

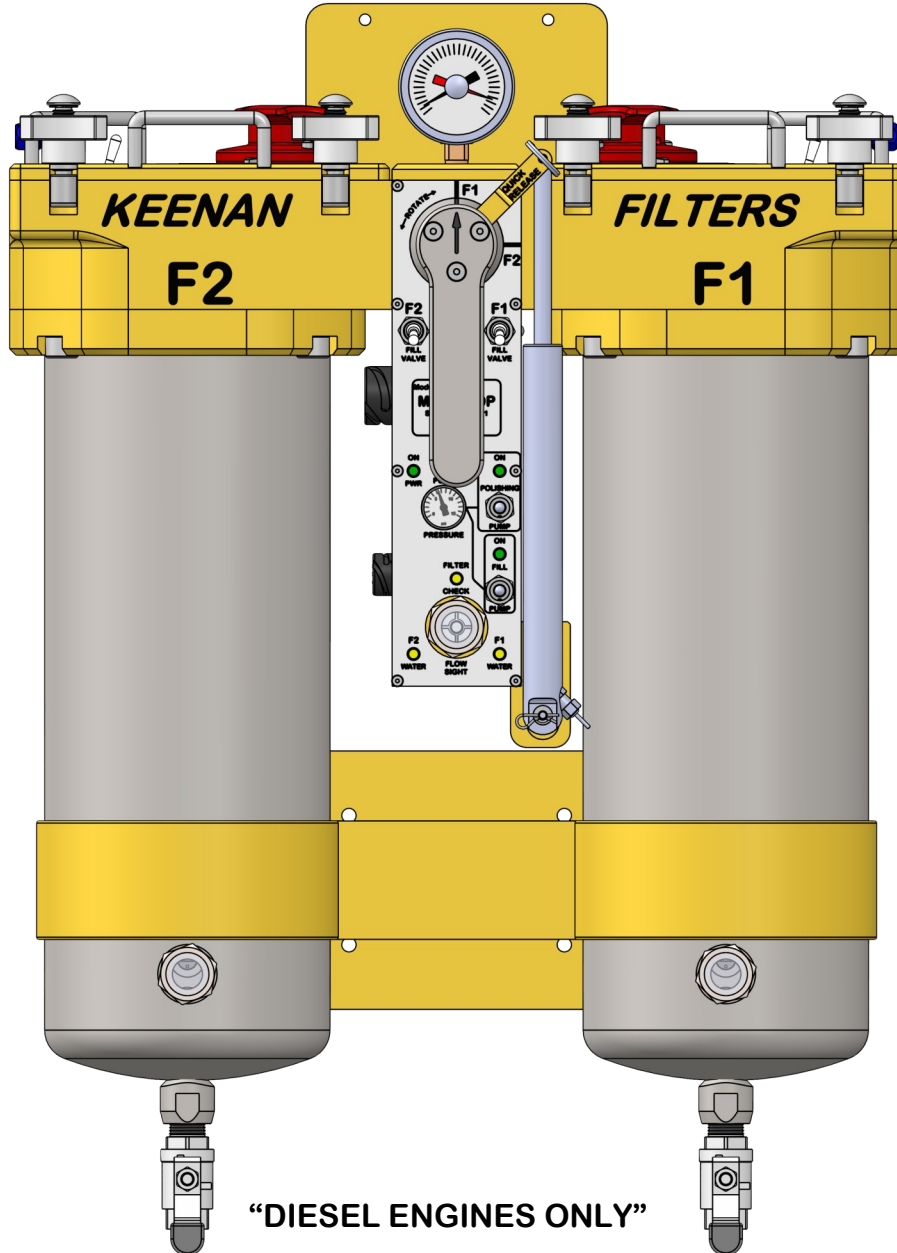


By KTI Systems, Inc.

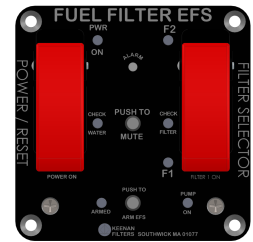
MK1500DP-EFS

FUEL MANAGEMENT SYSTEM

INSTALLATION / USER GUIDE



“DIESEL ENGINES ONLY”



REMOTE WARNING

THE INSTALLATION AND SETUP SHOULD BE PERFORMED BY A QUALIFIED TECHNICIAN

US PATENTS AND PATENT PENDING, ALL RIGHTS RESERVED.

KTI SYSTEMS INC 55 HUDSON DRIVE SOUTHWICK MA 01077 (413) 569-3323 info@ktisystems.com

MADE IN USA

MK1500DP-EFS Product Description

Our Keenan Filters were designed to provide the marine, industrial and transportation industries a fuel filtration system that delivers clean/dry fuel to the engine, protects the engines fuel delivery system while the engine is operating, provides early warning detection, and the tools to efficiently maintain the fuel system from the tank to the engine, reducing downtime and cost while increasing engine reliability.

Our new MK1500DP-EFS filter utilizes the  Aquabloc 3D element that incorporates three media stages to remove impurities, emulsified water and water droplets while increasing the filter service life by 50%. Using our new patent pending design, **WE CAN NOW REMOVE AND REPLACE THE OFFLINE FBO ELEMENT FROM THE TOP—WHILE THE ENGINE IS IN OPERATION**, this significantly reduces time, effort and clean up.

Our dual filter systems allows one filter to be online while the second is ready when needed. With a dedicated fill pump, we designed the filter manifolds with internal passages so the dirty offline filter can be swiftly replaced, primed and ready to go back online, all while the engine is operating. We also incorporate an optional second higher flow pump for engine priming, polishing and fuel transfer using the existing fuel lines.

Standard with our system comes a remote warning and control panel. This warns the operator when a problem is starting. With the EFS option, it can switch filters remotely, or arm the system; so if a filter starts to clog or water is detected it will automatically switch filters. Designed into the center manifolds are the controls, sensors and electrical connections that communicate with a remote interface box. This makes it easy to configure the system for a stand alone operation or communicate with a remote monitoring system.

Benefits/Features:

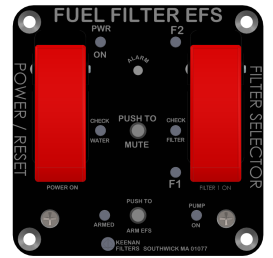
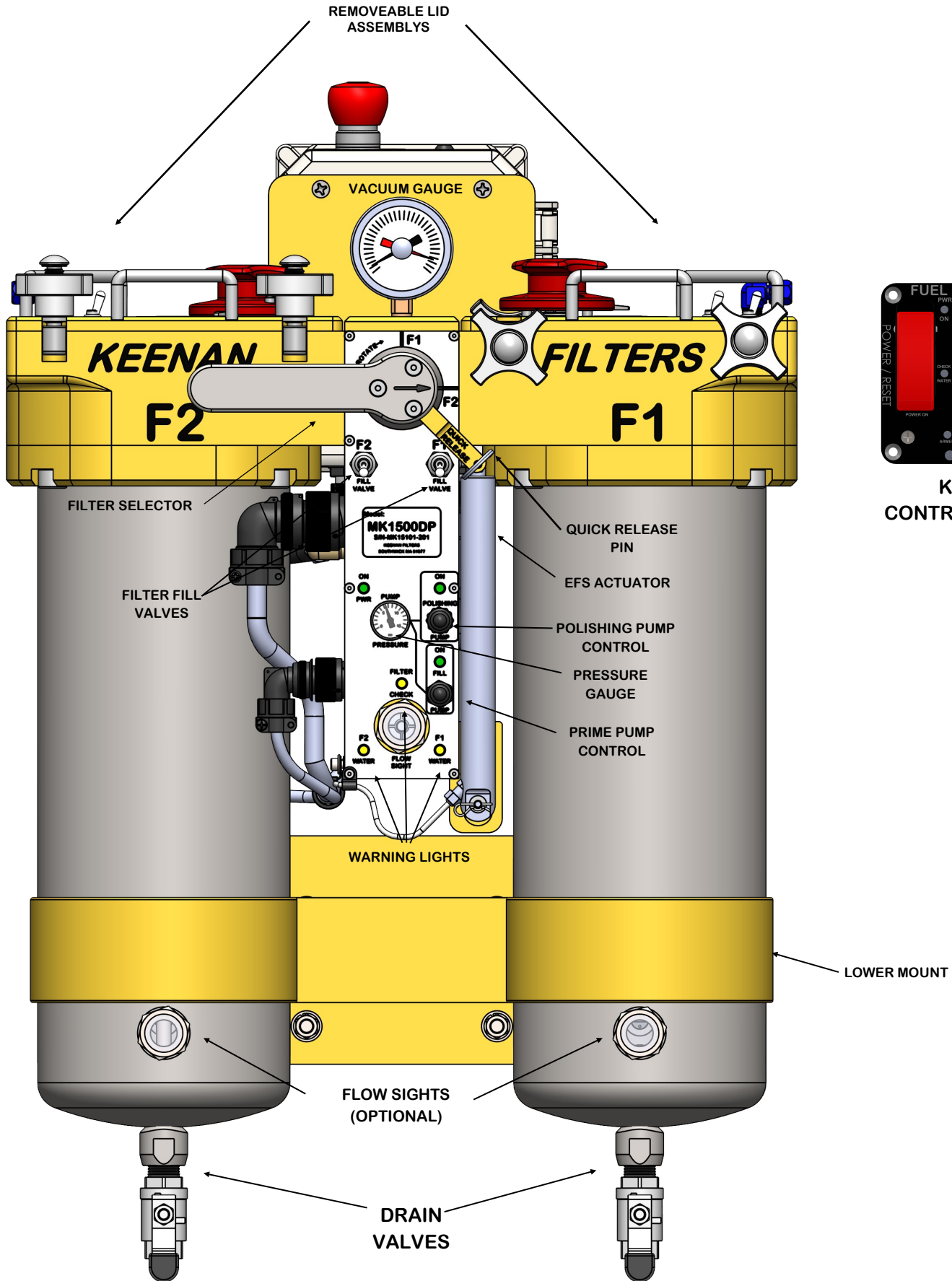
- **DUAL FILTER SYSTEM** - Allows one filter online and the second ready when needed. - Replace the dirty filter without stopping the engine.
- **INTERNAL FUEL PASSAGES**– This provides clean fuel to be ported into the offline filter for servicing or to assist in removing contaminants from the bottom of the filter housing.
- **REMOVES EMULSIFIED WATER** that damages the injector systems reducing cost.
- **ELIMINATES** unscheduled maintenance and cost.
- **TOP LOADING**– Simplifies element replacement and reduces or eliminates system bleeding.
- **ADVANCE WARNING** – Allows the operator to use a lower micron pre-filter for cleaner engine fuel delivery.
- **REMOTE WARNING PANEL** - Alerts the operator before fuel problems can affect engine operation.
- **FILL PUMP**– Makes filter servicing and priming quick and efficient
- **SYSTEM TESTING** - Allows the operator to test the system for indication and integrity before operation or after maintenance has been performed.
- **FUEL POLISHING-** (OPTIONAL) Ensures clean fuel is supplied to the engine. - Reduces maintenance cost. - Allows the operator to polish the fuel quality during and after engine operation. - Gives the operator a solution to fuel contamination.
- **ELECTRIC FILTER SWITCH (EFS)** - (OPTIONAL) Allows the operator to switch filters from the remote panel or can be armed to switch filters automatically when the filter starts to clog or water is detected.
- Uses genuine Racor® elements

MK1500DP-EFS INSTALLATION/ USER GUIDE

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MK1500DP-EFS



**KP600
CONTROL PANEL**

EMERGENCY SHUT OFF (OPTIONAL WITH POLISHING SYSTEMS)

ELECTRICAL INTERFACE BOX

FILTER FILL PUMP

UPPER MOUNT

STAR KNOBS

RAM POSITION KNOB

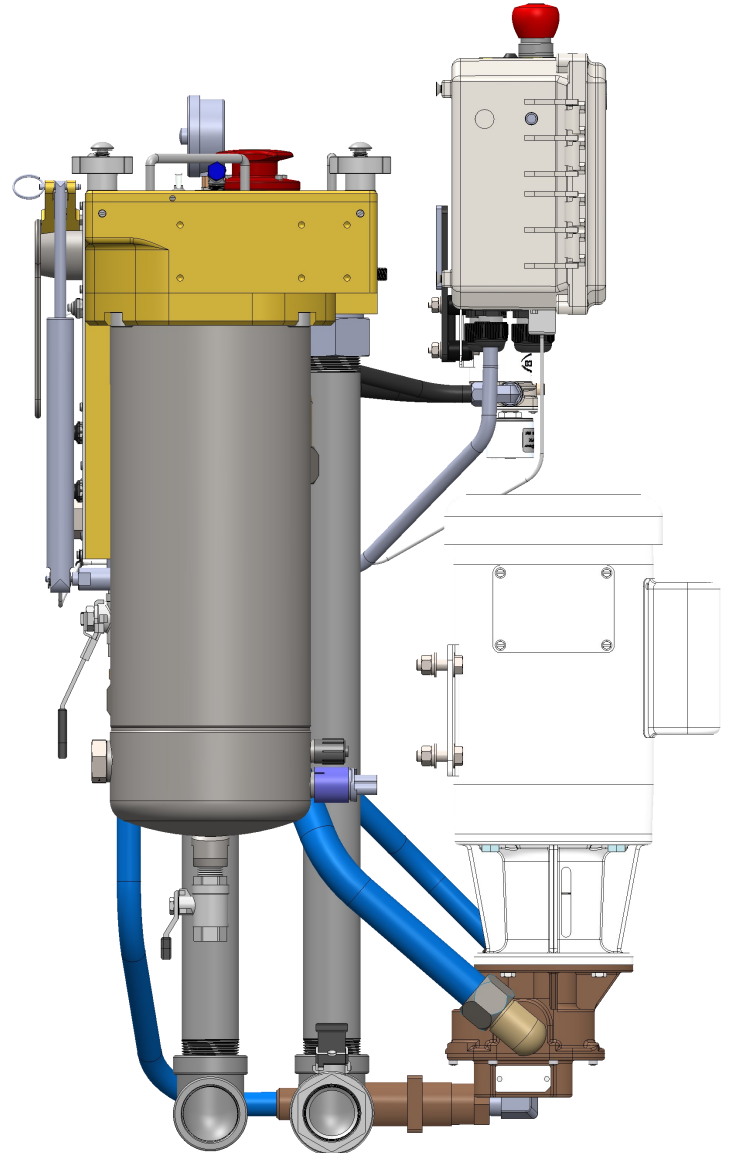
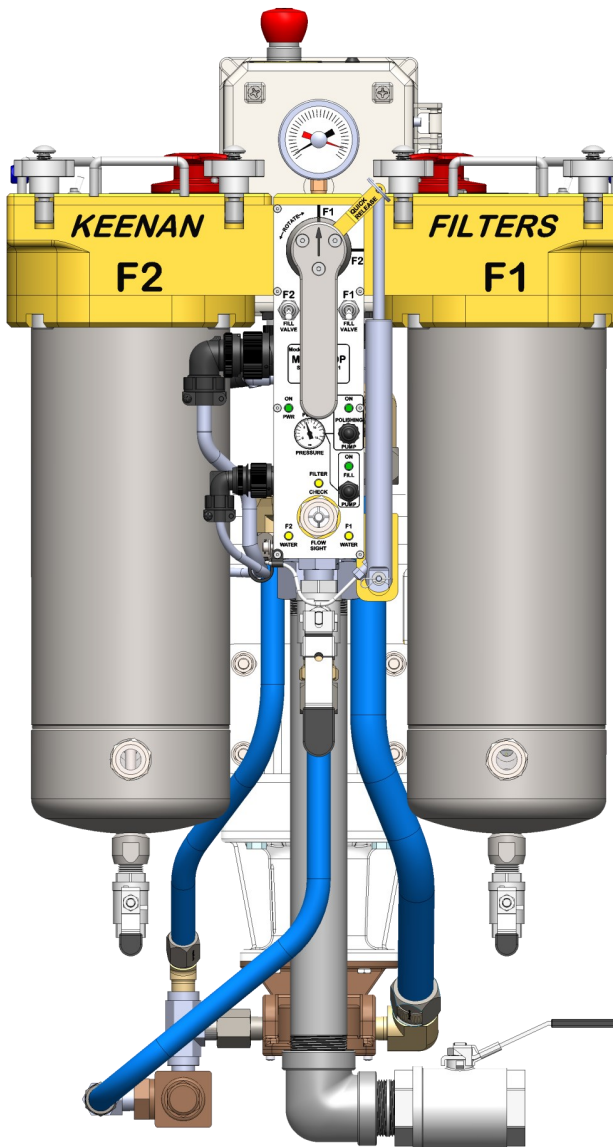
POINTER

BLEED PORT

VALVE GUARD

INNER/OUTER BLEED/VENT VALVES

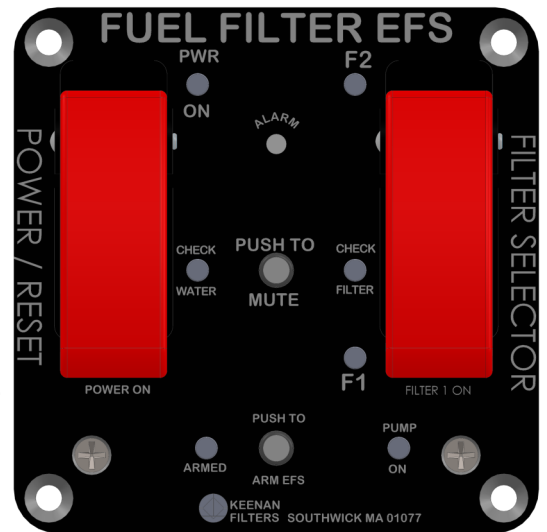
LIFTING HANDLES



KP600 CONTROL PANEL

The KP600 control panel will give the operator indication and audible warning if the filter is starting to clog (high vacuum) or more than 60 ounces of water is present in the online fuel bowl. The operator can MUTE the audible alarm so it is not distracting.

