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Skimmer/Filter/Pump Unit

Assembly & Operating Instructions

Model SFP-100

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Tri Nuclear Record of Revision

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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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SKIMMER/FILTER/PUMP
(Model SFP-100)

Operating Instructions

1.0 INTRODUCTION

The Model SFP-100 is a self contained portable surface water skimmer that is designed to be operated independent of any other Tri Nuclear or plant support equipment. It can operate efficiently with flow rates between 50 and 150 GPM.

The SFP-100 is designed to provide a skim perimeter of 9-1/2 ft. at flow rates between 50-150 GPM. This permits a thin overflow depth, which is necessary to effectively use water tension to skim pool surface water and not dilute the overflow stream with sub-surface water.

When putting the unit into operation, ballast water is added to initially adjust and maintain the correct floating level of the skimmer. The overflow trough directs the overflow water to the bottom outlet, through the filter, through the pump, and out the discharge diffuser.

The floating overflow weir consists of a red polyester skirt banded to the OD of the overflow trough. The weir has an internal 1" flexible tube that maintains proper level control over variable flow rates of skimming operations

The following paragraphs describe the equipment components shown on Tri Nuclear Drawing TNC-017-02 and following photographs.

2.0 EQUIPMENT DESCRIPTION

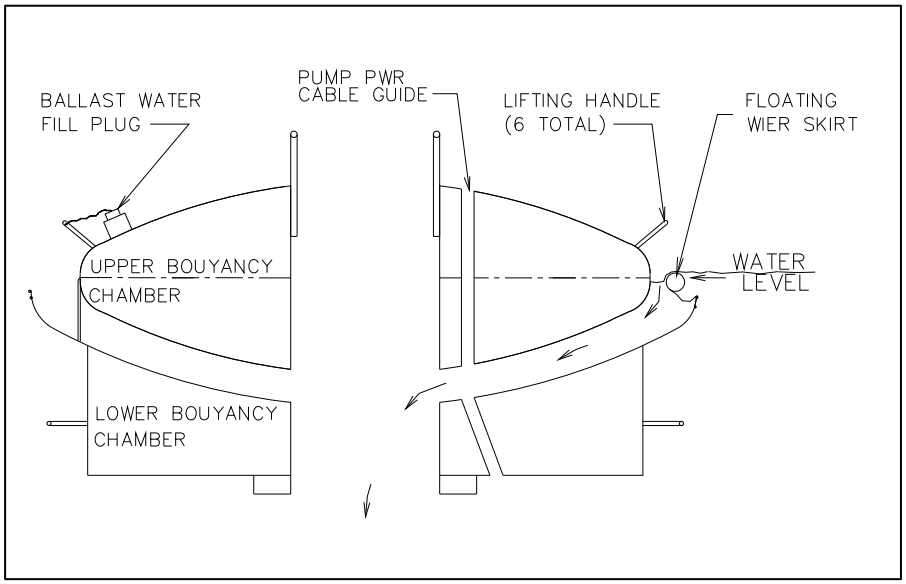
Equipment Guide List

For
SKIMMER/FILTER/PUMP
Model SFP-100

TNC Part Number	Description	SFP-100 QTY
SFP-100 Upper Float Chamber	36in dia skimmer upper float chamber. Contains the upper and lower buoyancy chambers	1
SFP-100 Filter Housing	SFP-100 Filter housing for (1) Tri Nuclear Filter Cartridge with 3in discharge Victaulic connection.	1
PP-100P	2-1/2 HP 460V/3PH/60Hz AC submersible pump with 3in suction Victaulic connection and SS Victaulic coupling. Includes 2in discharge pipe with Flow Meter connection & male camlock, 100 ft non removable 12/4 SOOW power cable, and (1) 460V/3ph/30amp NEMA 4X twistlock plug.	1
CB-PR-100P-4XP-	2-1/2 HP 460V/3Ph/50Hz PHASE REVERSING control box, NEMA 4X SS, 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 Prosser Pump power cable.	1
FM-100	Flow Meter Kit, includes 0-200 GPM analog meter and paddlewheel flow sensor w/100 ft cable	1
PH-2x10	2” x 10’ hose with MxF camlock couplers	1
UT-8A-1.125	2in Diffuser pipe assembly x 14”lg. with an internal 1-1/8in orifice	1
GS-SFP-100-NP	1/8in thick Neoprene for sealing the Filter Tube and the SFP-100 Upper Float Chamber.	1
UT-10A	Mounting Panel for mounting Flow Meter and Phase Reversing Control Box	1
AS-2	Assembly Stand for assembling the SFP-100	1

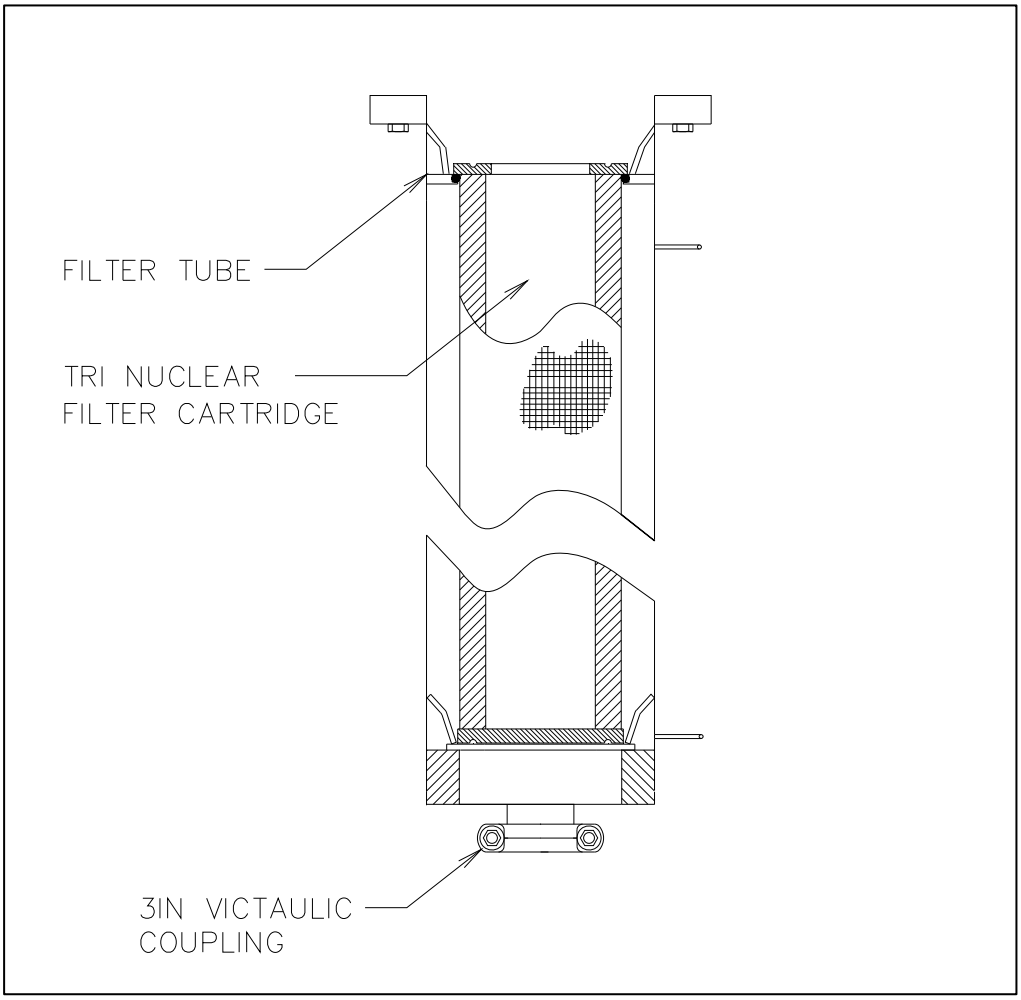
2.1 TOP FLOAT AND OVERFLOW TROUGH

This sub-assembly consists of the top primary buoyancy float welded with three legs to the overflow trough dished head, and the secondary sealed buoyancy float welded to the underside of the overflow trough. Both buoyancy floats have an internal cable way to allow for the passing of the pump power cable and flow meter cable. The primary buoyancy float also contains a 3/4in male camlock fitting to allow for the addition of ballast water.



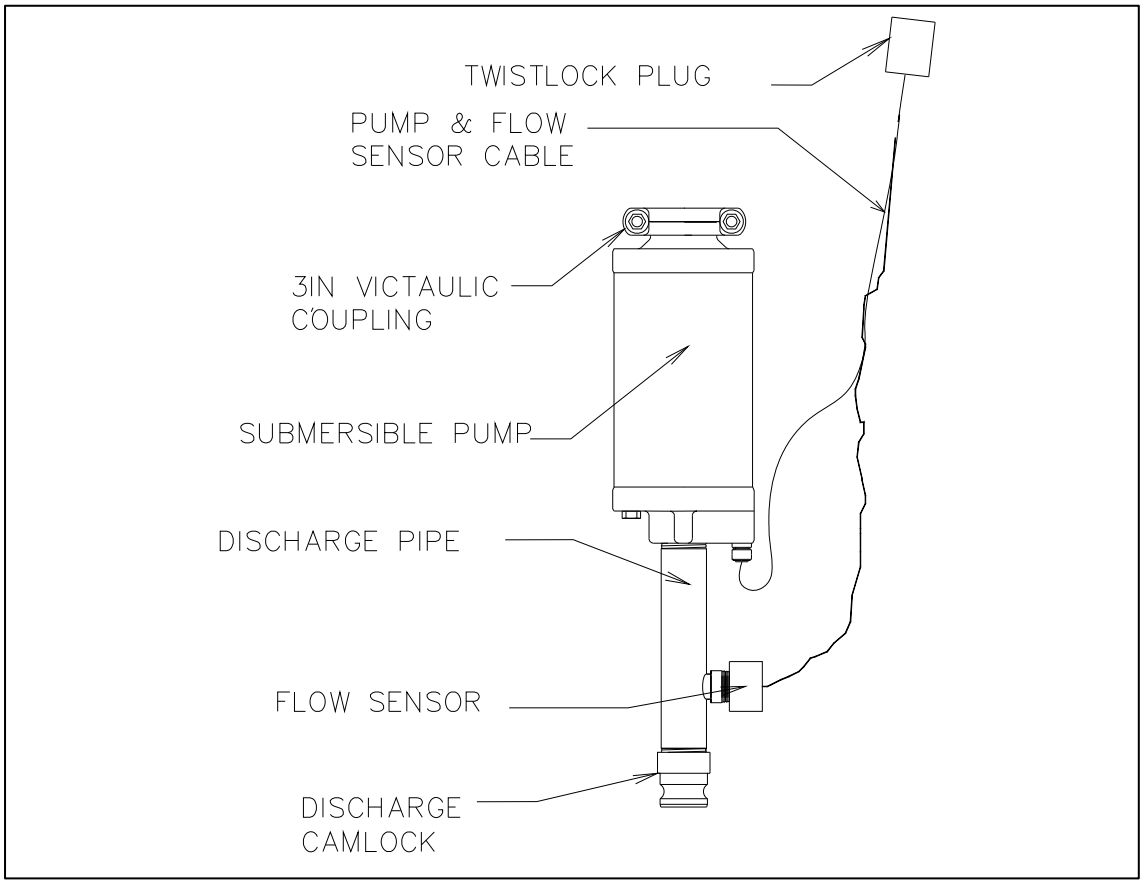
2.2 FILTER HOUSING

The filter housing bolts to the bottom of the secondary buoyancy chamber and is designed to hold one standard Tri Nuclear filter cartridge. There is a neoprene gasket that seals the filter housing to the bottom of the buoyancy chamber. The outlet of the filter housing uses a 3" Victaulic connection to connect with the suction of the pump.



