

# AFP-600

Automatic Fuel Polishing System, 600 GPH



*Shown with optional enclosure and stand*

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### System Description

Reverso Automatic Fuel Polishing (AFP) System is designed for middle distillate fuels with flash points of 100°F and above. This includes #1,2 and 3 diesel fuel, home heating oil and bio-diesel up to B20, with no modifications required. The AFP single-tank system is designed specifically to maintain diesel fuel quality in storage tanks and standby generator sub-base tanks. This is accomplished by first removing all free water and particulate to 30 micron in the primary fuel water separator by Separ Filter, and further reducing particulate to as low as 2 micron through a secondary filter. This system is constructed with a 7-day programmable digital timer, with alarms for high vacuum and high water in the primary filter, and high pressure in the secondary filter. A drip pan high level float alarm is also included. Enclosure is NEMA 3 rated for outdoor installations.

### Control

The AFP system operates at 120 volt 60Hz. This system is equipped with an IDEC PLC control for unattended operation and is UL508 listed. All system controls are housed in a NEMA 4 water-tight control box.

Digital control with 7 day programming provides flexibility in scheduling polishing operations. User can create a weekly schedule to automatically run the system.

The following monitoring systems are provided:

Primary filter high vacuum  
 Primary filter high water  
 Secondary filter high pressure  
 Drip tray high level

When equipped with an enclosure option, an electrical junction box is located on the exterior and houses the emergency stop button.

### Primary Filtration

The Reverso AFP-600 is designed around the Separ Filter brand of diesel fuel water separators. This filter has been specifically designed to utilize hydrodynamic principles to remove free water and particulate from the flow of the fuel. By changing the direction of flow and the velocity of the fuel multiple times, and imparting centrifugal force, the heavier particulate and free water drop from suspension and fall to the bottom of the bowl. As these natural laws are put into effect on the fuel, it passes through 5 stages within the Separ Filter housing. For this reason, approximately 70+% of the contaminants are removed from the fuel prior to passing through the final stage filter element, bringing the particulate removal efficiency to 100% for particulate larger than the

element rating (30 micron standard) and a high level of separation for smaller particulate in test fluid using standard test methods. At the rated flow of 10 gallons per minute, the filter is 100% efficient at removing free water as certified by the RWTUV testing facility in Germany (copy available upon request).

The 5 stages of separation and filtration are:

*Refer to Diag. 1*

1. After entering the inlet(s), the 1st vane system spins the diesel fuel in a circular motion, generating centrifugal force.
2. In the bowl, fuel continues to spin – separating water and heavier particulates, through centrifugal force.
3. A 2nd vane system then forces the fuel to spin in a different direction – separating smaller water droplets and finer particulates.
4. A wider passage, just below the element, slows down fuel to allow more contaminants to settle into the bowl.
5. Finally, the element filters finer particulates out of the fuel before exiting through the outlet(s).

### Secondary Filtration

Once fuel has been filtered, it passes through the pump and finally to a 2 micron filter. It removes particulate contaminant such as dirt, dust and rust. The cellulose/microglass media offers higher efficiencies and longer filter life. Gaskets are pre-lubed. It is recognized by the Underwriters Laboratory (UL®) for use with service station pumps and dispensers.

### Optional Features

Certain applications can benefit from optional features, which are additional to the standard AFP System. Contact your representative for details and pricing.

- Enclosure
- Enclosure for cold climate
- Stand for enclosure
- Magnetic fuel conditioner
- Flow meter
- Automatic Water Drain System for primary filter
- Basic touchscreen control panel
- Advanced touchscreen control: Includes integration with Building Management Systems (BMS)

1

After entering the inlet(s), the 1st vane system spins the diesel fuel in a circular motion, generating centrifugal force.

2

In the bowl, fuel continues to spin – separating water and heavier particulates, through centrifugal force.

3

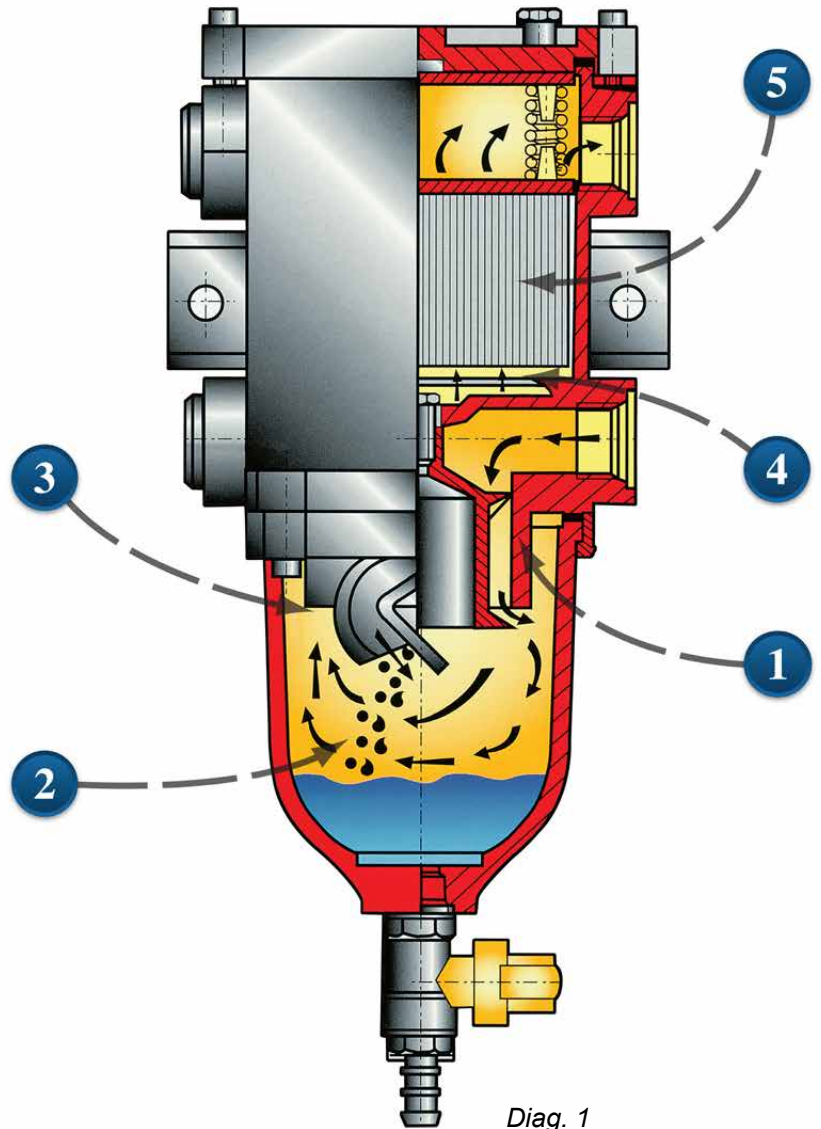
A 2nd vane system then forces the fuel to spin in a different direction – separating smaller water droplets and finer particulates.

