

AFP-210

Automatic Fuel Polishing System, 210 GPH



Shown with optional enclosure and stand

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System Description

Reverso Automatic Fuel Polishing (AFP) systems are 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-210 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 spin-on filter element (installed). A 10 micron spin-on filter element with water absorption ability for emulsified fuel is optional. 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.

Control

The AFP-210 fuel polishing system operates at 120 volt 60Hz or 220 volt 50Hz. This system is equipped with an IDEC PLC Smart Relay control for unattended operation and is UL508 listed. All system controls are housed in a NEMA 4 water-tight control box. This affords mounting the system in most any location or environment including outdoors, inside a generator enclosure, etc...

Digital readout programmable smart relay with 7 day programming provides flexibility in scheduling polishing operations.

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 E-Stop, (Emergency Stop Button, IP65 and UL508 rated) and external connection point for incoming power. Nominal system current draw is < 10.5 amp @ 120 volt AC 60Hz. All internal electrical connections are made IAW NFPA/NEC standards.

Primary Filtration

The Reverso AFP-210 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 (10 micron water block is available). 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.

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

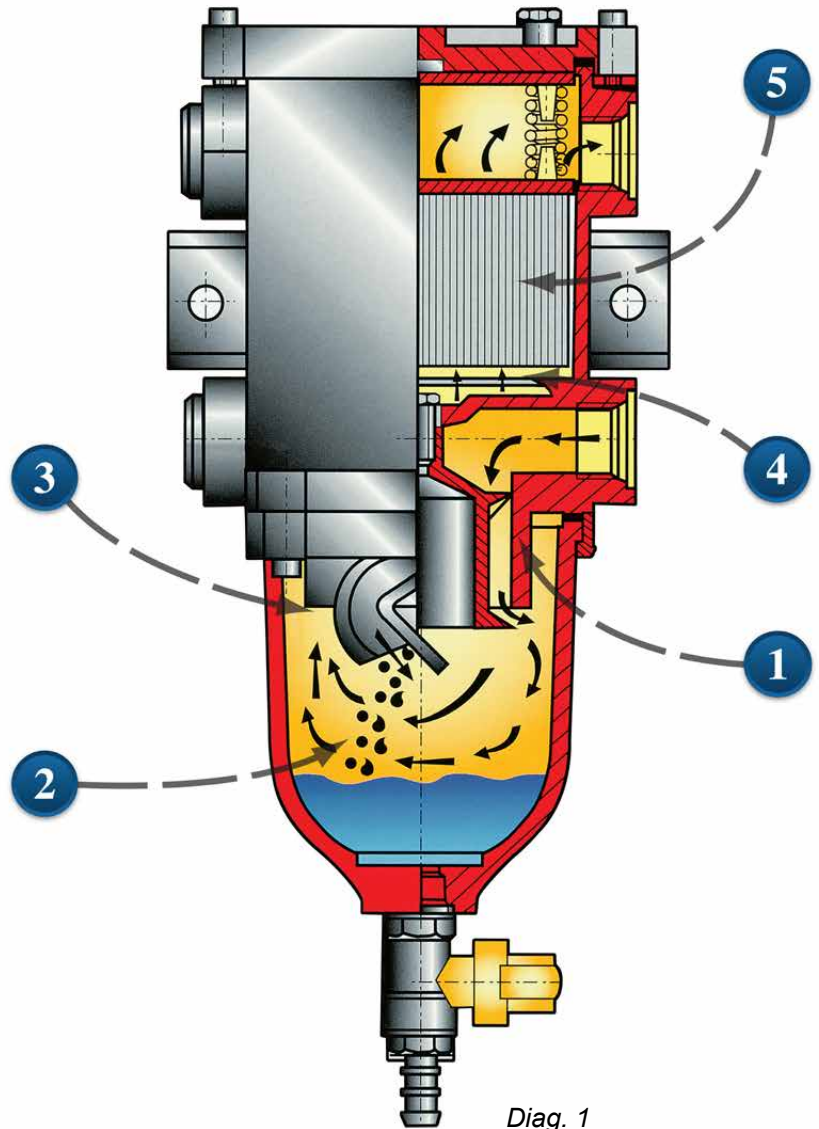
A 2nd vane system then forces the fuel to spin in a different direction – separating smaller water droplets and finer particulates.

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).

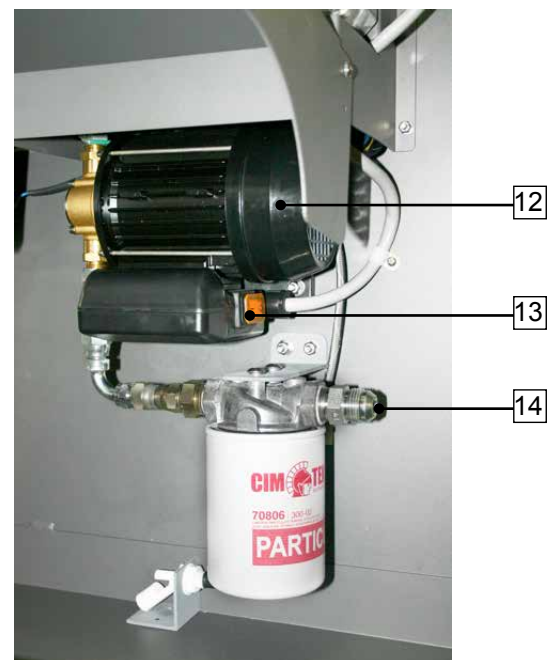
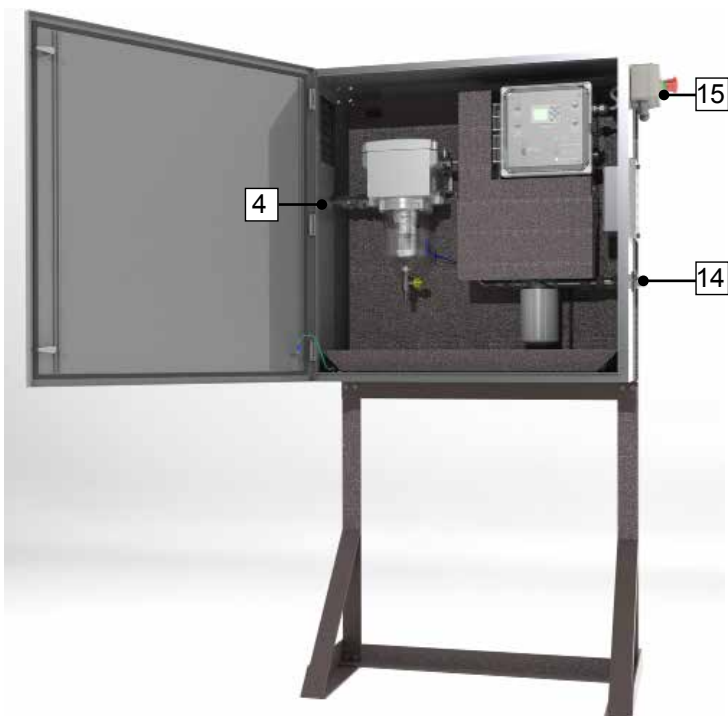


1. Serial number plate
2. Fuel/water separator lid
3. Fuel/water separator
4. Inlet
5. Water sensors
6. Drain valve - *Push in and turn counter-clockwise to open*
7. Control panel
8. Hinged cover - *covers pump and outlet*
9. 2 micron filter
10. Spill sensor
11. Drip pan
12. Pump
13. Service switch
14. Outlet
15. Emergency stop button - *with enclosure option only*

