecting bare cables to internal terminal blocks in the control box.



Inside view of a typical CB-PR-xxx-4XP control box showing the two solid state motor starters, over current trip, transformer, and the Twist Lock plug terminals



Twist Lock plugs are located on the bottom of the control box.

The plug to the right (with the male Twist Lock connections) is the line in / power in plug.

The plug to the left (with the female Twist Lock connections) is the power out to the pump.



6.0 FLOW INDICATION

The flow meter is installed to provide a gross indication of system flow. System flow rate is a gauge of the condition of the filters. Under normal operations a filter would be changed out when system flow rate drops to ~50% of clean filter value.

The flow meter used in all Tri Nuclear Underwater equipment is a self-powered analog meter that provides flow indication in the following ranges:

Flow Range	Part Number	Equipment Used with
0-200 gpm	FM-100	UFV-100 UD-30A & UD-36A
0-400 gpm	FM-260	UFV-260, UD-48A
0-1000 gpm	FM-600	UF-600 & UFV-600
0-2000gpm	FM-1000	UF-1000

The flow meter uses the amplitude of the flow sensor signal to drive the 100-microamp meter movement.

The flow sensor is a paddlewheel type flow sensor having a mounted rotor with molded magnets in each of the four paddles. The paddlewheel has a re-enforced sleeve that covers the shaft and is designed to minimize wear of the rotor. When water flows past the paddlewheel and it rotates, the flow sensor produces a sinusoidal waveform with frequency and amplitude directly proportional to the flow rate. The sensor comes equipped with 100ft of sensor cable.



CAUTION: The flow meter dial read-out gauge is a delicate instrument (milli-ammeter) and should be protected from rough handling. It will probably be broken if dropped on the floor. It should be mounted to the UT-10/UT-10A mounting panel and hung on a suitable railing for protection.

Flow Sensor Specifications:

Output frequency: 5-6 Hz/fps nominal
Flow Range: 1-50 fps
Linearity: $\pm 1\%$ full range

Flow Meter Specifications:

Input signal amplitude: 0.4 V peak to peak minimum
Input Frequency range: 0-200 Hz
Meter Range: 100 micro amps $\pm 2\%$ at full deflection

<p>Analog Flow Meter FM-260 shown</p> <p>(All others similar)</p>	 <p>The image shows an analog flow meter with a black face and a white scale. The scale ranges from 0 to 4 with major markings every 0.5 units. The needle is pointing to approximately 2.5. The text '+GF+' is at the top left, and 'Signet Monitor' is at the bottom. A small label in the center reads 'GPM x 100'.</p>
<p>Paddlewheel Flow Sensor</p>	 <p>The image shows a paddlewheel flow sensor installed in a metal pipe. The sensor has a red and blue body with a black cable extending from it.</p>

See the diagram below for proper flow sensor to meter installation.

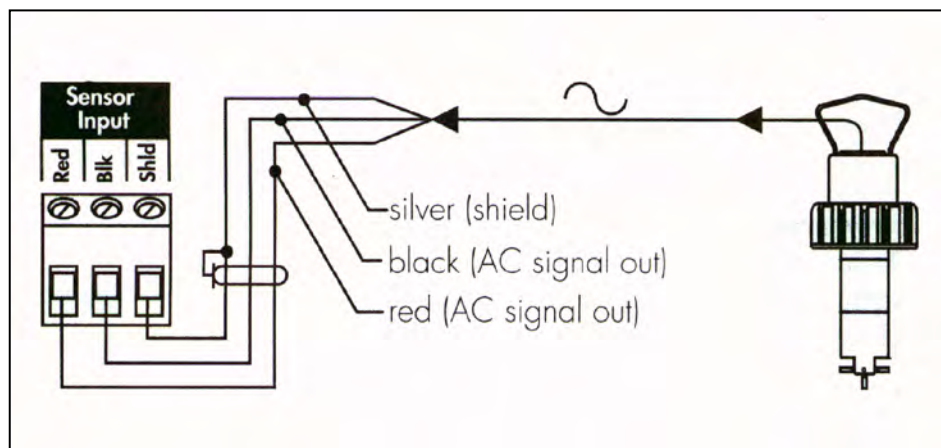


Figure 6-1
Flow Sensor & Meter connection diagram

7.0 TROUBLESHOOTING

Most troubleshooting steps are easily diagnosed. You can usually determine the cause of the problems from observing specific symptoms.

A faulty flow meter can indicate both high or low flow readings. Prior to proceeding with other troubleshooting steps, the flow meter checks should be performed first.

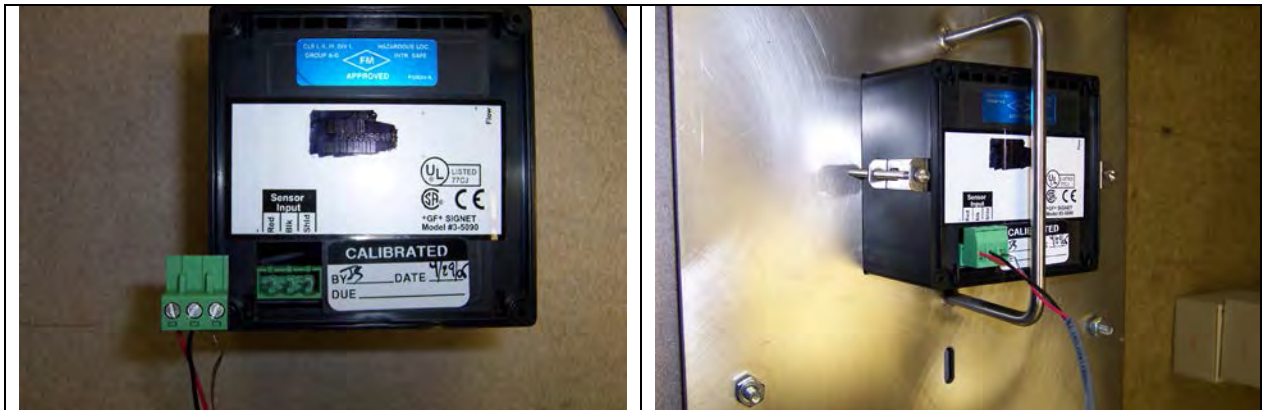
7.1 FLOW METER

Prior to installing the flow meter (new or old) into a pump the following steps should be performed:

7.1.1 Flow Sensor Installation

CAUTION:

The flow meter dial read-out gauge is a delicate instrument (milliammeter) and should be protected from rough handling. It will probably be broken if dropped on the floor. It should be mounted to the UT-10 or UT-10A control panel and hung on a suitable railing for protection.

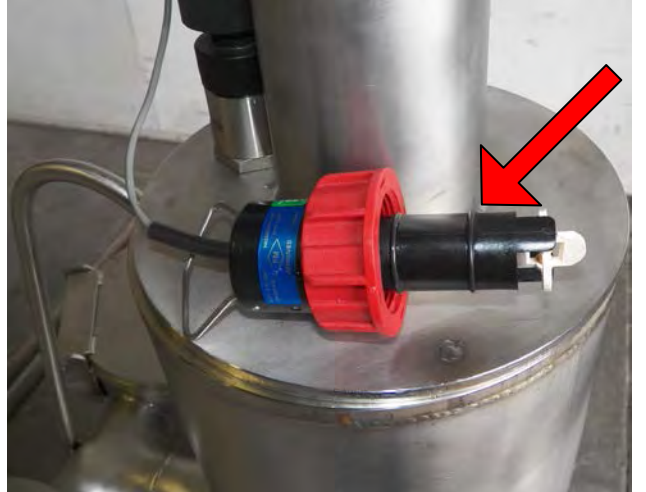


Remove the flow meter from its box. Verify the analog flow meter has the proper scale for the equipment being used and mount the flow meter to the mounting panel UT-10/UT-10A .

Remove the FM-SR, paddlewheel flow sensor from its box. Connect the flow sensor cable to the back of the Flow Meter using figure 6.1 as a guide (see previous page).

Before installing the flow sensor to the flow tap mounted on the pump discharge pipe, flip the paddle wheel with a finger to check for dial read-out response.

Verify the two o-rings are installed on shaft of the Flow Sensor. The flow sensor may not operate properly without the o-rings installed.



Prior to installing the flow sensor in the pump, lubricate the o-rings with DI water or other approved lubricant



Install the probe into the flow sensor tap making sure the slots in the fitting mate properly with the flow meter sensor orientation pins. The paddle wheel will then be perpendicular to the direction of flow.



7.2 HIGH FLOW RATE

A high system flow rate can be experienced with new filters. Operating experience has shown that with clean filters and a new pump the PP-100 can have an initial flow rate of 150-200 gpm, the PP-260 300 gpm and the PP-600 800-900 gpm. Flow rate should decrease as the filters load with particulate material from the water.

The flow meter may read high or go off scale if it is dropped or mishandled. If the flow meter is in this condition, it may be recalibrated. See section 7 for the flow meter recalibration procedure.

7.3 LOW FLOW RATE

A low system flow rate can be caused by several factors. They include, but are not limited to:

- Missing o-ring on flow sensor (causing it to not be installed correctly)
- Faulty flow meter/sensor
- Flow Sensor installed incorrectly
- Flow Sensor to Meter installed incorrectly
- Plugged filters / collapsed, damaged or plugged hoses
- Running with only one suction hose and the other suction port capped (UFV-260)
- Suction hose length too long (> 50 feet long)
- Suction hoses dead ended or not vented and filled with air
- Pump phased incorrectly and pump running in reverse (approximately 1/3 full flow)
- Incorrect power frequency (eg. 50hz)
- Pump mechanical internal wear or strainer plugged

These items will be covered in the troubleshooting chart in section 7.4

7.4 TROUBLESHOOTING CHART

The following troubleshooting chart was developed to help in the identification and correction of most of the pump problems you may encounter

Problem	Possible Causes	How To Check	How To Correct
A. Flow meter does not respond	1. Pump is off	Check for voltage at control box	<ul style="list-style-type: none"> • Verify control box has not tripped • Verify the “Phase Rotation Switch is in the “A” or “B” position. • Verify supply breaker is on. • Verify 1amp fuse in control transformer • Verify the 10A control circuit breaker has not tripped (380V only) • Start pump
	2. Flow sensor is not connected properly to flow meter	Verify flow sensor is connected to the flow meter per Figure 6-1	Connect flow sensor to flow meter per Figure 6-1.
	3. Flow meter is faulty.	Verify pump is running by using a clamp-on ammeter on one lead of the pump power cable.	Install a spare flow meter
	4. Flow sensor is faulty	Verify pump is running by using a clamp-on ammeter on one lead of the pump power cable. Install spare flow meter to check for response	<ul style="list-style-type: none"> • After performing steps A.2 & A.3 and there is still no indication, the pump must be removed and the flow sensor replaced. • Perform flow sensor checks per 6.1 prior to installing it in the pump

Problem	Possible Causes	How To Check	How To Correct
A. Flow meter does not indicate (Cont.)	5. Motor and/or cable are damaged	Turn off power. Disconnect motor leads from control box. Measure the lead-to-lead resistances with the ohmmeter (Rx1) Measure lead to ground values with the ohmmeter (Rx100K)	If open motor winding or ground is found, remove pump from pool/cavity and recheck resistance values.
	6. Motor starter overloads have tripped See step E if this is reoccurring	Check for voltage on the line side of starter	Check Solid State Trip setpoint. Replace burnt heaters and reset. Inspect starter for other damage. If heater trips again, check the supply voltage and starter holding coil.
B. Flow meter indicates higher than normal flow	1. New pump and/or filters installed	Check when pump was placed in service. Pumps shipped after 1998 are more efficient.	No corrective action needed. See Section 7.2
	2. Flow meter is off scale high	If the flow sensor is on greater than the indicated flow, but not hard pegged, the flow meter can be recalibrated. If the flow sensor is hard pegged, it may be damaged not able to be recalibrated.	<ul style="list-style-type: none"> • See section 8 for the recalibration procedure. • If the flow meter is hard pegged, and recalibration does not correct the problem, replace the flow meter