Normally a clogged filter or water warning will take many hours of operation to trip the alarm, so an engine shut down will not happen immediately when the alarm does sound. .



Note: If the water alarm sounds after fueling or switching tanks the operator may need to shut down the engine quickly because of EXCESSIVE water contamination. Check the fuel bowl for a rising water level.

The system can be turned on or off from the panel using the power reset switch. It also allows the operator to electrically switch from filter F1 and F2 by lifting the guard and selecting the filter. You can arm the system to automatically switch filters by pressing the ARM SWITCH (arm light will illuminate). When a warning is tripped the system will automatically switch filters.

PUMP ON - Indication that the polishing pump is in operation. See the wiring diagram for information on connections if a pump is installed.

POWER / RESET - allows the operator to shutdown or reset the system

THE INSTALLATION AND SETUP SHOULD BE PERFORMED BY A QUALIFIED TECHNICIAN

INSTALLATION TIPS

PLEASE READ BEFORE INSTALLING

- Do not smoke or allow open flames.
- Turn off engine.
- Turn off power and disconnect battery ground cable connection.
- Before drilling holes or installing mounting hardware make sure the back side is clear of obstructions such as fuel lines, electrical harnesses, fuel and fluid tanks, ships hull, etc.
- Use proper fuel lines, connections and mounting hardware. Use proper wire, connectors and routing.

SUGGESTED TOOLS AND SUPPLIES

- Shop towels and a clean bucket.
- Clean diesel to prime the filter.
- Clean engine oil to lubricate seals.
- Proper thread sealant (do not use thread tape).
- Use adequate light, ventilation and eye and skin protection.
- Proper 16 AWG wire for harness or 10 conductor 16 AWG cable (KTI P/N KW1216 or KW1416 optional)

FUEL SYSTEM DESIGN AND LAYOUT

(Note: The information in this manual is a guide and it is the responsibility of the installer, builder or designer to follow proper installation requirements, codes and procedures.

INSTALLATION

The MK1500DP-EFS can be installed as a fuel management system that prefilters the fuel to the engine, allows engine priming, fuel polishing and fuel transfer. It can also be installed to be just a prefilter or polisher/transfer system, so depending on the installation will decide its location. Take in consideration fuel supply and return piping and electrical routing.

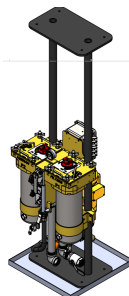
We offer two mounting options:

Stand Alone– This can be mounted to any horizontal surface and allow 360 degree access to any of the components.

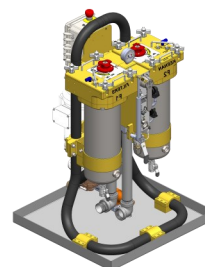
Engine Room - The mount is secured to the floor and ceiling surface this also allows for full access to any of the components.

*CUSTOM MOUNTING
AVAILABLE

ENGINE ROOM



STAND ALONE

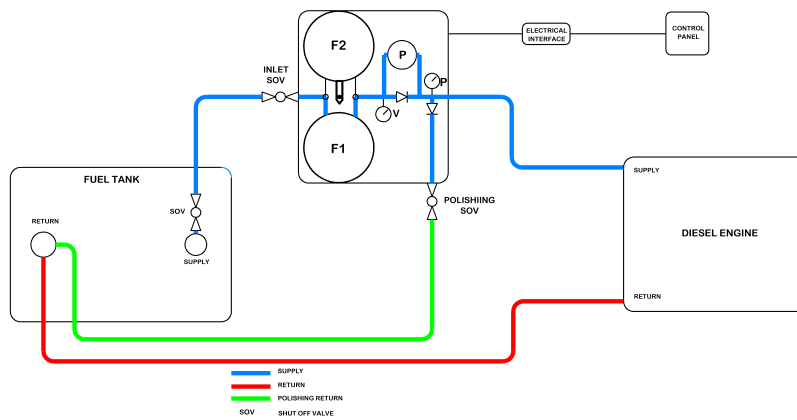


INSTALLATION TIPS CONTINUED

(PRIMARY FILTER, PRIMING, POLISHING AND FUEL TRANSFER)

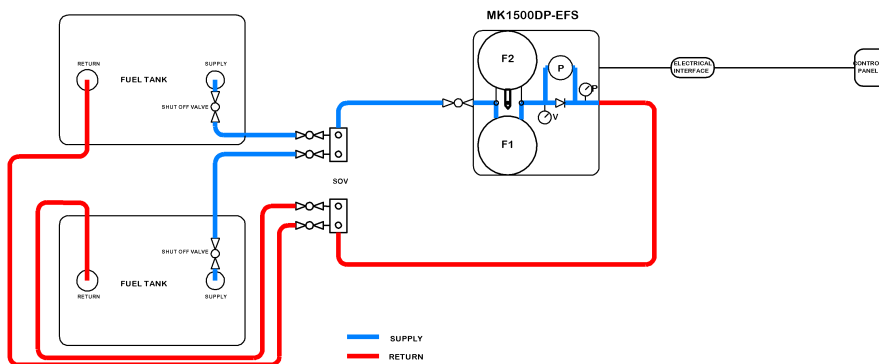
The system is installed on the suction (inlet) side of the engine lift/transfer pump. The location normally is close to the engine and its height should be about the same as the engine lift/transfer pump. Mounting the system should always be away from equipment that can cause injury (belts, exhaust and rotating parts). The backpack mounting design allows for several mounting options that will need a horizontal structure to support its weight and also its momentum if the equipment is moving. Connections are the same as any other filter with an inlet supply from the fuel source and the outlet to the engine and if the system is utilizing the polishing/transfer pump a return hose/pipe will be required to return fuel back to the tank or tank return manifold.

The ports are SAE straight thread O-ring (ORB) type and can be adapted to NPT, JIC, SAE, O-ring face seal and flareless type hose or pipe fitting connections. Use proper mounting hardware and practices.



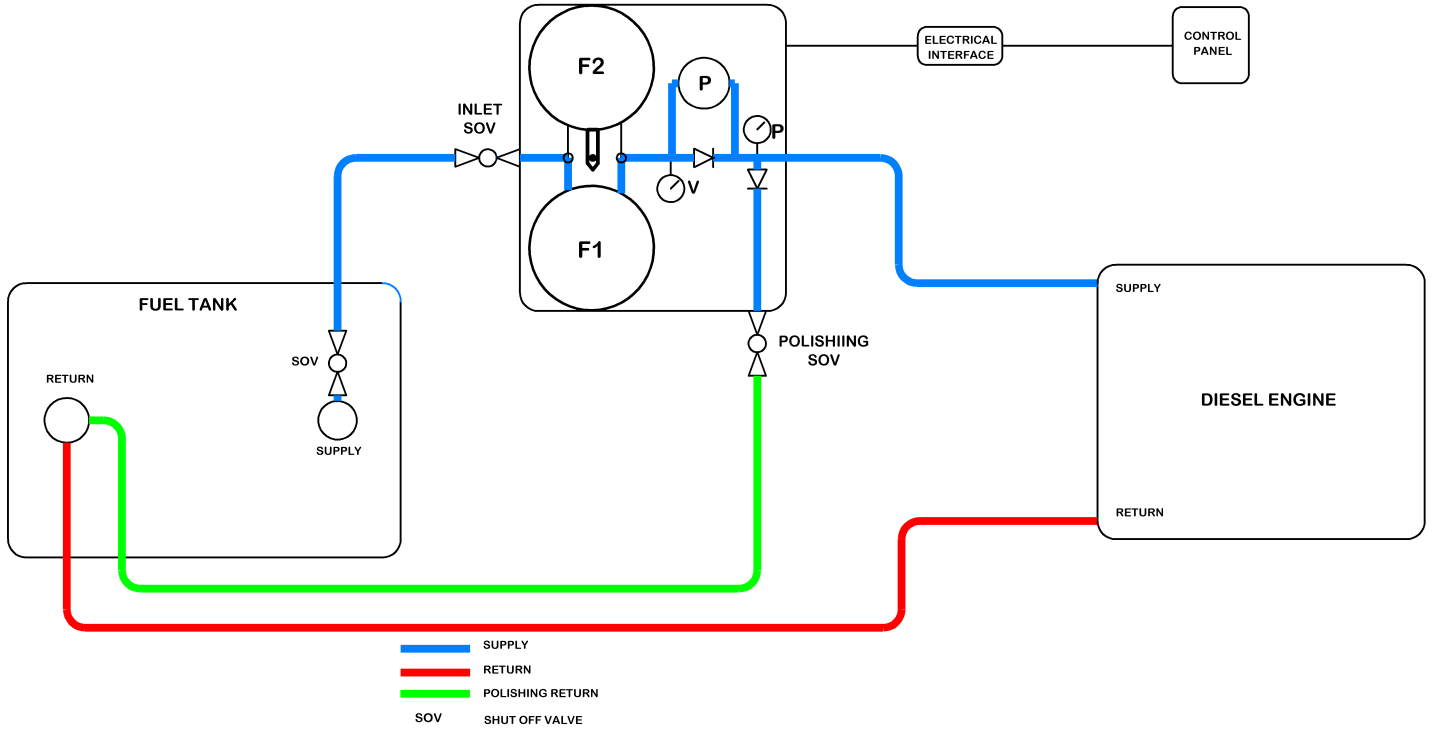
FUEL TRANSFER AND POLISHING ONLY

This system can be installed close to the fuel supply and return manifolds. The "To Engine" port should be used as the outlet port. Using supply and return manifolds makes it simple and easy to clean and transfer fuel.