4

A wider passage, just below the element, slows down fuel to allow more contaminants to settle into the bowl.

5

Finally, the element filters finer particulates out of the fuel before exiting through the outlet(s).

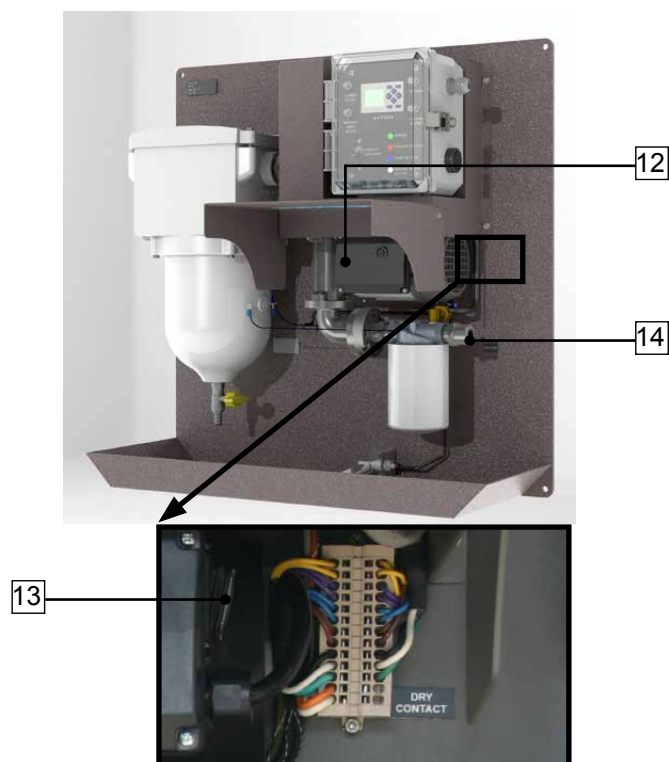


1. Serial number plate
2. Vacuum gauge
3. Primary: Separ Filter SWK-2000/40MK-G
4. Inlet
5. Water sensors
6. Drain valve - *Push in and turn counter-clockwise to open*
7. Control panel
8. Hinged cover - *covers pump and outlet*
9. 2 micron filter
10. Spill sensor
11. Drip pan
12. Pump
13. Service switch
14. Outlet
15. Emergency stop button

## Wall Mount Version



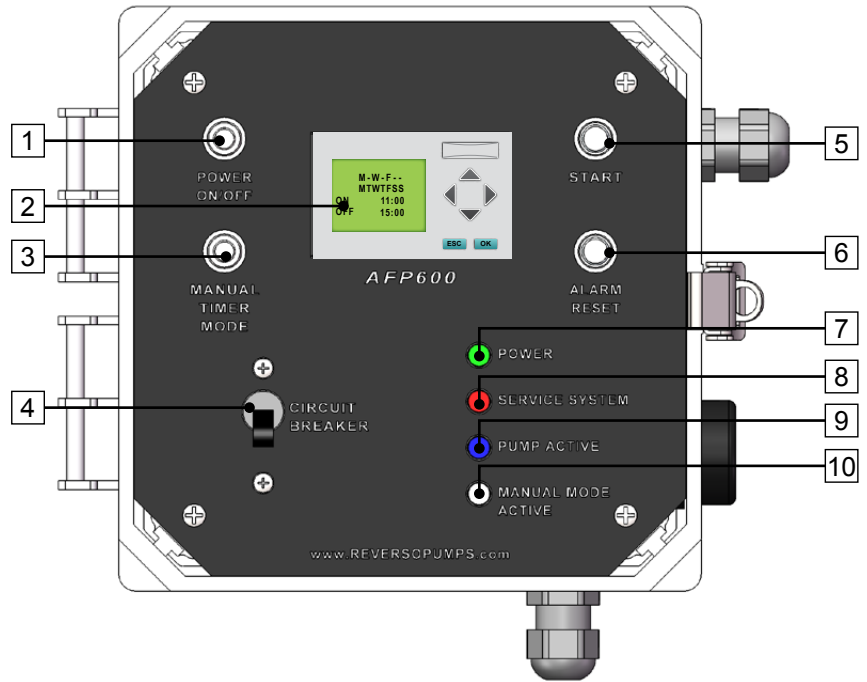
## Enclosure Version



## Control Panel

Control Panel

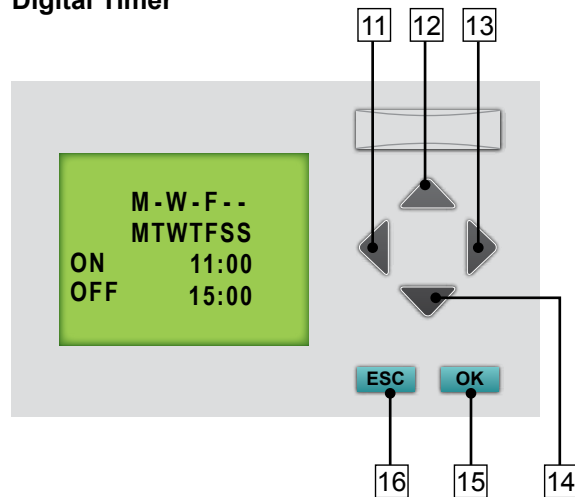
1. Power button
2. Digital timer
3. Manual timer mode button
4. Circuit breaker
5. Start button
6. Alarm reset button
7. Power on light - *indicates when system is on*
8. Service system light - *indicates an alarm has been triggered and user must service the system*
9. Pump active light - *indicates fuel polishing system is running*
10. Manual timer mode active light - *indicates system is operating in manual timer mode (not schedule timer mode)*