2.3 PUMP AND DISCHARGE PIPE

The pump is a 2-1/2HP, 460V/3Ph/60Hz or a 380V/3Ph/50hz, single stage submersible centrifugal pump. The pump comes equipped with a 100' "non-removable" SO power cable with a Twist Lock plug. There is a 2in male camlock attached to the end of the pump discharge pipe. The discharge pipe also contains the flow meter connection.



Pump Type	HP	Volt	Hz	NEMA Start Code	Amperage	
					Full Load	Locked Rotor
PP-100P	2.5	460	60	J	3.9	24.6
PP-100P-380	2.5	380	50	J	7.8	49.2

PP-100P Pump with Discharge Pipe installed and Flow Meter Fitting

2.4 ELECTRICAL CONTROL BOXES

2.4.1 CB-100P ***Supplied with most SFP-100 units shipped before January 2012.***

The CB-100P control box is a NEMA 1 breaker box that contains a combined starter breaker and thermal overloads. The pump is started when the breaker is closed, and stopped when the breaker is opened.

2.4.2 CB-PR-100P-4XP (-380) PHASE REVERSING CONTROL BOX WITH TWIST LOCK PLUGS ***Supplied on all SFP-100 units shipped after January 2012.***

The CB-PR-100P-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 CB-PR-100P-4XP-380 is a NEMA 4X type enclosure (14x16) and has two 380V/3Ph/50Hz solid state controllers with an single adjustable over current trip.

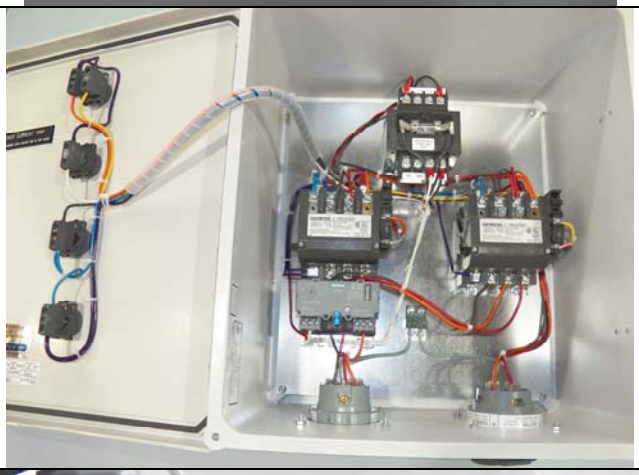
The control box has a "Phase Rotation Switch" with safety cover, start/stop pushbuttons and a green "run" indicating light on the front of the panel.

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 PC-50 drop cable and the PP-100P (-380) pump power cable to the control box without drilling and connecting bare cables to internal terminal blocks in the control box.

See Drawing TNC-018-08 for 380V Phase Reversing Control Box details

CB-PR-260-4XP shown (all others similar) The Phase Rotation Switch has a safety cover to prevent inadvertent actuation.	
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.	

2.5 PP-100P POWER CABLE

The PP-100P Pump Power cable is non removable 100’ 12/4 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.

PP-100P Pump Power Cable shown with the the male Twist Lock connection.	

2.6 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.	

2.7 FLOW METER & SENSOR

The SFP-100 flow meter is installed to provide a gross indication of system flow. System flow rate is a gauge for determining change in pressure drop through the filter cartridge. Under normal operations a filter would be changed out when system flow rate drops to ~50% of clean filter value.

The flow meter used with the SFP-100 is a self-powered analog meter that provides flow indication from 0-200GPM. The flow meter uses the amplitude of the flow sensor signal to drive the 100-microamp meter.

The flow sensor for the SFP-100 is a paddlewheel type flow sensor. The paddlewheel has a re-enforced sleeve that rotates on titanium shaft and is designed to minimize wear of the rotor. When water flows past the paddlewheel and it rotates, the flow sensor generates a sinusoidal waveform relating its frequency and amplitude directly to the flow rate. The sensor comes equipped with 100ft of instrument cable.

Flow Sensor Specifications:

Output frequency:	5-6 Hz/fps nominal
Flow Range:	1-50 fps
Linearity:	± 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 ± 2% at full deflection

Analog Flow Meter FM-260 shown (FM-600 similar)	
Paddlewheel Flow Sensor	

2.8 MOUNTING PANEL:

The UT-10A mounting panel mounts the flow meter and control box in one convenient location. The mounting panel is designed to hang from a rail (as shown).

CB-PR-260-4XP mounted on the UT-10A Mounting Panel. All other control boxes mount is a similar fashion.	

2.9 TRI NUCLEAR FILTER CARTRIDGES

Tri Nuclear has designed our Filter Cartridges so they are interchangeable between all models of Tri Nuclear equipment (UFV-100, 260, 600, 1000, SFP-100 etc..).

Design Data:

Size:	6in dia x 30in long
Flow:	Inside to outside
Media:	Pleated Polyester
Shroud:	18x18 Stainless Steel Mesh
Storage:	Designed for long term underwater storage
Max D/P:	25PSID
Max Flow:	150 GPM per filter
Max Temp:	140F

Filter Cartridge Data					
TNC Part No.	**Cartridge Size**	**Size Rating**	**Media Area**	**Media Type**	**Weight Each**
VCPH-0.2G	0.2 µ (micron)	Absolute	52 Sq. Ft.	Micro Glass	6 Lbs.
VCPH-0.3PE	0.3 µ (micron)	Nominal	60 Sq. Ft	Polyester	6 Lbs.
VCPH-1PE	1.0 µ (micron)	Nominal	62 Sq. Ft	Polyester	4.21 Lbs.
VCPH-5PE	5.0 µ (micron)	Nominal	85 Sq. Ft	Polyester	3.83 Lbs.
VCPH-10PE	10.0 µ (micron)	Nominal	64 Sq. Ft	Polyester	4.21 Lbs.
VCPH-20PE	20.0 µ (micron)	Nominal	64 Sq. Ft	Polyester	4 Lbs.

Typical Tri Nuclear Filter Cartridge showing the open top and solid bottom.	

Cut away view of a typical Tri Nuclear Filter Cartrige	
Looking into a standard Tri Nuclear Filter Cartridge	

Notes concerning the Filter Cartridge design:

- Tri Nuclear Filter Cartridges are designed for inside to outside flow. This keeps major contamination on the inside of the filter cartridge and reduces contamination exposure to workers during filter change out and transfer.
- The Polyester filter media has a higher dirt loading capacity than other similar media and results in longer filter runs. It also has a higher resistance to gamma radiation.
- CAUTION: At 10^6 RADS filter cartridges can start to break down

Guidelines for filter selection:

- The 10 micron filter VCPH-10PE is normally chosen for high dirt loading when vacuuming settled particulate.

- The 5 micron filter VCPH-5PE will capture material that might bypass the 10 micron during vacuuming.
- The 1 micron filter VCPH-1PE is excellent for water clarity issues.
- The 0.3 micron VCPH-0.3PE filter is used for "polishing" when water clarity is "a must".

2.10 DISCHARGE HOSE

Supplied with all SFP-100 units shipped after July 2012

The SFP-100 comes equipped with one 2" x 10ft hose with male x female cam lock couplers that is connected to the discharge of the PP-100P pump in order to move water away from the unit for better water circulation.

2.11 DIFFUSER PIPE (UT-8A-1.125)

Supplied with all SFP-100 units shipped after July 2012

This 2in pipe assembly (2-3/8" diameter x 14"lg.) has an internal 1-1/8in orifice and it is connected to the 2" ***discharge*** hose from the PP-100P pump on the SFP-100.


UT-8A Diffuser Pipe

The diffuser and PH-2x10 discharge hose serves two important functions. The first is they minimize the high velocity discharge water exiting the hose and prevents hose-end whipping.

The second function is the hose and diffuser pipe discharge water a sufficient distance away from the SFP-100 to greatly minimize any "upflow" along the skimmer pump, filter tube and buoyancy chambers.

This upflow can disrupt the proper skimmer operation due to the fact it can "short circuit" the water flow at the skimmer skirt interface.

In a typical Rx Cavity or Spent Fuel Pool, this upflow from a SFP-100 operating without a discharge hose and diffuser pipe (P/N: PH-2x10 & UT-8A-1.25) can be difficult to detect unless there is a significant amount of debris on the surface of the water.

2.12 SFP-100 Gasket (P/N: GS-SFP-100-NP)

A 1/8in thick Neoprene gasket is installed between the Filter Tube and Upper Float Chamber.

2.13 ASSEMBLY STAND (AS-2)

An assembly stand is provided with the SFP-100 to provide stability when assembling the Filter Housing to the PP-100P Pump and the upper float chamber to the Filter Housing.

3.0 EQUIPMENT AS SHIPPED

(This is a general description of how the equipment is normally shipped. Packaging may differ depending on customer shipping requirements)

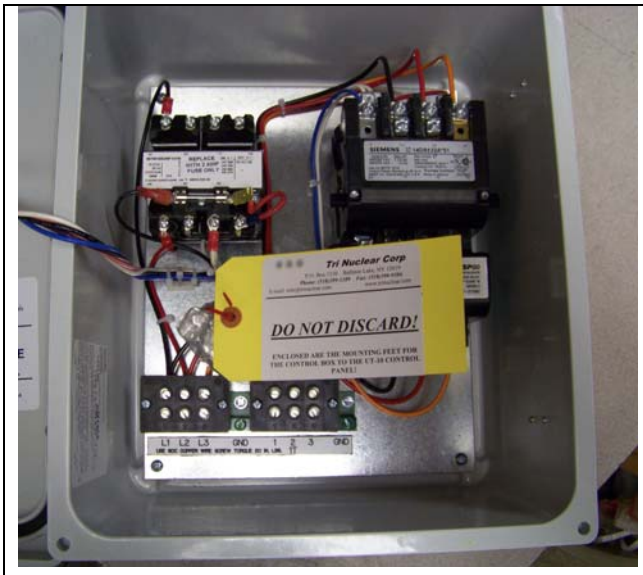
The SFP-100 is shipped in an unassembled condition in a wooden crate.