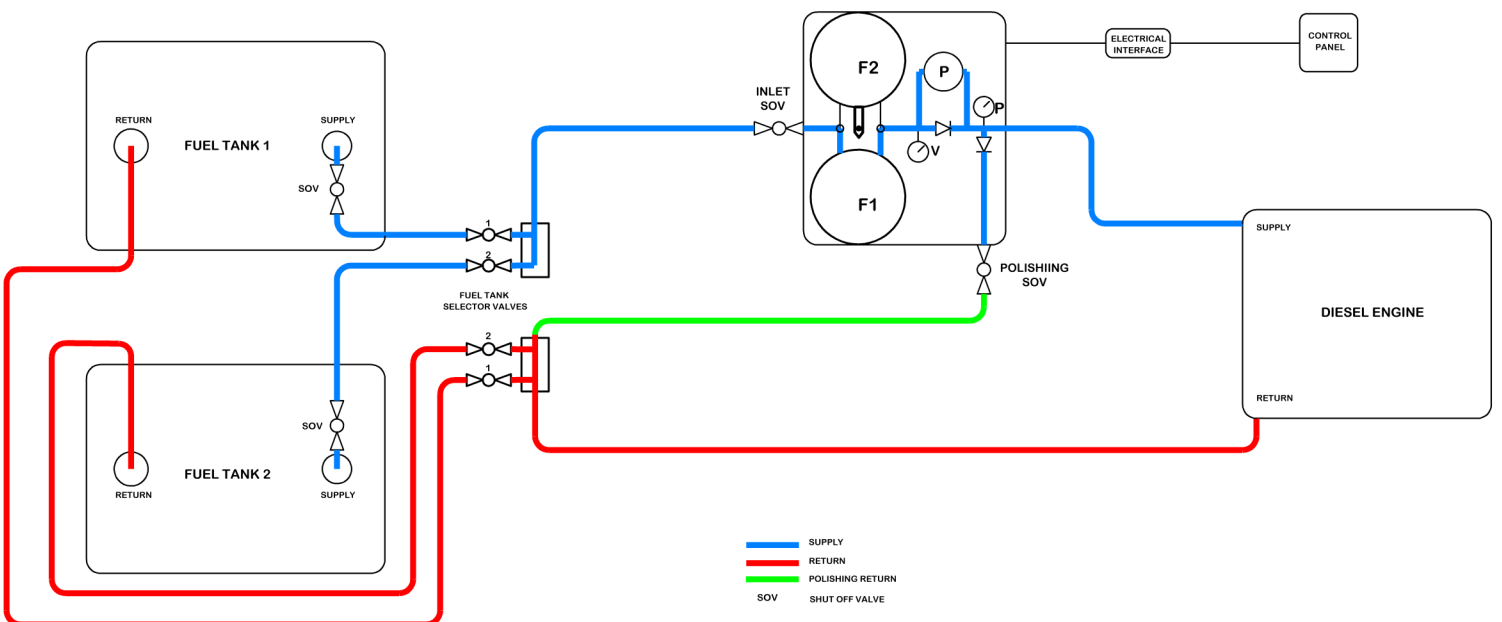


FUEL DIAGRAMS

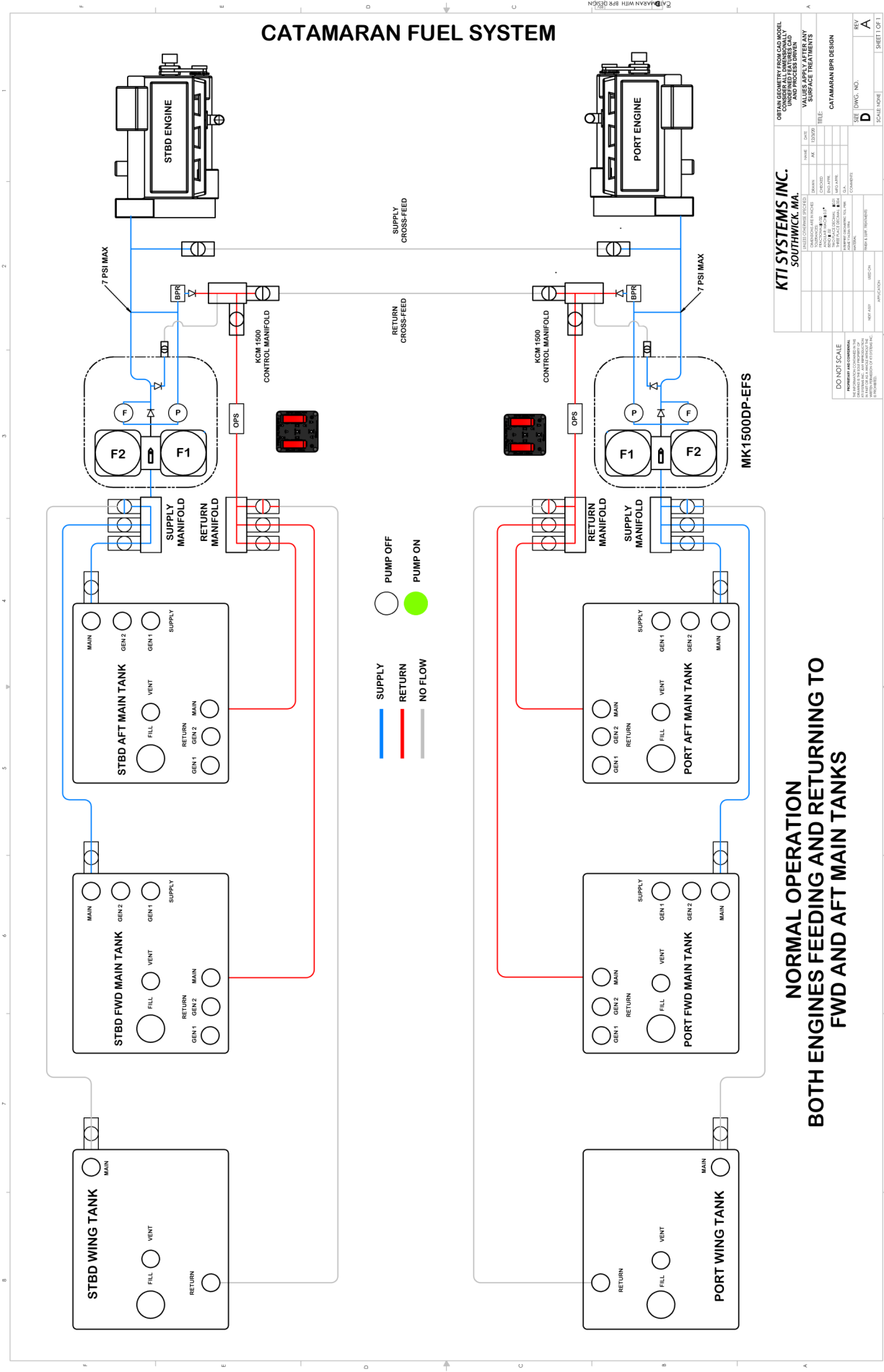
SINGLE ENGINE SINGLE TANK



SINGLE ENGINE DUAL TANKS



CATAMARAN FUEL SYSTEM



KTi SYSTEMS INC.
SOUTH WICK, MA.

REV	DATE	DESCRIPTION
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

DESIGNED BY: []
CHECKED BY: []
DRAWN BY: []
DATE: []
SCALE: []
PROJECT: []
JOB NO.: []
REV: []
DATE: []
SCALE: []
SHEET NO.: []
SHEET TOTAL: []

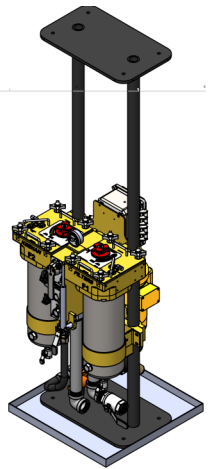
DO NOT SCALE
FOR DIMENSIONS
OR MATERIALS
UNLESS SPECIFIED
OTHERWISE
CONTACT THE
DESIGNER FOR
DETAILS

**NORMAL OPERATION
BOTH ENGINES FEEDING AND RETURNING TO
FWD AND AFT MAIN TANKS**

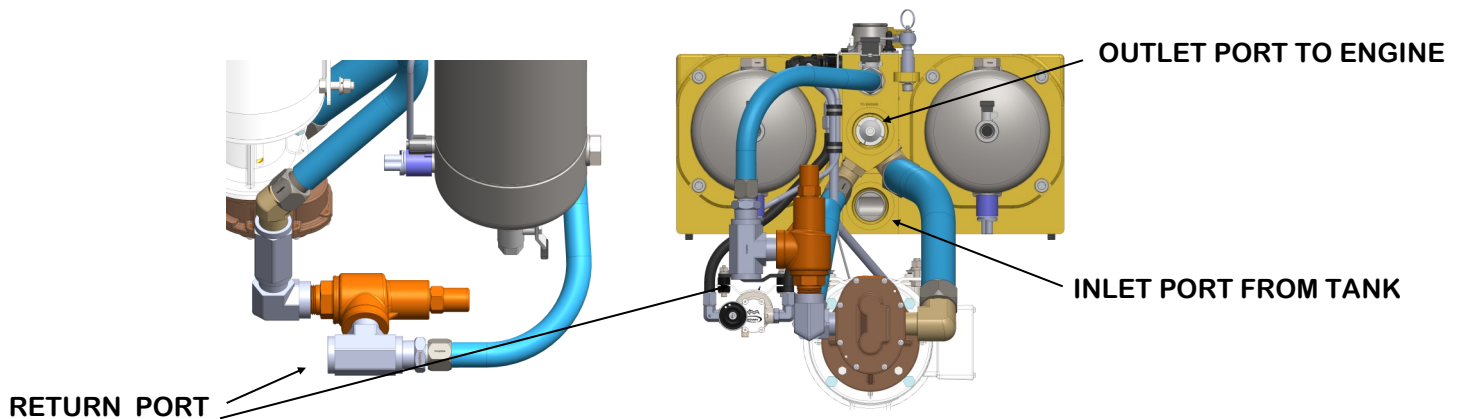
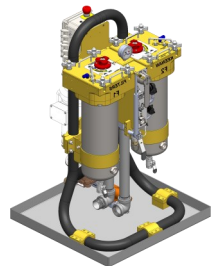
MK1500DP-EFS MOUNT LOCATION

1. The MK1500DP-EFS currently can be installed using either the engine room or stand alone mount. Pre-existing filters should be removed. If the engine manufacturer has permanently installed primary filters, service with new filter elements.
2. The filter assembly should be mounted between the horizontal plane of the engine lift or transfer pump inlet and the fuel tank. The mount should be bolted to a horizontal surface that can support its weight and also its momentum if the equipment is moving. The system should be installed between the fuel tank (fuel source) and the suction side of the engine lift or transfer (**DO NOT MOUNT ON ENGINE**). Leave at least 4" below the drain valves and about 14" above the filter to remove and replace the filter element. **USE APPROPRIATE MOUNTING HARDWARE**
3. A shut off valve is installed in the inlet side of the filter, which will allow for system testing. If the fuel tank (fuel source) is located close to the filter, the fuel tank supply shut off may be used.
4. If the fuel tank (fuel source) is mounted higher than the filter, a shut off valve must be installed into the inlet of the filter assembly. This will stop the flow of fuel when servicing the filter or fuel system.
5. If the system has a high flow polishing pump it will require a pressure regulator to protect the system if the pump is turned on and the polishing port is closed. The regulator bypass is shared with the polishing port and must be connected to the tank return or return manifold.
6. Location of the filter should allow for easy access while servicing and away from anything that can injure the operator, such as hot and/or moving equipment.
7. Use appropriate fuel line with the least amount of restriction, such as 3/4 ID or higher hose. Avoid sharp 90 degree bends. Route fuel lines away from sharp objects and heat.
Note: if sharing the engine return line, use the recommended hose ID for both the engine return and polishing flow to reduce back pressure.
(please see Table T1 on page 7 for recommended flow diameters)

ENGINE ROOM MOUNT



STAND ALONE MOUNT



CONNECTION PORTS

The MK1500DP inlet, outlet ports are -24 SAE ORB ports, they can be adapted to most hose and pipe connections. The return or polishing port will change with pump size but normally it will be at least a 5/8" NPT (-10) port. Use approved fuel line and connectors. To reduce restrictions, limit the amount of 90 degree connectors or sharp bends. Make sure fuel lines are supported and keep fuel lines away from sharp and hot objects. Fuel line size depends on distance to tank, flow and lift. Please refer to page 7 for recommended flow diameters.

Recommended Flow Diameter – In Inches **S**

Maximum Flow Rate GPM	Recommended Flow Diameter in Inches		
	Pressure Lines	Return Lines	Suction Lines
0.25	0.064	0.101	0.160
0.50	0.091	0.143	0.226
0.75	0.111	0.175	0.277
1.00	0.128	0.202	0.320
1.25	0.143	0.226	0.358
1.50	0.157	0.247	0.392
1.75	0.169	0.267	0.423
2.00	0.181	0.286	0.453
2.50	0.202	0.319	0.506
3.00	0.222	0.350	0.554
3.50	0.239	0.378	0.599
4.00	0.256	0.404	0.640
4.50	0.272	0.429	0.679
5.00	0.286	0.452	0.716
5.50	0.300	0.474	0.750
6.00	0.314	0.495	0.784
6.50	0.326	0.515	0.816
7.00	0.339	0.534	0.847
7.50	0.351	0.553	0.876
8.00	0.362	0.571	0.905
8.50	0.373	0.589	0.933
9.00	0.384	0.606	0.960
9.50	0.395	0.623	0.986
10.00	0.405	0.639	1.012
11.00	0.425	0.670	1.061
12.00	0.443	0.700	1.109
13.00	0.462	0.728	1.154
14.00	0.479	0.756	1.197
15.00	0.496	0.782	1.239
16.00	0.512	0.808	1.280
17.00	0.528	0.833	1.319
18.00	0.543	0.857	1.358
19.00	0.558	0.880	1.395
20.00	0.572	0.903	1.431
22.00	0.600	0.947	1.501
24.00	0.627	0.990	1.568
26.00	0.653	1.030	1.632
28.00	0.677	1.069	1.693
30.00	0.701	1.106	1.753
32.00	0.724	1.143	1.810
34.00	0.746	1.178	1.866
36.00	0.768	1.212	1.920
38.00	0.789	1.245	1.973
40.00	0.810	1.278	2.024
42.00	0.830	1.309	2.074
44.00	0.849	1.340	2.123
46.00	0.868	1.370	2.170
48.00	0.887	1.399	2.217
50.00	0.905	1.428	2.263
55.00	0.949	1.498	2.373
60.00	0.991	1.565	2.479

Maximum Flow Rate GPM	Recommended Flow Diameter in Inches		
	Pressure Lines	Return Lines	Suction Lines
65.00	1.032	1.629	2.580
70.00	1.071	1.690	2.677
75.00	1.109	1.749	2.771
80.00	1.145	1.807	2.862
85.00	1.180	1.862	2.950
90.00	1.214	1.916	3.036
95.00	1.248	1.969	3.119
100.00	1.280	2.020	3.200
110.00	1.342	2.119	3.356
120.00	1.402	2.213	3.505
130.00	1.459	2.303	3.649
140.00	1.515	2.390	3.786
150.00	1.568	2.474	3.919
160.00	1.619	2.555	4.048
170.00	1.669	2.634	4.172
180.00	1.717	2.710	4.293
190.00	1.764	2.784	4.411
200.00	1.810	2.857	4.525

TABLE
OF
CONTENTS

Table T1 – Recommended Flow Diameters, in Inches

T

Dimensions and pressures for reference only, subject to change.



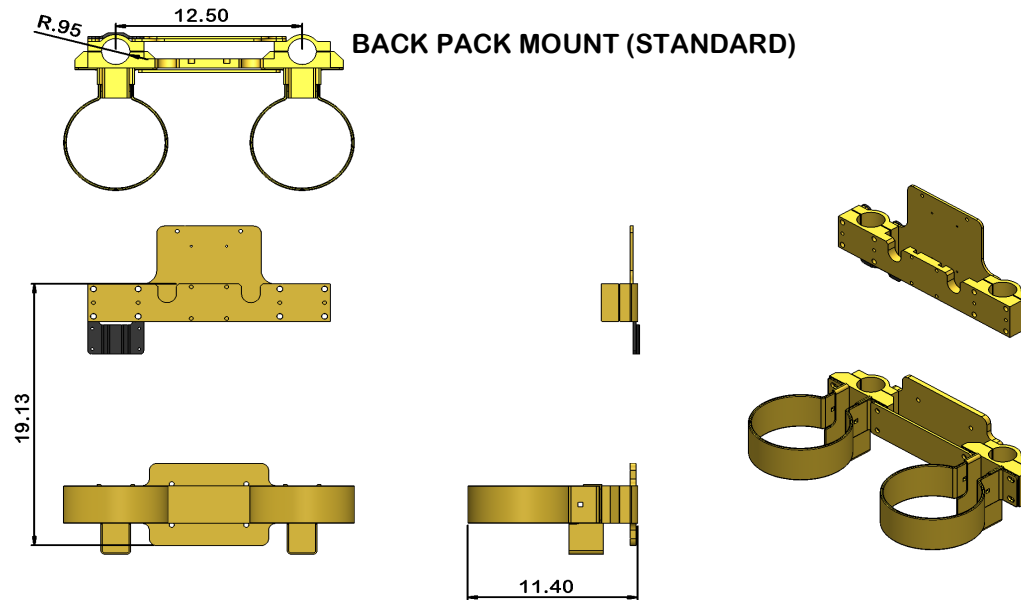
T5

Parker Hannifin Corporation
 Tube Fittings Division
 Columbus, Ohio
<http://www.parker.com/tfd>

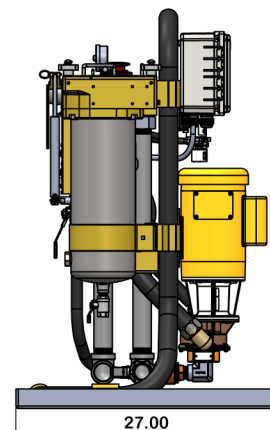
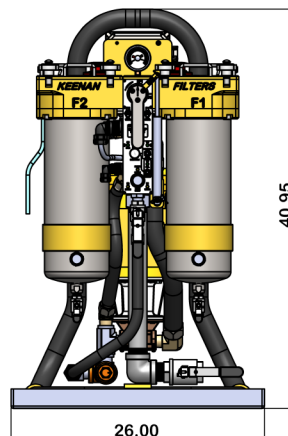
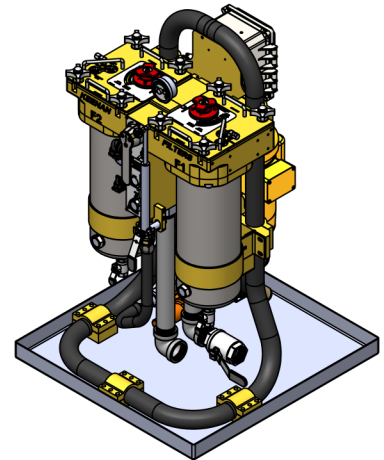
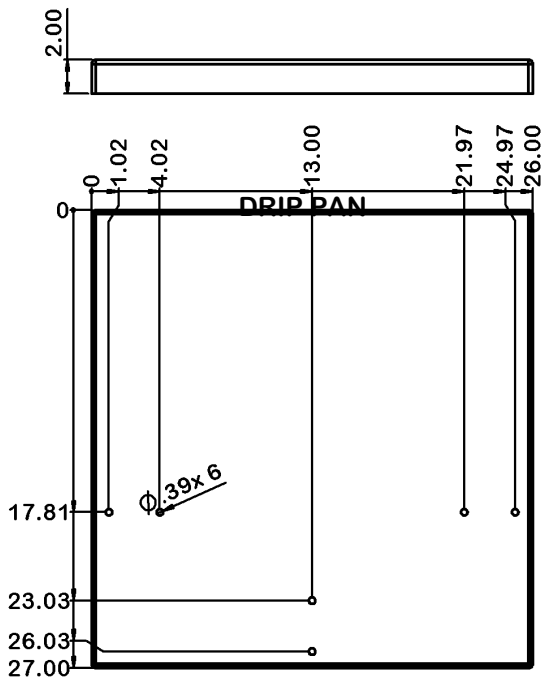
MOUNTING OPTIONS

The standard backpack mount system permits the designer or installer many mounting options.