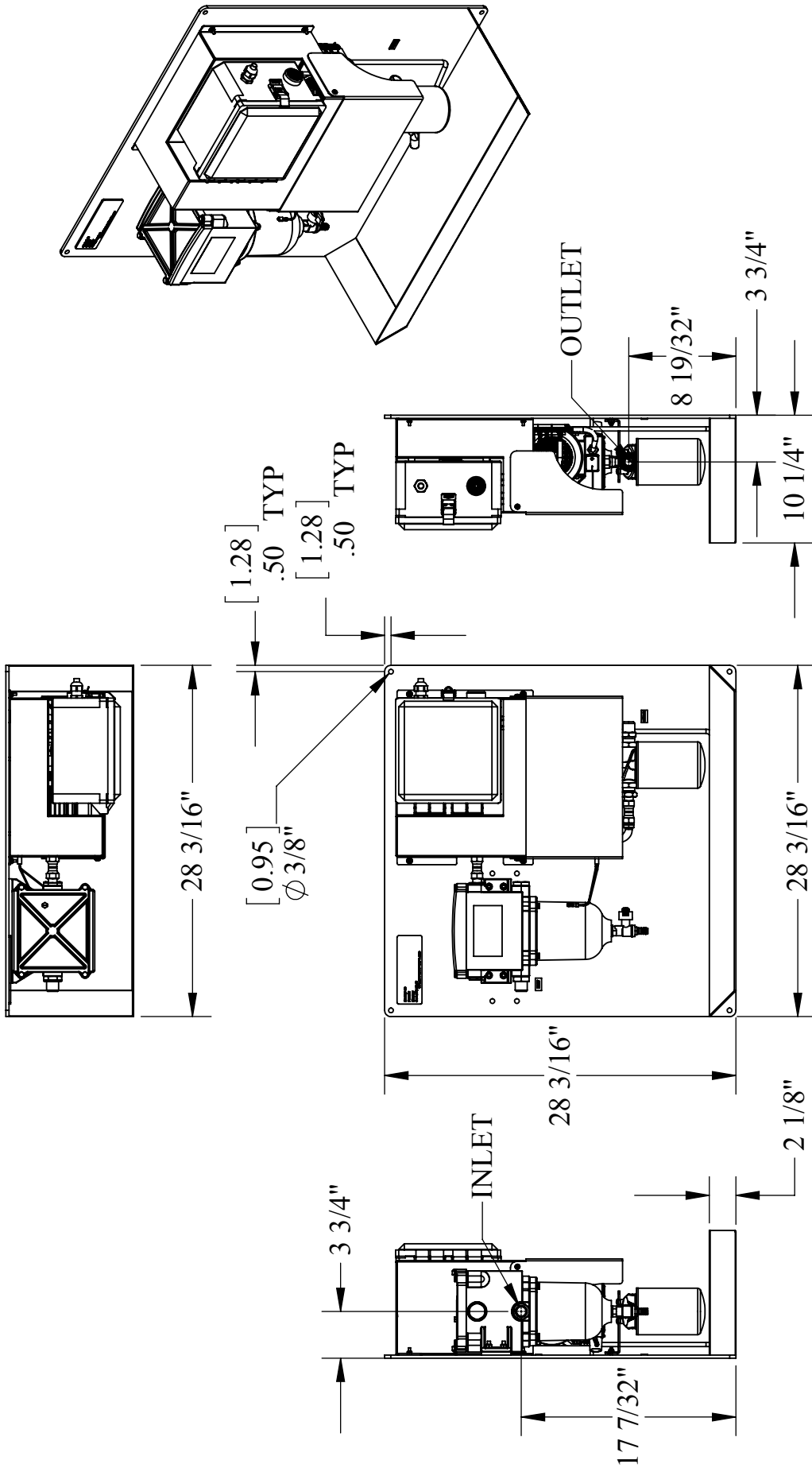
Digital Timer

11. Left key
12. Up key
13. Right key
14. Down key
15. OK key
16. Escape key

## Digital Timer



Part #: 21-3409



# REVERSO PUMPS

TITLE:

Automatic Fuel Polishing System  
- 210 Series - Industrial Format -  
110V

REV

SIZE **A** DWG. NO. **AFP600-ER-0911**

SCALE: 1:12 WEIGHT:

SHEET 1 OF 1

INTERPRET GEOMETRIC TOLERANCING PER. MATERIAL	DRAWN	NAME	DATE
FINISH	CHECKED	JV	1/7/2013
DO NOT SCALE DRAWING	ENG APPR.		
	MFG APPR.		
	Q.A.		

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES

TOLERANCES:  
FRACTIONAL: ±1/64  
ANGULAR: MACH±  
TWO PLACE DECIMAL ±.01  
THREE PLACE DECIMAL ±.005

**PROPRIETARY AND CONFIDENTIAL**  
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF **REVERSO PUMPS**  
ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF **REVERSO PUMPS** IS PROHIBITED.

Flow Rate	System rated at 600 GPH (2271 LPH). Actual flow rate may vary due to conditions of installation	
Dimensions (W x H x L)	Wall Mount	28.4" x 28.2" x 11" (721 mm x 716 mm x 279 mm)
	Enclosure	34.5" x 30" x 12" (876 mm x 762 mm x 305mm)
	Enclosure with Stand	36" x 59.75" x 12" (914 mm x 1518 mm x 305 mm)
Amp. Draw	3.4A@110V	
Circuit Breaker	10A@110V	
Service Space	4" on top and bottom of Wall Mount, to facilitate changing filter elements and draining water and particulate from the bowl	
Pump Type	Vane	
Pump Relief Valve	Internal, non-adjustable and preset at 35 psi / 2.4 bar	
Pump Rating	TEFC for continuous duty operation	
Max. Lift	13 ft / 4 m with foot valve above liquid level	
Timer	Digital PLC	
Inlet	1" Male JIC	
Outlet	1" Male JIC	
Primary Filtration	30 micron	
Secondary Filtration	2 micron	
Filter Torque Values	Bowl Retainer Ring	13 Nm (115 in-lbs)
	Lid	15 Nm (130 in-lbs)
	Bleed Screw	6 Nm (53 in-lbs)

## Warning

- The system has been developed to be used with diesel fuel only, **DO NOT USE WITH GASOLINE.**
- The system is designed to meet environmental standards for safe operation (NOT for use with fluids that have a flash point below 100°F (38°C), e. g.: Gasoline, alcohol,...)



## Primary Inspection

- Upon delivery inspect the AFP (Automated Fuel Polishing) for any damage that may have occurred during shipment.
- Inspect the interior of the unit for mechanical or electrical damage.
- If the unit is damaged upon delivery, contact the shipping company immediately.

## Mounting

- The AFP should be wall mounted on a hard, vertical surface capable of supporting the weight of the unit.
- The control electronics are enclosed in a NEMA 4 weather proof box and will withstand being located outside. The unit without an enclosure should, however be located under shelter, out of the weather if possible. The unit with the optional enclosure can be located in any location accessible to the operator.
- In all cases the unit should be located as close as possible to the tank being serviced. (see Max. Lift in Technical Specifications).
- When installing the unit below the level of the fuel on above ground fuel tanks, consideration should be made to the installation of an anti-syphon valve to prevent fuel spillage in the case of a leak in the piping system.

## Electrical

- Installation of unit should only be performed by qualified installation personnel who have thoroughly read and understands the installation instructions covered in this manual.
- To avoid the risk of electric shock, make sure that the power supply is disconnected. Ensure that the power supply is at zero volts with a multimeter before making any electrical connections.
- To ensure operator safety the AFP must be connected to properly grounded power sources.
- Make sure that your unit and power supply are configured for the same voltage rating.
- Dry contacts are for external use.
- External control voltage must be supplied by customer.