Wall Mount Version



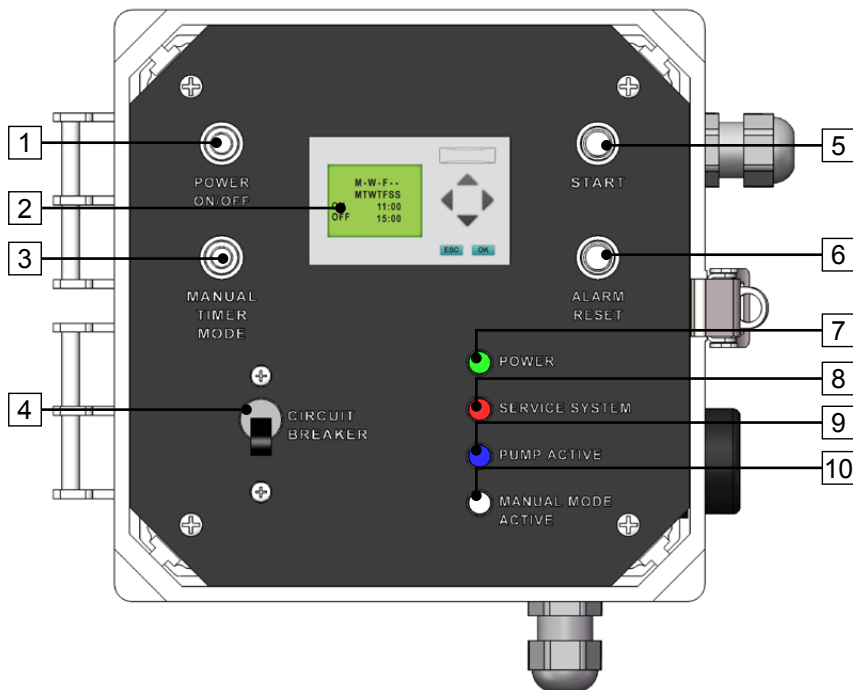
Enclosure Version with Stand



Control Panel

Control Panel

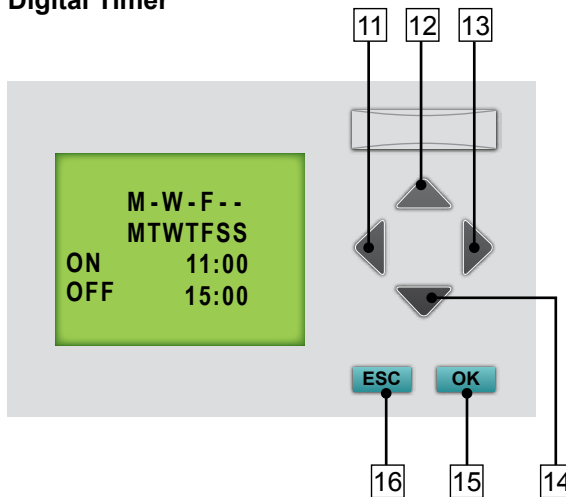
1. Power button
2. Digital timer
3. Manual timer mode button
4. Circuit breaker
5. Start button
6. Alarm reset button
7. Power on light - *indicates when system is on*
8. Service system light - *indicates an alarm has been triggered and user must service the system*
9. Pump active light - *indicates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



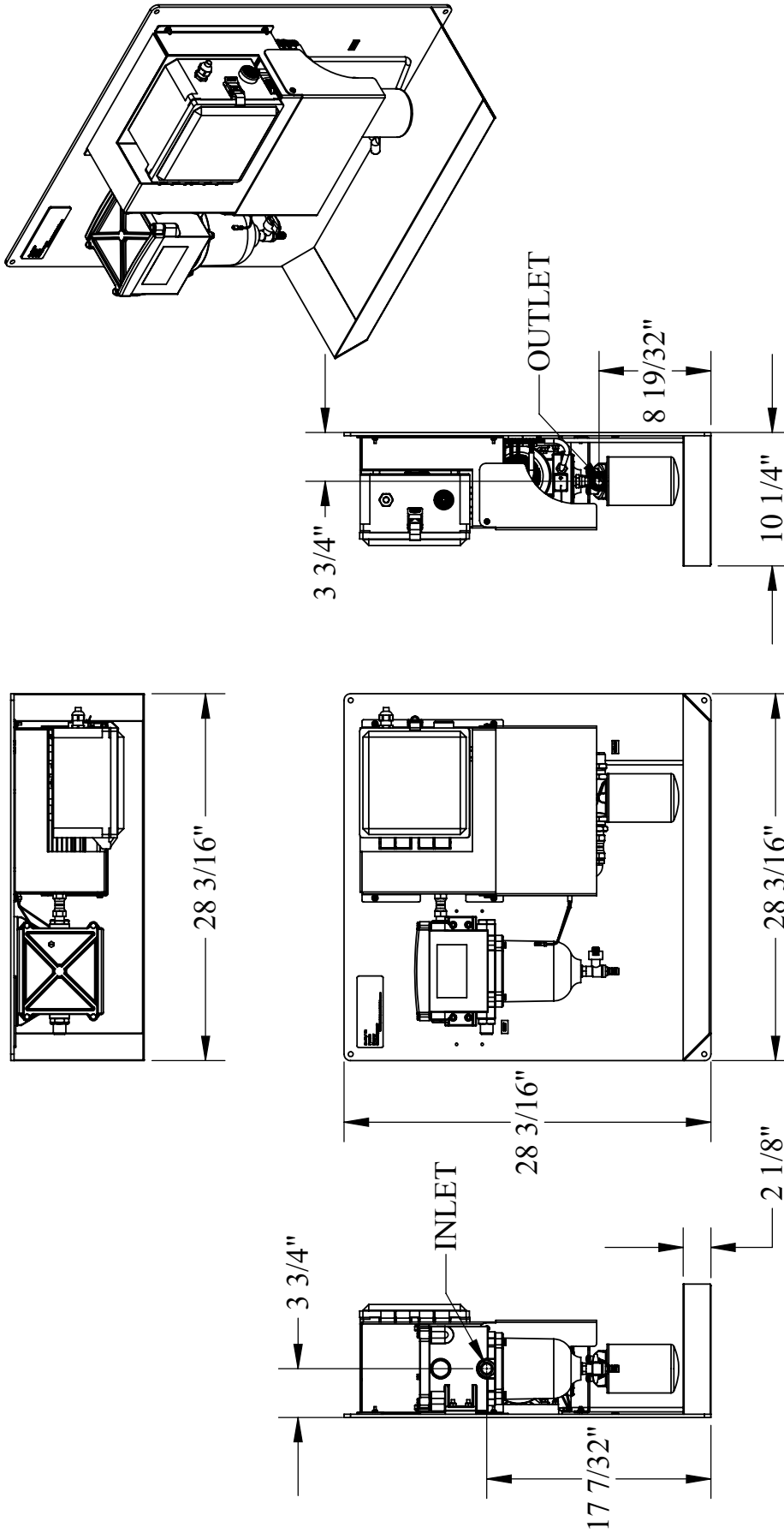
Digital Timer

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

SIZE	DWG. NO.	REV
A	AFP210-ER-0712	
SCALE: 1:12	WEIGHT:	SHEET 1 OF 1

INTERPRET GEOMETRIC TOLERANCING PER:	NAME	DATE
MATERIAL	JV	7/27/2012
FINISH	DRAWN	CHECKED
DO NOT SCALE DRAWING	ENG APPR.	MFG APPR.
Q.A.		