Currently we offer two floor type mounting stands and also have a design for a wall mount.

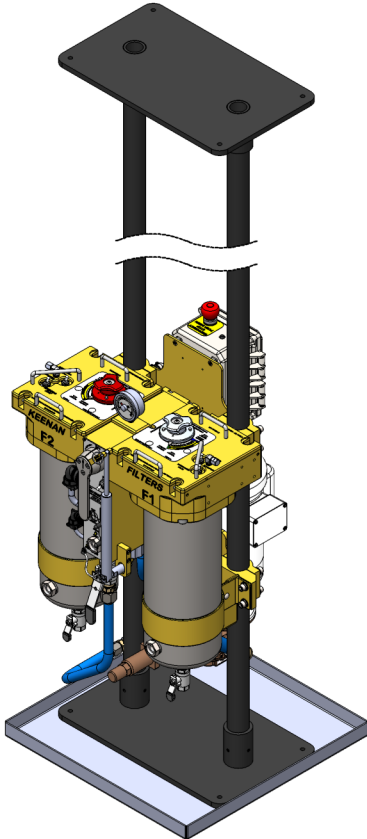
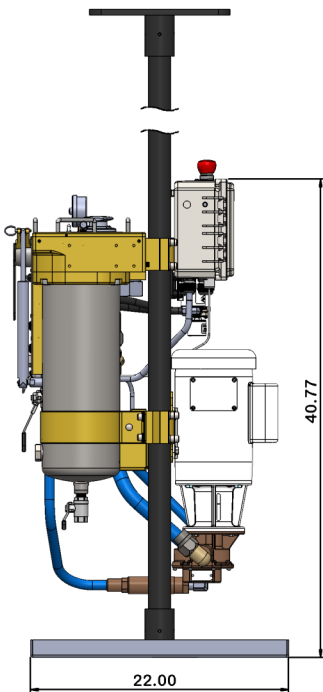
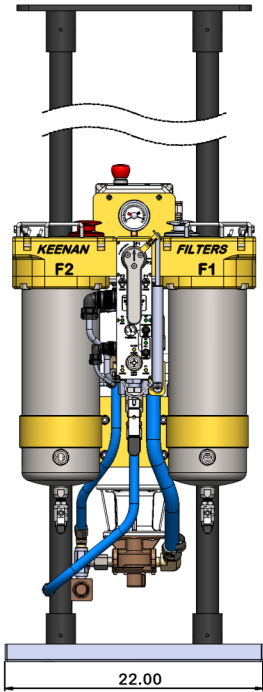


MK15300 STAND ALONE MOUNT (OPTIONAL) This mount allows for 360 degree access to all the components and connections for easy servicing and installation. The stand bolts to the floor structure using 6 bolts. The electrical enclosure is

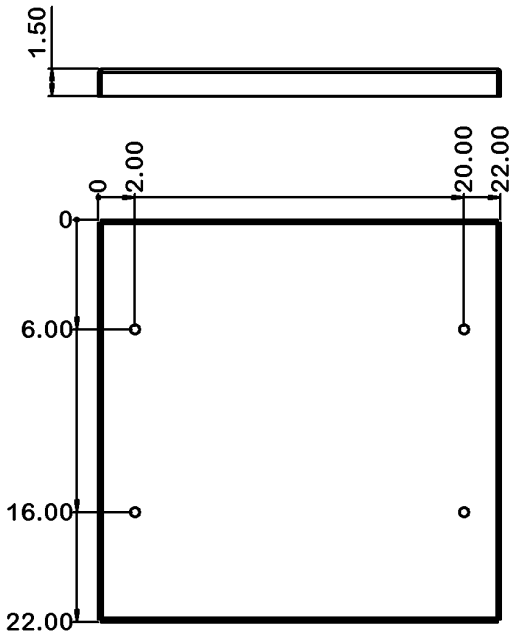


MOUNTING OPTIONS CONTINUED

MK15400 ENGINE ROOM MOUNT—This mount allows for 360 degree access to all the components and connections for easy servicing and installation. The mount bolts to the floor and ceiling structure using a total of 8 bolts. The electrical enclosure is mounted on the back side and allows for easy access to the electrical connections and components.



DRIP PAN



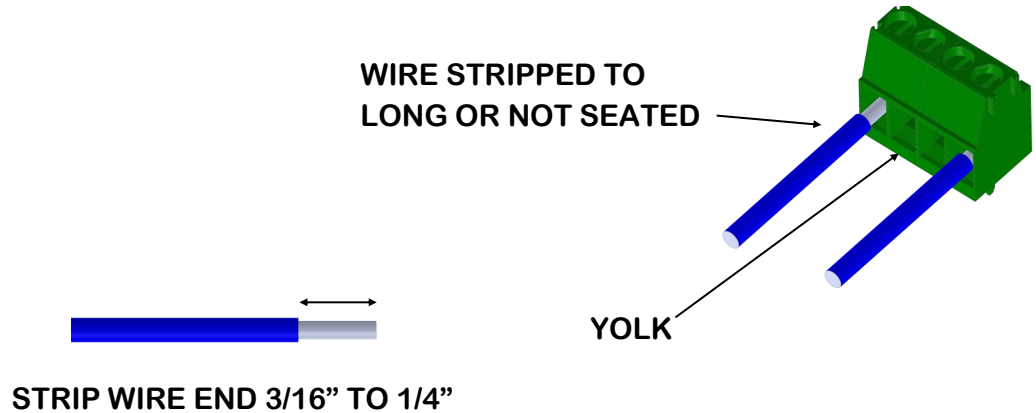
WIRING INSTALLATION TIP

**SERVICE NOTE: Euro type blocks are very common and user friendly, but simple mistakes can make you spend time trouble shooting. One of the most common mistakes is not stripping enough insulation off of the termination end. When this happens, the insulation gets clamped not the conductor. Another common mistake is loose strands shorting to the adjacent clamping yoke (wire socket).*

IF NEEDED use approved stranded wire and strip 3/16" to 1/4" of insulation off on the termination end. Make sure the yolk screw is backed out and the yolk cavity is clear.

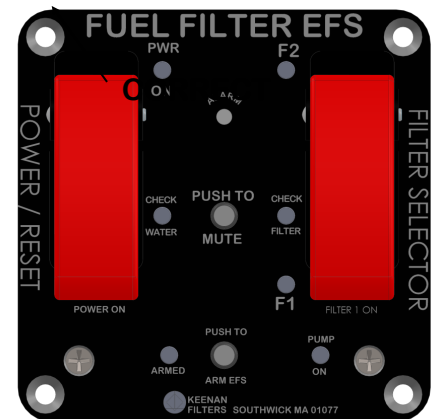
Push the wire in until it bottoms and hold the wire in position when tightening the yolk screw. After tightening, pull on the connection to test, then retighten if needed.

Visually inspect to make sure all the strands are clamped in the yolk clamp and the conductor is barely visible.



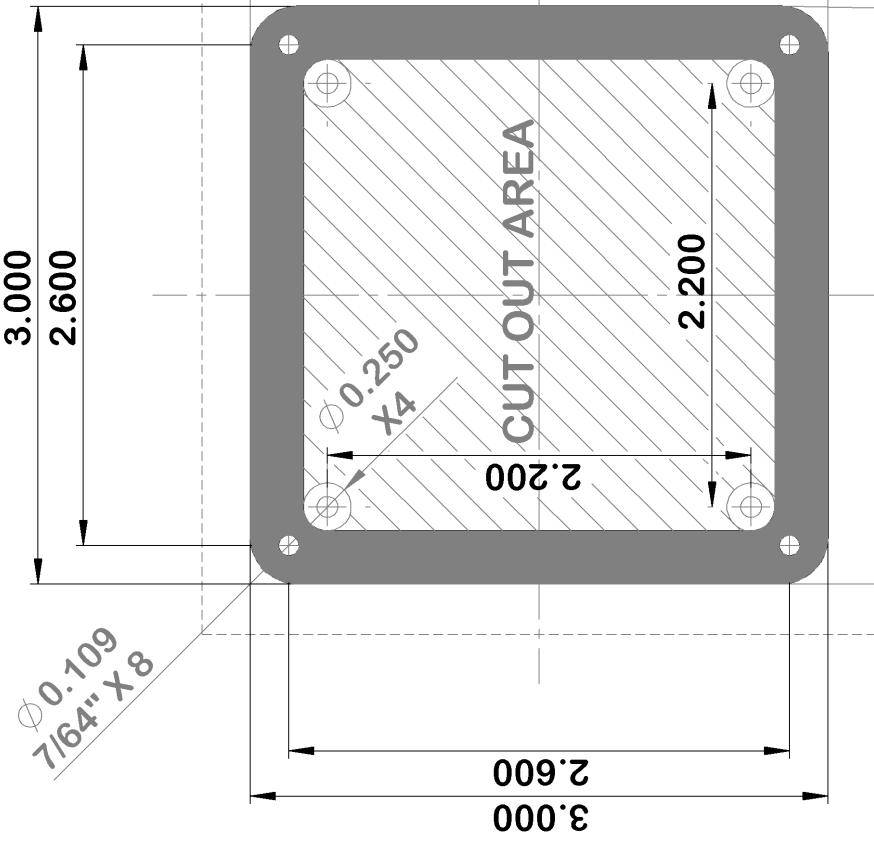
KP600 CONTROL PANEL INSTALLATION

1. This KP600 remote warning and control panel alerts the operator when the online filter starts to clog or water is present in the filter bowl. When the alarm sounds a amber LED light will also illuminate to indicate a check filter or check water warning. The operator can now "mute" the alarm by pushing the Mute switch on the control panel, next switch the dirty filter offline by lifting the red switch guard on the right side of the panel marked "Filter Selector" and move the switch toggle to the "F2 ON" position. This will actuate the electric drive to move the filter selector from "F1 to F2". In the event of an electric failure or the electric drive has failed the operator can manually switch filters by removing the quick release pin at the top of the electric drive then rotate the handle to the clean filter.
2. The system can be also armed to automatically switch filters when there is a filter warning. To arm the EFS push the "Arm EFS" button on the KP600 panel, to disarm, lift the red power reset guard and momentarily move the toggle switch to up "Off" position then back down, lower switch guard.
3. Mount the KP600 in an area that is not exposed to the outside elements and in a dry location. On a marine vessel it should be in a location the crew will hear the alarm. Make sure the mounting surface is flat, easily accessible and not in an area that will be bumped, kicked or objects placed on it. Keep the distance from the KP600 to the filter to a minimum (we have seen no problems with cable distances of 50 ft).
4. The cutout template is only a guide. When printing out the KP600 template on PAGE ? make sure the printer settings are set to 100% scale and use the document margins. After printing, measure the template and confirm the template is to scale. The final drill and cut dimensions are the installers responsibility to check.
5. Temporarily install the KP600 panel and secure with #6 flat screws. Make sure the panel is flat and the screws fit flush, then remove panel for wiring.



1

2



B

B

1. CUT OUT TEMPLATE ON DOTTED LINE.
2. ALIGN TEMPLATE ON SURFACE THAT THE PANEL WILL BE MOUNTED-MAKE SURE THERE IS CLEARANCE BEHIND MOUNTING AREA.
3. SECURE TEMPLATE WITH TAPE.
4. USING CENTER MARKS DRILL 8 X 7/64 (109)" HOLES.
5. DRILL OUT THE 4 X 1/4 (.25)" HOLES.
6. CUT OUT THE CENTER SECTION (HATCHED AREA).
7. DEBUR AND CLEAN EDGES.
8. REMOVE TEMPLATE

**DO NOT SCALE WHEN PRINTING USE 1:1
MEASURE TEMPLATE BEFORE USING**

A

A

UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES		AK	5/17/17
TOLERANCES:		DRAWN	
FRACTIONAL ±		CHECKED	
ANGULAR: MACH ± BEND ±		ENG APPR.	
TWO PLACE DECIMAL ±		MFG APPR.	
THREE PLACE DECIMAL ±		Q.A.	
INTERPRET GEOMETRIC TOLERANCING PER:		COMMENTS:	
MATERIAL			
FINISH			
NEXT ASSY		USED ON	
APPLICATION		DO NOT SCALE DRAWING	

TITLE:
KP600 TEMPLATE

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF <INSERT COMPANY NAME HERE>. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF <INSERT COMPANY NAME HERE> IS PROHIBITED.

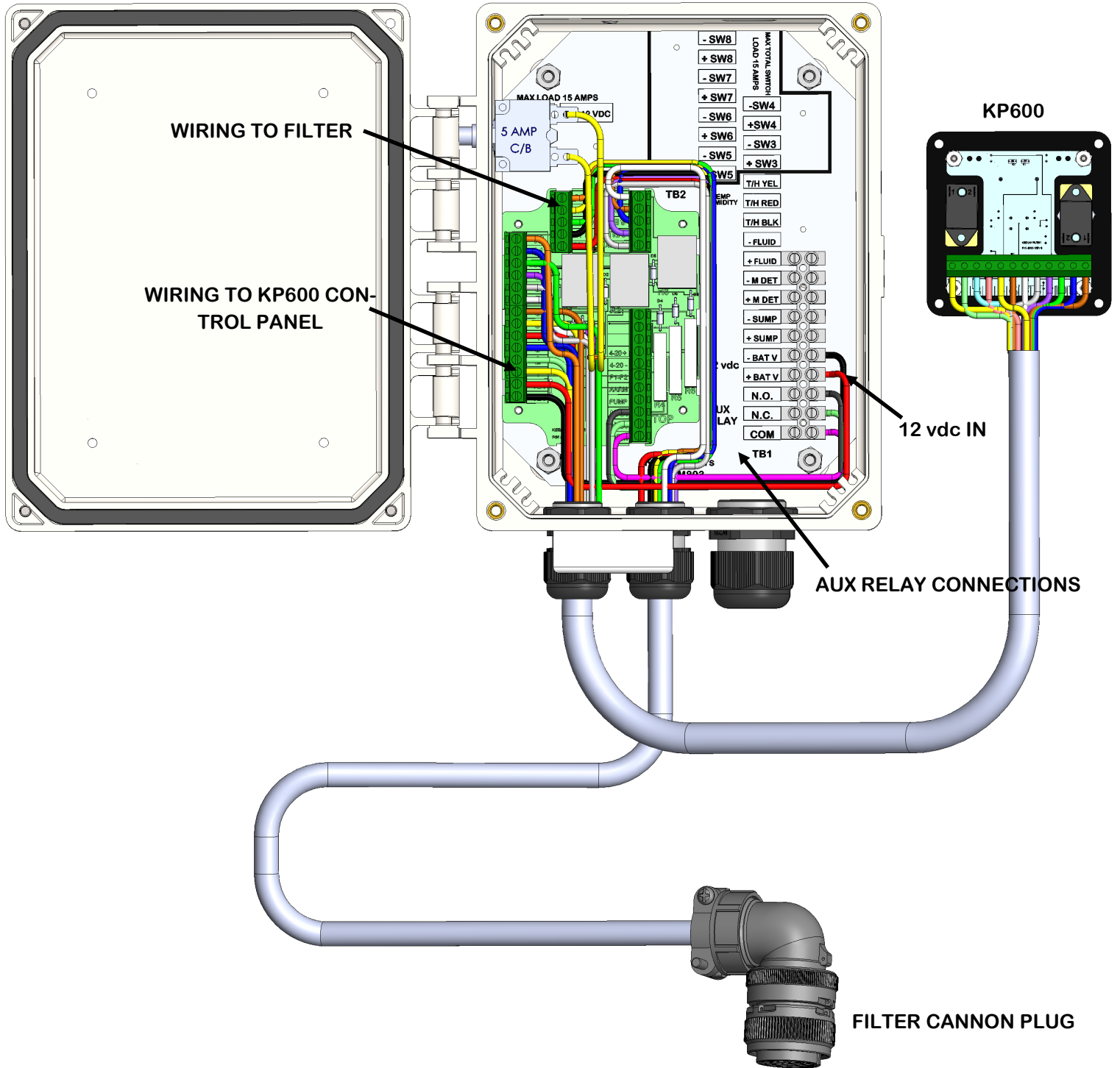
SIZE DWG. NO. REV
A KP600CUTTEMP

SCALE: 2:1 WEIGHT: SHEET 1 OF 1

1

2

KGSM801 ENCLOSURE



INTERFACE WIRING

1. Referencing the MK1500DP-EFS wiring diagram, a small harness of 12 communication wires need to be routed between the KP600 panel and the KGSM801 box.
2. 12 volts DC needs to be connected to the TB1 terminal block if the systems is being used as just a pre-filter with remote warning. If the system is using a polishing pump that is driven by AC voltage an AC to DC power supply is installed in the enclosure. **“CAUTION REVERSE POLARITY WILL DAMAGE THE SYSTEM”**
3. If the system is not prewired from the K7240 PCB to the KP600 fabricate a 12 wire harness using approved 16 AWG wire or purchase our cable assembly P/N KW1416 by the foot. Start your connections at the 7240 PCB closest to the cable gland +12 next -12 then connections 1-12. Next make your connections to the KP600.
4. Connect the KP600 control panel to the wiring harness and also the 12 VDC circuit protected power. Inspect and recheck all connections, check that wire harness and connections are supported and away from hot or moving equipment.