## Piping

Use quality approved fuel line materials with at least 1" inner diameter line. Smaller plumbing will place excessive load on the motor and shorten its life. A full port ball valve should be installed on the inlet and outlet ports of the AFP (Automated Fuel Polishing). Valves are available, see Options page.

The pickup line(s) (suction) should originate from the lowest point of the tank and should be connected directly to the inlet. For optimal performance, ensure that this line is free and nothing is restricting flow. It is recommended to install a foot valve to keep the system primed, especially if the system is located above the lowest possible fuel level in the tank.

If the AFP is mounted below tank top level, a priming tee should be installed on the highest point of the suction line to be able to easily prime the systems suction line.

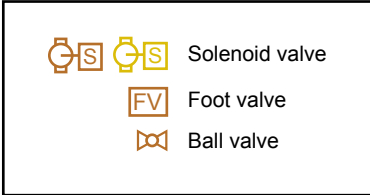
The return line(s) (discharge) should be connected to the outlet and enter the tank as far as possible from the pick up tube and extending 2/3 down into the tank. For optimal performance, ensure that the outlet, discharge or return, line(s) are free and nothing is restricting their flow.

**The suction line of the AFP must be independent and separate from the suction line of the engine. Do not integrate into engine fuel system.**

**When installing this unit, FLEXIBLE CONNECTIONS MUST BE USED TO REDUCE STRESS on the plumbing and prevent damage to the unit.**

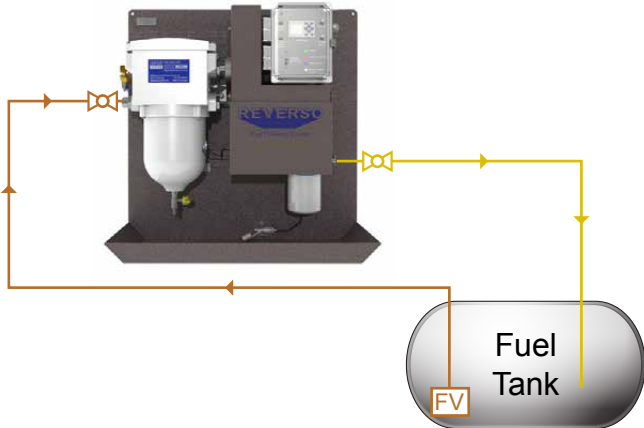
*Refer to Diag. 2 and 3 on next page.*

Hoses, piping, solenoid valves and foot valves shown in the diagrams below are not provided with the system and must be provided by the user/contractor, unless agreed upon otherwise.



### Single Tank Diagram

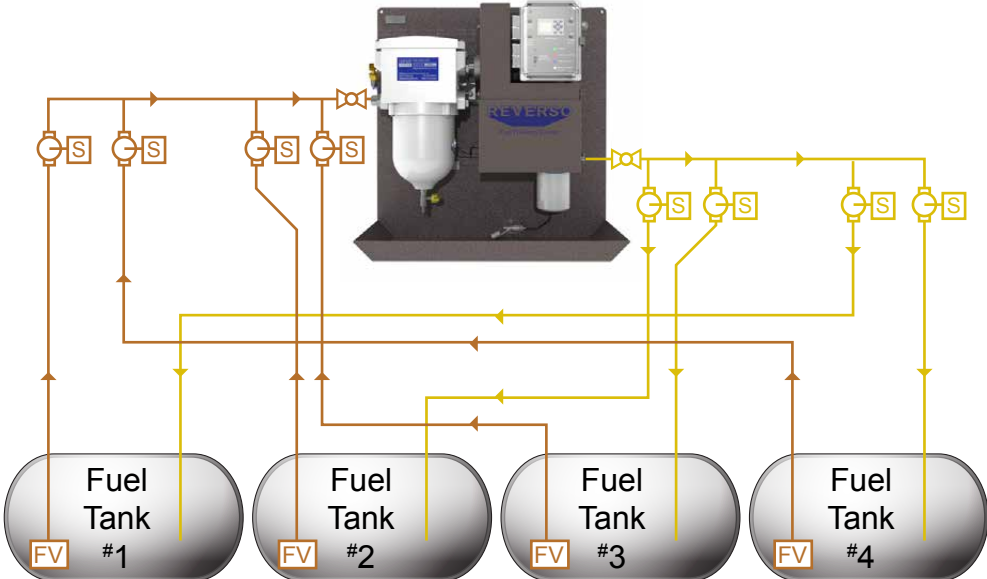
Diag. 2



### Multiple Tank Diagram

Requires Advanced Control (Touchscreen)

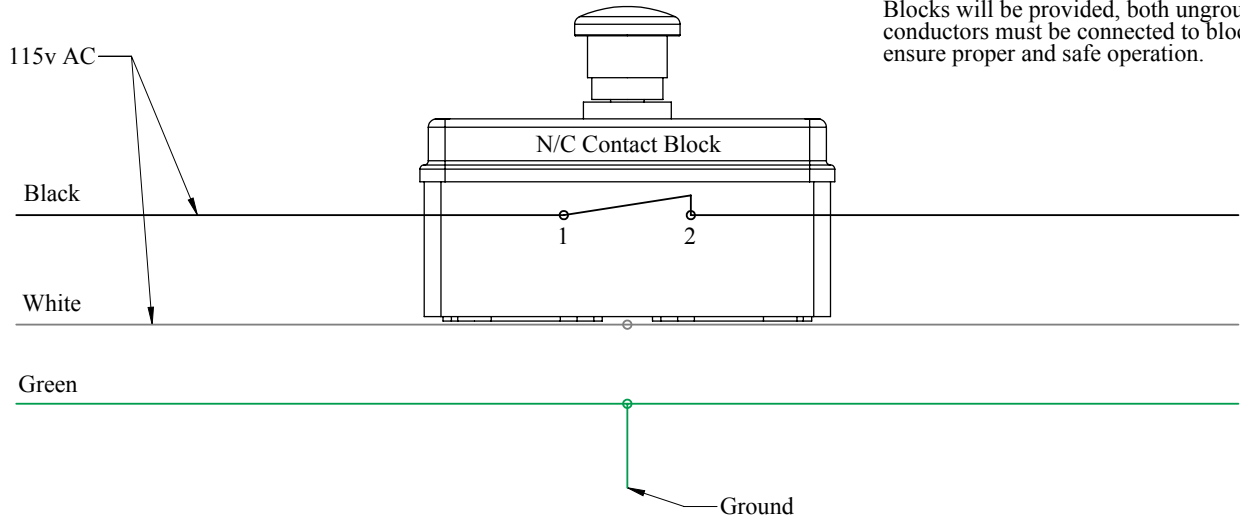
Diag. 3



# Emergency Stop (E-Stop) Wiring

Applies to enclosure option.