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL: ± 1/64 BEND ± 0.2
ANGULAR: MACH ± TWO PLACE DECIMAL
THREE PLACE DECIMAL ± .005

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PERMISSION OF
REVERSO PUMPS
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5	4	3	2	1
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Flow Rate	Approximately 210 GPH (795 LPH) Actual flow rate may vary due to conditions of installation	
Dimensions (H x W x L)	Wall Mount	28.2" x 28.2" x 11" (716 mm x 716 mm x 279 mm)
	Enclosure (including E-Stop button)	34.5" x 30" x 12" (876 mm x 762 mm x 305mm)
	Enclosure with Stand (including E-Stop button)	34.5" x 59.75" x 12" (876 mm x 1518 mm x 305 mm)
Operating Temperature	40 - 104°F (4-40°C)	
Amp. Draw	3A@110V, 1.2A@220V	
Circuit Breaker	10A@110V, 10A@220V	
Watts	140 W	
Service Space	4" on top and bottom, to facilitate changing filter elements and draining water and particulate from the bowl	
Pump	Brass Gear stainless shaft- double lip seal	
Max. Lift	15 ft / 4.7 m with foot valve above liquid level	
Timer	Digital PLC	
Inlet	3/4" #12 male JIC flare fitting	
Outlet	3/4" #12 male JIC flare fitting	
Max Fluid Viscosity	29 CST	
Filter Torque Values	Bowl Retainer Ring	12 Nm (105 in-lbs)
	Lid	12 Nm (105 in-lbs)
	Bleed Screw	6 Nm (50 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,...)

Enclosure

- NEMA 4 epoxy coated industrial gray cabinet with fully welded seams
- ANSI-61 gray polyester powder coat inside and out over phosphatized surfaces
- NEMA 4 stainless steel, 14 gauge
- NEMA 3R same as NEMA 4 with forced ventilation
- Stand for enclosure is available
- Grounding provisions provided
- Print pocket is provided
- Heavy gauge removable pin hinges
- Two, single point door latches (tamper proof locks optional)
- Doors are sealed with a closed cell neoprene gasket. Rolled lip around all sides of enclosure opening is provided to exclude liquids and contaminants

Enclosure Meets:

- UL 508 Type 3R, 4 and 12
- UL File E64791
- CSA Certified, Type 3R, 4 and 12
- CSA File LL66078
- NEMA 3R, 4 and 12
- JIC EL-1-71
- IEC 60529, IP66

Enclosure external dimensions are:

34.5" x 30" x 12" (877 x 762 x 305mm)

The bottom 1.4 inches (35.4mm) of the enclosure functions as a secondary leak proof drip pan.

Enclosure piping penetrations will be on opposite sides with inlet on the left and discharge or return on the right.

When equipped with an enclosure, an electrical junction box is located on the exterior and houses the E-Stop (Emergency Stop Button, which is IP65 and UL508 rated) and external connection point for incoming power.

External Audible Alarm

KLAXON flashing strobe with 123 dBA alarm horn.

Automatic Water Drain

Includes hydrocarbon removal filter. Only available with advanced control.

Artic Version

Includes fuel-proof foam insulation and surface mount space heater.

Secondary Filtration 10 Micron

Replaces 2 micron (standard).

Ball Valves

The AFP system should be installed with ball valves on the inlet and outlet side. These do not come standard with the system, but are available as added options.

E-Stop / Dry Contact Relay Box

Converts the remote alarm contact into a dry contact alarm.

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.
- Remote alarms are for external use.
- External control voltage must be supplied by customer.

Piping

Use quality approved fuel line materials with at least 3/4" 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.

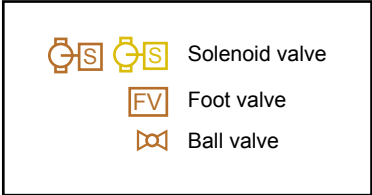
The return line(s) (discharge) should be connected to the outlet and enter the tank as far as possible from the pick up tube and extending 2/3 down into the tank. For optimal performance, ensure that the outlet, discharge or return, line(s) are free and nothing is restricting their flow.

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.

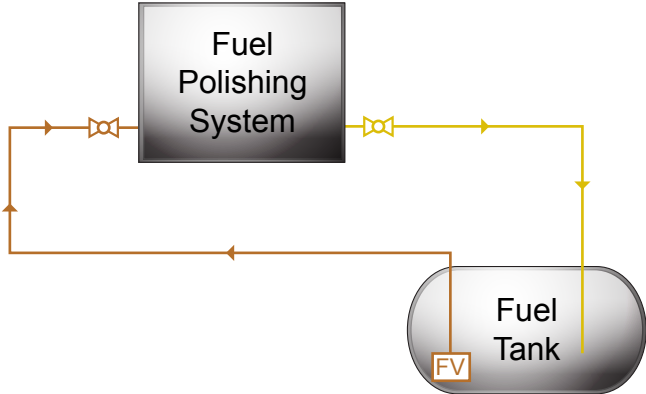
Refer to Diag. 2 and 3 on next page.