WIRE COLORS CAN BE INSTALLERS CHOICE

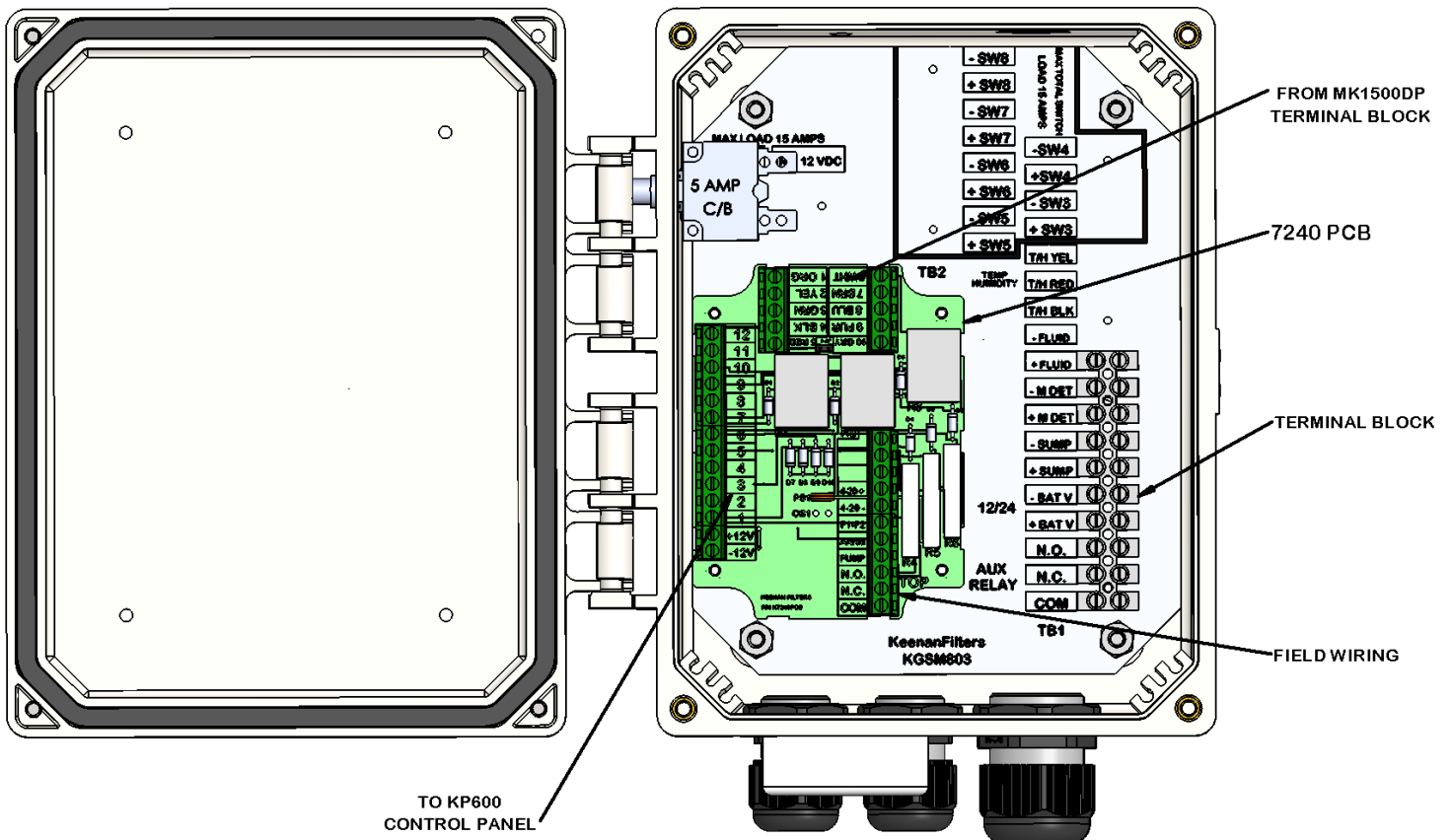
KP600 CONTROL PANEL CONNECTON		K7240 INTERFACE CONNECTION
1 YEL/WHT	CONNECTS TO	1 YEL/WHT
2 GRN/WHT	CONNECTS TO	2 GRN/WHT
3 BLUE/WHT	CONNECTS TO	3 BLUE/WHT
4 RED/WHT	CONNECTS TO	4 RED/WHT
5 YELLOW	CONNECTS TO	5 YELLOW
6 BROWN	CONNECTS TO	6 BROWN
7 WHITE	CONNECTS TO	7 WHITE
8 GREY	CONNECTS TO	8 GREY
9 PURPLE	CONNECTS TO	9 PURPLE
10 GREEN	CONNECTS TO	10 GREEN
11 DARK BLUE	CONNECTS TO	11 DARK BLUE
12 ORANGE	CONNECTS TO	12 ORANGE

CIRCUIT PROTECTED 12 VOLT SUPPLY		K7240 INTERFACE CONNECTION
+12 RED	CONNECTS TO	+12
-12 BLACK	CONNECTS TO	-12

WARNING: REVERSE POLARITY WILL DAMAGE INTERNAL CIRCUITS

INTERFACE “PREFILTER ONLY NO PUMP” (STANDARD)

The MK1500DP-EFS without the polishing pump comes prewired and ready to install. The KP600 warning and control panel will also be wired with a 14 conductor control cable. All of the systems come with a standard filter fill pump. The pump is used to fill the offline filter and bleed out the remaining air prior to being placed back online. Additional options (4-20 ma transducers, GSM, remote pump control) will be prewired and configured for a easy installation. Please refer to the wiring diagram supplied with each system.



1. The MK1500DP-EFS will use the KP600 control panel and the K7240 PCB mounted into a NEMA enclosure. The system has several ways to be installed so always refer to the system wiring diagram
2. Field connections are already made between the K7240 interface box terminals and the KP600 remote control panel terminals. The unit has a printed circuit board (PCB) with installed Euro type* terminal blocks. This makes the connections simple to make. The system control voltage is 12 VDC. If it is being installed into a 24 volt system use a 24 to 12 volt DC inverter with at least a 5 amp load capacity.

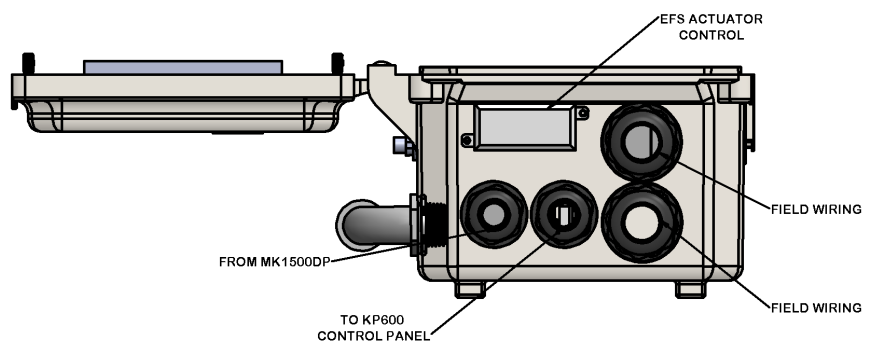
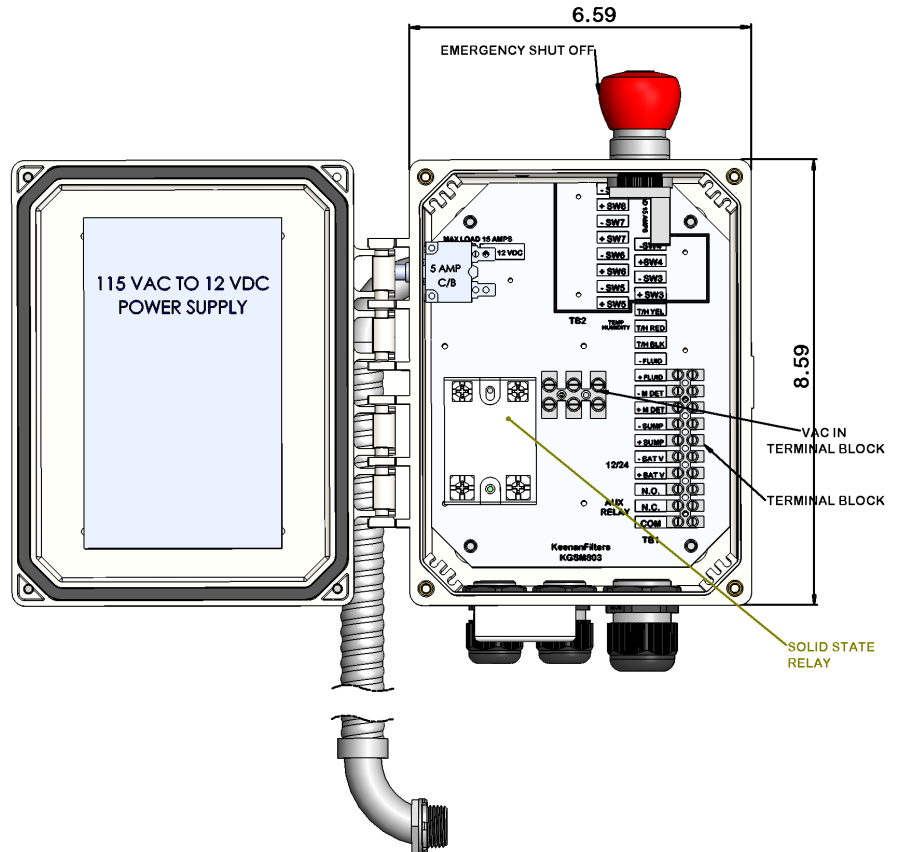
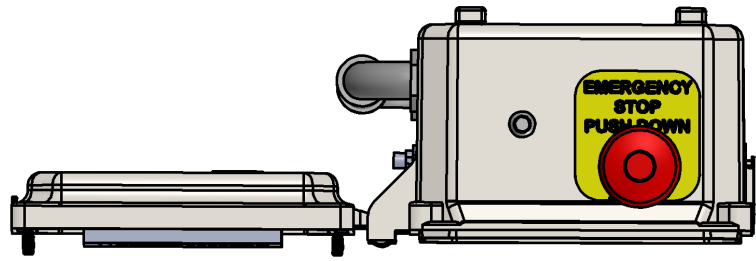
INTERFACE "WITH POLISHING PUMP" (OPTIONAL)

The MK1500DP-EFS with the basic polishing/transfer pump package comes prewired and ready to install. The KP600 warning and control panel will also be wired with a 14 conductor control cable. All of the systems come with a standard filter fill pump. The pump is used to fill the offline filter and bleed out the remaining air prior to being placed back online.

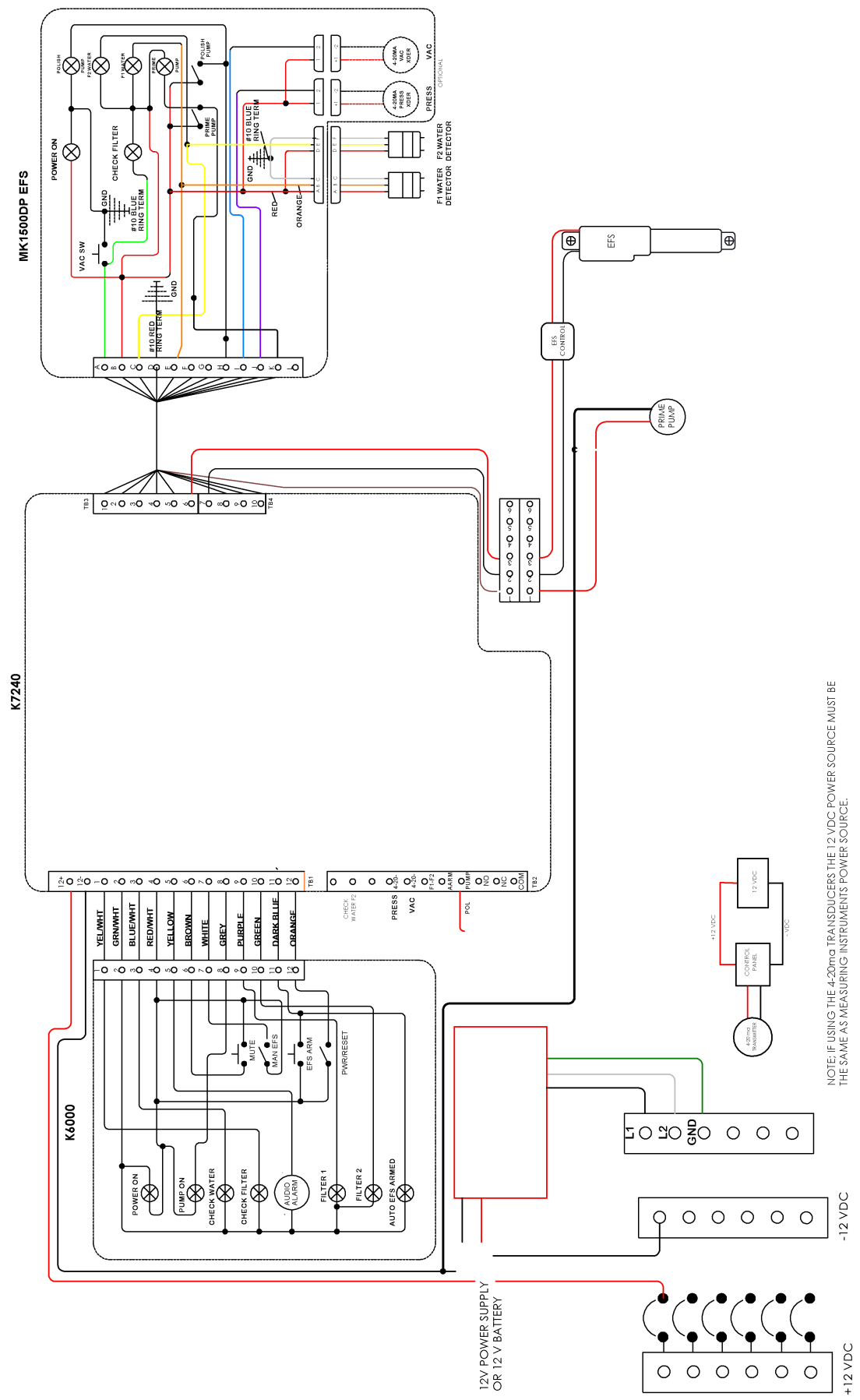
Additional options (4-20 ma transducers, GSM, remote pump control) will be prewired and configured for a easy installation. Please refer to the wiring diagram supplied with each system.

WIRING

Supply 115 vac hot , neutral and ground to the VAC in terminal block. If additional options were installed please follow the wiring instructions that came with the system.