**\* NOTE \***  
For 220v AC. 2 each Normal Closed Contact Blocks will be provided, both ungrounded conductors must be connected to blocks to ensure proper and safe operation.



1

Open the fuel supply valve.  
Prime fuel system and  
check for leaks.

2

Set gauge pressure indicator  
(red needle) slightly to the  
left of the black needle prior  
to operation.

The gauge will indicate  
maximum vacuum pressure  
during system operation.



3

Choose timer mode:

### Manual Timer Mode

Operate in this mode if system will run one set time.

- Must press manual timer mode button to activate / deactivate.
- Manual timer mode light will be ON.
- Pump will start upon pressing the start button.
- Pump will automatically shut off after the preset run time.

### Schedule Timer Mode

Operate in this mode if system will start/stop  
automatically on the programmed days of the  
week and times.

- Must press manual timer mode button to activate / deactivate.
- Manual timer mode light will be OFF.
- Pump will automatically start and stop according to the preset date and time.

4

Press start button.  
Power on indicator will be lit.

If in manual timer mode, pump will immediately  
begin running.

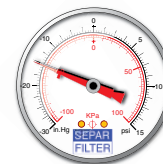
If in schedule timer mode, pump will only begin  
running if within programmed date/time to run.

Verify the pump is operating by checking vacuum  
gauge located on the filter. Gauge will be reading  
0-5 in-Hg of vacuum.

5

When the indicator reaches  
15 in-Hg, it is time to drain or  
change the filter element.

The same procedure is  
necessary if the water level  
reaches 30% of the clear bowl.



### Emergency Stop Button

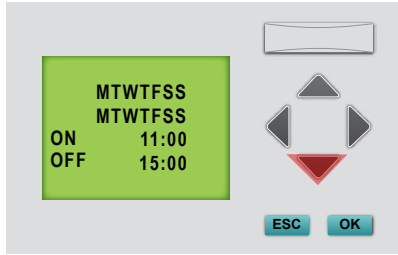
The emergency stop button is located on the  
right side of the enclosure, if equipped.  
Turn clockwise and press down to shut down  
the operation.  
Press the reset button. Then press the start  
button to resume operation.



# Digital Timer Instructions: Set Date and Time

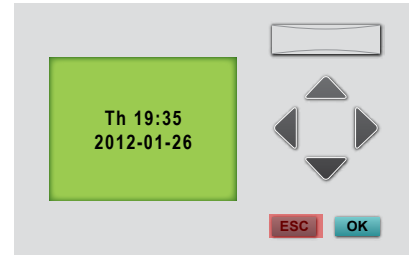
1

Starting at the program screen, press DOWN key to view current time screen.



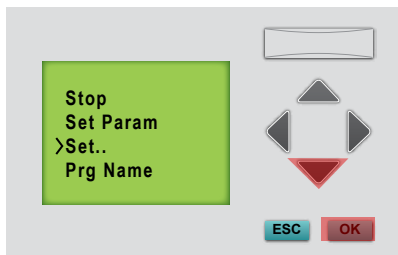
2

The current date and time is displayed. Time is shown as 24 hr clock. Date is shown YYYY-MM-DD. Press ESC key.



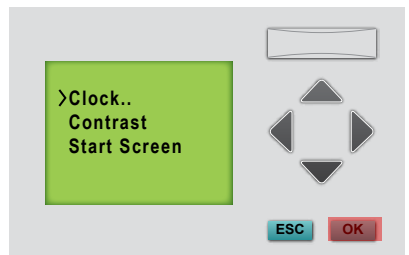
3

Use the DOWN arrow to move the cursor to Set.. option. Press OK key to continue.



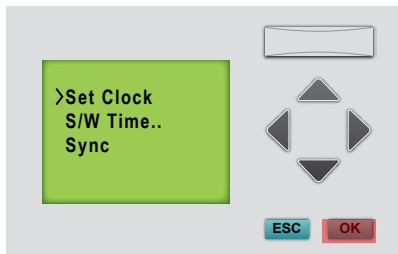
4

Select Clock.. option. Press OK key to continue.



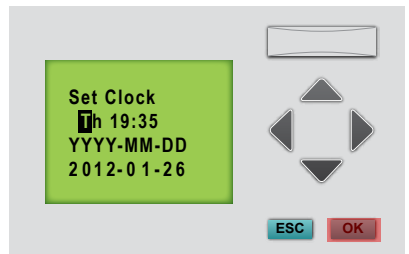
5

Select Set Clock option and press OK key to continue.



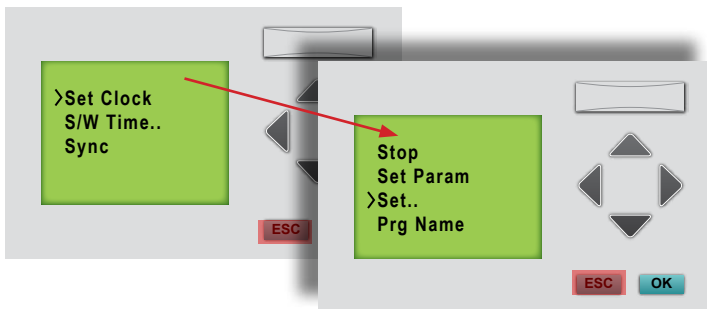
6

Flashing black box indicates your selection. Use LEFT/RIGHT key to move selection. Use UP/DOWN key to change date and time. Press OK key when finished and to return to previous menu.



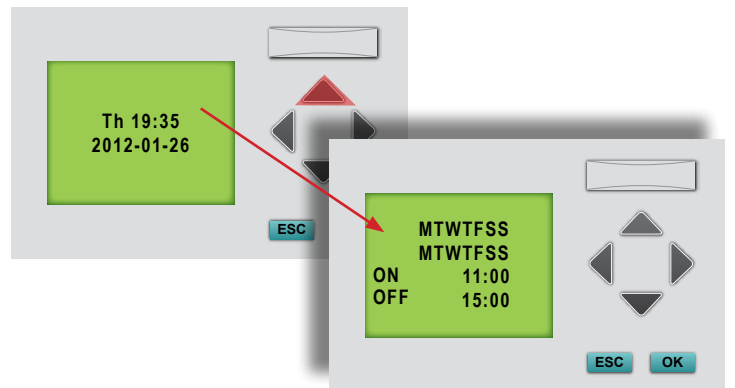
7

Press ESC key. Press ESC key again to return to current time screen.