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

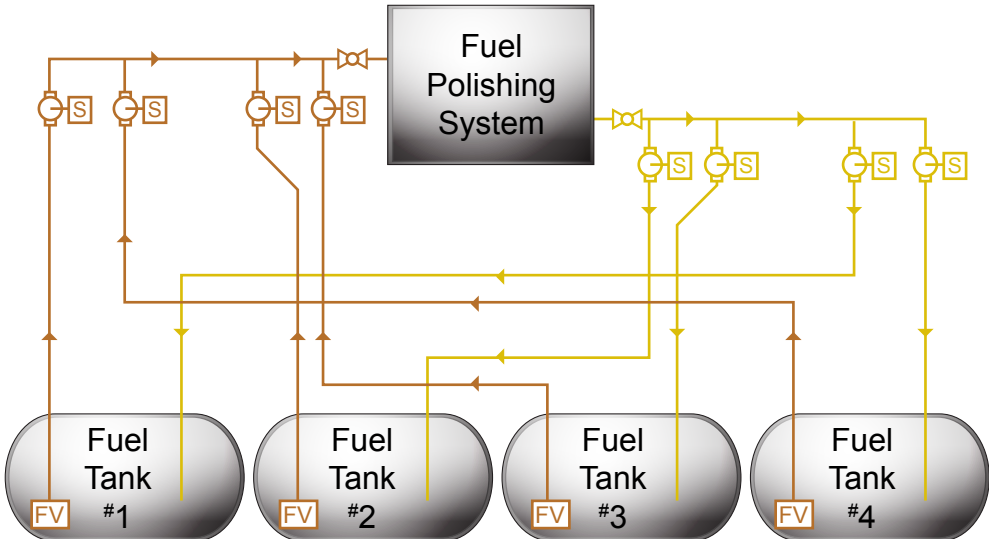
Diag. 2

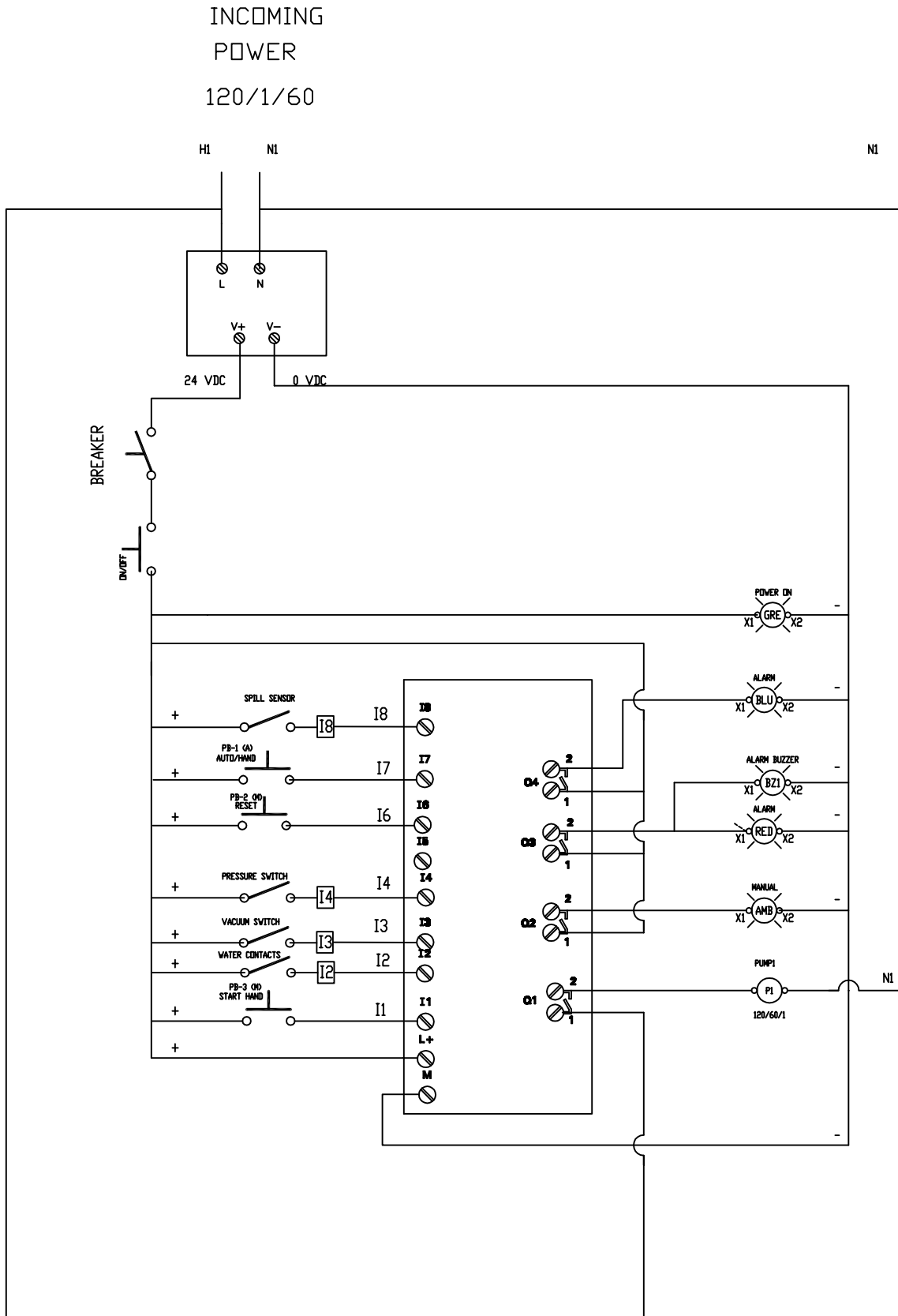


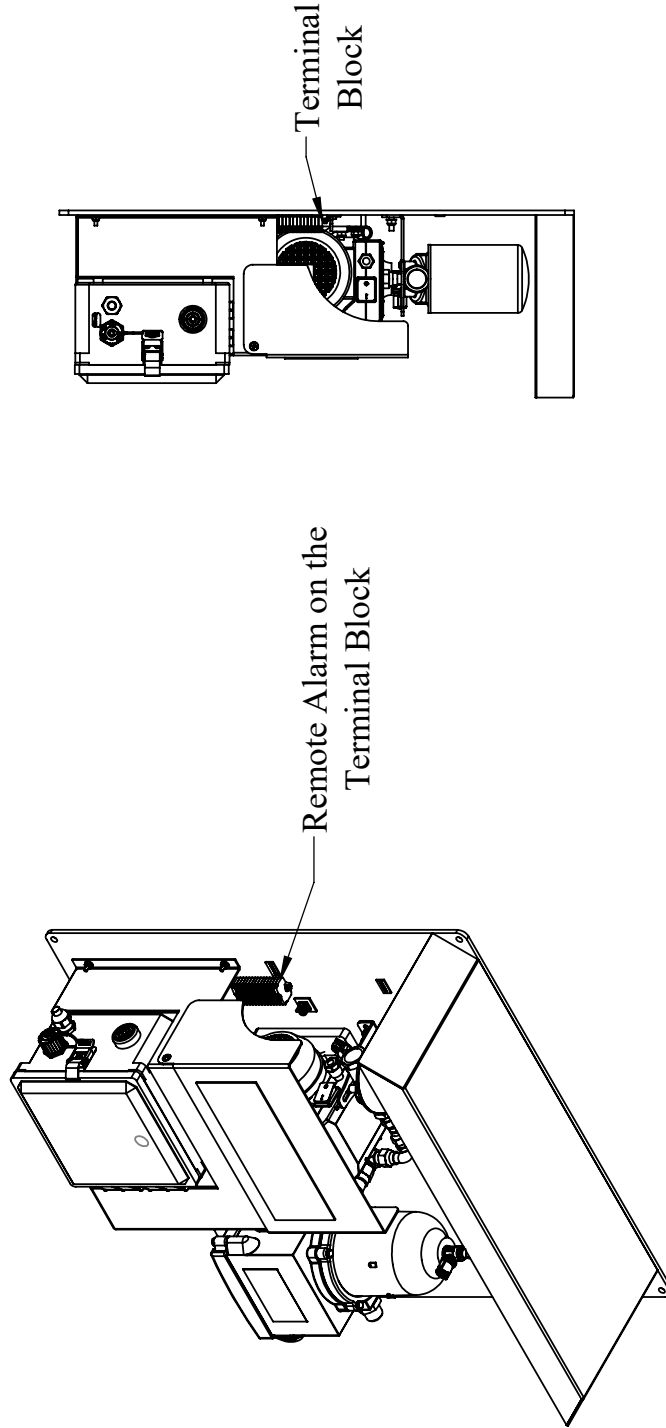
Multiple Tank Diagram

Requires Advanced Control (Touchscreen)

Diag. 3







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												SIZE: A DWG. NO. A REV A		SCALE: 1:10 WEIGHT: SHEET 1 OF 1	