Problem	Possible Causes	How To Check	How To Correct
B. Flow meter indicates higher than normal flow (cont.)	3. Flow meter is faulty.	Verify pump is running by using a clamp on ammeter on one lead of the pump power cable.	Install a spare flow meter
	4. Pump cover not seated on pump tube	Lift pump ~6" from the pump tube while running. This bypasses the UF/UFV system. There should be an increase in flow when the pump is lifted.	Reseat the pump and verify that it is not "cocked" or that there is nothing interfering with the seating surface on the pump tube.
	5. Filters not installed	Verify filters installed in the UFV-100/260 (filter tube cover must be opened to verify)	Install filters (drop in flow rate should not be greater than 15% with new filters)
C. Flow meter indicates lower than expected flow	1. Pump phased incorrectly	With pump running, record flow. Reverse two of the three motor leads at the control box. Record that flow rate. With a Phase Reversing Control Box – stop the pump and change the phase rotation switch to either "A" or "B"	The proper phasing will give the higher flow rate. Note: If pump is phased incorrectly, system will run at approximately 1/3 flow
	2. Flow meter is faulty.	Verify pump is running by using a clamp-on ammeter on one lead of the pump power cable.	Install a spare flow meter
	3. Flow sensor is faulty	Verify pump is running by using a clamp-on ammeter on one lead of the pump power cable. Install spare flow meter	After performing steps C.2 & C.3 and if there is still no indication, the pump must be removed and the flow sensor replaced. Perform flow sensor checks per 6.1 prior to installing it in the pump

Problem	Possible Causes	How To Check	How To Correct
C. Flow meter indicates lower than expected flow (Cont.)	4. Filters are expended	Filters should be changed out at 50% clean flow rate	If filter change out is occurring too rapidly see section D.
D. Low flow /velocity at suction nozzle	1. Filters are expended	Filters should be changed out at 50% clean flow rate	If filter change out is occurring too rapidly see section E.
	2. Collapsed hose	Visually check hose for collapsed section	Change out damaged hose, keep hose away from high rad fields and high temperatures (>110F).
	3. Suction hose clogged	Change out filters Lift pump ~6" from the pump tube while running. This bypasses the UF/UFV system. There should be an increase in flow when the pump is lifted.	Ensures filters are not expended. If flow increases on flow meter and clean filters, this indicates a plugged hose. Remove & replace hose on housing.
	4. Hose too long	More than one 50' section of hose on the suction of the pump will decrease the flow thru that hose and cause low velocity at the nozzle	Only use one 50' hose on suction of the pump.
E. Filters load up too quickly	1. Incorrect filter selection for application	-The 10 micron filter VCPH-10PE has the most dirt holding capacity as a vacuuming filter. -The 5 micron filter VCPH-5PE will pick up items that bypasses the 10 micron during vacuuming. -The 1 micron filter VCPH-1PE is excellent for water clarity issues -The 0.3 micron filter is used for polishing when water clarity is "a must".	Install proper size micron, based on application

Problem	Possible Causes	How To Check	How To Correct
F. Circuit breakers/overloads trip	1. High or low voltage	Check voltage at control box. If not within $\pm 10\%$ check equipment loads at power source.	If not in specification, correct power supply or choose an alternate power supply.
	2. Three-phase current unbalance	Check current draw on each lead. Unbalance must be within $\pm 5\%$. Follow the steps in Table F below to perform current unbalance check.	If current unbalance is not within $\pm 5\%$, contact the electrical supervisor.
	3. Incorrect Overload trip setting	Check the adjustable trip set point. They should be set to: PP-40SC 1-1/2HP 3.7a PP-100SC 2HP 4.4a PP-260SC 5HP 9.9a PP-600SC 15HP 24.5a PP-1000SC 20HP 32.0a	If incorrectly set, Adjust set point per paragraph 8.0. NOTE: See TNC-018-03 for 575V overcurrent setpoints & TNC-018-04 for 380V overcurrent setpoints

Table F

Example: Correcting for Three-Phase Power Unbalance

Example: Check for current unbalance for a 230 volt, 3 phase, 60 Hz submersible pump motor, 18.6 full load amps.

Solution: Steps 1 to 3 measure and record amps on each motor drop lead for Hookups 1, 2 and 3.

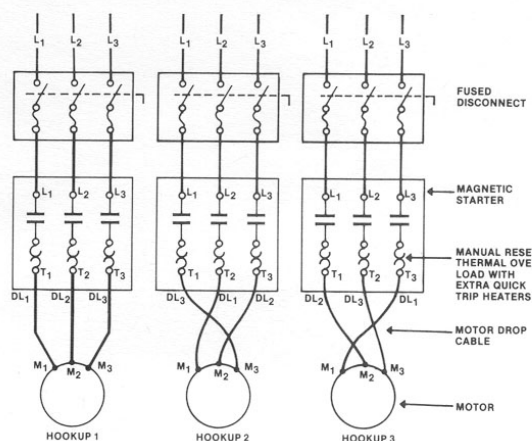
	Step 1 (Hookup 1)	Step 2 (Hookup 2)	Step 3 (Hookup 3)
(T ₁)	DL ₁ = 25.5 amps	DL ₃ = 25 amps	DL ₂ = 25.0 amps
(T ₂)	DL ₂ = 23.0 amps	DL ₁ = 24 amps	DL ₃ = 24.5 amps
(T ₃)	DL ₃ = 26.5 amps	DL ₂ = 26 amps	DL ₁ = 25.5 amps
Step 4	Total = 75 amps	Total = 75 amps	Total = 75 amps
Step 5	Average Current =	Total current =	75 = 25 amps
		3 readings	3
Step 6	Greatest amp difference from the average:	(Hookup 1) = 25-23 = 2 (Hookup 2) = 26-25 = 1 (Hookup 3) = 25.5-25 = .5	
Step 7	% Unbalance	(HOOKUP 1) = 2/25 X 100 = 8 (HOOKUP 2) = 1/25 X 100 = 4 (HOOKUP 3) = .5/25 X 100 = 2	

As can be seen, Hookup 3 should be used since it shows the least amount of current unbalance. Therefore, the motor will operate at maximum efficiency and reliability.

By comparing the current values recorded on each leg, you will note the highest value was always on the same leg, L₃. This indicates the unbalance is in the power source. If the high current values were on a different leg each time the leads were changed, the unbalance would be caused by the motor or a poor connection.

If the current is greater than 5%, contact your power company for help.

* For a detailed explanation of three-phase balance procedures, see Three-Phase Motor, section 2, page 6.



7.5 MOTOR DATA

Figure 7-1 Motor Ohm Data

OHM VALUE	MEGAHOM VALUE	CONDITION OF MOTOR AND LEADS
Motor not yet installed		
2,000,000	2.0	New motor
1,000,000	1.0	Used motor
Motor in use (ohm values are for motor plus power cable)		
500,000-1,000,000	0.5-1.0	A motor in reasonably good condition
20,000-500,000	0.02-0.5	A motor which may have been damaged or has a damaged power cable or pigtail
10,000-20,000	0.01-0.02	A motor which has definitely has been damaged or has a damaged power cable or pigtail. The pump & power cord should be removed from the unit and inspected
< 10,000	0-0.01	A motor which has failed or with completely destroyed cable insulation.

Figure 7-2 60Hz Motor Data

Pump Type	HP	Volt	Hz	Furnas Heater Size	S.F.	Circuit Breaker	Amperage		Nominal Line-to-Line Resistance (Ohms)
							Start	Max	Blk-Yel Red-Yel Delta
PP-40SC	1-1/2	460	60	n/a	1.30	10	20.1	3.7	15.9
PP-100SC	2	460	60	K-33	1.25	10	24	4.4	12.1
PP-100SC	2	575	60	K-31	1.25	10	19.2	3.5	18.8
PP-260SC	5	460	60	K-50	1.15	20	54	9.9	5.0
PP-260SC	5	575	60	K-43	1.15	15	54	7.9	7.3
PP-600SC	15	460	60	K-67	1.15	60	115	24.5	1.6
PP-600SC	15	575	60	n/a	1.15	60	115	18.6	1.6
PP-1000SC	20	460	60	n/a	1.15	80	172	32.0	.78
PP-1000SC	20	575	60	n/a	1.15	80	172	25.0	.78

Figure 7-3 380V / 50hz Motor Data

Pump Type	HP	Volt	Hz	S.F.	Amperage		Nominal Line-to-Line Resistance (Ohms)
					Start	Max	Blk-Yel Red-Yel Delta
PP-40SC	1-1/2	380	50	1.30	20.1	3.4	15.9
PP-100SC	2	380	50	1.25	24	4.2	12.1
PP-260SC	5	380	50	1.15	54	9.6	5.0
PP-600SC	15	380	50	1.15	115	24.0	1.6
PP-1000SC	20	380	50	1.15	172	32.0	.78

8.0 FLOW METER RECALIBRATION

Note:

This procedure must be performed with clean filters and a running pump that is known to operate properly.

This section provides for an operational recalibration of the Tri Nuclear flow meters installed in the standard UF/UFV equipment.

- 8.1 Install clean filters in UF/UFV equipment
- 8.2 Remove flow meter façade and clear plastic cover (requires Phillips screwdriver)
- 8.3 Start pump, verify the pump is running with an ammeter
- 8.4 Adjust the span set screw (see figure 7-1) to the values on table 7-1 below depending on the equipment.
- 8.5 Replace the items removed in step 8.2
- 8.6 Monitor flow to ensure the flow meter tracks correctly

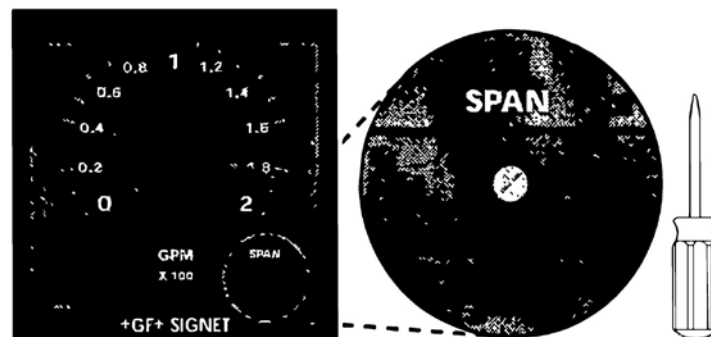


Figure 7-1
Flow Meter Face and span set screw

Underwater Filter Model	Adjust Flow to
UFV-100	100 gpm
UFV-260	260 gpm
UF-600	600 gpm
UF-1000	1000gpm




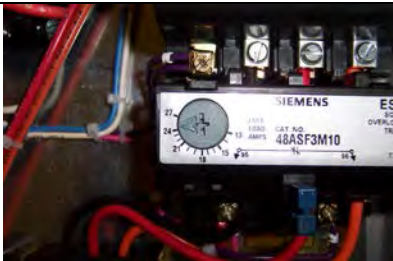
Table 8-1
Flow Meter Calibration Data

9.0 ADJUSTMENT OF OVERCURRENT SETPOINT - for all control boxes supplied after May 2005

WARNING:

IMPROPER SETTING OF THE OVER CURRENT TRIP SETPOINT MAY CAUSE SEVERE DAMAGE TO THE PUMP/MOTOR ASSEMBLY.