8

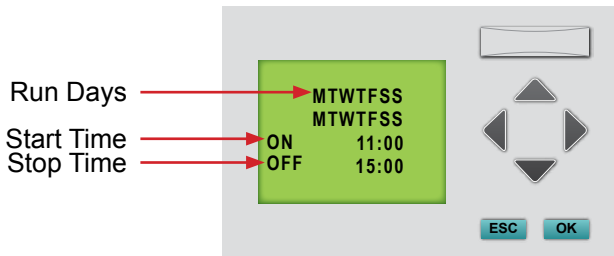
Now shown is the current time screen. Press UP key to return to program screen.



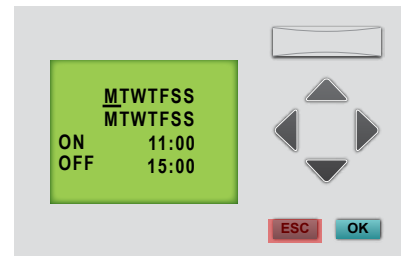
# Digital Timer Instructions: Set Schedule Timer

**1** *When using this method, follow sequence exactly or damage to program can occur (non-warrantable situation).*

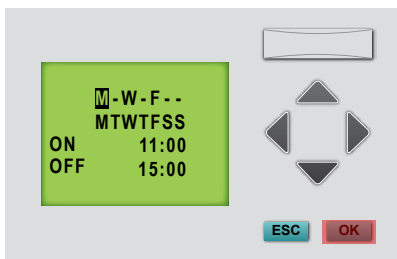
- A. Ensure the breaker is ON.
- B. Move the red power switch to the ON position and power indicator light is on.
- C. Ensure timer mode is switched to Schedule Timer.



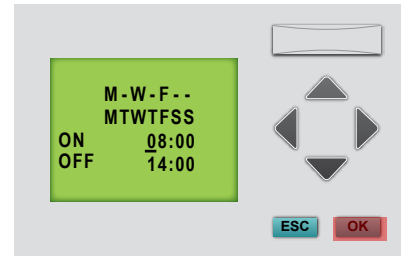
**2** Hold the ESC key until flashing underline appears under the first day of the week. This flashing underline indicates your selection. Use the LEFT/RIGHT keys to move between the dates, start time, and stop time.



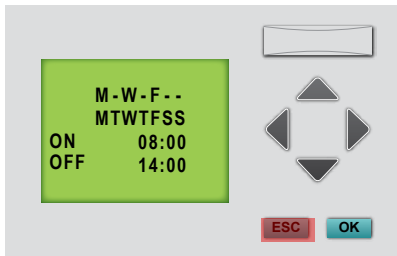
**3** **Change the run days**  
With the flashing underline in the days row, press the OK key until flashing box appears. Use the LEFT/RIGHT key to move between days. Use the UP/DOWN key to program run days. A dash(-) indicates the system will not run on that day. Press OK key when finished and the cursor will return to flashing underline.



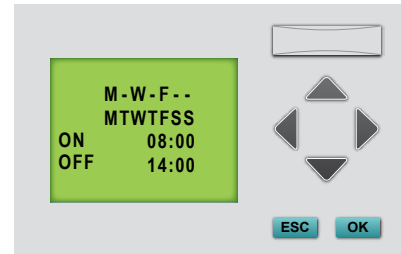
**4** **Change the run time**  
With the flashing underline in the days row, use the LEFT/RIGHT key to move to start time (ON). Press OK key until flashing box appears. Use UP/DOWN key to change time. Press OK key when finished and the cursor will return to flashing underline. Repeat with stop time (OFF).



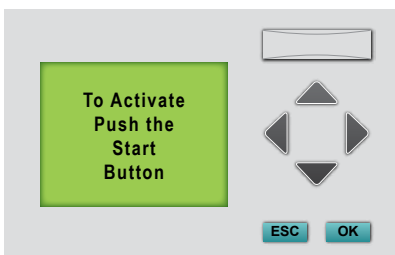
**5** Press ESC to save. Flashing underline will disappear.



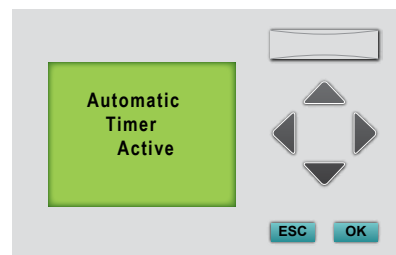
**6** Setting the schedule timer is finished. In this example, system will run on Monday, Wednesday and Friday. System will start at 8:00 am and stop at 2:00 pm.



**7** Every 5 seconds, screen will request user to push Start button to activate program.



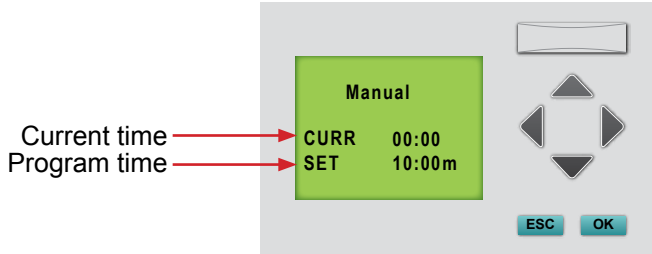
**8** Afterwards, every 5 seconds screen will indicate the schedule timer is active.



# Digital Timer Instructions: Set Manual Timer

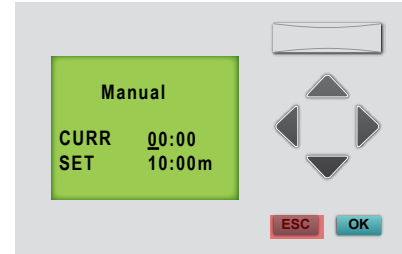
1

Top row indicates current time.  
Bottom row indicates program time.



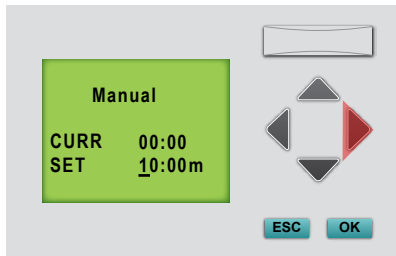
2

Press and hold ESC key until flashing underline appears. This indicates your selection.



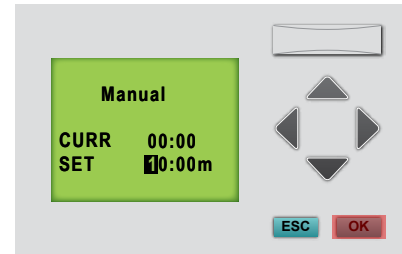
3

Use RIGHT arrow key to move underline to program time (SET).



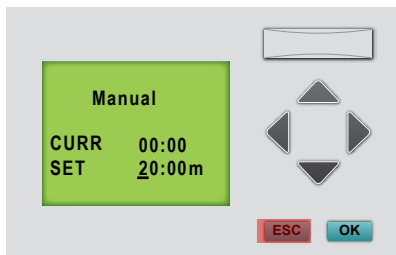
4

Press OK key and flashing box appears. Use UP/DOWN key to change time. The "m" indicates minutes and can be changed to "h" for hours. When finished, press OK key.