TOP FLOAT AND OVERFLOW TROUGH - This portion of the SFP-100 is located in the upper section of the crate and cribbed in place with standard 2x4's.

FILTER HOUSING, PUMP, HOSE, FLOW METER KIT, MOUNTING PANEL, AND DIFFUSER PIPE – these components are located in the bottom section of the crate and secured in place with cribbing and nylon banding.

4.0 ASSEMBLY AND INSTALLATION IN POOL

4.1 Pump Control Box



Remove the control box from its cardboard box. Install the (4) mounting feet (located inside the control box) to the back of the control panel.

CB-PR-260-4XP control box shown mounted on the UT-10A Mounting Panel.

All other CB-PR-xxx-4XP boxes mount in a similar fashion.

4.2 Pump / Line Cable

Install the PC-50 line in Twist Lock Plug to the CB-PR-100P control box (shown on right) Connect the bare end of the cable to an approve in plant electrical power source Install the power cable from the PP-100P Twist Lock Plug to the CB-PR-100P-4XP control box (shown on left)	

NOTE: Run the pump power cable will through the clips on the filter housing and through the upper float chamber BEFORE the Twist Lock plug is installed on the power cable.

4.3 Pump Phase Rotation Check

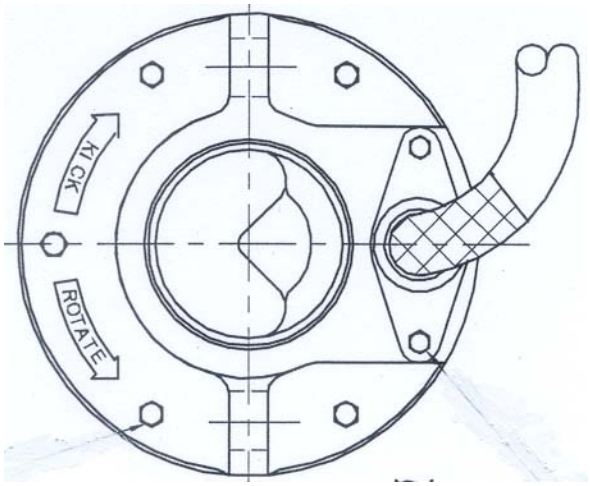
IMPORTANT - READ THIS STEP CAREFULLY! Do not run the pump until a proper phase rotation check is made! Running the pump in reverse for any long duration <u>WILL</u> damage the pump!

NOTE: The pump may be started (bumped) while out of water to check for proper phase rotation. It should not be left running for more than 1 minute out of water.

Suspend the pump freely by its lift lugs and momentarily start the pump and observe the "KICK".

The "KICK" should always be in a clockwise direction as viewed from the top of the pump motor housing.

Pump "KICK" is the opposite direction of pump rotation.



IMPORTANT:
Carefully inspect the Top Skimmer Skirt Float and Overflow Trough for damage.

CAUTION:
TO AVOID DAMAGE TO THE POLYESTER SKIMMER SKIRT, DO NOT USE A CUTTING KNIFE WHEN REMOVING PACKAGING FROM THIS PORTION OF THE SFP-100.

4.4 TOP FLOAT AND OVERFLOW TROUGH

This sub-assembly consists of the top primary buoyancy float welded with three legs to the overflow trough dished head, and the secondary sealed buoyancy float welded to the underside of the overflow trough. Check the position of the polyester skimmer skirt where it is banded to the OD of the overflow trough dished head; if it has shifted position, refer to section 5.5 of this procedure.

4.5 FILTER HOUSING, PUMP AND DIFFUSER ASSEMBLY

Open the wooden box and inspect the Filter Housing, Pump with Diffuser Assembly and Flow meter for damage. The Pump and discharge pipe come pre-assembled from Tri Nuclear.

Place the Assembly Stand (AS-2) on the floor and install the PP-100P pump male camlock fitting into the female camlock on the Assembly Stand.

Remove the Victaulic split collar coupler with two bolts from the submersible pump leaving the neoprene gasket on the pump. In a vertical position place the filter housing on top of the submersible pump bringing the two mating 3" pipe nozzles together. While supporting the filter housing, slide the neoprene gasket collar equally between the two pipes, but not into the machined groove. The two split collars are now assembled over the gasket and into the two machined pipe grooves. Install and tighten the two coupler bolts and tightened until the two collars are seated metal-to-metal.

Note: The Victaulic coupler joining the filter housing to the submersible pump is not a rigid type connector. After installing, there will be some flexibility.

Place the 1/8in neoprene gasket on the flange of the SFP-100 Filter Tube. Ensure the holes on the gasket align with the holes on the Filter Tube.

Using an overhead crane, lift the SFP-100 Upper Float Chamber. Remove the six (6) 7/16in x 3/4in long SS bolts & split lock washers from the bottom mounting flange. Position SFP-100 Upper Float Chamber on the top of the filter housing & pump assembly.

These two components have mating flanges that require proper orientation. The two flanges should be positioned so that the electric cable tubes through the top float sections are directly in-line with the two (2) rod "U" clips welded to the side of the filter housing.

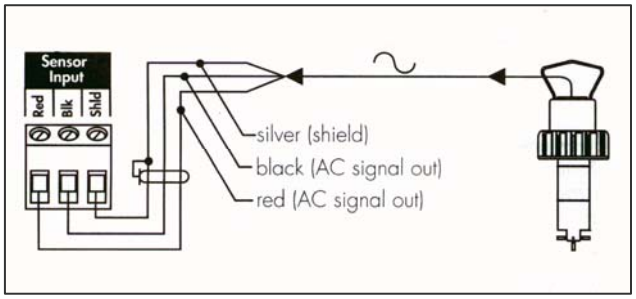
Install and tighten the six (6) 7/16in x 3/4in long SS bolts & split lock washers. The bolts must be tightened in a "Star" pattern. Continue tightening the bolts until all six (6) split lock washers are completely "flat".

4.6 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-10A mounting panel and hung on a suitable railing for protection.

Remove the FM-100 flow meter from its box. Verify the analog flow meter has a 0-200GPM scale and mount the flow meter to the mounting panel UT-10A.



Remove the FM-SR, paddlewheel flow sensor from its box. Connect the flow sensor cable to the back of the FM-100 meter using figure to the right as a guide.

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.	 

4.7 ZIP TIE CABLES TOGETHER

Zip Tie and secure the power cable and flow meter cable to the top lift handle to prevent the cable from sliding down the cable tube.

Lay-out the 100 ft. of pump power cable and flow meter cable in a straight line. Tie the two cables together with "zip-ties" every 2 feet starting at the pump end.

Approx. 50 zip-ties are in a small plastic bag in the flow meter box. These “zip-ties” are black in color and are made out of polypropylene. They will float if accidentally

dropped in the water.

4.8 INSTALL DISCHARGE HOSE AND DIFFUSER

Attach rigging lines (supplied by purchaser) to the two centered lifting fixtures found on the SFP-100 top head and carefully. Remove the AS-2 Assembly Stand from the discharge of the pump.

WARNING.

The AS-2 Assembly Stand must be removed from the discharge of the pump prior to lowering into the Rx Cavity or Spent Fuel Pool. If the AS-2 is not removed, the SFP-100 will not operate properly and severe damage to the pump may occur due to running it without water and / or running it at shutoff head.

4.9 LOWER ASSEMBLY INTO POOL

After the SFP-100 is complexly assembled, carefully lower the assembly into the pool.

5.0 OPERATION

5.1 ADDITION OF BALLAST WATER

5.1.1 Ballast water initially must be added to the top dished head primary float chamber through the top 3/4in male camlock connection in order to adjust the floating level of the unit for proper operation. Once the unit is at the proper level, the skimmer skirt will automatically adjust the overflow to maintain a minimum skimming water thickness as the flow rate varies with the gradual buildup of dirt on the filters.

5.1.2 With the filter pump SHUT OFF, add water to the float chamber until the water level is approximately even with the **circumferential weld of the upper dished head.** Depending the temperature of the water, the boric acid content, etc., added ballast water will normally vary between 1/2 to 3 gallons to achieve the proper floating level of the skimmer.

5.1.3 Reinstall the 3/4in camlock cap in the top of the float chamber; the skimmer is now ready for start-up.

5.2 NORMAL OPERATION

Ensure proper phase rotation has been performed per section 4.3

5.3 FILTER INSTALLATION

Install a new filter cartridge slowly into the filter housing using a rope filter lift tool. The filter cartridge will take several minutes to flood unless it is pre-wetted prior to installation.

NOTE: See the attached operating instruction (OI-6) for using the rope filter lift tool.

5.4 NORMAL START-UP

Start the pump. The skimmer will begin to overflow and start the skimming operation. Note that the water level and floating skirt ring will drop slightly in the trough when the pump first starts. The skimmer body will rise slightly and float a little higher in the water. This is normal during startup.

CAUTION: If the skimmer rises too high in the pool and water does not spill into the trough, this usually indicates insufficient ballast water has been added to the float chamber; recheck Section 4.2 above.

As the filter cartridge starts to plug from dirt buildup with extended operations, the flow will decrease through the skimmer. This will not significantly affect the skimming efficiency of the unit, since it is designed for a flow rate of between 50 and 150 GPM. The skirt float ring will automatically adjust its level to the flow rate and maintain an efficient thin overflow stream.

The dose rate on the filter should be periodically and carefully monitored for radiation levels, since floating crud caught by the skimmer can cause high dose rate levels on the filter cartridges. Normally, filters are changed out when at a pre determined dose rate OR when the flow rate drops to approximately 1/2 of the clean condition flow rate.

5.5 SKIMMER SKIRT REPLACEMENT

If the skimmer skirt is damaged due to ripping or if it has been exposed to high contamination levels or high dose rates, it may be necessary to replace the skirt.

5.5.1 Remove and dispose of damaged/contaminated skirt by loosening the screw clamp band that holds the skirt in place.

SK-175 Skimmer shown with skimmer skirt removed.
SFP-100 similar

5.5.2 Ensure the edge of the skimmer trough is smooth with no rough/sharp edges. With two people, place the new skimmer skirt in the skimmer trough so that the floatation tube portion is on the inside of the skimmer trough with the excess rip-stop nylon hanging over the edge of the overflow trough.

Skimmer Skirt shown pulled over the overflow trough
Note: Ensure that the hem on the rip-stop nylon is facing out.

5.2.2 Obtain the 1/2" x (approx.) 115" stainless steel screw clamp band to hold the skirt in place. Place the band on the skimmer overflow trough so that the sharp edges are facing out and tighten to just snug.

Note: Ensure that the stainless steel band is up against the lip of the overflow trough.

5.2.3 Carefully pull the skirt up so that the edge of the skirt hem catches the band. See Photo below. Tighten band using the screw clamp. The floatation tube should have freedom to move up and down uniformly within the skimmer trough.

If the overflow skirt is damaged or has built up excessive dose rates and requires replacement, procure a new skimmer skirt from Tri Nuclear Corp. The skimmer should not be operated without a floating skirt since this would defeat the basic design feature of maintaining a thin overflow stream.