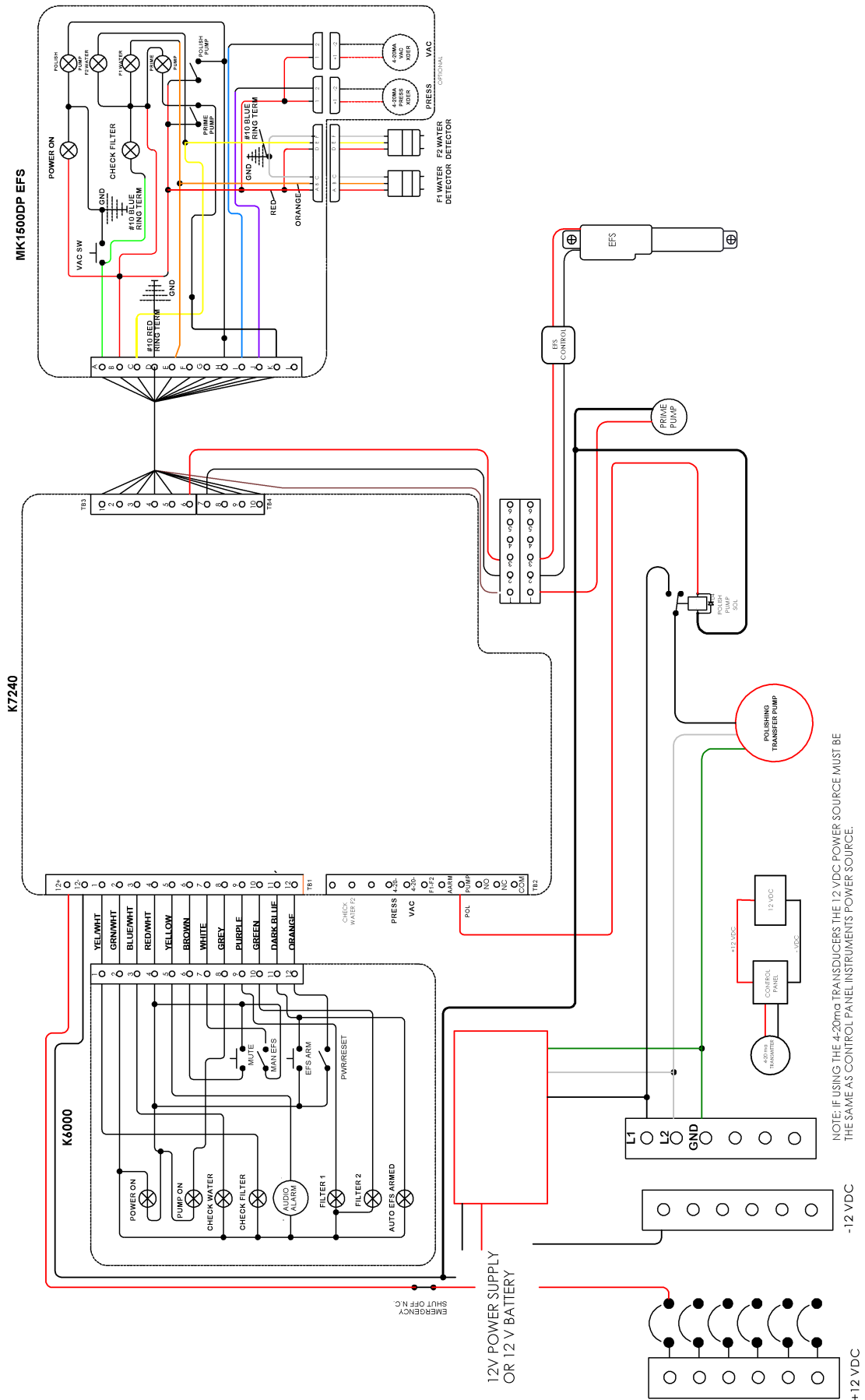


MK1500DP-EFS WIRING DIAGRAM WITHOUT POLISHING/TRANSFER PUMP




NOTE: IF USING THE 4-20mA TRANSDUCERS THE 12 VDC POWER SOURCE MUST BE THE SAME AS MEASURING INSTRUMENTS POWER SOURCE.

MK1500DP-EFS WITH POLISHING/TRANSFER PUMP



NOTE: IF USING THE 4-20mA TRANSDUCERS THE 12 VDC POWER SOURCE MUST BE THE SAME AS CONTROL PANEL INSTRUMENTS POWER SOURCE.

MK1500DP-EFS TECHNICAL SPECIFICATIONS

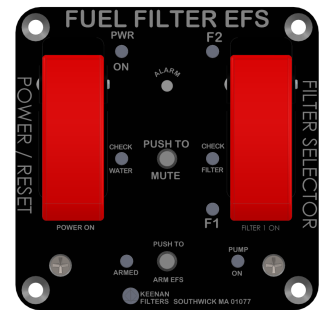
Height	Stand alone mount 41" (104 cm) Engine room mount 41" (104 cm) plus mount
Width	Stand alone mount 28.64" (71 cm) Engine room mount 22" (56 cm)
Depth	Stand alone mount 27" (68.58 cm) Engine room mount 22" (56 cm)
Service Clearance	14" (35.56 cm) above 4" (10.16 cm) below
Weight	160 lbs (73 kg) Varies with mount and pump type
Inlet and out ports	#24 J1926 ORB or 1-1/2" NPT 6405 adapter
Fuel	Diesel
Max Fuel Flow	1500gph (5678 lt/h)
Max Operating Pressure	75 psi (3.4 bar)
Normal Operating Vacuum	0-6 in Hg (20 kPa)
Vacuum Alarm	8" \pm 2" in Hg (27 \pm 7 kPa)
Vacuum Sensor (optional)	4-20 ma
Pressure Sensor (optional)	4-20 ma
Bowl Water Alarm Capacity	50 oz. (1.5 L)
Water Removal	99%
Voltage	12 VDC <i>Use 24v to 12v inverter for 24v systems</i>
Fill pump Pressure Voltage	Marco UP2 15 psi (1 bar) 12 vdc
Control voltage DC circuit protection	5 amp
Pump AC circuit protection	20 amp
Polishing Pump Varies on pump selection Psi Flow Max lift Motor	Oberdorfer N990 5-50 psi (.34 - 3.44b ar) 1400 gph (5299 lt/hr) 20 feet Leeson 2 hp 115 volts AC
Replacement element 	Racor FBO Aquabloc 3D 10 Micron 60364 Or KEENAN KFBO14Z5V 5 Micron
Control panel	KP600

POST INSTALLATION

NOTE: Before servicing the filter, re-check all connections for security. Check that fuel lines are supported and will not interfere with other equipment or be near sharp objects, moving or hot equipment.

POWERING THE SYSTEM

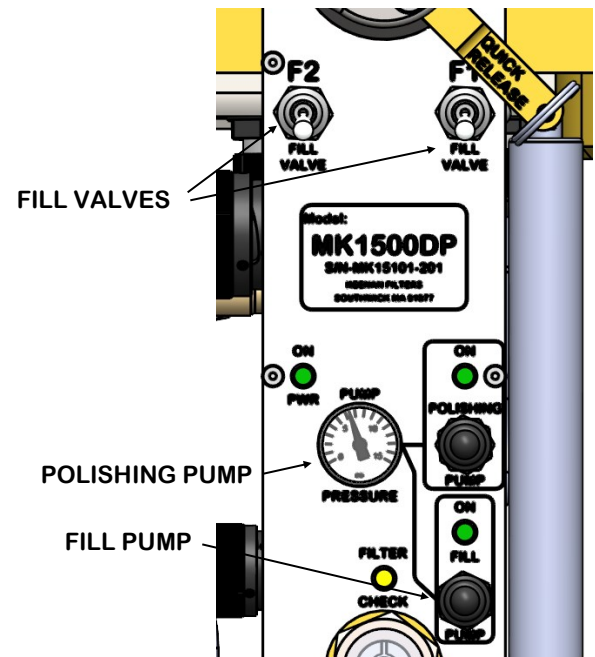
On the KP600 control panel lift the power/reset red switch guard and toggle to the “Up off position” now apply power from the circuit breaker. Next place the switch guard to the “Down on position, the green power LED should illuminate with the amber check water LED. A audible beeping should be heard for 1-2 seconds, this is the water detector doing a self test.



Test filter fill pump by lifting the filter fill switch to the ON position a green pump on LED will illuminate at the filter housing control panel, after a few seconds you should feel the pump turn on, if ok turn off pump. (NOTE; do not run dry for more than 30 seconds)

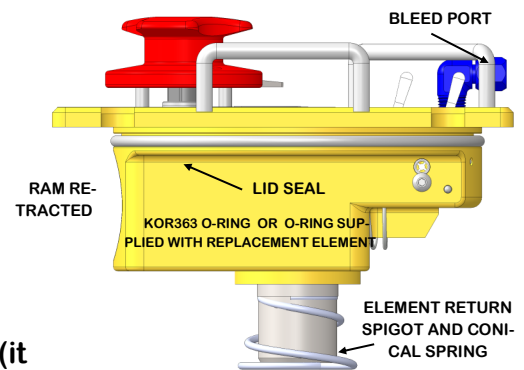
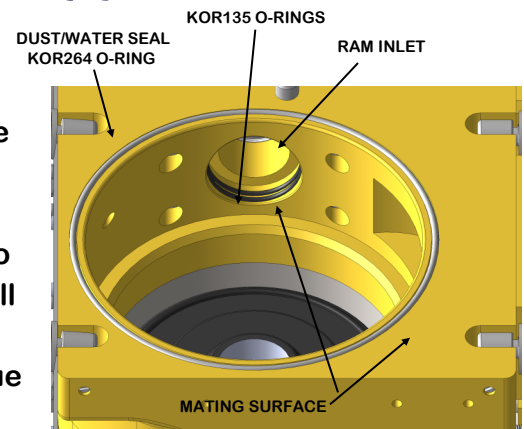
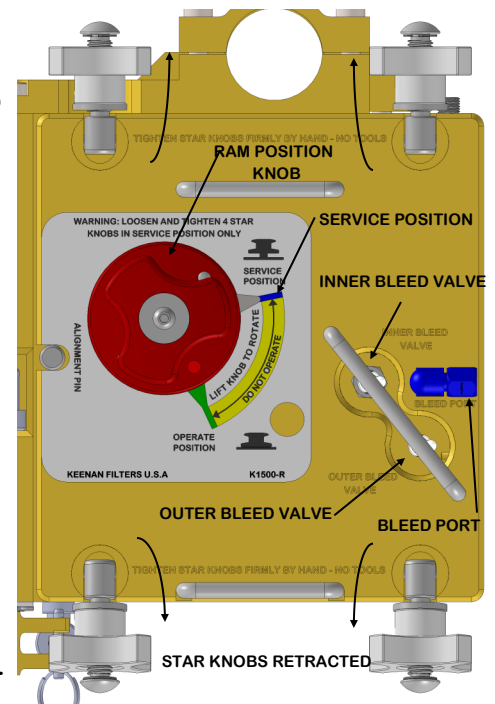
Test EFS (electric filter switch electric drive) The filter should be in the F1 position with the selector handle in the 6 o'clock position, remove the quick release pin at the top of the electric drive. Rotate the handle to the F2 position and back to check for any restrictions. Reinstall the quick release pin, next on the KP600 control panel lift the filter selector red guarded switch and lift the toggle switch. The LED light should switch from a green F1 to the amber F2 and electric drive should take about 25 seconds to change positions. Switch filter back to F1 when finished.

Test Polishing/Prime pump Momentarily lift the polishing pump switch to the up on position a green LED light should illuminate and the sound of the pump should be heard, turn off pump. (NOTE; Do not run dry for more than 30 seconds)

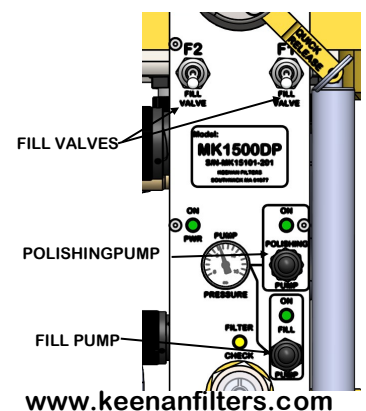


FILTER INITIAL SERVICING (gravity feed without polishing pump)

1. Open F1 filter drain valve at bottom of housing. This will allow air into the filter to make the lid removal easier. Position filter selector to F1.
2. Lift the red "Ram position knob" 3/8" and rotate it CCW to align the pointer with the service position blue line.
3. Loosen the 4 star knobs and rotate 90 degrees away from the lid.
4. Use the lifting handles pull lid away from housing, place the lid on a secure clean surface, care should be taken not to damage any of the lid surfaces. Leave the filter element in the housing.
5. Close F1 drain valve at bottom of housing.
6. Slowly open the fuel inlet valve and monitor the fuel level until it reaches the same height as the filter element- close inlet valve.
7. Make sure all mating surfaces are clean and free of contaminants. Lubricate the KOR135, KOR264 and KOR363 O-rings with petroleum jelly or O-ring lube.
8. Position lid assembly over housing, make sure the ram is still retracted, align the element return spigot with the element bore and lower the lid assembly (make sure the conical spring is pushing on the element). Position the 4 star knob slots and the alignment pin. Reposition the 4 star knobs back over the lid and uniformly tighten the knobs making sure the two surfaces come together evenly. Hand tighten.
9. Lift and rotate the ram position knob CW so the pointer is aligned to the GREEN operate position line. The knob is spring loaded so it will drop the knob back down to its operate position.
10. Next bleed the remaining air out of the housing by removing the blue bleed port cap. Attach the bleed bottle or a suitable container to catch the fuel as you bleed the air out.
11. Open the fuel inlet valve to allow fuel to flow into the filter and onto the engine. Next open the outer bleed valve on top of the lid. Air should be heard escaping from the port, continue until a steady stream of fuel is seen. Next open the inner bleed valve and repeat until only fuel is noticed. Install bleed port cap when finished.
12. Repeat the same procedures for filter F2 but move the filter selector to F2 or use the electric fill pump to service the F2 filter (see below).
13. **FILL PUMP**-position filter selector to F1, turn on the filter fill pump (it will take a few minutes to remove the residual air from the pump. Check the 1" pressure gauge on the front panel for about 15 psi. Install the bleed bottle or a suitable container to catch the fuel from the F2 blue bleed port. Open the F2 fill valve and the F2 outer bleed valve until a steady stream of fuel is viewed (may take a fuel minutes), next repeat the same for the inner bleed valve. When only fuel is clear release the valve, turn off the fill pump and install the bleed port cap.



FILTERS ARE NOW BLED AND READY FOR SERVICE



FILTER INITIAL SERVICING (Tank below without polishing pump)

1. Open F1 filter drain valve at bottom of housing. This will allow air into the filter to make the lid removal easier. Position filter selector to F1.
2. Lift the red “Ram position knob” 1/4” and rotate it CCW to align the pointer with the service position blue line.
3. Loosen the 4 star knobs and rotate 90 degrees away from the lid.
4. Use the lifting handles pull lid away from housing, place the lid on a secure clean surface, care should be taken not to damage any of the lid surfaces. Leave the filter element in the housing.
5. Close F1 drain valve at bottom of housing.
6. Normally a new installation the fuel lines are empty and can be difficult to bleed the air out without a priming or polishing pump. If the tank is at or below the system we will need to fill as much of the lines with fuel and may require several gallons of diesel fuel.
7. With the F1 lid removed and the selector in the F1 position start filling the filter housing with clean dry diesel, pour the fuel between the outer element and the housing inside wall. Stay away from the element return tube spigot port. If some fuel makes its way into the filter it will be filtered by the engine secondary filter.
8. Once the filter housing is full it will start to drain back down the fuel lines towards the tank. When the fuel lines are full stop. Now move the filter selector between F1-F2 this will drain off some of the fuel at the top of the F1– housing-reposition the filter selector to F1.
9. Make sure all mating surfaces are clean and free of contaminants. Lubricate the KOR135, KOR264 and KOR363 O-rings with petroleum jelly or O-ring lube.
10. Position lid assembly over housing, make sure the ram is still retracted, align the element return spigot with the element bore and lower the lid assembly (make sure the conical spring is pushing on the element). Position the 4 star knob slots and the alignment pin. Reposition the 4 star knobs back over the lid and uniformly tighten the knobs making sure the two surfaces come together evenly. Hand tighten.
11. Lift and rotate the ram position knob CW so the pointer is aligned to the GREEN operate position line. The knob is spring loaded so it will drop the knob back down to its operate position.
12. Now that the F1 filter is almost full the filter fill pump can be used to fill the F2 filter.
13. **FILL PUMP**-position filter selector to F1, turn on the filter fill pump (it will take a few minutes to remove the residual air from the pump. Check the 1” pressure gauge on the front panel for about 15 psi. Install the bleed bottle or a suitable container to catch the fuel from the F2 blue bleed port. Open the F2 fill valve and the F2 outer bleed valve until a steady stream of fuel is viewed (This will take a few minutes to fill the housing), next repeat the same for the inner bleed valve. When only clear fuel is visible release the valves, turn off the fill pump and install the bleed port cap.