5

Flashing box will return to flashing underline. Press ESC to save. Flashing underline will disappear.



6

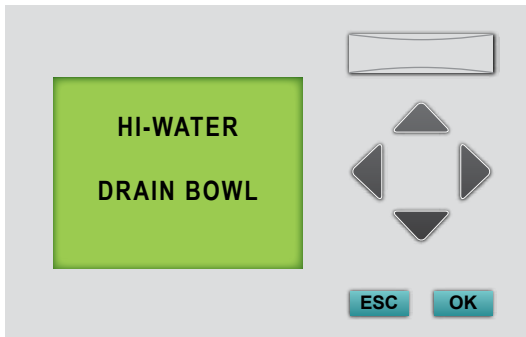
In the screen shown below, the system is set to run for 20 minutes and will stop once the time has expired.



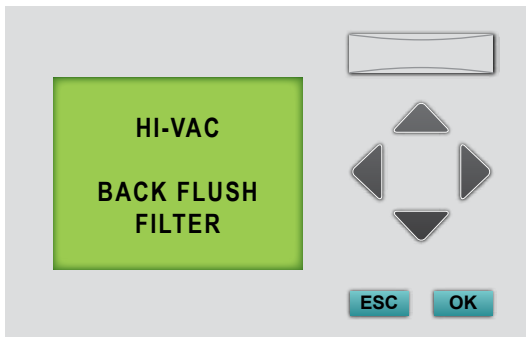
There are four different alarms installed in the unit.

If one of the alarms should sound: De-energize the system when servicing unit.

1. Follow the directions displayed on the screen.
  2. Press RESET/STOP button
  3. Wait at least 2 minutes, then press START to restart the unit.
- If you have successfully cleared the alarms, the unit will restart.

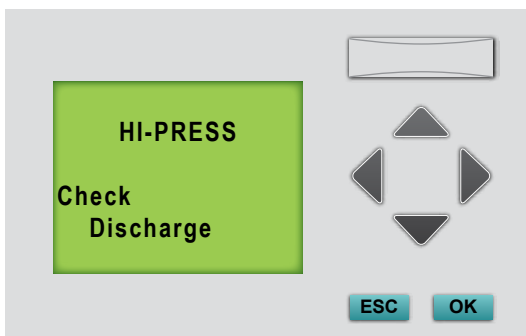


## High Water Alarm

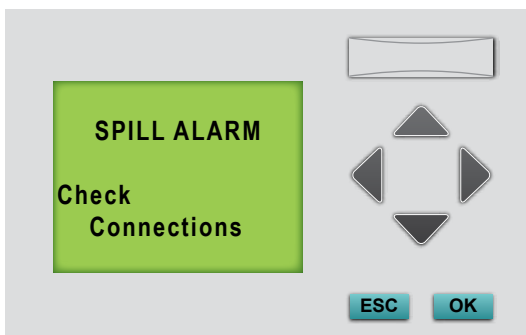


## High Vacuum Alarm

Backflushing procedure can be executed up to 5 times before replacing the filter element.