- 9.1 If required, adjust the set point of the over current trip to the following:
(A #2 Philips or flat head screw driver is required to adjust the setpoint)

<p>CB-40-4X CB-PR-40-4X CB-PR-40-4XP</p> <p>PP-40SC 1-1/2HP 3.7a</p>	
<p>CB-100-4X CB-PR-100-4X CB-PR-100-4XP</p> <p>PP-100SC 2HP 4.4a</p>	
<p>CB-260-4X CB-PR-260-4X CB-PR-260-4XP</p> <p>PP-260SC 5HP 9.9a</p>	
<p>CB-600-4X CB-PR-600-4X CB-PR-600-4XP</p> <p>PP-600SC 15HP 24.5a</p>	
<p>CB-PR-1000-4X CB-PR-1000-4XP</p> <p>PP-1000SC 20HP 32.0a</p>	<p>Photo not available</p>

- 9.2 See TNC-018-03 for 575V overcurrent set points & TNC-018-04 for 380V overcurrent set points

10.0 Precautions and Warnings

WARNING:

Do not run/bump the pump dry or out of the water! Severe damage to the pump may occur!

WARNING:

Install the power cord to pump pigtail HAND TIGHT ONLY. Do NOT use any tools (pliers, channel locks etc.) to tighten the connection.

CAUTION:

Do not start the pump more than once every 2 minutes or 300 starts/day. Damage to the motor winding insulation may occur.

CAUTION:

Do not run the pump until a proper phase rotation check is made! Running the pump in reverse for any long duration will damage the pump!

CAUTION:

When installing and removing the power cord, do not move the power cable connector with side to side motion in an attempt to install or remove it.

- If difficulty is encountered during installation ensure that the keyway is lined up and that the male end of the PSC-100P power cord is properly lubricated with a non conductive electrical lubricant (Dow Corning #4).
- If difficulty is encountered during removal ensure the power cable has been unthreaded fully and pull in the vertical direction ONLY to remove the power cable from the pump.

CAUTION:

The CB-PR-**-4XP is rated for 460V/3ph/60Hz ONLY. Any other voltage/frequency supplied to this control box will prevent them from operating properly.

CAUTION:

The CB-PR-**-4XP-380 is rated for 380V/3ph/50Hz ONLY. Any other voltage/frequency supplied to this control box will prevent them from operating properly.

CAUTION:

The CB-PR-**-4XP-575 is rated for 575V/3ph/60Hz ONLY. Any other voltage/frequency supplied to this control box will prevent them from operating properly.

CAUTION:

The flow meter dial read-out gauge is a delicate instrument (milliammeter) and should be protected from rough handling. It could be broken if dropped on the floor. Mount it to the UT-10A control panel and hung on a suitable railing for protection.

NOTE:

Perform the flow meter check before installing the Underwater Filter units into the pool for the first time, whenever the flow meter or sensor is replaced, or anytime the flow sensor is suspected of being damaged.

11.0 Replacement Parts

Below is a listing of **Recommended Spare Parts**:

Common to all Tri Nuclear Grundfos Pumps:

Qty	Part No.	Description
1	PSC-100	The PSC-100 Pump Power cable is a 100' 10/4 SO cable with a Sea Con Connector x bare wire (Note: For use with the CB-xxx-4X & CB-PR-xxx-4X control boxes)
1	PSC-100P	Pump Power Cable, 100ft 10/4 SO with SC connector & twist lock plug (Note: For use with the CB-PR-xxx-4XP control box)
1	PC-50	Control Box Drop Cable, 50ft 10/4 SO cable w/ twist lock plug x bare wire (Note: For use with the CB-PR-xxx-4XP control box)
1	FM-100	Flow meter kit - analog meter (0-200 gpm scale), flow sensor and 100' of cable
1	FM-260	Flow meter kit - analog meter (0-400 gpm scale), flow sensor and 100' of cable
1	FM-600	Flow meter kit - analog meter (0-1000 gpm scale), flow sensor and 100' of cable
1	FM-1000	Flow meter kit - analog meter (0-2000 gpm scale), flow sensor and 100' of cable

Common to all PP-40SC Tri Nuclear Grundfos Pumps:

Qty	Part No.	Description
1	PP-40SC	Grundfos pump, 1-1/2HP 460V/3Ph/60Hz, w/cover, SC connector, CB PR-600-4XP PHASE REVERSING control box with twist lock plugs, PSC-100P Power Cable with twist lock plug and PC-50 drop cable with twist lock plug
1	CB-PR-40-4XP	1-1/2HP 460V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-40-4XP-380	1-1/2HP/380V/3Ph/50Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-40-4XP-575	1-1/2HP 575V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable

Common to all PP-100SC Tri Nuclear Grundfos Pumps:

Qty	Part No.	Description
1	PP-100SC	Grundfos pump, 2HP 460V/3Ph/60Hz, w/cover, SC connector, CB PR-600-4XP PHASE REVERSING control box with twist lock plugs, PSC-100P Power Cable with twist lock plug and PC-50 drop cable with twist lock plug
1	CB-PR-100-4XP	2HP 460V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-100-4XP-380	2HP/380V/3Ph/50Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-100-4XP-575	2HP 575V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable

Common to all PP-260SC Tri Nuclear Grundfos Pumps:

Qty	Part No.	Description
1	PP-260SC	Grundfos pump, 5HP 460V/3Ph/60Hz, w/cover, SC connector, CB PR-600-4XP PHASE REVERSING control box with twist lock plugs, PSC-100P Power Cable with twist lock plug and PC-50 drop cable with twist lock plug
1	CB-PR-260-4XP	5HP 460V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-260-4XP-380	5HP/380V/3Ph/50Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-260-4XP-575	5HP 575V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable

Common to all PP-600SC Tri Nuclear Grundfos Pumps:

Qty	Part No.	Description
1	PP-600SC	Grundfos pump, 15HP 460V/3Ph/60Hz, w/cover, SC connector, CB PR-600-4XP PHASE REVERSING control box with twist lock plugs, PSC-100P Power Cable with twist lock plug and PC-50 drop cable with twist lock plug
1	CB-PR-600-4XP	15HP 460V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-600-4XP-380	15HP/380V/3Ph/50Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-600-4XP-575	15HP 575V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable

Common to all PP-1000SC Tri Nuclear Grundfos Pumps:

Qty	Part No.	Description
1	PP-1000SC	Grundfos pump, 20HP 460V/3Ph/60Hz, w/cover, SC connector, CB PR-600-4XP PHASE REVERSING control box with twist lock plugs, PSC-100P Power Cable with twist lock plug and PC-50 drop cable with twist lock plug
1	CB-PR-1000-4XP	20HP 460V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-1000-4XP-380	20HP/380V/3Ph/50Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable
1	CB-PR-1000-4XP-575	20HP 575V/3Ph/60Hz PHASE REVERSING control box, NEMA 4X, 14x16 enclosure, solid state starter/overload block, Start/Stop push buttons, run light and phase reversing switch w/ safety cover. Includes NEMA 4X twist lock plugs for line in/line out, PC-50 drop cable (w/twist lock plug) and associated twist lock plug to wire to an existing PSC-100 power cable

12.0 ADDITIONAL INFORMATION

For additional information, or if special problems develop, please contact:

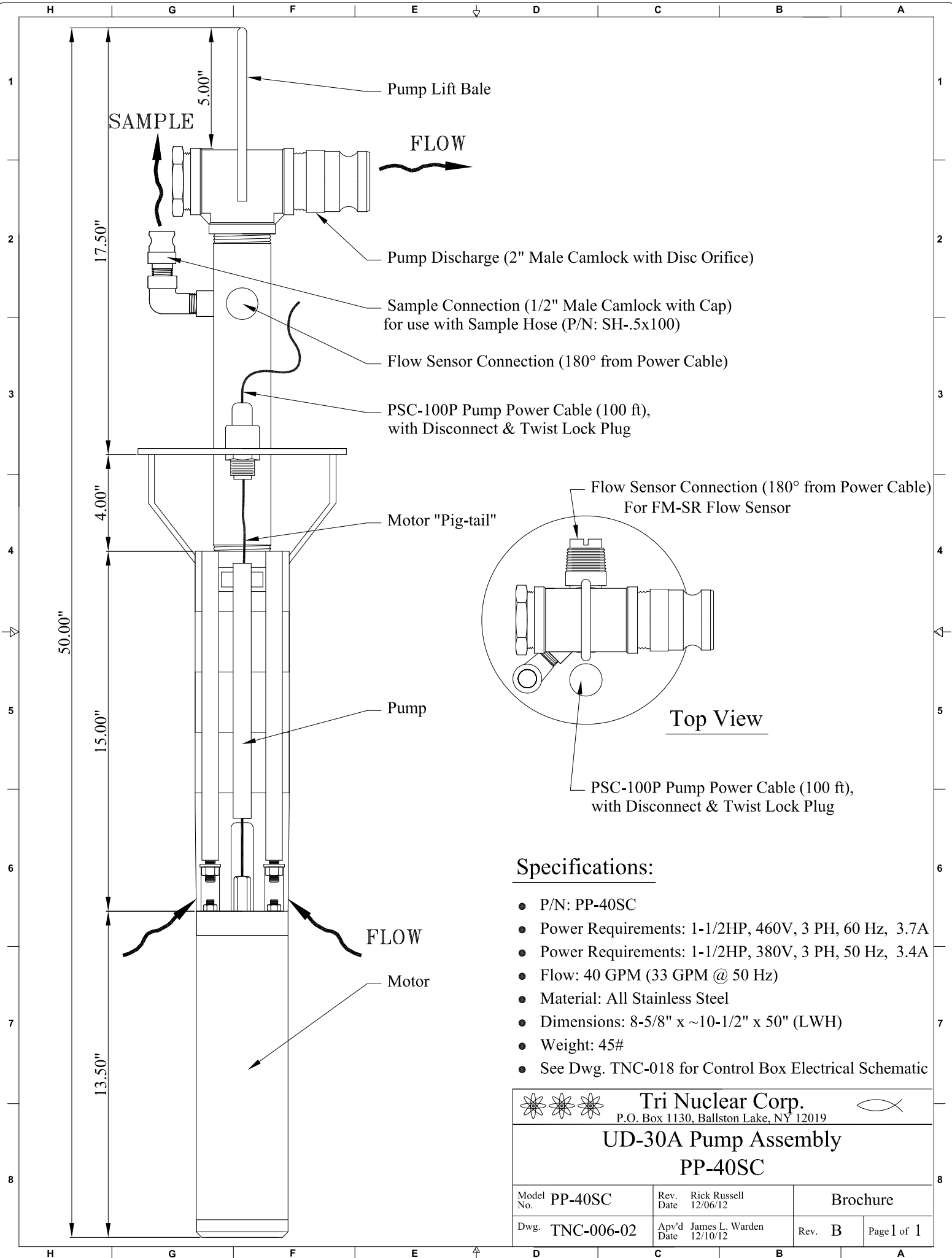
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We also have a CD-Rom that contains all the operating procedures/drawings/brochures for this system and all other Tri Nuclear equipment. Please call, fax, or e-mail us to request your copy.