6.0 PRECAUTIONS AND WARNINGS

***WARNING**:*
The AS-2 Assembly Stand must be removed from the discharge of the pump prior to lowering into the Rx Cavity or Spent Fuel Pool. If the AS-2 is not removed, the SFP-100 will not operate properly and severe damage to the pump may occur due to running it without water and / or running it at shutoff head.

CAUTION:
If the skimmer body rises too high in the water and the pump loses suction, this usually indicates insufficient ballast water has been added to the float chamber; recheck Section 5.1 above.

If the skimmer body floats too low in the water, tilts excessively and is unstable, this usually is caused by too much water in the buoyancy heads. Water will need to be removed from the buoyancy heads.

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:
To avoid damage to the polyester skimmer skirt, do not use a cutting knife when removing packaging from this portion of the SFP.

NOTE:
If the overflow skirt is damaged or has built up excessive dose rates and requires replacement, procure a new skimmer skirt from Tri Nuclear Corp. The skimmer should not be operated without a floating skirt since this would defeat the basic design feature of maintaining a thin overflow stream.

NOTE:
Perform the flow meter check before installing the SFP 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.

***NOTE*:**
The Victaulic coupler joining the filter housing to the submersible pump is not a rigid type connector. After installing, there will be some flexibility.

NOTE:
Run the pump power cable will through the clips on the filter housing and through the upper float chamber BEFORE the Twist Lock plug is installed on the power cable.

7.0 STORAGE REQUIREMENTS

7.1 Caution should be taken to ***NOT*** store any plastic components (eg. filters or hoses) near high radiation fields associated with equipment such as fuel bundles, LPRM's or control blades. Breakdown of such components can occur with accumulated exposures of 10^6R. For this reason, precautions should be taken to minimize accumulative dose for the following components: suction hose, filter cartridges, power and instrument cable, flow sensor, and electric motor. All components are chemically suitable for long term storage in the fuel pool cavity environment.

7.2 The preferred method of storing the submersible pump assembly when not in use is underwater. If stored out of water, the skimmer should not be stored in freezing temperatures. Periodically, running the pump (at least once a month) is also desirable to prevent seals from remaining in a stagnant condition.

8.0 REPLACEMENT PARTS

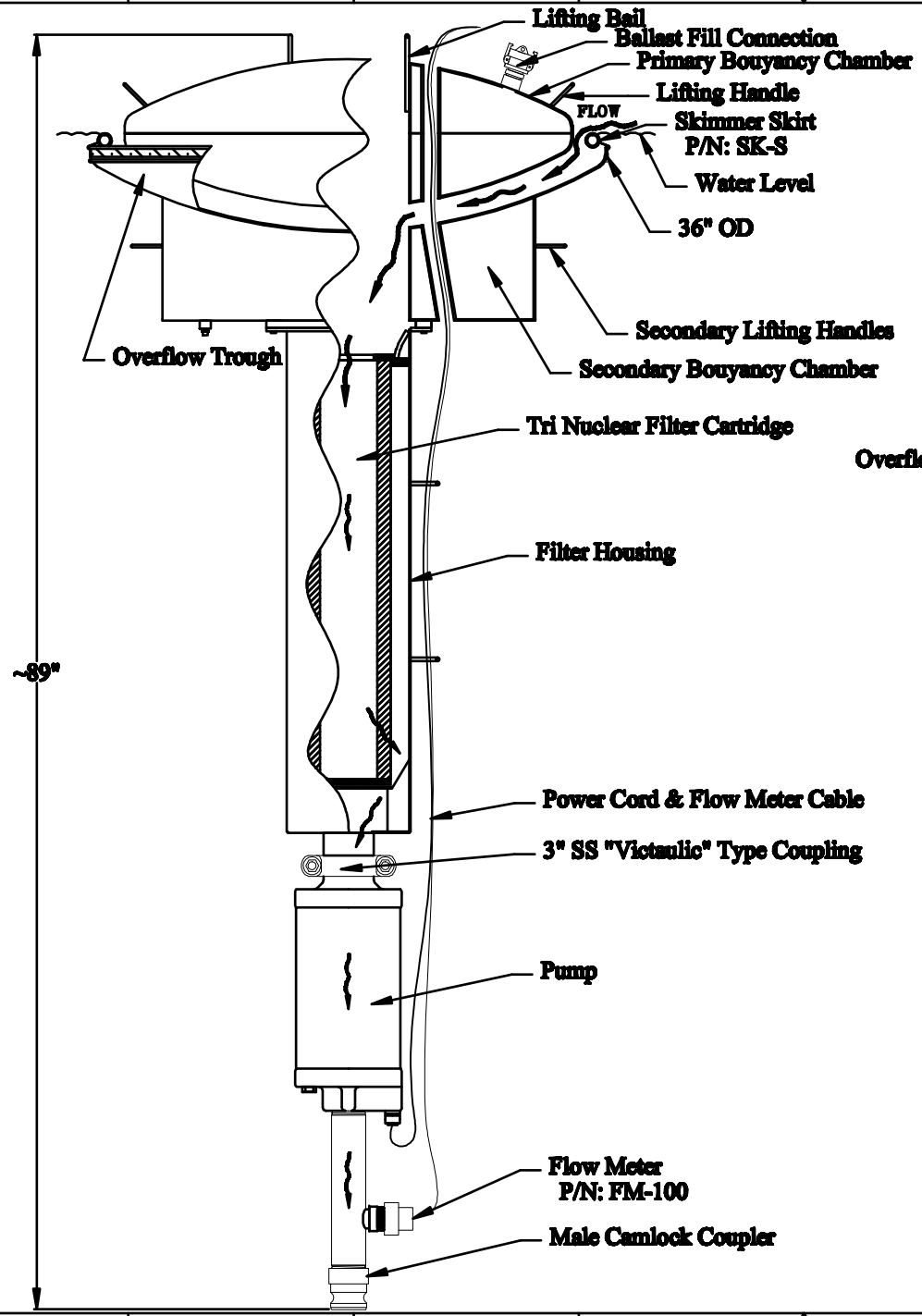
Below is a listing of **Recommended Spare Parts:**

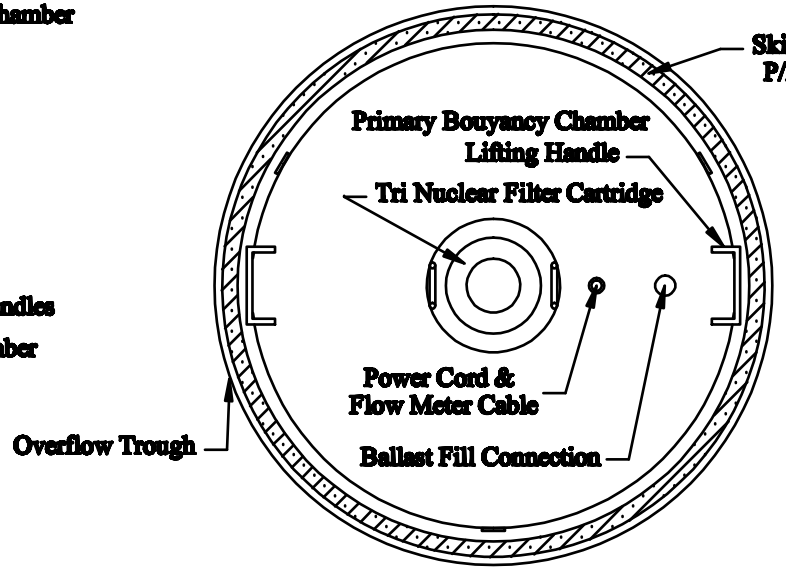
Qty	Part No.	Description
1	PP-100P	Prosser pump, 2-1/2HP/460V/3Ph/60Hz, with discharge pipe and male camlock SS Victaulic connector and CB-PR-100P-4XP PHASE REVERSING control box with Twist Lock plugs, and PC-50 drop cable with Twist Lock plug
1	CB-PR-100P-4XP-	2-1/2 HP 460V/3Ph/50Hz PHASE REVERSING 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 Prosser Pump power cable.
AR	PP-100P-380	Prosser pump, 2-1/2HP/380V/3Ph/50Hz, with diffuser, SS Victaulic connector and CB-PR-100P-4XP PHASE REVERSING control box with Twist Lock plugs, and PC-50 drop cable with Twist Lock plug
AR	CB-PR-100P-4XP-380	2-1/2 HP 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 Prosser Pump power cable.
1	FM-100	Flow meter kit - analog meter (0-200 gpm scale), flow sensor & 100' cable
1	PH-2x10	2” x 10’ hose with MxF camlock couplers
1	UT-8A-1.125	2in Diffuser pipe assembly x 14”lg. with an internal 1-1/8in orifice
1	GS-SFP-100-NP	1/8in thick Neoprene for sealing the Filter Tube and the SFP-100 Upper Float Chamber.
1	SK-S	Skimmer Skirt and stainless steel clamp
1	O-Ring	O-ring for filter tube sheet
Filter Cartridges		
AR	VCPH-0.3PE	Filter Cartridge 0.3 micron, 6”dia x 30” lg, 6/case
AR	VCPH-1PE	Filter Cartridge 1 micron, 6”dia x 30” lg, 6/case
AR	VCPH-5PE	Filter Cartridge 5 micron, 6”dia x 30” lg, 6/case
AR	VCPH-10PE	Filter Cartridge 10 micron, 6”dia x 30” lg, 6/case

9.0 ADDITIONAL INFORMATION

For additional information, or if special problems develop, please call James Warden, President of Tri Nuclear or John J. Flynn, Tri Nuclear’s Operations Manager at (518)-399-1389.

We 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.