## Hi Pressure Alarm

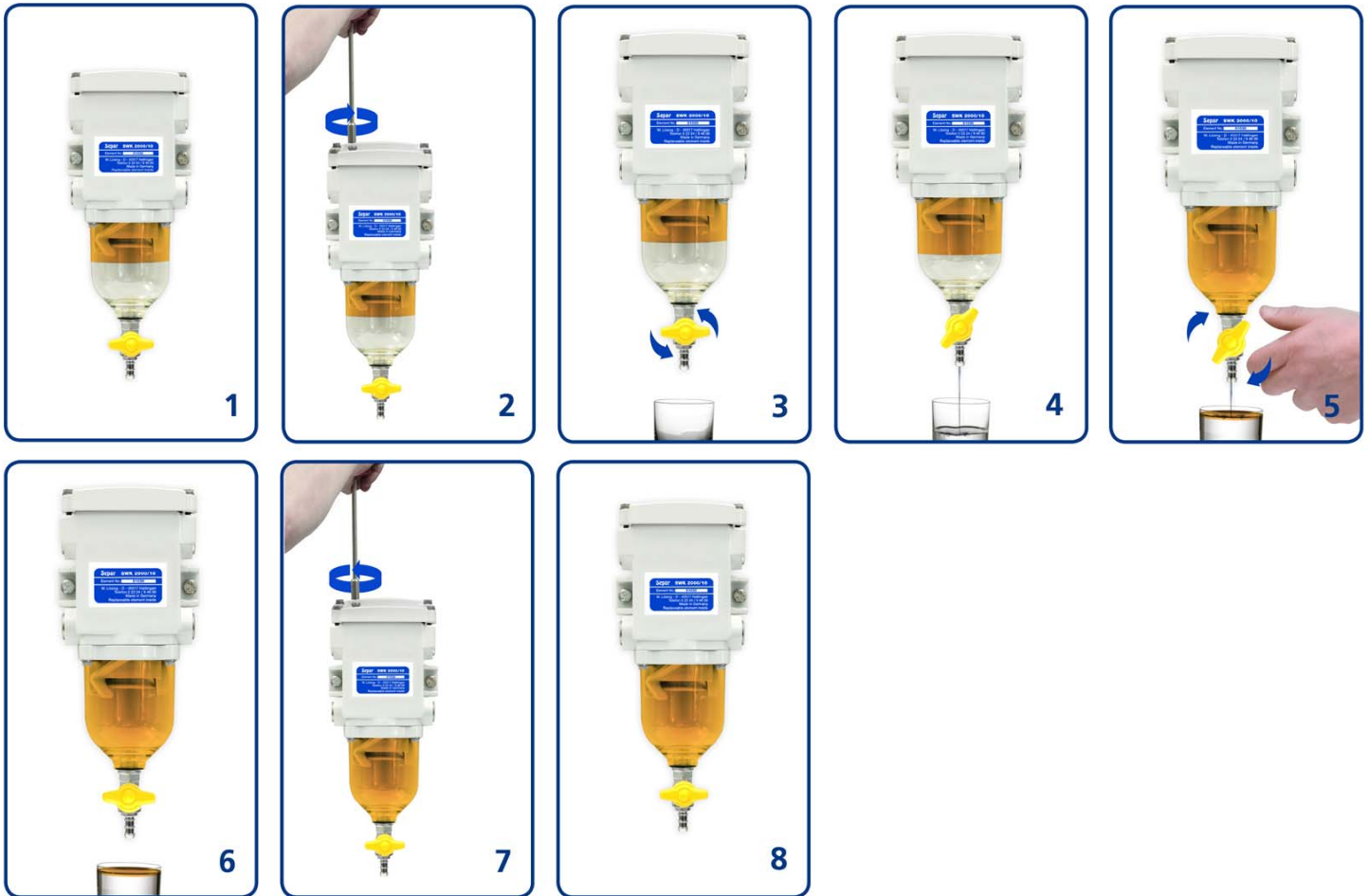


## Spill Alarm

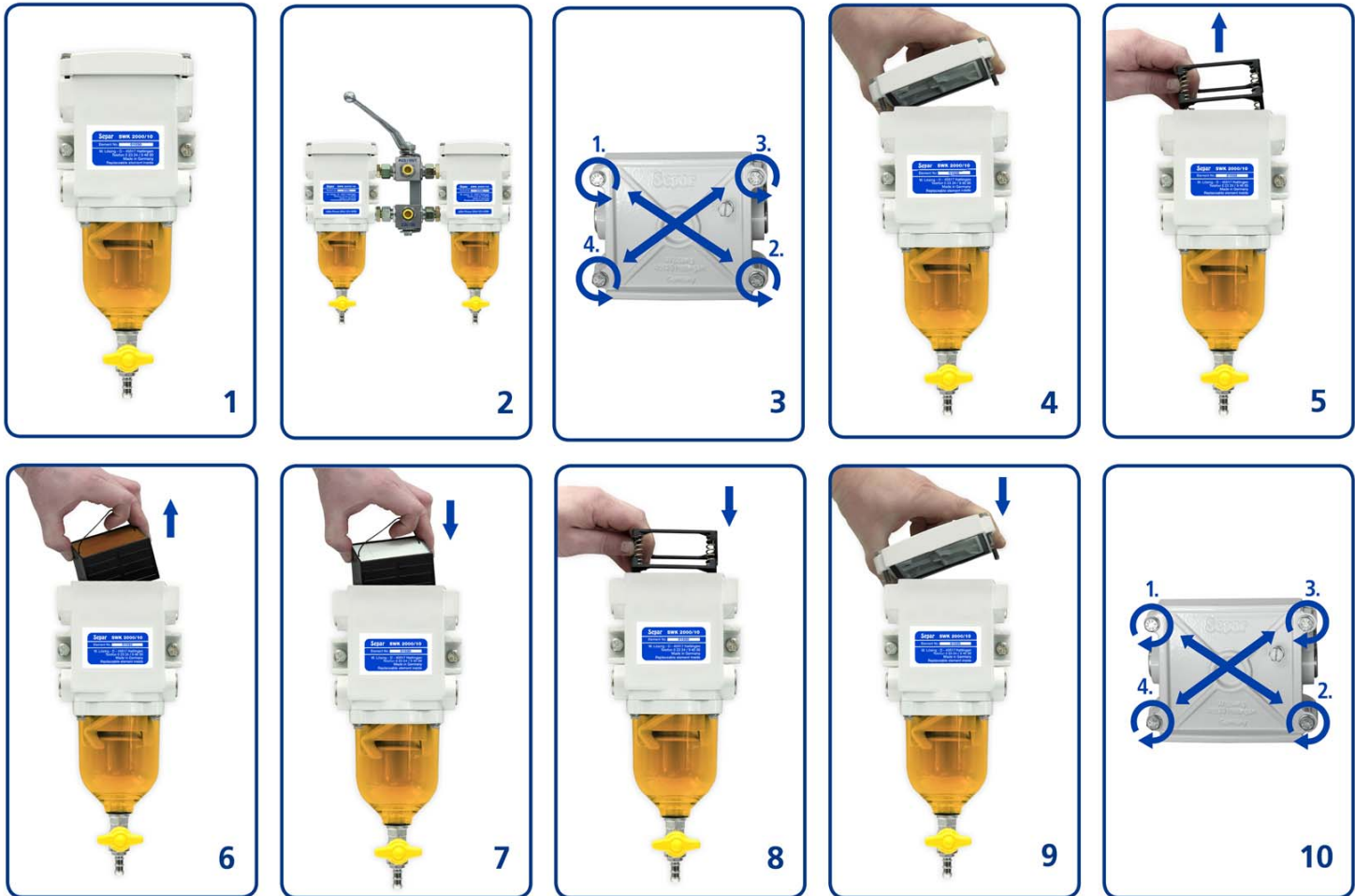


Prior to service, ensure the system is off.

Backflushing is for particulate removal only and will not remove sludge once embedded in the filter media.



Prior to service, ensure the system is off.



## Replacement Filter Element

Element #	Description
04010	10 Micron
04030	30 Micron (Standard)
04060S	60 Micron (Stainless Steel)

Prior to service, ensure the system is off.

**Step 1**  
Shut off the fuel supply valve and isolate unit before servicing the filter.

**Step 2**  
Unscrew used filter as shown.



**Step 3**  
Replace with new spin-on filter in the direction shown.



### Replacement Spin-On

Part #	Description
04-3382	2 Micron
04-3382-01	1 Micron

Problem	Possible Causes
<b>No fuel delivery</b>	<ul style="list-style-type: none"> <li>• Pump does not run</li> <li>• Pump and filter are not primed</li> <li>• Fuel supply or discharge line blocked. Check the alarm</li> <li>• Lift is too high</li> <li>• Air leak in fuel supply to pump</li> <li>• Inlet or outlet valve closed. Check the solenoid valve</li> <li>• Foot (check) valve installed backwards</li> </ul>
<b>Insufficient fuel delivered</b>	<ul style="list-style-type: none"> <li>• Air leak at inlet</li> <li>• Lift too high</li> <li>• Pump worn</li> <li>• Inoperative foot valve</li> <li>• Piping improperly installed or dimensioned</li> <li>• Filter/water separator plugged</li> </ul>
<b>Rapid pump wear</b>	<ul style="list-style-type: none"> <li>• Pump has been run dry or insufficient fuel</li> <li>• Plumbing on inlet side not appropriately dimensioned. Pump requires too much power</li> <li>• Air in plumbing lines</li> <li>• Liquid too viscous</li> </ul>
<b>Noisy operation</b>	<ul style="list-style-type: none"> <li>• Insufficient fuel supply</li> <li>• Air leaks in the inlet pipe</li> <li>• Air or gas on the suction side</li> </ul>
<b>Motor does not turn or turns intermittently</b>	<ul style="list-style-type: none"> <li>• Control power not available</li> <li>• Tripped circuit breaker on control board</li> <li>• Pump failed and seized</li> <li>• Motor failure</li> <li>• Check service switch is in the ON position ( - )</li> </ul>
<b>Pump leaks fuel</b>	<ul style="list-style-type: none"> <li>• Loose pump plumbing fittings</li> <li>• Worn pump shaft seal</li> <li>• Excessive heat from over head storage tank</li> <li>• Worn pump o-rings or seals</li> </ul>