5

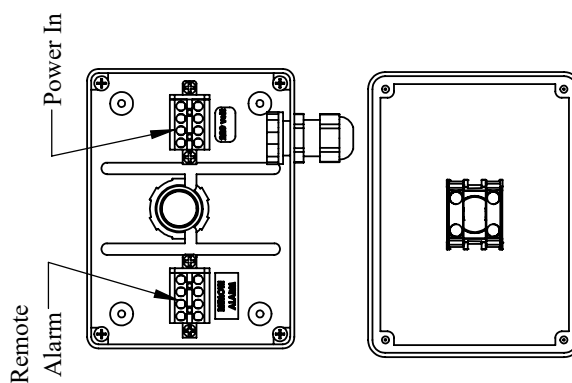
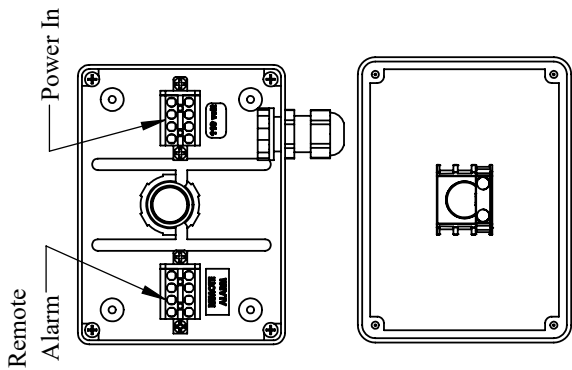
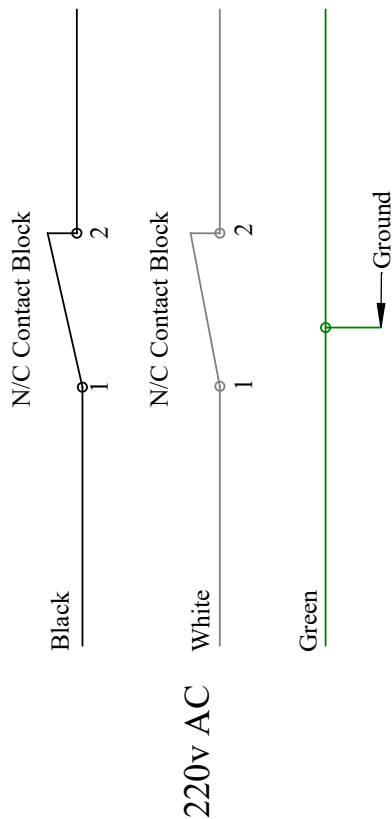
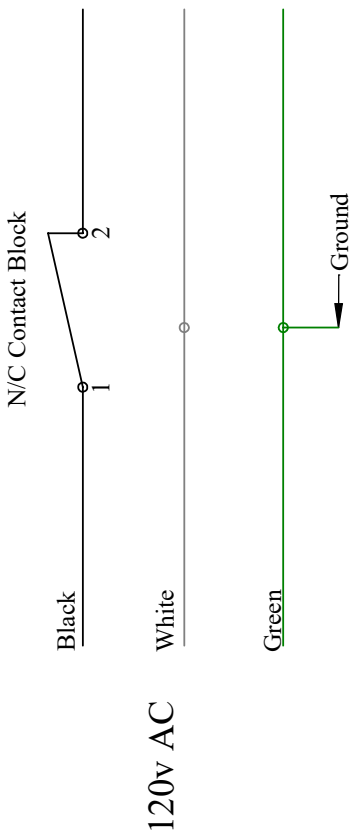
4

3

2

1

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
	A	Original Drawing Issued	6/8/2020	JC



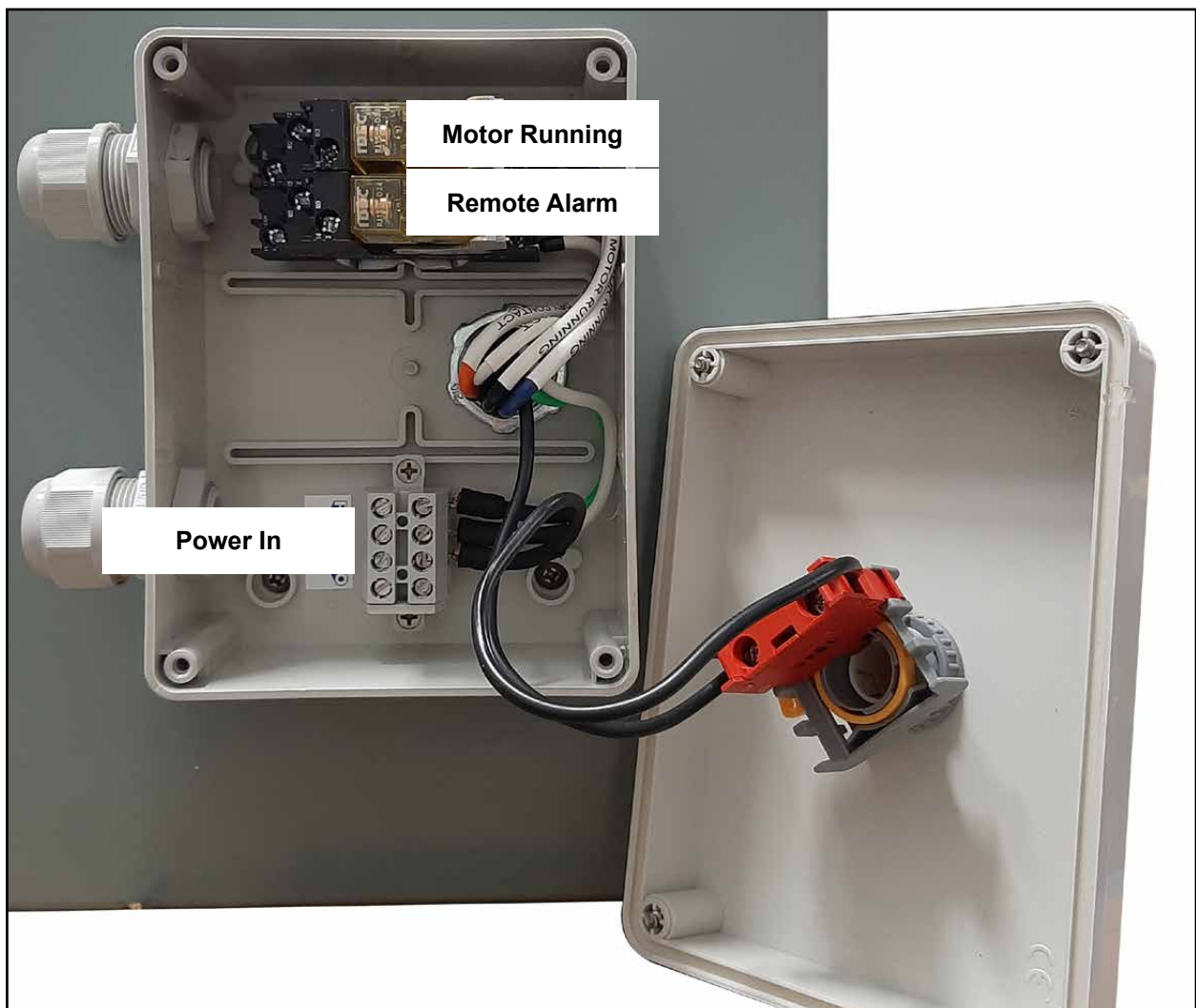
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	<p>TITLE: ESTOP Wiring Diagram</p>			<p>NAME</p>	<p>DATE</p>	<p>SCALE: 1:5</p>			
	<p>SIZE: A</p>			<p>DWG. NO.</p>	<p>REV</p>	<p>WEIGHT:</p>			
	<p>SIZE: A</p>			<p>DWG. NO.</p>	<p>REV</p>	<p>SHEET 1 OF 1</p>			
	<p>SIZE: A</p>			<p>DWG. NO.</p>	<p>REV</p>	<p>SHEET 1 OF 1</p>			

5 4 3 2 1

Emergency Stop (E-Stop) / Dry Contact Relay Box

When this option is added (part # 40-40001), the remote alarm contact converts into a dry contact alarm.