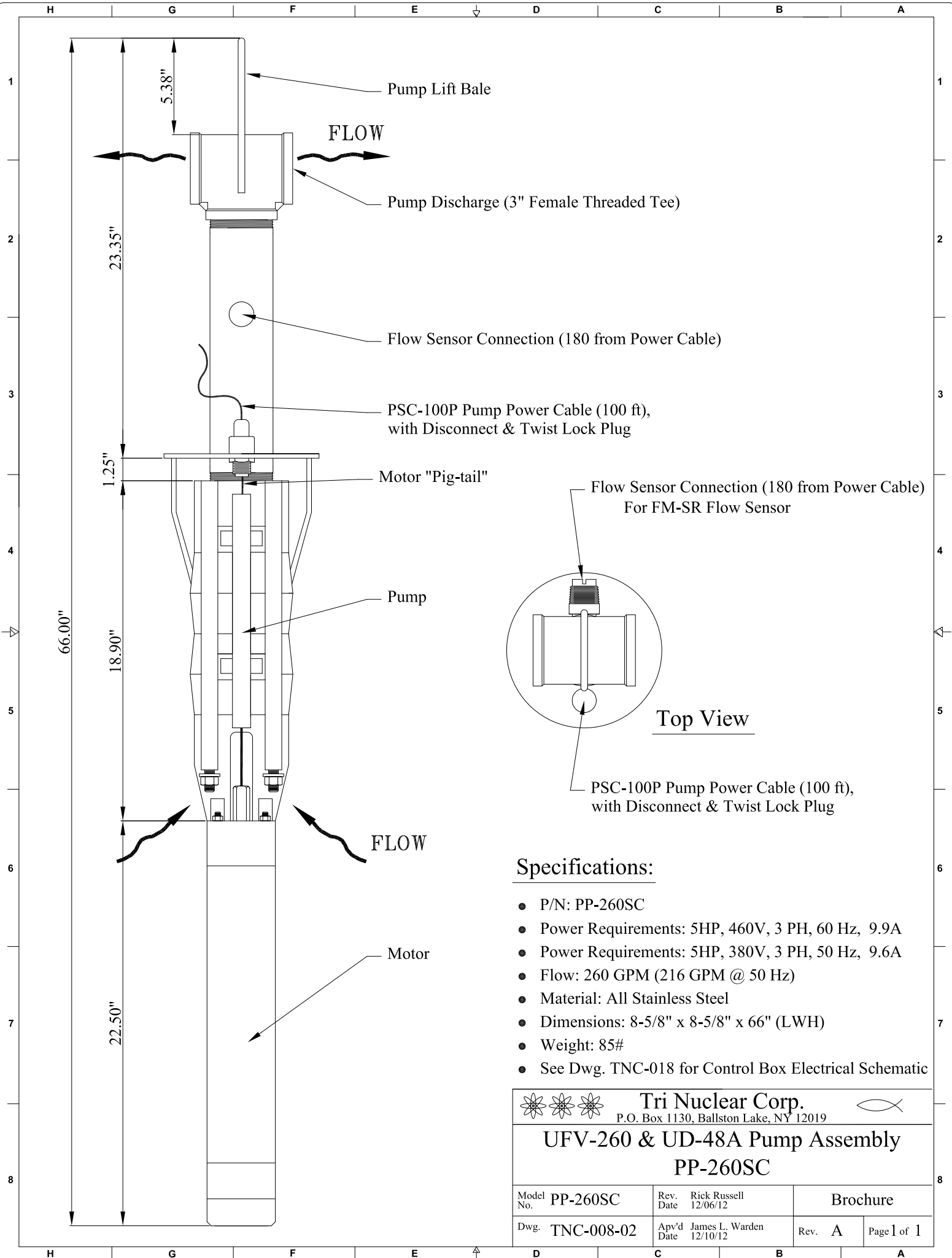


Specifications:

- P/N: PP-40SC
- Power Requirements: 1-1/2HP, 460V, 3 PH, 60 Hz, 3.7A
- Power Requirements: 1-1/2HP, 380V, 3 PH, 50 Hz, 3.4A
- Flow: 40 GPM (33 GPM @ 50 Hz)
- Material: All Stainless Steel
- Dimensions: 8-5/8" x ~10-1/2" x 50" (LWH)
- Weight: 45#
- See Dwg. TNC-018 for Control Box Electrical Schematic



		Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019			
UD-30A Pump Assembly					
PP-40SC					
Model No. PP-40SC		Rev. Date Rick Russell 12/06/12		Brochure	
Dwg. TNC-006-02		App'd Date James L. Warden 12/10/12		Rev. B	Page 1 of 1

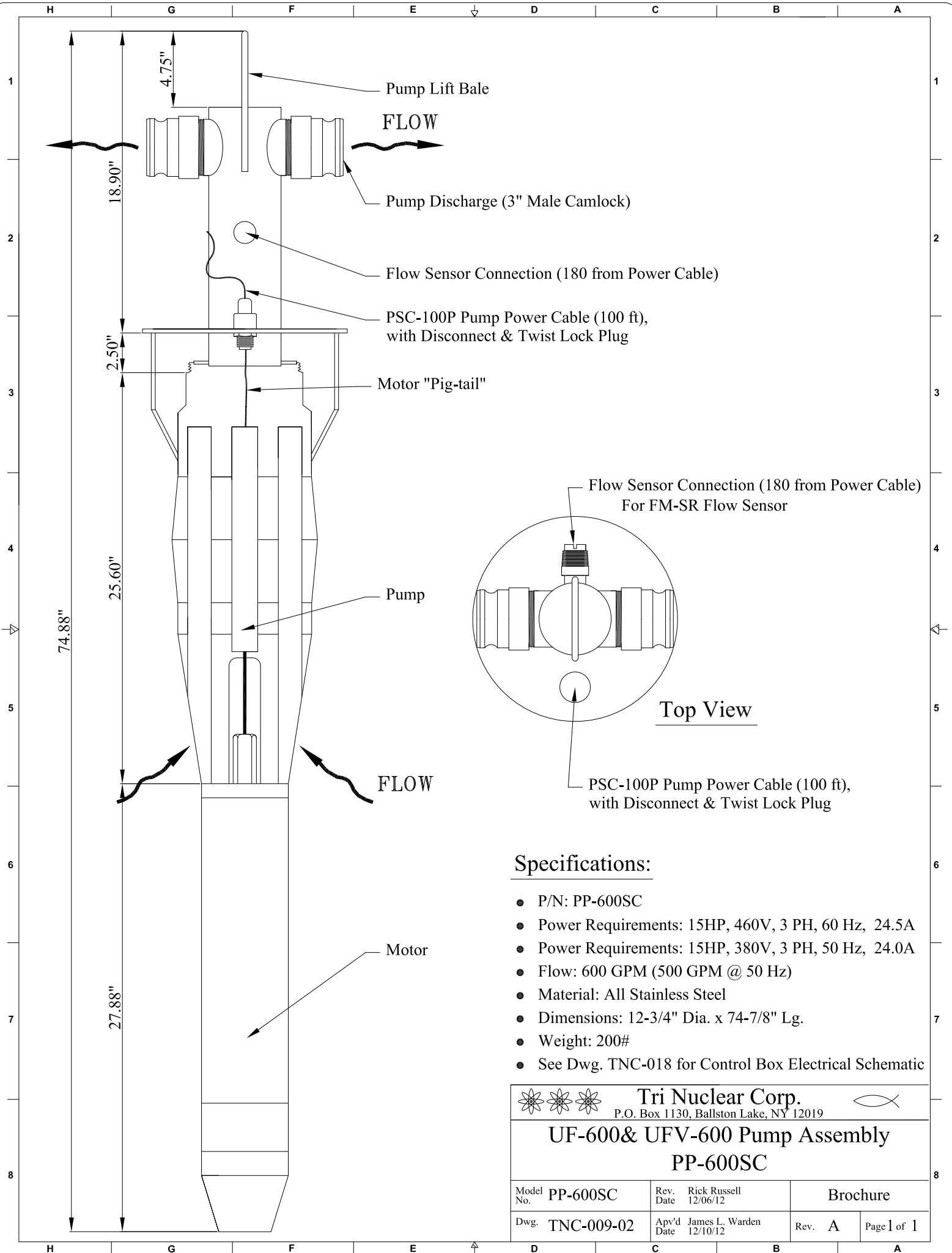
 Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019		
UFV-100 & UD-36A Pump Assembly PP-100SC		
Model No. PP-100SC	Rev. Date Rick Russell 12/06/12	Brochure
Dwg. TNC-007-02	App'd Date James L. Warden 12/10/12	Rev. B Page 1 of 1

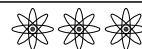
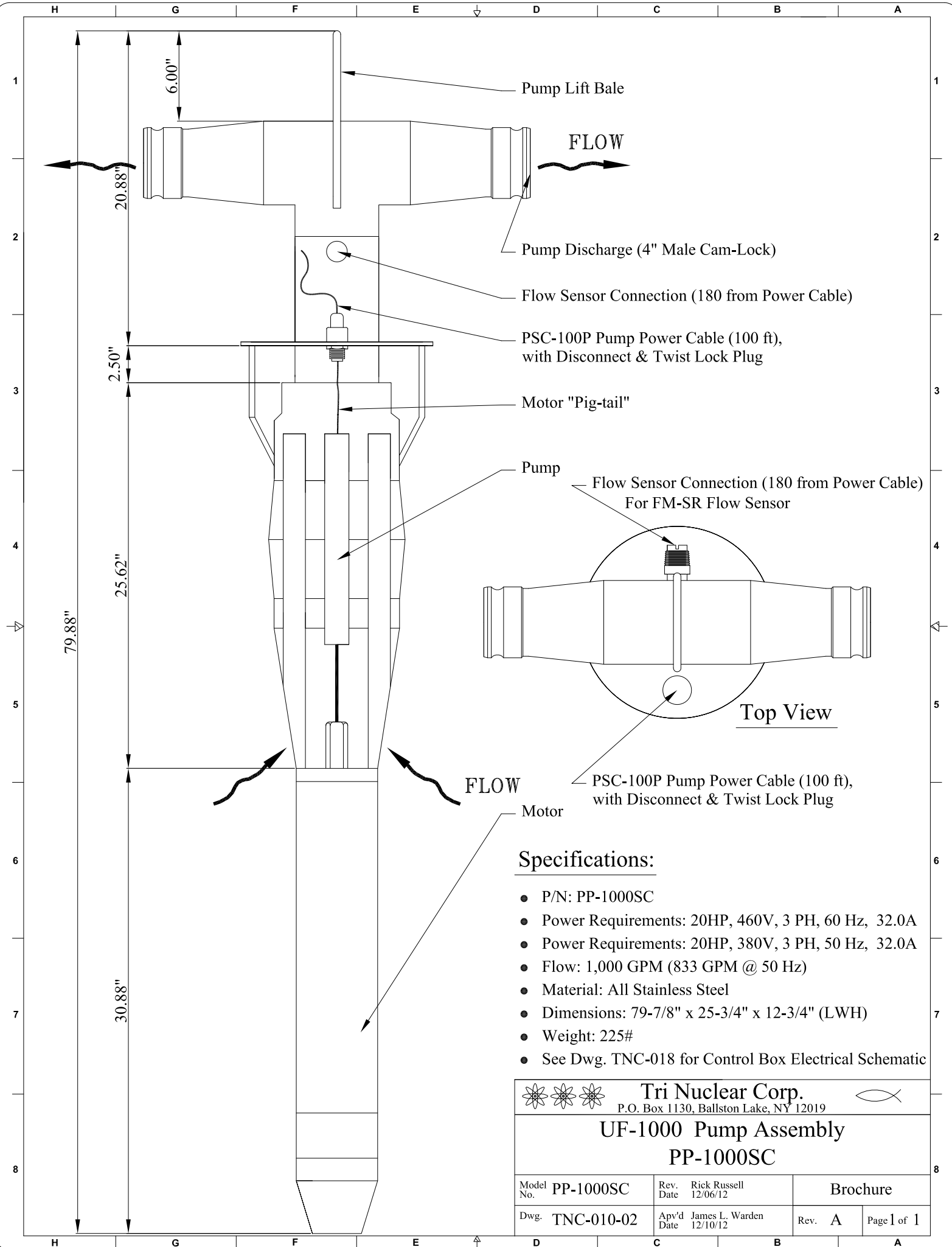