Top View

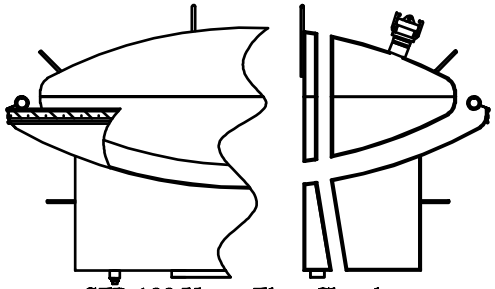
General Specifications:

- Designed for Skimming Water Surface
- 100 GPM, 1 Filter Unit
- Power Requirements: 2-1/2HP, 460V, 3 PH, 60 Hz, 3.9A
- Power Requirements: 2-1/2HP, 380V, 3 PH, 50 Hz, 7.8A
- All Material - Stainless Steel except Aluminum Pump
- System Operation: Negative Pressure
- Empty Weight (Including Pump): 280#
- Weight Full of Water (Including Pump): 350#
- Zip Tie Power Cord & Flow Meter Cable to Lifting Bail
- Pump with Non-Removable Power Cord
- Single Tri Nuclear Filter Cartridge

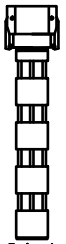
Tri Nuclear Corp.
P.O. Box 1130, Ballston Lake, NY 12019

Skimmer / Filter / Pump Unit

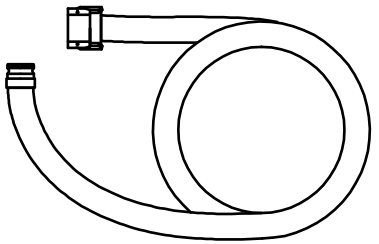
Model No. SFP-100	Rev. Date Rick Russell 08/21/12	Brochure	
Dwg. TNC-017-02	Apv'd Date James L. Weston 08/21/12	Rev. B	Page 1 of 2



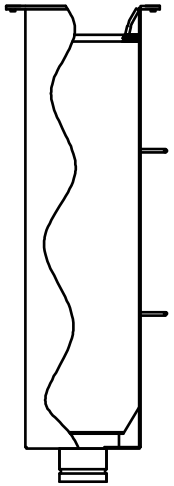
SFP-100 Upper Float Chamber



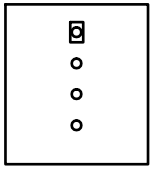
UT-8A-1.125
2" Diffuser with
1-1/8" Orifice



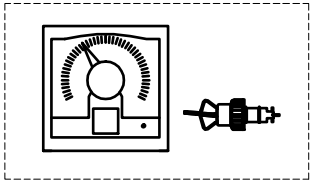
PH-2x10 Discharge Hose



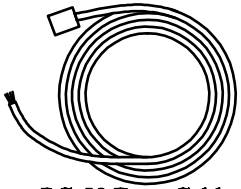
SFP-100 Filter Housing



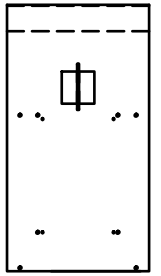
CB-PR-100P-4XP
Phase Reversing Control Box
with Twistlock Plugs



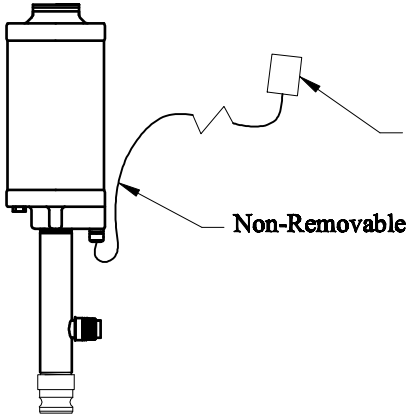
FM-100 Flow Meter Kit



PC-50 Drop Cable



UT-10A Control Panel



SFP-100 Pump & Discharge Nipple

NOTE:

All Items Shown come with the SFP-100.

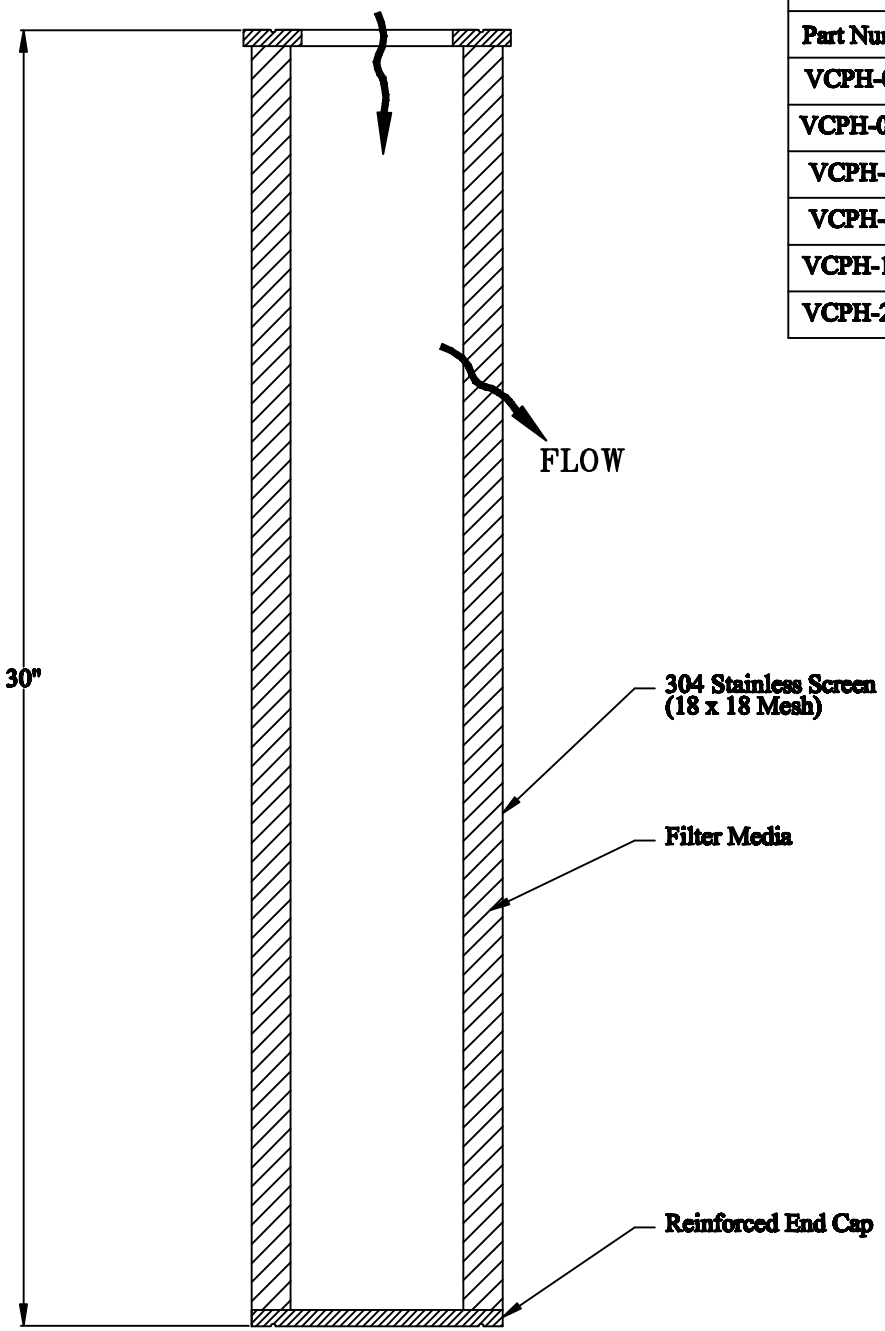
Tri Nuclear Corp.
P.O. Box 1130, Ballston Lake, NY 12019

SFP-100 System
Part Identification

Model No.	Dwg.	Rev.	Page
SFP-100	TNC-017-02	B	2 of 2

Filter Cartridge Data

Part Number	Cartridge Size	Size Rating	Media Area	Media Type	Weight Each
VCPH-0.2G	0.2 µ (micron)	Absolute	52 Sq. Ft.	Micro Glass	6 Lbs.
VCPH-0.3PE	0.3 µ (micron)	Nominal	60 Sq. Ft.	Polyester	6 Lbs.
VCPH-1PE	1 µ (micron)	Nominal	62 Sq. Ft.	Polyester	4.21 Lbs.
VCPH-5PE	5 µ (micron)	Nominal	85 Sq. Ft.	Polyester	3.83 Lbs.
VCPH-10PE	10 µ (micron)	Nominal	64 Sq. Ft.	Polyester	4.21 Lbs.
VCPH-20PE	20 µ (micron)	Nominal	64 Sq. Ft.	Polyester	4 Lbs.



General Specifications:

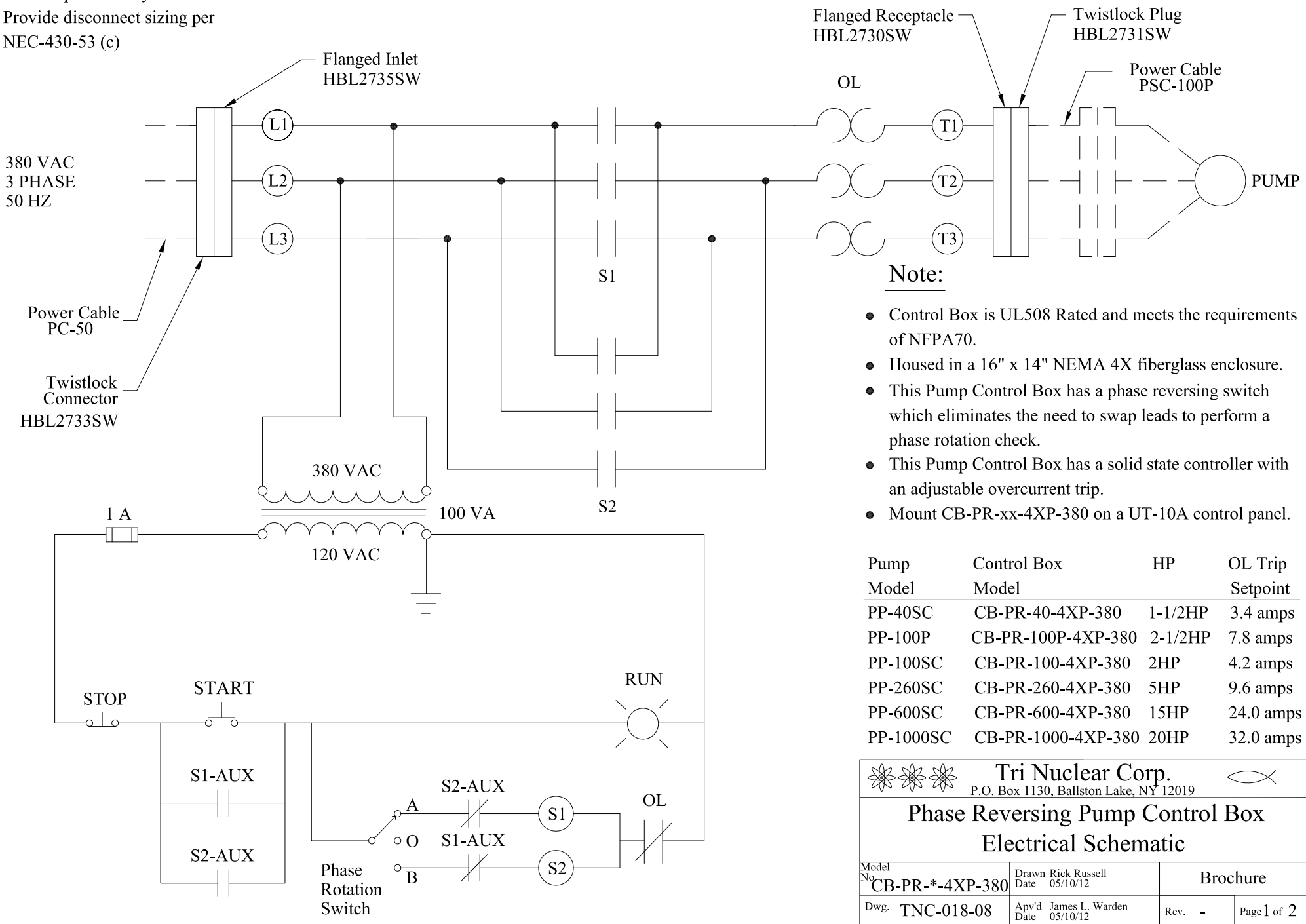
- Size: 6" Diameter x 30" Long, Open Top, Solid Bottom
- Max Flow Rate per Filter: 150 GPM
- Max Operating Differential Pressure : 25 psid
- Application: For all Tri Nuclear equipment used in PWR/BWR Plants.
- Designed for Inside to Outside Flow (Retains Crud)
- May be stored in Filter Storage Racks
- To be used with Tri Nuclear Rope Filter Lift Tool for remote grapple and transport.
- Packaged & Sold: Six Cartridges in a cardboard case.