- 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.
- Normally Open, Normally Closed, and Common dry contact relay connection points are available for customer use.
- Do not exceed 250VAC or 30VDC at 12 amps. Relay contact connection will indicate when motor is running and when alarm is activated.
- External voltage must be supplied by customer.



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.

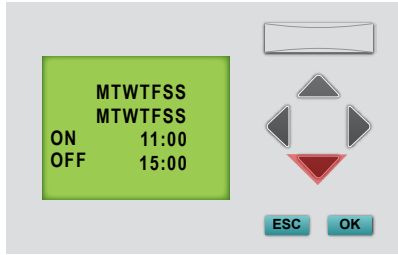
Press the reset button. Then press the start
button to resume operation.



Digital Timer Instructions: Set Date and Time

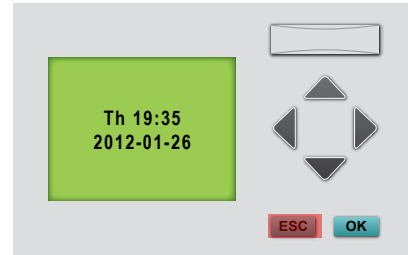
1

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



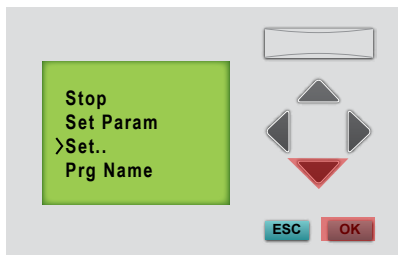
2

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



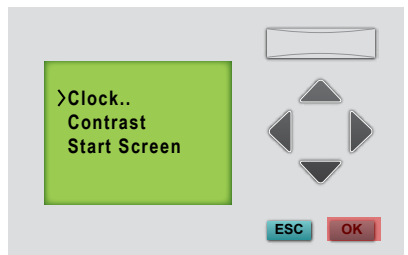
3

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



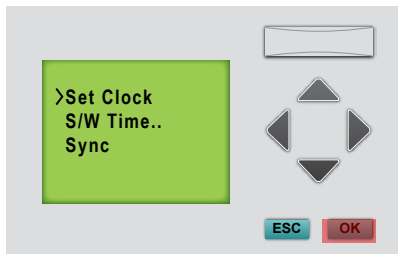
4

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



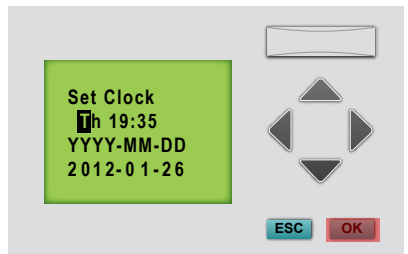
5

Select Set Clock option and press OK key to continue.



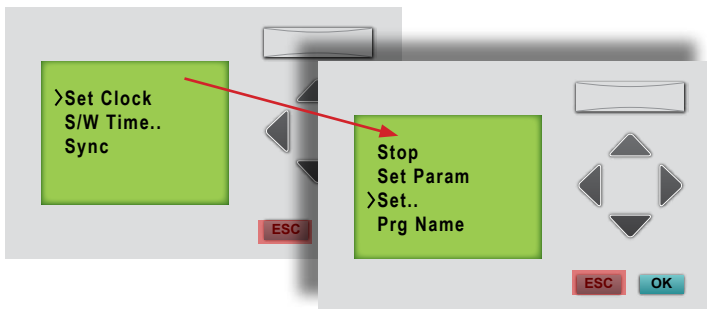
6

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.



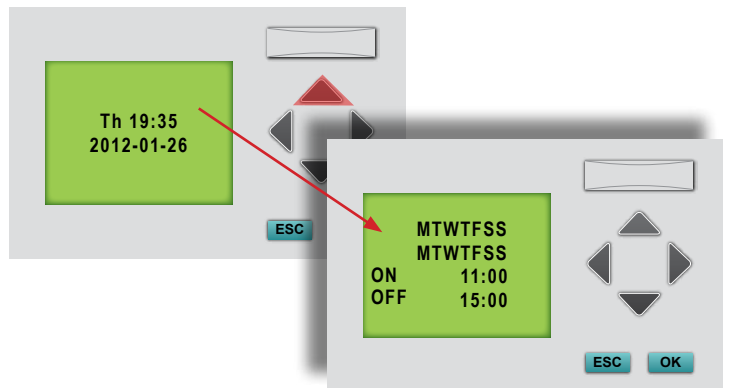
7

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



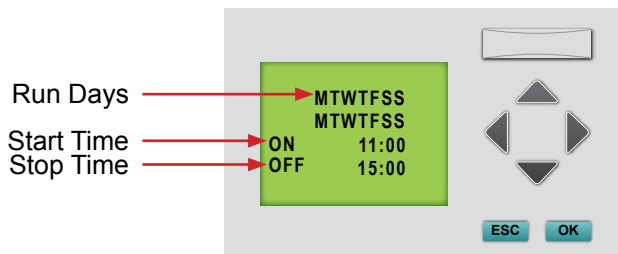
8

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

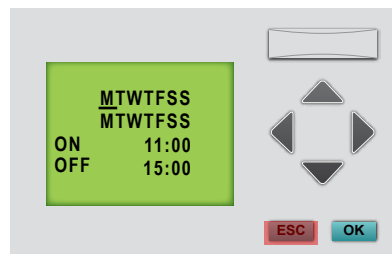


Digital Timer Instructions: Set Schedule Timer

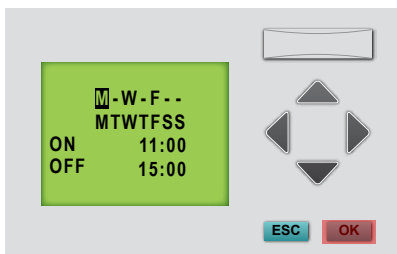
- 1 *When using this method, follow sequence exactly or damage to program can occur (non-warrantable situation).*
- A. Ensure the breaker is ON.
 - B. Move the red power switch to the ON position and power indicator light is on.
 - C. Ensure timer mode is switched to Schedule Timer.



- 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.



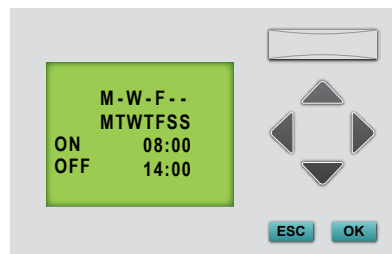
- 4 **Change the run time**
With the flashing underline in the days row, use the LEFT/RIGHT key to move to start time (ON). Press OK key until flashing box appears. Use UP/DOWN key to change time. Press OK key when finished and the cursor will return to flashing underline. Repeat with stop time (OFF).



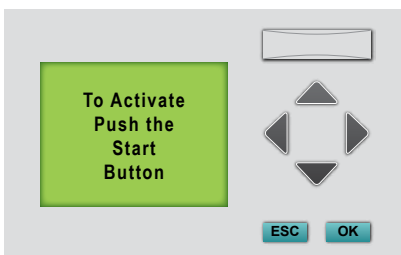
- 5 Press ESC to save. Flashing underline will disappear.



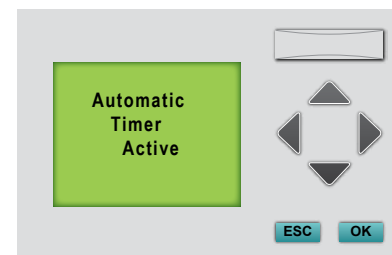
- 6 Setting the schedule timer is finished. In this example, system will run on Monday, Wednesday and Friday. System will start at 8:00 am and stop at 2:00 pm.