Specifications:

- P/N: PP-260SC
- Power Requirements: 5HP, 460V, 3 PH, 60 Hz, 9.9A
- Power Requirements: 5HP, 380V, 3 PH, 50 Hz, 9.6A
- Flow: 260 GPM (216 GPM @ 50 Hz)
- Material: All Stainless Steel
- Dimensions: 8-5/8" x 8-5/8" x 66" (LWH)
- Weight: 85#
- See Dwg. TNC-018 for Control Box Electrical Schematic

		Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019			
UFV-260 & UD-48A Pump Assembly PP-260SC					
Model No. PP-260SC		Rev. Date Rick Russell 12/06/12		Brochure	
Dwg. TNC-008-02		App'd Date James L. Warden 12/10/12		Rev. A	Page 1 of 1





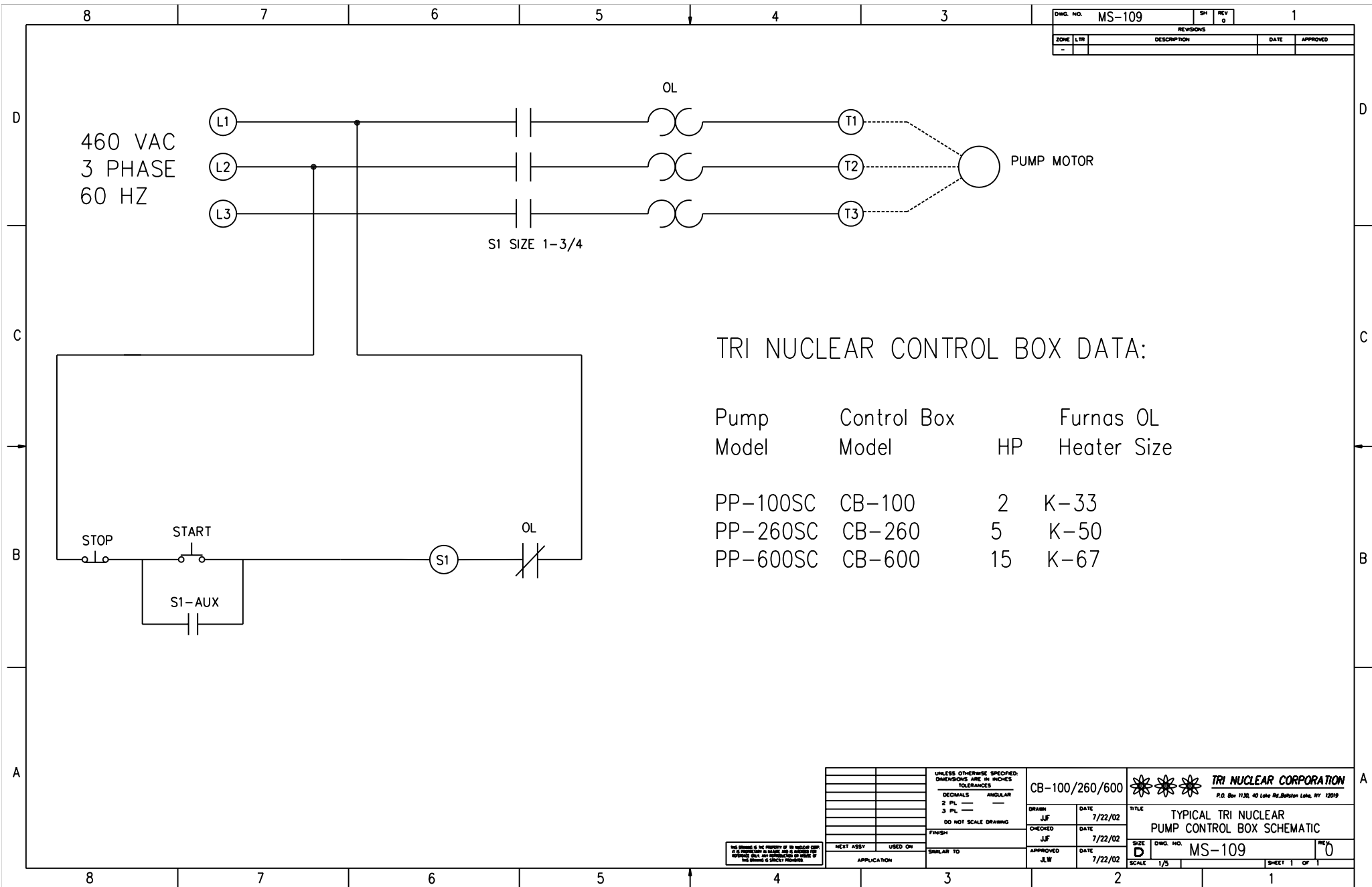
Tri Nuclear Corp.

P.O. Box 1130, Ballston Lake, NY 12019



UF-1000 Pump Assembly PP-1000SC

Model No.	PP-1000SC	Rev. Date	Rick Russell 12/06/12	Brochure	
Dwg.	TNC-010-02	App'd Date	James L. Warden 12/10/12	Rev. A	Page 1 of 1

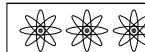


A B C D E F G H



- Housed in a 12" x 10" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-*-4X on a UT-10 control panel.

Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-40SC	CB-40-4X	1-1/2HP	3.7 amps
PP-100SC	CB-100-4X	2HP	4.4 amps
PP-260SC	CB-260-4X	5HP	9.9 amps
PP-600SC	CB-600-4X	15HP	24.5 amps
PP-1000SC	CB-1000-4X	20HP	32.0 amps



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P.O. Box 1130, Ballston Lake, NY 12019

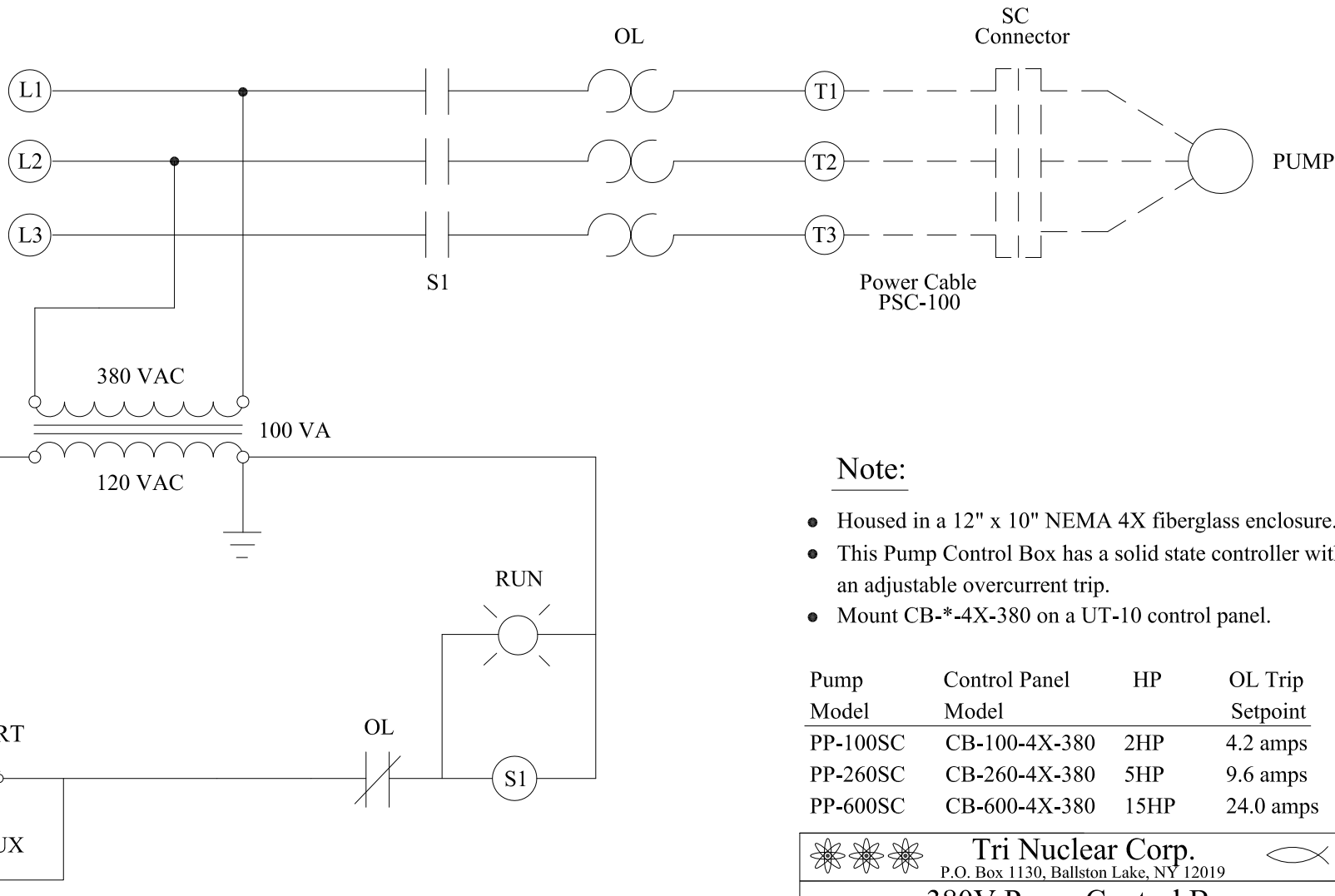


Pump Control Box Electrical Schematic

Model No. CB-*-4X	Rev. Date Rick Russell 05/10/12	Brochure	
Dwg. TNC-018-01	App'd Date James L. Warden 05/10/12	Rev. A	Page 1 of 1

A fused disconnect or circuit breaker
must be provided by installer.
Provide disconnect sizing per
NEC-430-53 (c)