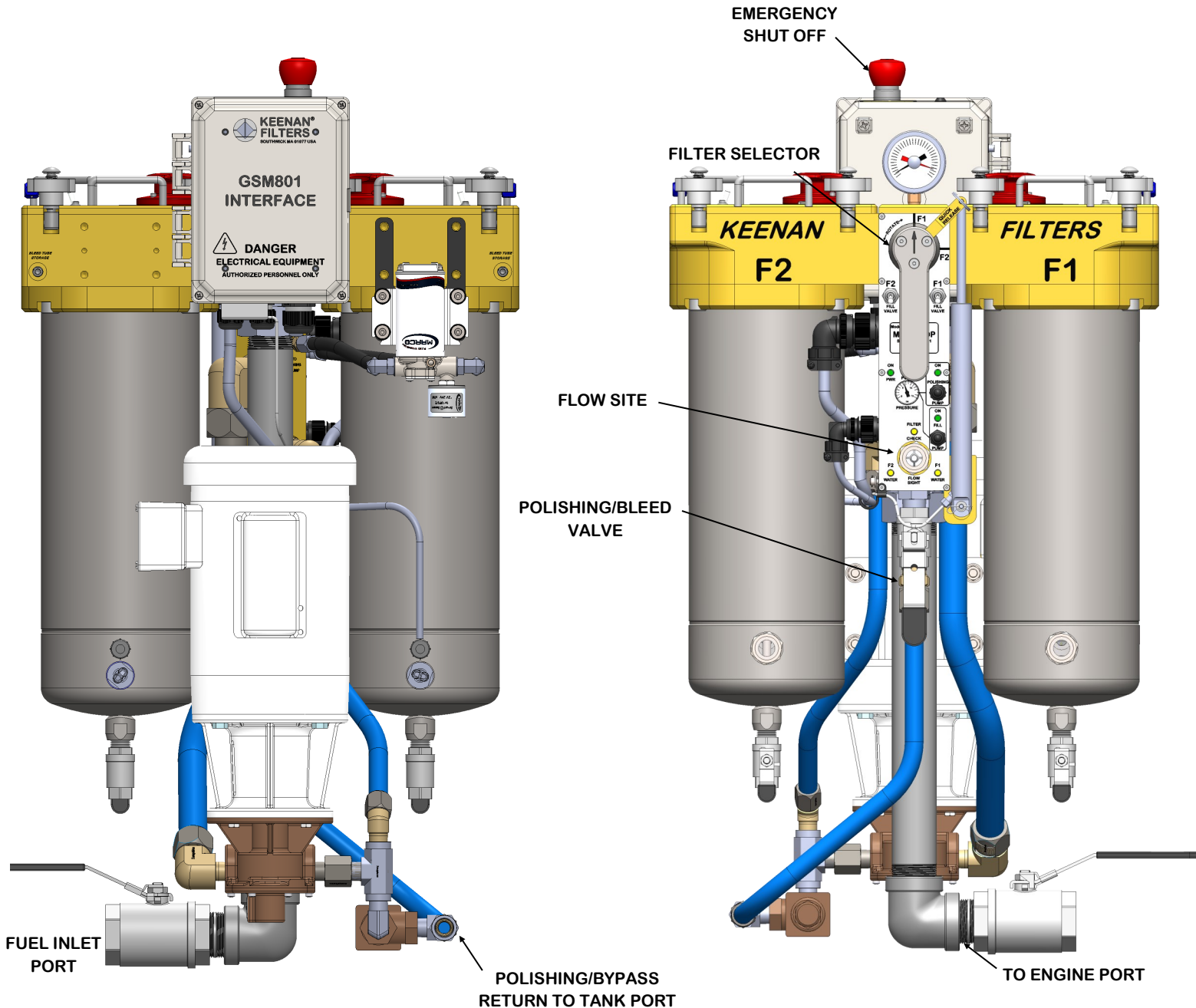
F2 filter is now fully bled, now finish bleeding the F1 filter. Position the filter selector to F2, remove the blue bleed port cap and install the bleed bottle or a suitable container to catch the fuel. Turn on the fill pump and observe the 1” pressure gauge reads about 15 psi. Open the F1 outer bleed valve until a steady stream of fuel is observed, next switch to the inner bleed valve until bled.

Both filters are ready for service

INITIAL FILTER SERVICE (Using polishing pump)

NOTE; The polishing pump is designed for high fuel flow so check for leaks when operating the pump. A RED emergency shut off is mounted on top of the enclosure. To shut the system off, push down on the RED knob.

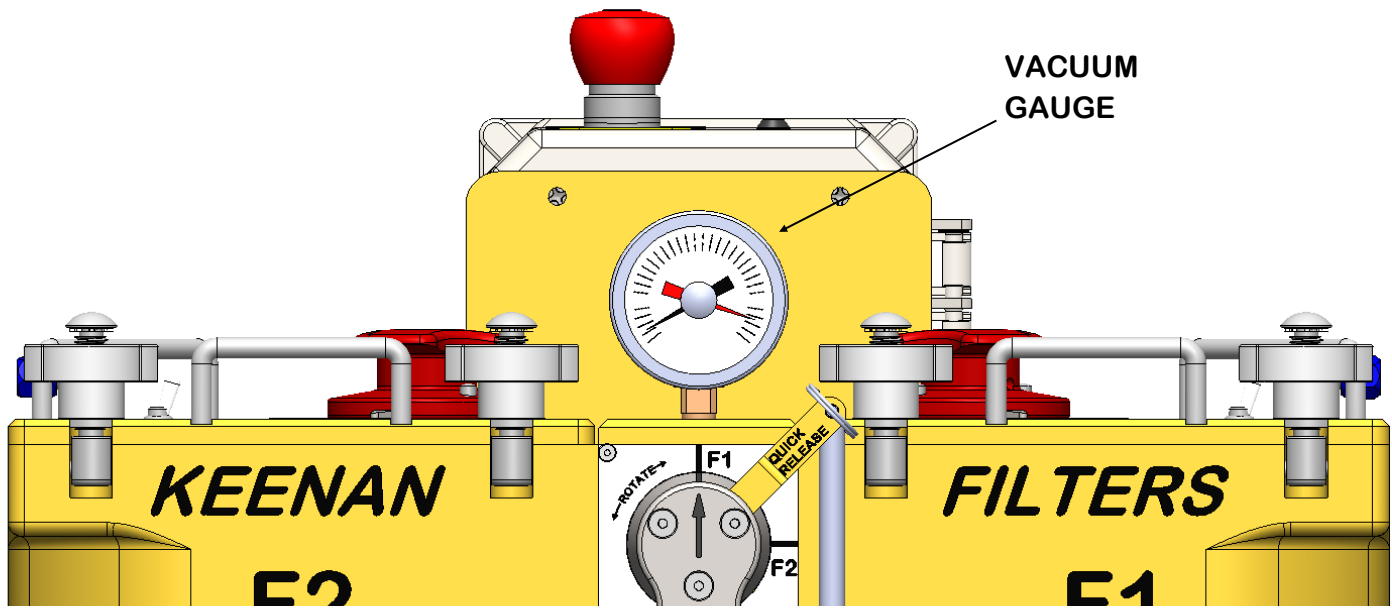
1. Position the filter selector to F1, make sure the fuel inlet valve is open, fuel supply is open, fuel return is open (multiple tanks make sure the correct tank is selected for supply and return).
2. Polishing/bleed valve is in the open position.
3. Turn on the polishing pump from the front filter panel. The pump will take a few minutes to bleed out the air. Monitor the flow site on the front panel, it will have a lot of bubbles in the window but as the air is bled out it will clear. Switch to filter F2 and wait for the bubble to clear.
4. System is now ready for service.



OPERATIONAL TEST

This test checks the installation for air leaks and proper operation of the system.

1. Position the filter handle to F1 and turn on power to the MK1500DP-EFS filter. There will be a momentary 1-2 second pulse tone and the “CHECK WATER” LED will illuminate. Next perform a normal engine start and warm up for 5 minutes. Check for leaks.
2. With the engine at idle speed, close the fuel inlet shut off valve and monitor the vacuum gauge for a steady increase in vacuum. Normally around 6”in Hg or 8”± 2” in Hg, the “CHECK FILTER” LED will illuminate and the audible pulse tone will sound. Press the mute switch on the KP600 panel to mute the tone.
3. Shut down the engine and monitor the vacuum gauge needle. It should remain at the setting it was showing when the engine was shut down. If there is an air leak between the shut off valve and the engine lift pump, the gauge needle will move towards zero. Recheck all connections if a leak is detected and re-test. (A large leak could show up within 5 minutes, slower leaks will take more time) Perform the same test to filter F2.
4. The same test can be used to check the fuel systems integrity from the fuel tank shut to the engine by using the tank shut off instead of the filter inlet valve.
5. If satisfied with the operational test, open the fuel inlet shut off valve and operate the engine at idle for a few minutes. Next check the system for leaks and operation under normal engine operation between idle and full power. A normal vacuum reading should read below 3” in Hg at all power settings with a clean filter and full tanks. When satisfied with the engine operation test, perform the normal engine shutdown.

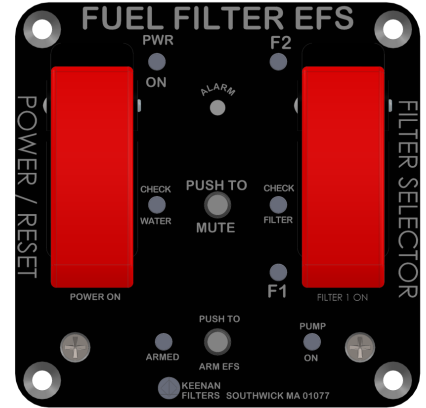


NORMAL OPERATION CONFIGURATION

Once the system has been serviced and the operational test was completed it is ready to be used.

Make sure the filter is configured as follows:

- Fill pump switch off
- Polishing pump switch off
- Fuel inlet shut off valve open
- Filter selector on F1
- Drain valves closed
- Polishing/bleed (return) shut off valve closed
- Vacuum gauge drag pointer set to “zero” position
- Both ram position knobs in operate position with the knob down.
- All star knobs hand tight

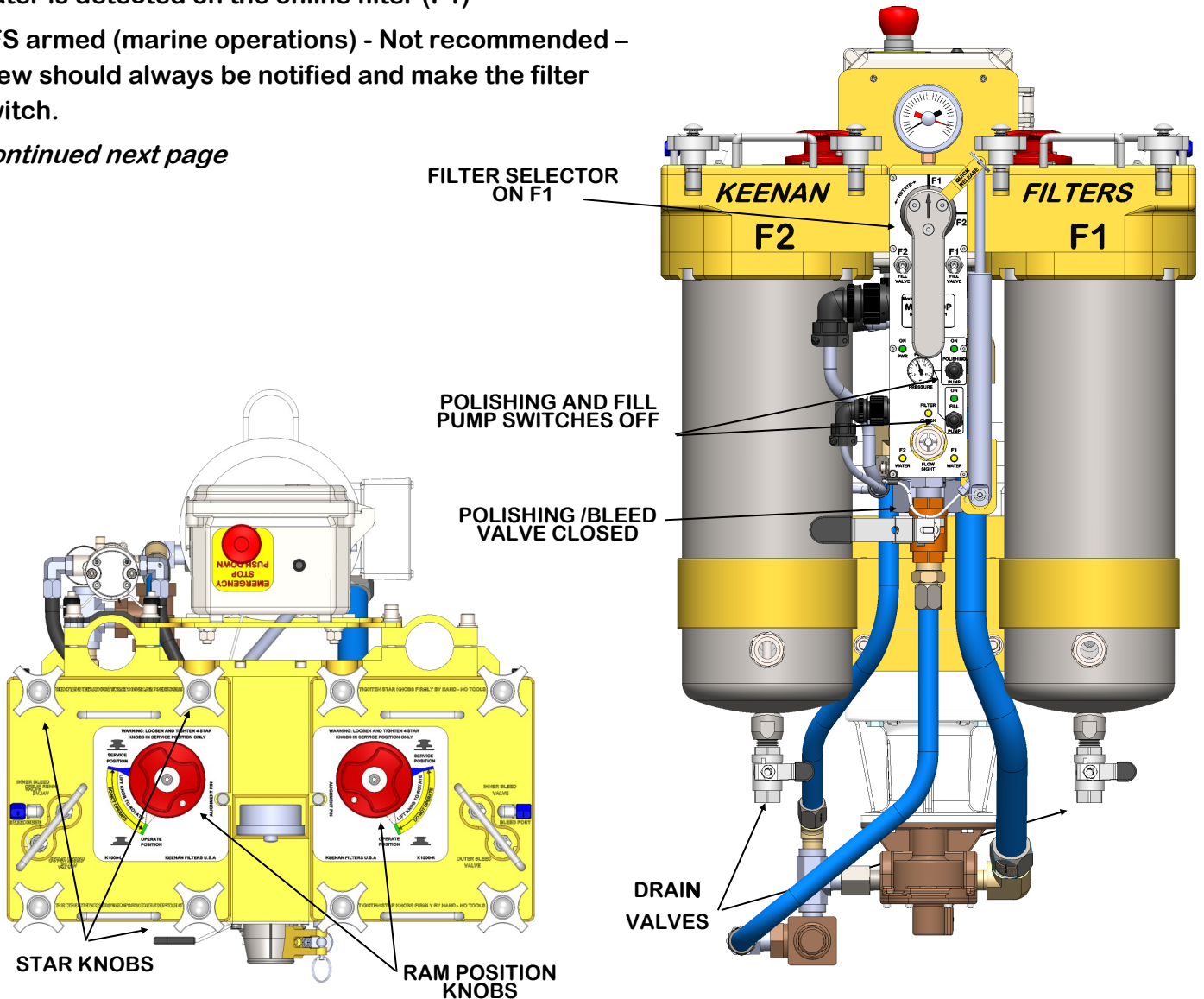


The Control Panel is configured as follows: “POWER ON”

EFS armed (land based operations)– Normally armed - automatic filter switching when a clogged filter or water is detected on the online filter (F1)

EFS armed (marine operations) - Not recommended – crew should always be notified and make the filter switch.

Continued next page



NORMAL OPERATON *Continued*

PROTECTION:

While the engine is in operation the online filter is being monitored for a clogged filter or water detection. A vacuum switch is set to close around 8 inches of vacuum, this will send a warning signal to the KP600 control panel and will illuminate the “Check Filter” LED and sound the alarm. A water detector is also installed in the bottom of the housing and will sound the alarm and illuminate the “Check Water” LED when about 60 ounces of water is present at the bottom. Mounted on the top of the manifold is a vacuum gauge, this will show operator the filter condition when the engine is in operation. A drag pointer or sometimes call a tell tale pointer is installed on the dial face. The red needle will ride with the main pointer but stay at the highest setting, so when the pressure is reduced the operator can see the highest reading after the engine is shutdown.