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



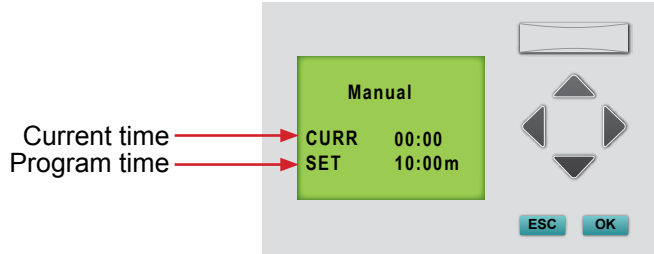
- 8 Afterwards, every 5 seconds screen will indicate the schedule timer is active.



Digital Timer Instructions: Set Manual Timer

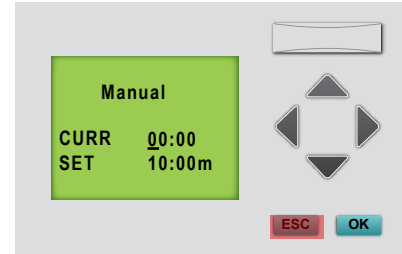
1

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



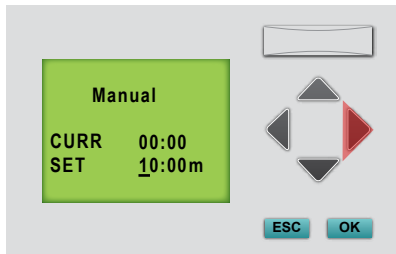
2

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



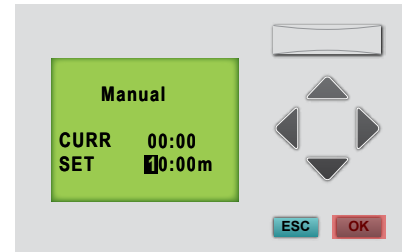
3

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



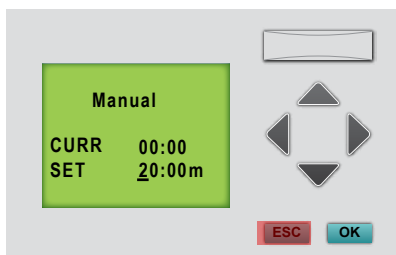
4

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

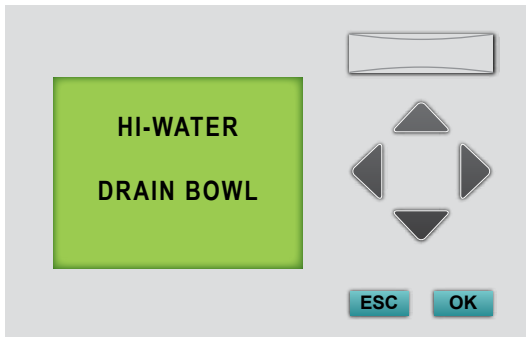
In the screen shown below, the system is set to run for 20 minutes and will stop once the time has expired.



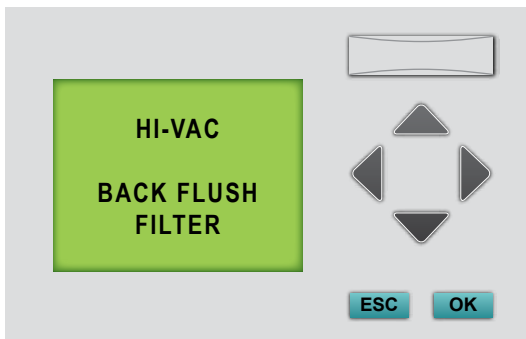
There are four different alarms installed in the unit.

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.