380 VAC
3 PHASE
50 HZ



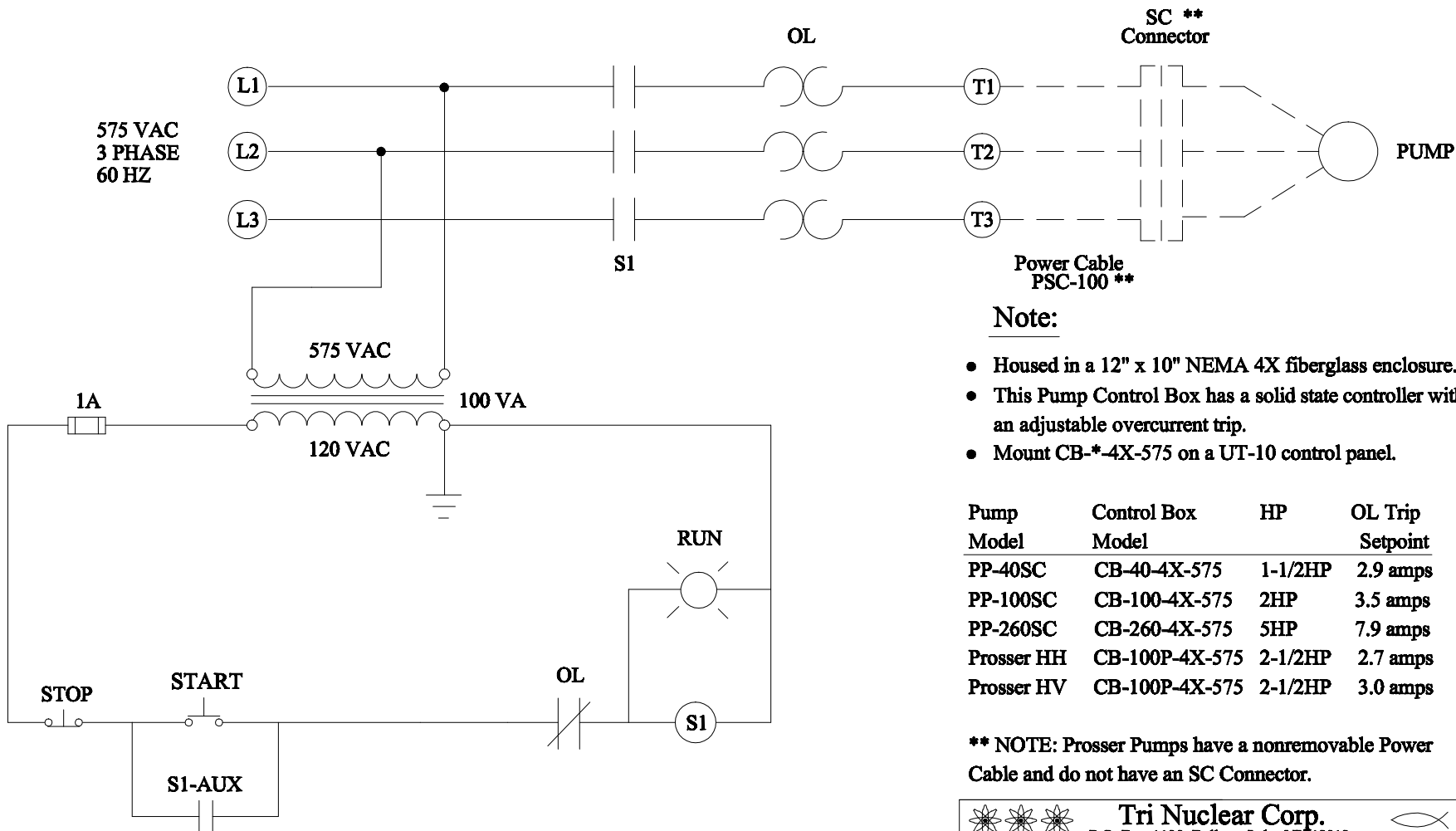
Note:

- Housed in a 12" x 10" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-*-4X-380 on a UT-10 control panel.

Pump Model	Control Panel Model	HP	OL Trip Setpoint
PP-100SC	CB-100-4X-380	2HP	4.2 amps
PP-260SC	CB-260-4X-380	5HP	9.6 amps
PP-600SC	CB-600-4X-380	15HP	24.0 amps

<div>  <div> Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019 </div>  </div>			
380V Pump Control Box Electrical Schematic			
Model No.	CB-*-4X-380	Rev. Date	Rick Russell 05/10/12
Dwg.	TNC-018-04	Apv'd Date	James L. Warden 05/10/12
		Rev.	A
		Page 1 of 1	

A fused disconnect or circuit breaker
must be provided by installer.
Provide disconnect sizing per
NEC-430-53 (c)




Note:

- Housed in a 12" x 10" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-*4X-575 on a UT-10 control panel.

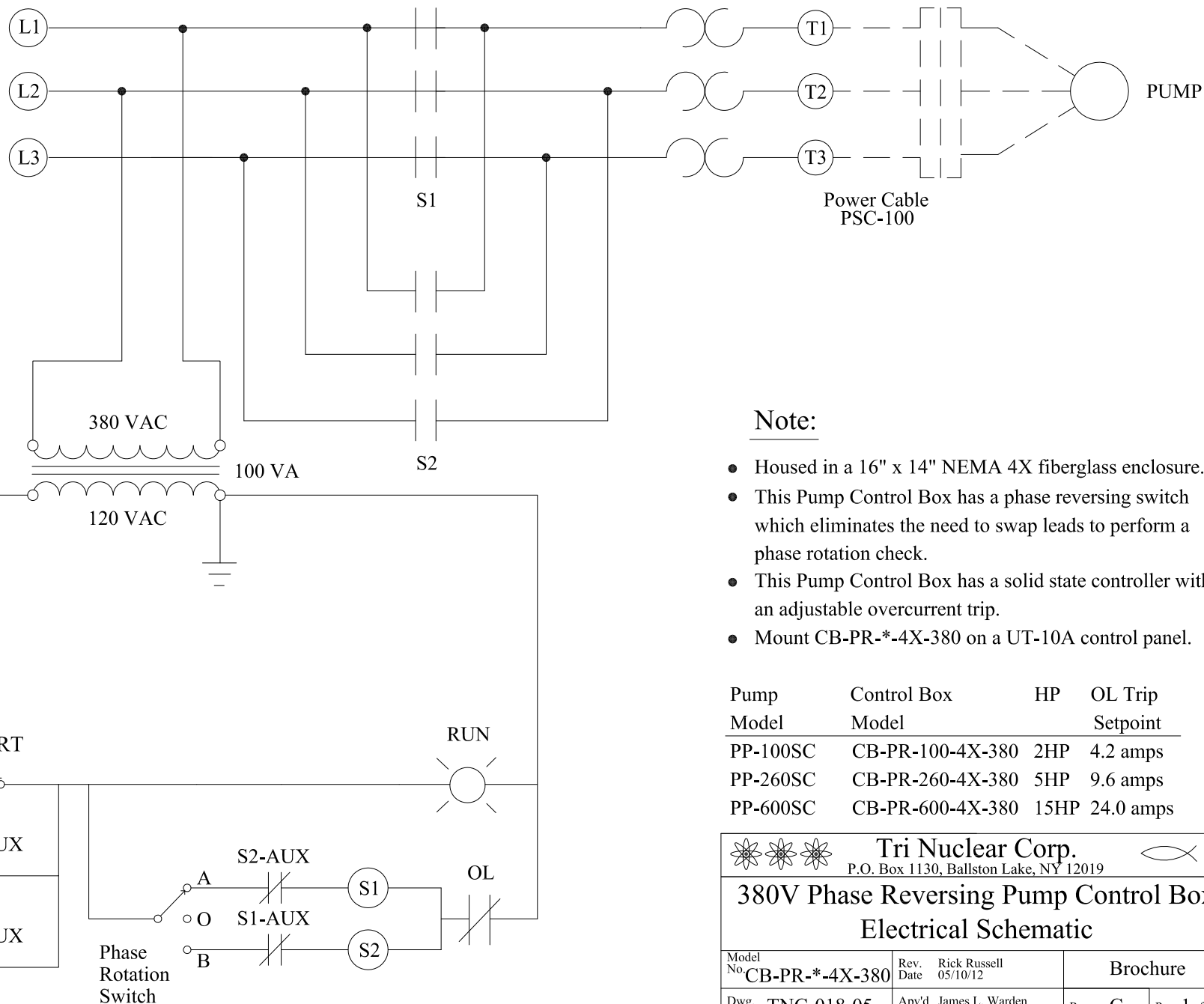
Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-40SC	CB-40-4X-575	1-1/2HP	2.9 amps
PP-100SC	CB-100-4X-575	2HP	3.5 amps
PP-260SC	CB-260-4X-575	5HP	7.9 amps
Prosser HH	CB-100P-4X-575	2-1/2HP	2.7 amps
Prosser HV	CB-100P-4X-575	2-1/2HP	3.0 amps

**** NOTE:** Prosser Pumps have a nonremovable Power Cable and do not have an SC Connector.

 Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019			
575V Pump Control Box Electrical Schematic			
Model No. CB-*4X-575	Drawn Rick Russell Date 02/02/10	Brochure	
Dwg. TNC-018-03	App'd James L. Warden Date 08/13/10	Rev. -	Page 1 of 1

A fused disconnect or circuit breaker
must be provided by installer.
Provide disconnect sizing per
NEC-430-53 (c)


380 VAC
3 PHASE
50 HZ



Note:

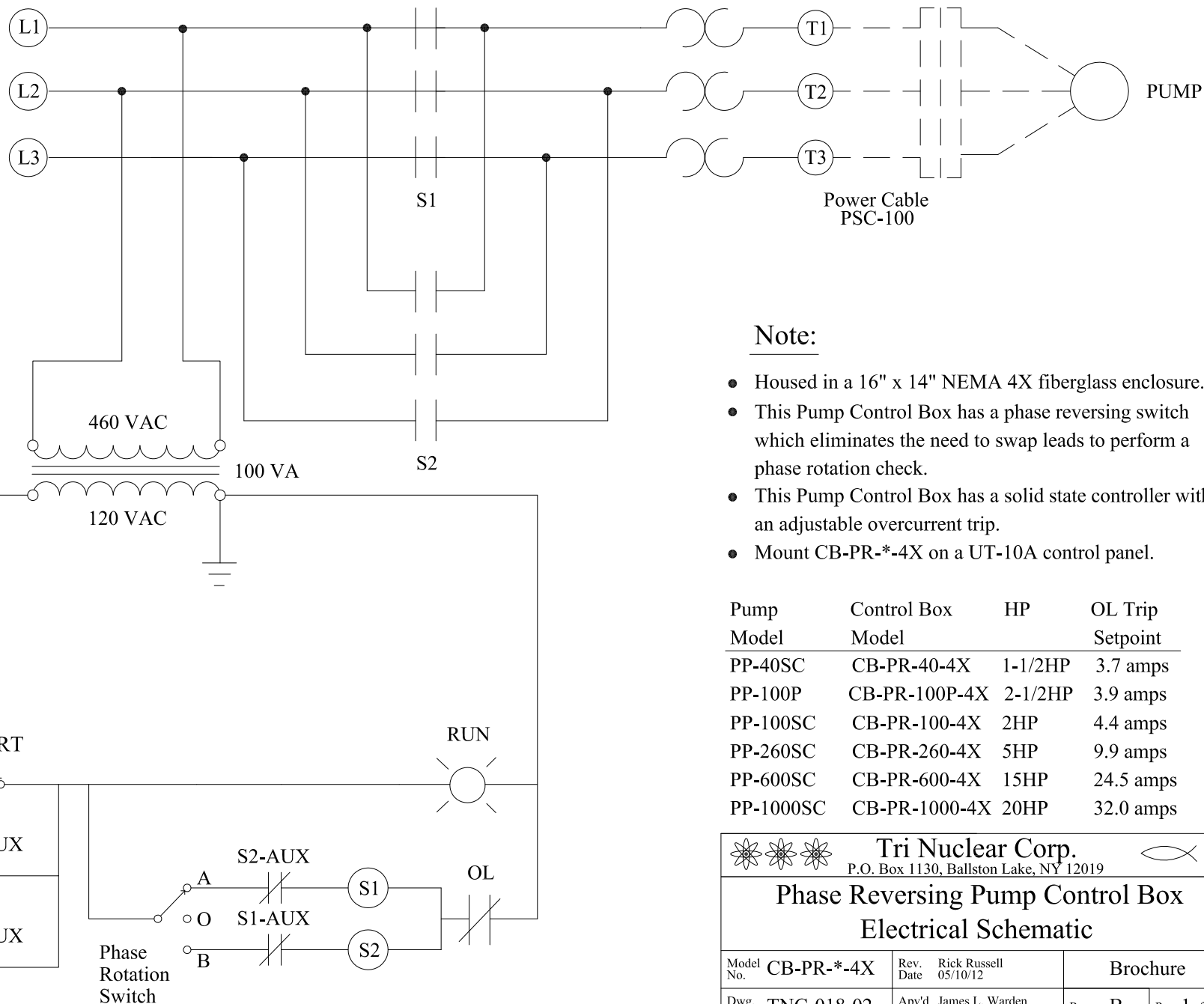
- Housed in a 16" x 14" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a phase reversing switch which eliminates the need to swap leads to perform a phase rotation check.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-PR-*-4X-380 on a UT-10A control panel.

Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-100SC	CB-PR-100-4X-380	2HP	4.2 amps
PP-260SC	CB-PR-260-4X-380	5HP	9.6 amps
PP-600SC	CB-PR-600-4X-380	15HP	24.0 amps

 Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019			
380V Phase Reversing Pump Control Box Electrical Schematic			
Model No. CB-PR-*-4X-380	Rev. Date Rick Russell 05/10/12	Brochure	
Dwg. TNC-018-05	Apv'd Date James L. Warden 05/10/12	Rev. C	Page 1 of 1

A fused disconnect or circuit breaker
must be provided by installer.
Provide disconnect sizing per
NEC-430-53 (c)

460 VAC
3 PHASE
60 HZ



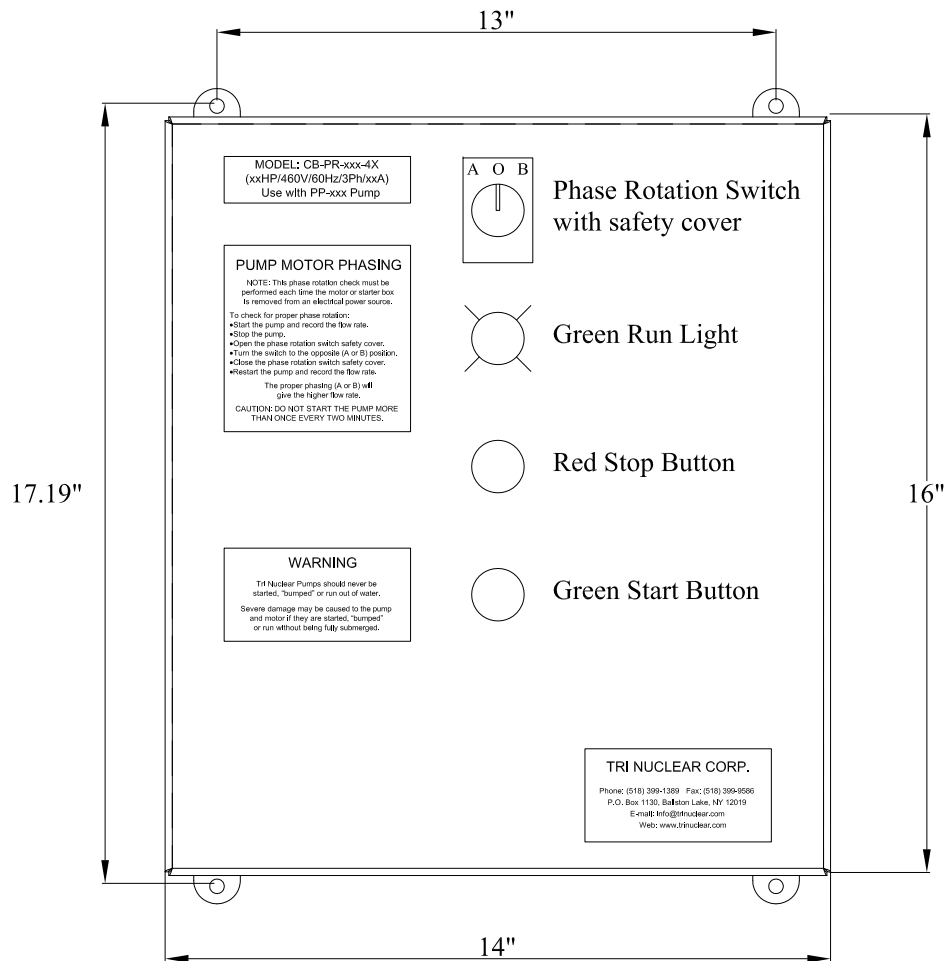
Note:

- Housed in a 16" x 14" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a phase reversing switch which eliminates the need to swap leads to perform a phase rotation check.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-PR-*-4X on a UT-10A control panel.

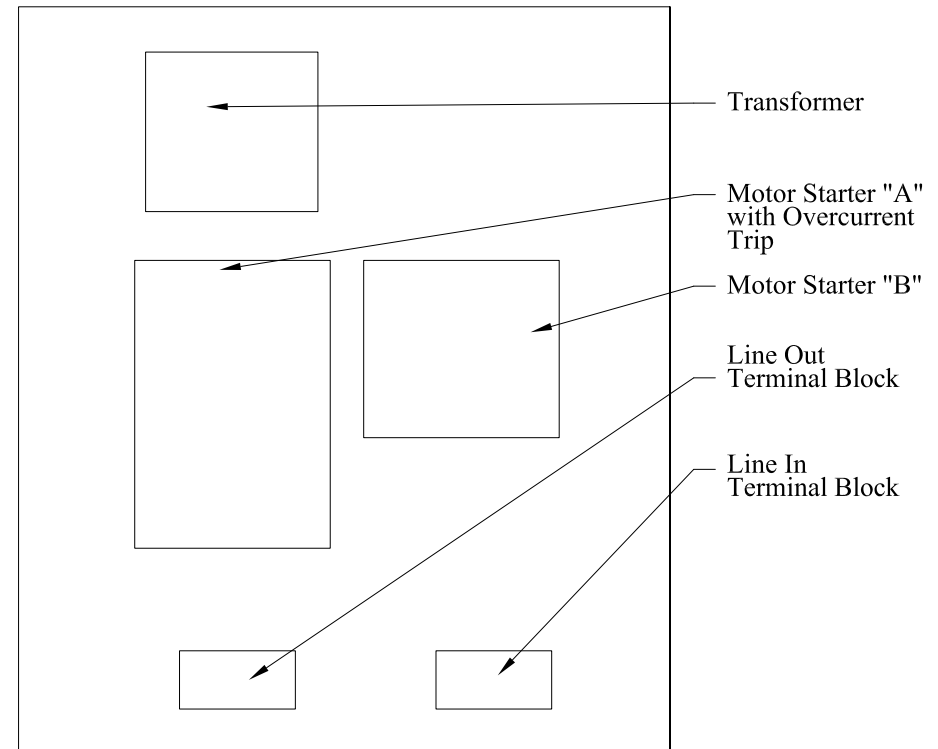
Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-40SC	CB-PR-40-4X	1-1/2HP	3.7 amps
PP-100P	CB-PR-100P-4X	2-1/2HP	3.9 amps
PP-100SC	CB-PR-100-4X	2HP	4.4 amps
PP-260SC	CB-PR-260-4X	5HP	9.9 amps
PP-600SC	CB-PR-600-4X	15HP	24.5 amps
PP-1000SC	CB-PR-1000-4X	20HP	32.0 amps

<div>Tri Nuclear Corp.</div> <div>P.O. Box 1130, Ballston Lake, NY 12019</div>			
Phase Reversing Pump Control Box Electrical Schematic			
Model No.	CB-PR-*-4X	Rev. Date	Rick Russell 05/10/12
Dwg.	TNC-018-02	Apv'd Date	James L. Warden 05/10/12
Brochure		Rev.	B
Page 1 of 2			

CONTROL BOX FRONT





CONTROL BOX INSIDE



To check for proper phase rotation of the pump motor, turn on the unit and record the flow rate. Switch the phase of the pump using the phase rotation switch, start the pump and again record the flow rate. The proper phasing will give the higher flow rate.

To change the phase of the pump, stop the pump (if running), open the safety cover, rotate the switch to the Phase A or B position, close the safety cover, and restart the pump.

This phase rotation check must be performed each time the motor or starter box is disconnected from the electrical power source.

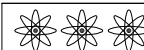
		Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019			
Phase Reversing Pump Control Box Electrical Schematic					
Model No.	CB-PR-xx-4X	Dwg.	TNC-018-02	Rev.	B
				Page	2 of 2

A B C D E F G H



- Control Box is UL508 Rated and meets the requirements of NFPA70.
- Housed in a 16" x 14" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a phase reversing switch which eliminates the need to swap leads to perform a phase rotation check.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-PR-xx-4XP on a UT-10A control panel.

Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-40SC	CB-PR-40-4XP	1-1/2HP	3.7 amps
PP-100P	CB-PR-100P-4XP	2-1/2HP	3.9 amps
PP-100SC	CB-PR-100-4XP	2HP	4.4 amps
PP-260SC	CB-PR-260-4XP	5HP	9.9 amps
PP-600SC	CB-PR-600-4XP	15HP	24.5 amps
PP-1000SC	CB-PR-1000-4XP	20HP	32.0 amps



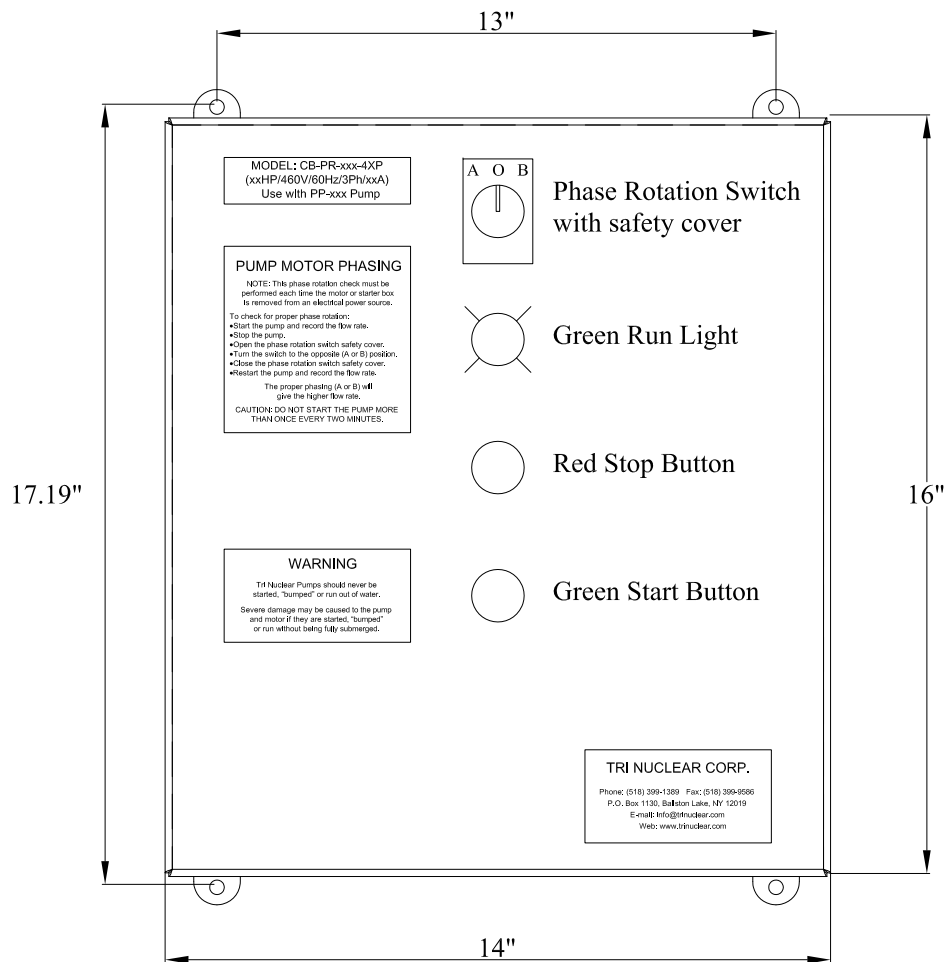
Tri Nuclear Corp.
P.O. Box 1130, Ballston Lake, NY 12019