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

Standard Tri Nuclear Filter Cartridge

Model No. VCPH-*	Drawn Rick Russell Date 09/30/11	Brochure	
Dwg. TNC-019-02	Apv'd James L. Worden Date 09/30/11	Rev. -	Page 1 of 1

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



Note:

- 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.

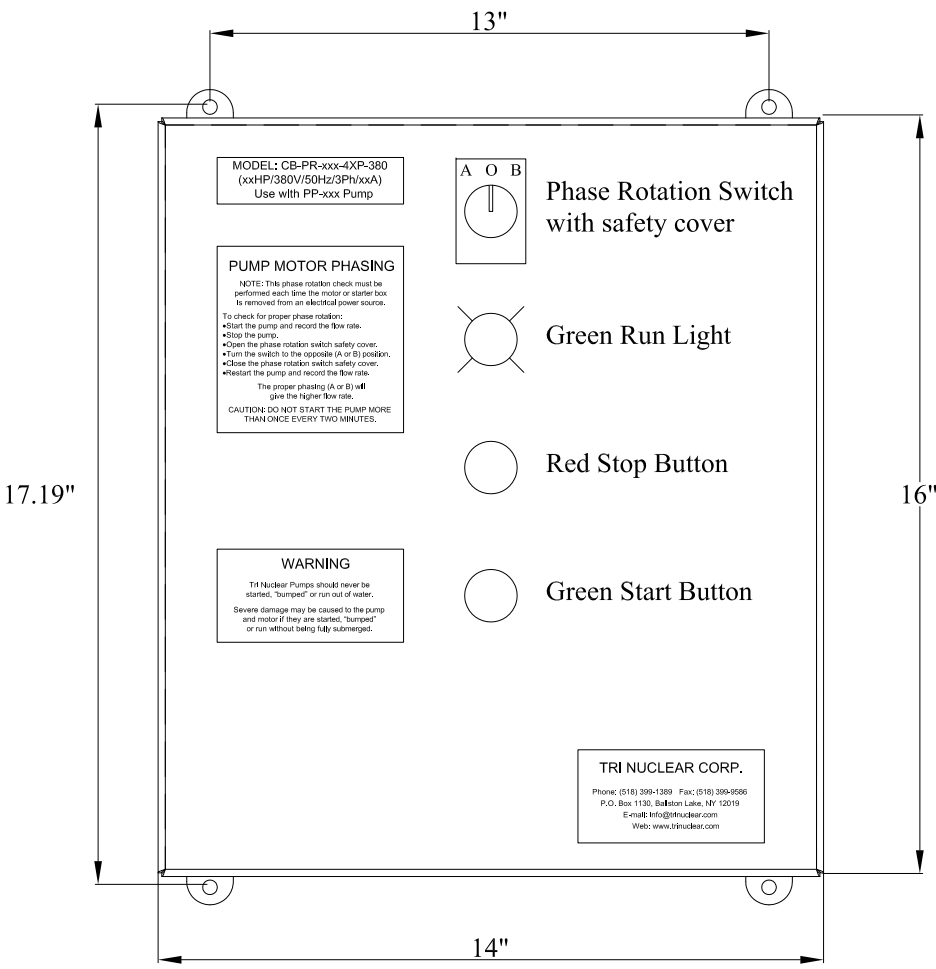
Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-40SC	CB-PR-40-4XP-380	1-1/2HP	3.4 amps
PP-100P	CB-PR-100P-4XP-380	2-1/2HP	7.8 amps
PP-100SC	CB-PR-100-4XP-380	2HP	4.2 amps
PP-260SC	CB-PR-260-4XP-380	5HP	9.6 amps
PP-600SC	CB-PR-600-4XP-380	15HP	24.0 amps
PP-1000SC	CB-PR-1000-4XP-380	20HP	32.0 amps

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

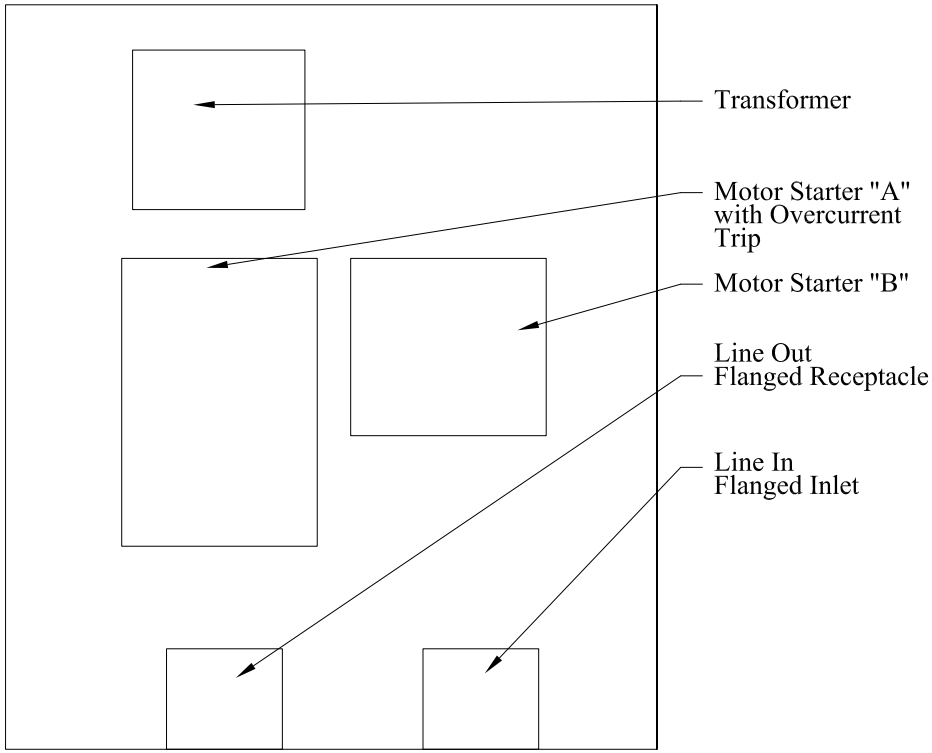
Phase Reversing Pump Control Box Electrical Schematic

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.

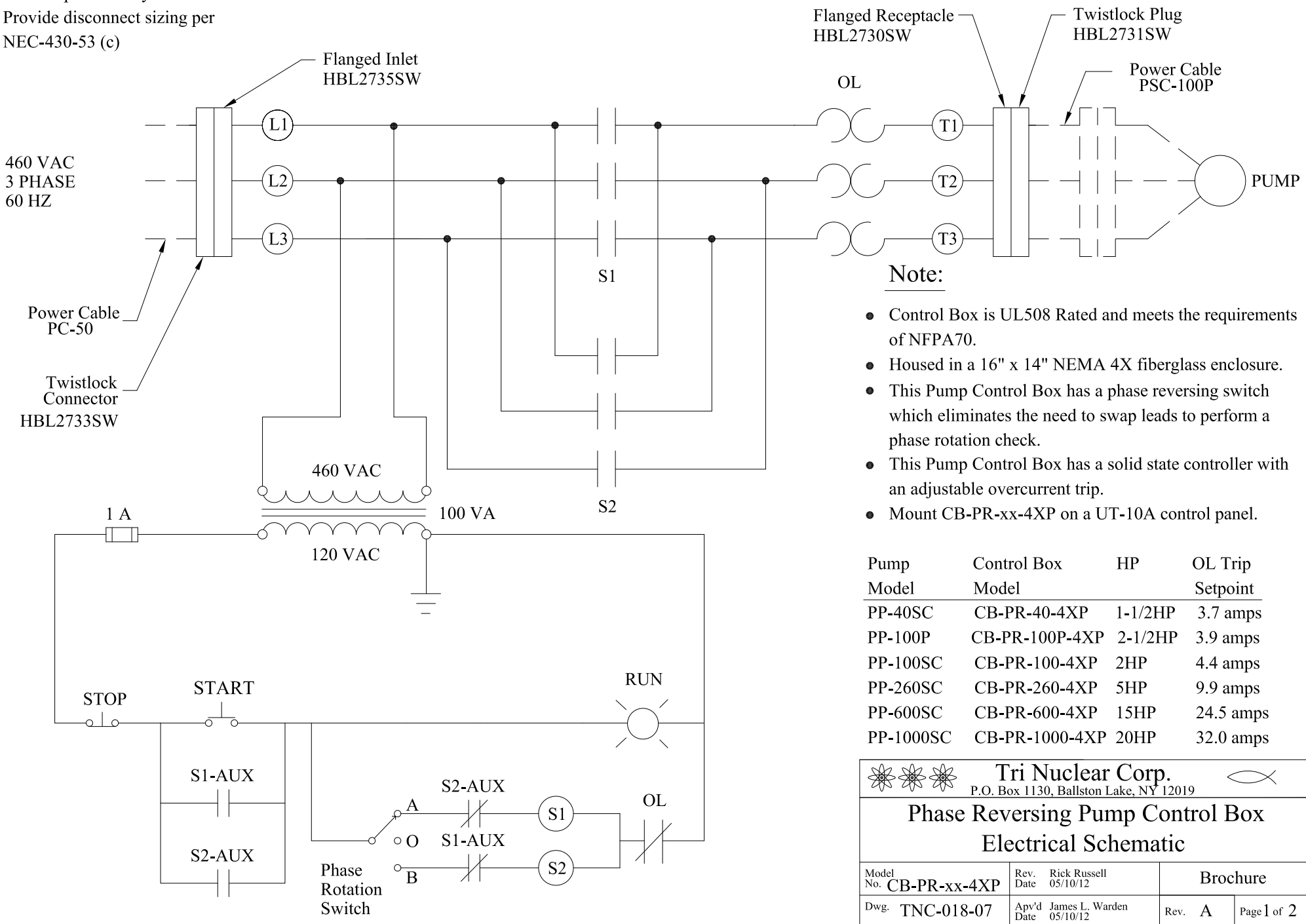
This phase rotation check must be performed each time the motor or starter box is disconnected from the electrical power source.

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

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



Note:

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- 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.