SWITCH FILTERS:

Once the alarm has sounded the operator can switch the contaminated online filter to offline with a clean filter keeping the engine in operation. This can be done by lifting the guarded filter selector on the KP600 and moving the toggle switch to the F2 position. The electric drive will move the filter selector from F1 to F2. Once the alarm has sounded the operator can mute the alarm by pressing the mute switch. With generator systems the electric drive can be armed to automatically switch filters when the alarm sounds.

ELEMENT REPLACEMENT OR WATER REMOVAL:

The system is designed so the operator can replace the element, drain water, prime and place the filter back online while the engine is in operation. Please see pages for element replacement or draining water.

POLISHING;

Removal of sediment, water and microbes from diesel fuel. This system provides a simple method of polishing the fuel when the engine is off or operating. Simply turn on the polishing pump and open the polishing valve. This will take the fuel from the tank, through the online filter and back to the tank. While the systems is polishing it will monitor the online filter.

FUEL TRANSFER;

With multi tank systems the operator can select the tank that will supply the fuel and which tank to return to. Using the polishing pump increases the fuel flow for quicker fuel transfer, with or without the engine operating.

COMMUNICATION;

All of our duplex systems can intergrated to be controlled and monitored from a remote location by a network communication system or GSM. Optional 4-20 ma vacuum and pressure transducers can be added for additional monitoring.

CHECK FILTER WARNING

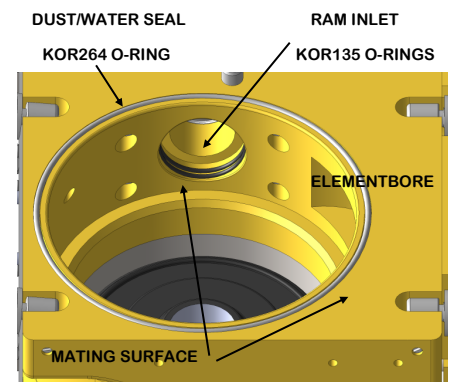
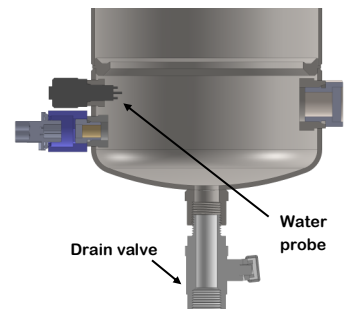
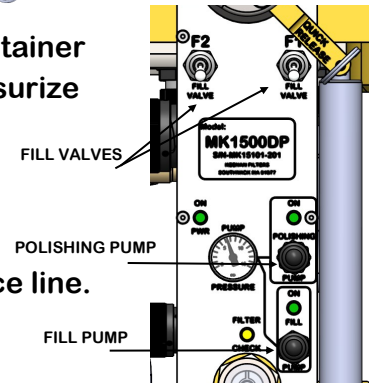
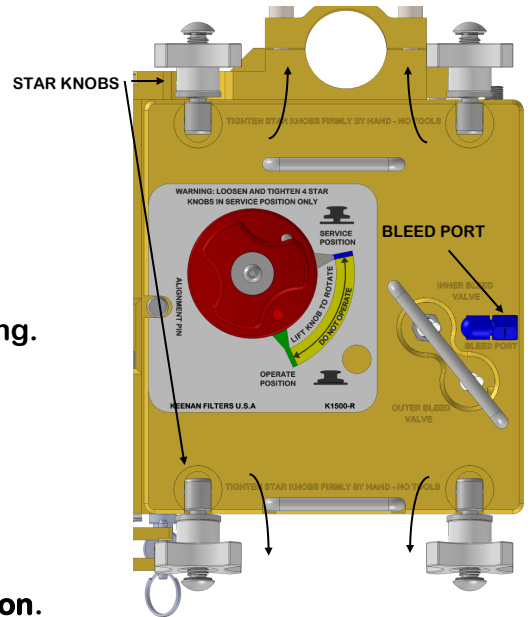
When the check filter alarm has sounded it will require the filter element to be replaced. Normally the operator will switch filters from F1 to F2. Check the vacuum gauge drag pointer to check what was the highest setting.

SUGGESTED TOOLS AND SUPPLIES

- Replacement element 60364, seal kit KSK15.
- Shop towels or oil absorbent mats.
- Container for dirty element.
- Container to catch the dirty fuel mixture when draining the housing.
- Petroleum jelly or O-ring lube.
- Protective glasses and gloves.
- Bleed bottle or container to catch the fuel for bleeding.

Changing the element can be replaced while the engine in in operation.

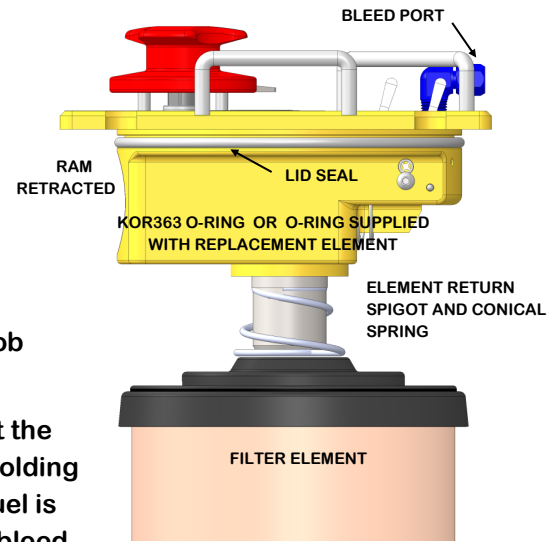
1. Make sure the Filter is offline. Remove the bleed port cap and position a container or rag under port now momentarily open either bleed valve, this will depressurize the filter housing.
2. Place some oil absorbent towels under the filter you are servicing to catch any overflow (just in case).
3. Lift (3/8") and rotate the ram position knob so the pointer is at the blue service line.
4. Loosen the 4 star knobs and rotate away from the lid top.
5. Turn on the filter fill pump check the 1" pressure gauge it should read about 15 psi.
6. Using the filter fill valve F1 or F2, slowly toggle the valve until the filter lid lifts free from the top manifold about 1/4" (To quickly may overflow some fuel).
Note: If the fill pump has failed you will need to place a container under the drain valve. Have an assistant open the drain valve while you pull the lid up and away, quickly close the drain valve once the lid is free.
7. Lift the filter element up and let it drain the excess fuel into the housing. Place the used element into a container to finish draining and dispose per local requirements.
8. Inspect and clean the interior housing of sediment and water. Be careful not to damage the water probe in the bottom side of the housing. Use the fill valve to help flush out the sediment.
9. Clean all mating surfaces and inspect O-rings for nicks and damage, replace as needed. Lubricate O-rings with petroleum jelly or O-ring lube.
10. Install new element into the housing.



Continued next page

ELEMENT CHANGE *Continued*

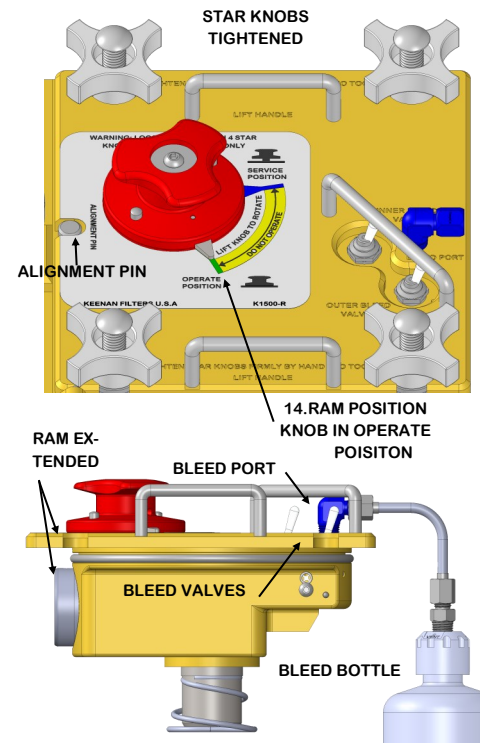
11. Ram is retracted and the knob is positioned to blue service line.
12. Make sure conical spring is on the return tube spigot.
13. Position lid assembly over housing and slowly lower mating the return tube spigot with the filter return port. Use alignment pin to position lid in housing. Rotate star knobs back into position and tighten evenly so lid mates with upper housing. Tighten hand tight—no tools.
14. Lift and rotate ram position knob to the operate green line, push down knob so it is flush with surface.
15. Turn on the filter fill pump—observe 15 psi on the pressure gauge. Connect the bleed bottle or a suitable container to catch fuel to the bleed port. While holding the F1 or F2 fill valve open the outer bleed valve until a steady stream of fuel is observed. Next open the inner bleed valve and repeat bleeding. Reinstall bleed port cap.
16. The filter is ready to put back into service. Clean any residual fuel from filter.



CHECK WATER WARNING (Water in bowl)

If the water alarm has sounded, switch the filter offline

1. Place a suitable container under the filter to catch the sediment, fuel and water mixture.
2. Turn on the filter fill pump, the 1" pressure gauge should read about 15 psi.
3. Hold the filter fill valve open (either up or down).
4. Open the drain valve slowly and the mixture will be pumped out, Repeat as needed.
5. Install the bleed bottle or a suitable container to catch the fuel from the filter lid bleed port. Open fill valve and use the inner and outer bleed valves to bleed any remaining air.
6. When ready place filter back online when ready.



MAINTENANCE AND INSPECTION

- Routinely inspect the filter for leakage, damage or corrosion. Clean filter and wipe down with a light oil.
- Exercise selector handle between F1-F2 or operate EFS (electric filter switch) through a couple of cycles.
- Change the filter element on an annual basis or when the vacuum reading starts to change.
- Perform the OPERATIONAL TEST before operation or during routine inspections.
- The OPERATIONAL TEST checks the warning system for operation and also the integrity of the fuel system for air leaks.
- Cycle fill and polishing pumps on and off.

FUEL POLISHING

Fuel polishing is the technical cleaning process used to remove or filter contamination from hydrocarbon fuel in storage. It is essentially the removal of water, sediment and microbial contamination from such fuels as #2 [diesel](#) and [biodiesel](#). This fuel contamination, also known as “algae, fuel bugs or diesel bugs” build up over time in stored fuels if they are treated on a regular basis.

Fuel polishing is more effective when the contaminants are suspended or mixed in the fuel, so polishing just after or during refueling, during engine operation or after a boating trip is best.

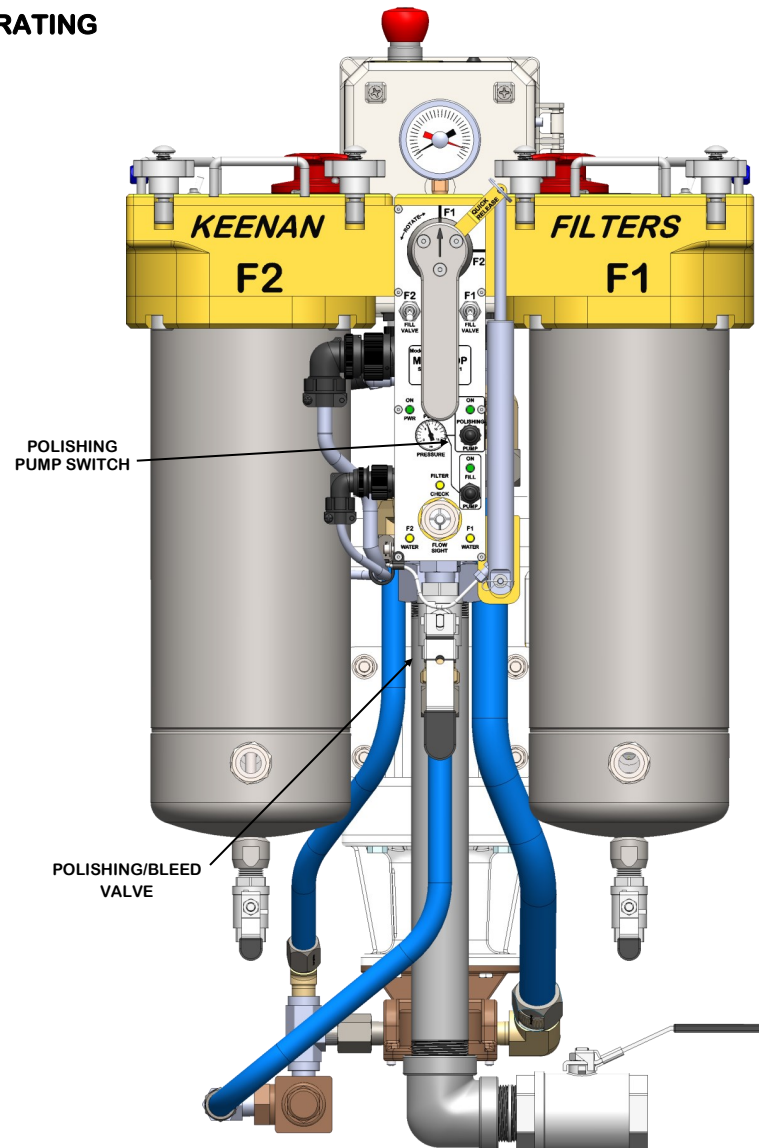
To Polish: OPEN POLISHING/BLEED VALVE, next turn on the POLISHING fuel pump. Now the fuel will be pulled from the fuel tank through the online filter and ported back to the tank, it is that easy.

The rated fuel flow of the MK1500DP will depend on the pump that is installed, so take the tank fuel quantity and multiply it by 3 then divide it by the fuel pump flow rate and that will be a good rule of thumb of how long you should polish the fuel.

The F1 filter is the primary filter, so if the water or filter alarm is sounded, switch the F1 filter offline, drain and service as needed, then switch the F1 back online. This can be done without stopping the polishing pump.

WARNING: TO AVOID OVERFILLING A TANK ALWAYS SELECT THE PROPER SUPPLY AND RETURN TANK BEFORE OPERATING PUMP.

DO NOT RUN PUMP DRY.



LIMITED WARRANTY

Thank you for purchasing a product from K.T.I. Systems, Inc. of Southwick, Massachusetts.

All products manufactured by K.T.I. are subject to the following Limited Warranty.

Limited Warranty. K.T.I. warrants and guarantees only to the original purchaser that the product is free from defects of materials and workmanship in the manufacturing process for the period of one year from the date of purchase of a new K.T.I. product.

This Warranty does not apply to special order items and this Warranty does not apply to renovated, retrofit or modified products, whether or not they originated with K.T.I. and whether or not they were retrofit by the original owner.

This Warranty does not apply to products installed in watercraft for racing or competition.

This Warranty shall be inapplicable to any product not properly installed and not properly used by the purchaser or to any product damaged or impaired by external forces.

This Warranty does not cover any product for which applicable proof of purchase date, installation date and watercraft mileage at the time of installation is not presented.

This Warranty does not cover any issues that are considered normal maintenance and which are customarily replaced, cleaned or adjusted as normal owner maintenance, unless they are defective in material or factory workmanship.

Process. A product claimed to be defective must be returned to the place of purchase. K.T.I. at its sole option shall replace the defective product with a comparable new product or repair the defective product in the event that it qualifies under this Warranty.

LIMITATION OF LIABILITY

To the extent that this Warranty is available on this product, K.T.I. shall have no liability whatsoever for incidental or consequential damages flowing from the use of any defect product or by reason of the failure of any product. K.T.I. specifically disavows all express or implied warranties of fitness for a particular purpose, warranties of description, and warranties of merchantability.

Product Warning. This product and its use may be considered inherently dangerous. Failure of the product, improper selection of the product or improper use of the product or related products may cause death, personal injury and property damage. K.T.I. disclaims any responsibility for any such injury or damage.

Indemnity. You agree to indemnify and hold K.T.I., its officers, directors, employees, agents, harmless from any and all claims, demands, lawsuits, liabilities and expenses arising out of or in connection with your use of the product and your breach or violation of any of the Terms of this Limited Warranty.

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