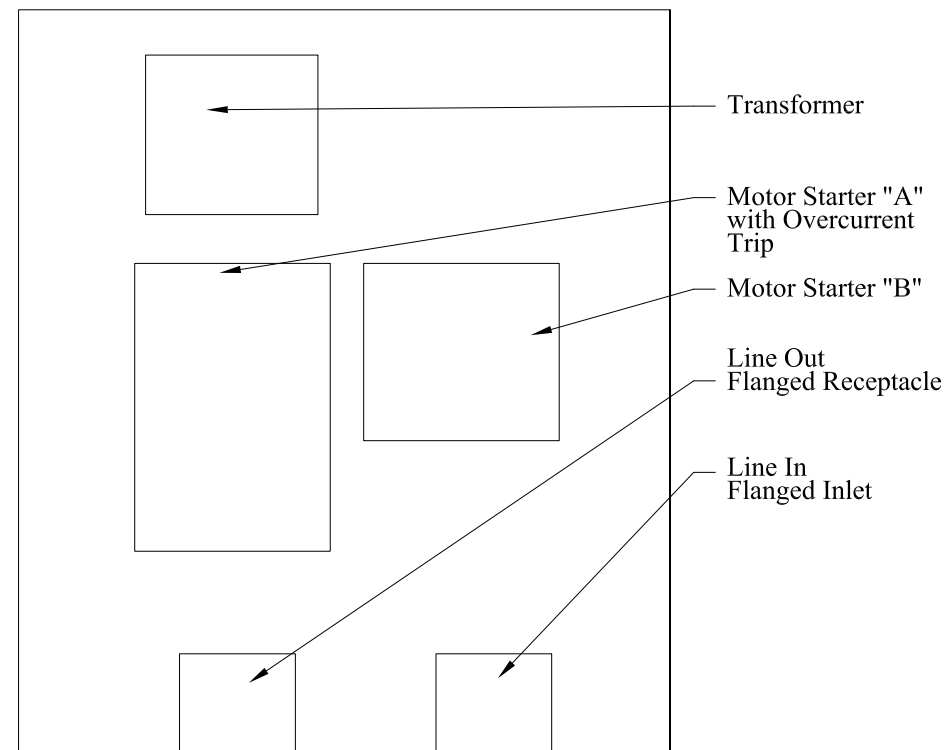
Phase Reversing Pump Control Box Electrical Schematic

Model No. CB-PR-xx-4XP	Rev. Rick Russell Date 05/10/12	Brochure	
Dwg. TNC-018-07	Apv'd James L. Warden Date 05/10/12	Rev. A	Page 1 of 2

CONTROL BOX FRONT



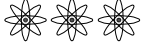

CONTROL BOX INSIDE



To check for proper phase rotation of the pump motor, turn on the unit and record the flow rate. Switch the phase of the pump using the phase rotation switch, start the pump and again record the flow rate. The proper phasing will give the higher flow rate.

To change the phase of the pump, stop the pump (if running), open the safety cover, rotate the switch to the Phase A or B position, close the safety cover, and restart the pump.

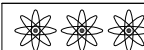
This phase rotation check must be performed each time the motor or starter box is disconnected from the electrical power source.

 Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019			
Phase Reversing Pump Control Box Electrical Schematic			
Model No.	CB-PR-xx-4XP	Dwg.	TNC-018-07
Rev.	A	Page	2 of 2

A B C D E F G H

- Control Box is UL508 Rated and meets the requirements of NFPA70.
- Housed in a 16" x 14" NEMA 4X fiberglass enclosure.
- This Pump Control Box has a phase reversing switch which eliminates the need to swap leads to perform a phase rotation check.
- This Pump Control Box has a solid state controller with an adjustable overcurrent trip.
- Mount CB-PR-xx-4XP-380 on a UT-10A control panel.

Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-40SC	CB-PR-40-4XP-380	1-1/2HP	3.4 amps
PP-100P	CB-PR-100P-4XP-380	2-1/2HP	7.8 amps
PP-100SC	CB-PR-100-4XP-380	2HP	4.2 amps
PP-260SC	CB-PR-260-4XP-380	5HP	9.6 amps
PP-600SC	CB-PR-600-4XP-380	15HP	24.0 amps
PP-1000SC	CB-PR-1000-4XP-380	20HP	32.0 amps



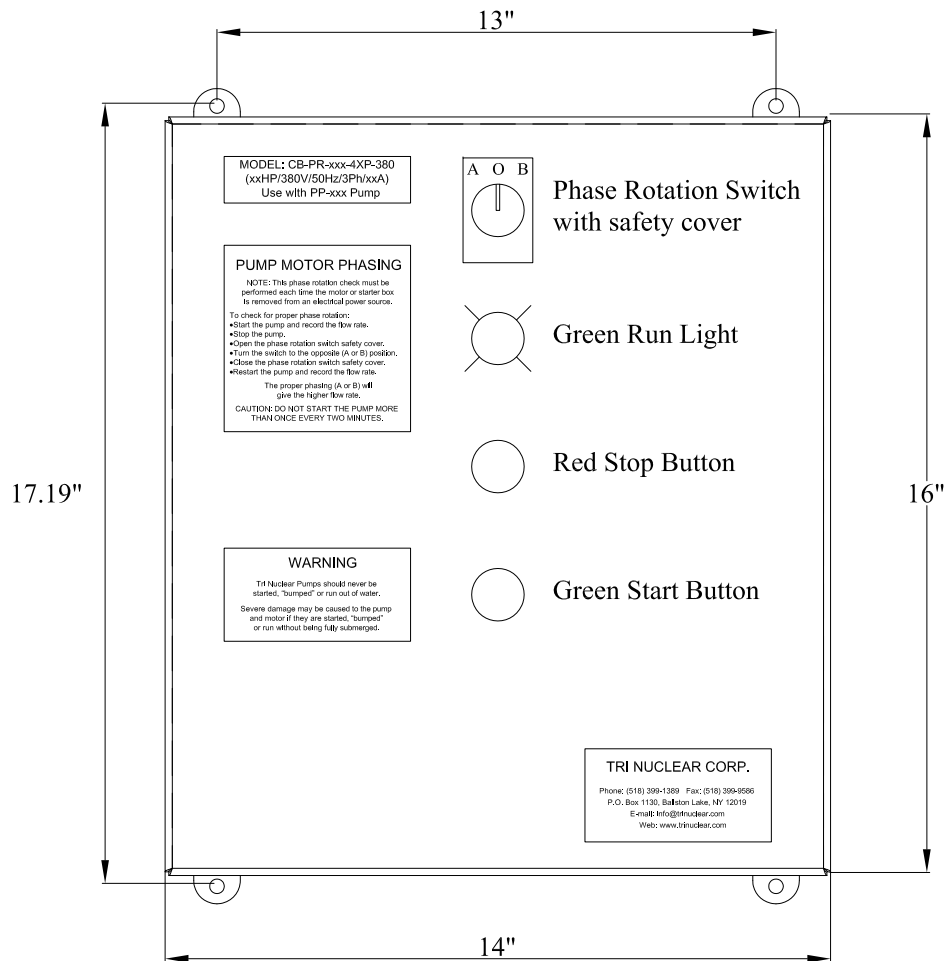
Tri Nuclear Corp.
P.O. Box 1130, Ballston Lake, NY 12019



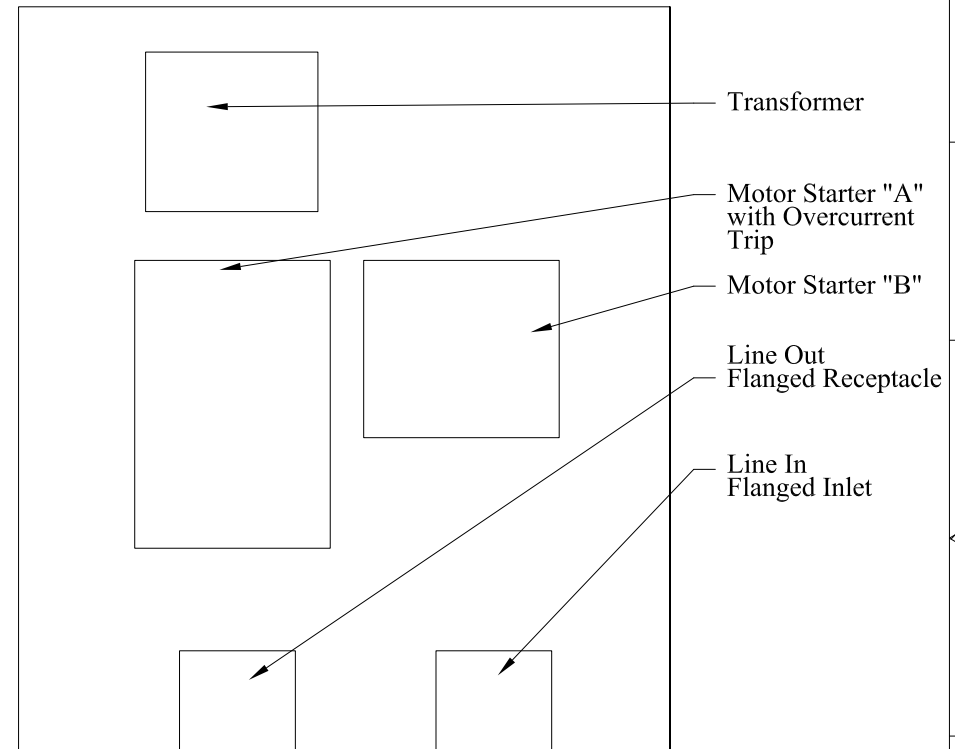
Phase Reversing Pump Control Box Electrical Schematic

Model No. CB-PR-*-4XP-380	Drawn Rick Russell Date 05/10/12	Brochure	
Dwg. TNC-018-08	Apv'd James L. Warden Date 05/10/12	Rev. -	Page 1 of 2

CONTROL BOX FRONT





CONTROL BOX INSIDE



To check for proper phase rotation of the pump motor, turn on the unit and record the flow rate. Switch the phase of the pump using the phase rotation switch, start the pump and again record the flow rate. The proper phasing will give the higher flow rate.

To change the phase of the pump, stop the pump (if running), open the safety cover, rotate the switch to the Phase A or B position, close the safety cover, and restart the pump.

This phase rotation check must be performed each time the motor or starter box is disconnected from the electrical power source.

 Tri Nuclear Corp. P.O. Box 1130, Ballston Lake, NY 12019			
Phase Reversing Pump Control Box Electrical Schematic			
Model No.	Dwg.	Rev.	Page
CB-PR-*-4XP-380	TNC-018-08	-	2 of 2