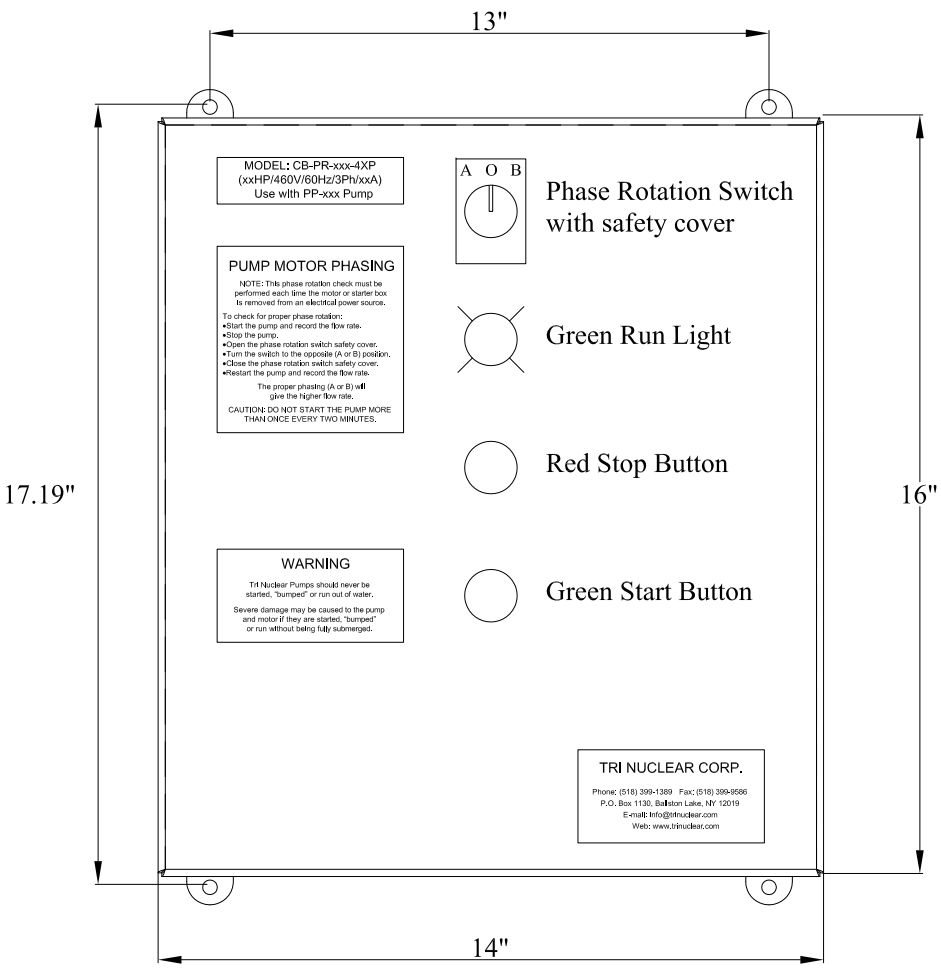
Pump Model	Control Box Model	HP	OL Trip Setpoint
PP-40SC	CB-PR-40-4XP	1-1/2HP	3.7 amps
PP-100P	CB-PR-100P-4XP	2-1/2HP	3.9 amps
PP-100SC	CB-PR-100-4XP	2HP	4.4 amps
PP-260SC	CB-PR-260-4XP	5HP	9.9 amps
PP-600SC	CB-PR-600-4XP	15HP	24.5 amps
PP-1000SC	CB-PR-1000-4XP	20HP	32.0 amps

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

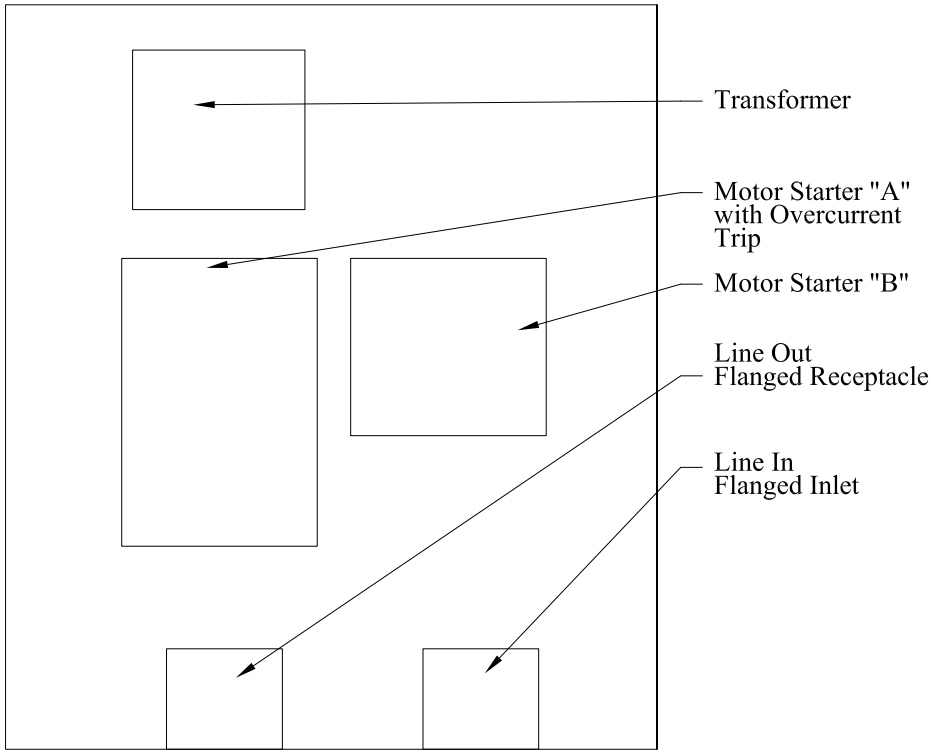
Phase Reversing Pump Control Box Electrical Schematic

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.	Dwg.	Rev.	Page
CB-PR-xx-4XP	TNC-018-07	A	2 of 2

Tri Nuclear Corp.
PO Box 1130 ♦ Ballston Lake, NY 12019 Tel. : (518) 399-1389 Fax: (518) 399-9586

Rope Filter Lift Tool

Operating Instructions

Model UT-9

Document No: OI-6 Rev 1 06/15/12
Date

Prepared By: _____ 06/15/12
John J. Flynn, Operations Manager Date

Approved By: _____ 06/15/12
James Warden, President Date

Tri Nuclear Record of Revision

Revision or Change Number	Effective Date of Revision or Change	Affected Page and/or Para #	Person Entering Revision	Revision or change Cancelled By
Rev. 0	6/26/02	Original Issue	----------	Rev. 1
Rev. 1	06/15/12	Complete Reissue	J. Flynn	

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

TABLE OF CONTENTS

Attachments:

Drawing TN-1687	Rope Filter Lift Tool
Drawing TNC-019-02	Tri Nuclear Filter Cartridge Drawing

ROPE FILTER LIFT TOOL
(Model UT-9)

Operating Instructions

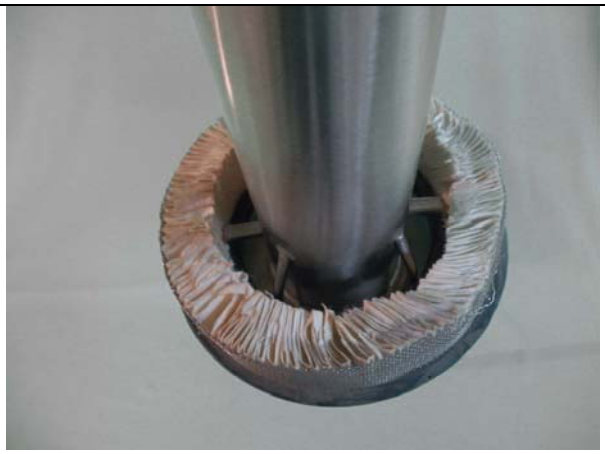
1.0 INTORDUCTION

One of the advantages of TRI NUCLEAR Underwater Filter/Vacuum Units is the ability to change-out depleted filter cartridges while the unit is still submerged on the bottom of the pool.

TRI NUCLEAR has designed a special "Rope Filter Lift Tool" Model UT-9, to change out filters underwater. A 50ft stainless steel chain, nylon line, (or equivalent) is attached to the Rope Filter Lift Tool to allow for fast and easy filter change outs.

2.0 DESCRIPTION

The Rope Filter Lift Tool is shown on Dwg. TN-1687. The left view shows one of the two openings in the side of the housing allowing the fingers to extend out to catch under the top cap of the filter cartridge for lifting. The center view describes the key parts of the tool. The right view is a picture of the tool suspended over a filter cartridge, ready to be lowered into the cartridge for remote transferal.



As the top pull rod is operated up or down in the tool housing, the hinged arms rotating on an internal cam will extend either in or out through the two open slots. The hinged arms will capture the filter for lifting, or release it for withdrawal of the tool.

STAINLESS STEEL UTILIY CHAIN (UT-15)

The Stainless Steel Utility Chain (UT-15) is a 50ft lightweight stainless steel chain with a swivel clip on each end. It is designed to be used with the UT-9 Rope Filter Lift Tool, and the UT-5SP vac head.

Stainless Steel Utility Chain UT-15	

3.0 OPERATION

3.1 To change-out an expended filter cartridge from an Underwater Filter/Vacuum Unit, first lower the Underwater Filter Storage Rack with new filter cartridges down to the bottom of the pool adjacent to the Underwater Filter/Vacuum Unit. Allow the filters to fill with water before lowering quickly into the pool.

UT-3/6 Floor Storage Rack next to the a UFV-260	

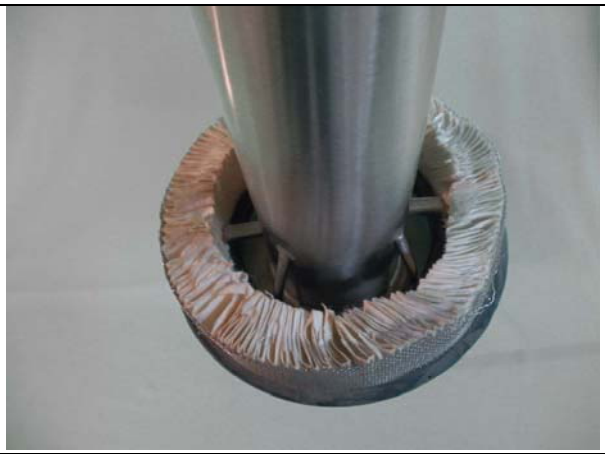
3.2 Attach the UT-15, Stainless Steel Utility Chain, a nylon line, or equivalent rope to the top lifting eye of the Rope Filter Lift Tool, and lower it down until it lands on the top cover of the filter housing.