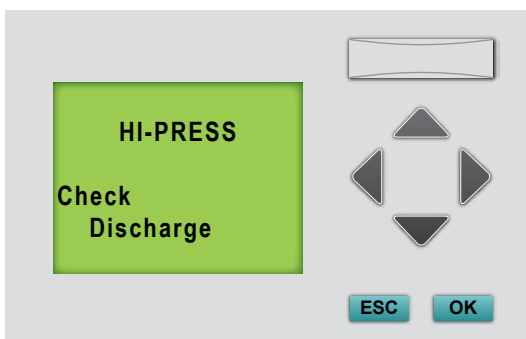


High Water Alarm

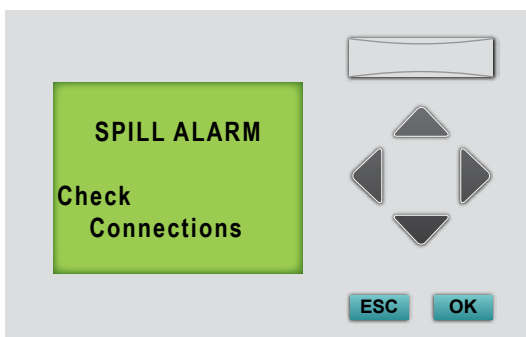


High Vacuum Alarm

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



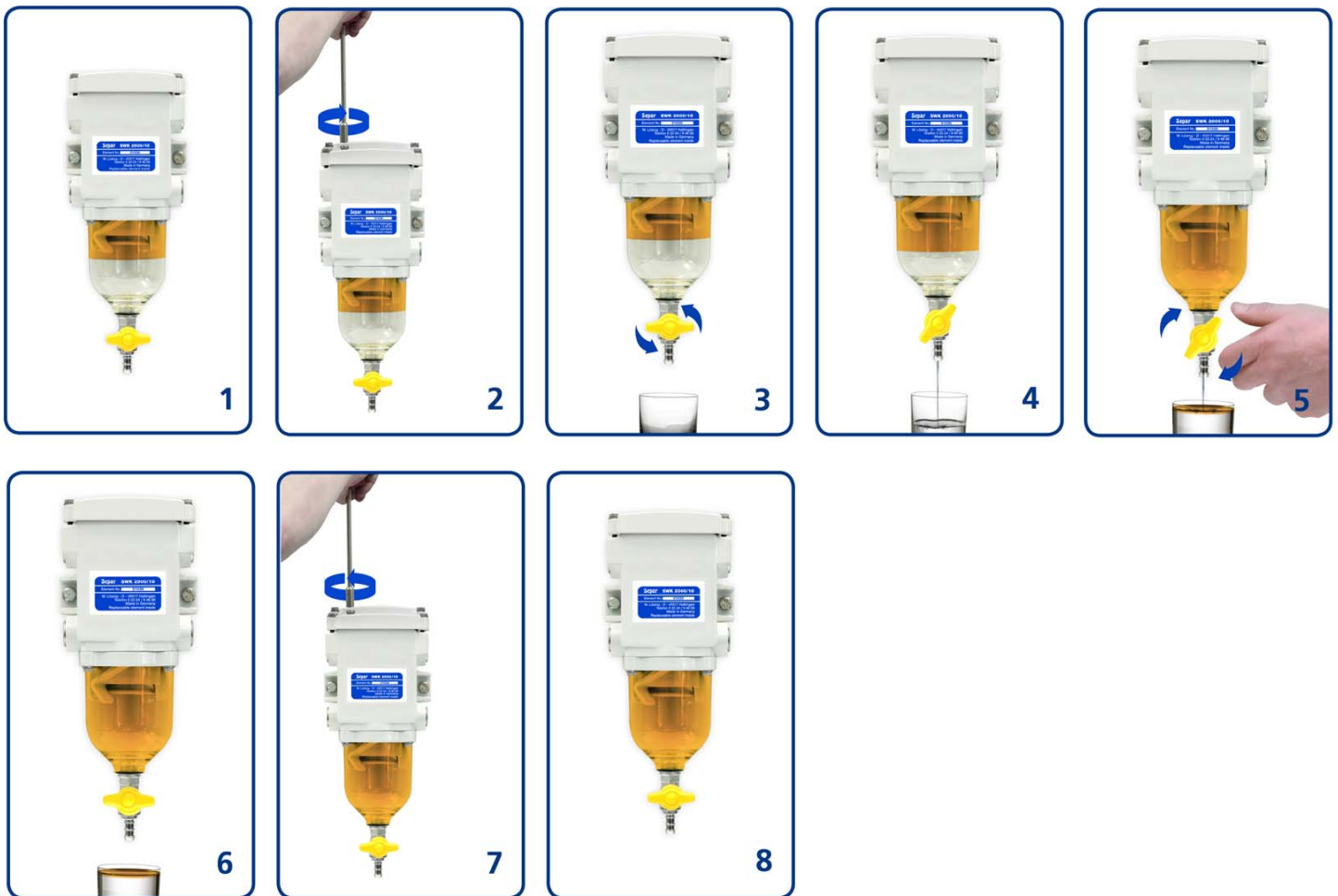
Hi Pressure Alarm



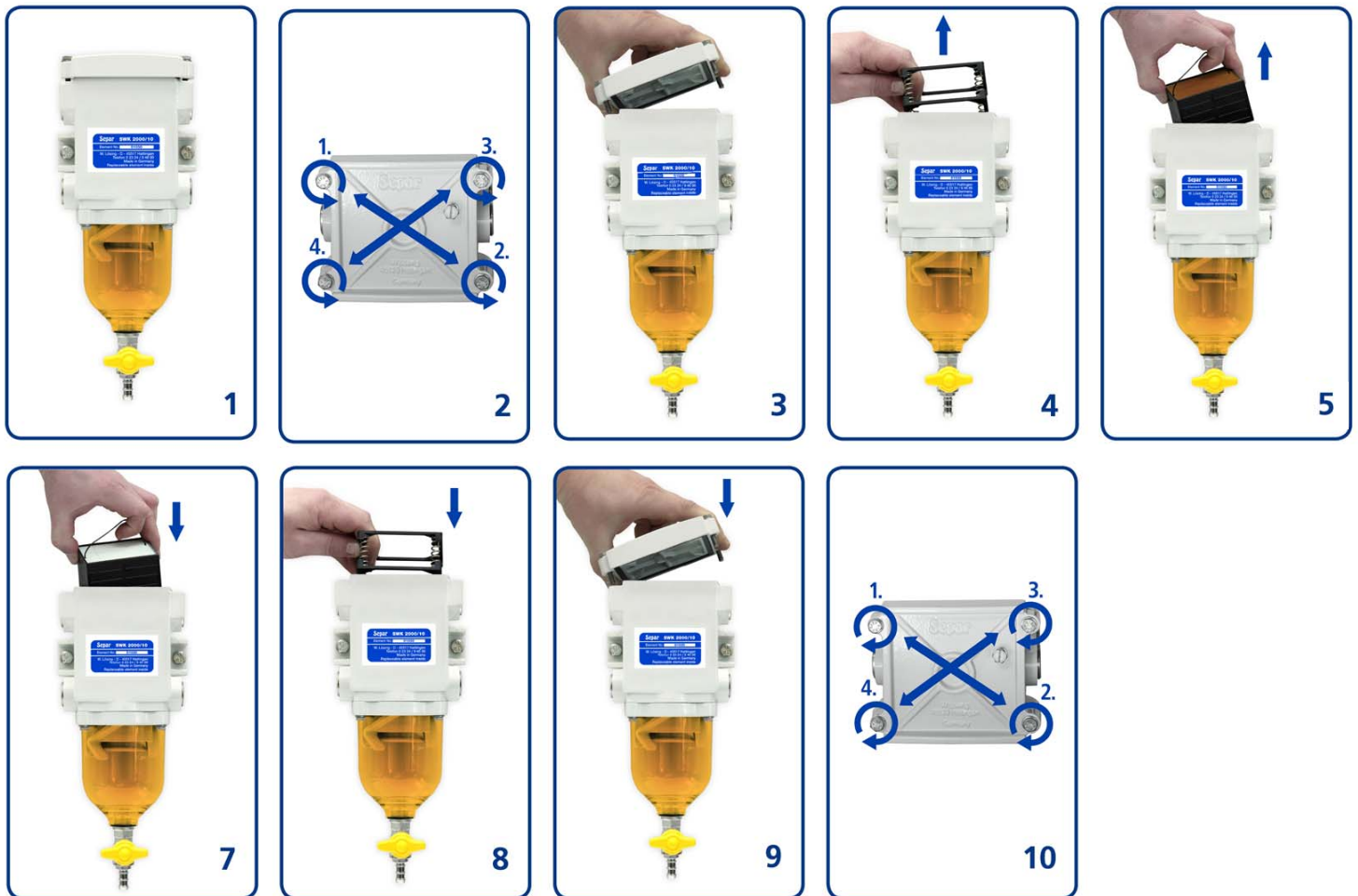
Spill Alarm

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
01810	10 Micron
01830	30 Micron (Standard)
01860S	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

Reverso Pumps warrants the product will be free of defects in material and workmanship under normal use and service within Reverso Pumps' guidelines, for one (1) year from date of purchase. This warranty is not intended to substitute normal inspection and maintenance of the product covered by the user, therefore will not obligate Reverso Pumps, Inc. to provide free service during the warranty period due to breakage or difficulties caused by misuse or improper maintenance of the product.

Warranty does not apply to any part of the product if it has been:

1. Neglected or user has not taken the proper measures for inspection and maintenance.
2. Modified or repaired without written consent of Reverso Pumps, Inc.
3. Misused or improperly operated/serviced in a way that affects the reliability, as determined by Reverso Pumps, Inc. For example, Reverso Pumps, Inc. will not cover with warranty if product has been submerged under water.
4. Tampered with regarding its serial number.
5. Damaged from failure adhere to instructions relating to Reverso products use.

The warranty is limited to the repair or replacement of the defective part. Reverso Pumps, Inc. assumes no responsibility for labor charges or other costs incurred by any purchaser incidental to the service, adjustment, repair, return, removal or replacement of product. Reverso Pumps, Inc. assumes no liability for any general, special, incidental, consequential, contingent or other damages under any warranty.

If product is determined to be repairable and is within the limited warranty, Reverso Pumps will repair or replace parts with new and/or serviceable used parts.

A product must be returned to Reverso Pumps with prior request for a Return Material Authorization (RMA) number and marked clearly on the return packaging. An unauthorized return, i.e. one for which an RMA number has not been issued, will be returned to at the user's expense.

Certain parts are excluded which are subject to normal wear and tear (e.g. fuses, filter element, o-rings, gaskets, switches, etc).

Entire financial liability of Reverso Pumps, Inc. in no event shall exceed the purchase price for the product.

Reverso Pumps, Inc. reserves the right to modify the design, material and performance of products and is not obligated to cover same changes in products previously purchased. Reverso Pumps reserves the right to modify its warranty policy at any time, at its sole discretion and without prior notice.