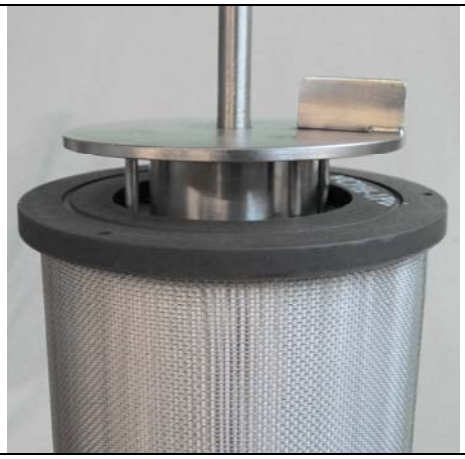
3.3 Rotate and move the tool until the bottom J-hook engages the lift handle on the filter housing top cover. Note that the hook locator tab welded on the top of the tool indicates from a top view the orientation of the open side of the hook

3.4 Raise the UT-15, Stainless Steel Utility Chain with tool to open and lay back the top cover and disengage the tool from the cover.

3.5 Next, lower the tool down into the open top of the expended filter cartridge until the top plate of the Rope Filter Lift Tool seats on the top of the filter cartridge. This is determined by a sudden decrease in the weight of the tool on the UT-15, Stainless Steel Utility Chain or nylon line.

3.6 Continue to partially lower the UT-15, Stainless Steel Utility Chain or nylon line ONLY another 4 or 5 inches. This will allow the side arms of the tool to extend out through the open slots on the side of the tool housing and engage the underside of the filter top cap.





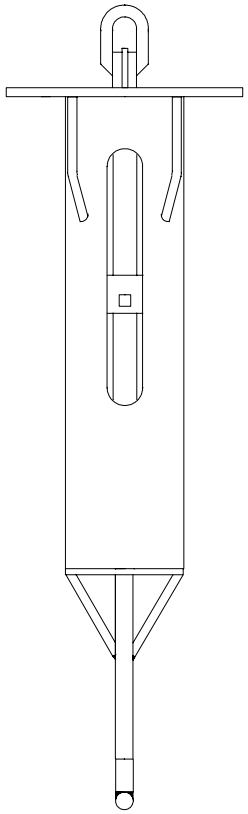
3.7 Pull up on the tool to raise the filter out of the filter housing, and lower it into one of the open tubes in the Underwater Filter Storage Rack.

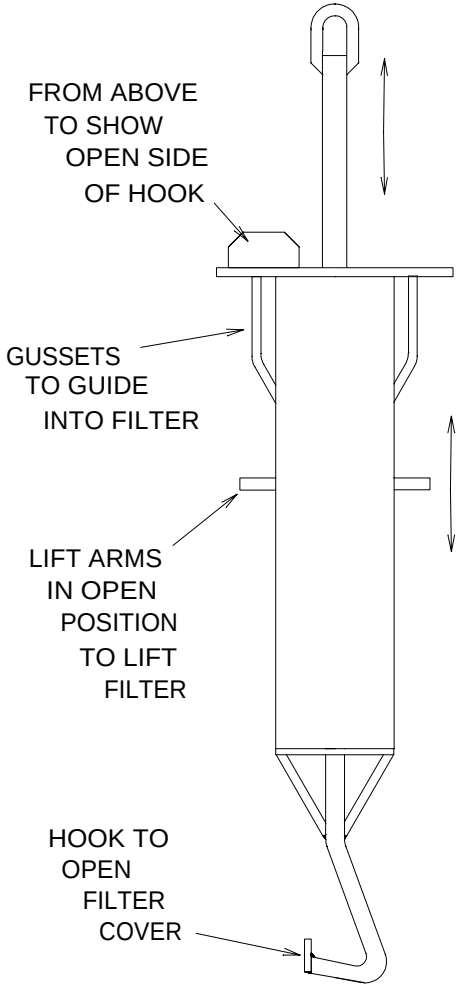
3.8 Slack-off the UT-15, Stainless Steel Utility Chain or nylon line until the rope tool slide rod hits the bottom and all of the weight of the rope tool is transferred to the filter cartridge. This will rotate the internal cam fitting so the hinged arms will no longer extend out through the side slots in the tool housing.

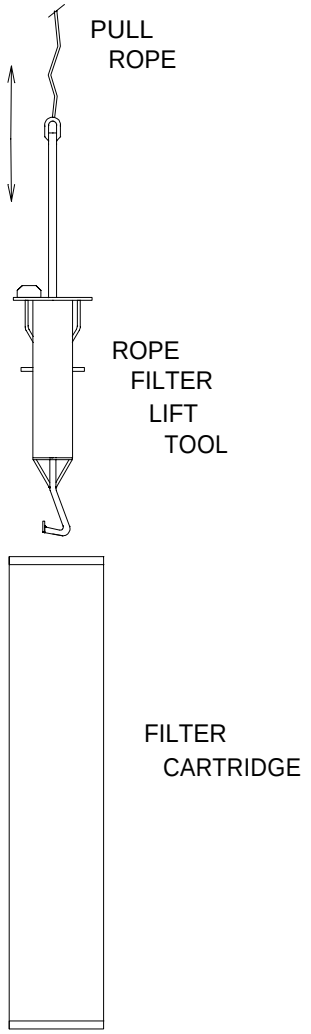
3.9 Next, raise the UT-15, Stainless Steel Utility Chain or nylon line and lift the rope tool out of the filter cartridge.

3.10 Lower the rope tool down into a new filter cartridge, and repeat the steps to install a new filter into the housing.

3.11 Finally, re-engage the bottom J-hook of the rope tool onto the lift handle on the filter housing top cover, lift up to close the filter housing cover, and then disengage the hook. This will complete the filter change-out operation.



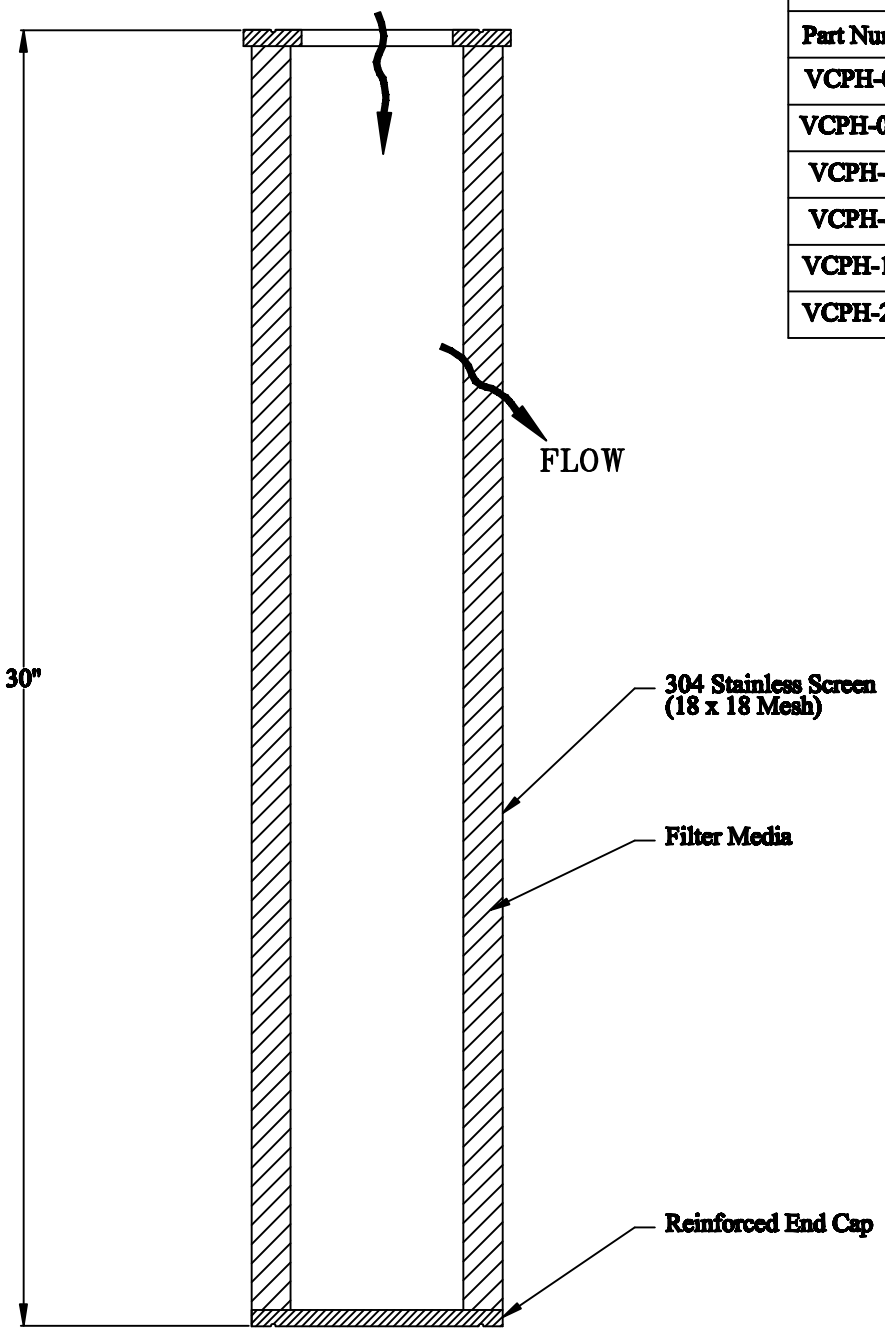




ROPE FILTER LIFT TOOL MODEL UT-9	TN-1687 REV: 7/28/95	TRI NUCLEAR CORP BALLSTON LAKE NEW YORK 12019	APV'D

Filter Cartridge Data

Part Number	Cartridge Size	Size Rating	Media Area	Media Type	Weight Each
VCPH-0.2G	0.2 µ (micron)	Absolute	52 Sq. Ft.	Micro Glass	6 Lbs.
VCPH-0.3PE	0.3 µ (micron)	Nominal	60 Sq. Ft.	Polyester	6 Lbs.
VCPH-1PE	1 µ (micron)	Nominal	62 Sq. Ft.	Polyester	4.21 Lbs.
VCPH-5PE	5 µ (micron)	Nominal	85 Sq. Ft.	Polyester	3.83 Lbs.
VCPH-10PE	10 µ (micron)	Nominal	64 Sq. Ft.	Polyester	4.21 Lbs.
VCPH-20PE	20 µ (micron)	Nominal	64 Sq. Ft.	Polyester	4 Lbs.



General Specifications:

- Size: 6" Diameter x 30" Long, Open Top, Solid Bottom
- Max Flow Rate per Filter: 150 GPM
- Max Operating Differential Pressure : 25 psid
- Application: For all Tri Nuclear equipment used in PWR/BWR Plants.
- Designed for Inside to Outside Flow (Retains Crud)
- May be stored in Filter Storage Racks
- To be used with Tri Nuclear Rope Filter Lift Tool for remote grapple and transport.
- Packaged & Sold: Six Cartridges in a cardboard case.

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

Standard Tri Nuclear Filter Cartridge

Model No. VCPH-*	Drawn Rick Russell Date 09/30/11	Brochure	
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